STORMWATER MANAGEMENT REPORT

for

PROPOSED GROCER AT THE PROMENADE SHOPS AT EVERGREEN WALK (UNIT 2)
801 Evergreen Way
South Windsor, CT

Prepared for:

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April 8, 2021
140222801

TABLE OF CONTENTS

FIGURES

DRAWINGS

APPENDICES

EXECUTIVE SUMMARY

Langan prepared this stormwater management report in support of the proposed grocery and retail stores located at 801 Evergreen Way within Unit 2 of the Promenade Shops at Evergreen Walk, located in the town of South Windsor, Connecticut. This site is identified as Map 27, Block 15, Unit 2 by the Town of South Windsor Assessor's Office and is approximately 7.3± acres of the Evergreen Walk Master Development Plan Area.

In the existing condition, two retail buildings with associated parking lots and drive aisles occupy the site. The majority of stormwater is collected by on-site drainage structures. It is conveyed through an existing pipe network in Hemlock Avenue in the westerly direction where it eventually discharges to Detention Basin 4 or a drainage swale that both ultimately discharge to the nearby wetlands.

The proposed redevelopment project includes the demolition of the two existing retail buildings and the construction of a ±40,000 square-foot grocer and adjacent inline ±10,000 square-foot retail space. Other associated site improvements including walkways, parking, drive aisles, driveways, site lighting, utility improvements, and drainage improvements. The overall impervious coverage has been reduced (approximately 0.5%), the overall peak flow rates have been reduced, and additional water quality measures have been introduced on site.

The proposed stormwater management system has been designed in general compliance with the Town of South Windsor Design Requirements, the 2002 State of Connecticut Guidelines for Soil Erosion and Sediment Control, and the 2004 Connecticut Stormwater Quality Manual. This report demonstrates that the proposed stormwater system will effectively manage the quality and quantity of stormwater runoff for the proposed development at 801 Evergreen Way, consistent with the approved master plans. A comparative analysis is provided of the calculated total pre- and post-development site runoff conditions, in which the overall peak runoff flow rates leaving the project limits in the 2, 10, 25, and 100-year storm events do not exceed those in the existing condition. In addition, stormwater quality improvements and the installation of erosion and sedimentation controls during demolition and construction periods is specified, as well as long-term stabilization and pollution prevention on the site.

Water quality Best Management Practices (BMP's) have also been incorporated to promote treatment and include sumped catch basins, rain gardens, permeable pavers, a reduction in pervious surfaces, and three water quality units.

It is the opinion of this office and the findings of this report that the proposed stormwater system, as designed, will effectively manage the stormwater runoff for quality and quantity for the proposed redevelopment. The design in this report is further supported by the "Proposed Grocer at The Promenade Shops at Evergreen Walk" plans prepared by Langan and dated April 6, 2021.

INTRODUCTION

1.1 General

This stormwater management report has been prepared in support of the proposed grocery and retail spaces to be located at 801 Evergreen Way (Unit 2) in the town of South Windsor, Connecticut. The development will include the construction of a ±40,000 square-foot grocer and adjacent inline ±10,000 square-foot retail space along with associated parking, drive aisles, driveways, walkways, a loading dock, landscaped areas, site lighting, utility upgrades, and drainage improvements. This report addresses the engineering design of the stormwater conveyance and management systems for the site.

1.2 Site Location

This site is identified as Map 27, Block 15, Unit 2 by the Town of South Windsor Assessor's Office and is approximately 7.3± acres of the Evergreen Walk Master Development Plan Area. The project limits is bordered by a largely wooded area to the north, wetlands and retail space to the east, a private drive Hemlock Avenue to the south, and Evergreen Crossings Retirement Community to the west. A Costco and fueling station is proposed to be developed to the north of the site on the currently vacant land.

1.3 Existing Conditions

The proposed site is currently developed with two existing retail buildings, parking lot, and associated site features. The site generally slopes from east to west with an elevation ±139 at the eastern most part of the site, elevation ±107 in the southwest corner of the site, and existing building elevations of ±130 and ±128.

Currently ±2,460 square-feet of wetlands and ±29,765 square-feet of upland review area, inclusive of the wetland area, are present in the northeast corner of the site. The wetlands have been delineated by All Points Technologies Corporation in February 2021 and their findings are presented under a separate cover.

1.4 Project Description

The redevelopment project consists of the demolition of two existing retail spaces and construction of a ±40,000 square-foot grocer and adjacent inline ±10,000 square-foot retail space. Site improvements include parking, drive aisles, driveways, a loading dock, landscaping, walkways, site lighting, utility improvements, and drainage improvements.

Because of previous development, no wetland alterations are proposed for the redevelopment of the site, with the exception of intermittent stream and wetland buffer enhancements. Minor regrading and site improvements will take place within the upland review area. These improvements will occur in previously disturbed areas and will generally increase the separation from the wetlands.

Under the proposed conditions, small portion of the west, north, and northeast perimeters of the site will continue to sheet flow off site as they do in existing conditions. The stormwater runoff patterns from the interior of the site will generally be maintained. Runoff will continue to be collected by on-site drainage structures where it is conveyed through closed pipe networks before exiting the site through the existing Evergreen Walk stormwater system. New low impact design techniques such as rain gardens will be added to improve water quality treatment prior to discharging to the closed pipe network.

1.5 FEMA

According to the *Flood Insurance Study of Hartford County, Connecticut* conducted by the Federal Emergency Management Agency (FEMA) map number 09003C0383F with an effective date of September 26, 2008 (Figure 4), the site is located within the FEMA Flood Zone X, which is outside of the 100-year floodplain and is considered an area of minimal flood risk.

1.6 Soil Conditions

Soils are classified into hydrologic soil groups (HSG) to indicate the minimum rate of infiltration obtained for bare soil after prolonged wetting. The HSGs, which are classified as A, B, C, and D, are one element used to determine runoff curve numbers and analyzing stormwater characteristics on site.

Group A: Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B: Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well-drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C: Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D: Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a clay pan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

According to the *USDA Natural Resources Conservation Service Web Soil Survey* (Figure 5), the site soil type is classified as Tisbury silt loam, 0 to 3 percent; Enfield silt loam, 0 to 3 percent slopes; and Enfield silt loam, 3 to 8 percent slopes. The Web Soil Survey has classified these soils as hydrologic soil groups B and C.

Table 1: NRCS Soil Survey

Hydrologic Soil Group - Summary by Map Unit- State of Connecticut

Map Unit Symbol	Map Unit Name	Rating
702 A	Tisbury silt loam, 0 to 3 percent	C
704 A	Enfield silt loam, 0 to 3 percent slopes	B
704 B	Enfield silt loam, 3 to 8 percent slopes	B

All soils within the project site have been classified as hydrologic soil groups B and C. In general, the soils within project site have moderate to slow infiltration rates when thoroughly wet.

1.0 STORMWATER MANAGEMENT

2.1 Design Criteria

Proposed peak flow rates at all points of discharge from the site were analyzed to compare proposed discharge rates with the existing condition.

The storms analyzed include the following:

- A 2-year, 24-hour storm consisting of 3.11 inches of rainfall
- A 10-year, 24-hour storm consisting of 4.91 inches of rainfall
- A 25-year, 24-hour storm consisting of 6.03 inches of rainfall
- A 100-year, 24-hour storm consisting of 7.77 inches of rainfall

These events are based on NOAA Atlas 14, Volume 10, Version 2 South Windsor, CT.

2.2 Design Methodology

The peak runoff discharges for the existing and proposed conditions were analyzed using Soil Conservation Service (SCS) methodology, which outlines procedures for calculating peak rates of runoff resulting from precipitation events, and procedures for developing runoff hydrographs. Values for area, curve number, and time of concentration were calculated for the existing and proposed conditions.

The curve number "CN" is a land-sensitive coefficient that dictates the relationship between total rainfall depth and direct storm runoff. The soils within the watershed are divided into hydrologic soil groups (A, B, C, and D) as previously described.

The time of concentration, Tc, is defined as the time for runoff to travel from the hydraulically most distant point in the watershed to a point of interest. Values of time of concentration were determined for existing and proposed conditions based on land cover and slope of the flow path, using methods outlined in the SCS methodology.

For this study, a 24-hour SCS Type III standard rainfall distribution was used to determine the peak flow rate to all points of discharge from the site.

2.3 Existing Runoff Discharges (See Appendix A for Calculations)

The existing drainage conditions were delineated into four (4) watershed areas: EX-1 through EX-4 (See EX-WS).

Watershed EX-1, consisting of 0.35 acres, is comprised of the western edge of the site. It includes steep sloped landscaped and wooded areas and a portion of the western drive aisle, which is approximately 2,200 SF of pavement. Runoff from this watershed sheet flows off site to the west and is either collected in the Tamarack Avenue drainage network or discharged to the wetlands west of the site.

Watershed EX-2, consisting of 1.32± acres, is comprised of approximately 3,000± sf of building roof, 47,000± sf of parking lot, and 7,000± landscaped area in the western portion of the site. Runoff from this watershed is collected through drainage structures on site and conveyed through a closed pipe drainage network before exiting the site through an 18-inch RCP pipe that eventually discharges to a drainage swale and ultimately flows into the wetlands west of the site.

Watershed EX-3, consisting of 5.46± acres, makes up the majority of the site's runoff. It is comprised of the majority of the existing building roofs, the main parking area, and the site driveways. Runoff from this watershed is collected through various drainage structures on site and is conveyed through a closed pipe drainage network before exiting the site through a 24-inch RCP pipe that connects to the Evergreen Walk drainage network and eventually discharges to Detention Basin 4 west of the site.

Watershed EX-4, consisting 0.16± pervious acres, is comprised of the on-site wetlands in the northeastern corner of the site. Runoff from this watershed sheet flows northeast to the wetlands.

2.4 Proposed Runoff Discharges (See Appendix B for Calculations)

The proposed drainage conditions were delineated into four (4) watershed areas: PR-1 through PR-4 (See PR-WS).

Watershed PR-1, consisting of 0.39 acres, is comprised of the western edge of the site. It includes steep sloped landscaped and wooded areas and a portion of the western

drive aisle, which is approximately 1,800 SF of pavement. Runoff from this watershed sheet flows off site to the west and is either collected in the Tamarack Avenue drainage network or discharged to the wetlands west of the site, as it does in existing conditions.

Watershed PR-2, consisting of 1.32± acres, is comprised of the western portion of the parking lot. Runoff from this watershed is collected through various drainage structures on site and is conveyed through a closed pipe drainage network. The runoff passes through a proposed water quality unit before exiting the site through an existing 18-inch pipe that connects to a drainage manhole southwest of the site. Runoff eventually discharges to a drainage swale that ultimately flows into wetlands west of the site, as it does in existing conditions.

Watershed PR-3, consisting of 5.43± acres, makes up the majority of the site's runoff. It is comprised of the building roof, the front parking area, and the site driveways. Runoff from this watershed is collected through various drainage structures on site and conveyed through a closed pipe drainage network. The runoff passes through a proposed water quality unit before exiting the site through a 24-inch pipe that connects to the Evergreen Walk drainage network and eventually discharges to Detention Basin 4, as it does in existing conditions.

Watershed PR-4, consisting 0.16± pervious acres, is comprised of the on-site wetlands in the northeastern corner of the site. Runoff from this watershed sheet flows northeast to the wetlands as it does in existing conditions.

Table 2: Peak Runoff Flow Comparison (CFS)

Design Point	2-YEAR		10-YEAR		25-YEAR		100-YEAR	
	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed
Design Point 1 (Tamarack Ave.)	0.81	0.87	1.49	1.62	1.91	2.09	2.56	2.81
Design Point 2 (Hemlock Ave. 18" RCP)	4.05	3.97	6.51	6.45	8.03	7.98	10.38	10.34
Design Point 3 (Hemlock Ave. 24" RCP)	16.42	16.33	26.67	26.52	32.99	32.81	42.76	42.53
Design Point 4 (Wetlands)	0.34	0.34	0.65	0.65	0.84	0.84	1.14	1.14
Total Site Discharge	21.63	21.51	35.31	35.23	43.76	43.55	56.84	56.81

Note: Because of varying times of concentrations, the total site discharge is not cumulative of the contributing flows.

The redevelopment project has been designed to the maximum extent practicable to maintain existing drainage patterns. In addition, the proposed development results in a net decrease in the site's impervious areas by approximately ±1,330 square-feet. Ultimately, the majority of the stormwater on site flows into the wetlands west of the abutting development. By striving to maintain existing drainage patterns to the extent feasible and decreasing the total impervious area, the total site peak flow for all analyzed storms are decreased without any additional stormwater management features.

The small increase in the peak flows to Design Point 1, Tamarack Avenue, is expected to have an insignificant impact on the design point, as it is a minimal increase in flow and volume and ultimately connects to the aforementioned wetlands west of the abutting development. Additionally, there is a reduction in discharge rates overall.

2.0 STORMWATER QUALITY

3.1 Stormwater Quality Improvements

The stormwater management system has been designed in with the guidance of the Connecticut DEEP Stormwater Quality Manual and the Connecticut DEEP Soil Erosion and Sediment Control Manual. The primary source of water quality improvement comes from the reduction in the sites total impervious area, added landscaped areas, added rain gardens, added water quality units, and modernization of the drainage network.

3.2 Additional Stormwater Quality Features

In addition to decreasing the site's impervious area, the following additional water-quality control measures will be provided:

Catch basins with sumps: Catch basins at the site are to be constructed with sumps (minimum 2 feet) to prevent discharge of sediments.

Rain gardens: Rain gardens are to be constructed in landscaped islands to facilitate the filtering of collected stormwater.

Water Quality Units: Water quality units are to be installed prior to discharge into the existing storm sewer system within Hemlock Avenue.

Permeable pavers: Permeable pavers are to be installed in the pedestrian only seasonal marketing area, which leads to a net decrease in impervious area for the site.

3.0 STORM DRAINAGE COLLECTION SYSTEM DESIGN (See Appendix C for Calculations)

4.1 Design Criteria

The proposed subsurface storm drainage collection system is designed to convey the 10-year design storm with event with one foot of freeboard per the Town of South Windsor requirements.

4.2 Design Methodology

The storm drainage system was analyzed using the Rational Method for estimating runoff for a 10-year design storm event. The site was divided into subareas, each contributing runoff to an individual catch basin inlet or roof drain. A value for area, time of concentration, and runoff coefficient was calculated for each contributing subarea.

Values of time of concentration were chosen based on land cover and flow path slope from the hydraulically most distant point in the subarea to the appropriate inlet. The average runoff coefficient, which is the ratio of peak runoff rate to the average rainfall rate for the period known as the time of concentration, was chosen using the following values:

CONDITION	C
Grass/Landscaping	0.30
Paved/Impervious/Roof	0.90

Rainfall intensities were taken from the NOAA Atlas 14, Volume 10, Version 2 South Windsor, CT rain gauge data. Storm drainage pipes were then sized based on calculated flows using Manning's Equation and were verified by solving for the hydraulic grade line. Starting hydraulic grade lines for the pipe networks were set to the calculated maximum water elevations for the 10-year-design storm event within the analyzed drainage network.

4.3 Storm Drainage Collection Summary

The runoff from the development will be collected using a conventional roof drains, catch basin, and manhole system. The collection system was designed to convey the

10-year storm to allow for one foot of free board within the proposed catch basins on-site.

4.0 CONCLUSION

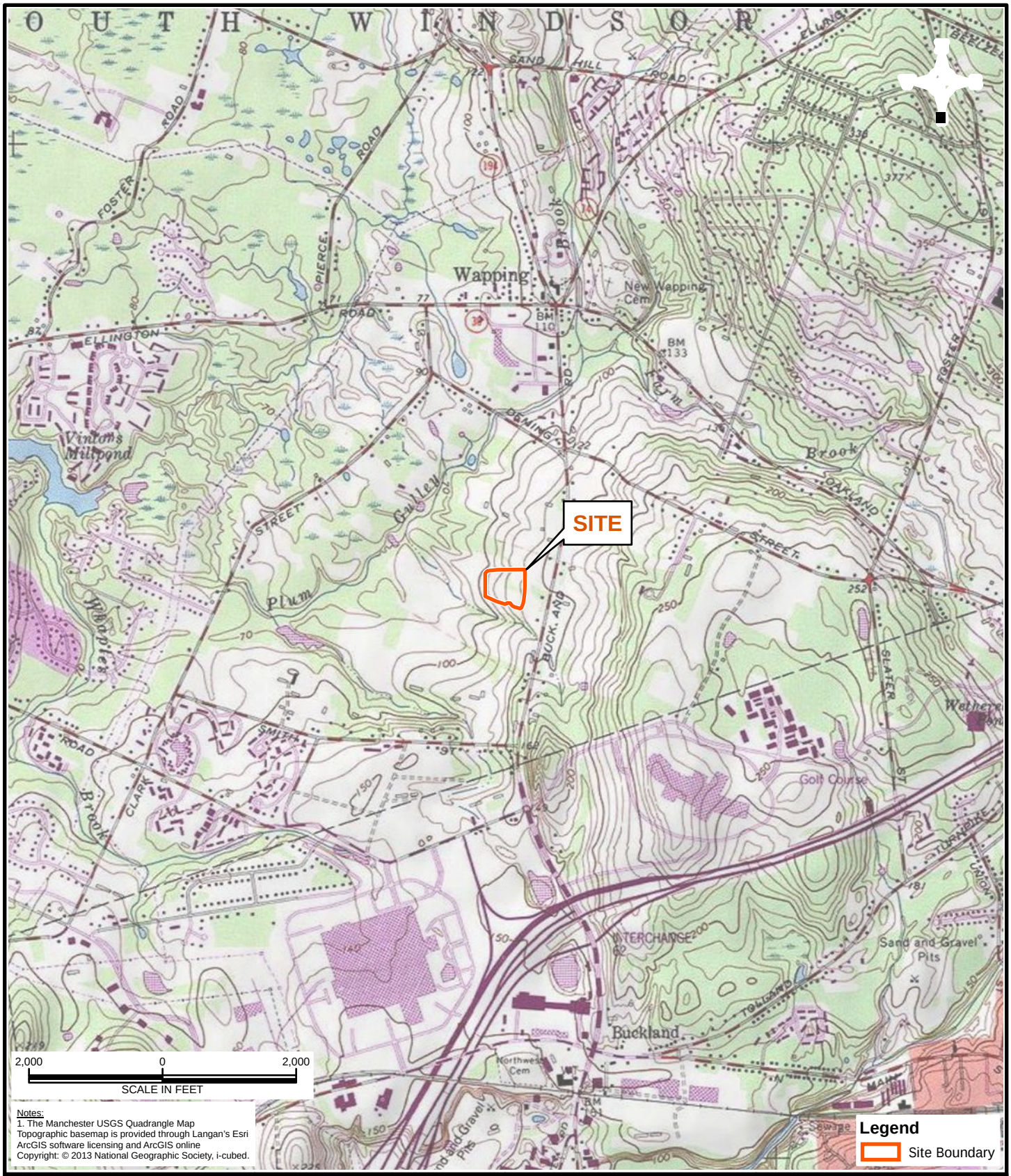
The proposed stormwater management system has been designed in general accordance with the town of South Windsor requirements, the 2004 CT DEEP Stormwater Quality Manual, and the 2000 CT DOT Drainage Manual. The system incorporates stormwater quality measures and decreases the overall peak rate of runoff from the project development for all storm events analyzed as compared to the existing conditions.

It is the opinion of this office and the findings of this report that the proposed stormwater system, as designed, will effectively manage quality and quantity of stormwater runoff for the proposed development.

LIST OF FIGURES

LIST OF DRAWINGS

FIGURES



LANGAN

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Project	801 EVERGREEN WAY SOUTH WINDSOR HARTFORD COUNTY CONNECTICUT
Drawing Title	SITE LOCATION MAP
Project No.	140222801
Date	2/16/2021
Scale	1" = 2,000 feet
Drawn By	ELB
Figure	1

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Project
801 EVERGREEN WAY
SOUTH WINDSOR
HARTFORD COUNTY CONNECTICUT

Drawing Title
AERIAL MAP

Project No.	140222801
Date	2/16/2021
Scale	1" = 500 feet
Drawn By	ELB
Figure	2

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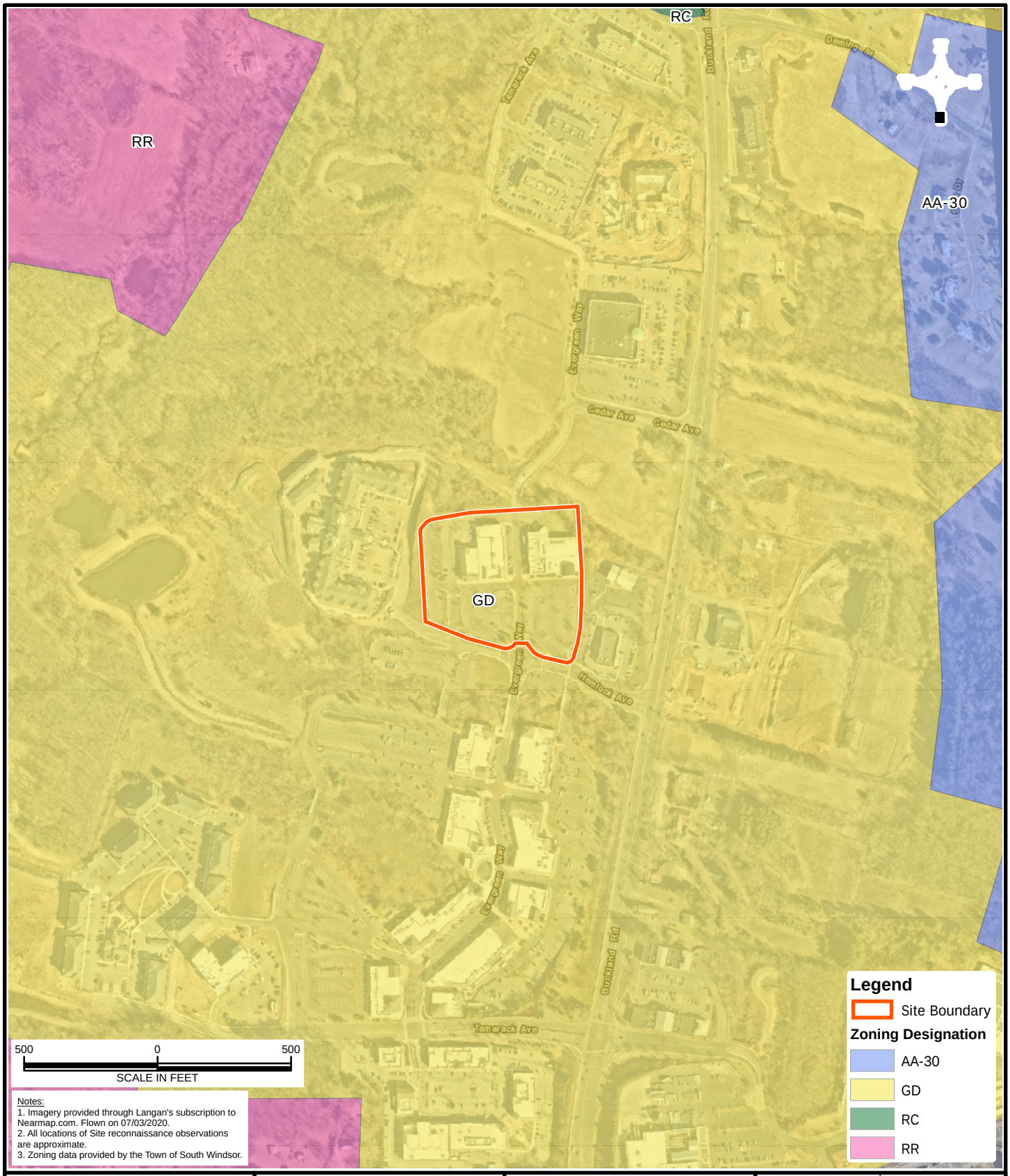

Notes:
1. Imagery provided through Langan's subscription to Nearmap.com. Flown on 07/03/2020.
2. All locations of Site reconnaissance observations are approximate.
3. Zoning data provided by the Town of South Windsor.

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SOUTH WINDSOR
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Drawing Title
NEARBY PROPERTIES MAP

Project No. 140222801	Figure 3
Date 2/16/2021	
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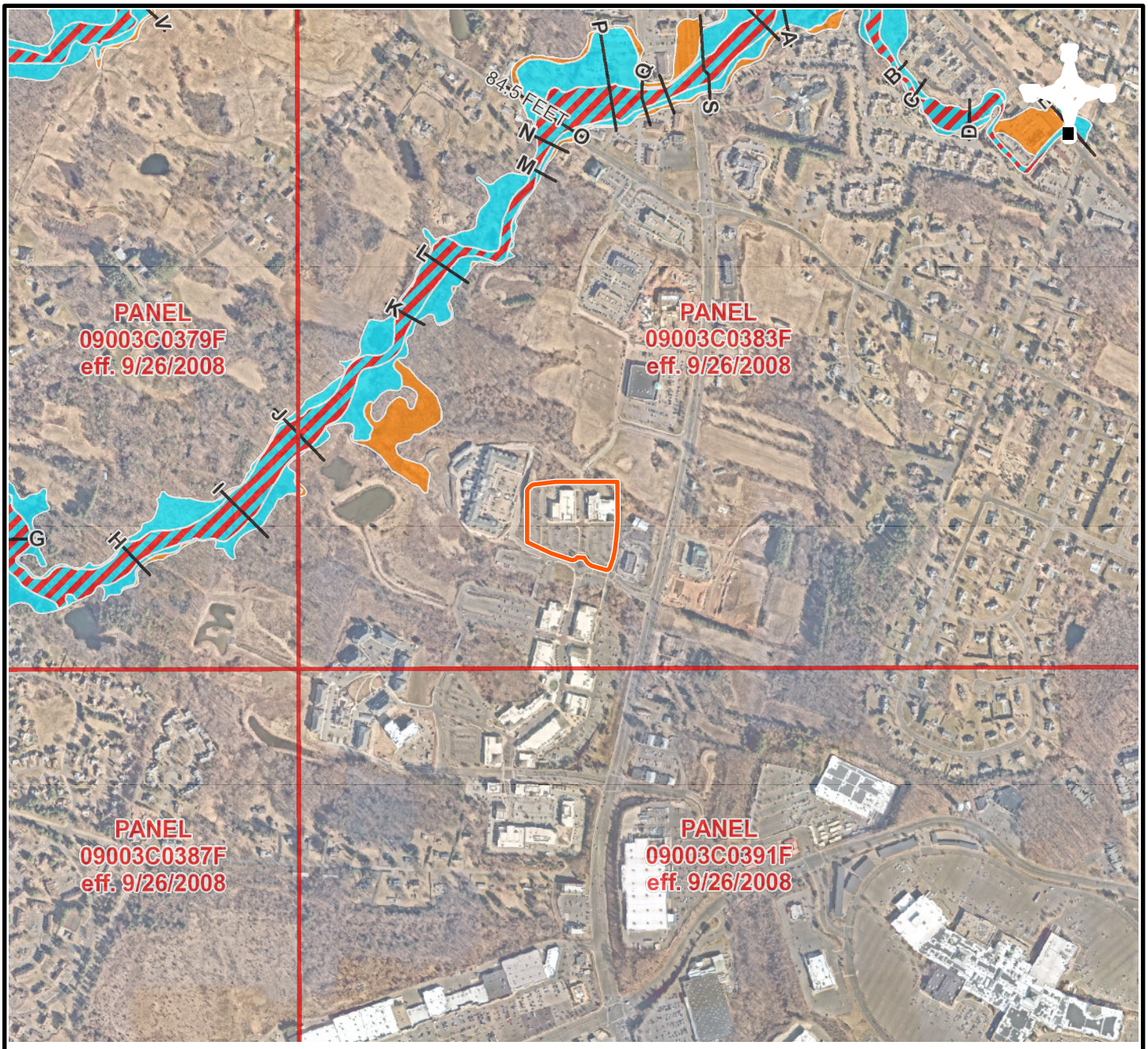

Legend

- Site Boundary
- FIRM Panels
- Cross-Sections
- Limit of Moderate Wave Action

Flood Hazard Boundaries

- Other Boundaries
- Limit Lines
- SFHA / Flood Zone Boundary

Flood Hazard Zones

- 1% Annual Chance Flood Hazard
- Regulatory Floodway
- Special Floodway
- Area of Undetermined Flood Hazard
- 0.2% Annual Chance Flood Hazard
- Future Conditions 1% Annual Chance Flood Hazard
- Area with Reduced Risk Due to Levee

Notes:
1. Imagery provided through Langan's subscription to Nearmap.com. Flown on 07/03/2020.
2. All locations of site reconnaissance observations are approximate.
3. Effective FEMA Firm data provided by the Federal Emergency Management Agency.

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Project
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SOUTH WINDSOR
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Drawing Title
EFFECTIVE FEMA FIRM

Project No. 140222801	Figure 4
Date 2/16/2021	
Scale 1" = 1,000 feet	
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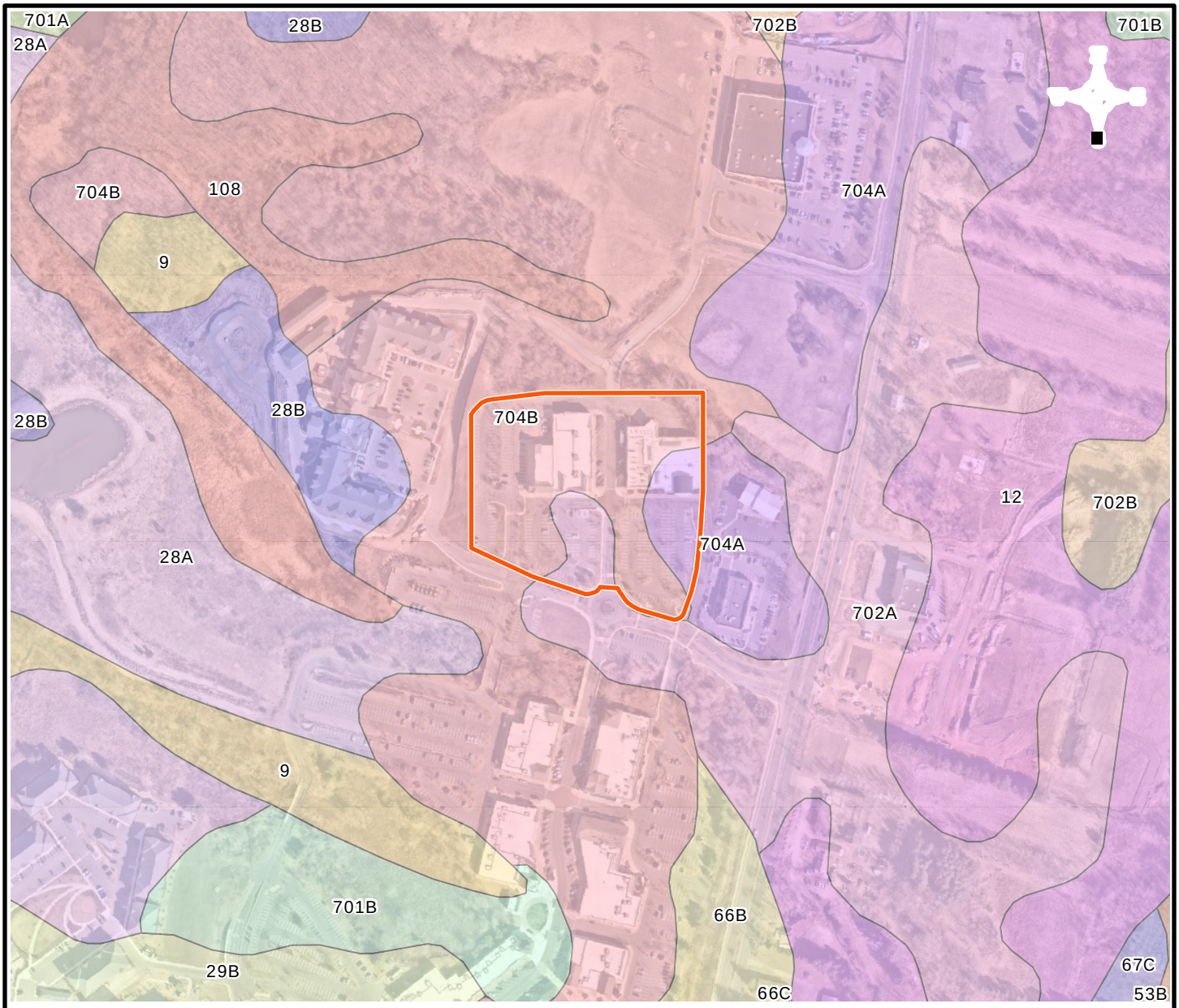

Notes:
1. Imagery provided through Langan's subscription to Nearmap.com. Flown on 03/07/2020.
2. All locations of Site reconnaissance observations are approximate.
3. Soils data provided by the Natural Resource Conservation Service.

Legend

- Site Boundary

Mapunit Symbol,Mapunit Name

- 108,Saco silt loam
- 12,Raypol silt loam
- 28A,Elmridge fine sandy loam, 0 to 3 percent slopes
- 28B,Elmridge fine sandy loam, 3 to 8 percent slopes
- 29B,Agawam fine sandy loam, 3 to 8 percent slopes
- 53B,Wapping very fine sandy loam, 3 to 8 percent slopes
- 66B,Narragansett silt loam, 2 to 8 percent slopes
- 66C,Narragansett silt loam, 8 to 15 percent slopes
- 67C,Narragansett silt loam, 8 to 15 percent slopes, very stony
- 701A,Ninigret fine sandy loam, 0 to 3 percent slopes
- 701B,Ninigret fine sandy loam, 3 to 8 percent slopes
- 702A,Tisbury silt loam, 0 to 3 percent slopes
- 702B,Tisbury silt loam, 3 to 8 percent slopes
- 704A,Enfield silt loam, 0 to 3 percent slopes
- 704B,Enfield silt loam, 3 to 8 percent slopes
- 9,Scitico, Shaker, and Maybid soils

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Drawing Title
NRCS SOILS

Project No.	140222801
Date	2/16/2021
Scale	1" = 400 feet
Drawn By	ELB
Figure	5

Path: \\langan.com\data\NHV\data8\140222801\Project Data\ArcGIS\APRX\140222801- Evergreen Way.aprx Date: 2/16/2021 User: eburns Time: 5:31 PM

LAND USE TABLE

LAND AREA WITHIN			
- THE 'BUCKLAND ROAD GATEWAY DEVELOPMENT ZONE'		229.9 AC.	
- THE 'RURAL RESIDENTIAL ZONE'		13.1 AC.	
OVERALL PROPERTY		243 AC.	
	EXIST./APPROVED	PROPOSED	
- BUILDINGS, RETAIL			
The Shops at Evergreen Walk	284,750 SF		
The Shops - Phase II (88,095 SF u/c)	90,250 SF		
Wright Property		50,000 SF	
Site '3' - Lifestyle Retail		95,000 SF	
Site '6' - Town Square		205,000 SF	
TOTAL	375,000 SF	350,000 SF	725,000 SF
	EXISTING	PROPOSED	
- BUILDINGS, OFFICE			
The Shops at Evergreen Walk	3,870 SF		
ECHN Medical Center	39,820 SF		
Office - South I & II		58,800 SF	
Office - West, A, B, C, D, E, F, G		447,510 SF	
TOTAL	43,690 SF	506,310 SF	550,000 SF
	EXISTING	PROPOSED	
- BUILDINGS, RECREATION			
L.A.Fitness at Evergreen Walk	45,000 SF		
L.A.Fitness Expansion & Site 3		30,000 SF	
TOTAL	45,000 SF	30,000 SF	75,000 SF
	EXISTING	PROPOSED	
- BUILDINGS, HOTEL			
Hotel - North & South		250 Rooms	
TOTAL		250 Rooms	250 Rooms
	EXISTING	PROPOSED	
- BUILDINGS, RESIDENTIAL			
Town Square at Evergreen Walk		200 Units	
TOTAL		200 Units	

PROJECT SITE

PLUM GULLY BROOK

ECHN II
(APPROVED APPLICATION)
Detention Basin 7

W10
(CONCEPTUAL DESIGN)
No Detention

ECHN
(CONSTRUCTED)
No Detention

UNIT 13
(CONCEPTUAL DESIGN)
Detention Basin 7

UNIT 12
(CONCEPTUAL DESIGN)
Detention Basin 7

WALKING / JOGGING TRAIL

UNIT 11
(CONCEPTUAL DESIGN)
Detention Basin 7

L.A. FITNESS
(CONSTRUCTED)
No detention

DETENTION BASIN #1

DETENTION BASIN #2

DETENTION BASIN #2a

DETENTION BASIN #4

DETENTION BASIN #5

DETENT 5/UNIT 5
(CONCEPTUAL DESIGN)
Detention Basin 5

Detention Basin 5
Underground Storage

LA FITNESS
(CONCEPTUAL DESIGN)
No detention

EW5
(CONSTRUCTED)
No detention

UNIT 4
(CONCEPTUAL DESIGN)
Detention Basin 4

EW4
(CONSTRUCTED)
Detention Basin 4

EW VILLAGE
(CONCEPTUAL DESIGN)
Detention Basin 2 & 2a

EW4
(CONSTRUCTED)
Detention Basin 4

EW3
(CONSTRUCTED)
Detention Basin 2 & 2a

EXPO
(UNDER CONSTRUCTION)
Detention Basin 1

EW VILLAGE
(CONCEPTUAL DESIGN)

EW 3
(CONCEPTUAL DESIGN)
Detention Basin 2 & 2a

File Path: \\blcompanies.com\dfs\prog\JOBS13\113\C13C4718\RECORDING\2015-12-03 master plan drainage area map\Prop Dra - Standard\STC Drainage\Prop Dra.dwg, Layout: PROP DRA Tue, Jun 12, 2018 - 11:42 AM User: sleclerc

CTB: LMAN: MS VIEW: UCS:WORLD

SCALE:
HORZ.: 1" = 400'
VERT.:
DATUM:
HORZ.:
VERT.:
0 200 400
GRAPHIC SCALE

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146 HARTFORD RD MANCHESTER, CT 06040 860.646.2469

EVERGREEN WALK, LLC

PROPOSED WATERSHED AREAS

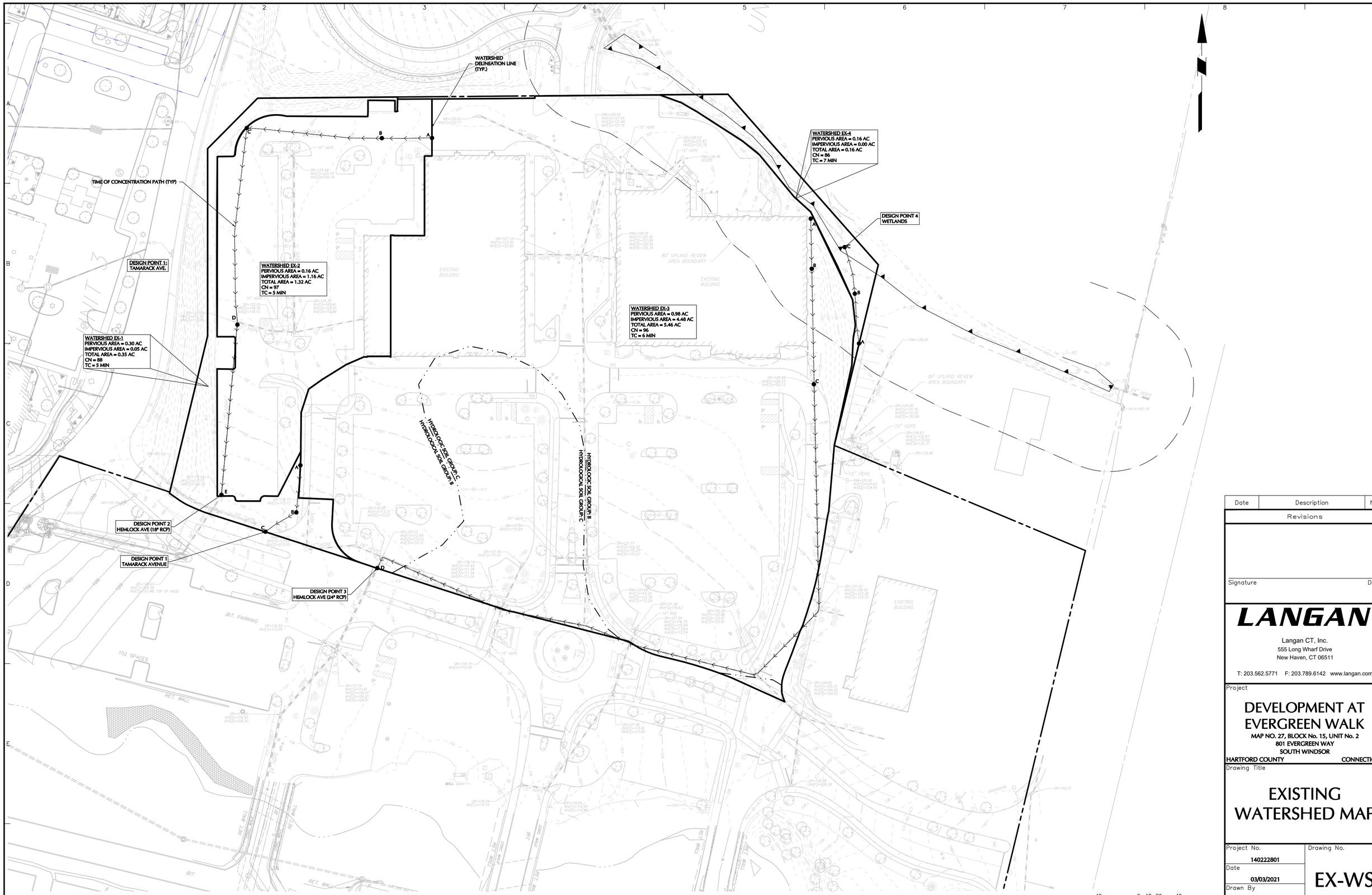
EVERGREEN WALK MASTER DEVELOPMENT PLAN

SOUTH WINDSOR CONNECTICUT

PROJ. No.: 2000 481 A30
DATE: 6/8/2007

DRA-1

DRAWINGS



NOTES:
1. LIMITS OF WETLANDS WERE DELINEATED BY ALL POINTS TECHNOLOGIES CORPORATION IN FEBRUARY 2021.

No.	Description	Date
	Revisions	

Signature Date

LANGAN

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Project

DEVELOPMENT AT EVERGREEN WALK

MAP NO. 27, BLOCK No. 15, UNIT No. 2
801 EVERGREEN WAY
SOUTH WINDSOR
HARTFORD COUNTY CONNECTICUT

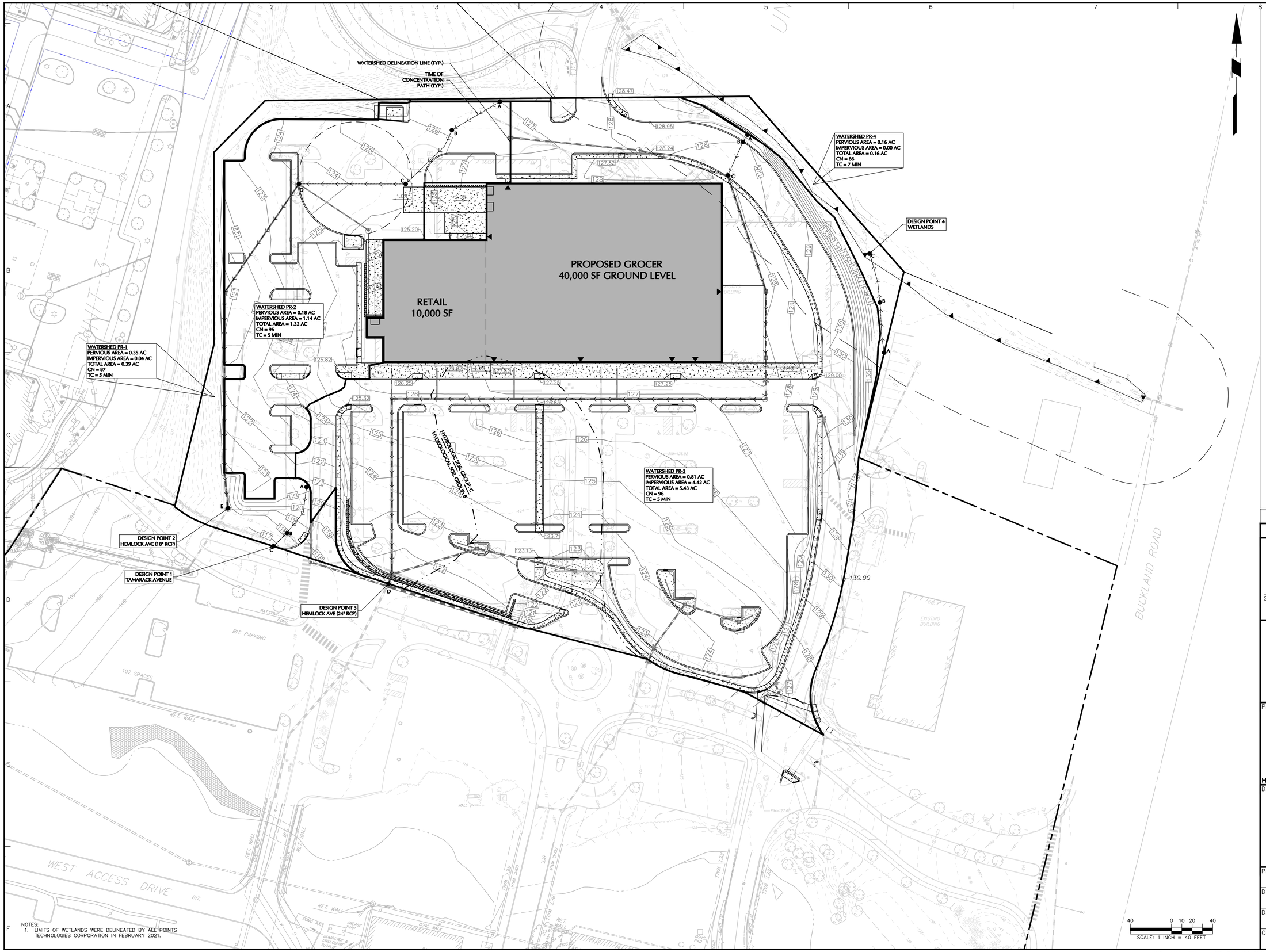
Drawing Title

EXISTING WATERSHED MAP

Project No.	Drawing No.
140222801	EX-WS
Date: 03/03/2021	
Drawn By: HES	
Checked By: JEL	

LANGAN
Project No. 140222801

Date: 4/8/2021 Time: 16:39 User: ibrown Style Table: Langan.stb Layout: Layout1 Document Code: 140222801-0503-CG103-0101



NOTES:
1. LIMITS OF WETLANDS WERE DELINEATED BY ALL POINTS TECHNOLOGIES CORPORATION IN FEBRUARY 2021.

SCALE: 1 INCH = 40 FEET

Date	Description	No.

Revisions

Signature Date

LANGAN

Langan CT, Inc.
555 Long Wharf Drive
New Haven, CT 06511

T: 203.562.5771 F: 203.789.6142 www.langan.com

Project

DEVELOPMENT AT EVERGREEN WALK

MAP NO. 27, BLOCK No. 15, UNIT No. 2
801 EVERGREEN WAY
SOUTH WINDSOR
HARTFORD COUNTY CONNECTICUT

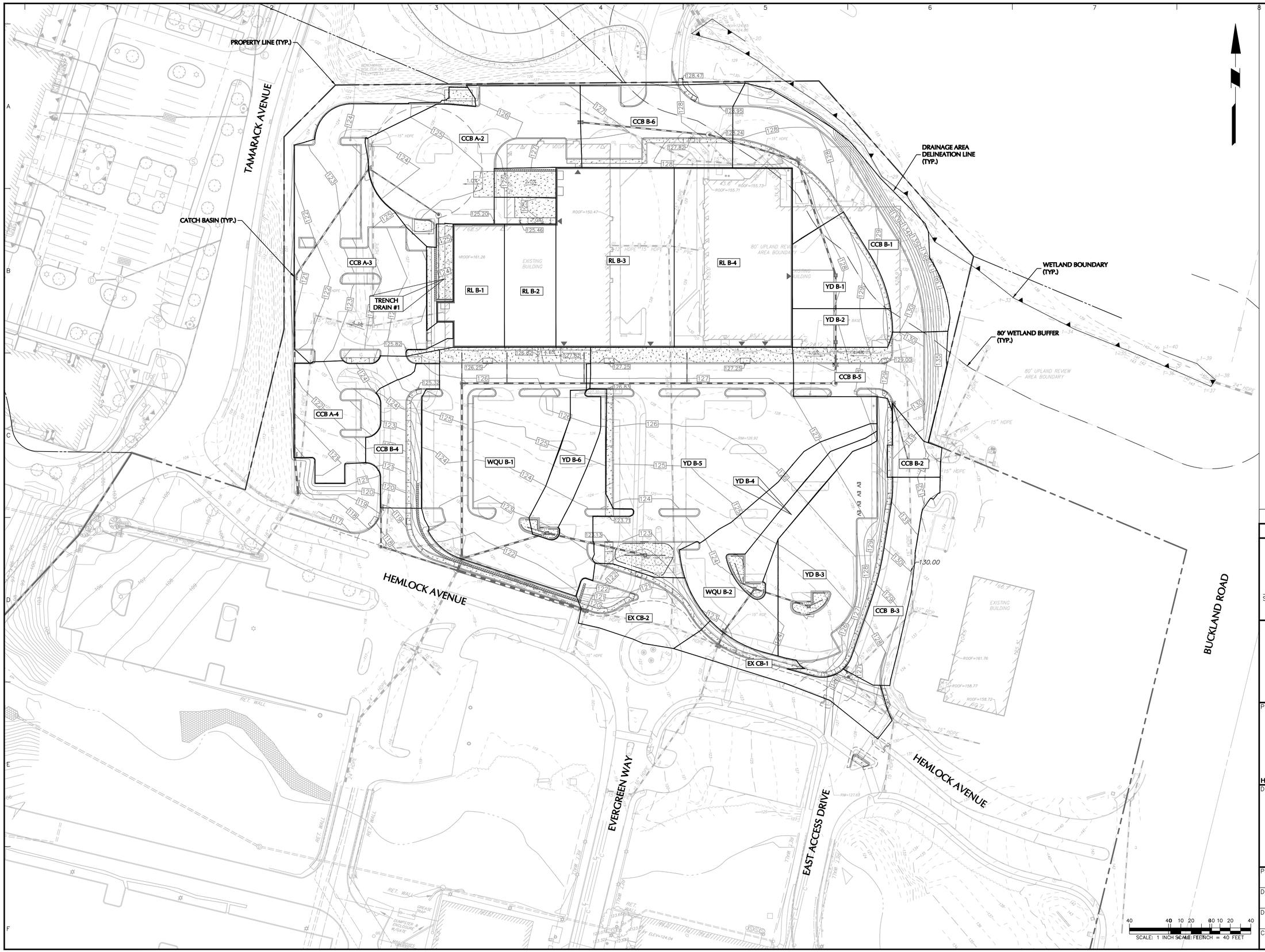
Drawing Title

PROPOSED WATERSHED MAP

Project No.	Drawing No.
140222801	PR-WS
Date: 03/12/2021	
Drawn By: HES	
Checked By: JEL	

LANGAN Project No. 140222801

Date: 4/8/2021 Time: 16:46 User: ibrown Style Table: Langan.stb Layout: Layout1 Document Code: 140222801-0503-CG104-0101



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Project No. 140222801

Date	Description	No.

Revisions

Signature Date

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Project

DEVELOPMENT AT EVERGREEN WALK

MAP NO. 27, BLOCK No. 15, UNIT No. 2
801 EVERGREEN WAY
SOUTH WINDSOR
HARTFORD COUNTY CONNECTICUT

Drawing Title

DRAINAGE AREA MAP

Project No.	Drawing No.
140222801	DA-CB
Date: 03/12/2021	
Drawn By: IJAB	
Checked By: JEL	0

Date: 4/8/2021 Time: 16:51 User: ibrown Style Table: Langan.stb Layout: Layout1 Document Code: 140222801-0504-CG104-0101

APPENDIX A

Existing Stormwater Discharge Calculations

Project **Evergreen Walk** By **HES** Date **3/12/2021**

Location **South Windsor, CT** Checked **JEL** Date **3/12/2021**

Circle One: (Present) Developed

Circle One: (T_c) T_t through subarea **EX-1**

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c Only)		Segment ID	AB					
1. Surface description (table 3-1)			Short Grass Prairie					
2. Manning's roughness coeff., n (table 3-1)			0.15					
3. Flow Length, L (total L ≤ 150 ft)		ft	50					
4. Two-yr 24-hr rainfall, P_2		in	3.1					
5. Land slope, s		ft/ft	0.066					
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$	Compute T_t	hr	0.059	+		+	=	0.059

Shallow concentrated flow		Segment ID	BC					
7. Surface description (paved or unpaved)			Unpaved					
8. Flow length, L		ft	34					
9. Watercourse slope, s		ft/ft	0.065					
10. Average velocity, V (figure 3-1)		ft/s	4.1					
11. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr	0.002	+		+	=	0.002

Channel flow		Segment ID						
12. Cross sectional flow area, a		ft^2						
13. Wetted perimeter, p_w		ft						
14. Hydraulic radius, r $r = \frac{a}{p_w}$	Compute r	ft						
15. Channel slope, s		ft/ft						
16. Manning's roughness coeff., n								
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$	Compute V	ft/s						
18. Flow length, L		ft						
19. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr		+			=	0.000
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19)								0.061 hr

Use Tc= 5 min

Project **Evergreen Walk** By **HES** Date **3/12/2021**

Location **South Windsor, CT** Checked **JEL** Date **3/12/2021**

Circle One: (Present) Developed

Circle One: (T_c) T_t through subarea **EX-2**

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c Only)		Segment ID	AB					
1. Surface description (table 3-1)			Asphalt					
2. Manning's roughness coeff., n (table 3-1)			0.01					
3. Flow Length, L (total L ≤ 150 ft)		ft	50					
4. Two-yr 24-hr rainfall, P_2		in	3.1					
5. Land slope, s		ft/ft	0.012					
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$	Compute T_t	hr	0.014	+		+	=	0.014

Shallow concentrated flow		Segment ID	BC	CD				
7. Surface description (paved or unpaved)			Paved	Paved				
8. Flow length, L		ft	125	193				
9. Watercourse slope, s		ft/ft	0.022	0.010				
10. Average velocity, V (figure 3-1)		ft/s	3.0	2.0				
11. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr	0.011	+ 0.026	+		=	0.038

Channel flow		Segment ID	DE				
12. Cross sectional flow area, a		ft^2					
13. Wetted perimeter, p_w		ft					
14. Hydraulic radius, $r = \frac{a}{p_w}$	Compute r	ft					
15. Channel slope, s		ft/ft	0.023				
16. Manning's roughness coeff., n			0.011				
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$	Compute V	ft/s	5.00				
18. Flow length, L		ft	175				
19. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr	0.010	+	=	0.010	
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19)						0.062	hr

Use Tc= 5 min

Project **Evergreen Walk** By **HES** Date **3/12/2021**

Location **South Windsor, CT** Checked **JEL** Date **3/12/2021**

Circle One: (Present) Developed

Circle One: (T_c) T_t through subarea **EX-3**

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c Only)		Segment ID	AB					
1. Surface description (table 3-1)			Short Grass Prairie					
2. Manning's roughness coeff., n (table 3-1)			0.15					
3. Flow Length, L (total L ≤ 150 ft)		ft	50					
4. Two-yr 24-hr rainfall, P_2		in	3.1					
5. Land slope, s		ft/ft	0.072					
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$	Compute T_t	hr	0.057	+		+	=	0.057

Shallow concentrated flow		Segment ID	BC					
7. Surface description (paved or unpaved)			Unpaved					
8. Flow length, L		ft	116					
9. Watercourse slope, s		ft/ft	0.032					
10. Average velocity, V (figure 3-1)		ft/s	2.9					
11. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr	0.011	+		+	=	0.011

Channel flow		Segment ID	CD				
12. Cross sectional flow area, a		ft^2					
13. Wetted perimeter, p_w		ft					
14. Hydraulic radius, r $r = \frac{a}{p_w}$	Compute r	ft					
15. Channel slope, s		ft/ft	0.017				
16. Manning's roughness coeff., n			0.011				
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$	Compute V	ft/s	5.00				
18. Flow length, L		ft	721				
19. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr	0.040	+		=	0.040
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19)							0.108 hr

Use Tc= 6 min

Project **Evergreen Walk** By **HES** Date **3/12/2021**

Location **South Windsor, CT** Checked **JEL** Date **3/12/2021**

Circle One: (Present) Developed

Circle One: (T_c) T_t through subarea **EX-4**

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c Only)		Segment ID	AB					
1. Surface description (table 3-1)			Short Grass Prairie					
2. Manning's roughness coeff., n (table 3-1)			0.15					
3. Flow Length, L (total L ≤ 150 ft)		ft	50					
4. Two-yr 24-hr rainfall, P_2		in	3.1					
5. Land slope, s		ft/ft	0.015					
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$	Compute T_t	hr	0.107	+		+	=	0.107

Shallow concentrated flow		Segment ID	BC					
7. Surface description (paved or unpaved)			Unpaved					
8. Flow length, L		ft	48					
9. Watercourse slope, s		ft/ft	0.053					
10. Average velocity, V (figure 3-1)		ft/s	3.7					
11. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr	0.004	+		+	=	0.004

Channel flow		Segment ID						
12. Cross sectional flow area, a		ft^2						
13. Wetted perimeter, p_w		ft						
14. Hydraulic radius, r $r = \frac{a}{p_w}$	Compute r	ft						
15. Channel slope, s		ft/ft						
16. Manning's roughness coeff., n								
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$	Compute V	ft/s						
18. Flow length, L		ft						
19. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr		+		=	0.000	
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19)							0.110	hr

Use Tc= 7 min

Drainage Area ID	**EX-1**

Composite Curve Number Calculations

TR-55 Reference Table

Abbreviated TR-55 Table 2-2a Runoff Curve Numbers for Urban Areas

Cover Description	Curve Numbers for Hydrologic Soil Group (HSG)			
Fully Developed Urban Areas	A	B	C	D
Pervious Area				
Open Space - Lawns, Parks, and Cemeteries	68	79	86	89
Woods and Forest	30	55	70	77
Slectively Cleared Woods and Forest	43	65	76	82
Impervious Area				
Paved Areas and Roofs	98	98	98	98
Gravel Roads	76	85	89	91
Dirt Roads	72	82	87	89
Developing Urban Areas				
Newly Graded Pervious Areas	77	86	91	94

Composite Runoff Curve Number Calculation

$$\text{Composite CN} = \frac{\sum_{i=1}^{n} CN_i \times A_i}{\sum_{i=1}^{n} A_i}$$

n = Number of Distinct Cover Types in the Drainage Area

Cover Description	HSG	CN	Area (ft^2)	CN × A
Newly Graded Pervious Areas	B	86	13,379	1,150,594
Paved Areas and Roofs	B	98	2,082	204,036
				0
				0
				0
		Total	15,461	1,354,630

Composite CN =	88

EVERGREEN WALK	BY	HES	
	DATE	3/12/2021	LANGAN PROJ. NUMBER: 140222801
SOUTH WINDSOR, CT	CKD	JEL	
	DATE	3/12/2021	

Drainage Area ID	**EX-2**

Composite Curve Number Calculations

TR-55 Reference Table

Abbreviated TR-55 Table 2-2a Runoff Curve Numbers for Urban Areas

Cover Description	Curve Numbers for Hydrologic Soil Group (HSG)			
Fully Developed Urban Areas	A	B	C	D
Pervious Area				
Open Space - Lawns, Parks, and Cemeteries	68	79	86	89
Woods and Forest	30	55	70	77
Slectively Cleared Woods and Forest	43	65	76	82
Impervious Area				
Paved Areas and Roofs	98	98	98	98
Gravel Roads	76	85	89	91
Dirt Roads	72	82	87	89
Developing Urban Areas				
Newly Graded Pervious Areas	77	86	91	94

Composite Runoff Curve Number Calculation

$$\text{Composite } CN = \frac{\sum_{i=1}^{n} CN_i \times A_i}{\sum_{i=1}^{n} A_i}$$

n = Number of Distinct Cover Types in the Drainage Area

Cover Description	HSG	CN	Area (ft^2)	CN × A
Newly Graded Pervious Areas	B	86	7,171	616,727
Paved Areas and Roofs	B	98	50,664	4,965,081
				0
				0
				0
		Total	57,835	5,581,807

Composite CN =	97

EVERGREEN WALK

SOUTH WINDSOR, CT

BY HES
DATE 3/12/2021
CKD JEL
DATE 3/12/2021

LANGAN PROJ. NUMBER: 140222801

Drainage Area ID	**EX-3**

Composite Curve Number Calculations

TR-55 Reference Table

Abbreviated TR-55 Table 2-2a Runoff Curve Numbers for Urban Areas

Cover Description	Curve Numbers for Hydrologic Soil Group (HSG)			
Fully Developed Urban Areas	A	B	C	D
Pervious Area				
Open Space - Lawns, Parks, and Cemeteries	68	79	86	89
Woods and Forest	30	55	70	77
Slectively Cleared Woods and Forest	43	65	76	82
Impervious Area				
Paved Areas and Roofs	98	98	98	98
Gravel Roads	76	85	89	91
Dirt Roads	72	82	87	89
Developing Urban Areas				
Newly Graded Pervious Areas	77	86	91	94

Composite Runoff Curve Number Calculation

$$\text{Composite } CN = \frac{\sum_{i=1}^{n} CN_i \times A_i}{\sum_{i=1}^{n} A_i}$$

n = Number of Distinct Cover Types in the Drainage Area

Cover Description	HSG	CN	Area (ft^2)	CN × A
Newly Graded Pervious Areas	B	86	33,956	2,920,216
Newly Graded Pervious Areas	C	91	8,939	813,486
Paved Areas and Roofs	B	98	195,305	19,139,890
				0
				0
		Total	238,200	22,873,592

Composite CN =	96

EVERGREEN WALK

SOUTH WINDSOR, CT

BY HES
DATE 3/12/2021
CKD JEL
DATE 3/12/2021

LANGAN PROJ. NUMBER: 140222801

Drainage Area ID	**EX-4**

Composite Curve Number Calculations

TR-55 Reference Table

Abbreviated TR-55 Table 2-2a Runoff Curve Numbers for Urban Areas

Cover Description	Curve Numbers for Hydrologic Soil Group (HSG)			
Fully Developed Urban Areas	A	B	C	D
Pervious Area				
Open Space - Lawns, Parks, and Cemeteries	68	79	86	89
Woods and Forest	30	55	70	77
Slectively Cleared Woods and Forest	43	65	76	82
Impervious Area				
Paved Areas and Roofs	98	98	98	98
Gravel Roads	76	85	89	91
Dirt Roads	72	82	87	89
Developing Urban Areas				
Newly Graded Pervious Areas	77	86	91	94

Composite Runoff Curve Number Calculation

$$\text{Composite CN} = \frac{\sum_{i=1}^{n} CN_i \times A_i}{\sum_{i=1}^{n} A_i}$$

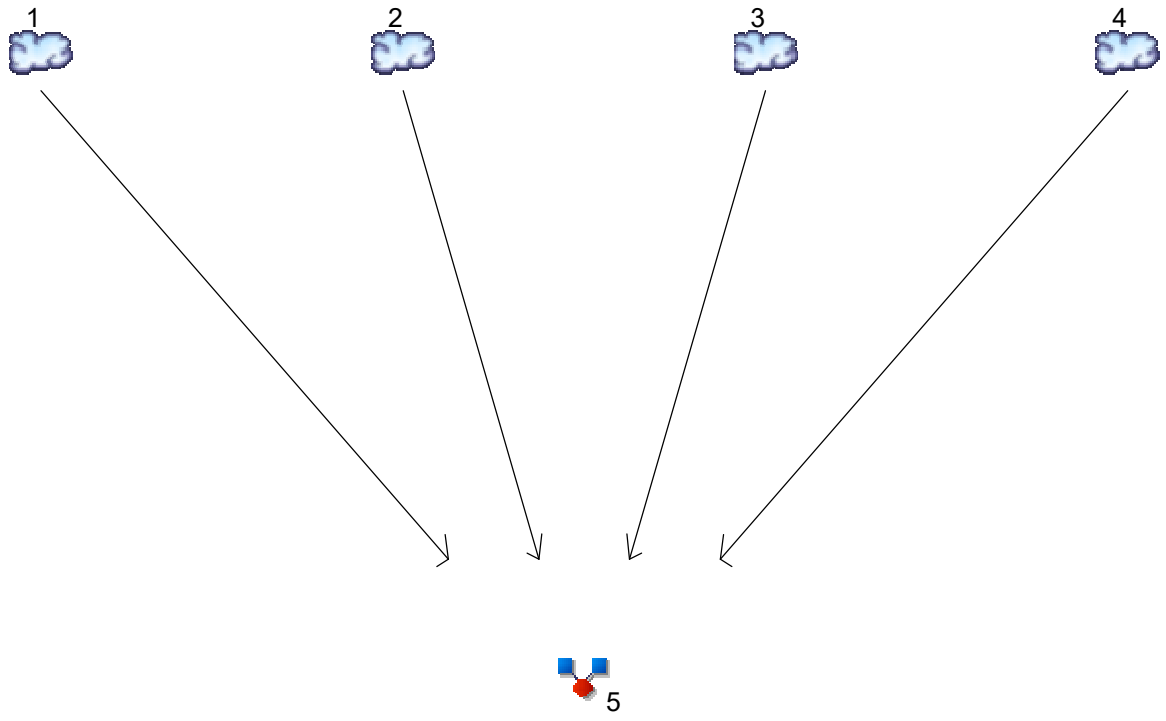
n = Number of Distinct Cover Types in the Drainage Area

Cover Description	HSG	CN	Area (ft^2)	CN × A
Newly Graded Pervious Areas	B	86	6,954	598,044
				0
				0
				0
				0
		Total	6,954	598,044

Composite CN =	86

EVERGREEN WALK	BY	HES	
	DATE	3/12/2021	LANGAN PROJ. NUMBER: 140222801
SOUTH WINDSOR, CT	CKD	JEL	
	DATE	3/12/2021	

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	SCS Runoff	EX-1
2	SCS Runoff	EX-2
3	SCS Runoff	EX-3
4	SCS Runoff	EX-4
5	Combine	Combined Existing Condition

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	-------	0.811	-------	-------	1.485	1.906	-------	2.556	EX-1
2	SCS Runoff	------	-------	4.053	-------	-------	6.510	8.029	-------	10.38	EX-2
3	SCS Runoff	------	-------	16.42	-------	-------	26.67	32.99	-------	42.76	EX-3
4	SCS Runoff	------	-------	0.341	-------	-------	0.647	0.840	-------	1.138	EX-4
5	Combine	1, 2, 3, 4	-------	21.63	-------	-------	35.31	43.76	-------	56.84	Combined Existing Condition

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

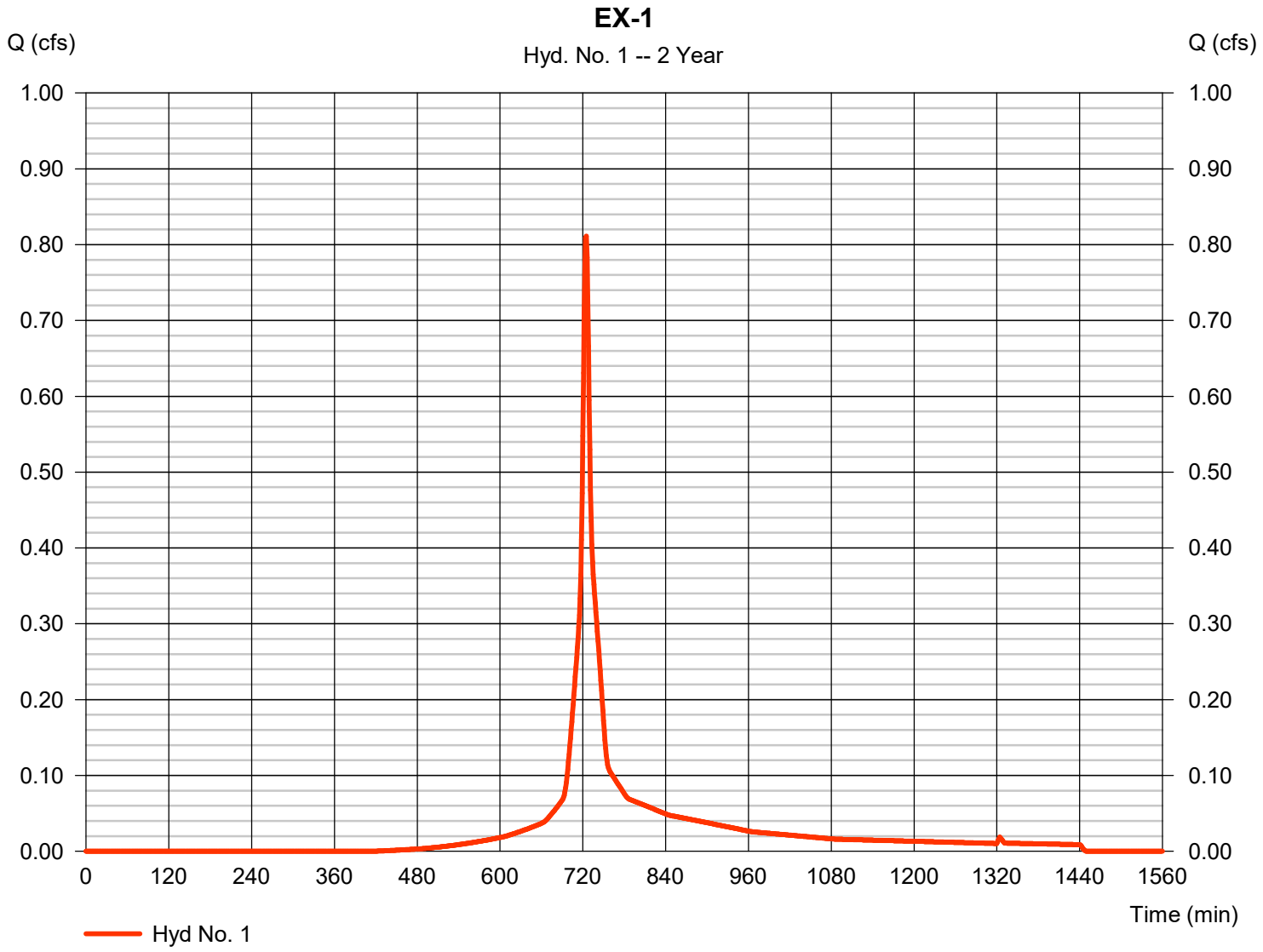
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.811	1	725	2,511	------	------	------	EX-1
2	SCS Runoff	4.053	1	724	13,674	------	------	------	EX-2
3	SCS Runoff	16.42	1	724	54,377	------	------	------	EX-3
4	SCS Runoff	0.341	1	725	1,052	------	------	------	EX-4
5	Combine	21.63	1	724	71,614	1, 2, 3, 4	------	------	Combined Existing Condition

Hydrograph Report

Hyd. No. 1

EX-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.811 cfs
Storm frequency	=	2 yrs	Time to peak	=	725 min
Time interval	=	1 min	Hyd. volume	=	2,511 cuft
Drainage area	=	0.350 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.11 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

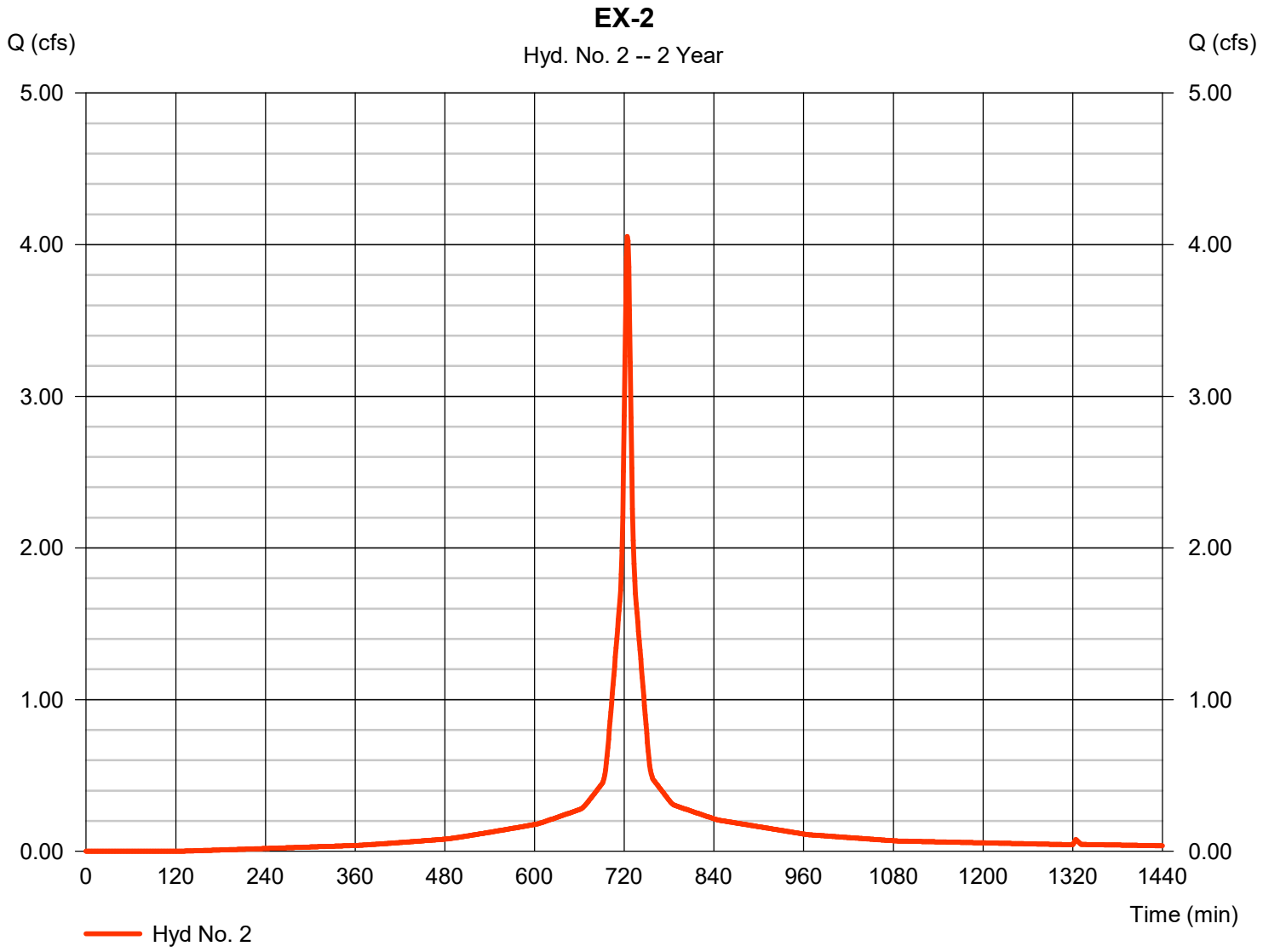


Hydrograph Report

Hyd. No. 2

EX-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.053 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	13,674 cuft
Drainage area	=	1.320 ac	Curve number	=	97
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.11 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

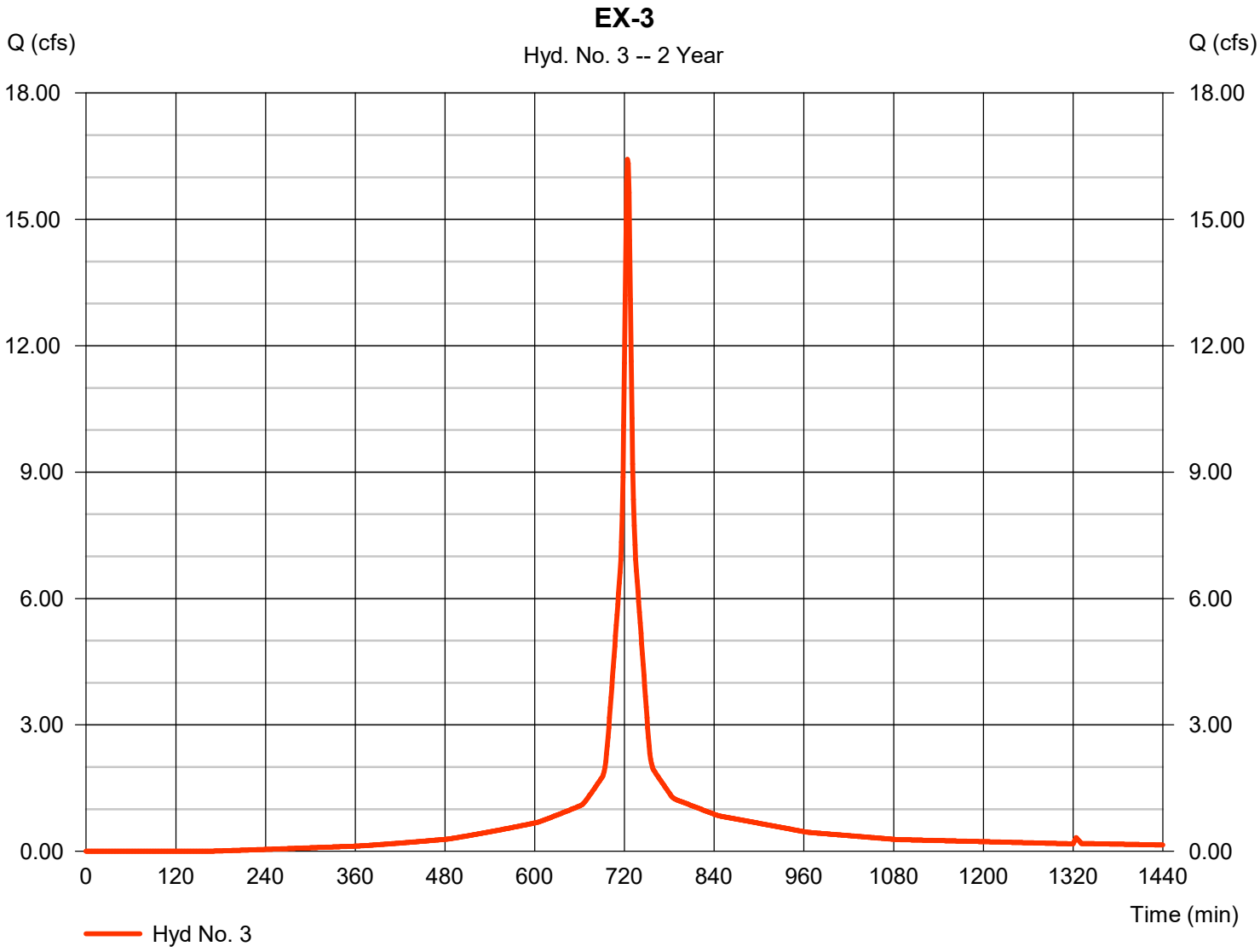


Hydrograph Report

Hyd. No. 3

EX-3

Hydrograph type	=	SCS Runoff	Peak discharge	=	16.42 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	54,377 cuft
Drainage area	=	5.460 ac	Curve number	=	96
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.11 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

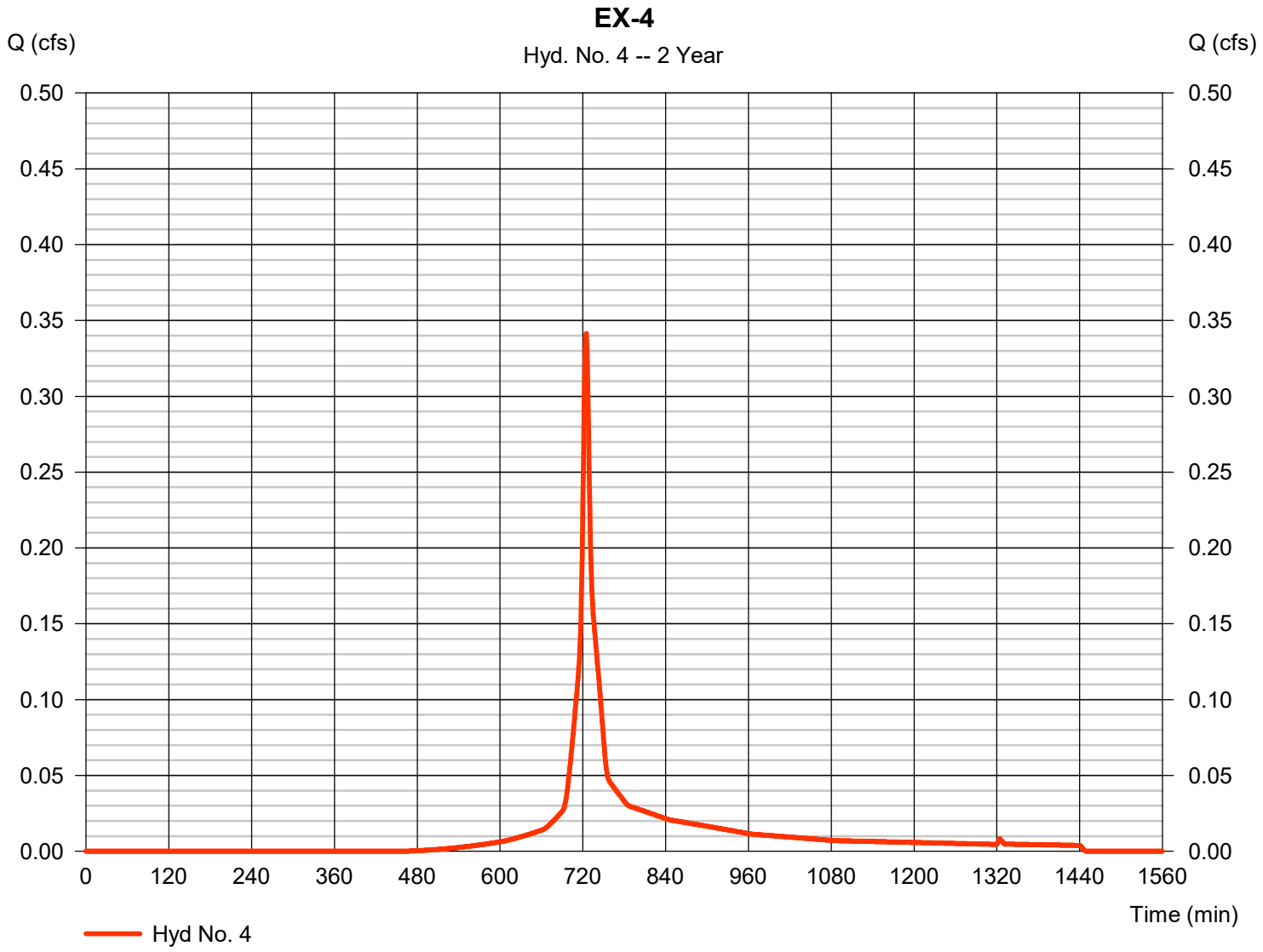


Hydrograph Report

Hyd. No. 4

EX-4

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.341 cfs
Storm frequency	=	2 yrs	Time to peak	=	725 min
Time interval	=	1 min	Hyd. volume	=	1,052 cuft
Drainage area	=	0.160 ac	Curve number	=	86
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.11 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

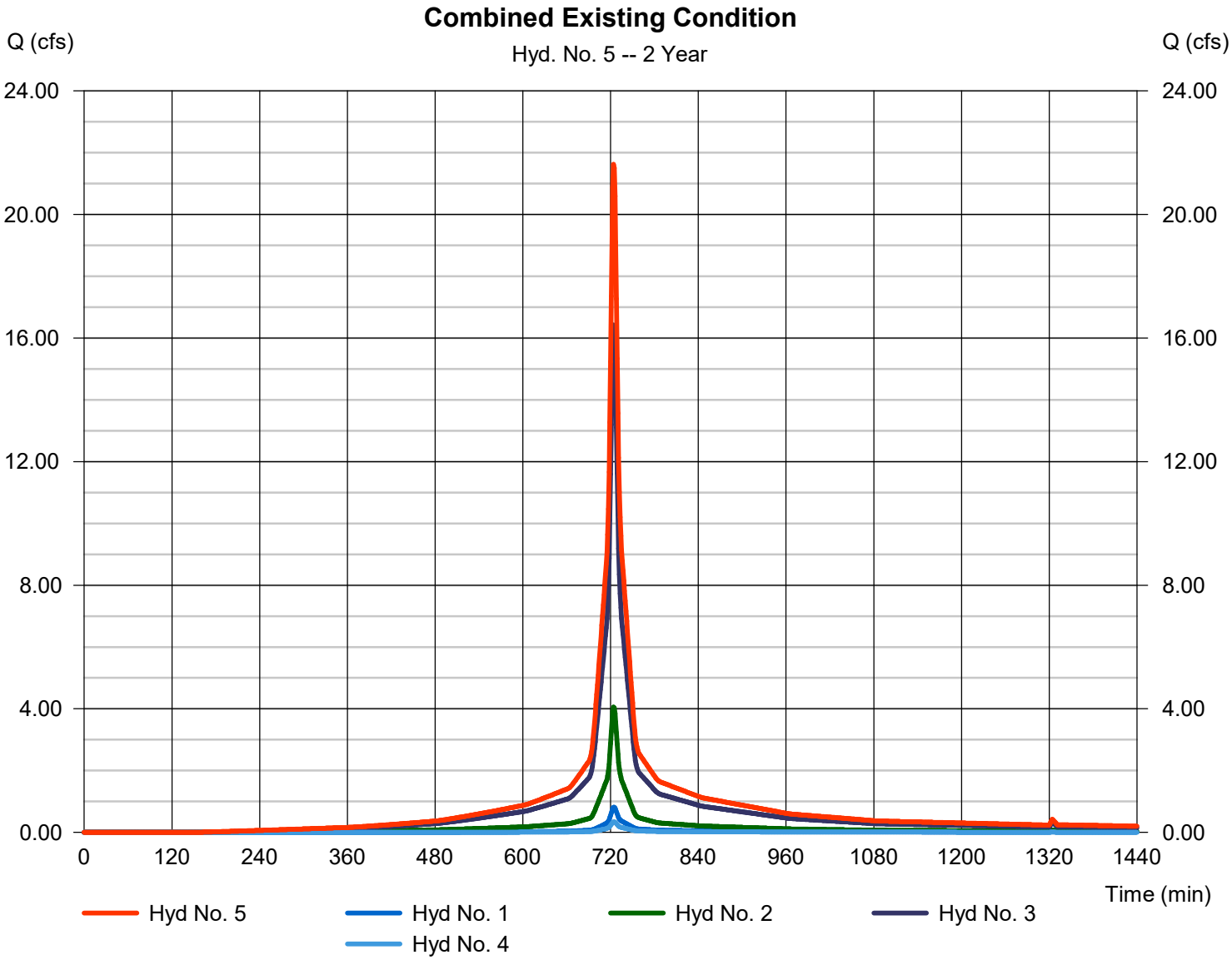


Hydrograph Report

Hyd. No. 5

Combined Existing Condition

Hydrograph type	= Combine	Peak discharge	= 21.63 cfs
Storm frequency	= 2 yrs	Time to peak	= 724 min
Time interval	= 1 min	Hyd. volume	= 71,614 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 7.290 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

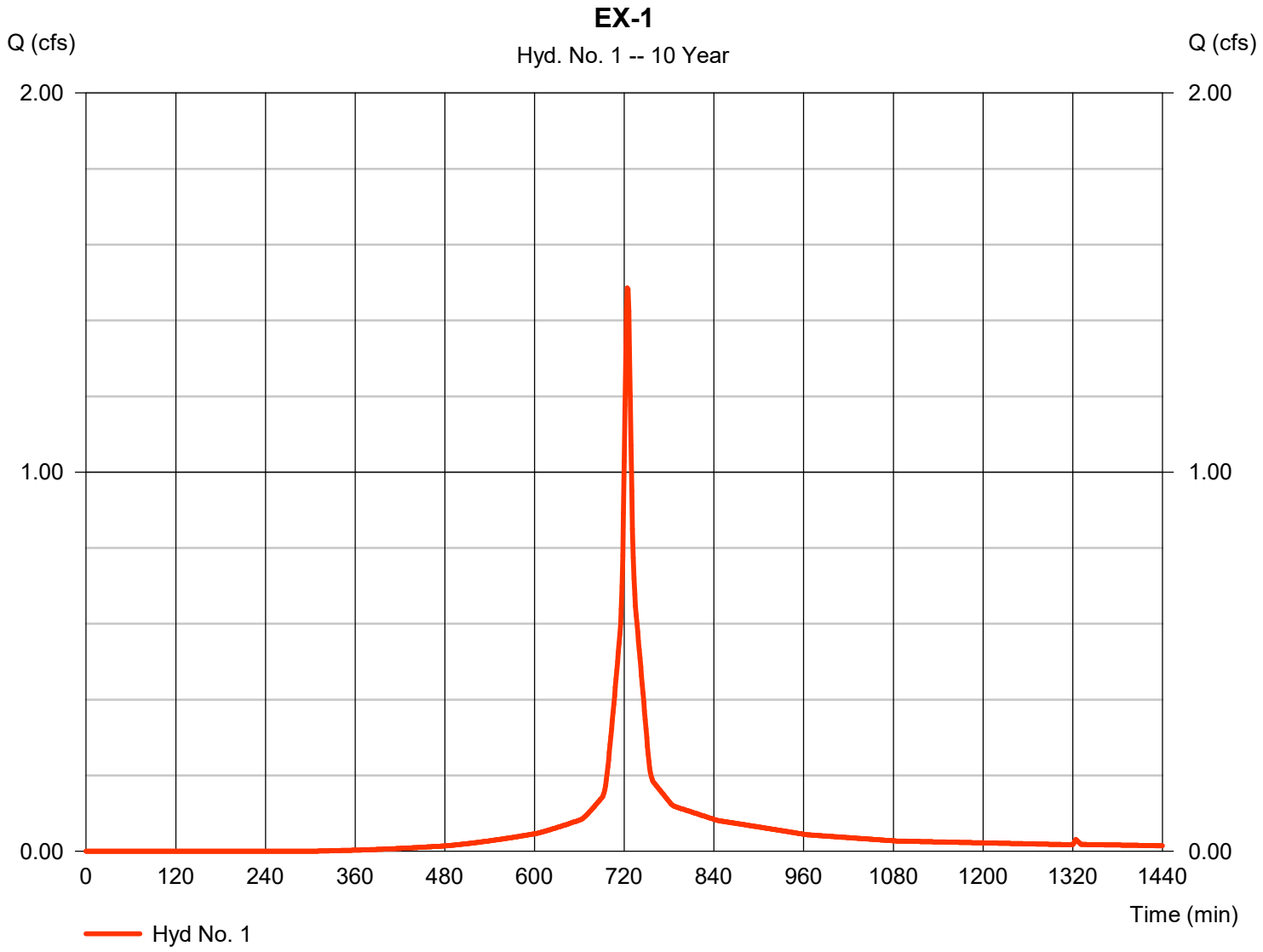
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	1.485	1	724	4,695	------	------	------	EX-1
2	SCS Runoff	6.510	1	724	22,520	------	------	------	EX-2
3	SCS Runoff	26.67	1	724	90,814	------	------	------	EX-3
4	SCS Runoff	0.647	1	724	2,026	------	------	------	EX-4
5	Combine	35.31	1	724	120,055	1, 2, 3, 4	------	------	Combined Existing Condition

Hydrograph Report

Hyd. No. 1

EX-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.485 cfs
Storm frequency	=	10 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	4,695 cuft
Drainage area	=	0.350 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	4.91 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

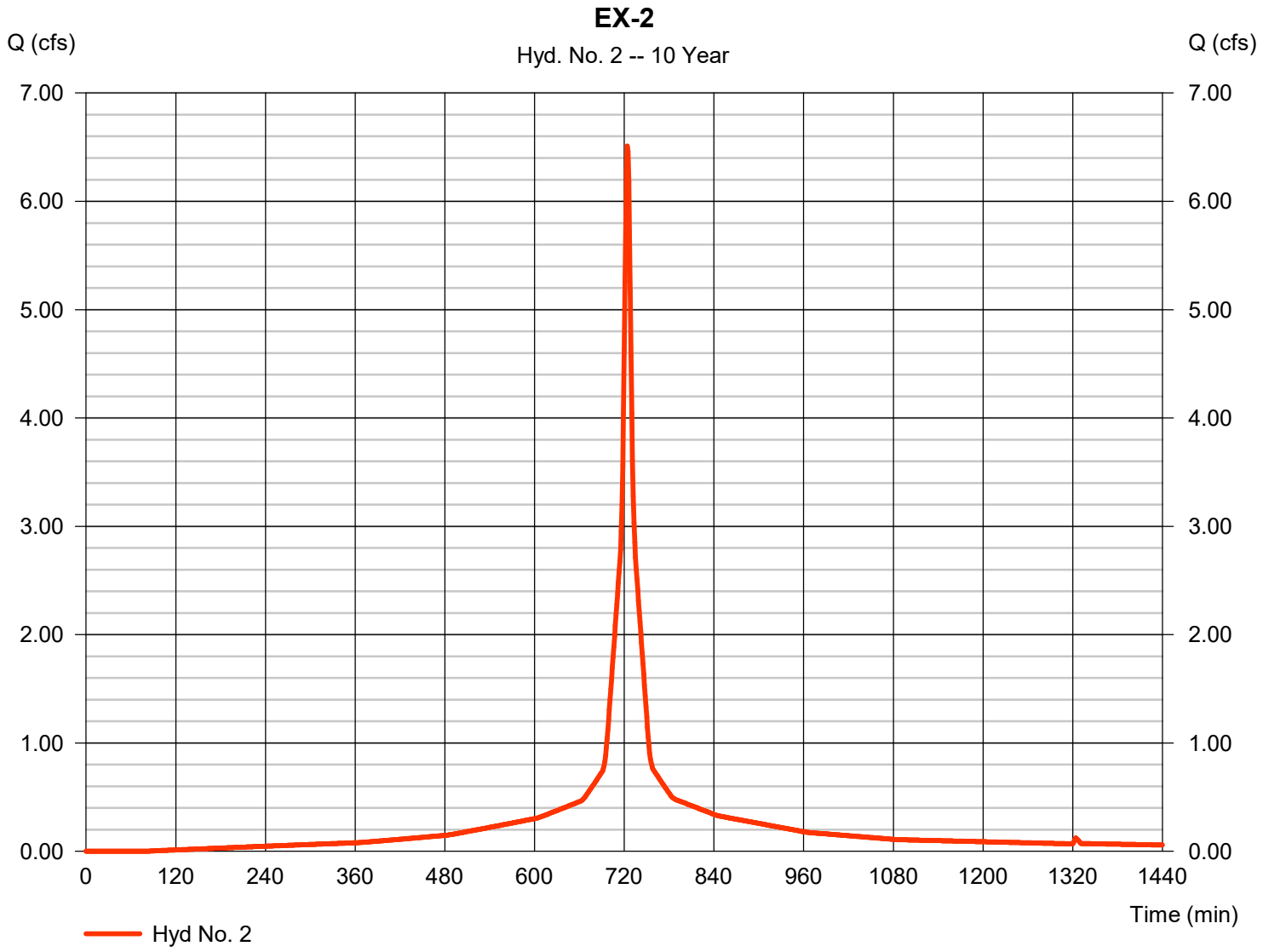


Hydrograph Report

Hyd. No. 2

EX-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.510 cfs
Storm frequency	=	10 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	22,520 cuft
Drainage area	=	1.320 ac	Curve number	=	97
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	4.91 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

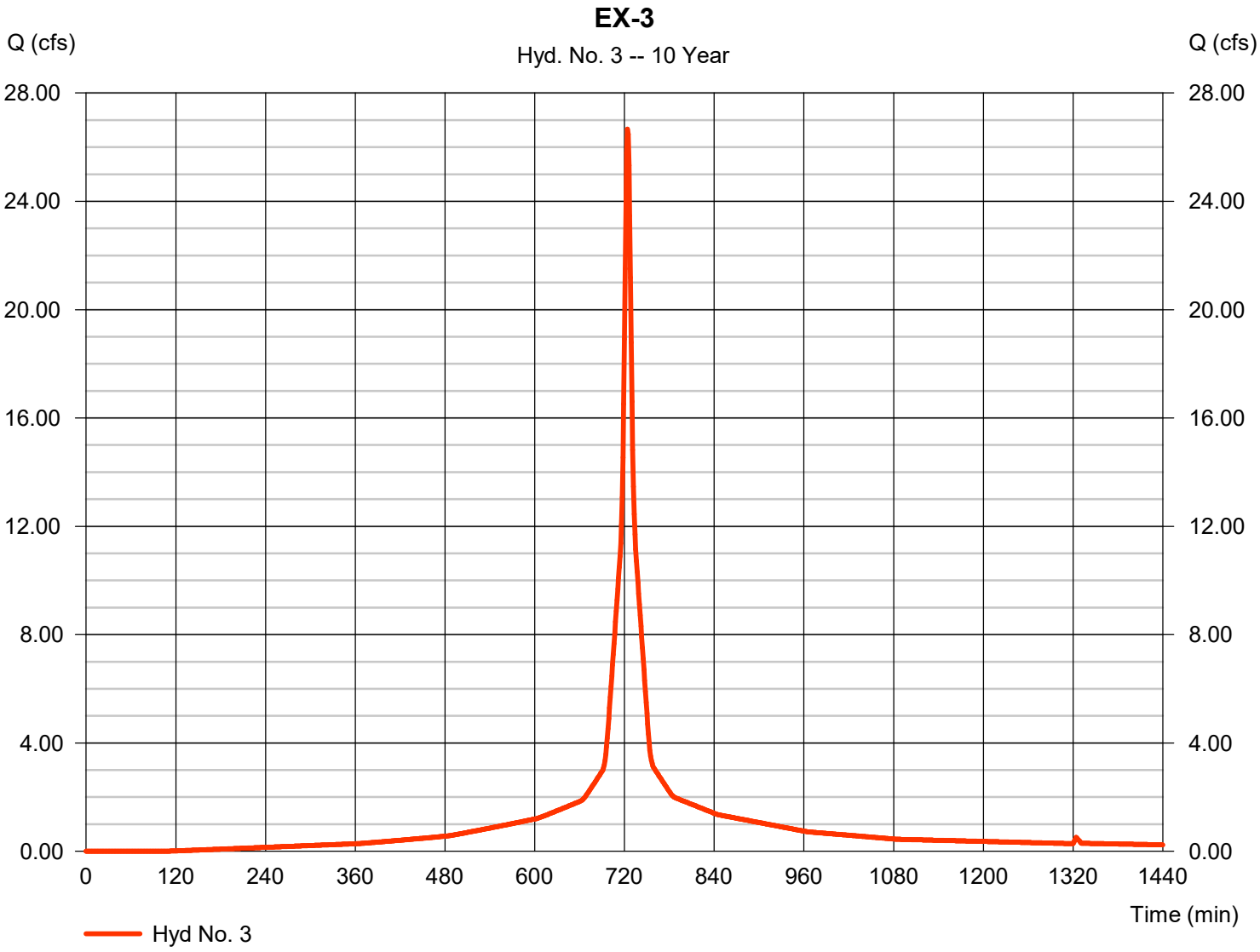


Hydrograph Report

Hyd. No. 3

EX-3

Hydrograph type	=	SCS Runoff	Peak discharge	=	26.67 cfs
Storm frequency	=	10 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	90,814 cuft
Drainage area	=	5.460 ac	Curve number	=	96
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	4.91 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

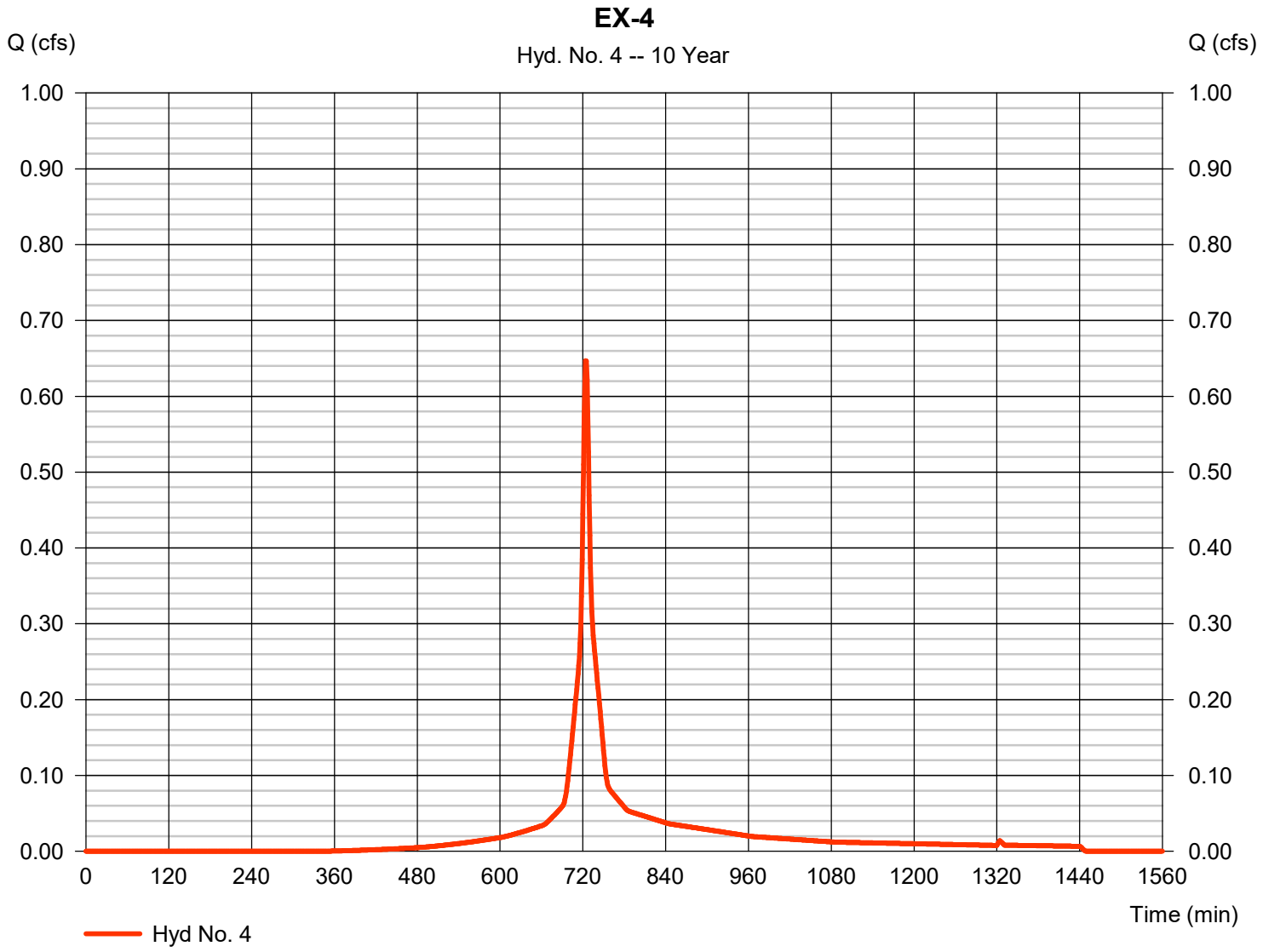


Hydrograph Report

Hyd. No. 4

EX-4

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.647 cfs
Storm frequency	=	10 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	2,026 cuft
Drainage area	=	0.160 ac	Curve number	=	86
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	4.91 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

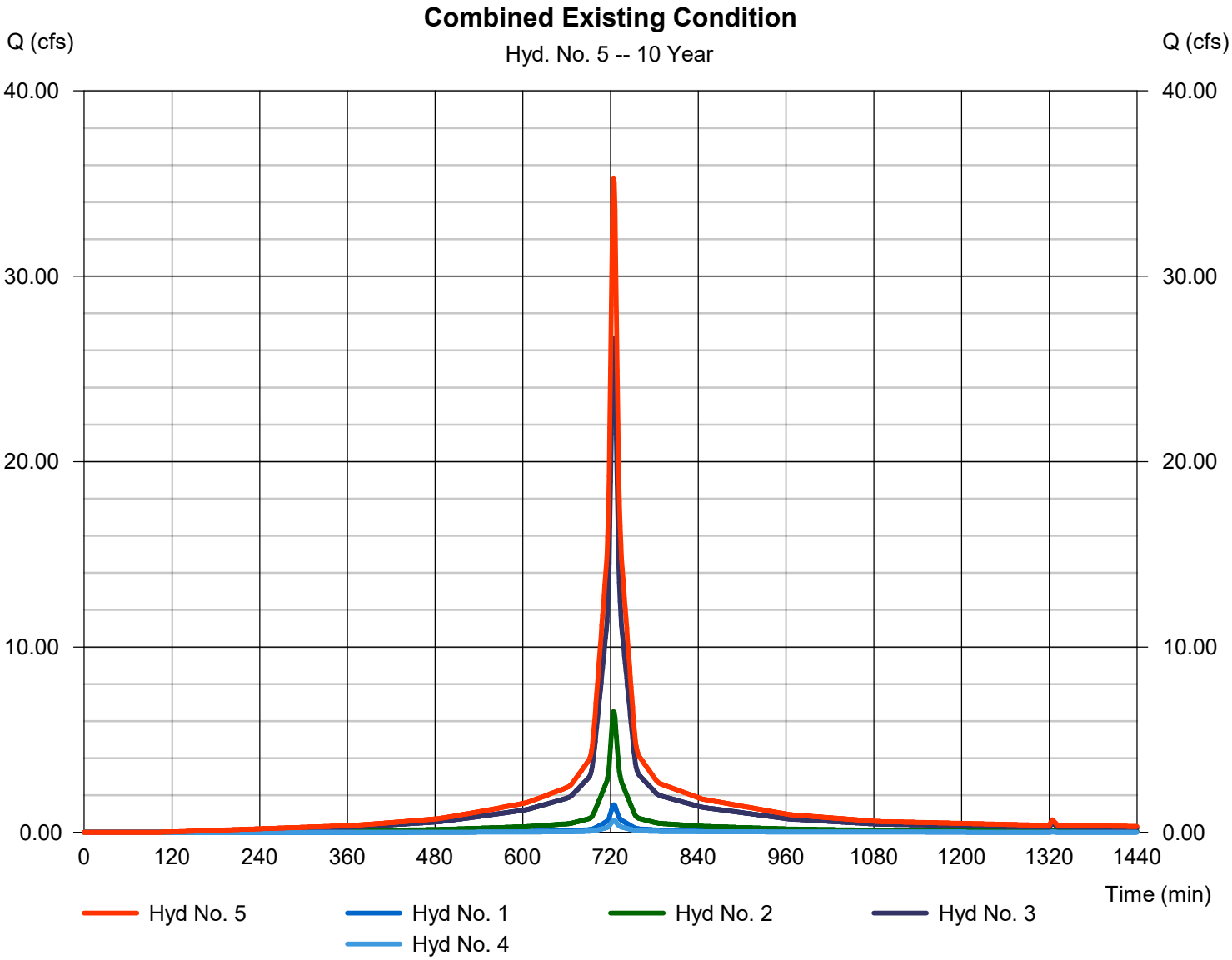


Hydrograph Report

Hyd. No. 5

Combined Existing Condition

Hydrograph type	=	Combine	Peak discharge	=	35.31 cfs
Storm frequency	=	10 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	120,055 cuft
Inflow hyds.	=	1, 2, 3, 4	Contrib. drain. area	=	7.290 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

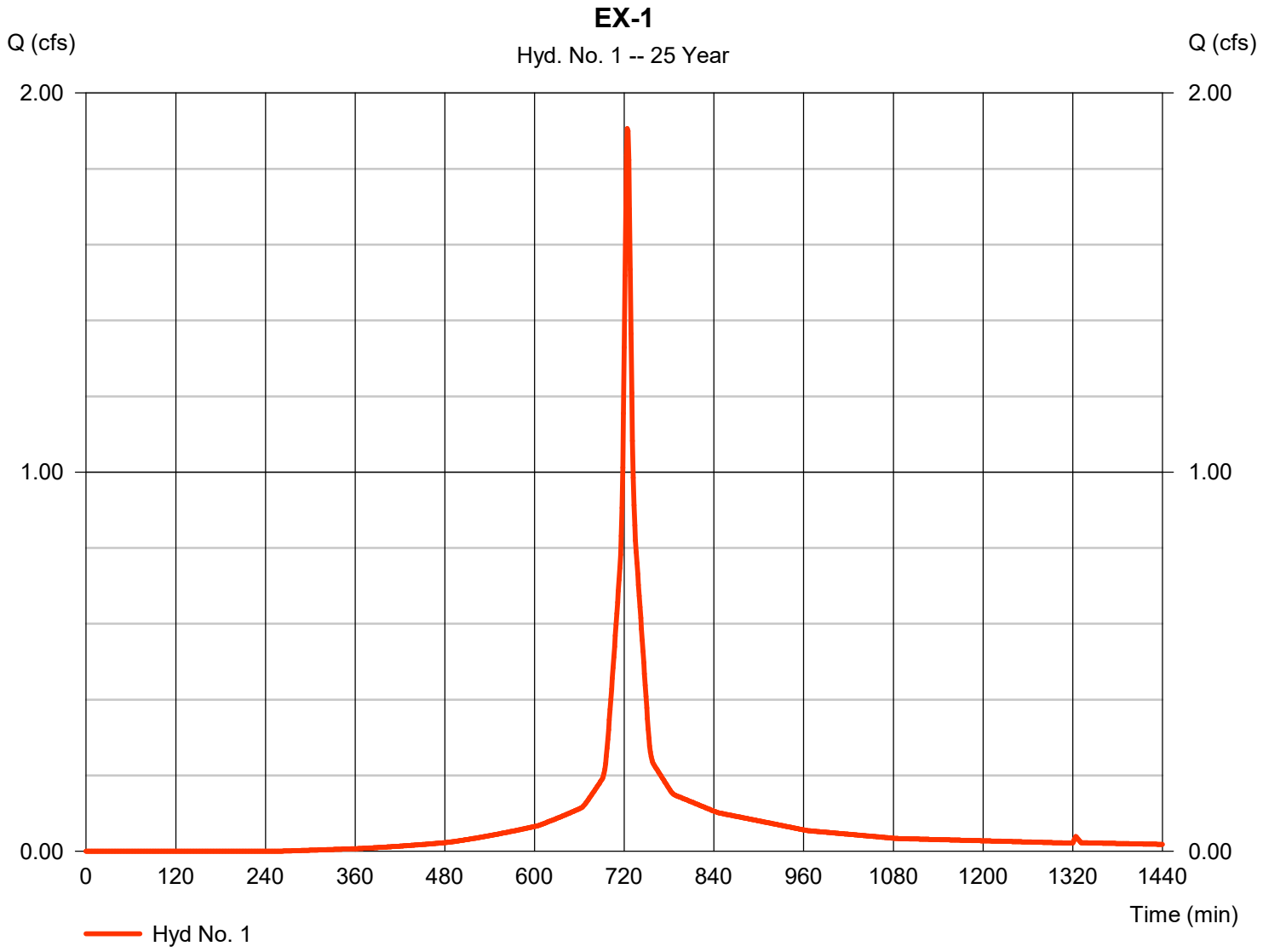
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	1.906	1	724	6,099	------	------	------	EX-1
2	SCS Runoff	8.029	1	724	28,038	------	------	------	EX-2
3	SCS Runoff	32.99	1	724	113,586	------	------	------	EX-3
4	SCS Runoff	0.840	1	724	2,658	------	------	------	EX-4
5	Combine	43.76	1	724	150,381	1, 2, 3, 4	------	------	Combined Existing Condition

Hydrograph Report

Hyd. No. 1

EX-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.906 cfs
Storm frequency	=	25 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	6,099 cuft
Drainage area	=	0.350 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	6.03 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

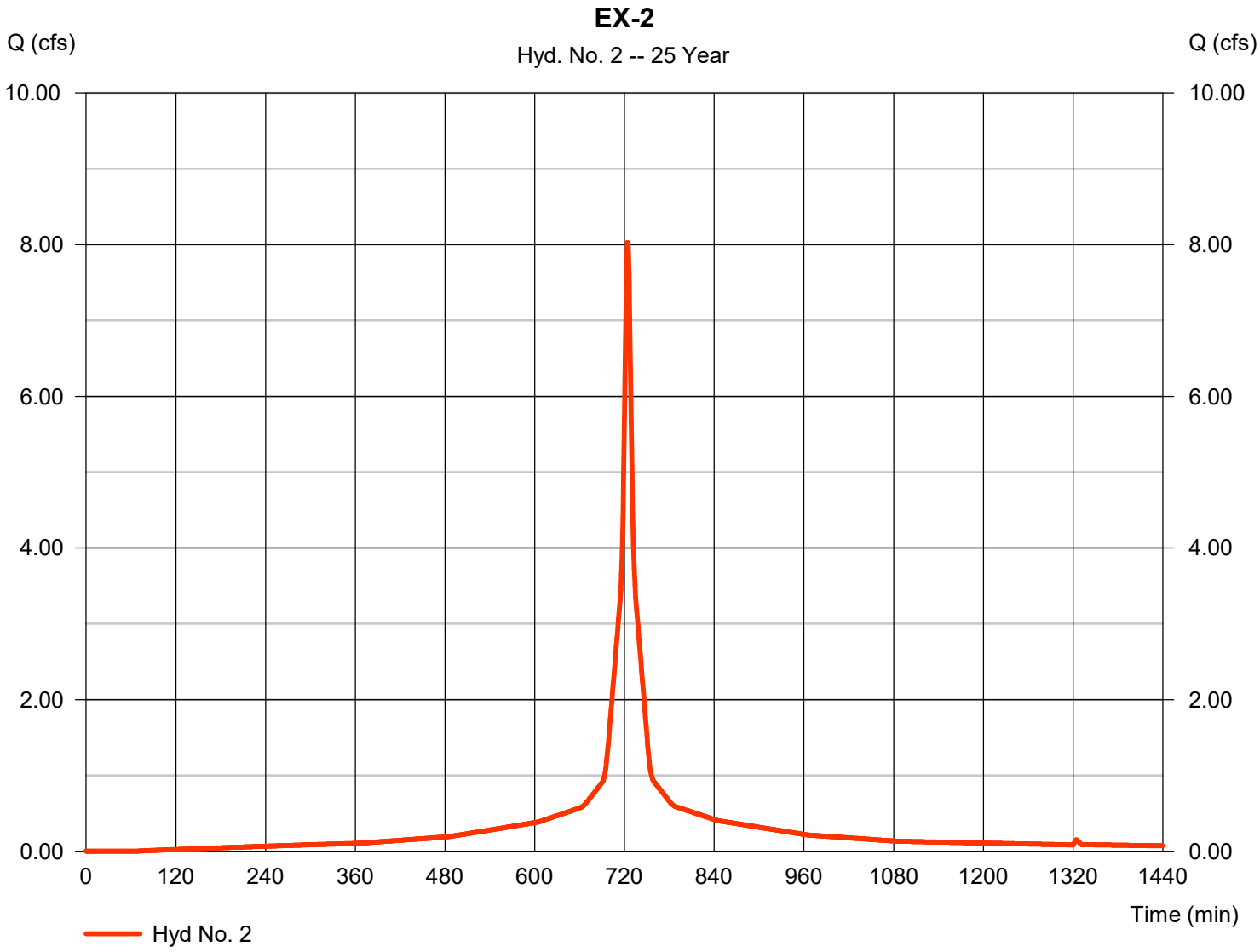


Hydrograph Report

Hyd. No. 2

EX-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.029 cfs
Storm frequency	=	25 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	28,038 cuft
Drainage area	=	1.320 ac	Curve number	=	97
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	6.03 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

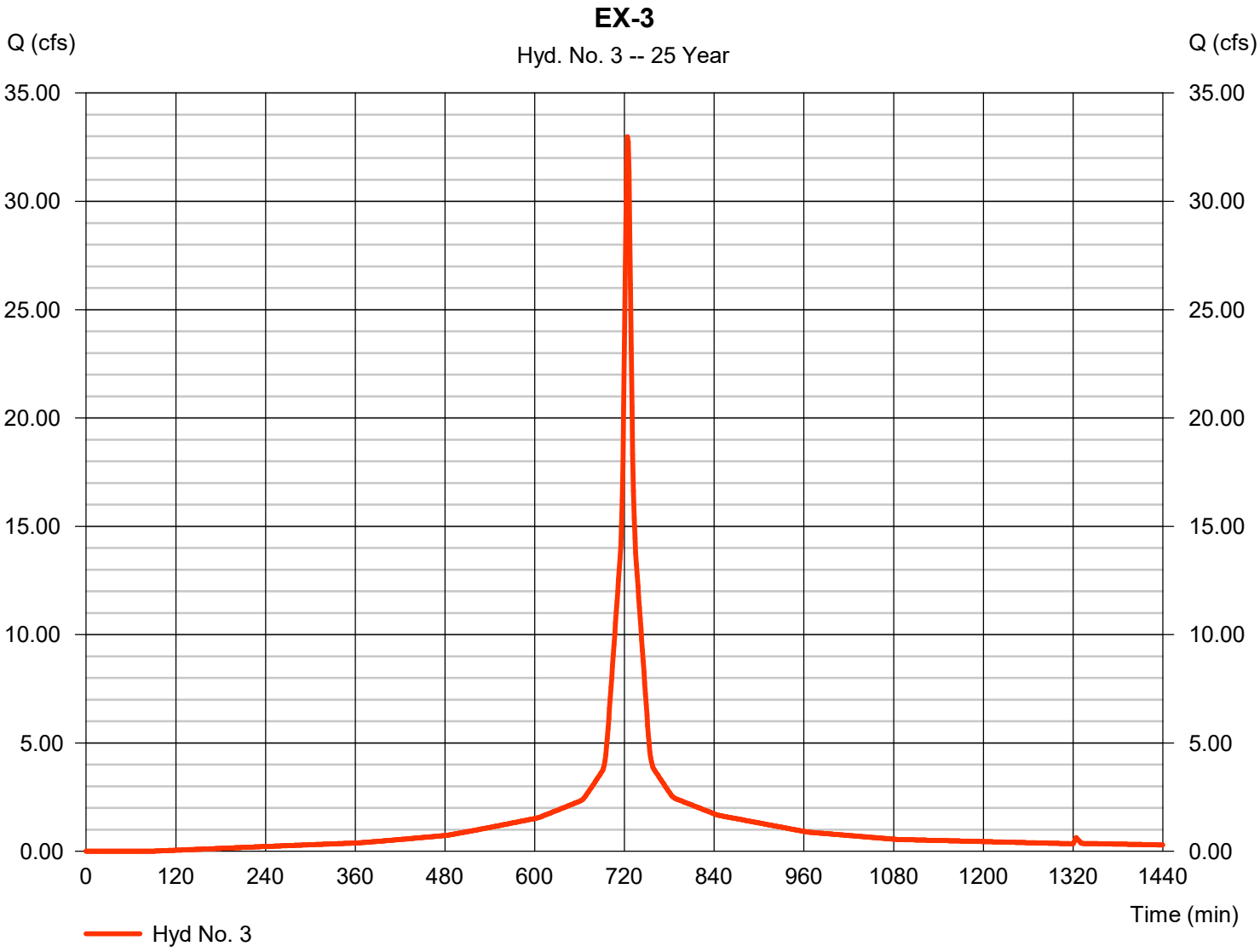


Hydrograph Report

Hyd. No. 3

EX-3

Hydrograph type	=	SCS Runoff	Peak discharge	=	32.99 cfs
Storm frequency	=	25 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	113,586 cuft
Drainage area	=	5.460 ac	Curve number	=	96
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	6.03 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

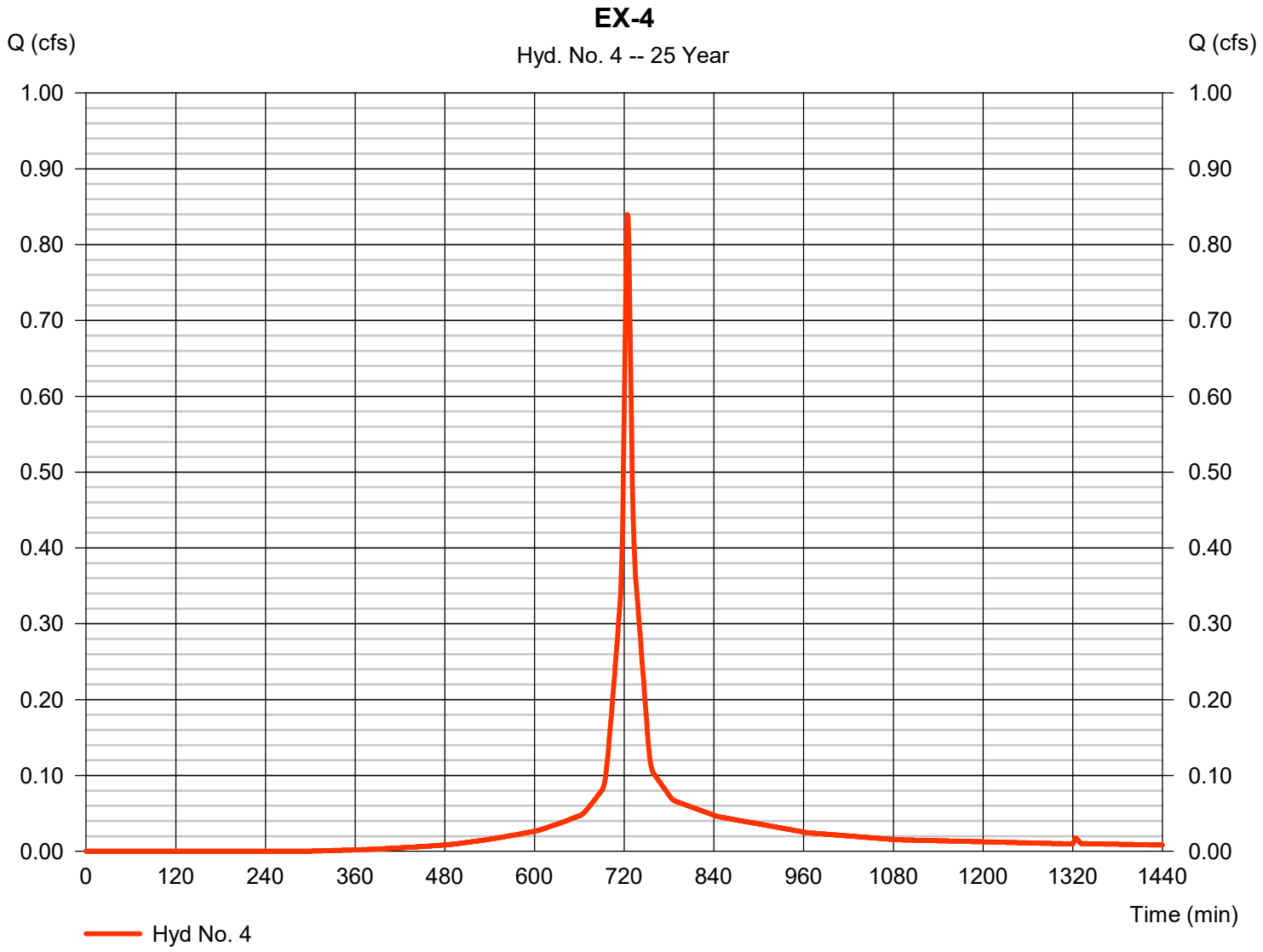


Hydrograph Report

Hyd. No. 4

EX-4

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.840 cfs
Storm frequency	=	25 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	2,658 cuft
Drainage area	=	0.160 ac	Curve number	=	86
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	6.03 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

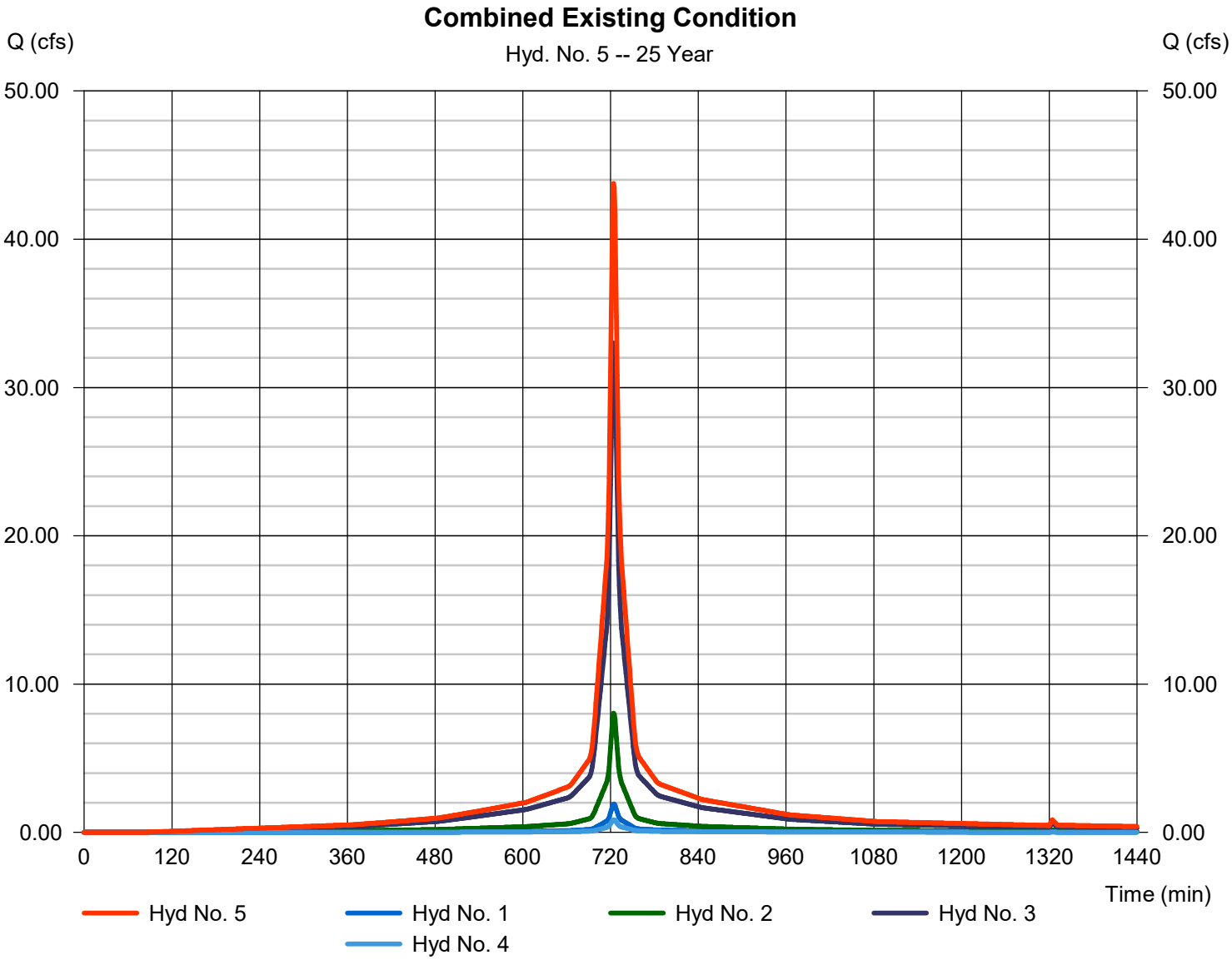


Hydrograph Report

Hyd. No. 5

Combined Existing Condition

Hydrograph type	=	Combine	Peak discharge	=	43.76 cfs
Storm frequency	=	25 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	150,381 cuft
Inflow hyds.	=	1, 2, 3, 4	Contrib. drain. area	=	7.290 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

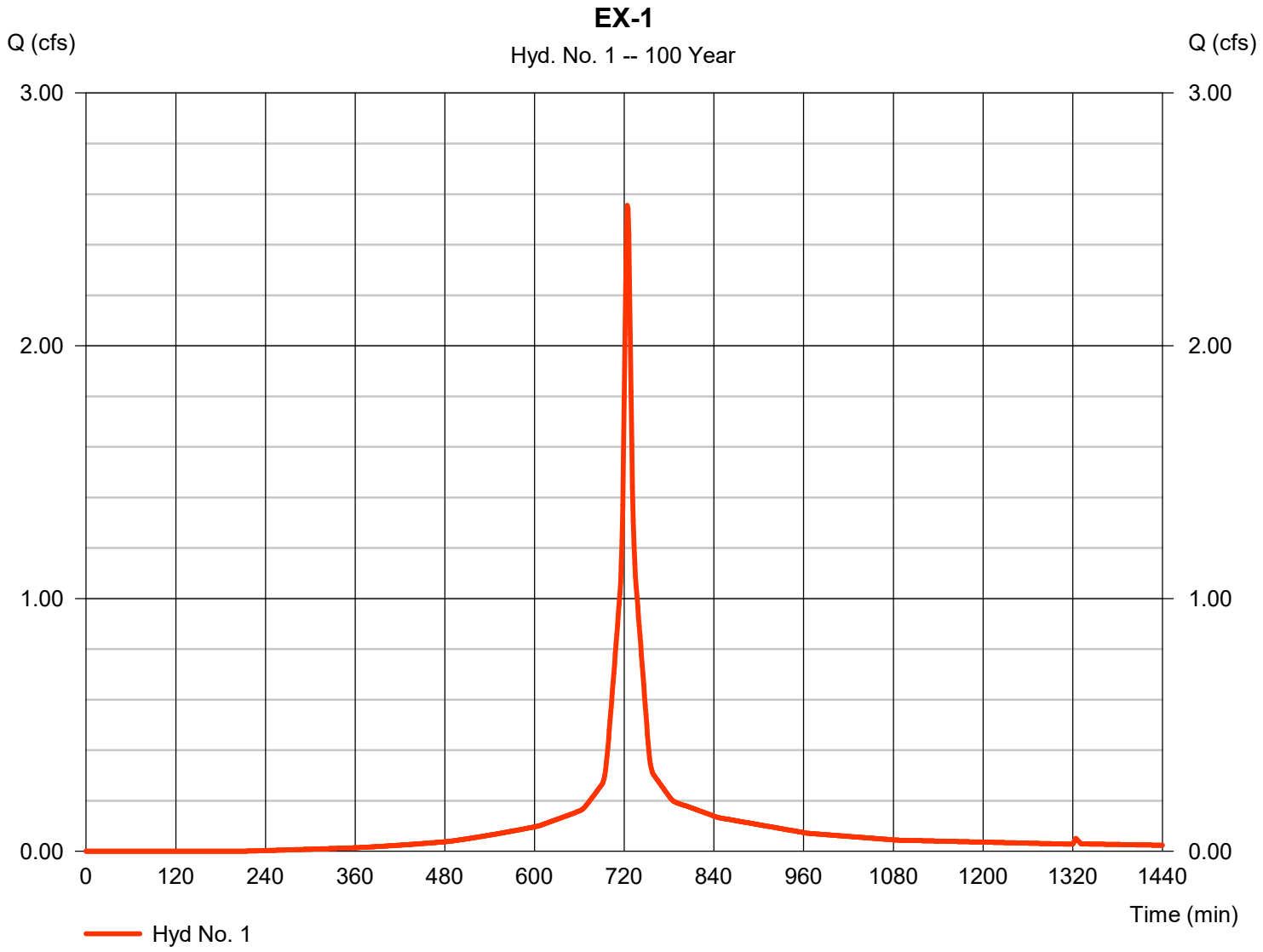
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	2.556	1	724	8,311	------	------	------	EX-1
2	SCS Runoff	10.38	1	724	36,619	------	------	------	EX-2
3	SCS Runoff	42.76	1	724	149,031	------	------	------	EX-3
4	SCS Runoff	1.138	1	724	3,659	------	------	------	EX-4
5	Combine	56.84	1	724	197,620	1, 2, 3, 4	------	------	Combined Existing Condition

Hydrograph Report

Hyd. No. 1

EX-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.556 cfs
Storm frequency	=	100 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	8,311 cuft
Drainage area	=	0.350 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	7.77 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

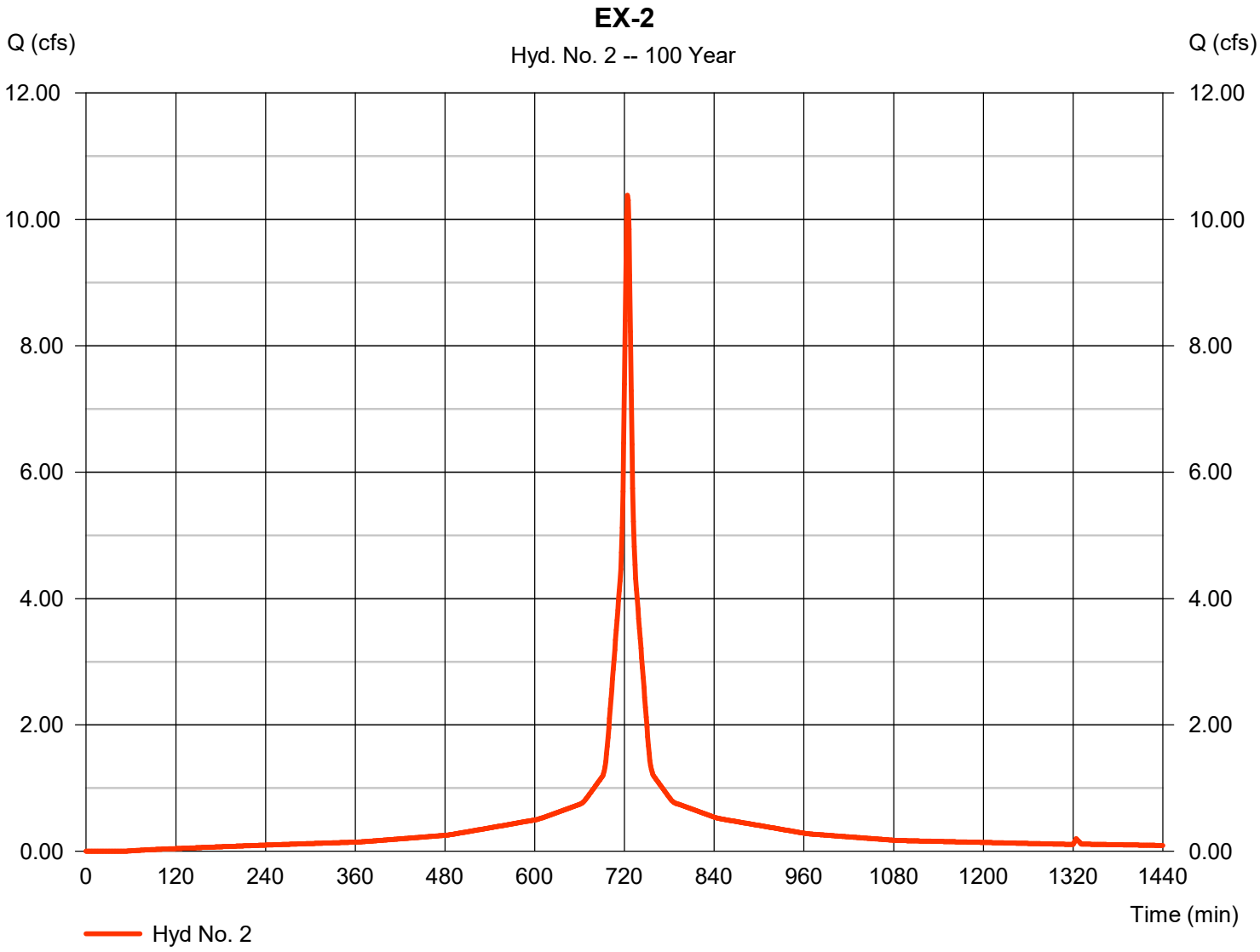


Hydrograph Report

Hyd. No. 2

EX-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	10.38 cfs
Storm frequency	=	100 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	36,619 cuft
Drainage area	=	1.320 ac	Curve number	=	97
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	7.77 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

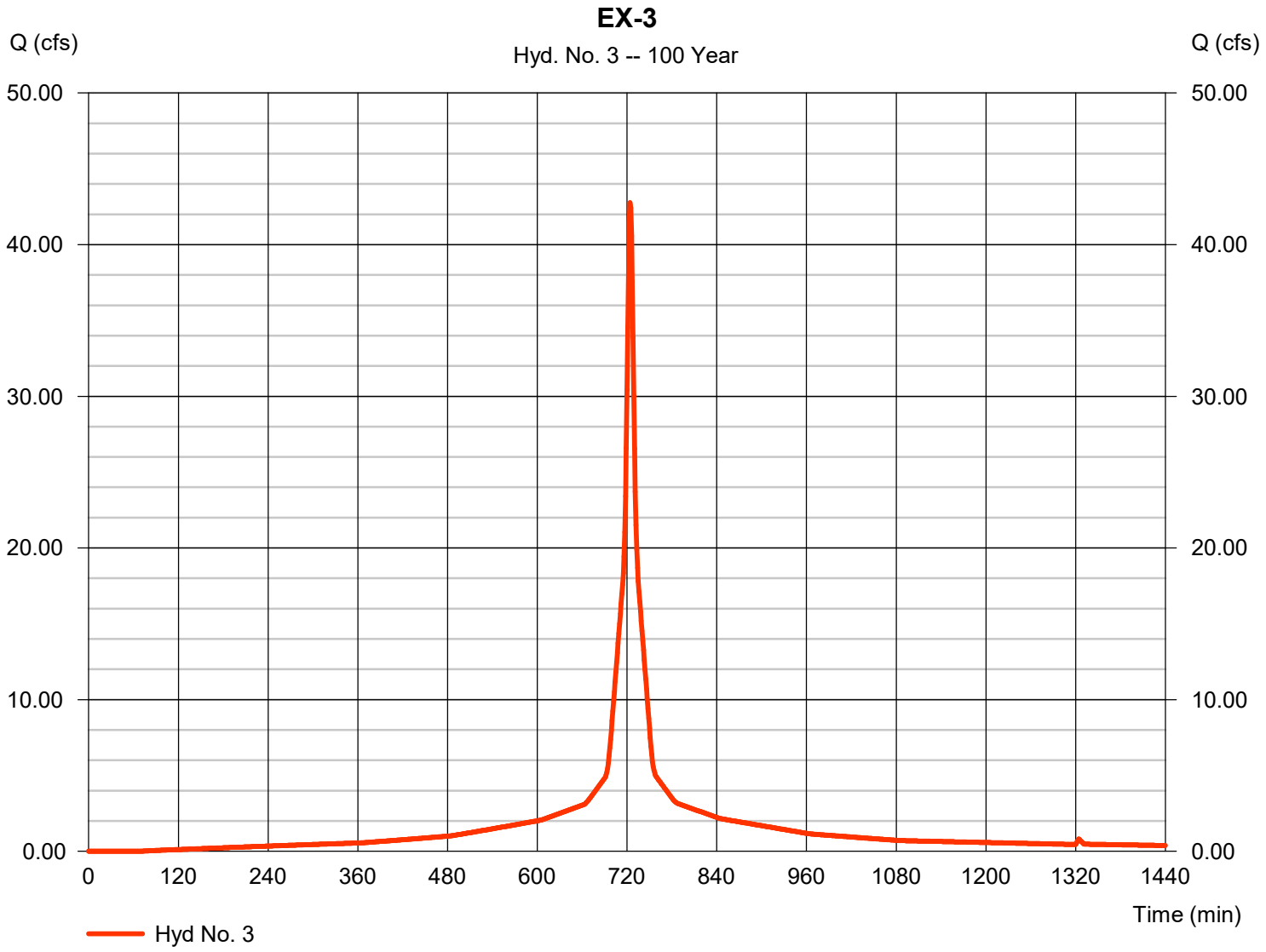


Hydrograph Report

Hyd. No. 3

EX-3

Hydrograph type	=	SCS Runoff	Peak discharge	=	42.76 cfs
Storm frequency	=	100 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	149,031 cuft
Drainage area	=	5.460 ac	Curve number	=	96
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	7.77 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

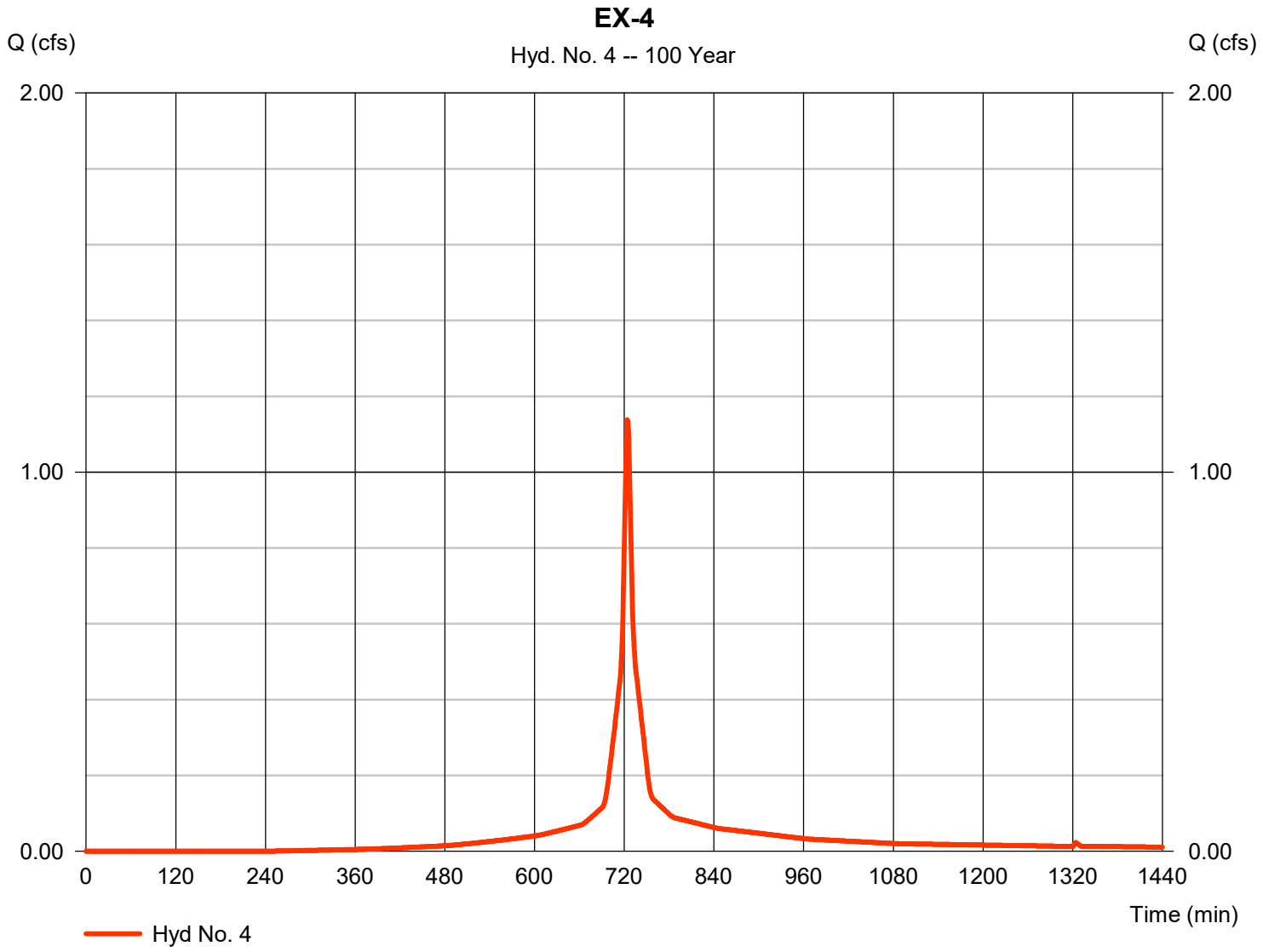


Hydrograph Report

Hyd. No. 4

EX-4

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.138 cfs
Storm frequency	=	100 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	3,659 cuft
Drainage area	=	0.160 ac	Curve number	=	86
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	7.77 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

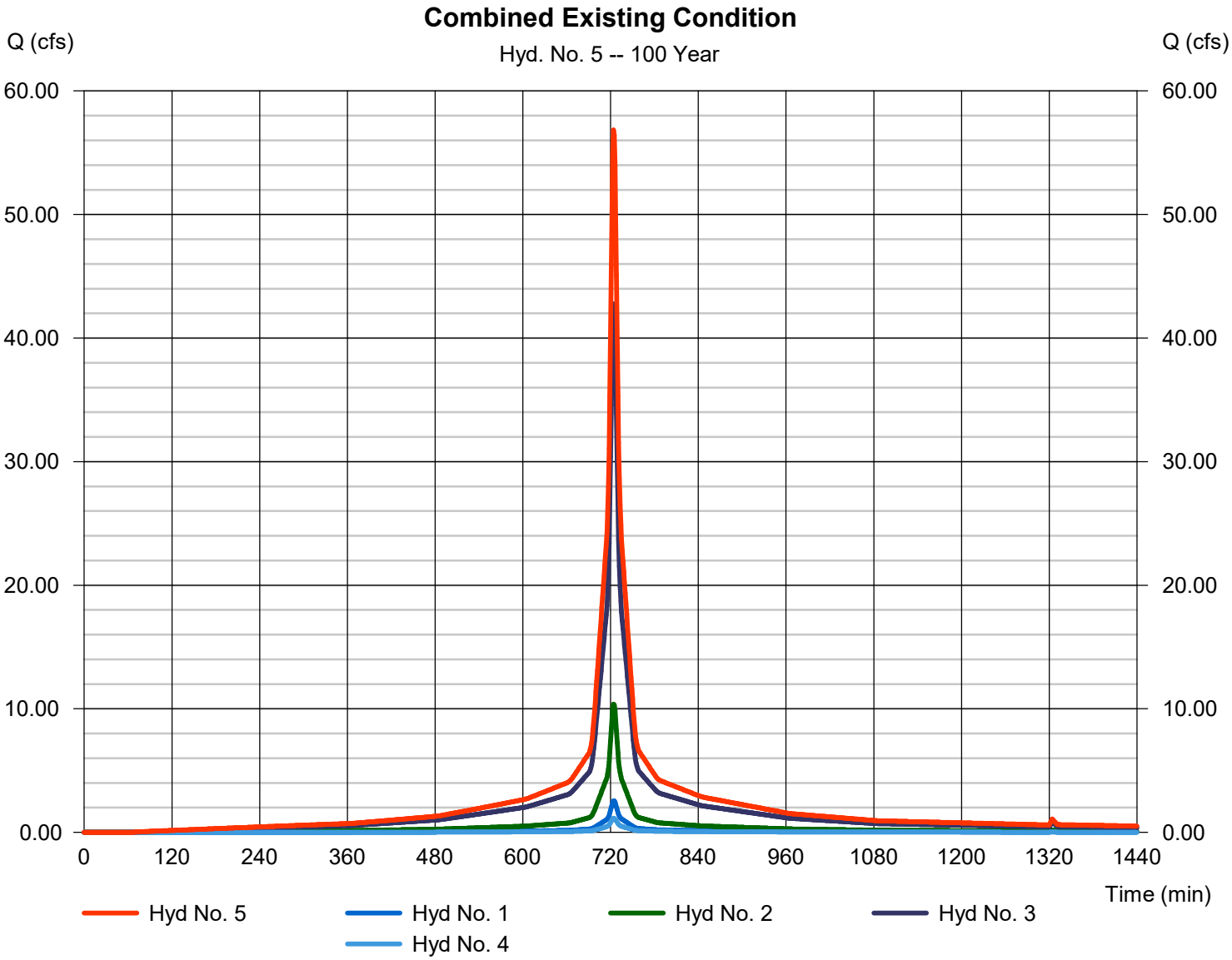


Hydrograph Report

Hyd. No. 5

Combined Existing Condition

Hydrograph type	=	Combine	Peak discharge	=	56.84 cfs
Storm frequency	=	100 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	197,620 cuft
Inflow hyds.	=	1, 2, 3, 4	Contrib. drain. area	=	7.290 ac



APPENDIX B

Proposed Stormwater Discharge Calculations

Project **Evergreen Walk** By **IJAB** Date **4/7/2021**

Location **South Windsor, CT** Checked **DTG** Date **4/7/2021**

Circle One: Present (Developed)

Circle One: (T_c) T_t through subarea **PR-1**

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c Only)		Segment ID	AB					
1. Surface description (table 3-1)			Short Grass Prairie					
2. Manning's roughness coeff., n (table 3-1)			0.15					
3. Flow Length, L (total L ≤ 150 ft)		ft	50					
4. Two-yr 24-hr rainfall, P_2		in	3.1					
5. Land slope, s		ft/ft	0.069					
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$	Compute T_t	hr	0.058	+		+	=	0.058

Shallow concentrated flow		Segment ID	BC					
7. Surface description (paved or unpaved)			Unpaved					
8. Flow length, L		ft	20					
9. Watercourse slope, s		ft/ft	0.065					
10. Average velocity, V (figure 3-1)		ft/s	4.1					
11. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr	0.001	+		+	=	0.001

Channel flow		Segment ID						
12. Cross sectional flow area, a		ft^2						
13. Wetted perimeter, p_w		ft						
14. Hydraulic radius, r $r = \frac{a}{p_w}$	Compute r	ft						
15. Channel slope, s		ft/ft						
16. Manning's roughness coeff., n								
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$	Compute V	ft/s						
18. Flow length, L		ft						
19. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr		+		=	0.000	
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19)							0.059	hr

Use Tc= 5 min

Project **Evergreen Walk** By **IJAB** Date **4/7/2021**

Location **South Windsor, CT** Checked **DTG** Date **4/7/2021**

Circle One: Present (Developed)

Circle One: (T_c) T_t through subarea **PR-2**

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c Only)		Segment ID	AB					
1. Surface description (table 3-1)			Asphalt					
2. Manning's roughness coeff., n (table 3-1)			0.01					
3. Flow Length, L (total L ≤ 150 ft)		ft	50					
4. Two-yr 24-hr rainfall, P_2		in	3.1					
5. Land slope, s		ft/ft	0.017					
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$	Compute T_t	hr	0.013	+		+	=	0.013

Shallow concentrated flow		Segment ID	BC	CD				
7. Surface description (paved or unpaved)			Paved	Paved				
8. Flow length, L		ft	74	103				
9. Watercourse slope, s		ft/ft	0.017	0.016				
10. Average velocity, V (figure 3-1)		ft/s	2.7	2.6				
11. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr	0.008	+	0.011	+	=	0.019

Channel flow		Segment ID	DE			
12. Cross sectional flow area, a		ft^2				
13. Wetted perimeter, p_w		ft				
14. Hydraulic radius, r $r = \frac{a}{p_w}$	Compute r	ft				
15. Channel slope, s		ft/ft	0.010			
16. Manning's roughness coeff., n			0.011			
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$	Compute V	ft/s	5.00			
18. Flow length, L		ft	494			
19. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr	0.027	+	=	0.027
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19)						0.059 hr

Use Tc= 5 min

Project **Evergreen Walk** By **IJAB** Date **4/7/2021**

Location **South Windsor, CT** Checked **DTG** Date **4/7/2021**

Circle One: Present (Developed)

Circle One: (T_c) T_t through subarea **PR-3**

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c Only)		Segment ID	AB	BC					
1. Surface description (table 3-1)			Short Grass Prairie	Asphalt					
2. Manning's roughness coeff., n (table 3-1)			0.15	0.01					
3. Flow Length, L (total L ≤ 150 ft)		ft	8	36					
4. Two-yr 24-hr rainfall, P_2		in	3.1	3.1					
5. Land slope, s		ft/ft	0.130	0.020					
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$	Compute T_t	hr	0.010	+ 0.008	+	=	0.019		

Shallow concentrated flow		Segment ID							
7. Surface description (paved or unpaved)			Unpaved						
8. Flow length, L		ft							
9. Watercourse slope, s		ft/ft							
10. Average velocity, V (figure 3-1)		ft/s							
11. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr	+	+	=	0.000			

Channel flow		Segment ID	CD						
12. Cross sectional flow area, a		ft^2							
13. Wetted perimeter, p_w		ft							
14. Hydraulic radius, r $r = \frac{a}{p_w}$	Compute r	ft							
15. Channel slope, s		ft/ft	0.010						
16. Manning's roughness coeff., n			0.011						
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$	Compute V	ft/s	5.00						
18. Flow length, L		ft	769						
19. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr	0.043	+	=	0.043			
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19)						0.062	hr		

Use Tc= 5 min

Project **Evergreen Walk** By **IJAB** Date **4/7/2021**

Location **South Windsor, CT** Checked **DTG** Date **4/7/2021**

Circle One: Present (Developed)

Circle One: (T_c) T_t through subarea **PR-4**

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c Only)		Segment ID	AB		
1. Surface description (table 3-1)			Short Grass Prairie		
2. Manning's roughness coeff., n (table 3-1)			0.15		
3. Flow Length, L (total L ≤ 150 ft)		ft	50		
4. Two-yr 24-hr rainfall, P_2		in	3.1		
5. Land slope, s		ft/ft	0.015		
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}}$	Compute T_t	hr	0.107	+	+ = 0.107

Shallow concentrated flow		Segment ID	BC		
7. Surface description (paved or unpaved)			Unpaved		
8. Flow length, L		ft	48		
9. Watercourse slope, s		ft/ft	0.053		
10. Average velocity, V (figure 3-1)		ft/s	3.7		
11. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr	0.004	+	+ = 0.004

Channel flow		Segment ID		
12. Cross sectional flow area, a		ft^2		
13. Wetted perimeter, p_w		ft		
14. Hydraulic radius, r $r = \frac{a}{p_w}$	Compute r	ft		
15. Channel slope, s		ft/ft		
16. Manning's roughness coeff., n				
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$	Compute V	ft/s		
18. Flow length, L		ft		
19. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr	+	= 0.000
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, 19)				0.110 hr

Use Tc= 7 min

Drainage Area ID	**PR-1**

Composite Curve Number Calculations

TR-55 Reference Table

Abbreviated TR-55 Table 2-2a Runoff Curve Numbers for Urban Areas

Cover Description	Curve Numbers for Hydrologic Soil Group (HSG)			
Fully Developed Urban Areas	A	B	C	D
Pervious Area				
Open Space - Lawns, Parks, and Cemeteries	68	79	86	89
Woods and Forest	30	55	70	77
Slectively Cleared Woods and Forest	43	65	76	82
Impervious Area				
Paved Areas and Roofs	98	98	98	98
Gravel Roads	76	85	89	91
Dirt Roads	72	82	87	89
Developing Urban Areas				
Newly Graded Pervious Areas	77	86	91	94

Composite Runoff Curve Number Calculation

$$\text{Composite } CN = \frac{\sum_{i=1}^{n} CN_i \times A_i}{\sum_{i=1}^{n} A_i}$$

n = Number of Distinct Cover Types in the Drainage Area

Cover Description	HSG	CN	Area (ft^2)	CN × A
Newly Graded Pervious Areas	B	86	15,324	1,317,864
Paved Areas and Roofs	B	98	1,793	175,714
				0
				0
				0
		Total	17,117	1,493,578

Composite CN =	87

EVERGREEN WALK

SOUTH WINDSOR, CT

BY HES

DATE 3/12/2021

CKD JEL

DATE 3/12/2021

LANGAN PROJ. NUMBER: 140222801

Drainage Area ID	**PR-2**

Composite Curve Number Calculations

TR-55 Reference Table

Abbreviated TR-55 Table 2-2a Runoff Curve Numbers for Urban Areas

Cover Description	Curve Numbers for Hydrologic Soil Group (HSG)			
Fully Developed Urban Areas	A	B	C	D
Pervious Area				
Open Space - Lawns, Parks, and Cemeteries	68	79	86	89
Woods and Forest	30	55	70	77
Slectively Cleared Woods and Forest	43	65	76	82
Impervious Area				
Paved Areas and Roofs	98	98	98	98
Gravel Roads	76	85	89	91
Dirt Roads	72	82	87	89
Developing Urban Areas				
Newly Graded Pervious Areas	77	86	91	94

Composite Runoff Curve Number Calculation

$$\text{Composite } CN = \frac{\sum_{i=1}^{n} CN_i \times A_i}{\sum_{i=1}^{n} A_i}$$

n = Number of Distinct Cover Types in the Drainage Area

Cover Description	HSG	CN	Area (ft^2)	CN × A
Newly Graded Pervious Areas	B	86	7,677	660,222
Paved Areas and Roofs	B	98	49,975	4,897,550
				0
				0
				0
		Total	57,652	5,557,772

Composite CN =	96

EVERGREEN WALK

SOUTH WINDSOR, CT

BY HES
DATE 3/12/2021
CKD JEL
DATE 3/12/2021

LANGAN PROJ. NUMBER: 140222801

Drainage Area ID	**PR-3**

Composite Curve Number Calculations

TR-55 Reference Table

Abbreviated TR-55 Table 2-2a Runoff Curve Numbers for Urban Areas

Cover Description	Curve Numbers for Hydrologic Soil Group (HSG)			
Fully Developed Urban Areas	A	B	C	D
Pervious Area				
Open Space - Lawns, Parks, and Cemeteries	68	79	86	89
Woods and Forest	30	55	70	77
Slectively Cleared Woods and Forest	43	65	76	82
Impervious Area				
Paved Areas and Roofs	98	98	98	98
Gravel Roads	76	85	89	91
Dirt Roads	72	82	87	89
Developing Urban Areas				
Newly Graded Pervious Areas	77	86	91	94

Composite Runoff Curve Number Calculation

$$\text{Composite } CN = \frac{\sum_{i=1}^{n} CN_i \times A_i}{\sum_{i=1}^{n} A_i}$$

n = Number of Distinct Cover Types in the Drainage Area

Cover Description	HSG	CN	Area (ft^2)	CN × A
Newly Graded Pervious Areas	B	86	32,959	2,834,474
Newly Graded Pervious Areas	C	91	4,937	449,267
Paved Areas and Roofs	B	98	195,896	19,197,808
Gravel Roads	B	85	3,000	255,000
				0
		Total	236,792	22,736,549

Composite CN =	96

EVERGREEN WALK

SOUTH WINDSOR, CT

BY HES
DATE 3/12/2021
CKD JEL
DATE 3/12/2021

LANGAN PROJ. NUMBER: 140222801

Drainage Area ID	**PR-4**

Composite Curve Number Calculations

TR-55 Reference Table

Abbreviated TR-55 Table 2-2a Runoff Curve Numbers for Urban Areas

Cover Description	Curve Numbers for Hydrologic Soil Group (HSG)			
Fully Developed Urban Areas	A	B	C	D
Pervious Area				
Open Space - Lawns, Parks, and Cemeteries	68	79	86	89
Woods and Forest	30	55	70	77
Slectively Cleared Woods and Forest	43	65	76	82
Impervious Area				
Paved Areas and Roofs	98	98	98	98
Gravel Roads	76	85	89	91
Dirt Roads	72	82	87	89
Developing Urban Areas				
Newly Graded Pervious Areas	77	86	91	94

Composite Runoff Curve Number Calculation

$$\text{Composite CN} = \frac{\sum_{i=1}^{n} CN_i \times A_i}{\sum_{i=1}^{n} A_i}$$

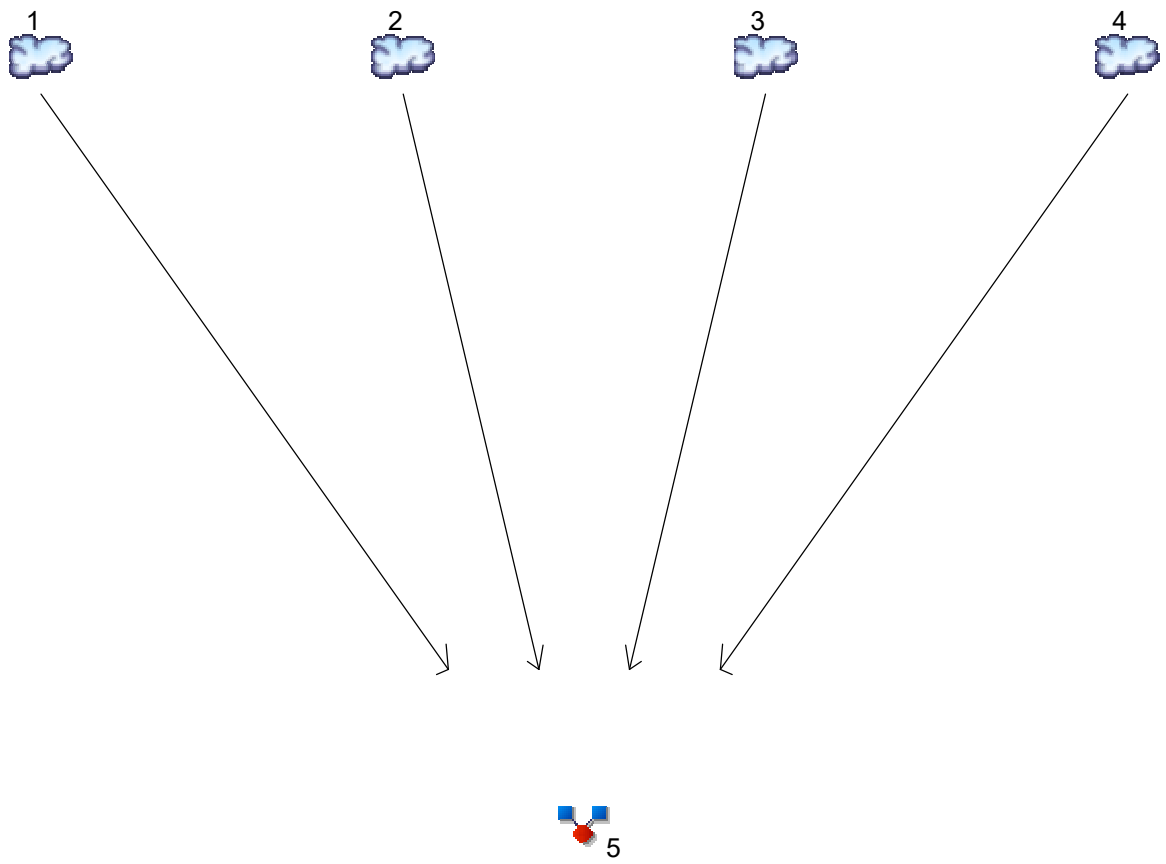
n = Number of Distinct Cover Types in the Drainage Area

Cover Description	HSG	CN	Area (ft^2)	CN × A
Newly Graded Pervious Areas	B	86	6,954	598,044
				0
				0
				0
				0
		Total	6,954	598,044

Composite CN =	86

EVERGREEN WALK	BY	HES	
	DATE	3/12/2021	LANGAN PROJ. NUMBER: 140222801
SOUTH WINDSOR, CT	CKD	JEL	
	DATE	3/12/2021	

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	SCS Runoff	PR-1
2	SCS Runoff	PR-2
3	SCS Runoff	PR-3
4	SCS Runoff	PR-4
5	Combine	Combined - Proposed Condition

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	-------	0.868	-------	-------	1.616	2.086	-------	2.812	PR-1
2	SCS Runoff	------	-------	3.971	-------	-------	6.447	7.975	-------	10.34	PR-2
3	SCS Runoff	------	-------	16.33	-------	-------	26.52	32.81	-------	42.53	PR-3
4	SCS Runoff	------	-------	0.341	-------	-------	0.647	0.840	-------	1.138	PR-4
5	Combine	1, 2, 3, 4	-------	21.51	-------	-------	35.23	43.71	-------	56.81	Combined - Proposed Condition

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

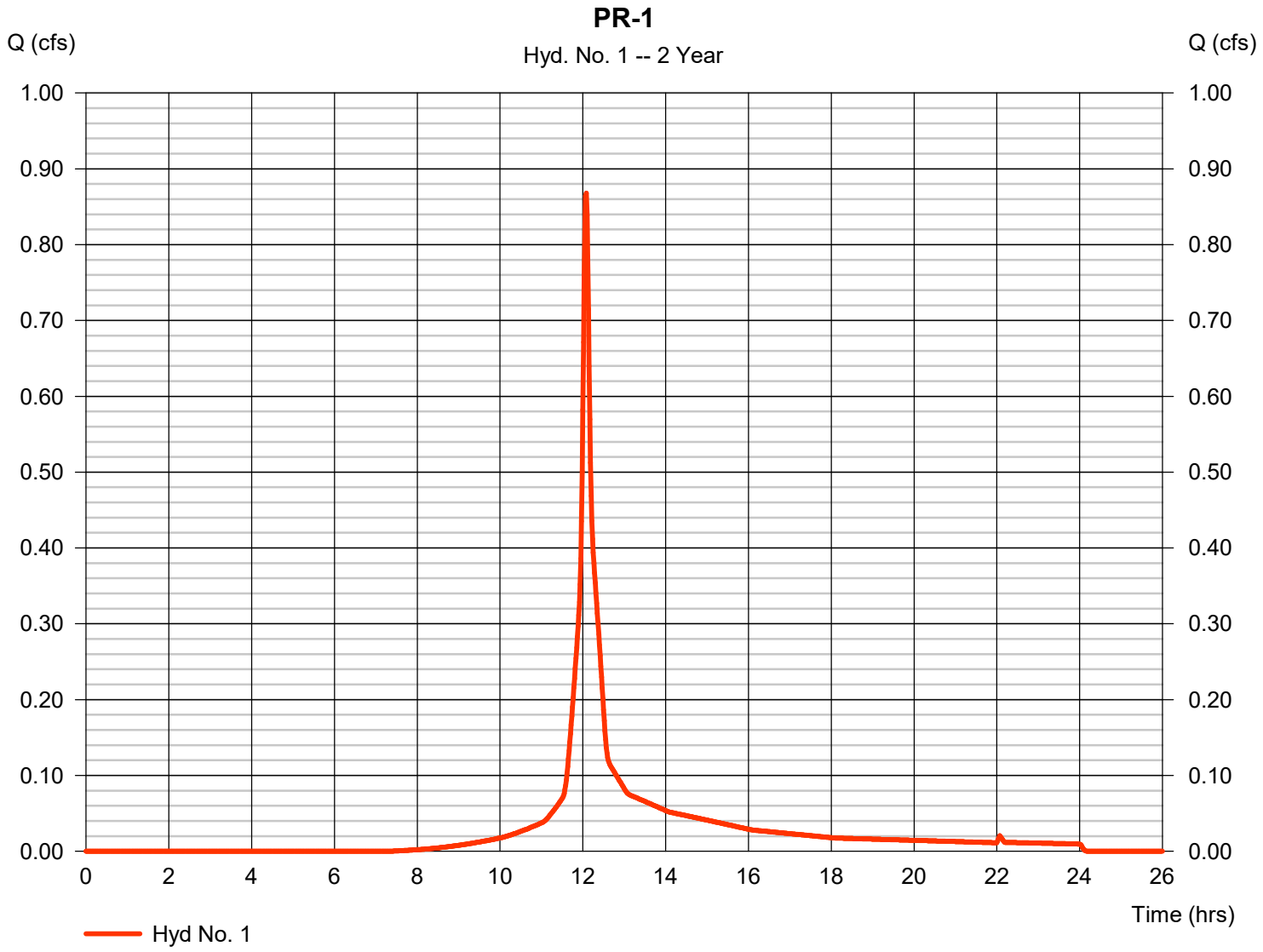
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.868	1	725	2,680	------	------	------	PR-1
2	SCS Runoff	3.971	1	724	13,146	------	------	------	PR-2
3	SCS Runoff	16.33	1	724	54,078	------	------	------	PR-3
4	SCS Runoff	0.341	1	725	1,052	------	------	------	PR-4
5	Combine	21.51	1	724	70,956	1, 2, 3, 4	------	------	Combined - Proposed Condition

Hydrograph Report

Hyd. No. 1

PR-1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.868 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.08 hrs
Time interval	= 1 min	Hyd. volume	= 2,680 cuft
Drainage area	= 0.390 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.11 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

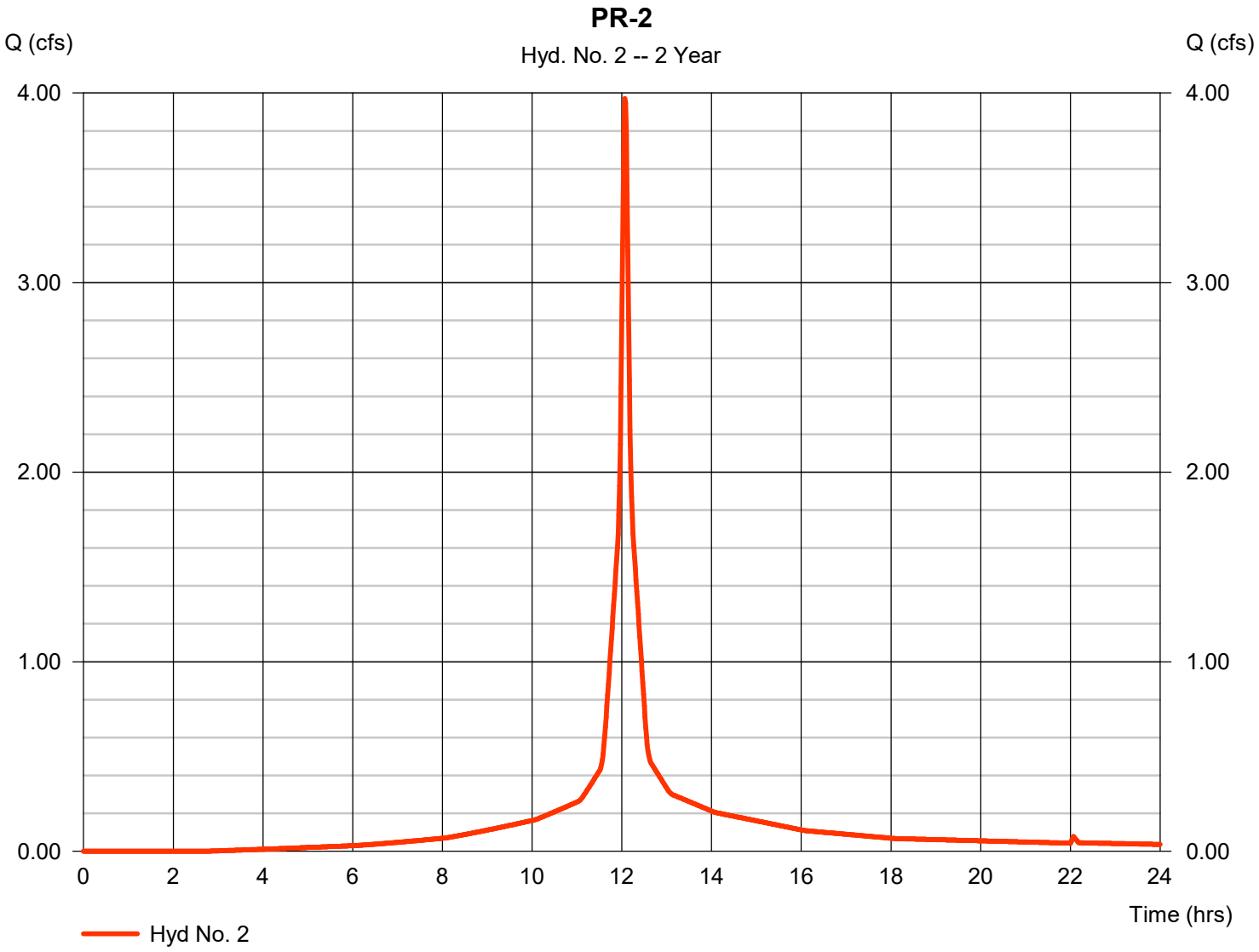


Hydrograph Report

Hyd. No. 2

PR-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.971 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.07 hrs
Time interval	=	1 min	Hyd. volume	=	13,146 cuft
Drainage area	=	1.320 ac	Curve number	=	96
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.11 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

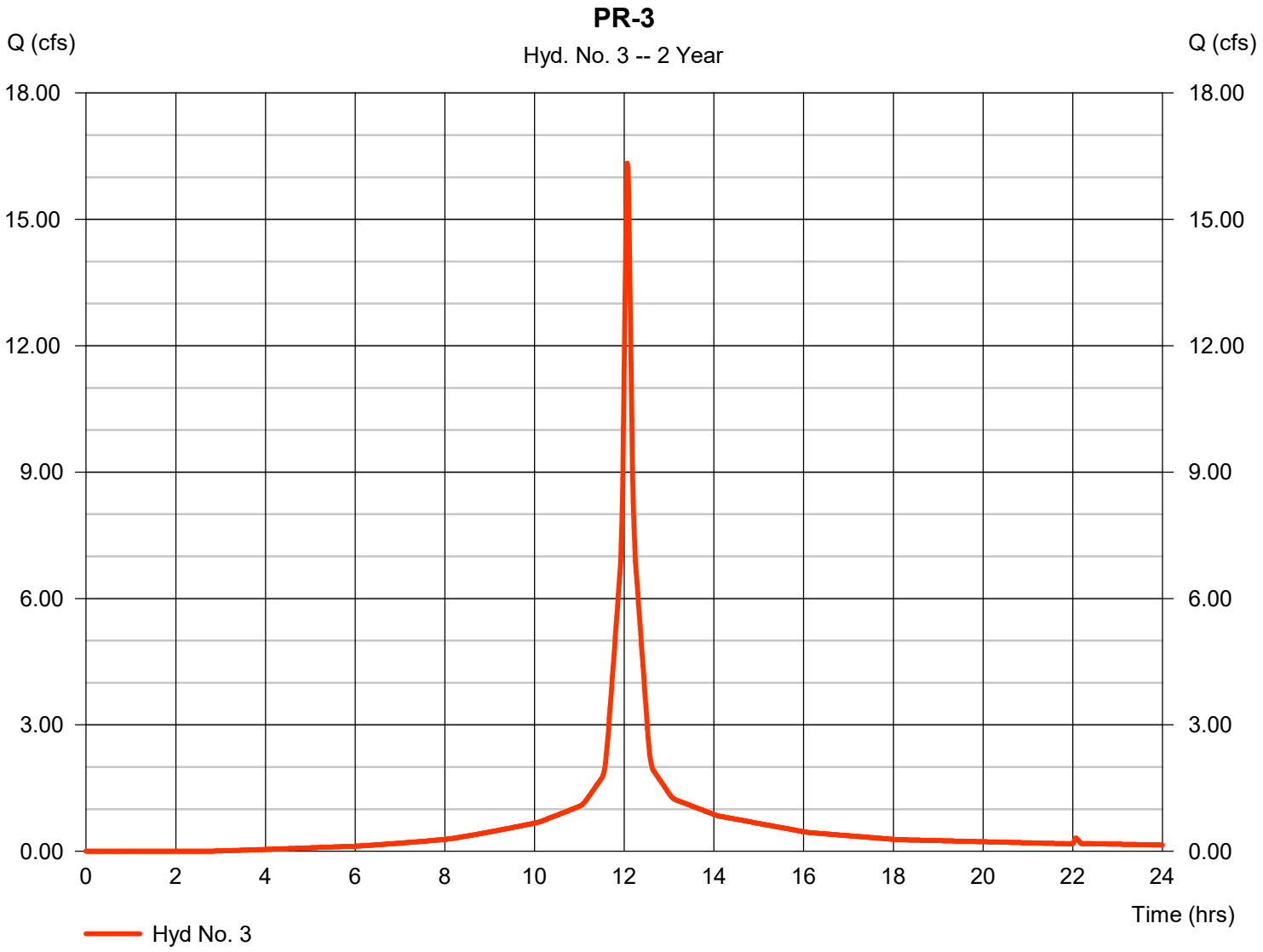


Hydrograph Report

Hyd. No. 3

PR-3

Hydrograph type	=	SCS Runoff	Peak discharge	=	16.33 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.07 hrs
Time interval	=	1 min	Hyd. volume	=	54,078 cuft
Drainage area	=	5.430 ac	Curve number	=	96
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.11 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

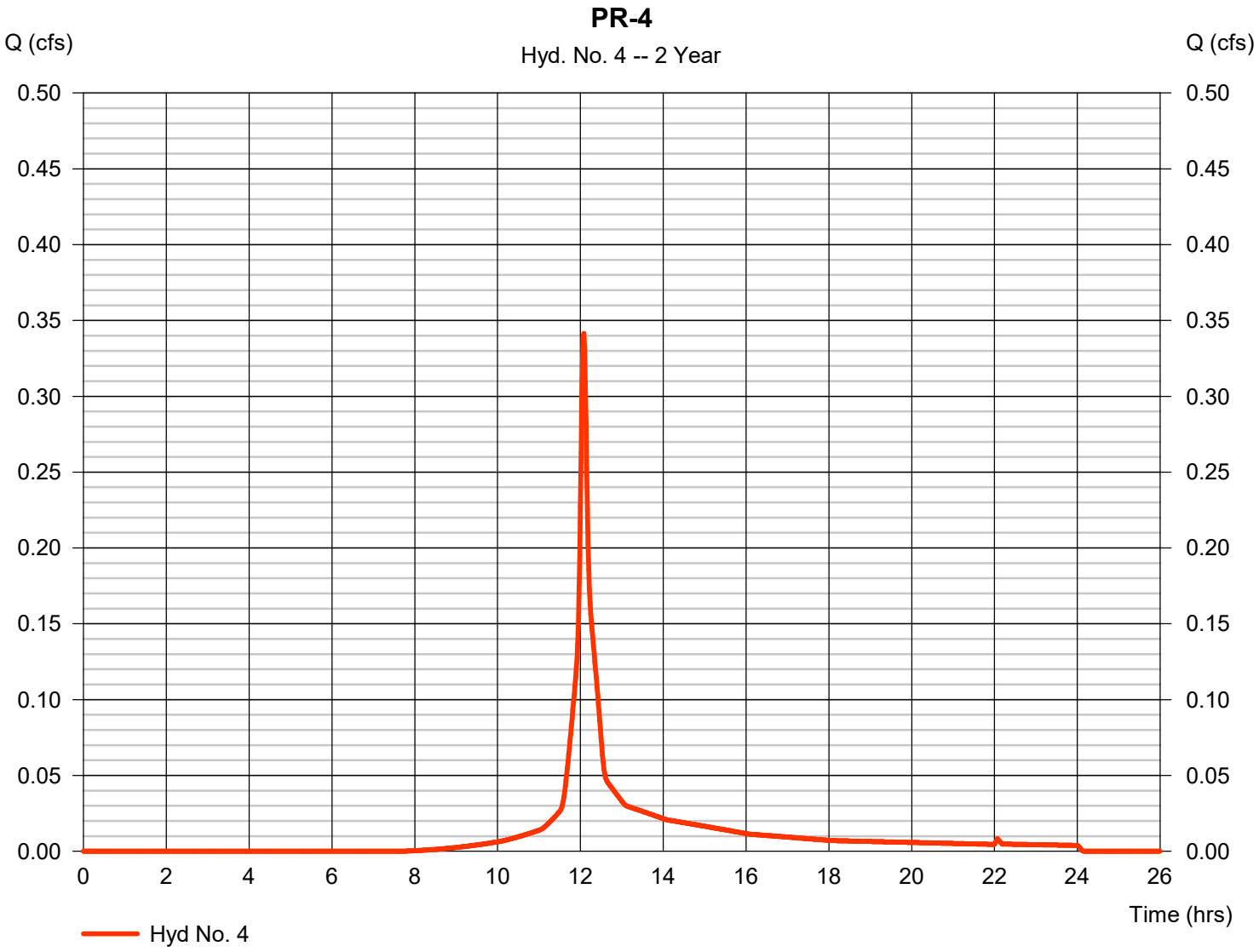


Hydrograph Report

Hyd. No. 4

PR-4

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.341 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.08 hrs
Time interval	=	1 min	Hyd. volume	=	1,052 cuft
Drainage area	=	0.160 ac	Curve number	=	86
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.11 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

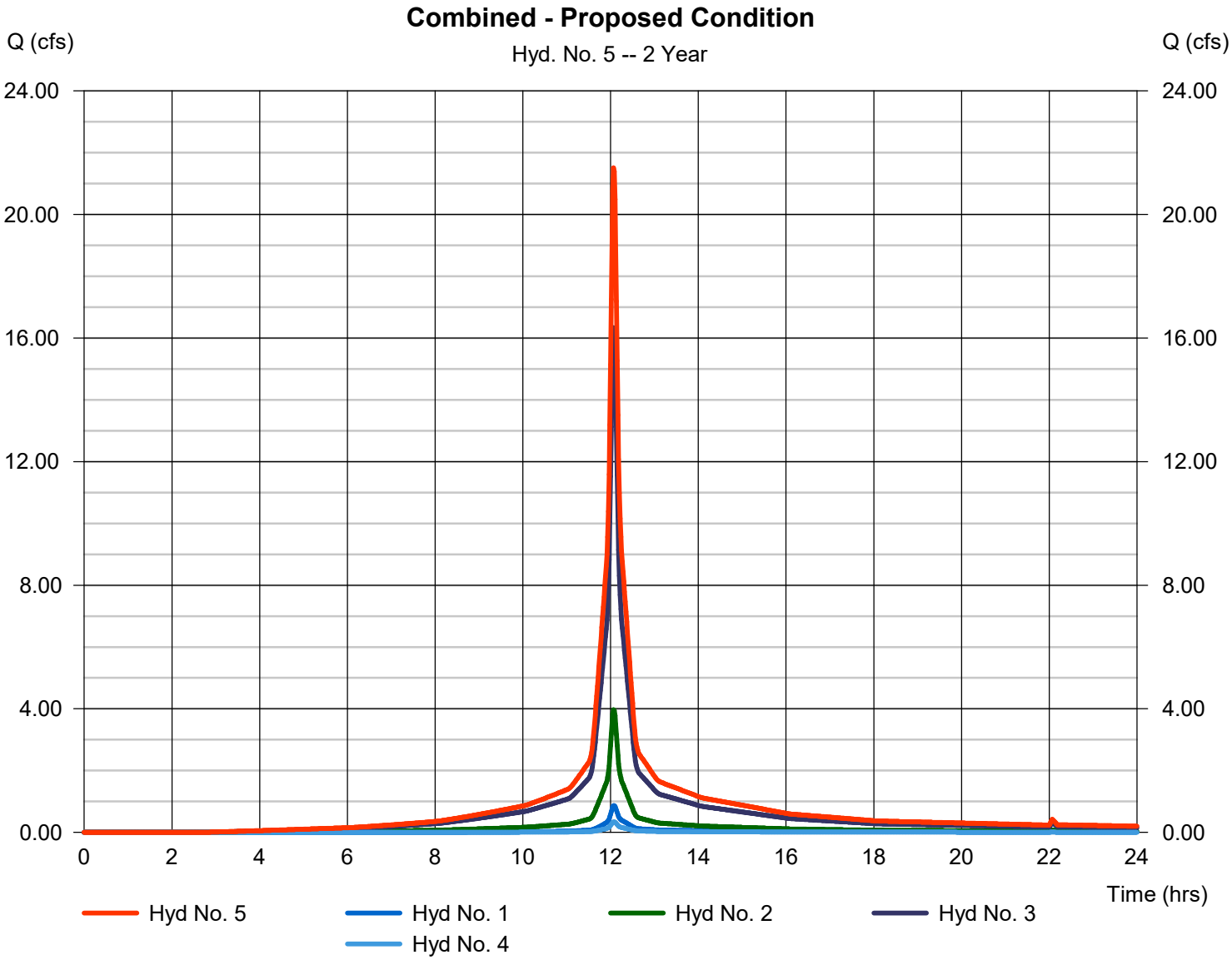


Hydrograph Report

Hyd. No. 5

Combined - Proposed Condition

Hydrograph type	=	Combine	Peak discharge	=	21.51 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.07 hrs
Time interval	=	1 min	Hyd. volume	=	70,956 cuft
Inflow hyds.	=	1, 2, 3, 4	Contrib. drain. area	=	7.300 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

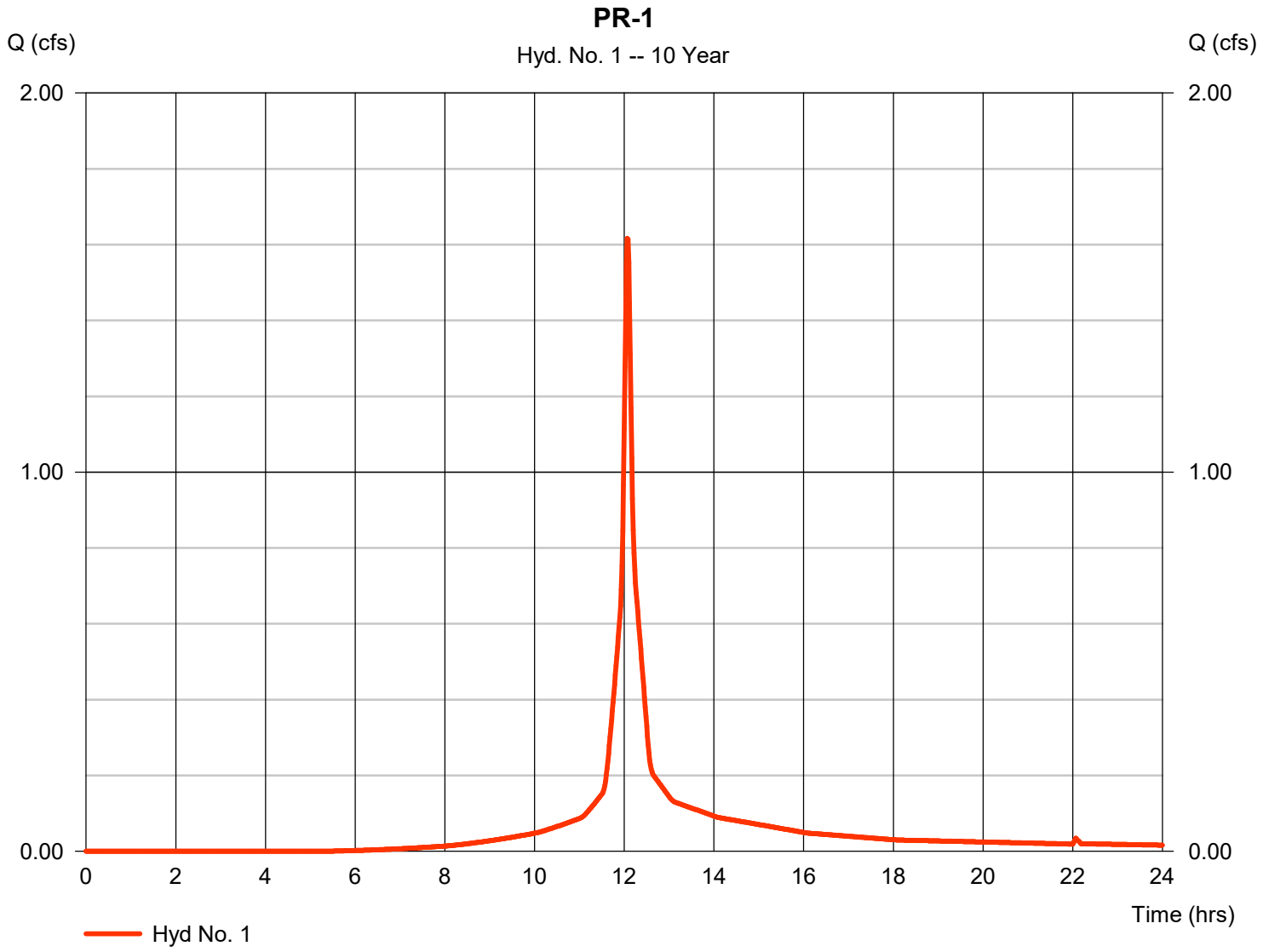
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	1.616	1	724	5,084	------	------	------	PR-1
2	SCS Runoff	6.447	1	724	21,955	------	------	------	PR-2
3	SCS Runoff	26.52	1	724	90,314	------	------	------	PR-3
4	SCS Runoff	0.647	1	724	2,026	------	------	------	PR-4
5	Combine	35.23	1	724	119,380	1, 2, 3, 4	------	------	Combined - Proposed Condition

Hydrograph Report

Hyd. No. 1

PR-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.616 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.07 hrs
Time interval	=	1 min	Hyd. volume	=	5,084 cuft
Drainage area	=	0.390 ac	Curve number	=	87
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	4.91 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

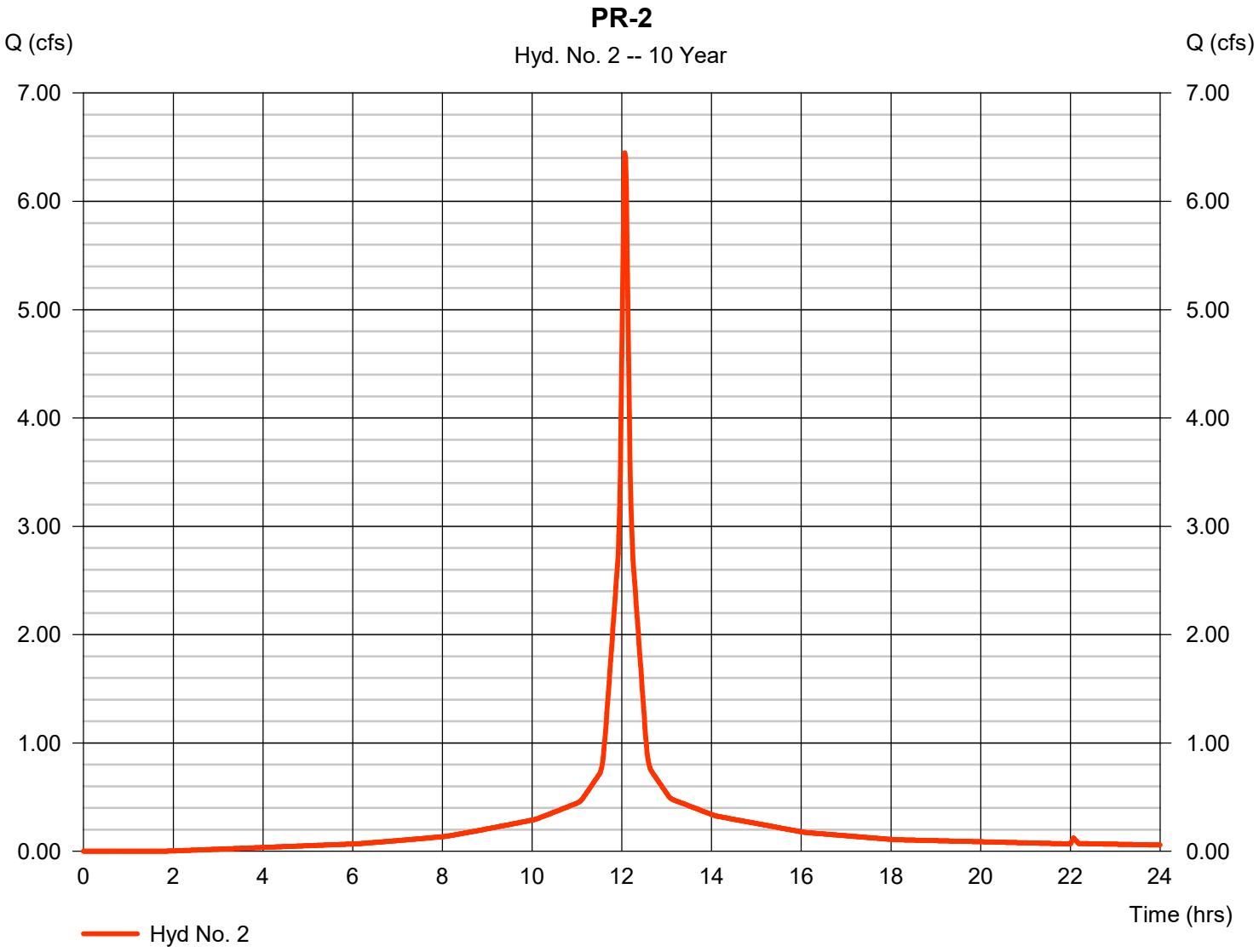


Hydrograph Report

Hyd. No. 2

PR-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.447 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.07 hrs
Time interval	=	1 min	Hyd. volume	=	21,955 cuft
Drainage area	=	1.320 ac	Curve number	=	96
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	4.91 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

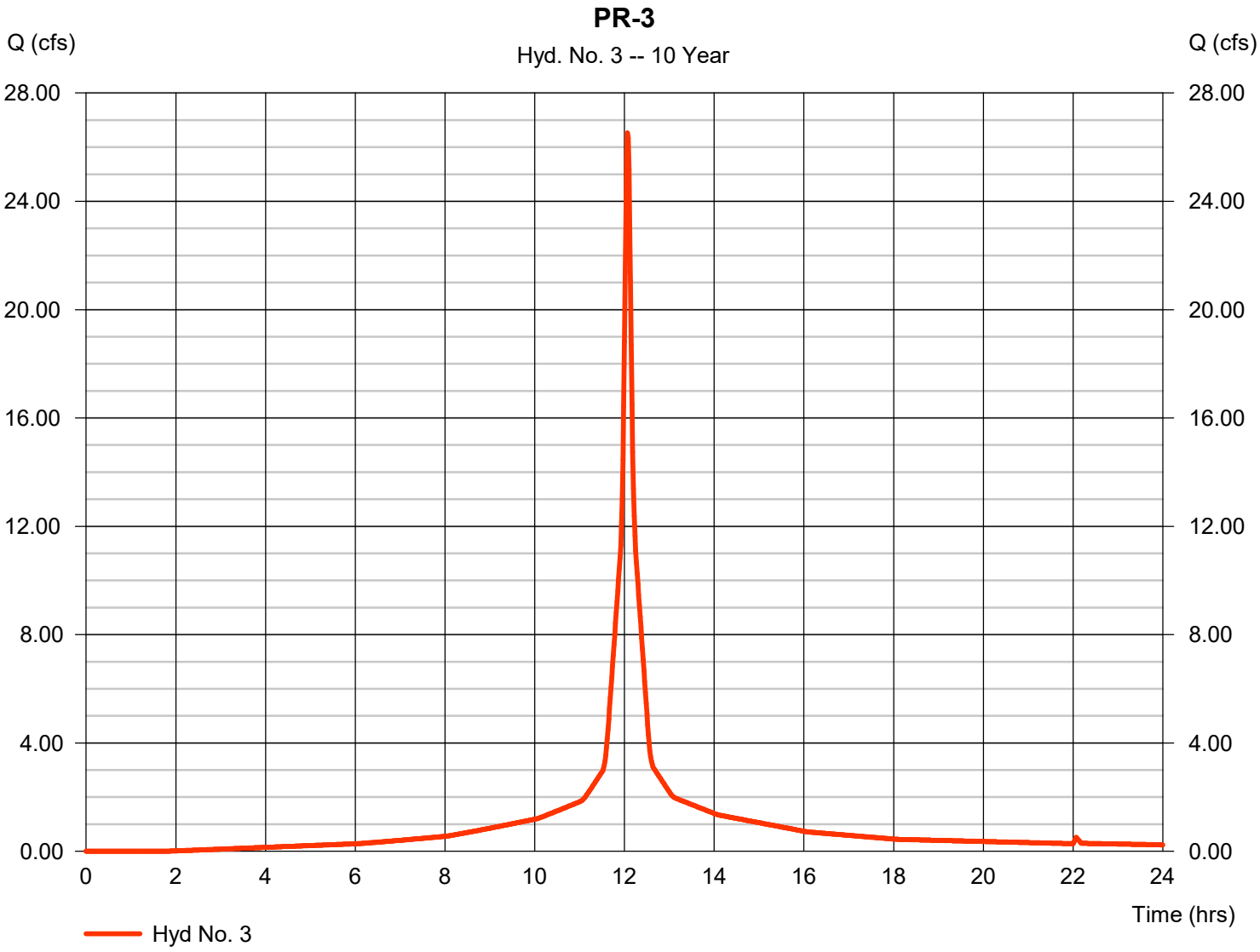


Hydrograph Report

Hyd. No. 3

PR-3

Hydrograph type	=	SCS Runoff	Peak discharge	=	26.52 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.07 hrs
Time interval	=	1 min	Hyd. volume	=	90,314 cuft
Drainage area	=	5.430 ac	Curve number	=	96
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	4.91 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

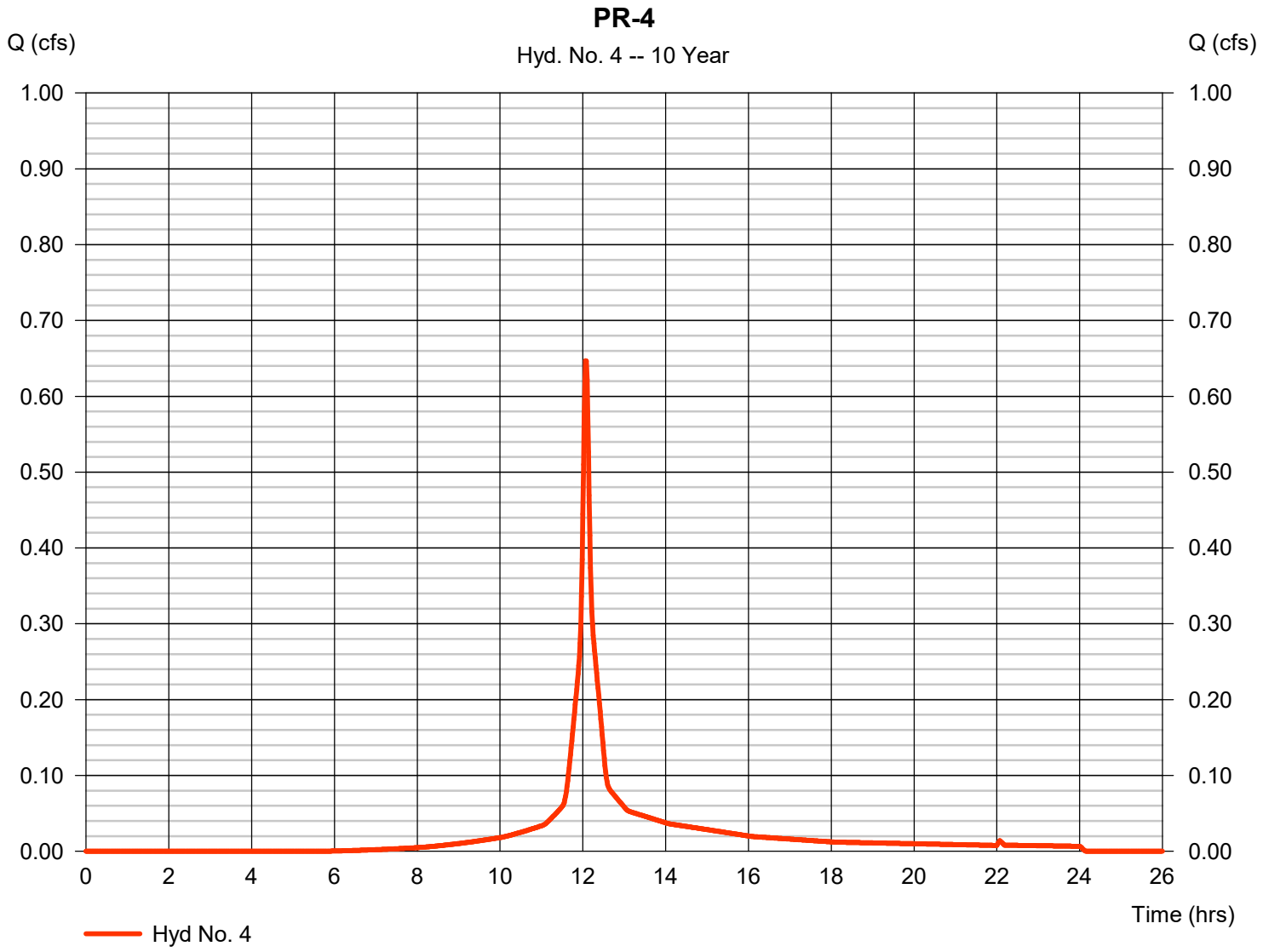


Hydrograph Report

Hyd. No. 4

PR-4

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.647 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.07 hrs
Time interval	=	1 min	Hyd. volume	=	2,026 cuft
Drainage area	=	0.160 ac	Curve number	=	86
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	4.91 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

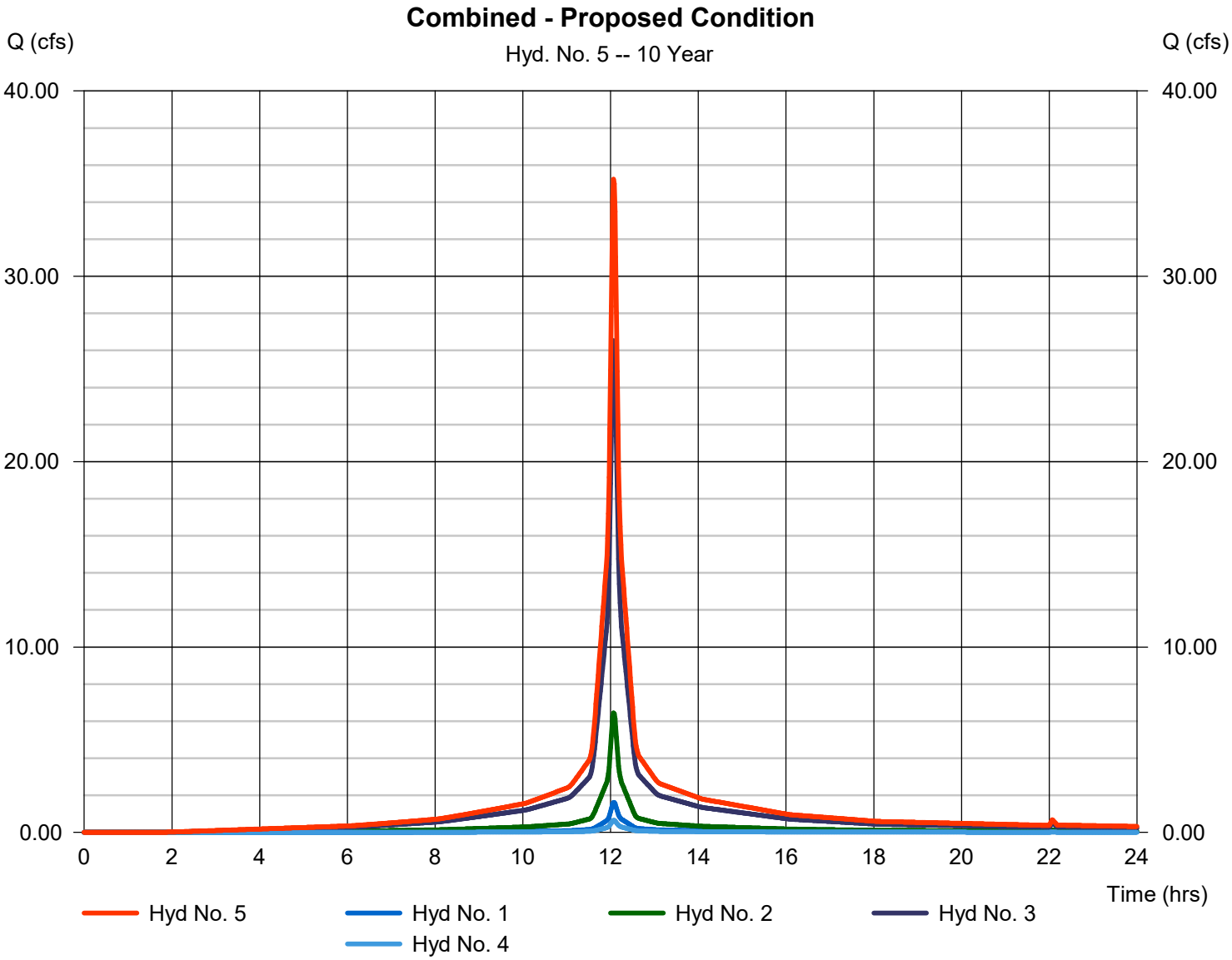


Hydrograph Report

Hyd. No. 5

Combined - Proposed Condition

Hydrograph type	=	Combine	Peak discharge	=	35.23 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.07 hrs
Time interval	=	1 min	Hyd. volume	=	119,380 cuft
Inflow hyds.	=	1, 2, 3, 4	Contrib. drain. area	=	7.300 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

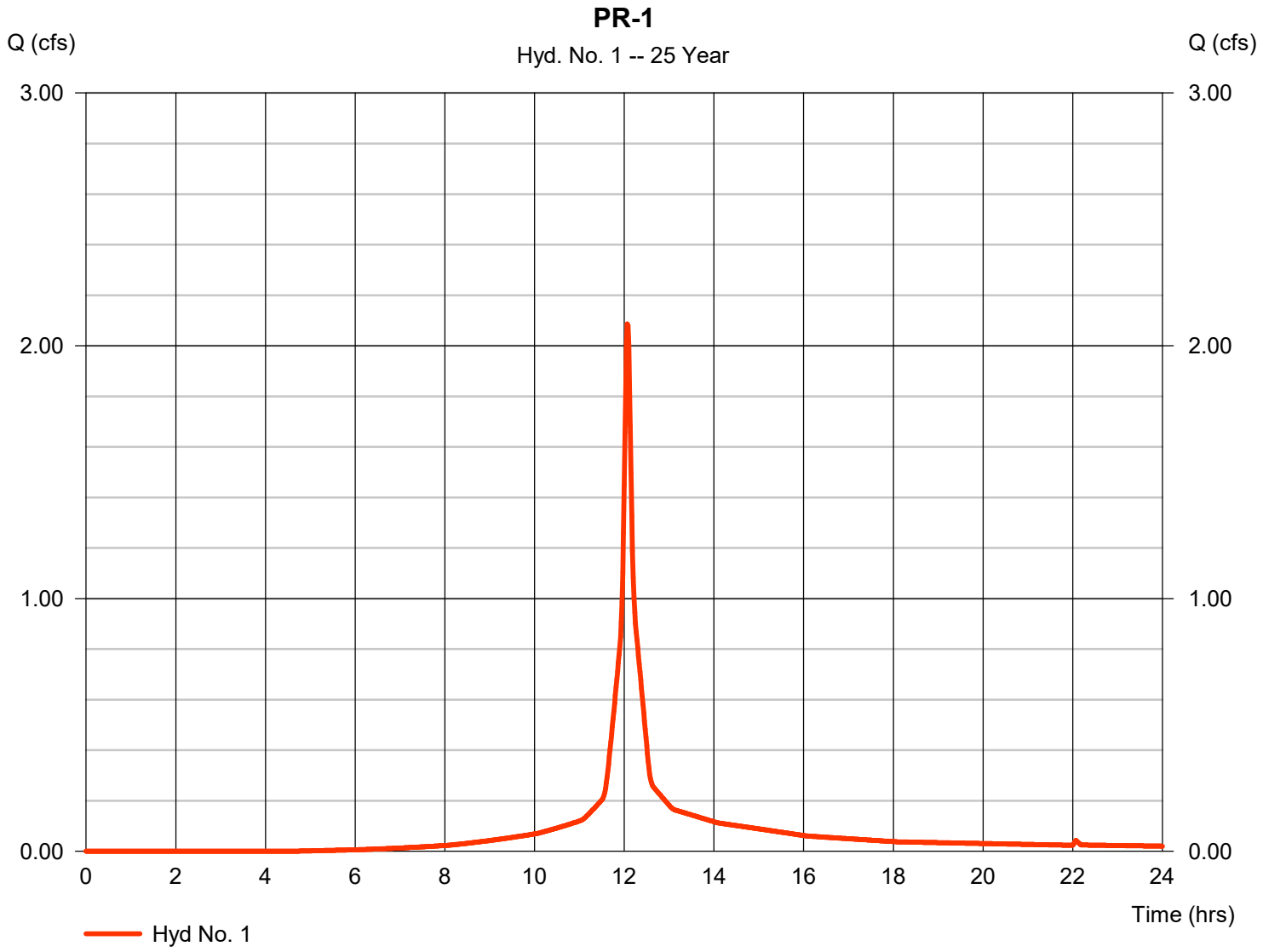
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	2.086	1	724	6,637	------	------	------	PR-1
2	SCS Runoff	7.975	1	724	27,460	------	------	------	PR-2
3	SCS Runoff	32.81	1	724	112,962	------	------	------	PR-3
4	SCS Runoff	0.840	1	724	2,658	------	------	------	PR-4
5	Combine	43.71	1	724	149,717	1, 2, 3, 4	------	------	Combined - Proposed Condition

Hydrograph Report

Hyd. No. 1

PR-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.086 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.07 hrs
Time interval	=	1 min	Hyd. volume	=	6,637 cuft
Drainage area	=	0.390 ac	Curve number	=	87
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	6.03 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

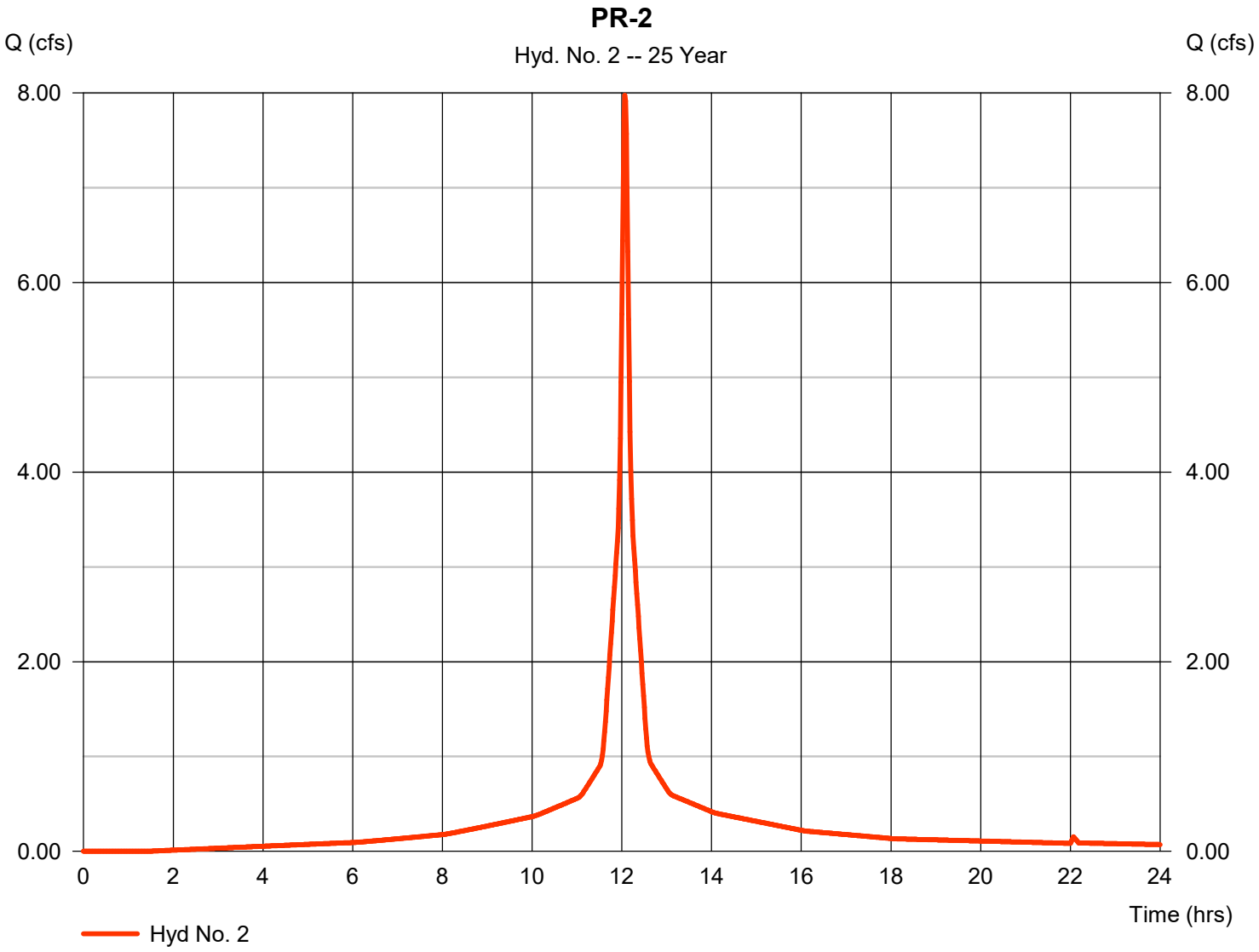


Hydrograph Report

Hyd. No. 2

PR-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.975 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.07 hrs
Time interval	=	1 min	Hyd. volume	=	27,460 cuft
Drainage area	=	1.320 ac	Curve number	=	96
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	6.03 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

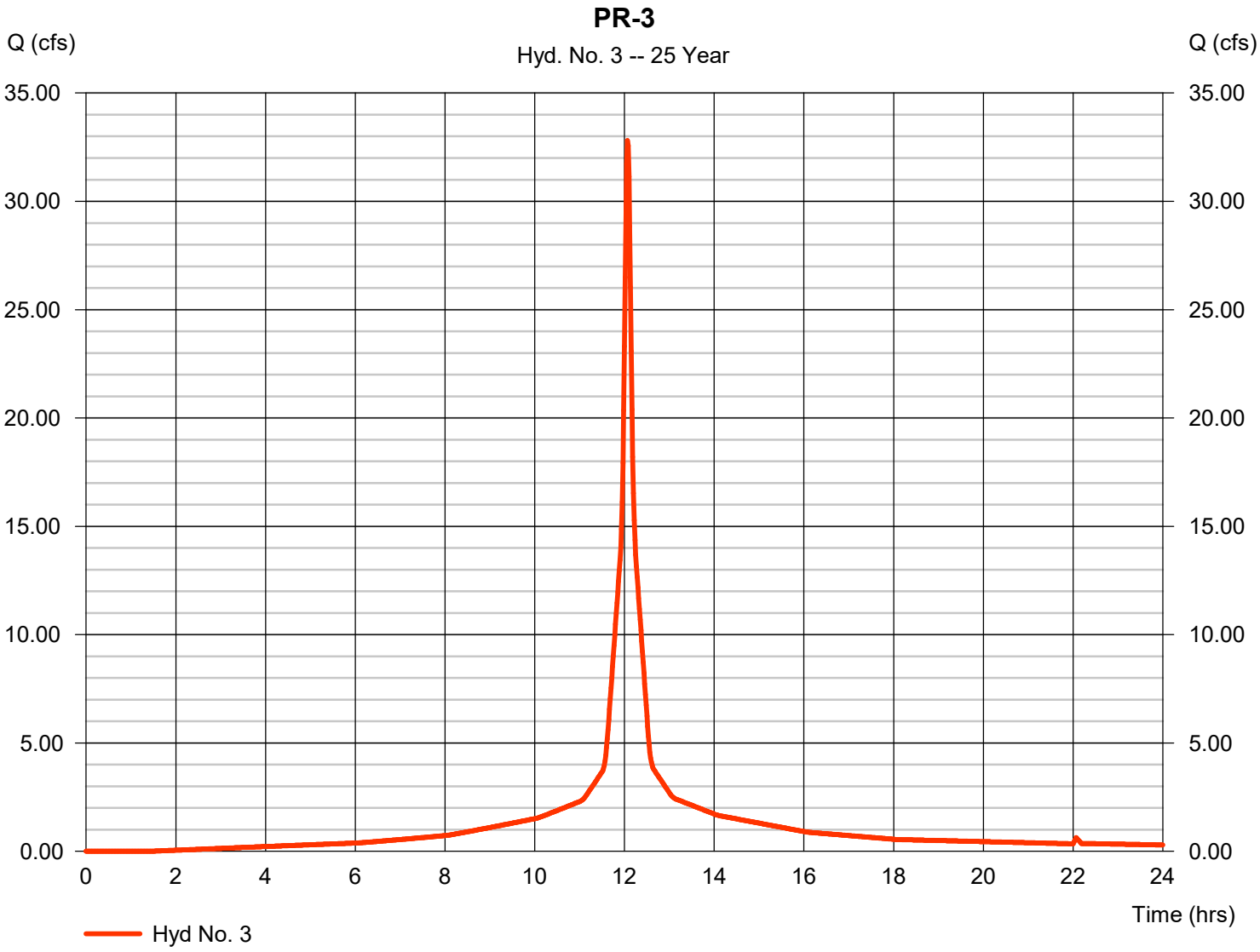


Hydrograph Report

Hyd. No. 3

PR-3

Hydrograph type	=	SCS Runoff	Peak discharge	=	32.81 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.07 hrs
Time interval	=	1 min	Hyd. volume	=	112,962 cuft
Drainage area	=	5.430 ac	Curve number	=	96
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	6.03 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

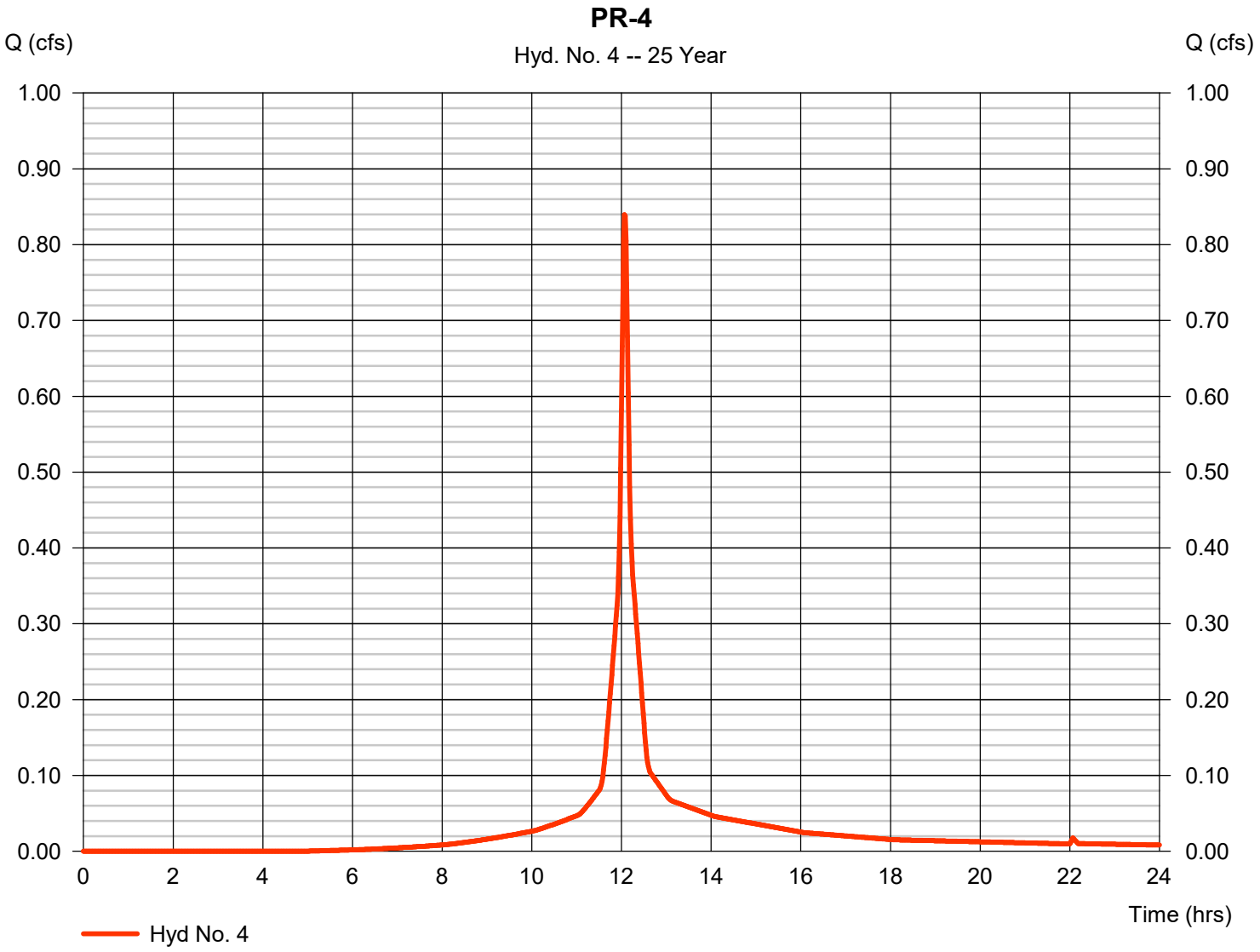


Hydrograph Report

Hyd. No. 4

PR-4

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.840 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.07 hrs
Time interval	=	1 min	Hyd. volume	=	2,658 cuft
Drainage area	=	0.160 ac	Curve number	=	86
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	6.03 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

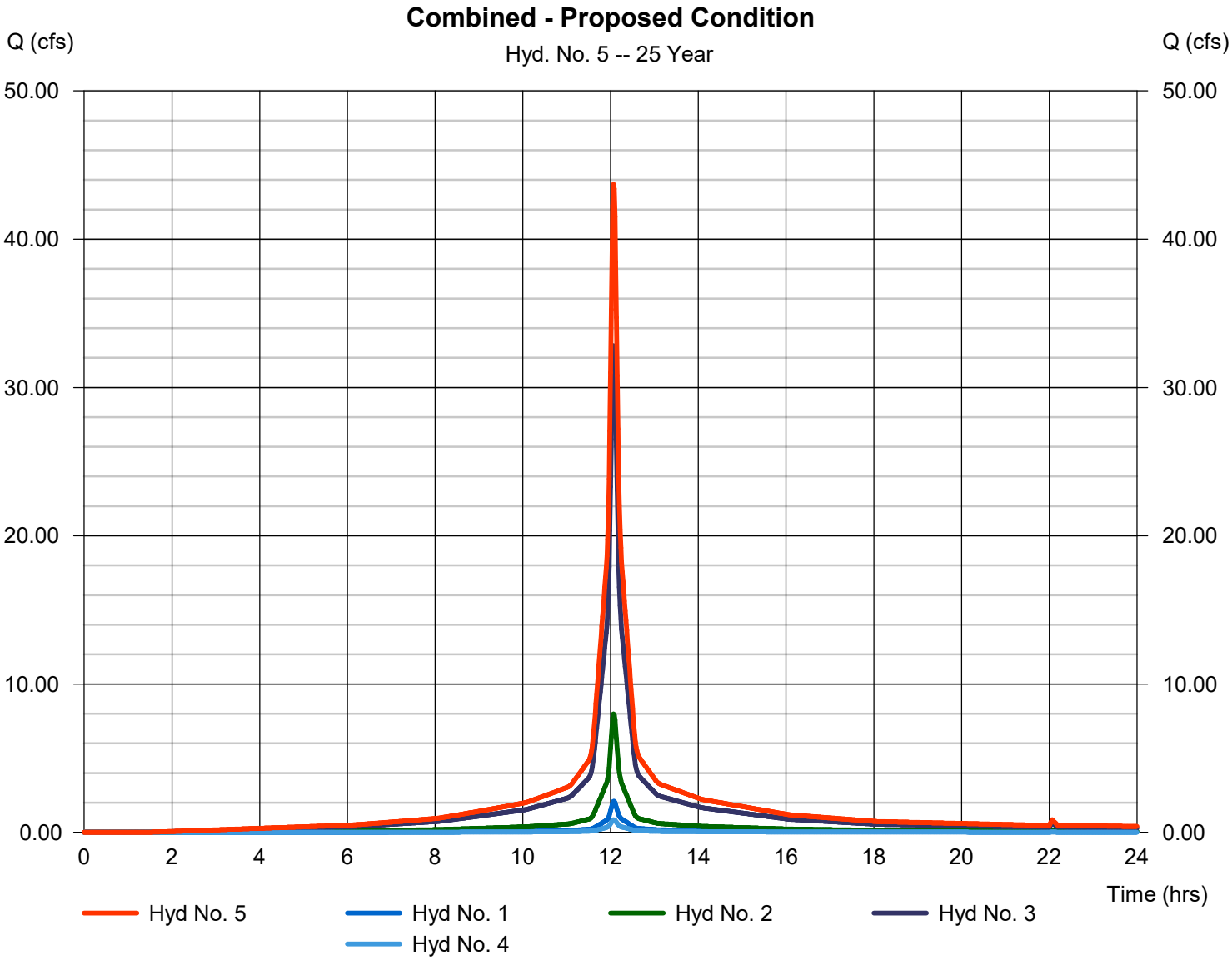


Hydrograph Report

Hyd. No. 5

Combined - Proposed Condition

Hydrograph type	=	Combine	Peak discharge	=	43.71 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.07 hrs
Time interval	=	1 min	Hyd. volume	=	149,717 cuft
Inflow hyds.	=	1, 2, 3, 4	Contrib. drain. area	=	7.300 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

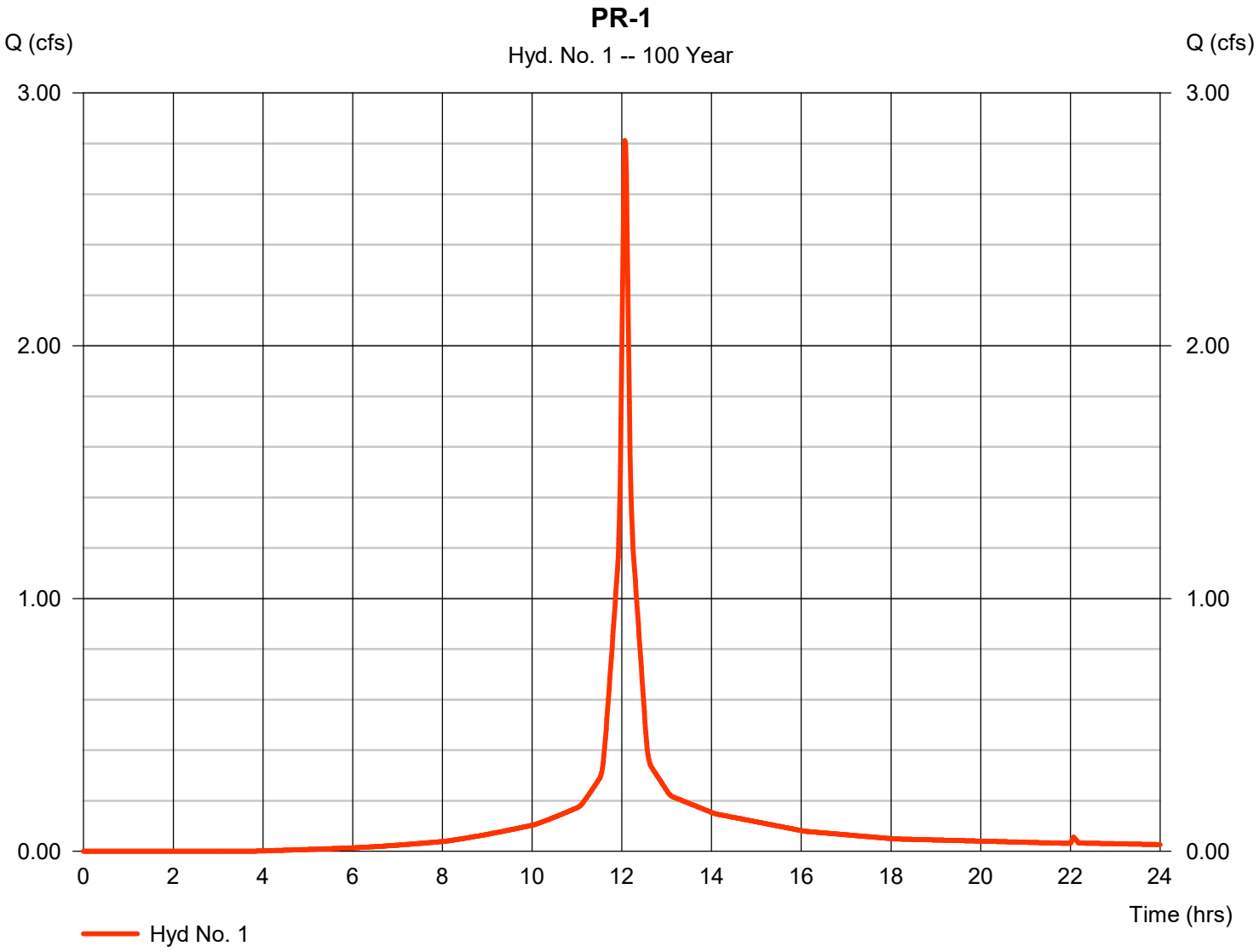
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	2.812	1	724	9,090	------	------	------	PR-1
2	SCS Runoff	10.34	1	724	36,029	------	------	------	PR-2
3	SCS Runoff	42.53	1	724	148,212	------	------	------	PR-3
4	SCS Runoff	1.138	1	724	3,659	------	------	------	PR-4
5	Combine	56.81	1	724	196,989	1, 2, 3, 4	------	------	Combined - Proposed Condition

Hydrograph Report

Hyd. No. 1

PR-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.812 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.07 hrs
Time interval	=	1 min	Hyd. volume	=	9,090 cuft
Drainage area	=	0.390 ac	Curve number	=	87
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	7.77 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

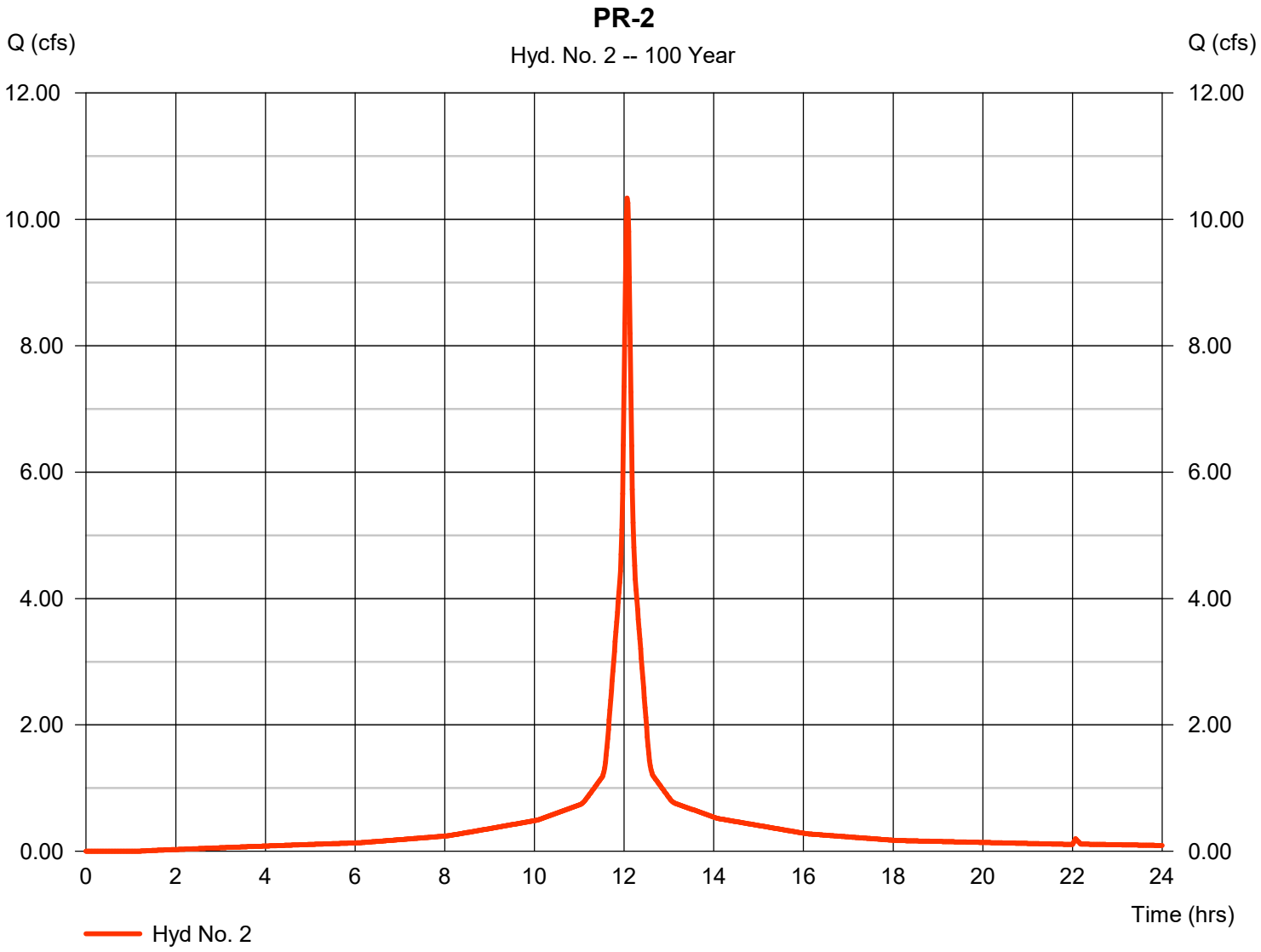


Hydrograph Report

Hyd. No. 2

PR-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	10.34 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.07 hrs
Time interval	=	1 min	Hyd. volume	=	36,029 cuft
Drainage area	=	1.320 ac	Curve number	=	96
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	7.77 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

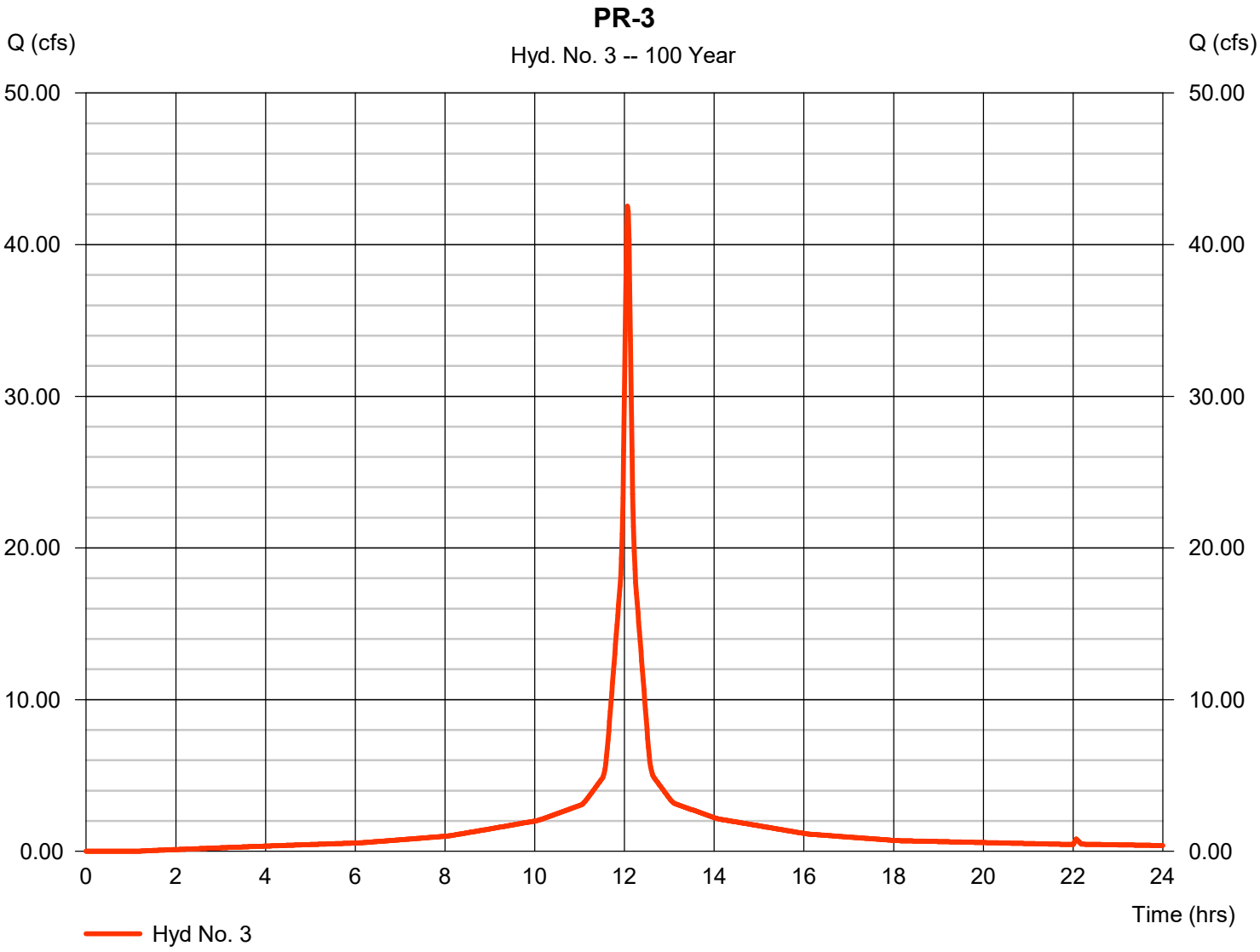


Hydrograph Report

Hyd. No. 3

PR-3

Hydrograph type	=	SCS Runoff	Peak discharge	=	42.53 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.07 hrs
Time interval	=	1 min	Hyd. volume	=	148,212 cuft
Drainage area	=	5.430 ac	Curve number	=	96
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	7.77 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

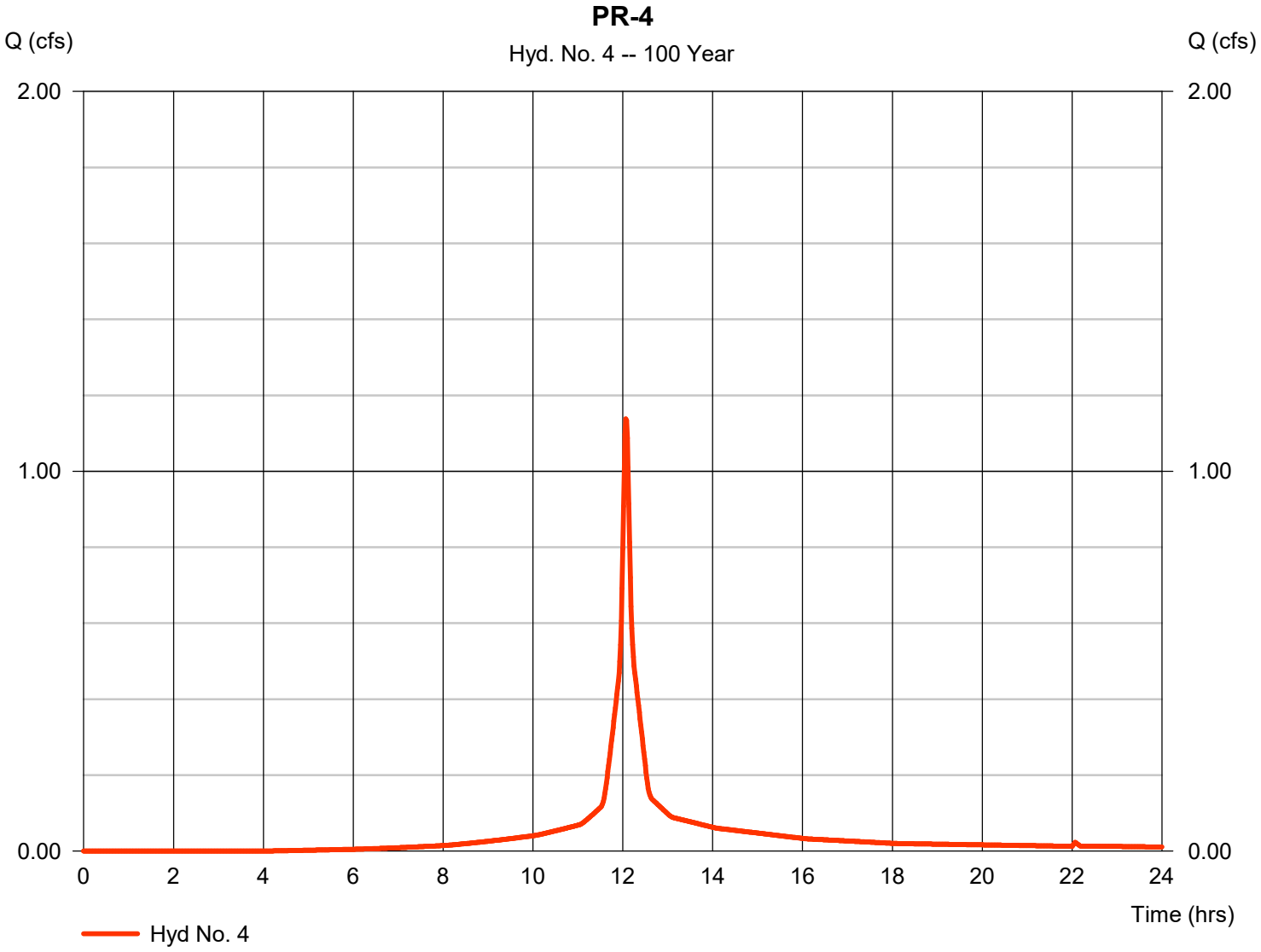


Hydrograph Report

Hyd. No. 4

PR-4

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.138 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.07 hrs
Time interval	=	1 min	Hyd. volume	=	3,659 cuft
Drainage area	=	0.160 ac	Curve number	=	86
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	7.77 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

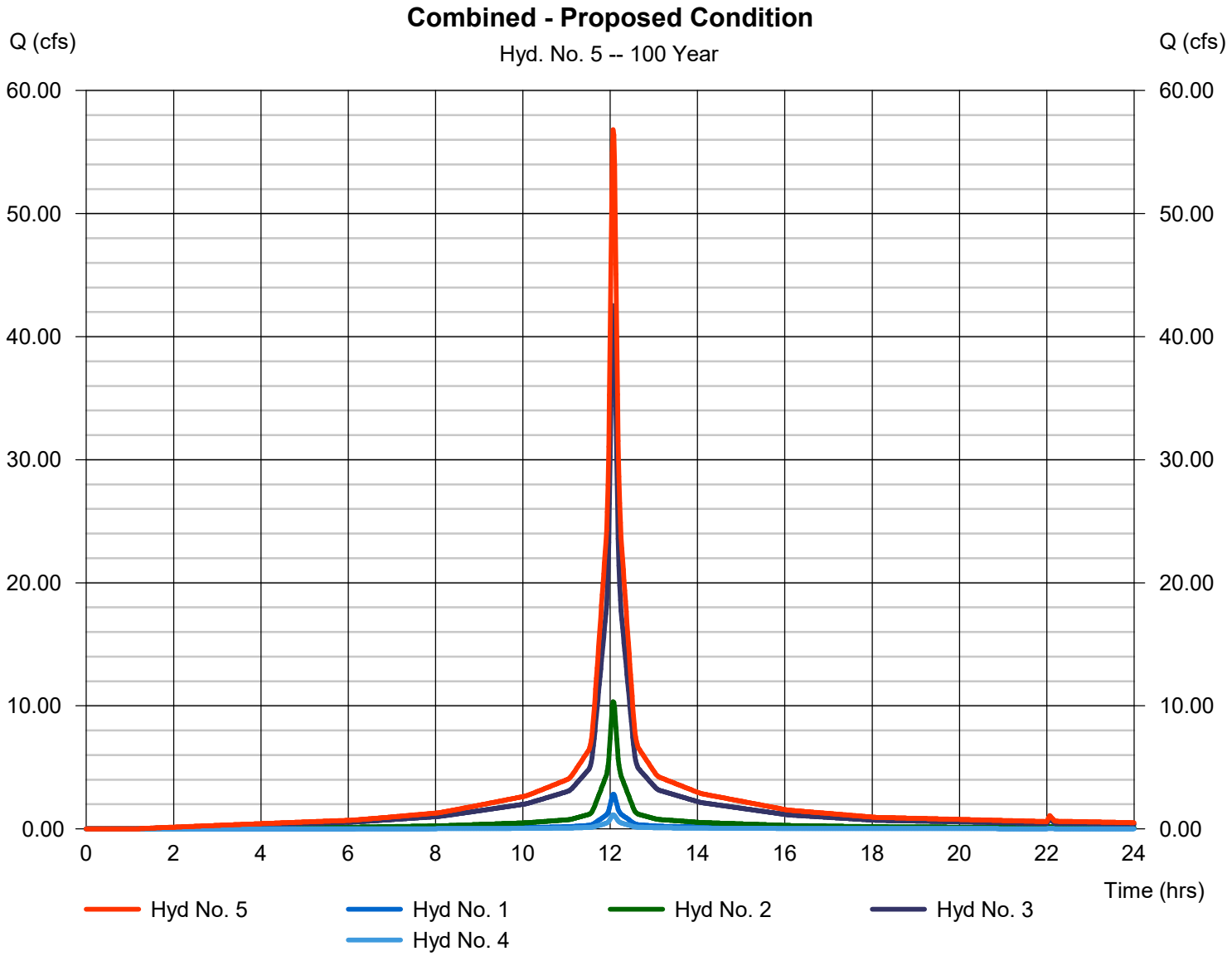


Hydrograph Report

Hyd. No. 5

Combined - Proposed Condition

Hydrograph type	=	Combine	Peak discharge	=	56.81 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.07 hrs
Time interval	=	1 min	Hyd. volume	=	196,989 cuft
Inflow hyds.	=	1, 2, 3, 4	Contrib. drain. area	=	7.300 ac



APPENDIX C

Stormwater Collection System Calculations

Project **EVERGREEN WALK** By **IJAB** Date **3/10/2021**

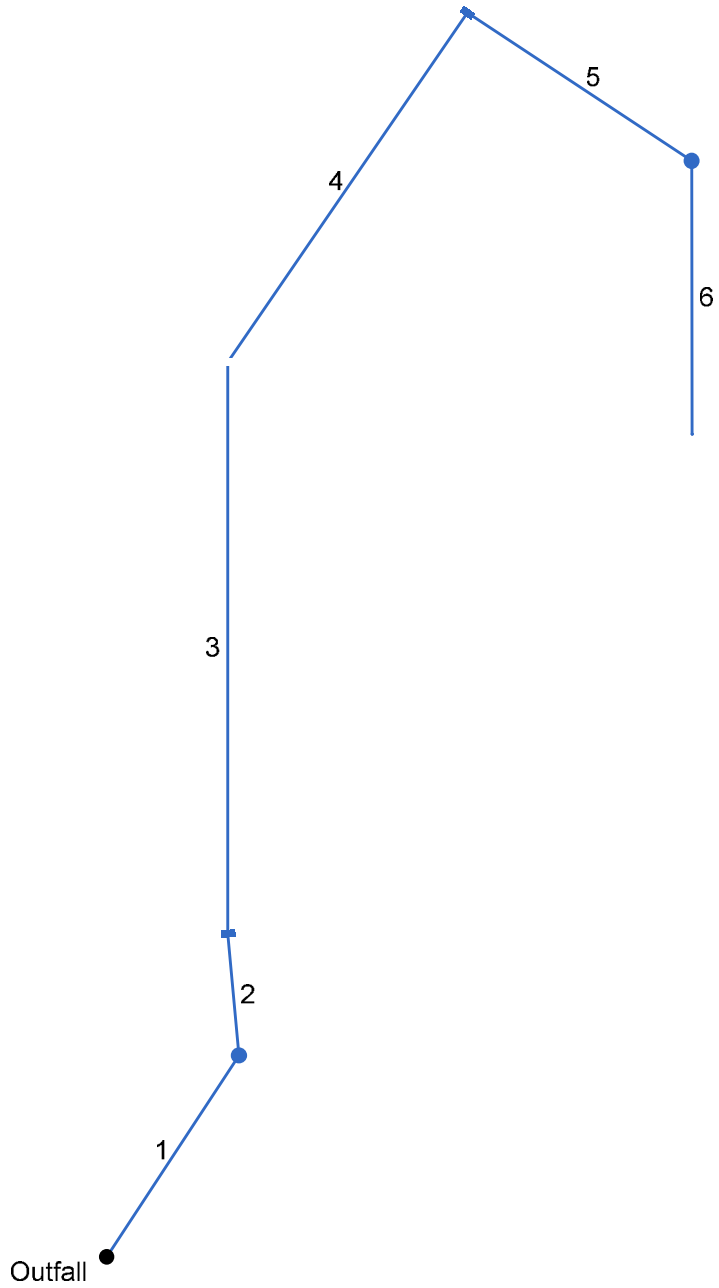
Location **South Windsor, CT** Checked **JEL** Date **3/10/2021**

Circle one: Present (Developed) Job No. **140222801**

1. Rational 'C' Runoff Coefficient & Area Calculations

Catchment Area	Total Area		Impervious (C=.9)		Pervious (C=0.3)		Percent Impervious	C
	SF	AC	SF	AC	SF	AC		
CCB A-1	20,076	0.461	18,904	0.434	1,172	0.027	94%	0.86
CCB A-2	26,673	0.612	22,476	0.516	4,197	0.096	84%	0.81
CCB A-3	9,325	0.214	7,994	0.184	1,331	0.031	86%	0.81
TD A-1	1,970	0.045	1,579	0.036	391	0.009	80%	0.78
CCB B-1	19,099	0.438	9,868	0.227	9,231	0.212	52%	0.61
CCB B-2	2,306	0.053	2,306	0.053	0	0.000	100%	0.90
CCB B-3	7,452	0.171	6,432	0.148	1,020	0.023	86%	0.82
CCB B-4	6,012	0.138	4,771	0.110	1,241	0.028	79%	0.78
CCB B-5	9,134	0.210	6,796	0.156	2,338	0.054	74%	0.75
CCB B-6	12,046	0.277	8,228	0.189	3,818	0.088	68%	0.71
WQU B-1	32,575	0.748	29,847	0.685	2,728	0.063	92%	0.85
WQU B-2	9,855	0.226	9,789	0.225	66	0.002	99%	0.90
YD B-1	6,395	0.147	517	0.012	5,878	0.135	8%	0.35
YD B-2	3,615	0.083	152	0.003	3,463	0.079	4%	0.33
YD B-3	18,165	0.417	12,398	0.285	5,767	0.132	68%	0.71
YD B-4	3,759	0.086	3,017	0.069	742	0.017	80%	0.78
YD B-5	37,840	0.869	34,841	0.800	2,999	0.069	92%	0.85
YD B-6	4,526	0.104	4,167	0.096	359	0.008	92%	0.85
RL B-1	6,132	0.141	6,132	0.141	0	0.000	100%	0.90
RL B-2	6,000	0.138	6,000	0.138	0	0.000	100%	0.90
RL B-3	20,000	0.459	20,000	0.459	0	0.000	100%	0.90
RL B-4	20,000	0.459	20,000	0.459	0	0.000	100%	0.90
EX CB-1	5,567	0.128	4,850	0.111	717	0.016	87%	0.82
EX CB-2	7,200	0.165	5,391	0.124	1,809	0.042	75%	0.75

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Network A.stm	Number of lines: 6	Date: 4/7/2021

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	PIPE-39	6.91	18	Cir	72.784	110.03	113.55	4.833	111.53	114.56	n/a	114.56 j	End	Manhole
2	PIPE-20	6.96	18	Cir	37.051	113.26	115.22	5.290	114.56	116.24	n/a	116.24 j	1	Grate
3	PIPE-2	6.05	15	Cir	172.892	115.51	117.24	1.000	116.41	118.23	0.48	118.23	2	Grate
4	PIPE-49	2.90	12	Cir	128.110	117.50	118.89	1.090	118.23	119.62	n/a	119.62 j	3	Grate
5	PIPE-47	0.25	8	Cir	81.161	118.89	119.70	1.000	119.62	119.94	n/a	119.94 j	4	Manhole
6	PIPE-46	0.26	6	Cir	82.658	119.70	120.53	1.000	119.94	120.79	0.10	120.79	5	Manhole

Project File: Network A.stm | Number of lines: 6 | Run Date: 4/7/2021

NOTES: Return period = 10 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	72.784	0.00	1.33	0.00	0.00	1.10	0.0	7.4	6.3	6.91	20.01	4.66	18	4.83	110.03	113.55	111.53	114.56	111.88	118.13	PIPE-39
2	1	37.051	0.21	1.33	0.81	0.17	1.10	5.0	7.3	6.3	6.96	26.17	4.85	18	5.29	113.26	115.22	114.56	116.24	118.13	119.76	PIPE-20
3	2	172.892	0.61	1.12	0.81	0.50	0.93	5.0	6.8	6.5	6.05	7.00	6.10	15	1.00	115.51	117.24	116.41	118.23	119.76	120.61	PIPE-2
4	3	128.110	0.46	0.51	0.86	0.40	0.43	5.0	6.4	6.7	2.90	4.03	4.71	12	1.09	117.50	118.89	118.23	119.62	120.61	123.26	PIPE-49
5	4	81.161	0.00	0.05	0.00	0.00	0.04	0.0	5.5	7.2	0.25	1.31	1.53	8	1.00	118.89	119.70	119.62	119.94	123.26	125.24	PIPE-47
6	5	82.658	0.05	0.05	0.78	0.04	0.04	5.0	5.0	7.5	0.26	0.61	2.76	6	1.00	119.70	120.53	119.94	120.79	125.24	121.07	PIPE-46

Project File: Network A.stm

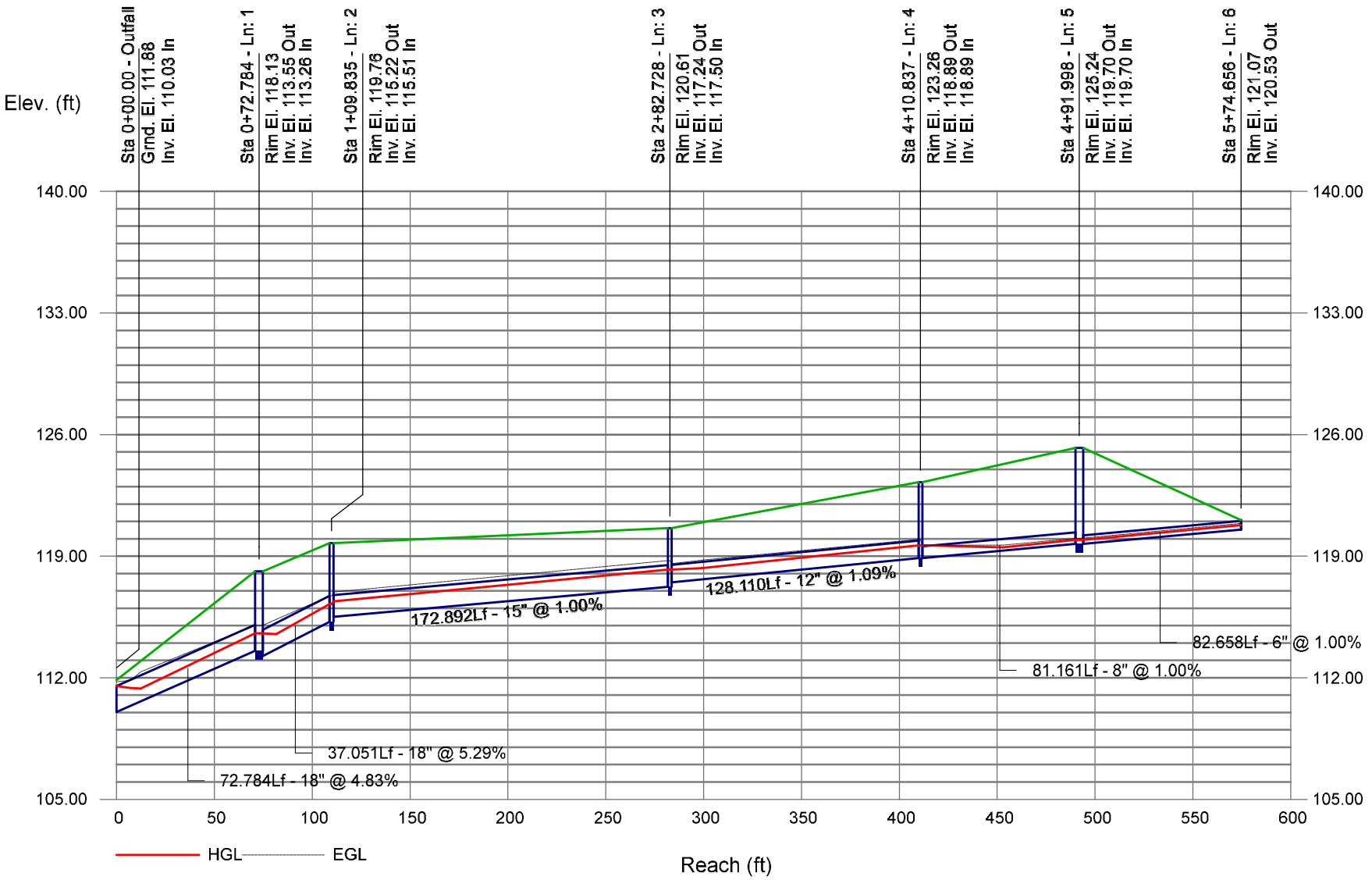
Number of lines: 6

Run Date: 4/7/2021

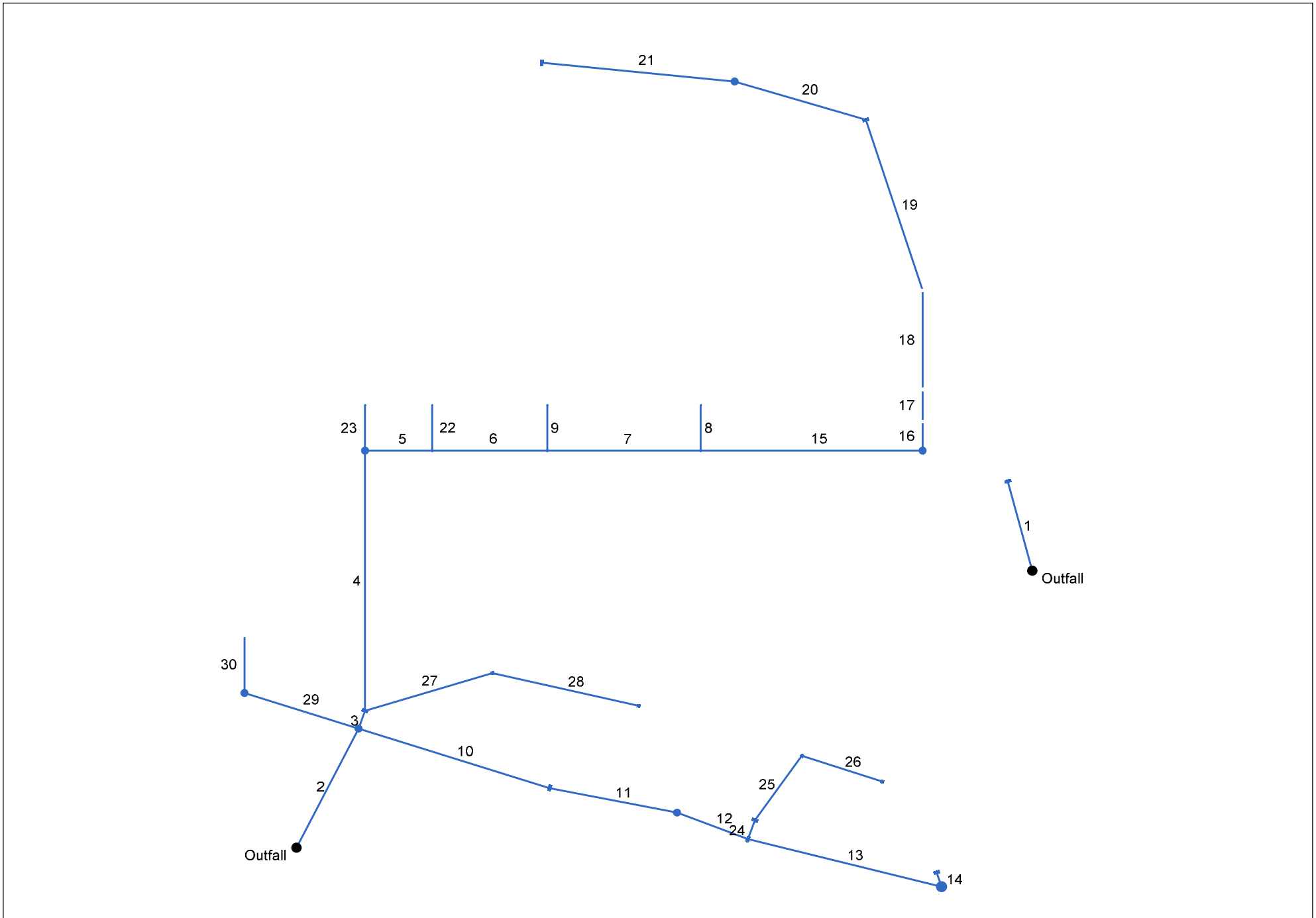
NOTES:Intensity = 35.55 / (Inlet time + 3.80) ^ 0.72; Return period =Yrs. 10 ; c = cir e = ellip b = box

Storm Sewer Profile

Proj. file: Network A.stm



Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Network B.stm	Number of lines: 30	Date: 4/7/2021

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	PIPE-56	0.34	8	Cir	60.801	125.22	126.50	2.105	125.89	126.77	n/a	126.77 j	End	Grate
2	PIPE-40	23.02	24	Cir	87.891	109.21	110.13	1.047	111.21	111.84	n/a	111.84 j	End	Manhole
3	PIPE-28	17.37	18	Cir	12.361	114.74	115.92	9.546	115.49	117.36	n/a	117.36	2	Grate
4	PIPE-73	9.78	18	Cir	170.427	115.92	117.62	0.997	117.36	118.83	n/a	118.83 j	3	Manhole
5	PIPE-71	9.14	15	Cir	43.832	117.62	118.06	1.004	118.87*	119.62*	0.86	120.48	4	Manhole
6	PIPE-69	8.53	15	Cir	75.000	118.06	118.81	1.000	120.48*	121.60*	0.75	122.35	5	Manhole
7	PIPE-68	6.33	15	Cir	100.000	118.81	119.81	1.000	122.35*	123.17*	0.41	123.58	6	Manhole
8	PIPE-66	3.09	8	Cir	29.754	123.54	125.38	6.184	124.06	126.04	n/a	126.04	7	Grate
9	PIPE-65	3.09	8	Cir	29.754	123.54	125.38	6.184	124.06	126.04	n/a	126.04	6	Grate
10	PIPE-35	6.57	24	Cir	130.589	110.13	111.24	0.850	111.84	112.15	n/a	112.15 j	2	Grate
11	PIPE-81	5.84	18	Cir	84.594	111.34	112.29	1.123	112.15	113.22	n/a	113.22	10	Manhole
12	PIPE-80	5.90	15	Cir	49.272	112.39	113.24	1.725	113.22	114.22	0.76	114.22	11	Grate
13	PIPE-79	1.04	15	Cir	130.054	116.69	122.81	4.706	116.91	123.21	0.15	123.21	12	Manhole
14	PIPE-78	1.04	12	Cir	9.990	123.13	123.23	1.001	123.48	123.66	0.16	123.66	13	Grate
15	PIPE-67	4.15	15	Cir	144.583	119.81	121.26	1.003	123.58*	124.09*	0.18	124.27	7	Manhole
16	PIPE-94	4.17	15	Cir	19.000	121.26	121.35	0.474	124.27*	124.34*	0.09	124.43	15	Grate
17	PIPE-72	3.27	15	Cir	21.000	121.35	121.46	0.524	124.43*	124.47*	0.06	124.53	16	Grate
18	PIPE-60	3.19	15	Cir	65.000	121.46	121.78	0.492	124.53*	124.66*	0.06	124.72	17	Grate
19	PIPE-59	3.02	15	Cir	117.605	121.78	122.37	0.502	124.72*	124.94*	0.12	125.06	18	Grate
20	PIPE-96	1.36	12	Cir	89.077	122.37	122.82	0.505	125.06*	125.17*	0.01	125.18	19	Manhole
21	PIPE-95	1.48	12	Cir	126.166	122.82	123.45	0.499	125.18*	125.37*	0.06	125.42	20	Grate
22	PIPE-61	0.94	8	Cir	29.754	122.54	124.38	6.184	122.79	124.84	0.21	124.84	5	Grate
23	PIPE-70	0.94	8	Cir	29.754	122.54	124.38	6.184	122.79	124.84	0.21	124.84	4	Grate
24	PIPE-58	4.14	12	Cir	13.138	119.51	119.64	0.989	120.51	120.64	0.22	120.86	12	Grate

Project File: Network B.stm | Number of lines: 30 | Run Date: 4/7/2021

NOTES: Return period = 10 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
25	PIPE-57	2.70	12	Cir	52.099	119.64	120.73	2.092	120.86	121.43	n/a	121.43 j	24	Grate
26	PIPE-55	2.23	12	Cir	55.287	120.73	121.91	2.134	121.43	122.55	n/a	122.55 j	25	Grate
27	PIPE-74	6.01	15	Cir	86.598	117.59	118.54	1.097	118.45	119.53	n/a	119.53	3	Grate
28	PIPE-24	5.52	15	Cir	97.671	118.54	120.14	1.638	119.53	121.09	n/a	121.09 j	27	Grate
29	PIPE-76	0.80	12	Cir	77.894	113.03	113.81	1.001	113.34	114.18	n/a	114.18	2	Manhole
30	PIPE-75	0.81	12	Cir	37.609	113.81	115.69	4.999	114.18	116.07	n/a	116.07	29	Grate

Project File: Network B.stm | Number of lines: 30 | Run Date: 4/7/2021

NOTES: Return period = 10 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	60.801	0.05	0.05	0.90	0.05	0.05	5.0	5.0	7.5	0.34	1.90	1.76	8	2.11	125.22	126.50	125.89	126.77	125.97	129.45	PIPE-56
2	End	87.891	0.00	5.43	0.00	0.00	4.30	0.0	10.2	5.3	23.02	25.07	7.70	24	1.05	109.21	110.13	111.21	111.84	111.49	118.55	PIPE-40
3	2	12.361	0.75	4.08	0.85	0.64	3.25	5.0	10.2	5.4	17.37	35.15	14.89	18	9.55	114.74	115.92	115.49	117.36	118.55	121.24	PIPE-28
4	3	170.427	0.00	2.36	0.00	0.00	1.78	0.0	9.7	5.5	9.78	11.36	6.02	18	1.00	115.92	117.62	117.36	118.83	121.24	125.90	PIPE-73
5	4	43.832	0.00	2.22	0.00	0.00	1.66	0.0	9.6	5.5	9.14	7.01	7.45	15	1.00	117.62	118.06	118.87	119.62	125.90	125.91	PIPE-71
6	5	75.000	0.00	2.08	0.00	0.00	1.53	0.0	9.4	5.6	8.53	7.00	6.95	15	1.00	118.06	118.81	120.48	121.60	125.91	126.92	PIPE-69
7	6	100.000	0.00	1.62	0.00	0.00	1.12	0.0	9.1	5.7	6.33	7.00	5.16	15	1.00	118.81	119.81	122.35	123.17	126.92	126.92	PIPE-68
8	7	29.754	0.46	0.46	0.90	0.41	0.41	5.0	5.0	7.5	3.09	3.25	9.74	8	6.18	123.54	125.38	124.06	126.04	126.92	127.85	PIPE-66
9	6	29.754	0.46	0.46	0.90	0.41	0.41	5.0	5.0	7.5	3.09	3.25	9.74	8	6.18	123.54	125.38	124.06	126.04	126.92	127.85	PIPE-65
10	2	130.589	0.17	1.21	0.75	0.13	0.95	5.0	6.0	6.9	6.57	22.59	3.52	24	0.85	110.13	111.24	111.84	112.15	118.55	113.01	PIPE-35
11	10	84.594	0.00	1.04	0.00	0.00	0.82	0.0	5.6	7.1	5.84	12.06	5.54	18	1.12	111.34	112.29	112.15	113.22	113.01	121.05	PIPE-81
12	11	49.272	0.13	1.04	0.82	0.11	0.82	5.0	5.5	7.2	5.90	9.19	6.25	15	1.73	112.39	113.24	113.22	114.22	121.05	122.06	PIPE-80
13	12	130.054	0.00	0.17	0.00	0.00	0.14	0.0	5.0	7.4	1.04	15.18	5.06	15	4.71	116.69	122.81	116.91	123.21	122.06	126.53	PIPE-79
14	13	9.990	0.17	0.17	0.82	0.14	0.14	5.0	5.0	7.5	1.04	3.86	3.70	12	1.00	123.13	123.23	123.48	123.66	126.53	126.33	PIPE-78
15	7	144.583	0.00	1.16	0.00	0.00	0.70	0.0	8.4	5.9	4.15	7.01	3.38	15	1.00	119.81	121.26	123.58	124.09	126.92	127.15	PIPE-67
16	15	19.000	0.21	1.16	0.75	0.16	0.70	5.0	8.3	5.9	4.17	4.81	3.40	15	0.47	121.26	121.35	124.27	124.34	127.15	126.93	PIPE-94
17	16	21.000	0.08	0.95	0.33	0.03	0.55	5.0	8.2	6.0	3.27	5.06	2.66	15	0.52	121.35	121.46	124.43	124.47	126.93	127.65	PIPE-72
18	17	65.000	0.15	0.87	0.35	0.05	0.52	5.0	7.8	6.1	3.19	4.91	2.60	15	0.49	121.46	121.78	124.53	124.66	127.65	127.75	PIPE-60
19	18	117.605	0.44	0.72	0.61	0.27	0.47	5.0	7.0	6.5	3.02	4.95	2.46	15	0.50	121.78	122.37	124.72	124.94	127.75	127.26	PIPE-59
20	19	89.077	0.00	0.28	0.00	0.00	0.20	0.0	6.1	6.9	1.36	2.74	1.73	12	0.51	122.37	122.82	125.06	125.17	127.26	128.15	PIPE-96
21	20	126.166	0.28	0.28	0.71	0.20	0.20	5.0	5.0	7.5	1.48	2.73	1.89	12	0.50	122.82	123.45	125.18	125.37	128.15	126.55	PIPE-95
22	5	29.754	0.14	0.14	0.90	0.13	0.13	5.0	5.0	7.5	0.94	3.25	5.86	8	6.18	122.54	124.38	122.79	124.84	125.91	126.85	PIPE-61

Project File: Network B.stm | Number of lines: 30 | Run Date: 4/7/2021

NOTES:Intensity = 35.55 / (Inlet time + 3.80) ^ 0.72; Return period =Yrs. 10 ; c = cir e = ellip b = box

Storm Sewer Tabulation

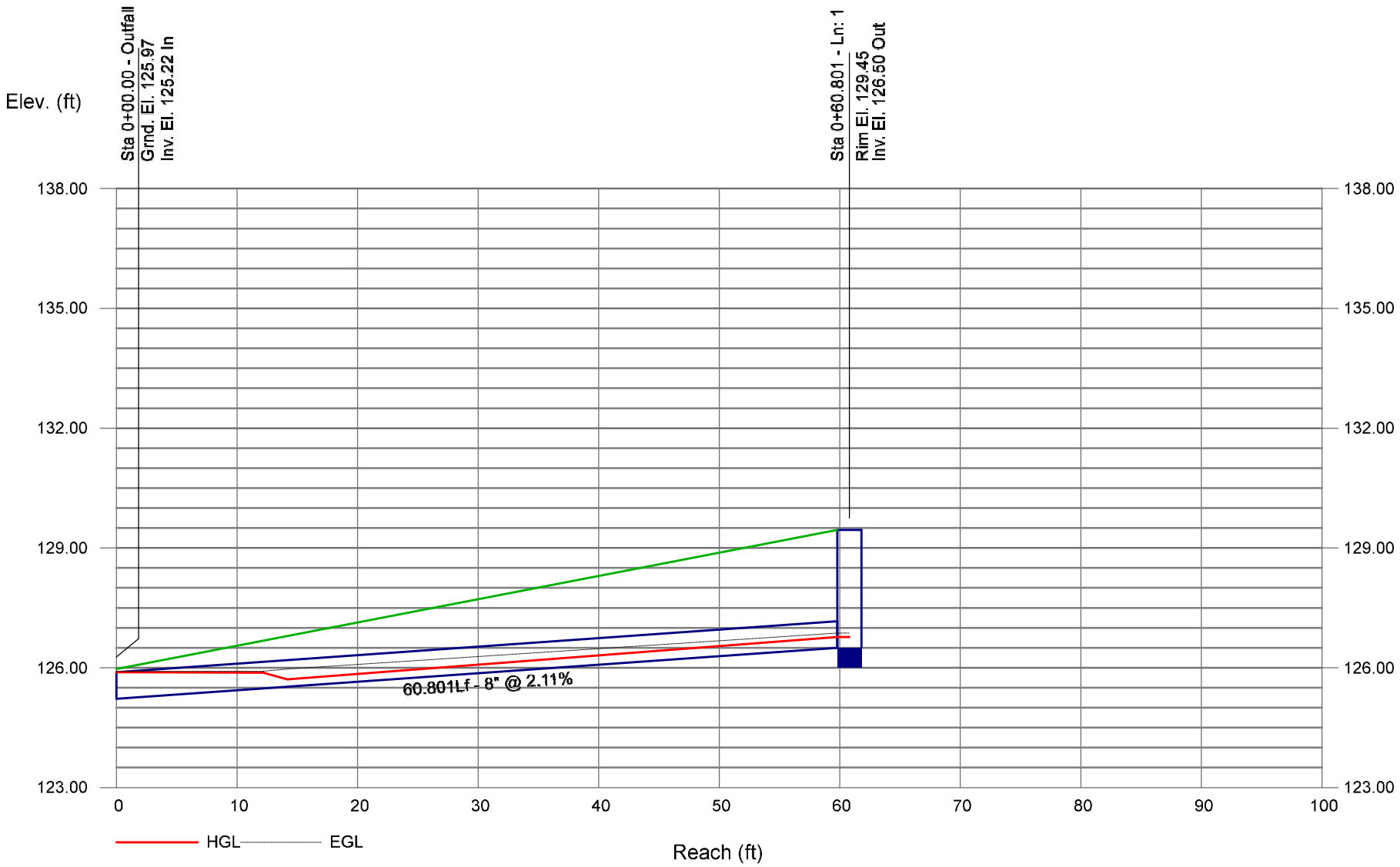
Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
23	4	29.754	0.14	0.14	0.90	0.13	0.13	5.0	5.0	7.5	0.94	3.25	5.86	8	6.18	122.54	124.38	122.79	124.84	125.90	126.85	PIPE-70
24	12	13.138	0.23	0.74	0.90	0.21	0.58	5.0	5.4	7.2	4.14	3.84	5.28	12	0.99	119.51	119.64	120.51	120.64	122.06	122.75	PIPE-58
25	24	52.099	0.09	0.51	0.78	0.07	0.37	5.0	5.2	7.3	2.70	5.58	4.00	12	2.09	119.64	120.73	120.86	121.43	122.75	124.61	PIPE-57
26	25	55.287	0.42	0.42	0.71	0.30	0.30	5.0	5.0	7.5	2.23	5.64	3.99	12	2.13	120.73	121.91	121.43	122.55	124.61	124.55	PIPE-55
27	3	86.598	0.10	0.97	0.85	0.09	0.82	5.0	5.3	7.3	6.01	7.33	6.21	15	1.10	117.59	118.54	118.45	119.53	121.24	123.31	PIPE-74
28	27	97.671	0.87	0.87	0.85	0.74	0.74	5.0	5.0	7.5	5.52	8.95	5.40	15	1.64	118.54	120.14	119.53	121.09	123.31	122.76	PIPE-24
29	2	77.894	0.00	0.14	0.00	0.00	0.11	0.0	5.2	7.3	0.80	3.86	3.43	12	1.00	113.03	113.81	113.34	114.18	118.55	117.68	PIPE-76
30	29	37.609	0.14	0.14	0.78	0.11	0.11	5.0	5.0	7.5	0.81	8.63	3.02	12	5.00	113.81	115.69	114.18	116.07	117.68	118.80	PIPE-75

Project File: Network B.stm | Number of lines: 30 | Run Date: 4/7/2021

NOTES:Intensity = 35.55 / (Inlet time + 3.80) ^ 0.72; Return period =Yrs. 10 ; c = cir e = ellip b = box

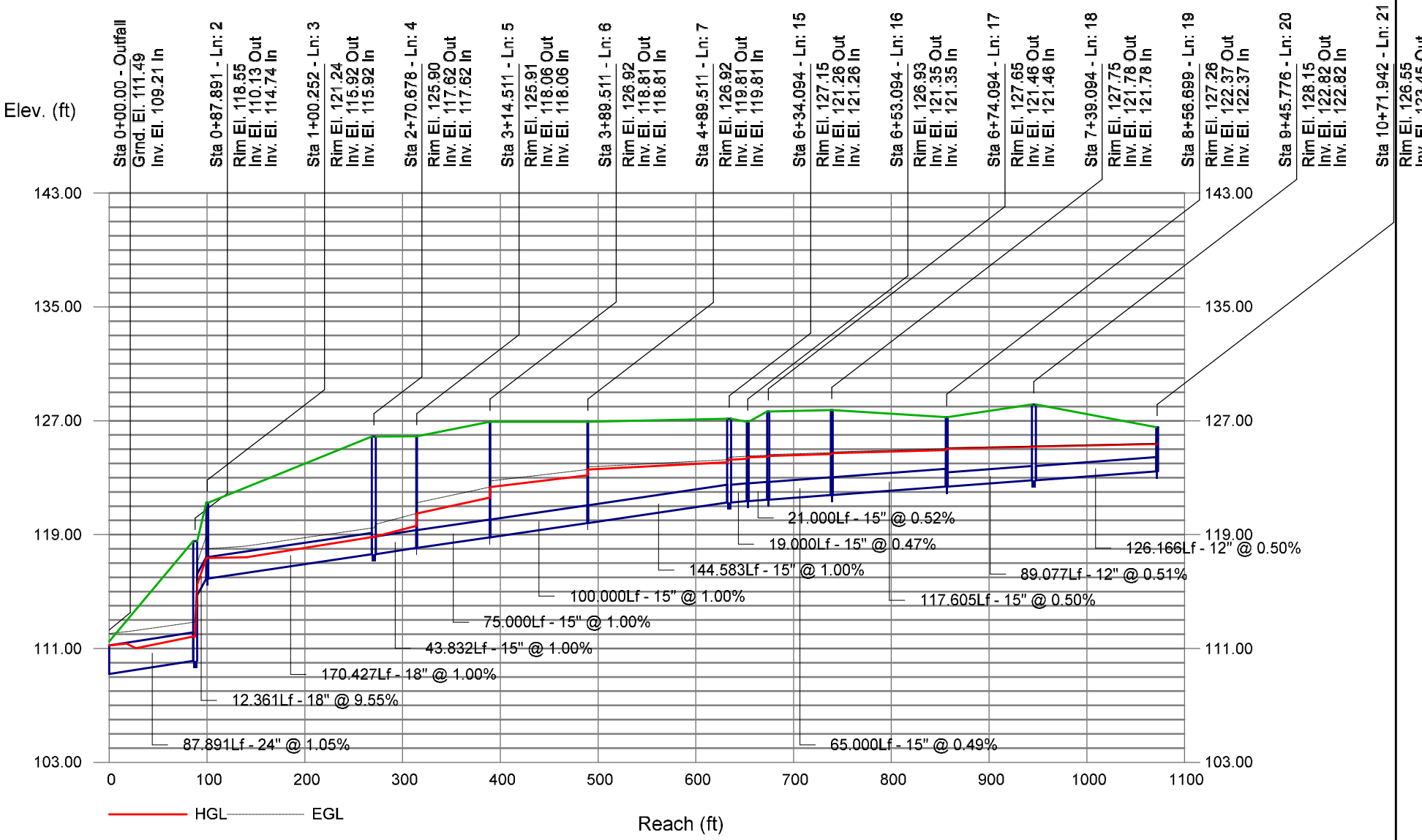
Storm Sewer Profile

Proj. file: Network B.stm



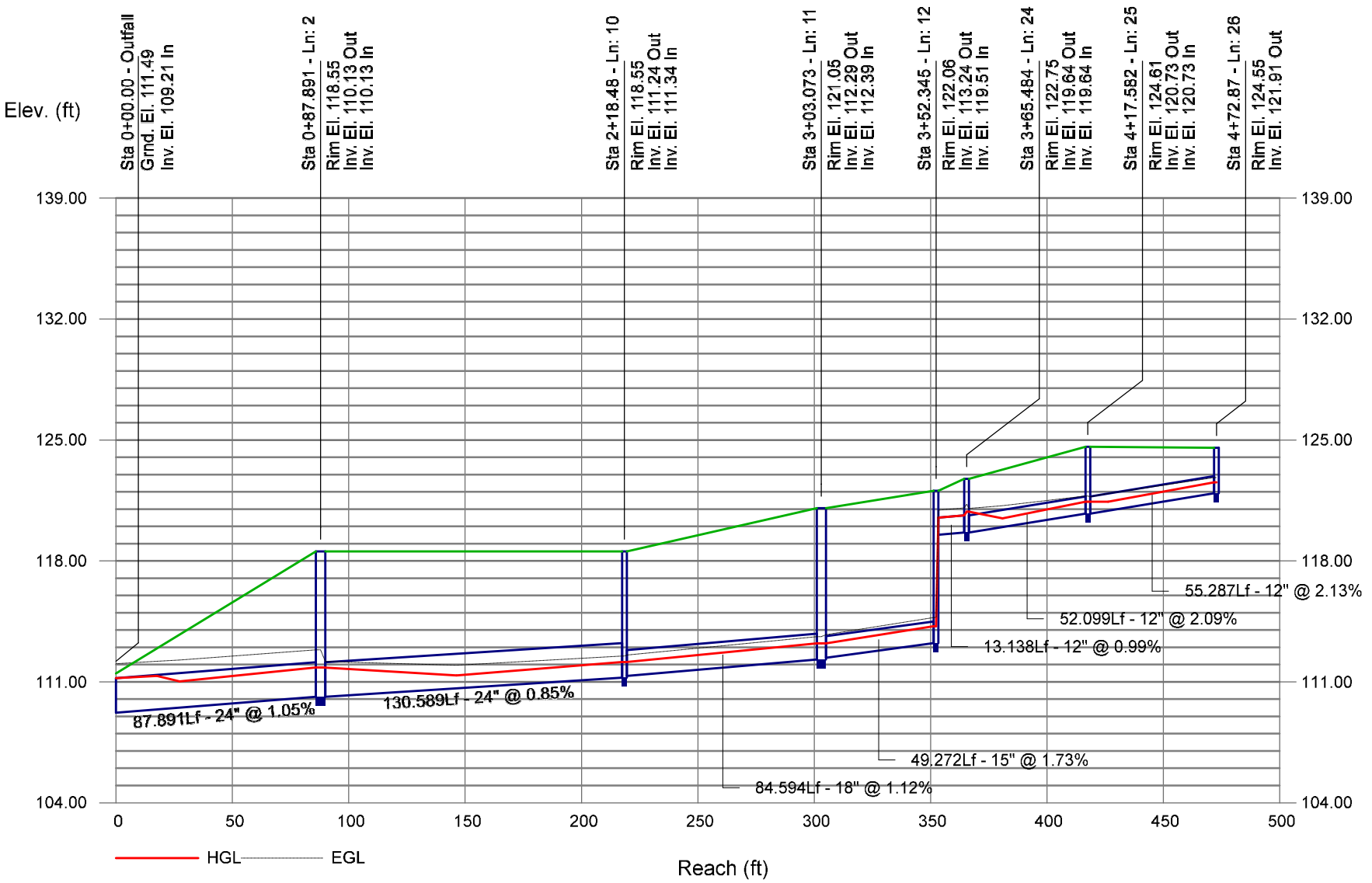
Storm Sewer Profile

Proj. file: Network B.stm



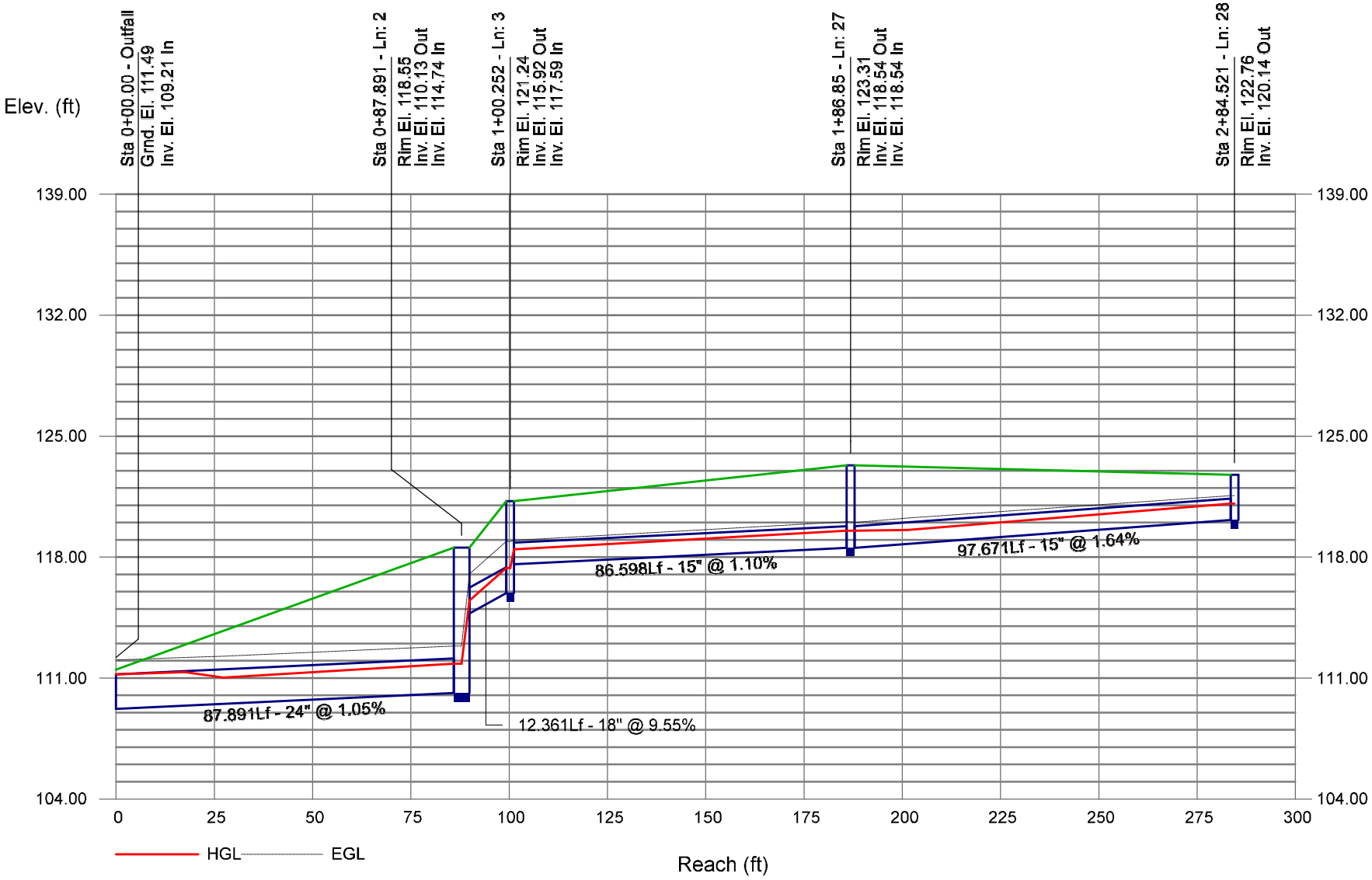
Storm Sewer Profile

Proj. file: Network B.stm



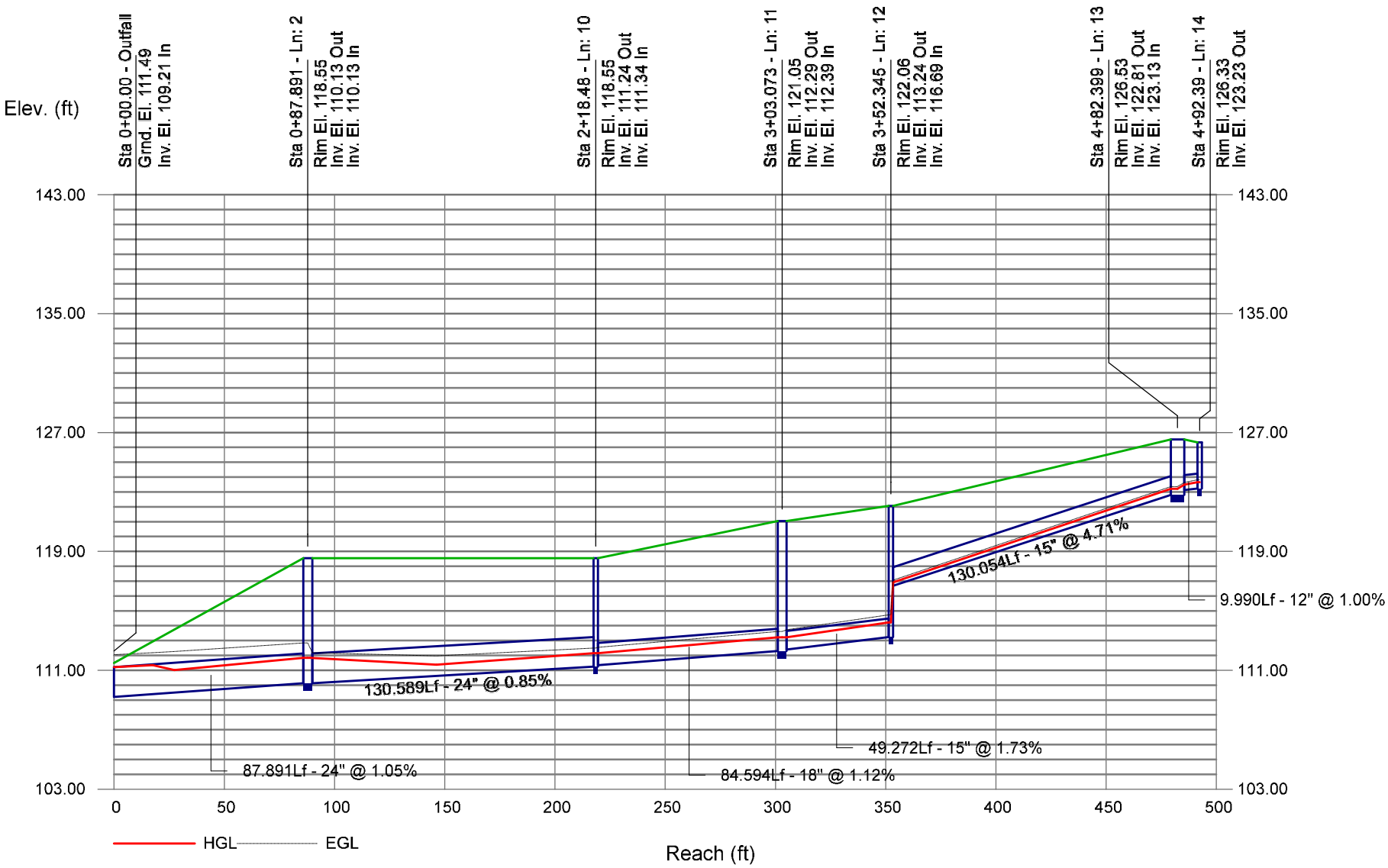
Storm Sewer Profile

Proj. file: Network B.stm



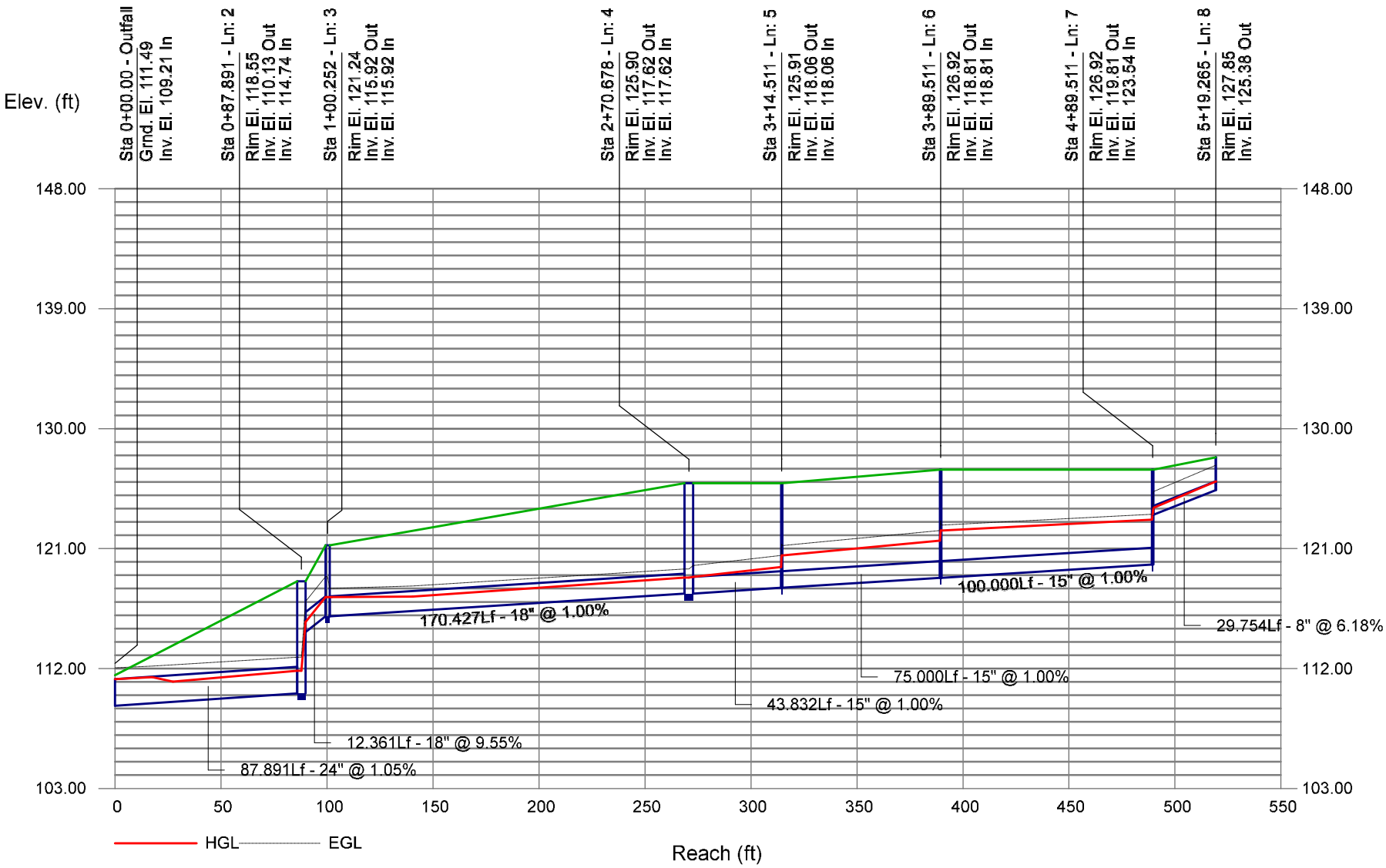
Storm Sewer Profile

Proj. file: Network B.stm



Storm Sewer Profile

Proj. file: Network B.stm



APPENDIX D

Stormwater Quality Calculations

STORMWATER QUALITY CALCULATIONS

Methodology: Water Quality Volume and Flow

Reference: 2004 Stormwater Quality Manual

$$WQV = \frac{(1")(R)(A)}{12}$$

WQV = water quality volume (acre-feet)
R = volumetric runoff coefficient
I = percent impervious cover
A = site area (acres)

$$WQF = (q_u)(A)(Q)$$

WQF = water quality flow (cfs)
q_u = unit peak discharge (cfs/mi^2/inch)
A = drainage area (mi^2)
Q = runoff depth (watershed inches)
= [WQV (acre-feet)]x[12 (inches/foot)] / Drainage area (acres)

Site Characteristics

Description	**WQU A-1**	Drainage Area to feature		
Area	1.33	acres	0.002078 mi^2	
Impervious Area	1.17	acres		7761
Tc	0.08	hr		
I	88.0	%		
R = 0.05+ 0.009(I) =	0.842			
WQV =	**0.09**	**acre-ft**	4,064 cf	

Q = WQV x 12/A = 0.84 inches
determine qu using NRCS Runoff Curve Number

P = 1.0 inch

$$CN = \frac{1000}{[10 + 5P + 10Q - 10(Q^2 + 1.25QP)^{1/2}]}$$

CN = 90

Determine I_a, table 4-1 Chapter 4 TR-55

I_a = 0.222

Determine q_u, Exhibit 4-III Chapter 4 TR-55

q_u = 640 csm/in

WQF = 1.1 cfs

Evergreen Walk South Windsor, CT	BY	IJAB	DATE	3/12/2021	PROJ NO.	140222801
	CKD	JEL	DATE	3/12/2021	SHEET	1 of 1

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STORMWATER QUALITY CALCULATIONS

Methodology: Water Quality Volume and Flow

Reference: 2004 Stormwater Quality Manual

$$WQV = \frac{(1")(R)(A)}{12}$$

WQV = water quality volume (acre-feet)
R = volumetric runoff coefficient
I = percent impervious cover
A = site area (acres)

$$WQF = (q_u)(A)(Q)$$

WQF = water quality flow (cfs)
q_u = unit peak discharge (cfs/mi^2/inch)
A = drainage area (mi^2)
Q = runoff depth (watershed inches)
= [WQV (acre-feet)]x[12 (inches/foot)] / Drainage area (acres)

Site Characteristics

Description	**WQU B-1**	Drainage Area to feature		
Area	3.86	acres	0.006031 mi^2	
Impervious Area	3.21	acres		7761
Tc	0.08	hr		
I	83.2	%		
R = 0.05+ 0.009(I) =	0.798			
WQV =	**0.26**	**acre-ft**	11,188 cf	
Q = WQV x 12/A =	0.80	inches		

determine qu using NRCS Runoff Curve Number

P = 1.0 inch

$$CN = \frac{1000}{[10 + 5P + 10Q - 10(Q^2 + 1.25QP)^{1/2}]}$$

CN = 90

Determine I_a, table 4-1 Chapter 4 TR-55

I_a = 0.222

Determine q_u, Exhibit 4-III Chapter 4 TR-55

q_u = 640 csm/in

WQF = 3.1 cfs

Evergreen Walk South Windsor, CT	BY	IJAB	DATE	3/12/2021	PROJ NO.	140222801
	CKD	JEL	DATE	3/12/2021	SHEET	1 of 1

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STORMWATER QUALITY CALCULATIONS

Methodology: Water Quality Volume and Flow

Reference: 2004 Stormwater Quality Manual

$$WQV = \frac{(1")(R)(A)}{12}$$

WQV = water quality volume (acre-feet)
R = volumetric runoff coefficient
I = percent impervious cover
A = site area (acres)

$$WQF = (q_u)(A)(Q)$$

WQF = water quality flow (cfs)
q_u = unit peak discharge (cfs/mi^2/inch)
A = drainage area (mi^2)
Q = runoff depth (watershed inches)
= [WQV (acre-feet)]x[12 (inches/foot)] / Drainage area (acres)

Site Characteristics

Description	**WQU B-2**	Drainage Area to feature		
Area	0.73	acres	0.001141 mi^2	
Impervious Area	0.58	acres		7761
Tc	0.08	hr		
I	79.5	%		
R = 0.05+ 0.009(I) =	0.765			
WQV =	**0.05**	**acre-ft**	2,027 cf	

Q = WQV x 12/A = 0.77 inches
determine qu using NRCS Runoff Curve Number

P = 1.0 inch

$$CN = \frac{1000}{[10 + 5P + 10Q - 10(Q^2 + 1.25QP)^{1/2}]}$$

CN = 90

Determine I_a, table 4-1 Chapter 4 TR-55

I_a = 0.222

Determine q_u, Exhibit 4-III Chapter 4 TR-55

q_u = 640 csm/in

WQF = 0.6 cfs

Evergreen Walk South Windsor, CT	BY	IJAB	DATE	3/12/2021	PROJ NO.	140222801
	CKD	JEL	DATE	3/12/2021	SHEET	1 of 1

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APPENDIX E

NOAA Atlas 14 Rainfall Depths and Intensities

NOAA Atlas 14, Volume 10, Version 2
Location name: South Windsor, Connecticut, USA*
Latitude: 41.8163°, Longitude: -72.5538°
Elevation: 148.62 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.334** (0.259-0.431)	**0.406** (0.314-0.524)	**0.523** (0.403-0.677)	**0.620** (0.476-0.807)	**0.754** (0.560-1.03)	**0.857** (0.625-1.19)	**0.960** (0.681-1.39)	**1.09** (0.732-1.61)	**1.26** (0.816-1.93)	**1.39** (0.880-2.17)
10-min	**0.473** (0.367-0.610)	**0.575** (0.445-0.742)	**0.741** (0.571-0.959)	**0.878** (0.674-1.14)	**1.07** (0.794-1.46)	**1.21** (0.885-1.69)	**1.36** (0.964-1.97)	**1.54** (1.04-2.28)	**1.79** (1.16-2.74)	**1.97** (1.25-3.08)
15-min	**0.557** (0.431-0.718)	**0.676** (0.523-0.873)	**0.871** (0.672-1.13)	**1.03** (0.793-1.35)	**1.26** (0.934-1.71)	**1.43** (1.04-1.99)	**1.60** (1.13-2.31)	**1.82** (1.22-2.69)	**2.10** (1.36-3.22)	**2.32** (1.47-3.62)
30-min	**0.748** (0.580-0.964)	**0.910** (0.705-1.18)	**1.18** (0.907-1.52)	**1.40** (1.07-1.82)	**1.70** (1.26-2.31)	**1.93** (1.41-2.69)	**2.16** (1.53-3.13)	**2.46** (1.65-3.63)	**2.84** (1.84-4.36)	**3.14** (1.98-4.90)
60-min	**0.939** (0.728-1.21)	**1.14** (0.886-1.48)	**1.48** (1.14-1.92)	**1.76** (1.35-2.29)	**2.14** (1.59-2.91)	**2.43** (1.77-3.39)	**2.73** (1.93-3.95)	**3.10** (2.08-4.58)	**3.59** (2.32-5.49)	**3.95** (2.50-6.18)
2-hr	**1.21** (0.946-1.56)	**1.47** (1.14-1.89)	**1.89** (1.47-2.43)	**2.24** (1.72-2.90)	**2.71** (2.03-3.69)	**3.08** (2.27-4.29)	**3.45** (2.47-5.00)	**3.96** (2.67-5.83)	**4.64** (3.01-7.07)	**5.15** (3.27-8.00)
3-hr	**1.40** (1.09-1.79)	**1.69** (1.32-2.17)	**2.17** (1.69-2.79)	**2.57** (1.99-3.32)	**3.11** (2.34-4.22)	**3.54** (2.61-4.91)	**3.96** (2.85-5.73)	**4.57** (3.09-6.70)	**5.38** (3.50-8.17)	**5.99** (3.81-9.28)
6-hr	**1.75** (1.38-2.23)	**2.13** (1.67-2.71)	**2.74** (2.14-3.50)	**3.24** (2.52-4.17)	**3.94** (2.98-5.32)	**4.48** (3.33-6.20)	**5.01** (3.64-7.25)	**5.83** (3.95-8.49)	**6.90** (4.50-10.4)	**7.72** (4.92-11.9)
12-hr	**2.14** (1.69-2.71)	**2.62** (2.07-3.32)	**3.41** (2.68-4.33)	**4.06** (3.17-5.18)	**4.95** (3.76-6.65)	**5.64** (4.21-7.76)	**6.33** (4.62-9.10)	**7.38** (5.02-10.7)	**8.77** (5.74-13.2)	**9.83** (6.29-15.0)
24-hr	**2.51** (1.99-3.15)	**3.11** (2.47-3.91)	**4.09** (3.24-5.17)	**4.91** (3.86-6.24)	**6.03** (4.61-8.08)	**6.90** (5.19-9.47)	**7.77** (5.71-11.2)	**9.15** (6.24-13.2)	**11.0** (7.20-16.3)	**12.4** (7.93-18.8)
2-day	**2.83** (2.26-3.54)	**3.56** (2.84-4.45)	**4.75** (3.78-5.97)	**5.74** (4.54-7.25)	**7.11** (5.47-9.49)	**8.16** (6.18-11.2)	**9.21** (6.84-13.3)	**11.0** (7.53-15.8)	**13.4** (8.81-19.8)	**15.2** (9.78-22.9)
3-day	**3.08** (2.47-3.84)	**3.88** (3.10-4.84)	**5.19** (4.14-6.50)	**6.28** (4.97-7.90)	**7.77** (6.00-10.4)	**8.93** (6.78-12.2)	**10.1** (7.52-14.5)	**12.1** (8.29-17.3)	**14.8** (9.72-21.8)	**16.8** (10.8-25.2)
4-day	**3.30** (2.65-4.11)	**4.15** (3.33-5.17)	**5.55** (4.43-6.93)	**6.70** (5.33-8.42)	**8.30** (6.42-11.0)	**9.52** (7.25-13.0)	**10.8** (8.03-15.4)	**12.9** (8.85-18.3)	**15.7** (10.4-23.1)	**17.9** (11.5-26.7)
7-day	**3.91** (3.15-4.84)	**4.87** (3.92-6.03)	**6.43** (5.16-8.00)	**7.73** (6.16-9.66)	**9.51** (7.39-12.6)	**10.9** (8.31-14.8)	**12.3** (9.17-17.4)	**14.6** (10.1-20.7)	**17.7** (11.7-25.9)	**20.0** (13.0-29.8)
10-day	**4.53** (3.66-5.59)	**5.54** (4.47-6.85)	**7.19** (5.79-8.92)	**8.56** (6.85-10.7)	**10.5** (8.13-13.7)	**11.9** (9.09-16.0)	**13.4** (9.97-18.8)	**15.7** (10.9-22.2)	**18.9** (12.5-27.5)	**21.2** (13.8-31.5)
20-day	**6.51** (5.30-7.99)	**7.59** (6.16-9.32)	**9.34** (7.56-11.5)	**10.8** (8.68-13.4)	**12.8** (9.97-16.6)	**14.3** (10.9-19.0)	**15.9** (11.8-21.9)	**18.1** (12.5-25.2)	**20.9** (14.0-30.2)	**23.1** (15.0-34.0)
30-day	**8.21** (6.70-10.1)	**9.31** (7.59-11.4)	**11.1** (9.02-13.7)	**12.6** (10.2-15.6)	**14.7** (11.4-18.8)	**16.2** (12.4-21.3)	**17.8** (13.1-24.2)	**19.8** (13.8-27.5)	**22.3** (14.9-32.1)	**24.3** (15.8-35.6)
45-day	**10.4** (8.47-12.6)	**11.5** (9.39-14.0)	**13.3** (10.9-16.3)	**14.9** (12.0-18.3)	**17.0** (13.3-21.6)	**18.6** (14.2-24.2)	**20.3** (14.8-27.1)	**21.9** (15.3-30.3)	**24.1** (16.2-34.5)	**25.8** (16.8-37.7)
60-day	**12.2** (9.97-14.8)	**13.3** (10.9-16.2)	**15.2** (12.4-18.6)	**16.8** (13.6-20.7)	**19.0** (14.8-24.1)	**20.7** (15.7-26.7)	**22.4** (16.4-29.6)	**23.8** (16.7-32.8)	**25.8** (17.3-36.7)	**27.2** (17.8-39.7)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical

APPENDIX F

Operation and Maintenance Plan

Operation and Maintenance Manual
801 Evergreen Way
South Windsor, Connecticut

Regular inspection and maintenance of the stormwater management system and uphill areas is necessary to ensure proper operation. These costs will be the responsibility of the developer. Inspections of the stormwater management system should be conducted monthly based on the following table:

Site Areas:

General inspections shall be conducted monthly and after a storm event resulting in more than 2.5" of rain over a 24-hour period (1 year storm).

Inspection and Maintenance

Check for:	***Corrective Measure:***
Erosion	Install erosion control measures and provide stabilization measures.
Spillage	Contain spill as close to source as possible with a dike of absorbent materials installed to protect drainage inlets, stormwater areas, or downstream wetlands and streams. All hazardous waste material, including absorbent materials must be disposed of by a licensed hazardous waste transporter and disposed of in an environmentally acceptable manner
Sediment Accumulation	Stabilize any disturbed areas uphill of where the sedimentation is occurring. Use temporary erosion control measures (i.e. silt fence, straw bales) to filter stormwater runoff.
Trash	Pick up and dispose of trash and litter in an environmentally acceptable manner.

Routine Maintenance

Maintenance Measure:	***Frequency:***
Surface Sweeping	Parking area and truck court paved areas shall be swept annually between April 1st and July 1st.

Catch Basins and Pipe:

All catch basins shall be inspected annually between May 1st and September 15th.

Inspection and Maintenance

Check for:	***Corrective Measure:***
Trash, Sediment, Snow, Ice and Debris at Grate	Remove trash, sediment, snow/ice and debris and dispose of in an environmentally acceptable manner.
Sediment & Trash Accumulation in Sump	Remove sediment from sumps if depth of deposits is greater than one-half the depth from the bottom of the catch basin to the invert of the lowest pipe in the basin.
Pipe blockages	Flush pipes to remove blockages. TV inspect as required.

At a minimum, the following maintenance measures shall be provided at the frequency listed in the following table:

Routine Maintenance

Maintenance Measure:	***Frequency:***
Sediment Removal	Minimum once per year, between May 1st and September 15th: Remove sediment and trash from catch basin sumps and grates and pipe inverts. Dispose of sediment and trash in an environmentally acceptable manner. Catch basins shall be cleaned when accumulated material exceeds 1 foot.

Rain Gardens

Rain Gardens shall be inspected monthly. Inspect after every major storm during first 3 months of operation and monthly thereafter. Rain gardens shall be inspected for invasive vegetation every 6 months.

Inspection and Maintenance

Check for:	***Corrective Measure:***
Trash and Debris	Remove trash and debris and dispose of in an environmentally acceptable manner.
Invasive and dead vegetation	Remove vegetation from rain garden. Revegetate as needed.

At a minimum, the following maintenance measures shall be provided at the frequency listed in the following table:

Routine Maintenance

Maintenance Measure:	***Frequency:***
Mowing	Twice a year: mow the buffer area. Remove trash and debris, grass clippings and accumulated organic matter.
Mulch, fertilize, prune	Annually

Water Quality Units

Water quality units shall be inspected and cleaned in strict accordance with the manufacturer's recommendations and requirements. Clean the units using the method specified by the manufacturer.