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2022-015-999

ENGINEERING DESIGN REPORT

SEA BRIGHT BEACH CLUB

Block 23, Lot 4

Borough of Sea Bright, Monmouth County, New Jersey

October 25, 2024

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PRELIMINARY & FINAL SITE PLAN
SEA BRIGHT BEACH CLUB

Block 23, Lot 4
Borough of Sea Bright, Monmouth County, New Jersey

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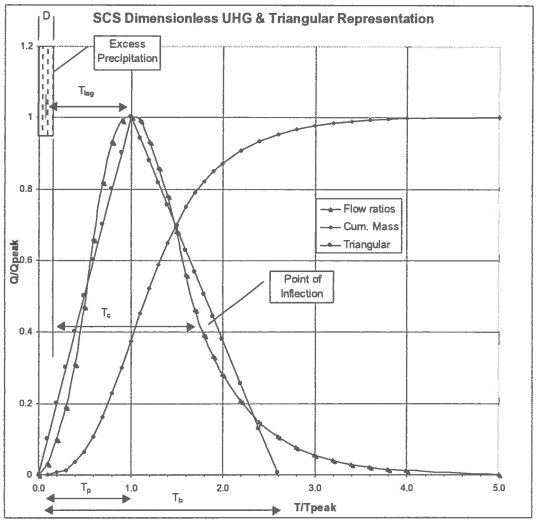
I. SCOPE & INTENT OF STUDY

The scope of this study is to present a comprehensive analysis of the anticipated impacts upon surrounding properties and waters of the state as a result of the re-development of certain lands known as Block 23, Lot 4, Borough of Sea Bright, Monmouth County, New Jersey. The premises in question are fully developed and are intended to be improved with a reconfiguration of an existing paved parking area along Ocean Avenue (NJSH Route 36).

The engineering analyses presented, and conclusions drawn therefrom have been carried out in accordance with the New Jersey Department of Environmental Protection Stormwater Best Management Practices Manual, as well as design standards of the Borough of Sea Bright and County of Monmouth.

The hydrologic study has been performed using the methodology described in The National Engineering Handbook (NEH), Part 630 by the U.S. Department of Agriculture, Natural Resources Conservation Service, entitled Hydrology. Scientific parameters utilized in the calculations performed have been based upon those presented in NEH 630, including Runoff Curve Numbers (CN), Time of Concentration (Tc), Manning's Roughness Coefficient (n), Initial Abstraction (Ia), and Unit Hydrograph shape factors.

The basis of the NEH 630 methodology is the Dimensionless Unit Hydrograph, which is the discharge hydrograph resulting from 1 inch of direct runoff distributed uniformly over the watershed resulting from a rainfall of a specified duration



The Soil Conservation Service (SCS) dimensionless unit hydrograph procedure is one of the most well-known methods for deriving synthetic unit hydrographs in use today. The dimensionless unit hydrograph used by the SCS was derived based on a large number of unit hydrographs from basins that varied in characteristics such as size and geographic location.

A hydrograph shape factor of 285 is utilized consistent with the DelMarVa dimensionless hydrograph, recognizing that the project location is within the mapped coastal plain. The dimensionless unit hydrograph is based upon a Type D distribution pursuant to prevailing regulations.

To adequately assess the project impacts, hydrologic analyses were carried out for the site under pre-development conditions, then again considering the improvements to be completed

under the intended development application. The site was broken into watershed sub-areas which drain to a design point established at a critical location where impacts are adequately assessed.

At the design point the peak rate and volume of runoff is computed for the 2, 10, and 100-year return frequency 24-hour SCS design storms considering the pre-development hydrologic site characteristics, then again considering post-development conditions and a comparison drawn to quantify impacts.

The magnitude of development for which approval is being sought does not meet the definition of a 'Major Project' as it proposes less than 10,000 square feet of new impervious cover and requires the disturbance of less than one (1) acre of land area, thus compliance with Stormwater regulations related to major development is not required.

The hydrologic computations presented later in this report in support of the conclusions drawn include runoff hydrographs, CN & Tc calculations, and runoff hydrographs. The computations were carried out using application software known as *Hydraflow Hydrographs* by Autodesk.

II. PROJECT OVERVIEW

The project site is identified as Block 23, Lot 4 as shown on the official Tax Map of the Borough of Sea Bright, Monmouth County, New Jersey. The property contains a total of 9.32 acres and is located along Ocean Avenue (NJSH Route 36) in the B-3 zoning district of the borough.

The re-development activities proposed include the reconstruction and reconfiguration of the site entrance and main parking field along Ocean Avenue. The improvements have been mandated as part of a project undertaken by the County of Monmouth to replace the Rumson-Sea Bright Bridge (Monmouth County Bridge S-32). The bridge approach was designed by others to form a four (4) leg signalized intersection with Ocean Avenue and Rumson Road.

The eastbound leg of the approach was configured to serve as the entrance to the beach club, and the present southern entrance along Ocean Avenue was eliminated due to the Route 36 highway re-alignment. Please refer to the Bridge S-32 replacement plan dated October, 2021 included herewith as **Figure 1**.

The relocation of the site driveway from its present southerly alignment to the bridge approach intersection required a re-design of the existing parking area serving the beach club. The resultant parking area layout incorporates the intersection configuration designed by others as part of the Bridge S-32 project, as well as improvements in the traffic circulation geometry to facilitate adequate and safe emergency vehicle access. The parking area was designed to meet

the new site driveway being constructed as part of the Bridge S-32 project, using an efficient layout which promotes good civic design and arrangement; and including attractive landscaping, uniform site lighting and barrier-free accessibility improvements.

The overall footprint of the present parking area remains unaltered as part of this development. The arrangement of parking stalls was designed relying on aisle widths and curb return radii which comply with present design standard and facilitate the replacement of pavement with landscaped islands within the parking area, reducing overall impervious coverage by roughly 8,750 square feet and improving the overall visual appearance of the site.

The reduction in impervious coverage consequently results in a post-development peak rate reduction in stormwater runoff leaving the site as evidenced in the hydrologic computation included herewith in **Appendix C**.

III. SOILS ASSESSMENT

The site is underlain by *Urban land-Brockatonorton* (USBROA) complex soil series as indicated by the USDA Web Soil Survey. A copy of the Soils Map and Soils Report is included herewith as **Appendix D**.

The USBROA soils are described as Hydrologic Soil Group A, sandy eolian and marine deposits, with high to very high permeability rates. The land they encompass has slopes of 0 to 2% and is occasionally flooded. Depths to groundwater are noted to lie at a depth between 17 and 30 inches.

IV. PRE-DEVELOPMENT CONDITIONS

The tract being studied is irregularly shaped, consisting of 9.32 acres of beachfront land area, situated between NJ Route 36 and the Atlantic Ocean. The site is fully developed with a commercial beach club consisting of multiple frame buildings and decks, a permanent inground pool, paved off-street parking areas and shore protection structures.

The area of study which is the subject of this analysis is limited to the existing paved parking area which lies generally parallel to Ocean Avenue and controls ingress and egress to the site from a state highway. The overall study area contains 2.11 acres of presently paved surfaces.

The parking area presently provides off-street parking for 241 vehicles and has a full-service driveway accessing Ocean Avenue at the southerly property limit; and a one-way exit driveway to Ocean Avenue at the northerly property limit.

The topography of the parking lot is gently sloping at gradients in the 1-2 percent range. All parking area runoff travels overland to Ocean Avenue where it is collected by the existing storm sewer system.

V. HYDROLOGIC ANALYSIS

The portion of the site to be improved was analyzed to determine the hydrologic impacts of development. The drainage subarea analyzed is graphically indicated on Pre & Post-Development Drainage Area Maps included in this report at **Appendix A**. The drainage area studied is limited to the portion of the site which is subject to construction activities resulting in an alteration to the hydrologic characteristics of the site.

To demonstrate compliance with the requirements of the Borough of Sea Bright Stormwater Management Ordinance for non-major development found at §130-95, the requisite runoff analyses for Pre-Development runoff and Post-Development conditions were carried out as described herein.

The drainage area was analyzed using NEH 630 methodology utilizing a Type D storm distribution and a shape factor of 285 to represent the Delmarva dimensionless hydrograph. The computations were based on pervious and impervious hydrographs being separately computed and subsequently combined at the design point established along Ocean Avenue.

Precipitation amounts considered were the 24-hour rainfall amounts were determined using the NOAA Point Precipitation Frequency Estimate, based on the actual site location. The precipitation depths identified by NOAA were adjusted for present and future estimates as required by NJDEP and ordinance requirements and the resultant adjusted precipitations used in the hydrologic models prepared.

Please see the table below for present and future adjusted precipitation depths.

The runoff curve numbers and time of concentrations utilized in hydrologic models are based on the prevailing requirements of the NEH Part 630. Tc and CN worksheets are included herewith in **Appendix B**.

PRECIPIATION SUMMARY					
Return Frequency Storm Event	**NOAA 24 Hr Precipitation**	**Present Adjusted Precipitation**		**Future Adjusted Precipitation**	
		Factor	**P**	**Factor**	**P**
2 Year	3.42	***1.00***	3.42	***1.19***	4.07
10 Year	5.25	***1.01***	5.30	***1.19***	6.25
100 Year	8.87	***1.02***	9.05	***1.26***	11.18

The IDF curves utilized are Sandy Hook, New Jersey as established by NOAA. Rainfall values used in models have been derived from the NOAA Hydrometeorological Design Studies Center.Precipitation Frequency Data Server (PFDS) and adjusted for the present and future estimated conditions as required by prevailing regulations.

A copy of the NOAA rainfall data is included herewith in **Appendix E**.

A summary of the computed peak rates of runoff for the site in Pre-Developed and Post-Developed conditions is outlined below demonstrating post-development peak rate reductions for all storm events.

ADJUSTED PRESENT PEAK RUNOFF			
Hydrograph	**2 year**	**10 year**	**100 year**
Pre-Development	3.679 cfs	5.746 cfs	9.851 cfs
Post-Development	2.687 cfs	4.199 cfs	7.296 cfs
Peak Rate Difference	**-0.992 cfs**	**-1.547 cfs**	**-2.555 cfs**

ADJUSTED FUTURE PEAK RUNOFF			
Hydrograph	**2 year**	**10 year**	**100 year**
Pre-Development	4.395 cfs	6.787 cfs	12.18 cfs
Post-Development	3.211 cfs	4.970 cfs	9.105 cfs
Peak Rate Difference	**-1.184 cfs**	**-1.817 cfs**	**-3.075 cfs**

The runoff computations carried out as part of this study quantify the peak rates of runoff at the analysis point for the 2, 10 and 100 year return frequency SCS 24-hour design storm events. The computations were carried out in accordance with most current NJDEP and local regulations and design standards and demonstrate a post-development reduction in runoff for all storm events as part of this project.

VI. CAFRA PERMIT COMPLIANCE

The requirements of the Coastal Zone Management Rules found out N.J.S.A. 7:7 are satisfied by compliance with the requirements for a Permit by Rule No. 6 as outlined below.

7:7-4.6 Permit-by-rule-6- Reconstruction of a residential or commercial development within the same footprint

(a) Other than reconstruction within the CAFRA area that meets the exemption from a CAFRA permit at N.J.A.C. 7:7-2.2(c)3, this permit-by-rule authorizes the reconstruction, within the same footprint, of a legally constructed residential or commercial development that has been or could have been legally occupied in the most recent five-year period, provided that such reconstruction:

1. Is in compliance with existing requirements or codes of municipal, State, and Federal law;

   The intended re-development was designed to ensure that requirements or codes of municipal, State, and Federal law are met or exceeded.

2. Does not result in the enlargement of or relocation of the footprint of the development;

   The proposed development activities will not result in the enlargement of or relocation of the development. The present limit of the paved parking lot shall remain unaltered by this project.

3. In the case of a residential development, does not result in an increase in the number of dwelling units;

   The intended re-development is not residential in nature, therefore compliance is achieved.

4. In the case of a commercial development, does not result in an increase in the number of parking spaces or equivalent paved area associated with the development;

   The number of parking spaces is reduced as part of this development, along with the degree of paved area in the existing parking lot by virtue of the creation of landscaped islands and more conventionally arranged parking stalls.

5. Meets the requirements of N.J.A.C. 7:7-9.25; and

   The portion of site to be re-developed is limited to the present paved parking area which lies landward of shore protection structures and is indicated on effective FEMA mapping to lie in Tidal Flood Zone AE 8. The parking area presently exists above the Mean High Water Line elevation and shall remain substantial similar in extent and elevation.

   No habitable building, railway, roadway, bridges and/or culverts are proposed as part of this project, therefore the requirements of N.J.A.C. 7:7-9.25 have been satisfied.

   Effective FEMA mapping is included herewith as Figure 2.

6. Does not increase the area covered by buildings and/or asphalt or concrete pavement.

   The area covered by buildings and/asphalt or concrete pavement are reduced by roughly 8,750 square feet as part of this development.

(b) This permit-by-rule does not apply to repairs or maintenance of the residential or commercial development, such as replacing siding, windows, or roofs.

The regulated activities for which authorization is sought shall not include the repairs or maintenance of this commercial development, such as replacing siding, windows, or roofs.

Based upon the above outline of compliance a Permit by Rule No. 6 is presumptively issued by NJDEP through demonstration of said compliance.

No other regulated activities are proposed by the development for which approval is being sought.

VII. SUMMARY & CONCLUSIONS

The runoff computations carried out as part of this study quantify the peak rates of runoff at the analysis point for the 2, 10 and 100 year return frequency SCS 24-hour design storm events. The computations were carried out in accordance with most current NJDEP and local regulations and design standards.

The improvements being proposed as part of this project result in a net decrease in overall impervious coverage for the site, and similarly a post-development reduction in peak runoff from the site without the implementation of attenuation strategies.

The project has been designed in accordance with the Flood Hazard Area Control Act Rules, as well as the Coastal Zone Management Rules. The local regulations related to storm water management and control have also been satisfied without the need for stormwater mitigation strategies by virtue of a reduction in impervious coverage.

Based upon the scientific analyses carried out and presented herein it may be concluded that the intended development shall not result in any negative impacts to downstream lands, nor result in adverse impacts to surrounding properties or adjacent roadways. The project has been designed in strict accordance with applicable design standards and meets all requisite performance standards.

FIGURE 1
Bridge S-32 Replacement Plan


PENINSULA AVENUE
OLD RUMSON ROAD
COUNTY ROUTE 520 (RUMSON ROAD)
SHREWSBURY RIVER
ROUTE 36 (OCEAN AVENUE)
PROPOSED STRIPING CONTROLLED BY FUTURE NJDOT STRIPING PLANS
Block 17 Lot 2 N/F Kalaka Realty
Block 17 Lot 3 N/F SBBP, LLC
Block 17 Lot 1 N/F Kalaka Realty
Block 17 Lot 4 N/F 1030 Partners LLC
Block 17.01 Lots 1.01-1.19
Block 17 Lot 6 N/F Nautilus Homeowners Association
Block 17 Lot 5 N/F 1010 Ocean Partners LLC
Block 18 Lot 1 N/F Sea Bright Beach Club
Block 18 Lot 2 N/F County of Monmouth
Block 24 Lot 1.01 N/F NJDEP
Block 23 Lot 2.01 N/F Borough of Sea Bright
Block 23 Lot 2.02 N/F Borough of Sea Bright
Block 23 Lot 3 N/F SBBP, LLC
Block 23 Lot 4 N/F Sea Bright Beach Club
52
53
54
55
56
57
58
59
60
61
62
63
LEGEND
- PROPOSED PAVEMENT
- PROPOSED BRIDGE / MOVABLE
- PROPOSED RETAINING WALL
- PROPOSED PARKING PAVEMENT
- PROPOSED DRIVEWAY
- PROPOSED SIDEWALK
- CONCRETE
- WATER BODIES
- LANDSCAPING
- PROPOSED RIGHT-OF-WAY
- EXISTING RIGHT-OF-WAY / PROPERTY
SCALE 1"=20'
OCTOBER, 2021
RUMSON ROAD & OCEAN AVENUE (ROUTE 36) INTERSECTION IMPROVEMENTS

FIGURE 2
FEMA Flood Map Community Panel 34025C0201H

National Flood Hazard Layer FIRMette

FEMA

73°58'42"W 40°22'9"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

73°58'4"W 40°21'42"N

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

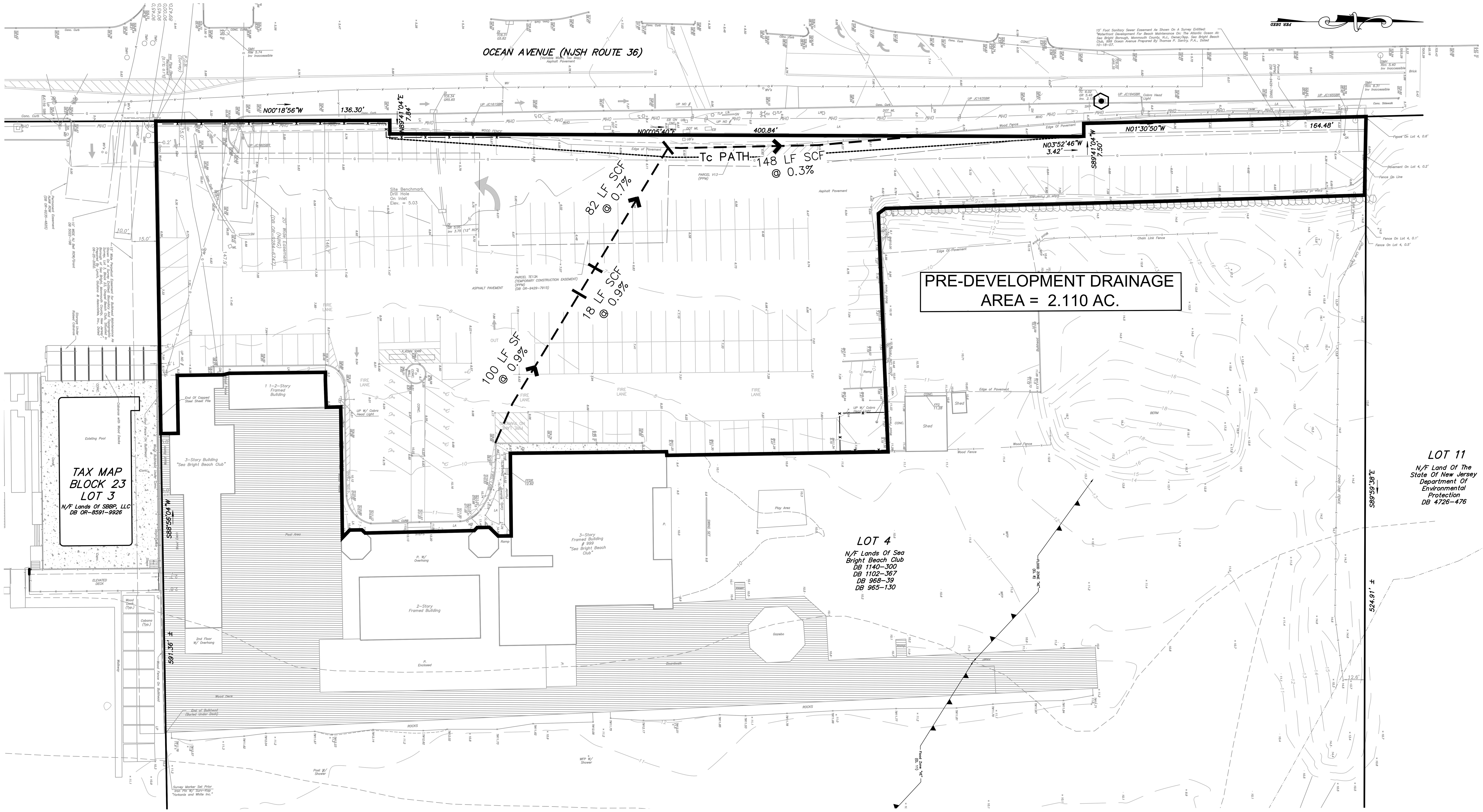
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 10/28/2024 at 3:11 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX A
Drainage Area Maps



REVISION NO.	DATE	REVISION
1	10/23/2024	REVISED PER CLIENT DIRECTION

GRAPHIC SCALE
30 0 30 60 120
1 INCH = 30 FEET

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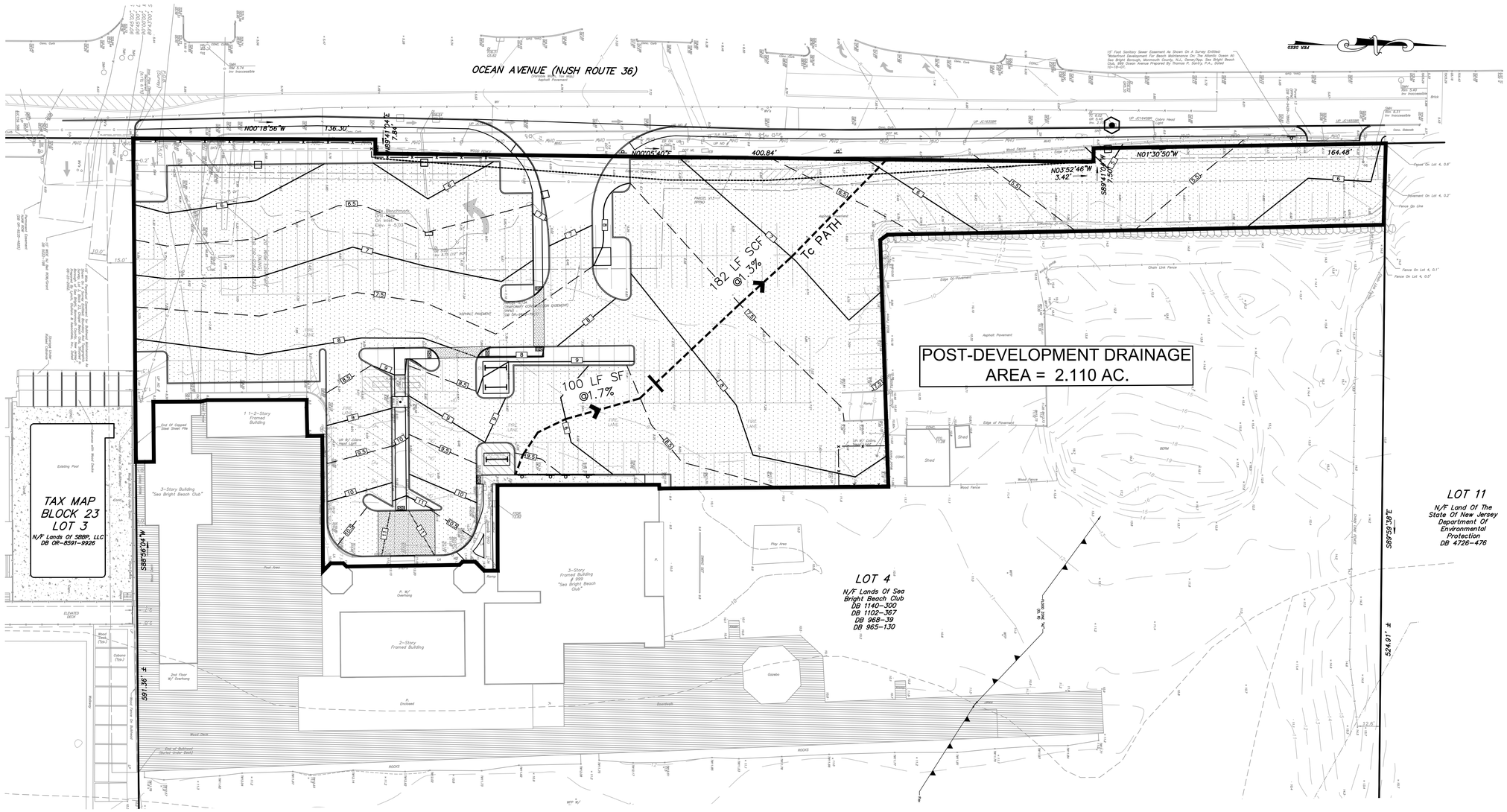
PRELIMINARY & FINAL SITE PLAN

PRE-DEVELOPMENT DRAINAGE AREA MAP

SEA BRIGHT BEACH CLUB
BLOCK 23, LOT 4
BOROUGH OF SEA BRIGHT MONMOUTH COUNTY NEW JERSEY

PROJECT No 2022-015-133	
DRAWN BY WWN/ERH	DESIGNED BY NM/ERH
SCALE 1"=30'	CHECKED BY DAC
DATE JULY 25, 2023	SHEET NO. 1 of 1



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GRAPHIC SCALE

30 0 30 60 120

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PRELIMINARY & FINAL SITE PLAN

POST-DEVELOPMENT DRAINAGE AREA MAP

SEA BRIGHT BEACH CLUB

BLOCK 23, LOT 4

BOROUGH OF SEA BRIGHT MONMOUTH COUNTY NEW JERSEY

PROJECT No.	2022-015-133
DRAWN BY	WWN/ERH
DESIGNED BY	NM/ERH
SCALE	1"=30'
CHECKED BY	DAC
DATE	JULY 25, 2023
SHEET NO.	1 of 1

I:\2021-015-999 Sea Bright Beach Club\DWG\2021-015-999 - 01-10 SITE 2024-10-24.dwg

APPENDIX B
CN Worksheets

Cranmer Engineering

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Worksheet 2: Runoff curve number and runoff

Project	By	Date
Sea Bright Beach Club	ERH	21-Aug-23
Location	**Checked**	**Date**
Pre Development		

Check one: [X] Present [ ] Developed

1. Runoff curve number

Soil name and hydrologic group (Appendix D)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN[1] Table 2-2	CN[1] Figure 2-3	CN[1] Figure 2-4	Area [X] acres / mi² / %	Product of CN x Area
USBROA "A"	Asphalt Pavement	98			2.1100	206.78
1. Use only one CN source per line				**Totals** ➡	2.1100	206.78

CN (weighted) = tot.prod. / tot. area = 206.78 / 2.1100 = 98.0 ; **Use CN** ➡ **98**

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency..... yr			
Rainfall, P (24-hour)..... in			
Runoff, Q..... in			

Use P and CN with table 2-1, figure 2-1, or equation 2-3 abd 2-4

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Worksheet 2: Runoff curve number and runoff

Project	By	Date
Sea Bright Beach Club	ERH	21-Aug-23
Location	**Checked**	**Date**
Post Development		

Check one: ☐ Present ☒ Developed

1. Runoff curve number

Soil name and hydrologic group (Appendix D)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN[1] Table 2-2	CN[1] Figure 2-3	CN[1] Figure 2-4	Area (X) acres / mi² / %	Product of CN x Area
USBROA "A"	Asphalt Pavement	98			1.9100	187.18
USBROA "A"	Mulch Landscaping	39			0.2010	7.84

1. Use only one CN source per line

Totals ➡ 2.1110 | 195.02

CN (weighted) = $\frac{\text{tot. prod.}}{\text{tot. area}} = \frac{195.02}{2.1110}$ = 92.4 ; **Use CN** ➡ **92**

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency.....	yr			
Rainfall, P (24-hour).....	in			
Runoff, Q.....	in			

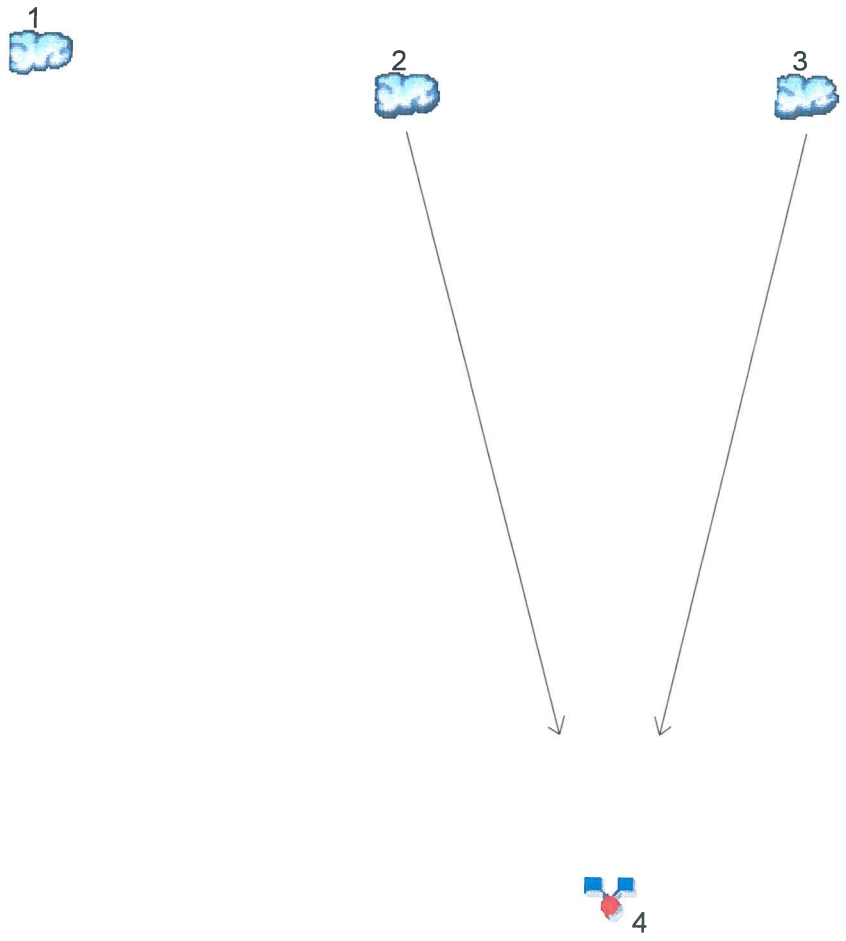
Use P and CN with table 2-1, figure 2-1, or equation 2-3 abd 2-4

APPENDIX C

Hydrologic Models & Computations

Hydraflow Table of Contents

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	SCS Runoff	Pre-Development
2	SCS Runoff	Post-Development Impervious
3	SCS Runoff	Post-Development Pervious
4	Combine	Post-Development Total

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	------	-------	3.679	-------	-------	5.746	-------	-------	9.851	Pre-Development
2	SCS Runoff	------	-------	2.687	-------	-------	4.199	-------	-------	7.200	Post-Development Impervious
3	SCS Runoff	------	-------	0.000	-------	-------	0.009	-------	-------	0.117	Post-Development Pervious
4	Combine	2, 3	-------	2.687	-------	-------	4.199	-------	-------	7.296	Post-Development Total

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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	3.679	6	732	24,254	------	------	------	Pre-Development
2	SCS Runoff	2.687	6	738	22,768	------	------	------	Post-Development Impervious
3	SCS Runoff	0.000	6	1440	4	------	------	------	Post-Development Pervious
4	Combine	2.687	6	738	22,772	2, 3	------	------	Post-Development Total

Hydrograph Report

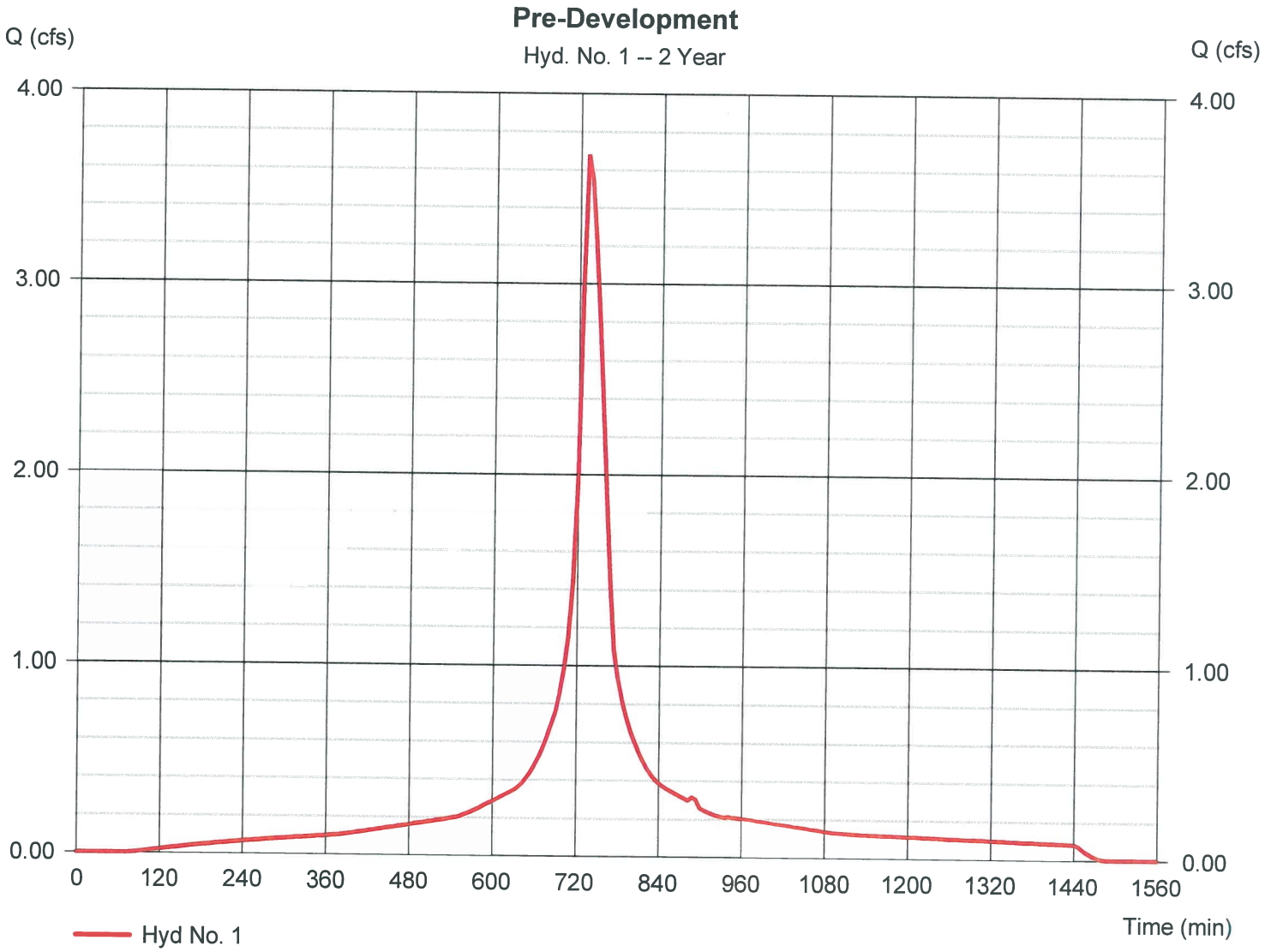
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 10 / 28 / 2024

Hyd. No. 1

Pre-Development

Hydrograph type	= SCS Runoff	Peak discharge	= 3.679 cfs
Storm frequency	= 2 yrs	Time to peak	= 732 min
Time interval	= 6 min	Hyd. volume	= 24,254 cuft
Drainage area	= 2.110 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 14.09 min
Total precip.	= 3.42 in	Distribution	= Custom
Storm duration	= NOAA TYPE D.cds	Shape factor	= 285



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Hyd. No. 1

Pre-Development

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.42		0.00		0.00		
Land slope (%)	= 0.09		0.00		0.00		
Travel Time (min)	**= 4.05**	**+**	**0.00**	**+**	**0.00**	**=**	**4.05**
Shallow Concentrated Flow							
Flow length (ft)	= 18.00		82.00		148.00		
Watercourse slope (%)	= 0.09		0.07		0.03		
Surface description	= Paved		Paved		Paved		
Average velocity (ft/s)	=0.61		0.54		0.35		
Travel Time (min)	**= 0.49**	**+**	**2.54**	**+**	**7.01**	**=**	**10.04**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... **14.09 min**

Hydrograph Report

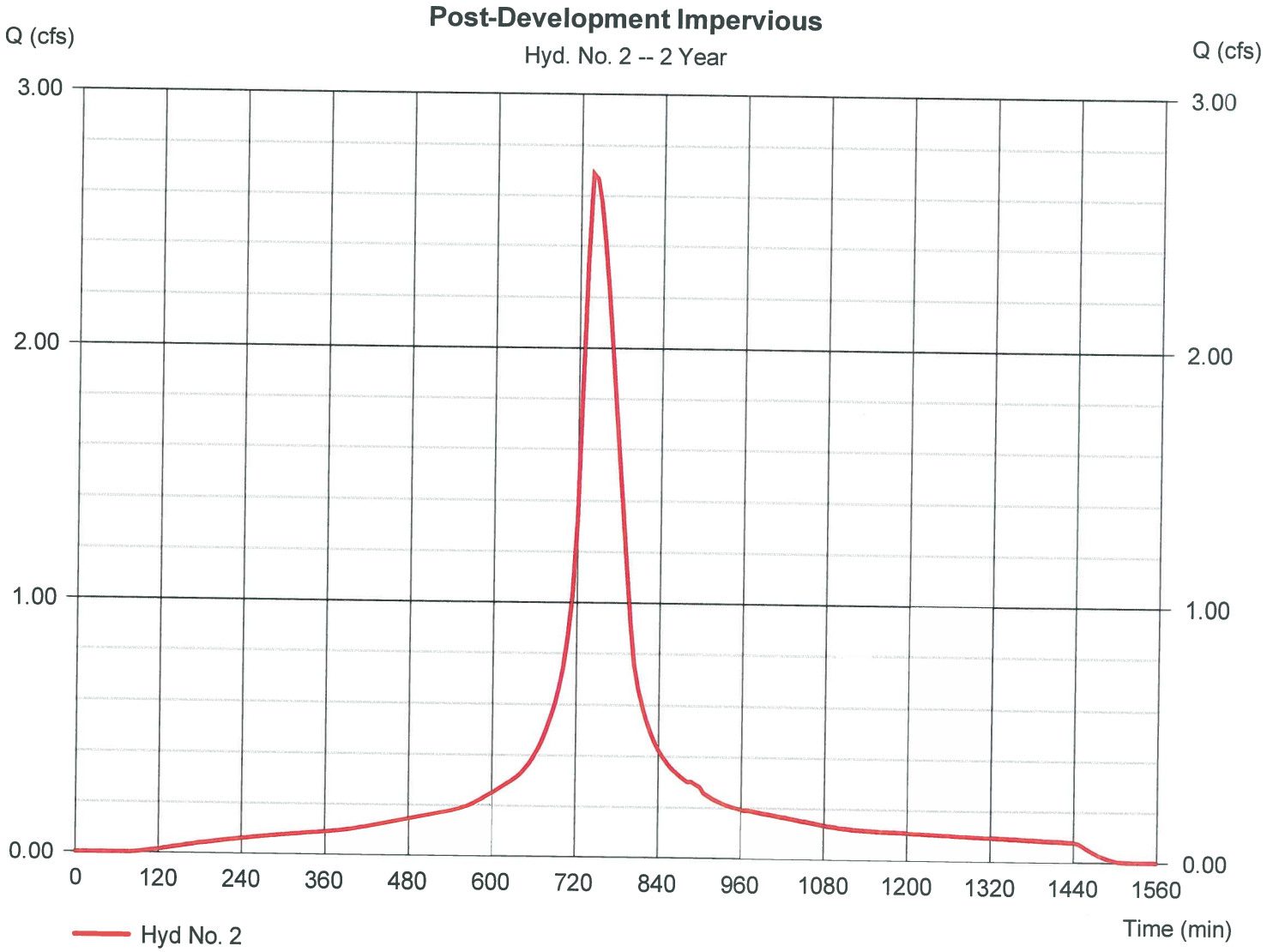
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 10 / 28 / 2024

Hyd. No. 2

Post-Development Impervious

Hydrograph type	= SCS Runoff	Peak discharge	= 2.687 cfs
Storm frequency	= 2 yrs	Time to peak	= 738 min
Time interval	= 6 min	Hyd. volume	= 22,768 cuft
Drainage area	= 1.910 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 21.00 min
Total precip.	= 3.42 in	Distribution	= Custom
Storm duration	= NOAA TYPE D.cds	Shape factor	= 285



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Hyd. No. 2

Post-Development Impervious

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.42		0.00		0.00		
Land slope (%)	= 0.02		0.00		0.00		
Travel Time (min)	**= 7.89**	**+**	**0.00**	**+**	**0.00**	**=**	**7.89**
Shallow Concentrated Flow							
Flow length (ft)	= 182.00		0.00		0.00		
Watercourse slope (%)	= 0.01		0.00		0.00		
Surface description	= Paved		Paved		Paved		
Average velocity (ft/s)	=0.23		0.00		0.00		
Travel Time (min)	**= 13.09**	**+**	**0.00**	**+**	**0.00**	**=**	**13.09**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... **21.00 min**

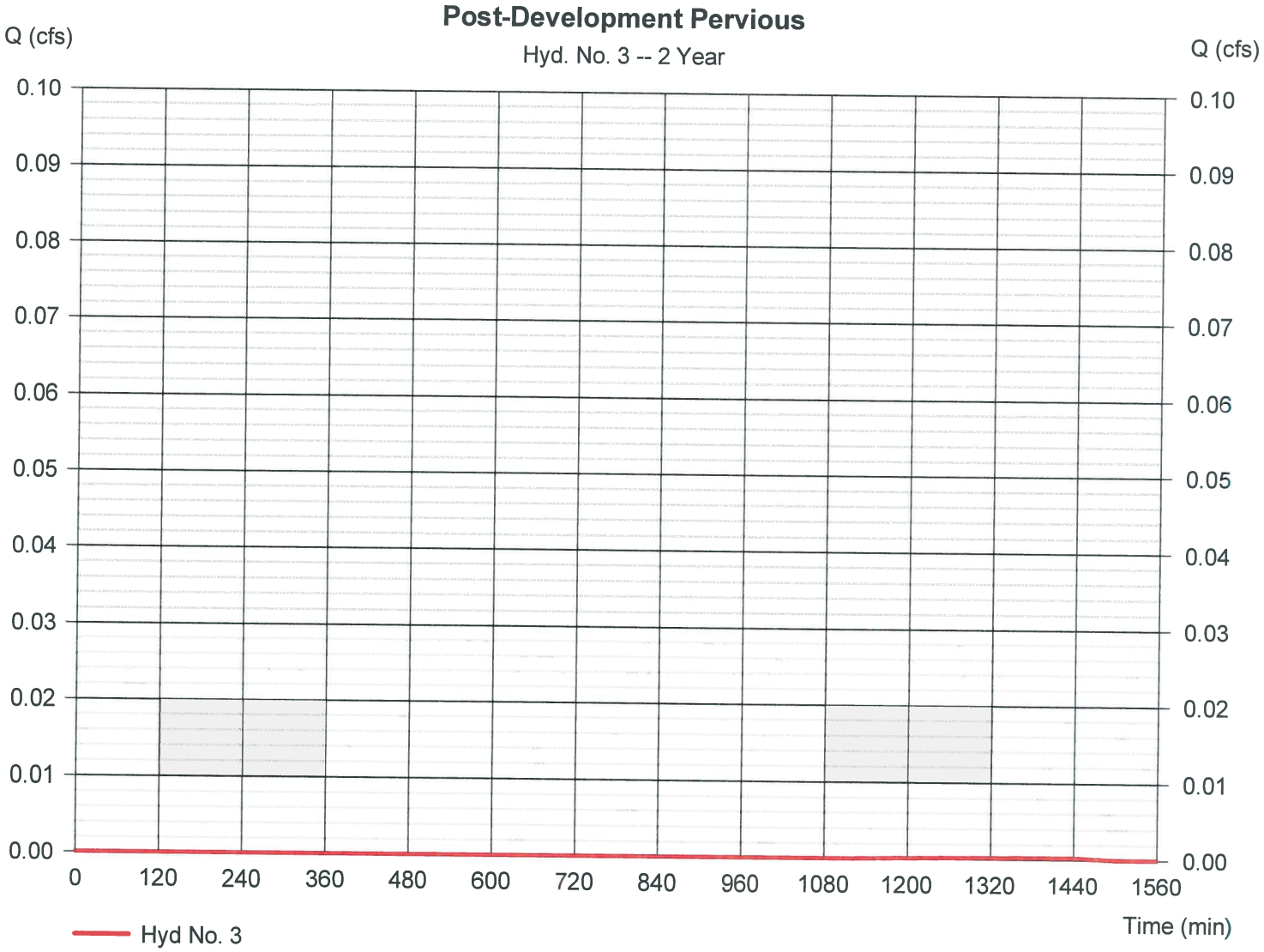
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Monday, 10 / 28 / 2024

Hyd. No. 3

Post-Development Pervious

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 1440 min
Time interval	= 6 min	Hyd. volume	= 4 cuft
Drainage area	= 0.201 ac	Curve number	= 39
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 21.00 min
Total precip.	= 3.42 in	Distribution	= Custom
Storm duration	= NOAA TYPE D.cds	Shape factor	= 285



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Hyd. No. 3

Post-Development Pervious

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.42		0.00		0.00		
Land slope (%)	= 0.02		0.00		0.00		
Travel Time (min)	**= 7.89**	**+**	**0.00**	**+**	**0.00**	**=**	**7.89**
Shallow Concentrated Flow							
Flow length (ft)	= 182.00		0.00		0.00		
Watercourse slope (%)	= 0.01		0.00		0.00		
Surface description	= Paved		Paved		Paved		
Average velocity (ft/s)	=0.23		0.00		0.00		
Travel Time (min)	**= 13.09**	**+**	**0.00**	**+**	**0.00**	**=**	**13.09**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

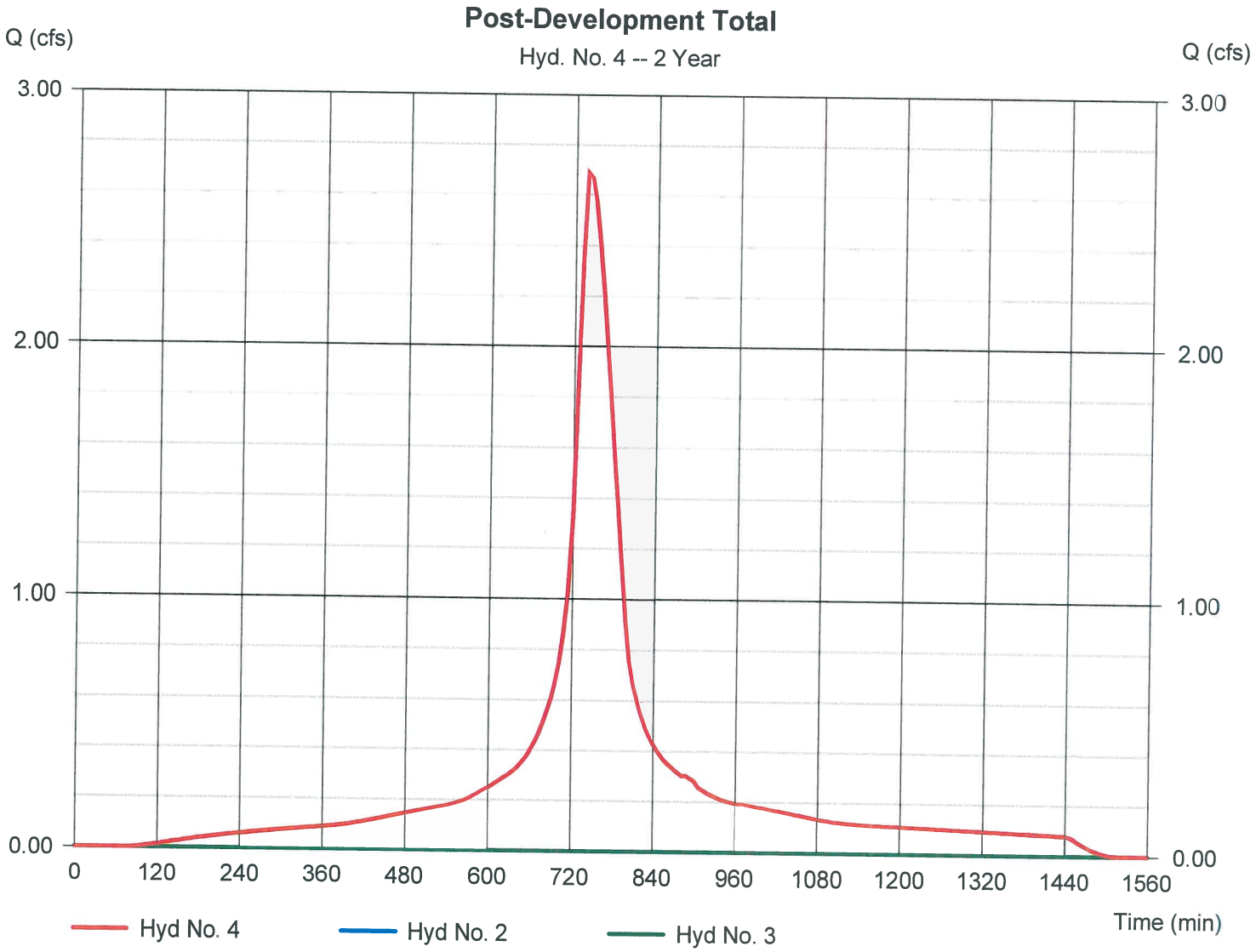
Total Travel Time, Tc ..... 21.00 min

Hydrograph Report

Hyd. No. 4

Post-Development Total

Hydrograph type	= Combine	Peak discharge	= 2.687 cfs
Storm frequency	= 2 yrs	Time to peak	= 738 min
Time interval	= 6 min	Hyd. volume	= 22,772 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 2.111 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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	5.746	6	732	38,532	------	------	------	Pre-Development
2	SCS Runoff	4.199	6	738	36,171	------	------	------	Post-Development Impervious
3	SCS Runoff	0.009	6	804	199	------	------	------	Post-Development Pervious
4	Combine	4.199	6	738	36,370	2, 3	------	------	Post-Development Total

Hydrograph Report

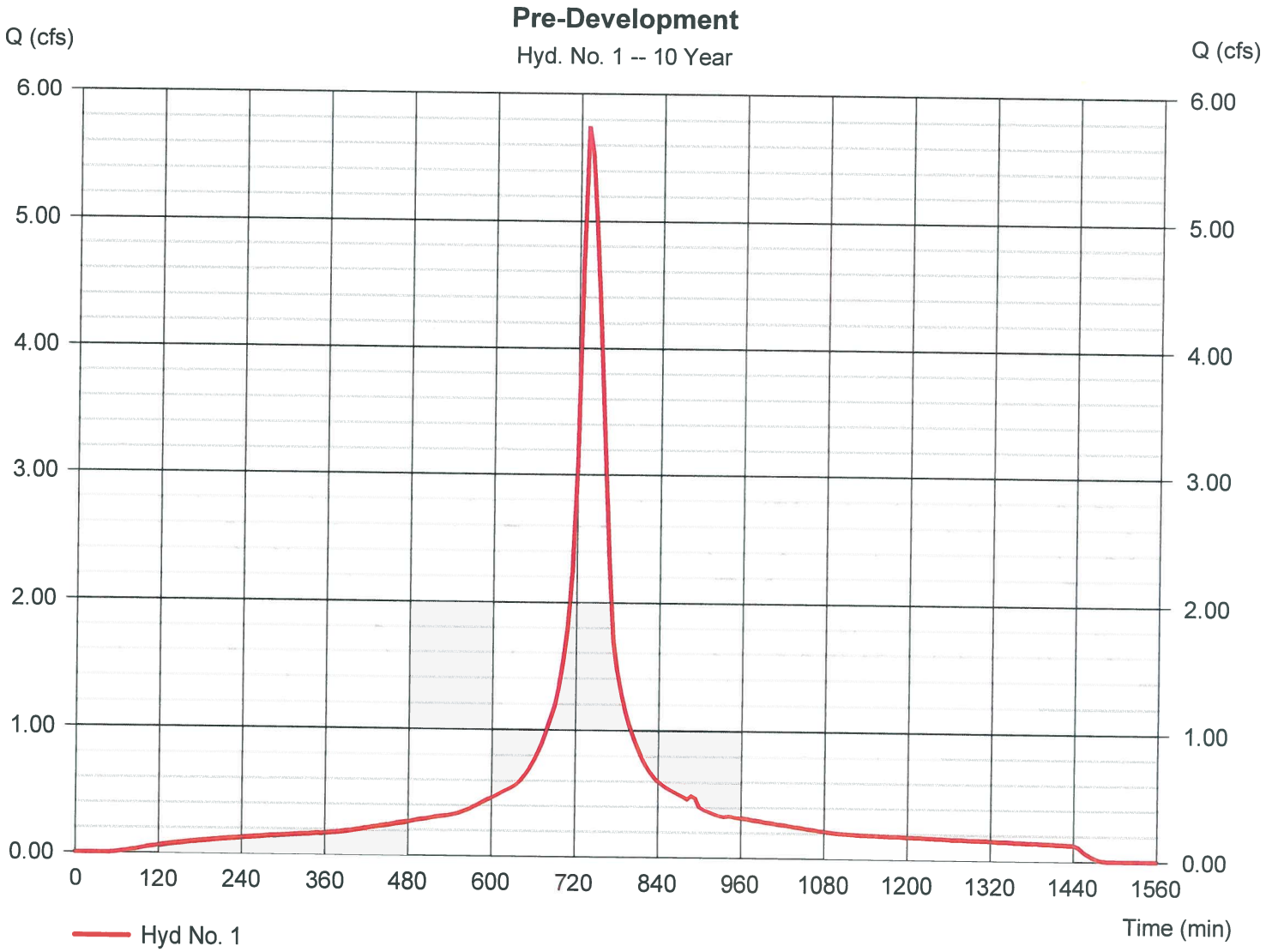
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 10 / 28 / 2024

Hyd. No. 1

Pre-Development

Hydrograph type	= SCS Runoff	Peak discharge	= 5.746 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 6 min	Hyd. volume	= 38,532 cuft
Drainage area	= 2.110 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 14.09 min
Total precip.	= 5.30 in	Distribution	= Custom
Storm duration	= NOAA TYPE D.cds	Shape factor	= 285

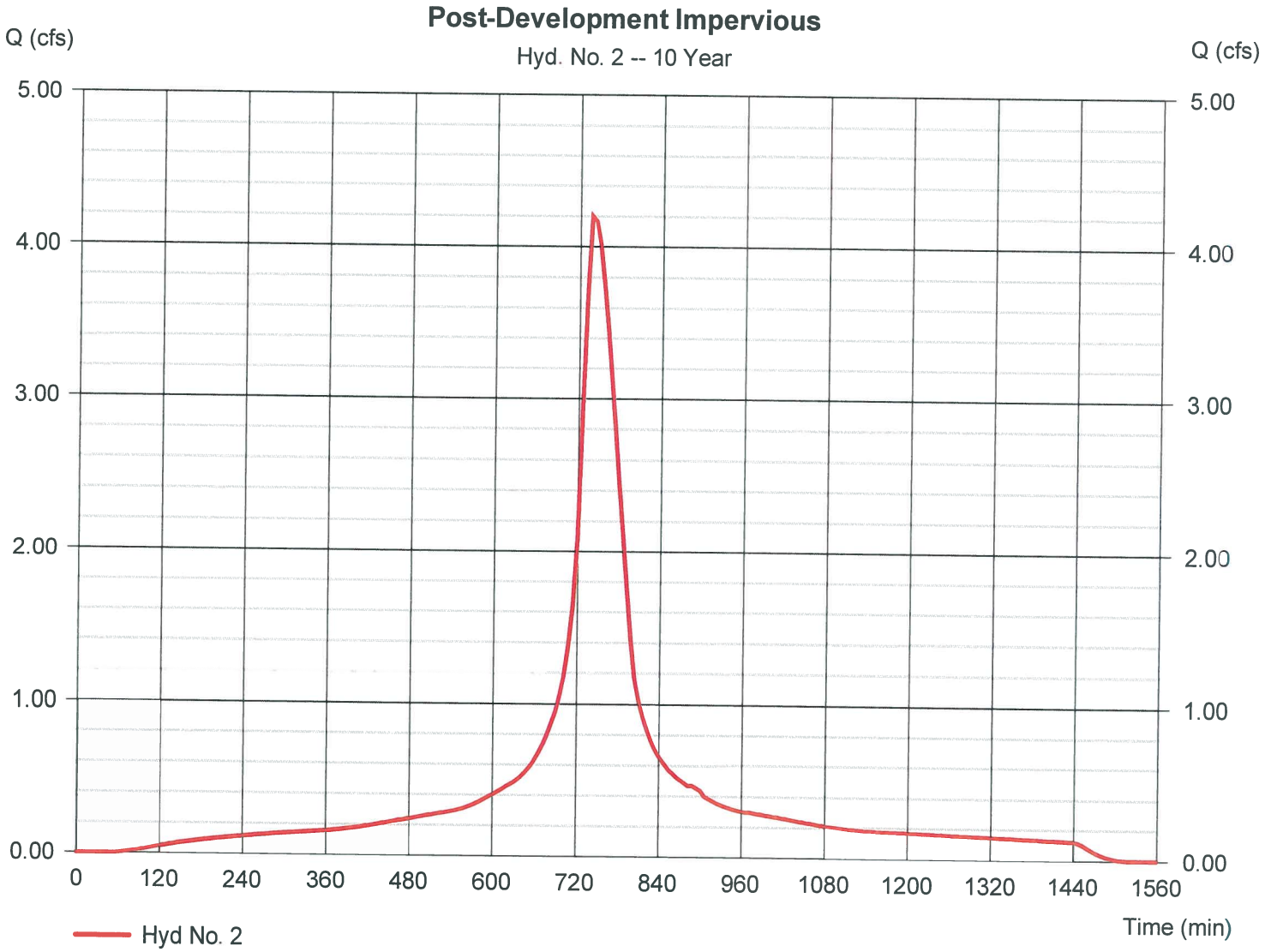


Hydrograph Report

Hyd. No. 2

Post-Development Impervious

Hydrograph type	= SCS Runoff	Peak discharge	= 4.199 cfs
Storm frequency	= 10 yrs	Time to peak	= 738 min
Time interval	= 6 min	Hyd. volume	= 36,171 cuft
Drainage area	= 1.910 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 21.00 min
Total precip.	= 5.30 in	Distribution	= Custom
Storm duration	= NOAA TYPE D.cds	Shape factor	= 285



Hydrograph Report

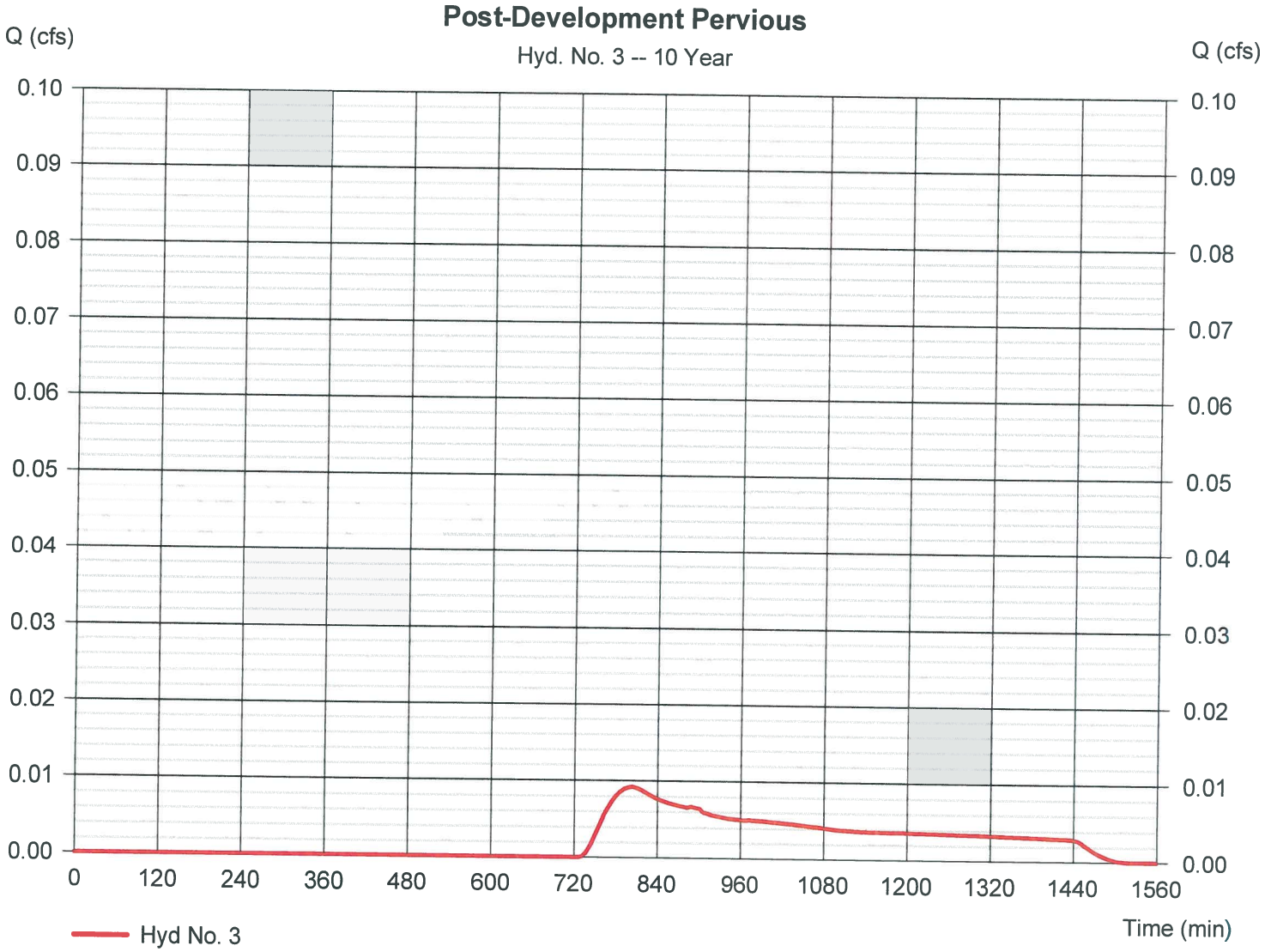
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 10 / 28 / 2024

Hyd. No. 3

Post-Development Pervious

Hydrograph type	= SCS Runoff	Peak discharge	= 0.009 cfs
Storm frequency	= 10 yrs	Time to peak	= 804 min
Time interval	= 6 min	Hyd. volume	= 199 cuft
Drainage area	= 0.201 ac	Curve number	= 39
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 21.00 min
Total precip.	= 5.30 in	Distribution	= Custom
Storm duration	= NOAA TYPE D.cds	Shape factor	= 285

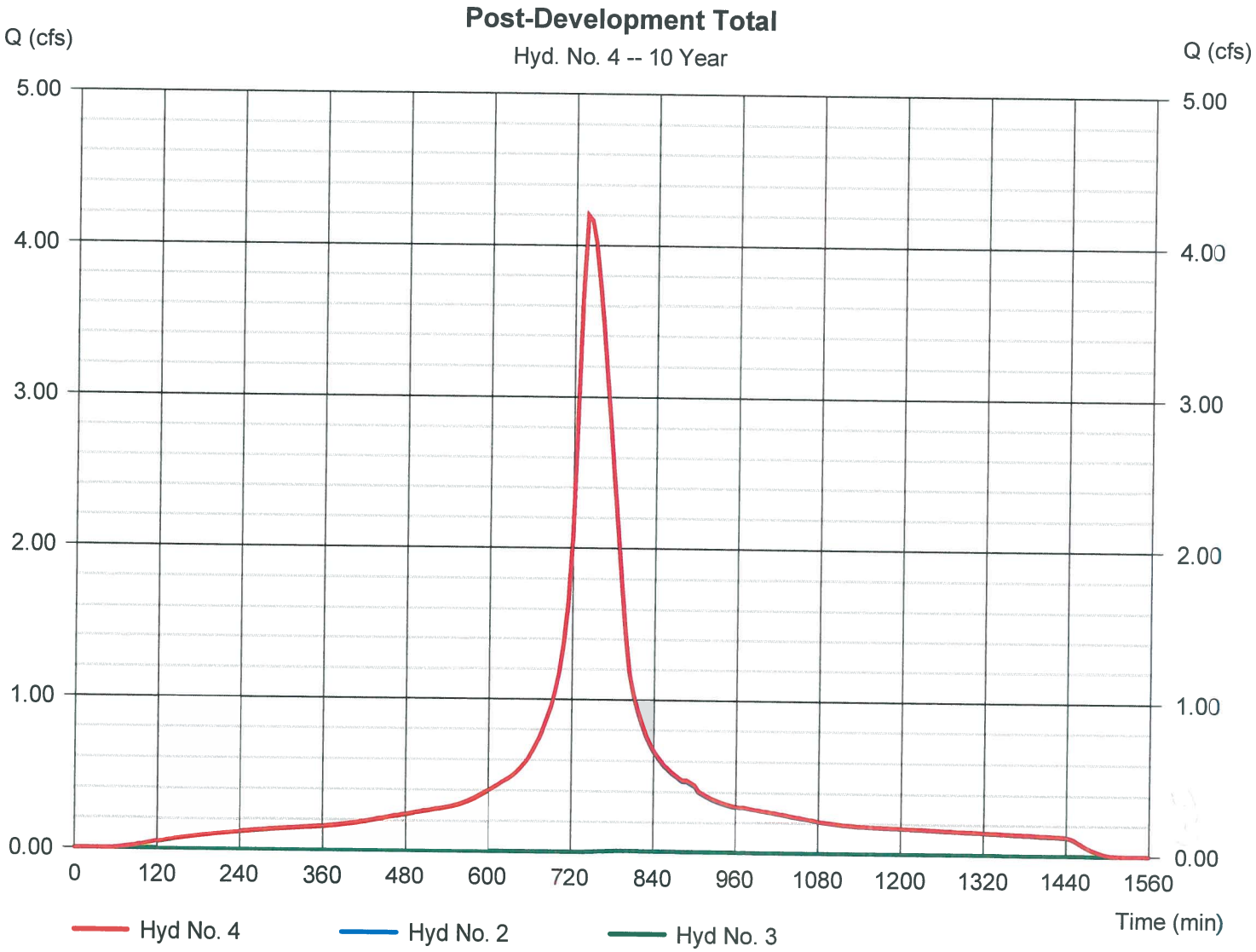


Hydrograph Report

Hyd. No. 4

Post-Development Total

Hydrograph type	= Combine	Peak discharge	= 4.199 cfs
Storm frequency	= 10 yrs	Time to peak	= 738 min
Time interval	= 6 min	Hyd. volume	= 36,370 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 2.111 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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	9.851	6	732	67,049	------	------	------	Pre-Development
2	SCS Runoff	7.200	6	738	62,941	------	------	------	Post-Development Impervious
3	SCS Runoff	0.117	6	756	1,222	------	------	------	Post-Development Pervious
4	Combine	7.296	6	738	64,164	2, 3	------	------	Post-Development Total

Hydrograph Report

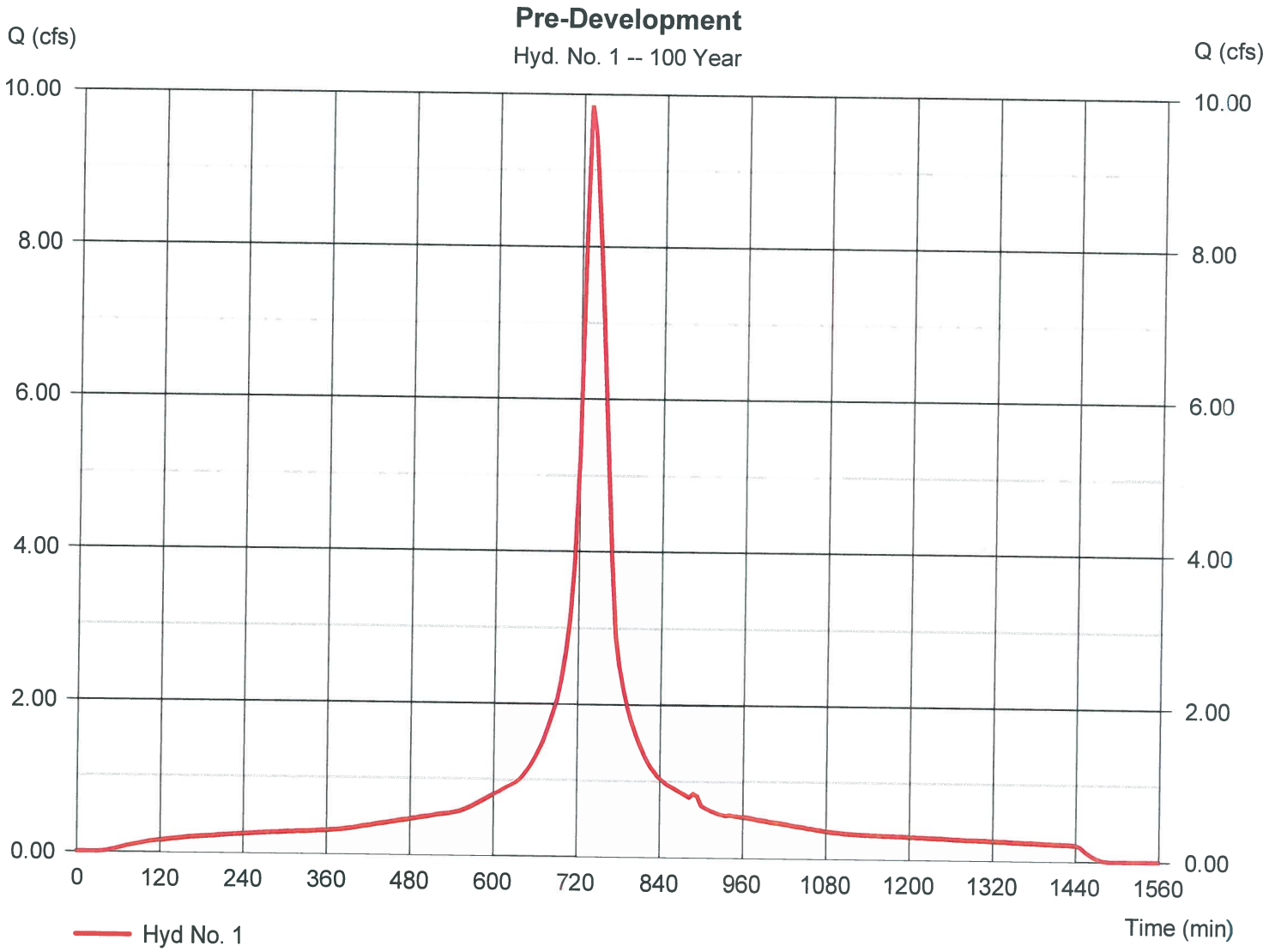
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 10 / 28 / 2024

Hyd. No. 1

Pre-Development

Hydrograph type	= SCS Runoff	Peak discharge	= 9.851 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 6 min	Hyd. volume	= 67,049 cuft
Drainage area	= 2.110 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 14.09 min
Total precip.	= 9.05 in	Distribution	= Custom
Storm duration	= NOAA TYPE D.cds	Shape factor	= 285

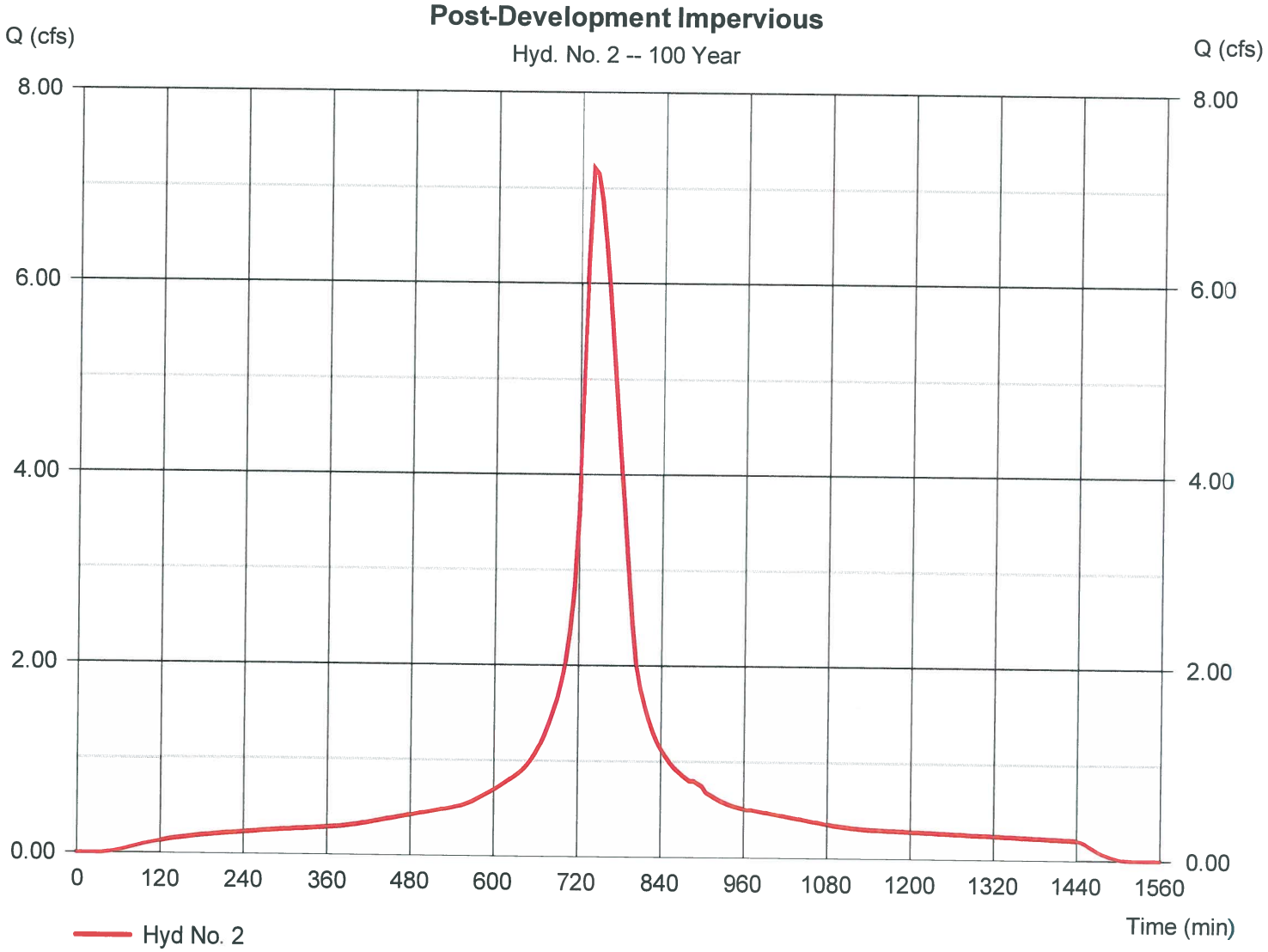


Hydrograph Report

Hyd. No. 2

Post-Development Impervious

Hydrograph type	= SCS Runoff	Peak discharge	= 7.200 cfs
Storm frequency	= 100 yrs	Time to peak	= 738 min
Time interval	= 6 min	Hyd. volume	= 62,941 cuft
Drainage area	= 1.910 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 21.00 min
Total precip.	= 9.05 in	Distribution	= Custom
Storm duration	= NOAA TYPE D.cds	Shape factor	= 285

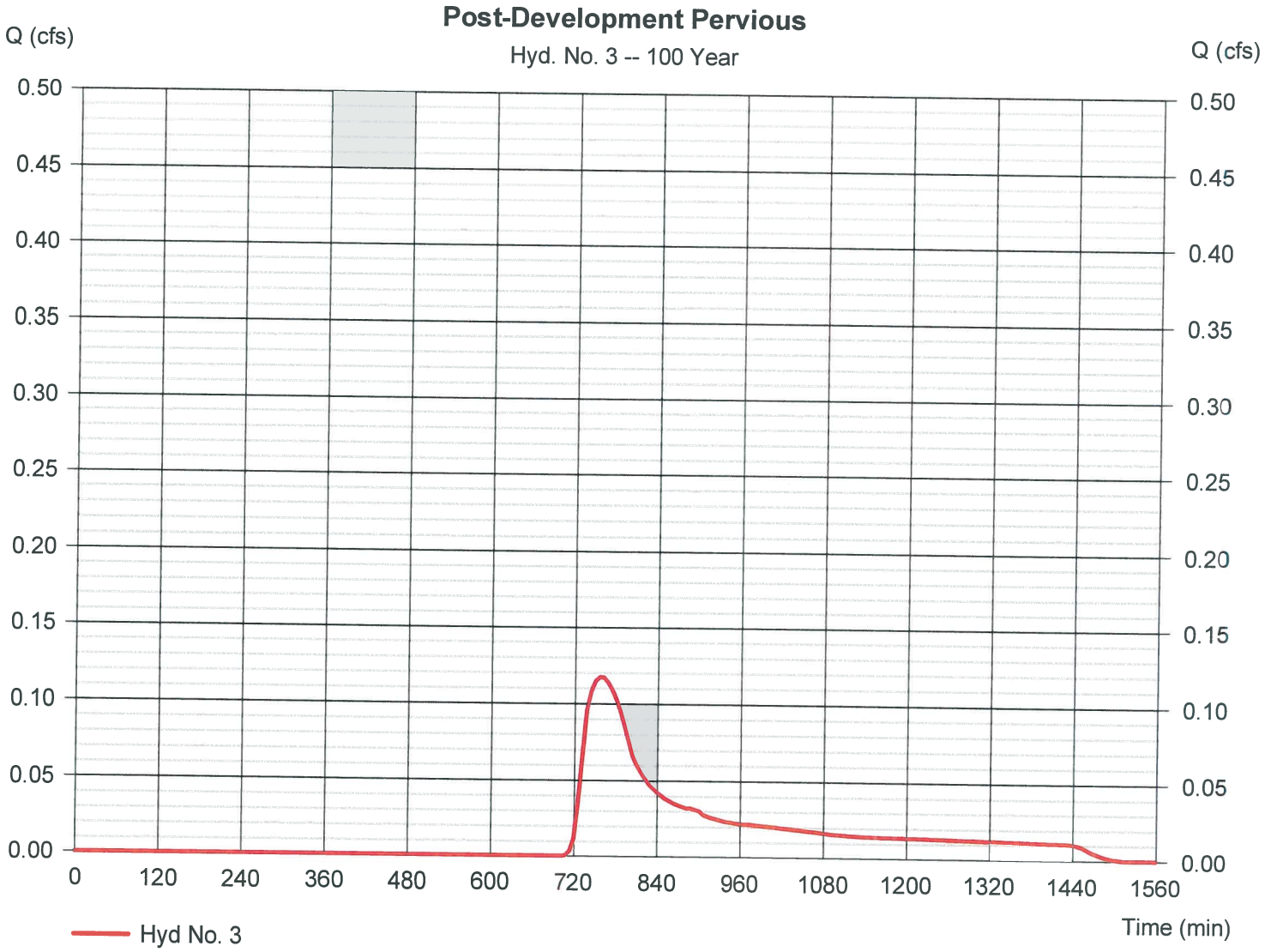


Hydrograph Report

Hyd. No. 3

Post-Development Pervious

Hydrograph type	= SCS Runoff	Peak discharge	= 0.117 cfs
Storm frequency	= 100 yrs	Time to peak	= 756 min
Time interval	= 6 min	Hyd. volume	= 1,222 cuft
Drainage area	= 0.201 ac	Curve number	= 39
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 21.00 min
Total precip.	= 9.05 in	Distribution	= Custom
Storm duration	= NOAA TYPE D.cds	Shape factor	= 285



Hydrograph Report

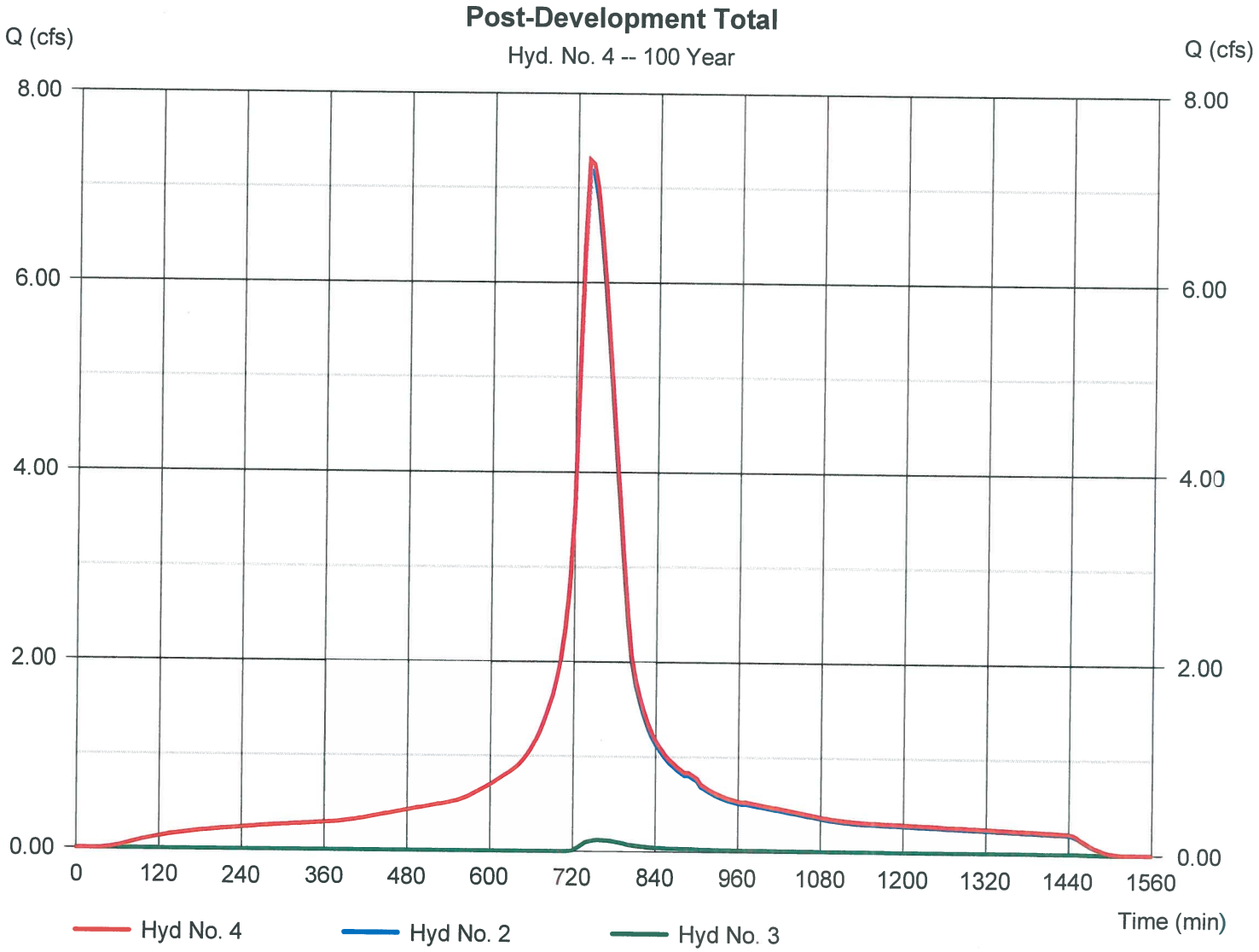
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 10 / 28 / 2024

Hyd. No. 4

Post-Development Total

Hydrograph type	= Combine	Peak discharge	= 7.296 cfs
Storm frequency	= 100 yrs	Time to peak	= 738 min
Time interval	= 6 min	Hyd. volume	= 64,164 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 2.111 ac



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	12.0317	0.6000	0.5720	--------
2	10.8385	0.1000	0.5273	--------
3	0.0000	0.0000	0.0000	--------
5	22.0563	2.0000	0.6282	--------
10	22.4454	1.1000	0.6004	--------
25	19.5187	0.1000	0.5221	--------
50	27.0380	1.0000	0.5792	--------
100	30.9606	1.8000	0.5915	--------

File name: Sandy Hook.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	4.49	3.12	2.50	2.13	1.88	1.70	1.56	1.45	1.35	1.27	1.21	1.15
2	4.59	3.20	2.59	2.23	1.98	1.80	1.66	1.55	1.45	1.38	1.31	1.25
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.50	4.63	3.72	3.16	2.78	2.50	2.28	2.11	1.96	1.84	1.74	1.65
10	7.58	5.29	4.23	3.60	3.17	2.85	2.61	2.41	2.25	2.12	2.00	1.90
25	8.34	5.84	4.73	4.07	3.63	3.30	3.05	2.84	2.67	2.53	2.41	2.30
50	9.58	6.74	5.43	4.64	4.10	3.70	3.39	3.15	2.94	2.77	2.63	2.50
100	9.96	7.19	5.83	5.00	4.43	4.00	3.67	3.40	3.18	3.00	2.84	2.70

Tc = time in minutes. Values may exceed 60.

Precip. file name: Sea Bright Current Adjusted.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	3.42	0.00	0.00	5.30	0.00	0.00	9.05
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	3.42	0.00	0.00	5.30	0.00	0.00	9.05

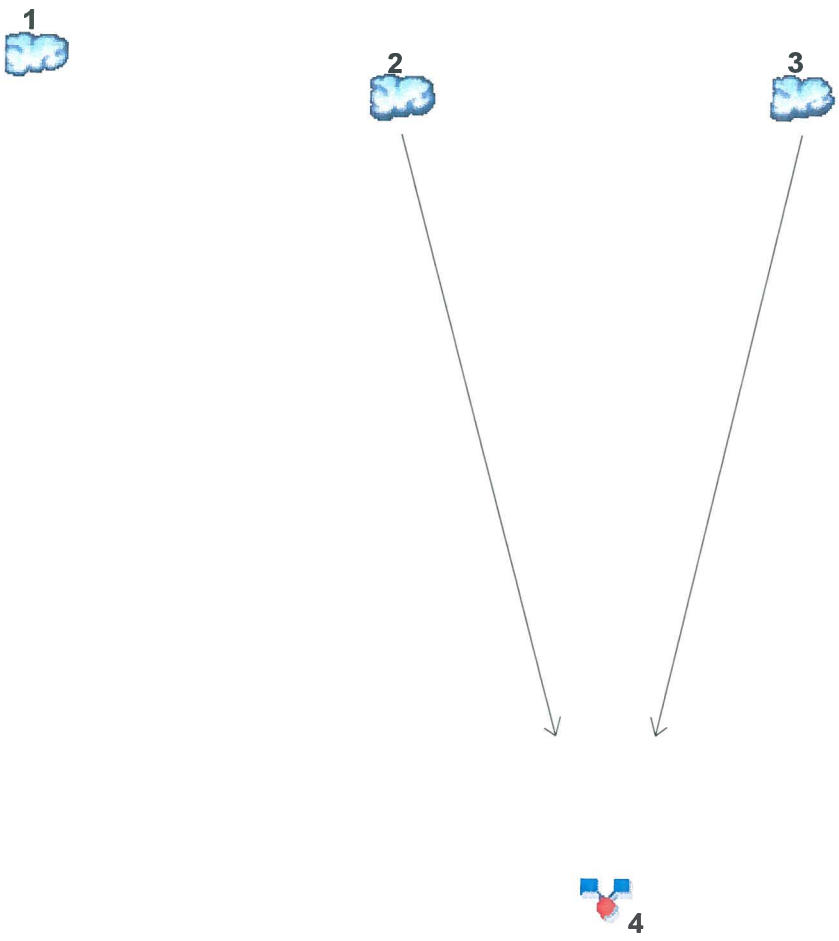
Hydraflow Table of Contents

FUTURE HYDROGRAPHS SBC.gpw

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 10 / 28 / 2024

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	SCS Runoff	Pre-Development
2	SCS Runoff	Post-Development Impervious
3	SCS Runoff	Post-Development Pervious
4	Combine	Post-Development Total

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	------	-------	4.395	-------	-------	6.787	-------	-------	12.18	Pre-Development
2	SCS Runoff	------	-------	3.211	-------	-------	4.960	-------	-------	8.902	Post-Development Impervious
3	SCS Runoff	------	-------	0.001	-------	-------	0.024	-------	-------	0.225	Post-Development Pervious
4	Combine	2, 3	-------	3.211	-------	-------	4.970	-------	-------	9.105	Post-Development Total

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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	4.395	6	732	29,187	------	------	------	Pre-Development
2	SCS Runoff	3.211	6	738	27,399	------	------	------	Post-Development Impervious
3	SCS Runoff	0.001	6	1032	40	------	------	------	Post-Development Pervious
4	Combine	3.211	6	738	27,439	2, 3	------	------	Post-Development Total

Hydrograph Report

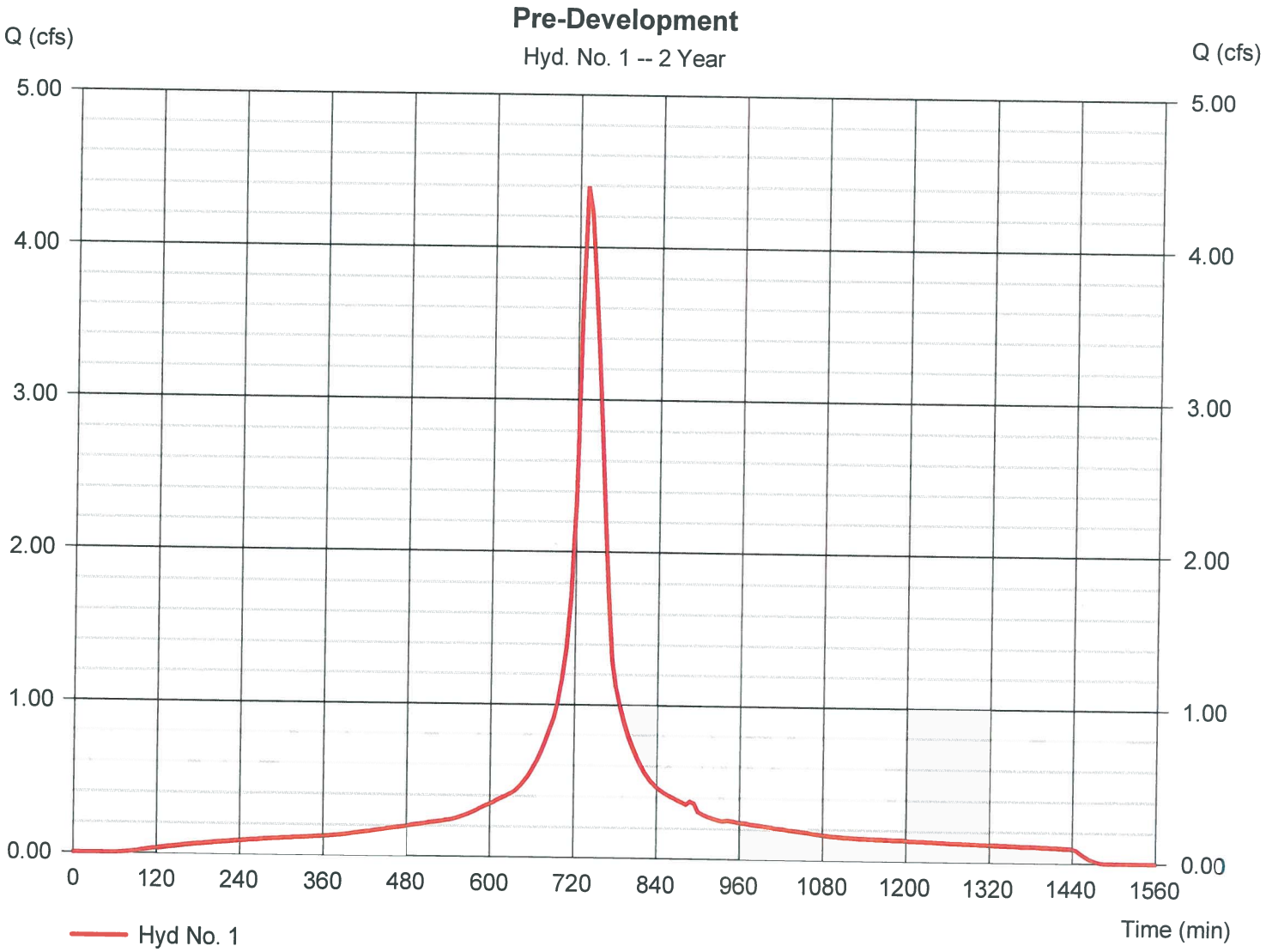
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 10 / 28 / 2024

Hyd. No. 1

Pre-Development

Hydrograph type	= SCS Runoff	Peak discharge	= 4.395 cfs
Storm frequency	= 2 yrs	Time to peak	= 732 min
Time interval	= 6 min	Hyd. volume	= 29,187 cuft
Drainage area	= 2.110 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 14.09 min
Total precip.	= 4.07 in	Distribution	= Custom
Storm duration	= NOAA TYPE D.cds	Shape factor	= 285



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Hyd. No. 1

Pre-Development

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.42		0.00		0.00		
Land slope (%)	= 0.09		0.00		0.00		
Travel Time (min)	**= 4.05**	**+**	**0.00**	**+**	**0.00**	**=**	**4.05**
Shallow Concentrated Flow							
Flow length (ft)	= 18.00		82.00		148.00		
Watercourse slope (%)	= 0.09		0.07		0.03		
Surface description	= Paved		Paved		Paved		
Average velocity (ft/s)	=0.61		0.54		0.35		
Travel Time (min)	**= 0.49**	**+**	**2.54**	**+**	**7.01**	**=**	**10.04**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... **14.09 min**

Hydrograph Report

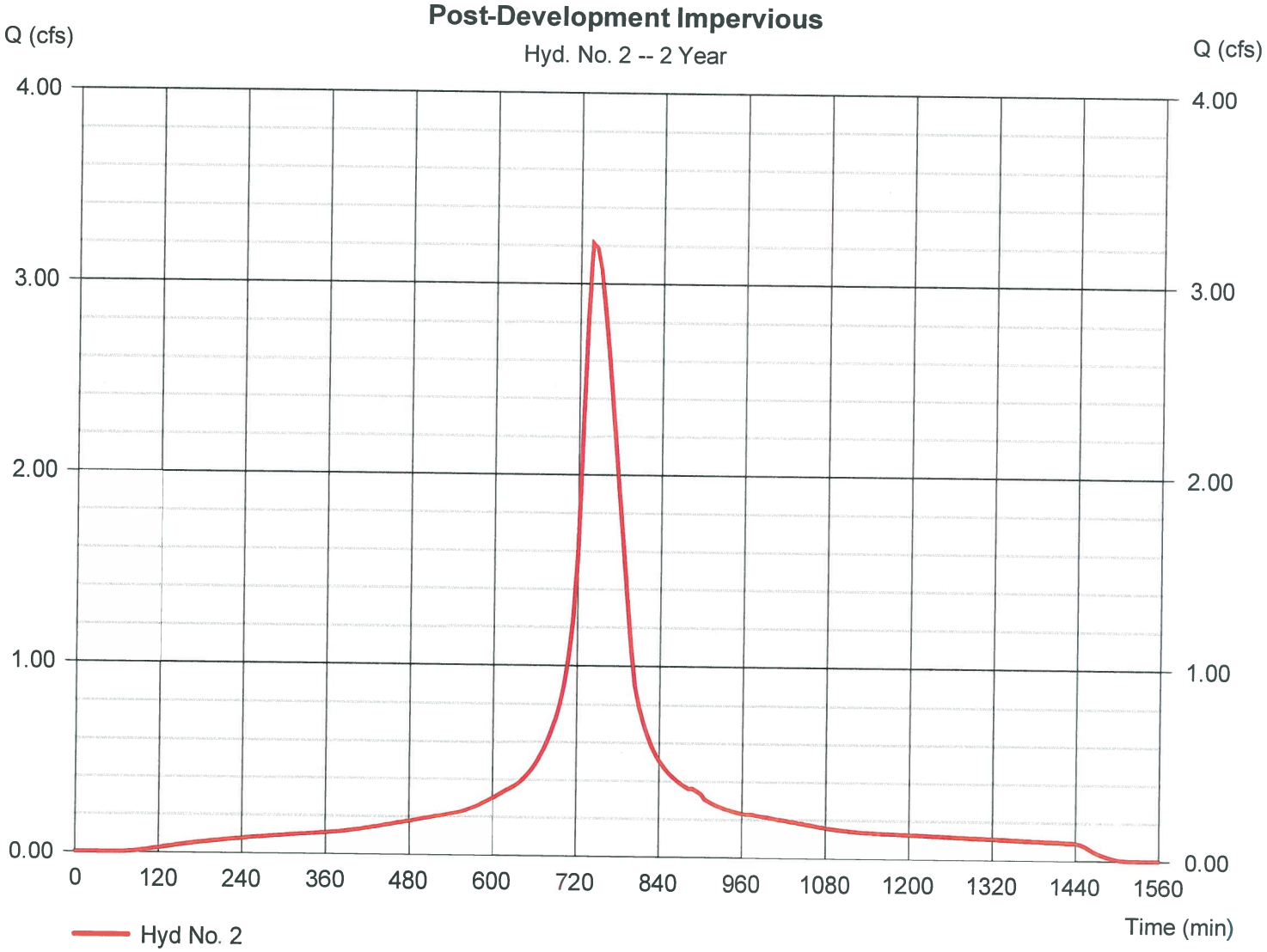
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 10 / 28 / 2024

Hyd. No. 2

Post-Development Impervious

Hydrograph type	= SCS Runoff	Peak discharge	= 3.211 cfs
Storm frequency	= 2 yrs	Time to peak	= 738 min
Time interval	= 6 min	Hyd. volume	= 27,399 cuft
Drainage area	= 1.910 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 21.00 min
Total precip.	= 4.07 in	Distribution	= Custom
Storm duration	= NOAA TYPE D.cds	Shape factor	= 285



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Hyd. No. 2

Post-Development Impervious

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.011	0.011	0.011	
Flow length (ft)	= 100.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.42	0.00	0.00	
Land slope (%)	= 0.02	0.00	0.00	
Travel Time (min)	**= 7.89** +	**0.00** +	**0.00** =	**7.89**
Shallow Concentrated Flow				
Flow length (ft)	= 182.00	0.00	0.00	
Watercourse slope (%)	= 0.01	0.00	0.00	
Surface description	= Paved	Paved	Paved	
Average velocity (ft/s)	=0.23	0.00	0.00	
Travel Time (min)	**= 13.09** +	**0.00** +	**0.00** =	**13.09**
Channel Flow				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	=0.00			
		0.00		
			0.00	
Flow length (ft)	({0})0.0	0.0	0.0	
Travel Time (min)	**= 0.00** +	**0.00** +	**0.00** =	**0.00**

Total Travel Time, Tc ..... **21.00 min**

Hydrograph Report

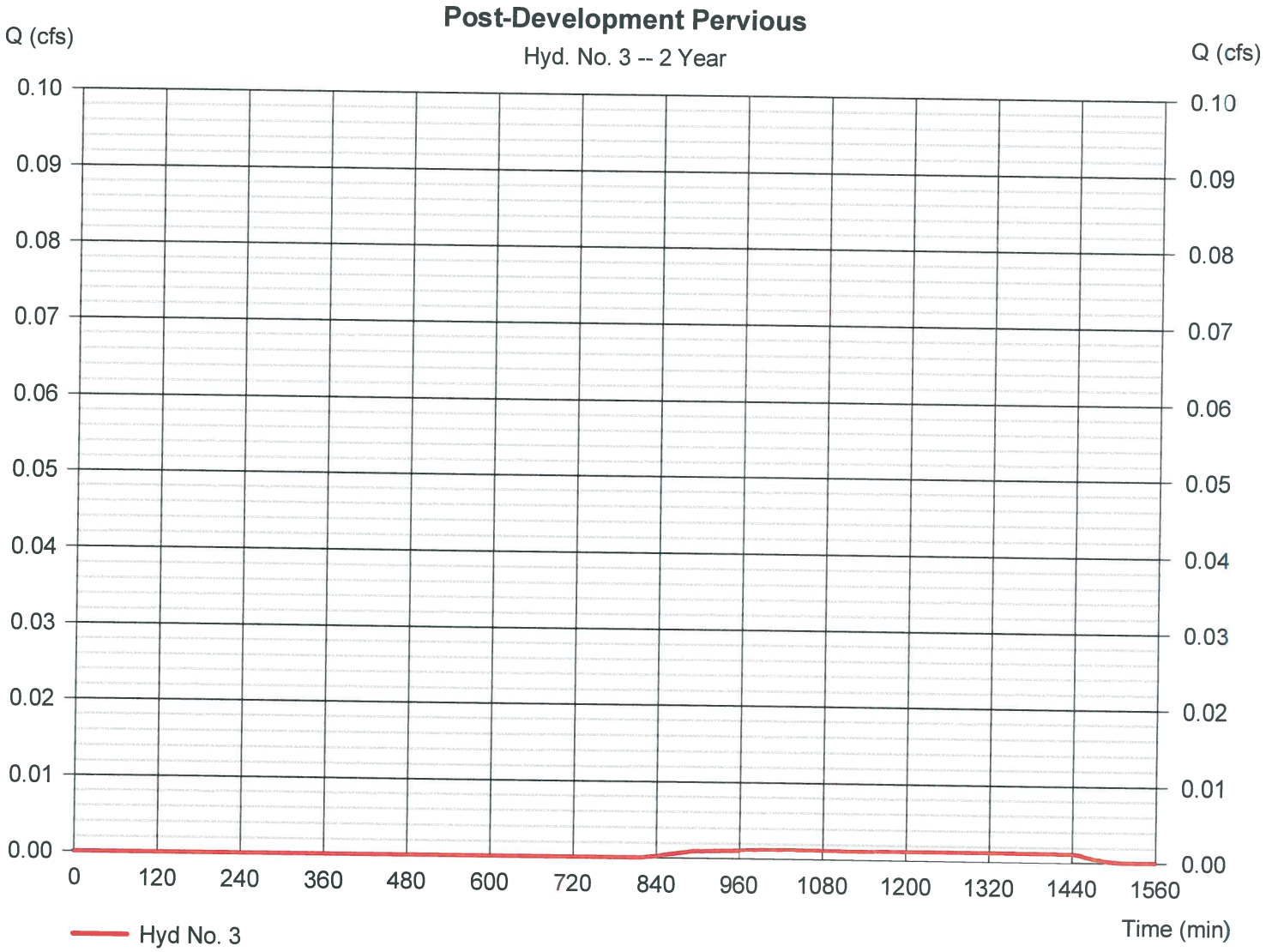
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 10 / 28 / 2024

Hyd. No. 3

Post-Development Pervious

Hydrograph type	= SCS Runoff	Peak discharge	= 0.001 cfs
Storm frequency	= 2 yrs	Time to peak	= 1032 min
Time interval	= 6 min	Hyd. volume	= 40 cuft
Drainage area	= 0.201 ac	Curve number	= 39
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 21.00 min
Total precip.	= 4.07 in	Distribution	= Custom
Storm duration	= NOAA TYPE D.cds	Shape factor	= 285



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Hyd. No. 3

Post-Development Pervious

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.42		0.00		0.00		
Land slope (%)	= 0.02		0.00		0.00		
Travel Time (min)	**= 7.89**	**+**	**0.00**	**+**	**0.00**	**=**	**7.89**
Shallow Concentrated Flow							
Flow length (ft)	= 182.00		0.00		0.00		
Watercourse slope (%)	= 0.01		0.00		0.00		
Surface description	= Paved		Paved		Paved		
Average velocity (ft/s)	=0.23		0.00		0.00		
Travel Time (min)	**= 13.09**	**+**	**0.00**	**+**	**0.00**	**=**	**13.09**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

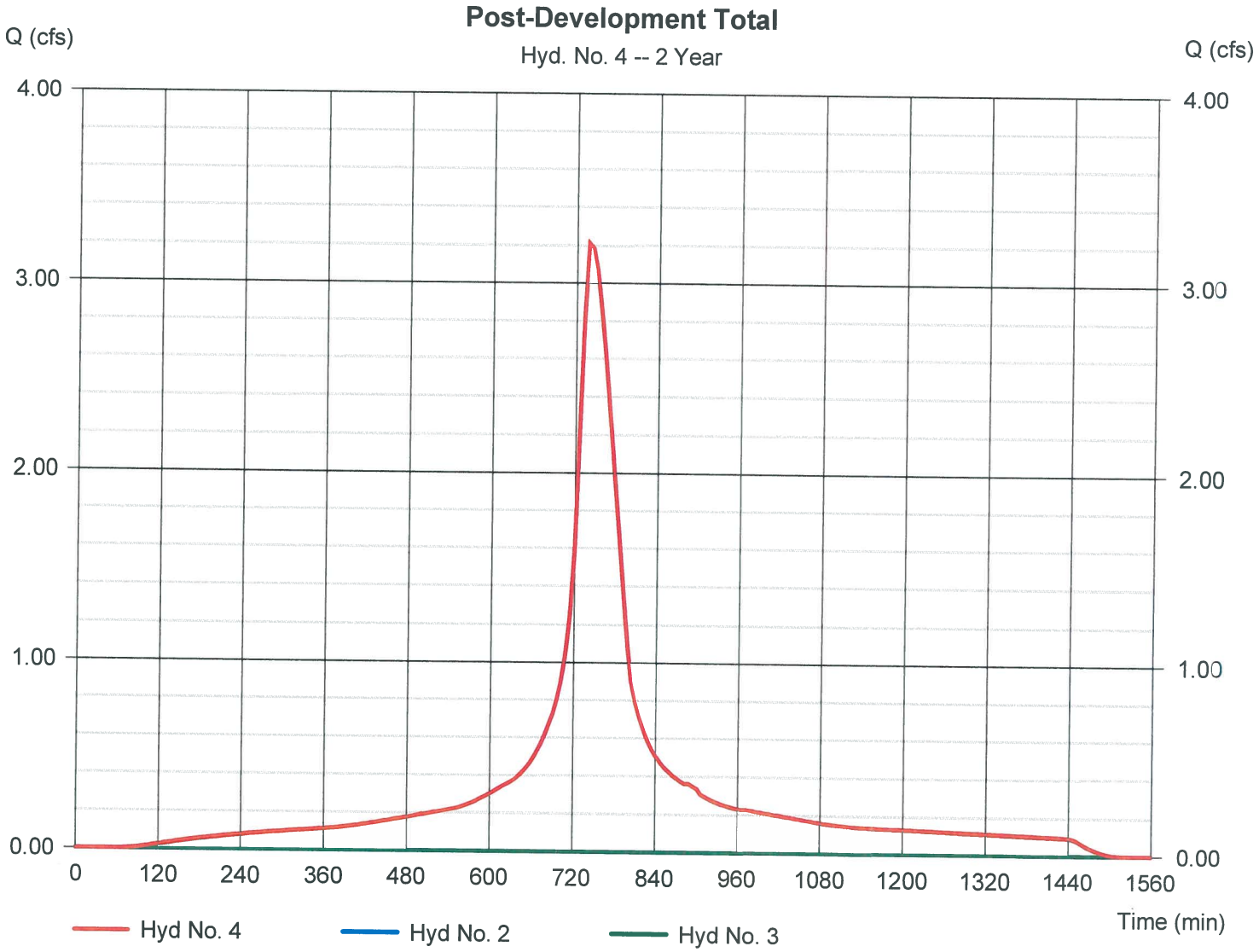
Total Travel Time, Tc ..... 21.00 min

Hydrograph Report

Hyd. No. 4

Post-Development Total

Hydrograph type	= Combine	Peak discharge	= 3.211 cfs
Storm frequency	= 2 yrs	Time to peak	= 738 min
Time interval	= 6 min	Hyd. volume	= 27,439 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 2.111 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

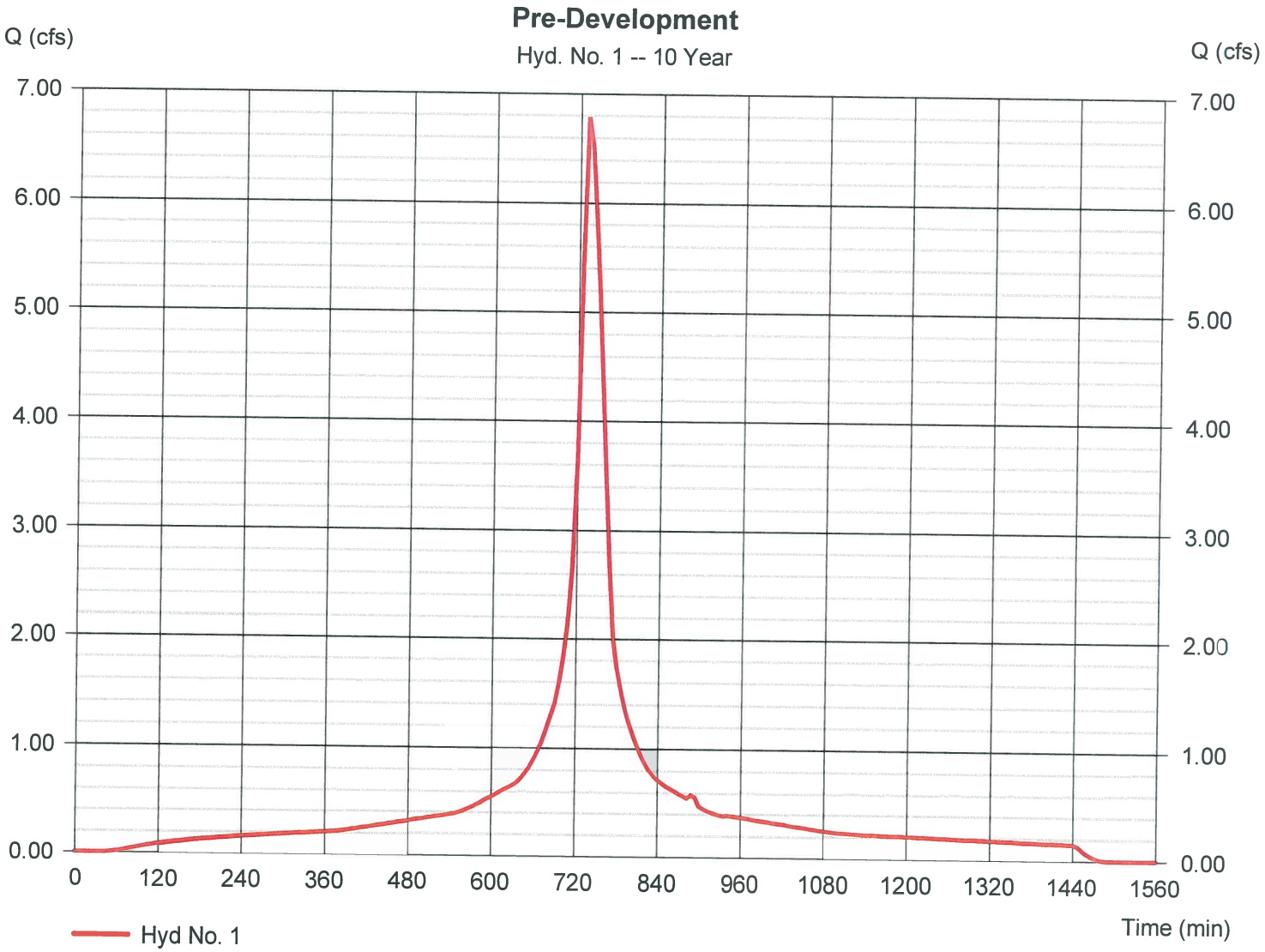
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	6.787	6	732	45,753	------	------	------	Pre-Development
2	SCS Runoff	4.960	6	738	42,950	------	------	------	Post-Development Impervious
3	SCS Runoff	0.024	6	780	390	------	------	------	Post-Development Pervious
4	Combine	4.970	6	738	43,340	2, 3	------	------	Post-Development Total

Hydrograph Report

Hyd. No. 1

Pre-Development

Hydrograph type	= SCS Runoff	Peak discharge	= 6.787 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 6 min	Hyd. volume	= 45,753 cuft
Drainage area	= 2.110 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 14.09 min
Total precip.	= 6.25 in	Distribution	= Custom
Storm duration	= NOAA TYPE D.cds	Shape factor	= 285



Hydrograph Report

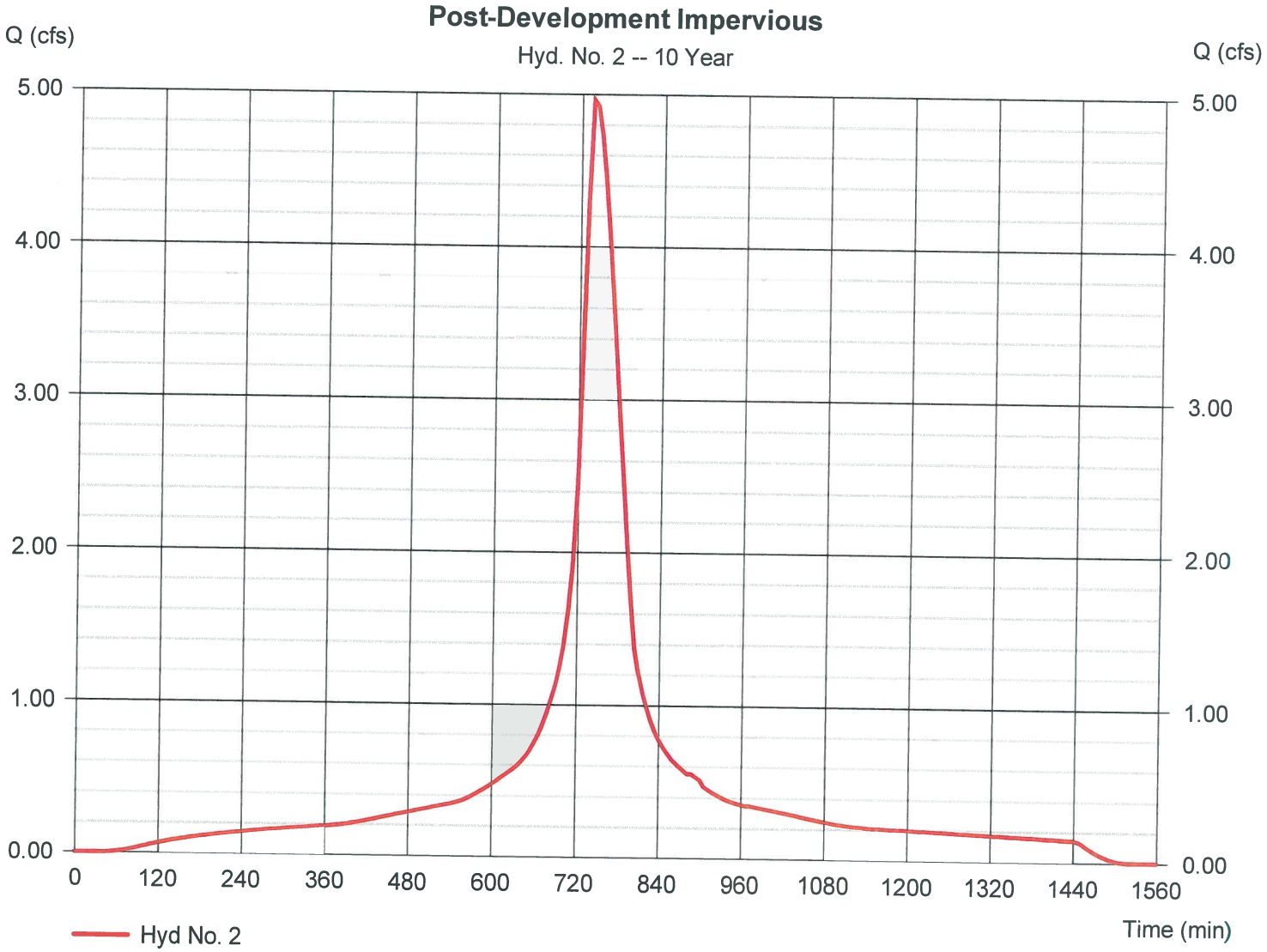
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 10 / 28 / 2024

Hyd. No. 2

Post-Development Impervious

Hydrograph type	= SCS Runoff	Peak discharge	= 4.960 cfs
Storm frequency	= 10 yrs	Time to peak	= 738 min
Time interval	= 6 min	Hyd. volume	= 42,950 cuft
Drainage area	= 1.910 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 21.00 min
Total precip.	= 6.25 in	Distribution	= Custom
Storm duration	= NOAA TYPE D.cds	Shape factor	= 285



Hydrograph Report

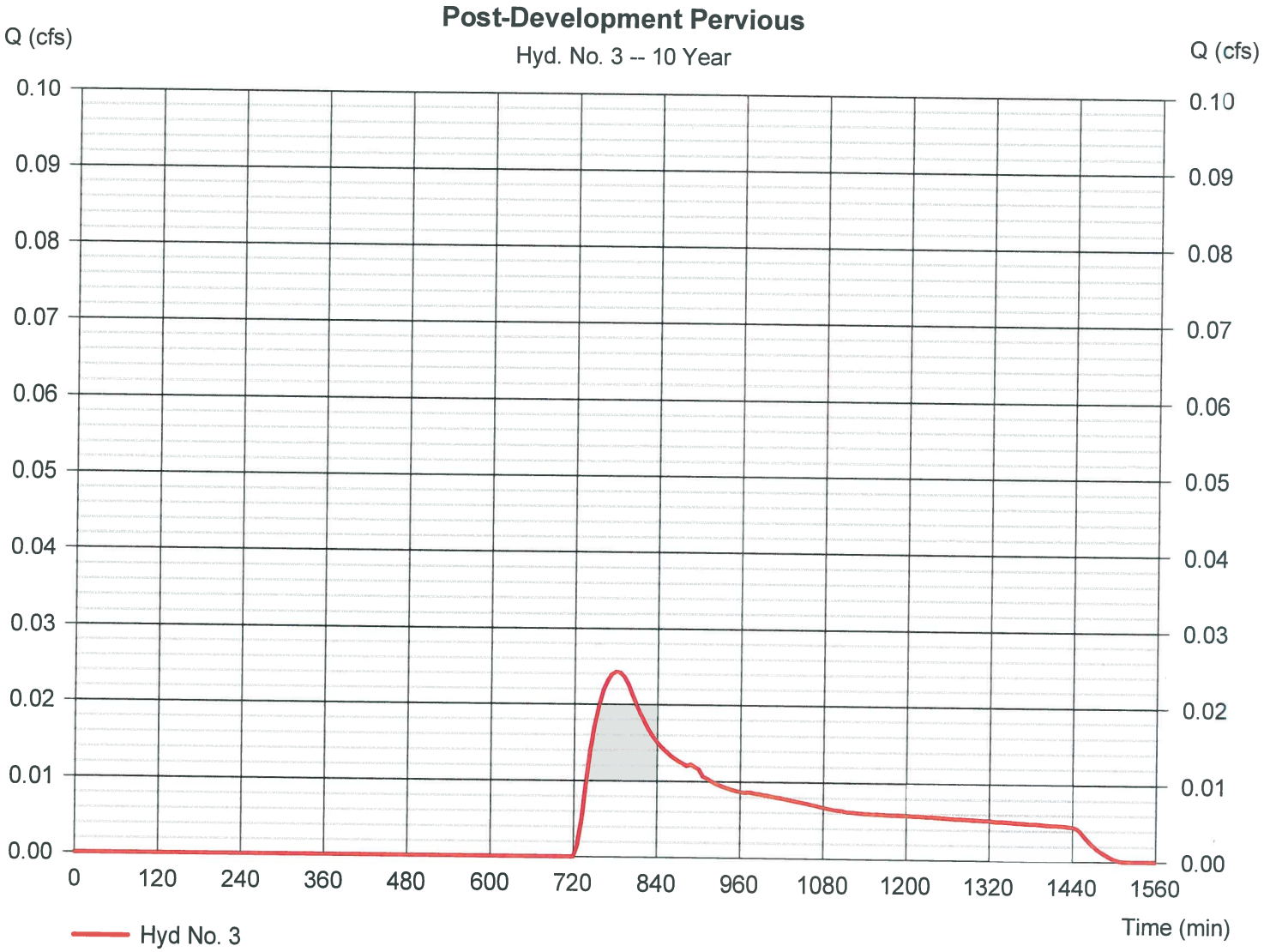
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 10 / 28 / 2024

Hyd. No. 3

Post-Development Pervious

Hydrograph type	= SCS Runoff	Peak discharge	= 0.024 cfs
Storm frequency	= 10 yrs	Time to peak	= 780 min
Time interval	= 6 min	Hyd. volume	= 390 cuft
Drainage area	= 0.201 ac	Curve number	= 39
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 21.00 min
Total precip.	= 6.25 in	Distribution	= Custom
Storm duration	= NOAA TYPE D.cds	Shape factor	= 285



Hydrograph Report

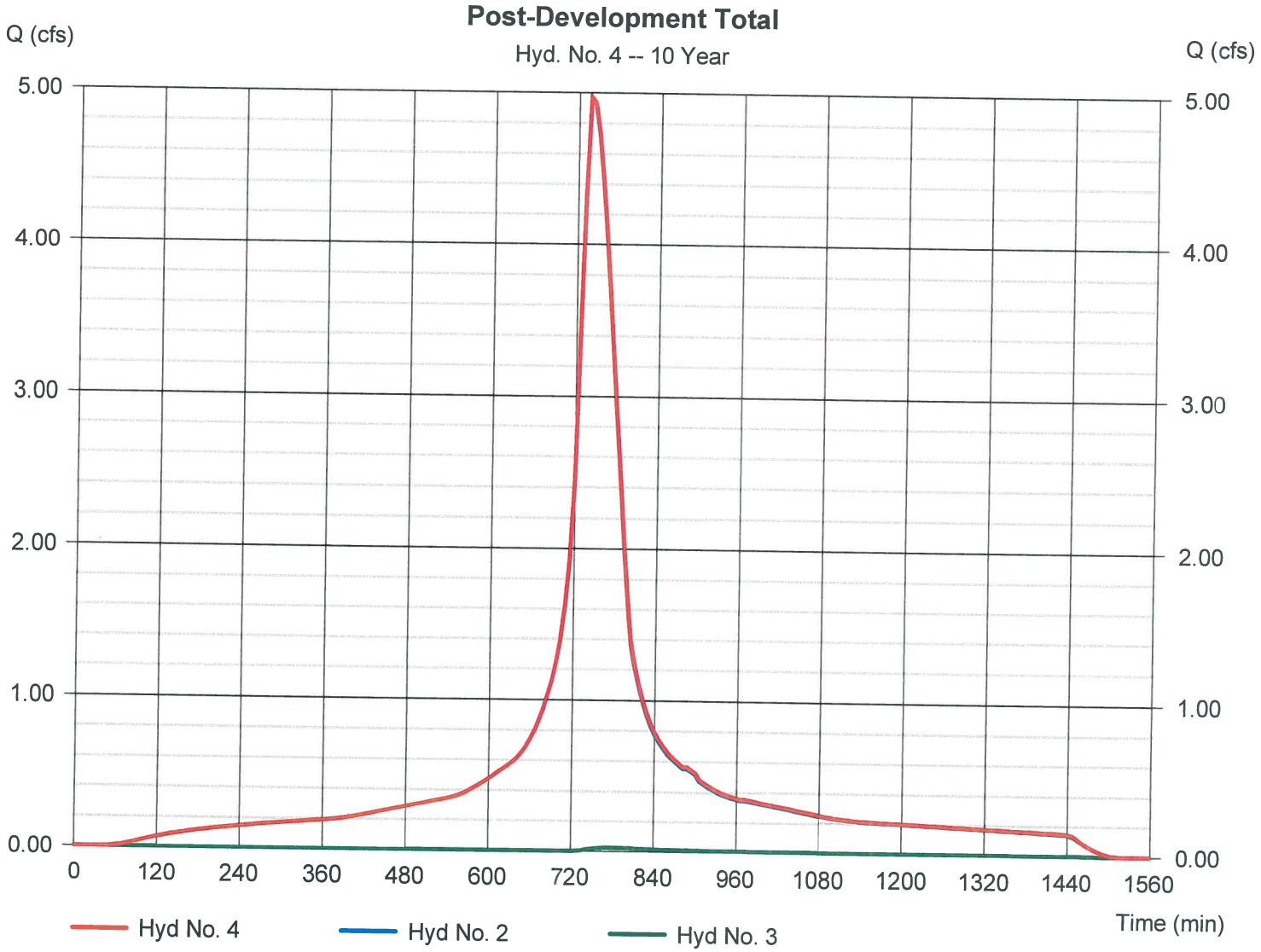
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 10 / 28 / 2024

Hyd. No. 4

Post-Development Total

Hydrograph type	= Combine	Peak discharge	= 4.970 cfs
Storm frequency	= 10 yrs	Time to peak	= 738 min
Time interval	= 6 min	Hyd. volume	= 43,340 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 2.111 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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	12.18	6	732	83,253	------	------	------	Pre-Development
2	SCS Runoff	8.902	6	738	78,153	------	------	------	Post-Development Impervious
3	SCS Runoff	0.225	6	750	2,057	------	------	------	Post-Development Pervious
4	Combine	9.105	6	738	80,210	2, 3	------	------	Post-Development Total

Hydrograph Report

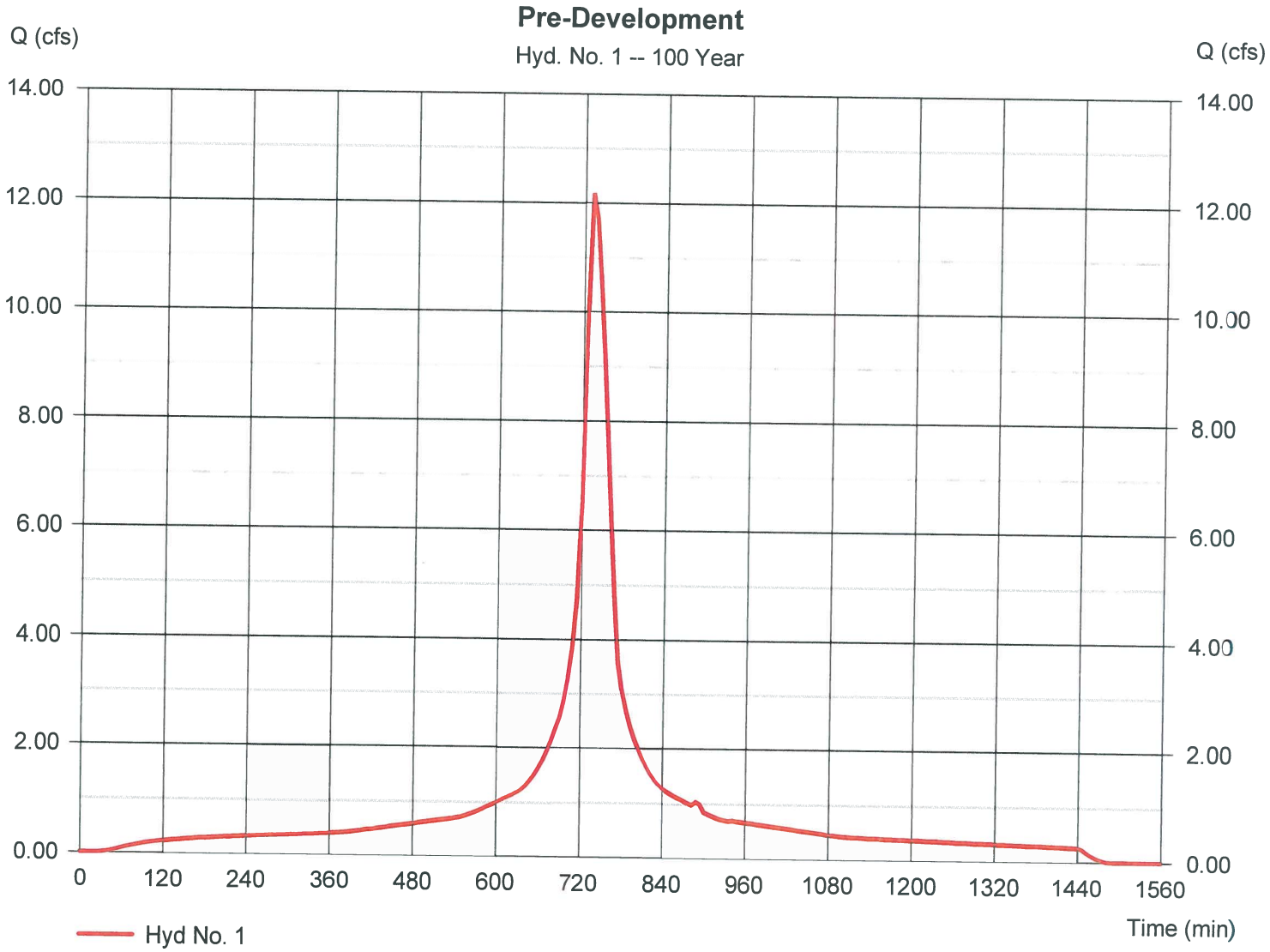
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 10 / 28 / 2024

Hyd. No. 1

Pre-Development

Hydrograph type	= SCS Runoff	Peak discharge	= 12.18 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 6 min	Hyd. volume	= 83,253 cuft
Drainage area	= 2.110 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 14.09 min
Total precip.	= 11.18 in	Distribution	= Custom
Storm duration	= NOAA TYPE D.cds	Shape factor	= 285



Hydrograph Report

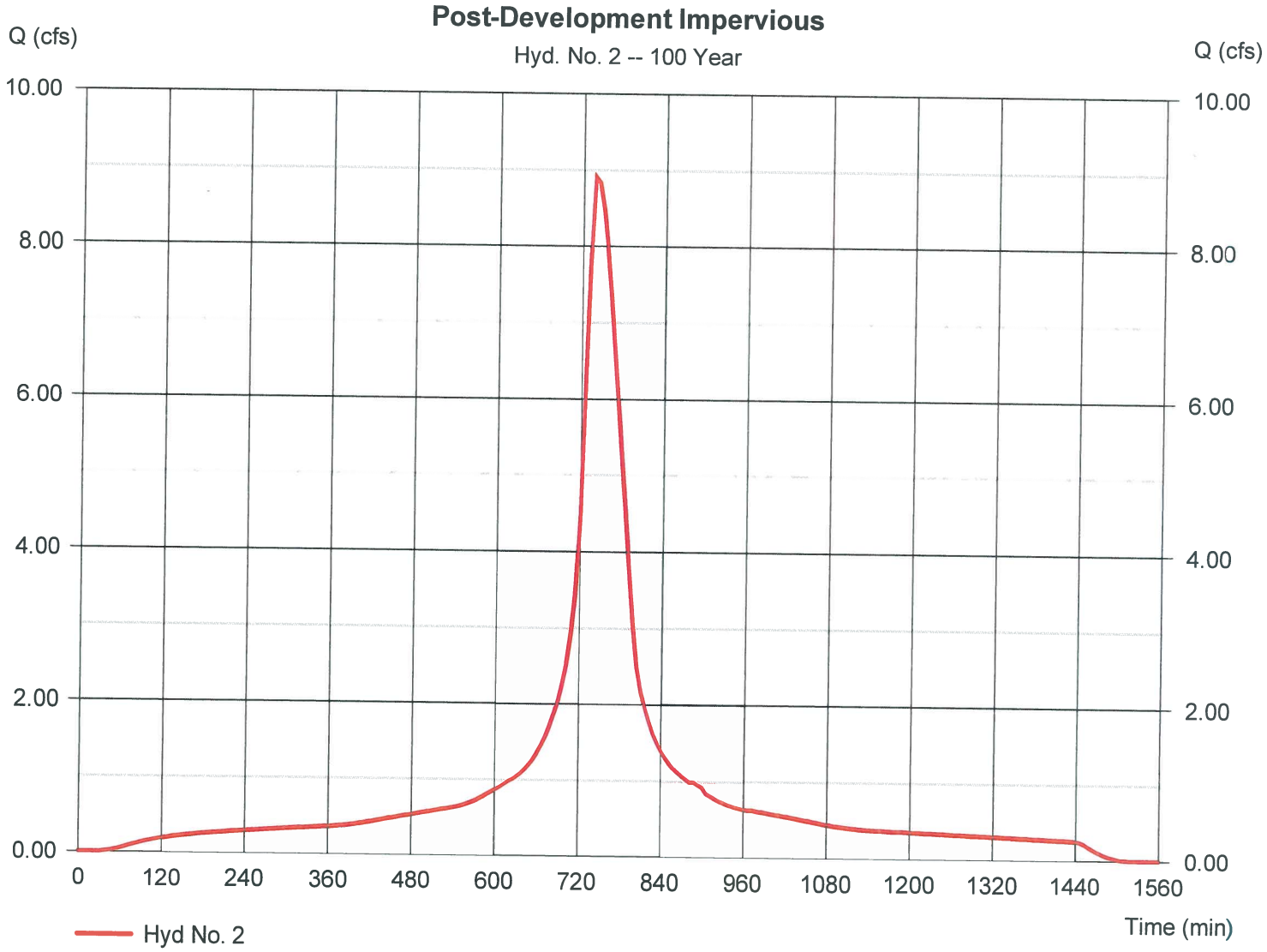
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 10 / 28 / 2024

Hyd. No. 2

Post-Development Impervious

Hydrograph type	= SCS Runoff	Peak discharge	= 8.902 cfs
Storm frequency	= 100 yrs	Time to peak	= 738 min
Time interval	= 6 min	Hyd. volume	= 78,153 cuft
Drainage area	= 1.910 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 21.00 min
Total precip.	= 11.18 in	Distribution	= Custom
Storm duration	= NOAA TYPE D.cds	Shape factor	= 285



Hydrograph Report

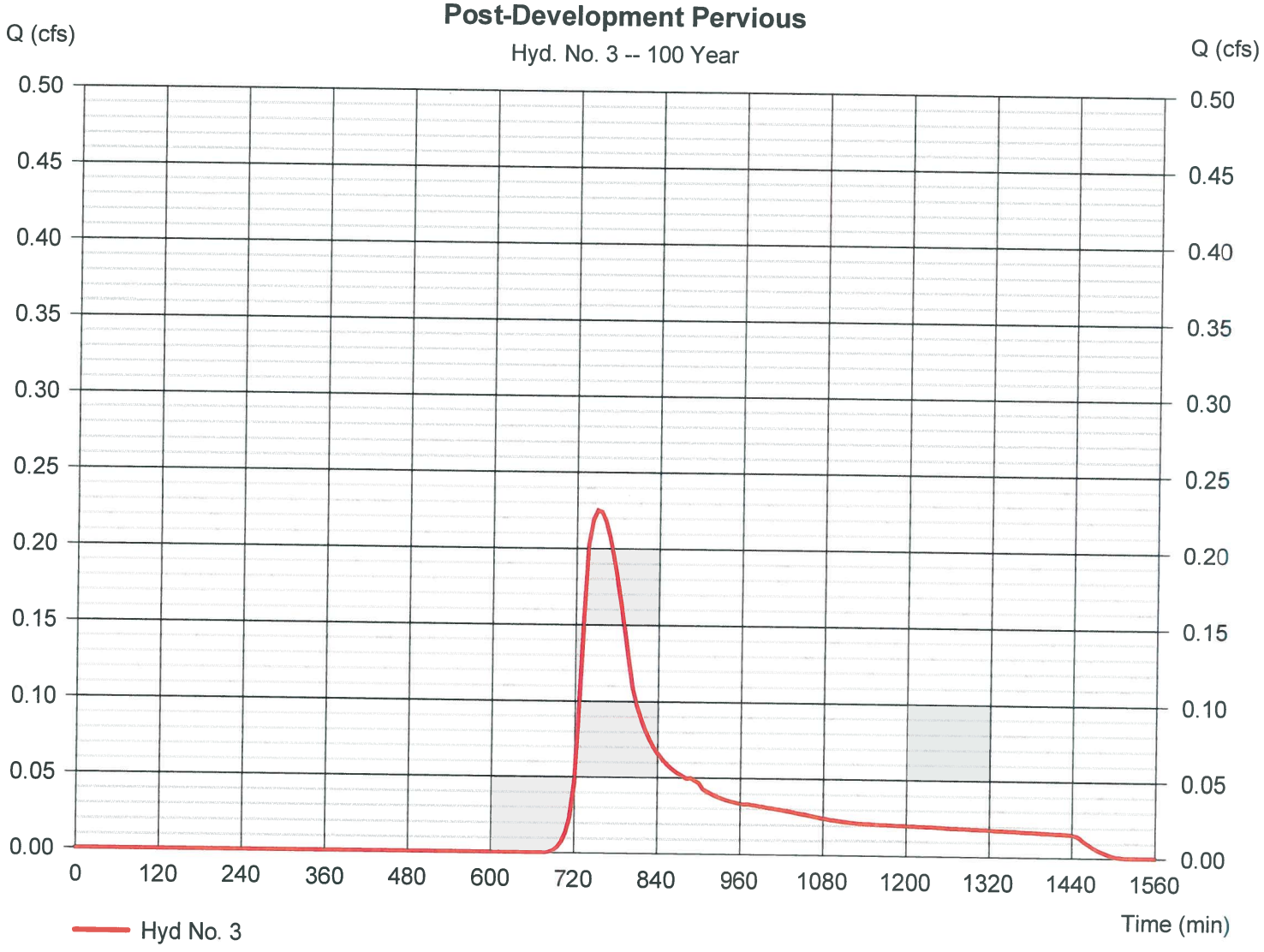
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 10 / 28 / 2024

Hyd. No. 3

Post-Development Pervious

Hydrograph type	= SCS Runoff	Peak discharge	= 0.225 cfs
Storm frequency	= 100 yrs	Time to peak	= 750 min
Time interval	= 6 min	Hyd. volume	= 2,057 cuft
Drainage area	= 0.201 ac	Curve number	= 39
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 21.00 min
Total precip.	= 11.18 in	Distribution	= Custom
Storm duration	= NOAA TYPE D.cds	Shape factor	= 285

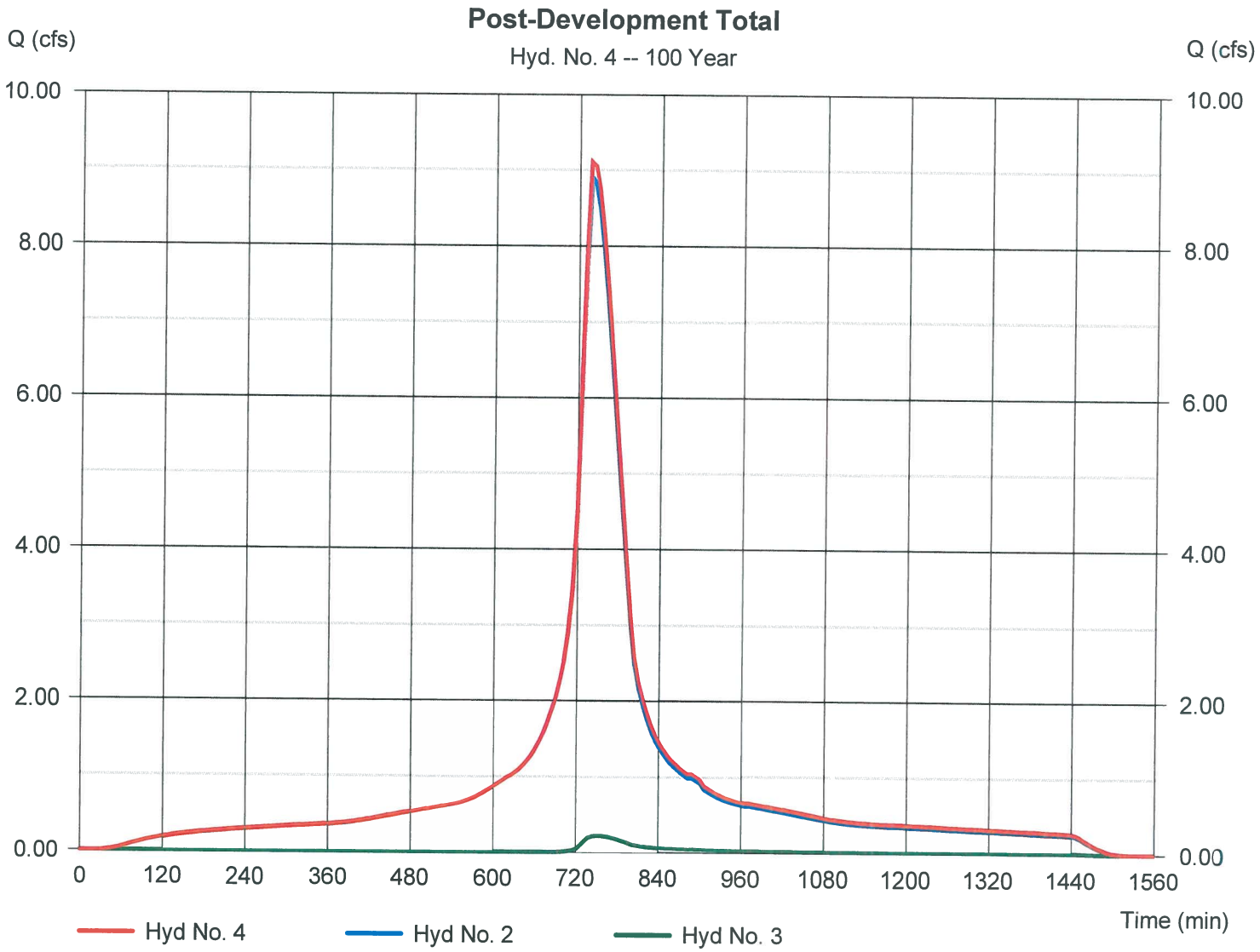


Hydrograph Report

Hyd. No. 4

Post-Development Total

Hydrograph type	= Combine	Peak discharge	= 9.105 cfs
Storm frequency	= 100 yrs	Time to peak	= 738 min
Time interval	= 6 min	Hyd. volume	= 80,210 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 2.111 ac



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	12.0317	0.6000	0.5720	--------
2	10.8385	0.1000	0.5273	--------
3	0.0000	0.0000	0.0000	--------
5	22.0563	2.0000	0.6282	--------
10	22.4454	1.1000	0.6004	--------
25	19.5187	0.1000	0.5221	--------
50	27.0380	1.0000	0.5792	--------
100	30.9606	1.8000	0.5915	--------

File name: Sandy Hook.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	4.49	3.12	2.50	2.13	1.88	1.70	1.56	1.45	1.35	1.27	1.21	1.15
2	4.59	3.20	2.59	2.23	1.98	1.80	1.66	1.55	1.45	1.38	1.31	1.25
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.50	4.63	3.72	3.16	2.78	2.50	2.28	2.11	1.96	1.84	1.74	1.65
10	7.58	5.29	4.23	3.60	3.17	2.85	2.61	2.41	2.25	2.12	2.00	1.90
25	8.34	5.84	4.73	4.07	3.63	3.30	3.05	2.84	2.67	2.53	2.41	2.30
50	9.58	6.74	5.43	4.64	4.10	3.70	3.39	3.15	2.94	2.77	2.63	2.50
100	9.96	7.19	5.83	5.00	4.43	4.00	3.67	3.40	3.18	3.00	2.84	2.70

Tc = time in minutes. Values may exceed 60.

Precip. file name: Sea Bright Future Adjusted.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	4.07	0.00	0.00	6.25	0.00	0.00	11.18
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	4.07	0.00	0.00	6.25	0.00	0.00	11.18

APPENDIX D

Web Soils Survey

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Monmouth County, New Jersey

July 26, 2023

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

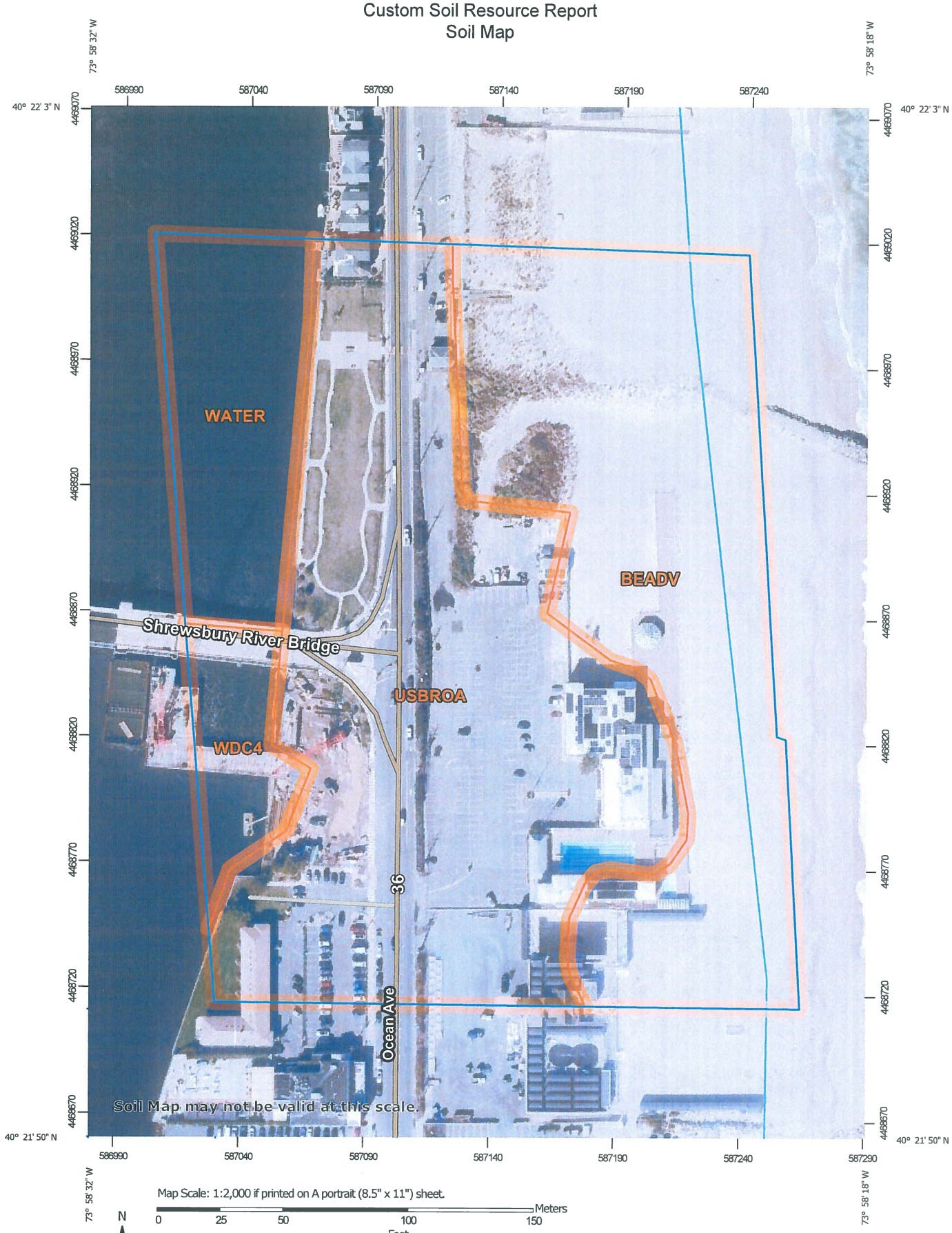
The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Custom Soil Resource Report
Soil Map



Map Scale: 1:2,000 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BEADV	Beaches, 0 to 15 percent slopes, very frequently flooded	6.4	36.1%
USBROA	Urban land-Brockatonorton complex, 0 to 2 percent slopes, occasionally flooded	8.4	47.7%
WATER	Water	2.0	11.3%
WDC4	Dredge Channel, 2 to 4 meter water depth	0.9	4.8%
Totals for Area of Interest		**17.7**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

Monmouth County, New Jersey

BEADV—Beaches, 0 to 15 percent slopes, very frequently flooded

Map Unit Setting

National map unit symbol: 2xhp6
Elevation: 0 to 20 feet
Mean annual precipitation: 41 to 50 inches
Mean annual air temperature: 46 to 58 degrees F
Frost-free period: 190 to 260 days
Farmland classification: Not prime farmland

Map Unit Composition

Beaches, frequently flooded: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Beaches, Frequently Flooded

Setting

Landform: Dunes
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Beach sand

Typical profile

A - 0 to 6 inches: sand
C - 6 to 80 inches: coarse sand

Properties and qualities

Slope: 0 to 15 percent
Drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: About 0 to 7 inches
Frequency of flooding: Frequent
Maximum salinity: Slightly saline to strongly saline (4.0 to 16.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8w
Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Minor Components

Urban land, occasionally flooded

Percent of map unit: 5 percent
Landform: Beaches
Down-slope shape: Linear
Across-slope shape: Convex, linear
Hydric soil rating: Unranked

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy eolian deposits and/or sandy marine deposits

Typical profile

A - 0 to 3 inches: sand
C - 3 to 24 inches: sand
Cg - 24 to 50 inches: sand
Oese - 50 to 60 inches: mucky peat
Cseg - 60 to 80 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (1.98 to 19.98 in/hr)
Depth to water table: About 17 to 30 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Maximum salinity: Nonsaline to strongly saline (0.0 to 16.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Psamments, wet substratum, occasionally flooded

Percent of map unit: 10 percent
Landform: Flats
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

WATER—Water

Map Unit Setting

National map unit symbol: 4j93
Mean annual precipitation: 30 to 64 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 131 to 178 days
Farmland classification: Not prime farmland

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APPENDIX E
Rainfall Data

NOAA Atlas 14, Volume 2, Version 3
Location name: Sea Bright Borough, New Jersey, USA*
Latitude: 40.3621°, Longitude: -73.9739°
Elevation: 6 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

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	**0.343** (0.311-0.379)	**0.410** (0.372-0.452)	**0.485** (0.439-0.536)	**0.541** (0.489-0.598)	**0.613** (0.551-0.678)	**0.664** (0.593-0.733)	**0.715** (0.635-0.792)	**0.763** (0.673-0.848)	**0.825** (0.718-0.922)	**0.873** (0.752-0.981)
10-min	**0.547** (0.496-0.604)	**0.656** (0.595-0.724)	**0.778** (0.704-0.860)	**0.866** (0.783-0.957)	**0.974** (0.876-1.08)	**1.05** (0.941-1.16)	**1.13** (1.01-1.26)	**1.21** (1.06-1.34)	**1.30** (1.13-1.45)	**1.37** (1.18-1.54)
15-min	**0.683** (0.619-0.755)	**0.822** (0.746-0.908)	**0.981** (0.888-1.08)	**1.09** (0.987-1.21)	**1.23** (1.11-1.36)	**1.33** (1.19-1.47)	**1.43** (1.27-1.58)	**1.52** (1.34-1.69)	**1.64** (1.42-1.83)	**1.72** (1.48-1.93)
30-min	**0.936** (0.849-1.03)	**1.14** (1.03-1.25)	**1.39** (1.26-1.54)	**1.58** (1.43-1.75)	**1.82** (1.64-2.01)	**2.00** (1.79-2.21)	**2.18** (1.94-2.42)	**2.36** (2.08-2.62)	**2.59** (2.26-2.90)	**2.77** (2.39-3.11)
60-min	**1.17** (1.06-1.29)	**1.42** (1.29-1.57)	**1.78** (1.62-1.97)	**2.06** (1.86-2.27)	**2.42** (2.18-2.68)	**2.71** (2.42-2.99)	**3.00** (2.67-3.33)	**3.30** (2.91-3.67)	**3.72** (3.23-4.15)	**4.04** (3.48-4.54)
2-hr	**1.45** (1.31-1.61)	**1.77** (1.60-1.96)	**2.24** (2.02-2.48)	**2.60** (2.34-2.88)	**3.09** (2.77-3.43)	**3.50** (3.11-3.88)	**3.92** (3.46-4.36)	**4.36** (3.82-4.86)	**4.98** (4.30-5.58)	**5.48** (4.69-6.17)
3-hr	**1.60** (1.45-1.78)	**1.96** (1.78-2.17)	**2.48** (2.24-2.75)	**2.88** (2.60-3.20)	**3.45** (3.09-3.83)	**3.92** (3.48-4.35)	**4.40** (3.88-4.89)	**4.92** (4.30-5.47)	**5.65** (4.86-6.32)	**6.24** (5.30-7.02)
6-hr	**2.04** (1.84-2.27)	**2.48** (2.25-2.76)	**3.12** (2.82-3.47)	**3.64** (3.28-4.03)	**4.38** (3.90-4.85)	**4.99** (4.42-5.53)	**5.65** (4.95-6.26)	**6.34** (5.51-7.05)	**7.34** (6.27-8.21)	**8.17** (6.89-9.17)
12-hr	**2.49** (2.25-2.75)	**3.02** (2.73-3.35)	**3.82** (3.45-4.23)	**4.49** (4.03-4.96)	**5.46** (4.87-6.03)	**6.29** (5.56-6.94)	**7.18** (6.28-7.94)	**8.17** (7.04-9.05)	**9.61** (8.14-10.7)	**10.8** (9.03-12.1)
24-hr	**2.82** (2.58-3.09)	**3.42** (3.14-3.75)	**4.40** (4.03-4.83)	**5.25** (4.79-5.74)	**6.52** (5.92-7.10)	**7.63** (6.86-8.29)	**8.87** (7.91-9.63)	**10.3** (9.05-11.1)	**12.4** (10.7-13.4)	**14.2** (12.1-15.4)
2-day	**3.34** (3.06-3.69)	**4.05** (3.71-4.47)	**5.21** (4.75-5.74)	**6.19** (5.62-6.80)	**7.65** (6.91-8.41)	**8.91** (8.00-9.79)	**10.3** (9.18-11.3)	**11.9** (10.4-13.1)	**14.2** (12.3-15.7)	**16.2** (13.9-17.9)
3-day	**3.52** (3.24-3.86)	**4.27** (3.93-4.68)	**5.47** (5.02-5.98)	**6.48** (5.92-7.08)	**7.97** (7.25-8.71)	**9.26** (8.36-10.1)	**10.7** (9.56-11.7)	**12.2** (10.9-13.4)	**14.6** (12.7-16.0)	**16.6** (14.3-18.2)
4-day	**3.70** (3.42-4.03)	**4.49** (4.15-4.89)	**5.72** (5.28-6.23)	**6.76** (6.22-7.36)	**8.30** (7.59-9.01)	**9.60** (8.73-10.4)	**11.0** (9.95-12.0)	**12.6** (11.3-13.7)	**15.0** (13.2-16.3)	**17.0** (14.8-18.6)

7-day	**4.27** (3.96-4.61)	**5.14** (4.77-5.55)	**6.45** (5.98-6.96)	**7.55** (6.98-8.14)	**9.15** (8.42-9.85)	**10.5** (9.60-11.3)	**12.0** (10.9-12.9)	**13.5** (12.2-14.6)	**15.9** (14.1-17.2)	**17.8** (15.6-19.4)
10-day	**4.80** (4.48-5.14)	**5.75** (5.37-6.16)	**7.10** (6.63-7.62)	**8.22** (7.66-8.81)	**9.82** (9.12-10.5)	**11.2** (10.3-12.0)	**12.6** (11.5-13.5)	**14.1** (12.8-15.1)	**16.4** (14.7-17.6)	**18.3** (16.2-19.7)
20-day	**6.49** (6.11-6.90)	**7.72** (7.27-8.20)	**9.27** (8.73-9.83)	**10.5** (9.88-11.1)	**12.2** (11.4-12.9)	**13.5** (12.6-14.3)	**14.9** (13.9-15.8)	**16.3** (15.1-17.3)	**18.2** (16.7-19.4)	**19.8** (18.0-21.1)
30-day	**8.05** (7.64-8.50)	**9.52** (9.03-10.1)	**11.2** (10.6-11.8)	**12.6** (11.9-13.2)	**14.3** (13.5-15.1)	**15.7** (14.8-16.6)	**17.1** (16.0-18.0)	**18.4** (17.2-19.4)	**20.2** (18.7-21.4)	**21.6** (19.9-22.9)
45-day	**10.2** (9.70-10.7)	**12.0** (11.4-12.6)	**14.0** (13.3-14.7)	**15.5** (14.7-16.3)	**17.4** (16.5-18.3)	**18.9** (17.9-19.8)	**20.3** (19.1-21.3)	**21.7** (20.4-22.8)	**23.4** (21.9-24.8)	**24.7** (23.0-26.2)
60-day	**12.2** (11.6-12.8)	**14.4** (13.7-15.1)	**16.5** (15.7-17.3)	**18.1** (17.2-19.0)	**20.1** (19.1-21.1)	**21.6** (20.5-22.7)	**23.0** (21.7-24.1)	**24.3** (22.9-25.6)	**26.0** (24.4-27.4)	**27.2** (25.5-28.7)

[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.

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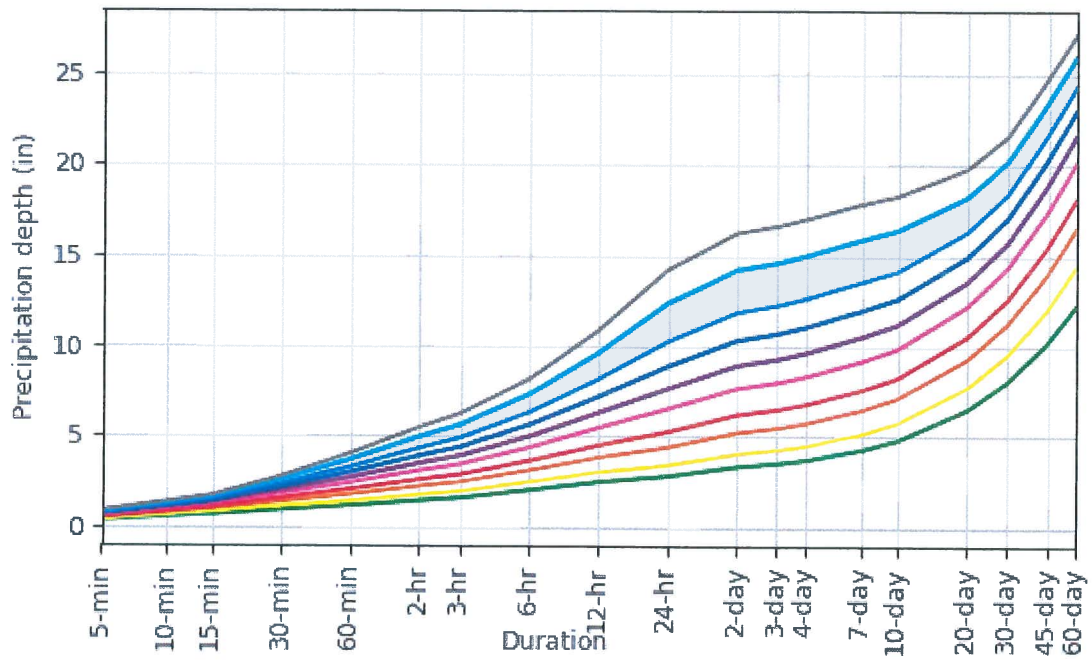
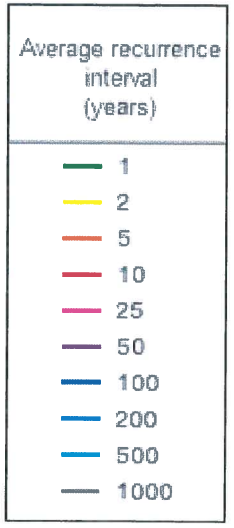
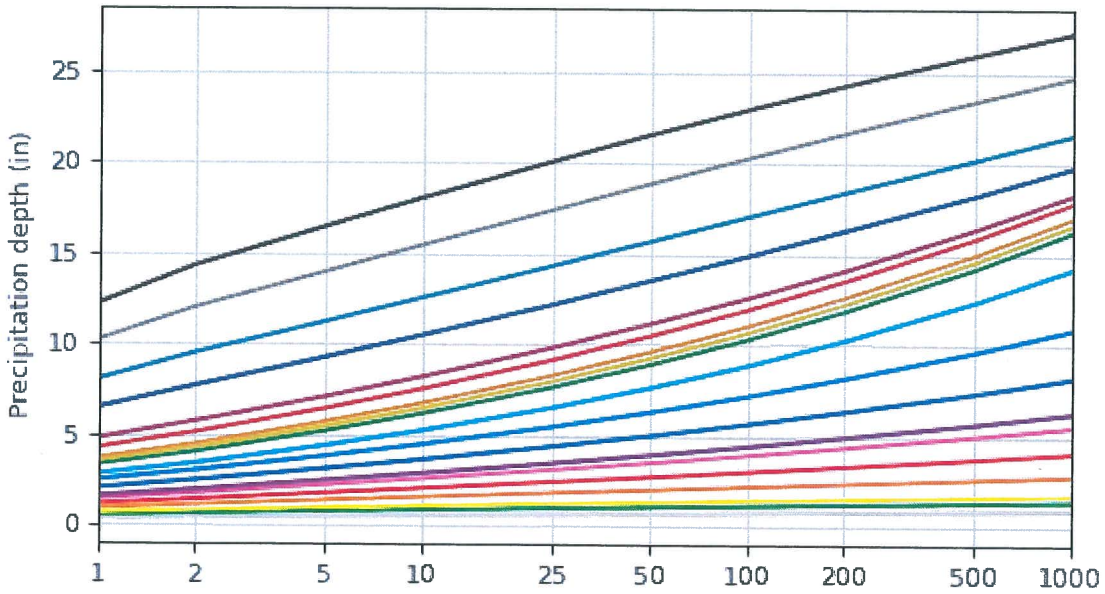
PF graphical

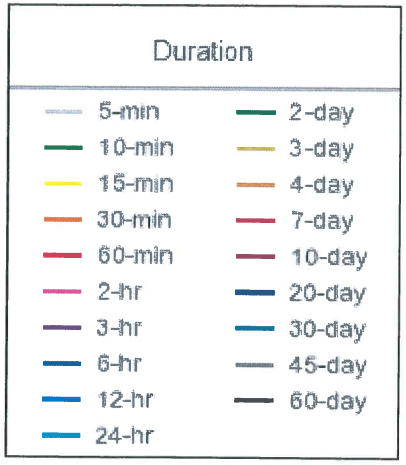
PDS-based depth-duration-frequency (DDF) curves

Latitude: 40.3621°, Longitude: -73.9739°









Average recurrence interval (years)

NOAA Atlas 14, Volume 2, Version 3

Created (GMT): Fri Oct 25 16:44:22 2024

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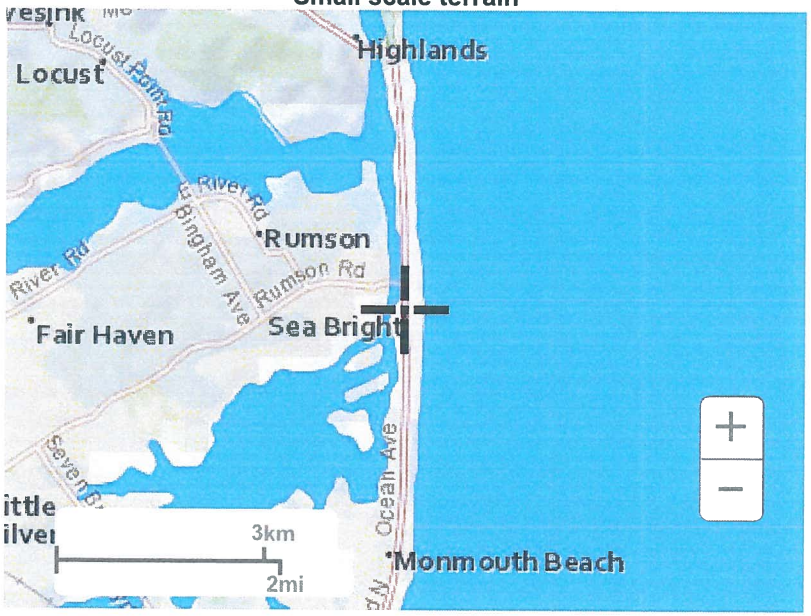
Maps & aerials

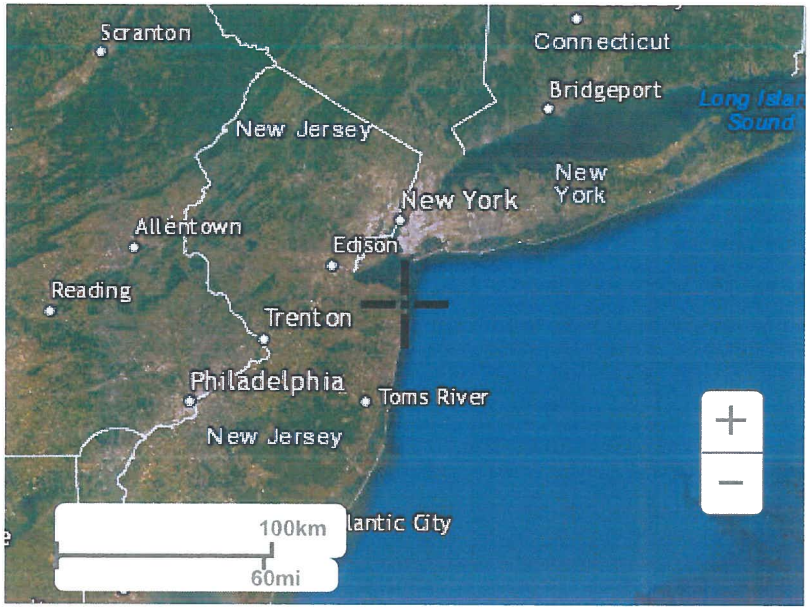
Small scale terrain



Large scale terrain

Large scale map

Large scale aerial



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