DRAINAGE REPORT

PROPOSED RESIDENTIAL APARTMENTS
131 FORT LEE ROAD
LOT 16, BLOCK 802
BOROUGH OF LEONIA
BERGEN COUNTY, NEW JERSEY
(JOB # 3956)

A-12
April 27, 2022

PREPARED ON:

May 5, 2021
April 5, 2022

PREPARED FOR:

FORT LEE ROAD, LLC
131 Fort Lee Road
Leonia, New Jersey 07605

HUBSCHMAN ENGINEERING, P.A.
MICHAEL J. HUBSCHMAN, P.E., P.P.
PROFESSIONAL ENGINEER AND PLANNER
263 A SOUTH WASHINGTON AVENUE
BERGENFIELD, NEW JERSEY 07621

NJPE No. 29497 NJPP No. 3200

TABLE OF CONTENTS

	Page
INTRODUCTION, EVALUATION AND CONCLUSIONS	i to ii
SECTION 1	
Present Flow & Developed Flow for 2, 10, 25 & 100-Year Storms	1.1 to 1.17
SECTION 2	
Seepage Pit Calculations	2.1
SECTION 3	
Direct Runoff Calculations	3.1

APPENDIX 1

- Site Location and Soil Type Map
- Typical Runoff Coefficients Table
- Time of Concentration (Tc) Nomograph
- IDF Curves and Tabulation

INTRODUCTION:

This report has been developed to demonstrate compliance of the proposed drainage improvements on the project site with the Borough of Leonia Stormwater Control Ordinance and the New Jersey Department of Environmental Protection (NJDEP) Stormwater Rules (N.J.A.C. 7:8). This project does not qualify as a major project under either of the above listed regulations since it proposes less than one acre of overall land disturbance and less than ¼ acre of net new impervious surface coverage.

The project site is located along the northerly side of Fort Lee Road (Bergen County Route 12) across form the intersection of Spring Street in the Borough of Leonia, Bergen County, New Jersey. The site is rectangular in shape, measuring 60 feet wide by 150 feet deep. The lot has an area of 9,000.00 square feet (0.207 acres). The applicant proposes to remove all existing improvement and construct a five-story residential apartment building with parking beneath. Other associated minor site improvements will also be constructed.

EVALUATION:

Storm water runoff for the site was analyzed utilizing the Modified Rational Method. The property was evaluated for the 2, 10, 25- and 100-year design storm events in the present and developed conditions. Consistent with the Stormwater Regulations in the New Jersey Residential Site Improvement Standards (RSIS), peak flow reductions to 50%, 75% and 80% were included in the Modified Rational Method analysis for the 2, 10- and 100-year design storm events respectively. The 25-year design storm was evaluated for the site in accordance with Bergen County requirements since the project site is located on a County roadway. No flow reductions are associated with the 25-year design storm event.

CONCLUSIONS:

Six (6) 6' deep, 6' diameter Seepage Pit are required to meet the design criteria. Seepage Pits location and details are shown on the Site Plan prepared for the project.

STORMWATER MANAGEMENT SUMMARY

Storm	Existing Runoff (CFS)	Allowable Percent of Existing Flow (%)	Allowable Runoff (CFS)	Post Construction Flow to Seepage Pit (CFS)	Storage Required for Developed Site (CF)	Storage Provided (CF)
2 Year	0.874	50	0.437	0.831	447	1,743
10 Year	1.160	75	0.870	1.104	186	1,743
25 Year	1.315	100	1.315	1.251	151	1,743
100 Year	1.544	80	1.235	1.470	375	1,743
Direct Runoff, 10-yr, 60 min. 2" in/hr.				0.363	1,307	1,743

SECTION 1

PRESENT FLOW & DEVELOPED FLOW FOR 2, 10, 25 & 100 - YEAR DESIGN STORMS

133 FORT LEE ROAD - LEONIA, NEW JERSEY - OUR FILE NO. 2694

DEVELOPED SITE AREA	= 9,000.00	SF	0.207	Ac
EXISTING IMPERVIOUS AREA	= 8,877.00	SF	0.204	Ac
PROPOSED IMPERVIOUS AREA	= 8,306.00	SF	0.191	Ac

SOIL TYPE = Urban Land - Udorthents (Boonton Series Nearby)
SOIL GROUP = C

C LAWN = 0.51
C IMPERVIOUS = 0.99

EXISTING

$$C = \frac{8{,}877.00 \cdot 0.99 + 1 \cdot 123.00 \cdot 0.51}{9{,}000.00} = 0.983$$

PROPOSED

$$C = \frac{8{,}306.00 \cdot 0.99 + 1 \cdot 694.00 \cdot 0.51}{9{,}000.00} = 0.953$$

SITE EXISTING FLOW & SITE ALLOWABLE FLOW (CFS)

											RSIS Factor		Allowable Flow	
								Existing Flow						
Q_2	=	CiA	=	0.983	*	4.30	*	0.207	=	0.874	CFS	* 0.50	=	0.437 CFS
Q_{10}	=	CiA	=	0.983	*	5.71	*	0.207	=	1.160	CFS	* 0.75	=	0.870 CFS
Q_{25}	=	CiA	=	0.983	*	6.47	*	0.207	=	1.315	CFS	* 1.00	=	1.315 CFS
Q_{100}	=	CiA	=	0.983	*	7.60	*	0.207	=	1.544	CFS	* 0.80	=	1.235 CFS

PROPOSED FLOW (CFS)

										Proposed Flow	
Q_2	=	CiA	=	0.953	*	4.30	*	0.207	=	0.847	CFS
Q_{10}	=	CiA	=	0.953	*	5.71	*	0.207	=	1.124	CFS
Q_{25}	=	CiA	=	0.953	*	6.47	*	0.207	=	1.274	CFS
Q_{100}	=	CiA	=	0.953	*	7.60	*	0.207	=	1.496	CFS

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 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	Rational	0.870	1	10	522	----	----	----	Existing Conditions - Peak Flows
3	Rational	0.843	1	10	506	----	----	----	Proposed Conditions - Peak Flows
5	Mod. Rational	0.521	1	10	816	-----	------	------	Proposed Conditions - Peak Flows

Hydrograph Report

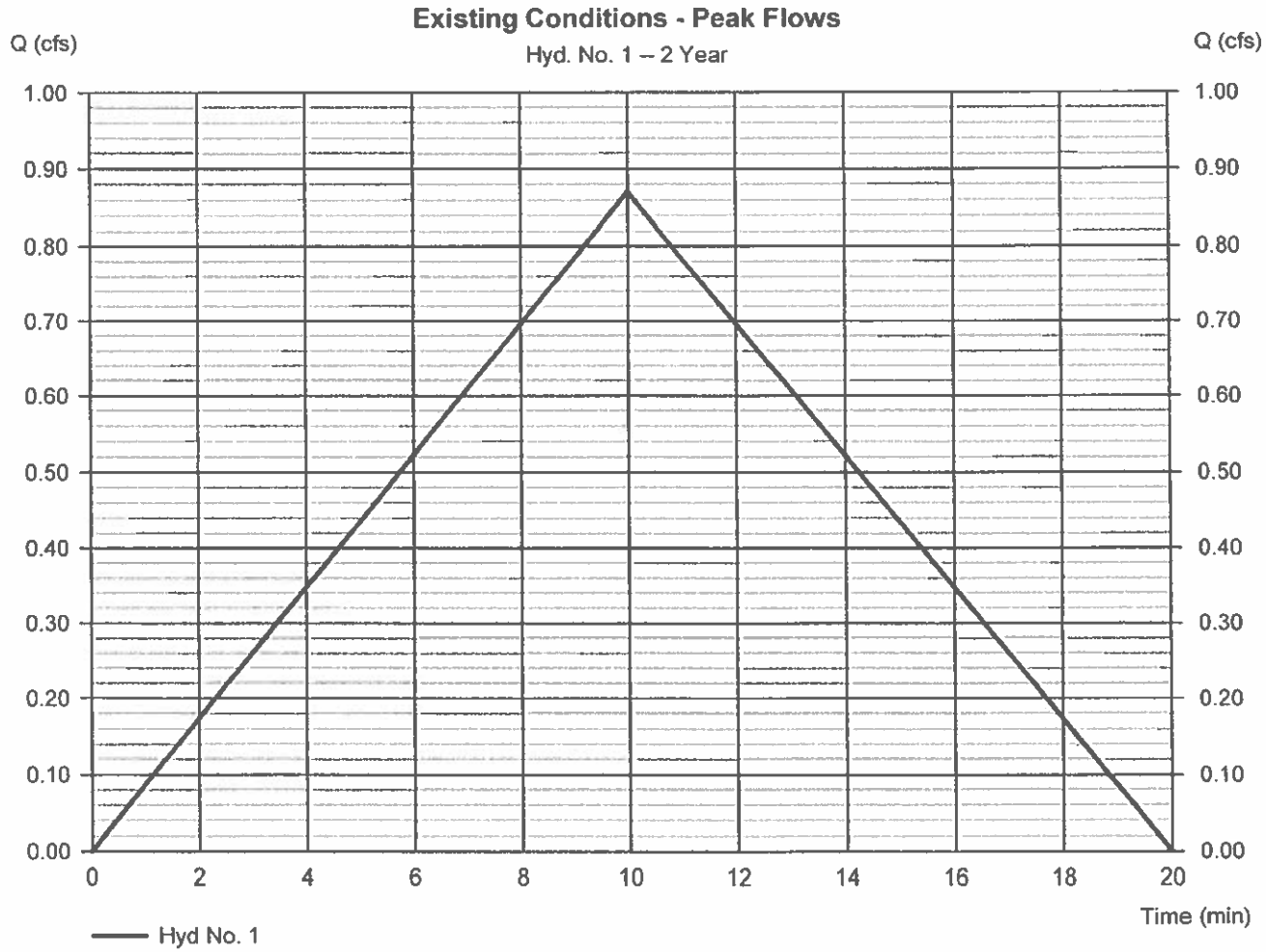
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 04 / 27 / 2022

Hyd. No. 1

Existing Conditions - Peak Flows

Hydrograph type	= Rational	Peak discharge	= 0.870 cfs
Storm frequency	= 2 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 522 cuft
Drainage area	= 0.210 ac	Runoff coeff.	= 0.98*
Intensity	= 4.225 in/hr	Tc by User	= 10.00 min
IDF Curve	= NJ-RSIS.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.003 x 0.51) + (0.204 x 0.99)] / 0.210



Hydrograph Report

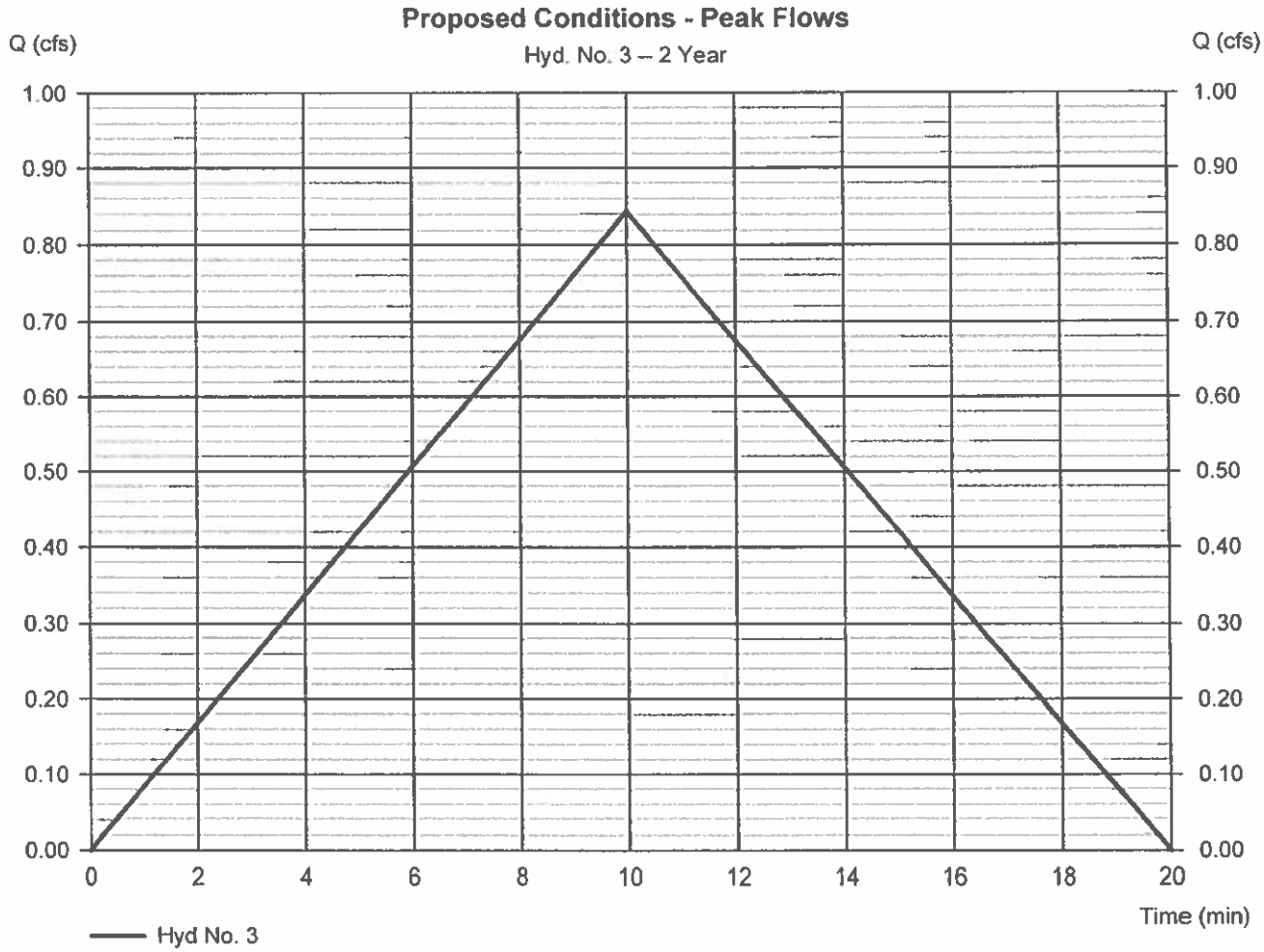
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 04 / 27 / 2022

Hyd. No. 3

Proposed Conditions - Peak Flows

Hydrograph type	= Rational	Peak discharge	= 0.843 cfs
Storm frequency	= 2 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 506 cuft
Drainage area	= 0.210 ac	Runoff coeff.	= 0.95*
Intensity	= 4.225 in/hr	Tc by User	= 10.00 min
IDF Curve	= NJ-RSIS.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.016 x 0.51) + (0.191 x 0.99)] / 0.210



Hydrograph Report

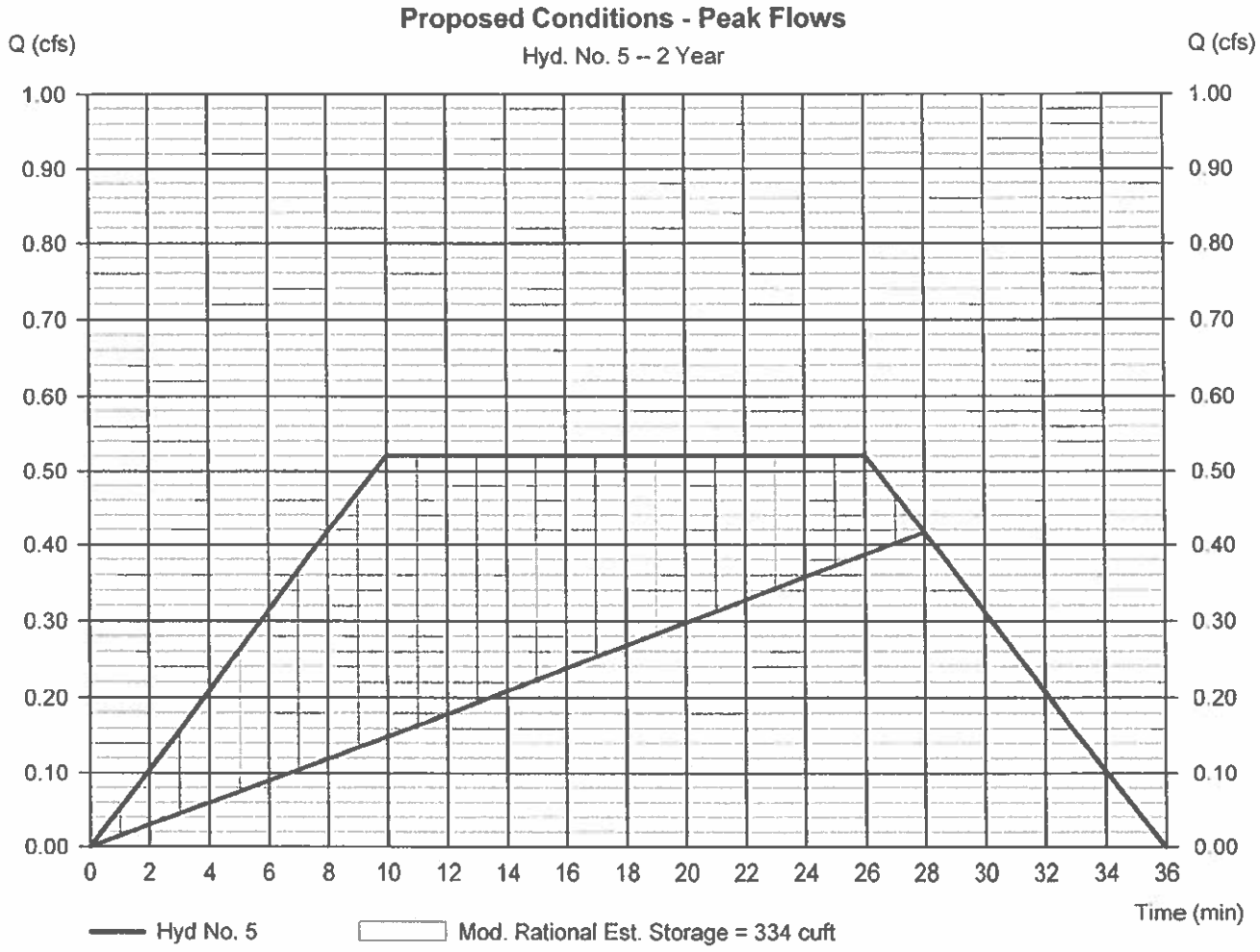
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 04 / 27 / 2022

Hyd. No. 5

Proposed Conditions - Peak Flows

Hydrograph type	= Mod. Rational	Peak discharge	= 0.521 cfs
Storm frequency	= 2 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 816 cuft
Drainage area	= 0.210 ac	Runoff coeff.	= 0.95*
Intensity	= 2.613 in/hr	Tc by User	= 10.00 min
IDF Curve	= NJ-RSIS.IDF	Storm duration	= 2.6 x Tc
Target Q	=0.437 cfs	Est. Req'd Storage	=334 cuft

* Composite (Area/C) = [(0.016 x 0.51) + (0.191 x 0.99)] / 0.210



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 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	Rational	1.144	1	10	687	—	—	—	Existing Conditions - Peak Flows
3	Rational	1.109	1	10	666	—	—	—	Proposed Conditions - Peak Flows
5	Mod. Rational	0.930	1	10	843	—	—	—	Proposed Conditions - Peak Flows

Hydrograph Report

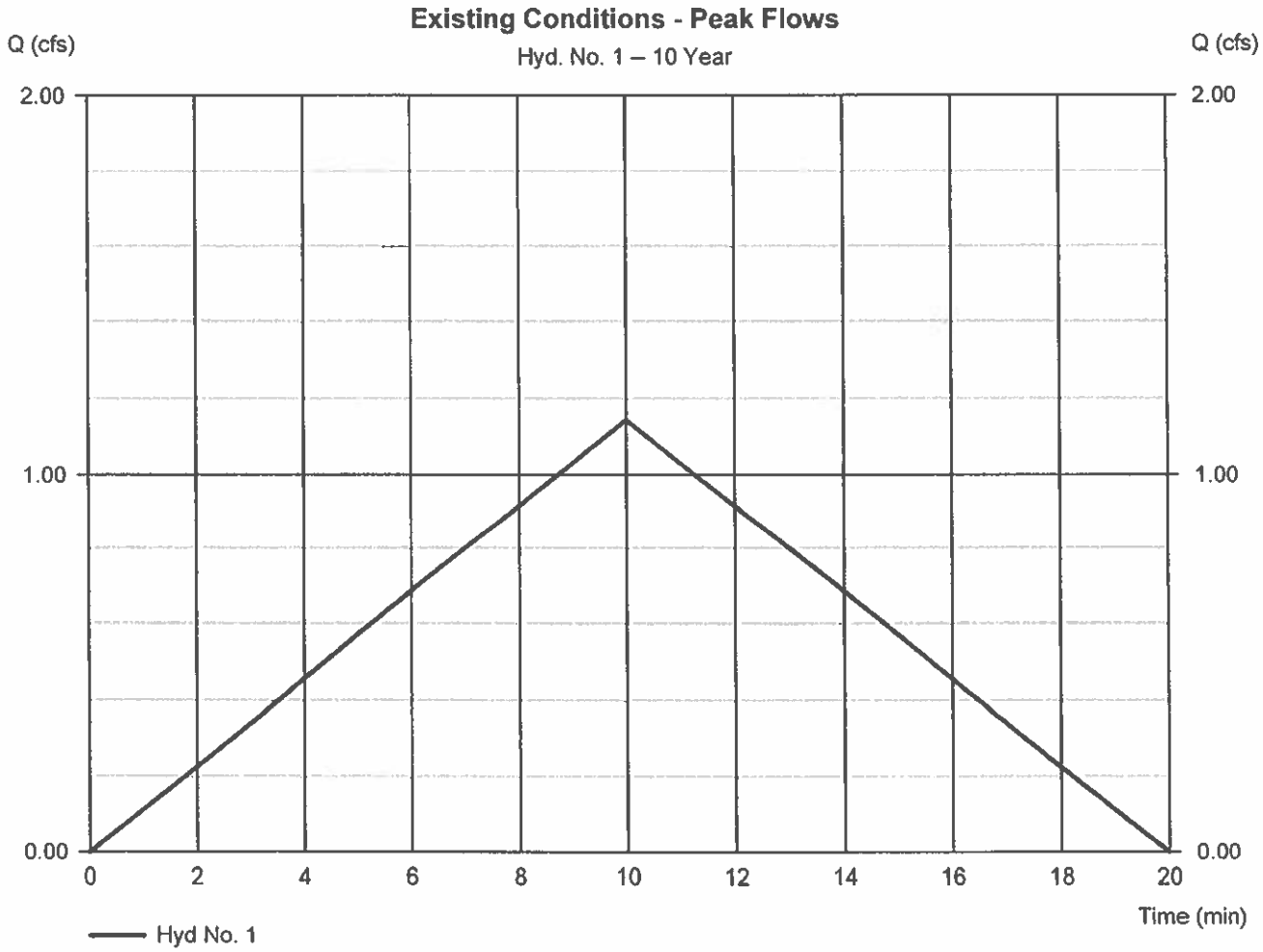
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 04 / 27 / 2022

Hyd. No. 1

Existing Conditions - Peak Flows

Hydrograph type	= Rational	Peak discharge	= 1.144 cfs
Storm frequency	= 10 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 687 cuft
Drainage area	= 0.210 ac	Runoff coeff.	= 0.98*
Intensity	= 5.560 in/hr	Tc by User	= 10.00 min
IDF Curve	= NJ-RSIS.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.003 x 0.51) + (0.204 x 0.99)] / 0.210



Hydrograph Report

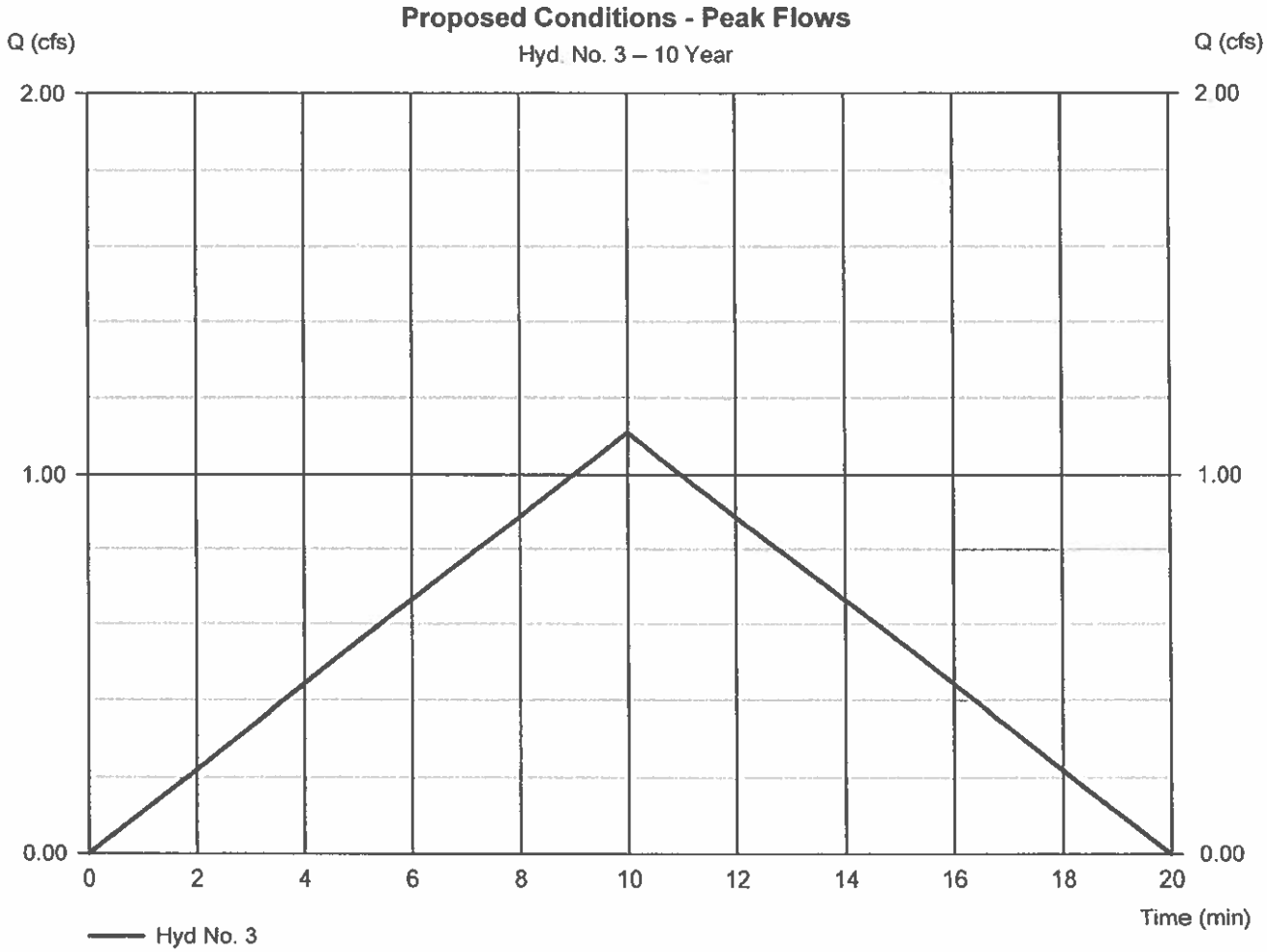
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 04 / 27 / 2022

Hyd. No. 3

Proposed Conditions - Peak Flows

Hydrograph type	= Rational	Peak discharge	= 1.109 cfs
Storm frequency	= 10 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 666 cuft
Drainage area	= 0.210 ac	Runoff coeff.	= 0.95*
Intensity	= 5.560 in/hr	Tc by User	= 10.00 min
IDF Curve	= NJ-RSIS.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.016 x 0.51) + (0.191 x 0.99)] / 0.210



Hydrograph Report

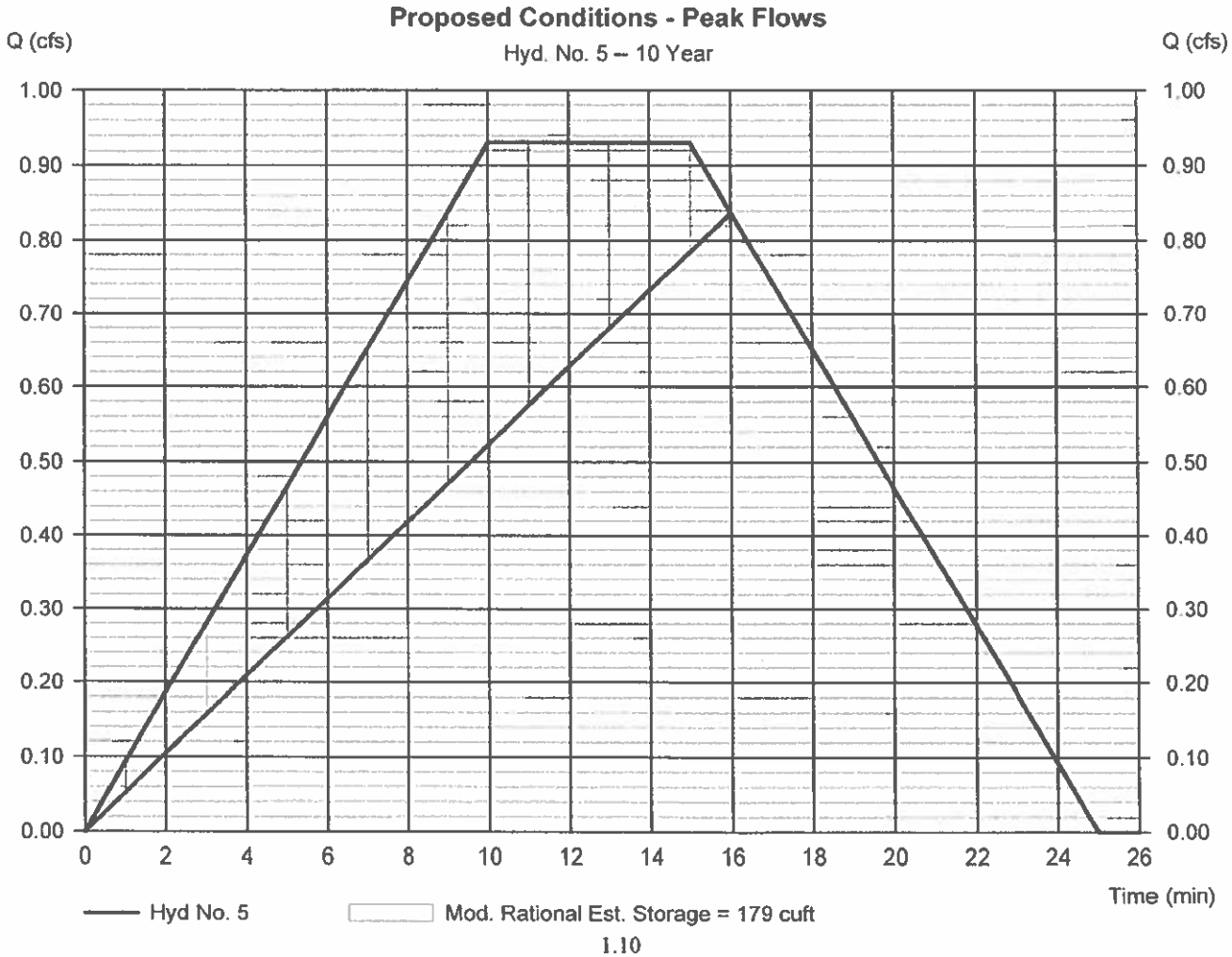
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 04 / 27 / 2022

Hyd. No. 5

Proposed Conditions - Peak Flows

Hydrograph type	= Mod. Rational	Peak discharge	= 0.930 cfs
Storm frequency	= 10 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 843 cuft
Drainage area	= 0.210 ac	Runoff coeff.	= 0.95*
Intensity	= 4.661 in/hr	Tc by User	= 10.00 min
IDF Curve	= NJ-RSIS.IDF	Storm duration	= 1.5 x Tc
Target Q	=0.870 cfs	Est. Req'd Storage	=179 cuft

* Composite (Area/C) = [(0.016 x 0.51) + (0.191 x 0.99)] / 0.210



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 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	Rational	1.314	1	10	788	----	----	----	Existing Conditions - Peak Flows
3	Rational	1.274	1	10	764	----	----	----	Proposed Conditions - Peak Flows
5	Mod. Rational	1.083	1	10	981	----	----	----	Proposed Conditions - Peak Flows

Hydrograph Report

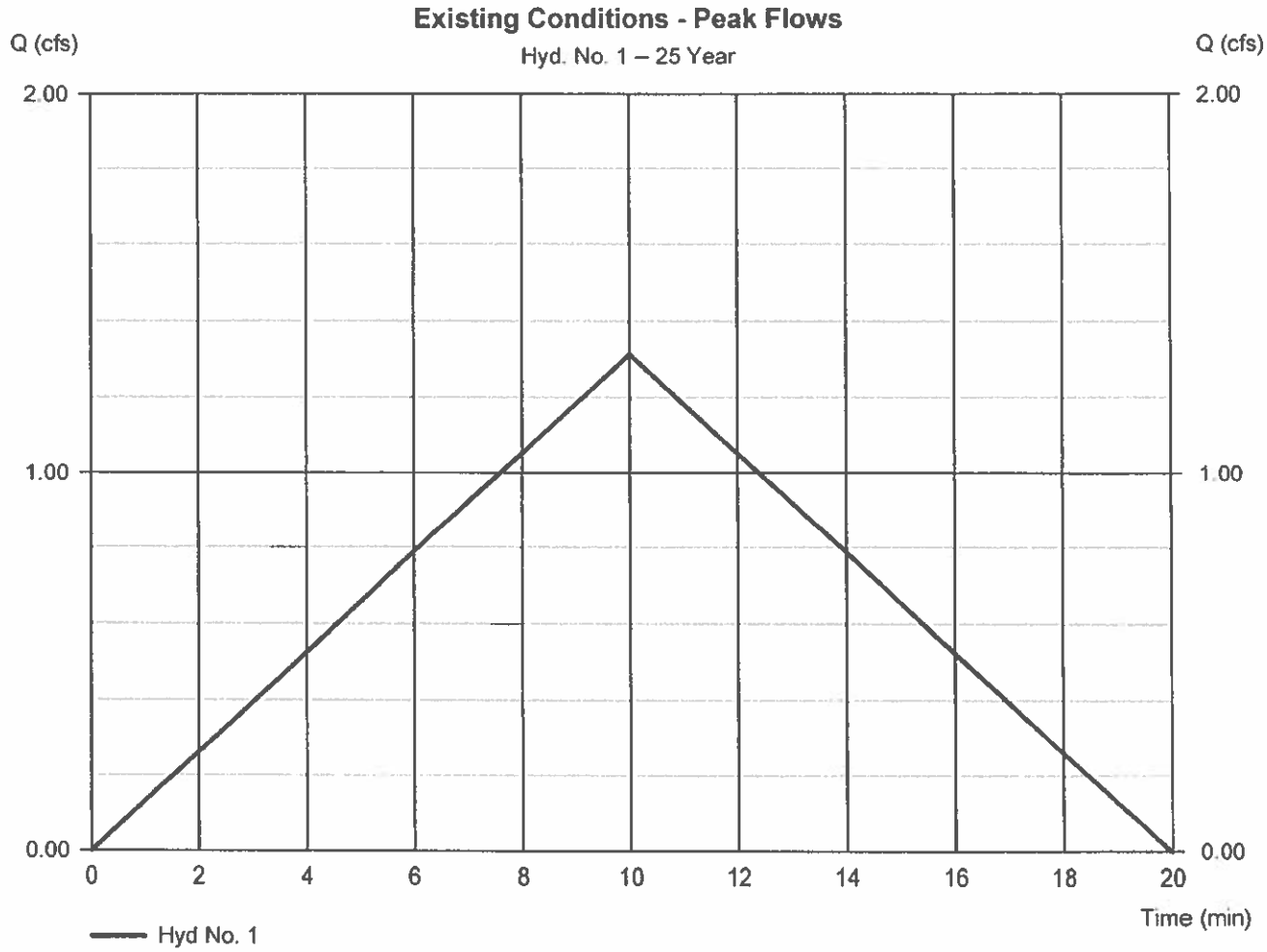
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 04 / 27 / 2022

Hyd. No. 1

Existing Conditions - Peak Flows

Hydrograph type	= Rational	Peak discharge	= 1.314 cfs
Storm frequency	= 25 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 788 cuft
Drainage area	= 0.210 ac	Runoff coeff.	= 0.98*
Intensity	= 6.386 in/hr	Tc by User	= 10.00 min
IDF Curve	= NJ-RSIS.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.003 x 0.51) + (0.204 x 0.99)] / 0.210



Hydrograph Report

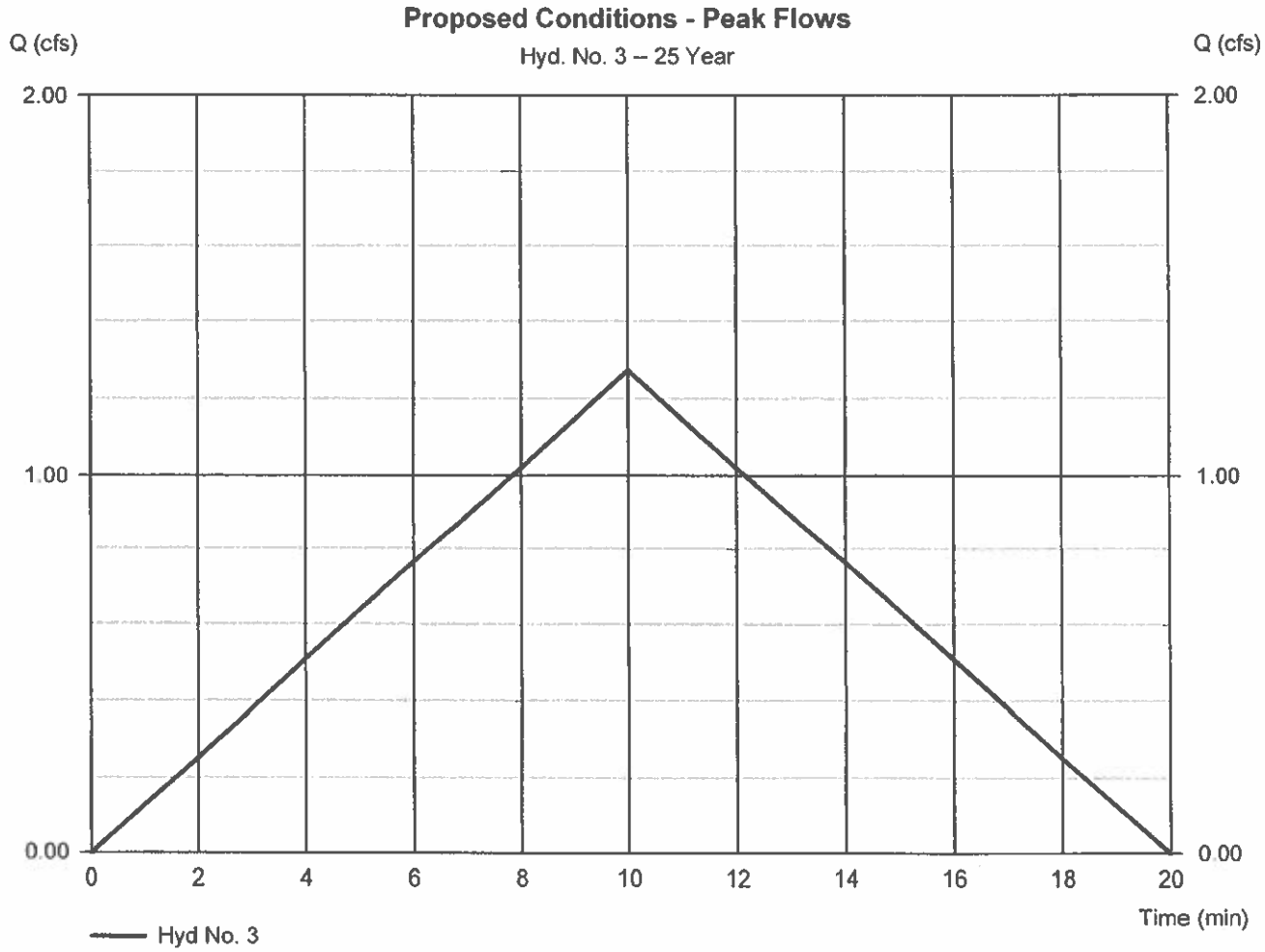
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 04 / 27 / 2022

Hyd. No. 3

Proposed Conditions - Peak Flows

Hydrograph type	= Rational	Peak discharge	= 1.274 cfs
Storm frequency	= 25 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 764 cuft
Drainage area	= 0.210 ac	Runoff coeff.	= 0.95*
Intensity	= 6.386 in/hr	Tc by User	= 10.00 min
IDF Curve	= NJ-RSIS.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.016 x 0.51) + (0.191 x 0.99)] / 0.210



Hydrograph Report

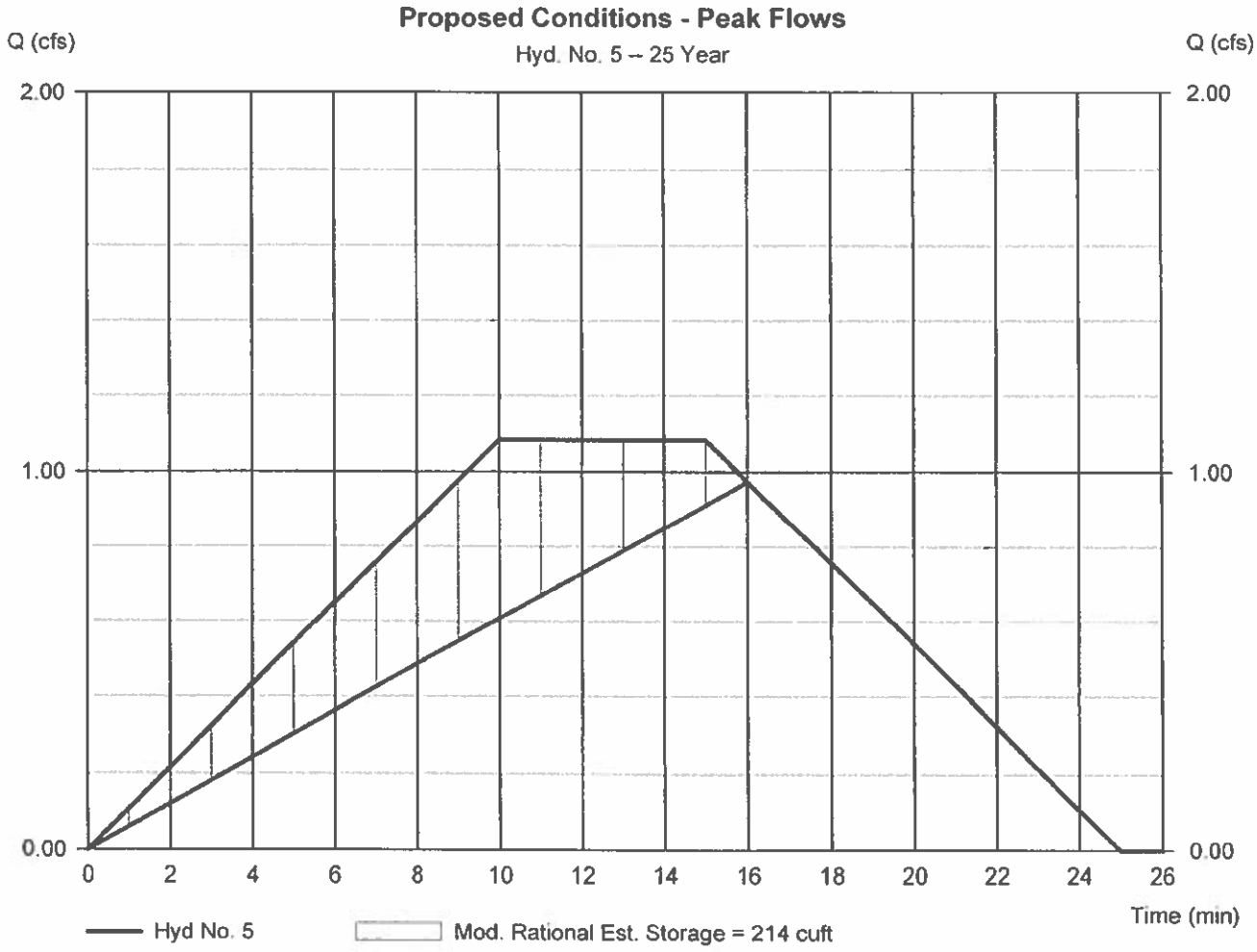
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 04 / 27 / 2022

Hyd. No. 5

Proposed Conditions - Peak Flows

Hydrograph type	= Mod. Rational	Peak discharge	= 1.083 cfs
Storm frequency	= 25 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 981 cuft
Drainage area	= 0.210 ac	Runoff coeff.	= 0.95*
Intensity	= 5.428 in/hr	Tc by User	= 10.00 min
IDF Curve	= NJ-RSIS.IDF	Storm duration	= 1.5 x Tc
Target Q	=1.000 cfs	Est. Req'd Storage	=214 cuft

* Composite (Area/C) = [(0.016 x 0.51) + (0.191 x 0.99)] / 0.210



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 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	Rational	1.574	1	10	944	----	----	----	Existing Conditions - Peak Flows
3	Rational	1.526	1	10	915	----	----	----	Proposed Conditions - Peak Flows
5	Mod. Rational	1.304	1	10	1,181	----	----	----	Proposed Conditions - Peak Flows

Hydrograph Report

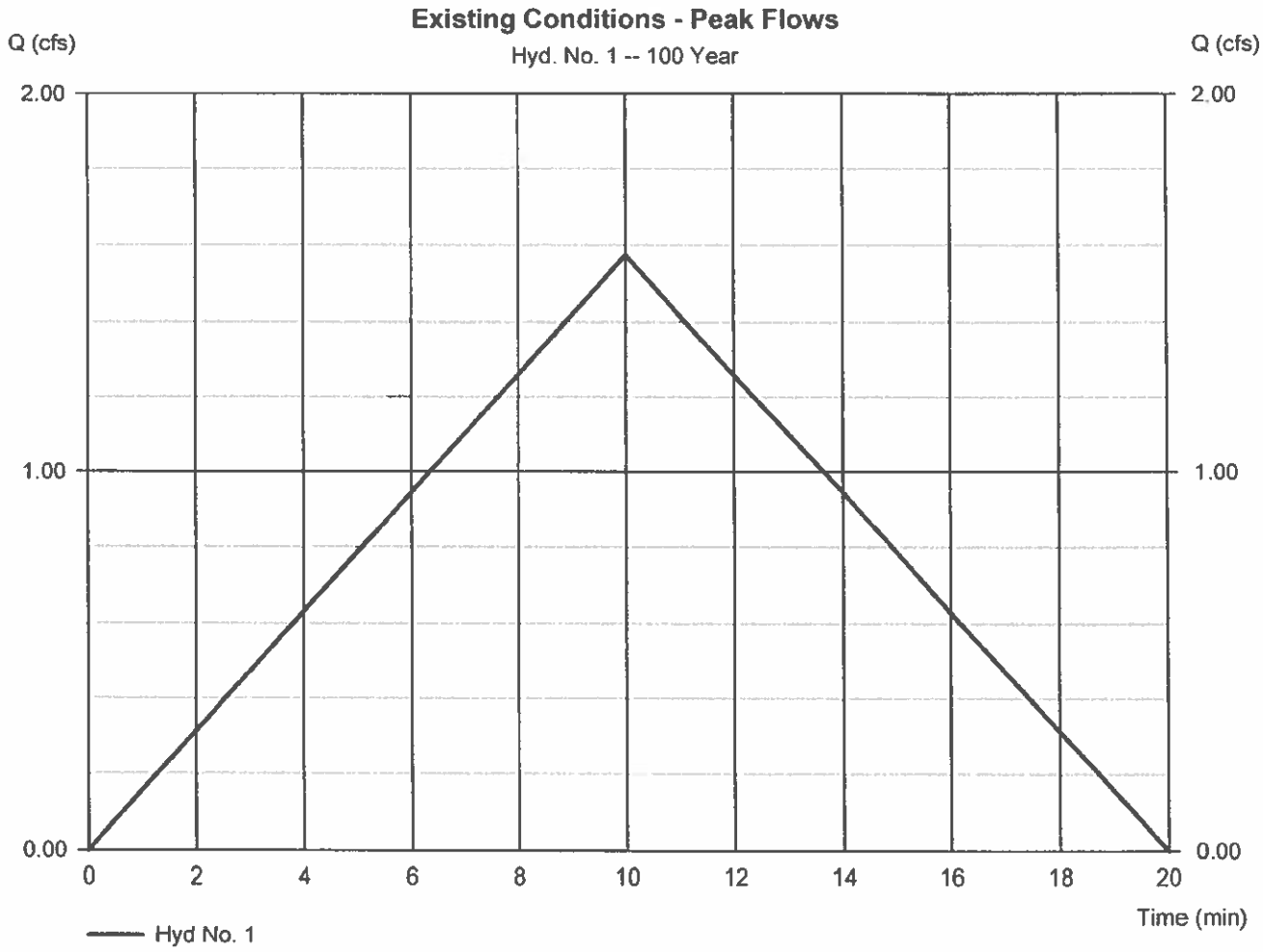
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc v2020 — Wednesday, 04 / 27 / 2022

Hyd. No. 1

Existing Conditions - Peak Flows

Hydrograph type	= Rational	Peak discharge	= 1.574 cfs
Storm frequency	= 100 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 944 cuft
Drainage area	= 0.210 ac	Runoff coeff.	= 0.98*
Intensity	= 7.647 in/hr	Tc by User	= 10.00 min
IDF Curve	= NJ-RSIS.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.003 x 0.51) + (0.204 x 0.99)] / 0.210



Hydrograph Report

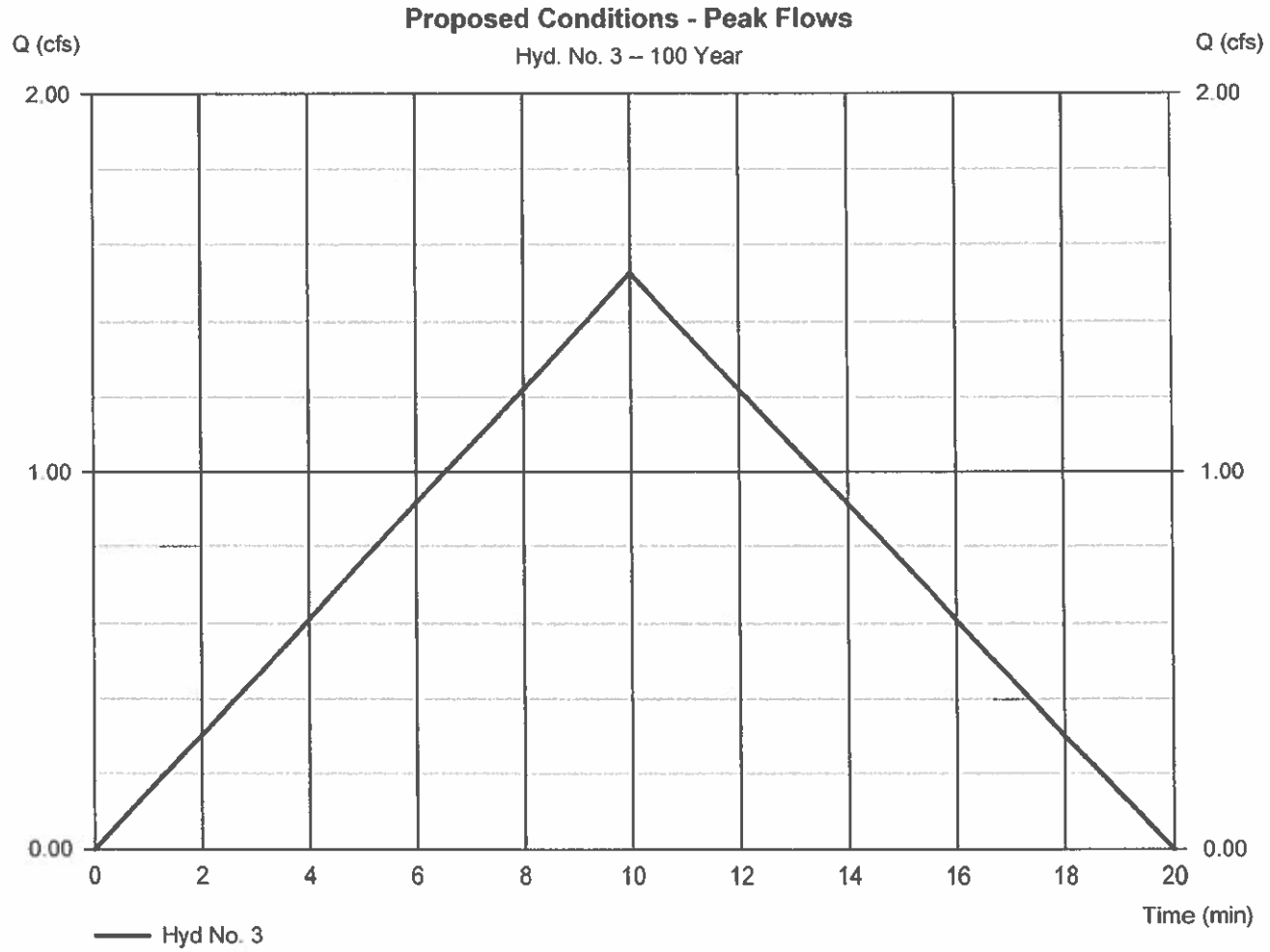
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 04 / 27 / 2022

Hyd. No. 3

Proposed Conditions - Peak Flows

Hydrograph type	= Rational	Peak discharge	= 1.526 cfs
Storm frequency	= 100 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 915 cuft
Drainage area	= 0.210 ac	Runoff coeff.	= 0.95*
Intensity	= 7.647 in/hr	Tc by User	= 10.00 min
IDF Curve	= NJ-RSIS.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.016 x 0.51) + (0.191 x 0.99)] / 0.210



Hydrograph Report

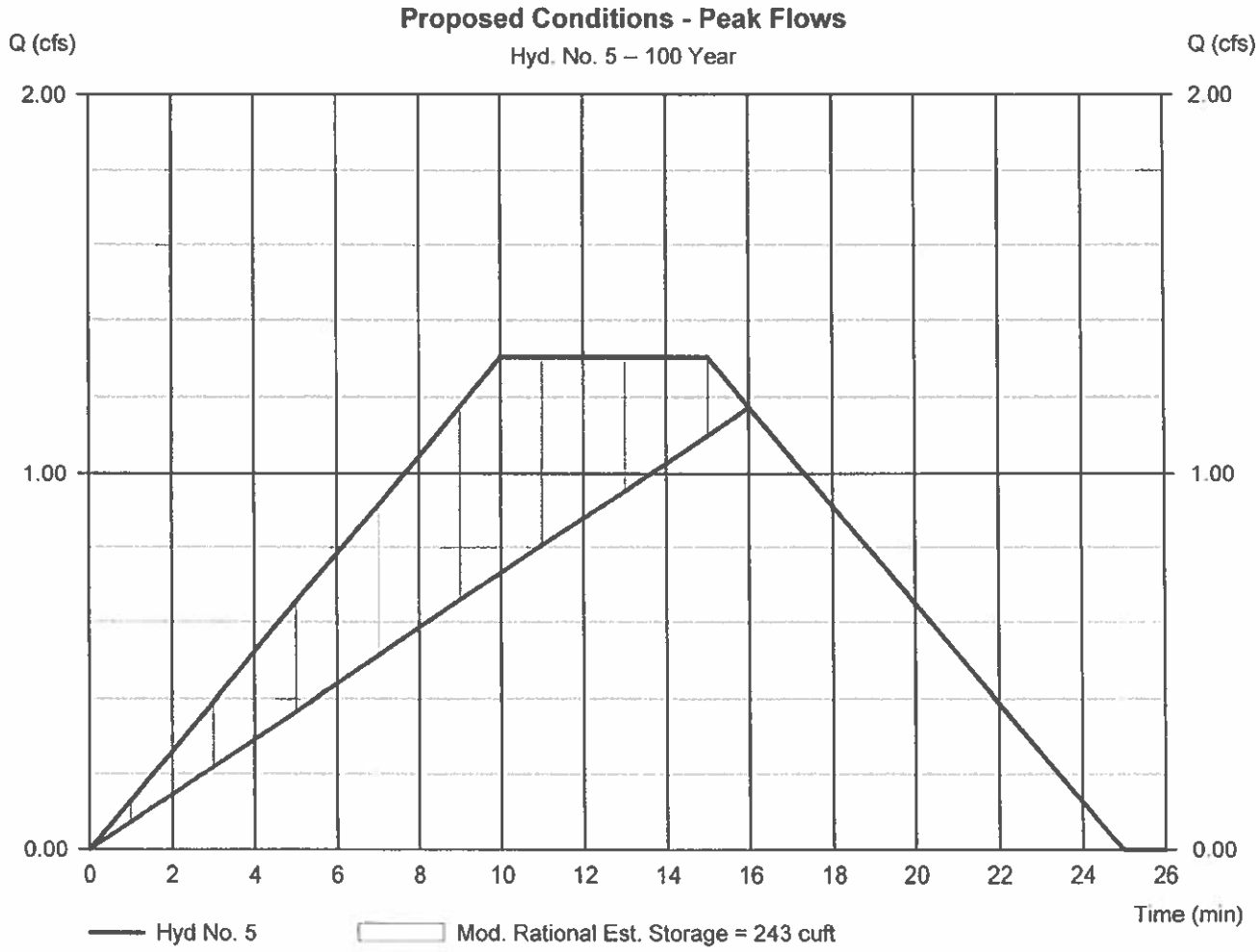
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 04 / 27 / 2022

Hyd. No. 5

Proposed Conditions - Peak Flows

Hydrograph type	= Mod. Rational	Peak discharge	= 1.304 cfs
Storm frequency	= 100 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 1,181 cuft
Drainage area	= 0.210 ac	Runoff coeff.	= 0.95*
Intensity	= 6.535 in/hr	Tc by User	= 10.00 min
IDF Curve	= NJ-RSIS.IDF	Storm duration	= 1.5 x Tc
Target Q	=1.235 cfs	Est. Req'd Storage	=243 cuft

* Composite (Area/C) = [(0.016 x 0.51) + (0.191 x 0.99)] / 0.210



Hydraflow Rainfall Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Wednesday, 04 / 27 / 2022

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	18.2280	0.1000	0.8968	----
2	61.4708	11.8000	0.8688	----
3	0.0000	0.0000	0.0000	----
5	99.7061	14.8000	0.9304	----
10	93.2845	13.4000	0.8945	----
25	131.5029	16.5000	0.9231	----
50	297.9532	23.2001	1.0724	----
100	192.6755	18.7000	0.9612	----

File name: NJ-RSIS.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	5.86	3.64	2.75	2.25	1.93	1.70	1.53	1.39	1.28	1.19	1.12	1.05
2	5.30	4.23	3.53	3.04	2.68	2.40	2.18	1.99	1.84	1.71	1.60	1.50
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	6.20	5.03	4.24	3.67	3.24	2.90	2.63	2.40	2.22	2.06	1.92	1.80
10	6.89	5.56	4.68	4.04	3.57	3.20	2.90	2.66	2.45	2.28	2.13	2.00
25	7.74	6.39	5.44	4.75	4.22	3.80	3.46	3.17	2.94	2.73	2.55	2.40
50	8.30	6.96	5.99	5.25	4.67	4.20	3.81	3.49	3.22	2.98	2.78	2.60
100	9.19	7.65	6.55	5.74	5.10	4.60	4.19	3.84	3.55	3.30	3.09	2.90

Tc = time in minutes. Values may exceed 60.

Precip. file name: Bergen-24hr.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	2.80	3.41	0.00	4.30	5.19	6.42	7.30	8.67
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	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SECTION 2

SEEPAGE PIT VOLUME

SEEPAGE PIT CALCULATIONS

6' Diameter, 3' Deep

PIT VOLUME

6' $(\pi)(6^2/4)$ = 84.82

STONE AROUND PIT

3' OF STONE, 40% VOIDS

		HEIGHT =
INNER DIA.	= 6'	3'
OUTER DIA.	= 6.5'	
STONE DIA.	= 12.5'	

$0.4(6')(\pi)(12.5^2-6.5^2)/4$ = 107.44

STONE AT BOTTOM

2' OF STONE, 40 % VOIDS

$0.4(2')(\pi)(12.5^2/4)$ = 98.17

290.44 cf

*USE TWO (2) SEEPAGE PITS WITH STONE

6 * 290.44 cf = 1,742.64 cf

Conclusion: Use Six (6) Seepage Pits to be provided.

SECTION 3

DIRECT RUNOFF CALCULATIONS

DIRECT RUNOFF: 10 YEAR, 60 MINUTE, 2"/HOUR

TOTAL AREA = 8,306 0.0 SF 0.191 Ac

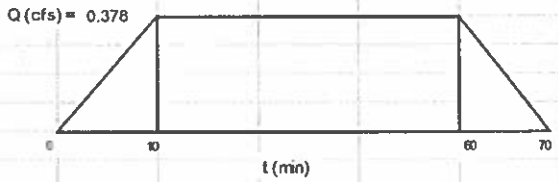
PROPOSED RUNOFF COEFFICIENT

C ROOF = 0.99

PROPOSED FLOW

Q for 60 MIN = CiA = 0.990 (2.0) (0.191) = **0.378** cfs

CONCLUSION



Storage = 2 x 0.5 x 10 ~~min~~ x 60 ~~sec/mi~~ 0.378 cf/~~sec~~ +
50 ~~min/hr~~ x 60 ~~sec/min~~ x 0.378 cf/~~sec~~

= 1,359 cu. ft. (Required Storage)

1,359	cu. ft.	x	1 / 290	Seepage Pi cu. ft.	=	5	Minimum Required Seepage Pit(s).

APPENDIX 1

- Site Location and Soil Type Map
- Typical Runoff Coefficients Table
- Time of Concentration (Tc) Nomograph
- IDF Curves and Tabulation

Soils (SSURGO)

Rec	Map Unit Symbol	Map Unit Name
1	UR	Urban Land - Udorthents

Recommended Coefficient of Runoff Values for Various Selected Land Uses

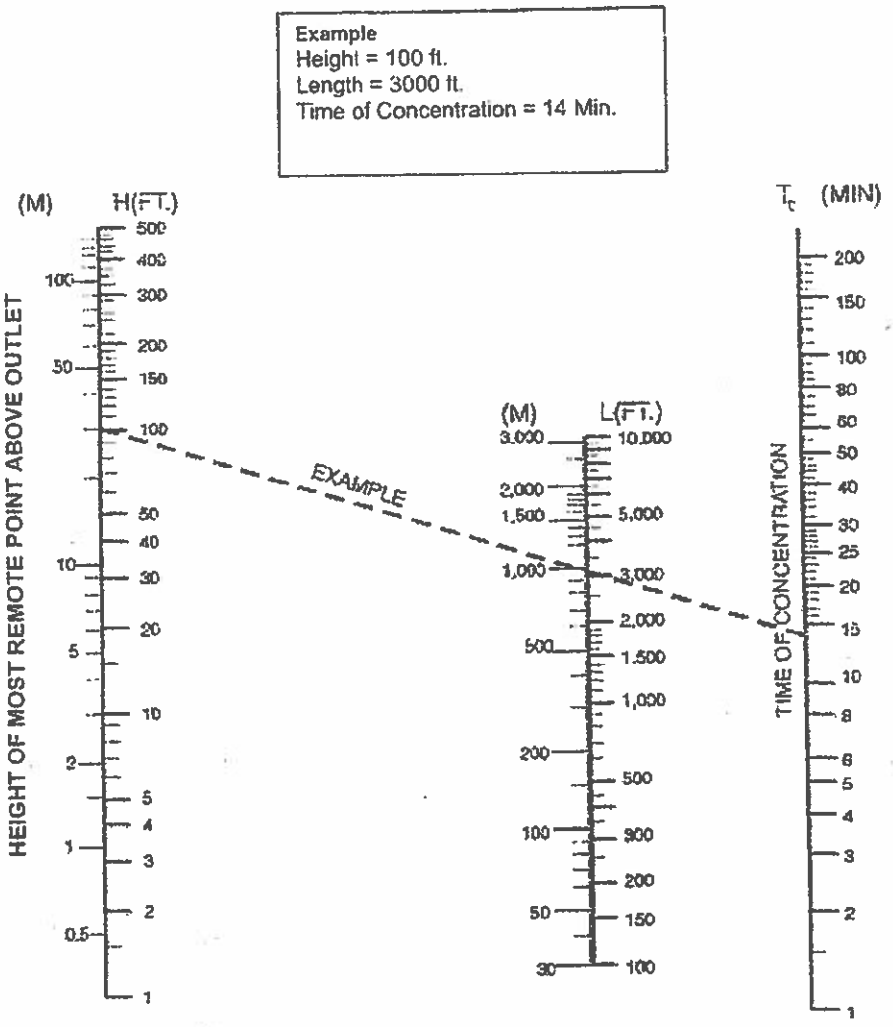
Land Use	Description	Hydrologic Soils Group			
		A	B	C	D
Cultivated Land	without conservation treatment	0.49	0.67	0.81	0.88
	with conservation treatment	0.27	0.43	0.67	0.67
Pasture or Range Land Meadow	poor condition	0.38	0.63	0.78	0.84
	good condition	---	0.25	0.51	0.65
	good condition	---	---	0.41	0.61
Wood or Forest Land	thin stand, poor cover, no mulch	---	0.34	0.59	0.70
	good cover	---	---	0.45	0.59
Open Spaces, Lawns, Parks, Golf Courses, Cemeteries					
Good Condition	grass cover on 75% or more	---	0.25	0.51	0.65
Fair Condition	grass cover on 50% to 75%	---	0.45	0.63	0.74
Commercial and Business Area	85% impervious	0.84	0.90	0.93	0.96
Industrial Districts	72% impervious	0.67	0.81	0.88	0.92
Residential	average % impervious				
Average Lot Size (acres)					
1/8	65	0.59	0.76	0.86	0.90
1/4	38	0.29	0.55	0.70	0.80
1/3	30	---	0.49	0.67	0.78
1/2	25	---	0.45	0.65	0.76
1	20	---	0.41	0.63	0.74
Paved Areas	parking lots, roofs, driveways, etc.	0.99	0.99	0.99	0.99
Streets and Roads	paved with curbs & storm sewers	0.99	0.99	0.99	0.99
	gravel	0.57	0.76	0.84	0.88
	dirt	0.49	0.69	0.80	0.84

NOTE: Values are based on NRCS (formerly the SCS) definitions and are average values.

Source: Technical Manual for Land Use Regulation Program, Bureau of Inland and Coastal Regulations, Stream Encroachment Permits, New Jersey Department of Environmental Protection

Figure 7.1

TIME OF CONCENTRATION



Notes:

Use Nomograph T_c for natural basins with well-defined channels, for overland or bare earth, and for mowed grass roadside channels.

For overland flow, grassed surfaces, multiply T_c by 2.

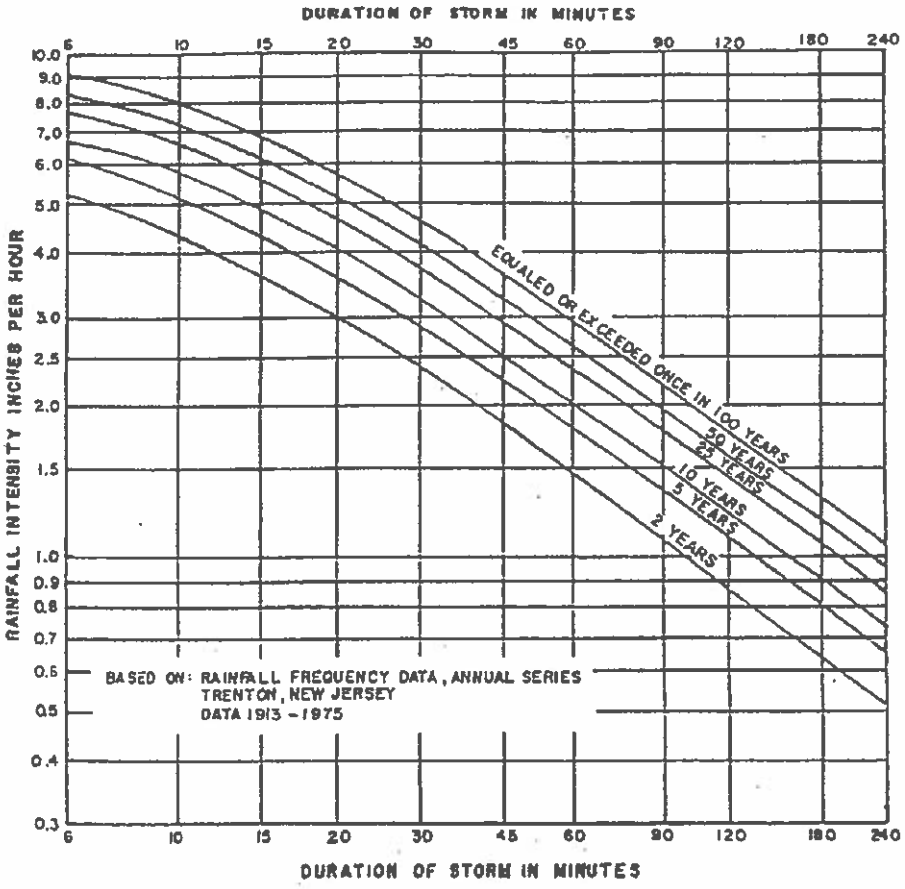
For overland flow, concrete or asphalt surfaces, multiply T_c by 0.4.

For concrete channels, multiply T_c by 0.2 overland flow.

Based on a study by P.Z. Kirpich, *Civil Engineering*, Vol.10, No.6, June 1940, p. 362.

N.J.A.C. 5:21-7.2

FIGURE 7.2 RAINFALL INTENSITY CURVES



Note: Adapted from Figure 2.1-2 in the NJDEP *Technical Manual for Stream Encroachment Permits*.

Northern New Jersey One Year Storm

Recurrence Frequency = 1

DURATION (Minutes)	INTENSITY (inches/hour)
6	3.7
10	3.59
15	2.95
20	2.13
30	1.98
45	1.42
60	1.22
90	0.79
120	0.76

NJDEP Curve 2 Year Storm

Recurrence Frequency = 2

DURATION (Minutes)	INTENSITY (inches/hour)
6	5.2
10	4.3
15	3.55
20	3
30	2.4
45	1.8
60	1.49
90	1.1
120	0.92

NJDEP Curve 10 Year Storm

Recurrence Frequency = 10

DURATION (Minutes)	INTENSITY (inches/hour)
6	6.8
10	5.71
15	4.74
20	4
30	3.35
45	2.5
60	2
90	1.5
120	1.34

NJDEP Curve 25 Year Storm

Recurrence Frequency = 25

DURATION (Minutes)	INTENSITY (inches/hour)
6	7.7
10	6.47
15	5.38
20	4.6
30	3.88
45	3
60	2.54
90	1.8
120	1.6

NJDEP Curve 100 Year Storm

Recurrence Frequency = 100

DURATION (Minutes)	INTENSITY (inches/hour)
6	9
10	7.6
15	6.33
20	5.8
30	4.68
45	3.8
60	3.17
90	2.3
120	2.02