Abbington Engineering, LLC

Exhibit: A-12

DRAINAGE REPORT

PREPARED FOR

CAMELOT AT ERNSTON ROAD

Sayreville Borough Middlesex County

New Jersey

Prepared by:

September 12th, 2019
Last Revised: September 17, 2020

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WW:RMP

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PROJECT DESCRIPTION:

The project site is located west of Route 9 and the Garden State Parkway, on Ernston Road, County Route 673, south and intersecting with Main Street, in the Brough of Sayreville, Middlesex County, New Jersey. Also known as Block 366.01, Lot 1 & Block 347.01, Lot 3.01.

The existing on-site stormwater runoff flows overland in a north westerly and easterly direction, depending on location on lot, connecting into an existing storm drainage system.

The proposed development will consist of the construction of 6 buildings, containing 142 multifamily apartments over an existing grass/wooded lot. The proposed units, parking area, sidewalk area, pool area, as well as the roadways into and throughout it will contain the only pavement on the site and lawn and landscaped areas will be implemented on all other areas of the property. Stormwater runoff from the site will be routed through a storm pipe system, being directed to two proposed on-site BMP Wet Ponds. The site includes 5 drywells/recharge trenches that collect runoff from the rooftop of the buildings for groundwater recharge.

Existing site topography will essentially remain the same. Grading on the site will be designed to be as close to the existing overall grading pattern as possible and have a minimal impact on drainage. Site topography will have no significant environmental impact.

STORMWATER MANAGEMENT:

This report will analyze the stormwater run-off affected by the proposed site improvements. The proposed development will increase the impervious area of the site by 5.25 acres. Consequently, peak flow will increase. The increase is in part due to the existing wooded condition of the site. The stormwater runoff within the area of development, where practical, will be collected by inlets that will discharge into wet ponds located on the westerly portion of the property. The wet ponds have been designed to meet the required reductions for the 2, 10, and 100-year storms as required by local Sayreville ordinances and the New Jersey Department of Environmental Protection (NJDEP).

SUMMARY:

The existing and proposed stormwater runoff values have been calculated using Hydraflow Hydrographs Extension for Autodesk AutoCAD Civil 3D 2021. Detailed software information and limitations may be obtained at *www.autodesk.com/civil3D-stormwater*.

The following table summarizes the results of the analysis and lists pre and post development peak flow.

WET PONDS:

The two wet ponds have been designed to meet NJDEP regulations for water quality and quantity, and in accordance with Chapter 9.11 of the New Jersey Best Management Practices (BMP) Manual. Routing calculations for the basins were performed utilizing the NRCS Method (TR-55 Method). Below is a summary of the wet pond design standards and indication that the design standards have been met in our design.

Wet ponds must have a minimum inflow drainage area of 20 acres.
Inflow drainage area to Wet Pond 1: 3.66 AC.
Inflow drainage area to Wet Pond 2 is 4.76 AC.

Therefore, the site will utilize water supply wells adjacent to both wet ponds to maintain the desired permanent pool depth. The basin will be lined with clay to prevent excessive seepage. The design includes an aerator in the wet pond to ensure sufficient oxygen levels and proper mixing. The specified aerator for both wet ponds is the Sunburst Surface Spray Aerator (or approved equal), manufactured by Otterbine Barebo, Inc. Based on the surface area and depth of the proposed wet ponds, the Sunburst Surface Spray Aerator Model 100 will effectively aerate the ponds.

The design intends to achieve a TSS removal rate of 80% by providing a 3:1 ratio of Permanent Pool Volume to Water Quality Storm Runoff Volume.
Wet Pond 1:
Permanent Pool Volume = 0.787 AC-FT (34,291 cf)
Water Quality Storm Runoff Volume = 0.203 AC-FT (8,829 cf)
Ratio of Permanent Pool Volume to Water Quality Storm Runoff = 3.88

Wet Pond 2:
Permanent Pool Volume = 1.086 AC-FT (47,310 cf)
Water Quality Storm Runoff Volume = 0.229 AC-FT (9,987 cf)
Ratio of Permanent Pool Volume to Water Quality Storm Runoff = 4.74

The minimum permanent pool surface area is 0.25 acres.
Wet Pond 1:
Permanent Pool Surface Area = 11,380 SF = 0.261 AC
Wet Pond 2:
Permanent Pool Surface Area = 15,007 SF = 0.344 AC

A mean depth of 3 to 6 feet is normally sufficient to maintain a healthy environment within the permanent pool. The mean depth of the permanent pool is calculated by dividing the storage volume of the permanent pool by the pool surface area.
Wet Pond 1:
Mean Depth of Permanent Pool = (0.787 AC-FT) / (0.261 AC) = 3.01 FT
Wet Pond 2:
Mean Depth of Permanent Pool = (1.086 AC-FT) / (0.344 AC) = 3.15 FT

Safety ledges must be constructed on the slopes of all wet ponds with a permanent pool deeper than 3 feet. Two ledges must be constructed, each 4 to 6 feet in width. The first ledge must be located between 1 and 1.5 feet above the permanent pool level; the second ledge must be constructed approximately 2.5 feet below the permanent pool level.
Both wet ponds are equipped with two (4' wide) safety ledges in accordance with the aforementioned design standard.

Proposed Wet Pond #1 is designed with a 2.5" diameter orifice at an invert elevation 34.50. The grate of the Outlet Control Structure is at 39.00 with a 2.5" weir at 38.00. The proposed peak flows from the basin meets the requirements of the New Jersey Department of Environmental Protection (NJDEP).

Proposed Wet Pond #2 is designed with a 2.5" diameter orifice at an invert elevation 38.00. The grate of the Outlet Control Structure is at 42.30 with an 8" weir at 41.20. The proposed peak flows from the basin meets the requirements of the New Jersey Department of Environmental Protection (NJDEP).

Regular maintenance activities must be carried out to ensure that the wet ponds function properly. This includes draining the permanent pool and cleaning out accumulated sediment in the wet pond. In order to drain the proposed wet ponds for maintenance and cleaning, a pump must be utilized. The Operation and Maintenance Manual further defines the required maintenance operations for this development.

EMERGENCY OUTFLOW:

The wet ponds have been calculated under failing conditions, whereas, the outfall control structure was eliminated in the aforementioned analysis. The results under this failing condition indicates a maximum elevation, within Wet Pond #1, of 39.14 for the 100-year storm. The designed top-of-basin elevation is 40.00 and noted to be constructed to an elevation of 40.23. A ten (10) L.F. emergency spill way has been added at elevation 39.00 to accommodate total outlet structure failure, therefore basin is assumed to withstand the failing condition outlined above.

For Wet Pond #2, a maximum elevation of 42.54 was modeled for the 100-year storm. The designed top-of-basin elevation is 43.30 and noted to be constructed to an elevation of 43.54. A ten (10) L.F. emergency spill way has been added at elevation 42.30 to accommodate total outlet structure failure, therefore basin is assumed to withstand the failing condition outlined above.

WATER QUALITY ANALYSIS:

NJDEP Groundwater Recharge Requirements were met by utilizing five (5) drywells/recharge trenches located throughout the site. The drywells/recharge trenches consist of 30" Perforated HDPE pipe in a stone filled trench. The average pre-developed annual recharge volume was calculated using the New Jersey Groundwater Recharge Spreadsheet (NJGRS). Furthermore, the spreadsheet provided the Post-Developed Annual Recharge Deficit. The BMP calculation worksheet provides dimensions of the groundwater recharge BMPs to satisfy the recharge deficit. The spreadsheet demonstrates that the proposed stormwater management measures effectively

maintain the pre-developed annual recharge volume of the site. The completed NJGRS can be found in the appendix of this report. Below is a summary of the Roof Drain Recharge Systems (RDRS):

System	Pipe Size (IN)	Pipe Length (LF)	System Volume (CF)	Imp. Area to System (SF)
RDRS-1	30	138	1,276	17,040
RDRS-2	30	75	693	9,230
RDRS-3	30	75	693	9,230
RDRS-4	30	90	832	11,016
RDRS-5	30	78	721	9,600

Test Pits and Percolation Tests were performed by Oweis Engineering, Inc. at the proposed locations of the underground recharge systems. The test pits and percolation tests provide necessary information to determine soil types, permeability rates, and elevations of the seasonal high water table (SHWT). The soil must be sufficiently permeable to ensure that the system is able to function properly. The SHWT elevation defines a prominent design constraint involved with the recharge system. The proposed design ensures that the bottom of BMP elevation is a minimum 2 feet above the SHWT. The Test Pit summary chart below further indicates the separation between the bottom of BMP and the SHWT:

TP#	Surveyed Ex. TP Elevation	Test Pit Depth (FT)	Bottom of Test Pit Elev.	SHWT Elev.	RDS#	RDS Inv.	Bottom of BMP Elev.	Vertical Separation of Bottom of BMP and SHWT (FT)
TP-9	37.05	10	27.05	33.05	1	37.28	36.78	3.73
TP-10	41.90	13	28.90	33.90	2	38.50	38.00	4.10
TP-11	38.00	10	28.00	34.00	3	38.40	37.90	3.90
TP-12	43.50	11	32.50	36.00	4	40.36	39.86	3.86
TP-13	45.72	11.5	34.22	36.22	5	40.50	40.00	3.78

CONCLUSION:

The development of the property will be accomplished in accordance with local, county, and state regulations governing engineering and environmental practices. The environmental constraints affected, such as the soil erosion control measures, are regulated by State laws and regulations designed to insure that encroachments carried out in accordance with published guidelines will minimize environmental impacts. Upon issuance of the any required permits and approvals, verification will be provided of conformance with environmental regulations.

No natural resources, such as streams, floodplains, wetlands, unusual geologic features, and endangered species of wildlife or unique natural vegetative associates will be destroyed by the proposed construction.

Thus, the proposed designed retention systems have sufficient storage volume and will control stormwater runoff for all proposed improvements.

APPENDIX A

SITE MAPS

ABBINGTON ENGINEERING, LLC.
436 W. COMMODORE BLVD., SUITE #2
JACKSON, NJ 08527
TEL: (732) 431-1440 FAX: (732) 987-5078

REVISIONS	DATE
DATE: 9/12/2019	RB
SCALE: NOT TO SCALE	AM
AE FILE NAME: ERNSTON ROAD	WTW
AE FILE NUMBER: 117	

SOIL MAP
FIGURE 1

PREPARED FOR

CAMELOT AT ERNSTON ROAD

SITUATED IN

BLOCK 366.01 - LOT 1
BLOCK 347.01 - LOT 1
BOROUGH OF SAYREVILLE
MIDDLESEX COUNTY
NEW JERSEY

Ernston Rd
Old Bridge Township, NJ

Directions Save Nearby Send to your phone Share

Photos

ABBINGTON ENGINEERING, LLC.
436 W. COMMODORE BLVD., SUITE #2
JACKSON, NJ 08527
TEL: (732) 431-1440 FAX: (732) 987-5078

REVISIONS	DATE
DATE: 9/12/2019	RB DRAWN
SCALE: NOT TO SCALE	AM CHECKED
AE FILE NAME: ERNSTON ROAD	WTW RELEASED
AE FILE NUMBER: 117	

AERIAL MAP
FIGURE 2

PREPARED FOR

CAMELOT AT ERNSTON ROAD

SITUATED IN

BLOCK 366.01 - LOT 1
BLOCK 347.01 - LOT 1
BOROUGH OF SAYREVILLE
MIDDLESEX COUNTY
NEW JERSEY

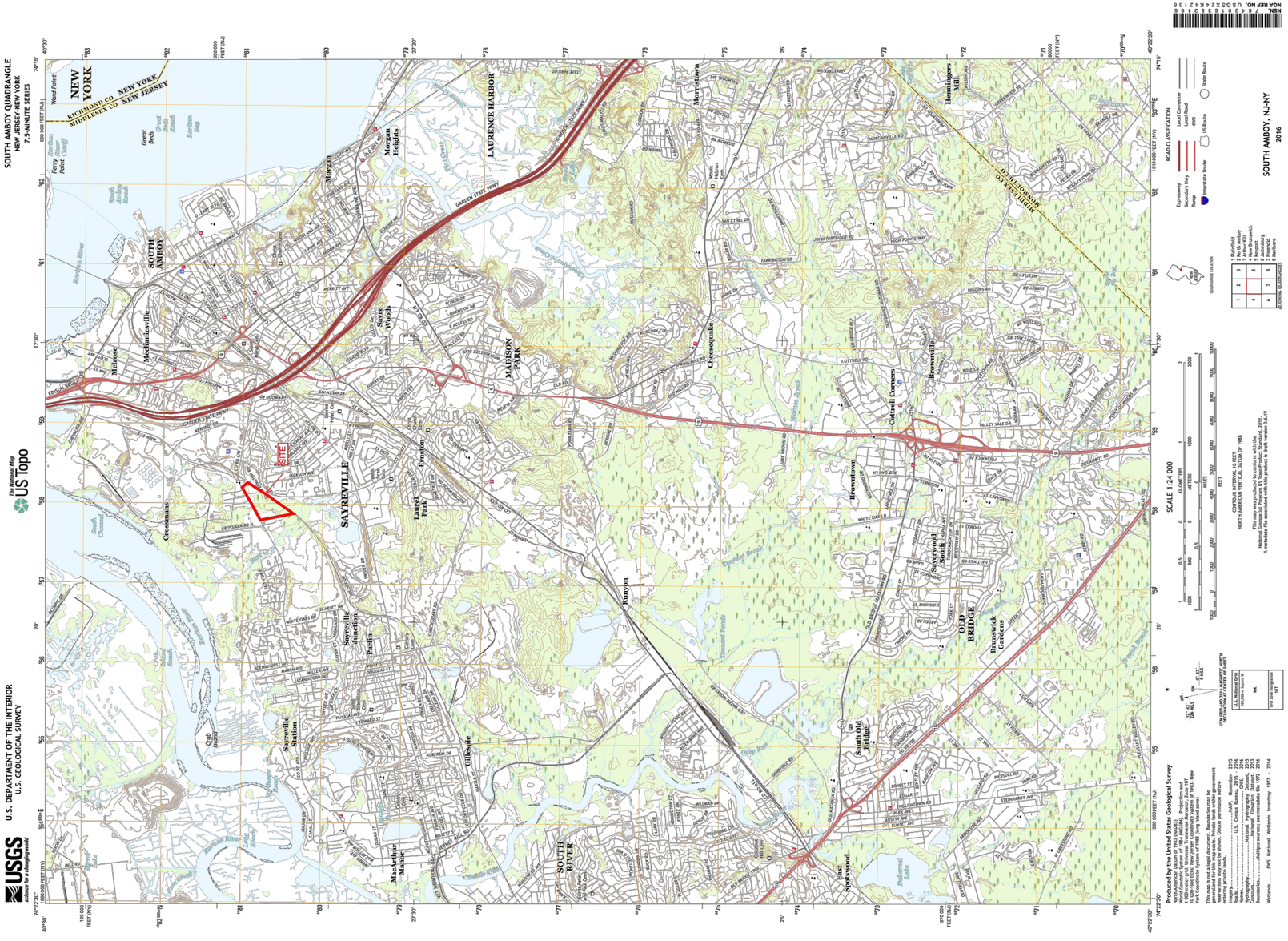


FIGURE-3

ABBINGTON ENGINEERING, LLC.
436 W. COMMODORE BLVD., SUITE #2
JACKSON, NJ 08527
TEL: (732) 431-1440 FAX: (732) 987-5078

REVISIONS	DATE
DATE: 9/12/2019	RB DRAWN
SCALE: NOT TO SCALE	AM CHECKED
AE FILE NAME: ERNSTON ROAD	WTW RELEASED
AE FILE NUMBER: 117	

QUAD MAP
FIGURE 3

PREPARED FOR

CAMELOT AT ERNSTON ROAD

SITUATED IN

BLOCK 366.01 - LOT 1
BLOCK 347.01 - LOT 1
BOROUGH OF SAYREVILLE
MIDDLESEX COUNTY
NEW JERSEY

APPENDIX B

EXISTING AND PROPOSED CONDITIONS

EXISTING CONDITIONS

STORM EVENT	EXIST. FLOW	EXIST. AREA TO BE DISTURBED	REQ'D REDUCTION IN FLOW	**TOTAL ALLOWED FLOW**
100 year	22.40 cfs	10.56 acre	4.48 cfs (20%)	**17.92 cfs**
10 year	3.55 cfs	10.56 acre	0.89 cfs (25%)	**2.66 cfs**
2 year	0.24 cfs	10.56 acre	0.12 cfs (50%)	**0.12 cfs**

PROPOSED CONDITIONS

STORM EVENT	PROP. BASIN #1 IN-FLOW	PROP. BASIN DISCHARGE	PEAK BASIN ELEV.
100 year	24.22 cfs	0.84 cfs	38.80
10 year	13.58 cfs	0.27 cfs	37.25
2 year	8.33 cfs	0.21 cfs	36.23
STORM EVENT	PROP. BASIN #2 IN-FLOW	PROP. BASIN DISCHARGE	PEAK BASIN ELEV.
100 year	26.36 cfs	2.82 cfs	42.27
10 year	14.22 cfs	0.28 cfs	41.03
2 year	8.32 cfs	0.22 cfs	39.83

STORM EVENT	PROP. OFFSITE #3 IN-FLOW	PROP. OFFSITE #4 IN-FLOW
100 year	6.82 cfs	11.20 cfs
10 year	1.01 cfs	1.76 cfs
2 year	0.06 cfs	0.12 cfs

STORM EVENT	**PROP. TOTAL OUT-FLOW**	**REMARKS**
100 year	**16.05 cfs**	**≤ 17.92 cfs OK**
10 year	**2.66 cfs**	**≤ 2.66 cfs OK**
2 year	**0.58 cfs**	**> 0.12 cfs OK Minimum orifice size used**

APPENDIX C

SOIL REPORTS AND BORINGS

Engineering Properties

This table gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Hydrologic soil group is a group of soils having similar runoff potential under similar storm and cover conditions. The criteria for determining Hydrologic soil group is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Listing HSGs by soil map unit component and not by soil series is a new concept for the engineers. Past engineering references contained lists of HSGs by soil series. Soil series are continually being defined and redefined, and the list of soil series names changes so frequently as to make the task of maintaining a single national list virtually impossible. Therefore, the criteria is now used to calculate the HSG using the component soil properties and no such national series lists will be maintained. All such references are obsolete and their use should be discontinued. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonal high water table, saturated hydraulic conductivity after prolonged wetting, and depth to a layer with a very slow water transmission rate. Changes in soil properties caused by land management or climate changes also cause the hydrologic soil group to change. The influence of ground cover is treated independently. There are four hydrologic soil groups, A, B, C, and D, and three dual groups, A/D, B/D, and C/D. In the dual groups, the first letter is for drained areas and the second letter is for undrained areas.

The four hydrologic soil groups are described in the following paragraphs:

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

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

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

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

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Percentage of rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

References:

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Report—Engineering Properties

Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash. The criteria for determining the hydrologic soil group for individual soil components is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Engineering Properties–Middlesex County, New Jersey														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
AtsA—Atsion sand, 0 to 2 percent slopes, Northern Coastal Plain														
Atsion	90	A/D	0-2	Peat	PT	A-8	0- 0- 0	0- 0- 0	—	—	—	—	—	—
			2-4	Sand	SP-SM, SM	A-2-4, A-3	0- 0- 0	0- 0- 0	84-95-100	80-93-100	56-71-80	6-10- 15	0-0 -14	NP
			4-26	Sand, loamy sand	SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	87-96-100	85-95-100	59-72-82	6-10- 15	0-0 -14	NP
			26-34	Sand, loamy sand	SM	A-2-4	0- 0- 0	0- 0- 0	87-96-100	85-95-100	62-76-85	8-13- 19	26-29 -33	1-1 -2
			34-80	Sand, gravelly loamy sand, loamy sand, sandy loam, gravelly sandy loam, gravelly sand	SP-SM	A-2-4	0- 0- 0	0- 0- 0	86-96-100	83-95-100	60-74-87	7-12- 23	0-0 -23	NP-0 -9

Engineering Properties–Middlesex County, New Jersey														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
EveB—Evesboro sand, 0 to 5 percent slopes														
Evesboro	80	A	0-4	Sand	SC-SM, SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	83-96-100	79-95-100	60-74-83	9-12- 18	0-17 -24	NP-1 -5
			4-17	Sand	SC-SM, SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	83-96-100	79-95-100	60-74-83	9-12- 18	0-15 -21	NP-1 -5
			17-31	Sand, loamy sand	SC, SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	82-96-100	78-95-100	60-74-88	9-12- 23	0-15 -25	NP-1 -9
			31-80	Sand, loamy sand, stratified loamy sand to sand, sandy loam, gravelly sandy loam, gravelly sand, gravelly loamy sand	SC, SP-SM, SC-SM	A-1-b, A-2-4	0- 0- 0	0- 0- 0	61-96-100	52-95-100	40-78-90	8-19- 28	0-18 -26	NP-4 -10
EveC—Evesboro sand, 5 to 10 percent slopes														
Evesboro	95	A	0-4	Sand	SC-SM, SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	83-96-100	79-95-100	60-74-83	9-12- 18	0-17 -24	NP-1 -5
			4-17	Sand	SC-SM, SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	83-96-100	79-95-100	60-74-83	9-12- 18	0-15 -21	NP-1 -5
			17-31	Sand, loamy sand	SC, SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	82-96-100	78-95-100	60-74-88	9-12- 23	0-15 -25	NP-1 -9
			31-80	Sand, loamy sand, stratified loamy sand to sand, sandy loam, gravelly sandy loam, gravelly sand, gravelly loamy sand	SC, SP-SM, SC-SM	A-1-b, A-2-4	0- 0- 0	0- 0- 0	61-96-100	52-95-100	39-76-88	10-22-31	0-18 -26	NP-4 -10

Engineering Properties–Middlesex County, New Jersey														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
GamB—Galloway loamy sand, 0 to 5 percent slopes														
Galloway	85	A/D	0-2	Loamy sand	SC, SC-SM, SM	A-2-4	0- 0- 0	0- 0- 0	100-100 -100	94-96-100	70-77-88	17-22-31	0-23 -33	NP-4 -10
			2-10	Loamy sand	SC, SC-SM, SM	A-2-4	0- 0- 0	0- 0- 0	100-100 -100	94-96-100	70-77-88	17-22-31	0-23 -33	NP-4 -10
			10-24	Loamy sand	SC, SC-SM, SM	A-2-4	0- 0- 0	0- 0- 0	100-100 -100	94-96-100	70-77-88	17-22-31	0-23 -33	NP-4 -10
			24-36	Loamy sand	SC, SC-SM, SM	A-2-4	0- 0- 0	0- 0- 0	100-100 -100	94-96-100	70-77-88	17-22-31	0-23 -33	NP-4 -10
			36-52	Sand	SC-SM, SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	90-95-100	76-83-100	58-66-84	7-10- 17	0-18 -22	NP-3 -6
			52-60	Sand	SC-SM, SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	90-95-100	76-83-100	58-66-84	7-10- 17	0-18 -22	NP-3 -6
GaokB—Galloway, clayey substratum-Urban land complex, 0 to 5 percent slopes														
Galloway, clayey substratum	45	A/D	0-6	Loamy sand	SM, SP-SM	A-2, A-2-4	0- 0- 0	0- 0- 0	100-100 -100	95-98-100	50-63-75	5-18- 30	15-18 -20	NP
			6-40	Sand, loamy sand	SM, SP-SM	A-1, A-2, A-2-4	0- 0- 0	0- 0- 0	90-95-100	90-95-100	45-63-80	5-18- 30	15-18 -20	NP
			40-48	Sand, loamy sand	SM, SP-SM	A-1, A-2, A-2-4	0- 0- 0	0- 0- 0	90-95-100	90-95-100	45-63-80	5-18- 30	15-18 -20	NP
			48-60	Clay	CH, CL	A-6, A-7	0- 0- 0	0- 0- 0	95-98-100	90-95-100	80-90-100	70-80-90	15-35 -55	11-21-30
Urban land	40		0-60	Variable	—	—	—	—	—	—	—	—	0-7 -14	—

Engineering Properties–Middlesex County, New Jersey														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
LakB—Lakehurst sand, 0 to 5 percent slopes														
Lakehurst	85	A	0-2	Slightly decomposed plant material	PT	A-8	0- 0- 0	0- 0- 0	81-96-100	79-95-100	60-74-83	9-12- 18	—	—
			2-4	Sand	SM, SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	81-96-100	79-95-100	60-74-83	9-12- 18	0-20 -28	NP-1 -5
			4-18	Sand, fine sand	SC-SM, SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	81-96-100	79-95-100	60-74-83	9-12- 18	0-15 -21	NP-1 -5
			18-32	Sand, loamy sand, fine sand	SC, SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	80-95-100	78-95-100	60-74-88	9-12- 23	0-17 -28	NP-1 -9
			32-45	Sand, fine sand, loamy sand, gravelly loamy sand, gravelly sand	SC, SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	57-96-100	53-95-100	41-74-88	6-12- 23	0-15 -26	NP-1 -9
			45-54	Sand, gravelly sand, loamy sand, gravelly loamy sand	SC, SP-SM	A-2-4, A-3	0- 0- 0	0- 0- 0	57-96-100	53-95-100	41-74-90	6-12- 25	0-15 -27	NP-1 -10
			54-80	Sand, gravelly sand, sandy loam, gravelly sandy loam	SP-SM, SC	A-2-4, A-3	0- 0- 0	0- 0- 0	57-96-100	53-95-100	41-74-90	6-12- 25	0-15 -27	NP-1 -10

Data Source Information

Soil Survey Area: Middlesex County, New Jersey
Survey Area Data: Version 14, Sep 15, 2018


74° 19' 3" W
74° 18' 43" W
557860
557930
558000
558070
558140
558210
558280
40° 28' 42" N
40° 28' 21" N
4481050
4480980
4480910
4480840
4480770
4480700
4480630
4480560
4480490
Burts Creek Ter
Main St
Main
Ramp
GaokB
GamB
EveB
AtsA
EveC
UR
GamB
LakB
Roginski Ct
Ivy Hill Rd
Bielak Pl
Soil Map may not be valid at this scale.
Map Scale: 1:3,040 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0 45 90 180 270
Feet
0 100 200 400 600
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, New Jersey
Survey Area Data: Version 14, Sep 15, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 12, 2014—Sep 26, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AtsA	Atsion sand, 0 to 2 percent slopes, Northern Coastal Plain	A/D	9.7	43.8%
EveB	Evesboro sand, 0 to 5 percent slopes	A	2.0	9.1%
EveC	Evesboro sand, 5 to 10 percent slopes	A	3.3	14.7%
GamB	Galloway loamy sand, 0 to 5 percent slopes	A/D	6.5	29.2%
GaokB	Galloway, clayey substratum-Urban land complex, 0 to 5 percent slopes	A/D	0.6	2.9%
LakB	Lakehurst sand, 0 to 5 percent slopes	A	0.1	0.3%
UR	Urban land		0.0	0.1%
Totals for Area of Interest			**22.2**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

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

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

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

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

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

` LOGGED BY:VINCENT CREEVY,Ernston Rd. Sayreville, NJ

DEPTH AE-SOIL LOG # 1---3/25/2019

SOIL DESCRIPTION

0-6" 10YR 3/1 Very dark gray loamy sand
slightly moist,loose, single grained,non-plastic

6"-15" 10YR 5/1 Gray sand
moist,loose, single grained,non-plastic

15"24" 10YR 7/3 Very pale brown sand
saturated,loose, single grained,non-plastic
H2O @14"-Sample @ 15"

` LOGGED BY:VINCENT CREEVY,Ernston Rd. Sayreville, NJ

DEPTH AE-SOIL LOG # 2---3/25/2019

SOIL DESCRIPTION

0-6" 10YR 3/1 Very dark gray loamy sand
slightly moist,loose, single grained,non-plastic

6"-10" 10YR 5/1 Gray sand
moist,loose, single grained,non-plastic

10"-24" 10YR 7/3 Very pale brown sand
saturated,loose, single grained,non-plastic
H2O @10"-Sample @ 10"

Form 3b. Tube Permeameter Test Data: Kaplan Ernston Rd., Sayreville

1. Test Number__1_ Replicate (letter) __A__ Date Collected ___3/25/2019__

2. Material Tested: Test in Native Soil – Indicate Depth_15"_

3. Type of Sample: __X___ Undisturbed _____Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in inches _1.88"_
Length of Sample, L, in inches__ ___3.75"____

5. Bulk Density Determination: __N/A_

6. Standpipe used: ___No _X_ Yes
Indicate Internal Radius, __0.44"__

7. Height of Water Level Above Rim of Test Basin, in inches:
At the Beginning of Each Test Interval, H1 __7.0"_
At the End of Each Test Interval, H2 __6.0"_____

8. Rate of Water Level Drop:

******STOPWATCH USED

Length of Test Interval, T in Minutes (decimal)

___0.17min./inch__
___0.20min./inch__
___0.20min./inch__
___0.22min./inch__
___0.22min./inch__
___0.22min./inch__

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln(H1/H2)
= (60 min/hr x 0.194/3.534) x __3.75"/0.22__
x ln (7.0/6.0) = _8.65_in/hr = K-4

10. Defects in the Sample: None

11. I hereby certify that the information furnished on Form 3C of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. : 7:14-8.

Signature of Soil Evaluator _____ Date __3/29/2019
Vincent Creevy

Signature of Professional Engineer _____ Date __3/29/2019
William T. Wentzien, P.E., P.P., Lic. No.27799

Form 3b. Tube Permeameter Test Data: Kaplan Ernston Rd., Sayreville

1. Test Number__1_ Replicate (letter) __B__ Date Collected ___3/25/2019__

2. Material Tested: Test in Native Soil – Indicate Depth_15"_

3. Type of Sample: __X___ Undisturbed _____Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in inches _1.88"_
Length of Sample, L, in inches__ ___3.5"___

5. Bulk Density Determination: __N/A_

6. Standpipe used: ___No _X_ Yes
Indicate Internal Radius, __0.44"__

7. Height of Water Level Above Rim of Test Basin, in inches:
At the Beginning of Each Test Interval, H1 __7.0"_
At the End of Each Test Interval, H2 __6.0"_____

8. Rate of Water Level Drop:

******STOPWATCH USED

Length of Test Interval, T in Minutes (decimal)

___0.17min./inch__
___0.18min./inch__
___0.20min./inch__
___0.20min./inch__
___0.20min./inch__
___0.20min./inch__

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln(H1/H2)
= (60 min/hr x 0.194/3.534) x __3.5"/0.20__
x ln (7.0/6.0) = _8.88_in/hr = K-4

10. Defects in the Sample: None

11. I hereby certify that the information furnished on Form 3C of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. : 7:14-8.

Signature of Soil Evaluator _____ Date __3/29/2019
Vincent Creevy

Signature of Professional Engineer _____ Date __3/29/2019
William T. Wentzien, P.E., P.P., Lic. No.27799

Form 3b. Tube Permeameter Test Data: Kaplan Ernston Rd., Sayreville

1. Test Number 2 Replicate (letter) A Date Collected 3/25/2019

2. Material Tested: Test in Native Soil – Indicate Depth 10”

3. Type of Sample: X Undisturbed _____Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in inches 1.88”
Length of Sample, L, in inches 3.5”

5. Bulk Density Determination: N/A

6. Standpipe used: No X Yes
Indicate Internal Radius, 0.44”

7. Height of Water Level Above Rim of Test Basin, in inches:
At the Beginning of Each Test Interval, H1 7.0”
At the End of Each Test Interval, H2 6.0”

8. Rate of Water Level Drop:

******STOPWATCH USED

Length of Test Interval, T in Minutes (decimal)

0.21min./inch
0.22min./inch
0.24min./inch
0.24min./inch
0.24min./inch
0.24min./inch

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln(H1/H2)
= (60 min/hr x 0.194/3.534) x 3.5”/0.24
x ln (7.0/6.0) = 7.4 in/hr = K-4

10. Defects in the Sample: None

11. I hereby certify that the information furnished on Form 3C of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. : 7:14-8.

Signature of Soil Evaluator _____ Date 3/29/2019
Vincent Creevy

Signature of Professional Engineer _____ Date 3/29/2019
William T. Wentzien, P.E., P.P., Lic. No.27799

Form 3b. Tube Permeameter Test Data: Kaplan Ernston Rd., Sayreville

1. Test Number 2 Replicate (letter) B Date Collected 3/25/2019

2. Material Tested: Test in Native Soil – Indicate Depth 10”

3. Type of Sample: X Undisturbed _____Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in inches 1.88”
Length of Sample, L, in inches 3.5”

5. Bulk Density Determination: N/A

6. Standpipe used: No X Yes
Indicate Internal Radius, 0.44”

7. Height of Water Level Above Rim of Test Basin, in inches:
At the Beginning of Each Test Interval, H1 7.0”
At the End of Each Test Interval, H2 6.0”

8. Rate of Water Level Drop:

******STOPWATCH USED

Length of Test Interval, T in Minutes (decimal)

0.19min./inch
0.18min./inch
0.19min./inch
0.19min./inch
0.19min./inch
0.19min./inch

9. Calculation of Permeability:

K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln(H1/H2)
= (60 min/hr x 0.194/3.534) x 3.5”/0.19
x ln (7.0/6.0) = 9.35 in/hr = K-4

10. Defects in the Sample: None

11. I hereby certify that the information furnished on Form 3C of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. : 7:14-8.

Signature of Soil Evaluator _____ Date 3/29/2019
Vincent Creevy

Signature of Professional Engineer _____ Date 3/29/2019
William T. Wentzien, P.E., P.P., Lic. No.27799

Oweis ENGINEERING INC.	TEST PIT LOG	TEST PIT NO. TP- 9 (Stake # 850)
PROJECT: Camelot at Ernston Road, Main Street, Sayreville, New Jersey		SHEET NO. 1 of 1
CONTRACTOR: NJ Site and Utility		PROJ. NO.: 19-NJ272-02
CLIENT: Kaplan Companies	EQUIPMENT: Komatsu PC 138 US Excavator	ELEVATION: 37.05 ft.

GROUNDWATER DATA:				DATE	TIME	DATUM: NAVD 88
DATE	TIME	DEPTH	START	5/28/2020	~0755	OPERATOR: Harold
			END	5/28/2020	0838	OEI REP: Paula MacRae

DEPTH FT.	DENSITY	MOISTURE	SYMBOL	IDENTIFICATION	REMARKS
0				Leaf litter, herbaceous and woody vegetation	
1			OL	Black-dark br. organics with light grey-br. sand	~ 6in.
2	L to VL	M	SP-SM	Light grey-br., poorly graded sand with silt	
3					Collected sample TP-9/S-1 at 2.5 ft. to 3 ft.
4	VL	M to W to VW	SP-SM/SM	Red br., br., poorly graded sand with silt to silty sand	~4 ft. to 4.25 ft. bgs. water seepage from 3 walls, significant sloughing of pit walls. Collected sample TP-9/S-2 at 4 to 4.5 ft. bgs. and TP-9/S-3 at 6 to 6.5 ft. bgs.
5		W to Sat.			
6	VL	W	SP/SP-SM	Light grey with 15% to 20% red br. mottles, poorly graded sand to poorly graded sand with silt	
7					
8		W to Sat.			~8 ft. bgs. water seepage from 2 walls.
9	L to VL	W to Sat.	SP/SP-SM	Light grey with 30% to 40% red br. mottles, poorly graded sand to poorly graded sand with silt	
10					
11				End of Test Pit TP-9 at 10 ft.	
12					Unable to safely keep TP-9 pit open at 10 ft. bgs., significant sloughing of walls from ~4 ft. down to 10 ft. bgs. Significant water seepage visible at ~4 ft. to 4.25 ft bgs and at ~ 8 ft. bgs. However, evidence that water seepage at additional depths from 4.5 ft. to 10 ft. bgs.
13					
14					
15					
16					
17					
18					
19					
20					Proposed Building #2

KEY

DENSITY:
VL: Very Loose
L: Loose
M: Medium
D: Dense
VD: Very Dense
S: Soft
VS: Very Soft

bgs.: below ground
br.: brown

MOISTURE
D: Dry
M: Moist
W: Wet
VW: Very Wet
W to Sat.: Wet to Saturated

A2LA ACCREDITED CERTIFICATE #5176.01

Oweis ENGINEERING INC.	TEST PIT LOG				TEST PIT NO. TP- 10 (Stake # 851)
PROJECT: Camelot at Ernston Road, Main Street, Sayreville, New Jersey					SHEET NO. 1 of 1
CONTRACTOR: NJ Site and Utility					PROJ. NO.: 19-NJ272-02
CLIENT: Kaplan Companies	EQUIPMENT: Komatsu PC 138 US Excavator				ELEVATION: 41.9 ft.
GROUNDWATER DATA:			DATE	TIME	DATUM: NAVD 88
DATE / TIME / DEPTH		START	5/28/2020	~0910	OPERATOR: Harold
		END	5/28/2020	0940	OEI REP: Paula MacRae

DEPTH FT.	DENSITY	MOISTURE	SYMBOL	IDENTIFICATION	REMARKS
0				Leaf litter, herbaceous and woody vegetation	
1			OL	Black-dark br. organics with sand	~ 9in.
2	L	M	SM	Light br. to yellow br., silty sand to silty sand with clay	Collected sample TP-10/S-1 at ~2 ft. to 3 ft. bgs.
3					
4	L	M to W			
5					
6	L to VL	M to W	SM	Grey to light grey br., silty sand	Collected sample TP-10/S-2 at ~6 bgs.
7					Sample TP-10/ S-3 collected at ~7 ft. bgs. *
8	VL	W to Sat.	SM	Yellow br. To orange br., silty sand	
9	VD	M to W	CL	Light grey, light br., br., clay with silt and sand, sand content increased with depth.	Sample TP-10/ S-4 collected at ~8 ft. bgs. * Possible water at silty sand/clay interface.
10					
11					
12				Grey to dark grey, clay with silt and sand, sand included micaceous sand.	
13	VD	M to W	CL		
14				End of Test Pit TP-10 at 13 ft.	* At silty sand/clay interface the silty sand appeared VW to Sat. and VL, though no sloughing or visible seepage flowing down walls was observed.
15					
16					
17					Maximum depth excavator was able to reach from the surface.
18					
19					
20					Proposed Building #3

KEY

DENSITY:
VL: Very Loose
L: Loose
M: Medium
D: Dense
VD: Very Dense
S: Soft
VS: Very Soft

bgs.: below ground
br.: brown

MOISTURE
D: Dry
M: Moist
W: Wet
VW: Very Wet
W to Sat.: Wet to Saturated

A2LA ACCREDITED CERTIFICATE #5176.01

Oweis ENGINEERING INC.	TEST PIT LOG	TEST PIT NO. TP- 11 (~19 ft. N of Stake # 852)
PROJECT: Camelot at Ernston Road, Main Street, Sayreville, New Jersey		SHEET NO. 1 of 1
CONTRACTOR: NJ Site and Utility		PROJ. NO.: 19-NJ272-02
CLIENT: Kaplan Companies	EQUIPMENT: Komatsu PC 138 US Excavator	ELEVATION: ~38 ft.

GROUNDWATER DATA:				DATE	TIME	DATUM: Based on Site Plan
DATE	TIME	DEPTH	START	5/28/2020	~1020	OPERATOR: Harold
			END	5/28/2020	~1100	OEI REP: Paula MacRae

DEPTH FT.	DENSITY	MOISTURE	SYMBOL	IDENTIFICATION	REMARKS
0				Leaf litter, herbaceous and woody vegetation	
1	L	M	OL	Black-dark br. organics with sand	~ 7in.
2	L to VL	M to W	SP-SM/SM	Light grey-br., to grey br., poorly graded sand with silt to silty sand	Collected sample TP-11/S-1 at 1.5 ft. to 2 ft.
3	L to VL	W	SP-SM	Red br., orange br., poorly graded sand with silt	Collected sample TP-11/S-2 at 3.5 ft. bgs.
4	VL	W to Sat.			~4 ft. water seepage and sloughing of pit walls.
5	VL	W			
6		W to Sat.	SP-SM	Red br. to yellow br., poorly graded sand with silt.	Additional water seepage at ~ 6 ft. bgs.
7					
8	VL	W to Sat.	SP-SM	Grey br. to grey, poorly graded sand with silt	Collected sample TP-11/S-3 at 8ft. to 10 ft. bgs.
9					
10	VL	W to Sat.			
11				End of Test Pit TP-11 at 10 feet	
12					Sloughing of excavation walls from 4 ft to 10 ft. bgs. Cannot excavate further due to dangerous cave-ins and continued sloughing of pit walls.
13					
14					TP-11 exavation located about 30 ft. from TP-3 stake and about 19 ft. north of stake #852.
15					
16					
17					
18					
19					
20					Proposed Building #4

KEY

DENSITY:
VL: Very Loose
L: Loose
M: Medium
D: Dense
VD: Very Dense
S: Soft
VS: Very Soft

bgs.: below ground
br.: brown

MOISTURE
D: Dry
M: Moist
W: Wet
VW: Very Wet
W to Sat.: Wet to Saturated

Oweis ENGINEERING INC.	TEST PIT LOG	TEST PIT NO. TP- 12 (Stake # 853)
PROJECT: Camelot at Ernston Road, Main Street, Sayreville, New Jersey		SHEET NO. 1 of 1
CONTRACTOR: NJ Site and Utility		PROJ. NO.: 19-NJ272-02
CLIENT: Kaplan Companies	EQUIPMENT: Komatsu PC 138 US Excavator	ELEVATION: 43.5 ft.

GROUNDWATER DATA:				DATE	TIME	DATUM: NAVD 88
DATE	TIME	DEPTH	START	5/28/2020	~1115	OPERATOR: Harold
			END	5/28/2020	1134	OEI REP: Paula MacRae

DEPTH FT.	DENSITY	MOISTURE	SYMBOL	IDENTIFICATION	REMARKS
0				Leaf litter, herbaceous and woody vegetation	
1			OL	Black-dark br. organics with sand	~ 6in.
2	L	M	SP-SM/SM	Orange br., poorly graded sand with silt to silty sand	
3		M			
4	L	M to W.		silt increases with depth	Collected sample TP-12/S-1 at 4 ft. bgs.
5					
6	L	W	SM	Yellow br., silty sand.	Walls sloughing at ~ 6 ft. bgs.
7					Collected sample TP-12/S-2 at 6.5 to 7 ft. bgs.
8					
9	L to VL	W to VW			Walls sloughing.
10					
11	L to VL	W to Sat.	SP/SP-SM	Light grey to grey with 10 % to 15% red br. mottles, poorly graded sand with silt	Collected sample TP-12/S-3 at 10 to 10.5 ft. bgs.
12				End of Test Pit TP-12 at 11 feet	Unable to safely excavate deeper than 11 ft. bgs. Walls sloughing from 4 ft to 11 ft. bgs.
13					
14					
15					No visible signs of water seepage or groundwater. However, briefly felt "a cool rush of air" emitted from the pit at ~10 ft. bgs. (moisture or methane?)
16					
17					
18					
19					
20					Proposed Building #5

KEY

DENSITY:
VL: Very Loose
L: Loose
M: Medium
D: Dense
VD: Very Dense
S: Soft
VS: Very Soft

bgs.: below ground
br.: brown

MOISTURE
D: Dry
M: Moist
W: Wet
VW: Very Wet
W to Sat.: Wet to Saturated

A2LA ACCREDITED CERTIFICATE #5176.01

Oweis ENGINEERING INC.	TEST PIT LOG	TEST PIT NO. TP- 13 (Stake # 854)
PROJECT: Camelot at Ernston Road, Main Street, Sayreville, New Jersey		SHEET NO. 1 of 1
CONTRACTOR: NJ Site and Utility		PROJ. NO.: 19-NJ272-02
CLIENT: Kaplan Companies	EQUIPMENT: Komatsu PC 138 US Excavator	ELEVATION: 45.72 ft.

GROUNDWATER DATA:				DATE	TIME	DATUM: NAVD 88
DATE	TIME	DEPTH	START	5/28/2020	~1200	OPERATOR: Harold
			END	5/28/2020	~1220	OEI REP: Paula MacRae

DEPTH FT.	DENSITY	MOISTURE	SYMBOL	IDENTIFICATION	REMARKS
0				Leaf litter, herbaceous and woody vegetation	
1	L	M	OL	Black-dark br. organics with sand	~ 6in.
2			Poss. Fill	Br. to red br., silty sand with plastic bottle within 1.5 ft to 2 ft. bgs.	
3	VL	M to W.	SM	Orange br., silty sand.	Collected sample TP-13/S-1 at 2 ft. to 2.5 ft. bgs. Walls sloughing at ~ 3 ft. bgs.
4					
5					Walls sloughing at ~ 3 ft. to 7 ft. bgs.
6	L to VL	W			
7					
8		W to Sat.	SM	Yellow br. to light br., silty sand with micaceous sand.	Collected sample TP-13/S-2 at 8ft. to 8.5 ft. bgs. *
9	L to VL	M to W.			
10	VL	W to Sat.	SP-SM	Light grey br. with < 10 % br. to red br. mottles, poorly graded sand with silt	Collected sample TP-13/S-3 at 9.5 ft. to 10 ft. bgs.
11					
12				End of Test Pit TP-13 at 11.5 feet	Excavation pit caving in, sloughing from ~3 ft. to bottom of excavation,; not safe to comtinue excavtion deeper.
13					
14					
15					No visible signs of water seepage or groundwater. However,sample TP-13/ S-3 was very wet to saturated and the rest of the material from ~ 10 ft. to 11.5 ft bgs was visiblly the same. Also felt "a cool rush of air" emitted from the pit at ~9 ft. bgs. (moisture or methane?)
16					
17					
18				* Observed H2S smell at ~ 8.5 ft. to 9 ft. bgs.	
19					
20					Proposed Building #6

KEY

DENSITY:
VL: Very Loose
L: Loose
M: Medium
D: Dense
VD: Very Dense
S: Soft
VS: Very Soft

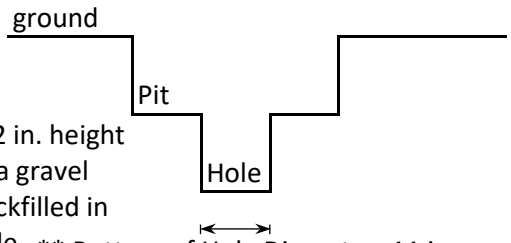
bgs.: below ground
br.: brown

MOISTURE
D: Dry
M: Moist
W: Wet
VW: Very Wet
W to Sat.: Wet to Saturated

Percolation Test

Oweis ENGINEERING INC.	**Basin No.** Linear Trench Bldg 1 & 2
	Test No. P-850/9
PROJECT: Camelot at Ernston Road, Sayreville, NJ	DATE: June 22, 2020
OEI REP. K. Connelly and P. MacRae	PROJ. NO.: 19-NJ272-02
CLIENT: Kaplan Companies	ELEVATION: ~ 36 ft amsl

Test Pit & Hole Dimensions



** Bottom of Hole Diameter: 11 in.

Depth of Pit (below ground surface): 12 in.

Depth of Hole (below bottom of pit): 15 in.

Construction Stage: Pre-Construction

Layer Tested: Most restrictive layer below BMP

Note: Metal mesh liner/casing with annulus between hole and liner/casing filled with pea gravel.

Presoaking

Presoaking of Sandy Textured Soil	**4-Hour Presoaking**
1. Fill the test hole to a depth of 12 inches and allow to drain completely. (8.38 mins) 2. Refill the hole to a depth of 12 inches and record the time required for the hole to drain completely. Time (mins): 11 mins 33 sec = 11.55 mins If water remains in the test hole after 60 minutes, preform 4-hour presoaking. No.	1. Fill the test hole with water and maintain a minimum depth of 12 inches for a period of 4 hours by refilling as necessary. 2. At the end of 4 hours, cease adding water to the hole and allow the hole to drain for a period of from 16 to 24 hours. If water remains in the test hole after the completion period, test should be terminated.

Percolation Test

Step 1: Fill hole with 7 inches of water

Start Time: **Time Interval (5 mins to 30 mins) each Refill: 3 minutes**

Time Interval Number	Depth to the Water Table from the Reference Point (0.1 inch accuracy)	Drop Down of Water Table (0.1 inch accuracy)	Remarks (Refill hole to height of 7 inches water after each time interval)
initial t=0	17.5 in. = 1.46 ft	0.0	Stopwatch #5, Tape #8, Level Folding Ruler, Water Level #3
1	1.73 ft	0.27 ft = 3.26 in.	
2	1.70 ft	0.24 ft = 2.90 in.	
3	1.69 ft	0.23 ft = 2.76 in.	
4	1.69 ft	0.23 ft = 2.76 in.	
5	1.68 ft	0.22 ft = 2.64 in.	
6	1.68 ft	0.22 ft = 2.64 in.	
7	1.67 ft	0.21 ft = 2.52 in.	
8	1.67 ft	0.21 ft = 2.52 in.	

Step 2: Refill hole with 7 inches of water

Time for 6 inches of water level drop (minutes): 10 mins 48 sec = 10.80 mins

Percolation Rate (P_m)(mins/in.): 10.8/6 = 1.8 mins/in.

$K = \frac{a}{P_m}$ (in./hour) [Equation 1]

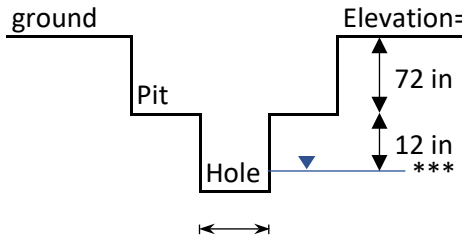
K= 26.3/1.8 = 14.61 in./ hour

Bottom Width (inches) **	Parameter "a" for Equation 1
8	22
9	23.5
10	25
(11)	(26.3)
12	27.5

Percolation Test

Oweis ENGINEERING INC.	**Basin No.** Linear Infiltration Bldg 3 **Test No.** P-851/10
PROJECT: Camelot at Ernston Road, Sayreville, NJ	DATE: June 23, 2020
OEI REP. K. Connelly and P. MacRae	PROJ. NO.: 19-NJ272-02
CLIENT: Kaplan Companies	ELEVATION: * ~ 33.98 ft amsl

Test Pit & Hole Dimensions



** Bottom of Hole Diameter:

*Stake elevation 41.9ft amsl -7 ft 11 in.

Depth of Pit (below ground surface): 72 in.

Depth of Hole (below bottom of pit): 15 in.

Construction Stage: Pre-Construction

Layer Tested: Most restrictive layer below BMP

*** Water seepage at ~ 12 in. below bottom of pit which is elevation ~33.98 ft -1 ft = ~32.98 ft

Presoaking

Presoaking of Sandy Textured Soil	**4-Hour Presoaking**
1. Fill the test hole to a depth of 12 inches and allow to drain completely. 2. Refill the hole to a depth of 12 inches and record the time required for the hole to drain completely. Time (mins): If water remains in the test hole after 60 minutes, preform 4-hour presoaking.	1. Fill the test hole with water and maintain a minimum depth of 12 inches for a period of 4 hours by refilling as necessary. 2. At the end of 4 hours, cease adding water to the hole and allow the hole to drain for a period of from 16 to 24 hours. If water remains in the test hole after the completion period, test should be terminated.

Percolation Test

Step 1: Fill hole with 7 inches of water

Start Time: **Time Interval (5 mins to 30 mins) each Refill: 1.5 mins.**

Time Interval Number	Depth to the Water Level from the Reference Point (0.1 in. accuracy)	Drop Down of Water Level (0.1 in. accuracy)	Remarks (Refill hole to height of 7 inches water after each time interval)
initial t=0	in. = 0.00 ft	0.0	Stopwatch #5, Tape #8, Level, Folding Ruler, Water Level #3. Abandoned test hole due to water seepage observed; no test performed. Remeasured elevation from stake #851 and found that ground surface was lower than originally thought. The soil encountered within the test hole and sampled was grey, sandy silty clay to sandy silt with clay, dense, moist to wet. Collected soil sample #P-851/10/S-1 at 6.5 ft to 7 ft bgs., elevation ~2.5 ft.
1			
2			
3			
4			
5			
6			
7			

Step 2: Refill hole with 7 inches of water

Time for 6 inches of water level drop (minutes):

Percolation Rate (P_m)(mins/inch): n/a

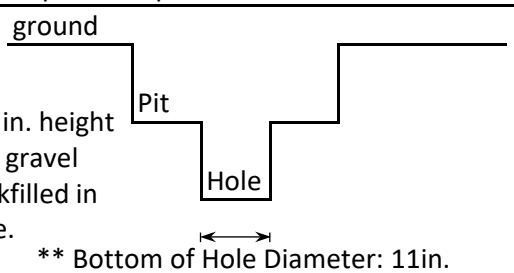
$K = \frac{a}{P_m}$ (inches/hour) [Equation 1]

K= n/a

Bottom Width (inches) **	Parameter "a" for Equation 1
8	22
9	23.5
10	25
11	26.3
12	27.5

Oweis ENGINEERING INC.	Percolation Test	**Basin No.** Linear Infiltration Bldg 3 **Test No.** P-851/10A
PROJECT: Camelot at Ernston Road, Sayreville, NJ		DATE: June 23, 2020
OEI REP. K. Connelly and P. MacRae		PROJ. NO.: 19-NJ272-02
CLIENT: Kaplan Companies		ELEVATION: * ~ 35.9 ft amsl

Test Pit & Hole Dimensions



** Bottom of Hole Diameter: 11in.

*Stake elevation 41.9ft amsl -72 in.

Depth of Pit (below ground surface): 72 in.

Depth of Hole (below bottom of pit): 14.5 in.

Construction Stage: Pre-Construction

Layer Tested: Most restrictive layer below BMP

Note: Metal mesh liner/casing with annulus between hole and liner/casing filled with pea gravel.

Presoaking

Presoaking of Sandy Textured Soil	**4-Hour Presoaking**
1. Fill the test hole to a depth of 12 inches and allow to drain completely. ~ 1 in. > 60 mins 2. Refill the hole to a depth of 12 inches and record the time required for the hole to drain completely. Time (mins): If water remains in the test hole after 60 minutes, preform 4-hour presoaking. Yes Aborted the presoak.	1. Fill the test hole with water and maintain a minimum depth of 12 inches for a period of 4 hours by refilling as necessary. 2. At the end of 4 hours, cease adding water to the hole and allow the hole to drain for a period of from 16 to 24 hours. If water remains in the test hole after the completion period, test should be terminated.

Percolation Test

Step 1: Fill hole with 7 inches of water

Start Time: **Time Interval (5 mins to 30 mins) each Refill: 1.5 mins.**

Time Interval Number	Depth to the Water Level from the Reference Point (0.1 in. accuracy)	Drop Down of Water Level (0.1 in. accuracy)	Remarks (Refill hole to height of 7 inches water after each time interval)
initial t=0	in. = 0.00 ft	0.0	Stopwatch #5, Tape #8, Level, Folding Ruler, Water Level #3. Abandoned test hole due to during first pre-soak observed water level drop of about 1 in. after more than 60 minutes time lapse and the test hole was too close to the proposed wet pond.
1			
2			
3			
4			
5			
6			
7			

Step 2: Refill hole with 7 inches of water

Time for 6 inches of water level drop (minutes):

Percolation Rate (P_m)(mins/inch): n/a

$K = \frac{a}{P_m}$ (inches/hour) [Equation 1]

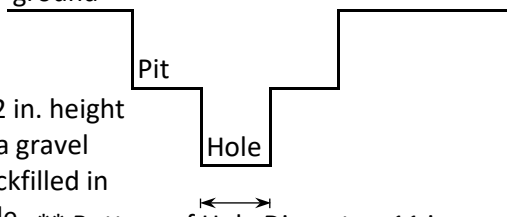
K= n/a

Bottom Width (inches) **	Parameter "a" for Equation 1
8	22
9	23.5
10	25
11	26.3
12	27.5

Percolation Test

Basin No.	Linear Infiltration Bldg 3
Test No.	P-851/10B
PROJECT:	Camelot at Ernston Road, Sayreville, NJ
DATE:	June 23, 2020
OEI REP.	K. Connelly and P. MacRae
PROJ. NO.:	19-NJ272-02
CLIENT:	Kaplan Companies
ELEVATION: *	~ 35.9 ft amsl

Test Pit & Hole Dimensions



*Stake elevation 41.9ft amsl - 6 ft

Depth of Pit (below ground surface): 72 in.

Depth of Hole (below bottom of pit): 15 in.

Construction Stage: Pre-Construction

Layer Tested: Most restrictive layer below BMP

Note: Metal mesh liner/casing with annulus between hole and liner/casing filled with pea gravel.

Presoaking

Presoaking of Sandy Textured Soil	**4-Hour Presoaking**
1. Fill the test hole to a depth of 12 inches and allow to drain completely. (4.28 mins) 2. Refill the hole to a depth of 12 inches and record the time required for the hole to drain completely. Time (mins): 6 mins 7 sec = 6.12 mins If water remains in the test hole after 60 minutes, preform 4-hour presoaking. No.	1. Fill the test hole with water and maintain a minimum depth of 12 inches for a period of 4 hours by refilling as necessary. 2. At the end of 4 hours, cease adding water to the hole and allow the hole to drain for a period of from 16 to 24 hours. If water remains in the test hole after the completion period, test should be terminated.

Percolation Test

Step 1: Fill hole with 7 inches of water

Start Time: ~1130 | **Time Interval (5 mins to 30 mins) each Refill: 1.5 mis**

Time Interval Number	Depth to the Water Level from the Reference Point (0.1 in. accuracy)	Drop Down of Water Level (0.1 in. accuracy)	Remarks (Refill hole to height of 7 inches water after each time interval)
initial t=0	17.3 in = 1.44 ft	0.0	Stopwatch #5, Tape #8, 8A, Level, Folding Ruler, Water Level #3 Note test hole was in the orange brown poorly-graded sand with silt. See Test Pit log TP-851-10B for additional details.
1	1.68 ft	0.24 ft = 2.91 in	
2	1.64 ft	0.20 ft = 2.43 in	
3	1.63 ft	0.19 ft = 2.31 in	
4	1.62 ft	0.18 ft = 2.19 in	
5	1.62 ft	0.18 ft = 2.19 in	
6	1.62 ft	0.18 ft = 2.19 in	
7	1.61 ft	0.17 ft = 2.07 in	

Step 2: Refill hole with 7 inches of water

Time for 6 inches of water level drop (minutes): 6 mins 30 sec = 6.30 mins

Percolation Rate (P_m)(mins/inch): 6.5/6 = 1.08 mins/in.

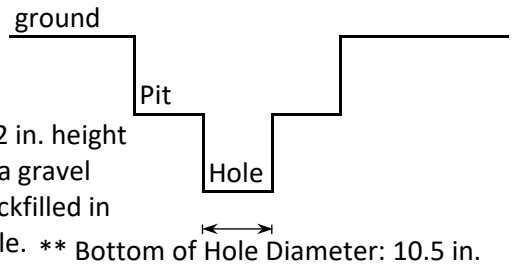
$K = \frac{a}{P_m}$ (inches/hour) [Equation 1]

K= 26.3/1.08 = 24.3 in./ hour

Bottom Width (inches) **	Parameter "a" for Equation 1
8	22
9	23.5
10	25
(11)	(26.3)
12	27.5

Oweis ENGINEERING INC.	Percolation Test	**Basin No.** Linear Infiltration Bldg 4 **Test No.** P-852/11
PROJECT: Camelot at Ernston Road, Sayreville, NJ		DATE: June 23, 2020
OEI REP. K. Connelly and P. MacRae		PROJ. NO.: 19-NJ272-02
CLIENT: Kaplan Companies		ELEVATION: ~ 38 ft amsl

Test Pit & Hole Dimensions



Depth of Pit (below ground surface): 12 in.

Depth of Hole (below bottom of pit): 15 in.

Construction Stage: Pre-Construction

Layer Tested: Most restrictive layer below BMP

Note: Metal mesh liner/casing with annulus between hole and liner/casing filled with pea gravel.

Presoaking

Presoaking of Sandy Textured Soil	**4-Hour Presoaking**
1. Fill the test hole to a depth of 12 inches and allow to drain completely. (6.02 mins) 2. Refill the hole to a depth of 12 inches and record the time required for the hole to drain completely. Time (mins): 12 mins 15 sec = 12.25 mins If water remains in the test hole after 60 minutes, preform 4-hour presoaking. No.	1. Fill the test hole with water and maintain a minimum depth of 12 inches for a period of 4 hours by refilling as necessary. 2. At the end of 4 hours, cease adding water to the hole and allow the hole to drain for a period of from 16 to 24 hours. If water remains in the test hole after the completion period, test should be terminated.

Percolation Test

Step 1: Fill hole with 7 inches of water

Start Time: 1319 — **Time Interval (5 mins to 30 mins) each Refill: 5 mins**

Time Interval Number	Depth to the Water Level from the Reference Point (0.1 in. accuracy)	Drop Down of Water Level (0.1 in. accuracy)	Remarks (Refill hole to height of 7 inches water after each time interval)
initial t=0	17.0 in = 1.42 ft	0.0	Stopwatch #5, Tape #8, 8A, Level Folding Ruler, Water Level #3.
1	1.72 ft	0.30 ft = 3.64 in	* Parameter "a" value for the test hole diameter of 10.5 in. was based on graphing the linear relationship of the test hole diameter with the Parameter "a" values provided in the NJ Stormwater Manual, Appendix E. The Parameter "a" value was then extrapolated from the interception of the graph line by the corresponding test hole diameter.
2	1.71 ft	0.29 ft = 3.52 in	
3	1.70 ft	0.28 ft = 3.40 in	
4	1.67 ft	0.25 ft = 3.04 in	
5	1.67 ft	0.25 ft = 3.04 in	
6	1.66 ft	0.24 ft = 2.92 in	
7			

Step 2: Refill hole with 7 inches of water

Time for 6 inches of water level drop (minutes): 12 mins 57 sec = 12.95 mins

Percolation Rate (P_m)(mins/inch): 12.95/6 = 2.16 mins/in.

* Parameter "a" = 25.55

$K = \frac{a}{P_m}$ (inches/hour) [Equation 1]

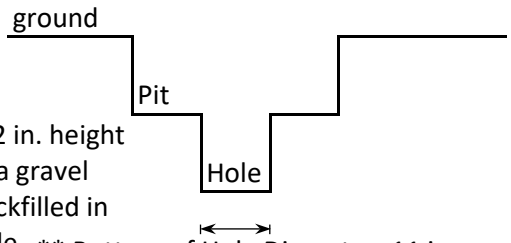
K= 25.55/2.16 = 11.8 in./ hour

Bottom Width (inches) **	Parameter "a" for Equation 1
8	22
9	23.5
10	25
11	26.3
12	27.5

Percolation Test

Basin No.	Linear Infiltration Bldg 5
Test No.	P-852/12A
PROJECT:	Camelot at Ernston Road, Sayreville, NJ
DATE:	June 22, 2020
OEI REP.	K. Connelly and P. MacRae
PROJ. NO.:	19-NJ272-02
CLIENT:	Kaplan Companies
ELEVATION: *	~ 39.33 ft amsl

Test Pit & Hole Dimensions



Depth of Pit (below ground surface): 50 in.

Depth of Hole (below bottom of pit): 14.5 in.

Construction Stage: Pre-Construction

Layer Tested: Most restrictive layer below BMP

Note: Metal mesh liner/casing with annulus between hole and liner/casing filled with pea gravel.

Presoaking

Presoaking of Sandy Textured Soil	**4-Hour Presoaking**
1. Fill the test hole to a depth of 12 inches and allow to drain completely. (2.62 mins) 2. Refill the hole to a depth of 12 inches and record the time required for the hole to drain completely. Time (mins): 4 mins 3 sec = 4.05 mins If water remains in the test hole after 60 minutes, preform 4-hour presoaking. No.	1. Fill the test hole with water and maintain a minimum depth of 12 inches for a period of 4 hours by refilling as necessary. 2. At the end of 4 hours, cease adding water to the hole and allow the hole to drain for a period of from 16 to 24 hours. If water remains in the test hole after the completion period, test should be terminated.

Percolation Test

Step 1: Fill hole with 7 inches of water

Start Time: **Time Interval (5 mins to 30 mins) each Refill: 1.5 mins.**

Time Interval Number	Depth to the Water Level from the Reference Point (0.1 in. accuracy)	Drop Down of Water Level (0.1 in. accuracy)	Remarks (Refill hole to height of 7 inches water after each time interval)
initial t=0	13.5 ins. = 1.13 ft	0.0	Stopwatch #5, Tape #8, Level Folding Ruler, Water Level #3
1	1.60 ft	0.48 ft = 5.70 in.	
2	1.53 ft	0.41 ft = 4.86 in.	
3	1.49 ft	0.37 ft = 4.38 in.	
4	1.48 ft	0.36 ft = 4.26 in.	
5	1.49 ft	0.37 ft = 4.38 in.	
6	1.48 ft	0.36 ft = 4.26 in.	
7	1.47 ft	0.35 ft = 4.14 in.	
8	1.47 ft	0.35 ft = 4.14 in.	
9	1.47 ft	0.35 ft = 4.14 in.	
10	1.47 ft	0.35 ft = 4.14 in.	

Step 2: Refill hole with 7 inches of water

Time for 6 inches of water level drop (minutes): 2 mins 35 sec = 2.58 mins

Percolation Rate (P_m)(mins/inch): 2.58/6 = 0.43 mins/in.

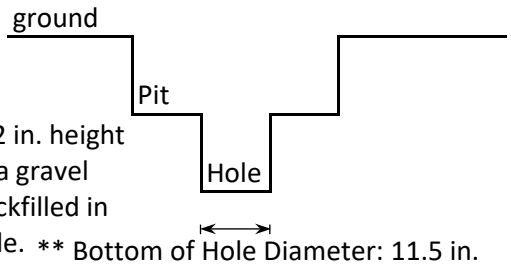
$K = \frac{a}{P_m}$ (inches/hour) [Equation 1]

K= 26.3/0.43 = 61.1 in./ hour

Bottom Width (inches) **	Parameter "a" for Equation 1
8	22
9	23.5
10	25
(11)	(26.3)
12	27.5

Oweis ENGINEERING INC.	Percolation Test	**Basin No.** Linear Infiltration Bldg 6 **Test No.** P-853/13A
PROJECT: Camelot at Ernston Road, Sayreville, NJ		DATE: June 22, 2020
OEI REP. K. Connelly and P. MacRae		PROJ. NO.: 19-NJ272-02
CLIENT: Kaplan Companies		ELEVATION: * ~ 40.72 ft amsl

Test Pit & Hole Dimensions



** Bottom of Hole Diameter: 11.5 in.

Depth of Pit (below ground surface): 60 in.

Depth of Hole (below bottom of pit): 15 in.

Construction Stage: Pre-Construction

Layer Tested: Most restrictive layer below BMP

Note: Metal mesh liner/casing with annulus between hole and liner/casing filled with pea gravel.

Presoaking

Presoaking of Sandy Textured Soil	**4-Hour Presoaking**
1. Fill the test hole to a depth of 12 inches and allow to drain completely. (4.98 mins) 2. Refill the hole to a depth of 12 inches and record the time required for the hole to drain completely. Time (mins): 8 mins 75 sec = 8.75 mins If water remains in the test hole after 60 minutes, preform 4-hour presoaking. No.	1. Fill the test hole with water and maintain a minimum depth of 12 inches for a period of 4 hours by refilling as necessary. 2. At the end of 4 hours, cease adding water to the hole and allow the hole to drain for a period of from 16 to 24 hours. If water remains in the test hole after the completion period, test should be terminated.

Percolation Test

Step 1: Fill hole with 7 inches of water

Start Time: ~1130

Time Interval (5 mins to 30 mins) each Refill: 1.5 mins.

Time Interval Number	Depth to the Water Level from the Reference Point (0.1 in. accuracy)	Drop Down of Water Level (0.1 in. accuracy)	Remarks (Refill hole to height of 7 inches water after each time interval)
initial t=0	14.5 ins. = 1.21 ft	0.0	Stopwatch #5, Tape #8, Level Folding Ruler, Water Level #3
1	1.46 ft	0.25 ft = 3.02 in.	* Parameter "a" value for the test hole diameter of 10.5 in. was based on graphing the linear relationship of the test hole diameter with the Parameter "a" values provided in the NJ Stormwater Manual, Appendix E. The Parameter "a" value was then extrapolated from the interception of the graph line by the corresponding test hole diameter.
2	1.44 ft	0.23 ft = 2.78 in.	
3	1.45 ft	0.24 ft = 2.90 in.	
4	1.45 ft	0.24 ft = 2.90 in.	
5	1.44 ft	0.23 ft = 2.78 in.	
6	1.43 ft	0.22 ft = 2.66 in.	
7	1.43 ft	0.22 ft = 2.66 in.	
8	1.43 ft	0.22 ft = 2.66 in.	

Step 2: Refill hole with 7 inches of water

Time for 6 inches of water level drop (minutes): 4 mins 44 sec = 4.73 mins

Percolation Rate (P_m)(mins/inch): 4.73/6 = 0.79 mins/in.

* Parameter "a" = 26.91

$K = \frac{a}{P_m}$ (inches/hour) [Equation 1]

K= 26.91/0.79 = 34.1 in./ hour

Bottom Width (inches) **	Parameter "a" for Equation 1
8	22
9	23.5
10	25
11	26.3
12	27.5

ADJ. BUILDING

BLOCK 251
LOT 2.01

BLOCK 366.01 LOT 1
AREA OF TRACT= 326,256.33 S.F.
OR +/- 7.489 ACRES
DB-2573, PG-283

BLOCK 347.01-LOT 3.01
AREA OF TRACT=579,784.87 S.F.
OR 13.310 +/- ACRES
DB-2862, PG-479

150.00' WIDE JCP&L EASEMENT
DB-993, PG-451

MAIN STREET
(tax map)

BURTS CREEK TERRACE
(50' R.O.W.)

MIDDLEMARSKI TERRACE
(50' R.O.W.)

STRICKLEY PLACE
(50' R.O.W.)

WEBBER TERRACE
(50' R.O.W.)

SURVEY

PROPOSED DETENTION BASIN #1
APPROX. 17,200 SQ. FT.

PROPOSED DETENTION BASIN #2
APPROX. 17,350 SQ. FT.

P-851/10A (Aborted)
P-851/10 (Aborted)
P-850/9
P-851/TP-10B
P-852/11
P-853/TP-12A
P-854/TP-13A
TP-9
TP-10
TP-11
TP-12
TP-13

BUILDING 1
20 UNITS
10 GARAGES
10 DRIVEWAYS
F.F.E. = 45.62
G.F.E. = 45.12

BUILDING 2
16 UNITS
10 GARAGES
10 DRIVEWAYS
F.F.E. = 45.50
G.F.E. = 44.50

BUILDING 3
16 UNITS
10 GARAGES
10 DRIVEWAYS
F.F.E. = 45.50
G.F.E. = 44.50

BUILDING 4
16 UNITS
10 GARAGES
10 DRIVEWAYS
F.F.E. = 45.00
G.F.E. = 44.50

BUILDING 5
ELEVATOR BUILDING
W/ CLUBHOUSE
20 UNITS
10 GARAGES
10 DRIVEWAYS
F.F.E. = 45.67
G.F.E. = 45.00

BUILDING 6
16 UNITS
10 GARAGES
10 DRIVEWAYS
F.F.E. = 45.50
G.F.E. = 45.00

MAINTENANCE BUILDING
F.F.E. = 46.11

TOT LOT

DOG PARK

DRIVE AISLE "A"

DRIVE AISLE "B"

ADJ. BUILDING (TYP.)

BLOCK 62.01
LOT 12

CONRAIL, RARITAN RIVER RAIL ROAD
(100' R.O.W.)

IVY HILL ROAD
(variable width)

N 40° 03' 00" E
SURVEYED DISTANCE440.49'

N 40° 03' 00" E
535.33'

S 40° 04' 00" E
731.73'

S 87° 10' 00" W
778.47'

S 87° 10' 00" W
857.58'

N 87° 10' 00" E
332.43'

S 17° 40' 00" W
375.97'

S 75° 23' 48" E
257.05'

S 44° 36' 30" E
257.05'

L=272.22' R=1497.70'
D=10° 24' 58"

L=510.30' R=1382.70'
D=21° 08' 44"

L=467.87' R=1382.70'
D=19° 23' 59"

GENERAL NOTES

1. GENERAL LAYOUT TAKEN FROM ABBINGTON ENGINEERING GRADING PLAN FOR CAMELOT AT ERNSTON ROAD, DATED 09/12/2019.
2. THIS DRAWING IS PART OF OWEIS ENGINEERING INC. REPORT NO. 19-NJ272-01 AND SHOULD BE READ TOGETHER WITH THE REPORT FOR COMPLETE EVALUATION.
3. TEST LOCATIONS WERE LOCATED AND SURVEYED BY _____. SOME TEST LOCATIONS WHERE MOVED DUE BY THE INSPECTOR IN THE FIELD AND THEIR ELEVATIONS ESTIMATED BASED ON STAKED LOCATION.

LEGEND

- TEST PIT LOCATION
- PERCOLATION TEST LOCATION

0 60 120
APPROX. SCALE IN FEET

#	REVISION	DATE:

1" 1 1/2" 0"

Oweis ENGINEERING INC.
INNOVATIVE GEOTECHNICAL ENGINEERING SOLUTIONS
100 EAST HANOVER AVE, SUITE 101, CEDAR KNOLLS, NEW JERSEY 07927
Phone: 973.539.4400 Fax: 973.539.1122 www.oweisengineering.com

CAMELOT AT
ERNSTON ROAD

BOROUGH OF SAYREVILLE — MIDDLESEX COUNTY NEW JERSEY

LUMA J. OWEIS, P.E.

N.J.P.E. No. 43235 Date

EXPLORATION/PERCOLATION TEST LOCATION PLAN

DATE:	DES: LJO	DRAWING
07-13-2020	DRN: JB	1
PROJECT NO. 19-NJ272-01	CHK: LJO	
	APV: LJO	

APPENDIX D

STORMWATER PIPE CALCULATIONS

ABBINGTON ENGINEERING, LLC
436 W. COMMODORE BLVD.
SUITE 2
JACKSON, NJ 08527
(732) 431-1440

DRAINAGE COMPUTATIONS
RATIONAL METHOD
Q = CIA

C= 0.99 FOR PAVEMENT
C= 0.25 FOR UNPAVED

PROJECT: Ernston Road
I = 2.3 FOR Tc = 60 min.
STORM FREQUENCY= 25 YEARS

RAINFALL DATA FROM - SANDY HOOK
"n" VALUE = 0.013

JOB No. PROJECT No. 117
BY: RB DATE: 9/12/2019
REV: WTW DATE: 9/17/2020

NOTES (STATION)	STRUCTURES FROM	TO	% PAVE	C (ADJ.)	A (Ac.)	SUM A (Ac.)	CA	SUM CA	Tc INLET	Tc PIPE	SUM Tc (MIN)	I (IN/HR)	Q (CFS)	CAP. (CFS)	VEL. (FPS)	LENGTH (FT)	DESIGN SIZE (IN)	CONSTRUCTION SIZE (IN)	SLOPE %	INV. UPPER	INV. LOWER	TC (GR/RIM)
	1	2	85%	0.88	0.20	0.20	0.18	0.18	10.00	0.75	10.75	5.85	1.03	2.53	3.22	145	12	15	0.50%	40.20	39.47	43.70
	2	3	82%	0.86	0.28	0.48	0.24	0.42	10.75	0.47	11.97	5.51	2.29	2.52	3.21	90	12	15	0.50%	39.47	39.02	43.70
	3	4	81%	0.85	0.12	0.60	0.10	0.52	11.97	0.28	12.71	5.34	2.76	4.57	3.72	62	15	18	0.50%	38.77	38.46	43.75
	5	4	81%	0.85	0.29	0.29	0.25	0.25	10.00	0.02	10.02	6.07	1.50	7.97	10.14	15	12	15	5.00%	39.66	38.91	44.66
	4	6	86%	0.89	0.15	1.04	0.13	0.90	12.71	0.32	13.32	5.20	4.67	4.80	3.91	76	15	18	0.55%	38.46	38.04	43.56
	7	6	95%	0.95	0.17	0.17	0.16	0.16	10.00	0.02	10.02	6.07	0.98	7.97	10.14	15	12	15	5.00%	39.30	38.55	43.30
	6	MH8	88%	0.90	0.15	1.36	0.14	1.19	13.32	0.27	13.58	5.15	6.15	8.79	4.97	80	18	21	0.70%	37.79	37.23	43.61
	MH8	MH9	0%	0.25	0.00	1.36	0.00	1.19	13.58	0.26	14.11	5.04	6.02	7.48	4.24	65	18	21	0.51%	37.24	36.91	43.50
	MH9	HW10	0%	0.25	0.00	1.36	0.00	1.19	14.11	0.11	14.47	4.97	5.94	16.10	9.11	60	18	21	2.35%	36.91	35.50	41.00
	11	12	100%	0.99	0.03	0.03	0.03	0.03	10.00	0.07	10.07	6.06	0.18	5.04	6.41	26	12	15	2.00%	40.76	40.24	46.59
	12	13	79%	0.83	0.07	0.10	0.06	0.09	10.07	0.10	10.23	6.01	0.53	5.04	6.41	37	12	15	2.00%	40.24	39.50	46.56
	13	16	91%	0.92	0.17	0.27	0.16	0.25	10.23	0.63	10.95	5.79	1.42	2.53	3.22	121	12	15	0.50%	39.50	38.89	43.50
	14	15	90%	0.92	0.15	0.15	0.14	0.14	10.00	0.03	10.03	6.07	0.83	5.04	6.41	10	12	15	2.00%	39.73	39.53	45.50
	15	16	94%	0.95	0.19	0.34	0.18	0.32	10.03	0.08	10.14	6.04	1.91	5.04	6.41	32	12	15	2.00%	39.53	38.89	45.00
	16	18	77%	0.82	0.22	0.49	0.18	0.43	10.95	0.18	11.14	5.74	2.44	2.52	3.21	35	12	15	0.50%	38.89	38.71	43.50
	17	18	71%	0.78	0.22	0.22	0.17	0.17	10.00	0.11	10.11	6.04	1.03	4.36	5.56	38	12	15	1.50%	39.28	38.71	43.30
	18	19	45%	0.58	0.02	0.73	0.01	0.61	11.14	0.21	11.46	5.65	3.43	5.04	6.41	80	12	15	2.00%	38.71	37.11	44.26
	19	HW20	70%	0.77	0.14	0.87	0.11	0.72	11.46	0.13	11.79	5.56	3.98	5.94	7.56	58	12	15	2.78%	37.11	35.50	41.50
	OCS21	HW22						25 year basin outflow					0.25	4.60	5.86	36	12	15	1.67%	33.20	32.60	39.00

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DRAINAGE COMPUTATIONS
RATIONAL METHOD
Q = CIA

C= 0.99 FOR PAVEMENT
C= 0.25 FOR UNPAVED

PROJECT: Ernston Road
I = 2.3 FOR Tc = 60 min.
STORM FREQUENCY= 25 YEARS

RAINFALL DATA FROM - SANDY HOOK
"n" VALUE = 0.013

JOB No. PROJECT No. 117
BY: RB DATE: 9/12/2019
REV: WTW DATE: 9/17/2020

NOTES (STATION)	STRUCTURES FROM	STRUCTURES TO	% PAVE	C (ADJ.)	A (Ac.)	SUM A (Ac.)	CA	SUM CA	Tc INLET	Tc PIPE	SUM Tc (MIN)	I (IN/HR)	Q (CFS)	CAP. (CFS)	VEL. (FPS)	LENGTH (FT)	DESIGN SIZE (IN)	CONSTRUCTION SIZE (IN)	SLOPE %	INV. UPPER	INV. LOWER	TC (GR/RIM)
	23	24	99%	0.98	0.13	0.13	0.13	0.13	10.00	0.12	10.12	6.04	0.77	2.52	3.21	24	12	15	0.50%	43.76	43.64	46.76
	24	26	100%	0.99	0.13	0.26	0.13	0.26	10.12	1.06	11.31	5.69	1.46	3.57	4.54	288	12	15	1.00%	43.64	40.75	46.76
	25	26	93%	0.94	0.29	0.29	0.27	0.27	10.00	0.15	10.15	6.03	1.64	2.52	3.21	28	12	15	0.50%	40.89	40.75	43.63
	26	27	98%	0.98	0.09	0.64	0.09	0.62	11.31	0.22	11.68	5.59	3.44	4.57	3.72	50	15	18	0.50%	40.50	40.25	43.66
	27	28	93%	0.94	0.02	0.66	0.02	0.64	11.68	0.40	12.30	5.43	3.45	4.57	3.73	89	15	18	0.50%	40.25	39.80	43.77
	28	43	90%	0.92	0.02	0.68	0.02	0.65	12.30	0.39	13.08	5.25	3.43	4.57	3.72	86	15	18	0.50%	39.80	39.37	44.42
	29	31	59%	0.69	0.36	0.36	0.25	0.25	10.00	0.15	10.15	6.03	1.49	2.52	3.21	28	12	15	0.50%	41.42	41.28	44.42
	30	31	88%	0.90	0.03	0.03	0.03	0.03	10.00	0.08	10.22	6.01	0.16	3.56	4.54	21	12	15	1.00%	41.48	41.27	44.47
	31	32	93%	0.94	0.17	0.56	0.16	0.43	10.22	0.15	10.45	5.94	2.57	4.57	3.72	34	15	18	0.50%	41.02	40.85	44.42
	32	38	100%	0.99	0.12	0.68	0.12	0.55	10.45	0.54	10.99	5.78	3.19	4.57	3.72	120	15	18	0.50%	40.85	40.25	46.00
	HW37	38	1%	0.26	1.19	1.19	0.31	0.31	10.00	0.17	10.17	6.03	1.85	2.52	3.21	32	12	15	0.50%	41.00	40.84	42.00
	33	34	70%	0.77	0.04	0.04	0.03	0.03	10.00	0.10	10.10	6.05	0.19	2.52	3.21	20	12	15	0.50%	42.03	41.93	45.00
	34	35	99%	0.98	0.01	0.05	0.01	0.04	10.10	0.29	10.39	5.96	0.24	2.52	3.21	55	12	15	0.50%	41.93	41.65	45.00
	35	36	99%	0.98	0.03	0.08	0.03	0.07	10.39	0.04	10.72	5.86	0.41	2.52	3.21	8	12	15	0.50%	41.65	41.61	45.00
	36	38	100%	0.99	0.02	0.10	0.02	0.09	10.72	0.11	10.87	5.81	0.52	2.52	3.21	21	12	15	0.50%	41.61	41.50	44.69
	38	41	100%	0.99	0.04	2.01	0.04	0.99	10.99	0.41	11.40	5.66	5.59	7.46	4.22	105	18	21	0.50%	40.00	39.47	44.69
	40	41	91%	0.92	0.15	0.15	0.14	0.14	10.00	0.08	10.08	6.05	0.84	3.56	4.54	22	12	15	1.00%	40.19	39.97	43.89
	41	42	100%	0.99	0.08	2.24	0.08	1.21	11.40	0.09	11.58	5.62	6.77	7.43	4.20	23	18	21	0.50%	39.47	39.35	43.30
	42	43	88%	0.90	0.25	2.49	0.23	1.43	11.58	0.16	11.83	5.55	7.94	11.20	4.66	45	21	24	0.50%	39.10	38.87	43.80
	43	HW44	94%	0.95	0.09	2.58	0.09	1.52	11.83	0.04	12.03	5.50	8.34	28.98	12.05	26	21	24	3.35%	38.87	38.00	43.30
	45	46	93%	0.94	0.09	0.09	0.08	0.08	10.00	0.23	10.23	6.01	0.51	2.52	3.21	45	12	15	0.50%	42.20	41.98	45.20
	46	47	57%	0.67	0.11	0.20	0.07	0.16	10.23	0.25	10.48	5.93	0.94	2.52	3.21	48	12	15	0.50%	41.98	41.74	45.00
	47	48	100%	0.99	0.02	0.22	0.02	0.18	10.48	0.12	10.85	5.82	1.04	4.36	5.56	40	12	15	1.50%	41.74	41.14	44.78
	48	52	53%	0.64	0.04	0.26	0.03	0.20	10.85	0.27	11.24	5.71	1.16	2.52	3.21	51	12	15	0.50%	41.14	40.89	44.09
	49	51	100%	0.99	0.09	0.09	0.09	0.09	10.00	0.21	10.21	6.01	0.54	2.52	3.21	40	12	15	0.50%	41.11	40.91	44.11
	HW50	51	5%	0.29	0.12	0.12	0.03	0.03	10.00	0.06	10.06	6.06	0.21	2.52	3.21	12	12	15	0.50%	40.00	39.94	40.00
	51	52	100%	0.99	0.04	0.25	0.04	0.16	10.21	0.21	10.48	5.93	0.97	2.52	3.21	40	12	15	0.50%	39.94	39.74	44.13
	52	53	91%	0.92	0.12	0.63	0.11	0.48	11.24	0.13	11.58	5.61	2.68	4.57	3.72	30	15	18	0.50%	39.49	39.34	44.42
	53	54	97%	0.97	0.19	0.82	0.18	0.66	11.58	0.18	11.89	5.53	3.66	4.57	3.72	40	15	18	0.50%	39.34	39.14	43.50
	54	HW55	100%	0.99	0.13	0.95	0.13	0.79	11.89	0.14	12.22	5.45	4.31	8.76	7.14	62	15	18	1.84%	39.14	38.00	43.55
	OCS56	HW57						25 year basin outflow					1.03	12.43	5.17	26	21	24	0.62%	36.00	35.84	42.00

APPENDIX E

CONDUIT OUTLET PROTECTION & EMERGENCY SPILLWAY CALCULATIONS

CONDUIT OUTLET PROTECTION

PROJECT: CAMELOT AT ERNSTON ROAD JOB No: 117

BY: RB DATE: 9/17/2019

PIPE LOCATION: HEADWALL #10

Q= 5.92 cfs (from pipe calculations)

Pipe size= 21 in.

1.75 ft.

a) Required Apron Length (La), where TW > 1/2 Do

$$La = \frac{3Q}{D_o^{3/2}} =$$ 7.67 ft, use **8ft Long**

b) Required Apron Width at Apron Outlet (Wa), where TW > 1/2 Do

$$Wa = (3 * Do) + (0.4 * La) =$$ 8.32 ft, use **9ft Wide**

c) Required Rip Rap Median Stone Diameters (d50)

$$d_{50} = \left(\frac{0.02}{TW}\right) * \left(\frac{Q}{D_o}\right)^{4/3} =$$ 0.14 ft, use **3" stone**

Tailwater = 0.73 ft

2-yr Storm max. water elev. 36.23 pipe inv.= 35.50

d) Apron thickness with filter fabric

2 * D50= 0.28 ft, use **10" thick @0.00%**

CONDUIT OUTLET PROTECTION

PROJECT: CAMELOT AT ERNSTON ROAD JOB No: 117

BY: RB DATE: 9/17/2019

PIPE LOCATION: HEADWALL #20

Q= 3.97 cfs (from pipe calculations)

Pipe size= 15 in.

1.25 ft.

a) Required Apron Length (La), where TW > 1/2 Do

$$La = \frac{3Q}{D_o^{3/2}} =$$ 8.52 ft, use **9ft Long**

b) Required Apron Width at Apron Outlet (Wa), where TW > 1/2 Do

$$Wa = (3 * Do) + (0.4 * La) =$$ 7.16 ft, use **8ft Wide**

c) Required Rip Rap Median Stone Diameters (d50)

$$d_{50} = \left(\frac{0.02}{TW}\right) * \left(\frac{Q}{D_o}\right)^{4/3} =$$ 0.13 ft, use **3" stone**

Tailwater = 0.73 ft

2-yr Storm max. water elev. 36.23 pipe inv.= 35.50

d) Apron thickness with filter fabric

2 * D50= 0.26 ft, use **10" thick @0.00%**

CONDUIT OUTLET PROTECTION

PROJECT: CAMELOT AT ERNSTON ROAD JOB No: 117

BY: RB DATE: 9/17/2019

PIPE LOCATION: HEADWALL #22

Q= 0.972 cfs (from hydrographs-100 year storm)

Pipe size= 15 in.

1.25 ft.

a) Required Apron Length (La), where TW > 1/2 Do

$$La = \frac{3Q}{D_o^{3/2}} =$$ 2.09 ft, use **2ft Long**

b) Required Apron Width at Apron Outlet (Wa), where TW > 1/2 Do

$$Wa = (3 * Do) + (0.4 * La) =$$ 4.58 ft, use **5ft Wide**

c) Required Rip Rap Median Stone Diameters (d50)

$$d_{50} = \left(\frac{0.02}{TW}\right) * \left(\frac{Q}{D_o}\right)^{4/3} =$$ 0.57 ft, use **7" stone**

Tailwater = 0.03 ft

pipe inv.= 32.60

d) Apron thickness with filter fabric

2 * D50= 1.14 ft, use **10" thick @0.00%**

CONDUIT OUTLET PROTECTION

PROJECT: CAMELOT AT ERNSTON ROAD JOB No: 117

BY: RB DATE: 9/17/2019

PIPE LOCATION: HEADWALL #44

Q= 8.36 cfs (from pipe calculations)

Pipe size= 24 in.

2 ft.

a) Required Apron Length (La), where TW > 1/2 Do

$$La = \frac{3Q}{D_o^{3/2}} =$$ 8.87 ft, use **9ft Long**

b) Required Apron Width at Apron Outlet (Wa), where TW > 1/2 Do

$$Wa = (3 * Do) + (0.4 * La) =$$ 9.55 ft, use **10ft Wide**

c) Required Rip Rap Median Stone Diameters (d50)

$$d_{50} = \left(\frac{0.02}{TW}\right) * \left(\frac{Q}{D_o}\right)^{4/3} =$$ 0.07 ft, use **3" stone**

Tailwater = 1.83 ft

2-yr Storm max. water elev. 39.83 pipe inv.= 38.00

d) Apron thickness with filter fabric

2 * D50= 0.15 ft, use **10" thick @0.00%**

CONDUIT OUTLET PROTECTION

PROJECT: CAMELOT AT ERNSTON ROAD JOB No: 117

BY: RB DATE: 9/17/2019

PIPE LOCATION: HEADWALL #55

Q= 4.28 cfs (from pipe calculations)

Pipe size= 18 in.

1.5 ft.

a) Required Apron Length (La), where TW > 1/2 Do

$$La = \frac{3Q}{D_o^{3/2}} =$$ 6.99 ft, use **7ft Long**

b) Required Apron Width at Apron Outlet (Wa), where TW > 1/2 Do

$$Wa = (3 * Do) + (0.4 * La) =$$ 7.30 ft, use **8ft Wide**

c) Required Rip Rap Median Stone Diameters (d50)

$$d_{50} = \left(\frac{0.02}{TW}\right) * \left(\frac{Q}{D_o}\right)^{4/3} =$$ 0.04 ft, use **3" stone**

Tailwater = 1.83 ft

2-yr Storm max. water elev. 39.83 pipe inv.= 38.00

d) Apron thickness with filter fabric

2 * D50= 0.09 ft, use **10" thick @0.00%**

CONDUIT OUTLET PROTECTION

PROJECT: CAMELOT AT ERNSTON ROAD JOB No: 117

BY: MAZ DATE: 9/24/2020

PIPE LOCATION: HEADWALL #57

Q= 2.881 cfs (from hydrographs-100 year storm)

Pipe size= 24 in.

2 ft.

a) Required Apron Length (La), where TW > 1/2 Do

$$La = \frac{3Q}{D_o^{3/2}} =$$ 3.06 ft, use **3ft Long**

b) Required Apron Width at Apron Outlet (Wa), where TW > 1/2 Do

$$Wa = (3 * Do) + (0.4 * La) =$$ 7.22 ft, use **8ft Wide**

c) Required Rip Rap Median Stone Diameters (d50)

$$d_{50} = \left(\frac{0.02}{TW}\right) * \left(\frac{Q}{D_o}\right)^{4/3} =$$ 0.81 ft, use **10" stone**

Tailwater = 0.04 ft

pipe inv.= 35.84

d) Apron thickness with filter fabric

2 * D50= 1.63 ft, use **10" thick @0.00%**

Hydrograph Report

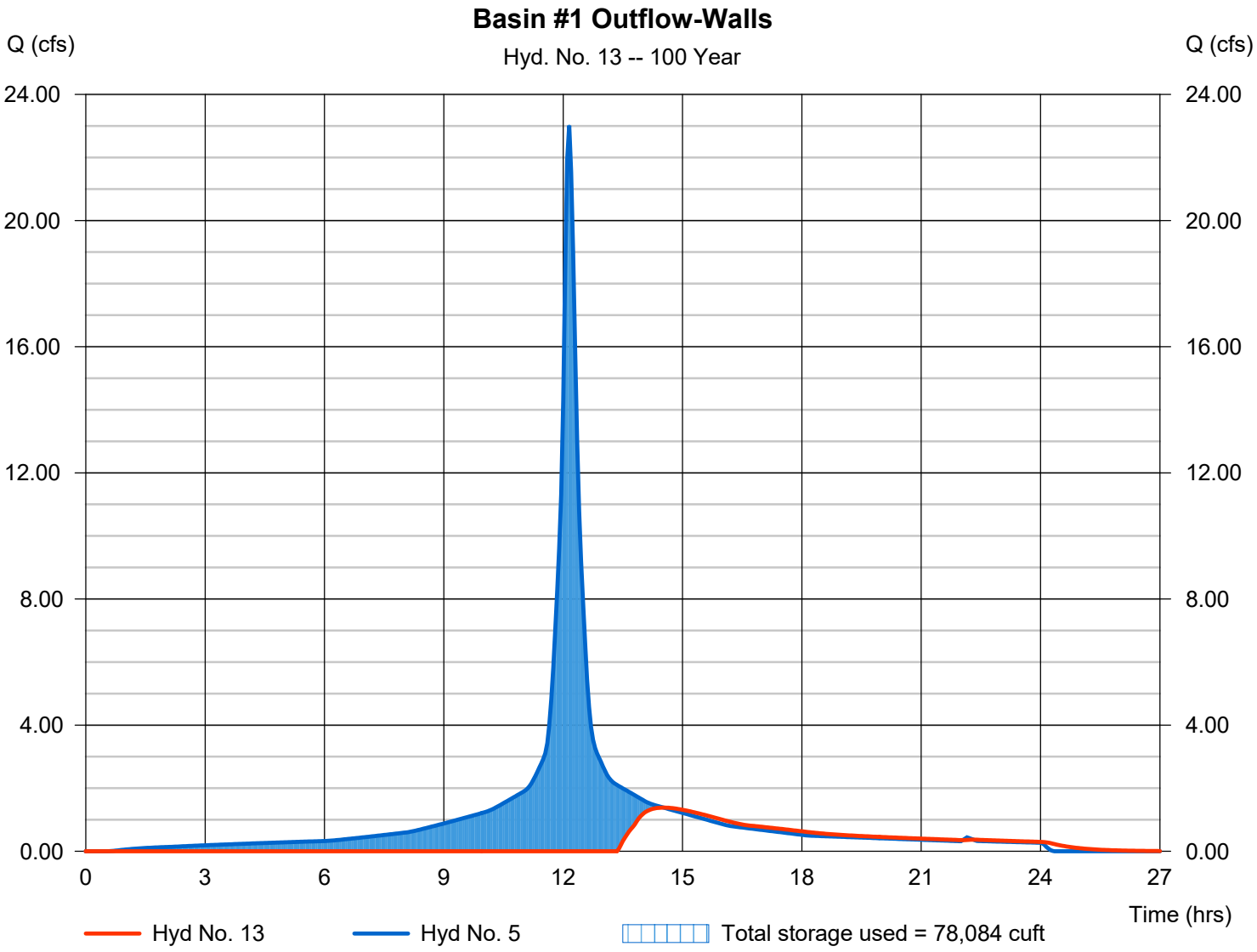
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Thursday, 09 / 24 / 2020

Hyd. No. 13

Basin #1 Outflow-Walls

Hydrograph type	= Reservoir	Peak discharge	= 1.384 cfs
Storm frequency	= 100 yrs	Time to peak	= 14.50 hrs
Time interval	= 3 min	Hyd. volume	= 26,199 cuft
Inflow hyd. No.	= 5 - Total Prop. to Basin #1	Max. Elevation	= 39.14 ft
Reservoir name	= Wet Pond 1 - Upper Only	Max. Storage	= 78,084 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Thursday, 09 / 24 / 2020

Pond No. 15 - Wet Pond 1 - Upper Only

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 34.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	34.50	11,380	0	0
0.50	35.00	12,169	5,886	5,886
1.50	36.00	16,070	14,073	19,959
2.50	37.00	17,342	16,700	36,659
3.50	38.00	19,191	18,257	54,916
4.50	39.00	21,100	20,136	75,052
5.50	40.00	23,066	22,073	97,125

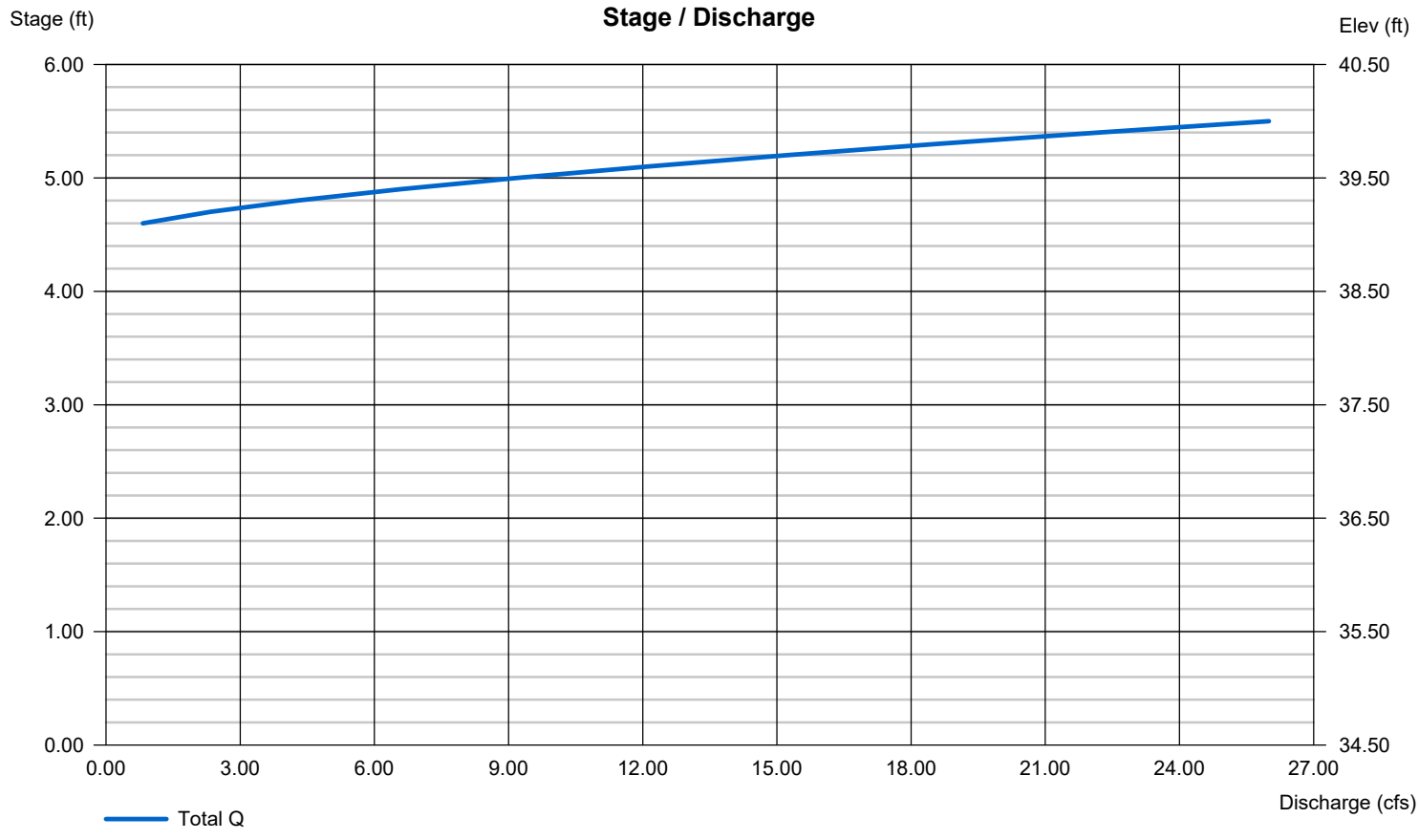
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	Inactive	Inactive	Inactive	Inactive
Span (in)	= 15.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 33.20	0.00	0.00	0.00
Length (ft)	= 36.00	0.00	0.00	0.00
Slope (%)	= 0.62	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.00	Inactive	Inactive	Inactive
Crest El. (ft)	= 39.00	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Report

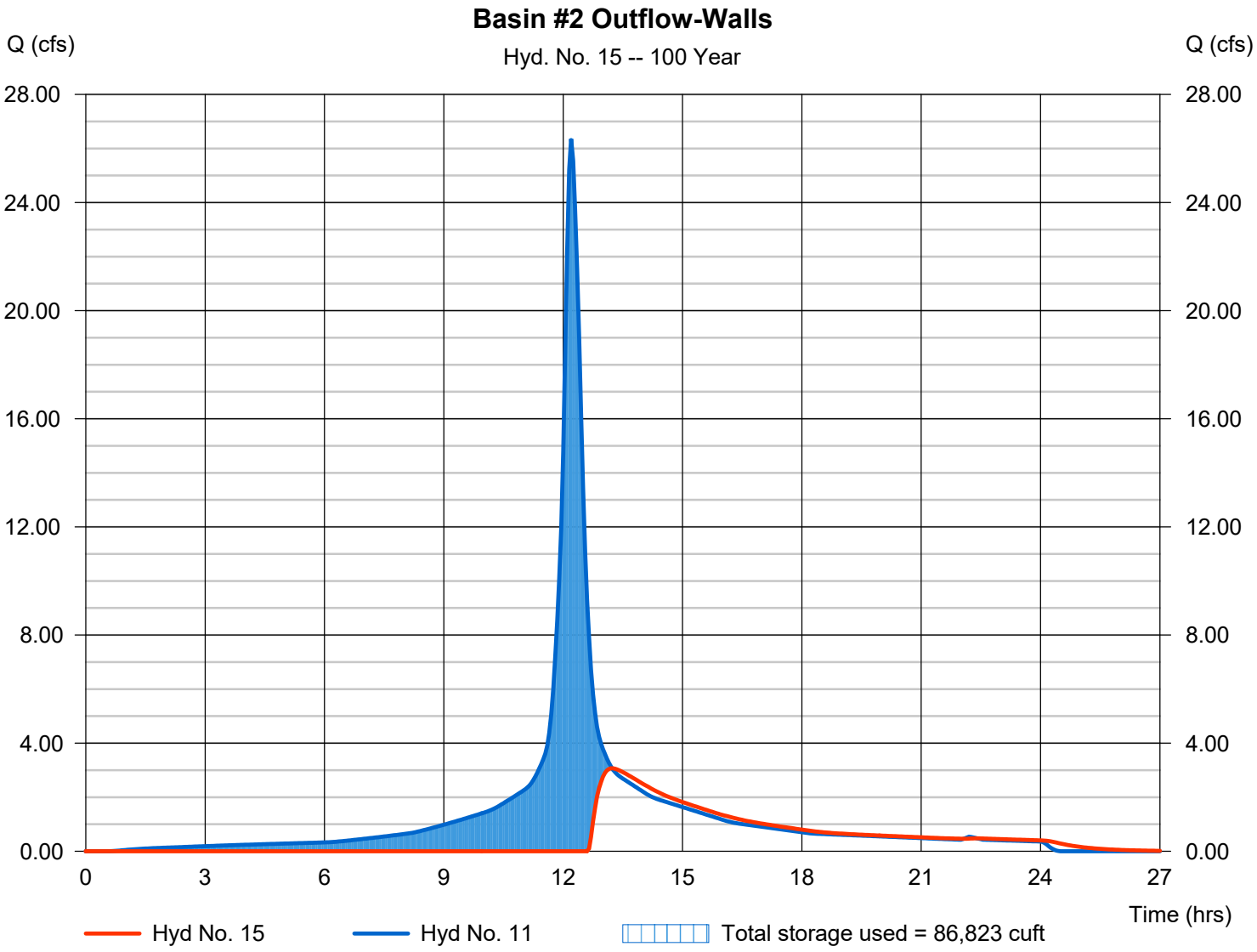
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Thursday, 09 / 24 / 2020

Hyd. No. 15

Basin #2 Outflow-Walls

Hydrograph type	= Reservoir	Peak discharge	= 3.070 cfs
Storm frequency	= 100 yrs	Time to peak	= 13.25 hrs
Time interval	= 3 min	Hyd. volume	= 46,437 cuft
Inflow hyd. No.	= 11 - Total Prop. to Basin #2	Max. Elevation	= 42.54 ft
Reservoir name	= Wet Pond 2 - Upper Only	Max. Storage	= 86,823 cuft

Storage Indication method used.



Pond Report

Pond No. 16 - Wet Pond 2 - Upper Only

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 38.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	38.00	15,007	0	0
1.00	39.00	16,797	15,892	15,892
2.00	40.00	20,291	18,515	34,407
2.30	40.30	20,575	6,129	40,536
3.00	41.00	20,575	14,401	54,937
4.00	42.00	20,575	20,573	75,510
4.30	42.30	20,748	6,198	81,708
5.00	43.00	21,989	14,954	96,662
5.20	43.20	24,560	4,652	101,314

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	Inactive	Inactive	Inactive	Inactive
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

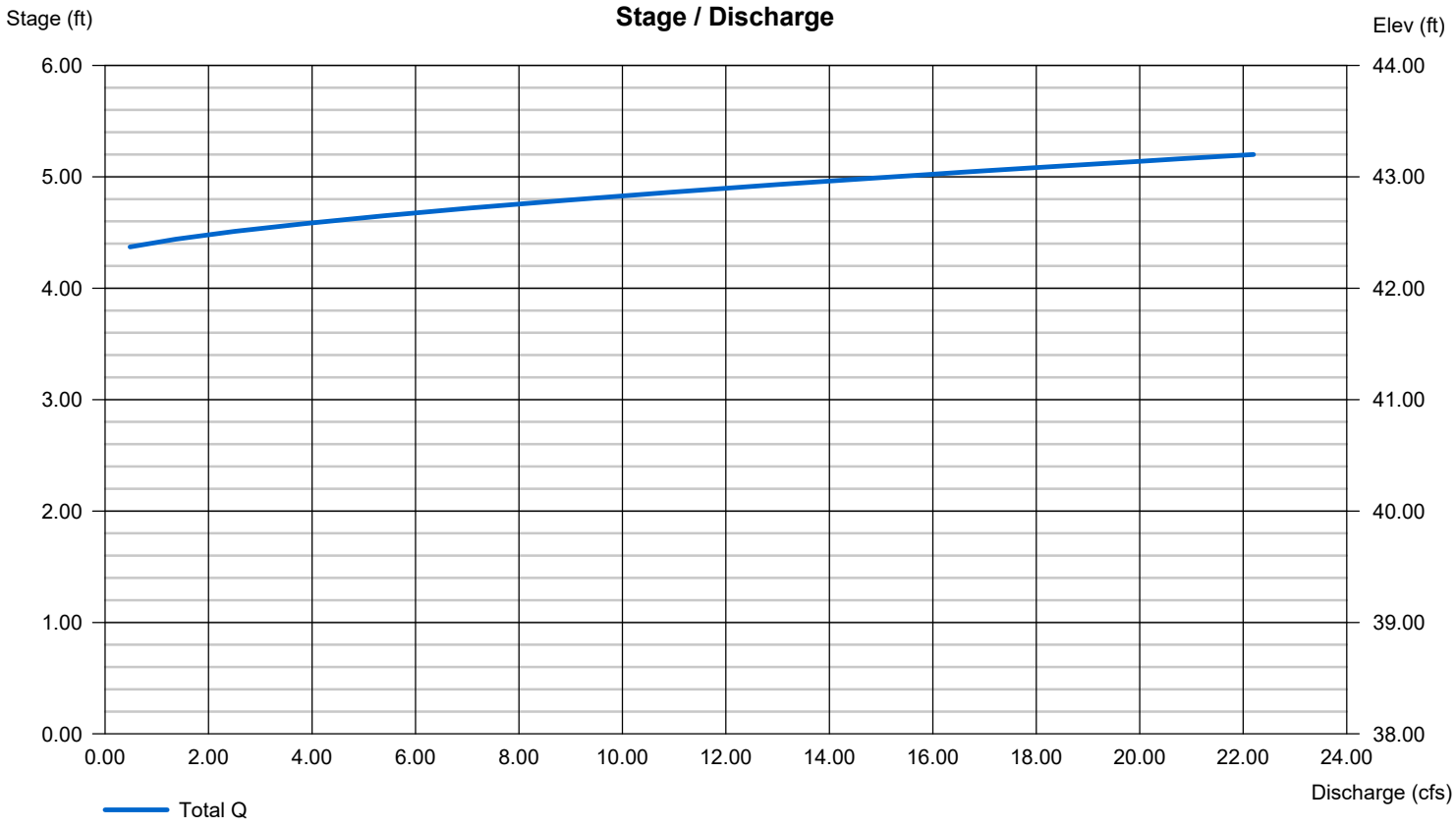
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.00	Inactive	Inactive	Inactive
Crest El. (ft)	= 42.30	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	--------
2	69.8703	13.1000	0.8658	--------
3	0.0000	0.0000	0.0000	--------
5	79.2597	14.6000	0.8369	--------
10	88.2351	15.5000	0.8279	--------
25	102.6072	16.5000	0.8217	--------
50	114.8193	17.2000	0.8199	--------
100	127.1596	17.8000	0.8186	--------

File name: Southern NJ.idf

Intensity = B / (Tc + D)^E

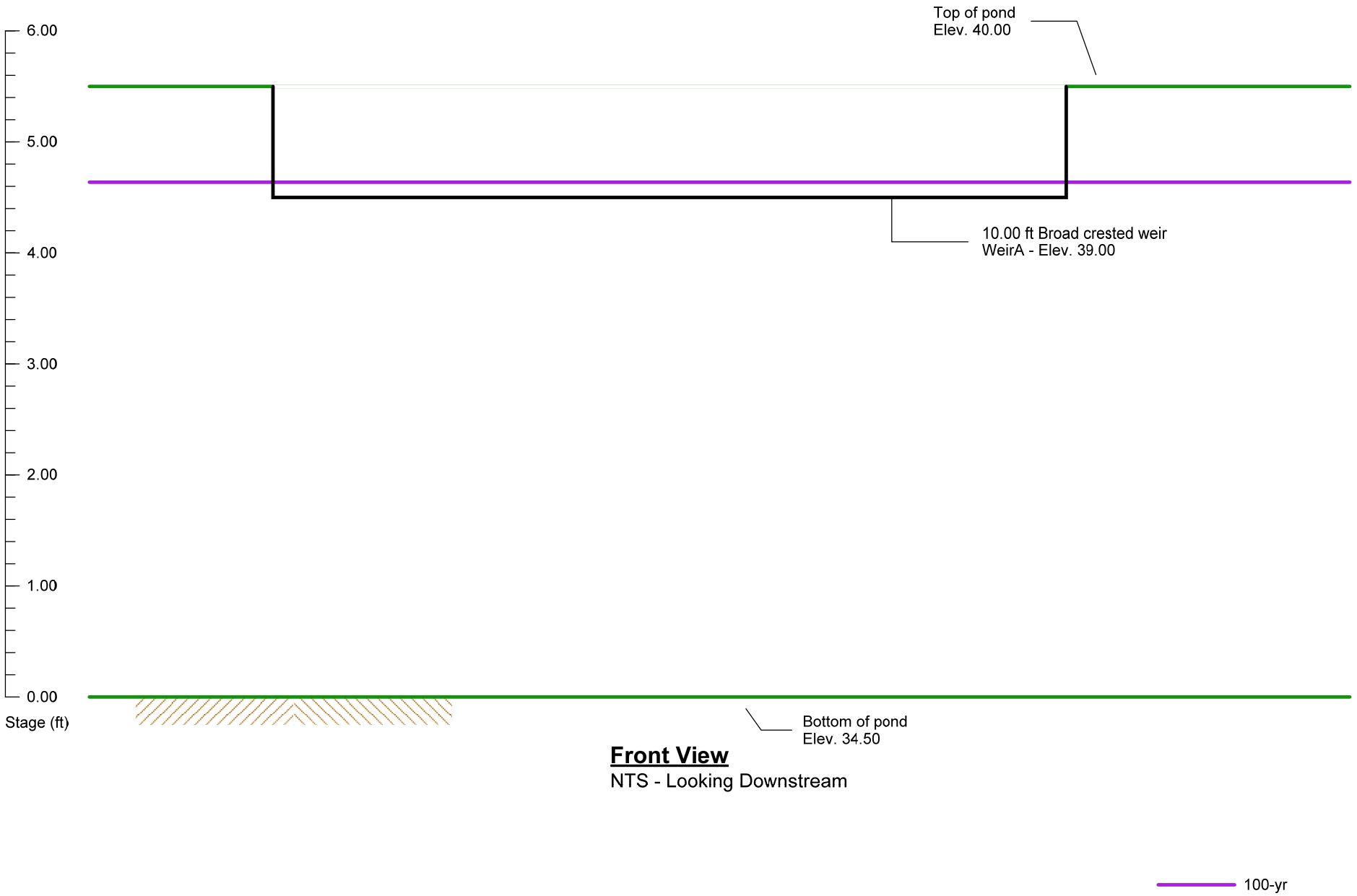
Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.69	4.61	3.89	3.38	2.99	2.69	2.44	2.24	2.07	1.93	1.81	1.70
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.57	5.43	4.65	4.08	3.65	3.30	3.02	2.79	2.59	2.42	2.27	2.15
10	7.24	6.04	5.21	4.59	4.12	3.74	3.43	3.17	2.95	2.77	2.60	2.46
25	8.25	6.95	6.03	5.34	4.80	4.38	4.02	3.73	3.48	3.26	3.07	2.91
50	9.04	7.65	6.66	5.92	5.34	4.87	4.49	4.16	3.88	3.65	3.44	3.25
100	9.83	8.36	7.30	6.50	5.87	5.36	4.94	4.59	4.29	4.03	3.80	3.60

Tc = time in minutes. Values may exceed 60.

e name: P:\Jobs - Construction\Jobs\034 (Contemporary Motors - Little Silver)\HYDRO\Monmouth Cty 24hr rainfall.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	3.35	0.00	4.40	5.12	6.36	7.70	8.63
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	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Pond No. 15 - Wet Pond 1 - Upper Only

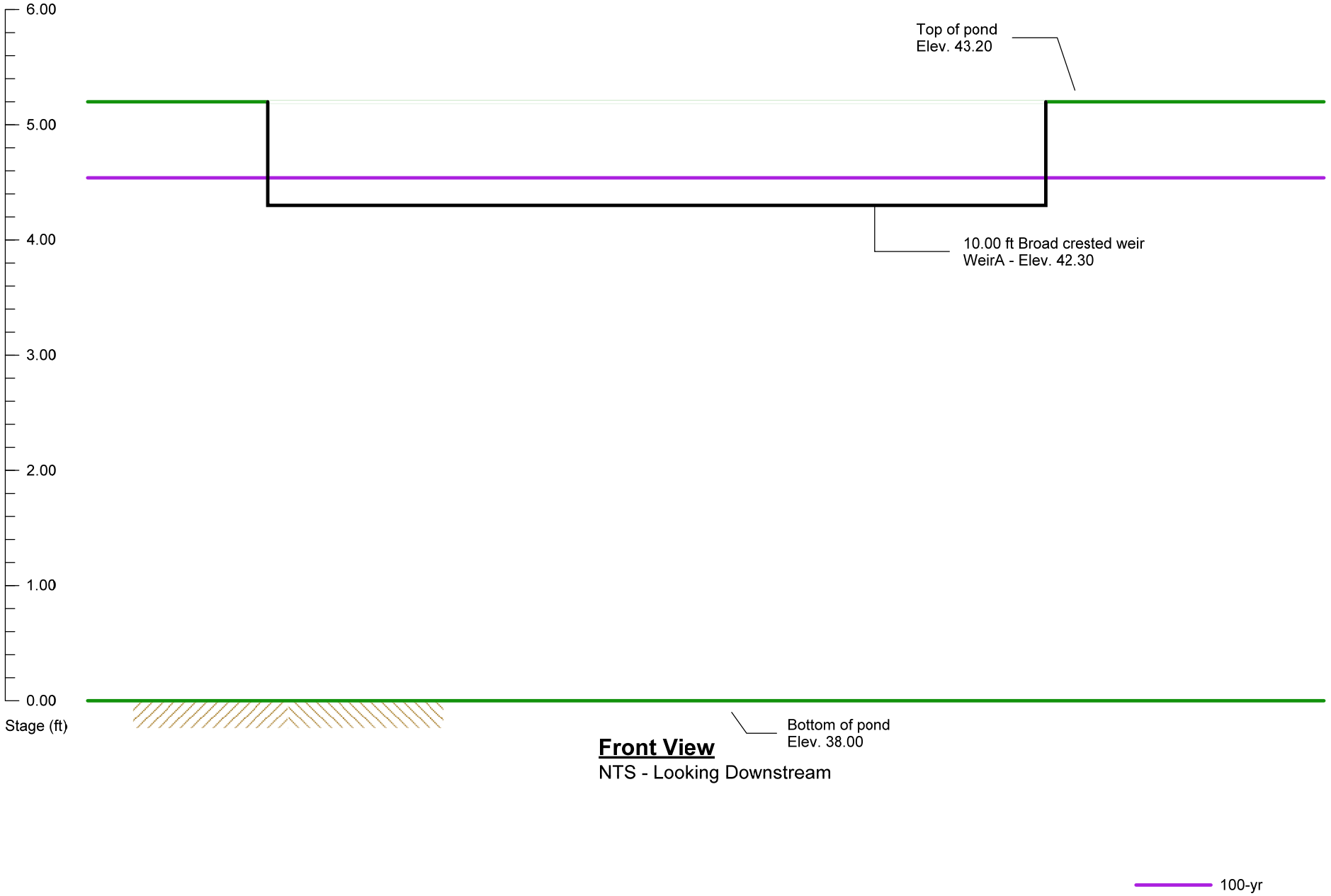


Front View

NTS - Looking Downstream

Inflow hydrograph = 5. Combine - Total Prop. to Basin #1

Pond No. 16 - Wet Pond 2 - Upper Only



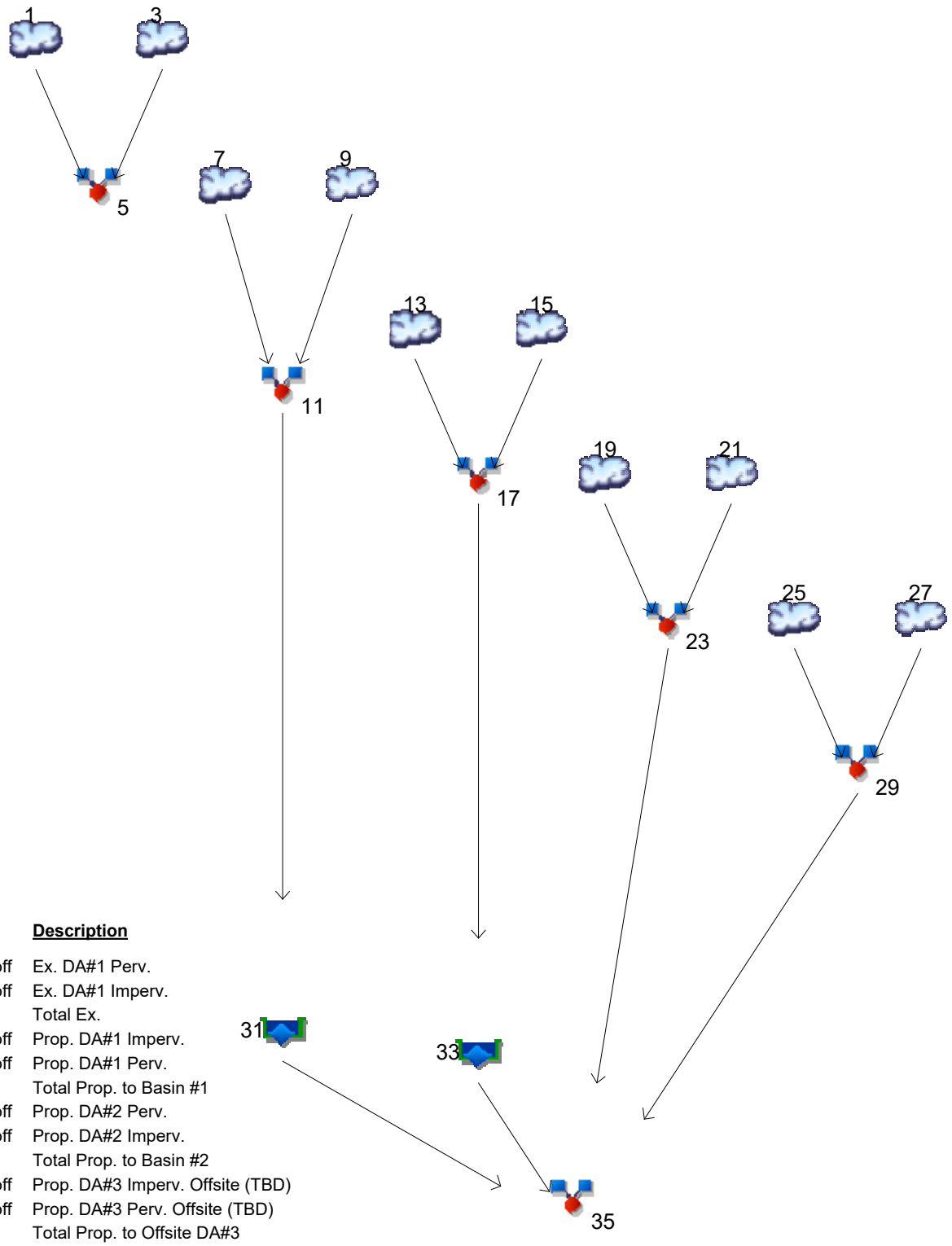
Inflow hydrograph = 11. Combine - Total Prop. to Basin #2

APPENDIX F

HYDROFLOW REPORT

Hydraflow Table of Contents

Watershed Model Schematic



Legend

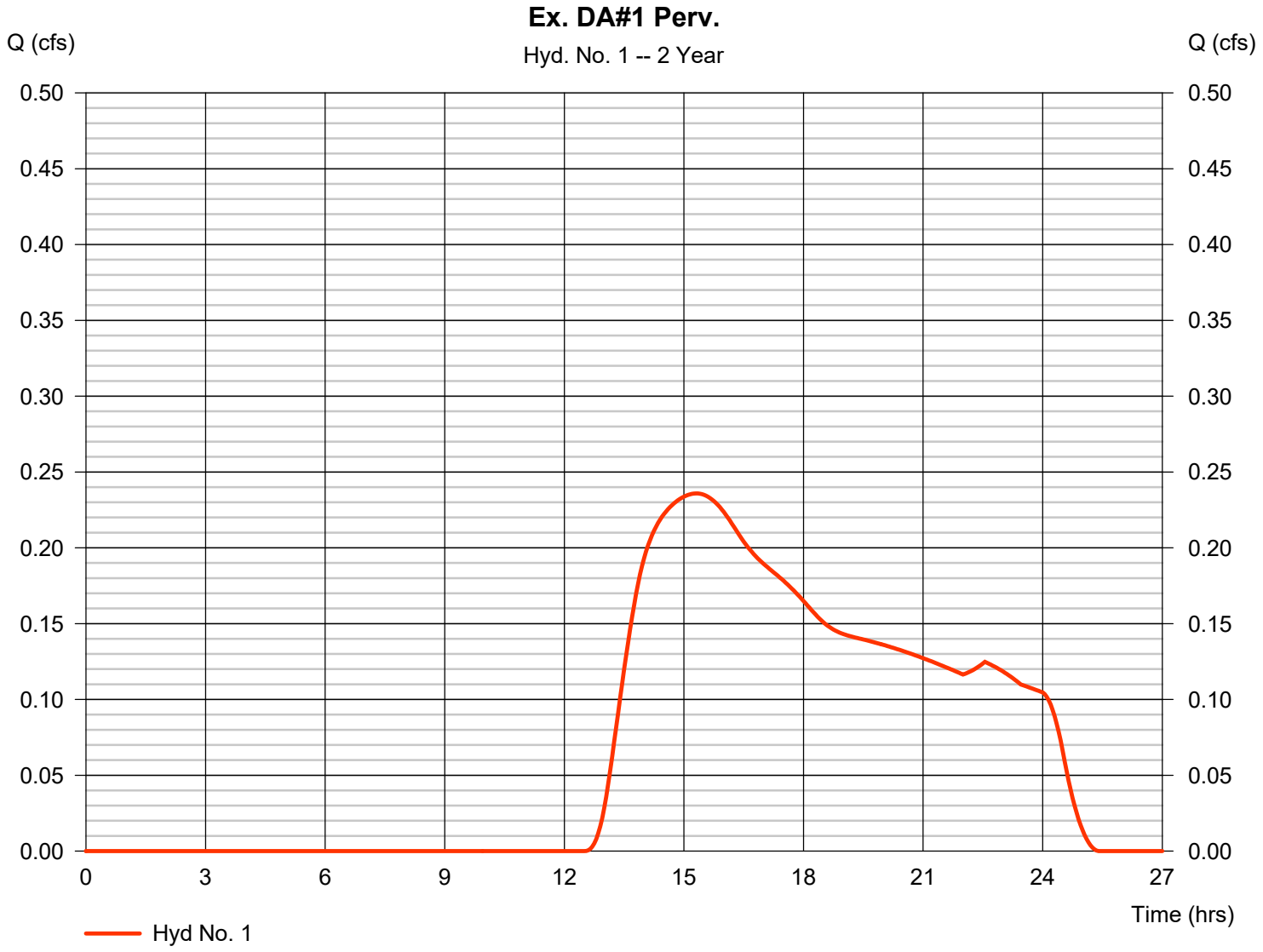
Hyd.	Origin	Description
1	SCS Runoff	Ex. DA#1 Perv.
3	SCS Runoff	Ex. DA#1 Imperv.
5	Combine	Total Ex.
7	SCS Runoff	Prop. DA#1 Imperv.
9	SCS Runoff	Prop. DA#1 Perv.
11	Combine	Total Prop. to Basin #1
13	SCS Runoff	Prop. DA#2 Perv.
15	SCS Runoff	Prop. DA#2 Imperv.
17	Combine	Total Prop. to Basin #2
19	SCS Runoff	Prop. DA#3 Imperv. Offsite (TBD)
21	SCS Runoff	Prop. DA#3 Perv. Offsite (TBD)
23	Combine	Total Prop. to Offsite DA#3
25	SCS Runoff	Prop. DA#4 Imperv. Offsite
27	SCS Runoff	Prop. DA#4 Perv. Offsite
29	Combine	Total Prop. to Offsite DA#4
31	Reservoir	Basin #1 Outflow-Walls
33	Reservoir	Basin #2 Outflow-Walls
35	Combine	Total Prop. to be Reduced-Walls

Hydrograph Report

Hyd. No. 1

Ex. DA#1 Perv.

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.236 cfs
Storm frequency	=	2 yrs	Time to peak	=	15.30 hrs
Time interval	=	3 min	Hyd. volume	=	6,472 cuft
Drainage area	=	22.880 ac	Curve number	=	46
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	50.80 min
Total precip.	=	3.35 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd. No. 1

Ex. DA#1 Perv.

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.800		0.011		0.011		
Flow length (ft)	= 150.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.38		0.00		0.00		
Land slope (%)	= 3.20		0.00		0.00		
Travel Time (min)	**= 41.69**	**+**	**0.00**	**+**	**0.00**	**=**	**41.69**
Shallow Concentrated Flow							
Flow length (ft)	= 1203.00		0.00		0.00		
Watercourse slope (%)	= 1.86		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=2.20		0.00		0.00		
Travel Time (min)	**= 9.11**	**+**	**0.00**	**+**	**0.00**	**=**	**9.11**
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	= 0.013		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**

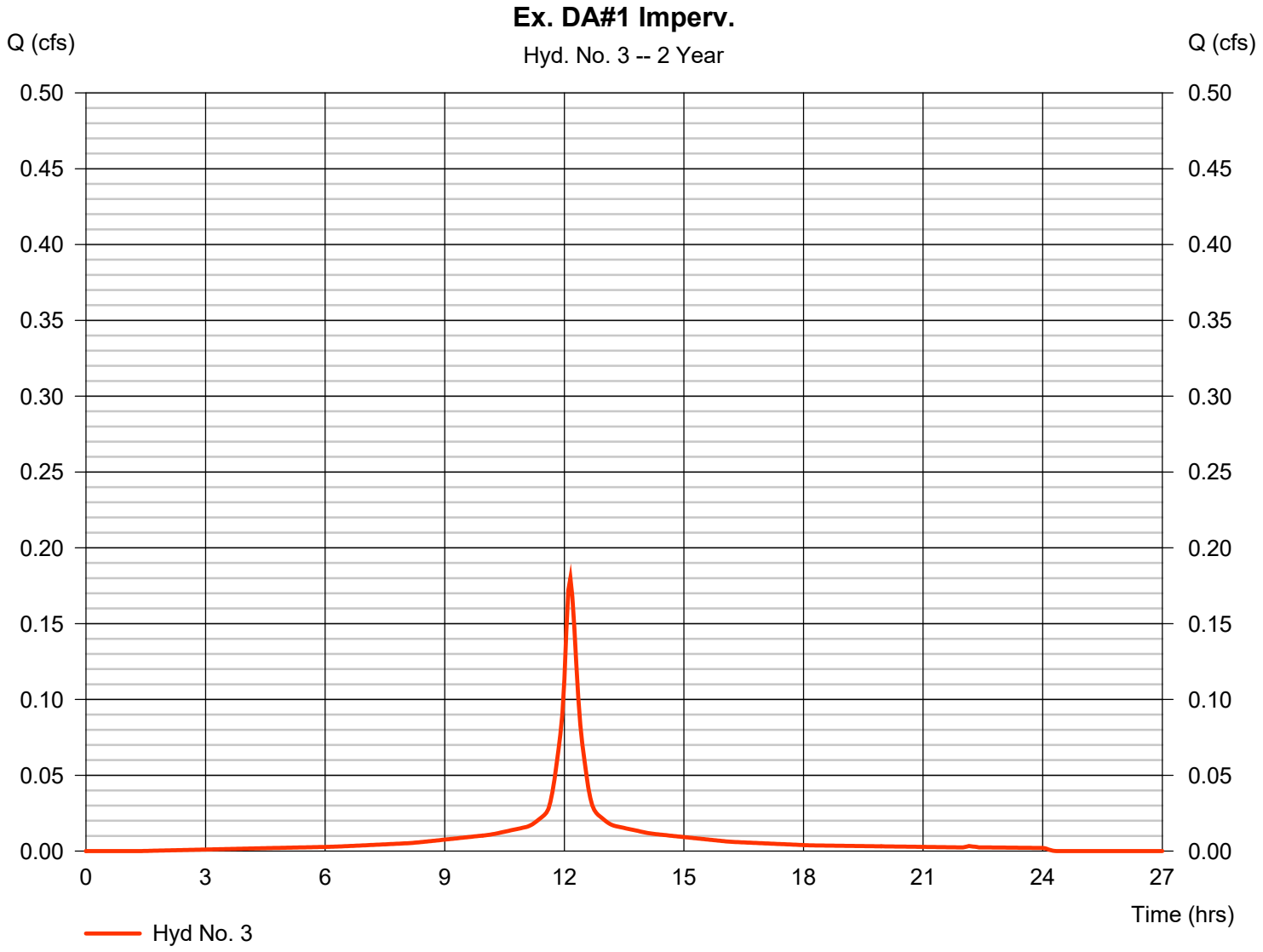
Total Travel Time, Tc ..... 50.80 min

Hydrograph Report

Hyd. No. 3

Ex. DA#1 Imperv.

Hydrograph type	= SCS Runoff	Peak discharge	= 0.180 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.15 hrs
Time interval	= 3 min	Hyd. volume	= 792 cuft
Drainage area	= 0.070 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.35 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

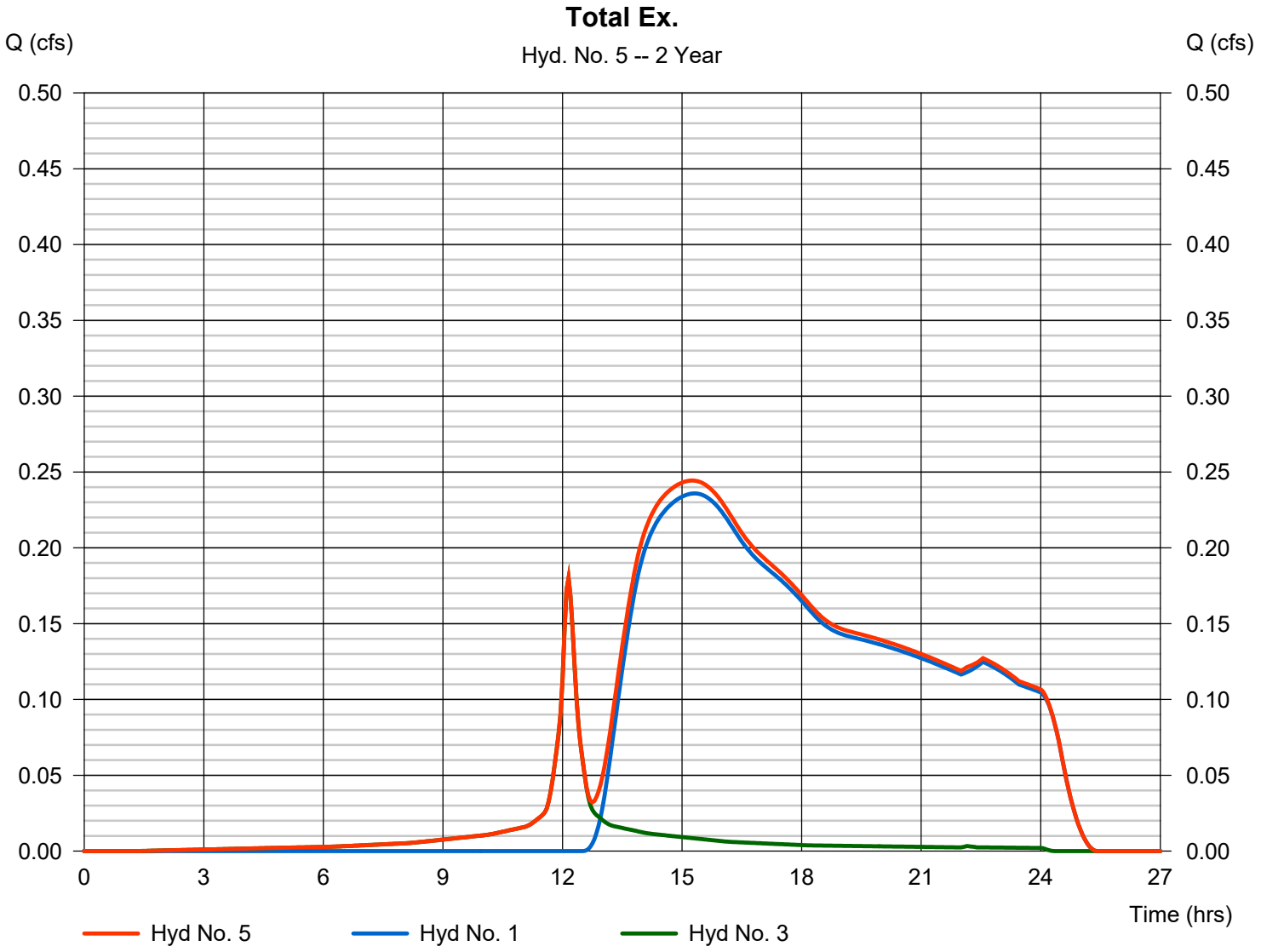


Hydrograph Report

Hyd. No. 5

Total Ex.

Hydrograph type	= Combine	Peak discharge	= 0.244 cfs
Storm frequency	= 2 yrs	Time to peak	= 15.25 hrs
Time interval	= 3 min	Hyd. volume	= 7,264 cuft
Inflow hyds.	= 1, 3	Contrib. drain. area	= 22.950 ac

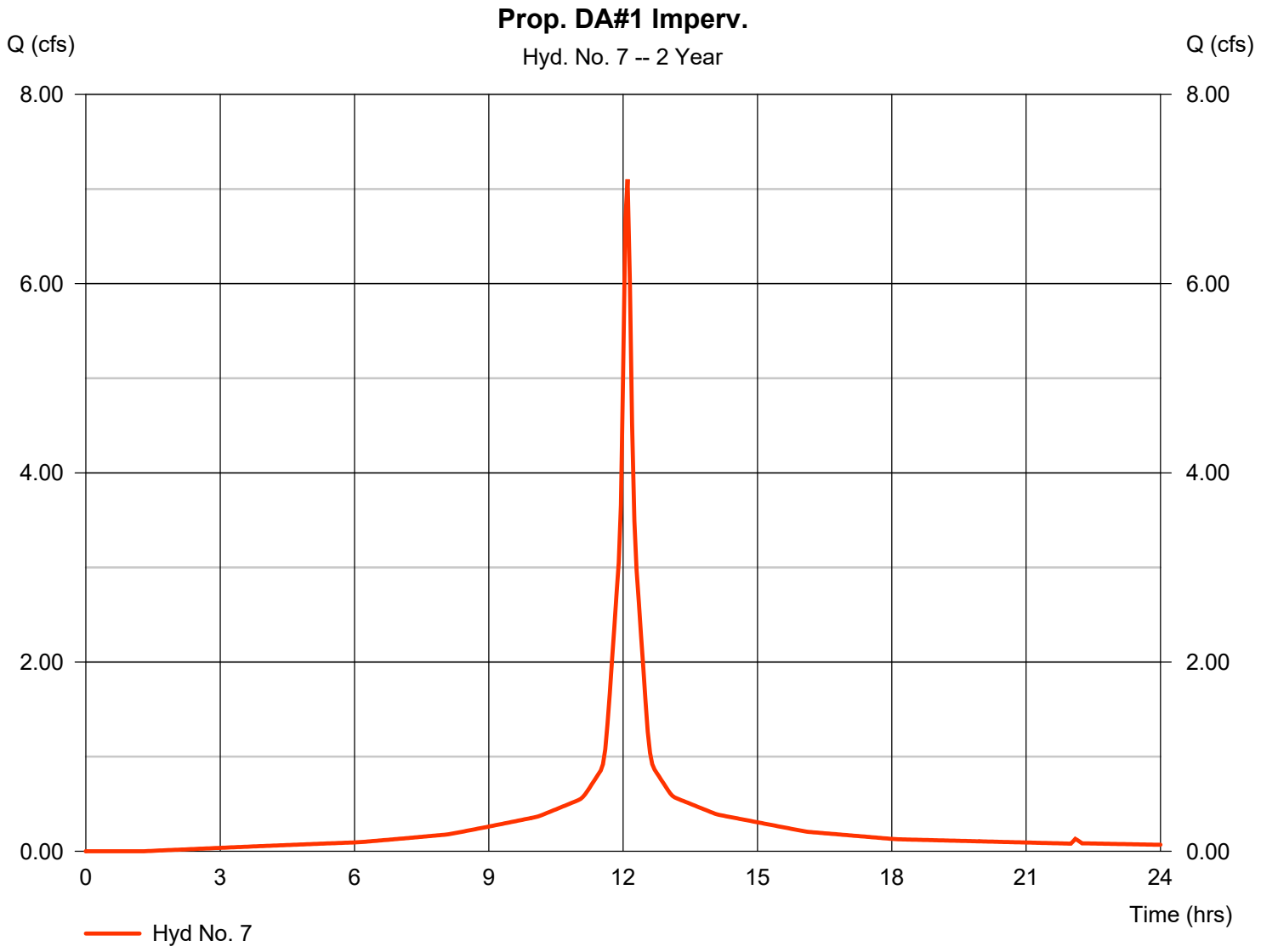


Hydrograph Report

Hyd. No. 7

Prop. DA#1 Imperv.

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.103 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.10 hrs
Time interval	=	3 min	Hyd. volume	=	26,731 cuft
Drainage area	=	2.520 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.35 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

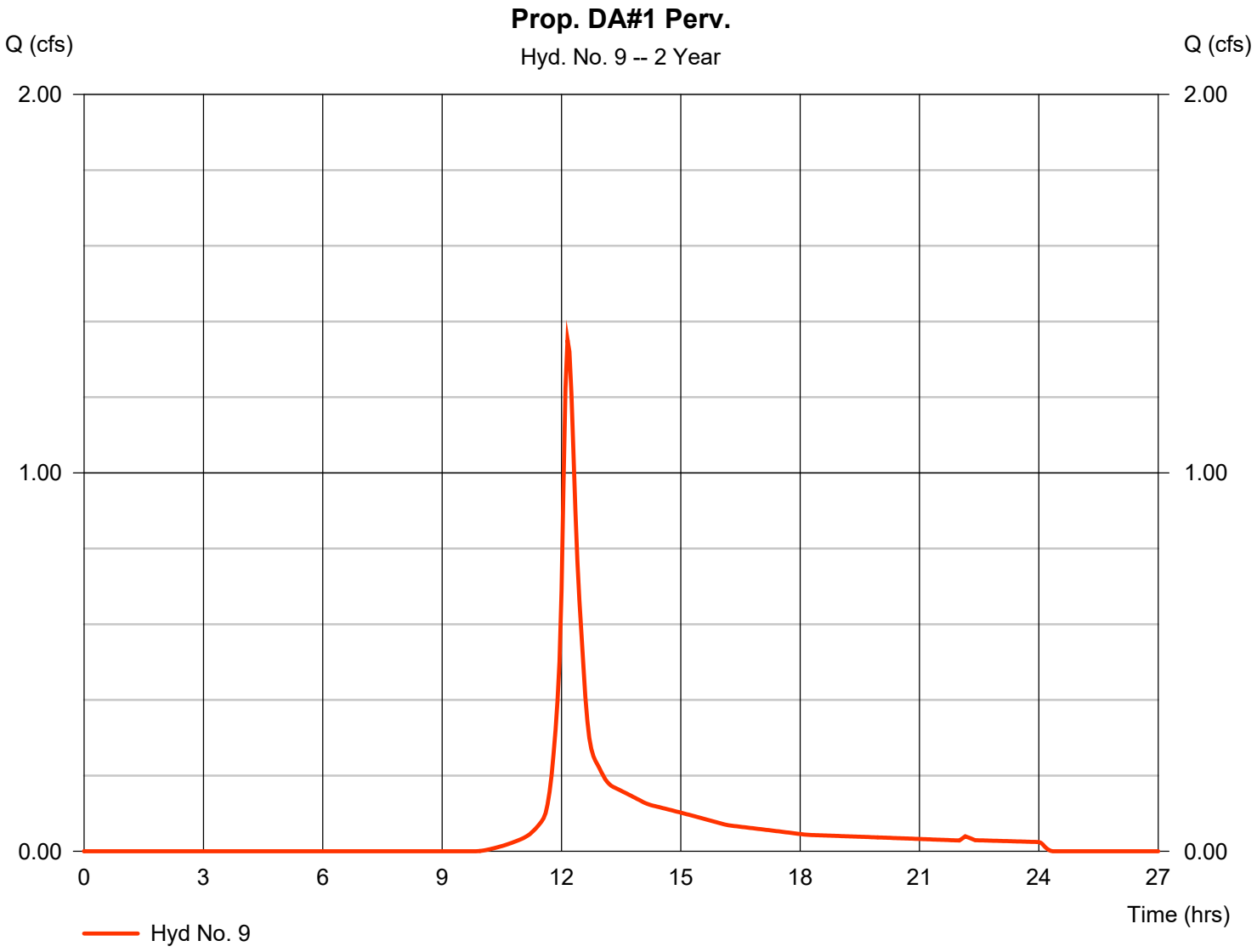


Hydrograph Report

Hyd. No. 9

Prop. DA#1 Perv.

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.352 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.15 hrs
Time interval	=	3 min	Hyd. volume	=	5,463 cuft
Drainage area	=	1.140 ac	Curve number	=	77
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.35 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

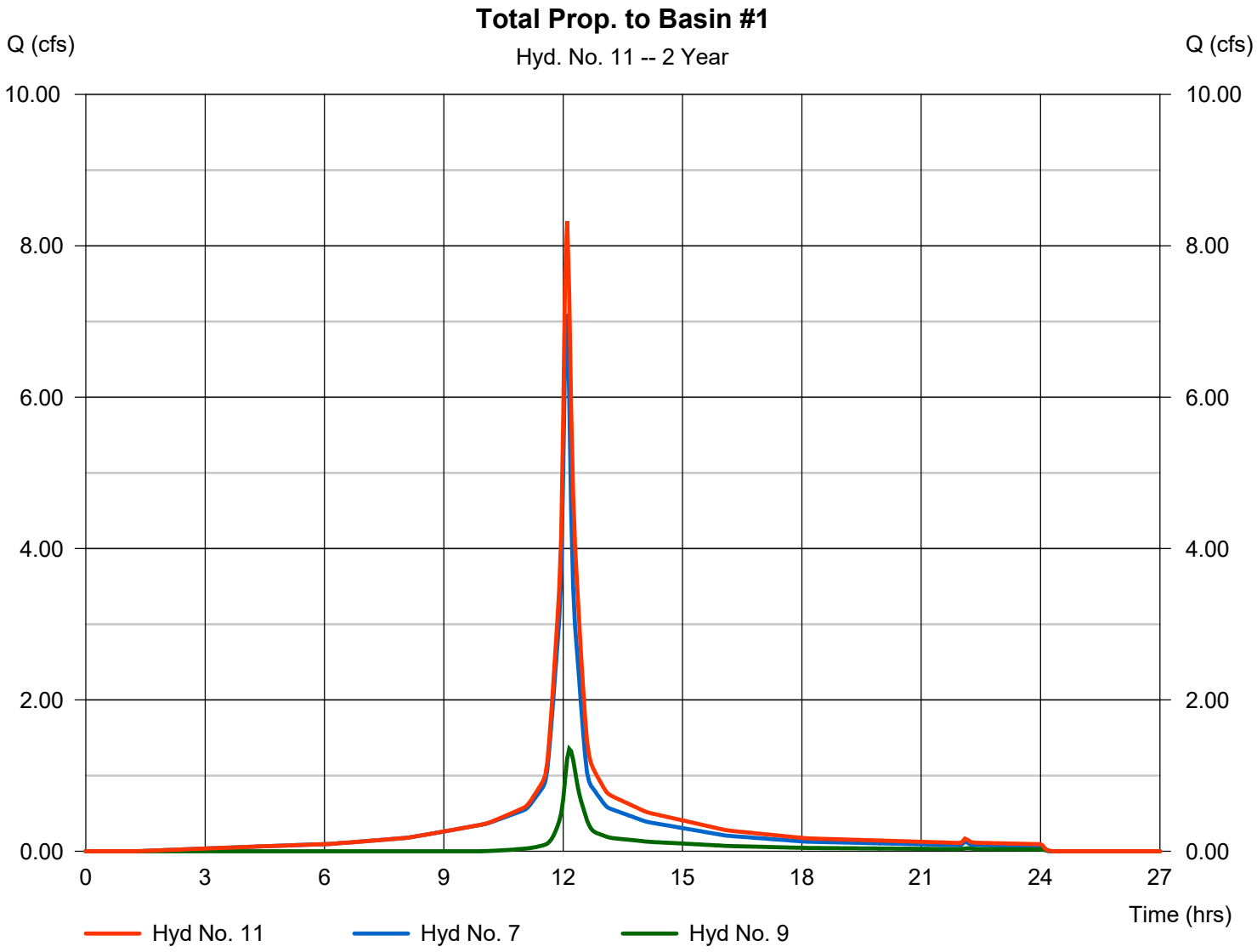


Hydrograph Report

Hyd. No. 11

Total Prop. to Basin #1

Hydrograph type	= Combine	Peak discharge	= 8.327 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.10 hrs
Time interval	= 3 min	Hyd. volume	= 32,193 cuft
Inflow hyds.	= 7, 9	Contrib. drain. area	= 3.660 ac

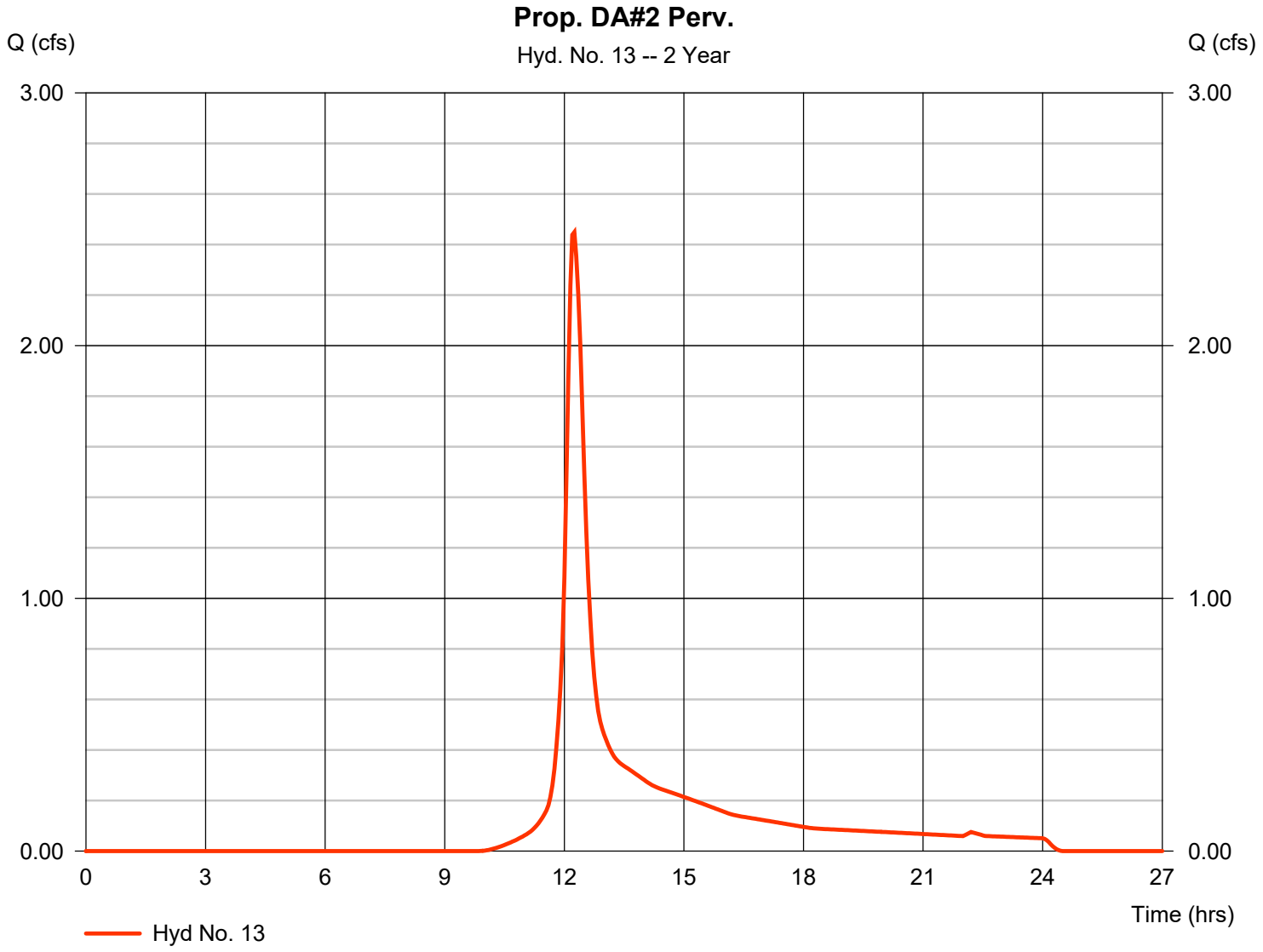


Hydrograph Report

Hyd. No. 13

Prop. DA#2 Perv.

Hydrograph type	= SCS Runoff	Peak discharge	= 2.449 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.25 hrs
Time interval	= 3 min	Hyd. volume	= 11,267 cuft
Drainage area	= 2.280 ac	Curve number	= 77
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 19.80 min
Total precip.	= 3.35 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



TR55 Tc Worksheet

Hyd. No. 13

Prop. DA#2 Perv.

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 150.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.38		0.00		0.00		
Land slope (%)	= 2.33		0.00		0.00		
Travel Time (min)	**= 18.06**	**+**	**0.00**	**+**	**0.00**	**=**	**18.06**
Shallow Concentrated Flow							
Flow length (ft)	= 122.00		0.00		0.00		
Watercourse slope (%)	= 2.05		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=2.31		0.00		0.00		
Travel Time (min)	**= 0.88**	**+**	**0.00**	**+**	**0.00**	**=**	**0.88**
Channel Flow							
X sectional flow area (sqft)	= 1.23		2.41		3.14		
Wetted perimeter (ft)	= 3.93		5.50		6.28		
Channel slope (%)	= 0.50		0.50		0.50		
Manning's n-value	= 0.013		0.013		0.013		
Velocity (ft/s)	=3.72		4.66		5.09		
Flow length (ft)	({0})32.0		128.0		79.0		
Travel Time (min)	**= 0.14**	**+**	**0.46**	**+**	**0.26**	**=**	**0.86**

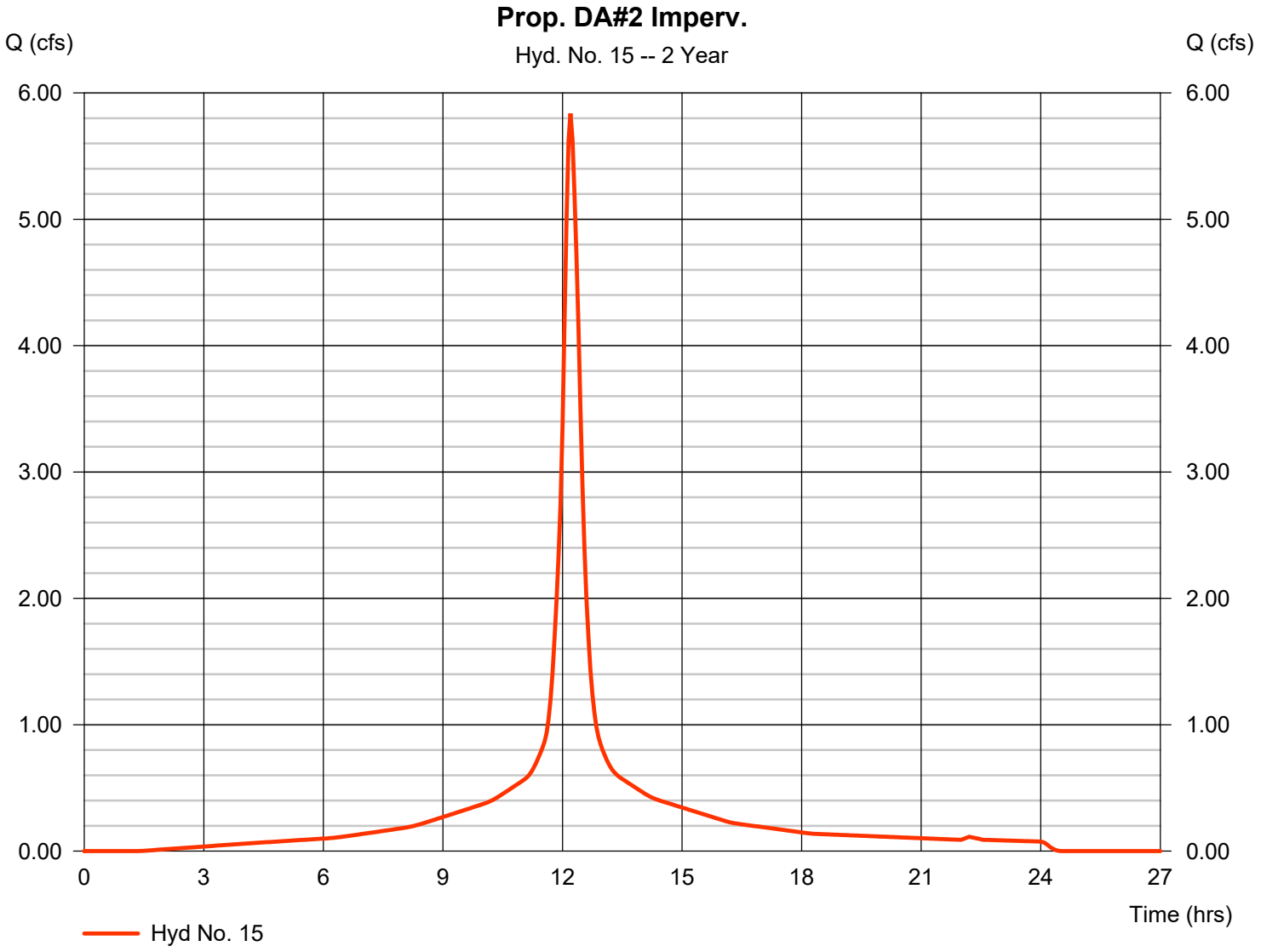
Total Travel Time, Tc ..... 19.80 min

Hydrograph Report

Hyd. No. 15

Prop. DA#2 Imperv.

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.838 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.20 hrs
Time interval	=	3 min	Hyd. volume	=	28,937 cuft
Drainage area	=	2.480 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.80 min
Total precip.	=	3.35 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



TR55 Tc Worksheet

Hyd. No. 15

Prop. DA#2 Imperv.

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 150.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.38		0.00		0.00		
Land slope (%)	= 2.33		0.00		0.00		
Travel Time (min)	**= 18.06**	**+**	**0.00**	**+**	**0.00**	**=**	**18.06**
Shallow Concentrated Flow							
Flow length (ft)	= 122.00		0.00		0.00		
Watercourse slope (%)	= 2.05		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=2.31		0.00		0.00		
Travel Time (min)	**= 0.88**	**+**	**0.00**	**+**	**0.00**	**=**	**0.88**
Channel Flow							
X sectional flow area (sqft)	= 1.23		2.41		3.14		
Wetted perimeter (ft)	= 3.93		5.50		6.28		
Channel slope (%)	= 0.50		0.50		0.50		
Manning's n-value	= 0.013		0.013		0.013		
Velocity (ft/s)	=3.72						
			4.66				
					5.09		
Flow length (ft)	({0})32.0		128.0		79.0		
Travel Time (min)	**= 0.14**	**+**	**0.46**	**+**	**0.26**	**=**	**0.86**

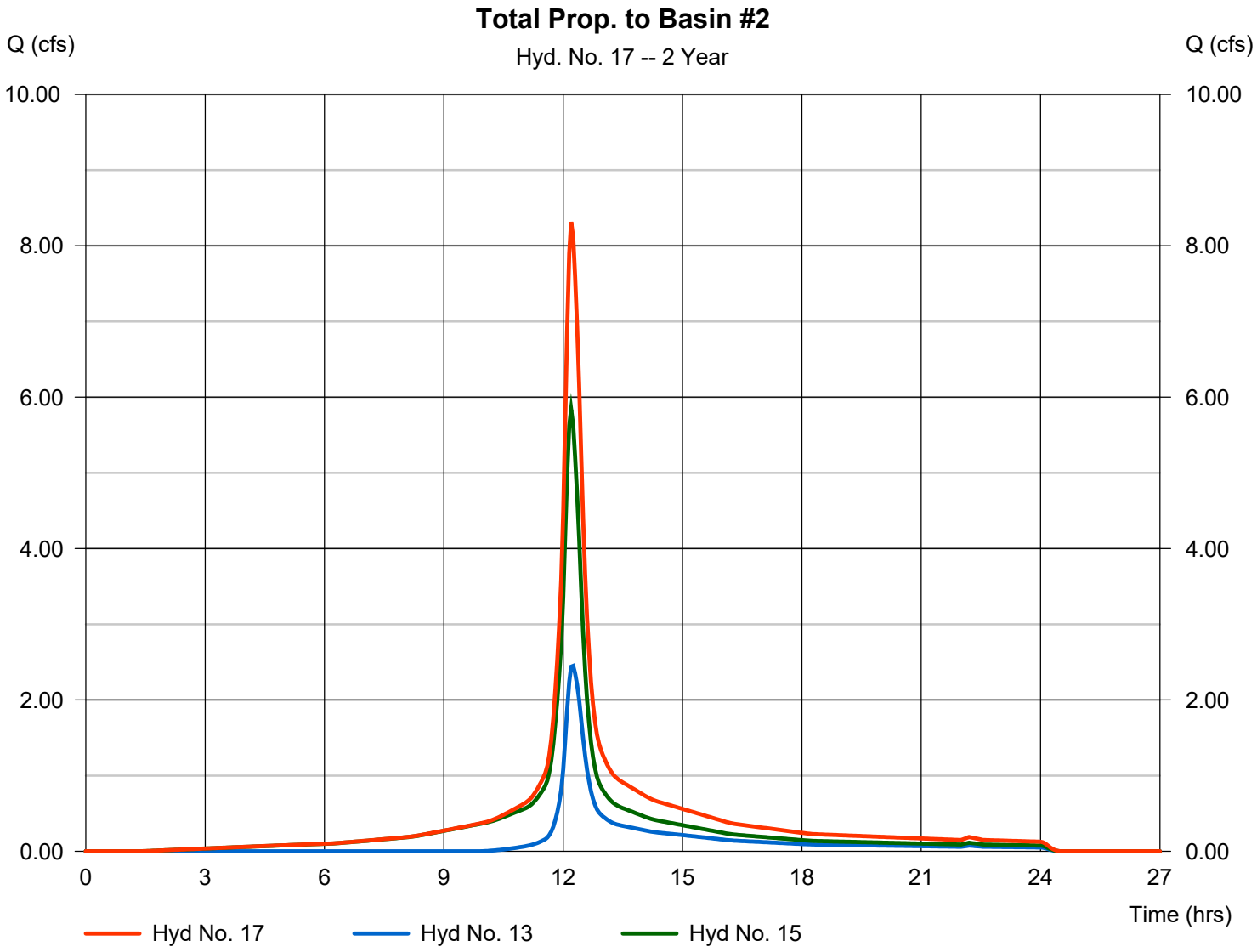
Total Travel Time, Tc ..... 19.80 min

Hydrograph Report

Hyd. No. 17

Total Prop. to Basin #2

Hydrograph type	= Combine	Peak discharge	= 8.315 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.20 hrs
Time interval	= 3 min	Hyd. volume	= 40,406 cuft
Inflow hyds.	= 13, 15	Contrib. drain. area	= 4.760 ac

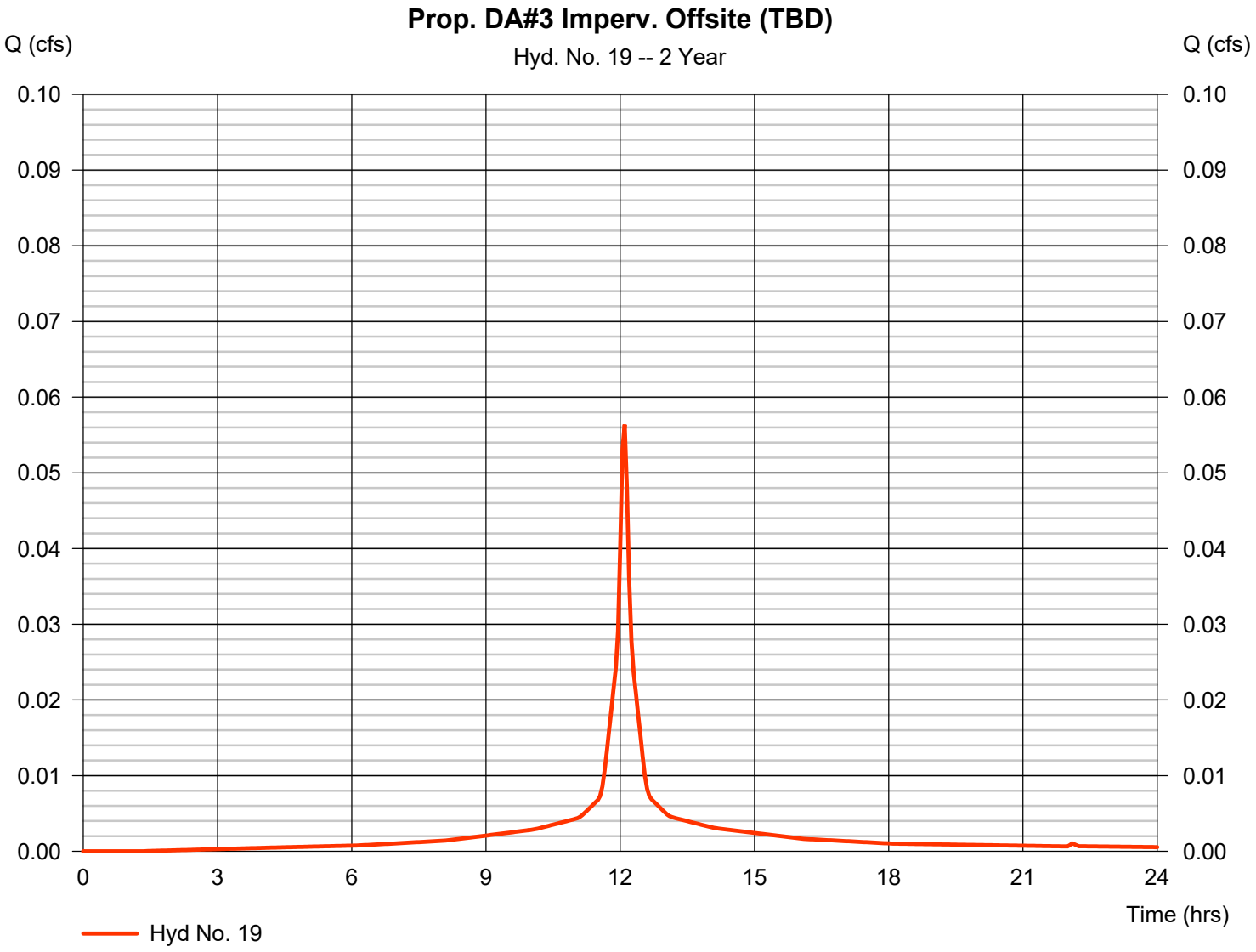


Hydrograph Report

Hyd. No. 19

Prop. DA#3 Imperv. Offsite (TBD)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.056 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.10 hrs
Time interval	=	3 min	Hyd. volume	=	212 cuft
Drainage area	=	0.020 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.35 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

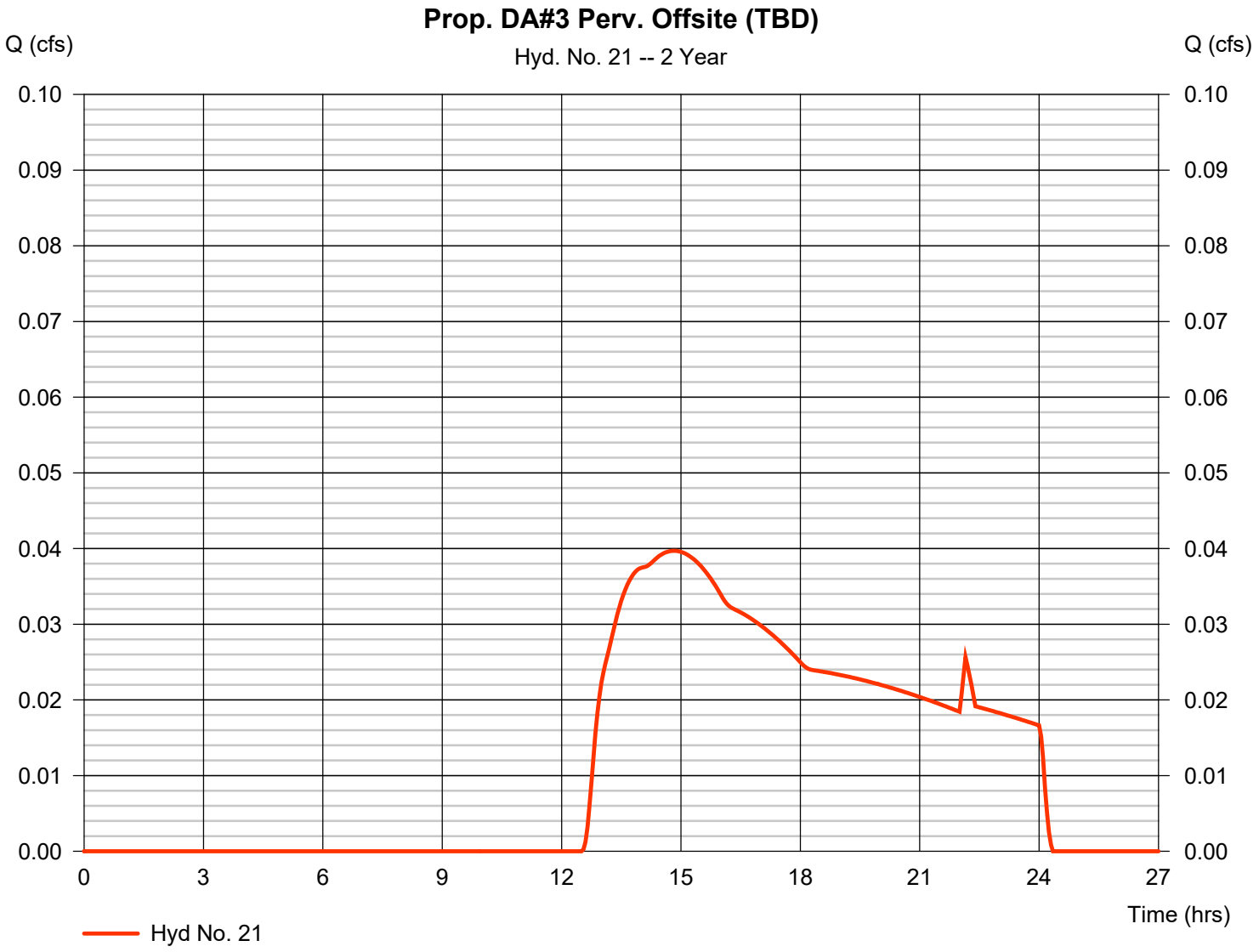


Hydrograph Report

Hyd. No. 21

Prop. DA#3 Perv. Offsite (TBD)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.040 cfs
Storm frequency	=	2 yrs	Time to peak	=	14.80 hrs
Time interval	=	3 min	Hyd. volume	=	1,079 cuft
Drainage area	=	3.770 ac	Curve number	=	46
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.35 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

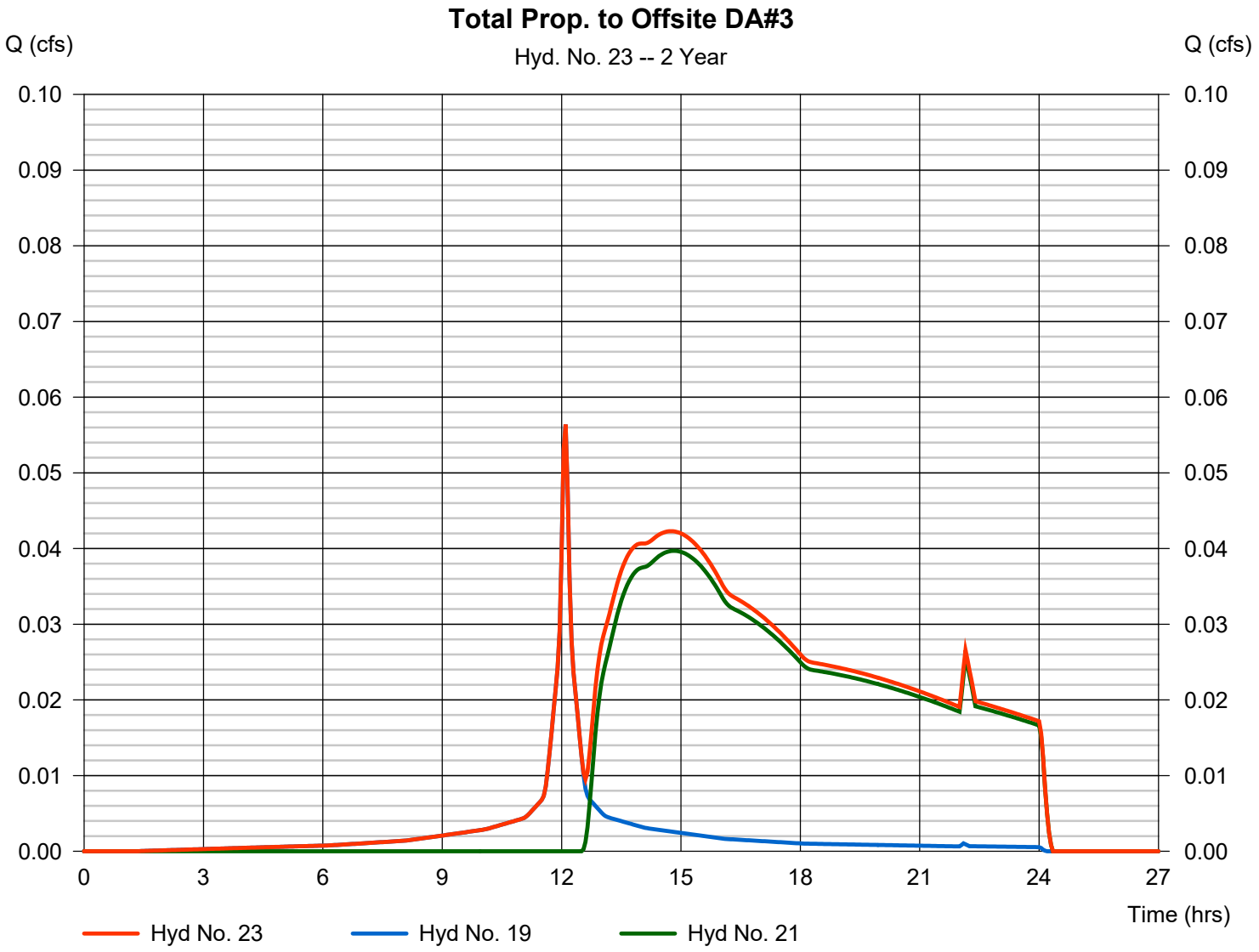


Hydrograph Report

Hyd. No. 23

Total Prop. to Offsite DA#3

Hydrograph type	= Combine	Peak discharge	= 0.056 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.10 hrs
Time interval	= 3 min	Hyd. volume	= 1,291 cuft
Inflow hyds.	= 19, 21	Contrib. drain. area	= 3.790 ac

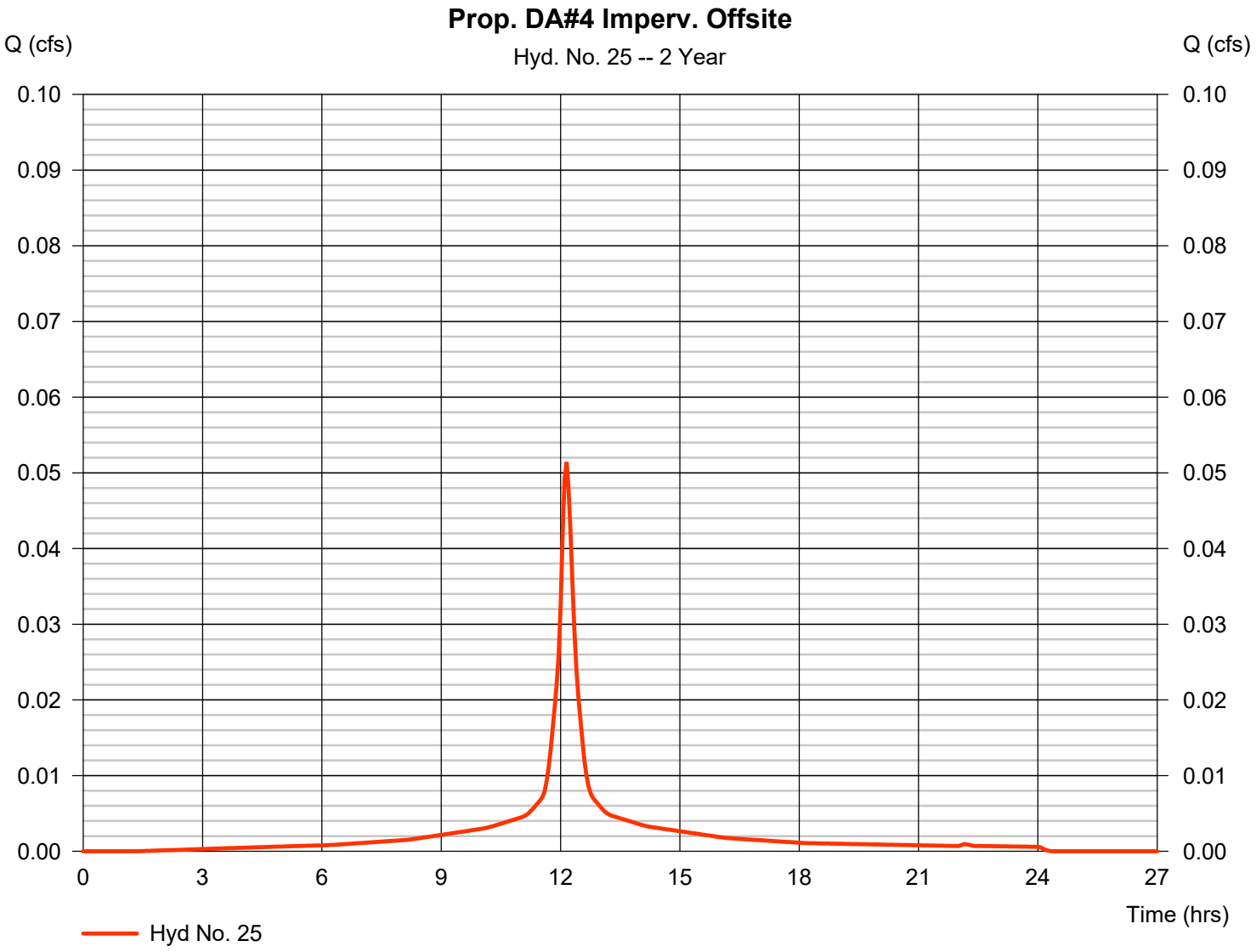


Hydrograph Report

Hyd. No. 25

Prop. DA#4 Imperv. Offsite

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.051 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.15 hrs
Time interval	=	3 min	Hyd. volume	=	226 cuft
Drainage area	=	0.020 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.35 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

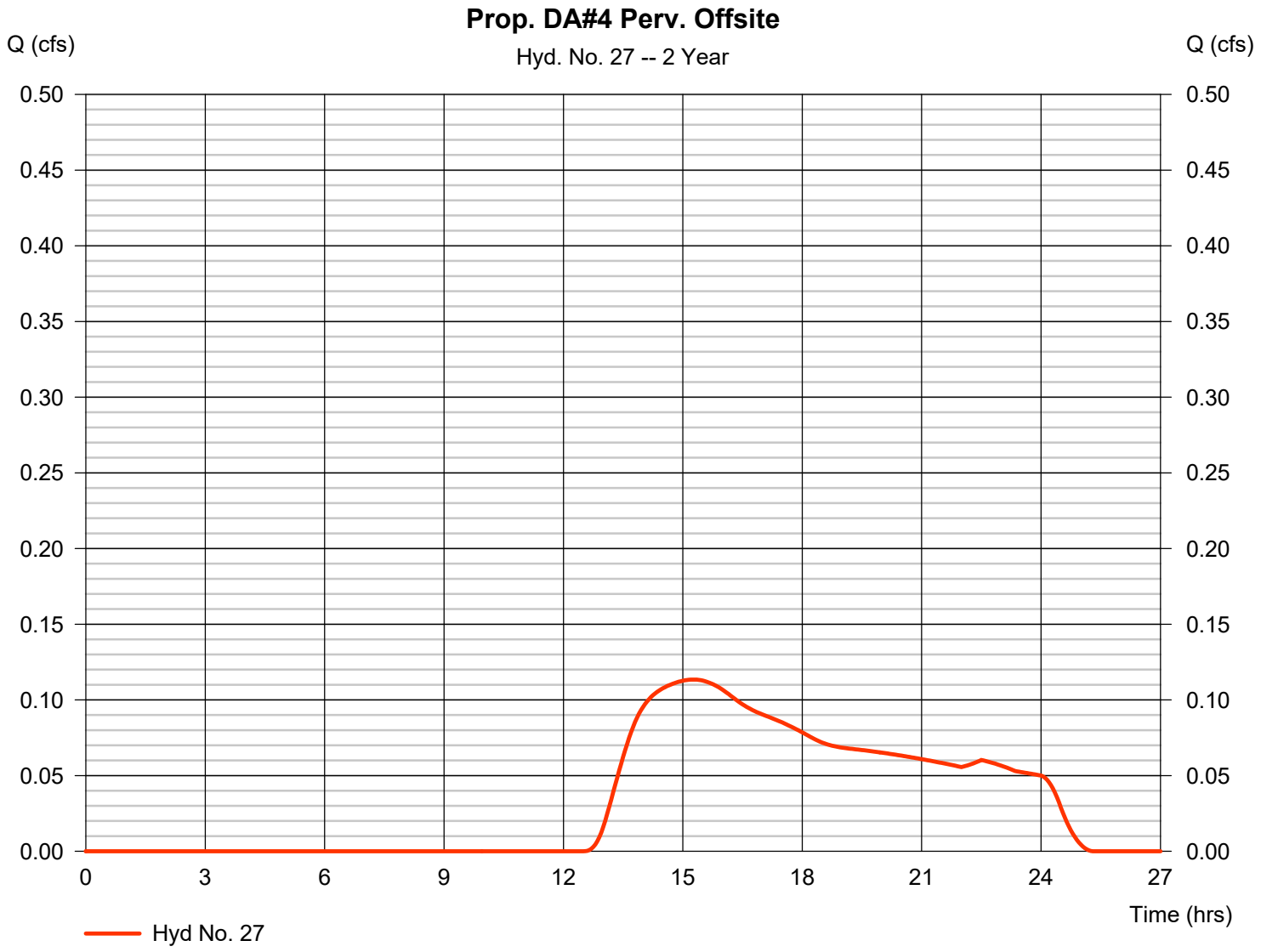


Hydrograph Report

Hyd. No. 27

Prop. DA#4 Perv. Offsite

Hydrograph type	= SCS Runoff	Peak discharge	= 0.113 cfs
Storm frequency	= 2 yrs	Time to peak	= 15.25 hrs
Time interval	= 3 min	Hyd. volume	= 3,109 cuft
Drainage area	= 10.730 ac	Curve number	= 46
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 46.30 min
Total precip.	= 3.35 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



TR55 Tc Worksheet

Hyd. No. 27

Prop. DA#4 Perv. Offsite

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.800		0.011		0.011		
Flow length (ft)	= 150.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.38		0.00		0.00		
Land slope (%)	= 3.00		0.00		0.00		
Travel Time (min)	**= 42.78**	**+**	**0.00**	**+**	**0.00**	**=**	**42.78**
Shallow Concentrated Flow							
Flow length (ft)	= 367.00		0.00		0.00		
Watercourse slope (%)	= 1.14		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.72		0.00		0.00		
Travel Time (min)	**= 3.55**	**+**	**0.00**	**+**	**0.00**	**=**	**3.55**
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	= 0.013		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**

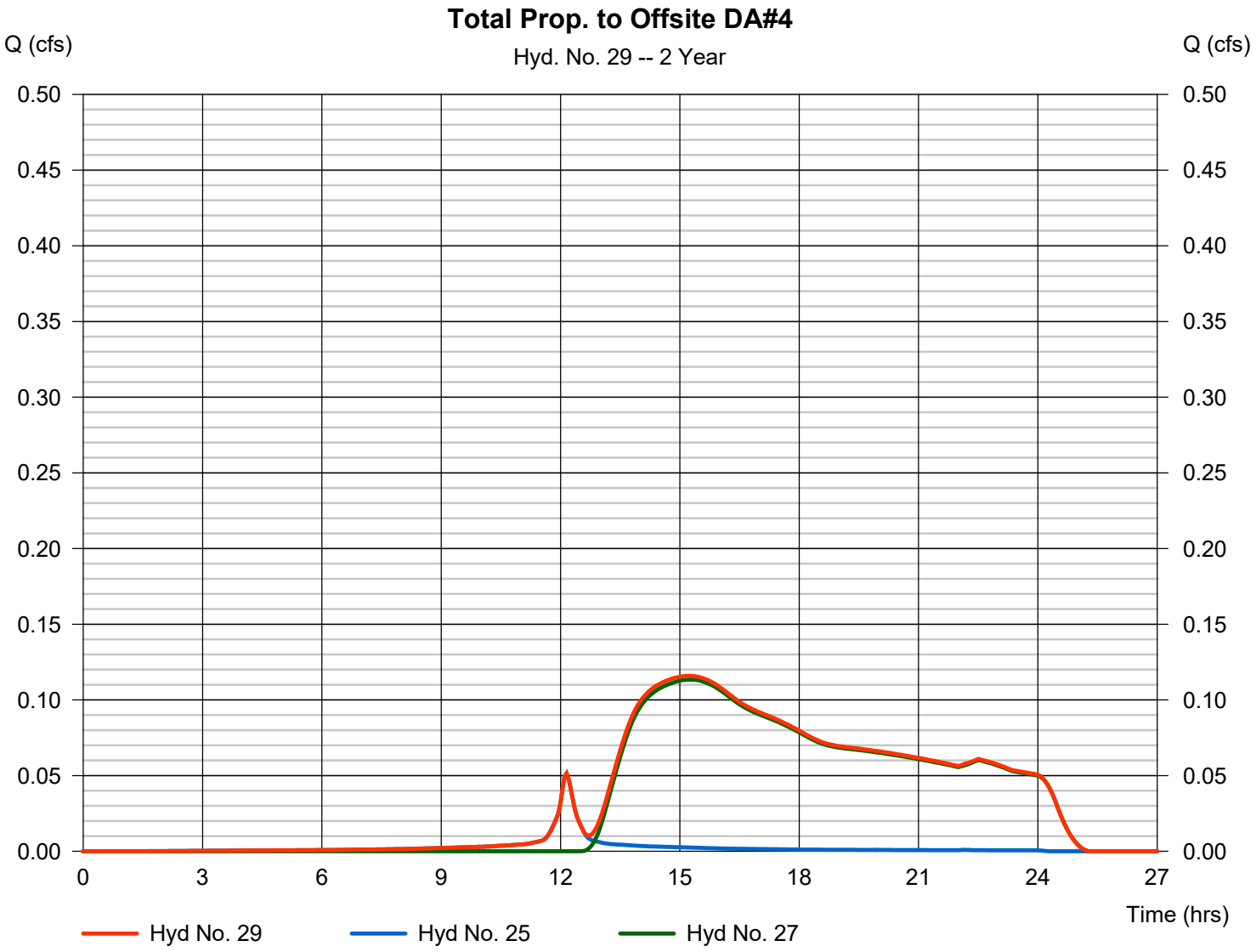
Total Travel Time, Tc ..... 46.30 min

Hydrograph Report

Hyd. No. 29

Total Prop. to Offsite DA#4

Hydrograph type	= Combine	Peak discharge	= 0.116 cfs
Storm frequency	= 2 yrs	Time to peak	= 15.25 hrs
Time interval	= 3 min	Hyd. volume	= 3,335 cuft
Inflow hyds.	= 25, 27	Contrib. drain. area	= 10.750 ac



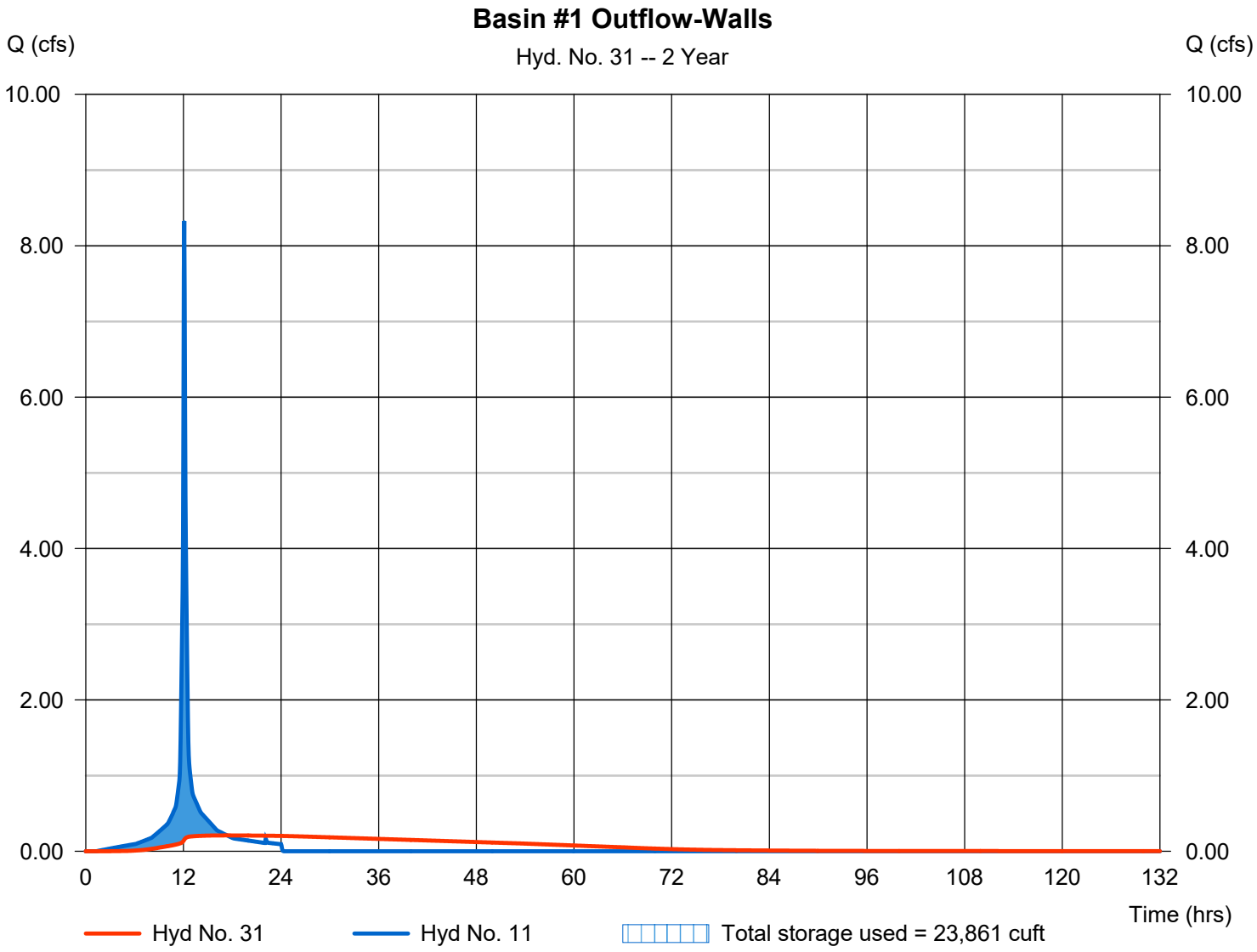
Hydrograph Report

Hyd. No. 31

Basin #1 Outflow-Walls

Hydrograph type	=	Reservoir	Peak discharge	=	0.209 cfs
Storm frequency	=	2 yrs	Time to peak	=	17.35 hrs
Time interval	=	3 min	Hyd. volume	=	32,068 cuft
Inflow hyd. No.	=	11 - Total Prop. to Basin #1	Max. Elevation	=	36.23 ft
Reservoir name	=	Wet Pond 1 - Upper Only	Max. Storage	=	23,861 cuft

Storage Indication method used.



Pond Report

Pond No. 15 - Wet Pond 1 - Upper Only

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 34.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	34.50	11,380	0	0
0.50	35.00	12,169	5,886	5,886
1.50	36.00	16,070	14,073	19,959
2.50	37.00	17,342	16,700	36,659
3.50	38.00	19,191	18,257	54,916
4.50	39.00	21,100	20,136	75,052
5.50	40.00	23,066	22,073	97,125

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	2.50	0.00	0.00
Span (in)	= 15.00	2.50	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 33.20	34.50	0.00	0.00
Length (ft)	= 36.00	0.00	0.00	0.00
Slope (%)	= 1.67	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

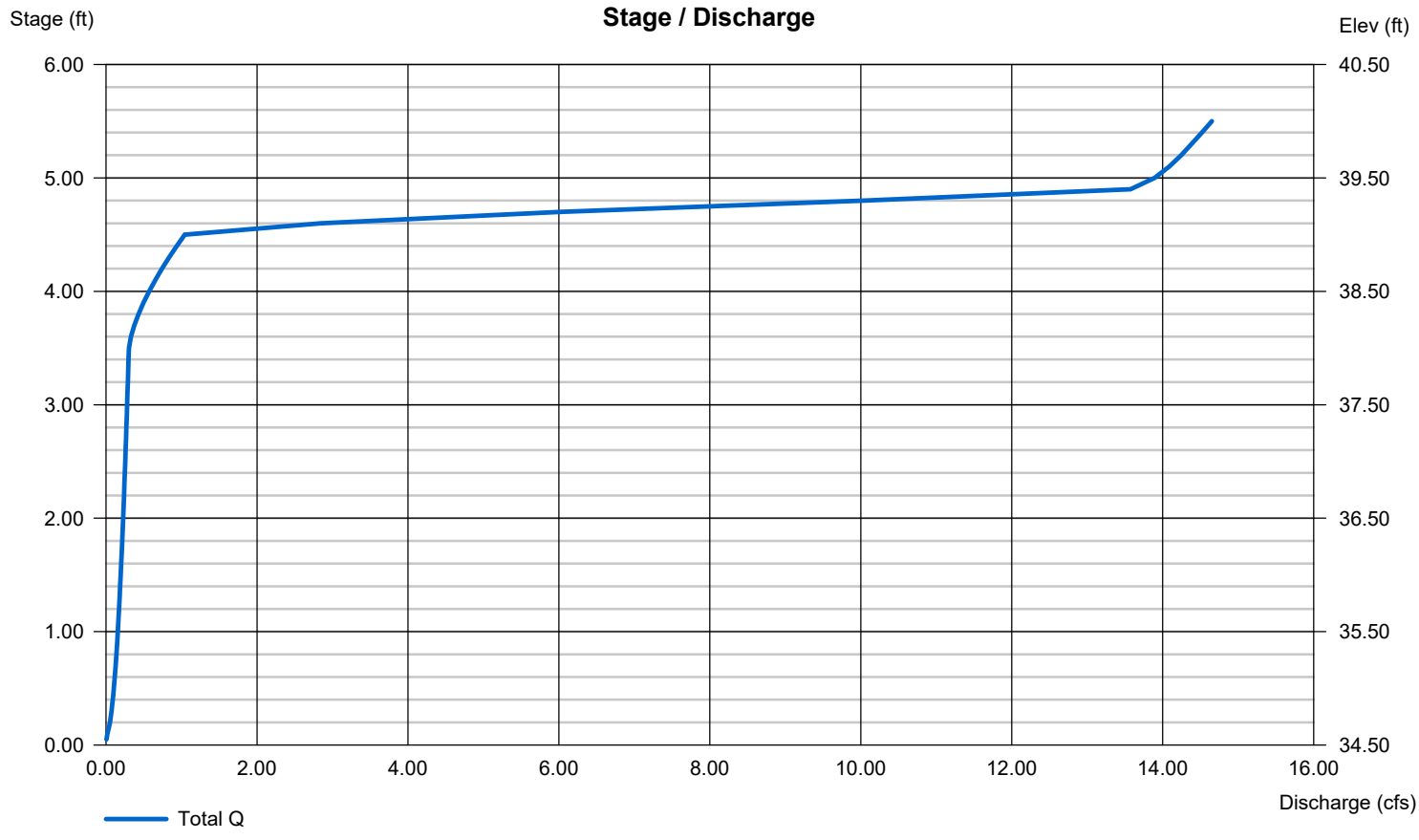
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	0.21	Inactive	Inactive
Crest El. (ft)	= 39.00	38.00	37.40	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Rect	Rect	Rect
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



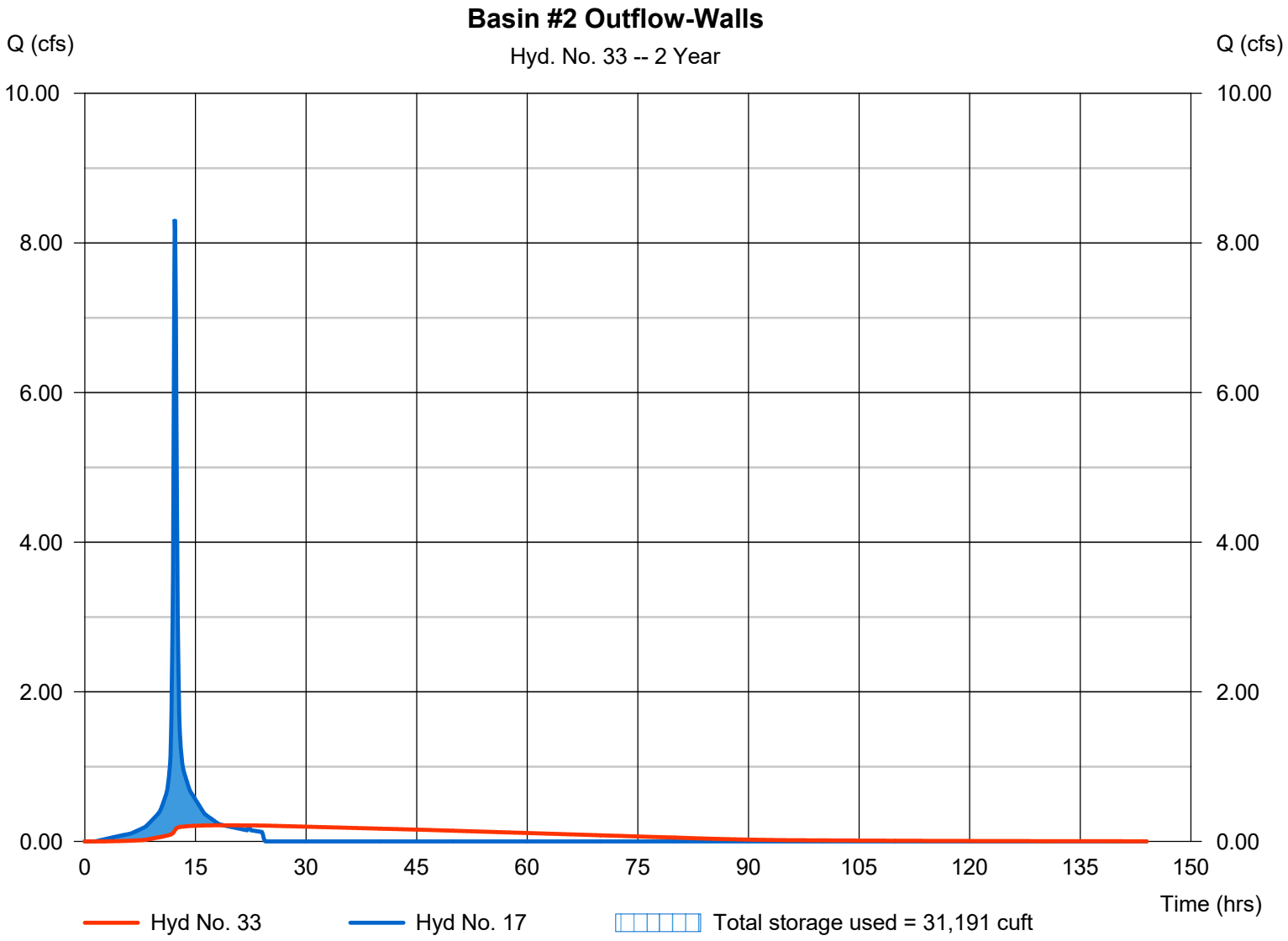
Hydrograph Report

Hyd. No. 33

Basin #2 Outflow-Walls

Hydrograph type	= Reservoir	Peak discharge	= 0.215 cfs
Storm frequency	= 2 yrs	Time to peak	= 18.80 hrs
Time interval	= 3 min	Hyd. volume	= 40,187 cuft
Inflow hyd. No.	= 17 - Total Prop. to Basin #2	Max. Elevation	= 39.83 ft
Reservoir name	= Wet Pond 2 - Upper Only	Max. Storage	= 31,191 cuft

Storage Indication method used.



Pond No. 16 - Wet Pond 2 - Upper Only

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 38.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	38.00	15,007	0	0
1.00	39.00	16,797	15,892	15,892
2.00	40.00	20,291	18,515	34,407
2.30	40.30	20,575	6,129	40,536
3.00	41.00	20,575	14,401	54,937
4.00	42.00	20,575	20,573	75,510
4.30	42.30	20,748	6,198	81,708
5.00	43.00	21,989	14,954	96,662
5.20	43.20	24,560	4,652	101,314

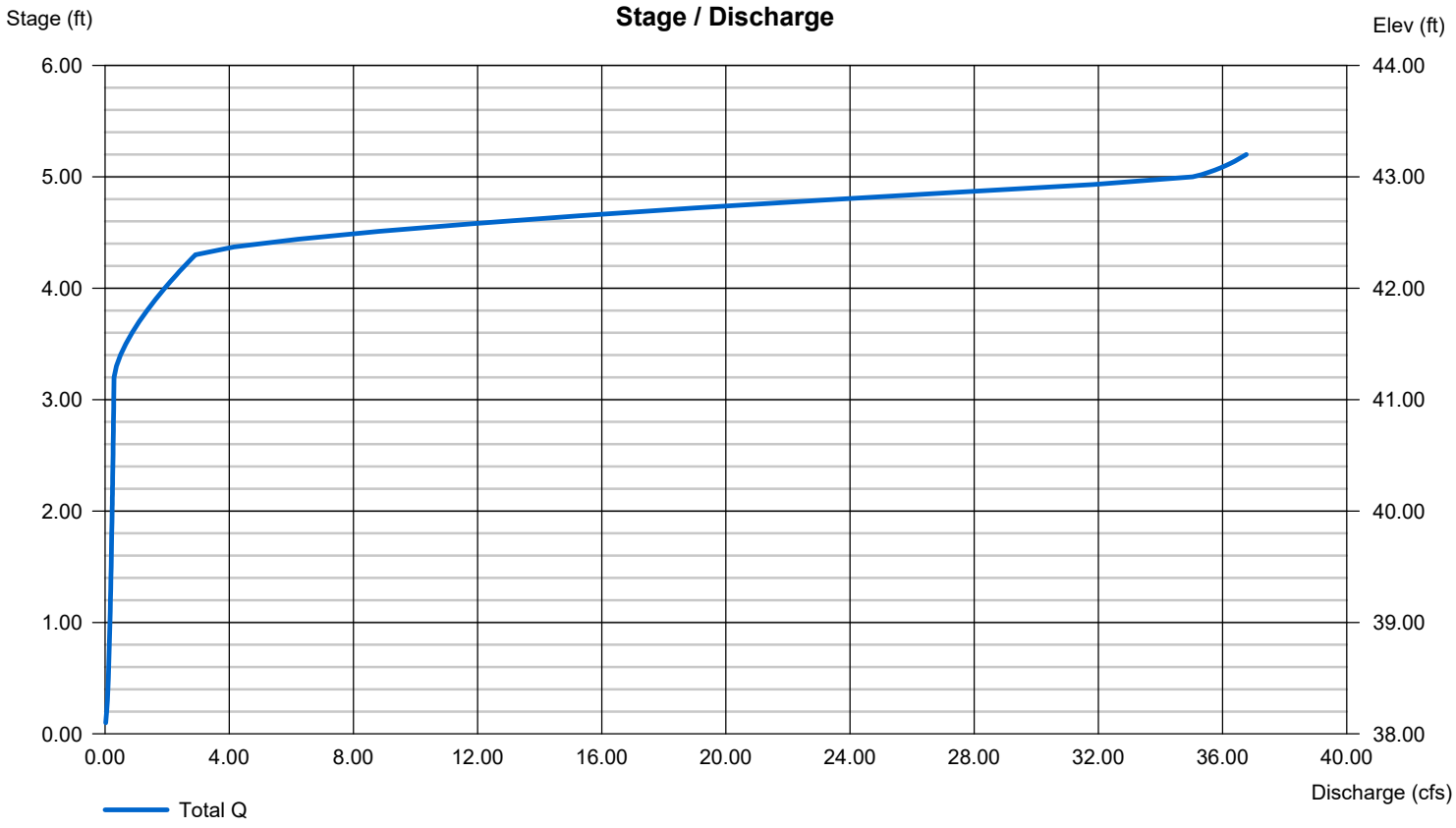
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	2.50	Inactive	Inactive
Span (in)	= 24.00	2.50	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 36.00	38.00	0.00	0.00
Length (ft)	= 23.00	0.00	0.00	0.00
Slope (%)	= 0.62	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	0.67	Inactive	Inactive
Crest El. (ft)	= 42.30	41.20	41.10	41.50
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Rect	Rect	Rect
Multi-Stage	= Yes	Yes	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

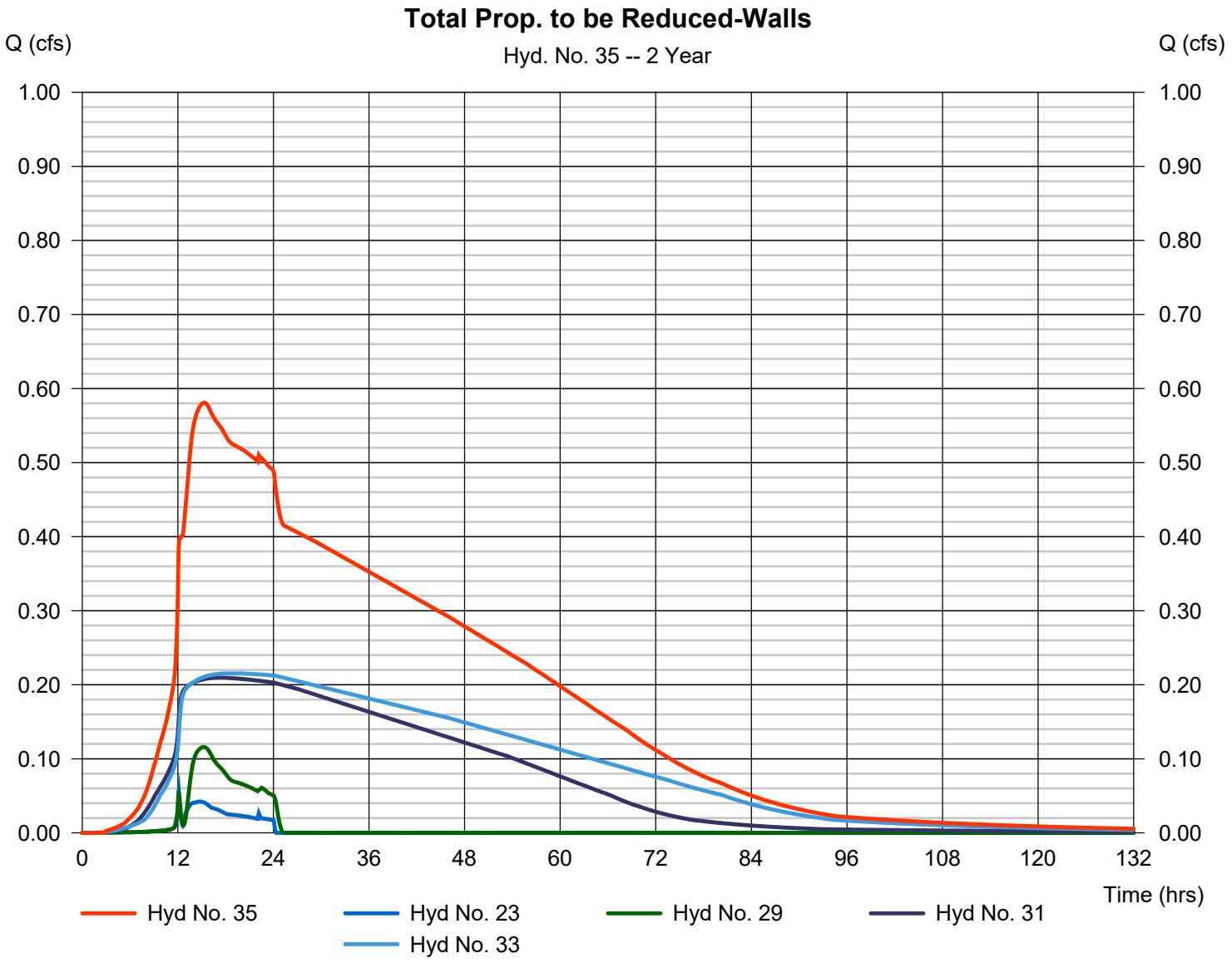


Hydrograph Report

Hyd. No. 35

Total Prop. to be Reduced-Walls

Hydrograph type	=	Combine	Peak discharge	=	0.581 cfs
Storm frequency	=	2 yrs	Time to peak	=	15.30 hrs
Time interval	=	3 min	Hyd. volume	=	78,850 cuft
Inflow hyds.	=	23, 29, 31, 33	Contrib. drain. area	=	0.000 ac

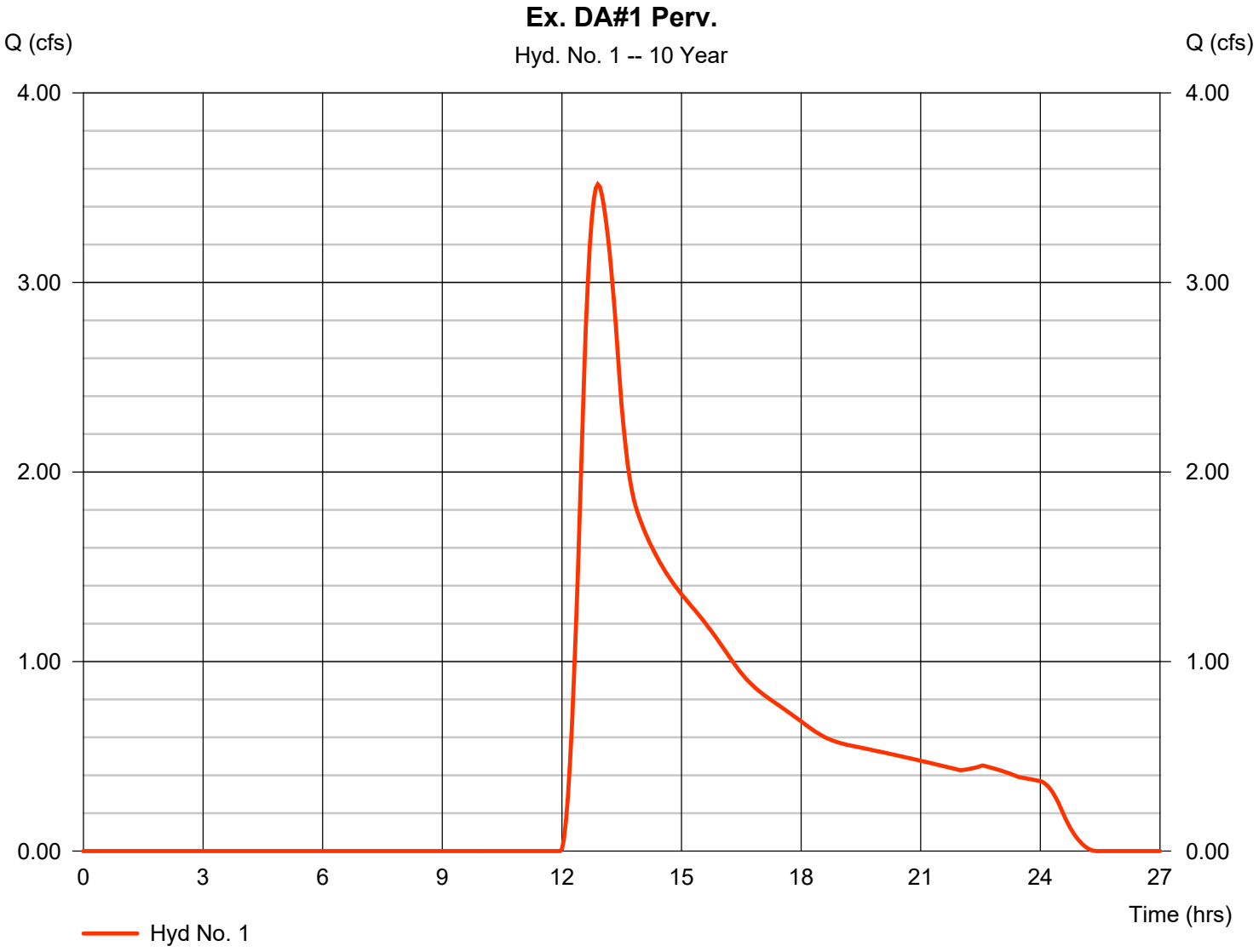


Hydrograph Report

Hyd. No. 1

Ex. DA#1 Perv.

Hydrograph type	= SCS Runoff	Peak discharge	= 3.518 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.90 hrs
Time interval	= 3 min	Hyd. volume	= 43,467 cuft
Drainage area	= 22.880 ac	Curve number	= 46
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 50.80 min
Total precip.	= 5.12 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

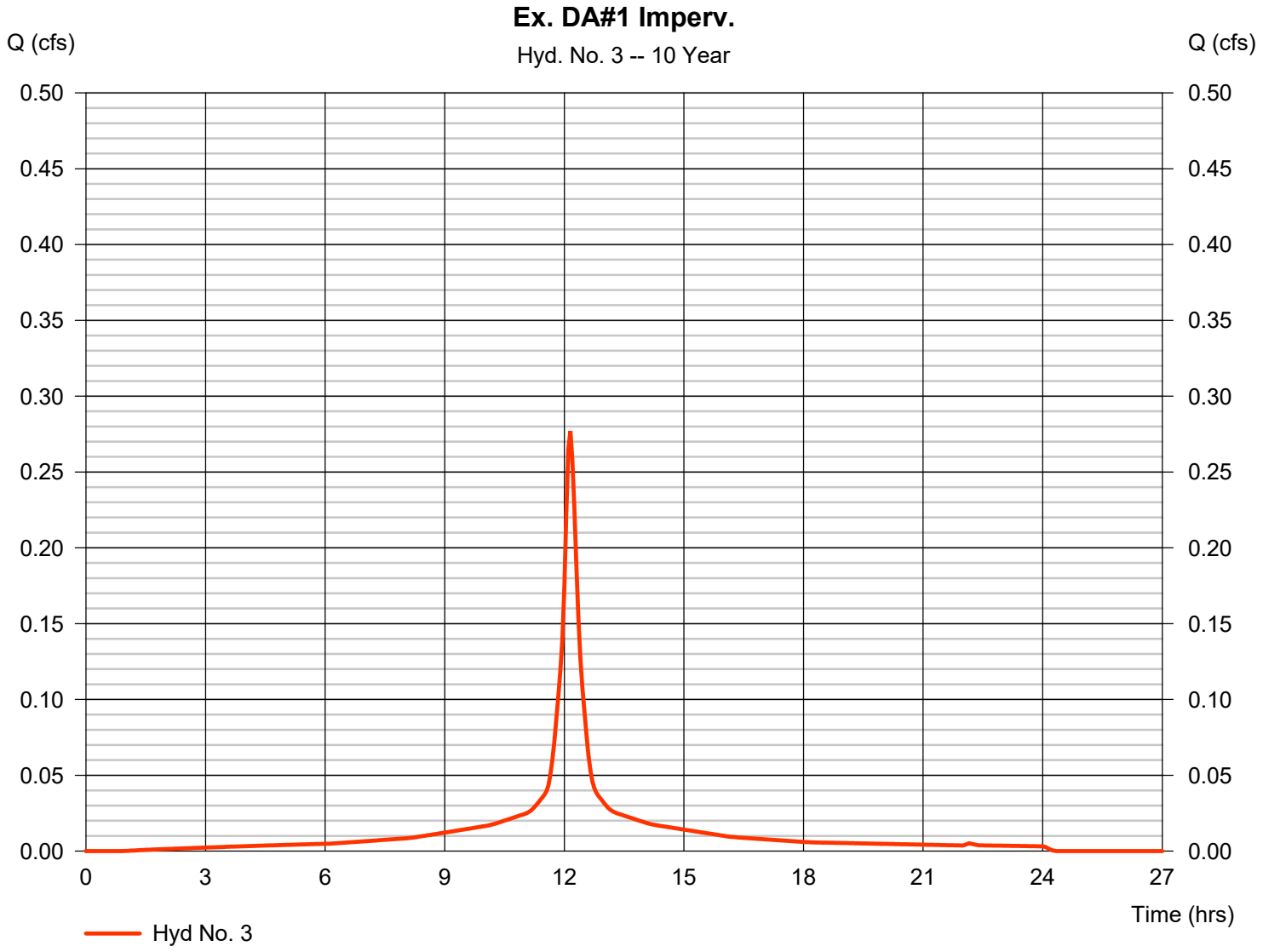


Hydrograph Report

Hyd. No. 3

Ex. DA#1 Imperv.

Hydrograph type	= SCS Runoff	Peak discharge	= 0.277 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.15 hrs
Time interval	= 3 min	Hyd. volume	= 1,241 cuft
Drainage area	= 0.070 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.12 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

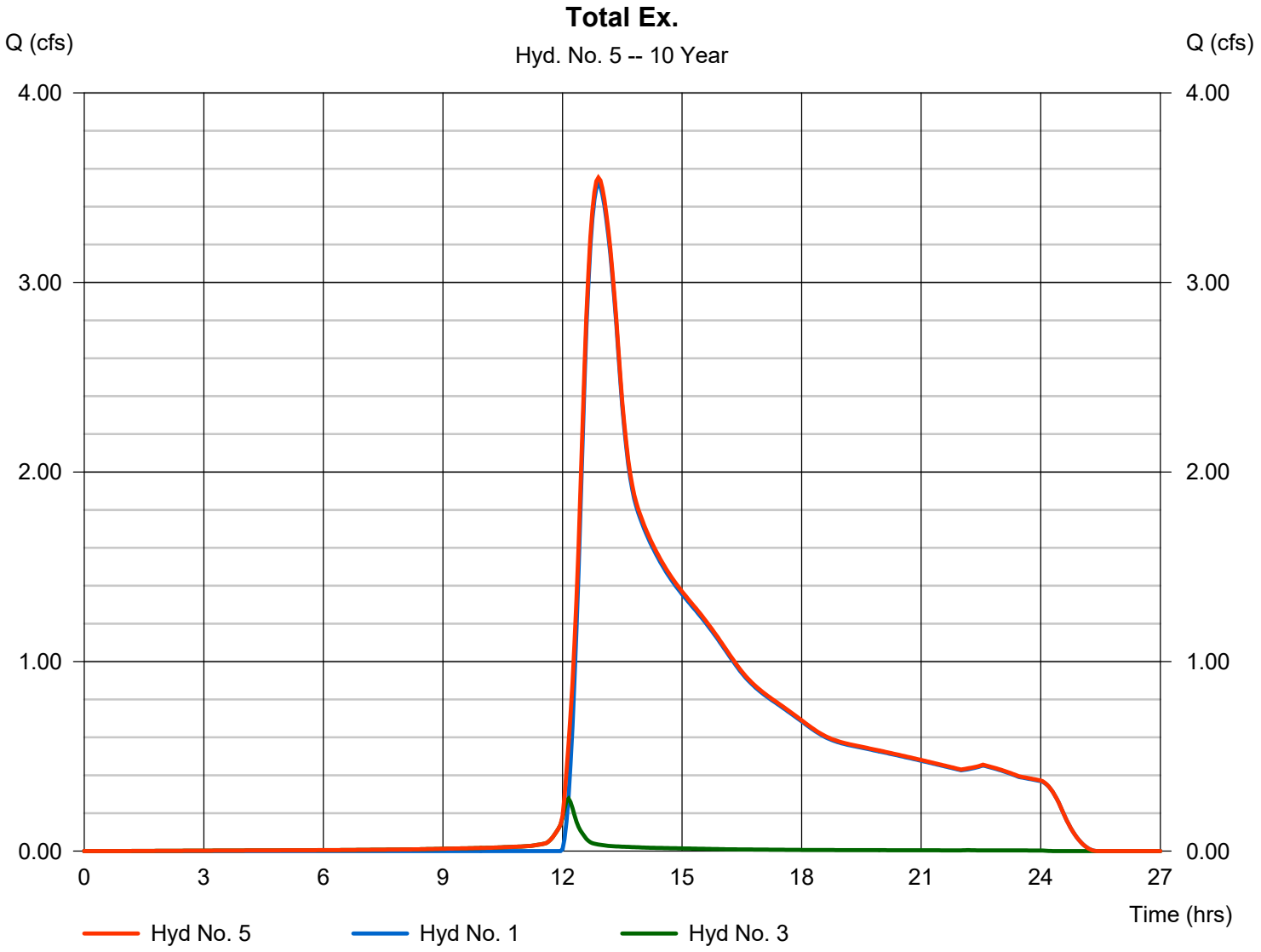


Hydrograph Report

Hyd. No. 5

Total Ex.

Hydrograph type	= Combine	Peak discharge	= 3.553 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.90 hrs
Time interval	= 3 min	Hyd. volume	= 44,708 cuft
Inflow hyds.	= 1, 3	Contrib. drain. area	= 22.950 ac

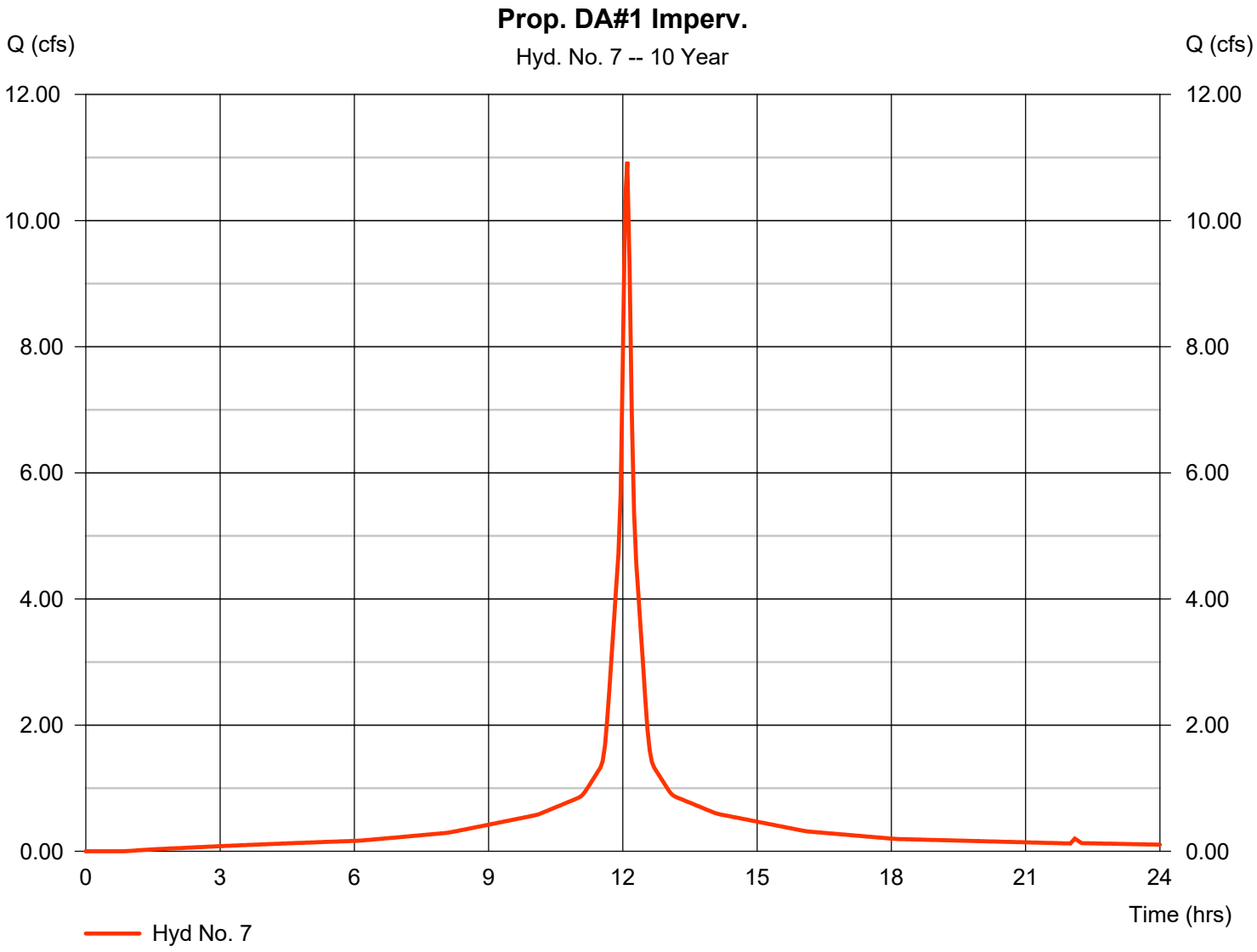


Hydrograph Report

Hyd. No. 7

Prop. DA#1 Imperv.

Hydrograph type	= SCS Runoff	Peak discharge	= 10.93 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 3 min	Hyd. volume	= 41,876 cuft
Drainage area	= 2.520 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 5.12 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

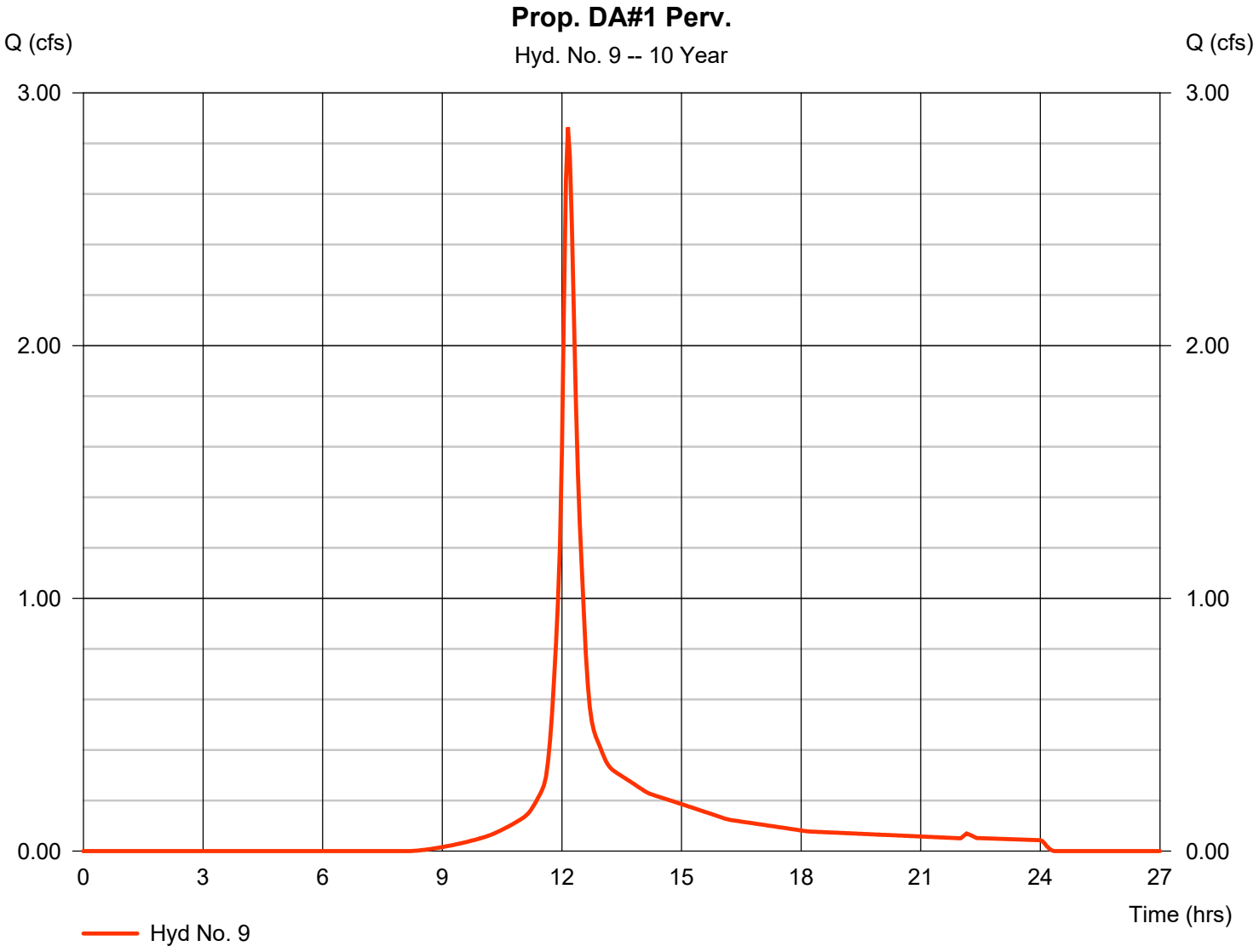


Hydrograph Report

Hyd. No. 9

Prop. DA#1 Perv.

Hydrograph type	= SCS Runoff	Peak discharge	= 2.864 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.15 hrs
Time interval	= 3 min	Hyd. volume	= 11,271 cuft
Drainage area	= 1.140 ac	Curve number	= 77
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.12 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

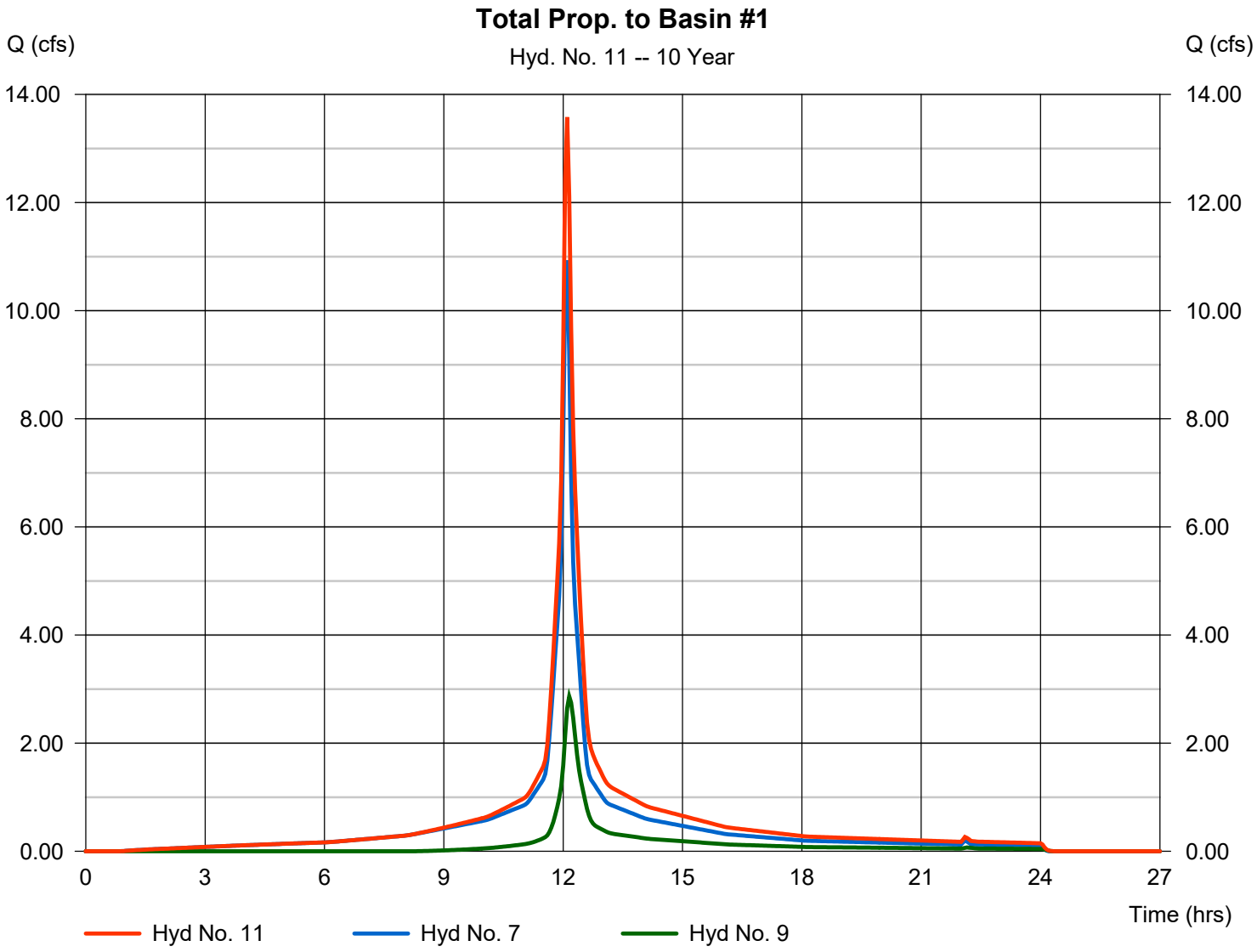


Hydrograph Report

Hyd. No. 11

Total Prop. to Basin #1

Hydrograph type	= Combine	Peak discharge	= 13.58 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 3 min	Hyd. volume	= 53,147 cuft
Inflow hyds.	= 7, 9	Contrib. drain. area	= 3.660 ac

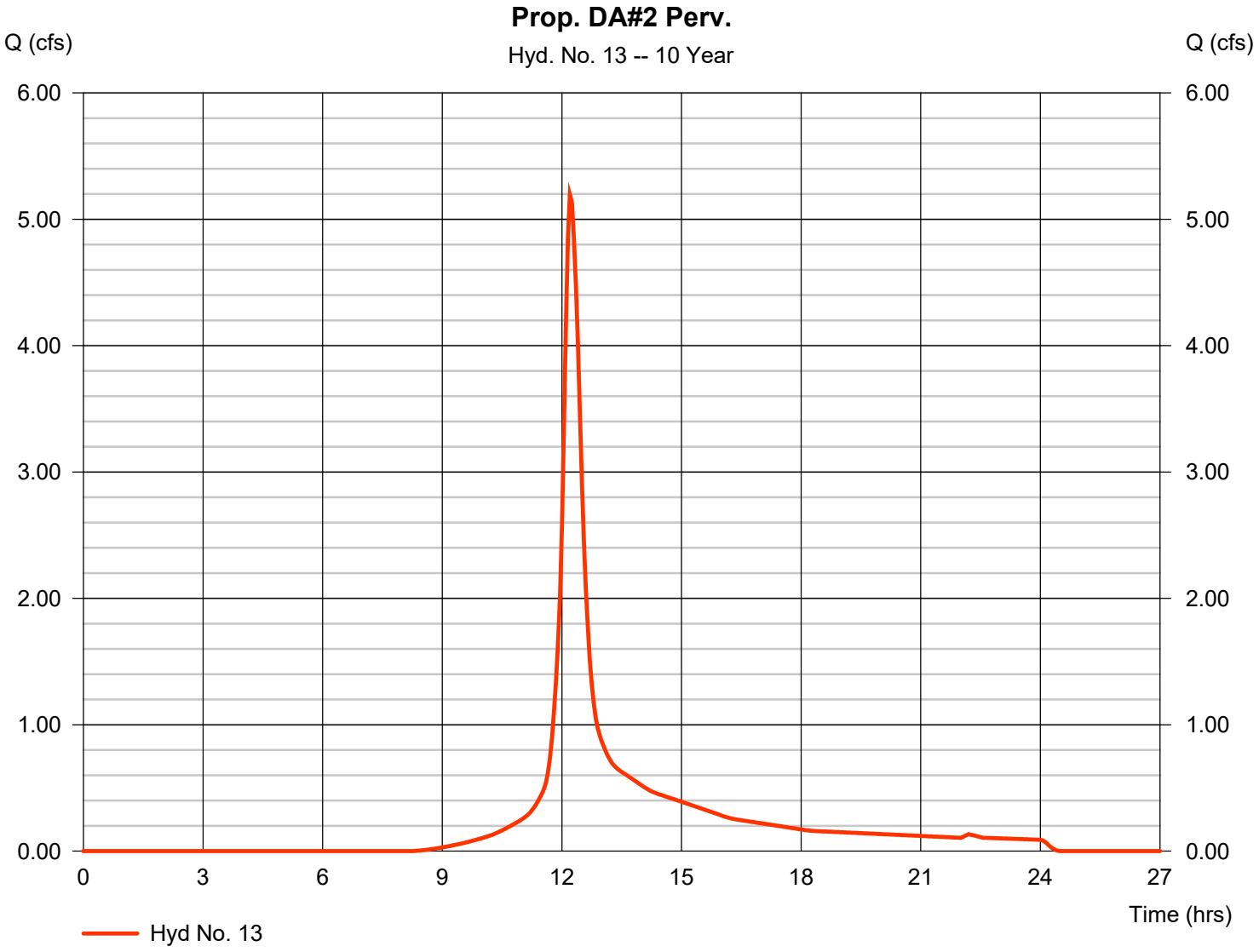


Hydrograph Report

Hyd. No. 13

Prop. DA#2 Perv.

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.193 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.20 hrs
Time interval	=	3 min	Hyd. volume	=	23,247 cuft
Drainage area	=	2.280 ac	Curve number	=	77
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.80 min
Total precip.	=	5.12 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

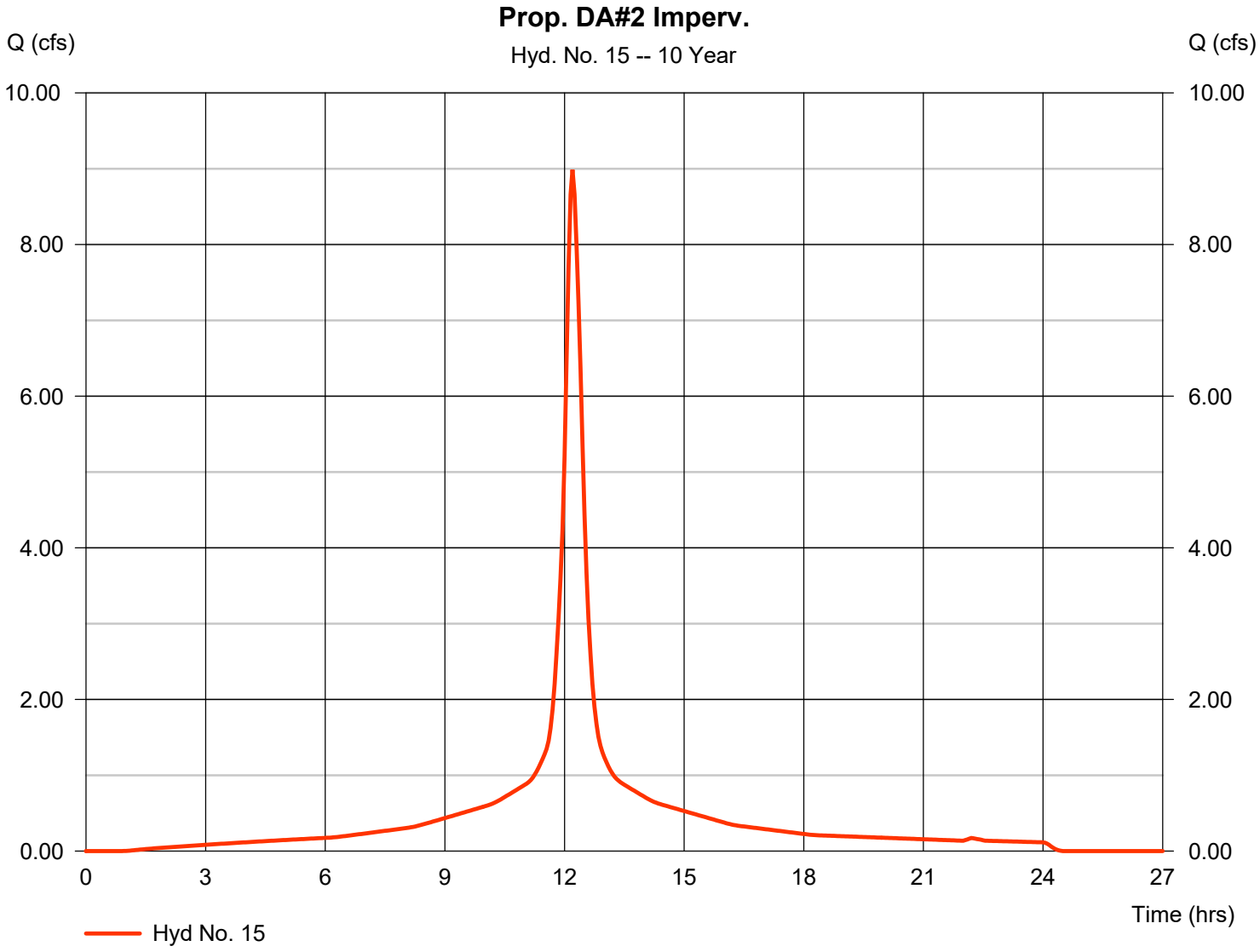


Hydrograph Report

Hyd. No. 15

Prop. DA#2 Imperv.

Hydrograph type	= SCS Runoff	Peak discharge	= 8.987 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 3 min	Hyd. volume	= 45,332 cuft
Drainage area	= 2.480 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 19.80 min
Total precip.	= 5.12 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

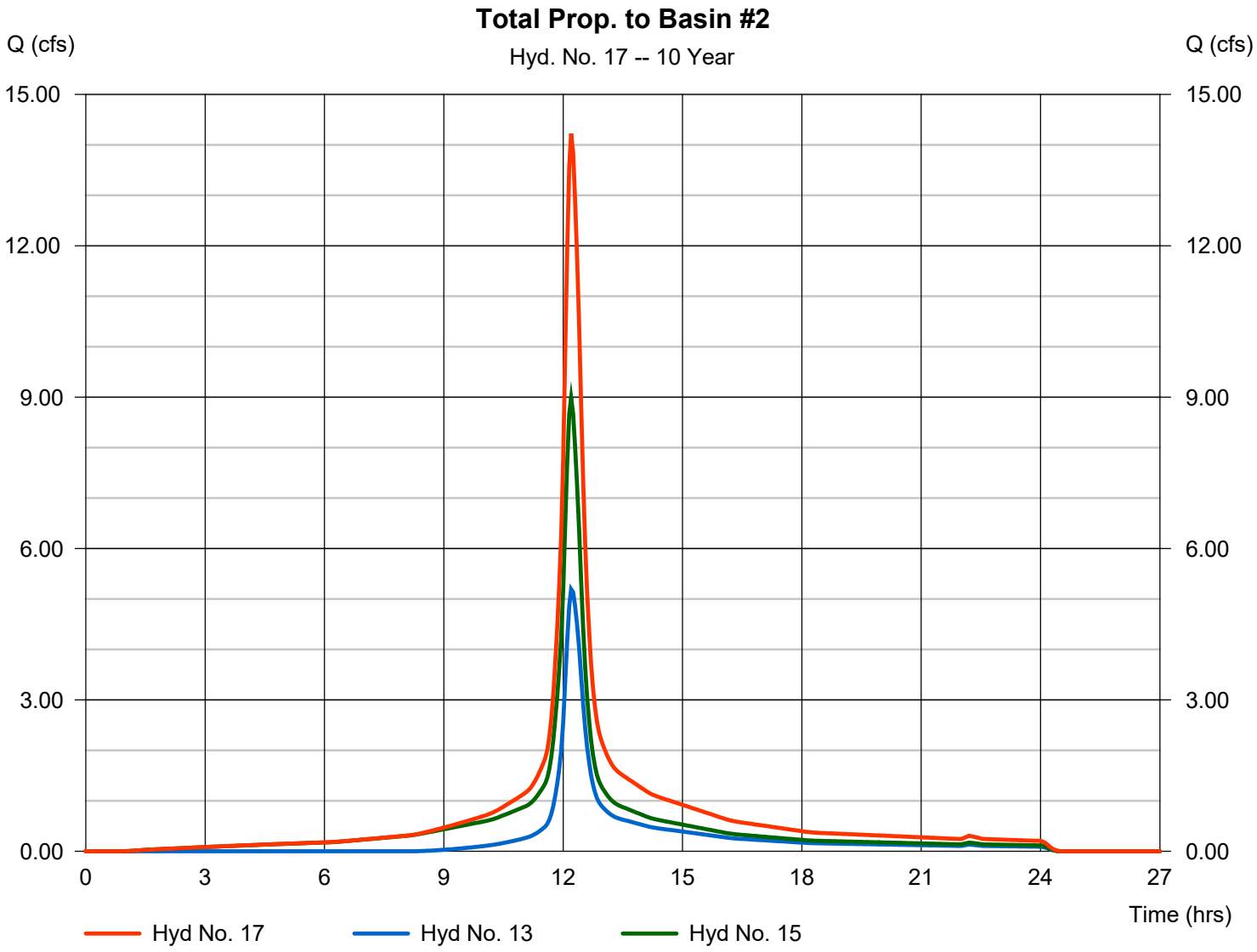


Hydrograph Report

Hyd. No. 17

Total Prop. to Basin #2

Hydrograph type	=	Combine	Peak discharge	=	14.22 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.20 hrs
Time interval	=	3 min	Hyd. volume	=	68,822 cuft
Inflow hyds.	=	13, 15	Contrib. drain. area	=	4.760 ac

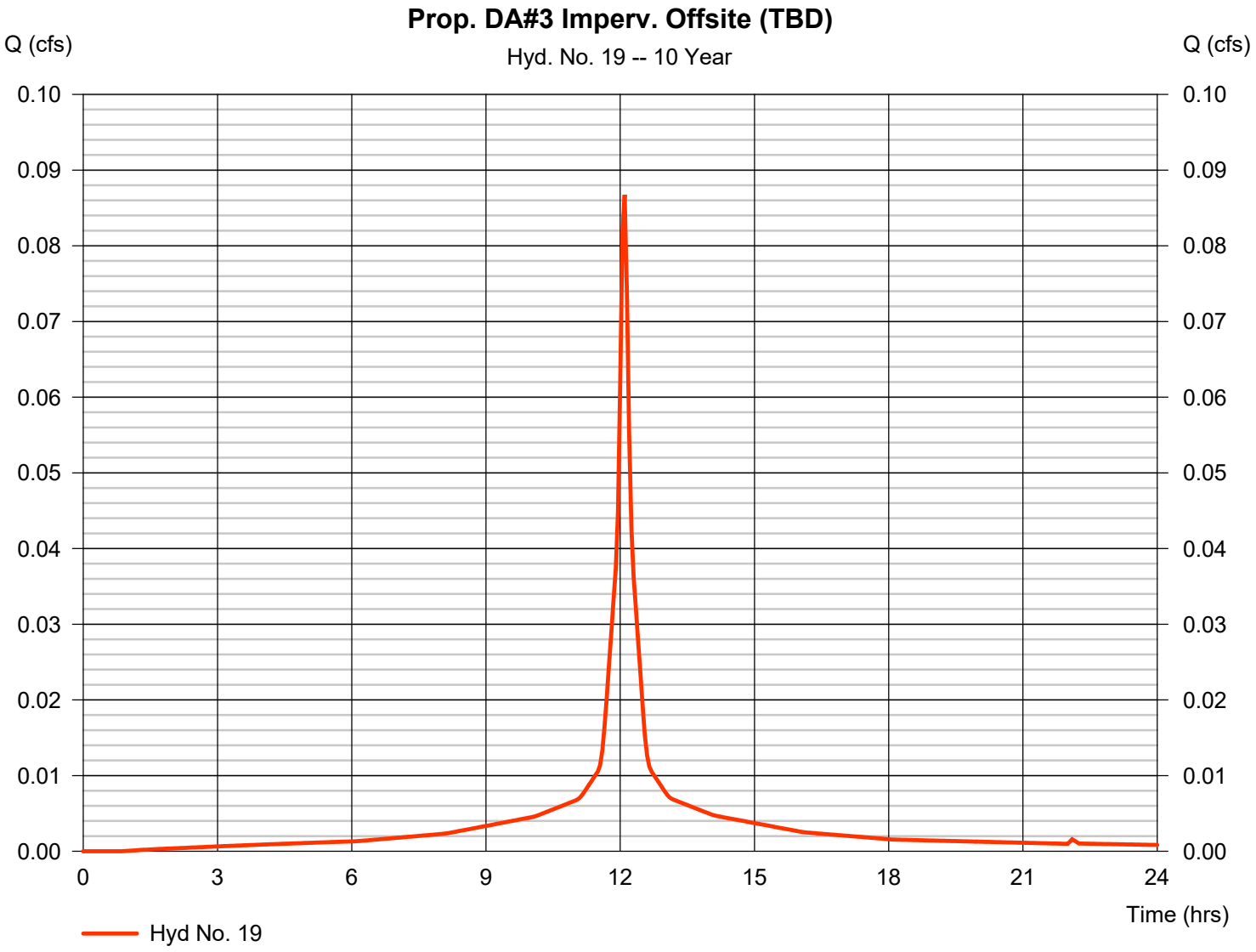


Hydrograph Report

Hyd. No. 19

Prop. DA#3 Imperv. Offsite (TBD)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.087 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.10 hrs
Time interval	=	3 min	Hyd. volume	=	332 cuft
Drainage area	=	0.020 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	5.12 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

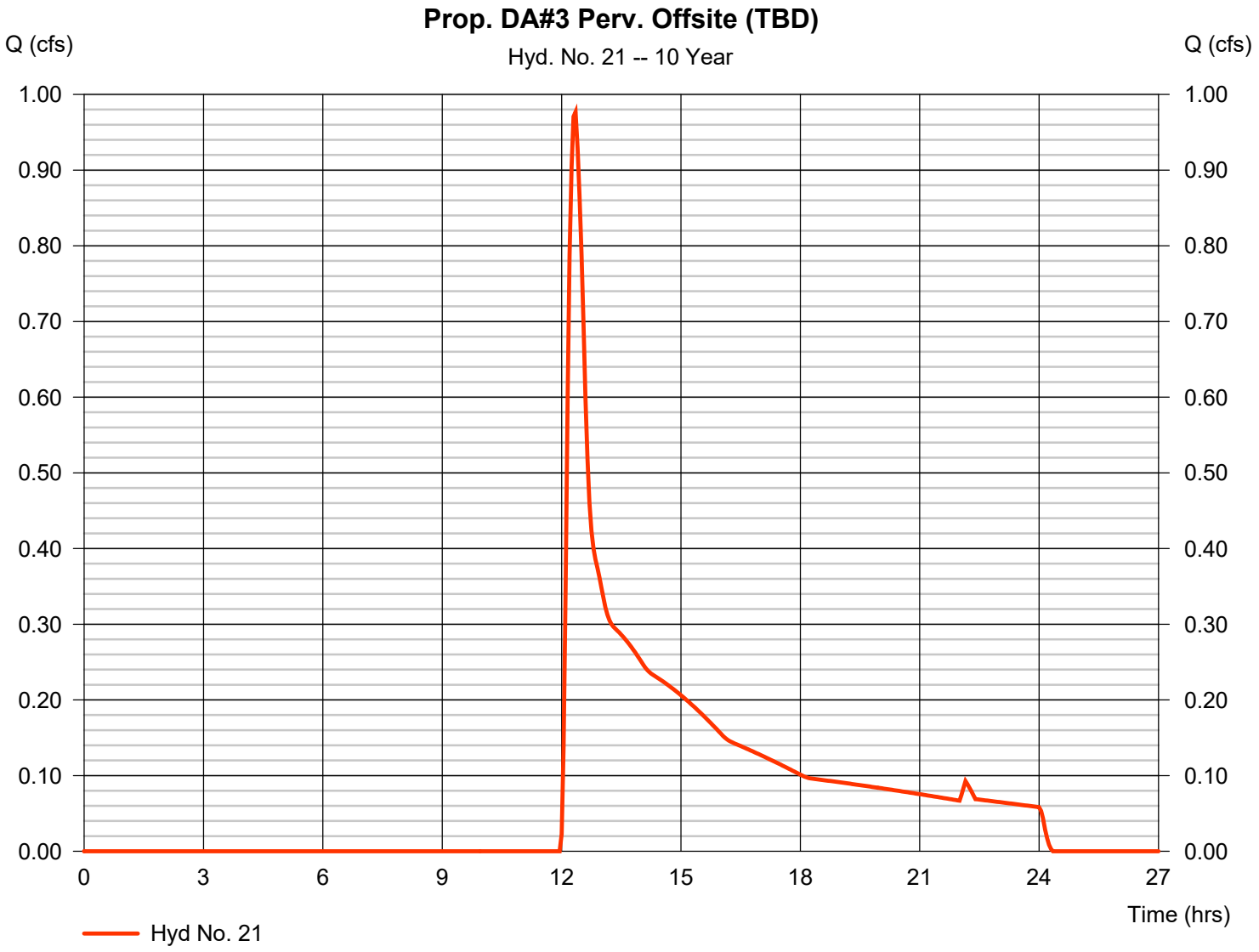


Hydrograph Report

Hyd. No. 21

Prop. DA#3 Perv. Offsite (TBD)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.977 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.35 hrs
Time interval	=	3 min	Hyd. volume	=	7,245 cuft
Drainage area	=	3.770 ac	Curve number	=	46
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.12 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

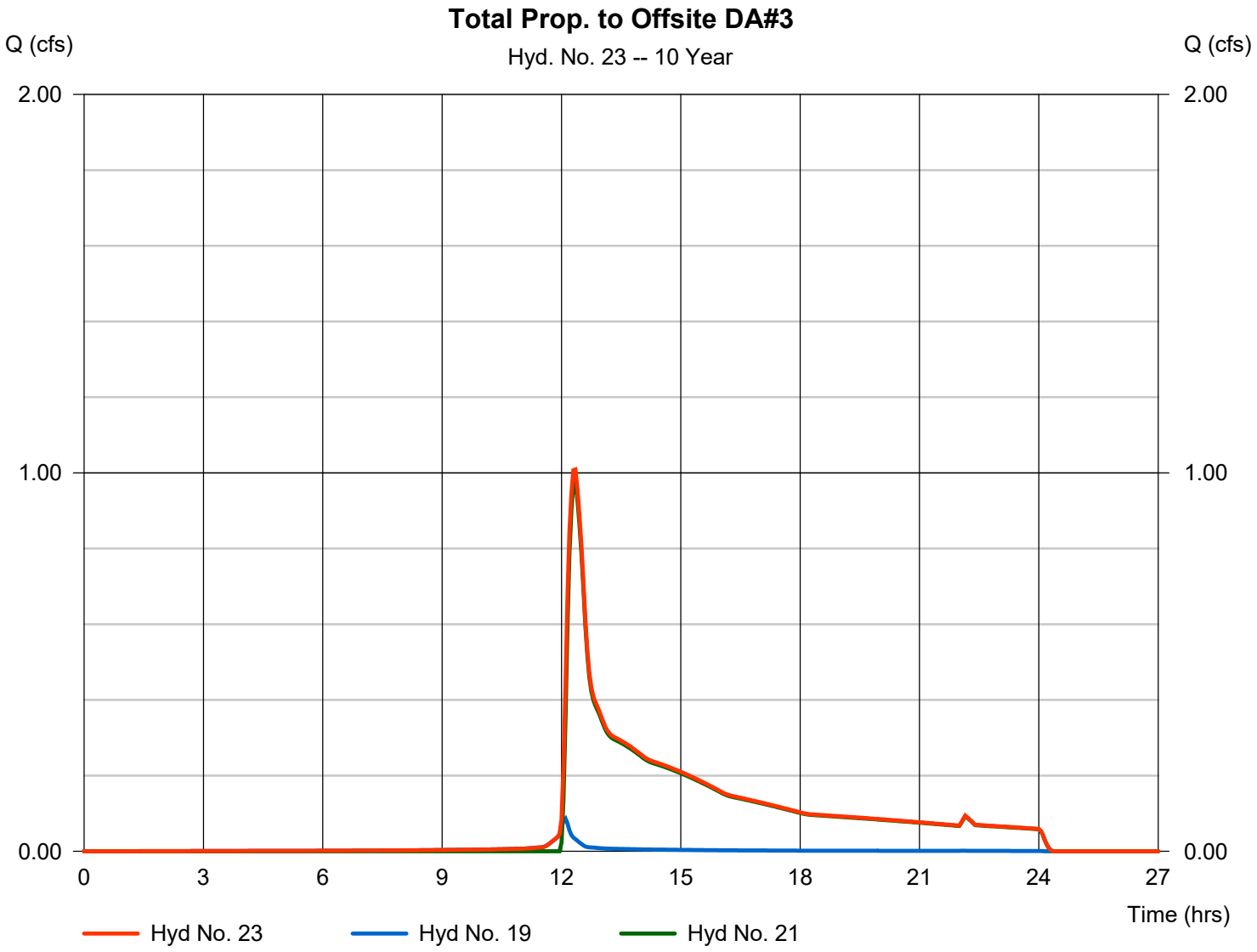


Hydrograph Report

Hyd. No. 23

Total Prop. to Offsite DA#3

Hydrograph type	=	Combine	Peak discharge	=	1.009 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.35 hrs
Time interval	=	3 min	Hyd. volume	=	7,577 cuft
Inflow hyds.	=	19, 21	Contrib. drain. area	=	3.790 ac

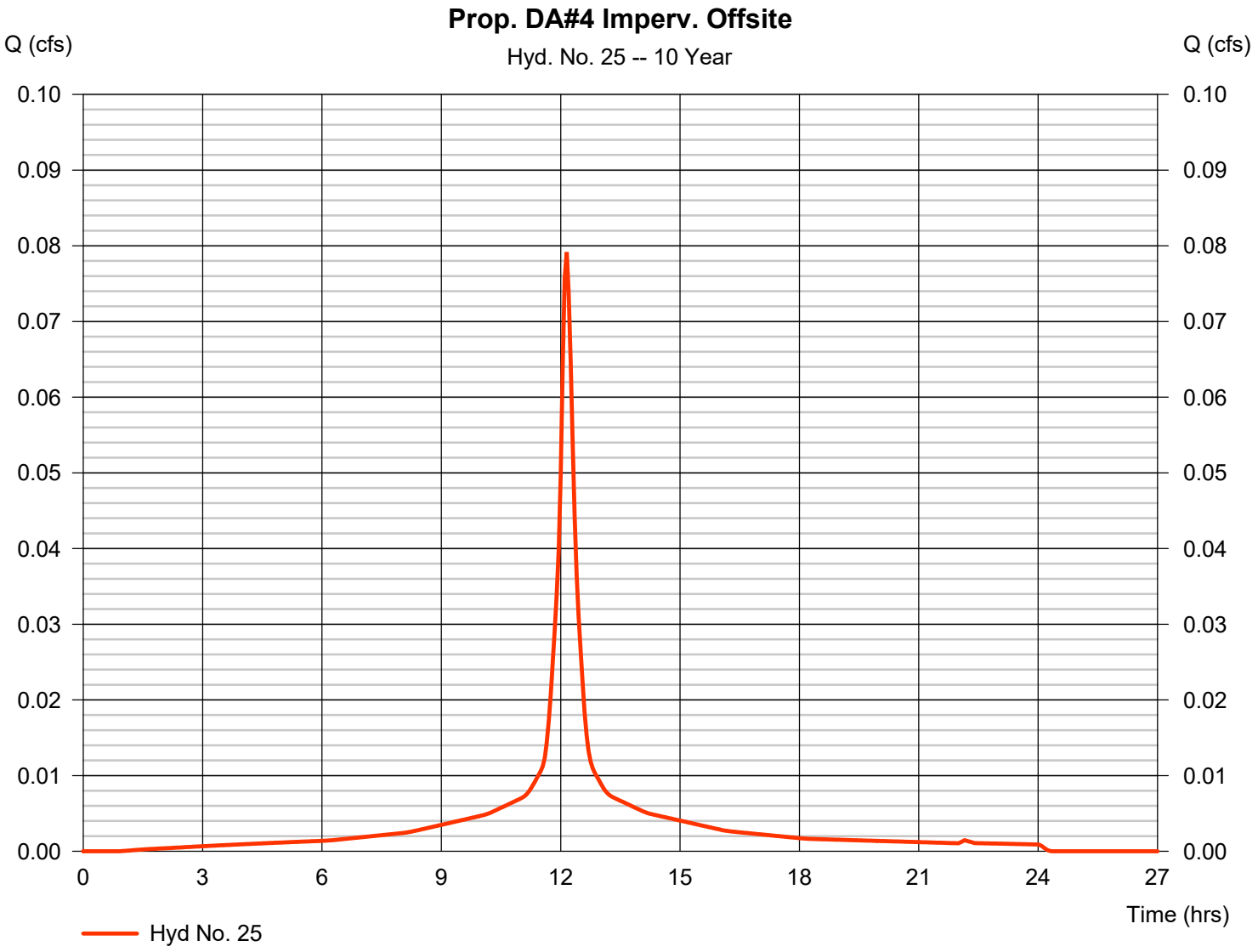


Hydrograph Report

Hyd. No. 25

Prop. DA#4 Imperv. Offsite

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.079 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.15 hrs
Time interval	=	3 min	Hyd. volume	=	355 cuft
Drainage area	=	0.020 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.12 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

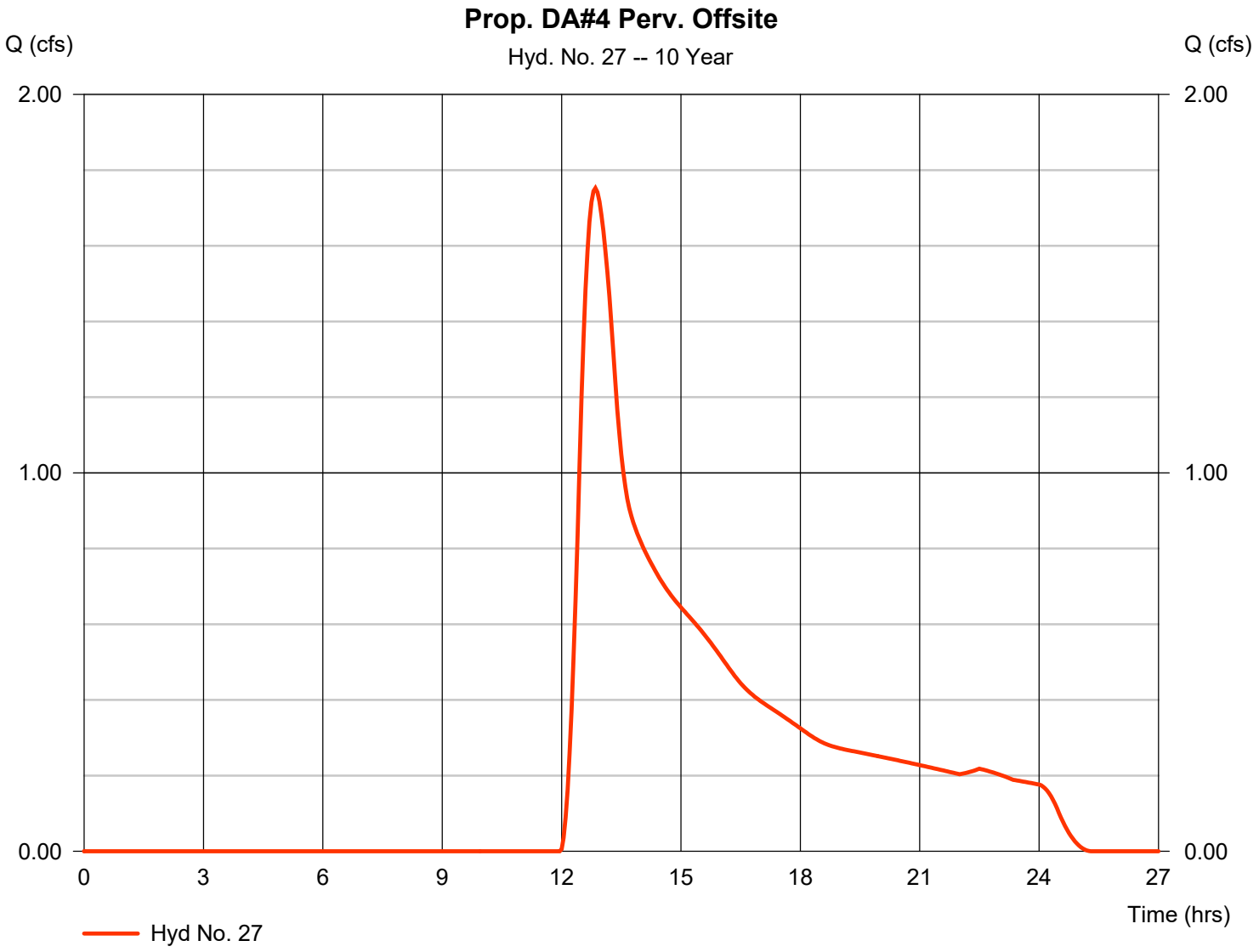


Hydrograph Report

Hyd. No. 27

Prop. DA#4 Perv. Offsite

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.752 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.85 hrs
Time interval	=	3 min	Hyd. volume	=	20,877 cuft
Drainage area	=	10.730 ac	Curve number	=	46
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	46.30 min
Total precip.	=	5.12 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

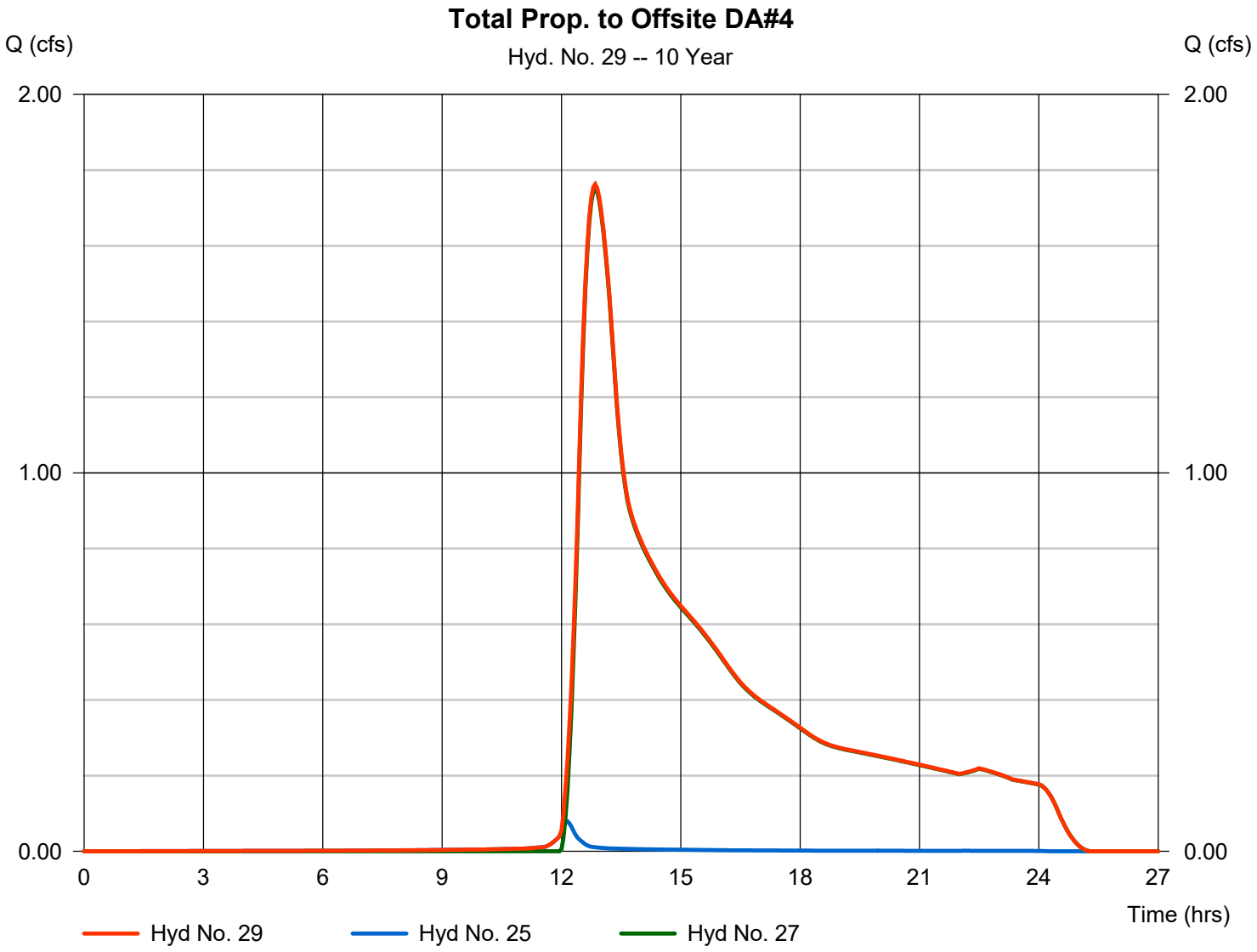


Hydrograph Report

Hyd. No. 29

Total Prop. to Offsite DA#4

Hydrograph type	= Combine	Peak discharge	= 1.763 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.85 hrs
Time interval	= 3 min	Hyd. volume	= 21,231 cuft
Inflow hyds.	= 25, 27	Contrib. drain. area	= 10.750 ac



Hydrograph Report

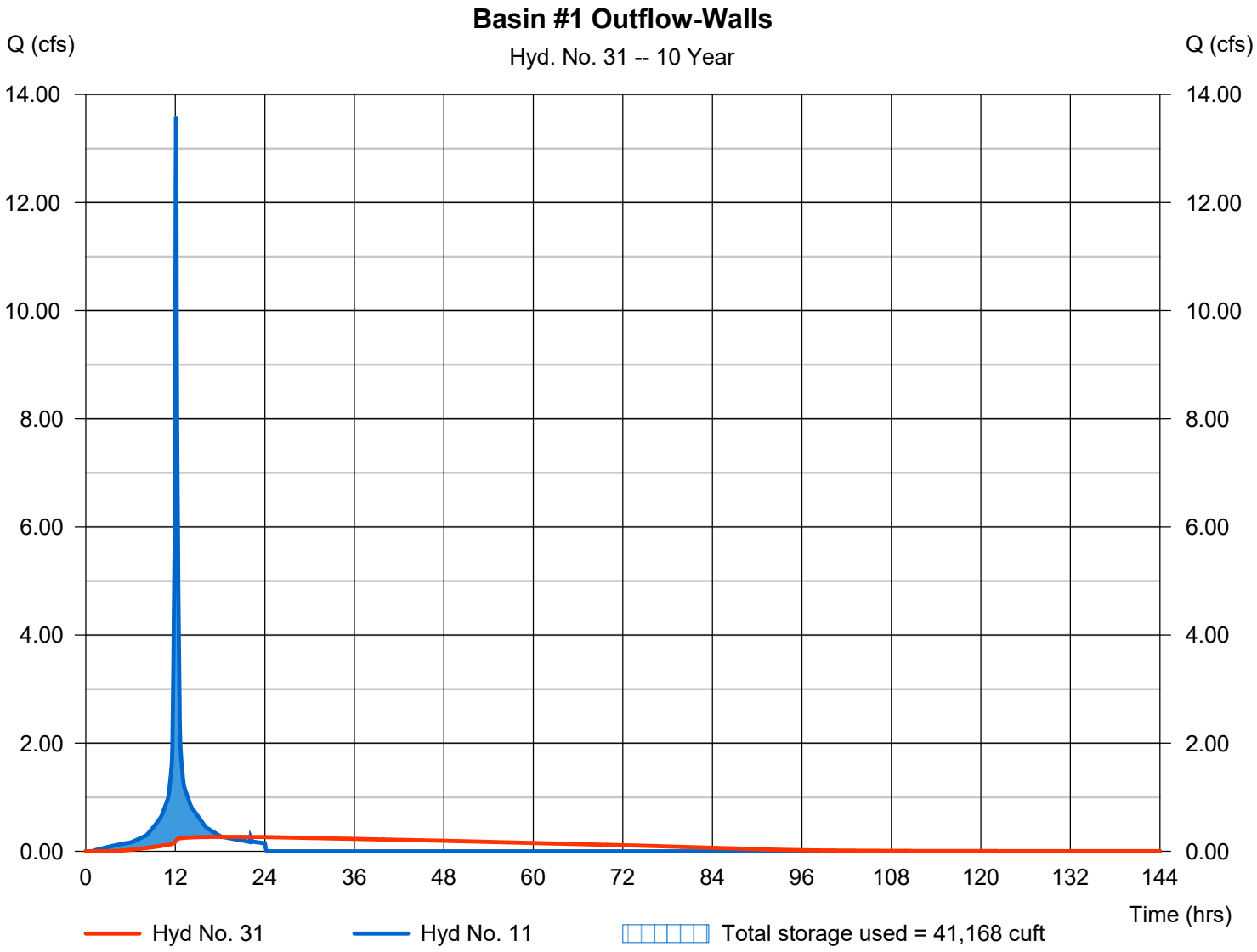
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Thursday, 09 / 24 / 2020

Hyd. No. 31

Basin #1 Outflow-Walls

Hydrograph type	= Reservoir	Peak discharge	= 0.267 cfs
Storm frequency	= 10 yrs	Time to peak	= 18.35 hrs
Time interval	= 3 min	Hyd. volume	= 52,910 cuft
Inflow hyd. No.	= 11 - Total Prop. to Basin #1	Max. Elevation	= 37.25 ft
Reservoir name	= Wet Pond 1 - Upper Only	Max. Storage	= 41,168 cuft

Storage Indication method used.



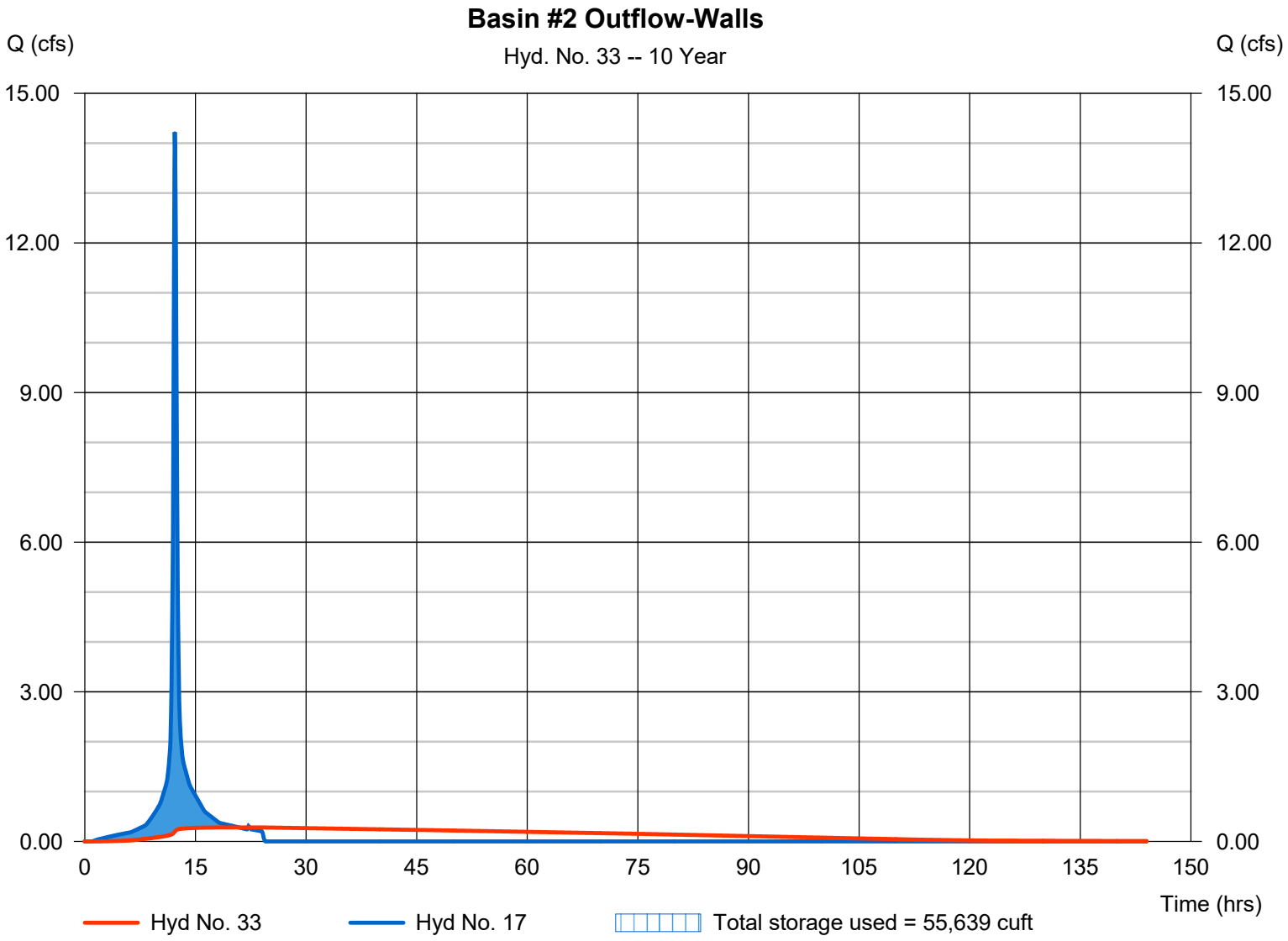
Hydrograph Report

Hyd. No. 33

Basin #2 Outflow-Walls

Hydrograph type	= Reservoir	Peak discharge	= 0.281 cfs
Storm frequency	= 10 yrs	Time to peak	= 20.85 hrs
Time interval	= 3 min	Hyd. volume	= 68,151 cuft
Inflow hyd. No.	= 17 - Total Prop. to Basin #2	Max. Elevation	= 41.03 ft
Reservoir name	= Wet Pond 2 - Upper Only	Max. Storage	= 55,639 cuft

Storage Indication method used.

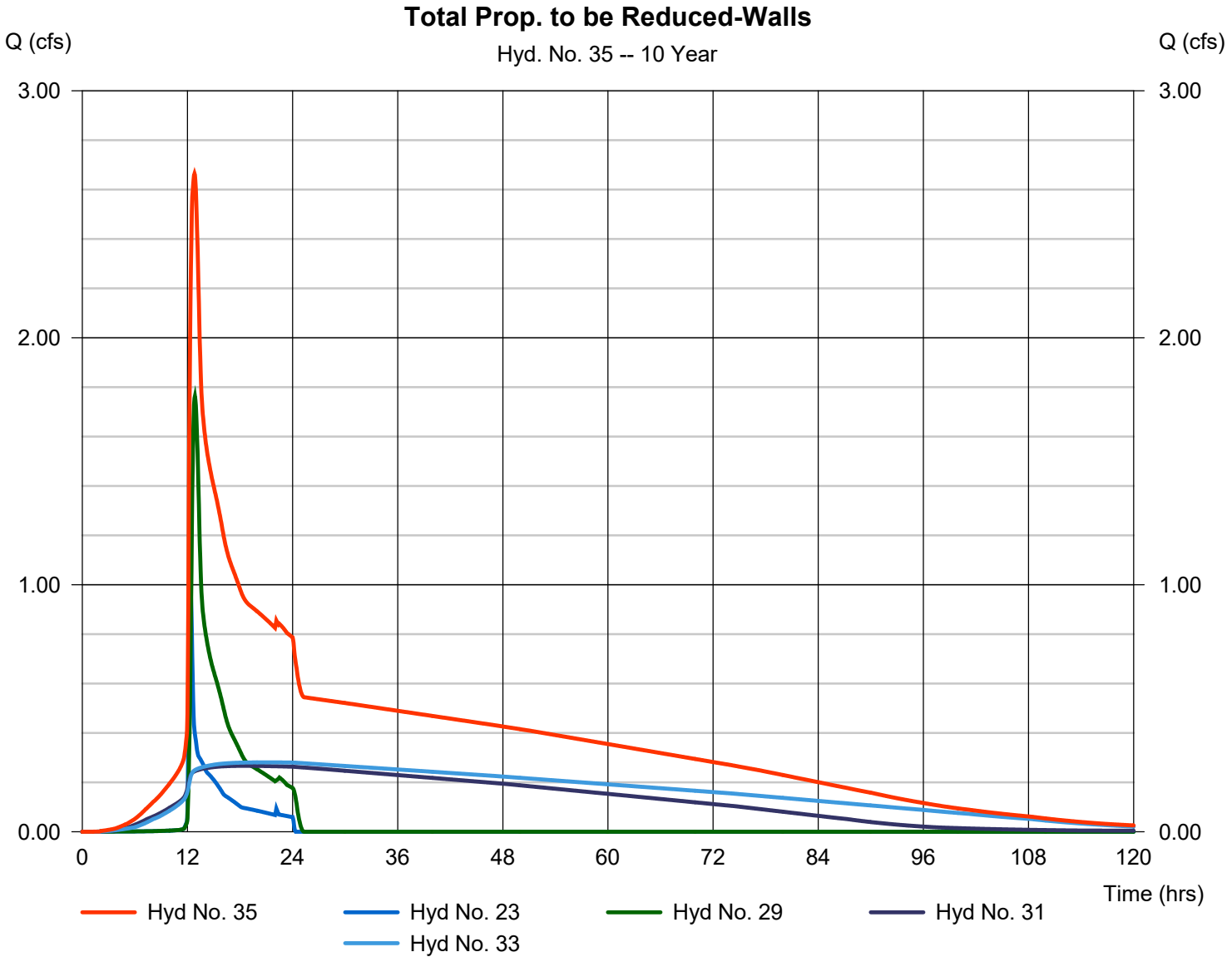


Hydrograph Report

Hyd. No. 35

Total Prop. to be Reduced-Walls

Hydrograph type	= Combine	Peak discharge	= 2.664 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.80 hrs
Time interval	= 3 min	Hyd. volume	= 152,875 cuft
Inflow hyds.	= 23, 29, 31, 33	Contrib. drain. area	= 0.000 ac

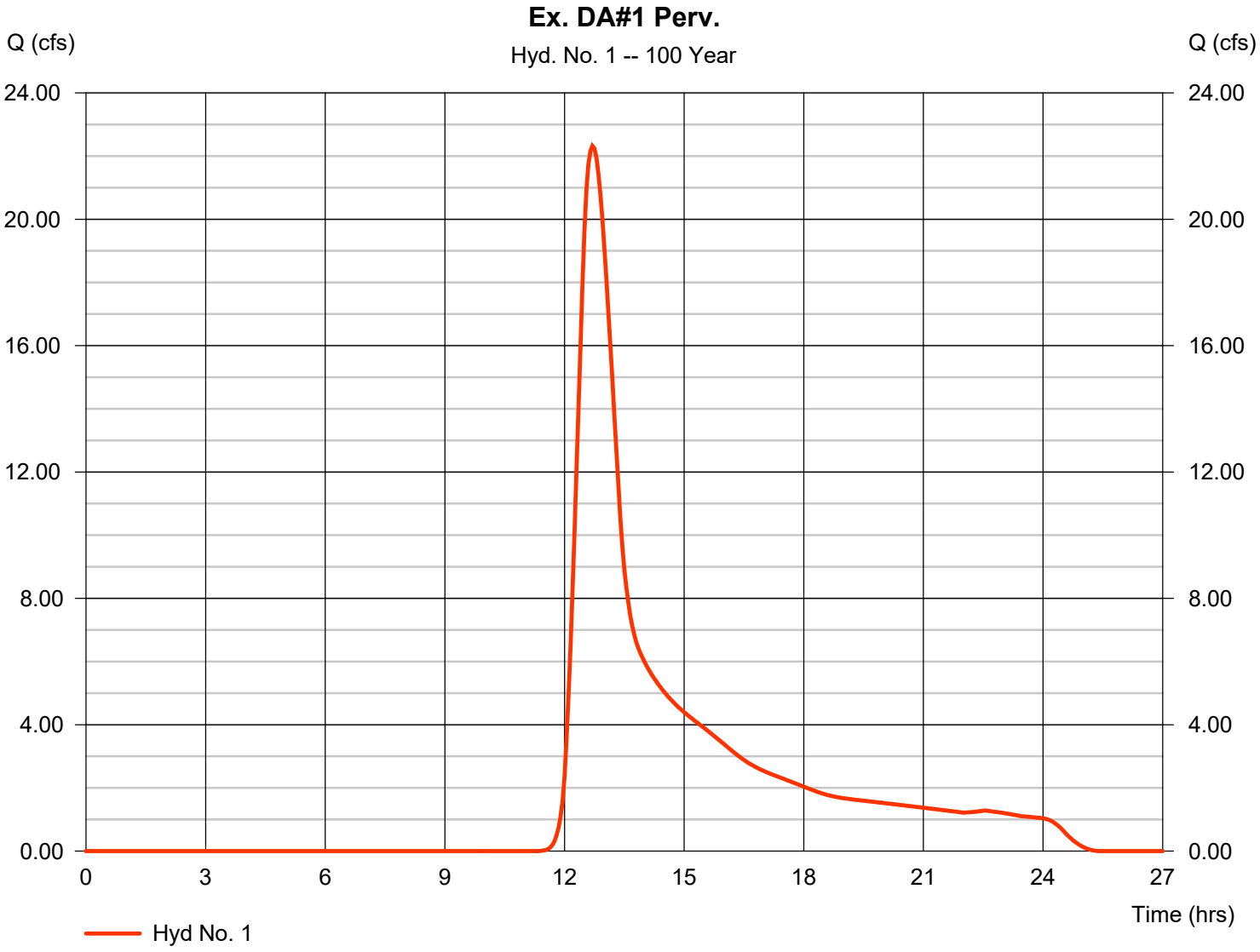


Hydrograph Report

Hyd. No. 1

Ex. DA#1 Perv.

Hydrograph type	= SCS Runoff	Peak discharge	= 22.32 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.70 hrs
Time interval	= 3 min	Hyd. volume	= 179,817 cuft
Drainage area	= 22.880 ac	Curve number	= 46
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 50.80 min
Total precip.	= 8.63 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

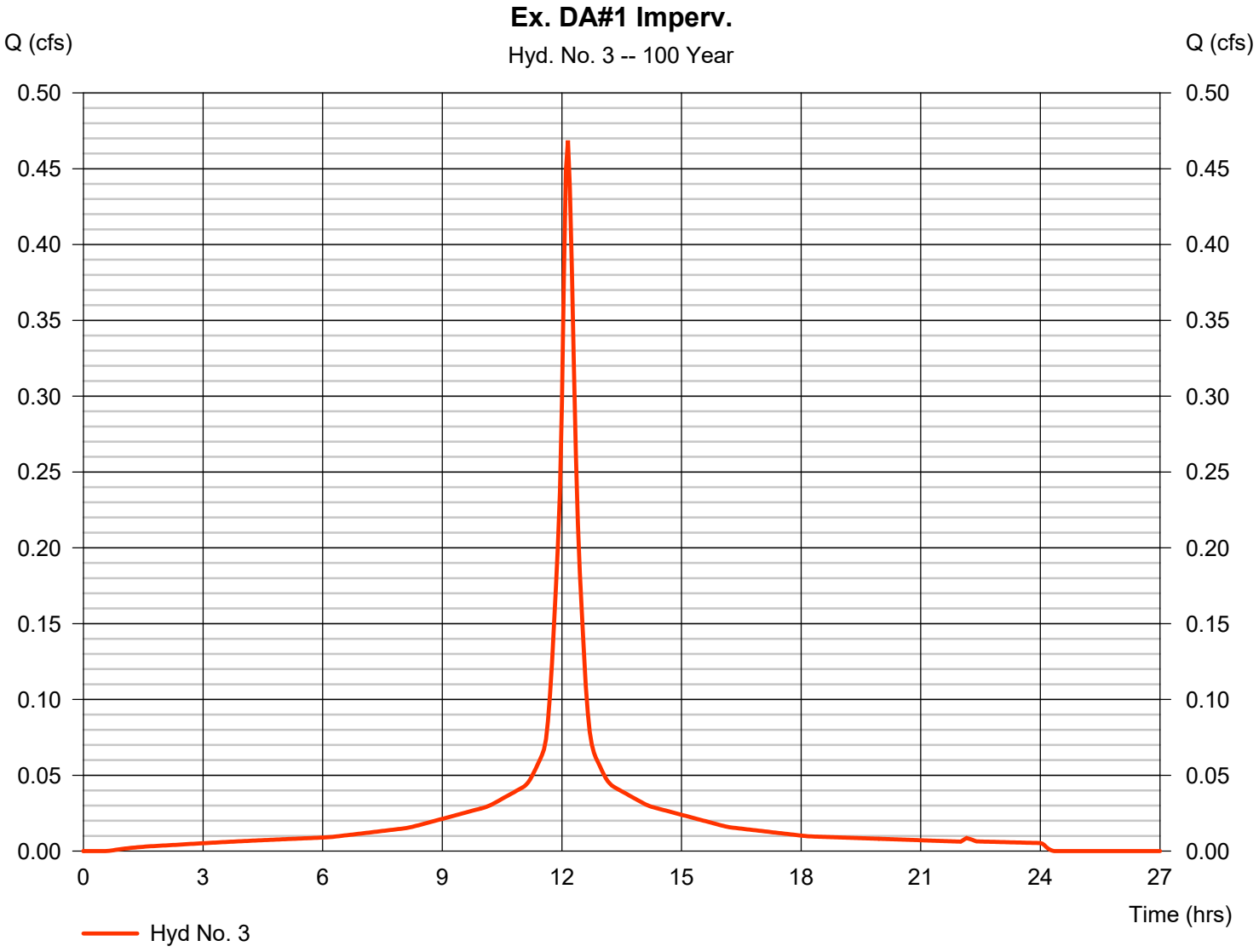


Hydrograph Report

Hyd. No. 3

Ex. DA#1 Imperv.

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.469 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.15 hrs
Time interval	=	3 min	Hyd. volume	=	2,132 cuft
Drainage area	=	0.070 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.63 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

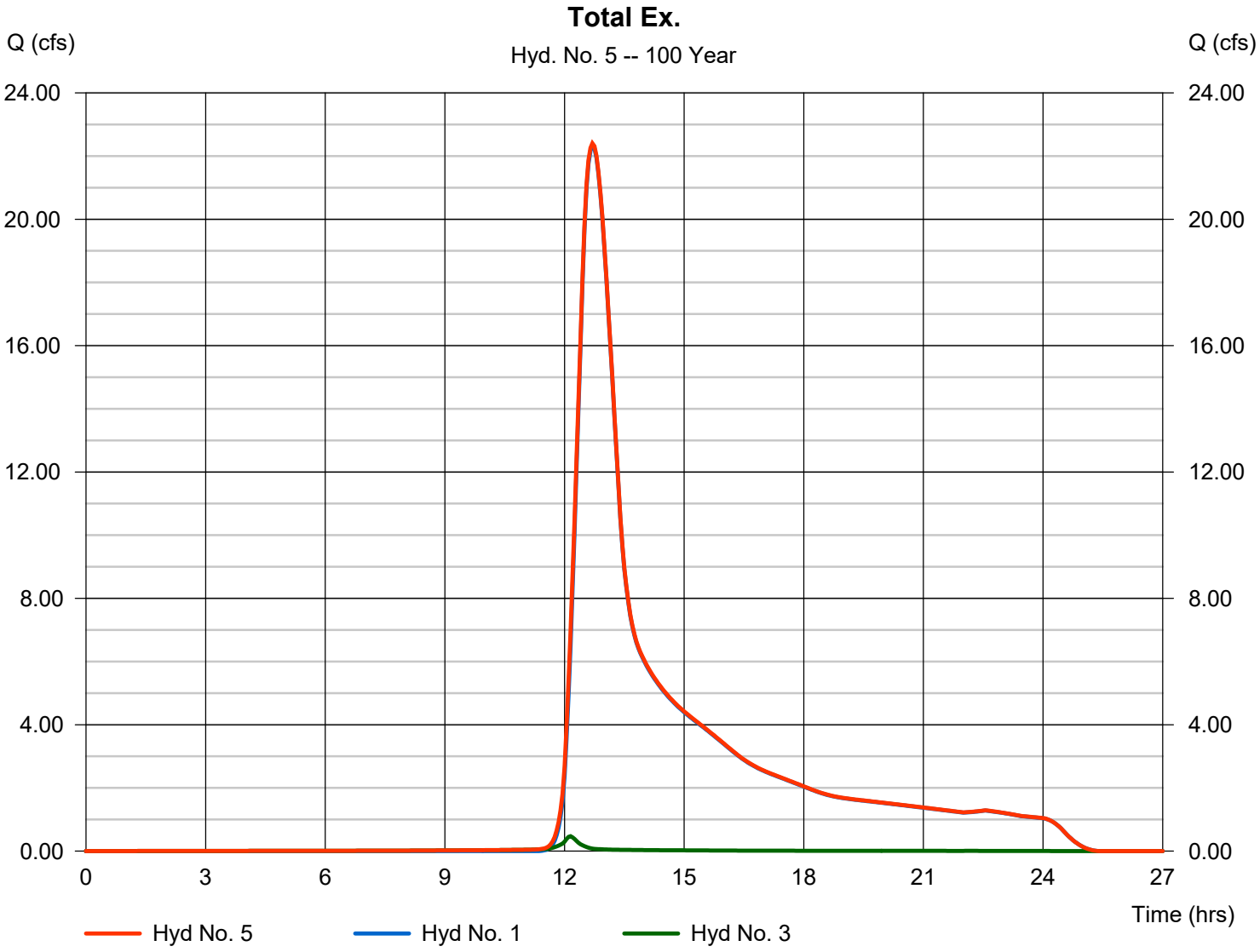


Hydrograph Report

Hyd. No. 5

Total Ex.

Hydrograph type	= Combine	Peak discharge	= 22.40 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.70 hrs
Time interval	= 3 min	Hyd. volume	= 181,949 cuft
Inflow hyds.	= 1, 3	Contrib. drain. area	= 22.950 ac

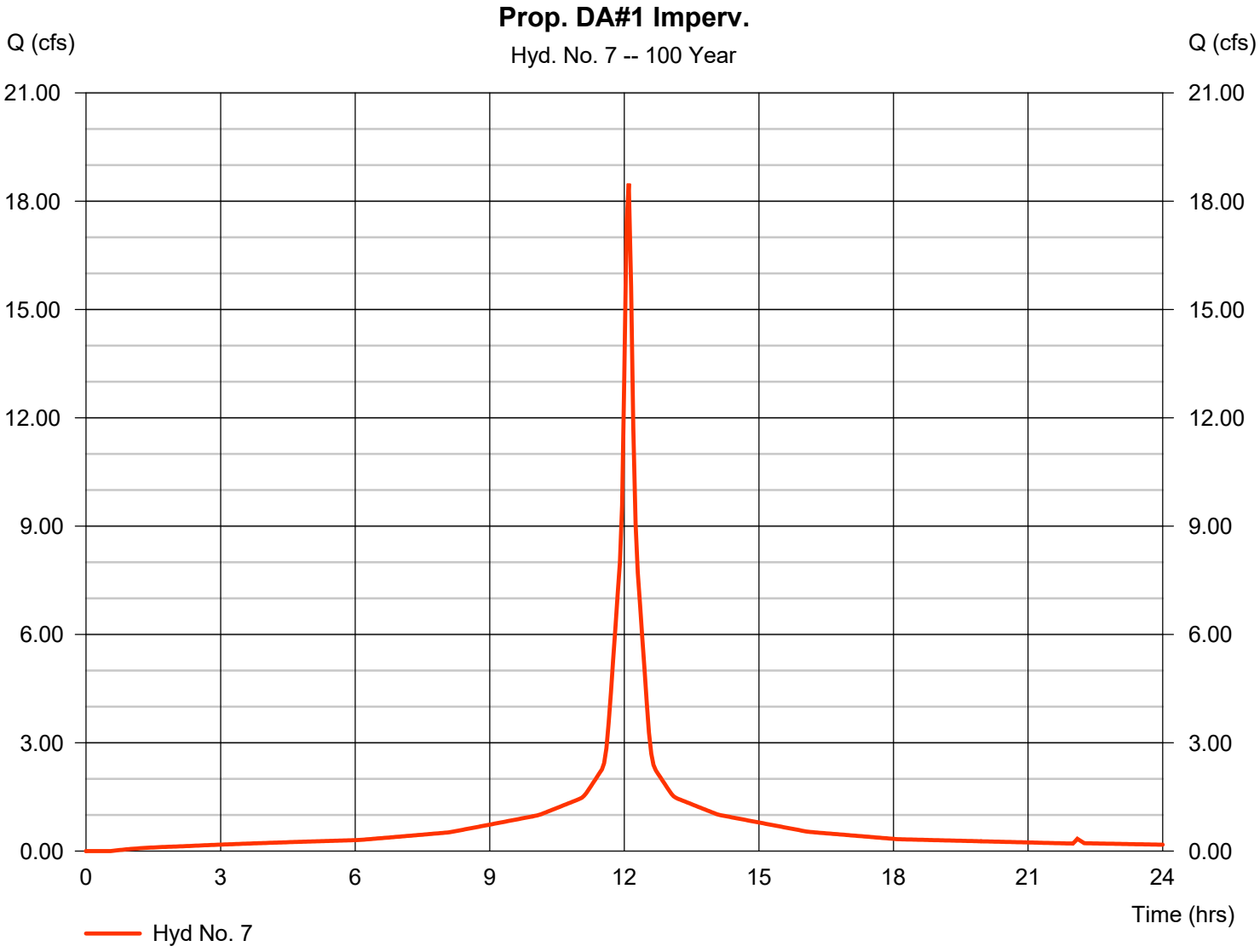


Hydrograph Report

Hyd. No. 7

Prop. DA#1 Imperv.

Hydrograph type	=	SCS Runoff	Peak discharge	=	18.49 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.10 hrs
Time interval	=	3 min	Hyd. volume	=	71,950 cuft
Drainage area	=	2.520 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	8.63 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

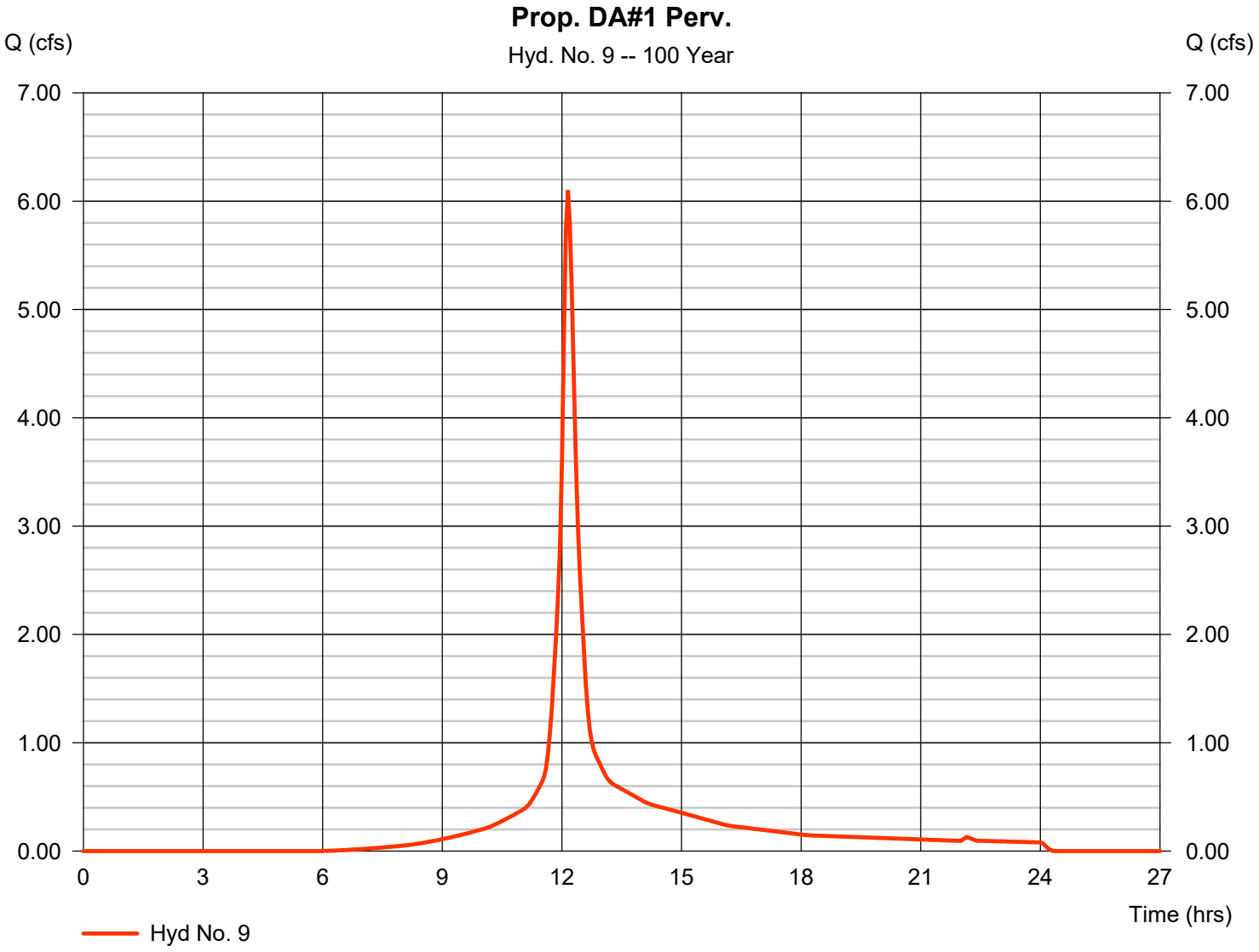


Hydrograph Report

Hyd. No. 9

Prop. DA#1 Perv.

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.101 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.15 hrs
Time interval	=	3 min	Hyd. volume	=	24,230 cuft
Drainage area	=	1.140 ac	Curve number	=	77
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.63 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

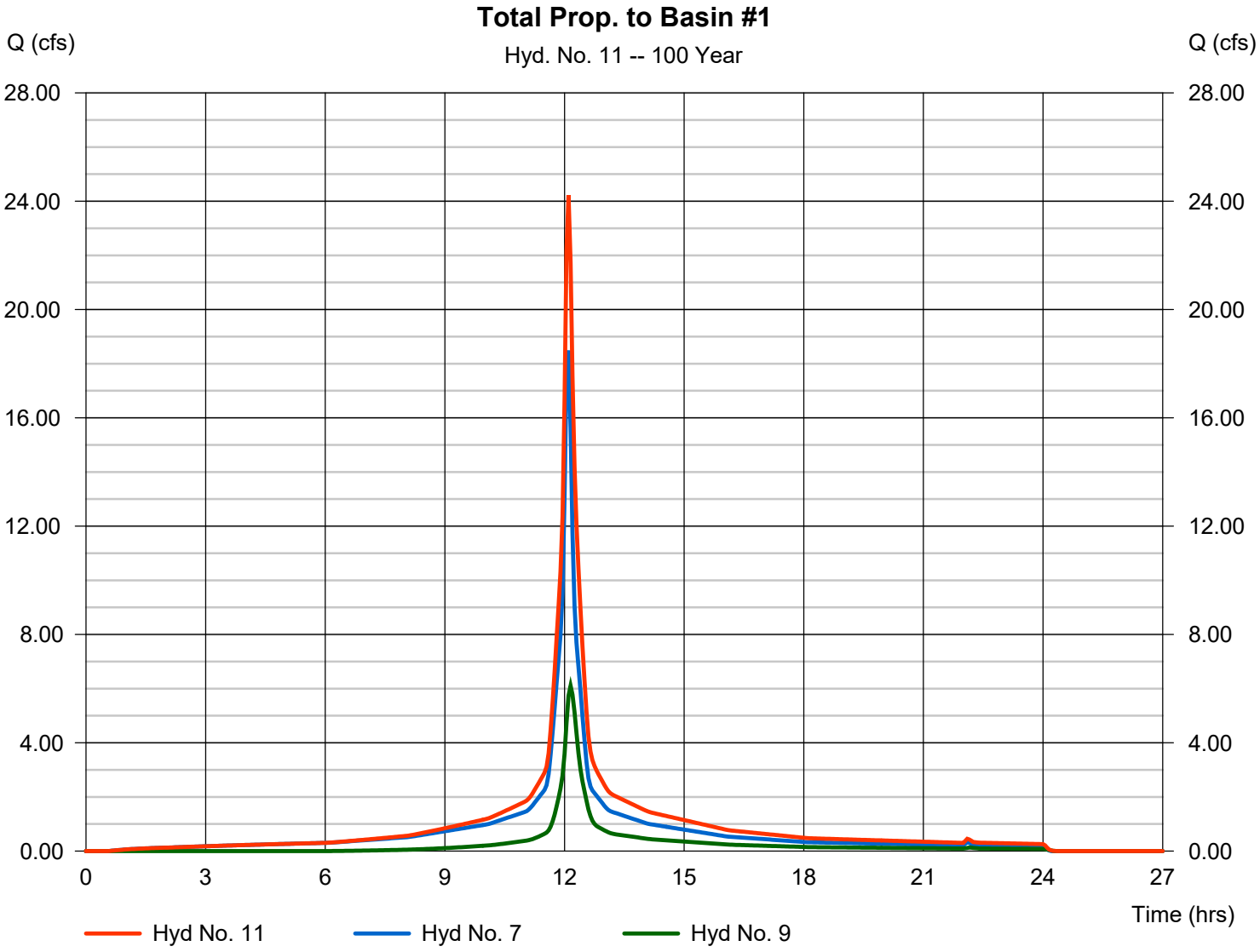


Hydrograph Report

Hyd. No. 11

Total Prop. to Basin #1

Hydrograph type	= Combine	Peak discharge	= 24.22 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 3 min	Hyd. volume	= 96,180 cuft
Inflow hyds.	= 7, 9	Contrib. drain. area	= 3.660 ac

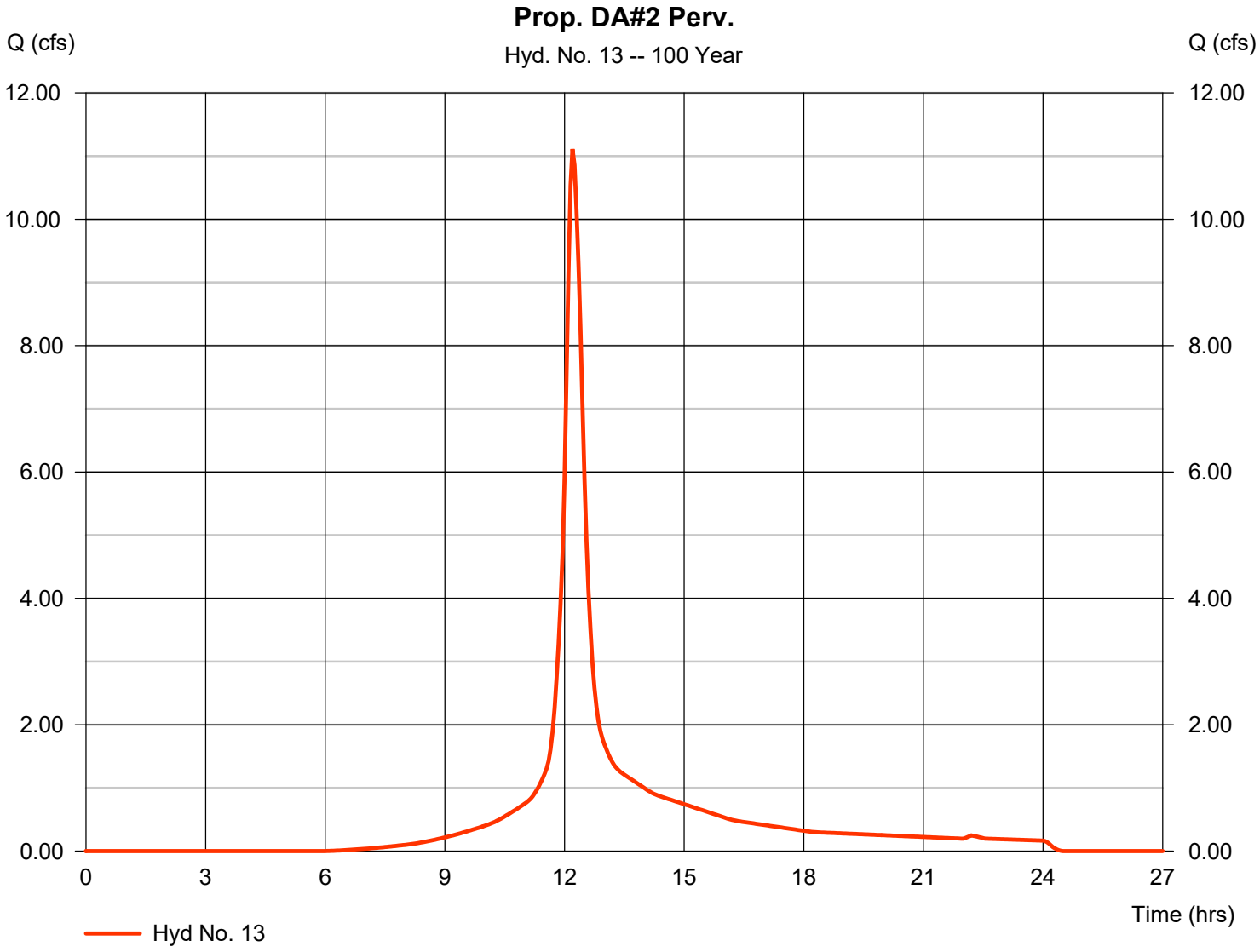


Hydrograph Report

Hyd. No. 13

Prop. DA#2 Perv.

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.11 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.20 hrs
Time interval	=	3 min	Hyd. volume	=	49,975 cuft
Drainage area	=	2.280 ac	Curve number	=	77
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.80 min
Total precip.	=	8.63 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

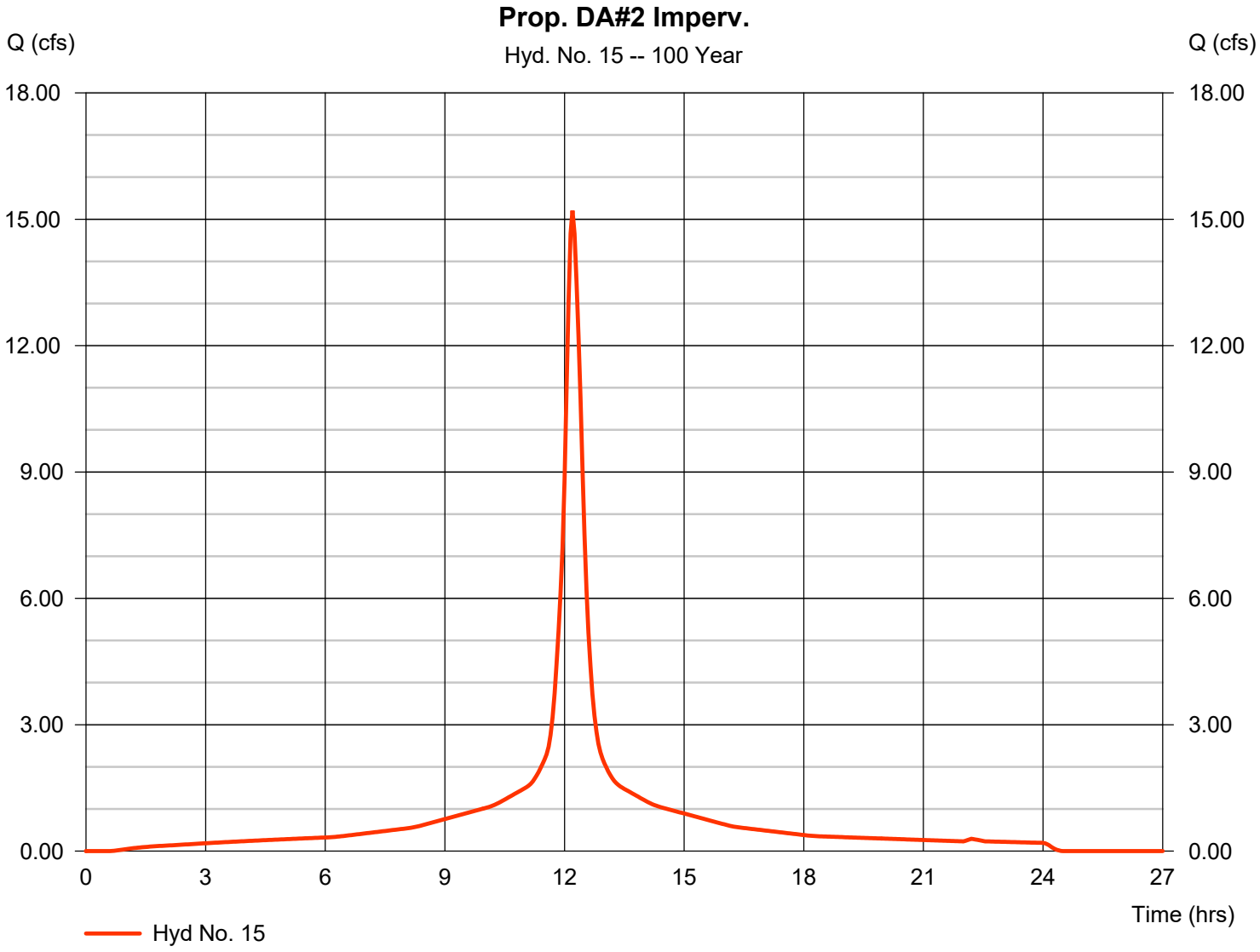


Hydrograph Report

Hyd. No. 15

Prop. DA#2 Imperv.

Hydrograph type	= SCS Runoff	Peak discharge	= 15.21 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 3 min	Hyd. volume	= 77,889 cuft
Drainage area	= 2.480 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 19.80 min
Total precip.	= 8.63 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

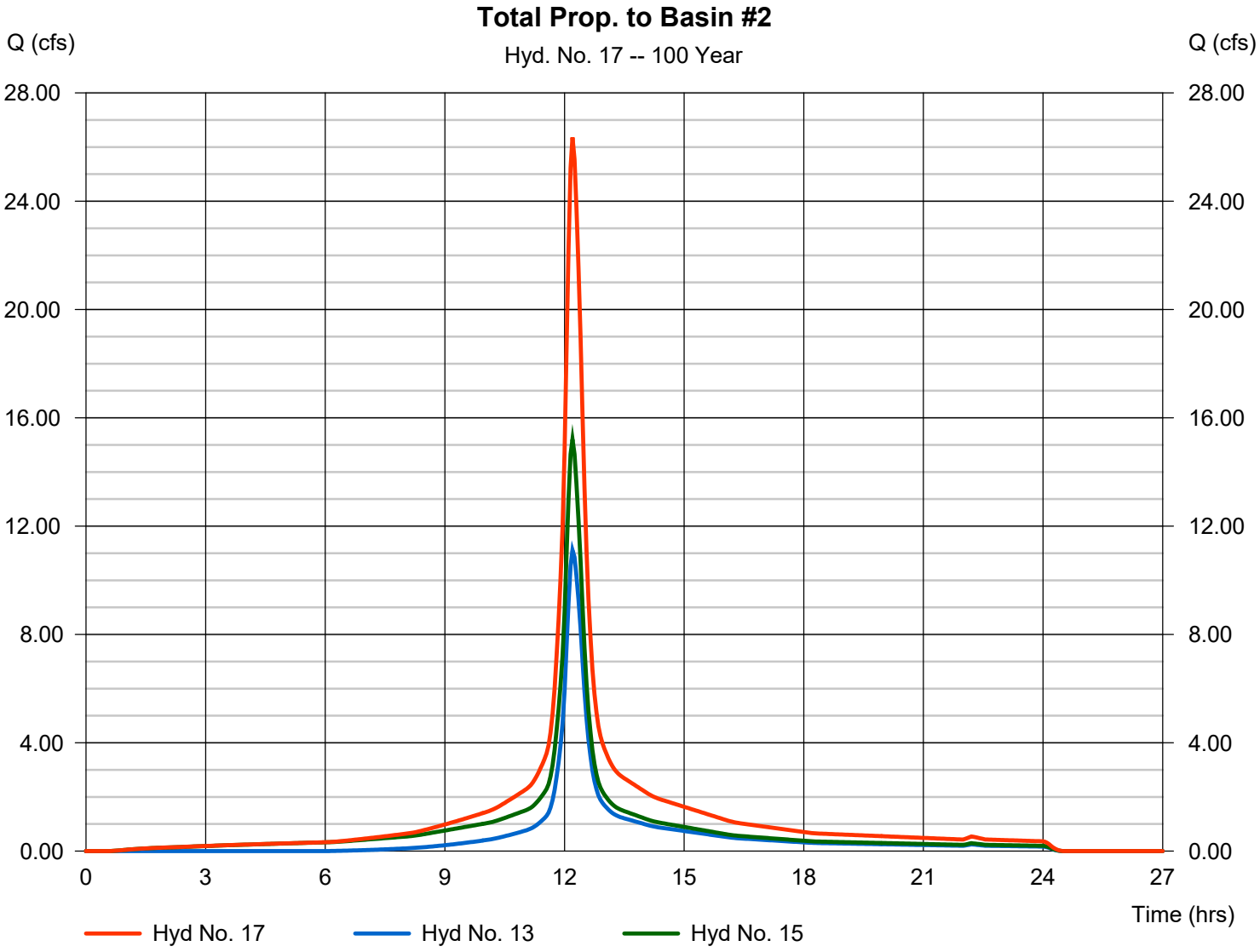


Hydrograph Report

Hyd. No. 17

Total Prop. to Basin #2

Hydrograph type	= Combine	Peak discharge	= 26.36 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 3 min	Hyd. volume	= 128,148 cuft
Inflow hyds.	= 13, 15	Contrib. drain. area	= 4.760 ac

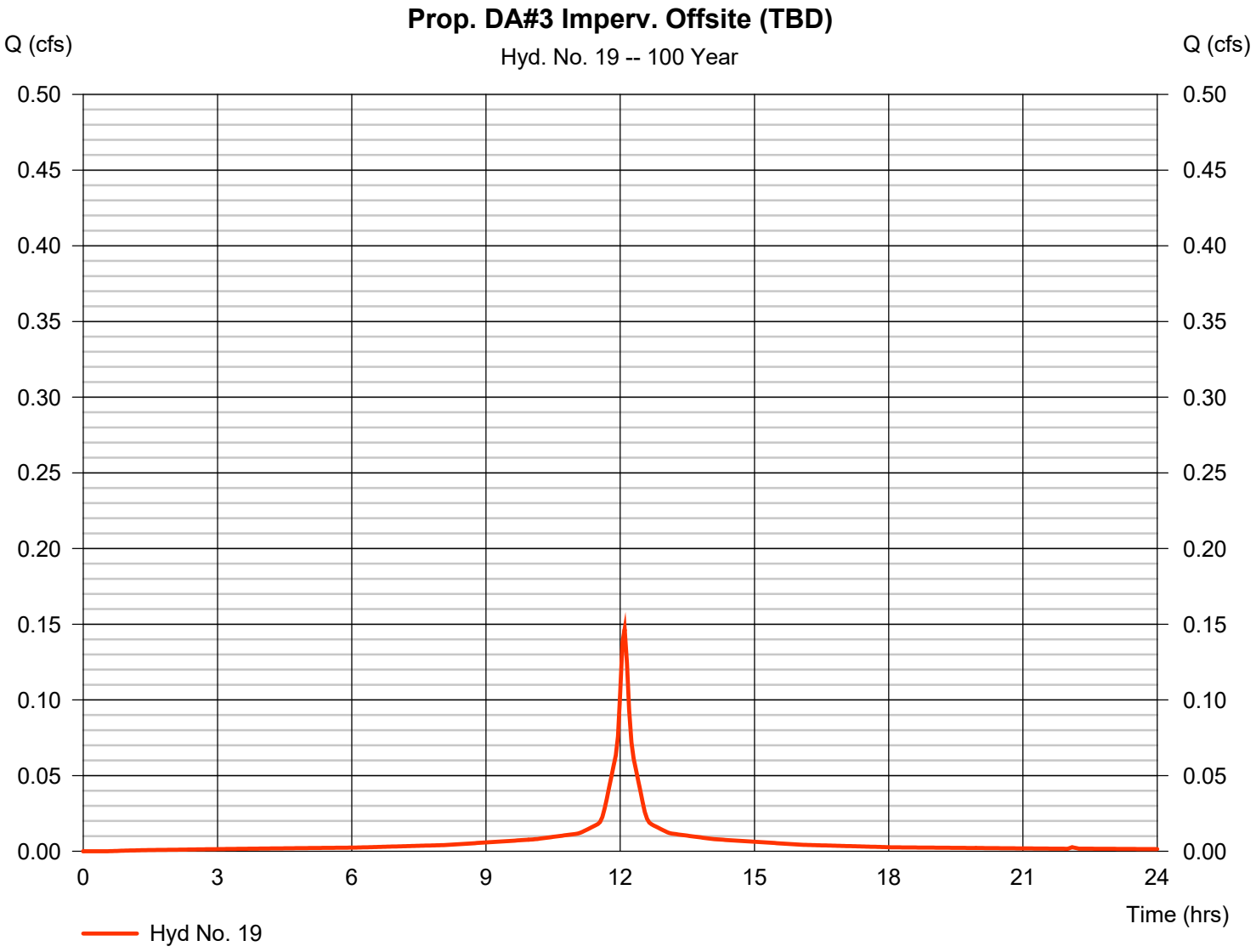


Hydrograph Report

Hyd. No. 19

Prop. DA#3 Imperv. Offsite (TBD)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.147 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.10 hrs
Time interval	=	3 min	Hyd. volume	=	571 cuft
Drainage area	=	0.020 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	8.63 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

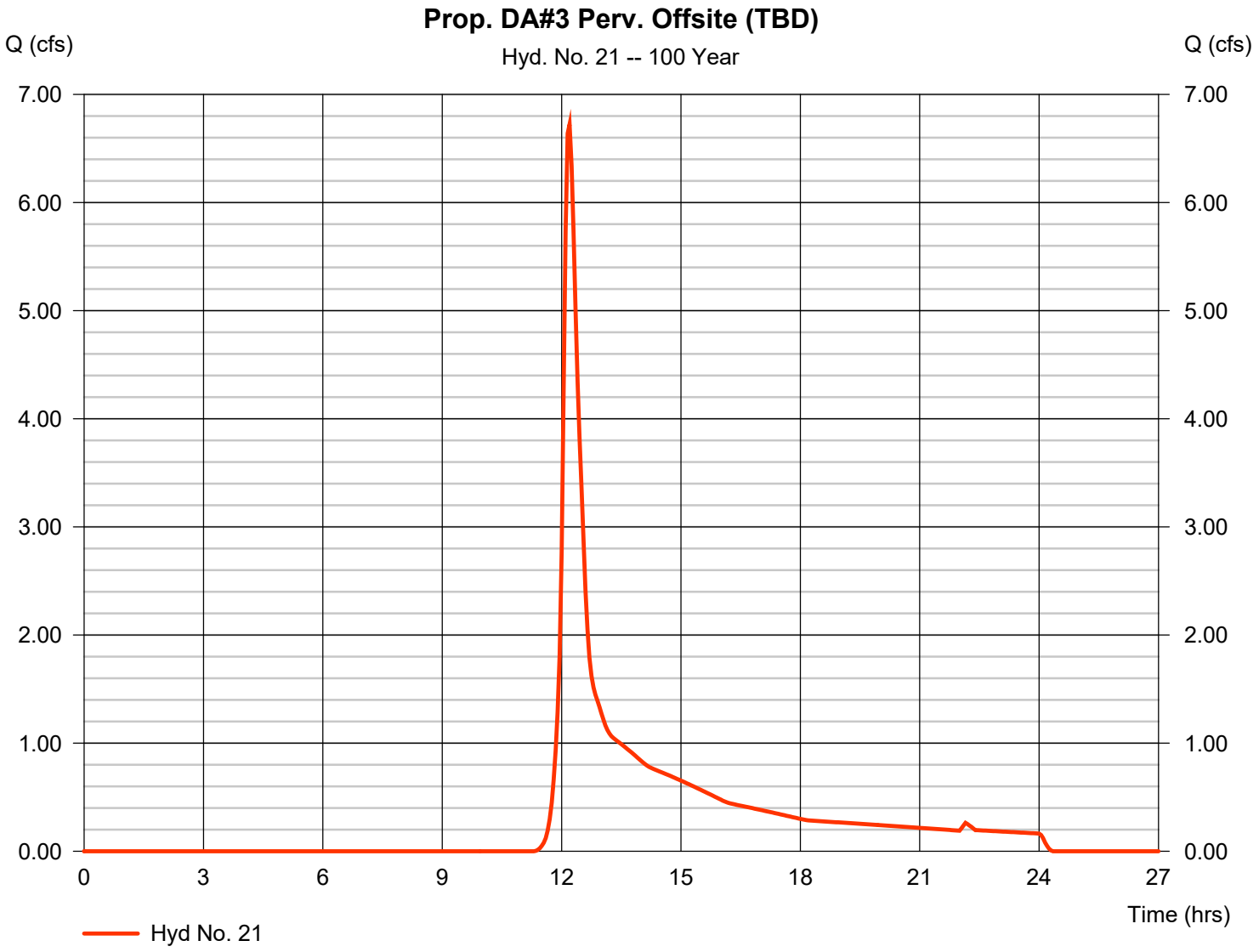


Hydrograph Report

Hyd. No. 21

Prop. DA#3 Perv. Offsite (TBD)

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.722 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.20 hrs
Time interval	=	3 min	Hyd. volume	=	29,970 cuft
Drainage area	=	3.770 ac	Curve number	=	46
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.63 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

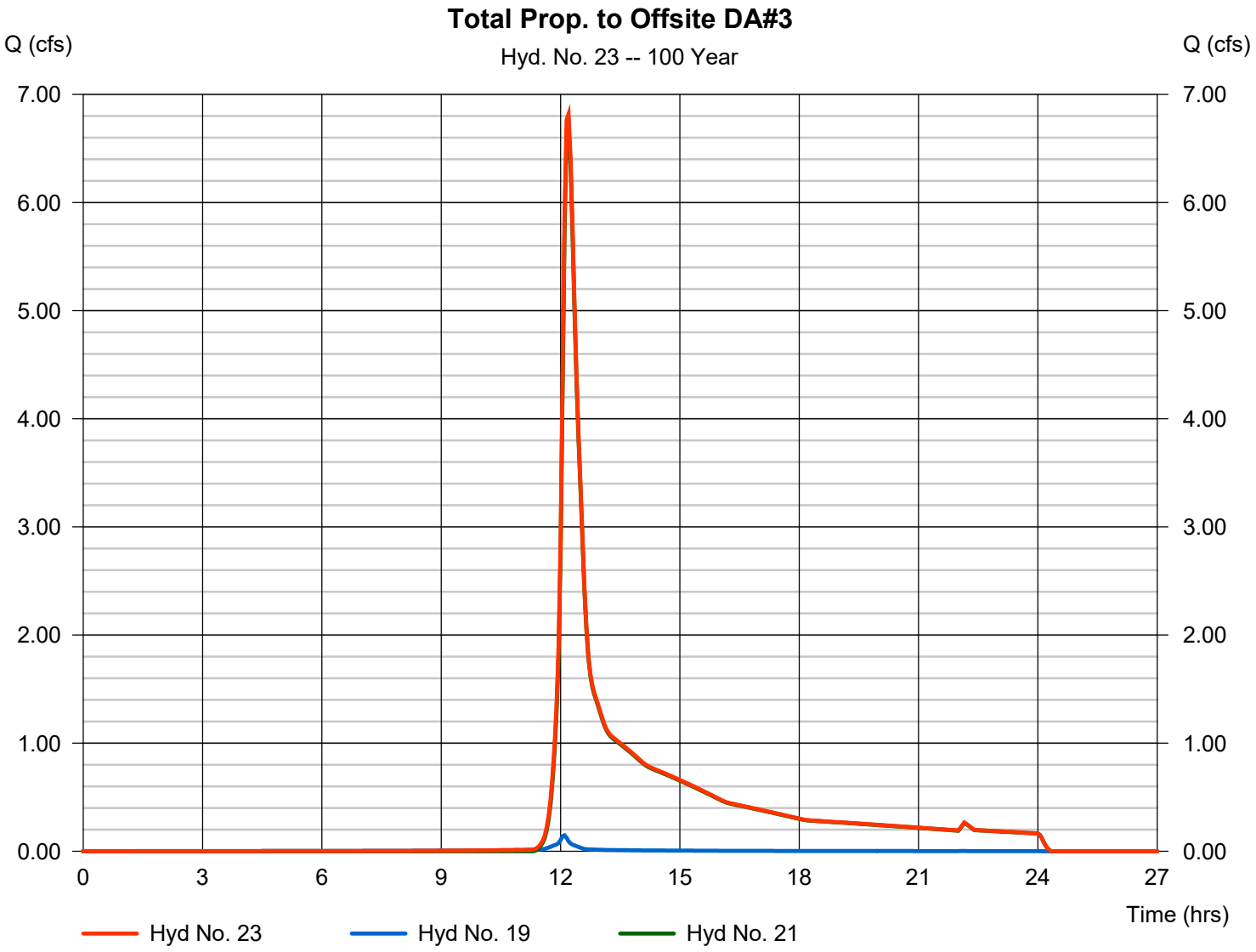


Hydrograph Report

Hyd. No. 23

Total Prop. to Offsite DA#3

Hydrograph type	= Combine	Peak discharge	= 6.815 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 3 min	Hyd. volume	= 30,541 cuft
Inflow hyds.	= 19, 21	Contrib. drain. area	= 3.790 ac

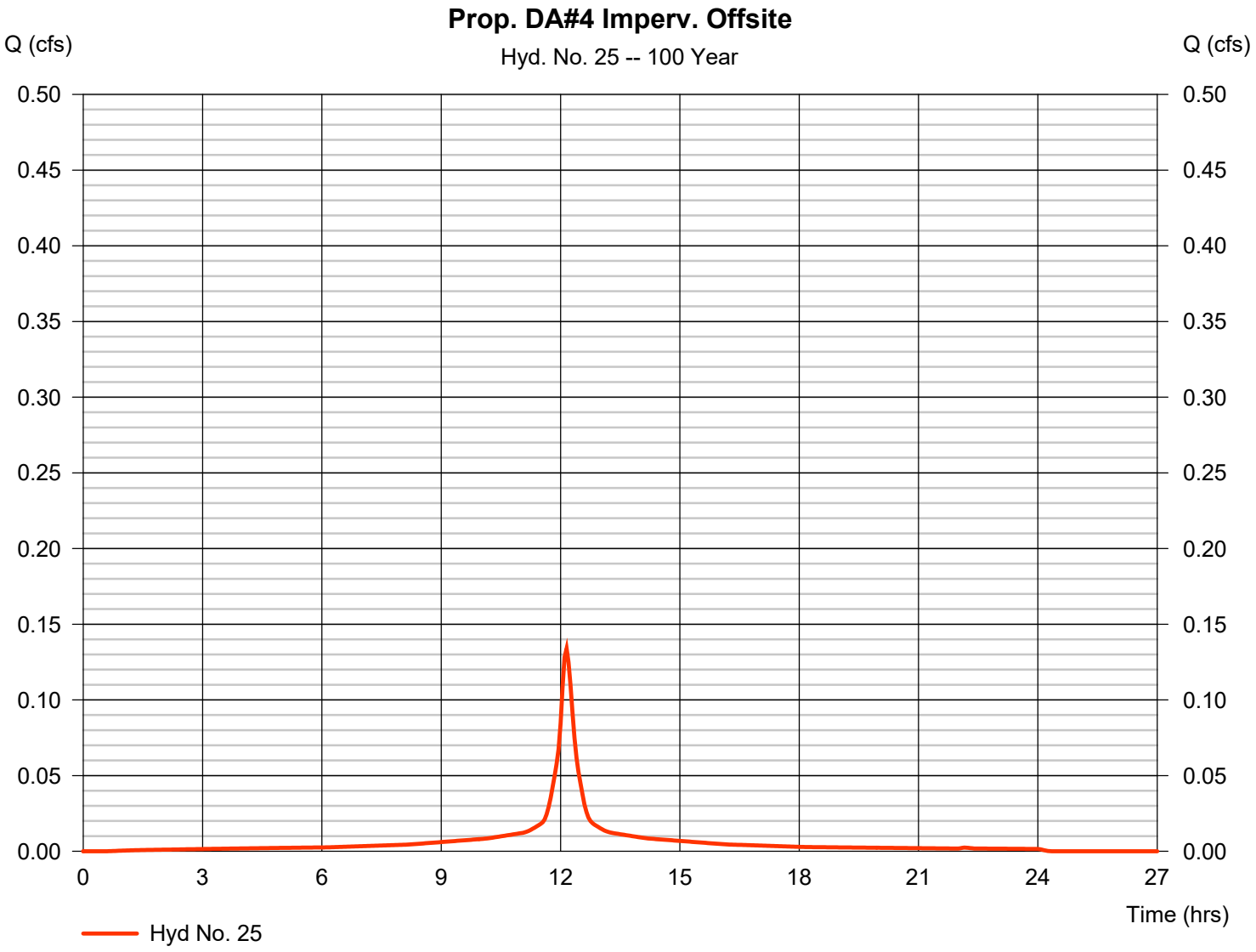


Hydrograph Report

Hyd. No. 25

Prop. DA#4 Imperv. Offsite

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.134 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.15 hrs
Time interval	=	3 min	Hyd. volume	=	609 cuft
Drainage area	=	0.020 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.63 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

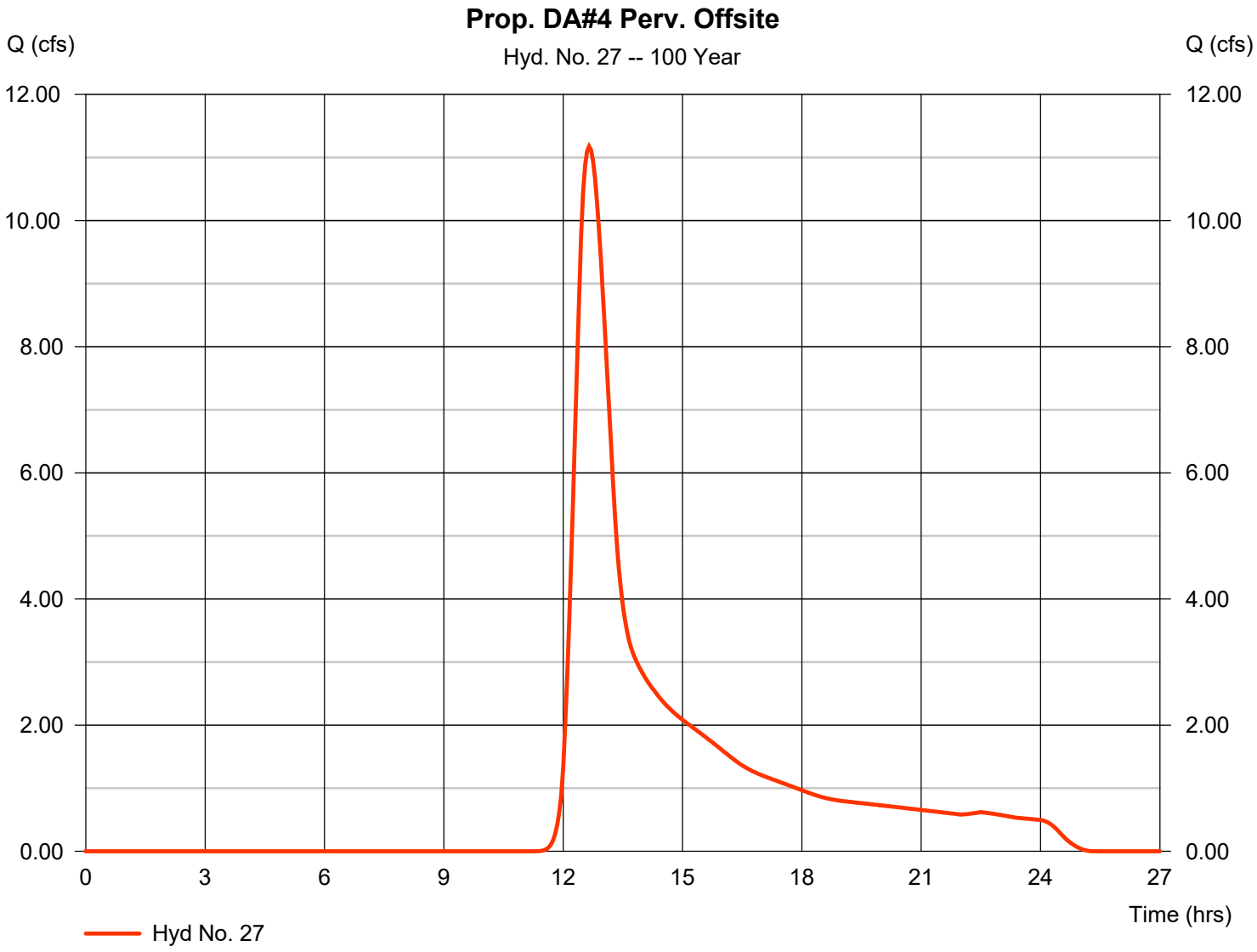


Hydrograph Report

Hyd. No. 27

Prop. DA#4 Perv. Offsite

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.18 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.65 hrs
Time interval	=	3 min	Hyd. volume	=	86,364 cuft
Drainage area	=	10.730 ac	Curve number	=	46
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	46.30 min
Total precip.	=	8.63 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

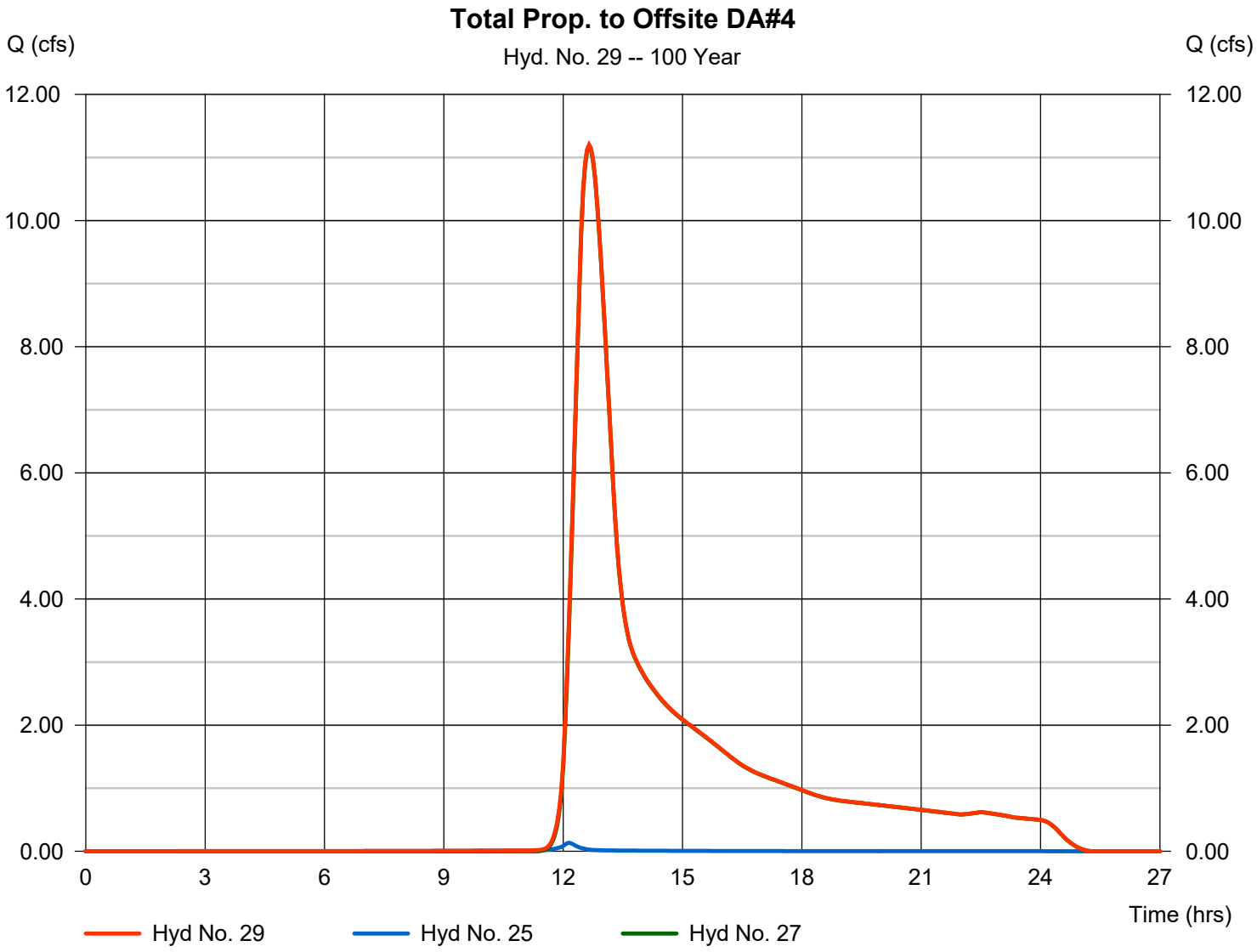


Hydrograph Report

Hyd. No. 29

Total Prop. to Offsite DA#4

Hydrograph type	= Combine	Peak discharge	= 11.20 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.65 hrs
Time interval	= 3 min	Hyd. volume	= 86,973 cuft
Inflow hyds.	= 25, 27	Contrib. drain. area	= 10.750 ac



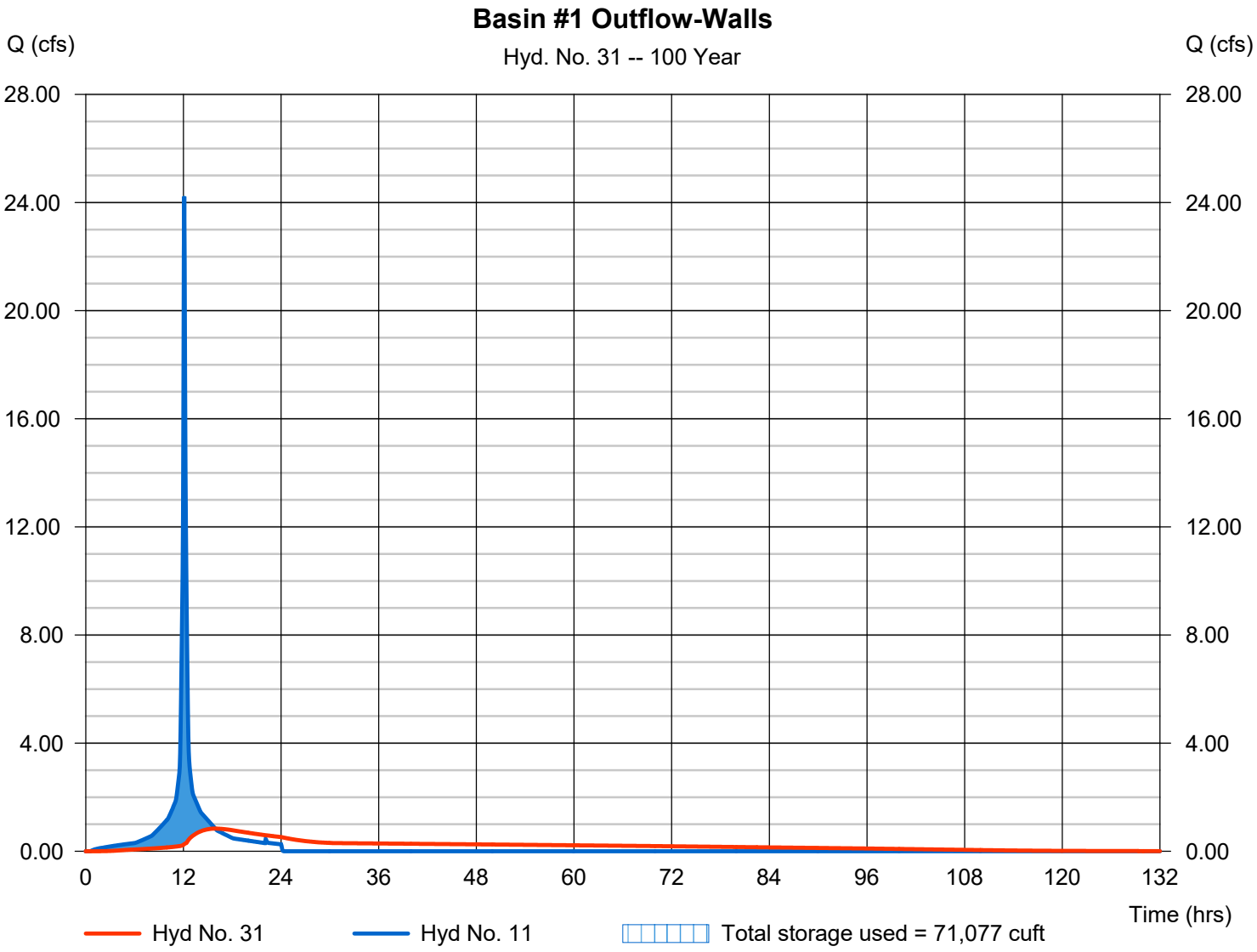
Hydrograph Report

Hyd. No. 31

Basin #1 Outflow-Walls

Hydrograph type	=	Reservoir	Peak discharge	=	0.839 cfs
Storm frequency	=	100 yrs	Time to peak	=	15.90 hrs
Time interval	=	3 min	Hyd. volume	=	95,731 cuft
Inflow hyd. No.	=	11 - Total Prop. to Basin #1	Max. Elevation	=	38.80 ft
Reservoir name	=	Wet Pond 1 - Upper Only	Max. Storage	=	71,077 cuft

Storage Indication method used.



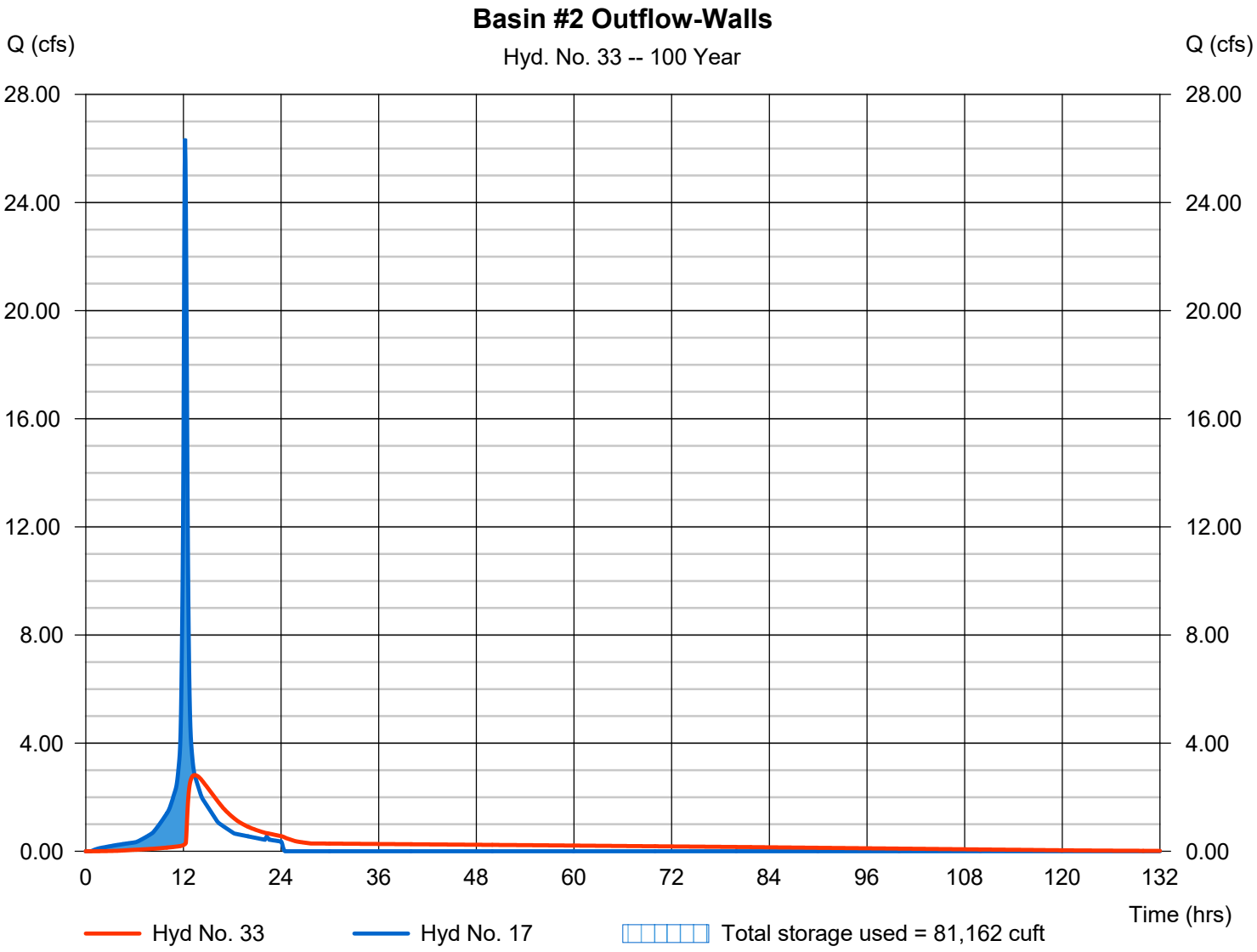
Hydrograph Report

Hyd. No. 33

Basin #2 Outflow-Walls

Hydrograph type	= Reservoir	Peak discharge	= 2.817 cfs
Storm frequency	= 100 yrs	Time to peak	= 13.40 hrs
Time interval	= 3 min	Hyd. volume	= 127,255 cuft
Inflow hyd. No.	= 17 - Total Prop. to Basin #2	Max. Elevation	= 42.27 ft
Reservoir name	= Wet Pond 2 - Upper Only	Max. Storage	= 81,162 cuft

Storage Indication method used.

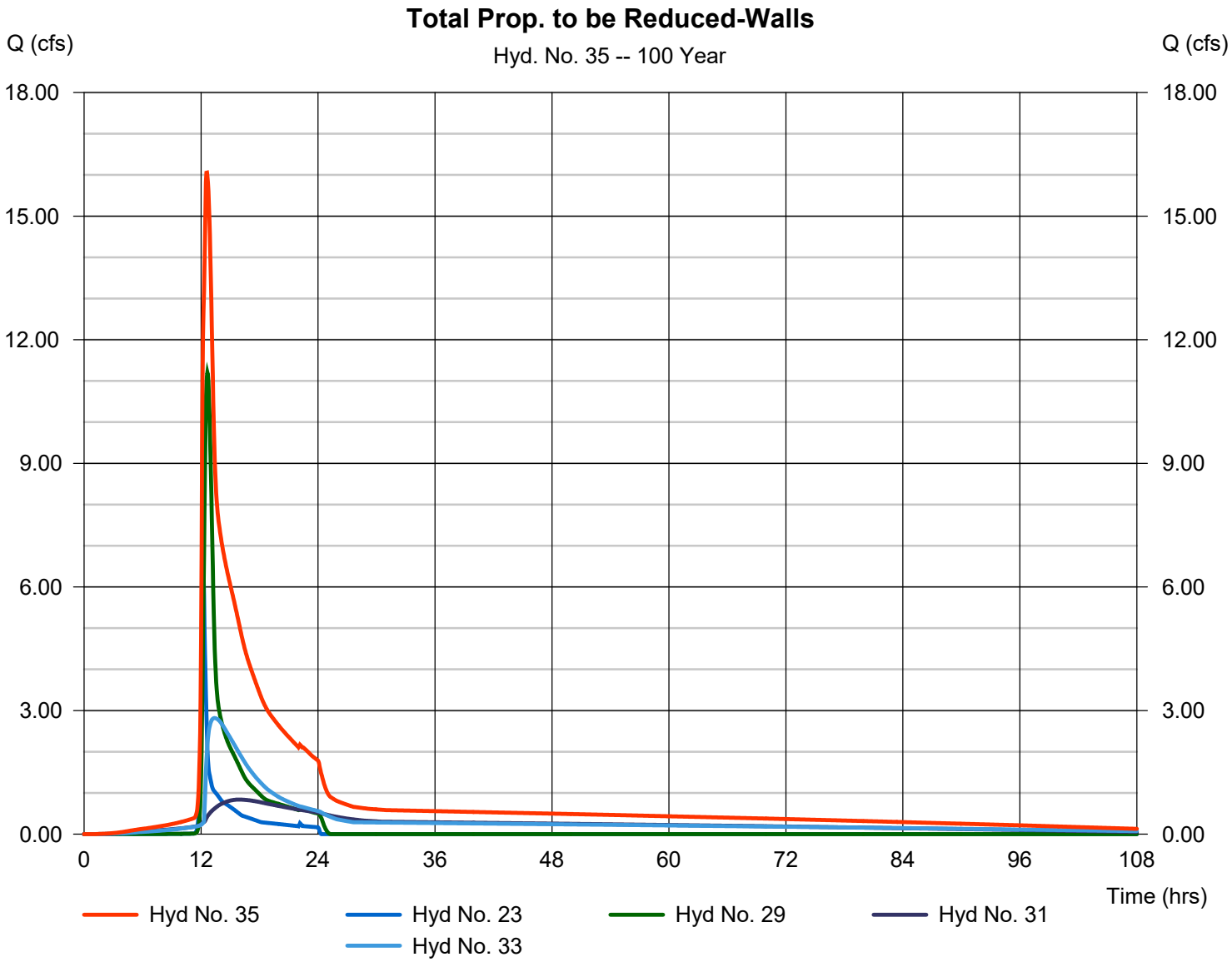


Hydrograph Report

Hyd. No. 35

Total Prop. to be Reduced-Walls

Hydrograph type	= Combine	Peak discharge	= 16.05 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.60 hrs
Time interval	= 3 min	Hyd. volume	= 345,566 cuft
Inflow hyds.	= 23, 29, 31, 33	Contrib. drain. area	= 0.000 ac



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	--------
2	69.8703	13.1000	0.8658	--------
3	0.0000	0.0000	0.0000	--------
5	79.2597	14.6000	0.8369	--------
10	88.2351	15.5000	0.8279	--------
25	102.6072	16.5000	0.8217	--------
50	114.8193	17.2000	0.8199	--------
100	127.1596	17.8000	0.8186	--------

File name: Southern NJ.idf

Intensity = B / (Tc + D)^E

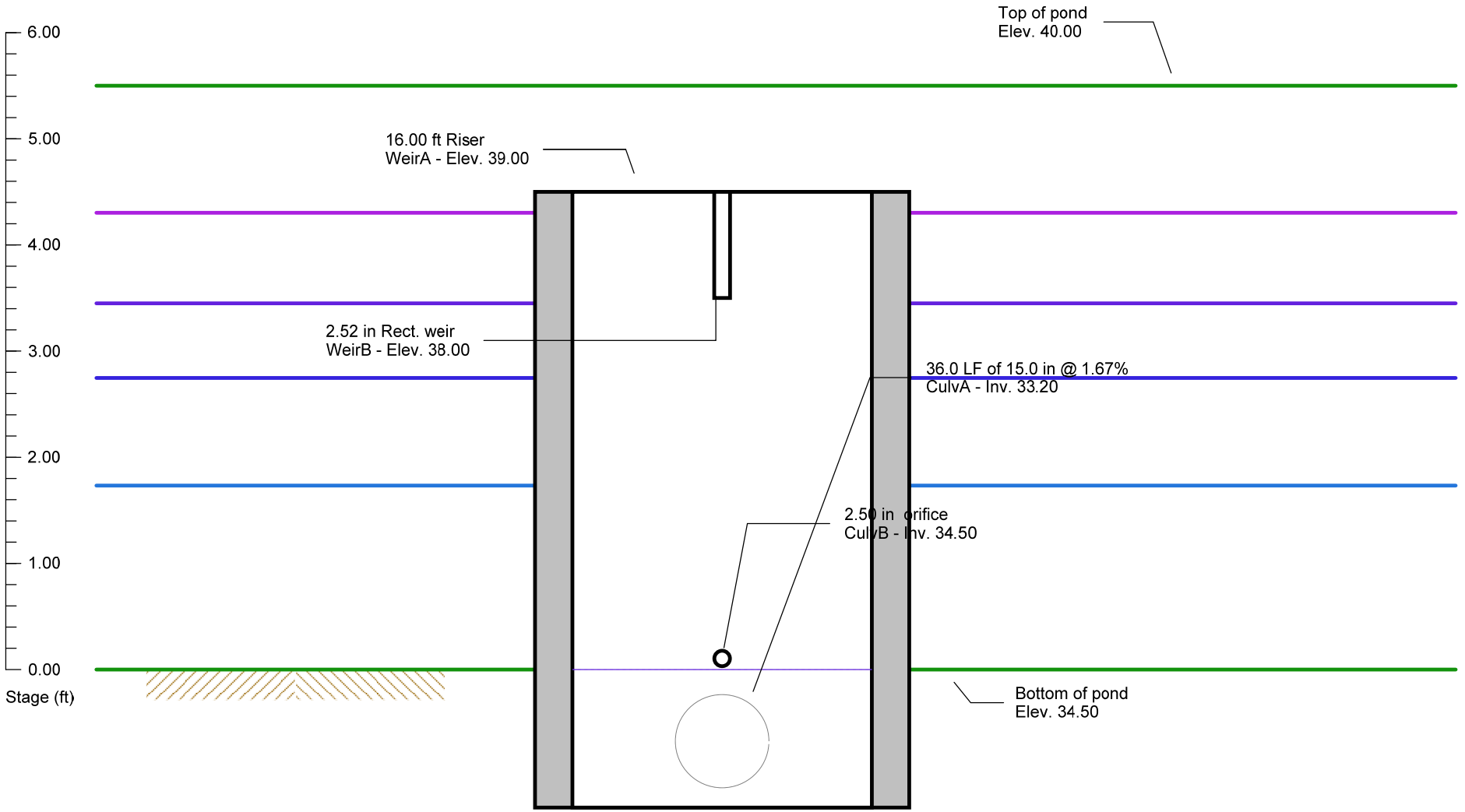
Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.69	4.61	3.89	3.38	2.99	2.69	2.44	2.24	2.07	1.93	1.81	1.70
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.57	5.43	4.65	4.08	3.65	3.30	3.02	2.79	2.59	2.42	2.27	2.15
10	7.24	6.04	5.21	4.59	4.12	3.74	3.43	3.17	2.95	2.77	2.60	2.46
25	8.25	6.95	6.03	5.34	4.80	4.38	4.02	3.73	3.48	3.26	3.07	2.91
50	9.04	7.65	6.66	5.92	5.34	4.87	4.49	4.16	3.88	3.65	3.44	3.25
100	9.83	8.36	7.30	6.50	5.87	5.36	4.94	4.59	4.29	4.03	3.80	3.60

Tc = time in minutes. Values may exceed 60.

e name: P:\Jobs - Construction\Jobs\034 (Contemporary Motors - Little Silver)\HYDRO\Monmouth Cty 24hr rainfall.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	3.35	0.00	4.40	5.12	6.36	7.70	8.63
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	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Pond No. 15 - Wet Pond 1 - Upper Only

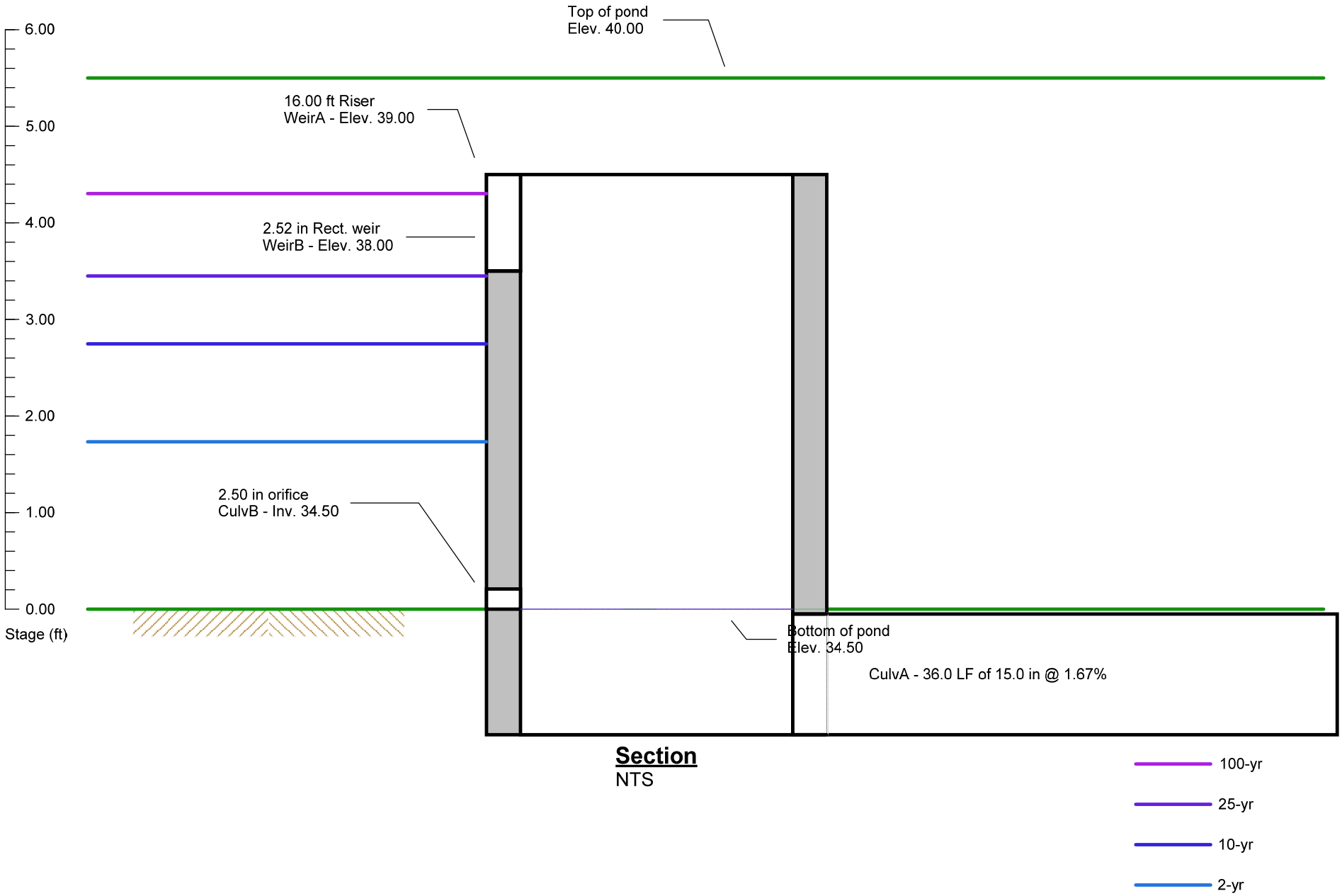


Front View

NTS - Looking Downstream

Inflow hydrograph = 11. Combine - Total Prop. to Basin #1

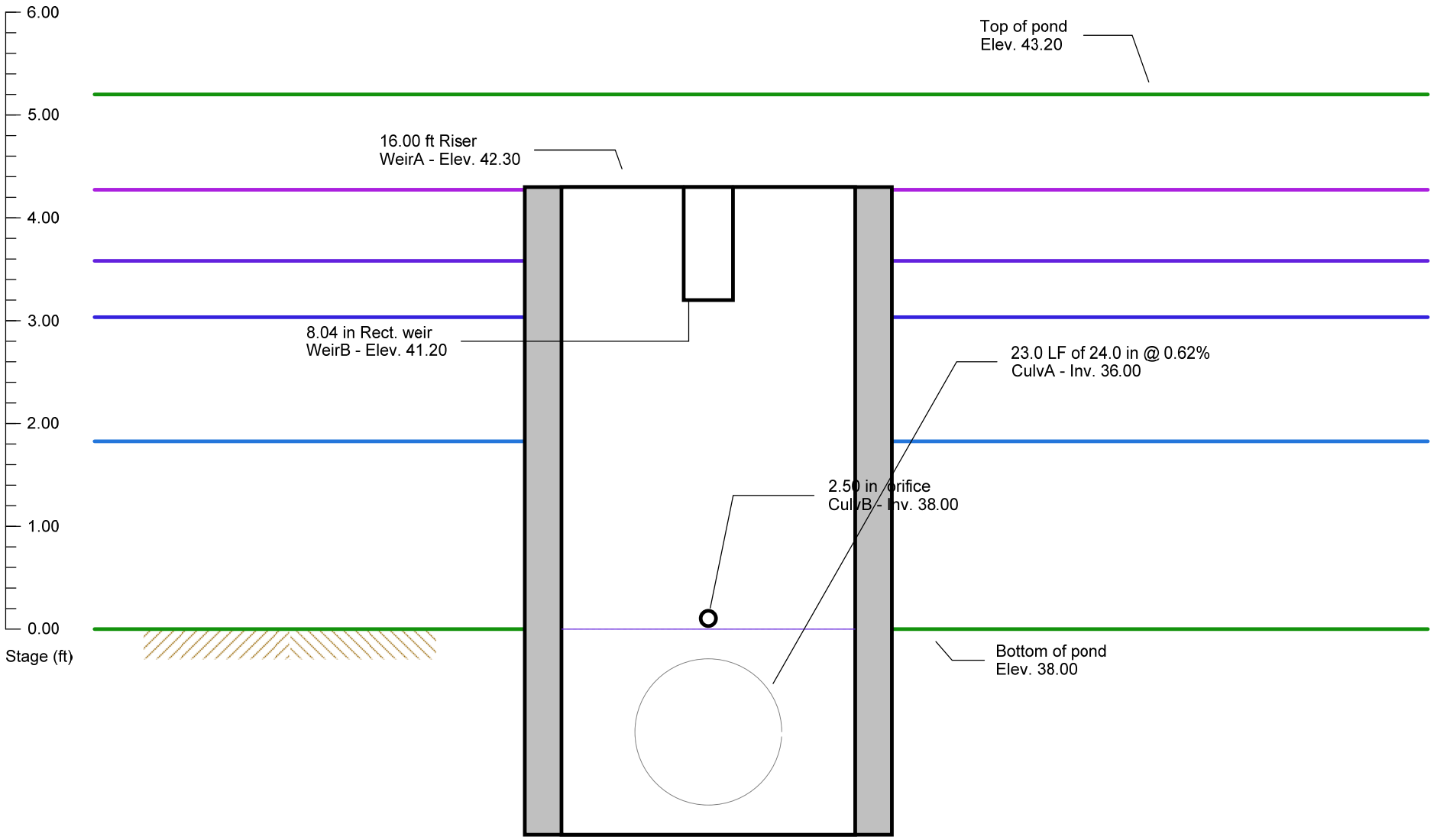
Pond No. 15 - Wet Pond 1 - Upper Only



Section
NTS

Inflow hydrograph = 11. Combine - Total Prop. to Basin #1

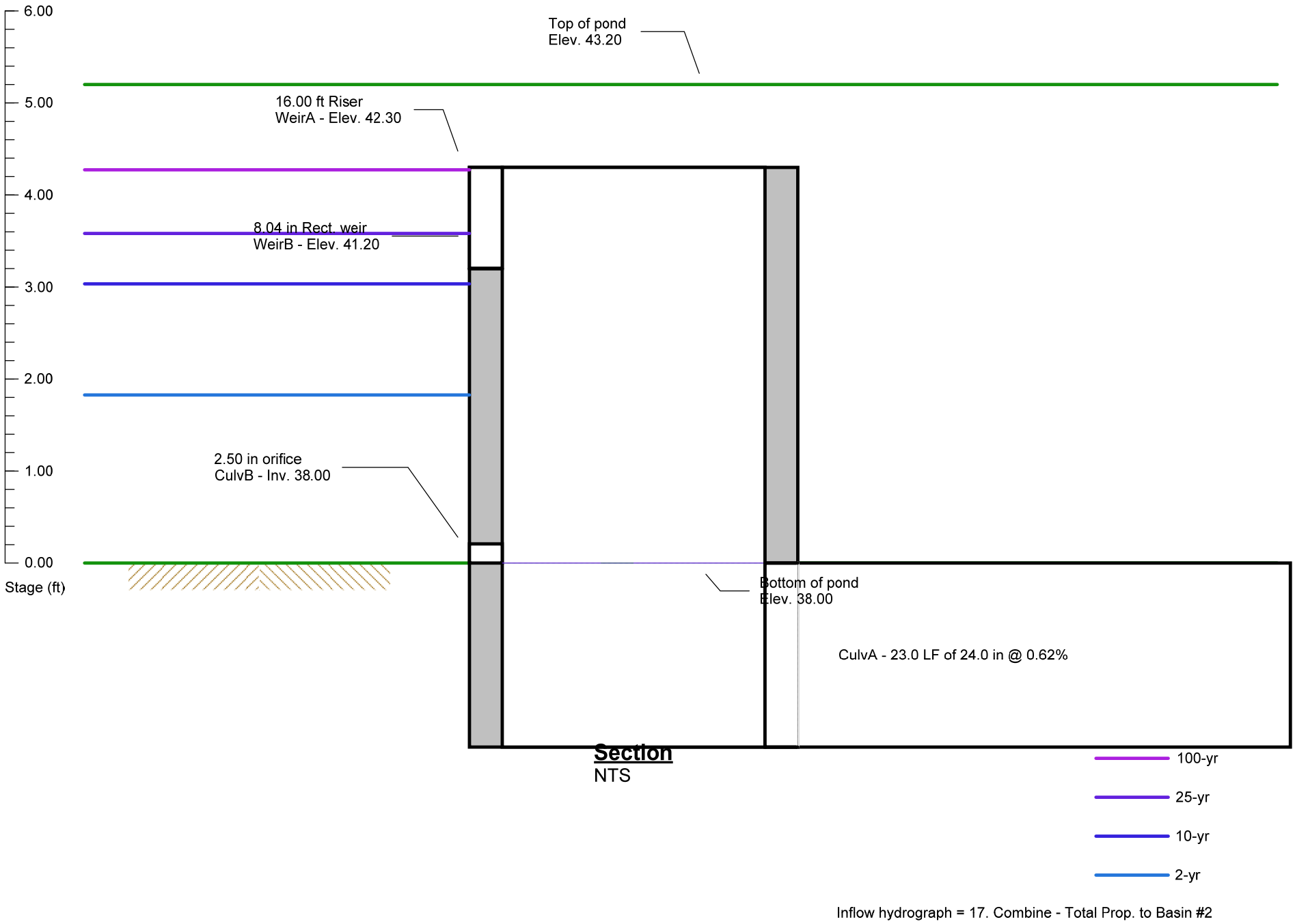
Pond No. 16 - Wet Pond 2 - Upper Only



Front View
NTS - Looking Downstream

Inflow hydrograph = 17. Combine - Total Prop. to Basin #2

Pond No. 16 - Wet Pond 2 - Upper Only



Inflow hydrograph = 17. Combine - Total Prop. to Basin #2

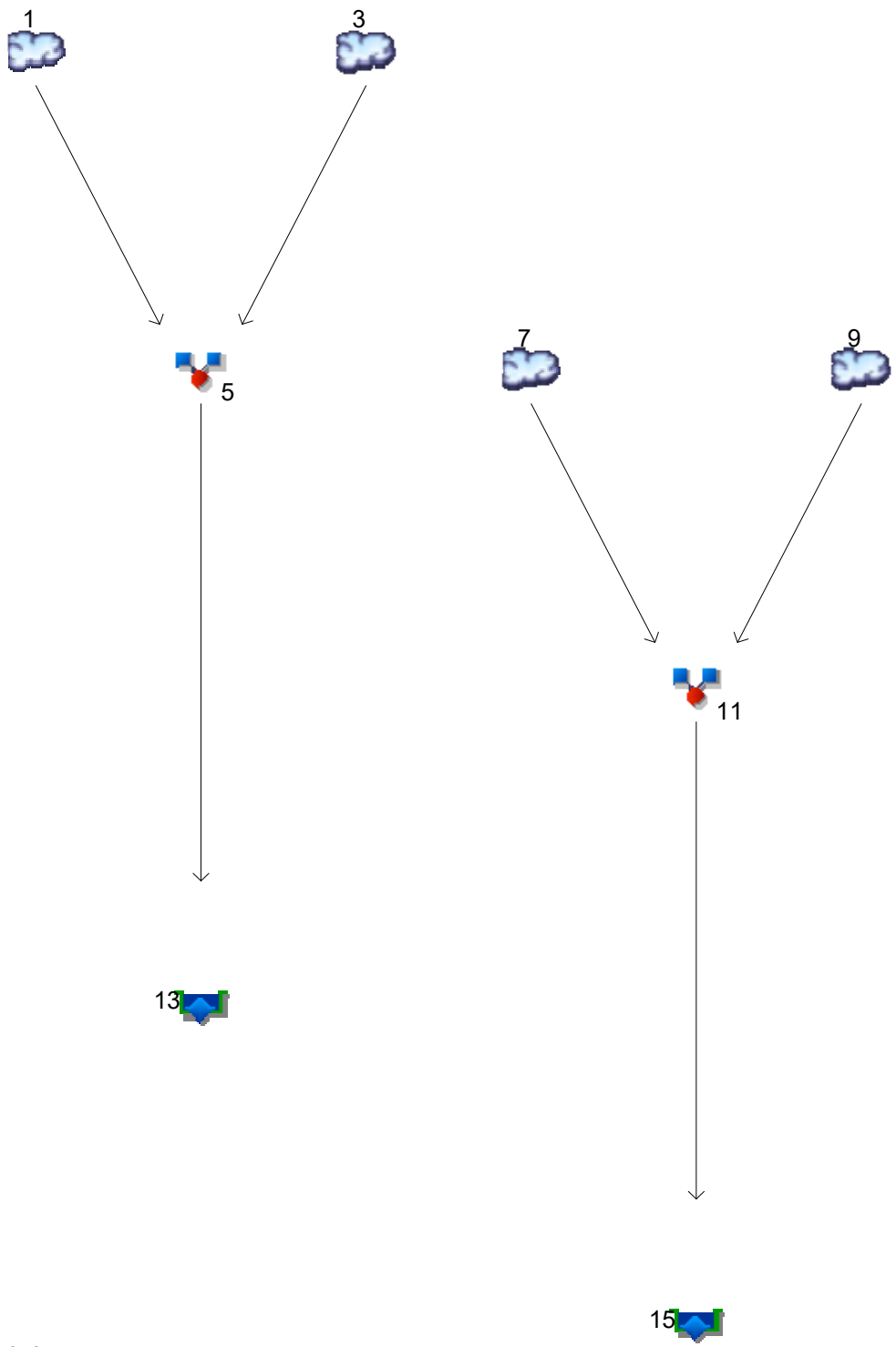
APPENDIX G

WATER QUALITY STORM REPORT

Hydraflow Table of Contents

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Thursday, 09 / 24 / 2020

Watershed Model Schematic



Legend

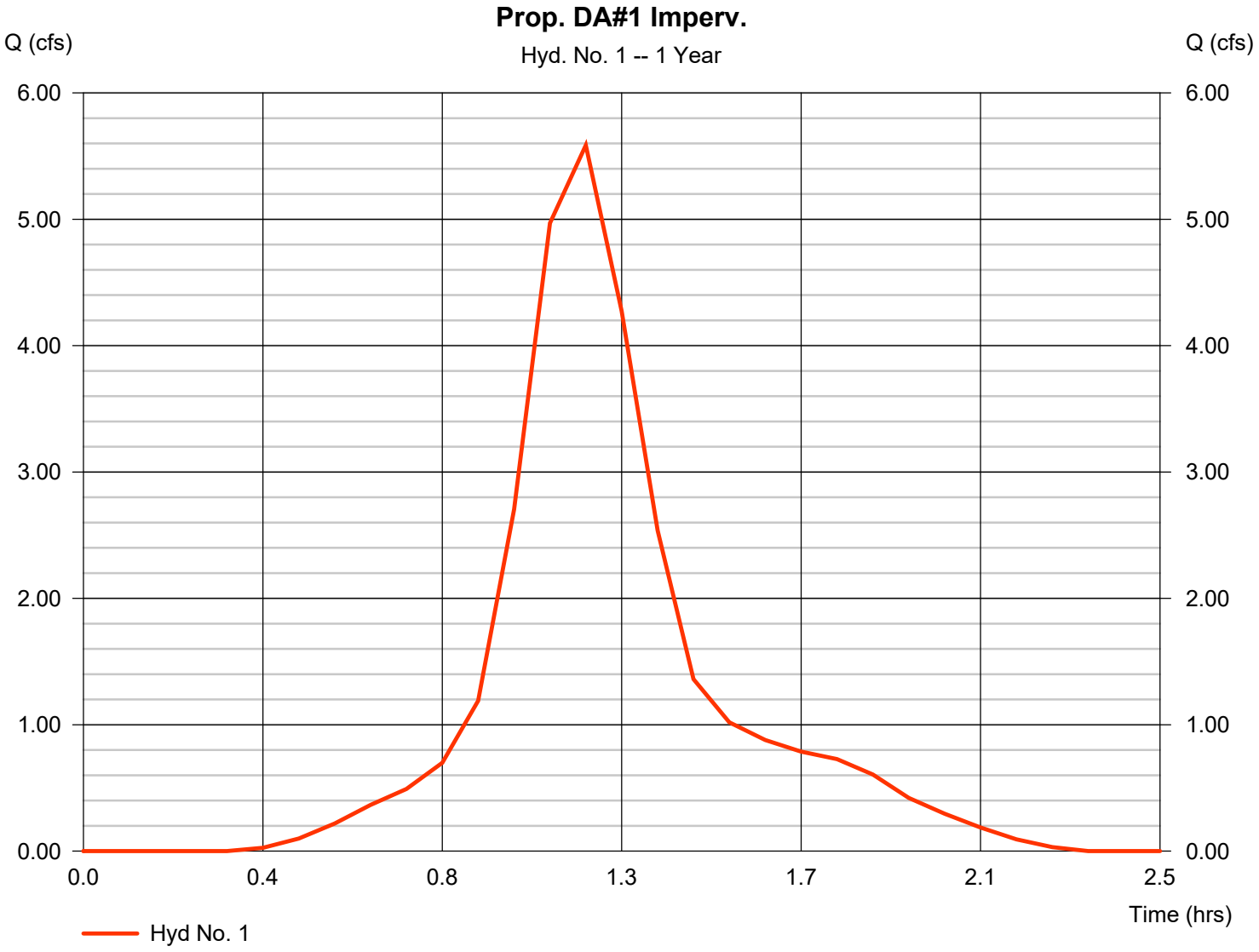
Hyd.	Origin	Description
1	SCS Runoff	Prop. DA#1 Imperv.
3	SCS Runoff	Prop. DA#1 Perv.
5	Combine	Total Prop. to Basin #1
7	SCS Runoff	Prop. DA#2 Perv.
9	SCS Runoff	Prop. DA#2 Imperv.
11	Combine	Total Prop. to Basin #2
13	Reservoir	Basin #1 Outflow-Walls
15	Reservoir	Basin #2 Outflow-Walls

Hydrograph Report

Hyd. No. 1

Prop. DA#1 Imperv.

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.586 cfs
Storm frequency	=	1 yrs	Time to peak	=	1.17 hrs
Time interval	=	5 min	Hyd. volume	=	8,869 cuft
Drainage area	=	2.520 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.00 min
Total precip.	=	1.25 in	Distribution	=	Custom
Storm duration	=	Y:\Library\Engineering\Stormwater Management\NJWaterQuality.cds	Storm frequency	=	24

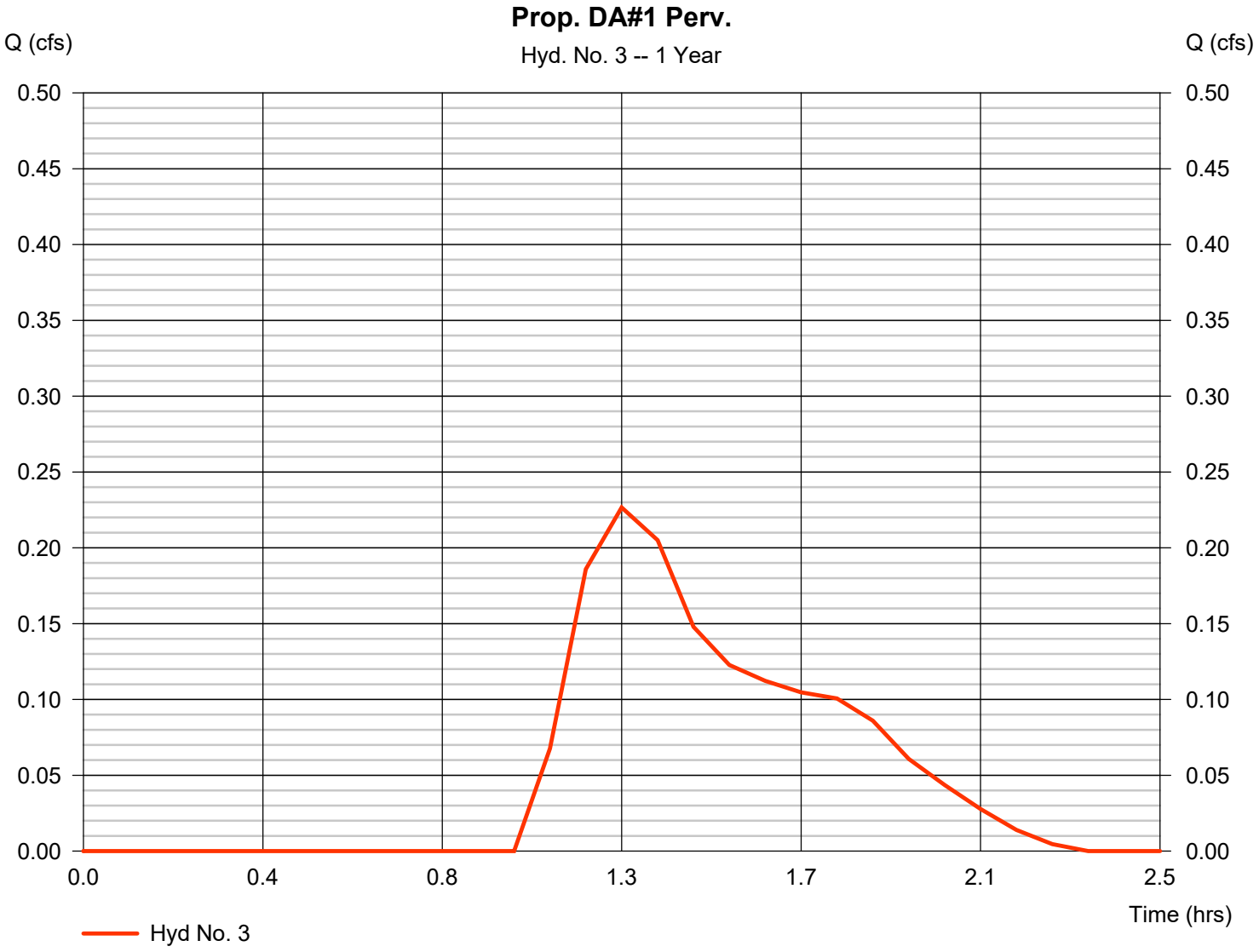


Hydrograph Report

Hyd. No. 3

Prop. DA#1 Perv.

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.227 cfs
Storm frequency	=	1 yrs	Time to peak	=	1.25 hrs
Time interval	=	5 min	Hyd. volume	=	453 cuft
Drainage area	=	1.140 ac	Curve number	=	77
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	1.25 in	Distribution	=	Custom
Storm duration	=	Y:\Library\Engineering\Stormwater Management\NJWaterQuality.cds	Storm frequency	=	24

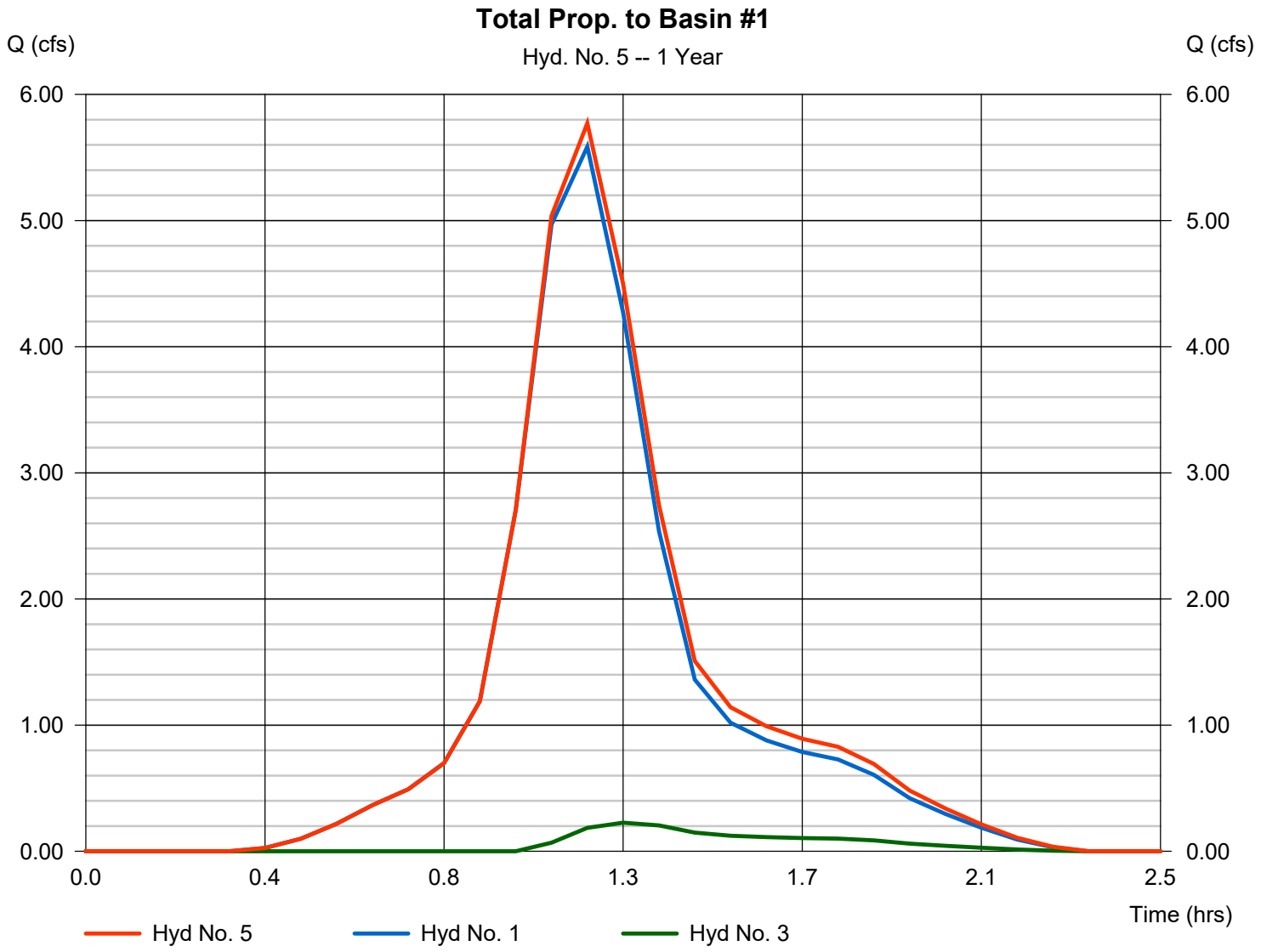


Hydrograph Report

Hyd. No. 5

Total Prop. to Basin #1

Hydrograph type	= Combine	Peak discharge	= 5.772 cfs
Storm frequency	= 1 yrs	Time to peak	= 1.17 hrs
Time interval	= 5 min	Hyd. volume	= 9,322 cuft
Inflow hyds.	= 1, 3	Contrib. drain. area	= 3.660 ac

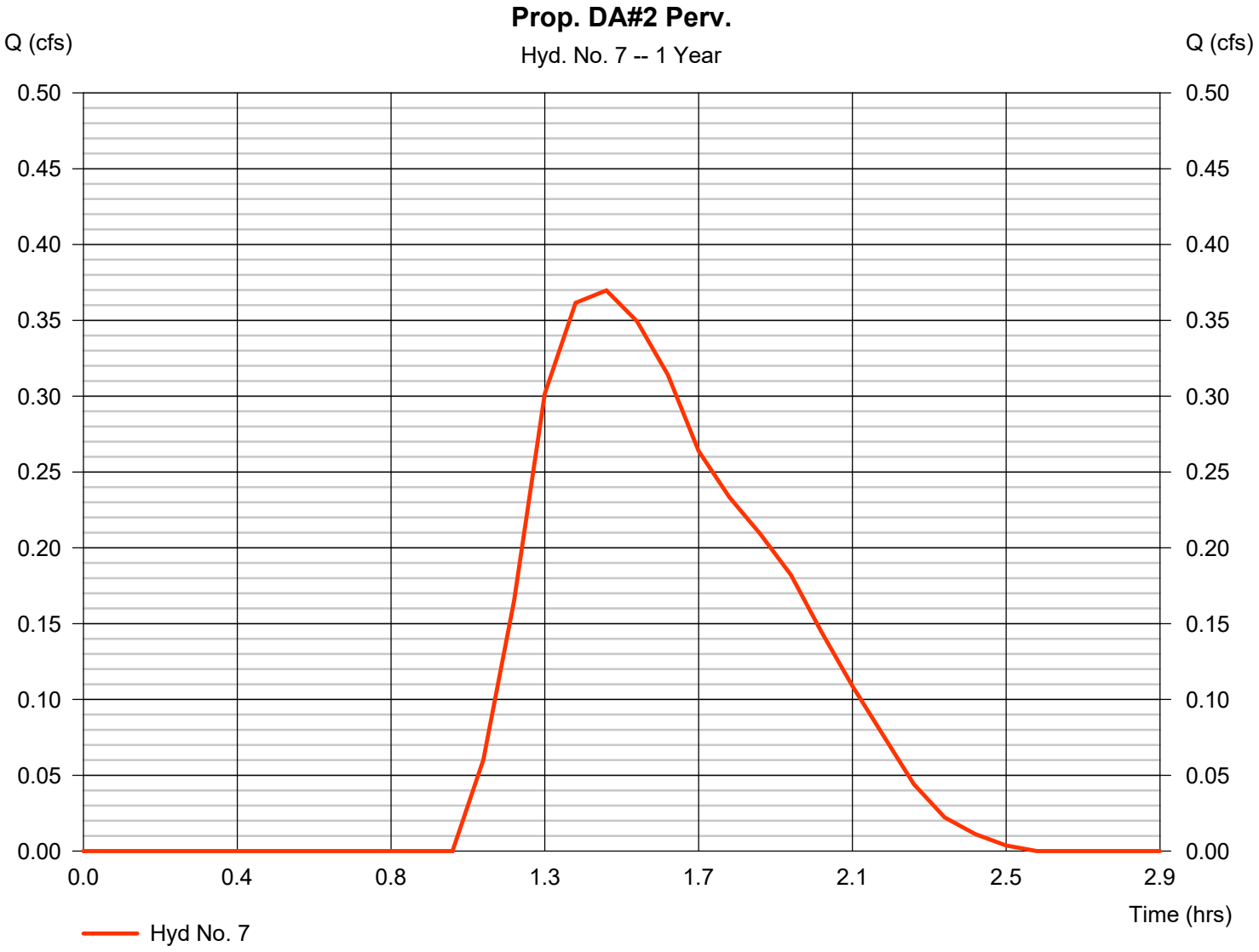


Hydrograph Report

Hyd. No. 7

Prop. DA#2 Perv.

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.370 cfs
Storm frequency	=	1 yrs	Time to peak	=	1.42 hrs
Time interval	=	5 min	Hyd. volume	=	966 cuft
Drainage area	=	2.280 ac	Curve number	=	77
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.80 min
Total precip.	=	1.25 in	Distribution	=	Custom
Storm duration	=	Y:\Library\Engineering\Stormwater Management\NJWaterQuality.cds	Storm duration	=	24

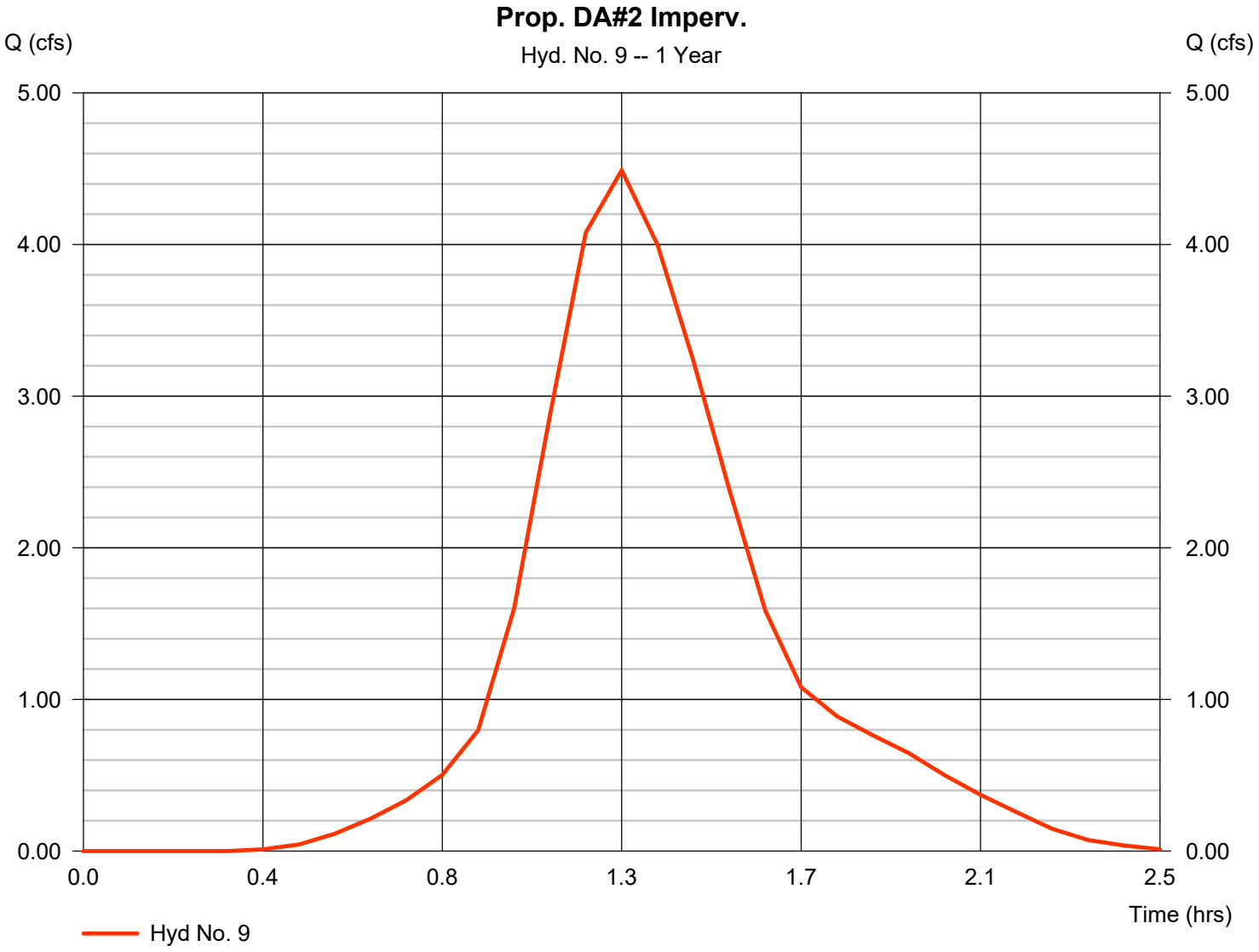


Hydrograph Report

Hyd. No. 9

Prop. DA#2 Imperv.

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.489 cfs
Storm frequency	=	1 yrs	Time to peak	=	1.25 hrs
Time interval	=	5 min	Hyd. volume	=	9,310 cuft
Drainage area	=	2.480 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.80 min
Total precip.	=	1.25 in	Distribution	=	Custom
Storm duration	=	Y:\Library\Engineering\Stormwater Management\NJWaterQuality.cds	Storm duration	=	24

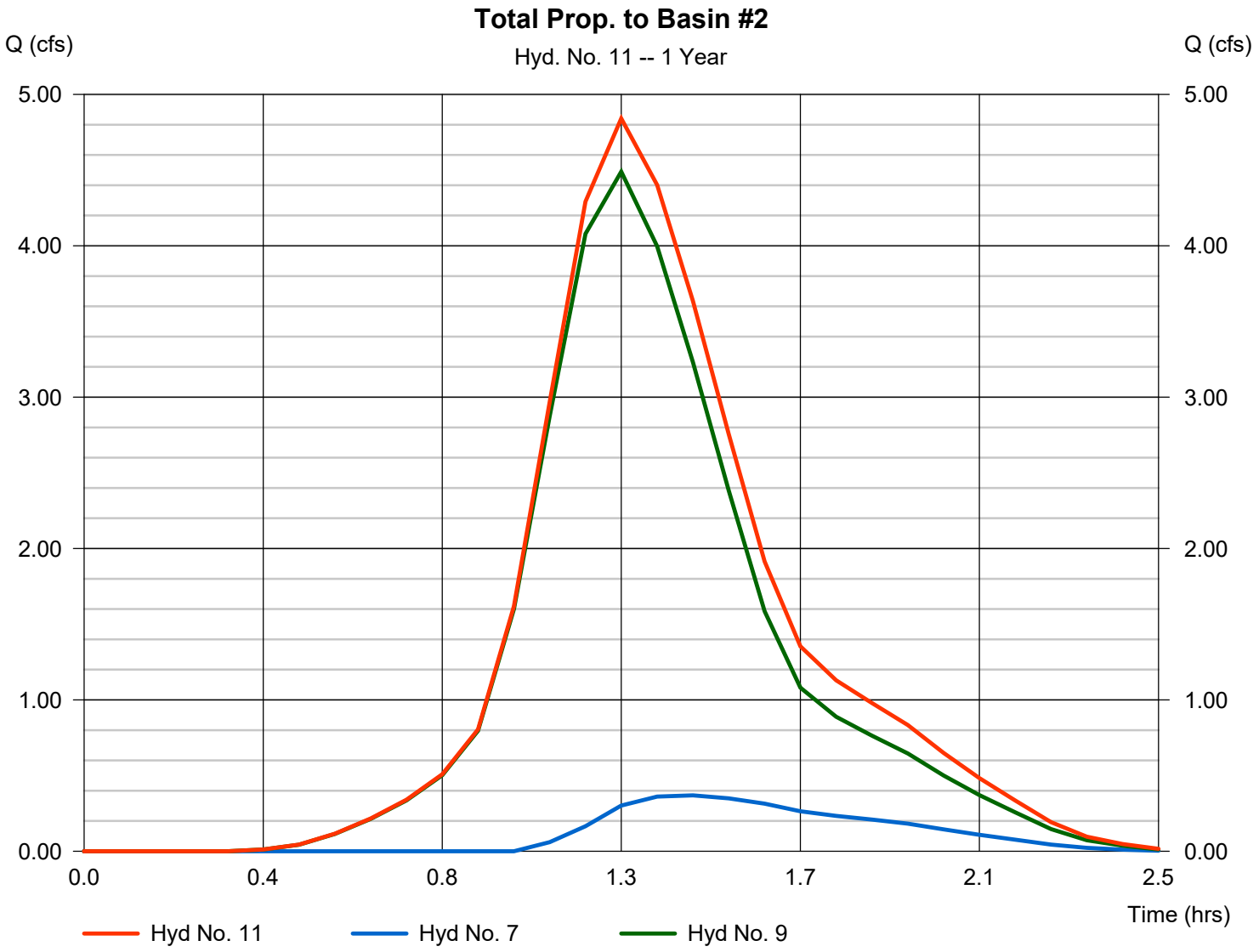


Hydrograph Report

Hyd. No. 11

Total Prop. to Basin #2

Hydrograph type	= Combine	Peak discharge	= 4.841 cfs
Storm frequency	= 1 yrs	Time to peak	= 1.25 hrs
Time interval	= 5 min	Hyd. volume	= 10,376 cuft
Inflow hyds.	= 7, 9	Contrib. drain. area	= 4.760 ac



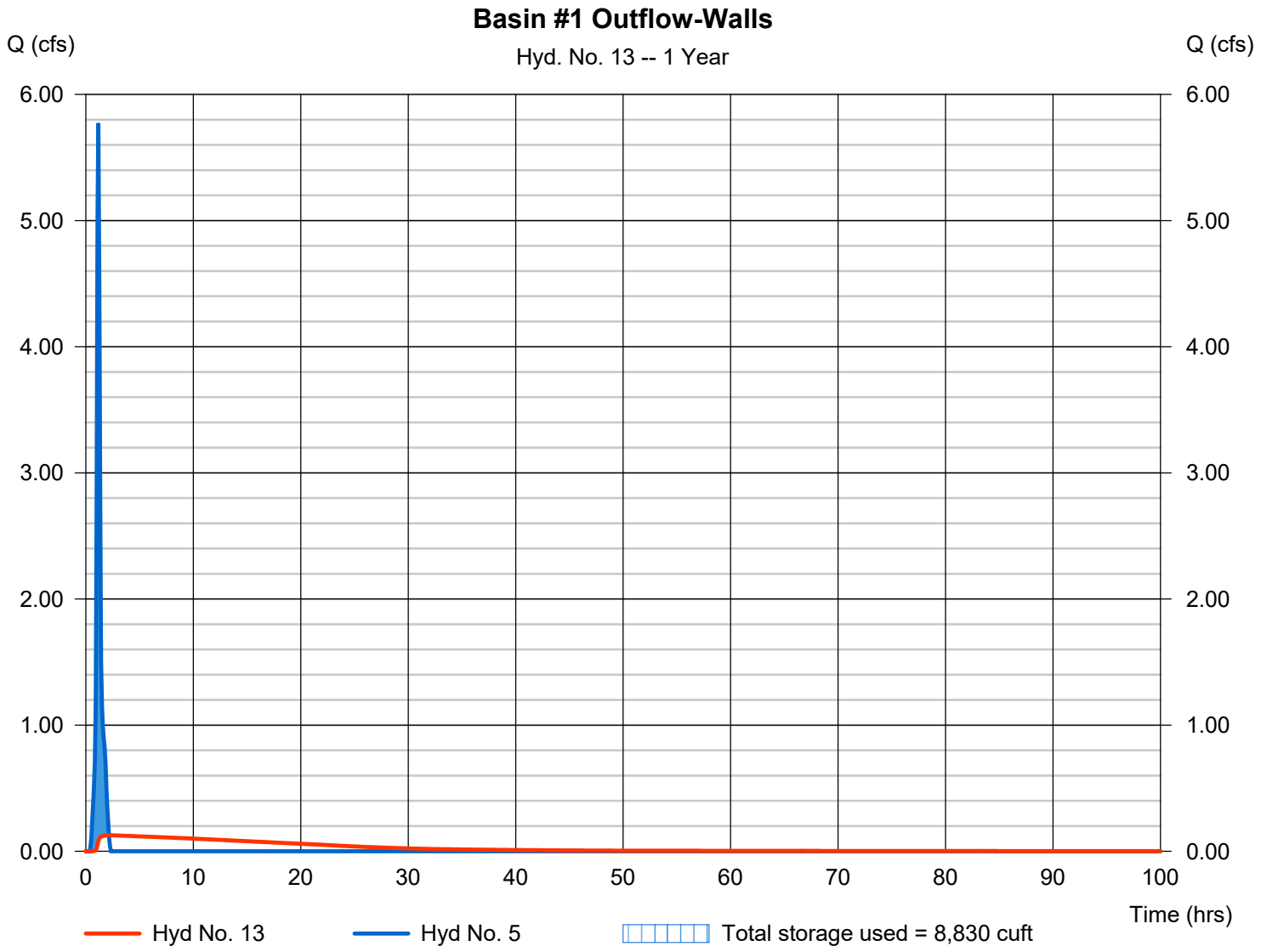
Hydrograph Report

Hyd. No. 13

Basin #1 Outflow-Walls

Hydrograph type	=	Reservoir	Peak discharge	=	0.128 cfs
Storm frequency	=	1 yrs	Time to peak	=	2.17 hrs
Time interval	=	5 min	Hyd. volume	=	9,203 cuft
Inflow hyd. No.	=	5 - Total Prop. to Basin #1	Max. Elevation	=	35.21 ft
Reservoir name	=	Wet Pond 1 Upper Only	Max. Storage	=	8,830 cuft

Storage Indication method used.



Hydrograph Report

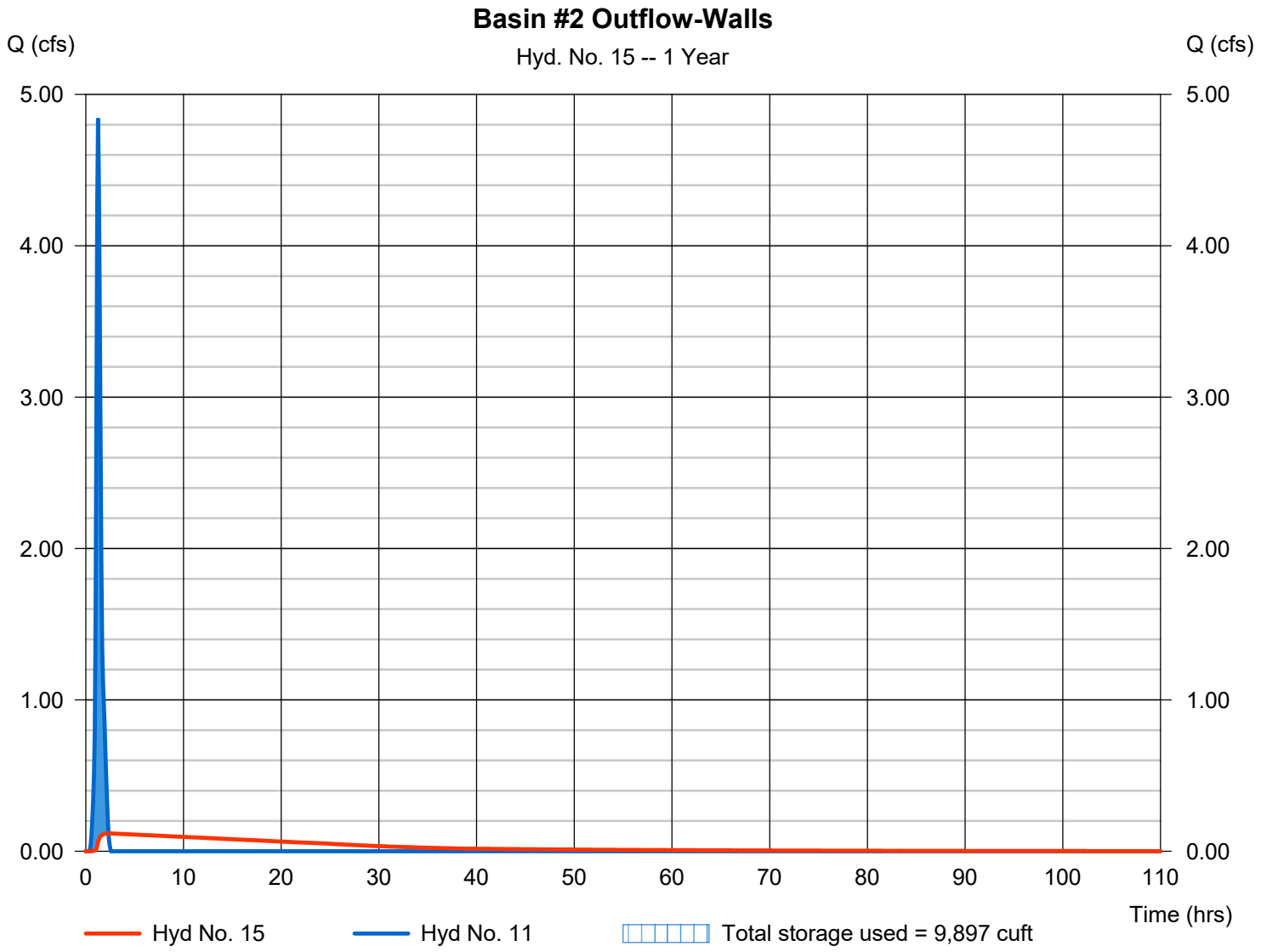
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Thursday, 09 / 24 / 2020

Hyd. No. 15

Basin #2 Outflow-Walls

Hydrograph type	= Reservoir	Peak discharge	= 0.118 cfs
Storm frequency	= 1 yrs	Time to peak	= 2.33 hrs
Time interval	= 5 min	Hyd. volume	= 10,286 cuft
Inflow hyd. No.	= 11 - Total Prop. to Basin #2	Max. Elevation	= 38.62 ft
Reservoir name	= Wet Pond 2 Upper Only	Max. Storage	= 9,897 cuft

Storage Indication method used.



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.1000	-3.4234	--------
2	71.8477	13.3000	0.8718	--------
3	0.0000	0.0000	0.0000	--------
5	75.7517	14.2000	0.8271	--------
10	86.7192	15.3000	0.8244	--------
25	103.3028	16.6000	0.8227	--------
50	116.5747	17.3000	0.8234	--------
100	124.5731	17.6000	0.8144	--------

File name: Water Quality IDF.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	0.00	0.00	0.00	0.01	0.01	0.02	0.04	0.07	0.10	0.14	0.20	0.27
2	5.70	4.62	3.90	3.38	2.99	2.69	2.45	2.24	2.08	1.93	1.81	1.70
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	6.58	5.43	4.65	4.08	3.64	3.30	3.02	2.79	2.59	2.42	2.28	2.15
10	7.25	6.05	5.21	4.59	4.12	3.74	3.43	3.17	2.95	2.77	2.60	2.46
25	8.25	6.95	6.03	5.34	4.81	4.38	4.03	3.73	3.48	3.26	3.08	2.91
50	9.05	7.66	6.67	5.92	5.34	4.87	4.48	4.16	3.88	3.64	3.43	3.25
100	9.83	8.35	7.30	6.49	5.87	5.36	4.94	4.59	4.29	4.03	3.80	3.60

Tc = time in minutes. Values may exceed 60.

e name: P:\Jobs - Construction\Jobs\034 (Contemporary Motors - Little Silver)\HYDRO\Monmouth Cty 24hr rainfall.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	3.35	0.00	4.40	5.12	6.36	7.70	8.63
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	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00

APPENDIX H

GROUNDWATER RECHARGE

New Jersey Groundwater Recharge Spreadsheet Version 2.0 November 2003

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
MIDDLESEX CO., SAYREVILLE BORO	45.9	1.48

Project Name:	**Ernston Road**
Description:	**Recharge System**
Analysis Date:	**04/23/20**

Pre-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	9	Woods	Atsion	0.0	-
2	1.8	Woods	Evesboro	15.6	101,920
3	3.8	Woods	Evesboro	15.6	215,164
4	4.8	Woods-grass combination	Mullica	0.0	-
5	0.2	Woods	Keyport	12.5	9,101
6	0.5	Woods	Lakehurst	15.6	28,262
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	20.1			Total Annual Recharge (in)	Total Annual Recharge (cu-ft)
				4.9	354,447

Post-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	5.28	Impervious areas	Evesboro	0.0	-
2	3.14	Open space	Evesboro	16.3	186,064
3	9	Woods	Atsion	0.0	-
4	0.5	Woods	Lakehurst	15.6	28,262
5	2.2	Open space	Mullica	0.0	-
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	20.1	Warning: make total area equal to Pre-Developed Condition		Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
				2.9	214,326

Annual Recharge Requirements Calculation ↓

% of Pre-Developed Annual Recharge to Preserve =	100%	Total Impervious Area (sq.ft)	229,997
Post-Development Annual Recharge Deficit=	***140,121***	(cubic feet)	

Recharge Efficiency Parameters Calculations (area averages)

RWC=	0.83	(in)	DRWC=	0.12	(in)
ERWC =	0.21	(in)	EDRWC=	0.03	(in)

Procedure to fill the Pre-Development and Post-Development Conditions Tables

For each land segment, first enter the area, then select TR-55 Land Cover, then select Soil. Start from the top of the table and proceed downward. Don't leave blank rows (with A=0) in between your segment entries. Rows with A=0 will not be displayed or used in calculations. For impervious areas outside of standard lots select "Impervious Areas" as the Land Cover. Soil type for impervious areas are only required if an infiltration facility will be built within these areas.

Project Name	Description	Analysis Date	BMP or LID Type
Ernston Road	Recharge System 1	04/23/20	

Recharge BMP Input Parameters

Parameter	Symbol	Value	Unit
BMP Area	ABMP	621.2	sq.ft
BMP Effective Depth, this is the design variable	dBMP	24.7	in
Upper level of the BMP surface (negative if above ground)	dBMPu	12.0	in
Depth of lower surface of BMP, must be>=dBMPu	dEXC	54.0	in
Post-development Land Segment Location of BMP , Input Zero if Location is distributed or undetermined	SegBMP	0	unitless

Root Zone Water capacity Calculated Parameters

Parameter	Symbol	Value	Unit
Empty Portion of RWC under Post-D Natural Recharge	ERWC	0.21	in
ERWC Modified to consider dEXC	EDRWC	0.03	in
Empty Portion of RWC under Infilt. BMP	RERWC	0.02	in

Recharge Design Parameters

Parameter	Symbol	Value	Unit
Inches of Runoff to capture	Qdesign	0.93	in
Inches of Rainfall to capture	Pdesign	1.13	in
Recharge Provided Avg. over Imp. Area		30.0	in
Runoff Captured Avg. over imp. Area		30.0	in

BMP Calculated Size Parameters

ABMP/Aimp	Aratio	0.04	unitless
BMP Volume	VBMP	1,279	cu.ft

Parameters from Annual Recharge Worksheet

Post-D Deficit Recharge (or desired recharge volume)	Vdef	42,549	cu.ft
Post-D Impervious Area (or target Impervious Area)	Aimp	17,040	sq.ft
Root Zone Water Capacity	RWC	0.83	in
RWC Modified to consider dEXC	DRWC	0.12	in
Climatic Factor	C-factor	1.48	no units
Average Annual P	Pavg	45.9	in
Recharge Requirement over Imp. Area	dr	2.2	in

System Performance Calculated Parameters

Annual BMP Recharge Volume		42,549	cu.ft
Avg BMP Recharge Efficiency		99.8%	Represents % Infiltration Recharged
%Rainfall became Runoff		77.9%	%
%Runoff Infiltrated		84.0%	%
%Runoff Recharged		6.2%	%
%Rainfall Recharged		4.8%	%

CALCULATION CHECK MESSAGES

Volume Balance-> OK
dBMP Check---> OK
dEXC Check---> OK

BMP Location---> Location is selected as distributed or undetermined

OTHER NOTES

Pdesign is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The portion of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Results are sensetive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days. For land Segment Location of BMP if you select "impervious areas" RWC will be minimal but not zero as determined by the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and other losses.

How to solve for different recharge volumes: By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and total proposed impervious area "Aimp" from the "Annual Recharge" sheet to "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP.
To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp to impervious area directly connected to your infiltration facility and then solve for ABMP or dBMP. To go back to the default configuration clik the "Default Vdef & Aimp" button.

Project Name	Description	Analysis Date	BMP or LID Type
Ernston Road	Recharge System 2	04/23/20	

Recharge BMP Input Parameters

Parameter	Symbol	Value	Unit
BMP Area	ABMP	336.5	sq.ft
BMP Effective Depth, this is the design variable	dBMP	24.7	in
Upper level of the BMP surface (negative if above ground)	dBMPu	12.0	in
Depth of lower surface of BMP, must be>=dBMPu	dEXC	54.0	in
Post-development Land Segment Location of BMP , Input Zero if Location is distributed or undetermined	SegBMP	0	unitless

Root Zone Water capacity Calculated Parameters

Parameter	Symbol	Value	Unit
Empty Portion of RWC under Post-D Natural Recharge	ERWC	0.21	in
ERWC Modified to consider dEXC	EDRWC	0.03	in
Empty Portion of RWC under Infilt. BMP	RERWC	0.02	in

Recharge Design Parameters

Parameter	Symbol	Value	Unit
Inches of Runoff to capture	Qdesign	0.93	in
Inches of Rainfall to capture	Pdesign	1.13	in
Recharge Provided Avg. over Imp. Area		30.0	in
Runoff Captured Avg. over imp. Area		30.0	in

BMP Calculated Size Parameters

ABMP/Aimp	Aratio	0.04	unitless
BMP Volume	VBMP	693	cu.ft

CALCULATION CHECK MESSAGES

Volume Balance-> OK
dBMP Check---> OK
dEXC Check---> OK

BMP Location---> Location is selected as distributed or undetermined

Parameters from Annual Recharge Worksheet

Post-D Deficit Recharge (or desired recharge volume)	Vdef	23,047	cu.ft
Post-D Impervious Area (or target Impervious Area)	Aimp	9,230	sq.ft
Root Zone Water Capacity	RWC	0.83	in
RWC Modified to consider dEXC	DRWC	0.12	in
Climatic Factor	C-factor	1.48	no units
Average Annual P	Pavg	45.9	in
Recharge Requirement over Imp. Area	dr	1.2	in

System Performance Calculated Parameters

Annual BMP Recharge Volume		23,047	cu.ft
Avg BMP Recharge Efficiency		99.8%	Represents % Infiltration Recharged
%Rainfall became Runoff		77.9%	%
%Runoff Infiltrated		84.0%	%
%Runoff Recharged		3.4%	%
%Rainfall Recharged		2.6%	%

OTHER NOTES

Pdesign is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The portion of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Results are sensetive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days. For land Segment Location of BMP if you select "impervious areas" RWC will be minimal but not zero as determined by the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and other losses.

How to solve for different recharge volumes: By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and total proposed impervious area "Aimp" from the "Annual Recharge" sheet to "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP.
To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp to impervious area directly connected to your infiltration facility and then solve for ABMP or dBMP. To go back to the default configuration clik the "Default Vdef & Aimp" button.

Project Name	Description	Analysis Date	BMP or LID Type
Ernston Road	Recharge System 3	04/23/20	

Recharge BMP Input Parameters

Parameter	Symbol	Value	Unit
BMP Area	ABMP	336.5	sq.ft
BMP Effective Depth, this is the design variable	dBMP	24.7	in
Upper level of the BMP surface (negative if above ground)	dBMPu	12.0	in
Depth of lower surface of BMP, must be>=dBMPu	dEXC	54.0	in
Post-development Land Segment Location of BMP , Input Zero if Location is distributed or undetermined	SegBMP	0	unitless

Root Zone Water capacity Calculated Parameters

Parameter	Symbol	Value	Unit
Empty Portion of RWC under Post-D Natural Recharge	ERWC	0.21	in
ERWC Modified to consider dEXC	EDRWC	0.03	in
Empty Portion of RWC under Infilt. BMP	RERWC	0.02	in

Recharge Design Parameters

Parameter	Symbol	Value	Unit
Inches of Runoff to capture	Qdesign	0.93	in
Inches of Rainfall to capture	Pdesign	1.13	in
Recharge Provided Avg. over Imp. Area		30.0	in
Runoff Captured Avg. over imp. Area		30.0	in

BMP Calculated Size Parameters

ABMP/Aimp	Aratio	0.04	unitless
BMP Volume	VBMP	693	cu.ft

CALCULATION CHECK MESSAGES

Volume Balance-> OK
dBMP Check---> OK
dEXC Check---> OK

BMP Location---> Location is selected as distributed or undetermined

Parameters from Annual Recharge Worksheet

Post-D Deficit Recharge (or desired recharge volume)	Vdef	23,047	cu.ft
Post-D Impervious Area (or target Impervious Area)	Aimp	9,230	sq.ft
Root Zone Water Capacity	RWC	0.83	in
RWC Modified to consider dEXC	DRWC	0.12	in
Climatic Factor	C-factor	1.48	no units
Average Annual P	Pavg	45.9	in
Recharge Requirement over Imp. Area	dr	1.2	in

System Performance Calculated Parameters

Annual BMP Recharge Volume		23,047	cu.ft
Avg BMP Recharge Efficiency		99.8%	Represents % Infiltration Recharged
%Rainfall became Runoff		77.9%	%
%Runoff Infiltrated		84.0%	%
%Runoff Recharged		3.4%	%
%Rainfall Recharged		2.6%	%

OTHER NOTES

Pdesign is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The portion of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Results are sensetive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days. For land Segment Location of BMP if you select "impervious areas" RWC will be minimal but not zero as determined by the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and other losses.

How to solve for different recharge volumes: By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and total proposed impervious area "Aimp" from the "Annual Recharge" sheet to "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP.
To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp to impervious area directly connected to your infiltration facility and then solve for ABMP or dBMP. To go back to the default configuration clik the "Default Vdef & Aimp" button.

Project Name	Description	Analysis Date	BMP or LID Type
Ernston Road	Recharge System 4	04/23/20	

Recharge BMP Input Parameters

Parameter	Symbol	Value	Unit
BMP Area	ABMP	401.6	sq.ft
BMP Effective Depth, this is the design variable	dBMP	24.7	in
Upper level of the BMP surface (negative if above ground)	dBMPu	12.0	in
Depth of lower surface of BMP, must be>=dBMPu	dEXC	54.0	in
Post-development Land Segment Location of BMP , Input Zero if Location is distributed or undetermined	SegBMP	0	unitless

Root Zone Water capacity Calculated Parameters

Parameter	Symbol	Value	Unit
Empty Portion of RWC under Post-D Natural Recharge	ERWC	0.21	in
ERWC Modified to consider dEXC	EDRWC	0.03	in
Empty Portion of RWC under Infilt. BMP	RERWC	0.02	in

Recharge Design Parameters

Parameter	Symbol	Value	Unit
Inches of Runoff to capture	Qdesign	0.93	in
Inches of Rainfall to capture	Pdesign	1.13	in
Recharge Provided Avg. over Imp. Area		30.0	in
Runoff Captured Avg. over imp. Area		30.0	in

BMP Calculated Size Parameters

ABMP/Aimp	Aratio	0.04	unitless
BMP Volume	VBMP	827	cu.ft

CALCULATION CHECK MESSAGES

Volume Balance-> OK
dBMP Check---> OK
dEXC Check---> OK

BMP Location---> Location is selected as distributed or undetermined

Parameters from Annual Recharge Worksheet

Post-D Deficit Recharge (or desired recharge volume)	Vdef	27,507	cu.ft
Post-D Impervious Area (or target Impervious Area)	Aimp	11,016	sq.ft
Root Zone Water Capacity	RWC	0.83	in
RWC Modified to consider dEXC	DRWC	0.12	in
Climatic Factor	C-factor	1.48	no units
Average Annual P	Pavg	45.9	in
Recharge Requirement over Imp. Area	dr	1.4	in

System Performance Calculated Parameters

Annual BMP Recharge Volume		27,507	cu.ft
Avg BMP Recharge Efficiency		99.8%	Represents % Infiltration Recharged
%Rainfall became Runoff		77.9%	%
%Runoff Infiltrated		84.0%	%
%Runoff Recharged		4.0%	%
%Rainfall Recharged		3.1%	%

OTHER NOTES

Pdesign is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The portion of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Results are sensetive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days. For land Segment Location of BMP if you select "impervious areas" RWC will be minimal but not zero as determined by the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and other losses.

How to solve for different recharge volumes: By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and total proposed impervious area "Aimp" from the "Annual Recharge" sheet to "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP.
To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp to impervious area directly connected to your infiltration facility and then solve for ABMP or dBMP. To go back to the default configuration clik the "Default Vdef & Aimp" button.

Project Name	Description	Analysis Date	BMP or LID Type
Ernston Road	Recharge System 5	04/23/20	

Recharge BMP Input Parameters

Parameter	Symbol	Value	Unit
BMP Area	ABMP	350.0	sq.ft
BMP Effective Depth, this is the design variable	dBMP	24.7	in
Upper level of the BMP surface (negative if above ground)	dBMPu	12.0	in
Depth of lower surface of BMP, must be>=dBMPu	dEXC	54.0	in
Post-development Land Segment Location of BMP , Input Zero if Location is distributed or undetermined	SegBMP	0	unitless

Root Zone Water capacity Calculated Parameters

Parameter	Symbol	Value	Unit
Empty Portion of RWC under Post-D Natural Recharge	ERWC	0.21	in
ERWC Modified to consider dEXC	EDRWC	0.03	in
Empty Portion of RWC under Infilt. BMP	RERWC	0.02	in

Recharge Design Parameters

Parameter	Symbol	Value	Unit
Inches of Runoff to capture	Qdesign	0.93	in
Inches of Rainfall to capture	Pdesign	1.13	in
Recharge Provided Avg. over Imp. Area		30.0	in
Runoff Captured Avg. over imp. Area		30.0	in

BMP Calculated Size Parameters

ABMP/Aimp	Aratio	0.04	unitless
BMP Volume	VBMP	720	cu.ft

CALCULATION CHECK MESSAGES

Volume Balance-> OK
dBMP Check---> OK
dEXC Check---> OK

BMP Location---> Location is selected as distributed or undetermined

Parameters from Annual Recharge Worksheet

Post-D Deficit Recharge (or desired recharge volume)	Vdef	23,971	cu.ft
Post-D Impervious Area (or target Impervious Area)	Aimp	9,600	sq.ft
Root Zone Water Capacity	RWC	0.83	in
RWC Modified to consider dEXC	DRWC	0.12	in
Climatic Factor	C-factor	1.48	no units
Average Annual P	Pavg	45.9	in
Recharge Requirement over Imp. Area	dr	1.3	in

System Performance Calculated Parameters

Annual BMP Recharge Volume		23,971	cu.ft
Avg BMP Recharge Efficiency		99.8%	Represents % Infiltration Recharged
%Rainfall became Runoff		77.9%	%
%Runoff Infiltrated		84.0%	%
%Runoff Recharged		3.5%	%
%Rainfall Recharged		2.7%	%

OTHER NOTES

Pdesign is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The portion of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Results are sensetive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days. For land Segment Location of BMP if you select "impervious areas" RWC will be minimal but not zero as determined by the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and other losses.

How to solve for different recharge volumes: By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and total proposed impervious area "Aimp" from the "Annual Recharge" sheet to "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP.
To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp to impervious area directly connected to your infiltration facility and then solve for ABMP or dBMP. To go back to the default configuration clik the "Default Vdef & Aimp" button.

Groundwater Recharge System Summary

TOTAL RECHARGE DEFICIT	**140,121**
TOTAL BMP AREA	**3,808**
TOTAL BMP VOLUME	**8,380**

SITE

# buildings	bldg area	sum bldg area
2	8,520	17,040
2	9,230	18,460
1	11,016	11,016
1	9,600	9,600
		-
total		**56,116**

SYSTEM 1

# buildings	bldg area	sum bldg area			
2	8,520	17,040	**PIPE SIZE =**	2.5	FT
			PIPE LENGTH =	138	LF
			PIPE VOLUME =	677	CF
			STONE VOLUME =	599	CF
IMP AREA TO SYSTEM		**17,040**	**TOTAL VOLUME =**	1,276	CF
% TOTAL AREA		**0.30**	ABMP	621.0	SF
DEFICIT PORTION		**42,549**	dBMPu	12	IN
BMP AREA PORTION		**1,156**	Dexc	54	IN
BMP VOLUME PORTION		**2,545**	Aimp	17,040	SF

SYSTEM 2

# buildings	bldg area	sum bldg area			
1	9,230	9,230	**PIPE SIZE =**	2.5	FT
			PIPE LENGTH =	75	LF
			PIPE VOLUME =	368	CF
			STONE VOLUME =	325	CF
IMP AREA TO SYSTEM		**9,230**	**TOTAL VOLUME =**	693	CF
% TOTAL AREA		**0.16**	ABMP	337.5	SF
DEFICIT PORTION		**23,047**	dBMPu	12	IN
BMP AREA PORTION		**626**	Dexc	54	IN
BMP VOLUME PORTION		**1,378**	Aimp	9,230	SF

SYSTEM 3

# buildings	bldg area	sum bldg area			
1	9,230	9,230	**PIPE SIZE =**	2.5	FT
			PIPE LENGTH =	75	LF
			PIPE VOLUME =	368	CF
			STONE VOLUME =	325	CF
IMP AREA TO SYSTEM		**9,230**	**TOTAL VOLUME =**	693	CF
% TOTAL AREA		**0.16**	ABMP	337.5	SF
DEFICIT PORTION		**23,047**	dBMPu	12	IN
BMP AREA PORTION		**626**	Dexc	54	IN
BMP VOLUME PORTION		**1,378**	Aimp	9,230	SF

SYSTEM 4

# buildings	bldg area	sum bldg area	PIPE SIZE =	2.5	FT
1	11,016	11,016	PIPE LENGTH =	90	LF
			PIPE VOLUME =	442	CF
			STONE VOLUME =	390	CF
IMP AREA TO SYSTEM		11,016	TOTAL VOLUME =	832	CF
% TOTAL AREA		0.20	ABMP	405.0	SF
DEFICIT PORTION		27,507	dBMPu	12	IN
BMP AREA PORTION		747	Dexc	54	IN
BMP VOLUME PORTION		1,645	Aimp	11,016	SF

SYSTEM 5

# buildings	bldg area	sum bldg area	PIPE SIZE =	2.5	FT
1	9,600	9,600	PIPE LENGTH =	78	LF
			PIPE VOLUME =	383	CF
			STONE VOLUME =	338	CF
IMP AREA TO SYSTEM		9,600	TOTAL VOLUME =	721	CF
% TOTAL AREA		0.17	ABMP	351.0	SF
DEFICIT PORTION		23,971	dBMPu	12	IN
BMP AREA PORTION		651	Dexc	54	IN
BMP VOLUME PORTION		1,434	Aimp	9,600	SF

All

# buildings	bldg area	sum bldg area	PIPE SIZE =	2.5	FT
			PIPE LENGTH =	456	LF
			PIPE VOLUME =	2,237	CF
			STONE VOLUME =	1,978	CF
total		56,116	TOTAL VOLUME =	4,215	CF
	% TOTAL	1.00	ABMP	2,052.0	SF
DEFICIT PORTION		140,121	dBMPu	12	IN
BMP AREA PORTION		3,808	Dexc	54	IN
BMP VOLUME PORTION		8,380	Aimp	56,116	SF

APPENDIX I

LOW IMPACT DEVELOPMENT CHECKLIST

Low Impact Development Checklist

A checklist for identifying nonstructural stormwater management strategies incorporated into proposed land development

Municipality: Borough of Sayreville

County: Middlesex Date: 09/29/2020

Review board or agency: Borough of Sayreville Planning Board

Proposed land development name: Camelot at Ernston Road

Lot(s): 1 / 3.01 Block(s): 366.01 / 347.01

Project or application number: N/A

Applicant's name: Kaplan Companies

Applicant's address: 433 River Road

Highland Park, NJ 08904

Telephone: 732-253-8156 Fax: N/A

Email address: jasonk@thinkkaplan.com

Designer's name: Abbington Engineering, LLC

Designer's address: 922 NJ-33, Suite #3

Freehold, NJ 07728

Telephone: 732-431-1440 Fax: N/A

Email address: ryanp@abbingtonengineering.com

Part 1: Description of Nonstructural Approach to Site Design

In narrative form, provide an overall description of the nonstructural stormwater management approach and strategies incorporated into the proposed site's design. Attach additional pages as necessary. Details of each nonstructural strategy are provided in Part 3 below.

1. Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss.

Runoff from the site will be collected in inlets and piped to the wet ponds to prevent erosion & sediment loss.

2. Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces. Impervious

coverage was minimized and the design disconnects runoff wherever practical without compromising the design.

3. Maximize the protection of natural drainage features and vegetation. The design aims to minimize

site disturbance and provide ample areas of open space.

4. Minimize the decrease in the pre-construction "time of concentration." Time of concentration was

minimized as much as possible by reducing slopes in graded areas & introducing swales at 2% slopes.

5. Minimize land disturbance including clearing and grading. The design aims to minimize site disturbance

and provide ample areas of open space.

6. Minimize soil compaction. Construction vehicles are instructed to utilize roadways and driveways

to minimize soil compaction. All excavation equipment utilized to construct the subsurface retention

systems shall be placed outside the limits of the system (or lightweight equipment shall be used).

7. Provide low maintenance landscaping that encourages retention and planting of native vegetation

and minimizes the use of lawns, fertilizers, and pesticides. The design incorporates low maintenance

landscaping and native vegetation.

8. Provide vegetated open-channel conveyance systems discharge into and through stable vegetated areas.
Where ever possible runoff generated from the lots will flow through vegetated swales at minimum slopes.

9. Provide preventative source controls. Trash receptacles provided at appropriate locations throughout the site. Inlets with 'Dump No Waste' stamped on grates. Outlet structures equipped with a trash rack.

Part 2: Review of Local Stormwater Management Regulations

Title and date of stormwater management regulations used in development design:

NJDEP Stormwater Regulations - NJAC 7:8 (adopted 02/01/2004 & amended on 06/20/2016)

Do regulations include nonstructural requirements? Yes: _____ No: X

If yes, briefly describe: _____

List LID-BMPs prohibited by local regulations: N/A

Pre-design meeting held? Yes: _____ Date: _____ No: X

Meeting held with: _____

Pre-design site walk held? Yes: _____ Date: _____ No: X

Site walk held with: _____

Other agencies with stormwater review jurisdiction:

Name: Middlesex County Planning Board

Required approval: Major Site Plan Approval

Name: _____

Required approval: _____

Name: _____

Required approval: _____

Part 3: Nonstructural Strategies and LID-BMPs in Design

3.1 Vegetation and Landscaping

Effective management of both existing and proposed site vegetation can reduce a development's adverse impacts on groundwater recharges and runoff quality and quantity. This section of the checklist helps identify the vegetation and landscaping strategies and nonstructural LID-BMPs that have been incorporated into the proposed development's design to help maintain existing recharge rates and/or minimize or prevent increases in runoff quantity and pollutant loading.

A. Has an inventory of existing site vegetation been performed? Yes: X No: _____

If yes, was this inventory a factor in the site's layout and design? Yes: X No: _____

B. Does the site design utilize any of the following nonstructural LID-BMPs?

Preservation of natural areas? Yes: X No: _____ If yes, specify % of site: 45%

Native ground cover? Yes: X No: _____ If yes, specify % of site: 45%

Vegetated buffers? Yes: X No: _____ If yes, specify % of site: 45%

C. Do the land development regulations require these nonstructural LID-BMPs?

Preservation of natural areas? Yes: _____ No: X If yes, specify % of site: _____

Native ground cover? Yes: _____ No: X If yes, specify % of site: _____

Vegetated buffers? Yes: _____ No: X If yes, specify % of site: _____

D. If vegetated filter strips or buffers are utilized, specify their functions:

Reduce runoff volume increases through lower runoff coefficient: Yes: _____ No: X

Reduce runoff pollutant loads through runoff treatment: Yes: _____ No: X

Maintain groundwater recharge by preserving natural areas: Yes: _____ No: X

3.2 Minimize Land Disturbance

Minimizing land disturbance is a nonstructural LID-BMP that can be applied during both the development's construction and post-construction phases. This section of the checklist helps identify those land disturbance strategies and nonstructural LID-BMPs that have been incorporated into the proposed development's design to minimize land disturbance and the resultant change in the site's hydrologic character.

A. Have inventories of existing site soils and slopes been performed? Yes: X No: _____

If yes, were these inventories factors in the site's layout and design? Yes: X No: _____

B. Does the development's design utilize any of the following nonstructural LID-BMPs?

Restrict permanent site disturbance by land owners? Yes: _____ No: X

If yes, how: _____

_____

Restrict temporary site disturbance during construction? Yes: _____ No: X

If yes, how: _____

_____

Consider soils and slopes in selecting disturbance limits? Yes: _____ No: X

If yes, how: _____

_____

C. Specify percentage of site to be cleared: 50.5% Regraded: 50.5%

D. Specify percentage of cleared areas done so for buildings: 12.6%

For driveways and parking: 12.4% For roadways: 17.1%

E. What design criteria and/or site changes would be required to reduce the percentages in C and D above?

To reduce areas of site clearance the design would need to incorporate steeper slopes. By increasing the slopes, less area will be disturbed to tie proposed grades into existing grades.

F. Specify site's hydrologic soil group (HSG) percentages:

HSG A: 28.7% HSG B: 0% HSG C: 0% HSG D: 0%

HSG A/D: 71.3%

G. Specify percentage of each HSG that will be permanently disturbed:

HSG A: 80.1% HSG B: N/A HSG C: N/A HSG D: N/A

HSG A/D: 38.4%

H. Locating site disturbance within areas with less permeable soils (HSG C and D) and minimizing disturbance within areas with greater permeable soils (HSG A and B) can help maintain groundwater recharge rates and reduce runoff volume increases. In light of the HSG percentages in F and G above, what other practical measures if any can be taken to achieve this?

This is difficult to accomplish at this site. There are predominantly A type soils present on site and a large portion of the site is occupied by wetlands that are associated with HSG A/D.

I. Does the site include Karst topography? Yes: _____ No: X

If yes, discuss measures taken to limit Karst impacts:

3.3 Impervious Area Management

New impervious surfaces at a development site can have the greatest adverse effect on groundwater recharge and stormwater quality and quantity. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into a proposed development's design to comprehensively manage the extent and impacts of new impervious surfaces.

A. Specify impervious cover at site: Existing: 0.0% Proposed: 23.5%

B. Specify maximum site impervious coverage allowed by regulations: 65.0%

C. Compare proposed street cartway widths with those required by regulations:

Type of Street	Proposed Cartway Width (feet)	Required Cartway Width (feet)
Residential access – low intensity	24	24
Residential access – medium intensity		
Residential access – high intensity with parking		
Residential access – high intensity without parking		
Neighborhood		
Minor collector – low intensity without parking		
Minor collector – with one parking lane		
Minor collector – with two parking lanes		
Minor collector – without parking		
Major collector		

D. Compare proposed parking space dimensions with those required by regulations:

Proposed: 9' X 18' Regulations: 9' X 18'

E. Compare proposed number of parking spaces with those required by regulations:

Proposed: 304 Regulations: 274

F. Specify percentage of total site impervious cover created by buildings: 6.4%

By driveways and parking: 6.3% By roadways: 8.8%

G. What design criteria and/or site changes would be required to reduce the percentages in F above?

Incorporate gravel driveways into the design. Reduce roadway width throughout the site.

H. Specify percentage of total impervious area that will be unconnected:

Total site: 0% Buildings: 0% Driveways and parking: 0% Roads: 0%

I. Specify percentage of total impervious area that will be porous:

Total site: 0% Buildings: 0% Driveways and parking: 0% Roads: 0%

J. Specify percentage of total building roof area that will be vegetated: 0%

K. Specify percentage of total parking area located beneath buildings: 19.4%

L. Specify percentage of total parking located within multi-level parking deck: 0%

3.4 Time of Concentration Modifications

Decreasing a site's time of concentration (Tc) can lead directly to increased site runoff rates which, in turn, can create new and/or aggravate existing erosion and flooding problems downstream. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into the proposed development's design to effectively minimize such Tc decreases.

When reviewing Tc modification strategies, it is important to remember that a drainage area's Tc should reflect the general conditions throughout the area. As a result, Tc modifications must generally be applied throughout a drainage area, not just along a specific Tc route.

A. Specify percentage of site's total stormwater conveyance system length that will be:

Storm sewer: 90% Vegetated swale: 0% Natural channel: 10%

Stormwater management facility: 0% Other: 0%

Note: the total length of the stormwater conveyance system should be measured from the site's downstream property line to the downstream limit of sheet flow at the system's headwaters.

B. What design criteria and/or site changes would be required to reduce the storm sewer percentages and increase the vegetated swale and natural channel percentages in A above?

Eliminate curbing and construct swales along the roadway.

C. In conveyance system subareas that have overland or sheet flow over impervious surfaces or turf grass, what practical and effective site changes can be made to:

Decrease overland flow slope: Reduction of slopes to be less than 2%.

Increase overland flow roughness: Change in lining or material composition. (i.e. Using meadow-grass rather than lawn-grass.)

3.5 Preventative Source Controls

The most effective way to address water quality concerns is by pollution prevention. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into the proposed development's design to reduce the exposure of pollutants to prevent their release into the stormwater runoff.

A. Trash Receptacles

Specify the number of trash receptacles provided: 5

Specify the spacing between the trash receptacles: 370' (avg.)

Compare trash receptacles proposed with those required by regulations:

Proposed: 5 Regulations: N/A

B. Pet Waste Stations

Specify the number of pet waste stations provided: 1

Specify the spacing between the pet waste stations: N/A

Compare pet waste stations proposed with those required by regulations:

Proposed: 1 Regulations: N/A

C. Inlets, Trash Racks, and Other Devices that Prevent Discharge of Large Trash and Debris

Specify percentage of total inlets that comply with the NJPDES storm drain inlet criteria: 100%

D. Maintenance

Specify the frequency of the following maintenance activities:

Street sweeping: Proposed: As needed Regulations: N/A

Litter collection: Proposed: As needed Regulations: N/A

Identify other stormwater management measures on the site that prevent discharge of large trash and debris:

Outlet structures equipped with trash racks. Inlets equipped with ECO Curb Pieces.

E. Prevention and Containment of Spills N/A

Identify locations where pollutants are located on the site, and the features that prevent these pollutants from being exposed to stormwater runoff:

Pollutant: _____ Location: _____

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: _____ Location: _____

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: _____ Location: _____

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: _____ Location: _____

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: _____ Location: _____

Part 4: Compliance with Nonstructural Requirements of NJDEP Stormwater Management Rules

1. Based upon the checklist responses above, indicate which nonstructural strategies have been incorporated into the proposed development's design in accordance with N.J.A.C. 7:8-5.3(b):

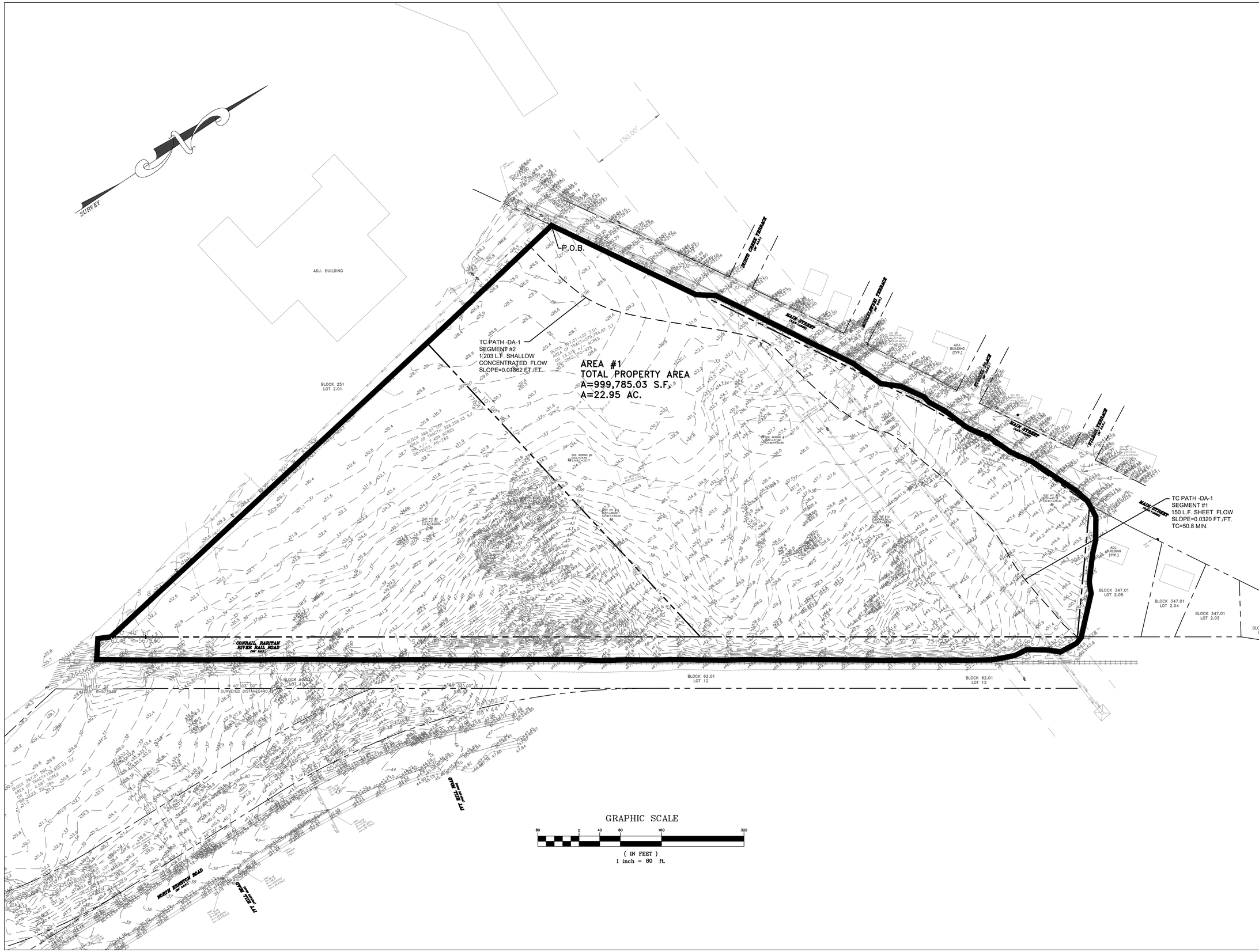
No.	Nonstructural Strategy	Yes	No
1.	Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss.	X	
2.	Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces.	X	
3.	Maximize the protection of natural drainage features and vegetation.	X	
4.	Minimize the decrease in the pre-construction time of concentration.	X	
5.	Minimize land disturbance including clearing and grading.	X	
6.	Minimize soil compaction.	X	
7.	Provide low maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides.	X	
8.	Provide vegetated open-channel conveyance systems discharge into and through stable vegetated areas.	X	
9.	Provide preventative source controls. N/A		

2. For those strategies that have not been incorporated into the proposed development's design, provide engineering, environmental, and/or safety reasons. Attached additional pages as necessary.

N/A

APPENDIX J

EXISTING AND PROPOSED DRAINAGE AREA MAPS



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CERTIFICATE OF AUTHORIZATION #24GA28239800

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ENGINEERING
SITE PLANNING
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LANDSCAPE ARCHITECTURE

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REVISIONS	DATE
REVISED PER TOWNSHIP ENGINEERS REVIEW COMMENTS	09/17/2020

DATE: 09/12/2019	DRAWN: RMP
SCALE: 1"=80'	CHECKED: SK
AE FILE NAME: EX. DA	RELEASED: WTW
AE FILE NUMBER: 117	

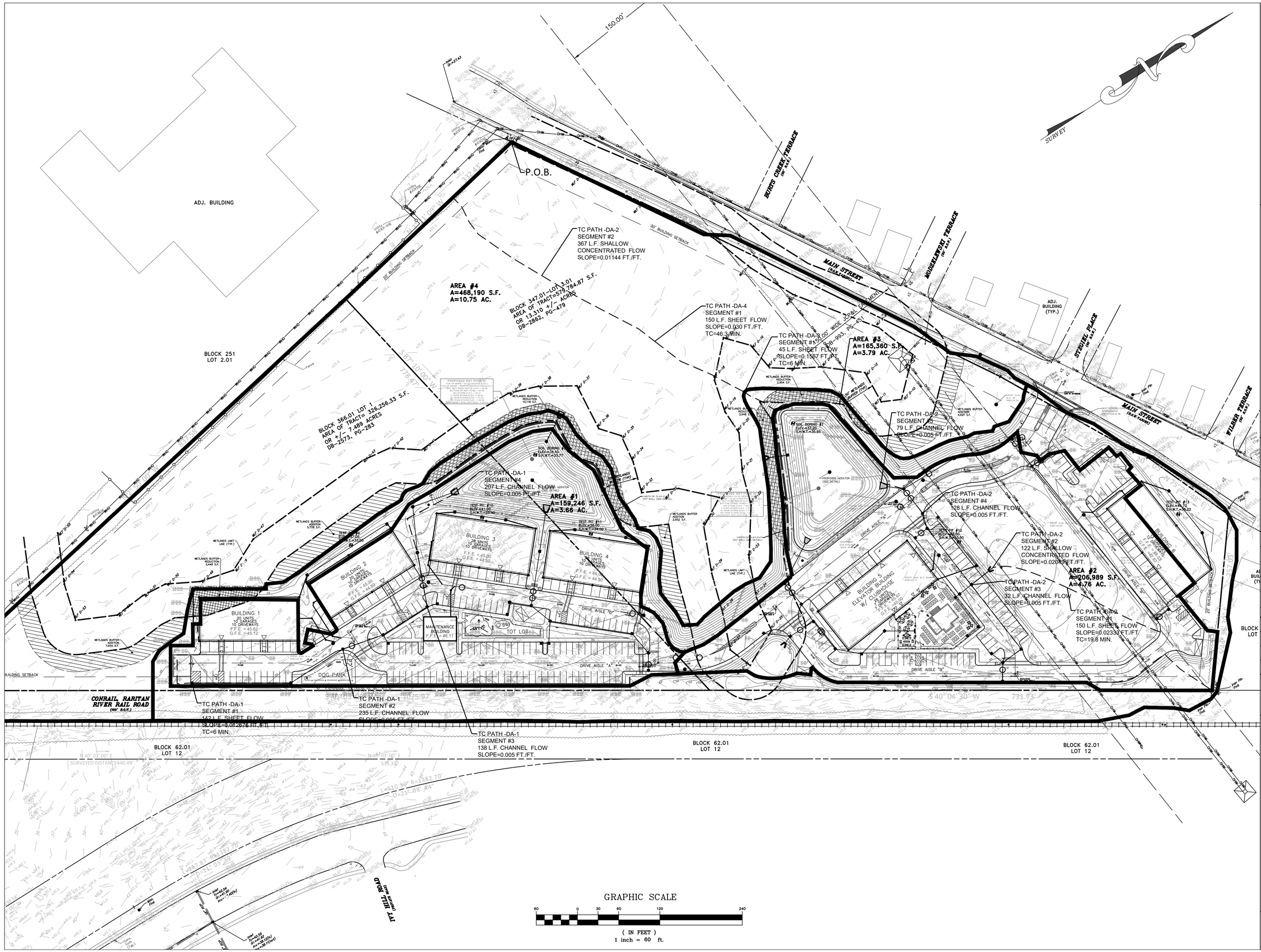
EXISTING DRAINAGE AREA MAP

PREPARED FOR

CAMELOT AT ERNSTON ROAD

SITUATED IN

BLOCK 366.01 - LOT 1
BLOCK 347.01 - LOT 3.01
BOROUGH OF SAYREVILLE
MIDDLESEX COUNTY
NEW JERSEY



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REVISIONS	DATE
REVISED PER TOWNSHIP ENGINEERS REVIEW COMMENTS	09/17/2020

DATE: 09/12/2019	RMP DRAWN
SCALE: 1"=60'	SK CHECKED
AE FILE NAME: GRADING PLAN	
AE FILE NUMBER: 117	WTW RELEASED

PROPOSED DRAINAGE AREA MAP

PREPARED FOR

CAMELOT AT ERNSTON ROAD

SITUATED IN

BLOCK 366.01 - LOT 1
BLOCK 347.01 - LOT 3.01
BOROUGH OF SAYREVILLE
MIDDLESEX COUNTY
NEW JERSEY

BLOCK 251
LOT 2.01

Fence

SURVEY

S 12° 50' 00" W
837.58'

S 87° 10' 00" W
778.47'

BLOCK 366.01 LOT 1
AREA OF TRACT= 326,256.33 S.F.
OR +/- 7.489 ACRES
DB-2573, PG-283

PROPOSED WET POND #1
TOP OF BERM = 40.00 (DESIGN ELEV.)
TOP OF BERM = 40.23 (CONSTRUCTION ELEV.)
MIN. WET POND WATER ELEV = 34.50
BOTTOM OF WET POND = 30.00
WQ STORM ELEV. = 35.21
2 YEAR STORM ELEV. = 36.23
10 YEAR STORM ELEV. = 37.25
100 YEAR STORM ELEV. = 38.80
EMERGENCY SPILLWAY ELEV. = 39.14

WETLANDS BUFFER REDUCTION
10,118 S.F.

WETLANDS BUFFER ADDITION
5,728 S.F.

WETLANDS BUFFER REDUCTION
3,448 S.F.

WETLANDS BUFFER ADDITION
2,952 S.F.

WETLANDS LIMIT LINE (TYP.)

WETLANDS BUFFER (TYP)

LIMITS OF CLAY-CUT-OFF WALL (SEE DETAIL)

PROPOSED AERATOR (SEE DETAIL)

SOIL BORING #1
ELEV.=34.40
S.H.W.T.=33.77

TC PATH -DA-1
SEGMENT #4
207 L.F. CHANNEL FLOW
SLOPE=0.005 FT./FT.

AREA #1
A=159,246 S.F.
A=3.66 AC.

TEST PIT #9
ELEV.=37.05
S.H.W.T.=33.05

TEST PIT #10
ELEV.=41.90
S.H.W.T.=38.90

TEST PIT #11
ELEV.=38.00
S.H.W.T.=34.00

BUILDING 1
20 UNITS
10 GARAGES
10 DRIVEWAYS
F.F.E. = 45.62
G.F.E. = 45.12

BUILDING 2
20 UNITS
10 GARAGES
10 DRIVEWAYS
F.F.E. = 45.00
G.F.E. = 44.50

BUILDING 3
28 UNITS
10 GARAGES
10 DRIVEWAYS
F.F.E. = 45.00
G.F.E. = 44.50

BUILDING 4
28 UNITS
10 GARAGES
10 DRIVEWAYS
F.F.E. = 45.00
G.F.E. = 44.50

MAINTENANCE BUILDING
F.F.E. = 46.11

DOG PARK

TOT LOT

DRIVE AISLE "A"

PROP. SAN. M.H. #10
RIM=44.00

PROP. SAN. M.H. #9
RIM=43.80

PROP. SAN. M.H. #8
RIM=44.25

PROP. SAN. M.H. #7
RIM=46.80

LOW POINT
STA. 1+10.47
ELEV.=43.92

HIGH POINT
STA. 10+00.00
ELEV.=46.51

LOW POINT
STA. 9+00.00
ELEV.=45.60

HIGH POINT
STA. 7+17.50
ELEV.=47.21

TC PATH -DA-1
SEGMENT #1
142 L.F. SHEET FLOW
SLOPE=0.012676 FT./FT.
TC=6 MIN.

TC PATH -DA-1
SEGMENT #2
235 L.F. CHANNEL FLOW
SLOPE=0.005 FT./FT.

TC PATH -DA-1
SEGMENT #3
138 L.F. CHANNEL FLOW
SLOPE=0.005 FT./FT.

S 40° 03' 00" W
1075.97'

N 40° 03' 00" E
535.33'

440.49'

L= 287.22' R=1482.70'
D=11° 05' 56"

L=510.30' R=1482.70'
D=21° 08' 44"

BLOCK 62.01
LOT 12

BLOCK 62.01
LOT 12

MATCH LINE

RARITAN RAIL ROAD R.O.W.

GRAPHIC SCALE
30 0 15 30 60 120
(IN FEET)
1 inch = 30 ft.

WILLIAM T. WENTZIEN, P.E., P.P., C.M.E.
PROFESSIONAL ENGINEER
NJ LICENSE No. 27799

CERTIFICATE OF AUTHORIZATION #24GA28239800

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ENGINEERING
SITE PLANNING
ENVIRONMENTAL
LANDSCAPE ARCHITECTURE

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REVISIONS	DATE
REVISED PER TOWNSHIP ENGINEERS REVIEW COMMENTS	09/17/2020

DATE: 09/12/2019	RMP DRAWN
SCALE: 1"=30'	SK CHECKED
AE FILE NAME: PROP. DA	
AE FILE NUMBER: 117	WTW RELEASED

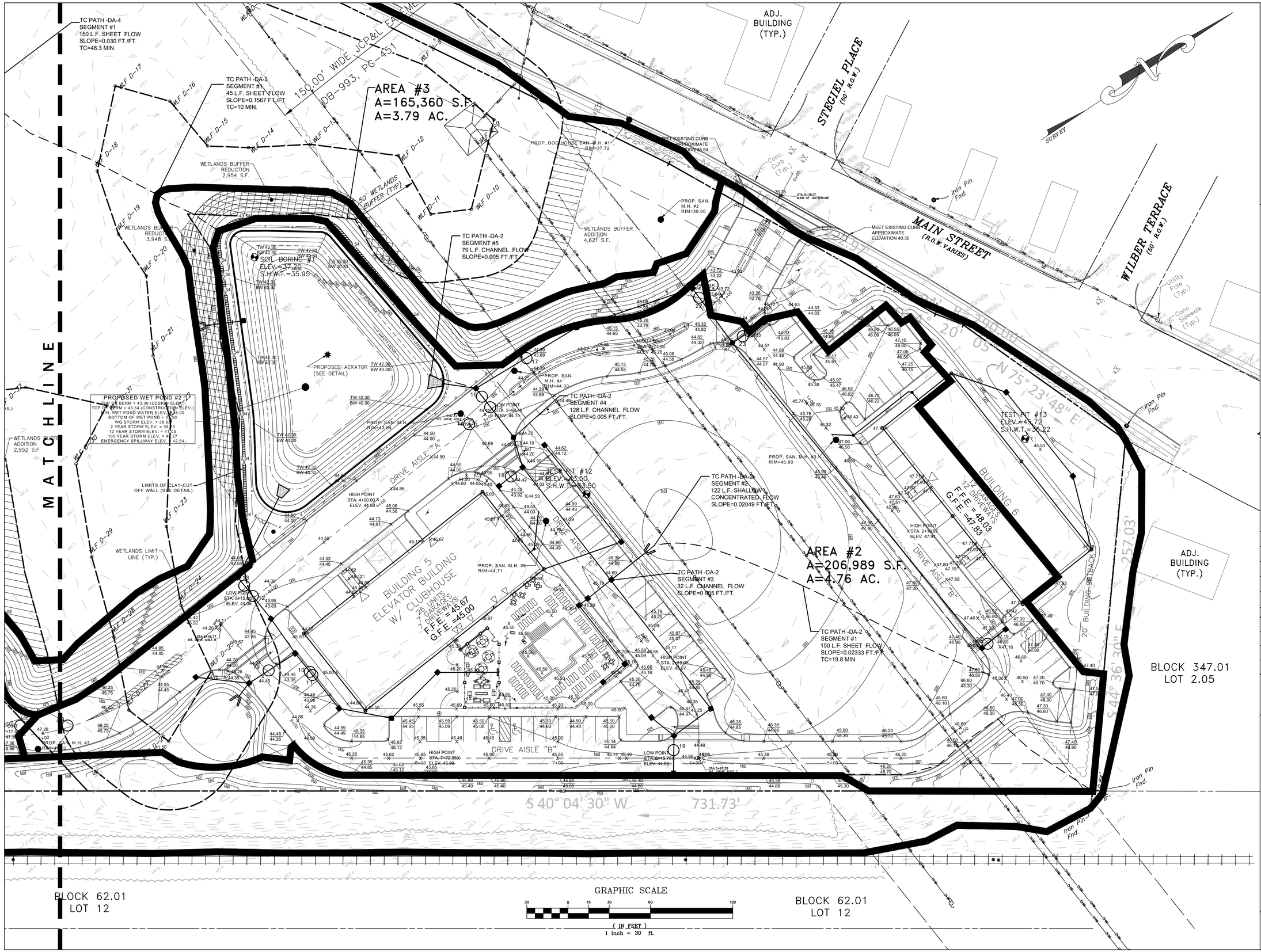
PROPOSED DRAINAGE AREA MAP

PREPARED FOR

CAMELOT AT ERNSTON ROAD

SITUATED IN

BLOCK 366.01 - LOT 1
BLOCK 347.01 - LOT 3.01
BOROUGH OF SAYREVILLE
MIDDLESEX COUNTY
NEW JERSEY



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PROPOSED DRAINAGE AREA MAP

PREPARED FOR

CAMELOT AT ERNSTON ROAD

SITUATED IN

BLOCK 366.01 - LOT 1
BLOCK 347.01 - LOT 3.01
BOROUGH OF SAYREVILLE
MIDDLESEX COUNTY
NEW JERSEY

BLOCK 251
LOT 2.01

Fence

SURVEY

N 12° 50' 00" W
837.58

S 87° 10' 00" W
778.47'

BLOCK 366.01 LOT 1
AREA OF TRACT= 326,256.33 S.F.
OR +/- 7.489 ACRES
DB-2573, PG-283

PROPOSED WET POND #1
TOP OF BERM = 40.00 (DESIGN ELEV.)
TOP OF BERM = 40.23 (CONSTRUCTION ELEV.)
MIN. WET POND WATER ELEV = 34.50
BOTTOM OF WET POND = 30.00
WQ STORM ELEV. = 35.21
2 YEAR STORM ELEV. = 36.23
10 YEAR STORM ELEV. = 37.25
100 YEAR STORM ELEV. = 38.80
EMERGENCY SPILLWAY ELEV. = 39.14

WETLANDS BUFFER REDUCTION 10,118 S.F.

WETLANDS BUFFER ADDITION 5,728 S.F.

WETLANDS BUFFER REDUCTION 3,448 S.F.

WETLANDS BUFFER ADDITION 2,952 S.F.

WETLANDS LIMIT LINE (TYP.)

50' WETLANDS BUFFER (TYP)

LIMITS OF CLAY-CUT OFF WALL (SEE DETAIL)

PROPOSED AERATOR (SEE DETAIL)

PROPOSED WATER SUPPLY WELL 1.25" P.V.C. PIPE

PROP. HEADWALL #22 INV.=32.60

ANTI-SEEP COLLAR (TYP.) (SEE DETAIL)

PROP. OUTLET CONTROL STRUCTURE #21
GRATE=39.00
INV.2.5" WEIR=38.00
INV.2.5" ORIFICE=34.50
INV.(15" OUT)=33.20

PROP. OUTLET CONTROL STRUCTURE #56
GRATE=42.30
INV. 2.5" ORIFICE=38.00
8" WEIR=41.20
INV.(24" OUT)=36.00

PROP. HEADWALL #57 INV.=35.84

ANTI-SEEP COLLAR (TYP.) (SEE DETAIL)

PROPOSED WET
TOP OF BERM = 43.30 (DE
TOP OF BERM = 43.54 (CONST
MIN. WET POND WATER E
BOTTOM OF WET PON
WQ STORM ELEV.
2 YEAR STORM ELEV
10 YEAR STORM ELE
100 YEAR STORM ELE
EMERGENCY SPILLWAY E

WETLANDS BUFFER REDU
3,94

WETLANDS LIMIT LINE (TYP.

LIMITS OF CLAY-CUT OFF WALL (SEE DETAIL)

PROP. HEADWALL #10 INV.=35.50

PROP. DROP MANHOLE #9
RIM=40.60
INV.(IN)=36.91
INV.(OUT)=36.91

SOIL BORING #2
ELEV.=39.40
S.H.W.T.=33.77

TEST PIT #10
ELEV.=41.00
S.H.W.T.=33.00

TEST PIT #11
ELEV.=38.00
S.H.W.T.=34.00

TEST PIT #9
ELEV.=37.05
S.H.W.T.=33.05

ROOF DRAIN RECHARGE SYSTEM #1

ROOF DRAIN RECHARGE SYSTEM #2

ROOF DRAIN RECHARGE SYSTEM #3

PROP. 'A' INLET #59
GRATE=41.10
6"INV.=39.29
30"INV.=37.08

PROP. 'A' INLET #58
GRATE=40.80
6"INV.=39.28
30"INV.=37.28

PROP. 'A' INLET #60
GRATE=42.20
6"INV.=40.60
30"INV.=38.40

PROP. 'A' INLET #61
GRATE=42.20
6"INV.=40.60
30"INV.=38.40

PROP. 'A' INLET #62
GRATE=42.10
6"INV.=40.40
30"INV.=38.40

PROP. 'A' INLET #63
GRATE=42.10
6"INV.=40.40
30"INV.=38.40

PROP. HEADWALL #20 INV.=35.50

6" PVC ROOF DRAIN @ 0.5% (TYP.)

PROP. SAN. LATERAL INV. OUT=36.30

PROP. SAN. CLEANOUT RIM=44.30 INV.=35.53

PROP. MANHOLE #8
RIM=43.50
INV.(IN)=37.24
INV.(OUT)=37.24

PROP. SAN. CLEANOUT RIM=42.60 INV.=36.88

PROP. SAN. LATERAL INV. OUT=36.06

PROP. SAN. CLEANOUT RIM=44.50

PROP. SAN. LATERAL INV. OUT=36.96

PROP. SAN. LATERAL INV. OUT=36.94

PROP. SAN. CLEANOUT RIM=43.65 INV.=35.51

PROP. SAN. CLEANOUT RIM=44.50

PROP. SAN. LATERAL INV. OUT=36.09

PROP. SAN. M.H. #10 RIM=44.00

PROP. SAN. M.H. #18 RIM=43.25

PROP. SAN. M.H. #19 RIM=43.25

PROP. SAN. LATERAL INV. OUT=34.96

LOWER PIPE STA.: 1+10.47 ELEV.: 43.92

PROP. 'E' INLET #19
GRATE=41.50
INV.(IN)=37.11
INV.(OUT)=37.11

PROP. 'B' INLET #20
TC=43.80
GRATE=43.30
INV.(OUT)=39.30

PROP. MARBLE #17A
TC=43.80
INV.(IN)=35.48
INV.(OUT)=35.48

PROP. 'B' INLET #17
TC=43.80
GRATE=43.30
INV.(OUT)=39.28

PROP. 'B' INLET #18
GRADE=44.76
GRATE=43.26
INV.(IN)#1=38.71
INV.(IN)#2=38.71
INV.(OUT)=38.71

PROP. 'B' INLET #19
TC=44.08
GRATE=43.58
INV.(IN)=39.50
INV.(OUT)=39.50

PROP. 'B' INLET #12
TC=47.05
GRATE=46.55
INV.(IN)=40.24
INV.(OUT)=40.24

PROP. 'B' INLET #16
TC=45.50
GRATE=45.00
INV.(IN)=39.53
INV.(OUT)=39.53

PROP. 'B' INLET #14
TC=45.50
GRATE=45.00
INV.(OUT)=39.73

PROP. 'B' INLET #13
TC=45.50
GRATE=45.00
INV.(OUT)=39.73

PROP. 'B' INLET #15
TC=44.25
GRATE=43.75
INV.(IN)=39.02
INV.(OUT)=38.77

PROP. 'B' INLET #1
TC=44.20
GRATE=43.70
INV.(OUT)=40.20

PROP. 'B' INLET #2
TC=44.20
GRATE=43.70
INV.(IN)=39.47
INV.(OUT)=39.47

BUILDING 1
20 UNITS
10 DRIVEWAYS
F.F.E. = 45.62
G.F.E. = 45.12

BUILDING 2
20 UNITS
10 DRIVEWAYS
F.F.E. = 45.00
G.F.E. = 44.50

BUILDING 3
28 UNITS
10 GARAGES
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G.F.E. = 44.50

BUILDING 4
28 UNITS
10 GARAGES
10 DRIVEWAYS
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G.F.E. = 44.50

MAINTENANCE BUILDING
F.F.E. = 46.11

TOT LOT

DOG PARK

DRIVE AISLE 'D'

DRIVE AISLE 'E'

AREA #1 A=0.20 AC. 85% IMPERV.

AREA #2 A=0.28 AC. 82% IMPERV.

AREA #3 A=0.12 AC. 81% IMPERV.

AREA #4 A=0.15 AC. 86% IMPERV.

AREA #5 A=0.28 AC. 81% IMPERV.

AREA #6 A=0.15 AC. 82% IMPERV.

AREA #7 A=0.17 AC. 95% IMPERV.

AREA #8 A=0.14 AC. 70% IMPERV.

AREA #9 A=0.22 AC. 71% IMPERV.

AREA #10 A=0.22 AC. 77% IMPERV.

AREA #11 A=0.03 AC. 100% IMPERV.

AREA #12 A=0.07 AC. 79% IMPERV.

AREA #13 A=0.17 AC. 91% IMPERV.

AREA #14 A=0.15 AC. 90% IMPERV.

AREA #15 A=0.18 AC. 94% IMPERV.

AREA #16 A=0.22 AC. 77% IMPERV.

AREA #17 A=0.22 AC. 71% IMPERV.

AREA #18 A=0.02 AC. 45% IMPERV.

AREA #19 A=0.07 AC. 100% IMPERV.

N 40° 03' 00" E
1075.97'

S 40° 03' 00" W
535.33'

N 72° 50' 00" W
1440.49'

L= 287.22' R=1482.70'
D=11° 05' 56"

L=510.30' R=1482.70'
D=21° 08' 44"

BLOCK 62.01
LOT 12

BLOCK 62.01
LOT 12

MATCH LINE

GRAPHIC SCALE
30 0 15 30 60 120
(IN FEET)
1 inch = 30 ft.

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AE FILE NAME: PROP DA-PIPES — WTW RELEASED
AE FILE NUMBER: 117

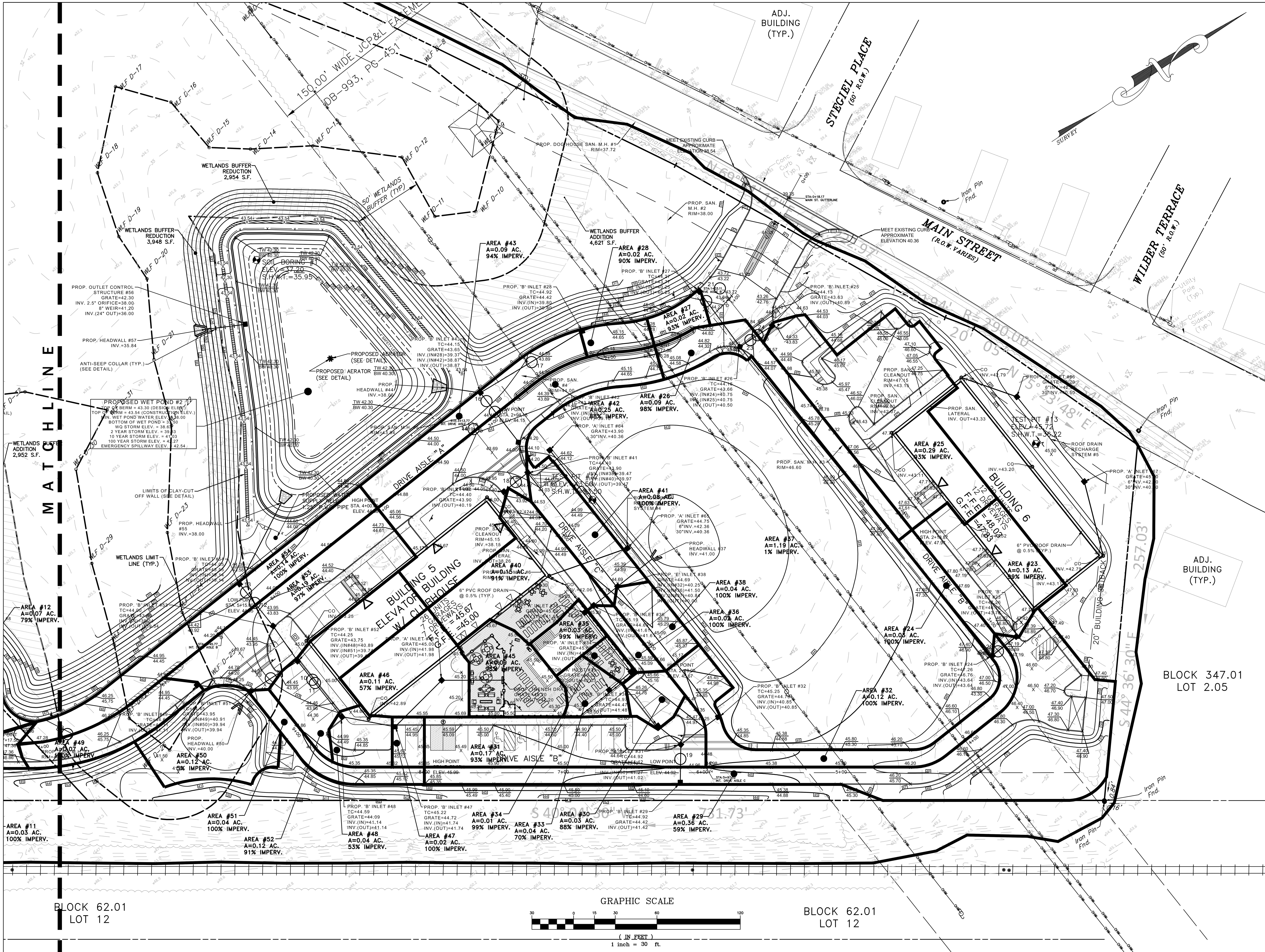
PROPOSED DRAINAGE AREA MAP-PIPES

PREPARED FOR

CAMELOT AT ERNSTON ROAD

SITUATED IN

BLOCK 366.01 - LOT 1
BLOCK 347.01 - LOT 3.01
BOROUGH OF SAYREVILLE
MIDDLESEX COUNTY
NEW JERSEY



SURVEY

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PROPOSED DRAINAGE AREA MAP-PIPES

PREPARED FOR

CAMELOT AT ERNSTON ROAD

SITUATED IN

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BLOCK 347.01 - LOT 3.01
BOROUGH OF SAYREVILLE
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