

DRAINAGE CALCULATIONS, HYDRAULICS & HYDROLOGY REPORT

**1492 Hartford – New London Turnpike (CT Route 85)
Montville, CT**

**April 8th, 2024
Revised 5/1/24
Revised 6/10/24**

DRAINAGE HYDRAULICS AND HYDROLOGY REPORT

1492 Hartford – New London Turnpike (CT Route 85) Montville, CT

EXISTING CONDITIONS

The site is approximately 5.62 acres in area and is shown on the Existing Conditions Survey (Sheet 1 of the site plans). The site has frontage on Hartford – New London Turnpike (Route 85). There are approximately 0.38 acres of wetlands on the site.

PROPOSED DEVELOPMENT

The project proposes the development of a processing, material storage, and equipment storage facility. There will be no free standing buildings on the site but there will be several storage bays and a construction trailer.

The 5.62 acres site contains wetlands as shown on sheet 1. Of the 5.62 acres, 4.08 acres will be disturbed during the development process. There will be no disturbance within the wetlands or upland review area.

EXISTING AND PROPOSED HYDRAULICS

The stormwater management system has been designed to provide for zero increase in peak stormwater discharge from the site. The project has been designed to actually result in a decrease in the peak stormwater rates leaving the project site. The proposed stormwater water quality basin will provide treatment of the runoff from the proposed site.

The current site is divided into two, existing, drainage areas:

Existing Drainage Area 1	2.98 Acres
Existing Drainage Area 2	2.64 Acres

The development of the proposed site will result in two drainage areas:

Proposed Drainage Area 1	4.08 Acres
Proposed Drainage Area 2	1.54 Acres

Proposed Drainage Area 1 contains the developed site. The stormwater runoff from this area will be treated by the water quality basin in the northwestern corner of the site. Proposed Drainage Area 2 contains the wetlands and upland review area and will remain undeveloped. The basin has been modelled to assume that the basin will have water in it up to elevation 206 at the onset of the storm event. The basin will drain between storms down to elevation 206 thru the new outlet structure and then connect to the existing drainage system in Route 85.

Both the existing and the proposed conditions for the development site have been analyzed for the 2-year, 10-year, 25-year, 50-year, and 100 year design storms using the SCS model and the NOAA Type D rainfall distribution.

Drainage Area 1

	2 Year	10 Year	25 Year	50 Year	100 Year
Existing	2.58 cfs	4.56 cfs	5.81 cfs	6.73 cfs	7.72 cfs
Proposed	0.89 cfs	1.77 cfs	4.05 cfs	5.66 cfs	7.35 cfs

Drainage Area 2

	2 Year	10 Year	25 Year	50 Year	100 Year
Existing	2.09 cfs	3.70 cfs	4.72 cfs	5.47 cfs	6.27 cfs
Proposed	1.22 cfs	2.16 cfs	2.75 cfs	3.19 cfs	3.66 cfs

EROSION & SEDIMENTATION CONTROL

The 2002 CT Guidelines for Soil Erosion & Sedimentation Control applies to the construction phase of the project. A detailed erosion and sediment control plan has been provided in the site development plans. The proposed stormwater water quality basin has been designed to function as sedimentation traps during stabilization.

The first calculation required by the Guidelines is for the sediment storage volume (SSV). The sediment storage volume is the calculation for one year of predicted sediment load. The required SSV calculation for the temporary sediment trap is shown below.

Drainage Area 1A

$$SSV = A(134CY/Acre)$$

$$A = 4.08 \text{ ACRE}$$

$$SSV = 546.72 \text{ CY} = \underline{\mathbf{14,760 \text{ CF}}}$$

The second calculation required by the Guidelines is for wet storage volume (WSV). The wet storage volume is the volume in the basin that is located below the bottom of the riprap for the level spreader outlet of the basin. The volume of the wet storage is required to be half of the required SSV. The required wet storage volume is shown below along with the dry storage volumes (DSV).

Drainage Area 1A

$$WSV = DSV = SSV/2$$

$$= \underline{\mathbf{7,380 \text{ CF}}}$$

The required and provided storage for each basin are as follows:

Drainage Area 1 (Outlet structure inlet elevation = 205.5)

Sedimentation Trap

Forebay and Basin:

7,380 CF of Wet Storage Volume Required	12,500 CF Provided
7,380 CF of Dry Storage Volume Required	22,500 CF Provided
14,760 CF of Sediment Storage Volume Required	35,000 CF Total Provided

CONNECTICUT STORMWATER QUALITY MANUAL

The Connecticut 2024 Stormwater Quality Manual (Manual) applies to the post construction phase, for the operation of the facility. The temporary sediment traps have been designed to function as water quality basins after the site is stabilized. They all meet the criteria of the Connecticut Stormwater Quality Manual for a Water Quality Basin.

Drainage Area 1

$$WQV = (1.3'')(R)(A)/12$$

$$A = 4.08 \text{ Acre}$$

$$R = 0.05 + 0.009(I)$$

$$I = 3.8 \text{ Acres} / 4.08 \text{ Acres} = 0.93 \quad (93\%)$$

$$R = 0.88$$

$$WQV = 0.388 \text{ Ac-Ft} = 16,901 \text{ CF (Required)}$$

$$22,500 \text{ CF (Provided in Water Quality Basin and forebay)}$$

Once development of the site is completed, there will be a decrease in runoff from the site. The temporary sedimentation basin provides ample wet and dry storage volume to meet and exceed the requirements of the 2002 CT Guidelines for Soil & Sedimentation Control. Likewise, Water Quality Basin meets and exceeds the post construction requirements of the Connecticut 2024 Stormwater Quality Manual.

DRAINAGE SWALE:

The attached drainage calculations shows that for a 25 year design storm, the swale will have a peak flow of 7.8 cfs and a depth of 0.6 feet, providing 16 inches of free board in the swale. The calculations also show a velocity of 3.45 ft/sec.

The site soils are generally gravel or sandy-loam. The stormwater velocity within the swales are below the Maximum Permissible Velocity for good condition as outlined in the chart below. The swales will be stable during the early stabilization phase, as the plans call for North American Green S-150 on the sides and bottom of the swale, and when fully grown-in and stable post construction.

Figure VW-1 Maximum Permissible Velocity (ft./sec.)

Soil Texture	Channel Vegetation Condition ¹			
	Poor	Fair	Good	Stone Center
Sand, silt loam, sandy loam, loamy sand, loam and muck	2.0	2.5	3.5	8.0
Silty clay loam, sandy clay loam, clay, clay loam, sandy clay, silty clay	3.0	4.0	5.0	8.0

¹For channels with geosynthetic turf reinforcement, permissible velocities shall be designed on a product-specific basis and for long duration flows (>24 hours).

Source: USDA-NRCS

Channel Report

<Name>

Trapezoidal

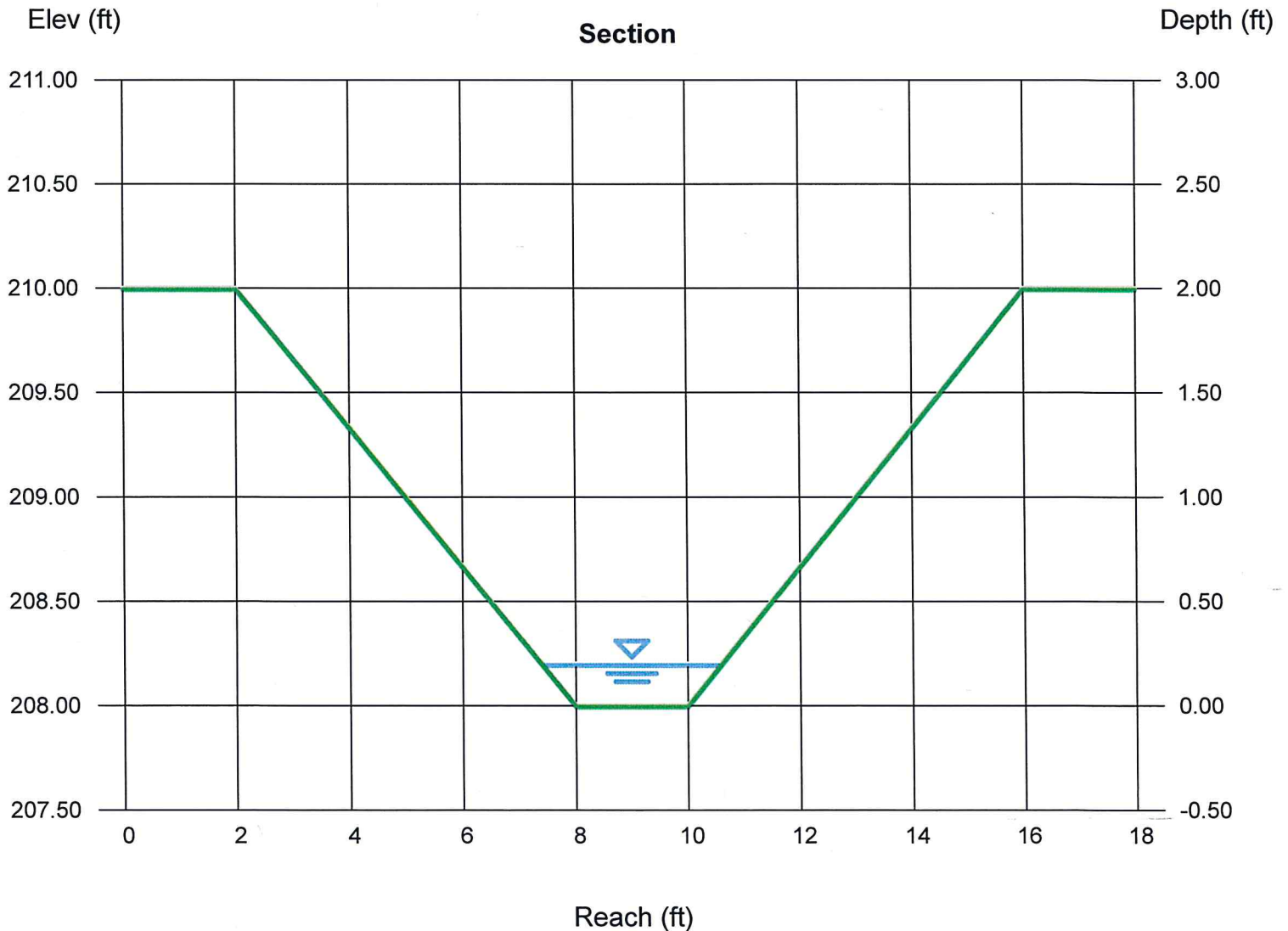
Bottom Width (ft) = 2.00
Side Slopes (z:1) = 3.00, 3.00
Total Depth (ft) = 2.00
Invert Elev (ft) = 208.00
Slope (%) = 3.00
N-Value = 0.040

Highlighted

Depth (ft) = 0.20
Q (cfs) = 0.983
Area (sqft) = 0.52
Velocity (ft/s) = 1.89
Wetted Perim (ft) = 3.26
Crit Depth, Yc (ft) = 0.01
Top Width (ft) = 3.20
EGL (ft) = 0.26

Calculations

Compute by: Q vs Depth
No. Increments = 10



Depth	Q	Area	Veloc
(ft)	(cfs)	(sqft)	(ft/s)
0.20	0.983	0.520	1.89
0.40	3.545	1.280	2.77
<u>0.60</u>	<u>7.875</u>	2.280	<u>3.45</u>
0.80	14.24	3.520	4.05
1.00	22.90	5.000	4.58
1.20	34.11	6.720	5.08
1.40	48.12	8.680	5.54
1.60	65.15	10.88	5.99
1.80	85.43	13.32	6.41
2.00	109.2	16.00	6.82

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

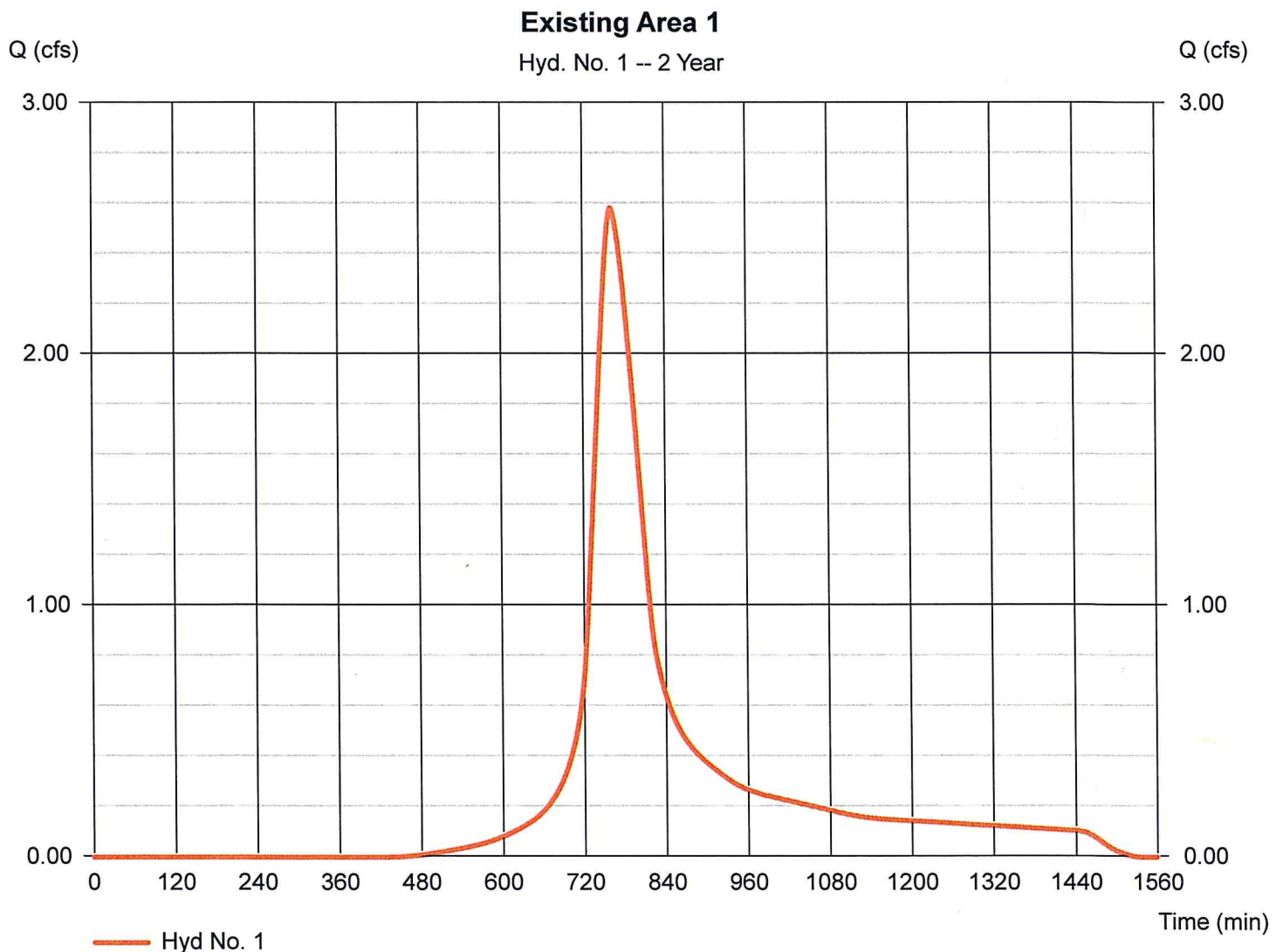
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	2.584	1	762	21,414	----	----	----	Existing Area 1
2	SCS Runoff	3.421	2	768	29,385	----	----	----	Proposed Area 1
3	Reservoir	3.408	2	772	29,385	2	205.81	862	forebay
4	Reservoir	0.892	2	850	29,323	3	206.75	13,804	Water Quality Basin
5	SCS Runoff	2.094	1	768	18,962	----	----	----	Existing Area 2
6	SCS Runoff	1.221	1	768	11,061	----	----	----	Proposed Area 2
8	Rational	4.349	1	7	1,827	----	----	----	Runoff to Swale
GSD 69 - Drainage Calculations - SCSgpp							Return Period: 2 Year		Monday, Jun 10, 2024

Hydrograph Report

Hyd. No. 1

Existing Area 1

Hydrograph type	= SCS Runoff	Peak discharge	= 2.584 cfs
Storm frequency	= 2 yrs	Time to peak	= 762 min
Time interval	= 1 min	Hyd. volume	= 21,414 cuft
Drainage area	= 2.980 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 62.20 min
Total precip.	= 3.45 in	Distribution	= Custom
Storm duration	= NOAA Type D Distribution 1 min.cds	Shape factor	= 484



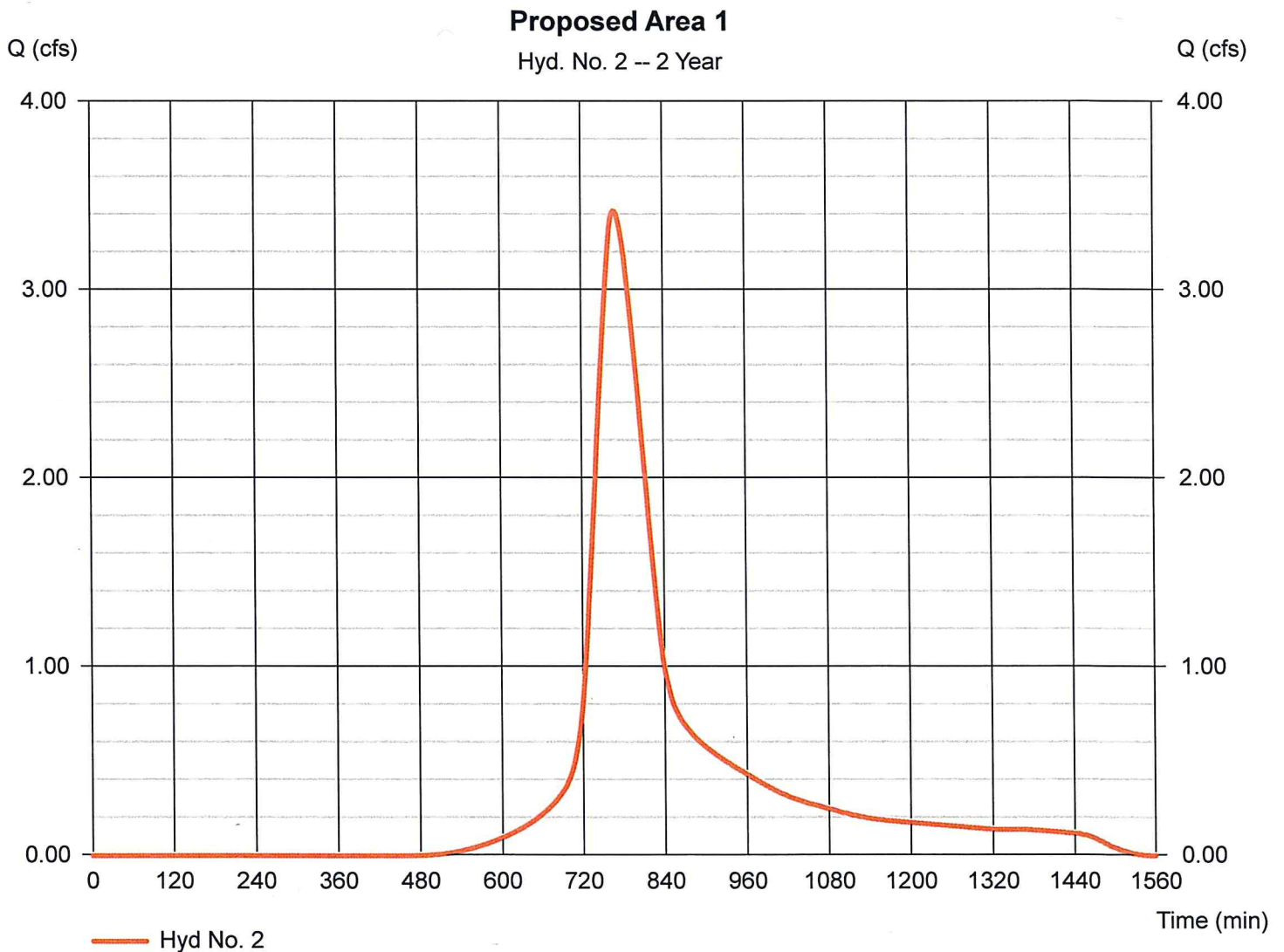
Hydrograph Report

Hyd. No. 2

Proposed Area 1

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 2 min
Drainage area = 4.080 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 3.45 in
Storm duration = 24 hrs

Peak discharge = 3.421 cfs
Time to peak = 768 min
Hyd. volume = 29,385 cuft
Curve number = 85
Hydraulic length = 0 ft
Time of conc. (Tc) = 72.50 min
Distribution = Type III
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

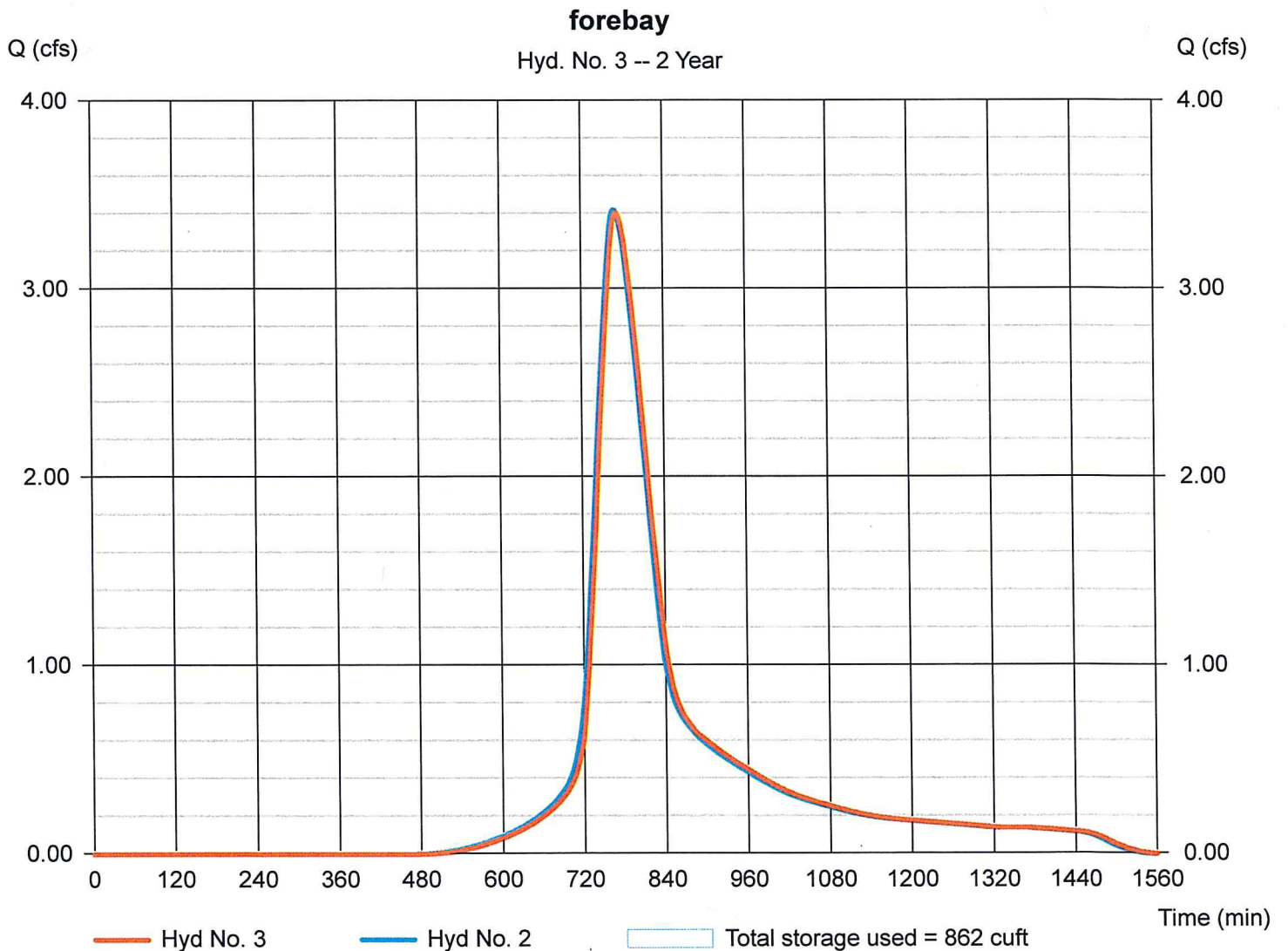
Monday, Jun 10, 2024

Hyd. No. 3

forebay

Hydrograph type	= Reservoir	Peak discharge	= 3.408 cfs
Storm frequency	= 2 yrs	Time to peak	= 772 min
Time interval	= 2 min	Hyd. volume	= 29,385 cuft
Inflow hyd. No.	= 2 - Proposed Area 1	Max. Elevation	= 205.81 ft
Reservoir name	= forebay	Max. Storage	= 862 cuft

Storage Indication method used.



Hydrograph Report

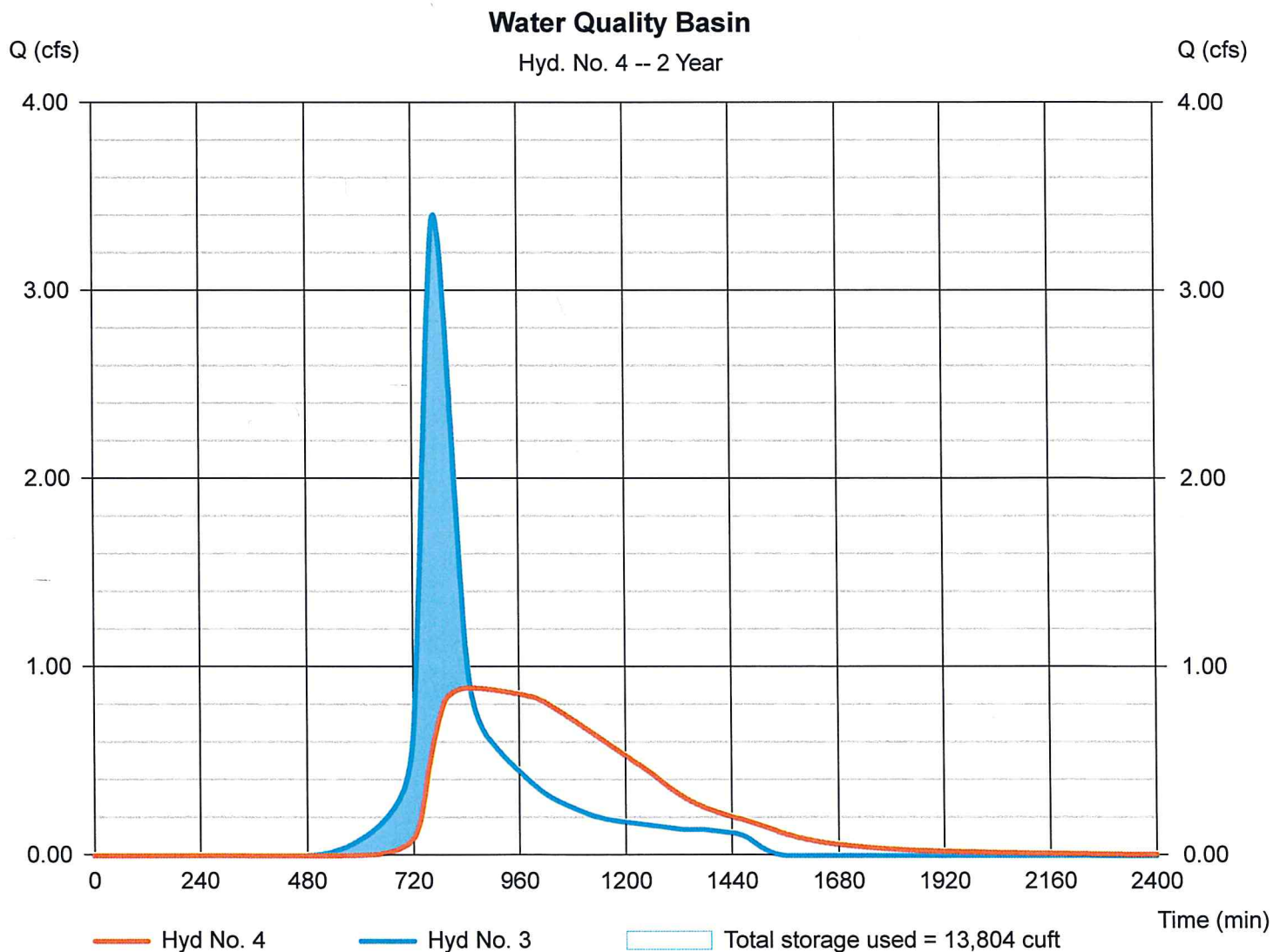
Hyd. No. 4

Water Quality Basin

Hydrograph type = Reservoir
Storm frequency = 2 yrs
Time interval = 2 min
Inflow hyd. No. = 3 - forebay
Reservoir name = Pond 1

Peak discharge = 0.892 cfs
Time to peak = 850 min
Hyd. volume = 29,323 cuft
Max. Elevation = 206.75 ft
Max. Storage = 13,804 cuft

Storage Indication method used.



Hydrograph Report

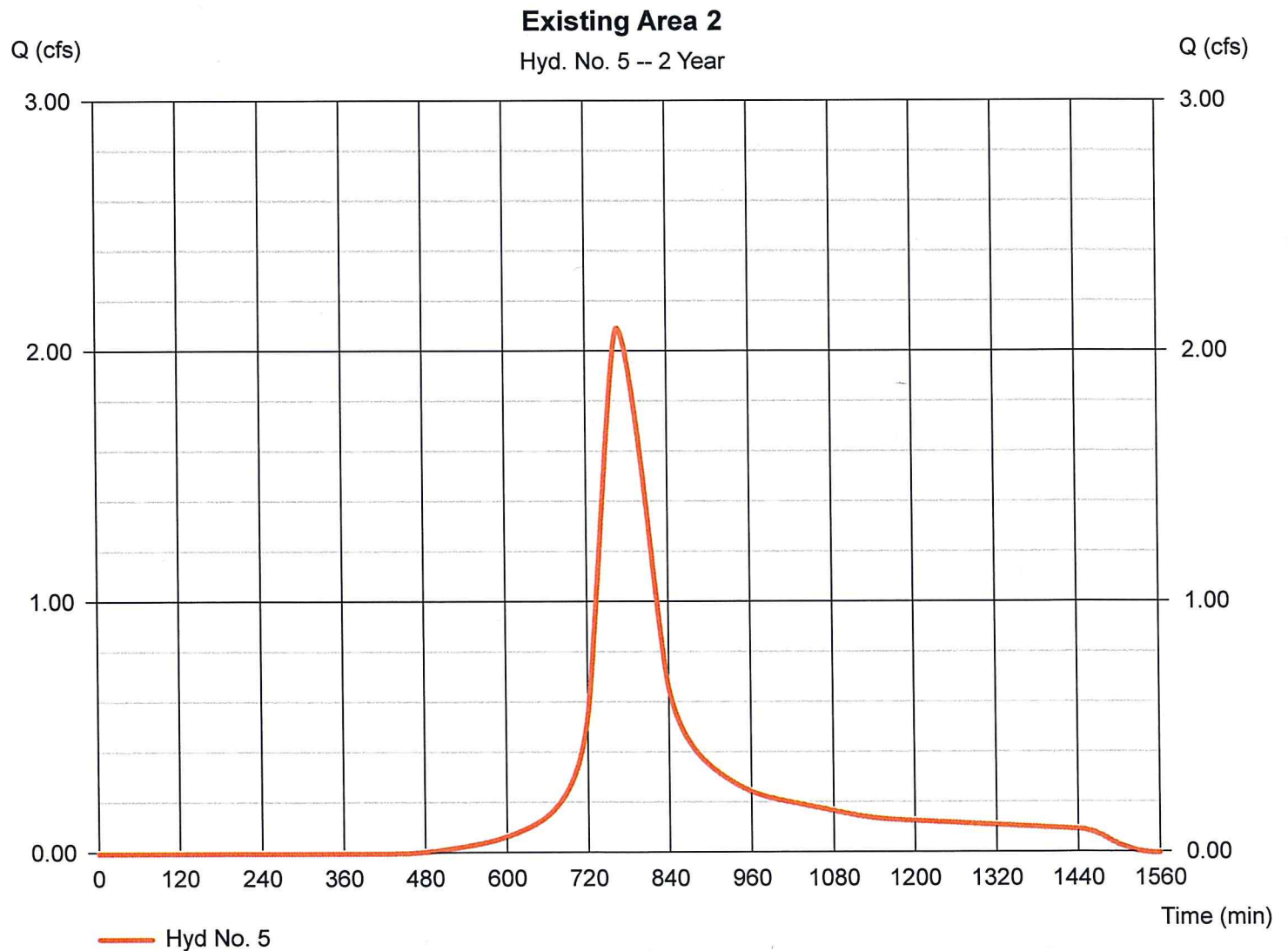
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Monday, Jun 10, 2024

Hyd. No. 5

Existing Area 2

Hydrograph type	= SCS Runoff	Peak discharge	= 2.094 cfs
Storm frequency	= 2 yrs	Time to peak	= 768 min
Time interval	= 1 min	Hyd. volume	= 18,962 cuft
Drainage area	= 2.640 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 72.50 min
Total precip.	= 3.45 in	Distribution	= Custom
Storm duration	= NOAA Type D Distribution 1 min.cds	Shape factor	= 484

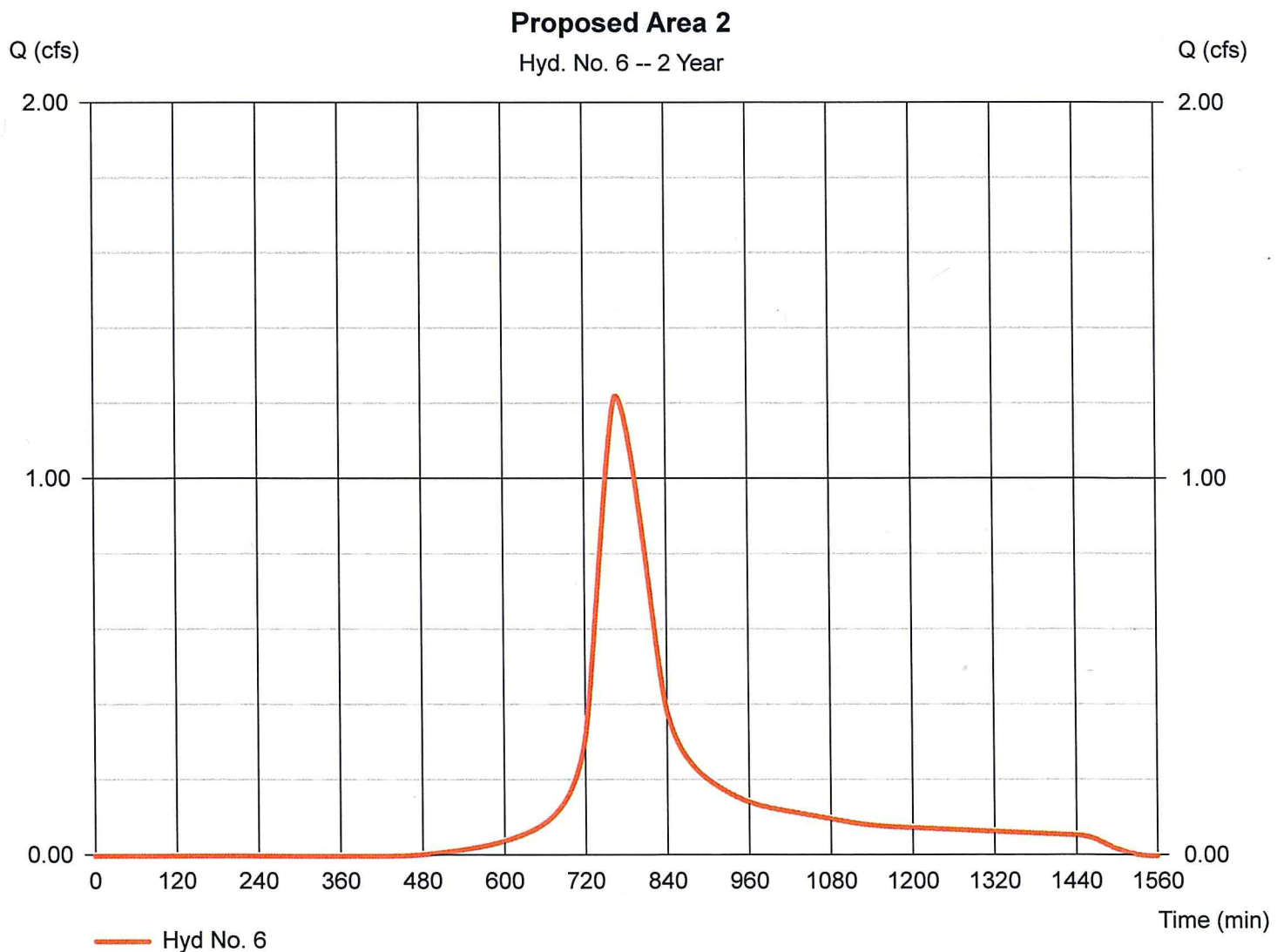


Hydrograph Report

Hyd. No. 6

Proposed Area 2

Hydrograph type	= SCS Runoff	Peak discharge	= 1.221 cfs
Storm frequency	= 2 yrs	Time to peak	= 768 min
Time interval	= 1 min	Hyd. volume	= 11,061 cuft
Drainage area	= 1.540 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 72.50 min
Total precip.	= 3.45 in	Distribution	= Custom
Storm duration	= NOAA Type D Distribution 1 min.cds	Shape factor	= 484



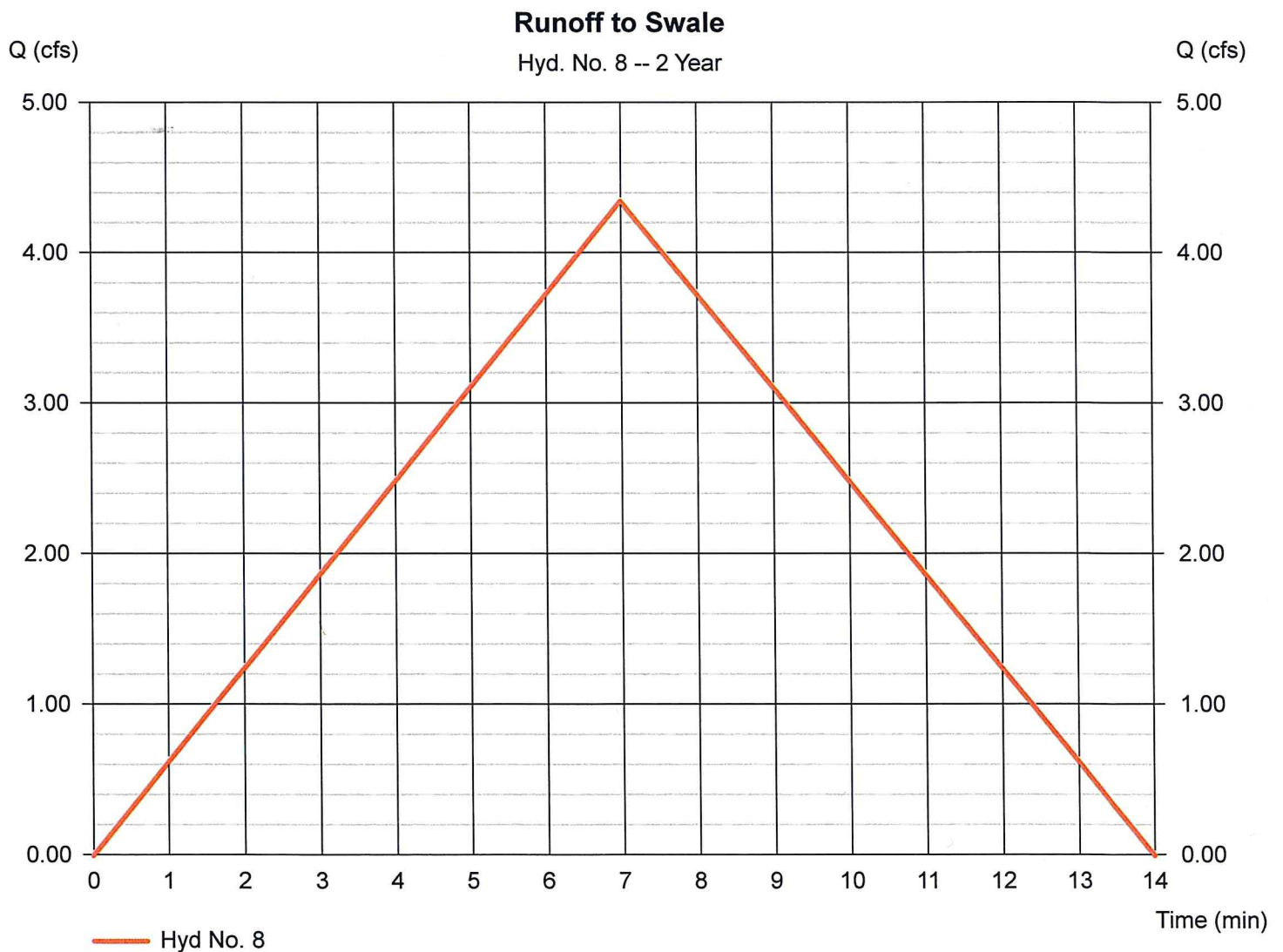
Hydrograph Report

Hyd. No. 8

Runoff to Swale

Hydrograph type = Rational
Storm frequency = 2 yrs
Time interval = 1 min
Drainage area = 1.300 ac
Intensity = 4.182 in/hr
IDF Curve = GSD-60 NOAA.IDF

Peak discharge = 4.349 cfs
Time to peak = 7 min
Hyd. volume = 1,827 cuft
Runoff coeff. = 0.8
Tc by User = 7.00 min
Asc/Rec limb fact = 1/1



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

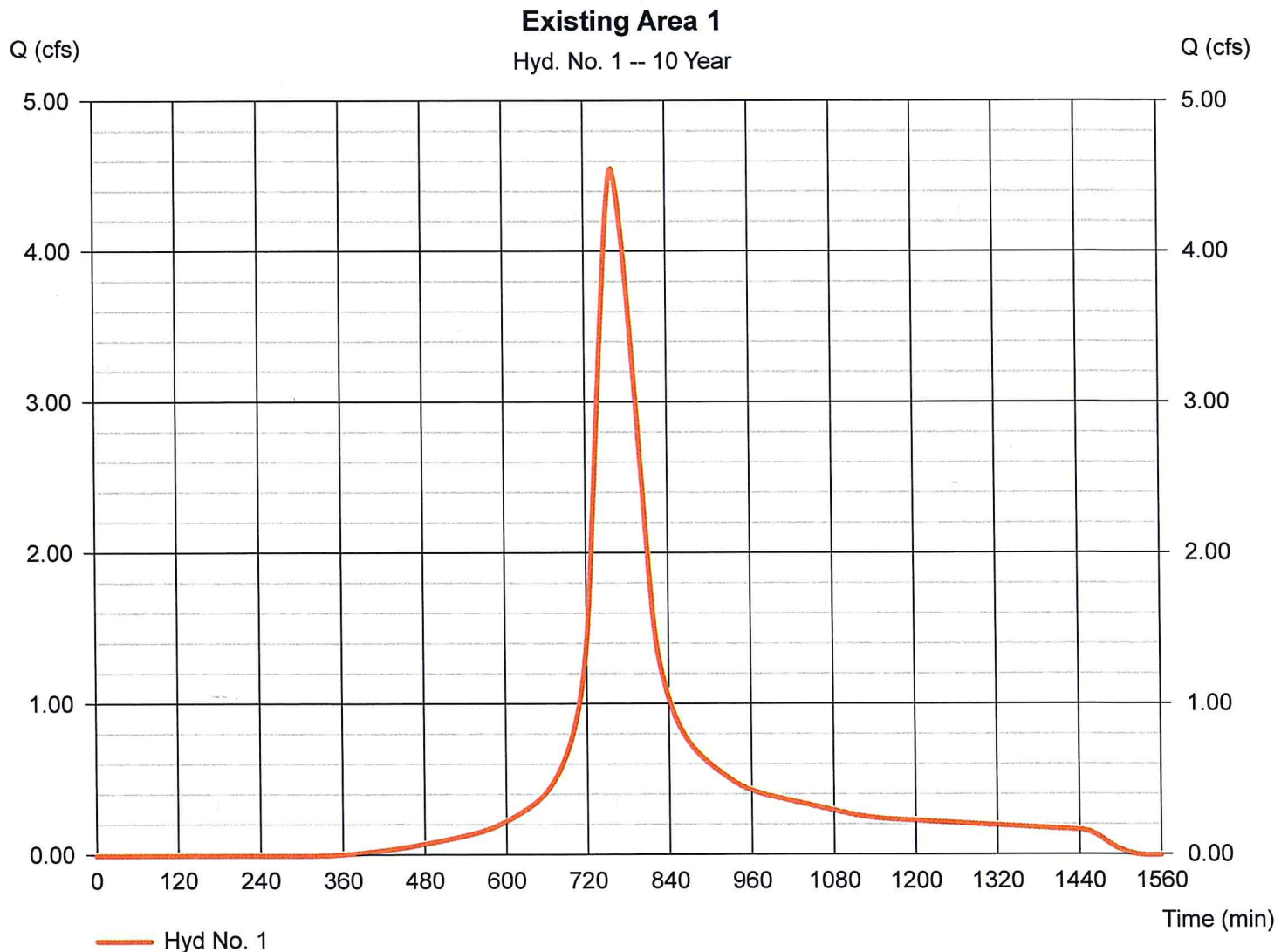
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	4.556	1	761	37,964	----	----	----	Existing Area 1
2	SCS Runoff	6.044	2	768	52,096	----	----	----	Proposed Area 1
3	Reservoir	6.025	2	770	52,096	2	205.95	1,259	forebay
4	Reservoir	1.767	2	840	52,034	3	207.56	25,772	Water Quality Basin
5	SCS Runoff	3.696	1	767	33,616	----	----	----	Existing Area 2
6	SCS Runoff	2.156	1	767	19,610	----	----	----	Proposed Area 2
8	Rational	6.520	1	7	2,739	----	----	----	Runoff to Swale

Hydrograph Report

Hyd. No. 1

Existing Area 1

Hydrograph type	= SCS Runoff	Peak discharge	= 4.556 cfs
Storm frequency	= 10 yrs	Time to peak	= 761 min
Time interval	= 1 min	Hyd. volume	= 37,964 cuft
Drainage area	= 2.980 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 62.20 min
Total precip.	= 5.14 in	Distribution	= Custom
Storm duration	= NOAA Type D Distribution 1 min.cds	Shape factor	= 484



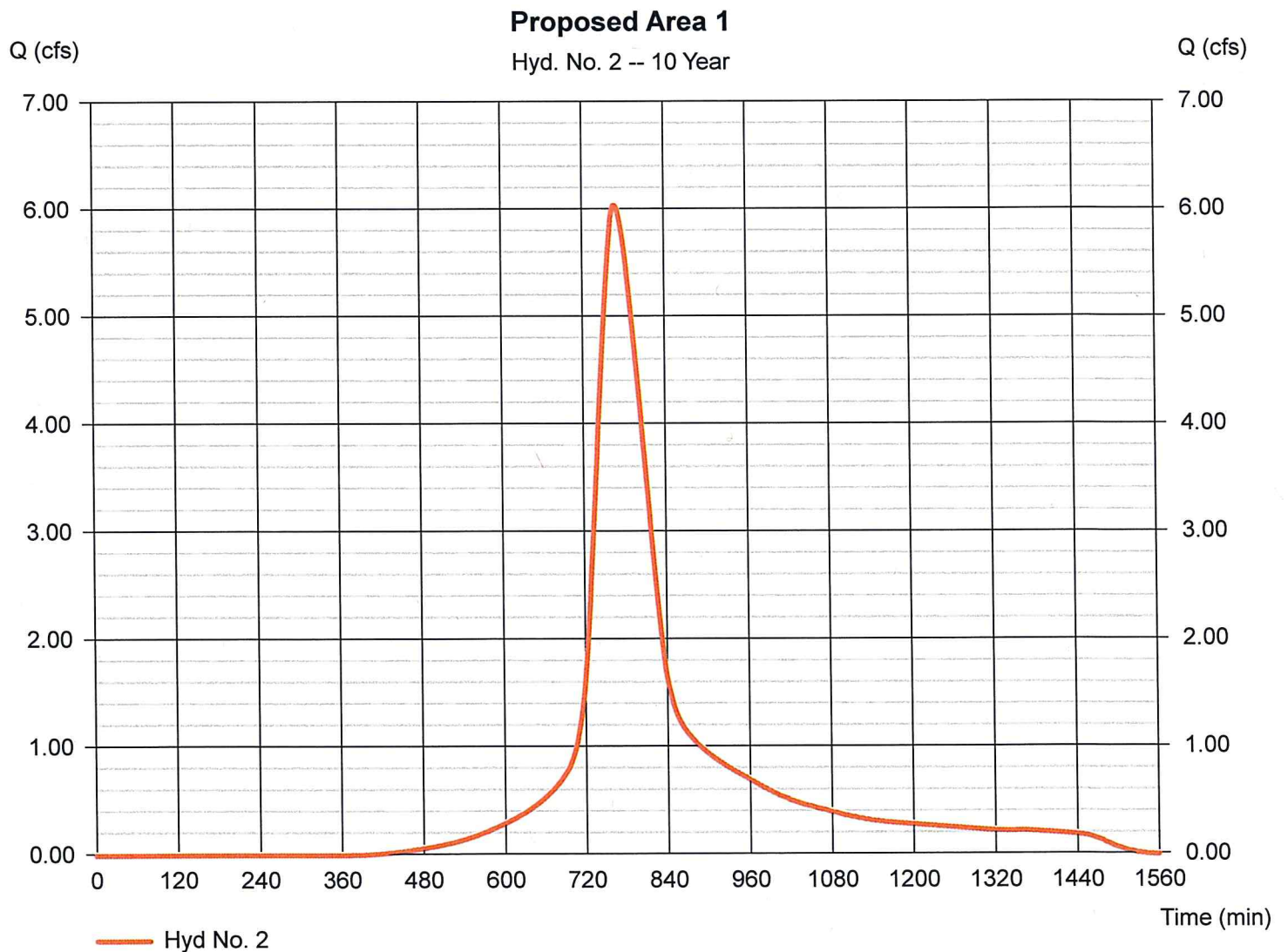
Hydrograph Report

Hyd. No. 2

Proposed Area 1

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 2 min
Drainage area = 4.080 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 5.14 in
Storm duration = 24 hrs

Peak discharge = 6.044 cfs
Time to peak = 768 min
Hyd. volume = 52,096 cuft
Curve number = 85
Hydraulic length = 0 ft
Time of conc. (Tc) = 72.50 min
Distribution = Type III
Shape factor = 484



Hydrograph Report

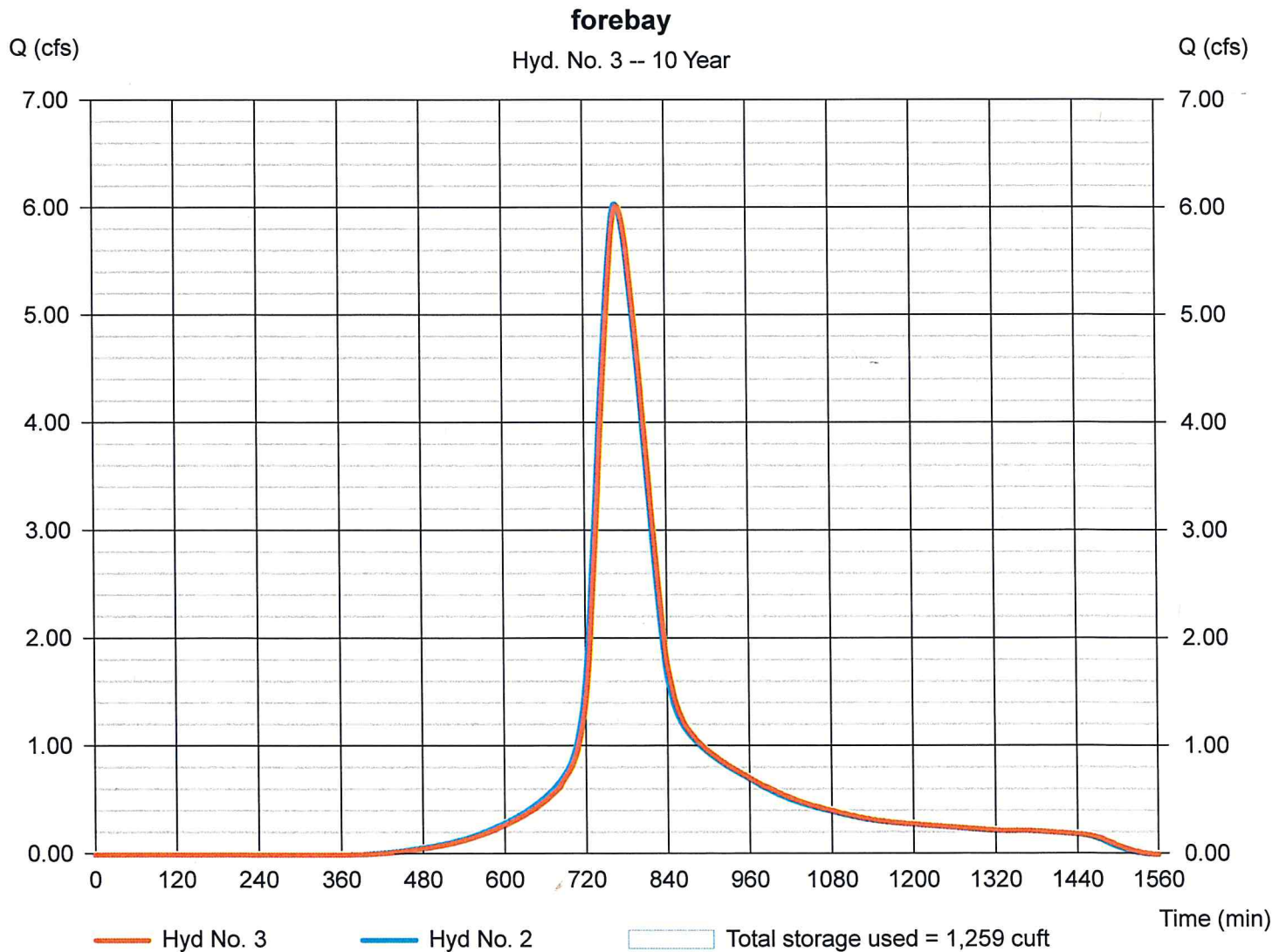
Hyd. No. 3

forebay

Hydrograph type = Reservoir
Storm frequency = 10 yrs
Time interval = 2 min
Inflow hyd. No. = 2 - Proposed Area 1
Reservoir name = forebay

Peak discharge = 6.025 cfs
Time to peak = 770 min
Hyd. volume = 52,096 cuft
Max. Elevation = 205.95 ft
Max. Storage = 1,259 cuft

Storage Indication method used.



Hydrograph Report

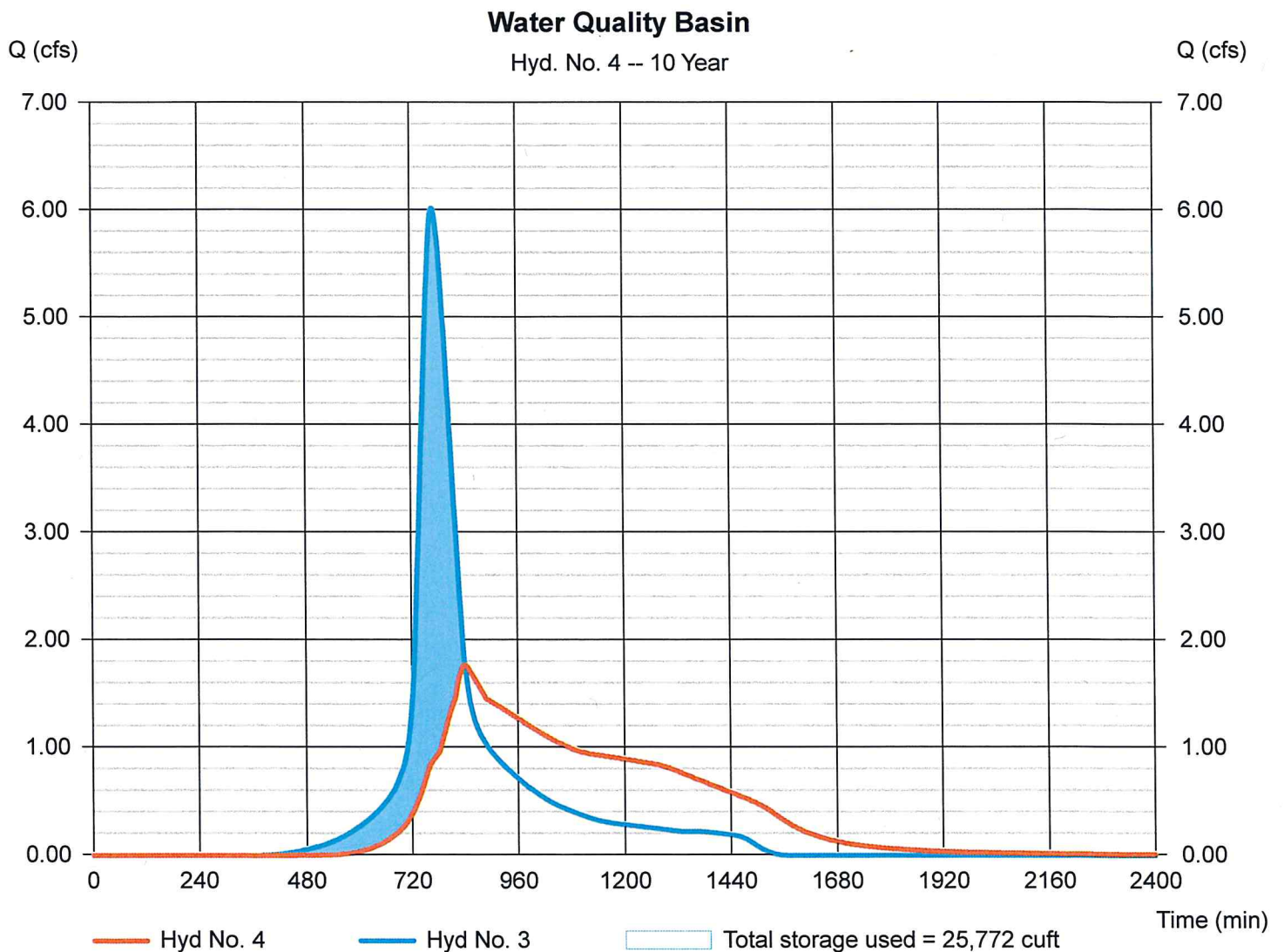
Hyd. No. 4

Water Quality Basin

Hydrograph type = Reservoir
Storm frequency = 10 yrs
Time interval = 2 min
Inflow hyd. No. = 3 - forebay
Reservoir name = Pond 1

Peak discharge = 1.767 cfs
Time to peak = 840 min
Hyd. volume = 52,034 cuft
Max. Elevation = 207.56 ft
Max. Storage = 25,772 cuft

Storage Indication method used.

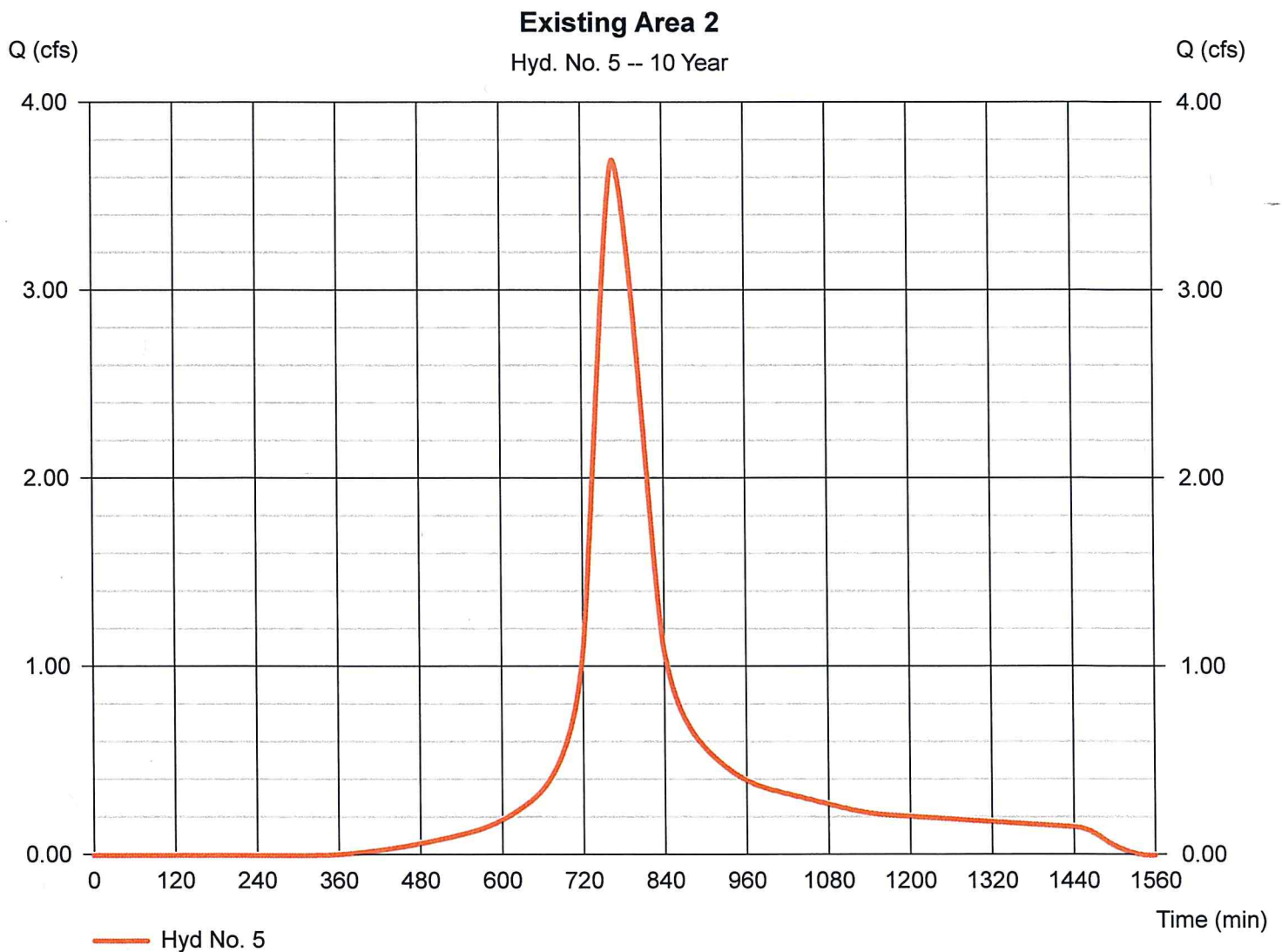


Hydrograph Report

Hyd. No. 5

Existing Area 2

Hydrograph type	= SCS Runoff	Peak discharge	= 3.696 cfs
Storm frequency	= 10 yrs	Time to peak	= 767 min
Time interval	= 1 min	Hyd. volume	= 33,616 cuft
Drainage area	= 2.640 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 72.50 min
Total precip.	= 5.14 in	Distribution	= Custom
Storm duration	= NOAA Type D Distribution 1 min.cds	Shape factor	= 484

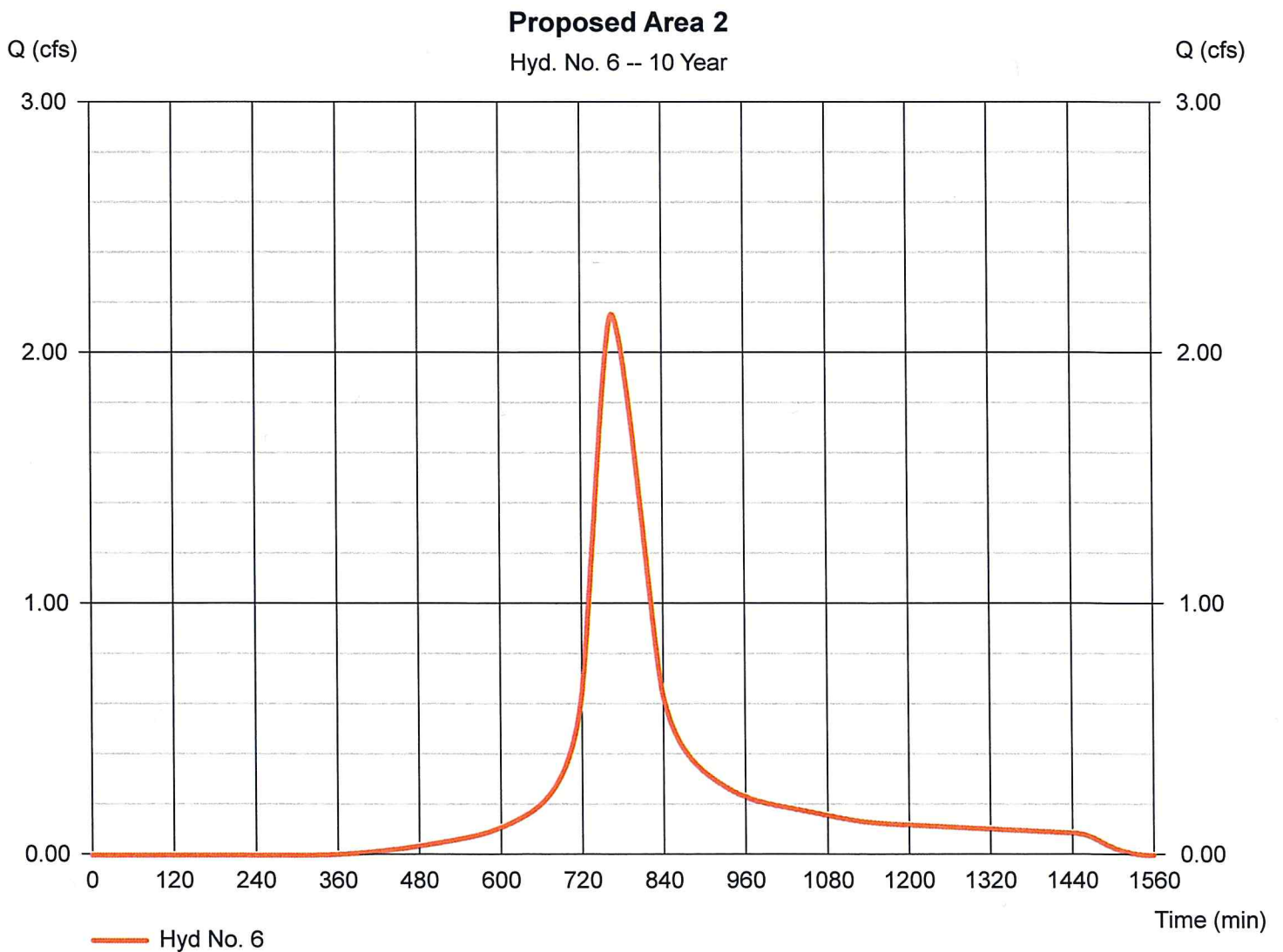


Hydrograph Report

Hyd. No. 6

Proposed Area 2

Hydrograph type	= SCS Runoff	Peak discharge	= 2.156 cfs
Storm frequency	= 10 yrs	Time to peak	= 767 min
Time interval	= 1 min	Hyd. volume	= 19,610 cuft
Drainage area	= 1.540 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 72.50 min
Total precip.	= 5.14 in	Distribution	= Custom
Storm duration	= NOAA Type D Distribution 1 min.cds	Shape factor	= 484



Hydrograph Report

Hyd. No. 8

Runoff to Swale

Hydrograph type = Rational
Storm frequency = 10 yrs
Time interval = 1 min
Drainage area = 1.300 ac
Intensity = 6.270 in/hr
IDF Curve = GSD-60 NOAA.IDF

Peak discharge = 6.520 cfs
Time to peak = 7 min
Hyd. volume = 2,739 cuft
Runoff coeff. = 0.8
Tc by User = 7.00 min
Asc/Rec limb fact = 1/1

