DRAINAGE PLAN

CEDAR HILLS ESTATES

TO

SEDGWICK COUNTY, KANSAS

PREPARED BY

Baughman
ENGINEERING | SURVEYING | PLANNING
LANDSCAPE ARCHITECTURE

29 JULY 2009

ENGINEERING | SURVEYING | PLANNING
LANDSCAPE ARCHITECTURE

DRAINAGE PLAN
CEDAR HILLS ESTATES

FINAL REPORT

Prepared by Baughman Company, P.A.
29 July 2009

By Trevor R. Kurth, P.E., CFM
N. Brent Wooten, P.E., L.S.

REPORT CONTENTS

EXISTING CONDITIONS

The site is located ½ mile between Central Avenue (4th Street) and Maple Street along the west side of 151st Street West in Sedgwick County, Kansas. The site is currently pasture with terracing, an existing pond, and trees along the southern and eastern portions of the property. The site consists of approximately 19 acres and generally drains to the north and east. There is an underground gas line which runs along the frontage to 151st Street as well as overhead electric just south of the property which serves the south adjacent homeowner.

There is no FEMA Special Flood Hazard Area (SFHA) located on this property as of this report.

Existing trees will be retained and left at existing grades, where applicable.

PROPOSED CONDITIONS

The property is proposed to be developed into a residential subdivision consisting of 6 estate sized lots (approximately 2+ acres). The subdivision will consist of single-family homes with corresponding streets, utilities, and stormwater management systems (curb and gutter, culverts, and pond systems with outfalls). There is currently one pond on the property with a dam overflow. The current dam appears to be an NRCS dam with no apparent outlet except overtopping of the dam itself. We anticipate the pond and dam outfall to be reconfigured at time of development. Approximately half of the site drains to the north – along with additional offsite runoff from the south and west – and the other half discharges to the east and into the 151st Street ROW ditch where it is then conveyed to the east under the roadway with culverts. The on-site terracing is expected to be removed at the time of development.

For a half-scale copy of the Plat, see Exhibit 4.

OFFSITE CONDITIONS

There is approximately 16 acres of offsite runoff encroaching the property at the southwest corner. Offsite areas were primarily obtained from the Sedgwick County LIDAR contouring, USGS Quadrangle Sheets, as well as site walk-throughs. The runoff appears to enter the property at the southwest corner and enters the existing pond. Due to terracing on the site as well as the adjacent west site, the LIDAR contouring may not be as accurate as the field survey and site visits. The smaller storm events may be contained and re-routed to the north on the west site; however, the larger events will encroach the existing pond and continue on this site to the northeast.

Half of the site discharges to the north property in a concentrated flow pattern.

The remainder of the site discharges to the east and into the 151st Street ROW.

The USGS Quadrangle Sheet can be seen with the site location plotted as Exhibit 1.

The LIDAR topography data for this area can be viewed as Exhibit 2.

EXISTING CONDITIONS RUNOFF CALCULATIONS

DRAINAGE METHODS & STANDARDS

The following methods and standards, although not a complete list, were used in calculating the existing conditions runoff values.

- Ø STORM SERIES
  - 24-hour; 2-yr, 5-yr, 10-yr, 25-yr, 100-yr Storm Events Modeled
  - 2-yr Rainfall Depth = 3.5 in
  - 5-yr Rainfall Depth = 4.5 in
  - 10-yr Rainfall Depth = 5.3 in
  - 25-yr Rainfall Depth = 6.1 in
  - 100-yr Rainfall Depth = 7.9 in

- Ø FLOW DATA
  - Areas per LIDAR data, USGS Quadrangle Sheet, Aerial Photos, and Site Visits
  - Hydraflow Hydrograph software for existing offsite flows
  - SCS Curve Number Method for existing flows
  - Runoff Coefficient: CN = 80 (Type B Soils, Row Crops/Open Space)
  - Time of Concentration: Lag Method

SITE CHARACTERISTICS

The proposed site is currently open space and/or pasture. The predominant soil type is Type B. The site currently includes terracing which is re-directing historical flows from the original conditions. Approximately half the site flows to east and into the 151st ROW ditch. The existing pond at the southwest corner accepts offsite runoff and discharges to the north over the existing dam section. The dam section is at elevation 1419 as well as the adjacent property to the west. On the north side of the dam section, the elevations quickly fall off and drain to the north. However, as you can see from the LIDAR data, field topography, and site visits; any runoff discharging to the west will immediately return to this property and flow to the northeast through the defined swale section. This may be misleading based on only on LIDAR topographic data due to the terracing on the adjacent site. However, when observing surveyed spot elevations and walking the site, it is readily apparent the pond will ultimately discharge to the northeast as the overall basin shows on the USGS Quadrangle Sheet prior to terracing and the construction of the ponds dam. The FEMA FIRM Panel also shows a stream 'thread' which runs to the north and then east. Also, when the areas to the north and west are developed in the future, the terracing will be removed and the natural drainage will likely/should be re-instated.

The existing site characteristics can be seen from the aerial exhibit (Exhibit 3).

EXISTING CONDITIONS HYDROLOGIC ANALYSIS

The site was analyzed for pre-development conditions using the hydrograph method for the 2, 5, 10, 25, and 100 year storm events. A curve number of 80 was used for existing conditions assuming a mix use of undeveloped open space in fair

condition and row crops with Type B soils. The time of concentration was calculated using Lag Method with a minimum time of concentration of 15 minutes. There are currently two locations of offsite drainage encroachment onto the property. As discussed earlier, the main offsite drainage comes from the southwest and into the existing pond. This area, approximately 16 acres, will produce approximately 75 cfs in the 100-year storm, with a calculated time of concentration (Tc) of 30 minutes. There is also a smaller amount of runoff entering the site just north of the pond from the west. This area appears to be approximately 2.6 acres and will produce 18 cfs in the 100-year storm event, assuming a 15 minute Tc. Both of these areas then drain to the north and east onto the adjacent north property via a defined swale section. Eventually, approximately 700 feet downstream, this runoff drains to the east and under 151st Street via culverts. Again, this flow pattern may not be apparent on smaller event storms due to the number of terraces in the area.

DOWNSTREAM DRAINAGE CAPACITY

There are currently two points of drainage discharge for the current site. First, the westerly flow is conveyed north through the adjacent farmed agricultural field and then to the east and under 151st Street through 2 – HECMP's. These pipes are 40"x28" (approximately equivalent to 33" pipes) and approximately 30 feet long. We anticipate these pipes to carry approximately 85 cfs (combined) without overtopping the roadway. The easterly portion of the site, as well as additional ROW drainage, is conveyed to the east under 151st Street via an additional set of 40"x28" HECMP's. These pipes are also anticipated to convey 84 cfs (combined) without overtopping 151st Street. The ROW ditch section also appears to have limited capacity, and may need cleaned out for additional capacity. These pipes appear to be adequately sized to handle the existing flows.

POST-DEVELOPMENT HYDROLOGIC ANALYSIS

DRAINAGE METHODS & STANDARDS

The following methods and standards, although not a complete list, were used in developing the drainage and grading plans.

- Ø STORM SERIES
  - 24-hour; 2-yr, 5-yr, 10-yr, 25-yr, 100-yr Storm Events Modeled
  - Hydraflow Hydrograph software for existing flows
  - Curve Number; CN = 70 (Type B/C Soils, Single-Family, 2 acre)
  - Time of Concentration; Lag Method, minimum Tc = 15min

- Ø GRADING CONSTRAINTS
  - Minimum 1% Cross-lot Rear Yard Grades
  - Minimum 0.5% Street Grades
  - Double Curb Inlets utilized at all street sump locations
  - Emergency Overflows for 24-hr, 100-yr Storm Event

- Ø POND ROUTING / GRADING
  - Hydraflow Hydrograph software utilized for modeling
  - Minimum 1 ' Freeboard from 100-yr Water Surface Elevations to adjacent lot corners
  - Minimum 5:1 sideslopes on pond and pond weir outfall

DETENTION FACILITIES

There is one (1) pond proposed in this subdivision. The pond can be seen on the half-scale Drainage & Grading Plan in Exhibit 5. The proposed pond system is described in more detail below.

- Ø PROPOSED SOUTH POND

  The proposed south pond is located at the extreme southwest corner of the property. The existing pond at this location will be over-excavated and a defined outfall constructed. Currently, there is no defined outfall structure on the pond. The pond discharges runoff over the existing dam section near the west side and then flows north on this property in a ditch section and onto the north adjacent property. The pond will have a static water surface elevation of a 1414 with a 5 ' weir section at the same elevation. The weir section will have 5:1 sideslopes and will tie directly into the current dam elevations when constructed. This will allow the pond to have a manageable water surface and a defined outlet. The pond is expected to have a 100-year water surface elevation of a 1416.6. The top of the dam, as well as the adjacent property to the west, is at elevation 1419. This will also serve as the emergency spillway.

DETENTION SUMMARY

The overall site, including offsite runoff from the south and west, will be absorbed/detained in the proposed pond. As described above, the existing pond has no defined outfall and is therefore being considered as having no existing detention effect. The overall detention of the site after development detailed below.

POND SYSTEM

POND	INFLOW	OUTFLOW	100-yr WSE	OUTLET
South Pond	86 cfs	53 cfs	1416.6	5 'Weir Cut into Dam

DISCHARGE POINTS SUMMARY

There are two main discharge points for this proposed addition. First, the western portion of the site along with offsite runoff drains to the directly north adjacent property (currently a farmed agricultural field with terracing and standing water – based on site visits and aerial photographs). This area is then directly connected to the 151st ROW ditch. Secondly, the eastern portion of the site drains to the east and into the 151st ROW ditch. There are two sets of culverts under 151st Street that serve as the primary outlets for these two basins. Based on hydraulic analysis, these pipes are very similar when comparing capacity and effectiveness.

Please note the values for the developed areas actually lower the proposed runoff to less than existing conditions. This is due to SCS Curve Numbers being less than the existing pasture / open space curve numbers with this particular soil type. The development will remove terracing and will likely add turf grasses and ground cover that will allow the curve number to be less than the sparsely poor-conditioned open space that is currently on site.

The flows listed below are peak flows for the 24-hour, 100-yr storm events.

LOCATION	STRUCTURE	EXIST RUNOFF	PROP RUNOFF**
Adjacent North Agricultural Land	At-Grade	120 cfs *	67 cfs
151st ROW Ditch	Ditch Section	69 cfs	55 cfs

*This value is the total runoff from this site as well as south and west offsite areas. No detention was assumed in the existing pond.

**These values are proposed runoff from the subdivision after detention and the removal of terracing.

POTENTIAL UPSTREAM/DOWNSTREAM IMPACTS

No potential upstream impacts are expected with this development.

Due to detention on the proposed site as well as an adequately sized culverts conveying runoff to the east under 151st Street, we do not anticipate any negative downstream impacts.

SOURCE OF FLOODPLAIN INFORMATION

The site lies within a FEMA Zone X. The site is not located within a mapped FEMA SFHA. The location of the property, on FEMA FIRM Panels 310 and 320 of 700 for Sedgwick County, Kansas, effective February 2, 2007, is attached as Exhibit 6.

FEDERAL, STATE, & LOCAL PERMITTING

US ARMY CORPS OF ENGINEERS

There does not appear to be any jurisdictional waters of the US on this site.

KANSAS DEPT OF AGRICULTURE – DWR PERMITTING

There does not appear to be any DWR permitting needed on the proposed site at this time.

FEMA

There is no mapped floodplain located upon the proposed site. Therefore, no FEMA permitting is expected at this time.

KANSAS DEPT OF TRANSPORTATION

There does not appear to be any KDOT permitting needed on the proposed project.

SEDGWICK COUNTY PERMITTING

A portion of the site will discharge into the 151st Street ROW ditch and will therefore require a county ROW permit.

EXHIBIT 1: Site Location Map

EXHIBIT 2: LIDAR Exhibit with Aerial Photograph

EXHIBIT 3: Aerial Photo Exhibit with Hand Topography

EXHIBIT 4: Plat – Half Scale

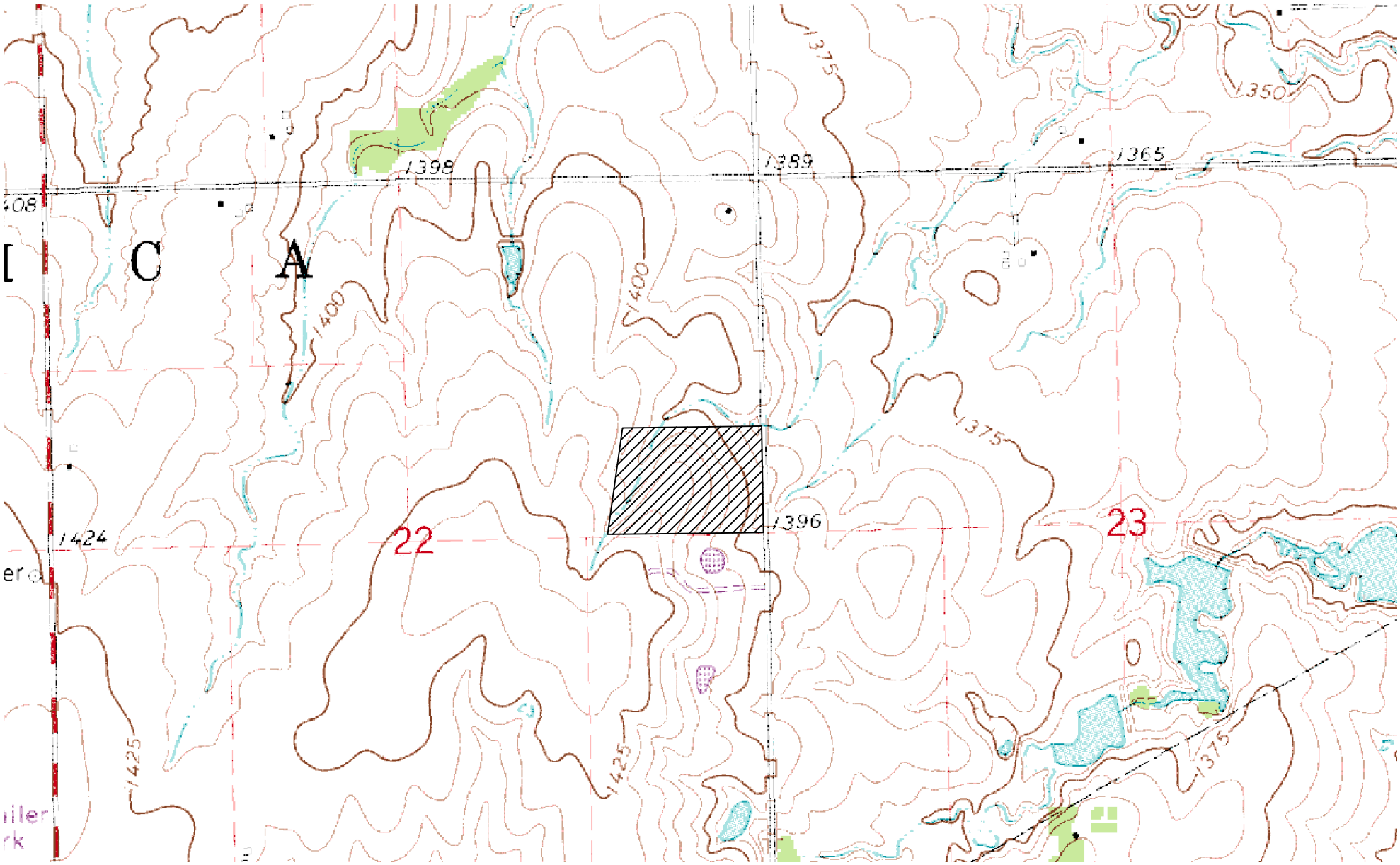
EXHIBIT 5: Drainage & Grading Plan – Half Scale

EXHIBIT 6: Floodplain Location (FIRM)

USGS QUADRANGLE EXHIBIT

CEDAR HILLS ESTATES

SEDGWICK COUNTY, KANSAS



0 500 1000

DATE OF PREPARATION: 24 July 2009
CONTOUR INTERVALS = 1 FOOT

EXHIBIT 1
CEDAR HILLS ESTATES
24 July 2009

Baughman Company , P.A.
315 Ellis St Wichita, KS 67211 P 316-262-7271 F 316-262-0149
Baughman ENGINEERING | SURVEYING | PLANNING | LANDSCAPE ARCHITECTURE

LIDAR EXHIBIT

CEDAR HILLS ESTATES

SEDGWICK COUNTY, KANSAS

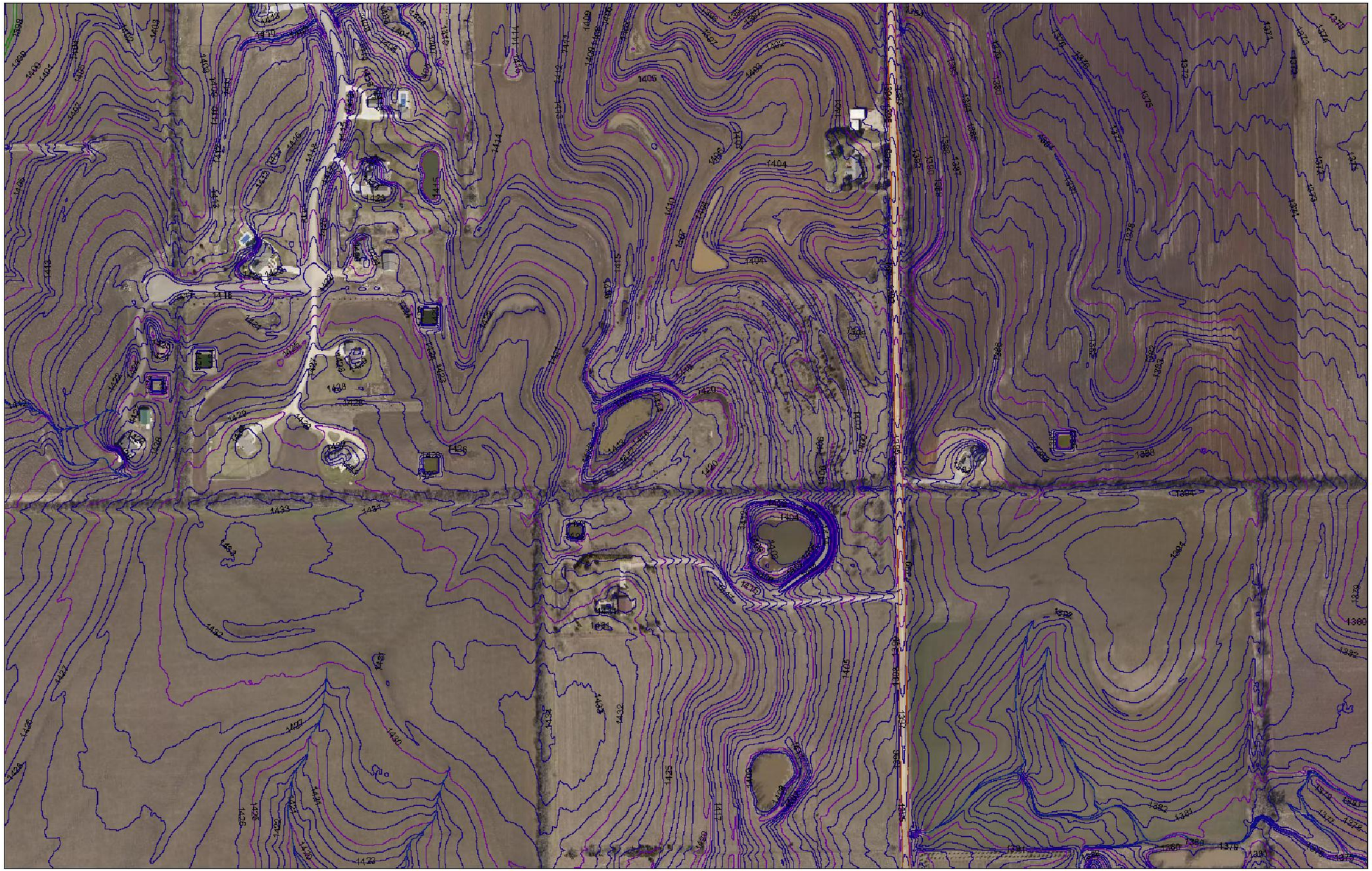


EXHIBIT 8

CEDAR HILLS ESTATES

24 July 2009

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315 Ellis St Wichita, KS 67211 P 316.262.7271 F 316.262.0149
Baughman ENGINEERING | SURVEYING | PLANNING | LANDSCAPE ARCHITECTURE

AERIAL EXHIBIT

CEDAR HILLS ESTATES

SEDGWICK COUNTY, KANSAS

0 100 200

DATE OF PREPARATION: 24 July 2009
CONTOUR INTERVALS = 1 FOOT

EXHIBIT 2
CEDAR HILLS ESTATES
24 July 2009

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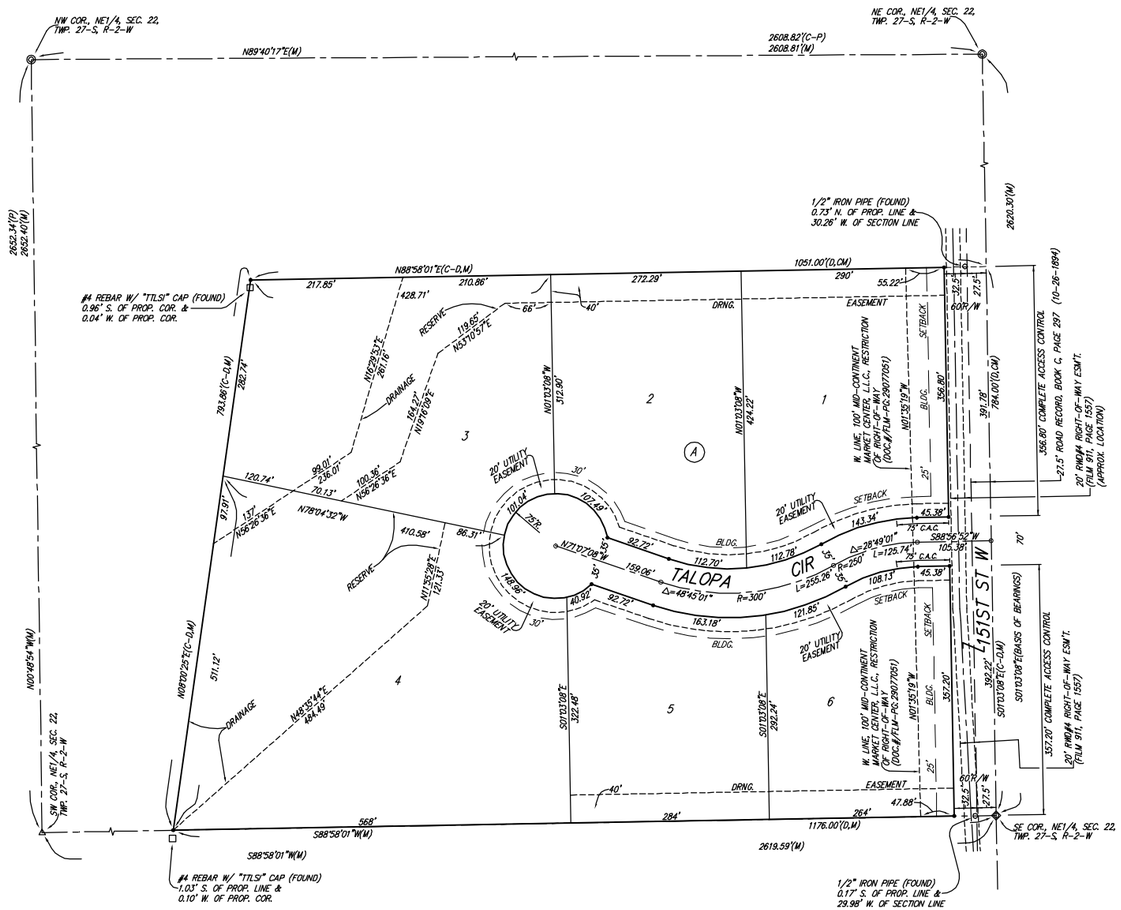
CEDAR HILLS ESTATES
SEDGWICK COUNTY, KANSAS



MINIMUM BUILDING PAD ELEVATIONS FOR LOWEST OPENING TO THE STRUCTURES		
LOT	BLOCK	ELEVATION NAVD88
3	A	1410.0
4	A	1419.5

BENCHMARK:
RAILROAD SPIKE IN EAST FACE OF FIRST POWER POLE NORTH OF THE E1/4 COR., SEC. 22, TWP. 27-S, R-2-W.
27.7' WEST OF SECTION LINE
251.7' NORTH OF E1/4 COR., SEC. 22.
ELEV. = 1398.81 NAVD88

- ● = #4 REBAR W/ "BAUGHMAN" CAP (SET)
- ○ = 1/2" IRON PIPE (FOUND)
- □ = #4 REBAR W/ "TTLS" CAP (FOUND)
- ◎ = 3/4" IRON PIPE WITH SEDGWICK COUNTY CAP (FOUND)
- △ = STONE (FOUND)
- ◆ = 1/2" IRON PIPE OVER STONE (FOUND)

(M) = MEASURED
(P) = PLATTED
(D) = DESCRIBED
(CM) = CALCULATED PER MEASURED INFO.
(C-P) = CALCULATED PER PLATTED INFO.
(C-D) = CALCULATED PER DESCRIBED INFO.

0 100 200

NOTE:
A drainage plan has been developed for this subdivision and is on file with the County Engineer of the appropriate governing body. Drainage intent shall remain as depicted or as modified with the approval of the County Engineer of the appropriate governing body. No obstructions which impede the flow of this drainage plan shall be allowed.

State of Kansas)
Sedgwick County) SS

We, Baughman Company, P.A., Surveyors in aforesaid county and state do hereby certify that we have surveyed and platted "CEDAR HILLS ESTATES", Sedgwick County, Kansas and that the accompanying plat is a true and correct exhibit of the property surveyed, described as follows: A tract in the NE1/4 of Sec. 22, Twp. 27-S, R-2-W of the 6th P.M., Sedgwick County, Kansas, described as beginning at the SE corner thereof; thence north along the east line of said NE1/4, 784 feet; thence west parallel with the south line of said NE/4, 1051 feet; thence southwesterly to a point on the south line of said NE1/4, said point being 1176 feet west of the SE corner thereof; thence east 1176 feet to beginning, subject to road easement on east 30 feet thereof.

Existing public easements and dedications being vacated by virtue of K.S.A. 12-512(b).

Baughman Company, P.A.

_____, Surveyor
Michael G. Conrey

Know all men by these presents that we, the undersigned, have caused the land in the surveyors certificate to be platted into Lots, a Block, and a Street, to be known as "CEDAR HILLS ESTATES", Sedgwick County, Kansas. The utility easements are hereby granted as indicated for the construction and maintenance of all public utilities. The drainage easement is hereby granted as indicated for drainage purposes. The drainage reserves are hereby reserved for drainage purposes and each drainage reserve shall be the responsibility of the corresponding lot owners, (Lot 3 and Lot 4, Block A), until such time as the appropriate governing body elects to assume the responsibility for maintenance and improvements to the drainage. No buildings shall be constructed or placed on or within said drainage reserve, nor shall any fill, change of grade, creation of channel, or any other work be carried on without the permission of the Engineer for said appropriate governing body. Access controls shall be as depicted on the face of the plat and are hereby granted to the appropriate governing body. The Minimum Building Pad Elevations for the lowest opening to the structures on Lots 3, Block A, shall be 1410.0 NAVD88. The Minimum Building Pad Elevations for the lowest opening to the structures on Lots 4, Block A, shall be 1419.5 NAVD88.

Jason A. Wenzel a/k/a Jason Wenzel

Jodi M. Wenzel a/k/a Jodi Wenzel

State of Kansas)
Sedgwick County) SS

The foregoing instrument acknowledged before me, this_____day of_____, 2009, by Jason A. Wenzel, a/k/a Jason Wenzel and Jodi M. Wenzel, a/k/a Jodi Wenzel, husband and wife.

_____, Notary Public

My App't. Exp._____

We, the undersigned holders of a mortgage on the above described property, do hereby consent to this plat of "CEDAR HILLS ESTATES", Sedgwick County, Kansas.

Farm Credit of the Heartland, FLCA

_____, _____
(Title)

State of Kansas)
Sedgwick County) SS

The foregoing instrument acknowledged before me, this_____day of_____, 2009, by_____, _____(Title) of Farm Credit of the Heartland, FLCA, on behalf of the association.

_____, Notary Public

My App't. Exp._____

This plat of "CEDAR HILLS ESTATES", Sedgwick County, Kansas has been submitted to and approved by the Wichita-Sedgwick County Metropolitan Area Planning Commission, Wichita, Kansas.

Dated this_____day of_____, _____.
Wichita-Sedgwick County Metropolitan Area Planning Commission

_____, Chair
Darrell Downing

_____, Secretary
John L. Schlegel

This plat approved and all dedications shown hereon accepted by the City Council of the City of Wichita, Kansas, this_____day of_____, 2009.

_____, Mayor
Carl Brewer

_____, City Clerk
Karen Sublett

This plat approved and all dedications shown hereon accepted by the Board of Commissioners of Sedgwick County, Kansas, this_____day of_____, 2009.

_____, Chairman
Kelly Parks

ATTEST:_____, County Clerk
Kelly B. Arnold

Reviewed in accordance with K.S.A. 58-2005 on this_____day of_____, 2009.

_____
Tricia L. Robello, L.S. #1246
Deputy County Surveyor
Sedgwick County, Kansas

Entered on transfer record this_____day of_____, 2009.

_____, County Clerk
Kelly B. Arnold

State of Kansas)
Sedgwick County) SS

This is to certify that this plat has been filed for record in the office of the Register of Deeds, this_____day of_____, 2009 at_____o'clock___M; and is duly recorded.

_____, Register of Deeds
Bill Meek

_____, Deputy
Tonya Buckingham

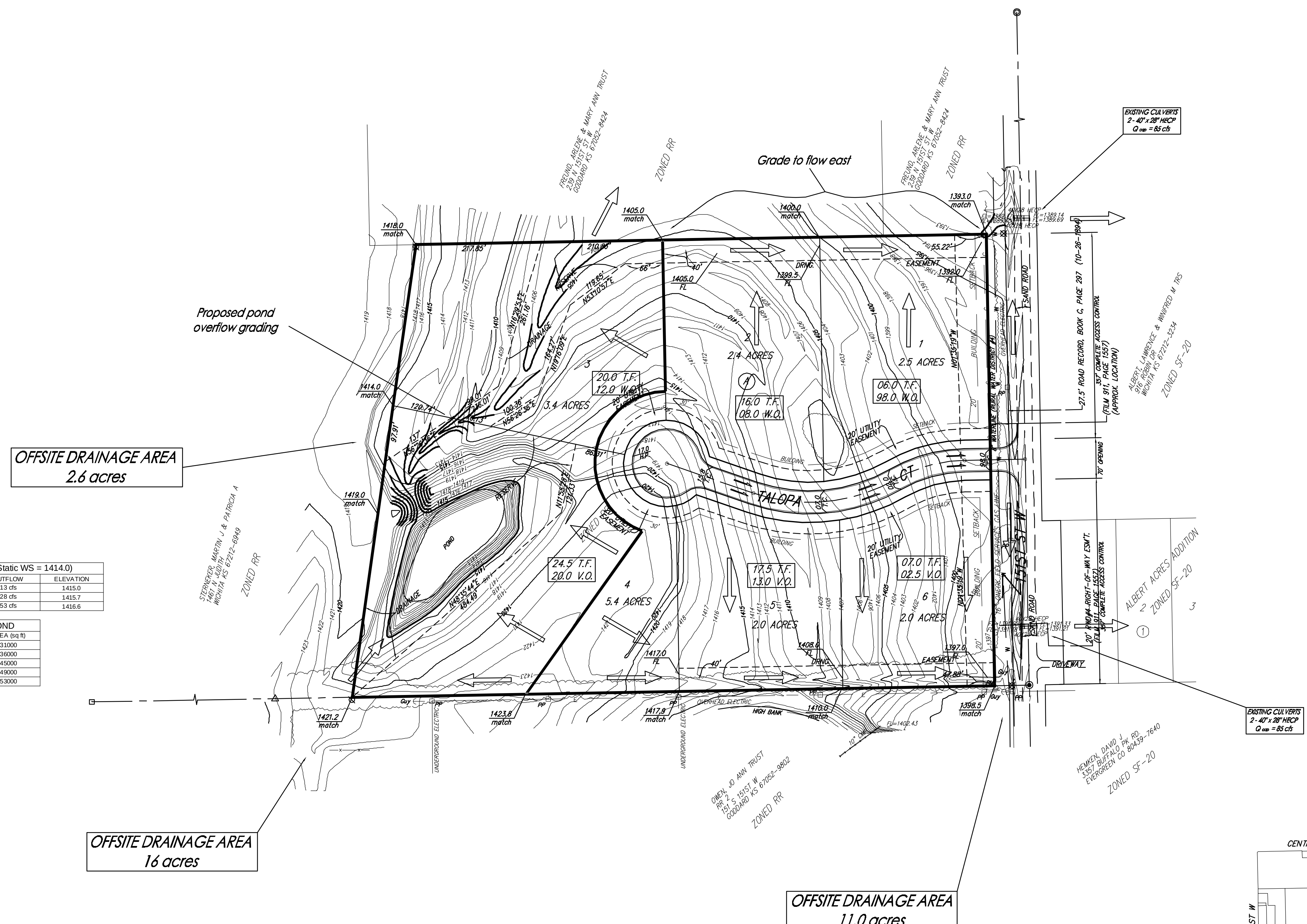
Baughman Company, P.A.
315 Ellis St. Wichita, KS 67211 P 316-262-7271 F 316-262-0149
ENGINEERING | SURVEYING | PLANNING | LANDSCAPE ARCHITECTURE

F:\PLAT\CEDAR HILLS ESTATES\DWG\WENZELF.DWG-MGC

DRAINAGE & GRADING PLAN

CEDAR HILLS ESTATES

SEDGWICK COUNTY, KANSAS



PROPOSED SOUTH POND (Static WS = 1414.0)			
STAGE	INFLOW	OUTFLOW	ELEVATION
2 yr	25 cfs	13 cfs	1415.0
10 yr	49 cfs	28 cfs	1415.7
100 yr	86 cfs	53 cfs	1416.6

PROPOSED POND	
ELEVATION	AREA (sq ft)
1414	31000
1415	36000
1416	45000
1417	49000
1418	53000

OWNER/DEVELOPER:
JASON WENZEL
240 N. REECE RD.
GODDARD, KS 67052
PH: 316-641-6144

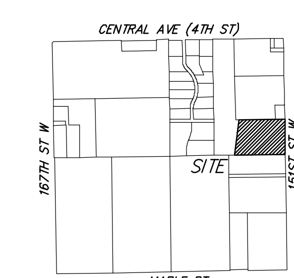
LEGAL DESCRIPTION:
A TRACT IN THE NE1/4 OF SEC. 22, TWP. 27-S, R-2-W OF THE 6TH P.M., SEDGWICK COUNTY, KANSAS, DESCRIBED AS BEGINNING AT THE SE. CORNER THEREOF; THENCE NORTH ALONG THE EAST LINE OF SAID NE1/4, 784 FEET; THENCE WEST PARALLEL WITH THE SOUTH LINE OF SAID NE1/4, 1051 FEET; THENCE SOUTWESTERLY TO A POINT ON THE SOUTH LINE OF SAID NE1/4, SAID POINT BEING 1176 FEET WEST OF THE SE. CORNER THEREOF; THENCE EAST 1176 FEET TO BEGINNING, SUBJECT TO ROAD EASEMENT ON EAST 30 FEET THEREOF.

RAILROAD SPIKE IN EAST FACE POWER POLE 250' NE OF THE SE COR. NE1/4, SEC. 22, TWP. 27-S, R-2-W
ELEV. = 1398.81 (NAVD 88)

- • = #4 REBAR W/ "BAUGHMAN" CAP (SET)
- ⦰ = #4 REBAR W/ "TERRATECH" CAP (FOUND)
- △ = 3/4" IRON (FOUND)
- ⊠ = 1/2" IRON PIPE (FOUND)
- ⊡ = STONE (FOUND)
- = 1/2" IRON PIPE OVER STONE (FOUND)
- ◎ = IP W/COUNTY CAP (FOUND)

PP ⊡ = Power Pole
Guy ⟵ = Guy Anchor
PM = Pipeline Marker

W — WATER LINE
G — GAS LINE
x — FENCE
E — ELECTRIC LINE



VICINITY MAP
SEC. 22, T27S, R2W

NOTE: This site does not lie within a FEMA SFHA based on FEMA FIRM Panels 310 & 320 of 700 for Sedgwick County, Kansas, effective February 2, 2007.

NOTE: Remove terracing at time of site development.

DRAINAGE & GRADING PLAN
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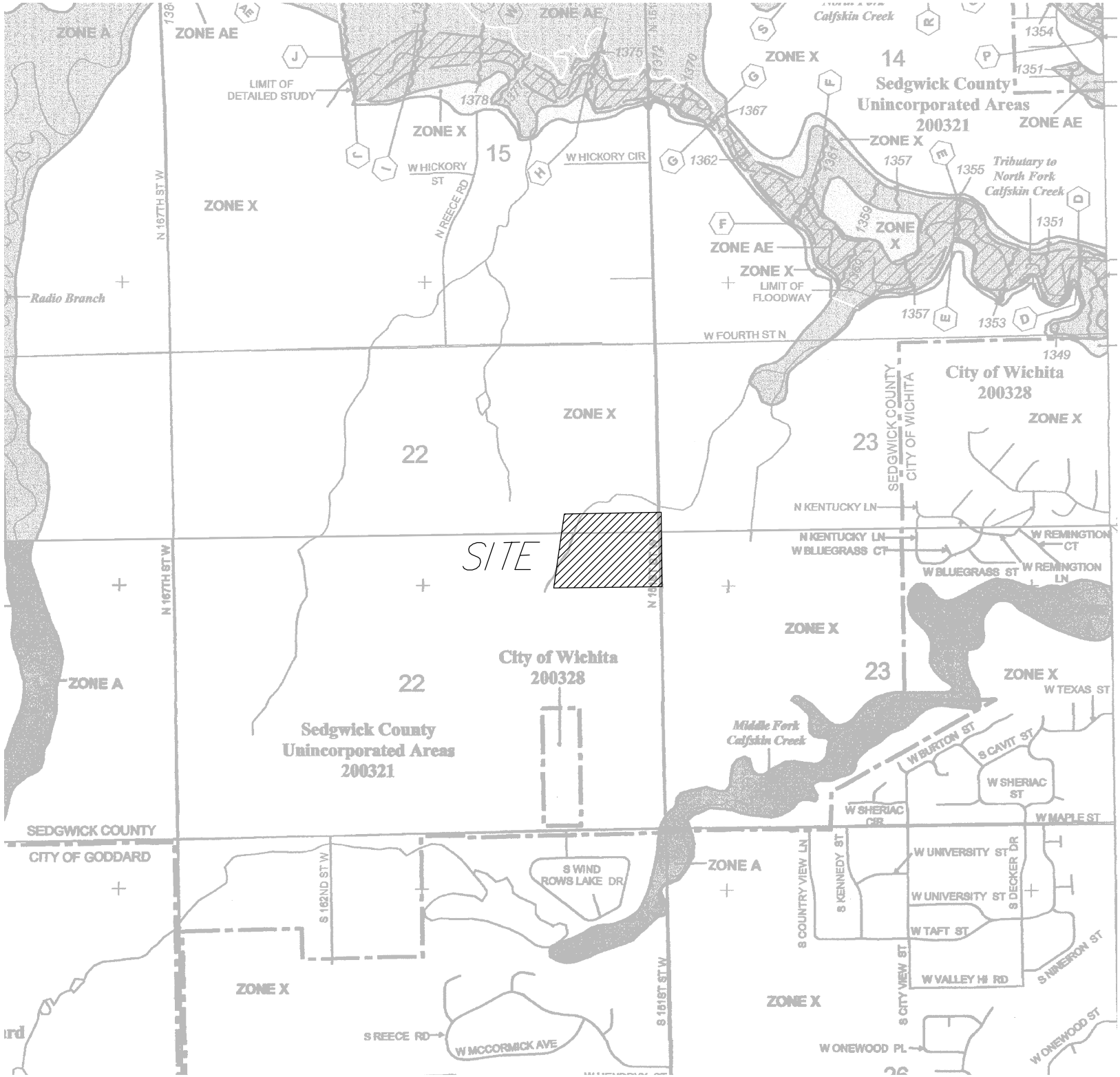
F:\HYDRO\Projects\Cedar Hills Estates - Wenzel\WENZEL-P_drain-grade REVISED 7-24-09.dwg



MAP SCALE 1" = 1000'

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0310E

FIRM

FLOOD INSURANCE RATE MAP

SEDGWICK COUNTY, KANSAS
AND INCORPORATED AREAS

PANEL 310 OF 700

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SEDGWICK COUNTY	200321	0310	E
WICHITA, CITY OF	200328	0310	E

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0320E

FIRM

FLOOD INSURANCE RATE MAP

SEDGWICK COUNTY, KANSAS
AND INCORPORATED AREAS

PANEL 320 OF 700

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GODDARD, CITY OF	200900	0320	E
SEDGWICK COUNTY	200321	0320	E
WICHITA, CITY OF	200328	0320	E

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
20173C0320E

EFFECTIVE DATE
FEBRUARY 2, 2007
Federal Emergency Management Agency

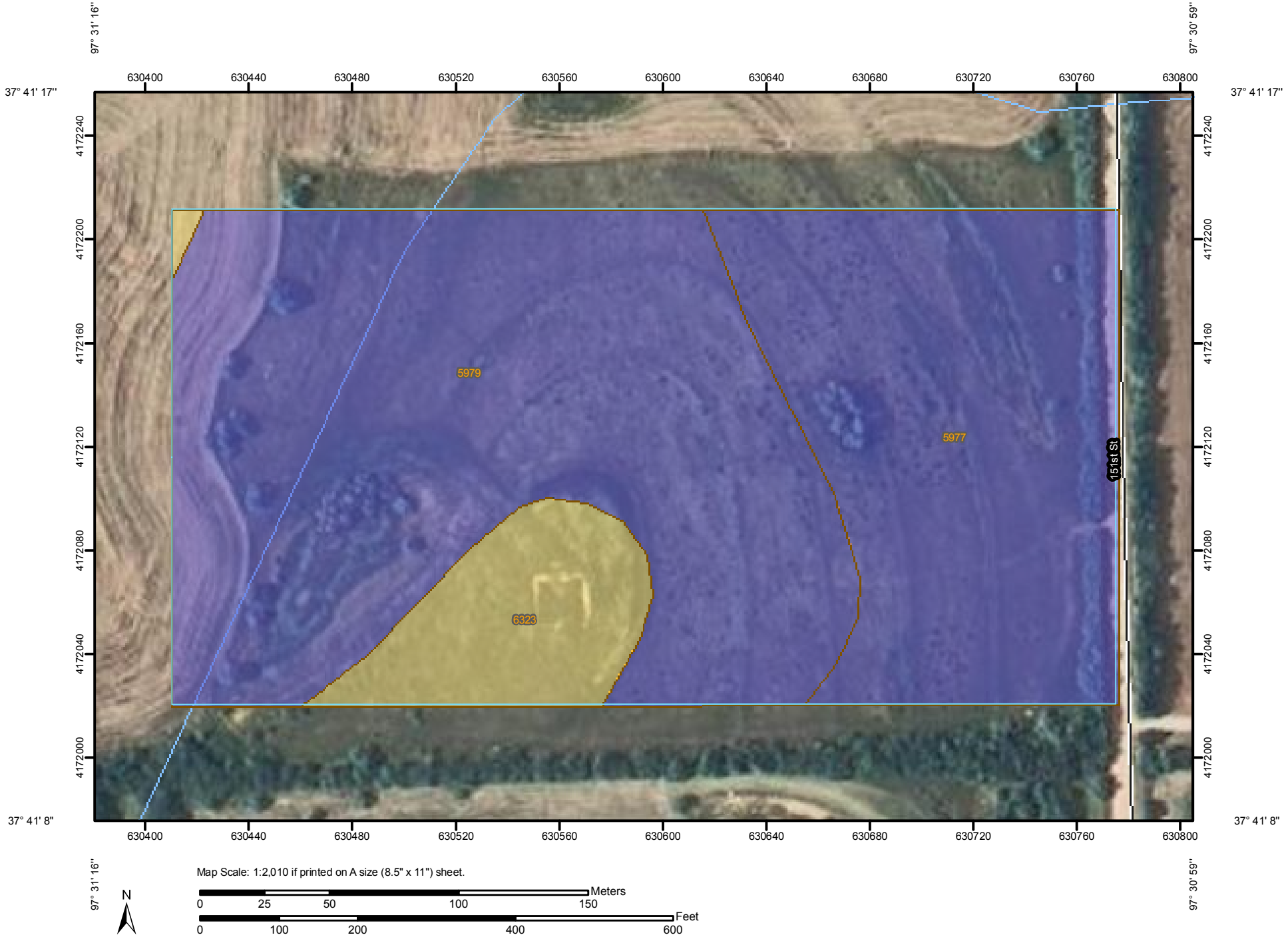
APPENDIX A: USGS Soils Survey

APPENDIX B: HydraFlow Hydrograph
- Existing Conditions
- Proposed Pond System

APPENDIX C: HydraFlow Express
- North 151st Culverts
- South 151st Culverts

USGS Soils Survey

Hydrologic Soil Group—Sedgwick County, Kansas
(Cedar Hills Estates)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Soil Ratings
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:2,010 if printed on A size (8.5" × 11") sheet.

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 14N NAD83

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

Soil Survey Area: Sedgwick County, Kansas
Survey Area Data: Version 5, Dec 3, 2008

Date(s) aerial images were photographed: 6/30/2006

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

Hydrologic Soil Group— Summary by Map Unit — Sedgwick County, Kansas				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
5977	Vanoss silt loam, 1 to 3 percent slopes	B	5.8	33.8%
5979	Vanoss silt loam, 3 to 7 percent slopes, eroded	B	9.8	56.5%
6323	Blanket silt loam, 1 to 3 percent slopes	C	1.7	9.7%
Totals for Area of Interest			**17.3**	**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

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie.

The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Lower

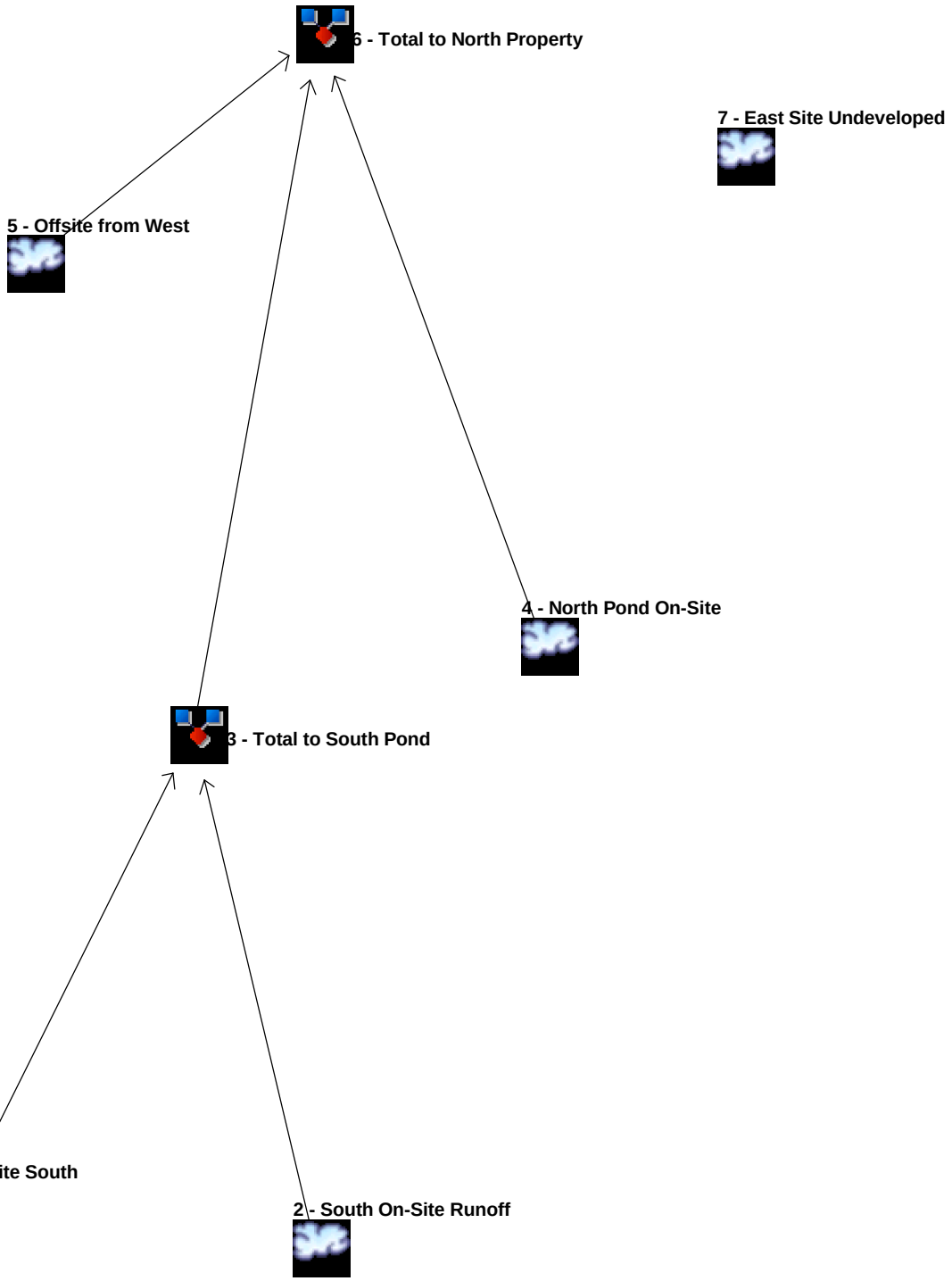
The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

HydraFlow Hydrographs

Existing Conditions
Proposed Pond System

Watershed Model Schematic

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



Legend

Hyd.	Origin	Description
1	SCS Runoff	Offsite South
2	SCS Runoff	South On-Site Runoff
3	Combine	Total to South Pond
4	SCS Runoff	North Pond On-Site
5	SCS Runoff	Offsite from West
6	Combine	Total to North Property
7	SCS Runoff	East Site Undeveloped

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	SCS Runoff	------	-------	22.01	-------	33.42	42.96	52.66	-------	74.79	Offsite South
2	SCS Runoff	------	-------	4.183	-------	7.199	9.883	12.70	-------	19.35	South On-Site Runoff
3	Combine	1, 2	-------	24.46	-------	37.62	48.74	60.11	-------	86.15	Total to South Pond
4	SCS Runoff	------	-------	5.019	-------	8.639	11.86	15.24	-------	23.21	North Pond On-Site
5	SCS Runoff	------	-------	5.349	-------	8.080	10.34	12.63	-------	17.84	Offsite from West
6	Combine	3, 4, 5	-------	32.31	-------	51.04	66.84	83.08	-------	120.50	Total to North Property
7	SCS Runoff	------	-------	20.57	-------	31.08	39.76	48.57	-------	68.60	East Site Undeveloped

Hydrograph Summary Report

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

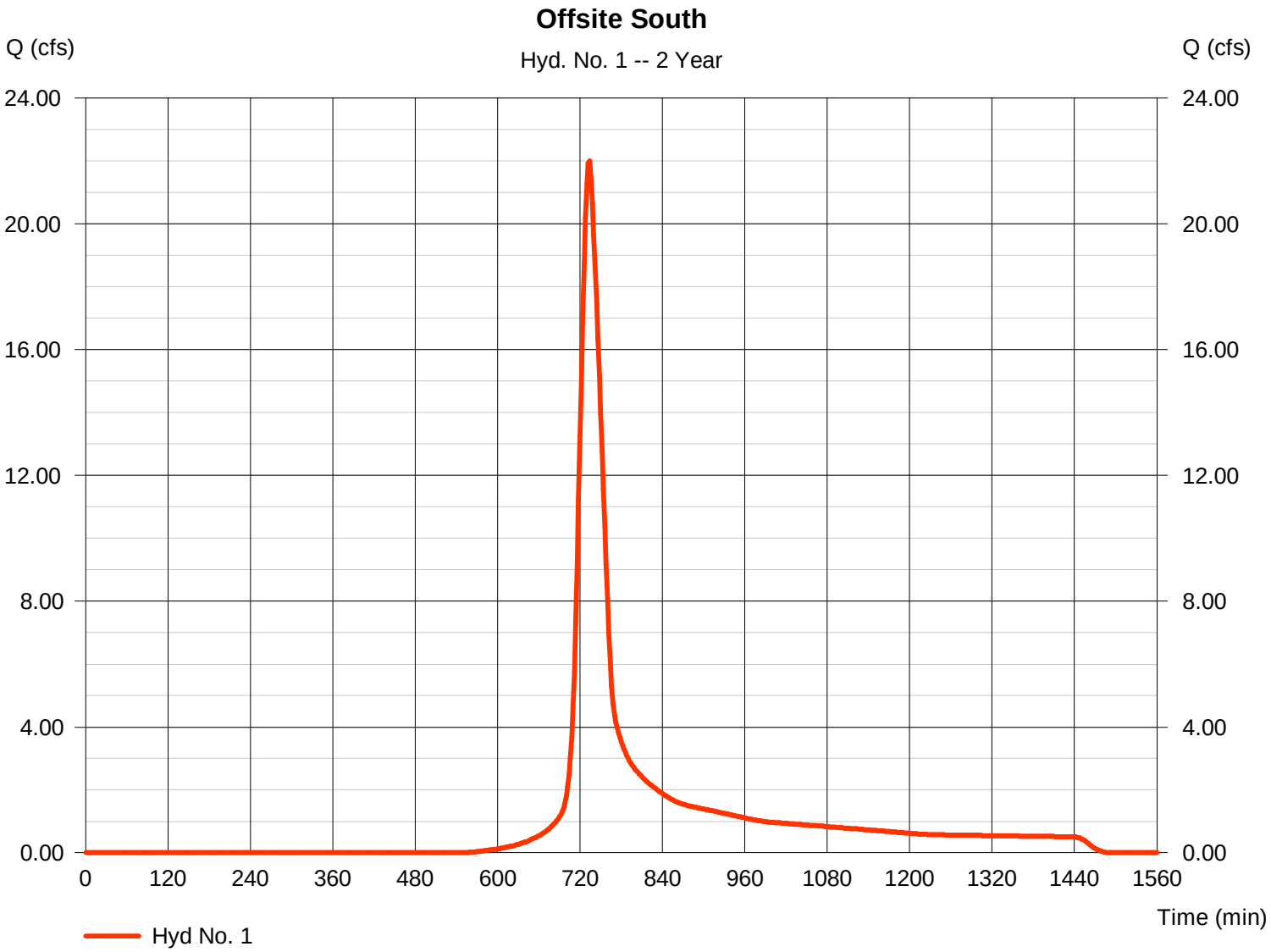
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	22.01	2	734	96,228	------	------	------	Offsite South
2	SCS Runoff	4.183	2	724	12,488	------	------	------	South On-Site Runoff
3	Combine	24.46	2	732	108,716	1, 2	------	------	Total to South Pond
4	SCS Runoff	5.019	2	724	14,985	------	------	------	North Pond On-Site
5	SCS Runoff	5.349	2	722	15,058	------	------	------	Offsite from West
6	Combine	32.31	2	726	138,759	3, 4, 5	------	------	Total to North Property
7	SCS Runoff	20.57	2	722	57,915	------	------	------	East Site Undeveloped

Hydrograph Report

Hyd. No. 1

Offsite South

Hydrograph type	=	SCS Runoff	Peak discharge	=	22.01 cfs
Storm frequency	=	2 yrs	Time to peak	=	734 min
Time interval	=	2 min	Hyd. volume	=	96,228 cuft
Drainage area	=	16.000 ac	Curve number	=	80
Basin Slope	=	1.0 %	Hydraulic length	=	950 ft
Tc method	=	LAG	Time of conc. (Tc)	=	30.56 min
Total precip.	=	3.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

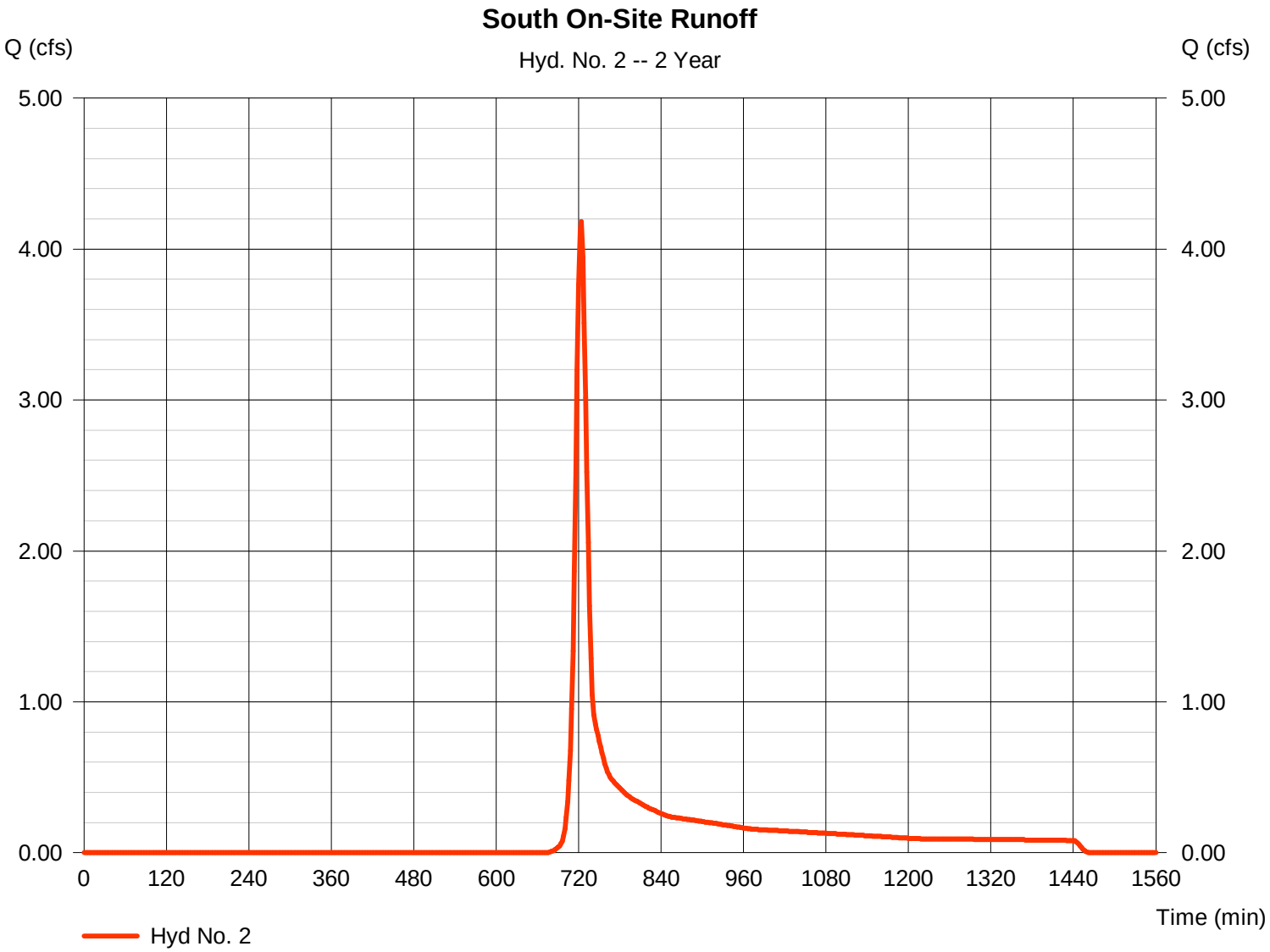


Hydrograph Report

Hyd. No. 2

South On-Site Runoff

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.183 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	12,488 cuft
Drainage area	=	3.500 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	3.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

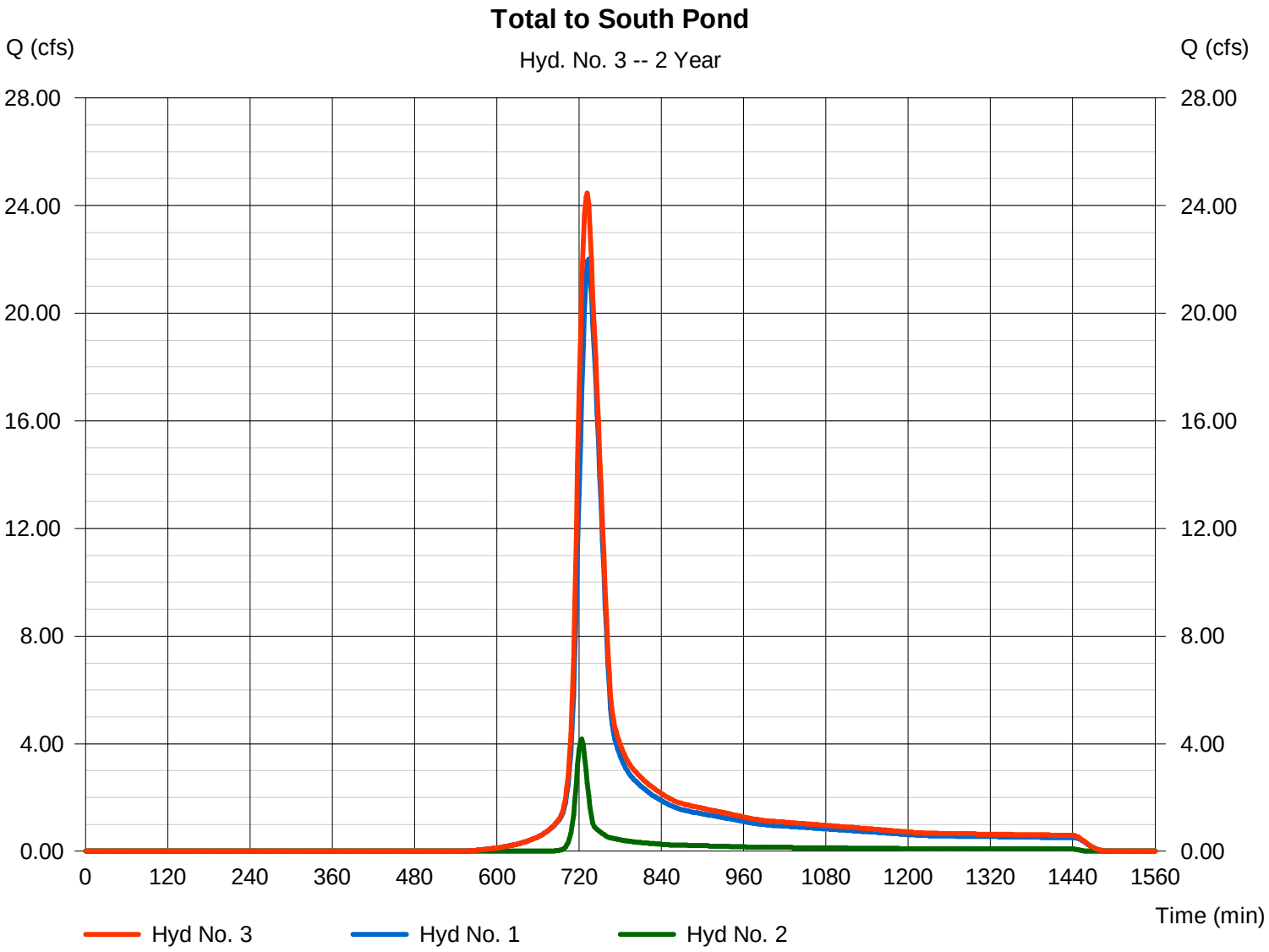


Hydrograph Report

Hyd. No. 3

Total to South Pond

Hydrograph type	= Combine	Peak discharge	= 24.46 cfs
Storm frequency	= 2 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 108,716 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 19.500 ac

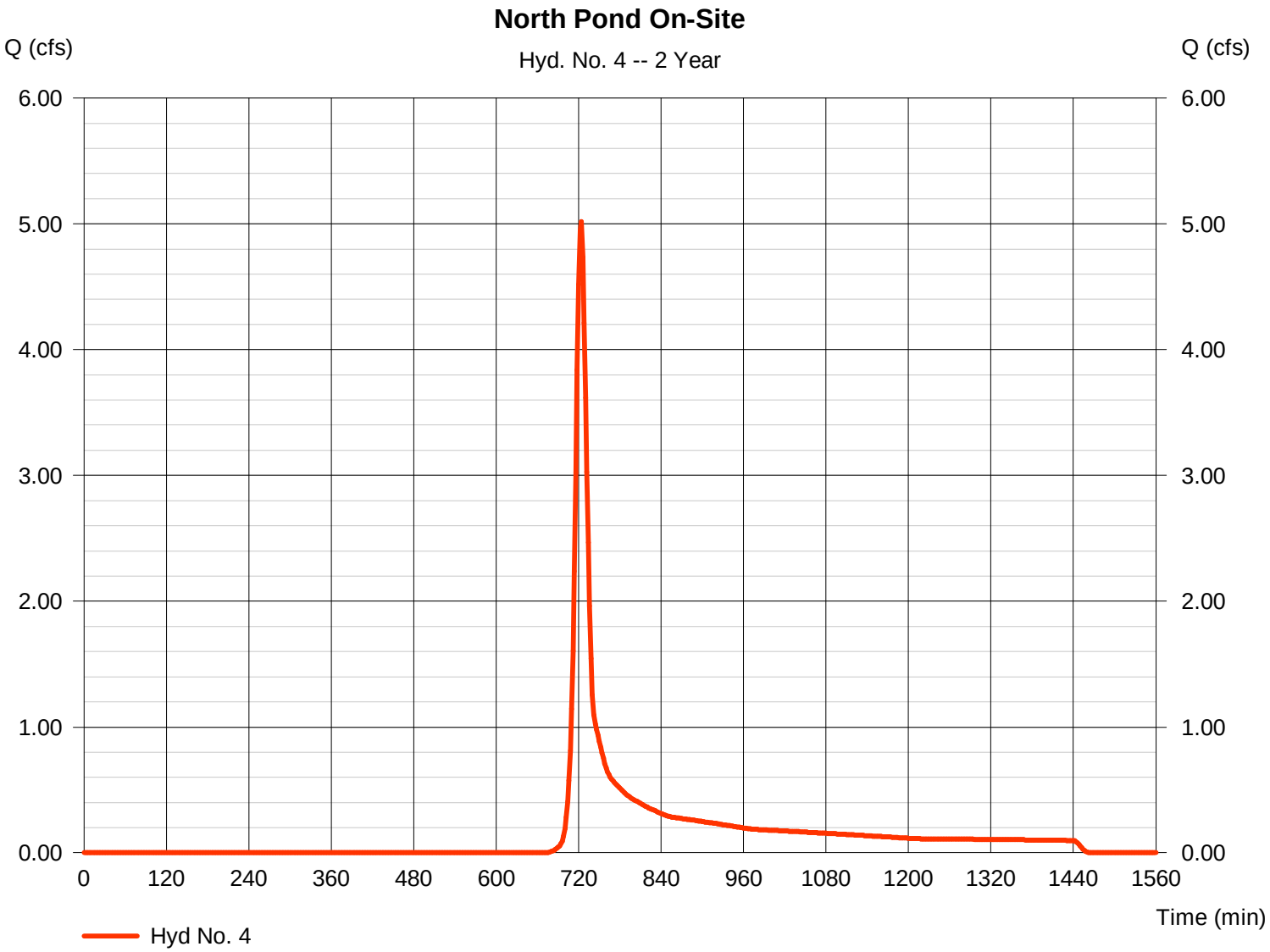


Hydrograph Report

Hyd. No. 4

North Pond On-Site

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.019 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	14,985 cuft
Drainage area	=	4.200 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	3.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

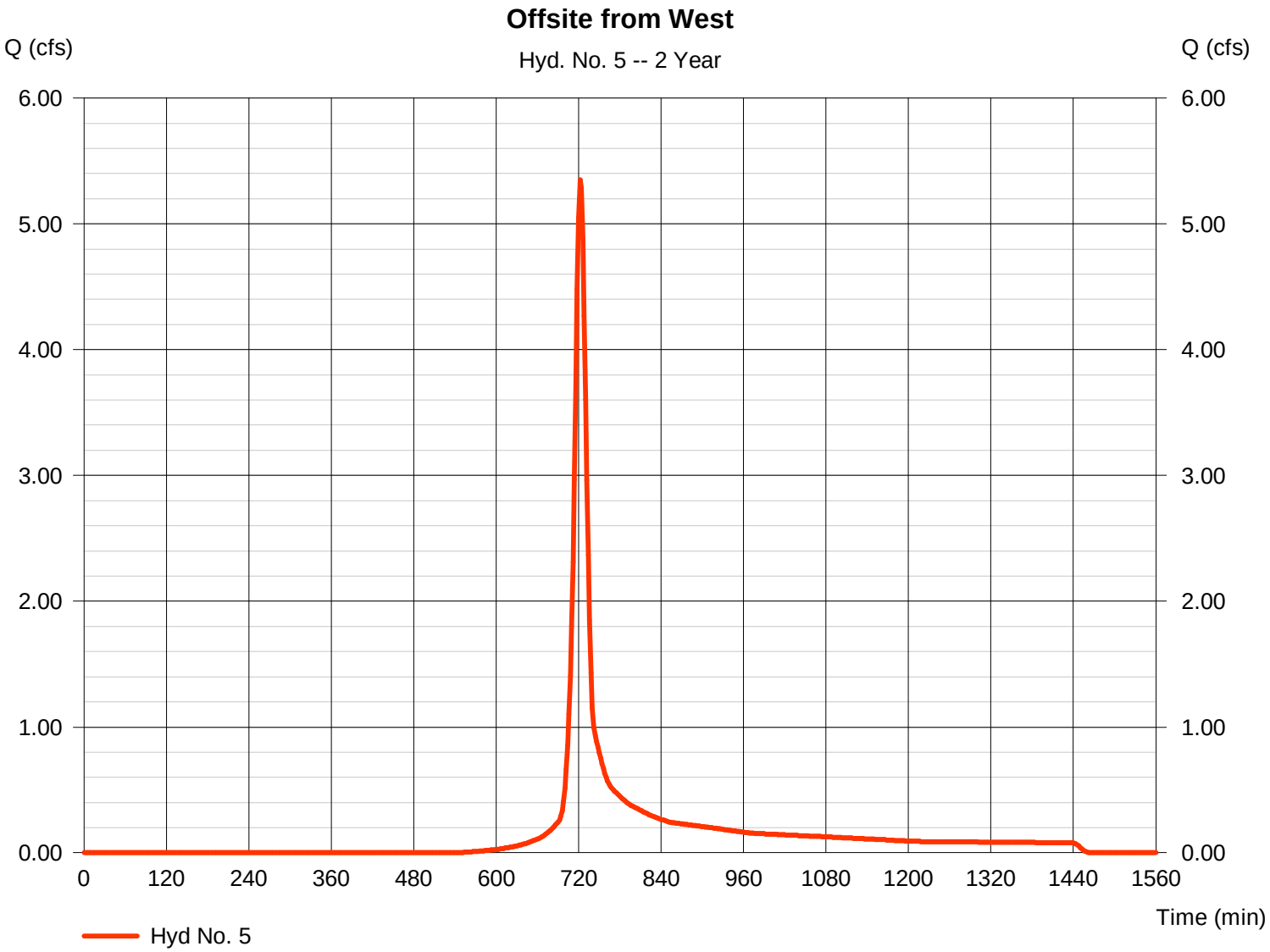


Hydrograph Report

Hyd. No. 5

Offsite from West

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.349 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	15,058 cuft
Drainage area	=	2.600 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	3.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

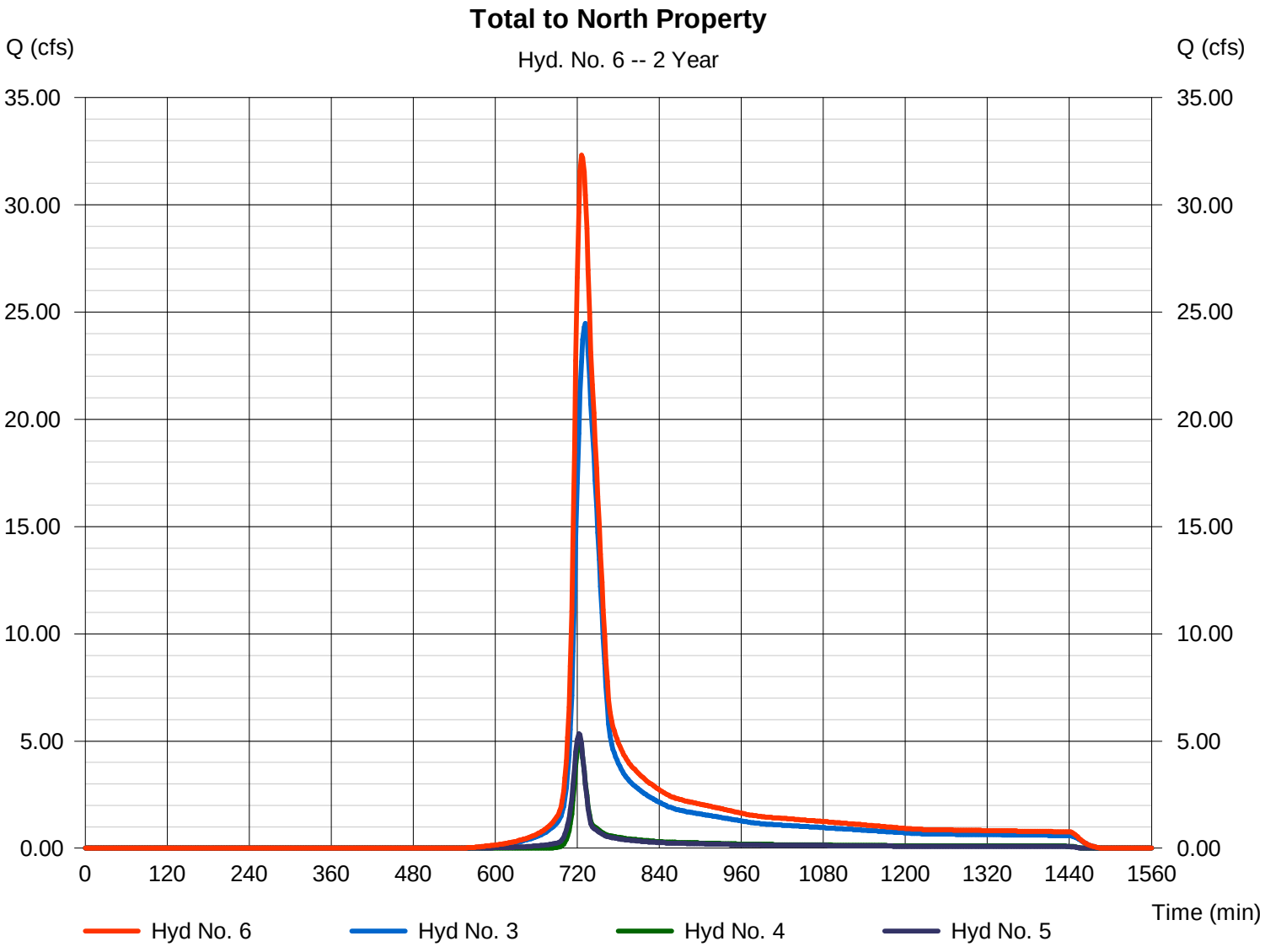


Hydrograph Report

Hyd. No. 6

Total to North Property

Hydrograph type	= Combine	Peak discharge	= 32.31 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 138,759 cuft
Inflow hyds.	= 3, 4, 5	Contrib. drain. area	= 6.800 ac

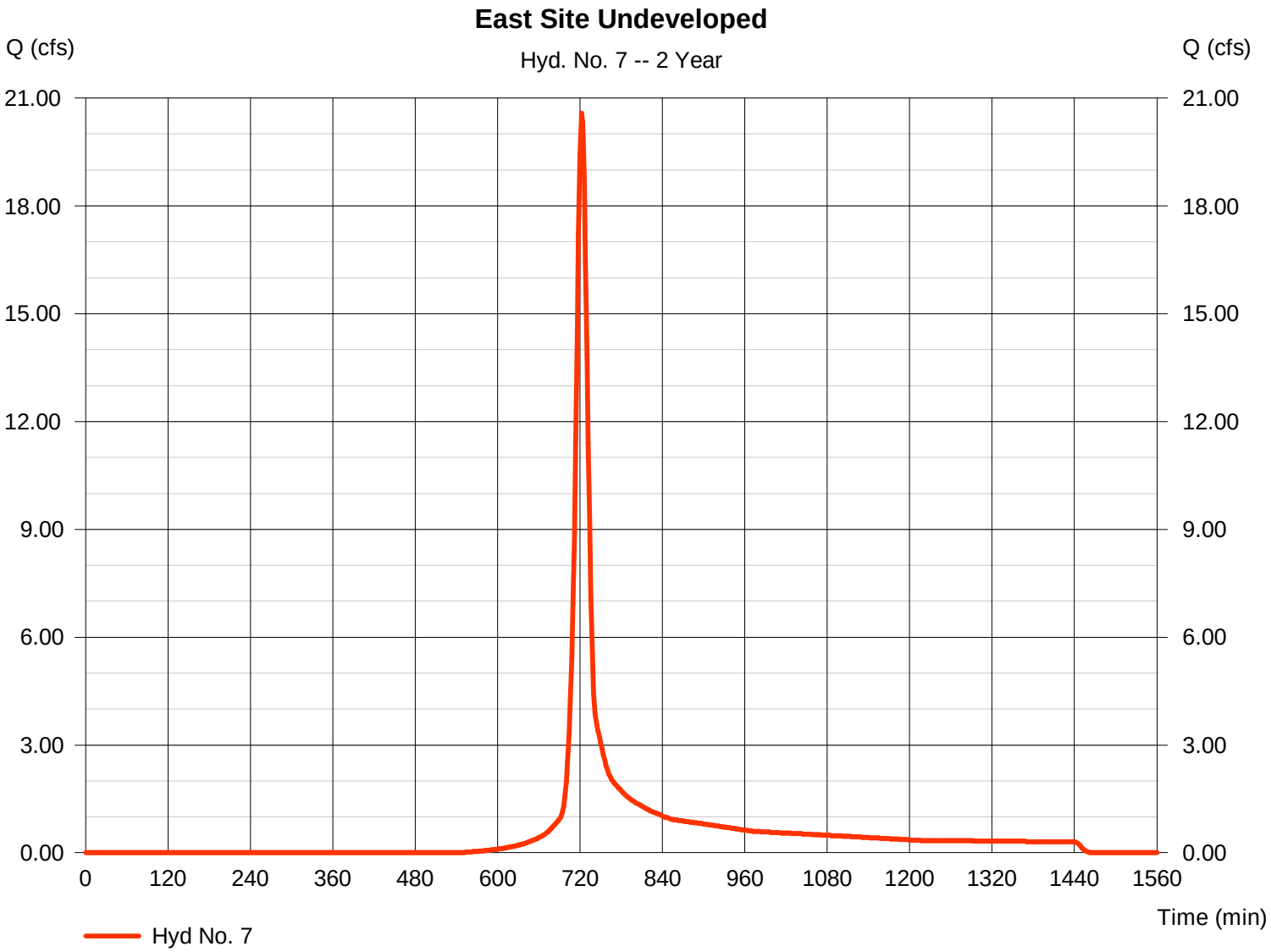


Hydrograph Report

Hyd. No. 7

East Site Undeveloped

Hydrograph type	=	SCS Runoff	Peak discharge	=	20.57 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	57,915 cuft
Drainage area	=	10.000 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	3.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Summary Report

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

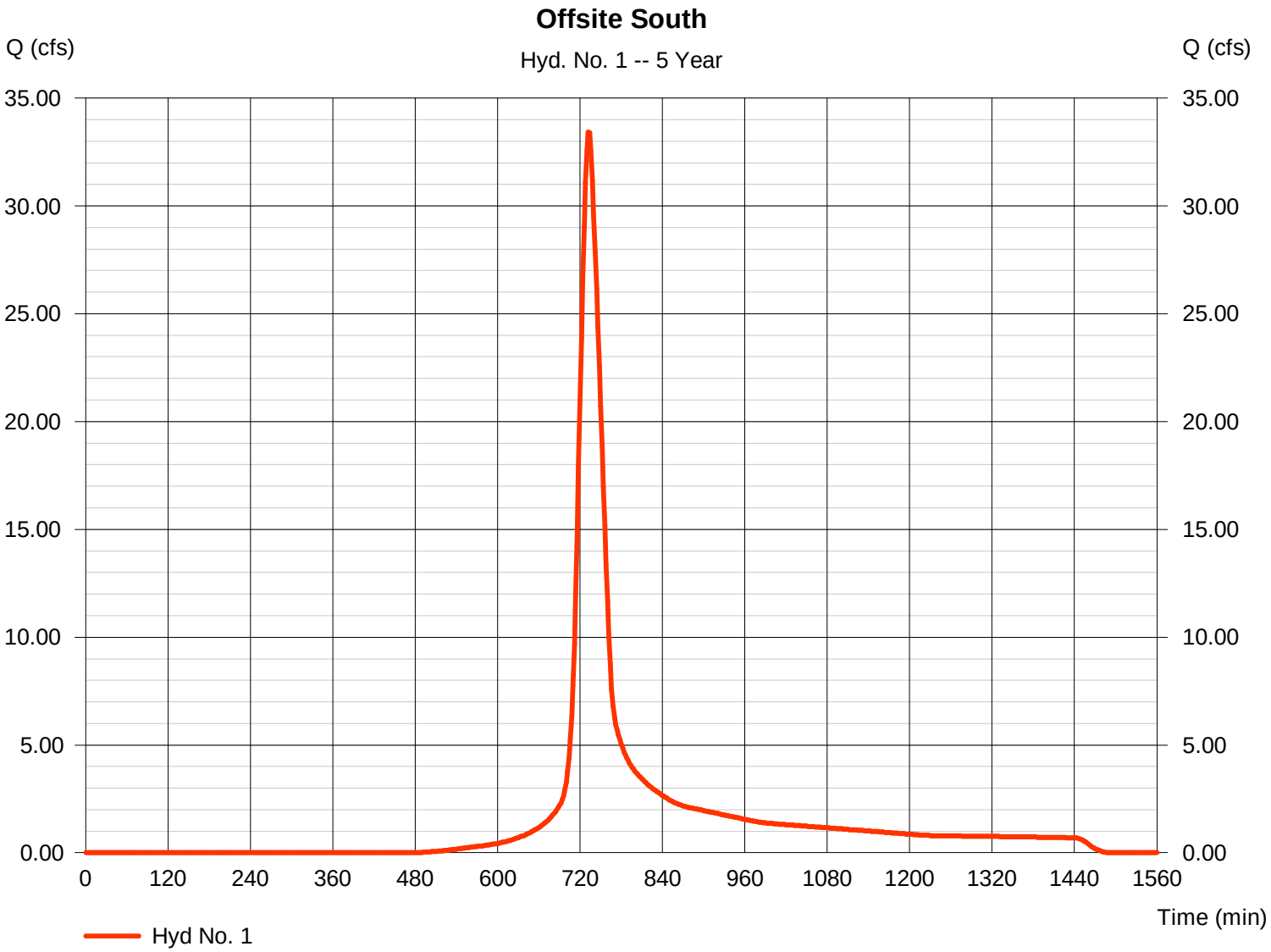
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	33.42	2	732	144,753	------	------	------	Offsite South
2	SCS Runoff	7.199	2	722	20,733	------	------	------	South On-Site Runoff
3	Combine	37.62	2	730	165,486	1, 2	------	------	Total to South Pond
4	SCS Runoff	8.639	2	722	24,880	------	------	------	North Pond On-Site
5	SCS Runoff	8.080	2	722	22,651	------	------	------	Offsite from West
6	Combine	51.04	2	726	213,018	3, 4, 5	------	------	Total to North Property
7	SCS Runoff	31.08	2	722	87,120	------	------	------	East Site Undeveloped

Hydrograph Report

Hyd. No. 1

Offsite South

Hydrograph type	=	SCS Runoff	Peak discharge	=	33.42 cfs
Storm frequency	=	5 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	144,753 cuft
Drainage area	=	16.000 ac	Curve number	=	80
Basin Slope	=	1.0 %	Hydraulic length	=	950 ft
Tc method	=	LAG	Time of conc. (Tc)	=	30.56 min
Total precip.	=	4.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



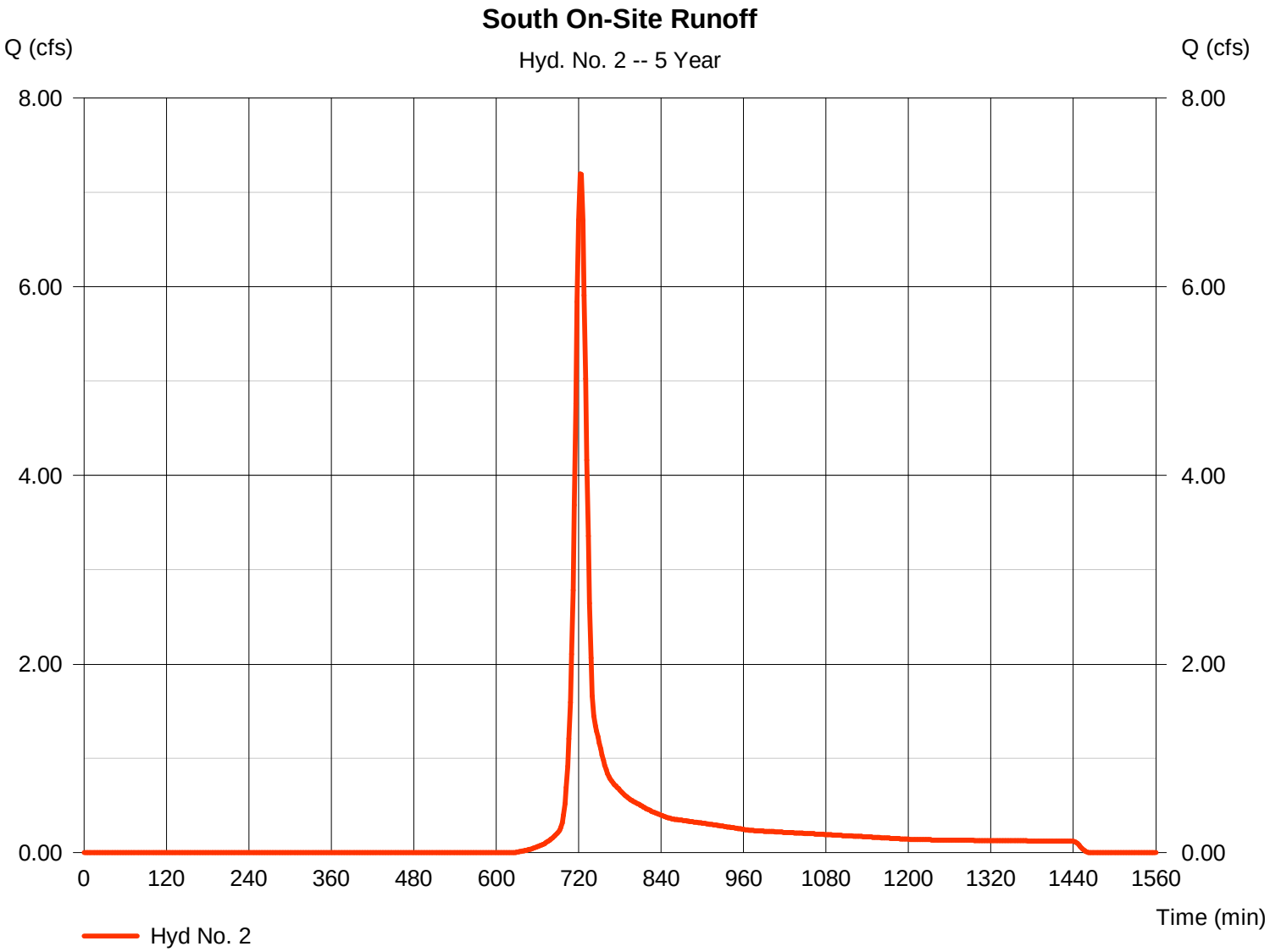
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Wednesday, Jun 24, 2009

Hyd. No. 2

South On-Site Runoff

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.199 cfs
Storm frequency	=	5 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	20,733 cuft
Drainage area	=	3.500 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	4.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

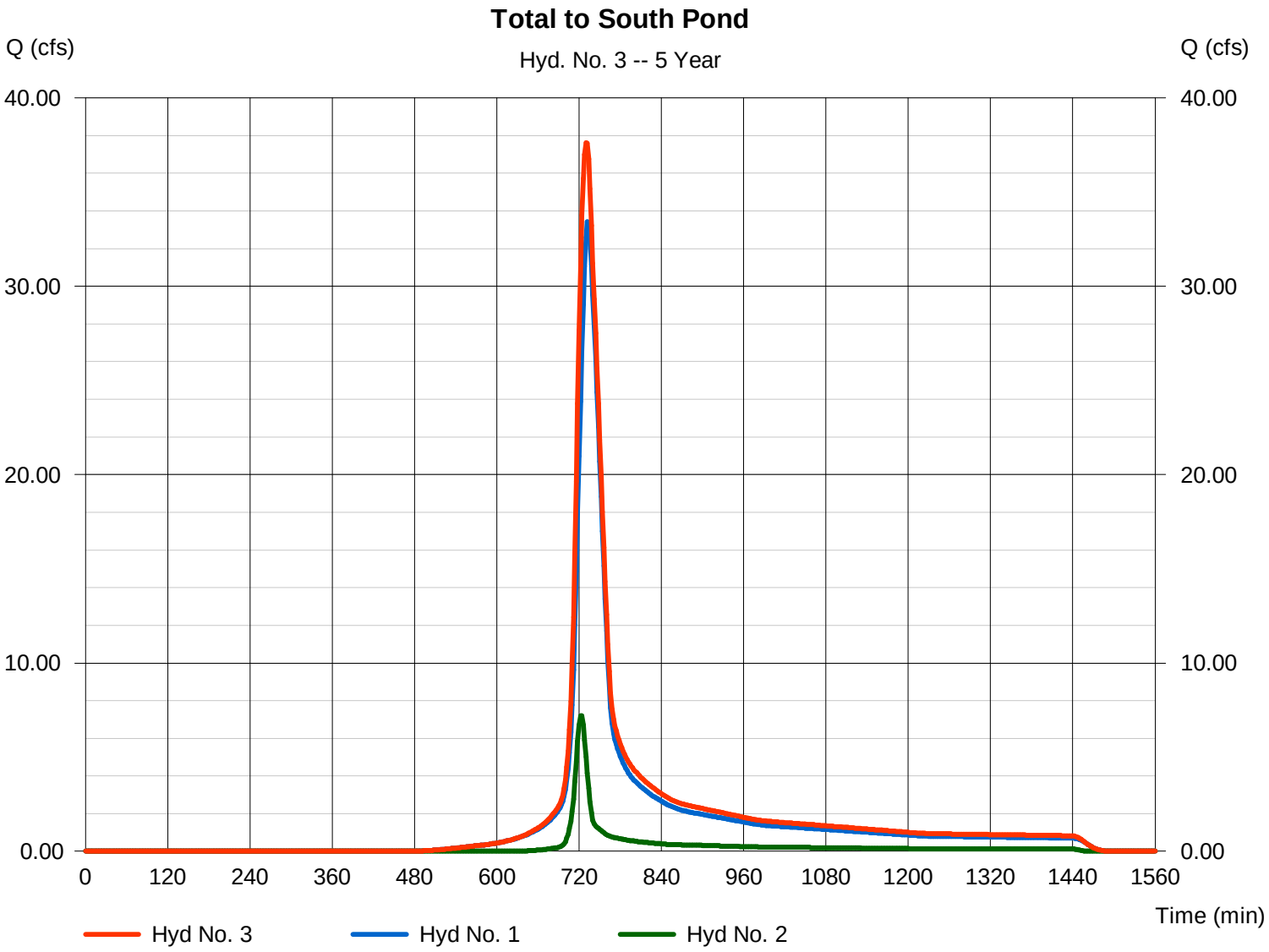


Hydrograph Report

Hyd. No. 3

Total to South Pond

Hydrograph type	= Combine	Peak discharge	= 37.62 cfs
Storm frequency	= 5 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 165,486 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 19.500 ac

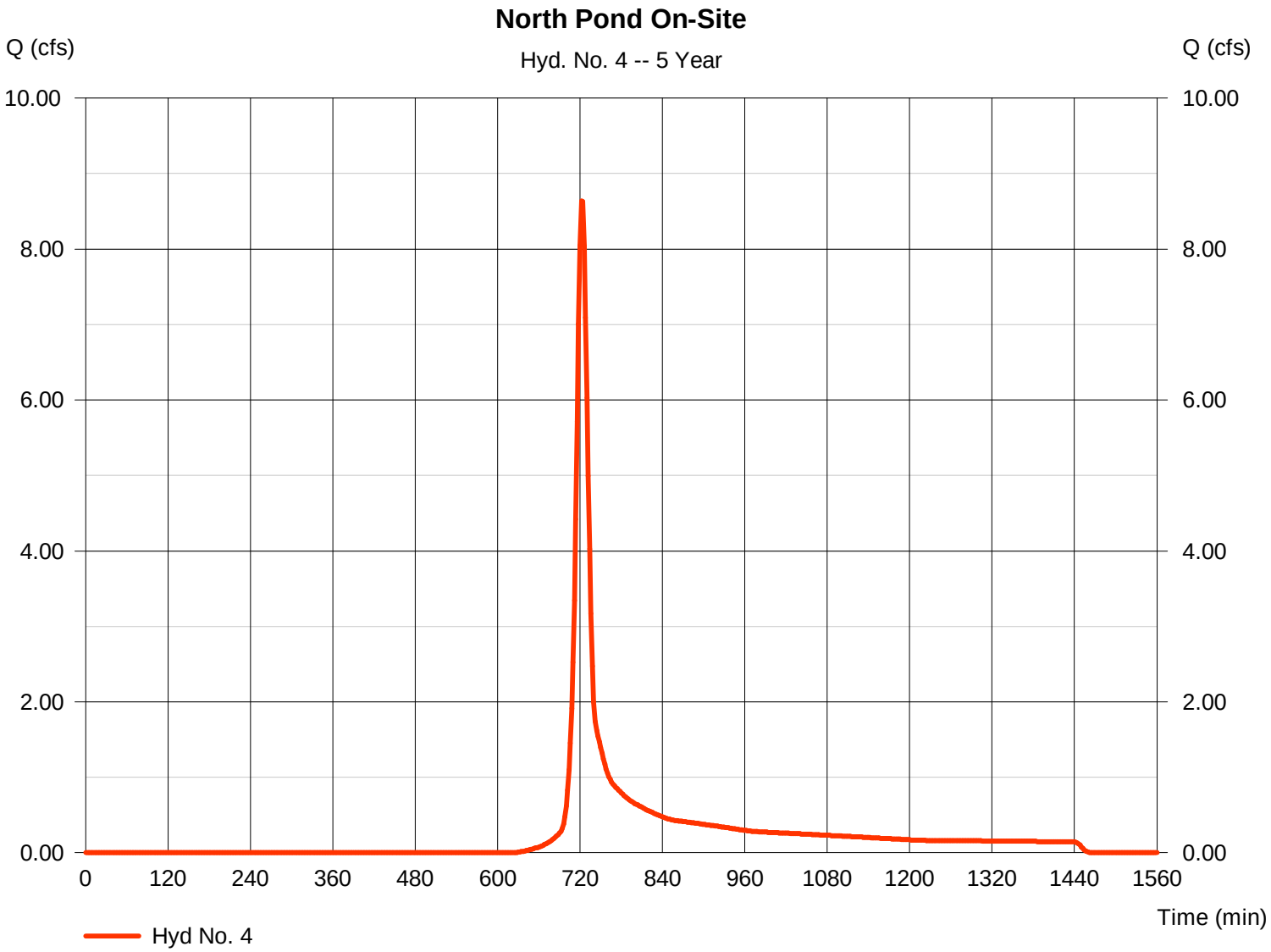


Hydrograph Report

Hyd. No. 4

North Pond On-Site

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.639 cfs
Storm frequency	=	5 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	24,880 cuft
Drainage area	=	4.200 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	4.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

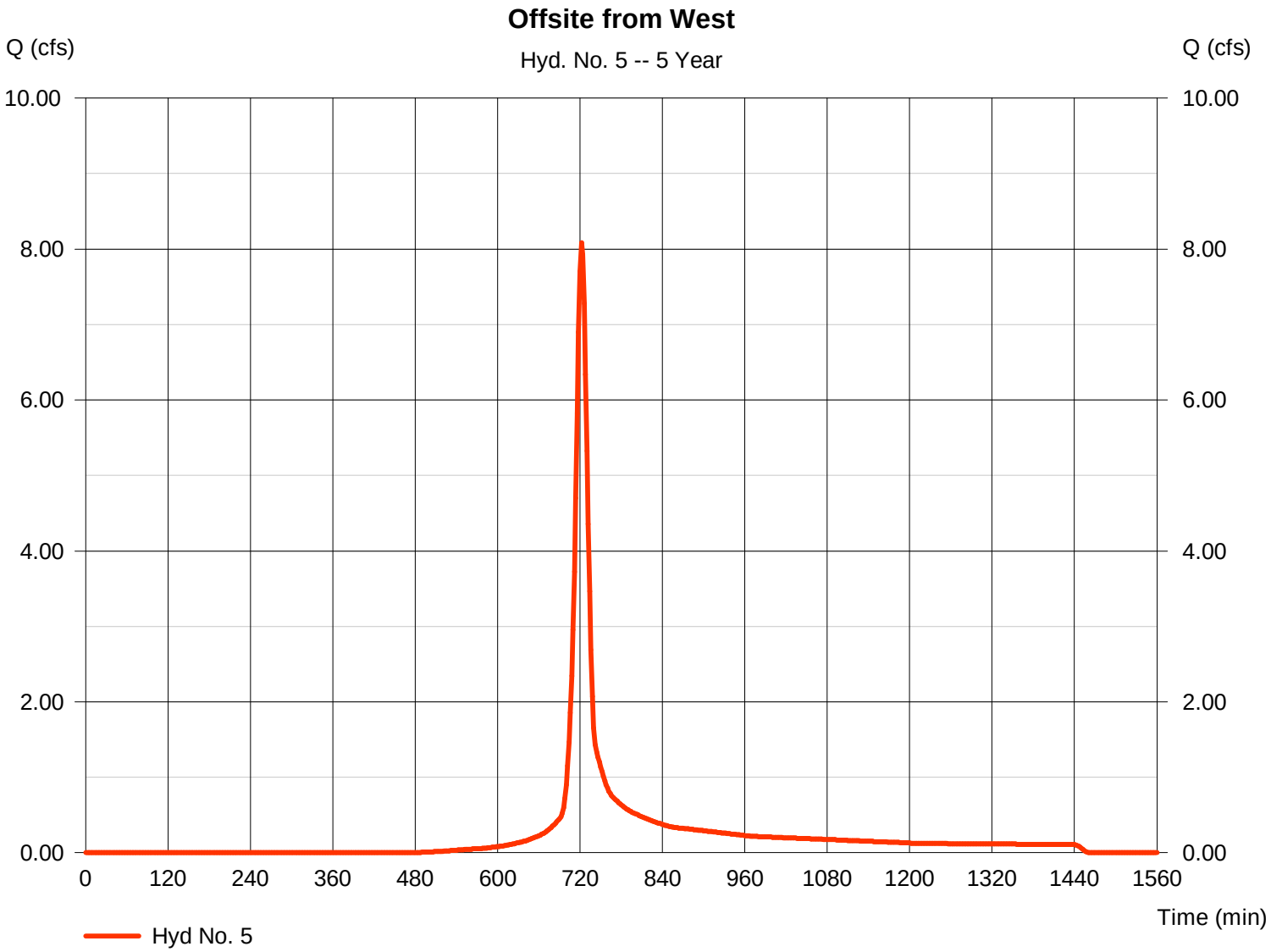


Hydrograph Report

Hyd. No. 5

Offsite from West

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.080 cfs
Storm frequency	=	5 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	22,651 cuft
Drainage area	=	2.600 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	4.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

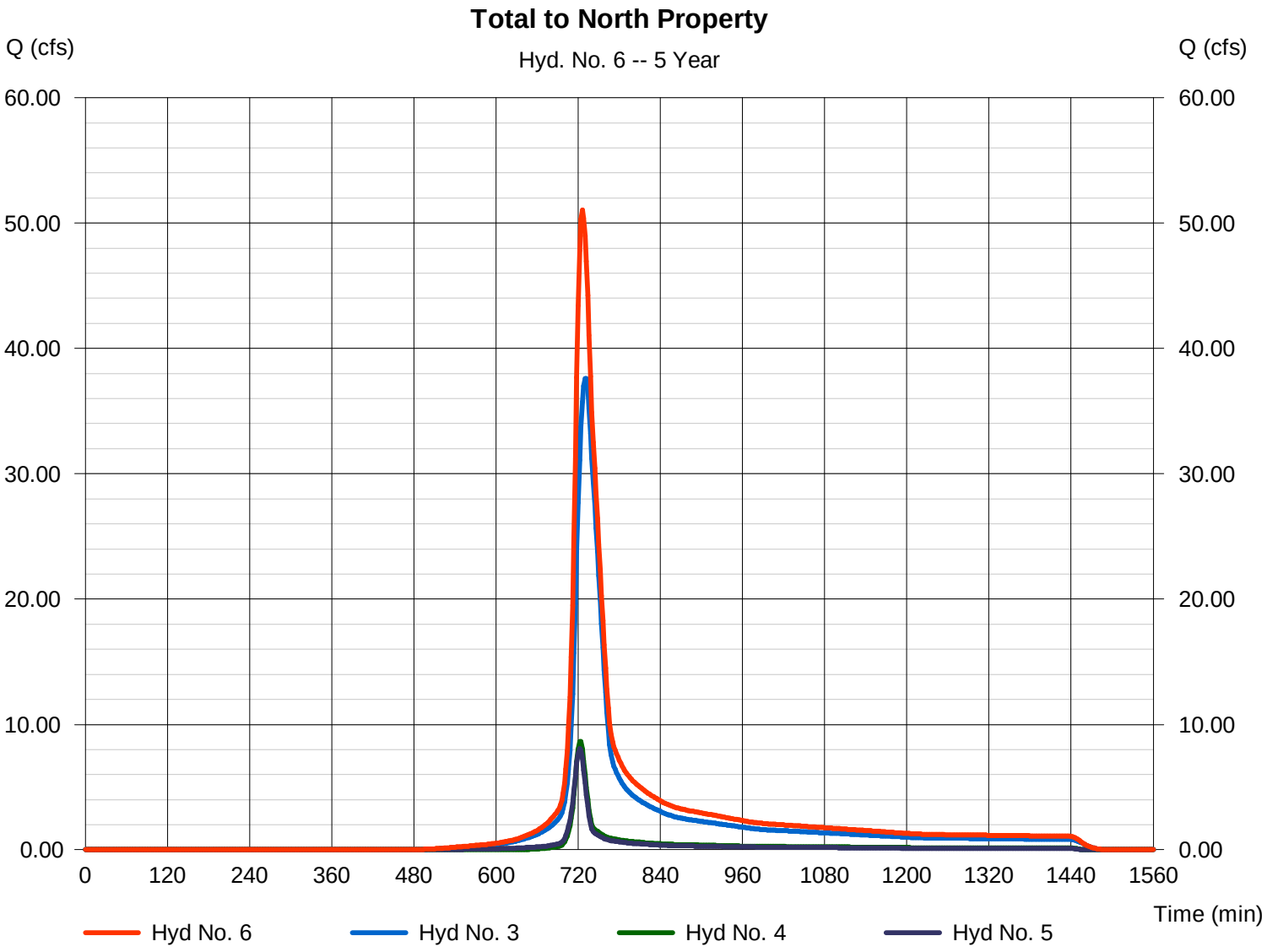


Hydrograph Report

Hyd. No. 6

Total to North Property

Hydrograph type	= Combine	Peak discharge	= 51.04 cfs
Storm frequency	= 5 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 213,018 cuft
Inflow hyds.	= 3, 4, 5	Contrib. drain. area	= 6.800 ac

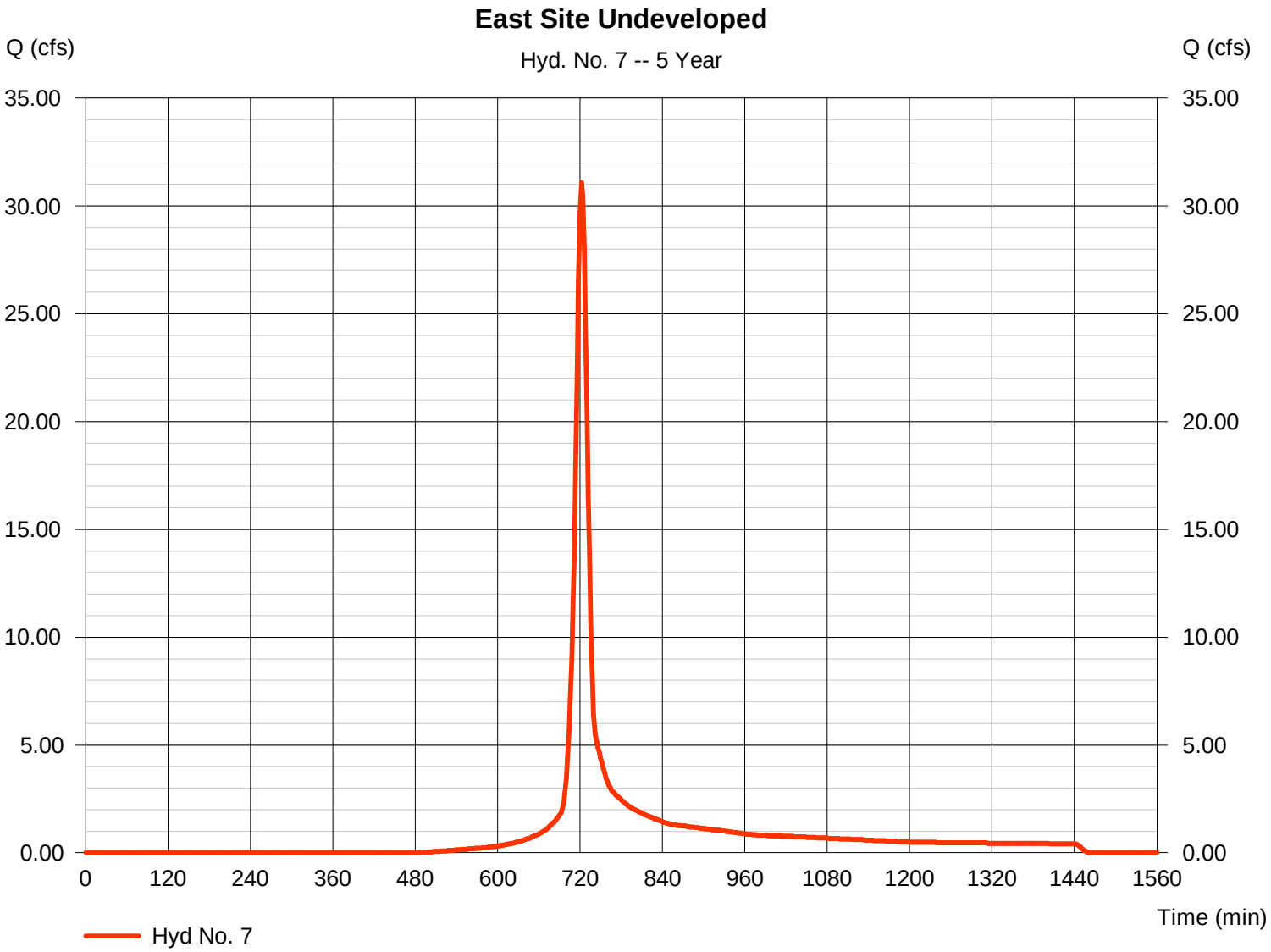


Hydrograph Report

Hyd. No. 7

East Site Undeveloped

Hydrograph type	=	SCS Runoff	Peak discharge	=	31.08 cfs
Storm frequency	=	5 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	87,120 cuft
Drainage area	=	10.000 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	4.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Summary Report

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

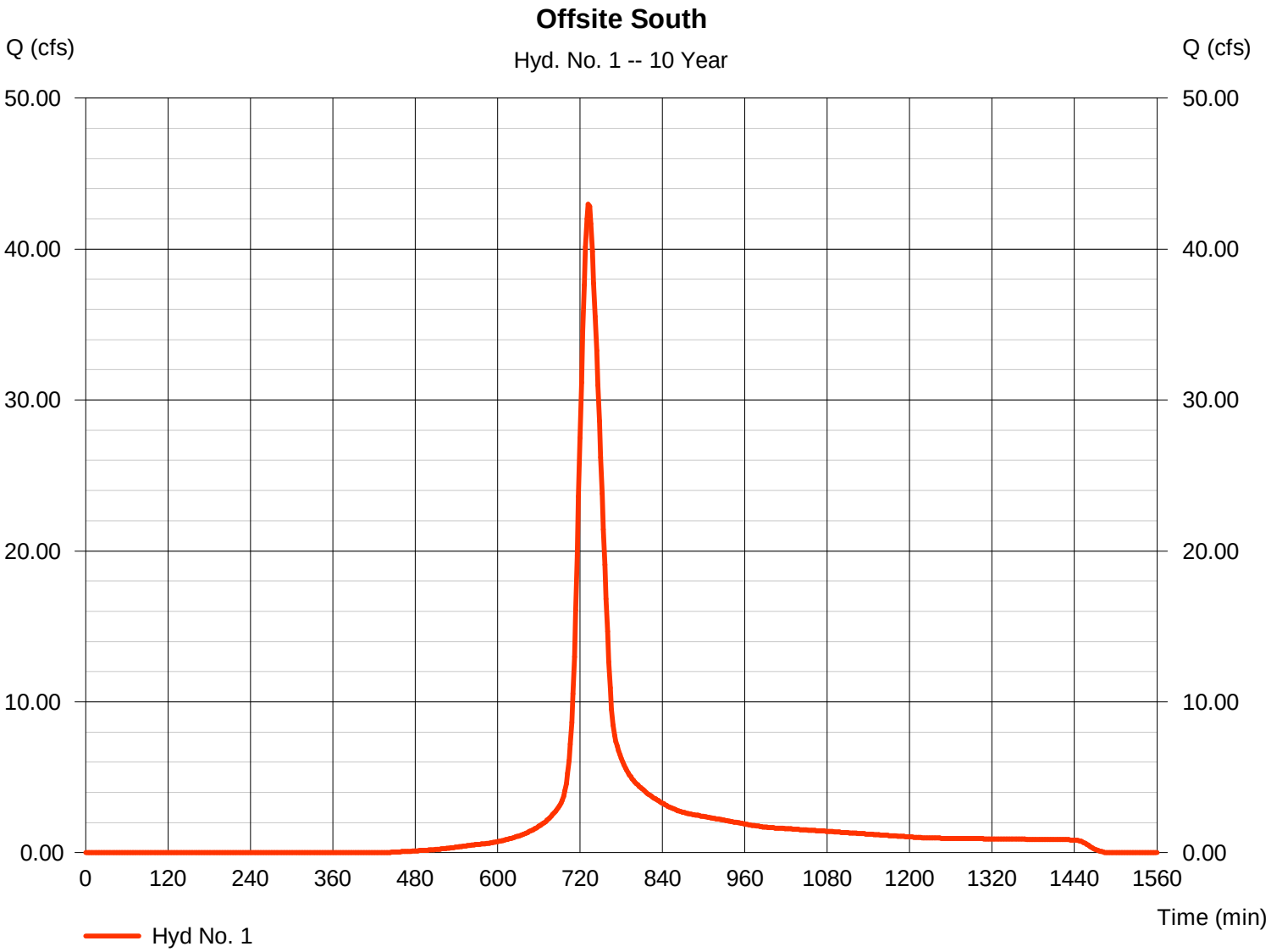
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	42.96	2	732	185,601	------	------	------	Offsite South
2	SCS Runoff	9.883	2	722	28,013	------	------	------	South On-Site Runoff
3	Combine	48.74	2	730	213,615	1, 2	------	------	Total to South Pond
4	SCS Runoff	11.86	2	722	33,616	------	------	------	North Pond On-Site
5	SCS Runoff	10.34	2	722	29,043	------	------	------	Offsite from West
6	Combine	66.84	2	726	276,273	3, 4, 5	------	------	Total to North Property
7	SCS Runoff	39.76	2	722	111,705	------	------	------	East Site Undeveloped

Hydrograph Report

Hyd. No. 1

Offsite South

Hydrograph type	=	SCS Runoff	Peak discharge	=	42.96 cfs
Storm frequency	=	10 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	185,601 cuft
Drainage area	=	16.000 ac	Curve number	=	80
Basin Slope	=	1.0 %	Hydraulic length	=	950 ft
Tc method	=	LAG	Time of conc. (Tc)	=	30.56 min
Total precip.	=	5.30 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

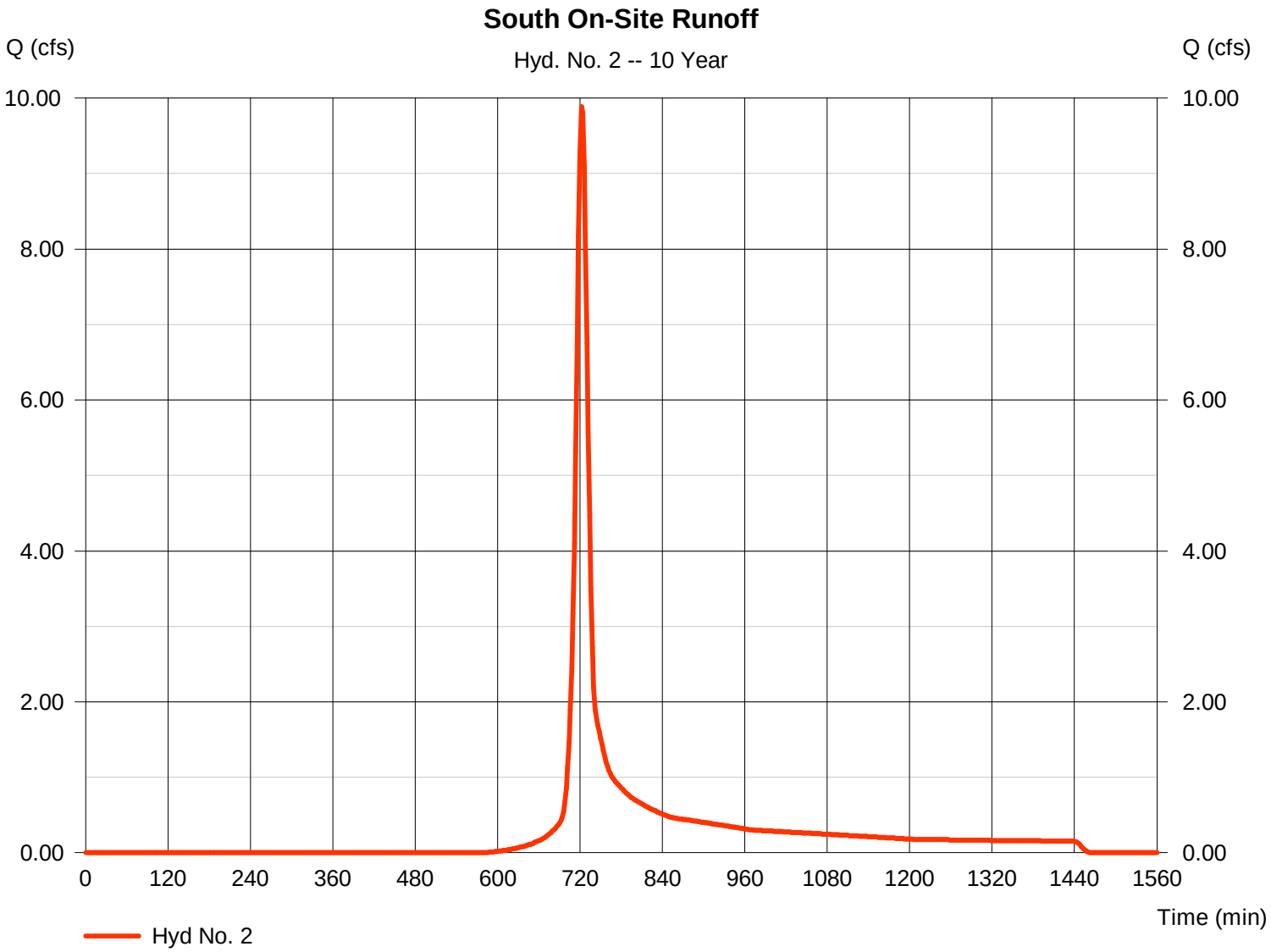


Hydrograph Report

Hyd. No. 2

South On-Site Runoff

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.883 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	28,013 cuft
Drainage area	=	3.500 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	5.30 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

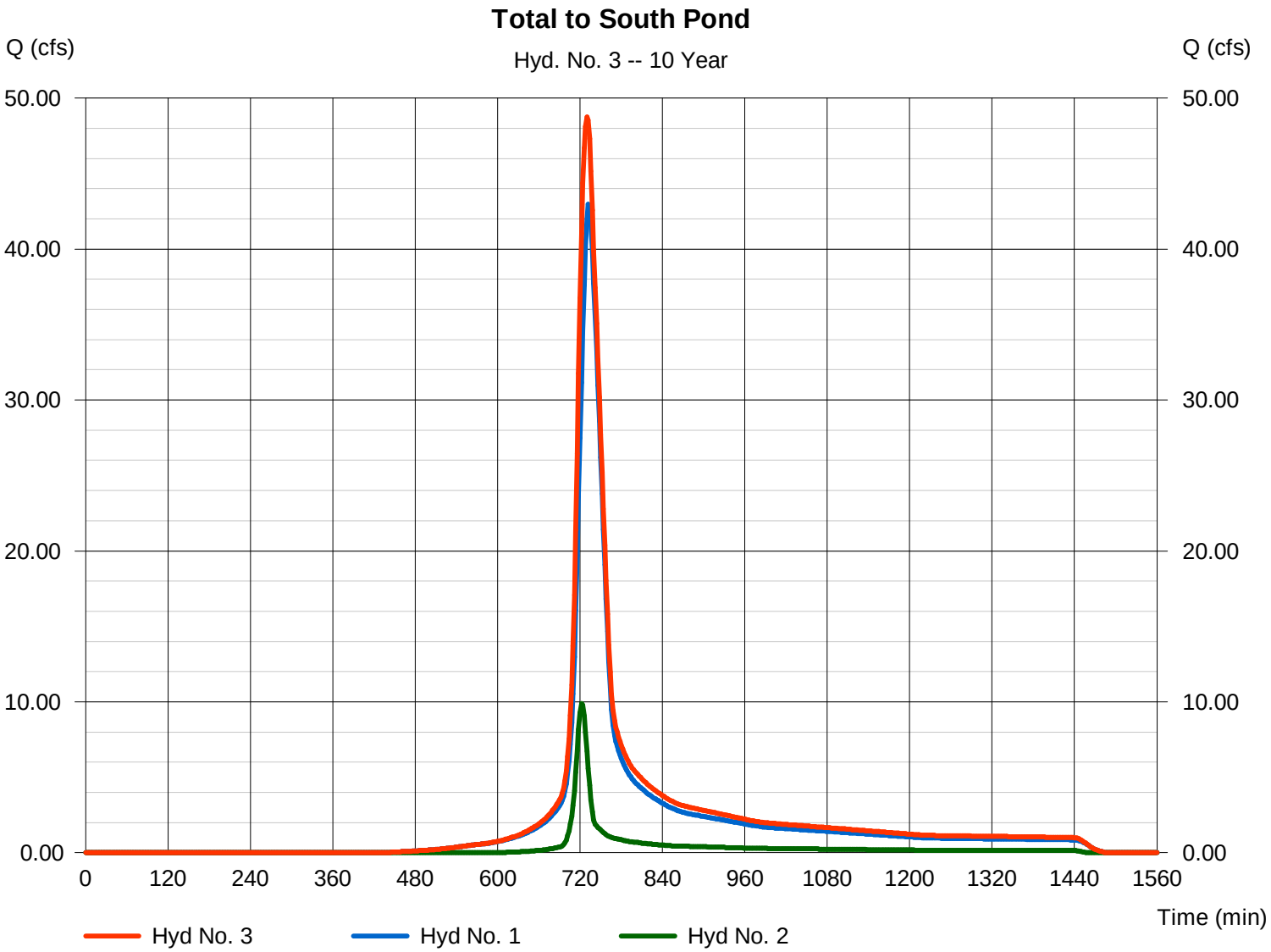


Hydrograph Report

Hyd. No. 3

Total to South Pond

Hydrograph type	= Combine	Peak discharge	= 48.74 cfs
Storm frequency	= 10 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 213,615 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 19.500 ac

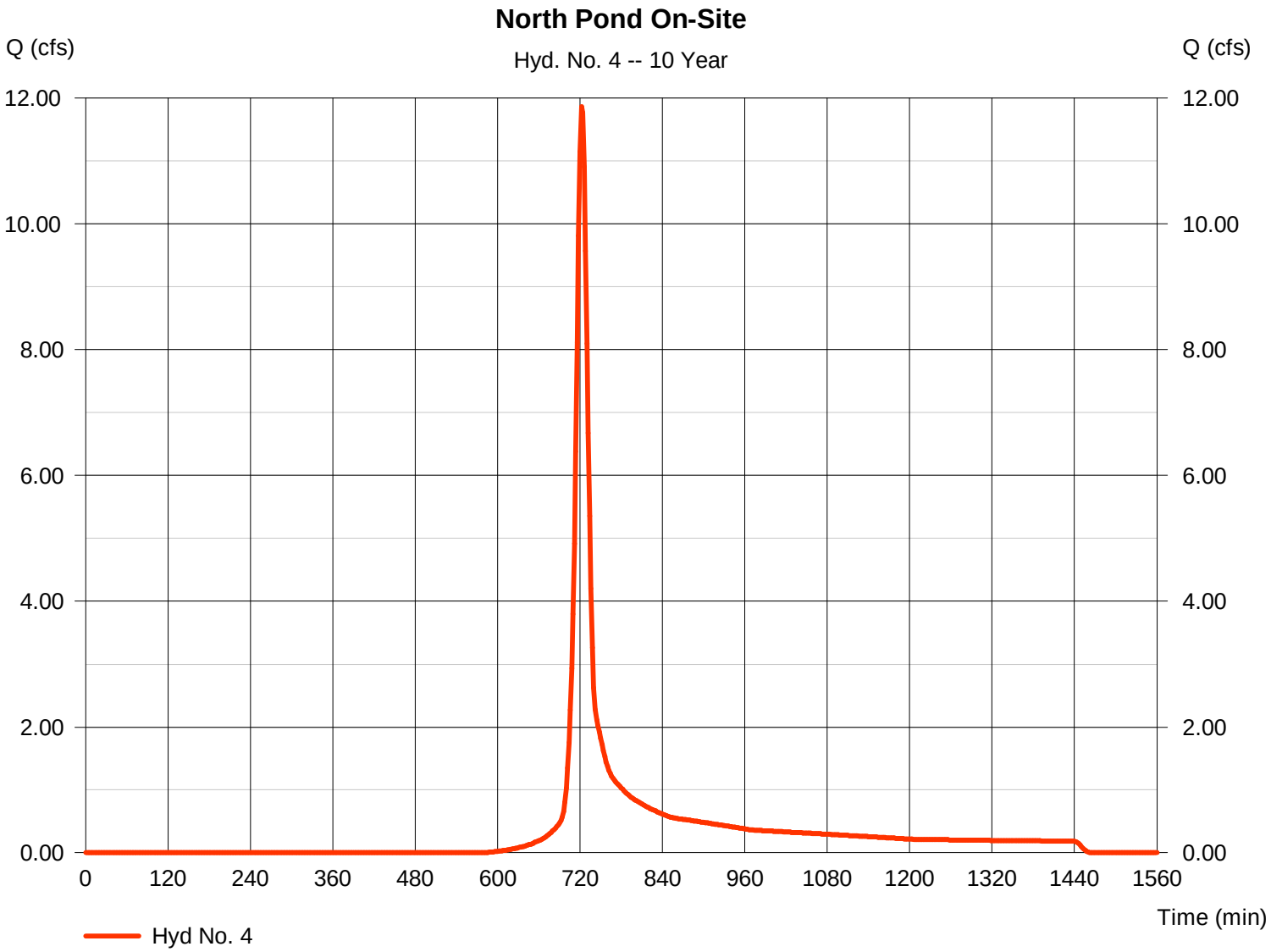


Hydrograph Report

Hyd. No. 4

North Pond On-Site

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.86 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	33,616 cuft
Drainage area	=	4.200 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	5.30 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

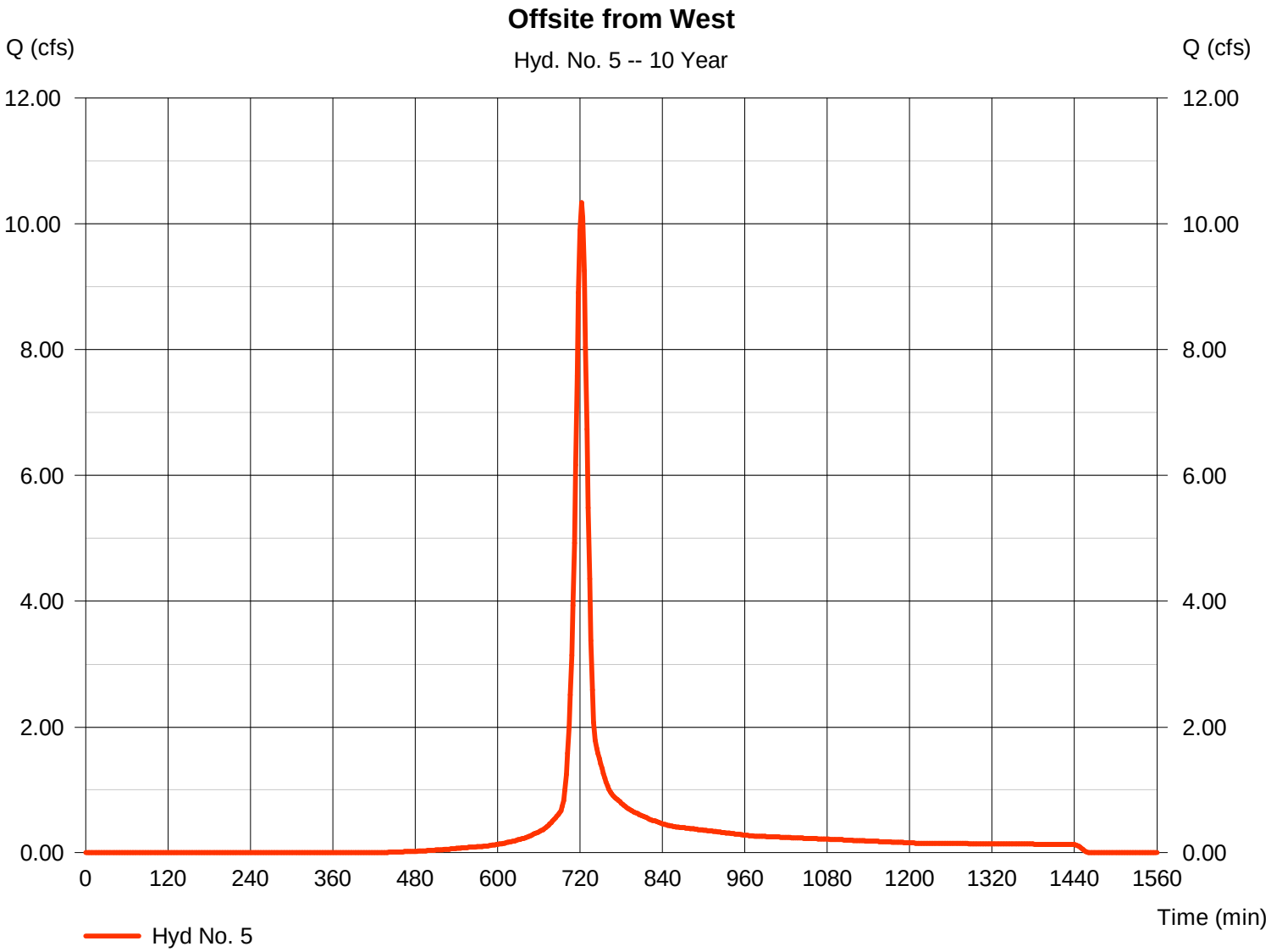


Hydrograph Report

Hyd. No. 5

Offsite from West

Hydrograph type	=	SCS Runoff	Peak discharge	=	10.34 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	29,043 cuft
Drainage area	=	2.600 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	5.30 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

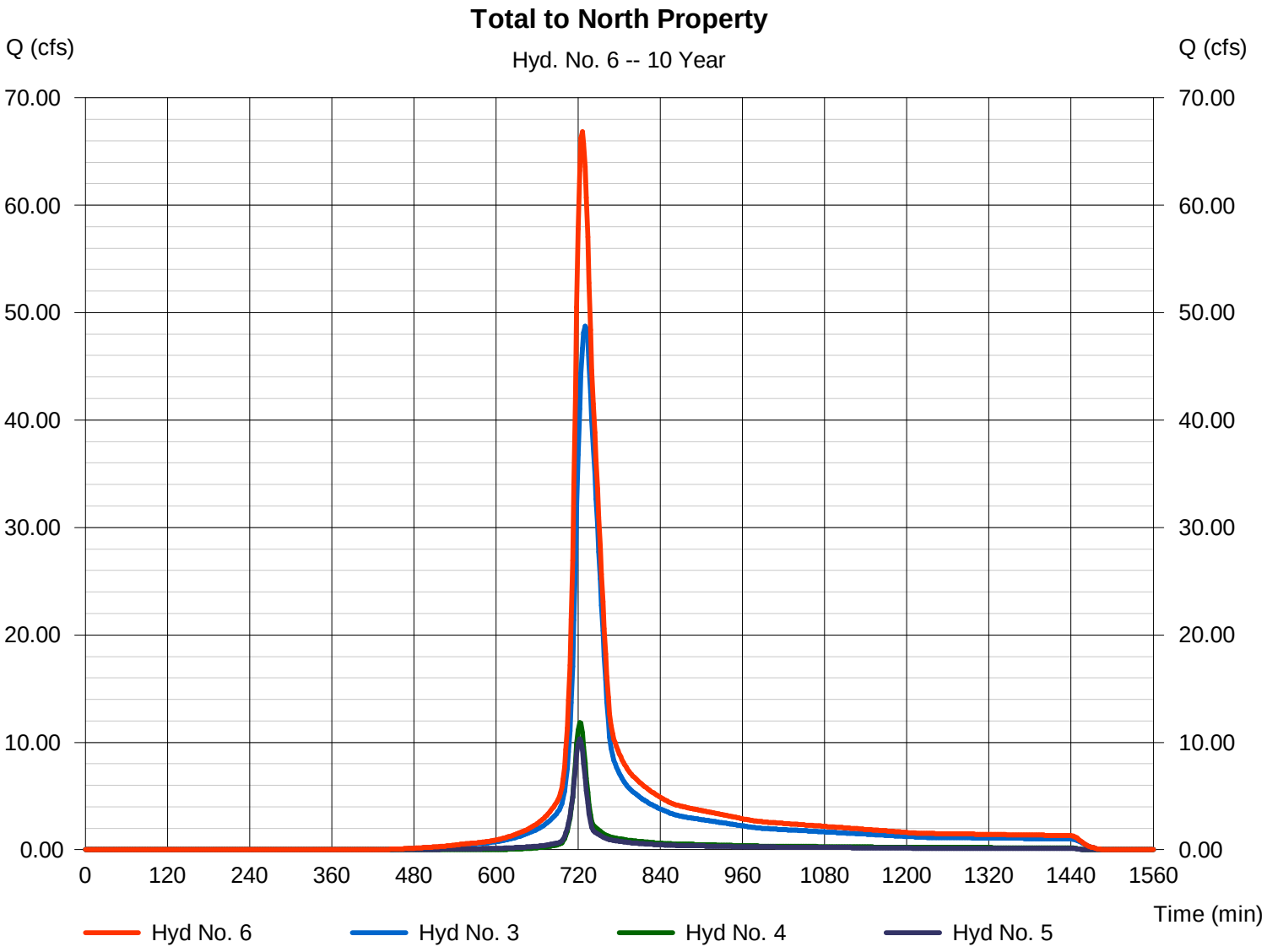


Hydrograph Report

Hyd. No. 6

Total to North Property

Hydrograph type	= Combine	Peak discharge	= 66.84 cfs
Storm frequency	= 10 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 276,273 cuft
Inflow hyds.	= 3, 4, 5	Contrib. drain. area	= 6.800 ac

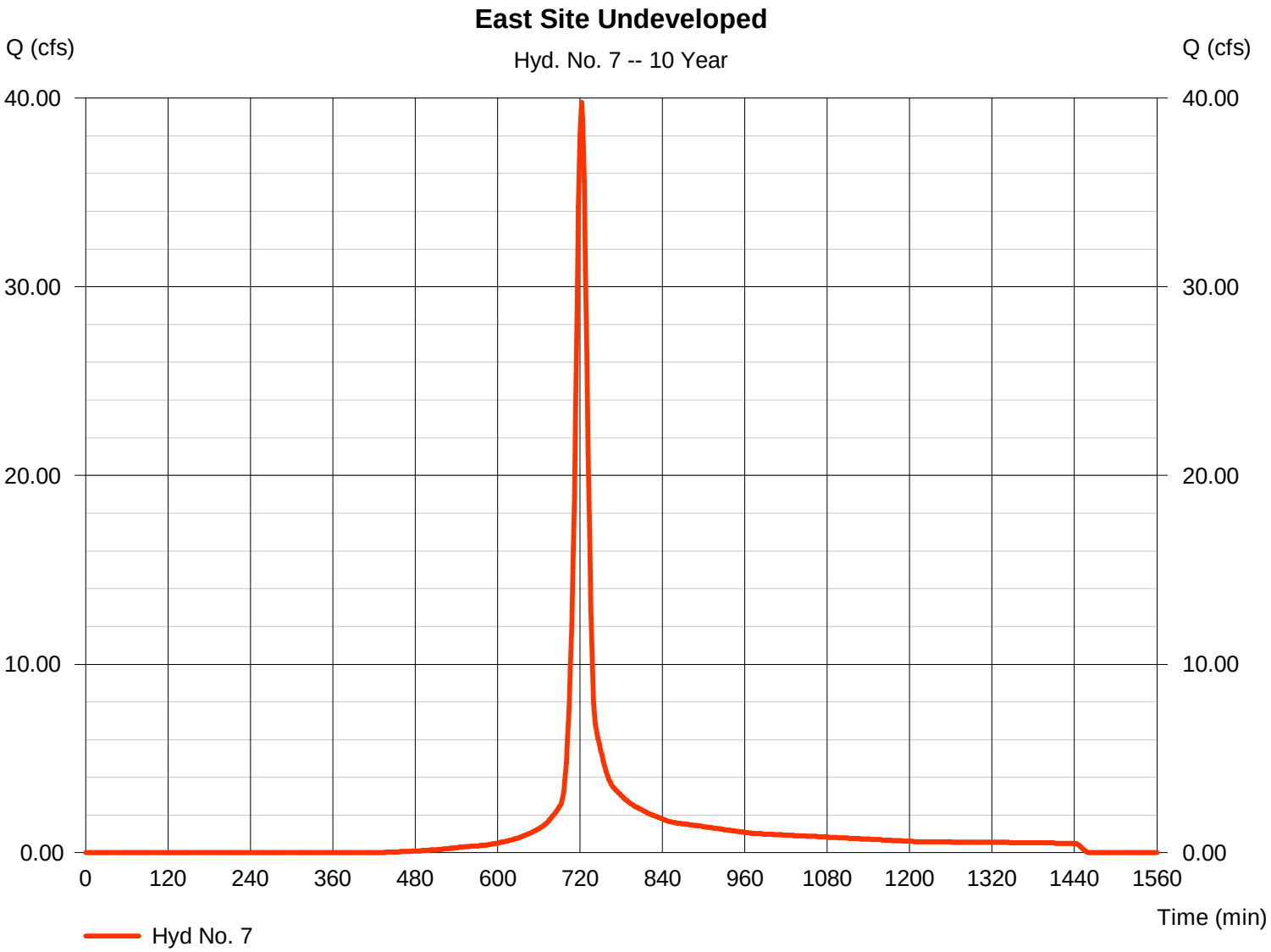


Hydrograph Report

Hyd. No. 7

East Site Undeveloped

Hydrograph type	=	SCS Runoff	Peak discharge	=	39.76 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	111,705 cuft
Drainage area	=	10.000 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	5.30 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Summary Report

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

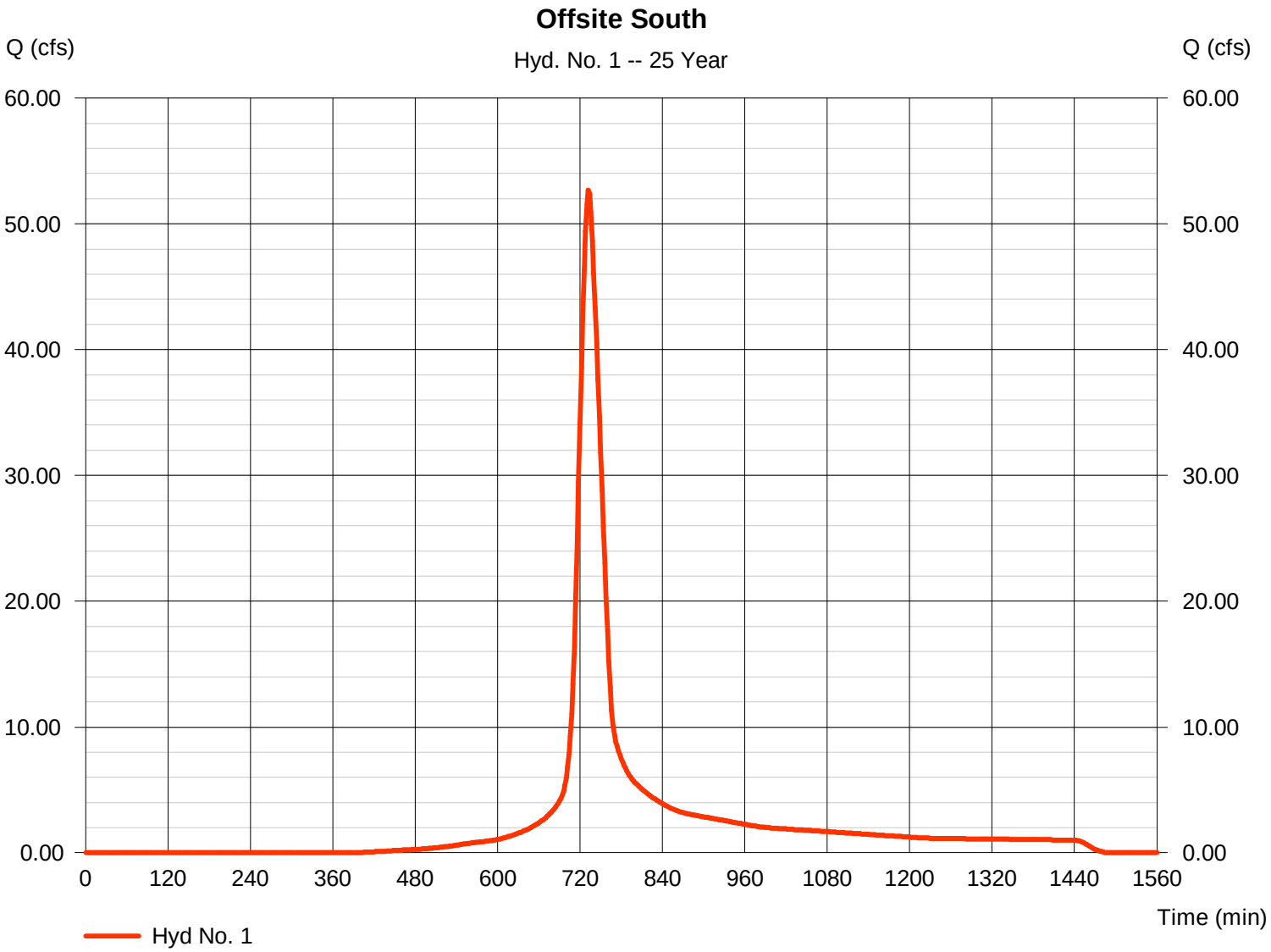
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	52.66	2	732	227,674	------	------	------	Offsite South
2	SCS Runoff	12.70	2	722	35,734	------	------	------	South On-Site Runoff
3	Combine	60.11	2	730	263,408	1, 2	------	------	Total to South Pond
4	SCS Runoff	15.24	2	722	42,881	------	------	------	North Pond On-Site
5	SCS Runoff	12.63	2	722	35,627	------	------	------	Offsite from West
6	Combine	83.08	2	726	341,916	3, 4, 5	------	------	Total to North Property
7	SCS Runoff	48.57	2	722	137,026	------	------	------	East Site Undeveloped

Hydrograph Report

Hyd. No. 1

Offsite South

Hydrograph type	=	SCS Runoff	Peak discharge	=	52.66 cfs
Storm frequency	=	25 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	227,674 cuft
Drainage area	=	16.000 ac	Curve number	=	80
Basin Slope	=	1.0 %	Hydraulic length	=	950 ft
Tc method	=	LAG	Time of conc. (Tc)	=	30.56 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

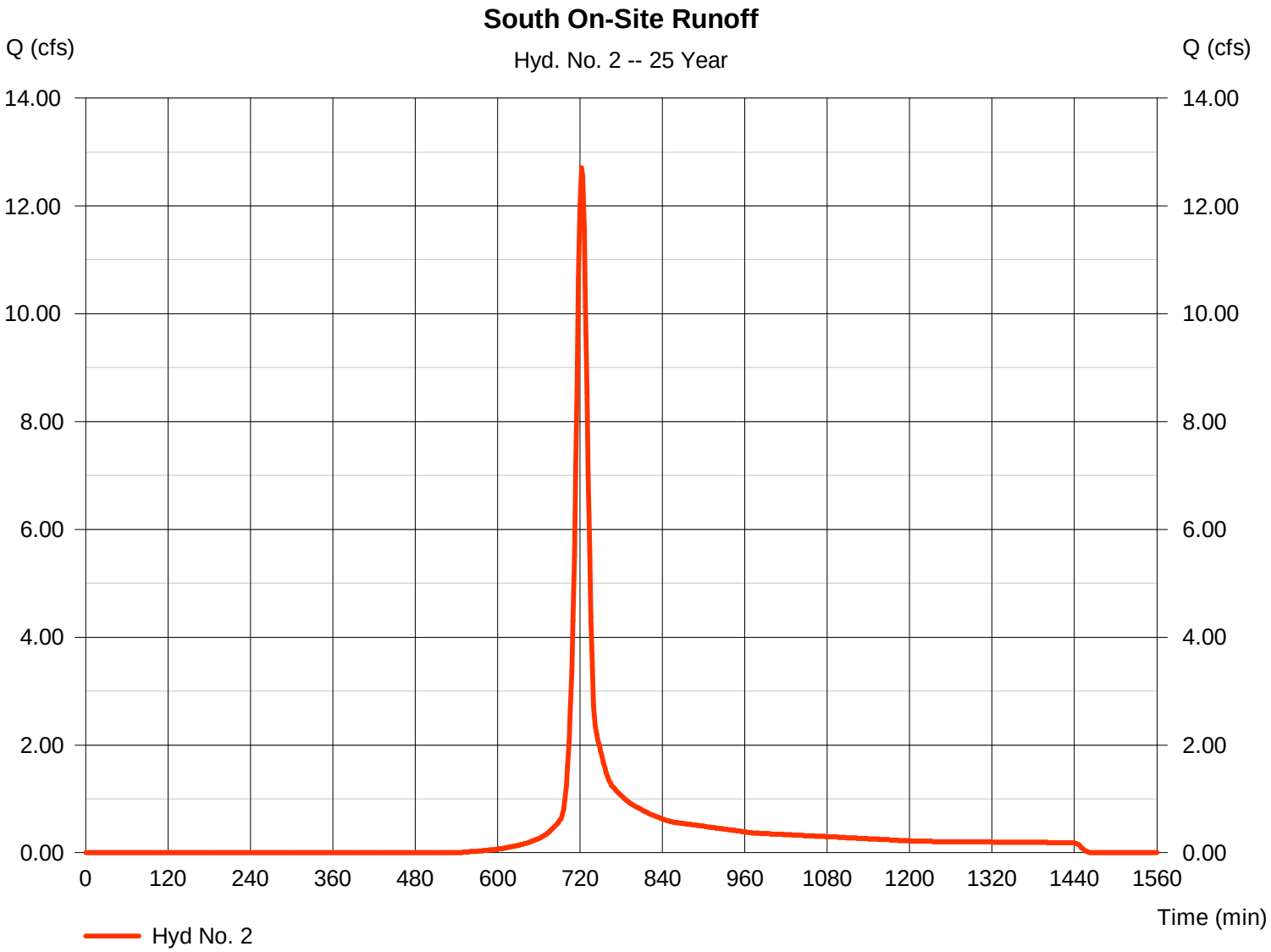


Hydrograph Report

Hyd. No. 2

South On-Site Runoff

Hydrograph type	=	SCS Runoff	Peak discharge	=	12.70 cfs
Storm frequency	=	25 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	35,734 cuft
Drainage area	=	3.500 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

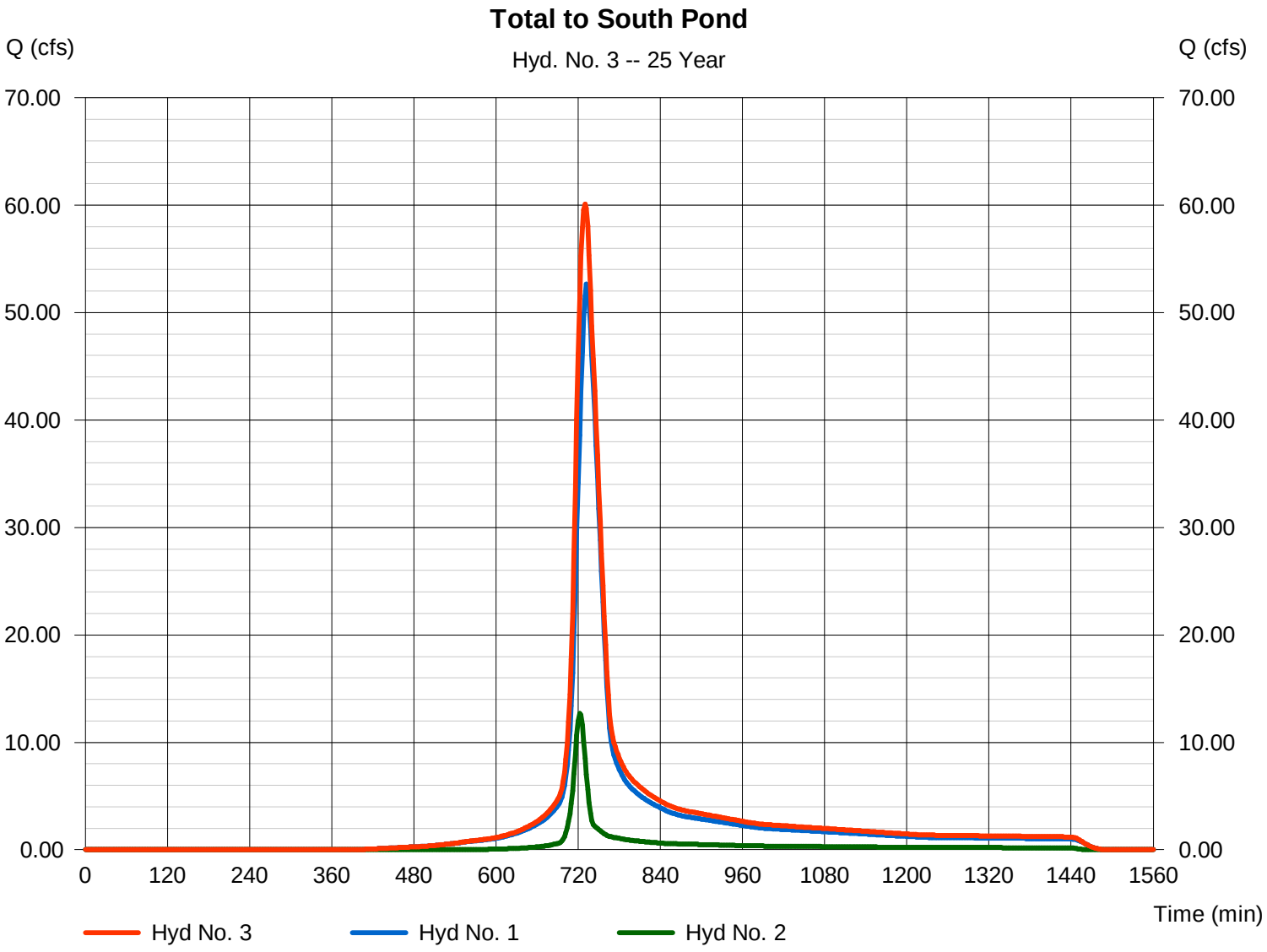


Hydrograph Report

Hyd. No. 3

Total to South Pond

Hydrograph type	= Combine	Peak discharge	= 60.11 cfs
Storm frequency	= 25 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 263,408 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 19.500 ac

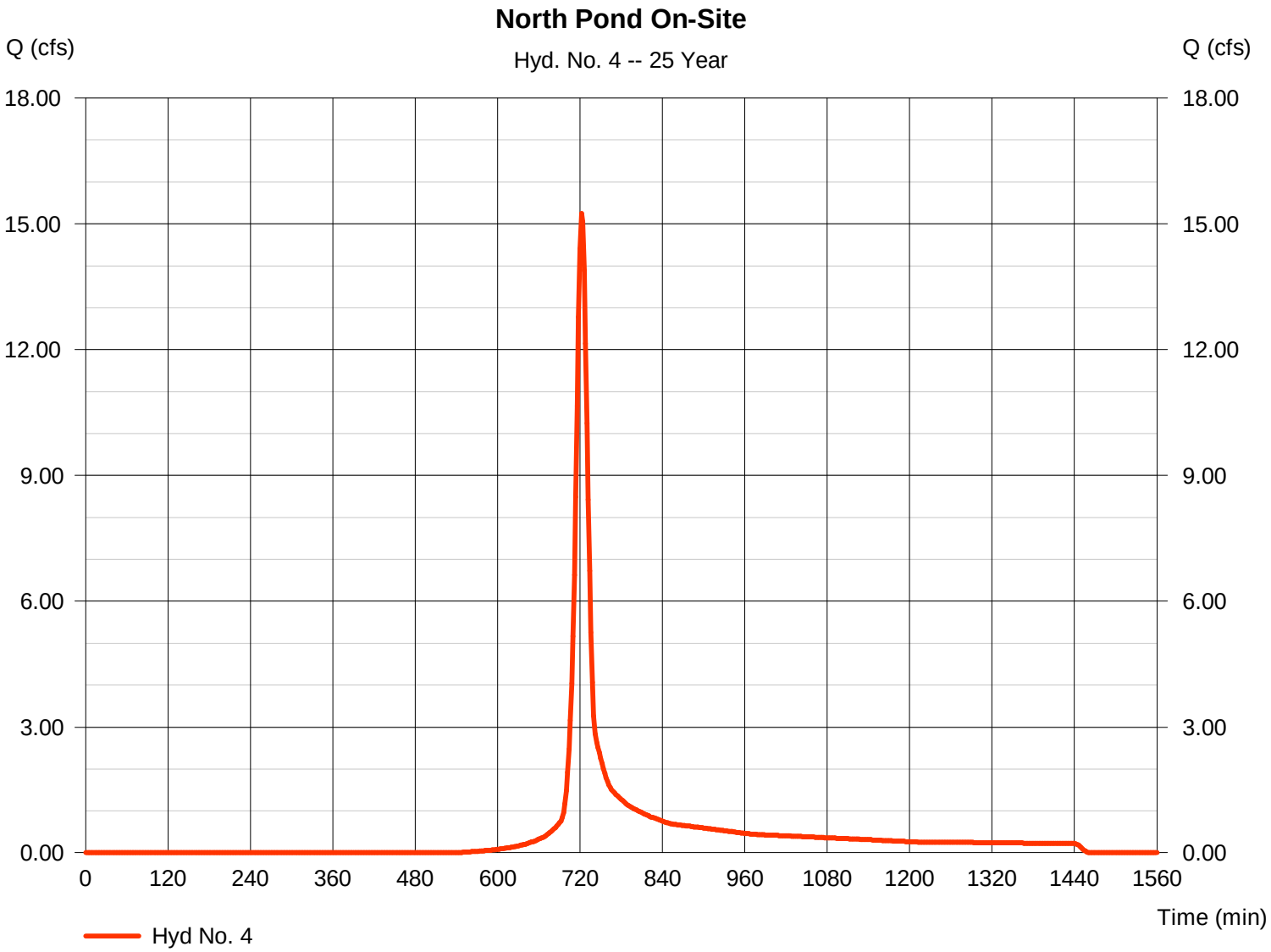


Hydrograph Report

Hyd. No. 4

North Pond On-Site

Hydrograph type	=	SCS Runoff	Peak discharge	=	15.24 cfs
Storm frequency	=	25 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	42,881 cuft
Drainage area	=	4.200 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

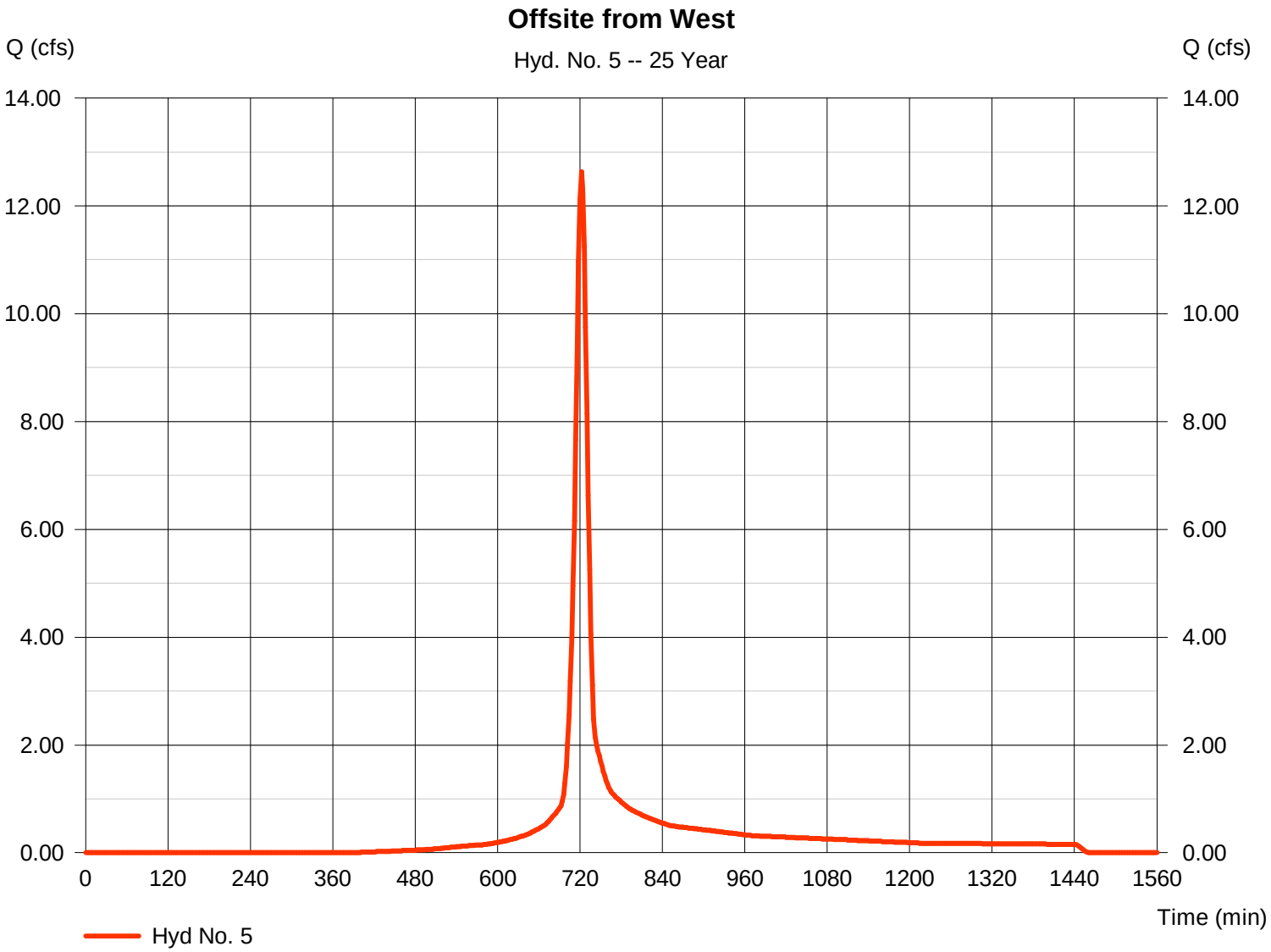


Hydrograph Report

Hyd. No. 5

Offsite from West

Hydrograph type	=	SCS Runoff	Peak discharge	=	12.63 cfs
Storm frequency	=	25 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	35,627 cuft
Drainage area	=	2.600 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

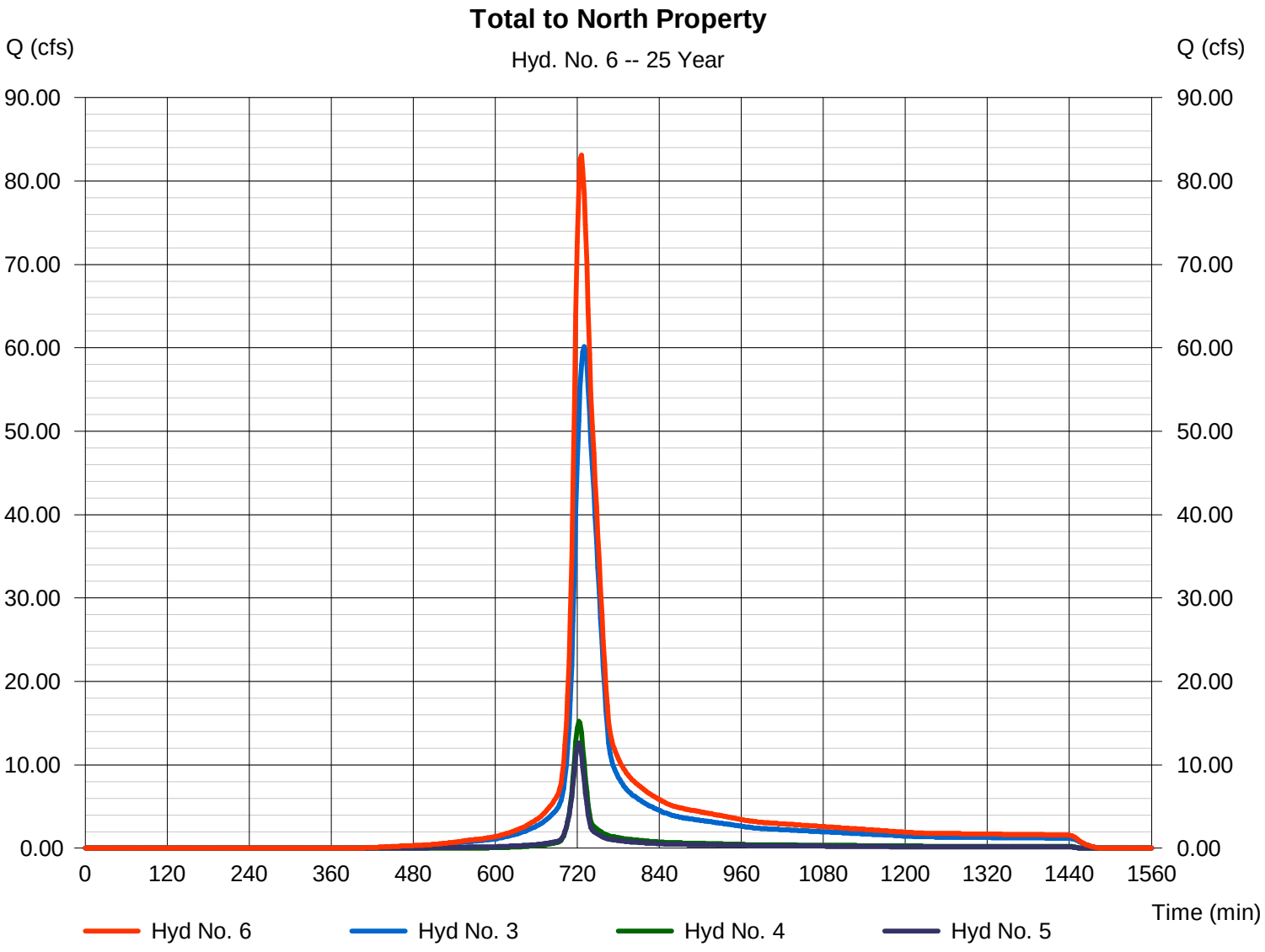


Hydrograph Report

Hyd. No. 6

Total to North Property

Hydrograph type	= Combine	Peak discharge	= 83.08 cfs
Storm frequency	= 25 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 341,916 cuft
Inflow hyds.	= 3, 4, 5	Contrib. drain. area	= 6.800 ac

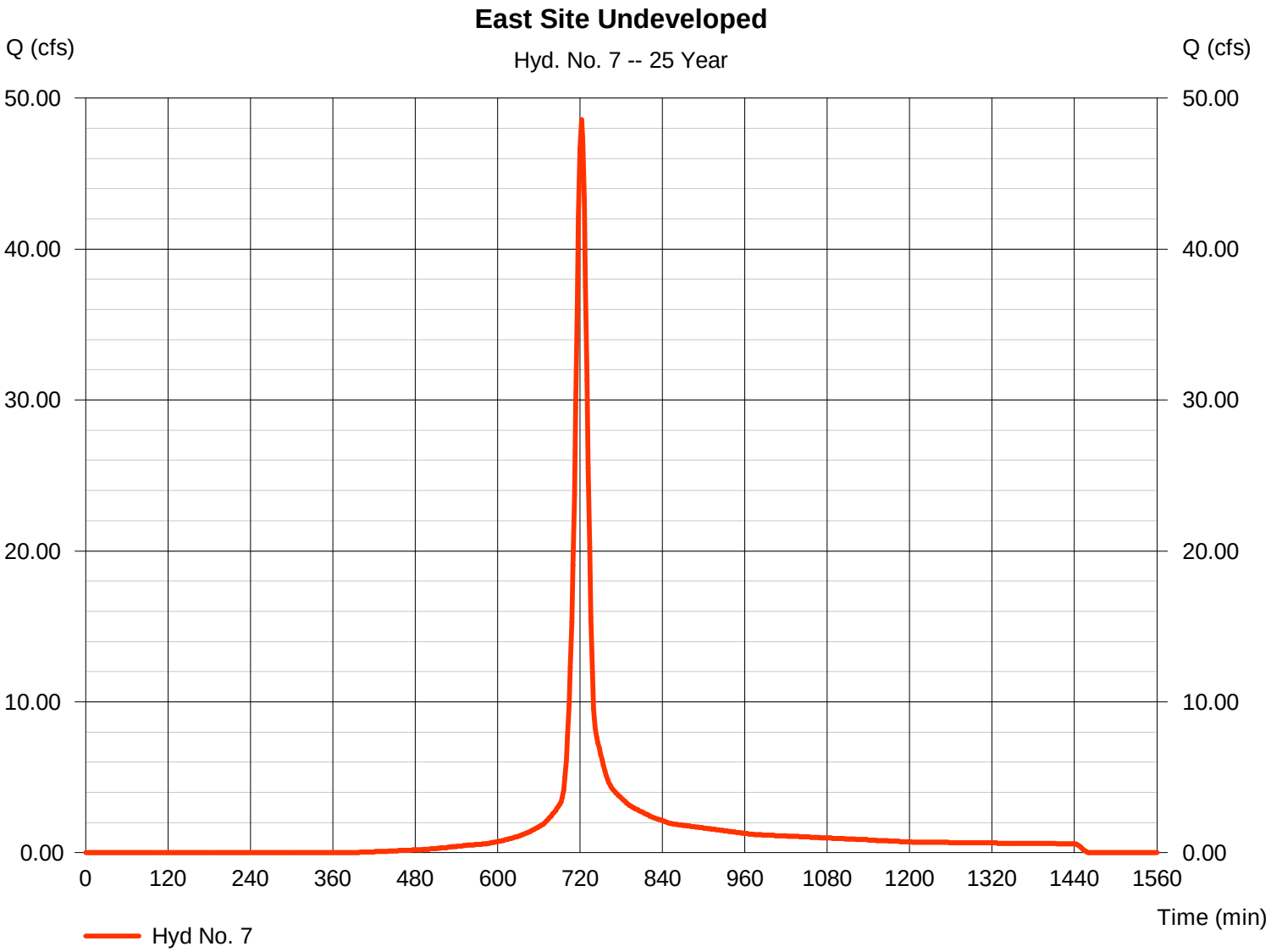


Hydrograph Report

Hyd. No. 7

East Site Undeveloped

Hydrograph type	=	SCS Runoff	Peak discharge	=	48.57 cfs
Storm frequency	=	25 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	137,026 cuft
Drainage area	=	10.000 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Summary Report

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

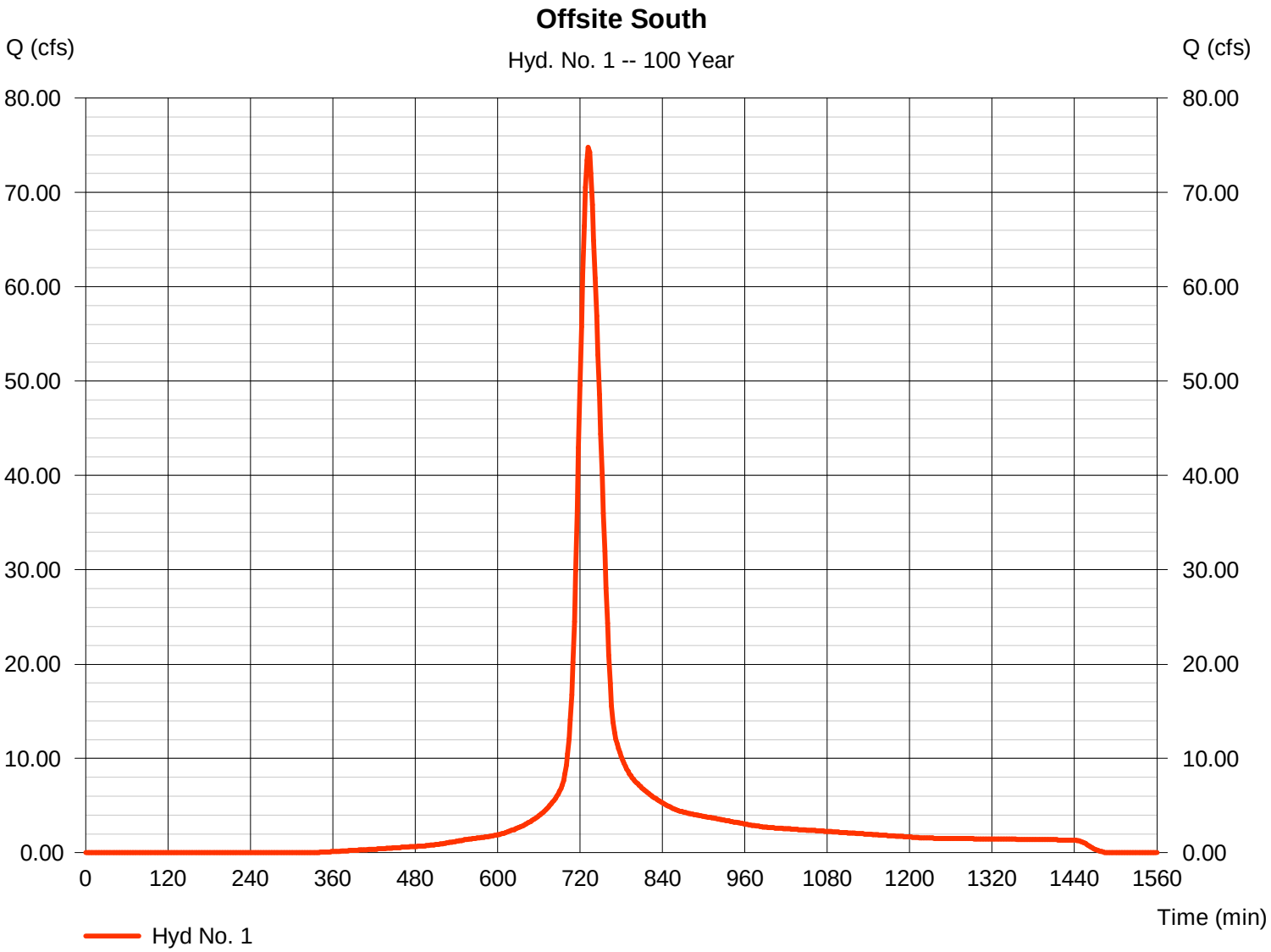
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	74.79	2	732	325,274	------	------	------	Offsite South
2	SCS Runoff	19.35	2	722	54,238	------	------	------	South On-Site Runoff
3	Combine	86.15	2	730	379,512	1, 2	------	------	Total to South Pond
4	SCS Runoff	23.21	2	722	65,085	------	------	------	North Pond On-Site
5	SCS Runoff	17.84	2	722	50,899	------	------	------	Offsite from West
6	Combine	120.50	2	726	495,497	3, 4, 5	------	------	Total to North Property
7	SCS Runoff	68.60	2	722	195,767	------	------	------	East Site Undeveloped

Hydrograph Report

Hyd. No. 1

Offsite South

Hydrograph type	=	SCS Runoff	Peak discharge	=	74.79 cfs
Storm frequency	=	100 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	325,274 cuft
Drainage area	=	16.000 ac	Curve number	=	80
Basin Slope	=	1.0 %	Hydraulic length	=	950 ft
Tc method	=	LAG	Time of conc. (Tc)	=	30.56 min
Total precip.	=	7.90 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

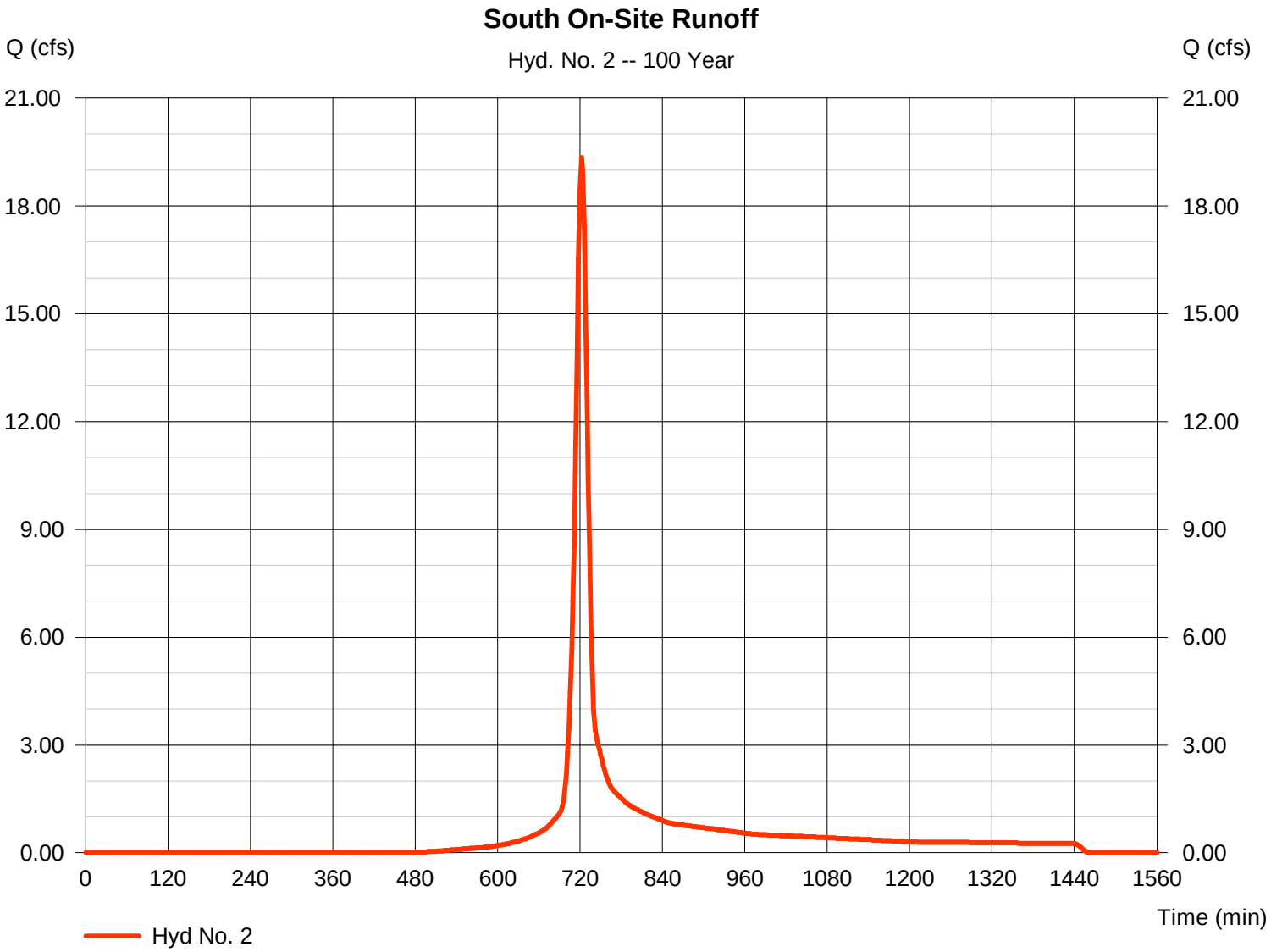


Hydrograph Report

Hyd. No. 2

South On-Site Runoff

Hydrograph type	=	SCS Runoff	Peak discharge	=	19.35 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	54,238 cuft
Drainage area	=	3.500 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	7.90 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

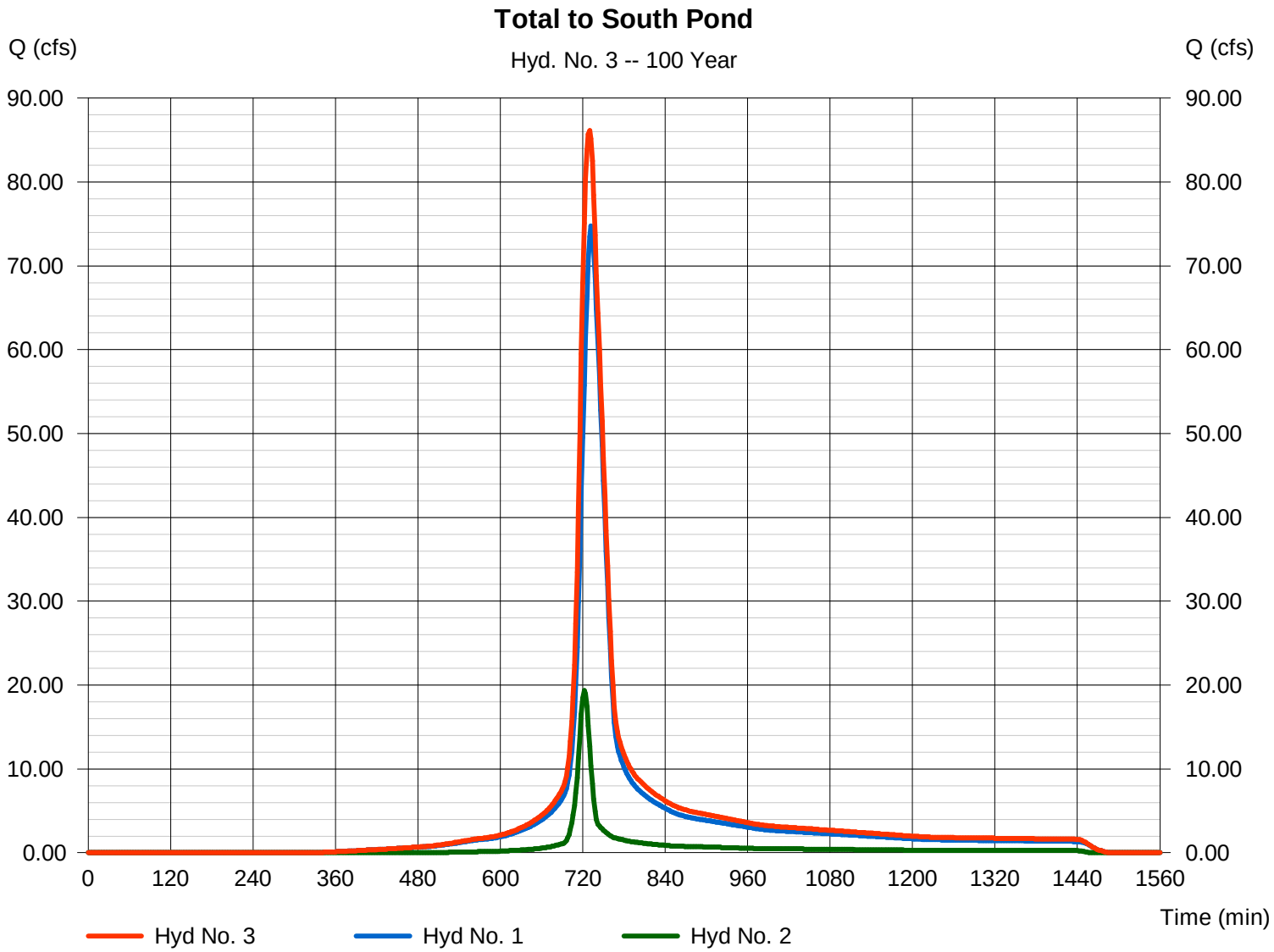


Hydrograph Report

Hyd. No. 3

Total to South Pond

Hydrograph type	= Combine	Peak discharge	= 86.15 cfs
Storm frequency	= 100 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 379,512 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 19.500 ac

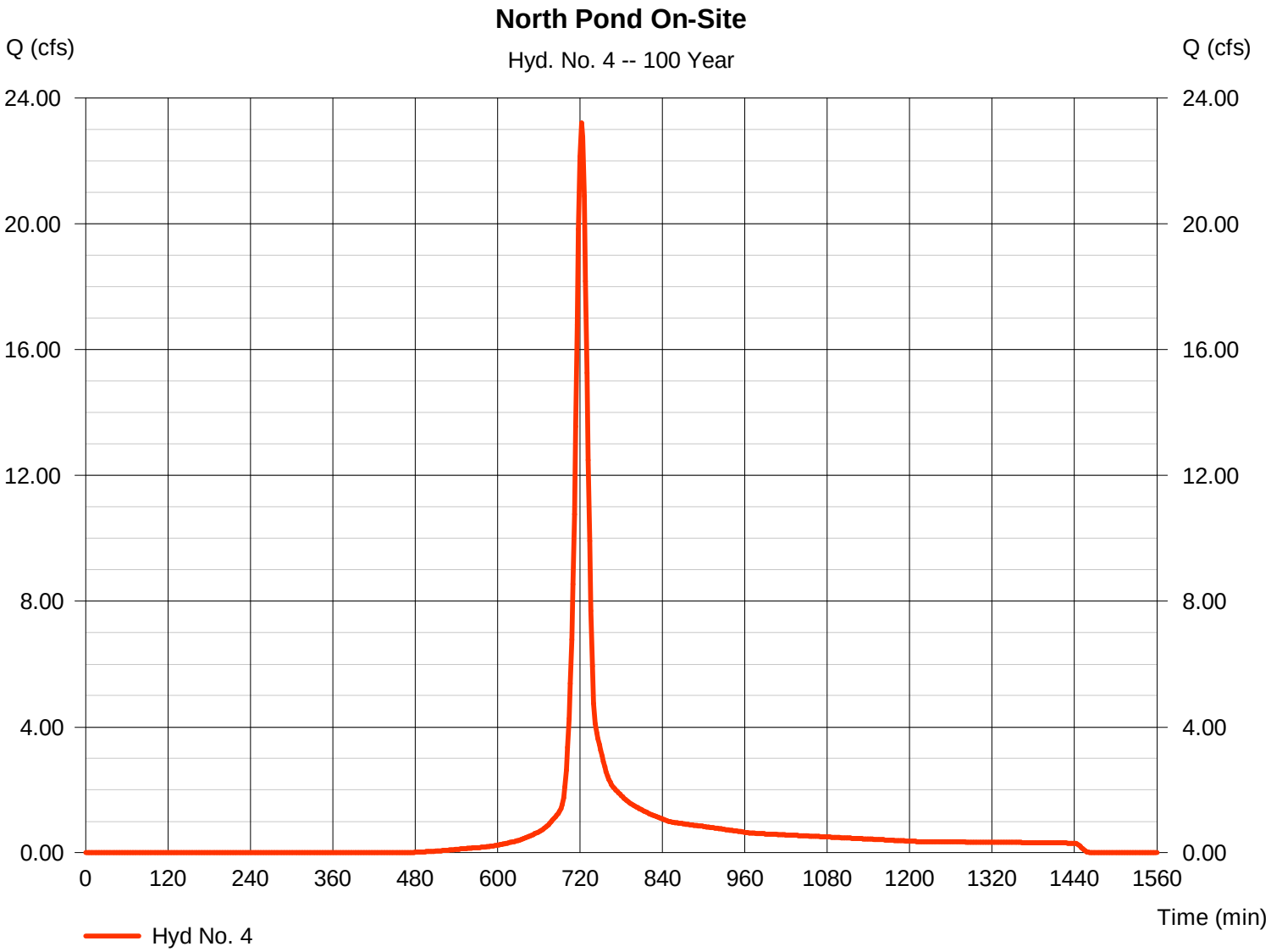


Hydrograph Report

Hyd. No. 4

North Pond On-Site

Hydrograph type	=	SCS Runoff	Peak discharge	=	23.21 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	65,085 cuft
Drainage area	=	4.200 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	7.90 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

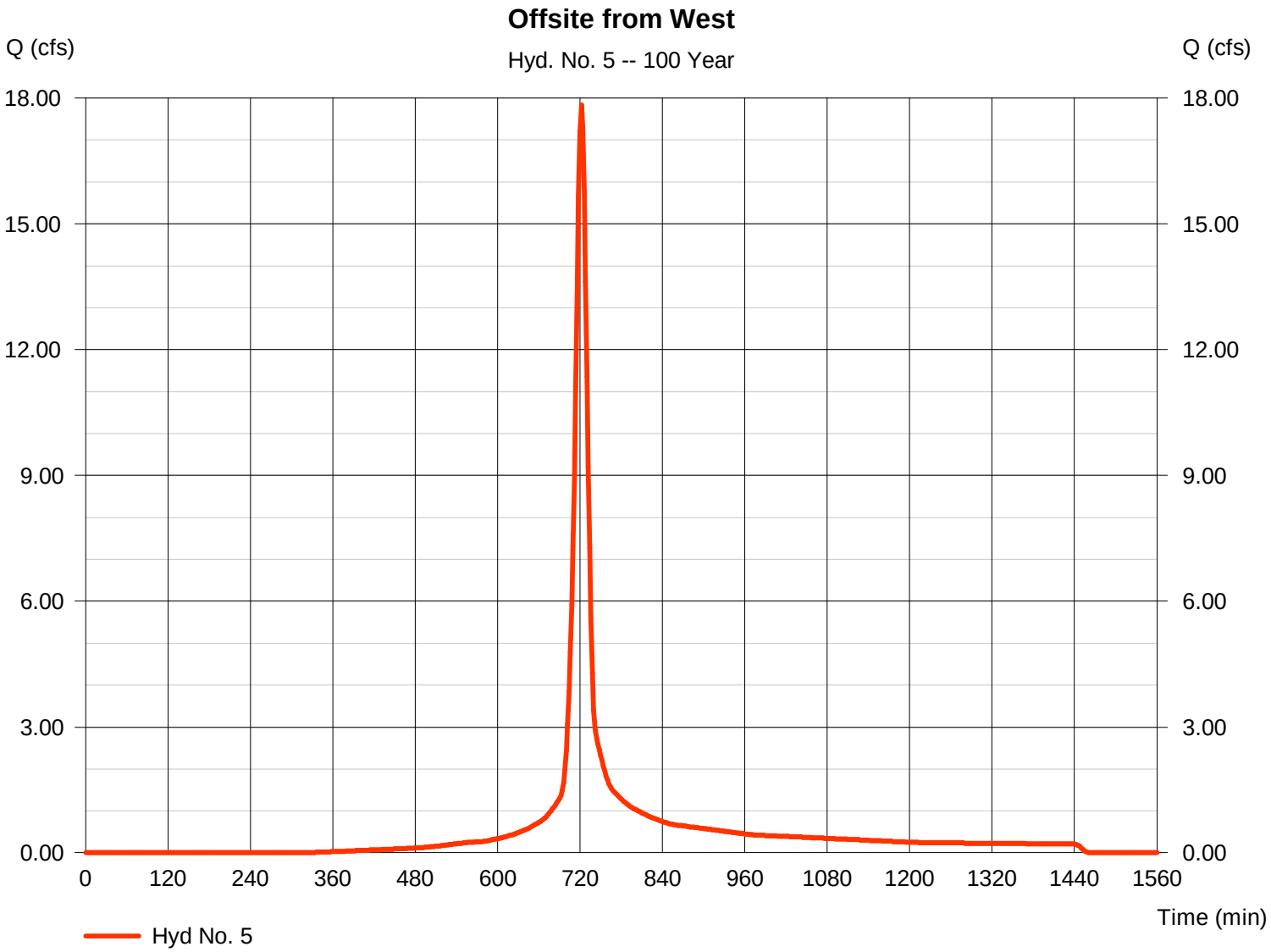


Hydrograph Report

Hyd. No. 5

Offsite from West

Hydrograph type	=	SCS Runoff	Peak discharge	=	17.84 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	50,899 cuft
Drainage area	=	2.600 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	7.90 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

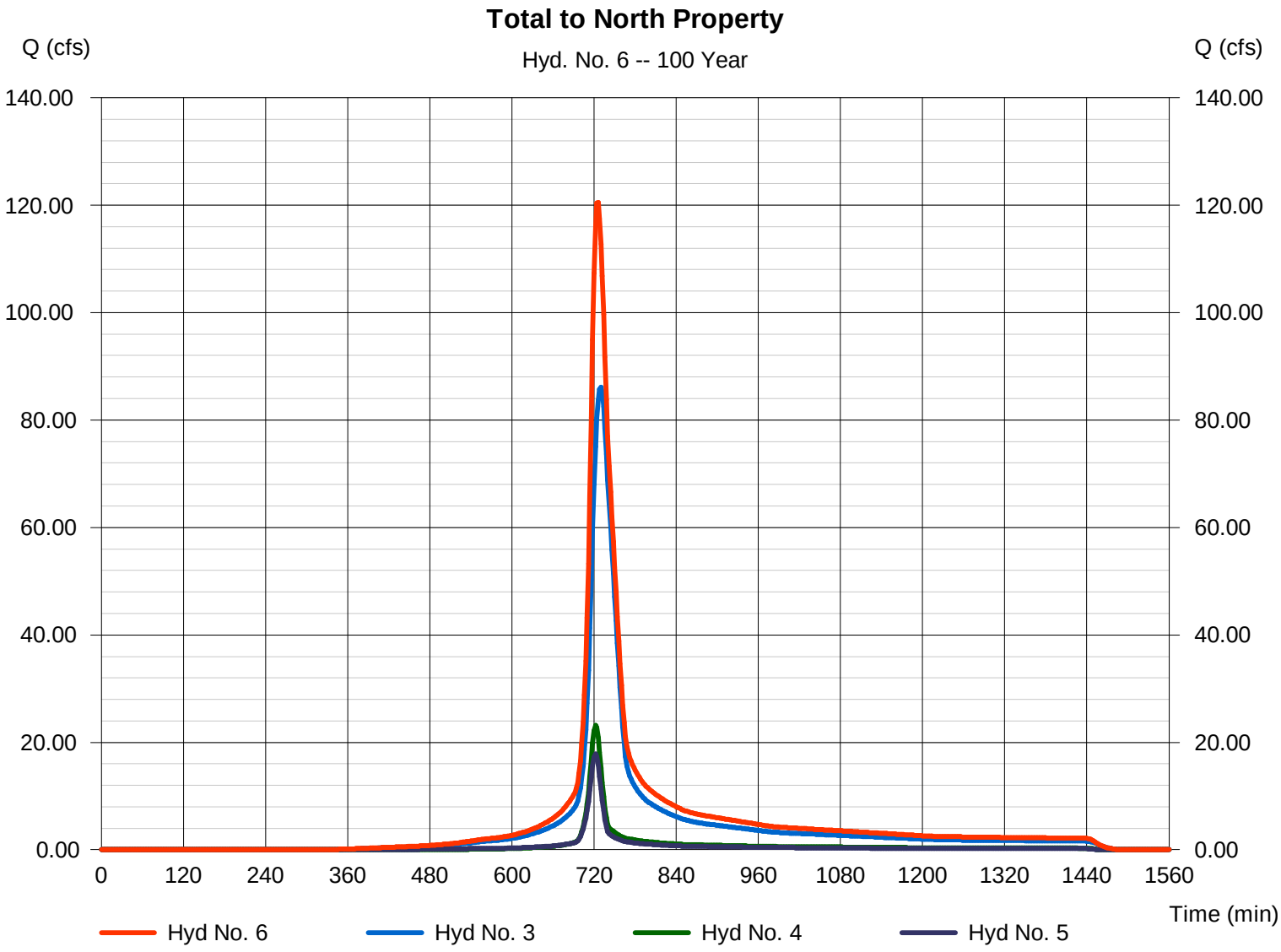


Hydrograph Report

Hyd. No. 6

Total to North Property

Hydrograph type	= Combine	Peak discharge	= 120.50 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 495,497 cuft
Inflow hyds.	= 3, 4, 5	Contrib. drain. area	= 6.800 ac

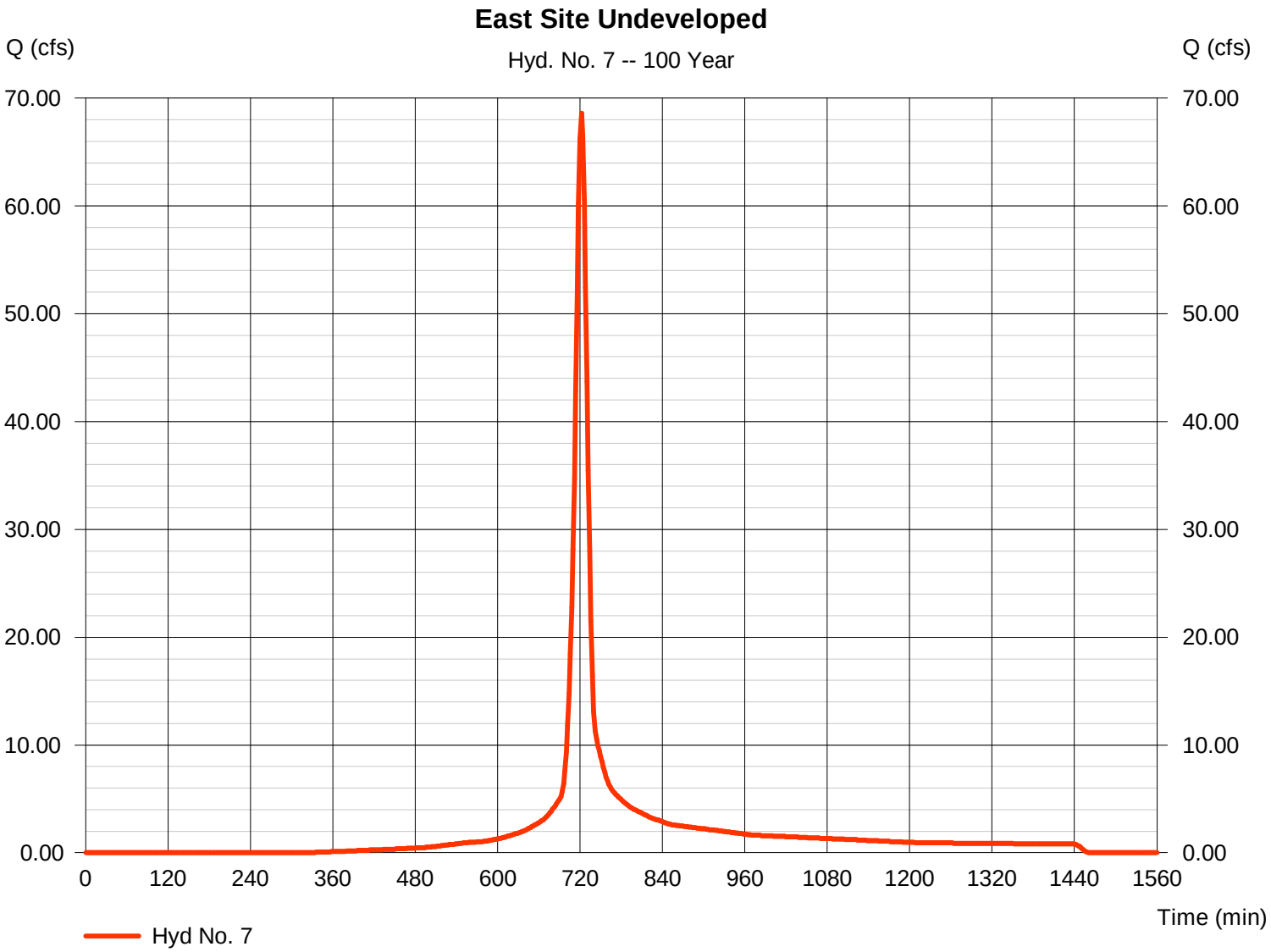


Hydrograph Report

Hyd. No. 7

East Site Undeveloped

Hydrograph type	=	SCS Runoff	Peak discharge	=	68.60 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	195,767 cuft
Drainage area	=	10.000 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	7.90 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



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	76.3137	14.3000	0.8844	--------
3	0.0000	0.0000	0.0000	--------
5	52.6224	11.2000	0.7497	--------
10	55.1841	11.1000	0.7229	--------
25	60.7012	11.1000	0.7068	--------
50	66.9222	11.3000	0.7004	--------
100	62.2794	10.1000	0.6624	--------

File name: wichita.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	5.57	4.54	3.85	3.35	2.97	2.67	2.43	2.23	2.06	1.92	1.80	1.69
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	6.52	5.33	4.55	3.99	3.57	3.24	2.97	2.75	2.57	2.41	2.27	2.15
10	7.40	6.09	5.22	4.60	4.13	3.76	3.46	3.21	3.00	2.82	2.67	2.53
25	8.51	7.03	6.05	5.35	4.81	4.39	4.05	3.76	3.52	3.32	3.14	2.98
50	9.47	7.86	6.78	6.00	5.41	4.94	4.56	4.24	3.98	3.75	3.55	3.37
100	10.31	8.53	7.37	6.53	5.90	5.40	5.00	4.66	4.37	4.13	3.92	3.73

Tc = time in minutes. Values may exceed 60.

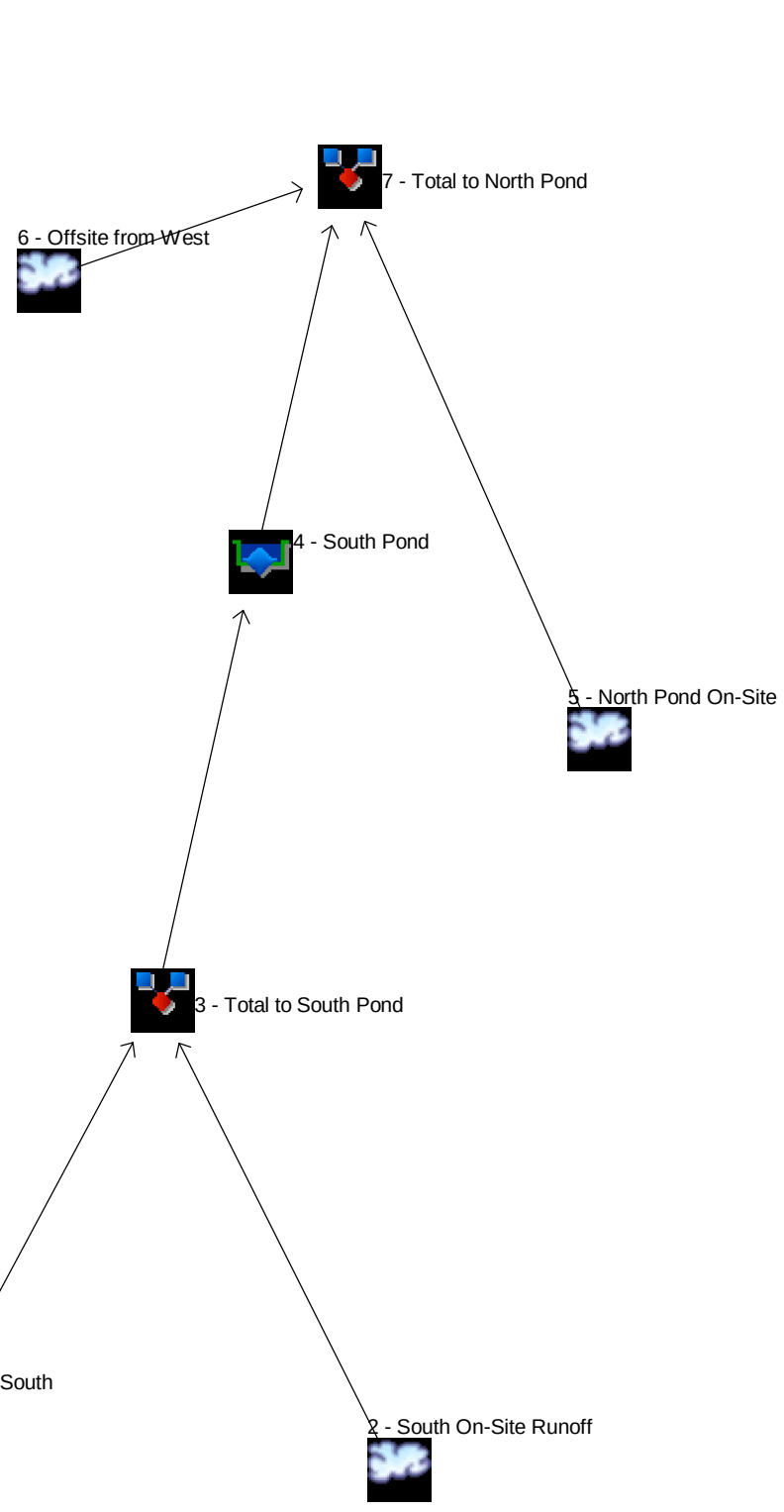
Precip. file name: wich_24hr.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	3.50	0.00	4.50	5.30	6.10	6.80	7.90
SCS 6-Hr	0.00	1.80	0.00	0.00	2.60	0.00	0.00	4.00
Huff-1st	0.00	1.55	0.00	2.75	4.00	5.38	6.50	8.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	1.75	0.00	2.80	3.90	5.25	6.00	7.10

Hydraflow Table of Contents

Watershed Model Schematic

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



Legend

Hyd.	Origin	Description
1	SCS Runoff	Offsite South
2	SCS Runoff	South On-Site Runoff
3	Combine	Total to South Pond
4	Reservoir	South Pond
5	SCS Runoff	North Pond On-Site
6	SCS Runoff	Offsite from West
7	Combine	Total to North Pond
8	SCS Runoff	East Site Developed

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	SCS Runoff	------	-------	22.01	-------	33.42	42.96	52.66	-------	74.79	Offsite South
2	SCS Runoff	------	-------	4.183	-------	7.199	9.883	12.70	-------	19.35	South On-Site Runoff
3	Combine	1, 2	-------	24.46	-------	37.62	48.74	60.11	-------	86.15	Total to South Pond
4	Reservoir	3	-------	12.79	-------	20.97	28.36	36.23	-------	53.37	South Pond
5	SCS Runoff	------	-------	5.019	-------	8.639	11.86	15.24	-------	23.21	North Pond On-Site
6	SCS Runoff	------	-------	5.349	-------	8.080	10.34	12.63	-------	17.84	Offsite from West
7	Combine	4, 5, 6	-------	14.37	-------	24.80	34.33	43.88	-------	67.03	Total to North Pond
8	SCS Runoff	------	-------	11.95	-------	20.57	28.24	36.29	-------	55.27	East Site Developed

Hydrograph Summary Report

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

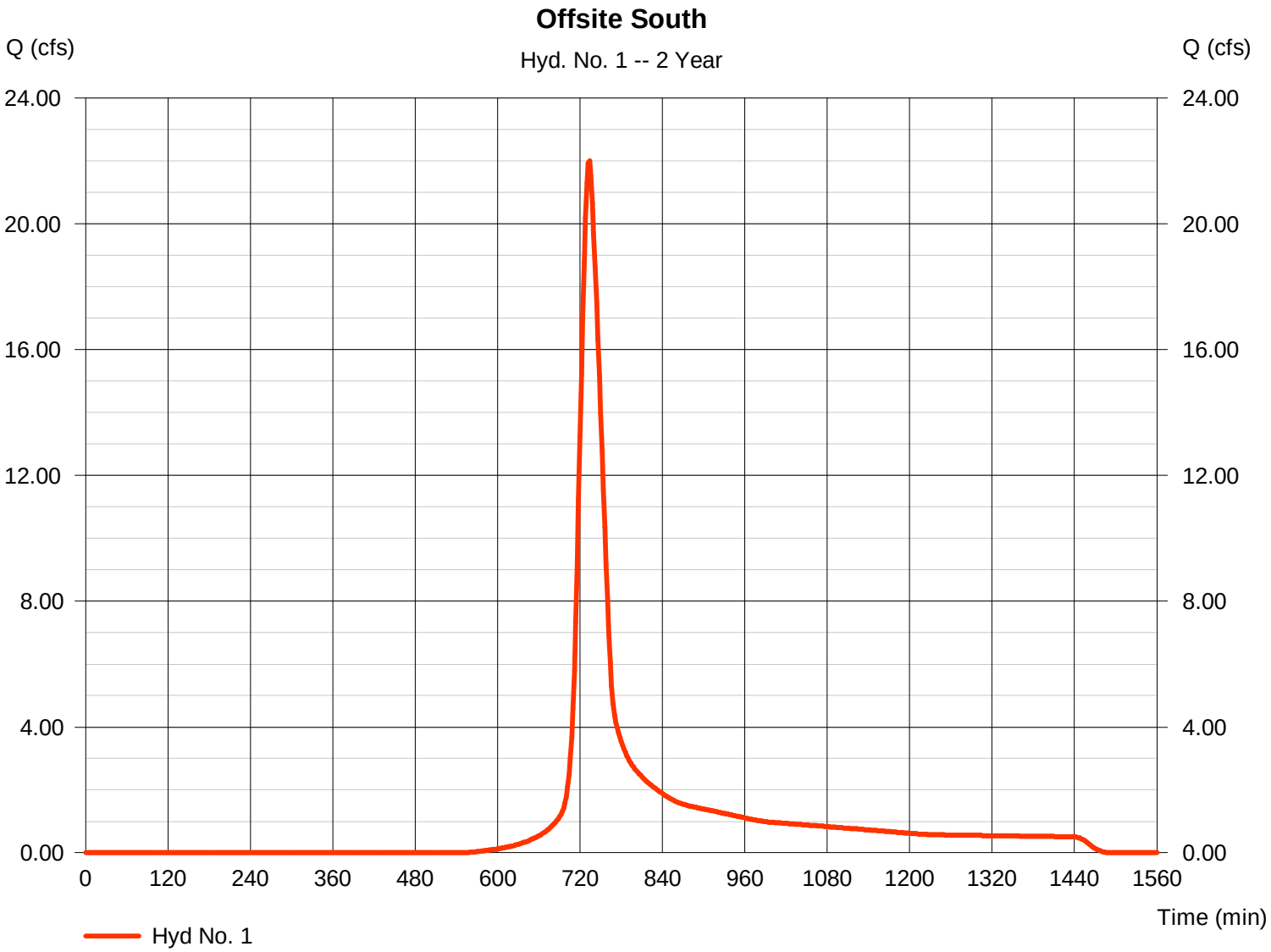
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	22.01	2	734	96,228	------	------	------	Offsite South
2	SCS Runoff	4.183	2	724	12,488	------	------	------	South On-Site Runoff
3	Combine	24.46	2	732	108,716	1, 2	------	------	Total to South Pond
4	Reservoir	12.79	2	754	108,708	3	1414.99	33,088	South Pond
5	SCS Runoff	5.019	2	724	14,985	------	------	------	North Pond On-Site
6	SCS Runoff	5.349	2	722	15,058	------	------	------	Offsite from West
7	Combine	14.37	2	752	138,751	4, 5, 6	------	------	Total to North Pond
8	SCS Runoff	11.95	2	724	35,679	------	------	------	East Site Developed

Hydrograph Report

Hyd. No. 1

Offsite South

Hydrograph type	=	SCS Runoff	Peak discharge	=	22.01 cfs
Storm frequency	=	2 yrs	Time to peak	=	734 min
Time interval	=	2 min	Hyd. volume	=	96,228 cuft
Drainage area	=	16.000 ac	Curve number	=	80
Basin Slope	=	1.0 %	Hydraulic length	=	950 ft
Tc method	=	LAG	Time of conc. (Tc)	=	30.56 min
Total precip.	=	3.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

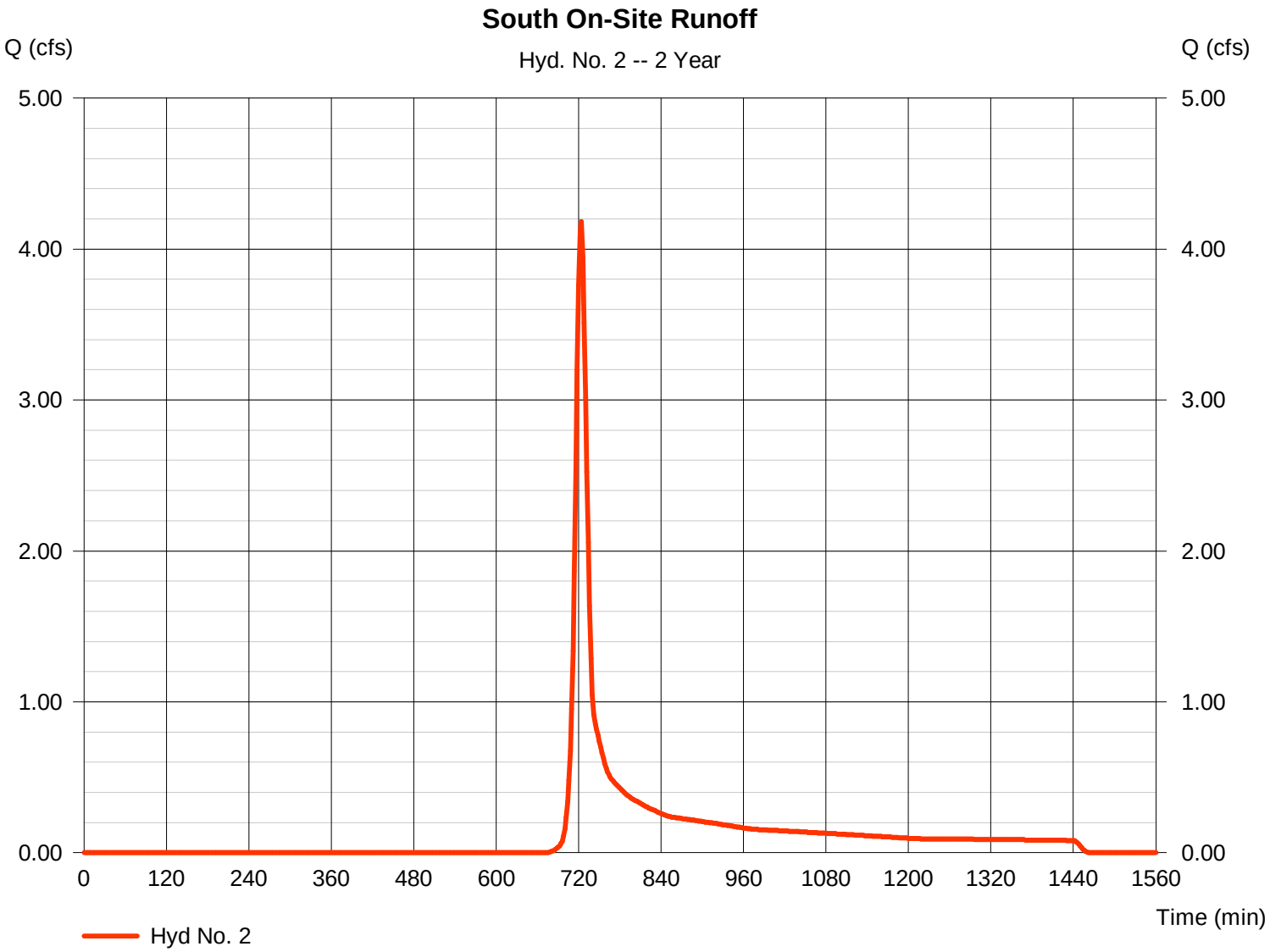


Hydrograph Report

Hyd. No. 2

South On-Site Runoff

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.183 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	12,488 cuft
Drainage area	=	3.500 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	3.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

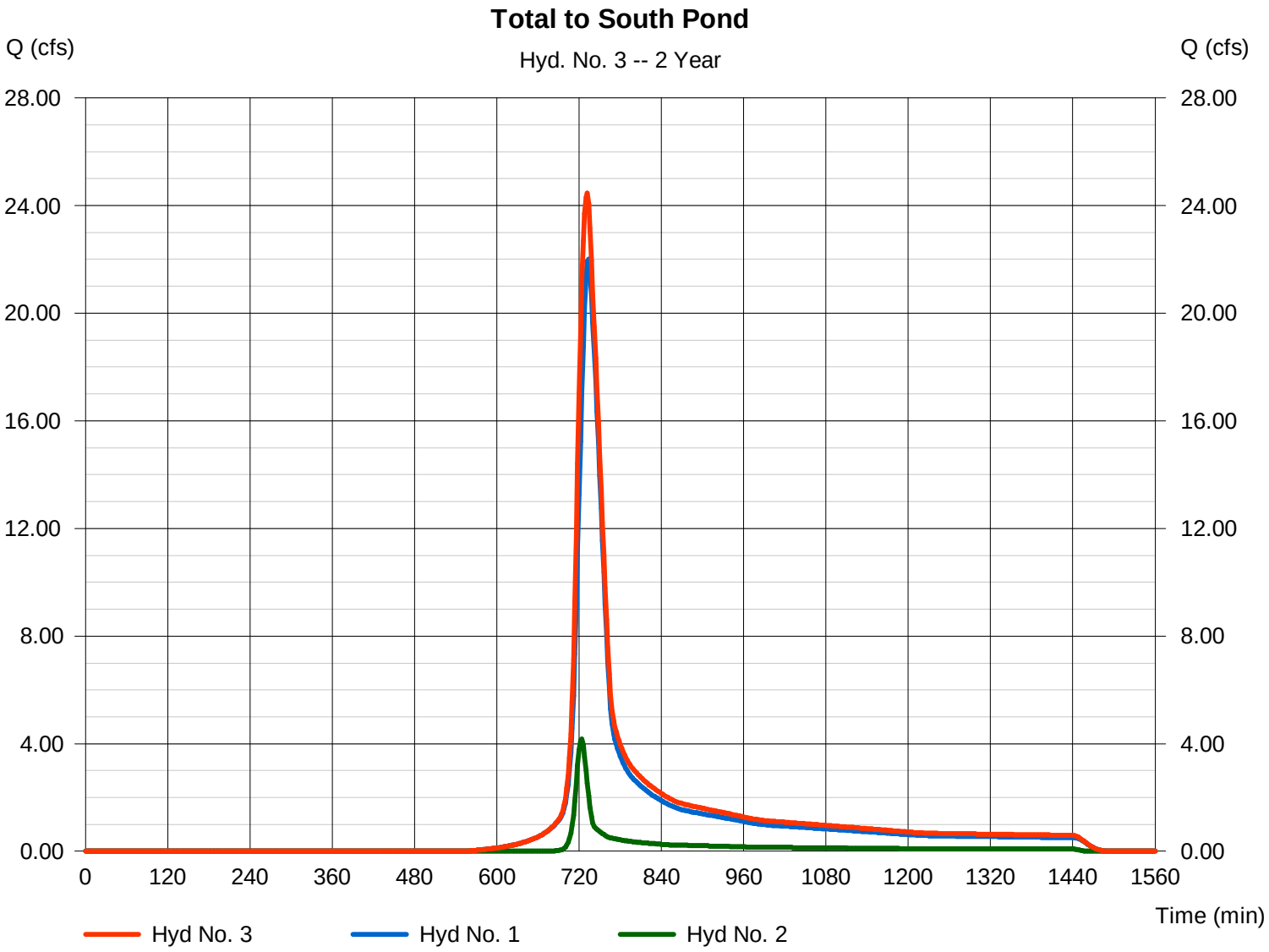


Hydrograph Report

Hyd. No. 3

Total to South Pond

Hydrograph type	= Combine	Peak discharge	= 24.46 cfs
Storm frequency	= 2 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 108,716 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 19.500 ac



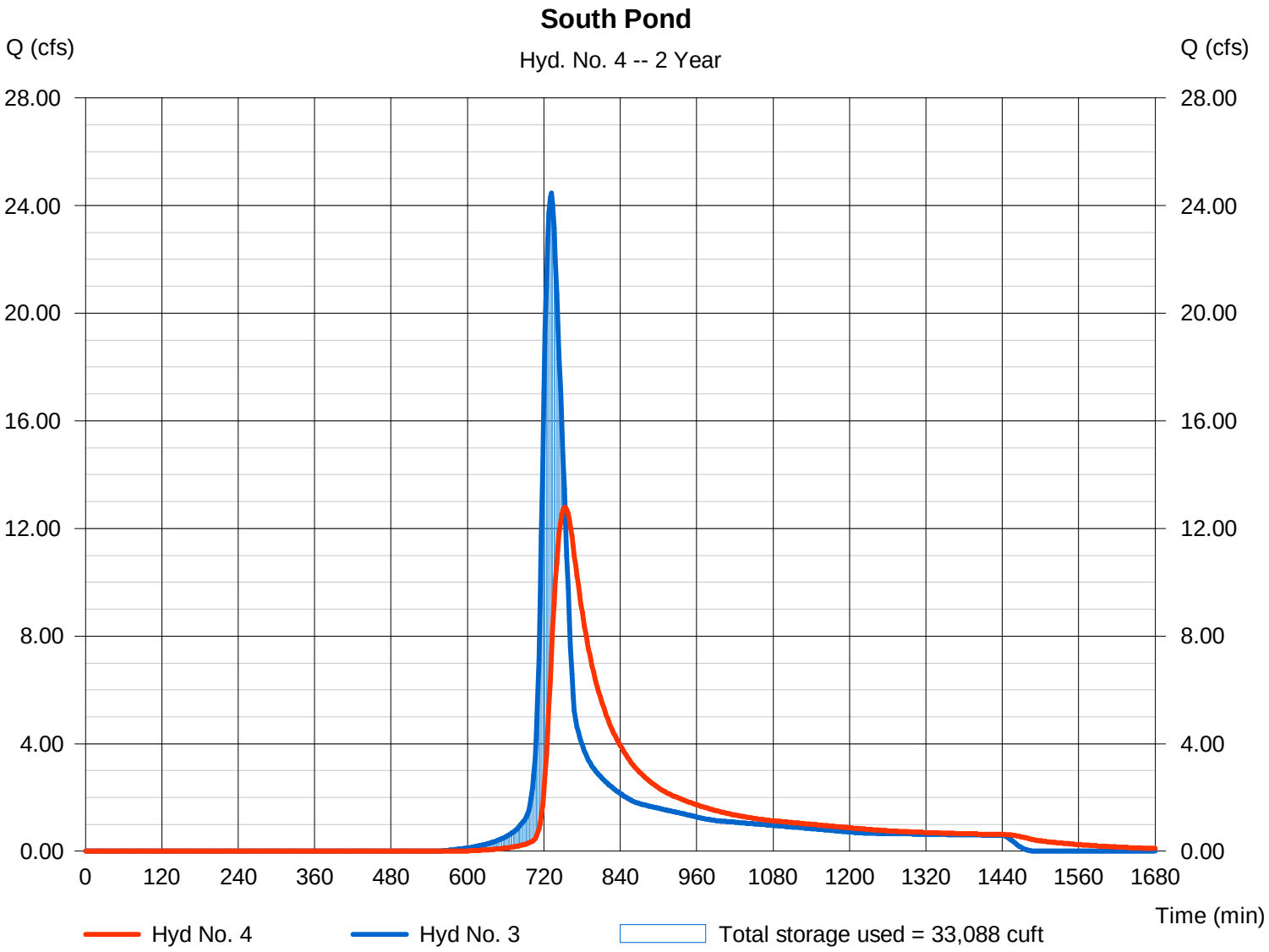
Hydrograph Report

Hyd. No. 4

South Pond

Hydrograph type	=	Reservoir	Peak discharge	=	12.79 cfs
Storm frequency	=	2 yrs	Time to peak	=	754 min
Time interval	=	2 min	Hyd. volume	=	108,708 cuft
Inflow hyd. No.	=	3 - Total to South Pond	Max. Elevation	=	1414.99 ft
Reservoir name	=	South Pond	Max. Storage	=	33,088 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - South Pond

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 1414.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1414.00	31,000	0	0
1.00	1415.00	36,000	33,466	33,466
2.00	1416.00	45,000	40,412	73,878
3.00	1417.00	49,000	46,981	120,859
4.00	1418.00	53,000	50,982	171,841

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
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

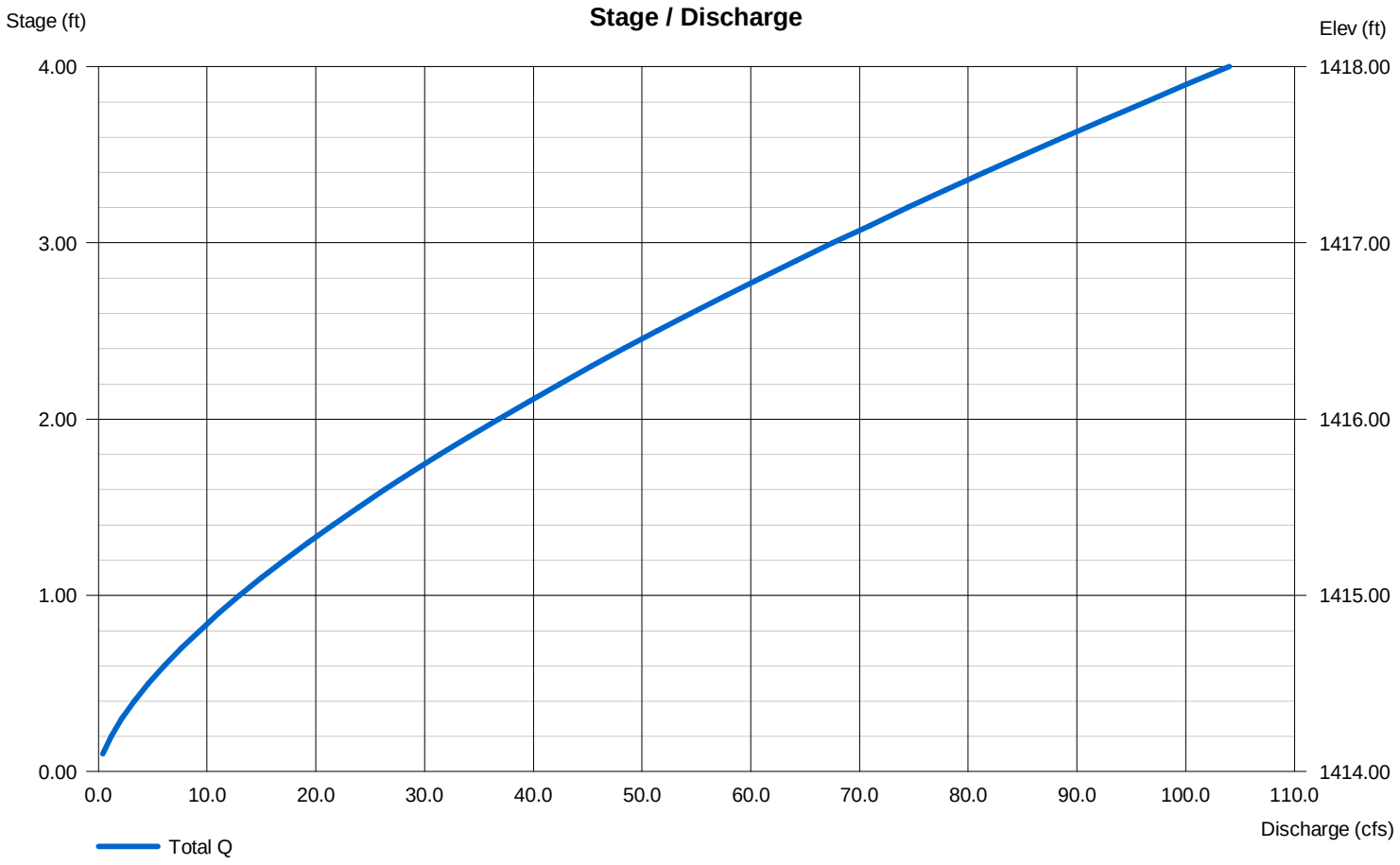
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 5.00	0.00	0.00	0.00
Crest El. (ft)	= 1414.00	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 Contour)

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).

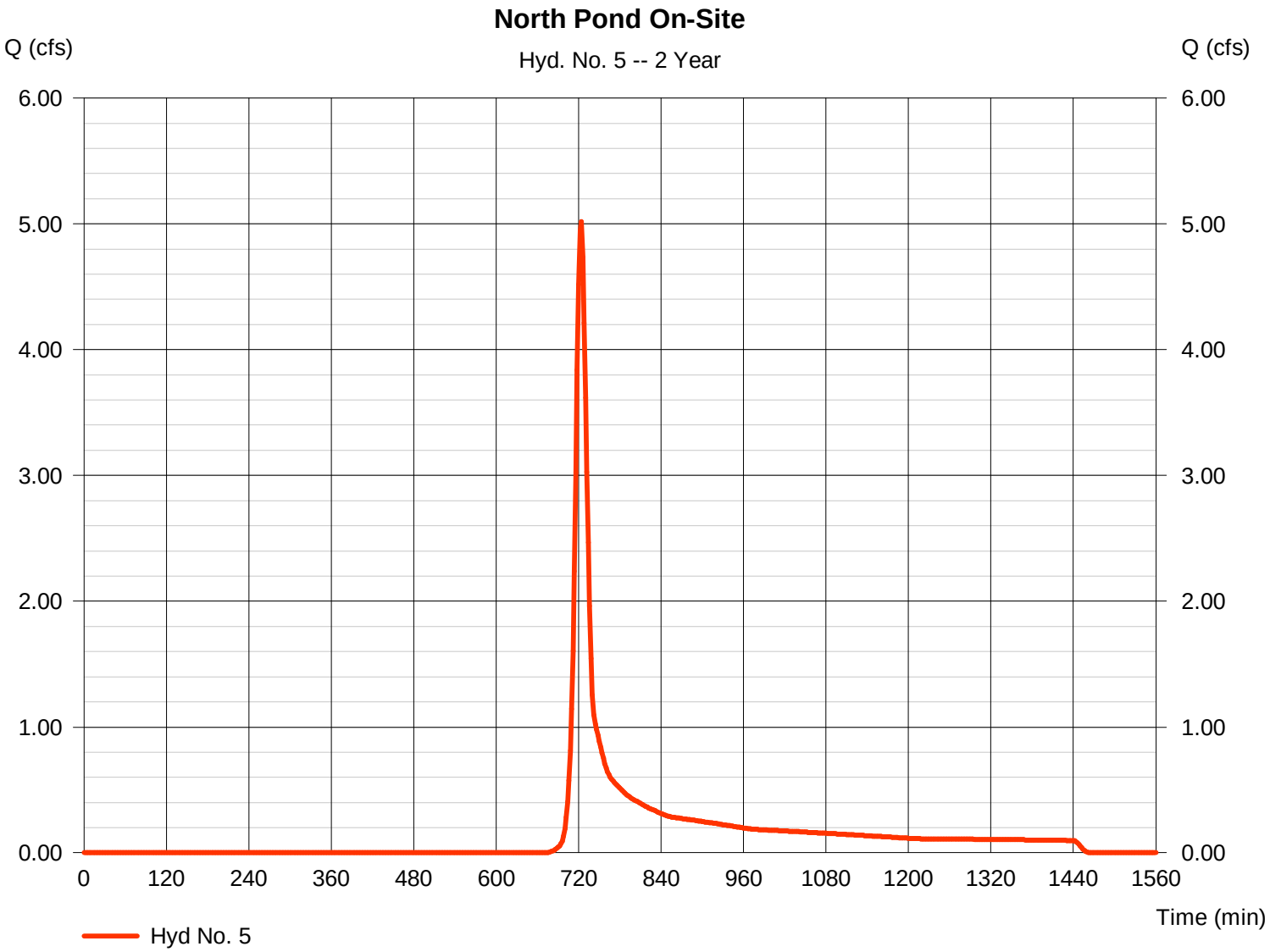


Hydrograph Report

Hyd. No. 5

North Pond On-Site

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.019 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	14,985 cuft
Drainage area	=	4.200 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	3.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

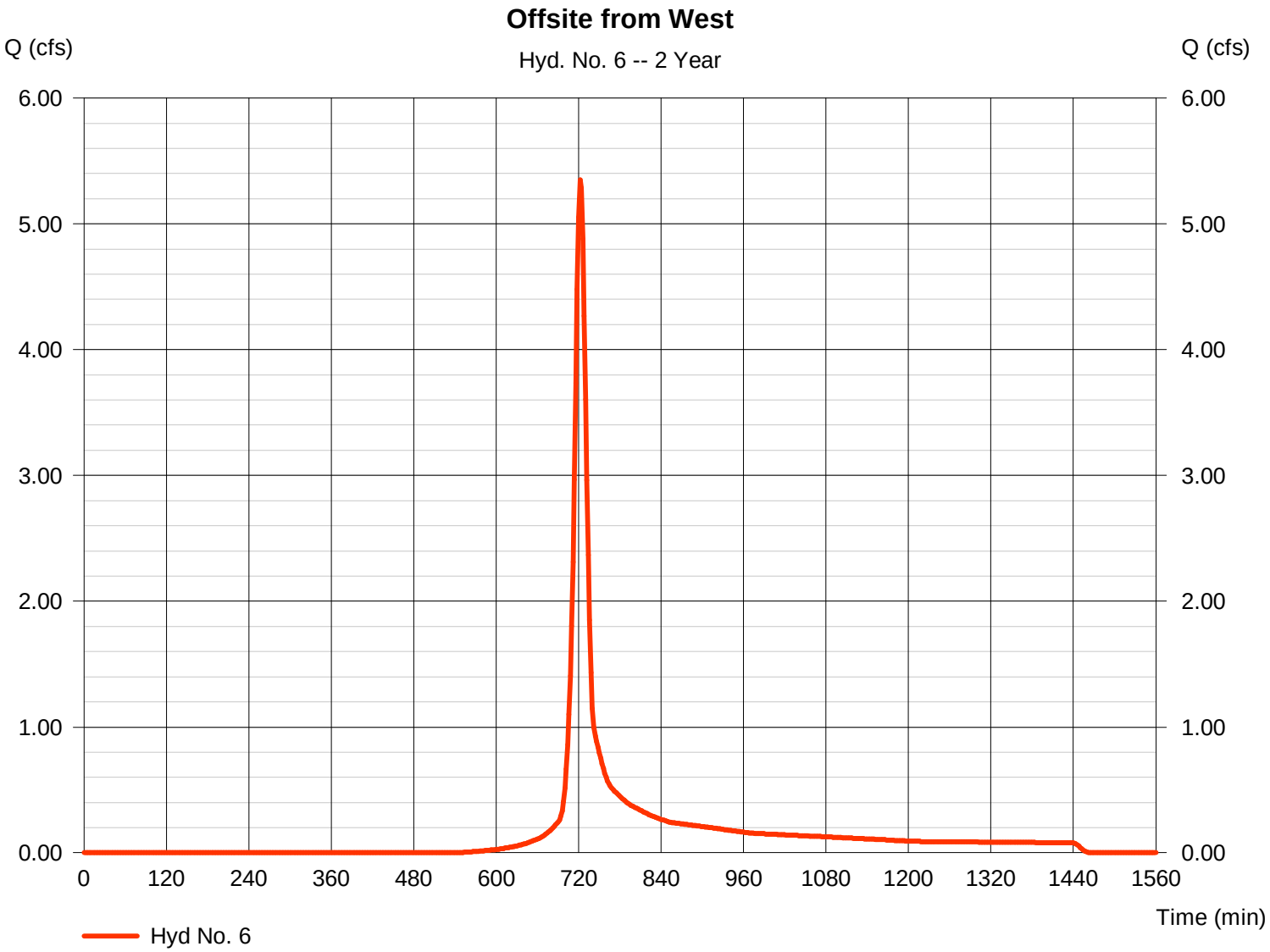


Hydrograph Report

Hyd. No. 6

Offsite from West

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.349 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	15,058 cuft
Drainage area	=	2.600 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	3.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

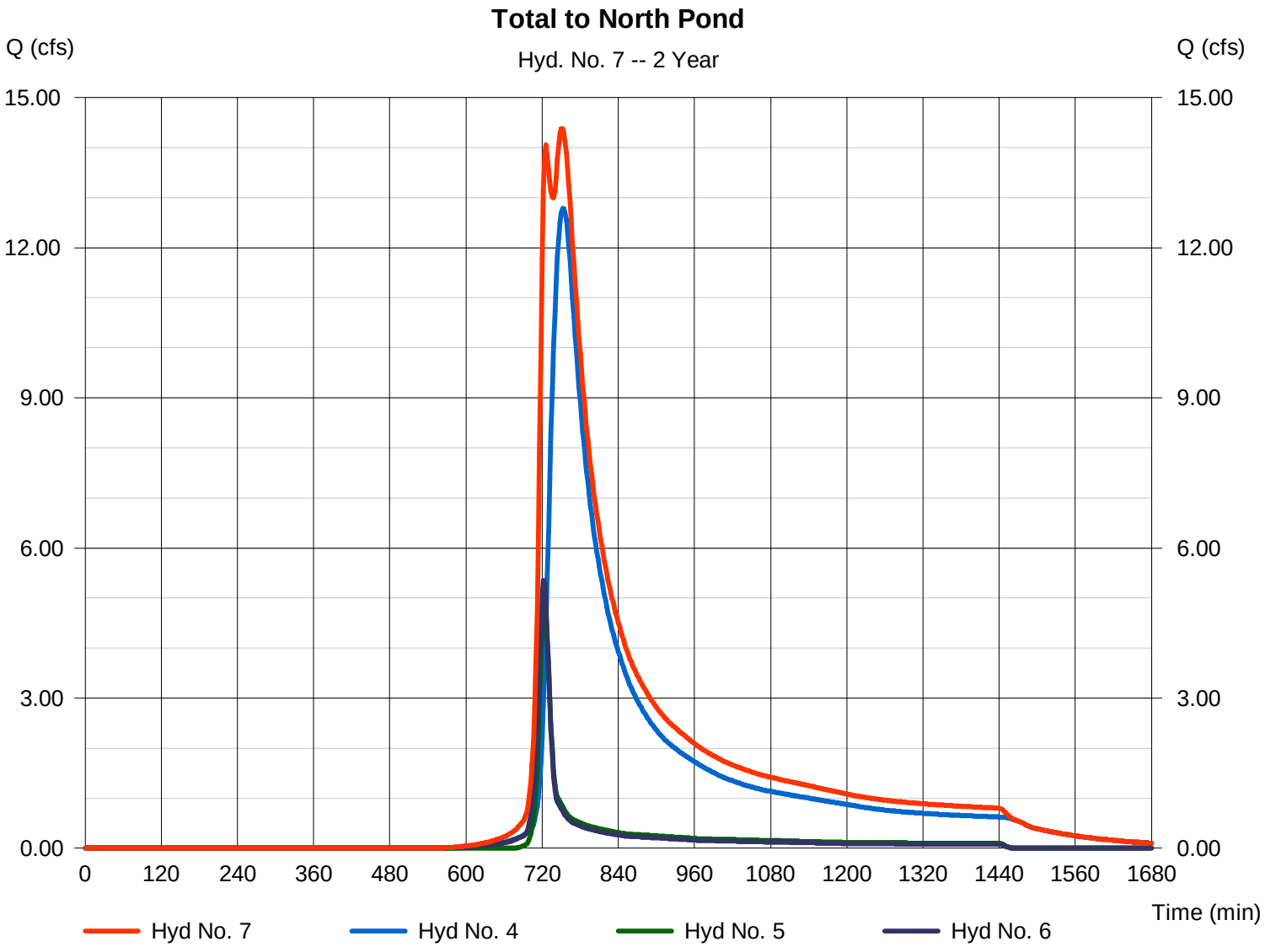


Hydrograph Report

Hyd. No. 7

Total to North Pond

Hydrograph type	= Combine	Peak discharge	= 14.37 cfs
Storm frequency	= 2 yrs	Time to peak	= 752 min
Time interval	= 2 min	Hyd. volume	= 138,751 cuft
Inflow hyds.	= 4, 5, 6	Contrib. drain. area	= 6.800 ac

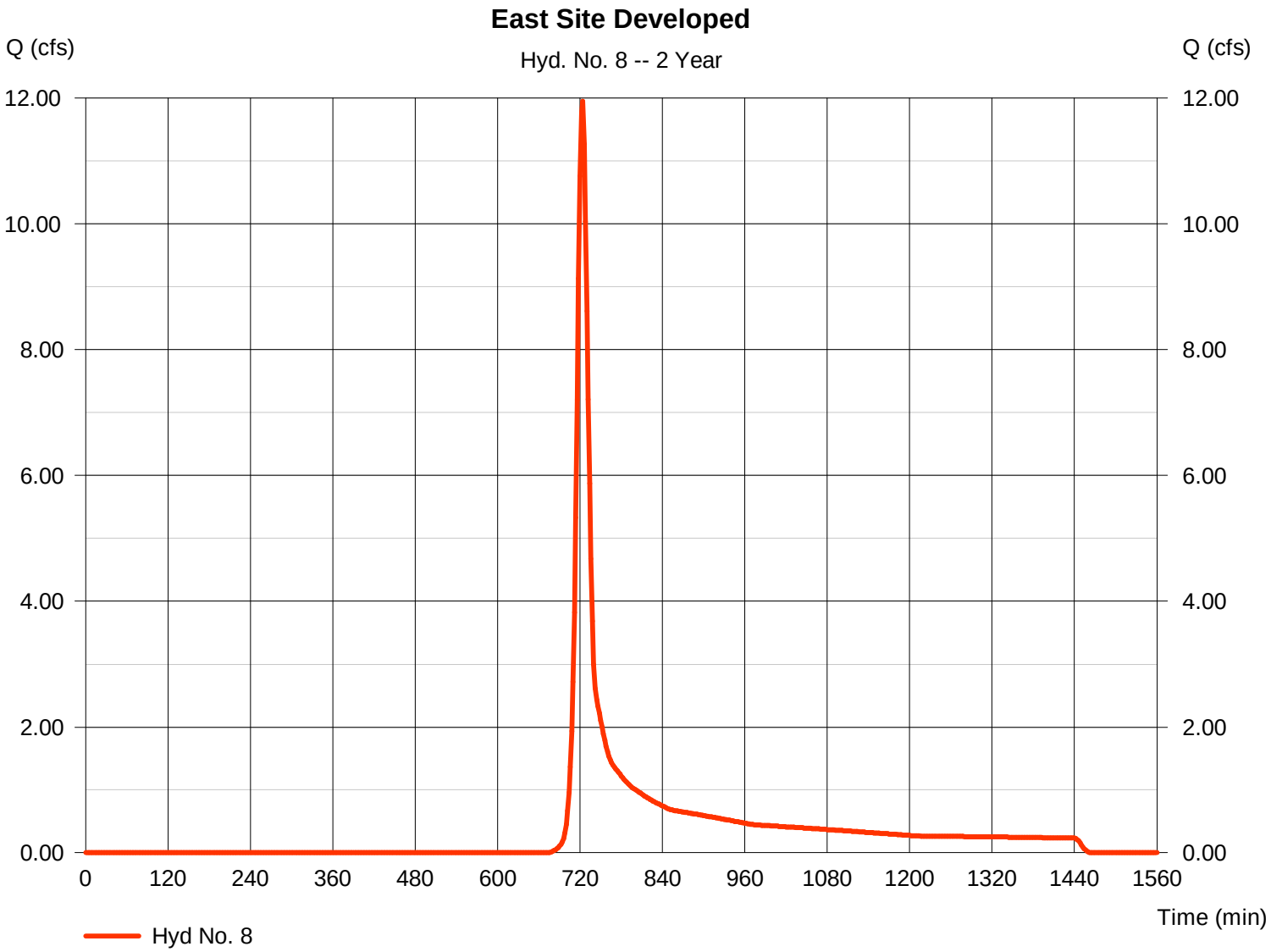


Hydrograph Report

Hyd. No. 8

East Site Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.95 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	35,679 cuft
Drainage area	=	10.000 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	3.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Summary Report

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

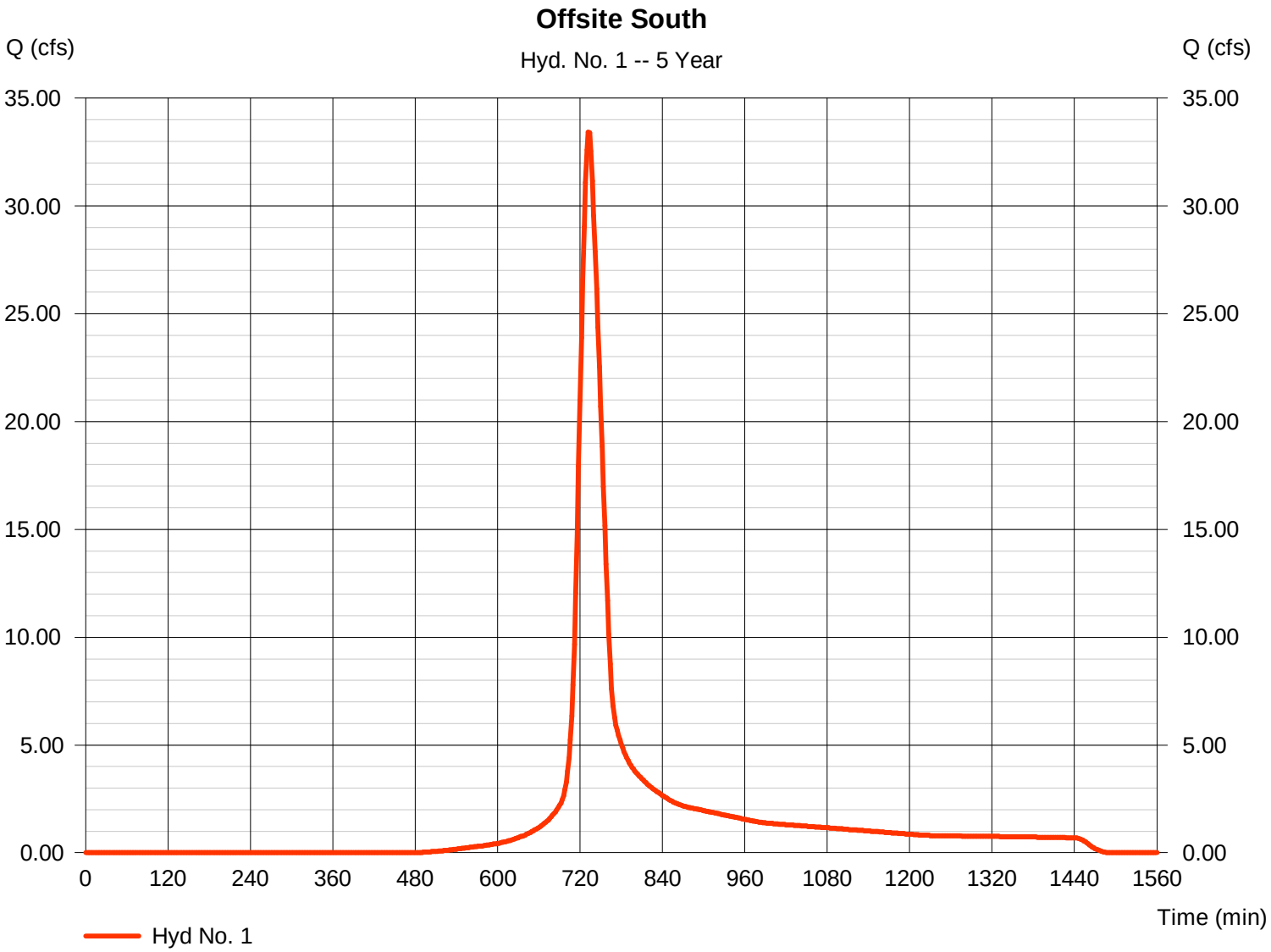
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	33.42	2	732	144,753	------	------	------	Offsite South
2	SCS Runoff	7.199	2	722	20,733	------	------	------	South On-Site Runoff
3	Combine	37.62	2	730	165,486	1, 2	------	------	Total to South Pond
4	Reservoir	20.97	2	750	165,478	3	1415.38	48,636	South Pond
5	SCS Runoff	8.639	2	722	24,880	------	------	------	North Pond On-Site
6	SCS Runoff	8.080	2	722	22,651	------	------	------	Offsite from West
7	Combine	24.80	2	726	213,009	4, 5, 6	------	------	Total to North Pond
8	SCS Runoff	20.57	2	722	59,238	------	------	------	East Site Developed

Hydrograph Report

Hyd. No. 1

Offsite South

Hydrograph type	=	SCS Runoff	Peak discharge	=	33.42 cfs
Storm frequency	=	5 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	144,753 cuft
Drainage area	=	16.000 ac	Curve number	=	80
Basin Slope	=	1.0 %	Hydraulic length	=	950 ft
Tc method	=	LAG	Time of conc. (Tc)	=	30.56 min
Total precip.	=	4.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

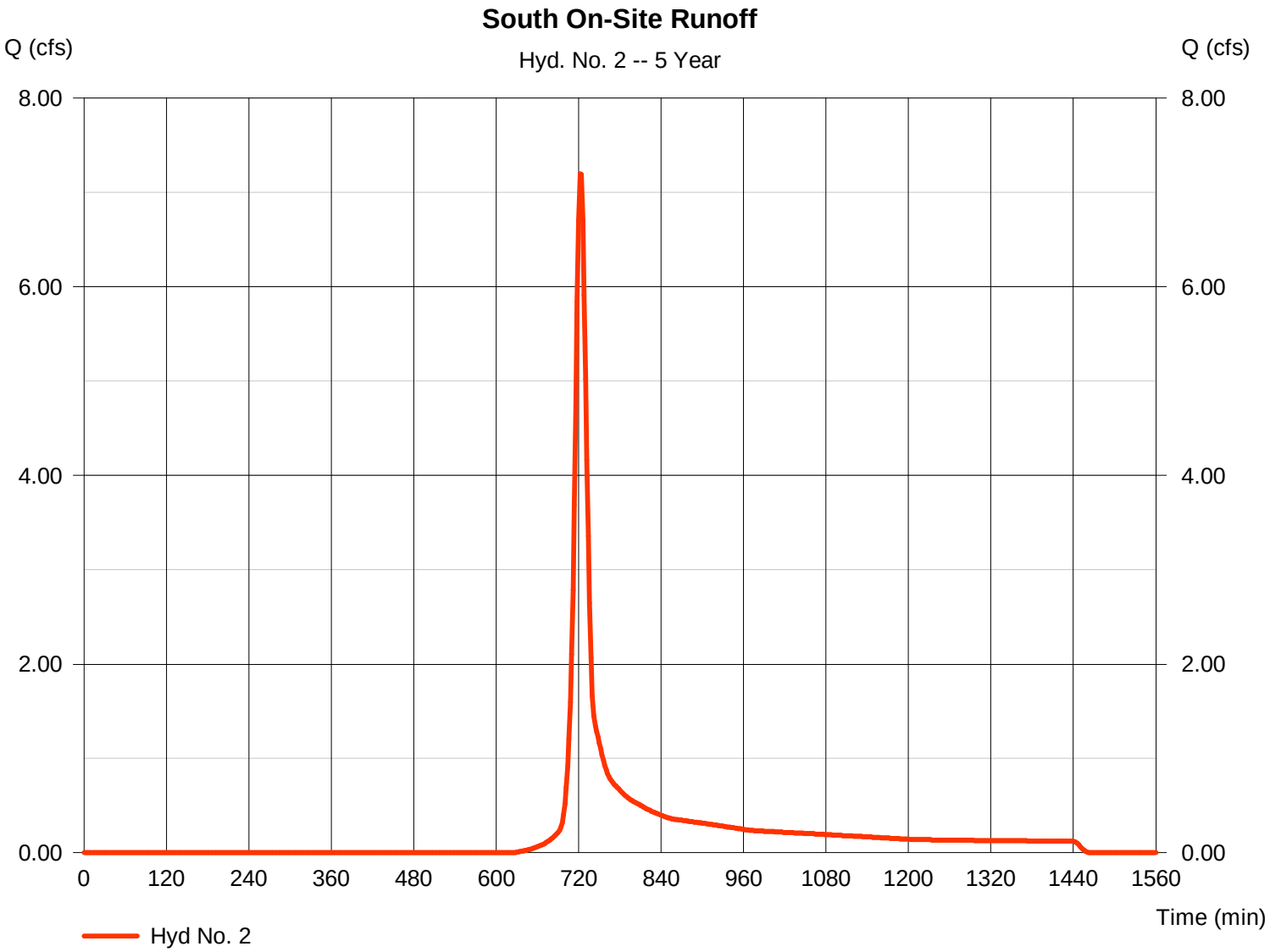


Hydrograph Report

Hyd. No. 2

South On-Site Runoff

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.199 cfs
Storm frequency	=	5 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	20,733 cuft
Drainage area	=	3.500 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	4.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

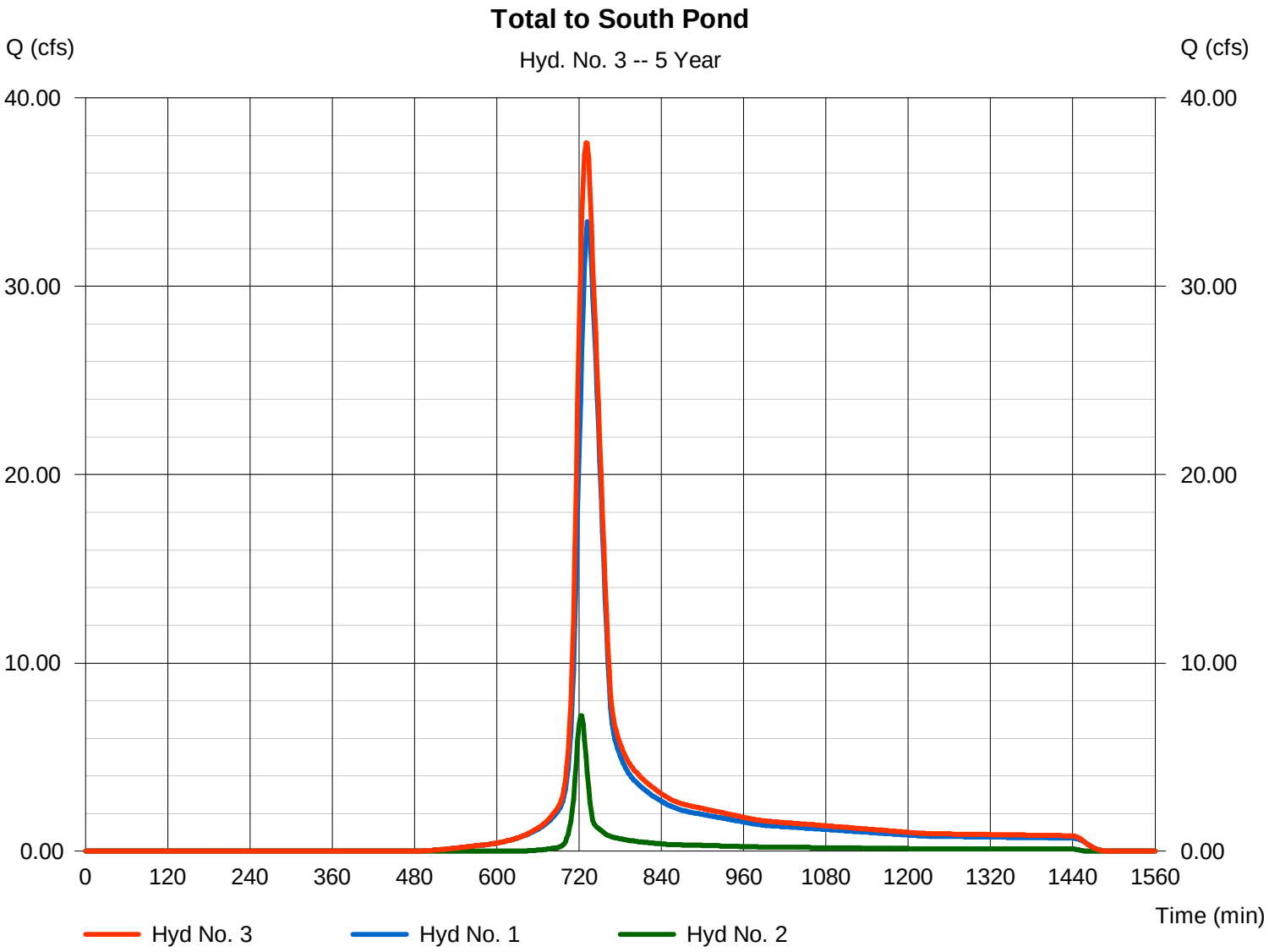


Hydrograph Report

Hyd. No. 3

Total to South Pond

Hydrograph type	= Combine	Peak discharge	= 37.62 cfs
Storm frequency	= 5 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 165,486 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 19.500 ac



Hydrograph Report

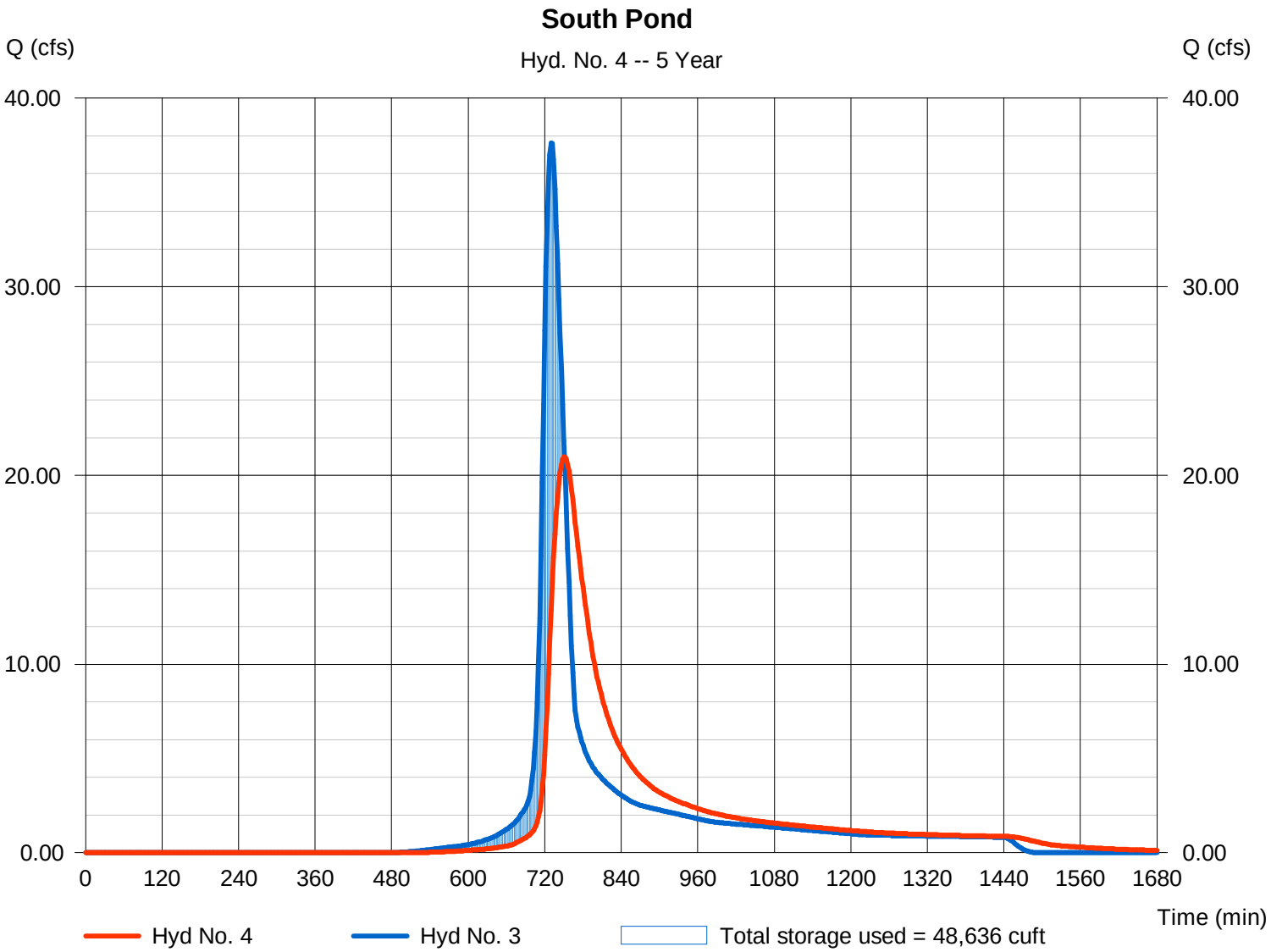
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Tuesday, Jul 28, 2009

Hyd. No. 4

South Pond

Hydrograph type	=	Reservoir	Peak discharge	=	20.97 cfs
Storm frequency	=	5 yrs	Time to peak	=	750 min
Time interval	=	2 min	Hyd. volume	=	165,478 cuft
Inflow hyd. No.	=	3 - Total to South Pond	Max. Elevation	=	1415.38 ft
Reservoir name	=	South Pond	Max. Storage	=	48,636 cuft

Storage Indication method used.

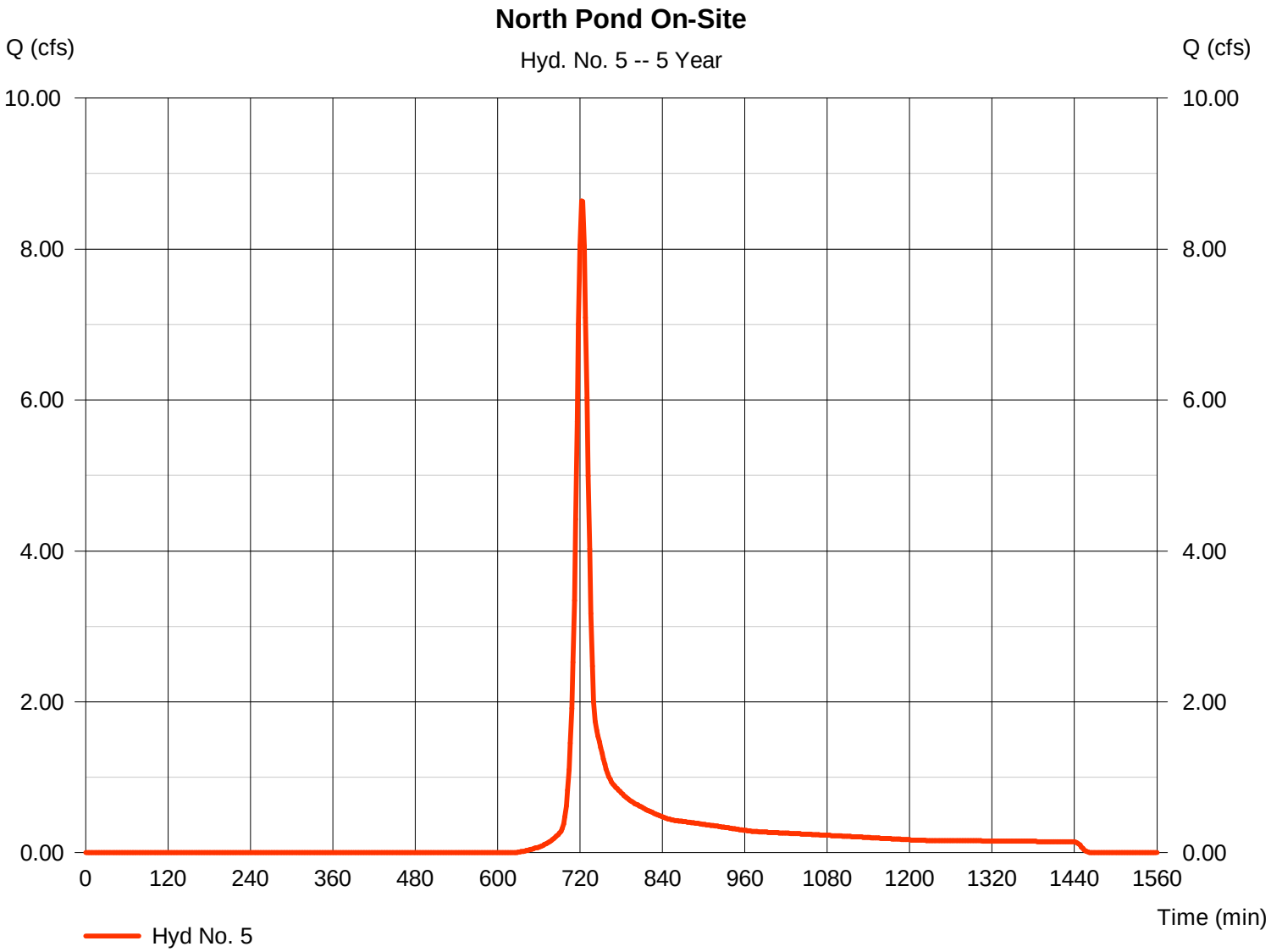


Hydrograph Report

Hyd. No. 5

North Pond On-Site

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.639 cfs
Storm frequency	=	5 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	24,880 cuft
Drainage area	=	4.200 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	4.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

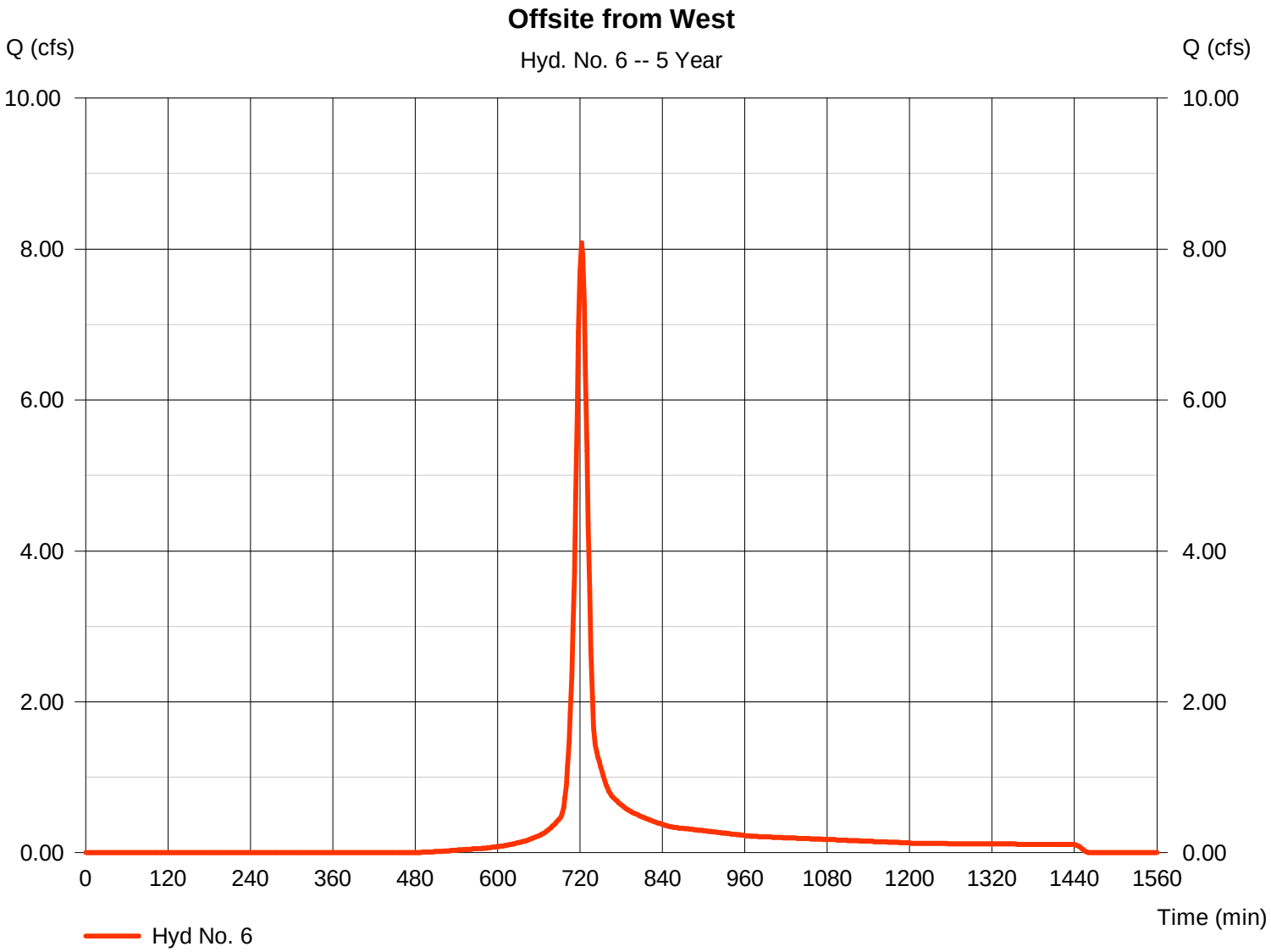


Hydrograph Report

Hyd. No. 6

Offsite from West

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.080 cfs
Storm frequency	=	5 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	22,651 cuft
Drainage area	=	2.600 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	4.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

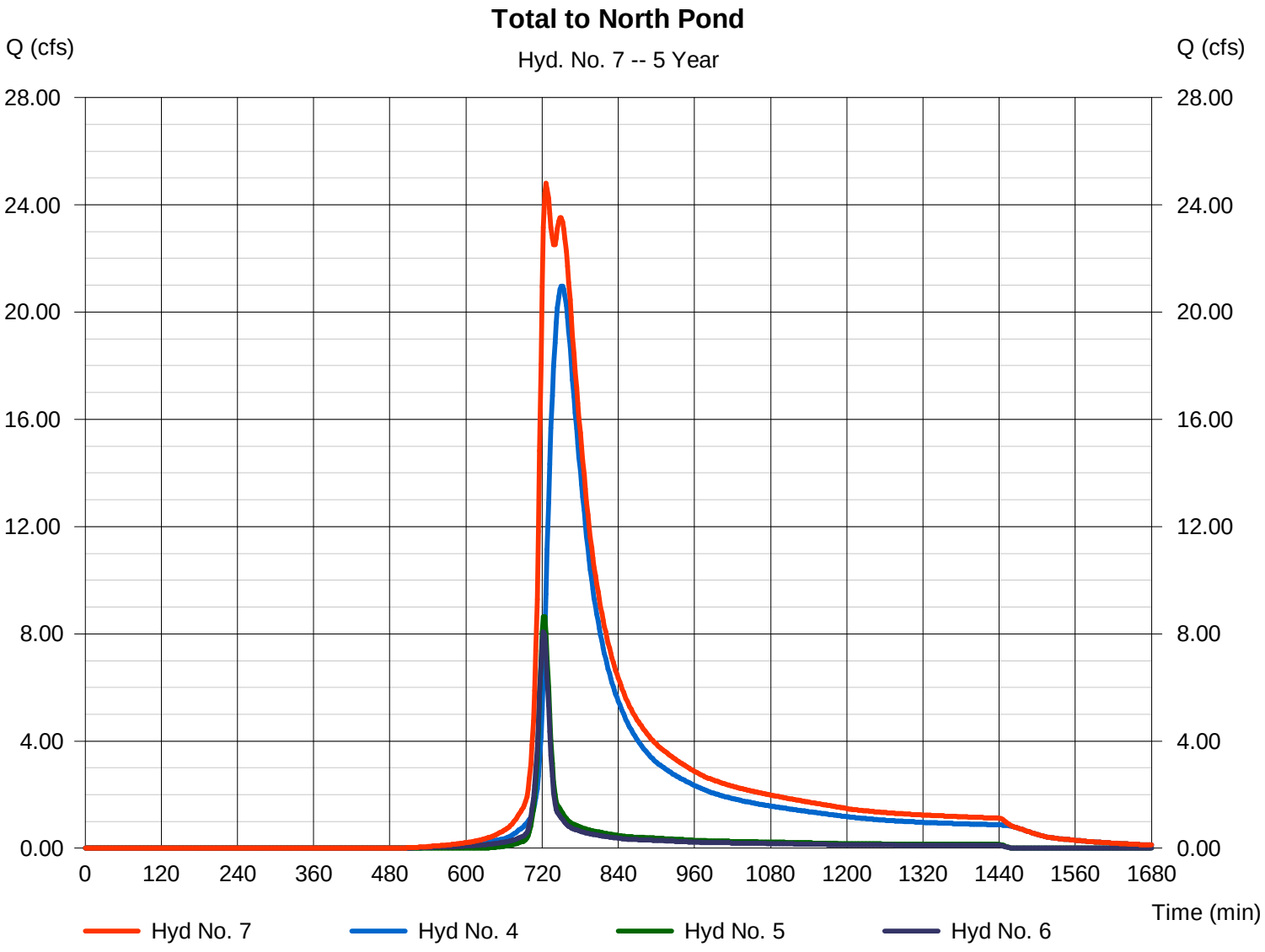


Hydrograph Report

Hyd. No. 7

Total to North Pond

Hydrograph type	= Combine	Peak discharge	= 24.80 cfs
Storm frequency	= 5 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 213,009 cuft
Inflow hyds.	= 4, 5, 6	Contrib. drain. area	= 6.800 ac

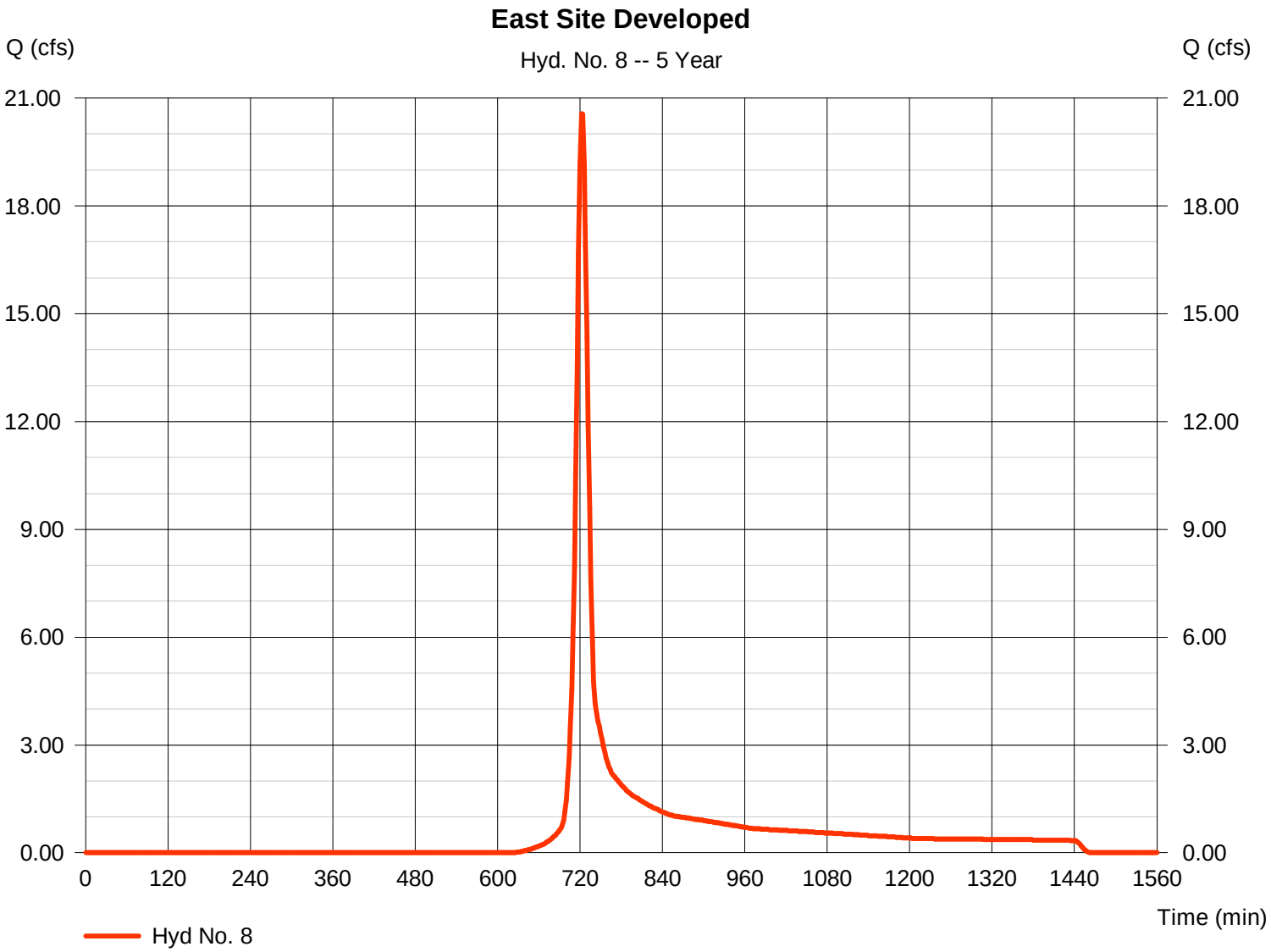


Hydrograph Report

Hyd. No. 8

East Site Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	20.57 cfs
Storm frequency	=	5 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	59,238 cuft
Drainage area	=	10.000 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	4.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Summary Report

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

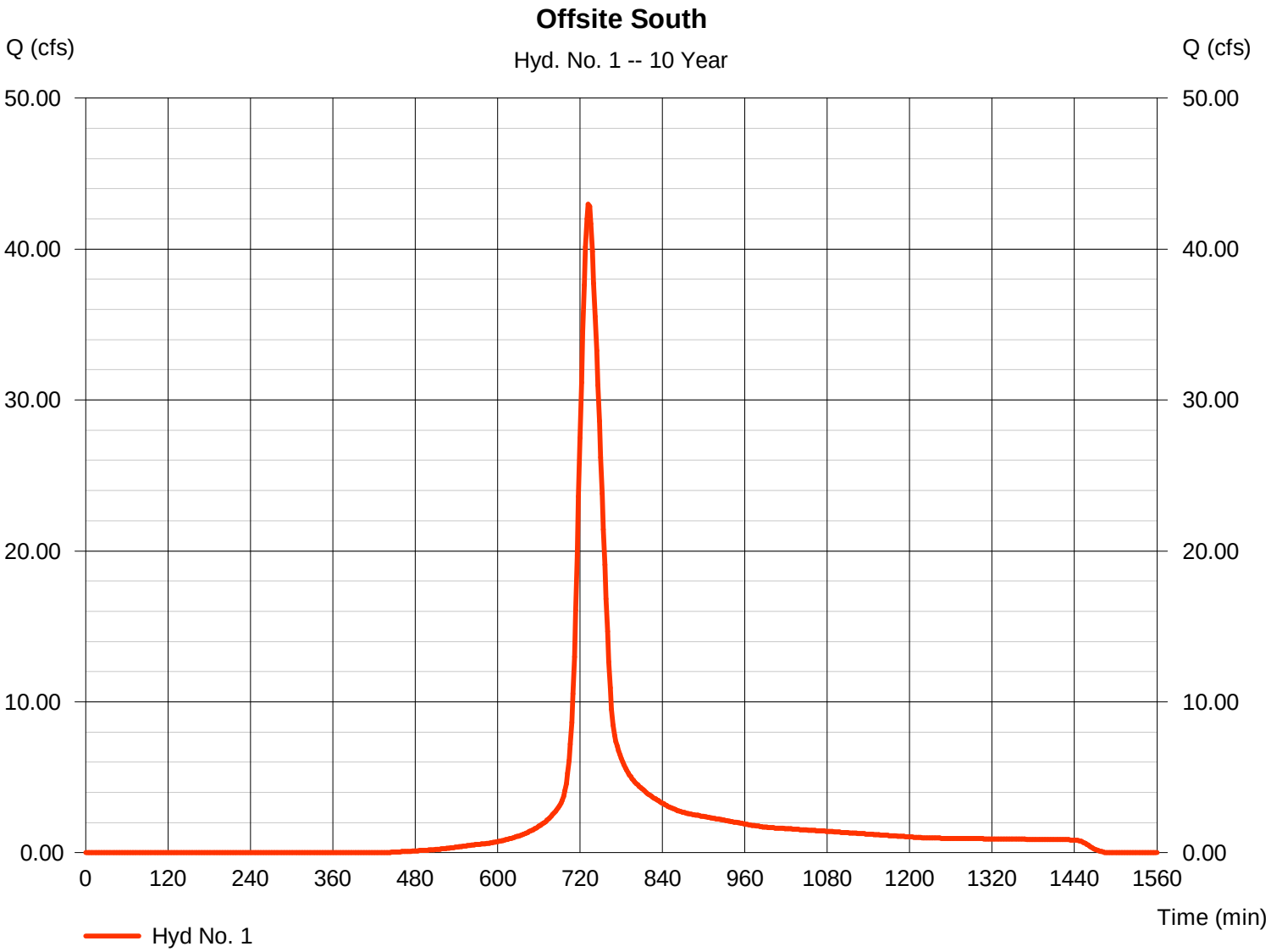
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	42.96	2	732	185,601	------	------	------	Offsite South
2	SCS Runoff	9.883	2	722	28,013	------	------	------	South On-Site Runoff
3	Combine	48.74	2	730	213,615	1, 2	------	------	Total to South Pond
4	Reservoir	28.36	2	750	213,606	3	1415.68	61,027	South Pond
5	SCS Runoff	11.86	2	722	33,616	------	------	------	North Pond On-Site
6	SCS Runoff	10.34	2	722	29,043	------	------	------	Offsite from West
7	Combine	34.33	2	726	276,265	4, 5, 6	------	------	Total to North Pond
8	SCS Runoff	28.24	2	722	80,037	------	------	------	East Site Developed

Hydrograph Report

Hyd. No. 1

Offsite South

Hydrograph type	=	SCS Runoff	Peak discharge	=	42.96 cfs
Storm frequency	=	10 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	185,601 cuft
Drainage area	=	16.000 ac	Curve number	=	80
Basin Slope	=	1.0 %	Hydraulic length	=	950 ft
Tc method	=	LAG	Time of conc. (Tc)	=	30.56 min
Total precip.	=	5.30 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

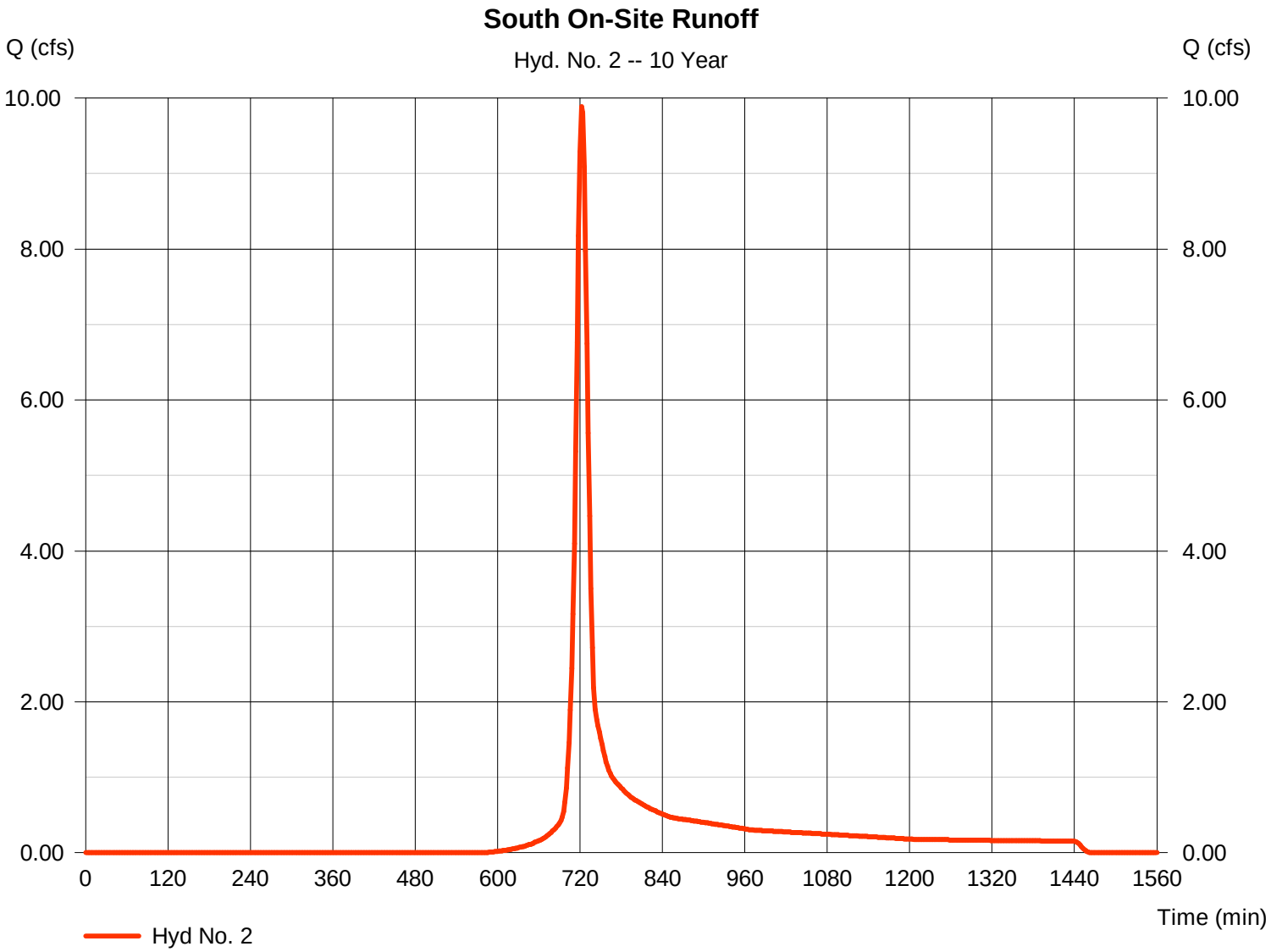


Hydrograph Report

Hyd. No. 2

South On-Site Runoff

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.883 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	28,013 cuft
Drainage area	=	3.500 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	5.30 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

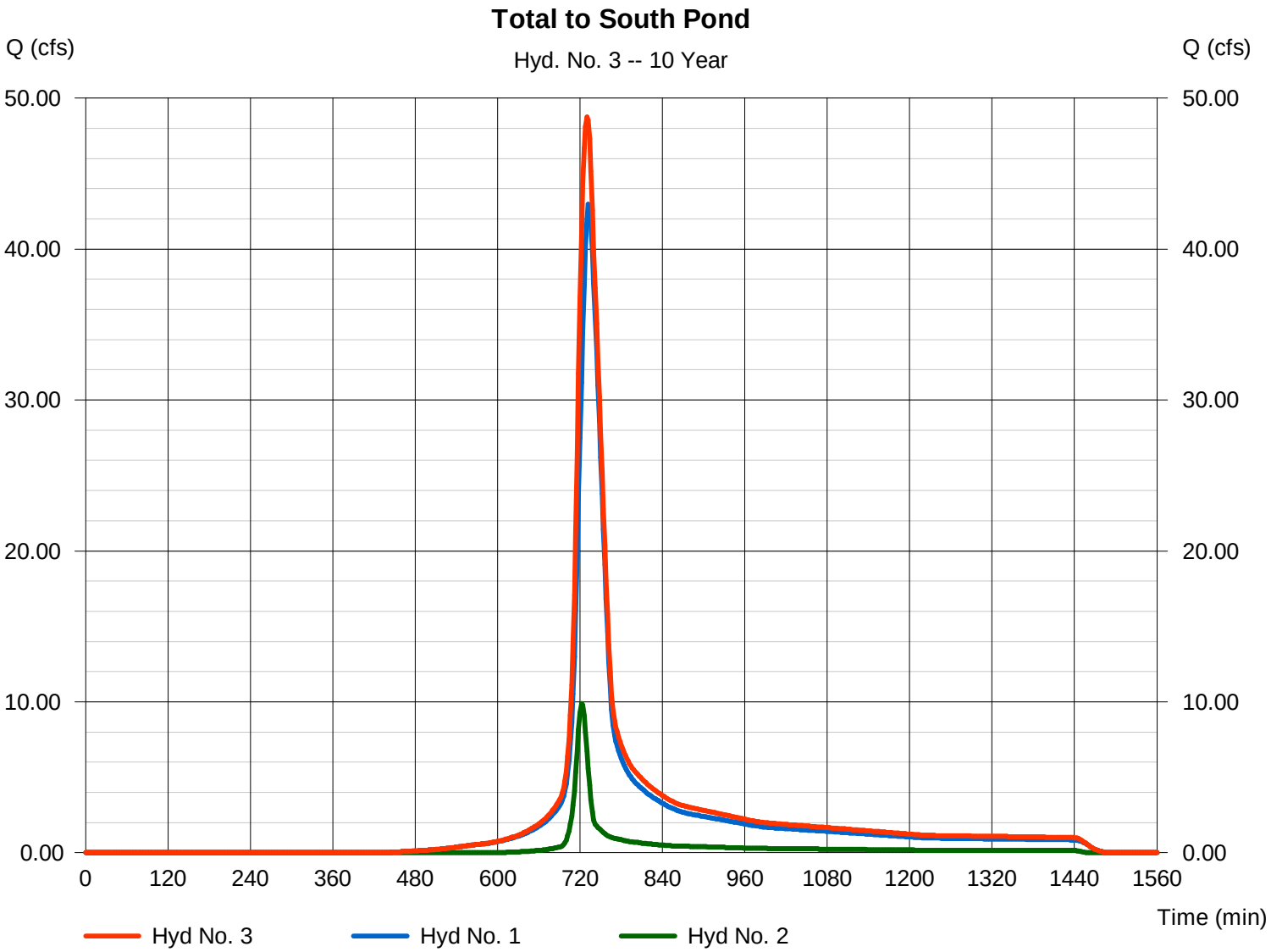


Hydrograph Report

Hyd. No. 3

Total to South Pond

Hydrograph type	=	Combine	Peak discharge	=	48.74 cfs
Storm frequency	=	10 yrs	Time to peak	=	730 min
Time interval	=	2 min	Hyd. volume	=	213,615 cuft
Inflow hyds.	=	1, 2	Contrib. drain. area	=	19.500 ac



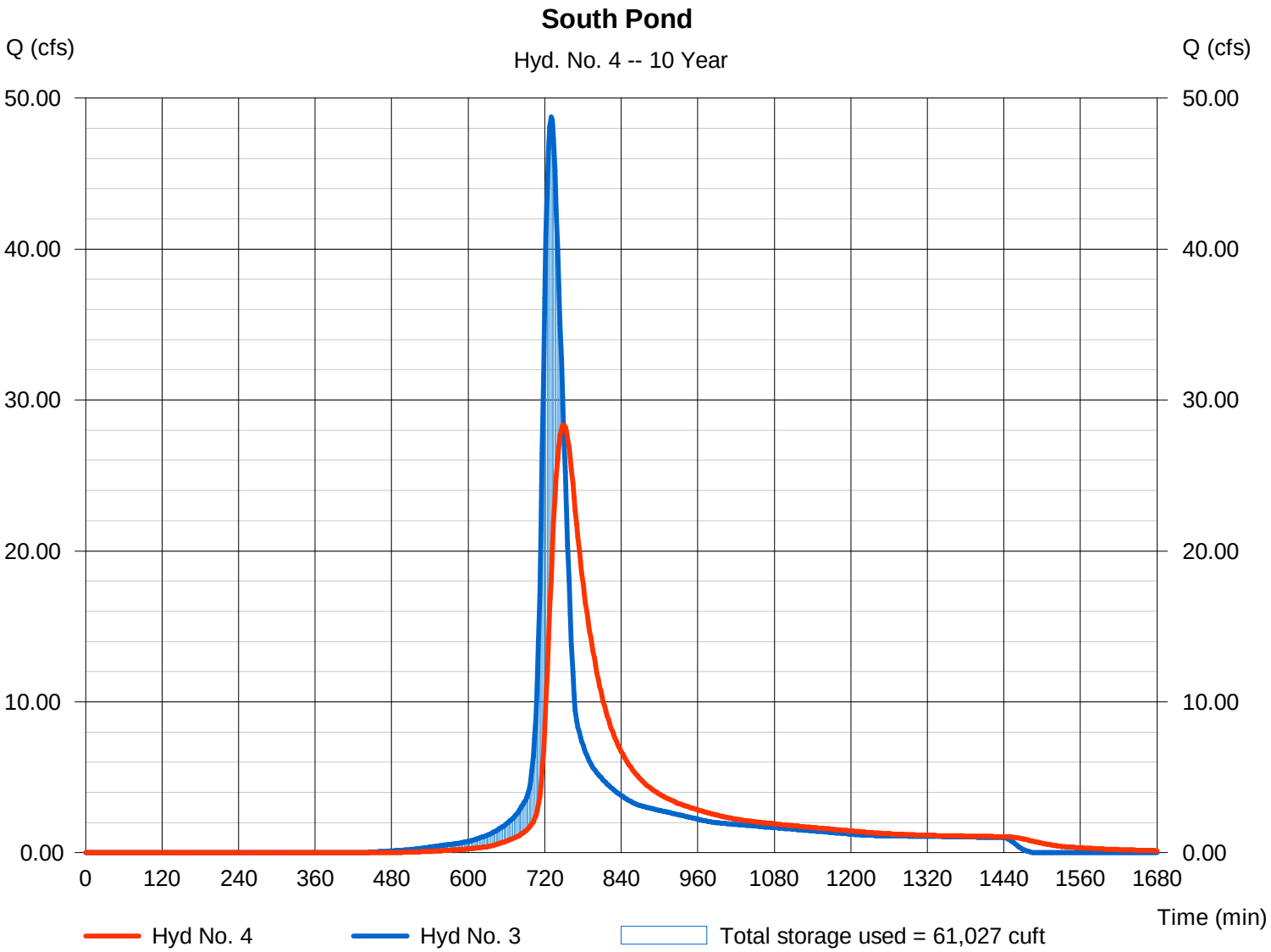
Hydrograph Report

Hyd. No. 4

South Pond

Hydrograph type	=	Reservoir	Peak discharge	=	28.36 cfs
Storm frequency	=	10 yrs	Time to peak	=	750 min
Time interval	=	2 min	Hyd. volume	=	213,606 cuft
Inflow hyd. No.	=	3 - Total to South Pond	Max. Elevation	=	1415.68 ft
Reservoir name	=	South Pond	Max. Storage	=	61,027 cuft

Storage Indication method used.

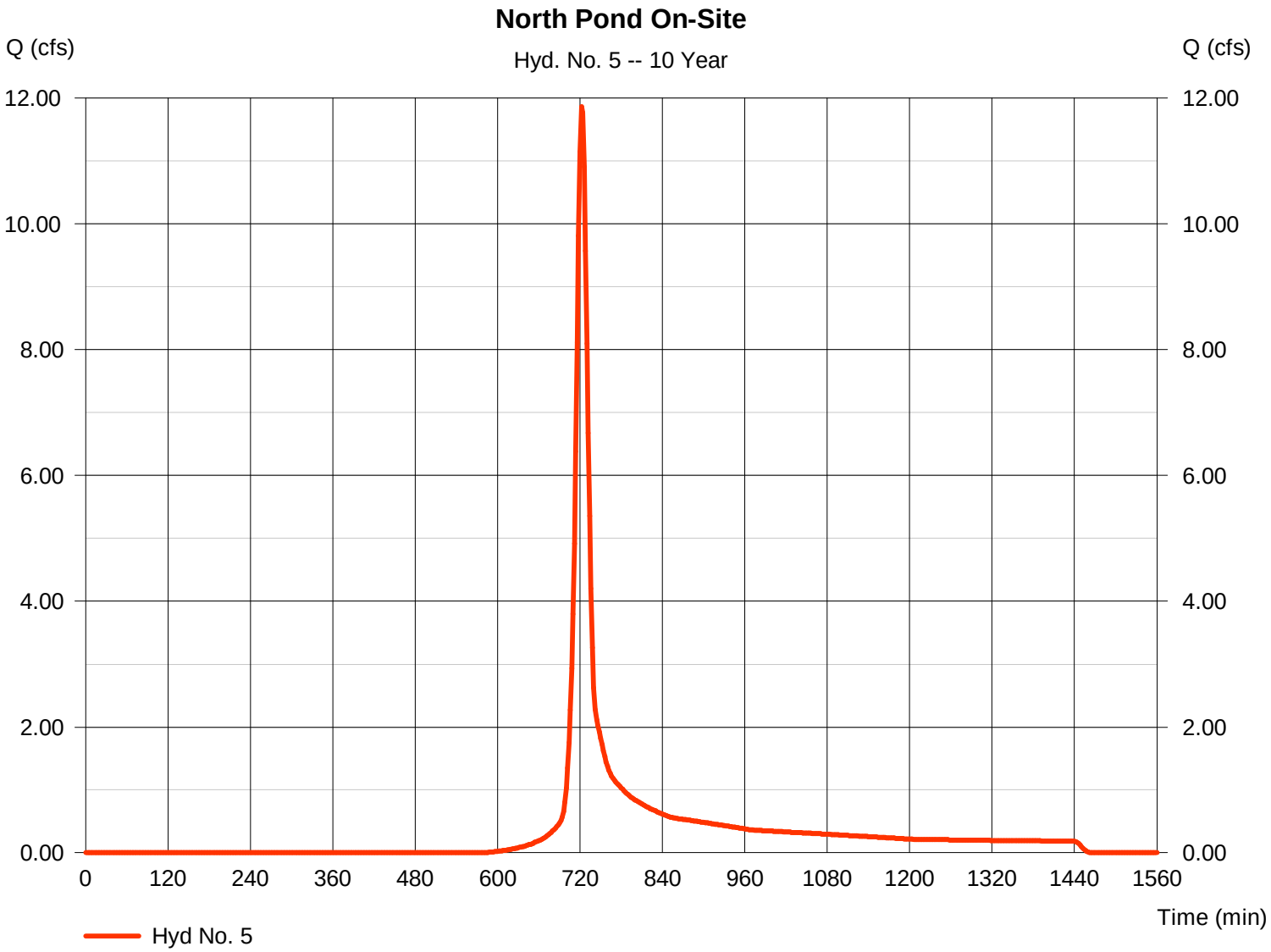


Hydrograph Report

Hyd. No. 5

North Pond On-Site

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.86 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	33,616 cuft
Drainage area	=	4.200 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	5.30 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

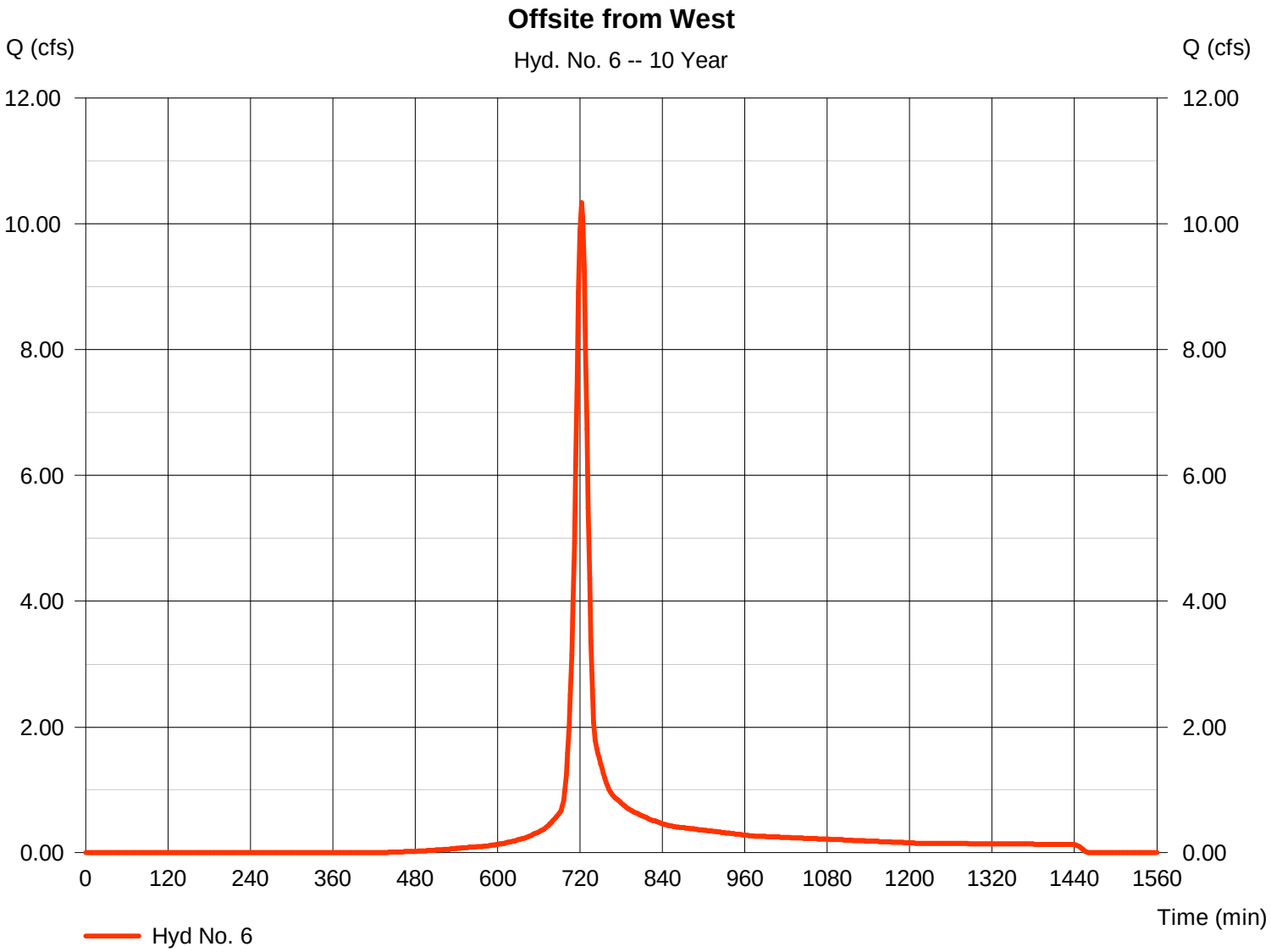


Hydrograph Report

Hyd. No. 6

Offsite from West

Hydrograph type	=	SCS Runoff	Peak discharge	=	10.34 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	29,043 cuft
Drainage area	=	2.600 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	5.30 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

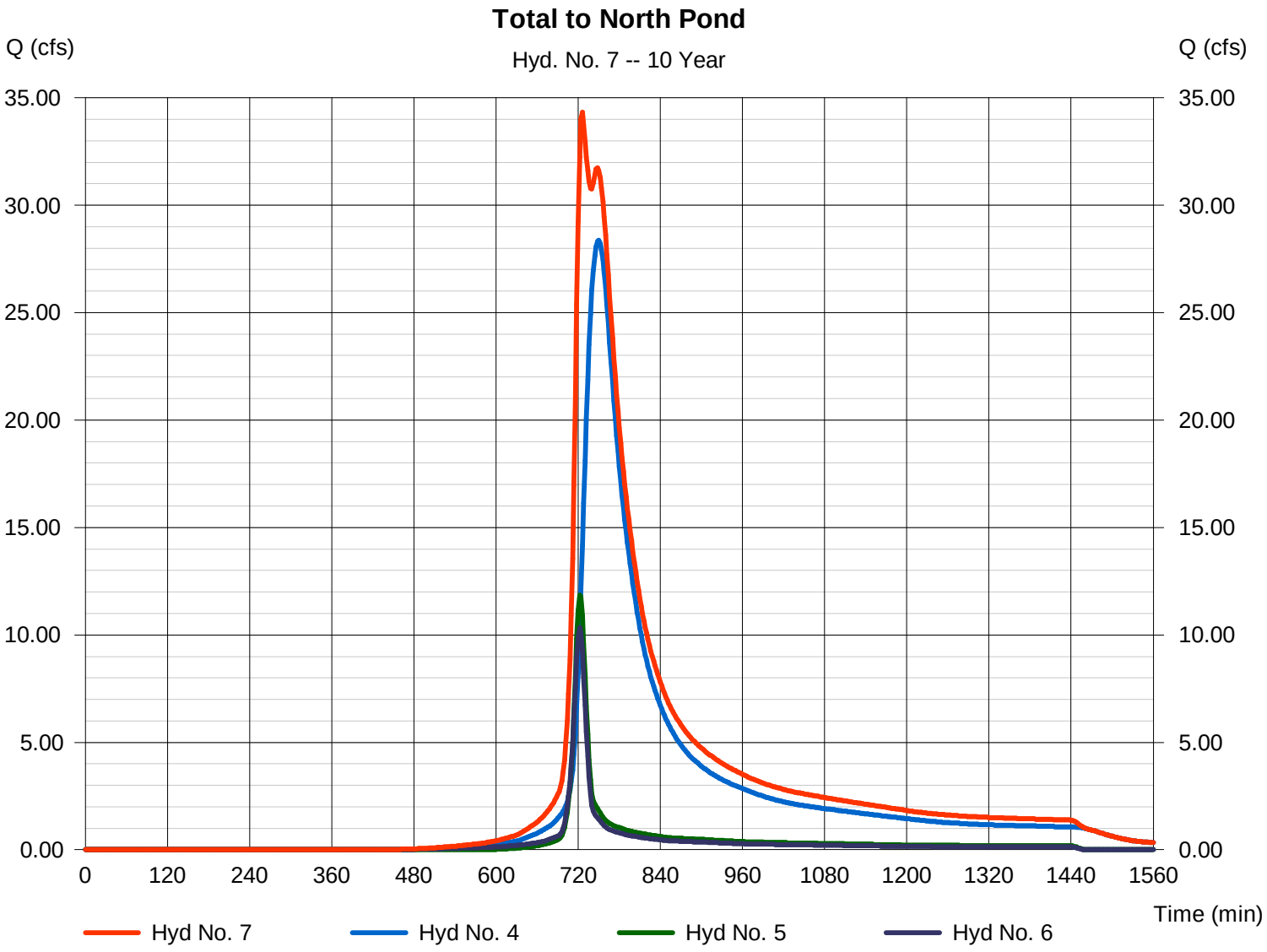


Hydrograph Report

Hyd. No. 7

Total to North Pond

Hydrograph type	=	Combine	Peak discharge	=	34.33 cfs
Storm frequency	=	10 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	276,265 cuft
Inflow hyds.	=	4, 5, 6	Contrib. drain. area	=	6.800 ac

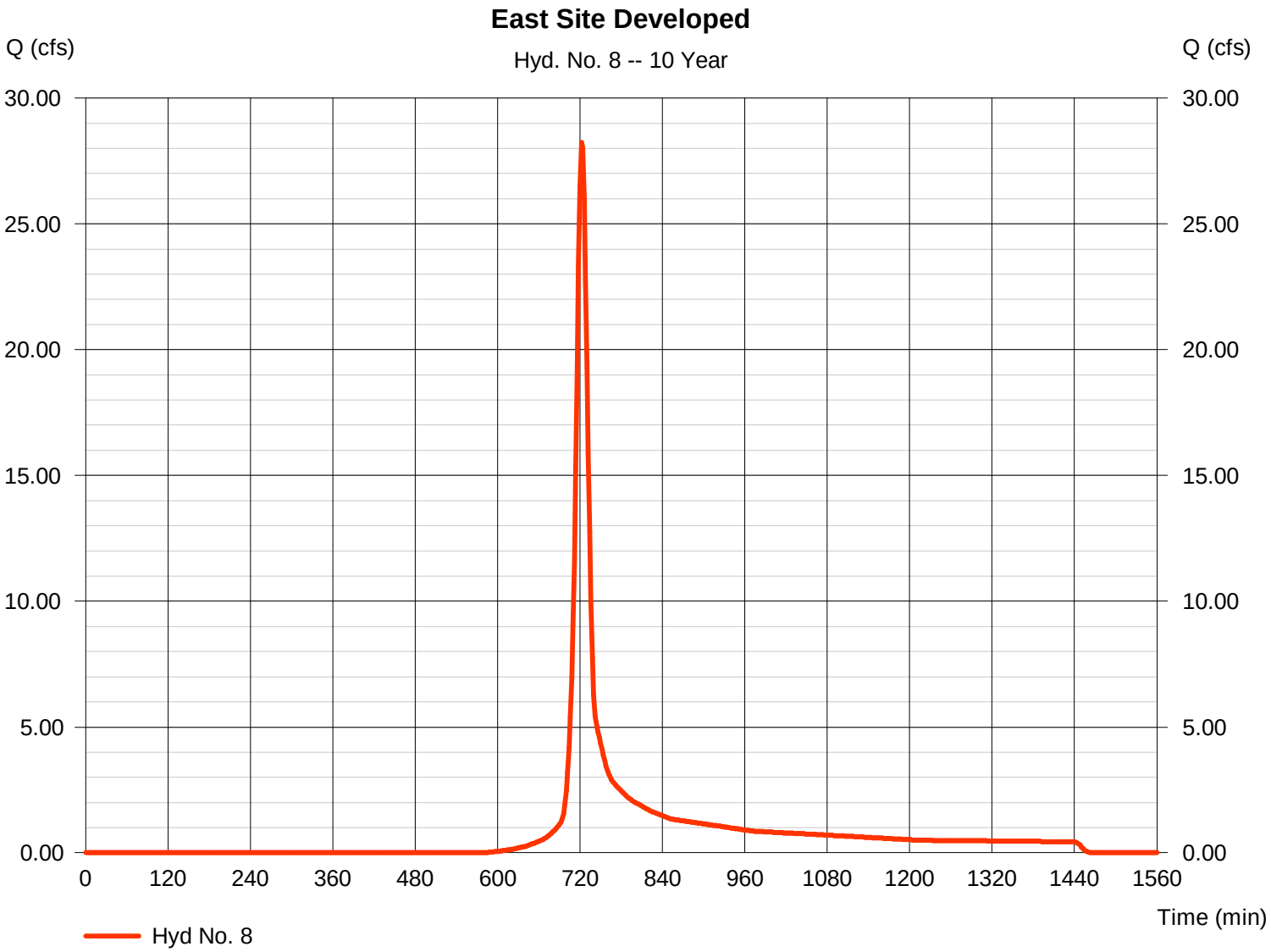


Hydrograph Report

Hyd. No. 8

East Site Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	28.24 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	80,037 cuft
Drainage area	=	10.000 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	5.30 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Summary Report

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

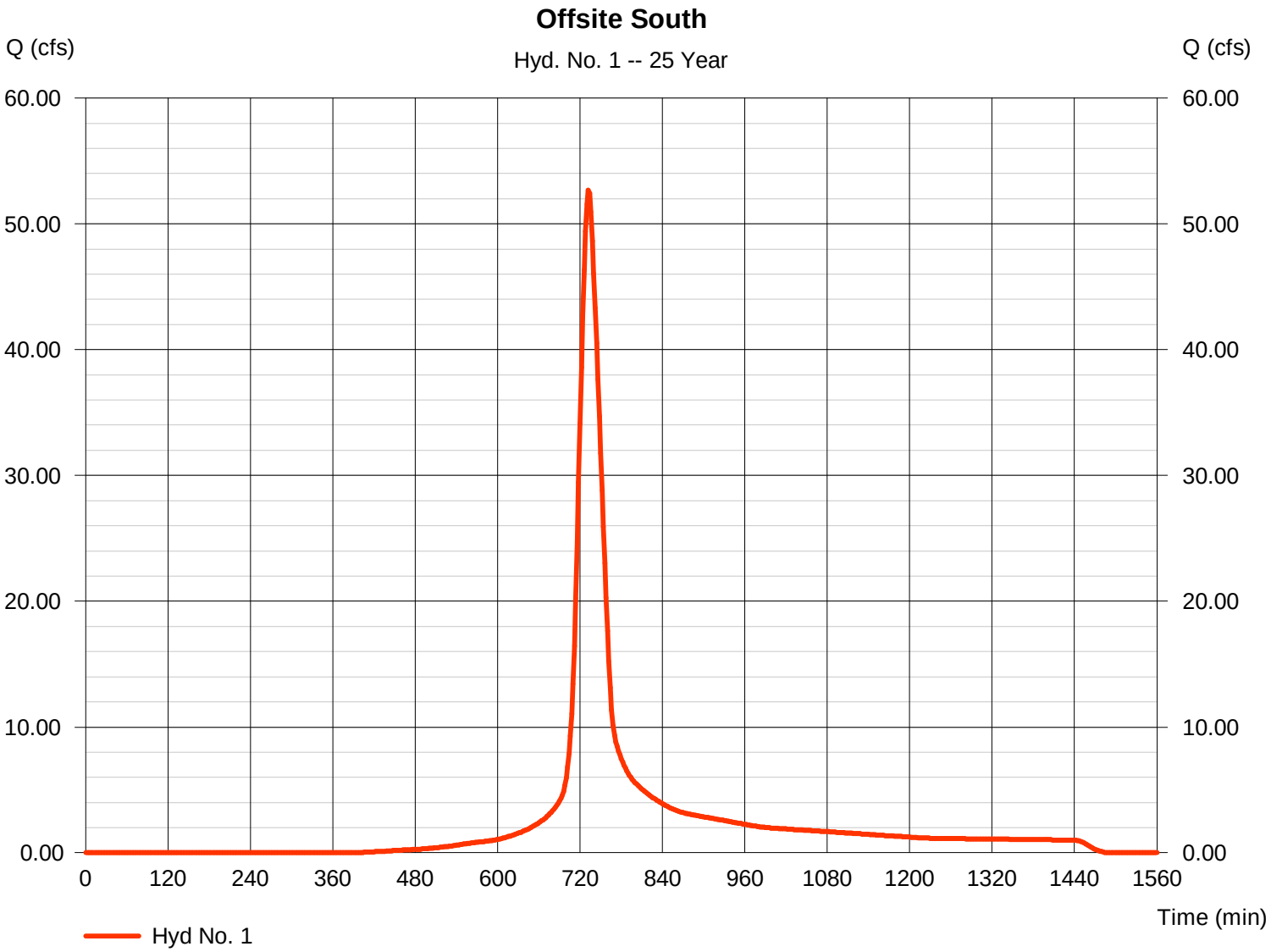
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	52.66	2	732	227,674	------	------	------	Offsite South
2	SCS Runoff	12.70	2	722	35,734	------	------	------	South On-Site Runoff
3	Combine	60.11	2	730	263,408	1, 2	------	------	Total to South Pond
4	Reservoir	36.23	2	748	263,400	3	1415.98	73,084	South Pond
5	SCS Runoff	15.24	2	722	42,881	------	------	------	North Pond On-Site
6	SCS Runoff	12.63	2	722	35,627	------	------	------	Offsite from West
7	Combine	43.88	2	726	341,908	4, 5, 6	------	------	Total to North Pond
8	SCS Runoff	36.29	2	722	102,099	------	------	------	East Site Developed

Hydrograph Report

Hyd. No. 1

Offsite South

Hydrograph type	=	SCS Runoff	Peak discharge	=	52.66 cfs
Storm frequency	=	25 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	227,674 cuft
Drainage area	=	16.000 ac	Curve number	=	80
Basin Slope	=	1.0 %	Hydraulic length	=	950 ft
Tc method	=	LAG	Time of conc. (Tc)	=	30.56 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

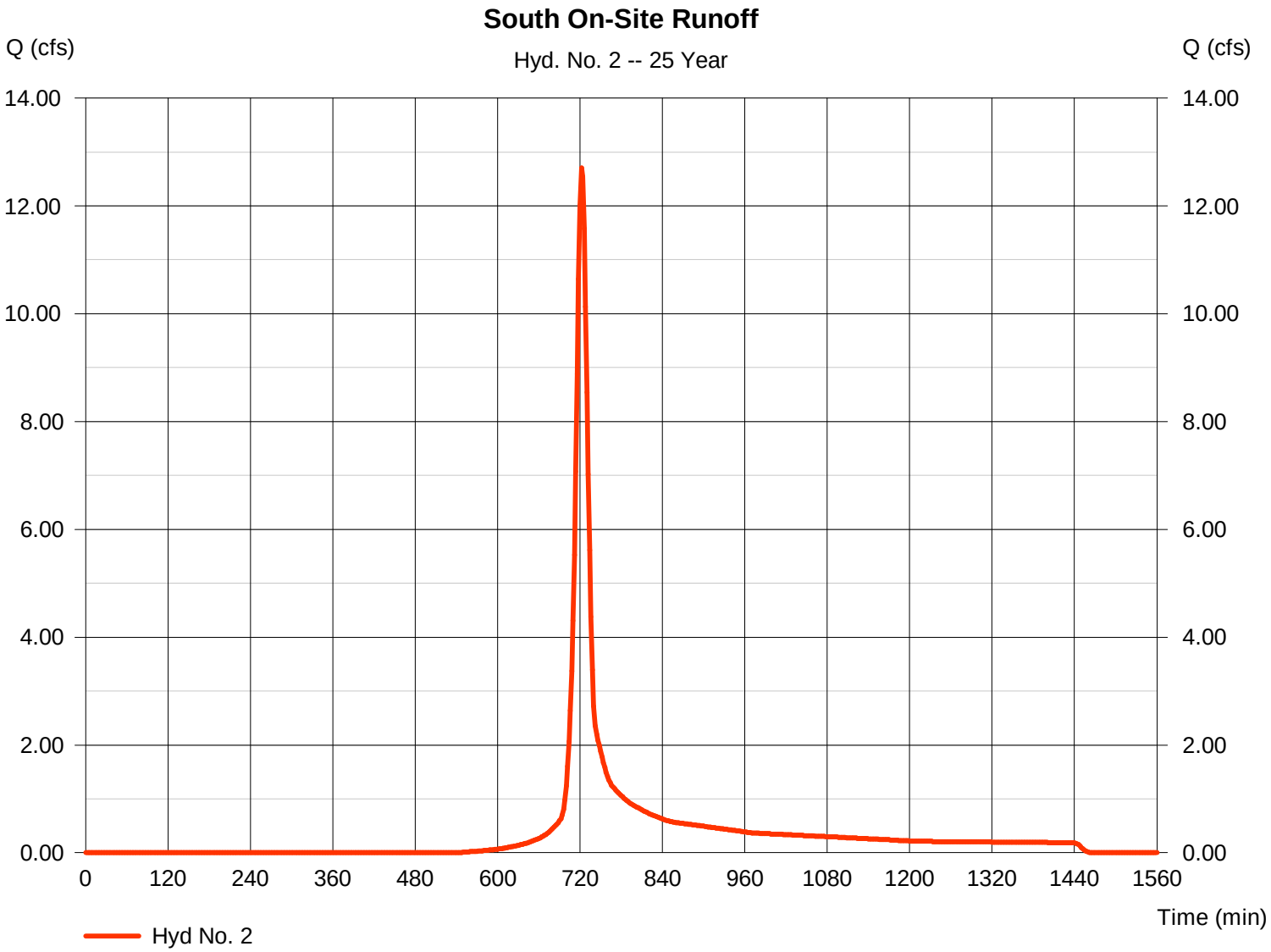


Hydrograph Report

Hyd. No. 2

South On-Site Runoff

Hydrograph type	=	SCS Runoff	Peak discharge	=	12.70 cfs
Storm frequency	=	25 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	35,734 cuft
Drainage area	=	3.500 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

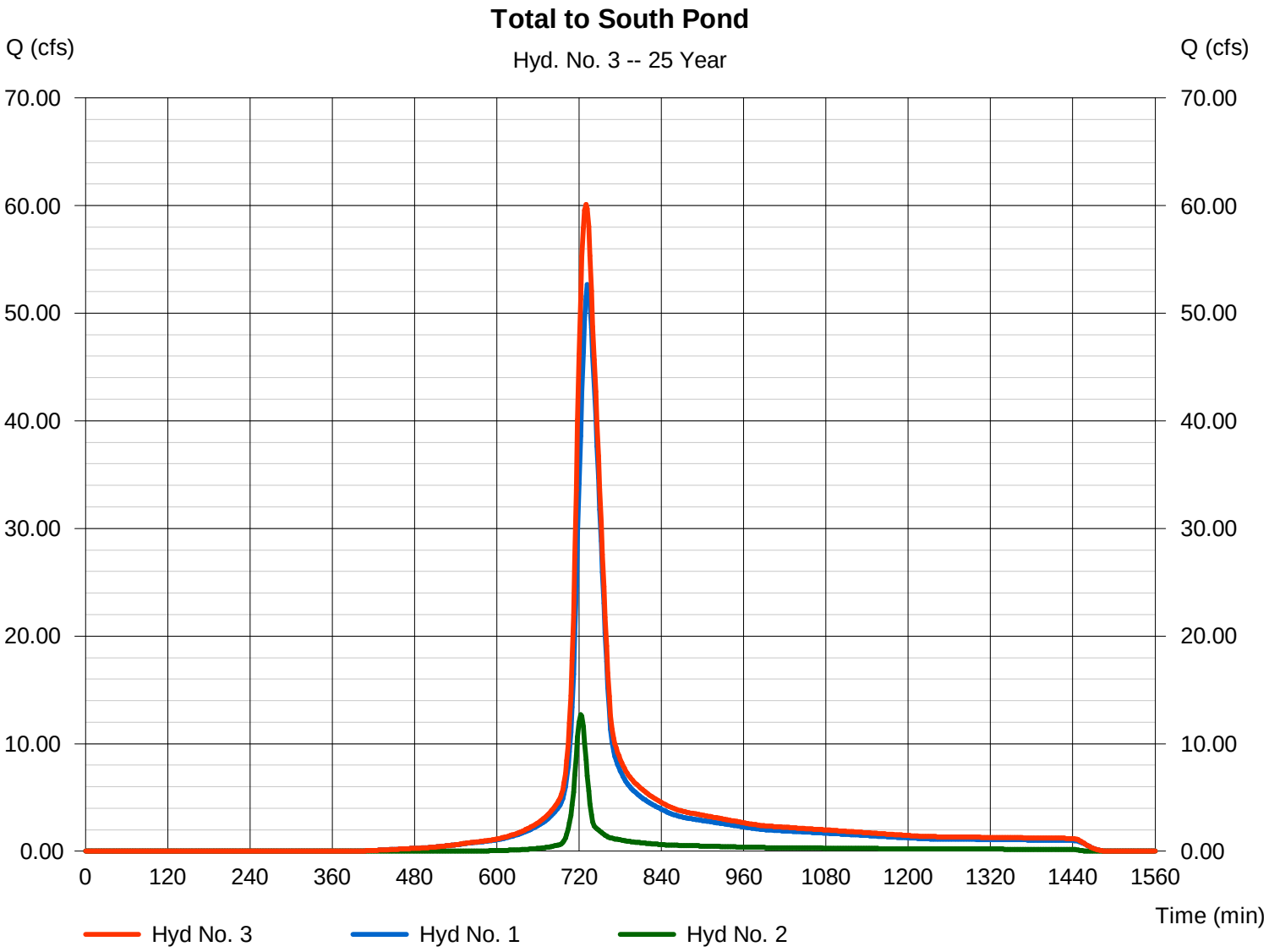


Hydrograph Report

Hyd. No. 3

Total to South Pond

Hydrograph type	= Combine	Peak discharge	= 60.11 cfs
Storm frequency	= 25 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 263,408 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 19.500 ac



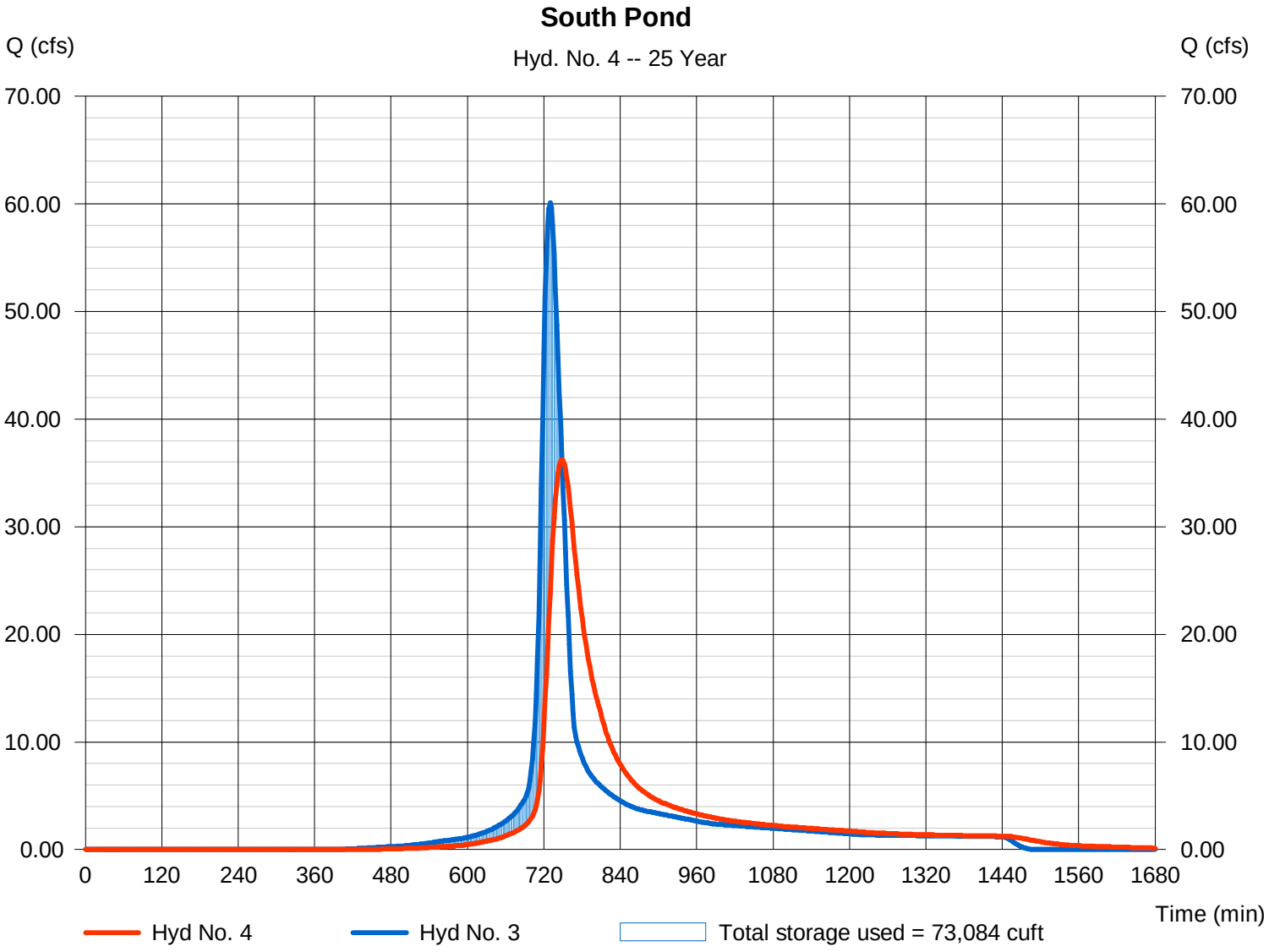
Hydrograph Report

Hyd. No. 4

South Pond

Hydrograph type	=	Reservoir	Peak discharge	=	36.23 cfs
Storm frequency	=	25 yrs	Time to peak	=	748 min
Time interval	=	2 min	Hyd. volume	=	263,400 cuft
Inflow hyd. No.	=	3 - Total to South Pond	Max. Elevation	=	1415.98 ft
Reservoir name	=	South Pond	Max. Storage	=	73,084 cuft

Storage Indication method used.

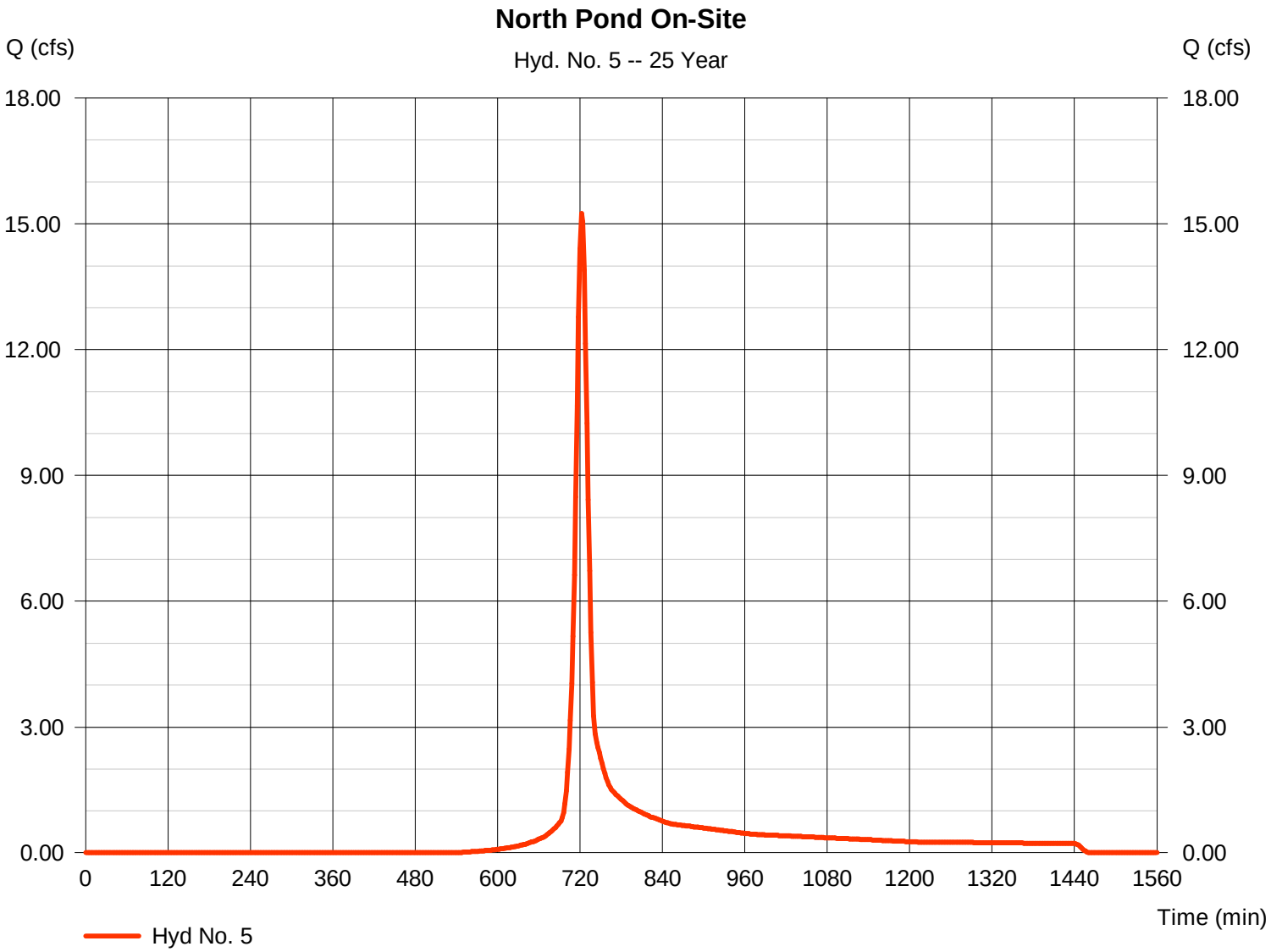


Hydrograph Report

Hyd. No. 5

North Pond On-Site

Hydrograph type	=	SCS Runoff	Peak discharge	=	15.24 cfs
Storm frequency	=	25 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	42,881 cuft
Drainage area	=	4.200 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

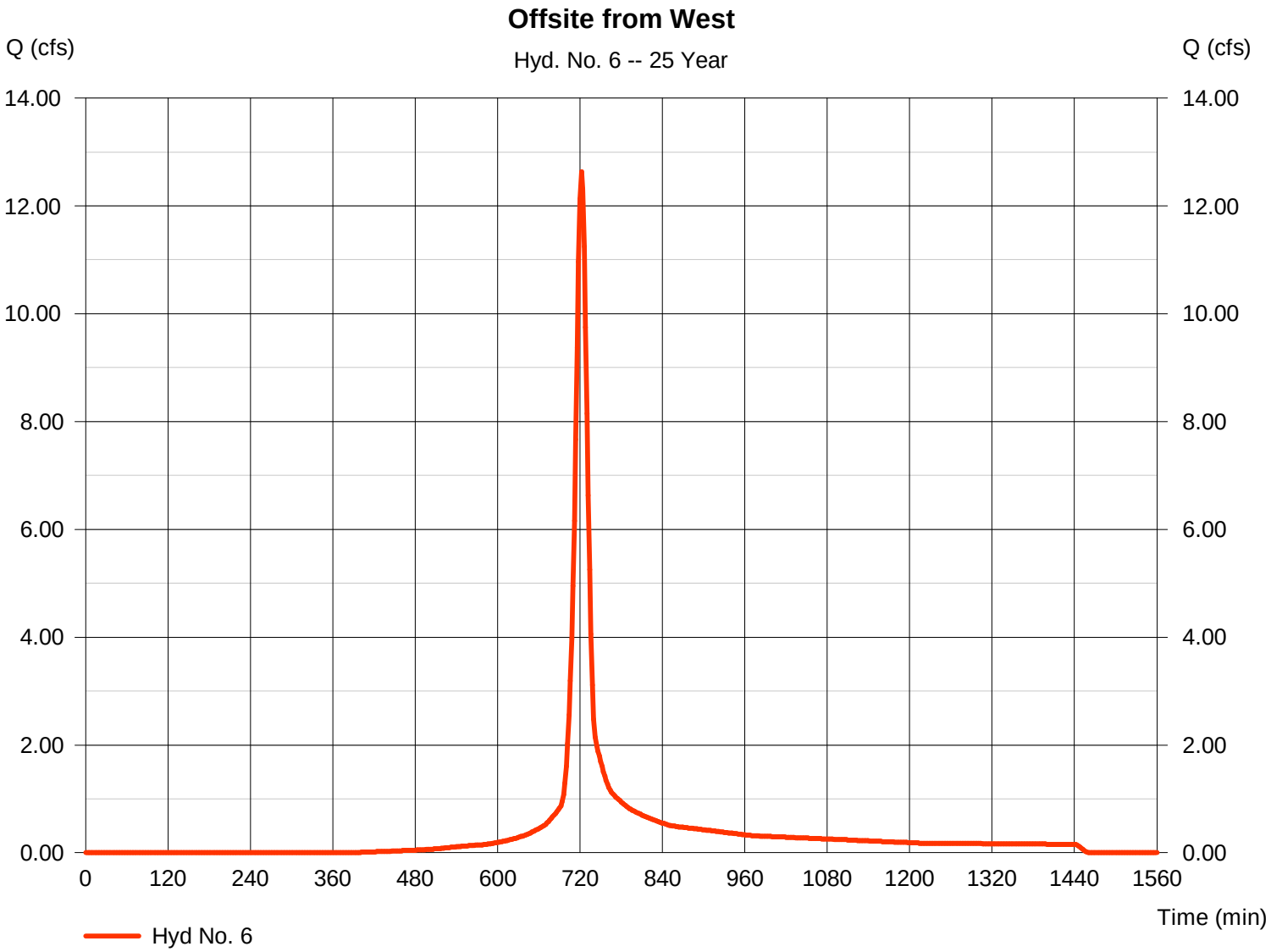


Hydrograph Report

Hyd. No. 6

Offsite from West

Hydrograph type	=	SCS Runoff	Peak discharge	=	12.63 cfs
Storm frequency	=	25 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	35,627 cuft
Drainage area	=	2.600 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

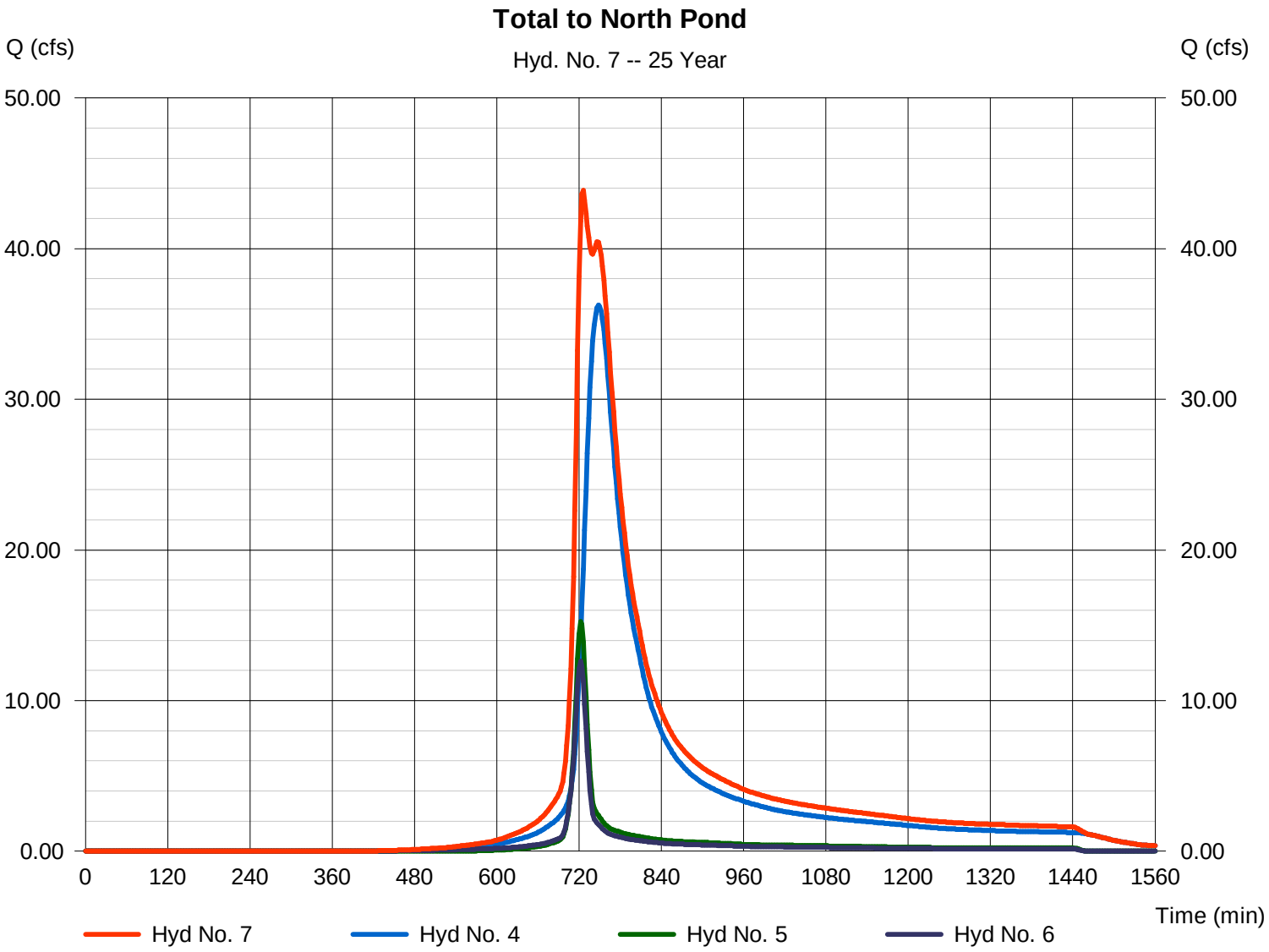


Hydrograph Report

Hyd. No. 7

Total to North Pond

Hydrograph type	= Combine	Peak discharge	= 43.88 cfs
Storm frequency	= 25 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 341,908 cuft
Inflow hyds.	= 4, 5, 6	Contrib. drain. area	= 6.800 ac

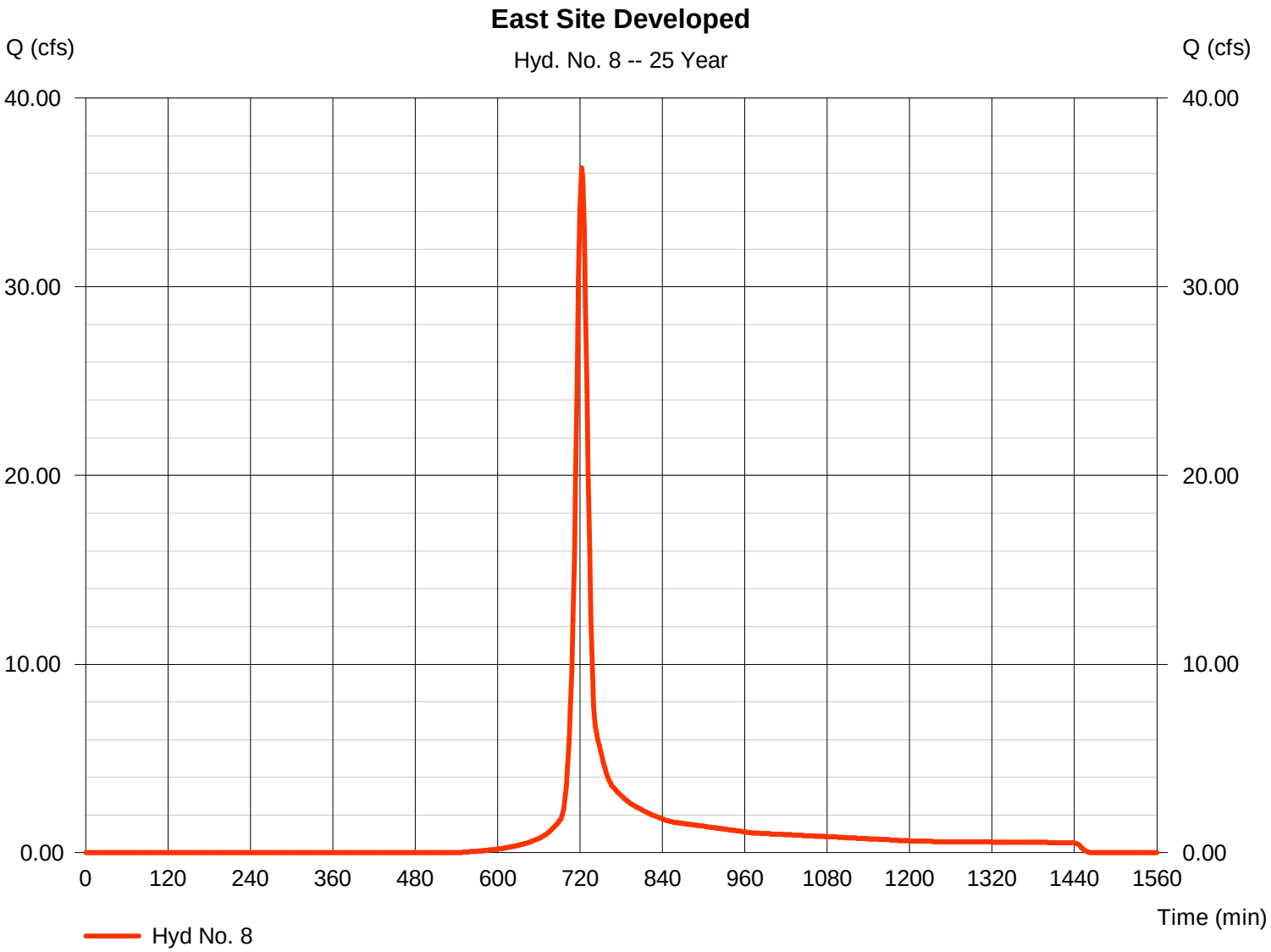


Hydrograph Report

Hyd. No. 8

East Site Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	36.29 cfs
Storm frequency	=	25 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	102,099 cuft
Drainage area	=	10.000 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Summary Report

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

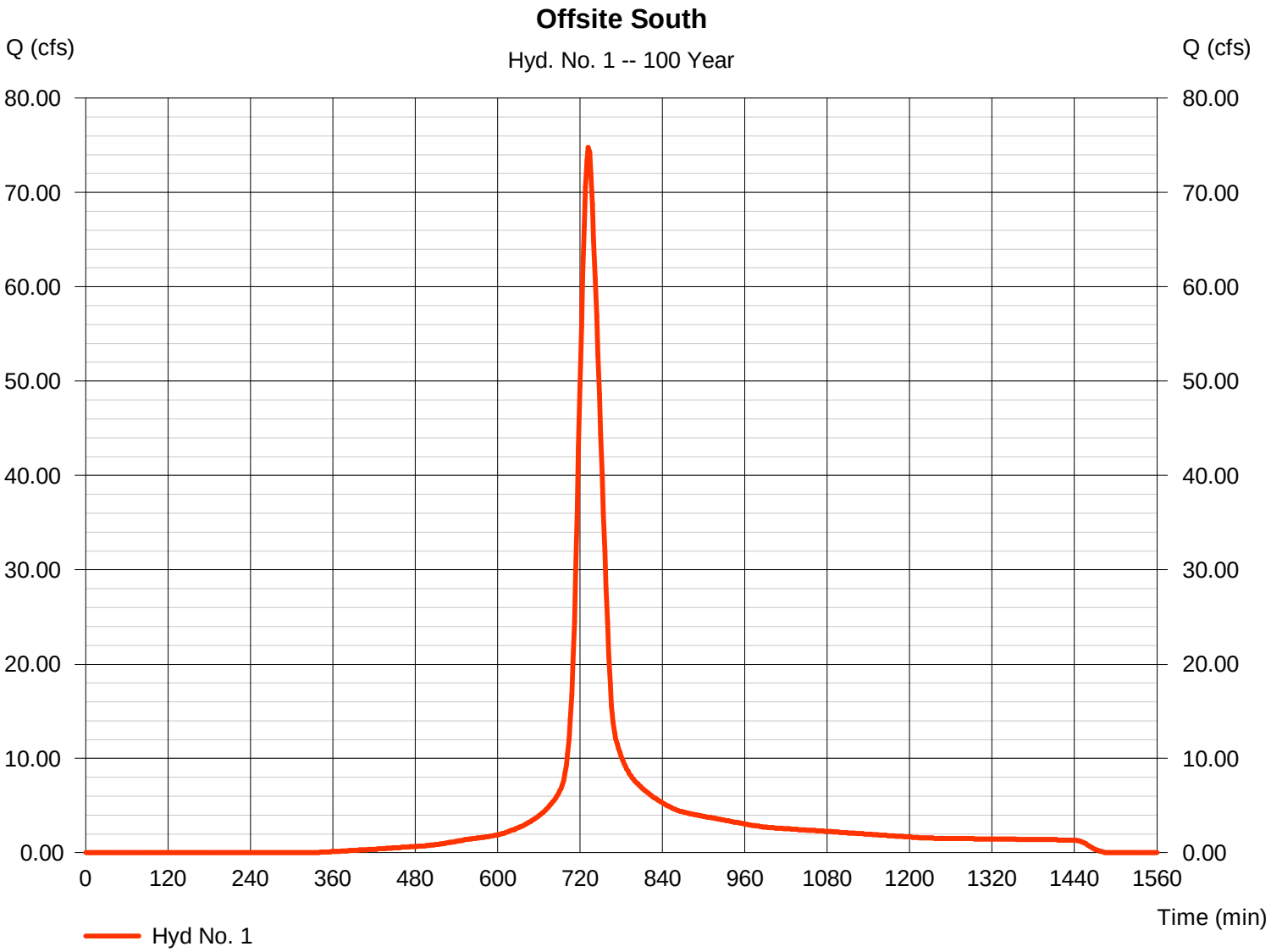
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	74.79	2	732	325,274	------	------	------	Offsite South
2	SCS Runoff	19.35	2	722	54,238	------	------	------	South On-Site Runoff
3	Combine	86.15	2	730	379,512	1, 2	------	------	Total to South Pond
4	Reservoir	53.37	2	748	379,504	3	1416.57	100,373	South Pond
5	SCS Runoff	23.21	2	722	65,085	------	------	------	North Pond On-Site
6	SCS Runoff	17.84	2	722	50,899	------	------	------	Offsite from West
7	Combine	67.03	2	726	495,489	4, 5, 6	------	------	Total to North Pond
8	SCS Runoff	55.27	2	722	154,965	------	------	------	East Site Developed

Hydrograph Report

Hyd. No. 1

Offsite South

Hydrograph type	=	SCS Runoff	Peak discharge	=	74.79 cfs
Storm frequency	=	100 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	325,274 cuft
Drainage area	=	16.000 ac	Curve number	=	80
Basin Slope	=	1.0 %	Hydraulic length	=	950 ft
Tc method	=	LAG	Time of conc. (Tc)	=	30.56 min
Total precip.	=	7.90 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

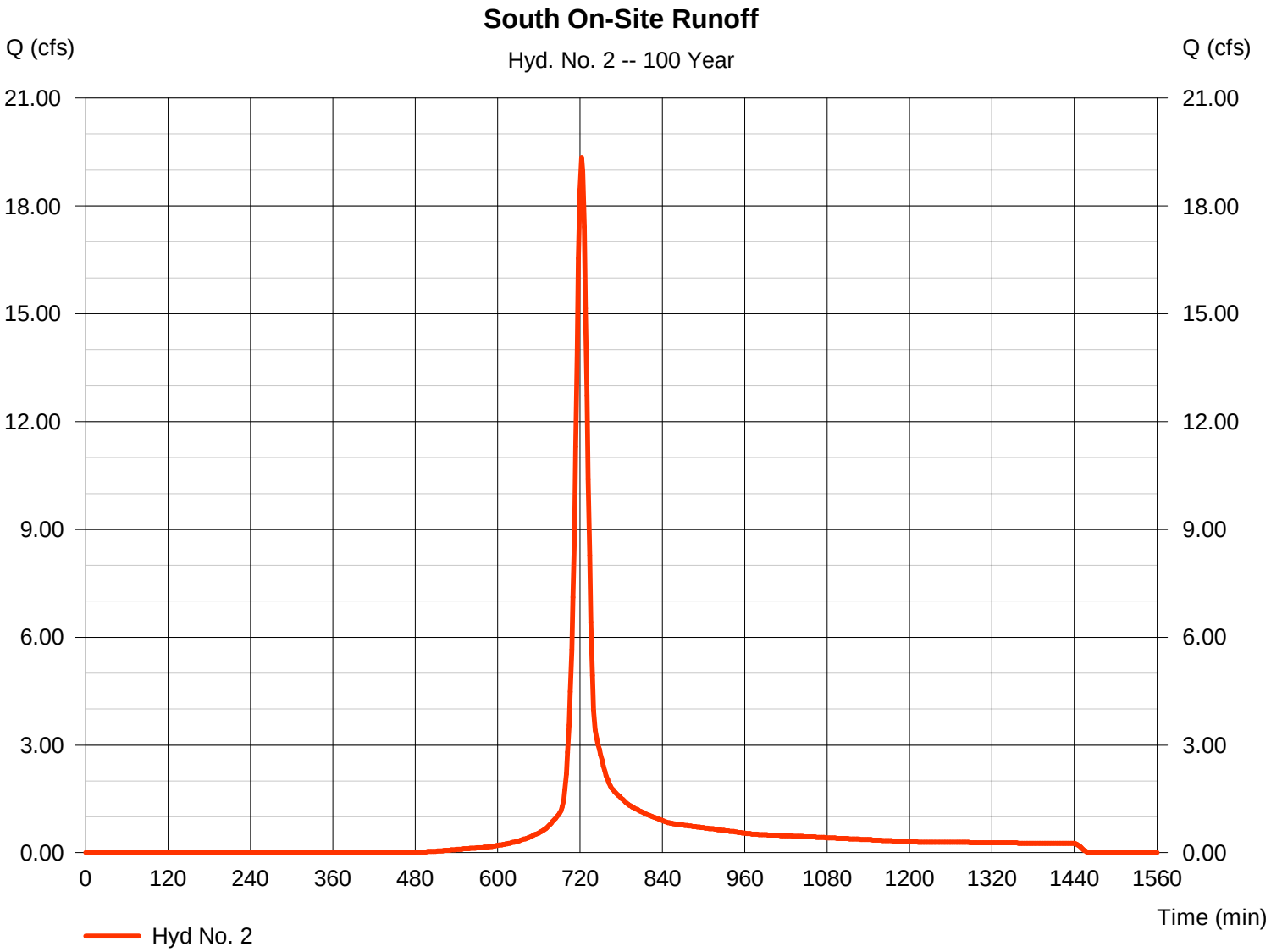


Hydrograph Report

Hyd. No. 2

South On-Site Runoff

Hydrograph type	=	SCS Runoff	Peak discharge	=	19.35 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	54,238 cuft
Drainage area	=	3.500 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	7.90 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

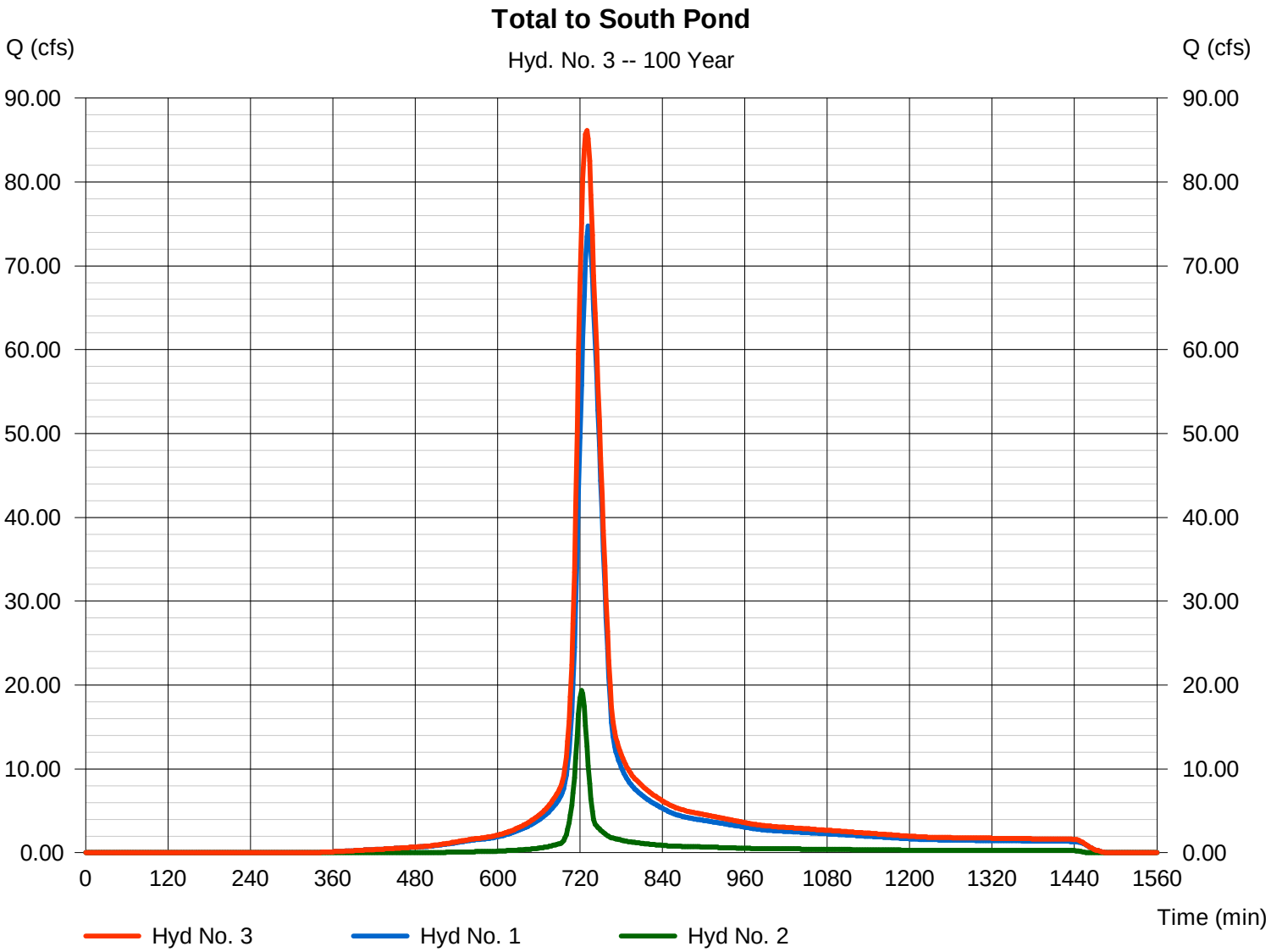


Hydrograph Report

Hyd. No. 3

Total to South Pond

Hydrograph type	=	Combine	Peak discharge	=	86.15 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	2 min	Hyd. volume	=	379,512 cuft
Inflow hyds.	=	1, 2	Contrib. drain. area	=	19.500 ac



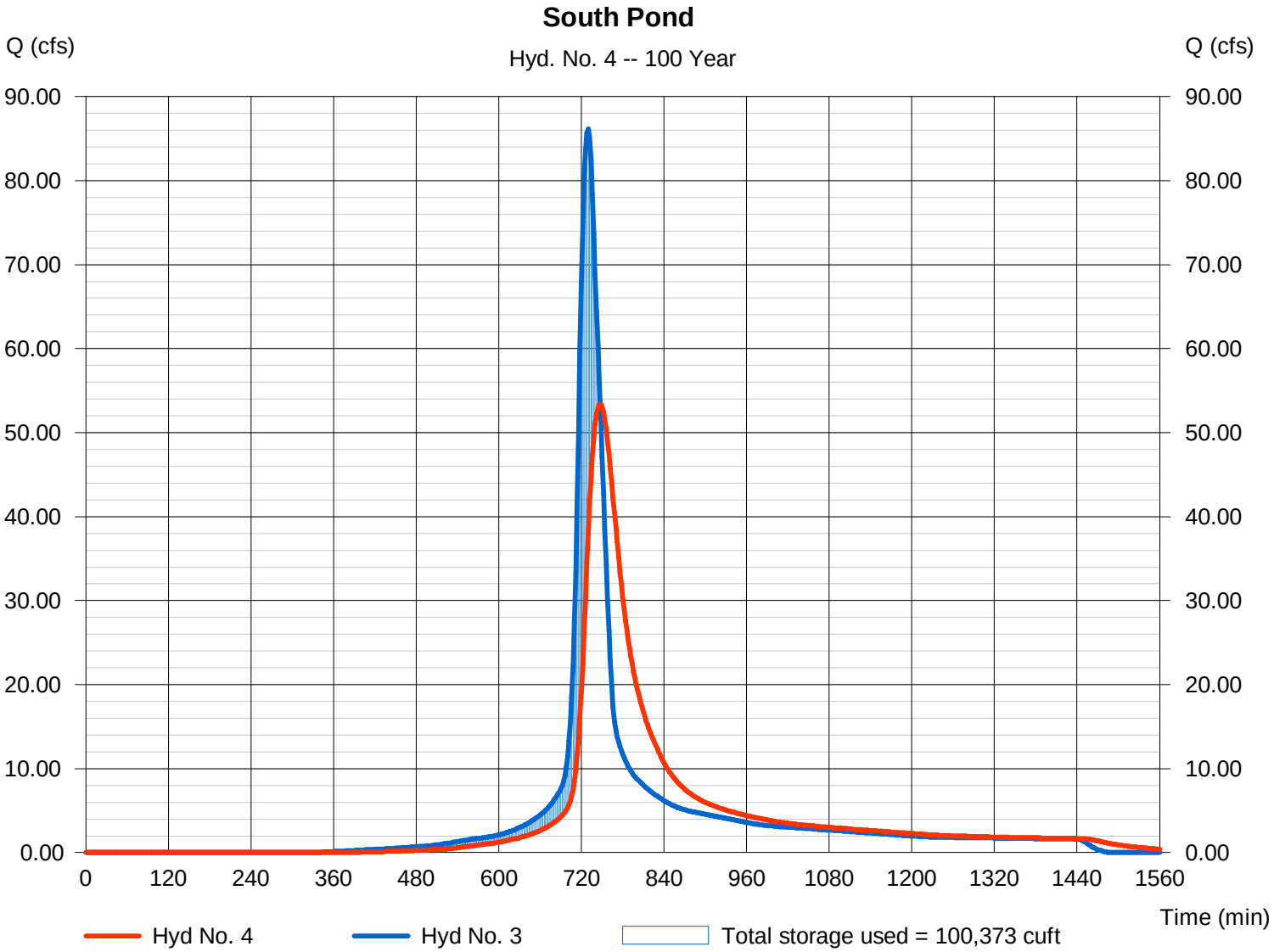
Hydrograph Report

Hyd. No. 4

South Pond

Hydrograph type	=	Reservoir	Peak discharge	=	53.37 cfs
Storm frequency	=	100 yrs	Time to peak	=	748 min
Time interval	=	2 min	Hyd. volume	=	379,504 cuft
Inflow hyd. No.	=	3 - Total to South Pond	Max. Elevation	=	1416.57 ft
Reservoir name	=	South Pond	Max. Storage	=	100,373 cuft

Storage Indication method used.

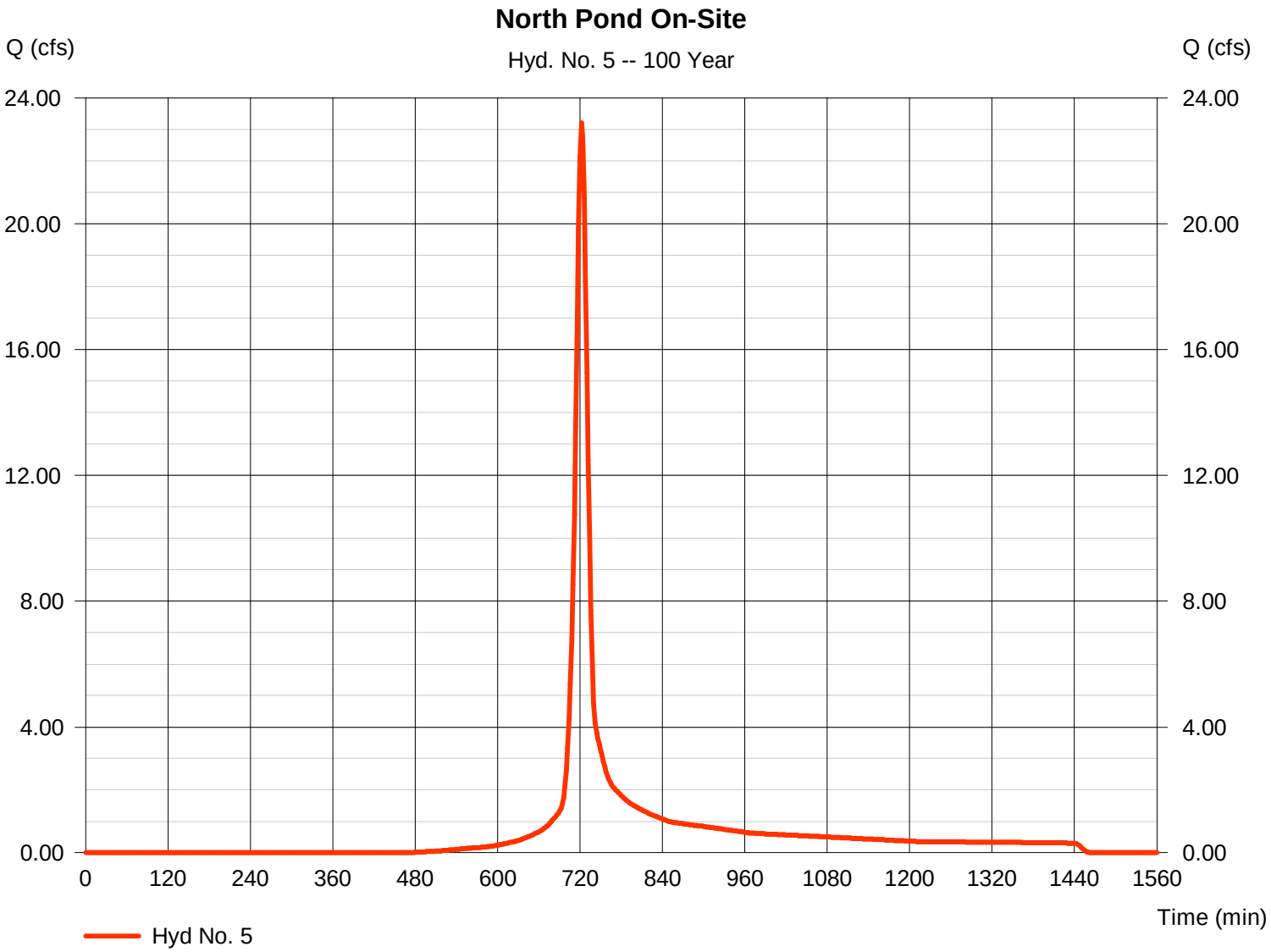


Hydrograph Report

Hyd. No. 5

North Pond On-Site

Hydrograph type	=	SCS Runoff	Peak discharge	=	23.21 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	65,085 cuft
Drainage area	=	4.200 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	7.90 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

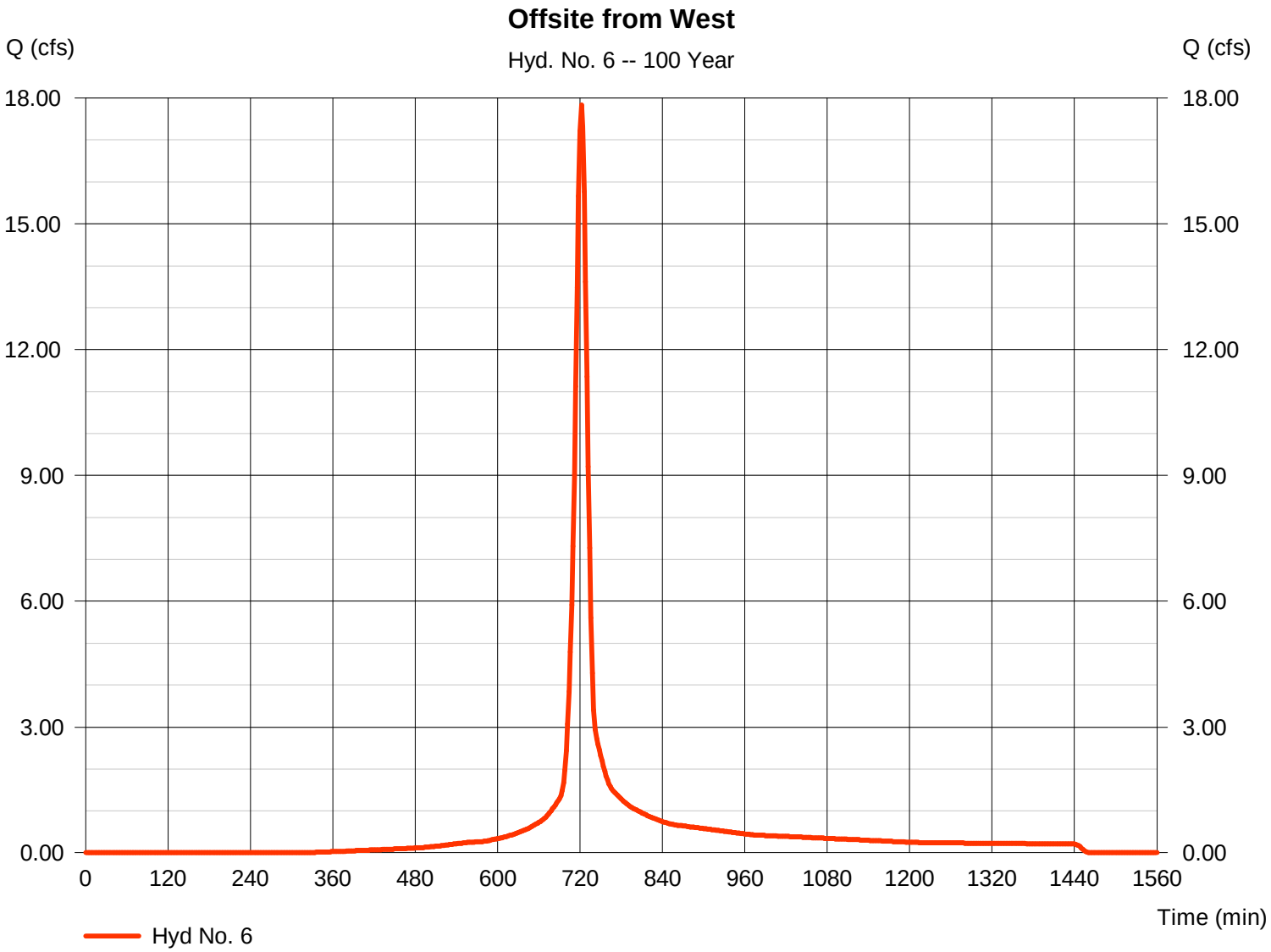


Hydrograph Report

Hyd. No. 6

Offsite from West

Hydrograph type	=	SCS Runoff	Peak discharge	=	17.84 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	50,899 cuft
Drainage area	=	2.600 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	7.90 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

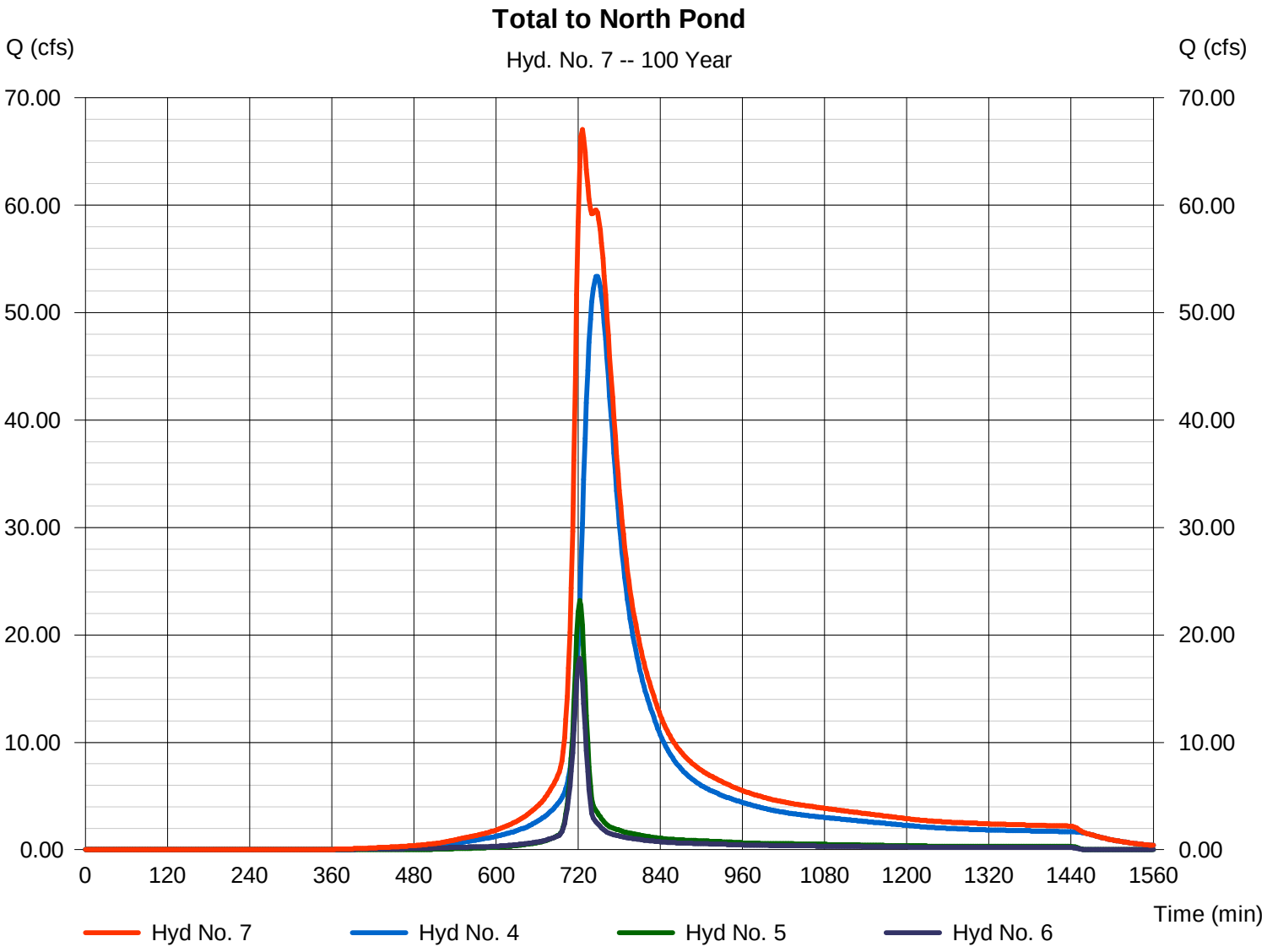


Hydrograph Report

Hyd. No. 7

Total to North Pond

Hydrograph type	= Combine	Peak discharge	= 67.03 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 495,489 cuft
Inflow hyds.	= 4, 5, 6	Contrib. drain. area	= 6.800 ac

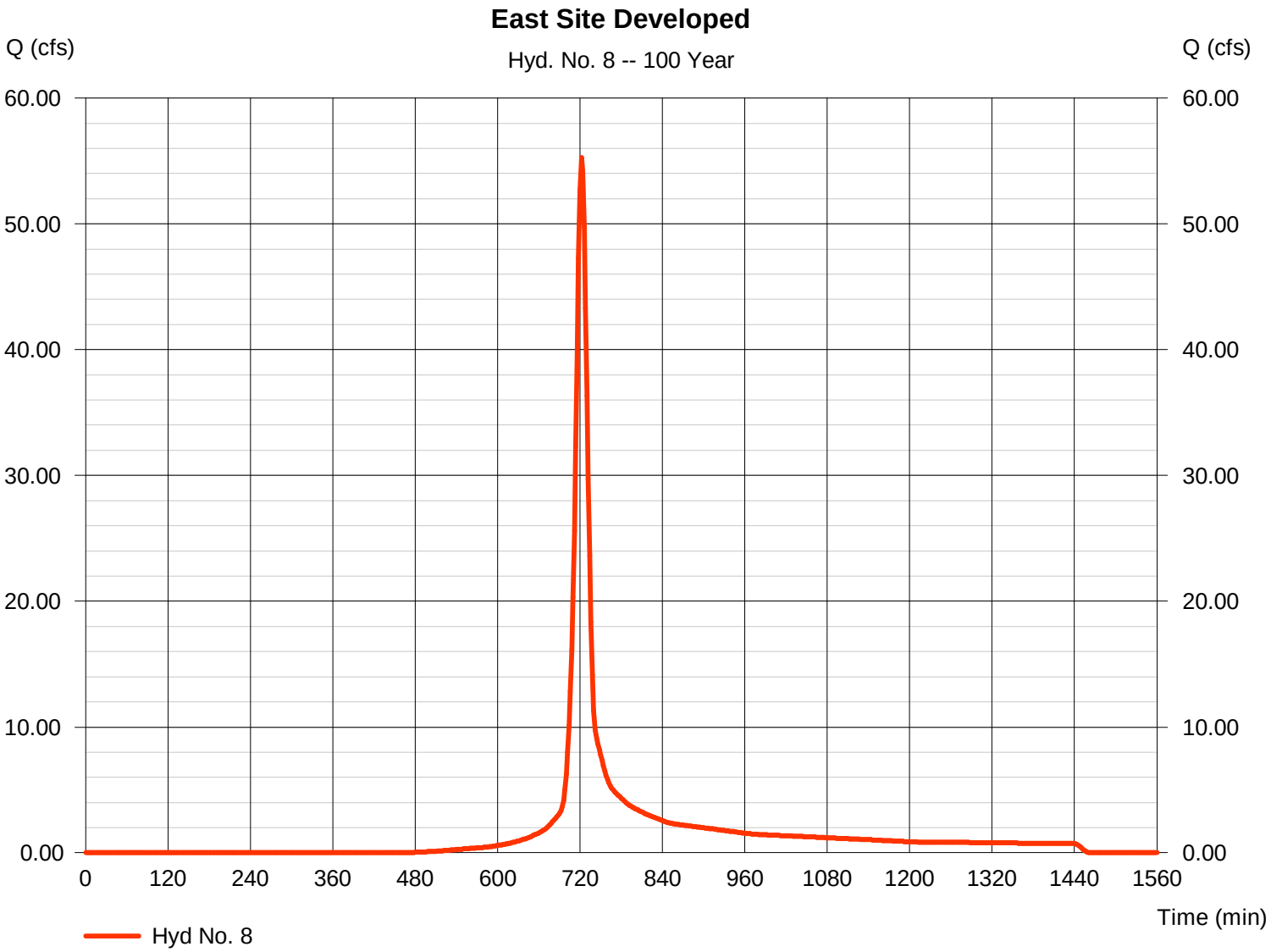


Hydrograph Report

Hyd. No. 8

East Site Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	55.27 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	154,965 cuft
Drainage area	=	10.000 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	7.90 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



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	76.3137	14.3000	0.8844	--------
3	0.0000	0.0000	0.0000	--------
5	52.6224	11.2000	0.7497	--------
10	55.1841	11.1000	0.7229	--------
25	60.7012	11.1000	0.7068	--------
50	66.9222	11.3000	0.7004	--------
100	62.2794	10.1000	0.6624	--------

File name: wichita.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	5.57	4.54	3.85	3.35	2.97	2.67	2.43	2.23	2.06	1.92	1.80	1.69
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	6.52	5.33	4.55	3.99	3.57	3.24	2.97	2.75	2.57	2.41	2.27	2.15
10	7.40	6.09	5.22	4.60	4.13	3.76	3.46	3.21	3.00	2.82	2.67	2.53
25	8.51	7.03	6.05	5.35	4.81	4.39	4.05	3.76	3.52	3.32	3.14	2.98
50	9.47	7.86	6.78	6.00	5.41	4.94	4.56	4.24	3.98	3.75	3.55	3.37
100	10.31	8.53	7.37	6.53	5.90	5.40	5.00	4.66	4.37	4.13	3.92	3.73

Tc = time in minutes. Values may exceed 60.

Precip. file name: wich_24hr.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	3.50	0.00	4.50	5.30	6.10	6.80	7.90
SCS 6-Hr	0.00	1.80	0.00	0.00	2.60	0.00	0.00	4.00
Huff-1st	0.00	1.55	0.00	2.75	4.00	5.38	6.50	8.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	1.75	0.00	2.80	3.90	5.25	6.00	7.10

Hydraflow Table of Contents

Hydraflow Express

North Culverts
South Culverts

Culvert Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. Monday, Jun 22 2009

Cir Culvert

Invert Elev Dn (ft)	=	1389.10
Pipe Length (ft)	=	30.00
Slope (%)	=	1.00
Invert Elev Up (ft)	=	1389.40
Rise (in)	=	33.0
Shape	=	Cir
Span (in)	=	33.0
No. Barrels	=	2
n-Value	=	0.024
Inlet Edge	=	Projecting
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.5

Embankment

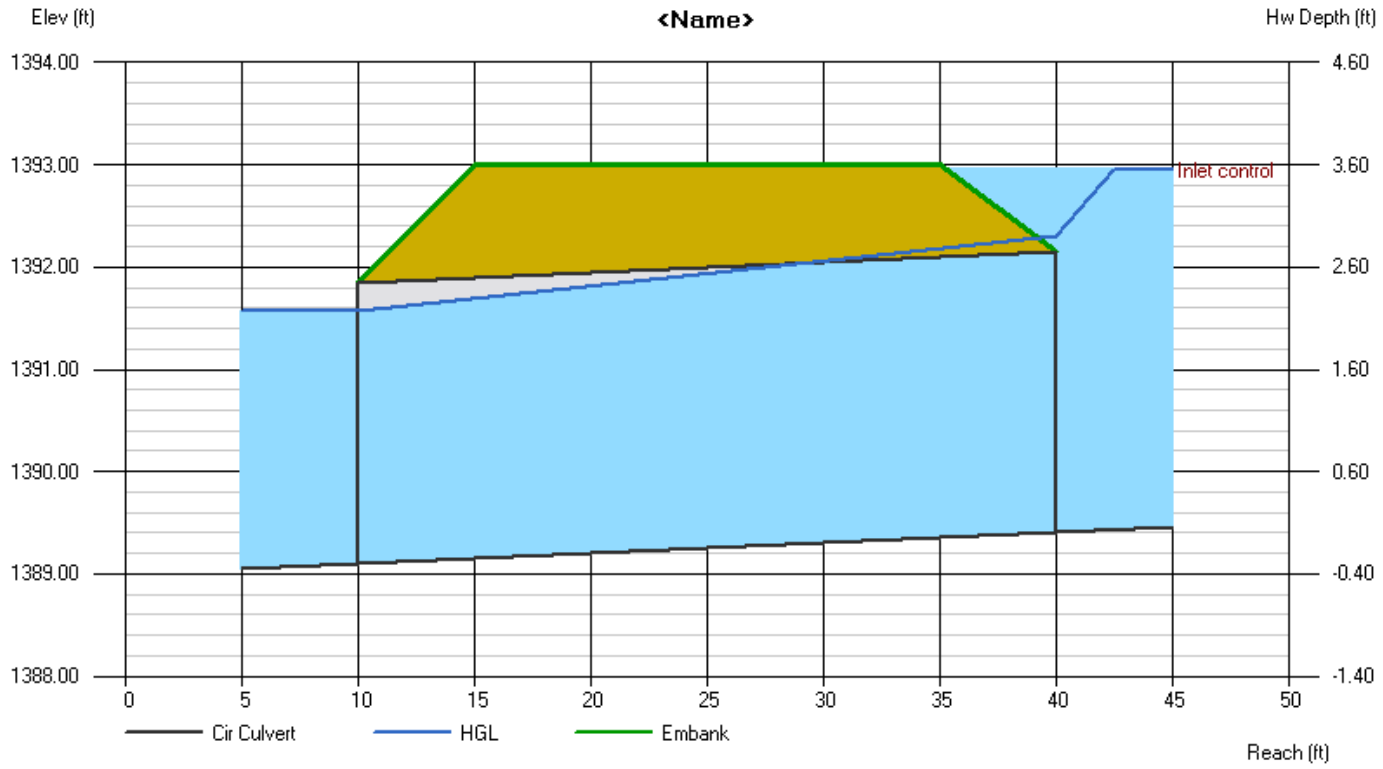
Top Elevation (ft)	=	1393.00
Top Width (ft)	=	20.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	2.00
Qmax (cfs)	=	90.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	86.00
Qpipe (cfs)	=	86.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	7.66
Veloc Up (ft/s)	=	7.24
HGL Dn (ft)	=	1391.57
HGL Up (ft)	=	1392.30
Hw Elev (ft)	=	1392.95
Hw/D (ft)	=	1.29
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. Monday, Jun 22 2009

Cir Culvert

Invert Elev Dn (ft)	=	1391.30
Pipe Length (ft)	=	30.00
Slope (%)	=	1.33
Invert Elev Up (ft)	=	1391.70
Rise (in)	=	33.0
Shape	=	Cir
Span (in)	=	33.0
No. Barrels	=	2
n-Value	=	0.024
Inlet Edge	=	Projecting
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.5

Embankment

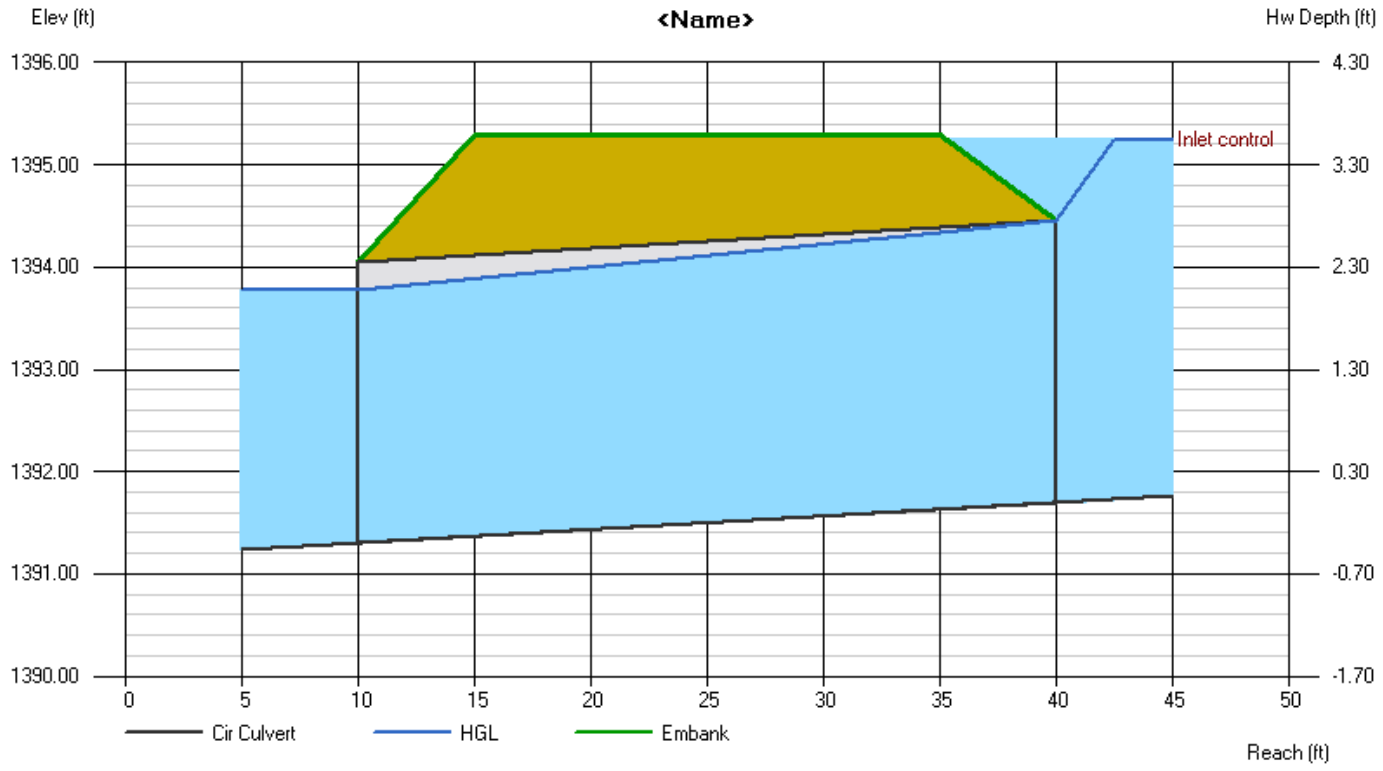
Top Elevation (ft)	=	1395.30
Top Width (ft)	=	20.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	2.00
Qmax (cfs)	=	90.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	86.00
Qpipe (cfs)	=	86.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	7.66
Veloc Up (ft/s)	=	7.24
HGL Dn (ft)	=	1393.77
HGL Up (ft)	=	1394.44
Hw Elev (ft)	=	1395.24
Hw/D (ft)	=	1.29
Flow Regime	=	Inlet Control



DRAINAGE & GRADING PLAN Scale 1:100