POST CONSTRUCTION STORMWATER MANAGEMENT (PCSM) REPORT

for

SMITHFIELD GATEWAY PHASE 1A-2
Route 209 & Route 447
Smithfield Township, Monroe County, PA

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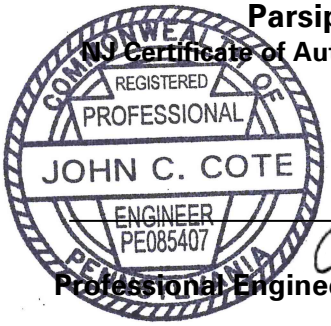

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INTRODUCTION

DEPG Mosier Associates, L.P. is proposing to construct Phase 1A-2 of the Smithfield Gateway project on a 92+/- acre tract located in Smithfield Township, Monroe County, Pennsylvania. The site is located to the north of the intersection of Route 209 and Route 447; refer to Figure 1 – USGS Site Location Map.

The Smithfield Gateway project is a mixed-use development that will be constructed in phases. The approved preliminary land development plans for the Smithfield Gateway project, prepared by Langan Engineering & Environmental Services, Inc. and last revised December 19, 2017, proposed Phase 1 of the development, and the original post-construction stormwater management report, prepared by Langan Engineering & Environmental Services, Inc. and last revised October 4, 2018, detailed the proposed stormwater management design for the entire Phase 1 of the development, with provisions incorporated into the design to account for the future phases of the project.

Phase 1A-1 was the first phase of the project to be permitted, and is currently under construction at the time of this application for Phase 1A-2. The approved final land development plans for Phase 1A-1 of the Smithfield Gateway project, prepared by Langan Engineering & Environmental Services, Inc. and dated last revised August 18, 2021, and the accompanying post-construction stormwater management report, prepared by Langan Engineering & Environmental Services, Inc. dated lasted last revised May 11, 2021, detailed the proposed development and stormwater management infrastructure associated with Phase 1A-1, which included an approximately 39,921± square-foot medical office building, 9,000 square-foot retail building, portions proposed roadways (Road A, Road B, and Road C, now referred to as Mosier Farm Drive, Gateway Drive, and Smithfield Lane, respectively), and proposed improvements to Route 209. The Phase 1A-1 land development plans proposed interim grading and erosion control measures on the pad area that is now referred to as Phase 1A-2, which is bound by Route 209 to the south, Mosier Farm Drive to the west, Smithfield Lane to the North, and Music Center Drive to the east.

This post construction stormwater management report and accompanying final land development plans are associated with Phase 1A-2 of the project development. This report modifies the stormwater management design of the Phase 1A-1 PCSM report, dated last revised May 11, 2021. The Phase 1A-1 PCSM report considered the Phase 1A-2 pad area to be in an undeveloped, interim

state; this Phase 1A-2 PCSM report now considers the full-build out of this pad area, modifying the analysis and calculations in the Phase 1A-1 PCSM report to account for this new development. Furthermore, this Phase 1A-2 PCSM report traces its roots back to the original Phase 1 preliminary land development PCSM report, dated last revised October 4, 2018 as it pertains to prior approvals obtained for BMP design and regional watershed analysis. Information contained within this report has been carried over from the prior design for the original Phase 1 preliminary land development, and Phase 1A-1 final land development, where applicable for continuity.

Phase 1A-2 of the Smithfield Gateway project includes approximately 6,049± SF Wawa convenience store with a gas station, a 2,890± SF restaurant, stormwater systems, utility infrastructure, and associated parking facilities. Included in the development plans on the Phase 1A-2 pad area are two above-ground infiltration basins, one subsurface infiltration system, water quality structures, and an underground stormwater conveyance system to provide for drainage of the site. The development of the project includes stormwater conveyance pipes which convey runoff from the Phase 1A-2 pad area to the southeast to a previously permitted conveyance network in Route 209, which ultimately conveys runoff to the Marshalls Creek watershed. This report addresses the engineering design of the stormwater conveyance and management systems for Phase 1A-2. These facilities have been designed in accordance with regulations set forth by Smithfield Township, Monroe County Conservation District, and Pennsylvania Department of Environmental Protection.

DESIGN METHODOLOGY

Stormwater Management Design

Hydrographs for the existing and proposed watersheds were developed using the NRCS TR-55 method. The TR-55 method simulates a watershed as a series of overland flows, channel flows, and inflow and outflow structures for its contribution to runoff. A value for area, curve number (CN), and time of concentration (Tc) was calculated for each watershed.

The curve number (CN) is a land sensitive coefficient that dictates the relationship between total rainfall depth and direct storm runoff. Based on the coverage of soil groups and land use in the area, an average CN was determined for each watershed for existing and proposed conditions. In accordance with Smithfield Township requirements, the curve number for the pre-development

conditions was based on a ground cover of "meadow" in good condition, unless the natural ground cover generates a lower curve number.

The time of concentration is defined as the time for runoff to travel from the hydraulically most distant point of the watershed to a point of interest. Values of the time of concentration were determined for existing and proposed conditions based on land cover and slope of the flow path using methods described in TR-55. Unless otherwise noted, minimum time of concentration for watershed calculations is 6 minutes.

The design storm used for the TR-55 study is the 24 hour SCS Type II cumulative rainfall distribution. Twenty-four (24) hour rainfall depths were determined based upon information provided from National Oceanic and Atmospheric Administration (NOAA) Precipitation Frequency Data Server (PFDS) for the project site. Hydrographs were generated for the 1, 2, 10, 25, 50 and 100 year storms.

Storm Event (yr)	1	2	10	25	50	100
Rainfall (in.)	2.77	3.32	4.84	5.95	6.96	8.16

The Pennsylvania Stormwater Management Act (Act 167) provides a basis for floodplain management. This Act was adopted by the Monroe County Planning Commission, May 1988. The goal of Act 167 is to implement stormwater discharge criteria for post development flows based upon the existing watershed analysis. This criteria stems from the modeling of the entire existing watershed and concluding allowable release rates for post-development stormwater systems. The entire watershed is divided into numerous subareas, each with its own allowable release rates. The allowable release rates are dictated as a percentage of existing release rates for the particular sub area. The proposed site falls within watershed management district "C" which is a provisional direct discharge district (no detention). Development in those subareas designated as "no detention required" areas must convey the resulting stormwater runoff in a safe manner, which does not cause erosion or sedimentation. In accordance with the Smithfield Township Ordinance the project is subject to the water quality requirement for reducing the Post-Construction (Proposed conditions) 2-year storm runoff rates to be less than or equal to the Pre-Construction (Existing conditions) 1-year storm runoff rates.

PLAN PREPARER

The Post-Construction Stormwater Management Plan has been prepared by Mr. John C. Coté., P.E. of Langan Engineering and Environmental Services Inc., Parsippany, NJ. Langan is a full service civil engineering consulting firm established in 1970. Mr. Coté's record of training and experience in post construction stormwater management methods and techniques is included in Appendix G.

EXISTING CONDITIONS

It should be noted that there are no modifications to the existing conditions watershed assessment; the design methodology and supporting calculations are unchanged compared to the existing conditions assessment prepared as part of the Phase 1A-1 final land development PCSM report, dated last revised May 11, 2021.

Existing Site Description

The 92 +/- acre tract is located in Smithfield Township, Monroe County, Pennsylvania. The site is located to the north of the intersection of Route 209 and Route 447. The site is bounded by Route 447 to the west, Route 209 to the southeast, commercial properties to the south, commercial development to the northwest and residential properties to the east. The topography of the site generally slopes from north (EL 625) to the southwest (EL 470) and southeast (EL 437). The existing site consists of woods and meadow areas along with several small buildings and Mosier Farm Drive which connects from Route 447 to the commercial development to the northwest.

Receiving Watershed

The subject site discharges to both Brodhead Creek and Marshalls Creek. Per Chapter 93 of the Pennsylvania Code, Brodhead Creek has a designated use as Trout Stocking Fishes (TSF), Migratory Fishes (MF) and Marshalls Creek has a designated use as High Quality-Cold Water Fishes (HQ-CWF), Migratory Fishes (MF).

The project site is within the Brodhead Creek ACT 167 watershed. The proposed site falls within watershed management district "C" of the Brodhead Creek Watershed, which is a provisional direct discharge district (no detention). Development in those subareas designated as "no detention required" areas must convey the resulting stormwater runoff in a safe manner, which does not cause erosion or sedimentation.

Volume reduction requirements for the project are based on the difference between the 2-year, 24-hour pre-development runoff volume and the 2-year, 24-hour post-development runoff volume. Proposed BMPs have been designed to reduce the runoff volume for the project, to a value that is at or below the pre-development condition. Volume calculations and BMP credit calculations can be found in Appendix G

The project is subject to the Smithfield Township water quality requirement for reducing the Post-Construction (Proposed conditions) 2-year storm runoff rates to be less than or equal to the Pre-Construction (Existing conditions) 1-year storm runoff rates.

Soil Types

Site soils classification and boundary information referenced on the land development plans and on the Soils Map (Figure 2) are referenced from the United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Soil Resource Report for Monroe County, Pennsylvania. The Soils Descriptions and Limitations table is provided on the Soils Map. Soils within the watershed are classified as soils with the hydrologic soil group designation of "C & D".

Existing Watersheds Description

The existing watersheds are comprised of several on-site and off-site watersheds which discharge to seven Points of Analysis. Point of Analysis A (POA-A) is the existing concrete box culvert which crosses under Route 209. For the purposes of this analysis, we have evaluated the on-site upstream points of analysis which discharge to existing conveyance systems which ultimately discharge to this existing box culvert. These areas are identified as POA-A-1, POA-A-2 and POA-A-3. Hydrographs are included for Existing Watershed POA-A-4, which consists of existing sheet flow; it should be noted that this watershed area does not change in the post-construction conditions. Point of Analysis D (POA-D) is located below an existing 54" RCP pipe that crosses under Route 209. For the purposes of this analysis we have evaluated the point of analysis at the upstream end of the existing drainage swale (POA-D-1) which collects on-site drainage areas and the downstream point of analysis (POA-D) which collects the on-site and off-site drainage areas associated with the project improvements. The points of analysis (POA-B, POA-C and POA-E) are described below. Also provided below is a description of the existing watersheds. POA-D ultimately discharges to Marshalls Creek. POA-A-1, POA-A-2, POA-A-3, POA-B, POA-C and POA-E all ultimately discharge

to the Brodhead Creek. Existing watersheds and points of analysis are provided on the Existing Watershed Map (Figure 3). Refer to Appendix A for Existing Watershed Calculations.

Based upon our meeting with Monroe County Conservation District and PADEP on April 10, 2017, the stormwater analysis has been revised to evaluate three overall points of analysis which includes POA-ABC (which is the combined watersheds for POA-A-1, POA-A-2, POA-A-3, POA-B and POA-C); POA-D and POA-E.

Points of Analysis

For purposes of this analysis, there are seven general points of analysis (POA) where all discharges from the on-site watersheds flow toward (refer to Figure 3). **As noted above we have evaluated three overall points of analysis for the project which includes POA-ABC, POA-D and POA-E**:

POA-A-1 is located at the south west portion of the site. Existing flows are conveyed to an existing 24" RCP storm pipe (non-surface water discharge) near the property boundary. This point of analysis is conveyed to the existing concrete box culvert at POA-A which discharges to an unnamed tributary to the Brodhead Creek (surface water), ultimately discharging to the Brodhead Creek.

POA-A-2 is located at the southern portion of the site. Existing flows are conveyed to an existing 12" RCP storm pipe (non-surface water discharge) near the property boundary. This point of analysis is conveyed to the existing concrete box culvert at POA-A which discharges to an unnamed tributary to the Brodhead Creek (surface water), ultimately discharging to the Brodhead Creek.

POA-A-3 is located at the southern portion of the site. Existing flows are conveyed to the existing drainage ponds and are discharged via an existing 36" CMP storm pipe (non-surface water discharge). This point of analysis is conveyed to the existing concrete box culvert at POA-A which discharges to an unnamed tributary to the Brodhead Creek (surface water), ultimately discharging to the Brodhead Creek.

POA-B is located at the southern portion of the site along Route 209. Existing flows are conveyed to the existing 15" RCP storm pipes which discharge to a swale along the south side of Route 209 (non-surface water discharge). This point of analysis ultimately discharges to an unnamed tributary to the Brodhead Creek (surface water), ultimately discharging to the Brodhead Creek.

POA-C is located at the southern portion of the site along Route 209. Existing flows are conveyed to the existing 18" CMP storm pipe which discharges to a swale along the south side of Route 209 (non-surface water discharge). This point of analysis ultimately discharges to the Brodhead Creek.

POA-ABC is located to the southwest of the project site, south and east of Route 209 within an unnamed tributary to Brodhead Creek. This point of analysis represents the confluence of existing flows from POA-A-1, POA-A-2, POA-A-3, POA-B, and POA-C within the unnamed tributary before ultimately discharging to Brodhead Creek.

POA-D-1 is located at the southeast portion of the site along Route 209. Existing flows are conveyed to the existing 18" CMP storm pipe which discharges to an existing drainage swale along the north side of Route 209 (non-surface water discharge). This point of analysis discharges under Route 209, ultimately discharging to Marshalls Creek.

POA-D is located the southeast of the site along Route 209. Existing flows are conveyed via existing drainage swales along both sides of Route 209 and via existing 54" RCP pipe crossing under Route 209 (non-surface water discharge). This point of analysis discharges under Route 209, ultimately discharging to Marshalls Creek.

POA-E is located at the southern portion of the Smithfield Gateway East (Chelsea Site) property. Existing flows are conveyed to an existing outfall via 42" HDPE storm pipe (surface water discharge). This point of analysis ultimately discharges to the Brodhead Creek.

Existing Watersheds

EX-A-1-A-Onsite is approximately 7.59± acres and consists of pervious areas (woods, grass) and portions of Mosier Farm Drive and Pasture Lane. This watershed discharges to POA-A-1.

EX-A-1-A-Offsite-Disturbed is approximately 1.49± acres and consists of off-site pervious areas portions of Route 447 that are proposed to be disturbed in the post-construction condition. This watershed discharges to existing swales and conveyance pipes which discharge through Existing Watershed EX-A-1-A-Onsite to POA-A-1.

EX-A-1-A-Offsite-Undisturbed is approximately 36.07± acres and consists of off-site pervious areas (woods, grass), buildings, parking lots and portions of Route 447. This watershed discharges to existing swales and conveyance pipes which discharge through Existing Watershed EX-A-1-A-Onsite to POA-A-1.

EX-A-1-B-Offsite is associated with the Mosier Development, LLC, Senior Living Development. Runoff from this watershed discharges to Existing Basin #3. The peak runoff information for this watershed is taken from the pond outflow for Existing Basin #3 from the Stormwater Management Report, prepared by Reilly Associates; last revised October 6, 2005. Referenced Pond information from the Mosier Development LLC, Senior Living Development Stormwater Management Report is provided in Appendix A. This existing runoff discharges to POA-A-1.

EX-A-1-C-Onsite and EX-A-1-C-Offsite are associated with the Mosier Development, LLC, Senior Living Development. Runoff from this watershed discharges to Existing Basin #2. The peak runoff information for this watershed is taken from the pond outflow for Existing Basin #2 from the Stormwater Management Report, prepared by Reilly Associates; last revised October 6, 2005. Referenced Pond information from the Mosier Development LLC, Senior Living Development Stormwater Management Report is provided in Appendix A. This existing runoff discharges to POA-A-1.

EX-A-1-D-Offsite is approximately 15.82± acres and consists of pervious areas (woods, grass), buildings and roads. This watershed discharges through the adjacent Mosier Development, LLC, Senior Living Development project via storm conveyance pipes, discharging through Existing Watershed EX-A-1-A-Onsite to POA-A-1.

EX-A-2-A-Onsite is approximately 11.97± acres and consists of pervious areas (woods, grass), and portions of Mosier Farm Drive and Pasture Lane. This watershed discharges to POA-A-2.

EX-A-2-A-Offsite is approximately 17.99± acres and consists of off-site residential areas (woods, grass, buildings, roads) and undeveloped areas of the Mosier Development, LLC, Senior Living Development (woods, grass). This watershed is conveyed via swales and discharges through EX-A-2-A-Onsite watershed to POA-A-2.

EX-A-2-B-Onsite and EX-A-2-B-Offsite are associated with the Mosier Development, LLC, Senior Living Development. Runoff from this watershed discharges to Existing Basin #4. The peak runoff information for this watershed is taken from the pond outflow for Existing Basin #4 from the Stormwater Management Report, prepared by Reilly Associates; last revised October 6, 2005. Referenced Pond information from the Mosier Development LLC, Senior Living Development Stormwater Management Report is provided in Appendix A. This existing runoff discharges to POA-A-2.

EX-A-3-A-Onsite is approximately 31.22± acres and consists of pervious areas (woods, grass), buildings and roads. Runoff from this existing watershed discharges to POA-A-3.

EX-A-3-A-Offsite is approximately 27.10± acres and consists of offsite residential areas (woods, grass, buildings and roads). Runoff from this existing watershed discharges to POA-A-3.

EX-A-4-Onsite is approximately 2.99± acres and consists of pervious areas (woods, grass) and existing impervious areas (existing pump station). Runoff from this existing watershed discharges off-site via sheet flow, ultimately discharging to POA-A. Hydrographs are provided for EX-A-4-Onsite but no additional analysis is provided since there is no change in pre-construction to post-construction conditions.

EX-B-1-Onsite is approximately 1.51± acres and consists of pervious areas (grass), buildings, parking areas and portion of Route 209. Runoff from this existing watershed discharges to POA-B.

EX-B-1-Offsite is approximately 4.08± acres and consists of pervious areas (woods, grass), buildings, parking areas and portion of Route 209. Runoff from this existing watershed discharges to POA-B.

EX-B-2-Onsite is approximately 22.91± acres and consists of pervious areas (woods, grass), buildings, parking areas and roads. This watershed discharges to a sumped area which overflows to existing inlets along Route 209. Runoff from this existing watershed discharges to POA-B.

EX-B-2 Offsite is approximately 1.25± acres and consists of pervious areas (woods, grass), buildings, parking areas and portion of Route 209. Runoff from this existing watershed discharges

to POA-B.

EX-C-1-Onsite is approximately 1.09 ± acres and consists of pervious areas (woods, grass), building, and portions of Route 209. Runoff from this existing watershed discharges to POA-C.

EX-C-1-Offsite is approximately 1.32 ± acres and consists of pervious areas (grass), pavement areas (parking and access driveway) and portion of Route 209. Runoff from this existing watershed discharges to POA-C.

EX-D-1-Onsite is approximately 4.91 ± acres and consists of pervious areas (woods, grass) and portion of Music Center Drive. Runoff from this existing watershed discharges to POA-D-1, ultimately discharging to POA-D.

EX-D-2-Onsite is approximately 4.04 ± acres and consists of pervious areas (woods, grass), buildings, parking areas and portion of Route 209. Runoff from this existing watershed discharges to POA-D-1, ultimately discharging to POA-D.

EX-D-2-Offsite-Disturbed is approximately 0.76 ± acres and consists of pervious areas (woods, grass), parking areas, and portions of Music Center Drive that are proposed to be disturbed in the post-construction condition. Runoff from this existing watershed discharges to POA-D-1, ultimately discharging to POA-D.

EX-D-2-Offsite-Undisturbed is approximately 0.87 ± acres and consists of pervious areas (woods, grass), parking areas, and portions of Music Center Drive that are proposed to be undisturbed in the post-construction condition. Runoff from this existing watershed discharges to POA-D-1, ultimately discharging to POA-D.

EX-D-3-Offsite is approximately 2.58 ± acres and consists of grass and portions of Route 209 that proposed to be disturbed in the post-construction condition. Runoff from this existing watershed discharges to POA-D.

EX-E-1-Disturbed is approximately 2.49 ± acres and consists of portions of the Chelsea site that are proposed to be disturbed in the post-construction condition. Runoff from this existing watershed

discharges to POA-E.

EX-E-1-Undisturbed is approximately 9.58 ± acres and consists of the car wash, Dairy Queen, Odd Lot and pervious areas (woods, grass) of the Chelsea Site. Runoff from this existing watershed discharges to POA-E.

EX-E-2-Disturbed is approximately 2.31 ± acres and consists of pervious areas (woods, grass) of the Chelsea Site that are proposed to be disturbed as part of the proposed 72" discharge pipe installation. Runoff from this existing watershed discharges to POA-E.

EX-E-2-Undisturbed is approximately 19.68 ± acres and consists of pervious areas (woods, grass) of the Chelsea Site. Runoff from this existing watershed discharges to POA-E.

Existing Discharges

The TR-55 method was used to determine existing runoff hydrographs for the 1, 2, 10, 25, 50, and 100-year, 24 hour storms for the existing watersheds. The peak discharges are summarized below and calculations are provided in Appendix A.

EXISTING CONDITIONS - POINT OF ANALYSIS POA-A-1				
STORM EVENT (YR)	**COMBINED EXISTING HYDROGRAPHS (CFS)**	**EX-A-1-B OFFSITE (OUTFLOW FROM EXISTING BASIN 3) (CFS)**	**EX-A-1-C ONSITE/OFFSITE (OUTFLOW FROM EXISTING BASIN 2) (CFS)**	**COMBINED EXISTING DISCHARGE TO POA-A-1 (CFS)**
1	69.41	0.00	0.11	69.52
2	94.05	5.79	1.78	101.62
10	166.20	8.00	2.57	176.77
25	220.20	24.54	3.06	247.80
50	269.61	33.60	3.32	306.53
100	328.32	41.15	3.54	373.01

NOTES:

1. Existing Basin 2 and Existing Basin 3 outflow is taken from the Mosier Development, LLC, Senior Living Development Stormwater Management Report, prepared by Reilly Associates, last revised October 6, 2005.

EXISTING CONDITIONS - POINT OF ANALYSIS POA-A-2			
STORM EVENT (YR)	**COMBINED EXISTING HYDROGRAPHS (CFS)**	**EX-A-2-B ONSITE/OFFSITE (OUTFLOW FROM EXISTING BASIN 4) (CFS)**	**COMBINED EXISTING DISCHARGE TO POA-A-2 (CFS)**
1	36.80	0.34	37.14
2	51.92	8.06	59.98
10	97.01	11.25	108.26
25	131.80	12.25	144.05
50	164.07	12.76	176.83
100	202.68	13.22	215.90

NOTES:

1. Existing Basin 4 outflow is taken from the Mosier Development, LLC, Senior Living Development Stormwater Management Report, prepared by Reilly Associates, last revised October 6, 2005.

EXISTING CONDITIONS - POINT OF ANALYSIS POA-ABC					
STORM EVENT (YR)	**COMBINED EXISTING HYDROGRAPHS (POA-A-1, POA-A-2, POA-A-3, EX-A-4-ONSITE, POA-B, POA-C) (CFS)**	**EX-A-1-B OFFSITE (OUTFLOW FROM EXISTING BASIN 3) (CFS)**	**EX-A-1-C ONSITE/OFFSITE (OUTFLOW FROM EXISTING BASIN 2) (CFS)**	**EX-A-2-B ONSITE/OFFSITE (OUTFLOW FROM EXISTING BASIN 4) (CFS)**	**COMBINED EXISTING DISCHARGE TO POA-ABC (CFS)**
1	180.68	0.00	0.11	0.34	181.13
2	249.70	5.79	1.78	8.06	265.33
10	458.45	8.00	2.57	11.25	480.27
25	624.65	24.54	3.06	12.25	664.50
50	779.81	33.60	3.32	12.76	829.49
100	959.70	41.15	3.54	13.22	1,017.61

Notes:

1. Existing Basin 2, Existing Basin 3, and Existing Basin 4 outflow is taken from the Mosier Development, LLC, Senior Living Development Stormwater Management Report, prepared by Reilly Associates, last revised October 6, 2005.

Below is a summary of the existing discharges to each Point of Analysis.

SUMMARY OF EXISTING PEAK DISCHARGE RATES FOR POINTS OF ANALYSIS									
Storm Event (YR)	POA-A-1 (CFS)	POA-A-2 (CFS)	POA-A-3 (CFS)	POA-B (CFS)	POA-C (CFS)	POA-ABC (CFS)	POA-D (CFS)	POA-D-1 (CFS)	POA-E (CFS)
1	69.52	37.14	61.04	15.58	4.39	181.13	22.41	16.46	49.07
2	101.62	59.98	85.43	19.80	5.78	265.33	30.32	22.53	66.74
10	176.77	108.26	157.78	31.66	9.74	480.27	53.26	40.29	118.39
25	247.80	144.05	212.77	47.94	12.66	664.50	70.44	53.67	157.29
50	306.53	176.83	263.41	65.75	15.31	829.49	86.15	65.95	193.00
100	373.01	215.90	323.84	87.95	18.47	1,017.61	104.84	80.57	235.56

Note:
POA-B discharge rates totals include a routing calculation for existing watershed EX-B-2-Onsite of the existing sumped area. The pond routing calculation is provided in Appendix A.

Below is a summary of the existing discharges to each overall Point of Analysis.

SUMMARY OF EXISTING PEAK DISCHARGE RATES FOR OVERALL POINTS OF ANALYSIS			
Storm Event (YR)	POA-ABC (CFS)	POA-D (CFS)	POA-E (CFS)
1	181.13	22.41	49.07
2	265.33	30.32	66.74
10	480.27	53.26	118.39
25	664.50	70.44	157.29
50	829.49	86.15	193.00
100	1,017.61	104.84	235.56

PROPOSED CONDITIONS

Proposed Development

Phase 1A-2 of the Smithfield Gateway project includes approximately 6,049± SF Wawa convenience store with a gas station, a 2,890± SF restaurant, stormwater systems, utility infrastructure, and associated parking facilities. Included in the development plans on the Phase

1A-2 pad area are two above-ground infiltration basins, one subsurface infiltration system, water quality structures, and an underground stormwater conveyance system to provide for drainage of the site. The development of the project includes stormwater conveyance pipes which convey runoff from the Phase 1A-2 pad area to the southeast to a previously permitted conveyance network in Route 209, which ultimately conveys runoff to the Marshalls Creek watershed.

Stormwater Conveyance Design

This report contains calculations supporting the design of the subsurface conveyance network proposed as part of Phase 1A-2 of the development. The Phase 1A-2 conveyance network ties into a portion of the stormwater conveyance network proposed and constructed as part of the Phase 1A-1 Route 209 HOP improvements. In order to demonstrate continued capacity, this downstream portion of the conveyance network has been included in the conveyance calculations; refer to the Phase 1A-1 land development plans and PCSM report for inlet locations, pipe sizes, and inverts for this portion of the conveyance network which has already been constructed. Refer to Appendix B for supporting conveyance calculations.

Furthermore, this report contains supporting conveyance calculations for the portion of the Phase 1A-1 conveyance network affected by the proposed grading design and site layout of the Phase 1A-2 development. Drainage subareas for the inlets that interface with the Phase 1A-2 development area were revised based upon the final proposed grades. Revisions to these inlet subareas are included in order to demonstrate continued capacity for the pipes constructed as part of the Phase 1A-1 land development. Refer to the Phase 1A-1 land development plans and PCSM report for inlet locations, pipe sizes, and inverts for this portion of the conveyance network which has already been constructed Refer to Appendix B for supporting conveyance calculations.

The proposed stormwater conveyance system is designed for the 50-year storm event per the Smithfield Township ordinance, utilizing the Rational Method. Stormwater conveyance calculations are provided in Appendix B. Refer to Figure 5 for the Partial Inlet Subarea Maps.

A value for area, time of concentration, and runoff coefficient was calculated for each contributing sub-area. Values of time of concentration were chosen based on land cover and slope of the flow path from the hydraulically most distance point in the sub-area to the appropriate inlet. An average runoff coefficient was chosen based on the type of land cover in accordance with the Smithfield

Township Stormwater Management Ordinance. Rainfall intensities were taken from the intensity-duration-frequency curves for Pennsylvania Department of Transportation (PennDOT); the IDF curve is provided in Appendix B.

The proposed stormwater conveyance system for the Smithfield Gateway project has been sized for the full build-out scenario, including conceptual stormwater runoff from future Phase 1, Phase 2, and Phase 3 development areas of the project. Impervious coverage for the future development areas have been assumed based upon the anticipated development for each lot, and in accordance with the Township requirements for maximum allowable impervious coverage for each lot within an overall mixed-use development. A separate stormwater conveyance calculation is included for the full build-out scenario; refer to Appendix B.

Proposed Watershed Description

The proposed watershed analysis is a carry-over from the Phase 1A-1 PCSM report, with the exception of the proposed watersheds in the vicinity of the Phase 1A-2 development area. The Phase 1A-1 PCSM report included a proposed watershed analysis considering the Phase 1A-2 development area in an interim state; that watershed analysis is now modified as part of this Phase 1A-2 PCSM report, considering the Phase 1A-2 development area in its final post-construction state.

The proposed watersheds are comprised of several on-site and off-site watersheds which discharge to seven Points of Analysis. Refer to the section above for the description of the Points of Analysis. Below is a description of the proposed watersheds. Proposed peak discharge calculations are provided in Appendix C. Refer to Figure 4 for the Proposed Watershed Map. Below is a summary of the proposed watersheds. **As noted above we have evaluated three overall points of analysis for the project which includes POA-ABC, POA-D and POA-E.**

Proposed Watersheds

PR-A-1-A-Onsite is approximately 5.63± acres and consists of pervious areas (woods, grass) and portions of Mosier Farm Drive and Pasture Lane. This watershed discharges to POA-A-1.

PR-A-1-A-Offsite-Disturbed is approximately 1.49± acres and consists of off-site pervious areas portions of Route 447 that are proposed to be disturbed in the post-construction condition. This watershed discharges to existing swales and conveyance pipes which discharge through Proposed

Watershed PR-A-1-A-Onsite to POA-A-1.

PR-A-1-A-Offsite-Undisturbed is approximately 36.07± acres and consists of off-site pervious areas (woods, grass), buildings, parking lots and portions of Route 447. This watershed discharges to existing swales and conveyance pipes which discharge through Proposed Watershed PR-A-1-A-Onsite to POA-A-1.

PR-A-1-B-Offsite is associated with the Mosier Development, LLC, Senior Living Development. Runoff from this watershed discharges to Existing Basin #3. The peak runoff information for this watershed is taken from the pond outflow for Existing Basin #3 from the Stormwater Management Report, prepared by Reilly Associates; last revised October 6, 2005. Referenced Pond information from the Mosier Development LLC, Senior Living Development Stormwater Management Report is provided in Appendix A. This existing runoff discharges to POA-A-1.

PR-A-1-C-Onsite and PR-A-1-C-Offsite are associated with the Mosier Development, LLC, Senior Living Development. Runoff from this watershed discharges to Existing Basin #2. The peak runoff information for this watershed is taken from the pond outflow for Existing Basin #2 from the Stormwater Management Report, prepared by Reilly Associates; last revised October 6, 2005. Referenced Pond information from the Mosier Development LLC, Senior Living Development Stormwater Management Report is provided in Appendix A. This existing runoff discharges to POA-A-1.

PR-A-1-D-Offsite is approximately 15.82± acres and consists of pervious areas (woods, grass), buildings and roads. This watershed discharges through the adjacent Mosier Development, LLC, Senior Living Development project via storm conveyance pipes, discharging through Proposed Watershed PR-A-1-A-Onsite to POA-A-1.

PR-A-1-E-Onsite is approximately 1.60± acres and consists of pervious areas (grass), and portions of Mosier Farm Drive. This watershed discharges to Interim Phase I Temporary Infiltration Basin 1-1 which reduces runoff to POA-A-1.

PR-A-2-A-Onsite is approximately 11.25± acres and consists of pervious areas (woods, grass), and portions of Mosier Farm Drive and Pasture Lane. This watershed discharges to POA-A-2.

PR-A-2-A-Offsite is approximately 17.99± acres and consists of off-site residential areas (woods, grass, buildings, roads) and undeveloped areas of the Mosier Development, LLC, Senior Living Development (woods, grass). This watershed is conveyed via swales and discharges through PR-A-2-A-Onsite watershed to POA-A-2.

PR-A-2-B-Onsite and PR-A-2-B-Offsite are associated with the Mosier Development, LLC, Senior Living Development. Runoff from this watershed discharges to Existing Basin #4. The peak runoff information for this watershed is taken from the pond outflow for Existing Basin #4 from the Stormwater Management Report, prepared by Reilly Associates; last revised October 6, 2005. Referenced Pond information from the Mosier Development LLC, Senior Living Development Stormwater Management Report is provided in Appendix A. This runoff discharges to POA-A-2.

PR-A-3-A-Onsite is approximately 14.24± acres and consists of pervious areas (woods, grass). Runoff from this watershed discharges to POA-A-3.

PR-A-3-A-Offsite is approximately 25.89± acres and consists of offsite residential areas (woods, grass, buildings and roads). Runoff from this watershed discharges to POA-A-3.

PR-A-4-Onsite is approximately 2.99± acres and consists of pervious areas (woods, grass) and existing impervious areas (existing pump station). Runoff from this proposed watershed discharges off-site via sheet flow, ultimately discharging to POA-A. Hydrographs are provided for PR-A-4-Onsite but no additional analysis is provided since there is no change in pre-construction to post-construction conditions.

PR-B-1-Onsite is approximately 1.51± acres includes pervious areas (grass), existing buildings, parking areas, and portions of Route 209. Runoff from this watershed discharges to POA-B.

PR-B-1-Offsite is approximately 4.08± acres includes pervious areas (woods, grass), existing buildings, parking areas, and portions of Route 209. Runoff from this watershed discharges to POA-B.

PR-B-2-Onsite is approximately 5.04± acres and consists of pervious areas (grass), buildings,

parking areas and roads. This watershed discharges to an existing sumped area which overflows to existing inlets along Route 209. Runoff from this existing watershed discharges to POA-B.

PR-C is approximately 0.95 ± acres and consists of pervious areas (grass), pavement areas (parking and access driveway) and portion of Route 209. Runoff from this watershed discharges to POA-C.

PR-D-1 is approximately 2.13 ± acres and consists of proposed parking areas, landscape areas, and rooftop associated with the Wawa building and gas station. Runoff from this watershed is conveyed to above-ground Infiltration Basin 4-1 (INF4-1), and discharges to POA-D-1, ultimately discharging to POA-D.

PR-D-2-Disturbed is approximately 0.44 ± acres and consists of landscaped areas, parking areas and portions of Smithfield Lane. Runoff from this watershed is conveyed to above ground Infiltration Basin 4-2 (INF4-2) and discharges to POA-D-1, ultimately discharging to POA-D.

PR-D-2-Undisturbed is approximately 0.07± acres and consists of undisturbed pervious areas. Runoff from this watershed is conveyed to above ground Infiltration Basin 4-2 (INF4-2) and discharges to POA-D-1, ultimately discharging to POA-D.

PR-D-3 is approximately 0.42± acres and consists of proposed parking areas, landscaped areas, and rooftop associated with the restaurant building. Runoff from this watershed is conveyed to Underground Infiltration Basin 4-1 (UGD-INF4-1) and discharges to POA-D-1, ultimately discharging to POA-D.

PR-D-4-Onsite-Disturbed is approximately 1.50± acres and consists of landscaped areas, a small portion of Smithfield Lane, and portions of Route 209. Runoff from this watershed is undetained and discharges to POA-D-1, ultimately discharging to POA-D.

PR-D-4-Onsite-Undisturbed is approximately 3.62± acres and consists of existing pervious areas that will remain undisturbed in the post-construction condition. Runoff from this watershed discharges to POA-D-1, ultimately discharging to POA-D.

PR-D-4-Offsite-Disturbed is approximately 0.47± acres and consists of offsite landscaped areas,

existing pervious areas, parking areas and portions of Music Center Drive and Route 209. Runoff from this watershed discharges to POA-D-1, ultimately discharging to POA-D.

PR-D-4-Offsite-Undisturbed is approximately 0.87± acres and consists of offsite landscaped areas, existing pervious areas, parking areas and portions of Music Center Drive. Runoff from this watershed discharges to POA-D-1, ultimately discharging to POA-D.

PR-D-5-Offsite is approximately 2.63± acres and consists of pervious areas (grass) and impervious areas of Route 209. Runoff from this watershed discharges to POA-D

PR-E-1 is approximately 0.20± acres and consists of landscaped areas and parking area. Runoff from this watershed is conveyed to Rain Garden 5-1 (RG5-1) and ultimately discharges to POA-E.

PR-E-2 is approximately 0.16± acres and consists of landscaped areas and portions of Road A. Runoff from this watershed is conveyed to Rain Garden 5-2 (RG5-2) and ultimately discharges to POA-E.

PR-E-3-Disturbed is approximately 0.50± acres and consists of landscaped areas and portions of Road A. Runoff from this watershed is conveyed to Rain Garden 5-3 (RG5-3) and ultimately discharges to POA-E.

PR-E-3-Undisturbed is approximately 0.02± acres and consists of existing pervious areas that will remain undisturbed in the post-construction condition. Runoff from this watershed is conveyed to Rain Garden 5-3 (RG5-3) and ultimately discharges to POA-E.

PR-E-4-Disturbed is approximately 1.06± acres and consists of landscaped areas and portions of Road A and Road C. Runoff from this watershed is conveyed to Underground Infiltration Basin 5-1 (UGD-INF5-1) and ultimately discharges to POA-E.

PR-E-4-Undisturbed is approximately 1.17± acres and consists of existing pervious areas that will remain undisturbed in the post-construction condition. Runoff from this watershed is conveyed to Underground Infiltration Basin 5-1 (UGD-INF5-1) and ultimately discharges to POA-E. This watershed is likely to be diverted away from UGD-INF5-1 in future phases of the development, but

remain within the POA-E watershed; therefore, no credit is taken for the infiltration volume associated with this watershed since this is likely to be an interim condition.

PR-E-5 is approximately 1.17± acres and consists of areas of the future Phase 1A-2 development that will be graded to an interim condition and temporarily stabilized with vegetation. Runoff from this watershed is conveyed to Underground Infiltration Basin 5-2 (UGD-INF5-2) and ultimately discharges to POA-E.

PR-E-6 is approximately 1.02± acres and consists of landscaped areas, parking areas, and roof areas. Runoff from this watershed is conveyed to Underground Infiltration Basin 5-3 (UGD-INF5-3) and ultimately discharges to POA-E.

PR-E-7 is approximately 2.64± acres and consists of landscaped areas, parking areas, and roof areas. Runoff from this watershed is conveyed to Underground Infiltration Basin 5-4 (UGD-INF5-4) and ultimately discharges to POA-E.

PR-E-8 is approximately 7.33± acres and consists of existing pervious areas that will be diverted to a temporary sediment basin in the interim condition. Runoff from this watershed ultimately discharges to POA-E.

PR-E-10-Onsite-Disturbed is approximately 7.60± acres and consists of landscaped areas, and impervious areas associated with Road A, Road B, Route 209, and parking areas. Runoff from this watershed discharges to POA-E.

PR-E-10-Onsite-Undisturbed is approximately 14.95± acres and consists of existing woods and pervious areas that will remain undisturbed in the proposed condition. Runoff from this watershed discharges to POA-E.

PR-E-10-Offsite-Disturbed is approximately 1.20± acres and consists of landscaped areas, portions of Route 209, and the main entrance driveway on the Chelsea site. Runoff from this watershed discharges to POA-E.

PR-E-10-Offsite-Undisturbed is approximately 2.44± acres and consists of existing pervious areas,

woods, landscaping, and impervious areas that will remain undisturbed in the proposed condition. Runoff from this watershed discharges to POA-E

PR-E-11-Disturbed is approximately 1.93± acres and consists of proposed driveways on the Chelsea site, and area that will be disturbed as part of the 72" outfall pipe installation. Runoff from this watershed discharges to POA-E.

PR-E-11-Undisturbed is approximately 9.58± acres and consists of impervious areas associated with the car wash, Dairy Queen, Odd Lot and pervious areas (woods, grass) of the Chelsea site that will remain undisturbed in the proposed condition. Runoff from this watershed discharges to POA-E.

PR-E-12-Disturbed is approximately 2.31± acres and consists of pervious areas of the Chelsea Site that will be disturbed as part of the 72" outfall pipe installation. Runoff from this watershed discharges to POA-E.

PR-E-12-Undisturbed is approximately 19.68± acres and consists of pervious areas (woods, grass) of the Chelsea Site that will remain undisturbed in the proposed condition. Runoff from this watershed discharges to POA-E.

Proposed Discharges

The TR-55 method was used to determine existing runoff hydrographs for the 2, 10, 25, 50, and 100-year, 24 hour storms for the watersheds. The peak discharges are summarized below and calculations are given in Appendix C.

PROPOSED CONDITIONS - POINT OF ANALYSIS POA-A-1				
STORM EVENT (YR)	**COMBINED PROPOSED HYDROGRAPHS (CFS)**	**PR-A-1-B OFFSITE (OUTFLOW FROM EXISTING BASIN 3) (CFS)**	**PR-A-1-C ONSITE/OFFSITE (OUTFLOW FROM EXISTING BASIN 2) (CFS)**	**COMBINED PROPOSED DISCHARGE TO POA-A-1 (CFS)**
2	91.06	5.79	1.78	98.63
10	162.61	8.00	2.57	173.18
25	217.59	24.54	3.06	245.19
50	267.49	33.60	3.32	304.41
100	326.00	41.15	3.54	370.69

NOTES:

1. Existing Basin 2 and Existing Basin 3 outflow is taken from the Mosier Development, LLC, Senior Living

Development Stormwater Management Report, prepared by Reilly Associates, last revised October 6, 2005.

PROPOSED CONDITIONS - POINT OF ANALYSIS POA-A-2			
STORM EVENT (YR)	**COMBINED PROPOSED HYDROGRAPHS (CFS)**	**PR-A-2-B ONSITE/OFFSITE (OUTFLOW FROM EXISTING BASIN 4) (CFS)**	**COMBINED PROPOSED DISCHARGE TO POA-A-2 (CFS)**
2	50.81	8.06	58.87
10	94.86	11.25	106.11
25	128.95	12.25	141.20
50	160.50	12.76	173.26
100	198.23	13.22	211.45

NOTES:

1. Existing Basin 4 outflow is taken from the Mosier Development, LLC, Senior Living Development Stormwater Management Report, prepared by Reilly Associates, last revised October 6, 2005.

PROPOSED CONDITIONS - POINT OF ANALYSIS POA-ABC					
STORM EVENT (YR)	**COMBINED PROPOSED HYDROGRAPHS (POA-A-1, POA-A-2, POA-A-3, PR-A-4-ONSITE, POA-B, POA-C) (CFS)**	**PR-A-1-B OFFSITE (OUTFLOW FROM EXISTING BASIN 3) (CFS)**	**PR-A-1-C ONSITE/OFFSITE (OUTFLOW FROM EXISTING BASIN 2) (CFS)**	**PR-A-2-B ONSITE/OFFSITE (OUTFLOW FROM EXISTING BASIN 4) (CFS)**	**COMBINED PROPOSED DISCHARGE TO POA-ABC (CFS)**
2	212.82	5.79	1.78	8.06	228.45
10	385.35	8.00	2.57	11.25	407.17
25	517.76	24.54	3.06	12.25	557.61
50	638.99	33.60	3.32	12.76	688.67
100	782.28	41.15	3.54	13.22	840.19

Notes:

1. Existing Basin 2, Existing Basin 3, and Existing Basin 4 outflow is taken from the Mosier Development, LLC, Senior Living Development Stormwater Management Report, prepared by Reilly Associates, last revised October 6, 2005.

SUMMARY OF PROPOSED PEAK DISCHARGE RATES FOR POINTS OF ANALYSIS									
Storm Event (YR)	POA-A-1 (CFS)	POA-A-2 (CFS)	POA-A-3 (CFS)	POA-B (CFS)	POA-C (CFS)	POA-ABC (CFS)	POA-D (CFS)	POA-D-1 (CFS)	POA-E (CFS)
2	98.63	58.87	57.01	19.80	3.76	228.45	22.40	13.17	118.85
10	173.18	106.11	103.88	31.48	5.83	407.17	39.68	25.87	218.85
25	245.19	141.20	139.34	39.95	7.32	557.61	55.20	37.53	299.33
50	304.41	173.26	171.92	47.62	8.67	688.67	69.87	48.72	377.48
100	370.69	211.45	210.76	56.67	10.27	840.19	87.22	61.95	468.49

SUMMARY OF PROPOSED PEAK DISCHARGE RATES FOR OVERALL POINTS OF ANALYSIS			
Storm Event (YR)	POA-ABC (CFS)	POA-D (CFS)	POA-E (CFS)
2	228.45	22.40	118.85
10	407.17	39.68	218.85
25	557.61	55.20	299.33
50	688.67	69.87	377.48
100	840.19	87.22	468.49

Proposed Conditions 2-Year Storm versus Existing Condition 1-Year Storm

In accordance with the Smithfield Township Ordinance the project is subject to the water quality requirement for reducing the Post-Construction (Proposed conditions) 2-year, 24-hour storm runoff rates to be less than or equal to the Pre-Construction (Existing conditions) 1-year, 24-hour storm runoff rates.

The points of analysis in the future Phase 2 lots (POA-A-1, POA-A-2 and POA-A-3) have been evaluated for the 2-yr to 1-yr reduction on an individual basis, and as part of a total evaluation of POA-A as a whole. Since these lots are predominantly undeveloped within the Phase 1A-1 Land Development Plans, and the proposed Road A (Mosier Farm Drive) improvements are discharged towards POA-E, most of the land remains unchanged from the existing to the proposed condition. The tables below show that these three watersheds have reduced the runoff rates and volumes for the 2-year storm events in the proposed conditions, and when evaluated for the 2-year to 1-year reductions, all contributing flows from POA-A-1, POA-A-2, and POA-A-3 meet the reduction requirements when analyzing them as a part of overall POA-A. These three points of analysis will also be subject to the 2-year to 1-year reduction requirement when the future lots are developed.

POINT OF ANALYSIS POA-A-1	
EXISTING 2-YR STORM	**PROPOSED 2-YR STORM**
PEAK DISCHARGE (CFS)	PEAK DISCHARGE (CFS)
94.05	91.06
PEAK RUNOFF VOLUME (CF)	PEAK RUNOFF VOLUME (CF)
394,146	383,864

POINT OF ANALYSIS POA-A-2	
EXISTING 2-YR STORM	**PROPOSED 2-YR STORM**
PEAK DISCHARGE (CFS)	PEAK DISCHARGE (CFS)
51.92	50.81
PEAK RUNOFF VOLUME (CF)	PEAK RUNOFF VOLUME (CF)
154,356	150,796

POINT OF ANALYSIS POA-A-3	
EXISTING 2-YR STORM	**PROPOSED 2-YR STORM**
PEAK DISCHARGE (CFS)	PEAK DISCHARGE (CFS)
85.43	57.01
PEAK RUNOFF VOLUME (CF)	PEAK RUNOFF VOLUME (CF)
332,267	236,436

Note: The Tables above for POA-A-1, POA-A-2 and POA-A-3 exclude the runoff volumes associated with the outflow hydrograph information for the existing basins (Reilly Associates Stormwater Report). There is no net change in runoff volume associated with these off-site flows.

POINT OF ANALYSIS POA-A-1	
EXISTING 1-YR STORM PEAK DISCHARGE (CFS)	**PROPOSED 2-YR STORM PEAK DISCHARGE (CFS)**
10.94	11.99

Notes:
1. Only on-site and disturbed off-site watersheds included in analysis.
2. Watersheds EX-A-1-A-ONSITE and EX-A-1-A-OFFSITE-DISTURBED used to determine the existing 1-year storm peak discharge.
3. Watersheds PR-A-1-A-ONSITE, PR-A-1-A-OFFSITE-DISTURBED, AND PR-A-1-E-ONSITE used to determine the proposed 2-year storm peak discharge.

POINT OF ANALYSIS POA-A-2	
EXISTING 1-YR STORM PEAK DISCHARGE (CFS)	**PROPOSED 2-YR STORM PEAK DISCHARGE (CFS)**
12.93	17.42

Notes:
1. Only on-site and disturbed off-site watersheds included in analysis.
2. Watershed EX-A-2-A-ONSITE used to determine the existing 1-year storm peak discharge.
3. Watershed PR-A-2-A-ONSITE used to determine the proposed 2-year storm peak discharge.

POINT OF ANALYSIS POA-A-3	
EXISTING 1-YR STORM PEAK DISCHARGE (CFS)	**PROPOSED 2-YR STORM PEAK DISCHARGE (CFS)**
38.14	25.68

Notes:
1. Only on-site and disturbed off-site watersheds included in analysis.
2. Watershed EX-A-3-ONSITE used to determine the existing 1-year storm peak discharge.
3. Watershed PR-A-3-A-ONSITE used to determine the proposed 2-year storm peak discharge.

POINT OF ANALYSIS POA-A (POA-A-1 + POA-A-2 + POA-A-3)	
EXISTING 1-YR STORM PEAK DISCHARGE (CFS)	**PROPOSED 2-YR STORM PEAK DISCHARGE (CFS)**
61.83	54.74

Below are the summary tables for the comparison of the Proposed Conditions 2-year storm runoff rates versus the Existing Conditions 1-year storm runoff rates for the non-surface water discharge points of analysis POA-B, POA-C, POA-D, and POA-D-1. The project is not required to reduce the flows in the areas where there is no disturbance. This assessment has excluded the off-site undisturbed watershed areas contributing to the points of analysis. The watershed contributing to Point of Analysis B (POA-B) remains mostly unchanged from the existing to the proposed condition as part of the Phase 1A-1 development plans, hence why the proposed 2-year peak discharge is greater than the existing 1 year peak discharge. This watershed is subject to future development associated with Phase 1B in which the reduction criteria will be met.

POINT OF ANALYSIS POA-B	
EXISTING 1-YR STORM PEAK DISCHARGE (CFS)	**PROPOSED 2-YR STORM PEAK DISCHARGE (CFS)**
4.70	5.85

Notes:
1. Only on-site and disturbed off-site watersheds included in analysis.
2. Watersheds EX-B-1-ONSITE and EX-B-2-ONSITE used to determine the existing 1-year storm peak discharge.
3. Watersheds PR-B-1-ONSITE and PR-B-2-ONSITE used to determine the proposed 2-year storm peak discharge.

POINT OF ANALYSIS POA-C	
EXISTING 1-YR STORM PEAK DISCHARGE (CFS)	**PROPOSED 2-YR STORM PEAK DISCHARGE (CFS)**
4.39	3.76

Notes:

1. Only on-site and disturbed off-site watersheds included in analysis.
2. Watersheds EX-C-ONSITE and EX-C-OFFSITE used to determine the existing 1-year storm peak discharge.
3. Watershed PR-C used to determine the proposed 2-year storm peak discharge.

POINT OF ANALYSIS POA-D	
EXISTING 1-YR STORM PEAK DISCHARGE (CFS)	**PROPOSED 2-YR STORM PEAK DISCHARGE (CFS)**
20.64	19.94

Notes:

1. Only on-site and disturbed off-site watersheds included in analysis.
2. Watersheds EX-D-1-ONSITE, EX-D-2-ONSITE, EX-D-2-OFFSITE-DISTURBED, and EX-D-3-OFFSITE used to determine the existing 1-year storm peak discharge.
3. Watersheds PR-D-1, PR-D-2-DISTURBED, PR-D-3, PR-D-4-ONSITE-DISTURBED, PR-D-4-ONSITE-UNDISTURBED, PR-D-4-OFFSITE-DISTURBED, and PR-D-5-OFFSITE used to determine the proposed 2-year storm peak discharge.

POINT OF ANALYSIS POA-D-1	
EXISTING 1-YR STORM PEAK DISCHARGE (CFS)	**PROPOSED 2-YR STORM PEAK DISCHARGE (CFS)**
14.69	11.42

Notes:

1. Only on-site and disturbed off-site watersheds included in analysis.
2. Watersheds EX-D-1-ONSITE, EX-D-2-ONSITE, and EX-D-2-OFFSITE used to determine the existing 1-year storm peak discharge.
3. Watersheds PR-D-1, PR-D-2-DISTURBED, PR-D-3, PR-D-4-ONSITE-DISTURBED, PR-D-4-ONSITE-UNDISTURBED, and PR-D-4-OFFSITE-DISTURBED used to determine the proposed 2-year storm peak discharge.

Since the project is within the watershed management district "C" of the Brodhead Creek ACT 167 Watershed, which is a provisional direct discharge district (no detention), the proposed stormwater design includes redirecting runoff from the Smithfield Gateway site through the Chelsea site to discharge to the Brodhead Creek (POA-E). POA-E is a surface water discharge point of analysis. Considering that this area didn't previously discharge to the POA-E at the Brodhead Creek, the proposed 2-year storm peak discharge rate will be greater than the existing 1 year peak discharge rate at this particular location.

POINT OF ANALYSIS POA-E	
EXISTING 1-YR STORM PEAK DISCHARGE (CFS)	**PROPOSED 2-YR STORM PEAK DISCHARGE (CFS)**
6.59	35.03

Notes:
1. Only on-site and disturbed off-site watersheds included in analysis.
2. Watersheds EX-E-1-DISTURBED and EX-E-2-DISTURBED used to determine the existing 1-year storm peak discharge.
3. Watersheds PR-E-1, PR-E-2, PR-E-3, PR-E-4, PR-E-5, PR-E-6, PR-E-7, PR-E-8, PR-E-10-ONSITE-DISTURBED, PR-E-10-OFFSITE-DISTURBED, PR-E-11-DISTURBED, and PR-E-12-DISTURBED used to determine the proposed 2-year storm peak discharge.

A waiver request was granted by the Smithfield Township for Chapter 22, Section 223.A. for POA-E for reducing the proposed conditions runoff rates for the two (2) year, 24-hour storm to be less than or equal to the existing conditions one (1) year, 24-hour storm runoff rates.

Proposed Stormwater Recharge Summary

The proposed development is located in the Act 167 Brodhead Creek watershed management district "C" which is a provisional direct discharge district (no detention). The PADEP requirements for recharge require that the net increase in runoff volume for the 2-year storm event (post construction runoff volume minus the existing conditions runoff volume) is recharged through the use of structural and non-structural BMP's. The required recharge volume for the 2-year storm event has been calculated through the use of the PADEP's PSCM Spreadsheet, Version 1.9.

The Phase 1A-2 portion of the project has proposed the construction of two above-ground infiltration basins and one subsurface infiltration system to meet the 2-year storm runoff volume recharge requirements; refer to calculations in Appendix G. Refer to the Post Construction Stormwater Management Notes & Details (drawings CG501-1121 through CG501-1124) for

construction details and specifications with regard to the infiltration systems and rain gardens. Refer to Appendix D for routing calculations.

According to the DEP Post-Construction Stormwater Management Spreadsheet Instructions, last revised April 28, 2022, separate discharge points to a single receiving surface water can be analyzed through the use of a single spreadsheet. Therefore, the disturbed area located within the watersheds contributing to POA-ABC and POA-E, which are both points of analysis that contribute to Brodhead Creek, has been analyzed as a single watershed as it pertains to the infiltration volume and water quality treatment requirements for Brodhead Creek. POA-ABC will be analyzed as a separate subsidiary of the overall Brodhead Creek watershed in order to analyze the proposed impacts to the unnamed tributary to Brodhead Creek at this point of interest. POA-D will be analyzed separately since it discharges to Marshalls Creek.

As it pertains to the design associated with the Phase 1A-2 development, the PCSM spreadsheets that were previously used for the Phase 1A-1 PCSM report have been carried over and utilized in this report; however, the post-construction land cover and BMP design associated with Phase 1A-2 has now been incorporated. Modifications were made to both the Brodhead Creek and Marshalls Creek PCSM spreadsheets; the POA-ABC PCSM spreadsheet is a carry-over from Phase 1A-1 and remains unchanged due to no proposed modifications to the POA-ABC watersheds. The watershed areas contributing to both Brodhead Creek and Marshalls Creek have also been modified based upon the final grading of the Phase 1A-2 development area.

Refer to Figure 10, which has been used to determine the existing land cover within the proposed limit of disturbance for each watershed, and Figure 11, which has been used to determine the proposed land cover within the proposed limit of disturbance for each watershed. The PCSM spreadsheet calculations are located in Appendix G.

POINT OF ANALYSIS ABC (POA-ABC)				
PRE-CONSTRUCTION RUNOFF VOLUME (CF)	**POST-CONSTRUCTION RUNOFF VOLUME (CF)**	**NET VOLUME TO MANAGE (CF)**	**TOTAL CREDITS (CF)**	**NET CHANGE IN VOLUME (CF)**
116,834	34,534	-82,301	10,532	-92,833

BRODHEAD CREEK WATERSHED (POA-ABC + POA-E)				
PRE-CONSTRUCTION RUNOFF VOLUME (CF)	**POST-CONSTRUCTION RUNOFF VOLUME (CF)**	**NET VOLUME TO MANAGE (CF)**	**TOTAL CREDITS (CF)**	**NET CHANGE IN VOLUME (CF)**
144,843	201,320	56,477	69,860	-13,383

MARSHALLS CREEK WATERSHED (POA-D)				
PRE-CONSTRUCTION RUNOFF VOLUME (CF)	**POST-CONSTRUCTION RUNOFF VOLUME (CF)**	**NET VOLUME TO MANAGE (CF)**	**TOTAL CREDITS (CF)**	**NET CHANGE IN VOLUME (CF)**
56,035	66,117	10,081	30,820	- 20,739

Downstream Analysis

A downstream analysis is required for each non-surface water discharge point of analysis for the project verifying capacity and stability of the downstream area to receive the peak flows from the project. The downstream analysis shall address the PADEP Guidance Document 3150-FS-DEP4124 and the PADEP Erosion and Sediment Control Program Manual (363-2134-008), page 161, #15. The PADEP Guidance Document 3150-FS-DEP4124, "Off-site Discharges of Stormwater to Areas that are not Surface Waters," notes that if there is no increase in rate or volume of stormwater runoff in post-construction conditions than the project is under common law easement to discharge stormwater to downstream off-site areas. Additionally the PADEP Guidance Document indicates that the project shall provide documentation to show that for the non-surface water discharge points, the proposed stormwater runoff volume and discharge rates in the post-construction conditions has avoided, minimized or mitigated stormwater discharges to prevent accelerated erosion or damage to down slope or adjacent properties. The Erosion and Sediment Pollution Control Program Manual (363-2134-008), p. 161 #15, notes that the first step in the downstream analysis is to show no increase in the discharge rates from pre-construction to post-construction conditions and if that is not possible, then evaluate the downstream conveyance system from the discharge point to the receiving surface water.

Based upon our meeting with Monroe County Conservation District and PADEP on April 10, 2017, the stormwater analysis has been revised to evaluate three overall points of analysis which includes POA-ABC (which is the combined watersheds for POA-A-1, POA-A-2, POA-A-3, POA-B and POA-C); POA-D and POA-E.

The proposed design reduces the stormwater runoff rate and runoff volume to points of analysis POA-ABC and POA-D in the post-construction conditions when compared to the pre-construction conditions; therefore the project prevents accelerated erosion to the existing downstream conveyance systems associated with the proposed project discharges and has addressed the downstream analysis requirements. Since the runoff rate and runoff volume have been reduced in the post-construction conditions for these points of analysis and these points of analysis represent pre-existing discharge points, the downstream conveyance is subject to the Common Law Easements for the stormwater discharges to downstream off-site areas.

The tables below summarize the Existing Conditions (pre-construction) peak discharges and runoff volumes versus the Proposed Conditions (post-construction) peak discharges and runoff volumes for the point of analysis POA-ABC:

POINT OF ANALYSIS POA-ABC		
STORM (YR)	**EXISTING PEAK DISCHARGE (CFS)**	**PROPOSED PEAK DISCHARGE (CFS)**
2	265.33	228.45
10	480.27	407.17
25	664.50	557.61
50	829.49	688.67
100	1,017.61	840.19

POINT OF ANALYSIS POA-ABC		
STORM (YR)	**EXISTING RUNOFF VOLUME (CF)**	**PROPOSED RUNOFF VOLUME (CF)**
2	1,016,797	842,290
10	1,880,891	1,502,613
25	2,549,304	2,012,234
50	3,173,432	2,494,682
100	3,928,400	3,084,818

Note: Runoff Volumes for Existing and Proposed conditions exclude the runoff volumes from Existing Basin 2, Existing Basin 3 and Existing Basin 4 outflow from the Mosier Development, LLC, Senior Living Development Stormwater Management Report, prepared by Reilly Associates, last revised October 6, 2005.

It is our understanding the Lehigh Valley Healthcare Network building (also referred to as PRBC III – East Stroudsburg Healthcare Center) has recently been completed and will discharge runoff via a 36" RCP stormwater conveyance system to an outfall located upstream of the existing concrete box culvert which ultimately discharges to POA-ABC. The table below includes the proposed runoff

rates and volumes from the project (referenced from the PCSM Report for PRBC III last revised April 4, 2016). The table summarizes the additional off-site runoff (PRBC III) and the resultant % reduction in runoff rates and volumes to this POA-ABC. A letter is provided in Appendix F to address the biological and physical conditions of the unnamed tributary (UNT) of Brodhead Creek based upon the reduction in runoff to the POA-ABC.

POINT OF ANALYSIS POA-ABC					
STORM (YR)	**SMITHFIELD GATEWAY EXISTING PEAK DISCHARGE (CFS)**	**SMITHFIELD GATEWAY PROPOSED PEAK DISCHARGE (CFS)**	**PRBC III ESHC PROPOSED PEAK DISCHARGE (CFS)**	**TOTAL PROPOSED PEAK DISCHARGE (CFS)**	**% REDUCTION**
2	265.33	228.45	11.83	240.28	9.4%
10	480.27	407.17	22.35	429.52	10.6%
25	664.50	557.61	30.67	588.28	11.5%
50	829.49	688.67	41.17	729.84	12.0%
100	1,017.61	840.19	52.87	893.06	12.2%

POINT OF ANALYSIS POA-ABC					
STORM (YR)	**SMITHFIELD GATEWAY EXISTING RUNOFF VOLUME (CF)**	**SMITHFIELD GATEWAY PROPOSED RUNOFF VOLUME (CF)**	**PRBC III ESHC PROPOSED RUNOFF VOLUME (CF)**	**TOTAL PROPOSED RUNOFF VOLUME (CF)**	**% REDUCTION**
2	1,016,797	842,290	61,307	903,597	11.1%
10	1,880,891	1,502,613	111,449	1,614,062	14.2%
25	2,549,304	2,012,234	151,968	2,164,202	15.1%
50	3,173,432	2,494,561	191,947	2,686,508	15.3%
100	3,928,400	3,084,649	240,563	3,325,212	15.4%

The tables below summarize the Existing Conditions (pre-construction) peak discharges and runoff volumes versus the Proposed Conditions (post-construction) peak discharges and runoff volumes for the surface water discharge points of analysis POA-D:

POINT OF ANALYSIS POA-D		
STORM (YR)	**EXISTING PEAK DISCHARGE (CFS)**	**PROPOSED PEAK DISCHARGE (CFS)**
2	30.32	22.40
10	53.26	39.68
25	70.44	55.20
50	86.15	69.87
100	104.84	87.22

POINT OF ANALYSIS POA-D		
STORM (YR)	**EXISTING RUNOFF VOLUME (CF)**	**PROPOSED RUNOFF VOLUME (CF)**
2	80,237	58,680
10	142,408	104,788
25	190,266	143,499
50	234,864	180,228
100	288,718	224,803

The tables below summarize the Existing Conditions (pre-construction) peak discharges versus the Proposed Conditions (post-construction) peak discharges for the surface water discharge points of analysis POA-E:

POINT OF ANALYSIS POA-E		
STORM (YR)	**EXISTING PEAK DISCHARGE (CFS)**	**PROPOSED PEAK DISCHARGE (CFS)**
2	66.74	118.85
10	118.39	218.85
25	157.29	299.33
50	193.00	377.48
100	235.56	468.49

POINT OF ANALYSIS POA-E		
STORM (YR)	**EXISTING RUNOFF VOLUME (CF)**	**PROPOSED RUNOFF VOLUME (CF)**
2	203,415	382,612
10	362,184	706,171
25	484,809	966,247
50	599,281	1,210,596
100	737,696	1,507,120

We have evaluated the downstream capacity and stability for the Stream 5/5C which is located below POA-E. Based upon our assessment of the existing channels for Stream 5 and Stream 5 C, the existing channels will need to be widened to provide additional capacity, and a new permanent channel liner is required for shear stress stability. In the proposed design, a uniform interlocking concrete block lined channel extends from the end of the energy dissipater at HW5-1 to the existing utility right-of-way parallel to Brodhead Creek. Calculations of the existing and proposed capacity calculations and stability calculations are provided in Appendix F.

Water Quality

The required water pollutant load reduction requirement has been calculated through the use of the PADEP's PSCM Spreadsheet, Version 1.9. This reduction requirement is the difference in total pollutant loads from the pre-construction condition to the post-construction condition, corresponding to the changes in total drainage area, and changes in proposed land cover as part of the development.

According to the DEP Post-Construction Stormwater Management Spreadsheet Instructions, last revised April 28, 2022, separate discharge points to a single receiving surface water can be analyzed through the use of a single spreadsheet. Therefore, the disturbed area located within the watersheds contributing to POA-ABC and POA-E, which are both points of analysis that contribute to Brodhead Creek, has been analyzed as a single watershed as it pertains to the infiltration volume and water quality treatment requirements for Brodhead Creek. POA-ABC will be analyzed as a separate subsidiary of the overall Brodhead Creek watershed in order to analyze the proposed impacts to the unnamed tributary to Brodhead Creek at this point of interest. POA-D will be analyzed separately since it discharges to Marshalls Creek. Refer to Figure 10, which has been used to determine the existing land cover within the proposed limit of disturbance for each watershed, and Figure 11, which has been used to determine the proposed land cover within the proposed limit of disturbance for each watershed. The PCSM spreadsheet calculations are located in Appendix G.

The tables below summarize the required total pollutant load reduction from the PCSM Spreadsheet for POA-ABC, the Brodhead Creek watershed, and Marshalls Creek watershed.

POINT OF ANALYSIS ABC (POA-ABC)			
POLLUTANT	**PRE-CONSTRUCTION POLLUTANT LOADS (LB)**	**POST-CONSTRUCTION POLLUTANT LOADS (LB)**	**REQUIRED REDUCTION (LB)**
TSS	462.06	205.49	0.00
TP	1.60	0.58	0.00
TN	15.71	4.41	0.00

BRODHEAD CREEK WATERSHED (POA-ABC + POA-E)			
POLLUTANT	**PRE-CONSTRUCTION POLLUTANT LOADS (LB)**	**POST-CONSTRUCTION POLLUTANT LOADS (LB)**	**REQUIRED REDUCTION (LB)**
TSS	553.57	1,092.35	538.79
TP	1.99	3.22	1.23
TN	19.60	27.55	7.95

MARSHALLS CREEK WATERSHED (POA-D)			
POLLUTANT	**PRE-CONSTRUCTION POLLUTANT LOADS (LB)**	**POST-CONSTRUCTION POLLUTANT LOADS (LB)**	**REQUIRED REDUCTION (LB)**
TSS	288.56	380.46	91.90
TP	0.85	1.08	0.22
TN	8.29	9.45	1.16

The PCSM Spreadsheet has been utilized to calculate the pollutant loads discharging from the infiltration BMP's. Separate calculations for Phase 1A-1 have been provided in order to demonstrate the pollutant removal for the non-structural BMP of street sweeping, which is proposed to take place on all constructed parking areas and roadways within the limits of the on-site Phase 1A-1 development. Separate calculations have also been provided to demonstrate the pollutant removal of the SNOUT manufactured treatment device, which is proposed throughout various structures across the development; refer to Drawing CG103-1110 for the proposed locations. Street sweeping and SNOUT manufactured treatment devices, along with Fabco StormFilter catch basin insert filters, are proposed as pre-treatment devices for BMPs proposed as part of the Phase 1A-2 development; however, since these devices act as pre-treatment to infiltration BMPs where there is zero proposed discharge during the 2-year storm event, additional water quality treatment credit is not taken for the Phase 1A-2 development area. These pollutant removal calculations, BMP in series removal rate calculations, and SNOUT pollutant removal performance testing data, are all located in Appendix G. Below is a summary of the proposed water quality treatment:

POINT OF ANALYSIS (POA-ABC)			
POLLUTANT	**POST-CONSTRUCTION POLLUTANT LOADS (LB)**	**PROPOSED POLLUTANT LOAD REMOVAL (LB)**	**NET POLLUTANT LOAD (LB)**
TSS	205.49	79.95	125.54
TP	0.58	0.18	0.40
TN	4.41	1.88	2.53

BRODHEAD CREEK WATERSHED (POA-ABC + POA-E)			
POLLUTANT	**POST-CONSTRUCTION POLLUTANT LOADS (LB)**	**PROPOSED POLLUTANT LOAD REMOVAL (LB)**	**NET POLLUTANT LOAD (LB)**
TSS	1,092.35	710.50	381.85
TP	3.22	1.91	1.31
TN	27.55	13.13	14.42

MARSHALL'S CREEK WATERSHED (POA-D)			
POLLUTANT	**POST-CONSTRUCTION POLLUTANT LOADS (LB)**	**PROPOSED POLLUTANT LOAD REMOVAL (LB)**	**NET POLLUTANT LOAD (LB)**
TSS	380.46	249.20	131.26
TP	1.08	0.57	0.51
TN	9.45	5.90	3.55

The tables below summarize the water quality treatment requirement comparing the net pollutant load discharged from the site after treatment to the existing pollutant load.

POINT OF ANALYSIS ABC (POA-ABC)		
POLLUTANT	**PRE-CONSTRUCTION POLLUTANT LOADS (LB)**	**NET POST-CONSTRUCTION POLLUTANT LOAD (LB)**
TSS	462.06	125.54
TP	1.60	0.40
TN	15.71	2.53

BRODHEAD CREEK WATERSHED (POA-ABC + POA-E)		
POLLUTANT	**PRE-CONSTRUCTION POLLUTANT LOADS (LB)**	**NET POST-CONSTRUCTION POLLUTANT LOAD (LB)**
TSS	553.57	381.85
TP	1.99	1.31
TN	19.60	14.42

MARSHALL'S CREEK WATERSHED (POA-D)		
POLLUTANT	**PRE-CONSTRUCTION POLLUTANT LOADS (LB)**	**NET POST-CONSTRUCTION POLLUTANT LOAD (LB)**
TSS	288.56	131.26
TP	0.85	0.51
TN	8.29	3.55

BEST MANAGEMENT PRACTICES (BMPs)

Proposed BMPs

The current NPDES regulations put emphasis on addressing stormwater quality in addition to

addressing quantity (volume and rate) reductions. A number of Best Management Practices (BMP's) are proposed in the stormwater runoff and conveyance design to meet the NPDES requirements.

Below is a list of BMPs used to achieve the requirements of Smithfield Township, Monroe County Conservation District and PADEP. Refer to Appendix G for the NPDES worksheets and infiltration BMP calculations.

Non-Structural BMPs

1. Protect Sensitive and Special Value Features

An Existing Resource and Site Analysis Plan (Drawing WN101-1112) is provided as part of the Phase 1A-2 land development plans to identify existing sensitive and special value features. The site has a stream located on the northern portion of the site located on the proposed lot 3.01 which conveys existing off-site areas towards the existing drainage ponds located at the southern portion of the site on proposed lot 4.01. The existing drainage ponds are to remain. The Protect Sensitive and Special Value Features Non-structural BMP is considered a preventive BMP for TSS, TP and Nitrates removal.

2. Street Sweeping (BMP 5.9.1)

Street sweeping will remove large debris and smaller particulate pollutants, prevent material from clogging stormwater conveyance systems and prevent the debris and pollutants from washing into Brodhead Creek and Marshalls Creek. A maintenance program will be developed by the owner for the site to include street sweeping. The maintenance program is provided on the Post Construction Stormwater Management Plan (Drawing CG503-1121) for mechanical broom sweepers (standard and heavy duty pavement). The Street Sweeping BMP is a nonstructural BMP used for water quality specifically in TSS, TP and Nitrates removal.

Structural BMPs

1. Above Ground Infiltration Basins (INF4-1 and INF4-2):

Infiltration Basins have been designed to recharge groundwater for the 2-year storm event and have an outlet control structure for discharge from the higher storm events. The infiltration basins provide volume reduction, peak rate control, water quality improvement (TSS, TP & Nitrates removal). Refer to the Partial Drainage Plan (Drawings CG102-1121) and Post Construction Stormwater Management Details (Drawing CG503-1121).

2. Underground Infiltration Basins (UGD-INF4-1):

The underground infiltration basins are designed recharge groundwater for the 2-year storm event and have outlet control structures for discharge from the higher storm events. The underground infiltration basins provide volume reduction, peak rate control, water quality improvement (TSS, TP & Nitrates removal). The underground infiltration basins are comprised of perforated HDPE and stone bed. Refer to the Partial Drainage Plan (Drawings CG102-1121) and Post Construction Stormwater Management Details (Drawing CG503-1121).

3. Water Quality Treatment Devices (SNOUT and Fabco StormFilter):

The water quality treatment devices will be used to provide water quality treatment of stormwater (TSS & TP removal). The water quality structures locations are identified on the Partial Drainage Plan (Drawings CG102-1121) and the Post Construction Stormwater Management Plan (Drawing CG103-1121). Details for the water quality treatment devices are provided on the PCSM Details (Drawing CG501-1121 and CG504-1121). The water quality treatment device manufacturer information is provided in Appendix G.

4. Vegetated Swale (Swale 4-1):

The proposed vegetated swale along SR 209 (Swale 4-1) designed for conveyance purposes will also provide water quality treatment of stormwater (TSS, TP & Nitrates removal) as well as provide minor volume reduction. The swale was previously proposed as part of the Phase 1A-1 land development plans. The swale location is identified on the Phase 1A-1 Partial Soil Erosion & Sediment Control Plan (Drawing CE101-1116) and details are provided on the Phase 1A-1 Soil Erosion & Sediment Control Notes & Details drawings (Drawings CE501-1111 through CE501-1114).

BMP Maintenance

The proposed stormwater management facilities and Best Management Practices will be owned and maintained by the property owner. Refer to Post Construction Stormwater Management Plan (Drawing CG103-1121) and Post Construction Stormwater Management Plan Notes (Drawing CG503-1121).

BMP Loading Ratios

Loading ratios are one of the most integral aspects related to the design of infiltration BMPs. The loading ratio is determined for each infiltration BMP by comparing the drainage area and infiltration area. The Pennsylvania BMP manual recommends loading ratios of 5:1 (impervious areas) and 8:1 (total drainage areas).

The PADEP recommended loading ratios are exceeded for certain BMPs on this project, however, there are reasons why the exceeded loading ratios are justified for these BMPs. Water quality treatment devices are provided upstream of the infiltration BMP's to provide TSS removal prior discharging to the infiltration BMPs. Additionally, a portion of the impervious area which discharges to these infiltration BMPs consists of roof areas. Roof areas provide about one-quarter of TSS as compared to parking lots and roadways. In addition to the water quality devices, street sweeping maintenance will be provided for the parking areas and roadways which will provide further TSS removal prior to discharging to the infiltration BMPs.

Although some infiltration BMP areas for this project have a loading ratio in excess of the recommended ratios found in the Pennsylvania BMP manual, it is with the understanding of the justification above that these BMPs will be able to function as designed provided that they are properly maintained.

The proposed loading ratios for above-ground infiltration basins INF4-1 and INF4-2 have been designed so as not to exceed the previously permitted loading ratios proposed as part of the original Phase 1 preliminary land development plans and PCSM report, dated last revised October 4, 2018.

CRITICAL STAGES OF PCSM PLAN IMPLEMENTATION

The critical stages of Post Construction Stormwater Management plan implementation are the following: The installation of the underground infiltration basin, above ground infiltration basins, and all associated components shall be constructed with oversight by a licensed professional or their designee.

THERMAL IMPACTS ANALYSIS

Thermal impacts could not be avoided. Thermal impacts will be minimized and mitigated in the

construction (E&S) phase by filtering runoff through natural vegetation, sediment trap and sediment basin prior to discharging off-site. Cooling will take place in the construction (E&S) phase because the ground will naturally cool stormwater during construction because pavement will be limited and bare/stripped earth will be cooler during construction. Thermal impacts will be minimized and mitigated in the post construction condition via proposed street trees that will shade proposed impervious surfaces; discharging runoff through rain gardens, infiltration basins and subsurface infiltration basins. In the Marshalls Creek watershed, stormwater runoff generated from the project site will be conveyed through a proposed vegetated swale prior to discharing to the specified point of analysis, which will act to reduce runoff velocities and cool down prior to ultimate discharge. All of these measures will provide cooling of stormwater in the post construction condition.

INFILTRATION TESTING

A subsurface investigation was performed at the site that consisted of test pits and in-situ infiltration testing to evaluate the existing subsurface soil conditions in select locations and determine whether infiltration BMP's are suitable on the subject site. In accordance with the regulations set forth in the PADEP Best Management Practices Manual, Infiltration tests were performed at the location of several proposed BMPs. The infiltration tests were performed by Midlantic Engineering, Inc, and the results are documented in the Geotechnical Engineering Report, Stormwater Management and Infiltration Testing, Smithfield Gateway Development Site, prepared by Midlantic Engineering, Inc., dated June 23, 2016. Supplemental infiltration tests were performed at proposed BMP locations by Midlantic Engineering, Inc., and the results are referenced in Addendum #1 to the Geotechnical Engineering Report, Stormwater Management and Infiltration Testing, Smithfield Gateway Development Site, prepared by Midlantic Engineering, Inc., dated May 22, 2017.

The proposed infiltration testing program consisted of ten locations throughout the site. The test results are provided in Appendix H. The tables below summarize the infiltration test results for the test pit locations and the design infiltration rates used for the proposed infiltration BMPs.

Infiltration Test Results (June 23, 2016)		
Test Pit ID	Average In-situ Infiltration Rate	Design Infiltration Rate
	(in/hr)	(in/hr)
TP-1	1.25	0.63
TP-2	0.63	0.31
TP-3	9.25	4.63
TP-4	10.00	5.00
TP-5	6.00	3.00
TP-6	8.25	4.13
TP-7	0.25	0.13
TP-8	0.31	0.16
TP-9	3.88	1.94
TP-10	10.00	5.00

Note:

1. Factor of Safety of 2 is applied to the observed Average In-situ Infiltration Rate.

Infiltration Test Results (May 22, 2017)		
Test Pit ID	Average In-situ Infiltration Rate	Design Infiltration Rate
	(in/hr)	(in/hr)
INF4-1	0.38	0.19
INF4-2	8.25	4.12
UGD-INF5-1	10.25	5.12
UGD-INF5-5	1.50	0.75
UGD-INF5-6	1.50	0.75
RG4-1	1.63	0.81
RG5-1	0.88	0.44
RG5-1*	3.81	1.90
RG5-2	9.38	4.69
RG5-3	4.13	2.06

Notes:

1. Factor of Safety of 2 is applied to the observed Average In-situ Infiltration Rate.
2. An additional test was performed at RG5-1 below the shallow existing fill materials.
3. INF4-1 was tested within compacted fill at the edge of an existing paved driveway. TP-4 shows natural soils with high infiltration rates below the compacted fill material. It should be noted that the Infiltration Basin INF4-1 will be over excavated two feet to the existing suitable soils within the TP-4 testing area.

Midlantic Engineering, Inc. performed additional in-situ infiltration testing to evaluate the subsurface soil conditions within the footprints of the proposed BMPs that did not previously have any

infiltration testing performed – which were Rain Garden 5-1, Underground Infiltration Basin 5-2, Underground Infiltration Basin 5-3, and Underground Infiltration Basin 5-4. The test results were obtained from a report titled "Geotechnical Engineering Report: Stormwater Management and Infiltration Testing – Smithfield Gateway Phase 1A-1, Smithfield Township, PA," prepared by Midlantic Engineering, Inc. dated February 3, 2021.

Infiltration Test Results (February 3, 2021)		
Test Pit ID	Average In-situ Infiltration Rate	Design Infiltration Rate
	(in/hr)	(in/hr)
TP-SW-1 (RG5-1)	3.50	1.75
TP-SW-2 (UGD-INF5-2)	2.75	1.38
TP-SW-3 (UGD-INF5-3)	1.25	0.63
TP-SW-4 (UGD-INF5-4)	14.00	2.54

Notes:

1. Factor of Safety of 2 is applied to the observed Average In-situ Infiltration Rates for TP-SW-1, TP-SW-2, and TP-SW-3.
2. The footprint of UGD-INF5-4 will be partially located within the footprint of a previously existing structure. The foundation elements within the portion of the basin located within this footprint will be excavated and replaced with suitable uncompacted native soils. The replacement soil is assumed to come from the stratum tested within nearby UGD-INF5-3, which had an in-situ infiltration rate of 1.25 in/hr. Therefore, an average in-situ infiltration rate will be utilized for this basin, to account for the portion of the basin that will infiltrate into native soils at 14 in/hr, and the portion that will infiltrated into replacement soils at 1.25 in/hr. This yields an average of 7.63 in/hr. A factor of safety of 3 will be applied – which yields a design infiltration rate of 2.54 in/hr.

The table below summarizes the design infiltration rates that are being utilized for each of the proposed infiltration BMPs.

Design Infiltration Rates Used for Proposed Infiltration BMPs		
Infiltration BMP	Design Infiltration Rate for BMP (in/hr)	Test Pit information used to determine BMP Design Infiltration Rate
Infiltration Basin 4-1	5.00	TP-4
Infiltration Basin 4-2	4.12	INF4-2
Underground Infiltration Basin 4-1	0.81	RG4-1
Rain Garden 5-1	1.75	TP-SW-1
Rain Garden 5-2	4.69	RG5-2
Rain Garden 5-3	3.00	TP-5
Underground Infiltration Basin 5-1	5.12	UGD-INF5-1
Underground Infiltration Basin 5-2	1.38	TP-SW-2
Underground Infiltration Basin 5-3	0.63	TP-SW-3
Underground Infiltration Basin 5-4	2.54	Average of TP-SW-3 and TP-SW-4 with factor of safety of 3
Temporary Infiltration Basin 1-1	1.94	TP-9

CONCLUSION

The stormwater facilities for this project have been designed based upon the regulations set forth by Smithfield Township, Monroe County Conservation District, and Pennsylvania Department of Environmental Protection.

FIGURES

41.005321, -75.150441

41.001519, -75.145978

EAST STROUDSBURG Quadrangle

BUSHKILL Quadrangle

STROUDSBURG Quadrangle

PORTLAND Quadrangle

STROUD TOWNSHIP

SMITHFIELD TOWNSHIP

MONROE COUNTY

EAST STROUDSBURG TOWNSHIP

STROUDSBURG TOWNSHIP

DELAWARE WATER GAP TOWNSHIP

Legend

- Study Area - 117.3 acres
- Township Boundary
- USGS Quadrangle Grid
- County Boundary (not shown in current map extent)

2,000 0 2,000

SCALE IN FEET

Notes:
1. East Stroudsburg USGS Quadrangle Map Topographic basemap is provided through Langan's Esri ArcGIS software licensing and ArcGIS online

2. Township boundaries provided by PENNDOT and PASDA.
3. County boundaries provided by PENNDOT and PASDA.
4. USGS topographic quad boundaries provided by the USGS.

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Langan International LLC
Collectively known as Langan

NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project

SMITHFIELD GATEWAY PROJECT

SMITHFIELD TOWNSHIP

MONROE COUNTY PENNSYLVANIA

Drawing Title

USGS SITE LOCATION MAP

Project No.	Figure
100501401	1
Date: 11/30/2017	
Scale: 1 in = 2,000 ft	
Drawn By: BLA	

Path: \\Langan.com\data\PAR\data4\100501401\ArcGIS\ArcMap_Documents\Natural Resource Figures\USGS Site Location Map_WithLabels.mxd

SMITHFIELD GATEWAY
SOIL DESCRIPTIONS AND LIMITATIONS

SOIL	NAME (TYPE)	HYDROLOGICAL SOIL GROUP	POTENTIAL DEVELOPMENT ISSUES	DEPTH TO WATER TABLE	DEPTH TO BEDROCK	SUITABILITY OF SOIL TYPE
Ad	Alden mucky silt loam	C / D	Very limited for buildings and roads due to frost action and depth to saturation	About 0 inches	More than 80 inches	Very limited for buildings & roads
BaC	Bath channery silt loam, 8 to 15 percent slopes	C	Very limited for buildings and roads due to frost action, depth to saturation and shallow depth to thick/thin cemented pan	About 24 to 36 inches	About 26 to 38 inches to fragipan	Very limited for buildings & roads
BeB	Benson-Rock outcrop complex, 0 to 8 percent slopes	D	Somewhat limited for buildings and roads due to shallow depth to bedrock	More than 80 inches	About 12 to 20 inches to lithic bedrock	Somewhat limited for buildings & roads
BeC	Benson-Rock outcrop complex, 8 to 25 percent slopes	D	Very limited for buildings and roads due to steep slopes and depth to saturated zone and shallow depth to lithic bedrock	More than 80 inches	About 12 to 20 inches to lithic bedrock	Very limited for buildings & roads
BeF	Benson-Rock outcrop complex, 25 to 70 percent slopes	D	Very limited for buildings and roads due to very steep slopes and shallow depth to lithic bedrock	More than 80 inches	About 12 to 20 inches to lithic bedrock	Very limited for buildings & roads
Cy	Cut and fill land	-	Very limited for buildings due to uncharacterized fill materials, depth to saturation and depth to suitable materials	About 12 to 72 inches	More than 80 inches	Very limited for buildings & roads
MaB	Mardin channery silt loam, 2 to 8 percent slopes	D	Very limited for buildings due to frost action, depth to saturation and shallow depth to thin/thick cemented pan	About 11 to 22 inches	About 14 to 26 inches to fragipan	Very limited for buildings & roads
MaC	Mardin channery silt loam, 8 to 15 percent slopes	D	Very limited for buildings due to frost action, depth to saturation, slopes, and shallow depth to thick/thin cemented pan	About 13 to 24 inches	About 14 to 26 inches to fragipan	Very limited for buildings & roads
W	Water	-	Cannot be developed	0 inches	-	Cannot be developed

Resolutions to Limitations

1. For areas where steep slopes are a limitation, soil shall be stabilized with specified erosion control matting and the slopes shall be tracked.
2. For areas where seasonal high water table is a limitation, ponded water shall be pumped through a "dirt bag" or to the sediment basin/trap.
3. For areas where shallow depth to bedrock is a limitation, contractor shall determine whether rock is rippable. If rock is not rippable, blasting will be required. All blasting shall meet all local, county, state and federal requirements.
4. For areas where topsoil is a limitation, topsoil shall be stripped and stockpiled in accordance with the details. The stockpile surface shall be maintained in accordance with the temporary stabilization notes.
5. For areas where embankments are a limitation, the existing road shall be closed prior to cutting embankments. No embankments that hold back water shall be removed.

NOTES:

1. **SOIL CLASSIFICATION AND BOUNDARY INFORMATION REFERENCED FROM SOIL RESOURCE REPORT FOR MONROE COUNTY, PENNSYLVANIA, PREPARED BY THE NATURAL RESOURCES CONSERVATION SERVICE, OBTAINED ON MAY 25, 2016.**

Date	Description	No.
REVISIONS		

SIGNATURE DATE SIGNED

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Langan Holdings, Inc. and Langan
NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
SMITHFIELD GATEWAY
PHASE 1A-2

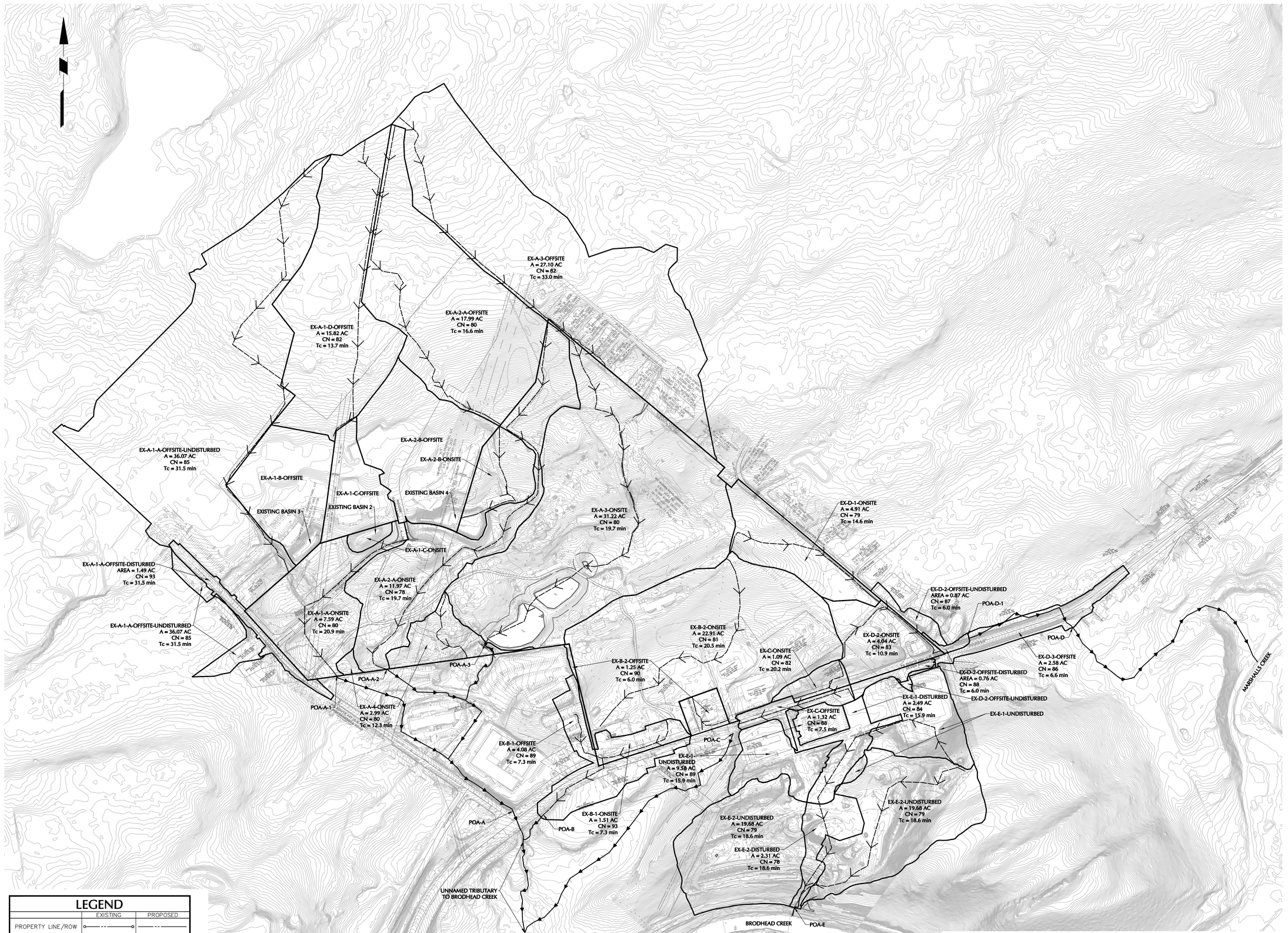
SMITHFIELD TOWNSHIP
MONROE COUNTY PENNSYLVANIA

Drawing Title
SOILS MAP

Project No. 100501401	Figure FG-02
Date AUGUST 19, 2016	
Scale 1" = 120'	
Drawn By MJV / Checked By TH	
Submission Date MARCH 3, 2017	Sheet 1 of 1

SUBMISSION DATE: MARCH 3, 2017
PROJECT NO. 100501401

Filename: \\langan.com\data\PAR\data\100501401\Cadd Data - 100501401\SheetFiles\Figures\Stormwater\FG02-100501401-GR102-0101.dwg Date: 11/16/2017 Time: 10:48 User: mvitiello Style Table: Langan.stb Layout: ARCH-F-SL



LEGEND

	EXISTING	PROPOSED
PROPERTY LINE/ROW		
CONTOUR	460	
SPOT ELEVATION	x452.50	
DRAINAGE AREA BOUNDARY		
TIME OF CONCENTRATION PATH		
FLOW PATH TO SURFACE WATER		

NOTES:

1. BOUNDARY AND TOPOGRAPHIC SURVEY INFORMATION AS PROVIDED BY FRANK J. SMITH JR. INC, MARSHALLS CREEK, PA AND FROM PAMAP LIDAR TOPOGRAPHIC MAPPING FOR MONROE COUNTY, PREPARED IN 2008, BY THE USGS AND PENNSYLVANIA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES.
2. OFF-SITE TOPOGRAPHIC BACKGROUND REFERENCED FROM PAMAP LIDAR DATA FOR MONROE COUNTY IS REPRESENTED BY 2-FT CONTOUR INTERVALS.
3. KNOWN OFF-SITE DRAINAGE AREAS AND DISCHARGES REFERENCED FROM A REPORT TITLED "STORMWATER MANAGEMENT REPORT," PREPARED FOR MOSIER DEVELOPMENT, LLC SENIOR LIVING DEVELOPMENT AND PREPARED BY REILLY ASSOCIATES, LAST REVISED OCTOBER 6, 2005.

200 0 100 200
SCALE IN FEET

PROJECT NO. 100501401
SUBMISSION DATE: SEPTEMBER 7, 2018

Date	Description	No.

REVISIONS

SIGNATURE DATE SIGNED

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Langan UK Limited
Langan International LLC
Collectively known as Langan
NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project

SMITHFIELD GATEWAY PHASE 1A-2

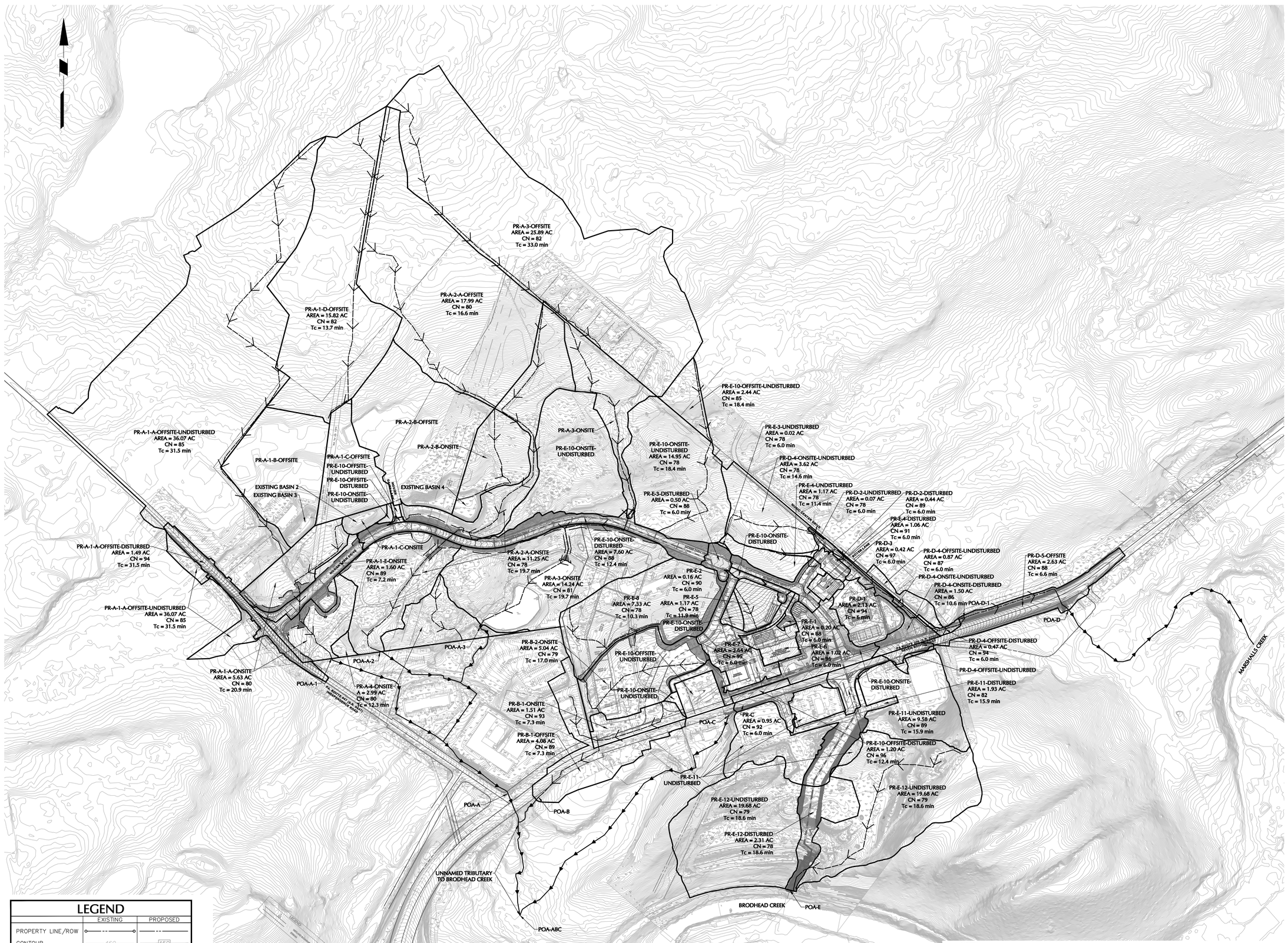
SMITHFIELD TOWNSHIP
MONROE COUNTY PENNSYLVANIA

Drawing Title

EXISTING DRAINAGE AREA MAP

Project No. 100501401	Figure FG03
Date DECEMBER 11, 2020	
Scale 1" = 200'	
Drawn By MJV / Checked By TH	
Submission Date DECEMBER 11, 2020	Sheet 1 of 1

Filename: C:\bms\langan-gw-01\dms44127\FG03-100501402-0203-CG103-1111.DWG Date: 3/29/2021 Time: 16:42 User: mvitallo Style Table: Langan.stb Layout: ARCH-ISL



LEGEND

	EXISTING	PROPOSED
PROPERTY LINE/ROW		
CONTOUR	460	460
SPOT ELEVATION	x452.50	x452.50
DRAINAGE AREA BOUNDARY		
TIME OF CONCENTRATION PATH		
FLOW PATH TO SURFACE WATER		

NOTES:

1. BOUNDARY AND TOPOGRAPHIC SURVEY INFORMATION AS PROVIDED BY FRANK J. SMITH JR. INC, MARSHALLS CREEK, PA AND FROM PAMAP LIDAR TOPOGRAPHIC MAPPING FOR MONROE COUNTY, PREPARED IN 2008, BY THE USGS AND PENNSYLVANIA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES.
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Date	Description	No.
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REVISIONS

SIGNATURE DATE SIGNED

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Langan CT, Inc.
Langan Treadwell Rollo, LLC
Collectively known as Langan
NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project

SMITHFIELD GATEWAY PHASE 1A-2

SMITHFIELD TOWNSHIP
MONROE COUNTY PENNSYLVANIA

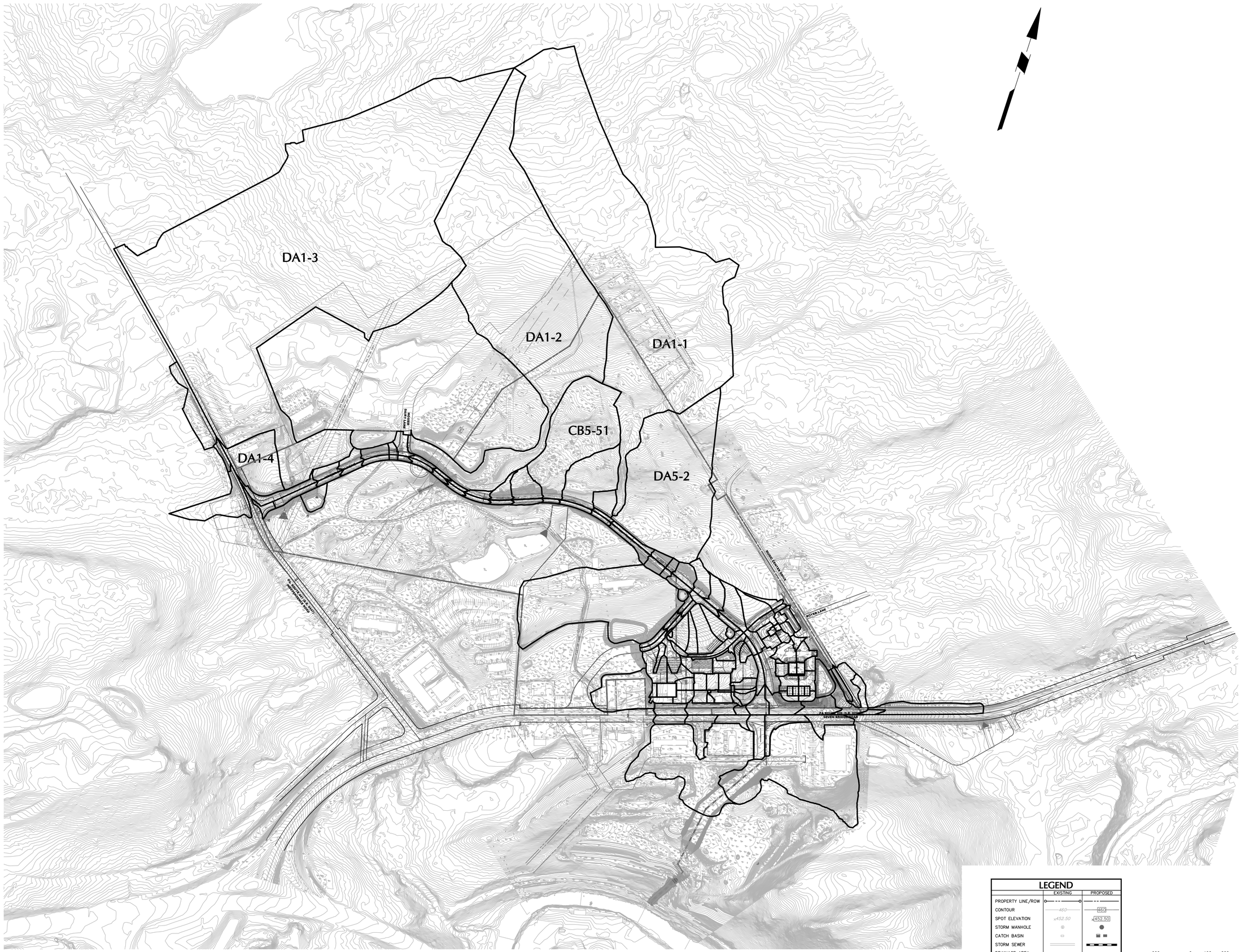
Drawing Title

PROPOSED DRAINAGE AREA MAP

Project No. 100501401	Drawing No. FG04
Date FEBRUARY 22, 2023	
Scale 1" = 200'	
Drawn By MV / Checked By TH	
Submission Date FEBRUARY 22, 2023	Sheet 1 of 1

LANGAN
PROJECT NO. 100501401
SUBMISSION DATE: X

Filename: C:\bms\langan-pw-01\d0321268\FG04-100501402-0204-CG104-1121.DWG Date: 2/17/2023 Time: 12:43 User: mvitello Style Table: Langan.stb Layout: ARCHF-SL



LEGEND	EXISTING	PROPOSED
PROPERTY LINE/ROW		
CONTOUR	460	460
SPOT ELEVATION	x452.50	x452.50
STORM MANHOLE		
CATCH BASIN		
STORM SEWER		
DRAINAGE AREA BOUNDARY		

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SCALE: 1 INCH = 200 FEET

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REVISIONS

SIGNATURE DATE SIGNED

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Langan Treviicos Joint Venture
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Project

SMITHFIELD GATEWAY
PHASE 1A-2

SMITHFIELD TOWNSHIP
MONROE COUNTY PENNSYLVANIA

Drawing Title

OVERALL INLET SUBAREA MAP

Project No. 100501401	Drawing No. FG05 CG105 1120
Date FEBRUARY 24, 2023	
Scale 1" = 200'	
Drawn By MV / Checked By TH	
Submission Date FEBRUARY 23, 2023	Sheet 1 of 1

PROJECT NO. 100501401 SUBMISSION DATE: FEBRUARY 17, 2023 LANGAN

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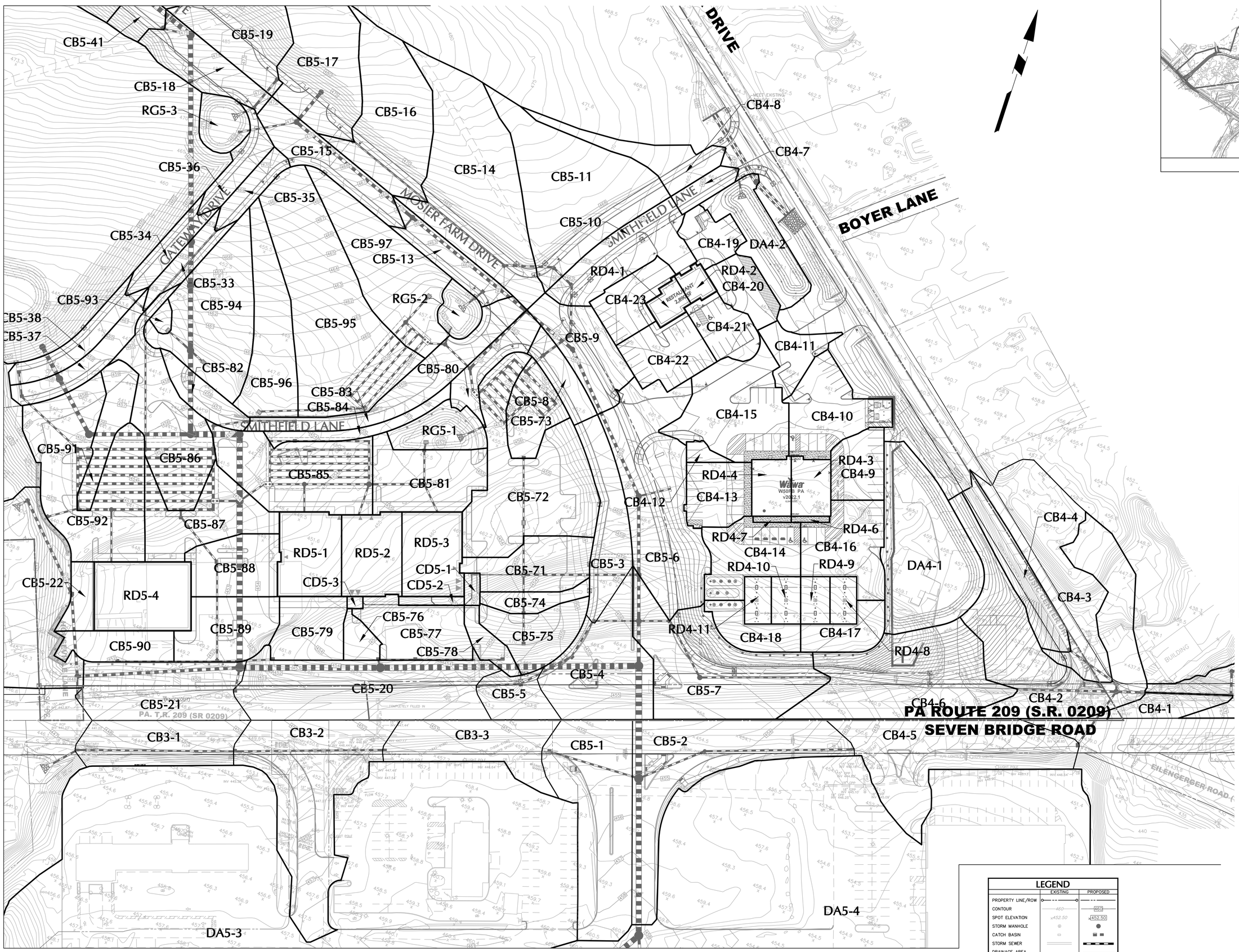

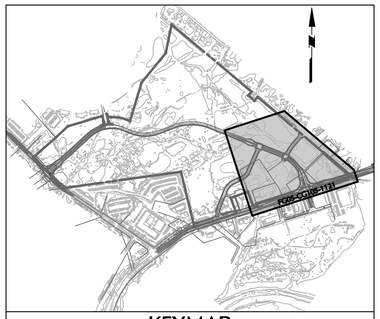

LEGEND

	EXISTING	PROPOSED
PROPERTY LINE/ROW		
CONTOUR	460	460
SPOT ELEVATION	x452.50	x452.50
STORM MANHOLE		
CATCH BASIN		
STORM SEWER		
DRAINAGE AREA BOUNDARY		

SCALE IN FEET
40 0 10 25 40

Date	Description	No.
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REVISIONS

SIGNATURE DATE SIGNED

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Langan UK Ltd.
Langan International LLC
Collectively known as Langan
NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
SMITHFIELD GATEWAY
PHASE 1A-2
SMITHFIELD TOWNSHIP
MONROE COUNTY PENNSYLVANIA

Drawing Title
PARTIAL INLET SUBAREA MAP

Project No. 100501401	Drawing No. FG05 CG105 1121
Date FEBRUARY 24, 2023	
Scale 1" = 40'	
Drawn By MV / Checked By TH	
Submission Date FEBRUARY 24, 2023	Sheet 1 of 1

SUBMISSION DATE: FEBRUARY 17, 2023
PROJECT NO. 100501401
LANGAN

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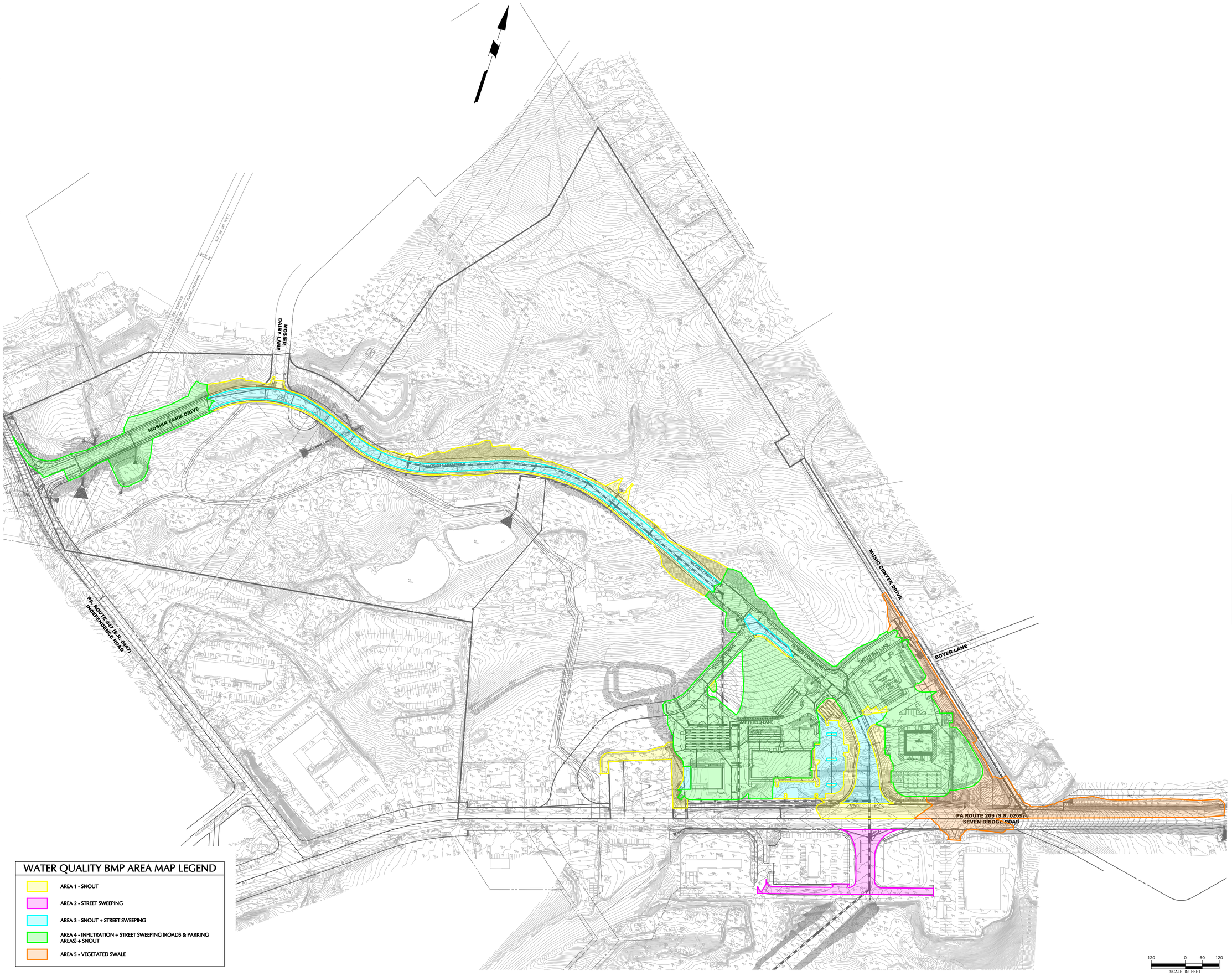

WATER QUALITY BMP AREA MAP LEGEND

- AREA 1 - SNOUT
- AREA 2 - STREET SWEEPING
- AREA 3 - SNOUT + STREET SWEEPING
- AREA 4 - INFILTRATION + STREET SWEEPING (ROADS & PARKING AREAS) + SNOUT
- AREA 5 - VEGETATED SWALE

Date	Description	No.
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REVISIONS

SIGNATURE DATE SIGNED

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Langan Engineering and Environmental Services, Inc.
Langan UK Ltd.
Langan International LLC
Construction Control Corporation (in London)
NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project

SMITHFIELD GATEWAY PHASE 1A-2

SMITHFIELD TOWNSHIP
MONROE COUNTY PENNSYLVANIA

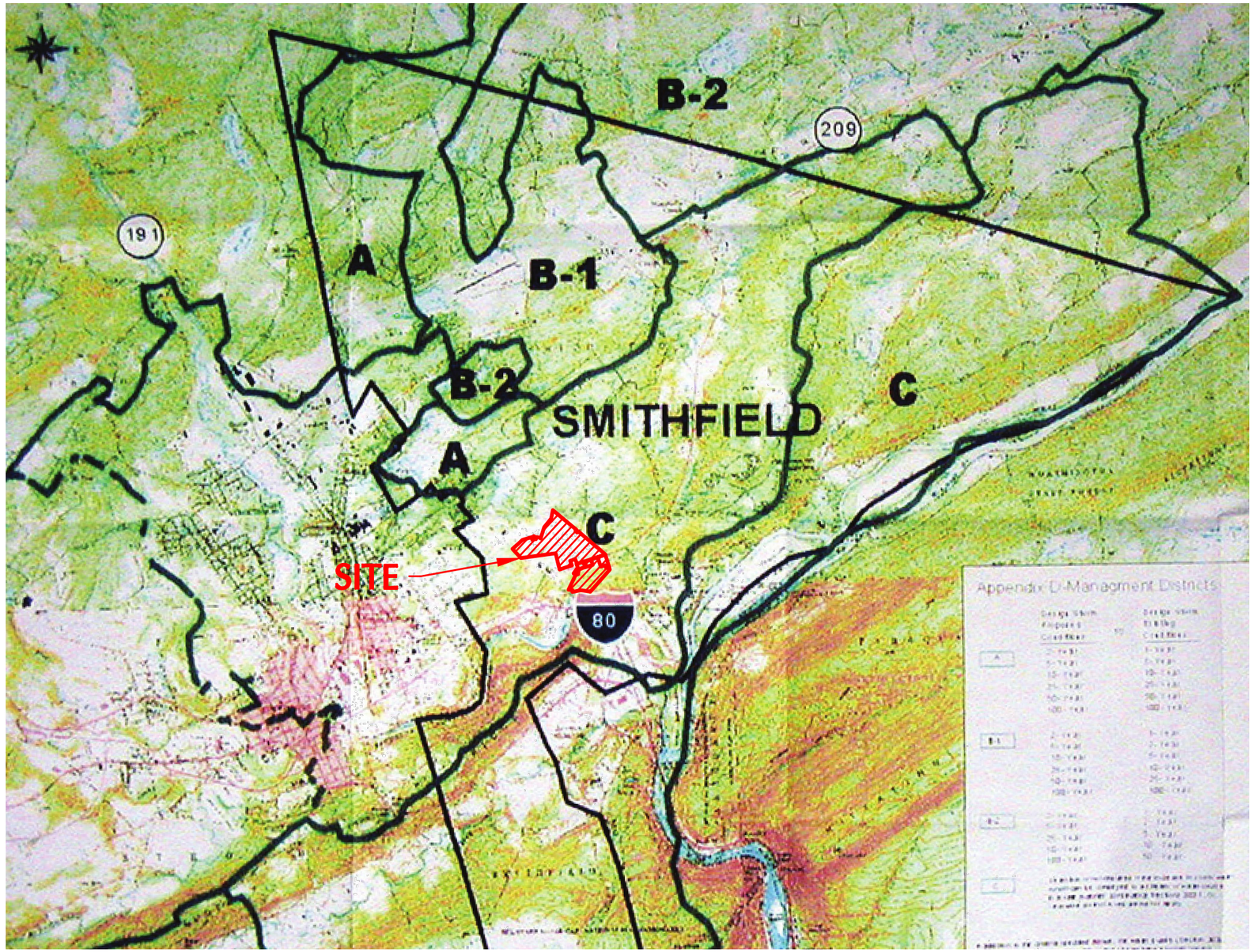
Drawing Title

WATER QUALITY TREATMENT AREA MAP

Project No. 100501401	Drawing No. FG06
Date FEBRUARY 22, 2023	
Scale 1" = 120'	
Drawn By MV / Checked By TH	
Submission Date FEBRUARY 22, 2023	Sheet 1 of 1

SUBMISSION DATE: X
PROJECT NO. 100501401

Filename: C:\bms\langan-pw-01\d0321268\FG06-100501402-0204-CIG104-1121.DWG Date: 2/17/2023 Time: 13:41 User: mvitiello Style Table: Langan.stb Layout: ARCHF-SL



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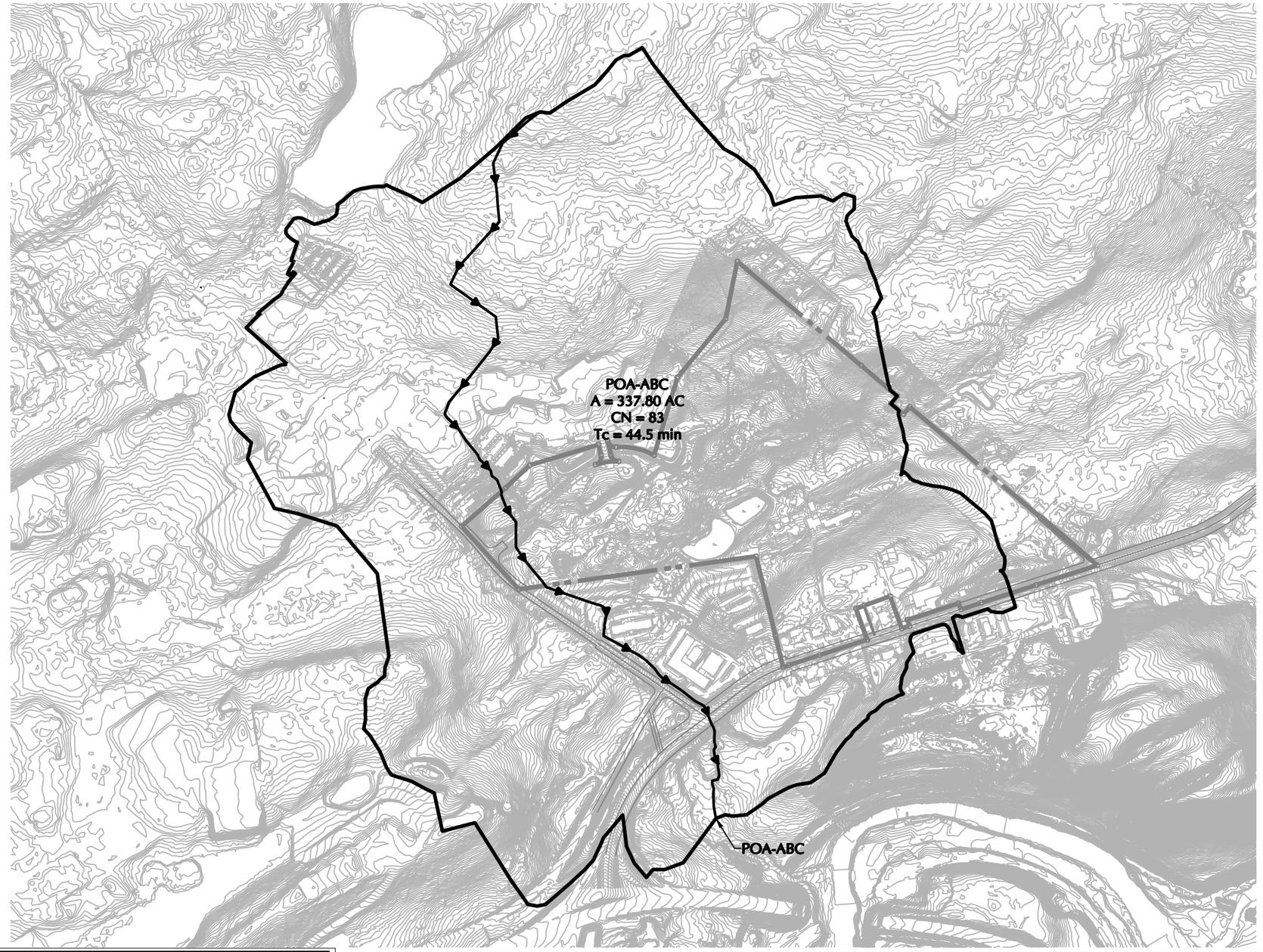
Langan CT, Inc.
Langan International LLC
Collectively known as Langan
NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
SMITHFIELD GATEWAY
SMITHFIELD TOWNSHIP
MONROE COUNTY PENNSYLVANIA

Drawing Title
SMITHFIELD TOWNSHIP MANAGEMENT DISTRICTS

Project No. 100501401	Drawing No. FG-07
Date AUGUST 19, 2016	
Scale N.T.S.	
Drawn By MJV / Checked By TH	
Submission Date MARCH 3, 2017	Sheet 1 of 1

Filename: \\langan.com\data\PAR\data4\100501401\Cadd Data - 100501401\SheetFiles\Figures\Stormwater\FG07-100501401-Smithfield Management Districts.dwg Date: 4/9/2018 Time: 17:12 User: mvitello Style Table: Langan.stb Layout: ANSIB-BL



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SCALE IN FEET

LEGEND

	EXISTING	PROPOSED
PROPERTY LINE/ROW	○ - - - ○	— - - —
DRAINAGE AREA BOUNDARY	———	
FLOW PATH	——▶——▶——	

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Collectively known as Langan

NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project

SMITHFIELD GATEWAY

SMITHFIELD TOWNSHIP
MONROE COUNTY PENNSYLVANIA

Drawing Title

POA-ABC EXISTING WATERSHED MAP

Project No. 100501401	Drawing No. FG-08
Date NOV.22, 2017	
Scale 1" = 700'	
Drawn By MJV / Checked By TH	
Submission Date NOV. 22, 2017	Sheet 1 of 1

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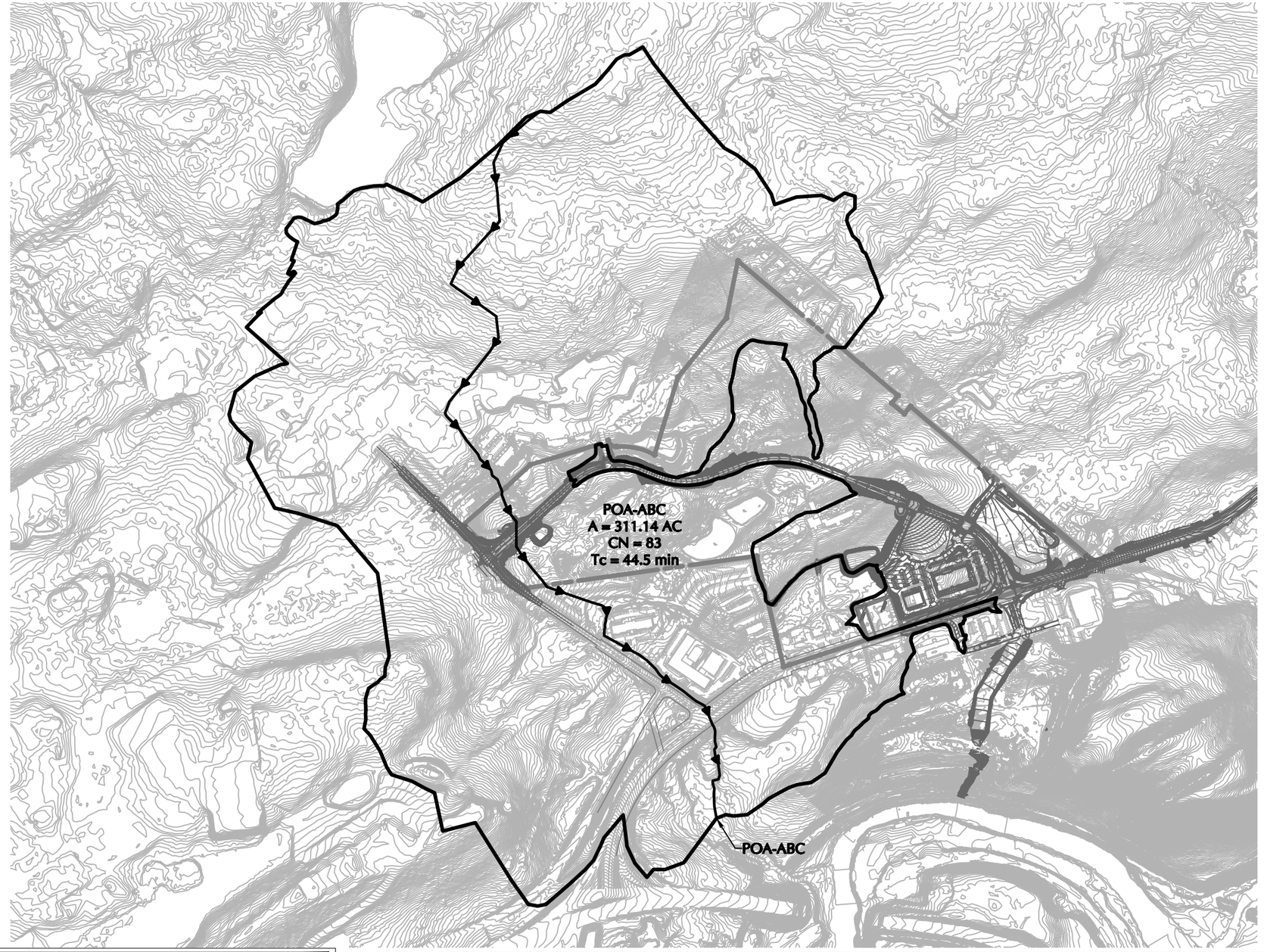

700 0 350 700

SCALE IN FEET

LEGEND

	EXISTING	PROPOSED
PROPERTY LINE/ROW		
DRAINAGE AREA BOUNDARY		
FLOW PATH		

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Langan CT, Inc.
Langan International LLC
Collectively known as Langan

NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project

SMITHFIELD GATEWAY

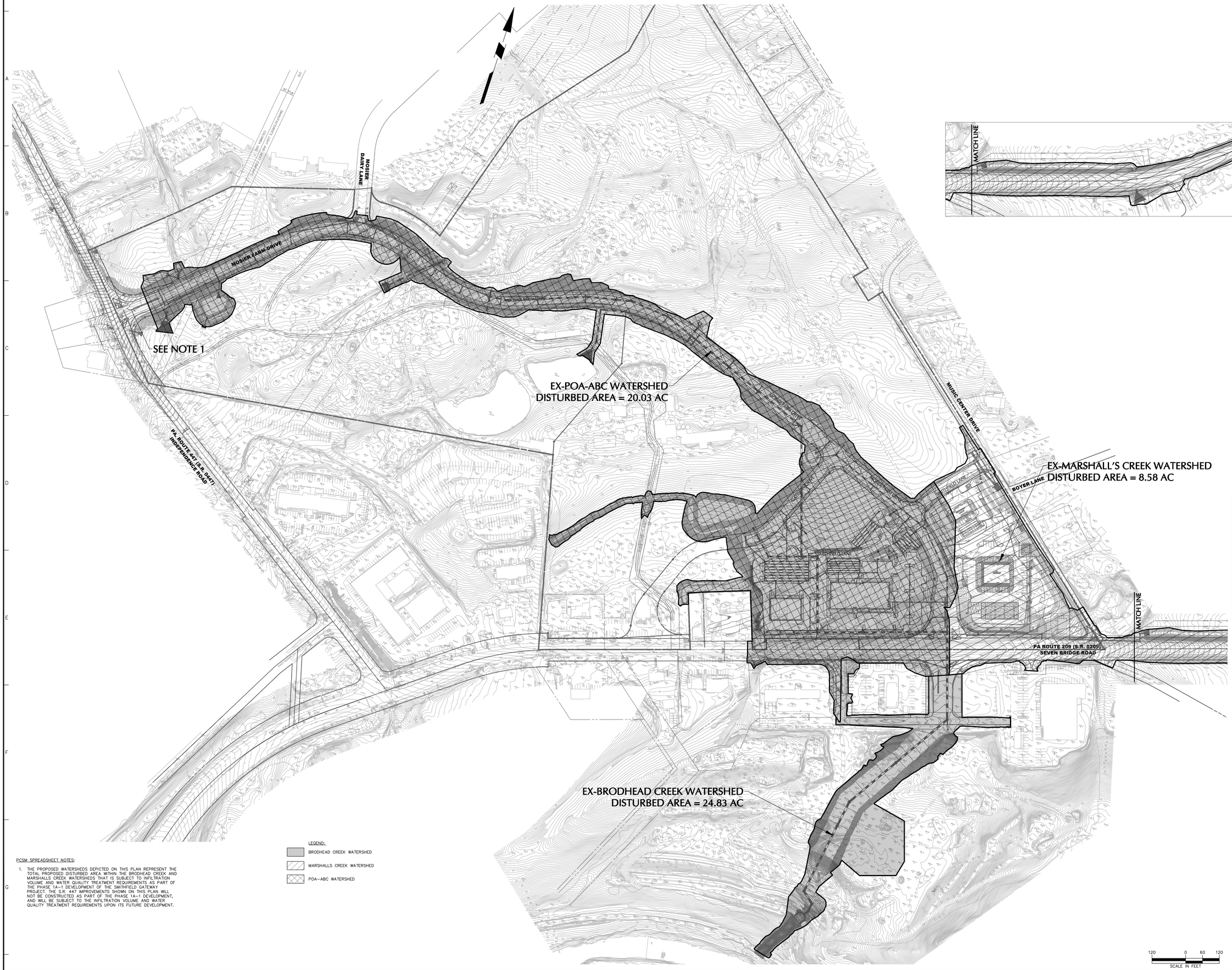
SMITHFIELD TOWNSHIP
MONROE COUNTY PENNSYLVANIA

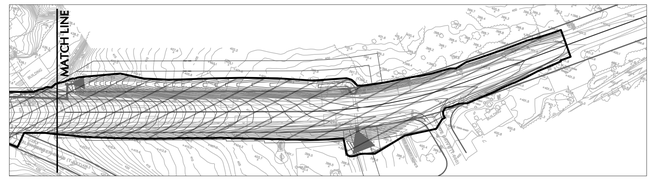
Drawing Title

POA-ABC PROPOSED WATERSHED MAP

Project No. 100501401	Drawing No. FG-09
Date DEC. 11, 2020	
Scale 1" = 700'	
Drawn By MJV / Checked By TH	
Submission Date DEC. 11, 2020	Sheet 1 of 1

Filename: C:\bms\langan-pw-01\dms44127\FG09-100501402-0203-CG104-1111.DWG Date: 12/10/2020 Time: 15:20 User: mvitello Style Table: Langan.stb Layout: ANSIB-BL





PCSM SPREADSHEET NOTES:

1. THE PROPOSED WATERSHEDS DEPICTED ON THIS PLAN REPRESENT THE TOTAL PROPOSED DISTURBED AREA WITHIN THE BRODHEAD CREEK AND MARSHALLS CREEK WATERSHEDS THAT IS SUBJECT TO INFILTRATION VOLUME AND WATER QUALITY TREATMENT REQUIREMENTS AS PART OF THE PHASE 1A-1 DEVELOPMENT OF THE SMITHFIELD GATEWAY PROJECT. THE S.R. 447 IMPROVEMENTS SHOWN ON THIS PLAN WILL NOT BE CONSTRUCTED AS PART OF THE PHASE 1A-1 DEVELOPMENT, AND WILL BE SUBJECT TO THE INFILTRATION VOLUME AND WATER QUALITY TREATMENT REQUIREMENTS UPON ITS FUTURE DEVELOPMENT.

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Date	Description	No.

REVISIONS

SIGNATURE DATE SIGNED

JOHN C. COTE
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Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. S.A.
Langan Engineering, Environmental, Surveying, Landscape Architecture, D.P.C.
Langan Engineering and Environmental Services, Inc.
Langan CT, Inc.
Langan Delaware, LLC
Collectively known as Langan
NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project

SMITHFIELD GATEWAY
PHASE 1A-2

SMITHFIELD TOWNSHIP
MONROE COUNTY PENNSYLVANIA

Drawing Title

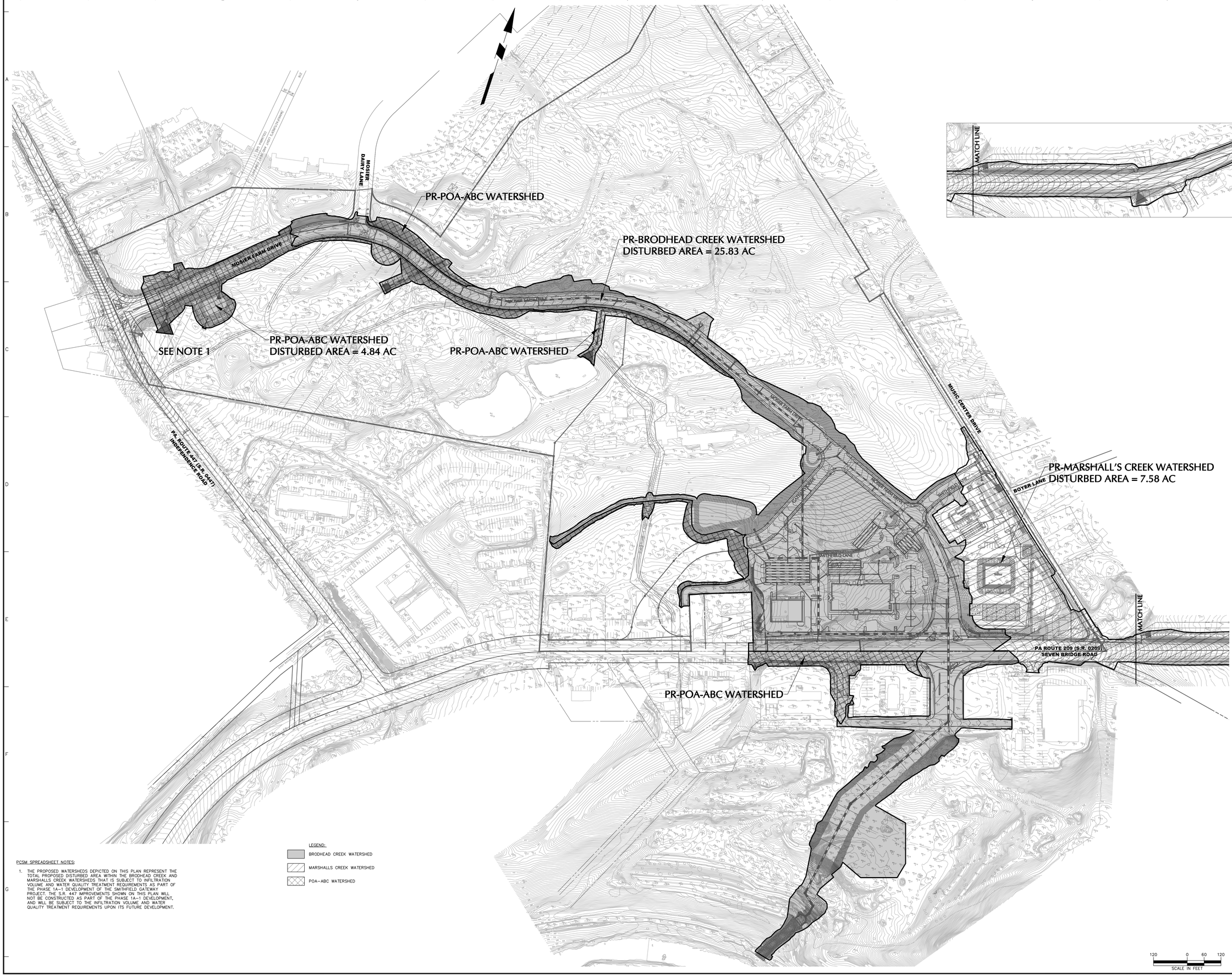
DEP PCSM
SPREADSHEET
EXISTING DRAINAGE
AREA MAP

Project No. 100501401	Drawing No. FG10
Date FEBRUARY 22, 2023	
Scale 1" = 120'	
Drawn By MV / Checked By TH	
Submission Date FEBRUARY 22, 2023	Sheet 1 of 1

PROJECT NO. 100501401 SUBMISSION DATE: X

LANGAN

Filename: C:\bms\langan-pw-01\d032126\BFG10-100501402-0204-CG103-1121.DWG Date: 2/17/2023 Time: 13:29 User: mvitello Style Table: Langan.stb Layout: ARCHF-SL



PCSM SPREADSHEET NOTES:

1. THE PROPOSED WATERSHEDS DEPICTED ON THIS PLAN REPRESENT THE TOTAL PROPOSED DISTURBED AREA WITHIN THE BRODHEAD CREEK AND MARSHALLS CREEK WATERSHEDS THAT IS SUBJECT TO INFILTRATION VOLUME AND WATER QUALITY TREATMENT REQUIREMENTS AS PART OF THE PHASE 1A-1 DEVELOPMENT OF THE SMITHFIELD GATEWAY PROJECT. THE S.R. 447 IMPROVEMENTS SHOWN ON THIS PLAN WILL NOT BE CONSTRUCTED AS PART OF THE PHASE 1A-1 DEVELOPMENT, AND WILL BE SUBJECT TO THE INFILTRATION VOLUME AND WATER QUALITY TREATMENT REQUIREMENTS UPON ITS FUTURE DEVELOPMENT.

LEGEND:

- BRODHEAD CREEK WATERSHED
- MARSHALLS CREEK WATERSHED
- POA-ABC WATERSHED

–	–	–
–	–	–
–	–	–
–	–	–
–	–	–
–	–	–
–	–	–
–	–	–
–	–	–
–	–	–
Date	Description	No.

REVISIONS

SIGNATURE DATE SIGNED

JOHN C. COTE
PROFESSIONAL ENGINEER PA Lic. No. PE085407

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Project

SMITHFIELD GATEWAY
PHASE 1A-2

SMITHFIELD TOWNSHIP
MONROE COUNTY PENNSYLVANIA

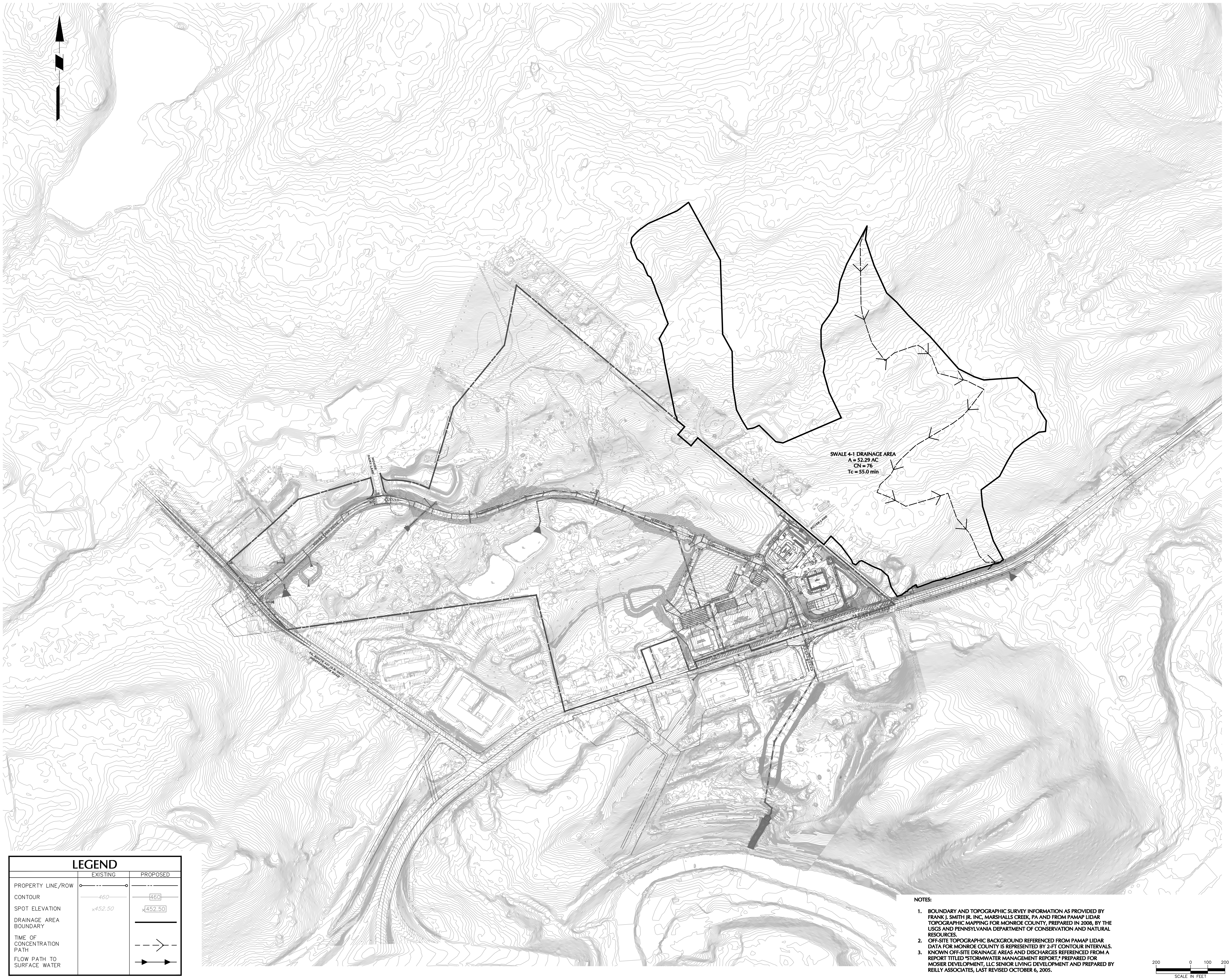
Drawing Title

DEP PCSM SPREADSHEET PROPOSED DRAINAGE AREA MAP

Project No. 100501401	Drawing No. FG11
Date FEBRUARY 22, 2023	
Scale 1" = 120'	
Drawn By MV / Checked By TH	
Submission Date FEBRUARY 22, 2023	Sheet 1 of 1

LANGAN
SUBMISSION DATE: X
PROJECT NO. 100501401

Filename: C:\bms\langan-pw-01\d0321268\FG11-100501402-0204-CG104-1121.DWG Date: 2/17/2023 Time: 13:27 User: mvitello Style Table: Langan.stb Layout: ARCHF-SL



LEGEND

	EXISTING	PROPOSED
PROPERTY LINE/ROW		
CONTOUR	460	460
SPOT ELEVATION	×452.50	×452.50
DRAINAGE AREA BOUNDARY		
TIME OF CONCENTRATION PATH		
FLOW PATH TO SURFACE WATER		

NOTES:

1. BOUNDARY AND TOPOGRAPHIC SURVEY INFORMATION AS PROVIDED BY FRANK J. SMITH JR. INC, MARSHALLS CREEK, PA AND FROM PAMAP LIDAR TOPOGRAPHIC MAPPING FOR MONROE COUNTY, PREPARED IN 2008, BY THE USGS AND PENNSYLVANIA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES.
2. OFF-SITE TOPOGRAPHIC BACKGROUND REFERENCED FROM PAMAP LIDAR DATA FOR MONROE COUNTY IS REPRESENTED BY 2-FT CONTOUR INTERVALS.
3. KNOWN OFF-SITE DRAINAGE AREAS AND DISCHARGES REFERENCED FROM A REPORT TITLED "STORMWATER MANAGEMENT REPORT," PREPARED FOR MOSIER DEVELOPMENT, LLC SENIOR LIVING DEVELOPMENT AND PREPARED BY REILLY ASSOCIATES, LAST REVISED OCTOBER 6, 2005.

Date	Description	No.

REVISIONS

SIGNATURE DATE SIGNED
JOHN C. COTE
PROFESSIONAL ENGINEER PA Lic. No. PE085407

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Langan CT, Inc.
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Collectively known as Langan
NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project

SMITHFIELD GATEWAY
PHASE 1A-2

SMITHFIELD TOWNSHIP
MONROE COUNTY PENNSYLVANIA

Drawing Title

PHASE I SR 209 HOP SWALE DRAINAGE AREA MAP

Project No.	Drawing No.
100501401	FG12
Date: FEBRUARY 17, 2023	
Scale: 1" = 40'	
Drawn By: MJV / Checked By: TH	
Submission Date: FEBRUARY 17, 2023	Sheet 1 of 1

Filename: C:\bms\langan-pw-01\d0321268\FG12-100501402-0204-CG105-1121.DWG Date: 2/17/2023 Time: 16:58 User: ssworav Style Table: Langan.stb Layout: ARCHF-SL

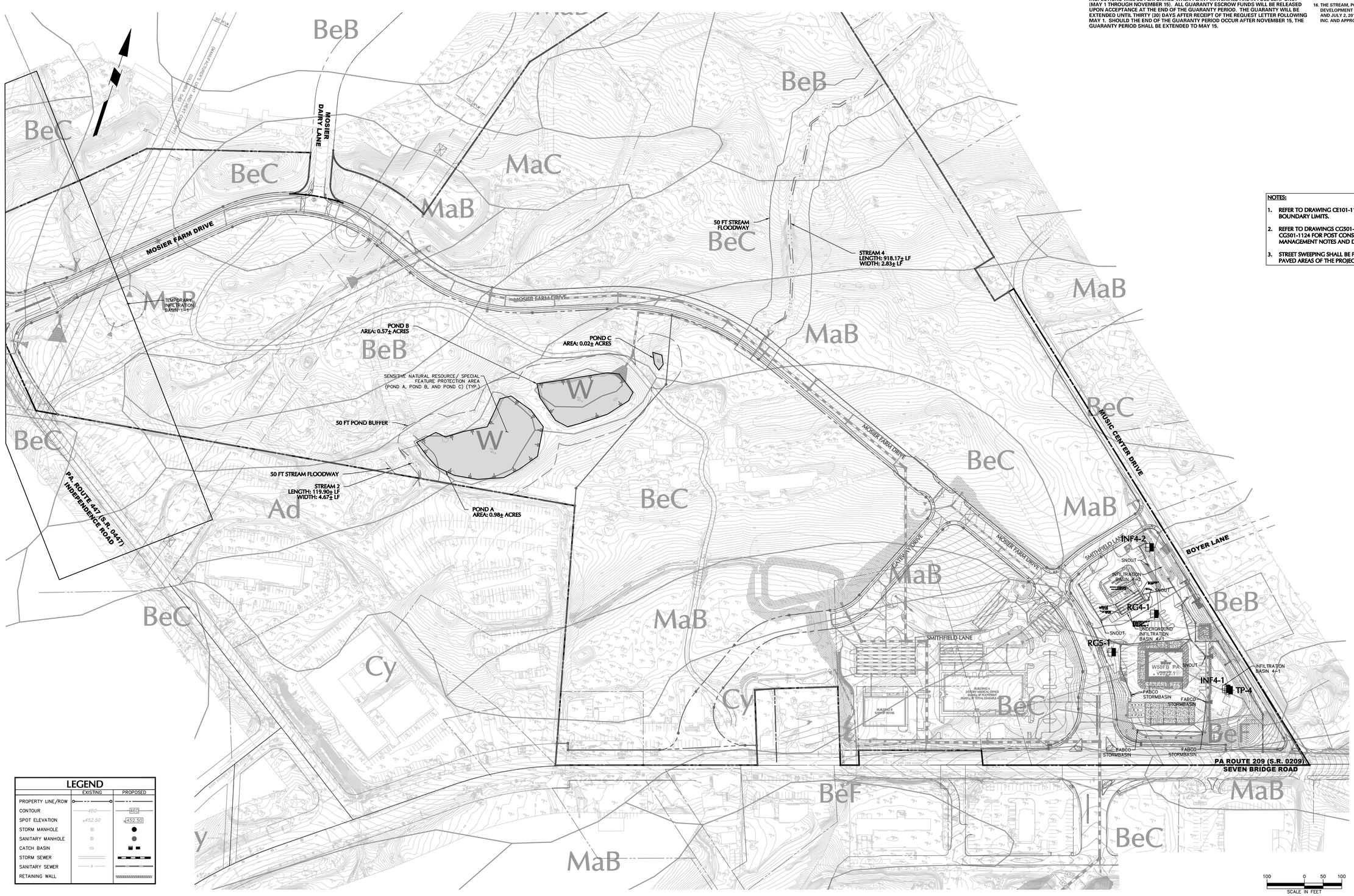
DRAWINGS

GENERAL NOTES:

1. EXISTING BOUNDARY AND SITE SURVEY INFORMATION AS PROVIDED BY FRANK J. SMITH JR. INC., MARSHALLS CREEK, PA.
2. ELEVATIONS BASED UPON 1988 NORTH AMERICA VERTICAL DATUM (NAVD 88).
3. MOSIER DEVELOPMENT, LLC, SENIOR LIVING DEVELOPMENT REFERENCED FROM PLANS PREPARED BY REILLY ASSOCIATES.
4. PHASE 1A-1 LAND DEVELOPMENT PLANS REFERENCE MAJOR SUBDIVISON PLAN, DRAWING CB101-1111, PREPARED BY LANGAN, DATED 12/11/2020, LAST REVISED 5/03/2021.
5. THESE PARCELS ARE SUBJECT TO A SUBSEQUENT LAND DEVELOPMENT APPLICATION PROCESS.
6. SEE PARTIAL SITE PLAN DRAWINGS FOR SETBACK DIMENSIONS.
7. ROAD NAMES HAVE BEEN REVISED BASED UPON COORDINATION WITH THE TOWNSHIP: ROAD A CHANGED TO MOSIER FARM DRIVE; ROAD B CHANGED TO GATEWAY DRIVE; AND ROAD C CHANGED TO SMITHFIELD LANE.
8. PHASE I, LOT 1.01 EXCEEDS 65% IMPERVIOUS COVERAGE. THE OTHER PROPOSED LOTS REQUIRE A DEED RESTRICTION, CONSERVATION EASEMENT, OR OTHER TOWNSHIP-APPROVED ENFORCEMENT METHOD THAT ESTABLISHES A MAXIMUM IMPERVIOUS COVERAGE OF LESS THAN SIXTY-FIVE PERCENT (65%). THESE APPROVED PERCENTAGES SHALL GUARANTEE THAT THE TOTAL IMPERVIOUS COVERAGE FOR ALL LOTS IN THE MIXED USE DEVELOPMENT DOES NOT EXCEED SIXTY-FIVE PERCENT (65%).
9. THE APPLICANT/DEVELOPER SHALL CONTACT THE TOWNSHIP IN WRITING TO REQUEST A FINAL INSPECTION FOR ACCEPTANCE AT THE END OF THE GUARANTY PERIOD. THESE INSPECTIONS WILL BE PERFORMED WHEN PLANT MATERIALS ARE IN FULL-LEAF ONLY (MAY 1 THROUGH NOVEMBER 15). ALL GUARANTY ESCROW FUNDS WILL BE RELEASED UPON ACCEPTANCE AT THE END OF THE GUARANTY PERIOD. THE GUARANTY WILL BE EXTENDED UNTIL THIRTY (30) DAYS AFTER RECEIPT OF THE REQUEST LETTER FOLLOWING MAY 1. SHOULD THE END OF THE GUARANTY PERIOD OCCUR AFTER NOVEMBER 15, THE GUARANTY PERIOD SHALL BE EXTENDED TO MAY 15.
10. THE CONTRACTOR SHALL PROVIDE A RETAINING WALL DESIGN FOR EACH PROPOSED WALL PREPARED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF PENNSYLVANIA FOR REVIEW BY THE OWNER'S ENGINEER PRIOR TO INSTALLATION. THE CONTRACTOR AND THE RETAINING WALL DESIGNER SHALL SPECIFICALLY NOTE ANY EXISTING OR PROPOSED STRUCTURES THAT ARE LOCATED IN OR NEAR THE WALL (INLETS, LIGHT POLES, FENCES, STORM PIPES, UTILITIES, GUIDE RAILS, AND OTHER FEATURES) AND SHALL COORDINATE DESIGN AND INSTALLATION OF RETAINING WALL SUCH THAT THE FEATURES ARE ACCOMMODATED IN THE DESIGN AS APPROPRIATE.
11. ALL EXISTING ON-SITE BUILDINGS/STRUCTURES ARE TO BE DEMOLISHED UNLESS OTHERWISE NOTED. THE EXISTING PUMP STATION IS TO REMAIN AND THE EXISTING FARM HOUSE IS TO BE RELOCATED.
12. THE OWNER, ITS SUCCESSORS AND ASSIGNS, SHALL MAKE PROVISION AND BE RESPONSIBLE FOR THE INSTALLATION, MAINTENANCE, OPERATION AND REPAIR OF THE STORMWATER MANAGEMENT FACILITIES DEPICTED ON THE LAND DEVELOPMENT PLANS. SMITHFIELD TOWNSHIP IS HEREBY GRANTED AN EASEMENT AND RIGHT TO ACCESS THE PROPERTY TO INSPECT THE STORMWATER FACILITIES, AND, IF MAINTENANCE OR REPAIRS ARE NOT BEING PERFORMED BY THE RESPONSIBLE PARTY, THEN THE TOWNSHIP MAY DO SO AT THE COST OF THE OWNER.
13. THE SIDEWALKS SHALL BE PROPERLY MAINTAINED BY THE OWNER OF THE LOT ON WHICH THE SIDEWALKS ARE LOCATED, UNLESS THE TOWNSHIP SPECIFICALLY APPROVES AN ALTERNATIVE RESPONSIBLE PARTY.
14. THE OWNER, ITS SUCCESSORS AND ASSIGNS, SHALL PROVIDE BLANKET EASEMENTS FOR STORMWATER DRAINAGE AND UTILITIES FOR MAINTENANCE.
15. REFER TO THE SMITHFIELD GATEWAY HIGHWAY OCCUPANCY PERMIT PLANS FOR HOP APPLICATION #119569 FOR ROADWAY IMPROVEMENTS ALONG SEVEN BRIDGES ROAD (S.R. 0209) AND INDEPENDENCE ROAD (S.R. 0447).
16. THE STREAM, POND, AND WETLAND DELINEATIONS REFERENCED ON THE LAND DEVELOPMENT PLANS ARE PER DELINEATIONS CONDUCTED ON JUNE 30, JULY 1, AND JULY 2, 2015 BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES, INC. AND APPROVED BY USACOE ON JUNE 29, 2016.

NOTES:

1. REFER TO DRAWING CE101-1121 FOR NPDES PROJECT BOUNDARY LIMITS.
2. REFER TO DRAWINGS CG501-1121 THROUGH CG501-1124 FOR POST CONSTRUCTION STORMWATER MANAGEMENT NOTES AND DETAILS.
3. STREET SWEEPING SHALL BE PERFORMED ON THE PAVED AREAS OF THE PROJECT.



LEGEND

	EXISTING	PROPOSED
PROPERTY LINE/ROW		
CONTOUR	450	460
SPOT ELEVATION	x452.50	x452.50
STORM MANHOLE		
SANITARY MANHOLE		
CATCH BASIN		
STORM SEWER		
SANITARY SEWER		
RETAINING WALL		

100 0 50 100
SCALE IN FEET

Date	Description	No.
REVISIONS		

COMMONWEALTH OF PENNSYLVANIA — JOHN C. COTE — PROFESSIONAL ENGINEER

2/24/2023
SIGNATURE — DATE SIGNED

JOHN C. COTE
PROFESSIONAL ENGINEER PA Lic. No. PE085407

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Project

SMITHFIELD GATEWAY
PHASE 1A-2

SMITHFIELD TOWNSHIP
MONROE COUNTY PENNSYLVANIA

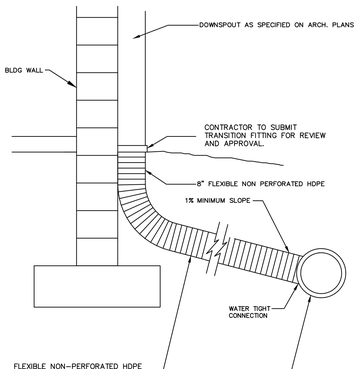
Drawing Title

POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

Project No. 100501402	Drawing No. CG103 1121
Date FEBRUARY 17, 2023	
Drawn By TEG	
Checked By TH	Sheet 15 of 39

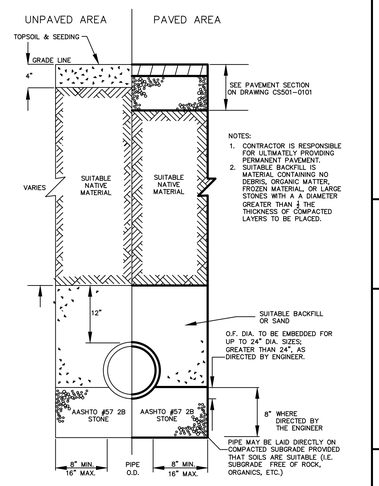
MAY 11, 2021
100501401

Filename: c:\bms\langan-pw-01\d0174082\100501402-0308-CG103-1121.DWG Date: 2/24/2023 Time: 11:23 User: smelo Style Table: Langan.stb Layout: CG103-1121



N.T.S.

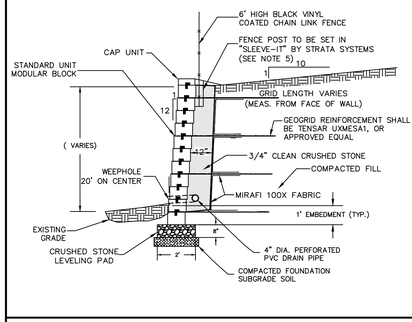
STORM DOWNSPOUT COLLECTOR



NOTES:
1. CONTRACTOR IS RESPONSIBLE FOR ULTIMATELY PROVIDING PERMANENT PAVEMENT.
2. SUITABLE BACKFILL IS MATERIAL CONTAINING NO DEBRIS, ORGANIC MATTER, FROZEN MATERIAL, OR LARGE STONES WITH A A DIAMETER GREATER THAN ½ THE THICKNESS OF COMPACTED LAYERS TO BE PLACED.

N.T.S.

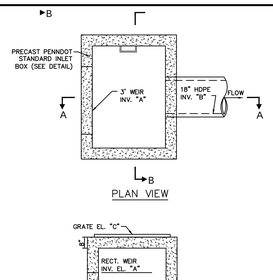
STORM SEWER TRENCH

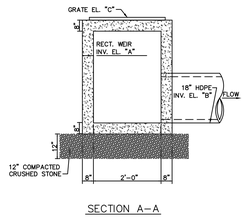


NOTES:
1. GEOGRID MANUFACTURED BY TENSAR EARTH TECHNOLOGIES, INC. OR APPROVED EQUAL.
2. SIGNED AND SEALED SHOP DRAWINGS, INCLUDING WALL PROFILES INDICATING WALL HEIGHTS, LOCATION, LIMIT OF GEOGRID AND STRUCTURAL CALCULATIONS FOR ALL COMPONENTS OF THE PROPOSED RETAINING WALLS (INCLUDING, BUT NOT LIMITED TO, MEMBERS, CONNECTIONS AND LOADING), MUST BE SUBMITTED FOR APPROVAL PRIOR TO CONSTRUCTION.
3. IN THE CASE OF THE EXISTING WALL REFER TO THE CMX DRAWINGS GOVERNING THE DESIGN
4. CHAIN LINK FENCE MUST BE PROVIDED FOR ALL WALLS GREATER THAN 30 INCHES IN HEIGHT.
5. TOP CAP STONE TO BE SECURED TO WALL USING EPOXY ADHESIVE.
6. CONTRACTOR TO INSTALL "SLEEVE-IT" IN TO EXISTING WALL AND GRID, ONLY GRID WITHIN THE LIMITS OF THE "SLEEVE-IT" O.D. IS TO BE CUT CLEAN AND REMOVED TO MINIMIZE IMPACTS TO THE EXISTING WALL.
7. CONTRACTOR TO REPLACE IN-KIND ANY GRID AND/OR BACKFILL DISTURBANCES MADE TO THE EXISTING WALL.
8. THE CONTRACTOR SHALL PROVIDE A RETAINING WALL DESIGN FOR EACH PROPOSED WALL PREPARED BY A LICENSED ENGINEER IN THE STATE OF PENNSYLVANIA FOR REVIEW BY THE OWNER'S ENGINEER PRIOR TO INSTALLATION. THE CONTRACTOR AND THE RETAINING WALL DESIGNER SHALL SPECIFICALLY NOTE ANY EXISTING OR PROPOSED STRUCTURES THAT ARE LOCATED IN OR NEAR THE WALL (INLETS, LIGHT POLES, FENCES, STORM PIPES, UTILITIES, GUIDE RAILS, AND OTHER FEATURES) AND SHALL COORDINATE DESIGN AND INSTALLATION OF RETAINING WALL SUCH THAT THE FEATURES ARE ACCOMMODATED IN THE DESIGN AS APPROPRIATE.

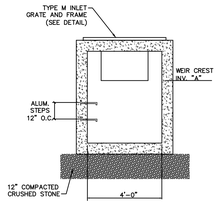
N.T.S.

MODULAR BLOCK RETAINING WALL





SECTION A–A

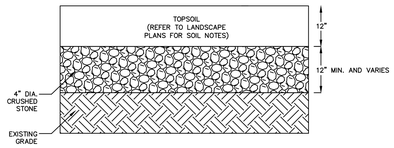


SECTION B–B

	RECT. WEIR		OUTLET PIPE		GRATE EL.
	SIZE	CREST EL.	SIZE	INVERT	
OCS4–1	3 FT	459.20	18" HDPE	452.67	460.01
OCS4–2	3 FT	461.10	18" HDPE	458.25	462.00

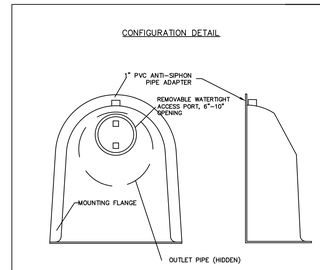
N.T.S.

OUTLET CONTROL STRUCTURE DETAIL FOR INFILTRATION BASINS

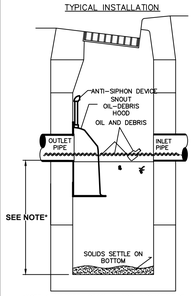


N.T.S.

INFILTRATION BASIN DETAIL FOR OVER-EXCAVATED AREAS



SNOUT OIL–WATER–DEBRIS SEPARATOR

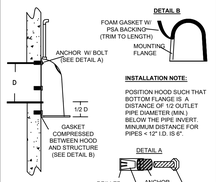


*NOTE- SUMP DEPTH OF 36" MIN. FOR UP TO 12" ID PIPE OUTLET. FOR PIPES 15" ID AND ABOVE SUMP DEPTH OF 2.5 TO 3 TIMES PIPE ID RECOMMENDED (E.G. 5' DEEP for 24" PIPE)

NOTES:
1. ALL HOODS AND TRAPS FOR CATCH BASINS AND WATER QUALITY STRUCTURES SHALL BE AS MANUFACTURED BY: BEST MANAGEMENT PRODUCTS, INC. 9 MATHEWS DRIVE, UNIT A1–A2. EAST HADDAM, CT 06423 TOLL FREE: (800) 504–8008 OR (888) 434–0277, FAX: (877) 434–3197 WEB SITE: www.bmpinc.com OR PRE–APPROVED EQUAL
2. ALL HOODS SHALL BE CONSTRUCTED OF A GLASS REINFORCED RESIN COMPOSITE WITH ISO GEL COAT EXTERIOR FINISH WITH A MINIMUM 0.125" LAMINATE THICKNESS.
3. ALL HOODS SHALL BE EQUIPPED WITH A WATERTIGHT ACCESS PORT, A MOUNTING FLANGE, AND AN ANTI–SIPHON VENT PIPE AND ELBOW AS DRAWN. (SEE CONFIGURATION DETAIL)
4. THE SIZE AND POSITION OF THE HOOD SHALL BE DETERMINED BY OUTLET PIPE SIZE AS PER MANUFACTURER'S RECOMMENDATION (SNOUT SIZE ALWAYS LARGER THAN PIPE SIZE).
5. THE BOTTOM OF THE HOOD SHALL EXTEND DOWNWARD A MINIMUM DISTANCE EQUAL TO 1/2 THE OUTLET PIPE DIAMETER WITH A MINIMUM DISTANCE OF 6" FOR PIPES <12" I.D.
6. THE ANTI–SIPHON VENT SHALL EXTEND ABOVE HOOD BY MINIMUM OF 3" AND A MAXIMUM OF 12" ACCORDING TO STRUCTURE CONFIGURATION.
7. THE SURFACE OF THE STRUCTURE WHERE THE HOOD IS MOUNTED SHALL BE FINISHED SMOOTH AND FREE OF LOOSE MATERIAL AND PIPE SHALL BE FINISHED FLUSH TO WALL.
8. ALL STRUCTURE JOINTS SHALL BE WATERTIGHT.
9. THE HOOD SHALL BE SECURELY ATTACHED TO STRUCTURE WALL WITH ⅜" STAINLESS STEEL BOLTS AND OIL–RESISTANT GASKET AS SUPPLIED BY MANUFACTURER. (SEE INSTALLATION DETAIL)
10. INSTALLATION INSTRUCTIONS SHALL BE FURNISHED WITH MANUFACTURER SUPPLIED INSTALLATION KIT. INSTALLATION KIT SHALL INCLUDE:
    A. INSTALLATION INSTRUCTIONS
    B. PVC ANTI–SIPHON VENT PIPE AND ADAPTER
    C. OIL–RESISTANT CRUSHED CELL FOAM GASKET WITH PSA BACKING
    D. 3/8" STAINLESS STEEL BOLTS
    E. ANCHOR SHIELDS

US Patent # 6126817, 7951294, 7857966, 8512556
Canada Patent # 2285146, 2690156, 2690156 others pending

INSTALLATION DETAIL



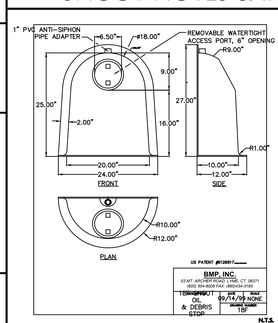
INSTALLATION NOTE:
POSITION HOOD SUCH THAT BOTTOM FLANGE IS A DISTANCE OF 1/2 OUTLET PIPE DIAMETER (MIN.) BELOW THE PIPE INVERT. MINIMUM DISTANCE FOR PIPES < 12" I.D. IS 6".

HOOD SPECIFICATION FOR CATCH BASINS AND WATER QUALITY STRUCTURES

DESCRIPTION	DATE	SCALE
OIL– DEBRIS HOOD SPECIFICATION AND INSTALLATION (TYPICAL)	09/08/18	NONE
	DRAWING NUMBER	SP–SN

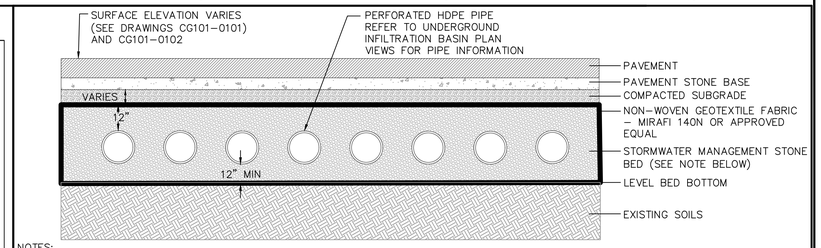
N.T.S.

SNOUT NOTES & INSTALLATION DETAILS



N.T.S.

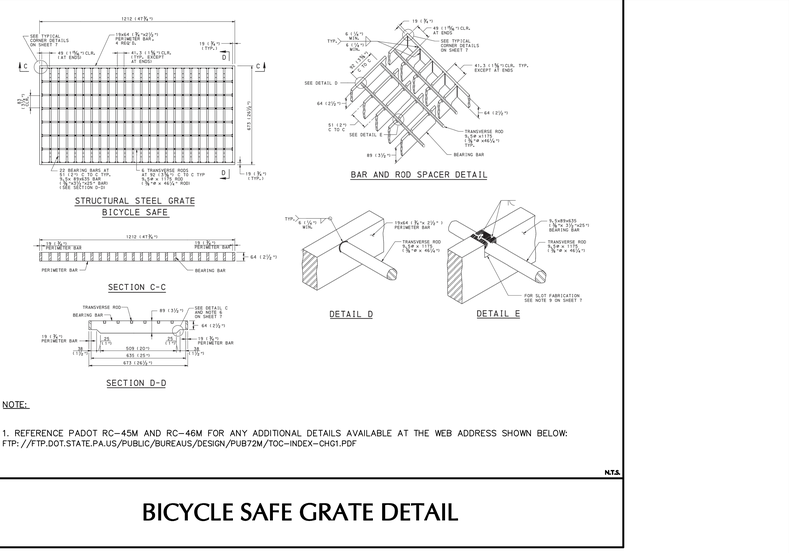
SNOUT 18F



NOTES:
1. STORMWATER MANAGEMENT STONE BED SHALL BE 2–INCH TO 1–INCH UNIFORMLY GRADED COARSE AGGREGATE, WITH A WASH LOSS OF NO MORE THAN 0.5%, AASHTO SIZE NUMBER 3 PER AASHTO SPECIFICATIONS, PART I, 19TH ED., 1998, OR LATER AND SHALL HAVE VOIDS 40% AS MEASURED BY ASTM–C29.
2. SEE DRAWING FOR PIPE LAYOUT, CONNECTIONS AND CLEAN–OUTS.
3. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS OF THE STORMWATER SYSTEM TO THE DESIGN ENGINEER FOR REVIEW PRIOR TO ORDERING/ CONSTRUCTION. THIS SUBMITTAL MUST INCLUDE THE WITHDRAWAL STRUCTURES AND CONNECTION TO THE UNDERGROUND STORMWATER SYSTEM.
4. EXISTING SUBGRADE UNDER THE INFILTRATION BMP'S SHALL NOT BE COMPACTED OR SUBJECT TO EXCESSIVE CONSTRUCTION EQUIPMENT TRAFFIC PRIOR TO CONSTRUCTION OF THE INFILTRATION BMP. SHOULD INFILTRATION BMP AREAS RECEIVE EXCESSIVE CONSTRUCTION TRAFFIC OR SUBJECTED TO COMPACTION, ADDITIONAL INFILTRATION TESTS MUST BE PERFORMED AND THE RESULTS SHALL BE SUBMITTED TO MONROE COUNTY CONSERVATION DISTRICT (MCCD) FOR REVIEW.
5. PRIOR TO CONSTRUCTION, INFILTRATION AREAS SHALL BE MARKED OFF IN THE FIELD. THE AREAS SHALL BE DELINEATED WITH CONSTRUCTION FENCING OR TAPE IN SUCH A MANNER AS TO PREVENT THE PARKING OF OR REPEATED MOVEMENT OF CONSTRUCTION EQUIPMENT ACROSS THE INFILTRATION AREAS.

N.T.S.

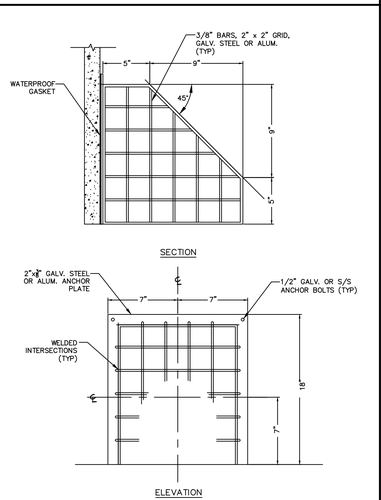
TYPICAL UNDERGROUND INFILTRATION BASIN SECTION



NOTE:
1. REFERENCE PADOT RC–45M AND RC–46M FOR ANY ADDITIONAL DETAILS AVAILABLE AT THE WEB ADDRESS SHOWN BELOW: FTP://FTP.DOT.STATE.PA.US/PUBLIC/BUREAUS/DESIGN/PUB72M/TOC–INDEX–CHG1.PDF

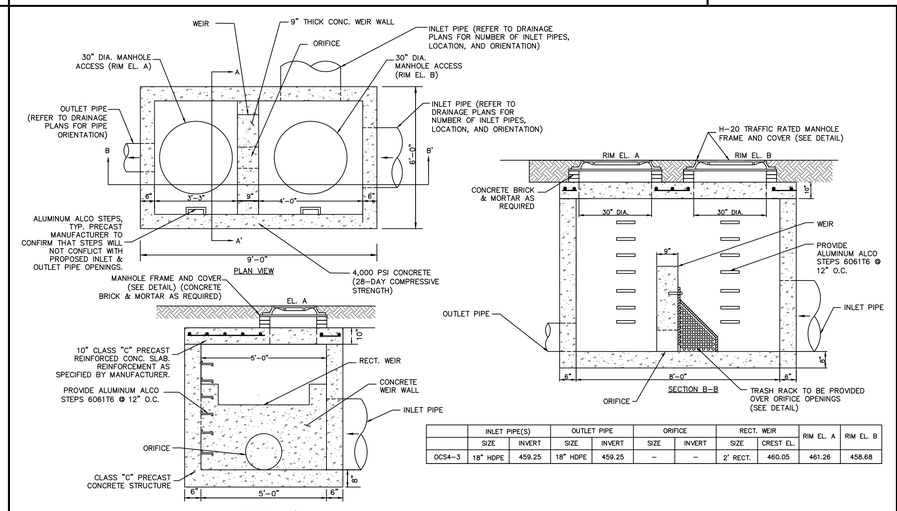
N.T.S.

BICYCLE SAFE GRATE DETAIL



N.T.S.

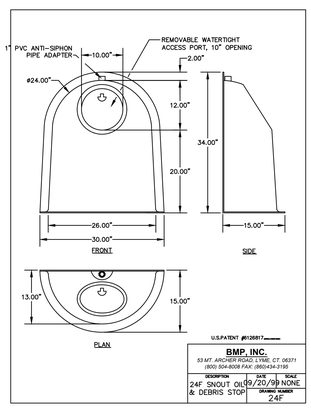
TRASH RACK



	INLET PIPE(S)		OUTLET PIPE		ORIFICE		RECT. WEIR		RIM EL. A	RIM EL. B
	SIZE	INVERT	SIZE	INVERT	SIZE	INVERT	SIZE	CREST EL.		
OCS4–3	18" HDPE	459.25	18" HDPE	459.25	–	–	2' RECT.	460.05	461.26	458.68

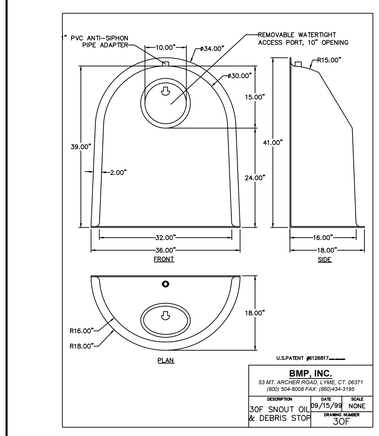
N.T.S.

UNDERGROUND INFILTRATION BASIN OUTLET CONTROL STRUCTURES



N.T.S.

SNOUT 24F



N.T.S.

SNOUT 30F

No.	Description	Date
REVISIONS		

JOHN C. COTE — REGISTERED PROFESSIONAL ENGINEER — PE085407 — COMMONWEALTH OF PENNSYLVANIA

SIGNATURE — 2/24/2023 DATE SIGNED

JOHN C. COTE
PROFESSIONAL ENGINEER PA Lic. No. PE085407

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Project

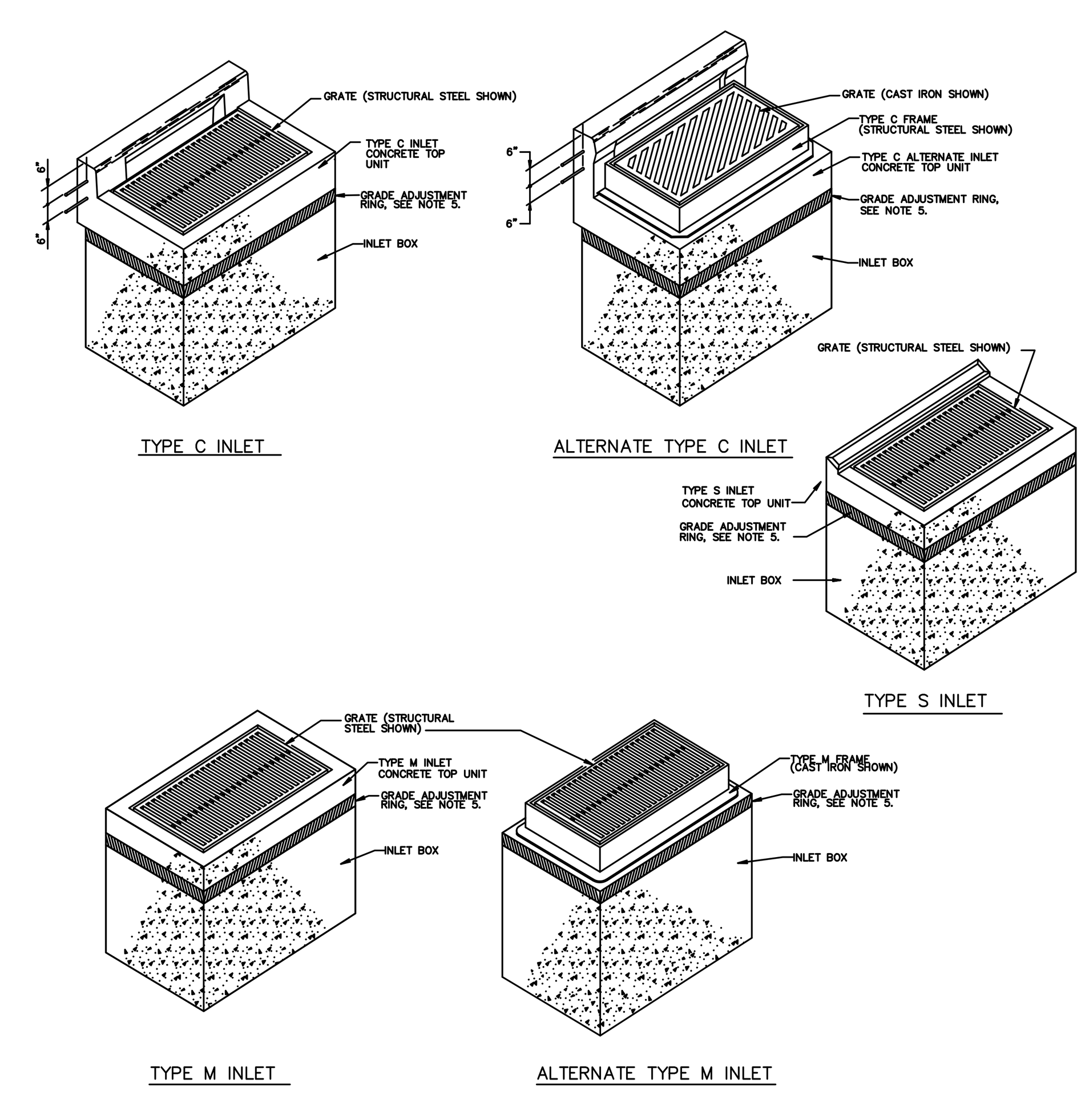
SMITHFIELD GATEWAY
PHASE 1A-2

SMITHFIELD TOWNSHIP
MONROE COUNTY PENNSYLVANIA

Drawing Title

POST CONSTRUCTION STORMWATER MANAGEMENT NOTES & DETAILS

Project No. 100501402	Drawing No. CG501 1121
Date FEBRUARY 17, 2023	
Drawn By SM	
Checked By TH	Sheet 19 of 39



NOTES

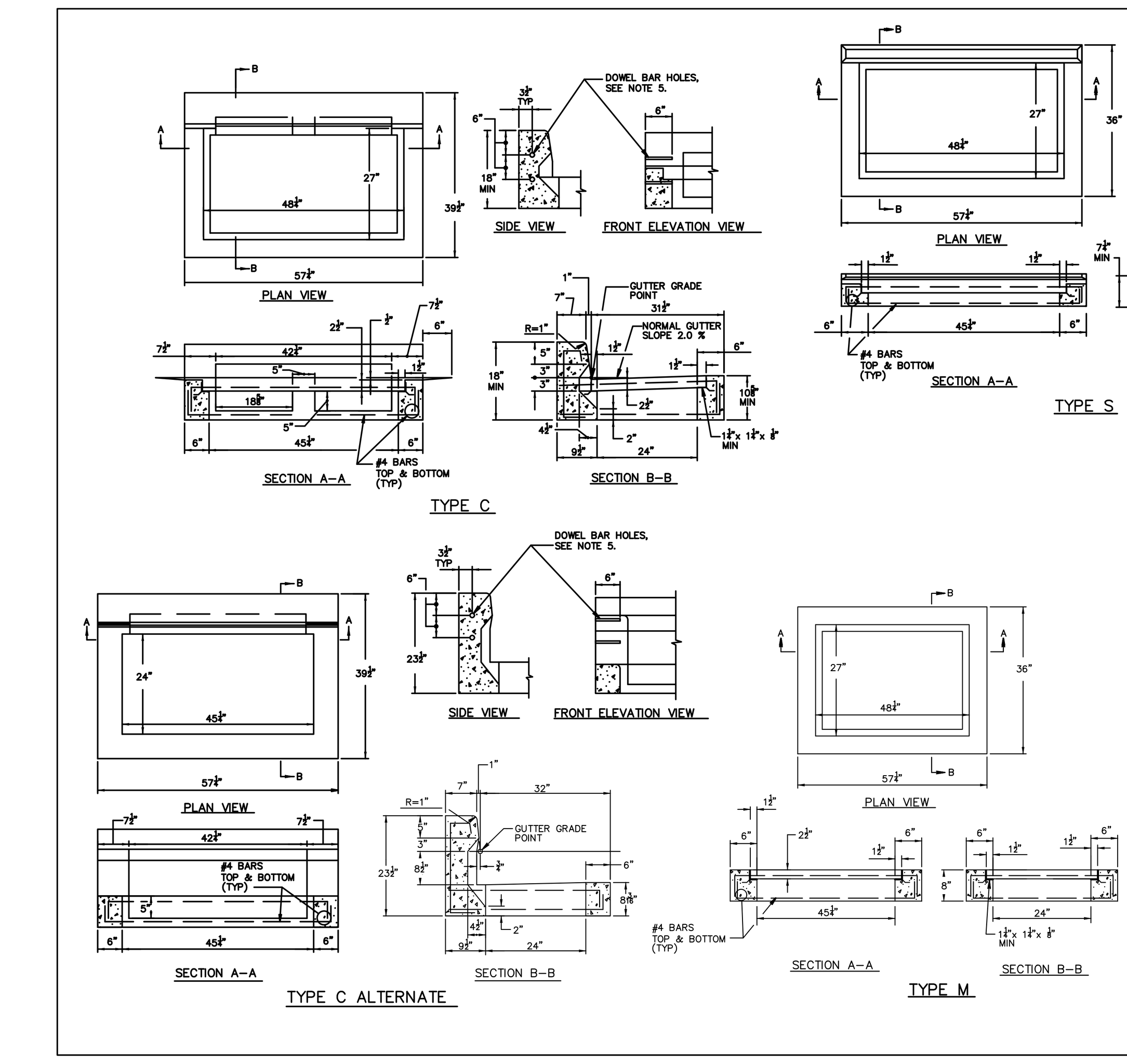
1. CONSTRUCTION REQUIREMENTS:
   A. CONSTRUCT IN ACCORDANCE WITH PUBLICATION 408, SECTIONS 605, 606 AND 714; AND AS MODIFIED HEREIN.
   B. MINIMUM CONCRETE CLASS: CAST-IN-PLACE CLASS A; PRECAST CLASS AA
   C. PROVIDE STEEL REINFORCEMENT IN ACCORDANCE WITH PUBLICATION 408, SECTION 709. PROVIDE MINIMUM YIELD STRENGTH OF 400 MPa (60,000 PSI).
   D. CLEAR COVER FOR STEEL: WALLS: CAST-IN PLACE 2", PRECAST 1½"; FOOTINGS: CAST-IN PLACE 2½" TOP BARS, 3" BOTTOM BARS, 2" SIDE COVER; PRECAST 2" TOP BARS, 1½" BOTTOM BARS, 1½" SIDE COVER; SLABS: CAST-IN PLACE 2" TOP & BOTTOM BARS
2. THIS SHEET DEPICTS THE VARIOUS COMPONENTS REQUIRED FOR COMPLETE INLET ASSEMBLIES. FOR INDIVIDUAL COMPONENTS AND OTHER SPECIAL DETAILS, SEE THE FOLLOWING: SHEET 2 OF 10 FOR CONCRETE TOP UNITS. SHEET 3, 4 & 5 OF 10 FOR GRATES AND GRADE ADJUSTMENT RINGS. SHEET 6 OF 10 FOR FRAMES. SHEET 7 OF 10 FOR STANDARD INLET BOXES (CAST-IN-PLACE). SHEET 8 OF 10 FOR STANDARD INLET BOXES (PRECAST). SHEET 9 OF 10 FOR MODIFIED INLET BOXES (CAST-IN-PLACE AND PRECAST). SHEET 10 OF 10 FOR TYPE D-H INLET.
3. EACH TYPE OF INLET SHOWN IS SUITED FOR A PARTICULAR SITUATION AS FOLLOWS: TYPE C INLET IS DESIGNATED FOR INSTALLATION WITH NON-MOUNTABLE CURBS. TYPE M INLET IS DESIGNATED FOR INSTALLATION IN MEDIAN AREAS AND MOUNTABLE CURBS. TYPE S INLET IS DESIGNATED FOR INSTALLATION IN SHOULDER SWALE AREAS.
4. THE SELECTION OF COMPONENTS TO ACHIEVE A SPECIFIED INLET ASSEMBLY IS THE CONTRACTOR'S RESPONSIBILITY.
5. USE PRECAST CONCRETE OR STEEL GRADE ADJUSTMENT RINGS WHEN REQUIRED. (REHABILITATION PROJECTS)
6. FOR WALL REINFORCEMENT, BOTH DIRECTIONS, USE 10" 2/m MIN EACH WAY, EACH FACE 6" MAX. SPACING.
7. FOR FOOTING REINFORCEMENT, TOP AND BOTTOM, USE #4 BARS AT 12" CENTERS EACH WAY OR 17" 2/m WWF 6" MAX. SPACING.
8. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.
9. PROVIDE WEEP HOLES ON INLET BOXES WHEN REQUIRED.
10. PIPES MAY BE CONNECTED TO DRAINAGE STRUCTURES (PRECAST INLETS, ETC.) WITH MORTAR OR WATERTIGHT RUBBER FLEXIBLE CONNECTORS.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

INLETS
INLET ASSEMBLIES

RECOMMENDED APR.15, 2004 DIRECTOR, BUREAU OF DESIGN | RECOMMENDED APR.15, 2004 CHIEF ENGINEER | SHT 1 OF 10 | RC-34M



NOTES

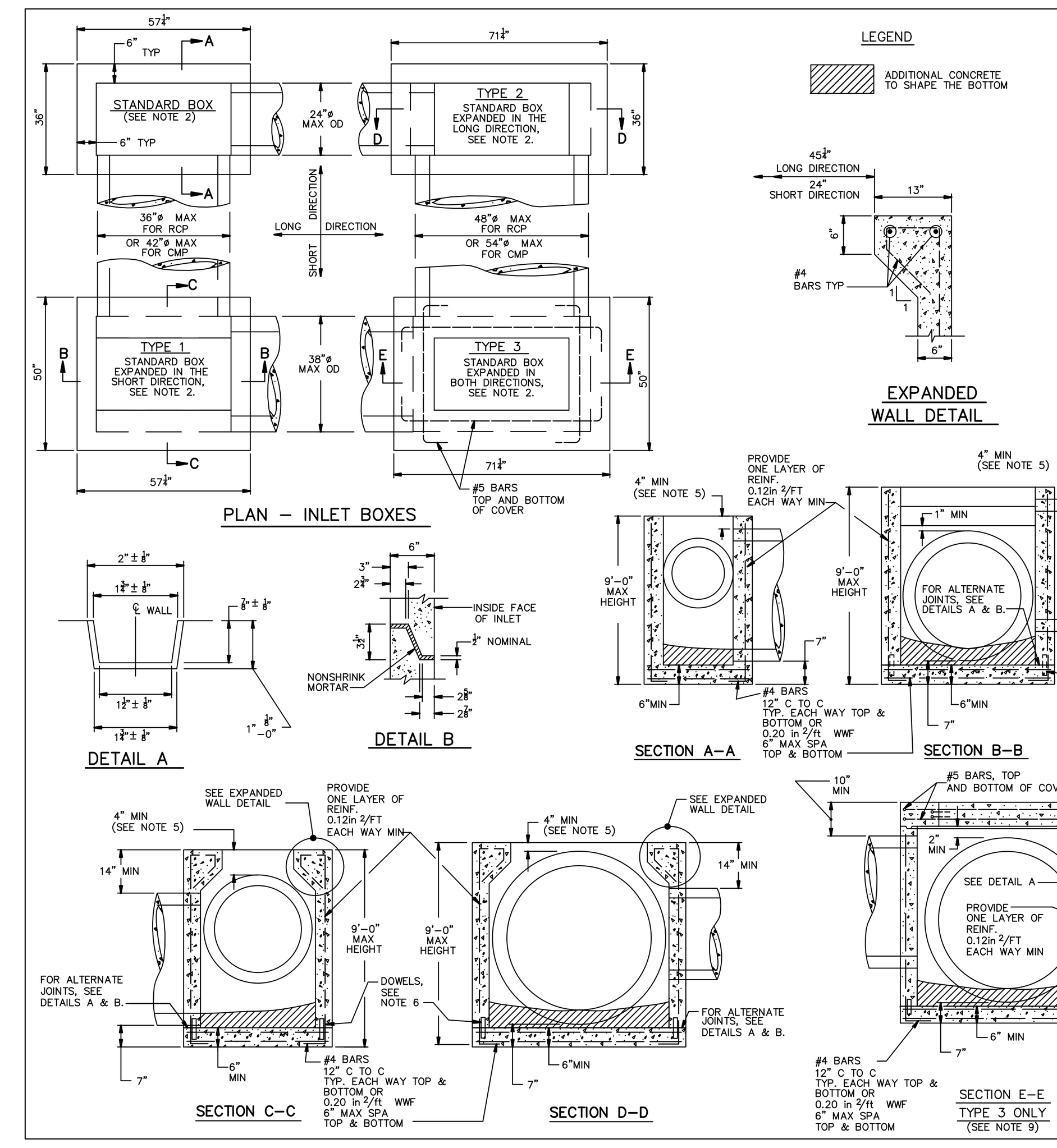
1. THIS SHEET DEPICTS THE SHAPE AND DIMENSIONS REQUIRED FOR UNIFORMITY AND COMPATIBILITY. PERMIT ONLY TOP UNITS SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. FOR DEVIATIONS OR MODIFICATIONS OF THE STANDARDS SUBMIT SHOP DRAWINGS FOR APPROVAL.
2. CAST-IN-PLACE TOP UNITS MAY BE MONOLITHIC WITH THE INLET BOX.
3. PROVIDE ANGLES EMBEDDED IN THE CONCRETE AS A BEARING AREA FOR THE GRATE FOR ALL TOP UNITS WHICH SEAT THE GRATE DIRECTLY WITHIN THE UNIT.
4. PLACE A TYPE M INLET ADJACENT TO THE BACK EDGE OF THE CURB, FLUSH WITH THE PAVEMENT SURFACE, WHEN REQUIRED WITHIN A CONCRETE MOUNTABLE CURB SECTION.
5. DOWEL TYPE C INLET TOP UNITS WITH 2-#25 x 2-#8 x 1'-0" DOWEL BARS AND PLACE PREMOLDED EXPANSION JOINT FILLER ¾" WIDE WHEN CONNECTING TO ADJACENT CURB SECTIONS.
6. THE PLACEMENT OF THE TYPE S INLET RELATIVE TO THE GUTTER INVERT IS DEPENDENT ON THE RATE OF BACK SLOPE. FOR BACK SLOPES GREATER THAN 2:1, LOCATE THE INLET WHERE THE BACK SLOPE LINE INTERSECTS THE BACK, TOP, OUTSIDE CORNER OF THE INLET. FOR BACK SLOPES LESS THAN 2:1, LOCATE THE INLET WHERE THE BACK SLOPE LINE INTERSECTS THE EDGE OF THE INLET GRATE.
7. TAPERS MAY BE PROVIDED ON INSIDE VERTICAL FACES OF PRECAST INLET TOPS TO FACILITATE FORM STRIPPING. TAPERS WILL RESULT IN INTERNAL BOTTOM DIMENSIONS THAT VARY TO A MAXIMUM OF 1".

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

INLETS
CONCRETE TOP UNITS
CAST-IN-PLACE AND PRECAST

RECOMMENDED APR.15, 2004 DIRECTOR, BUREAU OF DESIGN | RECOMMENDED APR.15, 2004 CHIEF ENGINEER | SHT 2 OF 10 | RC-34M



LEGEND

ADDITIONAL CONCRETE TO SHAPE THE BOTTOM

NOTES

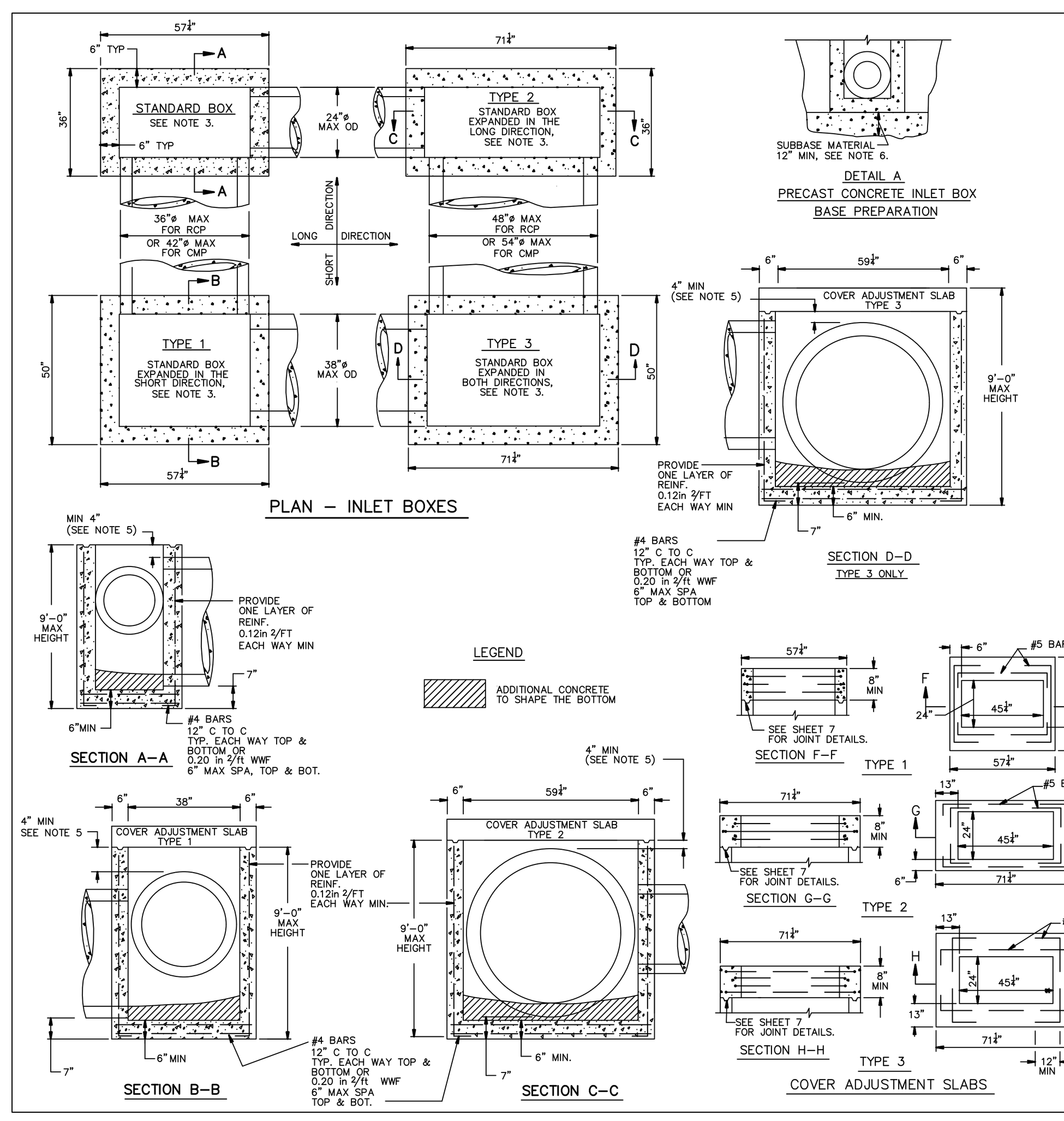
1. CONSTRUCT INLET BOXES IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408, SECTION 605.
2. PROVIDE INLET BOXES WITH 24"x 45¾" STANDARD OPENING TO ACCOMMODATE THE STANDARD TOP COMPONENTS.
3. FOR CAST-IN-PLACE OR PRECAST CONSTRUCTION, PROVIDE INLET WALLS 6" THICK, UNLESS OTHERWISE INDICATED.
4. INLETS THAT EXCEED THE MAXIMUM HEIGHT SHOWN SHALL REQUIRE SPECIAL DETAILS AND DESIGN FOR THE INLET WALLS AND BASE. CONSTRUCT INLETS THAT EXCEED 5' IN HEIGHT WITH STEPS SIMILAR TO MANHOLES. SEE RC-39M.
5. LOCATE PIPE OR PIPES, AS INDICATED, WITH THE INLET BOTTOM SHAPED TO CHANNEL THE FLOW TOWARD THE OUTLET PIPE. WHEN PROJECT CONDITIONS REQUIRE PIPES TO BE LOCATED WITHIN 4" FROM THE TOP OF THE INLET BOX, PROVIDE AN ADDITIONAL #3 REINFORCEMENT BAR LOCATED 1½" FROM THE TOP OF THE INLET BASE, FULL WIDTH ALONG THE INLET FACE. IF REINFORCED CONCRETE PIPE IS USED, THE PIPE BLOCKOUT MAY BE FORMED 'FLUSH' WITH THE INLET BASE. LIMIT PIPE BLOCKOUT OF WALL TO 1".
6. PLACE #4 REINFORCEMENT BARS, MINIMUM 12" LONG, SPACED AT 12" C TO C, AS DOWELS BETWEEN THE INLET BASE AND WALLS WHEN THE CONCRETE WALLS AND INLET BASE ARE NOT CONSTRUCTED MONOLITHICALLY. THE DOWELS MAY BE ELIMINATED IF AN ALTERNATE JOINT IS CONSTRUCTED AS SHOWN IN DETAILS A & B.
7. FOR CAST-IN-PLACE CONSTRUCTION, WHEN THE BASE IS CONSTRUCTED MONOLITHICALLY WITH THE VERTICAL WALLS, PROVIDE 3" MINIMUM FROM THE BOTTOM OF THE PIPE TO THE BOTTOM OF THE INLET BOX.
8. FOR PIPE DIAMETERS LARGER THAN 48" RCP OR 54" CMP USE A MODIFIED INLET BOX. SEE SHEET 9.
9. FOR INLETS OTHER THAN AS SHOWN ON THE STANDARDS, PROVIDE REINFORCEMENT BASED ON PHL 93 AND P-82 LOADING AND IN ACCORDANCE WITH PUBLICATION 408.
10. CONSTRUCTION JOINTS AND KEYS MAY BE CONSTRUCTED UPWARDS OR DOWNWARDS. CLEAN JOINTS AND KEYS THOROUGHLY BEFORE PLACING NEXT CONCRETE SEGMENT.
11. FOR SUBBASE, SEE NOTE 6 ON SHEET 8.
12. WHEN NECESSARY, THE BLOCKOUT MAY REMOVE UP TO 1" OF EACH WALL AT 3:00/9:00 LOCATIONS FOR RC PIPE CONNECTIONS.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

INLETS
STANDARD INLET BOXES
(CAST-IN-PLACE)

RECOMMENDED APR.15, 2004 DIRECTOR, BUREAU OF DESIGN | RECOMMENDED APR.15, 2004 CHIEF ENGINEER | SHT 7 OF 10 | RC-34M



NOTES

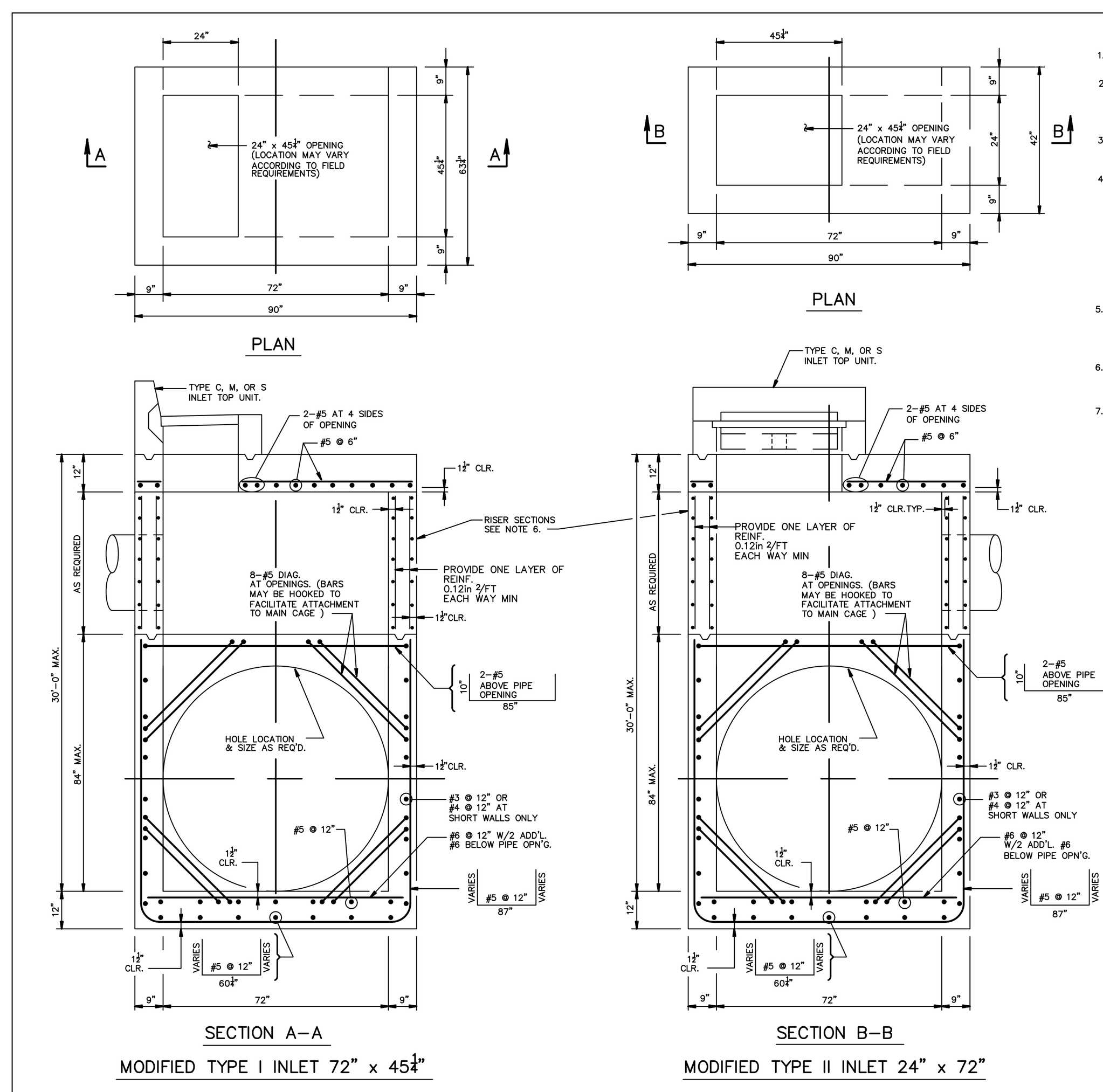
1. CONSTRUCT INLET BOXES IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408, SECTION 714.
2. PERMIT ONLY PRECAST INLET BOXES SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. USE CLASS AA CEMENT CONC FOR PRECAST BOXES. FOR DEVIATIONS OR MODIFICATIONS OF THE STANDARDS, SUBMIT SHOP DRAWINGS FOR APPROVAL.
3. PROVIDE STANDARD INLET BOXES AND COVER ADJUSTMENT SLABS WITH A 24"x 46" OPENING TO ACCOMMODATE STANDARD TOP COMPONENTS.
4. FOR INLETS THAT DEVIATE FROM THE STANDARD SUBMIT SPECIAL DETAILS AND DESIGN FOR THE INLET WALLS AND BASE TO THE BUREAU OF CONSTRUCTION FOR REVIEW AND APPROVAL. CONSTRUCT INLETS THAT EXCEED 5' IN HEIGHT WITH STEPS SIMILAR TO MANHOLES (SEE RC-39M). FOR INLETS OTHER THAN AS SHOWN ON THE STANDARDS, PROVIDE REINFORCEMENT BASED ON PHL 93 (HS 25) LOADING AND IN ACCORDANCE WITH PUBLICATION 408.
5. LOCATE PIPE OR PIPES, AS INDICATED, WITH THE INLET BOTTOM SHAPED TO CHANNEL THE FLOW TOWARD THE OUTLET PIPE. WHEN PROJECT CONDITIONS REQUIRE PIPE BLOCKOUTS TO BE FORMED WITHIN 4" FROM THE TOP OF THE INLET BOX, PROVIDE AN ADDITIONAL #3 REINFORCEMENT BAR LOCATED 1½" FROM THE TOP OF THE INLET BASE, FULL WIDTH ALONG THE INLET FACE. REMOVE ANY VISIBLE PORTION OF THE BAR, IF REQUIRED DURING INSTALLATION AND PRIOR TO JOINING THE PIPE TO THE INLET. IF REINFORCED CONCRETE PIPE IS USED, THE PIPE BLOCKOUT MAY BE FORMED 'FLUSH' WITH THE INLET BASE. LIMIT PIPE BLOCKOUT OF WALL TO 1".
6. PLACE SUBBASE MATERIAL MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 350.2, IN LAYERS 4" THICK, COMPACTED TO A DENSITY SATISFACTORY TO THE ENGINEER AND INCIDENTAL TO THE INLET PAY ITEM.
7. FOR PIPE DIAMETERS LARGER THAN 48" RCP OR 54" CMP, USE A MODIFIED INLET BOX, SHEET 9.
8. PROVIDE CONSTRUCTION JOINTS AS REQUIRED FOR INLET BOXES THAT ARE NOT MONOLITHIC. SEE DETAILS A & B SHEET 7.
9. TAPERS MAY BE PROVIDED ON VERTICAL FACES OF PRECAST INLET BOX BASE UNITS TO FACILITATE FORM STRIPPING. TAPERS WILL RESULT IN INTERNAL BOTTOM DIMENSIONS THAT VARY TO A MAXIMUM OF 1".
10. PROVIDE SUITABLE LIFTING DEVICES FOR HANDLING AND INSTALLATION. GALVANIZE METAL DEVICES AS SPECIFIED IN PUB. 408 SECTION 1105. TAPERS MAY BE PROVIDED ON INSIDE VERTICAL FACES OF PRECAST INLET TOPS TO FACILITATE FORM STRIPPING. TAPERS WILL RESULT IN INTERNAL BOTTOM DIMENSIONS THAT VARY TO A MAXIMUM OF 1".

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

INLETS
STANDARD INLET BOXES
(PRECAST)

RECOMMENDED APR.15, 2004 DIRECTOR, BUREAU OF DESIGN | RECOMMENDED APR.15, 2004 CHIEF ENGINEER | SHT 8 OF 10 | RC-34M



NOTES

1. CONSTRUCT IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408, SECTION 605 AND SECTION 714.
2. PROVIDE INLETS WITH A MAXIMUM HEIGHT TO BE THE GRADE ELEVATION. WHEN THE REQUIRED HEIGHT EXCEEDS THE MAXIMUM SHOWN, SHOW SPECIAL DETAILS AND DESIGN FOR THE INLET WALLS AND BASE. CONSTRUCT INLETS THAT EXCEED 5' IN HEIGHT WITH STEPS SIMILAR TO MANHOLES (SEE RC-39M)
3. WHEN A SITUATION CAN NOT BE SATISFIED BY THE MODIFIED INLET BOXES SHOWN, PROVIDE SPECIAL DETAILS AND DESIGNS.
4. FOR ORIENTATION OF THE TYPE C INLET TOP WITH MODIFIED TYPE I INLET BOX, THE TYPICAL INSTALLATION DETAILS ARE SHOWN BELOW. SHOW ANY VARIATION ON THE CONSTRUCTION DRAWINGS BY SPECIAL DETAILS.
5. PROVIDE A MINIMUM HEIGHT OF 20" MEASURED FROM THE TOP SURFACE OF THE TOP UNIT TO THE INSIDE TOP OF THE PIPE WHEN THE TOP UNIT AND EITHER A MODIFIED TYPE I OR A MODIFIED TYPE II INLET BOX ARE CONSTRUCTED MONOLITHICALLY.
6. FOR THAT PORTION OF THE INLET ASSEMBLY WHERE THE DEPTH MEASURED FROM GRADE IS LESS THAN 9'-0" A COVER REDUCTION SLAB AND STANDARD 24"x 45¾" RISER SECTION MAY BE UTILIZED.
7. PERMIT ONLY PRECAST MODIFIED INLET BOXES SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15.

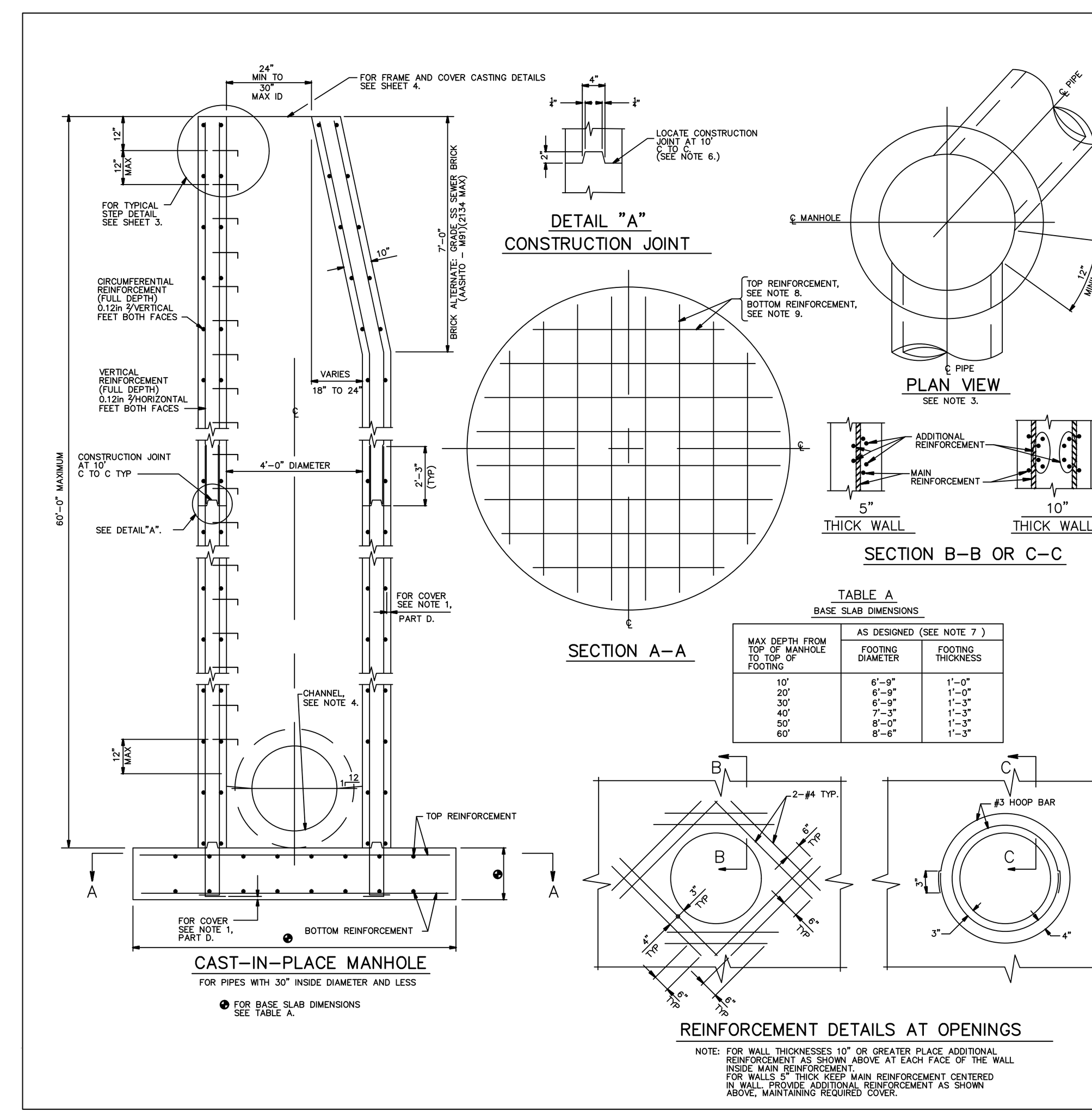
PIPE OPENING DETAILS

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

INLETS
MODIFIED INLET BOXES
(CAST-IN-PLACE AND PRECAST)

RECOMMENDED APR.15, 2004 DIRECTOR, BUREAU OF DESIGN | RECOMMENDED APR.15, 2004 CHIEF ENGINEER | SHT 9 OF 10 | RC-34M



NOTES

1. CONSTRUCTION REQUIREMENTS:
   A. CONSTRUCT IN ACCORDANCE WITH PUBLICATION 408, SECTIONS 605, 606 AND 714; AND ASTM C-478M-90, STANDARD SPECIFICATION FOR PRECAST REINFORCED CONCRETE MANHOLE SECTIONS, AS MODIFIED HEREIN.
   B. MINIMUM CONCRETE CLASS: CAST-IN-PLACE CLASS A; PRECAST CLASS AA
   C. PROVIDE STEEL REINFORCEMENT IN ACCORDANCE WITH ASTM A185, STEEL WELDED WIRE FABRIC ASTM A663/A663M & A675/A675M, PLAIN BILLET STEEL BARS OR ASTM A615/A615M, DEFORMED BILLET STEEL BARS. PROVIDE MINIMUM YIELD STRENGTH OF 60,000 PSI .
   D. CLEAR COVER FOR STEEL: WALLS: CAST-IN-PLACE 2", PRECAST 1½"; FOOTINGS: CAST-IN-PLACE 2½" TOP BARS, 3" BOTTOM BARS, 2" SIDE COVER; PRECAST 2" TOP BARS, 1½" BOTTOM BARS, 1½" SIDE COVER; SLABS: CAST-IN-PLACE 2" TOP & BOTTOM BARS
2. FOR PIPES WITH INSIDE DIAMETERS GREATER THAN 30" SEE MODIFIED CAST-IN-PLACE MANHOLES, SHEET 2.
3. PROVIDE 12" MINIMUM HORIZONTAL CLEARANCE BETWEEN OPENINGS LOCATED AT THE SAME DEPTH. LOCATE PIPES NOT AT THE SAME DEPTH VERTICALLY AT LEAST ONE HALF THE MAXIMUM OPENING DIAMETER APART.
4. FORM A CONCRETE CHANNEL AT THE BOTTOM OF THE MANHOLE CONFORMING TO THE SHAPE OF THE LOWER HALF OF THE INCOMING AND/OR OUTGOING PIPES. PROVIDE A FULL DEPTH U-SHAPED CHANNEL WHEN NECESSARY TO REDUCE ENERGY LOSSES.
5. USE 5" THICK WALLS WITH ONE (1) ROW OF REINFORCING, OR USE 10" THICK OR GREATER WALLS WITH TWO (2) ROWS OF REINFORCING.
6. CONSTRUCTION JOINTS AND KEYS MAY BE CONSTRUCTED UPWARDS OR DOWNWARDS. CLEAN JOINTS AND KEYS THOROUGHLY BEFORE PLACING NEXT CONCRETE SEGMENT.
7. A SAFE BEARING CAPACITY OF 1.5 Tons Per S.F. UNDER THE ENTIRE BASE SLAB IS ASSUMED TO DETERMINE THE BASE SIZE. WHEN THE SUBSOIL IS EXTREMELY POOR, PROCEED WITH CONSTRUCTION ONLY AFTER THE ENGINEER SPECIFIES AN ADEQUATE BASE DESIGN.
8. FOR FOOTING TOP REINFORCEMENT, BOTH DIRECTIONS, USE NO.19 (6) BARS AT 12" FOR DEPTHS TO 60' OR 0.30 in ²/FT WWF FOR DEPTHS TO 30' AND 0.32 in ²/FT WWF FOR DEPTHS GREATER THAN 30'-6" MAXIMUM SPACING FOR WWF.
9. FOR FOOTING BOTTOM REINFORCEMENT, BOTH DIRECTIONS, USE NO.13 (4) BARS AT 18" FOR DEPTHS TO 60' OR 0.15in ²/FT WWF FOR DEPTHS TO 30' AND 0.16in ²/FT WWF FOR DEPTHS GREATER THAN 30'-6" MAXIMUM SPACING FOR WWF.
10. ALL DIMENSIONS ARE IN ENGLISH UNLESS OTHERWISE NOTED.

TABLE A
BASE SLAB DIMENSIONS

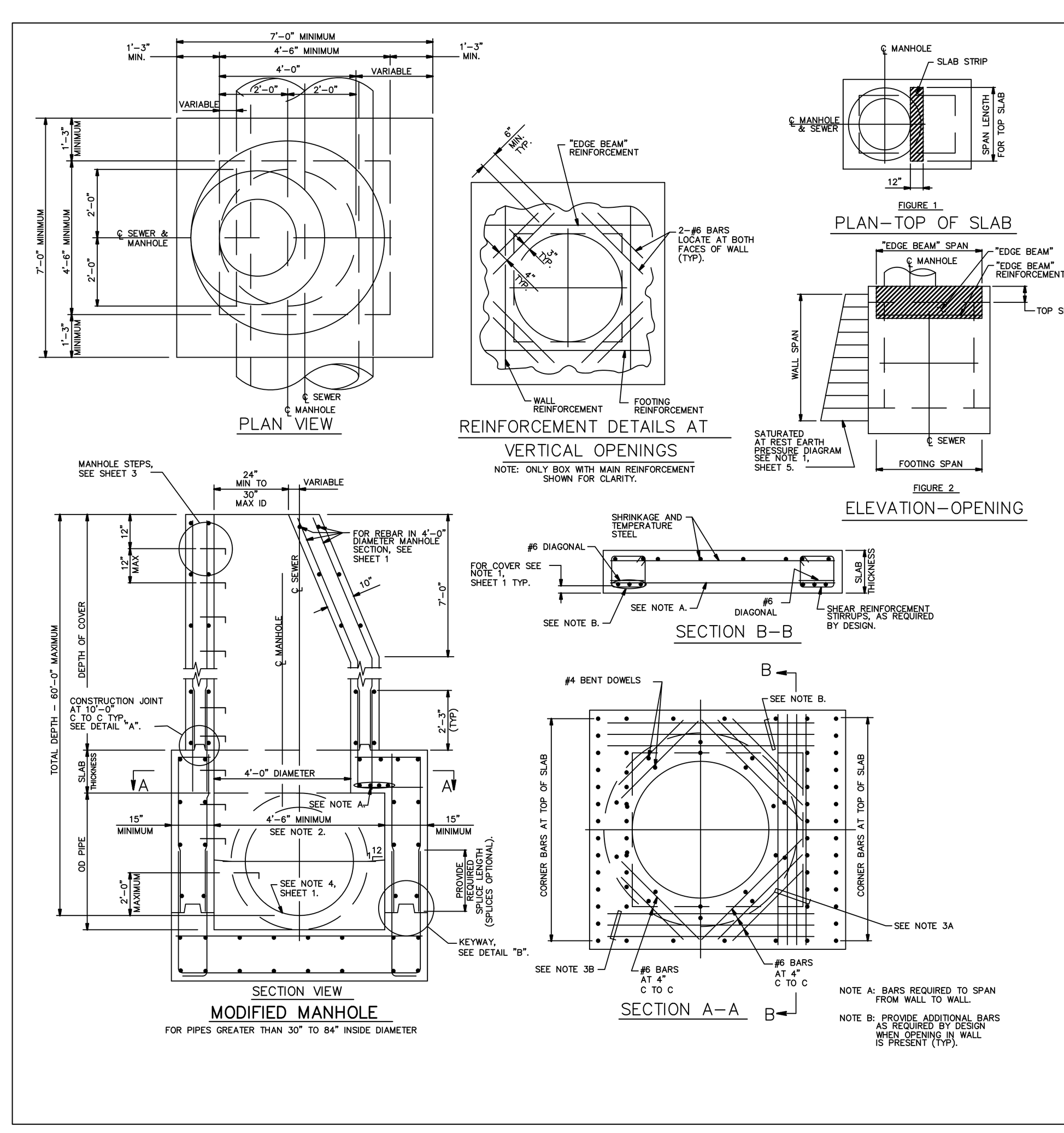
MAX DEPTH FROM TOP OF MANHOLE TO TOP OF FOOTING	AS DESIGNED (SEE NOTE 7) FOOTING DIAMETER	FOOTING THICKNESS
10'	6'-9"	1'-0"
20'	6'-9"	1'-0"
30'	6'-9"	1'-3"
40'	7'-3"	1'-3"
50'	8'-0"	1'-3"
60'	8'-6"	1'-3"

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

STANDARD MANHOLES
CAST-IN-PLACE MANHOLES

RECOMMENDED APR.15, 2004 DIRECTOR, BUREAU OF DESIGN | RECOMMENDED APR.15, 2004 CHIEF ENGINEER | SHT 1 OF 6 | RC-39M



NOTES

1. FOR CONSTRUCTION REQUIREMENTS SEE NOTE 1, SHEET 1. FOR DESIGN REQUIREMENTS SEE NOTE 1, SHEET 5.
2. INCREASE BOX SIZE WHEN REQUIRED TO KEEP WALLS OF MANHOLE BOX SECTION FLUSH WITH THE OPENING FOR PIPES LARGER THAN 42" ID. INDICATE THE BOX SIZE ON THE CONSTRUCTION PLANS OR SHOP DRAWINGS BASED ON THE DESIGN PROCEDURES PROVIDED BELOW.
3. DESIGN PROCEDURE FOR MANHOLE BOX SECTION: DESIGN ALL MEMBERS FOR MOMENT, CRACK CONTROL & SHEAR AT DISTANCE d (EFFECTIVE DEPTH OF MEMBER) FROM FACE OF SUPPORT. CALCULATE ALL SPAN LENGTHS FROM THE CENTER OF THE SUPPORTS.

3A. TOP SLAB
- DESIGN A 12" WIDE SLAB STRIP FOR ONE-WAY ACTION TO CARRY DEAD LOAD, LIVE LOAD, AND WEIGHT OF EARTH. SPAN THE STRIP, SIMPLY SUPPORTED, ACROSS THE WIDTH OF THE BOX OR IN THE SHORT DIRECTION. SEE FIGURE 1 FOR DETAILS.
- PLACE ADDITIONAL BARS IN THE SLAB AT 45° AROUND THE MANHOLE OPENING. SEE SECTION A-A FOR DETAILS.

3B. "EDGE BEAM"
VIEWS SHOWING THE CONFIGURATION OF MANHOLE BOX SECTION ILLUSTRATE "EDGE BEAMS" TO BE THE SAME DEPTH AS THE TOP SLAB. TO ACHIEVE REQUIRED CAPACITY WHERE NECESSARY, INCREASE DEPTH OF "EDGE BEAM" BY PROVIDING ADDITIONAL CLEARANCE BETWEEN THE SLAB AND TOP OF OPENING. LOCATE HORIZONTAL STEEL FOR BEAM ABOVE THE SOFFIT OF THE OPENING. SEE FIGURE 2 FOR DETAILS.
- DESIGN THE "EDGE BEAMS", SPANNING THE LENGTH OF THE BOX, TO CARRY A UNIFORMLY DISTRIBUTED LOAD EQUAL TO THE REACTION FROM THE SLAB.

3C. WALLS
- DESIGN THE WALLS TO CARRY THE AXIAL LOAD, DUE TO EARTH LOAD, LIVE LOAD, AND DEAD LOAD APPLIED DIRECTLY TO THE WALL IN ADDITION TO REACTIONS FROM THE "EDGE BEAMS", AND THE VERTICAL MOMENT CAUSED BY SATURATED AT REST EARTH PRESSURE. SEE FIGURE 2 FOR PRESSURE DIAGRAM. CONSIDER THE WALL SIMPLY SUPPORTED BETWEEN TOP SLAB AND FOOTING. PROVIDE THE SAME REINFORCEMENT ON THE OUTSIDE FACE.

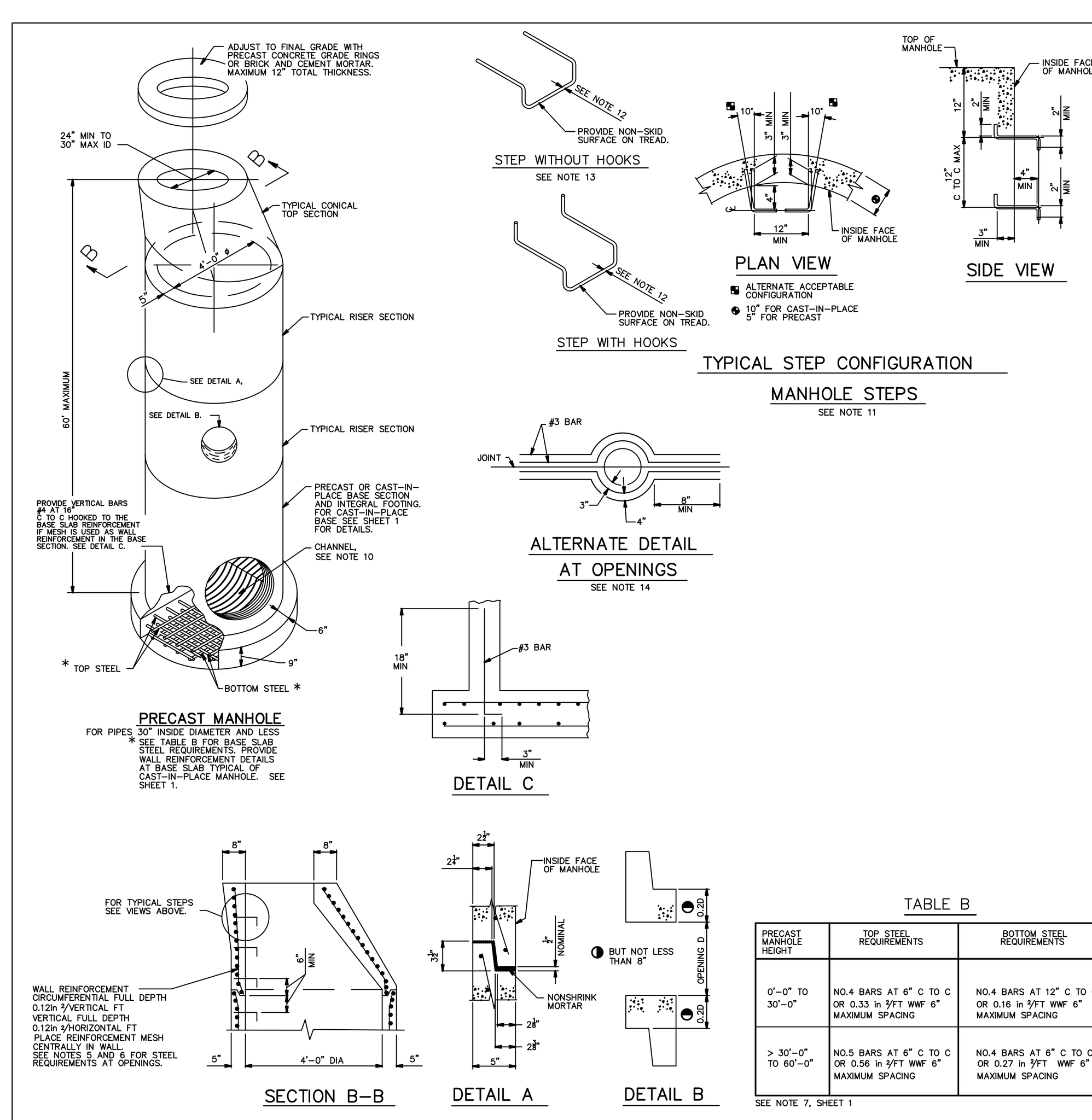
3D. FOOTING
- DESIGN SPAN NORMAL TO PIPE TO CARRY POSITIVE MOMENT OF 1/10 WL² AND NEGATIVE MOMENT OF 1/12 WL² WHERE W IS THE UNIFORM BEARING PRESSURE. DO NOT TAKE INTO ACCOUNT THE CONCRETE IN THE CHANNEL WHEN CALCULATING CAPACITY OF THE FOOTING.
- AS A MINIMUM, PROVIDE NO.4 BARS AT 12" CENTERS, TOP AND BOTTOM OF SLAB IN THE OPPOSITE DIRECTION.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

STANDARD MANHOLES
MODIFIED
CAST-IN-PLACE MANHOLES

RECOMMENDED APR.15, 2004 DIRECTOR, BUREAU OF DESIGN | RECOMMENDED APR.15, 2004 CHIEF ENGINEER | SHT 2 OF 6 | RC-39M



NOTES

1. PRECAST MANHOLES MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 714, MAY BE SUBSTITUTED FOR THE STANDARD CAST-IN-PLACE MANHOLE. FOR DEVIATION OR MODIFICATION OF THE STANDARDS, SUBMIT SHOP DRAWINGS FOR APPROVAL.
2. FOR CONSTRUCTION REQUIREMENTS SEE NOTE 1, SHEET 1. FOR DESIGN REQUIREMENTS SEE NOTE 1, SHEET 5.
3. FOR PERMISSIBLE LOCATION OF PIPES SEE PLAN VIEW AND NOTE 3, SHEET 1.
4. FOR RISERS OR BASE SECTIONS WITH OPENINGS, PROVIDE A MINIMUM HEIGHT OF SECTION SO AS TO PROVIDE AN UNCUT WALL EQUAL TO 20% OF THE OPENING, BUT NO LESS THAN 8", BETWEEN THE OPENING AND THE CLOSEST JOINT BETWEEN RISERS - SEE DETAIL B.
5. FOR PRECAST RISER OR BASE SECTIONS WITH ONE OPENING LOCATED AT DEPTHS TO 60', PROVIDE CIRCUMFERENTIAL REINFORCEMENT IN ACCORDANCE WITH SECTION B-B. FOR SECTIONS WITH TWO OR MORE OPENINGS, LOCATED AT DEPTH OF 10' AND LESS, PROVIDE CIRCUMFERENTIAL REINFORCEMENT EQUAL TO 0.16 in ²/VERTICAL FT. FOR THE HEIGHT OF THE RISER OR BASE SECTION.
6. FOR RISERS OR BASE SECTIONS WITH TWO OR MORE OPENINGS, LOCATED AT A DEPTH GREATER THAN 10', BUT LESS THAN OR EQUAL TO 25', PROVIDE CIRCUMFERENTIAL REINFORCEMENT EQUAL TO 0.44 in ²/VERTICAL FT. FOR THE HEIGHT OF THE RISER OR BASE SECTION.
7. FOR RISERS OR BASE SECTIONS WITH TWO OR MORE OPENINGS, LOCATED AT DEPTHS GREATER THAN 25', USE A 10" THICK WALL RISER OR BASE SECTION WITH CIRCUMFERENTIAL REINFORCEMENT EQUAL TO 0.22 in ²/VERTICAL FT. EACH FACE.
8. MARK RISERS OR BASE SECTIONS WITH HOLES CLEARLY WITH MAXIMUM ALLOWABLE DEPTH.
9. PROVIDE ADDITIONAL REINFORCEMENT BARS AROUND OPENINGS AS SHOWN ON REINFORCEMENT DETAILS AT OPENINGS SHEET 1.
10. FOR CHANNEL DETAILS IN PRECAST MANHOLE SEE CAST-IN-PLACE MANHOLE SHEET 1.
11. PROVIDE MANHOLE STEPS MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 605.2(c). ALTERNATE CONFIGURATIONS AND DIMENSIONS, AS APPROVED BY THE ENGINEER, MAY BE USED.
12. PROVIDE MINIMUM 1" SECTION DIMENSION FOR METAL STEPS. PROVIDE MINIMUM ¾" SECTION DIMENSION FOR NON-DETERIORATING MATERIAL STEPS.
13. MECHANICAL ANCHOR REQUIRED FOR INSTALLATION OF STEPS WITHOUT HOOKS.
14. THE ALTERNATE OPENING REINFORCEMENT DETAIL IS NOT DESIRABLE BY DESIGN. USE IT TO MEET EXISTING PIPE ELEVATIONS.

TABLE B

PRECAST MANHOLE HEIGHT	TOP STEEL REQUIREMENTS	BOTTOM STEEL REQUIREMENTS
0'-0" TO 30'-0"	NO.4 BARS AT 6" C TO C OR 0.33 in ²/FT WWF 6" MAXIMUM SPACING	NO.4 BARS AT 12" C TO C OR 0.16 in ²/FT WWF 6" MAXIMUM SPACING
> 30'-0" TO 60'-0"	NO.5 BARS AT 6" C TO C OR 0.56 in ²/FT WWF 6" MAXIMUM SPACING	NO.4 BARS AT 6" C TO C OR 0.27 in ²/FT WWF 6" MAXIMUM SPACING

SEE NOTE 7, SHEET 1

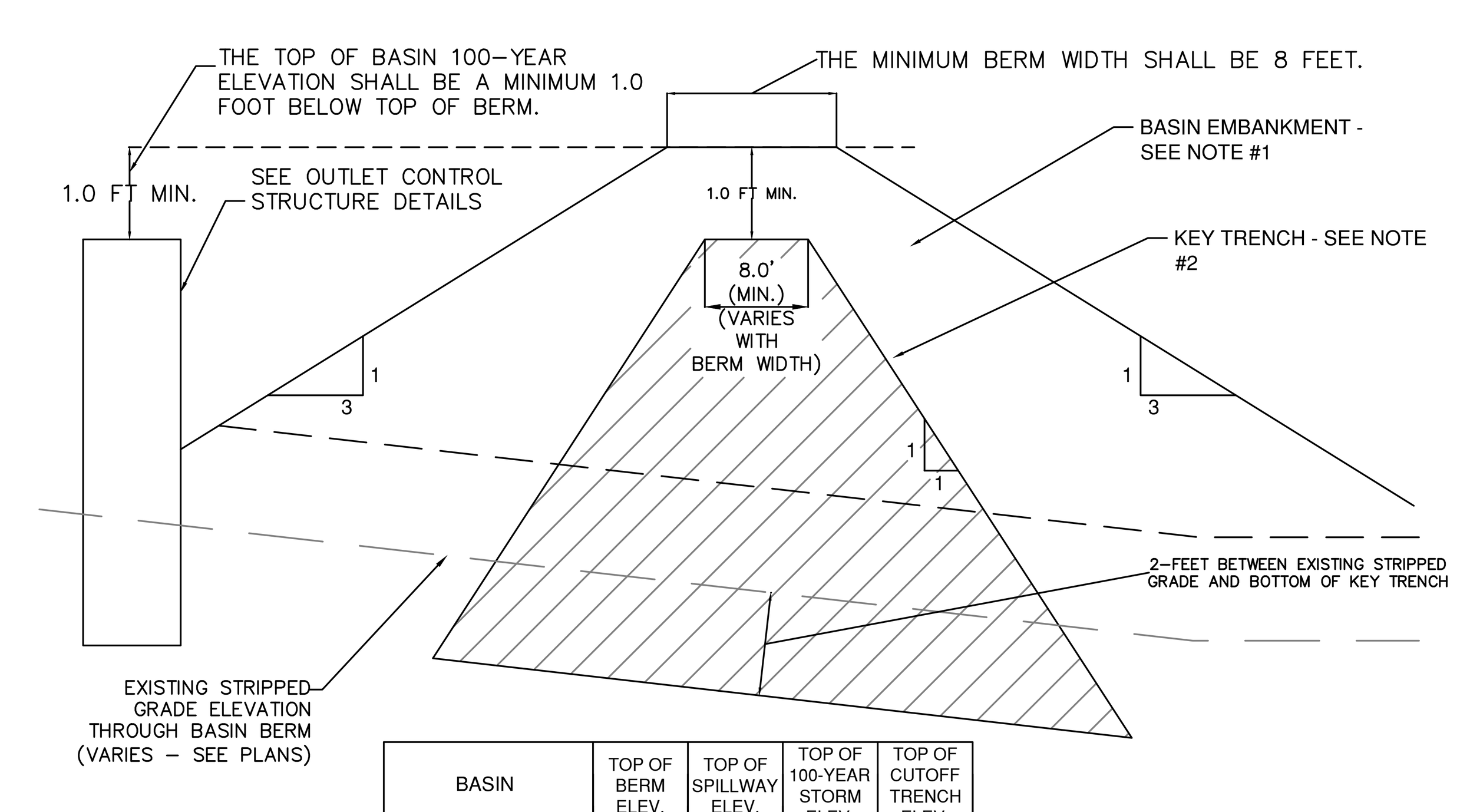
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

STANDARD MANHOLES
PRECAST MANHOLES &
MANHOLE STEPS

RECOMMENDED APR.15, 2004 DIRECTOR, BUREAU OF DESIGN | RECOMMENDED APR.15, 2004 CHIEF ENGINEER | SHT 3 OF 6 | RC-39M

NOTES:
1. ALL BASIN EMBANKMENTS SHALL BE CLEARED, GRUBBED, AND STRIPPED OF TOPSOIL TO A DEPTH OF TWO FEET PRIOR TO ANY PLACEMENT AND COMPACTION OF EARTHEN FILL. FILL MATERIAL FOR THE EMBANKMENTS SHALL BE FREE OF ROOTS, OR OTHER WOODY VEGETATION, ORGANIC MATERIAL, LARGE STONES, AND OTHER OBJECTIONABLE MATERIALS. THE EMBANKMENT SHALL BE COMPACTED IN LAYERED LIFTS CONSISTING OF MAXIMUM 8-INCH LIFTS. THE MAXIMUM ROCK SIZE SHALL BE NO GREATER THAN 2/3 THE LIFT THICKNESS. EMBANKMENTS SHALL BE COMPACTED TO A MINIMUM OF 95% DRY DENSITY. COMPACTION TESTS SHALL BE PERFORMED USING THE MODIFIED PROCTOR METHOD IN ACCORDANCE WITH ASTM-D-1557.
2. KEY TRENCH SHALL HAVE A MINIMUM DEPTH OF FILL MATERIAL THAT IS 2' BELOW THE STRIPPED GRADE (OR SHALLOWER IF BEDROCK IS ENCOUNTERED), MINIMUM WIDTH=4', MAXIMUM SIDE SLOPE STEEPNESS IS 1H:1V AND FILLED WITH HIGHLY IMPERVIOUS AND WELL COMPACTED CLAY MATERIAL. THE TRENCH MUST BE INSTALLED IN ALL AREAS OF FILL AND EXTEND UP BOTH ABUTMENTS TO 1' BELOW THE TOP OF BERM ELEVATION, AND EXCAVATED UNDER THE ENTIRE LENGTH OF THE BERM AND LOCATED AT OR UPSTREAM OF THE CENTERLINE OF THE BERM. COMPACTION REQUIREMENTS SHOULD BE THE SAME AS THOSE FOR THE EMBANKMENT. THE TRENCH SHOULD BE DEWATERED DURING BACKFILLING AND COMPACTION OPERATIONS.



BASIN	TOP OF BERM ELEV.	TOP OF SPILLWAY ELEV.	TOP OF 100-YEAR STORM ELEV.	TOP OF CUTOFF TRENCH ELEV.
INF4-1	462.50	461.25	459.98	461.50
INF4-2	463.80	462.63	461.65	462.80

(NOT TO SCALE)

INFILTRATION BASIN BERM DETAIL

DETAILS OTHER THAN THOSE INDICATED ARE ON THE FOLLOWING STANDARD DETAILS FROM PENNDOT PUBLICATION 72M:

STANDARD DETAILS

STANDARD DRAWING NUMBER	DRAWING DATE
RC-31M	JUNE 1, 2010
RC-33M	JUNE 1, 2010
RC-39M	JUNE 1, 2010
RC-45M	JUNE 1, 2010
RC-46M	JUNE 1, 2010

THE CONTRACTOR IS REQUIRED TO OBTAIN THE THE MOST CURRENT APPLICABLE RC DRAWINGS FROM PENNDOT PUBLICATION 72M.

Date	Description	No.

REVISIONS

JOHN C. COTE — PROFESSIONAL ENGINEER PA Lic. No. PE085407
SIGNATURE — 2/24/2023 DATE SIGNED

LANGAN
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Project
SMITHFIELD GATEWAY
PHASE 1A-2
SMITHFIELD TOWNSHIP
MONROE COUNTY PENNSYLVANIA

Drawing Title
POST CONSTRUCTION STORMWATER MANAGEMENT NOTES & DETAILS

Project No. 100501402
Date FEBRUARY 17, 2023
Drawn By SM
Checked By TH
Drawing No. CG502 1121
Sheet 20 of 39

MAINTENANCE FOR BEST MANAGEMENT PRACTICES NOTES:

THE PCSM PLAN, INSPECTION REPORTS, AND MONITORING RECORDS MUST BE AVAILABLE FOR REVIEW AND INSPECTION BY THE PADEP OR CONSERVATION DISTRICT.

DEPG MOSIER ASSOCIATES, L.P. (OR THE PROPERTY OWNER) IS RESPONSIBLE FOR MAINTENANCE OF THE STORMWATER CONVEYANCE SYSTEM, AND ALL OTHER PROPOSED BMP'S AS THE PROPERTY OWNER.

SEDIMENT REMOVED FROM BMPS SHALL BE DISPOSED OF IN LANDSCAPED AREAS OUTSIDE OF STEEP SLOPES, WETLANDS, FLOODPLAINS OR DRAINAGE SWALES AND IMMEDIATELY STABILIZED, OR PLACED IN TOPSOIL STOCKPILES. VEHICLES SHALL NOT BE PARKED OR DRIVEN OVER INFILTRATION BMPs.

1) INFILTRATION BASINS

- CATCH BASINS AND INLETS (UPGRADIENT OF INFILTRATION BASIN) SHOULD BE INSPECTED AND CLEANED AT LEAST TWO TIMES PER YEAR AND AFTER RUNOFF EVENTS.
- THE VEGETATION ALONG THE SURFACE OF THE INFILTRATION BASIN SHOULD BE MAINTAINED IN GOOD CONDITION, AND ANY BARE SPOTS REVEGETATED AS SOON AS POSSIBLE.
- VEHICLES SHOULD NOT BE PARKED OR DRIVEN ON AN INFILTRATION BASIN, AND CARE SHOULD BE TAKEN TO AVOID EXCESSIVE COMPACTION BY MOWERS.
- INSPECT THE BASIN AFTER RUNOFF EVENTS AND MAKE SURE THAT RUNOFF DRAINS DOWN WITHIN 72 HOURS. MOSQUITO'S SHOULD NOT BE A PROBLEM IF THE WATER DRAINS IN 72 HOURS. MOSQUITOES REQUIRE A CONSIDERABLY LONG BREEDING PERIOD WITH RELATIVELY STATIC WATER LEVELS.
- ALSO INSPECT FOR ACCUMULATION OF SEDIMENT, DAMAGE TO OUTLET CONTROL STRUCTURES, EROSION CONTROL MEASURES, SIGNS OF WATER CONTAMINATION/SPILLS, AND SLOPE STABILITY IN BERMS.
- MOW ONLY AS APPROPRIATE FOR VEGETATIVE COVER SPECIES.
- REMOVE ACCUMULATED SEDIMENT FROM BASIN AS REQUIRED. RESTORE ORIGINAL CROSS SECTION AND INFILTRATION RATE. PROPERLY DISPOSE OF SEDIMENT.

2) STORMWATER CONVEYANCE SYSTEM

- CATCH BASINS, MANHOLES AND PIPES TO BE INSPECTED FOR CLOGGING AND EXCESSIVE DEBRIS AND SEDIMENT ACCUMULATION AT LEAST TWO TIMES PER YEAR AND AFTER RUNOFF EVENTS.
- ALL STRUCTURAL COMPONENTS MUST BE INSPECTED FOR CRACKING, SUBSIDENCE, BREACHING, WEARING, AND DETERIORATION AT LEAST ANNUALLY.

3) WATER QUALITY TREATMENT DEVICES

A. SNOUT HOOD

- MONTHLY MONITORING FOR THE FIRST YEAR OF A NEW INSTALLATION AFTER THE SITE HAS BEEN STABILIZED IS RECOMMENDED BY THE MANUFACTURER.
- MEASUREMENTS SHOULD BE TAKEN AFTER EACH RAIN EVENT OF 0.5 INCHES OR MORE, OR MONTHLY, AS DETERMINED BY LOCAL WEATHER CONDITIONS.
- CHECKING SEDIMENT DEPTH AND NOTING THE SURFACE POLLUTANTS IN THE STRUCTURE WILL BE HELPFUL IN PLANNING MAINTENANCE.
- THE PRIMARY POLLUTANTS COLLECTED IN SNOUT EQUIPPED STRUCTURES WILL CONSIST OF FLOATABLE DEBRIS, OILS ON THE SURFACE OF CAPTURED WATER, AND GRIT AND SEDIMENT AT THE BOTTOM OF THE STRUCTURE.
- THE STRUCTURE SHOULD BE CLEANED WHEN THE SUMP IS HALF FULL, OR IF A SPILL OR INCIDENT CAUSES A LARGER THAN NORMAL ACCUMULATION OF POLLUTANTS IN THE STRUCTURE. MAINTENANCE AND CLEANING IS BEST DONE WITH A VACUUM TRUCK.
- ALL COLLECTED WASTES MUST BE HANDLED AND DISPOSED OF IN ACCORDANCE WITH LOCAL ENVIRONMENTAL REQUIREMENTS.
- AN ANNUAL INSPECTION OF THE ANTI-SIPHON VENT AND ACCESS HATCH ARE RECOMMENDED BY THE MANUFACTURER. A SIMPLE FLUSHING OF THE VENT, OR A GENTLE RODDING WITH A FLEXIBLE WIRE, WILL MAINTAIN ANTI-SIPHON PROPERTIES.

B. FABCO STORMBASIN

- FABCO INDUSTRIES RECOMMENDS CLEANING OUT THE UNIT(S) A MINIMUM TWICE PER YEAR BY REMOVING THE DEBRIS, SAND, AND SILT.
- FOLLOW MANUFACTURERS RECOMMENDATIONS FOR INSPECTION AND MAINTENANCE PROCEDURES.
- ADJUST THE INSPECTION/MAINTENANCE SCHEDULE DEPENDING ON THE ACTUAL OPERATING CONDITIONS ENCOUNTERED BY THE SYSTEM.

4) STREET SWEEPING

- THE STREETS AND ALLEYS SHOULD BE CLEANED A MINIMUM OF THREE TIMES PER YEAR. CLEANINGS SHOULD OCCUR AROUND THE BEGINNING OF THE SPRING, SUMMER AND FALL SEASONS.
- A VACUUM COMMERCIAL CLEANING UNIT SHALL BE USED. THE NON-POROUS AND POROUS PAVEMENT SHALL BE CLEAN AT THE SAME TIME.
- TO LIMIT THE DISRUPTION TO THE USE OF OF THE PROPERTY, SWEEPING SHALL OCCUR DURING OFF HOURS. TYPICALLY, THE EARLY MORNING IS THE OPTIMAL TIME FOR A COMMERCIAL FACILITY.
- THE PROPERTY OWNER SHALL POST SIGNS TO RESTRICT PARKING AND NOTIFY TENANTS OF THE DATE AND APPROXIMATE TIME OF THE SWEEPING. NOTIFICATION SHOULD OCCUR NO LESS THAN 2 DAYS PRIOR TO SWEEPING.

5) SUBSURFACE INFILTRATION BASIN

- THE SUBSURFACE BASIN MUST BE INSPECTED FOR CLOGGING AND EXCESSIVE DEBRIS AND SEDIMENT ACCUMULATION AT LEAST ONCE A SEASON (FOUR TIMES A YEAR) AS WELL AS AFTER EVERY STORM EXCEEDING 1-INCH OF RAINFALL WITHIN ONE HOUR. WATER QUALITY UNITS WILL BE INSTALLED AT THE INLETS DIRECTLY UPSTREAM OF THE SUBSURFACE BASIN. SEASONAL INSPECTIONS SHOULD BE ACCEPTABLE BECAUSE MATERIAL ACCUMULATION SHOULD BE MINIMIZED BY THE PROPER OPERATION OF THESE WATER QUALITY DEVICES.
- SEDIMENT REMOVAL SHOULD TAKE PLACE WHEN ALL RUNOFF HAS DRAINED FROM AND THE BASIN IS REASONABLY DRY. DISPOSAL OF DEBRIS, TRASH, SEDIMENT, AND OTHER WASTE MATERIAL SHALL BE DONE AT SUITABLE DISPOSAL/RECYCLING SITES AND IN COMPLIANCE WITH ALL APPLICABLE LOCAL, COUNTY, STATE AND FEDERAL WASTE REGULATIONS.
- ALL STRUCTURAL COMPONENTS MUST BE INSPECTED FOR CRACKING, SUBSIDENCE, BREACHING, WEARING, AND DETERIORATION DURING ANY INSPECTIONS. THE CONDITION OF SURROUNDING ABOVEGROUND AREAS SHALL BE INSPECTED FOR EVIDENCE OF POTENTIAL FAILURES OR DETERIORATION OF THE UNDERGROUND SYSTEM.
- IF STANDING WATER IS ENCOUNTERED IN THE SUBSURFACE FACILITY, THE WATER SHOULD BE PUMPED DOWNSTREAM THROUGH A SEDIMENT FILTER BAG. AFTER STANDING WATER IS REMOVED, THE FACILITY SHOULD BE INSPECTED AS USUAL. IF MODIFICATIONS TO THE FACILITY ARE REQUIRED TO ALLEVIATE STANDING WATER, THE PROPERTY OWNER SHALL HIRE A PROFESSIONAL ENGINEER TO REMEDY THE STANDING WATER ISSUE. ANY REMEDIES MUST BE APPROVED BY THE TOWNSHIP PRIOR TO THE START OF CONSTRUCTION.

BMP CONSTRUCTION SEQUENCE

WATER QUALITY TREATMENT DEVICES (REFER TO DRAWINGS CG501-1121 & CG504-1121 FOR CONSTRUCTION DETAILS AND NOTES.)

1. WATER QUALITY TREATMENT DEVICE INSTALLATION SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND DETAILS PROVIDED ON DRAWINGS CG501-1121 & CG504-1121.

SUBSURFACE INFILTRATION BASIN

1. DUE TO THE NATURE OF CONSTRUCTION SITES, SUBSURFACE INFILTRATION SHOULD BE INSTALLED TOWARD THE END OF THE CONSTRUCTION PERIOD, IF POSSIBLE. (INFILTRATION BEDS MAY BE USED AS TEMPORARY SEDIMENT BASINS OR TRAPS).
2. INSTALL AND MAINTAIN ADEQUATE EROSION AND SEDIMENT CONTROL MEASURES (AS PER THE PENNSYLVANIA EROSION AND SEDIMENTATION CONTROL PROGRAM MANUAL) DURING CONSTRUCTION.
3. THE EXISTING SUBGRADE UNDER THE BED AREAS SHOULD NOT BE COMPACTED OR SUBJECT TO EXCESSIVE CONSTRUCTION EQUIPMENT TRAFFIC PRIOR TO GEOTEXTILE AND STONE BED PLACEMENT.
4. WHERE EROSION OF SUBGRADE HAS CAUSED ACCUMULATION OF FINE MATERIALS AND/OR SURFACE PONDING, THIS MATERIAL SHOULD BE REMOVED WITH LIGHT EQUIPMENT AND THE UNDERLYING SOILS SCARIFIED TO A MINIMUM DEPTH OF 6 INCHES WITH A YORK RAKE (OR EQUIVALENT) AND LIGHT TRACTOR. ALL FINE GRADING SHOULD BE DONE BY HAND. ALL BED BOTTOMS SHOULD BE AT LEVEL GRADE.
5. INSTALL AMENDED SOIL LAYER WHERE APPLICABLE. THE AMENDED SOIL SHALL BE CAPABLE OF ACHIEVING A MINIMUM INFILTRATION RATE OF 1.0 INCHES PER HOUR AND HAVE A VOID RATIO OF NOT LESS THAN 0.2. THE CONTRACTOR SHALL PERFORM BENCH-SCALE SOILS LABORATORY TESTING TO VERIFY THAT THE MINIMUM INFILTRATION RATE AND VOID RATIO ARE ACHIEVED.
6. EARTHEN BERMS (IF USED) BETWEEN INFILTRATION BEDS SHOULD BE LEFT IN PLACE DURING EXCAVATION. THESE BERMS DO NOT REQUIRE COMPACTION IF PROVEN STABLE DURING CONSTRUCTION.
7. INSTALL UPSTREAM AND DOWNSTREAM CONTROL STRUCTURES, CLEANOUTS, PERFORATED PIPING, AND ALL OTHER NECESSARY STORMWATER STRUCTURES.
8. GEOTEXTILE AND BED AGGREGATE SHOULD BE PLACED IMMEDIATELY AFTER APPROVAL OF SUBGRADE PREPARATION AND INSTALLATION OF STRUCTURES. GEOTEXTILE SHOULD BE PLACED IN ACCORDANCE WITH MANUFACTURER'S STANDARDS AND RECOMMENDATIONS. ADJACENT STRIPS OF GEOTEXTILE SHOULD OVERLAP A MINIMUM OF 16 INCHES. IT SHOULD ALSO BE SECURED AT LEAST 4 FEET OUTSIDE OF BED IN ORDER TO PREVENT ANY RUNOFF OR SEDIMENT FROM ENTERING THE STORAGE BED. THIS EDGE STRIP SHOULD REMAIN IN PLACE UNTIL ALL BARE SOILS CONTIGUOUS TO BEDS ARE STABILIZED AND VEGETATED. AS THE SITE IS FULLY STABILIZED, EXCESS GEOTEXTILE ALONG BED EDGES CAN BE CUT BACK TO THE EDGE OF THE BED.
9. CLEAN-WASHED, UNIFORMLY GRADED AGGREGATE SHOULD BE PLACED IN THE BED IN MAXIMUM 8-INCH LIFTS. EACH LAYER SHOULD BE LIGHTLY COMPACTED, WITH CONSTRUCTION EQUIPMENT KEPT OFF THE BED BOTTOM AS MUCH AS POSSIBLE.
10. APPROVED SOIL MEDIA SHOULD BE PLACED OVER INFILTRATION BED IN MAXIMUM 6-INCH LIFTS.
11. SEED AND STABILIZE TOPSOIL.
12. DO NOT REMOVE INLET PROTECTION OR OTHER EROSION AND SEDIMENT CONTROL MEASURES UNTIL SITE IS FULLY STABILIZED.

INFILTRATION BASIN – CONSTRUCTION SEQUENCE

1. PROTECT INFILTRATION BASIN AREA FROM COMPACTION PRIOR TO CONSTRUCTION.
2. IF POSSIBLE, INSTALL INFILTRATION BASIN DURING LATER PHASES OF SITE CONSTRUCTION TO PREVENT SEDIMENTATION AND/OR DAMAGE FROM CONSTRUCTION ACTIVITY. AFTER INSTALLATION, PREVENT SEDIMENT-LADEN WATER FROM ENTERING INLETS AND PIPES.
3. INSTALL AND MAINTAIN PROPER EROSION AND SEDIMENT CONTROL MEASURES DURING CONSTRUCTION.
4. IF NECESSARY, EXCAVATE INFILTRATION BASIN BOTTOM TO AN UN-COMPACTED SUB-GRADE FREE FROM ROCKS AND DEBRIS. DO NOT COMPACT SUB-GRADE.
5. INSTALL OUTLET CONTROL STRUCTURES.
6. SEED AND STABILIZE TOPSOIL (VEGETATE IF APPROPRIATE WITH NATIVE PLANTINGS).
7. DO NOT REMOVE INLET PROTECTION OR OTHER EROSION AND SEDIMENT CONTROL MEASURES UNTIL SITE IS FULLY STABILIZED.

CRITICAL STAGES:

1. A LICENSED PROFESSIONAL OR A DESIGNEE SHALL BE PRESENT ONSITE AND BE RESPONSIBLE FOR OVERSIGHT OF CRITICAL STAGES OF IMPLEMENTATION OF THE APPROVED PCSM PLAN. THE LICENSED PROFESSIONAL WILL BE RESPONSIBLE TO PROVIDE A FINAL CERTIFICATION, PURSUANT TO 25 PA. CODE § 102.8(L) ALONG WITH THE REQUIRED NOTICE OF TERMINATION (NOT) AND RECORD DRAWINGS, CERTIFYING THAT THE PROJECT SITE WAS CONSTRUCTED IN ACCORDANCE WITH THE APPROVED OR MODIFIED PCSM PLAN.

2. CRITICAL STAGES OF THE PSCM PLAN THAT REQUIRE A LICENSED PROFESSIONAL OR DESIGNEE BE PRESENT ONSITE FOR THE OVERSIGHT OF CONSTRUCTION INCLUDES THE FOLLOWING:
   A. INFILTRATION BASINS
   B. STORMWATER PIPES AND STRUCTURES (MANHOLES AND CATCH BASINS)
   C. WATER QUALITY DEVICES

PCSM LONG-TERM OPERATION AND MAINTENANCE REQUIREMENTS:

(1) THE PERMITTEE OR CO-PERMITTEE SHALL BE RESPONSIBLE FOR LONG-TERM OPERATION AND MAINTENANCE OF PCSM BMPS UNLESS A DIFFERENT PERSON IS IDENTIFIED IN THE NOTICE OF TERMINATION AND HAS AGREED TO LONG-TERM OPERATION AND MAINTENANCE OF PCSM BMPS.

(2) FOR ANY PROPERTY CONTAINING A PCSM BMP, THE PERMITTEE OR CO-PERMITTEE SHALL RECORD AN INSTRUMENT WITH THE RECORDER OF DEEDS WHICH WILL ASSURE DISCLOSURE OF THE PCSM BMP AND THE RELATED OBLIGATIONS IN THE ORDINARY COURSE OF A TITLE SEARCH OF THE SUBJECT PROPERTY. THE RECORDED INSTRUMENT MUST IDENTIFY THE PCSM BMP, PROVIDE FOR NECESSARY ACCESS RELATED TO LONG-TERM OPERATION AND MAINTENANCE FOR PCSM BMPS AND PROVIDE NOTICE THAT THE RESPONSIBILITY FOR LONG-TERM OPERATION AND MAINTENANCE OF THE PCSM BMP IS A COVENANT THAT RUNS WITH THE LAND THAT IS BINDING UPON AND ENFORCEABLE BY SUBSEQUENT GRANTEES, AND PROVIDE PROOF OF FILING WITH THE NOTICE OF TERMINATION UNDER § 102.7(B)(5) (RELATING TO PERMIT TERMINATION).

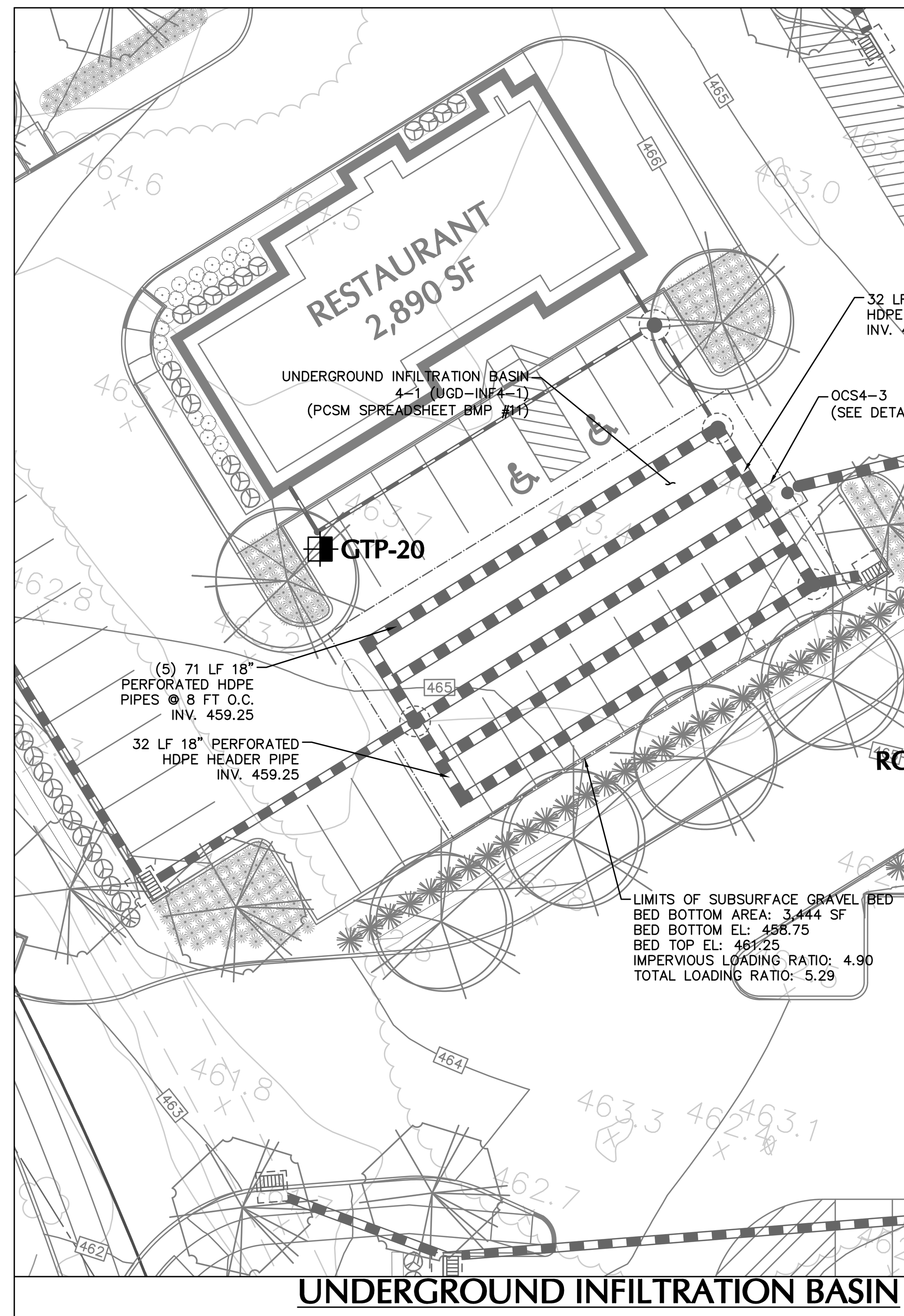
(3) THE PERSON RESPONSIBLE FOR PERFORMING LONG-TERM OPERATION AND MAINTENANCE MAY ENTER INTO AN AGREEMENT WITH ANOTHER PERSON INCLUDING A CONSERVATION DISTRICT, NONPROFIT ORGANIZATION, MUNICIPALITY, AUTHORITY, PRIVATE CORPORATION OR OTHER PERSON, TO TRANSFER THE RESPONSIBILITY FOR PCSM BMPS OR TO PERFORM LONG-TERM OPERATION AND MAINTENANCE AND PROVIDE NOTICE THEREOF TO THE DEPARTMENT.

(4) A PERMITTEE OR CO-PERMITTEE THAT FAILS TO TRANSFER LONG-TERM OPERATION AND MAINTENANCE OF THE PCSM BMP OR OTHERWISE FAILS TO COMPLY WITH THIS REQUIREMENT SHALL REMAIN JOINTLY AND SEVERALLY RESPONSIBLE WITH THE LANDOWNER FOR LONG-TERM OPERATION AND MAINTENANCE OF THE PCSM BMPS LOCATED ON THE PROPERTY.

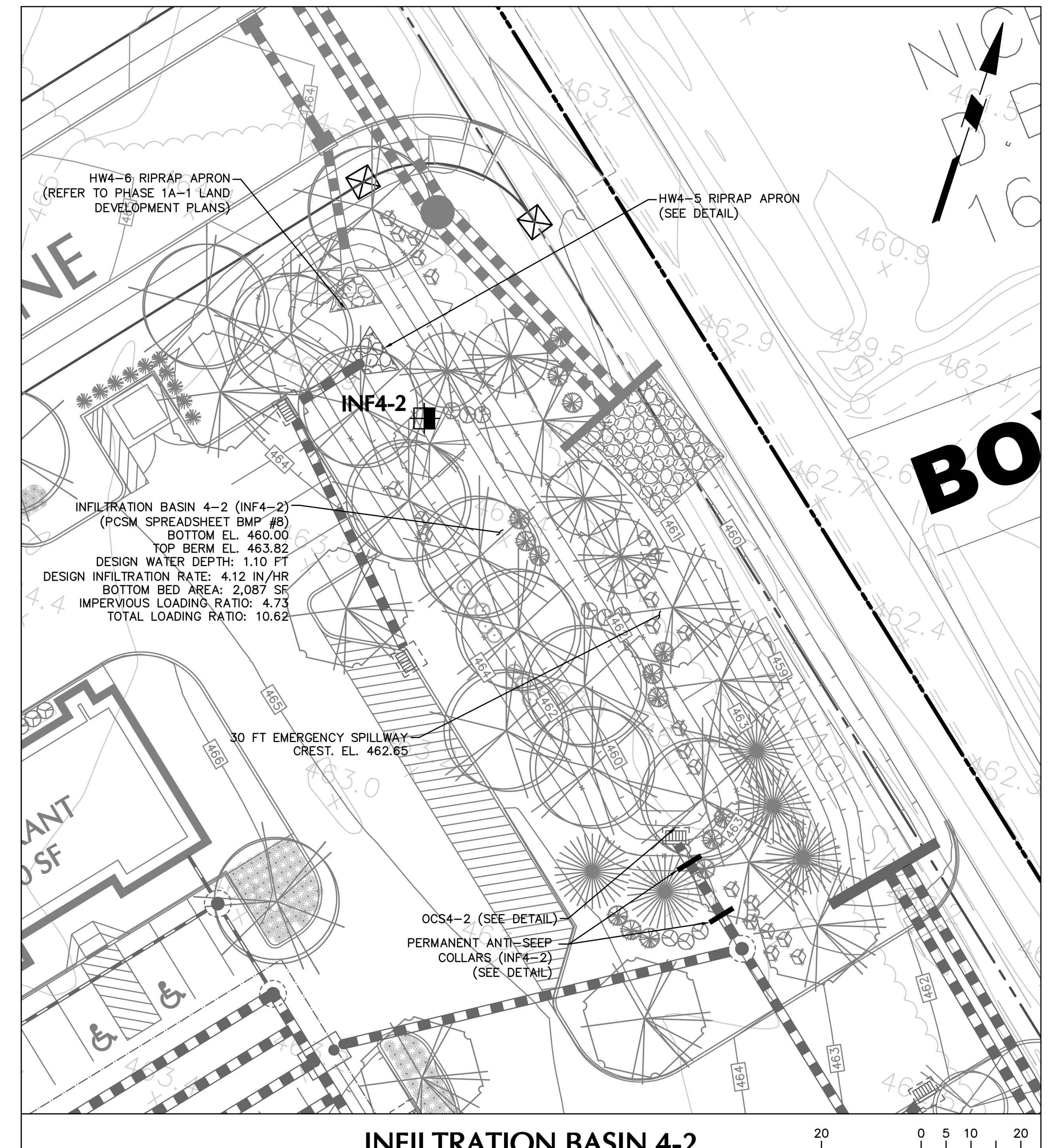
(5) THE LONG TERM OPERATION AND MAINTENANCE OF THE POST CONSTRUCTION STORMWATER MANAGEMENT SYSTEMS SHALL BE PERFORMED BY AND THE RESPONSIBILITY OF THE PERMITTEE/OWNER:
DEPG MOSIER ASSOCIATES, L.P.
580 W. GERMANTOWN PIKE, SUITE 103, PLYMOUTH MEETING, PA 19462
TEL: (610) 941-4034
FAX: (610) 941-4038
CONTACT: JAMES J. DEPETRIS

CRITICAL STAGES OF PCSM PLAN IMPLEMENTATION
THE CRITICAL STAGES OF PCSM PLAN IMPLEMENTATION ARE THE FOLLOWING: THE INSTALLATION OF THE SEDIMENT TRAPS, SUBSURFACE INFILTRATION BASINS, INFILTRATION BASINS, RAINGARDENS, AND ALL ASSOCIATED COMPONENTS (AND AT ALL OTHER TIMES AS DEEMED APPROPRIATE BY THE DEPARTMENT OR MONROE COUNTY CONSERVATION DISTRICT) SHALL BE CONSTRUCTED WITH OVERSIGHT BY A LICENSED PROFESSIONAL OR THEIR DESIGNEE.

AS-BUILT RECORD PLANS
CONTRACTOR IS REQUIRED TO PROVIDE AS-BUILT SURVEY OF THE POST CONSTRUCTION STORMWATER MANAGEMENT BMP'S. AS-BUILT RECORD PLAN WILL NEED TO BE SUBMITTED TO MONROE COUNTY CONSERVATION DISTRICT ALONG WITH THE NOTICE OF TERMINATION.



UNDERGROUND INFILTRATION BASIN 4-1
SCALE: 1" = 20'



INFILTRATION BASIN 4-2
SCALE: 1" = 20'

BASIN INF4-1 PLANT SCHEDULE

KEY	QTY.	BOTANICAL NAME	COMMON NAME	SIZE	ROOT	REMARKS
SHADE TREE(S)						
AR	6	ACER RUBRUM	RED MAPLE	2 1/2-3" CAL.	B+B	–
NS	6	NYSSA SYLVATICA	SOURGUM OR TUPELO	2 1/2-3" CAL.	B+B	–
ORNAMENTAL TREE(S)						
AGAB	2	AMELANCHIER X GRANDIFLORA 'AUTUMN BRILLIANCE'	AUTUMN BRILLIANCE SERVICEBERRY	8-10'	B+B	–
CC	3	CERCIS CANADENSIS	EASTERN REDBUD	8-10'	B+B	–
EVERGREEN SHRUB(S)						
IGS	21	ILEX GLABRA 'SHAMROCK'	SHAMROCK INKBERRY HOLLY	24-30"	CONTAINER	–
KL	13	KALMIA LATIFOLIA	MOUNTAIN LAUREL	30-36"	CONTAINER	–
DECIDUOUS SHRUB(S)						
CAH	20	CLETHRA ALNIFOLIA 'HUMMINGBIRD'	SWEET PEPPERBUSH	18-24"	CONTAINER	–

NOTE: IF ANY DISCREPANCIES OCCUR BETWEEN AMOUNTS SHOWN IN THE PLAN AND THE PLANT LIST, THE PLAN SHALL DICTATE.

BASIN INF4-2 PLANT SCHEDULE

KEY	QTY.	BOTANICAL NAME	COMMON NAME	SIZE	ROOT	REMARKS
SHADE TREE(S)						
AR	9	ACER RUBRUM	RED MAPLE	2 1/2-3" CAL.	B+B	–
SHADE TREE(S)						
AGAB	2	AMELANCHIER X GRANDIFLORA 'AUTUMN BRILLIANCE'	AUTUMN BRILLIANCE SERVICEBERRY	8-10'	B+B	–
EVERGREEN SHRUB(S)						
IGC	6	ILEX GLABRA COMPACTA	DWARF INKBERRY HOLLY	24-30"	B+B	–
IGS	13	ILEX GLABRA 'SHAMROCK'	SHAMROCK INKBERRY HOLLY	24-30"	CONTAINER	–
JCRG	6	JUNIPERUS CHINENSIS 'ROBUSTA GREEN'	ROBUSTA GREEN JUNIPER UPRIGHT	3-4'	B+B	–
KL	7	KALMIA LATIFOLIA	MOUNTAIN LAUREL	30-36"	B+B	–
DECIDUOUS SHRUB(S)						
CAH	8	CLETHRA ALNIFOLIA 'HUMMINGBIRD'	SWEET PEPPERBUSH	18-24"	CONTAINER	–

MEADOW SEED MIXES:

1. BASIN BOTTOM – PENNDOT FORMULA "L" SEED MIX

54.00% FESTUCA LONGIFOLIA	HARD FESCUE
36.00% FESTUCA RUBRA	CREEPING RED FESCUE
10.00% LOLIUM MULTIFLORUM	ANNUAL RYEGRASS

NOTE:
SEED AT A RATE OF 24 LBS./ACRE OF 100% PURE LIVE SEED.

2. DRAINAGE SWALES – PENNDOT FORMULA "D" SEED MIX

70.00% FESTUCA ARUNDINACEA	TALL FESCUE VAR. KENTUCKY 31
30.00% FESTUCA RUBRA	CREEPING RED FESCUE

NOTE:
SEED AT A RATE OF 21 LBS./ACRE OF 100% PURE LIVE SEED.

3. ERNST SEED MIX ERNMX-181 "NATIVE SLOPE MIX WITH ANNUAL RYEGRASS"

22% SORGHASTRUM NUTANS	INDIAN GRASS
20% LOLIUM MULTIFLORUM	ANNUAL RYEGRASS
17% SCHIZACHYRIUM SCOPARIUM	LITTLE BLUESTEM, PIEDMONT
15% ELYMUS RIPARIUS	RIVERBANK WILD RYE
5% ELYMUS VIRGINICUS	VIRGINIA WILD RYE
4% TRIDENS FLAVUS	PURPLETOP
4% AGROSTIS SCABRA	TICKLEGRASS (ROUGH BENTGRASS)
4% AGROSTIS PERENNANS	AUTUMN BENTGRASS
3% ECHINACEA PURPUREA	PURPLE CONEFLOWER
2% CHAMAECRISTA FASCICULATA	PARTRIDGE PEA
1% PENSTEMON DIGITALIS	TALL WHITE BEARDTONGUE
1% MONARDA FISTULOSA	WILD BERGAMOT
1% COREOPSIS LANCEOLATA	LANCELEAF COREOPSIS, COASTAL PLAIN
1% LIATRIS SPICATA	MARSH (DENSE) BLAZING STAR

NOTES:
1. SEED AT A RATE OF 60 LBS./ACRE OF 100% PURE LIVE SEED.
2. FOR SPRING SEEDING, APPLY A NURSE CROP OF OATS AT A RATE OF 30 LBS./ ACRE.
3. FOR FALL SEEDING, APPLY A NURSE CROP OF WINTER RYE AT A RATE OF 30 LBS./ ACRE.

GENERAL SEEDING NOTES:

1. SEEDING SHALL TAKE PLACE IN THE SPRING (APRIL 1 TO JUNE 1) OR THE FALL (SEPTEMBER 1 TO OCTOBER 1).
2. ELIMINATE UNWANTED VEGETATION PRIOR TO SEEDING USING A BROAD-SPECTRUM NON-SELECTIVE HERBICIDE PER MANUFACTURER'S SPECIFICATIONS.
3. IT IS RECOMMENDED THAT CONTRACTOR INSTALL SEED MIXTURE USING A NO-TILL TRUAX-TYPE DRILL WHERE APPLICABLE.
4. CONTINUOUS MOISTURE FOR 4-6 WEEKS MUST BE INSURED TO ALLOW PROPER GERMINATION. SOIL TO REMAIN CONTINUOUSLY MOIST FOR THE TOP 4 INCHES OF TOPSOIL. DO NOT SATURATE.

WEED CONTROL / MAINTENANCE

1. DURING THE ESTABLISHMENT YEAR, CONTRACTOR SHALL MOW SEEDING IF WEED HEIGHT EXCEEDS MEADOW MIX HEIGHT. MOW AT A HEIGHT OF 8"-10". DO NOT MOW CLOSE, AS SOME OF THE MEADOW MIX MAY BE DAMAGED.
2. AFTER THE FIRST GROWING SEASON, AND IF MEADOW MIX IS WELL ESTABLISHED, THE MEADOW MIX SHALL BE MOWED ONLY ONCE ANNUALLY. ANNUAL MAINTENANCE MOWING SHALL BE DONE IN LATE WINTER DURING THE MONTH OF MARCH.
3. MOW IN WETLAND AND WETLAND TRANSITION AREAS DURING DRIER SITE CONDITIONS WHEN SOIL DISTURBANCE WILL NOT OCCUR. MAINTENANCE FOR WETLAND AND WETLAND TRANSITION AREAS SHALL OCCUR DURING LATE SUMMER (JULY 15 – AUGUST 15) WHEN THE WATER TABLE IS USUALLY AT ITS LOWEST POINT OF THE YEAR. DO NOT MOW IN WETLAND OR WETLAND TRANSITION AREAS AFTER ESTABLISHMENT OF MEADOW MIX.

SOIL RESTORATION DETAIL AND SPECIFICATIONS FOR MINOR COMPACTION SUBSOILING / TILLING:

A. WHEN EXCAVATION IS COMPLETED, THE SUBSOIL SHALL BE IN A LOOSE, FRIABLE CONDITION TO A DEPTH OF 8 INCHES BELOW FINAL TOPSOIL GRADE AND THERE SHALL BE NO EROSION RILLS OR WASHOUTS IN THE SUBSOIL SURFACE EXCEEDING 3 INCHES IN DEPTH.

B. TO ACHIEVE THIS CONDITION, SUBSOILING, RIPPING, OR SCARIFICATION OF THE SUBSOIL WILL BE REQUIRED AS DIRECTED BY THE OWNERS REPRESENTATIVE, WHEREVER THE SUBSOIL HAS BEEN COMPACTED BY EQUIPMENT OPERATION OR HAS BECOME DRIED OUT AND CRUSTED, AND WHERE NECESSARY TO OBLITERATE EROSION RILLS. SUB-SOILING SHALL BE REQUIRED TO REDUCE SOIL COMPACTION IN ALL AREAS WHERE PLANT ESTABLISHMENT IS PLANNED. SUB-SOILING SHALL BE PERFORMED BY THE PRIME OR EXCAVATING CONTRACTOR AND SHALL OCCUR BEFORE COMPOST PLACEMENT.

C. SUBSOILED AREAS SHALL BE LOOSENED TO LESS THAN 1400 KPA (200 PSI) TO A DEPTH OF 8 INCHES BELOW FINAL TOPSOIL GRADE. WHEN DIRECTED BY THE OWNER'S REPRESENTATIVE, THE CONTRACTOR SHALL VERIFY THAT THE SUB-SOILING WORK CONFORMS TO THE SPECIFIED DEPTH.

D. SUB-SOILING SHALL FORM A TWO-DIRECTIONAL GRID. CHANNELS SHALL BE CREATED BY A COMMERCIALLY AVAILABLE, MULTI-SHANKED, PARALLELOGRAM IMPLEMENT (SOLID-SHANK RIPPER). THE EQUIPMENT SHALL BE CAPABLE OF EXERTING A PENETRATION FORCE NECESSARY FOR THE SITE. NO DISC CULTIVATORS CHISEL PLOWS, OR SPRING-LOADED EQUIPMENT WILL BE ALLOWED. THE GRID CHANNELS SHALL BE SPACED A MINIMUM OF 12 INCHES TO A MAXIMUM OF 36 INCHES APART, DEPENDING ON EQUIPMENT, SITE CONDITIONS, AND THE SOIL MANAGEMENT PLAN. THE CHANNEL DEPTH SHALL BE A MINIMUM OF 8 INCHES OR AS SPECIFIED IN THE SOIL MANAGEMENT PLAN. IF SOILS ARE SATURATED, THE CONTRACTOR SHALL DELAY OPERATIONS UNTIL THE SOIL WILL NOT HOLD A BALL WHEN SQUEEZED. ONLY ONE PASS SHALL BE PERFORMED ON ERODIBLE SLOPES GREATER THAN 1 VERTICAL TO 3 HORIZONTAL. WHEN ONLY ON PASS IS USED, WORK SHOULD BE AT RIGHT ANGLES TO THE DIRECTION OF SURFACE DRAINAGE, WHENEVER PRACTICAL.

E. EXCEPTIONS TO SUB-SOILING INCLUDE AREAS WITHIN THE DRIP LINE OF ANY EXISTING TREES, OVER UTILITY INSTALLATIONS WITHIN 30 INCHES OF THE SURFACE, WHERE TRENCHING/DRAINAGE LINES ARE INSTALLED, WHERE COMPACTION IS BY DESIGN (ABUTMENTS, FOOTINGS, OR IN SLOPES), AND ON INACCESSIBLE SLOPES, AS APPROVED BY THE OWNER'S REPERESENTATIVE. IN CASES WHERE EXCEPTIONS OCCUR, THE CONTRACTOR SHALL OBSERVE A MINIMUM SETBACK OF 20 FEET OR AS DIRECTED BY THE OWNER'S REPRESENTATIVE.

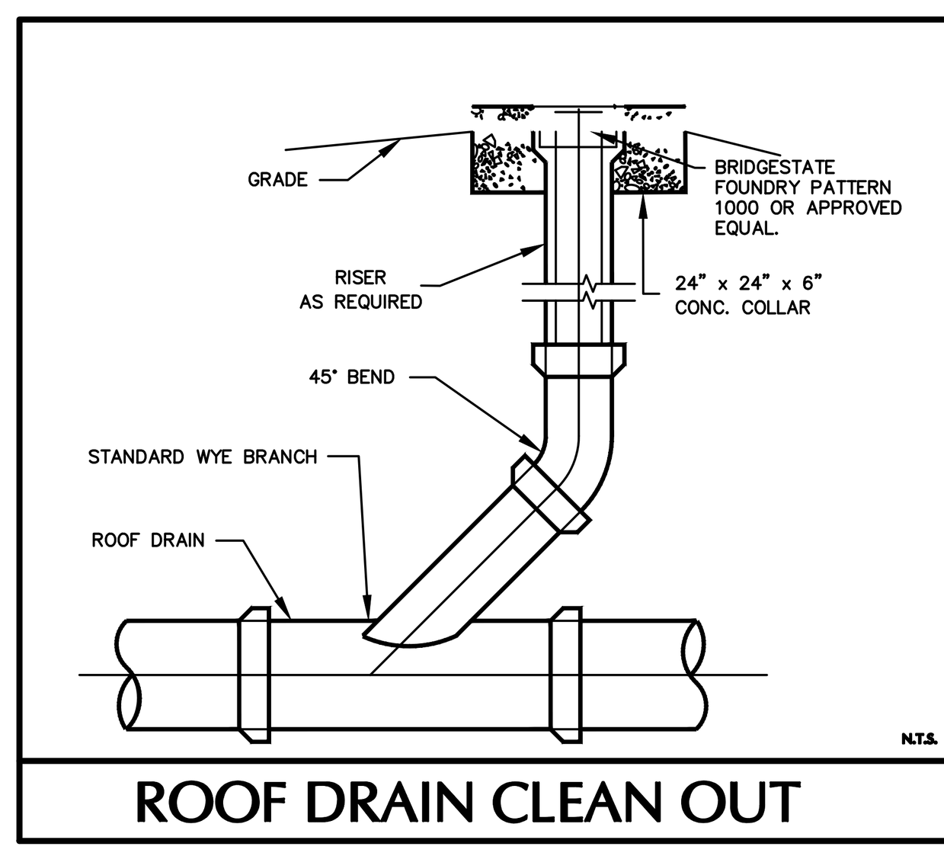
F. PERMANENT STABILIZATION OF SOIL RESTORATION AREAS TO BE SAME AS PERMANENT STABILIZATION REQUIREMENTS SHOWN ON DRAWING CE101-0101.

G. COMPOST SHOULD BE ADDED AT A RATE OF 2:1 (SOIL:COMPOST) OR PER MANUFACTURER'S INSTRUCTION.

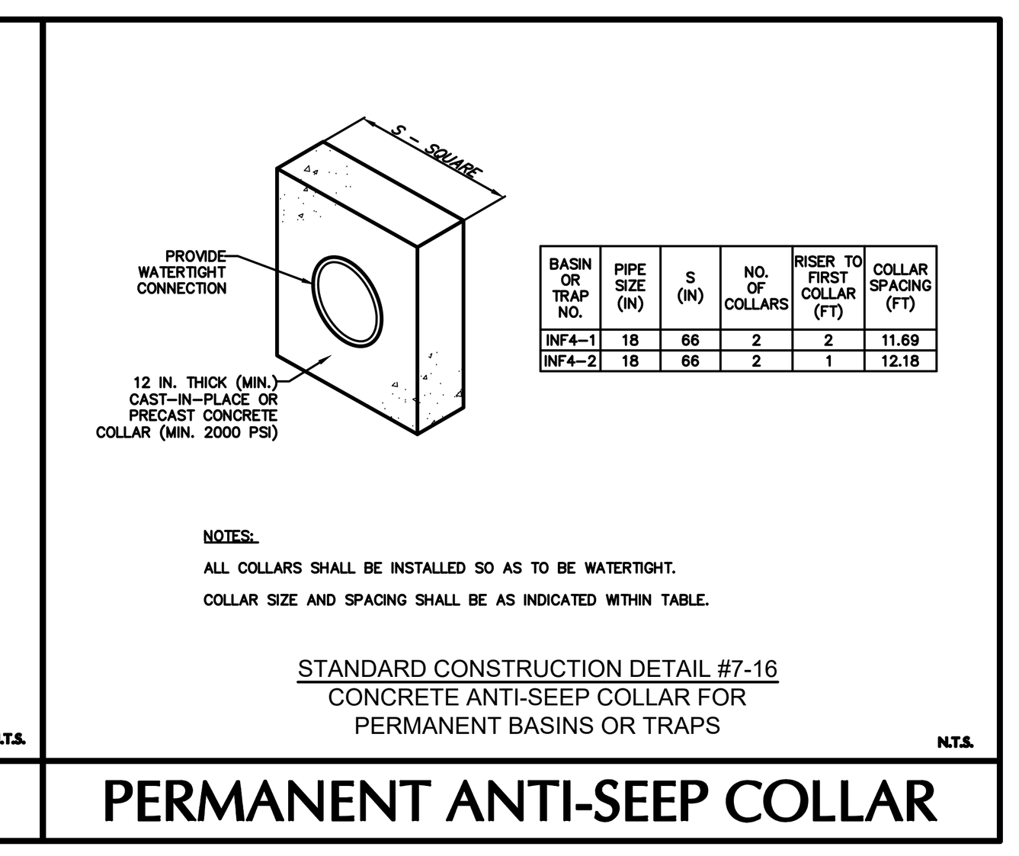
H. ON-SITE SOILS WITH AN ORGANIC CONTENT OF AT LEAST 5 PERCENT CAN BE PROPERLY STOCKPILED AND REUSED.

I. ADD 6 INCHES COMPOST/AMENDMENT AND TILL UP TO 8 INCHES FOR MINOR COMPACTION.

J. ADD 10 INCHES COMPOST/AMENDMENT AND TILL UP TO 20 INCHES FOR MAJOR COMPACTION.



ROOF DRAIN CLEAN OUT

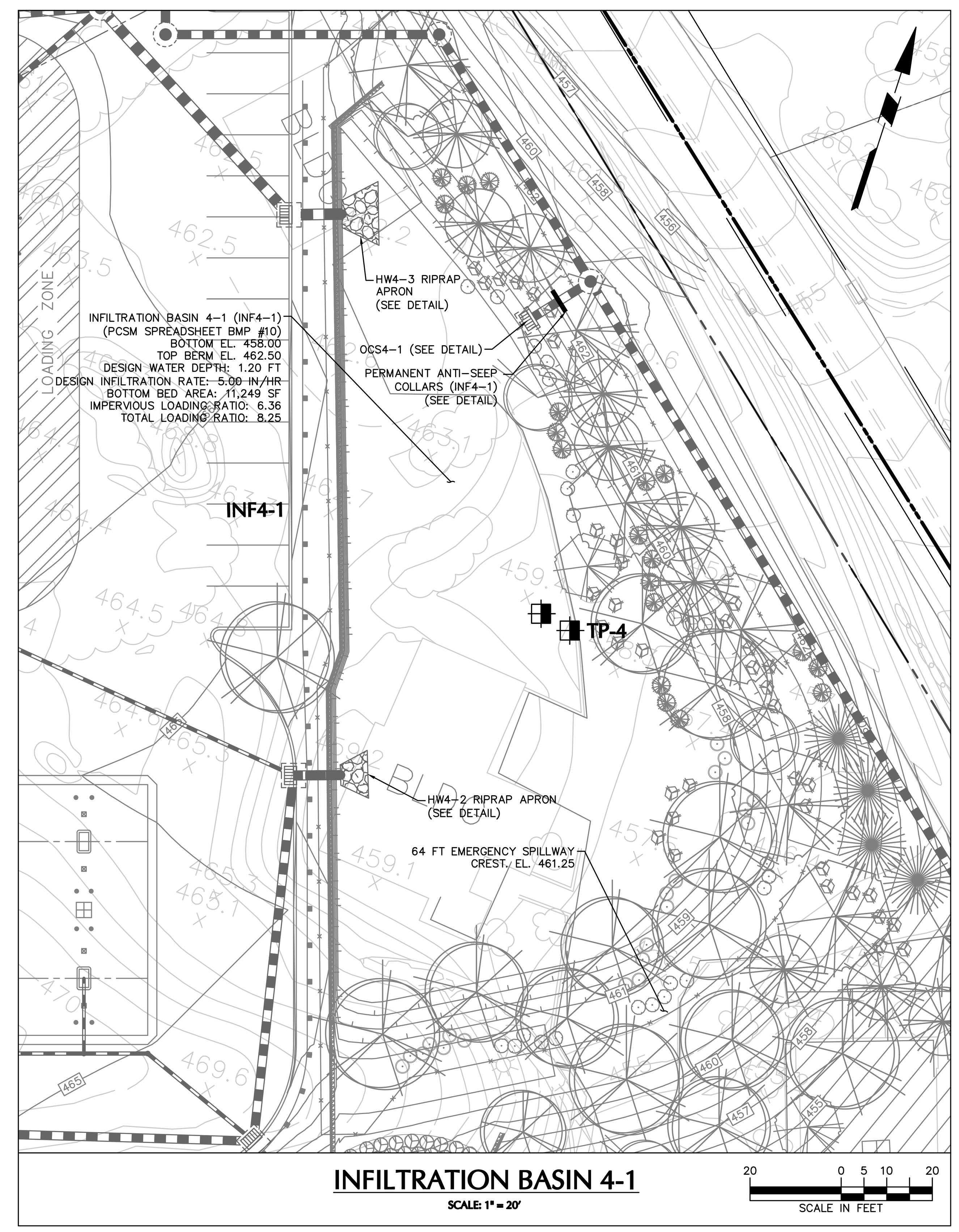


BASIN OR TRAP NO.	PIPE SIZE (IN)	S (IN)	NO. OF COLLARS	RISER TO FIRST COLLAR (FT)	COLLAR SPACING (FT)
INF4-1	18	66	2	2	11.69
INF4-2	18	66	2	1	12.18

NOTES:
ALL COLLARS SHALL BE INSTALLED SO AS TO BE WATERTIGHT.
COLLAR SIZE AND SPACING SHALL BE AS INDICATED WITHIN TABLE.

STANDARD CONSTRUCTION DETAIL #7-16
CONCRETE ANTI-SEEP COLLAR FOR PERMANENT BASINS OR TRAPS

PERMANENT ANTI-SEEP COLLAR



INFILTRATION BASIN 4-1
SCALE: 1" = 20'

Date	Description	No.

REVISIONS

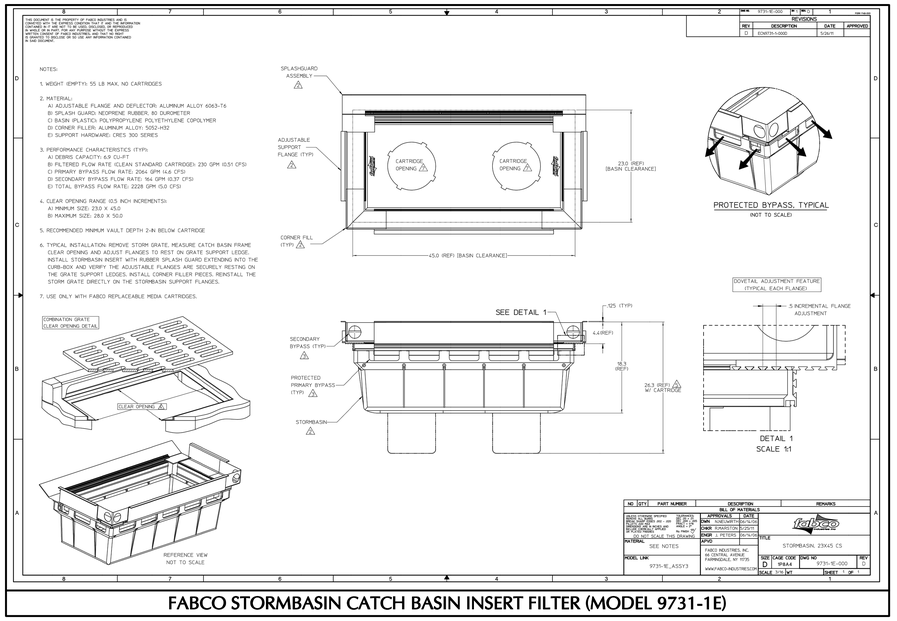
COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL JOHN C. COTE ENGINEER PE085407
SIGNATURE 2/24/2023 DATE SIGNED
JOHN C. COTE
PROFESSIONAL ENGINEER PA Lic. No. PE085407

LANGAN
Langan Engineering and Environmental Services, Inc.
300 Kimball Drive
Parsippany, NJ 07054
T: 973.560.4900 F: 973.560.4901 www.langan.com

Project
SMITHFIELD GATEWAY
PHASE 1A-2
SMITHFIELD TOWNSHIP
MONROE COUNTY PENNSYLVANIA

Drawing Title
POST CONSTRUCTION STORMWATER MANAGEMENT NOTES & DETAILS

Project No. 100501402
Date FEBRUARY 17, 2023
Drawn By SM
Checked By TH
Drawing No. CG503 1121
Sheet 21 of 39



FABCO STORMBASIN CATCH BASIN INSERT FILTER (MODEL 9731-1E)

SOIL RESTORATION DETAIL AND SPECIFICATIONS FOR MINOR COMPACTION SUBSOILING / TILLING:

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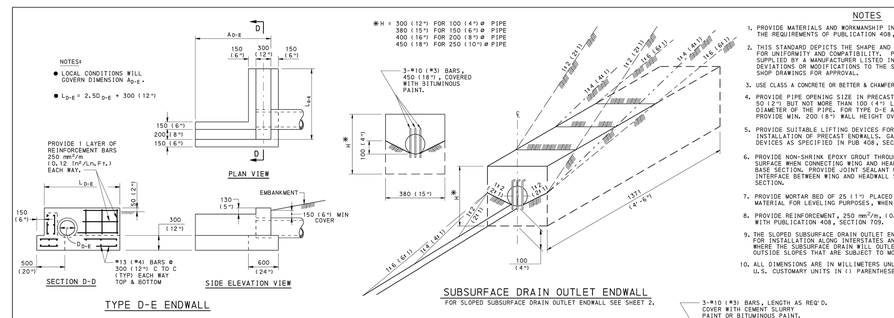

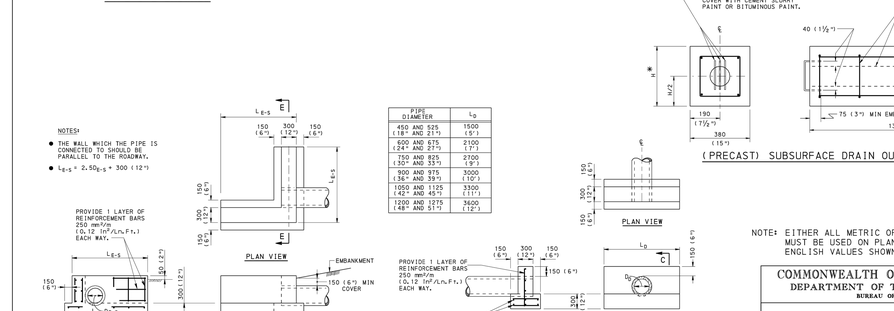

NOTES

1. PROVIDE MATERIALS AND WORKMANSHIP IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408, SECTION 605 AND SECTION 714.
2. THIS STANDARD DEPICTS THE SHAPE AND DIMENSIONS REQUIRED FOR UNIFORMITY AND COMPATIBILITY. PERMIT ONLY ITEMS SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. FOR DEVIATIONS OR MODIFICATIONS TO THE STANDARDS, SUBMIT SHOP DRAWINGS FOR APPROVAL.
3. USE CLASS A CONCRETE OR BETTER & CHAMFER EXPOSED EDGES AT .25 (1").
4. PROVIDE PIPE OPENING SIZE IN PRECAST UNITS AT LEAST 50 (2") BUT NOT MORE THAN 100 (4") LARGER THAN THE OUTSIDE DIAMETER OF THE PIPE. FOR TYPE D-E AND E-S ENDWALLS PROVIDE MIN. 200 (8") WALL HEIGHT OVER THE PIPE.
5. PROVIDE SUITABLE LIFTING DEVICES FOR HANDLING AND INSTALLATION OF PRECAST ENDWALLS. GALVANIZE METAL DEVICES AS SPECIFIED IN PUB 408, SECTION 1105.
6. PROVIDE NON-SHRINK EPOXY GROUT THROUGHOUT THE CONTACT SURFACE WHEN CONNECTING WING AND HEADWALL SECTION TO BASE SECTION. PROVIDE JOINT SEALANT MATERIAL ALONG INTERFACE BETWEEN WING AND HEADWALL SECTION AND BASE SECTION.
7. PROVIDE MORTAR BED OF .25 (1") PLACED ON TOP OF THE SUBBASE MATERIAL FOR LEVELING PURPOSES, WHEN REQUIRED.
8. PROVIDE REINFORCEMENT, 250 mm²/m, (0.12 in²/Ln.Ft.) IN ACCORDANCE WITH PUBLICATION 408, SECTION 709.
9. THE SLOPED SUBSURFACE DRAIN OUTLET ENDWALL IS DESIGNATED FOR INSTALLATION ALONG INTERSTATES AND EXPRESSWAYS WHERE THE SUBSURFACE DRAIN WILL OUTLET ON MEDIAN AND/OR OUTSIDE SLOPES THAT ARE SUBJECT TO MOWING.
10. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN ( ) PARENTHESES.

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

ENDWALLS
CAST-IN-PLACE & PRECAST

RECOMMENDED JUN. 1, 2010 — CHIEF, HWY. QA DIVISION
RECOMMENDED JUN. 1, 2010 — DIRECTOR, BUREAU OF DESIGN
SHT 1 OF 2
RC-31M

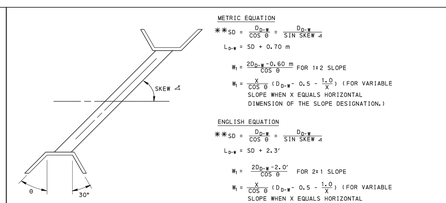
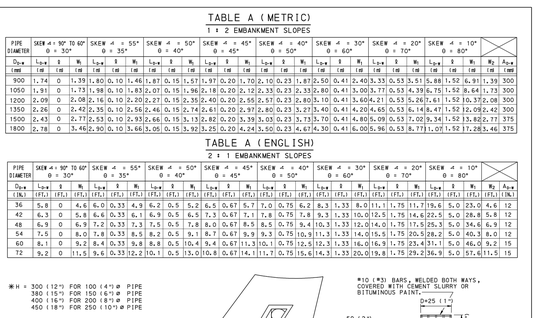


TABLE A (METRIC)
1 : 2 EMBANKMENT SLOPES

PIPE DIAMETER	SKEW ∠ = 90° TO 60° 0 = 30°		SKEW ∠ = 55° 0 = 35°		SKEW ∠ = 50° 0 = 40°		SKEW ∠ = 45° 0 = 45°		SKEW ∠ = 40° 0 = 50°		SKEW ∠ = 30° 0 = 60°		SKEW ∠ = 20° 0 = 70°		SKEW ∠ = 10° 0 = 80°			
D_{D-E} (mm)	L_{D-E} (m)	S (m)	W_1 (m)	L_{D-E} (m)	S (m)	W_1 (m)	L_{D-E} (m)	S (m)	W_1 (m)	L_{D-E} (m)	S (m)	W_1 (m)	L_{D-E} (m)	S (m)	W_1 (m)	L_{D-E} (m)	S (m)	W_1 (m)	W_2 (m)	A_{D-W} (mm²)
900	1.74	0	1.39	1.80	0.10	1.46	1.87	0.15	1.57	1.97	0.20	1.70	2.10	0.23	1.87	2.50	0.41	2.40	3.33	0.53	3.51	5.88	1.52	6.91	1.39	300
1050	1.91	0	1.73	1.98	0.10	1.83	2.07	0.15	1.96	2.18	0.20	2.12	2.33	0.23	2.33	2.80	0.41	3.00	3.77	0.53	4.39	6.75	1.52	8.64	1.73	300
1200	2.09	0	2.08	2.16	0.10	2.20	2.27	0.15	2.35	2.40	0.20	2.55	2.57	0.23	2.80	3.10	0.41	3.60	4.21	0.53	5.26	7.61	1.52	10.37	2.08	300
1350	2.26	0	2.42	2.35	0.10	2.56	2.46	0.15	2.74	2.61	0.20	2.97	2.80	0.23	3.27	3.40	0.41	4.20	4.65	0.53	6.14	8.47	1.52	12.09	2.42	300
1500	2.43	0	2.77	2.53	0.10	2.93	2.66	0.15	3.13	2.82	0.20	3.39	3.03	0.23	3.73	3.70	0.41	4.80	5.09	0.53	7.02	9.34	1.52	13.82	2.77	375
1800	2.78	0	3.46	2.90	0.10	3.66	3.05	0.15	3.92	3.25	0.20	4.24	3.50	0.23	4.67	4.30	0.41	6.00	5.96	0.53	8.77	11.07	1.52	17.28	3.46	375

TABLE A (ENGLISH)
2 : 1 EMBANKMENT SLOPES

PIPE DIAMETER	SKEW ∠ = 90° TO 60° 0 = 30°		SKEW ∠ = 55° 0 = 35°		SKEW ∠ = 50° 0 = 40°		SKEW ∠ = 45° 0 = 45°		SKEW ∠ = 40° 0 = 50°		SKEW ∠ = 30° 0 = 60°		SKEW ∠ = 20° 0 = 70°		SKEW ∠ = 10° 0 = 80°			
D_{D-E} (IN.)	L_{D-E} (FT.)	S (FT.)	W_1 (FT.)	L_{D-E} (FT.)	S (FT.)	W_1 (FT.)	L_{D-E} (FT.)	S (FT.)	W_1 (FT.)	L_{D-E} (FT.)	S (FT.)	W_1 (FT.)	L_{D-E} (FT.)	S (FT.)	W_1 (FT.)	L_{D-E} (FT.)	S (FT.)	W_1 (FT.)	W_2 (FT.)	A_{D-W} (IN.²)
36	5.8	0	4.6	6.0	0.33	4.9	6.2	0.5	5.2	6.5	0.67	5.7	7.0	0.75	6.2	8.3	1.33	8.0	11.1	1.75	11.7	19.6	5.0	23.0	4.6	12
42	6.3	0	5.8	6.6	0.33	6.1	6.9	0.5	6.5	7.3	0.67	7.1	7.8	0.75	7.8	9.3	1.33	10.0	12.5	1.75	14.6	22.5	5.0	28.8	5.8	12
48	6.9	0	6.9	7.2	0.33	7.3	7.5	0.5	7.8	8.0	0.67	8.5	8.5	0.75	9.4	10.3	1.33	12.0	14.0	1.75	17.5	25.3	5.0	34.6	6.9	12
54	7.5	0	8.0	7.8	0.33	8.5	8.2	0.5	9.1	8.7	0.67	9.9	9.3	0.75	10.9	11.3	1.33	14.0	15.5	1.75	20.5	28.2	5.0	40.3	8.0	12
60	8.1	0	9.2	8.4	0.33	9.8	8.8	0.5	10.4	9.4	0.67	11.3	10.1	0.75	12.5	12.3	1.33	16.0	16.9	1.75	23.4	31.1	5.0	46.0	9.2	15
72	9.2	0	11.5	9.6	0.33	12.2	10.1	0.5	13.0	10.8	0.67	14.1	11.7	0.75	15.6	14.3	1.33	20.0	19.8	1.75	29.2	36.9	5.0	57.6	11.5	15



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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

ENDWALLS
CAST-IN-PLACE & PRECAST

RECOMMENDED JUN. 1, 2010 — CHIEF, HWY. QA DIVISION
RECOMMENDED JUN. 1, 2010 — DIRECTOR, BUREAU OF DESIGN
SHT 2 OF 2
RC-31M

N.T.S.

HEADWALLS

Date	Description	No.
REVISIONS		

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
JOHN C. COTE
ENGINEER
PE085407
2/24/2023
SIGNATURE — DATE SIGNED
JOHN C. COTE
PROFESSIONAL ENGINEER PA Lic. No. PE085407

LANGAN
Langan Engineering and Environmental Services, Inc.
300 Kimball Drive
Parsippany, NJ 07054
T: 973.560.4900 F: 973.560.4901 www.langan.com

Project
SMITHFIELD GATEWAY
PHASE 1A-2
SMITHFIELD TOWNSHIP
MONROE COUNTY PENNSYLVANIA

Drawing Title
POST CONSTRUCTION STORMWATER MANAGEMENT NOTES & DETAILS

Project No.	Drawing No.
100501402	CG504 1121
Date: FEBRUARY 17, 2023	Sheet 22 of 39
Drawn By: SM	
Checked By: TH	

APPENDIX A

Existing Discharge Calculations

APPENDIX A
TABLE OF CONTENTS

EX-A-2-A-OFFSITE WATERSHED

- **Time of Concentration Calculation**
- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

COMBINED EXISTING FLOW POA-A-2

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

EX-A-3-ONSITE WATERSHED

- **Time of Concentration Calculation**
- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

EX-A-3-OFFSITE WATERSHED

- **Time of Concentration Calculation**
- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

COMBINED EXISTING FLOW TO POA-A-3

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

EX-A-4-ONSITE WATERSHED

- **Time of Concentration Calculation**
- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

EX-B-1-ONSITE WATERSHED

- **Time of Concentration Calculation**
- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**

25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

EX-B-1-OFFSITE WATERSHED
Time of Concentration Calculation
2 Year 24 Hour Storm
10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

EX-B-2-ONSITE WATERSHED
Time of Concentration Calculation
2 Year 24 Hour Storm
10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

EX-B-2-OFFSITE WATERSHED
Time of Concentration Calculation
2 Year 24 Hour Storm
10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

COMBINED EX-B-2
2 Year 24 Hour Storm
10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

EX-B-2 POND ROUTING
2 Year 24 Hour Storm
10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

TOTAL EXISTING FLOW TO POA-B
2 Year 24 Hour Storm
10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

EX-C-ONSITE WATERSHED
Time of Concentration Calculation
2 Year 24 Hour Storm

10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

EX-C-OFFSITE WATERSHED
Time of Concentration Calculation
2 Year 24 Hour Storm
10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

TOTAL EXISTING FLOW TO POA-C
2 Year 24 Hour Storm
10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

COMBINED EXISTING FLOW TO POA-ABC
2 Year 24 Hour Storm
10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

EX-D-1-ONSITE WATERSHED
Time of Concentration Calculation
2 Year 24 Hour Storm
10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

EX-D-2-ONSITE WATERSHED
Time of Concentration Calculation
2 Year 24 Hour Storm
10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

EX-D-2-OFFSITE-DISTURBED WATERSHED
2 Year 24 Hour Storm
10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

EX-D-2-OFFSITE-UNDISTURBED WATERSHED
2 Year 24 Hour Storm

10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

TOTAL EXISTING FLOW TO POA-D-1
2 Year 24 Hour Storm
10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

EX-D-3-OFFSITE WATERSHED
Time of Concentration Calculation
2 Year 24 Hour Storm
10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

TOTAL EXISTING FLOW TO POA-D
2 Year 24 Hour Storm
10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

EX-E-1-DISTURBED WATERSHED
Time of Concentration Calculation
2 Year 24 Hour Storm
10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

EX-E-1-UNDISTURBED WATERSHED
2 Year 24 Hour Storm
10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

EX-E-2-DISTURBED WATERSHED
Time of Concentration Calculation
2 Year 24 Hour Storm
10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

EX-E-2-UNDISTURBED WATERSHED
2 Year 24 Hour Storm

10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

TOTAL EXISTING FLOW TO POA-E
Time of Concentration Calculation
2 Year 24 Hour Storm
10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

TOTAL EXISTING FLOW TO BRODHEAD CREEK
2 Year 24 Hour Storm
10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

SUMMARY OF EXISTING PEAK DISCHARGES

STORMWATER MANAGEMENT REPORT – PREPARED BY REILLY ASSOCIATES
Existing Stormwater Basin Peak Discharges

NOAA RAINFALL DATA

NOAA Atlas 14, Volume 2, Version 3
Location name: East Stroudsburg, Pennsylvania, US*
Latitude: 41.0047°, Longitude: -75.1497°
Elevation: 473 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.327 (0.291-0.366)	0.391 (0.349-0.439)	0.471 (0.418-0.528)	0.537 (0.475-0.599)	0.627 (0.549-0.699)	0.704 (0.612-0.785)	0.790 (0.679-0.883)	0.885 (0.752-0.992)	1.02 (0.857-1.16)	1.15 (0.948-1.31)
10-min	0.516 (0.460-0.577)	0.619 (0.552-0.694)	0.743 (0.660-0.833)	0.844 (0.747-0.943)	0.979 (0.857-1.09)	1.09 (0.950-1.22)	1.22 (1.05-1.36)	1.36 (1.16-1.52)	1.56 (1.31-1.76)	1.74 (1.43-1.98)
15-min	0.638 (0.569-0.714)	0.767 (0.683-0.860)	0.927 (0.823-1.04)	1.05 (0.930-1.18)	1.23 (1.07-1.37)	1.37 (1.19-1.53)	1.53 (1.31-1.71)	1.70 (1.45-1.91)	1.96 (1.64-2.21)	2.18 (1.79-2.48)
30-min	0.859 (0.766-0.962)	1.04 (0.930-1.17)	1.29 (1.15-1.45)	1.49 (1.32-1.67)	1.77 (1.55-1.98)	2.01 (1.75-2.24)	2.27 (1.96-2.54)	2.56 (2.18-2.88)	3.00 (2.51-3.39)	3.39 (2.79-3.86)
60-min	1.06 (0.946-1.19)	1.29 (1.15-1.45)	1.64 (1.46-1.84)	1.92 (1.70-2.15)	2.33 (2.04-2.60)	2.69 (2.33-3.00)	3.08 (2.65-3.45)	3.54 (3.01-3.97)	4.23 (3.54-4.78)	4.86 (4.00-5.53)
2-hr	1.28 (1.15-1.43)	1.56 (1.41-1.74)	1.98 (1.78-2.21)	2.32 (2.08-2.59)	2.85 (2.53-3.17)	3.33 (2.93-3.71)	3.89 (3.39-4.33)	4.54 (3.92-5.07)	5.57 (4.72-6.28)	6.53 (5.45-7.41)
3-hr	1.43 (1.29-1.59)	1.73 (1.56-1.92)	2.16 (1.95-2.40)	2.52 (2.27-2.79)	3.09 (2.75-3.41)	3.59 (3.17-3.98)	4.18 (3.65-4.63)	4.86 (4.20-5.42)	5.96 (5.05-6.69)	6.96 (5.81-7.87)
6-hr	1.85 (1.68-2.06)	2.23 (2.02-2.47)	2.74 (2.48-3.04)	3.18 (2.88-3.53)	3.89 (3.48-4.31)	4.54 (4.01-5.03)	5.29 (4.63-5.88)	6.19 (5.34-6.90)	7.63 (6.45-8.56)	8.97 (7.45-10.1)
12-hr	2.31 (2.10-2.57)	2.79 (2.53-3.10)	3.45 (3.12-3.83)	4.04 (3.63-4.48)	4.96 (4.42-5.50)	5.82 (5.12-6.46)	6.83 (5.93-7.58)	8.02 (6.88-8.95)	9.95 (8.37-11.2)	11.7 (9.69-13.3)
24-hr	2.77 (2.56-3.03)	3.32 (3.07-3.64)	4.13 (3.81-4.52)	4.84 (4.44-5.28)	5.95 (5.41-6.46)	6.96 (6.28-7.54)	8.14 (7.29-8.80)	9.54 (8.44-10.3)	11.8 (10.3-12.7)	13.9 (11.9-14.9)
2-day	3.25 (3.01-3.55)	3.91 (3.62-4.27)	4.84 (4.48-5.29)	5.66 (5.21-6.17)	6.93 (6.33-7.53)	8.09 (7.33-8.77)	9.45 (8.48-10.2)	11.0 (9.79-11.9)	13.6 (11.9-14.6)	15.9 (13.7-17.2)
3-day	3.42 (3.17-3.72)	4.10 (3.80-4.46)	5.06 (4.69-5.51)	5.90 (5.44-6.40)	7.20 (6.60-7.79)	8.39 (7.63-9.06)	9.77 (8.81-10.5)	11.4 (10.2-12.3)	14.0 (12.3-15.0)	16.4 (14.2-17.6)
4-day	3.58 (3.33-3.88)	4.29 (3.98-4.66)	5.28 (4.90-5.72)	6.13 (5.68-6.63)	7.47 (6.86-8.05)	8.69 (7.93-9.35)	10.1 (9.14-10.8)	11.8 (10.5-12.6)	14.4 (12.8-15.4)	16.9 (14.7-18.1)
7-day	4.23 (3.94-4.59)	5.06 (4.70-5.50)	6.18 (5.73-6.70)	7.15 (6.61-7.74)	8.65 (7.96-9.33)	10.0 (9.15-10.8)	11.6 (10.5-12.4)	13.4 (12.0-14.3)	16.2 (14.4-17.4)	18.8 (16.5-20.1)
10-day	4.89 (4.56-5.28)	5.83 (5.43-6.29)	7.03 (6.54-7.58)	8.05 (7.48-8.67)	9.61 (8.88-10.3)	11.0 (10.1-11.8)	12.6 (11.5-13.5)	14.4 (13.0-15.4)	17.1 (15.4-18.3)	19.6 (17.4-21.0)
20-day	6.62 (6.23-7.07)	7.81 (7.36-8.35)	9.18 (8.64-9.80)	10.3 (9.69-11.0)	12.0 (11.2-12.8)	13.5 (12.5-14.3)	15.1 (14.0-16.1)	16.9 (15.6-18.0)	19.6 (17.9-20.9)	22.0 (19.9-23.4)
30-day	8.23 (7.78-8.75)	9.68 (9.13-10.3)	11.2 (10.5-11.8)	12.4 (11.7-13.1)	14.2 (13.3-15.0)	15.8 (14.7-16.7)	17.4 (16.2-18.4)	19.2 (17.8-20.3)	21.9 (20.2-23.2)	24.2 (22.2-25.6)
45-day	10.5 (9.96-11.1)	12.2 (11.6-12.9)	13.9 (13.2-14.7)	15.3 (14.5-16.1)	17.2 (16.3-18.2)	18.9 (17.8-19.9)	20.6 (19.4-21.7)	22.4 (21.1-23.7)	25.1 (23.4-26.6)	27.4 (25.4-29.0)
60-day	12.6 (12.0-13.3)	14.7 (14.0-15.4)	16.5 (15.8-17.4)	18.1 (17.2-19.0)	20.3 (19.3-21.3)	22.1 (20.9-23.2)	24.0 (22.7-25.2)	26.0 (24.5-27.3)	28.9 (27.1-30.4)	31.3 (29.2-33.0)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

EXISTING RUNOFF CURVE NUMBER CALCULATIONS

POST CONSTRUCTION STORMWATER MANAGEMENT
WEIGHTED CURVE NUMBER CALCULATIONS
SMITHFIELD GATEWAY PHASE 1A-1
LANGAN PROJECT #100501401

EXISTING CONDITIONS

EXISTING WATERSHED AREAS	MEADOW SOIL GROUP C CN = 71 (SF)	MEADOW SOIL GROUP D CN = 78 (SF)	WOODS (FAIR) SOIL GROUP C CN = 73 (SF)	WOODS (FAIR) SOIL GROUP D CN = 79 (SF)	OPEN SPACE SOIL GROUP D CN = 80 (SF)	TOTAL IMPERVIOUS CN = 98 (SF)	REDUCED IMPERVIOUS CN = 98 (SF)	INCREASED MEADOW CN = 78 (SF)	TOTAL AREA (SF)	TOTAL AREA (AC)	CURVE NUMBER CN (Weighted)
POA-A-1											
EX-A-1-A-ONSITE	0	219,280	0	78,217		33,286	26,629	6,657	330,783	7.59	80
EX-A-1-A-OFFSITE-DISTURBED	0	18,026	0	0		46,859			64,885	1.49	93
EX-A-1-A-OFFSITE-UNDISTURBED	0	143,398	0	989,859		437,803			1,571,060	36.07	85
EX-A-1-B (DA3)						103,237			327,136	7.51	
EX-A-1-C-ONSITE (DA2)	0	23,001	0	0		0	0	0	23,001	0.53	78
EX-A-1-C-OFFSITE (DA2)						59,677			172,148	3.95	
EX-A-1-D OFFSITE	0	170,864	0	409,768		108,469			689,101	15.82	82
POA-A-2											
EX-A-2-A-ONSITE	83,246	328,038	7,829	70,751		31,659	25,327	6,332	521,523	11.97	78
EX-A-2-A OFFSITE	86,162	389,204	0	242,154		65,924			783,443	17.99	80
EX-A-2-B-ONSITE (DA4)	45,043	101,447	0	0		0	0	0	146,490	3.36	76
EX-A-2-B-OFFSITE (DA4)						210,830			464,221	10.66	
POA-A-3											
EX-A-3-ONSITE	28,208	857,322	0	349,181		125,069	100,055	25,014	1,359,780	31.22	80
EX-A-3 OFFSITE	2,829	219,205	7,057	792,834		158,533			1,180,458	27.10	82
POA-B											
EX-B-1-ONSITE	0	15,381	0	0		50,552	40,442	10,110	65,934	1.51	93
EX-B-1-OFFSITE	0	87,030	0	0		90,593			177,623	4.08	89
EX-B-2-ONSITE	0	716,942	0	158,414		122,700	98,160	24,540	998,056	22.91	81
EX-B-2 OFFSITE	0	16,144	0	8,837		29,697			54,678	1.25	90
POA-C											
EX-C-ONSITE	0	0	0	38,594		9,022	7,218	1,804	47,616	1.09	82
EX-C-OFFSITE	0	31,433	0	0		25,904			57,337	1.32	88
POA-D											
EX-D-1-ONSITE	0	204,746	0	0		9,207	7,366	1,841	213,953	4.91	79
EX-D-2-ONSITE	0	84,000	0	50,356		41,611	33,289	8,322	175,967	4.04	83
EX-D-2-OFFSITE-DISTURBED	0	15,661	0	1,588		15,886			33,135	0.76	88
EX-D-2-OFFSITE-UNDISTURBED	0	9,097	0	12,864		15,848			37,809	0.87	87
EX-D-3-OFFSITE	0	54,371	0	11,591		46,426			112,388	2.58	86
POA-E											
EX-E-1-DISTURBED	0	71,216	0	0		37,117	29,694	7,423	108,333	2.49	84
EX-E-1-UNDISTURBED	0	190,420	0	0		226,784			417,204	9.58	89
EX-E-2-DISTURBED	0	100,833	0	0		0			100,833	2.31	78
EX-E-2-UNDISTURBED	0	651,506	0	205,649		0			857,155	19.68	79
POA-A											
EX-A-4 ONSITE	0	55,963	0	64,226		9,962	7,969	1,992	130,151	2.99	80

NOTES:

1. RUNOFF CURVE NUMBERS REFERENCED FROM TABLE B-2: RUNOFF CURVE NUMBERS, LOCATED IN APPENDIX B OF CHAPTER 26 - WATER OF THE ORDINANCE OF SMITHFIELD TOWNSHIP
2. FOR ONSITE WATERSHEDS, 20% OF THE EXISTING IMPERVIOUS AREA IS CONSIDERED MEADOW (GOOD CONDITION) IN THE MODEL FOR EXISTING CONDITIONS, AS PER SECTION 3.3.3 VOLUME CONTROL GUIDELINE 1.

EX-A-1-A-ONSITE WATERSHED

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No. 1

EX-A-1-A-ONSITE

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 150.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.32		0.00		0.00		
Land slope (%)	= 1.33		0.00		0.00		
Travel Time (min)	**= 15.66**	**+**	**0.00**	**+**	**0.00**	**=**	**15.66**
Shallow Concentrated Flow							
Flow length (ft)	= 978.00		0.00		0.00		
Watercourse slope (%)	= 3.78		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=3.14		0.00		0.00		
Travel Time (min)	**= 5.20**	**+**	**0.00**	**+**	**0.00**	**=**	**5.20**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 20.90 min

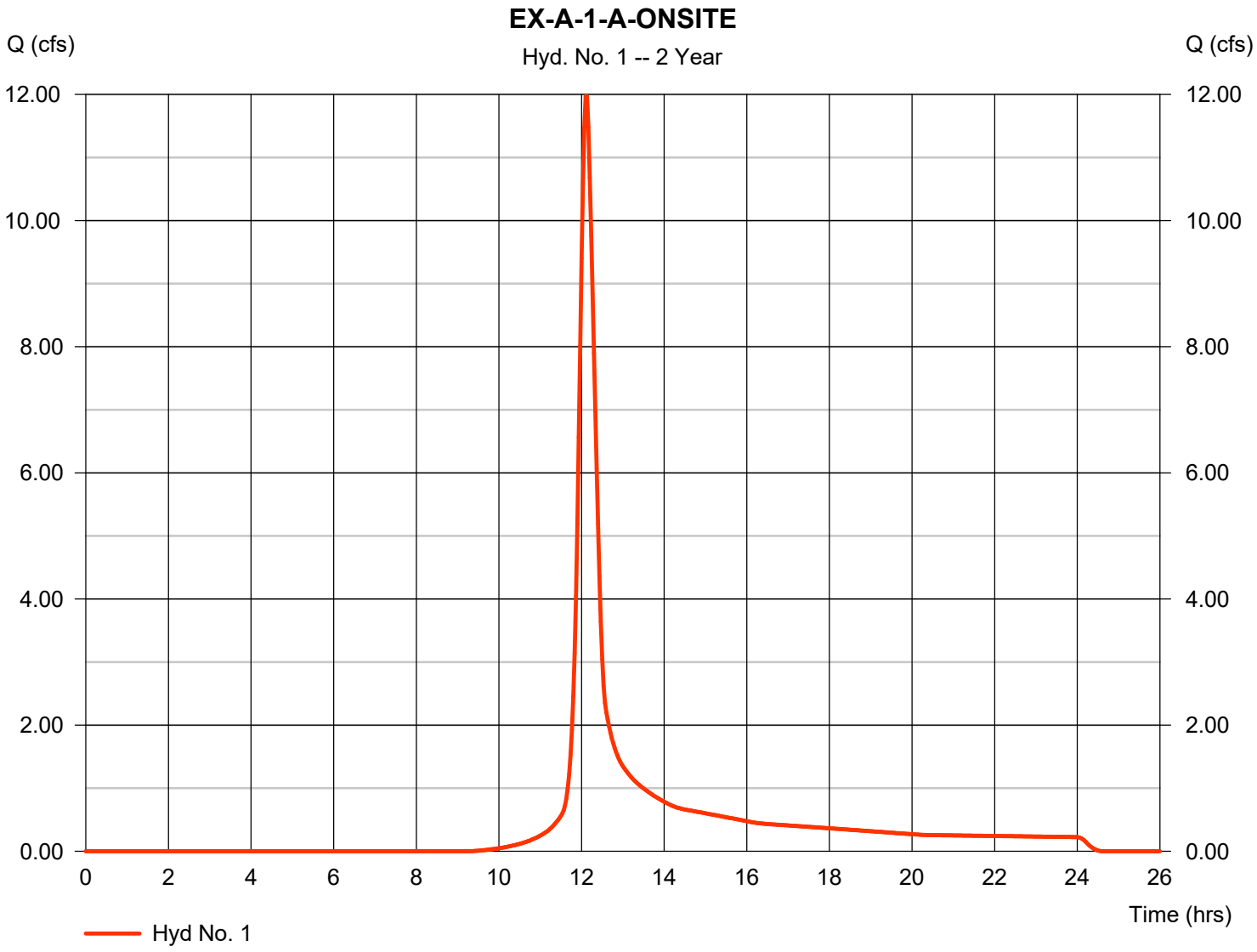
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 1

EX-A-1-A-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.97 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	41,920 cuft
Drainage area	=	7.590 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	20.90 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

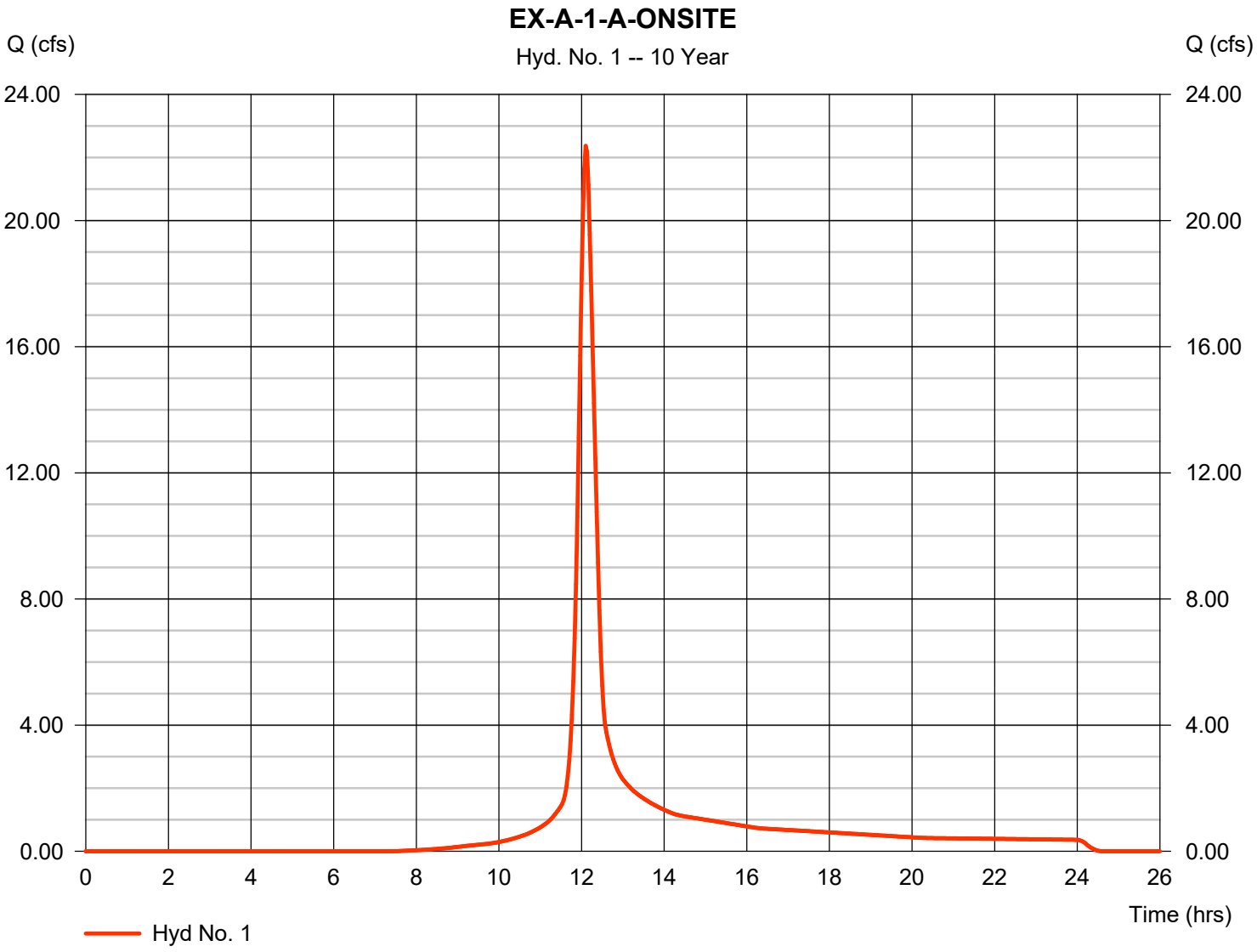


Hydrograph Report

Hyd. No. 1

EX-A-1-A-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	22.37 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	77,225 cuft
Drainage area	=	7.590 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	20.90 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

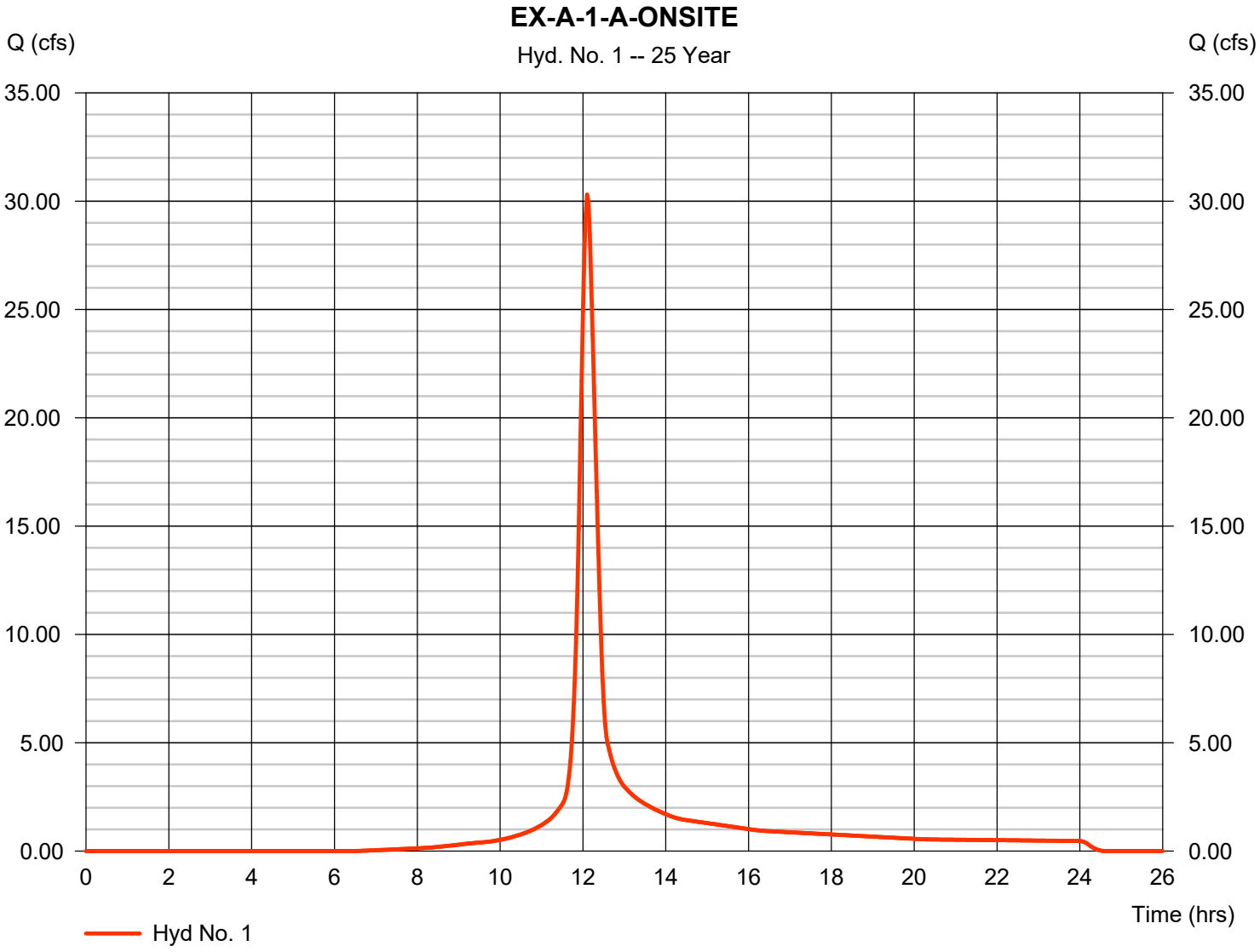


Hydrograph Report

Hyd. No. 1

EX-A-1-A-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	30.30 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	104,776 cuft
Drainage area	=	7.590 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	20.90 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

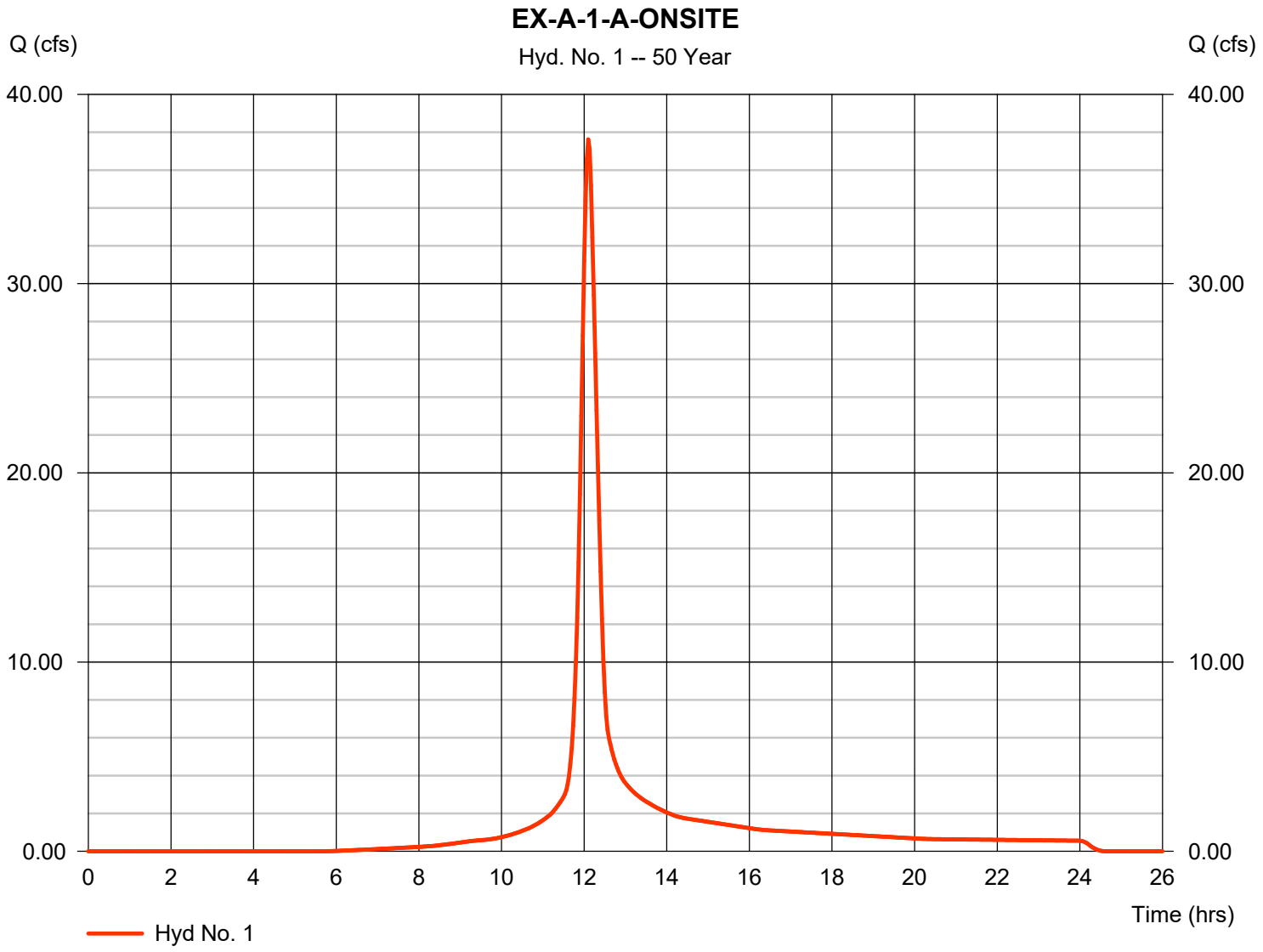


Hydrograph Report

Hyd. No. 1

EX-A-1-A-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	37.62 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	130,615 cuft
Drainage area	=	7.590 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	20.90 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

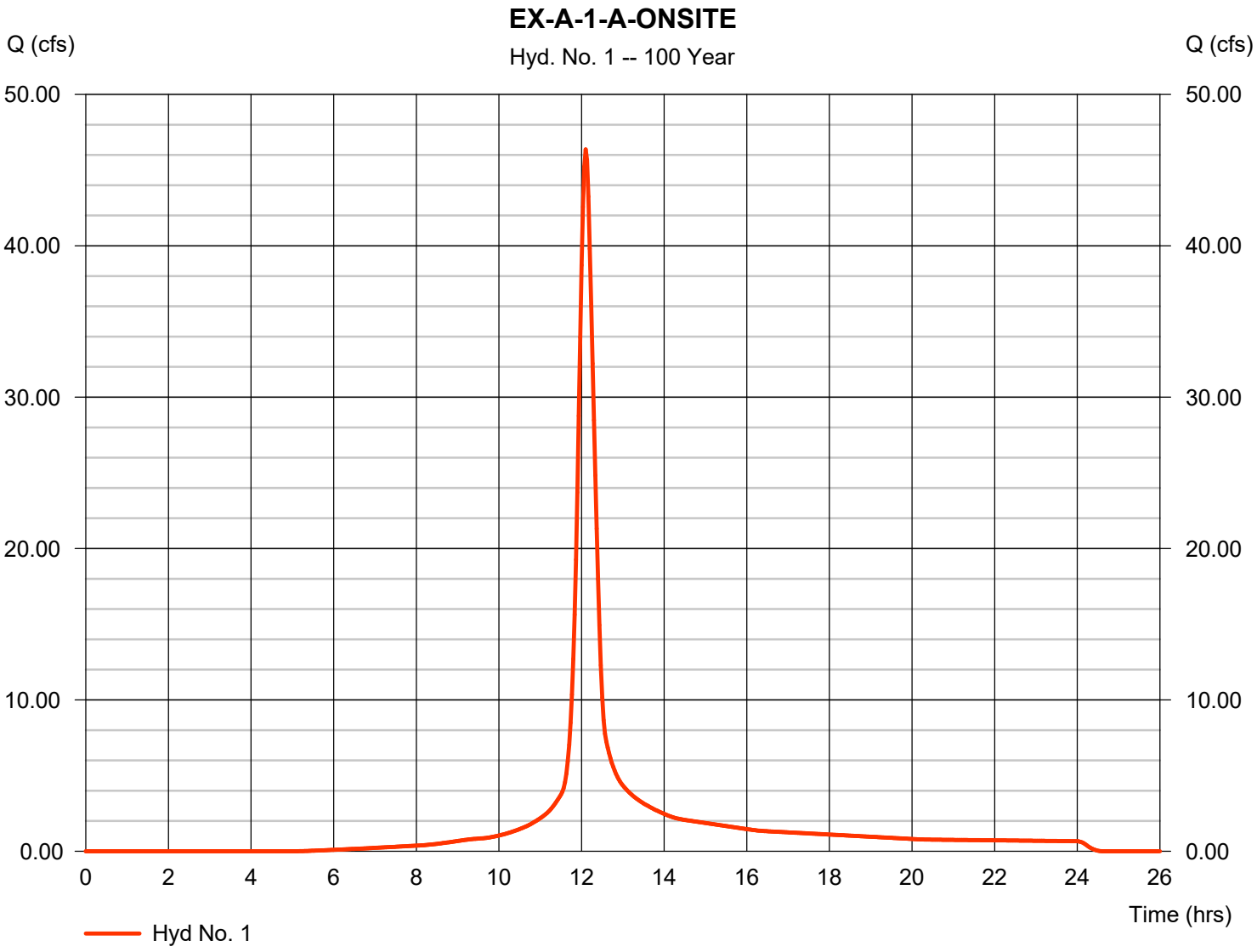


Hydrograph Report

Hyd. No. 1

EX-A-1-A-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	46.37 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	161,957 cuft
Drainage area	=	7.590 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	20.90 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



EX-A-1-A-OFFSITE-DISTRUBED WATERSHED

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No. 2

EX-A-1-A-OFFSITE-DISTURBED

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.400		0.011		0.011		
Flow length (ft)	= 150.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.32		0.00		0.00		
Land slope (%)	= 5.33		0.00		0.00		
Travel Time (min)	**= 19.70**	**+**	**0.00**	**+**	**0.00**	**=**	**19.70**
Shallow Concentrated Flow							
Flow length (ft)	= 1126.00		472.00		1174.00		
Watercourse slope (%)	= 5.50		4.25		7.33		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=3.78		3.33		4.37		
Travel Time (min)	**= 4.96**	**+**	**2.37**	**+**	**4.48**	**=**	**11.80**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 31.50 min

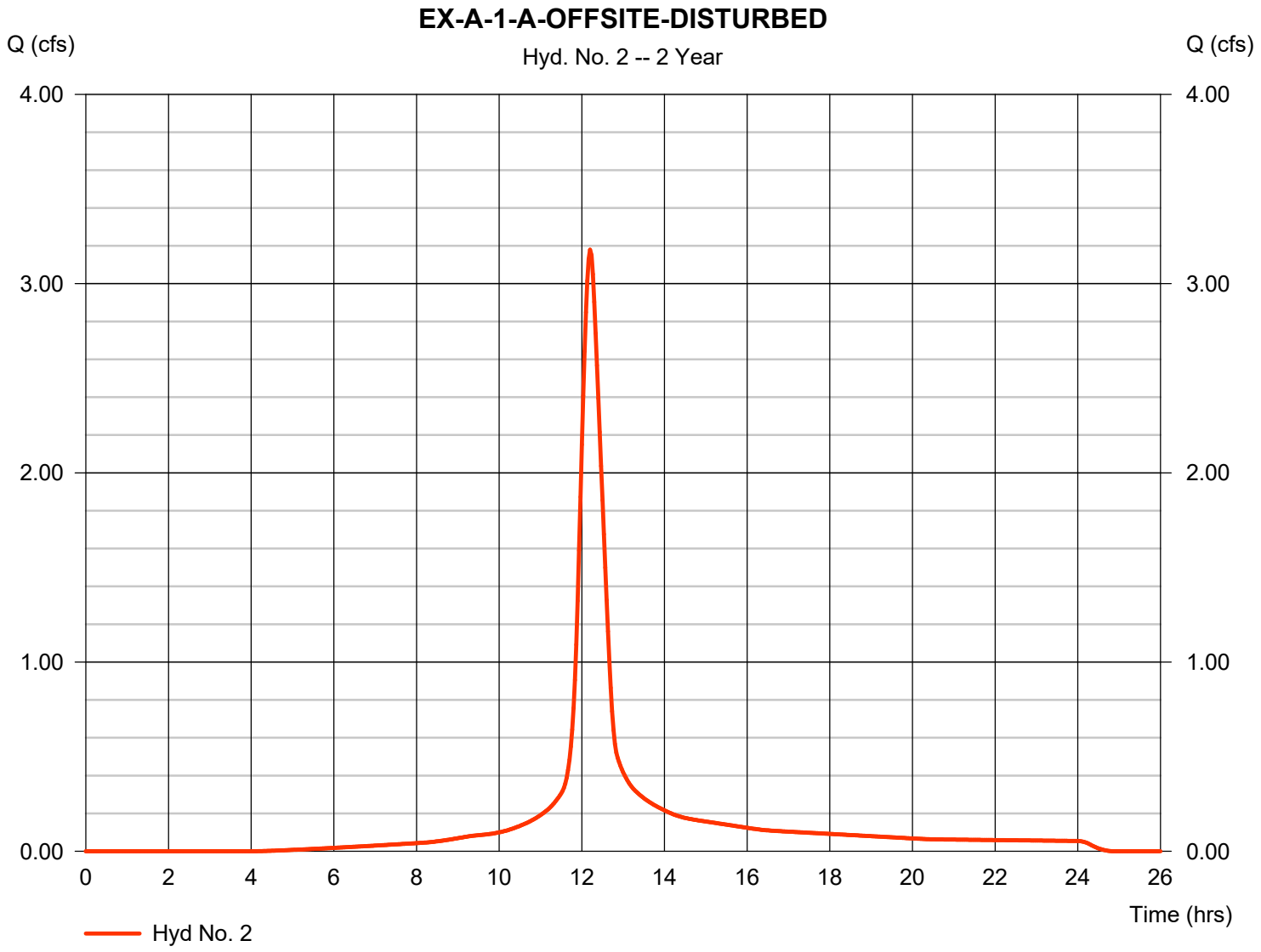
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 2

EX-A-1-A-OFFSITE-DISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 3.179 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.20 hrs
Time interval	= 2 min	Hyd. volume	= 14,026 cuft
Drainage area	= 1.490 ac	Curve number	= 93
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 31.50 min
Total precip.	= 3.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

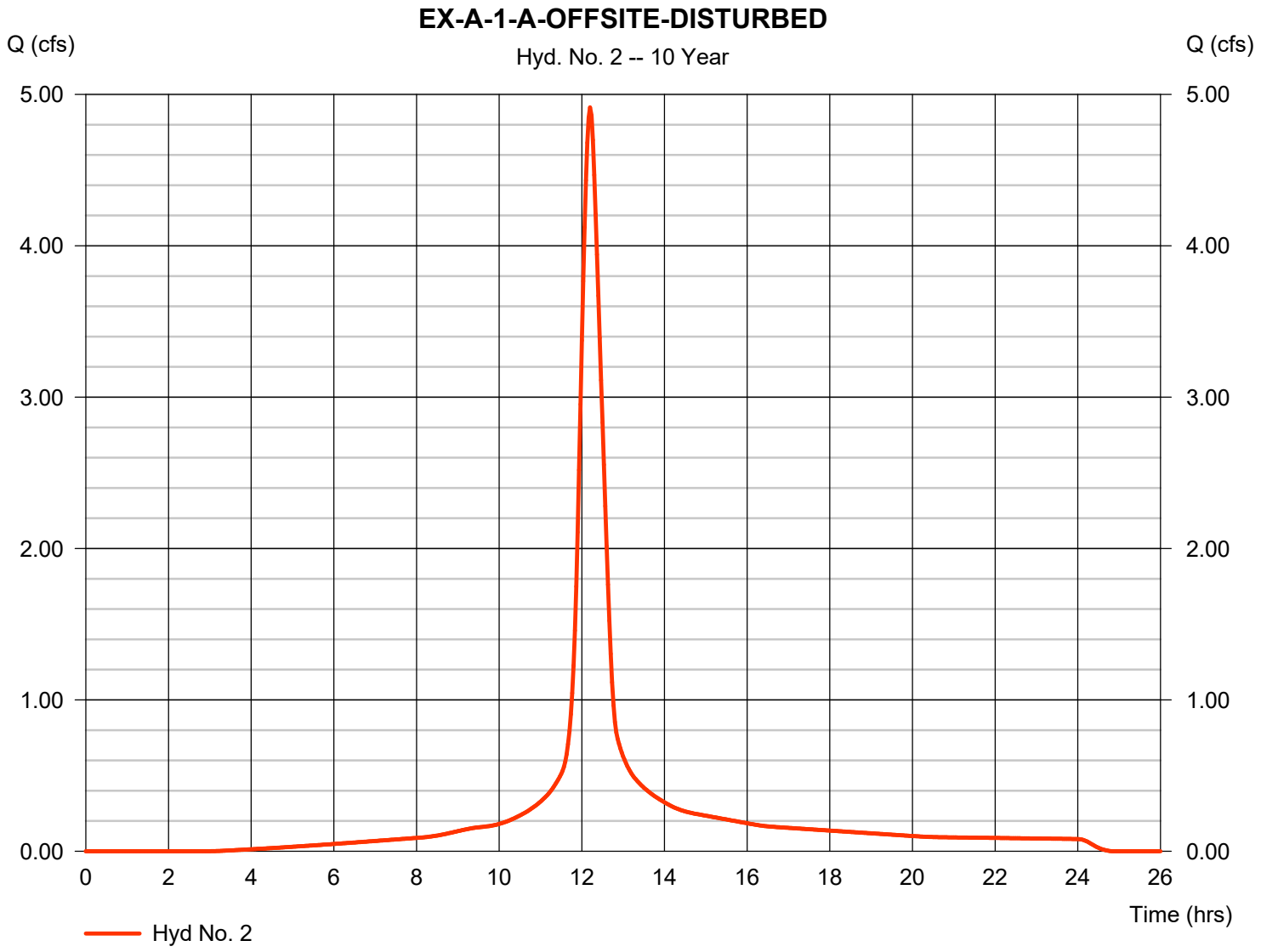


Hydrograph Report

Hyd. No. 2

EX-A-1-A-OFFSITE-DISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 4.913 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 2 min	Hyd. volume	= 22,129 cuft
Drainage area	= 1.490 ac	Curve number	= 93
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 31.50 min
Total precip.	= 4.84 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

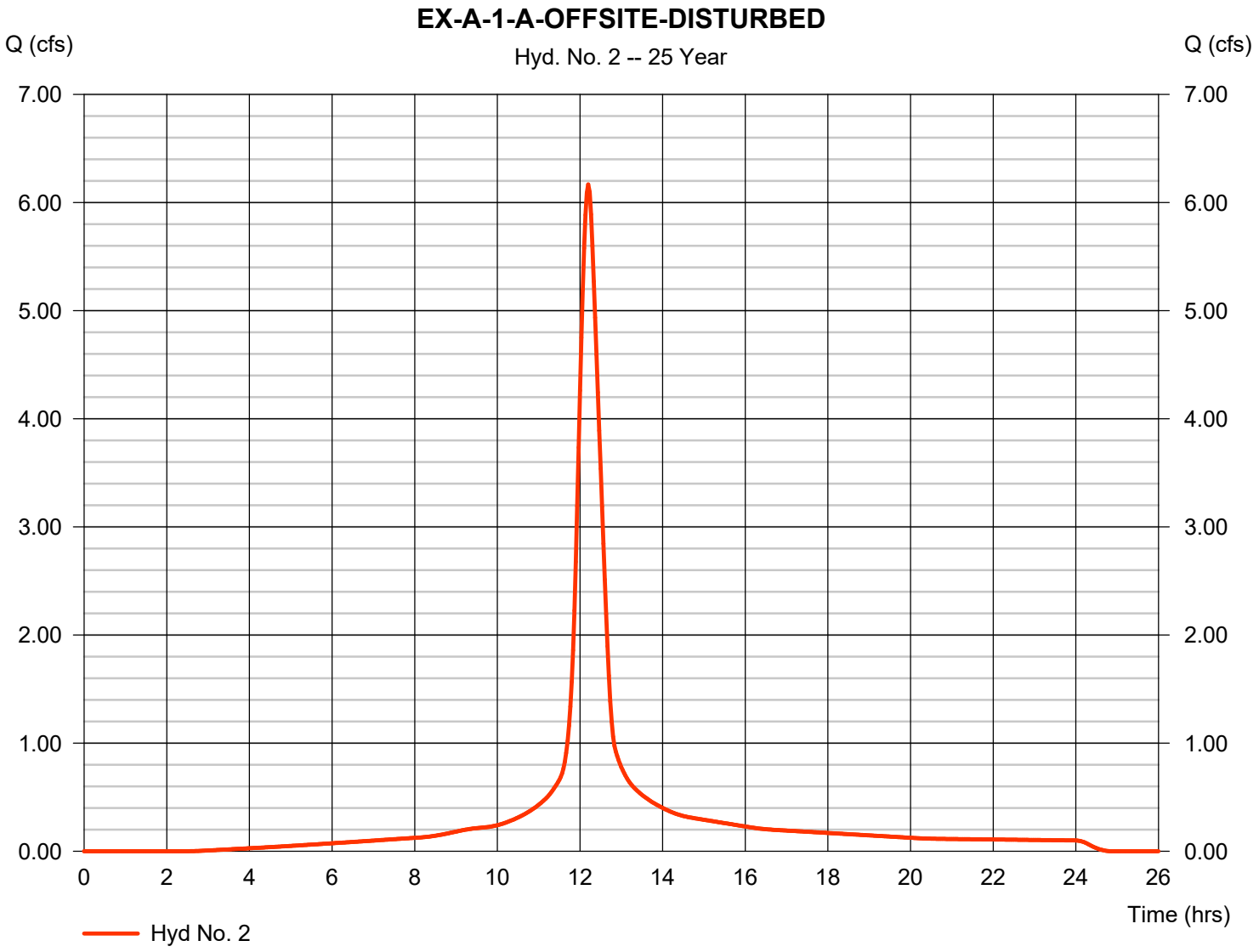


Hydrograph Report

Hyd. No. 2

EX-A-1-A-OFFSITE-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.168 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.20 hrs
Time interval	=	2 min	Hyd. volume	=	28,111 cuft
Drainage area	=	1.490 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	31.50 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

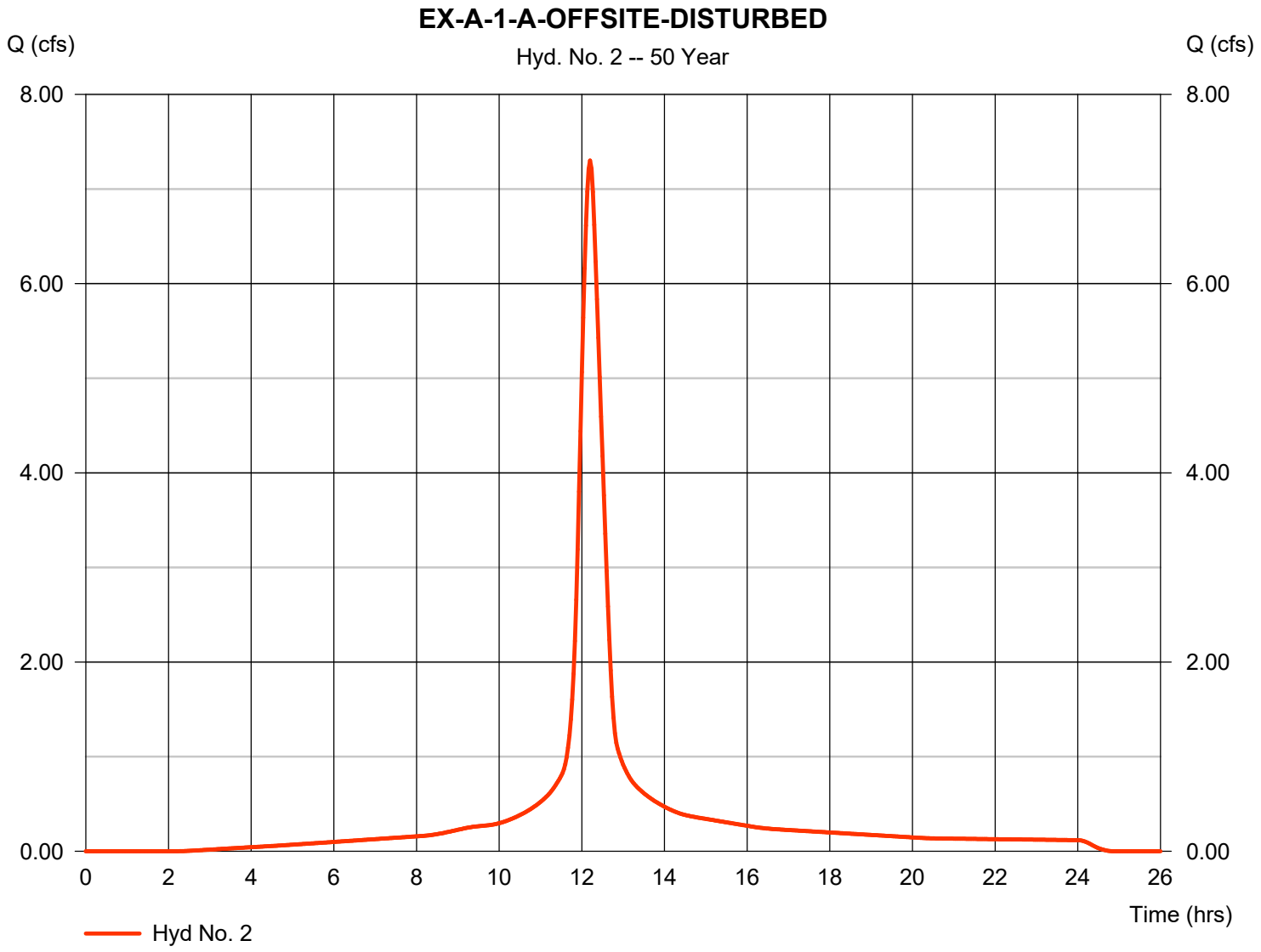


Hydrograph Report

Hyd. No. 2

EX-A-1-A-OFFSITE-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.302 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.20 hrs
Time interval	=	2 min	Hyd. volume	=	33,579 cuft
Drainage area	=	1.490 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	31.50 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

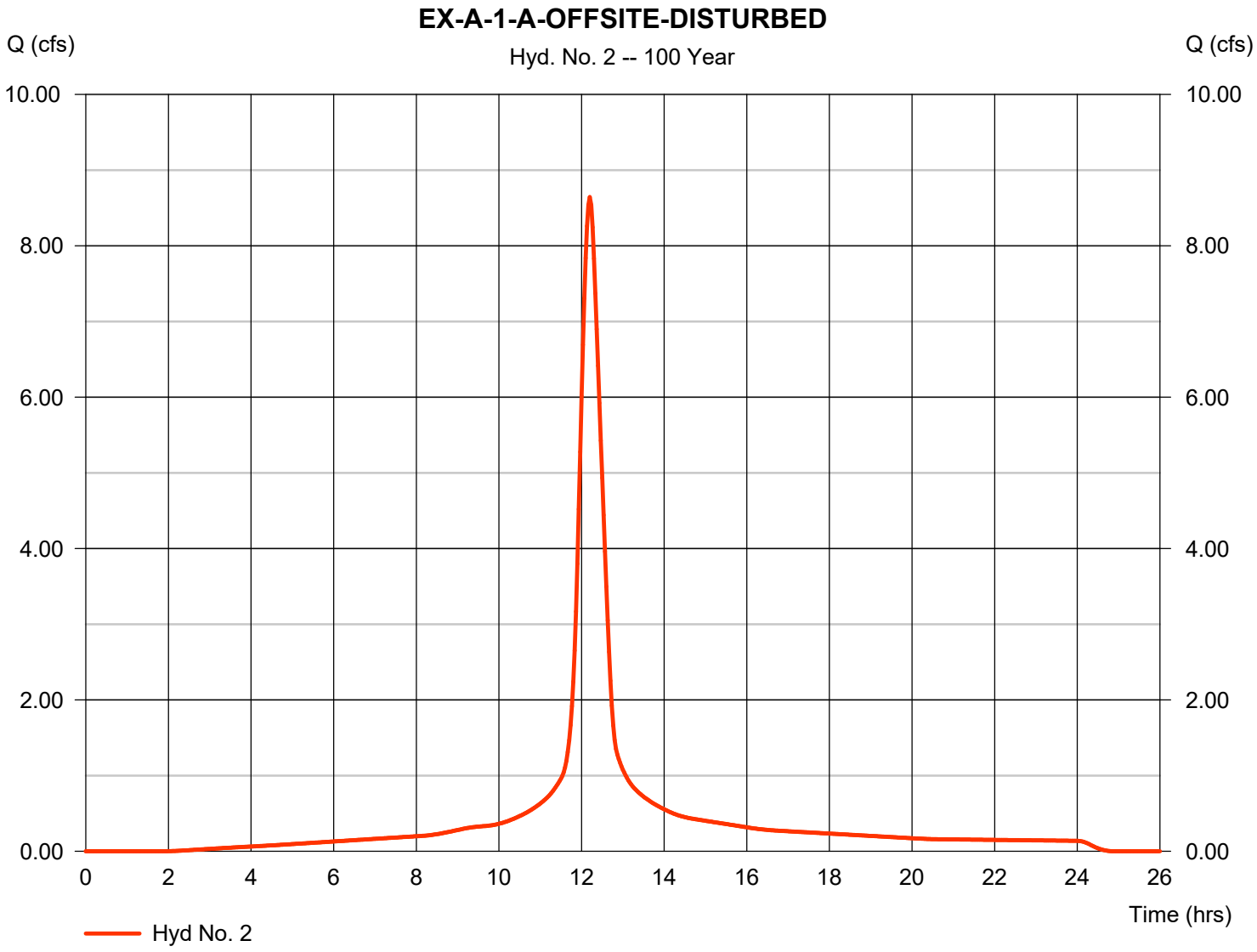


Hydrograph Report

Hyd. No. 2

EX-A-1-A-OFFSITE-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.643 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.20 hrs
Time interval	=	2 min	Hyd. volume	=	40,094 cuft
Drainage area	=	1.490 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	31.50 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



EX-A-1-A-OFFSITE-UNDISTRUBED WATERSHED

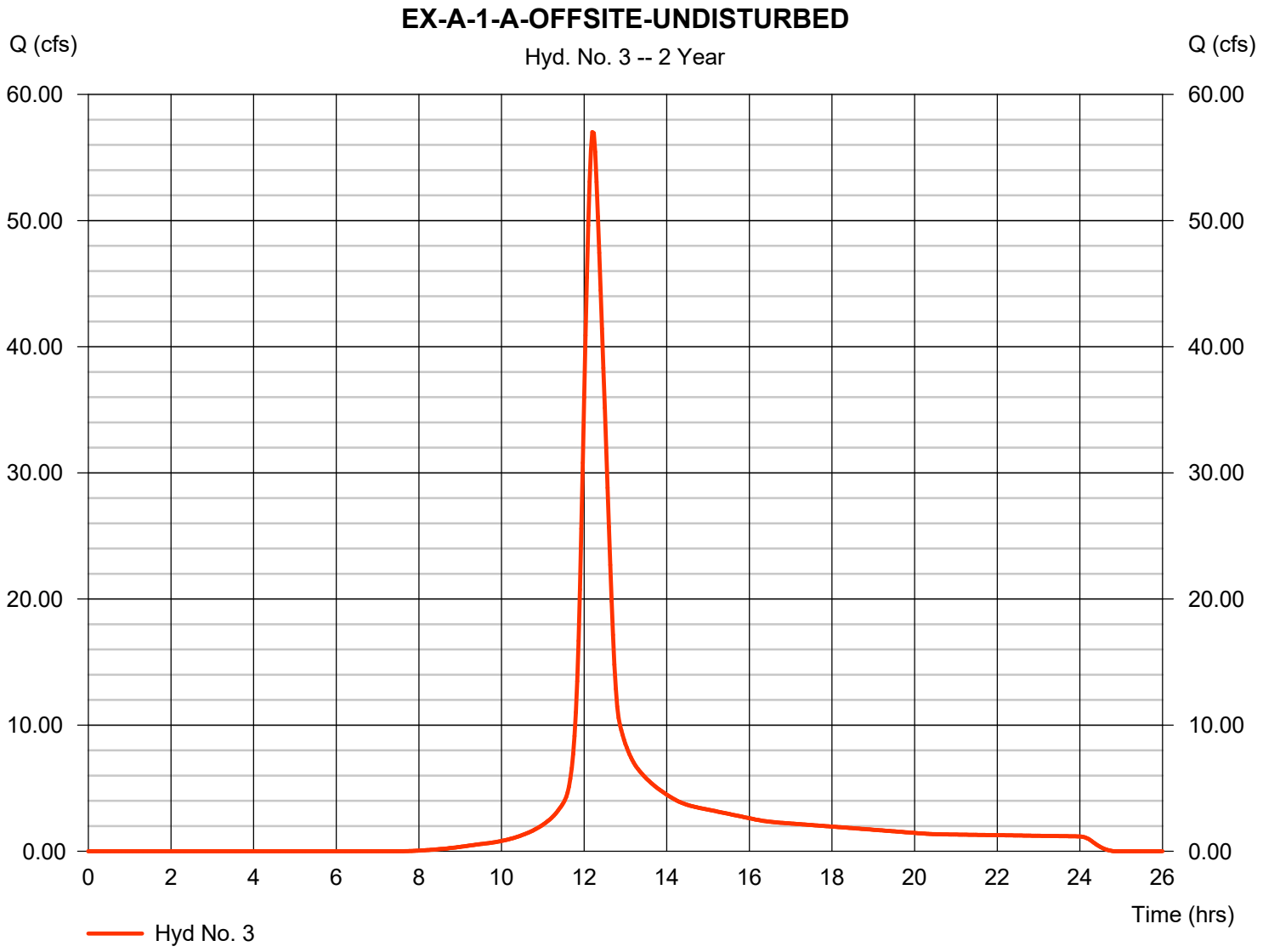
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 3

EX-A-1-A-OFFSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 57.01 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.20 hrs
Time interval	= 2 min	Hyd. volume	= 246,648 cuft
Drainage area	= 36.070 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 31.50 min
Total precip.	= 3.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

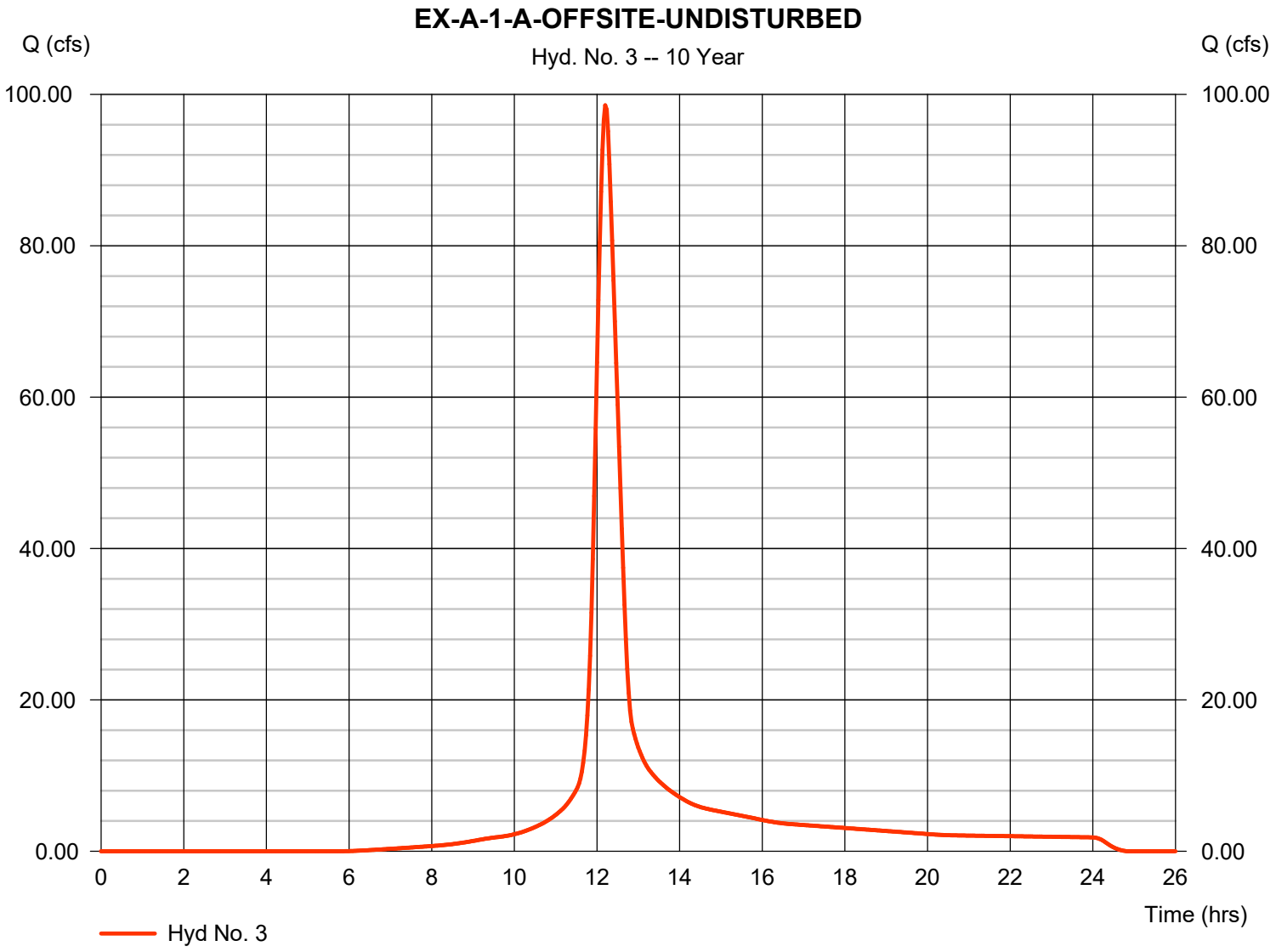


Hydrograph Report

Hyd. No. 3

EX-A-1-A-OFFSITE-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	98.56 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.20 hrs
Time interval	=	2 min	Hyd. volume	=	426,942 cuft
Drainage area	=	36.070 ac	Curve number	=	85
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	31.50 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

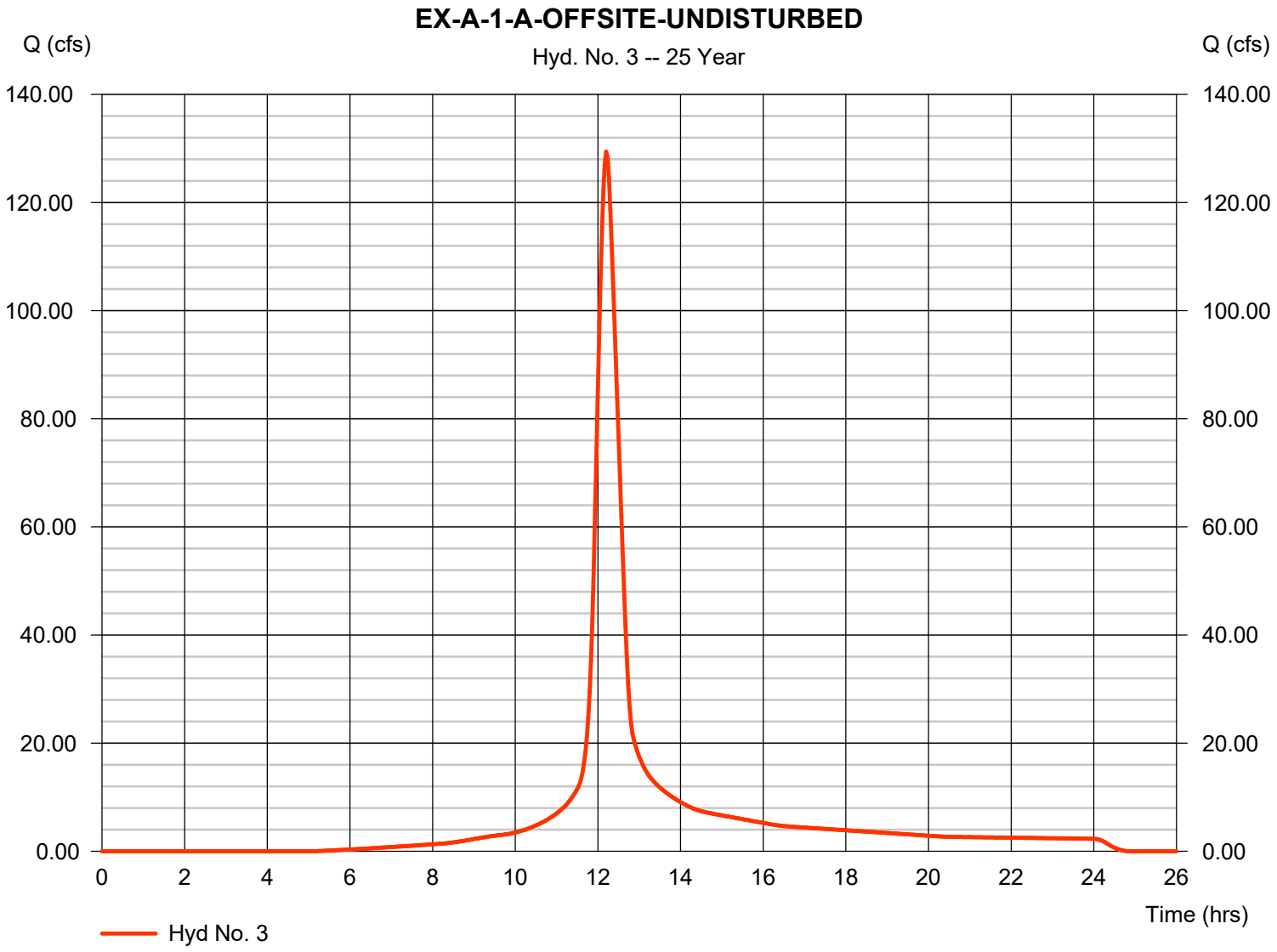


Hydrograph Report

Hyd. No. 3

EX-A-1-A-OFFSITE-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	129.41 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.20 hrs
Time interval	=	2 min	Hyd. volume	=	564,138 cuft
Drainage area	=	36.070 ac	Curve number	=	85
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	31.50 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

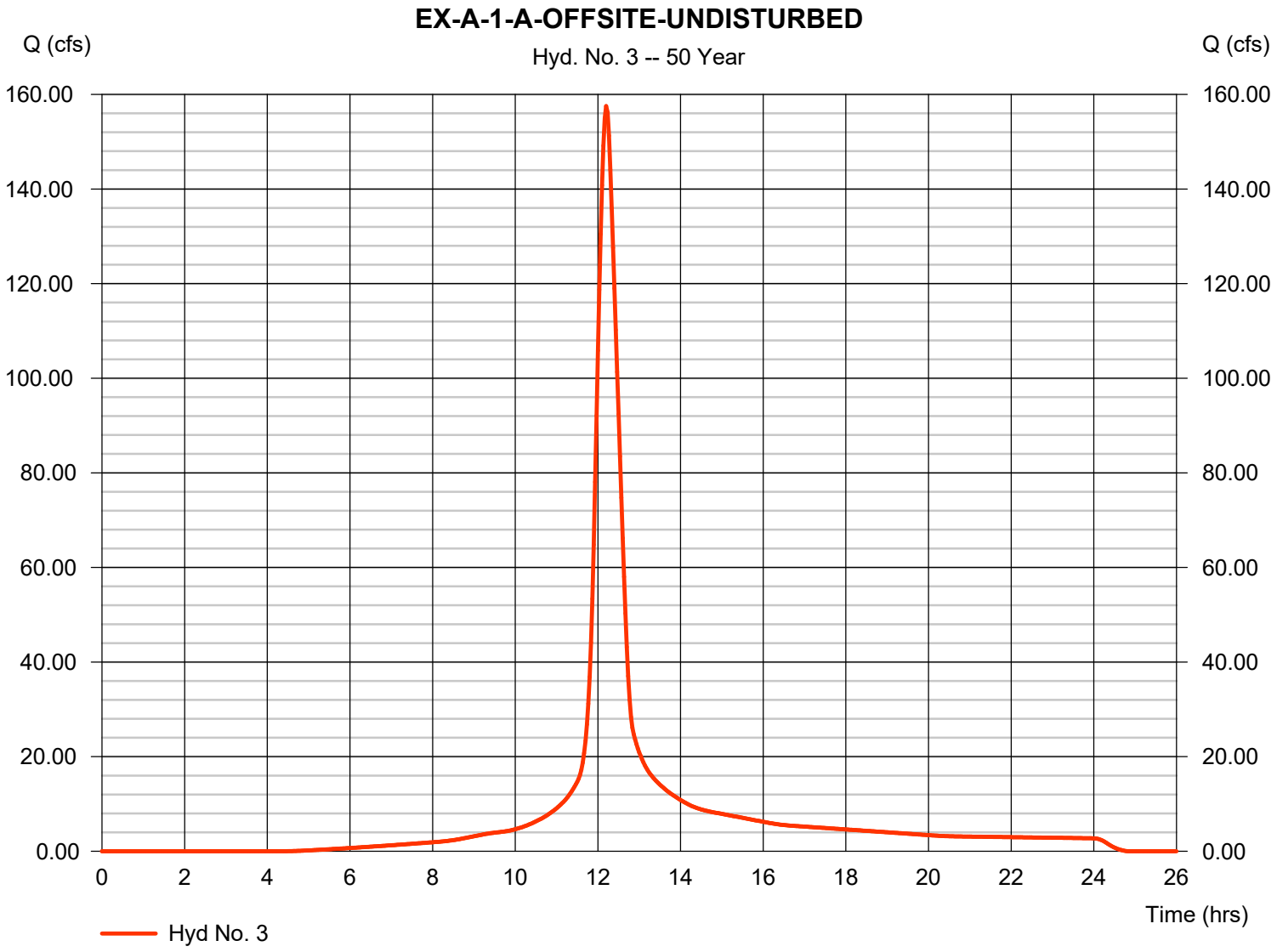


Hydrograph Report

Hyd. No. 3

EX-A-1-A-OFFSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 157.53 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.20 hrs
Time interval	= 2 min	Hyd. volume	= 691,270 cuft
Drainage area	= 36.070 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 31.50 min
Total precip.	= 6.96 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

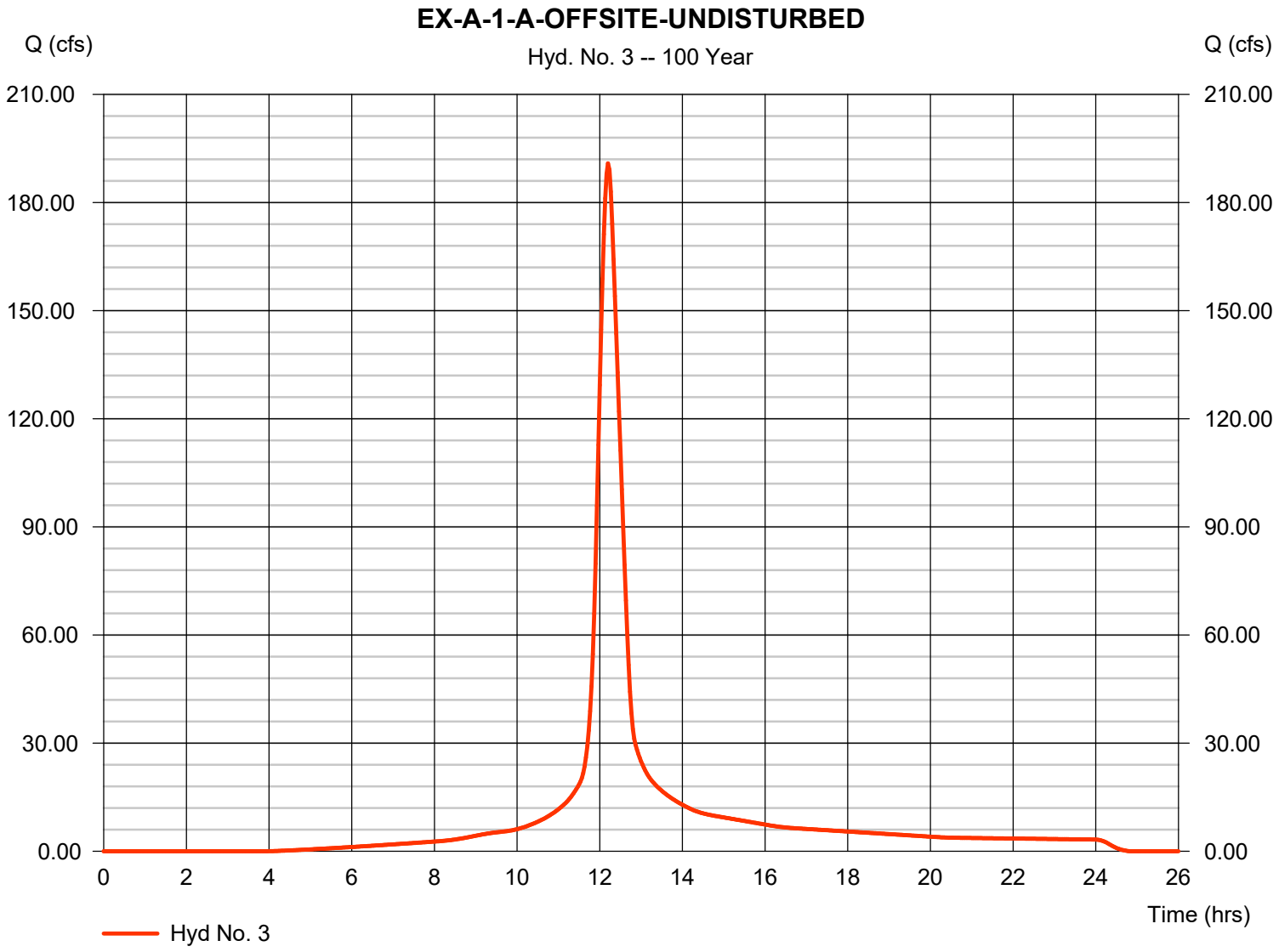


Hydrograph Report

Hyd. No. 3

EX-A-1-A-OFFSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 190.88 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 2 min	Hyd. volume	= 844,171 cuft
Drainage area	= 36.070 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 31.50 min
Total precip.	= 8.16 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



EX-A-1-D-OFFSITE WATERSHED

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No. 4

EX-A-1-D-OFFSITE

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 150.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.32		0.00		0.00		
Land slope (%)	= 8.00		0.00		0.00		
Travel Time (min)	**= 7.64**	**+**	**0.00**	**+**	**0.00**	**=**	**7.64**
Shallow Concentrated Flow							
Flow length (ft)	= 1597.00		0.00		0.00		
Watercourse slope (%)	= 7.39		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=4.39		0.00		0.00		
Travel Time (min)	**= 6.07**	**+**	**0.00**	**+**	**0.00**	**=**	**6.07**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 13.70 min

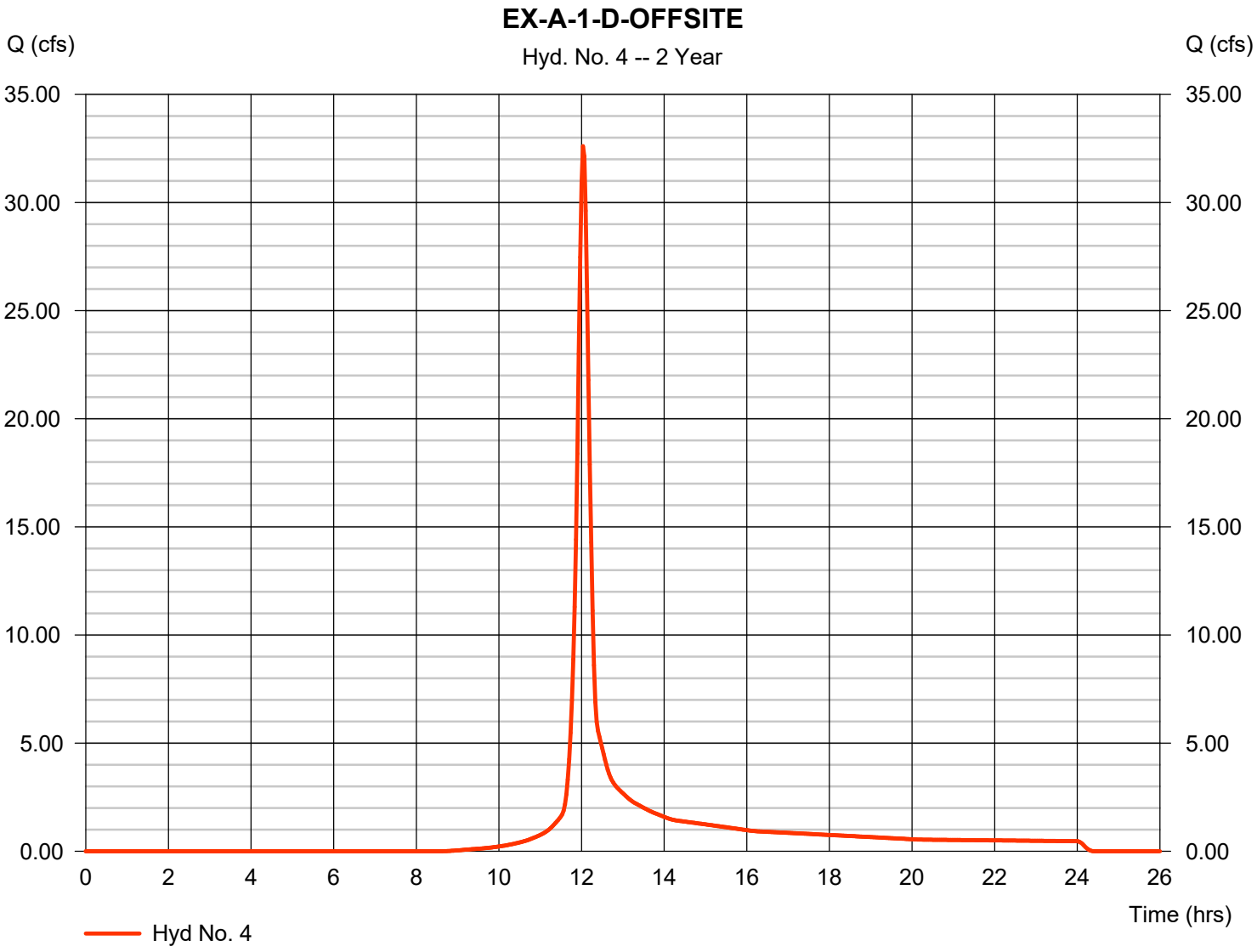
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 4

EX-A-1-D-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	32.61 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	91,552 cuft
Drainage area	=	15.820 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	13.70 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

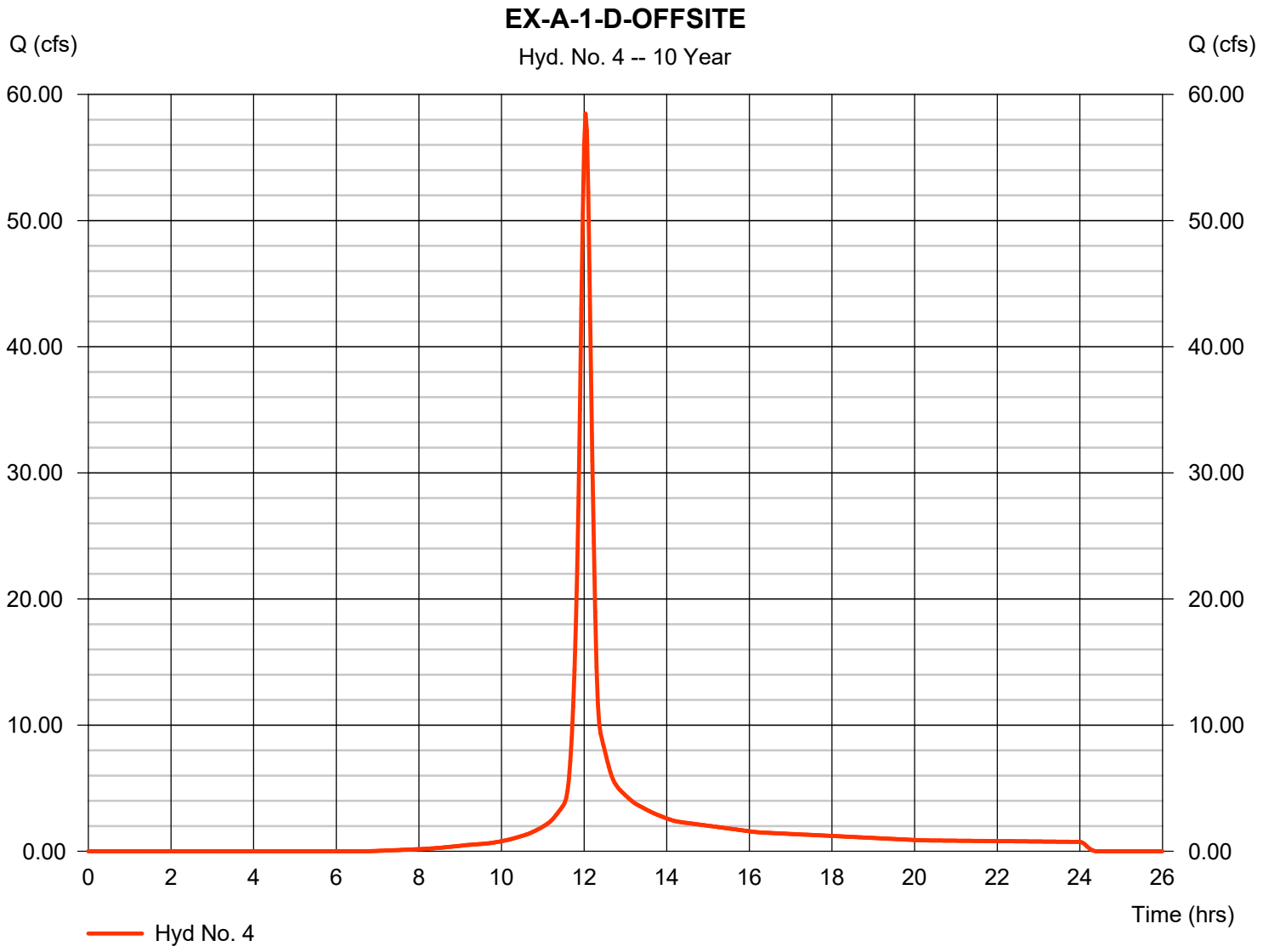


Hydrograph Report

Hyd. No. 4

EX-A-1-D-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	58.47 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	164,410 cuft
Drainage area	=	15.820 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	13.70 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

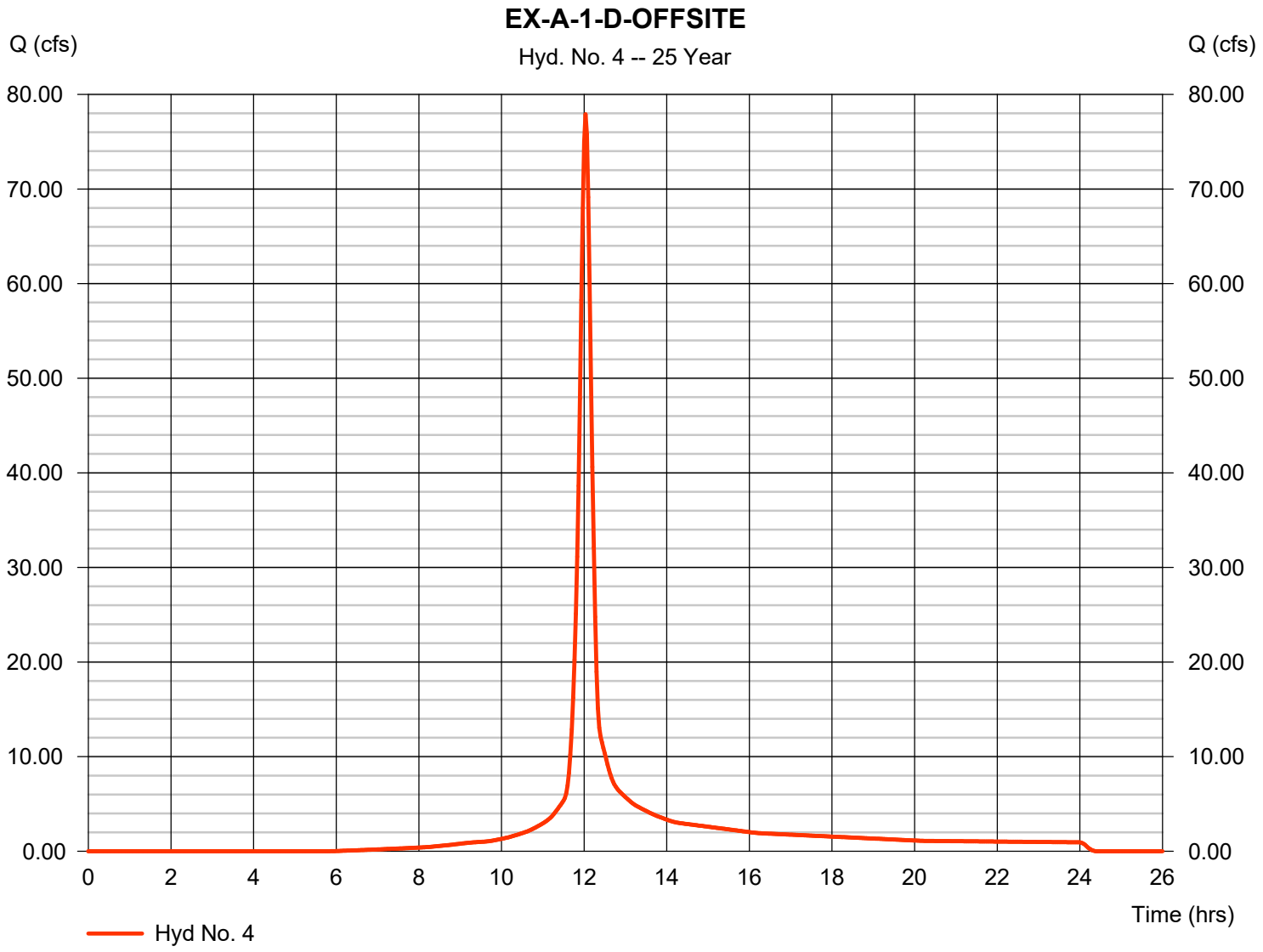


Hydrograph Report

Hyd. No. 4

EX-A-1-D-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	77.91 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	220,668 cuft
Drainage area	=	15.820 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	13.70 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

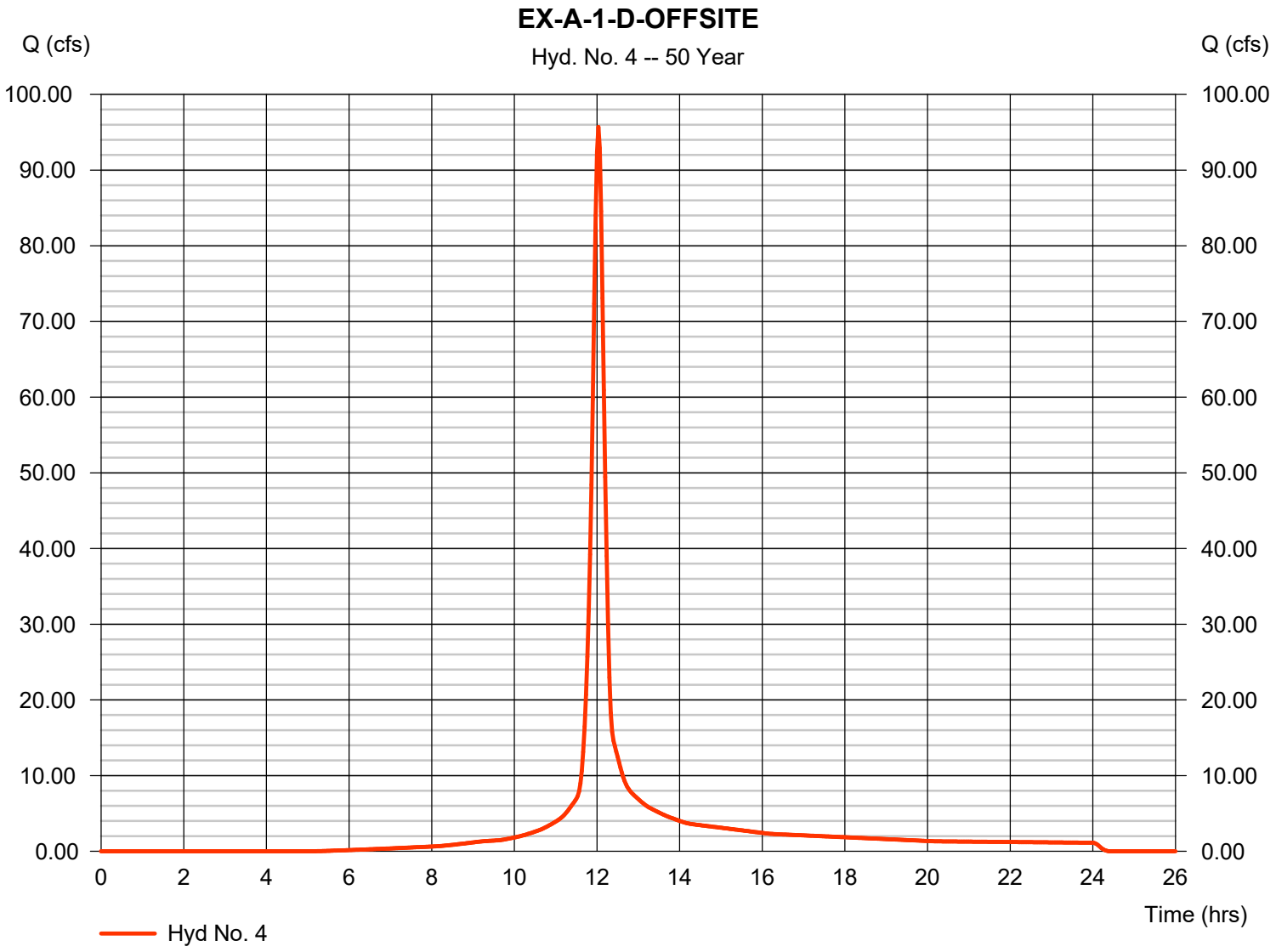


Hydrograph Report

Hyd. No. 4

EX-A-1-D-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	95.71 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	273,162 cuft
Drainage area	=	15.820 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	13.70 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

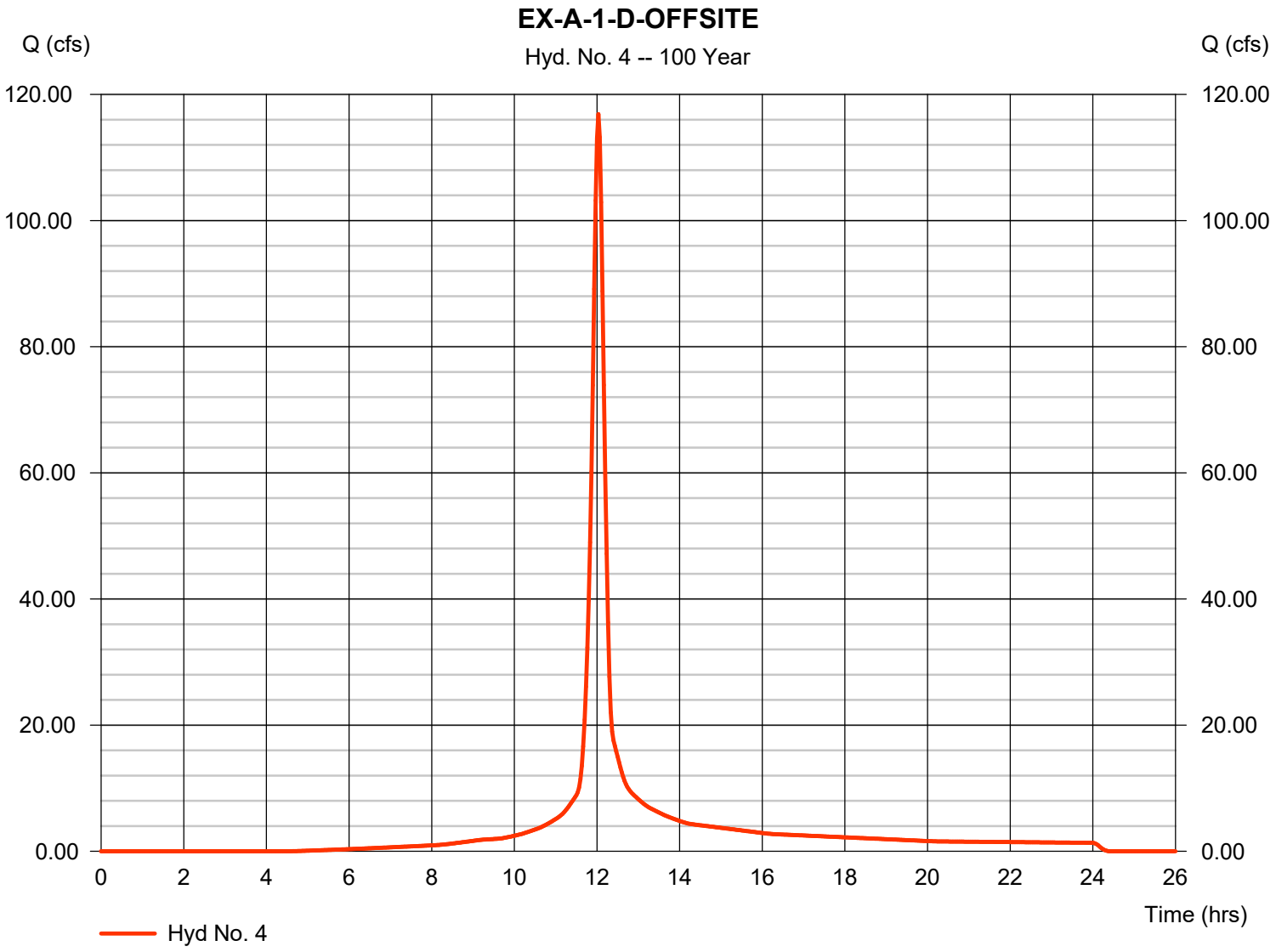


Hydrograph Report

Hyd. No. 4

EX-A-1-D-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	116.88 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	336,606 cuft
Drainage area	=	15.820 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	13.70 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



TOTAL EXISTING FLOW TO POA-A-1

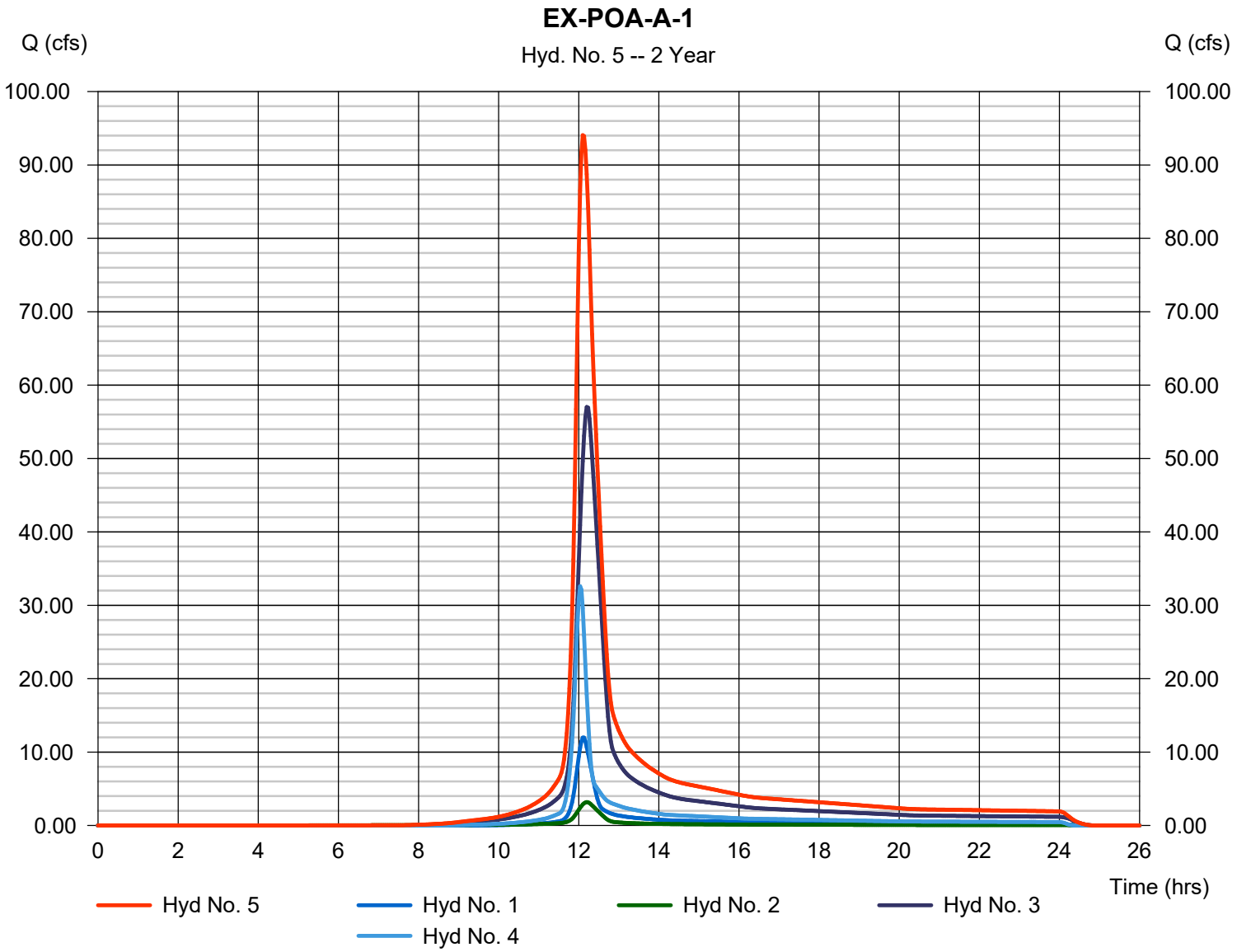
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 5

EX-POA-A-1

Hydrograph type	=	Combine	Peak discharge	=	94.05 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	394,146 cuft
Inflow hyds.	=	1, 2, 3, 4	Contrib. drain. area	=	60.970 ac

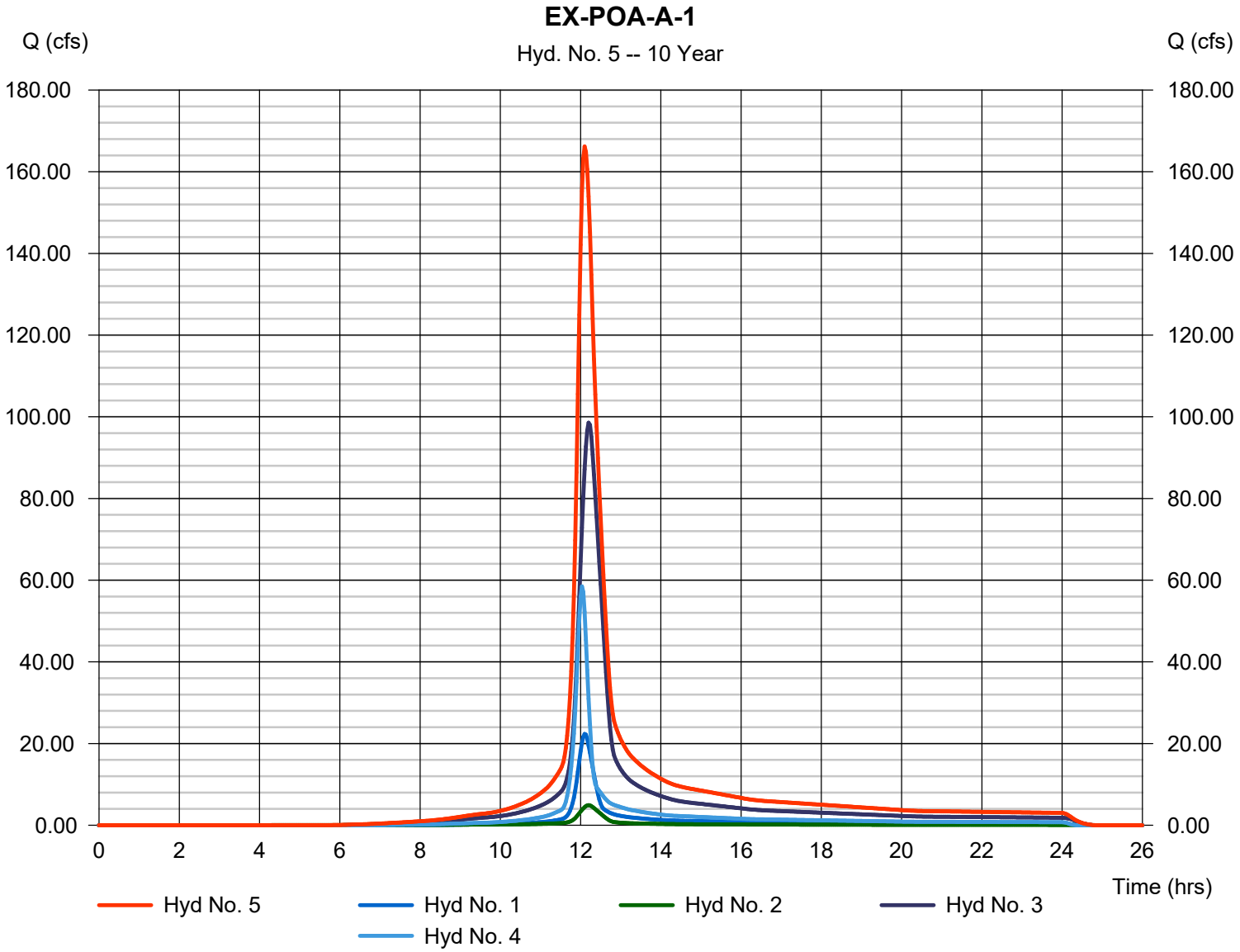


Hydrograph Report

Hyd. No. 5

EX-POA-A-1

Hydrograph type	=	Combine	Peak discharge	=	166.20 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	690,707 cuft
Inflow hyds.	=	1, 2, 3, 4	Contrib. drain. area	=	60.970 ac

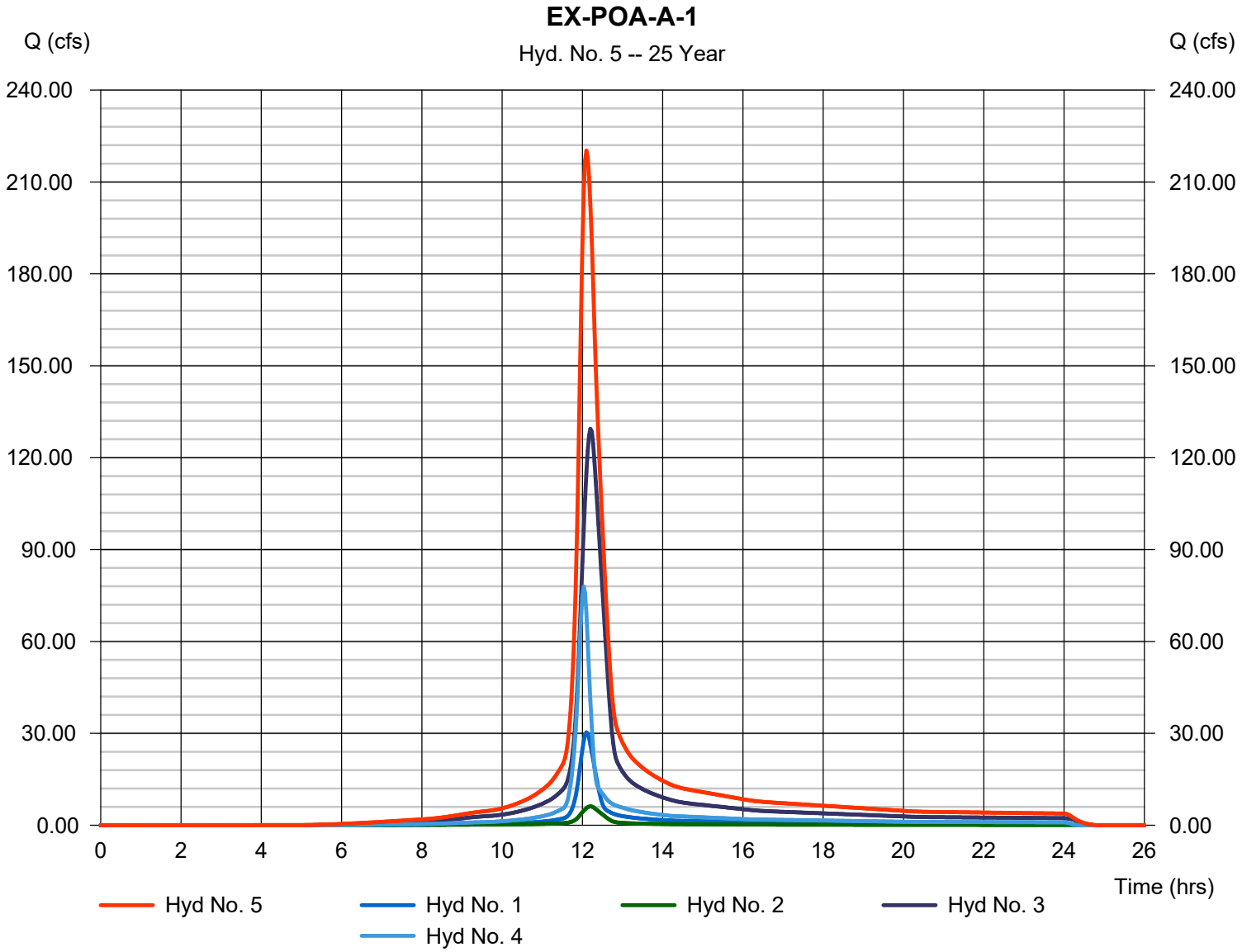


Hydrograph Report

Hyd. No. 5

EX-POA-A-1

Hydrograph type	=	Combine	Peak discharge	=	220.20 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	917,694 cuft
Inflow hyds.	=	1, 2, 3, 4	Contrib. drain. area	=	60.970 ac

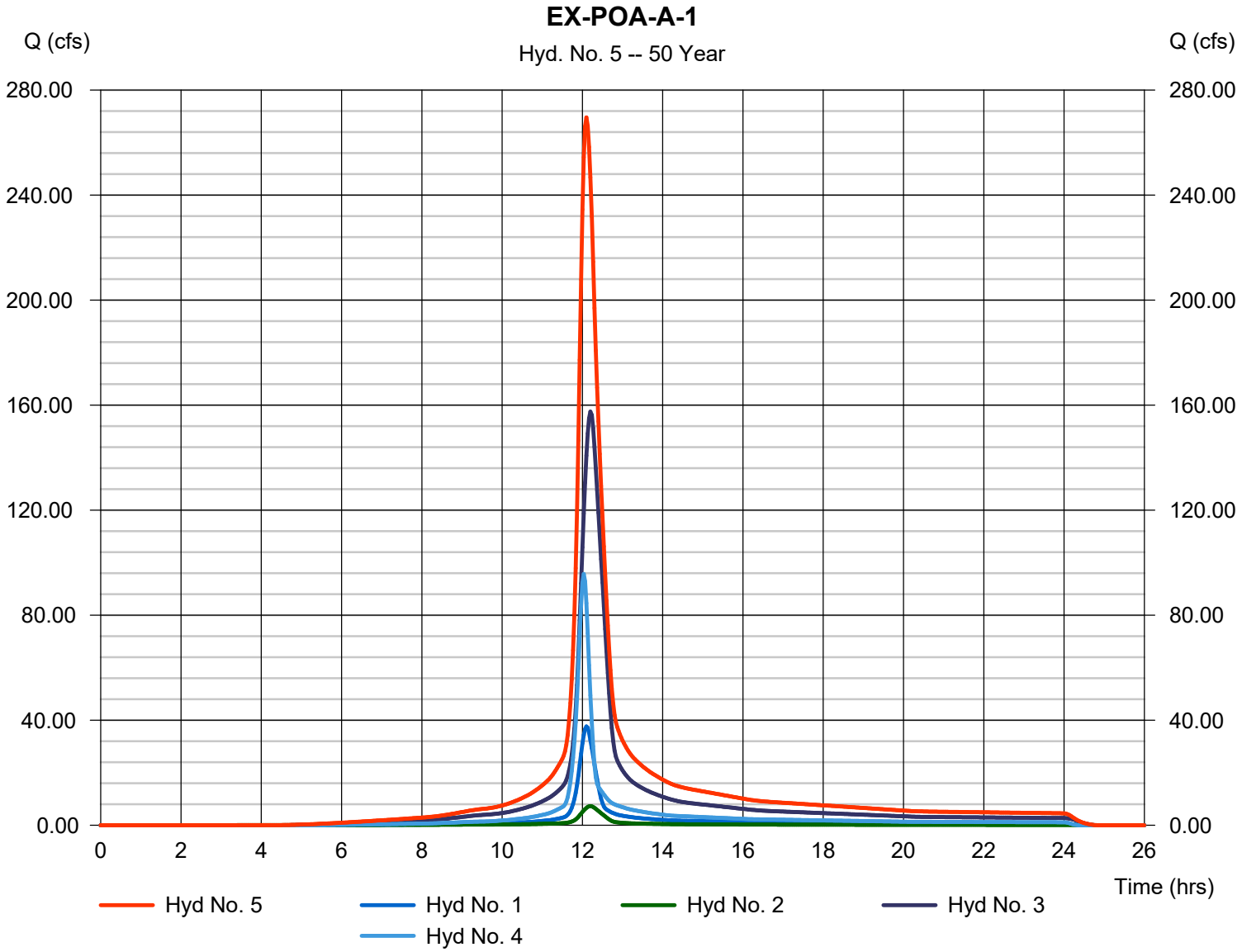


Hydrograph Report

Hyd. No. 5

EX-POA-A-1

Hydrograph type	=	Combine	Peak discharge	=	269.61 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	1,128,625 cuft
Inflow hyds.	=	1, 2, 3, 4	Contrib. drain. area	=	60.970 ac

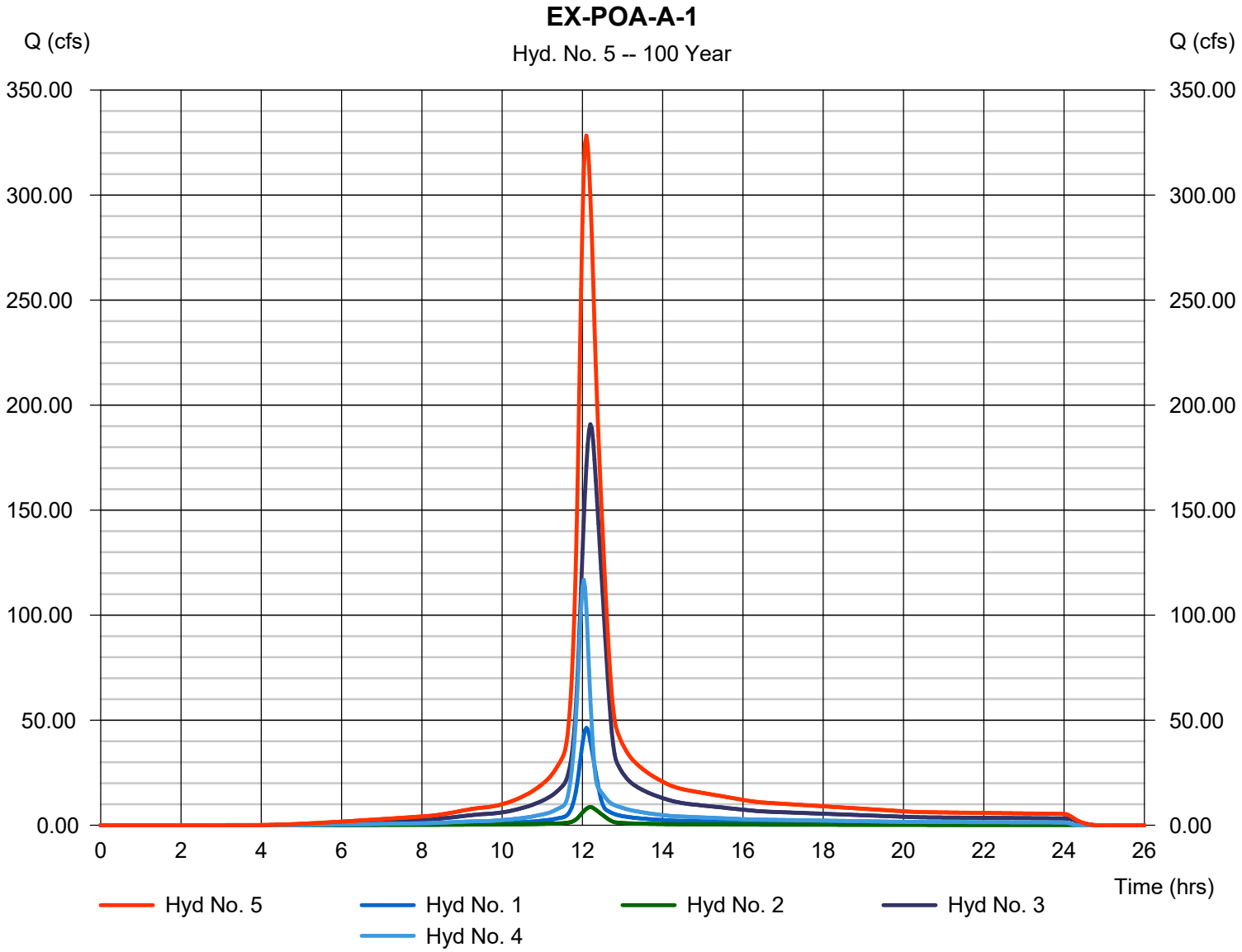


Hydrograph Report

Hyd. No. 5

EX-POA-A-1

Hydrograph type	=	Combine	Peak discharge	=	328.32 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	1,382,828 cuft
Inflow hyds.	=	1, 2, 3, 4	Contrib. drain. area	=	60.970 ac



EX-A-2-A-ONSITE WATERSHED

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No. 8

EX-A-2-A-ONSITE

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 150.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.32		0.00		0.00		
Land slope (%)	= 9.33		0.00		0.00		
Travel Time (min)	**= 7.19**	**+**	**0.00**	**+**	**0.00**	**=**	**7.19**
Shallow Concentrated Flow							
Flow length (ft)	= 535.00		769.00		1153.00		
Watercourse slope (%)	= 9.72		4.11		1.91		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=5.03		3.27		2.81		
Travel Time (min)	**= 1.77**	**+**	**3.92**	**+**	**6.84**	**=**	**12.53**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 19.70 min

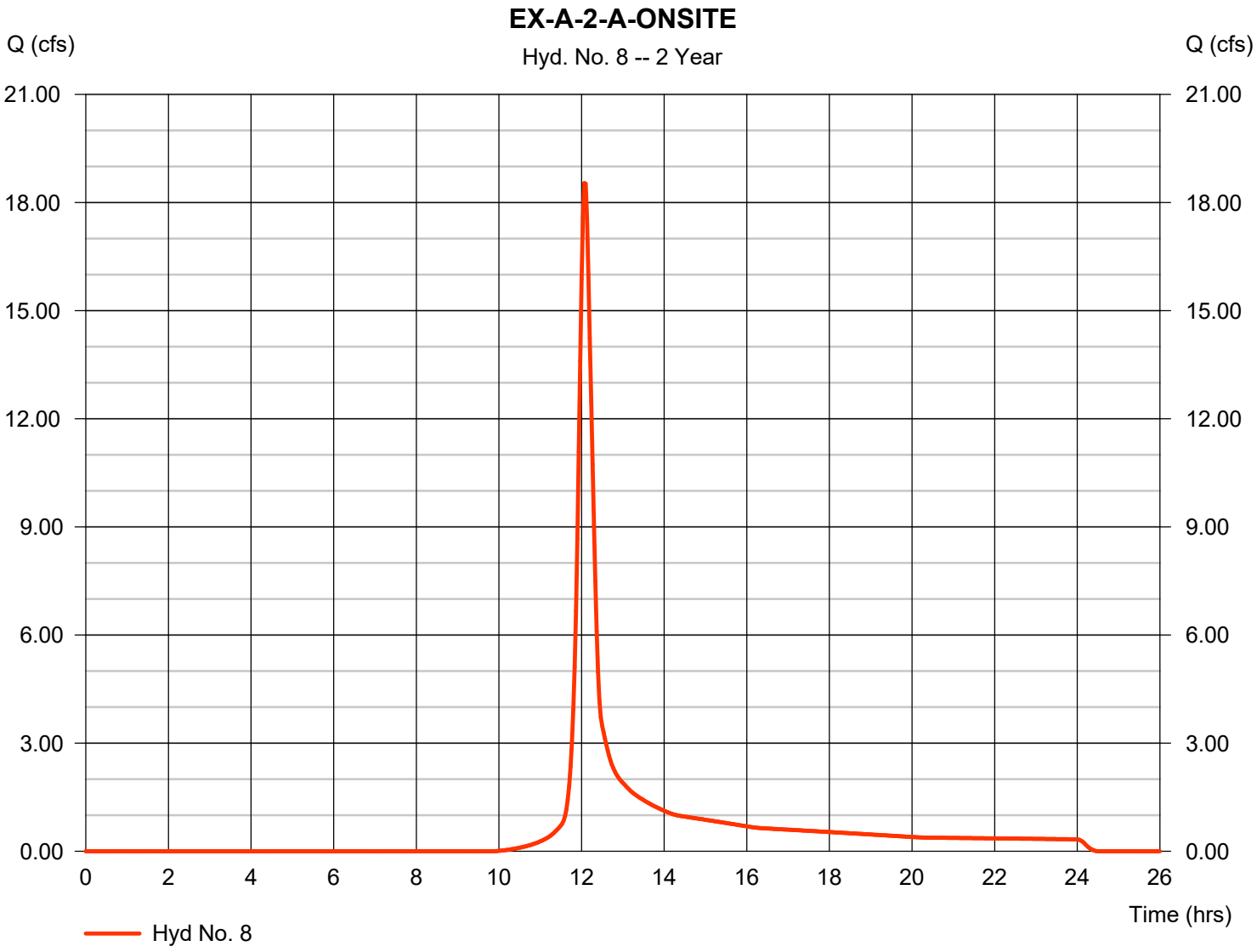
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 8

EX-A-2-A-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	18.54 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	59,180 cuft
Drainage area	=	11.970 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.70 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

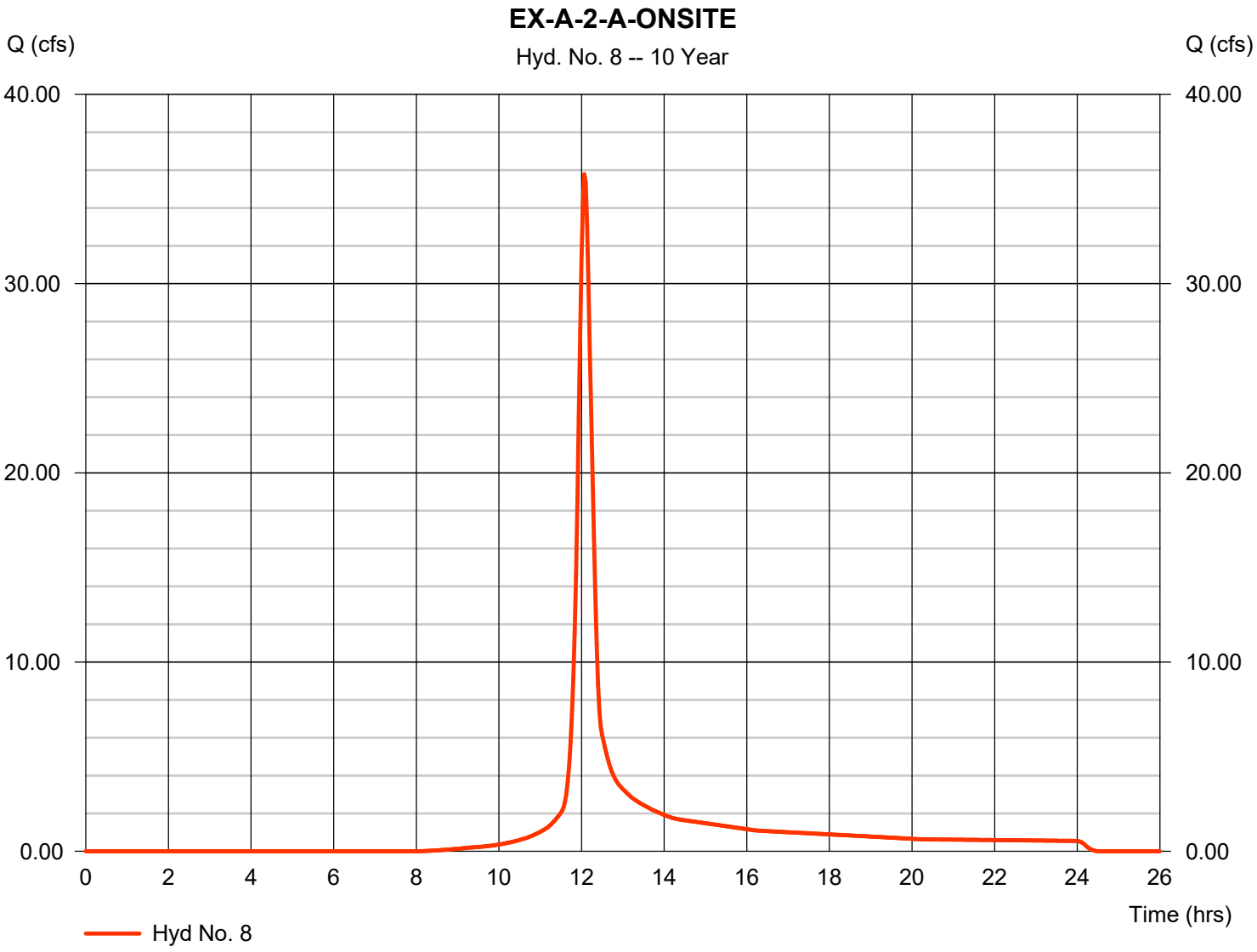


Hydrograph Report

Hyd. No. 8

EX-A-2-A-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	35.78 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	111,948 cuft
Drainage area	=	11.970 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.70 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

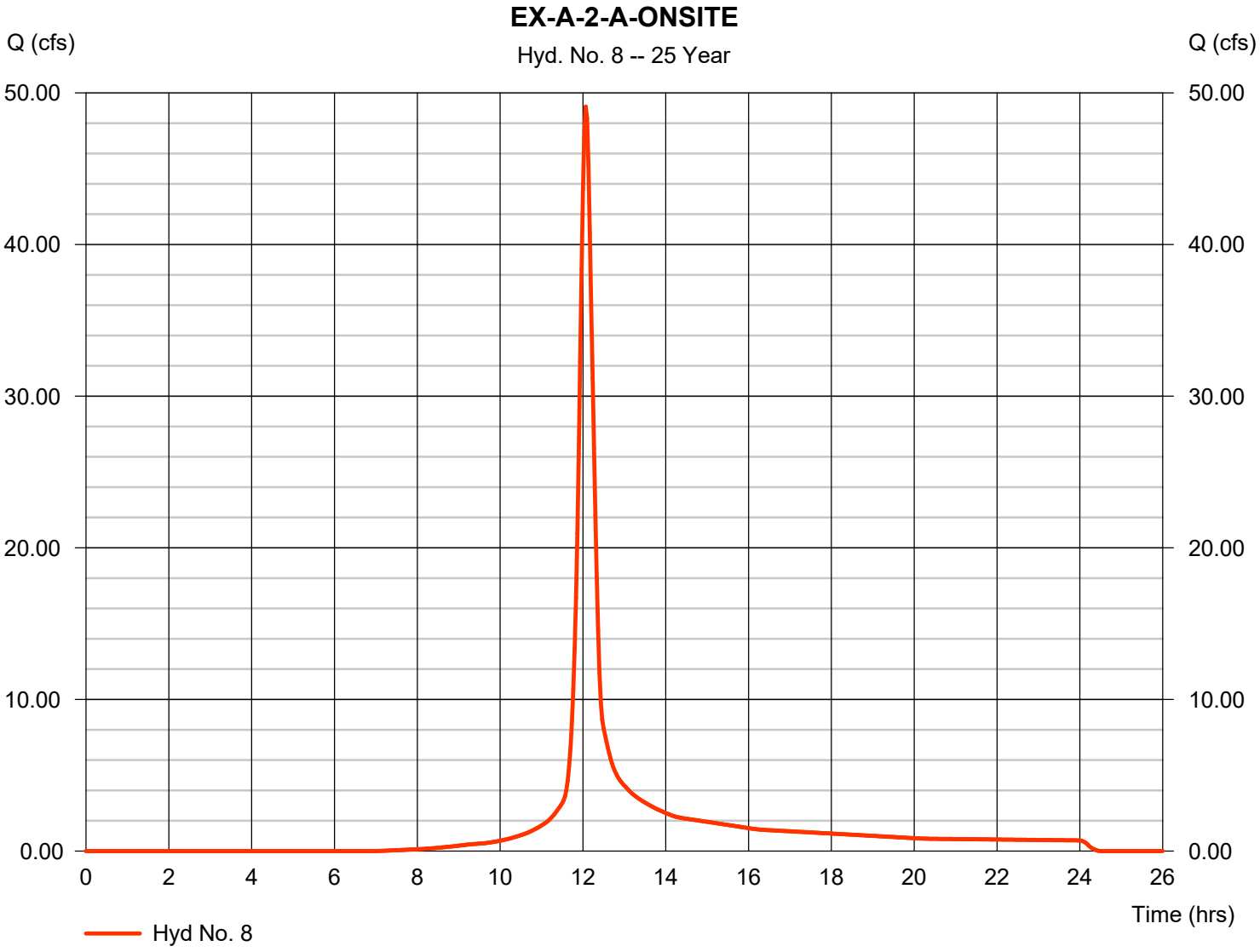


Hydrograph Report

Hyd. No. 8

EX-A-2-A-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	49.10 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	153,590 cuft
Drainage area	=	11.970 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.70 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

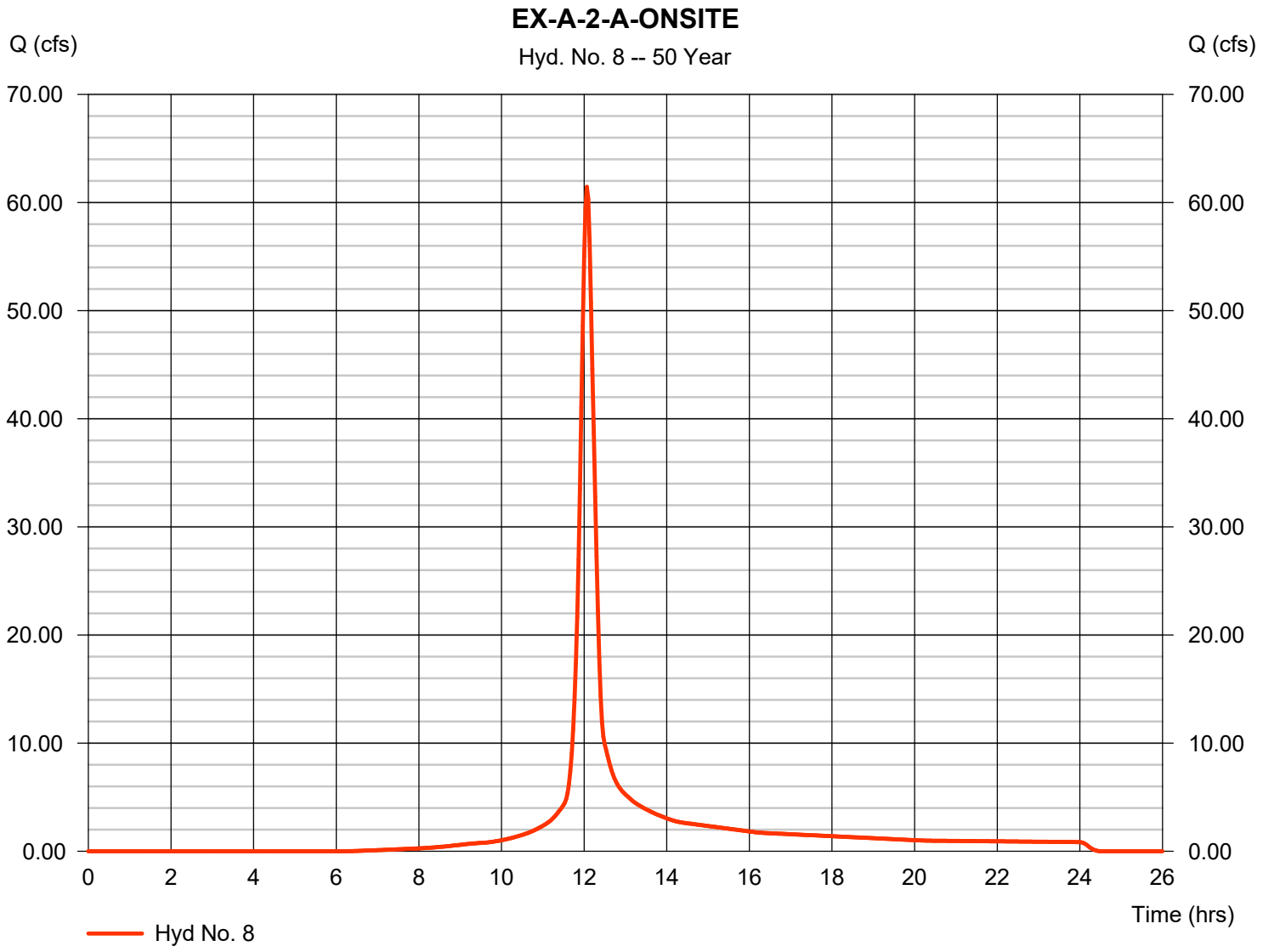


Hydrograph Report

Hyd. No. 8

EX-A-2-A-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	61.45 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	192,860 cuft
Drainage area	=	11.970 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.70 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

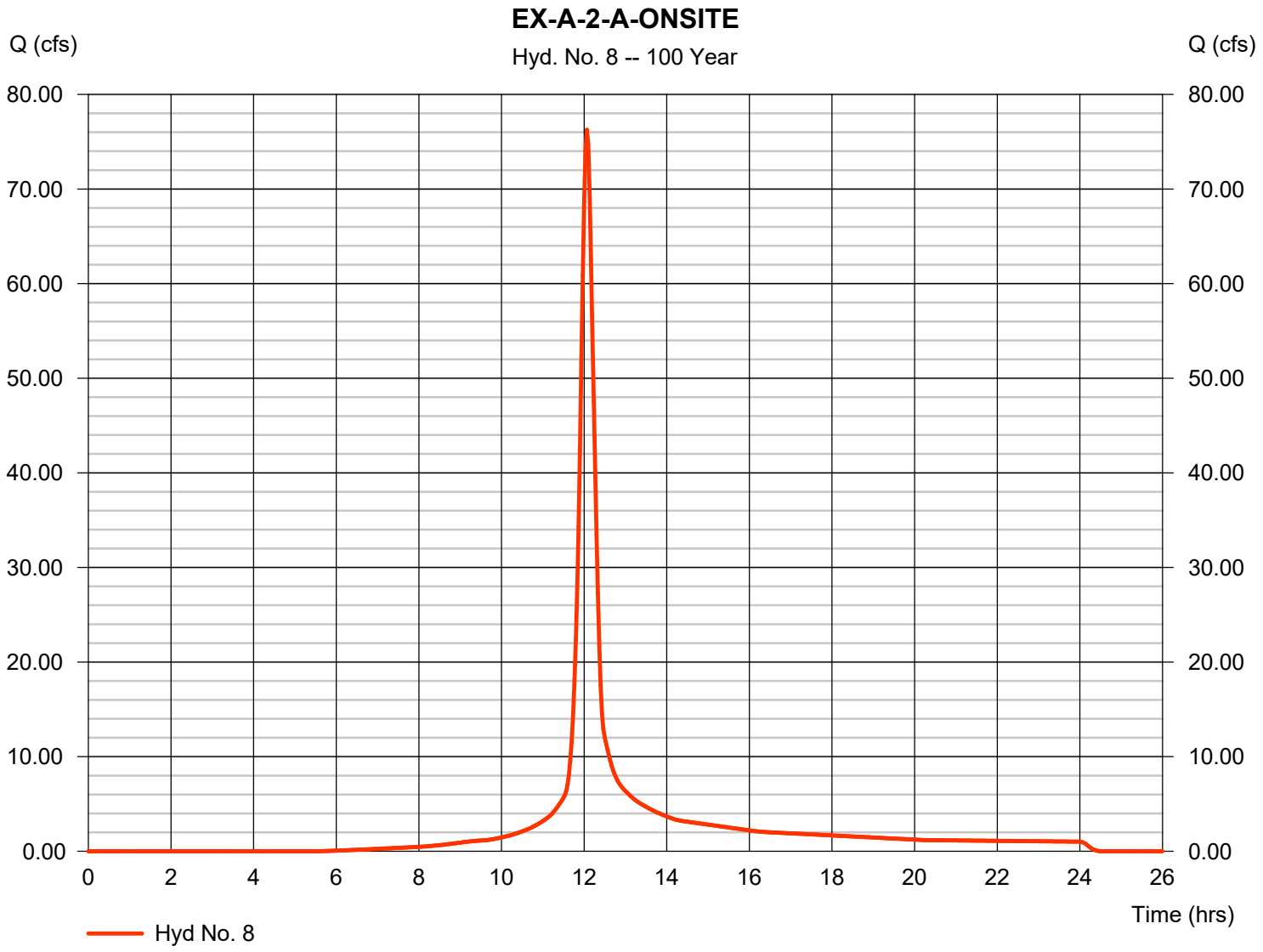


Hydrograph Report

Hyd. No. 8

EX-A-2-A-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	76.26 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	240,681 cuft
Drainage area	=	11.970 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.70 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



EX-A-2-A-OFFSITE WATERSHED

TR55 Tc Worksheet

Hyd. No. 9

EX-A-2-A OFFSITE

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 150.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.32		0.00		0.00		
Land slope (%)	= 5.33		0.00		0.00		
Travel Time (min)	**= 8.99**	**+**	**0.00**	**+**	**0.00**	**=**	**8.99**
Shallow Concentrated Flow							
Flow length (ft)	= 600.00		425.00		900.00		
Watercourse slope (%)	= 8.00		3.76		8.78		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=4.56		3.13		4.78		
Travel Time (min)	**= 2.19**	**+**	**2.26**	**+**	**3.14**	**=**	**7.59**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 16.60 min

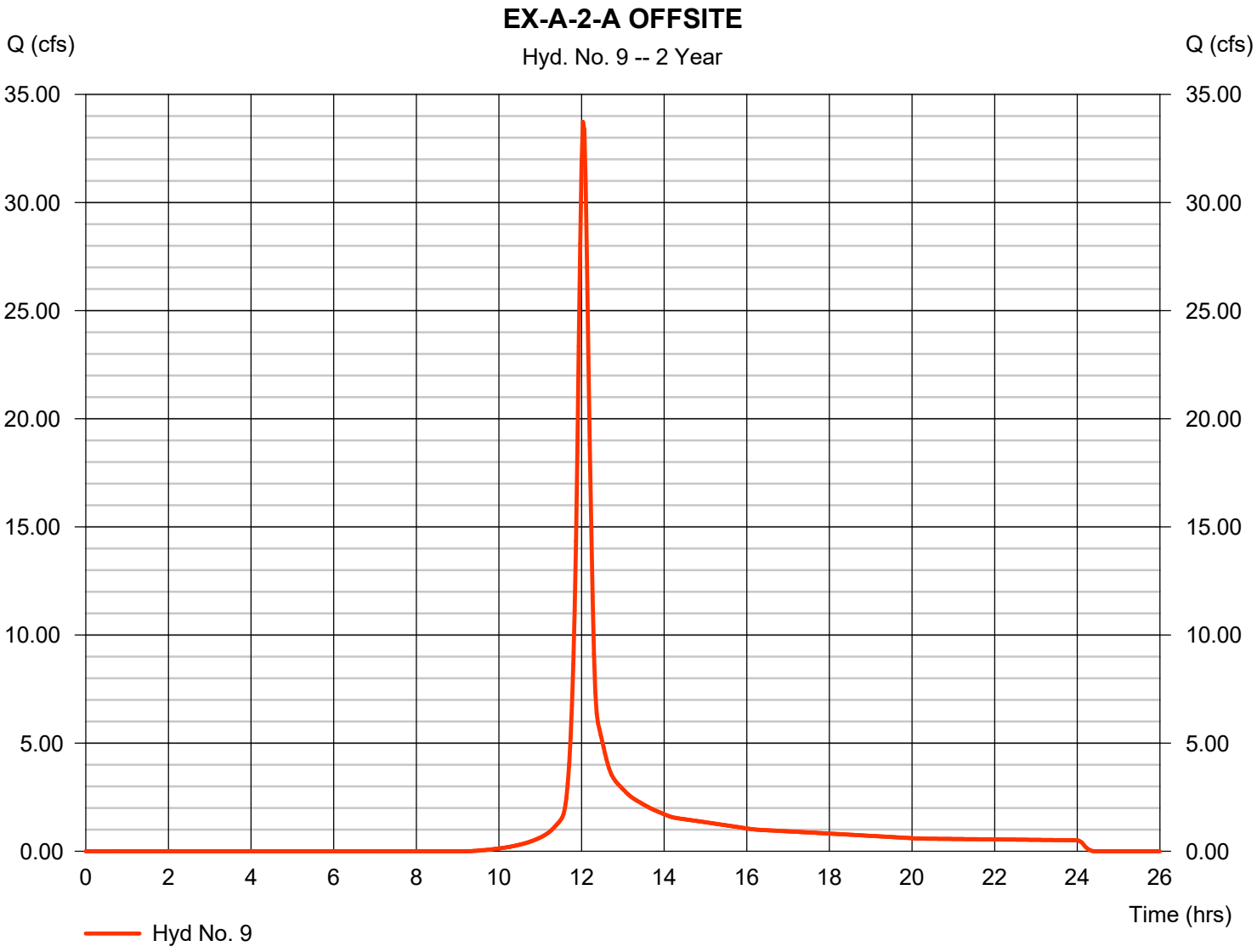
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 9

EX-A-2-A OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	33.73 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	95,176 cuft
Drainage area	=	17.990 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	16.60 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

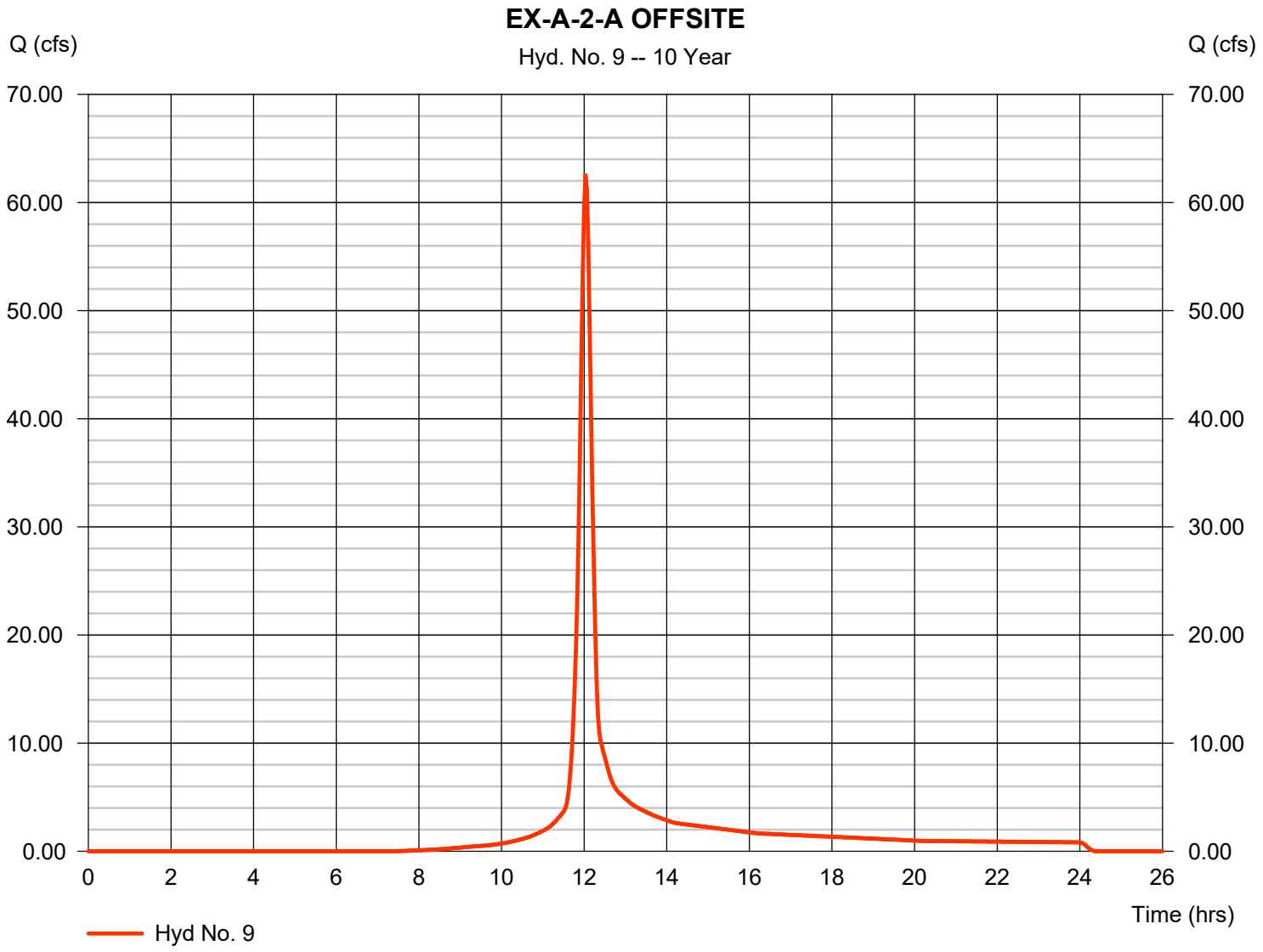


Hydrograph Report

Hyd. No. 9

EX-A-2-A OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	62.52 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	175,334 cuft
Drainage area	=	17.990 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	16.60 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

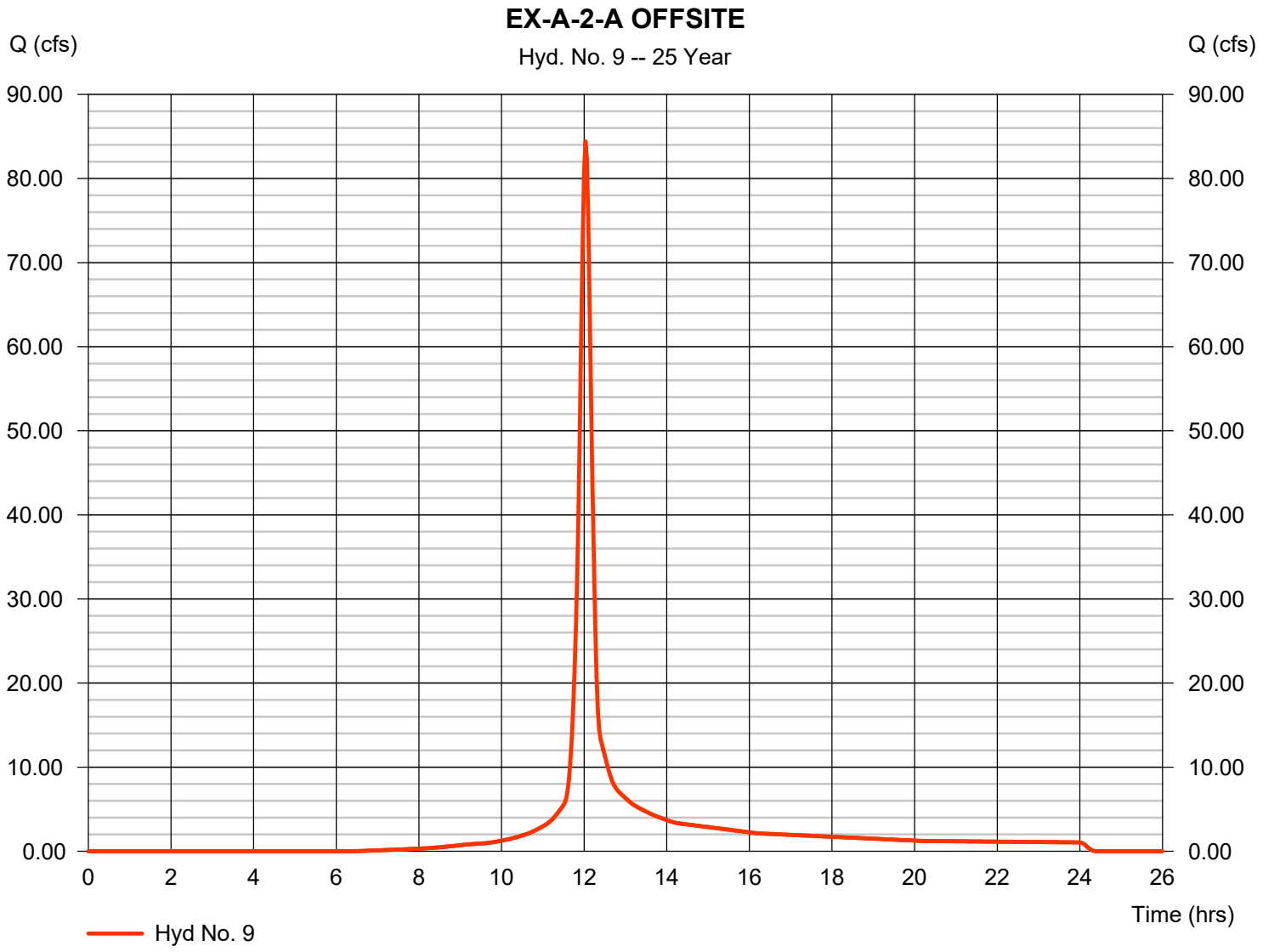


Hydrograph Report

Hyd. No. 9

EX-A-2-A OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	84.41 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	237,886 cuft
Drainage area	=	17.990 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	16.60 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

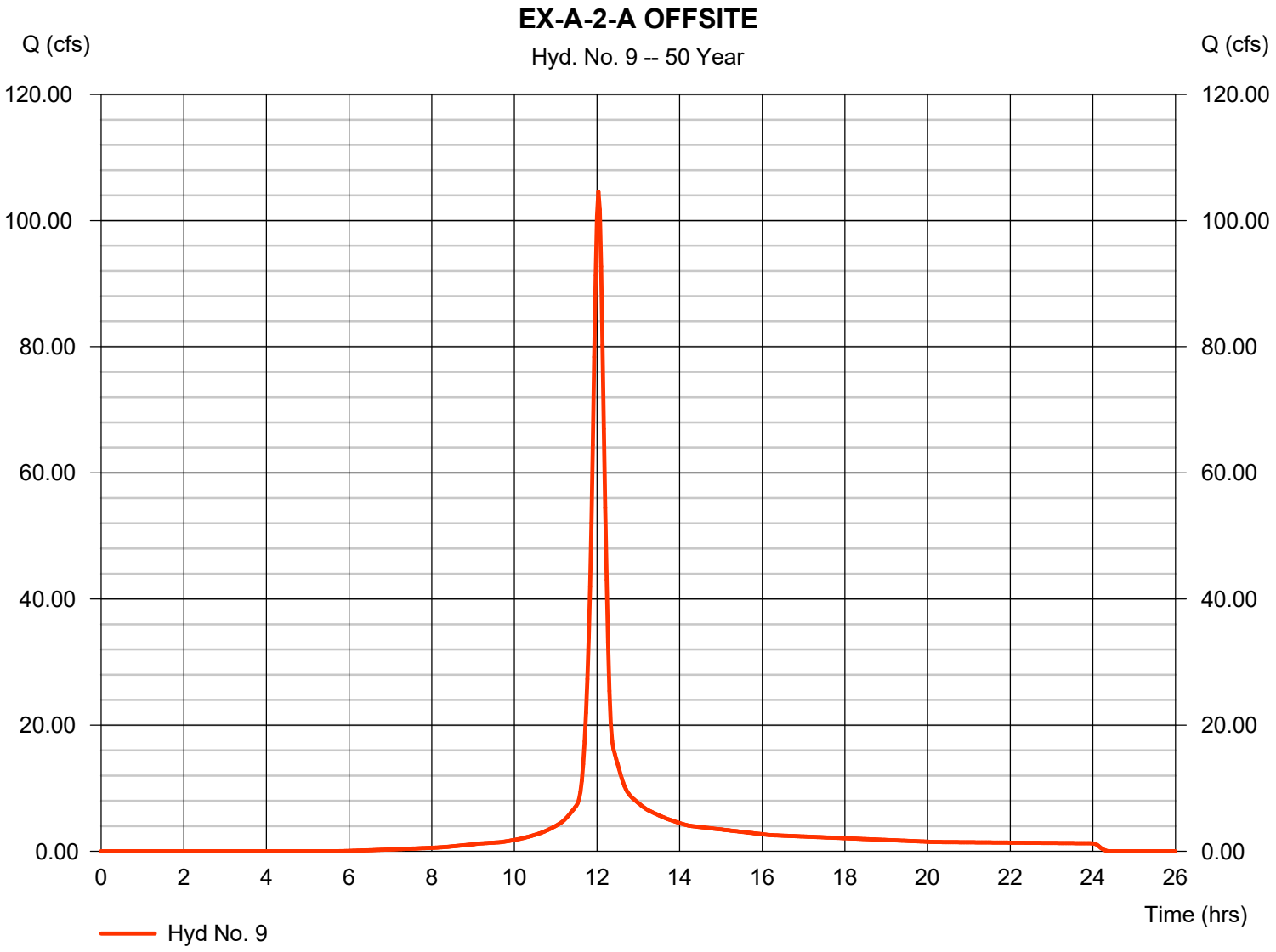


Hydrograph Report

Hyd. No. 9

EX-A-2-A OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	104.57 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	296,551 cuft
Drainage area	=	17.990 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	16.60 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

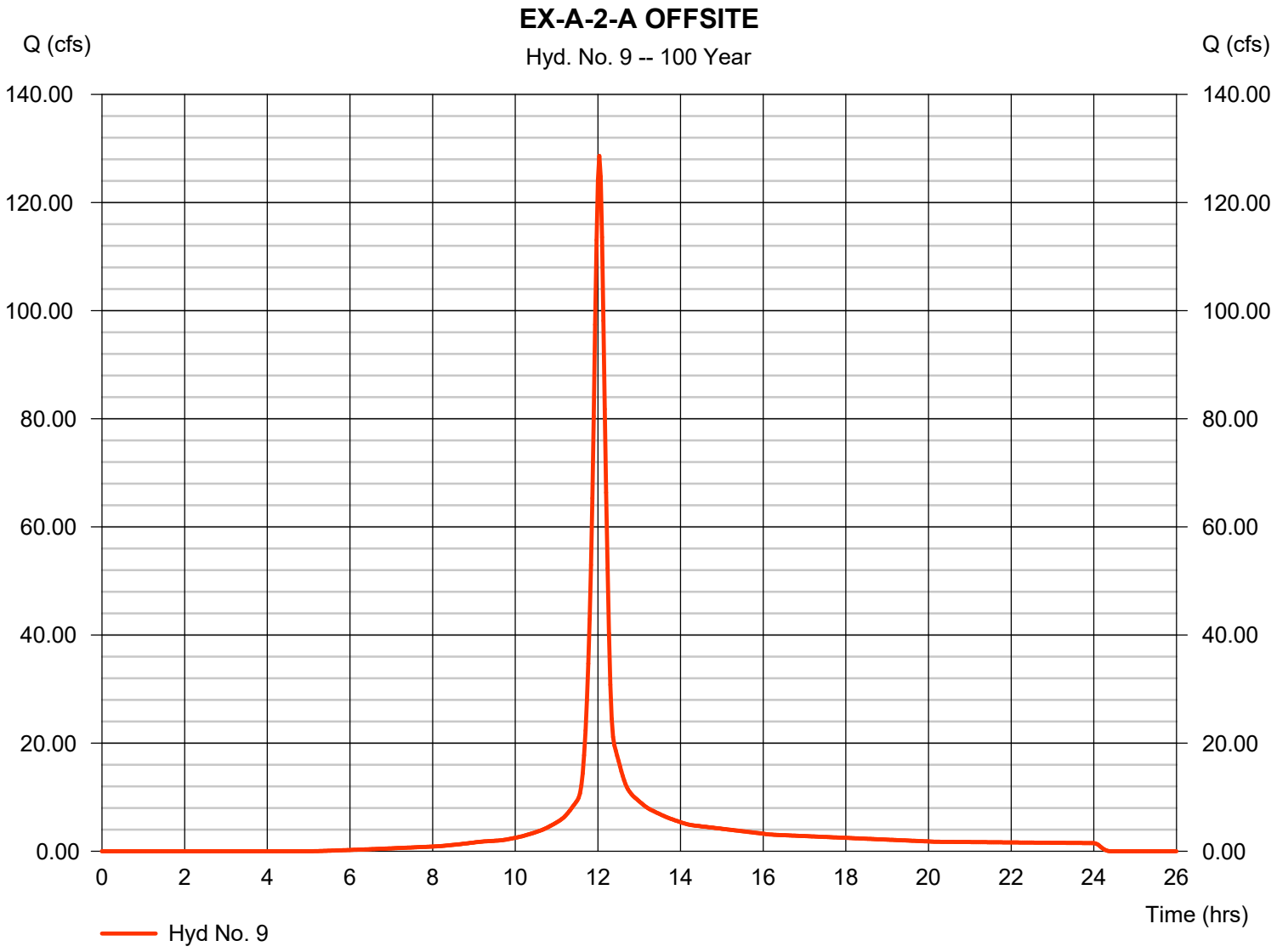


Hydrograph Report

Hyd. No. 9

EX-A-2-A OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	128.64 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	367,711 cuft
Drainage area	=	17.990 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	16.60 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



TOTAL EXISTING FLOW TO POA-A-2

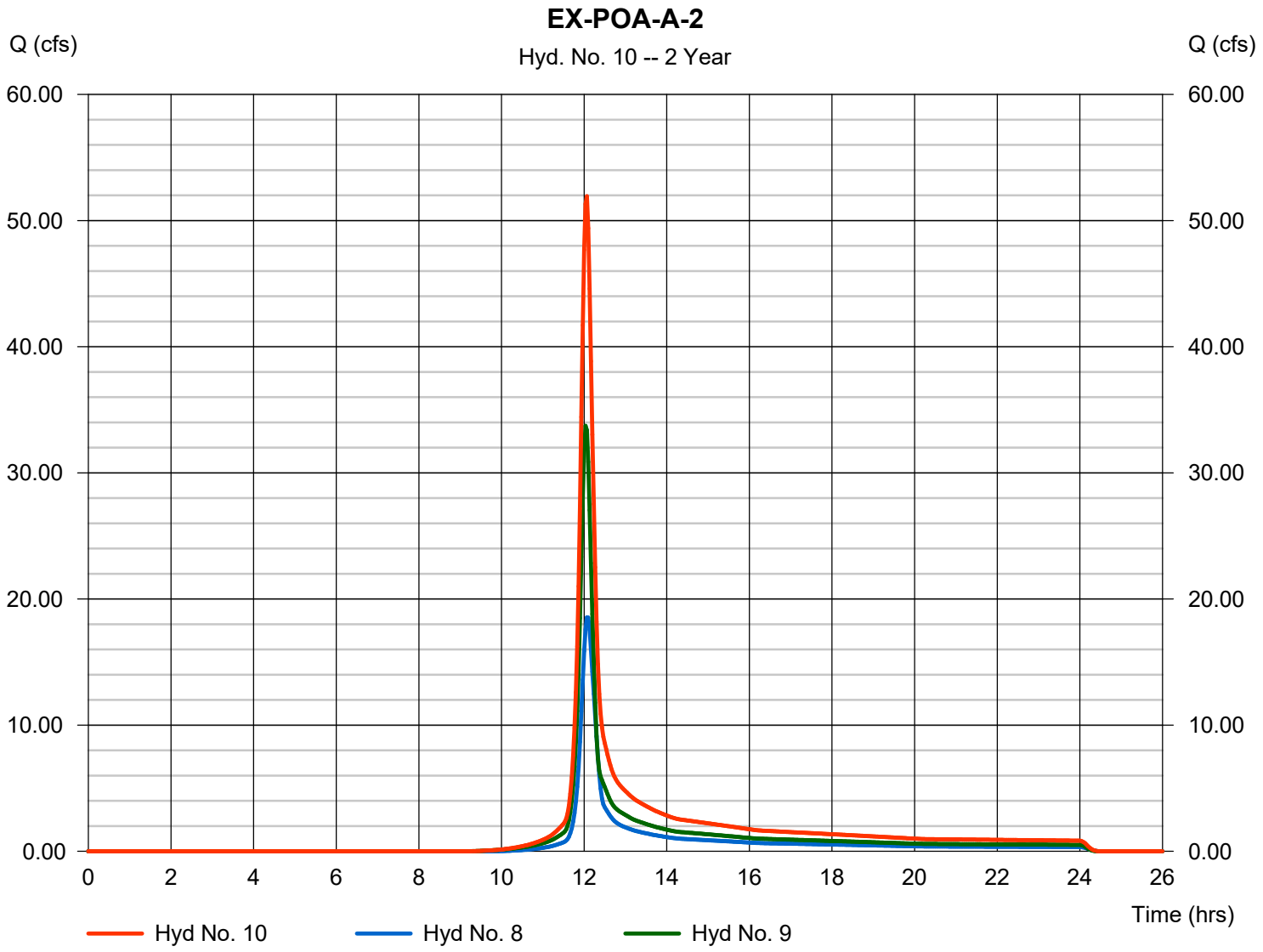
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 10

EX-POA-A-2

Hydrograph type	= Combine	Peak discharge	= 51.92 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 154,356 cuft
Inflow hyds.	= 8, 9	Contrib. drain. area	= 29.960 ac

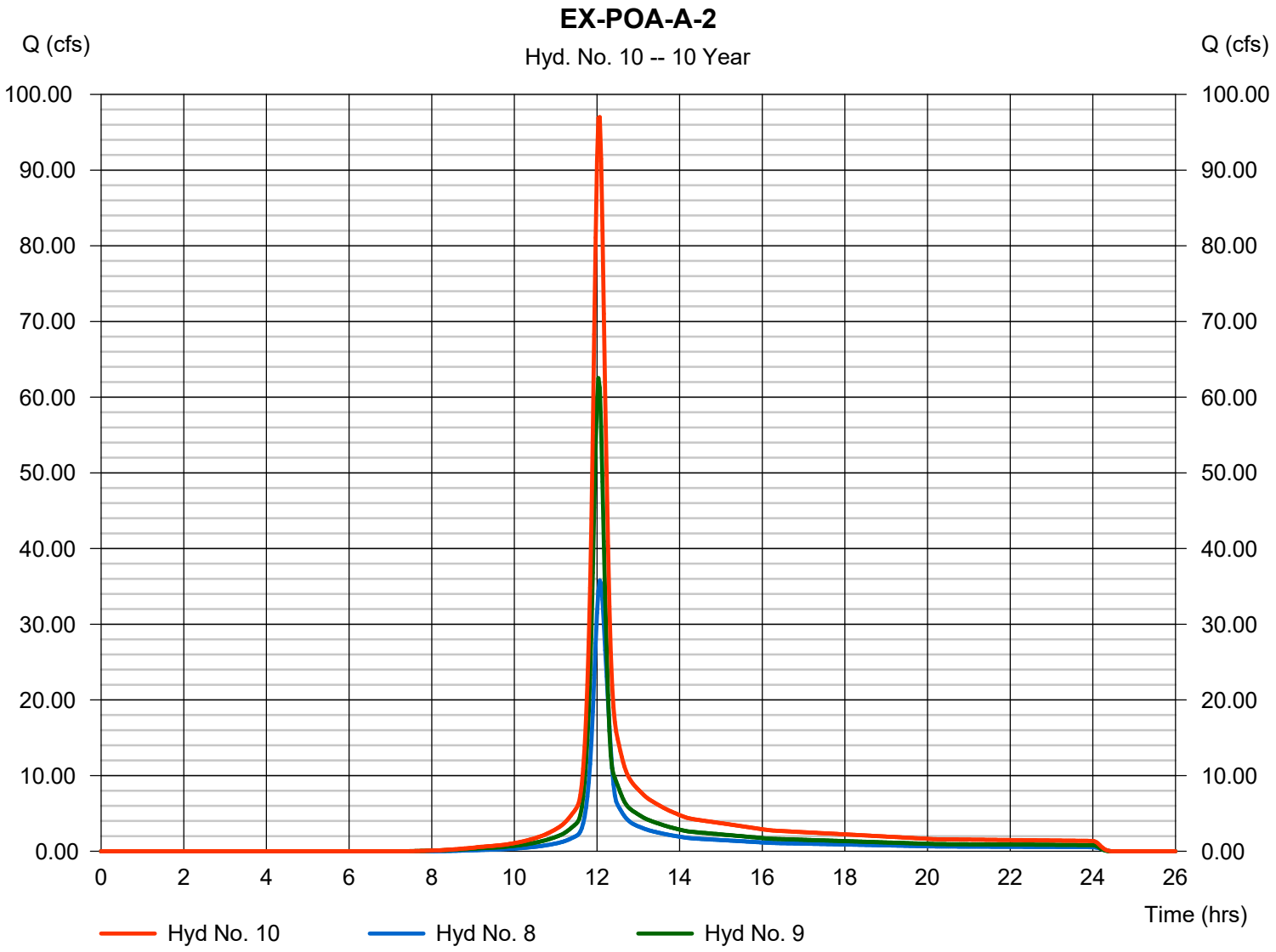


Hydrograph Report

Hyd. No. 10

EX-POA-A-2

Hydrograph type	=	Combine	Peak discharge	=	97.01 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	287,282 cuft
Inflow hyds.	=	8, 9	Contrib. drain. area	=	29.960 ac

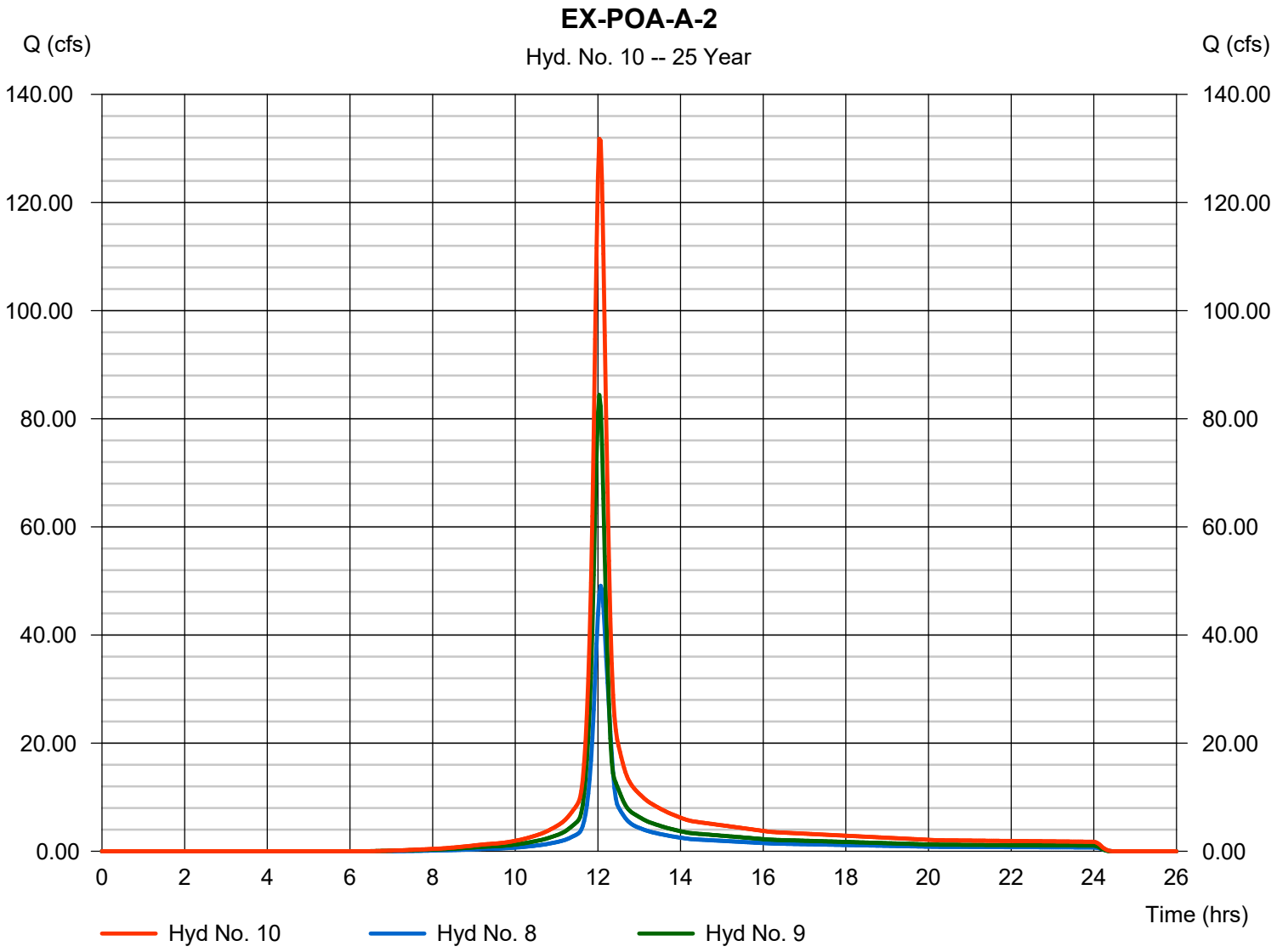


Hydrograph Report

Hyd. No. 10

EX-POA-A-2

Hydrograph type	=	Combine	Peak discharge	=	131.80 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	391,476 cuft
Inflow hyds.	=	8, 9	Contrib. drain. area	=	29.960 ac

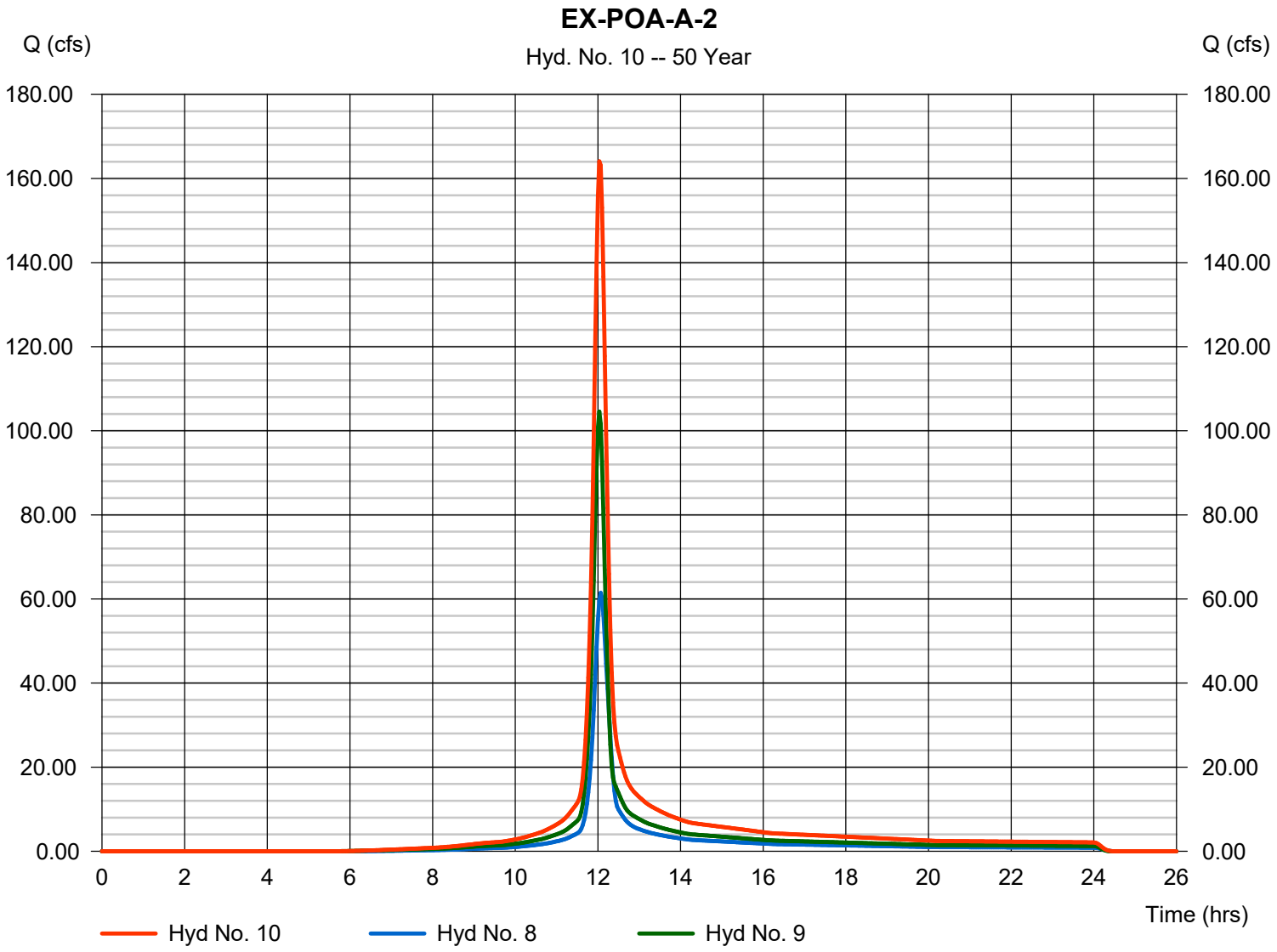


Hydrograph Report

Hyd. No. 10

EX-POA-A-2

Hydrograph type	=	Combine	Peak discharge	=	164.07 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	489,411 cuft
Inflow hyds.	=	8, 9	Contrib. drain. area	=	29.960 ac

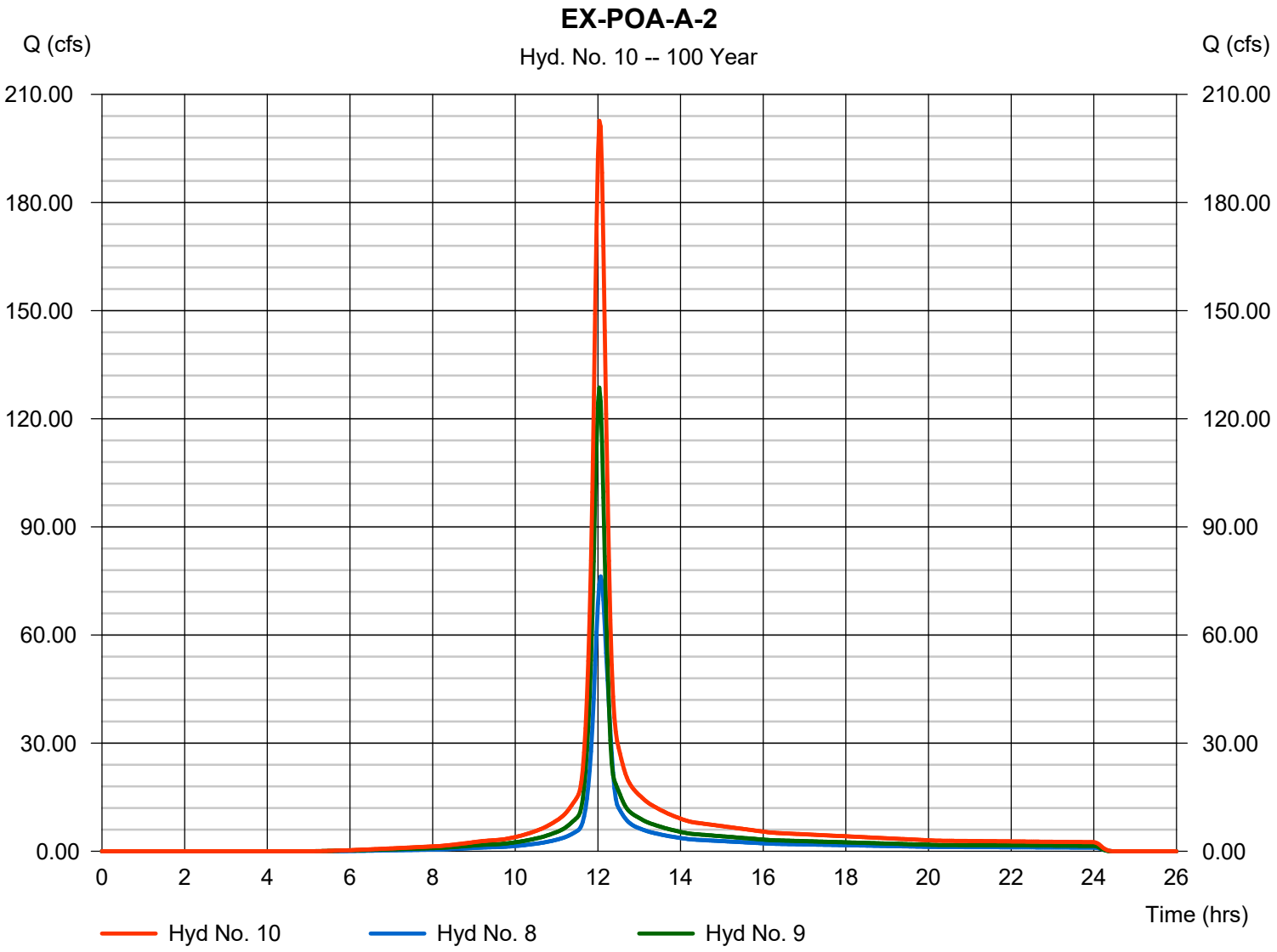


Hydrograph Report

Hyd. No. 10

EX-POA-A-2

Hydrograph type	= Combine	Peak discharge	= 202.68 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 608,391 cuft
Inflow hyds.	= 8, 9	Contrib. drain. area	= 29.960 ac



EX-A-3-ONSITE WATERSHED

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No. 12

EX-A-3-ONSITE

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 150.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.32		0.00		0.00		
Land slope (%)	= 12.67		0.00		0.00		
Travel Time (min)	**= 6.36**	**+**	**0.00**	**+**	**0.00**	**=**	**6.36**
Shallow Concentrated Flow							
Flow length (ft)	= 1190.00		258.00		733.00		
Watercourse slope (%)	= 8.82		3.50		0.95		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=4.79		3.02		1.57		
Travel Time (min)	**= 4.14**	**+**	**1.42**	**+**	**7.77**	**=**	**13.33**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 19.70 min

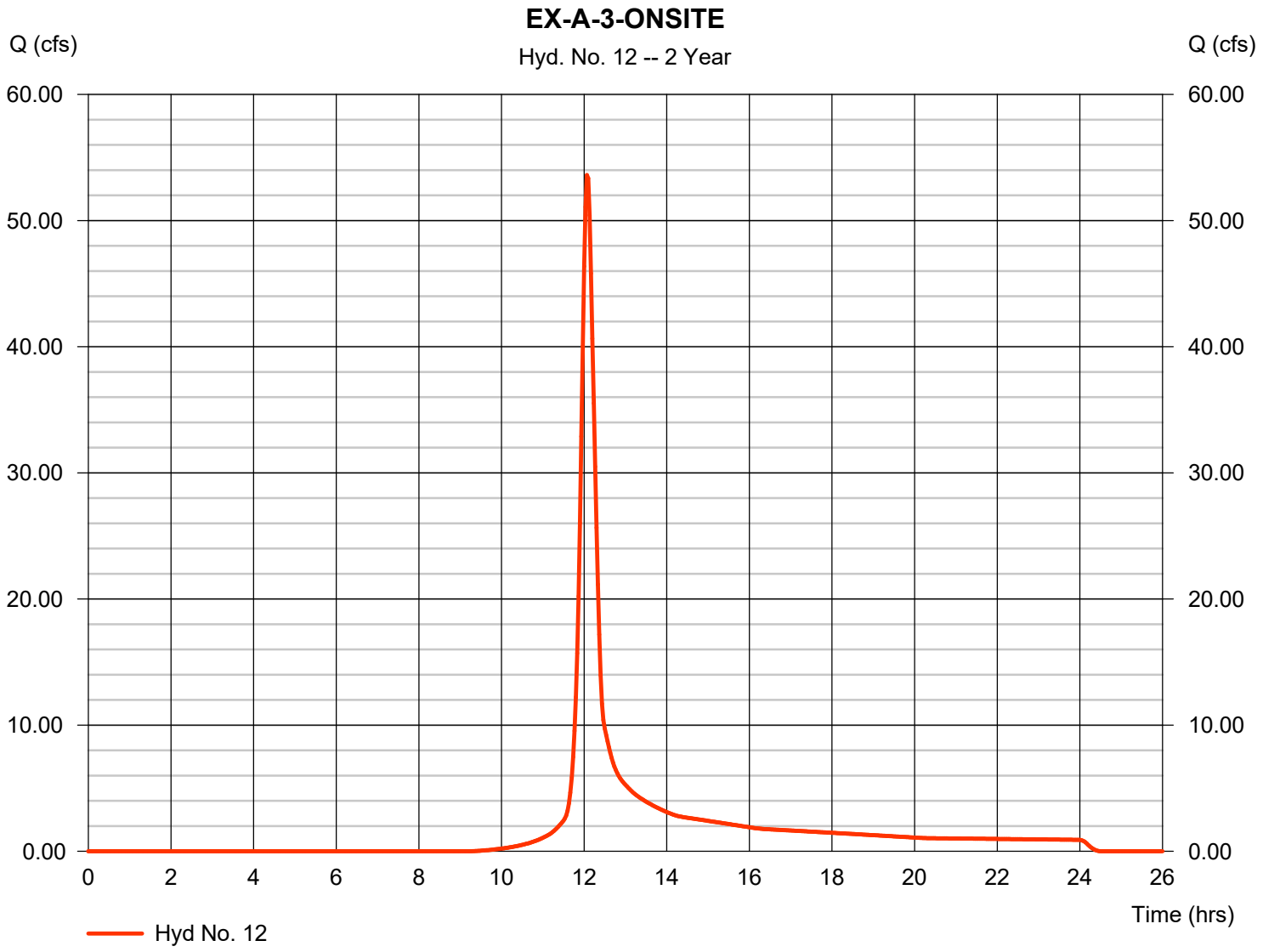
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 12

EX-A-3-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	53.61 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	169,405 cuft
Drainage area	=	31.220 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.70 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

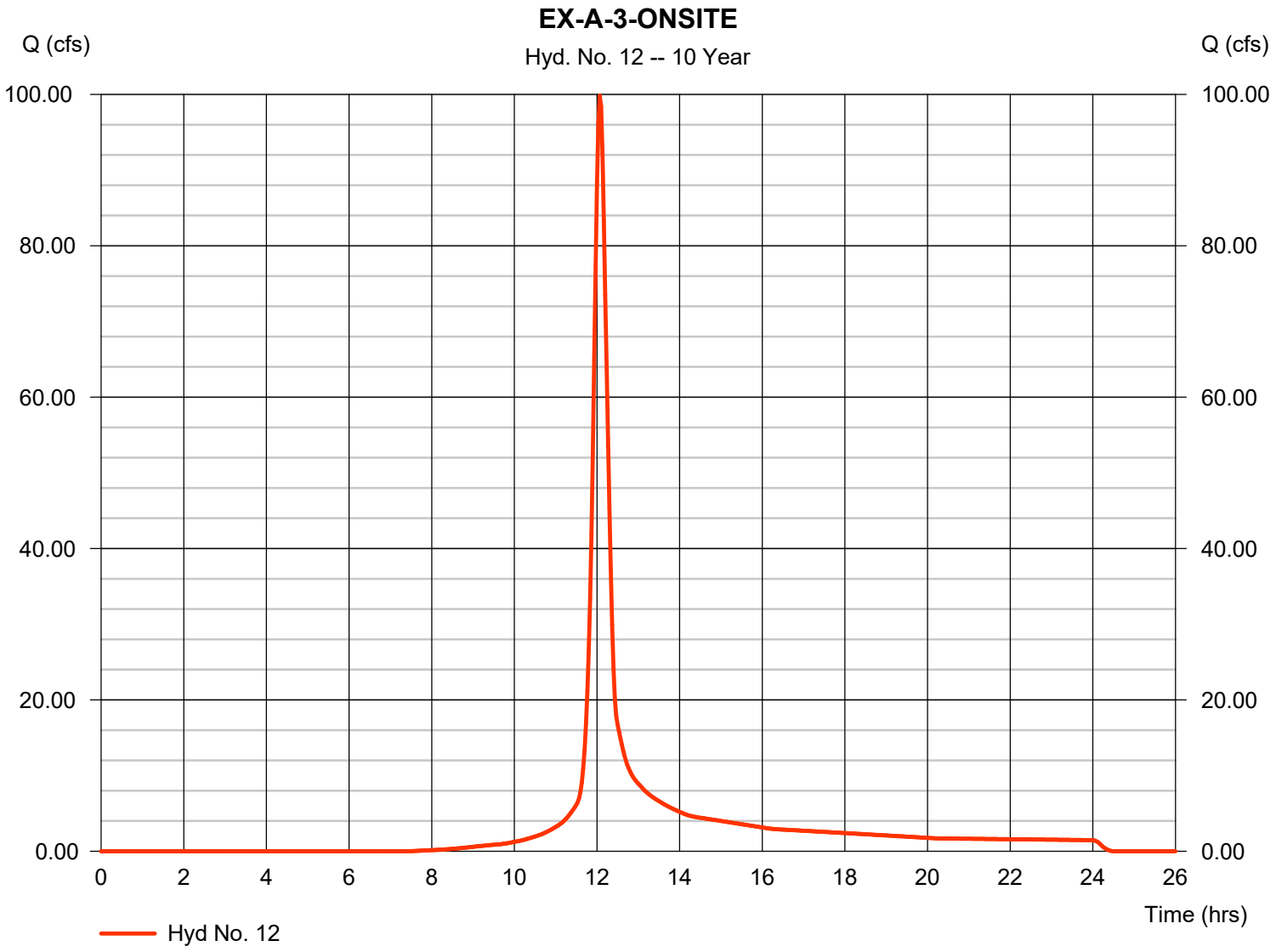


Hydrograph Report

Hyd. No. 12

EX-A-3-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	99.82 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	312,078 cuft
Drainage area	=	31.220 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.70 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

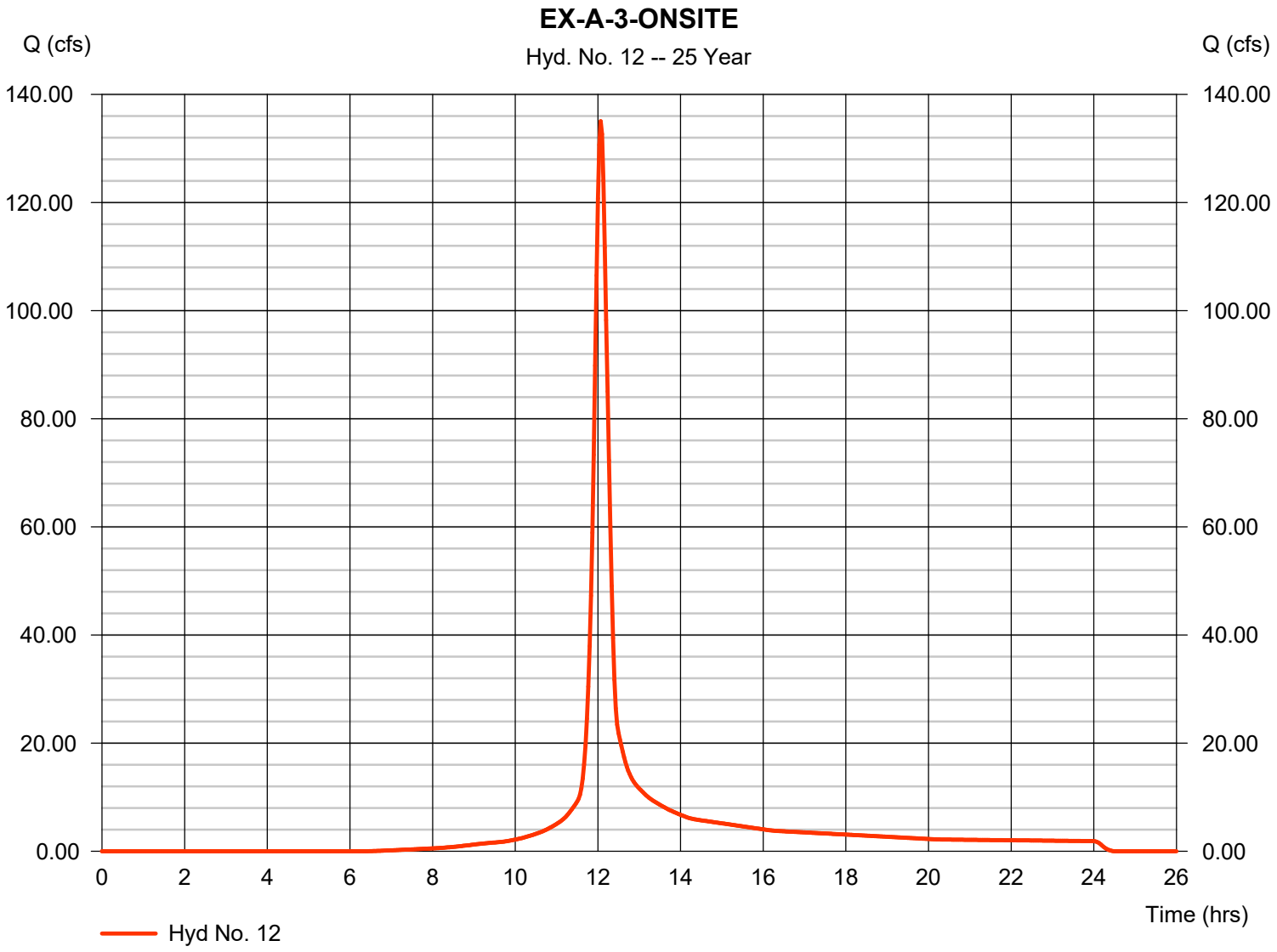


Hydrograph Report

Hyd. No. 12

EX-A-3-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	135.04 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	423,414 cuft
Drainage area	=	31.220 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.70 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

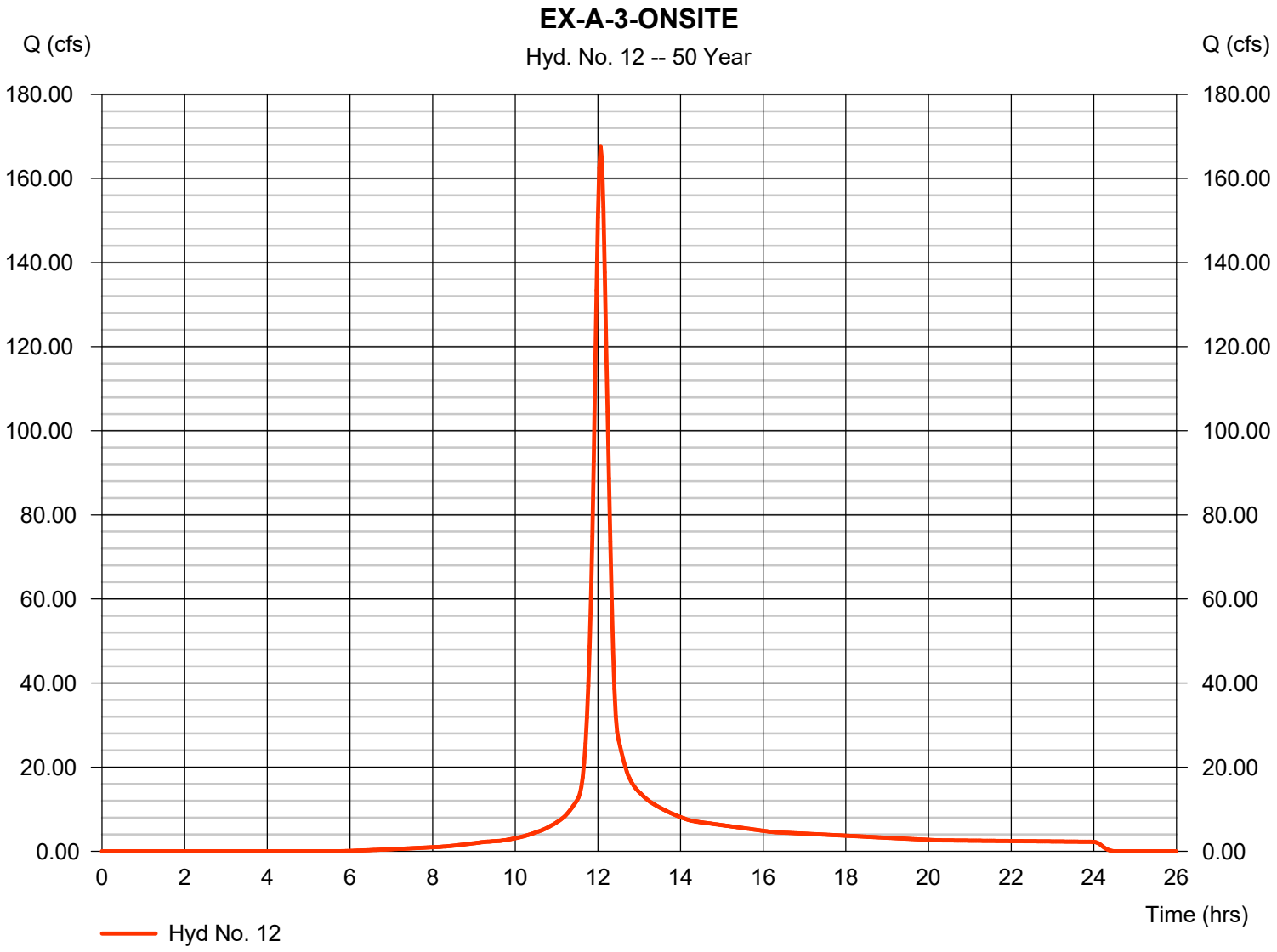


Hydrograph Report

Hyd. No. 12

EX-A-3-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	167.51 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	527,833 cuft
Drainage area	=	31.220 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.70 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

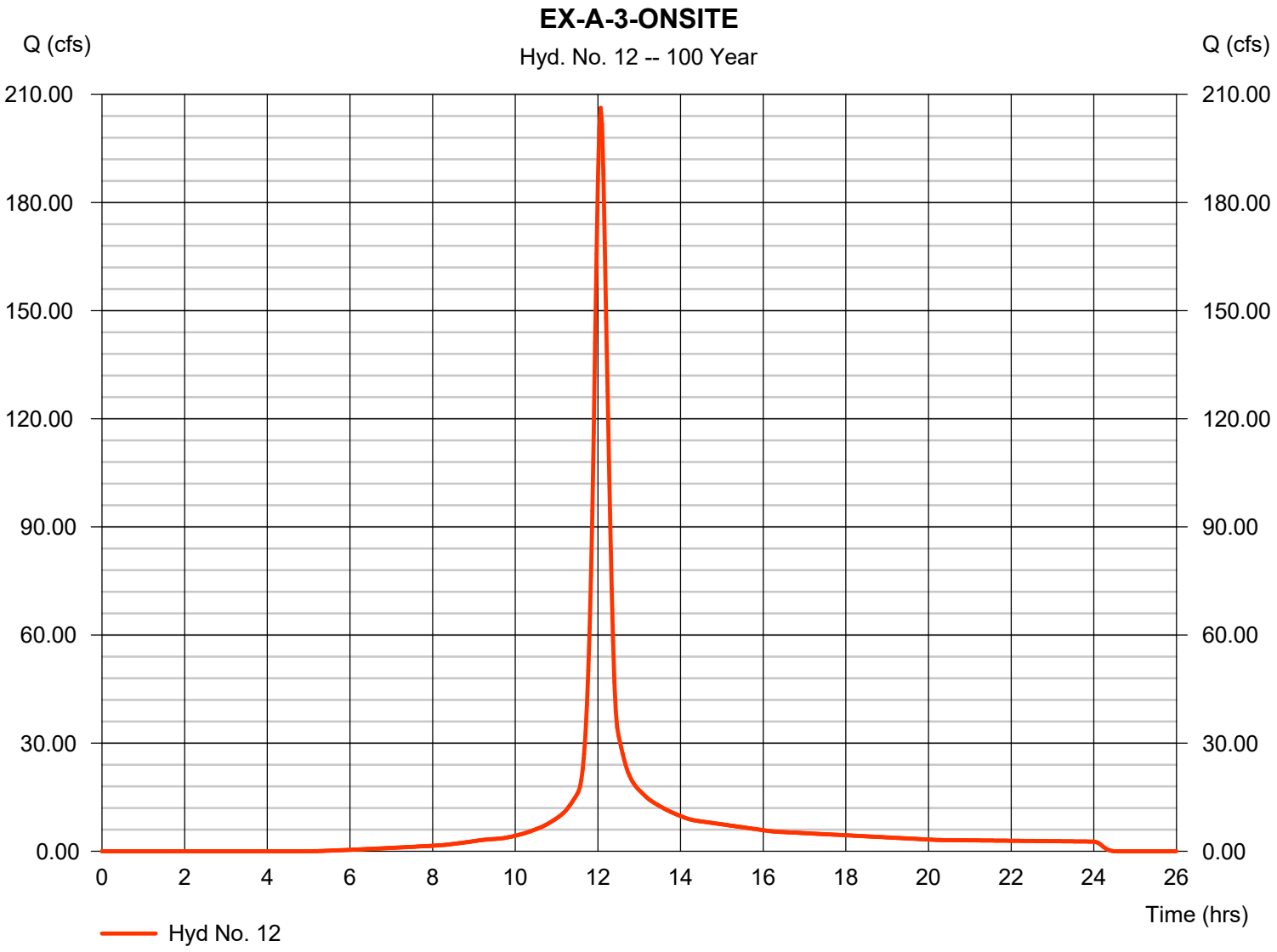


Hydrograph Report

Hyd. No. 12

EX-A-3-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	206.28 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	654,490 cuft
Drainage area	=	31.220 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.70 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



EX-A-3-OFFSITE WATERSHED

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No. 13

EX-A-3-OFFSITE

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.400		0.011		0.011		
Flow length (ft)	= 150.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.32		0.00		0.00		
Land slope (%)	= 2.67		0.00		0.00		
Travel Time (min)	**= 25.98**	**+**	**0.00**	**+**	**0.00**	**=**	**25.98**
Shallow Concentrated Flow							
Flow length (ft)	= 1758.00		0.00		0.00		
Watercourse slope (%)	= 6.77		0.00		0.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=4.20		0.00		0.00		
Travel Time (min)	**= 6.98**	**+**	**0.00**	**+**	**0.00**	**=**	**6.98**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 33.00 min

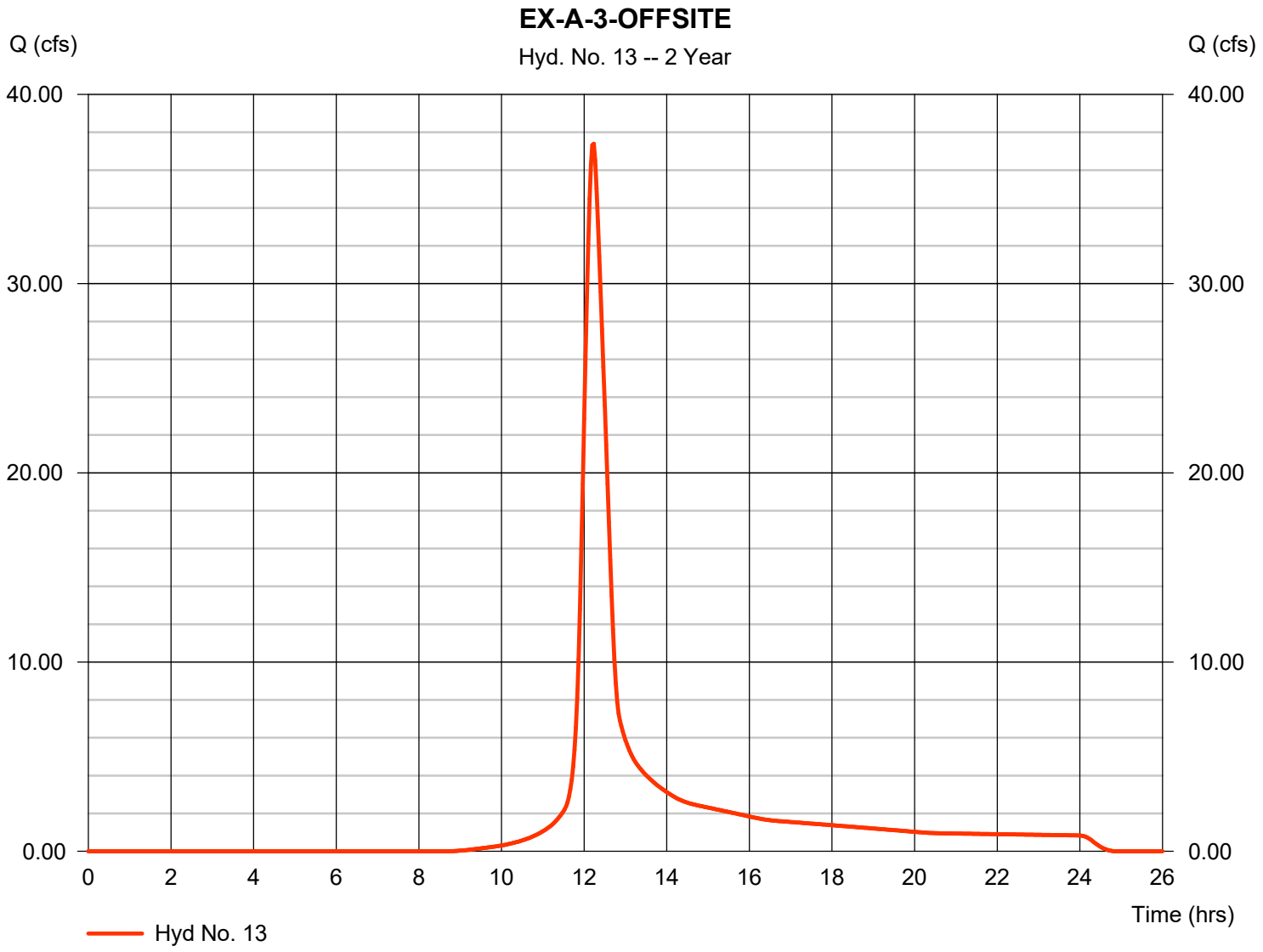
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 13

EX-A-3-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	37.39 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.23 hrs
Time interval	=	2 min	Hyd. volume	=	162,862 cuft
Drainage area	=	27.100 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	33.00 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

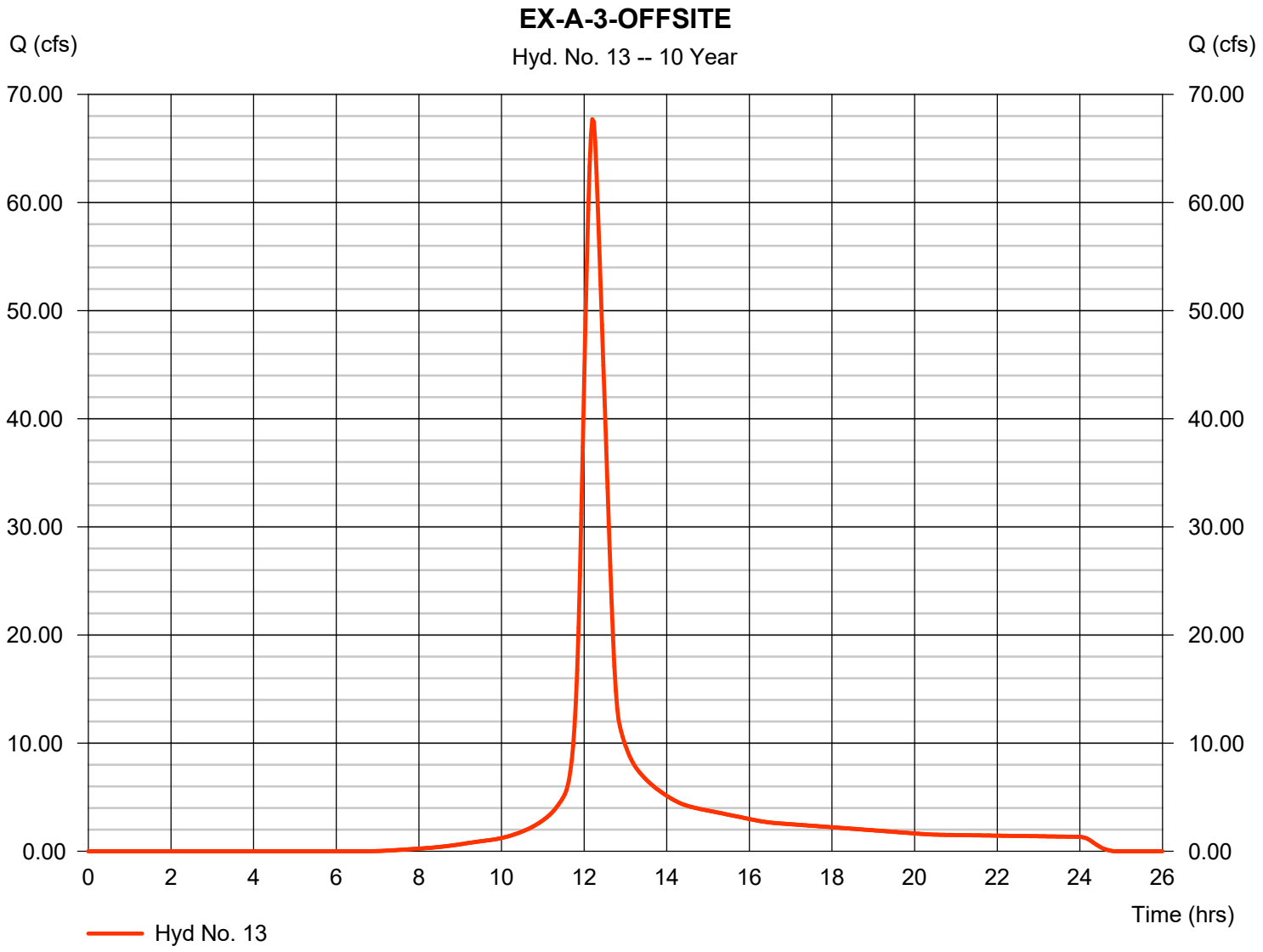


Hydrograph Report

Hyd. No. 13

EX-A-3-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	67.70 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.20 hrs
Time interval	=	2 min	Hyd. volume	=	292,470 cuft
Drainage area	=	27.100 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	33.00 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

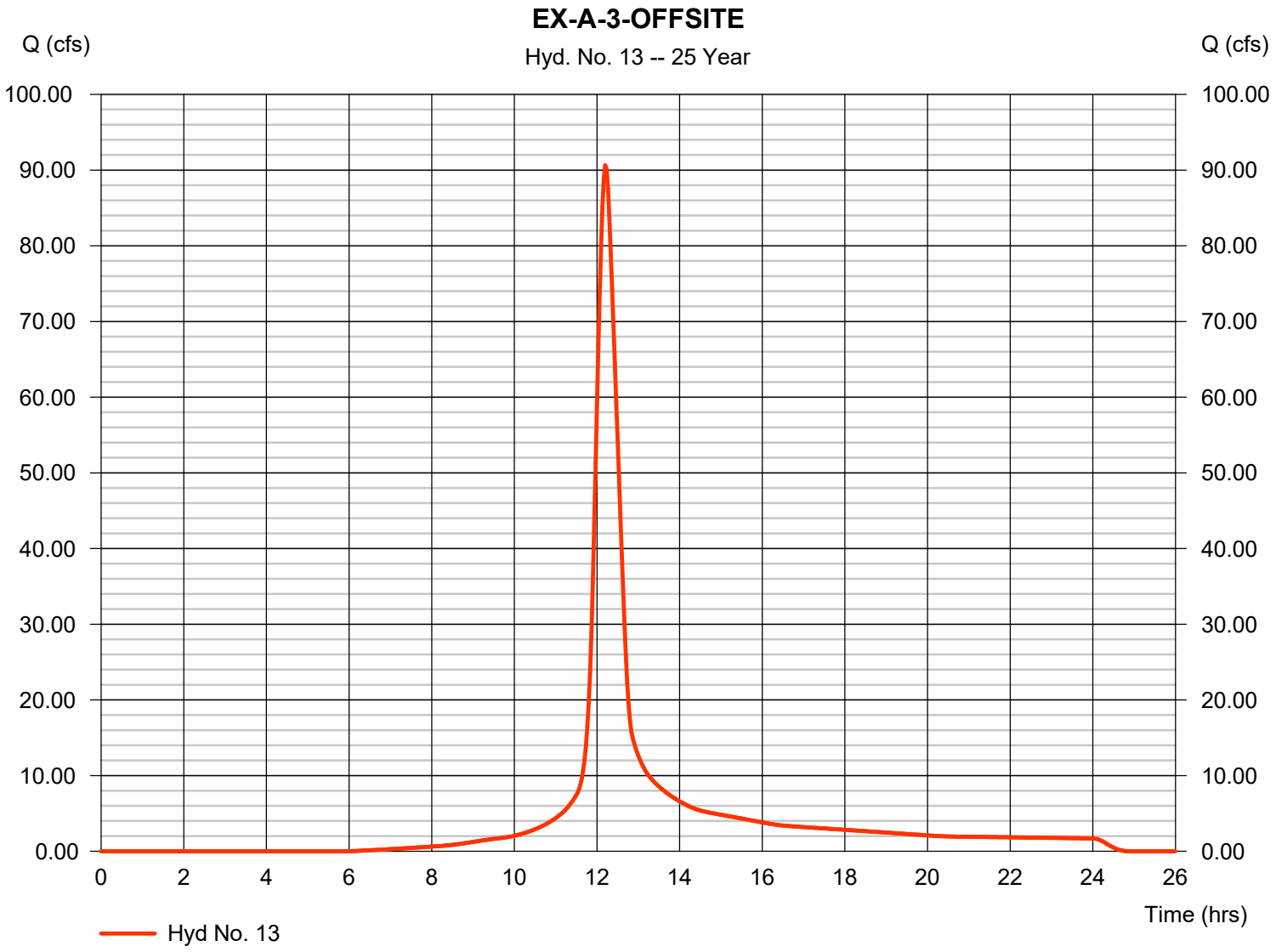


Hydrograph Report

Hyd. No. 13

EX-A-3-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	90.64 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.20 hrs
Time interval	=	2 min	Hyd. volume	=	392,549 cuft
Drainage area	=	27.100 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	33.00 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

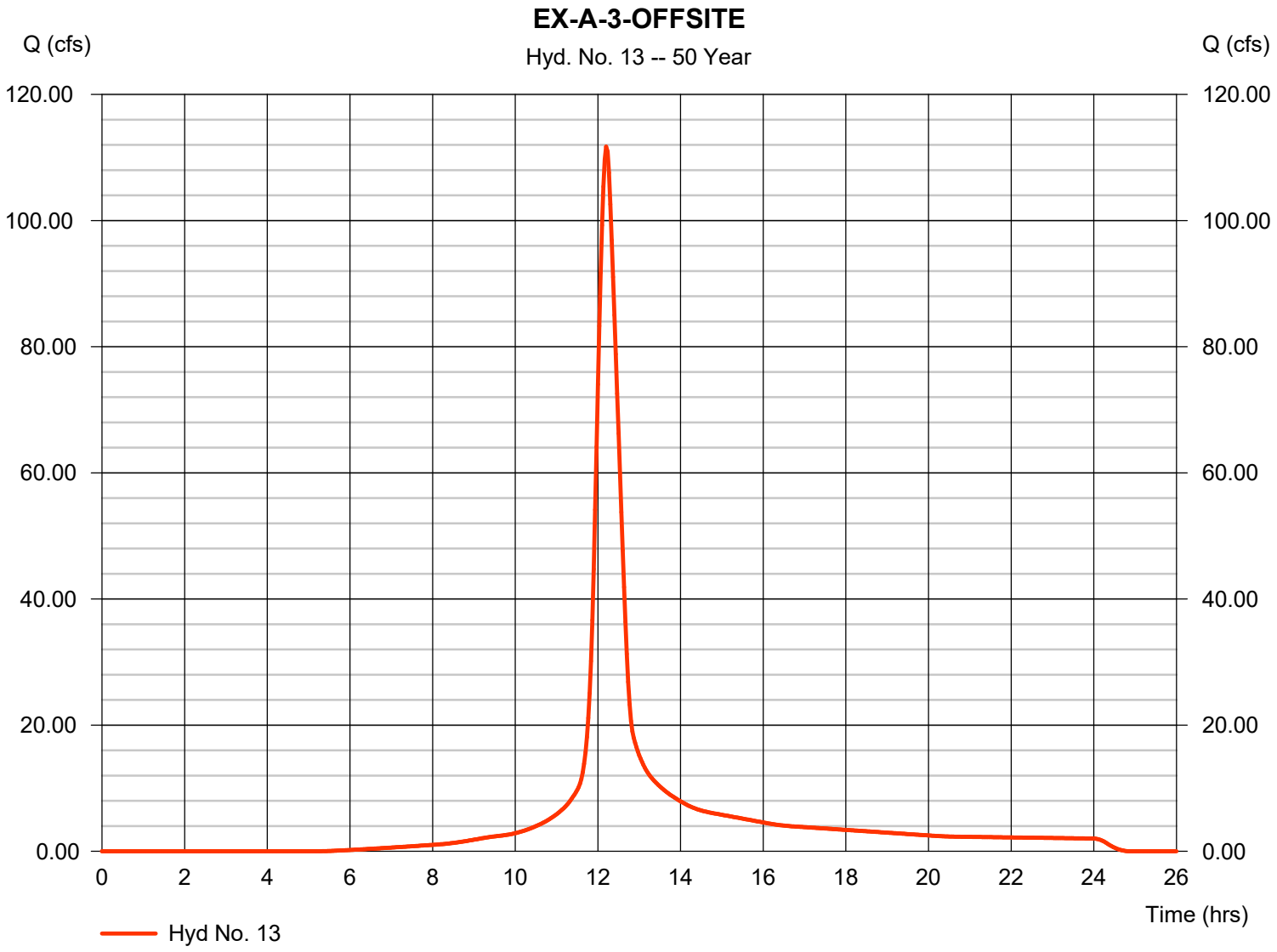


Hydrograph Report

Hyd. No. 13

EX-A-3-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	111.71 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.20 hrs
Time interval	=	2 min	Hyd. volume	=	485,930 cuft
Drainage area	=	27.100 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	33.00 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

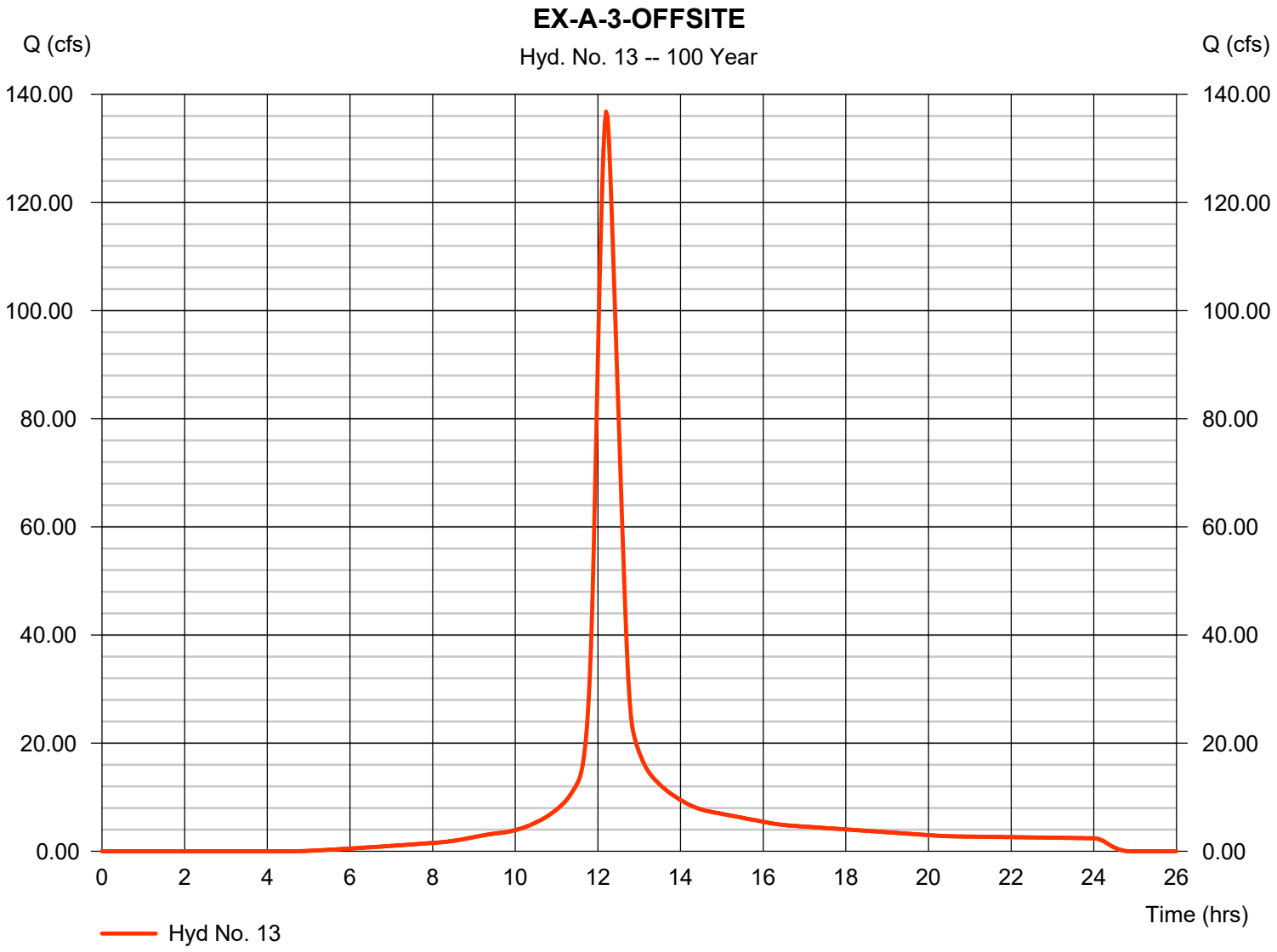


Hydrograph Report

Hyd. No. 13

EX-A-3-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	136.82 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.20 hrs
Time interval	=	2 min	Hyd. volume	=	598,790 cuft
Drainage area	=	27.100 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	33.00 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



TOTAL EXISTING FLOW TO POA-A-3

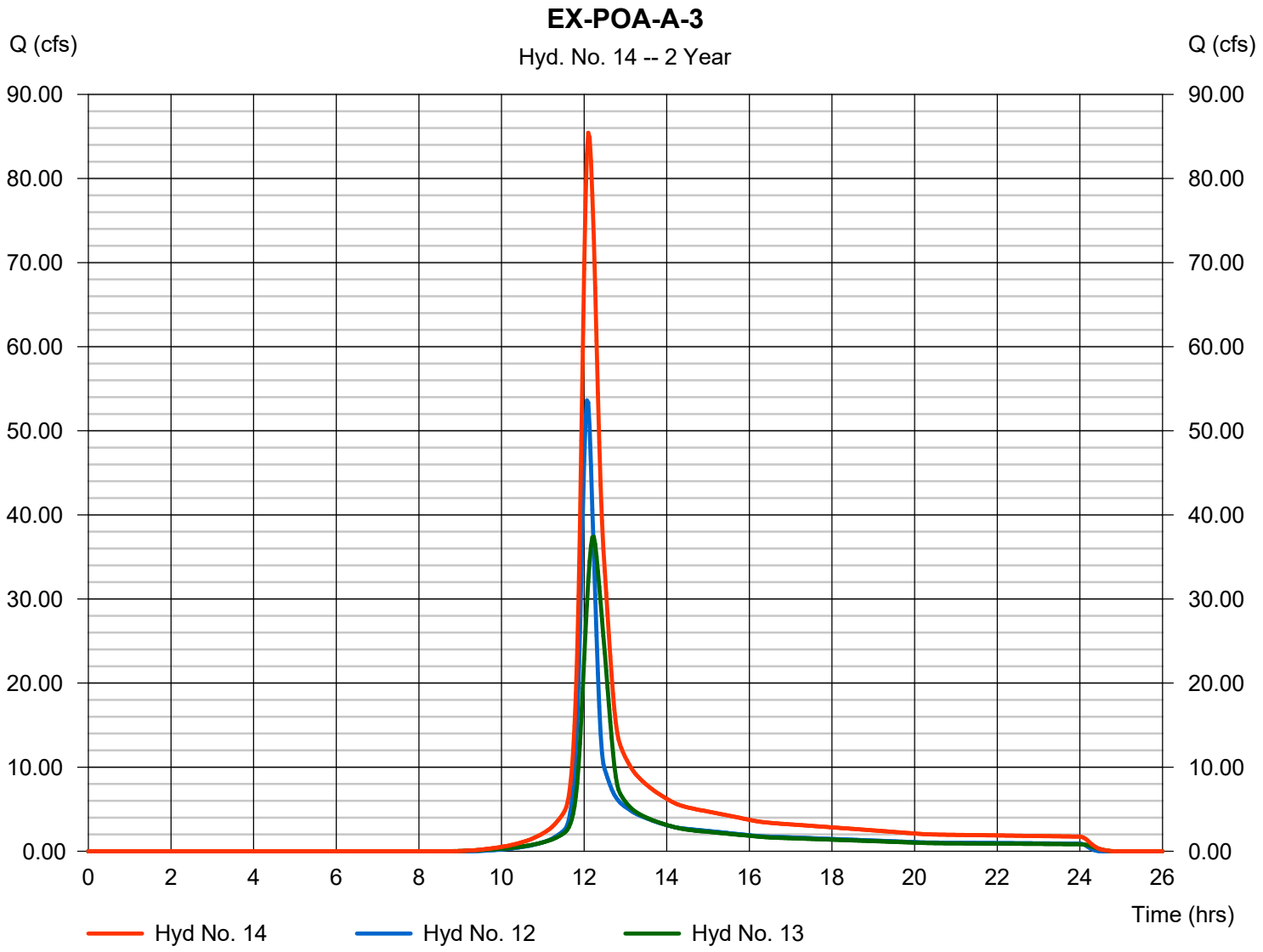
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 14

EX-POA-A-3

Hydrograph type	=	Combine	Peak discharge	=	85.43 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	332,267 cuft
Inflow hyds.	=	12, 13	Contrib. drain. area	=	58.320 ac

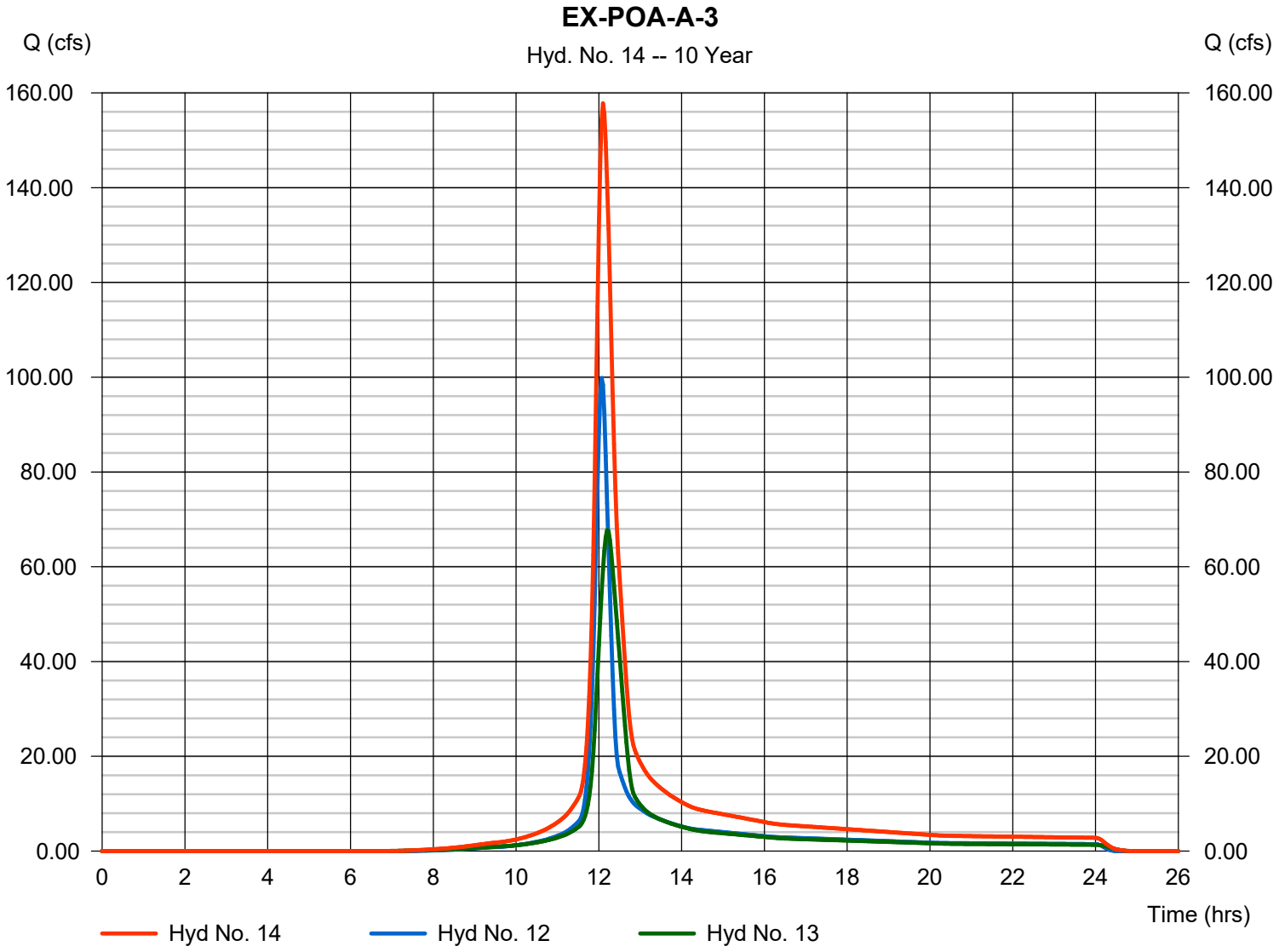


Hydrograph Report

Hyd. No. 14

EX-POA-A-3

Hydrograph type	=	Combine	Peak discharge	=	157.78 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	604,548 cuft
Inflow hyds.	=	12, 13	Contrib. drain. area	=	58.320 ac

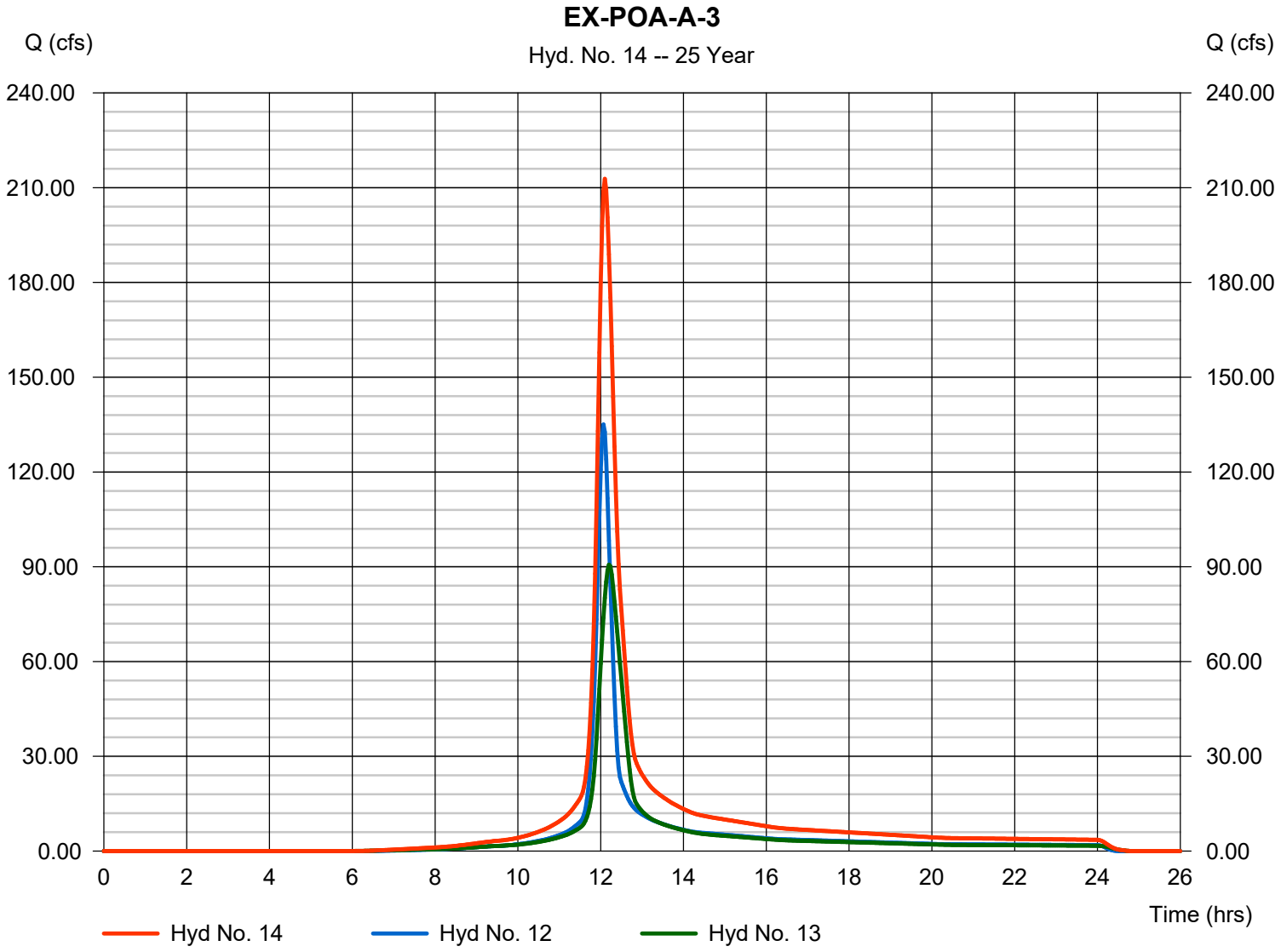


Hydrograph Report

Hyd. No. 14

EX-POA-A-3

Hydrograph type	=	Combine	Peak discharge	=	212.77 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	815,963 cuft
Inflow hyds.	=	12, 13	Contrib. drain. area	=	58.320 ac

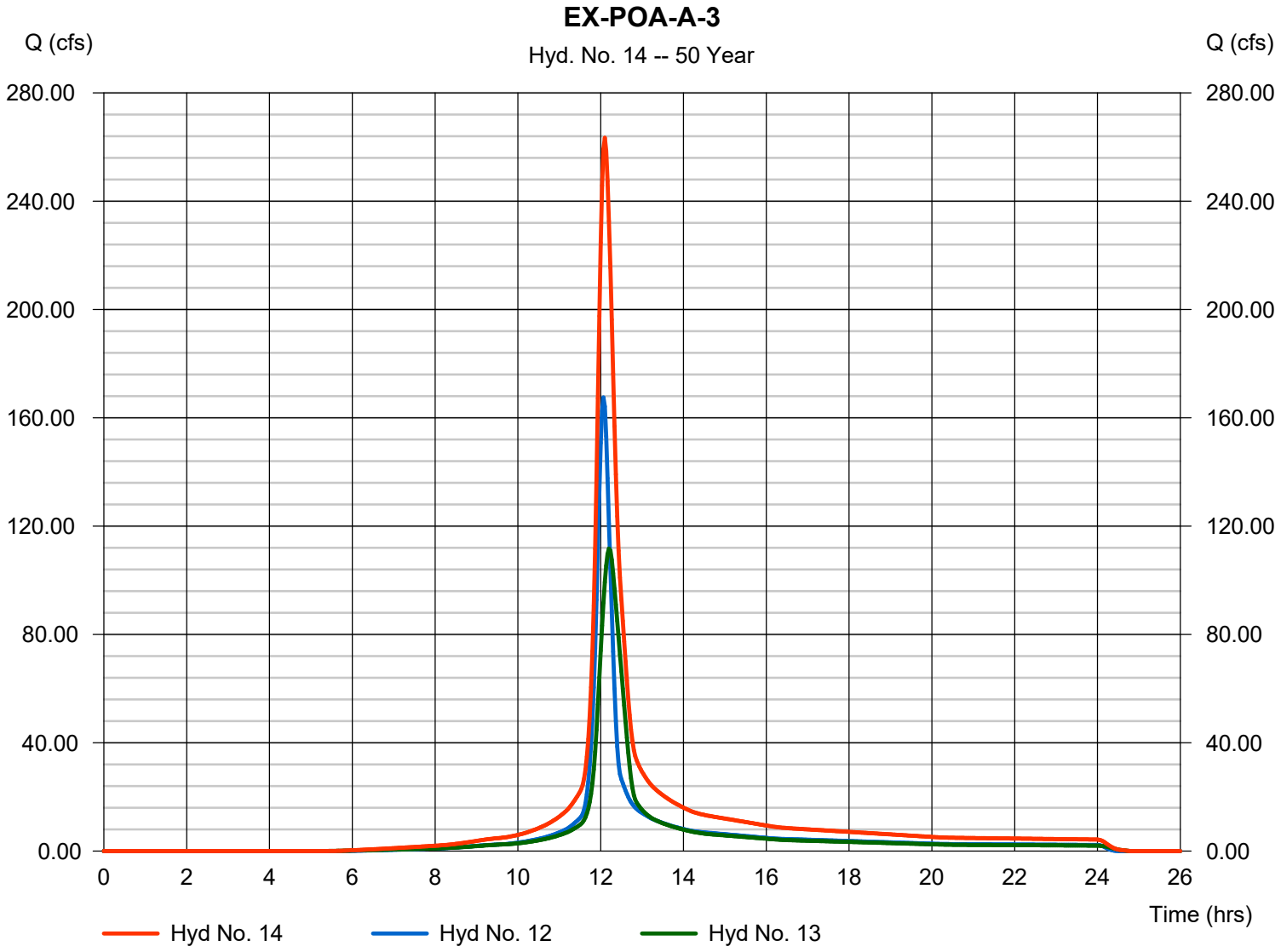


Hydrograph Report

Hyd. No. 14

EX-POA-A-3

Hydrograph type	=	Combine	Peak discharge	=	263.41 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	1,013,764 cuft
Inflow hyds.	=	12, 13	Contrib. drain. area	=	58.320 ac

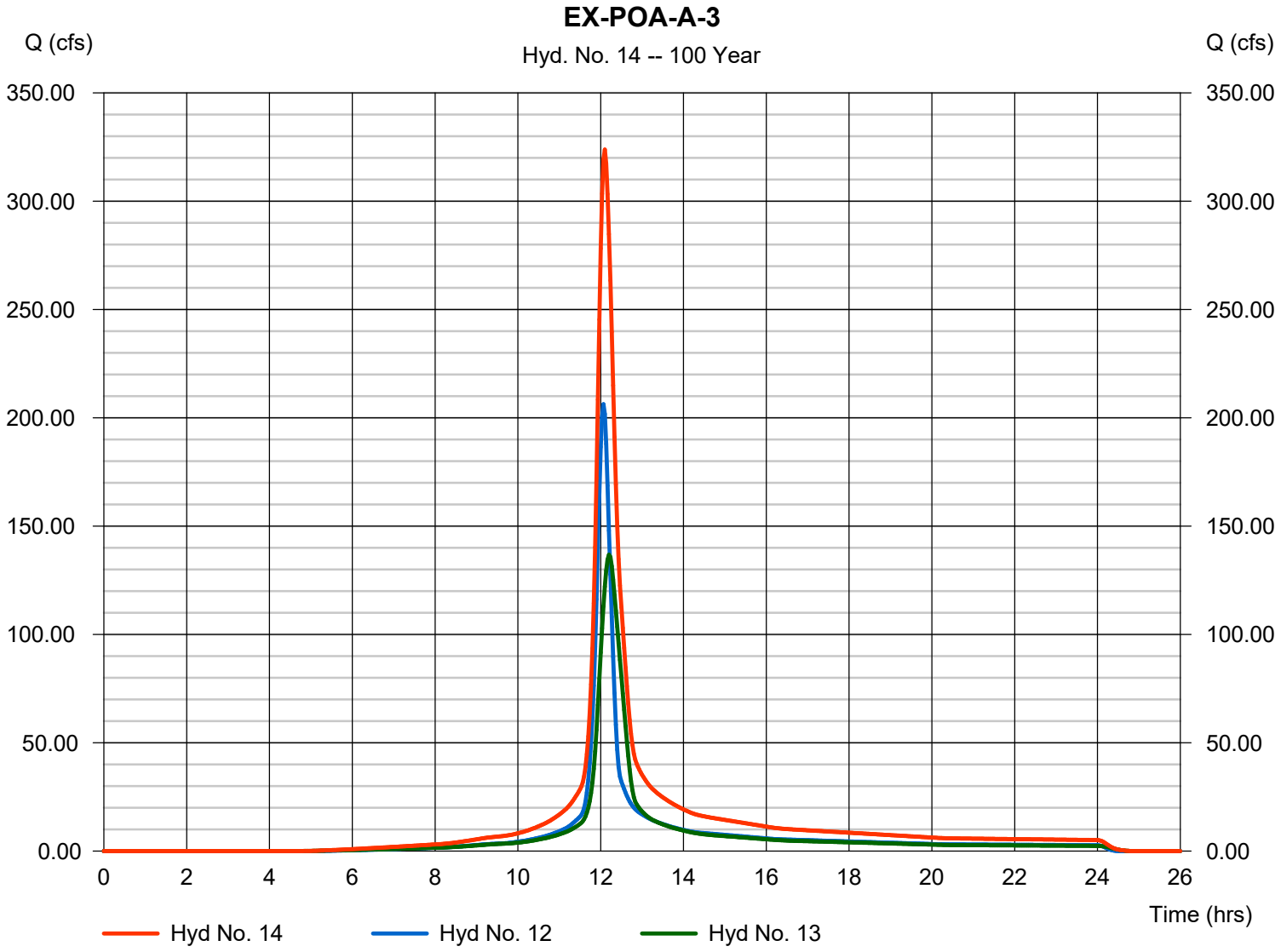


Hydrograph Report

Hyd. No. 14

EX-POA-A-3

Hydrograph type	=	Combine	Peak discharge	=	323.84 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	1,253,281 cuft
Inflow hyds.	=	12, 13	Contrib. drain. area	=	58.320 ac



EX-A-4-ONSITE WATERSHED

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No. 18

EX-A-4-ONSITE

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 150.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.32		0.00		0.00		
Land slope (%)	= 3.33		0.00		0.00		
Travel Time (min)	**= 10.85**	**+**	**0.00**	**+**	**0.00**	**=**	**10.85**
Shallow Concentrated Flow							
Flow length (ft)	= 297.00		55.00		0.00		
Watercourse slope (%)	= 5.05		23.63		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=3.63		7.84		0.00		
Travel Time (min)	**= 1.37**	**+**	**0.12**	**+**	**0.00**	**=**	**1.48**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 12.30 min

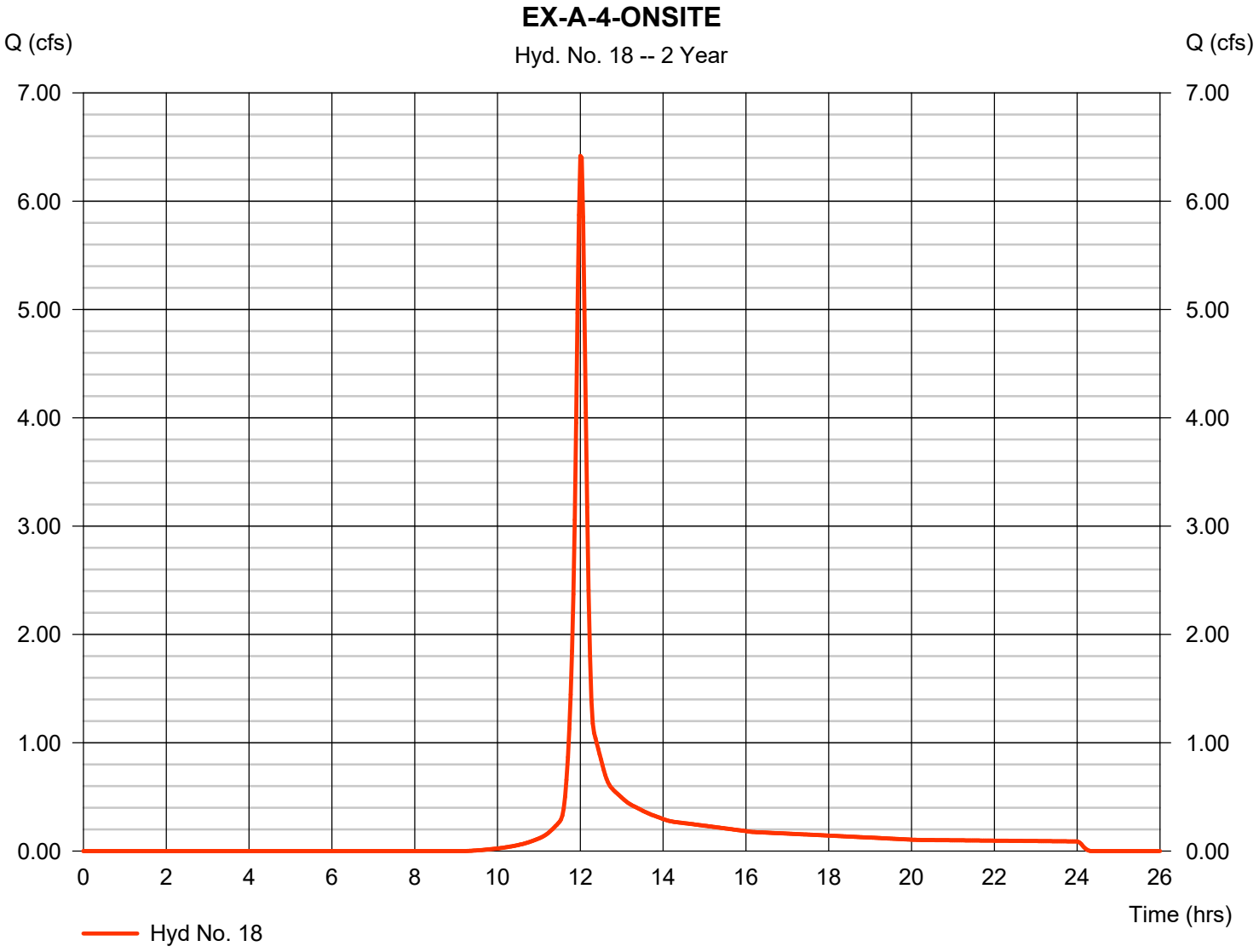
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 18

EX-A-4-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.417 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	16,731 cuft
Drainage area	=	2.990 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.30 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

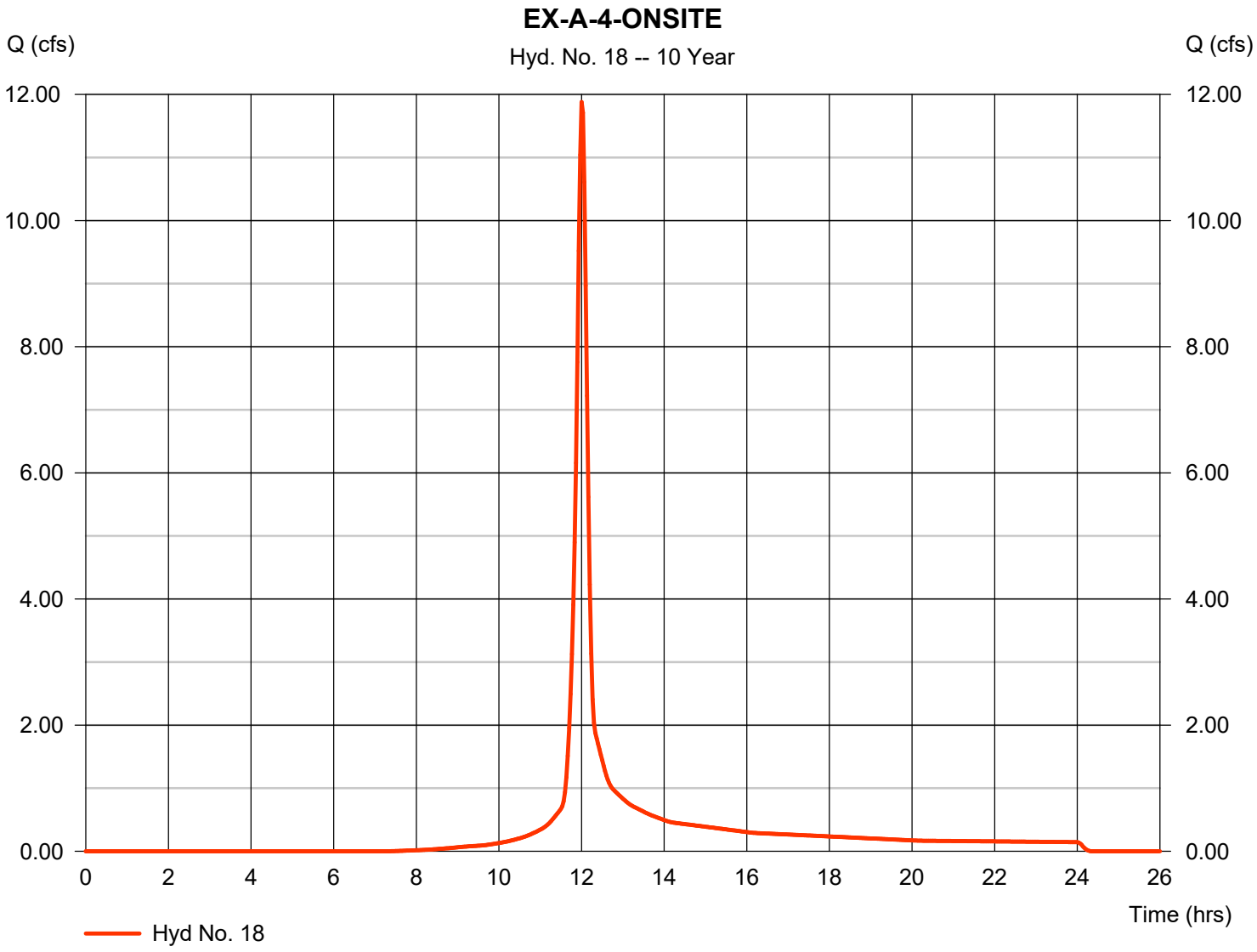


Hydrograph Report

Hyd. No. 18

EX-A-4-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.88 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	30,822 cuft
Drainage area	=	2.990 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.30 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

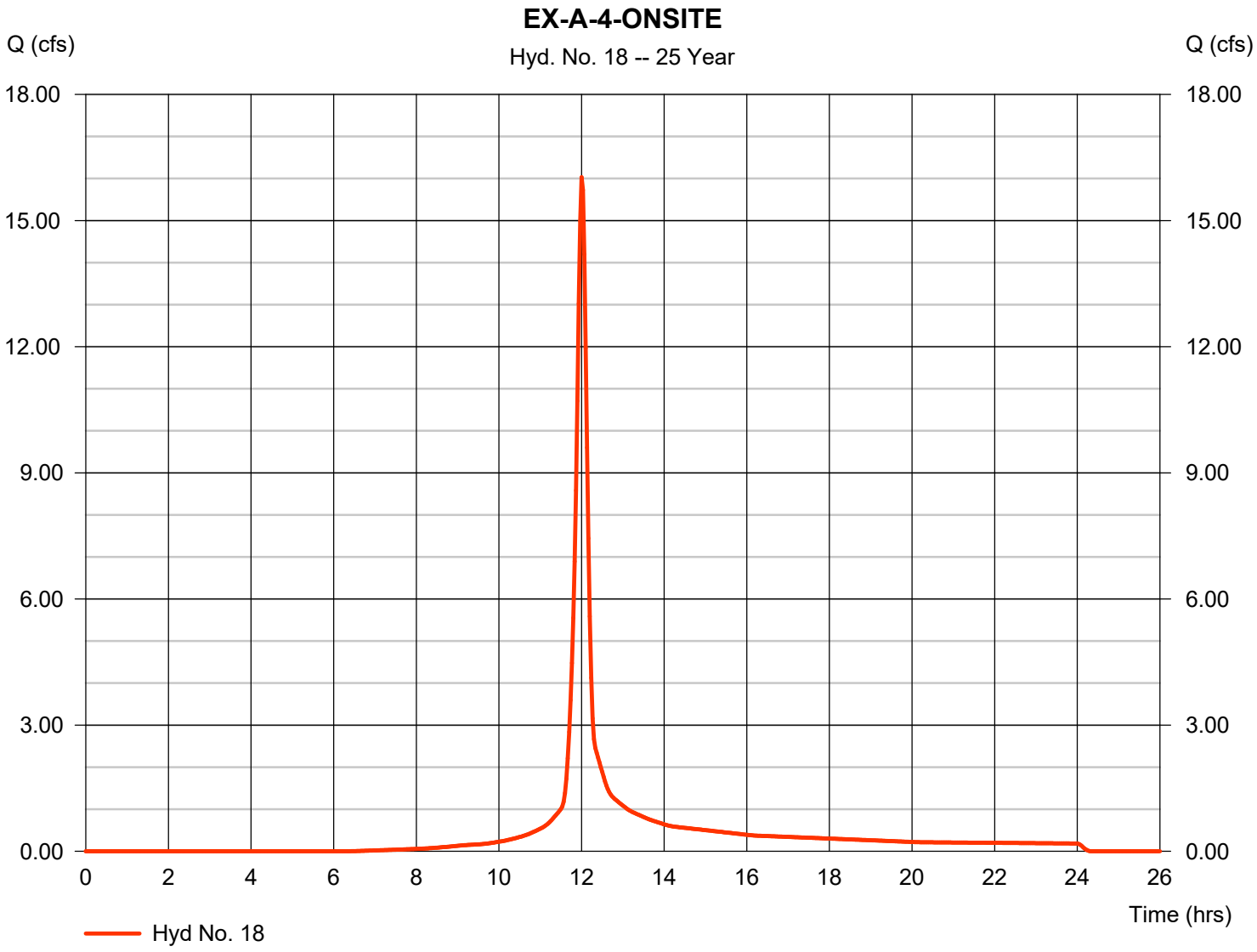


Hydrograph Report

Hyd. No. 18

EX-A-4-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	16.03 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	41,818 cuft
Drainage area	=	2.990 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.30 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

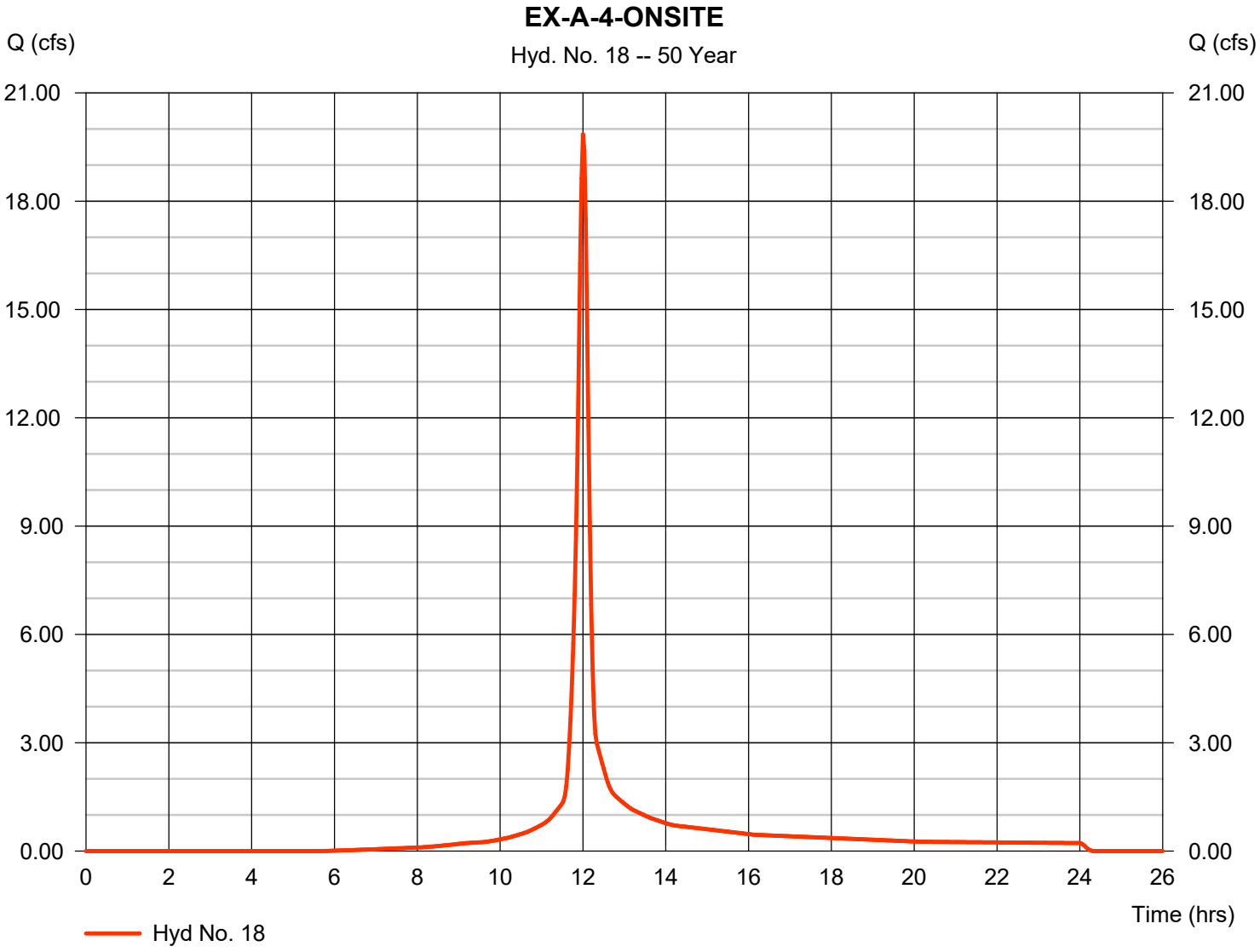


Hydrograph Report

Hyd. No. 18

EX-A-4-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	19.85 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	52,131 cuft
Drainage area	=	2.990 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.30 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

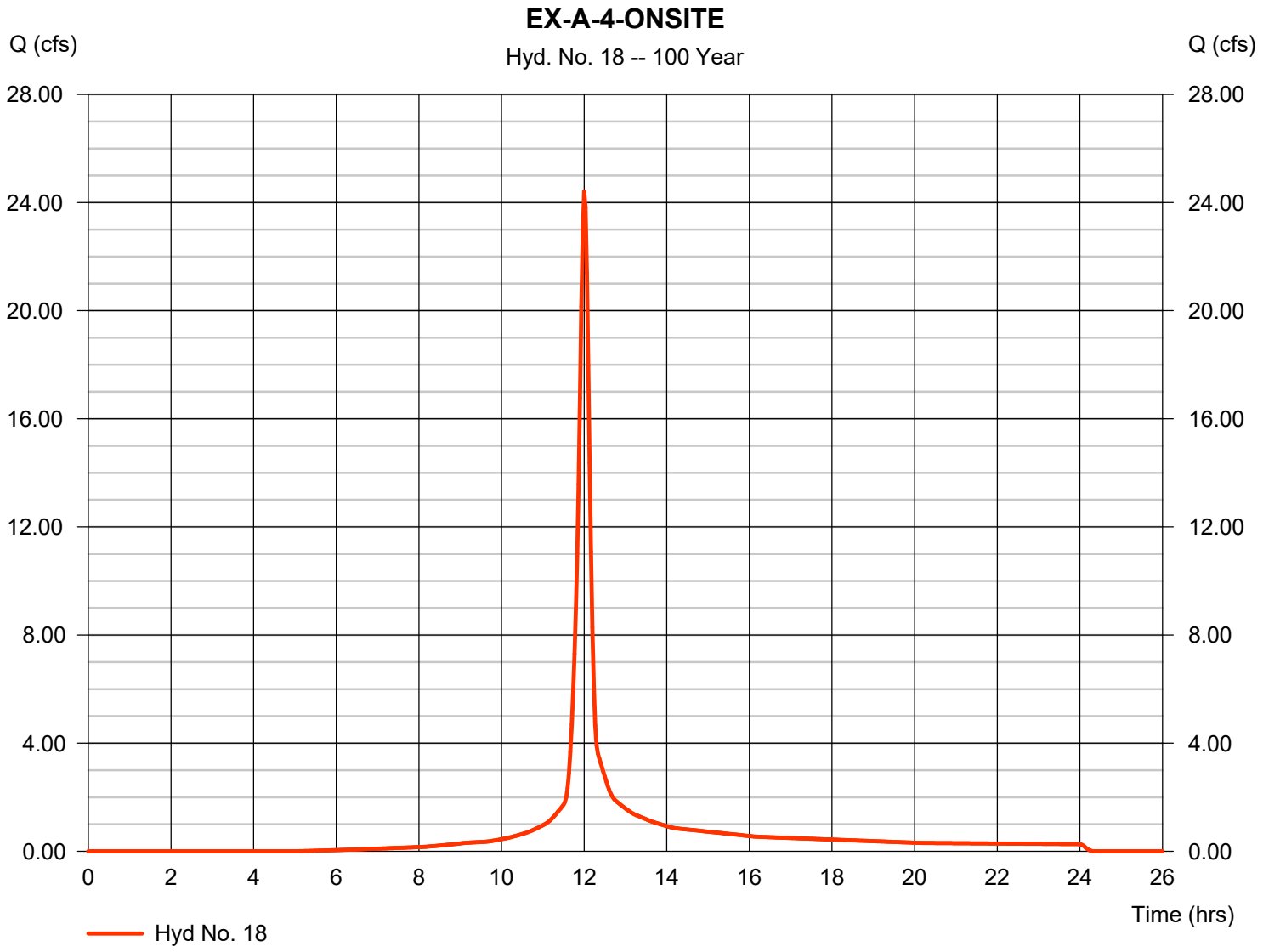


Hydrograph Report

Hyd. No. 18

EX-A-4-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	24.41 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	64,641 cuft
Drainage area	=	2.990 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.30 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



EX-B-1-ONSITE WATERSHED

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No. 20

EX-B-1-ONSITE

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 150.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.32		0.00		0.00		
Land slope (%)	= 0.67		0.00		0.00		
Travel Time (min)	**= 2.55**	**+**	**0.00**	**+**	**0.00**	**=**	**2.55**
Shallow Concentrated Flow							
Flow length (ft)	= 320.00		200.00		0.00		
Watercourse slope (%)	= 0.95		2.00		0.00		
Surface description	= Paved		Unpaved		Paved		
Average velocity (ft/s)	=1.98		2.28		0.00		
Travel Time (min)	**= 2.69**	**+**	**1.46**	**+**	**0.00**	**=**	**4.15**
Channel Flow							
X sectional flow area (sqft)	= 1.23		1.23		0.00		
Wetted perimeter (ft)	= 3.90		3.90		0.00		
Channel slope (%)	= 1.67		3.00		0.00		
Manning's n-value	= 0.013		0.013		0.015		
Velocity (ft/s)	=6.84						
			9.16				
					0.00		
Flow length (ft)	({0})55.0		240.0		0.0		
Travel Time (min)	**= 0.13**	**+**	**0.44**	**+**	**0.00**	**=**	**0.57**

Total Travel Time, Tc ..... 7.30 min

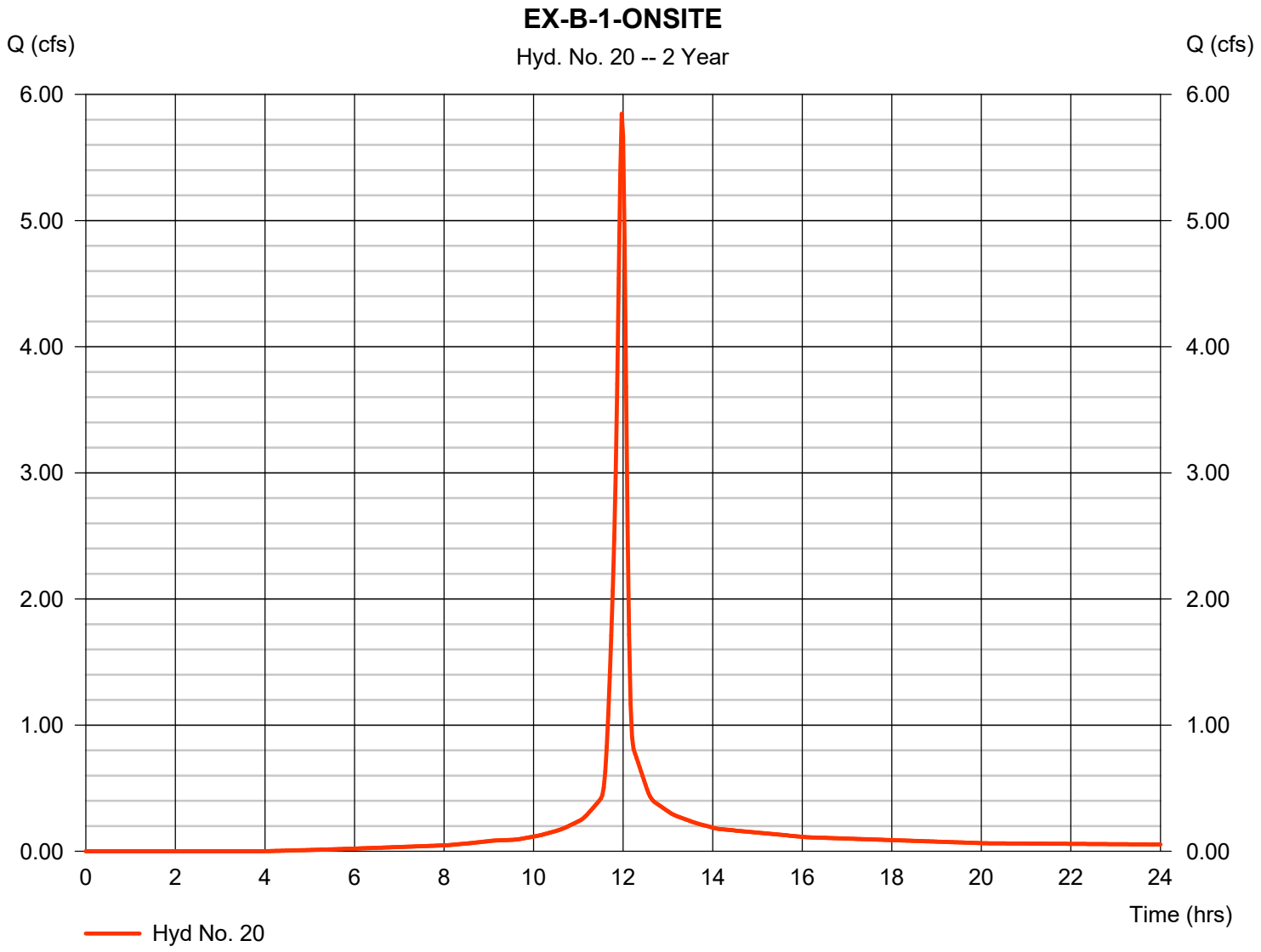
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 20

EX-B-1-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.846 cfs
Storm frequency	=	2 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	14,039 cuft
Drainage area	=	1.510 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.30 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

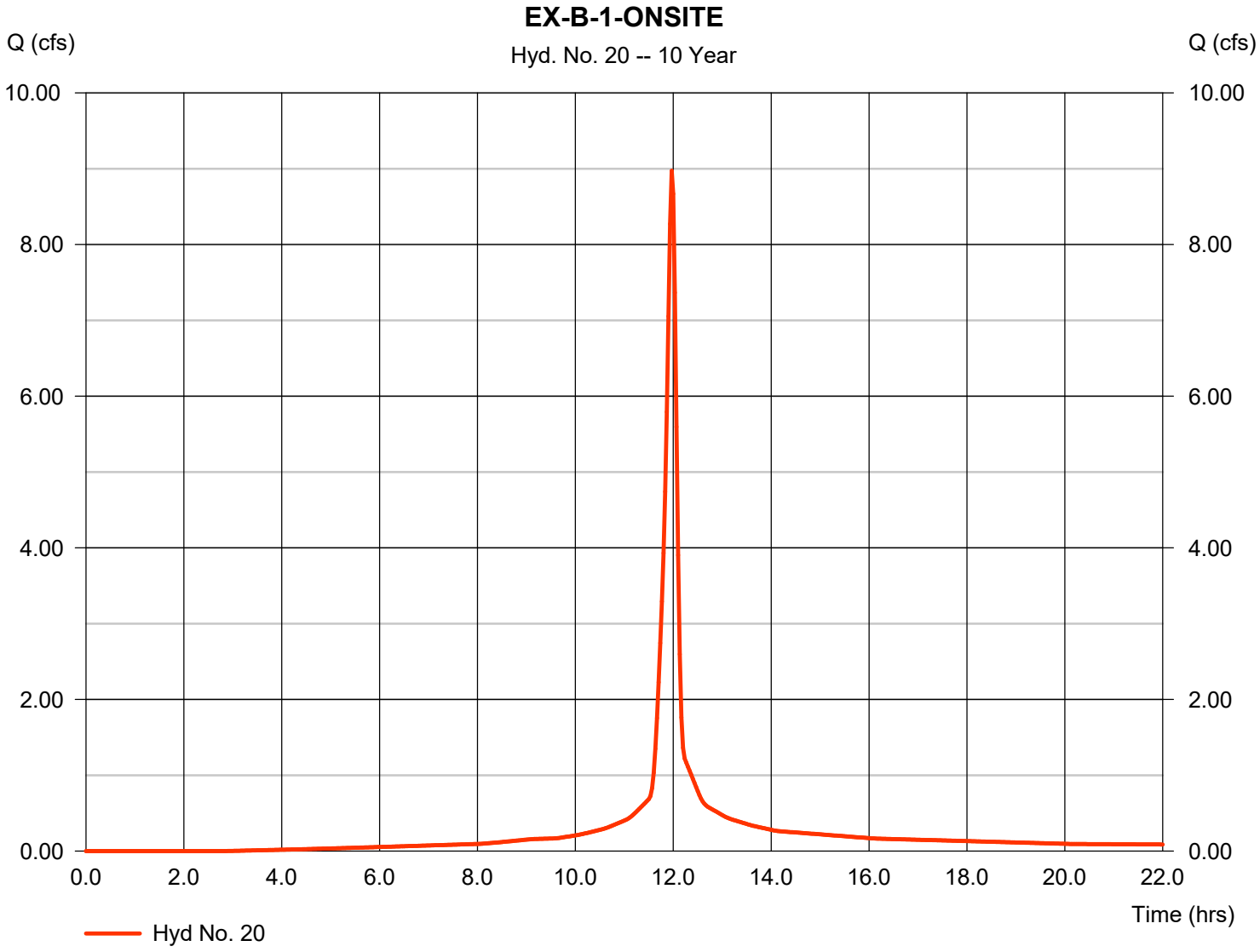


Hydrograph Report

Hyd. No. 20

EX-B-1-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.972 cfs
Storm frequency	=	10 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	22,149 cuft
Drainage area	=	1.510 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.30 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

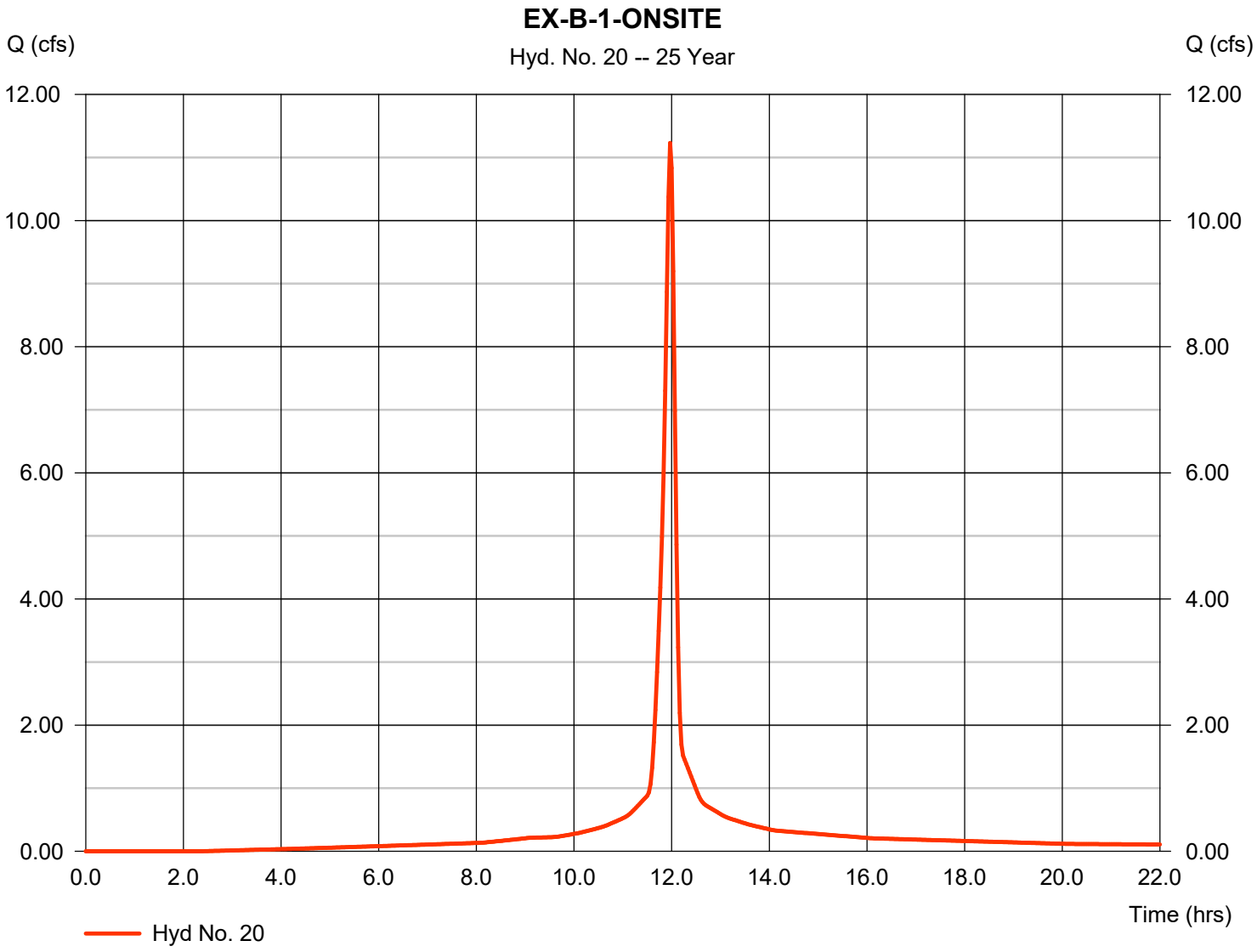


Hydrograph Report

Hyd. No. 20

EX-B-1-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.23 cfs
Storm frequency	=	25 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	28,137 cuft
Drainage area	=	1.510 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.30 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

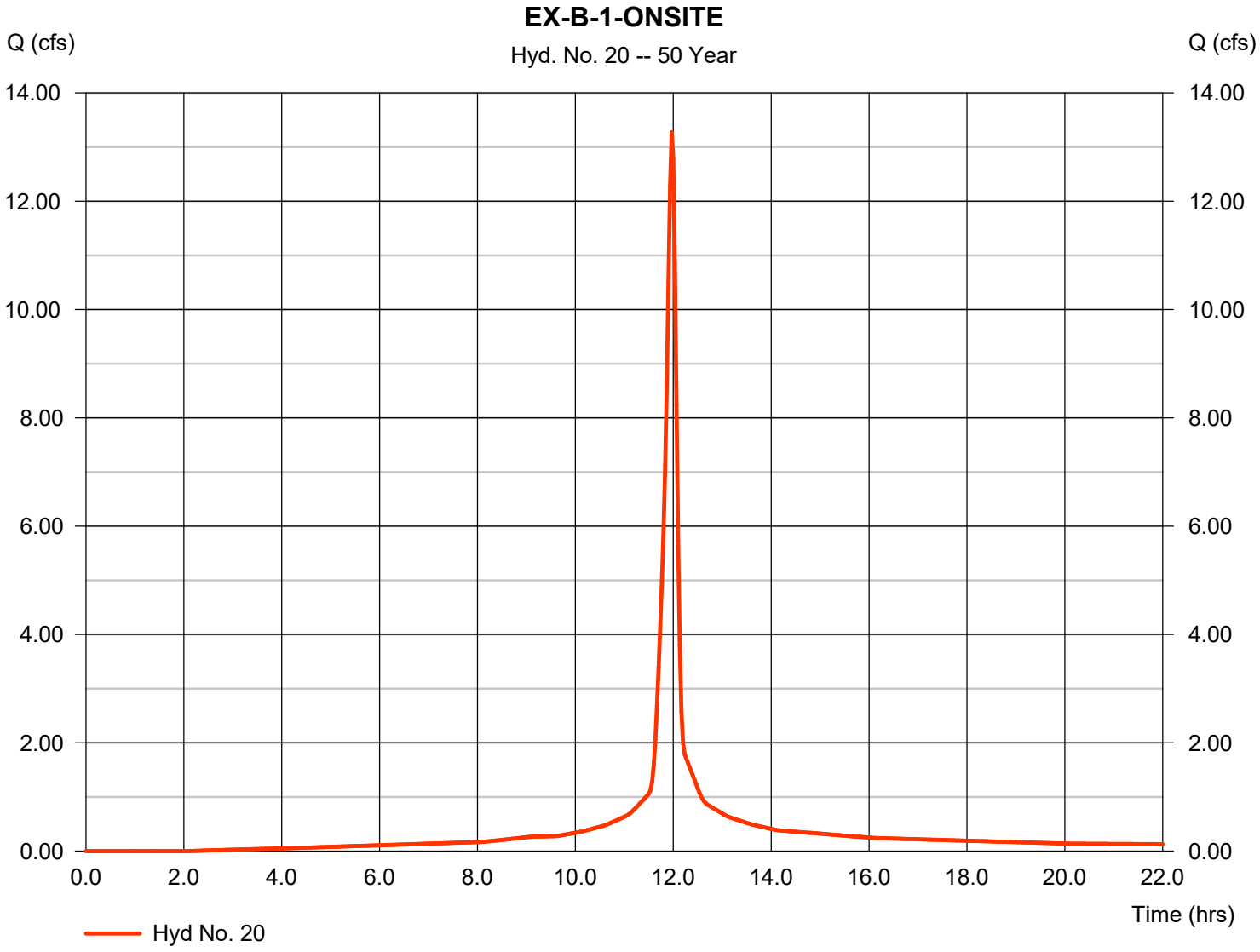


Hydrograph Report

Hyd. No. 20

EX-B-1-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	13.27 cfs
Storm frequency	=	50 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	33,610 cuft
Drainage area	=	1.510 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.30 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

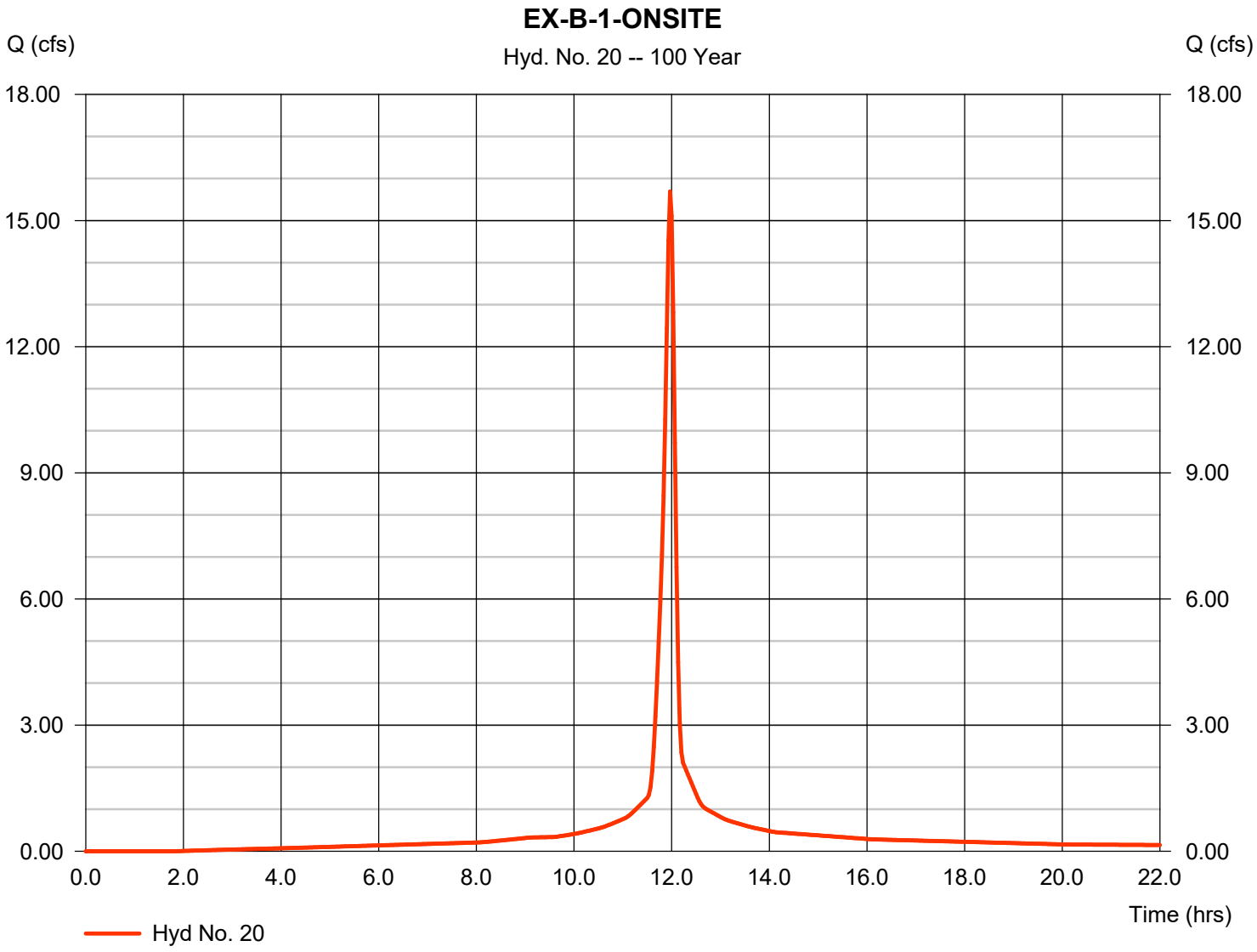


Hydrograph Report

Hyd. No. 20

EX-B-1-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	15.69 cfs
Storm frequency	=	100 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	40,131 cuft
Drainage area	=	1.510 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.30 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



EX-B-1-OFFSITE WATERSHED

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No. 21

EX-B-1-OFFSITE

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.150		
Flow length (ft)	= 40.0		70.0		40.0		
Two-year 24-hr precip. (in)	= 3.32		3.32		3.32		
Land slope (%)	= 15.00		7.00		7.00		
Travel Time (min)	**= 2.06**	**+**	**0.54**	**+**	**2.80**	**=**	**5.41**
Shallow Concentrated Flow							
Flow length (ft)	= 60.00		80.00		0.00		
Watercourse slope (%)	= 1.00		1.50		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.61		2.49		0.00		
Travel Time (min)	**= 0.62**	**+**	**0.54**	**+**	**0.00**	**=**	**1.16**
Channel Flow							
X sectional flow area (sqft)	= 1.23		1.23		1.23		
Wetted perimeter (ft)	= 3.90		3.90		3.90		
Channel slope (%)	= 0.90		1.50		3.00		
Manning's n-value	= 0.013		0.013		0.013		
Velocity (ft/s)	=5.02		6.48		9.16		
Flow length (ft)	({0})45.0		55.0		240.0		
Travel Time (min)	**= 0.15**	**+**	**0.14**	**+**	**0.44**	**=**	**0.73**

Total Travel Time, Tc ..... 7.30 min

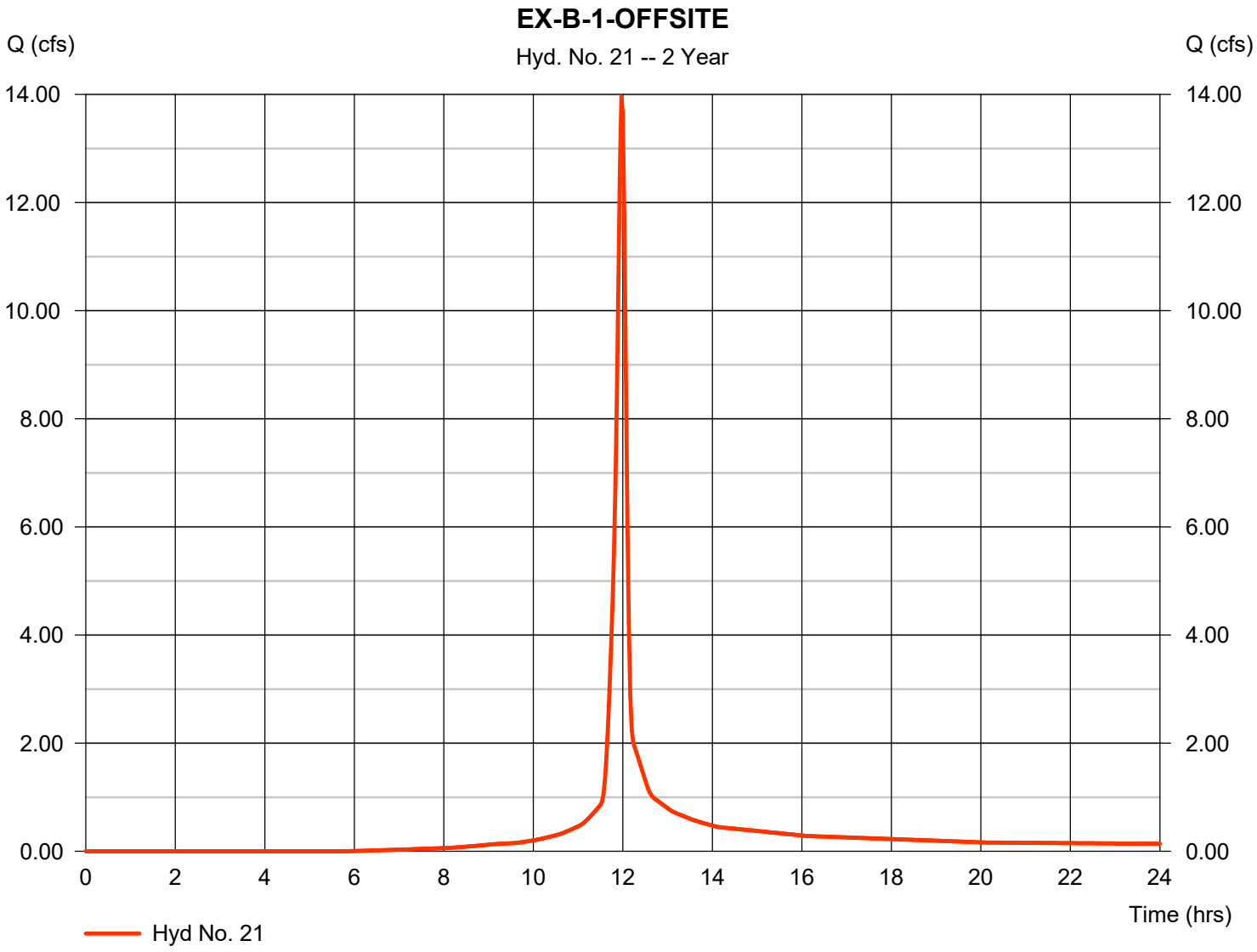
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 21

EX-B-1-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	13.96 cfs
Storm frequency	=	2 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	32,455 cuft
Drainage area	=	4.080 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.30 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

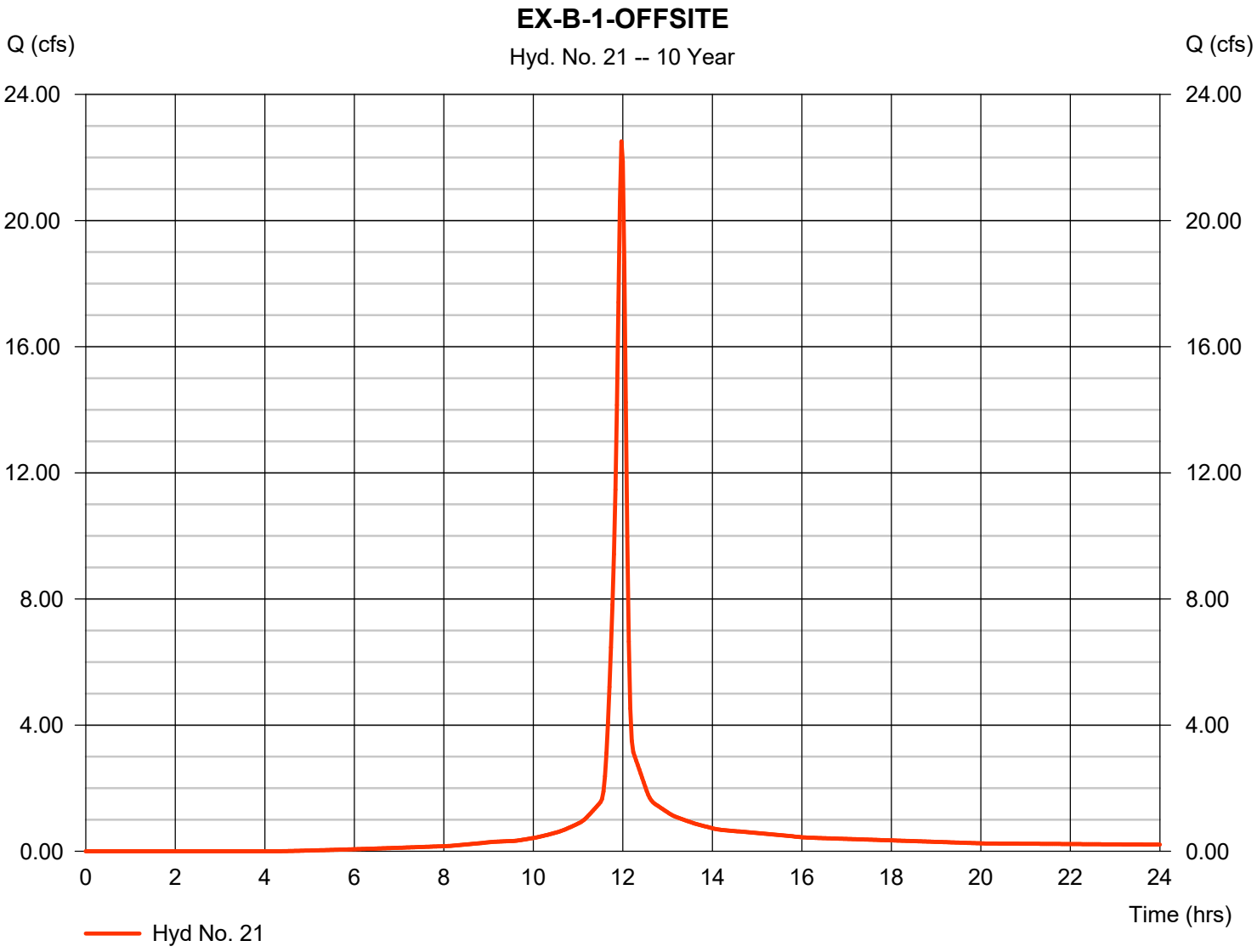


Hydrograph Report

Hyd. No. 21

EX-B-1-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	22.51 cfs
Storm frequency	=	10 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	53,598 cuft
Drainage area	=	4.080 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.30 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

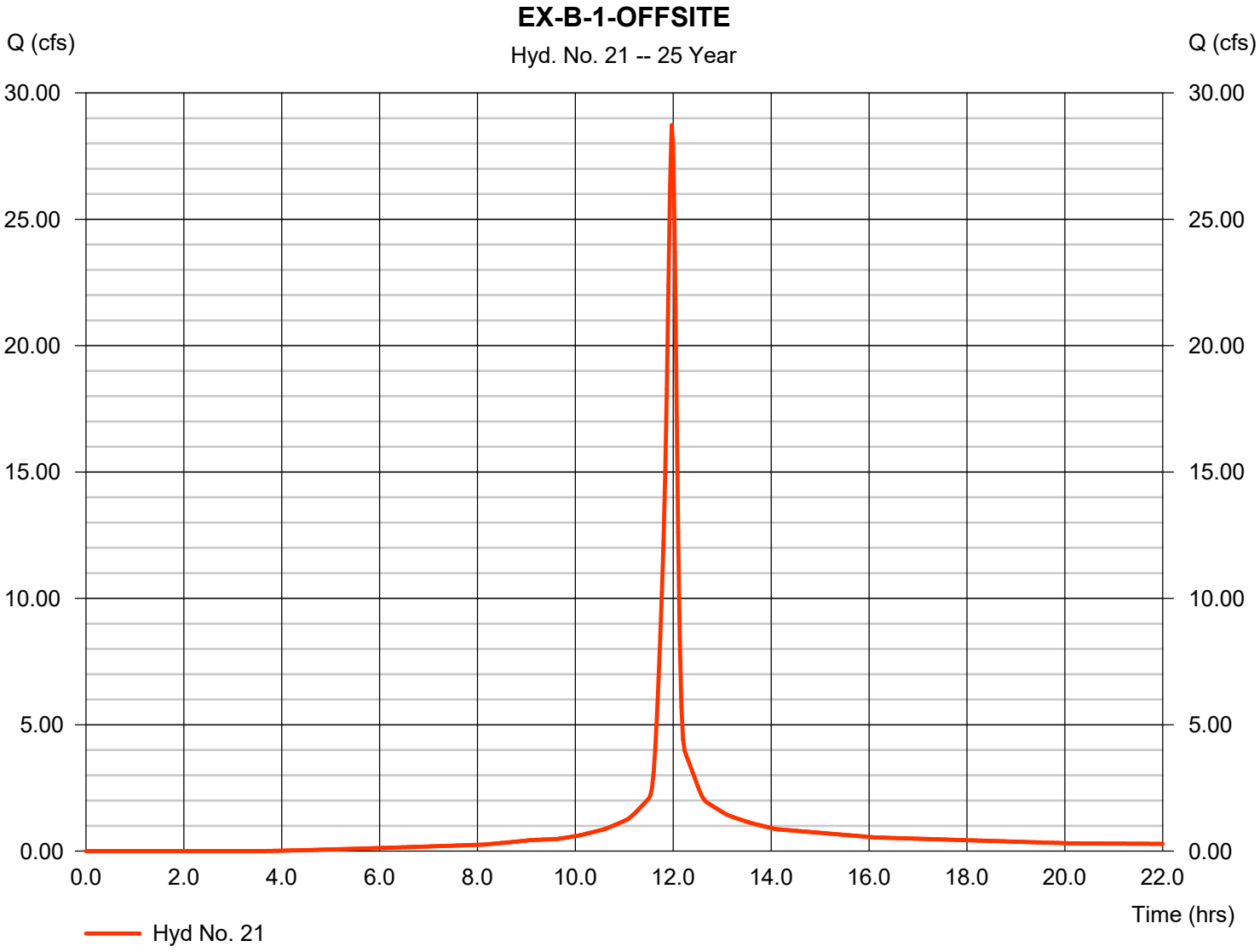


Hydrograph Report

Hyd. No. 21

EX-B-1-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	28.72 cfs
Storm frequency	=	25 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	69,416 cuft
Drainage area	=	4.080 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.30 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

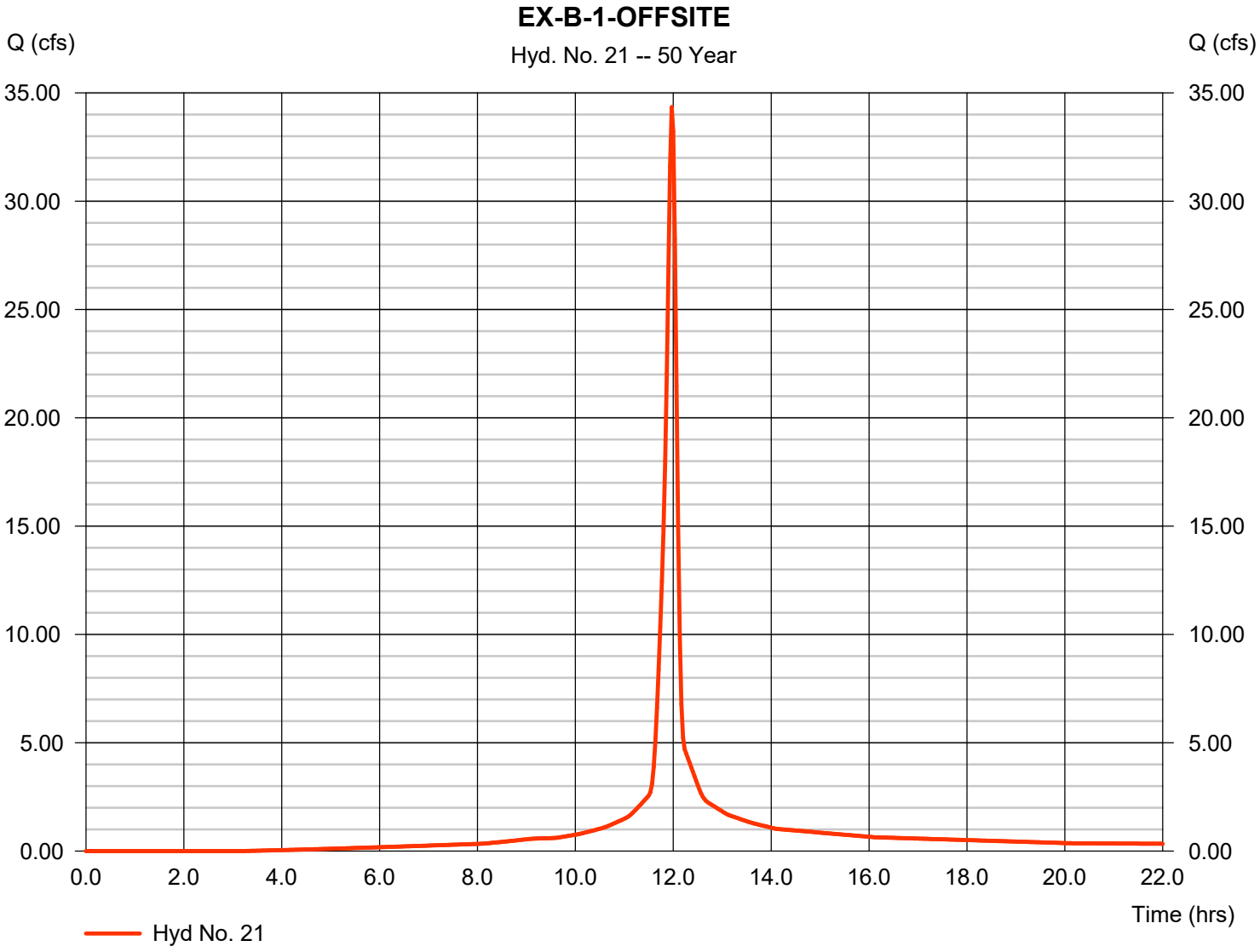


Hydrograph Report

Hyd. No. 21

EX-B-1-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	34.34 cfs
Storm frequency	=	50 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	83,961 cuft
Drainage area	=	4.080 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.30 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

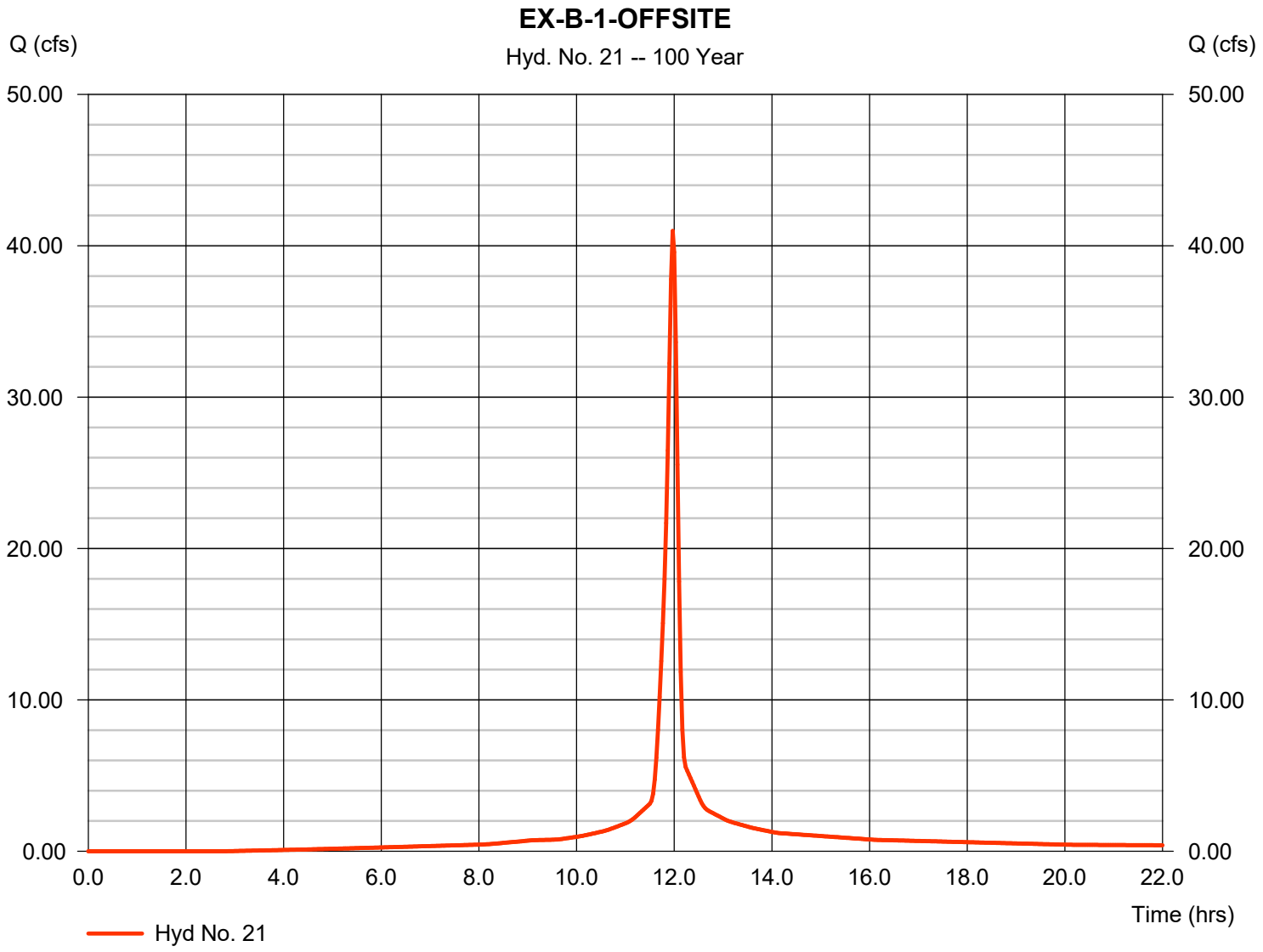


Hydrograph Report

Hyd. No. 21

EX-B-1-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	40.98 cfs
Storm frequency	=	100 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	101,360 cuft
Drainage area	=	4.080 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.30 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



EX-B-2-ONSITE WATERSHED

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No. 22

EX-B-2-ONSITE

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 150.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.32		0.00		0.00		
Land slope (%)	= 6.67		0.00		0.00		
Travel Time (min)	**= 8.22**	**+**	**0.00**	**+**	**0.00**	**=**	**8.22**
Shallow Concentrated Flow							
Flow length (ft)	= 350.00		980.00		0.00		
Watercourse slope (%)	= 10.86		0.82		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=5.32		1.46		0.00		
Travel Time (min)	**= 1.10**	**+**	**11.18**	**+**	**0.00**	**=**	**12.28**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 20.50 min

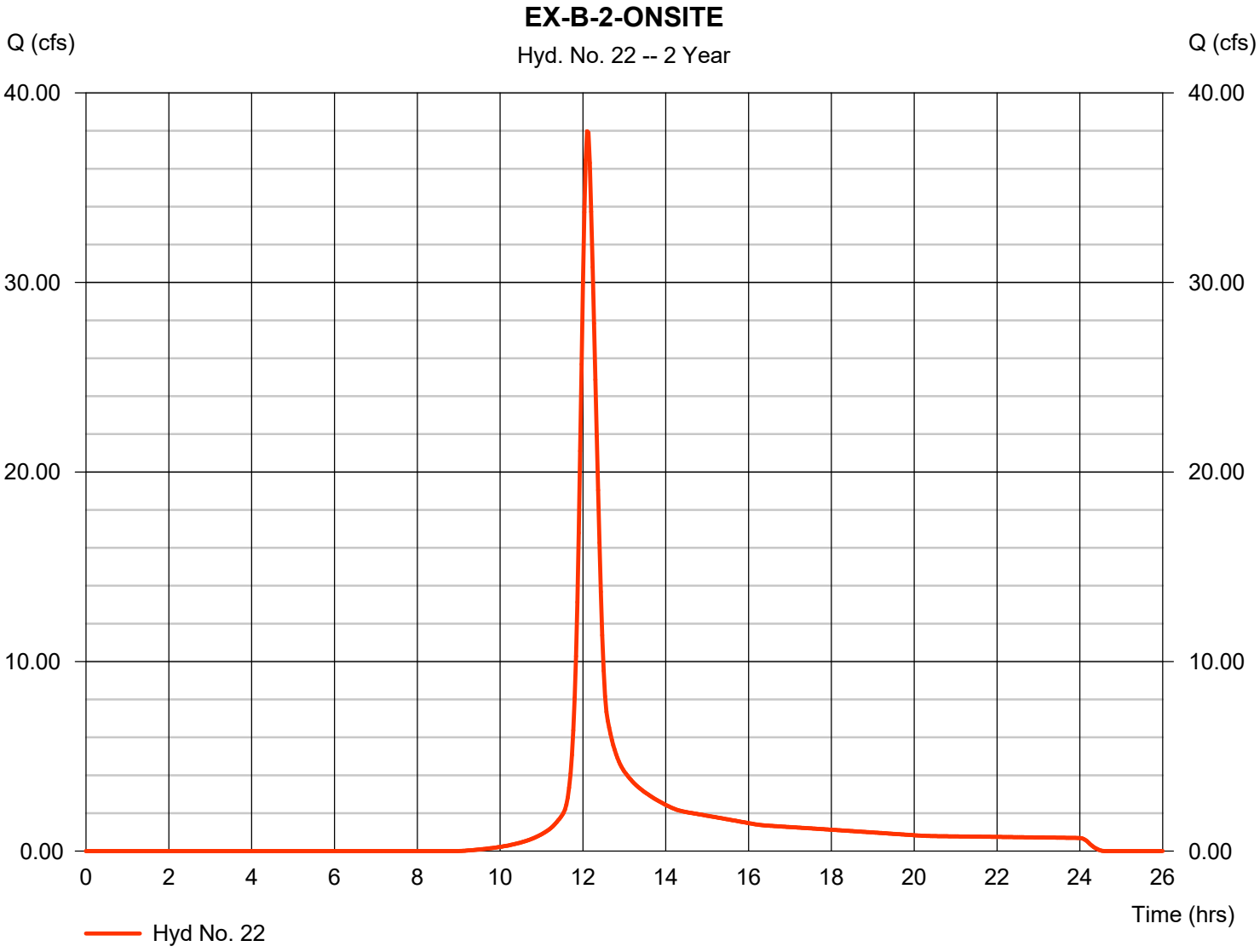
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 22

EX-B-2-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	37.97 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	132,390 cuft
Drainage area	=	22.910 ac	Curve number	=	81
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	20.50 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

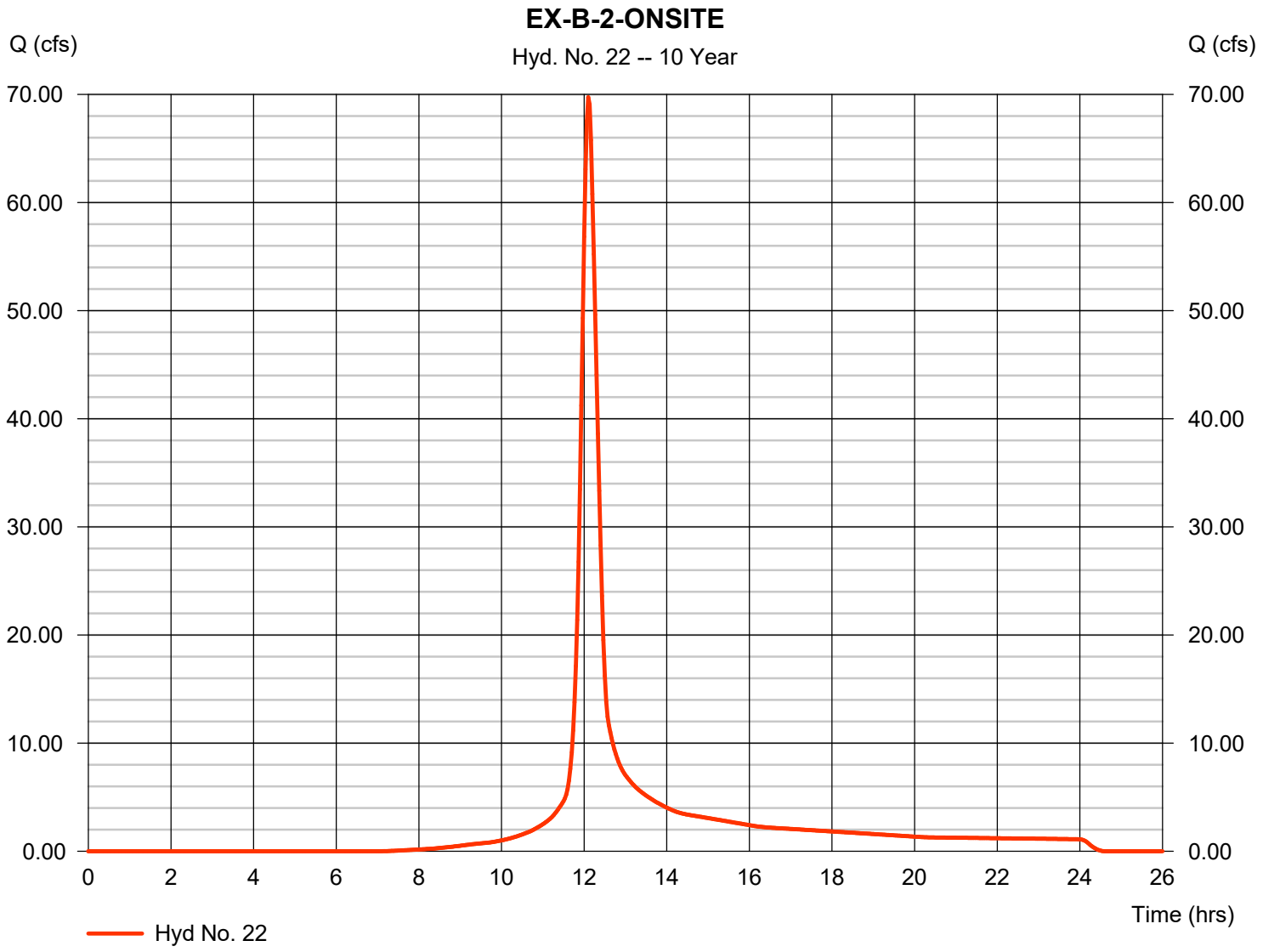


Hydrograph Report

Hyd. No. 22

EX-B-2-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	69.74 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	240,773 cuft
Drainage area	=	22.910 ac	Curve number	=	81
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	20.50 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

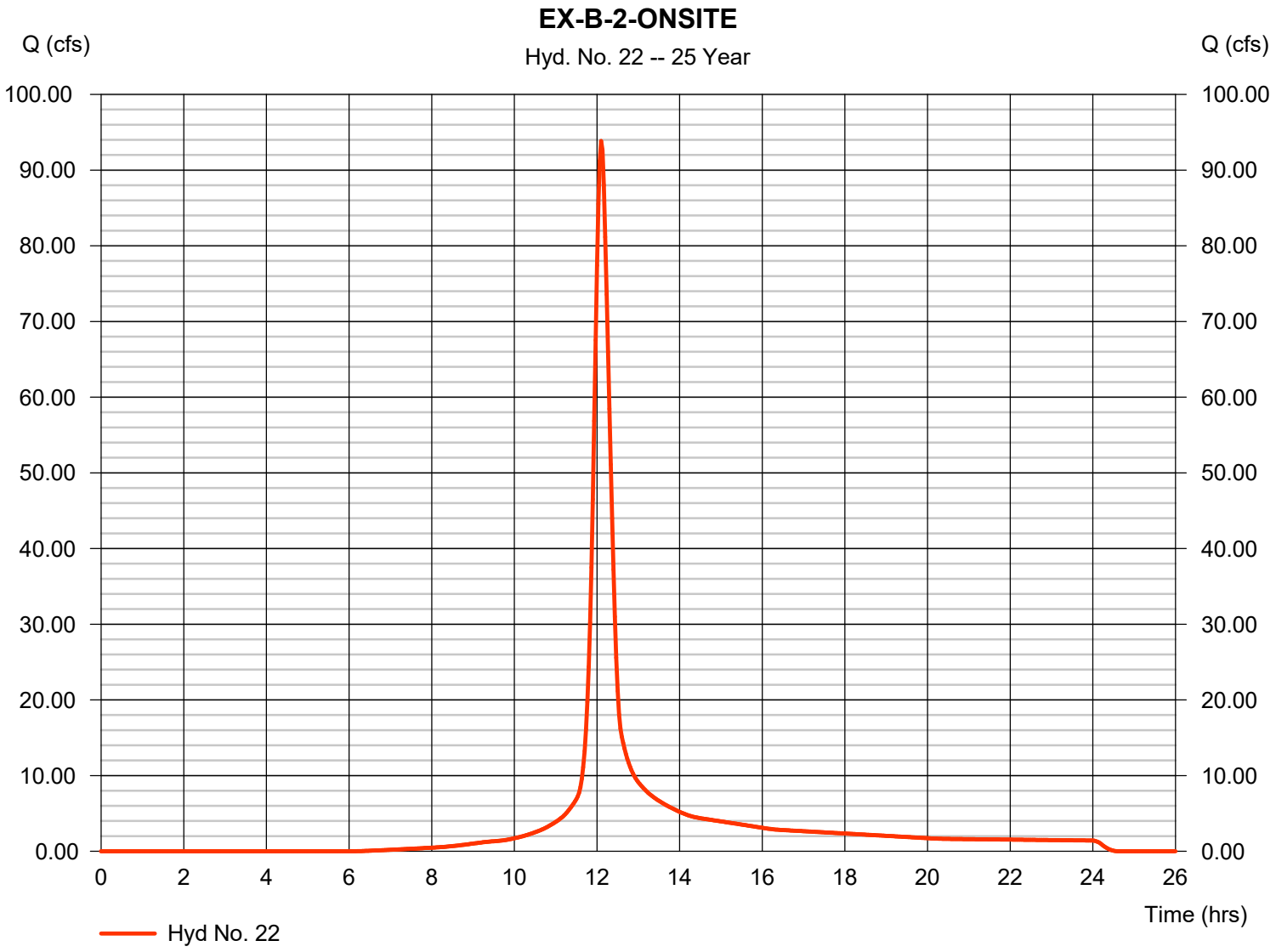


Hydrograph Report

Hyd. No. 22

EX-B-2-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	93.83 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	324,898 cuft
Drainage area	=	22.910 ac	Curve number	=	81
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	20.50 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

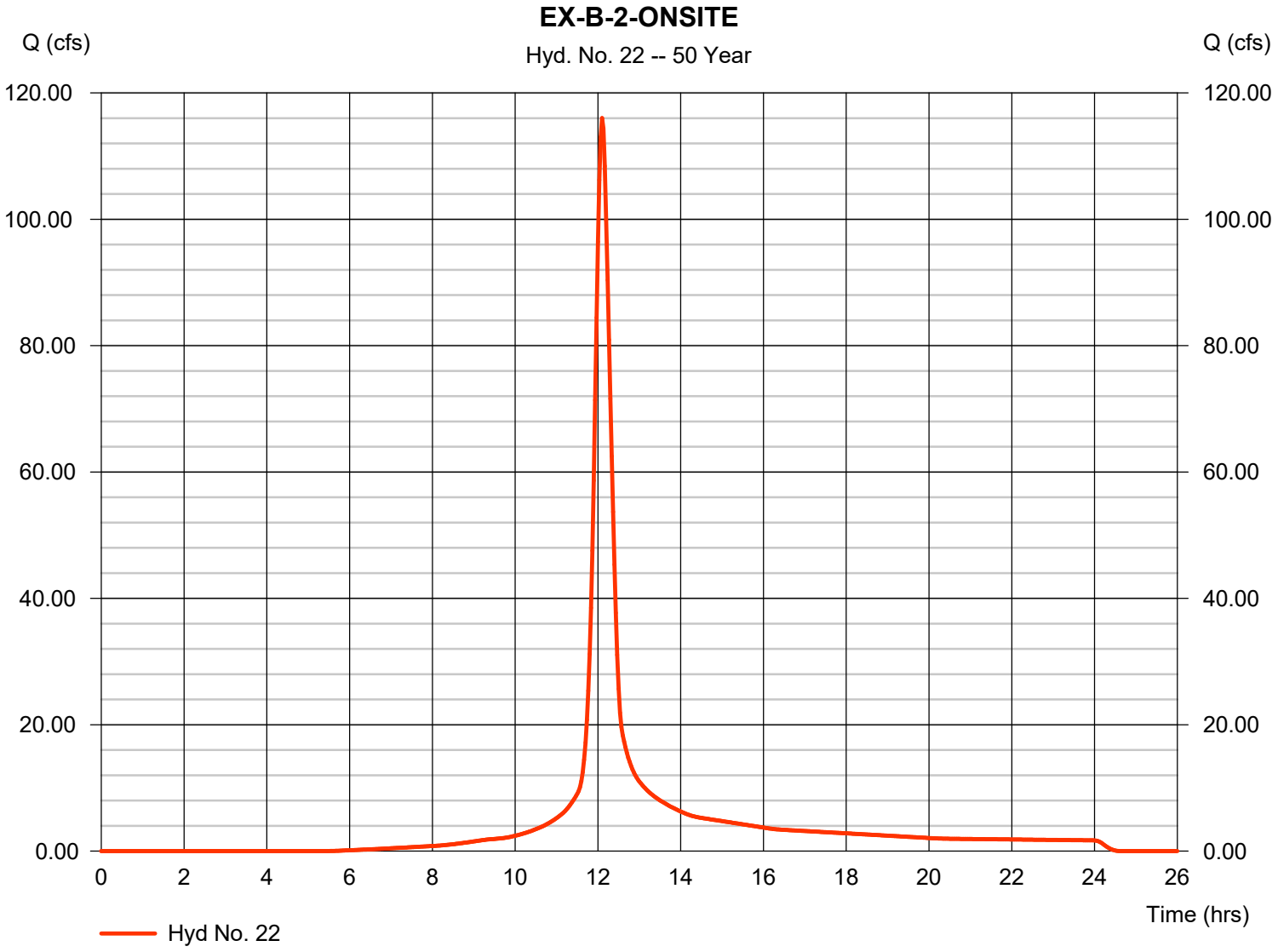


Hydrograph Report

Hyd. No. 22

EX-B-2-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	116.00 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	403,591 cuft
Drainage area	=	22.910 ac	Curve number	=	81
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	20.50 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

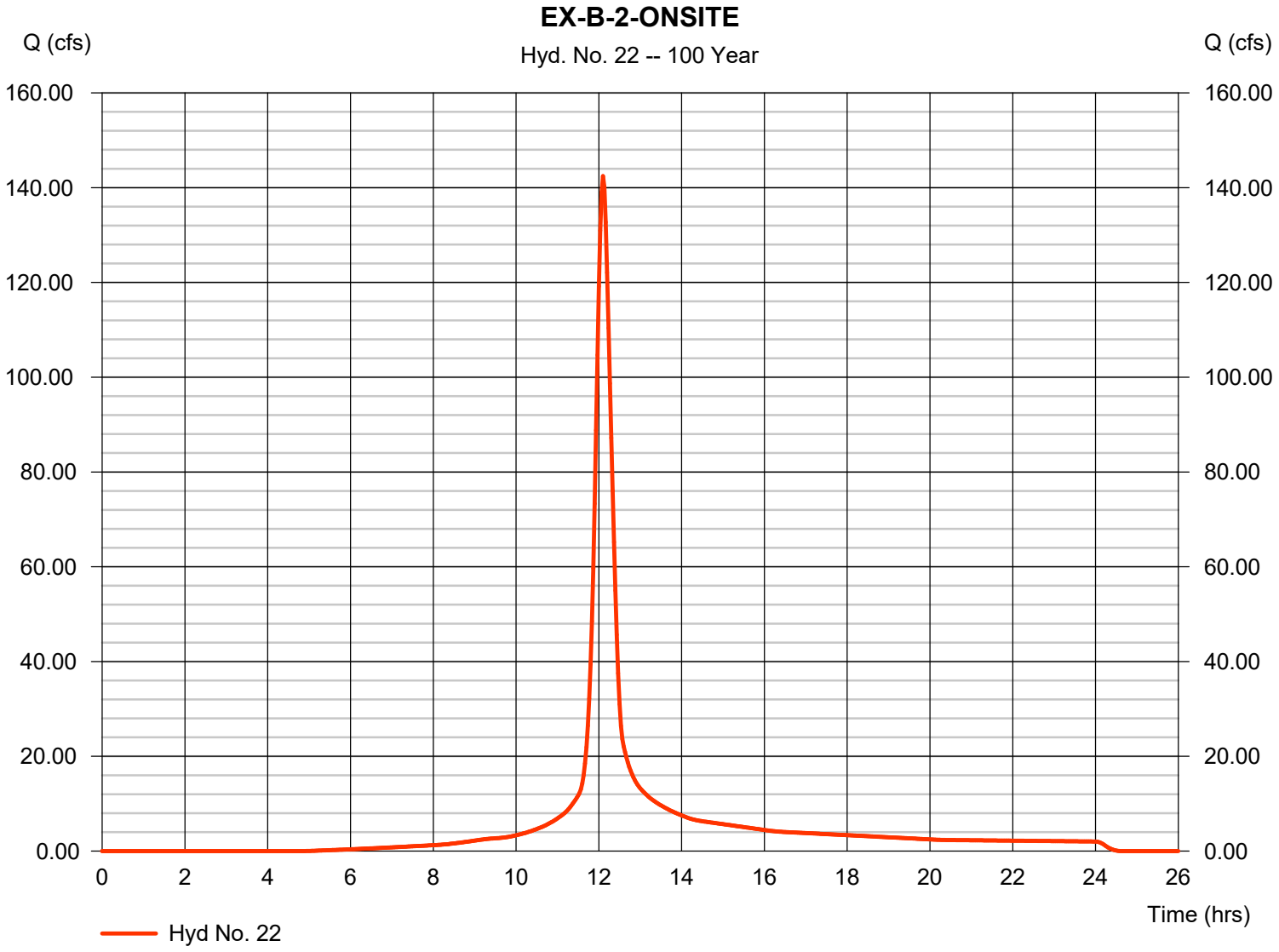


Hydrograph Report

Hyd. No. 22

EX-B-2-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	142.44 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	498,867 cuft
Drainage area	=	22.910 ac	Curve number	=	81
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	20.50 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



EX-B-2-OFFSITE WATERSHED

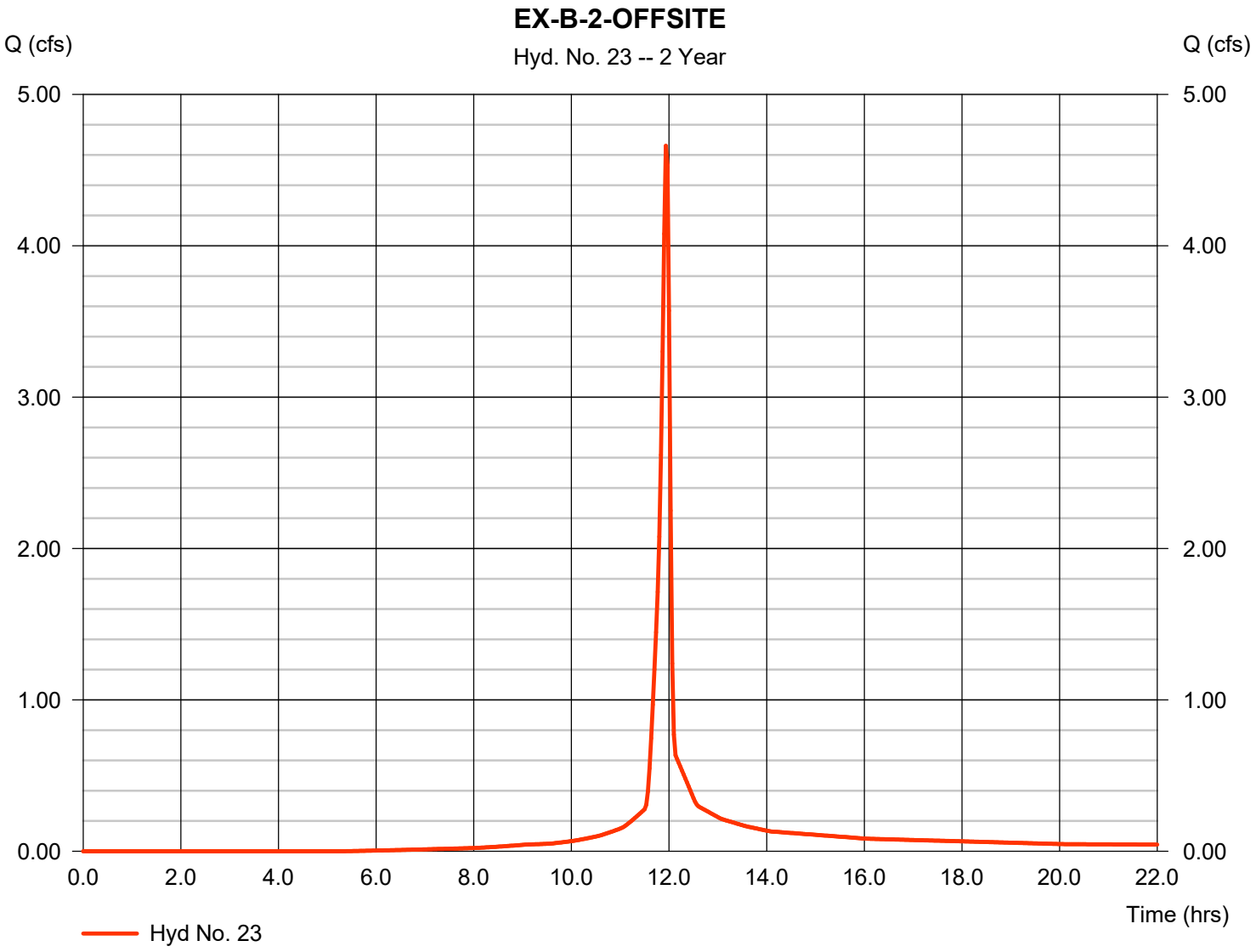
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 23

EX-B-2-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.661 cfs
Storm frequency	=	2 yrs	Time to peak	=	11.93 hrs
Time interval	=	2 min	Hyd. volume	=	9,699 cuft
Drainage area	=	1.250 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

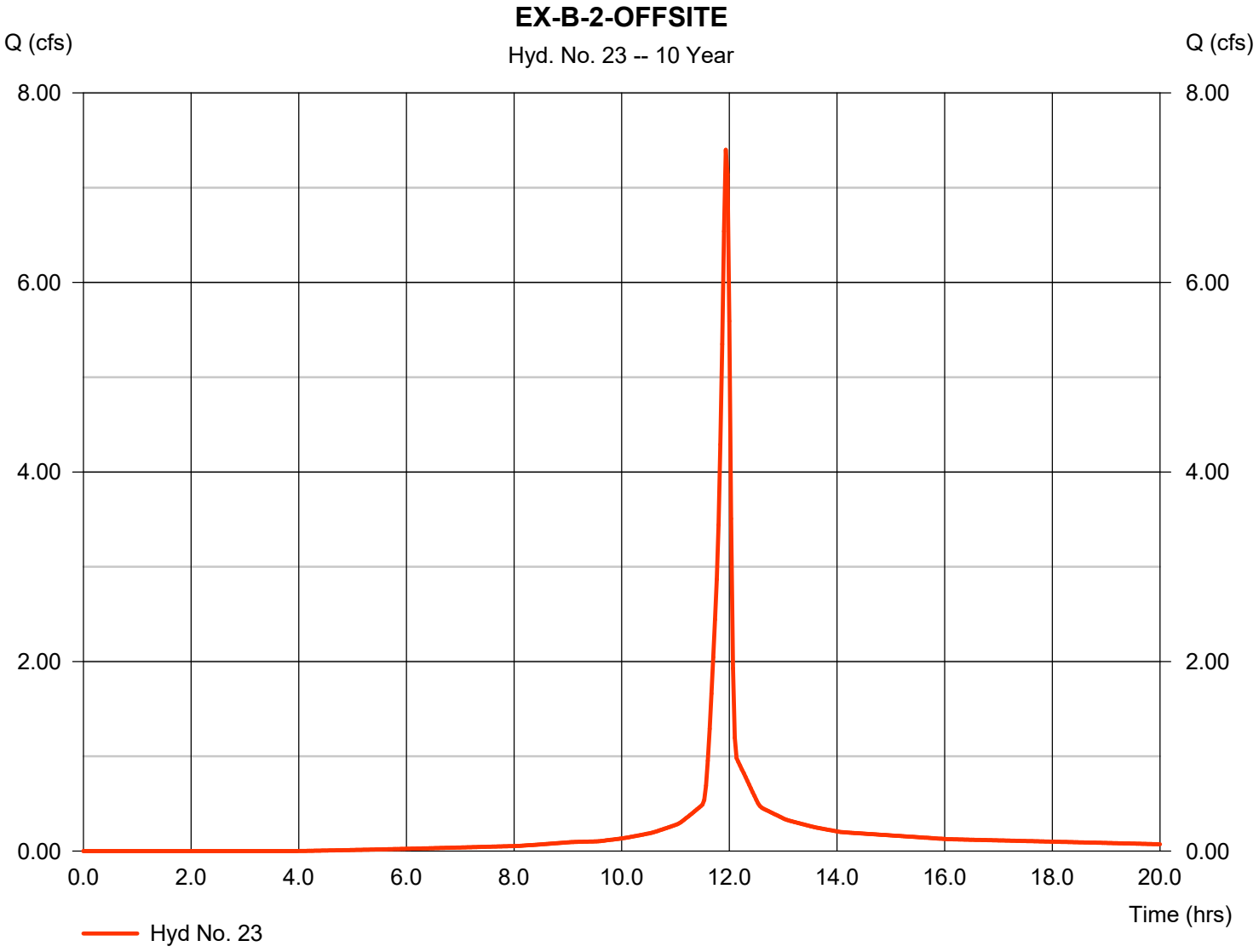


Hydrograph Report

Hyd. No. 23

EX-B-2-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.399 cfs
Storm frequency	=	10 yrs	Time to peak	=	11.93 hrs
Time interval	=	2 min	Hyd. volume	=	15,834 cuft
Drainage area	=	1.250 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

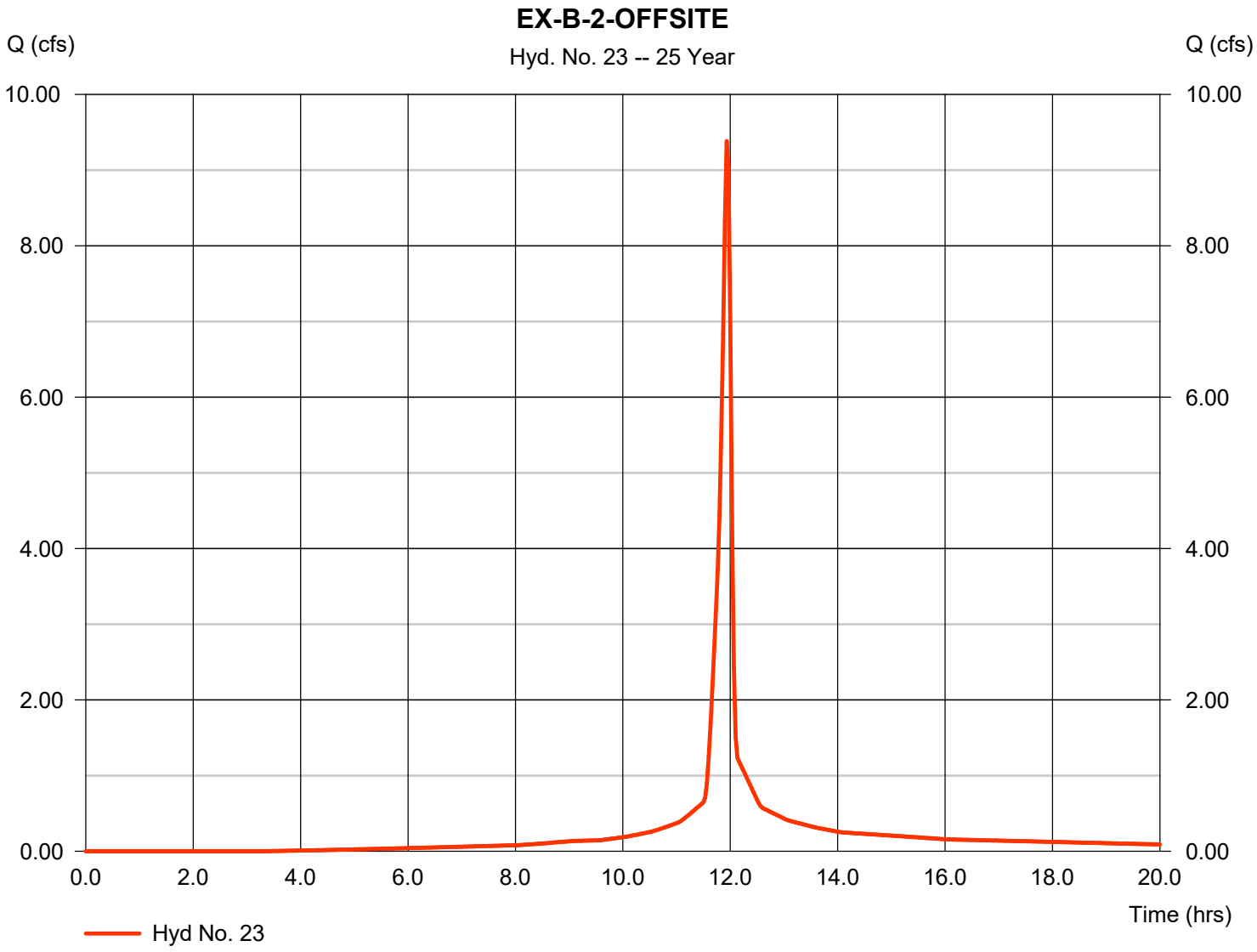


Hydrograph Report

Hyd. No. 23

EX-B-2-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.383 cfs
Storm frequency	=	25 yrs	Time to peak	=	11.93 hrs
Time interval	=	2 min	Hyd. volume	=	20,407 cuft
Drainage area	=	1.250 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

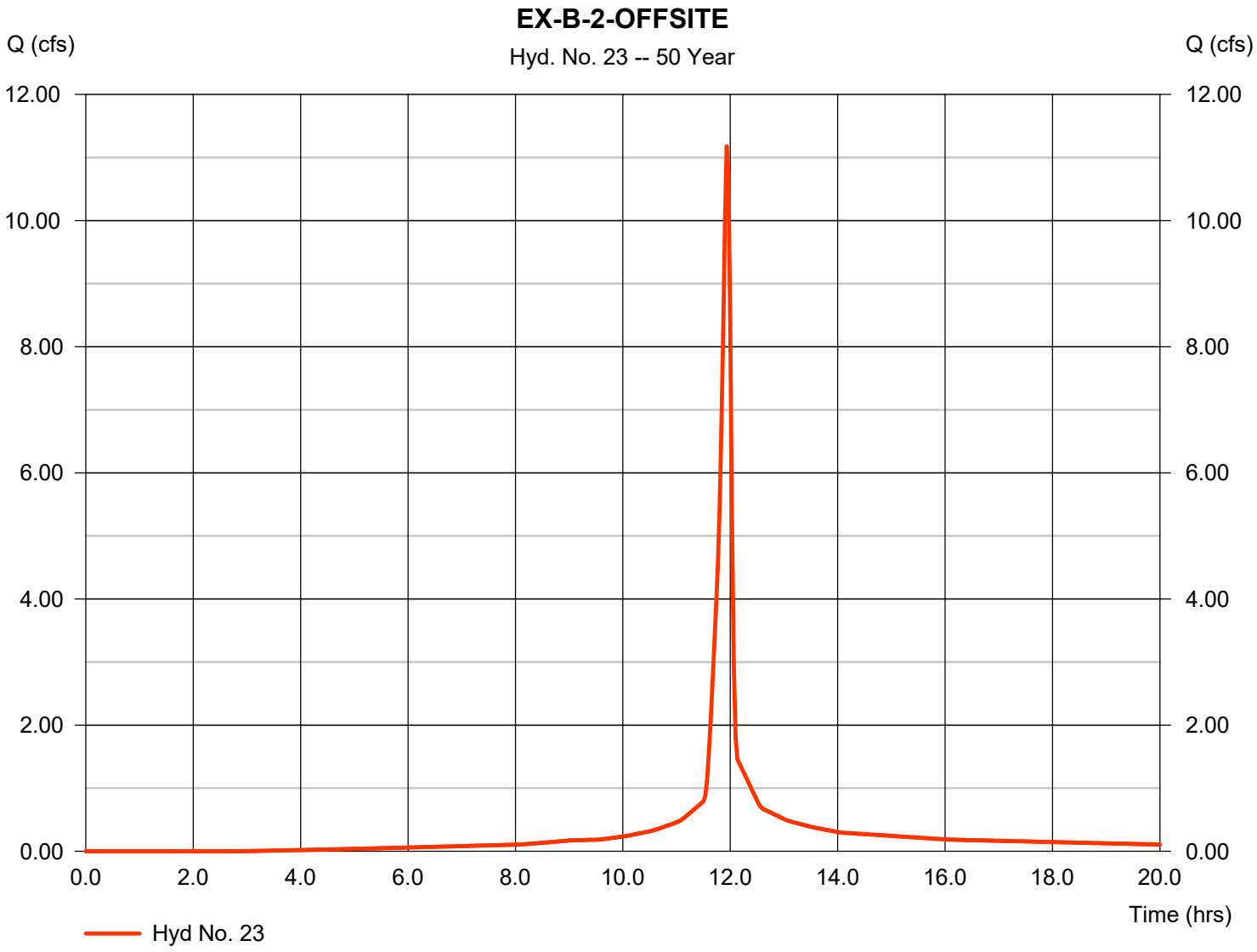


Hydrograph Report

Hyd. No. 23

EX-B-2-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.18 cfs
Storm frequency	=	50 yrs	Time to peak	=	11.93 hrs
Time interval	=	2 min	Hyd. volume	=	24,604 cuft
Drainage area	=	1.250 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

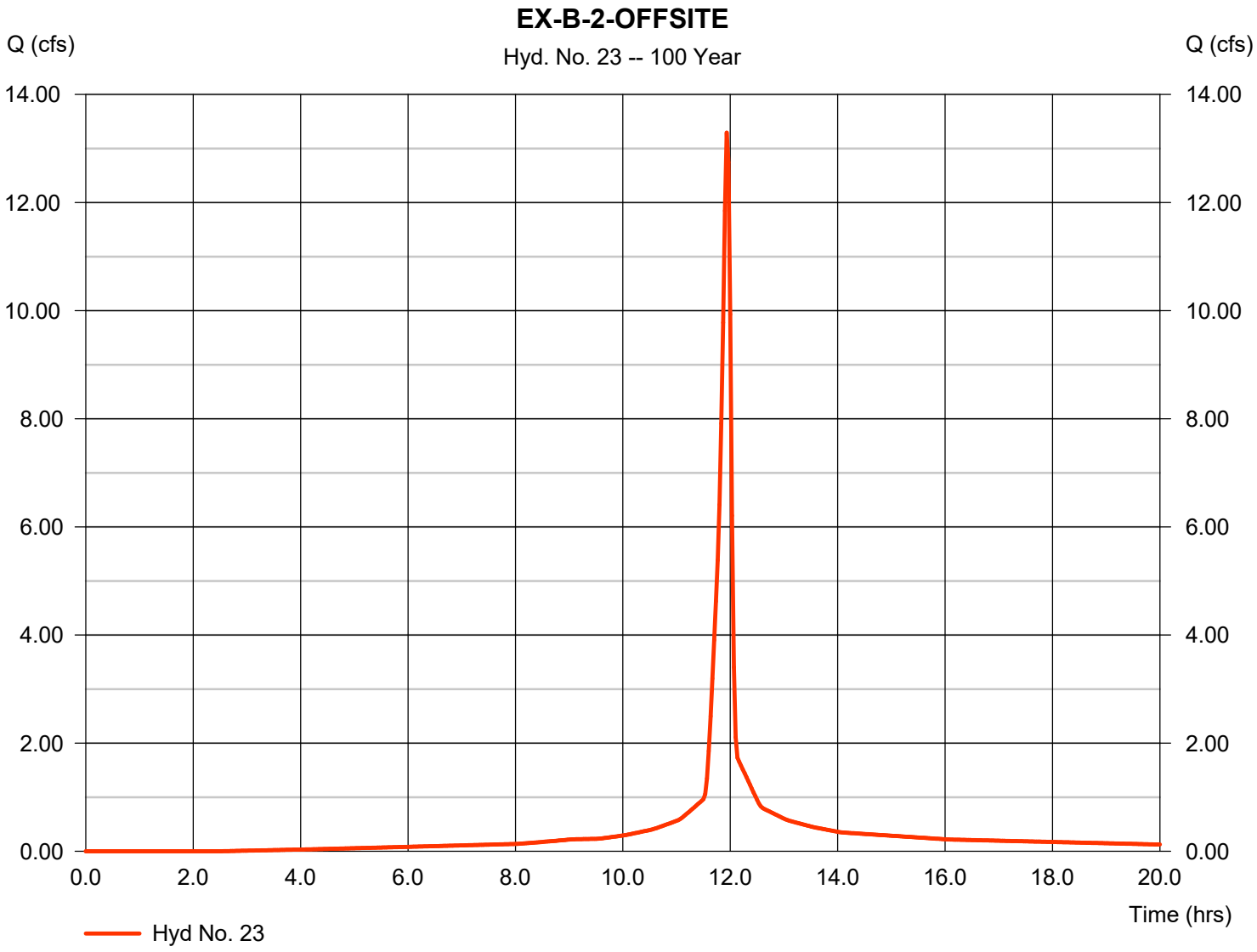


Hydrograph Report

Hyd. No. 23

EX-B-2-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	13.29 cfs
Storm frequency	=	100 yrs	Time to peak	=	11.93 hrs
Time interval	=	2 min	Hyd. volume	=	29,620 cuft
Drainage area	=	1.250 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



COMBINED EX-B-2

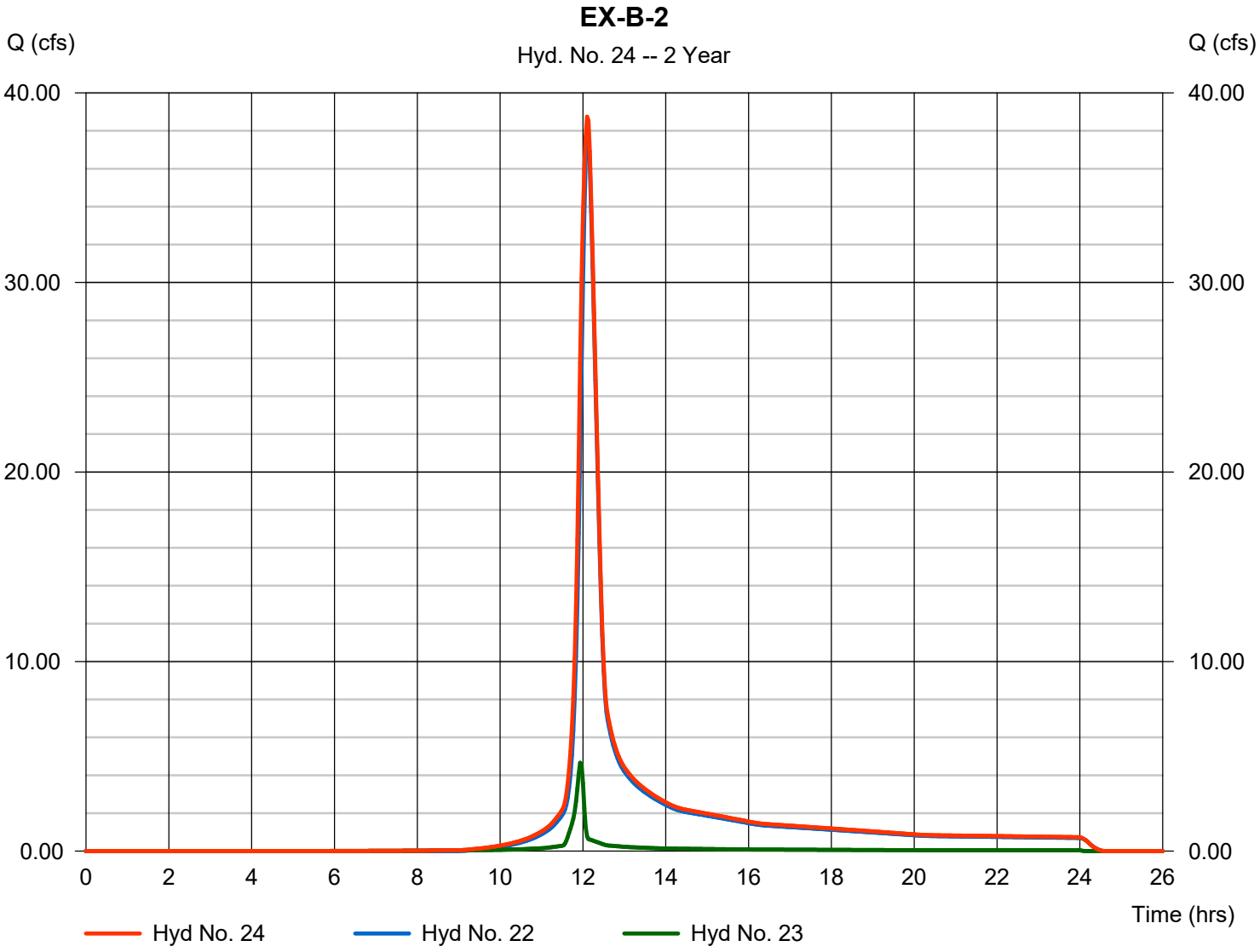
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 24

EX-B-2

Hydrograph type	=	Combine	Peak discharge	=	38.75 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	142,089 cuft
Inflow hyds.	=	22, 23	Contrib. drain. area	=	24.160 ac

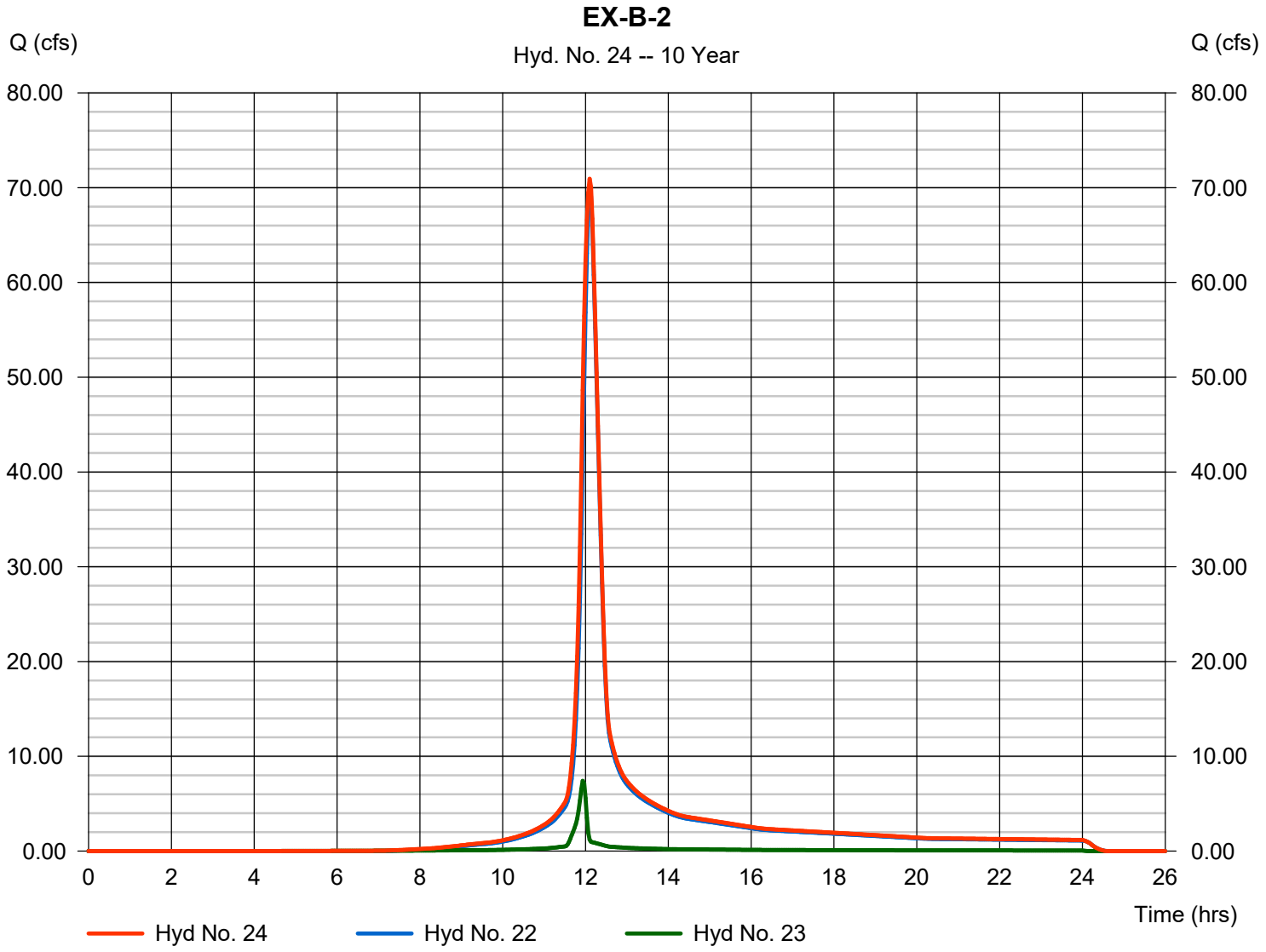


Hydrograph Report

Hyd. No. 24

EX-B-2

Hydrograph type	=	Combine	Peak discharge	=	70.94 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	256,606 cuft
Inflow hyds.	=	22, 23	Contrib. drain. area	=	24.160 ac

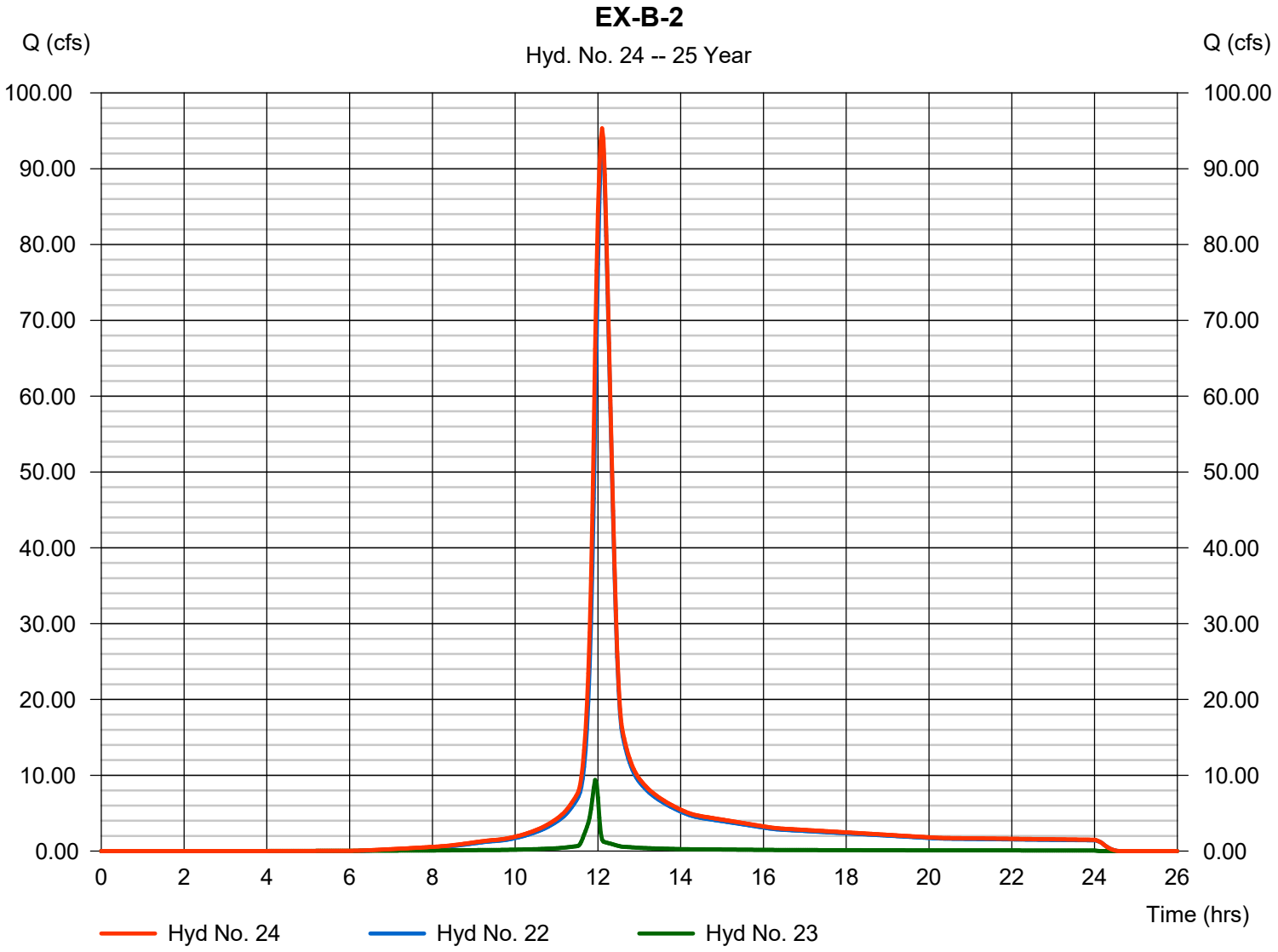


Hydrograph Report

Hyd. No. 24

EX-B-2

Hydrograph type	=	Combine	Peak discharge	=	95.34 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	345,304 cuft
Inflow hyds.	=	22, 23	Contrib. drain. area	=	24.160 ac

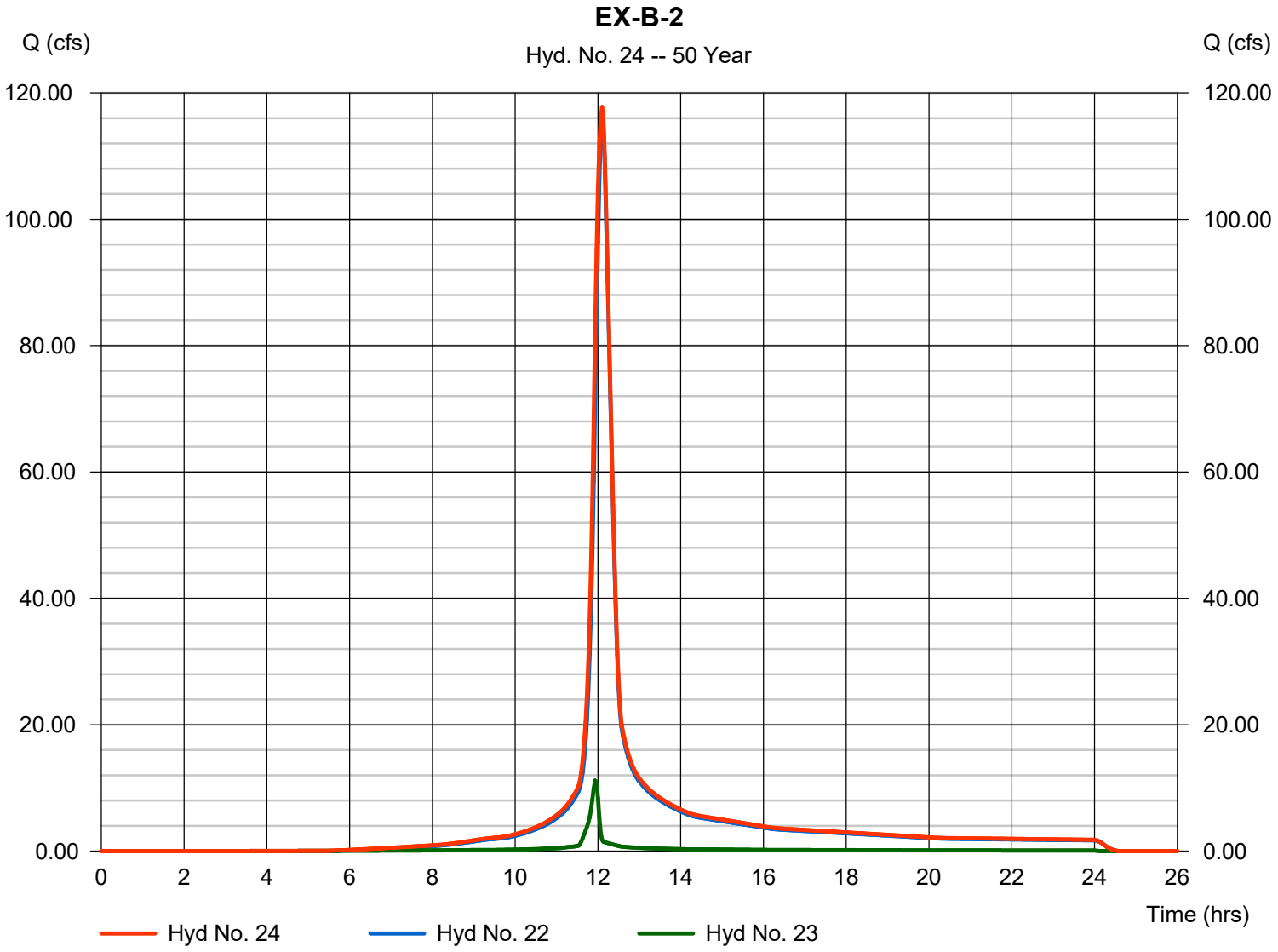


Hydrograph Report

Hyd. No. 24

EX-B-2

Hydrograph type	=	Combine	Peak discharge	=	117.78 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	428,195 cuft
Inflow hyds.	=	22, 23	Contrib. drain. area	=	24.160 ac

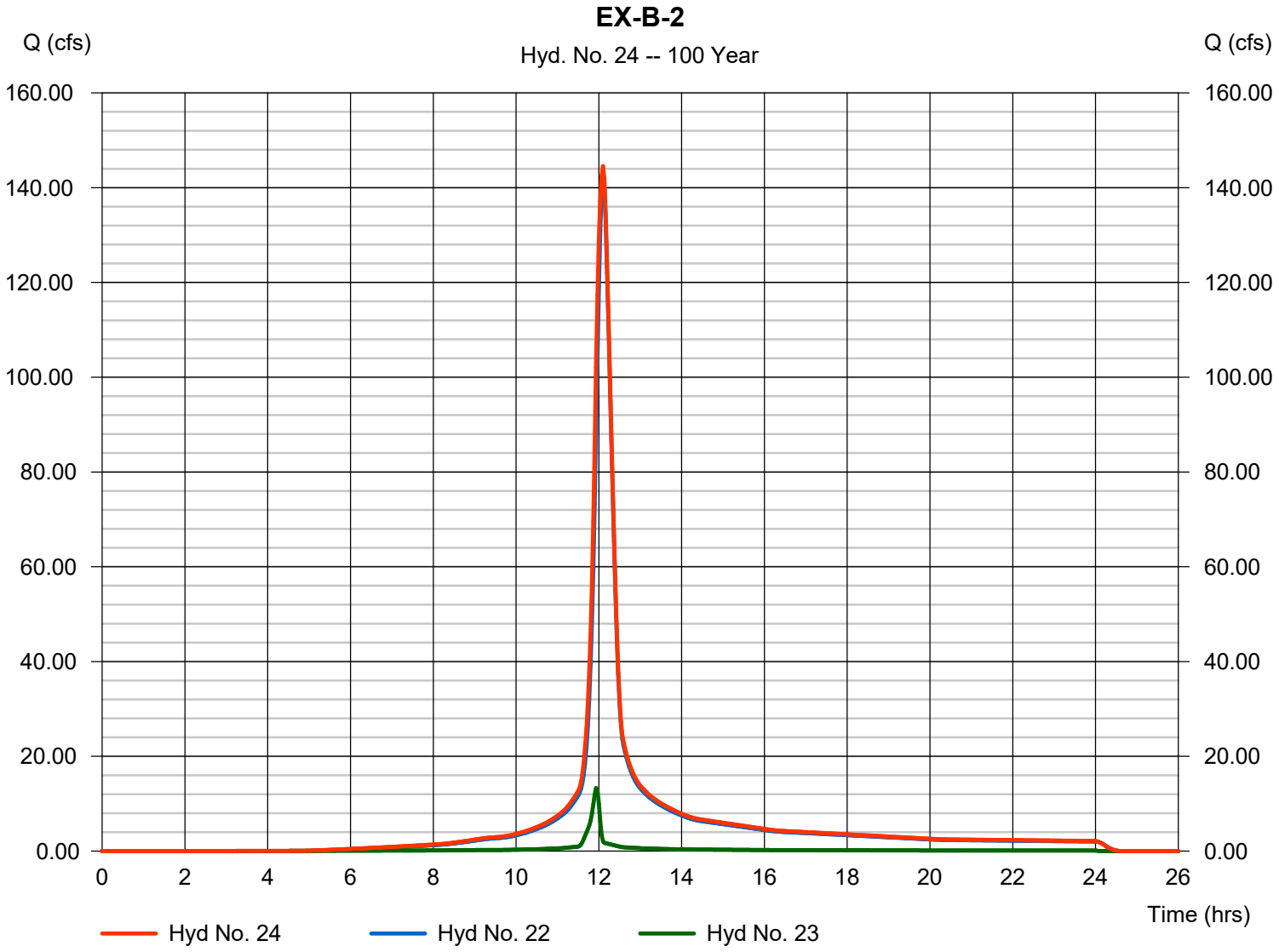


Hydrograph Report

Hyd. No. 24

EX-B-2

Hydrograph type	=	Combine	Peak discharge	=	144.54 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	528,487 cuft
Inflow hyds.	=	22, 23	Contrib. drain. area	=	24.160 ac



EX-B-2 POND ROUTING

Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Pond No. 1 - EX-B-2-ONSITE-POND

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 434.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	434.50	1,040	0	0
0.50	435.00	3,282	1,028	1,028
1.50	436.00	7,187	5,108	6,136
2.50	437.00	14,788	10,760	16,897
3.50	438.00	51,779	31,410	48,306
4.50	439.00	113,114	80,466	128,773
5.50	440.00	182,936	146,618	275,391

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

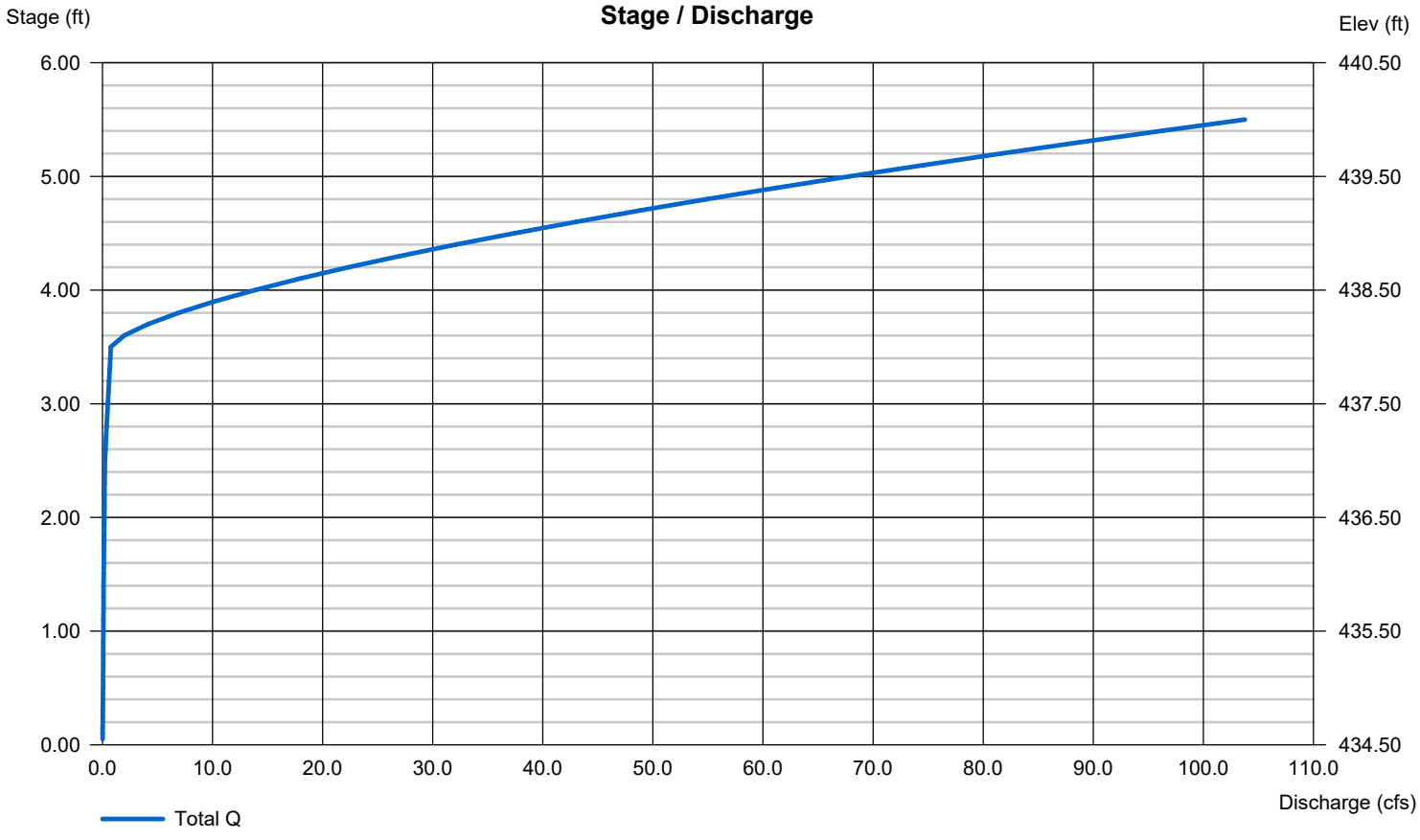
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 13.75	0.00	0.00	0.00
Crest El. (ft)	= 438.00	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) = 0.630 (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

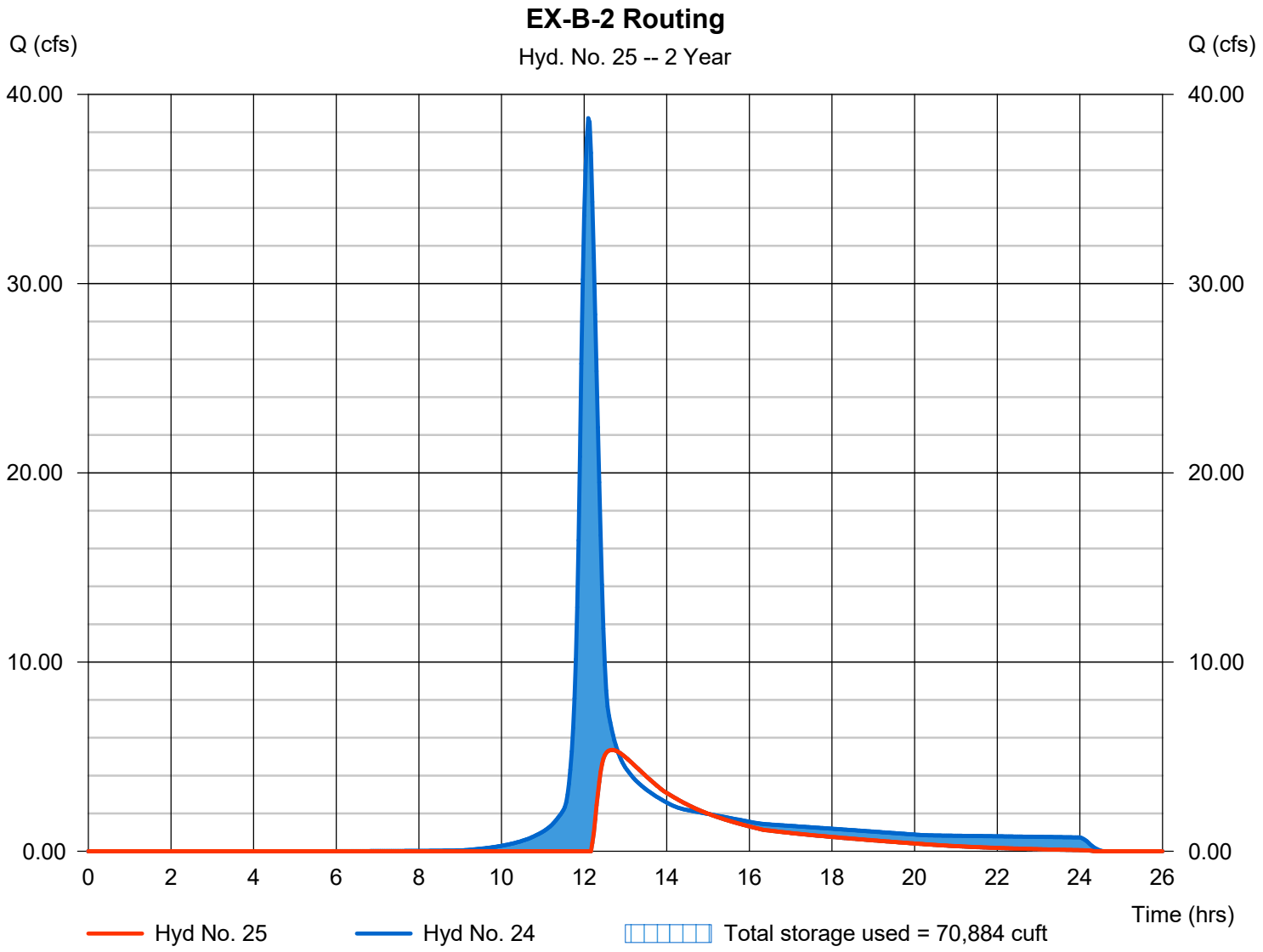
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Friday, 12 / 11 / 2020

Hyd. No. 25

EX-B-2 Routing

Hydrograph type	= Reservoir	Peak discharge	= 5.354 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.67 hrs
Time interval	= 2 min	Hyd. volume	= 56,131 cuft
Inflow hyd. No.	= 24 - EX-B-2	Max. Elevation	= 438.28 ft
Reservoir name	= EX-B-2-ONSITE-POND	Max. Storage	= 70,884 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



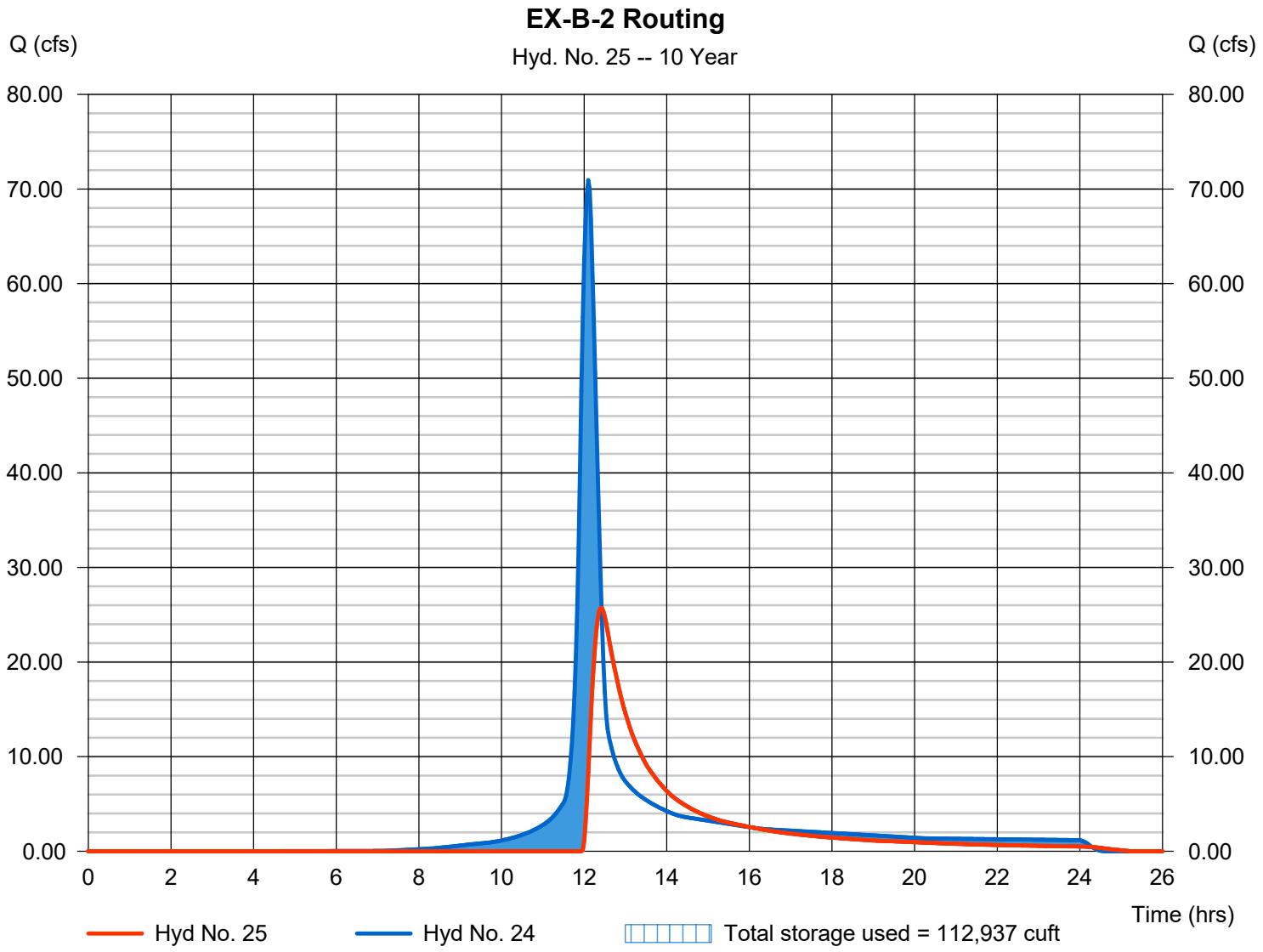
Hydrograph Report

Hyd. No. 25

EX-B-2 Routing

Hydrograph type	=	Reservoir	Peak discharge	=	25.74 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.40 hrs
Time interval	=	2 min	Hyd. volume	=	163,108 cuft
Inflow hyd. No.	=	24 - EX-B-2	Max. Elevation	=	438.80 ft
Reservoir name	=	EX-B-2-ONSITE-POND	Max. Storage	=	112,937 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



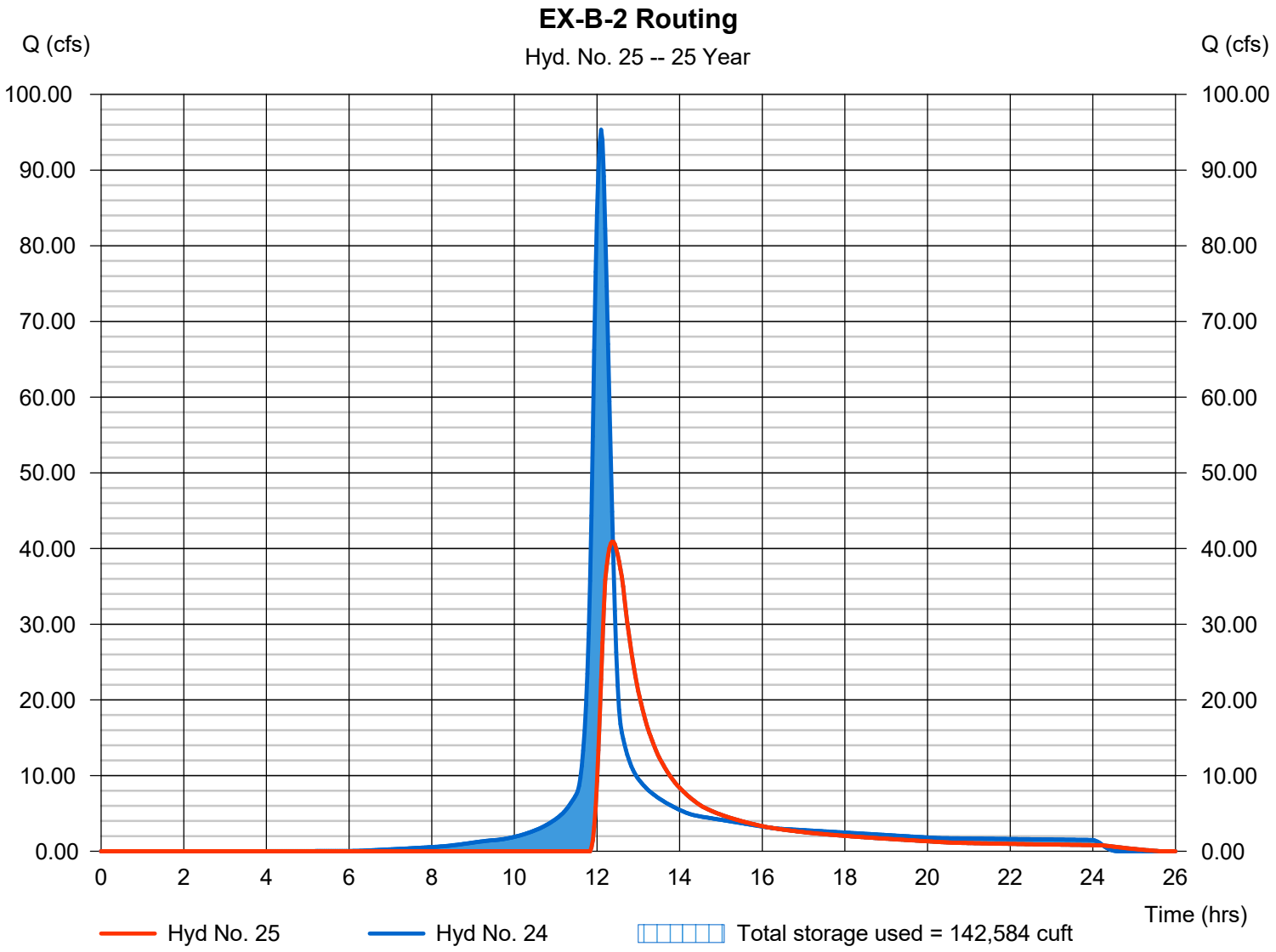
Hydrograph Report

Hyd. No. 25

EX-B-2 Routing

Hydrograph type	=	Reservoir	Peak discharge	=	40.93 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.37 hrs
Time interval	=	2 min	Hyd. volume	=	246,992 cuft
Inflow hyd. No.	=	24 - EX-B-2	Max. Elevation	=	439.09 ft
Reservoir name	=	EX-B-2-ONSITE-POND	Max. Storage	=	142,584 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



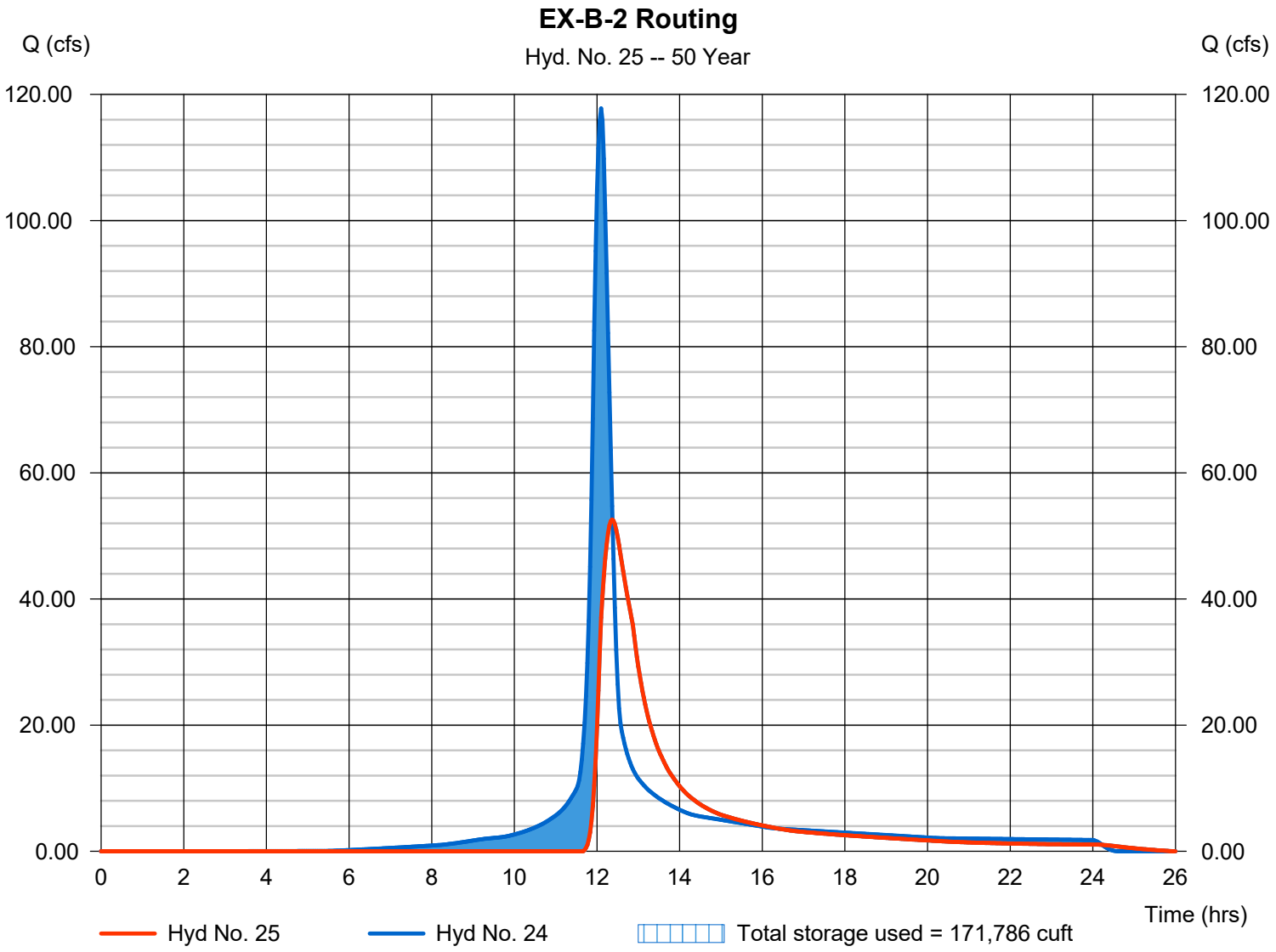
Hydrograph Report

Hyd. No. 25

EX-B-2 Routing

Hydrograph type	=	Reservoir	Peak discharge	=	52.59 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.37 hrs
Time interval	=	2 min	Hyd. volume	=	325,666 cuft
Inflow hyd. No.	=	24 - EX-B-2	Max. Elevation	=	439.29 ft
Reservoir name	=	EX-B-2-ONSITE-POND	Max. Storage	=	171,786 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



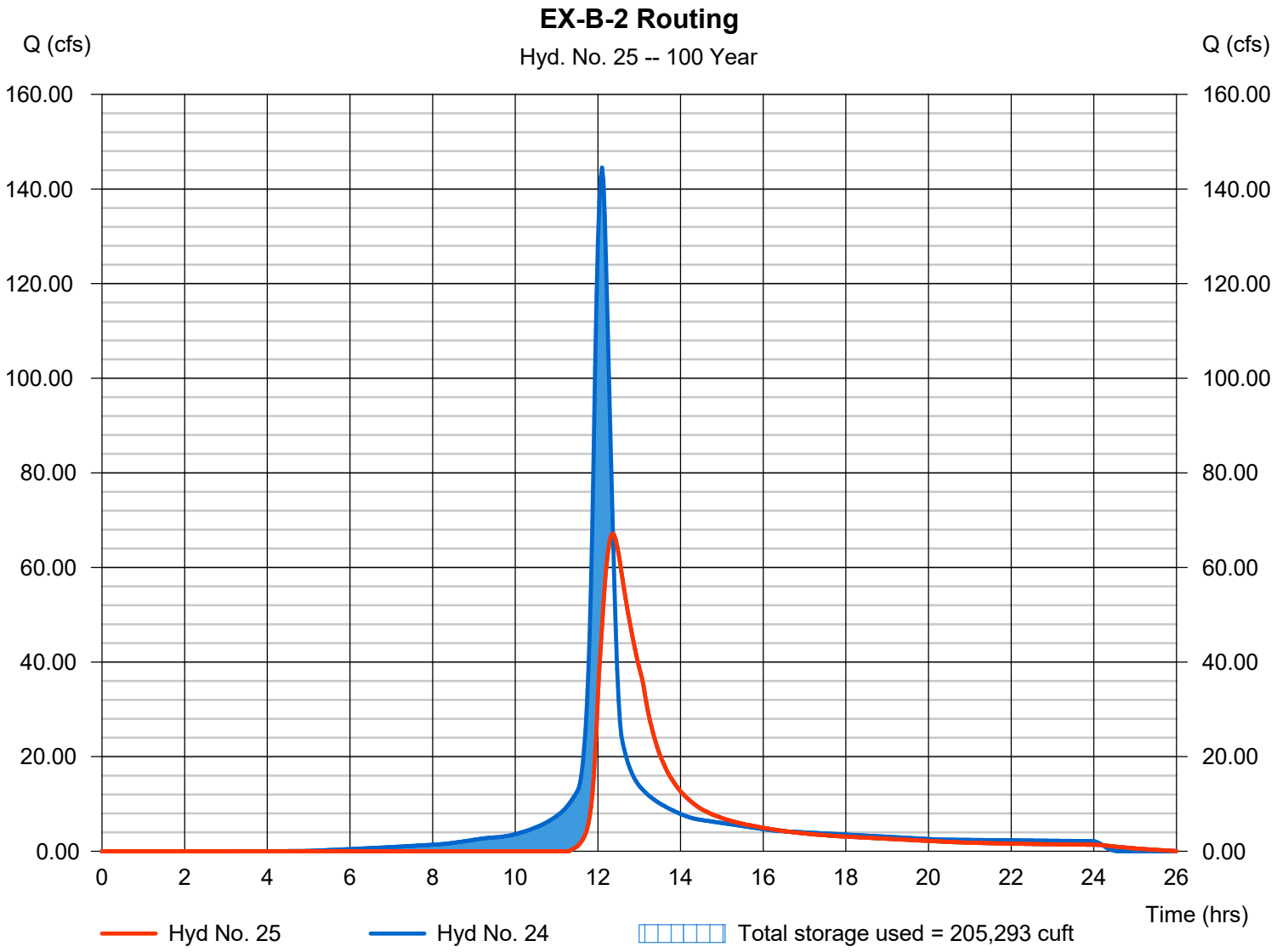
Hydrograph Report

Hyd. No. 25

EX-B-2 Routing

Hydrograph type	=	Reservoir	Peak discharge	=	67.14 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.37 hrs
Time interval	=	2 min	Hyd. volume	=	421,336 cuft
Inflow hyd. No.	=	24 - EX-B-2	Max. Elevation	=	439.52 ft
Reservoir name	=	EX-B-2-ONSITE-POND	Max. Storage	=	205,293 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



TOTAL EXISTING FLOW TO POA-B

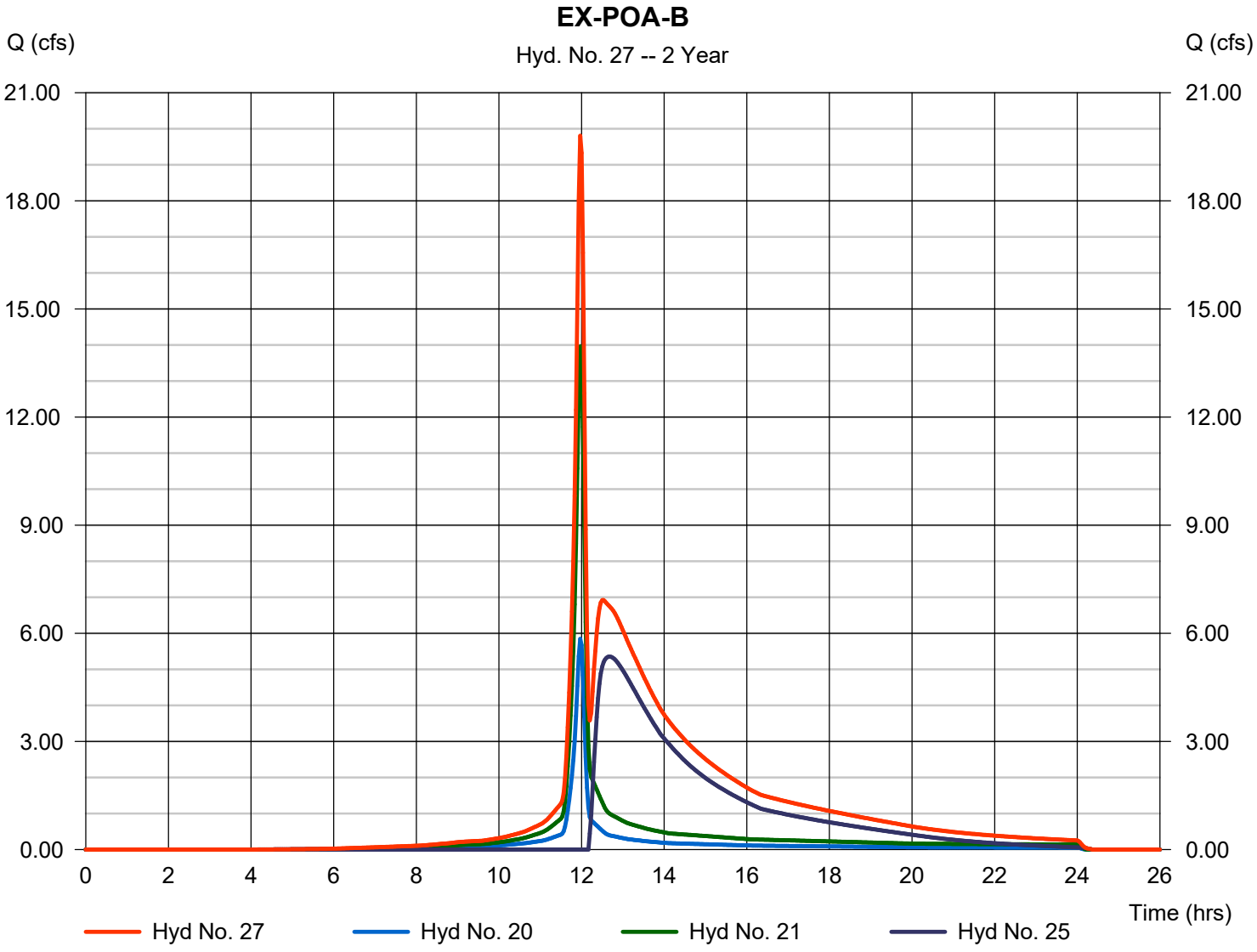
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 27

EX-POA-B

Hydrograph type	=	Combine	Peak discharge	=	19.80 cfs
Storm frequency	=	2 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	102,625 cuft
Inflow hyds.	=	20, 21, 25	Contrib. drain. area	=	5.590 ac

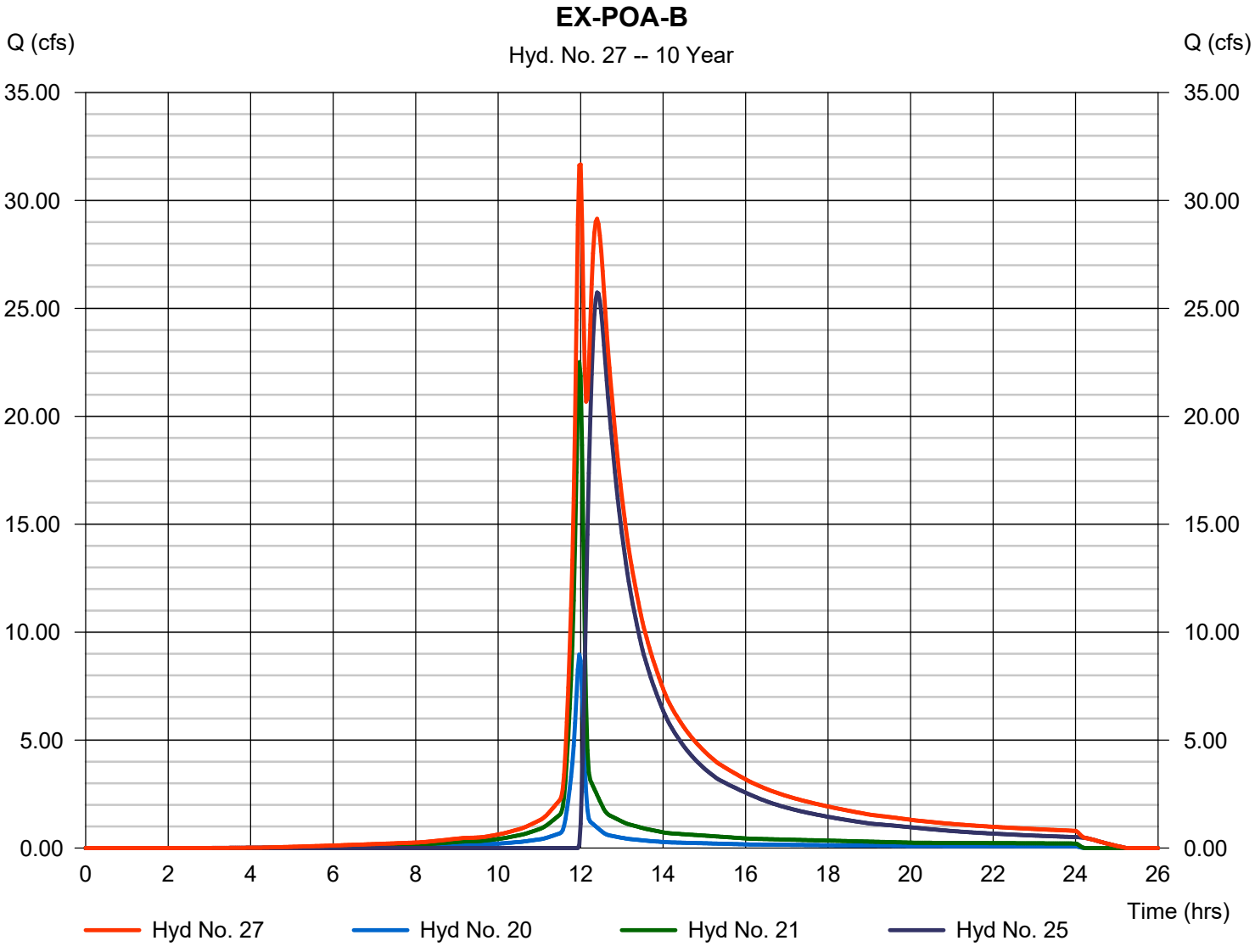


Hydrograph Report

Hyd. No. 27

EX-POA-B

Hydrograph type	=	Combine	Peak discharge	=	31.66 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	238,855 cuft
Inflow hyds.	=	20, 21, 25	Contrib. drain. area	=	5.590 ac

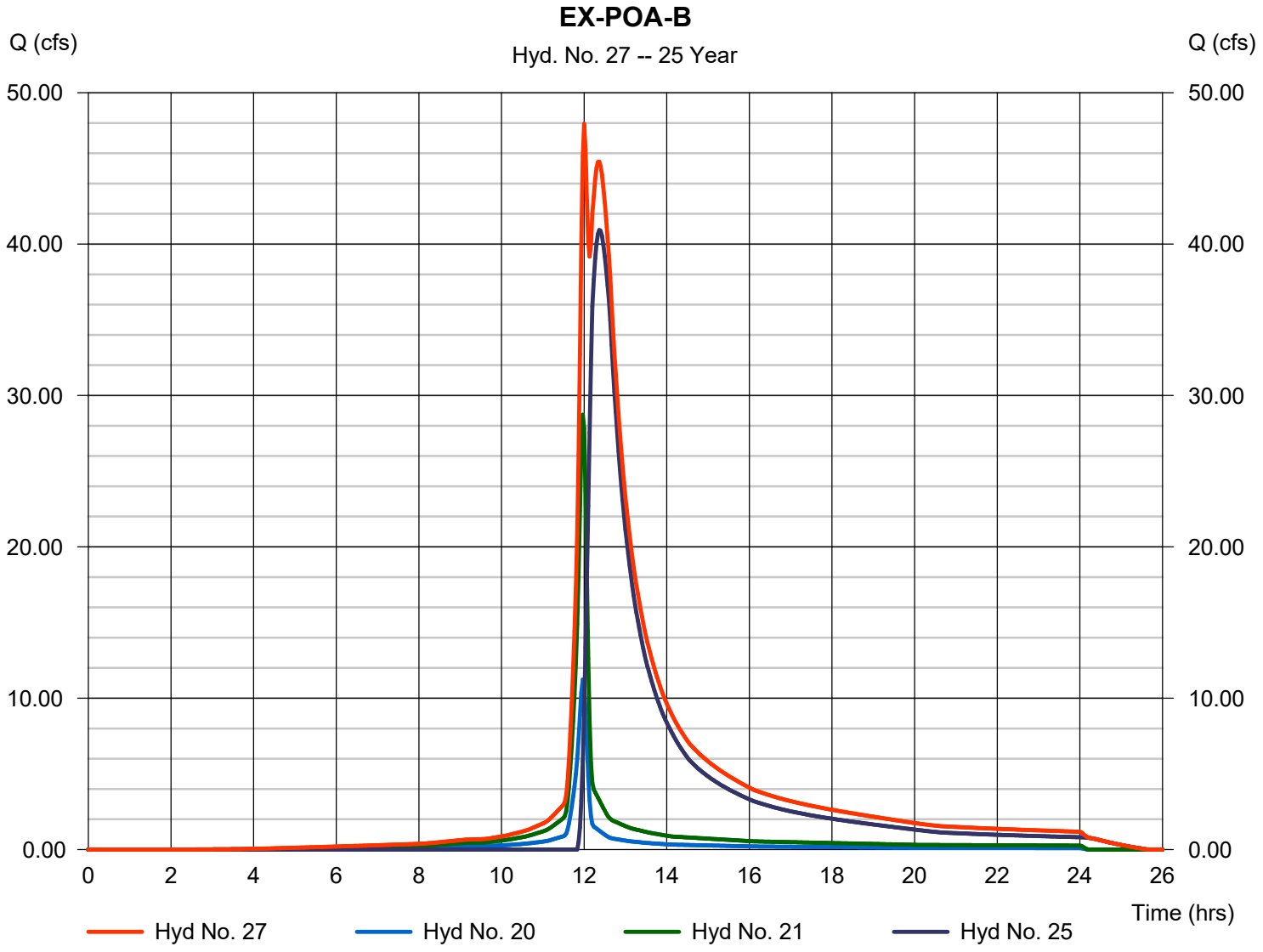


Hydrograph Report

Hyd. No. 27

EX-POA-B

Hydrograph type	=	Combine	Peak discharge	=	47.94 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	344,545 cuft
Inflow hyds.	=	20, 21, 25	Contrib. drain. area	=	5.590 ac

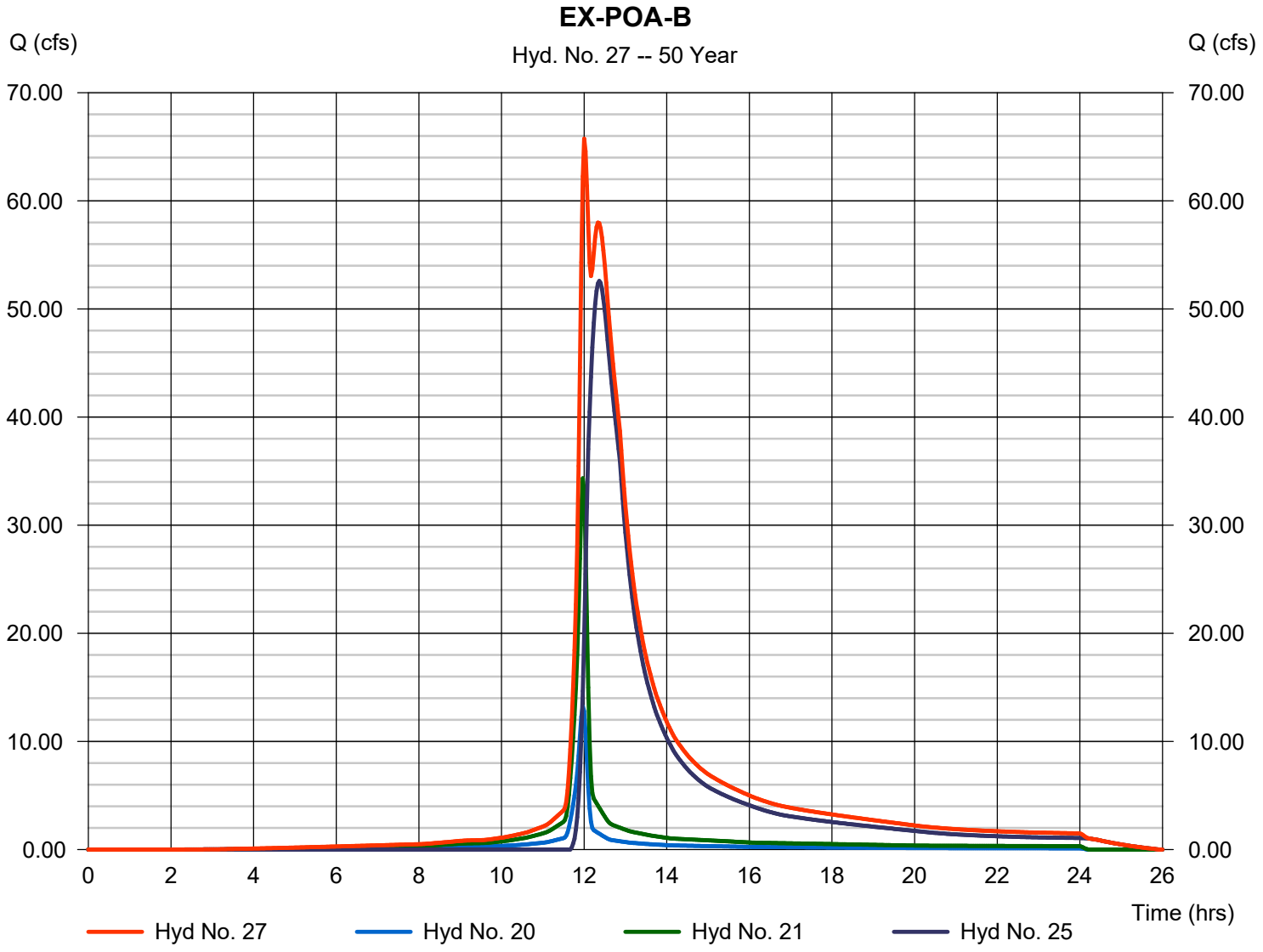


Hydrograph Report

Hyd. No. 27

EX-POA-B

Hydrograph type	=	Combine	Peak discharge	=	65.75 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	443,236 cuft
Inflow hyds.	=	20, 21, 25	Contrib. drain. area	=	5.590 ac

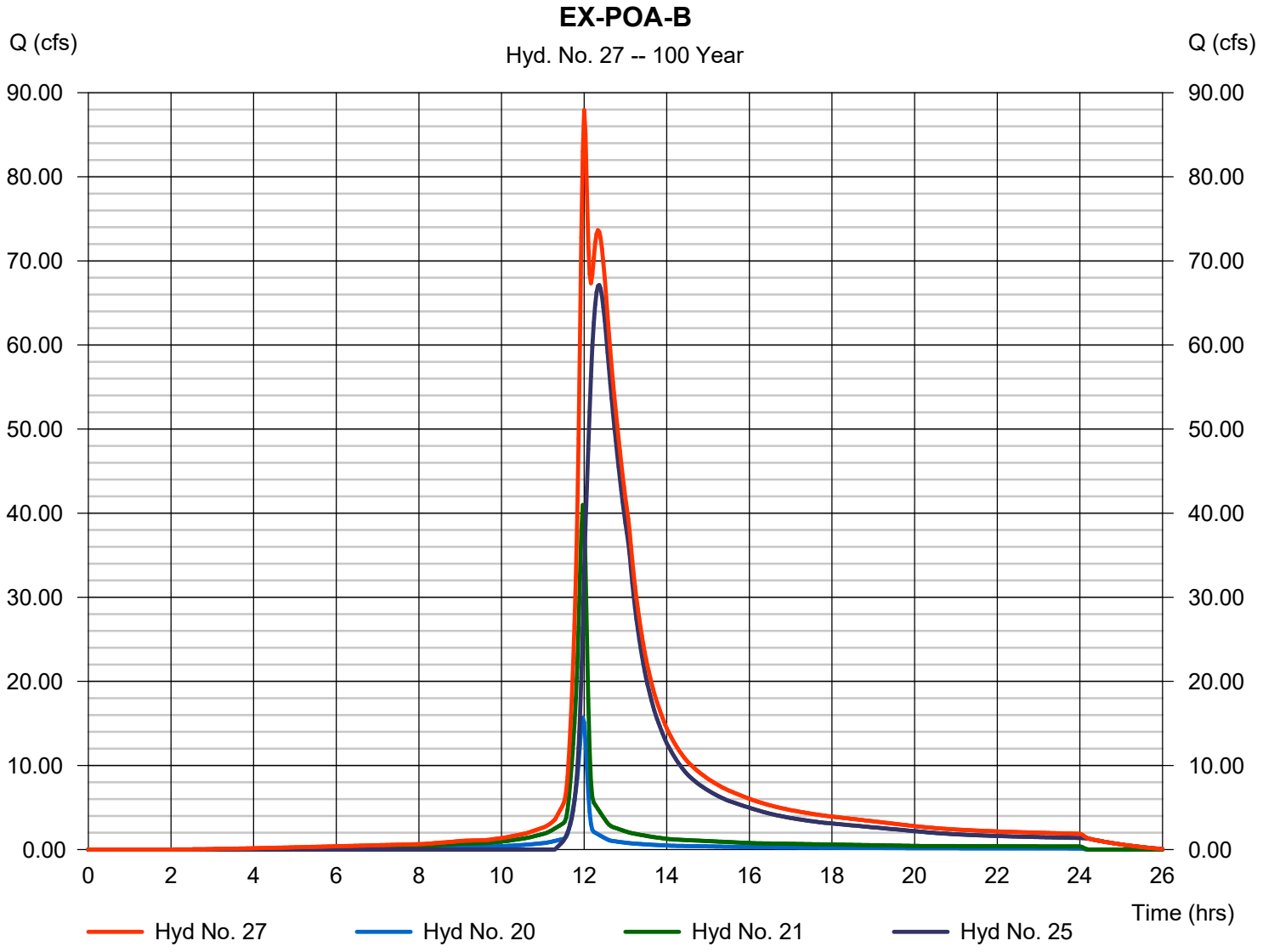


Hydrograph Report

Hyd. No. 27

EX-POA-B

Hydrograph type	=	Combine	Peak discharge	=	87.95 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	562,827 cuft
Inflow hyds.	=	20, 21, 25	Contrib. drain. area	=	5.590 ac



EX-C-ONSITE WATERSHED

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No. 29

EX-C-ONSITE

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.400		0.400		0.011		
Flow length (ft)	= 110.0		40.0		0.0		
Two-year 24-hr precip. (in)	= 3.32		3.32		0.00		
Land slope (%)	= 22.00		2.00		0.00		
Travel Time (min)	**= 8.72**	**+**	**10.13**	**+**	**0.00**	**=**	**18.85**
Shallow Concentrated Flow							
Flow length (ft)	= 269.00		0.00		0.00		
Watercourse slope (%)	= 2.60		0.00		0.00		
Surface description	= Paved		Paved		Paved		
Average velocity (ft/s)	=3.28		0.00		0.00		
Travel Time (min)	**= 1.37**	**+**	**0.00**	**+**	**0.00**	**=**	**1.37**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 20.20 min

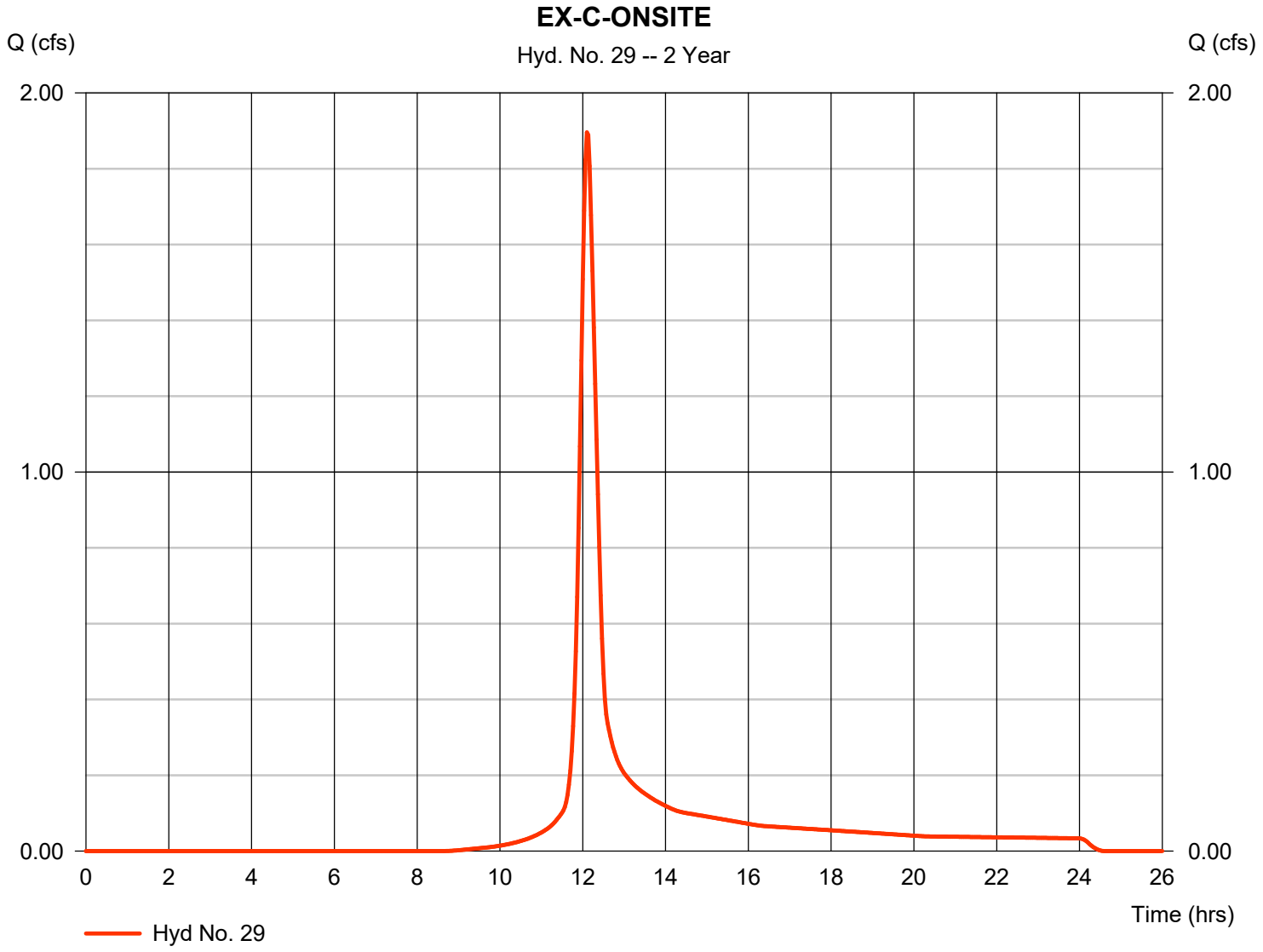
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 29

EX-C-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.896 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	6,585 cuft
Drainage area	=	1.090 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	20.20 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

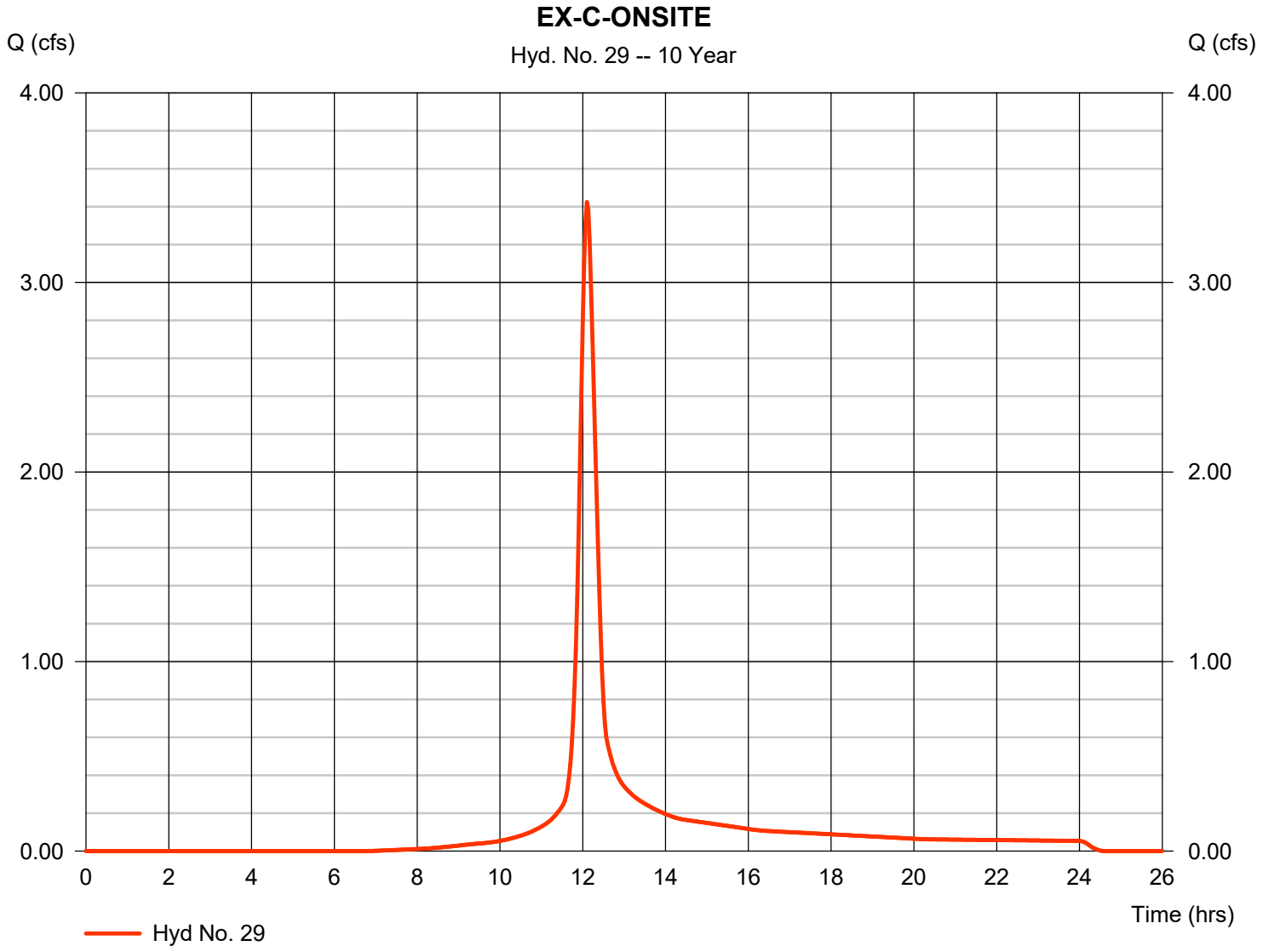


Hydrograph Report

Hyd. No. 29

EX-C-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.424 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	11,826 cuft
Drainage area	=	1.090 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	20.20 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

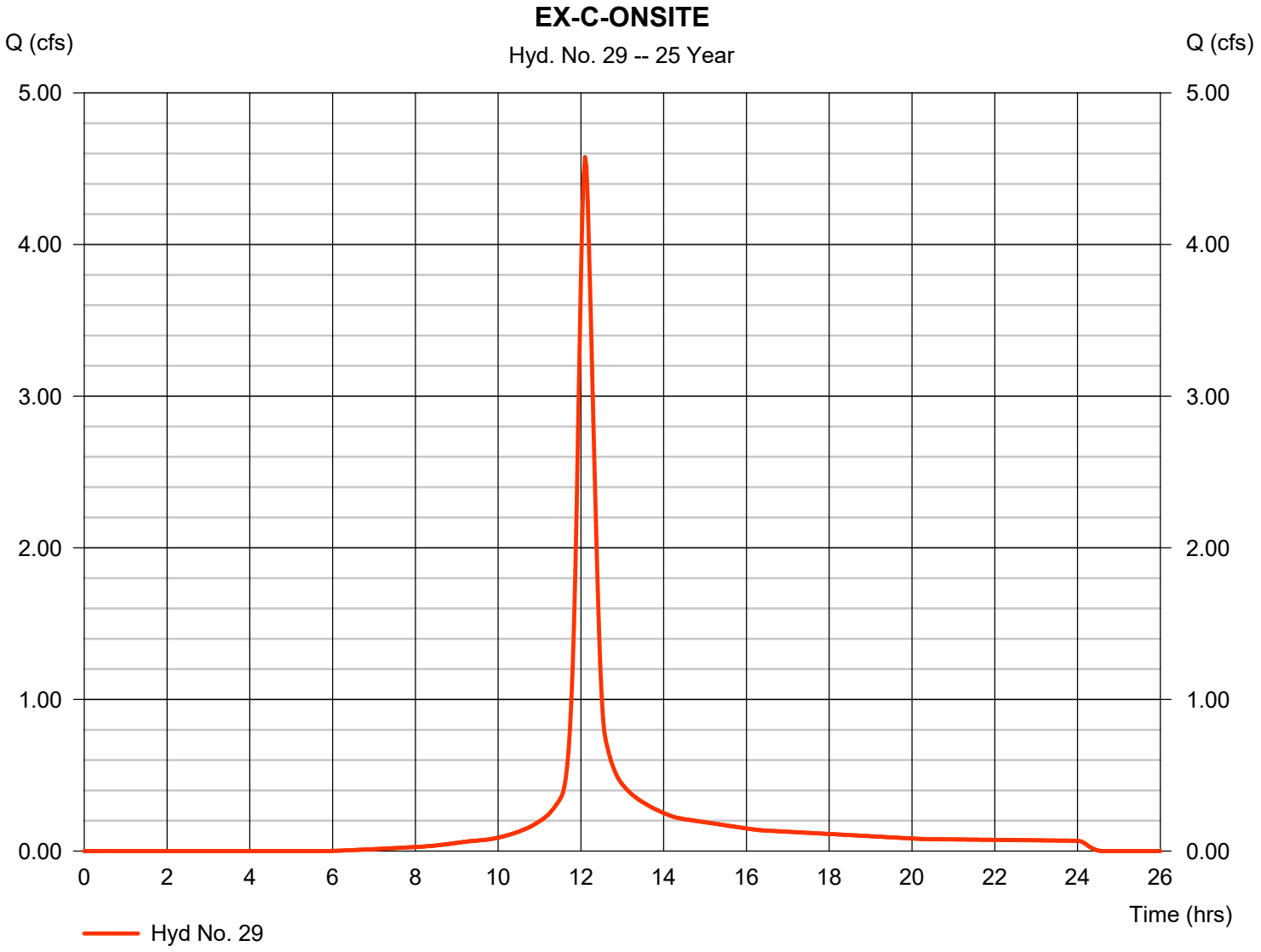


Hydrograph Report

Hyd. No. 29

EX-C-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.576 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	15,872 cuft
Drainage area	=	1.090 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	20.20 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

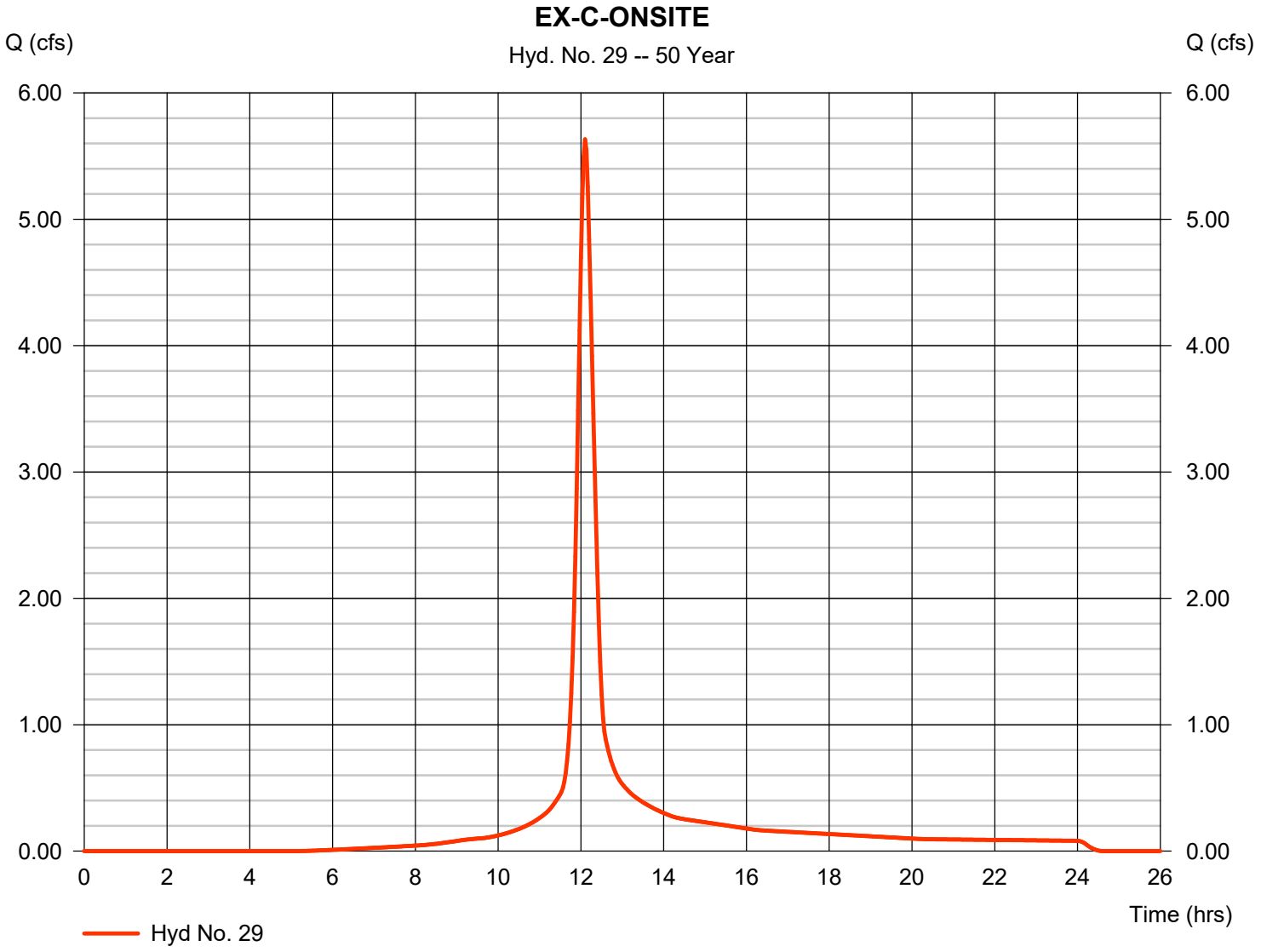


Hydrograph Report

Hyd. No. 29

EX-C-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.633 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	19,648 cuft
Drainage area	=	1.090 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	20.20 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

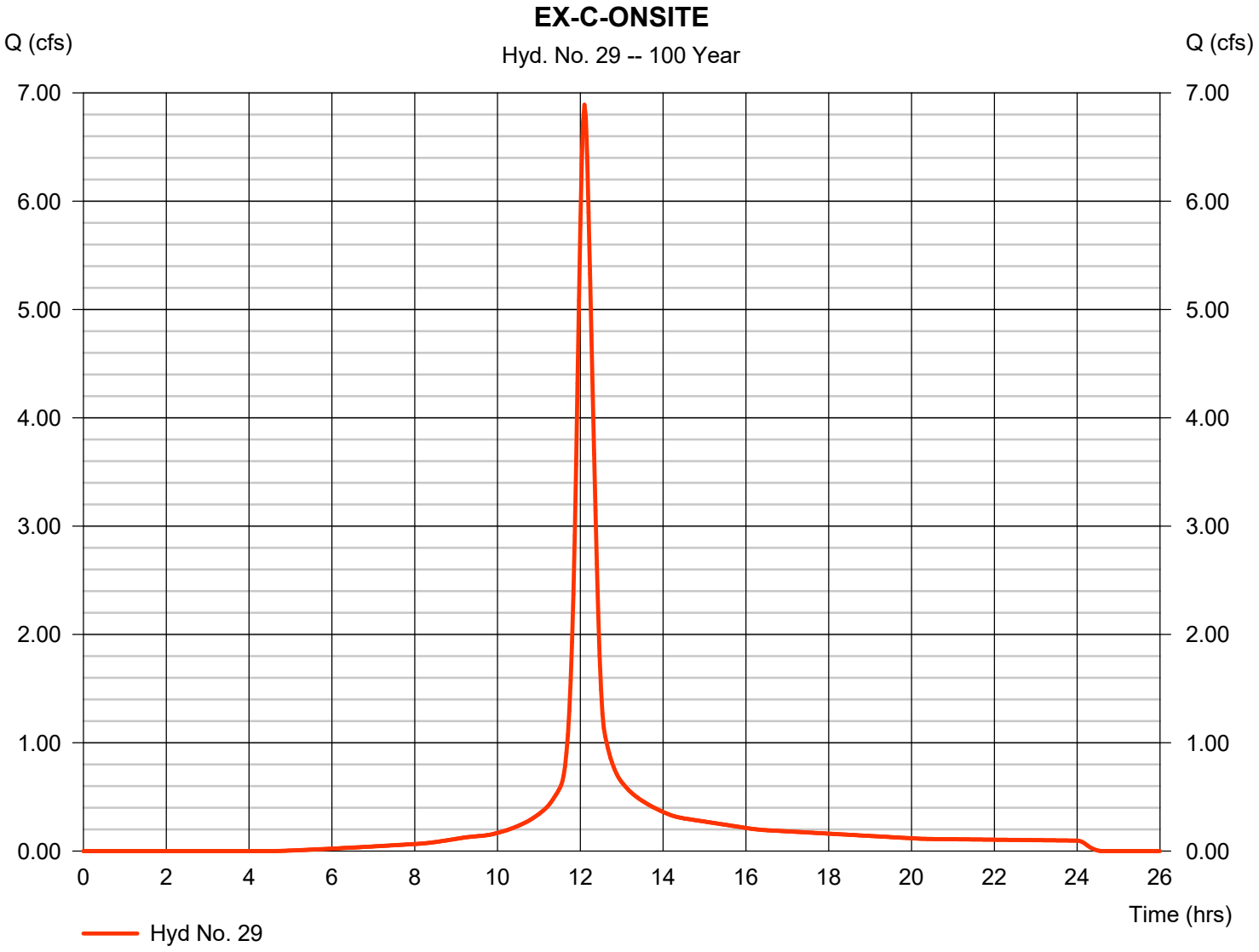


Hydrograph Report

Hyd. No. 29

EX-C-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.891 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	24,212 cuft
Drainage area	=	1.090 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	20.20 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



EX-C-OFFSITE WATERSHED

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No. 30

EX-C-OFFSITE

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 30.0		120.0		0.0		
Two-year 24-hr precip. (in)	= 3.32		3.32		0.00		
Land slope (%)	= 5.33		2.00		0.00		
Travel Time (min)	**= 2.48**	**+**	**1.38**	**+**	**0.00**	**=**	**3.86**
Shallow Concentrated Flow							
Flow length (ft)	= 585.00		0.00		0.00		
Watercourse slope (%)	= 1.70		0.00		0.00		
Surface description	= Paved		Paved		Paved		
Average velocity (ft/s)	=2.65		0.00		0.00		
Travel Time (min)	**= 3.68**	**+**	**0.00**	**+**	**0.00**	**=**	**3.68**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 7.50 min

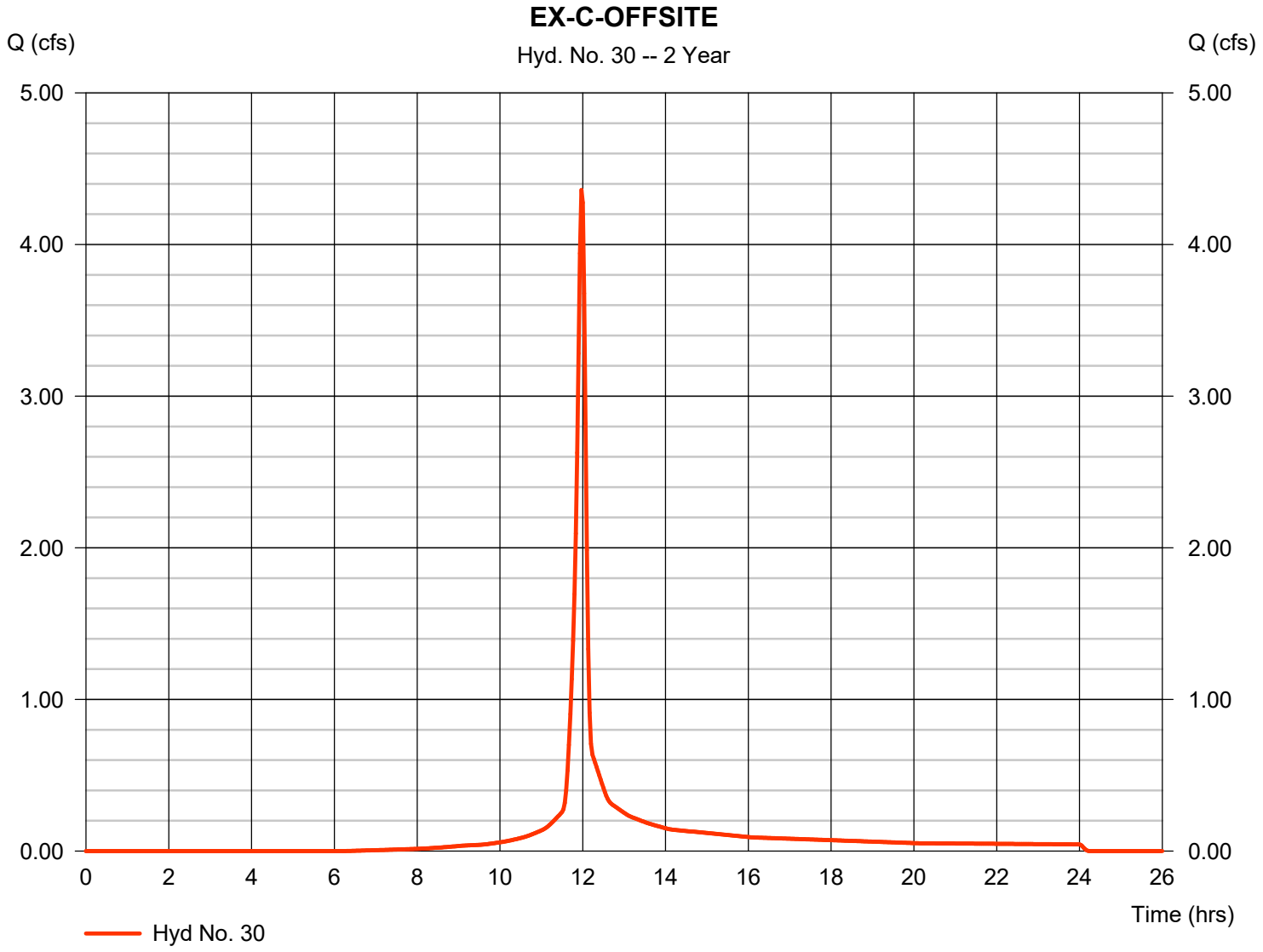
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 30

EX-C-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.360 cfs
Storm frequency	=	2 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	10,087 cuft
Drainage area	=	1.320 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.50 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

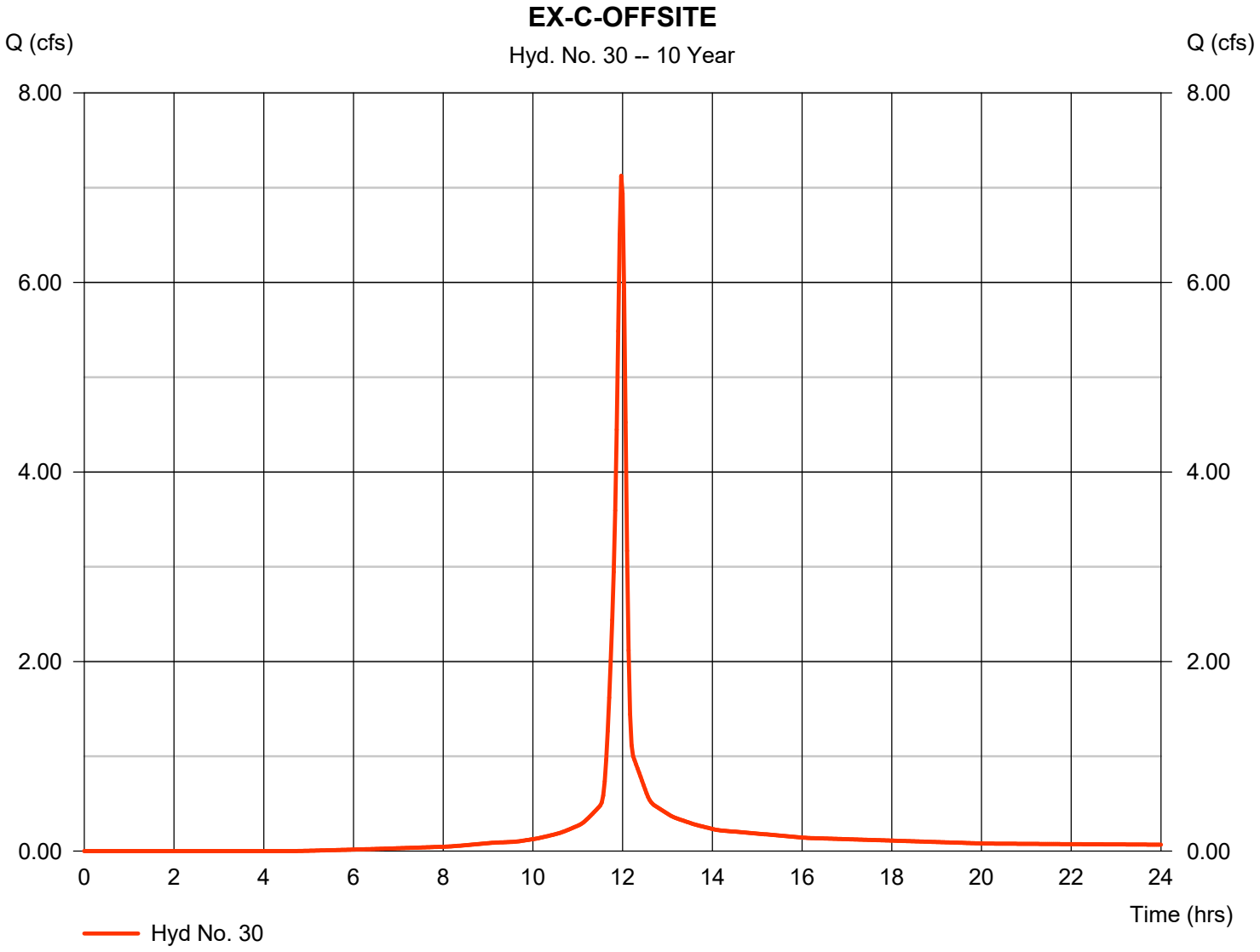


Hydrograph Report

Hyd. No. 30

EX-C-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.125 cfs
Storm frequency	=	10 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	16,853 cuft
Drainage area	=	1.320 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.50 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

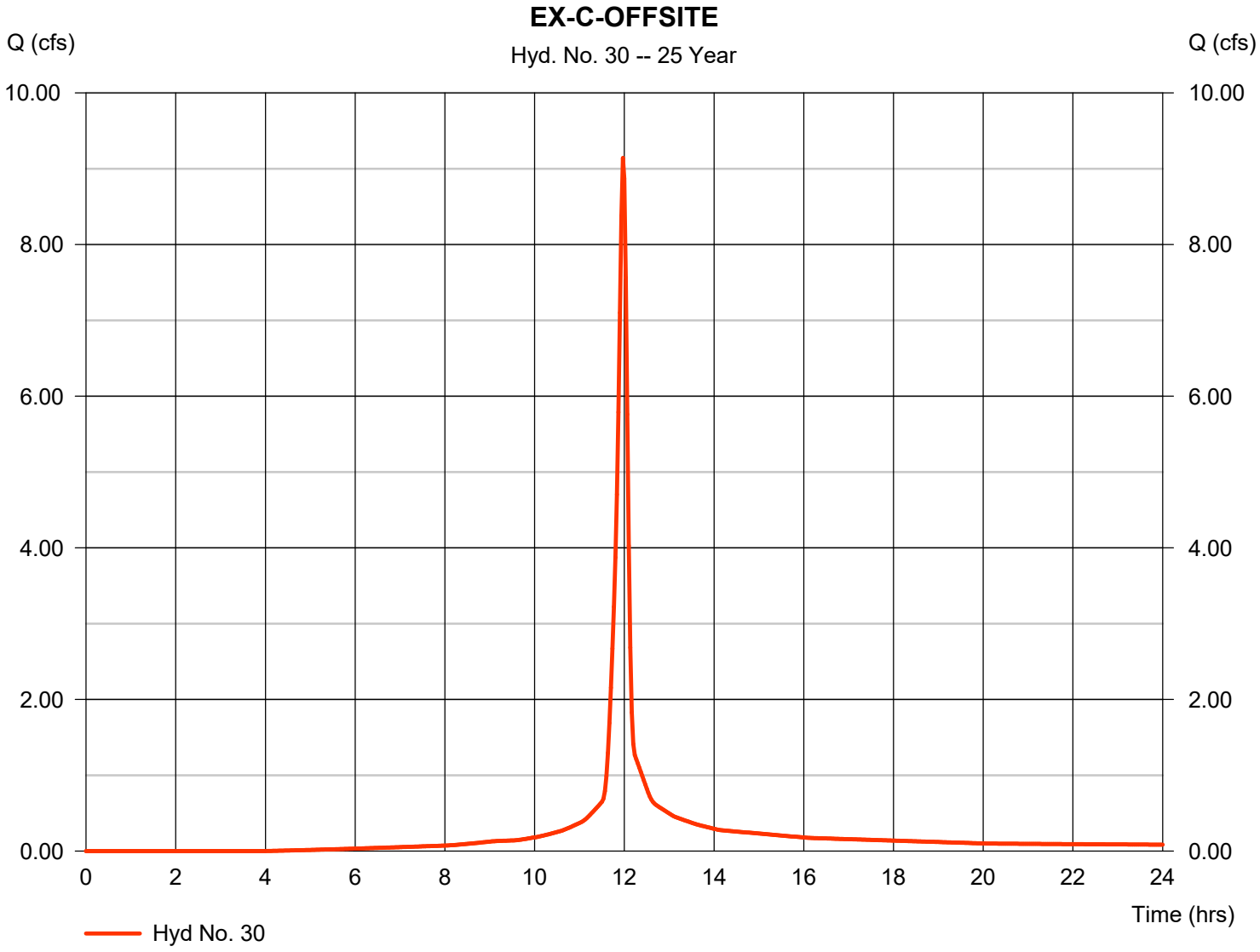


Hydrograph Report

Hyd. No. 30

EX-C-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.141 cfs
Storm frequency	=	25 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	21,935 cuft
Drainage area	=	1.320 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.50 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

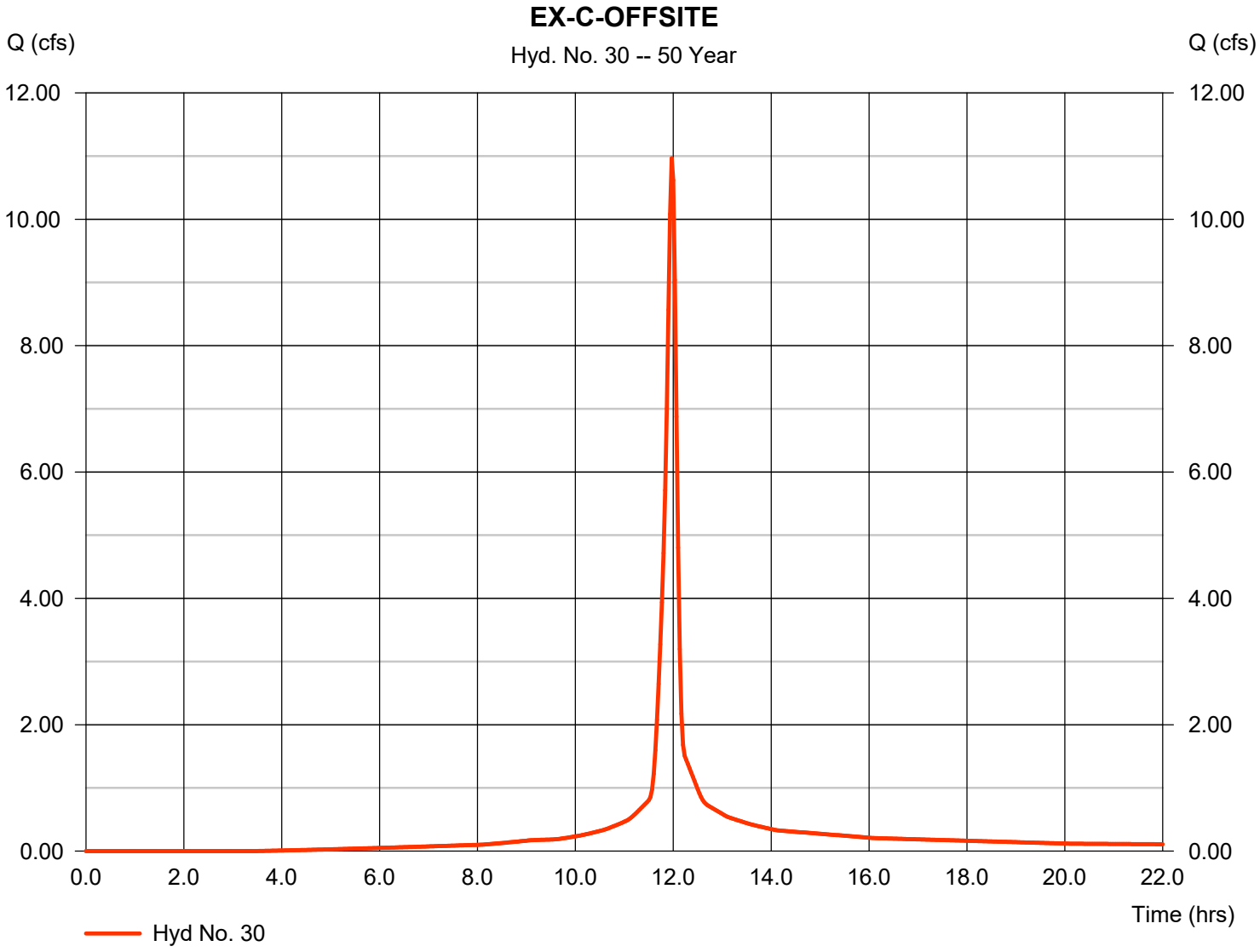


Hydrograph Report

Hyd. No. 30

EX-C-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	10.97 cfs
Storm frequency	=	50 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	26,615 cuft
Drainage area	=	1.320 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.50 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

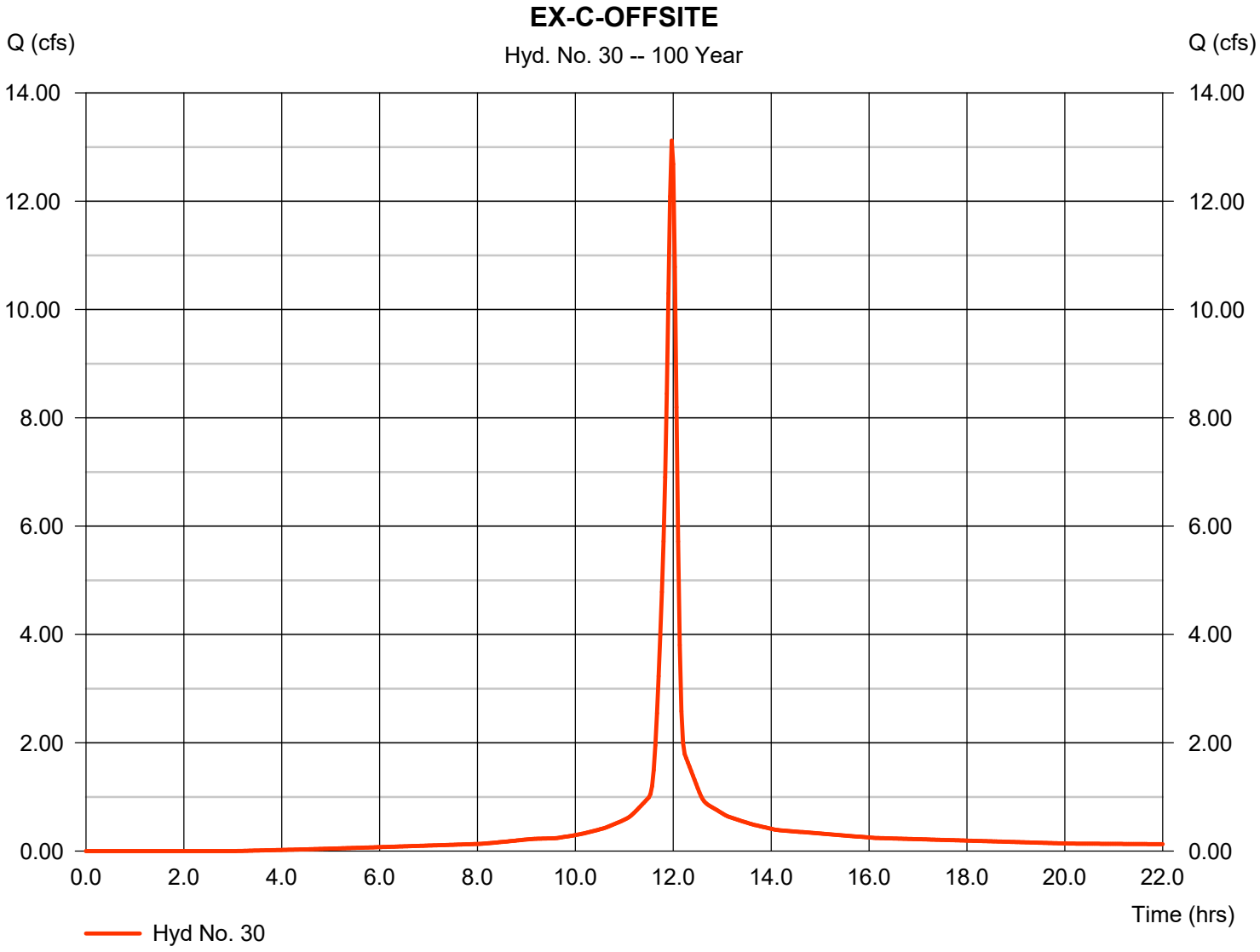


Hydrograph Report

Hyd. No. 30

EX-C-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	13.12 cfs
Storm frequency	=	100 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	32,222 cuft
Drainage area	=	1.320 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.50 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



TOTAL EXISTING FLOW TO POA-C

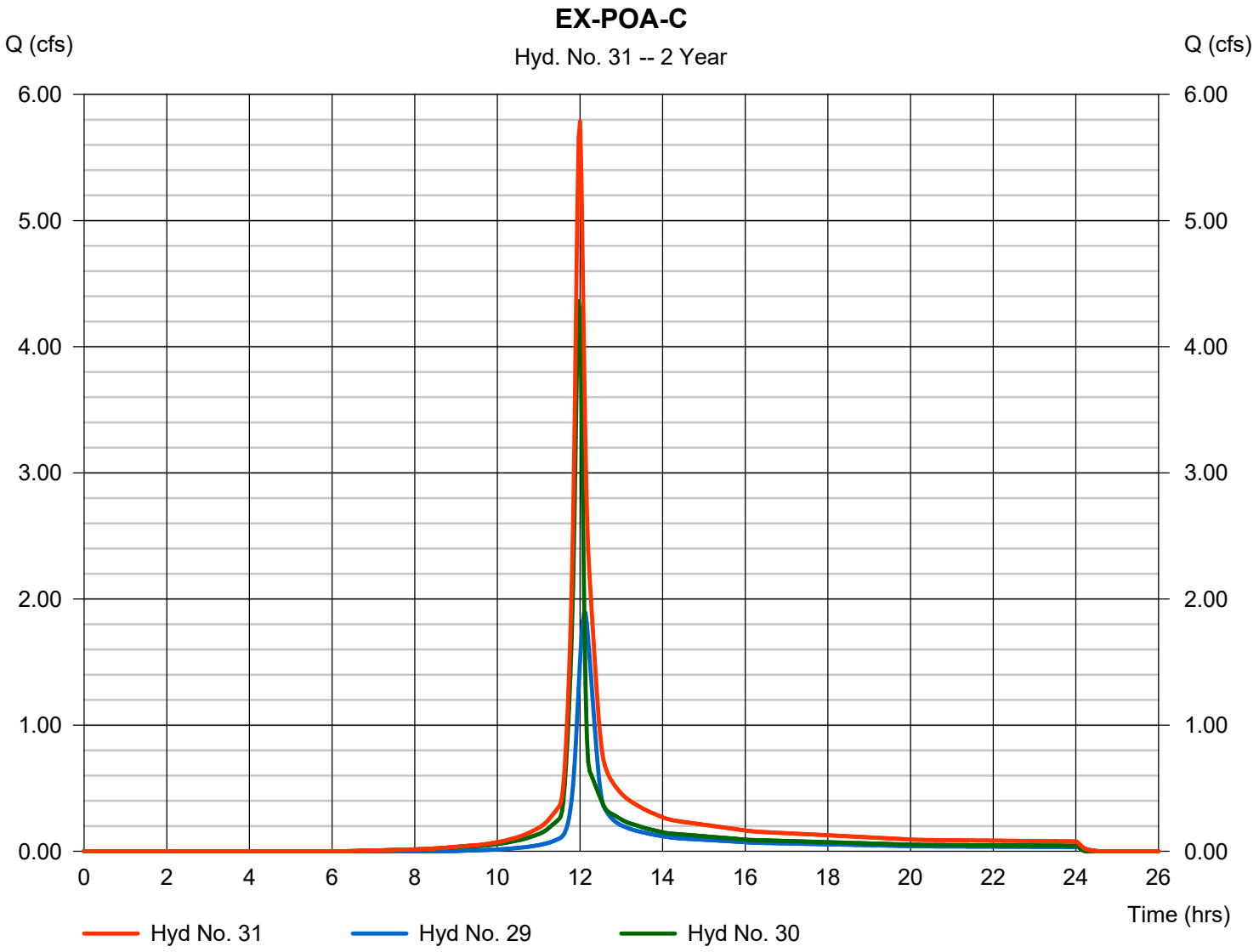
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 31

EX-POA-C

Hydrograph type	= Combine	Peak discharge	= 5.784 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 16,673 cuft
Inflow hyds.	= 29, 30	Contrib. drain. area	= 2.410 ac

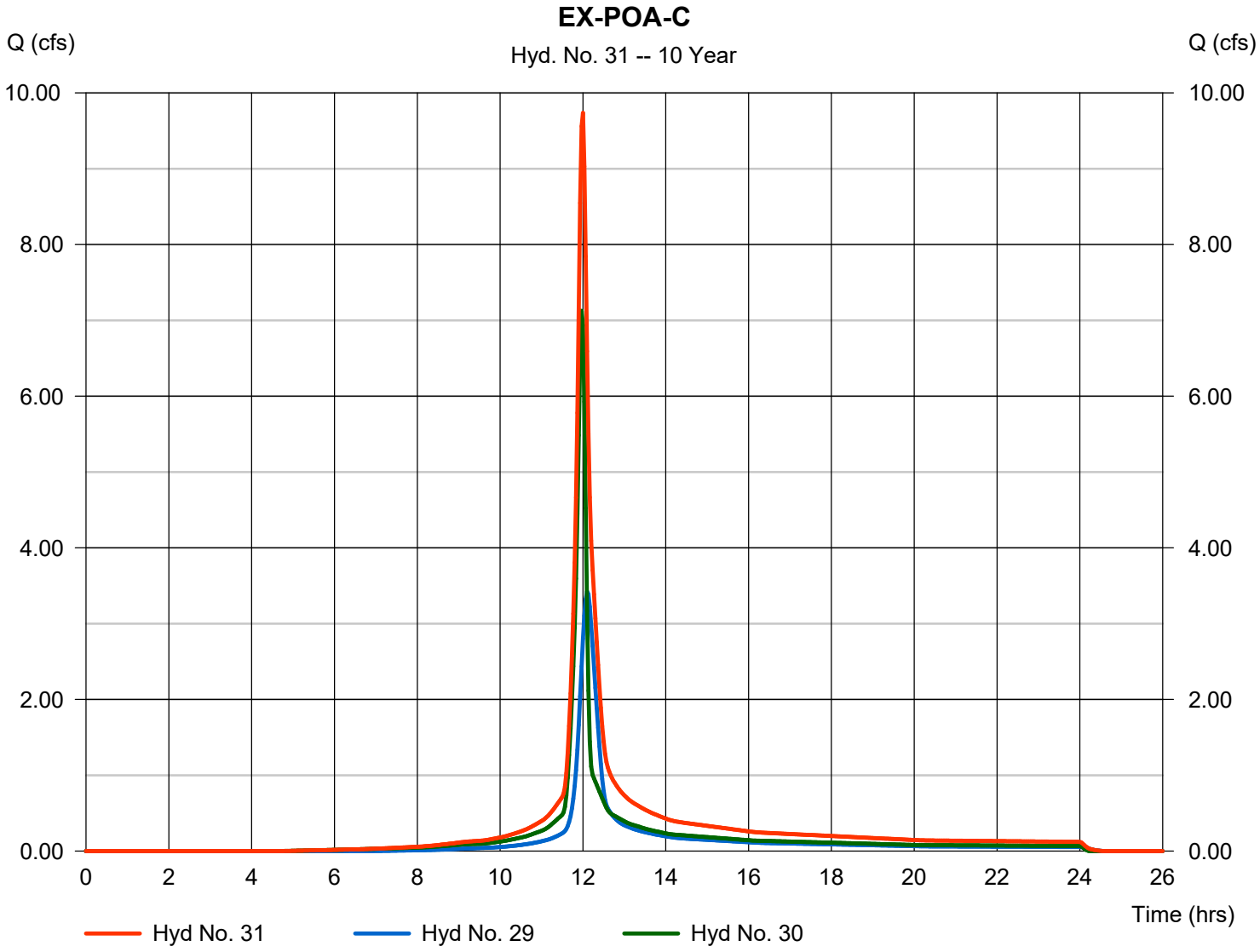


Hydrograph Report

Hyd. No. 31

EX-POA-C

Hydrograph type	=	Combine	Peak discharge	=	9.736 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	28,679 cuft
Inflow hyds.	=	29, 30	Contrib. drain. area	=	2.410 ac

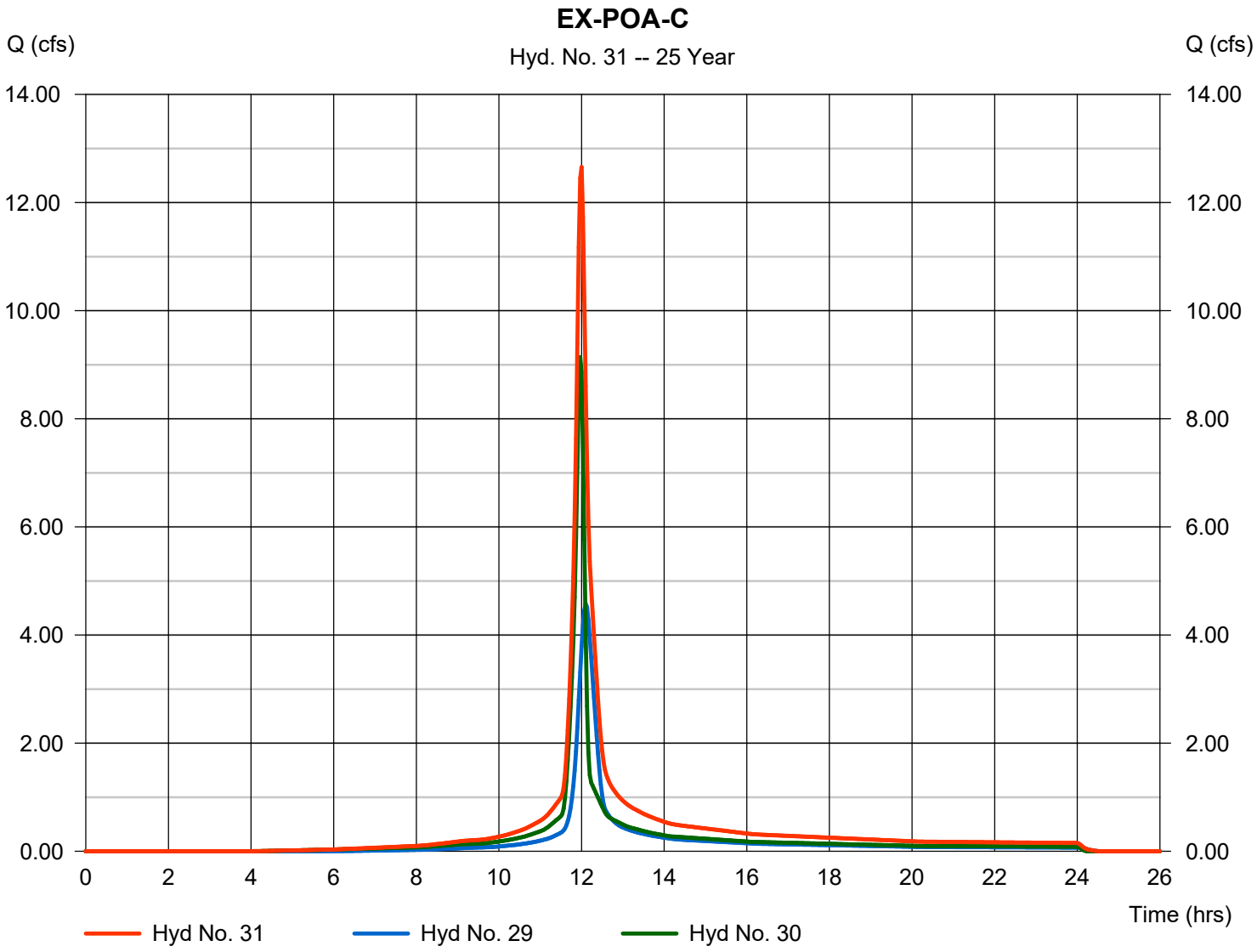


Hydrograph Report

Hyd. No. 31

EX-POA-C

Hydrograph type	=	Combine	Peak discharge	=	12.66 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	37,807 cuft
Inflow hyds.	=	29, 30	Contrib. drain. area	=	2.410 ac

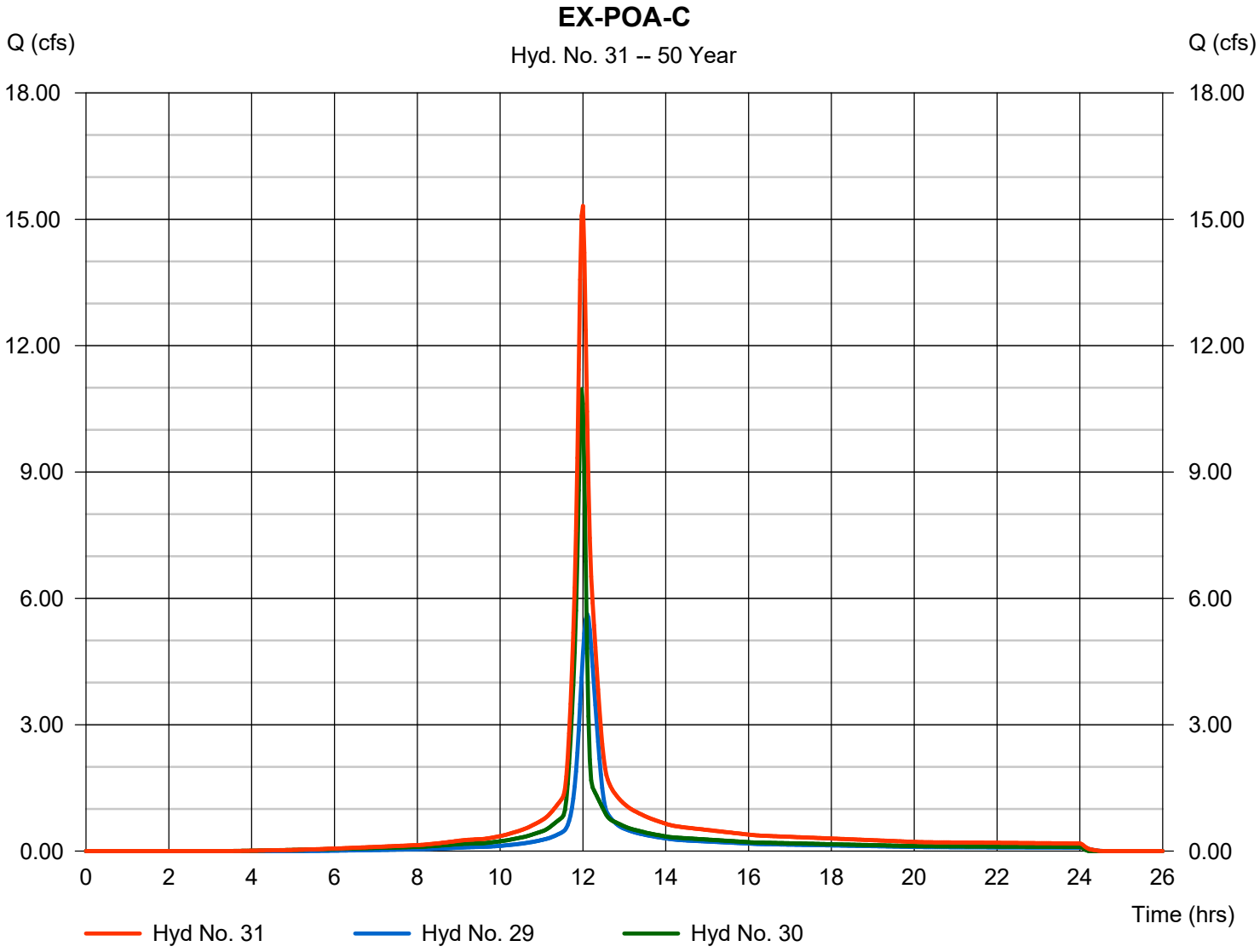


Hydrograph Report

Hyd. No. 31

EX-POA-C

Hydrograph type	=	Combine	Peak discharge	=	15.31 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	46,264 cuft
Inflow hyds.	=	29, 30	Contrib. drain. area	=	2.410 ac

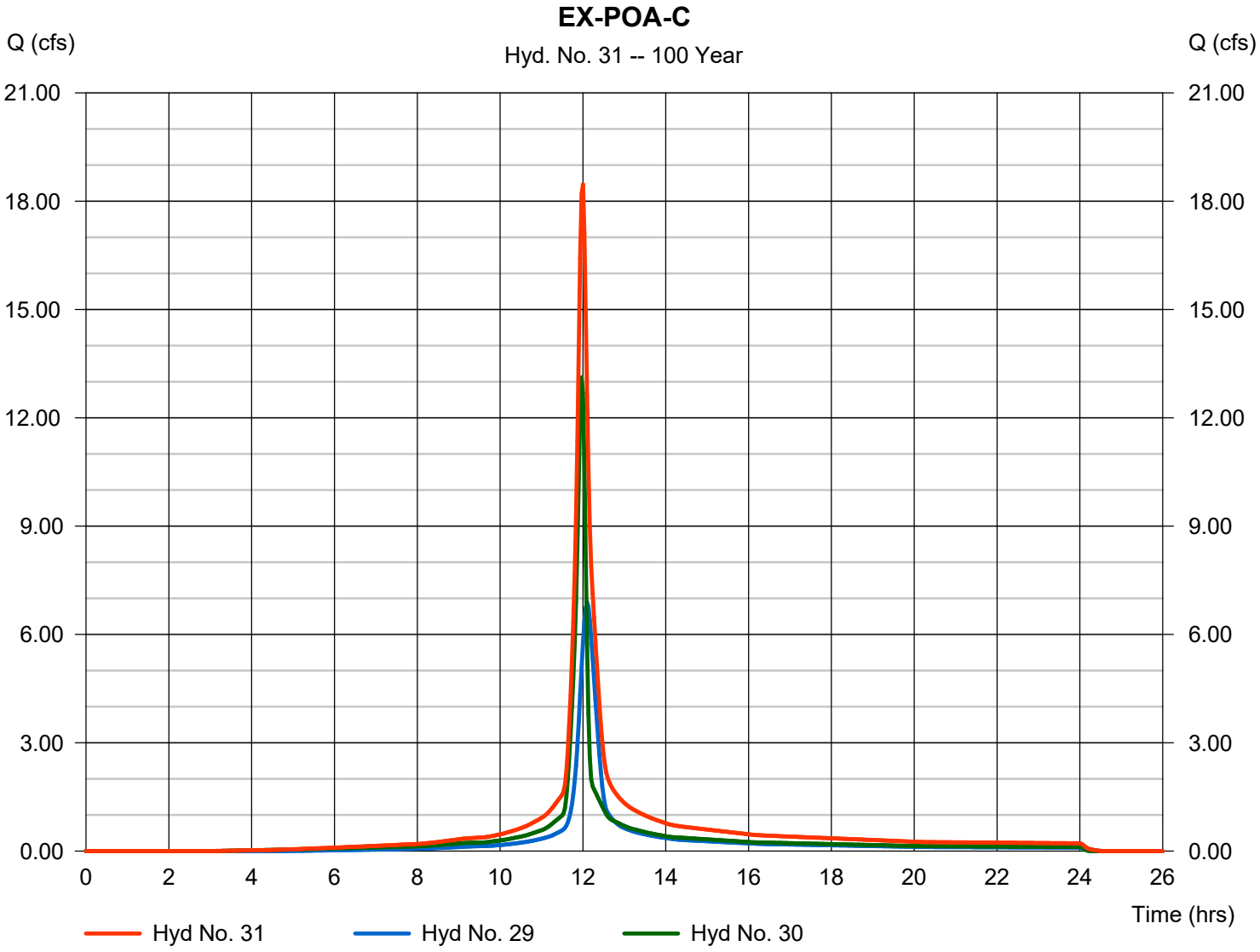


Hydrograph Report

Hyd. No. 31

EX-POA-C

Hydrograph type	=	Combine	Peak discharge	=	18.47 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	56,433 cuft
Inflow hyds.	=	29, 30	Contrib. drain. area	=	2.410 ac



TOTAL EXISTING FLOW TO POA-ABC

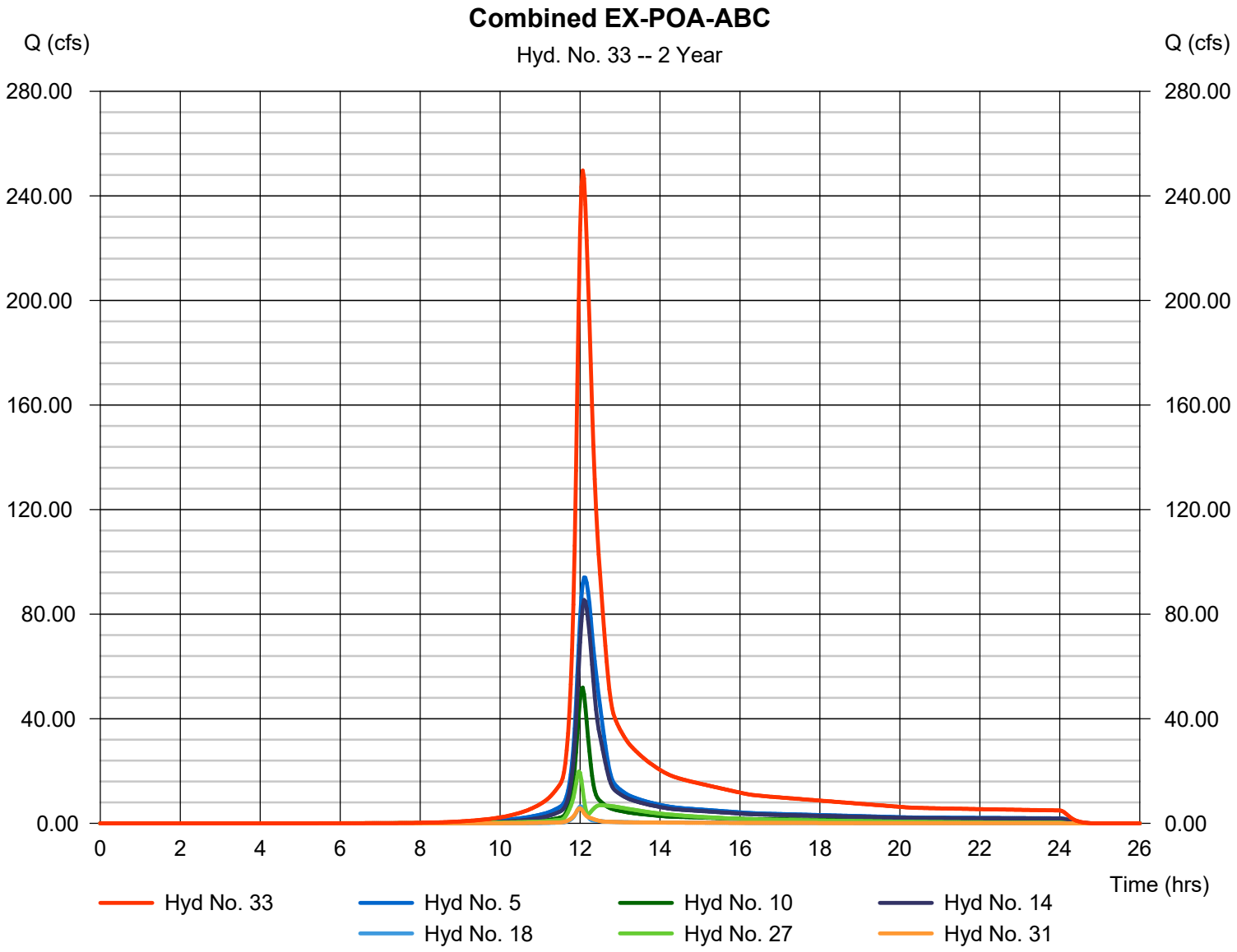
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 33

Combined EX-POA-ABC

Hydrograph type	=	Combine	Peak discharge	=	249.70 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	1,016,797 cuft
Inflow hyds.	=	5, 10, 14, 18, 27, 31	Contrib. drain. area	=	2.990 ac

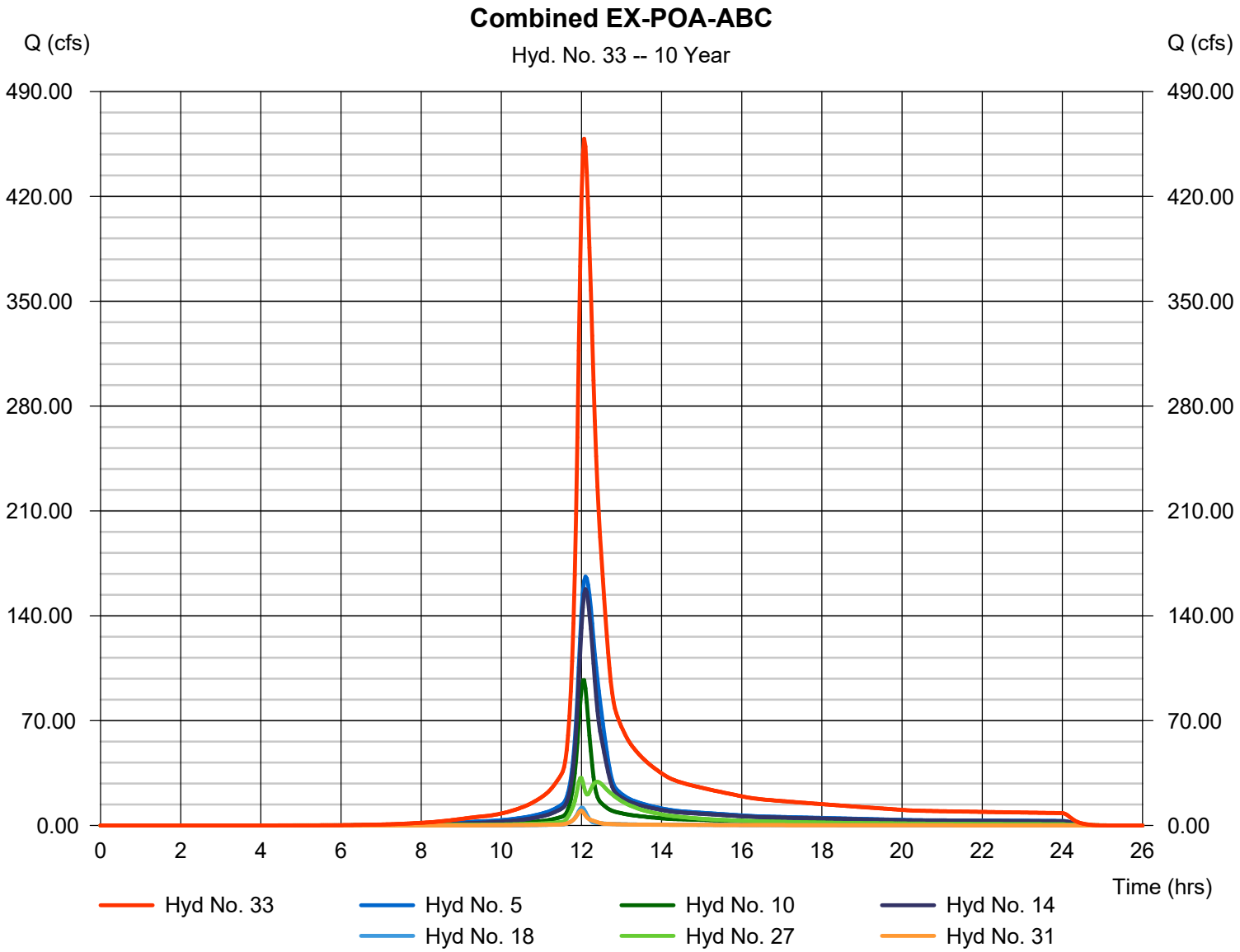


Hydrograph Report

Hyd. No. 33

Combined EX-POA-ABC

Hydrograph type	=	Combine	Peak discharge	=	458.45 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	1,880,891 cuft
Inflow hyds.	=	5, 10, 14, 18, 27, 31	Contrib. drain. area	=	2.990 ac

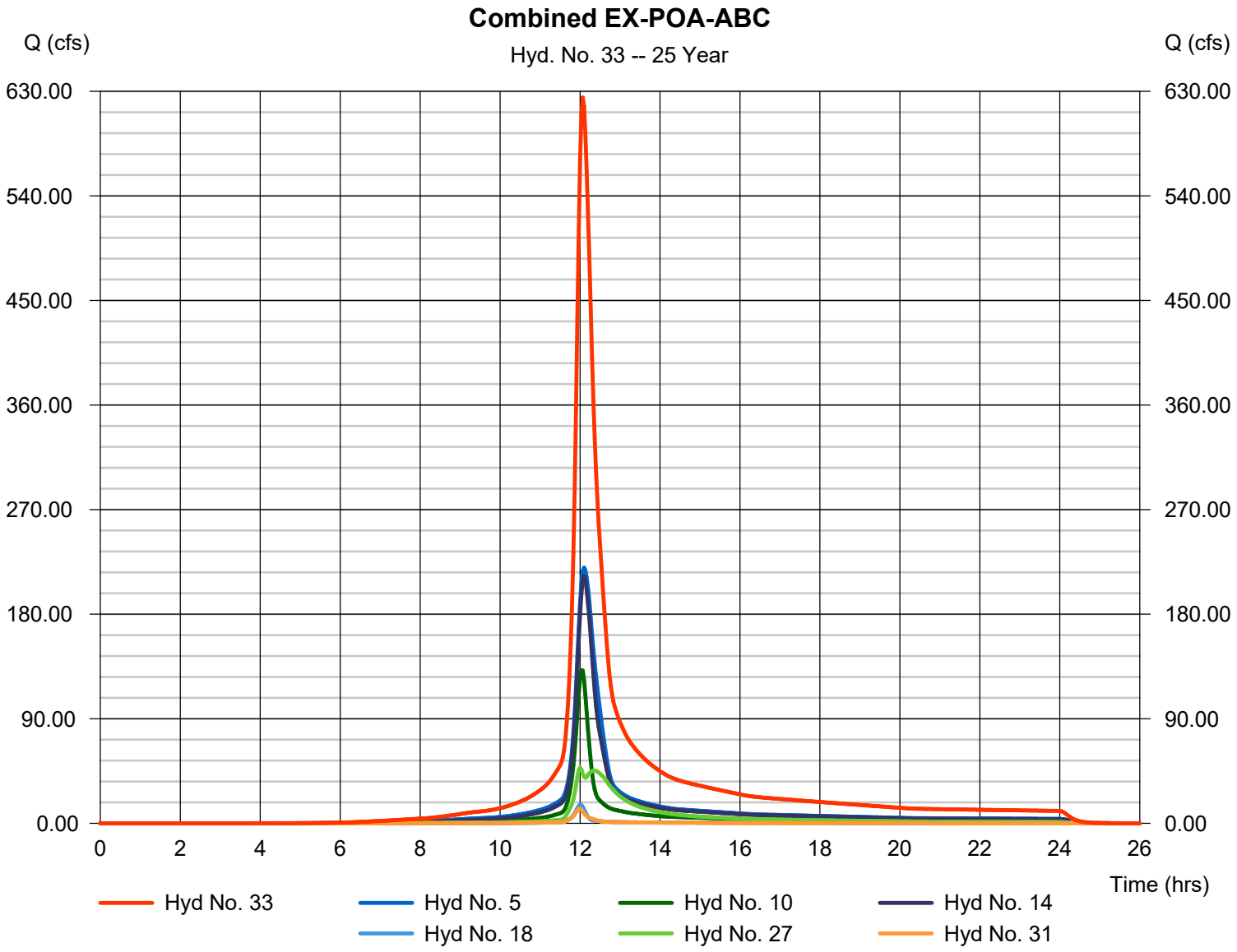


Hydrograph Report

Hyd. No. 33

Combined EX-POA-ABC

Hydrograph type	=	Combine	Peak discharge	=	624.65 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	2,549,304 cuft
Inflow hyds.	=	5, 10, 14, 18, 27, 31	Contrib. drain. area	=	2.990 ac

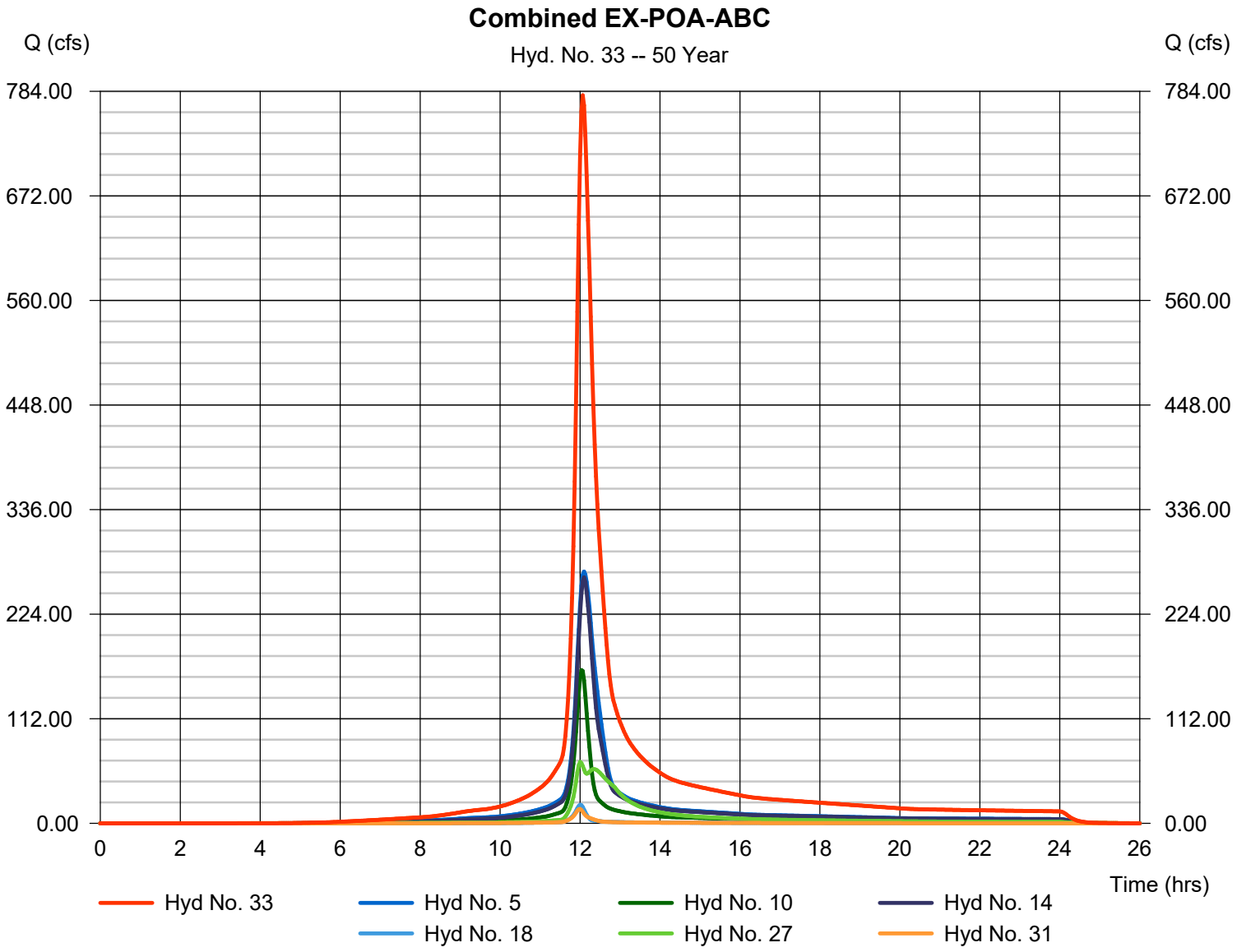


Hydrograph Report

Hyd. No. 33

Combined EX-POA-ABC

Hydrograph type	=	Combine	Peak discharge	=	779.81 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	3,173,432 cuft
Inflow hyds.	=	5, 10, 14, 18, 27, 31	Contrib. drain. area	=	2.990 ac

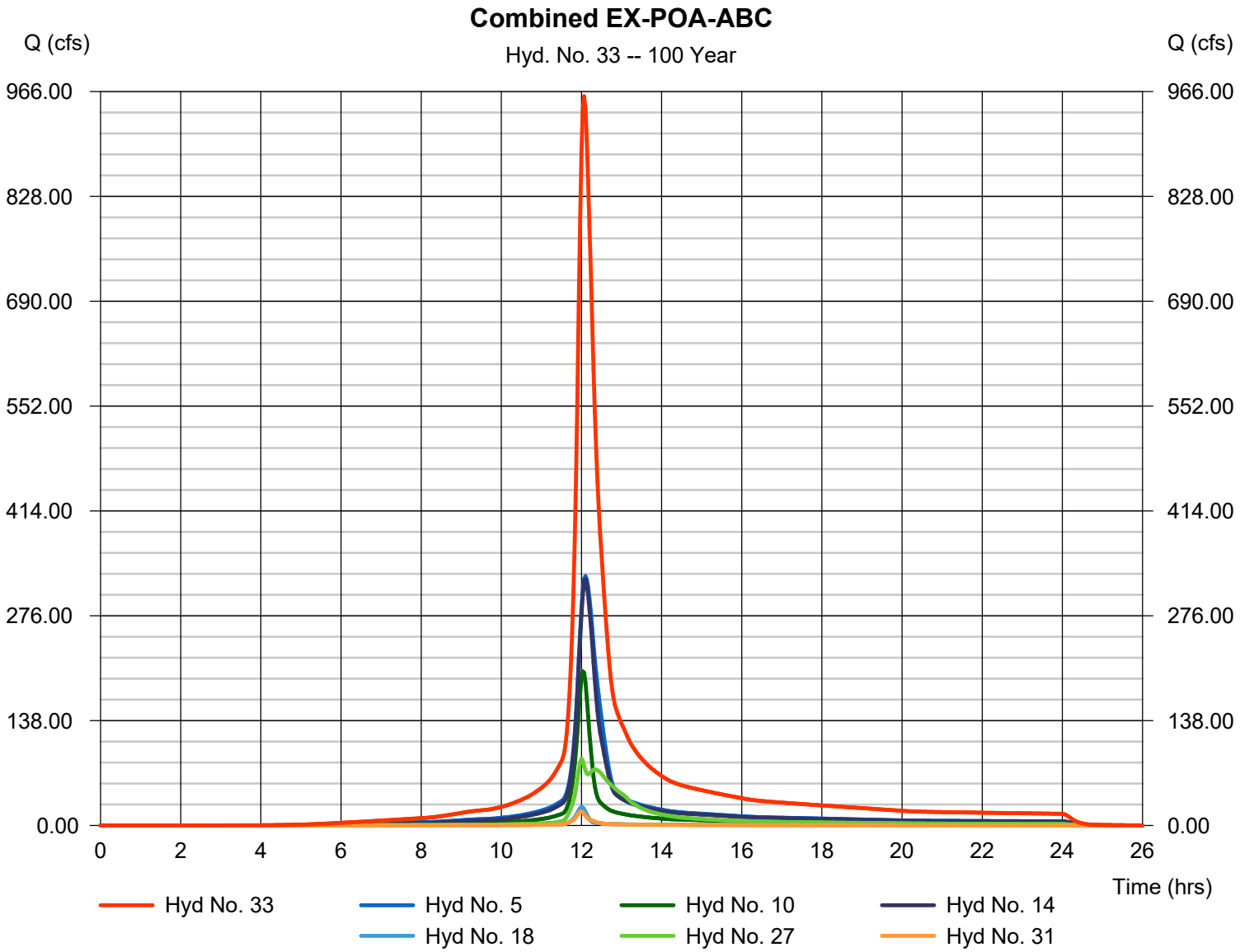


Hydrograph Report

Hyd. No. 33

Combined EX-POA-ABC

Hydrograph type	=	Combine	Peak discharge	=	959.70 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	3,928,400 cuft
Inflow hyds.	=	5, 10, 14, 18, 27, 31	Contrib. drain. area	=	2.990 ac



EX-D-1-ONSITE WATERSHED

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No. 35

EX-D-1-ONSITE

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 150.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.32		0.00		0.00		
Land slope (%)	= 9.33		0.00		0.00		
Travel Time (min)	**= 7.19**	**+**	**0.00**	**+**	**0.00**	**=**	**7.19**
Shallow Concentrated Flow							
Flow length (ft)	= 431.00		443.00		0.00		
Watercourse slope (%)	= 3.02		0.90		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=2.80		1.53		0.00		
Travel Time (min)	**= 2.56**	**+**	**4.82**	**+**	**0.00**	**=**	**7.39**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

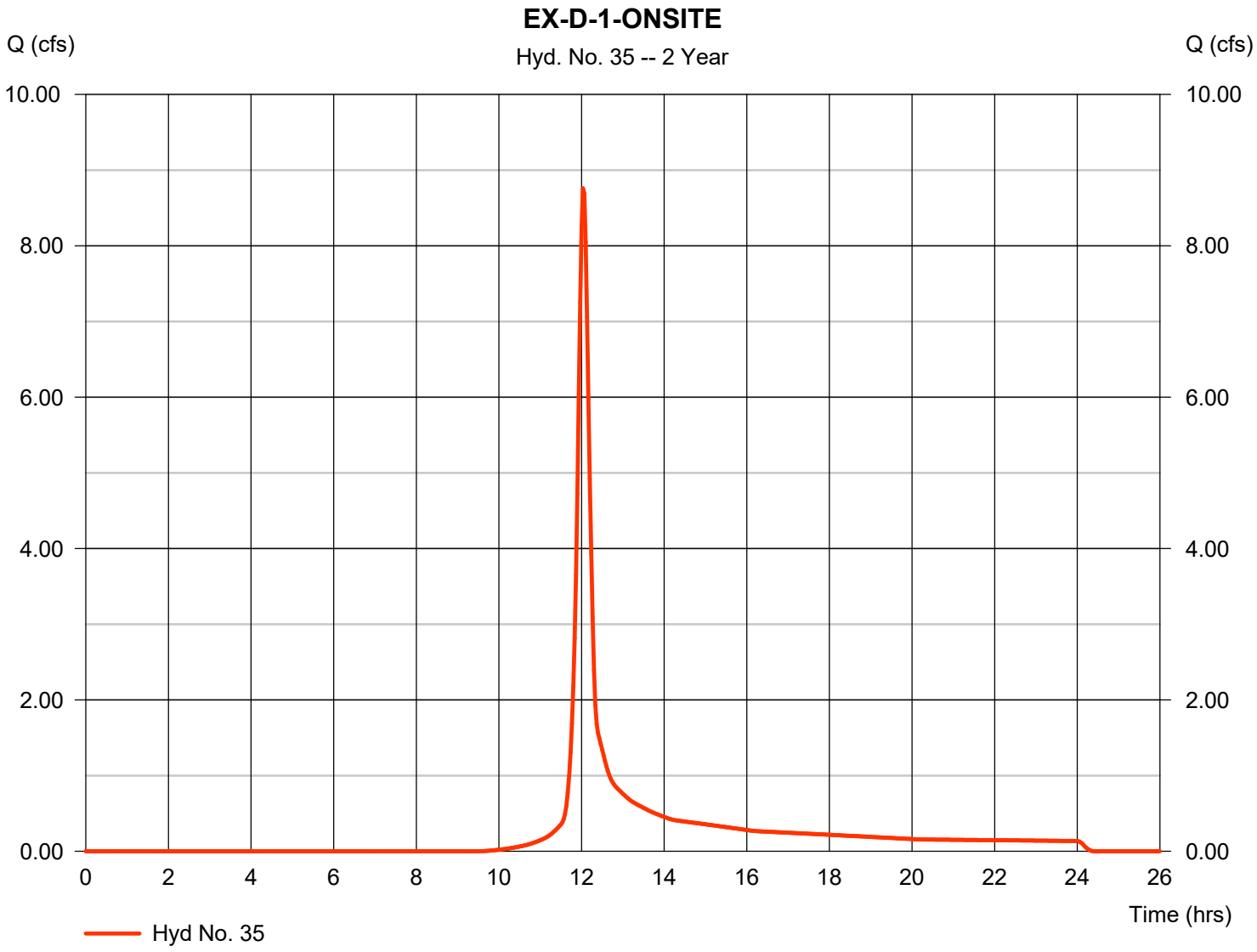
Total Travel Time, Tc ..... 14.60 min

Hydrograph Report

Hyd. No. 35

EX-D-1-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.759 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	24,806 cuft
Drainage area	=	4.910 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	14.60 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

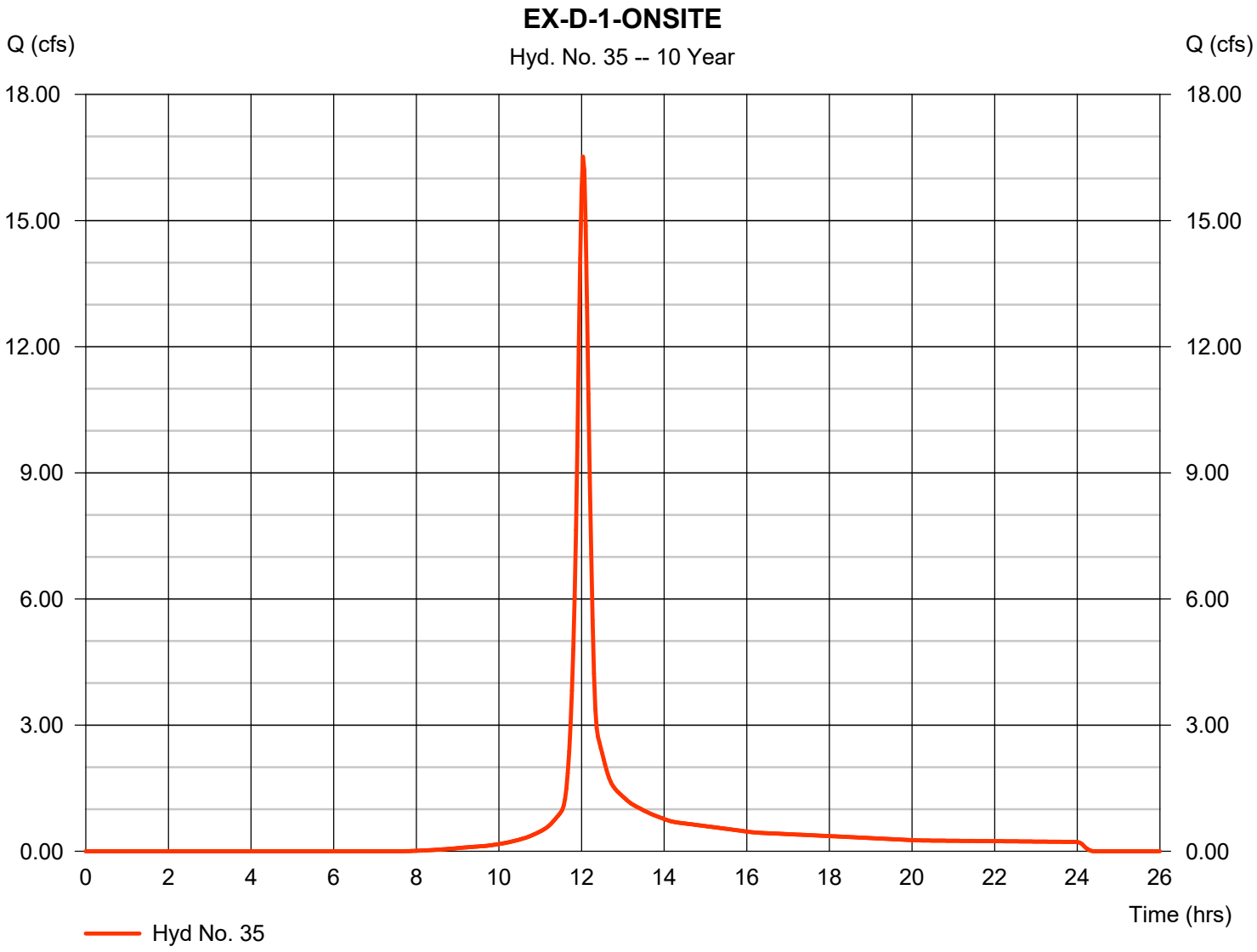


Hydrograph Report

Hyd. No. 35

EX-D-1-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	16.52 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	46,302 cuft
Drainage area	=	4.910 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	14.60 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

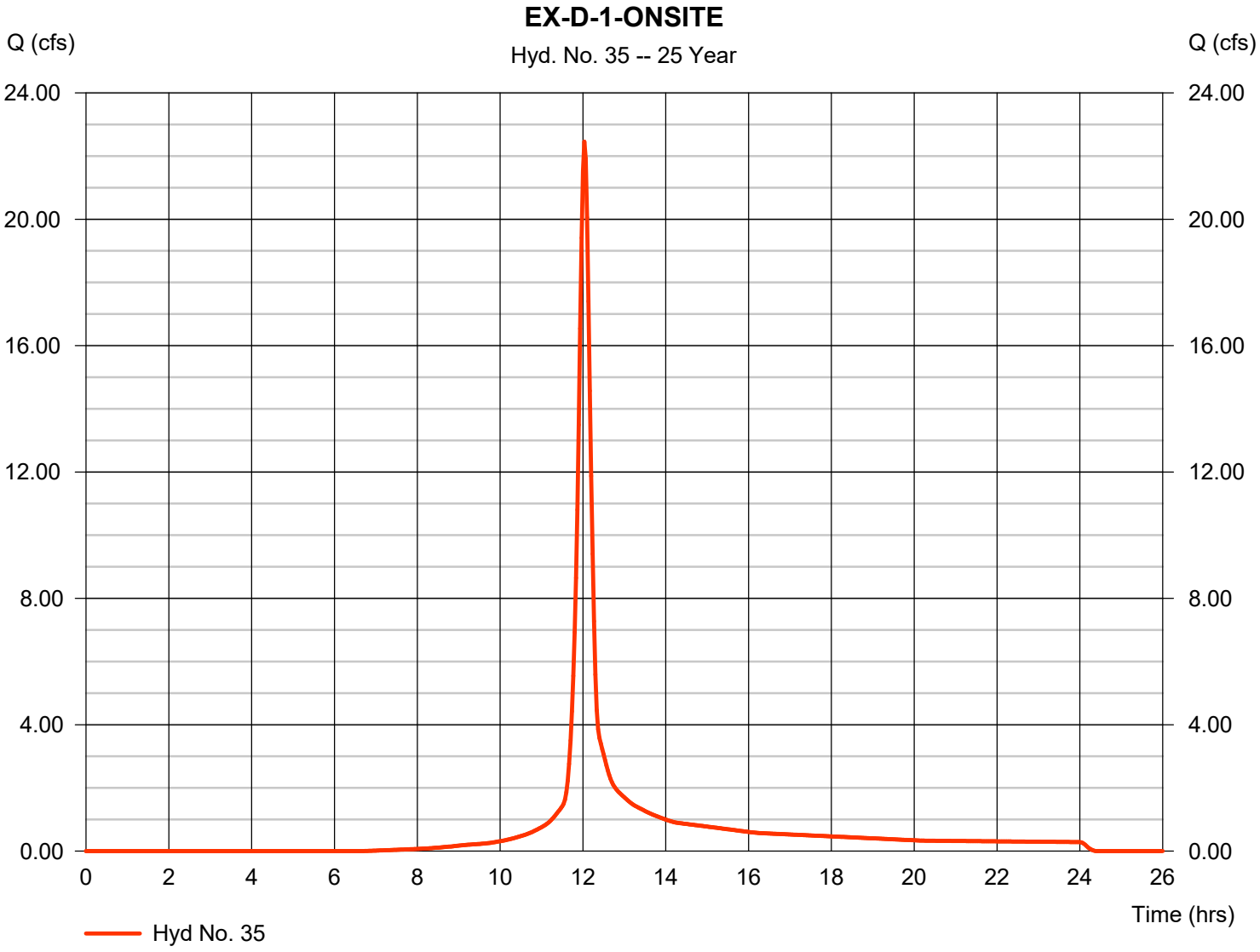


Hydrograph Report

Hyd. No. 35

EX-D-1-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	22.46 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	63,168 cuft
Drainage area	=	4.910 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	14.60 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

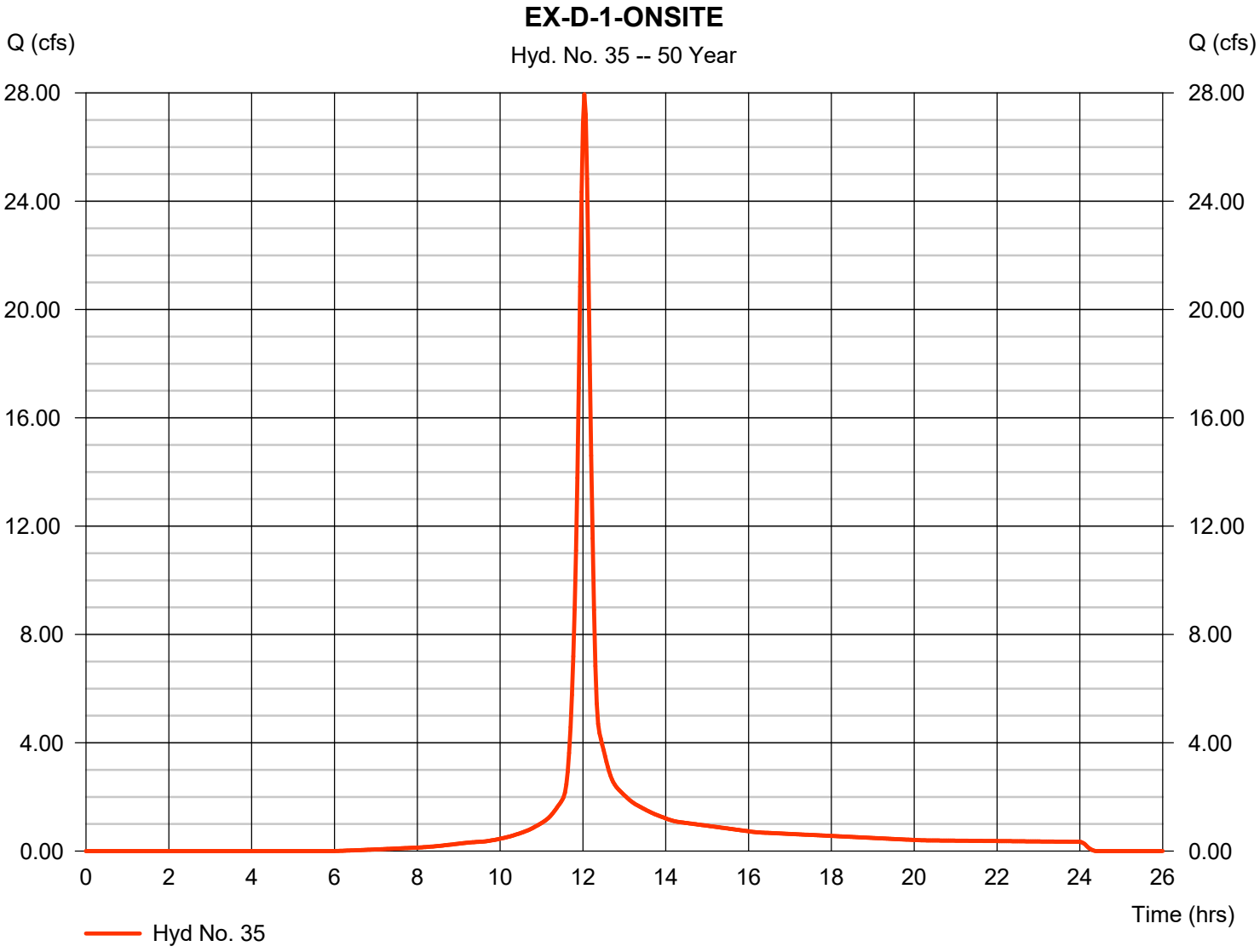


Hydrograph Report

Hyd. No. 35

EX-D-1-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	27.94 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	79,030 cuft
Drainage area	=	4.910 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	14.60 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

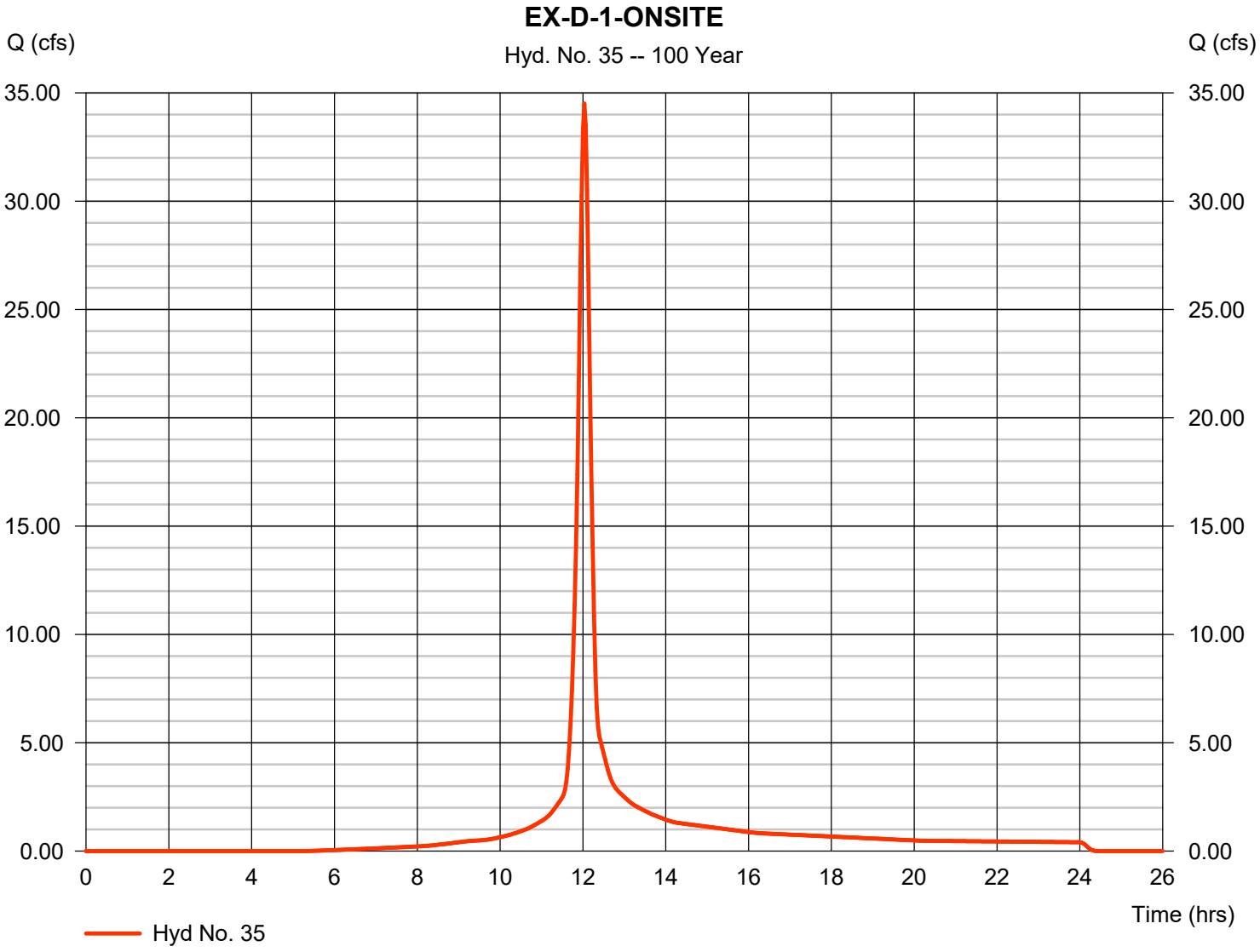


Hydrograph Report

Hyd. No. 35

EX-D-1-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	34.50 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	98,307 cuft
Drainage area	=	4.910 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	14.60 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



EX-D-2-ONSITE WATERSHED

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No. 36

EX-D-2-ONSITE

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 150.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.32		0.00		0.00		
Land slope (%)	= 10.00		0.00		0.00		
Travel Time (min)	**= 6.99**	**+**	**0.00**	**+**	**0.00**	**=**	**6.99**
Shallow Concentrated Flow							
Flow length (ft)	= 240.00		449.00		0.00		
Watercourse slope (%)	= 2.08		4.45		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=2.33		3.40		0.00		
Travel Time (min)	**= 1.72**	**+**	**2.20**	**+**	**0.00**	**=**	**3.92**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 10.90 min

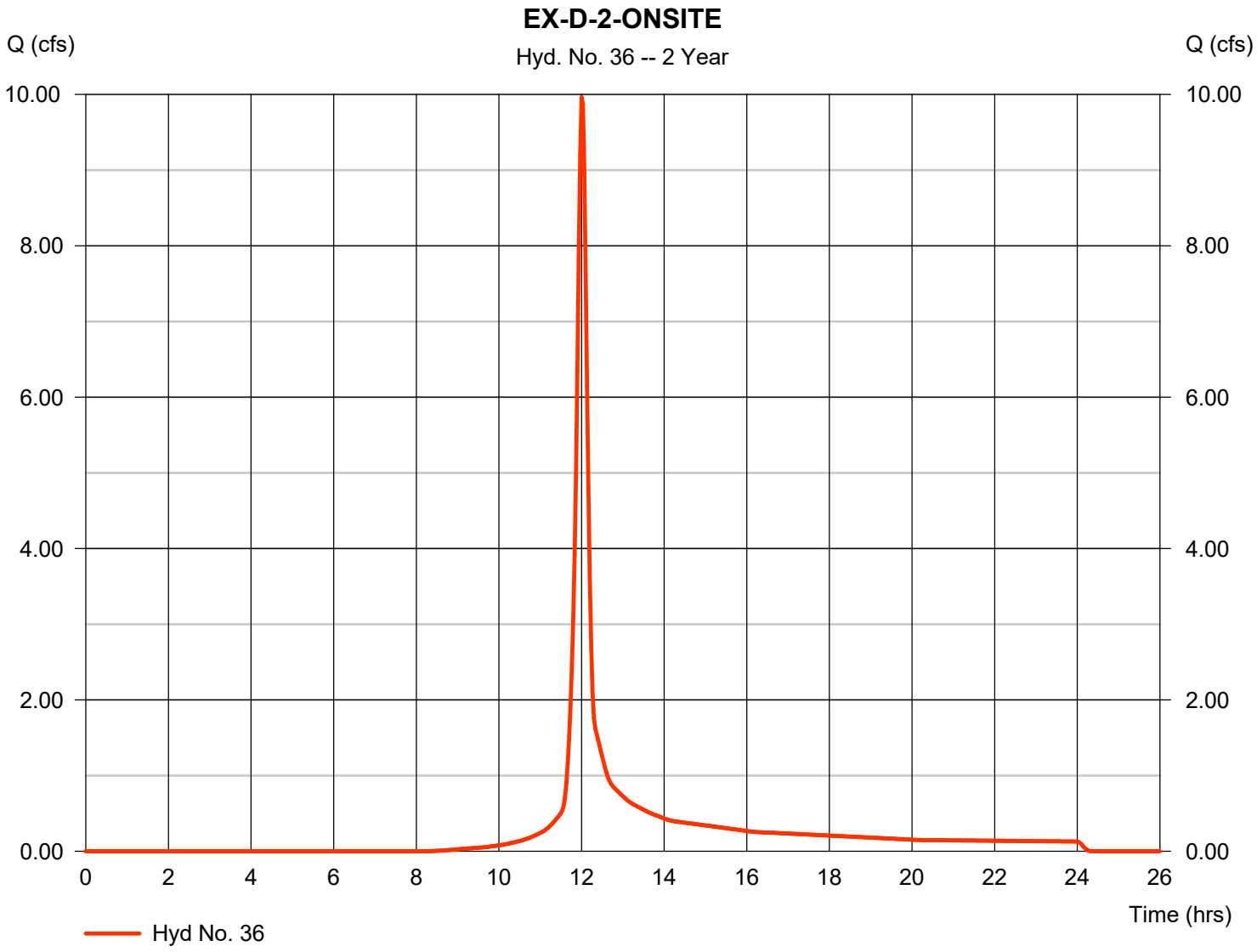
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 36

EX-D-2-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.963 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	25,834 cuft
Drainage area	=	4.040 ac	Curve number	=	83
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.90 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

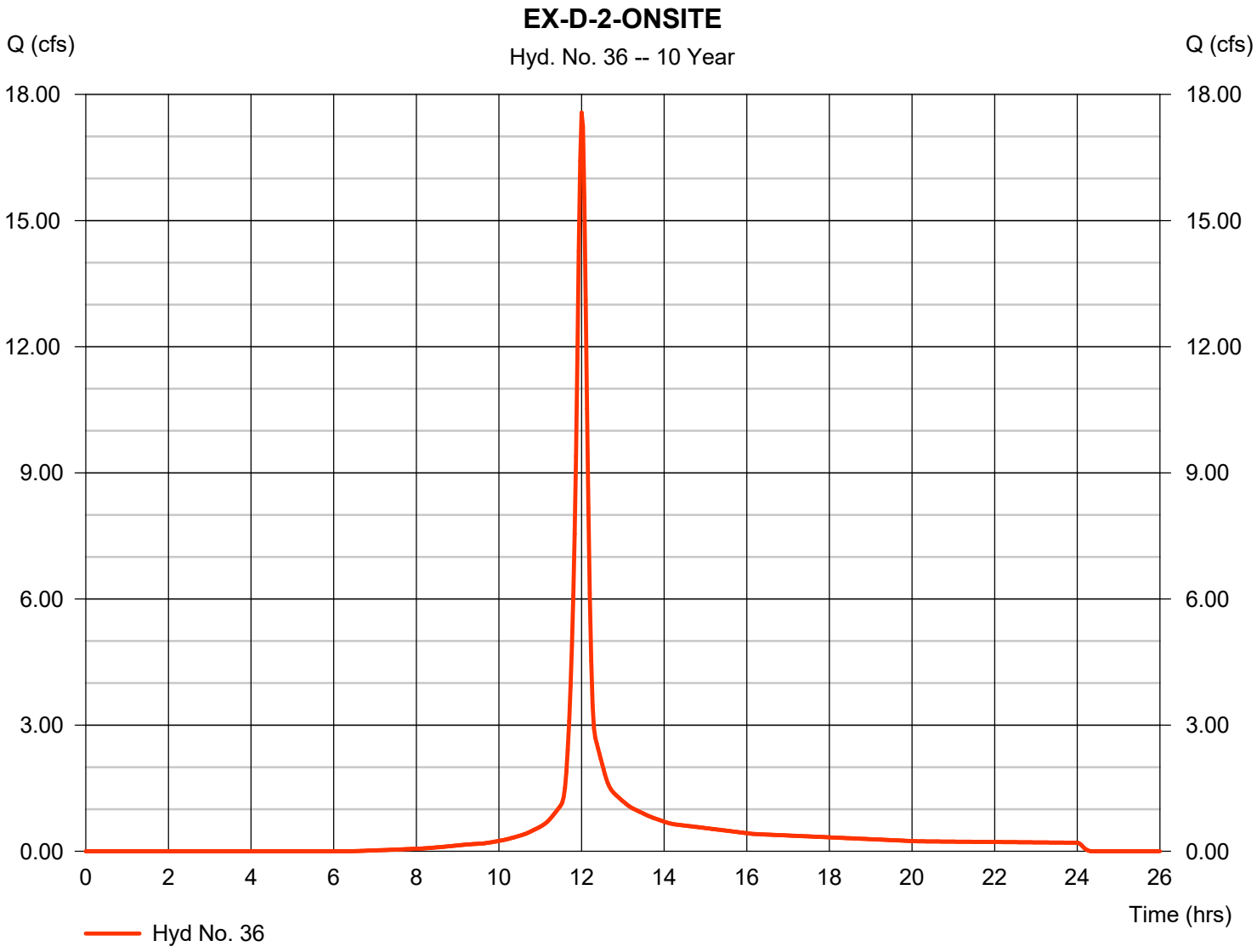


Hydrograph Report

Hyd. No. 36

EX-D-2-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	17.57 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	45,820 cuft
Drainage area	=	4.040 ac	Curve number	=	83
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.90 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

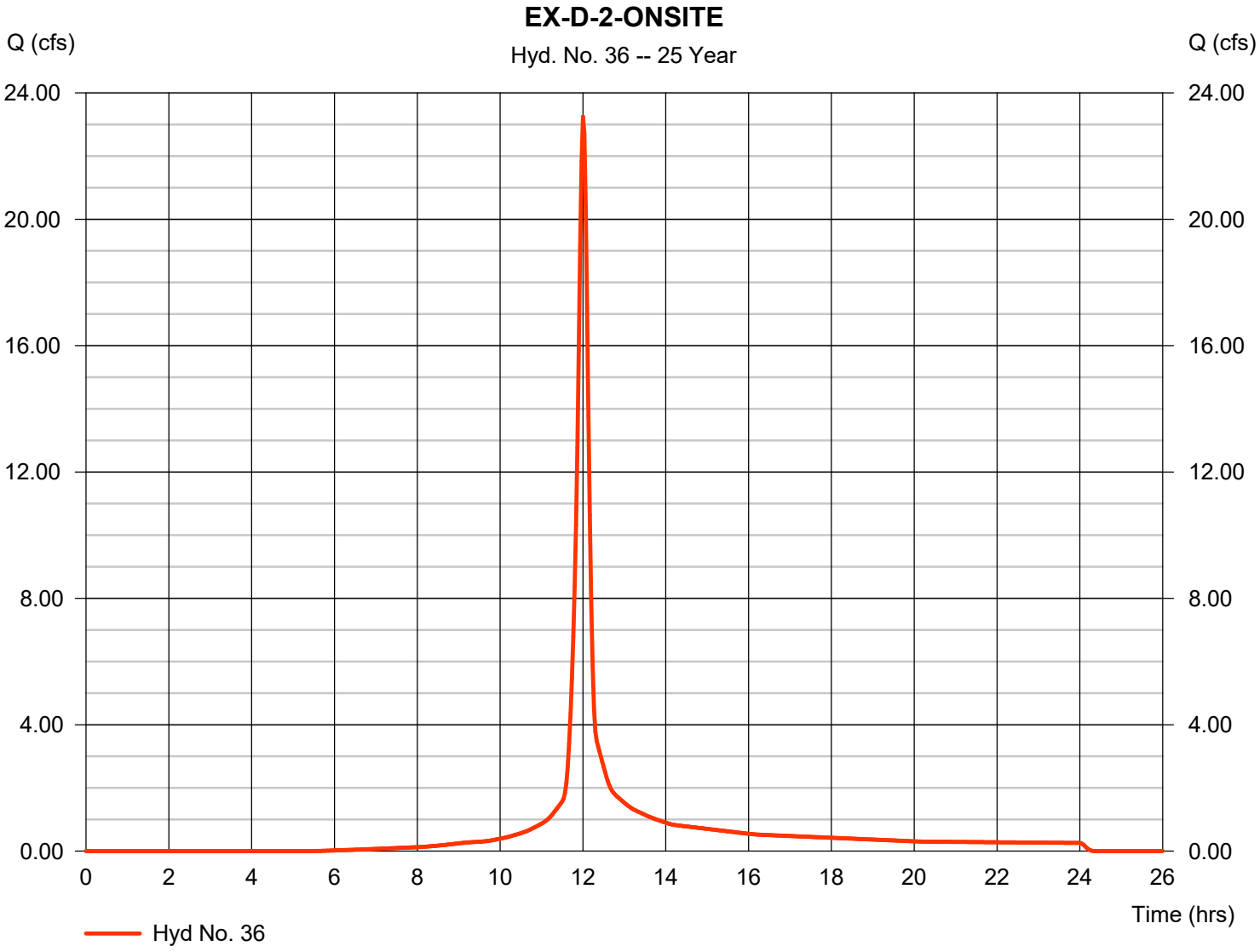


Hydrograph Report

Hyd. No. 36

EX-D-2-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	23.25 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	61,174 cuft
Drainage area	=	4.040 ac	Curve number	=	83
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.90 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

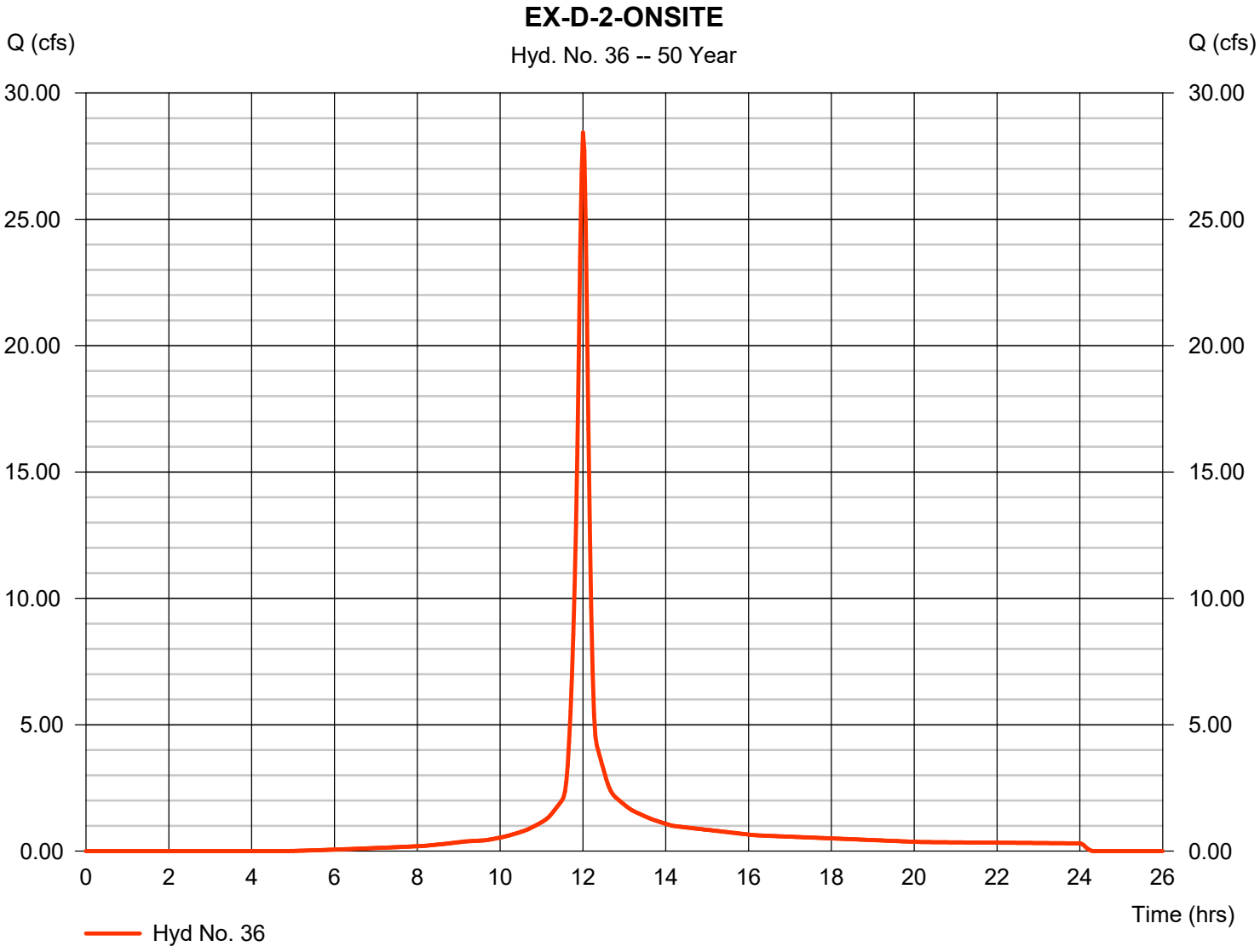


Hydrograph Report

Hyd. No. 36

EX-D-2-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	28.43 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	75,467 cuft
Drainage area	=	4.040 ac	Curve number	=	83
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.90 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

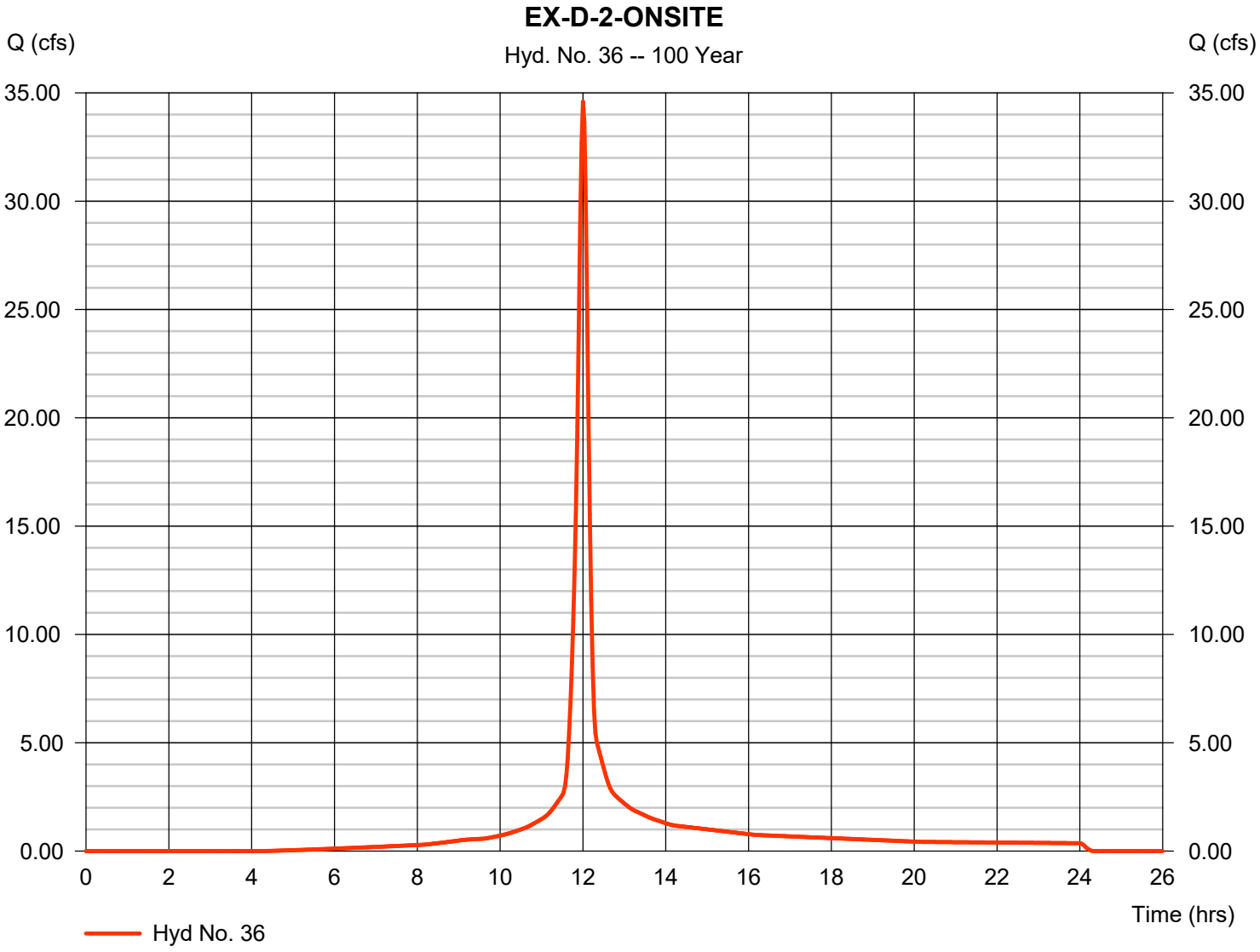


Hydrograph Report

Hyd. No. 36

EX-D-2-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	34.59 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	92,711 cuft
Drainage area	=	4.040 ac	Curve number	=	83
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.90 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



EX-D-2-OFFSITE-DISTURBED WATERSHED

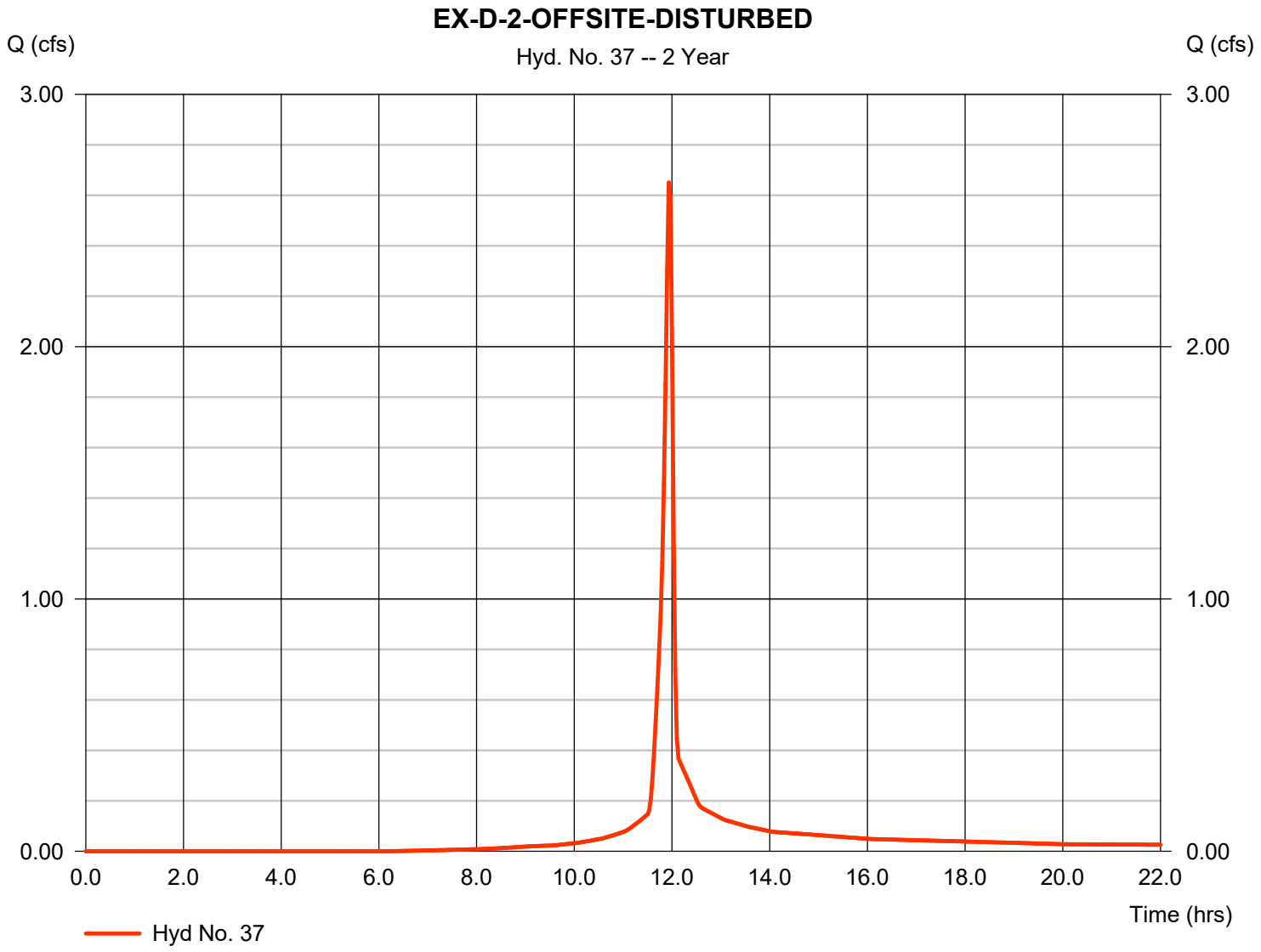
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 37

EX-D-2-OFFSITE-DISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 2.651 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 5,445 cuft
Drainage area	= 0.760 ac	Curve number	= 88
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

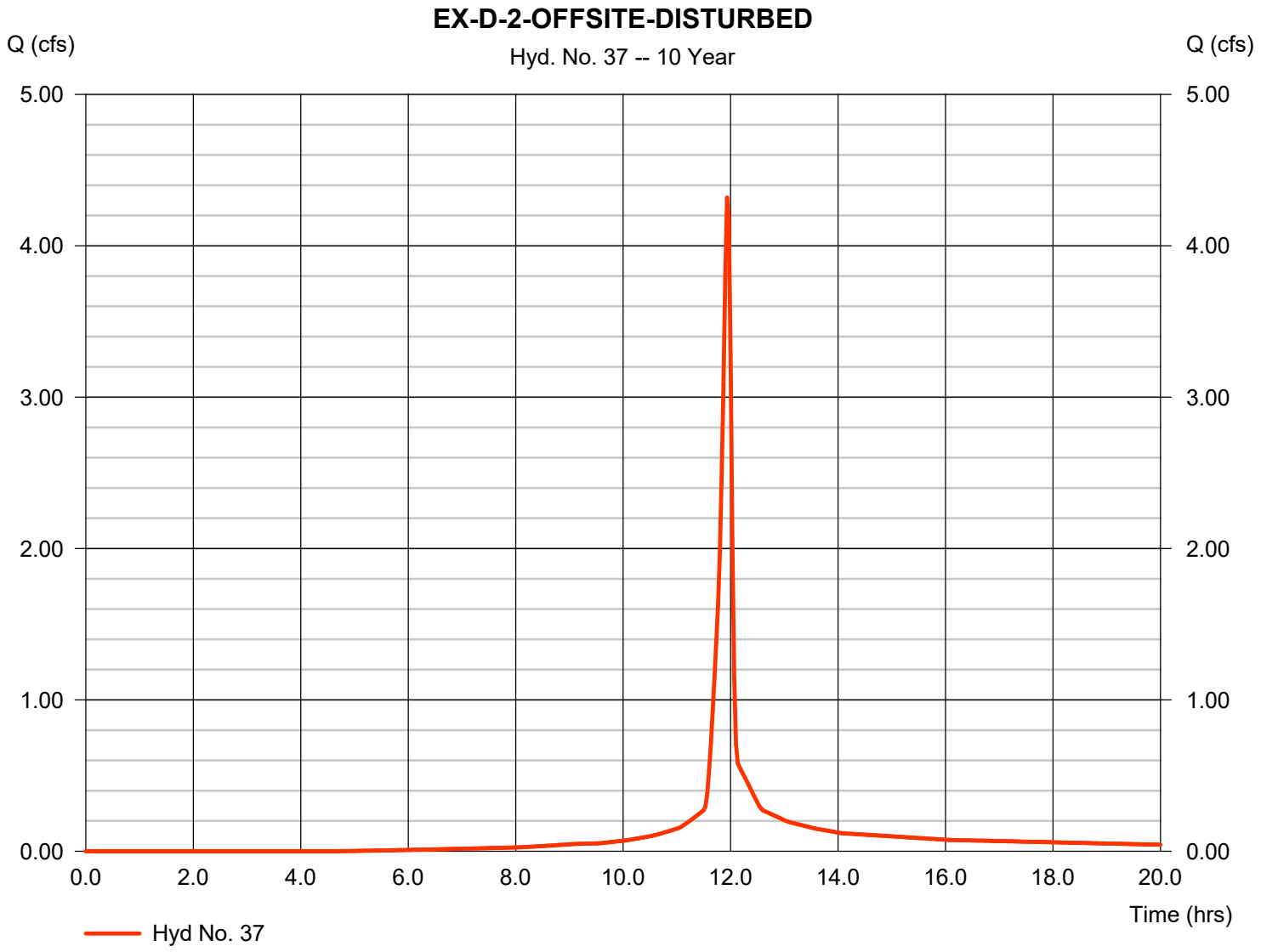


Hydrograph Report

Hyd. No. 37

EX-D-2-OFFSITE-DISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 4.318 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 9,097 cuft
Drainage area	= 0.760 ac	Curve number	= 88
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 4.84 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

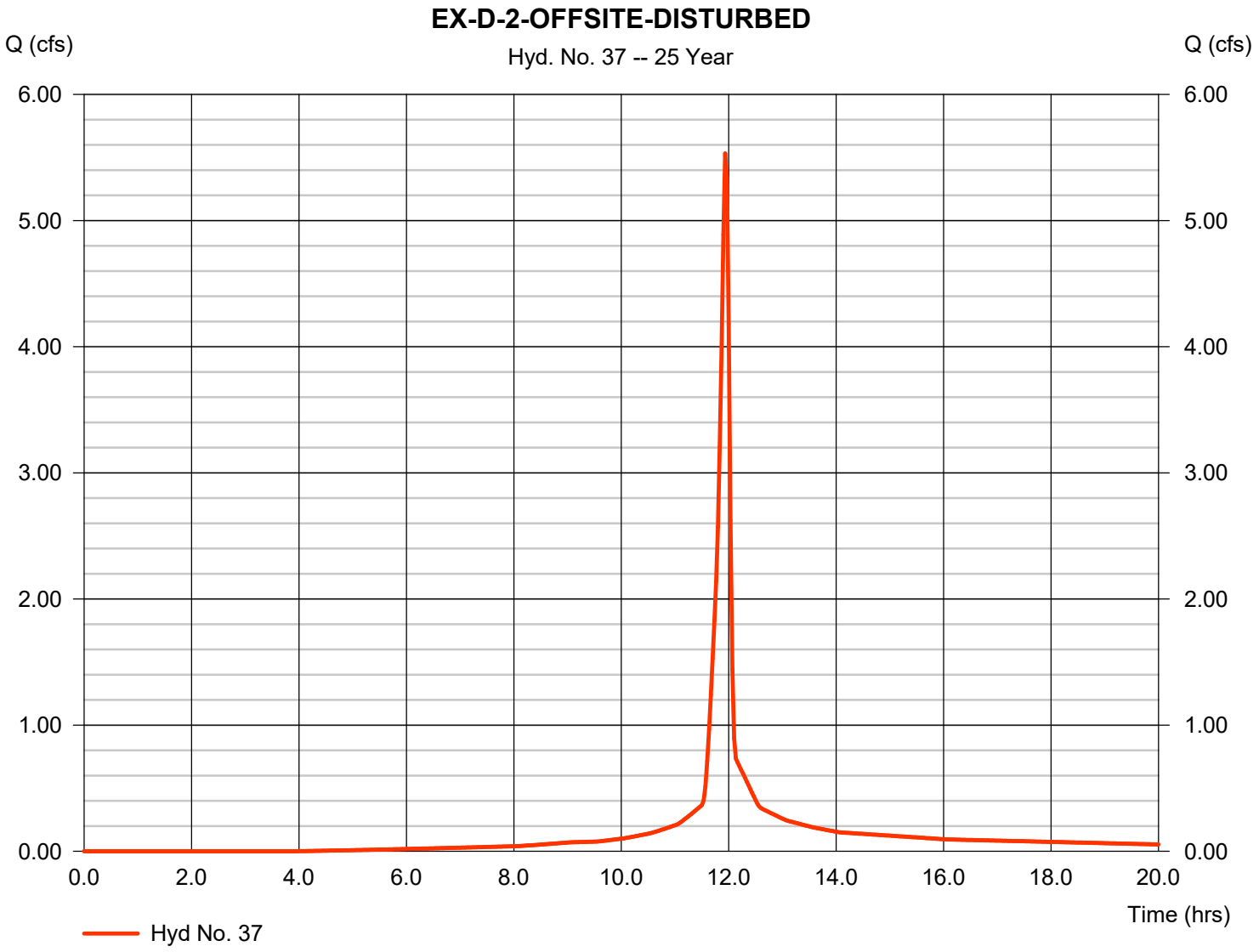


Hydrograph Report

Hyd. No. 37

EX-D-2-OFFSITE-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.532 cfs
Storm frequency	=	25 yrs	Time to peak	=	11.93 hrs
Time interval	=	2 min	Hyd. volume	=	11,840 cuft
Drainage area	=	0.760 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

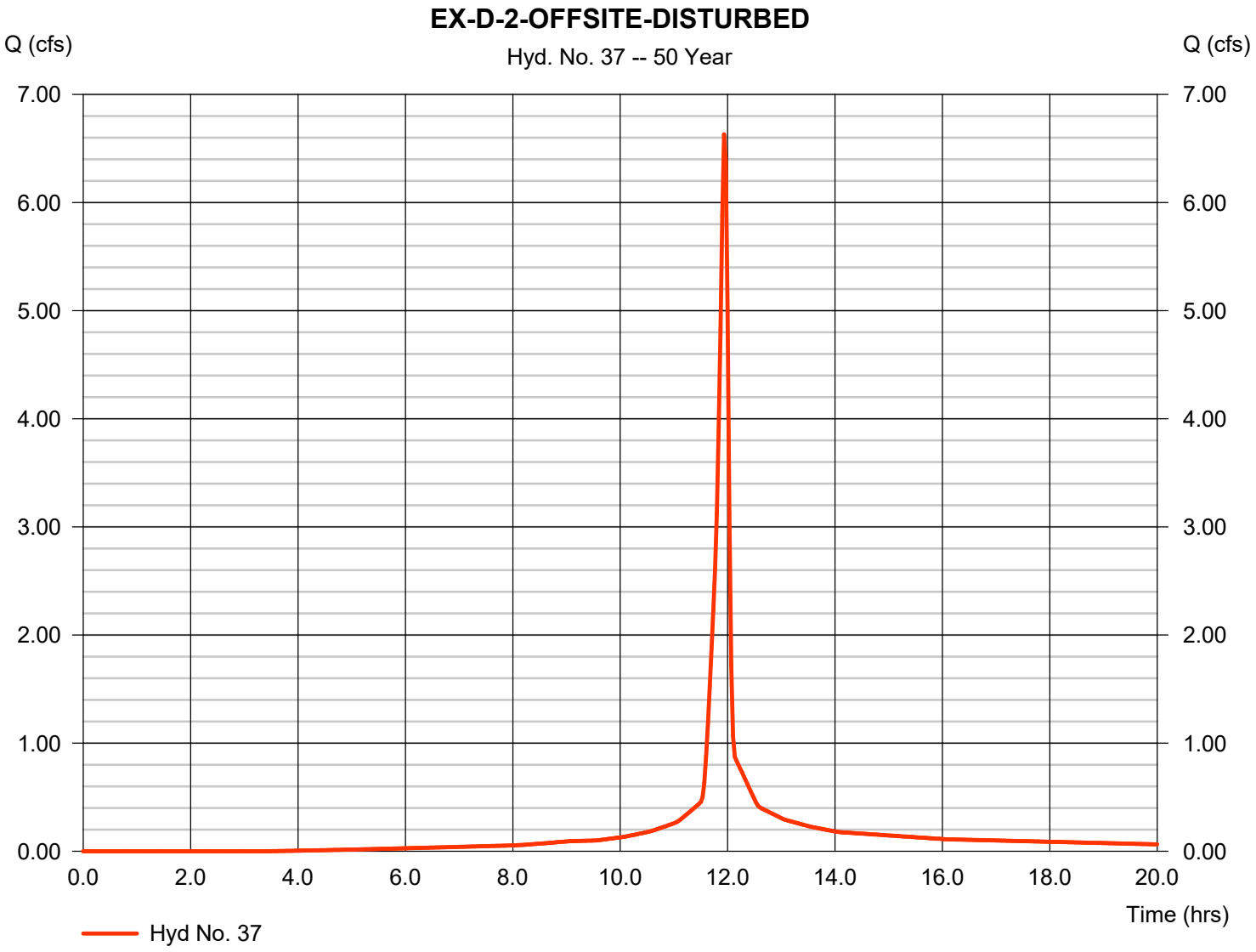


Hydrograph Report

Hyd. No. 37

EX-D-2-OFFSITE-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.630 cfs
Storm frequency	=	50 yrs	Time to peak	=	11.93 hrs
Time interval	=	2 min	Hyd. volume	=	14,366 cuft
Drainage area	=	0.760 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

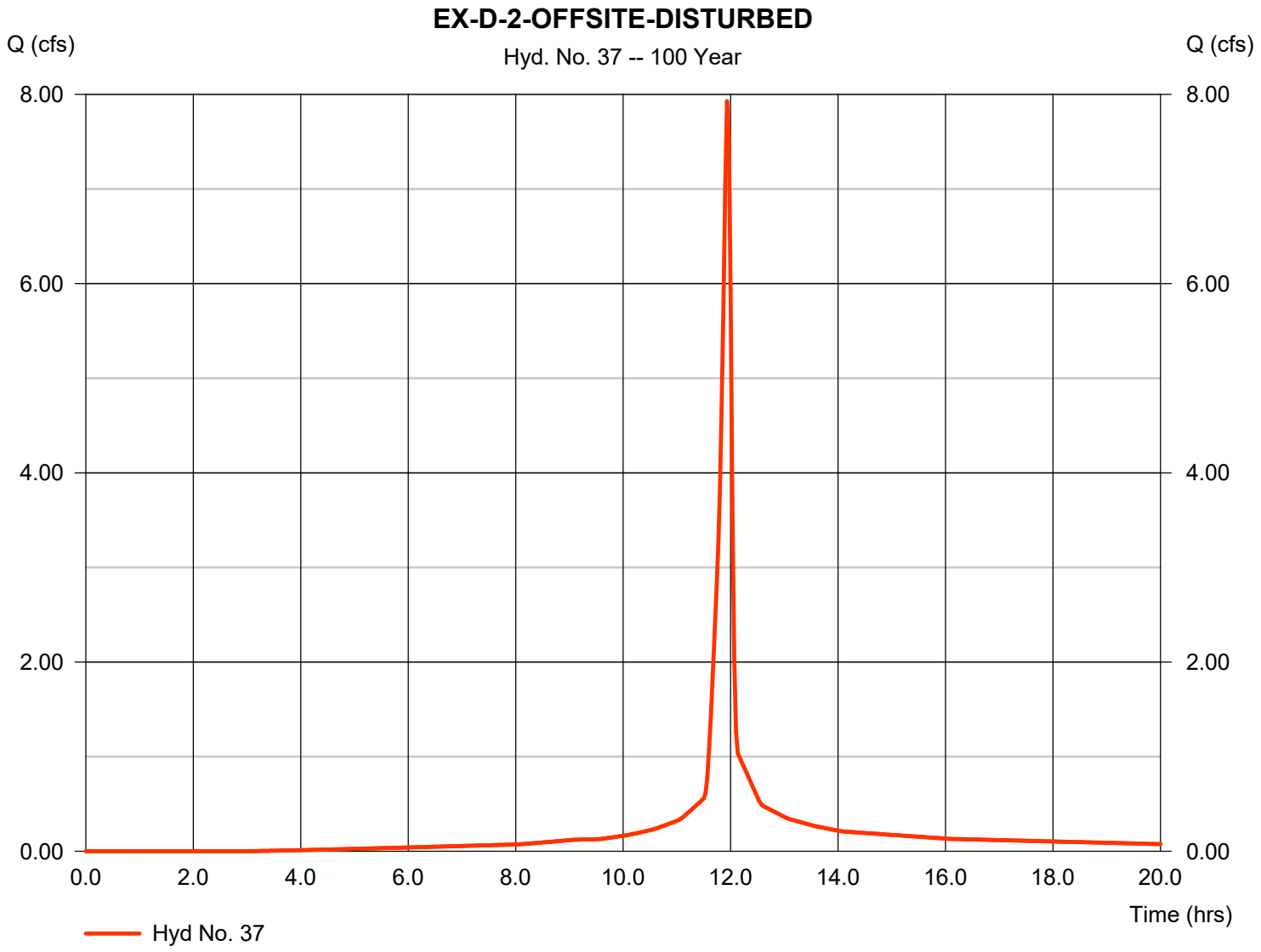


Hydrograph Report

Hyd. No. 37

EX-D-2-OFFSITE-DISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 7.928 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 17,392 cuft
Drainage area	= 0.760 ac	Curve number	= 88
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 8.16 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



EX-D-2-OFFSITE-UNDISTURBED WATERSHED

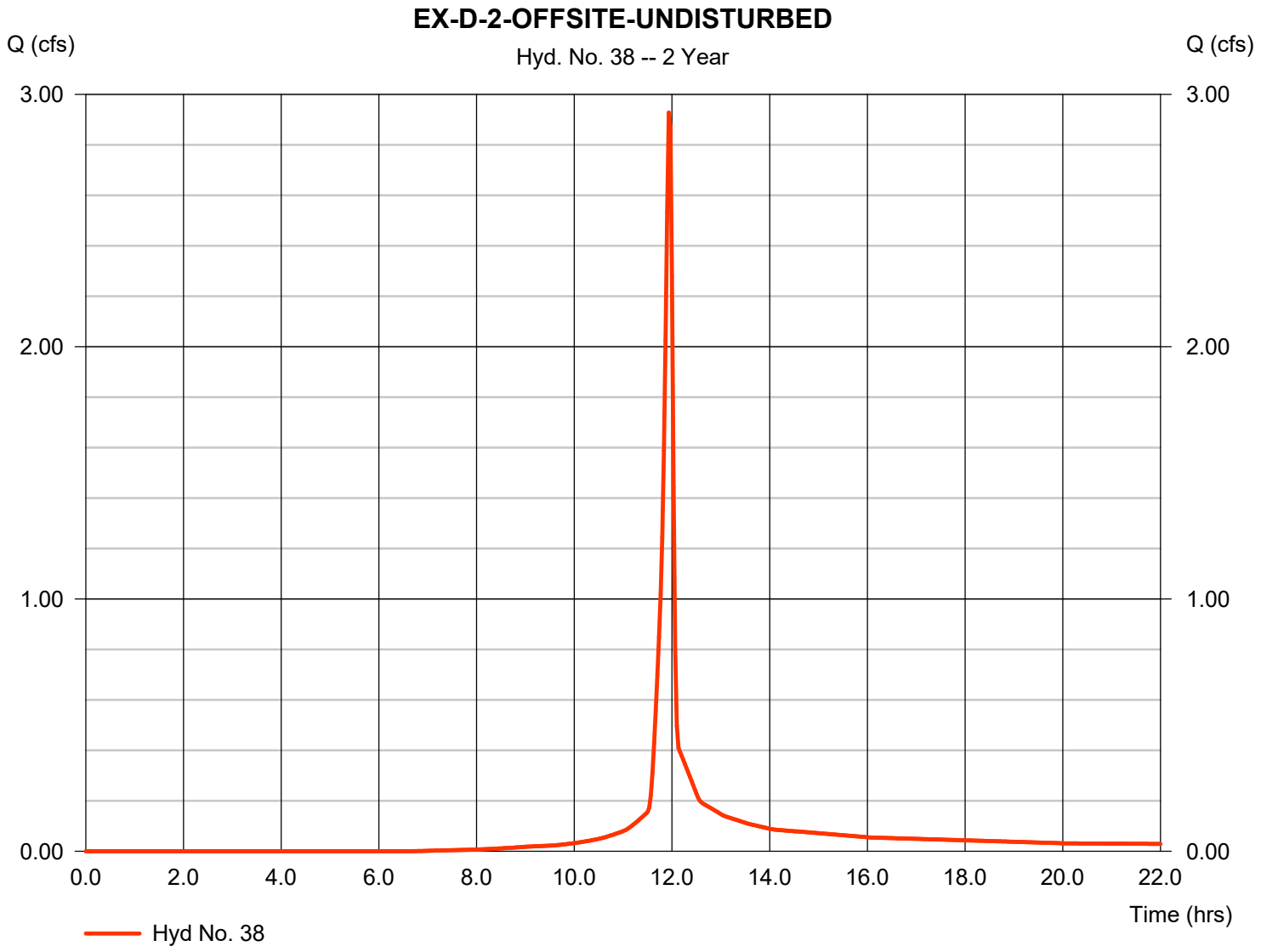
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 38

EX-D-2-OFFSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 2.928 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 5,985 cuft
Drainage area	= 0.870 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

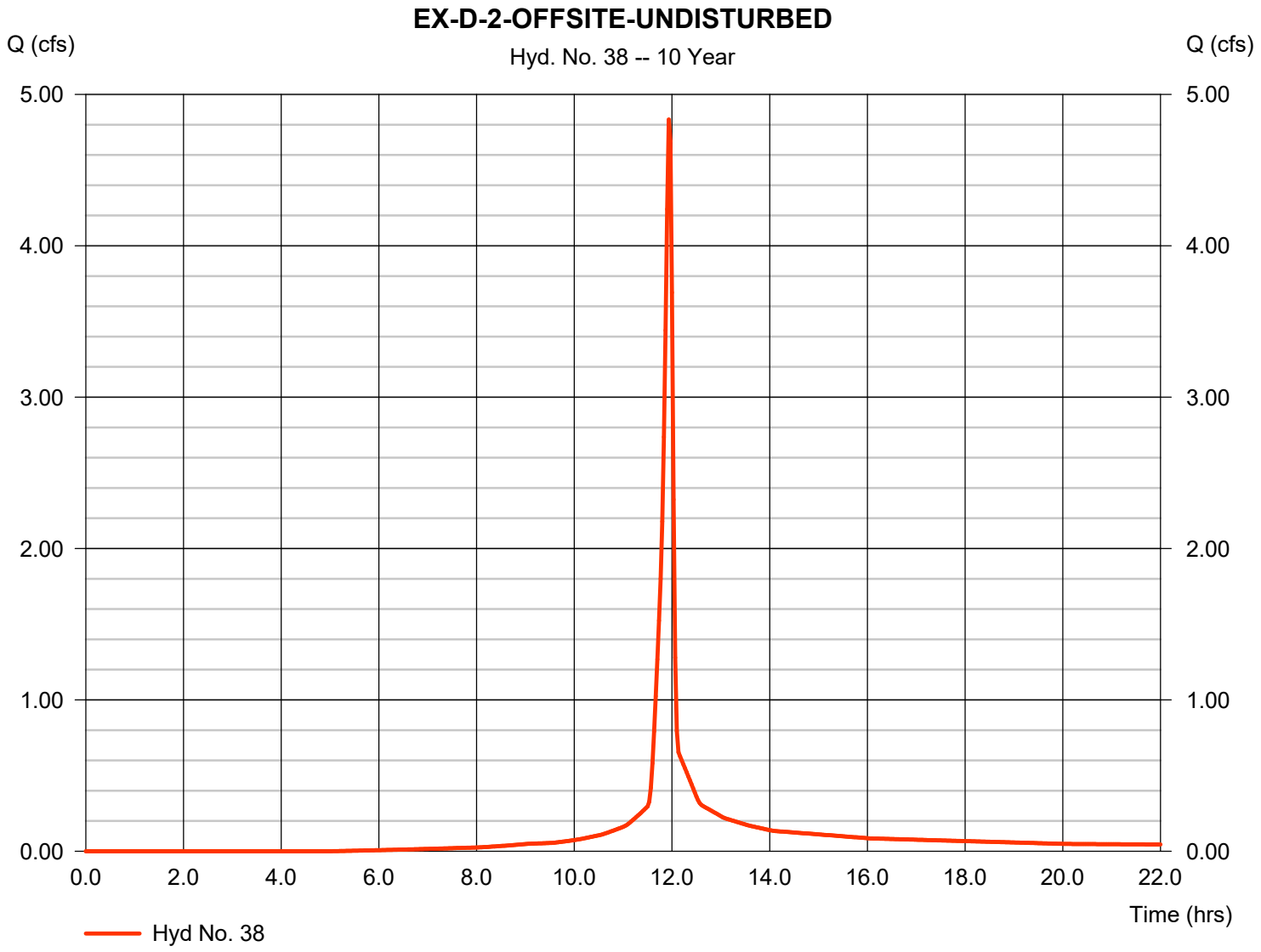


Hydrograph Report

Hyd. No. 38

EX-D-2-OFFSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 4.834 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 10,116 cuft
Drainage area	= 0.870 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 4.84 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

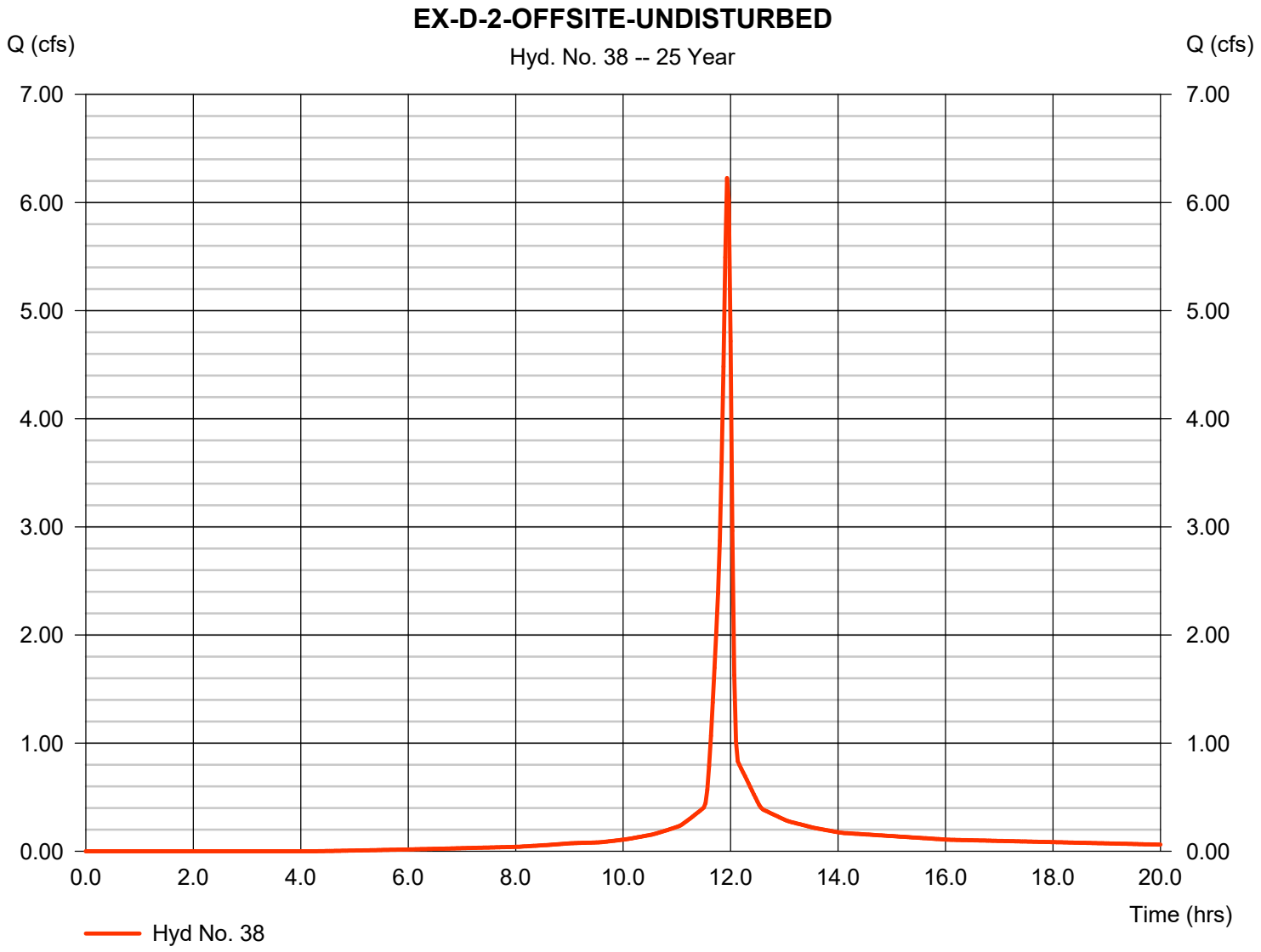


Hydrograph Report

Hyd. No. 38

EX-D-2-OFFSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 6.227 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 13,233 cuft
Drainage area	= 0.870 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 5.95 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

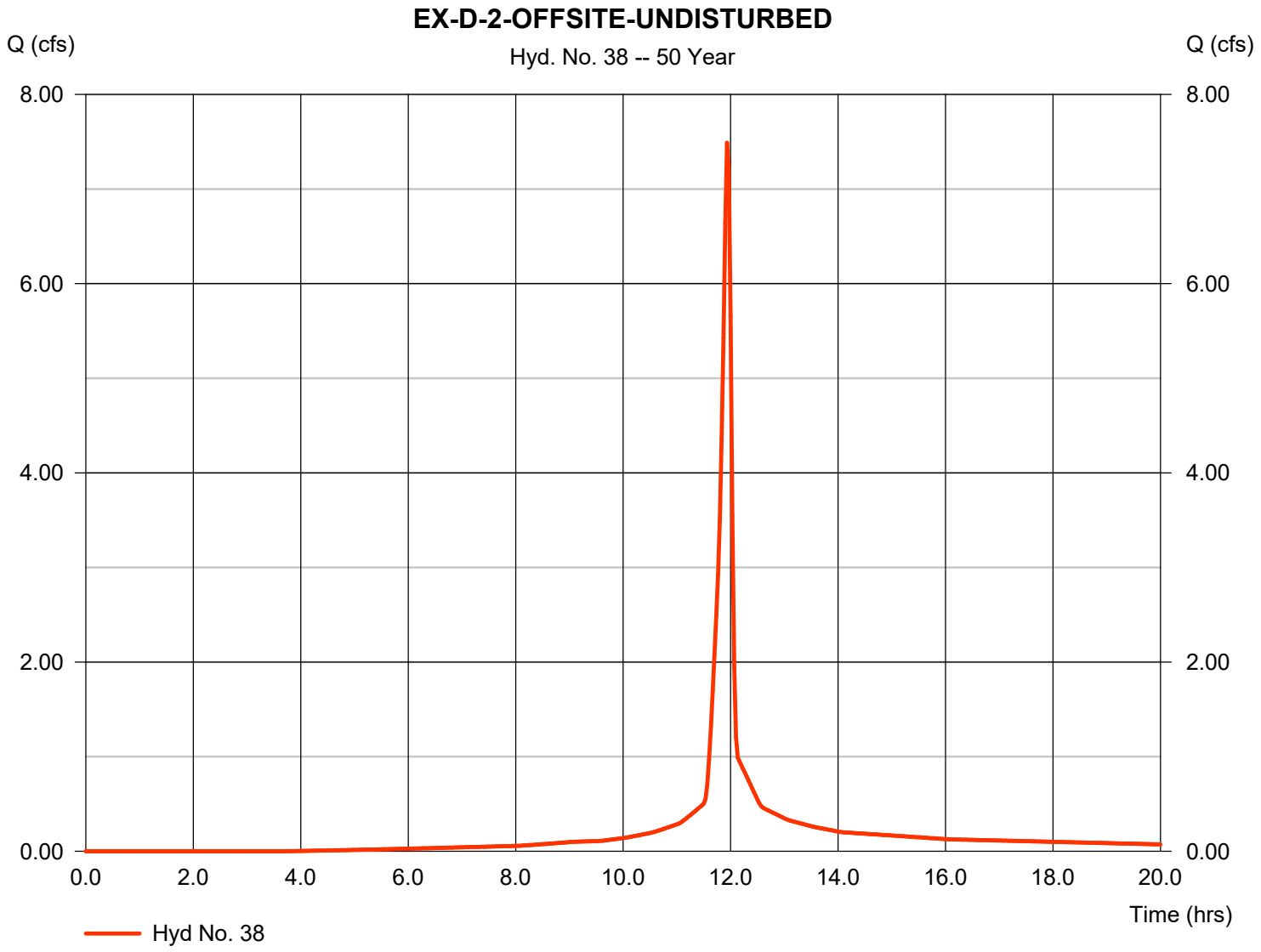


Hydrograph Report

Hyd. No. 38

EX-D-2-OFFSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 7.488 cfs
Storm frequency	= 50 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 16,108 cuft
Drainage area	= 0.870 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 6.96 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

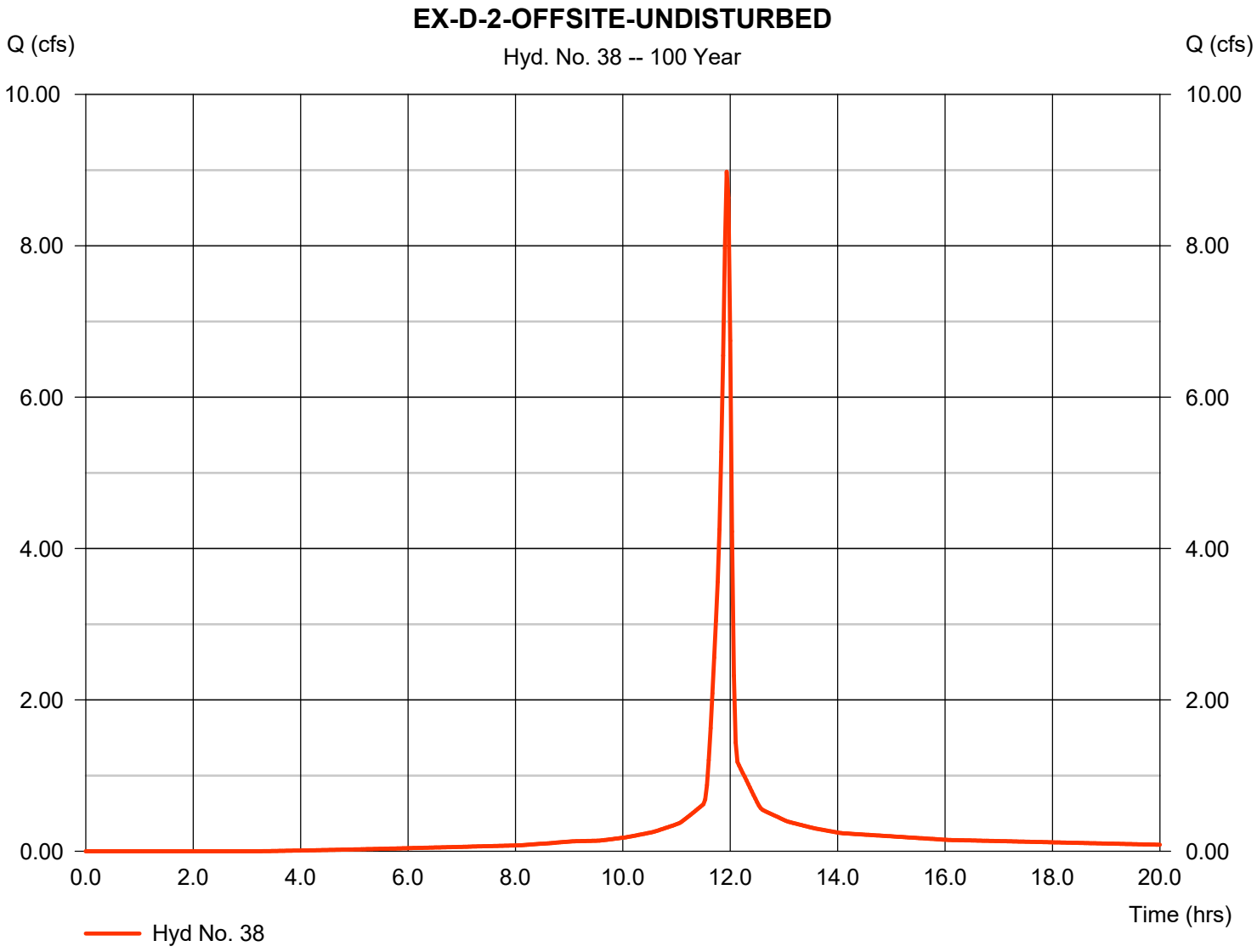


Hydrograph Report

Hyd. No. 38

EX-D-2-OFFSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 8.978 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 19,557 cuft
Drainage area	= 0.870 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 8.16 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



TOTAL EXISTING FLOW TO POA-D-1

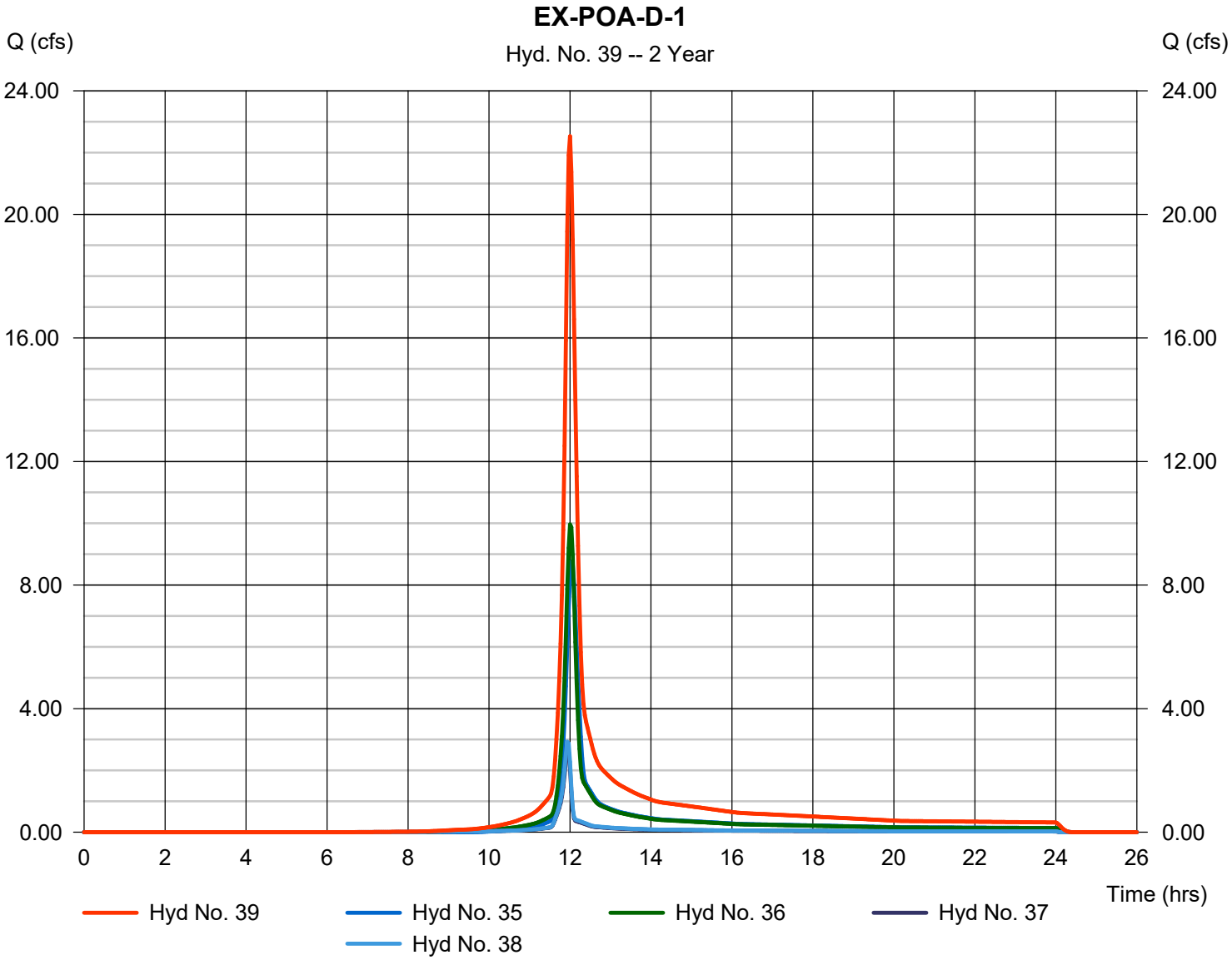
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 39

EX-POA-D-1

Hydrograph type	= Combine	Peak discharge	= 22.53 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 62,070 cuft
Inflow hyds.	= 35, 36, 37, 38	Contrib. drain. area	= 10.580 ac

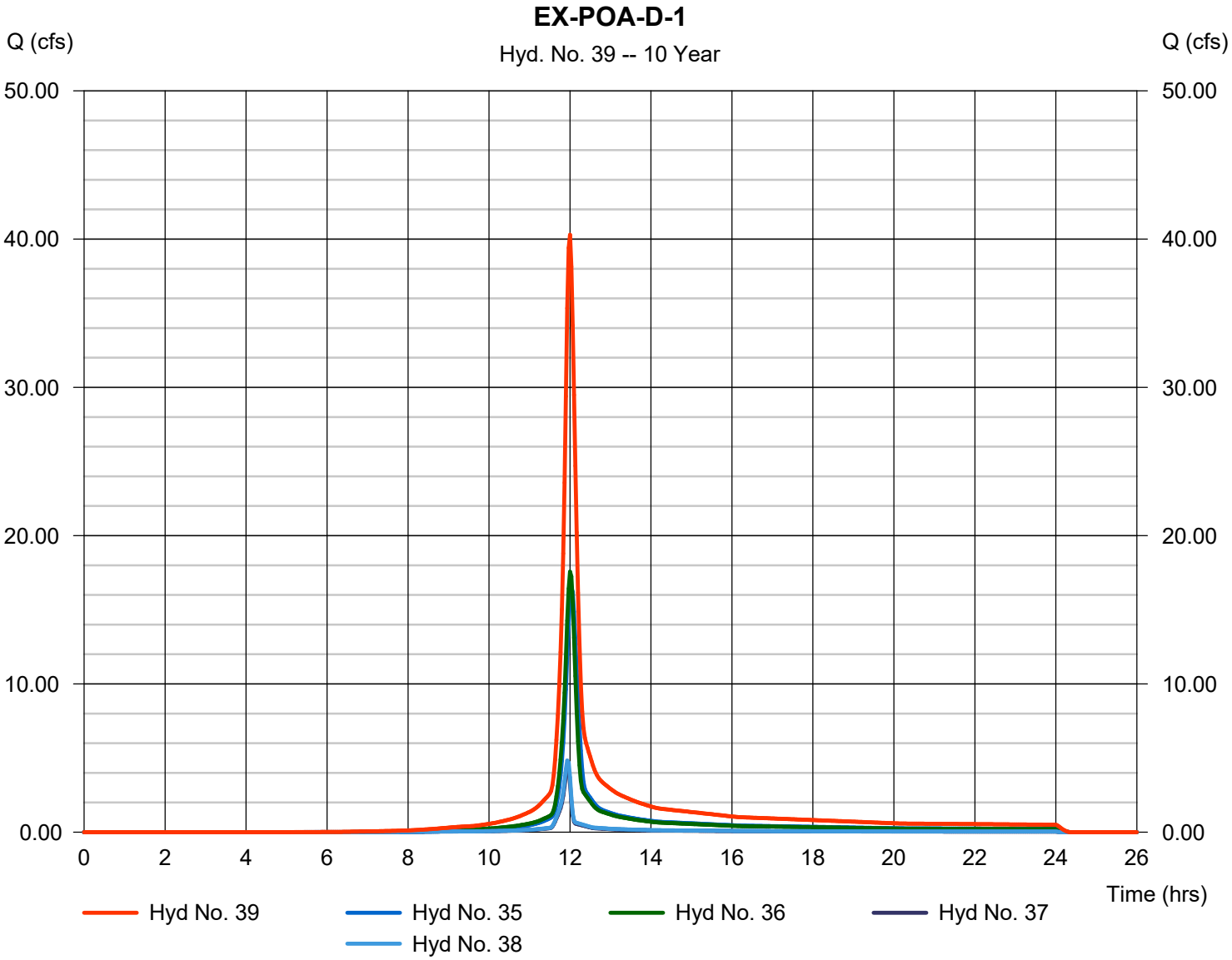


Hydrograph Report

Hyd. No. 39

EX-POA-D-1

Hydrograph type	=	Combine	Peak discharge	=	40.29 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	111,334 cuft
Inflow hyds.	=	35, 36, 37, 38	Contrib. drain. area	=	10.580 ac

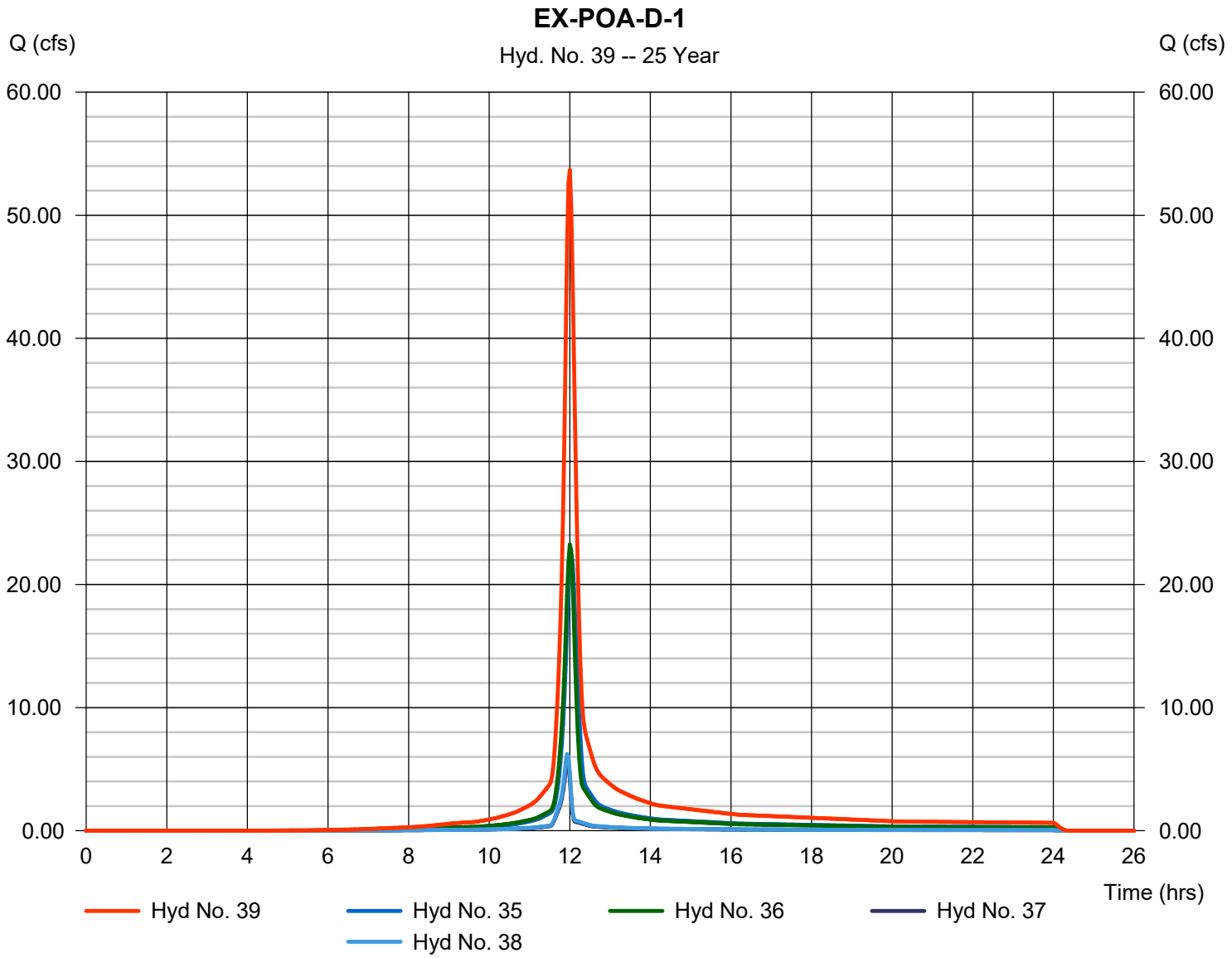


Hydrograph Report

Hyd. No. 39

EX-POA-D-1

Hydrograph type	=	Combine	Peak discharge	=	53.67 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	149,415 cuft
Inflow hyds.	=	35, 36, 37, 38	Contrib. drain. area	=	10.580 ac

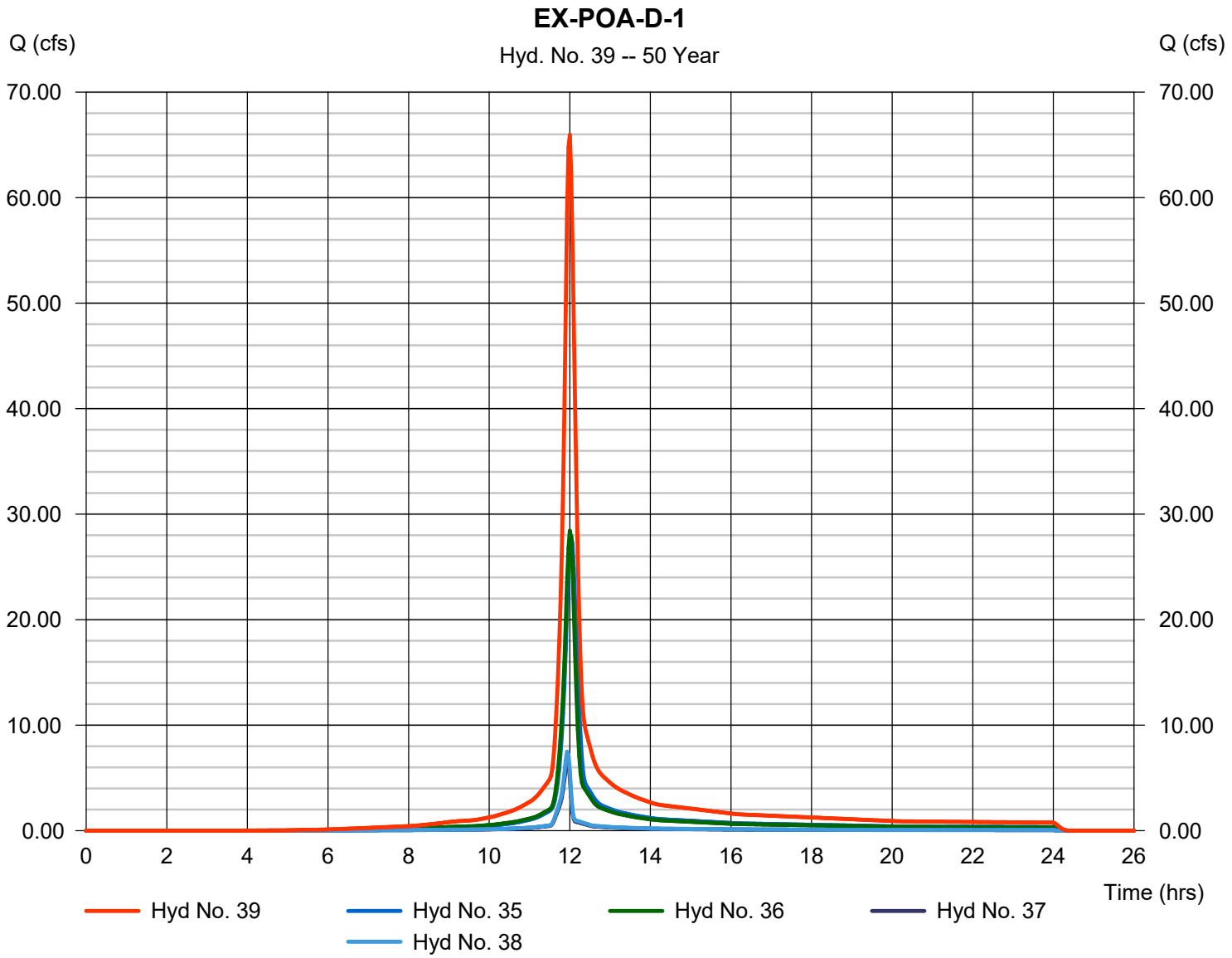


Hydrograph Report

Hyd. No. 39

EX-POA-D-1

Hydrograph type	=	Combine	Peak discharge	=	65.95 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	184,972 cuft
Inflow hyds.	=	35, 36, 37, 38	Contrib. drain. area	=	10.580 ac

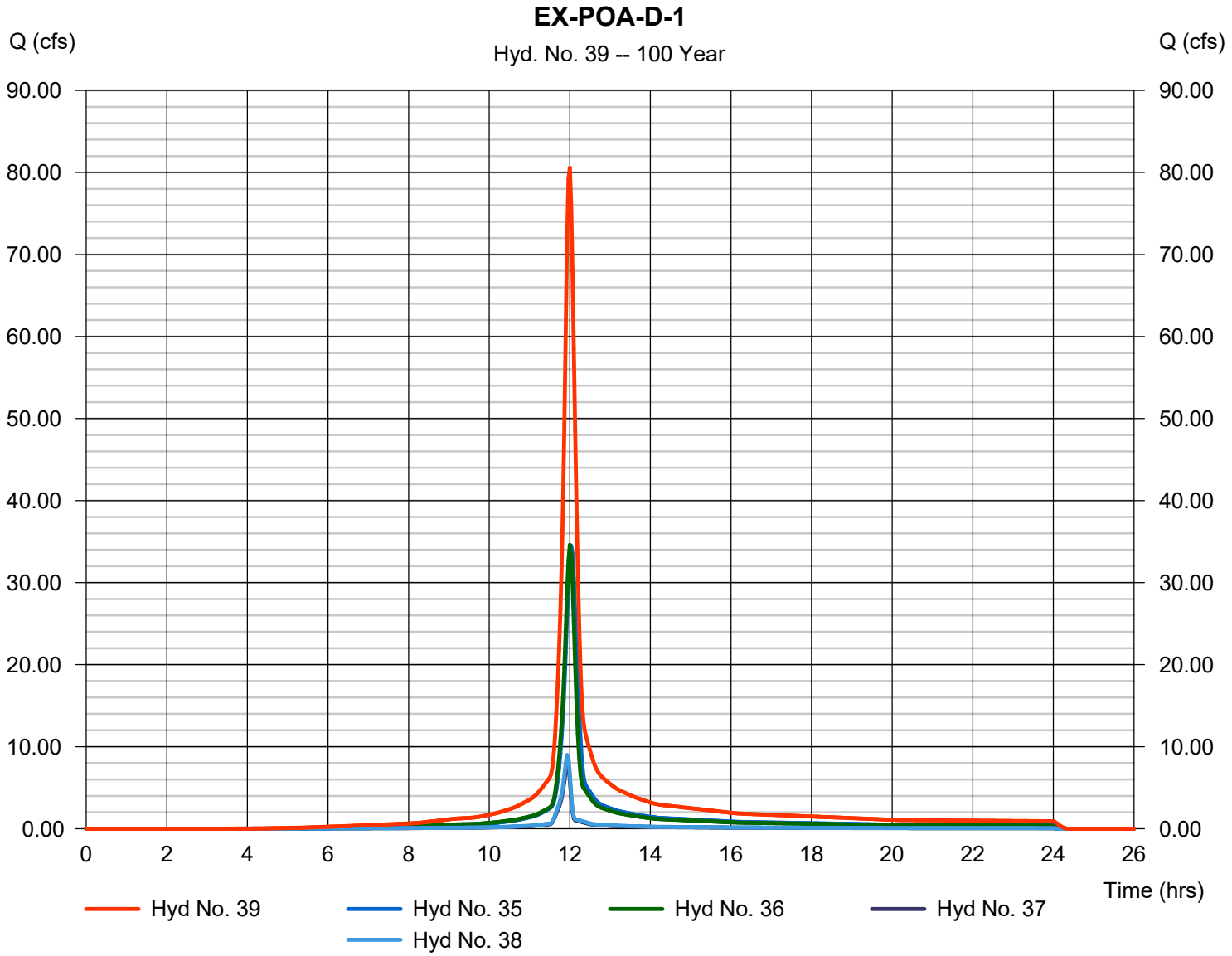


Hydrograph Report

Hyd. No. 39

EX-POA-D-1

Hydrograph type	=	Combine	Peak discharge	=	80.57 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	227,968 cuft
Inflow hyds.	=	35, 36, 37, 38	Contrib. drain. area	=	10.580 ac



EX-D-3-OFFSITE WATERSHED

TR-55 TIME OF CONCENTRATION (Tc) OR TRAVEL TIME (Tt) CALCULATIONS

Project: Smithfield Gateway Phase 1A-1 **By:** MJV **Date:** 12/11/2020
Location: Smithfield Township, Monroe County, PA **Checked:** TH **Date:** 12/11/2020
Watershed: EX-D-3-OFFSITE

Sheet Flow (Applicable to Tc only)														
1	Surface Description (table 3-1)		Grass		Grass									
2	Manning's roughness coeff., n (table 3-1)		0.240		0.240									
3	Flow length, L (total L<100 ft)	**ft**	25		20									
4	Two-yr 24-hr rainfall, P2	**in**	3.32		3.32									
5	Land Slope, s	**ft/ft**	0.1600		0.3300									
6	$Tt = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5}(s)^{.04}}$	**Compute Tt, hr**	0.0335	+	0.0210	+		+		+		+		
													0.0545	hr
Shallow Concentrated Flow														
7	Surface Description (Paved or Unpaved)		Unpaved		Unpaved		Unpaved							
8	Flow length, L	**ft**	200		207		150							
9	Watercourse slope, s	**ft/ft**	0.0800		0.0480		0.0100							
10	Average Velocity, V (figure 3-1)	**ft/sec**	4.56		3.53		1.61							
11	Tt = L / (3600V)	**Compute Tt , hr**	0.0122	+	0.0163	+	0.0258	+		+		+		
													0.0543	hr
Channel / Pipe Flow														
12	Cross Sectional flow area, a	**ft^2**	7.95											
13	Wetted Perimeter, p_w	**ft**	7.10											
14	Hydraulic radius, $r = a/p_w$	**ft**	1.12											
15	Channel slope, s	**ft/ft**	0.0080											
16	Manning's roughness coeff., n (table 3-1)		0.0130											
17	$V = (1.49 * r^{2/3} * s^{1/2})/n$	**ft/s**	11.05											
18	Flow length, L	**ft**	78											
19	Tt = L / (3600V)	**Compute Tt , hr**	0.0020	+		+		+		+		+		
													0.0020	hr
20	**Watershed or subarea Tc or Tt (add Tt in steps 6,11, and 19)**												0.11	hr
													6.6	**min**

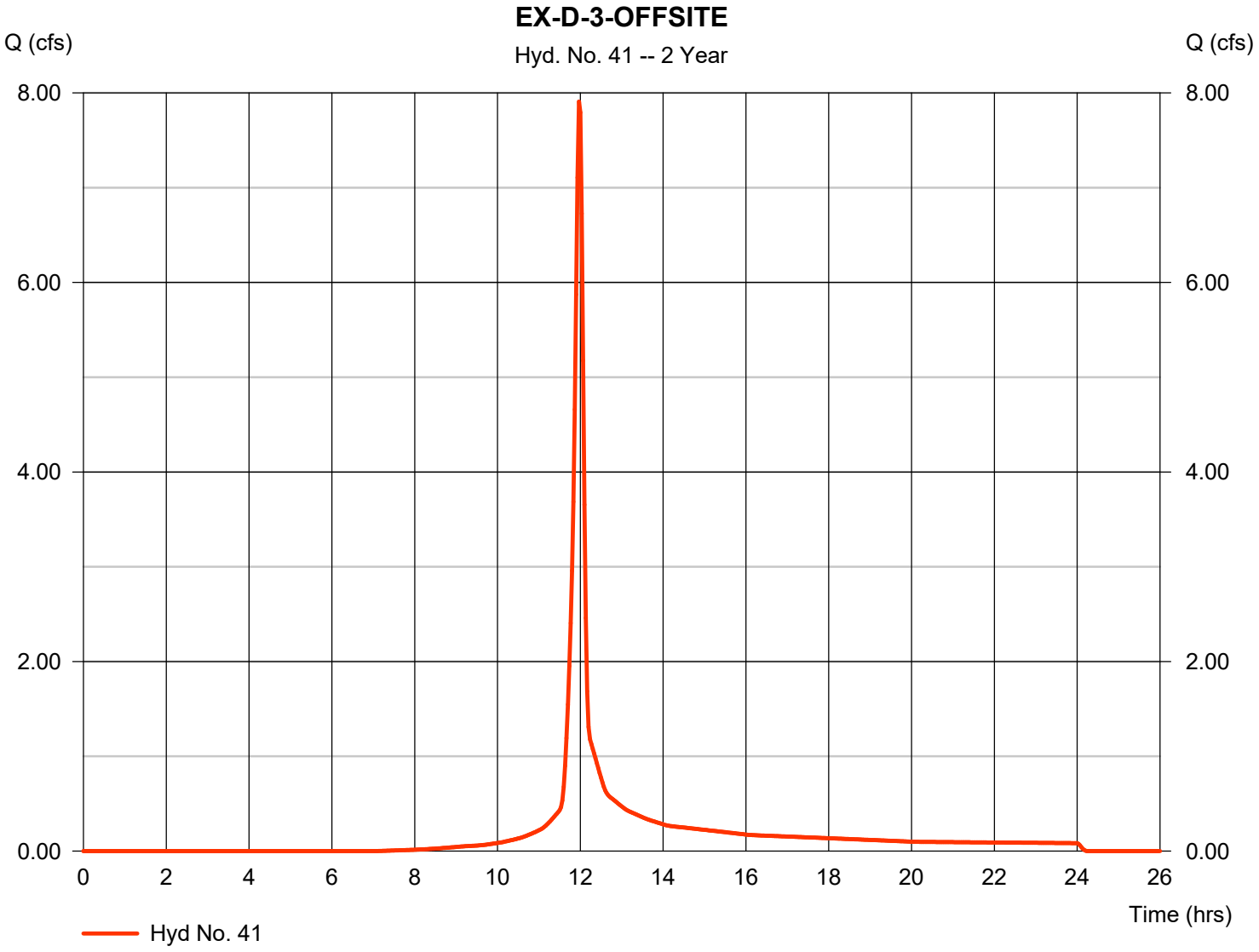
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 41

EX-D-3-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.907 cfs
Storm frequency	=	2 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	18,167 cuft
Drainage area	=	2.580 ac	Curve number	=	86
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.60 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

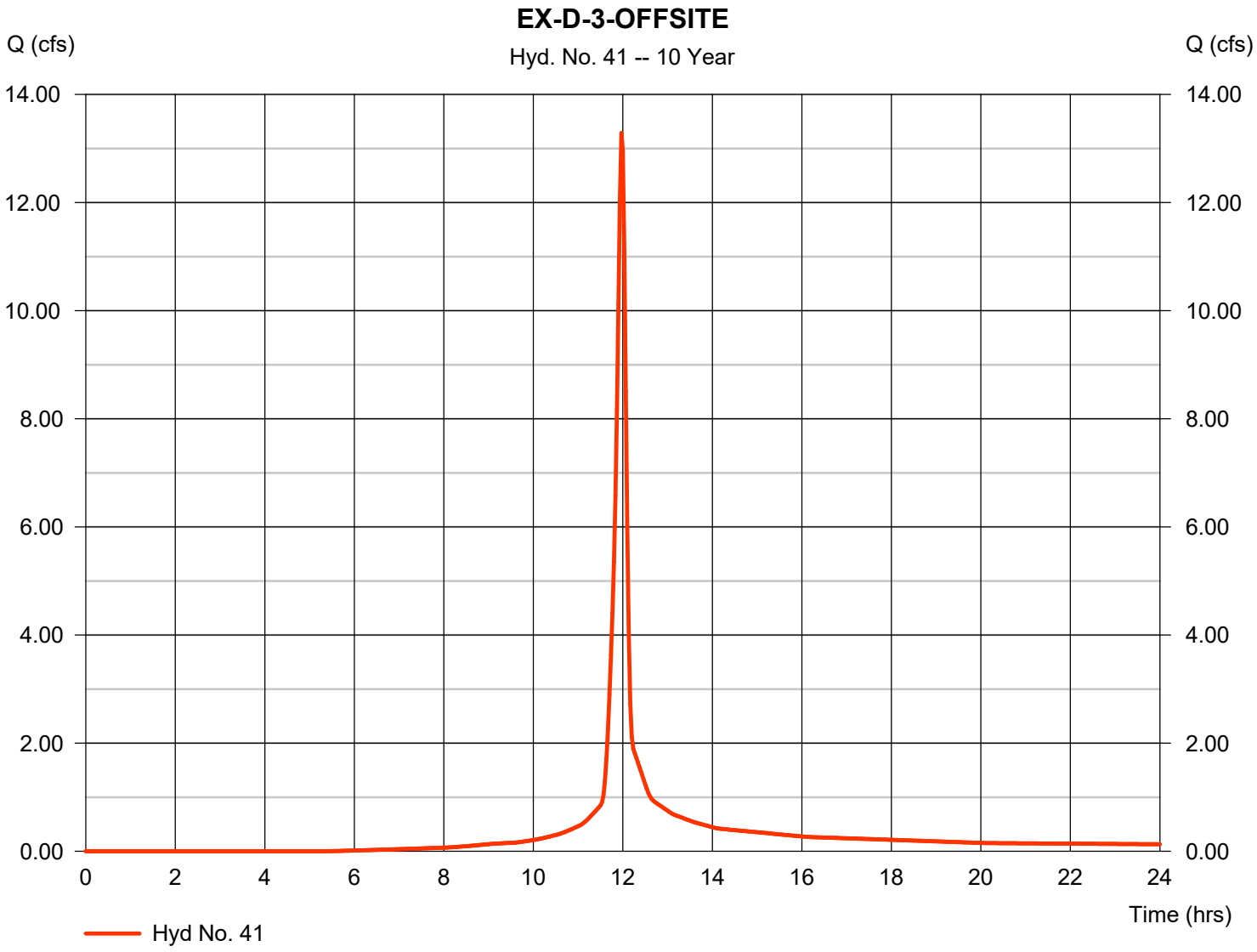


Hydrograph Report

Hyd. No. 41

EX-D-3-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	13.29 cfs
Storm frequency	=	10 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	31,074 cuft
Drainage area	=	2.580 ac	Curve number	=	86
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.60 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

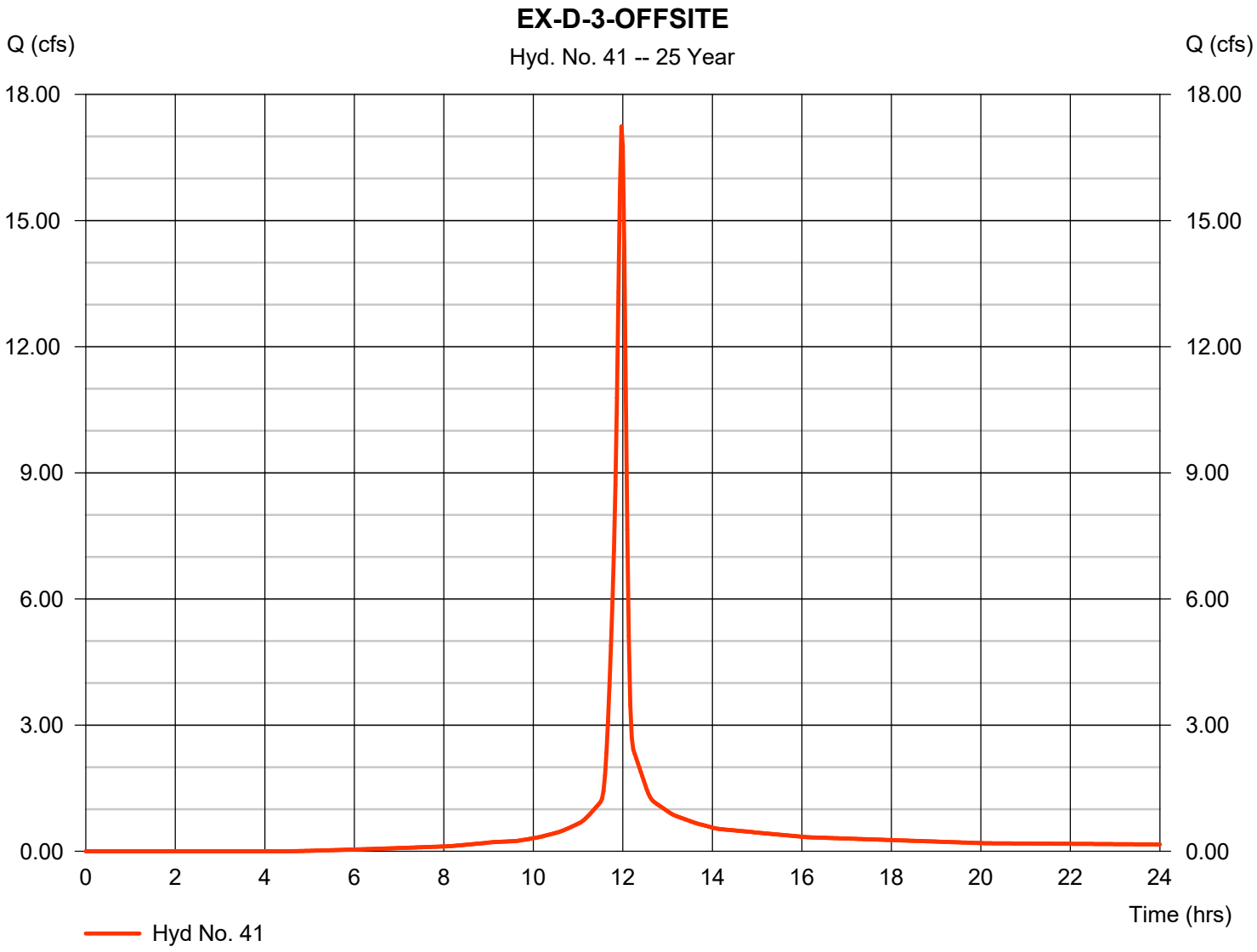


Hydrograph Report

Hyd. No. 41

EX-D-3-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	17.24 cfs
Storm frequency	=	25 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	40,851 cuft
Drainage area	=	2.580 ac	Curve number	=	86
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.60 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

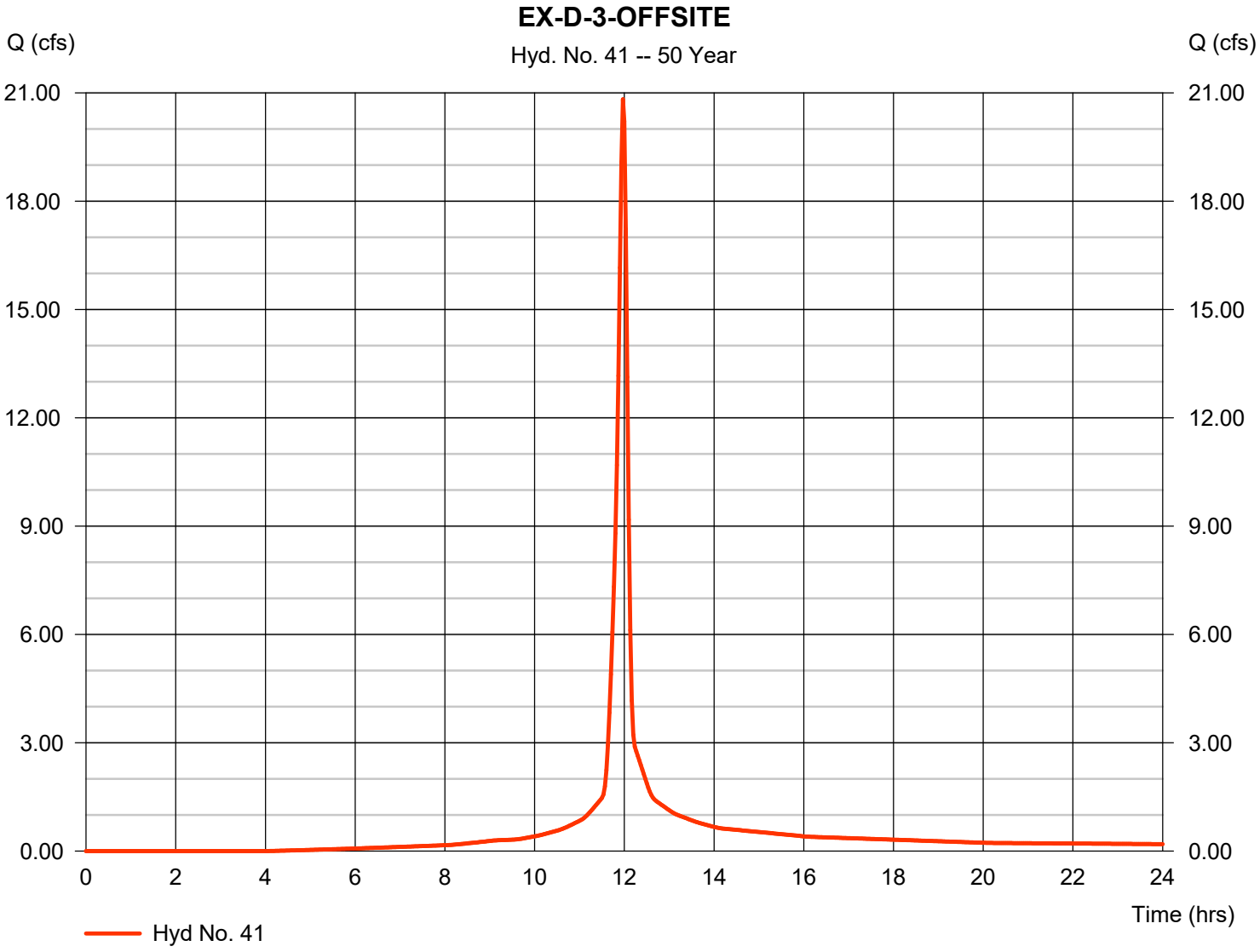


Hydrograph Report

Hyd. No. 41

EX-D-3-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	20.82 cfs
Storm frequency	=	50 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	49,892 cuft
Drainage area	=	2.580 ac	Curve number	=	86
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.60 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

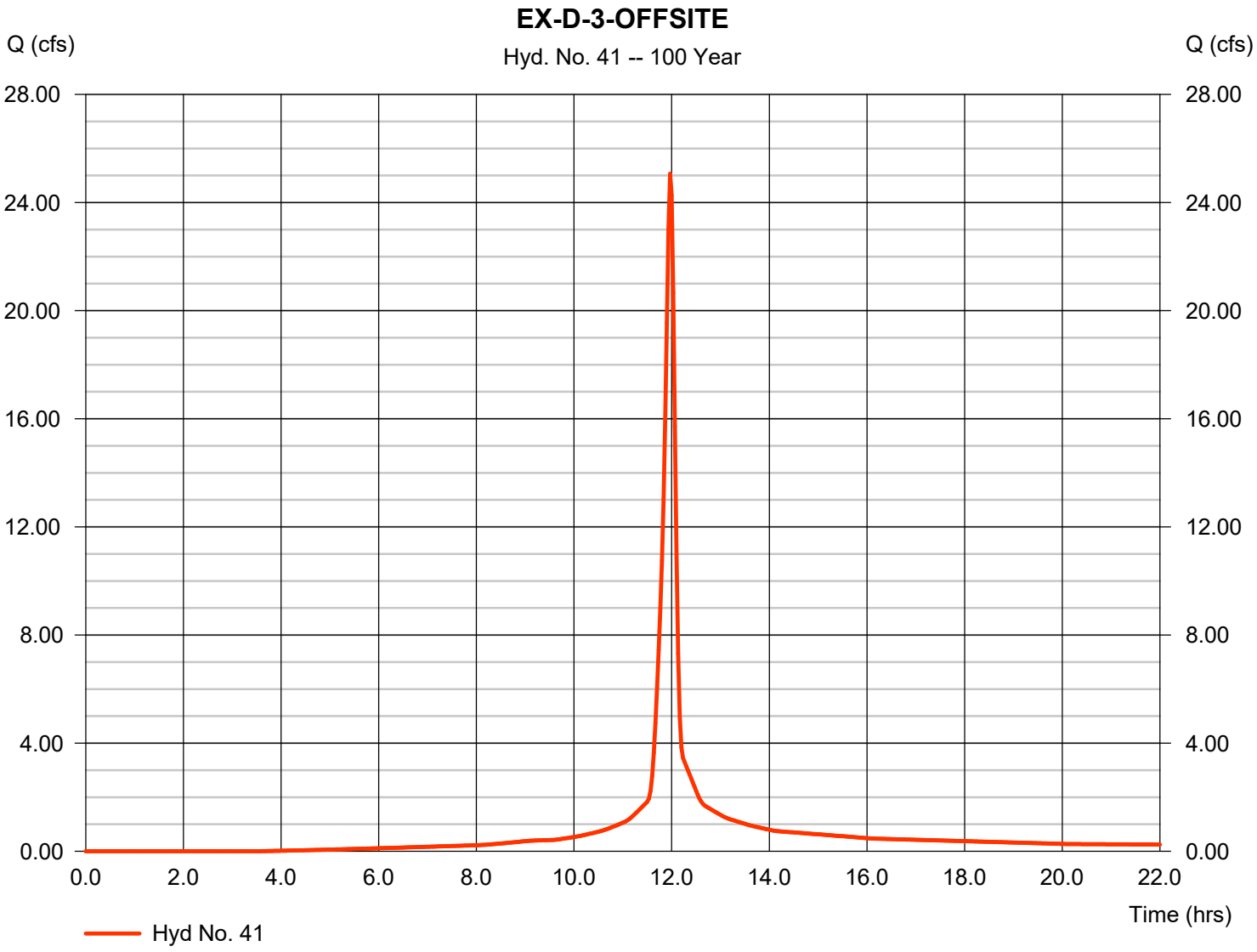


Hydrograph Report

Hyd. No. 41

EX-D-3-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	25.06 cfs
Storm frequency	=	100 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	60,749 cuft
Drainage area	=	2.580 ac	Curve number	=	86
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.60 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



TOTAL EXISTING FLOW TO POA-D

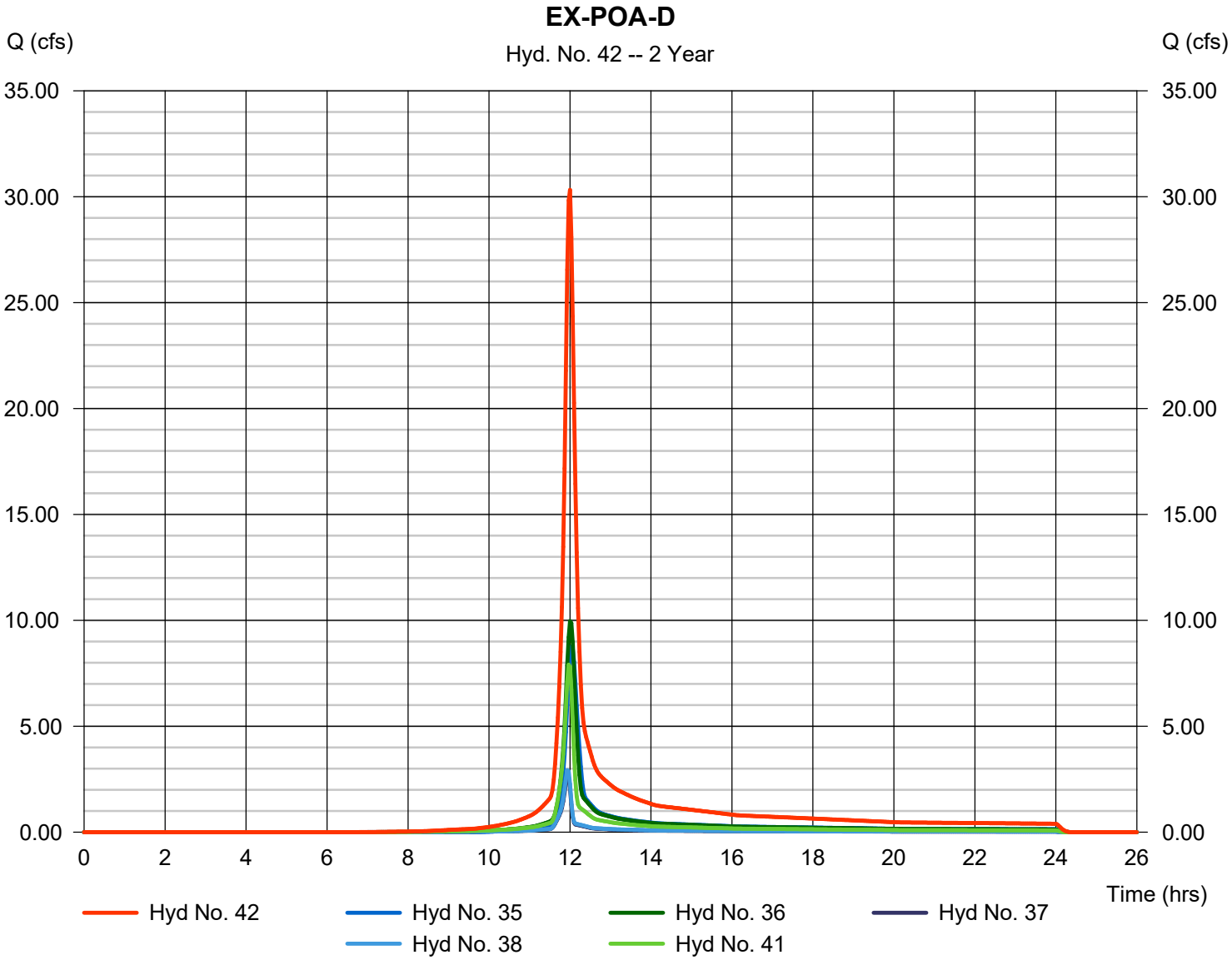
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 42

EX-POA-D

Hydrograph type	=	Combine	Peak discharge	=	30.32 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	80,237 cuft
Inflow hyds.	=	35, 36, 37, 38, 41	Contrib. drain. area	=	13.160 ac

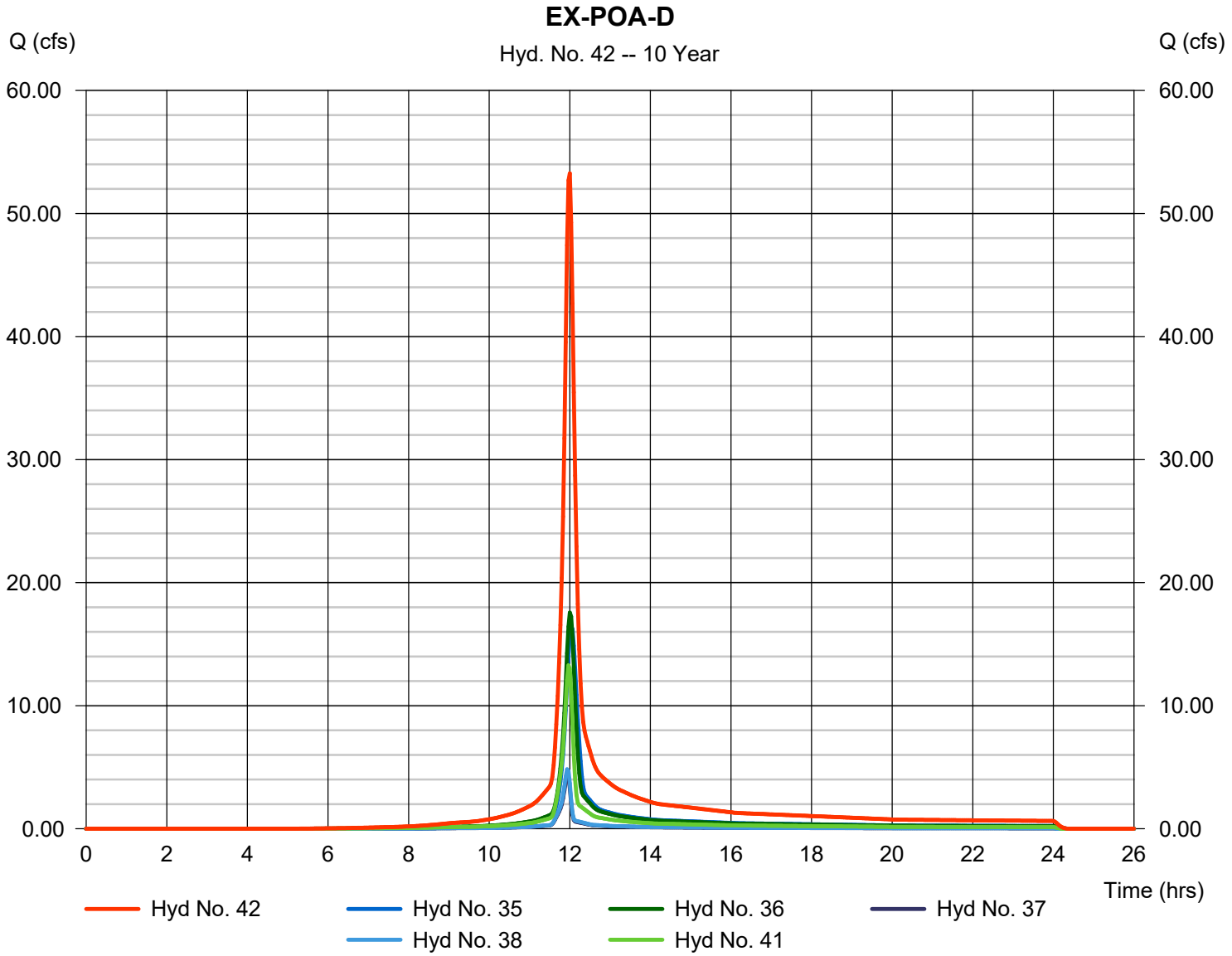


Hydrograph Report

Hyd. No. 42

EX-POA-D

Hydrograph type	=	Combine	Peak discharge	=	53.26 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	142,408 cuft
Inflow hyds.	=	35, 36, 37, 38, 41	Contrib. drain. area	=	13.160 ac

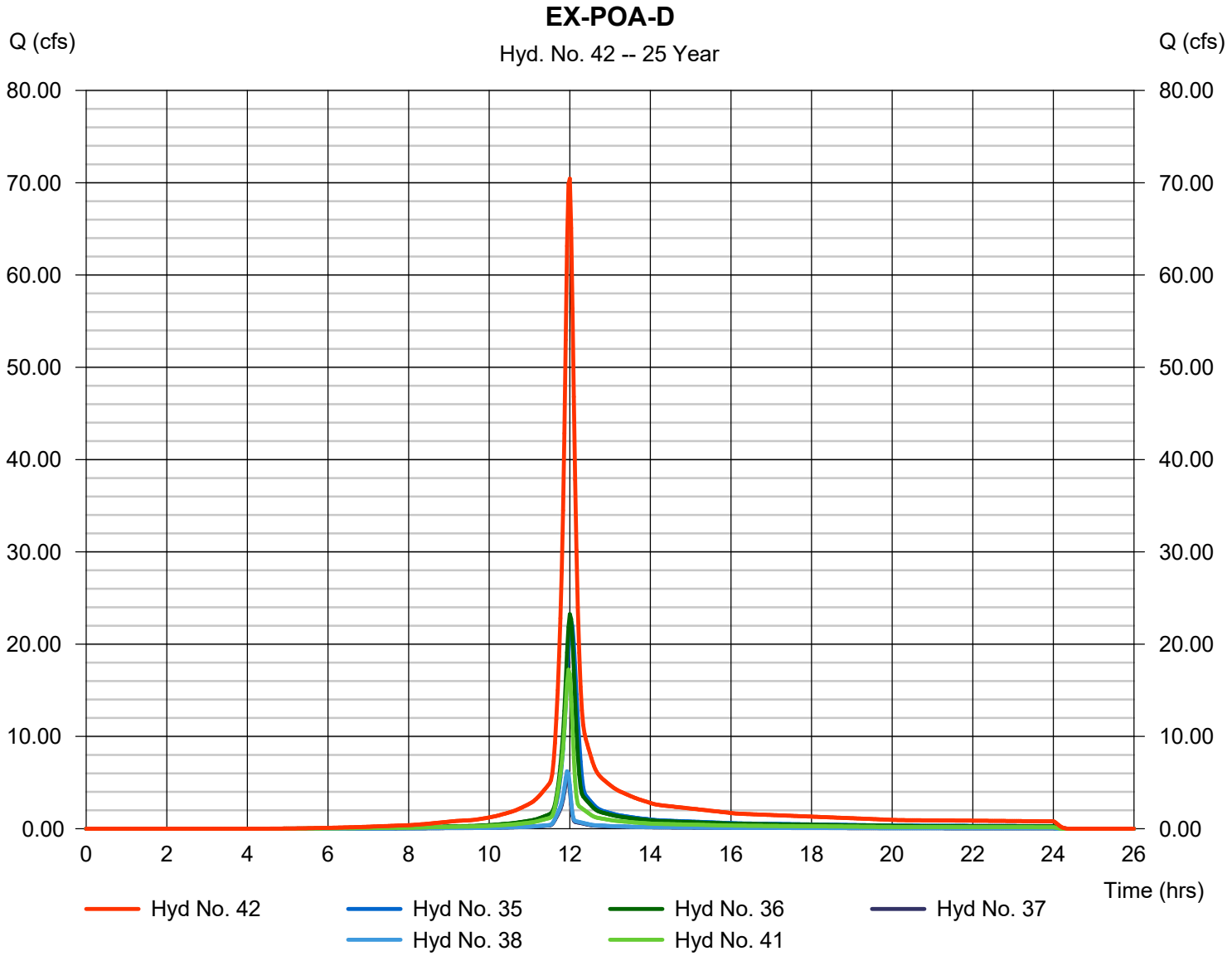


Hydrograph Report

Hyd. No. 42

EX-POA-D

Hydrograph type	=	Combine	Peak discharge	=	70.44 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	190,266 cuft
Inflow hyds.	=	35, 36, 37, 38, 41	Contrib. drain. area	=	13.160 ac

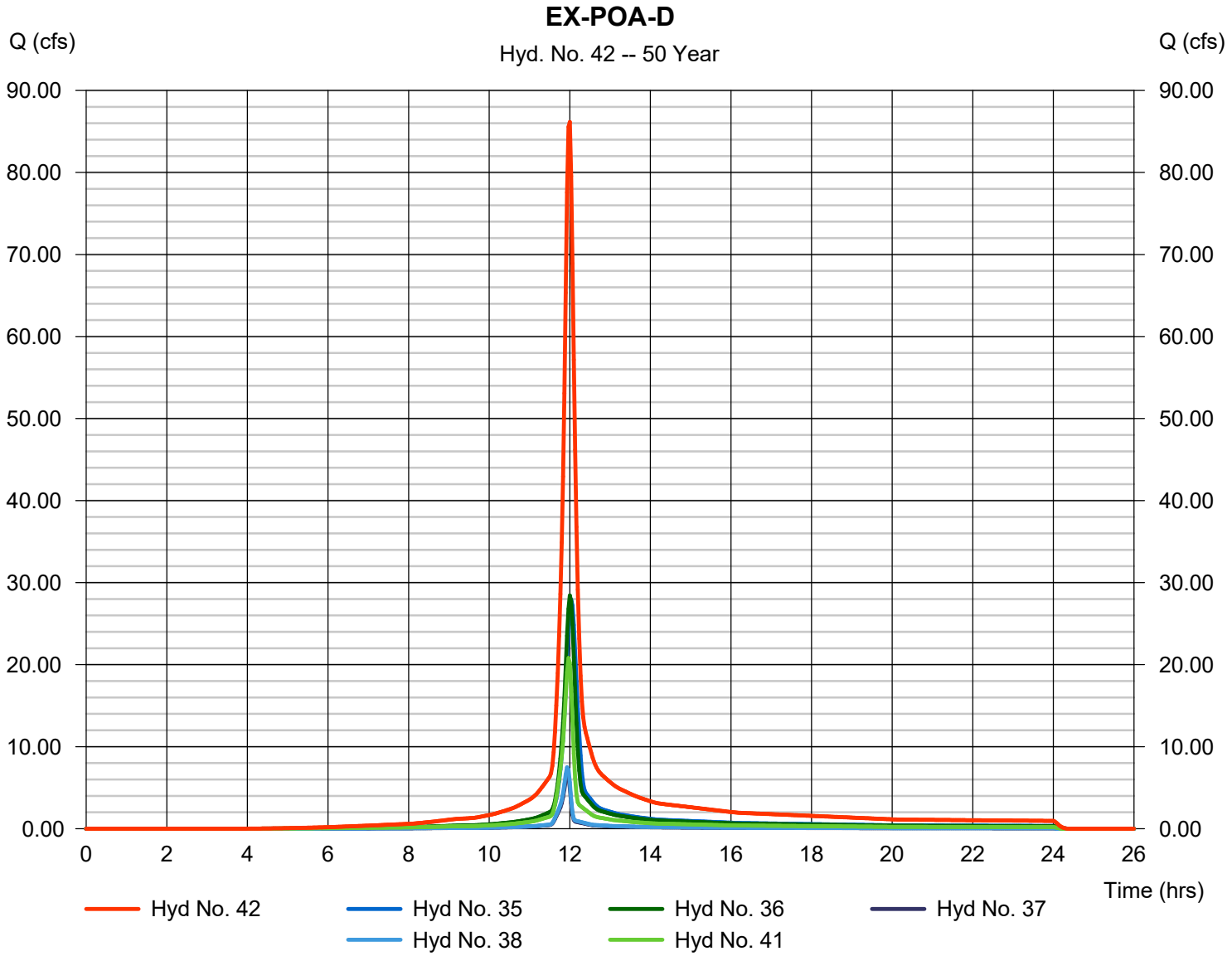


Hydrograph Report

Hyd. No. 42

EX-POA-D

Hydrograph type	=	Combine	Peak discharge	=	86.15 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	234,864 cuft
Inflow hyds.	=	35, 36, 37, 38, 41	Contrib. drain. area	=	13.160 ac

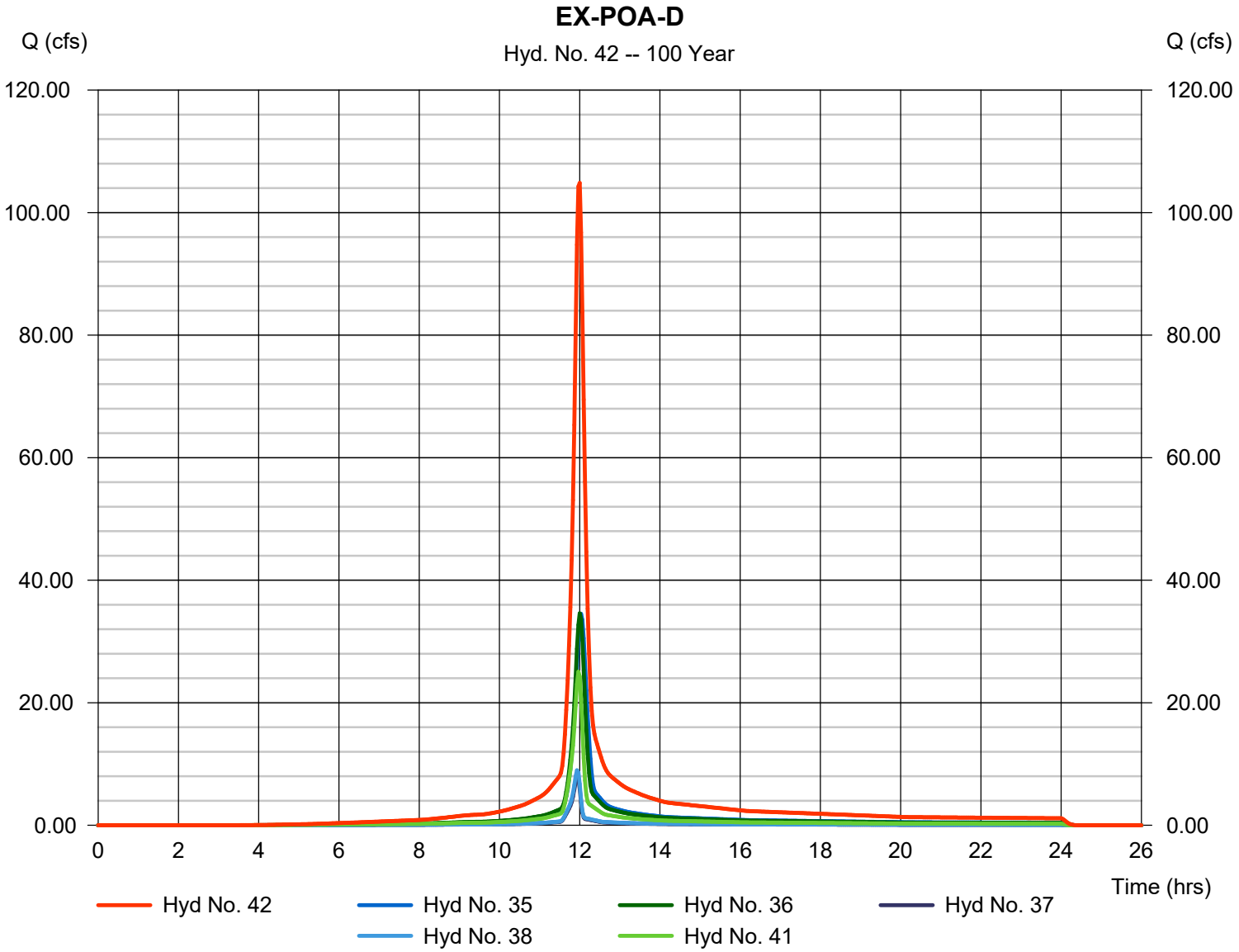


Hydrograph Report

Hyd. No. 42

EX-POA-D

Hydrograph type	=	Combine	Peak discharge	=	104.84 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	288,718 cuft
Inflow hyds.	=	35, 36, 37, 38, 41	Contrib. drain. area	=	13.160 ac



EX-E-1-DISTURBED WATERSHED

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No. 45

EX-E-1-DISTURBED

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 150.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.32		0.00		0.00		
Land slope (%)	= 22.67		0.00		0.00		
Travel Time (min)	**= 5.04**	**+**	**0.00**	**+**	**0.00**	**=**	**5.04**
Shallow Concentrated Flow							
Flow length (ft)	= 237.00		1037.00		376.00		
Watercourse slope (%)	= 19.41		1.25		26.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=7.11		1.80		8.23		
Travel Time (min)	**= 0.56**	**+**	**9.58**	**+**	**0.76**	**=**	**10.90**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 15.90 min

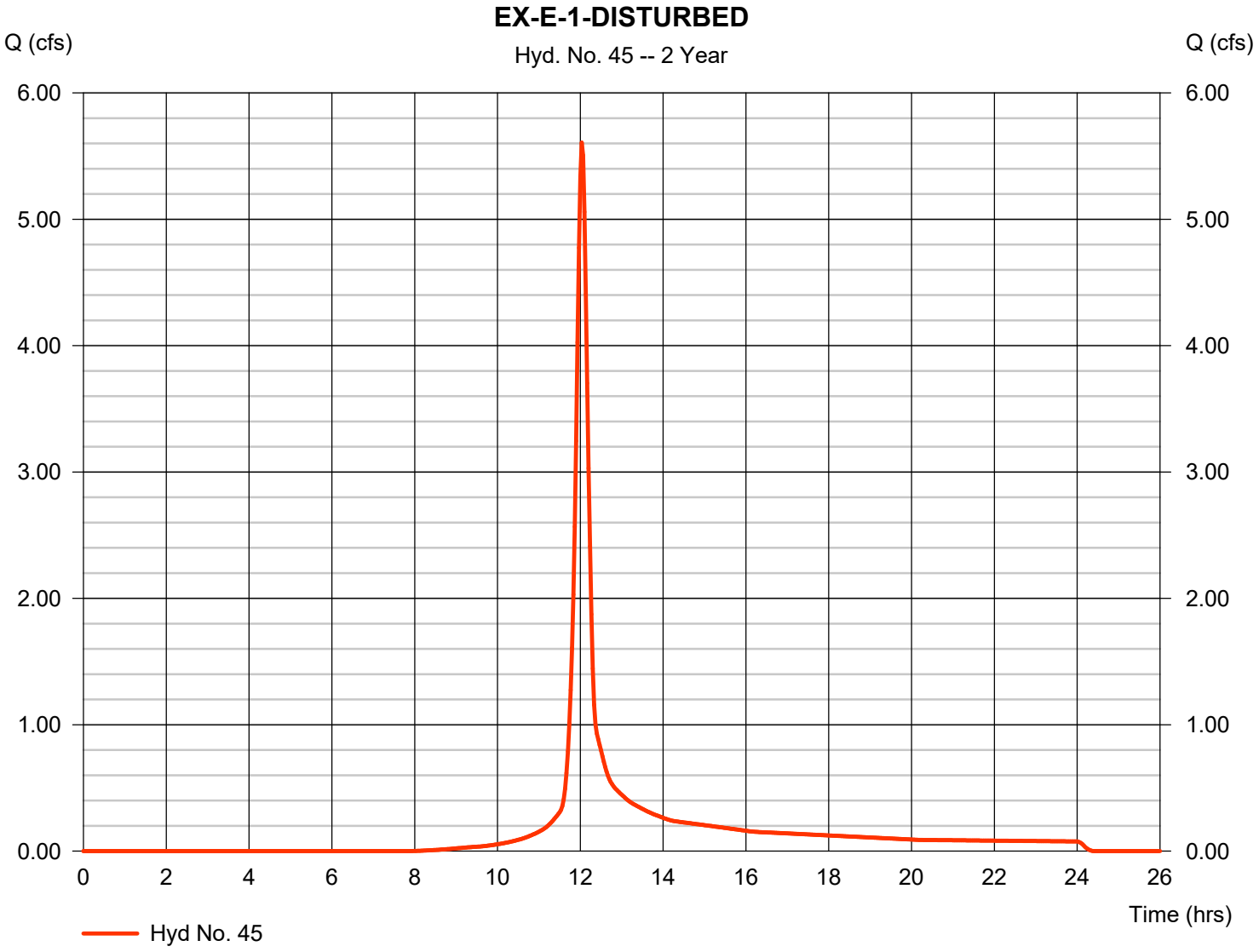
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 45

EX-E-1-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.607 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	15,716 cuft
Drainage area	=	2.490 ac	Curve number	=	84
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	15.90 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

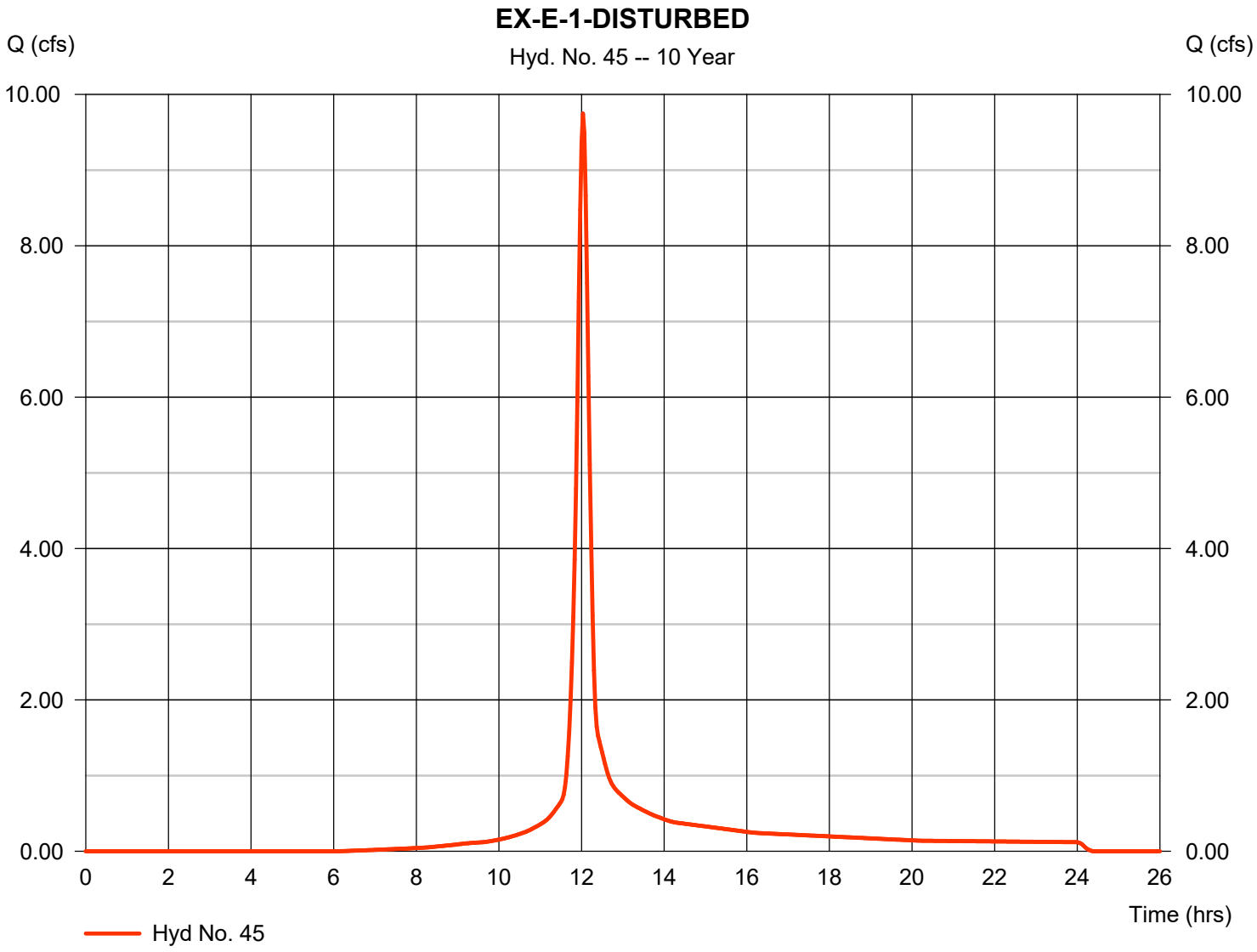


Hydrograph Report

Hyd. No. 45

EX-E-1-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.747 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	27,535 cuft
Drainage area	=	2.490 ac	Curve number	=	84
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	15.90 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

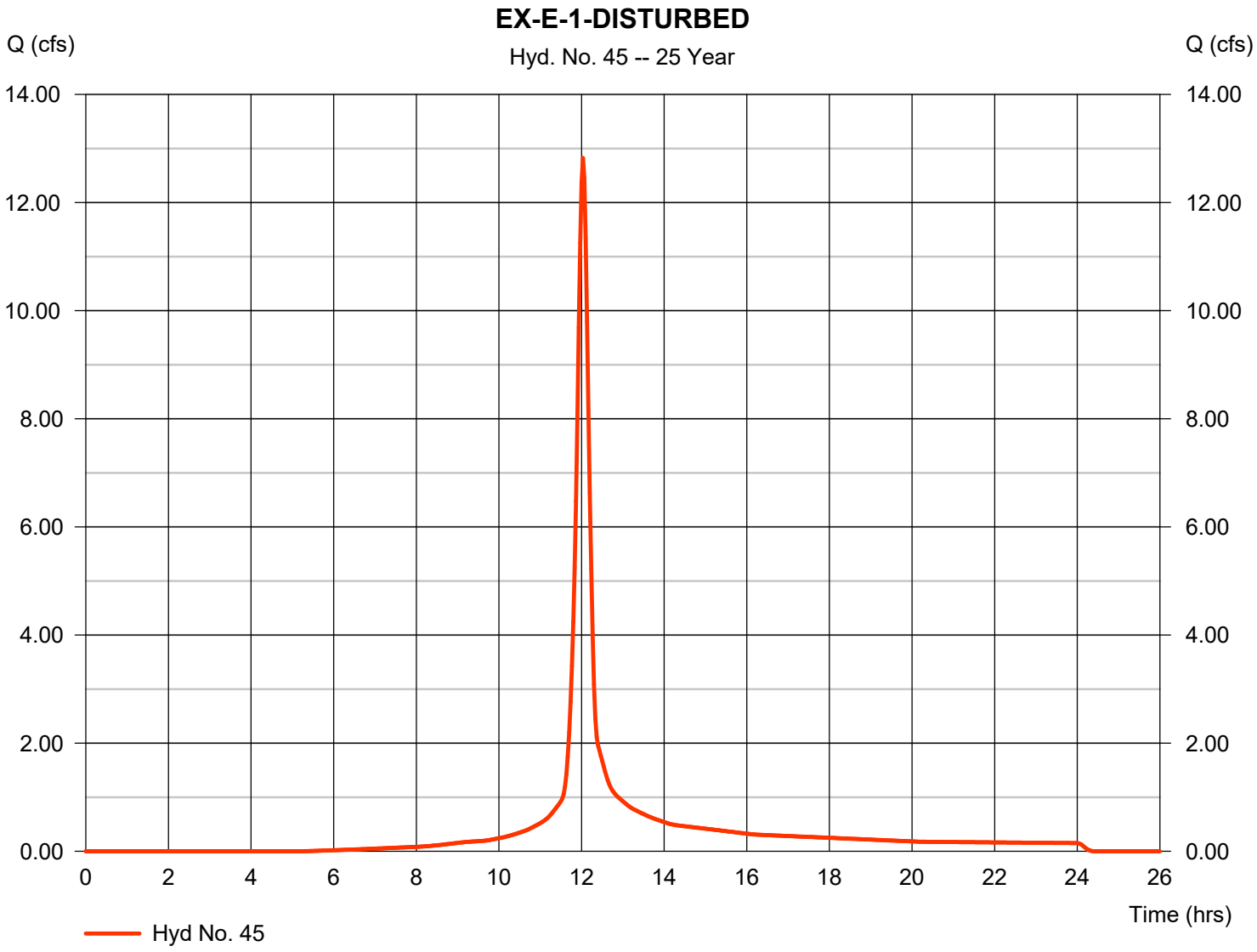


Hydrograph Report

Hyd. No. 45

EX-E-1-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	12.82 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	36,570 cuft
Drainage area	=	2.490 ac	Curve number	=	84
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	15.90 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

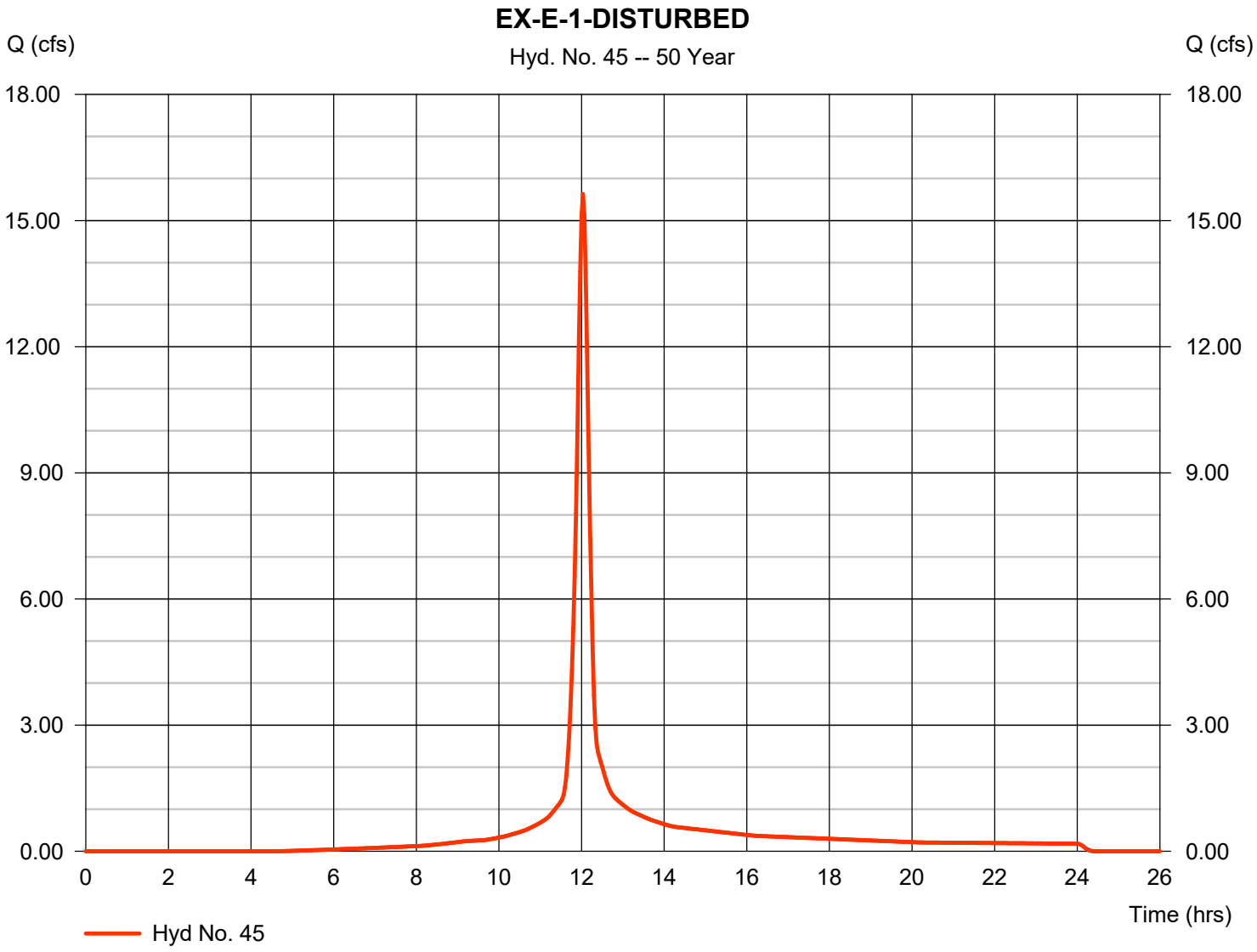


Hydrograph Report

Hyd. No. 45

EX-E-1-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	15.63 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	44,962 cuft
Drainage area	=	2.490 ac	Curve number	=	84
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	15.90 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

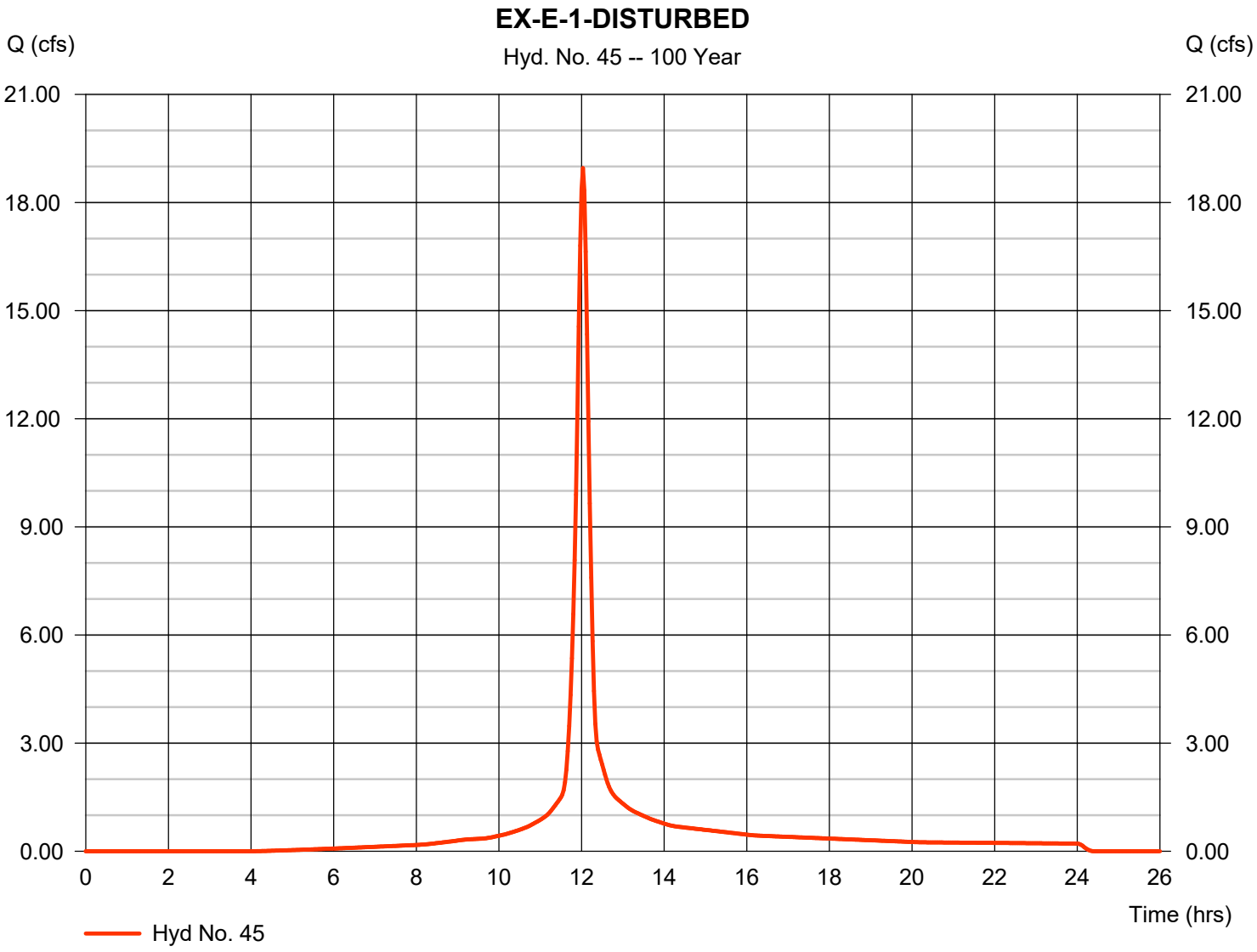


Hydrograph Report

Hyd. No. 45

EX-E-1-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	18.95 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	55,070 cuft
Drainage area	=	2.490 ac	Curve number	=	84
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	15.90 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



EX-E-1-UNDISTURBED WATERSHED

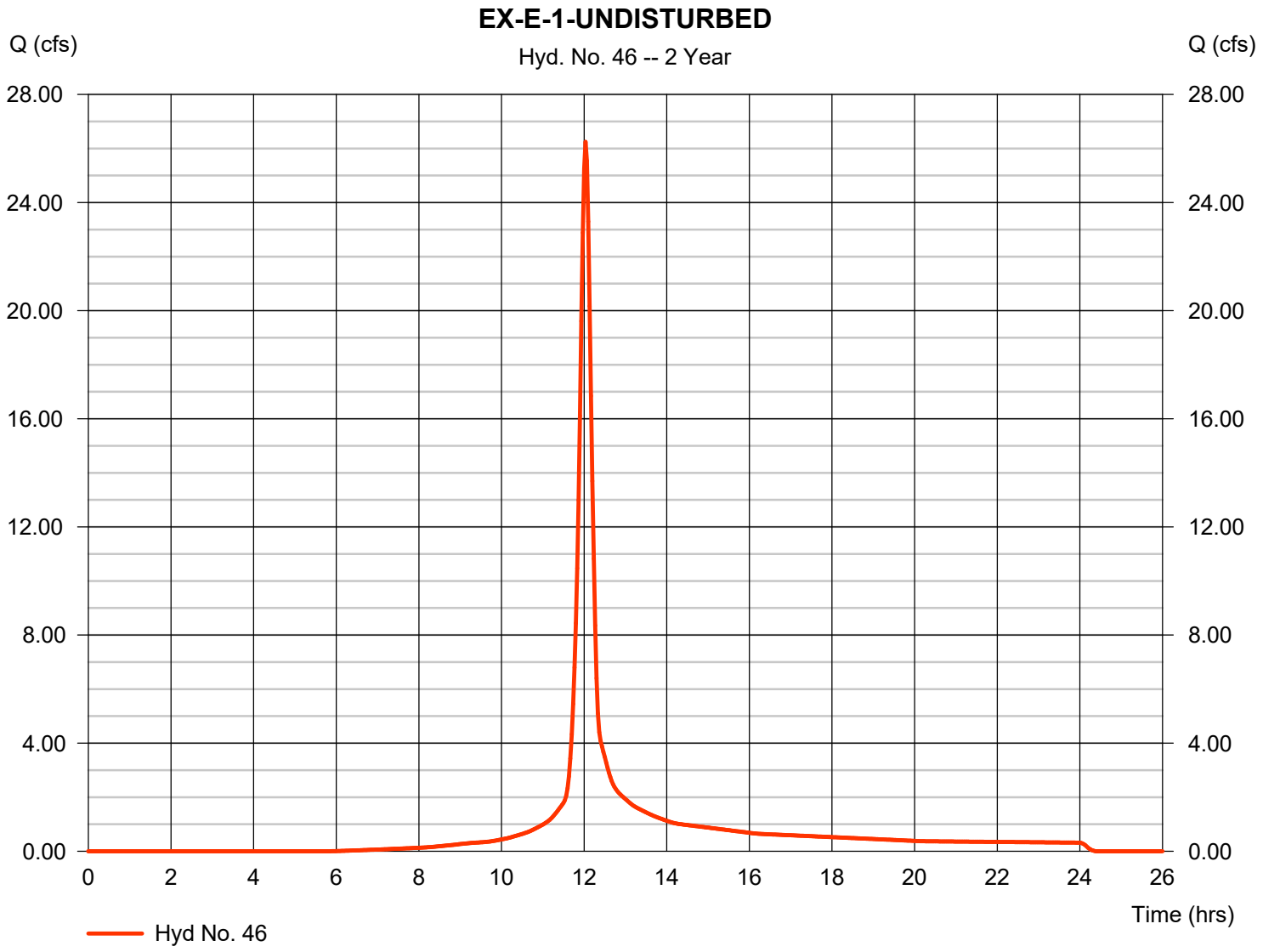
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 46

EX-E-1-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 26.24 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 74,301 cuft
Drainage area	= 9.580 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.90 min
Total precip.	= 3.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

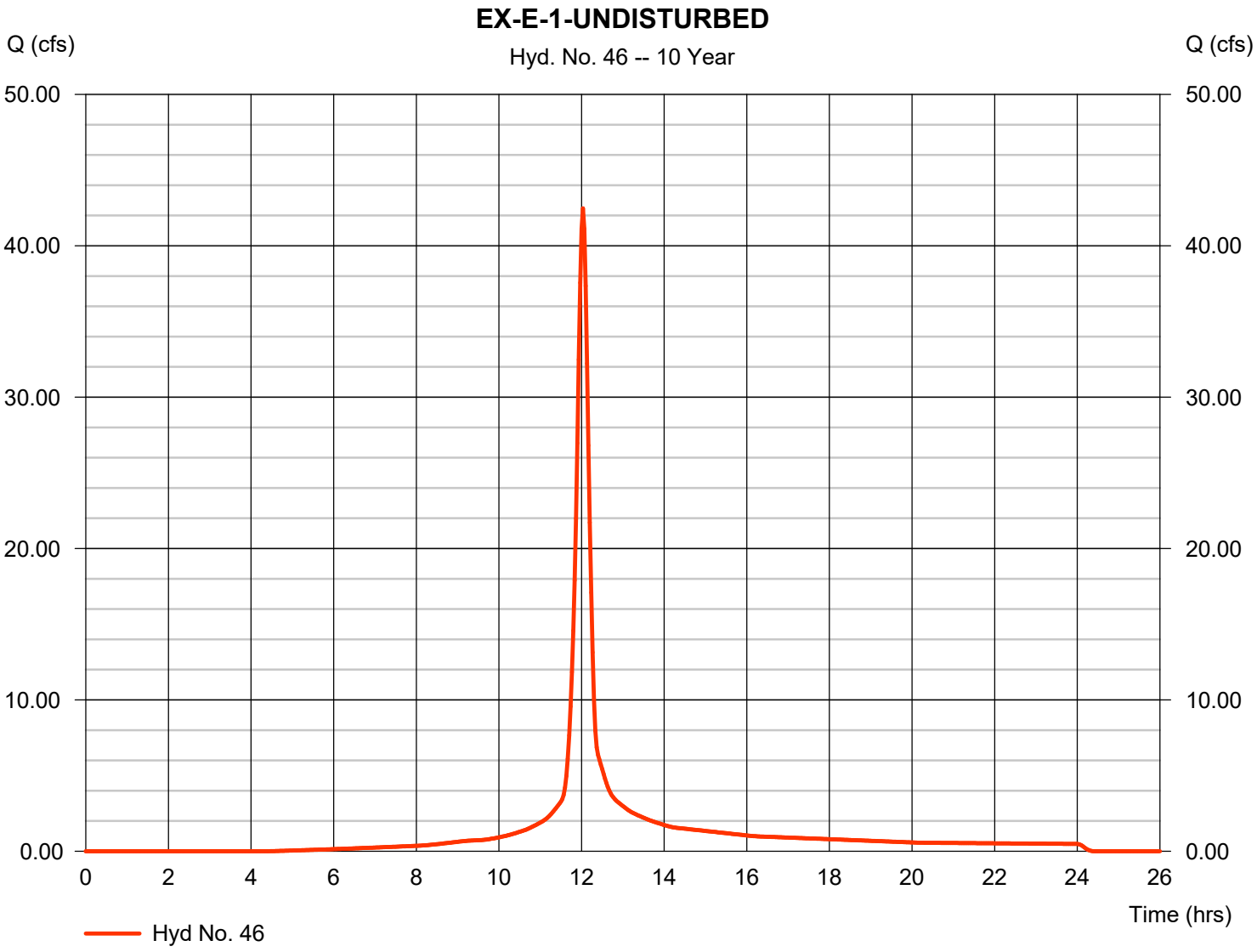


Hydrograph Report

Hyd. No. 46

EX-E-1-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	42.47 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	122,704 cuft
Drainage area	=	9.580 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.90 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

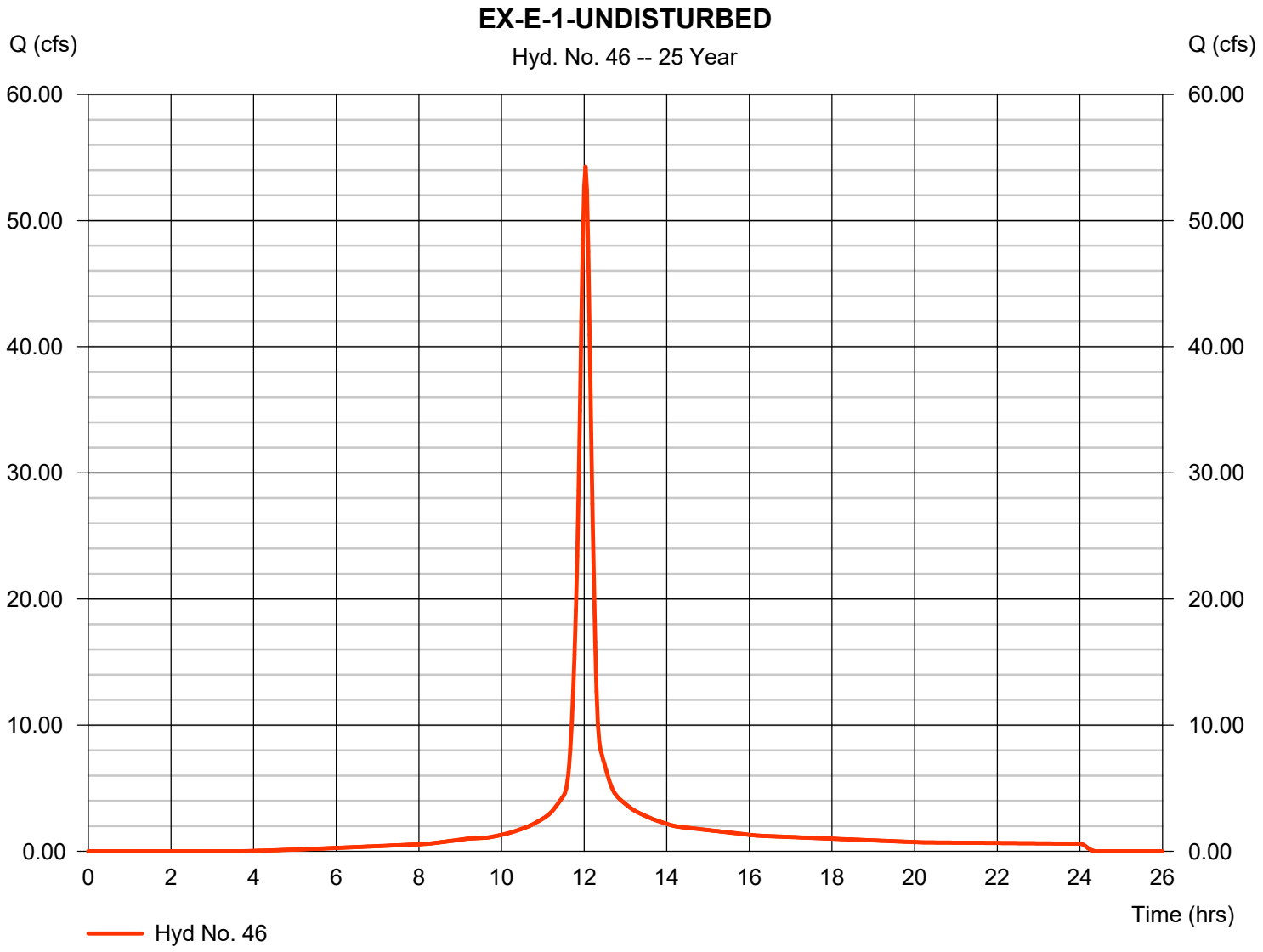


Hydrograph Report

Hyd. No. 46

EX-E-1-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 54.28 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 158,918 cuft
Drainage area	= 9.580 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.90 min
Total precip.	= 5.95 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

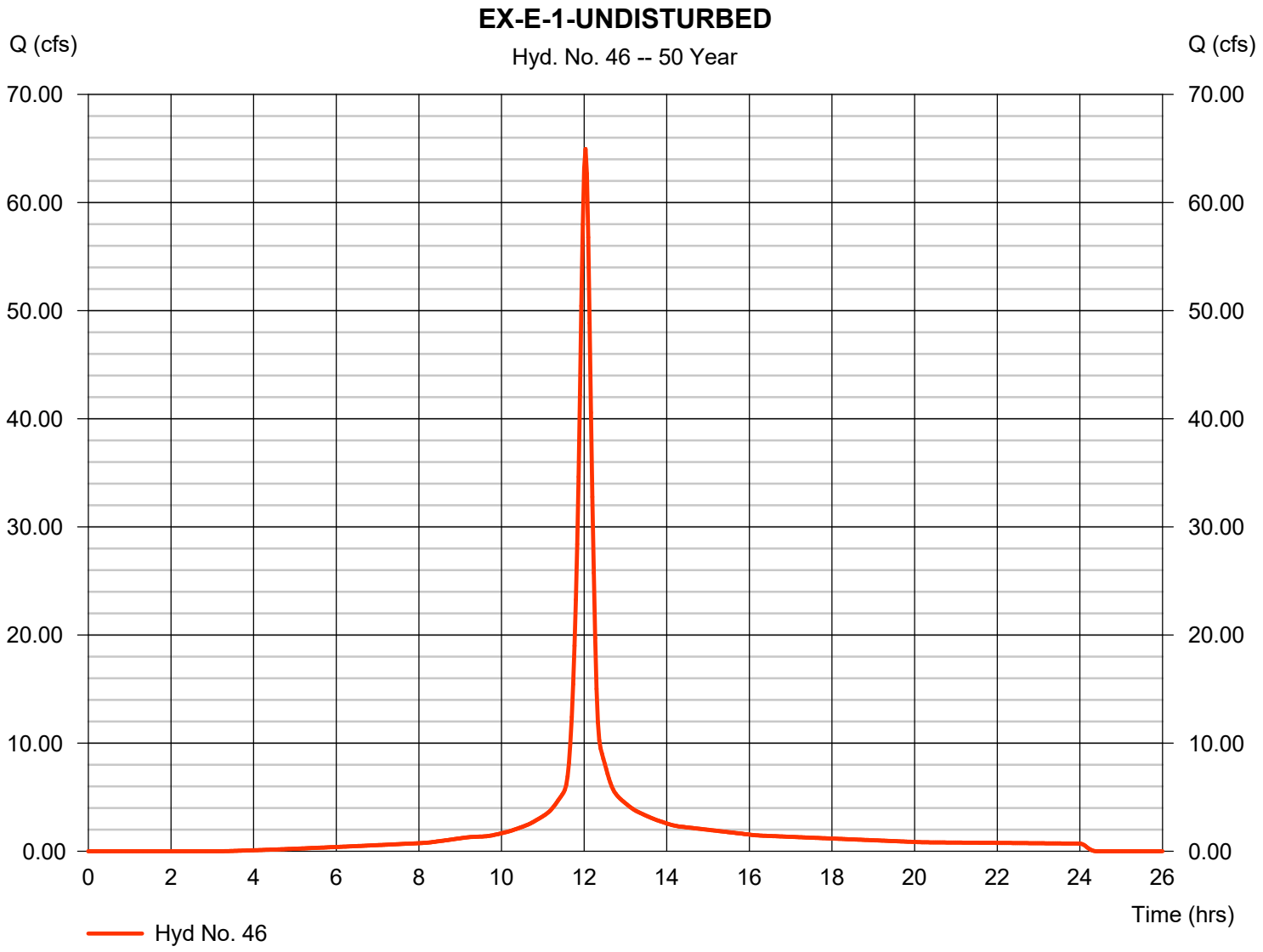


Hydrograph Report

Hyd. No. 46

EX-E-1-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	64.96 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	192,214 cuft
Drainage area	=	9.580 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.90 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

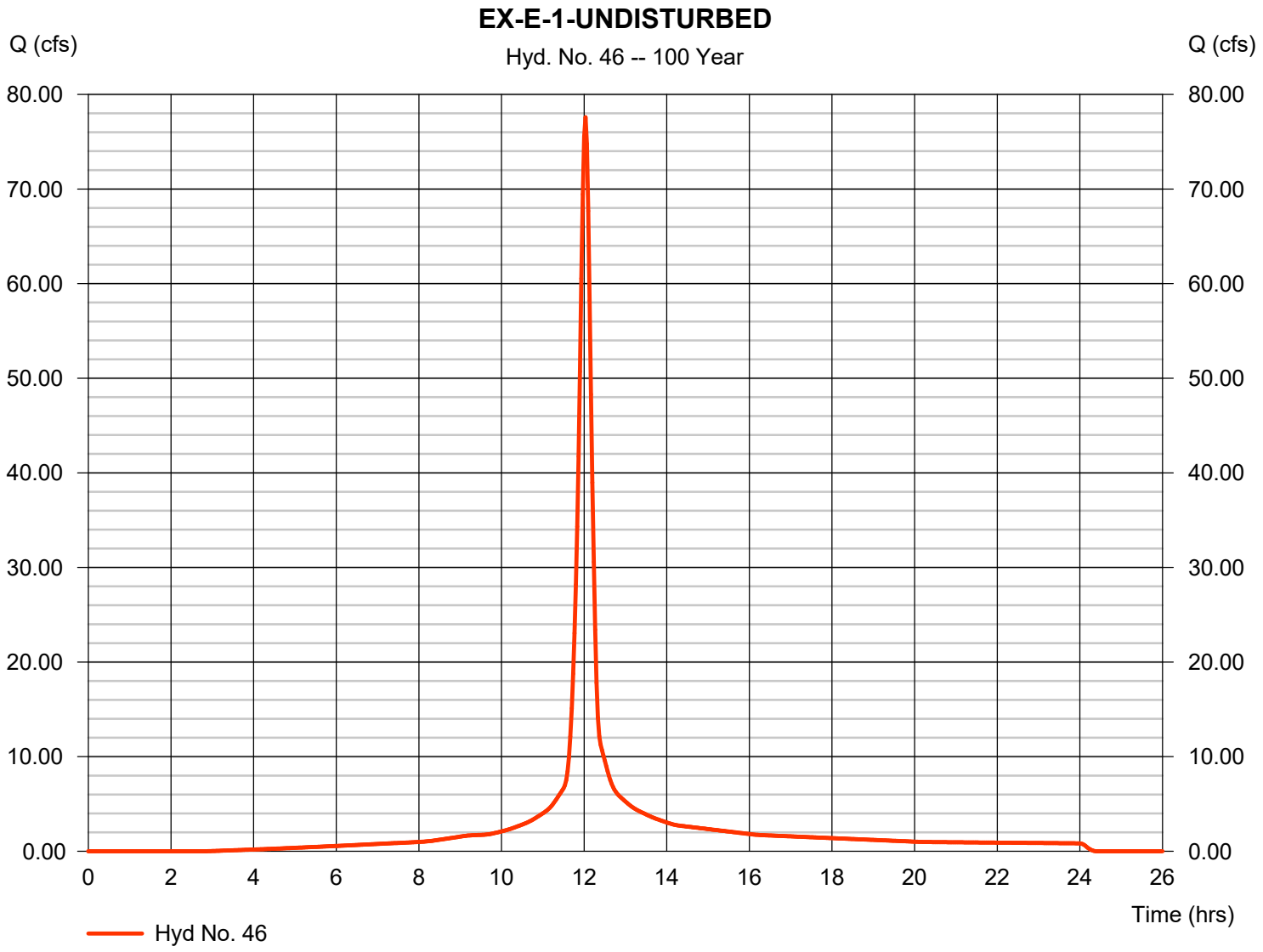


Hydrograph Report

Hyd. No. 46

EX-E-1-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	77.58 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	232,047 cuft
Drainage area	=	9.580 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.90 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



EX-E-2-DISTURBED WATERSHED

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No. 47

EX-E-2-DISTURBED

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.400		0.011		0.011		
Flow length (ft)	= 150.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.32		0.00		0.00		
Land slope (%)	= 10.67		0.00		0.00		
Travel Time (min)	**= 14.93**	**+**	**0.00**	**+**	**0.00**	**=**	**14.93**
Shallow Concentrated Flow							
Flow length (ft)	= 1290.00		0.00		0.00		
Watercourse slope (%)	= 12.97		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=5.81		0.00		0.00		
Travel Time (min)	**= 3.70**	**+**	**0.00**	**+**	**0.00**	**=**	**3.70**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 18.60 min

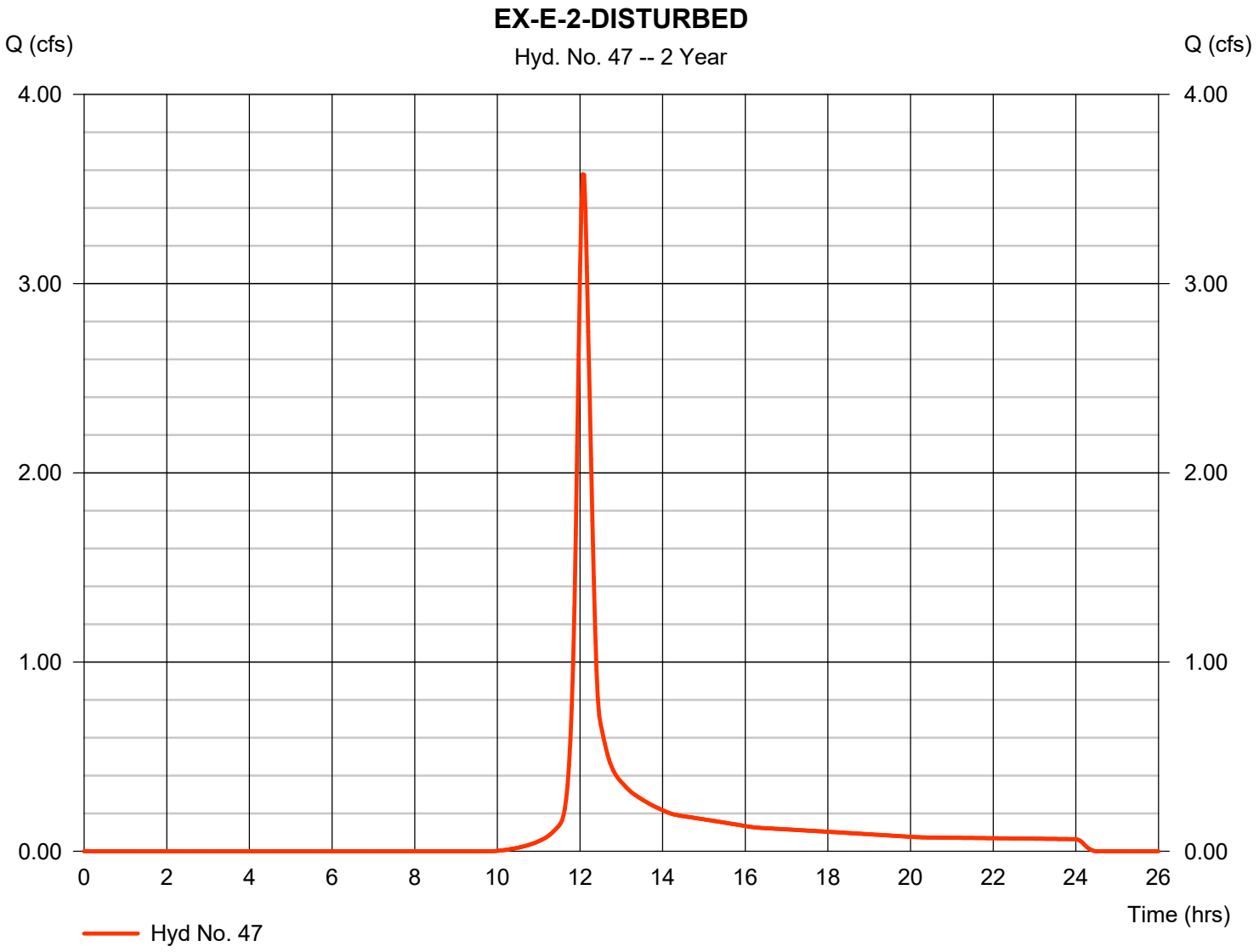
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 47

EX-E-2-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.578 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	11,421 cuft
Drainage area	=	2.310 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	18.60 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

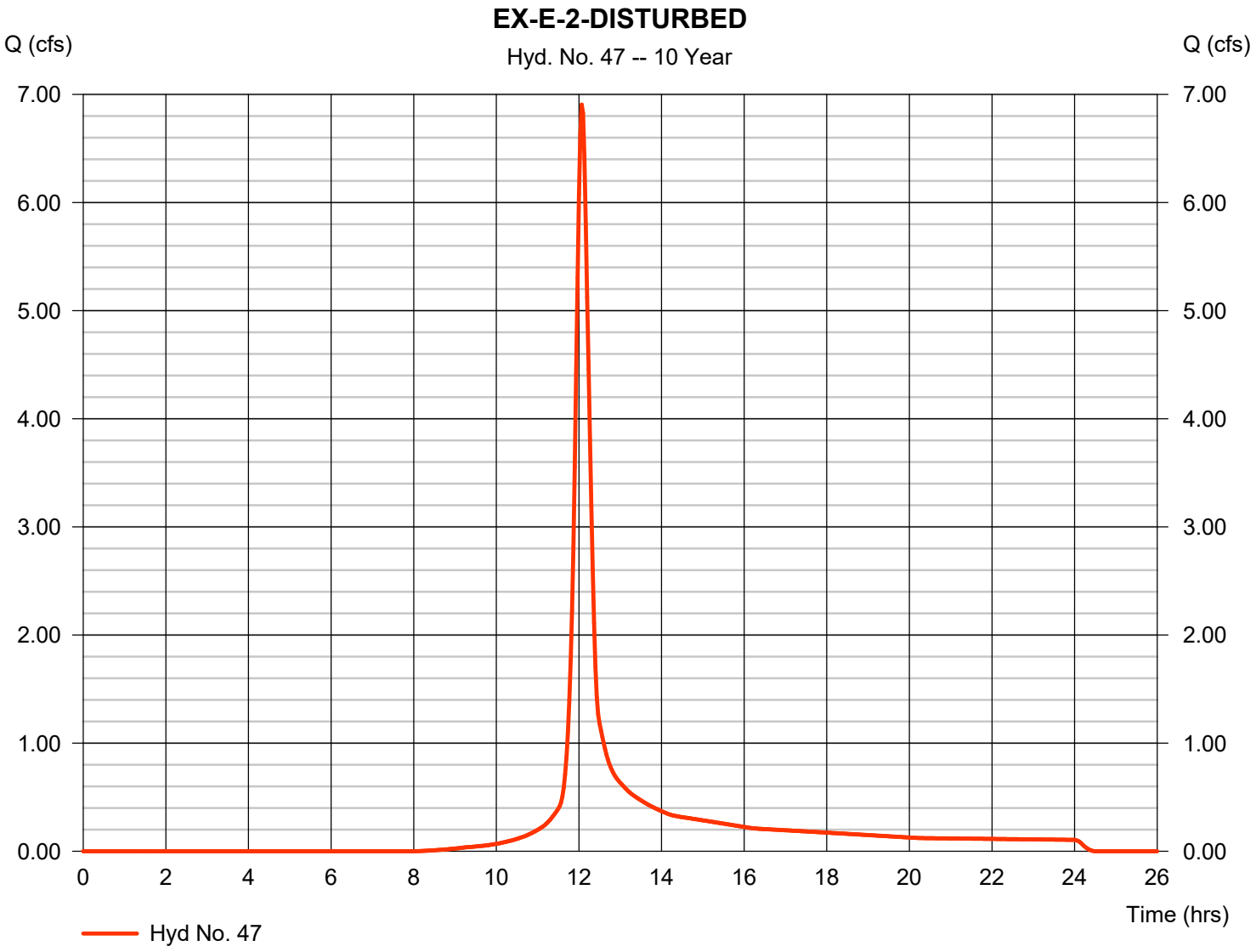


Hydrograph Report

Hyd. No. 47

EX-E-2-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.905 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	21,604 cuft
Drainage area	=	2.310 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	18.60 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

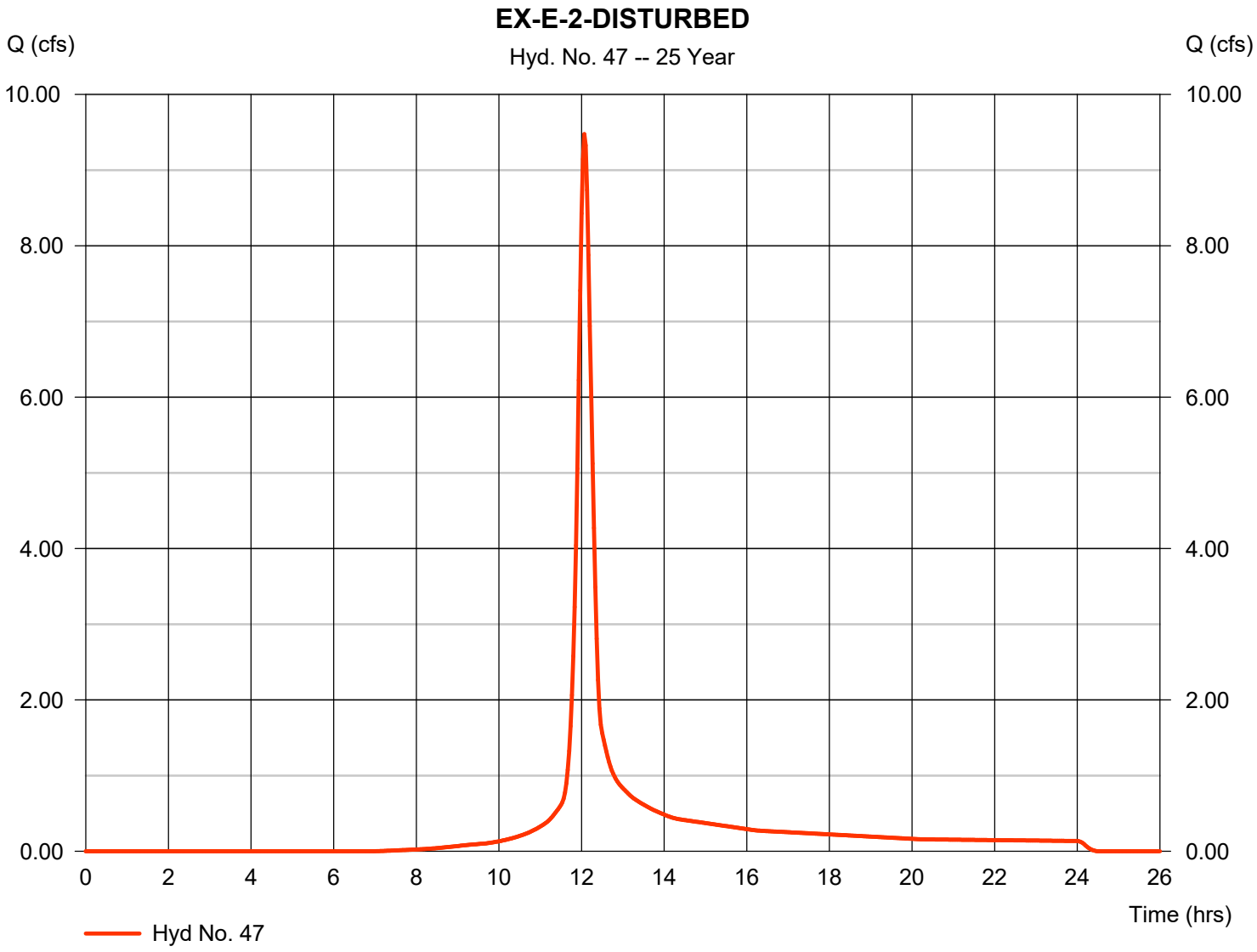


Hydrograph Report

Hyd. No. 47

EX-E-2-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.475 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	29,640 cuft
Drainage area	=	2.310 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	18.60 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

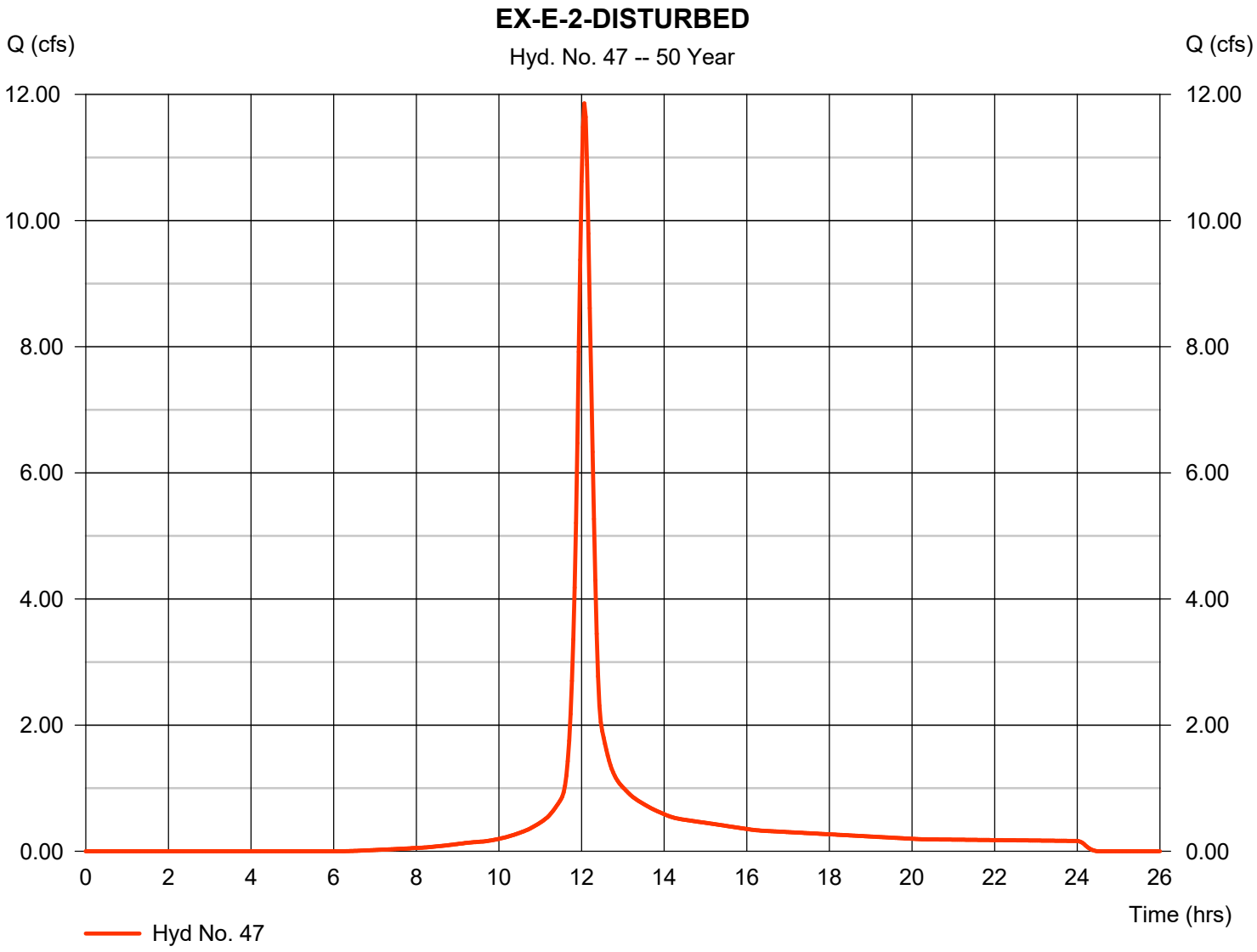


Hydrograph Report

Hyd. No. 47

EX-E-2-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.86 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	37,219 cuft
Drainage area	=	2.310 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	18.60 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

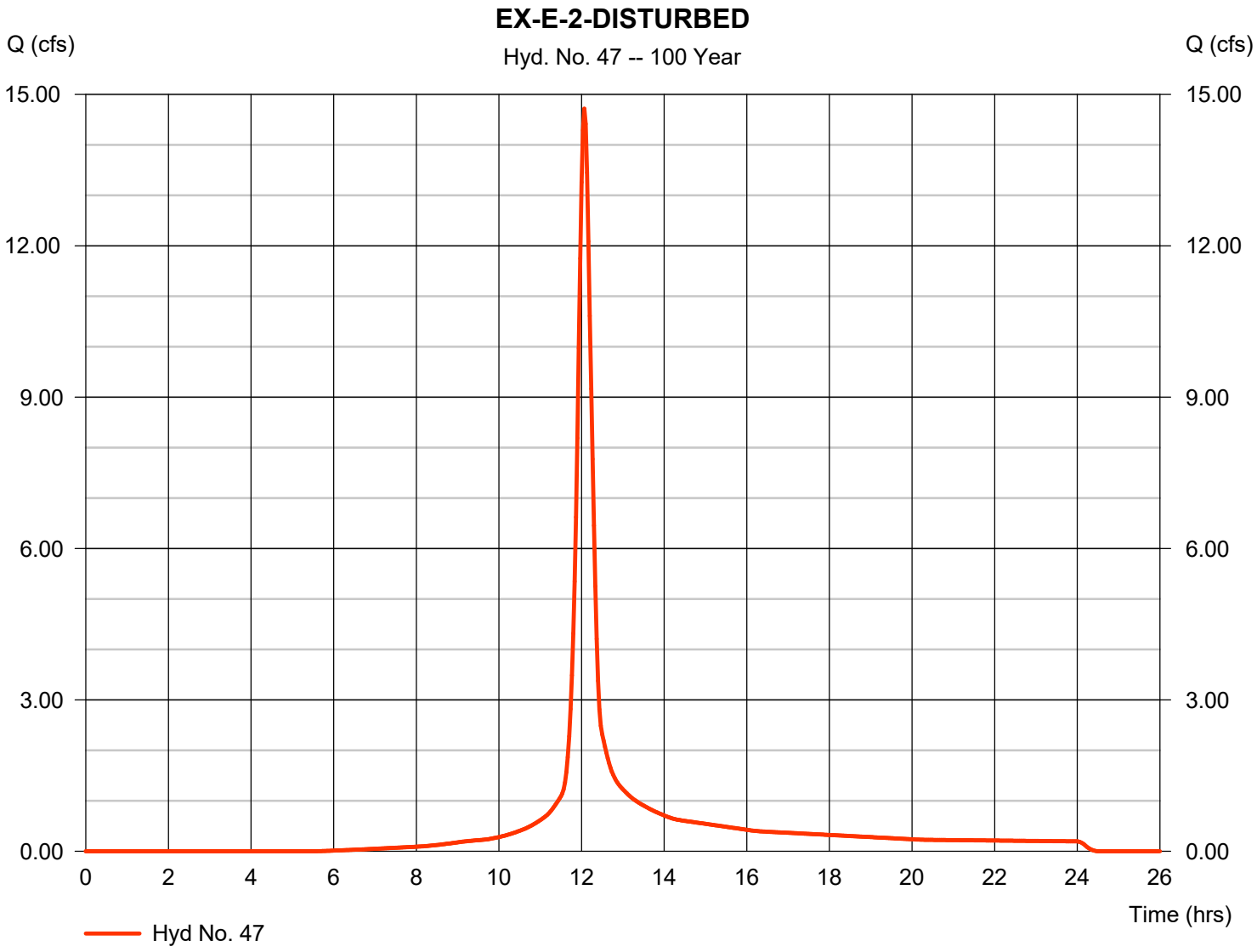


Hydrograph Report

Hyd. No. 47

EX-E-2-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	14.72 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	46,447 cuft
Drainage area	=	2.310 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	18.60 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



EX-E-2-UNDISTURBED WATERSHED

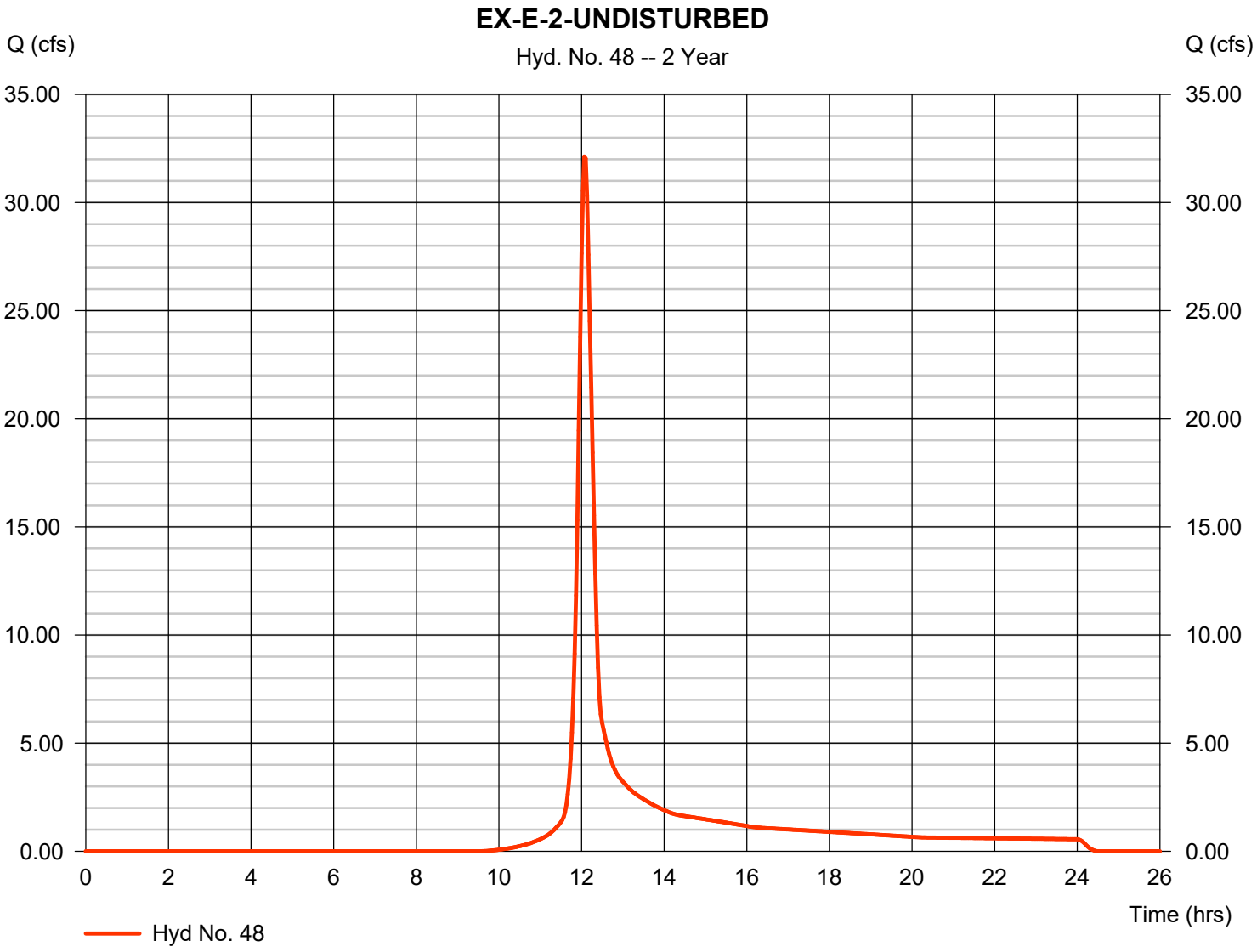
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 48

EX-E-2-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	32.12 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	101,977 cuft
Drainage area	=	19.680 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	18.60 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

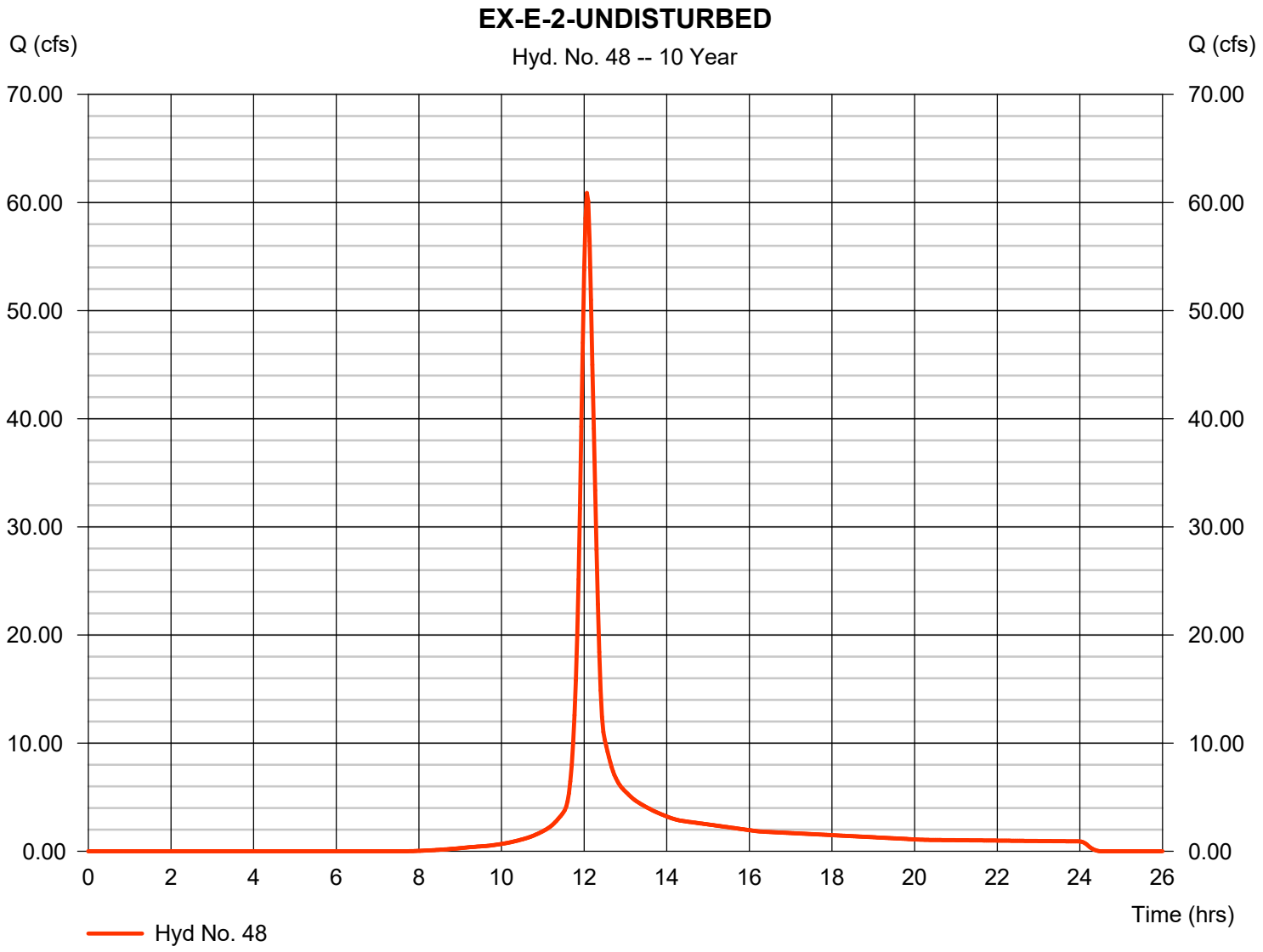


Hydrograph Report

Hyd. No. 48

EX-E-2-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	60.88 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	190,342 cuft
Drainage area	=	19.680 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	18.60 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

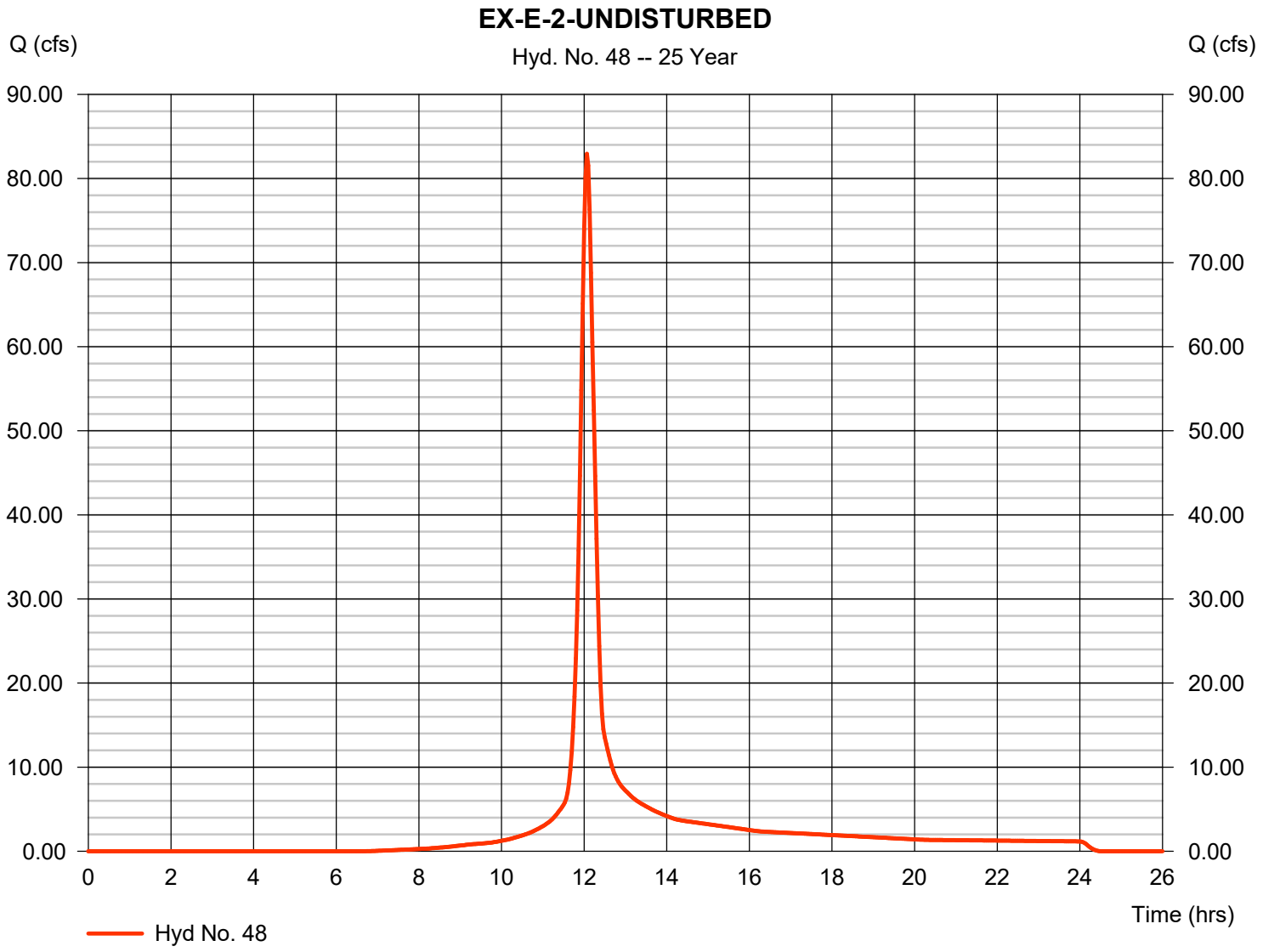


Hydrograph Report

Hyd. No. 48

EX-E-2-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	82.93 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	259,680 cuft
Drainage area	=	19.680 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	18.60 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

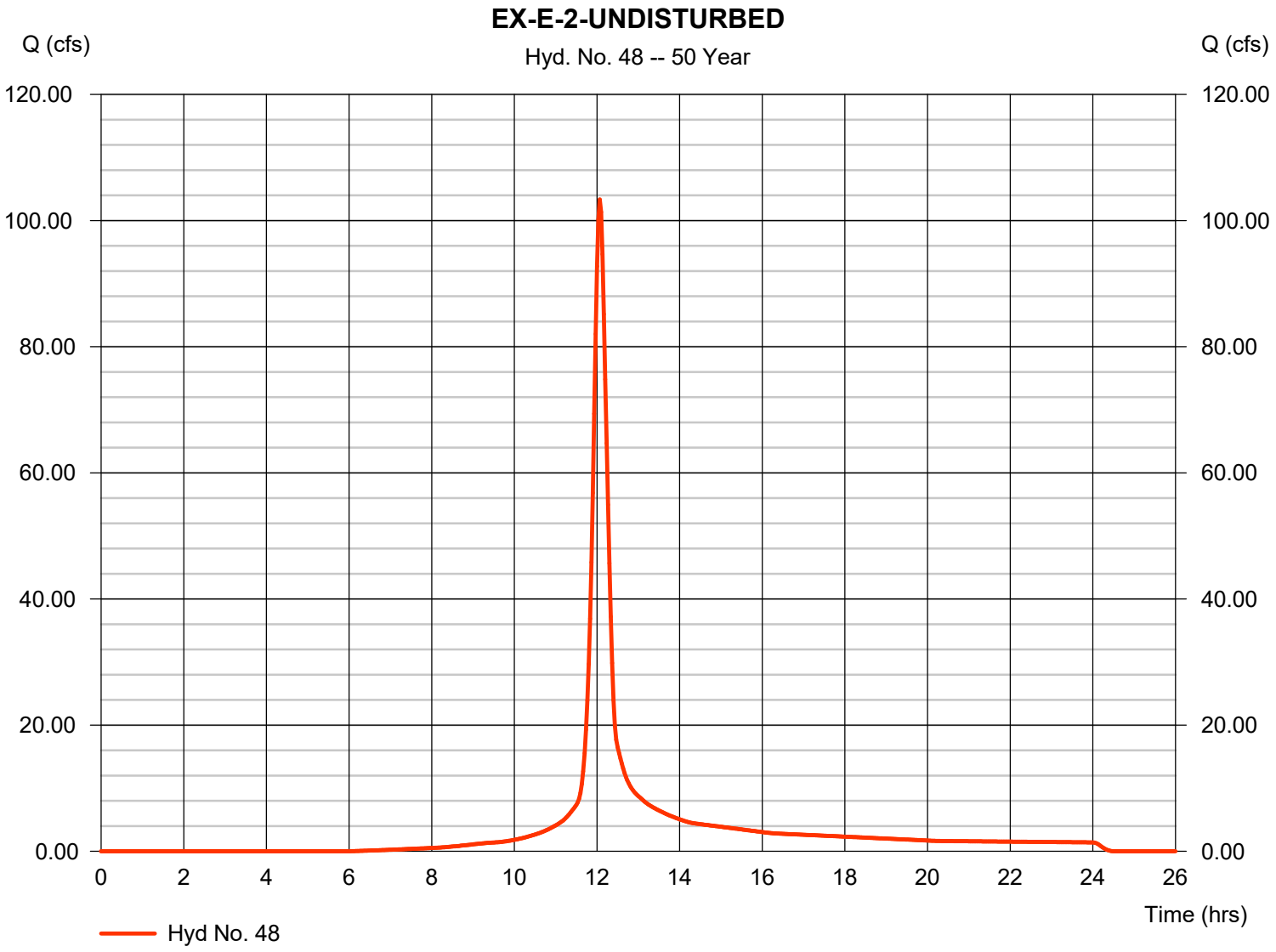


Hydrograph Report

Hyd. No. 48

EX-E-2-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	103.33 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	324,886 cuft
Drainage area	=	19.680 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	18.60 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

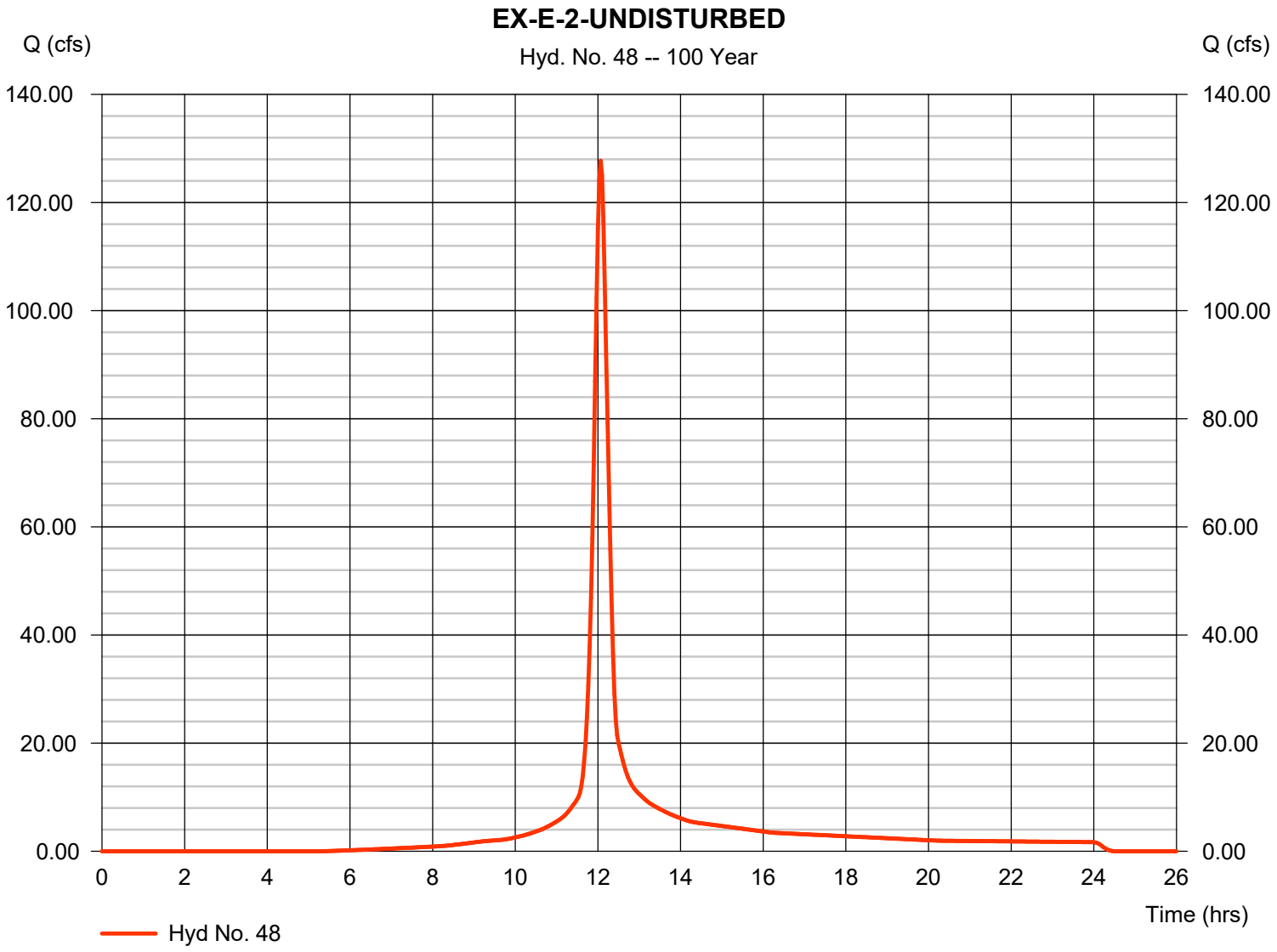


Hydrograph Report

Hyd. No. 48

EX-E-2-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	127.73 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	404,131 cuft
Drainage area	=	19.680 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	18.60 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



TOTAL EXISTING FLOW TO POA-E

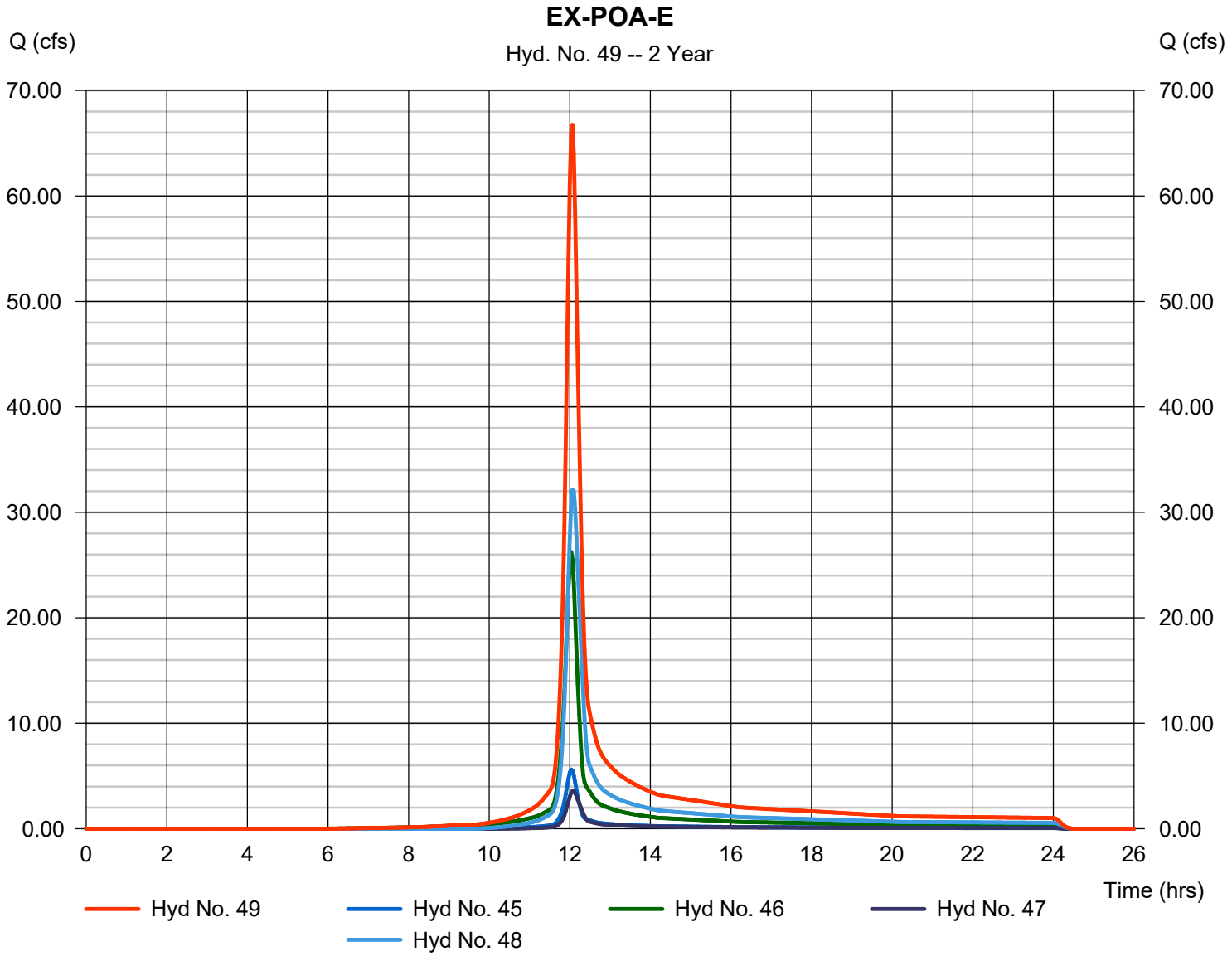
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 49

EX-POA-E

Hydrograph type	= Combine	Peak discharge	= 66.74 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 203,415 cuft
Inflow hyds.	= 45, 46, 47, 48	Contrib. drain. area	= 34.060 ac

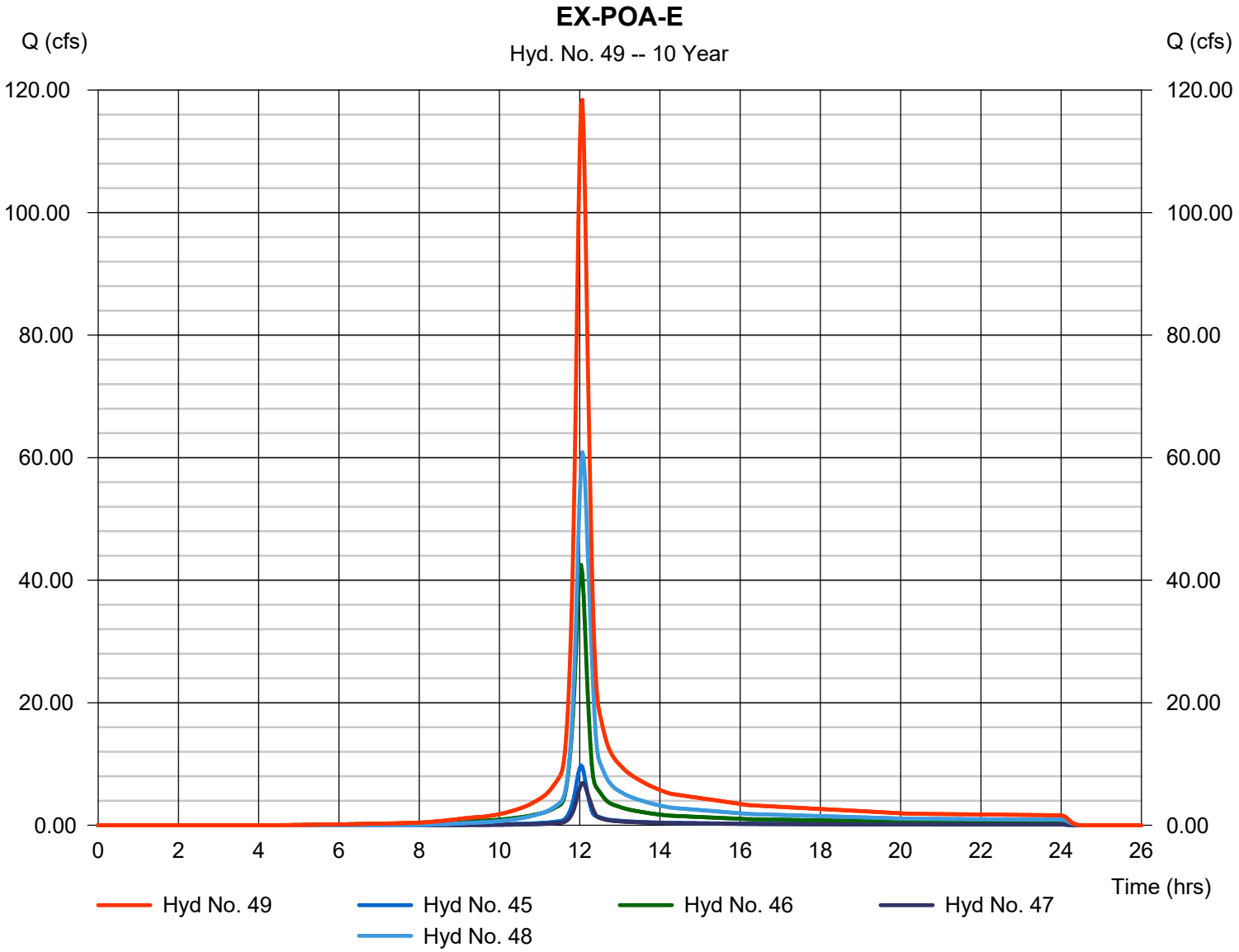


Hydrograph Report

Hyd. No. 49

EX-POA-E

Hydrograph type	=	Combine	Peak discharge	=	118.39 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	362,184 cuft
Inflow hyds.	=	45, 46, 47, 48	Contrib. drain. area	=	34.060 ac

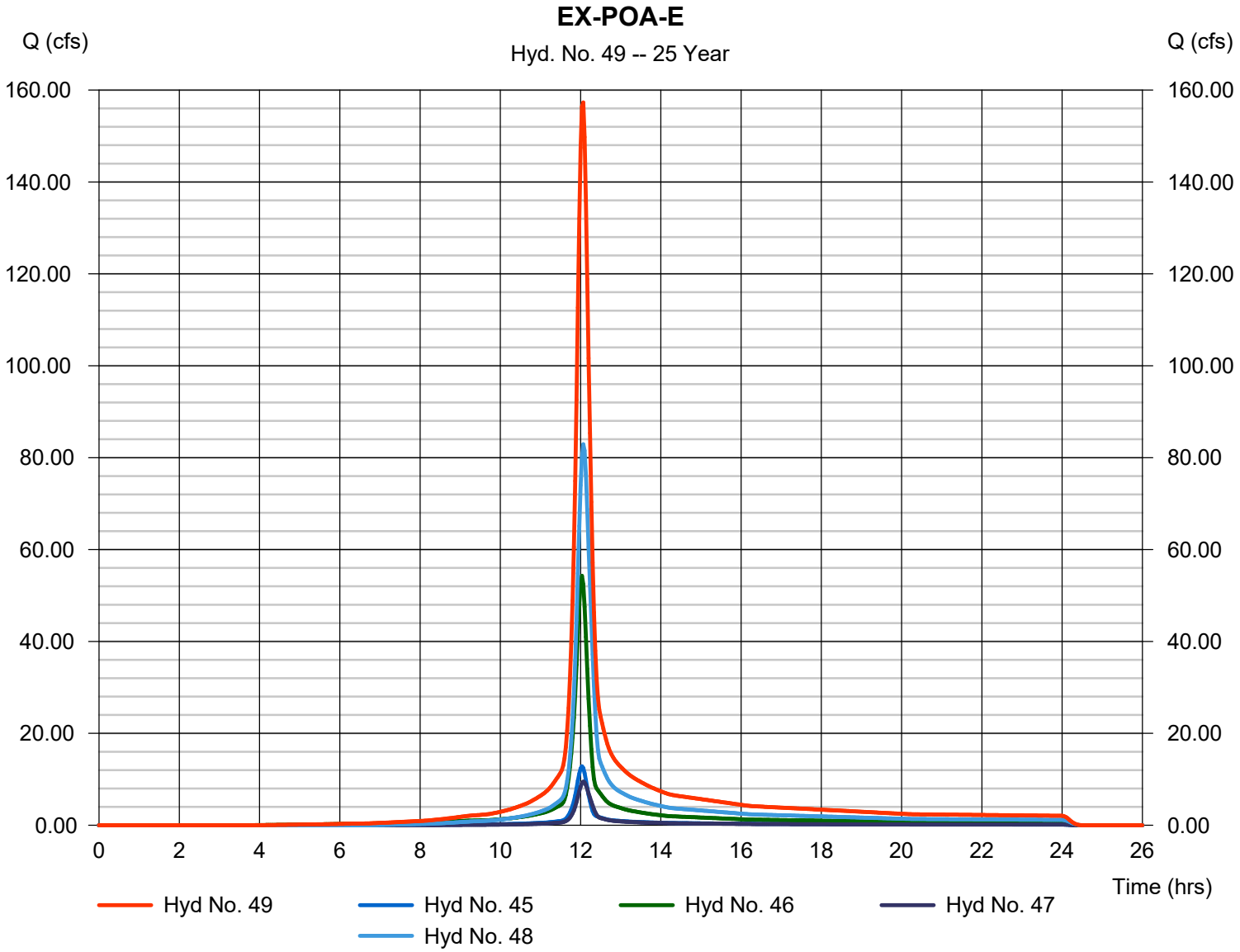


Hydrograph Report

Hyd. No. 49

EX-POA-E

Hydrograph type	=	Combine	Peak discharge	=	157.29 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	484,809 cuft
Inflow hyds.	=	45, 46, 47, 48	Contrib. drain. area	=	34.060 ac

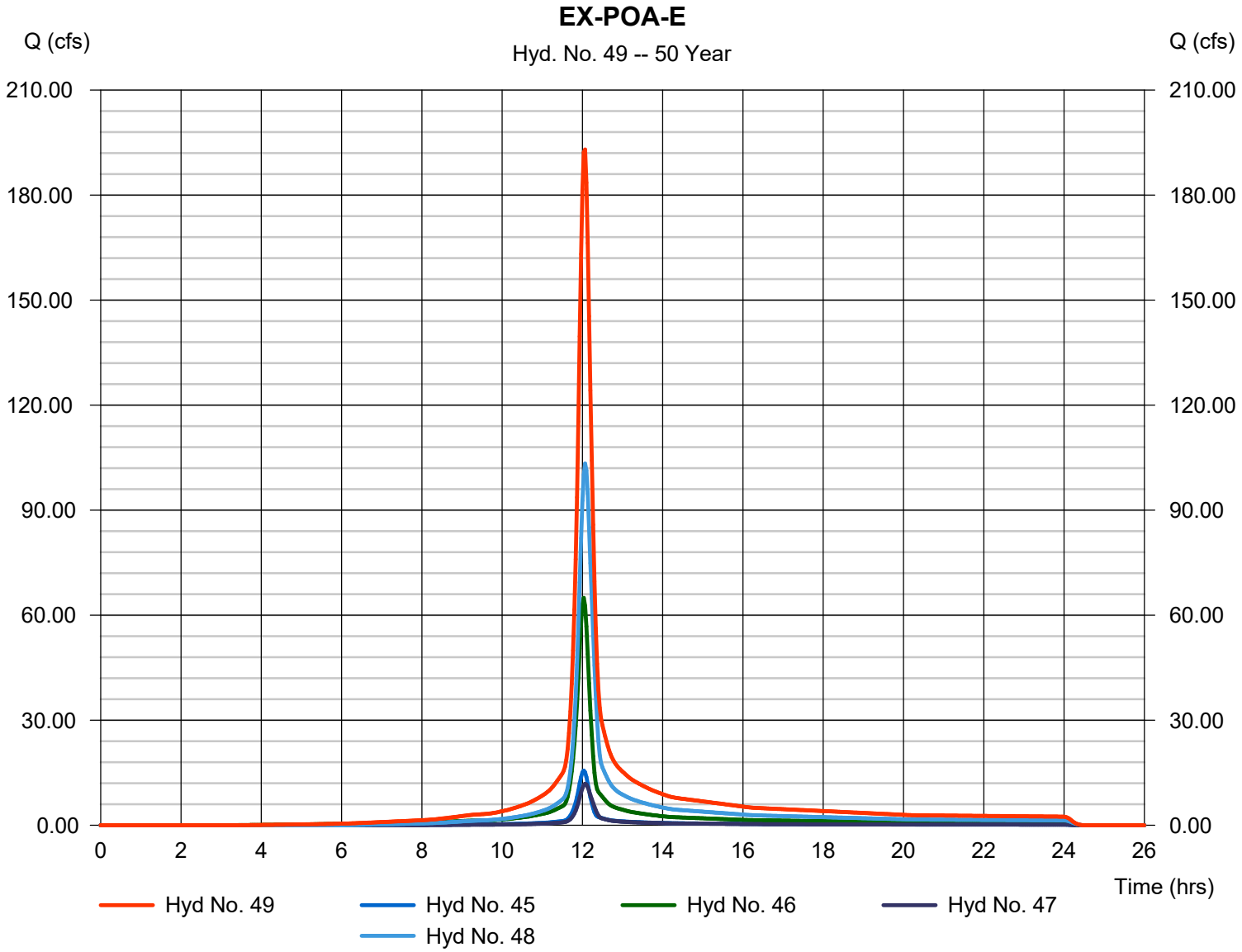


Hydrograph Report

Hyd. No. 49

EX-POA-E

Hydrograph type	=	Combine	Peak discharge	=	193.00 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	599,281 cuft
Inflow hyds.	=	45, 46, 47, 48	Contrib. drain. area	=	34.060 ac

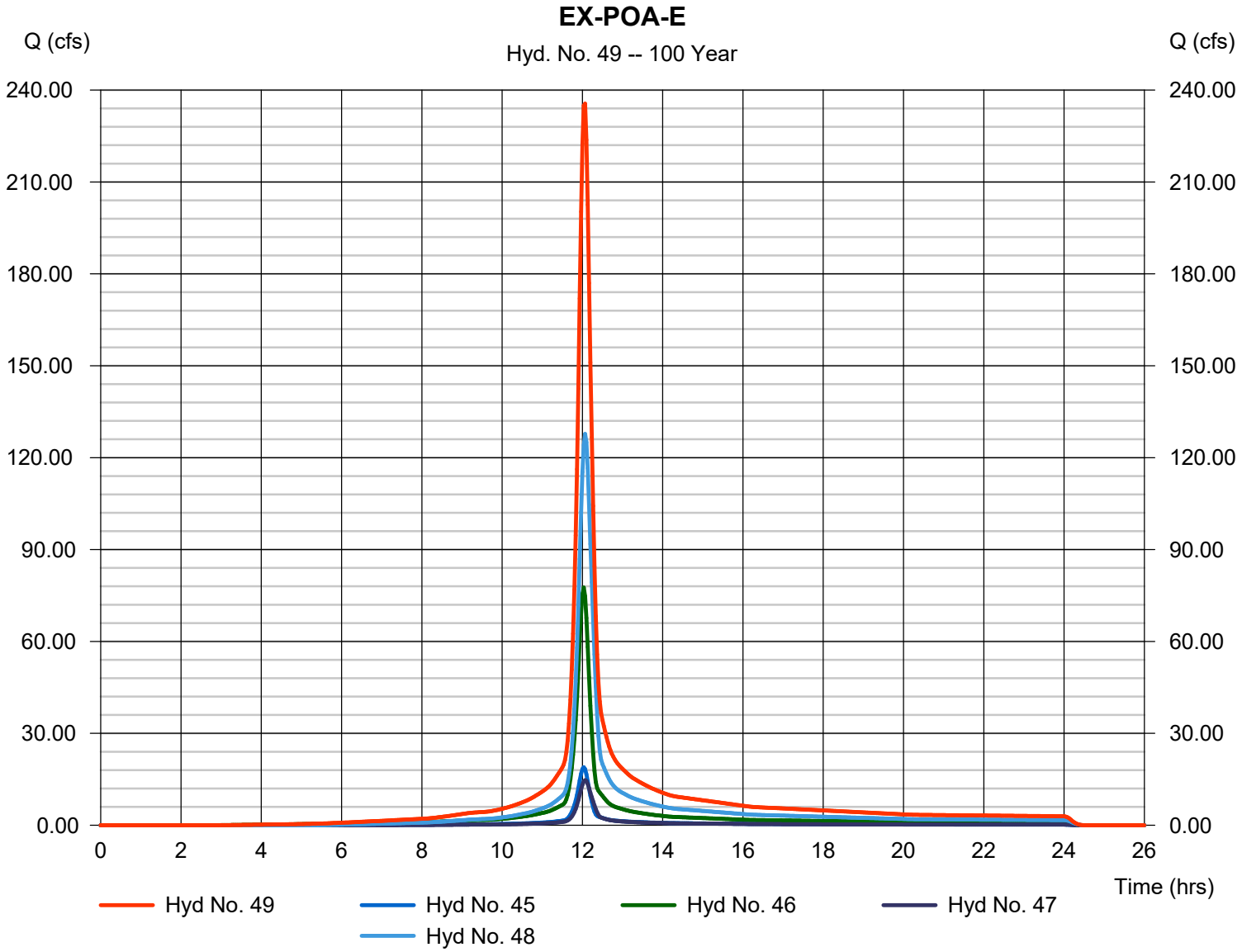


Hydrograph Report

Hyd. No. 49

EX-POA-E

Hydrograph type	=	Combine	Peak discharge	=	235.56 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	737,696 cuft
Inflow hyds.	=	45, 46, 47, 48	Contrib. drain. area	=	34.060 ac



TOTAL EXISTING FLOW TO BRODHEAD CREEK

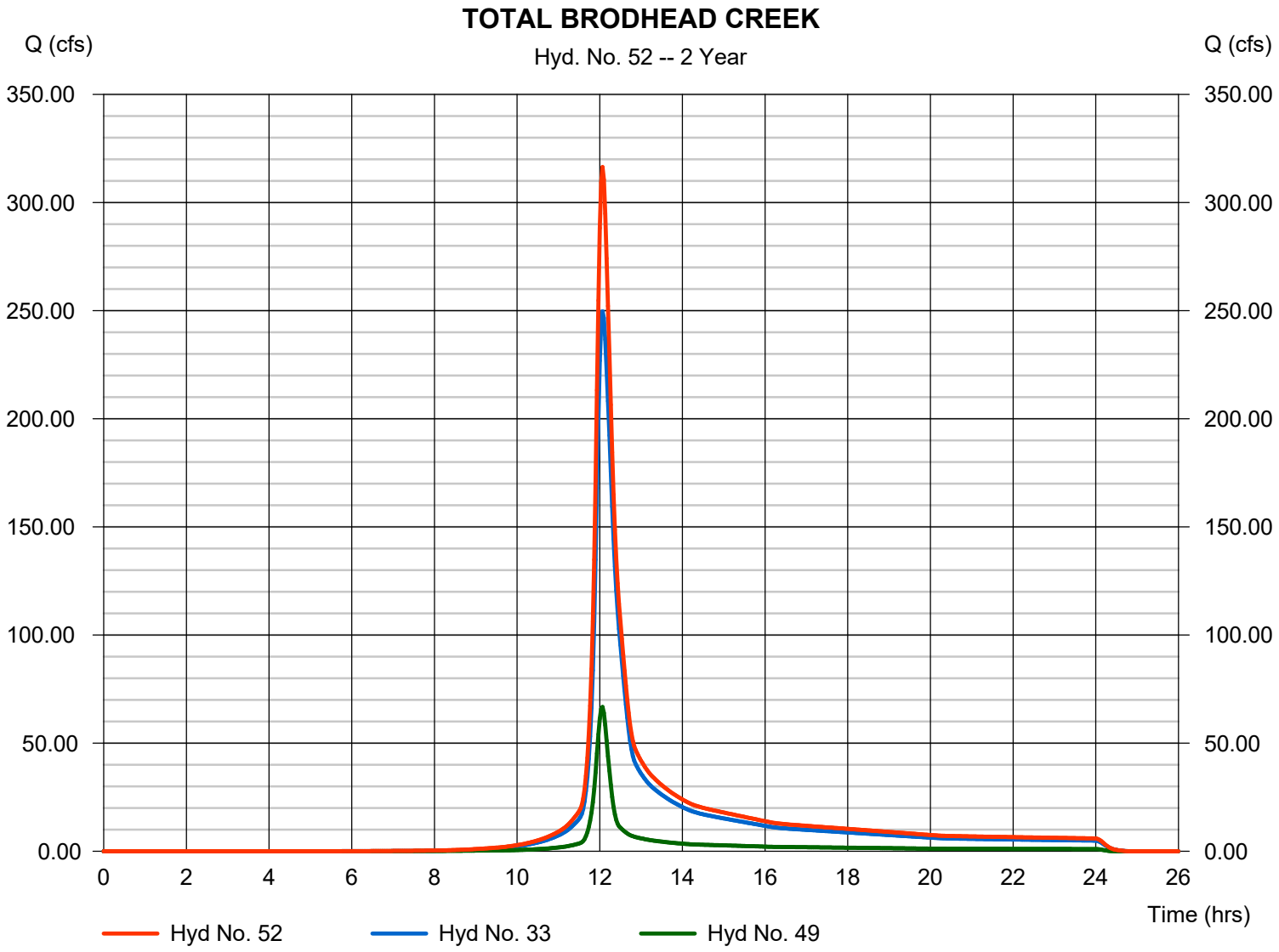
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 52

TOTAL BRODHEAD CREEK

Hydrograph type	=	Combine	Peak discharge	=	316.45 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	1,220,212 cuft
Inflow hyds.	=	33, 49	Contrib. drain. area	=	0.000 ac

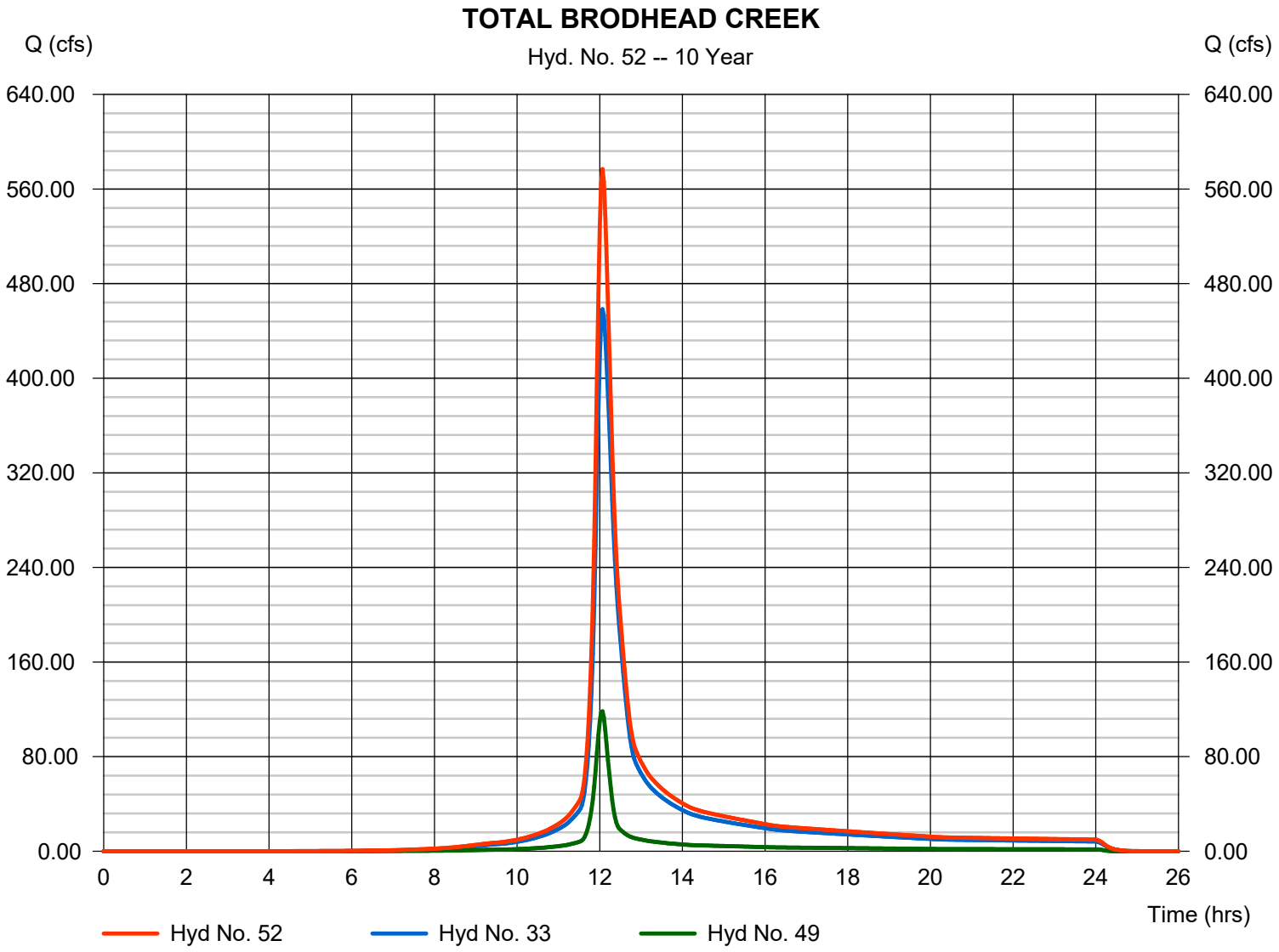


Hydrograph Report

Hyd. No. 52

TOTAL BRODHEAD CREEK

Hydrograph type	= Combine	Peak discharge	= 576.84 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 2,243,077 cuft
Inflow hyds.	= 33, 49	Contrib. drain. area	= 0.000 ac

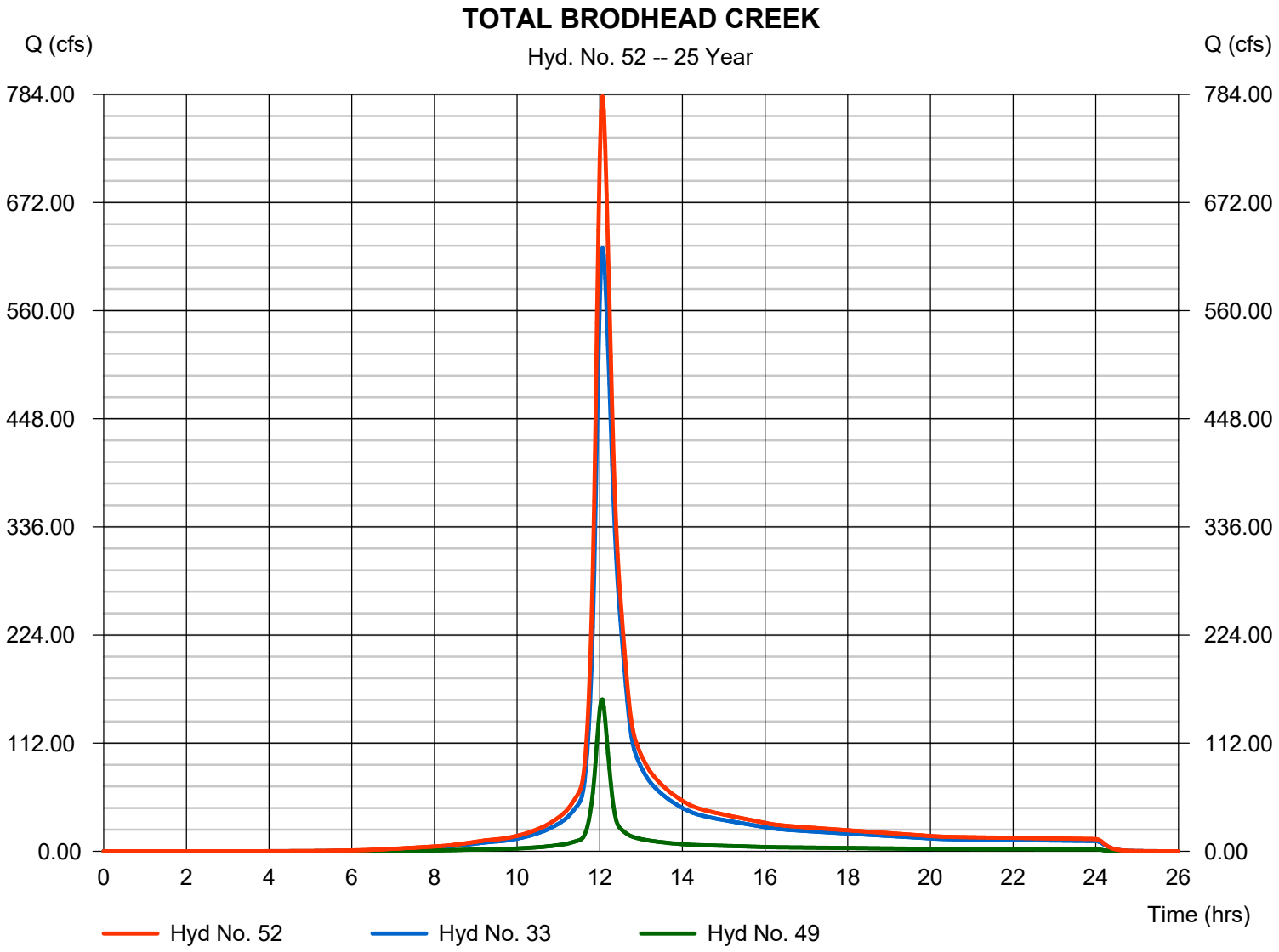


Hydrograph Report

Hyd. No. 52

TOTAL BRODHEAD CREEK

Hydrograph type	= Combine	Peak discharge	= 781.95 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 3,034,111 cuft
Inflow hyds.	= 33, 49	Contrib. drain. area	= 0.000 ac

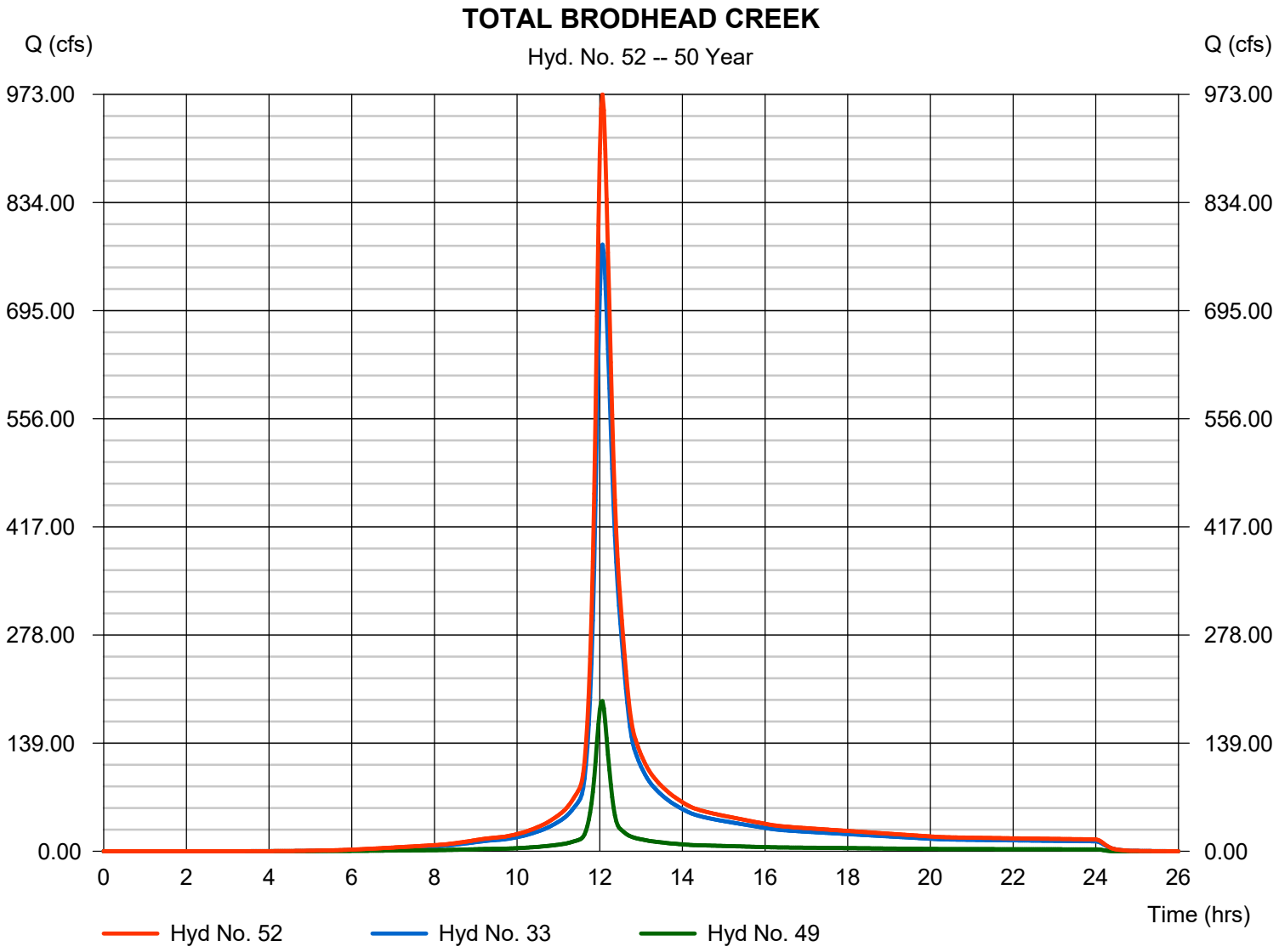


Hydrograph Report

Hyd. No. 52

TOTAL BRODHEAD CREEK

Hydrograph type	= Combine	Peak discharge	= 972.81 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 3,772,711 cuft
Inflow hyds.	= 33, 49	Contrib. drain. area	= 0.000 ac

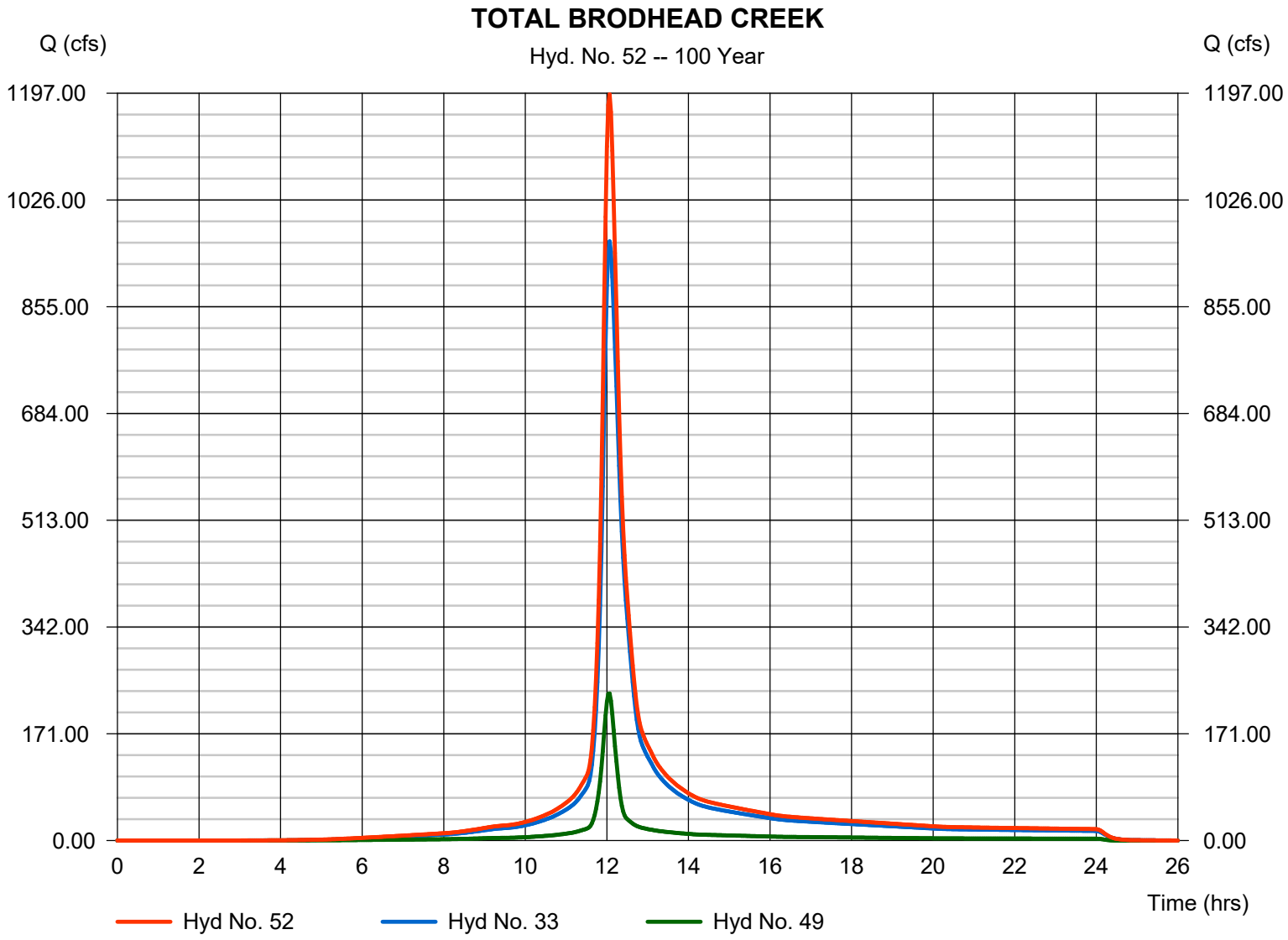


Hydrograph Report

Hyd. No. 52

TOTAL BRODHEAD CREEK

Hydrograph type	= Combine	Peak discharge	= 1195.26 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 4,666,100 cuft
Inflow hyds.	= 33, 49	Contrib. drain. area	= 0.000 ac



SUMMARY OF EXISTING PEAK DISCHARGES

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	11.97	2	726	41,920	------	------	------	EX-A-1-A-ONSITE
2	SCS Runoff	3.179	2	732	14,026	------	------	------	EX-A-1-A-OFFSITE-DISTURBED
3	SCS Runoff	57.01	2	732	246,648	------	------	------	EX-A-1-A-OFFSITE-UNDISTURBED
4	SCS Runoff	32.61	2	722	91,552	------	------	------	EX-A-1-D-OFFSITE
5	Combine	94.05	2	726	394,146	1, 2, 3, 4	------	------	EX-POA-A-1
6	Combine	14.98	2	728	55,946	1, 2,	------	------	POA-A-1 ONSITE & OFFSITE DISTU
8	SCS Runoff	18.54	2	724	59,180	------	------	------	EX-A-2-A-ONSITE
9	SCS Runoff	33.73	2	722	95,176	------	------	------	EX-A-2-A OFFSITE
10	Combine	51.92	2	724	154,356	8, 9	------	------	EX-POA-A-2
12	SCS Runoff	53.61	2	724	169,405	------	------	------	EX-A-3-ONSITE
13	SCS Runoff	37.39	2	734	162,862	------	------	------	EX-A-3-OFFSITE
14	Combine	85.43	2	726	332,267	12, 13	------	------	EX-POA-A-3
16	Combine	86.69	2	726	284,531	6, 8, 12,	------	------	POA-A ONSITE & OFFSITE DIST.
18	SCS Runoff	6.417	2	720	16,731	------	------	------	EX-A-4-ONSITE
20	SCS Runoff	5.846	2	718	14,039	------	------	------	EX-B-1-ONSITE
21	SCS Runoff	13.96	2	718	32,455	------	------	------	EX-B-1-OFFSITE
22	SCS Runoff	37.97	2	726	132,390	------	------	------	EX-B-2-ONSITE
23	SCS Runoff	4.661	2	716	9,699	------	------	------	EX-B-2-OFFSITE
24	Combine	38.75	2	726	142,089	22, 23	------	------	EX-B-2
25	Reservoir	5.354	2	760	56,131	24	438.28	70,884	EX-B-2 Routing
26	Combine	5.846	2	718	70,170	20, 25	------	------	EX-B-ONSITE
27	Combine	19.80	2	718	102,625	20, 21, 25,	------	------	EX-POA-B
29	SCS Runoff	1.896	2	726	6,585	------	------	------	EX-C-ONSITE
30	SCS Runoff	4.360	2	718	10,087	------	------	------	EX-C-OFFSITE
31	Combine	5.784	2	720	16,673	29, 30	------	------	EX-POA-C
33	Combine	249.70	2	724	1,016,797	5, 10, 14, 18, 27, 31,	------	------	Combined EX-POA-ABC
35	SCS Runoff	8.759	2	722	24,806	------	------	------	EX-D-1-ONSITE
36	SCS Runoff	9.963	2	720	25,834	------	------	------	EX-D-2-ONSITE
37	SCS Runoff	2.651	2	716	5,445	------	------	------	EX-D-2-OFFSITE-DISTURBED
38	SCS Runoff	2.928	2	716	5,985	------	------	------	EX-D-2-OFFSITE-UNDISTURBED

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
39	Combine	22.53	2	720	62,070	35, 36, 37, 38	------	------	EX-POA-D-1
40	Combine	20.25	2	720	56,085	35, 36, 37,	------	------	EX-POA-D-1 ONSITE & OFFSITE DI
41	SCS Runoff	7.907	2	718	18,167	------	------	------	EX-D-3-OFFSITE
42	Combine	30.32	2	720	80,237	35, 36, 37, 38, 41	------	------	EX-POA-D
43	Combine	28.04	2	720	74,253	35, 36, 37, 41,	------	------	EX-POA-D ONSITE & OFFSITE DIST
45	SCS Runoff	5.607	2	722	15,716	------	------	------	EX-E-1-DISTURBED
46	SCS Runoff	26.24	2	722	74,301	------	------	------	EX-E-1-UNDISTURBED
47	SCS Runoff	3.578	2	724	11,421	------	------	------	EX-E-2-DISTURBED
48	SCS Runoff	32.12	2	724	101,977	------	------	------	EX-E-2-UNDISTURBED
49	Combine	66.74	2	724	203,415	45, 46, 47, 48	------	------	EX-POA-E
50	Combine	9.083	2	724	27,136	45, 47,	------	------	EX-POA-E DISTURBED
52	Combine	316.45	2	724	1,220,212	33, 49,	------	------	TOTAL BRODHEAD CREEK

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	22.37	2	726	77,225	------	------	------	EX-A-1-A-ONSITE
2	SCS Runoff	4.913	2	732	22,129	------	------	------	EX-A-1-A-OFFSITE-DISTURBED
3	SCS Runoff	98.56	2	732	426,942	------	------	------	EX-A-1-A-OFFSITE-UNDISTURBED
4	SCS Runoff	58.47	2	722	164,410	------	------	------	EX-A-1-D-OFFSITE
5	Combine	166.20	2	726	690,707	1, 2, 3, 4	------	------	EX-POA-A-1
6	Combine	26.86	2	728	99,354	1, 2,	------	------	POA-A-1 ONSITE & OFFSITE DISTU
8	SCS Runoff	35.78	2	724	111,948	------	------	------	EX-A-2-A-ONSITE
9	SCS Runoff	62.52	2	722	175,334	------	------	------	EX-A-2-A OFFSITE
10	Combine	97.01	2	724	287,282	8, 9	------	------	EX-POA-A-2
12	SCS Runoff	99.82	2	724	312,078	------	------	------	EX-A-3-ONSITE
13	SCS Runoff	67.70	2	732	292,470	------	------	------	EX-A-3-OFFSITE
14	Combine	157.78	2	726	604,548	12, 13	------	------	EX-POA-A-3
16	Combine	161.36	2	724	523,380	6, 8, 12,	------	------	POA-A ONSITE & OFFSITE DIST.
18	SCS Runoff	11.88	2	720	30,822	------	------	------	EX-A-4-ONSITE
20	SCS Runoff	8.972	2	718	22,149	------	------	------	EX-B-1-ONSITE
21	SCS Runoff	22.51	2	718	53,598	------	------	------	EX-B-1-OFFSITE
22	SCS Runoff	69.74	2	726	240,773	------	------	------	EX-B-2-ONSITE
23	SCS Runoff	7.399	2	716	15,834	------	------	------	EX-B-2-OFFSITE
24	Combine	70.94	2	726	256,606	22, 23	------	------	EX-B-2
25	Reservoir	25.74	2	744	163,108	24	438.80	112,937	EX-B-2 Routing
26	Combine	26.69	2	744	185,257	20, 25	------	------	EX-B-ONSITE
27	Combine	31.66	2	720	238,855	20, 21, 25,	------	------	EX-POA-B
29	SCS Runoff	3.424	2	726	11,826	------	------	------	EX-C-ONSITE
30	SCS Runoff	7.125	2	718	16,853	------	------	------	EX-C-OFFSITE
31	Combine	9.736	2	720	28,679	29, 30	------	------	EX-POA-C
33	Combine	458.45	2	724	1,880,891	5, 10, 14, 18, 27, 31,	------	------	Combined EX-POA-ABC
35	SCS Runoff	16.52	2	722	46,302	------	------	------	EX-D-1-ONSITE
36	SCS Runoff	17.57	2	720	45,820	------	------	------	EX-D-2-ONSITE
37	SCS Runoff	4.318	2	716	9,097	------	------	------	EX-D-2-OFFSITE-DISTURBED
38	SCS Runoff	4.834	2	716	10,116	------	------	------	EX-D-2-OFFSITE-UNDISTURBED

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
39	Combine	40.29	2	720	111,334	35, 36, 37, 38	------	------	EX-POA-D-1
40	Combine	36.60	2	720	101,218	35, 36, 37,	------	------	EX-POA-D-1 ONSITE & OFFSITE DI
41	SCS Runoff	13.29	2	718	31,074	------	------	------	EX-D-3-OFFSITE
42	Combine	53.26	2	720	142,408	35, 36, 37, 38, 41	------	------	EX-POA-D
43	Combine	49.57	2	720	132,292	35, 36, 37, 41,	------	------	EX-POA-D ONSITE & OFFSITE DIST
45	SCS Runoff	9.747	2	722	27,535	------	------	------	EX-E-1-DISTURBED
46	SCS Runoff	42.47	2	722	122,704	------	------	------	EX-E-1-UNDISTURBED
47	SCS Runoff	6.905	2	724	21,604	------	------	------	EX-E-2-DISTURBED
48	SCS Runoff	60.88	2	724	190,342	------	------	------	EX-E-2-UNDISTURBED
49	Combine	118.39	2	724	362,184	45, 46, 47, 48	------	------	EX-POA-E
50	Combine	16.40	2	724	49,139	45, 47,	------	------	EX-POA-E DISTURBED
52	Combine	576.84	2	724	2,243,077	33, 49,	------	------	TOTAL BRODHEAD CREEK

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	30.30	2	726	104,776	------	------	------	EX-A-1-A-ONSITE
2	SCS Runoff	6.168	2	732	28,111	------	------	------	EX-A-1-A-OFFSITE-DISTURBED
3	SCS Runoff	129.41	2	732	564,138	------	------	------	EX-A-1-A-OFFSITE-UNDISTURBED
4	SCS Runoff	77.91	2	722	220,668	------	------	------	EX-A-1-D-OFFSITE
5	Combine	220.20	2	726	917,694	1, 2, 3, 4	------	------	EX-POA-A-1
6	Combine	35.88	2	726	132,887	1, 2,	------	------	POA-A-1 ONSITE & OFFSITE DISTU
8	SCS Runoff	49.10	2	724	153,590	------	------	------	EX-A-2-A-ONSITE
9	SCS Runoff	84.41	2	722	237,886	------	------	------	EX-A-2-A OFFSITE
10	Combine	131.80	2	722	391,476	8, 9	------	------	EX-POA-A-2
12	SCS Runoff	135.04	2	724	423,414	------	------	------	EX-A-3-ONSITE
13	SCS Runoff	90.64	2	732	392,549	------	------	------	EX-A-3-OFFSITE
14	Combine	212.77	2	726	815,963	12, 13	------	------	EX-POA-A-3
16	Combine	218.75	2	724	709,891	6, 8, 12,	------	------	POA-A ONSITE & OFFSITE DIST.
18	SCS Runoff	16.03	2	720	41,818	------	------	------	EX-A-4-ONSITE
20	SCS Runoff	11.23	2	718	28,137	------	------	------	EX-B-1-ONSITE
21	SCS Runoff	28.72	2	718	69,416	------	------	------	EX-B-1-OFFSITE
22	SCS Runoff	93.83	2	726	324,898	------	------	------	EX-B-2-ONSITE
23	SCS Runoff	9.383	2	716	20,407	------	------	------	EX-B-2-OFFSITE
24	Combine	95.34	2	726	345,304	22, 23	------	------	EX-B-2
25	Reservoir	40.93	2	742	246,992	24	439.09	142,584	EX-B-2 Routing
26	Combine	42.18	2	742	275,129	20, 25	------	------	EX-B-ONSITE
27	Combine	47.94	2	720	344,545	20, 21, 25,	------	------	EX-POA-B
29	SCS Runoff	4.576	2	726	15,872	------	------	------	EX-C-ONSITE
30	SCS Runoff	9.141	2	718	21,935	------	------	------	EX-C-OFFSITE
31	Combine	12.66	2	720	37,807	29, 30	------	------	EX-POA-C
33	Combine	624.65	2	724	2,549,304	5, 10, 14, 18, 27, 31,	------	------	Combined EX-POA-ABC
35	SCS Runoff	22.46	2	722	63,168	------	------	------	EX-D-1-ONSITE
36	SCS Runoff	23.25	2	720	61,174	------	------	------	EX-D-2-ONSITE
37	SCS Runoff	5.532	2	716	11,840	------	------	------	EX-D-2-OFFSITE-DISTURBED
38	SCS Runoff	6.227	2	716	13,233	------	------	------	EX-D-2-OFFSITE-UNDISTURBED

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
39	Combine	53.67	2	720	149,415	35, 36, 37, 38	------	------	EX-POA-D-1
40	Combine	48.95	2	720	136,183	35, 36, 37,	------	------	EX-POA-D-1 ONSITE & OFFSITE DI
41	SCS Runoff	17.24	2	718	40,851	------	------	------	EX-D-3-OFFSITE
42	Combine	70.44	2	720	190,266	35, 36, 37, 38, 41	------	------	EX-POA-D
43	Combine	65.72	2	720	177,034	35, 36, 37, 41,	------	------	EX-POA-D ONSITE & OFFSITE DIST
45	SCS Runoff	12.82	2	722	36,570	------	------	------	EX-E-1-DISTURBED
46	SCS Runoff	54.28	2	722	158,918	------	------	------	EX-E-1-UNDISTURBED
47	SCS Runoff	9.475	2	724	29,640	------	------	------	EX-E-2-DISTURBED
48	SCS Runoff	82.93	2	724	259,680	------	------	------	EX-E-2-UNDISTURBED
49	Combine	157.29	2	724	484,809	45, 46, 47, 48	------	------	EX-POA-E
50	Combine	21.97	2	722	66,211	45, 47,	------	------	EX-POA-E DISTURBED
52	Combine	781.95	2	724	3,034,111	33, 49,	------	------	TOTAL BRODHEAD CREEK

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	37.62	2	726	130,615	------	------	------	EX-A-1-A-ONSITE
2	SCS Runoff	7.302	2	732	33,579	------	------	------	EX-A-1-A-OFFSITE-DISTURBED
3	SCS Runoff	157.53	2	732	691,270	------	------	------	EX-A-1-A-OFFSITE-UNDISTURBED
4	SCS Runoff	95.71	2	722	273,162	------	------	------	EX-A-1-D-OFFSITE
5	Combine	269.61	2	726	1,128,625	1, 2, 3, 4	------	------	EX-POA-A-1
6	Combine	44.24	2	726	164,194	1, 2,	------	------	POA-A-1 ONSITE & OFFSITE DISTU
8	SCS Runoff	61.45	2	724	192,860	------	------	------	EX-A-2-A-ONSITE
9	SCS Runoff	104.57	2	722	296,551	------	------	------	EX-A-2-A OFFSITE
10	Combine	164.07	2	722	489,411	8, 9	------	------	EX-POA-A-2
12	SCS Runoff	167.51	2	724	527,833	------	------	------	EX-A-3-ONSITE
13	SCS Runoff	111.71	2	732	485,930	------	------	------	EX-A-3-OFFSITE
14	Combine	263.41	2	726	1,013,764	12, 13	------	------	EX-POA-A-3
16	Combine	271.74	2	724	884,887	6, 8, 12,	------	------	POA-A ONSITE & OFFSITE DIST.
18	SCS Runoff	19.85	2	720	52,131	------	------	------	EX-A-4-ONSITE
20	SCS Runoff	13.27	2	718	33,610	------	------	------	EX-B-1-ONSITE
21	SCS Runoff	34.34	2	718	83,961	------	------	------	EX-B-1-OFFSITE
22	SCS Runoff	116.00	2	726	403,591	------	------	------	EX-B-2-ONSITE
23	SCS Runoff	11.18	2	716	24,604	------	------	------	EX-B-2-OFFSITE
24	Combine	117.78	2	726	428,195	22, 23	------	------	EX-B-2
25	Reservoir	52.59	2	742	325,666	24	439.29	171,786	EX-B-2 Routing
26	Combine	54.06	2	742	359,276	20, 25	------	------	EX-B-ONSITE
27	Combine	65.75	2	720	443,236	20, 21, 25,	------	------	EX-POA-B
29	SCS Runoff	5.633	2	726	19,648	------	------	------	EX-C-ONSITE
30	SCS Runoff	10.97	2	718	26,615	------	------	------	EX-C-OFFSITE
31	Combine	15.31	2	720	46,264	29, 30	------	------	EX-POA-C
33	Combine	779.81	2	724	3,173,432	5, 10, 14, 18, 27, 31,	------	------	Combined EX-POA-ABC
35	SCS Runoff	27.94	2	722	79,030	------	------	------	EX-D-1-ONSITE
36	SCS Runoff	28.43	2	720	75,467	------	------	------	EX-D-2-ONSITE
37	SCS Runoff	6.630	2	716	14,366	------	------	------	EX-D-2-OFFSITE-DISTURBED
38	SCS Runoff	7.488	2	716	16,108	------	------	------	EX-D-2-OFFSITE-UNDISTURBED

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
39	Combine	65.95	2	720	184,972	35, 36, 37, 38	------	------	EX-POA-D-1
40	Combine	60.30	2	720	168,863	35, 36, 37,	------	------	EX-POA-D-1 ONSITE & OFFSITE DI
41	SCS Runoff	20.82	2	718	49,892	------	------	------	EX-D-3-OFFSITE
42	Combine	86.15	2	720	234,864	35, 36, 37, 38, 41	------	------	EX-POA-D
43	Combine	80.51	2	720	218,755	35, 36, 37, 41,	------	------	EX-POA-D ONSITE & OFFSITE DIST
45	SCS Runoff	15.63	2	722	44,962	------	------	------	EX-E-1-DISTURBED
46	SCS Runoff	64.96	2	722	192,214	------	------	------	EX-E-1-UNDISTURBED
47	SCS Runoff	11.86	2	724	37,219	------	------	------	EX-E-2-DISTURBED
48	SCS Runoff	103.33	2	724	324,886	------	------	------	EX-E-2-UNDISTURBED
49	Combine	193.00	2	724	599,281	45, 46, 47, 48	------	------	EX-POA-E
50	Combine	27.11	2	722	82,181	45, 47,	------	------	EX-POA-E DISTURBED
52	Combine	972.81	2	724	3,772,711	33, 49,	------	------	TOTAL BRODHEAD CREEK

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	46.37	2	726	161,957	------	------	------	EX-A-1-A-ONSITE
2	SCS Runoff	8.643	2	732	40,094	------	------	------	EX-A-1-A-OFFSITE-DISTURBED
3	SCS Runoff	190.88	2	732	844,171	------	------	------	EX-A-1-A-OFFSITE-UNDISTURBED
4	SCS Runoff	116.88	2	722	336,606	------	------	------	EX-A-1-D-OFFSITE
5	Combine	328.32	2	726	1,382,828	1, 2, 3, 4	------	------	EX-POA-A-1
6	Combine	54.21	2	726	202,051	1, 2,	------	------	POA-A-1 ONSITE & OFFSITE DISTU
8	SCS Runoff	76.26	2	724	240,681	------	------	------	EX-A-2-A-ONSITE
9	SCS Runoff	128.64	2	722	367,711	------	------	------	EX-A-2-A OFFSITE
10	Combine	202.68	2	722	608,391	8, 9	------	------	EX-POA-A-2
12	SCS Runoff	206.28	2	724	654,490	------	------	------	EX-A-3-ONSITE
13	SCS Runoff	136.82	2	732	598,790	------	------	------	EX-A-3-OFFSITE
14	Combine	323.84	2	726	1,253,281	12, 13	------	------	EX-POA-A-3
16	Combine	335.08	2	724	1,097,222	6, 8, 12,	------	------	POA-A ONSITE & OFFSITE DIST.
18	SCS Runoff	24.41	2	720	64,641	------	------	------	EX-A-4-ONSITE
20	SCS Runoff	15.69	2	718	40,131	------	------	------	EX-B-1-ONSITE
21	SCS Runoff	40.98	2	718	101,360	------	------	------	EX-B-1-OFFSITE
22	SCS Runoff	142.44	2	726	498,867	------	------	------	EX-B-2-ONSITE
23	SCS Runoff	13.29	2	716	29,620	------	------	------	EX-B-2-OFFSITE
24	Combine	144.54	2	726	528,487	22, 23	------	------	EX-B-2
25	Reservoir	67.14	2	742	421,336	24	439.52	205,293	EX-B-2 Routing
26	Combine	68.87	2	742	461,467	20, 25	------	------	EX-B-ONSITE
27	Combine	87.95	2	720	562,827	20, 21, 25,	------	------	EX-POA-B
29	SCS Runoff	6.891	2	726	24,212	------	------	------	EX-C-ONSITE
30	SCS Runoff	13.12	2	718	32,222	------	------	------	EX-C-OFFSITE
31	Combine	18.47	2	720	56,433	29, 30	------	------	EX-POA-C
33	Combine	959.70	2	724	3,928,400	5, 10, 14, 18, 27, 31,	------	------	Combined EX-POA-ABC
35	SCS Runoff	34.50	2	722	98,307	------	------	------	EX-D-1-ONSITE
36	SCS Runoff	34.59	2	720	92,711	------	------	------	EX-D-2-ONSITE
37	SCS Runoff	7.928	2	716	17,392	------	------	------	EX-D-2-OFFSITE-DISTURBED
38	SCS Runoff	8.978	2	716	19,557	------	------	------	EX-D-2-OFFSITE-UNDISTURBED

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
39	Combine	80.57	2	720	227,968	35, 36, 37, 38	------	------	EX-POA-D-1
40	Combine	73.82	2	720	208,411	35, 36, 37,	------	------	EX-POA-D-1 ONSITE & OFFSITE DI
41	SCS Runoff	25.06	2	718	60,749	------	------	------	EX-D-3-OFFSITE
42	Combine	104.84	2	720	288,718	35, 36, 37, 38, 41	------	------	EX-POA-D
43	Combine	98.09	2	720	269,160	35, 36, 37, 41,	------	------	EX-POA-D ONSITE & OFFSITE DIST
45	SCS Runoff	18.95	2	722	55,070	------	------	------	EX-E-1-DISTURBED
46	SCS Runoff	77.58	2	722	232,047	------	------	------	EX-E-1-UNDISTURBED
47	SCS Runoff	14.72	2	724	46,447	------	------	------	EX-E-2-DISTURBED
48	SCS Runoff	127.73	2	724	404,131	------	------	------	EX-E-2-UNDISTURBED
49	Combine	235.56	2	724	737,696	45, 46, 47, 48	------	------	EX-POA-E
50	Combine	33.24	2	722	101,517	45, 47,	------	------	EX-POA-E DISTURBED
52	Combine	1195.26	2	724	4,666,100	33, 49,	------	------	TOTAL BRODHEAD CREEK

STORMWATER MANAGEMENT REPORT - PREPARED BY REILLY ASSOCIATES

EXISTING STORMWATER BASIN PEAK DISCHARGES

Engineering

Environmental

Surveying

MOSIER DEVELOPMENT, LLC
Senior Living Development

STORMWATER MANAGEMENT REPORT

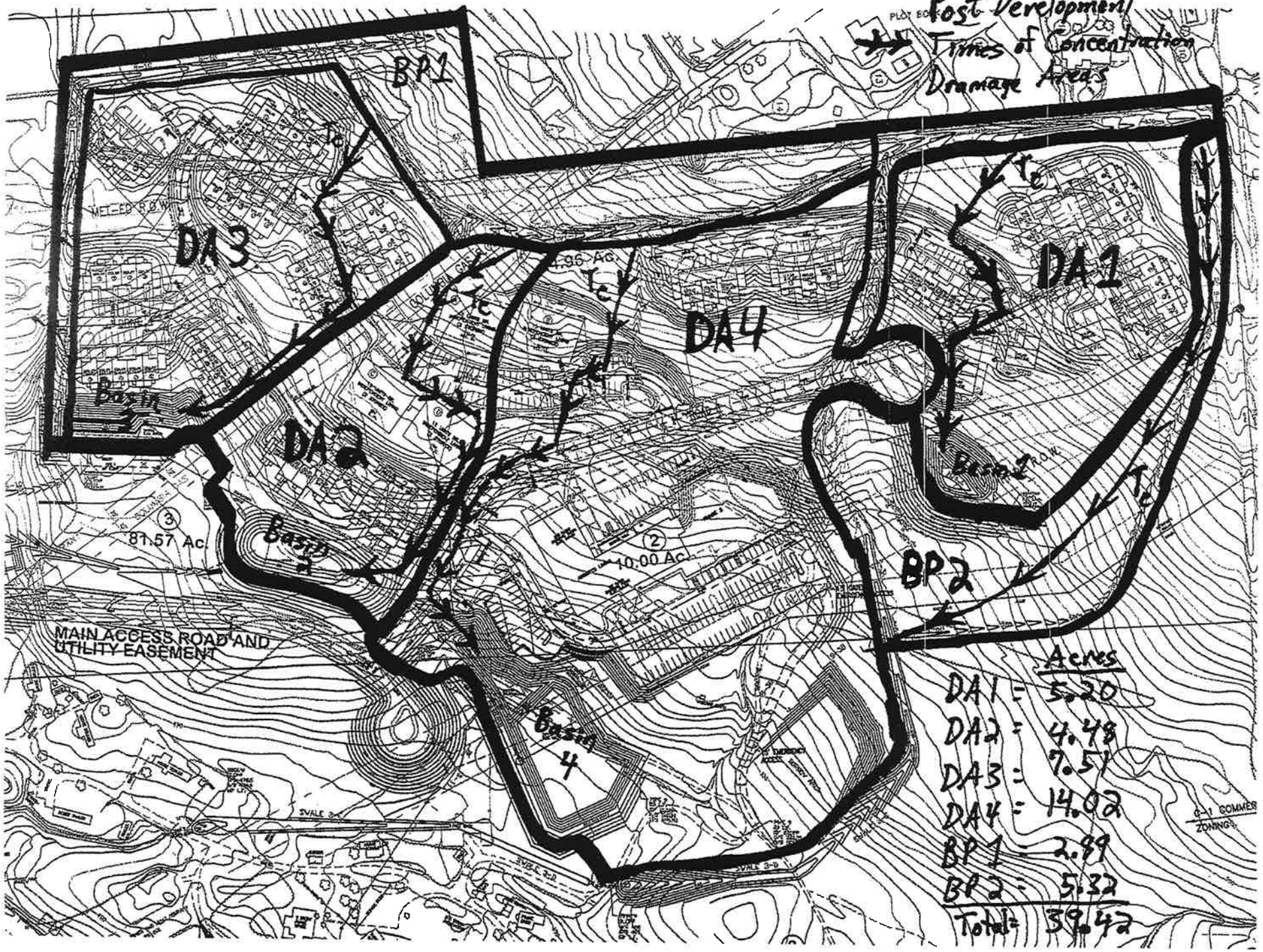
MARCH 7, 2005
REVISED: OCTOBER 6, 2005

PREPARED BY:

REILLY ASSOCIATES
222 WYOMING AVENUE
WEST PITTSTON, PA 18643-2822
(570) 654-2473
(570) 654-6880

RA#04037

Reilly ASSOCIATES SINCE 1930



	Acres
DA1 =	5.20
DA2 =	4.48
DA3 =	9.51
DA4 =	14.02
BP1 =	2.99
BP2 =	5.32
Total =	39.42

MASTER DESIGN STORM SUMMARY

Network Storm Collection: Brodhead SWMP

Return Event	Total Depth in	Rainfall Type	RNF ID
Dev.33	3.4000	Synthetic Curve	TypeII 24hr
Dev 5	4.3500	Synthetic Curve	TypeII 24hr
Dev 10	5.1300	Synthetic Curve	TypeIII 24hr
Dev 25	6.0700	Synthetic Curve	TypeII 24hr
Dev 50	6.8100	Synthetic Curve	TypeII 24hr
Dev100	7.5100	Synthetic Curve	TypeII 24hr
Dev.75	1.2400	Synthetic Curve	TypeII 24hr

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
DET. BASIN 1 IN	POND	2	.769		11.9000	13.86		
DET. BASIN 1 IN	POND	5	1.123		11.9000	20.33		
DET. BASIN 1 IN	POND	10	1.426		12.1000	17.48		
DET. BASIN 1 IN	POND	25	1.801		11.9000	32.38		
DET. BASIN 1 IN	POND	50	2.101		11.9000	37.60		
DET. BASIN 1 IN	POND	100	2.388		11.9000	42.54		
DET. BASIN 1 IN	POND	1	.104		12.0000	1.67		
DET. BASIN 1 OUT	POND	2	.769		11.9500	13.85	558.08	.026
DET. BASIN 1 OUT	POND	5	1.123		11.9500	20.15	558.51	.041
DET. BASIN 1 OUT	POND	10	1.426		12.1000	17.12	558.31	.034
DET. BASIN 1 OUT	POND	25	1.801		11.9500	30.18	559.24	.076
DET. BASIN 1 OUT	POND	50	2.101		11.9500	34.25	559.55	.095
DET. BASIN 1 OUT	POND	100	2.388		12.0000	37.84	559.86	.116
DET. BASIN 1 OUT	POND	1	.104		12.0000	1.66	556.70	.003

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
DET. BASIN 2 OUT	POND	2	.689		12.3000	1.78	513.33	.916
DET. BASIN 2 OUT	POND	5	.999		12.2500	2.32	513.90	1.073
DET. BASIN 2 OUT	POND	10	1.263		12.5500	2.57	514.21	1.162
DET. BASIN 2 OUT	POND	25	1.589		12.3500	3.06	514.90	1.375
DET. BASIN 2 OUT	POND	50	1.849		12.3500	3.32	515.30	1.509
DET. BASIN 2 OUT	POND	100	2.098		12.4000	3.54	515.67	1.638
DET. BASIN 2 OUT	POND	1	.097		13.1000	.11	512.20	.645
POST-DV AREA 2	AREA	2	.691		11.9000	12.48		
POST-DV AREA 2	AREA	5	1.001		11.9000	18.11		
POST-DV AREA 2	AREA	10	1.265		12.1000	15.43		
POST-DV AREA 2	AREA	25	1.591		11.9000	28.52		
POST-DV AREA 2	AREA	50	1.851		11.9000	33.02		
POST-DV AREA 2	AREA	100	2.100		11.9000	37.27		
POST-DV AREA 2	AREA	1	.100		11.9500	1.64		

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
DET. BASIN 3 OUT	POND	2	1.109		12.1000	5.79	511.59	.433
DET. BASIN 3 OUT	POND	5	1.620		12.1000	7.59	512.28	.646
DET. BASIN 3 OUT	POND	10	2.058		12.4000	8.00	512.46	.704
DET. BASIN 3 OUT	POND	25	2.599		12.0500	24.54	513.14	.932
DET. BASIN 3 OUT	POND	50	3.032		12.0500	33.60	513.37	1.010
DET. BASIN 3 OUT	POND	100	3.447		12.0500	41.15	513.54	1.070
POST-DEV AREA 3	AREA	2	1.111		11.9000	20.02		
POST-DEV AREA 3	AREA	5	1.622		11.9000	29.36		
POST-DEV AREA 3	AREA	10	2.060		12.1000	25.24		
POST-DEV AREA 3	AREA	25	2.601		11.9000	46.76		
POST-DEV AREA 3	AREA	50	3.034		11.9000	54.30		
POST-DEV AREA 3	AREA	100	3.449		11.9000	61.43		

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
DET. BASIN 4 OUT	POND	2	2.250		12.1500	8.06	495.88	1.012
DET. BASIN 4 OUT	POND	5	3.235		12.1000	11.25	496.65	1.465
DET. BASIN 4 OUT	POND	10	4.072		12.5000	11.38	497.01	1.691
DET. BASIN 4 OUT	POND	25	5.100		12.2500	12.25	498.07	2.397
DET. BASIN 4 OUT	POND	50	5.921		12.3000	12.76	498.66	2.814
DET. BASIN 4 OUT	POND	100	6.704		12.3500	13.22	499.21	3.214
DET. BASIN 4 OUT	POND	1	.342		13.7500	.34	494.32	.162
POST-DEV AREA 4	AREA	2	2.254		11.9000	40.78		
POST-DEV AREA 4	AREA	5	3.240		11.9000	58.54		
POST-DEV AREA 4	AREA	10	4.076		12.1000	49.46		
POST-DEV AREA 4	AREA	25	5.104		11.9000	91.20		
POST-DEV AREA 4	AREA	50	5.925		11.9000	105.28		
POST-DEV AREA 4	AREA	100	6.709		11.9000	118.57		
POST-DEV AREA 4	AREA	1	.347		11.9500	5.86		

APPENDIX B

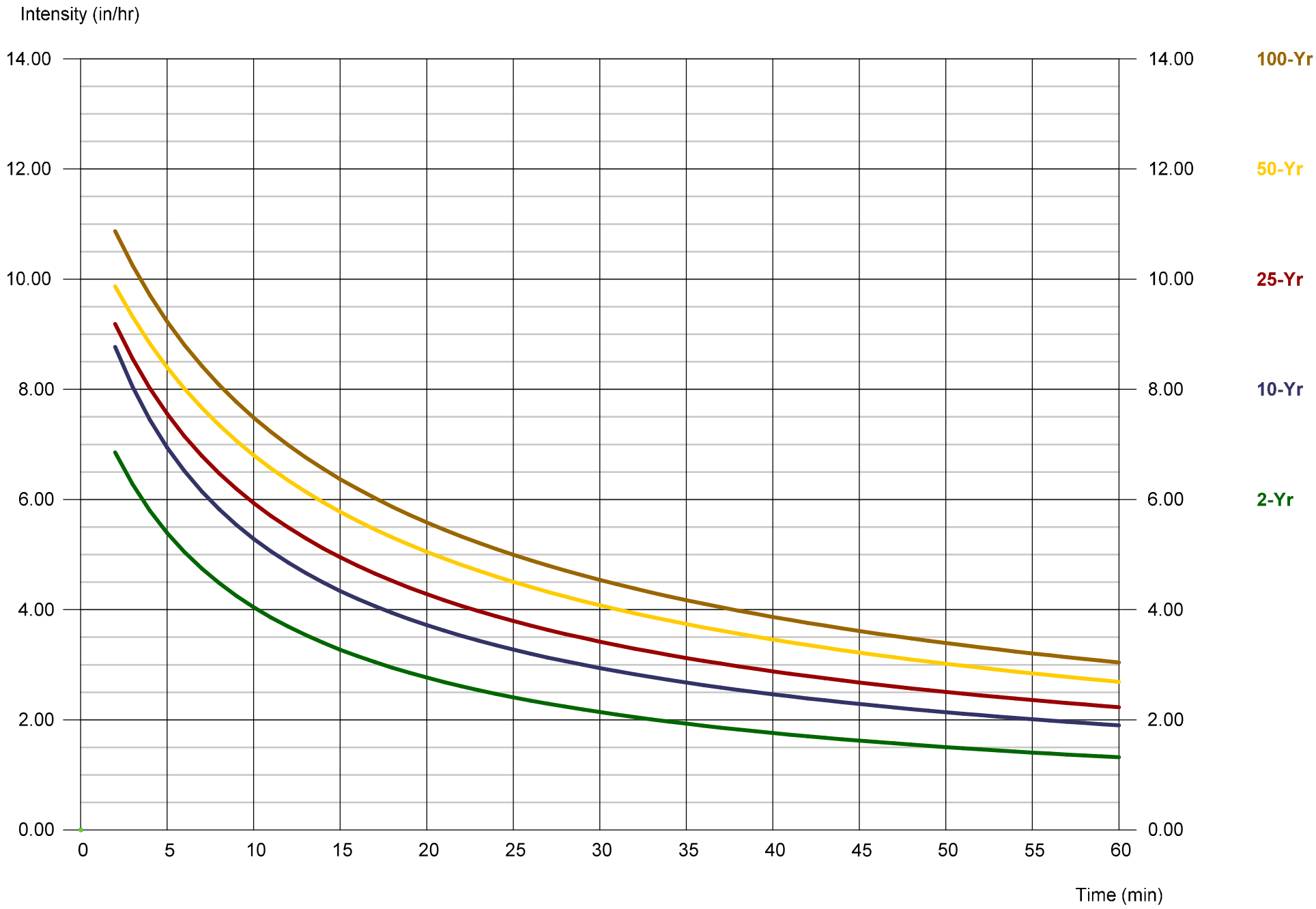
Stormwater Conveyance Calculations

APPENDIX B
TABLE OF CONTENTS

IDF CURVE DATA

Hydraflow IDF Curves

IDF file: PennDOT - Smithfield Twp.IDF



CALCULATION OF WEIGHTED RUNOFF COEFFICIENTS

RUNOFF COEFFICIENT CALCULATIONS
STORMWATER CONVEYANCE DESIGN - RATIONAL METHOD
SMITHFIELD GATEWAY
SMITHFIELD TOWNSHIP, MONROE COUNTY, PENNSYLVANIA
LANGAN PROJECT #100501401

PROPOSED CONVEYANCE SYSTEM

SUB-DRAINAGE AREA	MEADOW SOIL GROUP C C = 0.44 (SF)	MEADOW SOIL GROUP D C = 0.61 (SF)	WOODS SOIL GROUP C C = 0.45 (SF)	WOODS SOIL GROUP D C = 0.59 (SF)	OPEN SPACE SOIL GROUP D C = 0.65 (SF)	IMPERVIOUS AREA C = 0.99 (SF)	TOTAL AREA (SF)	TOTAL AREA (AC)	RUNOFF COEFFICIENT C (Weighted)	Structure Type
SYSTEM 4										
CB4-1	0	0	0	0	0	3,045	3,045	0.07	0.99	INLET
CB4-2	0	0	0	0	15,072	10,036	25,108	0.58	0.79	INLET
CB4-3	0	0	0	0	9,478	6,551	16,029	0.37	0.79	INLET
CB4-4	0	0	0	0	3,913	2,323	6,236	0.14	0.78	INLET
CB4-5	0	0	0	0	5,282	13,280	18,562	0.43	0.89	INLET
CB4-6	0	0	0	0	9,534	9,928	19,462	0.45	0.82	INLET
CB4-7	0	0	0	0	354	1,568	1,922	0.04	0.93	INLET
CB4-8	0	2,975	0	0	766	1,568	5,309	0.12	0.73	INLET
CB4-9	0	0	0	0	50	4,633	4,683	0.11	0.99	INLET
CB4-10	0	0	0	0	290	8,481	8,772	0.20	0.98	INLET
CB4-11	0	0	0	0	475	3,187	3,662	0.08	0.95	INLET
CB4-12	0	0	0	0	10	832	842	0.02	0.99	INLET
CB4-13	0	0	0	0	6	5,465	5,471	0.13	0.99	INLET
CB4-14	0	0	0	0	0	8,036	8,036	0.18	0.99	INLET
CB4-15	0	0	0	0	1,951	10,869	12,820	0.29	0.94	INLET
CB4-16	0	0	0	0	107	8,385	8,492	0.19	0.99	INLET
CB4-17	0	0	0	0	0	3,875	3,875	0.09	0.99	INLET

RUNOFF COEFFICIENT CALCULATIONS
STORMWATER CONVEYANCE DESIGN - RATIONAL METHOD
SMITHFIELD GATEWAY
SMITHFIELD TOWNSHIP, MONROE COUNTY, PENNSYLVANIA
LANGAN PROJECT #100501401

PROPOSED CONVEYANCE SYSTEM

SUB-DRAINAGE AREA	MEADOW SOIL GROUP C C = 0.44 (SF)	MEADOW SOIL GROUP D C = 0.61 (SF)	WOODS SOIL GROUP C C = 0.45 (SF)	WOODS SOIL GROUP D C = 0.59 (SF)	OPEN SPACE SOIL GROUP D C = 0.65 (SF)	IMPERVIOUS AREA C = 0.99 (SF)	TOTAL AREA (SF)	TOTAL AREA (AC)	RUNOFF COEFFICIENT C (Weighted)	Structure Type
SYSTEM 4										
CB4-18	0	0	0	0	0	3,943	3,943	0.09	0.99	INLET
CB4-19	0	0	0	0	724	2,775	3,499	0.08	0.92	INLET
CB4-20	0	0	0	0	214	3,970	4,184	0.10	0.97	INLET
CB4-21	0	0	0	0	721	3,521	4,241	0.10	0.93	INLET
CB4-22	0	0	0	0	183	6,033	6,216	0.14	0.98	INLET
CB4-23	0	0	0	0	444	4,431	4,875	0.11	0.96	INLET
DA4-1	0	0	0	0	18,310	0	18,310	0.42	0.65	-
DA4-2	0	0	0	0	7,260	0	7,260	0.17	0.65	-
DA4-3	0	27,040	0	0	0	12,243	39,283	0.90	0.31	-
RD4-1	0	0	0	0	0	1,622	1,622	0.04	0.99	INLET
RD4-2	0	0	0	0	0	1,268	1,268	0.03	0.99	INLET
RD4-3	0	0	0	0	0	3,064	3,064	0.07	0.99	INLET
RD4-4	0	0	0	0	0	3,029	3,029	0.07	0.99	INLET
RD4-6	0	0	0	0	0	314	314	0.01	0.99	INLET
RD4-7	0	0	0	0	0	314	314	0.01	0.99	INLET
RD4-8	0	0	0	0	0	1,705	1,705	0.04	0.99	INLET
RD4-9	0	0	0	0	0	1,870	1,870	0.04	0.99	INLET
RD4-10	0	0	0	0	0	1,870	1,870	0.04	0.99	INLET
RD4-11	0	0	0	0	0	1,705	1,705	0.04	0.99	INLET

RUNOFF COEFFICIENT CALCULATIONS
STORMWATER CONVEYANCE DESIGN - RATIONAL METHOD
SMITHFIELD GATEWAY - ROADWAY INFRASTRUCTURE
SMITHFIELD TOWNSHIP, MONROE COUNTY, PENNSYLVANIA
LANGAN PROJECT #100501401

PROPOSED CONVEYANCE SYSTEM

SUB-DRAINAGE AREA	MEADOW SOIL GROUP C C = 0.44 (SF)	MEADOW SOIL GROUP D C = 0.61 (SF)	WOODS SOIL GROUP C C = 0.45 (SF)	WOODS SOIL GROUP D C = 0.59 (SF)	OPEN SPACE SOIL GROUP D C = 0.65 (SF)	IMPERVIOUS AREA C = 0.99 (SF)	TOTAL AREA (SF)	TOTAL AREA (AC)	RUNOFF COEFFICIENT C (Weighted)	Structure Type
NETWORK 5										
CB5-1					3,707	15,473	19,180	0.44	0.92	INLET
CB5-2					2,320	16,819	19,139	0.44	0.95	INLET
CB5-3					1,030	6,898	7,928	0.18	0.95	INLET
CB5-4					392	13,018	13,410	0.31	0.98	INLET
CB5-5					432	3,599	4,031	0.09	0.95	INLET
CB5-6					10,100	10,186	20,286	0.47	0.82	INLET
CB5-7					6,138	13,660	19,798	0.45	0.88	INLET
CB5-8					462	2,908	3,370	0.08	0.94	INLET
CB5-9					3,499	4,123	7,621	0.17	0.83	INLET
CB5-10					3,332	5,785	9,118	0.21	0.87	INLET
CB5-11		14,330			2,651	3,767	20,748	0.48	0.68	INLET
CB5-13					596	3,980	4,576	0.11	0.95	INLET
CB5-14		16,164			2,608	5,130	23,902	0.55	0.70	INLET
CB5-15					578	6,332	6,910	0.16	0.96	INLET
CB5-16		10,225			1,971	2,821	15,017	0.34	0.69	INLET
CB5-17		10,202			3,835	2,830	16,867	0.39	0.68	INLET
CB5-18					1,820	4,905	6,725	0.15	0.90	INLET
CB5-19		1,058			7,037	4,696	12,791	0.29	0.77	INLET
CB5-20					7,800	11,957	19,757	0.45	0.86	INLET
CB5-21					5,425	7,033	12,458	0.29	0.84	INLET
CB5-22					0	2,467	2,467	0.06	0.99	INLET

RUNOFF COEFFICIENT CALCULATIONS
STORMWATER CONVEYANCE DESIGN - RATIONAL METHOD
SMITHFIELD GATEWAY - ROADWAY INFRASTRUCTURE
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NETWORK 5										
CB5-33					431	2,422	2,853	0.07	0.94	INLET
CB5-34					550	2,573	3,123	0.07	0.93	INLET
CB5-35					511	2,178	2,689	0.06	0.93	INLET
CB5-36					841	2,585	3,426	0.08	0.91	INLET
CB5-37					502	4,105	4,607	0.11	0.95	INLET
CB5-38					752	3,738	4,490	0.10	0.93	INLET
CB5-41					1,237	1,270	2,507	0.06	0.82	INLET
CB5-42					2,598	1,041	3,639	0.08	0.75	INLET
CB5-43					4,298	2,787	7,085	0.16	0.78	INLET
CB5-44					3,956	2,234	6,190	0.14	0.77	INLET
CB5-45					3,863	6,010	9,873	0.23	0.86	INLET
CB5-46					1,952	4,604	6,556	0.15	0.89	INLET
CB5-47					567	2,682	3,249	0.07	0.93	INLET
CB5-48					679	2,010	2,689	0.06	0.90	INLET
CB5-49					847	4,012	4,859	0.11	0.93	INLET
CB5-50		74,014			0	2,962	76,976	1.77	0.62	INLET
CB5-51		201,381			0	2,004	203,385	4.67	0.61	INLET
CB5-52					426	2,004	2,430	0.06	0.93	INLET
CB5-53					1,738	3,573	5,311	0.12	0.88	INLET
CB5-54		21,985			0	2,715	24,700	0.57	0.65	INLET
CB5-55					591	2,755	3,346	0.08	0.93	INLET
CB5-56		9,893			0	2,046	11,939	0.27	0.68	INLET
CB5-57					684	3,154	3,838	0.09	0.93	INLET
CB5-58		3,142			0	2,272	5,414	0.12	0.77	INLET
CB5-59		507			0	1,861	2,368	0.05	0.91	INLET
CB5-60					542	2,578	3,120	0.07	0.93	INLET

RUNOFF COEFFICIENT CALCULATIONS
STORMWATER CONVEYANCE DESIGN - RATIONAL METHOD
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SMITHFIELD TOWNSHIP, MONROE COUNTY, PENNSYLVANIA
LANGAN PROJECT #100501401

PROPOSED CONVEYANCE SYSTEM

SUB-DRAINAGE AREA	MEADOW SOIL GROUP C C = 0.44 (SF)	MEADOW SOIL GROUP D C = 0.61 (SF)	WOODS SOIL GROUP C C = 0.45 (SF)	WOODS SOIL GROUP D C = 0.59 (SF)	OPEN SPACE SOIL GROUP D C = 0.65 (SF)	IMPERVIOUS AREA C = 0.99 (SF)	TOTAL AREA (SF)	TOTAL AREA (AC)	RUNOFF COEFFICIENT C (Weighted)	Structure Type
NETWORK 5										
CB5-61		471			0	1,662	2,133	0.05	0.91	INLET
CB5-62					468	2,135	2,603	0.06	0.93	INLET
CB5-63		648			0	2,691	3,339	0.08	0.92	INLET
CB5-64					589	3,201	3,790	0.09	0.94	INLET
CB5-65		3,789			201	5,850	9,840	0.23	0.84	INLET
CB5-66					387	1,817	2,204	0.05	0.93	INLET
CB5-67					215	1,276	1,491	0.03	0.94	INLET
CB5-68		1,694			203	1,303	3,200	0.07	0.77	INLET
CB5-69		4,090			739	4,734	9,563	0.22	0.80	INLET
CB5-70					711	4,034	4,745	0.11	0.94	INLET
CB5-71					1,845	5,504	7,349	0.17	0.90	INLET
CB5-72					7,649	12,199	19,848	0.46	0.86	INLET
CB5-73					3,580	1,565	5,145	0.12	0.75	INLET
CB5-74					599	1,914	2,513	0.06	0.91	INLET
CB5-75					3,712	2,585	6,297	0.14	0.79	INLET
CB5-76					55	1,748	1,803	0.04	0.98	INLET
CB5-77					493	7,198	7,691	0.18	0.97	INLET
CB5-78					513	1,645	2,158	0.05	0.91	INLET
CB5-79					450	5,450	5,900	0.14	0.96	INLET
CB5-80					348	3,643	3,991	0.09	0.96	INLET

RUNOFF COEFFICIENT CALCULATIONS
STORMWATER CONVEYANCE DESIGN - RATIONAL METHOD
SMITHFIELD GATEWAY - ROADWAY INFRASTRUCTURE
SMITHFIELD TOWNSHIP, MONROE COUNTY, PENNSYLVANIA
LANGAN PROJECT #100501401

PROPOSED CONVEYANCE SYSTEM

SUB-DRAINAGE AREA	MEADOW SOIL GROUP C C = 0.44 (SF)	MEADOW SOIL GROUP D C = 0.61 (SF)	WOODS SOIL GROUP C C = 0.45 (SF)	WOODS SOIL GROUP D C = 0.59 (SF)	OPEN SPACE SOIL GROUP D C = 0.65 (SF)	IMPERVIOUS AREA C = 0.99 (SF)	TOTAL AREA (SF)	TOTAL AREA (AC)	RUNOFF COEFFICIENT C (Weighted)	Structure Type
NETWORK 5										
CB5-81					1,379	8,104	9,483	0.22	0.94	INLET
CB5-82					1,540	1,918	3,458	0.08	0.84	INLET
CB5-83					2,582	6,886	9,468	0.22	0.90	INLET
CB5-84					0	2,809	2,809	0.06	0.99	INLET
CB5-85					2,367	11,910	14,277	0.33	0.93	INLET
CB5-86					1,120	11,274	12,394	0.28	0.96	INLET
CB5-87					696	8,880	9,576	0.22	0.97	INLET
CB5-88					723	6,266	6,989	0.16	0.95	INLET
CB5-89					878	6,899	7,777	0.18	0.95	INLET
CB5-90					0	4,631	4,631	0.11	0.99	INLET
CB5-91					852	3,779	4,631	0.11	0.93	INLET
CB5-92					4,946	14,793	19,739	0.45	0.90	INLET
CB5-93		660			0	0	660	0.02	0.61	INLET
CB5-94		15,019			0	0	15,019	0.34	0.61	INLET
CB5-95		26,240			0	0	26,240	0.60	0.61	INLET
CB5-96		10,493			0	0	10,493	0.24	0.61	INLET
CB5-97		14,235			0	0	14,235	0.33	0.61	INLET
CD5-1					0	682	682	0.02	0.99	INLET
CD5-2					0	772	772	0.02	0.99	INLET
CD5-3					0	256	256	0.01	0.99	INLET
RD5-1					0	7,116	7,116	0.16	0.99	INLET
RD5-2					0	6,680	6,680	0.15	0.99	INLET
RD5-3					0	6,900	6,900	0.16	0.99	INLET
RD5-4					0	9,000	9,000	0.21	0.99	INLET
FES5-2					38,589	28,553	67,142	1.54	0.79	END SECTION
DA5-1		319,105			0	0	319,105	7.33	0.61	
DA5-2		210,793		188,030	0	3,237	402,060	9.23	0.60	
DA5-3		115,753			0	109,562	225,315	5.17	0.79	
DA5-4		140,847			0	135,699	276,546	6.35	0.80	
RG5-1					4,518	0	4,518	0.10	0.65	
RG5-2					2,437	0	2,437	0.06	0.65	
RG5-3					3,219	0	3,219	0.07	0.65	

CALCULATION OF FUTURE PROPOSED PHASES WEIGHTED RUNOFF COEFFICIENTS

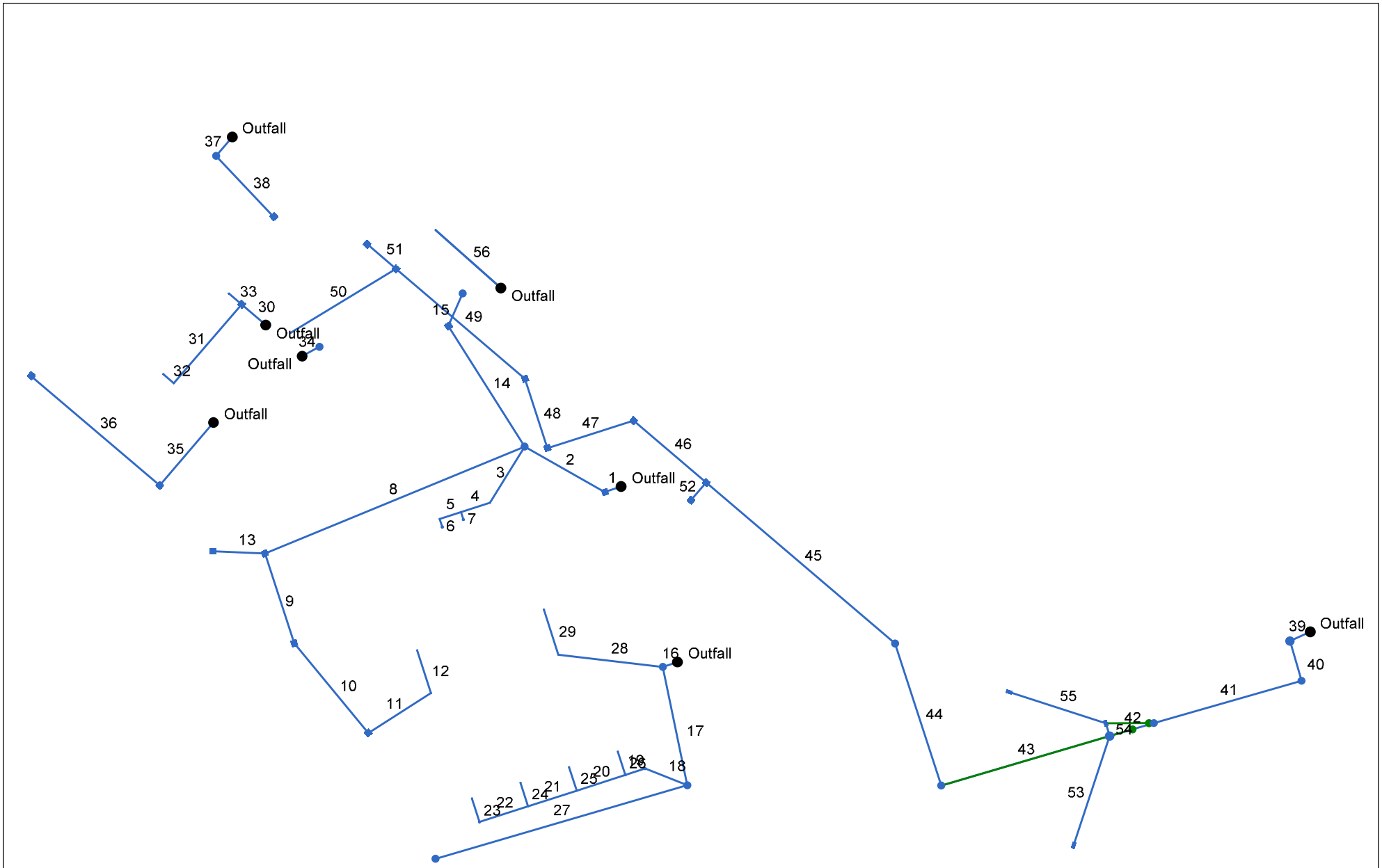
RUNOFF COEFFICIENT CALCULATIONS
STORMWATER CONVEYANCE DESIGN - RATIONAL METHOD
SMITHFIELD GATEWAY - ROADWAY INFRASTRUCTURE
SMITHFIELD TOWNSHIP, MONROE COUNTY, PENNSYLVANIA
LANGAN PROJECT #100501401

PROPOSED CONVEYANCE SYSTEM

SUB-DRAINAGE AREA	MEADOW SOIL GROUP C C = 0.44 (SF)	MEADOW SOIL GROUP D C = 0.61 (SF)	WOODS SOIL GROUP C C = 0.45 (SF)	WOODS SOIL GROUP D C = 0.59 (SF)	OPEN SPACE SOIL GROUP D C = 0.65 (SF)	IMPERVIOUS AREA C = 0.99 (SF)	TOTAL AREA (SF)	TOTAL AREA (AC)	RUNOFF COEFFICIENT C (Weighted)	Structure Type
FUTURE FLOWS										
PHASE 1A-2 RETAIL/COMMERCIAL	0	0	0	0	55,975	130,609	186,584	4.28	0.89	-
PHASE 1B - LOWER TIER	0	0	0	0	120,505	281,177	401,682	9.22	0.89	-
PHASE 1B - UPPER TIER	0	0	0	0	70,700	164,968	235,668	5.41	0.89	-
PHASE 2A RESIDENTIAL	0	0	0	0	220,500	330,751	551,251	12.65	0.85	-
PHASE 2B FORMER HOTEL / RESTAURANT PAD	0	0	0	0	76,737	179,053	255,790	5.87	0.89	-
PHASE 2C OFFICE	0	0	0	0	124,783	291,161	415,944	9.55	0.89	-
PHASE 2D RETAIL PAD ROUTE 447	0	0	0	0	65,369	98,054	163,423	3.75	0.85	-
CONCEPTUALLY DEVELOPED CHELSEA PROPERTY	0	0	0	0	245,940	573,859	819,799	18.82	0.89	

HYDRAULIC REPORT
25-YEAR STORM EVENT
PROPOSED STORM SEWERS (STRM-NTWK-04-25-YR)

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: STRM-NTWK-04-25yr.stm	Number of lines: 56	Date: 2/22/2023

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	CB4-9 TO HW4-3	7.03	24	Cir	11.637	458.00	458.06	0.516	459.54	459.00	n/a	459.00	End	Combination
2	MH4-8 TO CB4-9	6.42	24	Cir	61.373	458.06	458.36	0.489	459.00	459.26	n/a	459.26 j	1	Manhole
3	RD4-3-3 TO MH4-8	0.98	12	Cir	44.000	462.82	463.04	0.511	463.23	463.46	n/a	463.46	2	None
4	RD4-3-2 TO RD4-3-3	0.98	8	Cir	20.183	463.04	463.24	0.991	463.47	463.71	0.22	463.71	3	None
5	RD4-4-2 TO RD4-3-2	0.49	8	Cir	15.030	463.24	463.39	0.998	463.71	463.72	n/a	463.72 j	4	None
6	RD4-4 TO RD4-4-2	0.50	6	Cir	5.643	463.39	463.50	1.949	463.72	463.86	n/a	463.86	5	Manhole
7	RD4-3 TO RD4-3-2	0.50	6	Cir	5.251	463.24	463.34	1.999	463.71	463.70	n/a	463.70 j	4	Manhole
8	CB4-12 TO MH4-8	3.96	15	Cir	186.890	458.37	459.30	0.500	459.26	460.12	0.54	460.66	2	Combination
9	CB4-13 TO CB4-12	2.11	15	Cir	63.083	459.30	459.61	0.500	460.66	460.70	0.03	460.74	8	Combination
10	CB4-14 TO CB4-13	1.32	15	Cir	77.645	459.61	460.00	0.500	460.74	460.45	n/a	460.45	9	Combination
11	RD4-7-2 TO CB4-14	0.07	6	Cir	49.594	462.38	462.63	0.504	462.52	462.77	0.04	462.80	10	None
12	RD4-7 TO RD4-7-2	0.07	6	Cir	30.104	462.63	462.78	0.498	462.80	462.91	n/a	462.96 j	11	None
13	CB4-15 TO CB4-12	1.98	15	Cir	34.737	459.30	459.47	0.500	460.66	460.68	0.04	460.72	8	Combination
14	CB4-10 TO MH4-8	1.92	18	Cir	95.149	458.37	458.84	0.496	459.26	459.36	n/a	459.36 j	2	Combination
15	CB4-11 TO CB4-10	0.54	18	Cir	23.608	458.84	458.96	0.508	459.36	459.36	0.03	459.39	14	Combination
16	CB4-16 TO HW4-2	2.80	18	Cir	10.310	458.00	458.05	0.500	459.54	459.55	0.06	459.61	End	Combination
17	CB4-17 TO CB4-16	2.18	18	Cir	80.696	458.05	458.46	0.500	459.61	459.63	0.08	459.70	16	Combination
18	RD4-8-3 TO CB4-17	1.09	8	Cir	30.134	460.45	461.21	2.502	460.80	461.70	n/a	461.70	17	Manhole
19	RD4-8-2 TO RD4-8-3	1.09	8	Cir	14.000	461.21	461.49	2.000	461.70	461.98	n/a	461.98	18	Manhole
20	RD4-9-2 TO RD4-8-2	0.82	8	Cir	34.000	461.49	461.95	1.347	461.98	462.38	n/a	462.38 j	19	Manhole
21	RD4-10-2 TO RD4-9-2	0.55	6	Cir	34.000	461.95	462.37	1.250	462.38	462.75	n/a	462.75 j	20	Manhole
22	RD4-11-2 TO RD4-10-2	0.28	6	Cir	34.000	462.37	462.54	0.500	462.75	462.84	0.08	462.92	21	Manhole
23	RD4-11 TO RD4-11-2	0.28	6	Cir	16.500	462.54	462.70	0.951	462.92	462.97	n/a	462.97 j	22	None
24	RD4-10 TO RD4-10-2	0.28	6	Cir	16.500	462.37	462.54	1.030	462.75	462.81	n/a	462.81 j	21	None

Project File: STRM-NTWK-04-25yr.stm | Number of lines: 56 | Run Date: 2/22/2023

NOTES: Return period = 25 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
25	RD4-9 TO RD4-9-2	0.28	6	Cir	16.500	461.95	462.37	2.545	462.38	462.63	n/a	462.63 j	20	None
26	RD4-8 TO RD4-8-2	0.28	6	Cir	16.500	461.49	462.15	4.000	461.98	462.42	n/a	462.42 j	19	None
27	CB4-18 TO CB4-17	0.64	18	Cir	174.559	458.46	459.33	0.500	459.70	459.62	0.10	459.62	17	Combination
28	RD4-6-2 TO CB4-16	0.07	8	Cir	69.912	458.15	458.50	0.501	459.61*	459.61*	0.00	459.61	16	None
29	RD4-6 TO RD4-6-2	0.07	6	Cir	31.773	458.50	458.66	0.504	459.61*	459.62*	0.00	459.62	28	None
30	MH4-9 TO MH4-13	0.45	6	Cir	21.222	461.50	461.99	2.318	461.75	462.33	n/a	462.33	End	Manhole
31	RD4-1-2 TO MH4-9	0.26	6	Cir	69.231	461.99	462.34	0.500	462.33	462.60	0.10	462.70	30	Manhole
32	RD4-1 TO RD4-1-2	0.26	6	Cir	9.089	462.34	462.38	0.501	462.70	462.71	0.06	462.77	31	Manhole
33	RD4-2 TO MH4-9	0.21	6	Cir	11.092	461.99	462.05	0.500	462.33	462.35	0.04	462.39	30	Manhole
34	CB4-21 TO MH4-12	0.65	18	Cir	13.104	460.96	461.03	0.523	461.24	461.33	0.10	461.33	End	Combination
35	CB4-22 TO MH4-11	1.69	15	Cir	55.309	460.55	460.82	0.492	461.06	461.34	n/a	461.34	End	Combination
36	CB4-23 TO CB4-22	0.77	15	Cir	112.546	460.82	461.39	0.500	461.34	461.73	n/a	461.73	35	Combination
37	CB4-19 TO HW4-5	1.20	18	Cir	16.491	460.00	460.08	0.500	461.47	460.49	0.22	460.49	End	Combination
38	CB4-20 TO CB4-19	0.69	18	Cir	55.824	460.08	460.36	0.500	460.49	460.67	n/a	460.67 j	37	Combination
39	MH4-1 TO HW4-7	17.80	24	Cir	14.687	421.00	421.44	2.996	422.71	422.96	n/a	422.96 j	End	Manhole
40	CB4-1 TO MH4-1	17.82	24	Cir	27.602	422.29	423.12	3.007	423.24	424.64	n/a	424.64	39	Grate
41	CB4-2 TO CB4-1	17.44	24	Cir	102.277	424.00	429.11	4.996	424.81	430.61	0.37	430.61	40	Grate
42	MH4-2 TO CB4-2	14.28	24	Cir	30.666	429.75	431.29	5.022	430.61	432.65	n/a	432.65	41	Manhole
43	CB4-6 TO MH4-2	8.91	24	Cir	116.764	432.21	435.72	3.006	432.86	436.78	n/a	436.78	42	Combination
44	MH4-3 TO CB4-6	6.27	24	Cir	99.785	439.06	442.55	3.498	439.58	443.44	n/a	443.44	43	Manhole
45	MH4-4 TO MH4-3	6.27	18	Cir	165.384	447.61	452.52	2.968	448.19	453.48	0.42	453.48	44	Manhole
46	MH4-5 TO MH4-4	4.28	18	Cir	63.561	452.67	455.07	3.774	453.48	455.86	n/a	455.86 j	45	Manhole
47	MH4-6 TO MH4-5	4.28	18	Cir	60.043	455.07	455.37	0.500	455.86	456.16	0.32	456.16	46	Manhole
48	MH4-7 TO MH4-6	4.28	18	Cir	48.821	455.37	455.61	0.500	456.16	456.40	n/a	456.40 j	47	Manhole

Project File: STRM-NTWK-04-25yr.stm | Number of lines: 56 | Run Date: 2/22/2023

NOTES: Return period = 25 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
49	MH4-10 TO MH4-7	4.28	18	Cir	112.913	455.61	456.17	0.500	456.40	456.96	0.30	456.96	48	Manhole
50	OCS4-3 TO MH4-10	2.04	18	Cir	82.220	458.84	459.25	0.499	459.36	459.79	n/a	459.79	49	None
51	OCS4-2 TO MH4-10	2.24	18	Cir	25.418	457.95	458.25	1.180	458.38	458.81	0.21	458.81	49	Grate
52	OCS4-1 TO MH4-4	1.99	18	Cir	15.329	456.69	457.00	2.003	457.05	457.53	n/a	457.53	45	Combination
53	CB4-5 TO MH4-2	2.74	18	Cir	76.749	433.58	435.50	2.502	433.99	436.13	n/a	436.13	42	Grate
54	CB4-3 TO MH4-2	2.80	18	Cir	8.840	432.80	432.98	2.037	433.24	433.61	n/a	433.61	42	Combination
55	CB4-4 TO CB4-3	0.78	18	Cir	67.805	433.15	436.20	4.498	433.61	436.53	n/a	436.53 j	54	Combination
56	HW4-12 TO HW4-11	37.00	19x30	Ell(2b)	58.205	457.82	458.45	1.082	458.53	459.97	n/a	459.97	End	None

Project File: STRM-NTWK-04-25yr.stm | Number of lines: 56 | Run Date: 2/22/2023

NOTES: Return period = 25 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	11.637	0.11	1.17	0.99	0.11	1.13	6.0	9.0	6.2	7.03	17.59	3.78	24	0.52	458.00	458.06	459.54	459.00	459.76	465.09	CB4-9 TO HW4-3
2	1	61.373	0.00	1.06	0.00	0.00	1.02	0.0	8.7	6.3	6.42	17.13	4.56	24	0.49	458.06	458.36	459.00	459.26	465.09	465.84	MH4-8 TO CB4-9
3	2	44.000	0.00	0.14	0.00	0.00	0.14	0.0	6.2	7.1	0.98	2.76	3.19	12	0.51	462.82	463.04	463.23	463.46	465.84	466.42	RD4-3-3 TO MH4-
4	3	20.183	0.00	0.14	0.00	0.00	0.14	0.0	6.1	7.1	0.98	1.30	3.92	8	0.99	463.04	463.24	463.47	463.71	466.42	466.45	RD4-3-2 TO RD4-
5	4	15.030	0.00	0.07	0.00	0.00	0.07	0.0	6.0	7.1	0.49	1.31	2.38	8	1.00	463.24	463.39	463.71	463.72	466.45	466.45	RD4-4-2 TO RD4-
6	5	5.643	0.07	0.07	0.99	0.07	0.07	6.0	6.0	7.2	0.50	0.86	3.45	6	1.95	463.39	463.50	463.72	463.86	466.45	466.50	RD4-4 TO RD4-4-
7	4	5.251	0.07	0.07	0.99	0.07	0.07	6.0	6.0	7.2	0.50	0.87	2.92	6	2.00	463.24	463.34	463.71	463.70	466.45	466.50	RD4-3 TO RD4-3-
8	2	186.890	0.02	0.63	0.99	0.02	0.61	6.0	8.0	6.5	3.96	4.95	4.44	15	0.50	458.37	459.30	459.26	460.12	465.84	464.37	CB4-12 TO MH4-
9	8	63.083	0.13	0.32	0.99	0.12	0.32	6.0	7.5	6.6	2.11	4.95	1.79	15	0.50	459.30	459.61	460.66	460.70	464.37	464.69	CB4-13 TO CB4-1
10	9	77.645	0.18	0.19	0.99	0.18	0.19	6.0	6.9	6.8	1.32	4.95	2.21	15	0.50	459.61	460.00	460.74	460.45	464.69	464.90	CB4-14 TO CB4-1
11	10	49.594	0.00	0.01	0.00	0.00	0.01	0.0	6.4	7.0	0.07	0.44	1.61	6	0.50	462.38	462.63	462.52	462.77	464.90	465.75	RD4-7-2 TO CB4-
12	11	30.104	0.01	0.01	0.99	0.01	0.01	6.0	6.0	7.2	0.07	0.43	1.43	6	0.50	462.63	462.78	462.80	462.91	465.75	466.39	RD4-7 TO RD4-7-
13	8	34.737	0.29	0.29	0.94	0.28	0.28	6.0	6.0	7.2	1.98	4.95	1.62	15	0.50	459.30	459.47	460.66	460.68	464.37	463.13	CB4-15 TO CB4-1
14	2	95.149	0.20	0.28	0.98	0.20	0.27	6.0	6.3	7.0	1.92	8.01	2.64	18	0.50	458.37	458.84	459.26	459.36	465.84	463.70	CB4-10 TO MH4-
15	14	23.608	0.08	0.08	0.95	0.08	0.08	6.0	6.0	7.2	0.54	7.49	1.22	18	0.51	458.84	458.96	459.36	459.36	463.70	462.21	CB4-11 TO CB4-1
16	End	10.310	0.19	0.54	0.99	0.19	0.54	6.0	13.6	5.2	2.80	8.04	1.58	18	0.50	458.00	458.05	459.54	459.55	459.76	464.25	CB4-16 TO HW4-
17	16	80.696	0.09	0.34	0.99	0.09	0.34	6.0	7.9	6.5	2.18	8.04	1.35	18	0.50	458.05	458.46	459.61	459.63	464.25	464.27	CB4-17 TO CB4-1
18	17	30.134	0.00	0.16	0.00	0.00	0.16	0.0	6.8	6.9	1.09	2.07	4.96	8	2.50	460.45	461.21	460.80	461.70	464.27	464.98	RD4-8-3 TO CB4-
19	18	14.000	0.00	0.16	0.00	0.00	0.16	0.0	6.8	6.9	1.09	1.85	3.92	8	2.00	461.21	461.49	461.70	461.98	464.98	465.08	RD4-8-2 TO RD4-
20	19	34.000	0.00	0.12	0.00	0.00	0.12	0.0	6.6	6.9	0.82	1.52	3.22	8	1.35	461.49	461.95	461.98	462.38	465.08	465.33	RD4-9-2 TO RD4-
21	20	34.000	0.00	0.08	0.00	0.00	0.08	0.0	6.4	7.0	0.55	0.68	3.28	6	1.25	461.95	462.37	462.38	462.75	465.33	465.33	RD4-10-2 TO RD
22	21	34.000	0.00	0.04	0.00	0.00	0.04	0.0	6.1	7.1	0.28	0.43	2.02	6	0.50	462.37	462.54	462.75	462.84	465.33	465.08	RD4-11-2 TO RD

Project File: STRM-NTWK-04-25yr.stm

Number of lines: 56

Run Date: 2/22/2023

NOTES:Intensity = 48.83 / (Inlet time + 7.80) ^ 0.73; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
23	22	16.500	0.04	0.04	0.99	0.04	0.04	6.0	6.0	7.2	0.28	0.59	2.20	6	0.95	462.54	462.70	462.92	462.97	465.08	465.24	RD4-11 TO RD4-
24	21	16.500	0.04	0.04	0.99	0.04	0.04	6.0	6.0	7.2	0.28	0.62	2.20	6	1.03	462.37	462.54	462.75	462.81	465.33	465.44	RD4-10 TO RD4-
25	20	16.500	0.04	0.04	0.99	0.04	0.04	6.0	6.0	7.2	0.28	0.97	2.11	6	2.55	461.95	462.37	462.38	462.63	465.33	465.44	RD4-9 TO RD4-9-
26	19	16.500	0.04	0.04	0.99	0.04	0.04	6.0	6.0	7.2	0.28	1.21	2.04	6	4.00	461.49	462.15	461.98	462.42	465.08	465.24	RD4-8 TO RD4-8-
27	17	174.559	0.09	0.09	0.99	0.09	0.09	6.0	6.0	7.2	0.64	8.04	1.50	18	0.50	458.46	459.33	459.70	459.62	464.27	464.28	CB4-18 TO CB4-1
28	16	69.912	0.00	0.01	0.00	0.00	0.01	0.0	7.5	6.6	0.07	0.91	0.19	8	0.50	458.15	458.50	459.61	459.61	464.25	465.80	RD4-6-2 TO CB4-
29	28	31.773	0.01	0.01	0.99	0.01	0.01	6.0	6.0	7.2	0.07	0.44	0.36	6	0.50	458.50	458.66	459.61	459.62	465.80	466.39	RD4-6 TO RD4-6-
30	End	21.222	0.00	0.07	0.00	0.00	0.07	0.0	6.6	6.9	0.45	0.94	3.89	6	2.32	461.50	461.99	461.75	462.33	465.36	465.70	MH4-9 TO MH4-1
31	30	69.231	0.00	0.04	0.00	0.00	0.04	0.0	6.1	7.1	0.26	0.44	2.16	6	0.50	461.99	462.34	462.33	462.60	465.70	465.66	RD4-1-2 TO MH4-
32	31	9.089	0.04	0.04	0.99	0.04	0.04	6.0	6.0	7.2	0.26	0.44	1.82	6	0.50	462.34	462.38	462.70	462.71	465.66	466.30	RD4-1 TO RD4-1-
33	30	11.092	0.03	0.03	0.99	0.03	0.03	6.0	6.0	7.2	0.21	0.44	1.55	6	0.50	461.99	462.05	462.33	462.35	465.70	466.30	RD4-2 TO MH4-9
34	End	13.104	0.10	0.10	0.93	0.09	0.09	6.0	6.0	7.2	0.65	8.23	2.68	18	0.52	460.96	461.03	461.24	461.33	464.89	464.70	CB4-21 TO MH4-
35	End	55.309	0.14	0.25	0.98	0.14	0.25	6.0	6.8	6.8	1.69	4.91	3.57	15	0.49	460.55	460.82	461.06	461.34	464.85	463.87	CB4-22 TO MH4-
36	35	112.546	0.11	0.11	0.96	0.11	0.11	6.0	6.0	7.2	0.77	4.95	2.21	15	0.50	460.82	461.39	461.34	461.73	463.87	464.26	CB4-23 TO CB4-2
37	End	16.491	0.08	0.18	0.92	0.07	0.17	6.0	6.4	7.0	1.20	8.05	1.87	18	0.50	460.00	460.08	461.47	460.49	461.76	463.73	CB4-19 TO HW4-
38	37	55.824	0.10	0.10	0.97	0.10	0.10	6.0	6.0	7.2	0.69	8.04	2.21	18	0.50	460.08	460.36	460.49	460.67	463.73	464.15	CB4-20 TO CB4-1
39	End	14.687	0.00	2.04	0.00	0.00	1.68	0.0	6.8	6.9	17.80	39.15	6.59	24	3.00	421.00	421.44	422.71	422.96	423.29	426.82	MH4-1 TO HW4-7
40	39	27.602	0.07	2.04	0.99	0.07	1.68	6.0	6.8	6.9	17.82	39.22	9.57	24	3.01	422.29	423.12	423.24	424.64	426.82	428.95	CB4-1 TO MH4-1
41	40	102.277	0.58	1.97	0.79	0.46	1.61	6.0	6.6	6.9	17.44	50.56	10.74	24	5.00	424.00	429.11	424.81	430.61	428.95	435.50	CB4-2 TO CB4-1
42	41	30.666	0.00	1.39	0.00	0.00	1.15	0.0	6.5	7.0	14.28	50.69	8.64	24	5.02	429.75	431.29	430.61	432.65	435.50	438.07	MH4-2 TO CB4-2
43	42	116.764	0.45	0.45	0.82	0.37	0.37	6.0	6.0	7.2	8.91	39.21	7.67	24	3.01	432.21	435.72	432.86	436.78	438.07	443.16	CB4-6 TO MH4-2
44	43	99.785	0.00	0.00	0.00	0.00	0.00	0.0	1.8	0.0	6.27	42.30	7.16	24	3.50	439.06	442.55	439.58	443.44	443.16	454.27	MH4-3 TO CB4-6

Project File: STRM-NTWK-04-25yr.stm | Number of lines: 56 | Run Date: 2/22/2023

NOTES:Intensity = 48.83 / (Inlet time + 7.80) ^ 0.73; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
45	44	165.384	0.00	0.00	0.00	0.00	0.00	0.0	1.4	0.0	6.27	19.60	7.53	18	2.97	447.61	452.52	448.19	453.48	454.27	462.50	MH4-4 TO MH4-3
46	45	63.561	0.00	0.00	0.00	0.00	0.00	0.0	1.2	0.0	4.28	22.10	4.44	18	3.77	452.67	455.07	453.48	455.86	462.50	460.15	MH4-5 TO MH4-4
47	46	60.043	0.00	0.00	0.00	0.00	0.00	0.0	1.0	0.0	4.28	8.04	4.52	18	0.50	455.07	455.37	455.86	456.16	460.15	465.78	MH4-6 TO MH4-5
48	47	48.821	0.00	0.00	0.00	0.00	0.00	0.0	0.8	0.0	4.28	8.04	4.50	18	0.50	455.37	455.61	456.16	456.40	465.78	464.83	MH4-7 TO MH4-6
49	48	112.913	0.00	0.00	0.00	0.00	0.00	0.0	0.4	0.0	4.28	8.04	4.51	18	0.50	455.61	456.17	456.40	456.96	464.83	463.96	MH4-10 TO MH4-
50	49	82.220	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	2.04	8.03	3.69	18	0.50	458.84	459.25	459.36	459.79	463.96	465.10	OCS4-3 TO MH4-
51	49	25.418	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	2.24	12.36	4.49	18	1.18	457.95	458.25	458.38	458.81	463.96	462.00	OCS4-2 TO MH4-
52	45	15.329	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	1.99	16.10	4.87	18	2.00	456.69	457.00	457.05	457.53	462.50	460.01	OCS4-1 TO MH4-
53	42	76.749	0.43	0.43	0.89	0.38	0.38	6.0	6.0	7.2	2.74	16.61	5.42	18	2.50	433.58	435.50	433.99	436.13	438.07	439.46	CB4-5 TO MH4-2
54	42	8.840	0.37	0.51	0.79	0.29	0.40	6.0	6.5	7.0	2.80	14.99	5.21	18	2.04	432.80	432.98	433.24	433.61	438.07	437.95	CB4-3 TO MH4-2
55	54	67.805	0.14	0.14	0.78	0.11	0.11	6.0	6.0	7.2	0.78	22.27	2.20	18	4.50	433.15	436.20	433.61	436.53	437.95	440.87	CB4-4 TO CB4-3
56	End	58.205	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	37.00	45.61	9.22	19(2b) x 30 e	1.08	457.82	458.45	458.53	459.97	460.84	461.45	HW4-12 TO HW4-

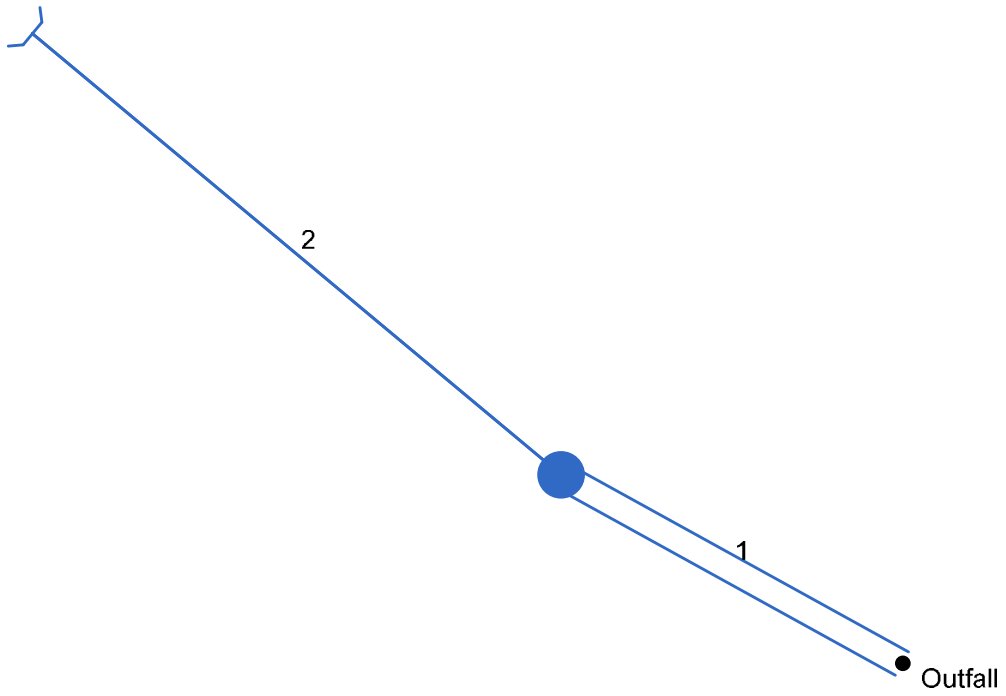
Project File: STRM-NTWK-04-25yr.stm

Number of lines: 56

Run Date: 2/22/2023

NOTES:Intensity = 48.83 / (Inlet time + 7.80) ^ 0.73; Return period =Yrs. 25 ; c = cir e = ellip b = box

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: STRM-NTWK-04A-25-YR.stm	Number of lines: 2	Date: 3/29/2021

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	MH4-7 TO HW4-8	37.00	19x30	Ell(2b)	52.436	459.52	459.89	0.706	461.04	461.41	n/a	461.41	End	Manhole
2	HW4-9 TO MH4-7	37.00	19x30	Ell(2b)	92.500	459.89	460.53	0.692	462.11*	462.67*	0.55	463.22	1	OpenHeadwall

Project File: STRM-NTWK-04A-25-YR.stm | Number of lines: 2 | Run Date: 3/29/2021

NOTES: Return period = 25 Yrs. ; *Surcharged (HGL above crown).

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	52.436	0.00	0.00	0.00	0.00	0.00	0.0	0.3	0.0	37.00	39.90	9.22	19(2b) x 30 e	0.71	459.52	459.89	461.04	461.41	463.22	463.57	MH4-7 TO HW4-8
2	1	92.500	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	37.00	39.51	5.95	19(2b) x 30 e	0.69	459.89	460.53	462.11	462.67	463.57	464.60	HW4-9 TO MH4-7

Project File: STRM-NTWK-04A-25-YR.stm

Number of lines: 2

Run Date: 3/29/2021

NOTES:Intensity = 48.83 / (Inlet time + 7.80) ^ 0.73; Return period =Yrs. 25 ; c = cir e = ellip b = box

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Feb 24 2023

Existing Music Center Drive Swale

Trapezoidal

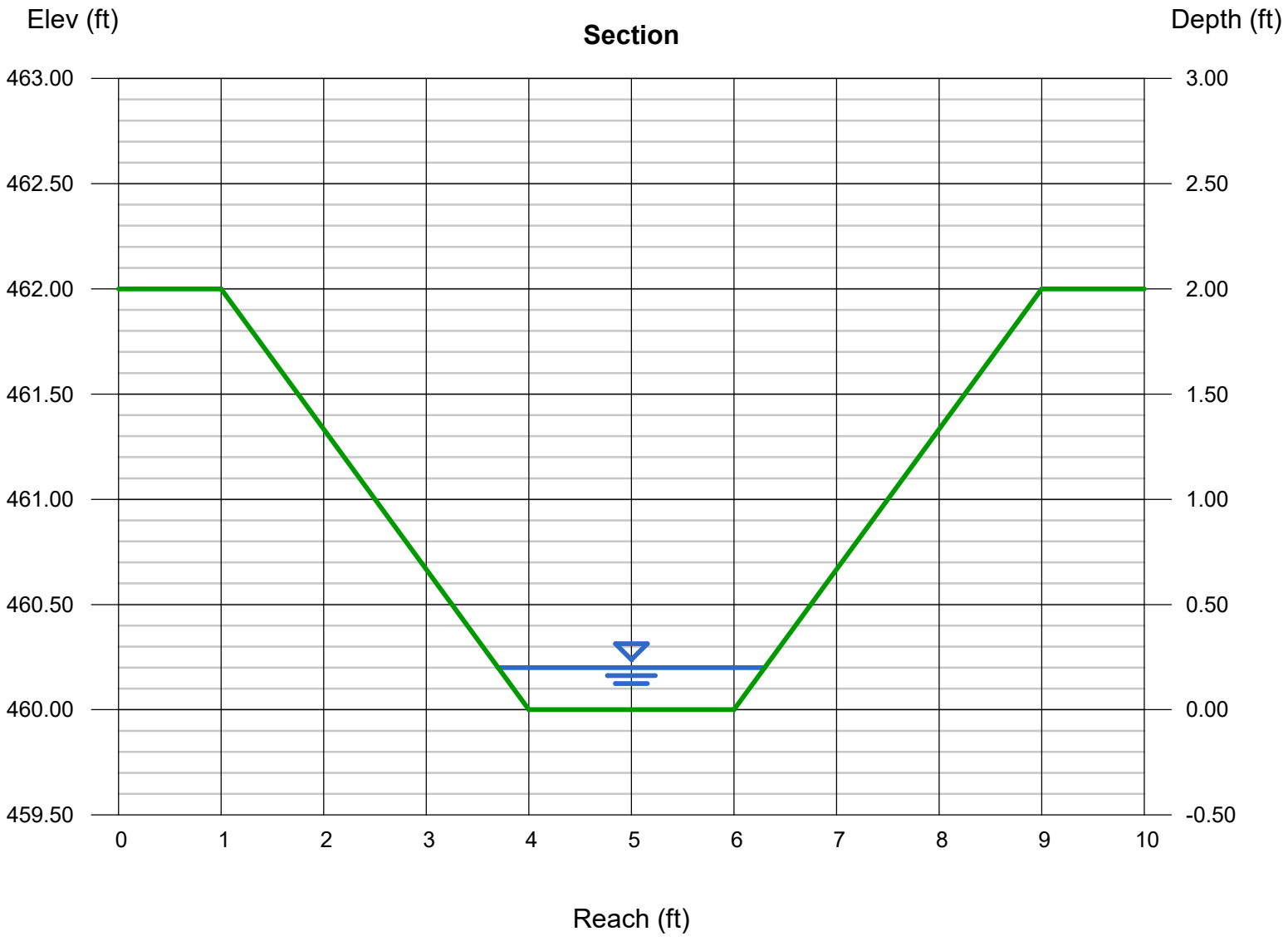
Bottom Width (ft)	= 2.00
Side Slopes (z:1)	= 1.50, 1.50
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 460.00
Slope (%)	= 2.00
N-Value	= 0.060

Calculations

Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

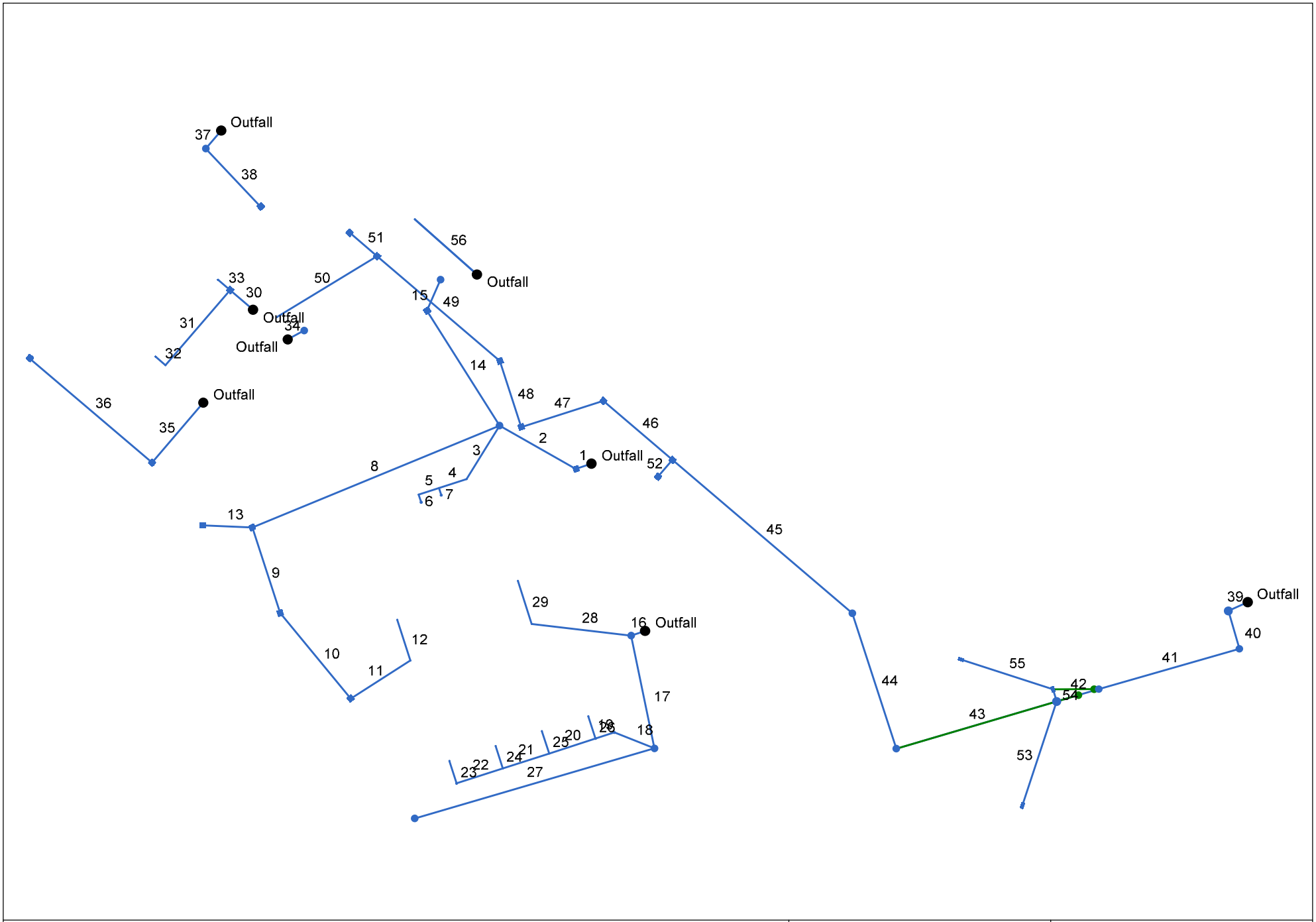
Depth (ft)	= 0.20
Q (cfs)	= 0.492
Area (sqft)	= 0.46
Velocity (ft/s)	= 1.07
Wetted Perim (ft)	= 2.72
Crit Depth, Yc (ft)	= 0.12
Top Width (ft)	= 2.60
EGL (ft)	= 0.22



Depth	Q	Area	Veloc	Wp	Yc
(ft)	(cfs)	(sqft)	(ft/s)	(ft)	(ft)
0.20	0.492	0.460	1.07	2.72	0.12
0.40	1.639	1.040	1.58	3.44	0.26
0.60	3.406	1.740	1.96	4.16	0.41
0.80	5.827	2.560	2.28	4.88	0.56
1.00	8.954	3.500	2.56	5.61	0.71
1.20	12.84	4.560	2.82	6.33	0.87
1.40	17.53	5.740	3.05	7.05	1.03
1.60	23.09	7.040	3.28	7.77	1.20
1.80	29.56	8.460	3.49	8.49	1.36
2.00	37.00	10.00	3.70	9.21	1.53

HYDRAULIC REPORT
50-YEAR STORM EVENT
PROPOSED STORM SEWERS (STRM-NTWK-04-50-YR)

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: STRM-NTWK-04-50yr.stm	Number of lines: 56	Date: 2/22/2023

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	CB4-9 TO HW4-3	8.06	24	Cir	11.637	458.00	458.06	0.516	459.76	459.07	n/a	459.07	End	Combination
2	MH4-8 TO CB4-9	7.35	24	Cir	61.373	458.06	458.36	0.489	459.07	459.32	n/a	459.32 j	1	Manhole
3	RD4-3-3 TO MH4-8	1.10	12	Cir	44.000	462.82	463.04	0.511	463.25	463.48	n/a	463.48	2	None
4	RD4-3-2 TO RD4-3-3	1.10	8	Cir	20.183	463.04	463.24	0.991	463.51	463.74	n/a	463.74	3	None
5	RD4-4-2 TO RD4-3-2	0.55	8	Cir	15.030	463.24	463.39	0.998	463.74	463.74	n/a	463.74 j	4	None
6	RD4-4 TO RD4-4-2	0.56	6	Cir	5.643	463.39	463.50	1.949	463.74	463.88	0.19	463.88	5	Manhole
7	RD4-3 TO RD4-3-2	0.56	6	Cir	5.251	463.24	463.34	1.999	463.74	463.72	0.19	463.72	4	Manhole
8	CB4-12 TO MH4-8	4.51	15	Cir	186.890	458.37	459.30	0.500	459.32	460.23	0.53	460.76	2	Combination
9	CB4-13 TO CB4-12	2.39	15	Cir	63.083	459.30	459.61	0.500	460.76	460.83	0.04	460.86	8	Combination
10	CB4-14 TO CB4-13	1.49	15	Cir	77.645	459.61	460.00	0.500	460.86	460.89	0.06	460.95	9	Combination
11	RD4-7-2 TO CB4-14	0.08	6	Cir	49.594	462.38	462.63	0.504	462.52	462.77	0.04	462.82	10	None
12	RD4-7 TO RD4-7-2	0.08	6	Cir	30.104	462.63	462.78	0.498	462.82	462.92	0.05	462.97	11	None
13	CB4-15 TO CB4-12	2.22	15	Cir	34.737	459.30	459.47	0.500	460.76*	460.79*	0.05	460.84	8	Combination
14	CB4-10 TO MH4-8	2.16	18	Cir	95.149	458.37	458.84	0.496	459.32	459.39	n/a	459.39 j	2	Combination
15	CB4-11 TO CB4-10	0.61	18	Cir	23.608	458.84	458.96	0.508	459.39	459.39	0.03	459.43	14	Combination
16	CB4-16 TO HW4-2	3.34	18	Cir	10.310	458.00	458.05	0.500	459.76*	459.77*	0.09	459.86	End	Combination
17	CB4-17 TO CB4-16	2.48	18	Cir	80.696	458.05	458.46	0.500	459.86	459.89	0.07	459.96	16	Combination
18	RD4-8-3 TO CB4-17	1.23	8	Cir	30.134	460.45	461.21	2.502	460.82	461.73	n/a	461.73	17	Manhole
19	RD4-8-2 TO RD4-8-3	1.23	8	Cir	14.000	461.21	461.49	2.000	461.73	462.01	n/a	462.01	18	Manhole
20	RD4-9-2 TO RD4-8-2	0.93	8	Cir	34.000	461.49	461.95	1.347	462.01	462.40	n/a	462.40 j	19	Manhole
21	RD4-10-2 TO RD4-9-2	0.62	6	Cir	34.000	461.95	462.37	1.250	462.40	462.77	n/a	462.77 j	20	Manhole
22	RD4-11-2 TO RD4-10-2	0.32	6	Cir	34.000	462.37	462.54	0.500	462.77	462.87	0.08	462.95	21	Manhole
23	RD4-11 TO RD4-11-2	0.32	6	Cir	16.500	462.54	462.70	0.951	462.95	462.98	n/a	462.98 j	22	None
24	RD4-10 TO RD4-10-2	0.32	6	Cir	16.500	462.37	462.54	1.030	462.77	462.83	n/a	462.83 j	21	None

Project File: STRM-NTWK-04-50yr.stm | Number of lines: 56 | Run Date: 2/22/2023

NOTES: Return period = 50 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
25	RD4-9 TO RD4-9-2	0.32	6	Cir	16.500	461.95	462.37	2.545	462.40	462.65	n/a	462.65 j	20	None
26	RD4-8 TO RD4-8-2	0.32	6	Cir	16.500	461.49	462.15	4.000	462.01	462.43	n/a	462.43 j	19	None
27	CB4-18 TO CB4-17	0.72	18	Cir	174.559	458.46	459.33	0.500	459.96	459.98	0.01	459.99	17	Combination
28	RD4-6-2 TO CB4-16	0.07	8	Cir	69.912	458.15	458.50	0.501	459.86*	459.86*	0.00	459.86	16	None
29	RD4-6 TO RD4-6-2	0.08	6	Cir	31.773	458.50	458.66	0.504	459.86*	459.87*	0.00	459.87	28	None
30	MH4-9 TO MH4-13	0.51	6	Cir	21.222	461.50	461.99	2.318	461.77	462.36	0.17	462.36	End	Manhole
31	RD4-1-2 TO MH4-9	0.29	6	Cir	69.231	461.99	462.34	0.500	462.36	462.62	0.10	462.72	30	Manhole
32	RD4-1 TO RD4-1-2	0.30	6	Cir	9.089	462.34	462.38	0.501	462.72	462.74	0.06	462.80	31	Manhole
33	RD4-2 TO MH4-9	0.23	6	Cir	11.092	461.99	462.05	0.500	462.36	462.37	0.05	462.42	30	Manhole
34	CB4-21 TO MH4-12	0.73	18	Cir	13.104	460.96	461.03	0.523	461.26	461.34	0.11	461.34	End	Combination
35	CB4-22 TO MH4-11	1.91	15	Cir	55.309	460.55	460.82	0.492	461.09	461.37	0.32	461.37	End	Combination
36	CB4-23 TO CB4-22	0.86	15	Cir	112.546	460.82	461.39	0.500	461.37	461.75	n/a	461.75 j	35	Combination
37	CB4-19 TO HW4-5	1.33	18	Cir	16.491	460.00	460.08	0.500	461.56	461.56	0.01	461.58	End	Combination
38	CB4-20 TO CB4-19	0.78	18	Cir	55.824	460.08	460.36	0.500	461.58	460.69	n/a	460.69	37	Combination
39	MH4-1 TO HW4-7	23.29	24	Cir	14.687	421.00	421.44	2.996	422.71	423.15	n/a	423.15	End	Manhole
40	CB4-1 TO MH4-1	23.31	24	Cir	27.602	422.29	423.12	3.007	423.40	424.83	n/a	424.83	39	Grate
41	CB4-2 TO CB4-1	22.86	24	Cir	102.277	424.00	429.11	4.996	424.94	430.81	0.50	430.81	40	Grate
42	MH4-2 TO CB4-2	19.30	24	Cir	30.666	429.75	431.29	5.022	430.81	432.87	0.82	432.87	41	Manhole
43	CB4-6 TO MH4-2	13.24	24	Cir	116.764	432.21	435.72	3.006	433.01	437.03	0.86	437.03	42	Combination
44	MH4-3 TO CB4-6	10.28	24	Cir	99.785	439.06	442.55	3.498	439.73	443.70	n/a	443.70	43	Manhole
45	MH4-4 TO MH4-3	10.28	18	Cir	165.384	447.61	452.52	2.968	448.38	453.75	n/a	453.75	44	Manhole
46	MH4-5 TO MH4-4	6.14	18	Cir	63.561	452.67	455.07	3.774	453.75	456.03	n/a	456.03 j	45	Manhole
47	MH4-6 TO MH4-5	6.14	18	Cir	60.043	455.07	455.37	0.500	456.05	456.35	0.39	456.74	46	Manhole
48	MH4-7 TO MH4-6	6.14	18	Cir	48.821	455.37	455.61	0.500	456.74	456.83	0.14	456.97	47	Manhole

Project File: STRM-NTWK-04-50yr.stm | Number of lines: 56 | Run Date: 2/22/2023

NOTES: Return period = 50 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
49	MH4-10 TO MH4-7	6.14	18	Cir	112.913	455.61	456.17	0.500	456.97	457.22	0.32	457.54	48	Manhole
50	OCS4-3 TO MH4-10	2.98	18	Cir	82.220	458.84	459.25	0.499	459.47	459.91	n/a	459.91	49	None
51	OCS4-2 TO MH4-10	3.16	18	Cir	25.418	457.95	458.25	1.180	458.47	458.93	0.26	458.93	49	Grate
52	OCS4-1 TO MH4-4	4.14	18	Cir	15.329	456.69	457.00	2.003	457.21	457.78	n/a	457.78	45	Combination
53	CB4-5 TO MH4-2	3.07	18	Cir	76.749	433.58	435.50	2.502	434.02	436.17	n/a	436.17	42	Grate
54	CB4-3 TO MH4-2	3.14	18	Cir	8.840	432.80	432.98	2.037	433.27	433.65	0.33	433.65	42	Combination
55	CB4-4 TO CB4-3	0.87	18	Cir	67.805	433.15	436.20	4.498	433.65	436.55	n/a	436.55 j	54	Combination
56	HW4-12 TO HW4-11	37.00	19x30	Ell(2b)	58.205	457.82	458.45	1.082	458.53	459.97	n/a	459.97	End	None

Project File: STRM-NTWK-04-50yr.stm | Number of lines: 56 | Run Date: 2/22/2023

NOTES: Return period = 50 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	11.637	0.11	1.17	0.99	0.11	1.13	6.0	8.8	7.1	8.06	17.59	3.91	24	0.52	458.00	458.06	459.76	459.07	459.76	465.09	CB4-9 TO HW4-3
2	1	61.373	0.00	1.06	0.00	0.00	1.02	0.0	8.6	7.2	7.35	17.13	4.77	24	0.49	458.06	458.36	459.07	459.32	465.09	465.84	MH4-8 TO CB4-9
3	2	44.000	0.00	0.14	0.00	0.00	0.14	0.0	6.2	7.9	1.10	2.76	3.30	12	0.51	462.82	463.04	463.25	463.48	465.84	466.42	RD4-3-3 TO MH4-
4	3	20.183	0.00	0.14	0.00	0.00	0.14	0.0	6.1	8.0	1.10	1.30	4.07	8	0.99	463.04	463.24	463.51	463.74	466.42	466.45	RD4-3-2 TO RD4-
5	4	15.030	0.00	0.07	0.00	0.00	0.07	0.0	6.0	8.0	0.55	1.31	2.49	8	1.00	463.24	463.39	463.74	463.74	466.45	466.45	RD4-4-2 TO RD4-
6	5	5.643	0.07	0.07	0.99	0.07	0.07	6.0	6.0	8.0	0.56	0.86	3.63	6	1.95	463.39	463.50	463.74	463.88	466.45	466.50	RD4-4 TO RD4-4-
7	4	5.251	0.07	0.07	0.99	0.07	0.07	6.0	6.0	8.0	0.56	0.87	3.13	6	2.00	463.24	463.34	463.74	463.72	466.45	466.50	RD4-3 TO RD4-3-
8	2	186.890	0.02	0.63	0.99	0.02	0.61	6.0	7.9	7.4	4.51	4.95	4.55	15	0.50	458.37	459.30	459.32	460.23	465.84	464.37	CB4-12 TO MH4-
9	8	63.083	0.13	0.32	0.99	0.12	0.32	6.0	7.4	7.5	2.39	4.95	1.95	15	0.50	459.30	459.61	460.76	460.83	464.37	464.69	CB4-13 TO CB4-1
10	9	77.645	0.18	0.19	0.99	0.18	0.19	6.0	6.8	7.7	1.49	4.95	1.40	15	0.50	459.61	460.00	460.86	460.89	464.69	464.90	CB4-14 TO CB4-1
11	10	49.594	0.00	0.01	0.00	0.00	0.01	0.0	6.3	7.9	0.08	0.44	1.66	6	0.50	462.38	462.63	462.52	462.77	464.90	465.75	RD4-7-2 TO CB4-
12	11	30.104	0.01	0.01	0.99	0.01	0.01	6.0	6.0	8.0	0.08	0.43	1.48	6	0.50	462.63	462.78	462.82	462.92	465.75	466.39	RD4-7 TO RD4-7-
13	8	34.737	0.29	0.29	0.94	0.28	0.28	6.0	6.0	8.0	2.22	4.95	1.81	15	0.50	459.30	459.47	460.76	460.79	464.37	463.13	CB4-15 TO CB4-1
14	2	95.149	0.20	0.28	0.98	0.20	0.27	6.0	6.3	7.9	2.16	8.01	2.73	18	0.50	458.37	458.84	459.32	459.39	465.84	463.70	CB4-10 TO MH4-
15	14	23.608	0.08	0.08	0.95	0.08	0.08	6.0	6.0	8.0	0.61	7.49	1.24	18	0.51	458.84	458.96	459.39	459.39	463.70	462.21	CB4-11 TO CB4-1
16	End	10.310	0.19	0.54	0.99	0.19	0.54	6.0	12.7	6.2	3.34	8.04	1.89	18	0.50	458.00	458.05	459.76	459.77	459.76	464.25	CB4-16 TO HW4-
17	16	80.696	0.09	0.34	0.99	0.09	0.34	6.0	7.9	7.4	2.48	8.04	1.41	18	0.50	458.05	458.46	459.86	459.89	464.25	464.27	CB4-17 TO CB4-1
18	17	30.134	0.00	0.16	0.00	0.00	0.16	0.0	6.8	7.7	1.23	2.07	5.17	8	2.50	460.45	461.21	460.82	461.73	464.27	464.98	RD4-8-3 TO CB4-
19	18	14.000	0.00	0.16	0.00	0.00	0.16	0.0	6.7	7.8	1.23	1.85	4.18	8	2.00	461.21	461.49	461.73	462.01	464.98	465.08	RD4-8-2 TO RD4-
20	19	34.000	0.00	0.12	0.00	0.00	0.12	0.0	6.6	7.8	0.93	1.52	3.40	8	1.35	461.49	461.95	462.01	462.40	465.08	465.33	RD4-9-2 TO RD4-
21	20	34.000	0.00	0.08	0.00	0.00	0.08	0.0	6.4	7.9	0.62	0.68	3.51	6	1.25	461.95	462.37	462.40	462.77	465.33	465.33	RD4-10-2 TO RD
22	21	34.000	0.00	0.04	0.00	0.00	0.04	0.0	6.1	8.0	0.32	0.43	2.08	6	0.50	462.37	462.54	462.77	462.87	465.33	465.08	RD4-11-2 TO RD

Project File: STRM-NTWK-04-50yr.stm

Number of lines: 56

Run Date: 2/22/2023

NOTES:Intensity = 65.86 / (Inlet time + 10.50) ^ 0.75; Return period =Yrs. 50 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
23	22	16.500	0.04	0.04	0.99	0.04	0.04	6.0	6.0	8.0	0.32	0.59	2.29	6	0.95	462.54	462.70	462.95	462.98	465.08	465.24	RD4-11 TO RD4-
24	21	16.500	0.04	0.04	0.99	0.04	0.04	6.0	6.0	8.0	0.32	0.62	2.31	6	1.03	462.37	462.54	462.77	462.83	465.33	465.44	RD4-10 TO RD4-
25	20	16.500	0.04	0.04	0.99	0.04	0.04	6.0	6.0	8.0	0.32	0.97	2.22	6	2.55	461.95	462.37	462.40	462.65	465.33	465.44	RD4-9 TO RD4-9-
26	19	16.500	0.04	0.04	0.99	0.04	0.04	6.0	6.0	8.0	0.32	1.21	2.18	6	4.00	461.49	462.15	462.01	462.43	465.08	465.24	RD4-8 TO RD4-8-
27	17	174.559	0.09	0.09	0.99	0.09	0.09	6.0	6.0	8.0	0.72	8.04	0.69	18	0.50	458.46	459.33	459.96	459.98	464.27	464.28	CB4-18 TO CB4-1
28	16	69.912	0.00	0.01	0.00	0.00	0.01	0.0	7.3	7.6	0.07	0.91	0.22	8	0.50	458.15	458.50	459.86	459.86	464.25	465.80	RD4-6-2 TO CB4-
29	28	31.773	0.01	0.01	0.99	0.01	0.01	6.0	6.0	8.0	0.08	0.44	0.40	6	0.50	458.50	458.66	459.86	459.87	465.80	466.39	RD4-6 TO RD4-6-
30	End	21.222	0.00	0.07	0.00	0.00	0.07	0.0	6.6	7.8	0.51	0.94	4.02	6	2.32	461.50	461.99	461.77	462.36	465.36	465.70	MH4-9 TO MH4-1
31	30	69.231	0.00	0.04	0.00	0.00	0.04	0.0	6.1	8.0	0.29	0.44	2.22	6	0.50	461.99	462.34	462.36	462.62	465.70	465.66	RD4-1-2 TO MH4-
32	31	9.089	0.04	0.04	0.99	0.04	0.04	6.0	6.0	8.0	0.30	0.44	1.88	6	0.50	462.34	462.38	462.72	462.74	465.66	466.30	RD4-1 TO RD4-1-
33	30	11.092	0.03	0.03	0.99	0.03	0.03	6.0	6.0	8.0	0.23	0.44	1.61	6	0.50	461.99	462.05	462.36	462.37	465.70	466.30	RD4-2 TO MH4-9
34	End	13.104	0.10	0.10	0.93	0.09	0.09	6.0	6.0	8.0	0.73	8.23	2.77	18	0.52	460.96	461.03	461.26	461.34	464.89	464.70	CB4-21 TO MH4-
35	End	55.309	0.14	0.25	0.98	0.14	0.25	6.0	6.8	7.7	1.91	4.91	3.71	15	0.49	460.55	460.82	461.09	461.37	464.85	463.87	CB4-22 TO MH4-
36	35	112.546	0.11	0.11	0.96	0.11	0.11	6.0	6.0	8.0	0.86	4.95	2.28	15	0.50	460.82	461.39	461.37	461.75	463.87	464.26	CB4-23 TO CB4-2
37	End	16.491	0.08	0.18	0.92	0.07	0.17	6.0	6.6	7.8	1.33	8.05	0.76	18	0.50	460.00	460.08	461.56	461.56	461.76	463.73	CB4-19 TO HW4-
38	37	55.824	0.10	0.10	0.97	0.10	0.10	6.0	6.0	8.0	0.78	8.04	1.58	18	0.50	460.08	460.36	461.58	460.69	463.73	464.15	CB4-20 TO CB4-1
39	End	14.687	0.00	2.04	0.00	0.00	1.68	0.0	6.8	7.7	23.29	39.15	8.14	24	3.00	421.00	421.44	422.71	423.15	423.29	426.82	MH4-1 TO HW4-7
40	39	27.602	0.07	2.04	0.99	0.07	1.68	6.0	6.7	7.8	23.31	39.22	10.57	24	3.01	422.29	423.12	423.40	424.83	426.82	428.95	CB4-1 TO MH4-1
41	40	102.277	0.58	1.97	0.79	0.46	1.61	6.0	6.6	7.8	22.86	50.56	11.86	24	5.00	424.00	429.11	424.94	430.81	428.95	435.50	CB4-2 TO CB4-1
42	41	30.666	0.00	1.39	0.00	0.00	1.15	0.0	6.5	7.8	19.30	50.69	9.33	24	5.02	429.75	431.29	430.81	432.87	435.50	438.07	MH4-2 TO CB4-2
43	42	116.764	0.45	0.45	0.82	0.37	0.37	6.0	6.0	8.0	13.24	39.21	8.67	24	3.01	432.21	435.72	433.01	437.03	438.07	443.16	CB4-6 TO MH4-2
44	43	99.785	0.00	0.00	0.00	0.00	0.00	0.0	1.7	0.0	10.28	42.30	8.30	24	3.50	439.06	442.55	439.73	443.70	443.16	454.27	MH4-3 TO CB4-6

Project File: STRM-NTWK-04-50yr.stm | Number of lines: 56 | Run Date: 2/22/2023

NOTES:Intensity = 65.86 / (Inlet time + 10.50) ^ 0.75; Return period =Yrs. 50 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
45	44	165.384	0.00	0.00	0.00	0.00	0.00	0.0	1.4	0.0	10.28	19.60	8.92	18	2.97	447.61	452.52	448.38	453.75	454.27	462.50	MH4-4 TO MH4-3
46	45	63.561	0.00	0.00	0.00	0.00	0.00	0.0	1.2	0.0	6.14	22.10	4.83	18	3.77	452.67	455.07	453.75	456.03	462.50	460.15	MH4-5 TO MH4-4
47	46	60.043	0.00	0.00	0.00	0.00	0.00	0.0	1.0	0.0	6.14	8.04	5.01	18	0.50	455.07	455.37	456.05	456.35	460.15	465.78	MH4-6 TO MH4-5
48	47	48.821	0.00	0.00	0.00	0.00	0.00	0.0	0.8	0.0	6.14	8.04	3.80	18	0.50	455.37	455.61	456.74	456.83	465.78	464.83	MH4-7 TO MH4-6
49	48	112.913	0.00	0.00	0.00	0.00	0.00	0.0	0.3	0.0	6.14	8.04	4.13	18	0.50	455.61	456.17	456.97	457.22	464.83	463.96	MH4-10 TO MH4-
50	49	82.220	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	2.98	8.03	4.11	18	0.50	458.84	459.25	459.47	459.91	463.96	465.10	OCS4-3 TO MH4-
51	49	25.418	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	3.16	12.36	4.97	18	1.18	457.95	458.25	458.47	458.93	463.96	462.00	OCS4-2 TO MH4-
52	45	15.329	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	4.14	16.10	6.05	18	2.00	456.69	457.00	457.21	457.78	462.50	460.01	OCS4-1 TO MH4-
53	42	76.749	0.43	0.43	0.89	0.38	0.38	6.0	6.0	8.0	3.07	16.61	5.61	18	2.50	433.58	435.50	434.02	436.17	438.07	439.46	CB4-5 TO MH4-2
54	42	8.840	0.37	0.51	0.79	0.29	0.40	6.0	6.5	7.8	3.14	14.99	5.39	18	2.04	432.80	432.98	433.27	433.65	438.07	437.95	CB4-3 TO MH4-2
55	54	67.805	0.14	0.14	0.78	0.11	0.11	6.0	6.0	8.0	0.87	22.27	2.25	18	4.50	433.15	436.20	433.65	436.55	437.95	440.87	CB4-4 TO CB4-3
56	End	58.205	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	37.00	45.61	9.22	19(2b) x 30 e	1.08	457.82	458.45	458.53	459.97	460.84	461.45	HW4-12 TO HW4-

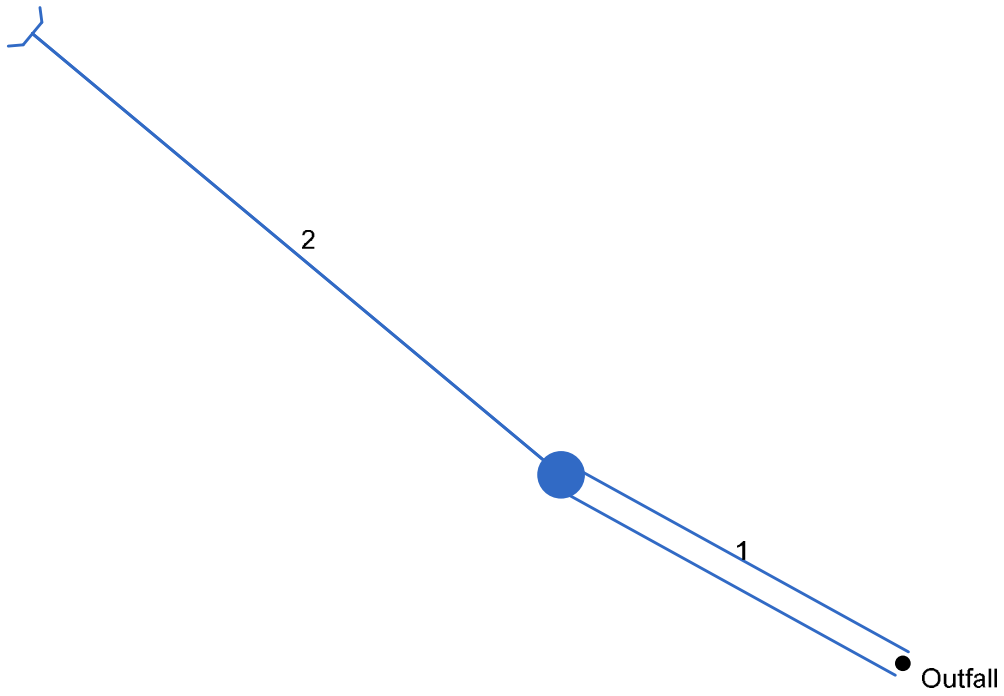
Project File: STRM-NTWK-04-50yr.stm

Number of lines: 56

Run Date: 2/22/2023

NOTES:Intensity = 65.86 / (Inlet time + 10.50) ^ 0.75; Return period =Yrs. 50 ; c = cir e = ellip b = box

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: STRM-NTWK-04A-50-YR.stm	Number of lines: 2	Date: 3/29/2021

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	MH4-7 TO HW4-8	37.00	19x30	Ell(2b)	52.436	459.52	459.89	0.706	461.04	461.41	n/a	461.41	End	Manhole
2	HW4-9 TO MH4-7	37.00	19x30	Ell(2b)	92.500	459.89	460.53	0.692	462.11*	462.67*	0.55	463.22	1	OpenHeadwall

Project File: STRM-NTWK-04A-50-YR.stm | Number of lines: 2 | Run Date: 3/29/2021

NOTES: Return period = 50 Yrs. ; *Surcharged (HGL above crown).

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	52.436	0.00	0.00	0.00	0.00	0.00	0.0	0.3	0.0	37.00	39.90	9.22	19(2b) x 30 e	0.71	459.52	459.89	461.04	461.41	463.22	463.57	MH4-7 TO HW4-8
2	1	92.500	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	37.00	39.51	5.95	19(2b) x 30 e	0.69	459.89	460.53	462.11	462.67	463.57	464.60	HW4-9 TO MH4-7

Project File: STRM-NTWK-04A-50-YR.stm | Number of lines: 2 | Run Date: 3/29/2021

NOTES:Intensity = 65.86 / (Inlet time + 10.50) ^ 0.75; Return period =Yrs. 50 ; c = cir e = ellip b = box

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Feb 24 2023

Existing Music Center Drive Swale

Trapezoidal

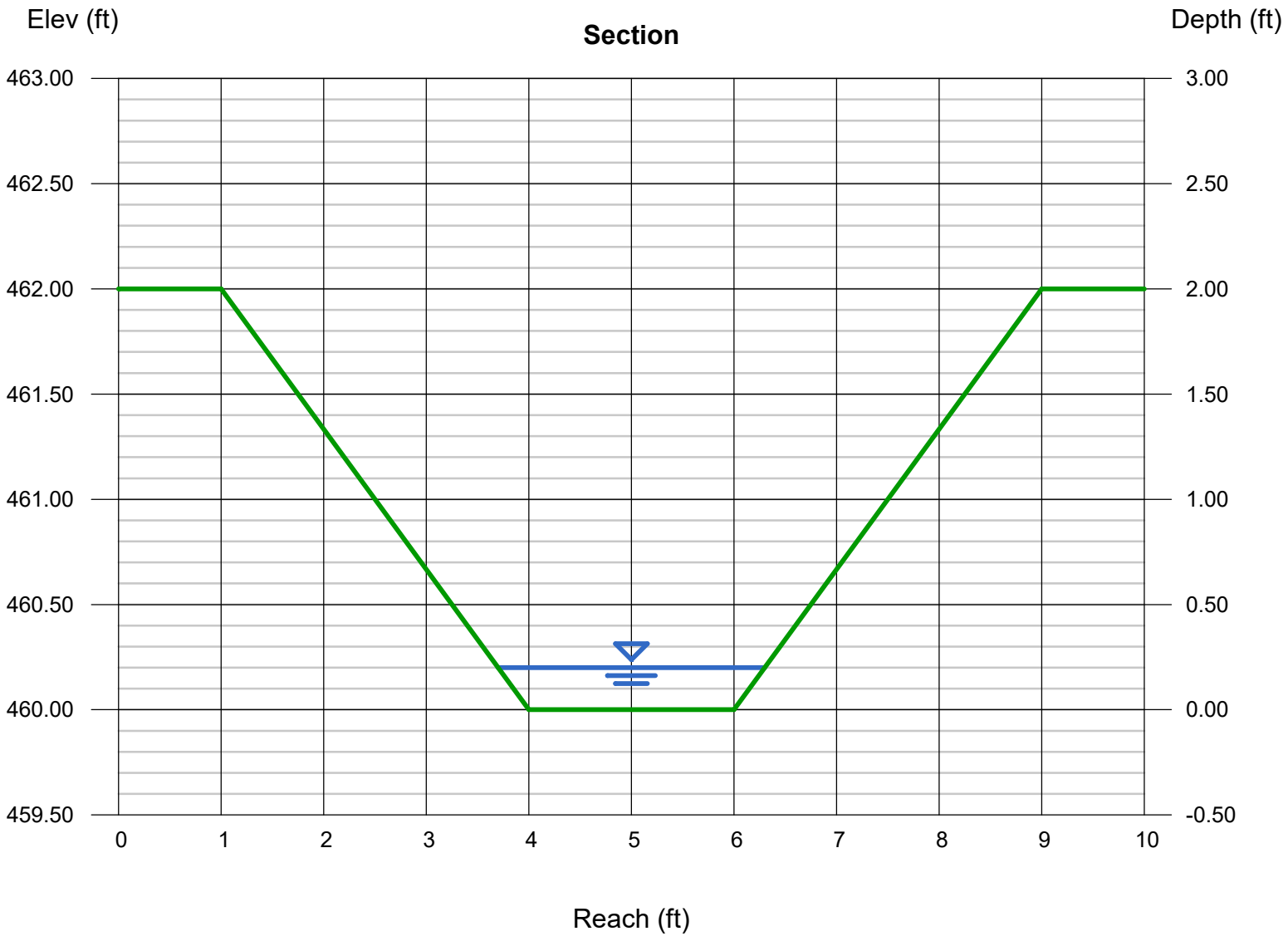
Bottom Width (ft)	= 2.00
Side Slopes (z:1)	= 1.50, 1.50
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 460.00
Slope (%)	= 2.00
N-Value	= 0.060

Calculations

Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

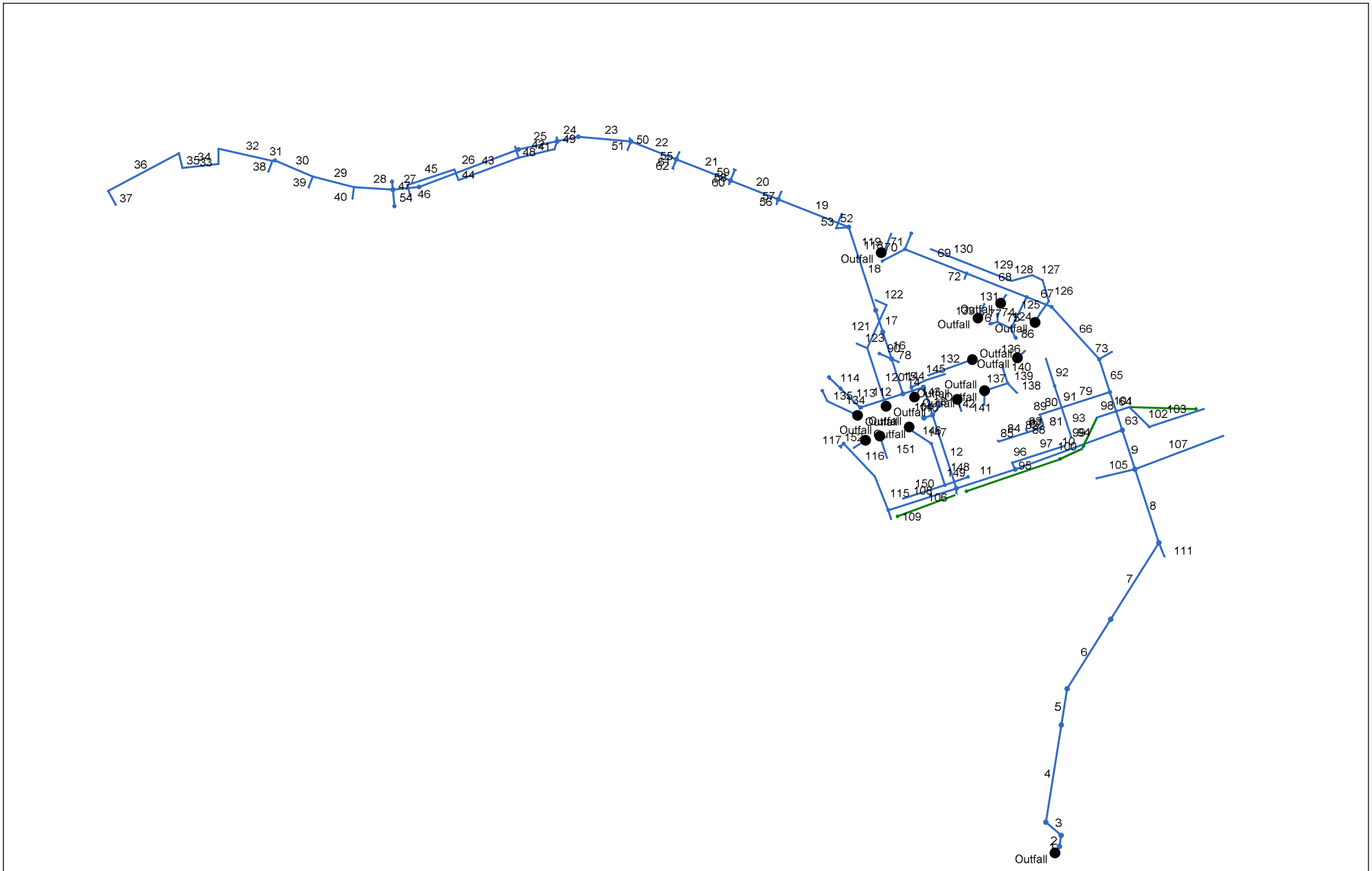
Depth (ft)	= 0.20
Q (cfs)	= 0.492
Area (sqft)	= 0.46
Velocity (ft/s)	= 1.07
Wetted Perim (ft)	= 2.72
Crit Depth, Yc (ft)	= 0.12
Top Width (ft)	= 2.60
EGL (ft)	= 0.22



Depth	Q	Area	Veloc	Wp	Yc
(ft)	(cfs)	(sqft)	(ft/s)	(ft)	(ft)
0.20	0.492	0.460	1.07	2.72	0.12
0.40	1.639	1.040	1.58	3.44	0.26
0.60	3.406	1.740	1.96	4.16	0.41
0.80	5.827	2.560	2.28	4.88	0.56
1.00	8.954	3.500	2.56	5.61	0.71
1.20	12.84	4.560	2.82	6.33	0.87
1.40	17.53	5.740	3.05	7.05	1.03
1.60	23.09	7.040	3.28	7.77	1.20
1.80	29.56	8.460	3.49	8.49	1.36
2.00	37.00	10.00	3.70	9.21	1.53

HYDRAULIC REPORT
25-YEAR STORM EVENT
PROPOSED STORM SEWERS (STRM-NTWK-05-25-YR)
PHASE 1A-1 AND PHASE 1A-2 DESIGNS

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: STRM-NTWK-05-25-YR.stm	Number of lines: 152	Date: 2/22/2023

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	HW5-1 TO MH5-1	136.0	72	Cir	20.440	398.80	399.21	2.006	401.96	402.37	0.61	402.37	End	Manhole
2	MH5-1 TO MH5-2	136.1	72	Cir	30.000	404.71	405.31	2.000	406.58	408.47	n/a	408.47	1	Manhole
3	MH5-2 TO MH5-3	136.2	72	Cir	53.039	410.81	411.87	1.999	412.68	415.03	n/a	415.03	2	Manhole
4	MH5-3 TO MH5-4	137.2	72	Cir	260.000	416.87	419.48	1.004	419.12	422.65	0.19	422.65	3	Manhole
5	MH5-4 TO MH5-5	137.6	72	Cir	96.972	419.58	420.55	1.000	422.65	423.73	0.57	423.73	4	Manhole
6	MH5-5 TO MH5-6	122.4	72	Cir	216.121	420.65	422.81	0.999	423.73	425.80	0.18	425.80	5	Manhole
7	MH5-6 TO MH5-7	123.4	72	Cir	238.559	422.91	425.30	1.002	425.80	428.30	1.18	428.30	6	Manhole
8	MH5-7 TO MH5-8	103.8	72	Cir	204.104	425.40	427.44	0.999	428.30	430.18	1.06	430.18	7	Manhole
9	MH5-8 TO MH5-9	100.8	72	Cir	108.405	427.54	428.62	0.996	430.18	431.32	n/a	431.32	8	Manhole
10	MH5-10 TO MH5-9	72.34	66	Cir	299.601	428.72	431.72	1.001	431.32	434.05	n/a	434.05 j	9	Manhole
11	MH5-10 TO MH5-11	71.80	66	Cir	162.986	431.82	433.45	1.000	434.05	435.77	n/a	435.77	10	Manhole
12	MH5-11 TO MH5-12	64.42	66	Cir	203.182	433.55	435.58	0.999	435.77	437.77	n/a	437.77 j	11	Manhole
13	MH5-12 TO MH5-13	58.06	66	Cir	77.359	435.68	436.46	1.008	437.77	438.54	n/a	438.54 j	12	Manhole
14	MH5-14 TO MH5-13	58.24	66	Cir	56.863	436.56	437.13	1.002	438.54	439.21	n/a	439.21	13	Manhole
15	MH5-15 TO MH5-14	56.73	60	Cir	97.052	437.23	438.20	0.999	439.21	440.31	0.80	440.31	14	Manhole
16	MH5-16 TO MH5-15	55.97	60	Cir	74.996	442.25	443.00	1.000	443.76	445.10	n/a	445.10	15	Manhole
17	MH5-17 TO MH5-16	56.13	60	Cir	60.019	448.00	448.60	1.000	449.51	450.70	n/a	450.70	16	Manhole
18	MH5-18 TO MH5-17	56.73	60	Cir	230.753	453.60	455.91	1.001	455.12	458.02	0.79	458.02	17	Manhole
19	MH5-19 TO MH5-18	56.90	60	Cir	199.226	456.01	458.00	0.999	458.02	460.12	n/a	460.12	18	Manhole
20	MH5-20 TO MH5-19	56.32	60	Cir	135.000	458.10	459.45	1.000	460.12	461.56	0.80	461.56	19	Manhole
21	MH5-21 TO MH5-20	36.36	60	Cir	152.928	459.55	461.08	1.000	461.56	462.76	n/a	462.76 j	20	Manhole
22	MH5-22 TO MH5-21	35.09	54	Cir	128.398	461.18	462.46	0.997	462.76	464.16	0.63	464.16	21	Manhole
23	MH5-23 TO MH5-22	28.86	54	Cir	138.853	462.56	463.95	1.001	464.16	465.49	n/a	465.49 j	22	Manhole
24	MH5-24 TO MH5-23	29.02	54	Cir	56.993	464.05	464.62	1.000	465.49	466.16	0.57	466.16	23	Manhole

Project File: STRM-NTWK-05-25-YR.stm | Number of lines: 152 | Run Date: 2/22/2023

NOTES: Return period = 25 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
25	MH5-25 TO MH5-24	7.60	54	Cir	103.591	464.72	465.76	1.004	466.16	466.54	n/a	466.54 j	24	Manhole
26	MH5-26 TO MH5-25	7.83	54	Cir	279.546	465.86	468.66	1.002	466.54	469.45	0.08	469.45	25	Manhole
27	MH5-27 TO MH5-26	7.89	54	Cir	69.589	468.76	469.46	1.006	469.45	470.25	0.28	470.25	26	Manhole
28	CB5-59 TO MH5-27	5.95	18	Cir	102.551	486.67	489.75	3.003	487.24	490.69	n/a	490.69	27	Combination
29	CB5-61 TO CB5-59	5.35	18	Cir	111.289	489.93	495.49	4.996	490.69	496.38	n/a	496.38	28	Combination
30	MH5-38 TO CB5-61	4.78	18	Cir	108.480	495.81	497.98	2.000	496.38	498.82	n/a	498.82	29	Manhole
31	CB5-63 TO MH5-38	4.79	18	Cir	6.682	498.08	498.21	1.946	498.82	499.05	n/a	499.05	30	Combination
32	CB5-65 TO CB5-63	3.89	18	Cir	145.419	498.31	499.76	0.997	499.05	500.51	n/a	500.51	31	Combination
33	CB5-66 TO CB5-65	2.66	18	Cir	39.874	499.86	500.26	1.003	500.51	500.88	n/a	500.88 j	32	Combination
34	CB5-67 TO CB5-66	2.40	18	Cir	94.795	500.36	500.84	0.506	500.92	501.43	0.33	501.43	33	Combination
35	CB5-68 TO CB5-67	2.23	18	Cir	40.000	500.94	501.14	0.500	501.48	501.70	0.32	501.70	34	Combination
36	CB5-69 TO CB5-68	1.97	18	Cir	210.926	503.14	504.19	0.498	503.65	504.72	n/a	504.72	35	Combination
37	CB5-70 TO CB5-69	0.74	18	Cir	41.272	504.29	504.50	0.509	504.72	504.82	n/a	504.82 j	36	Combination
38	CB5-64 TO CB5-63	0.60	18	Cir	30.002	501.85	502.00	0.500	502.13	502.29	n/a	502.29	31	Combination
39	CB5-62 TO CB5-61	0.40	18	Cir	30.000	495.85	496.00	0.500	496.38	496.23	0.08	496.23	29	Combination
40	CB5-60 TO CB5-59	0.47	18	Cir	30.000	489.85	490.00	0.500	490.69	490.25	n/a	490.25	28	Combination
41	CB5-52 TO MH5-24	6.23	18	Cir	22.434	474.12	474.57	2.006	474.77	475.53	0.55	475.53	24	Combination
42	CB5-53 TO CB5-52	5.95	18	Cir	96.516	474.67	476.60	2.000	475.53	477.54	n/a	477.54	41	Combination
43	CB5-55 TO CB5-53	2.96	18	Cir	169.115	476.78	480.59	2.253	477.54	481.24	n/a	481.24 j	42	Combination
44	CB5-56 TO CB5-55	2.48	18	Cir	30.000	480.69	481.29	2.000	481.24	481.89	0.34	481.89	43	Combination
45	CB5-57 TO CB5-56	1.28	18	Cir	129.245	481.39	484.94	2.747	481.89	485.36	n/a	485.36 j	44	Combination
46	CB5-58 TO CB5-57	0.50	18	Cir	30.000	485.04	485.34	1.000	485.36	485.60	n/a	485.60 j	45	Combination
47	MH5-29 TO MH5-27	1.00	42	Cir	20.949	482.79	483.00	1.002	483.03	483.30	n/a	483.30	27	Manhole
48	CB5-54 TO CB5-53	2.65	18	Cir	30.000	476.70	477.00	1.000	477.54	477.62	n/a	477.62 j	42	Combination

Project File: STRM-NTWK-05-25-YR.stm | Number of lines: 152 | Run Date: 2/22/2023

NOTES: Return period = 25 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
49	CB5-51 TO MH5-24	20.37	24	Cir	10.000	474.90	475.00	1.000	476.29	476.62	0.87	476.62	24	Combination
50	CB5-50 TO MH5-22	7.85	18	Cir	8.551	472.41	472.50	1.052	473.31	473.58	0.51	473.58	22	Combination
51	CB5-49 TO MH5-22	0.73	18	Cir	23.300	472.27	472.50	0.987	472.53	472.82	n/a	472.82	22	Combination
52	CB5-41 TO MH5-18	0.77	18	Cir	33.617	471.03	471.20	0.506	471.34	471.53	n/a	471.53	18	Combination
53	CB5-42 TO CB5-41	0.43	18	Cir	40.000	471.30	471.50	0.500	471.54	471.74	n/a	471.74	52	Combination
54	MH5-28 TO MH5-27	1.00	48	Cir	44.054	469.56	470.00	0.999	470.25	470.29	n/a	470.29 j	27	Manhole
55	CB5-48 TO MH5-21	0.39	18	Cir	20.000	470.30	470.50	1.000	470.49	470.73	0.08	470.73	21	Combination
56	CB5-43 TO MH5-19	0.89	18	Cir	11.944	470.13	470.25	1.005	470.41	470.60	0.12	470.60	19	Combination
57	CB5-44 TO MH5-19	0.77	18	Cir	21.944	470.03	470.25	1.003	470.29	470.58	0.12	470.58	19	Combination
58	CB5-46 TO MH5-20	25.36	36	Cir	20.000	466.10	466.50	2.000	467.12	468.12	n/a	468.12	20	Combination
59	HW5-5 TO CB5-46	24.77	36	Cir	10.000	468.00	468.50	5.000	468.79	470.10	n/a	470.10	58	OpenHeadwall
60	CB5-45 TO MH5-20	1.13	18	Cir	10.000	468.40	468.50	1.000	468.72	468.90	0.14	468.90	20	Combination
61	CB5-47 TO MH5-21	1.47	36	Cir	10.000	465.65	465.75	1.000	465.95	466.12	0.06	466.12	21	Combination
62	MH5-30 TO CB5-47	1.00	36	Cir	15.000	465.85	466.00	1.000	466.12	466.31	n/a	466.31	61	Manhole
63	MH5-9 TO MH5-34	34.58	42	Cir	52.136	444.31	444.83	0.997	445.67	446.65	0.73	446.65	9	Manhole
64	MH5-53 TO MH5-34	26.26	36	Cir	53.514	445.00	445.80	1.495	446.65	447.45	0.67	447.45	63	Manhole
65	MH5-35 TO MH5-53	20.98	36	Cir	91.065	446.63	448.00	1.500	447.63	449.47	0.56	449.47	64	Manhole
66	MH5-36 TO MH5-35	20.00	36	Cir	186.792	448.87	450.74	1.001	449.95	452.17	n/a	452.17	65	Manhole
67	MH5-37 TO MH5-36	20.01	36	Cir	70.000	450.84	451.54	1.000	452.17	452.97	n/a	452.97	66	Manhole
68	MH5-39 TO MH5-37	5.62	36	Cir	170.066	454.37	457.77	1.999	454.85	458.51	0.26	458.51	67	Manhole
69	MH5-40 TO MH5-39	4.53	36	Cir	174.174	457.97	461.45	1.998	458.51	462.12	n/a	462.12	68	Manhole
70	OCS5-7 TO MH5-40	3.53	18	Cir	67.311	465.83	466.50	0.995	466.40	467.22	0.28	467.22	69	Grate
71	MH5-41 TO MH5-40	1.00	36	Cir	45.000	461.55	462.00	1.000	462.12	462.31	n/a	462.31 j	69	Manhole
72	CB5-15 TO MH5-39	1.10	18	Cir	15.000	460.10	460.25	1.000	460.42	460.64	0.14	460.64	68	Combination

Project File: STRM-NTWK-05-25-YR.stm | Number of lines: 152 | Run Date: 2/22/2023

NOTES: Return period = 25 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
73	MH5-35 TO OCS5-1	1.00	18	Cir	38.184	456.62	457.00	0.995	456.92	457.37	0.13	457.37	65	None
74	MH5-42 TO MH5-37	14.41	30	Cir	92.998	451.64	452.10	0.500	452.97	453.38	n/a	453.38 j	67	Manhole
75	MH5-43 TO MH5-42	4.02	18	Cir	40.157	452.74	453.14	1.000	453.38	453.91	n/a	453.91	74	Manhole
76	OCS5-6 TO MH5-43	0.80	18	Cir	20.057	453.90	454.00	0.499	454.22	454.33	n/a	454.33	75	Grate
77	OCS5-2 TO MH5-43	3.22	18	Cir	18.349	453.32	453.50	0.981	453.91	454.18	0.26	454.18	75	Manhole
78	CB5-94 TO MH5-15	1.48	18	Cir	20.166	453.30	453.50	0.992	453.67	453.96	0.17	453.96	15	Grate
79	CB5-71 TO MH5-53	5.47	24	Cir	133.392	447.88	448.55	0.502	448.65	449.37	0.70	449.37	64	Grate
80	CD5-3 TO CB5-71 6	0.32	8	Cir	59.990	450.94	452.29	2.250	451.12	452.55	n/a	452.55	79	None
81	CD5-3 TO CB5-71 5	0.20	8	Cir	26.867	452.29	452.42	0.484	452.55	452.62	n/a	452.68 j	80	None
82	CD5-3 TO CB5-71 4	0.20	8	Cir	11.071	452.42	452.48	0.542	452.68	452.69	0.05	452.74	81	None
83	CD5-3 TO CB5-71 3	0.20	8	Cir	34.788	452.48	452.65	0.489	452.74	452.86	0.05	452.91	82	None
84	CD5-3 TO CB5-71 2	0.07	8	Cir	80.821	452.65	453.06	0.507	452.91	453.18	0.03	453.18	83	None
85	CD5-3 TO CB5-71 1	0.07	8	Cir	4.773	453.06	453.08	0.419	453.19	453.21	n/a	453.24 j	84	None
86	OCS5-1 TO MH5-42	10.39	24	Cir	26.226	452.24	452.50	0.991	453.38	453.65	0.48	453.65	74	Manhole
87	CD5-2 2	0.14	8	Cir	5.657	452.65	452.71	1.061	452.91	452.88	0.05	452.88	83	None
88	CD5-2 1	0.14	8	Cir	5.300	452.71	452.76	0.944	452.88	452.93	n/a	452.93	87	None
89	CD5-1	0.14	8	Cir	1.125	452.29	452.31	1.777	452.55	452.48	n/a	452.48	80	None
90	CB5-93 TO MH5-15	0.09	18	Cir	34.982	450.95	452.00	3.002	451.02	452.11	n/a	452.11	15	Grate
91	CB5-72 TO CB5-71	3.35	18	Cir	60.284	449.19	449.79	0.995	449.75	450.49	n/a	450.49	79	Grate
92	CB5-73 TO CB5-72	0.64	18	Cir	74.716	449.89	451.76	2.503	450.49	452.06	n/a	452.06 j	91	Combination
93	CB5-74 TO CB5-71	1.17	18	Cir	45.000	449.00	449.22	0.489	449.39	449.62	n/a	449.62	79	Combination
94	CB5-75 TO CB5-74	0.79	18	Cir	35.475	449.32	449.50	0.507	449.64	449.83	0.12	449.83	93	Combination
95	CB5-76 TO MH5-10	1.74	18	Cir	19.445	448.39	448.58	0.977	448.79	449.08	0.27	449.08	10	Combination
96	CB5-77 TO CB5-76	1.49	18	Cir	43.097	448.68	448.90	0.510	449.12	449.36	n/a	449.36	95	Combination

Project File: STRM-NTWK-05-25-YR.stm | Number of lines: 152 | Run Date: 2/22/2023

NOTES: Return period = 25 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
97	CB5-78 TO CB5-77	0.33	18	Cir	100.903	449.00	449.50	0.496	449.36	449.71	n/a	449.71 j	96	Combination
98	CB5-3 TO MH5-34	3.84	18	Cir	52.702	445.83	446.09	0.493	446.65	446.84	n/a	446.84 j	63	Combination
99	CB5-4 TO CB5-3	2.72	18	Cir	92.115	446.26	446.72	0.499	446.86	447.35	n/a	447.35	98	Combination
100	CB5-5 TO CB5-4	0.61	18	Cir	70.906	448.65	449.00	0.494	448.93	449.29	0.10	449.29	99	Combination
101	CB5-6 TO MH5-34	5.30	18	Cir	36.193	446.54	446.72	0.497	447.43	447.61	n/a	448.10 j	63	Combination
102	MH5-45 TO CB5-6	2.74	18	Cir	73.953	446.89	447.26	0.500	448.10	447.89	n/a	447.89	101	Manhole
103	CB5-7 TO MH5-45	2.83	18	Cir	149.233	447.43	448.18	0.503	448.04	448.82	n/a	448.82	102	Combination
104	OCS5-3 TO MH5-12	2.90	18	Cir	34.234	447.16	447.50	0.993	447.68	448.15	0.25	448.15	12	Manhole
105	CB5-1 TO MH5-8	2.89	18	Cir	104.025	445.29	447.37	2.000	445.72	448.02	n/a	448.02	8	Combination
106	CB5-20 TO MH5-11	2.83	18	Cir	16.837	445.16	445.50	2.019	445.58	446.14	n/a	446.14	11	Combination
107	CB5-2 TO MH5-8	2.99	18	Cir	247.954	445.02	447.50	1.000	445.54	448.16	0.25	448.16	8	Combination
108	MH5-46 TO MH5-11	10.47	36	Cir	188.089	433.45	434.39	0.500	435.77	435.41	n/a	435.41	11	Manhole
109	CB5-21 TO MH5-46	1.74	18	Cir	23.526	442.76	443.00	1.020	443.15	443.50	0.18	443.50	108	Combination
110	OCS5-4 TO MH5-12	3.71	24	Cir	23.855	441.26	441.50	1.006	441.79	442.17	n/a	442.17	12	Manhole
111	MH5-7 TO EX-CB	30.15	30	Cir	38.086	440.39	441.20	2.127	441.59	443.07	0.91	443.07	7	Grate
112	MH5-31 TO MH5-14	1.82	48	Cir	117.698	437.63	438.22	0.501	439.21	438.61	n/a	438.61	14	Manhole
113	MH5-32 TO MH5-31	1.82	48	Cir	72.596	438.32	438.68	0.496	438.68	439.07	n/a	439.07	112	Manhole
114	MH5-33 TO MH5-32	1.82	48	Cir	42.108	438.68	438.89	0.499	439.07	439.28	n/a	439.28	113	Manhole
115	CB5-22 TO MH5-46	8.93	30	Cir	95.823	434.89	435.37	0.501	435.80	436.37	0.24	436.37	108	Combination
116	MH5-51 TO CB5-22	8.69	30	Cir	119.492	435.47	436.07	0.502	436.37	437.05	n/a	437.05	115	Manhole
117	FES5-2 TO MH5-51	8.70	18	Cir	11.044	437.50	438.00	4.527	438.12	439.14	0.57	439.14	116	OpenHeadwall
118	CB5-18 TO FES5-5	2.52	18	Cir	14.051	469.00	469.07	0.498	469.60	469.67	n/a	469.67	End	Combination
119	CB5-19 TO CB5-18	1.60	14x23	Ell	43.701	469.07	469.29	0.503	469.90	469.80	0.07	469.80	118	Combination
120	CB5-33 TO MH5-58	1.79	18	Cir	161.016	451.37	456.20	3.000	451.87	456.70	0.22	456.70	End	Combination

Project File: STRM-NTWK-05-25-YR.stm | Number of lines: 152 | Run Date: 2/22/2023

NOTES: Return period = 25 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
121	CB5-35 TO CB5-33	0.91	18	Cir	124.908	457.60	462.60	4.003	457.80	462.96	0.19	462.96	120	Combination
122	CB5-36 TO CB5-35	0.52	18	Cir	30.000	462.70	463.00	1.000	462.96	463.27	0.09	463.27	121	Combination
123	CB5-34 TO CB5-33	0.47	18	Cir	30.000	457.60	457.90	1.000	457.81	458.15	n/a	458.15	120	Combination
124	CB5-8 TO MH5-44	10.59	24	Cir	26.751	455.88	456.15	1.009	457.07	457.31	n/a	457.31 j	End	Combination
125	CB5-9 TO CB5-8	10.15	24	Cir	40.000	456.25	456.45	0.500	457.35	457.59	n/a	457.59	124	Combination
126	CB5-10 TO CB5-9	9.30	24	Cir	57.813	456.55	456.84	0.502	457.59	457.93	0.52	457.93	125	Combination
127	CB5-11 TO CB5-10	8.12	24	Cir	30.034	456.94	457.09	0.499	457.93	458.10	n/a	458.10	126	Combination
128	CB5-14 TO MH5-38	5.99	24	Cir	56.444	457.19	457.47	0.496	458.10	458.33	n/a	458.33 j	127	Combination
129	CB5-16 TO MH5-39	3.47	18	Cir	117.308	457.57	460.21	2.250	458.33	460.92	n/a	460.92 j	128	Combination
130	CB5-17 TO CB5-16	1.90	18	Cir	109.764	460.31	464.15	3.498	460.92	464.67	n/a	464.67 j	129	Combination
131	CB5-13 TO FES5-4	0.75	18	Cir	25.654	457.00	457.50	1.949	457.32	457.82	0.11	457.82	End	Combination
132	CB5-96 TO CB5-95	1.05	18	Cir	122.513	454.14	454.75	0.498	454.52	455.13	n/a	455.13	End	Grate
133	CB5-97 TO MH5-61	1.44	18	Cir	40.587	453.95	454.25	0.739	454.40	454.70	n/a	454.70	End	Grate
134	CB5-37 TO MH5-60	1.40	18	Cir	88.639	448.07	448.96	1.004	448.51	449.40	0.17	449.40	End	Combination
135	CB5-38 TO CB5-37	0.66	18	Cir	30.003	452.85	453.00	0.500	453.14	453.30	0.11	453.30	134	Combination
136	CB5-80 TO FES5-1	0.62	18	Cir	25.905	451.90	452.68	3.011	452.19	452.97	n/a	452.97	End	Combination
137	MH5-57 TO MH5-56	3.75	24	Cir	64.000	448.19	448.51	0.500	448.87	449.19	n/a	449.19 j	End	Manhole
138	RD5-3 TO MH5-57	1.13	18	Cir	35.482	450.32	450.50	0.507	450.70	450.90	0.14	450.90	137	None
139	CB5-81 TO MH5-57	2.64	18	Cir	40.000	448.61	448.81	0.500	449.20	449.43	0.12	449.43	137	Combination
140	OCS5-5 TO CB5-81	1.17	18	Cir	8.931	448.91	449.00	1.008	449.43	449.40	n/a	449.40 j	139	Grate
141	RD5-1 TO MH5-55	1.16	18	Cir	32.000	450.18	450.50	1.000	450.58	450.90	0.14	450.90	End	None
142	RD5-2 TO MH5-56	1.06	18	Cir	37.355	450.13	450.50	0.990	450.51	450.88	0.14	450.88	End	None
143	MH5-63 TO MH5-62	1.85	18	Cir	27.000	445.77	445.90	0.482	446.28	446.41	n/a	446.41	End	Manhole
144	CB5-82 TO MH5-63	1.87	18	Cir	40.907	446.00	446.20	0.489	446.50	446.71	0.09	446.71	143	Combination

Project File: STRM-NTWK-05-25-YR.stm | Number of lines: 152 | Run Date: 2/22/2023

NOTES: Return period = 25 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
145	CB5-83 TO CB5-82	1.42	18	Cir	54.035	449.48	449.75	0.500	449.91	450.20	0.16	450.20	144	Combination
146	CB5-87 TO CB5-86	5.12	18	Cir	7.500	446.06	446.21	2.000	446.93	447.08	0.37	447.08	End	Combination
147	CB5-88 TO CB5-87	3.77	18	Cir	66.843	446.31	446.64	0.494	447.08	447.38	0.30	447.38	146	Combination
148	CB5-89 TO CB5-88	2.82	18	Cir	115.500	446.74	447.32	0.502	447.38	447.96	n/a	447.96 j	147	Combination
149	CB5-79 TO CB5-89	0.96	18	Cir	64.630	448.25	449.54	1.996	448.50	449.91	n/a	449.91	148	Combination
150	CB5-90 TO CB5-89	0.78	18	Cir	115.523	447.42	448.00	0.502	447.96	448.33	n/a	448.33 j	148	Combination
151	RD5-4 TO MH5-59	1.49	18	Cir	60.500	447.90	448.50	0.992	448.36	448.96	n/a	448.96 j	End	None
152	CB5-92 TO CB5-91	2.90	18	Cir	36.371	447.11	447.48	1.017	447.76	448.13	n/a	448.13 j	End	Combination

Project File: STRM-NTWK-05-25-YR.stm | Number of lines: 152 | Run Date: 2/22/2023

NOTES: Return period = 25 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	20.440	0.00	37.13	0.00	0.00	27.01	0.0	24.1	3.9	136.0	649.9	9.01	72	2.01	398.80	399.21	401.96	402.37	407.80	417.34	HW5-1 TO MH5-1
2	1	30.000	0.00	37.13	0.00	0.00	27.01	0.0	24.0	3.9	136.1	649.0	13.58	72	2.00	404.71	405.31	406.58	408.47	417.34	448.00	MH5-1 TO MH5-2
3	2	53.039	0.00	37.13	0.00	0.00	27.01	0.0	24.0	3.9	136.2	648.7	13.59	72	2.00	410.81	411.87	412.68	415.03	448.00	448.50	MH5-2 TO MH5-3
4	3	260.000	0.00	37.13	0.00	0.00	27.01	0.0	23.6	3.9	137.2	459.8	11.62	72	1.00	416.87	419.48	419.12	422.65	448.50	450.90	MH5-3 TO MH5-4
5	4	96.972	5.17	37.13	0.79	4.08	27.01	10.0	23.4	3.9	137.6	458.9	9.25	72	1.00	419.58	420.55	422.65	423.73	450.90	452.33	MH5-4 TO MH5-5
6	5	216.121	0.00	31.96	0.00	0.00	22.93	0.0	23.0	4.0	122.4	458.7	8.54	72	1.00	420.65	422.81	423.73	425.80	452.33	454.60	MH5-5 TO MH5-6
7	6	238.559	0.00	31.96	0.00	0.00	22.93	0.0	22.6	4.0	123.4	459.3	8.94	72	1.00	422.91	425.30	425.80	428.30	454.60	458.31	MH5-6 TO MH5-7
8	7	204.104	0.00	25.61	0.00	0.00	17.85	6.0	22.1	4.1	103.8	458.8	7.95	72	1.00	425.40	427.44	428.30	430.18	458.31	454.71	MH5-7 TO MH5-8
9	8	108.405	0.00	24.73	0.00	0.00	17.02	0.0	21.9	4.1	100.8	458.0	8.29	72	1.00	427.54	428.62	430.18	431.32	454.71	455.41	MH5-8 TO MH5-9
10	9	299.601	0.00	22.07	0.00	0.00	14.68	0.0	21.2	4.2	72.34	364.1	7.05	66	1.00	428.72	431.72	431.32	434.05	455.41	452.61	MH5-10 TO MH5-
11	10	162.986	0.00	21.80	0.00	0.00	14.42	0.0	20.9	4.2	71.80	363.9	7.73	66	1.00	431.82	433.45	434.05	435.77	452.61	450.86	MH5-10 TO MH5-
12	11	203.182	0.00	19.45	0.00	0.00	12.50	0.0	20.4	4.2	64.42	363.7	7.22	66	1.00	433.55	435.58	435.77	437.77	450.86	453.95	MH5-11 TO MH5-
13	12	77.359	0.00	19.45	0.00	0.00	12.50	0.0	20.2	4.3	58.06	365.3	7.02	66	1.01	435.68	436.46	437.77	438.54	453.95	454.72	MH5-12 TO MH5-
14	13	56.863	0.00	19.45	0.00	0.00	12.50	0.0	20.1	4.3	58.24	364.3	7.32	66	1.00	436.56	437.13	438.54	439.21	454.72	455.99	MH5-14 TO MH5-
15	14	97.052	0.00	19.45	0.00	0.00	12.50	0.0	19.9	4.3	56.73	282.1	7.50	60	1.00	437.23	438.20	439.21	440.31	455.99	458.24	MH5-15 TO MH5-
16	15	74.996	0.00	19.09	0.00	0.00	12.28	0.0	19.7	4.3	55.97	282.2	9.17	60	1.00	442.25	443.00	443.76	445.10	458.24	464.15	MH5-16 TO MH5-
17	16	60.019	0.00	19.09	0.00	0.00	12.28	0.0	19.6	4.3	56.13	282.1	9.18	60	1.00	448.00	448.60	449.51	450.70	464.15	466.02	MH5-17 TO MH5-
18	17	230.753	0.00	19.09	0.00	0.00	12.28	0.0	19.2	4.4	56.73	282.3	9.21	60	1.00	453.60	455.91	455.12	458.02	466.02	474.92	MH5-18 TO MH5-
19	18	199.226	0.00	18.95	0.00	0.00	12.17	0.0	18.8	4.4	56.90	282.0	7.44	60	1.00	456.01	458.00	458.02	460.12	474.92	474.35	MH5-19 TO MH5-
20	19	135.000	0.00	18.65	0.00	0.00	11.94	0.0	18.5	4.5	56.32	282.2	7.38	60	1.00	458.10	459.45	460.12	461.56	474.35	472.74	MH5-20 TO MH5-
21	20	152.928	0.00	9.10	0.00	0.00	6.11	0.0	12.2	5.5	36.36	282.2	5.61	60	1.00	459.55	461.08	461.56	462.76	472.74	474.62	MH5-21 TO MH5-
22	21	128.398	0.00	8.97	0.00	0.00	5.99	0.0	11.8	5.5	35.09	212.7	6.71	54	1.00	461.18	462.46	462.76	464.16	474.62	476.48	MH5-22 TO MH5-

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NOTES:Intensity = 48.83 / (Inlet time + 7.80) ^ 0.73; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
23	22	138.853	0.00	7.09	0.00	0.00	4.79	0.0	11.4	5.6	28.86	213.2	5.86	54	1.00	462.56	463.95	464.16	465.49	476.48	478.46	MH5-23 TO MH5-
24	23	56.993	0.00	7.09	0.00	0.00	4.79	0.0	11.3	5.6	29.02	213.1	6.33	54	1.00	464.05	464.62	465.49	466.16	478.46	479.43	MH5-24 TO MH5-
25	24	103.591	0.00	1.11	0.00	0.00	0.97	0.0	10.7	5.8	7.60	213.5	2.95	54	1.00	464.72	465.76	466.16	466.54	479.43	480.95	MH5-25 TO MH5-
26	25	279.546	0.00	1.11	0.00	0.00	0.97	0.0	9.7	6.0	7.83	213.2	4.72	54	1.00	465.86	468.66	466.54	469.45	480.95	488.70	MH5-26 TO MH5-
27	26	69.589	0.00	1.11	0.00	0.00	0.97	0.0	9.5	6.1	7.89	213.7	4.68	54	1.01	468.76	469.46	469.45	470.25	488.70	490.69	MH5-27 TO MH5-
28	27	102.551	0.05	1.11	0.91	0.05	0.97	6.0	9.2	6.1	5.95	19.72	7.43	18	3.00	486.67	489.75	487.24	490.69	490.69	493.77	CB5-59 TO MH5-
29	28	111.289	0.05	0.99	0.91	0.05	0.86	6.0	8.9	6.2	5.35	25.43	5.42	18	5.00	489.93	495.49	490.69	496.38	493.77	499.49	CB5-61 TO CB5-5
30	29	108.480	0.00	0.88	0.00	0.00	0.76	0.0	8.6	6.3	4.78	16.09	6.23	18	2.00	495.81	497.98	496.38	498.82	499.49	506.05	MH5-38 TO CB5-
31	30	6.682	0.08	0.88	0.92	0.07	0.76	6.0	8.6	6.3	4.79	15.87	5.11	18	1.95	498.08	498.21	498.82	499.05	506.05	505.74	CB5-63 TO MH5-
32	31	145.419	0.23	0.71	0.84	0.19	0.60	6.0	8.0	6.5	3.89	11.36	4.42	18	1.00	498.31	499.76	499.05	500.51	505.74	508.61	CB5-65 TO CB5-6
33	32	39.874	0.05	0.48	0.93	0.05	0.41	6.0	7.9	6.5	2.66	11.39	3.74	18	1.00	499.86	500.26	500.51	500.88	508.61	508.61	CB5-66 TO CB5-6
34	33	94.795	0.03	0.43	0.94	0.03	0.36	6.0	7.4	6.6	2.40	8.10	3.87	18	0.51	500.36	500.84	500.92	501.43	508.61	510.01	CB5-67 TO CB5-6
35	34	40.000	0.07	0.40	0.77	0.05	0.33	6.0	7.3	6.7	2.23	8.04	3.78	18	0.50	500.94	501.14	501.48	501.70	510.01	510.01	CB5-68 TO CB5-6
36	35	210.926	0.22	0.33	0.80	0.18	0.28	6.0	6.3	7.0	1.97	8.03	3.65	18	0.50	503.14	504.19	503.65	504.72	510.01	508.12	CB5-69 TO CB5-6
37	36	41.272	0.11	0.11	0.94	0.10	0.10	6.0	6.0	7.2	0.74	8.11	2.23	18	0.51	504.29	504.50	504.72	504.82	508.12	507.86	CB5-70 TO CB5-6
38	31	30.002	0.09	0.09	0.94	0.08	0.08	6.0	6.0	7.2	0.60	8.04	2.61	18	0.50	501.85	502.00	502.13	502.29	505.74	505.71	CB5-64 TO CB5-6
39	29	30.000	0.06	0.06	0.93	0.06	0.06	6.0	6.0	7.2	0.40	8.04	1.50	18	0.50	495.85	496.00	496.38	496.23	499.49	499.49	CB5-62 TO CB5-6
40	28	30.000	0.07	0.07	0.93	0.07	0.07	6.0	6.0	7.2	0.47	8.04	1.42	18	0.50	489.85	490.00	490.69	490.25	493.77	493.81	CB5-60 TO CB5-5
41	24	22.434	0.06	1.31	0.93	0.06	0.97	6.0	8.2	6.4	6.23	16.11	6.86	18	2.01	474.12	474.57	474.77	475.53	479.43	479.38	CB5-52 TO MH5-
42	41	96.516	0.12	1.25	0.88	0.11	0.92	6.0	7.9	6.5	5.95	16.09	5.37	18	2.00	474.67	476.60	475.53	477.54	479.38	480.87	CB5-53 TO CB5-5
43	42	169.115	0.08	0.56	0.93	0.07	0.44	6.0	7.1	6.8	2.96	17.08	3.65	18	2.25	476.78	480.59	477.54	481.24	480.87	485.36	CB5-55 TO CB5-5
44	43	30.000	0.27	0.48	0.68	0.18	0.36	6.0	7.0	6.8	2.48	16.09	3.98	18	2.00	480.69	481.29	481.24	481.89	485.36	485.36	CB5-56 TO CB5-5

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Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
45	44	129.245	0.12	0.21	0.93	0.11	0.18	6.0	6.2	7.1	1.28	18.85	2.82	18	2.75	481.39	484.94	481.89	485.36	485.36	489.32	CB5-57 TO CB5-5
46	45	30.000	0.09	0.09	0.77	0.07	0.07	6.0	6.0	7.2	0.50	11.38	2.09	18	1.00	485.04	485.34	485.36	485.60	489.32	489.34	CB5-58 TO CB5-5
47	27	20.949	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	1.00	109.1	3.04	42	1.00	482.79	483.00	483.03	483.30	490.69	492.44	MH5-29 TO MH5-
48	42	30.000	0.57	0.57	0.65	0.37	0.37	6.0	6.0	7.2	2.65	11.38	3.23	18	1.00	476.70	477.00	477.54	477.62	480.87	480.88	CB5-54 TO CB5-5
49	24	10.000	4.67	4.67	0.61	2.85	2.85	6.0	6.0	7.2	20.37	24.50	8.10	24	1.00	474.90	475.00	476.29	476.62	479.43	479.23	CB5-51 TO MH5-
50	22	8.551	1.77	1.77	0.62	1.10	1.10	6.0	6.0	7.2	7.85	11.67	6.41	18	1.05	472.41	472.50	473.31	473.58	476.48	476.43	CB5-50 TO MH5-
51	22	23.300	0.11	0.11	0.93	0.10	0.10	6.0	6.0	7.2	0.73	11.30	3.14	18	0.99	472.27	472.50	472.53	472.82	476.48	476.41	CB5-49 TO MH5-
52	18	33.617	0.06	0.14	0.82	0.05	0.11	6.0	6.3	7.0	0.77	8.09	2.80	18	0.51	471.03	471.20	471.34	471.53	474.92	475.10	CB5-41 TO MH5-
53	52	40.000	0.08	0.08	0.75	0.06	0.06	6.0	6.0	7.2	0.43	8.04	2.37	18	0.50	471.30	471.50	471.54	471.74	475.10	475.10	CB5-42 TO CB5-4
54	27	44.054	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	1.00	155.5	1.59	48	1.00	469.56	470.00	470.25	470.29	490.69	490.01	MH5-28 TO MH5-
55	21	20.000	0.06	0.06	0.90	0.05	0.05	6.0	6.0	7.2	0.39	11.38	2.62	18	1.00	470.30	470.50	470.49	470.73	474.62	474.42	CB5-48 TO MH5-
56	19	11.944	0.16	0.16	0.78	0.12	0.12	6.0	6.0	7.2	0.89	11.40	3.33	18	1.00	470.13	470.25	470.41	470.60	474.35	474.11	CB5-43 TO MH5-
57	19	21.944	0.14	0.14	0.77	0.11	0.11	6.0	6.0	7.2	0.77	11.39	3.20	18	1.00	470.03	470.25	470.29	470.58	474.35	474.11	CB5-44 TO MH5-
58	20	20.000	0.15	9.38	0.89	0.13	5.67	6.0	18.4	4.5	25.36	102.2	9.24	36	2.00	466.10	466.50	467.12	468.12	472.74	472.54	CB5-46 TO MH5-
59	58	10.000	9.23	9.23	0.60	5.54	5.54	18.4	18.4	4.5	24.77	161.6	11.49	36	5.00	468.00	468.50	468.79	470.10	472.54	473.00	HW5-5 TO CB5-4
60	20	10.000	0.17	0.17	0.93	0.16	0.16	6.0	6.0	7.2	1.13	11.38	3.56	18	1.00	468.40	468.50	468.72	468.90	472.74	472.54	CB5-45 TO MH5-
61	21	10.000	0.07	0.07	0.93	0.07	0.07	6.0	6.0	7.2	1.47	72.25	3.47	36	1.00	465.65	465.75	465.95	466.12	474.62	474.42	CB5-47 TO MH5-
62	61	15.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	1.00	72.25	2.85	36	1.00	465.85	466.00	466.12	466.31	474.42	475.88	MH5-30 TO CB5-
63	9	52.136	0.00	2.66	0.00	0.00	2.35	0.0	8.8	6.2	34.58	108.8	8.44	42	1.00	444.31	444.83	445.67	446.65	455.41	456.09	MH5-9 TO MH5-3
64	63	53.514	0.00	1.16	0.00	0.00	1.01	0.0	8.7	6.3	26.26	88.34	6.58	36	1.49	445.00	445.80	446.65	447.45	456.09	457.38	MH5-53 TO MH5-
65	64	91.065	0.00	0.16	0.00	0.00	0.15	6.0	7.2	6.7	20.98	88.49	8.17	36	1.50	446.63	448.00	447.63	449.47	457.38	460.34	MH5-35 TO MH5-
66	65	186.792	0.00	0.16	0.00	0.00	0.15	0.0	6.7	6.9	20.00	72.29	7.37	36	1.00	448.87	450.74	449.95	452.17	460.34	461.74	MH5-36 TO MH5-

Project File: STRM-NTWK-05-25-YR.stm | Number of lines: 152 | Run Date: 2/22/2023

NOTES:Intensity = 48.83 / (Inlet time + 7.80) ^ 0.73; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
67	66	70.000	0.00	0.16	0.00	0.00	0.15	0.0	6.5	6.9	20.01	72.25	6.29	36	1.00	450.84	451.54	452.17	452.97	461.74	462.71	MH5-37 TO MH5-
68	67	170.066	0.00	0.16	0.00	0.00	0.15	0.0	6.1	7.1	5.62	102.2	5.93	36	2.00	454.37	457.77	454.85	458.51	462.71	464.34	MH5-39 TO MH5-
69	68	174.174	0.00	0.00	0.00	0.00	0.00	0.0	0.4	0.0	4.53	102.1	4.54	36	2.00	457.97	461.45	458.51	462.12	464.34	470.85	MH5-40 TO MH5-
70	69	67.311	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	3.53	11.35	4.95	18	1.00	465.83	466.50	466.40	467.22	470.85	471.00	OCS5-7 TO MH5-
71	69	45.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	1.00	72.25	1.84	36	1.00	461.55	462.00	462.12	462.31	470.85	472.40	MH5-41 TO MH5-
72	68	15.000	0.16	0.16	0.96	0.15	0.15	6.0	6.0	7.2	1.10	11.38	3.53	18	1.00	460.10	460.25	460.42	460.64	464.34	464.04	CB5-15 TO MH5-
73	65	38.184	0.00	0.00	0.00	0.00	0.00	6.0	6.0	0.0	1.00	11.35	3.44	18	1.00	456.62	457.00	456.92	457.37	460.34	0.00	MH5-35 TO OCS5
74	67	92.998	0.00	0.00	0.00	0.00	0.00	6.0	6.1	0.0	14.41	31.42	5.55	30	0.50	451.64	452.10	452.97	453.38	462.71	459.43	MH5-42 TO MH5-
75	74	40.157	0.00	0.00	0.00	0.00	0.00	6.0	6.0	0.0	4.02	11.38	5.03	18	1.00	452.74	453.14	453.38	453.91	459.43	459.48	MH5-43 TO MH5-
76	75	20.057	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.80	8.03	2.82	18	0.50	453.90	454.00	454.22	454.33	459.48	458.00	OCS5-6 TO MH5-
77	75	18.349	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	3.22	11.27	4.55	18	0.98	453.32	453.50	453.91	454.18	459.48	459.06	OCS5-2 TO MH5-
78	15	20.166	0.34	0.34	0.61	0.21	0.21	6.0	6.0	7.2	1.48	11.33	3.85	18	0.99	453.30	453.50	453.67	453.96	458.24	457.88	CB5-94 TO MH5-
79	64	133.392	0.17	1.00	0.90	0.15	0.85	6.0	8.2	6.4	5.47	17.37	4.68	24	0.50	447.88	448.55	448.65	449.37	457.38	453.62	CB5-71 TO MH5-
80	79	59.990	0.00	0.05	0.00	0.00	0.05	0.0	7.9	6.5	0.32	1.96	3.33	8	2.25	450.94	452.29	451.12	452.55	453.62	455.08	CD5-3 TO CB5-71
81	80	26.867	0.00	0.03	0.00	0.00	0.03	0.0	7.7	6.6	0.20	0.91	1.84	8	0.48	452.29	452.42	452.55	452.62	455.08	455.00	CD5-3 TO CB5-71
82	81	11.071	0.00	0.03	0.00	0.00	0.03	0.0	7.6	6.6	0.20	0.96	1.84	8	0.54	452.42	452.48	452.68	452.69	455.00	455.00	CD5-3 TO CB5-71
83	82	34.788	0.00	0.03	0.00	0.00	0.03	0.0	7.3	6.7	0.20	0.91	1.87	8	0.49	452.48	452.65	452.74	452.86	455.00	455.08	CD5-3 TO CB5-71
84	83	80.821	0.00	0.01	0.00	0.00	0.01	0.0	6.1	7.1	0.07	0.93	1.10	8	0.51	452.65	453.06	452.91	453.18	455.08	455.08	CD5-3 TO CB5-71
85	84	4.773	0.01	0.01	0.99	0.01	0.01	6.0	6.0	7.2	0.07	0.85	1.48	8	0.42	453.06	453.08	453.19	453.21	455.08	455.10	CD5-3 TO CB5-71
86	74	26.226	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	10.39	24.40	5.58	24	0.99	452.24	452.50	453.38	453.65	459.43	458.84	OCS5-1 TO MH5-
87	83	5.657	0.00	0.02	0.00	0.00	0.02	0.0	6.0	7.1	0.14	1.35	1.55	8	1.06	452.65	452.71	452.91	452.88	455.08	455.12	CD5-2 2
88	87	5.300	0.02	0.02	0.99	0.02	0.02	6.0	6.0	7.2	0.14	1.27	1.99	8	0.94	452.71	452.76	452.88	452.93	455.12	455.20	CD5-2 1

Project File: STRM-NTWK-05-25-YR.stm | Number of lines: 152 | Run Date: 2/22/2023

NOTES:Intensity = 48.83 / (Inlet time + 7.80) ^ 0.73; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
89	80	1.125	0.02	0.02	0.99	0.02	0.02	6.0	6.0	7.2	0.14	1.74	1.55	8	1.78	452.29	452.31	452.55	452.48	455.08	455.09	CD5-1
90	15	34.982	0.02	0.02	0.61	0.01	0.01	6.0	6.0	7.2	0.09	19.71	2.16	18	3.00	450.95	452.00	451.02	452.11	458.24	458.99	CB5-93 TO MH5-
91	79	60.284	0.46	0.58	0.86	0.40	0.49	6.0	6.7	6.9	3.35	11.35	4.88	18	1.00	449.19	449.79	449.75	450.49	453.62	453.40	CB5-72 TO CB5-7
92	91	74.716	0.12	0.12	0.75	0.09	0.09	6.0	6.0	7.2	0.64	18.00	1.79	18	2.50	449.89	451.76	450.49	452.06	453.40	455.24	CB5-73 TO CB5-7
93	79	45.000	0.06	0.20	0.91	0.05	0.17	6.0	6.2	7.1	1.17	7.95	3.13	18	0.49	449.00	449.22	449.39	449.62	453.62	453.60	CB5-74 TO CB5-7
94	93	35.475	0.14	0.14	0.79	0.11	0.11	6.0	6.0	7.2	0.79	8.10	2.82	18	0.51	449.32	449.50	449.64	449.83	453.60	453.16	CB5-75 TO CB5-7
95	10	19.445	0.04	0.27	0.98	0.04	0.26	6.0	7.3	6.7	1.74	11.24	4.01	18	0.98	448.39	448.58	448.79	449.08	452.61	453.66	CB5-76 TO MH5-
96	95	43.097	0.18	0.23	0.97	0.17	0.22	6.0	7.1	6.8	1.49	8.13	3.38	18	0.51	448.68	448.90	449.12	449.36	453.66	453.25	CB5-77 TO CB5-7
97	96	100.903	0.05	0.05	0.91	0.05	0.05	6.0	6.0	7.2	0.33	8.01	1.58	18	0.50	449.00	449.50	449.36	449.71	453.25	453.38	CB5-78 TO CB5-7
98	63	52.702	0.18	0.58	0.95	0.17	0.56	6.0	6.8	6.8	3.84	7.99	4.12	18	0.49	445.83	446.09	446.65	446.84	456.09	455.51	CB5-3 TO MH5-3
99	98	92.115	0.31	0.40	0.98	0.30	0.39	6.0	6.5	7.0	2.72	8.04	4.00	18	0.50	446.26	446.72	446.86	447.35	455.51	453.79	CB5-4 TO CB5-3
100	99	70.906	0.09	0.09	0.95	0.09	0.09	6.0	6.0	7.2	0.61	7.99	2.61	18	0.49	448.65	449.00	448.93	449.29	453.79	452.70	CB5-5 TO CB5-4
101	63	36.193	0.47	0.92	0.82	0.39	0.78	6.0	7.0	6.8	5.30	8.02	4.85	18	0.50	446.54	446.72	447.43	447.61	456.09	455.38	CB5-6 TO MH5-3
102	101	73.953	0.00	0.45	0.00	0.00	0.40	0.0	6.6	6.9	2.74	8.05	2.85	18	0.50	446.89	447.26	448.10	447.89	455.38	454.51	MH5-45 TO CB5-
103	102	149.233	0.45	0.45	0.88	0.40	0.40	6.0	6.0	7.2	2.83	8.06	4.05	18	0.50	447.43	448.18	448.04	448.82	454.51	451.68	CB5-7 TO MH5-4
104	12	34.234	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	2.90	11.34	4.67	18	0.99	447.16	447.50	447.68	448.15	453.95	453.95	OCS5-3 TO MH5-
105	8	104.025	0.44	0.44	0.92	0.40	0.40	6.0	6.0	7.2	2.89	16.09	5.43	18	2.00	445.29	447.37	445.72	448.02	454.71	453.80	CB5-1 TO MH5-8
106	11	16.837	0.46	0.46	0.86	0.40	0.40	6.0	6.0	7.2	2.83	16.17	5.41	18	2.02	445.16	445.50	445.58	446.14	450.86	449.17	CB5-20 TO MH5-
107	8	247.954	0.44	0.44	0.95	0.42	0.42	6.0	6.0	7.2	2.99	11.38	4.72	18	1.00	445.02	447.50	445.54	448.16	454.71	451.11	CB5-2 TO MH5-8
108	11	188.089	0.00	1.89	0.00	0.00	1.52	0.0	6.7	6.9	10.47	51.08	3.35	36	0.50	433.45	434.39	435.77	435.41	450.86	449.06	MH5-46 TO MH5-
109	108	23.526	0.29	0.29	0.84	0.24	0.24	6.0	6.0	7.2	1.74	11.49	4.05	18	1.02	442.76	443.00	443.15	443.50	449.06	446.95	CB5-21 TO MH5-
110	12	23.855	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	3.71	24.58	4.81	24	1.01	441.26	441.50	441.79	442.17	453.95	453.32	OCS5-4 TO MH5-

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Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
111	7	38.086	6.35	6.35	0.80	5.08	5.08	10.0	10.0	5.9	30.15	64.79	10.31	30	2.13	440.39	441.20	441.59	443.07	458.31	458.11	MH5-7 TO EX-CB
112	14	117.698	0.00	0.00	0.00	0.00	0.00	0.0	0.6	0.0	1.82	110.2	1.65	48	0.50	437.63	438.22	439.21	438.61	455.99	455.28	MH5-31 TO MH5-
113	112	72.596	0.00	0.00	0.00	0.00	0.00	0.0	0.2	0.0	1.82	109.6	3.09	48	0.50	438.32	438.68	438.68	439.07	455.28	458.06	MH5-32 TO MH5-
114	113	42.108	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	1.82	109.9	2.92	48	0.50	438.68	438.89	439.07	439.28	458.06	458.23	MH5-33 TO MH5-
115	108	95.823	0.06	1.60	0.99	0.06	1.28	6.0	6.4	7.0	8.93	31.44	5.21	30	0.50	434.89	435.37	435.80	436.37	449.06	452.24	CB5-22 TO MH5-
116	115	119.492	0.00	1.54	0.00	0.00	1.22	0.0	6.0	7.1	8.69	31.48	5.17	30	0.50	435.47	436.07	436.37	437.05	452.24	441.47	MH5-51 TO CB5-
117	116	11.044	1.54	1.54	0.79	1.22	1.22	6.0	6.0	7.2	8.70	24.21	9.30	18	4.53	437.50	438.00	438.12	439.14	441.47	441.00	FES5-2 TO MH5-
118	End	14.051	0.15	0.44	0.90	0.14	0.36	6.0	6.3	7.0	2.52	8.03	3.82	18	0.50	469.00	469.07	469.60	469.67	472.00	471.45	CB5-18 TO FES5-
119	118	43.701	0.29	0.29	0.77	0.22	0.22	6.0	6.0	7.2	1.60	7.84	2.61	14 x 23 e	0.50	469.07	469.29	469.90	469.80	471.45	471.52	CB5-19 TO CB5-1
120	End	161.016	0.07	0.28	0.94	0.07	0.26	6.0	6.7	6.9	1.79	19.70	3.46	18	3.00	451.37	456.20	451.87	456.70	455.35	461.79	CB5-33 TO MH5-
121	120	124.908	0.06	0.14	0.93	0.06	0.13	6.0	6.2	7.1	0.91	22.76	4.56	18	4.00	457.60	462.60	457.80	462.96	461.79	466.79	CB5-35 TO CB5-3
122	121	30.000	0.08	0.08	0.91	0.07	0.07	6.0	6.0	7.2	0.52	11.38	2.53	18	1.00	462.70	463.00	462.96	463.27	466.79	466.79	CB5-36 TO CB5-3
123	120	30.000	0.07	0.07	0.93	0.07	0.07	6.0	6.0	7.2	0.47	11.38	2.77	18	1.00	457.60	457.90	457.81	458.15	461.79	461.79	CB5-34 TO CB5-3
124	End	26.751	0.08	2.22	0.94	0.08	1.61	6.0	7.7	6.6	10.59	24.62	5.51	24	1.01	455.88	456.15	457.07	457.31	461.30	461.38	CB5-8 TO MH5-4
125	124	40.000	0.17	2.14	0.83	0.14	1.54	6.0	7.6	6.6	10.15	17.33	5.61	24	0.50	456.25	456.45	457.35	457.59	461.38	461.38	CB5-9 TO CB5-8
126	125	57.813	0.21	1.97	0.87	0.18	1.39	6.0	7.4	6.7	9.30	17.35	5.47	24	0.50	456.55	456.84	457.59	457.93	461.38	461.71	CB5-10 TO CB5-9
127	126	30.034	0.48	1.76	0.68	0.33	1.21	6.0	7.3	6.7	8.12	17.32	5.16	24	0.50	456.94	457.09	457.93	458.10	461.71	461.66	CB5-11 TO CB5-1
128	127	56.444	0.55	1.28	0.70	0.39	0.88	6.0	7.1	6.8	5.99	17.26	4.45	24	0.50	457.19	457.47	458.10	458.33	461.66	461.26	CB5-14 TO MH5-
129	128	117.308	0.34	0.73	0.69	0.23	0.50	6.0	6.6	6.9	3.47	17.07	4.02	18	2.25	457.57	460.21	458.33	460.92	461.26	464.04	CB5-16 TO MH5-
130	129	109.764	0.39	0.39	0.68	0.27	0.27	6.0	6.0	7.2	1.90	21.28	3.16	18	3.50	460.31	464.15	460.92	464.67	464.04	468.13	CB5-17 TO CB5-1
131	End	25.654	0.11	0.11	0.95	0.10	0.10	6.0	6.0	7.2	0.75	15.88	2.70	18	1.95	457.00	457.50	457.32	457.82	460.00	461.25	CB5-13 TO FES5-
132	End	122.513	0.24	0.24	0.61	0.15	0.15	6.0	6.0	7.2	1.05	8.03	2.96	18	0.50	454.14	454.75	454.52	455.13	457.83	458.24	CB5-96 TO CB5-9

Project File: STRM-NTWK-05-25-YR.stm | Number of lines: 152 | Run Date: 2/22/2023

NOTES:Intensity = 48.83 / (Inlet time + 7.80) ^ 0.73; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

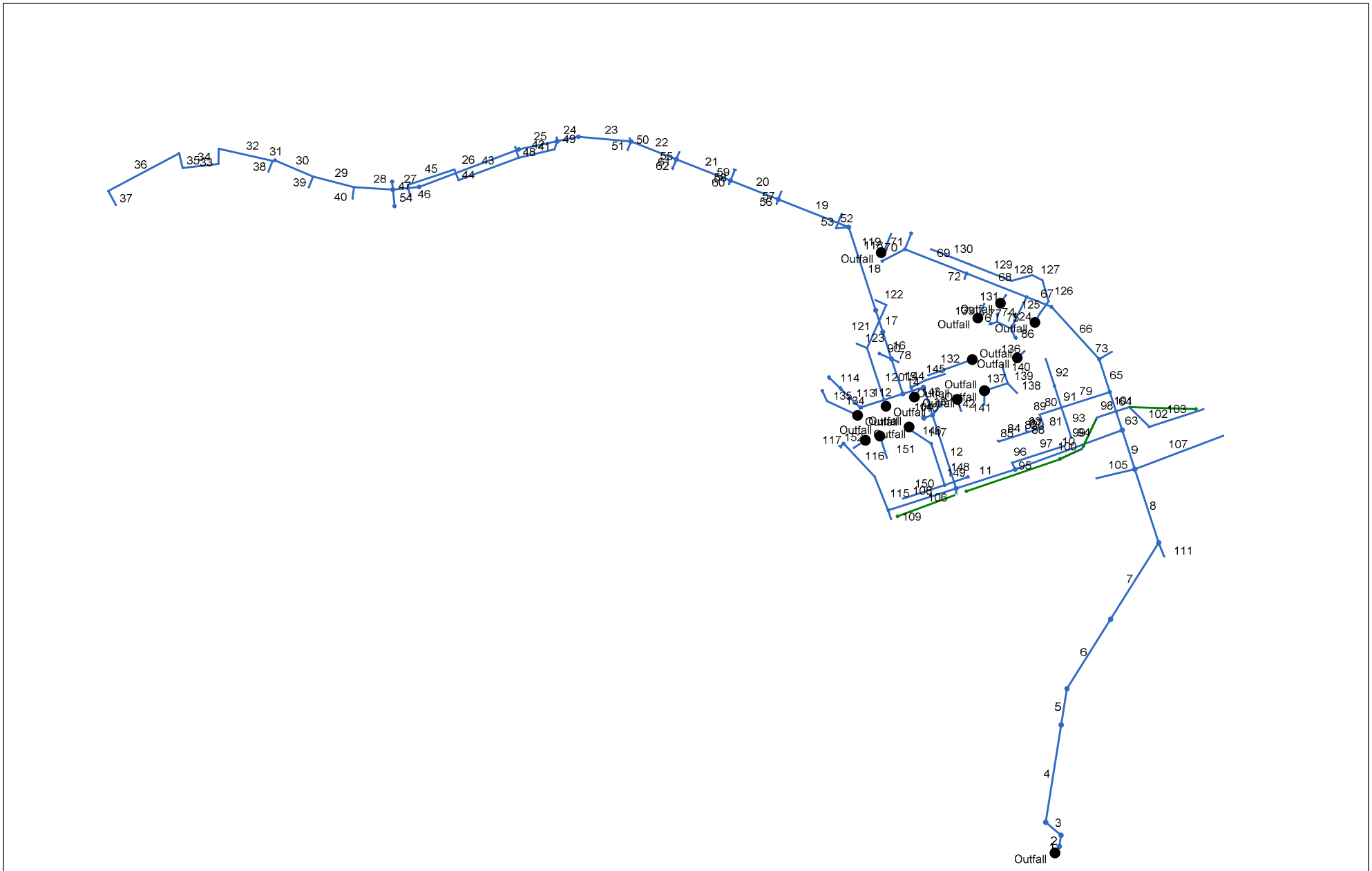
Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
133	End	40.587	0.33	0.33	0.61	0.20	0.20	6.0	6.0	7.2	1.44	9.78	3.23	18	0.74	453.95	454.25	454.40	454.70	459.12	457.75	CB5-97 TO MH5-
134	End	88.639	0.11	0.21	0.95	0.10	0.20	6.0	6.2	7.1	1.40	11.40	3.22	18	1.00	448.07	448.96	448.51	449.40	454.45	457.24	CB5-37 TO MH5-
135	134	30.003	0.10	0.10	0.93	0.09	0.09	6.0	6.0	7.2	0.66	8.04	2.68	18	0.50	452.85	453.00	453.14	453.30	457.24	457.24	CB5-38 TO CB5-3
136	End	25.905	0.09	0.09	0.96	0.09	0.09	6.0	6.0	7.2	0.62	19.74	2.57	18	3.01	451.90	452.68	452.19	452.97	456.00	457.10	CB5-80 TO FES5-
137	End	64.000	0.00	0.38	0.00	0.00	0.37	0.0	6.2	7.1	3.75	17.33	3.99	24	0.50	448.19	448.51	448.87	449.19	454.81	453.97	MH5-57 TO MH5-
138	137	35.482	0.16	0.16	0.99	0.16	0.16	6.0	6.0	7.2	1.13	8.10	3.13	18	0.51	450.32	450.50	450.70	450.90	453.97	455.00	RD5-3 TO MH5-5
139	137	40.000	0.22	0.22	0.94	0.21	0.21	6.0	6.1	7.1	2.64	8.04	3.97	18	0.50	448.61	448.81	449.20	449.43	453.97	453.40	CB5-81 TO MH5-
140	139	8.931	0.00	0.00	0.00	0.00	0.00	6.0	6.0	0.0	1.17	11.42	2.61	18	1.01	448.91	449.00	449.43	449.40	453.40	452.90	OCS5-5 TO CB5-
141	End	32.000	0.16	0.16	0.99	0.16	0.16	6.0	6.0	7.2	1.16	11.38	3.05	18	1.00	450.18	450.50	450.58	450.90	453.82	452.26	RD5-1 TO MH5-5
142	End	37.355	0.15	0.15	0.99	0.15	0.15	6.0	6.0	7.2	1.06	11.32	2.99	18	0.99	450.13	450.50	450.51	450.88	454.81	455.00	RD5-2 TO MH5-5
143	End	27.000	0.00	0.30	0.00	0.00	0.27	0.0	6.5	7.0	1.85	7.89	3.49	18	0.48	445.77	445.90	446.28	446.41	454.91	455.73	MH5-63 TO MH5-
144	143	40.907	0.08	0.30	0.84	0.07	0.27	6.0	6.3	7.0	1.87	7.95	3.58	18	0.49	446.00	446.20	446.50	446.71	455.73	454.26	CB5-82 TO MH5-
145	144	54.035	0.22	0.22	0.90	0.20	0.20	6.0	6.0	7.2	1.42	8.04	3.32	18	0.50	449.48	449.75	449.91	450.20	454.26	453.59	CB5-83 TO CB5-8
146	End	7.500	0.22	0.81	0.97	0.21	0.78	6.0	7.7	6.6	5.12	16.09	4.82	18	2.00	446.06	446.21	446.93	447.08	452.35	452.10	CB5-87 TO CB5-8
147	146	66.843	0.16	0.59	0.95	0.15	0.57	6.0	7.4	6.7	3.77	7.99	4.23	18	0.49	446.31	446.64	447.08	447.38	452.10	452.30	CB5-88 TO CB5-8
148	147	115.500	0.18	0.43	0.95	0.17	0.41	6.0	6.9	6.8	2.82	8.06	3.93	18	0.50	446.74	447.32	447.38	447.96	452.30	451.75	CB5-89 TO CB5-8
149	148	64.630	0.14	0.14	0.96	0.13	0.13	6.0	6.0	7.2	0.96	16.07	3.94	18	2.00	448.25	449.54	448.50	449.91	451.75	453.14	CB5-79 TO CB5-8
150	148	115.523	0.11	0.11	0.99	0.11	0.11	6.0	6.0	7.2	0.78	8.06	2.05	18	0.50	447.42	448.00	447.96	448.33	451.75	451.83	CB5-90 TO CB5-8
151	End	60.500	0.21	0.21	0.99	0.21	0.21	6.0	6.0	7.2	1.49	11.33	3.25	18	0.99	447.90	448.50	448.36	448.96	452.38	453.50	RD5-4 TO MH5-5
152	End	36.371	0.45	0.45	0.90	0.41	0.41	6.0	6.0	7.2	2.90	11.47	3.96	18	1.02	447.11	447.48	447.76	448.13	451.92	451.14	CB5-92 TO CB5-9

Project File: STRM-NTWK-05-25-YR.stm | Number of lines: 152 | Run Date: 2/22/2023

NOTES:Intensity = 48.83 / (Inlet time + 7.80) ^ 0.73; Return period =Yrs. 25 ; c = cir e = ellip b = box

HYDRAULIC REPORT
50-YEAR STORM EVENT
PROPOSED STORM SEWERS (STRM-NTWK-05-50-YR)
PHASE 1A-1 AND PHASE 1A-2 DESIGNS

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: STRM-NTWK-05-50-YR.stm	Number of lines: 152	Date: 2/22/2023

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	HW5-1 TO MH5-1	175.4	72	Cir	20.440	398.80	399.21	2.006	404.41	402.82	n/a	402.82	End	Manhole
2	MH5-1 TO MH5-2	175.5	72	Cir	30.000	404.71	405.31	2.000	406.84	408.92	n/a	408.92	1	Manhole
3	MH5-2 TO MH5-3	175.7	72	Cir	53.039	410.81	411.87	1.999	412.94	415.48	n/a	415.48	2	Manhole
4	MH5-3 TO MH5-4	176.6	72	Cir	260.000	416.87	419.48	1.004	419.45	423.10	n/a	423.10	3	Manhole
5	MH5-4 TO MH5-5	177.1	72	Cir	96.972	419.58	420.55	1.000	423.10	424.18	n/a	424.18	4	Manhole
6	MH5-5 TO MH5-6	158.8	72	Cir	216.121	420.65	422.81	0.999	424.18	426.24	0.21	426.24	5	Manhole
7	MH5-6 TO MH5-7	159.9	72	Cir	238.559	422.91	425.30	1.002	426.24	428.74	n/a	428.74	6	Manhole
8	MH5-7 TO MH5-8	136.3	72	Cir	204.104	425.40	427.44	0.999	428.74	430.60	n/a	430.60	7	Manhole
9	MH5-8 TO MH5-9	132.8	72	Cir	108.405	427.54	428.62	0.996	430.60	431.74	n/a	431.74	8	Manhole
10	MH5-10 TO MH5-9	95.09	66	Cir	299.601	428.72	431.72	1.001	431.74	434.41	n/a	434.41	9	Manhole
11	MH5-10 TO MH5-11	94.36	66	Cir	162.986	431.82	433.45	1.000	434.41	436.13	1.05	436.13	10	Manhole
12	MH5-11 TO MH5-12	85.51	66	Cir	203.182	433.55	435.58	0.999	436.13	438.12	0.98	438.12	11	Manhole
13	MH5-12 TO MH5-13	72.40	66	Cir	77.359	435.68	436.46	1.008	438.12	438.79	n/a	438.79 j	12	Manhole
14	MH5-14 TO MH5-13	72.59	66	Cir	56.863	436.56	437.13	1.002	438.79	439.47	n/a	439.47	13	Manhole
15	MH5-15 TO MH5-14	66.43	60	Cir	97.052	437.23	438.20	0.999	439.47	440.50	n/a	440.50	14	Manhole
16	MH5-16 TO MH5-15	65.52	60	Cir	74.996	442.25	443.00	1.000	443.89	445.28	0.13	445.28	15	Manhole
17	MH5-17 TO MH5-16	65.68	60	Cir	60.019	448.00	448.60	1.000	449.64	450.88	n/a	450.88	16	Manhole
18	MH5-18 TO MH5-17	66.31	60	Cir	230.753	453.60	455.91	1.001	455.25	458.20	0.87	458.20	17	Manhole
19	MH5-19 TO MH5-18	66.44	60	Cir	199.226	456.01	458.00	0.999	458.20	460.30	n/a	460.30	18	Manhole
20	MH5-20 TO MH5-19	65.69	60	Cir	135.000	458.10	459.45	1.000	460.30	461.73	n/a	461.73	19	Manhole
21	MH5-21 TO MH5-20	41.81	60	Cir	152.928	459.55	461.08	1.000	461.73	462.88	n/a	462.88 j	20	Manhole
22	MH5-22 TO MH5-21	40.45	54	Cir	128.398	461.18	462.46	0.997	462.88	464.29	0.69	464.29	21	Manhole
23	MH5-23 TO MH5-22	33.15	54	Cir	138.853	462.56	463.95	1.001	464.29	465.60	n/a	465.60 j	22	Manhole
24	MH5-24 TO MH5-23	33.31	54	Cir	56.993	464.05	464.62	1.000	465.60	466.27	0.61	466.27	23	Manhole

Project File: STRM-NTWK-05-50-YR.stm | Number of lines: 152 | Run Date: 2/22/2023

NOTES: Return period = 50 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
25	MH5-25 TO MH5-24	8.48	54	Cir	103.591	464.72	465.76	1.004	466.27	466.58	n/a	466.58 j	24	Manhole
26	MH5-26 TO MH5-25	8.71	54	Cir	279.546	465.86	468.66	1.002	466.58	469.49	0.09	469.49	25	Manhole
27	MH5-27 TO MH5-26	8.77	54	Cir	69.589	468.76	469.46	1.006	469.49	470.29	0.29	470.29	26	Manhole
28	CB5-59 TO MH5-27	6.83	18	Cir	102.551	486.67	489.75	3.003	487.28	490.76	n/a	490.76	27	Combination
29	CB5-61 TO CB5-59	6.13	18	Cir	111.289	489.93	495.49	4.996	490.76	496.45	n/a	496.45	28	Combination
30	MH5-38 TO CB5-61	5.47	18	Cir	108.480	495.81	497.98	2.000	496.45	498.88	0.24	498.88	29	Manhole
31	CB5-63 TO MH5-38	5.47	18	Cir	6.682	498.08	498.21	1.946	498.88	499.11	0.49	499.11	30	Combination
32	CB5-65 TO CB5-63	4.43	18	Cir	145.419	498.31	499.76	0.997	499.11	500.57	0.49	500.57	31	Combination
33	CB5-66 TO CB5-65	3.02	18	Cir	39.874	499.86	500.26	1.003	500.57	500.92	n/a	500.92 j	32	Combination
34	CB5-67 TO CB5-66	2.72	18	Cir	94.795	500.36	500.84	0.506	500.96	501.47	0.35	501.47	33	Combination
35	CB5-68 TO CB5-67	2.53	18	Cir	40.000	500.94	501.14	0.500	501.52	501.74	n/a	501.74	34	Combination
36	CB5-69 TO CB5-68	2.21	18	Cir	210.926	503.14	504.19	0.498	503.68	504.75	0.31	504.75	35	Combination
37	CB5-70 TO CB5-69	0.83	18	Cir	41.272	504.29	504.50	0.509	504.75	504.84	n/a	504.84 j	36	Combination
38	CB5-64 TO CB5-63	0.68	18	Cir	30.002	501.85	502.00	0.500	502.14	502.31	n/a	502.31	31	Combination
39	CB5-62 TO CB5-61	0.45	18	Cir	30.000	495.85	496.00	0.500	496.45	496.25	0.09	496.25	29	Combination
40	CB5-60 TO CB5-59	0.52	18	Cir	30.000	489.85	490.00	0.500	490.76	490.27	n/a	490.27	28	Combination
41	CB5-52 TO MH5-24	7.10	18	Cir	22.434	474.12	474.57	2.006	474.82	475.60	n/a	475.60	24	Combination
42	CB5-53 TO CB5-52	6.77	18	Cir	96.516	474.67	476.60	2.000	475.60	477.61	n/a	477.61	41	Combination
43	CB5-55 TO CB5-53	3.35	18	Cir	169.115	476.78	480.59	2.253	477.61	481.29	n/a	481.29 j	42	Combination
44	CB5-56 TO CB5-55	2.80	18	Cir	30.000	480.69	481.29	2.000	481.29	481.92	0.36	481.92	43	Combination
45	CB5-57 TO CB5-56	1.43	18	Cir	129.245	481.39	484.94	2.747	481.92	485.39	n/a	485.39 j	44	Combination
46	CB5-58 TO CB5-57	0.56	18	Cir	30.000	485.04	485.34	1.000	485.39	485.62	n/a	485.62 j	45	Combination
47	MH5-29 TO MH5-27	1.00	42	Cir	20.949	482.79	483.00	1.002	483.03	483.30	n/a	483.30	27	Manhole
48	CB5-54 TO CB5-53	2.97	18	Cir	30.000	476.70	477.00	1.000	477.61	477.65	n/a	477.65 j	42	Combination

Project File: STRM-NTWK-05-50-YR.stm | Number of lines: 152 | Run Date: 2/22/2023

NOTES: Return period = 50 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
49	CB5-51 TO MH5-24	22.82	24	Cir	10.000	474.90	475.00	1.000	476.43	476.70	n/a	476.70	24	Combination
50	CB5-50 TO MH5-22	8.79	18	Cir	8.551	472.41	472.50	1.052	473.38	473.65	0.57	473.65	22	Combination
51	CB5-49 TO MH5-22	0.82	18	Cir	23.300	472.27	472.50	0.987	472.54	472.84	n/a	472.84	22	Combination
52	CB5-41 TO MH5-18	0.86	18	Cir	33.617	471.03	471.20	0.506	471.36	471.55	0.18	471.55	18	Combination
53	CB5-42 TO CB5-41	0.48	18	Cir	40.000	471.30	471.50	0.500	471.55	471.76	0.09	471.76	52	Combination
54	MH5-28 TO MH5-27	1.00	48	Cir	44.054	469.56	470.00	0.999	470.29	470.29	n/a	470.29 j	27	Manhole
55	CB5-48 TO MH5-21	0.43	18	Cir	20.000	470.30	470.50	1.000	470.50	470.74	n/a	470.74	21	Combination
56	CB5-43 TO MH5-19	1.00	18	Cir	11.944	470.13	470.25	1.005	470.43	470.62	0.13	470.62	19	Combination
57	CB5-44 TO MH5-19	0.86	18	Cir	21.944	470.03	470.25	1.003	470.31	470.60	0.12	470.60	19	Combination
58	CB5-46 TO MH5-20	29.81	36	Cir	20.000	466.10	466.50	2.000	467.21	468.27	n/a	468.27	20	Combination
59	HW5-5 TO CB5-46	29.12	36	Cir	10.000	468.00	468.50	5.000	468.86	470.25	n/a	470.25	58	OpenHeadwall
60	CB5-45 TO MH5-20	1.27	18	Cir	10.000	468.40	468.50	1.000	468.74	468.92	0.15	468.92	20	Combination
61	CB5-47 TO MH5-21	1.52	36	Cir	10.000	465.65	465.75	1.000	465.95	466.13	0.07	466.13	21	Combination
62	MH5-30 TO CB5-47	1.00	36	Cir	15.000	465.85	466.00	1.000	466.13	466.31	n/a	466.31	61	Manhole
63	MH5-9 TO MH5-34	44.15	42	Cir	52.136	444.31	444.83	0.997	445.86	446.90	n/a	446.90	9	Manhole
64	MH5-53 TO MH5-34	34.61	36	Cir	53.514	445.00	445.80	1.495	446.90	447.71	0.83	447.71	63	Manhole
65	MH5-35 TO MH5-53	28.56	36	Cir	91.065	446.63	448.00	1.500	447.81	449.73	0.70	449.73	64	Manhole
66	MH5-36 TO MH5-35	27.58	36	Cir	186.792	448.87	450.74	1.001	450.16	452.44	n/a	452.44	65	Manhole
67	MH5-37 TO MH5-36	27.59	36	Cir	70.000	450.84	451.54	1.000	452.44	453.24	n/a	453.24	66	Manhole
68	MH5-39 TO MH5-37	6.49	36	Cir	170.066	454.37	457.77	1.999	454.88	458.57	0.29	458.57	67	Manhole
69	MH5-40 TO MH5-39	5.26	36	Cir	174.174	457.97	461.45	1.998	458.57	462.17	n/a	462.17	68	Manhole
70	OCS5-7 TO MH5-40	4.26	18	Cir	67.311	465.83	466.50	0.995	466.47	467.29	0.32	467.29	69	Grate
71	MH5-41 TO MH5-40	1.00	36	Cir	45.000	461.55	462.00	1.000	462.17	462.31	n/a	462.31 j	69	Manhole
72	CB5-15 TO MH5-39	1.23	18	Cir	15.000	460.10	460.25	1.000	460.43	460.66	n/a	460.66	68	Combination

Project File: STRM-NTWK-05-50-YR.stm | Number of lines: 152 | Run Date: 2/22/2023

NOTES: Return period = 50 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
73	MH5-35 TO OCS5-1	1.00	18	Cir	38.184	456.62	457.00	0.995	456.92	457.37	0.13	457.37	65	None
74	MH5-42 TO MH5-37	21.13	30	Cir	92.998	451.64	452.10	0.500	453.24	453.66	n/a	453.66 j	67	Manhole
75	MH5-43 TO MH5-42	6.88	18	Cir	40.157	452.74	453.14	1.000	453.66	454.16	n/a	454.16	74	Manhole
76	OCS5-6 TO MH5-43	1.18	18	Cir	20.057	453.90	454.00	0.499	454.29	454.41	n/a	454.41	75	Grate
77	OCS5-2 TO MH5-43	5.70	18	Cir	18.349	453.32	453.50	0.981	454.16	454.42	0.39	454.42	75	Manhole
78	CB5-94 TO MH5-15	1.66	18	Cir	20.166	453.30	453.50	0.992	453.69	453.98	0.18	453.98	15	Grate
79	CB5-71 TO MH5-53	6.23	24	Cir	133.392	447.88	448.55	0.502	448.71	449.43	0.76	449.43	64	Grate
80	CD5-3 TO CB5-71 6	0.37	8	Cir	59.990	450.94	452.29	2.250	451.14	452.57	n/a	452.57	79	None
81	CD5-3 TO CB5-71 5	0.22	8	Cir	26.867	452.29	452.42	0.484	452.57	452.64	0.06	452.70	80	None
82	CD5-3 TO CB5-71 4	0.22	8	Cir	11.071	452.42	452.48	0.542	452.70	452.70	0.05	452.76	81	None
83	CD5-3 TO CB5-71 3	0.23	8	Cir	34.788	452.48	452.65	0.489	452.76	452.87	0.06	452.93	82	None
84	CD5-3 TO CB5-71 2	0.08	8	Cir	80.821	452.65	453.06	0.507	452.93	453.19	0.03	453.19	83	None
85	CD5-3 TO CB5-71 1	0.08	8	Cir	4.773	453.06	453.08	0.419	453.20	453.22	0.04	453.25	84	None
86	OCS5-1 TO MH5-42	14.25	24	Cir	26.226	452.24	452.50	0.991	453.66	453.86	n/a	453.86 j	74	Manhole
87	CD5-2 2	0.16	8	Cir	5.657	452.65	452.71	1.061	452.93	452.89	n/a	452.89	83	None
88	CD5-2 1	0.16	8	Cir	5.300	452.71	452.76	0.944	452.89	452.94	n/a	452.94	87	None
89	CD5-1	0.16	8	Cir	1.125	452.29	452.31	1.777	452.57	452.49	n/a	452.49	80	None
90	CB5-93 TO MH5-15	0.10	18	Cir	34.982	450.95	452.00	3.002	451.03	452.11	0.04	452.11	15	Grate
91	CB5-72 TO CB5-71	3.77	18	Cir	60.284	449.19	449.79	0.995	449.79	450.53	n/a	450.53	79	Grate
92	CB5-73 TO CB5-72	0.72	18	Cir	74.716	449.89	451.76	2.503	450.53	452.08	n/a	452.08 j	91	Combination
93	CB5-74 TO CB5-71	1.31	18	Cir	45.000	449.00	449.22	0.489	449.43	449.65	n/a	449.65	79	Combination
94	CB5-75 TO CB5-74	0.89	18	Cir	35.475	449.32	449.50	0.507	449.66	449.85	n/a	449.85	93	Combination
95	CB5-76 TO MH5-10	1.97	18	Cir	19.445	448.39	448.58	0.977	448.81	449.11	n/a	449.11	10	Combination
96	CB5-77 TO CB5-76	1.68	18	Cir	43.097	448.68	448.90	0.510	449.14	449.39	n/a	449.39	95	Combination

Project File: STRM-NTWK-05-50-YR.stm | Number of lines: 152 | Run Date: 2/22/2023

NOTES: Return period = 50 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
97	CB5-78 TO CB5-77	0.36	18	Cir	100.903	449.00	449.50	0.496	449.39	449.72	0.08	449.72	96	Combination
98	CB5-3 TO MH5-34	4.33	18	Cir	52.702	445.83	446.09	0.493	446.90	446.89	0.37	446.89	63	Combination
99	CB5-4 TO CB5-3	3.06	18	Cir	92.115	446.26	446.72	0.499	446.90	447.38	0.26	447.38	98	Combination
100	CB5-5 TO CB5-4	0.68	18	Cir	70.906	448.65	449.00	0.494	448.95	449.31	0.11	449.31	99	Combination
101	CB5-6 TO MH5-34	5.99	18	Cir	36.193	446.54	446.72	0.497	447.51	447.69	0.52	448.21	63	Combination
102	MH5-45 TO CB5-6	3.09	18	Cir	73.953	446.89	447.26	0.500	448.21	447.93	0.23	447.93	101	Manhole
103	CB5-7 TO MH5-45	3.17	18	Cir	149.233	447.43	448.18	0.503	448.08	448.86	n/a	448.86	102	Combination
104	OCS5-3 TO MH5-12	5.86	18	Cir	34.234	447.16	447.50	0.993	447.93	448.43	0.40	448.43	12	Manhole
105	CB5-1 TO MH5-8	3.24	18	Cir	104.025	445.29	447.37	2.000	445.75	448.06	n/a	448.06	8	Combination
106	CB5-20 TO MH5-11	3.17	18	Cir	16.837	445.16	445.50	2.019	445.61	446.18	n/a	446.18	11	Combination
107	CB5-2 TO MH5-8	3.35	18	Cir	247.954	445.02	447.50	1.000	445.58	448.20	n/a	448.20	8	Combination
108	MH5-46 TO MH5-11	11.81	36	Cir	188.089	433.45	434.39	0.500	436.13	435.48	n/a	435.48	11	Manhole
109	CB5-21 TO MH5-46	1.95	18	Cir	23.526	442.76	443.00	1.020	443.18	443.53	0.19	443.53	108	Combination
110	OCS5-4 TO MH5-12	7.52	24	Cir	23.855	441.26	441.50	1.006	442.02	442.47	0.38	442.47	12	Manhole
111	MH5-7 TO EX-CB	34.57	30	Cir	38.086	440.39	441.20	2.127	441.69	443.20	n/a	443.20	7	Grate
112	MH5-31 TO MH5-14	6.49	48	Cir	117.698	437.63	438.22	0.501	439.47	438.96	0.23	438.96	14	Manhole
113	MH5-32 TO MH5-31	6.49	48	Cir	72.596	438.32	438.68	0.496	438.98	439.42	0.04	439.42	112	Manhole
114	MH5-33 TO MH5-32	6.49	48	Cir	42.108	438.68	438.89	0.499	439.42	439.63	0.26	439.63	113	Manhole
115	CB5-22 TO MH5-46	10.04	30	Cir	95.823	434.89	435.37	0.501	435.86	436.43	0.25	436.43	108	Combination
116	MH5-51 TO CB5-22	9.74	30	Cir	119.492	435.47	436.07	0.502	436.43	437.11	0.39	437.11	115	Manhole
117	FES5-2 TO MH5-51	9.75	18	Cir	11.044	437.50	438.00	4.527	438.16	439.20	0.64	439.20	116	OpenHeadwall
118	CB5-18 TO FES5-5	2.84	18	Cir	14.051	469.00	469.07	0.498	469.62	469.71	0.18	469.71	End	Combination
119	CB5-19 TO CB5-18	1.79	14x23	Ell	43.701	469.07	469.29	0.503	469.95	469.80	0.09	469.80	118	Combination
120	CB5-33 TO MH5-58	2.02	18	Cir	161.016	451.37	456.20	3.000	451.69	456.74	n/a	456.74	End	Combination

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NOTES: Return period = 50 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
121	CB5-35 TO CB5-33	1.02	18	Cir	124.908	457.60	462.60	4.003	457.82	462.98	n/a	462.98	120	Combination
122	CB5-36 TO CB5-35	0.58	18	Cir	30.000	462.70	463.00	1.000	462.98	463.28	0.10	463.28	121	Combination
123	CB5-34 TO CB5-33	0.52	18	Cir	30.000	457.60	457.90	1.000	457.82	458.17	n/a	458.17	120	Combination
124	CB5-8 TO MH5-44	12.03	24	Cir	26.751	455.88	456.15	1.009	456.89	457.39	0.27	457.39	End	Combination
125	CB5-9 TO CB5-8	11.52	24	Cir	40.000	456.25	456.45	0.500	457.44	457.67	n/a	457.67	124	Combination
126	CB5-10 TO CB5-9	10.53	24	Cir	57.813	456.55	456.84	0.502	457.67	458.00	0.56	458.00	125	Combination
127	CB5-11 TO CB5-10	9.19	24	Cir	30.034	456.94	457.09	0.499	458.00	458.17	n/a	458.17	126	Combination
128	CB5-14 TO MH5-38	6.77	24	Cir	56.444	457.19	457.47	0.496	458.17	458.39	n/a	458.39 j	127	Combination
129	CB5-16 TO MH5-39	3.90	18	Cir	117.308	457.57	460.21	2.250	458.39	460.97	n/a	460.97 j	128	Combination
130	CB5-17 TO CB5-16	2.12	18	Cir	109.764	460.31	464.15	3.498	460.97	464.70	n/a	464.70 j	129	Combination
131	CB5-13 TO FES5-4	0.84	18	Cir	25.654	457.00	457.50	1.949	457.23	457.84	n/a	457.84	End	Combination
132	CB5-96 TO CB5-95	1.17	18	Cir	122.513	454.14	454.75	0.498	454.53	455.15	0.14	455.15	End	Grate
133	CB5-97 TO MH5-61	1.61	18	Cir	40.587	453.95	454.25	0.739	454.36	454.73	0.17	454.73	End	Grate
134	CB5-37 TO MH5-60	1.57	18	Cir	88.639	448.07	448.96	1.004	448.45	449.43	0.18	449.43	End	Combination
135	CB5-38 TO CB5-37	0.75	18	Cir	30.003	452.85	453.00	0.500	453.16	453.32	0.11	453.32	134	Combination
136	CB5-80 TO FES5-1	0.69	18	Cir	25.905	451.90	452.68	3.011	452.09	452.99	n/a	452.99	End	Combination
137	MH5-57 TO MH5-56	4.51	24	Cir	64.000	448.19	448.51	0.500	448.89	449.26	n/a	449.26	End	Manhole
138	RD5-3 TO MH5-57	1.27	18	Cir	35.482	450.32	450.50	0.507	450.72	450.92	0.15	450.92	137	None
139	CB5-81 TO MH5-57	3.26	18	Cir	40.000	448.61	448.81	0.500	449.28	449.50	0.13	449.50	137	Combination
140	OCS5-5 TO CB5-81	1.61	18	Cir	8.931	448.91	449.00	1.008	449.50	449.48	n/a	449.48 j	139	Grate
141	RD5-1 TO MH5-55	1.30	18	Cir	32.000	450.18	450.50	1.000	450.52	450.93	n/a	450.93	End	None
142	RD5-2 TO MH5-56	1.19	18	Cir	37.355	450.13	450.50	0.990	450.46	450.91	n/a	450.91	End	None
143	MH5-63 TO MH5-62	2.08	18	Cir	27.000	445.77	445.90	0.482	446.30	446.44	n/a	446.44	End	Manhole
144	CB5-82 TO MH5-63	2.10	18	Cir	40.907	446.00	446.20	0.489	446.53	446.75	n/a	446.75	143	Combination

Project File: STRM-NTWK-05-50-YR.stm | Number of lines: 152 | Run Date: 2/22/2023

NOTES: Return period = 50 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
145	CB5-83 TO CB5-82	1.59	18	Cir	54.035	449.48	449.75	0.500	449.93	450.22	0.17	450.22	144	Combination
146	CB5-87 TO CB5-86	5.82	18	Cir	7.500	446.06	446.21	2.000	446.68	447.14	n/a	447.14	End	Combination
147	CB5-88 TO CB5-87	4.27	18	Cir	66.843	446.31	446.64	0.494	447.14	447.43	n/a	447.43 j	146	Combination
148	CB5-89 TO CB5-88	3.19	18	Cir	115.500	446.74	447.32	0.502	447.43	448.00	n/a	448.00	147	Combination
149	CB5-79 TO CB5-89	1.08	18	Cir	64.630	448.25	449.54	1.996	448.51	449.93	0.14	449.93	148	Combination
150	CB5-90 TO CB5-89	0.87	18	Cir	115.523	447.42	448.00	0.502	448.00	448.35	n/a	448.35 j	148	Combination
151	RD5-4 TO MH5-59	1.67	18	Cir	60.500	447.90	448.50	0.992	448.29	448.98	n/a	448.98	End	None
152	CB5-92 TO CB5-91	3.24	18	Cir	36.371	447.11	447.48	1.017	447.66	448.17	n/a	448.17	End	Combination

Project File: STRM-NTWK-05-50-YR.stm | Number of lines: 152 | Run Date: 2/22/2023

NOTES: Return period = 50 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	20.440	0.00	37.13	0.00	0.00	27.01	0.0	23.7	4.6	175.4	649.9	8.13	72	2.01	398.80	399.21	404.41	402.82	407.80	417.34	HW5-1 TO MH5-1
2	1	30.000	0.00	37.13	0.00	0.00	27.01	0.0	23.7	4.6	175.5	649.0	14.68	72	2.00	404.71	405.31	406.84	408.92	417.34	448.00	MH5-1 TO MH5-2
3	2	53.039	0.00	37.13	0.00	0.00	27.01	0.0	23.6	4.6	175.7	648.7	14.69	72	2.00	410.81	411.87	412.94	415.48	448.00	448.50	MH5-2 TO MH5-3
4	3	260.000	0.00	37.13	0.00	0.00	27.01	0.0	23.3	4.7	176.6	459.8	12.55	72	1.00	416.87	419.48	419.45	423.10	448.50	450.90	MH5-3 TO MH5-4
5	4	96.972	5.17	37.13	0.79	4.08	27.01	10.0	23.1	4.7	177.1	458.9	10.09	72	1.00	419.58	420.55	423.10	424.18	450.90	452.33	MH5-4 TO MH5-5
6	5	216.121	0.00	31.96	0.00	0.00	22.93	0.0	22.7	4.7	158.8	458.7	9.36	72	1.00	420.65	422.81	424.18	426.24	452.33	454.60	MH5-5 TO MH5-6
7	6	238.559	0.00	31.96	0.00	0.00	22.93	0.0	22.3	4.8	159.9	459.3	9.74	72	1.00	422.91	425.30	426.24	428.74	454.60	458.31	MH5-6 TO MH5-7
8	7	204.104	0.00	25.61	0.00	0.00	17.85	6.0	21.9	4.8	136.3	458.8	8.73	72	1.00	425.40	427.44	428.74	430.60	458.31	454.71	MH5-7 TO MH5-8
9	8	108.405	0.00	24.73	0.00	0.00	17.02	0.0	21.7	4.8	132.8	458.0	9.05	72	1.00	427.54	428.62	430.60	431.74	454.71	455.41	MH5-8 TO MH5-9
10	9	299.601	0.00	22.07	0.00	0.00	14.68	0.0	21.1	4.9	95.09	364.1	7.68	66	1.00	428.72	431.72	431.74	434.41	455.41	452.61	MH5-10 TO MH5-
11	10	162.986	0.00	21.80	0.00	0.00	14.42	0.0	20.7	5.0	94.36	363.9	8.40	66	1.00	431.82	433.45	434.41	436.13	452.61	450.86	MH5-10 TO MH5-
12	11	203.182	0.00	19.45	0.00	0.00	12.50	0.0	20.3	5.0	85.51	363.7	7.89	66	1.00	433.55	435.58	436.13	438.12	450.86	453.95	MH5-11 TO MH5-
13	12	77.359	0.00	19.45	0.00	0.00	12.50	0.0	20.1	5.0	72.40	365.3	7.32	66	1.01	435.68	436.46	438.12	438.79	453.95	454.72	MH5-12 TO MH5-
14	13	56.863	0.00	19.45	0.00	0.00	12.50	0.0	20.0	5.0	72.59	364.3	7.79	66	1.00	436.56	437.13	438.79	439.47	454.72	455.99	MH5-14 TO MH5-
15	14	97.052	0.00	19.45	0.00	0.00	12.50	0.0	19.8	5.1	66.43	282.1	7.68	60	1.00	437.23	438.20	439.47	440.50	455.99	458.24	MH5-15 TO MH5-
16	15	74.996	0.00	19.09	0.00	0.00	12.28	0.0	19.7	5.1	65.52	282.2	9.61	60	1.00	442.25	443.00	443.89	445.28	458.24	464.15	MH5-16 TO MH5-
17	16	60.019	0.00	19.09	0.00	0.00	12.28	0.0	19.6	5.1	65.68	282.1	9.61	60	1.00	448.00	448.60	449.64	450.88	464.15	466.02	MH5-17 TO MH5-
18	17	230.753	0.00	19.09	0.00	0.00	12.28	0.0	19.2	5.2	66.31	282.3	9.64	60	1.00	453.60	455.91	455.25	458.20	466.02	474.92	MH5-18 TO MH5-
19	18	199.226	0.00	18.95	0.00	0.00	12.17	0.0	18.7	5.2	66.44	282.0	7.78	60	1.00	456.01	458.00	458.20	460.30	474.92	474.35	MH5-19 TO MH5-
20	19	135.000	0.00	18.65	0.00	0.00	11.94	0.0	18.4	5.3	65.69	282.2	7.72	60	1.00	458.10	459.45	460.30	461.73	474.35	472.74	MH5-20 TO MH5-
21	20	152.928	0.00	9.10	0.00	0.00	6.11	0.0	12.0	6.4	41.81	282.2	5.81	60	1.00	459.55	461.08	461.73	462.88	472.74	474.62	MH5-21 TO MH5-
22	21	128.398	0.00	8.97	0.00	0.00	5.99	0.0	11.7	6.4	40.45	212.7	7.00	54	1.00	461.18	462.46	462.88	464.29	474.62	476.48	MH5-22 TO MH5-

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NOTES:Intensity = 65.86 / (Inlet time + 10.50) ^ 0.75; Return period =Yrs. 50 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
23	22	138.853	0.00	7.09	0.00	0.00	4.79	0.0	11.3	6.5	33.15	213.2	6.08	54	1.00	462.56	463.95	464.29	465.60	476.48	478.46	MH5-23 TO MH5-
24	23	56.993	0.00	7.09	0.00	0.00	4.79	0.0	11.1	6.5	33.31	213.1	6.57	54	1.00	464.05	464.62	465.60	466.27	478.46	479.43	MH5-24 TO MH5-
25	24	103.591	0.00	1.11	0.00	0.00	0.97	0.0	10.6	6.7	8.48	213.5	3.01	54	1.00	464.72	465.76	466.27	466.58	479.43	480.95	MH5-25 TO MH5-
26	25	279.546	0.00	1.11	0.00	0.00	0.97	0.0	9.6	6.9	8.71	213.2	4.81	54	1.00	465.86	468.66	466.58	469.49	480.95	488.70	MH5-26 TO MH5-
27	26	69.589	0.00	1.11	0.00	0.00	0.97	0.0	9.4	7.0	8.77	213.7	4.78	54	1.01	468.76	469.46	469.49	470.29	488.70	490.69	MH5-27 TO MH5-
28	27	102.551	0.05	1.11	0.91	0.05	0.97	6.0	9.1	7.0	6.83	19.72	7.76	18	3.00	486.67	489.75	487.28	490.76	490.69	493.77	CB5-59 TO MH5-
29	28	111.289	0.05	0.99	0.91	0.05	0.86	6.0	8.8	7.1	6.13	25.43	5.63	18	5.00	489.93	495.49	490.76	496.45	493.77	499.49	CB5-61 TO CB5-5
30	29	108.480	0.00	0.88	0.00	0.00	0.76	0.0	8.5	7.2	5.47	16.09	6.30	18	2.00	495.81	497.98	496.45	498.88	499.49	506.05	MH5-38 TO CB5-
31	30	6.682	0.08	0.88	0.92	0.07	0.76	6.0	8.5	7.2	5.47	15.87	5.32	18	1.95	498.08	498.21	498.88	499.11	506.05	505.74	CB5-63 TO MH5-
32	31	145.419	0.23	0.71	0.84	0.19	0.60	6.0	8.0	7.4	4.43	11.36	4.59	18	1.00	498.31	499.76	499.11	500.57	505.74	508.61	CB5-65 TO CB5-6
33	32	39.874	0.05	0.48	0.93	0.05	0.41	6.0	7.8	7.4	3.02	11.39	3.86	18	1.00	499.86	500.26	500.57	500.92	508.61	508.61	CB5-66 TO CB5-6
34	33	94.795	0.03	0.43	0.94	0.03	0.36	6.0	7.4	7.5	2.72	8.10	4.02	18	0.51	500.36	500.84	500.96	501.47	508.61	510.01	CB5-67 TO CB5-6
35	34	40.000	0.07	0.40	0.77	0.05	0.33	6.0	7.2	7.6	2.53	8.04	3.92	18	0.50	500.94	501.14	501.52	501.74	510.01	510.01	CB5-68 TO CB5-6
36	35	210.926	0.22	0.33	0.80	0.18	0.28	6.0	6.3	7.9	2.21	8.03	3.77	18	0.50	503.14	504.19	503.68	504.75	510.01	508.12	CB5-69 TO CB5-6
37	36	41.272	0.11	0.11	0.94	0.10	0.10	6.0	6.0	8.0	0.83	8.11	2.28	18	0.51	504.29	504.50	504.75	504.84	508.12	507.86	CB5-70 TO CB5-6
38	31	30.002	0.09	0.09	0.94	0.08	0.08	6.0	6.0	8.0	0.68	8.04	2.70	18	0.50	501.85	502.00	502.14	502.31	505.74	505.71	CB5-64 TO CB5-6
39	29	30.000	0.06	0.06	0.93	0.06	0.06	6.0	6.0	8.0	0.45	8.04	1.52	18	0.50	495.85	496.00	496.45	496.25	499.49	499.49	CB5-62 TO CB5-6
40	28	30.000	0.07	0.07	0.93	0.07	0.07	6.0	6.0	8.0	0.52	8.04	1.46	18	0.50	489.85	490.00	490.76	490.27	493.77	493.81	CB5-60 TO CB5-5
41	24	22.434	0.06	1.31	0.93	0.06	0.97	6.0	8.1	7.3	7.10	16.11	7.15	18	2.01	474.12	474.57	474.82	475.60	479.43	479.38	CB5-52 TO MH5-
42	41	96.516	0.12	1.25	0.88	0.11	0.92	6.0	7.9	7.4	6.77	16.09	5.62	18	2.00	474.67	476.60	475.60	477.61	479.38	480.87	CB5-53 TO CB5-5
43	42	169.115	0.08	0.56	0.93	0.07	0.44	6.0	7.1	7.6	3.35	17.08	3.76	18	2.25	476.78	480.59	477.61	481.29	480.87	485.36	CB5-55 TO CB5-5
44	43	30.000	0.27	0.48	0.68	0.18	0.36	6.0	7.0	7.7	2.80	16.09	4.10	18	2.00	480.69	481.29	481.29	481.92	485.36	485.36	CB5-56 TO CB5-5

Project File: STRM-NTWK-05-50-YR.stm | Number of lines: 152 | Run Date: 2/22/2023

NOTES:Intensity = 65.86 / (Inlet time + 10.50) ^ 0.75; Return period =Yrs. 50 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
45	44	129.245	0.12	0.21	0.93	0.11	0.18	6.0	6.2	7.9	1.43	18.85	2.88	18	2.75	481.39	484.94	481.92	485.39	485.36	489.32	CB5-57 TO CB5-5
46	45	30.000	0.09	0.09	0.77	0.07	0.07	6.0	6.0	8.0	0.56	11.38	2.13	18	1.00	485.04	485.34	485.39	485.62	489.32	489.34	CB5-58 TO CB5-5
47	27	20.949	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	1.00	109.1	3.04	42	1.00	482.79	483.00	483.03	483.30	490.69	492.44	MH5-29 TO MH5-
48	42	30.000	0.57	0.57	0.65	0.37	0.37	6.0	6.0	8.0	2.97	11.38	3.33	18	1.00	476.70	477.00	477.61	477.65	480.87	480.88	CB5-54 TO CB5-5
49	24	10.000	4.67	4.67	0.61	2.85	2.85	6.0	6.0	8.0	22.82	24.50	8.44	24	1.00	474.90	475.00	476.43	476.70	479.43	479.23	CB5-51 TO MH5-
50	22	8.551	1.77	1.77	0.62	1.10	1.10	6.0	6.0	8.0	8.79	11.67	6.66	18	1.05	472.41	472.50	473.38	473.65	476.48	476.43	CB5-50 TO MH5-
51	22	23.300	0.11	0.11	0.93	0.10	0.10	6.0	6.0	8.0	0.82	11.30	3.24	18	0.99	472.27	472.50	472.54	472.84	476.48	476.41	CB5-49 TO MH5-
52	18	33.617	0.06	0.14	0.82	0.05	0.11	6.0	6.3	7.9	0.86	8.09	2.89	18	0.51	471.03	471.20	471.36	471.55	474.92	475.10	CB5-41 TO MH5-
53	52	40.000	0.08	0.08	0.75	0.06	0.06	6.0	6.0	8.0	0.48	8.04	2.45	18	0.50	471.30	471.50	471.55	471.76	475.10	475.10	CB5-42 TO CB5-4
54	27	44.054	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	1.00	155.5	1.57	48	1.00	469.56	470.00	470.29	470.29	490.69	490.01	MH5-28 TO MH5-
55	21	20.000	0.06	0.06	0.90	0.05	0.05	6.0	6.0	8.0	0.43	11.38	2.71	18	1.00	470.30	470.50	470.50	470.74	474.62	474.42	CB5-48 TO MH5-
56	19	11.944	0.16	0.16	0.78	0.12	0.12	6.0	6.0	8.0	1.00	11.40	3.44	18	1.00	470.13	470.25	470.43	470.62	474.35	474.11	CB5-43 TO MH5-
57	19	21.944	0.14	0.14	0.77	0.11	0.11	6.0	6.0	8.0	0.86	11.39	3.30	18	1.00	470.03	470.25	470.31	470.60	474.35	474.11	CB5-44 TO MH5-
58	20	20.000	0.15	9.38	0.89	0.13	5.67	6.0	18.4	5.3	29.81	102.2	9.71	36	2.00	466.10	466.50	467.21	468.27	472.74	472.54	CB5-46 TO MH5-
59	58	10.000	9.23	9.23	0.60	5.54	5.54	18.4	18.4	5.3	29.12	161.6	12.07	36	5.00	468.00	468.50	468.86	470.25	472.54	473.00	HW5-5 TO CB5-4
60	20	10.000	0.17	0.17	0.93	0.16	0.16	6.0	6.0	8.0	1.27	11.38	3.68	18	1.00	468.40	468.50	468.74	468.92	472.74	472.54	CB5-45 TO MH5-
61	21	10.000	0.07	0.07	0.93	0.07	0.07	6.0	6.0	8.0	1.52	72.25	3.51	36	1.00	465.65	465.75	465.95	466.13	474.62	474.42	CB5-47 TO MH5-
62	61	15.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	1.00	72.25	2.79	36	1.00	465.85	466.00	466.13	466.31	474.42	475.88	MH5-30 TO CB5-
63	9	52.136	0.00	2.66	0.00	0.00	2.35	0.0	8.7	7.1	44.15	108.8	9.09	42	1.00	444.31	444.83	445.86	446.90	455.41	456.09	MH5-9 TO MH5-3
64	63	53.514	0.00	1.16	0.00	0.00	1.01	0.0	8.6	7.2	34.61	88.34	7.31	36	1.49	445.00	445.80	446.90	447.71	456.09	457.38	MH5-53 TO MH5-
65	64	91.065	0.00	0.16	0.00	0.00	0.15	6.0	7.1	7.6	28.56	88.49	8.96	36	1.50	446.63	448.00	447.81	449.73	457.38	460.34	MH5-35 TO MH5-
66	65	186.792	0.00	0.16	0.00	0.00	0.15	0.0	6.7	7.8	27.58	72.29	8.11	36	1.00	448.87	450.74	450.16	452.44	460.34	461.74	MH5-36 TO MH5-

Project File: STRM-NTWK-05-50-YR.stm | Number of lines: 152 | Run Date: 2/22/2023

NOTES:Intensity = 65.86 / (Inlet time + 10.50) ^ 0.75; Return period =Yrs. 50 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
67	66	70.000	0.00	0.16	0.00	0.00	0.15	0.0	6.5	7.8	27.59	72.25	6.95	36	1.00	450.84	451.54	452.44	453.24	461.74	462.71	MH5-37 TO MH5-
68	67	170.066	0.00	0.16	0.00	0.00	0.15	0.0	6.1	8.0	6.49	102.2	6.18	36	2.00	454.37	457.77	454.88	458.57	462.71	464.34	MH5-39 TO MH5-
69	68	174.174	0.00	0.00	0.00	0.00	0.00	0.0	0.4	0.0	5.26	102.1	4.64	36	2.00	457.97	461.45	458.57	462.17	464.34	470.85	MH5-40 TO MH5-
70	69	67.311	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	4.26	11.35	5.24	18	1.00	465.83	466.50	466.47	467.29	470.85	471.00	OCS5-7 TO MH5-
71	69	45.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	1.00	72.25	1.78	36	1.00	461.55	462.00	462.17	462.31	470.85	472.40	MH5-41 TO MH5-
72	68	15.000	0.16	0.16	0.96	0.15	0.15	6.0	6.0	8.0	1.23	11.38	3.65	18	1.00	460.10	460.25	460.43	460.66	464.34	464.04	CB5-15 TO MH5-
73	65	38.184	0.00	0.00	0.00	0.00	0.00	6.0	6.0	0.0	1.00	11.35	3.44	18	1.00	456.62	457.00	456.92	457.37	460.34	0.00	MH5-35 TO OCS5
74	67	92.998	0.00	0.00	0.00	0.00	0.00	6.0	6.1	0.0	21.13	31.42	6.46	30	0.50	451.64	452.10	453.24	453.66	462.71	459.43	MH5-42 TO MH5-
75	74	40.157	0.00	0.00	0.00	0.00	0.00	6.0	6.0	0.0	6.88	11.38	5.74	18	1.00	452.74	453.14	453.66	454.16	459.43	459.48	MH5-43 TO MH5-
76	75	20.057	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	1.18	8.03	3.15	18	0.50	453.90	454.00	454.29	454.41	459.48	458.00	OCS5-6 TO MH5-
77	75	18.349	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	5.70	11.27	5.32	18	0.98	453.32	453.50	454.16	454.42	459.48	459.06	OCS5-2 TO MH5-
78	15	20.166	0.34	0.34	0.61	0.21	0.21	6.0	6.0	8.0	1.66	11.33	3.97	18	0.99	453.30	453.50	453.69	453.98	458.24	457.88	CB5-94 TO MH5-
79	64	133.392	0.17	1.00	0.90	0.15	0.85	6.0	8.2	7.3	6.23	17.37	4.86	24	0.50	447.88	448.55	448.71	449.43	457.38	453.62	CB5-71 TO MH5-
80	79	59.990	0.00	0.05	0.00	0.00	0.05	0.0	7.9	7.4	0.37	1.96	3.46	8	2.25	450.94	452.29	451.14	452.57	453.62	455.08	CD5-3 TO CB5-71
81	80	26.867	0.00	0.03	0.00	0.00	0.03	0.0	7.6	7.5	0.22	0.91	1.91	8	0.48	452.29	452.42	452.57	452.64	455.08	455.00	CD5-3 TO CB5-71
82	81	11.071	0.00	0.03	0.00	0.00	0.03	0.0	7.5	7.5	0.22	0.96	1.89	8	0.54	452.42	452.48	452.70	452.70	455.00	455.00	CD5-3 TO CB5-71
83	82	34.788	0.00	0.03	0.00	0.00	0.03	0.0	7.2	7.6	0.23	0.91	1.94	8	0.49	452.48	452.65	452.76	452.87	455.00	455.08	CD5-3 TO CB5-71
84	83	80.821	0.00	0.01	0.00	0.00	0.01	0.0	6.1	8.0	0.08	0.93	1.13	8	0.51	452.65	453.06	452.93	453.19	455.08	455.08	CD5-3 TO CB5-71
85	84	4.773	0.01	0.01	0.99	0.01	0.01	6.0	6.0	8.0	0.08	0.85	1.52	8	0.42	453.06	453.08	453.20	453.22	455.08	455.10	CD5-3 TO CB5-71
86	74	26.226	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	14.25	24.40	6.12	24	0.99	452.24	452.50	453.66	453.86	459.43	458.84	OCS5-1 TO MH5-
87	83	5.657	0.00	0.02	0.00	0.00	0.02	0.0	6.0	8.0	0.16	1.35	1.60	8	1.06	452.65	452.71	452.93	452.89	455.08	455.12	CD5-2 2
88	87	5.300	0.02	0.02	0.99	0.02	0.02	6.0	6.0	8.0	0.16	1.27	2.05	8	0.94	452.71	452.76	452.89	452.94	455.12	455.20	CD5-2 1

Project File: STRM-NTWK-05-50-YR.stm | Number of lines: 152 | Run Date: 2/22/2023

NOTES:Intensity = 65.86 / (Inlet time + 10.50) ^ 0.75; Return period =Yrs. 50 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
89	80	1.125	0.02	0.02	0.99	0.02	0.02	6.0	6.0	8.0	0.16	1.74	1.59	8	1.78	452.29	452.31	452.57	452.49	455.08	455.09	CD5-1
90	15	34.982	0.02	0.02	0.61	0.01	0.01	6.0	6.0	8.0	0.10	19.71	2.23	18	3.00	450.95	452.00	451.03	452.11	458.24	458.99	CB5-93 TO MH5-
91	79	60.284	0.46	0.58	0.86	0.40	0.49	6.0	6.7	7.8	3.77	11.35	5.05	18	1.00	449.19	449.79	449.79	450.53	453.62	453.40	CB5-72 TO CB5-7
92	91	74.716	0.12	0.12	0.75	0.09	0.09	6.0	6.0	8.0	0.72	18.00	1.83	18	2.50	449.89	451.76	450.53	452.08	453.40	455.24	CB5-73 TO CB5-7
93	79	45.000	0.06	0.20	0.91	0.05	0.17	6.0	6.2	7.9	1.31	7.95	3.13	18	0.49	449.00	449.22	449.43	449.65	453.62	453.60	CB5-74 TO CB5-7
94	93	35.475	0.14	0.14	0.79	0.11	0.11	6.0	6.0	8.0	0.89	8.10	2.92	18	0.51	449.32	449.50	449.66	449.85	453.60	453.16	CB5-75 TO CB5-7
95	10	19.445	0.04	0.27	0.98	0.04	0.26	6.0	7.2	7.6	1.97	11.24	4.16	18	0.98	448.39	448.58	448.81	449.11	452.61	453.66	CB5-76 TO MH5-
96	95	43.097	0.18	0.23	0.97	0.17	0.22	6.0	7.0	7.7	1.68	8.13	3.50	18	0.51	448.68	448.90	449.14	449.39	453.66	453.25	CB5-77 TO CB5-7
97	96	100.903	0.05	0.05	0.91	0.05	0.05	6.0	6.0	8.0	0.36	8.01	1.62	18	0.50	449.00	449.50	449.39	449.72	453.25	453.38	CB5-78 TO CB5-7
98	63	52.702	0.18	0.58	0.95	0.17	0.56	6.0	6.8	7.7	4.33	7.99	3.87	18	0.49	445.83	446.09	446.90	446.89	456.09	455.51	CB5-3 TO MH5-3
99	98	92.115	0.31	0.40	0.98	0.30	0.39	6.0	6.4	7.9	3.06	8.04	4.14	18	0.50	446.26	446.72	446.90	447.38	455.51	453.79	CB5-4 TO CB5-3
100	99	70.906	0.09	0.09	0.95	0.09	0.09	6.0	6.0	8.0	0.68	7.99	2.70	18	0.49	448.65	449.00	448.95	449.31	453.79	452.70	CB5-5 TO CB5-4
101	63	36.193	0.47	0.92	0.82	0.39	0.78	6.0	7.0	7.7	5.99	8.02	4.98	18	0.50	446.54	446.72	447.51	447.69	456.09	455.38	CB5-6 TO MH5-3
102	101	73.953	0.00	0.45	0.00	0.00	0.40	0.0	6.6	7.8	3.09	8.05	2.97	18	0.50	446.89	447.26	448.21	447.93	455.38	454.51	MH5-45 TO CB5-
103	102	149.233	0.45	0.45	0.88	0.40	0.40	6.0	6.0	8.0	3.17	8.06	4.19	18	0.50	447.43	448.18	448.08	448.86	454.51	451.68	CB5-7 TO MH5-4
104	12	34.234	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	5.86	11.34	5.77	18	0.99	447.16	447.50	447.93	448.43	453.95	453.95	OCS5-3 TO MH5-
105	8	104.025	0.44	0.44	0.92	0.40	0.40	6.0	6.0	8.0	3.24	16.09	5.62	18	2.00	445.29	447.37	445.75	448.06	454.71	453.80	CB5-1 TO MH5-8
106	11	16.837	0.46	0.46	0.86	0.40	0.40	6.0	6.0	8.0	3.17	16.17	5.59	18	2.02	445.16	445.50	445.61	446.18	450.86	449.17	CB5-20 TO MH5-
107	8	247.954	0.44	0.44	0.95	0.42	0.42	6.0	6.0	8.0	3.35	11.38	4.88	18	1.00	445.02	447.50	445.58	448.20	454.71	451.11	CB5-2 TO MH5-8
108	11	188.089	0.00	1.89	0.00	0.00	1.52	0.0	6.7	7.8	11.81	51.08	3.43	36	0.50	433.45	434.39	436.13	435.48	450.86	449.06	MH5-46 TO MH5-
109	108	23.526	0.29	0.29	0.84	0.24	0.24	6.0	6.0	8.0	1.95	11.49	4.19	18	1.02	442.76	443.00	443.18	443.53	449.06	446.95	CB5-21 TO MH5-
110	12	23.855	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	7.52	24.58	5.91	24	1.01	441.26	441.50	442.02	442.47	453.95	453.32	OCS5-4 TO MH5-

Project File: STRM-NTWK-05-50-YR.stm | Number of lines: 152 | Run Date: 2/22/2023

NOTES:Intensity = 65.86 / (Inlet time + 10.50) ^ 0.75; Return period =Yrs. 50 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
111	7	38.086	6.35	6.35	0.80	5.08	5.08	10.0	10.0	6.8	34.57	64.79	10.82	30	2.13	440.39	441.20	441.69	443.20	458.31	458.11	MH5-7 TO EX-CB
112	14	117.698	0.00	0.00	0.00	0.00	0.00	0.0	0.4	0.0	6.49	110.2	2.61	48	0.50	437.63	438.22	439.47	438.96	455.99	455.28	MH5-31 TO MH5-
113	112	72.596	0.00	0.00	0.00	0.00	0.00	0.0	0.2	0.0	6.49	109.6	4.42	48	0.50	438.32	438.68	438.98	439.42	455.28	458.06	MH5-32 TO MH5-
114	113	42.108	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	6.49	109.9	4.07	48	0.50	438.68	438.89	439.42	439.63	458.06	458.23	MH5-33 TO MH5-
115	108	95.823	0.06	1.60	0.99	0.06	1.28	6.0	6.4	7.9	10.04	31.44	5.39	30	0.50	434.89	435.37	435.86	436.43	449.06	452.24	CB5-22 TO MH5-
116	115	119.492	0.00	1.54	0.00	0.00	1.22	0.0	6.0	8.0	9.74	31.48	5.33	30	0.50	435.47	436.07	436.43	437.11	452.24	441.47	MH5-51 TO CB5-
117	116	11.044	1.54	1.54	0.79	1.22	1.22	6.0	6.0	8.0	9.75	24.21	9.68	18	4.53	437.50	438.00	438.16	439.20	441.47	441.00	FES5-2 TO MH5-
118	End	14.051	0.15	0.44	0.90	0.14	0.36	6.0	6.2	7.9	2.84	8.03	4.03	18	0.50	469.00	469.07	469.62	469.71	472.00	471.45	CB5-18 TO FES5-
119	118	43.701	0.29	0.29	0.77	0.22	0.22	6.0	6.0	8.0	1.79	7.84	2.93	14 x 23 e	0.50	469.07	469.29	469.95	469.80	471.45	471.52	CB5-19 TO CB5-1
120	End	161.016	0.07	0.28	0.94	0.07	0.26	6.0	6.6	7.8	2.02	19.70	5.37	18	3.00	451.37	456.20	451.69	456.74	455.35	461.79	CB5-33 TO MH5-
121	120	124.908	0.06	0.14	0.93	0.06	0.13	6.0	6.2	7.9	1.02	22.76	4.72	18	4.00	457.60	462.60	457.82	462.98	461.79	466.79	CB5-35 TO CB5-3
122	121	30.000	0.08	0.08	0.91	0.07	0.07	6.0	6.0	8.0	0.58	11.38	2.56	18	1.00	462.70	463.00	462.98	463.28	466.79	466.79	CB5-36 TO CB5-3
123	120	30.000	0.07	0.07	0.93	0.07	0.07	6.0	6.0	8.0	0.52	11.38	2.86	18	1.00	457.60	457.90	457.82	458.17	461.79	461.79	CB5-34 TO CB5-3
124	End	26.751	0.08	2.22	0.94	0.08	1.61	6.0	7.6	7.5	12.03	24.62	6.71	24	1.01	455.88	456.15	456.89	457.39	461.30	461.38	CB5-8 TO MH5-4
125	124	40.000	0.17	2.14	0.83	0.14	1.54	6.0	7.5	7.5	11.52	17.33	5.83	24	0.50	456.25	456.45	457.44	457.67	461.38	461.38	CB5-9 TO CB5-8
126	125	57.813	0.21	1.97	0.87	0.18	1.39	6.0	7.3	7.6	10.53	17.35	5.68	24	0.50	456.55	456.84	457.67	458.00	461.38	461.71	CB5-10 TO CB5-9
127	126	30.034	0.48	1.76	0.68	0.33	1.21	6.0	7.2	7.6	9.19	17.32	5.36	24	0.50	456.94	457.09	458.00	458.17	461.71	461.66	CB5-11 TO CB5-1
128	127	56.444	0.55	1.28	0.70	0.39	0.88	6.0	7.0	7.7	6.77	17.26	4.60	24	0.50	457.19	457.47	458.17	458.39	461.66	461.26	CB5-14 TO MH5-
129	128	117.308	0.34	0.73	0.69	0.23	0.50	6.0	6.6	7.8	3.90	17.07	4.16	18	2.25	457.57	460.21	458.39	460.97	461.26	464.04	CB5-16 TO MH5-
130	129	109.764	0.39	0.39	0.68	0.27	0.27	6.0	6.0	8.0	2.12	21.28	3.24	18	3.50	460.31	464.15	460.97	464.70	464.04	468.13	CB5-17 TO CB5-1
131	End	25.654	0.11	0.11	0.95	0.10	0.10	6.0	6.0	8.0	0.84	15.88	3.77	18	1.95	457.00	457.50	457.23	457.84	460.00	461.25	CB5-13 TO FES5-
132	End	122.513	0.24	0.24	0.61	0.15	0.15	6.0	6.0	8.0	1.17	8.03	3.13	18	0.50	454.14	454.75	454.53	455.15	457.83	458.24	CB5-96 TO CB5-9

Project File: STRM-NTWK-05-50-YR.stm | Number of lines: 152 | Run Date: 2/22/2023

NOTES:Intensity = 65.86 / (Inlet time + 10.50) ^ 0.75; Return period =Yrs. 50 ; c = cir e = ellip b = box

Storm Sewer Tabulation

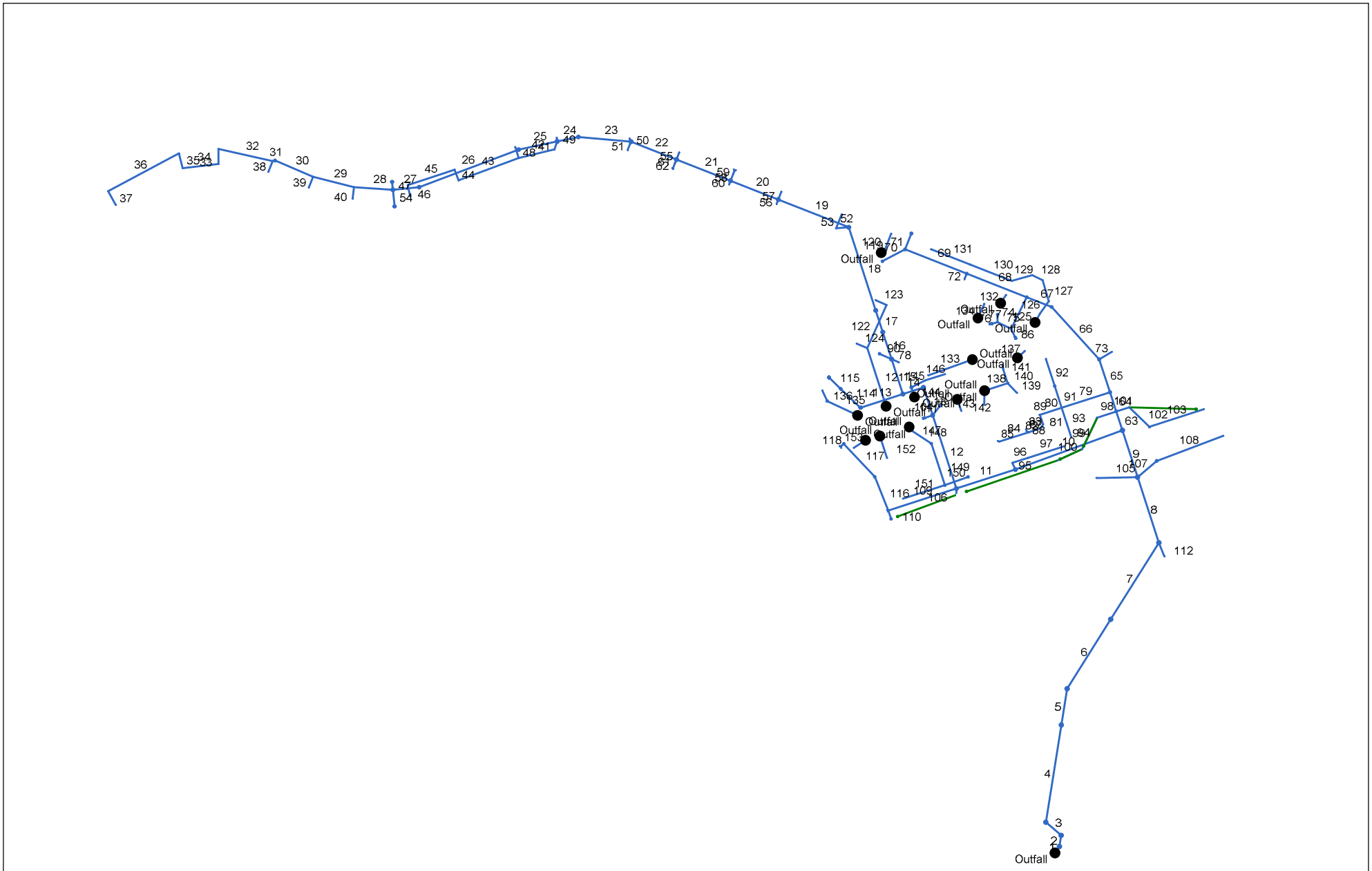
Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
133	End	40.587	0.33	0.33	0.61	0.20	0.20	6.0	6.0	8.0	1.61	9.78	3.71	18	0.74	453.95	454.25	454.36	454.73	459.12	457.75	CB5-97 TO MH5-
134	End	88.639	0.11	0.21	0.95	0.10	0.20	6.0	6.2	7.9	1.57	11.40	3.89	18	1.00	448.07	448.96	448.45	449.43	454.45	457.24	CB5-37 TO MH5-
135	134	30.003	0.10	0.10	0.93	0.09	0.09	6.0	6.0	8.0	0.75	8.04	2.77	18	0.50	452.85	453.00	453.16	453.32	457.24	457.24	CB5-38 TO CB5-3
136	End	25.905	0.09	0.09	0.96	0.09	0.09	6.0	6.0	8.0	0.69	19.74	3.93	18	3.01	451.90	452.68	452.09	452.99	456.00	457.10	CB5-80 TO FES5-
137	End	64.000	0.00	0.38	0.00	0.00	0.37	0.0	6.2	7.9	4.51	17.33	4.41	24	0.50	448.19	448.51	448.89	449.26	454.81	453.97	MH5-57 TO MH5-
138	137	35.482	0.16	0.16	0.99	0.16	0.16	6.0	6.0	8.0	1.27	8.10	3.23	18	0.51	450.32	450.50	450.72	450.92	453.97	455.00	RD5-3 TO MH5-5
139	137	40.000	0.22	0.22	0.94	0.21	0.21	6.0	6.1	8.0	3.26	8.04	4.22	18	0.50	448.61	448.81	449.28	449.50	453.97	453.40	CB5-81 TO MH5-
140	139	8.931	0.00	0.00	0.00	0.00	0.00	6.0	6.0	0.0	1.61	11.42	2.92	18	1.01	448.91	449.00	449.50	449.48	453.40	452.90	OCS5-5 TO CB5-
141	End	32.000	0.16	0.16	0.99	0.16	0.16	6.0	6.0	8.0	1.30	11.38	3.71	18	1.00	450.18	450.50	450.52	450.93	453.82	452.26	RD5-1 TO MH5-5
142	End	37.355	0.15	0.15	0.99	0.15	0.15	6.0	6.0	8.0	1.19	11.32	3.60	18	0.99	450.13	450.50	450.46	450.91	454.81	455.00	RD5-2 TO MH5-5
143	End	27.000	0.00	0.30	0.00	0.00	0.27	0.0	6.4	7.9	2.08	7.89	3.66	18	0.48	445.77	445.90	446.30	446.44	454.91	455.73	MH5-63 TO MH5-
144	143	40.907	0.08	0.30	0.84	0.07	0.27	6.0	6.3	7.9	2.10	7.95	3.70	18	0.49	446.00	446.20	446.53	446.75	455.73	454.26	CB5-82 TO MH5-
145	144	54.035	0.22	0.22	0.90	0.20	0.20	6.0	6.0	8.0	1.59	8.04	3.43	18	0.50	449.48	449.75	449.93	450.22	454.26	453.59	CB5-83 TO CB5-8
146	End	7.500	0.22	0.81	0.97	0.21	0.78	6.0	7.6	7.5	5.82	16.09	6.71	18	2.00	446.06	446.21	446.68	447.14	452.35	452.10	CB5-87 TO CB5-8
147	146	66.843	0.16	0.59	0.95	0.15	0.57	6.0	7.4	7.5	4.27	7.99	4.38	18	0.49	446.31	446.64	447.14	447.43	452.10	452.30	CB5-88 TO CB5-8
148	147	115.500	0.18	0.43	0.95	0.17	0.41	6.0	6.9	7.7	3.19	8.06	4.05	18	0.50	446.74	447.32	447.43	448.00	452.30	451.75	CB5-89 TO CB5-8
149	148	64.630	0.14	0.14	0.96	0.13	0.13	6.0	6.0	8.0	1.08	16.07	4.07	18	2.00	448.25	449.54	448.51	449.93	451.75	453.14	CB5-79 TO CB5-8
150	148	115.523	0.11	0.11	0.99	0.11	0.11	6.0	6.0	8.0	0.87	8.06	2.10	18	0.50	447.42	448.00	448.00	448.35	451.75	451.83	CB5-90 TO CB5-8
151	End	60.500	0.21	0.21	0.99	0.21	0.21	6.0	6.0	8.0	1.67	11.33	3.97	18	0.99	447.90	448.50	448.29	448.98	452.38	453.50	RD5-4 TO MH5-5
152	End	36.371	0.45	0.45	0.90	0.41	0.41	6.0	6.0	8.0	3.24	11.47	4.83	18	1.02	447.11	447.48	447.66	448.17	451.92	451.14	CB5-92 TO CB5-9

Project File: STRM-NTWK-05-50-YR.stm | Number of lines: 152 | Run Date: 2/22/2023

NOTES:Intensity = 65.86 / (Inlet time + 10.50) ^ 0.75; Return period =Yrs. 50 ; c = cir e = ellip b = box

HYDRAULIC REPORT
25-YEAR STORM EVENT
PROPOSED STORM SEWERS (STRM-NTWK-05-25-YR-FULL BUILD)
FULL PROJECT DESIGN

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: STRM-NTWK-05-25-YR-FULL-BUILD.stm	Number of lines: 153	Date: 2/22/2023

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	HW5-1 TO MH5-1	399.9	72	Cir	20.440	398.80	399.21	2.006	404.13	404.54	1.69	404.54	End	Manhole
2	MH5-1 TO MH5-2	400.2	72	Cir	30.000	404.71	405.31	2.000	408.12	410.64	n/a	410.64	1	Manhole
3	MH5-2 TO MH5-3	400.7	72	Cir	53.039	410.81	411.87	1.999	414.22	417.20	n/a	417.20	2	Manhole
4	MH5-3 TO MH5-4	328.6	72	Cir	260.000	416.87	419.48	1.004	420.62	424.41	n/a	424.41	3	Manhole
5	MH5-4 TO MH5-5	329.7	72	Cir	96.972	419.58	420.55	1.000	424.41	425.49	1.23	425.49	4	Manhole
6	MH5-5 TO MH5-6	313.6	72	Cir	216.121	420.65	422.81	0.999	425.49	427.64	n/a	427.64	5	Manhole
7	MH5-6 TO MH5-7	316.1	72	Cir	238.559	422.91	425.30	1.002	427.64	430.14	n/a	430.14	6	Manhole
8	MH5-7 TO MH5-8	294.8	72	Cir	182.000	425.40	427.22	1.000	430.14	431.91	n/a	431.91	7	Manhole
9	MH5-8 TO MH5-9	292.4	72	Cir	130.000	427.32	428.62	1.000	431.91	433.29	n/a	433.29	8	Manhole
10	MH5-10 TO MH5-9	241.4	66	Cir	299.601	428.72	431.72	1.001	433.29	436.06	n/a	436.06	9	Manhole
11	MH5-10 TO MH5-11	241.7	66	Cir	162.986	431.82	433.45	1.000	436.06	437.79	2.25	437.79	10	Manhole
12	MH5-11 TO MH5-12	234.7	66	Cir	203.182	433.55	435.58	0.999	437.79	439.86	n/a	439.86	11	Manhole
13	MH5-12 TO MH5-13	228.8	66	Cir	77.359	435.68	436.46	1.008	439.86	440.69	n/a	440.69	12	Manhole
14	MH5-14 TO MH5-13	229.4	66	Cir	56.863	436.56	437.13	1.002	440.69	441.36	n/a	441.36	13	Manhole
15	MH5-15 TO MH5-14	191.0	60	Cir	97.052	437.23	438.20	0.999	441.36	442.15	n/a	442.15	14	Manhole
16	MH5-16 TO MH5-15	190.5	60	Cir	74.996	442.25	443.00	1.000	445.26	446.94	n/a	446.94	15	Manhole
17	MH5-17 TO MH5-16	190.9	60	Cir	60.019	448.00	448.60	1.000	451.01	452.55	0.31	452.55	16	Manhole
18	MH5-18 TO MH5-17	192.6	60	Cir	230.753	453.60	455.91	1.001	456.63	459.87	n/a	459.87	17	Manhole
19	MH5-19 TO MH5-18	193.8	60	Cir	199.226	456.01	458.00	0.999	459.87	461.98	2.08	461.98	18	Manhole
20	MH5-20 TO MH5-19	193.8	60	Cir	135.000	458.10	459.45	1.000	461.98	463.43	2.08	463.43	19	Manhole
21	MH5-21 TO MH5-20	188.2	60	Cir	152.928	459.55	461.08	1.000	463.43	465.00	n/a	465.00	20	Manhole
22	MH5-22 TO MH5-21	161.6	54	Cir	128.398	461.18	462.46	0.997	465.00	466.17	2.06	466.17	21	Manhole
23	MH5-23 TO MH5-22	156.0	54	Cir	138.853	462.56	463.95	1.001	466.17	467.61	n/a	467.61	22	Manhole
24	MH5-24 TO MH5-23	156.5	54	Cir	56.993	464.05	464.62	1.000	467.61	468.28	1.98	468.28	23	Manhole

Project File: STRM-NTWK-05-25-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES: Return period = 25 Yrs.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
25	MH5-25 TO MH5-24	135.5	54	Cir	103.591	464.72	465.76	1.004	468.28	469.18	0.31	469.18	24	Manhole
26	MH5-26 TO MH5-25	137.9	54	Cir	279.546	465.86	468.66	1.002	469.18	472.11	n/a	472.11	25	Manhole
27	MH5-27 TO MH5-26	138.5	54	Cir	69.589	468.76	469.46	1.006	472.11	472.92	n/a	472.92	26	Manhole
28	CB5-59 TO MH5-27	5.95	18	Cir	102.551	486.67	489.75	3.003	487.24	490.69	n/a	490.69	27	Combination
29	CB5-61 TO CB5-59	5.35	18	Cir	111.289	489.93	495.49	4.996	490.69	496.38	n/a	496.38	28	Combination
30	MH5-38 TO CB5-61	4.78	18	Cir	108.480	495.81	497.98	2.000	496.38	498.82	n/a	498.82	29	Manhole
31	CB5-63 TO MH5-38	4.79	18	Cir	6.682	498.08	498.21	1.946	498.82	499.05	n/a	499.05	30	Combination
32	CB5-65 TO CB5-63	3.89	18	Cir	145.419	498.31	499.76	0.997	499.05	500.51	n/a	500.51	31	Combination
33	CB5-66 TO CB5-65	2.66	18	Cir	39.874	499.86	500.26	1.003	500.51	500.88	n/a	500.88 j	32	Combination
34	CB5-67 TO CB5-66	2.40	18	Cir	94.795	500.36	500.84	0.506	500.92	501.43	0.33	501.43	33	Combination
35	CB5-68 TO CB5-67	2.23	18	Cir	40.000	500.94	501.14	0.500	501.48	501.70	0.32	501.70	34	Combination
36	CB5-69 TO CB5-68	1.97	18	Cir	210.926	503.14	504.19	0.498	503.65	504.72	n/a	504.72	35	Combination
37	CB5-70 TO CB5-69	0.74	18	Cir	41.272	504.29	504.50	0.509	504.72	504.82	n/a	504.82 j	36	Combination
38	CB5-64 TO CB5-63	0.60	18	Cir	30.002	501.85	502.00	0.500	502.13	502.29	n/a	502.29	31	Combination
39	CB5-62 TO CB5-61	0.40	18	Cir	30.000	495.85	496.00	0.500	496.38	496.23	0.08	496.23	29	Combination
40	CB5-60 TO CB5-59	0.47	18	Cir	30.000	489.85	490.00	0.500	490.69	490.25	n/a	490.25	28	Combination
41	CB5-52 TO MH5-24	6.23	18	Cir	22.434	474.12	474.57	2.006	474.77	475.53	0.55	475.53	24	Combination
42	CB5-53 TO CB5-52	5.95	18	Cir	96.516	474.67	476.60	2.000	475.53	477.54	n/a	477.54	41	Combination
43	CB5-55 TO CB5-53	2.96	18	Cir	169.115	476.78	480.59	2.253	477.54	481.24	n/a	481.24 j	42	Combination
44	CB5-56 TO CB5-55	2.48	18	Cir	30.000	480.69	481.29	2.000	481.24	481.89	0.34	481.89	43	Combination
45	CB5-57 TO CB5-56	1.28	18	Cir	129.245	481.39	484.94	2.747	481.89	485.36	n/a	485.36 j	44	Combination
46	CB5-58 TO CB5-57	0.50	18	Cir	30.000	485.04	485.34	1.000	485.36	485.60	n/a	485.60 j	45	Combination
47	MH5-29 TO MH5-27	63.82	42	Cir	20.949	482.79	483.00	1.002	484.71	485.50	n/a	485.50	27	Manhole
48	CB5-54 TO CB5-53	2.65	18	Cir	30.000	476.70	477.00	1.000	477.54	477.62	n/a	477.62 j	42	Combination

Project File: STRM-NTWK-05-25-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES: Return period = 25 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
49	CB5-51 TO MH5-24	20.37	24	Cir	10.000	474.90	475.00	1.000	476.29	476.62	0.87	476.62	24	Combination
50	CB5-50 TO MH5-22	7.85	18	Cir	8.551	472.41	472.50	1.052	473.31	473.58	0.51	473.58	22	Combination
51	CB5-49 TO MH5-22	0.73	18	Cir	23.300	472.27	472.50	0.987	472.53	472.82	n/a	472.82	22	Combination
52	CB5-41 TO MH5-18	0.77	18	Cir	33.617	471.03	471.20	0.506	471.34	471.53	n/a	471.53	18	Combination
53	CB5-42 TO CB5-41	0.43	18	Cir	40.000	471.30	471.50	0.500	471.54	471.74	n/a	471.74	52	Combination
54	MH5-28 TO MH5-27	69.46	48	Cir	44.054	469.56	470.00	0.999	472.92	472.52	1.08	472.52	27	Manhole
55	CB5-48 TO MH5-21	0.39	18	Cir	20.000	470.30	470.50	1.000	470.49	470.73	0.08	470.73	21	Combination
56	CB5-43 TO MH5-19	0.89	18	Cir	11.944	470.13	470.25	1.005	470.41	470.60	0.12	470.60	19	Combination
57	CB5-44 TO MH5-19	0.77	18	Cir	21.944	470.03	470.25	1.003	470.29	470.58	0.12	470.58	19	Combination
58	CB5-46 TO MH5-20	28.07	36	Cir	20.000	466.10	466.50	2.000	467.18	468.21	n/a	468.21	20	Combination
59	HW5-5 TO CB5-46	27.42	36	Cir	10.004	468.00	468.50	4.998	468.84	470.19	0.69	470.19	58	OpenHeadwall
60	CB5-45 TO MH5-20	1.13	18	Cir	10.000	468.40	468.50	1.000	468.72	468.90	0.14	468.90	20	Combination
61	CB5-47 TO MH5-21	28.92	36	Cir	10.000	465.65	465.75	1.000	466.97	467.49	n/a	467.49	21	Combination
62	MH5-30 TO CB5-47	28.58	36	Cir	15.000	465.85	466.00	1.000	467.49	467.73	0.71	467.73	61	Manhole
63	MH5-9 TO MH5-34	61.38	42	Cir	52.136	444.31	444.83	0.997	446.19	447.28	1.13	447.28	9	Manhole
64	MH5-53 TO MH5-34	53.99	36	Cir	53.514	445.00	445.80	1.495	447.28	448.18	1.25	448.18	63	Manhole
65	MH5-35 TO MH5-53	49.35	36	Cir	91.065	446.63	448.00	1.500	448.23	450.28	1.11	450.28	64	Manhole
66	MH5-36 TO MH5-35	48.73	36	Cir	186.792	448.87	450.74	1.001	450.67	453.01	0.56	453.01	65	Manhole
67	MH5-37 TO MH5-36	48.90	36	Cir	70.000	450.84	451.54	1.000	453.01	453.81	n/a	453.81	66	Manhole
68	MH5-39 TO MH5-37	34.83	36	Cir	170.066	454.37	457.77	1.999	455.58	459.69	n/a	459.69	67	Manhole
69	MH5-40 TO MH5-39	34.40	36	Cir	174.174	457.97	461.45	1.998	459.69	463.35	n/a	463.35	68	Manhole
70	OCS5-7 TO MH5-40	3.53	18	Cir	67.311	465.83	466.50	0.995	466.40	467.22	0.28	467.22	69	Grate
71	MH5-41 TO MH5-40	31.01	36	Cir	45.000	461.55	462.00	1.000	463.35	463.80	0.76	463.80	69	Manhole
72	CB5-15 TO MH5-39	1.10	18	Cir	15.000	460.10	460.25	1.000	460.42	460.64	0.14	460.64	68	Combination

Project File: STRM-NTWK-05-25-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES: Return period = 25 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
73	MH5-35 TO OCS5-1	1.00	18	Cir	38.184	456.62	457.00	0.995	456.92	457.37	0.13	457.37	65	None
74	MH5-42 TO MH5-37	14.41	30	Cir	92.998	451.64	452.10	0.500	453.81	453.38	n/a	453.38	67	Manhole
75	MH5-43 TO MH5-42	4.02	18	Cir	40.157	452.74	453.14	1.000	453.38	453.91	n/a	453.91	74	Manhole
76	OCS5-6 TO MH5-43	0.80	18	Cir	20.057	453.90	454.00	0.499	454.22	454.33	n/a	454.33	75	Grate
77	OCS5-2 TO MH5-43	3.22	18	Cir	18.349	453.32	453.50	0.981	453.91	454.18	0.26	454.18	75	Manhole
78	CB5-94 TO MH5-15	1.48	18	Cir	20.166	453.30	453.50	0.992	453.67	453.96	0.17	453.96	15	Grate
79	CB5-71 TO MH5-53	5.47	24	Cir	133.392	447.88	448.55	0.502	448.65	449.37	0.70	449.37	64	Grate
80	CD5-3 TO CB5-71 6	0.32	8	Cir	59.990	450.94	452.29	2.250	451.12	452.55	n/a	452.55	79	None
81	CD5-3 TO CB5-71 5	0.20	8	Cir	26.867	452.29	452.42	0.484	452.55	452.62	n/a	452.68 j	80	None
82	CD5-3 TO CB5-71 4	0.20	8	Cir	11.071	452.42	452.48	0.542	452.68	452.69	0.05	452.74	81	None
83	CD5-3 TO CB5-71 3	0.20	8	Cir	34.788	452.48	452.65	0.489	452.74	452.86	0.05	452.91	82	None
84	CD5-3 TO CB5-71 2	0.07	8	Cir	80.821	452.65	453.06	0.507	452.91	453.18	0.03	453.18	83	None
85	CD5-3 TO CB5-71 1	0.07	8	Cir	4.773	453.06	453.08	0.419	453.19	453.21	n/a	453.24 j	84	None
86	OCS5-1 TO MH5-42	10.39	24	Cir	26.226	452.24	452.50	0.991	453.38	453.65	0.48	453.65	74	Manhole
87	CD5-2 2	0.14	8	Cir	5.657	452.65	452.71	1.061	452.91	452.88	0.05	452.88	83	None
88	CD5-2 1	0.14	8	Cir	5.300	452.71	452.76	0.944	452.88	452.93	n/a	452.93	87	None
89	CD5-1	0.14	8	Cir	1.125	452.29	452.31	1.777	452.55	452.48	n/a	452.48	80	None
90	CB5-93 TO MH5-15	0.09	18	Cir	34.982	450.95	452.00	3.002	451.02	452.11	n/a	452.11	15	Grate
91	CB5-72 TO CB5-71	3.35	18	Cir	60.284	449.19	449.79	0.995	449.75	450.49	n/a	450.49	79	Grate
92	CB5-73 TO CB5-72	0.64	18	Cir	74.716	449.89	451.76	2.503	450.49	452.06	n/a	452.06 j	91	Combination
93	CB5-74 TO CB5-71	1.17	18	Cir	45.000	449.00	449.22	0.489	449.39	449.62	n/a	449.62	79	Combination
94	CB5-75 TO CB5-74	0.79	18	Cir	35.475	449.32	449.50	0.507	449.64	449.83	0.12	449.83	93	Combination
95	CB5-76 TO MH5-10	1.74	18	Cir	19.445	448.39	448.58	0.977	448.79	449.08	0.27	449.08	10	Combination
96	CB5-77 TO CB5-76	1.49	18	Cir	43.097	448.68	448.90	0.510	449.12	449.36	n/a	449.36	95	Combination

Project File: STRM-NTWK-05-25-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES: Return period = 25 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
97	CB5-78 TO CB5-77	0.33	18	Cir	100.903	449.00	449.50	0.496	449.36	449.71	n/a	449.71 j	96	Combination
98	CB5-3 TO MH5-34	3.84	18	Cir	52.702	445.83	446.09	0.493	447.28	446.84	n/a	446.84	63	Combination
99	CB5-4 TO CB5-3	2.72	18	Cir	92.115	446.26	446.72	0.499	446.86	447.35	n/a	447.35	98	Combination
100	CB5-5 TO CB5-4	0.61	18	Cir	70.906	448.65	449.00	0.494	448.93	449.29	0.10	449.29	99	Combination
101	CB5-6 TO MH5-34	5.30	18	Cir	36.193	446.54	446.72	0.497	447.43	447.61	n/a	448.10 j	63	Combination
102	MH5-45 TO CB5-6	2.74	18	Cir	73.953	446.89	447.26	0.500	448.10	447.89	n/a	447.89	101	Manhole
103	CB5-7 TO MH5-45	2.83	18	Cir	149.233	447.43	448.18	0.503	448.04	448.82	n/a	448.82	102	Combination
104	OCS5-3 TO MH5-12	2.90	18	Cir	34.234	447.16	447.50	0.993	447.68	448.15	0.25	448.15	12	Manhole
105	CB5-1 TO MH5-8	2.89	18	Cir	108.000	440.74	442.90	2.000	441.17	443.55	n/a	443.55	8	Combination
106	CB5-20 TO MH5-11	2.83	18	Cir	16.837	445.16	445.50	2.019	445.58	446.14	n/a	446.14	11	Combination
107	MH5-8A TO MH5-8	2.89	18	Cir	66.000	443.55	444.21	1.000	444.07	444.85	0.10	444.85	8	Manhole
108	CB5-2 TO MH5-8(2)	2.99	18	Cir	187.000	445.84	447.50	0.888	446.38	448.16	0.25	448.16	107	Combination
109	MH5-46 TO MH5-11	10.07	36	Cir	188.089	433.45	434.39	0.500	437.79*	437.82*	0.03	437.86	11	Manhole
110	CB5-21 TO MH5-46	1.74	18	Cir	23.526	442.76	443.00	1.020	443.15	443.50	0.18	443.50	109	Combination
111	OCS5-4 TO MH5-12	3.71	24	Cir	23.855	441.26	441.50	1.006	441.79	442.17	n/a	442.17	12	Manhole
112	MH5-7 TO EX-CB	30.15	30	Cir	38.086	440.39	441.20	2.127	441.59	443.07	0.91	443.07	7	Grate
113	MH5-31 TO MH5-14	48.20	48	Cir	117.698	437.63	438.22	0.501	441.36	440.30	0.75	440.30	14	Manhole
114	MH5-32 TO MH5-31	48.51	48	Cir	72.596	438.32	438.68	0.496	440.30	440.77	0.12	440.77	113	Manhole
115	MH5-33 TO MH5-32	48.70	48	Cir	42.108	438.68	438.89	0.499	440.77	440.98	0.84	440.98	114	Manhole
116	CB5-22 TO MH5-46	8.84	30	Cir	95.823	434.89	435.37	0.501	437.86	437.87	0.03	437.90	109	Combination
117	MH5-51 TO CB5-22	8.69	30	Cir	119.492	435.47	436.07	0.502	437.90	437.05	n/a	437.05	116	Manhole
118	FES5-2 TO MH5-51	8.70	18	Cir	11.044	437.50	438.00	4.527	438.12	439.14	0.57	439.14	117	OpenHeadwall
119	CB5-18 TO FES5-5	2.52	18	Cir	14.051	469.00	469.07	0.498	469.58	469.67	n/a	469.67	End	Combination
120	CB5-19 TO CB5-18	1.60	14x23	Ell	43.701	469.07	469.29	0.503	469.90	469.80	0.07	469.80	119	Combination

Project File: STRM-NTWK-05-25-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

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Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
121	CB5-33 TO MH5-58	1.79	18	Cir	161.016	451.37	456.20	3.000	451.68	456.70	0.22	456.70	End	Combination
122	CB5-35 TO CB5-33	0.91	18	Cir	124.908	457.60	462.60	4.003	457.80	462.96	0.19	462.96	121	Combination
123	CB5-36 TO CB5-35	0.52	18	Cir	30.000	462.70	463.00	1.000	462.96	463.27	0.09	463.27	122	Combination
124	CB5-34 TO CB5-33	0.47	18	Cir	30.000	457.60	457.90	1.000	457.81	458.15	n/a	458.15	121	Combination
125	CB5-8 TO MH5-44	10.00	24	Cir	26.751	455.88	456.15	1.009	456.81	457.28	0.23	457.28	End	Combination
126	CB5-9 TO CB5-8	9.56	24	Cir	40.000	456.25	456.45	0.500	457.31	457.55	n/a	457.55	125	Combination
127	CB5-10 TO CB5-9	8.70	24	Cir	57.813	456.55	456.84	0.502	457.55	457.89	n/a	457.89	126	Combination
128	CB5-11 TO CB5-10	8.12	24	Cir	30.034	456.94	457.09	0.499	457.90	458.10	n/a	458.10	127	Combination
129	CB5-14 TO MH5-38	5.99	24	Cir	56.444	457.19	457.47	0.496	458.10	458.33	n/a	458.33 j	128	Combination
130	CB5-16 TO MH5-39	3.47	18	Cir	117.308	457.57	460.21	2.250	458.33	460.92	n/a	460.92 j	129	Combination
131	CB5-17 TO CB5-16	1.90	18	Cir	109.764	460.31	464.15	3.498	460.92	464.67	n/a	464.67 j	130	Combination
132	CB5-13 TO FES5-4	0.75	18	Cir	25.654	457.00	457.50	1.949	457.22	457.82	0.11	457.82	End	Combination
133	CB5-96 TO CB5-95	1.05	18	Cir	122.513	454.14	454.75	0.498	454.51	455.13	n/a	455.13	End	Grate
134	CB5-97 TO MH5-61	1.44	18	Cir	40.587	453.95	454.25	0.739	454.34	454.70	n/a	454.70	End	Grate
135	CB5-37 TO MH5-60	1.40	18	Cir	88.639	448.07	448.96	1.004	448.42	449.40	0.17	449.40	End	Combination
136	CB5-38 TO CB5-37	0.66	18	Cir	30.003	452.85	453.00	0.500	453.14	453.30	0.11	453.30	135	Combination
137	CB5-80 TO FES5-1	0.62	18	Cir	25.905	451.90	452.68	3.011	452.08	452.97	n/a	452.97	End	Combination
138	MH5-57 TO MH5-56	3.75	24	Cir	64.000	448.19	448.51	0.500	448.82	449.19	n/a	449.19	End	Manhole
139	RD5-3 TO MH5-57	1.13	18	Cir	35.482	450.32	450.50	0.507	450.70	450.90	0.14	450.90	138	None
140	CB5-81 TO MH5-57	2.64	18	Cir	40.000	448.61	448.81	0.500	449.20	449.43	0.12	449.43	138	Combination
141	OCS5-5 TO CB5-81	1.17	18	Cir	8.931	448.91	449.00	1.008	449.43	449.40	n/a	449.40 j	140	Grate
142	RD5-1 TO MH5-55	1.16	18	Cir	32.000	450.18	450.50	1.000	450.50	450.90	0.14	450.90	End	None
143	RD5-2 TO MH5-56	1.06	18	Cir	37.355	450.13	450.50	0.990	450.44	450.88	0.14	450.88	End	None
144	MH5-63 TO MH5-62	1.85	18	Cir	27.000	445.77	445.90	0.482	446.26	446.41	n/a	446.41	End	Manhole

Project File: STRM-NTWK-05-25-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES: Return period = 25 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
145	CB5-82 TO MH5-63	1.87	18	Cir	40.907	446.00	446.20	0.489	446.50	446.71	0.09	446.71	144	Combination
146	CB5-83 TO CB5-82	1.42	18	Cir	54.035	449.48	449.75	0.500	449.91	450.20	0.16	450.20	145	Combination
147	CB5-87 TO CB5-86	5.12	18	Cir	7.500	446.06	446.21	2.000	446.64	447.08	0.37	447.08	End	Combination
148	CB5-88 TO CB5-87	3.77	18	Cir	66.843	446.31	446.64	0.494	447.08	447.38	0.30	447.38	147	Combination
149	CB5-89 TO CB5-88	2.82	18	Cir	115.500	446.74	447.32	0.502	447.38	447.96	n/a	447.96 j	148	Combination
150	CB5-79 TO CB5-89	0.96	18	Cir	64.630	448.25	449.54	1.996	448.50	449.91	n/a	449.91	149	Combination
151	CB5-90 TO CB5-89	0.78	18	Cir	115.523	447.42	448.00	0.502	447.96	448.33	n/a	448.33 j	149	Combination
152	RD5-4 TO MH5-59	1.49	18	Cir	60.500	447.90	448.50	0.992	448.27	448.96	n/a	448.96	End	None
153	CB5-92 TO CB5-91	2.90	18	Cir	36.371	447.11	447.48	1.017	447.76	448.13	n/a	448.13 j	End	Combination

Project File: STRM-NTWK-05-25-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

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Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	20.440	0.00	102.4	0.00	0.00	84.46	0.0	18.7	4.4	399.9	649.9	15.07	72	2.01	398.80	399.21	404.13	404.54	407.80	417.34	HW5-1 TO MH5-1
2	1	30.000	0.00	102.4	0.00	0.00	84.46	0.0	18.7	4.4	400.2	649.0	19.60	72	2.00	404.71	405.31	408.12	410.64	417.34	448.00	MH5-1 TO MH5-2
3	2	53.039	18.82	102.4	0.89	16.75	84.46	10.0	18.7	4.4	400.7	648.7	19.61	72	2.00	410.81	411.87	414.22	417.20	448.00	448.50	MH5-2 TO MH5-3
4	3	260.000	0.00	83.58	0.00	0.00	67.71	0.0	18.4	4.5	328.6	459.8	15.45	72	1.00	416.87	419.48	420.62	424.41	448.50	450.90	MH5-3 TO MH5-4
5	4	96.972	5.17	83.58	0.79	4.08	67.71	10.0	18.2	4.5	329.7	458.9	13.38	72	1.00	419.58	420.55	424.41	425.49	450.90	452.33	MH5-4 TO MH5-5
6	5	216.121	0.00	78.41	0.00	0.00	63.63	0.0	18.0	4.5	313.6	458.7	12.85	72	1.00	420.65	422.81	425.49	427.64	452.33	454.60	MH5-5 TO MH5-6
7	6	238.559	0.00	78.41	0.00	0.00	63.63	0.0	17.7	4.6	316.1	459.3	13.08	72	1.00	422.91	425.30	427.64	430.14	454.60	458.32	MH5-6 TO MH5-7
8	7	182.000	0.00	72.06	0.00	0.00	58.55	6.0	17.4	4.6	294.8	458.9	12.36	72	1.00	425.40	427.22	430.14	431.91	458.32	455.11	MH5-7 TO MH5-8
9	8	130.000	0.00	71.18	0.00	0.00	57.73	0.0	17.2	4.6	292.4	458.9	12.49	72	1.00	427.32	428.62	431.91	433.29	455.11	455.41	MH5-8 TO MH5-9
10	9	299.601	0.00	62.65	0.00	0.00	50.15	0.0	16.8	4.7	241.4	364.1	11.72	66	1.00	428.72	431.72	433.29	436.06	455.41	452.61	MH5-10 TO MH5-
11	10	162.986	0.00	62.38	0.00	0.00	49.89	0.0	16.6	4.7	241.7	363.9	12.17	66	1.00	431.82	433.45	436.06	437.79	452.61	450.86	MH5-10 TO MH5-
12	11	203.182	0.00	60.03	0.00	0.00	47.98	0.0	16.3	4.8	234.7	363.7	11.89	66	1.00	433.55	435.58	437.79	439.86	450.86	453.95	MH5-11 TO MH5-
13	12	77.359	0.00	60.03	0.00	0.00	47.98	0.0	16.2	4.8	228.8	365.3	11.75	66	1.01	435.68	436.46	439.86	440.69	453.95	454.72	MH5-12 TO MH5-
14	13	56.863	0.00	60.03	0.00	0.00	47.98	0.0	16.1	4.8	229.4	364.3	11.84	66	1.00	436.56	437.13	440.69	441.36	454.72	455.99	MH5-14 TO MH5-
15	14	97.052	0.00	50.81	0.00	0.00	39.77	0.0	16.0	4.8	191.0	282.1	11.24	60	1.00	437.23	438.20	441.36	442.15	455.99	458.24	MH5-15 TO MH5-
16	15	74.996	0.00	50.45	0.00	0.00	39.55	0.0	15.9	4.8	190.5	282.2	13.45	60	1.00	442.25	443.00	445.26	446.94	458.24	464.15	MH5-16 TO MH5-
17	16	60.019	0.00	50.45	0.00	0.00	39.55	0.0	15.8	4.8	190.9	282.1	13.46	60	1.00	448.00	448.60	451.01	452.55	464.15	466.02	MH5-17 TO MH5-
18	17	230.753	0.00	50.45	0.00	0.00	39.55	0.0	15.5	4.9	192.6	282.3	13.50	60	1.00	453.60	455.91	456.63	459.87	466.02	474.92	MH5-18 TO MH5-
19	18	199.226	0.00	50.31	0.00	0.00	39.44	0.0	15.2	4.9	193.8	282.0	11.74	60	1.00	456.01	458.00	459.87	461.98	474.92	474.35	MH5-19 TO MH5-
20	19	135.000	0.00	50.01	0.00	0.00	39.21	0.0	15.0	4.9	193.8	282.2	11.72	60	1.00	458.10	459.45	461.98	463.43	474.35	472.74	MH5-20 TO MH5-
21	20	152.928	0.00	40.46	0.00	0.00	33.38	0.0	11.3	5.6	188.2	282.2	11.46	60	1.00	459.55	461.08	463.43	465.00	472.74	474.62	MH5-21 TO MH5-
22	21	128.398	0.00	34.92	0.00	0.00	28.45	0.0	11.1	5.7	161.6	212.7	11.37	54	1.00	461.18	462.46	465.00	466.17	474.62	476.48	MH5-22 TO MH5-

Project File: STRM-NTWK-05-25-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES:Intensity = 48.83 / (Inlet time + 7.80) ^ 0.73; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
23	22	138.853	0.00	33.04	0.00	0.00	27.25	0.0	10.9	5.7	156.0	213.2	11.34	54	1.00	462.56	463.95	466.17	467.61	476.48	478.46	MH5-23 TO MH5-
24	23	56.993	0.00	33.04	0.00	0.00	27.25	0.0	10.8	5.7	156.5	213.1	11.46	54	1.00	464.05	464.62	467.61	468.28	478.46	479.43	MH5-24 TO MH5-
25	24	103.591	0.00	27.06	0.00	0.00	23.43	0.0	10.6	5.8	135.5	213.5	10.24	54	1.00	464.72	465.76	468.28	469.18	479.43	480.95	MH5-25 TO MH5-
26	25	279.546	0.00	27.06	0.00	0.00	23.43	0.0	10.2	5.9	137.9	213.2	10.75	54	1.00	465.86	468.66	469.18	472.11	480.95	488.70	MH5-26 TO MH5-
27	26	69.589	0.00	27.06	0.00	0.00	23.43	0.0	10.1	5.9	138.5	213.7	10.73	54	1.01	468.76	469.46	472.11	472.92	488.70	490.69	MH5-27 TO MH5-
28	27	102.551	0.05	1.11	0.91	0.05	0.97	6.0	9.2	6.1	5.95	19.72	7.43	18	3.00	486.67	489.75	487.24	490.69	490.69	493.77	CB5-59 TO MH5-
29	28	111.289	0.05	0.99	0.91	0.05	0.86	6.0	8.9	6.2	5.35	25.43	5.42	18	5.00	489.93	495.49	490.69	496.38	493.77	499.49	CB5-61 TO CB5-5
30	29	108.480	0.00	0.88	0.00	0.00	0.76	0.0	8.6	6.3	4.78	16.09	6.23	18	2.00	495.81	497.98	496.38	498.82	499.49	506.05	MH5-38 TO CB5-
31	30	6.682	0.08	0.88	0.92	0.07	0.76	6.0	8.6	6.3	4.79	15.87	5.11	18	1.95	498.08	498.21	498.82	499.05	506.05	505.74	CB5-63 TO MH5-
32	31	145.419	0.23	0.71	0.84	0.19	0.60	6.0	8.0	6.5	3.89	11.36	4.42	18	1.00	498.31	499.76	499.05	500.51	505.74	508.61	CB5-65 TO CB5-6
33	32	39.874	0.05	0.48	0.93	0.05	0.41	6.0	7.9	6.5	2.66	11.39	3.74	18	1.00	499.86	500.26	500.51	500.88	508.61	508.61	CB5-66 TO CB5-6
34	33	94.795	0.03	0.43	0.94	0.03	0.36	6.0	7.4	6.6	2.40	8.10	3.87	18	0.51	500.36	500.84	500.92	501.43	508.61	510.01	CB5-67 TO CB5-6
35	34	40.000	0.07	0.40	0.77	0.05	0.33	6.0	7.3	6.7	2.23	8.04	3.78	18	0.50	500.94	501.14	501.48	501.70	510.01	510.01	CB5-68 TO CB5-6
36	35	210.926	0.22	0.33	0.80	0.18	0.28	6.0	6.3	7.0	1.97	8.03	3.65	18	0.50	503.14	504.19	503.65	504.72	510.01	508.12	CB5-69 TO CB5-6
37	36	41.272	0.11	0.11	0.94	0.10	0.10	6.0	6.0	7.2	0.74	8.11	2.23	18	0.51	504.29	504.50	504.72	504.82	508.12	507.86	CB5-70 TO CB5-6
38	31	30.002	0.09	0.09	0.94	0.08	0.08	6.0	6.0	7.2	0.60	8.04	2.61	18	0.50	501.85	502.00	502.13	502.29	505.74	505.71	CB5-64 TO CB5-6
39	29	30.000	0.06	0.06	0.93	0.06	0.06	6.0	6.0	7.2	0.40	8.04	1.50	18	0.50	495.85	496.00	496.38	496.23	499.49	499.49	CB5-62 TO CB5-6
40	28	30.000	0.07	0.07	0.93	0.07	0.07	6.0	6.0	7.2	0.47	8.04	1.42	18	0.50	489.85	490.00	490.69	490.25	493.77	493.81	CB5-60 TO CB5-5
41	24	22.434	0.06	1.31	0.93	0.06	0.97	6.0	8.2	6.4	6.23	16.11	6.86	18	2.01	474.12	474.57	474.77	475.53	479.43	479.38	CB5-52 TO MH5-
42	41	96.516	0.12	1.25	0.88	0.11	0.92	6.0	7.9	6.5	5.95	16.09	5.37	18	2.00	474.67	476.60	475.53	477.54	479.38	480.87	CB5-53 TO CB5-5
43	42	169.115	0.08	0.56	0.93	0.07	0.44	6.0	7.1	6.8	2.96	17.08	3.65	18	2.25	476.78	480.59	477.54	481.24	480.87	485.36	CB5-55 TO CB5-5
44	43	30.000	0.27	0.48	0.68	0.18	0.36	6.0	7.0	6.8	2.48	16.09	3.98	18	2.00	480.69	481.29	481.24	481.89	485.36	485.36	CB5-56 TO CB5-5

Project File: STRM-NTWK-05-25-YR-FULL-BUILD.stm

Number of lines: 153

Run Date: 2/22/2023

NOTES:Intensity = 48.83 / (Inlet time + 7.80) ^ 0.73; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
45	44	129.245	0.12	0.21	0.93	0.11	0.18	6.0	6.2	7.1	1.28	18.85	2.82	18	2.75	481.39	484.94	481.89	485.36	485.36	489.32	CB5-57 TO CB5-5
46	45	30.000	0.09	0.09	0.77	0.07	0.07	6.0	6.0	7.2	0.50	11.38	2.09	18	1.00	485.04	485.34	485.36	485.60	489.32	489.34	CB5-58 TO CB5-5
47	27	20.949	12.65	12.65	0.85	10.75	10.75	10.0	10.0	5.9	63.82	109.1	10.23	42	1.00	482.79	483.00	484.71	485.50	490.69	492.44	MH5-29 TO MH5-
48	42	30.000	0.57	0.57	0.65	0.37	0.37	6.0	6.0	7.2	2.65	11.38	3.23	18	1.00	476.70	477.00	477.54	477.62	480.87	480.88	CB5-54 TO CB5-5
49	24	10.000	4.67	4.67	0.61	2.85	2.85	6.0	6.0	7.2	20.37	24.50	8.10	24	1.00	474.90	475.00	476.29	476.62	479.43	479.23	CB5-51 TO MH5-
50	22	8.551	1.77	1.77	0.62	1.10	1.10	6.0	6.0	7.2	7.85	11.67	6.41	18	1.05	472.41	472.50	473.31	473.58	476.48	476.43	CB5-50 TO MH5-
51	22	23.300	0.11	0.11	0.93	0.10	0.10	6.0	6.0	7.2	0.73	11.30	3.14	18	0.99	472.27	472.50	472.53	472.82	476.48	476.41	CB5-49 TO MH5-
52	18	33.617	0.06	0.14	0.82	0.05	0.11	6.0	6.3	7.0	0.77	8.09	2.80	18	0.51	471.03	471.20	471.34	471.53	474.92	475.10	CB5-41 TO MH5-
53	52	40.000	0.08	0.08	0.75	0.06	0.06	6.0	6.0	7.2	0.43	8.04	2.37	18	0.50	471.30	471.50	471.54	471.74	475.10	475.10	CB5-42 TO CB5-4
54	27	44.054	13.30	13.30	0.88	11.70	11.70	10.0	10.0	5.9	69.46	155.5	7.26	48	1.00	469.56	470.00	472.92	472.52	490.69	490.01	MH5-28 TO MH5-
55	21	20.000	0.06	0.06	0.90	0.05	0.05	6.0	6.0	7.2	0.39	11.38	2.62	18	1.00	470.30	470.50	470.49	470.73	474.62	474.42	CB5-48 TO MH5-
56	19	11.944	0.16	0.16	0.78	0.12	0.12	6.0	6.0	7.2	0.89	11.40	3.33	18	1.00	470.13	470.25	470.41	470.60	474.35	474.11	CB5-43 TO MH5-
57	19	21.944	0.14	0.14	0.77	0.11	0.11	6.0	6.0	7.2	0.77	11.39	3.20	18	1.00	470.03	470.25	470.29	470.58	474.35	474.11	CB5-44 TO MH5-
58	20	20.000	0.15	9.38	0.89	0.13	5.67	6.0	15.0	4.9	28.07	102.2	9.53	36	2.00	466.10	466.50	467.18	468.21	472.74	472.54	CB5-46 TO MH5-
59	58	10.004	9.23	9.23	0.60	5.54	5.54	15.0	15.0	5.0	27.42	161.5	11.84	36	5.00	468.00	468.50	468.84	470.19	472.54	473.00	HW5-5 TO CB5-4
60	20	10.000	0.17	0.17	0.93	0.16	0.16	6.0	6.0	7.2	1.13	11.38	3.56	18	1.00	468.40	468.50	468.72	468.90	472.74	472.54	CB5-45 TO MH5-
61	21	10.000	0.07	5.48	0.93	0.07	4.88	6.0	10.0	5.9	28.92	72.25	8.23	36	1.00	465.65	465.75	466.97	467.49	474.62	474.42	CB5-47 TO MH5-
62	61	15.000	5.41	5.41	0.89	4.81	4.81	10.0	10.0	5.9	28.58	72.25	7.01	36	1.00	465.85	466.00	467.49	467.73	474.42	475.88	MH5-30 TO CB5-
63	9	52.136	0.00	8.53	0.00	0.00	7.57	0.0	11.5	5.6	61.38	108.8	10.08	42	1.00	444.31	444.83	446.19	447.28	455.41	456.08	MH5-9 TO MH5-3
64	63	53.514	0.00	7.03	0.00	0.00	6.23	0.0	11.4	5.6	53.99	88.34	9.16	36	1.49	445.00	445.80	447.28	448.18	456.08	457.38	MH5-53 TO MH5-
65	64	91.065	0.00	6.03	0.00	0.00	5.38	6.0	11.2	5.7	49.35	88.49	10.70	36	1.50	446.63	448.00	448.23	450.28	457.38	460.34	MH5-35 TO MH5-
66	65	186.792	0.00	6.03	0.00	0.00	5.38	0.0	10.9	5.7	48.73	72.29	9.73	36	1.00	448.87	450.74	450.67	453.01	460.34	461.74	MH5-36 TO MH5-

Project File: STRM-NTWK-05-25-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES:Intensity = 48.83 / (Inlet time + 7.80) ^ 0.73; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
67	66	70.000	0.00	6.03	0.00	0.00	5.38	0.0	10.8	5.8	48.90	72.25	8.72	36	1.00	450.84	451.54	453.01	453.81	461.74	462.71	MH5-37 TO MH5-
68	67	170.066	0.00	6.03	0.00	0.00	5.38	0.0	10.5	5.8	34.83	102.2	10.19	36	2.00	454.37	457.77	455.58	459.69	462.71	464.34	MH5-39 TO MH5-
69	68	174.174	0.00	5.87	0.00	0.00	5.22	0.0	10.1	5.9	34.40	102.1	7.75	36	2.00	457.97	461.45	459.69	463.35	464.34	470.85	MH5-40 TO MH5-
70	69	67.311	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	3.53	11.35	4.95	18	1.00	465.83	466.50	466.40	467.22	470.85	471.00	OCS5-7 TO MH5-
71	69	45.000	5.87	5.87	0.89	5.22	5.22	10.0	10.0	5.9	31.01	72.25	6.98	36	1.00	461.55	462.00	463.35	463.80	470.85	472.40	MH5-41 TO MH5-
72	68	15.000	0.16	0.16	0.96	0.15	0.15	6.0	6.0	7.2	1.10	11.38	3.53	18	1.00	460.10	460.25	460.42	460.64	464.34	464.04	CB5-15 TO MH5-
73	65	38.184	0.00	0.00	0.00	0.00	0.00	6.0	6.0	0.0	1.00	11.35	3.44	18	1.00	456.62	457.00	456.92	457.37	460.34	0.00	MH5-35 TO OCS5
74	67	92.998	0.00	0.00	0.00	0.00	0.00	6.0	6.1	0.0	14.41	31.42	4.44	30	0.50	451.64	452.10	453.81	453.38	462.71	459.43	MH5-42 TO MH5-
75	74	40.157	0.00	0.00	0.00	0.00	0.00	6.0	6.0	0.0	4.02	11.38	5.03	18	1.00	452.74	453.14	453.38	453.91	459.43	459.48	MH5-43 TO MH5-
76	75	20.057	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.80	8.03	2.82	18	0.50	453.90	454.00	454.22	454.33	459.48	458.00	OCS5-6 TO MH5-
77	75	18.349	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	3.22	11.27	4.55	18	0.98	453.32	453.50	453.91	454.18	459.48	459.06	OCS5-2 TO MH5-
78	15	20.166	0.34	0.34	0.61	0.21	0.21	6.0	6.0	7.2	1.48	11.33	3.85	18	0.99	453.30	453.50	453.67	453.96	458.24	457.88	CB5-94 TO MH5-
79	64	133.392	0.17	1.00	0.90	0.15	0.85	6.0	8.2	6.4	5.47	17.37	4.68	24	0.50	447.88	448.55	448.65	449.37	457.38	453.62	CB5-71 TO MH5-
80	79	59.990	0.00	0.05	0.00	0.00	0.05	0.0	7.9	6.5	0.32	1.96	3.33	8	2.25	450.94	452.29	451.12	452.55	453.62	455.08	CD5-3 TO CB5-71
81	80	26.867	0.00	0.03	0.00	0.00	0.03	0.0	7.7	6.6	0.20	0.91	1.84	8	0.48	452.29	452.42	452.55	452.62	455.08	455.00	CD5-3 TO CB5-71
82	81	11.071	0.00	0.03	0.00	0.00	0.03	0.0	7.6	6.6	0.20	0.96	1.84	8	0.54	452.42	452.48	452.68	452.69	455.00	455.00	CD5-3 TO CB5-71
83	82	34.788	0.00	0.03	0.00	0.00	0.03	0.0	7.3	6.7	0.20	0.91	1.87	8	0.49	452.48	452.65	452.74	452.86	455.00	455.08	CD5-3 TO CB5-71
84	83	80.821	0.00	0.01	0.00	0.00	0.01	0.0	6.1	7.1	0.07	0.93	1.10	8	0.51	452.65	453.06	452.91	453.18	455.08	455.08	CD5-3 TO CB5-71
85	84	4.773	0.01	0.01	0.99	0.01	0.01	6.0	6.0	7.2	0.07	0.85	1.48	8	0.42	453.06	453.08	453.19	453.21	455.08	455.10	CD5-3 TO CB5-71
86	74	26.226	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	10.39	24.40	5.58	24	0.99	452.24	452.50	453.38	453.65	459.43	458.84	OCS5-1 TO MH5-
87	83	5.657	0.00	0.02	0.00	0.00	0.02	0.0	6.0	7.1	0.14	1.35	1.55	8	1.06	452.65	452.71	452.91	452.88	455.08	455.12	CD5-2 2
88	87	5.300	0.02	0.02	0.99	0.02	0.02	6.0	6.0	7.2	0.14	1.27	1.99	8	0.94	452.71	452.76	452.88	452.93	455.12	455.20	CD5-2 1

Project File: STRM-NTWK-05-25-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES:Intensity = 48.83 / (Inlet time + 7.80) ^ 0.73; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
89	80	1.125	0.02	0.02	0.99	0.02	0.02	6.0	6.0	7.2	0.14	1.74	1.55	8	1.78	452.29	452.31	452.55	452.48	455.08	455.09	CD5-1
90	15	34.982	0.02	0.02	0.61	0.01	0.01	6.0	6.0	7.2	0.09	19.71	2.16	18	3.00	450.95	452.00	451.02	452.11	458.24	458.99	CB5-93 TO MH5-
91	79	60.284	0.46	0.58	0.86	0.40	0.49	6.0	6.7	6.9	3.35	11.35	4.88	18	1.00	449.19	449.79	449.75	450.49	453.62	453.40	CB5-72 TO CB5-7
92	91	74.716	0.12	0.12	0.75	0.09	0.09	6.0	6.0	7.2	0.64	18.00	1.79	18	2.50	449.89	451.76	450.49	452.06	453.40	455.24	CB5-73 TO CB5-7
93	79	45.000	0.06	0.20	0.91	0.05	0.17	6.0	6.2	7.1	1.17	7.95	3.13	18	0.49	449.00	449.22	449.39	449.62	453.62	453.60	CB5-74 TO CB5-7
94	93	35.475	0.14	0.14	0.79	0.11	0.11	6.0	6.0	7.2	0.79	8.10	2.82	18	0.51	449.32	449.50	449.64	449.83	453.60	453.16	CB5-75 TO CB5-7
95	10	19.445	0.04	0.27	0.98	0.04	0.26	6.0	7.3	6.7	1.74	11.24	4.01	18	0.98	448.39	448.58	448.79	449.08	452.61	453.66	CB5-76 TO MH5-
96	95	43.097	0.18	0.23	0.97	0.17	0.22	6.0	7.1	6.8	1.49	8.13	3.38	18	0.51	448.68	448.90	449.12	449.36	453.66	453.25	CB5-77 TO CB5-7
97	96	100.903	0.05	0.05	0.91	0.05	0.05	6.0	6.0	7.2	0.33	8.01	1.58	18	0.50	449.00	449.50	449.36	449.71	453.25	453.38	CB5-78 TO CB5-7
98	63	52.702	0.18	0.58	0.95	0.17	0.56	6.0	6.8	6.8	3.84	7.99	3.27	18	0.49	445.83	446.09	447.28	446.84	456.08	455.51	CB5-3 TO MH5-3
99	98	92.115	0.31	0.40	0.98	0.30	0.39	6.0	6.5	7.0	2.72	8.04	4.00	18	0.50	446.26	446.72	446.86	447.35	455.51	453.79	CB5-4 TO CB5-3
100	99	70.906	0.09	0.09	0.95	0.09	0.09	6.0	6.0	7.2	0.61	7.99	2.61	18	0.49	448.65	449.00	448.93	449.29	453.79	452.70	CB5-5 TO CB5-4
101	63	36.193	0.47	0.92	0.82	0.39	0.78	6.0	7.0	6.8	5.30	8.02	4.85	18	0.50	446.54	446.72	447.43	447.61	456.08	455.38	CB5-6 TO MH5-3
102	101	73.953	0.00	0.45	0.00	0.00	0.40	0.0	6.6	6.9	2.74	8.05	2.85	18	0.50	446.89	447.26	448.10	447.89	455.38	454.51	MH5-45 TO CB5-
103	102	149.233	0.45	0.45	0.88	0.40	0.40	6.0	6.0	7.2	2.83	8.06	4.05	18	0.50	447.43	448.18	448.04	448.82	454.51	451.68	CB5-7 TO MH5-4
104	12	34.234	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	2.90	11.34	4.67	18	0.99	447.16	447.50	447.68	448.15	453.95	453.95	OCS5-3 TO MH5-
105	8	108.000	0.44	0.44	0.92	0.40	0.40	6.0	6.0	7.2	2.89	16.09	5.43	18	2.00	440.74	442.90	441.17	443.55	455.11	453.90	CB5-1 TO MH5-8
106	11	16.837	0.46	0.46	0.86	0.40	0.40	6.0	6.0	7.2	2.83	16.17	5.41	18	2.02	445.16	445.50	445.58	446.14	450.86	449.17	CB5-20 TO MH5-
107	8	66.000	0.00	0.44	0.00	0.00	0.42	0.0	6.7	6.9	2.89	11.38	4.67	18	1.00	443.55	444.21	444.07	444.85	455.11	454.37	MH5-8A TO MH5-
108	107	187.000	0.44	0.44	0.95	0.42	0.42	6.0	6.0	7.2	2.99	10.72	4.61	18	0.89	445.84	447.50	446.38	448.16	454.37	451.11	CB5-2 TO MH5-8(
109	11	188.089	0.00	1.89	0.00	0.00	1.52	0.0	7.5	6.6	10.07	51.08	1.43	36	0.50	433.45	434.39	437.79	437.82	450.86	449.06	MH5-46 TO MH5-
110	109	23.526	0.29	0.29	0.84	0.24	0.24	6.0	6.0	7.2	1.74	11.49	4.05	18	1.02	442.76	443.00	443.15	443.50	449.06	446.95	CB5-21 TO MH5-

Project File: STRM-NTWK-05-25-YR-FULL-BUILD.stm

Number of lines: 153

Run Date: 2/22/2023

NOTES:Intensity = 48.83 / (Inlet time + 7.80) ^ 0.73; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
111	12	23.855	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	3.71	24.58	4.81	24	1.01	441.26	441.50	441.79	442.17	453.95	453.32	OCS5-4 TO MH5-
112	7	38.086	6.35	6.35	0.80	5.08	5.08	10.0	10.0	5.9	30.15	64.79	10.31	30	2.13	440.39	441.20	441.59	443.07	458.32	458.11	MH5-7 TO EX-CB
113	14	117.698	0.00	9.22	0.00	0.00	8.21	0.0	10.3	5.9	48.20	110.2	5.63	48	0.50	437.63	438.22	441.36	440.30	455.99	455.28	MH5-31 TO MH5-
114	113	72.596	0.00	9.22	0.00	0.00	8.21	0.0	10.1	5.9	48.51	109.6	7.57	48	0.50	438.32	438.68	440.30	440.77	455.28	458.06	MH5-32 TO MH5-
115	114	42.108	9.22	9.22	0.89	8.21	8.21	10.0	10.0	5.9	48.70	109.9	7.34	48	0.50	438.68	438.89	440.77	440.98	458.06	458.23	MH5-33 TO MH5-
116	109	95.823	0.06	1.60	0.99	0.06	1.28	6.0	6.6	6.9	8.84	31.44	1.80	30	0.50	434.89	435.37	437.86	437.87	449.06	452.24	CB5-22 TO MH5-
117	116	119.492	0.00	1.54	0.00	0.00	1.22	0.0	6.0	7.1	8.69	31.48	3.32	30	0.50	435.47	436.07	437.90	437.05	452.24	441.47	MH5-51 TO CB5-
118	117	11.044	1.54	1.54	0.79	1.22	1.22	6.0	6.0	7.2	8.70	24.21	9.30	18	4.53	437.50	438.00	438.12	439.14	441.47	441.00	FES5-2 TO MH5-
119	End	14.051	0.15	0.44	0.90	0.14	0.36	6.0	6.3	7.0	2.52	8.03	3.91	18	0.50	469.00	469.07	469.58	469.67	472.00	471.45	CB5-18 TO FES5-
120	119	43.701	0.29	0.29	0.77	0.22	0.22	6.0	6.0	7.2	1.60	7.84	2.61	14 x 23 e	0.50	469.07	469.29	469.90	469.80	471.45	471.52	CB5-19 TO CB5-1
121	End	161.016	0.07	0.28	0.94	0.07	0.26	6.0	6.7	6.9	1.79	19.70	5.12	18	3.00	451.37	456.20	451.68	456.70	455.35	461.79	CB5-33 TO MH5-
122	121	124.908	0.06	0.14	0.93	0.06	0.13	6.0	6.2	7.1	0.91	22.76	4.56	18	4.00	457.60	462.60	457.80	462.96	461.79	466.79	CB5-35 TO CB5-3
123	122	30.000	0.08	0.08	0.91	0.07	0.07	6.0	6.0	7.2	0.52	11.38	2.53	18	1.00	462.70	463.00	462.96	463.27	466.79	466.79	CB5-36 TO CB5-3
124	121	30.000	0.07	0.07	0.93	0.07	0.07	6.0	6.0	7.2	0.47	11.38	2.77	18	1.00	457.60	457.90	457.81	458.15	461.79	461.79	CB5-34 TO CB5-3
125	End	26.751	0.08	2.11	0.94	0.08	1.52	6.0	7.7	6.6	10.00	24.62	6.22	24	1.01	455.88	456.15	456.81	457.28	461.30	461.38	CB5-8 TO MH5-4
126	125	40.000	0.17	2.03	0.83	0.14	1.45	6.0	7.6	6.6	9.56	17.33	5.51	24	0.50	456.25	456.45	457.31	457.55	461.38	461.38	CB5-9 TO CB5-8
127	126	57.813	0.10	1.86	0.93	0.09	1.30	6.0	7.4	6.7	8.70	17.35	5.36	24	0.50	456.55	456.84	457.55	457.89	461.38	461.71	CB5-10 TO CB5-9
128	127	30.034	0.48	1.76	0.68	0.33	1.21	6.0	7.3	6.7	8.12	17.32	5.25	24	0.50	456.94	457.09	457.90	458.10	461.71	461.66	CB5-11 TO CB5-1
129	128	56.444	0.55	1.28	0.70	0.39	0.88	6.0	7.1	6.8	5.99	17.26	4.45	24	0.50	457.19	457.47	458.10	458.33	461.66	461.26	CB5-14 TO MH5-
130	129	117.308	0.34	0.73	0.69	0.23	0.50	6.0	6.6	6.9	3.47	17.07	4.02	18	2.25	457.57	460.21	458.33	460.92	461.26	464.04	CB5-16 TO MH5-
131	130	109.764	0.39	0.39	0.68	0.27	0.27	6.0	6.0	7.2	1.90	21.28	3.16	18	3.50	460.31	464.15	460.92	464.67	464.04	468.13	CB5-17 TO CB5-1
132	End	25.654	0.11	0.11	0.95	0.10	0.10	6.0	6.0	7.2	0.75	15.88	3.65	18	1.95	457.00	457.50	457.22	457.82	460.00	461.25	CB5-13 TO FES5-

Project File: STRM-NTWK-05-25-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES:Intensity = 48.83 / (Inlet time + 7.80) ^ 0.73; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
133	End	122.513	0.24	0.24	0.61	0.15	0.15	6.0	6.0	7.2	1.05	8.03	3.02	18	0.50	454.14	454.75	454.51	455.13	457.83	458.24	CB5-96 TO CB5-9
134	End	40.587	0.33	0.33	0.61	0.20	0.20	6.0	6.0	7.2	1.44	9.78	3.59	18	0.74	453.95	454.25	454.34	454.70	459.12	457.75	CB5-97 TO MH5-
135	End	88.639	0.11	0.21	0.95	0.10	0.20	6.0	6.2	7.1	1.40	11.40	3.79	18	1.00	448.07	448.96	448.42	449.40	454.45	457.24	CB5-37 TO MH5-
136	135	30.003	0.10	0.10	0.93	0.09	0.09	6.0	6.0	7.2	0.66	8.04	2.68	18	0.50	452.85	453.00	453.14	453.30	457.24	457.24	CB5-38 TO CB5-3
137	End	25.905	0.09	0.09	0.96	0.09	0.09	6.0	6.0	7.2	0.62	19.74	3.81	18	3.01	451.90	452.68	452.08	452.97	456.00	457.10	CB5-80 TO FES5-
138	End	64.000	0.00	0.38	0.00	0.00	0.37	0.0	6.2	7.1	3.75	17.33	4.20	24	0.50	448.19	448.51	448.82	449.19	454.81	453.97	MH5-57 TO MH5-
139	138	35.482	0.16	0.16	0.99	0.16	0.16	6.0	6.0	7.2	1.13	8.10	3.13	18	0.51	450.32	450.50	450.70	450.90	453.97	455.00	RD5-3 TO MH5-5
140	138	40.000	0.22	0.22	0.94	0.21	0.21	6.0	6.1	7.1	2.64	8.04	3.97	18	0.50	448.61	448.81	449.20	449.43	453.97	453.40	CB5-81 TO MH5-
141	140	8.931	0.00	0.00	0.00	0.00	0.00	6.0	6.0	0.0	1.17	11.42	2.61	18	1.01	448.91	449.00	449.43	449.40	453.40	452.90	OCS5-5 TO CB5-
142	End	32.000	0.16	0.16	0.99	0.16	0.16	6.0	6.0	7.2	1.16	11.38	3.59	18	1.00	450.18	450.50	450.50	450.90	453.82	452.26	RD5-1 TO MH5-5
143	End	37.355	0.15	0.15	0.99	0.15	0.15	6.0	6.0	7.2	1.06	11.32	3.49	18	0.99	450.13	450.50	450.44	450.88	454.81	455.00	RD5-2 TO MH5-5
144	End	27.000	0.00	0.30	0.00	0.00	0.27	0.0	6.5	7.0	1.85	7.89	3.56	18	0.48	445.77	445.90	446.26	446.41	454.91	455.73	MH5-63 TO MH5-
145	144	40.907	0.08	0.30	0.84	0.07	0.27	6.0	6.3	7.0	1.87	7.95	3.58	18	0.49	446.00	446.20	446.50	446.71	455.73	454.26	CB5-82 TO MH5-
146	145	54.035	0.22	0.22	0.90	0.20	0.20	6.0	6.0	7.2	1.42	8.04	3.32	18	0.50	449.48	449.75	449.91	450.20	454.26	453.59	CB5-83 TO CB5-8
147	End	7.500	0.22	0.81	0.97	0.21	0.78	6.0	7.7	6.6	5.12	16.09	6.45	18	2.00	446.06	446.21	446.64	447.08	452.35	452.10	CB5-87 TO CB5-8
148	147	66.843	0.16	0.59	0.95	0.15	0.57	6.0	7.4	6.7	3.77	7.99	4.23	18	0.49	446.31	446.64	447.08	447.38	452.10	452.30	CB5-88 TO CB5-8
149	148	115.500	0.18	0.43	0.95	0.17	0.41	6.0	6.9	6.8	2.82	8.06	3.93	18	0.50	446.74	447.32	447.38	447.96	452.30	451.75	CB5-89 TO CB5-8
150	149	64.630	0.14	0.14	0.96	0.13	0.13	6.0	6.0	7.2	0.96	16.07	3.94	18	2.00	448.25	449.54	448.50	449.91	451.75	453.14	CB5-79 TO CB5-8
151	149	115.523	0.11	0.11	0.99	0.11	0.11	6.0	6.0	7.2	0.78	8.06	2.05	18	0.50	447.42	448.00	447.96	448.33	451.75	451.83	CB5-90 TO CB5-8
152	End	60.500	0.21	0.21	0.99	0.21	0.21	6.0	6.0	7.2	1.49	11.33	3.82	18	0.99	447.90	448.50	448.27	448.96	452.38	453.50	RD5-4 TO MH5-5
153	End	36.371	0.45	0.45	0.90	0.41	0.41	6.0	6.0	7.2	2.90	11.47	3.96	18	1.02	447.11	447.48	447.76	448.13	451.92	451.14	CB5-92 TO CB5-9

Project File: STRM-NTWK-05-25-YR-FULL-BUILD.stm

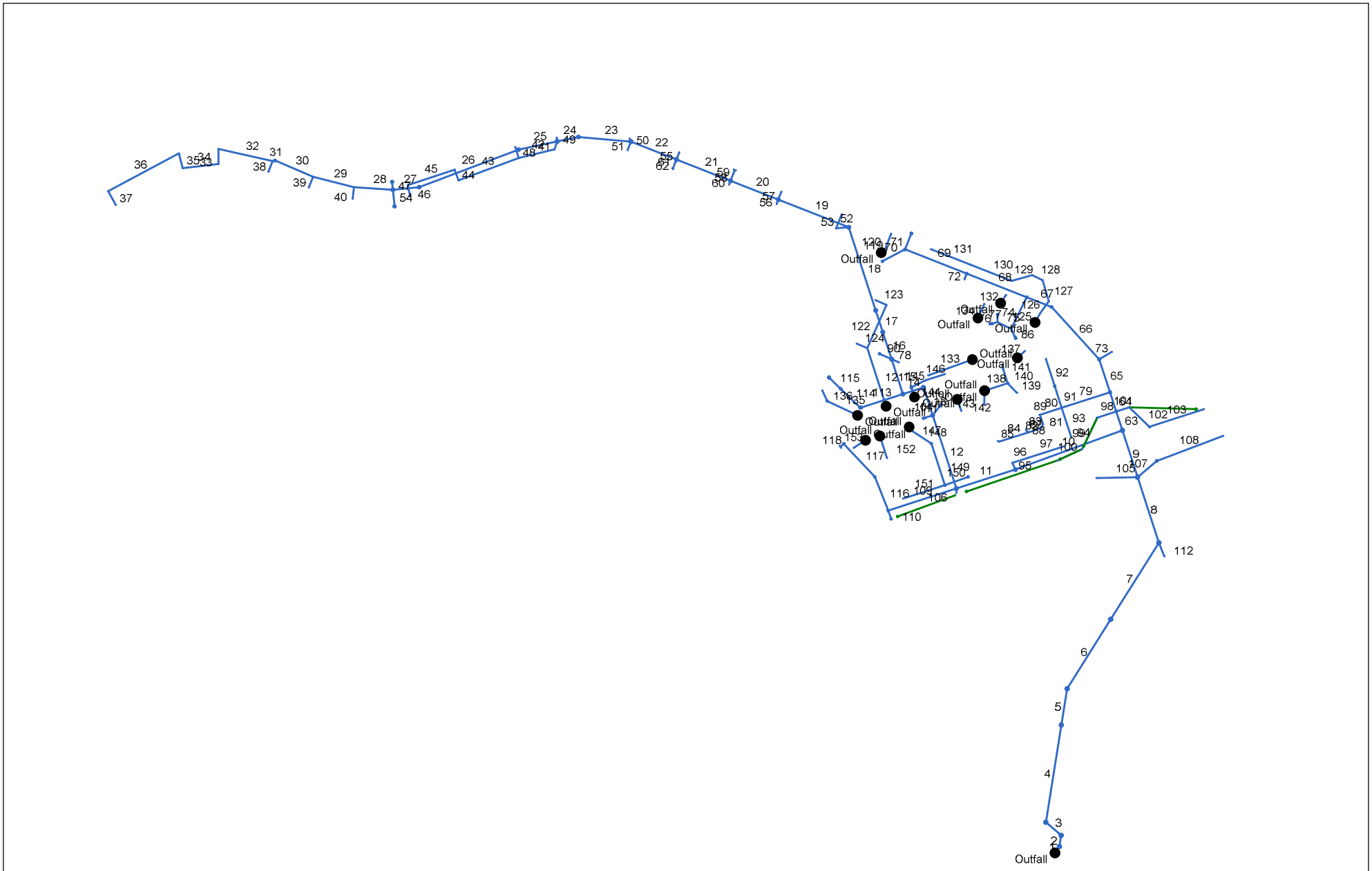
Number of lines: 153

Run Date: 2/22/2023

NOTES:Intensity = 48.83 / (Inlet time + 7.80) ^ 0.73; Return period =Yrs. 25 ; c = cir e = ellip b = box

HYDRAULIC REPORT
50-YEAR STORM EVENT
PROPOSED STORM SEWERS (STRM-NTWK-05-50-YR-FULL BUILD)
FULL PROJECT DESIGN

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: STRM-NTWK-05-50-YR-FULL-BUILD.stm	Number of lines: 153	Date: 2/22/2023

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	HW5-1 TO MH5-1	496.5	72	Cir	20.440	398.80	399.21	2.006	404.41	404.87	n/a	404.87	End	Manhole
2	MH5-1 TO MH5-2	496.7	72	Cir	30.000	404.71	405.31	2.000	408.64	410.97	4.42	410.97	1	Manhole
3	MH5-2 TO MH5-3	497.2	72	Cir	53.039	410.81	411.87	1.999	414.75	417.53	4.42	417.53	2	Manhole
4	MH5-3 TO MH5-4	411.3	72	Cir	260.000	416.87	419.48	1.004	421.30	424.86	0.55	424.86	3	Manhole
5	MH5-4 TO MH5-5	412.3	72	Cir	96.972	419.58	420.55	1.000	424.86	425.94	n/a	425.94	4	Manhole
6	MH5-5 TO MH5-6	392.7	72	Cir	216.121	420.65	422.81	0.999	425.94	428.11	n/a	428.11	5	Manhole
7	MH5-6 TO MH5-7	395.1	72	Cir	238.559	422.91	425.30	1.002	428.11	430.61	n/a	430.61	6	Manhole
8	MH5-7 TO MH5-8	369.5	72	Cir	182.000	425.40	427.22	1.000	430.61	432.40	n/a	432.40	7	Manhole
9	MH5-8 TO MH5-9	366.4	72	Cir	130.000	427.32	428.62	1.000	432.40	433.78	3.12	433.78	8	Manhole
10	MH5-10 TO MH5-9	301.5	66	Cir	299.601	428.72	431.72	1.001	433.78	436.49	2.95	436.49	9	Manhole
11	MH5-10 TO MH5-11	301.6	66	Cir	162.986	431.82	433.45	1.000	436.49	438.22	n/a	438.22	10	Manhole
12	MH5-11 TO MH5-12	281.0	66	Cir	203.182	433.55	435.58	0.999	438.22	440.22	n/a	440.22	11	Manhole
13	MH5-12 TO MH5-13	268.4	66	Cir	77.359	435.68	436.46	1.008	440.22	441.01	2.54	441.01	12	Manhole
14	MH5-14 TO MH5-13	268.9	66	Cir	56.863	436.56	437.13	1.002	441.01	441.68	2.54	441.68	13	Manhole
15	MH5-15 TO MH5-14	223.8	60	Cir	97.052	437.23	438.20	0.999	441.68	442.44	n/a	442.44	14	Manhole
16	MH5-16 TO MH5-15	223.1	60	Cir	74.996	442.25	443.00	1.000	445.60	447.23	0.37	447.23	15	Manhole
17	MH5-17 TO MH5-16	223.5	60	Cir	60.019	448.00	448.60	1.000	451.36	452.83	n/a	452.83	16	Manhole
18	MH5-18 TO MH5-17	225.3	60	Cir	230.753	453.60	455.91	1.001	456.98	460.16	n/a	460.16	17	Manhole
19	MH5-19 TO MH5-18	226.4	60	Cir	199.226	456.01	458.00	0.999	460.16	462.26	n/a	462.26	18	Manhole
20	MH5-20 TO MH5-19	226.2	60	Cir	135.000	458.10	459.45	1.000	462.26	463.70	n/a	463.70	19	Manhole
21	MH5-21 TO MH5-20	217.8	60	Cir	152.928	459.55	461.08	1.000	463.70	465.27	2.39	465.27	20	Manhole
22	MH5-22 TO MH5-21	186.7	54	Cir	128.398	461.18	462.46	0.997	465.27	466.40	n/a	466.40	21	Manhole
23	MH5-23 TO MH5-22	180.0	54	Cir	138.853	462.56	463.95	1.001	466.40	467.83	0.83	467.83	22	Manhole
24	MH5-24 TO MH5-23	180.5	54	Cir	56.993	464.05	464.62	1.000	467.83	468.51	2.37	468.51	23	Manhole

Project File: STRM-NTWK-05-50-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES: Return period = 50 Yrs.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
25	MH5-25 TO MH5-24	156.0	54	Cir	103.591	464.72	465.76	1.004	468.51	469.42	n/a	469.42	24	Manhole
26	MH5-26 TO MH5-25	158.3	54	Cir	279.546	465.86	468.66	1.002	469.42	472.34	n/a	472.34	25	Manhole
27	MH5-27 TO MH5-26	158.9	54	Cir	69.589	468.76	469.46	1.006	472.34	473.15	n/a	473.15	26	Manhole
28	CB5-59 TO MH5-27	6.83	18	Cir	102.551	486.67	489.75	3.003	487.28	490.76	n/a	490.76	27	Combination
29	CB5-61 TO CB5-59	6.13	18	Cir	111.289	489.93	495.49	4.996	490.76	496.45	n/a	496.45	28	Combination
30	MH5-38 TO CB5-61	5.47	18	Cir	108.480	495.81	497.98	2.000	496.45	498.88	0.24	498.88	29	Manhole
31	CB5-63 TO MH5-38	5.47	18	Cir	6.682	498.08	498.21	1.946	498.88	499.11	0.49	499.11	30	Combination
32	CB5-65 TO CB5-63	4.43	18	Cir	145.419	498.31	499.76	0.997	499.11	500.57	0.49	500.57	31	Combination
33	CB5-66 TO CB5-65	3.02	18	Cir	39.874	499.86	500.26	1.003	500.57	500.92	n/a	500.92 j	32	Combination
34	CB5-67 TO CB5-66	2.72	18	Cir	94.795	500.36	500.84	0.506	500.96	501.47	0.35	501.47	33	Combination
35	CB5-68 TO CB5-67	2.53	18	Cir	40.000	500.94	501.14	0.500	501.52	501.74	n/a	501.74	34	Combination
36	CB5-69 TO CB5-68	2.21	18	Cir	210.926	503.14	504.19	0.498	503.68	504.75	0.31	504.75	35	Combination
37	CB5-70 TO CB5-69	0.83	18	Cir	41.272	504.29	504.50	0.509	504.75	504.84	n/a	504.84 j	36	Combination
38	CB5-64 TO CB5-63	0.68	18	Cir	30.002	501.85	502.00	0.500	502.14	502.31	n/a	502.31	31	Combination
39	CB5-62 TO CB5-61	0.45	18	Cir	30.000	495.85	496.00	0.500	496.45	496.25	0.09	496.25	29	Combination
40	CB5-60 TO CB5-59	0.52	18	Cir	30.000	489.85	490.00	0.500	490.76	490.27	n/a	490.27	28	Combination
41	CB5-52 TO MH5-24	7.10	18	Cir	22.434	474.12	474.57	2.006	474.82	475.60	n/a	475.60	24	Combination
42	CB5-53 TO CB5-52	6.77	18	Cir	96.516	474.67	476.60	2.000	475.60	477.61	n/a	477.61	41	Combination
43	CB5-55 TO CB5-53	3.35	18	Cir	169.115	476.78	480.59	2.253	477.61	481.29	n/a	481.29 j	42	Combination
44	CB5-56 TO CB5-55	2.80	18	Cir	30.000	480.69	481.29	2.000	481.29	481.92	0.36	481.92	43	Combination
45	CB5-57 TO CB5-56	1.43	18	Cir	129.245	481.39	484.94	2.747	481.92	485.39	n/a	485.39 j	44	Combination
46	CB5-58 TO CB5-57	0.56	18	Cir	30.000	485.04	485.34	1.000	485.39	485.62	n/a	485.62 j	45	Combination
47	MH5-29 TO MH5-27	73.18	42	Cir	20.949	482.79	483.00	1.002	484.89	485.68	1.34	485.68	27	Manhole
48	CB5-54 TO CB5-53	2.97	18	Cir	30.000	476.70	477.00	1.000	477.61	477.65	n/a	477.65 j	42	Combination

Project File: STRM-NTWK-05-50-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES: Return period = 50 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
49	CB5-51 TO MH5-24	22.82	24	Cir	10.000	474.90	475.00	1.000	476.43	476.70	n/a	476.70	24	Combination
50	CB5-50 TO MH5-22	8.79	18	Cir	8.551	472.41	472.50	1.052	473.38	473.65	0.57	473.65	22	Combination
51	CB5-49 TO MH5-22	0.82	18	Cir	23.300	472.27	472.50	0.987	472.54	472.84	n/a	472.84	22	Combination
52	CB5-41 TO MH5-18	0.86	18	Cir	33.617	471.03	471.20	0.506	471.36	471.55	0.18	471.55	18	Combination
53	CB5-42 TO CB5-41	0.48	18	Cir	40.000	471.30	471.50	0.500	471.55	471.76	0.09	471.76	52	Combination
54	MH5-28 TO MH5-27	79.65	48	Cir	44.054	469.56	470.00	0.999	473.15	472.70	n/a	472.70	27	Manhole
55	CB5-48 TO MH5-21	0.43	18	Cir	20.000	470.30	470.50	1.000	470.50	470.74	n/a	470.74	21	Combination
56	CB5-43 TO MH5-19	1.00	18	Cir	11.944	470.13	470.25	1.005	470.43	470.62	0.13	470.62	19	Combination
57	CB5-44 TO MH5-19	0.86	18	Cir	21.944	470.03	470.25	1.003	470.31	470.60	0.12	470.60	19	Combination
58	CB5-46 TO MH5-20	32.75	36	Cir	20.000	466.10	466.50	2.000	467.27	468.36	0.40	468.36	20	Combination
59	HW5-5 TO CB5-46	31.99	36	Cir	10.004	468.00	468.50	4.998	468.91	470.33	n/a	470.33	58	OpenHeadwall
60	CB5-45 TO MH5-20	1.27	18	Cir	10.000	468.40	468.50	1.000	468.74	468.92	0.15	468.92	20	Combination
61	CB5-47 TO MH5-21	33.17	36	Cir	10.000	465.65	465.75	1.000	467.08	467.62	n/a	467.62	21	Combination
62	MH5-30 TO CB5-47	32.77	36	Cir	15.000	465.85	466.00	1.000	467.62	467.86	n/a	467.86	61	Manhole
63	MH5-9 TO MH5-34	75.51	42	Cir	52.136	444.31	444.83	0.997	446.46	447.55	1.38	447.55	9	Manhole
64	MH5-53 TO MH5-34	66.93	36	Cir	53.514	445.00	445.80	1.495	447.55	448.41	1.63	448.41	63	Manhole
65	MH5-35 TO MH5-53	61.53	36	Cir	91.065	446.63	448.00	1.500	448.47	450.53	n/a	450.53	64	Manhole
66	MH5-36 TO MH5-35	60.90	36	Cir	186.792	448.87	450.74	1.001	450.98	453.26	n/a	453.26	65	Manhole
67	MH5-37 TO MH5-36	61.05	36	Cir	70.000	450.84	451.54	1.000	453.26	454.06	n/a	454.06	66	Manhole
68	MH5-39 TO MH5-37	40.26	36	Cir	170.066	454.37	457.77	1.999	455.68	459.83	n/a	459.83	67	Manhole
69	MH5-40 TO MH5-39	39.68	36	Cir	174.174	457.97	461.45	1.998	459.83	463.50	n/a	463.50	68	Manhole
70	OCS5-7 TO MH5-40	4.26	18	Cir	67.311	465.83	466.50	0.995	466.47	467.29	0.32	467.29	69	Grate
71	MH5-41 TO MH5-40	35.56	36	Cir	45.000	461.55	462.00	1.000	463.50	463.94	n/a	463.94 j	69	Manhole
72	CB5-15 TO MH5-39	1.23	18	Cir	15.000	460.10	460.25	1.000	460.43	460.66	n/a	460.66	68	Combination

Project File: STRM-NTWK-05-50-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES: Return period = 50 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
73	MH5-35 TO OCS5-1	1.00	18	Cir	38.184	456.62	457.00	0.995	456.92	457.37	0.13	457.37	65	None
74	MH5-42 TO MH5-37	21.13	30	Cir	92.998	451.64	452.10	0.500	454.06	453.66	0.67	453.66	67	Manhole
75	MH5-43 TO MH5-42	6.88	18	Cir	40.157	452.74	453.14	1.000	453.66	454.16	n/a	454.16	74	Manhole
76	OCS5-6 TO MH5-43	1.18	18	Cir	20.057	453.90	454.00	0.499	454.29	454.41	n/a	454.41	75	Grate
77	OCS5-2 TO MH5-43	5.70	18	Cir	18.349	453.32	453.50	0.981	454.16	454.42	0.39	454.42	75	Manhole
78	CB5-94 TO MH5-15	1.66	18	Cir	20.166	453.30	453.50	0.992	453.69	453.98	0.18	453.98	15	Grate
79	CB5-71 TO MH5-53	6.23	24	Cir	133.392	447.88	448.55	0.502	448.71	449.43	0.76	449.43	64	Grate
80	CD5-3 TO CB5-71 6	0.37	8	Cir	59.990	450.94	452.29	2.250	451.14	452.57	n/a	452.57	79	None
81	CD5-3 TO CB5-71 5	0.22	8	Cir	26.867	452.29	452.42	0.484	452.57	452.64	0.06	452.70	80	None
82	CD5-3 TO CB5-71 4	0.22	8	Cir	11.071	452.42	452.48	0.542	452.70	452.70	0.05	452.76	81	None
83	CD5-3 TO CB5-71 3	0.23	8	Cir	34.788	452.48	452.65	0.489	452.76	452.87	0.06	452.93	82	None
84	CD5-3 TO CB5-71 2	0.08	8	Cir	80.821	452.65	453.06	0.507	452.93	453.19	0.03	453.19	83	None
85	CD5-3 TO CB5-71 1	0.08	8	Cir	4.773	453.06	453.08	0.419	453.20	453.22	0.04	453.25	84	None
86	OCS5-1 TO MH5-42	14.25	24	Cir	26.226	452.24	452.50	0.991	453.66	453.86	n/a	453.86 j	74	Manhole
87	CD5-2 2	0.16	8	Cir	5.657	452.65	452.71	1.061	452.93	452.89	n/a	452.89	83	None
88	CD5-2 1	0.16	8	Cir	5.300	452.71	452.76	0.944	452.89	452.94	n/a	452.94	87	None
89	CD5-1	0.16	8	Cir	1.125	452.29	452.31	1.777	452.57	452.49	n/a	452.49	80	None
90	CB5-93 TO MH5-15	0.10	18	Cir	34.982	450.95	452.00	3.002	451.03	452.11	0.04	452.11	15	Grate
91	CB5-72 TO CB5-71	3.77	18	Cir	60.284	449.19	449.79	0.995	449.79	450.53	n/a	450.53	79	Grate
92	CB5-73 TO CB5-72	0.72	18	Cir	74.716	449.89	451.76	2.503	450.53	452.08	n/a	452.08 j	91	Combination
93	CB5-74 TO CB5-71	1.31	18	Cir	45.000	449.00	449.22	0.489	449.43	449.65	n/a	449.65	79	Combination
94	CB5-75 TO CB5-74	0.89	18	Cir	35.475	449.32	449.50	0.507	449.66	449.85	n/a	449.85	93	Combination
95	CB5-76 TO MH5-10	1.97	18	Cir	19.445	448.39	448.58	0.977	448.81	449.11	n/a	449.11	10	Combination
96	CB5-77 TO CB5-76	1.68	18	Cir	43.097	448.68	448.90	0.510	449.14	449.39	n/a	449.39	95	Combination

Project File: STRM-NTWK-05-50-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES: Return period = 50 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
97	CB5-78 TO CB5-77	0.36	18	Cir	100.903	449.00	449.50	0.496	449.39	449.72	0.08	449.72	96	Combination
98	CB5-3 TO MH5-34	4.30	18	Cir	52.702	445.83	446.09	0.493	447.55	447.59	0.11	447.70	63	Combination
99	CB5-4 TO CB5-3	3.06	18	Cir	92.115	446.26	446.72	0.499	447.70	447.38	0.26	447.38	98	Combination
100	CB5-5 TO CB5-4	0.68	18	Cir	70.906	448.65	449.00	0.494	448.95	449.31	0.11	449.31	99	Combination
101	CB5-6 TO MH5-34	5.99	18	Cir	36.193	446.54	446.72	0.497	447.55	447.68	0.53	448.21	63	Combination
102	MH5-45 TO CB5-6	3.09	18	Cir	73.953	446.89	447.26	0.500	448.21	447.93	0.23	447.93	101	Manhole
103	CB5-7 TO MH5-45	3.17	18	Cir	149.233	447.43	448.18	0.503	448.08	448.86	n/a	448.86	102	Combination
104	OCS5-3 TO MH5-12	5.86	18	Cir	34.234	447.16	447.50	0.993	447.93	448.43	0.40	448.43	12	Manhole
105	CB5-1 TO MH5-8	3.24	18	Cir	108.000	440.74	442.90	2.000	441.20	443.59	n/a	443.59	8	Combination
106	CB5-20 TO MH5-11	3.17	18	Cir	16.837	445.16	445.50	2.019	445.61	446.18	n/a	446.18	11	Combination
107	MH5-8A TO MH5-8	3.25	18	Cir	66.000	443.55	444.21	1.000	444.10	444.90	n/a	444.90	8	Manhole
108	CB5-2 TO MH5-8A	3.35	18	Cir	187.000	445.63	447.50	1.000	446.19	448.20	n/a	448.20	107	Combination
109	MH5-46 TO MH5-11	22.04	36	Cir	188.089	433.45	434.39	0.500	438.22*	438.40*	0.15	438.55	11	Manhole
110	CB5-21 TO MH5-46	1.95	18	Cir	23.526	442.76	443.00	1.020	443.18	443.53	0.19	443.53	109	Combination
111	OCS5-4 TO MH5-12	7.52	24	Cir	23.855	441.26	441.50	1.006	442.02	442.47	0.38	442.47	12	Manhole
112	MH5-7 TO EX-CB	34.57	30	Cir	38.086	440.39	441.20	2.127	441.69	443.20	n/a	443.20	7	Grate
113	MH5-31 TO MH5-14	55.26	48	Cir	117.698	437.63	438.22	0.501	441.68	441.78	0.31	442.09	14	Manhole
114	MH5-32 TO MH5-31	55.66	48	Cir	72.596	438.32	438.68	0.496	442.09	440.92	0.14	440.92	113	Manhole
115	MH5-33 TO MH5-32	55.85	48	Cir	42.108	438.68	438.89	0.499	440.92	441.14	0.92	441.14	114	Manhole
116	CB5-22 TO MH5-46	9.77	30	Cir	95.823	434.89	435.37	0.501	438.55*	438.59*	0.04	438.63	109	Combination
117	MH5-51 TO CB5-22	9.73	30	Cir	119.492	435.47	436.07	0.502	438.63*	438.69*	0.06	438.75	116	Manhole
118	FES5-2 TO MH5-51	9.75	18	Cir	11.044	437.50	438.00	4.527	438.75	439.20	n/a	439.20 j	117	OpenHeadwall
119	CB5-18 TO FES5-5	2.84	18	Cir	14.051	469.00	469.07	0.498	469.62	469.71	0.18	469.71	End	Combination
120	CB5-19 TO CB5-18	1.79	14x23	Ell	43.701	469.07	469.29	0.503	469.95	469.80	0.09	469.80	119	Combination

Project File: STRM-NTWK-05-50-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES: Return period = 50 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
121	CB5-33 TO MH5-58	2.02	18	Cir	161.016	451.37	456.20	3.000	451.69	456.74	n/a	456.74	End	Combination
122	CB5-35 TO CB5-33	1.02	18	Cir	124.908	457.60	462.60	4.003	457.82	462.98	n/a	462.98	121	Combination
123	CB5-36 TO CB5-35	0.58	18	Cir	30.000	462.70	463.00	1.000	462.98	463.28	0.10	463.28	122	Combination
124	CB5-34 TO CB5-33	0.52	18	Cir	30.000	457.60	457.90	1.000	457.82	458.17	n/a	458.17	121	Combination
125	CB5-8 TO MH5-44	13.10	24	Cir	26.751	455.88	456.15	1.009	456.92	457.45	0.28	457.45	End	Combination
126	CB5-9 TO CB5-8	12.59	24	Cir	40.000	456.25	456.45	0.500	457.52	457.73	n/a	457.73	125	Combination
127	CB5-10 TO CB5-9	10.53	24	Cir	57.813	456.55	456.84	0.502	457.73	458.00	n/a	458.00 j	126	Combination
128	CB5-11 TO CB5-10	9.19	24	Cir	30.034	456.94	457.09	0.499	458.00	458.17	n/a	458.17	127	Combination
129	CB5-14 TO MH5-38	6.77	24	Cir	56.444	457.19	457.47	0.496	458.17	458.39	n/a	458.39 j	128	Combination
130	CB5-16 TO MH5-39	3.90	18	Cir	117.308	457.57	460.21	2.250	458.39	460.97	n/a	460.97 j	129	Combination
131	CB5-17 TO CB5-16	2.12	18	Cir	109.764	460.31	464.15	3.498	460.97	464.70	n/a	464.70 j	130	Combination
132	CB5-13 TO FES5-4	0.84	18	Cir	25.654	457.00	457.50	1.949	457.23	457.84	n/a	457.84	End	Combination
133	CB5-96 TO CB5-95	1.17	18	Cir	122.513	454.14	454.75	0.498	454.53	455.15	0.14	455.15	End	Grate
134	CB5-97 TO MH5-61	1.61	18	Cir	40.587	453.95	454.25	0.739	454.36	454.73	0.17	454.73	End	Grate
135	CB5-37 TO MH5-60	1.57	18	Cir	88.639	448.07	448.96	1.004	448.45	449.43	0.18	449.43	End	Combination
136	CB5-38 TO CB5-37	0.75	18	Cir	30.003	452.85	453.00	0.500	453.16	453.32	0.11	453.32	135	Combination
137	CB5-80 TO FES5-1	0.69	18	Cir	25.905	451.90	452.68	3.011	452.09	452.99	n/a	452.99	End	Combination
138	MH5-57 TO MH5-56	4.51	24	Cir	64.000	448.19	448.51	0.500	448.89	449.26	n/a	449.26	End	Manhole
139	RD5-3 TO MH5-57	1.27	18	Cir	35.482	450.32	450.50	0.507	450.72	450.92	0.15	450.92	138	None
140	CB5-81 TO MH5-57	3.26	18	Cir	40.000	448.61	448.81	0.500	449.28	449.50	0.13	449.50	138	Combination
141	OCS5-5 TO CB5-81	1.61	18	Cir	8.931	448.91	449.00	1.008	449.50	449.48	n/a	449.48 j	140	Grate
142	RD5-1 TO MH5-55	1.30	18	Cir	32.000	450.18	450.50	1.000	450.52	450.93	n/a	450.93	End	None
143	RD5-2 TO MH5-56	1.19	18	Cir	37.355	450.13	450.50	0.990	450.46	450.91	n/a	450.91	End	None
144	MH5-63 TO MH5-62	2.08	18	Cir	27.000	445.77	445.90	0.482	446.30	446.44	n/a	446.44	End	Manhole

Project File: STRM-NTWK-05-50-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES: Return period = 50 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
145	CB5-82 TO MH5-63	2.10	18	Cir	40.907	446.00	446.20	0.489	446.53	446.75	n/a	446.75	144	Combination
146	CB5-83 TO CB5-82	1.59	18	Cir	54.035	449.48	449.75	0.500	449.93	450.22	0.17	450.22	145	Combination
147	CB5-87 TO CB5-86	5.82	18	Cir	7.500	446.06	446.21	2.000	446.68	447.14	n/a	447.14	End	Combination
148	CB5-88 TO CB5-87	4.27	18	Cir	66.843	446.31	446.64	0.494	447.14	447.43	n/a	447.43 j	147	Combination
149	CB5-89 TO CB5-88	3.19	18	Cir	115.500	446.74	447.32	0.502	447.43	448.00	n/a	448.00	148	Combination
150	CB5-79 TO CB5-89	1.08	18	Cir	64.630	448.25	449.54	1.996	448.51	449.93	0.14	449.93	149	Combination
151	CB5-90 TO CB5-89	0.87	18	Cir	115.523	447.42	448.00	0.502	448.00	448.35	n/a	448.35 j	149	Combination
152	RD5-4 TO MH5-59	1.67	18	Cir	60.500	447.90	448.50	0.992	448.29	448.98	n/a	448.98	End	None
153	CB5-92 TO CB5-91	3.24	18	Cir	36.371	447.11	447.48	1.017	447.80	448.17	n/a	448.17 j	End	Combination

Project File: STRM-NTWK-05-50-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES: Return period = 50 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	20.440	0.00	102.4	0.00	0.00	84.46	0.0	18.3	5.3	496.5	649.9	18.01	72	2.01	398.80	399.21	404.41	404.87	407.80	417.34	HW5-1 TO MH5-1
2	1	30.000	0.00	102.4	0.00	0.00	84.46	0.0	18.3	5.3	496.7	649.0	21.63	72	2.00	404.71	405.31	408.64	410.97	417.34	448.00	MH5-1 TO MH5-2
3	2	53.039	18.82	102.4	0.89	16.75	84.46	10.0	18.3	5.3	497.2	648.7	21.63	72	2.00	410.81	411.87	414.75	417.53	448.00	448.50	MH5-2 TO MH5-3
4	3	260.000	0.00	83.58	0.00	0.00	67.71	0.0	18.0	5.3	411.3	459.8	16.88	72	1.00	416.87	419.48	421.30	424.86	448.50	450.90	MH5-3 TO MH5-4
5	4	96.972	5.17	83.58	0.79	4.08	67.71	10.0	17.9	5.3	412.3	458.9	15.53	72	1.00	419.58	420.55	424.86	425.94	450.90	452.33	MH5-4 TO MH5-5
6	5	216.121	0.00	78.41	0.00	0.00	63.63	0.0	17.7	5.4	392.7	458.7	14.88	72	1.00	420.65	422.81	425.94	428.11	452.33	454.60	MH5-5 TO MH5-6
7	6	238.559	0.00	78.41	0.00	0.00	63.63	0.0	17.4	5.4	395.1	459.3	15.06	72	1.00	422.91	425.30	428.11	430.61	454.60	458.32	MH5-6 TO MH5-7
8	7	182.000	0.00	72.06	0.00	0.00	58.55	6.0	17.2	5.4	369.5	458.9	14.21	72	1.00	425.40	427.22	430.61	432.40	458.32	455.11	MH5-7 TO MH5-8
9	8	130.000	0.00	71.18	0.00	0.00	57.73	0.0	17.0	5.5	366.4	458.9	14.26	72	1.00	427.32	428.62	432.40	433.78	455.11	455.41	MH5-8 TO MH5-9
10	9	299.601	0.00	62.65	0.00	0.00	50.15	0.0	16.7	5.5	301.5	364.1	13.48	66	1.00	428.72	431.72	433.78	436.49	455.41	452.61	MH5-10 TO MH5-
11	10	162.986	0.00	62.38	0.00	0.00	49.89	0.0	16.5	5.5	301.6	363.9	13.90	66	1.00	431.82	433.45	436.49	438.22	452.61	450.86	MH5-10 TO MH5-
12	11	203.182	0.00	60.03	0.00	0.00	47.98	0.0	16.2	5.6	281.0	363.7	13.10	66	1.00	433.55	435.58	438.22	440.22	450.86	453.95	MH5-11 TO MH5-
13	12	77.359	0.00	60.03	0.00	0.00	47.98	0.0	16.1	5.6	268.4	365.3	12.79	66	1.01	435.68	436.46	440.22	441.01	453.95	454.72	MH5-12 TO MH5-
14	13	56.863	0.00	60.03	0.00	0.00	47.98	0.0	16.0	5.6	268.9	364.3	12.93	66	1.00	436.56	437.13	441.01	441.68	454.72	455.99	MH5-14 TO MH5-
15	14	97.052	0.00	50.81	0.00	0.00	39.77	0.0	15.9	5.6	223.8	282.1	12.37	60	1.00	437.23	438.20	441.68	442.44	455.99	458.24	MH5-15 TO MH5-
16	15	74.996	0.00	50.45	0.00	0.00	39.55	0.0	15.8	5.6	223.1	282.2	14.26	60	1.00	442.25	443.00	445.60	447.23	458.24	464.15	MH5-16 TO MH5-
17	16	60.019	0.00	50.45	0.00	0.00	39.55	0.0	15.7	5.7	223.5	282.1	14.27	60	1.00	448.00	448.60	451.36	452.83	464.15	466.02	MH5-17 TO MH5-
18	17	230.753	0.00	50.45	0.00	0.00	39.55	0.0	15.5	5.7	225.3	282.3	14.32	60	1.00	453.60	455.91	456.98	460.16	466.02	474.92	MH5-18 TO MH5-
19	18	199.226	0.00	50.31	0.00	0.00	39.44	0.0	15.2	5.7	226.4	282.0	12.86	60	1.00	456.01	458.00	460.16	462.26	474.92	474.35	MH5-19 TO MH5-
20	19	135.000	0.00	50.01	0.00	0.00	39.21	0.0	15.0	5.8	226.2	282.2	12.84	60	1.00	458.10	459.45	462.26	463.70	474.35	472.74	MH5-20 TO MH5-
21	20	152.928	0.00	40.46	0.00	0.00	33.38	0.0	11.2	6.5	217.8	282.2	12.44	60	1.00	459.55	461.08	463.70	465.27	472.74	474.62	MH5-21 TO MH5-
22	21	128.398	0.00	34.92	0.00	0.00	28.45	0.0	11.0	6.6	186.7	212.7	12.48	54	1.00	461.18	462.46	465.27	466.40	474.62	476.48	MH5-22 TO MH5-

Project File: STRM-NTWK-05-50-YR-FULL-BUILD.stm

Number of lines: 153

Run Date: 2/22/2023

NOTES:Intensity = 65.86 / (Inlet time + 10.50) ^ 0.75; Return period =Yrs. 50 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
23	22	138.853	0.00	33.04	0.00	0.00	27.25	0.0	10.8	6.6	180.0	213.2	12.40	54	1.00	462.56	463.95	466.40	467.83	476.48	478.46	MH5-23 TO MH5-
24	23	56.993	0.00	33.04	0.00	0.00	27.25	0.0	10.8	6.6	180.5	213.1	12.50	54	1.00	464.05	464.62	467.83	468.51	478.46	479.43	MH5-24 TO MH5-
25	24	103.591	0.00	27.06	0.00	0.00	23.43	0.0	10.6	6.7	156.0	213.5	11.10	54	1.00	464.72	465.76	468.51	469.42	479.43	480.95	MH5-25 TO MH5-
26	25	279.546	0.00	27.06	0.00	0.00	23.43	0.0	10.2	6.8	158.3	213.2	11.56	54	1.00	465.86	468.66	469.42	472.34	480.95	488.70	MH5-26 TO MH5-
27	26	69.589	0.00	27.06	0.00	0.00	23.43	0.0	10.1	6.8	158.9	213.7	11.56	54	1.01	468.76	469.46	472.34	473.15	488.70	490.69	MH5-27 TO MH5-
28	27	102.551	0.05	1.11	0.91	0.05	0.97	6.0	9.1	7.0	6.83	19.72	7.76	18	3.00	486.67	489.75	487.28	490.76	490.69	493.77	CB5-59 TO MH5-
29	28	111.289	0.05	0.99	0.91	0.05	0.86	6.0	8.8	7.1	6.13	25.43	5.63	18	5.00	489.93	495.49	490.76	496.45	493.77	499.49	CB5-61 TO CB5-5
30	29	108.480	0.00	0.88	0.00	0.00	0.76	0.0	8.5	7.2	5.47	16.09	6.30	18	2.00	495.81	497.98	496.45	498.88	499.49	506.05	MH5-38 TO CB5-
31	30	6.682	0.08	0.88	0.92	0.07	0.76	6.0	8.5	7.2	5.47	15.87	5.32	18	1.95	498.08	498.21	498.88	499.11	506.05	505.74	CB5-63 TO MH5-
32	31	145.419	0.23	0.71	0.84	0.19	0.60	6.0	8.0	7.4	4.43	11.36	4.59	18	1.00	498.31	499.76	499.11	500.57	505.74	508.61	CB5-65 TO CB5-6
33	32	39.874	0.05	0.48	0.93	0.05	0.41	6.0	7.8	7.4	3.02	11.39	3.86	18	1.00	499.86	500.26	500.57	500.92	508.61	508.61	CB5-66 TO CB5-6
34	33	94.795	0.03	0.43	0.94	0.03	0.36	6.0	7.4	7.5	2.72	8.10	4.02	18	0.51	500.36	500.84	500.96	501.47	508.61	510.01	CB5-67 TO CB5-6
35	34	40.000	0.07	0.40	0.77	0.05	0.33	6.0	7.2	7.6	2.53	8.04	3.92	18	0.50	500.94	501.14	501.52	501.74	510.01	510.01	CB5-68 TO CB5-6
36	35	210.926	0.22	0.33	0.80	0.18	0.28	6.0	6.3	7.9	2.21	8.03	3.77	18	0.50	503.14	504.19	503.68	504.75	510.01	508.12	CB5-69 TO CB5-6
37	36	41.272	0.11	0.11	0.94	0.10	0.10	6.0	6.0	8.0	0.83	8.11	2.28	18	0.51	504.29	504.50	504.75	504.84	508.12	507.86	CB5-70 TO CB5-6
38	31	30.002	0.09	0.09	0.94	0.08	0.08	6.0	6.0	8.0	0.68	8.04	2.70	18	0.50	501.85	502.00	502.14	502.31	505.74	505.71	CB5-64 TO CB5-6
39	29	30.000	0.06	0.06	0.93	0.06	0.06	6.0	6.0	8.0	0.45	8.04	1.52	18	0.50	495.85	496.00	496.45	496.25	499.49	499.49	CB5-62 TO CB5-6
40	28	30.000	0.07	0.07	0.93	0.07	0.07	6.0	6.0	8.0	0.52	8.04	1.46	18	0.50	489.85	490.00	490.76	490.27	493.77	493.81	CB5-60 TO CB5-5
41	24	22.434	0.06	1.31	0.93	0.06	0.97	6.0	8.1	7.3	7.10	16.11	7.15	18	2.01	474.12	474.57	474.82	475.60	479.43	479.38	CB5-52 TO MH5-
42	41	96.516	0.12	1.25	0.88	0.11	0.92	6.0	7.9	7.4	6.77	16.09	5.62	18	2.00	474.67	476.60	475.60	477.61	479.38	480.87	CB5-53 TO CB5-5
43	42	169.115	0.08	0.56	0.93	0.07	0.44	6.0	7.1	7.6	3.35	17.08	3.76	18	2.25	476.78	480.59	477.61	481.29	480.87	485.36	CB5-55 TO CB5-5
44	43	30.000	0.27	0.48	0.68	0.18	0.36	6.0	7.0	7.7	2.80	16.09	4.10	18	2.00	480.69	481.29	481.29	481.92	485.36	485.36	CB5-56 TO CB5-5

Project File: STRM-NTWK-05-50-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES:Intensity = 65.86 / (Inlet time + 10.50) ^ 0.75; Return period =Yrs. 50 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
45	44	129.245	0.12	0.21	0.93	0.11	0.18	6.0	6.2	7.9	1.43	18.85	2.88	18	2.75	481.39	484.94	481.92	485.39	485.36	489.32	CB5-57 TO CB5-5
46	45	30.000	0.09	0.09	0.77	0.07	0.07	6.0	6.0	8.0	0.56	11.38	2.13	18	1.00	485.04	485.34	485.39	485.62	489.32	489.34	CB5-58 TO CB5-5
47	27	20.949	12.65	12.65	0.85	10.75	10.75	10.0	10.0	6.8	73.18	109.1	10.71	42	1.00	482.79	483.00	484.89	485.68	490.69	492.44	MH5-29 TO MH5-
48	42	30.000	0.57	0.57	0.65	0.37	0.37	6.0	6.0	8.0	2.97	11.38	3.33	18	1.00	476.70	477.00	477.61	477.65	480.87	480.88	CB5-54 TO CB5-5
49	24	10.000	4.67	4.67	0.61	2.85	2.85	6.0	6.0	8.0	22.82	24.50	8.44	24	1.00	474.90	475.00	476.43	476.70	479.43	479.23	CB5-51 TO MH5-
50	22	8.551	1.77	1.77	0.62	1.10	1.10	6.0	6.0	8.0	8.79	11.67	6.66	18	1.05	472.41	472.50	473.38	473.65	476.48	476.43	CB5-50 TO MH5-
51	22	23.300	0.11	0.11	0.93	0.10	0.10	6.0	6.0	8.0	0.82	11.30	3.24	18	0.99	472.27	472.50	472.54	472.84	476.48	476.41	CB5-49 TO MH5-
52	18	33.617	0.06	0.14	0.82	0.05	0.11	6.0	6.3	7.9	0.86	8.09	2.89	18	0.51	471.03	471.20	471.36	471.55	474.92	475.10	CB5-41 TO MH5-
53	52	40.000	0.08	0.08	0.75	0.06	0.06	6.0	6.0	8.0	0.48	8.04	2.45	18	0.50	471.30	471.50	471.55	471.76	475.10	475.10	CB5-42 TO CB5-4
54	27	44.054	13.30	13.30	0.88	11.70	11.70	10.0	10.0	6.8	79.65	155.5	7.76	48	1.00	469.56	470.00	473.15	472.70	490.69	490.01	MH5-28 TO MH5-
55	21	20.000	0.06	0.06	0.90	0.05	0.05	6.0	6.0	8.0	0.43	11.38	2.71	18	1.00	470.30	470.50	470.50	470.74	474.62	474.42	CB5-48 TO MH5-
56	19	11.944	0.16	0.16	0.78	0.12	0.12	6.0	6.0	8.0	1.00	11.40	3.44	18	1.00	470.13	470.25	470.43	470.62	474.35	474.11	CB5-43 TO MH5-
57	19	21.944	0.14	0.14	0.77	0.11	0.11	6.0	6.0	8.0	0.86	11.39	3.30	18	1.00	470.03	470.25	470.31	470.60	474.35	474.11	CB5-44 TO MH5-
58	20	20.000	0.15	9.38	0.89	0.13	5.67	6.0	15.0	5.8	32.75	102.2	10.00	36	2.00	466.10	466.50	467.27	468.36	472.74	472.54	CB5-46 TO MH5-
59	58	10.004	9.23	9.23	0.60	5.54	5.54	15.0	15.0	5.8	31.99	161.5	12.42	36	5.00	468.00	468.50	468.91	470.33	472.54	473.00	HW5-5 TO CB5-4
60	20	10.000	0.17	0.17	0.93	0.16	0.16	6.0	6.0	8.0	1.27	11.38	3.68	18	1.00	468.40	468.50	468.74	468.92	472.74	472.54	CB5-45 TO MH5-
61	21	10.000	0.07	5.48	0.93	0.07	4.88	6.0	10.0	6.8	33.17	72.25	8.59	36	1.00	465.65	465.75	467.08	467.62	474.62	474.42	CB5-47 TO MH5-
62	61	15.000	5.41	5.41	0.89	4.81	4.81	10.0	10.0	6.8	32.77	72.25	7.35	36	1.00	465.85	466.00	467.62	467.86	474.42	475.88	MH5-30 TO CB5-
63	9	52.136	0.00	8.53	0.00	0.00	7.57	0.0	11.4	6.5	75.51	108.8	10.82	42	1.00	444.31	444.83	446.46	447.55	455.41	456.08	MH5-9 TO MH5-3
64	63	53.514	0.00	7.03	0.00	0.00	6.23	0.0	11.3	6.5	66.93	88.34	10.35	36	1.49	445.00	445.80	447.55	448.41	456.08	457.38	MH5-53 TO MH5-
65	64	91.065	0.00	6.03	0.00	0.00	5.38	6.0	11.1	6.5	61.53	88.49	11.61	36	1.50	446.63	448.00	448.47	450.53	457.38	460.34	MH5-35 TO MH5-
66	65	186.792	0.00	6.03	0.00	0.00	5.38	0.0	10.8	6.6	60.90	72.29	10.54	36	1.00	448.87	450.74	450.98	453.26	460.34	461.74	MH5-36 TO MH5-

Project File: STRM-NTWK-05-50-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES:Intensity = 65.86 / (Inlet time + 10.50) ^ 0.75; Return period =Yrs. 50 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
67	66	70.000	0.00	6.03	0.00	0.00	5.38	0.0	10.7	6.6	61.05	72.25	9.82	36	1.00	450.84	451.54	453.26	454.06	461.74	462.71	MH5-37 TO MH5-
68	67	170.066	0.00	6.03	0.00	0.00	5.38	0.0	10.5	6.7	40.26	102.2	10.68	36	2.00	454.37	457.77	455.68	459.83	462.71	464.34	MH5-39 TO MH5-
69	68	174.174	0.00	5.87	0.00	0.00	5.22	0.0	10.1	6.8	39.68	102.1	8.16	36	2.00	457.97	461.45	459.83	463.50	464.34	470.85	MH5-40 TO MH5-
70	69	67.311	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	4.26	11.35	5.24	18	1.00	465.83	466.50	466.47	467.29	470.85	471.00	OCS5-7 TO MH5-
71	69	45.000	5.87	5.87	0.89	5.22	5.22	10.0	10.0	6.8	35.56	72.25	7.34	36	1.00	461.55	462.00	463.50	463.94	470.85	472.40	MH5-41 TO MH5-
72	68	15.000	0.16	0.16	0.96	0.15	0.15	6.0	6.0	8.0	1.23	11.38	3.65	18	1.00	460.10	460.25	460.43	460.66	464.34	464.04	CB5-15 TO MH5-
73	65	38.184	0.00	0.00	0.00	0.00	0.00	6.0	6.0	0.0	1.00	11.35	3.44	18	1.00	456.62	457.00	456.92	457.37	460.34	0.00	MH5-35 TO OCS5
74	67	92.998	0.00	0.00	0.00	0.00	0.00	6.0	6.1	0.0	21.13	31.42	5.45	30	0.50	451.64	452.10	454.06	453.66	462.71	459.43	MH5-42 TO MH5-
75	74	40.157	0.00	0.00	0.00	0.00	0.00	6.0	6.0	0.0	6.88	11.38	5.74	18	1.00	452.74	453.14	453.66	454.16	459.43	459.48	MH5-43 TO MH5-
76	75	20.057	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	1.18	8.03	3.15	18	0.50	453.90	454.00	454.29	454.41	459.48	458.00	OCS5-6 TO MH5-
77	75	18.349	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	5.70	11.27	5.32	18	0.98	453.32	453.50	454.16	454.42	459.48	459.06	OCS5-2 TO MH5-
78	15	20.166	0.34	0.34	0.61	0.21	0.21	6.0	6.0	8.0	1.66	11.33	3.97	18	0.99	453.30	453.50	453.69	453.98	458.24	457.88	CB5-94 TO MH5-
79	64	133.392	0.17	1.00	0.90	0.15	0.85	6.0	8.2	7.3	6.23	17.37	4.86	24	0.50	447.88	448.55	448.71	449.43	457.38	453.62	CB5-71 TO MH5-
80	79	59.990	0.00	0.05	0.00	0.00	0.05	0.0	7.9	7.4	0.37	1.96	3.46	8	2.25	450.94	452.29	451.14	452.57	453.62	455.08	CD5-3 TO CB5-71
81	80	26.867	0.00	0.03	0.00	0.00	0.03	0.0	7.6	7.5	0.22	0.91	1.91	8	0.48	452.29	452.42	452.57	452.64	455.08	455.00	CD5-3 TO CB5-71
82	81	11.071	0.00	0.03	0.00	0.00	0.03	0.0	7.5	7.5	0.22	0.96	1.89	8	0.54	452.42	452.48	452.70	452.70	455.00	455.00	CD5-3 TO CB5-71
83	82	34.788	0.00	0.03	0.00	0.00	0.03	0.0	7.2	7.6	0.23	0.91	1.94	8	0.49	452.48	452.65	452.76	452.87	455.00	455.08	CD5-3 TO CB5-71
84	83	80.821	0.00	0.01	0.00	0.00	0.01	0.0	6.1	8.0	0.08	0.93	1.13	8	0.51	452.65	453.06	452.93	453.19	455.08	455.08	CD5-3 TO CB5-71
85	84	4.773	0.01	0.01	0.99	0.01	0.01	6.0	6.0	8.0	0.08	0.85	1.52	8	0.42	453.06	453.08	453.20	453.22	455.08	455.10	CD5-3 TO CB5-71
86	74	26.226	0.00	0.00	0.00	0.00	0.00	6.0	6.0	0.0	14.25	24.40	6.12	24	0.99	452.24	452.50	453.66	453.86	459.43	458.84	OCS5-1 TO MH5-
87	83	5.657	0.00	0.02	0.00	0.00	0.02	0.0	6.0	8.0	0.16	1.35	1.60	8	1.06	452.65	452.71	452.93	452.89	455.08	455.12	CD5-2 2
88	87	5.300	0.02	0.02	0.99	0.02	0.02	6.0	6.0	8.0	0.16	1.27	2.05	8	0.94	452.71	452.76	452.89	452.94	455.12	455.20	CD5-2 1

Project File: STRM-NTWK-05-50-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES:Intensity = 65.86 / (Inlet time + 10.50) ^ 0.75; Return period =Yrs. 50 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
89	80	1.125	0.02	0.02	0.99	0.02	0.02	6.0	6.0	8.0	0.16	1.74	1.59	8	1.78	452.29	452.31	452.57	452.49	455.08	455.09	CD5-1
90	15	34.982	0.02	0.02	0.61	0.01	0.01	6.0	6.0	8.0	0.10	19.71	2.23	18	3.00	450.95	452.00	451.03	452.11	458.24	458.99	CB5-93 TO MH5-
91	79	60.284	0.46	0.58	0.86	0.40	0.49	6.0	6.7	7.8	3.77	11.35	5.05	18	1.00	449.19	449.79	449.79	450.53	453.62	453.40	CB5-72 TO CB5-7
92	91	74.716	0.12	0.12	0.75	0.09	0.09	6.0	6.0	8.0	0.72	18.00	1.83	18	2.50	449.89	451.76	450.53	452.08	453.40	455.24	CB5-73 TO CB5-7
93	79	45.000	0.06	0.20	0.91	0.05	0.17	6.0	6.2	7.9	1.31	7.95	3.13	18	0.49	449.00	449.22	449.43	449.65	453.62	453.60	CB5-74 TO CB5-7
94	93	35.475	0.14	0.14	0.79	0.11	0.11	6.0	6.0	8.0	0.89	8.10	2.92	18	0.51	449.32	449.50	449.66	449.85	453.60	453.16	CB5-75 TO CB5-7
95	10	19.445	0.04	0.27	0.98	0.04	0.26	6.0	7.2	7.6	1.97	11.24	4.16	18	0.98	448.39	448.58	448.81	449.11	452.61	453.66	CB5-76 TO MH5-
96	95	43.097	0.18	0.23	0.97	0.17	0.22	6.0	7.0	7.7	1.68	8.13	3.50	18	0.51	448.68	448.90	449.14	449.39	453.66	453.25	CB5-77 TO CB5-7
97	96	100.903	0.05	0.05	0.91	0.05	0.05	6.0	6.0	8.0	0.36	8.01	1.62	18	0.50	449.00	449.50	449.39	449.72	453.25	453.38	CB5-78 TO CB5-7
98	63	52.702	0.18	0.58	0.95	0.17	0.56	6.0	7.0	7.7	4.30	7.99	2.43	18	0.49	445.83	446.09	447.55	447.59	456.08	455.51	CB5-3 TO MH5-3
99	98	92.115	0.31	0.40	0.98	0.30	0.39	6.0	6.4	7.9	3.06	8.04	2.90	18	0.50	446.26	446.72	447.70	447.38	455.51	453.79	CB5-4 TO CB5-3
100	99	70.906	0.09	0.09	0.95	0.09	0.09	6.0	6.0	8.0	0.68	7.99	2.70	18	0.49	448.65	449.00	448.95	449.31	453.79	452.70	CB5-5 TO CB5-4
101	63	36.193	0.47	0.92	0.82	0.39	0.78	6.0	7.0	7.7	5.99	8.02	4.89	18	0.50	446.54	446.72	447.55	447.68	456.08	455.38	CB5-6 TO MH5-3
102	101	73.953	0.00	0.45	0.00	0.00	0.40	0.0	6.6	7.8	3.09	8.05	2.97	18	0.50	446.89	447.26	448.21	447.93	455.38	454.51	MH5-45 TO CB5-
103	102	149.233	0.45	0.45	0.88	0.40	0.40	6.0	6.0	8.0	3.17	8.06	4.19	18	0.50	447.43	448.18	448.08	448.86	454.51	451.68	CB5-7 TO MH5-4
104	12	34.234	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	5.86	11.34	5.77	18	0.99	447.16	447.50	447.93	448.43	453.95	453.95	OCS5-3 TO MH5-
105	8	108.000	0.44	0.44	0.92	0.40	0.40	6.0	6.0	8.0	3.24	16.09	5.62	18	2.00	440.74	442.90	441.20	443.59	455.11	453.90	CB5-1 TO MH5-8
106	11	16.837	0.46	0.46	0.86	0.40	0.40	6.0	6.0	8.0	3.17	16.17	5.59	18	2.02	445.16	445.50	445.61	446.18	450.86	449.17	CB5-20 TO MH5-
107	8	66.000	0.00	0.44	0.00	0.00	0.42	0.0	6.6	7.8	3.25	11.38	4.84	18	1.00	443.55	444.21	444.10	444.90	455.11	454.37	MH5-8A TO MH5-
108	107	187.000	0.44	0.44	0.95	0.42	0.42	6.0	6.0	8.0	3.35	11.38	4.88	18	1.00	445.63	447.50	446.19	448.20	454.37	451.08	CB5-2 TO MH5-8
109	11	188.089	0.00	1.89	0.00	0.00	1.52	10.5	10.5	6.7	22.04	51.08	3.12	36	0.50	433.45	434.39	438.22	438.40	450.86	449.06	MH5-46 TO MH5-
110	109	23.526	0.29	0.29	0.84	0.24	0.24	6.0	6.0	8.0	1.95	11.49	4.19	18	1.02	442.76	443.00	443.18	443.53	449.06	446.95	CB5-21 TO MH5-

Project File: STRM-NTWK-05-50-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES:Intensity = 65.86 / (Inlet time + 10.50) ^ 0.75; Return period =Yrs. 50 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
111	12	23.855	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	7.52	24.58	5.91	24	1.01	441.26	441.50	442.02	442.47	453.95	453.32	OCS5-4 TO MH5-
112	7	38.086	6.35	6.35	0.80	5.08	5.08	10.0	10.0	6.8	34.57	64.79	10.82	30	2.13	440.39	441.20	441.69	443.20	458.32	458.11	MH5-7 TO EX-CB
113	14	117.698	0.00	9.22	0.00	0.00	8.21	0.0	10.3	6.7	55.26	110.2	4.54	48	0.50	437.63	438.22	441.68	441.78	455.99	455.28	MH5-31 TO MH5-
114	113	72.596	0.00	9.22	0.00	0.00	8.21	0.0	10.1	6.8	55.66	109.6	6.11	48	0.50	438.32	438.68	442.09	440.92	455.28	458.06	MH5-32 TO MH5-
115	114	42.108	9.22	9.22	0.89	8.21	8.21	10.0	10.0	6.8	55.85	109.9	7.70	48	0.50	438.68	438.89	440.92	441.14	458.06	458.23	MH5-33 TO MH5-
116	109	95.823	0.06	1.60	0.99	0.06	1.28	6.0	7.0	7.7	9.77	31.44	1.99	30	0.50	434.89	435.37	438.55	438.59	449.06	452.24	CB5-22 TO MH5-
117	116	119.492	0.00	1.54	0.00	0.00	1.22	0.0	6.0	8.0	9.73	31.48	1.98	30	0.50	435.47	436.07	438.63	438.69	452.24	441.47	MH5-51 TO CB5-
118	117	11.044	1.54	1.54	0.79	1.22	1.22	6.0	6.0	8.0	9.75	24.21	6.30	18	4.53	437.50	438.00	438.75	439.20	441.47	441.00	FES5-2 TO MH5-
119	End	14.051	0.15	0.44	0.90	0.14	0.36	6.0	6.2	7.9	2.84	8.03	4.03	18	0.50	469.00	469.07	469.62	469.71	472.00	471.45	CB5-18 TO FES5-
120	119	43.701	0.29	0.29	0.77	0.22	0.22	6.0	6.0	8.0	1.79	7.84	2.93	14 x 23 e	0.50	469.07	469.29	469.95	469.80	471.45	471.52	CB5-19 TO CB5-1
121	End	161.016	0.07	0.28	0.94	0.07	0.26	6.0	6.6	7.8	2.02	19.70	5.37	18	3.00	451.37	456.20	451.69	456.74	455.35	461.79	CB5-33 TO MH5-
122	121	124.908	0.06	0.14	0.93	0.06	0.13	6.0	6.2	7.9	1.02	22.76	4.72	18	4.00	457.60	462.60	457.82	462.98	461.79	466.79	CB5-35 TO CB5-3
123	122	30.000	0.08	0.08	0.91	0.07	0.07	6.0	6.0	8.0	0.58	11.38	2.56	18	1.00	462.70	463.00	462.98	463.28	466.79	466.79	CB5-36 TO CB5-3
124	121	30.000	0.07	0.07	0.93	0.07	0.07	6.0	6.0	8.0	0.52	11.38	2.86	18	1.00	457.60	457.90	457.82	458.17	461.79	461.79	CB5-34 TO CB5-3
125	End	26.751	0.08	2.44	0.94	0.08	1.75	6.0	7.6	7.5	13.10	24.62	7.01	24	1.01	455.88	456.15	456.92	457.45	461.30	461.38	CB5-8 TO MH5-4
126	125	40.000	0.39	2.36	0.73	0.28	1.68	6.0	7.5	7.5	12.59	17.33	5.99	24	0.50	456.25	456.45	457.52	457.73	461.38	461.38	CB5-9 TO CB5-8
127	126	57.813	0.21	1.97	0.87	0.18	1.39	6.0	7.3	7.6	10.53	17.35	5.53	24	0.50	456.55	456.84	457.73	458.00	461.38	461.71	CB5-10 TO CB5-9
128	127	30.034	0.48	1.76	0.68	0.33	1.21	6.0	7.2	7.6	9.19	17.32	5.36	24	0.50	456.94	457.09	458.00	458.17	461.71	461.66	CB5-11 TO CB5-1
129	128	56.444	0.55	1.28	0.70	0.39	0.88	6.0	7.0	7.7	6.77	17.26	4.60	24	0.50	457.19	457.47	458.17	458.39	461.66	461.26	CB5-14 TO MH5-
130	129	117.308	0.34	0.73	0.69	0.23	0.50	6.0	6.6	7.8	3.90	17.07	4.16	18	2.25	457.57	460.21	458.39	460.97	461.26	464.04	CB5-16 TO MH5-
131	130	109.764	0.39	0.39	0.68	0.27	0.27	6.0	6.0	8.0	2.12	21.28	3.24	18	3.50	460.31	464.15	460.97	464.70	464.04	468.13	CB5-17 TO CB5-1
132	End	25.654	0.11	0.11	0.95	0.10	0.10	6.0	6.0	8.0	0.84	15.88	3.77	18	1.95	457.00	457.50	457.23	457.84	460.00	461.25	CB5-13 TO FES5-

Project File: STRM-NTWK-05-50-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES:Intensity = 65.86 / (Inlet time + 10.50) ^ 0.75; Return period =Yrs. 50 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
133	End	122.513	0.24	0.24	0.61	0.15	0.15	6.0	6.0	8.0	1.17	8.03	3.13	18	0.50	454.14	454.75	454.53	455.15	457.83	458.24	CB5-96 TO CB5-9
134	End	40.587	0.33	0.33	0.61	0.20	0.20	6.0	6.0	8.0	1.61	9.78	3.71	18	0.74	453.95	454.25	454.36	454.73	459.12	457.75	CB5-97 TO MH5-
135	End	88.639	0.11	0.21	0.95	0.10	0.20	6.0	6.2	7.9	1.57	11.40	3.89	18	1.00	448.07	448.96	448.45	449.43	454.45	457.24	CB5-37 TO MH5-
136	135	30.003	0.10	0.10	0.93	0.09	0.09	6.0	6.0	8.0	0.75	8.04	2.77	18	0.50	452.85	453.00	453.16	453.32	457.24	457.24	CB5-38 TO CB5-3
137	End	25.905	0.09	0.09	0.96	0.09	0.09	6.0	6.0	8.0	0.69	19.74	3.93	18	3.01	451.90	452.68	452.09	452.99	456.00	457.10	CB5-80 TO FES5-
138	End	64.000	0.00	0.38	0.00	0.00	0.37	0.0	6.2	7.9	4.51	17.33	4.41	24	0.50	448.19	448.51	448.89	449.26	454.81	453.97	MH5-57 TO MH5-
139	138	35.482	0.16	0.16	0.99	0.16	0.16	6.0	6.0	8.0	1.27	8.10	3.23	18	0.51	450.32	450.50	450.72	450.92	453.97	455.00	RD5-3 TO MH5-5
140	138	40.000	0.22	0.22	0.94	0.21	0.21	6.0	6.1	8.0	3.26	8.04	4.22	18	0.50	448.61	448.81	449.28	449.50	453.97	453.40	CB5-81 TO MH5-
141	140	8.931	0.00	0.00	0.00	0.00	0.00	6.0	6.0	0.0	1.61	11.42	2.92	18	1.01	448.91	449.00	449.50	449.48	453.40	452.90	OCS5-5 TO CB5-
142	End	32.000	0.16	0.16	0.99	0.16	0.16	6.0	6.0	8.0	1.30	11.38	3.71	18	1.00	450.18	450.50	450.52	450.93	453.82	452.26	RD5-1 TO MH5-5
143	End	37.355	0.15	0.15	0.99	0.15	0.15	6.0	6.0	8.0	1.19	11.32	3.60	18	0.99	450.13	450.50	450.46	450.91	454.81	455.00	RD5-2 TO MH5-5
144	End	27.000	0.00	0.30	0.00	0.00	0.27	0.0	6.4	7.9	2.08	7.89	3.66	18	0.48	445.77	445.90	446.30	446.44	454.91	455.73	MH5-63 TO MH5-
145	144	40.907	0.08	0.30	0.84	0.07	0.27	6.0	6.3	7.9	2.10	7.95	3.70	18	0.49	446.00	446.20	446.53	446.75	455.73	454.26	CB5-82 TO MH5-
146	145	54.035	0.22	0.22	0.90	0.20	0.20	6.0	6.0	8.0	1.59	8.04	3.43	18	0.50	449.48	449.75	449.93	450.22	454.26	453.59	CB5-83 TO CB5-8
147	End	7.500	0.22	0.81	0.97	0.21	0.78	6.0	7.6	7.5	5.82	16.09	6.71	18	2.00	446.06	446.21	446.68	447.14	452.35	452.10	CB5-87 TO CB5-8
148	147	66.843	0.16	0.59	0.95	0.15	0.57	6.0	7.4	7.5	4.27	7.99	4.38	18	0.49	446.31	446.64	447.14	447.43	452.10	452.30	CB5-88 TO CB5-8
149	148	115.500	0.18	0.43	0.95	0.17	0.41	6.0	6.9	7.7	3.19	8.06	4.05	18	0.50	446.74	447.32	447.43	448.00	452.30	451.75	CB5-89 TO CB5-8
150	149	64.630	0.14	0.14	0.96	0.13	0.13	6.0	6.0	8.0	1.08	16.07	4.07	18	2.00	448.25	449.54	448.51	449.93	451.75	453.14	CB5-79 TO CB5-8
151	149	115.523	0.11	0.11	0.99	0.11	0.11	6.0	6.0	8.0	0.87	8.06	2.10	18	0.50	447.42	448.00	448.00	448.35	451.75	451.83	CB5-90 TO CB5-8
152	End	60.500	0.21	0.21	0.99	0.21	0.21	6.0	6.0	8.0	1.67	11.33	3.97	18	0.99	447.90	448.50	448.29	448.98	452.38	453.50	RD5-4 TO MH5-5
153	End	36.371	0.45	0.45	0.90	0.41	0.41	6.0	6.0	8.0	3.24	11.47	4.11	18	1.02	447.11	447.48	447.80	448.17	451.92	451.14	CB5-92 TO CB5-9

Project File: STRM-NTWK-05-50-YR-FULL-BUILD.stm

Number of lines: 153

Run Date: 2/22/2023

NOTES:Intensity = 65.86 / (Inlet time + 10.50) ^ 0.75; Return period =Yrs. 50 ; c = cir e = ellip b = box

RIP-RAP APRON DESIGN

HW4-2

OUTLET PROTECTION WORKSHEET

PROJECT NAME: SMITHFIELD GATEWAY
PROJECT LOCATION: SMITHFIELD TOWNSHIP, MONROE COUNTY, PA
OUTLET: HW4-2
DONE BY: TEG **CHECKED:** TH **DATE:** 2/15/2023

PIPE DIAMETER (INCHES) d = 18 INCHES
SLOPE OF PIPE (FT/FT) S = 0.005
MANNINGS N VALUE, n = 0.012

DESIGN DISCHARGE (CFS): 2.8 CFS

FULL FLOW DISCHARGE (CFS):
D = Diameter (FT)
n = Mannings N
S = Slope of Pipe (FT/FT)

Q_f = 8.1 CFS

$$Q_f = \frac{0.464}{n} D^{8/3} S^{1/2}$$

FULL FLOW VELOCITY (FPS):
A = AREA (FT^2)

$V_f = Q_f / A$

V_f = 4.6 FPS

RATIO OF PART-FULL TO FULL-FLOW DISCHARGE: $d / D = Q / Q_f$ = 0.35

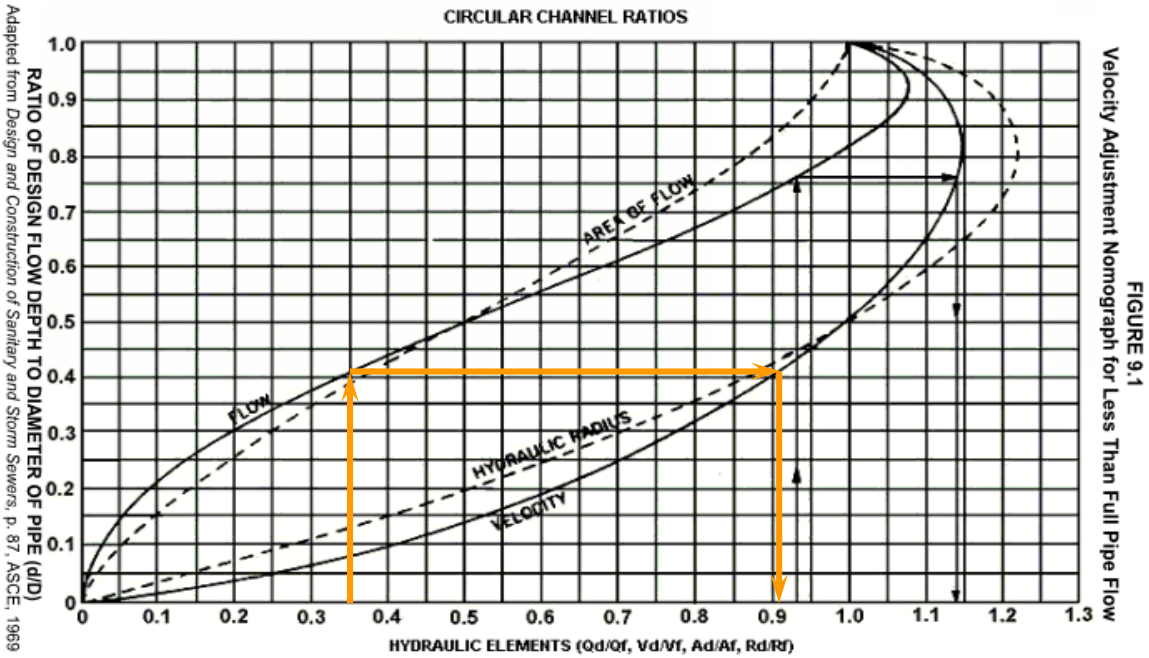
AREA OF FLOW RATIO: (FROM FIGURE 9.1) R_v = 0.91

DESIGN VELOCITY: $V_d = V_f \times R_v$ = 4.15 FPS

RIP RAP SIZE (FROM TABLE 6.6): R-2

Table 6.6

NSA No:	Vmax (fps)
R-1	2.5
R-2	4.5
R-3	6.5
R-4	9.0
R-5	11.5
R-6	13.0
R-7	14.5
R-8	17.0



Adapted from *Design and Construction of Sanitary and Storm Sewers*, p. 87, ASCE, 1969

FIGURE 9.1
Velocity Adjustment Nomograph for Less Than Full Pipe Flow

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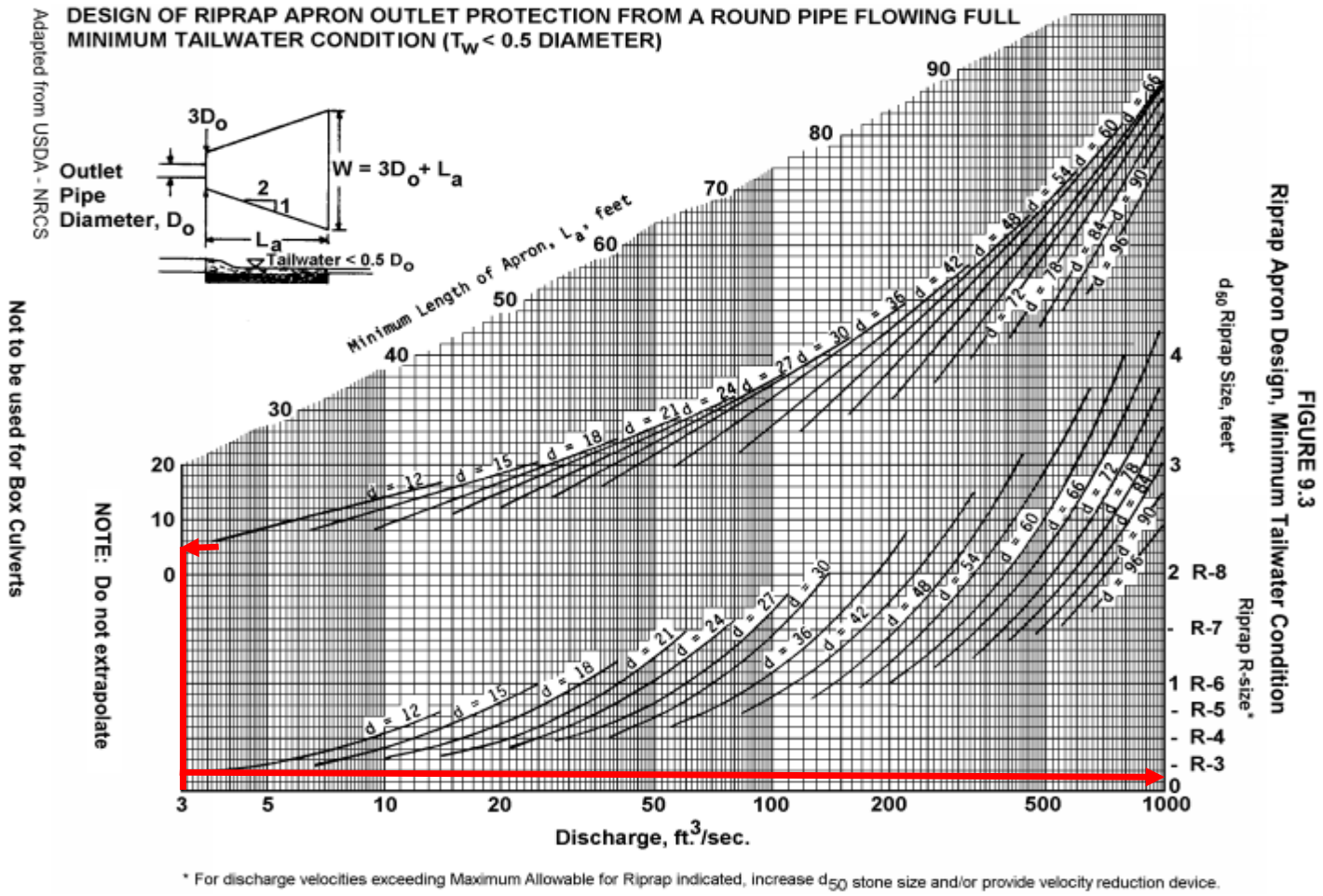
HW4-2

SMITHFIELD GATEWAY
SMITHFIELD TOWNSHIP, MONROE COUNTY, PA
100501401



$W = (3D_o + L_a)$		$Q =$	2.80	CFS	$D_o =$	1.5	FT
$W =$	10.5	$L_a =$	6	FT	Rip-Rap Size=	R-3	
Initial Pipe Size:	18	inch					
Equivalent Pipe Size:	12	inch					

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HW4-2

If Pipe Not Flowing Full:

Initial Pipe Size:	18	inch	
Flow Area:	1.77	sq ft	
Area of Flow Ratio:	0.35		*From Outlet Protection Sheet
Equivalent Flow Area:	0.619	sq ft	*Use Next Lowest
Equivalent Pipe Size:	12	inch	
Flow Area:	0.785	sq ft	

Table 14

K_p Values for Common Sizes of Pipe

Pipe Diameter (inch)	Flow Area (square feet)	Manning's Coefficient 0.015	0.025
6	0.196	0.105	0.2916
8	0.349	0.0715	0.1987
10	0.545	0.0531	0.1476
12	0.785	0.0417	0.1157
14	1.069	0.0339	0.0942
15	1.23	0.0309	0.0859
16	1.4	0.0284	0.0789
18	1.77	0.0243	0.0674
21	2.41	0.0198	0.0549
24	3.14	0.0165	0.0459
27	3.98	0.0141	0.0393
30	4.91	0.0123	0.0341
36	7.07	0.0096	0.0267
42	9.62	0.0078	0.0218
48	12.57	0.0066	0.0182
54	15.9	0.0056	0.0156
60	19.64	0.0049	0.0135

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HW4-3

OUTLET PROTECTION WORKSHEET

PROJECT NAME: SMITHFIELD GATEWAY
PROJECT LOCATION: SMITHFIELD TOWNSHIP, MONROE COUNTY, PA
OUTLET: HW4-3
DONE BY: TEG **CHECKED:** TH **DATE:** 2/15/2023

PIPE DIAMETER (INCHES) d = 24 INCHES
SLOPE OF PIPE (FT/FT) S = 0.005
MANNINGS N VALUE, n = 0.012

DESIGN DISCHARGE (CFS): 7.03 CFS

FULL FLOW DISCHARGE (CFS):
D = Diameter (FT)
n = Mannings N
S = Slope of Pipe (FT/FT)

Q_f = 17.4 CFS

$$Q_f = \frac{0.464}{n} D^{8/3} S^{1/2}$$

FULL FLOW VELOCITY (FPS):
A = AREA (FT^2)

$V_f = Q_f / A$

V_f = 5.5 FPS

RATIO OF PART-FULL TO FULL-FLOW DISCHARGE: d / D = Q / Q_f = 0.40

AREA OF FLOW RATIO: (FROM FIGURE 9.1) R_v = 0.93

DESIGN VELOCITY: $V_d = V_f \times R_v$ = 5.14 FPS

RIP RAP SIZE (FROM TABLE 6.6): R-3

Table 6.6	
NSA No:	Vmax (fps)
R-1	2.5
R-2	4.5
R-3	6.5
R-4	9.0
R-5	11.5
R-6	13.0
R-7	14.5
R-8	17.0

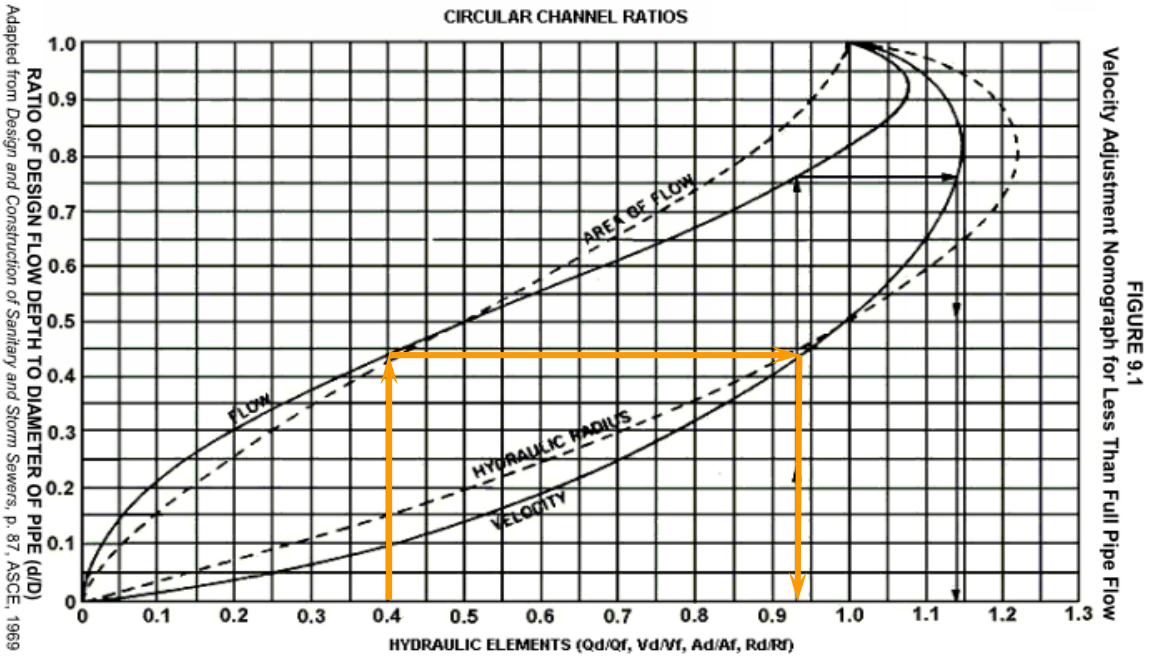

FIGURE 9.1

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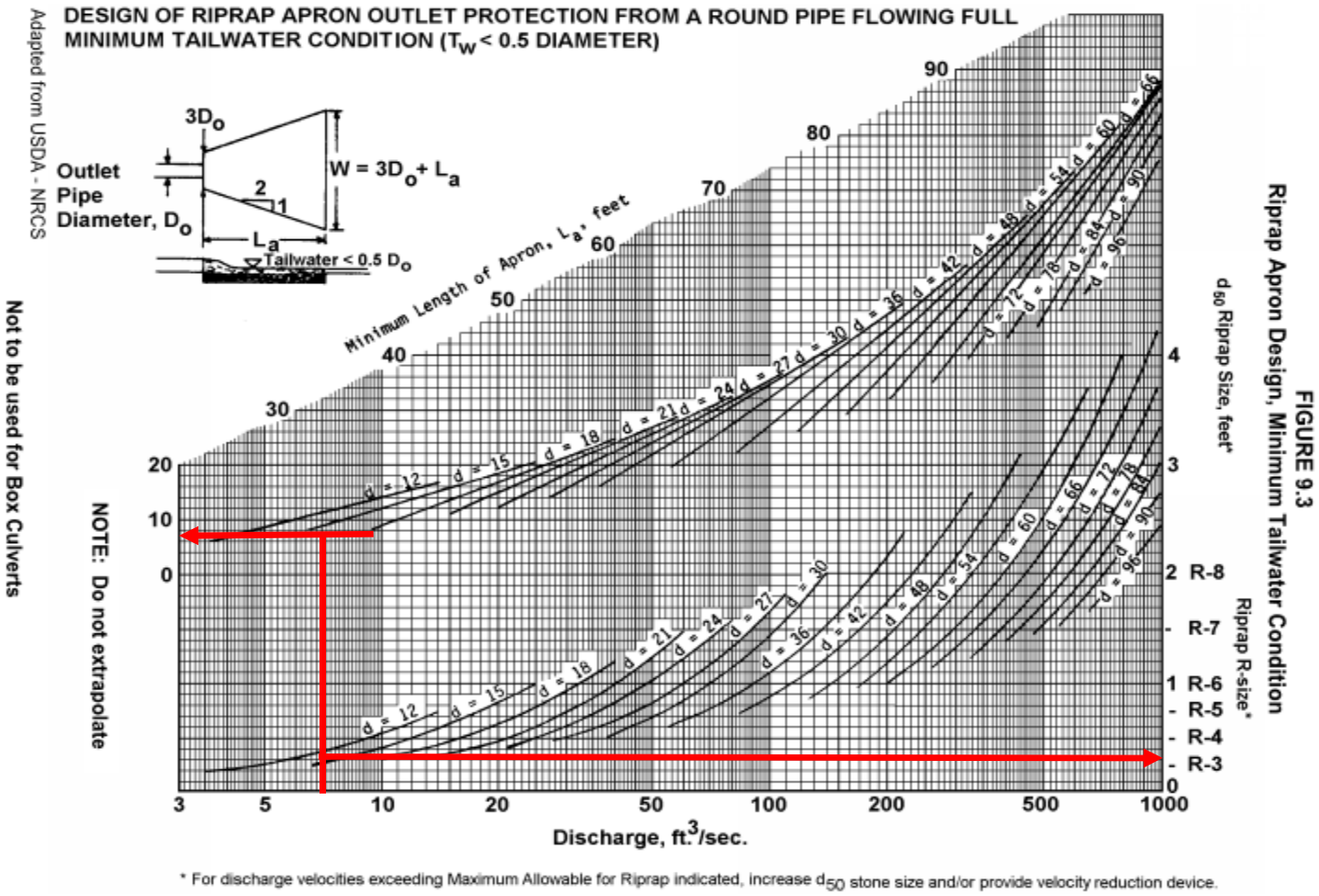
HW4-3

SMITHFIELD GATEWAY
SMITHFIELD TOWNSHIP, MONROE COUNTY, PA
100501401



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

$W = (3D_o + L_a)$		$Q =$	7.03	CFS		$D_o =$	2 FT
$W =$	14	$L_a =$	8	FT	Rip-Rap Size=	R-4	
Initial Pipe Size:	24	inch					
Equivalent Pipe Size:	18	inch					

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HW4-3

If Pipe Not Flowing Full:

Initial Pipe Size:	24	inch	
Flow Area:	3.14	sq ft	
Area of Flow Ratio:	0.40		*From Outlet Protection Sheet
Equivalent Flow Area:	1.257	sq ft	*Use Next Lowest
Equivalent Pipe Size:	18	inch	
Flow Area:	1.77	sq ft	

Table 14

K_p Values for Common Sizes of Pipe

Pipe Diameter (inch)	Flow Area (square feet)	Manning's Coefficient 0.015	0.025
6	0.196	0.105	0.2916
8	0.349	0.0715	0.1987
10	0.545	0.0531	0.1476
12	0.785	0.0417	0.1157
14	1.069	0.0339	0.0942
15	1.23	0.0309	0.0859
16	1.4	0.0284	0.0789
18	1.77	0.0243	0.0674
21	2.41	0.0198	0.0549
24	3.14	0.0165	0.0459
27	3.98	0.0141	0.0393
30	4.91	0.0123	0.0341
36	7.07	0.0096	0.0267
42	9.62	0.0078	0.0218
48	12.57	0.0066	0.0182
54	15.9	0.0056	0.0156
60	19.64	0.0049	0.0135

HW4-5

OUTLET PROTECTION WORKSHEET

PROJECT NAME: SMITHFIELD GATEWAY
PROJECT LOCATION: SMITHFIELD TOWNSHIP, MONROE COUNTY, PA
OUTLET: HW4-5
DONE BY: TEG **CHECKED:** TH **DATE:** 2/15/2023

PIPE DIAMETER (INCHES) d = 18 INCHES
SLOPE OF PIPE (FT/FT) S = 0.005
MANNINGS N VALUE, n = 0.012

DESIGN DISCHARGE (CFS): 1.2 CFS

FULL FLOW DISCHARGE (CFS):
D = Diameter (FT)
n = Mannings N
S = Slope of Pipe (FT/FT)

Q_f = 8.1 CFS

$$Q_f = \frac{0.464}{n} D^{8/3} S^{1/2}$$

FULL FLOW VELOCITY (FPS):
A = AREA (FT^2)

$V_f = Q_f / A$

V_f = 4.6 FPS

RATIO OF PART-FULL TO FULL-FLOW DISCHARGE: d / D = Q / Q_f = 0.15

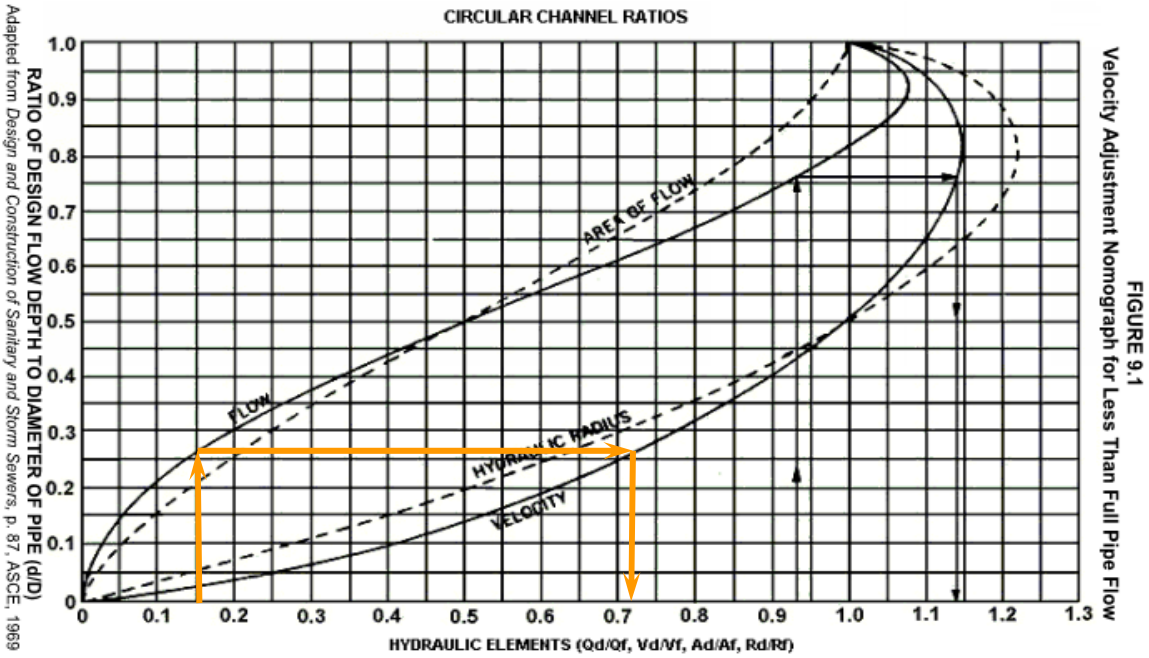
AREA OF FLOW RATIO: (FROM FIGURE 9.1) R_v = 0.72

DESIGN VELOCITY: $V_d = V_f \times R_v$ = 3.28 FPS

RIP RAP SIZE (FROM TABLE 6.6): R-2

Table 6.6

NSA No:	Vmax (fps)
R-1	2.5
R-2	4.5
R-3	6.5
R-4	9.0
R-5	11.5
R-6	13.0
R-7	14.5
R-8	17.0



Adapted from *Design and Construction of Sanitary and Storm Sewers*, p. 87, ASCE, 1969

FIGURE 9.1
Velocity Adjustment Nomograph for Less Than Full Pipe Flow

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HW4-5

SMITHFIELD GATEWAY
SMITHFIELD TOWNSHIP, MONROE COUNTY, PA
100501401

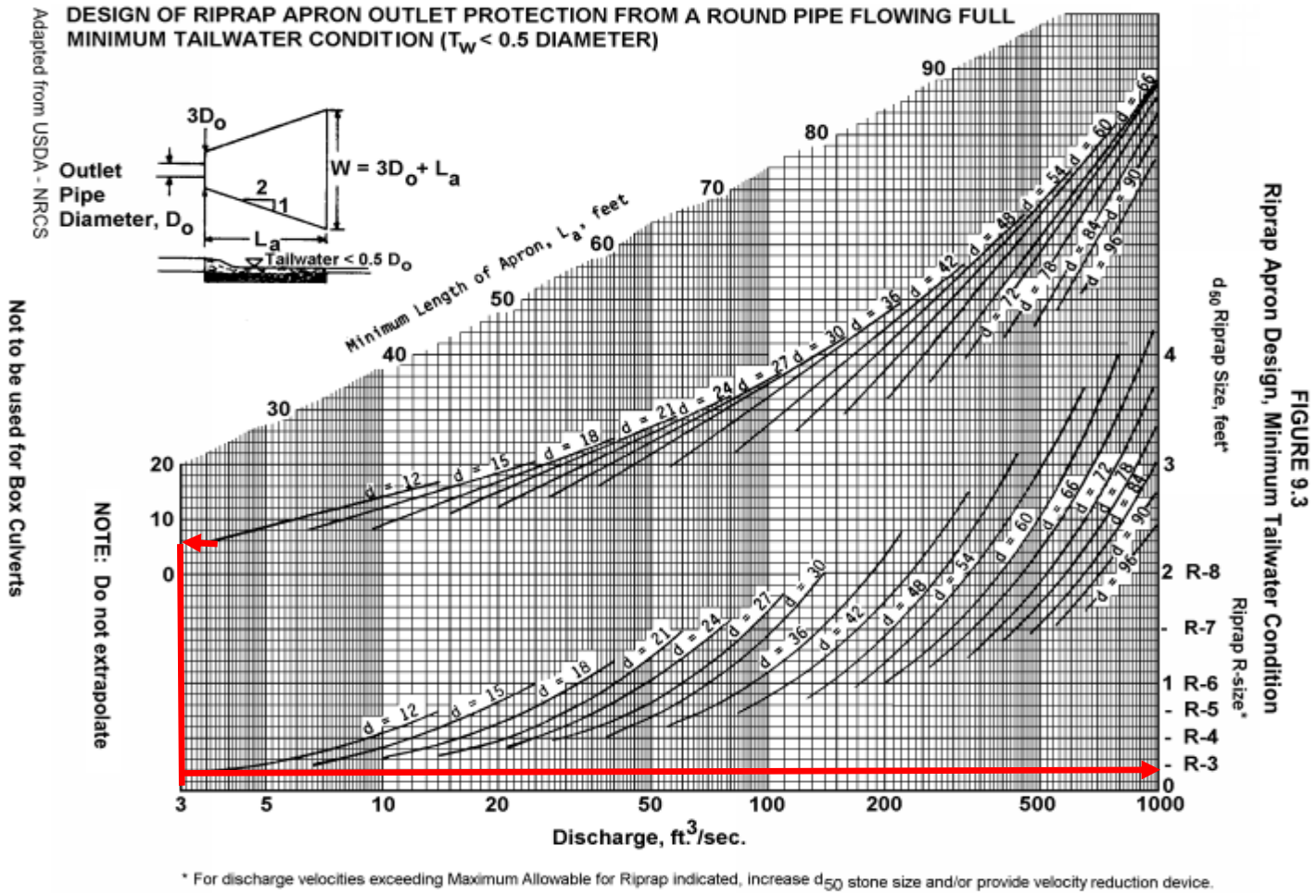

FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition

* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

$W = (3D_o + L_a)$ Q = 1.2 CFS D_o = 1.5 FT

W = 10.5 L_a = 6 FT Rip-Rap Size= R-3

Initial Pipe Size: 18 inch

Equivalent Pipe Size: 12 inch

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HW4-5

If Pipe Not Flowing Full:

Initial Pipe Size:	18	inch	
Flow Area:	1.77	sq ft	
Area of Flow Ratio:	0.15		*From Outlet Protection Sheet
Equivalent Flow Area:	0.265	sq ft	*Use Next Lowest
Equivalent Pipe Size:	12	inch	
Flow Area:	0.785	sq ft	

Table 14

K_p Values for Common Sizes of Pipe

Pipe Diameter (inch)	Flow Area (square feet)	Manning's Coefficient 0.015	0.025
6	0.196	0.105	0.2916
8	0.349	0.0715	0.1987
10	0.545	0.0531	0.1476
12	0.785	0.0417	0.1157
14	1.069	0.0339	0.0942
15	1.23	0.0309	0.0859
16	1.4	0.0284	0.0789
18	1.77	0.0243	0.0674
21	2.41	0.0198	0.0549
24	3.14	0.0165	0.0459
27	3.98	0.0141	0.0393
30	4.91	0.0123	0.0341
36	7.07	0.0096	0.0267
42	9.62	0.0078	0.0218
48	12.57	0.0066	0.0182
54	15.9	0.0056	0.0156
60	19.64	0.0049	0.0135

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HW4-7

OUTLET PROTECTION WORKSHEET

PROJECT NAME: SMITHFIELD GATEWAY
PROJECT LOCATION: SMITHFIELD TOWNSHIP, MONROE COUNTY, PA
OUTLET: HW4-7
DONE BY: TEG **CHECKED:** TH **DATE:** 2/15/2023

PIPE DIAMETER (INCHES) d = 24 INCHES
SLOPE OF PIPE (FT/FT) S = 0.03
MANNINGS N VALUE, n = 0.013

DESIGN DISCHARGE (CFS): 17.79 CFS

FULL FLOW DISCHARGE (CFS):
D = Diameter (FT)
n = Mannings N
S = Slope of Pipe (FT/FT)

Q_f = 39.3 CFS

$$Q_f = \frac{0.464}{n} D^{8/3} S^{1/2}$$

FULL FLOW VELOCITY (FPS):
A = AREA (FT^2)

$V_f = Q_f / A$

V_f = 12.5 FPS

RATIO OF PART-FULL TO FULL-FLOW DISCHARGE: $d / D = Q / Q_f$ = 0.45

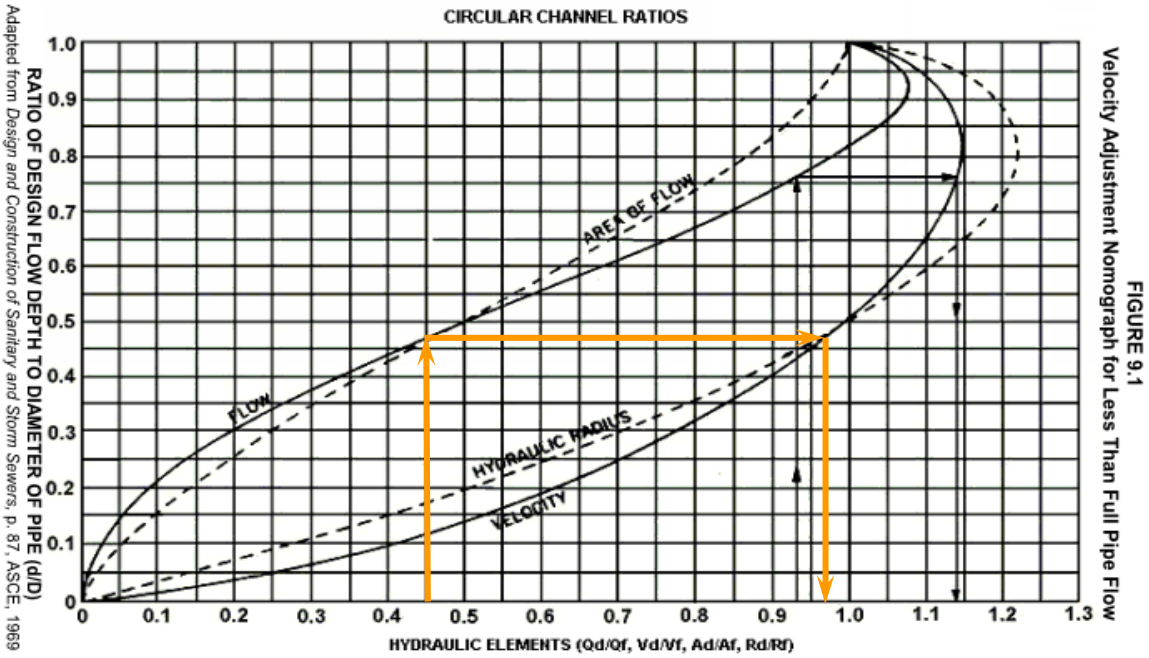
AREA OF FLOW RATIO: (FROM FIGURE 9.1) R_v = 0.97

DESIGN VELOCITY: $V_d = V_f \times R_v$ = 12.12 FPS

RIP RAP SIZE (FROM TABLE 6.6): R-6

Table 6.6

NSA No:	Vmax (fps)
R-1	2.5
R-2	4.5
R-3	6.5
R-4	9.0
R-5	11.5
R-6	13.0
R-7	14.5
R-8	17.0



Adapted from *Design and Construction of Sanitary and Storm Sewers*, p. 87, ASCE, 1969

FIGURE 9.1
Velocity Adjustment Nomograph for Less Than Full Pipe Flow

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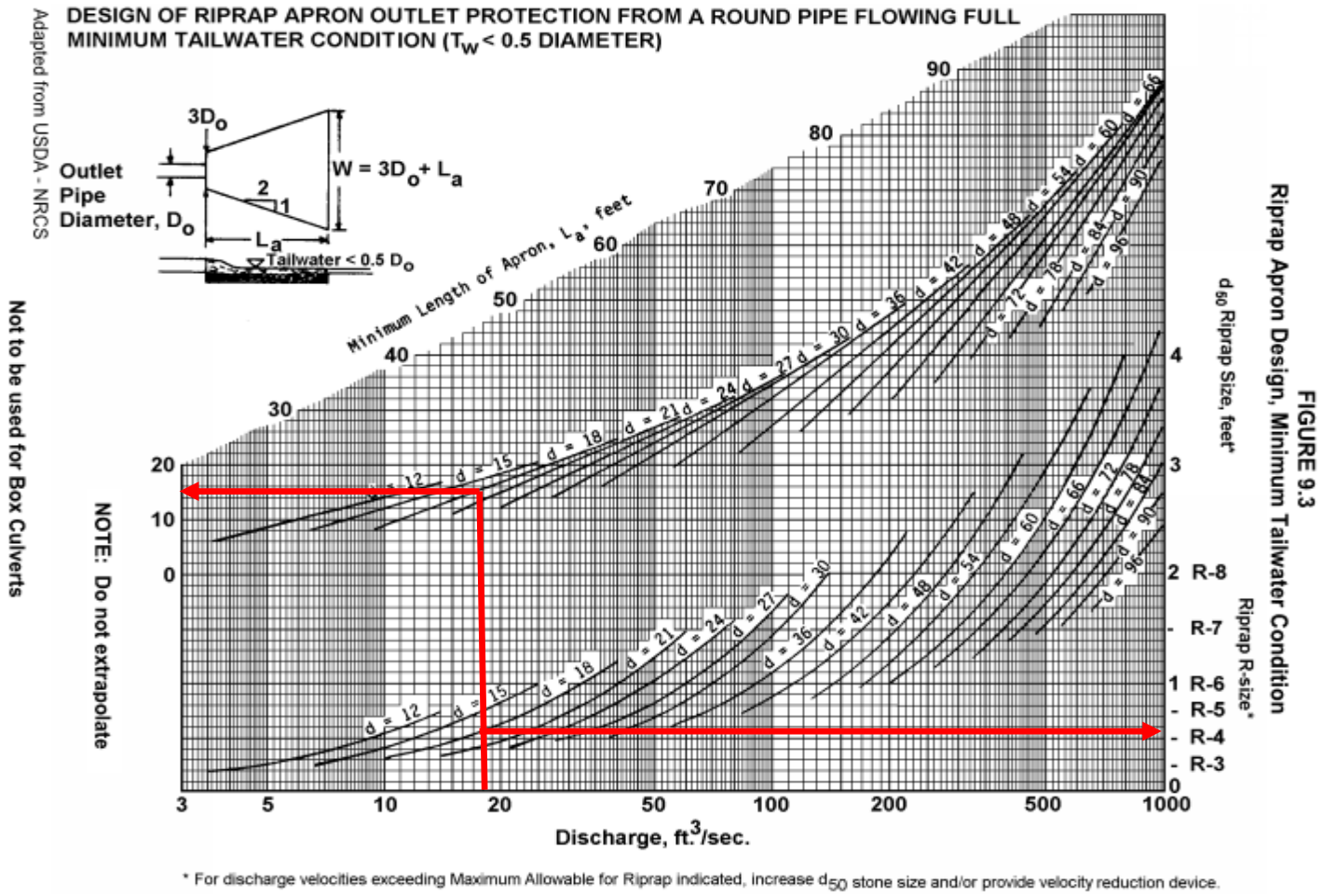
HW4-7

SMITHFIELD GATEWAY
SMITHFIELD TOWNSHIP, MONROE COUNTY, PA
100501401



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

$W = (3D_o + L_a)$ $\quad Q =$ 17.79 CFS $\quad D_o =$ 2 FT

$W =$ 22 $\quad L_a =$ 16 FT $\quad$ Rip-Rap Size= R-5 (USE R-6 FOR VELOCITY)

Initial Pipe Size: 24 inch

Equivalent Pipe Size: 18 inch

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If Pipe Not Flowing Full:

Initial Pipe Size:	24	inch	
Flow Area:	3.14	sq ft	
Area of Flow Ratio:	0.45		*From Outlet Protection Sheet
Equivalent Flow Area:	1.414	sq ft	*Use Next Lowest
Equivalent Pipe Size:	18	inch	
Flow Area:	1.77	sq ft	

Table 14

K_p Values for Common Sizes of Pipe

Pipe Diameter (inch)	Flow Area (square feet)	Manning's Coefficient 0.015	0.025
6	0.196	0.105	0.2916
8	0.349	0.0715	0.1987
10	0.545	0.0531	0.1476
12	0.785	0.0417	0.1157
14	1.069	0.0339	0.0942
15	1.23	0.0309	0.0859
16	1.4	0.0284	0.0789
18	1.77	0.0243	0.0674
21	2.41	0.0198	0.0549
24	3.14	0.0165	0.0459
27	3.98	0.0141	0.0393
30	4.91	0.0123	0.0341
36	7.07	0.0096	0.0267
42	9.62	0.0078	0.0218
48	12.57	0.0066	0.0182
54	15.9	0.0056	0.0156
60	19.64	0.0049	0.0135

HW4-11

OUTLET PROTECTION WORKSHEET

PROJECT NAME: SMITHFIELD GATEWAY
PROJECT LOCATION: SMITHFIELD TOWNSHIP, MONROE COUNTY, PA
OUTLET: HW4-11
DONE BY: TEG **CHECKED:** TH **DATE:** 2/15/2023

PIPE DIAMETER (INCHES) d = 24 INCHES (19 x 30 ELLIPTICAL PIPE EQUIVALENT DIAMETER)
SLOPE OF PIPE (FT/FT) S = 0.0108
MANNINGS N VALUE, n = 0.013

DESIGN DISCHARGE (CFS): 37 CFS

FULL FLOW DISCHARGE (CFS):
D = Diameter (FT)
n = Mannings N
S = Slope of Pipe (FT/FT)

Q_f = 47.1 CFS $\quad Q_f = \frac{0.464}{n} D^{8/3} S^{1/2}$ x 2 PIPES

FULL FLOW VELOCITY (FPS):
A = AREA (FT^2)

$V_f = Q_f / A$

V_f = 15.0 FPS

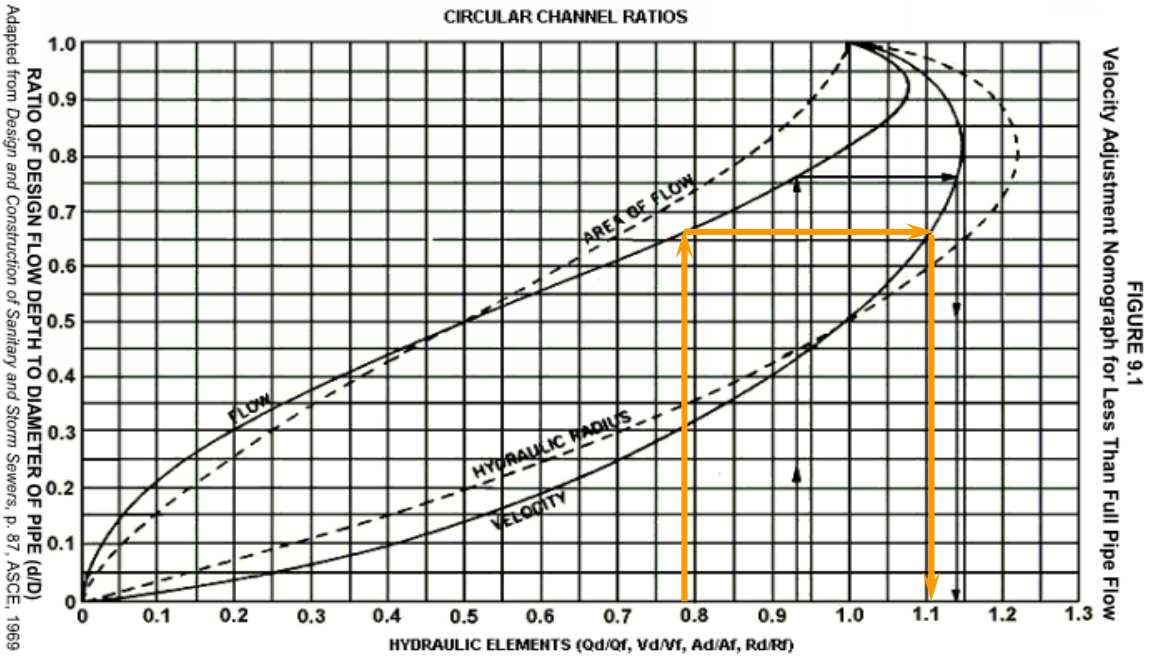
RATIO OF PART-FULL TO FULL-FLOW DISCHARGE: d / D = Q / Q_f = 0.79

AREA OF FLOW RATIO: (FROM FIGURE 9.1) R_v = 1.11

DESIGN VELOCITY: $V_d = V_f \times R_v$ = 16.64 FPS

RIP RAP SIZE (FROM TABLE 6.6): R-8

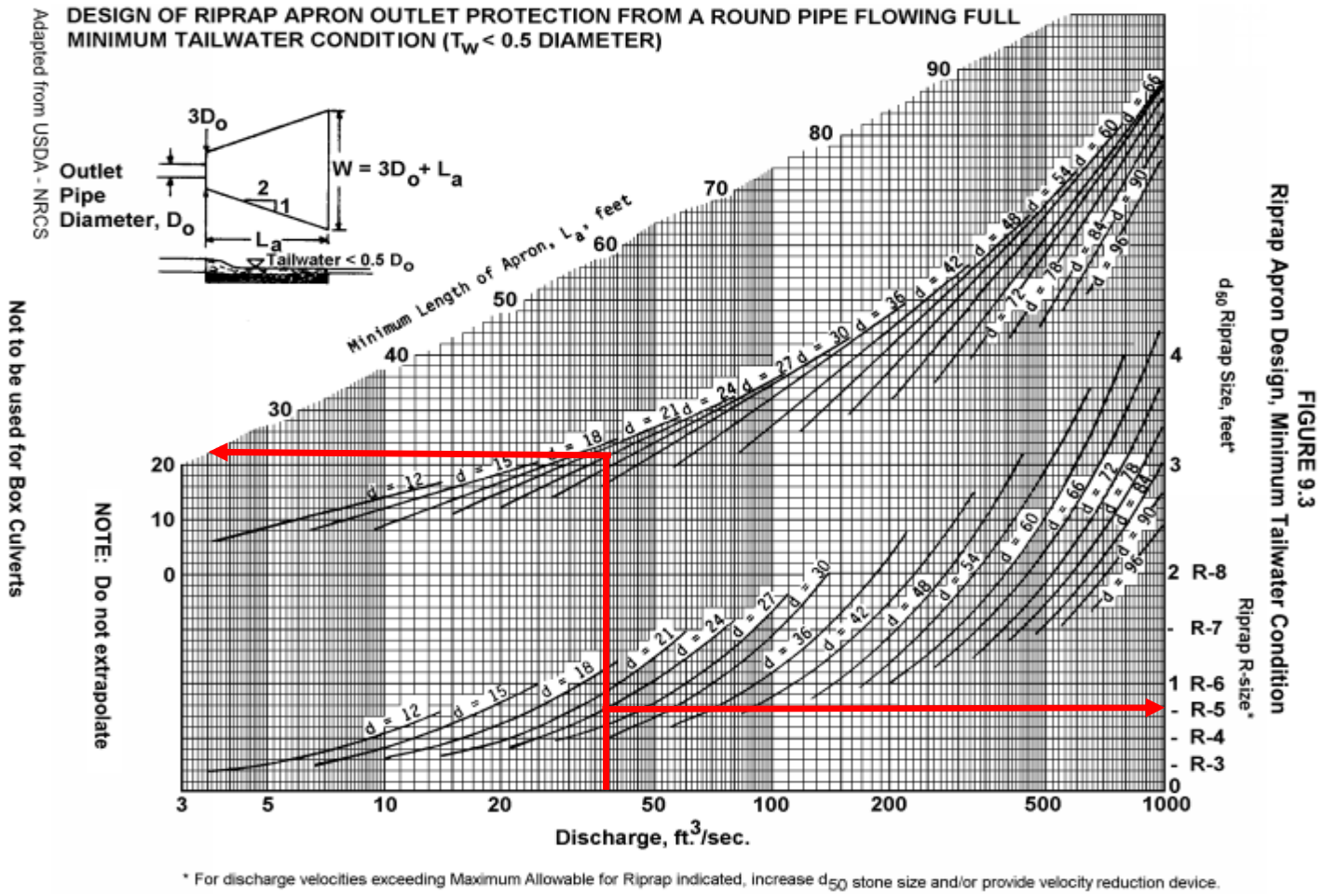
Table 6.6	
NSA No:	Vmax (fps)
R-1	2.5
R-2	4.5
R-3	6.5
R-4	9.0
R-5	11.5
R-6	13.0
R-7	14.5
R-8	17.0



LANGAN

HW4-11

SMITHFIELD GATEWAY
SMITHFIELD TOWNSHIP, MONROE COUNTY, PA
100501401



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

$W = (3D_o + L_a)$		Q =	37	CFS	D_o =	6	FT (EQUIVALENT (2) 19" X 30" R
W =	40	L_a =	22	FT	Rip-Rap Size=	R-5	(USE R-8 FOR VELOCITY)
Initial Pipe Size:	24	inch					
Equivalent Pipe Size:	24	inch					

LANGAN

HW4-11

SMITHFIELD GATEWAY
SMITHFIELD TOWNSHIP, MONROE COUNTY, PA
100501401

If Pipe Not Flowing Full:

Initial Pipe Size:	24	inch	
Flow Area:	3.14	sq ft	
Area of Flow Ratio:	0.79		*From Outlet Protection Sheet
Equivalent Flow Area:	2.482	sq ft	*Use Next Lowest
Equivalent Pipe Size:	24	inch	
Flow Area:	3.14	sq ft	

Table 14

K_p Values for Common Sizes of Pipe

Pipe Diameter (inch)	Flow Area (square feet)	Manning's Coefficient 0.015	Manning's Coefficient 0.025
6	0.196	0.105	0.2916
8	0.349	0.0715	0.1987
10	0.545	0.0531	0.1476
12	0.785	0.0417	0.1157
14	1.069	0.0339	0.0942
15	1.23	0.0309	0.0859
16	1.4	0.0284	0.0789
18	1.77	0.0243	0.0674
21	2.41	0.0198	0.0549
24	3.14	0.0165	0.0459
27	3.98	0.0141	0.0393
30	4.91	0.0123	0.0341
36	7.07	0.0096	0.0267
42	9.62	0.0078	0.0218
48	12.57	0.0066	0.0182
54	15.9	0.0056	0.0156
60	19.64	0.0049	0.0135

LANGAN

INLET GUTTER SPREAD CALCULATIONS

ROUTE 209

Inlet Gutter Spread of Flow Calculations - Route 209

PROJECT NAME: SMITHFIELD GATEWAY **LANGAN PROJECT #:** 100501401 **DATE:** 2/23/2023

Variables

Sx1 = Roadway Cross-Slope (ft/ft)
Sx2 = Proposed Access Slope (ft/ft)
Sl = Longitudinal Slope (ft/ft)
N = Roughness Coefficient
I= Rainfall intensity of 10-year storm of 5 minute duration(in/hr)
T = Flow Width
Ku = constant 0.56
Q = Flow (cfs)

Equations

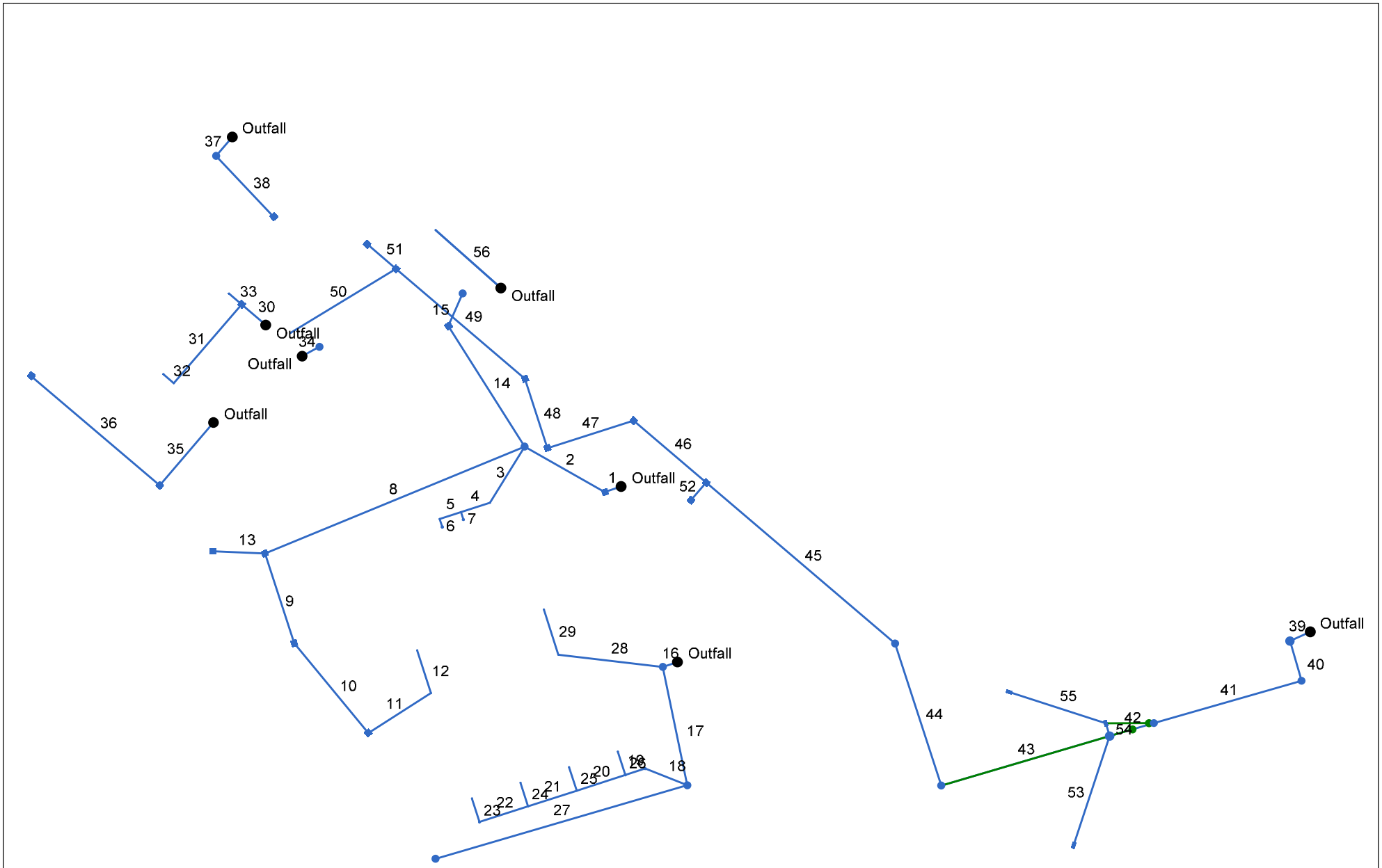
Sx = (Sx1*Sx2)/(Sx1+Sx2)
T = [(Q*N)/(Ku*Sx^(1.67)*Sl^(0.5)]^0.375
Encroachment = T*(Sx2/(Sx1*Sx2))

Drainage Area	Area (acres)	C	Equivalent Area	I	Q	Q Bypass	Total Q	N	Sx1	Sx2	Sl	Sx	T	Shoulder Width	Travel Lane Width	Max. Encroachment	Acceptable?
CB3-1	0.22	0.86	0.189	6.96	1.32	0.81	2.13	0.016	0.060	0.500	0.013	0.054	4.94	8.0	11.0	13.50	YES
CB3-2	0.49	0.85	0.420	6.96	2.92	0.24	3.16	0.016	0.060	1.000	0.015	0.057	5.39	8.0	11.0	13.50	YES
CB3-3	0.24	0.93	0.220	6.96	1.53	0.63	2.16	0.016	0.060	0.020	0.012	0.015	11.19	8.0	11.5	13.75	YES
CB4-1	0.07	0.99	0.069	6.96	0.48	0.91	1.39	0.016	0.060	0.050	0.062	0.027	4.80	8.0	11.0	13.50	YES
CB4-2	0.58	0.79	0.458	6.96	3.19	0.85	4.04	0.016	0.060	0.500	0.056	0.054	4.78	8.0	11.0	13.50	YES
CB4-3	0.37	0.79	0.291	6.96	2.02	0.10	2.12	0.016	0.030	0.600	0.030	0.029	6.25	0.0	15.0	7.50	YES
CB4-5	0.43	0.89	0.381	6.96	2.65	0.60	3.25	0.016	0.060	0.333	0.055	0.051	4.56	8.0	11.0	13.50	YES
CB4-6	0.45	0.82	0.369	6.96	2.57	0.94	3.51	0.016	0.060	1.000	0.050	0.057	4.47	8.0	11.0	13.50	YES
CB5-1	0.44	0.92	0.407	6.96	2.83	0.00	2.83	0.016	0.060	1.000	0.020	0.057	4.90	8.0	12.0	14.00	YES
CB5-2	0.44	0.95	0.417	6.96	2.90	0.00	2.90	0.016	0.060	1.000	0.030	0.057	4.58	8.0	11.0	13.50	YES
CB5-4	0.31	0.98	0.302	6.96	2.10	0.28	2.38	0.016	0.020	1.000	0.015	0.020	9.41	0.0	21.0	10.50	YES
CB5-5	0.09	0.95	0.088	6.96	0.61	0.52	1.13	0.016	0.060	1.000	0.012	0.057	3.83	8.0	12.0	14.00	YES
CB5-7	0.45	0.88	0.396	6.96	2.76	0.94	3.70	0.016	0.060	1.000	0.030	0.057	5.02	5.0	12.0	11.00	YES
CB5-20	0.45	0.86	0.388	6.96	2.70	0.14	2.84	0.016	0.060	1.000	0.016	0.057	5.11	8.0	11.0	13.50	YES
CB5-21	0.29	0.84	0.241	6.96	1.68	0.70	2.38	0.016	0.060	1.000	0.013	0.057	4.97	5.0	11.0	10.50	YES

Note: 1. As per Chapter 10.3.A.2 of PennDOT publication 13M (DM-2), for curbed sections, the maximum encroachment of water on the roadway pavement shall not exceed half of a through traffic lane during a 10-year storm of 5 minute duration.
2. Sx2 for the gutter spread calculations is valued at 1 to reflect curbed sections.
3. Q Byass represents the bypass flow from the nearest upstream structure(s) during the 10-year storm. Refer to Hydraflow Storm Sewers report for bypass flow calculations.

SUPPORTING 10-YR STORM EVENT HYDRAULIC REPORTS

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: STRM-NTWK-04-10yr.stm	Number of lines: 56	Date: 2/22/2023

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	CB4-9	0.71	0.00	0.71	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.15	4.38	0.15	4.38	0.0	Off
2	MH4-8	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
3	RD4-3-3	0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
4	RD4-3-2	0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
5	RD4-4-2	0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
6	RD4-4	0.45	0.00	0.00	0.45	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
7	RD4-3	0.45	0.00	0.00	0.45	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
8	CB4-12	0.12	0.00	0.12	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.000	0.08	1.57	0.08	1.57	0.0	Off
9	CB4-13	0.81	0.00	0.81	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.000	0.16	4.83	0.16	4.83	0.0	Off
10	CB4-14	1.19	0.00	1.19	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.000	0.19	6.39	0.19	6.39	0.0	Off
11	RD4-7-2	0.00	0.00	0.00	0.00	None	4.0	3.77	0.00	3.77	2.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
12	RD4-7	0.06	0.00	0.00	0.06	None	4.0	3.77	0.00	3.77	2.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
13	CB4-15	1.80	0.00	1.80	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.000	0.23	8.58	0.23	8.58	0.0	Off
14	CB4-10	1.29	0.00	1.29	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.000	0.20	6.75	0.20	6.75	0.0	Off
15	CB4-11	0.50	0.00	0.50	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.13	3.34	0.13	3.34	0.0	Off
16	CB4-16	1.26	0.00	1.26	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.000	0.19	6.64	0.19	6.64	0.0	Off
17	CB4-17	0.57	0.00	0.57	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.000	0.13	3.74	0.13	3.74	0.0	Off
18	RD4-8-3	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
19	RD4-8-2	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
20	RD4-9-2	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
21	RD4-10-2	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
22	RD4-11-2	0.00	0.00	0.00	0.00	MH	4.0	3.77	0.00	3.77	2.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
23	RD4-11	0.26	0.00	0.00	0.26	None	4.0	3.77	0.00	3.77	2.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off

Project File: STRM-NTWK-04-10yr.stm | Number of lines: 56 | Run Date: 2/22/2023

NOTES: Inlet N-Values = 0.016; Intensity = 38.27 / (Inlet time + 5.80) ^ 0.72; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
24	RD4-10	0.26	0.00	0.00	0.26	None	4.0	3.77	0.00	3.77	2.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
25	RD4-9	0.26	0.00	0.00	0.26	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
26	RD4-8	0.26	0.00	0.00	0.26	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
27	CB4-18	0.58	0.00	0.58	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.000	0.14	3.79	0.14	3.79	0.0	Off
28	RD4-6-2	0.00	0.00	0.00	0.00	None	4.0	3.77	0.00	3.77	2.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
29	RD4-6	0.06	0.00	0.00	0.06	None	4.0	3.77	0.00	3.77	2.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
30	MH4-9	0.00	0.00	0.00	0.00	MH	4.0	3.77	0.00	3.77	2.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
31	RD4-1-2	0.00	0.00	0.00	0.00	MH	4.0	3.77	0.00	3.77	2.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
32	RD4-1	0.24	0.00	0.00	0.24	MH	4.0	3.77	0.00	3.77	2.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
33	RD4-2	0.19	0.00	0.00	0.19	MH	4.0	3.77	0.00	3.77	2.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
34	CB4-21	0.59	0.00	0.59	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.000	0.14	3.82	0.14	3.82	0.0	Off
35	CB4-22	0.91	0.00	0.91	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.000	0.17	5.27	0.17	5.27	0.0	Off
36	CB4-23	0.70	0.00	0.70	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.000	0.15	4.34	0.15	4.34	0.0	Off
37	CB4-19	0.48	0.00	0.48	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.000	0.13	3.27	0.13	3.27	0.0	Off
38	CB4-20	0.63	0.00	0.63	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.14	4.02	0.14	4.02	0.0	Off
39	MH4-1	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
40	CB4-1	0.45	0.91	1.28	0.08	Grate	0.0	0.00	0.00	3.77	2.00	0.062	8.00	0.060	0.020	0.013	0.16	2.68	0.05	0.91	0.0	Off
41	CB4-2	2.99	0.85	2.93	0.91	Grate	0.0	0.00	0.00	3.77	2.00	0.056	8.00	0.060	0.020	0.013	0.24	4.02	0.14	2.34	0.0	40
42	MH4-2	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
43	CB4-6	2.40	0.00	2.02	0.39	Comb	4.0	3.77	0.00	3.77	2.00	0.050	8.00	0.060	0.020	0.013	0.21	3.45	0.10	1.74	0.0	41
44	MH4-3	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
45	MH4-4	0.00	0.00	0.00	0.00	MH	4.0	3.77	0.00	3.77	2.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
46	MH4-5	0.00	0.00	0.00	0.00	MH	4.0	3.77	0.00	3.77	2.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off

Project File: STRM-NTWK-04-10yr.stm | Number of lines: 56 | Run Date: 2/22/2023

NOTES: Inlet N-Values = 0.016; Intensity = 38.27 / (Inlet time + 5.80) ^ 0.72; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

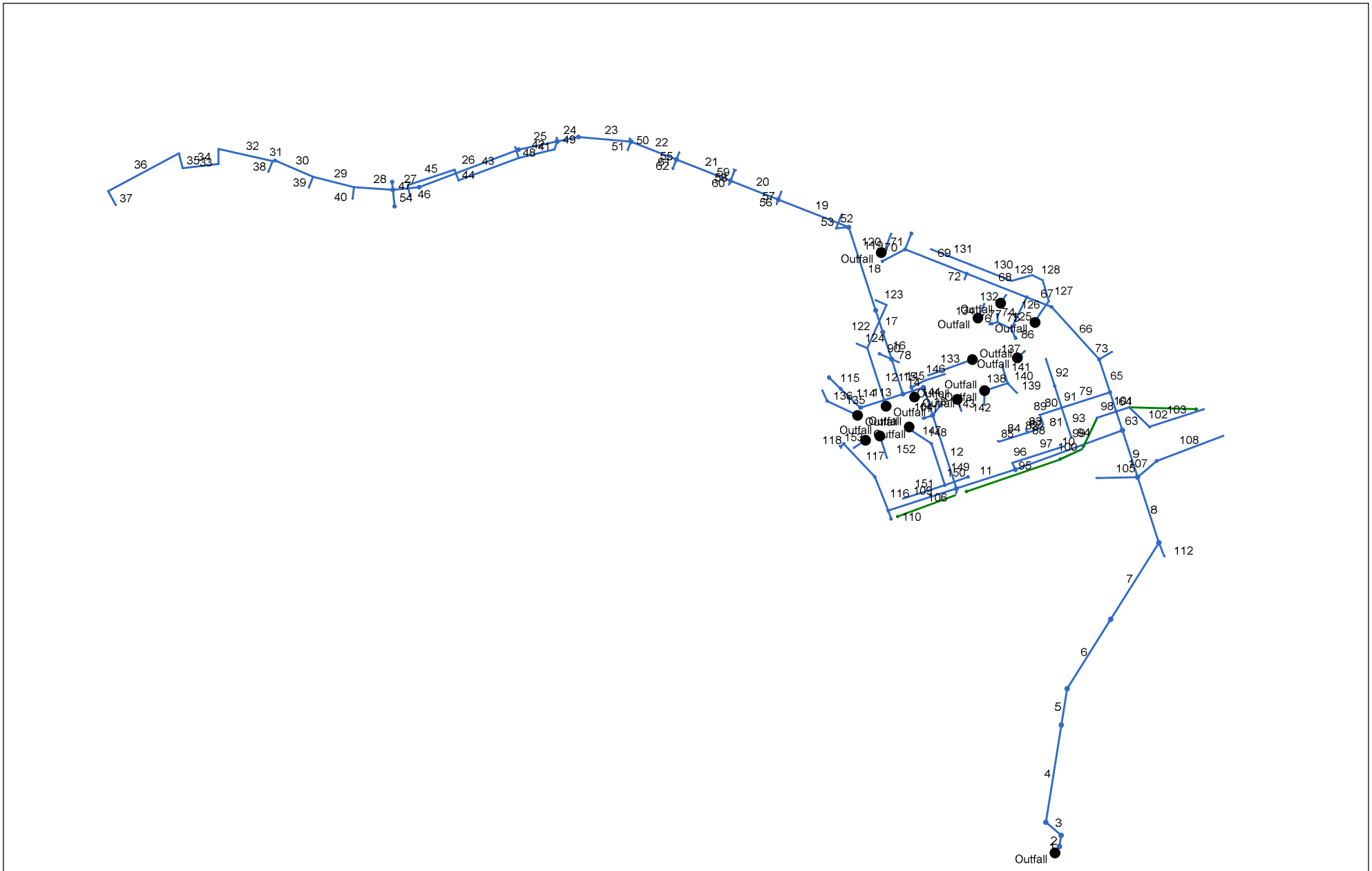
Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
47	MH4-6	0.00	0.00	0.00	0.00	MH	4.0	3.77	0.00	3.77	2.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
48	MH4-7	0.00	0.00	0.00	0.00	MH	4.0	3.77	0.00	3.77	2.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
49	MH4-10	0.00	0.00	0.00	0.00	MH	4.0	3.77	0.00	3.77	2.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
50	OCS4-3	0.98*	0.00	0.00	0.98	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
51	OCS4-2	1.13*	0.00	1.13	0.00	Grate	0.0	0.00	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.18	6.15	0.18	6.15	0.0	Off
52	OCS4-1	0.24*	0.00	0.24	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.10	2.00	0.10	2.00	0.0	Off
53	CB4-5	2.49	0.00	2.09	0.40	Grate	0.0	0.00	0.00	3.77	2.00	0.055	8.00	0.060	0.020	0.013	0.21	3.44	0.10	1.73	0.0	Off
54	CB4-3	1.90	0.10	1.55	0.46	Comb	4.0	3.77	0.00	3.77	2.00	0.030	2.00	0.030	0.030	0.013	0.16	5.47	0.09	3.16	0.0	41
55	CB4-4	0.71	0.00	0.61	0.10	Comb	4.0	3.77	0.00	3.77	2.00	0.060	2.00	0.020	0.020	0.013	0.08	4.20	0.04	2.04	0.0	54
56	HW4-12	37.00*	0.00	0.00	37.00	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off

Project File: STRM-NTWK-04-10yr.stm | Number of lines: 56 | Run Date: 2/22/2023

NOTES: Inlet N-Values = 0.016; Intensity = 38.27 / (Inlet time + 5.80) ^ 0.72; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: STRM-NTWK-05-10-YR-FULL-BUILD.stm	Number of lines: 153	Date: 2/22/2023

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH5-1	0.00	0.00	0.00	0.00	MH	4.0	3.77	0.00	3.77	2.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2	MH5-2	0.00	0.00	0.00	0.00	MH	4.0	3.77	0.00	3.77	2.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
3	MH5-3	88.54	0.00	0.00	88.54	MH	4.0	3.77	0.00	3.77	2.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
4	MH5-4	0.00	0.00	0.00	0.00	MH	4.0	3.77	0.00	3.77	2.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
5	MH5-5	21.59	0.00	0.00	21.59	MH	4.0	3.77	0.00	3.77	2.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
6	MH5-6	0.00	0.00	0.00	0.00	MH	4.0	3.77	0.00	3.77	2.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
7	MH5-7	0.00	0.00	0.00	0.00	MH	4.0	3.77	0.00	3.77	2.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
8	MH5-8	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
9	MH5-9	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
10	MH5-10	0.00	0.00	0.00	0.00	MH	4.0	3.77	0.00	3.77	2.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
11	MH5-11	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
12	MH5-12	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
13	MH5-13	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
14	MH5-14	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
15	MH5-15	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
16	MH5-16	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
17	MH5-17	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
18	MH5-18	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
19	MH5-19	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
20	MH5-20	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
21	MH5-21	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
22	MH5-22	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
23	MH5-23	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off

Project File: STRM-NTWK-05-10-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES: Inlet N-Values = 0.016; Intensity = 38.27 / (Inlet time + 5.80) ^ 0.72; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
24	MH5-24	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
25	MH5-25	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
26	MH5-26	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
27	MH5-27	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
28	CB5-59	0.30	0.00	0.28	0.02	Comb	4.0	3.77	0.00	3.77	2.00	0.040	2.00	0.020	0.020	0.013	0.07	3.26	0.02	1.10	0.0	Off
29	CB5-61	0.30	0.00	0.28	0.01	Comb	4.0	3.77	0.00	3.77	2.00	0.060	2.00	0.020	0.020	0.013	0.06	3.03	0.02	0.90	0.0	Off
30	MH5-38	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
31	CB5-63	0.48	0.00	0.43	0.05	Comb	4.0	3.77	0.00	3.77	2.00	0.040	2.00	0.020	0.020	0.013	0.08	3.91	0.03	1.70	0.0	Off
32	CB5-65	1.26	0.00	0.92	0.34	Comb	4.0	3.77	0.00	3.77	2.00	0.020	2.00	0.020	0.020	0.013	0.13	6.39	0.08	3.90	0.0	Off
33	CB5-66	0.30	0.00	0.28	0.02	Comb	4.0	3.77	0.00	3.77	2.00	0.020	2.00	0.020	0.020	0.013	0.07	3.75	0.03	1.42	0.0	Off
34	CB5-67	0.18	0.00	0.18	0.01	Comb	4.0	3.77	0.00	3.77	2.00	0.020	2.00	0.020	0.020	0.013	0.06	3.11	0.02	0.86	0.0	Off
35	CB5-68	0.35	0.00	0.32	0.03	Comb	4.0	3.77	0.00	3.77	2.00	0.020	2.00	0.020	0.020	0.013	0.08	3.96	0.03	1.61	0.0	Off
36	CB5-69	1.15	0.00	0.86	0.29	Comb	4.0	3.77	0.00	3.77	2.00	0.020	2.00	0.020	0.020	0.013	0.12	6.17	0.07	3.69	0.0	Off
37	CB5-70	0.67	0.00	0.56	0.12	Comb	4.0	3.77	0.00	3.77	2.00	0.020	2.00	0.020	0.020	0.013	0.10	5.05	0.05	2.63	0.0	Off
38	CB5-64	0.55	0.00	0.48	0.07	Comb	4.0	3.77	0.00	3.77	2.00	0.040	2.00	0.020	0.020	0.013	0.08	4.12	0.04	1.90	0.0	Off
39	CB5-62	0.36	0.00	0.34	0.02	Comb	4.0	3.77	0.00	3.77	2.00	0.060	2.00	0.020	0.020	0.013	0.07	3.27	0.02	1.13	0.0	Off
40	CB5-60	0.42	0.00	0.38	0.04	Comb	4.0	3.77	0.00	3.77	2.00	0.040	2.00	0.020	0.020	0.013	0.07	3.73	0.03	1.53	0.0	Off
41	CB5-52	0.36	0.00	0.33	0.03	Comb	4.0	3.77	0.00	3.77	2.00	0.030	2.00	0.020	0.020	0.013	0.07	3.72	0.03	1.47	0.0	Off
42	CB5-53	0.69	0.00	0.58	0.11	Comb	4.0	3.77	0.00	3.77	2.00	0.040	2.00	0.020	0.020	0.013	0.09	4.47	0.04	2.24	0.0	Off
43	CB5-55	0.48	0.00	0.43	0.05	Comb	4.0	3.77	0.00	3.77	2.00	0.040	2.00	0.020	0.020	0.013	0.08	3.92	0.03	1.72	0.0	Off
44	CB5-56	1.20	0.00	0.91	0.29	Comb	4.0	3.77	0.00	3.77	2.00	0.040	2.00	0.020	0.020	0.013	0.11	5.50	0.06	3.24	0.0	Off
45	CB5-57	0.73	0.00	0.61	0.12	Comb	4.0	3.77	0.00	3.77	2.00	0.040	2.00	0.020	0.020	0.013	0.09	4.57	0.05	2.33	0.0	Off
46	CB5-58	0.45	0.00	0.41	0.04	Comb	4.0	3.77	0.00	3.77	2.00	0.040	2.00	0.020	0.020	0.013	0.08	3.82	0.03	1.61	0.0	Off

Project File: STRM-NTWK-05-10-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES: Inlet N-Values = 0.016; Intensity = 38.27 / (Inlet time + 5.80) ^ 0.72; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
47	MH5-29	56.84	0.00	0.00	56.84	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
48	CB5-54	2.41	0.00	1.56	0.86	Comb	4.0	3.77	0.00	3.77	2.00	0.040	2.00	0.020	0.020	0.013	0.14	7.16	0.10	4.86	0.0	Off
49	CB5-51	18.57	0.00	6.51	12.06	Comb	4.0	3.77	0.00	3.77	2.00	0.030	2.00	0.020	0.020	0.013	0.32	16.23	0.28	13.81	0.0	Off
50	CB5-50	7.15	0.00	3.35	3.80	Comb	4.0	3.77	0.00	3.77	2.00	0.020	2.00	0.020	0.020	0.013	0.25	12.25	0.19	9.66	0.0	Off
51	CB5-49	0.67	0.00	0.55	0.12	Comb	4.0	3.77	0.00	3.77	2.00	0.020	2.00	0.020	0.020	0.013	0.10	5.03	0.05	2.61	0.0	Off
52	CB5-41	0.32	0.00	0.29	0.03	Comb	4.0	3.77	0.00	3.77	2.00	0.020	2.00	0.020	0.020	0.013	0.08	3.83	0.03	1.49	0.0	Off
53	CB5-42	0.39	0.00	0.35	0.04	Comb	4.0	3.77	0.00	3.77	2.00	0.020	2.00	0.020	0.020	0.013	0.08	4.12	0.04	1.76	0.0	Off
54	MH5-28	61.87	0.00	0.00	61.87	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
55	CB5-48	0.35	0.00	0.32	0.03	Comb	4.0	3.77	0.00	3.77	2.00	0.020	2.00	0.020	0.020	0.013	0.08	3.96	0.03	1.62	0.0	Off
56	CB5-43	0.81	0.00	0.65	0.16	Comb	4.0	3.77	0.00	3.77	2.00	0.020	2.00	0.020	0.020	0.013	0.11	5.42	0.06	2.98	0.0	Off
57	CB5-44	0.70	0.00	0.58	0.13	Comb	4.0	3.77	0.00	3.77	2.00	0.020	2.00	0.020	0.020	0.013	0.10	5.13	0.05	2.70	0.0	Off
58	CB5-46	0.87	0.00	0.69	0.18	Comb	4.0	3.77	0.00	3.77	2.00	0.020	2.00	0.020	0.020	0.013	0.11	5.56	0.06	3.11	0.0	Off
59	HW5-5	24.03	0.00	24.03	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
60	CB5-45	1.03	0.00	0.79	0.24	Comb	4.0	3.77	0.00	3.77	2.00	0.020	2.00	0.020	0.020	0.013	0.12	5.93	0.07	3.45	0.0	Off
61	CB5-47	0.42	0.00	0.38	0.05	Comb	4.0	3.77	0.00	3.77	2.00	0.020	2.00	0.020	0.020	0.013	0.09	4.25	0.04	1.88	0.0	Off
62	MH5-30	25.45	0.00	0.00	25.45	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
63	MH5-34	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
64	MH5-53	0.00	0.00	0.00	0.00	MH	4.0	3.77	0.00	3.77	2.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
65	MH5-35	0.00	0.00	0.00	0.00	MH	4.0	3.77	0.00	3.77	2.00	0.000	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
66	MH5-36	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
67	MH5-37	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
68	MH5-39	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
69	MH5-40	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off

Project File: STRM-NTWK-05-10-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES: Inlet N-Values = 0.016; Intensity = 38.27 / (Inlet time + 5.80) ^ 0.72; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
70	OCS5-7	2.64*	0.00	2.64	0.00	Grate	0.0	0.00	14.21	3.77	3.77	Sag	2.00	0.050	0.020	0.013	0.28	10.82	0.28	10.82	0.0	Off
71	MH5-41	27.62	0.00	0.00	27.62	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
72	CB5-15	1.00	0.00	0.79	0.21	Comb	4.0	3.77	0.00	3.77	2.00	0.040	2.00	0.020	0.020	0.013	0.10	5.15	0.06	2.89	0.0	Off
73	Null Structure	1.00*	0.00	0.00	1.00	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
74	MH5-42	0.00	0.00	0.00	0.00	MH	4.0	3.77	0.00	3.77	2.00	0.000	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
75	MH5-43	0.00	0.00	0.00	0.00	MH	4.0	3.77	0.00	3.77	2.00	0.000	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
76	OCS5-6	0.49*	0.00	0.49	0.00	Grate	0.0	0.00	14.21	3.77	3.77	Sag	2.00	0.050	0.020	0.013	0.12	2.92	0.12	2.92	0.0	Off
77	OCS5-2	0.43*	0.00	0.00	0.43	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
78	CB5-94	1.35	0.00	1.35	0.00	Grate	0.0	0.00	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.20	6.98	0.20	6.98	0.0	Off
79	CB5-71	1.00	0.00	1.00	0.00	Grate	0.0	0.00	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.17	5.61	0.17	5.61	0.0	Off
80	STRU-504	0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
81	STRU-503	0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
82	STRU-502	0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
83	STRU-510	0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
84	STRU-501	0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
85	CD5-3	0.06	0.00	0.00	0.06	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
86	OCS5-1	6.92*	0.00	0.00	6.92	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
87	STRU-509	0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
88	CD5-2	0.13	0.00	0.00	0.13	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
89	CD5-1	0.13	0.00	0.00	0.13	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
90	CB5-93	0.08	0.00	0.08	0.00	Grate	0.0	0.00	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.05	0.90	0.05	0.90	0.0	Off
91	CB5-72	2.58	0.00	2.58	0.00	Grate	0.0	0.00	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.28	11.01	0.28	11.01	0.0	Off
92	CB5-73	0.59	0.00	0.59	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.14	3.80	0.14	3.80	0.0	Off

Project File: STRM-NTWK-05-10-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES: Inlet N-Values = 0.016; Intensity = 38.27 / (Inlet time + 5.80) ^ 0.72; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
93	CB5-74	0.36	0.00	0.36	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.11	2.58	0.11	2.58	0.0	Off
94	CB5-75	0.72	0.00	0.72	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.15	4.43	0.15	4.43	0.0	Off
95	CB5-76	0.26	0.00	0.26	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.10	2.00	0.10	2.00	0.0	Off
96	CB5-77	1.14	0.00	1.14	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.18	6.18	0.18	6.18	0.0	Off
97	CB5-78	0.30	0.00	0.30	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.10	2.23	0.10	2.23	0.0	Off
98	CB5-3	1.11	0.00	0.84	0.28	Comb	4.0	3.77	0.00	3.77	2.00	0.020	2.00	0.020	0.020	0.013	0.12	6.10	0.07	3.62	0.0	99
99	CB5-4	1.98	0.28	1.74	0.52	Comb	4.0	3.77	0.00	3.77	2.00	0.015	8.00	0.060	0.020	0.013	0.25	4.22	0.15	2.43	0.0	100
100	CB5-5	0.56	0.52	0.94	0.14	Comb	4.0	3.77	0.00	3.77	2.00	0.012	2.00	0.060	0.020	0.013	0.19	5.51	0.09	1.54	0.0	106
101	CB5-6	2.51	0.00	1.57	0.94	Comb	4.0	3.77	0.00	3.77	2.00	0.020	2.00	0.020	0.020	0.013	0.17	8.28	0.11	5.73	0.0	103
102	MH5-45	0.00	0.00	0.00	0.00	MH	4.0	3.77	0.00	3.77	2.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
103	CB5-7	2.58	0.94	2.58	0.94	Comb	4.0	3.77	0.00	3.77	2.00	0.030	5.00	0.060	0.020	0.013	0.26	4.38	0.16	2.67	0.0	Off
104	OCS5-3	0.46*	0.00	0.00	0.46	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
105	CB5-1	2.64	0.00	2.00	0.63	Comb	4.0	3.77	0.00	3.77	2.00	0.020	8.00	0.060	0.020	0.013	0.25	4.24	0.15	2.48	0.0	Off
106	CB5-20	2.58	0.14	2.02	0.70	Comb	4.0	3.77	0.00	3.77	2.00	0.016	8.00	0.060	0.020	0.013	0.27	4.47	0.16	2.69	0.0	110
107	MH5-8A	0.00	0.60	0.00	0.60	MH	0.0	0.00	0.00	0.00	0.00	Sag	8.00	0.060	0.020	0.013	0.00	0.00	0.00	0.00	0.0	Off
108	CB5-2	2.72	0.00	2.13	0.60	Comb	4.0	3.77	0.00	3.77	2.00	0.030	8.00	0.060	0.020	0.013	0.24	3.98	0.14	2.26	0.0	107
109	MH5-46	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
110	CB5-21	1.59	0.69	1.66	0.62	Comb	4.0	3.77	0.00	3.77	2.00	0.020	2.00	0.050	0.020	0.013	0.21	7.33	0.14	3.80	0.0	Off
111	OCS5-4	0.57*	0.00	0.00	0.57	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
112	EX-CB5-1	26.85	0.00	26.85	0.00	Grate	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	1.15	54.45	1.15	54.45	0.0	Off
113	MH5-31	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
114	MH5-32	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
115	MH5-33	43.38	0.00	0.00	43.38	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off

Project File: STRM-NTWK-05-10-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES: Inlet N-Values = 0.016; Intensity = 38.27 / (Inlet time + 5.80) ^ 0.72; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
116	CB5-22	0.39	0.00	0.39	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.12	2.76	0.12	2.76	0.0	Off
117	MH5-51	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
118	FES5-2	7.93	0.00	7.93	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
119	CB5-18	0.88	0.00	0.88	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.16	5.13	0.16	5.13	0.0	Off
120	CB5-19	1.46	0.00	1.46	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.21	7.37	0.21	7.37	0.0	Off
121	CB5-33	0.43	0.00	0.39	0.04	Comb	4.0	3.77	0.00	3.77	2.00	0.040	2.00	0.020	0.020	0.013	0.07	3.75	0.03	1.54	0.0	Off
122	CB5-35	0.36	0.00	0.34	0.03	Comb	4.0	3.77	0.00	3.77	2.00	0.040	2.00	0.020	0.020	0.013	0.07	3.52	0.03	1.33	0.0	Off
123	CB5-36	0.47	0.00	0.42	0.05	Comb	4.0	3.77	0.00	3.77	2.00	0.040	2.00	0.020	0.020	0.013	0.08	3.89	0.03	1.68	0.0	Off
124	CB5-34	0.42	0.00	0.38	0.04	Comb	4.0	3.77	0.00	3.77	2.00	0.040	2.00	0.020	0.020	0.013	0.07	3.73	0.03	1.53	0.0	Off
125	CB5-8	0.49	0.00	0.49	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.13	3.31	0.13	3.31	0.0	Off
126	CB5-9	0.92	0.00	0.92	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.17	5.30	0.17	5.30	0.0	Off
127	CB5-10	1.19	0.00	1.19	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.19	6.39	0.19	6.39	0.0	Off
128	CB5-11	2.13	0.00	2.13	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.25	9.64	0.25	9.64	0.0	Off
129	CB5-14	2.51	0.00	2.51	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.28	10.82	0.28	10.82	0.0	Off
130	CB5-16	1.53	0.00	1.10	0.43	Comb	4.0	3.77	0.00	3.77	2.00	0.040	2.00	0.020	0.020	0.013	0.12	6.03	0.08	3.75	0.0	Off
131	CB5-17	1.73	0.00	1.21	0.52	Comb	4.0	3.77	0.00	3.77	2.00	0.040	2.00	0.020	0.020	0.013	0.13	6.32	0.08	4.03	0.0	Off
132	CB5-13	0.68	0.00	0.68	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.14	4.25	0.14	4.25	0.0	Off
133	CB5-96	0.95	0.00	0.95	0.00	Grate	0.0	0.00	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.17	5.43	0.17	5.43	0.0	Off
134	CB5-97	1.31	0.00	1.31	0.00	Grate	0.0	0.00	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.20	6.84	0.20	6.84	0.0	Off
135	CB5-37	0.68	0.00	0.56	0.12	Comb	4.0	3.77	0.00	3.77	2.00	0.020	2.00	0.020	0.020	0.013	0.10	5.07	0.05	2.65	0.0	Off
136	CB5-38	0.61	0.00	0.51	0.10	Comb	4.0	3.77	0.00	3.77	2.00	0.020	2.00	0.020	0.020	0.013	0.10	4.86	0.05	2.44	0.0	Off
137	CB5-80	0.56	0.00	0.49	0.07	Comb	4.0	3.77	0.00	3.77	2.00	0.040	2.00	0.020	0.020	0.013	0.08	4.15	0.04	1.92	0.0	Off
138	MH5-57	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off

Project File: STRM-NTWK-05-10-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES: Inlet N-Values = 0.016; Intensity = 38.27 / (Inlet time + 5.80) ^ 0.72; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
139	RD5-3	1.03	0.00	0.00	1.03	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
140	CB5-81	1.35	0.00	1.35	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.20	6.98	0.20	6.98	0.0	Off
141	OCS5-5	1.61*	0.00	1.61	0.00	Grate	0.0	0.00	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.22	7.91	0.22	7.91	0.0	Off
142	RD5-1	1.05	0.00	0.00	1.05	None	4.0	3.77	0.00	3.77	2.00	0.000	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
143	RD5-2	0.97	0.00	0.00	0.97	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
144	MH5-63	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
145	CB5-82	0.44	0.00	0.38	0.05	Comb	4.0	3.77	0.00	3.77	2.00	0.015	2.00	0.020	0.020	0.013	0.09	4.54	0.04	2.07	0.0	Off
146	CB5-83	1.29	0.00	1.29	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.20	6.77	0.20	6.77	0.0	Off
147	CB5-87	1.39	0.00	1.39	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.20	7.14	0.20	7.14	0.0	Off
148	CB5-88	0.99	0.00	0.99	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.17	5.59	0.17	5.59	0.0	Off
149	CB5-89	1.11	0.00	1.11	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.18	6.09	0.18	6.09	0.0	Off
150	CB5-79	0.88	0.00	0.88	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.16	5.11	0.16	5.11	0.0	Off
151	CB5-90	0.71	0.00	0.71	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.15	4.38	0.15	4.38	0.0	Off
152	RD5-4	1.35	0.00	0.00	1.35	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
153	CB5-92	2.64	0.00	2.64	0.00	Comb	4.0	3.77	7.54	3.77	2.00	Sag	2.00	0.050	0.020	0.013	0.28	11.21	0.28	11.21	0.0	Off

Project File: STRM-NTWK-05-10-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/22/2023

NOTES: Inlet N-Values = 0.016; Intensity = 38.27 / (Inlet time + 5.80) ^ 0.72; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

SWALE 4-1 CAPACITY CALCULATIONS

Worksheet 3: Time of Concentration (Tc) or travel time (Tt)

PROJECT: **Smithfield Gateway**
LOCATION: **Smithfield Township, PA**
AREA: **Barth Rubin Swale**

DATE: **Mar-20**
DESIGN BY: **MJV**
CHECKED BY: **TH**

LANGAN
ENGINEERING & ENVIRONMENTAL SERVICES

Sheet Flow (Applicable to Tc only)											
1	Surface Description (table 3-1)		Woods								
2	Manning's roughness coeff., n (table 3-1)		0.800								
3	Flow length, L (total L<150 ft)	ft	150								
4	Two-yr 24-hr rainfall, P_2	in	3.32								
5	Land Slope, s	ft/ft	0.0400								
6	$Tt = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5}(s)^{.04}}$	Compute Tt, hr	0.6413	+							0.6413
Shallow Concentrated Flow											
7	Surface Description (Paved or Unpaved)		Unpaved		Unpaved	Unpaved	Unpaved	Unpaved	Unpaved	Unpaved	
8	Flow length, L	ft	310		50	250	421	327	1141	744	
9	Watercourse slope, s	ft/ft	0.1000		0.3300	0.0700	0.0430	0.0180	0.0240	0.0830	
10	Average Velocity, V (figure 3-1)	ft/sec	5.10		9.27	4.27	3.35	2.16	2.50	4.65	
11	Tt = L / (3600V)	Compute Tt , hr	0.0169	+	0.0015	0.0163	0.0350	0.0420	0.1268	0.0445	0.2828
Channel Flow											
12	Cross Sectional flow area, a	ft^2									
13	Wetted Perimeter, p_w	ft									
14	Hydraulic radius, $r = a/p_w$	ft									
15	Channel slope, s	ft/ft									
16	Manning's roughness coeff., n (table 3-1)										
17	$V = (1.49*r^{2/3}*s^{1/2})/n$	ft/s									
18	Flow length, L	ft									
19	Tt = L / (3600V)	Compute Tt , hr		+							0.0000

20	**Watershed or subarea Tc or Tt (add Tt in steps 6,11, and 19)**	**hr**	0.92
		Min.	**55**

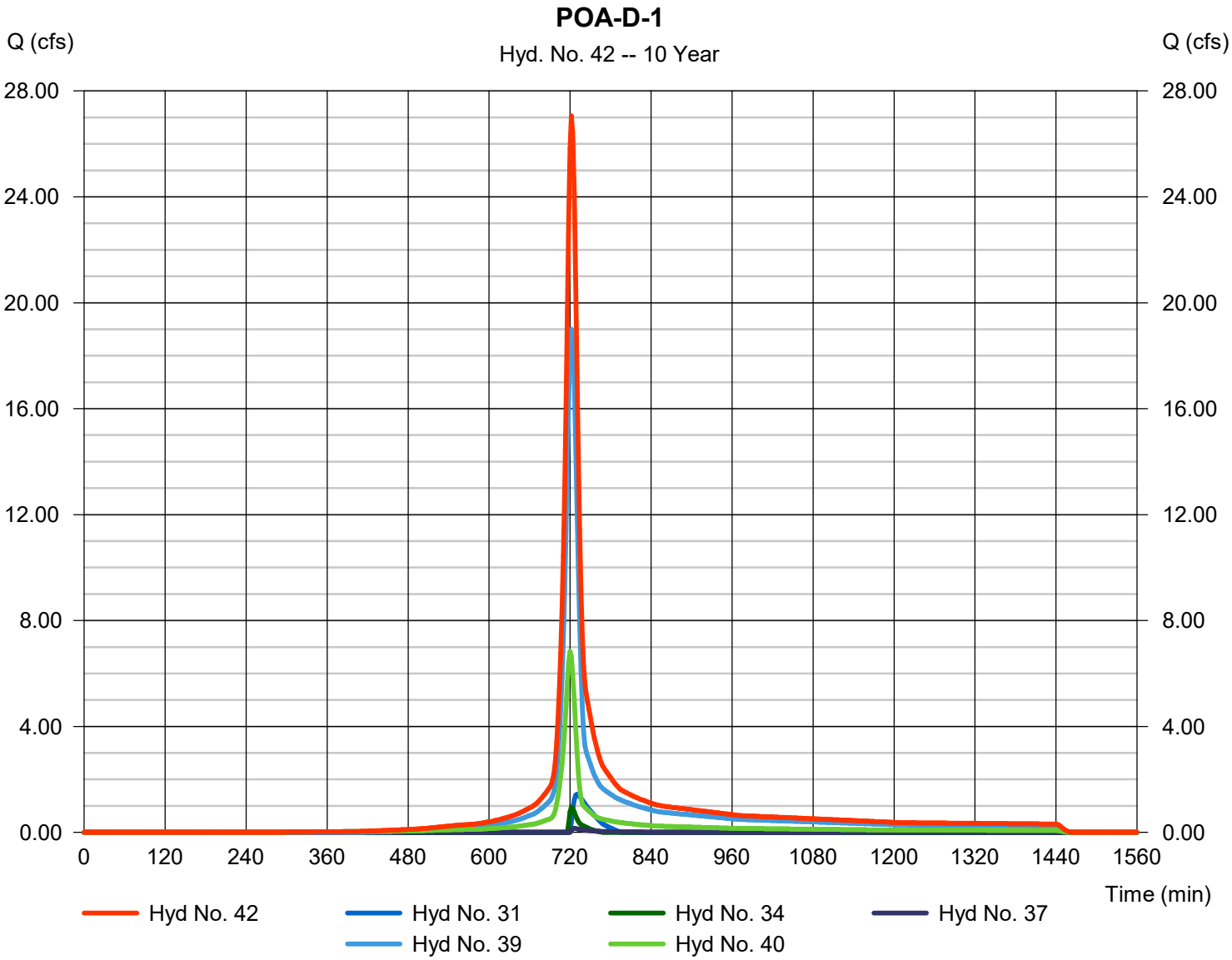
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Monday, 03 / 30 / 2020

Hyd. No. 42

POA-D-1

Hydrograph type	= Combine	Peak discharge	= 27.05 cfs
Storm frequency	= 10 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 75,718 cuft
Inflow hyds.	= 31, 34, 37, 39, 40	Contrib. drain. area	= 6.490 ac

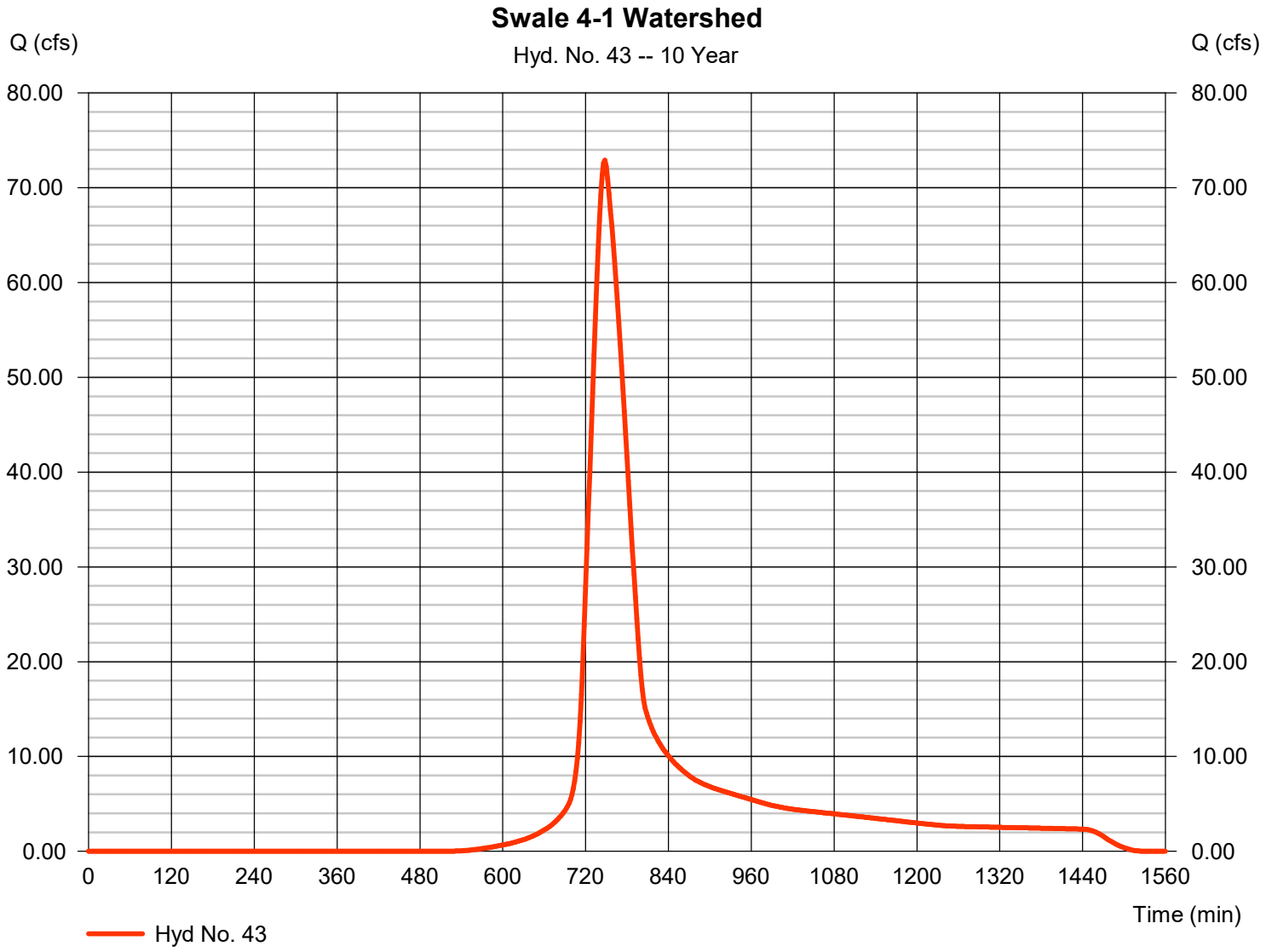


Hydrograph Report

Hyd. No. 43

Swale 4-1 Watershed

Hydrograph type	= SCS Runoff	Peak discharge	= 72.92 cfs
Storm frequency	= 10 yrs	Time to peak	= 748 min
Time interval	= 2 min	Hyd. volume	= 453,011 cuft
Drainage area	= 52.290 ac	Curve number	= 76
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 55.00 min
Total precip.	= 4.84 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

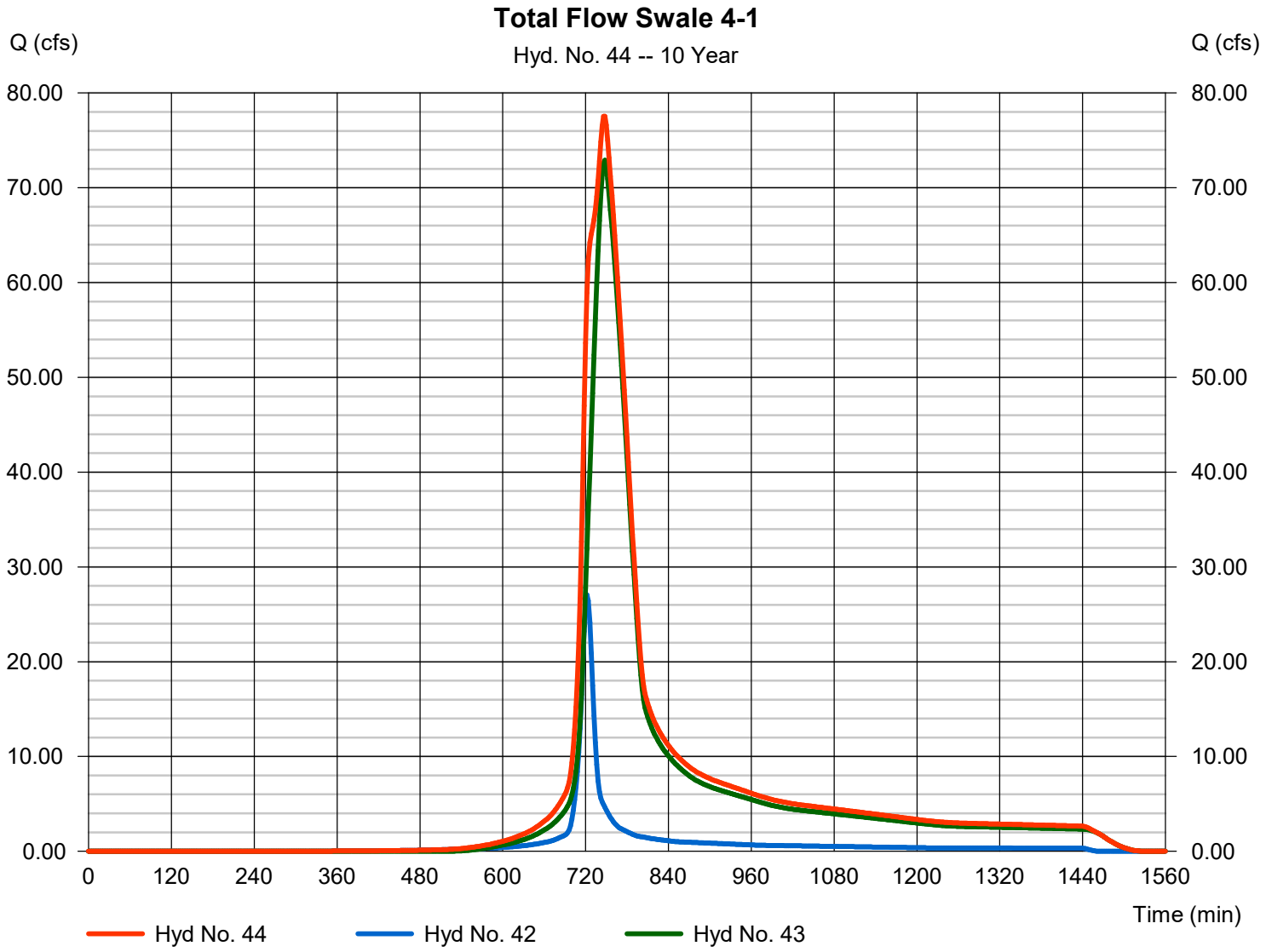


Hydrograph Report

Hyd. No. 44

Total Flow Swale 4-1

Hydrograph type	= Combine	Peak discharge	= 77.55 cfs
Storm frequency	= 10 yrs	Time to peak	= 748 min
Time interval	= 2 min	Hyd. volume	= 528,729 cuft
Inflow hyds.	= 42, 43	Contrib. drain. area	= 52.290 ac



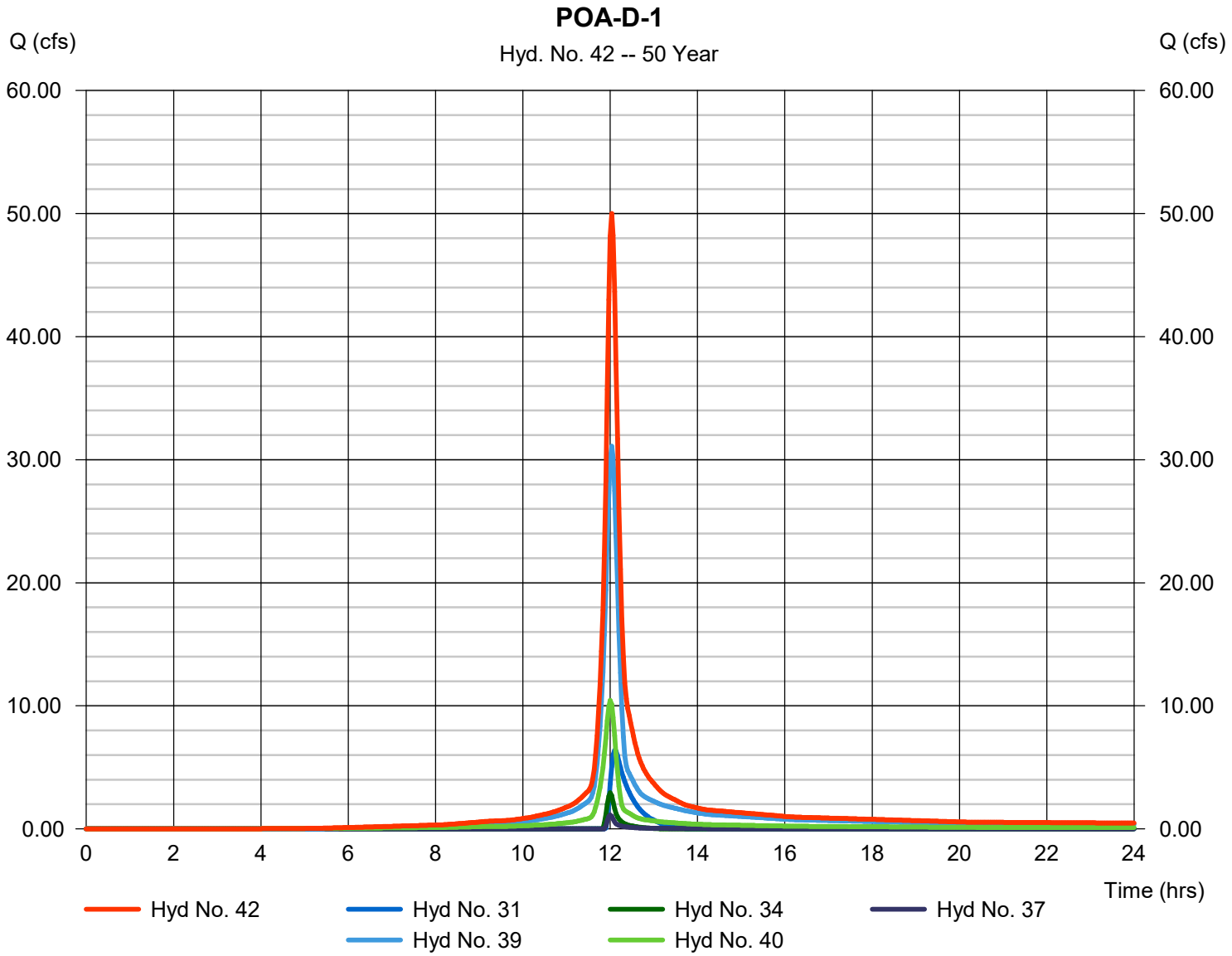
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Monday, 03 / 30 / 2020

Hyd. No. 42

POA-D-1

Hydrograph type	= Combine	Peak discharge	= 50.01 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 133,635 cuft
Inflow hyds.	= 31, 34, 37, 39, 40	Contrib. drain. area	= 6.490 ac

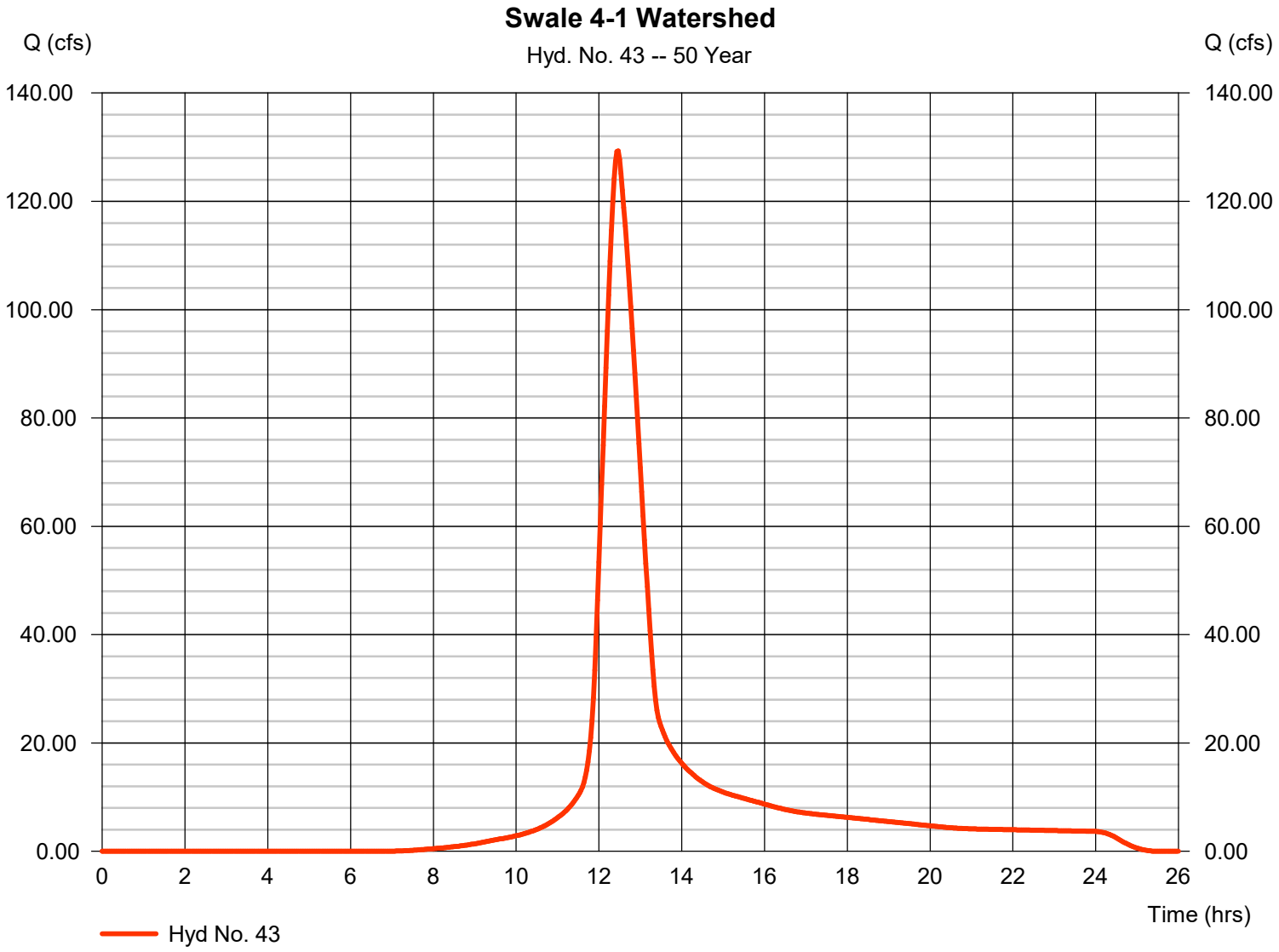


Hydrograph Report

Hyd. No. 43

Swale 4-1 Watershed

Hydrograph type	=	SCS Runoff	Peak discharge	=	129.29 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.47 hrs
Time interval	=	2 min	Hyd. volume	=	795,451 cuft
Drainage area	=	52.290 ac	Curve number	=	76
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	55.00 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

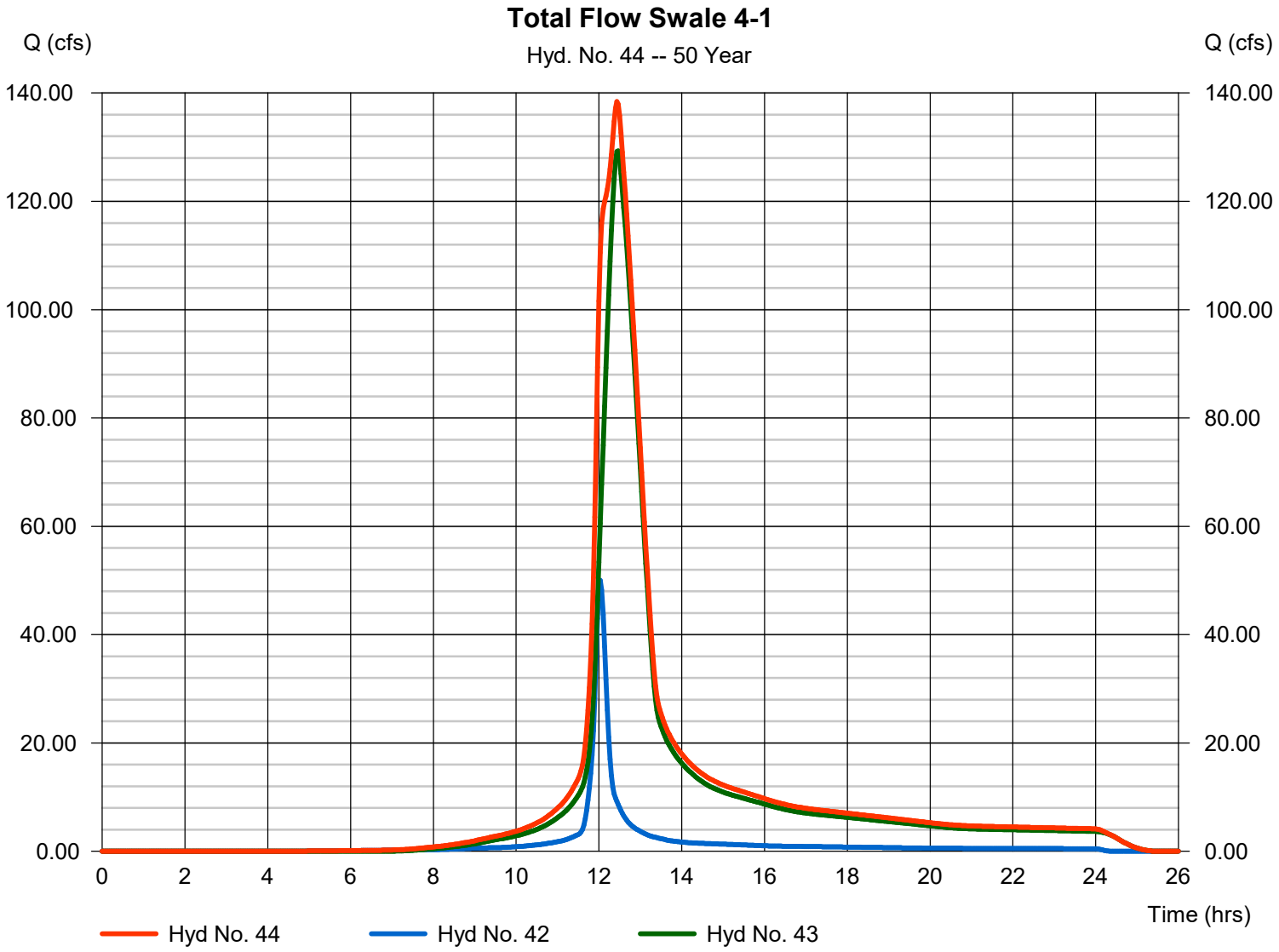


Hydrograph Report

Hyd. No. 44

Total Flow Swale 4-1

Hydrograph type	= Combine	Peak discharge	= 138.40 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.43 hrs
Time interval	= 2 min	Hyd. volume	= 929,087 cuft
Inflow hyds.	= 42, 43	Contrib. drain. area	= 52.290 ac



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Mar 30 2020

Swale 4-1 - Minimum Slope

Trapezoidal

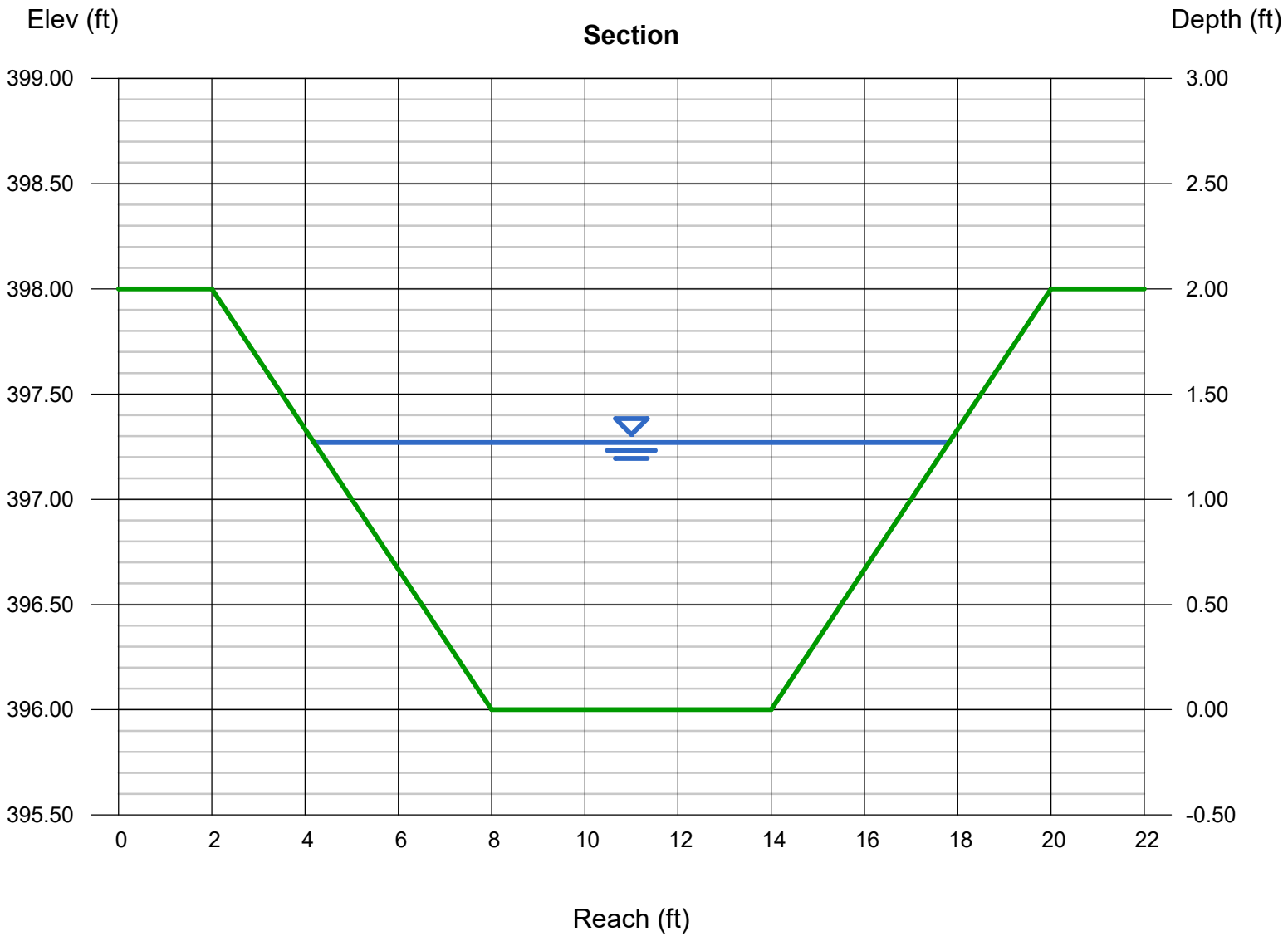
Bottom Width (ft)	= 6.00
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 396.00
Slope (%)	= 1.30
N-Value	= 0.025

Calculations

Compute by:	Known Q
Known Q (cfs)	= 77.55

Highlighted

Depth (ft)	= 1.27
Q (cfs)	= 77.55
Area (sqft)	= 12.46
Velocity (ft/s)	= 6.22
Wetted Perim (ft)	= 14.03
Crit Depth, Yc (ft)	= 1.38
Top Width (ft)	= 13.62
EGL (ft)	= 1.87



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Mar 30 2020

Swale 4-1 - Minimum Slope - 50yr

Trapezoidal

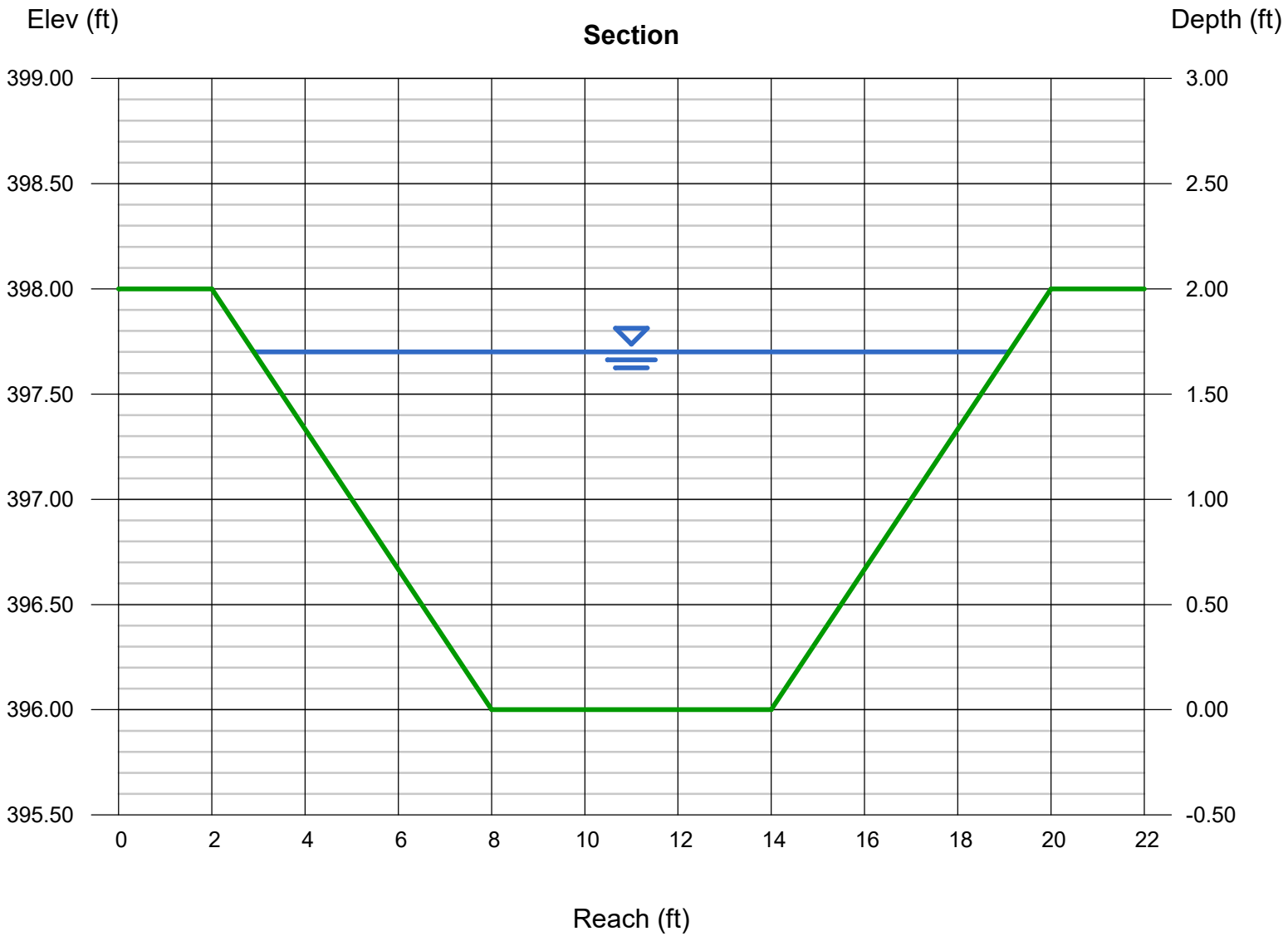
Bottom Width (ft)	= 6.00
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 396.00
Slope (%)	= 1.30
N-Value	= 0.025

Calculations

Compute by:	Known Q
Known Q (cfs)	= 138.40

Highlighted

Depth (ft)	= 1.70
Q (cfs)	= 138.40
Area (sqft)	= 18.87
Velocity (ft/s)	= 7.33
Wetted Perim (ft)	= 16.75
Crit Depth, Yc (ft)	= 1.88
Top Width (ft)	= 16.20
EGL (ft)	= 2.54



Standard E&S Worksheet #11
Channel Design Data

PROJECT NAME:	SMITHFIELD GATEWAY		
LOCATION:	SMITHFIELD TOWNSHIP, MONROE COUNTY, PA		
PREPARED BY:	MJV	DATE:	3/26/2020
CHECKED BY:	TH	DATE:	3/26/2020

CHANNEL OR CHANNEL SECTION		SWALE 4-1 MIN. SLOPE	SWALE 4-1 MAX. SLOPE			
TEMPORARY OR PERMANENT	**(T OR P)**	P	P			
DESIGN STORM	**(2,5, OR 10 YR)**	10	10			
ACRES	**(AC)**	67.67	67.67			
MULTIPLIER	**(1.6, 2.25, OR 2.75)[1]**	N/A	N/A			
Q_r (REQUIRED CAPACITY)	**(CFS)**	77.55	77.55			
Q (CALCULATED AT FLOW DEPTH d)	**(CFS)**	78.00	78.20			
PROTECTIVE LINING[2,6]		VMAX C350 (SYNTHETIC MAT)	VMAX C350 (SYNTHETIC MAT)			
n (MANNING'S COEFFICIENT)[2,7,8]		0.025	0.025			
V_a (ALLOWABLE VELOCITY)[6]	**(FPS)**	20.00	20.00			
V (CALCULATED AT FLOW DEPTH d)	**(FPS)**	6.26	11.83			
τ_a (MAX ALLOWABLE SHEAR STRESS)[6]	**(LB/FT^2)**	12.00	12.00			
τ_d (CALC'DSHEAR STRESS AT FLOW DEPTH d)	**(LB/FT^2)**	1.03	3.85			
CHANNEL BOTTOM WIDTH	**(FT)**	6.00	6.00			
CHANNEL SIDE SLOPES	**(H:V)**	3.00	3.00			
D (TOTAL DEPTH)	**(FT)**	2.00	2.00			
CHANNEL TOP WIDTH @ D	**(FT)**	18.00	18.00			
d (CALCULATED FLOW DEPTH)[9]	**(FT)**	1.27	0.79			
CHANNEL TOP WIDTH @ d	**(FT)**	13.62	10.74			
BOTTOM WIDTH: FLOW DEPTH RATIO	**(12:1 MAX)**	4.72	7.59			
d_{50} STONE SIZE	**(IN)**	N/A	N/A			
A (CROSS-SECTIONAL AREA)	**(SQ. FT.)**	12.46	6.61			
R (HYDRAULIC RADIUS)		0.89	0.60			
S (BED SLOPE)[3]	**(FT/FT)**	0.0130	0.0780			
S_c (CRITICAL SLOPE)	**(FT/FT)**	0.010	0.011			
$.7S_c$	**(FT/FT)**	0.007	0.008			
$1.3S_c$	**(FT/FT)**	0.013	0.014			
STABLE FLOW?	**(Y/N)**	NO	NO			
FREEBOARD BASED ON UNSTABLE FLOW	**(FT)**	0.596	0.701			
FREEBOARD BASED ON STABLE FLOW	**(FT)**	-	-			
MINIMUM REQUIRED FREEBOARD[4]	**(FT)**	0.50	0.50			
DESIGN METHOD FOR PROTECTIVE LINING[5] VELOCITY (V) OR SHEAR STRESS (S)	**PERMISSIBLE**	V	V			

Notes:

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater.
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.
6. Manufactured channel linings and the specified allowable velocity and maximum allowable shear stress taken from Tensar Rolled Erosion Control Systems Brochure. Allowable velocity and maximum allowable shear stress values reflect unvegetated channel conditions.
7. Manning's "n" value for riprap-lined channels taken from Figure 6.2 of the PA Erosion and Sediment Pollution Control Program Manual, dated March 2012. Depth of Flow taken from Hydraflow Express calculations.
8. Manning's "n" value for manufactured channel linings taken from Table 6.5 of the PA Erosion and Sediment Pollution Control Program Manual, dated March 2012.
9. Calculated flow depth taken from Hydraflow Express calculations.
10. Required capacity "Q" for Swale 2-1 taken from Hydraflow Hydrographs for proposed 10-year storm peak flow for POA-B. Required capacity "Q" for Swale 4-1 taken from Hydraflow Hydrographs for proposed 10-year storm event peak flow for POA-D-1.

APPENDIX C

Proposed Discharge Calculations

APPENDIX C
TABLE OF CONTENTS

PR-A-2-A-ONSITE WATERSHED

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-A-2-A-OFFSITE WATERSHED

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

COMBINED PROPOSED FLOW TO POA-A-2

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-A-3-A-ONSITE WATERSHED

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-A-3-OFFSITE WATERSHED

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

TOTAL PROPOSED FLOW TO POA-A-3

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-A-4-ONSITE WATERSHED

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-B-1-ONSITE WATERSHED

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-B-1-OFFSITE WATERSHED

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-B-2-ONSITE WATERSHED

- **Time of Concentration Calculation**
- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-B-2-ONSITE ROUTING

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

TOTAL PROPOSED FLOW TO POA-B

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-C WATERSHED (TOTAL PROPOSED FLOW TO POA-C)

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

COMBINED PROPOSED FLOW TO POA-ABC

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-D-1 WATERSHED

- **Time of Concentration Calculation**
- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-D-2-DISTURBED WATERSHED

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-D-2-UNDISTURBED WATERSHED

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-D-2 COMBINED FLOW

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-D-3 WATERSHED

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-D-4-ONSITE-DISTURBED WATERSHED

- **Time of Concentration Calculation**
- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-D-4-ONSITE-UNDISTURBED WATERSHED

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-D-4-OFFSITE-DISTURBED WATERSHED

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-D-4-OFFSITE-UNDISTURBED WATERSHED

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

TOTAL PROPOSED FLOW TO POA-D-1

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-D-5-OFFSITE WATERSHED

- **Time of Concentration Calculation**
- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

TOTAL PROPOSED FLOW TO POA-D

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-E-1 WATERSHED

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-E-2 WATERSHED

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-E-3-DISTURBED WATERSHED

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-E-3-UNDISTURBED WATERSHED

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-E-3 COMBINED FLOW

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-E-4-DISTURBED WATERSHED

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-E-4-UNDISTURBED WATERSHED

- **Time of Concentration Calculation**
- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-E-4 COMBINED FLOW

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-E-5 WATERSHED

- **Time of Concentration Calculation**
- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-E-6 WATERSHED

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-E-7 WATERSHED

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-E-8 WATERSHED

- **Time of Concentration Calculation**
- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-E-10-ONSITE-DISTURBED WATERSHED

- **Time of Concentration Calculation**
- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-E-10-ONSITE-UNDISTURBED WATERSHED

- **Time of Concentration Calculation**
- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-E-10-OFFSITE-DISTURBED WATERSHED

- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**
- **50 Year 24 Hour Storm**
- **100 Year 24 Hour Storm**

PR-E-10-OFFSITE-UNDISTURBED WATERSHED

- **Time of Concentration Calculation**
- **2 Year 24 Hour Storm**
- **10 Year 24 Hour Storm**
- **25 Year 24 Hour Storm**

50 Year 24 Hour Storm
100 Year 24 Hour Storm

PR-E-11-DISTURBED WATERSHED
2 Year 24 Hour Storm
10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

PR-E-11-UNDISTURBED WATERSHED
2 Year 24 Hour Storm
10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

PR-E-12-DISTURBED WATERSHED
2 Year 24 Hour Storm
10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

PR-E-12-UNDISTURBED WATERSHED
2 Year 24 Hour Storm
10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

TOTAL PROPOSED FLOW TO POA-E
2 Year 24 Hour Storm
10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

TOTAL PROPOSED FLOW TO BRODHEAD CREEK
2 Year 24 Hour Storm
10 Year 24 Hour Storm
25 Year 24 Hour Storm
50 Year 24 Hour Storm
100 Year 24 Hour Storm

SUMMARY OF PROPOSED PEAK DISCHARGES

***Note: Proposed Offsite Watersheds and Onsite Watersheds where there is no change in flow pattern reference Time of Concentration values calculated in Appendix A. The minimum time of concentration is 6.0 minutes.**

NOAA RAINFALL DATA

NOAA Atlas 14, Volume 2, Version 3
Location name: East Stroudsburg, Pennsylvania, US*
Latitude: 41.0047°, Longitude: -75.1497°
Elevation: 473 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.327 (0.291-0.366)	0.391 (0.349-0.439)	0.471 (0.418-0.528)	0.537 (0.475-0.599)	0.627 (0.549-0.699)	0.704 (0.612-0.785)	0.790 (0.679-0.883)	0.885 (0.752-0.992)	1.02 (0.857-1.16)	1.15 (0.948-1.31)
10-min	0.516 (0.460-0.577)	0.619 (0.552-0.694)	0.743 (0.660-0.833)	0.844 (0.747-0.943)	0.979 (0.857-1.09)	1.09 (0.950-1.22)	1.22 (1.05-1.36)	1.36 (1.16-1.52)	1.56 (1.31-1.76)	1.74 (1.43-1.98)
15-min	0.638 (0.569-0.714)	0.767 (0.683-0.860)	0.927 (0.823-1.04)	1.05 (0.930-1.18)	1.23 (1.07-1.37)	1.37 (1.19-1.53)	1.53 (1.31-1.71)	1.70 (1.45-1.91)	1.96 (1.64-2.21)	2.18 (1.79-2.48)
30-min	0.859 (0.766-0.962)	1.04 (0.930-1.17)	1.29 (1.15-1.45)	1.49 (1.32-1.67)	1.77 (1.55-1.98)	2.01 (1.75-2.24)	2.27 (1.96-2.54)	2.56 (2.18-2.88)	3.00 (2.51-3.39)	3.39 (2.79-3.86)
60-min	1.06 (0.946-1.19)	1.29 (1.15-1.45)	1.64 (1.46-1.84)	1.92 (1.70-2.15)	2.33 (2.04-2.60)	2.69 (2.33-3.00)	3.08 (2.65-3.45)	3.54 (3.01-3.97)	4.23 (3.54-4.78)	4.86 (4.00-5.53)
2-hr	1.28 (1.15-1.43)	1.56 (1.41-1.74)	1.98 (1.78-2.21)	2.32 (2.08-2.59)	2.85 (2.53-3.17)	3.33 (2.93-3.71)	3.89 (3.39-4.33)	4.54 (3.92-5.07)	5.57 (4.72-6.28)	6.53 (5.45-7.41)
3-hr	1.43 (1.29-1.59)	1.73 (1.56-1.92)	2.16 (1.95-2.40)	2.52 (2.27-2.79)	3.09 (2.75-3.41)	3.59 (3.17-3.98)	4.18 (3.65-4.63)	4.86 (4.20-5.42)	5.96 (5.05-6.69)	6.96 (5.81-7.87)
6-hr	1.85 (1.68-2.06)	2.23 (2.02-2.47)	2.74 (2.48-3.04)	3.18 (2.88-3.53)	3.89 (3.48-4.31)	4.54 (4.01-5.03)	5.29 (4.63-5.88)	6.19 (5.34-6.90)	7.63 (6.45-8.56)	8.97 (7.45-10.1)
12-hr	2.31 (2.10-2.57)	2.79 (2.53-3.10)	3.45 (3.12-3.83)	4.04 (3.63-4.48)	4.96 (4.42-5.50)	5.82 (5.12-6.46)	6.83 (5.93-7.58)	8.02 (6.88-8.95)	9.95 (8.37-11.2)	11.7 (9.69-13.3)
24-hr	2.77 (2.56-3.03)	3.32 (3.07-3.64)	4.13 (3.81-4.52)	4.84 (4.44-5.28)	5.95 (5.41-6.46)	6.96 (6.28-7.54)	8.14 (7.29-8.80)	9.54 (8.44-10.3)	11.8 (10.3-12.7)	13.9 (11.9-14.9)
2-day	3.25 (3.01-3.55)	3.91 (3.62-4.27)	4.84 (4.48-5.29)	5.66 (5.21-6.17)	6.93 (6.33-7.53)	8.09 (7.33-8.77)	9.45 (8.48-10.2)	11.0 (9.79-11.9)	13.6 (11.9-14.6)	15.9 (13.7-17.2)
3-day	3.42 (3.17-3.72)	4.10 (3.80-4.46)	5.06 (4.69-5.51)	5.90 (5.44-6.40)	7.20 (6.60-7.79)	8.39 (7.63-9.06)	9.77 (8.81-10.5)	11.4 (10.2-12.3)	14.0 (12.3-15.0)	16.4 (14.2-17.6)
4-day	3.58 (3.33-3.88)	4.29 (3.98-4.66)	5.28 (4.90-5.72)	6.13 (5.68-6.63)	7.47 (6.86-8.05)	8.69 (7.93-9.35)	10.1 (9.14-10.8)	11.8 (10.5-12.6)	14.4 (12.8-15.4)	16.9 (14.7-18.1)
7-day	4.23 (3.94-4.59)	5.06 (4.70-5.50)	6.18 (5.73-6.70)	7.15 (6.61-7.74)	8.65 (7.96-9.33)	10.0 (9.15-10.8)	11.6 (10.5-12.4)	13.4 (12.0-14.3)	16.2 (14.4-17.4)	18.8 (16.5-20.1)
10-day	4.89 (4.56-5.28)	5.83 (5.43-6.29)	7.03 (6.54-7.58)	8.05 (7.48-8.67)	9.61 (8.88-10.3)	11.0 (10.1-11.8)	12.6 (11.5-13.5)	14.4 (13.0-15.4)	17.1 (15.4-18.3)	19.6 (17.4-21.0)
20-day	6.62 (6.23-7.07)	7.81 (7.36-8.35)	9.18 (8.64-9.80)	10.3 (9.69-11.0)	12.0 (11.2-12.8)	13.5 (12.5-14.3)	15.1 (14.0-16.1)	16.9 (15.6-18.0)	19.6 (17.9-20.9)	22.0 (19.9-23.4)
30-day	8.23 (7.78-8.75)	9.68 (9.13-10.3)	11.2 (10.5-11.8)	12.4 (11.7-13.1)	14.2 (13.3-15.0)	15.8 (14.7-16.7)	17.4 (16.2-18.4)	19.2 (17.8-20.3)	21.9 (20.2-23.2)	24.2 (22.2-25.6)
45-day	10.5 (9.96-11.1)	12.2 (11.6-12.9)	13.9 (13.2-14.7)	15.3 (14.5-16.1)	17.2 (16.3-18.2)	18.9 (17.8-19.9)	20.6 (19.4-21.7)	22.4 (21.1-23.7)	25.1 (23.4-26.6)	27.4 (25.4-29.0)
60-day	12.6 (12.0-13.3)	14.7 (14.0-15.4)	16.5 (15.8-17.4)	18.1 (17.2-19.0)	20.3 (19.3-21.3)	22.1 (20.9-23.2)	24.0 (22.7-25.2)	26.0 (24.5-27.3)	28.9 (27.1-30.4)	31.3 (29.2-33.0)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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PROPOSED WEIGHTED RUNOFF CURVE NUMBER CALCULATIONS

POST CONSTRUCTION STORMWATER MANAGEMENT
WEIGHTED CURVE NUMBER CALCULATIONS
SMITHFIELD GATEWAY PHASE 1A-2
LANGAN PROJECT #100501401
PROPOSED CONDITIONS

PROPOSED WATERSHED AREAS	MEADOW SOIL GROUP C CN = 71 (SF)	MEADOW SOIL GROUP D CN = 78 (SF)	WOODS (FAIR) SOIL GROUP C CN = 73 (SF)	WOODS (FAIR) SOIL GROUP D CN = 79 (SF)	OPEN SPACE GRASS CN = 80 (SF)	TOTAL IMPERVIOUS CN = 98 (SF)	TOTAL AREA (SF)	TOTAL AREA (AC)	CURVE NUMBER CN (Weighted)
POA-A-1									
PR-A-1-A-ONSITE	0	153,898	0	74,209	0	17,328	245,435	5.63	80
PR-A-1-A-OFFSITE-DISTURBED	0	11,895	0	0		52,990	64,885	1.49	94
PR-A-1-A-OFFSITE-UNDISTURBED	0	143,398	0	989,859		437,803	1,571,060	36.07	85
PR-A-1-B-OFFSITE (DA3)						103,237	327,136	7.51	
PR-A-1-C-ONSITE (DA2)	0	23,001	0	0	0	0	23,001	0.53	78
PR-A-1-C-OFFSITE (DA2)						59,677	172,148	3.95	
PR-A-1-D-OFFSITE		170,864		409,768		108,469	689,101	15.82	82
PR-A-1-E-ONSITE		25,640			6,423	37,486	69,549	1.60	89
POA-A-2									
PR-A-2-A-ONSITE	83,246	277,318	7,829	67,054	36,160	18,274	489,881	11.25	78
PR-A-2-A-OFFSITE	86,162	389,204	0	242,154	0	65,924	783,443	17.99	80
PR-A-2-B-ONSITE (DA4)	45,043	101,447	0	0	0	0	146,490	3.36	76
PR-A-2-B-OFFSITE (DA4)						210,830	464,221	10.66	
POA-A-3									
PR-A-3-ONSITE	0	321,562	0	188,472	30,910	79,398	620,342	14.24	81
PR-A-3-OFFSITE	2,829	219,205	7,057	743,443	0	155,296	1,127,830	25.89	82
POA-B									
PR-B-1-ONSITE	0	15,381	0	0	0	50,552	65,934	1.51	93
PR-B-1-OFFSITE	0	87,030	0	0	0	90,593	177,623	4.08	89
PR-B-2-ONSITE	0	197,878	0	10,575	0	11,281	219,734	5.04	79
POA-C									
PR-C					14,178	27,165	41,342	0.95	92
POA-D									
PR-D-1					21,200	71,579	92,778	2.13	94
PR-D-2-DISTURBED		0			9,318	9,881	19,199	0.44	89
PR-D-2-UNDISTURBED		2,975			0	0	2,975	0.07	78
PR-D-3					1,348	16,874	18,223	0.42	97
PR-D-4-ONSITE-DISTURBED		0			43,034	22,276	65,310	1.50	86
PR-D-4-ONSITE-UNDISTURBED		157,757		0	0	0	157,757	3.62	78
PR-D-4-OFFSITE-DISTURBED		0		0	4,916	15,379	20,295	0.47	94
PR-D-4-OFFSITE-UNDISTURBED		9,097		12,864	0	15,848	37,809	0.87	87
PR-D-5-OFFSITE		57,278			0	57,101	114,379	2.63	88
		1.31			79,816.19	4.43			

POST CONSTRUCTION STORMWATER MANAGEMENT
WEIGHTED CURVE NUMBER CALCULATIONS
SMITHFIELD GATEWAY PHASE 1A-2
LANGAN PROJECT #100501401

PROPOSED CONDITIONS

PROPOSED WATERSHED AREAS	MEADOW SOIL GROUP C CN = 71 (SF)	MEADOW SOIL GROUP D CN = 78 (SF)	WOODS (FAIR) SOIL GROUP C CN = 73 (SF)	WOODS (FAIR) SOIL GROUP D CN = 79 (SF)	OPEN SPACE GRASS CN = 80 (SF)	TOTAL IMPERVIOUS CN = 98 (SF)	TOTAL AREA (SF)	TOTAL AREA (AC)	CURVE NUMBER CN (Weighted)
POA-E									
PR-E-1					4,866	3,643	8,509	0.20	88
PR-E-2					3,033	3,980	7,013	0.16	90
PR-E-3-DISTURBED		0			12,076	9,601	21,677	0.50	88
PR-E-3-UNDISTURBED		1,058			0	0	1,058	0.02	78
PR-E-4-DISTURBED		0			18,799	27,292	46,091	1.06	91
PR-E-4-UNDISTURBED		50,921			0	0	50,921	1.17	78
PR-E-5		50,968			0	0	50,968	1.17	78
PR-E-6					3,746	40,710	44,456	1.02	96
PR-E-7					17,374	97,377	114,751	2.64	95
PR-E-8		319,105			0	0	319,105	7.33	78
PR-E-10-ONSITE-DISTURBED		15,679	0	0	161,894	153,365	330,938	7.60	88
PR-E-10-ONSITE-UNDISTURBED		504,149		141,562	5,120	177	651,008	14.95	78
PR-E-10-OFFSITE-DISTURBED					7,119	45,003	52,122	1.20	96
PR-E-10-OFFSITE-UNDISTURBED		15,546		46,468	13,342	31,124	106,480	2.44	85
PR-E-11-DISTURBED	0	69,272	0	0	0	14,608	83,880	1.93	82
PR-E-11-UNDISTURBED	0	190,420	0	0	0	226,784	417,204	9.58	89
PR-E-12-DISTURBED		100,833					100,833	2.31	78
PR-E-12-UNDISTURBED	0	651,506	0	205,649	0	0	857,155	19.68	79
POA-A									
PR-A-4 ONSITE	0	55,963	0	64,226		9,962	130,151	2.99	80

NOTES:

1. RUNOFF CURVE NUMBERS REFERENCED FROM TABLE B-2: RUNOFF CURVE NUMBERS, LOCATED IN APPENDIX B OF CHAPTER 26 - WATER OF THE ORDINANCE OF SMITHFIELD TOWNSHI
2. FOR ONSITE WATERSHEDS, 20% OF THE EXISTING IMPERVIOUS AREA IS CONSIDERED MEADOW (GOOD CONDITION) IN THE MODEL FOR EXISTING CONDITIONS, AS PER SECTION 3.3.3 VOLUME CONTROL GUIDELINE 1.

PR-A-1-A-ONSITE WATERSHED

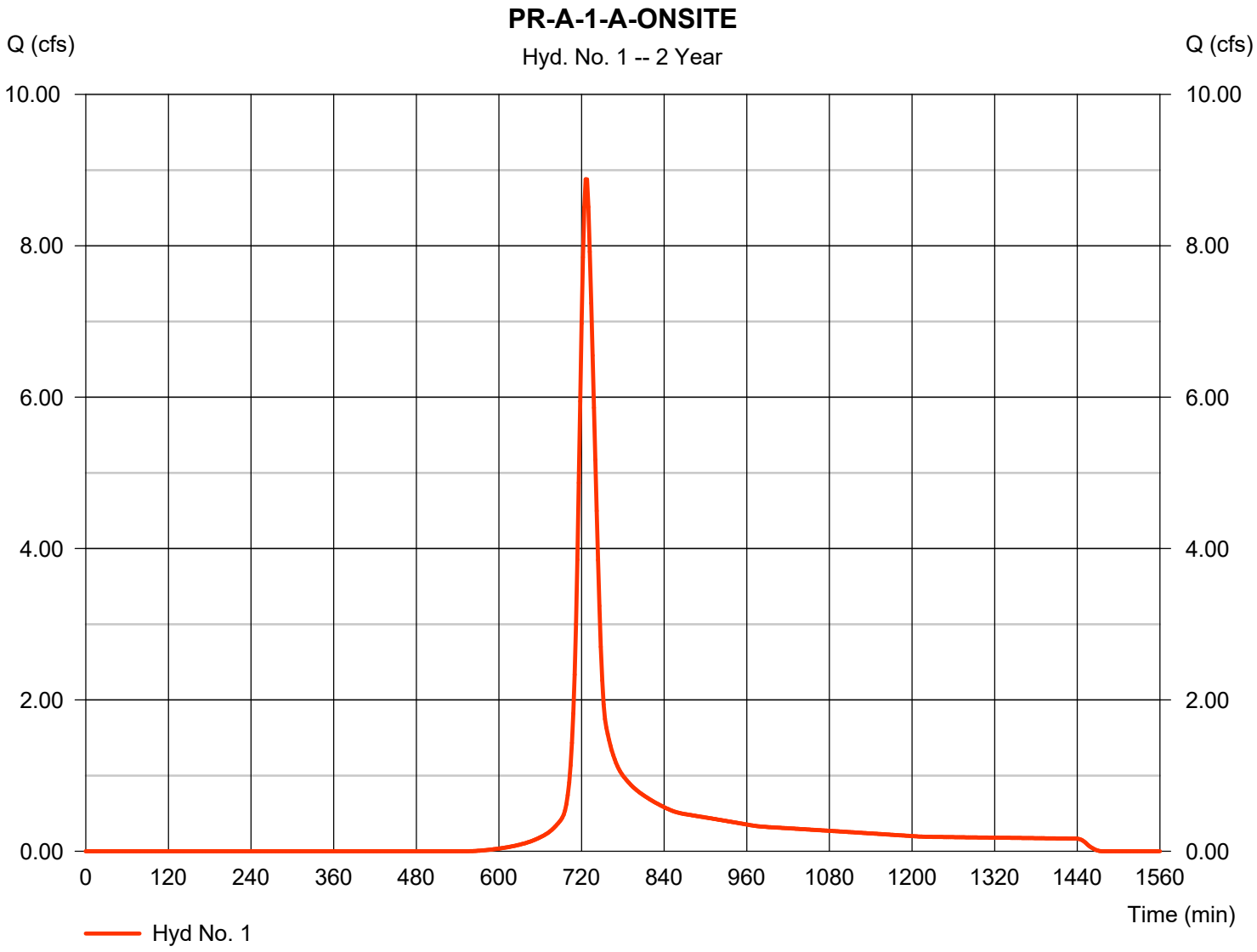
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 1

PR-A-1-A-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.880 cfs
Storm frequency	=	2 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	31,095 cuft
Drainage area	=	5.630 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	20.90 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

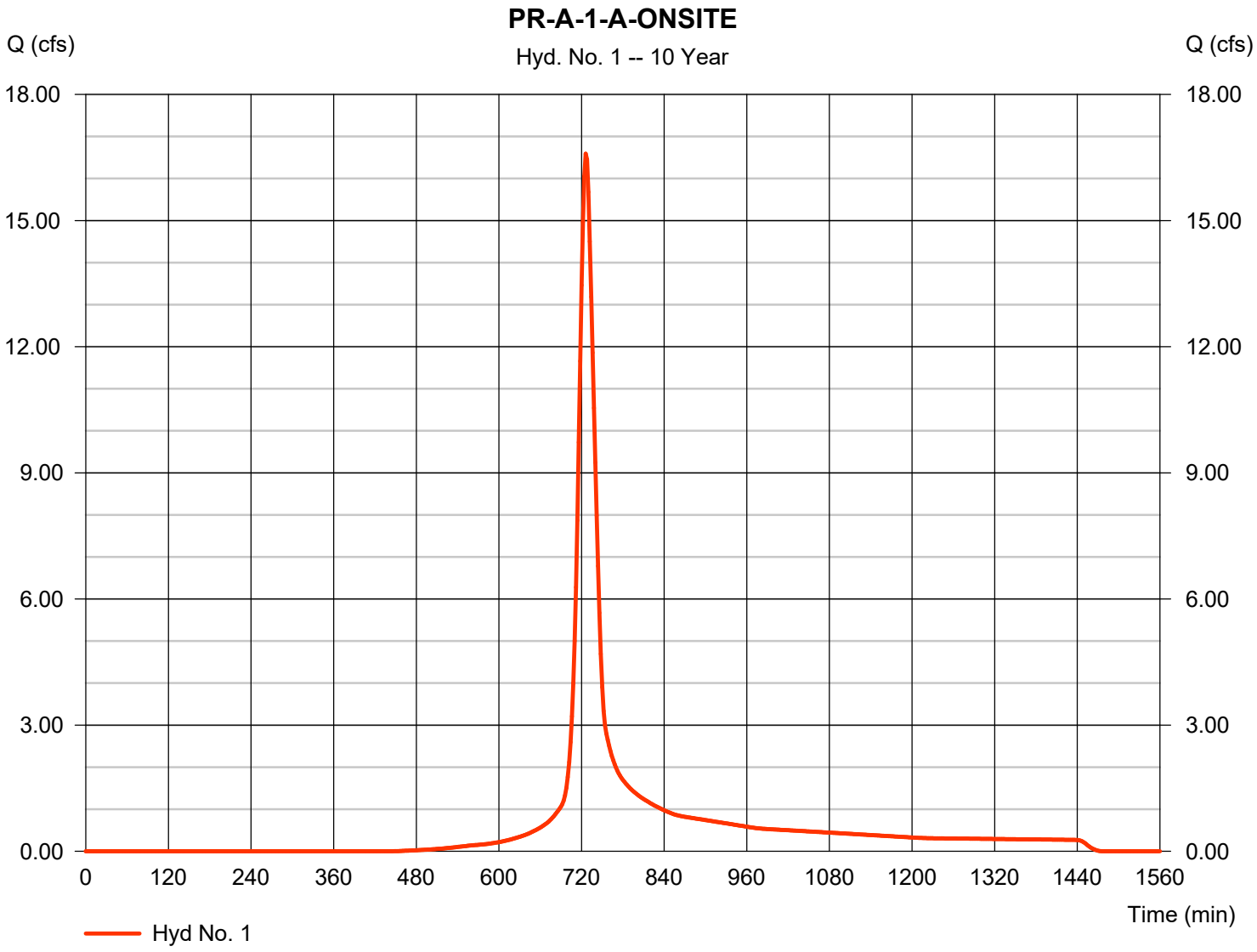


Hydrograph Report

Hyd. No. 1

PR-A-1-A-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	16.59 cfs
Storm frequency	=	10 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	57,283 cuft
Drainage area	=	5.630 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	20.90 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

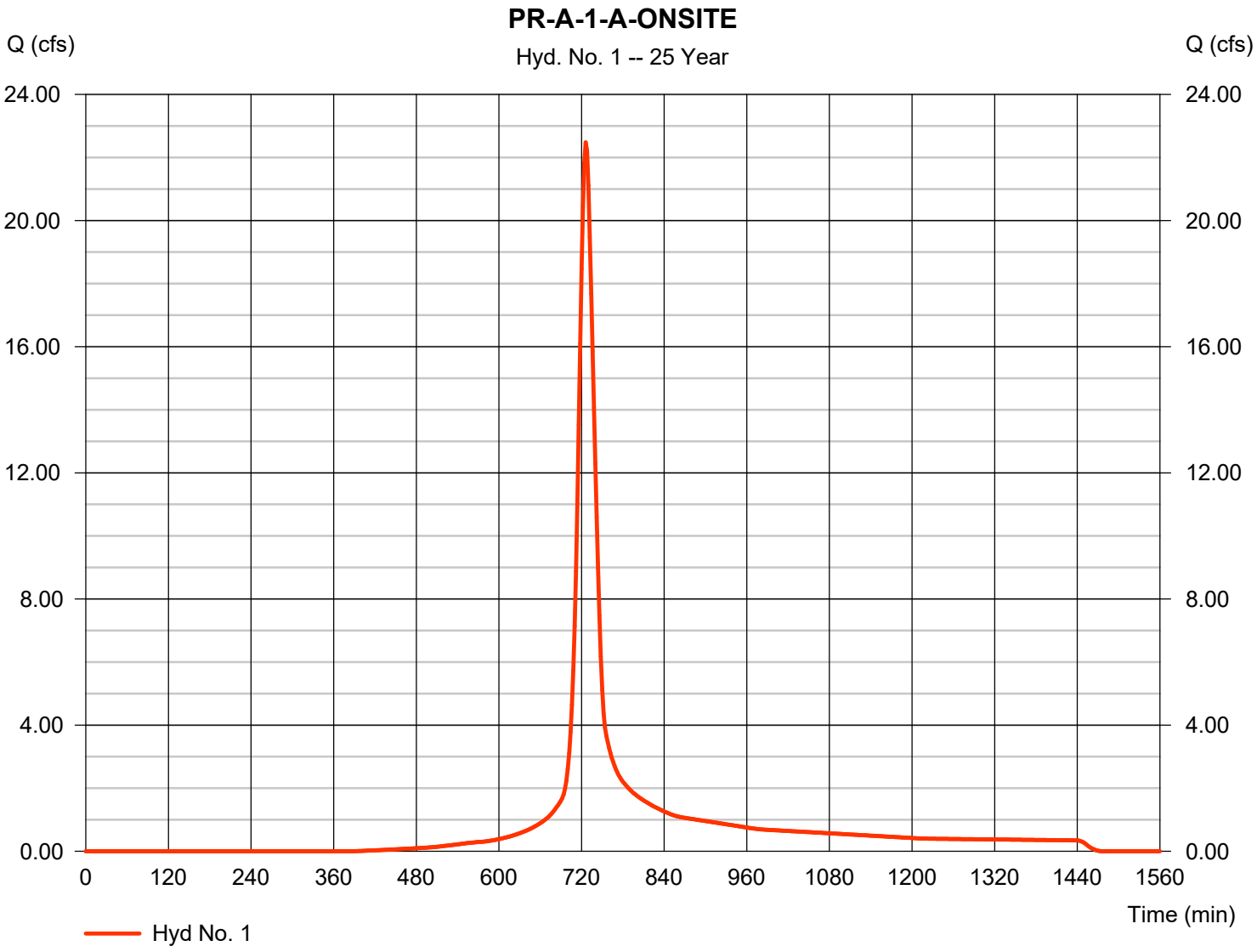


Hydrograph Report

Hyd. No. 1

PR-A-1-A-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	22.48 cfs
Storm frequency	=	25 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	77,719 cuft
Drainage area	=	5.630 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	20.90 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

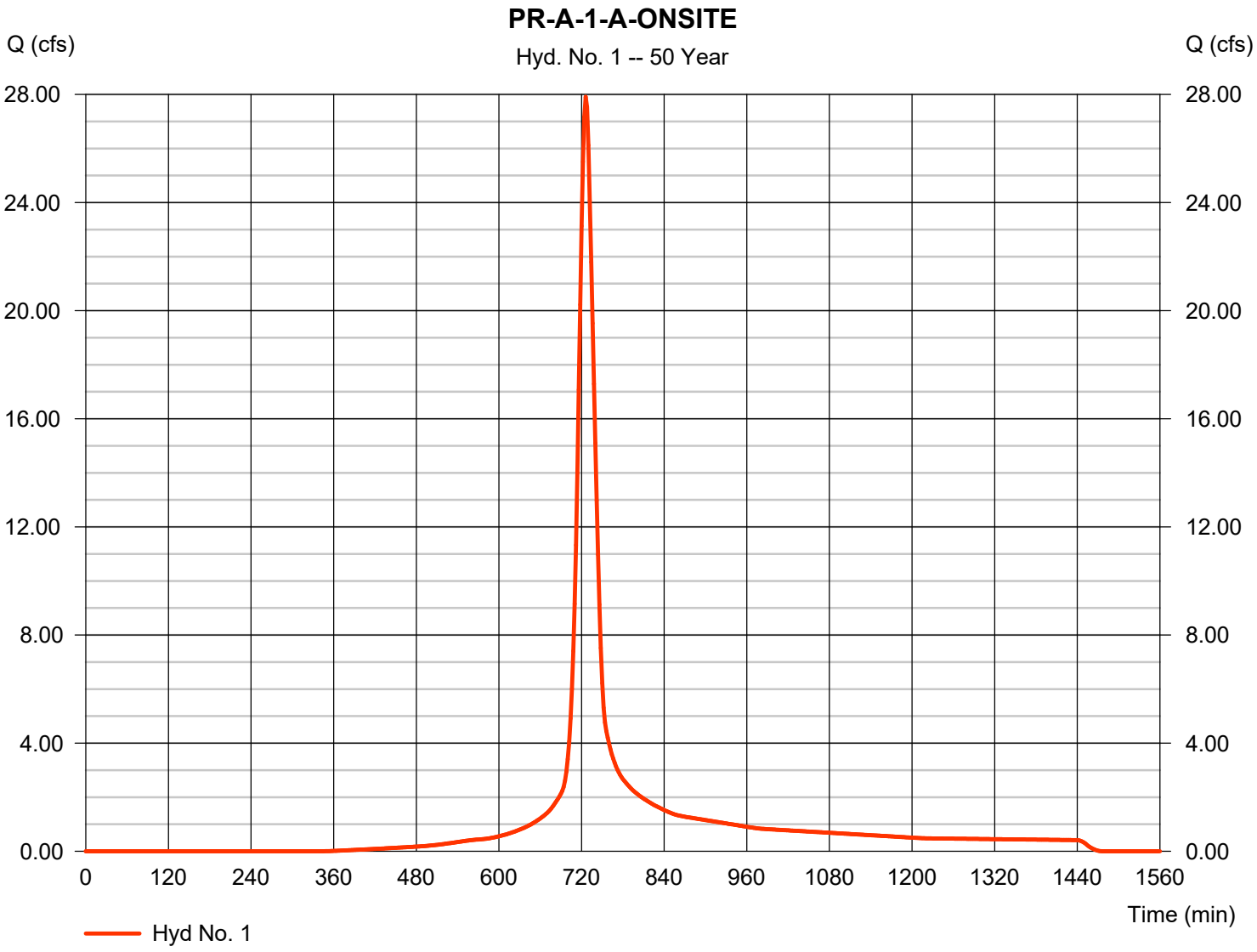


Hydrograph Report

Hyd. No. 1

PR-A-1-A-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	27.91 cfs
Storm frequency	=	50 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	96,886 cuft
Drainage area	=	5.630 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	20.90 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

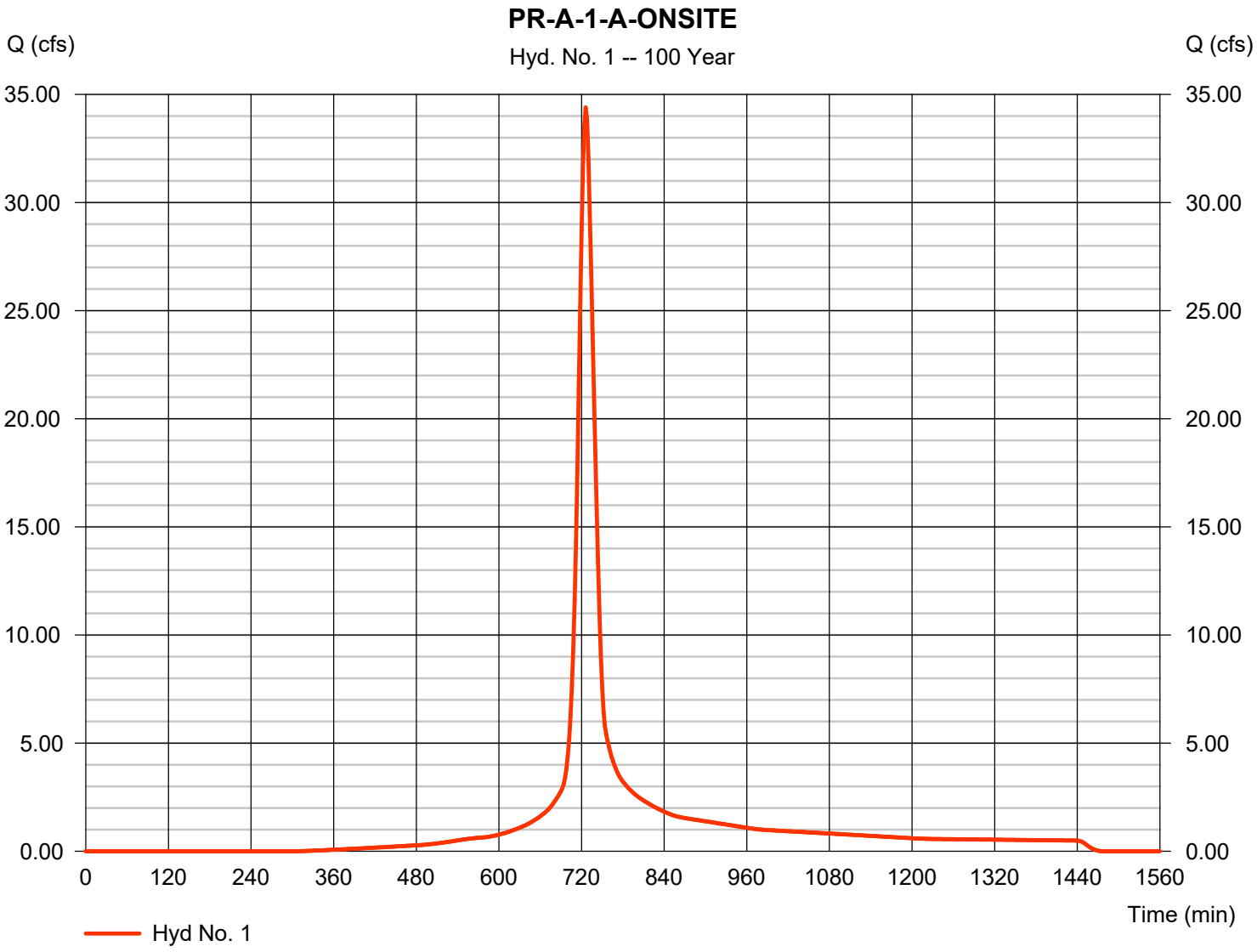


Hydrograph Report

Hyd. No. 1

PR-A-1-A-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	34.40 cfs
Storm frequency	=	100 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	120,134 cuft
Drainage area	=	5.630 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	20.90 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



PR-A-1-A-OFFSITE-DISTURBED WATERSHED

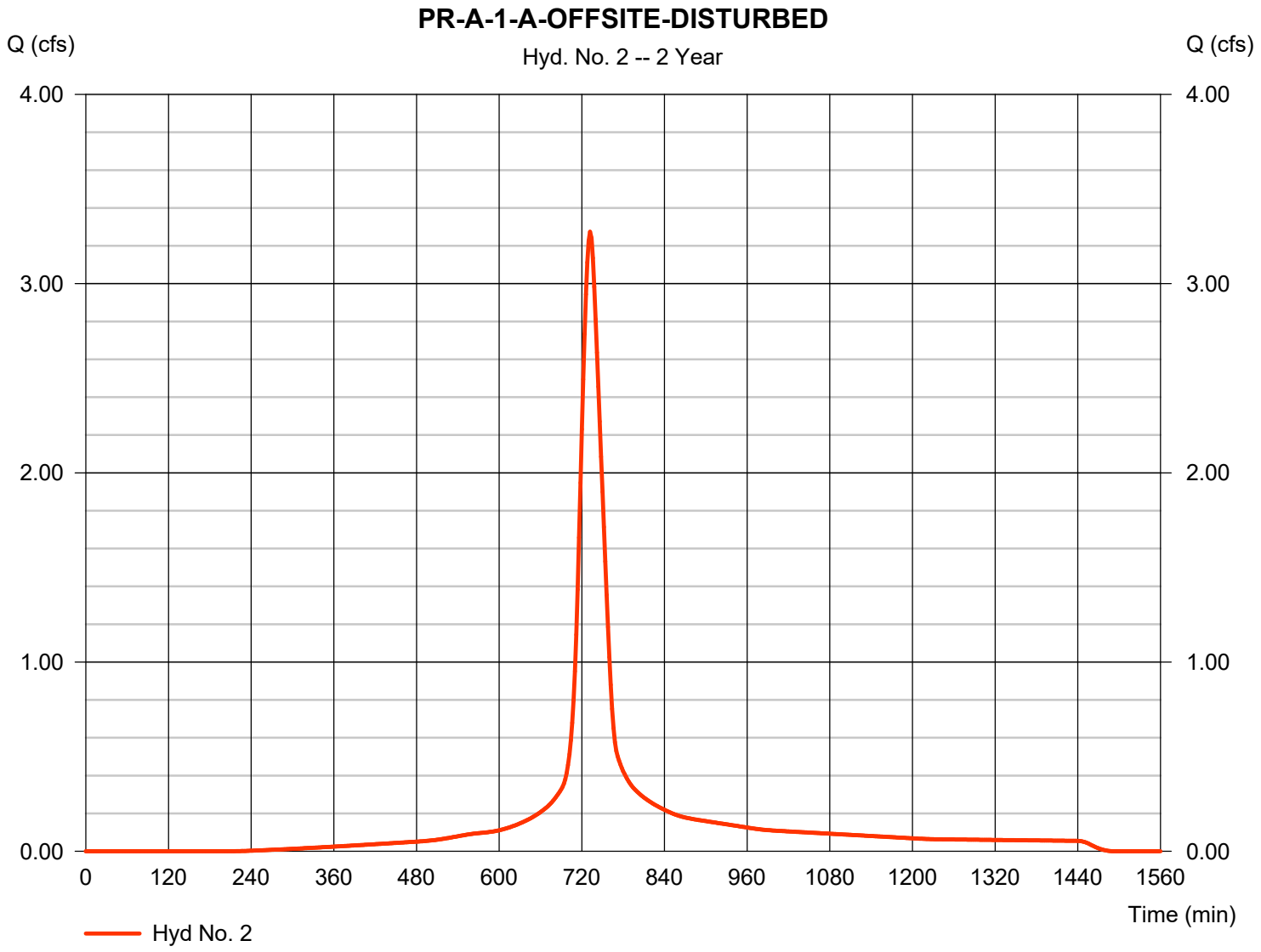
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 2

PR-A-1-A-OFFSITE-DISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 3.274 cfs
Storm frequency	= 2 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 14,569 cuft
Drainage area	= 1.490 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 31.50 min
Total precip.	= 3.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

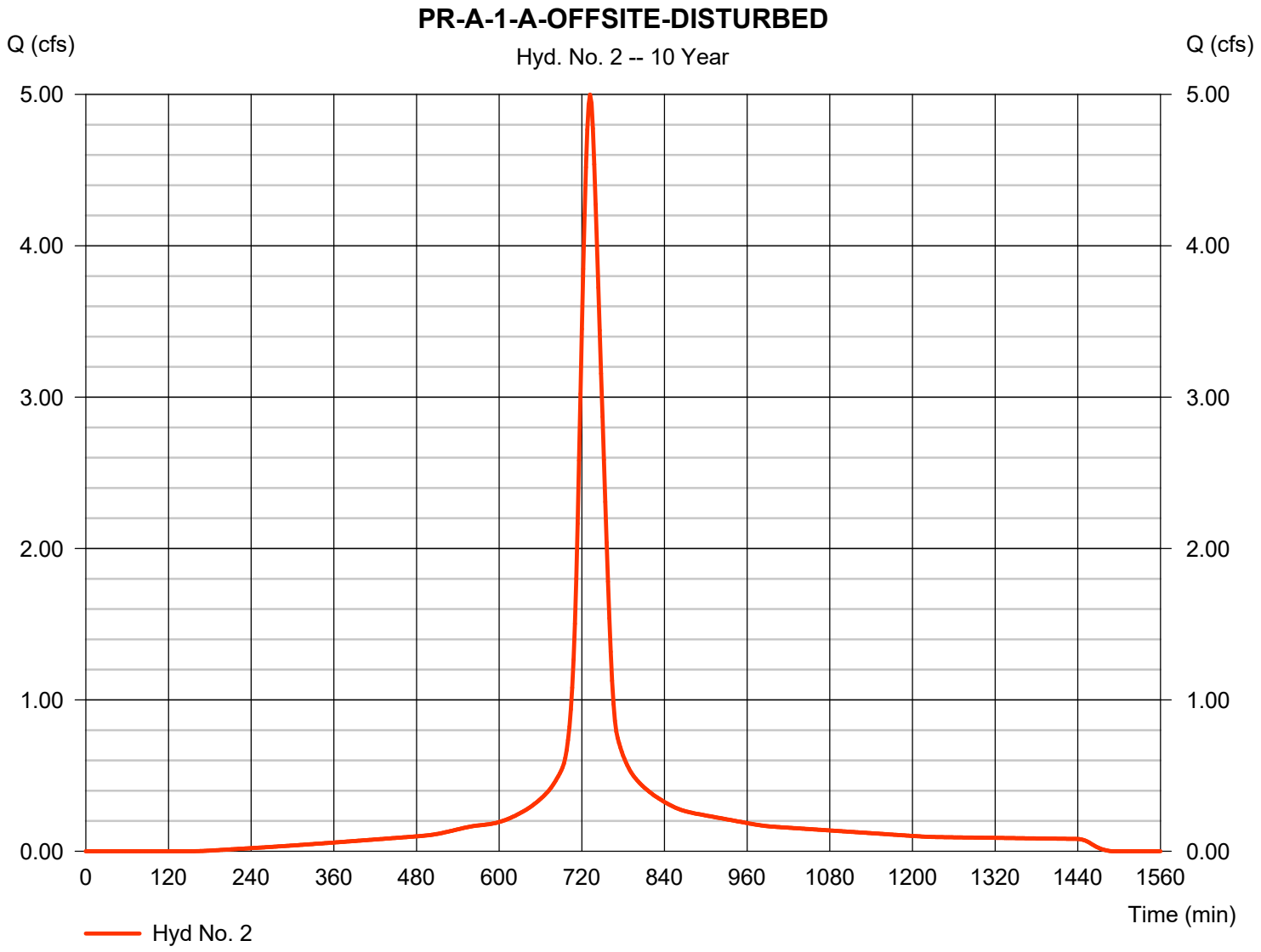


Hydrograph Report

Hyd. No. 2

PR-A-1-A-OFFSITE-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.999 cfs
Storm frequency	=	10 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	22,728 cuft
Drainage area	=	1.490 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	31.50 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

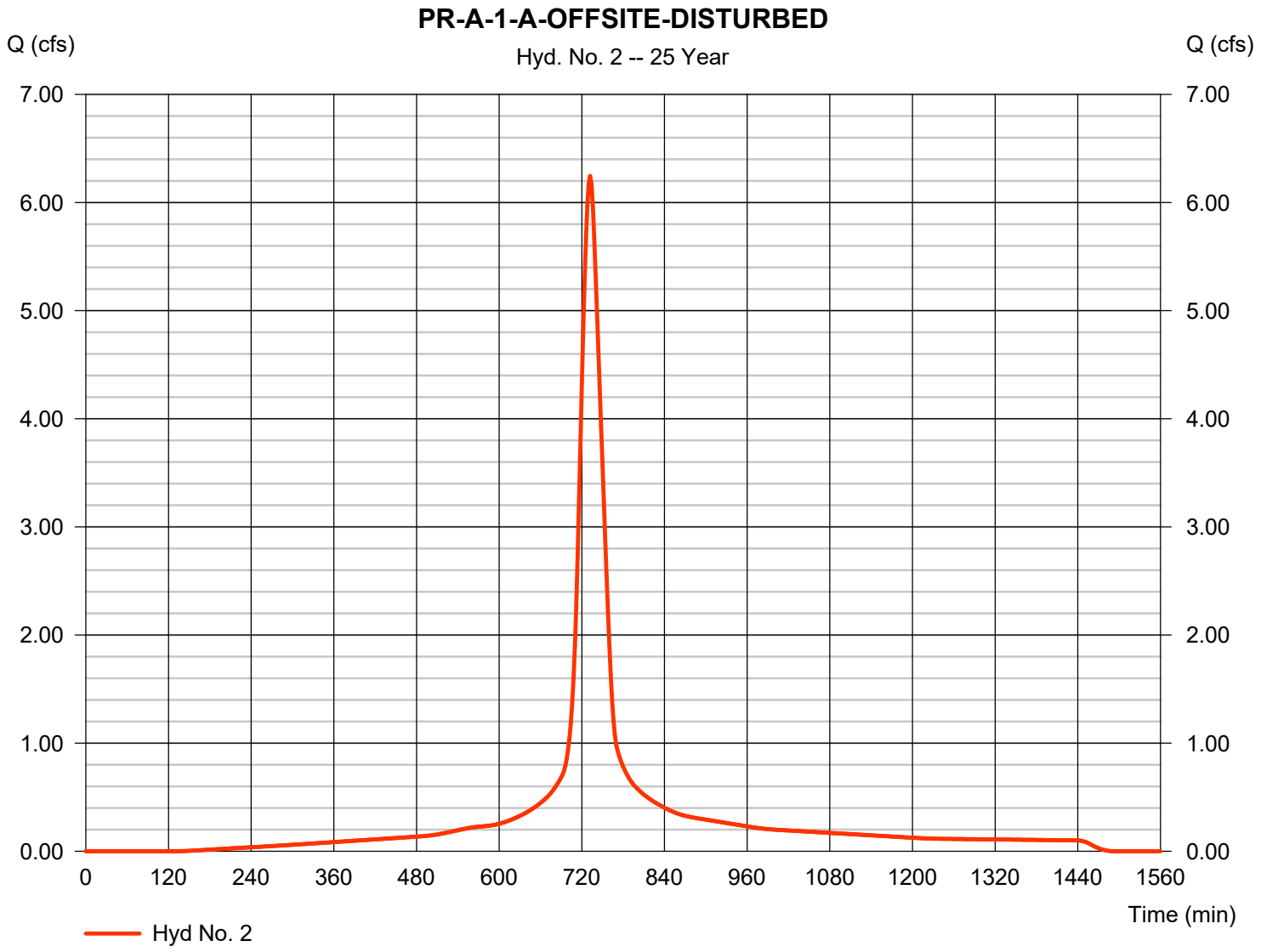


Hydrograph Report

Hyd. No. 2

PR-A-1-A-OFFSITE-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.246 cfs
Storm frequency	=	25 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	28,735 cuft
Drainage area	=	1.490 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	31.50 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

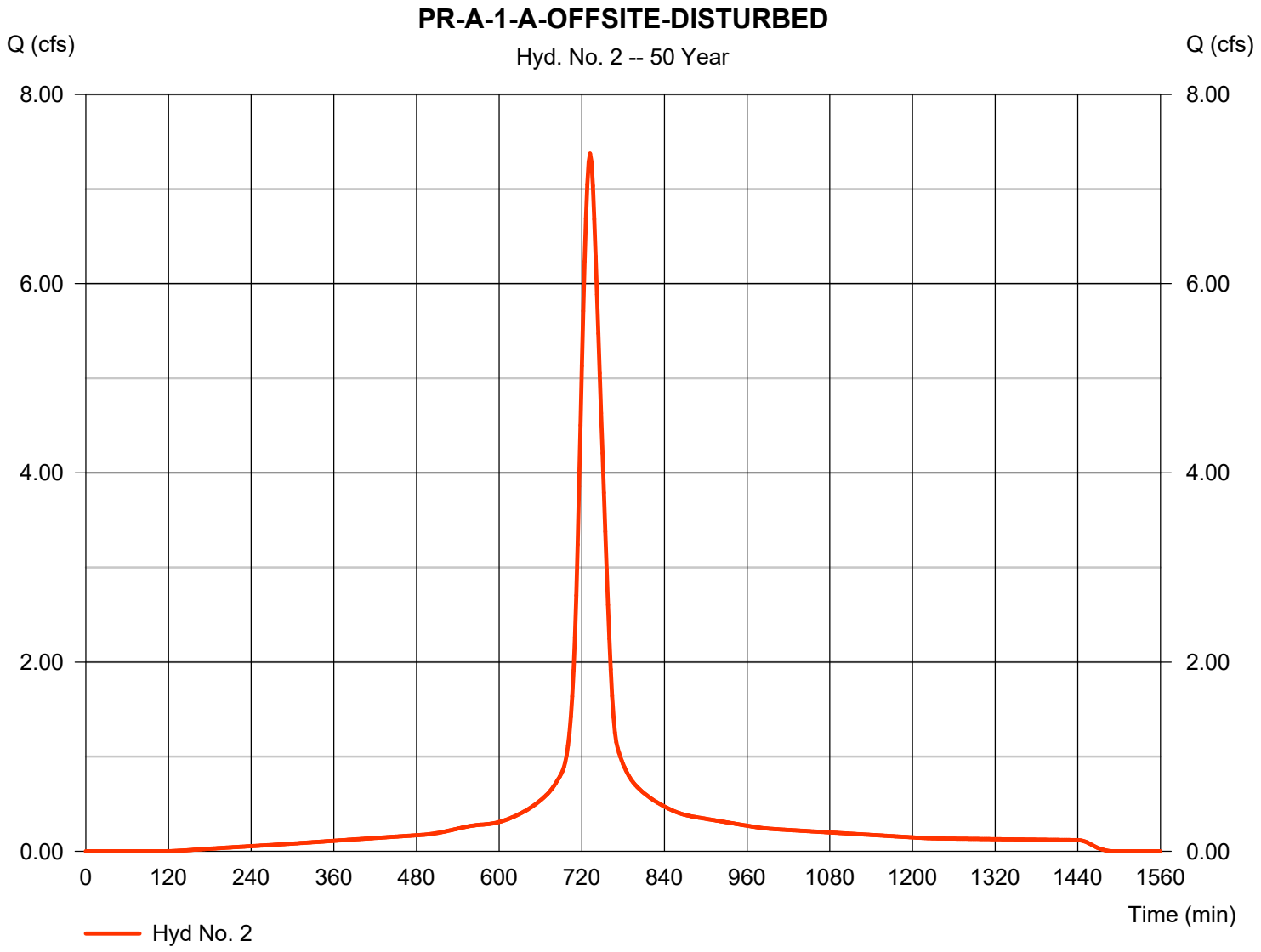


Hydrograph Report

Hyd. No. 2

PR-A-1-A-OFFSITE-DISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 7.374 cfs
Storm frequency	= 50 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 34,219 cuft
Drainage area	= 1.490 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 31.50 min
Total precip.	= 6.96 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

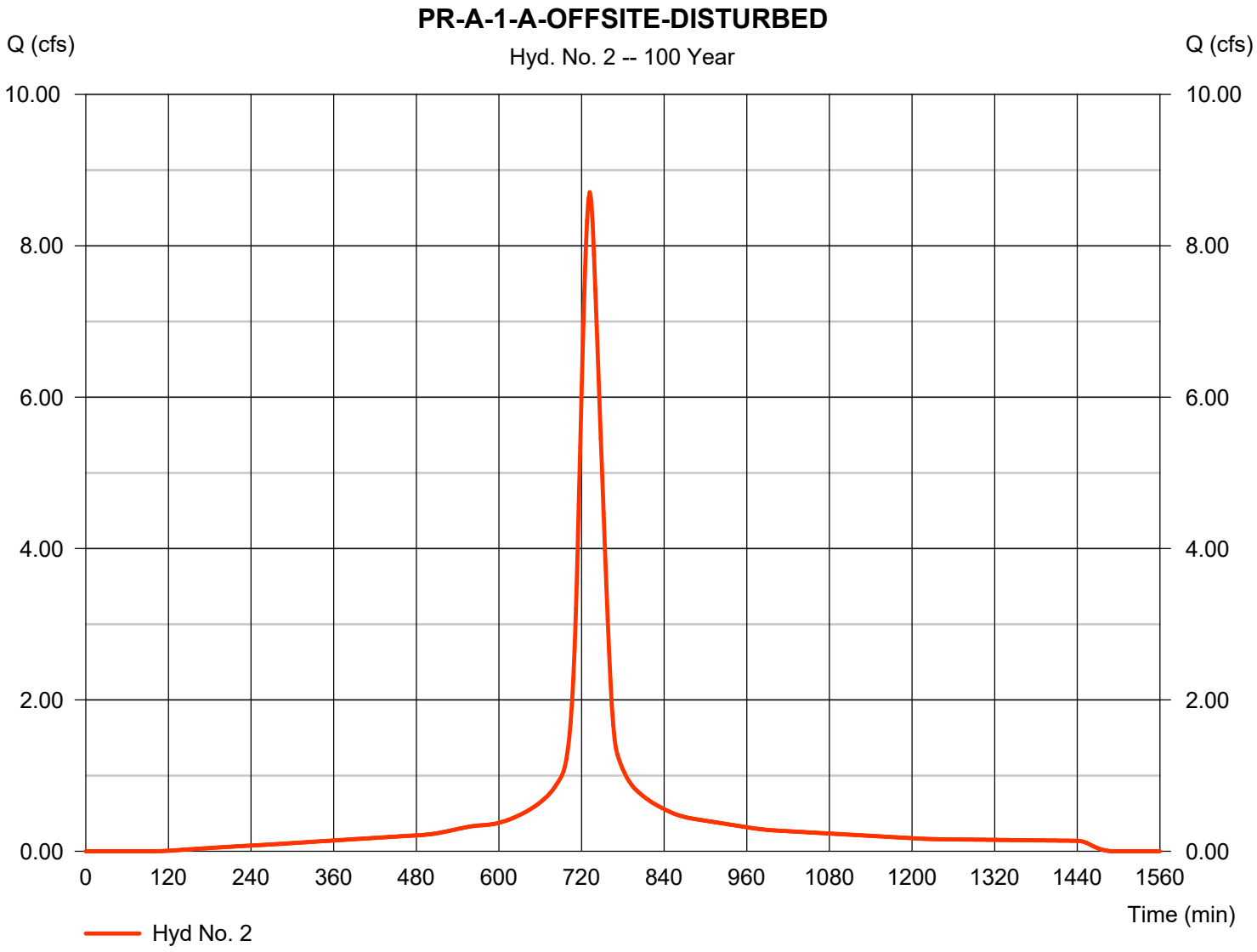


Hydrograph Report

Hyd. No. 2

PR-A-1-A-OFFSITE-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.709 cfs
Storm frequency	=	100 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	40,749 cuft
Drainage area	=	1.490 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	31.50 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



PR-A-1-A-OFFSITE-UNDISTURBED WATERSHED

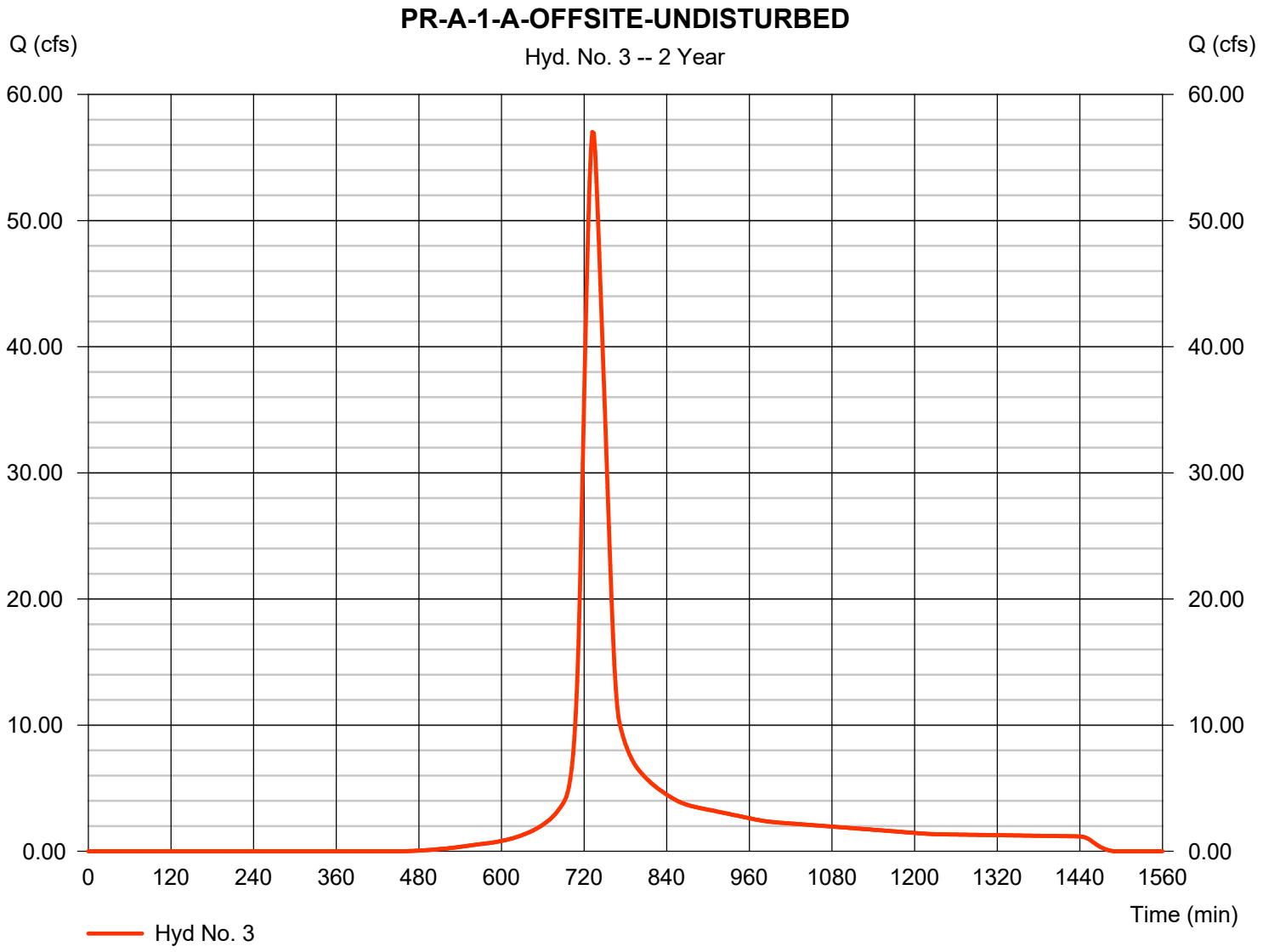
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 3

PR-A-1-A-OFFSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 57.01 cfs
Storm frequency	= 2 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 246,648 cuft
Drainage area	= 36.070 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 31.50 min
Total precip.	= 3.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

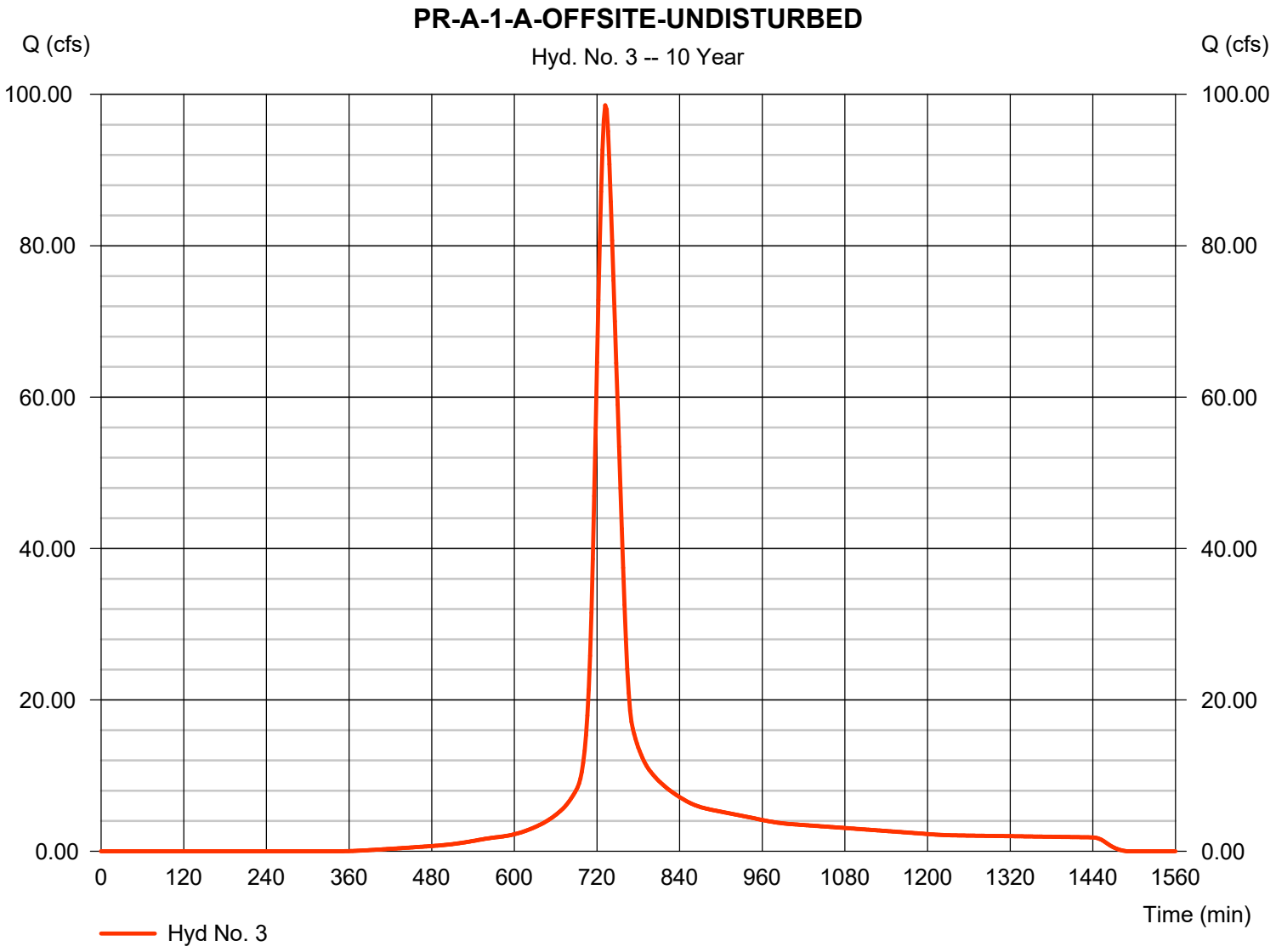


Hydrograph Report

Hyd. No. 3

PR-A-1-A-OFFSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 98.56 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 426,942 cuft
Drainage area	= 36.070 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 31.50 min
Total precip.	= 4.84 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

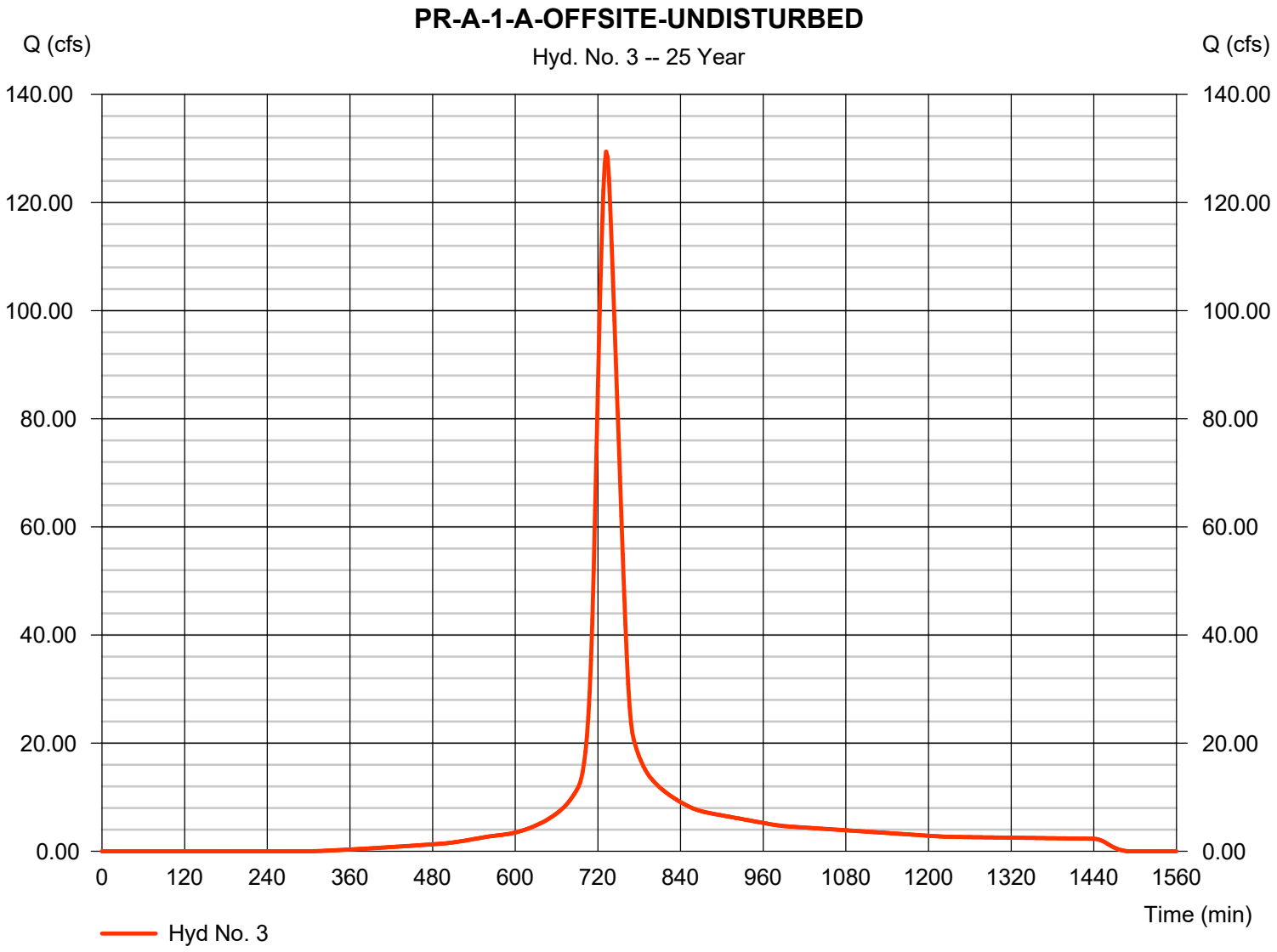


Hydrograph Report

Hyd. No. 3

PR-A-1-A-OFFSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 129.41 cfs
Storm frequency	= 25 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 564,138 cuft
Drainage area	= 36.070 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 31.50 min
Total precip.	= 5.95 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

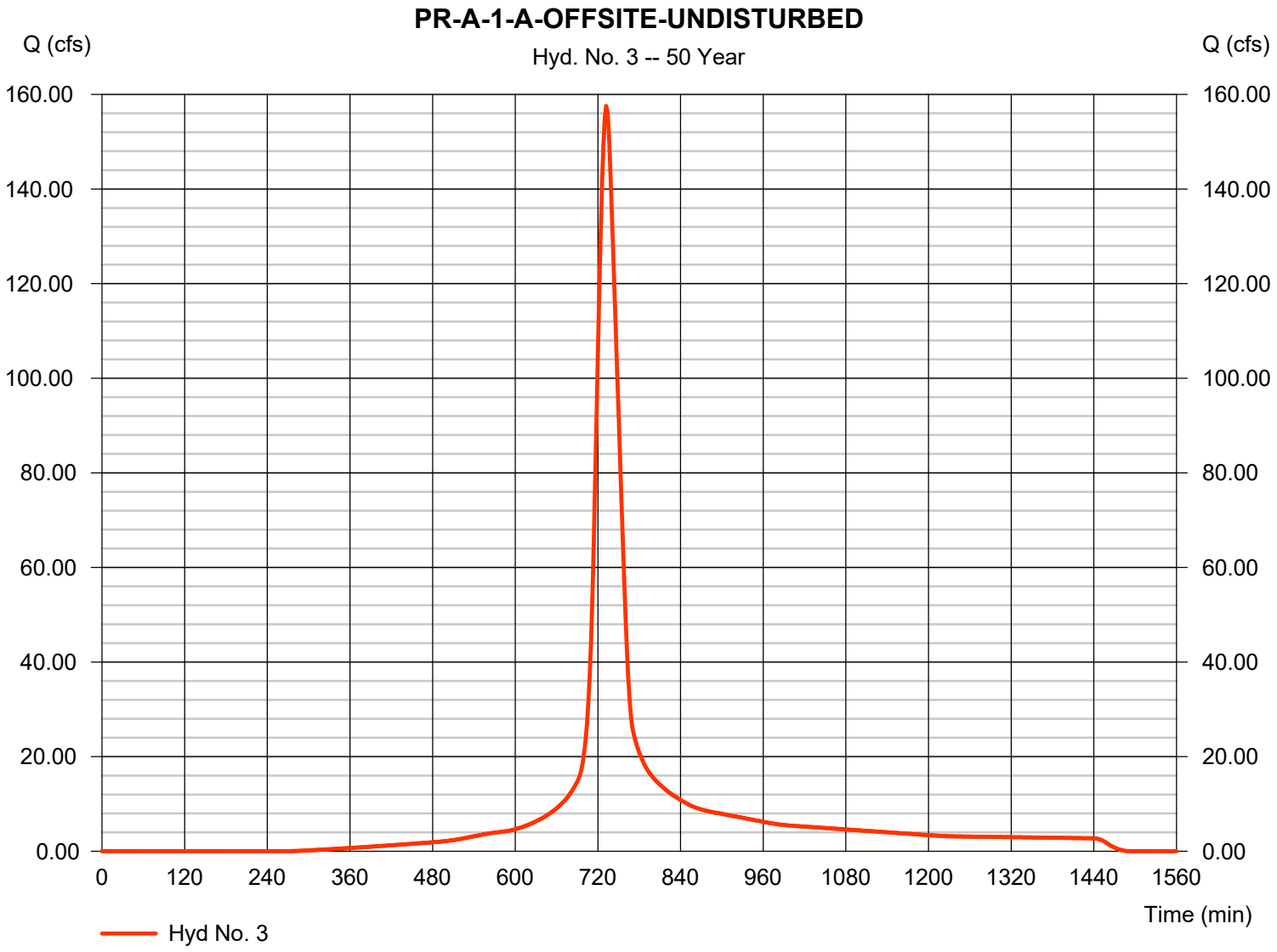


Hydrograph Report

Hyd. No. 3

PR-A-1-A-OFFSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 157.53 cfs
Storm frequency	= 50 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 691,270 cuft
Drainage area	= 36.070 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 31.50 min
Total precip.	= 6.96 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

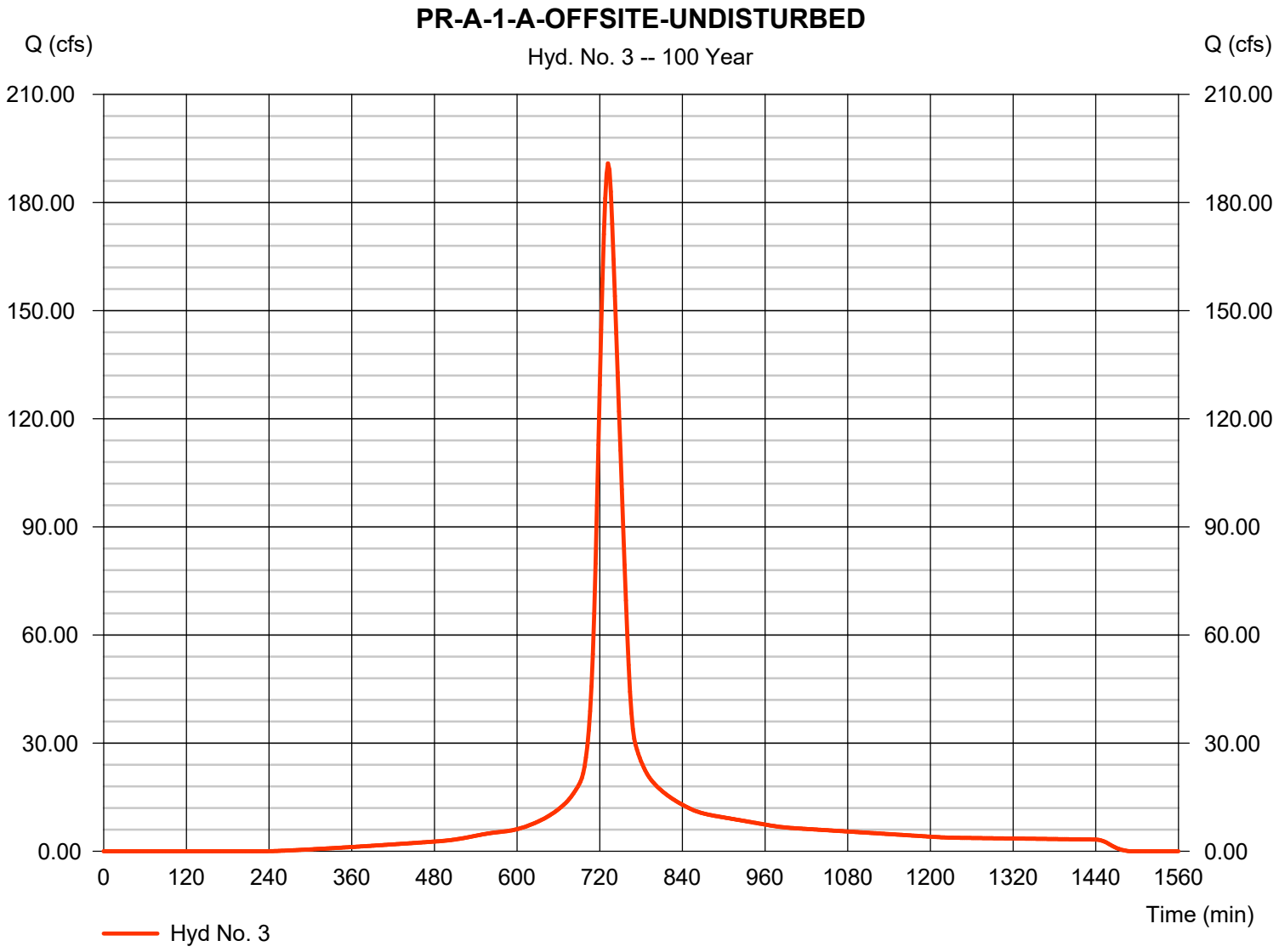


Hydrograph Report

Hyd. No. 3

PR-A-1-A-OFFSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 190.88 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 844,171 cuft
Drainage area	= 36.070 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 31.50 min
Total precip.	= 8.16 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



PR-A-1-D-OFFSITE WATERSHED

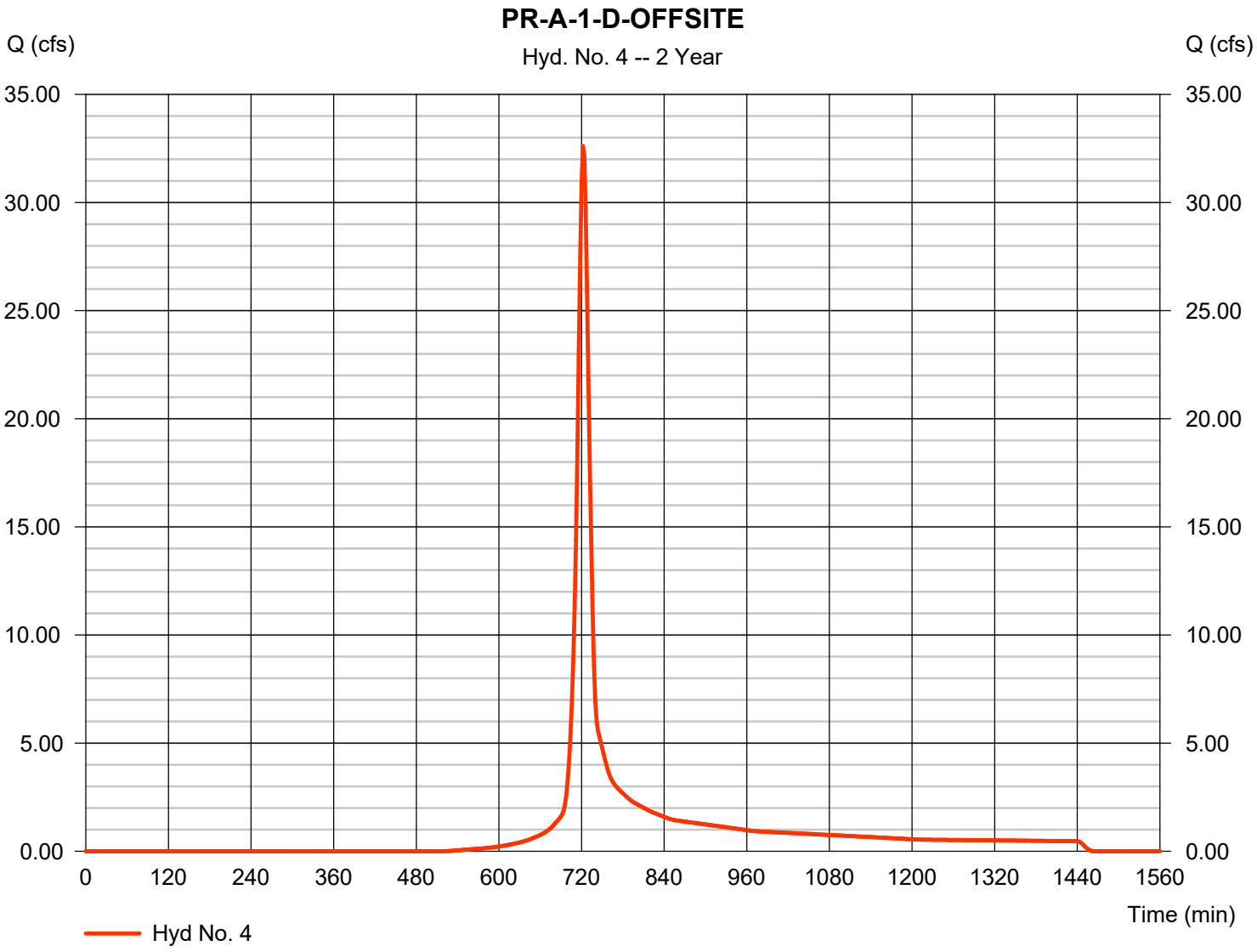
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 4

PR-A-1-D-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	32.61 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	91,552 cuft
Drainage area	=	15.820 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	13.70 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

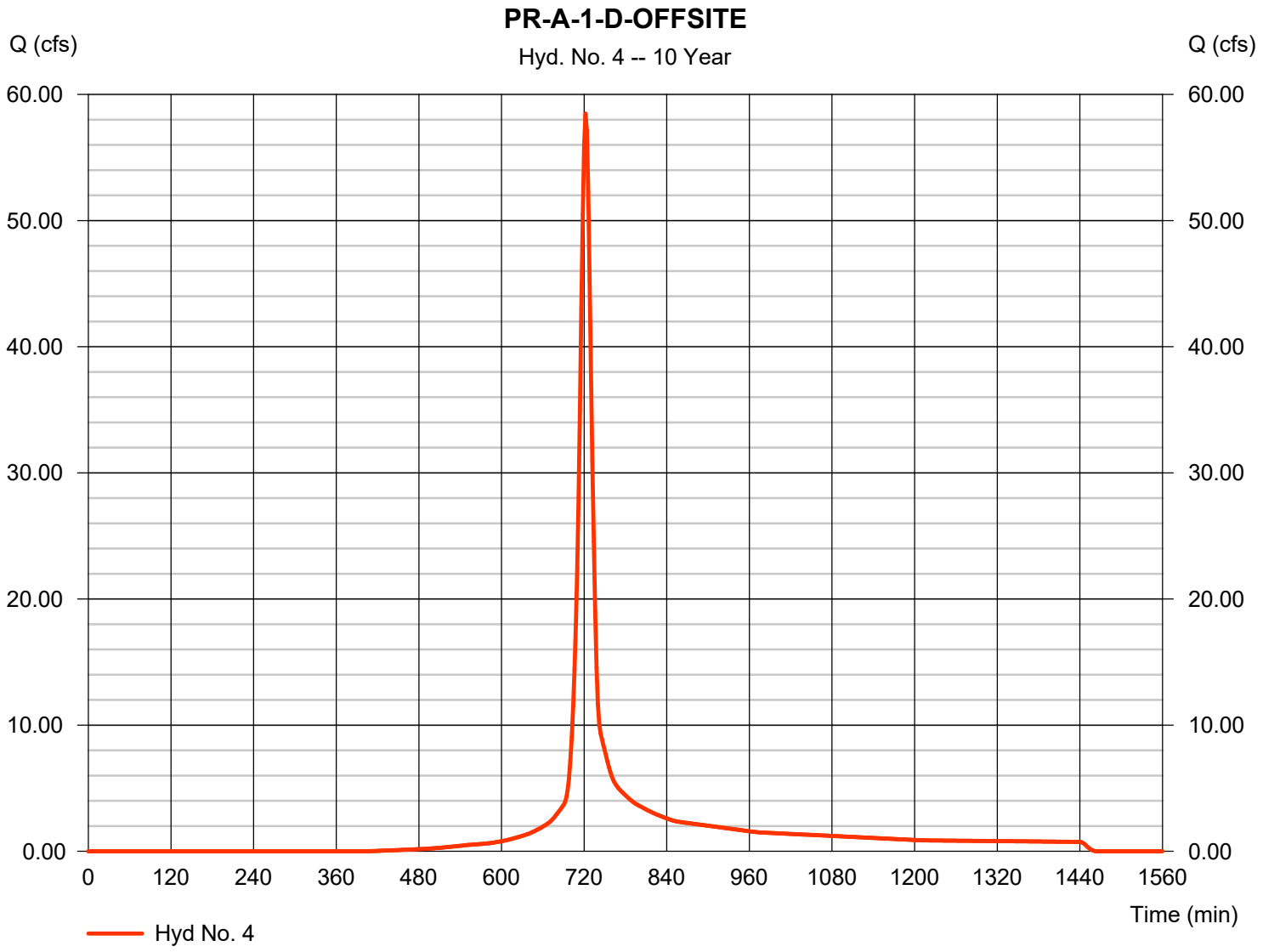


Hydrograph Report

Hyd. No. 4

PR-A-1-D-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	58.47 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	164,410 cuft
Drainage area	=	15.820 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	13.70 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

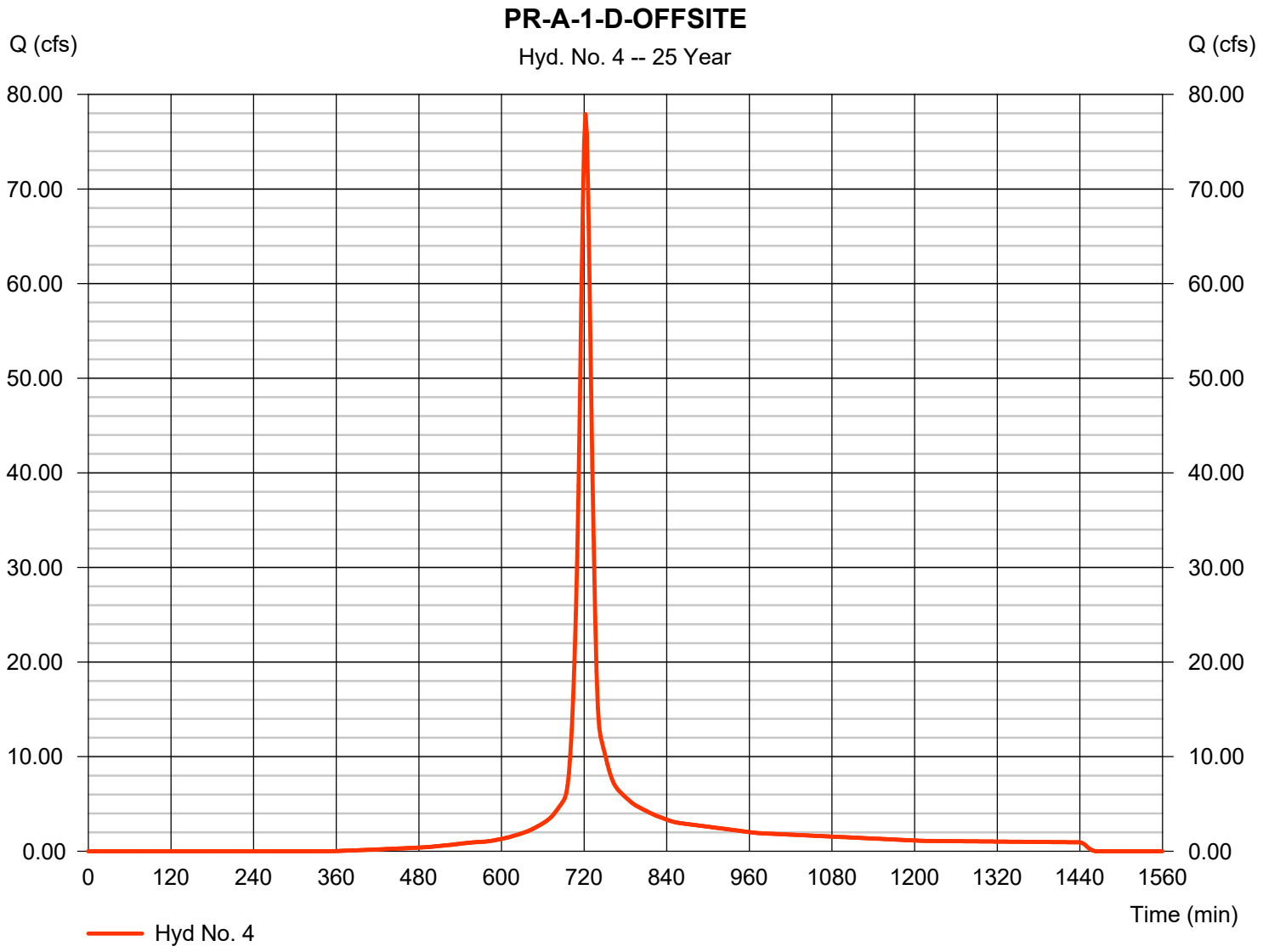


Hydrograph Report

Hyd. No. 4

PR-A-1-D-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	77.91 cfs
Storm frequency	=	25 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	220,668 cuft
Drainage area	=	15.820 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	13.70 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

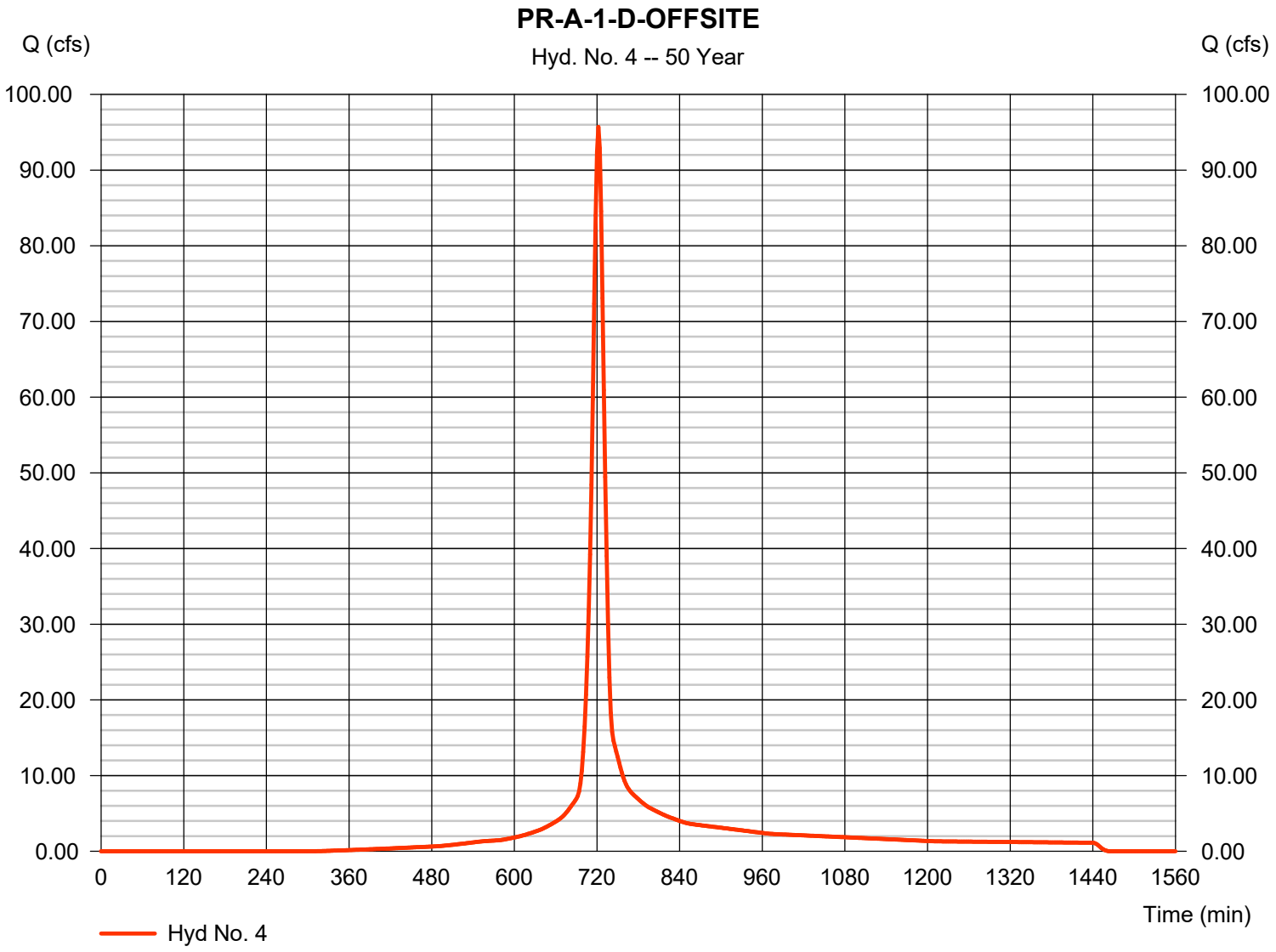


Hydrograph Report

Hyd. No. 4

PR-A-1-D-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	95.71 cfs
Storm frequency	=	50 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	273,162 cuft
Drainage area	=	15.820 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	13.70 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

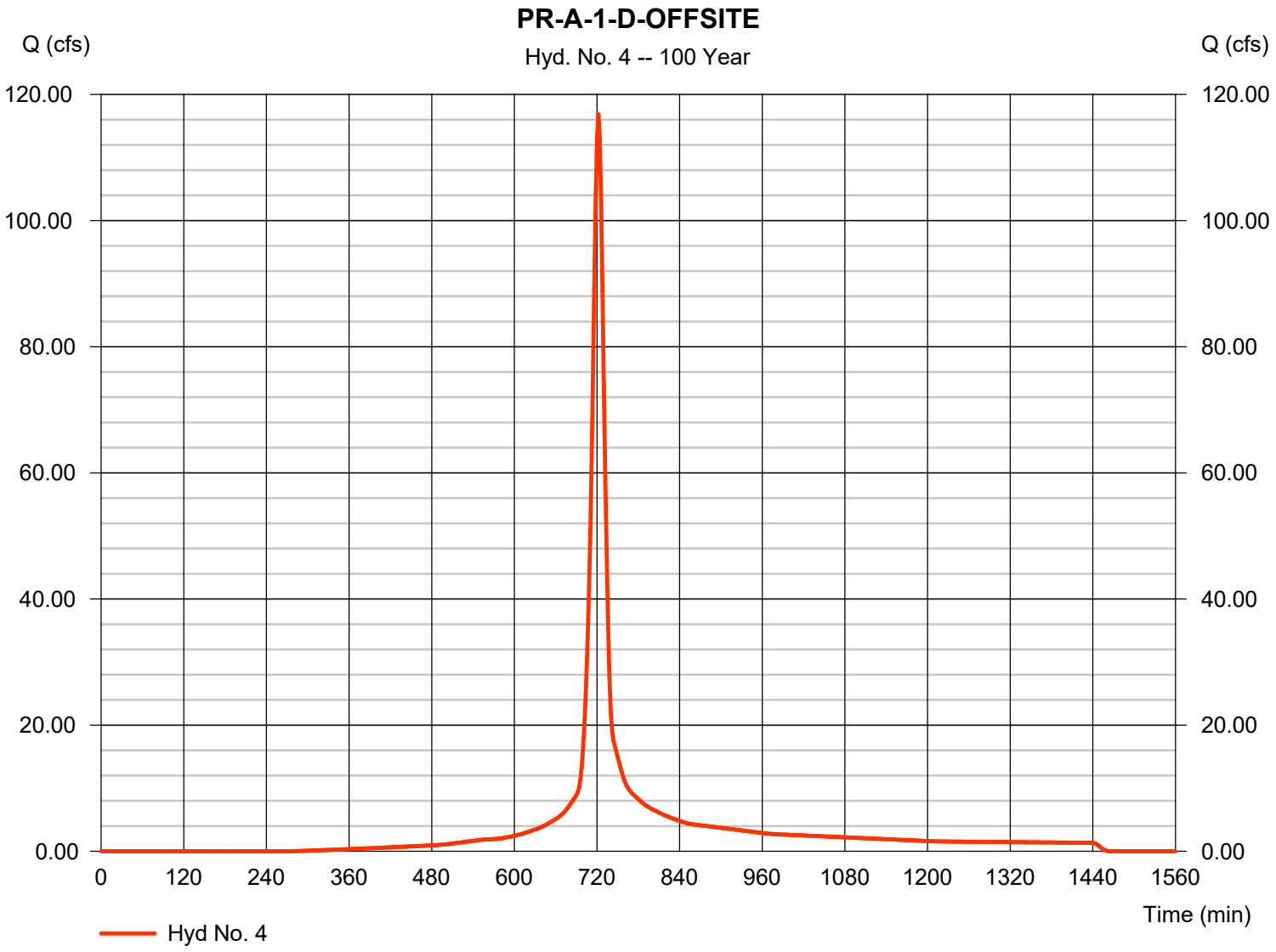


Hydrograph Report

Hyd. No. 4

PR-A-1-D-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	116.88 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	336,606 cuft
Drainage area	=	15.820 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	13.70 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



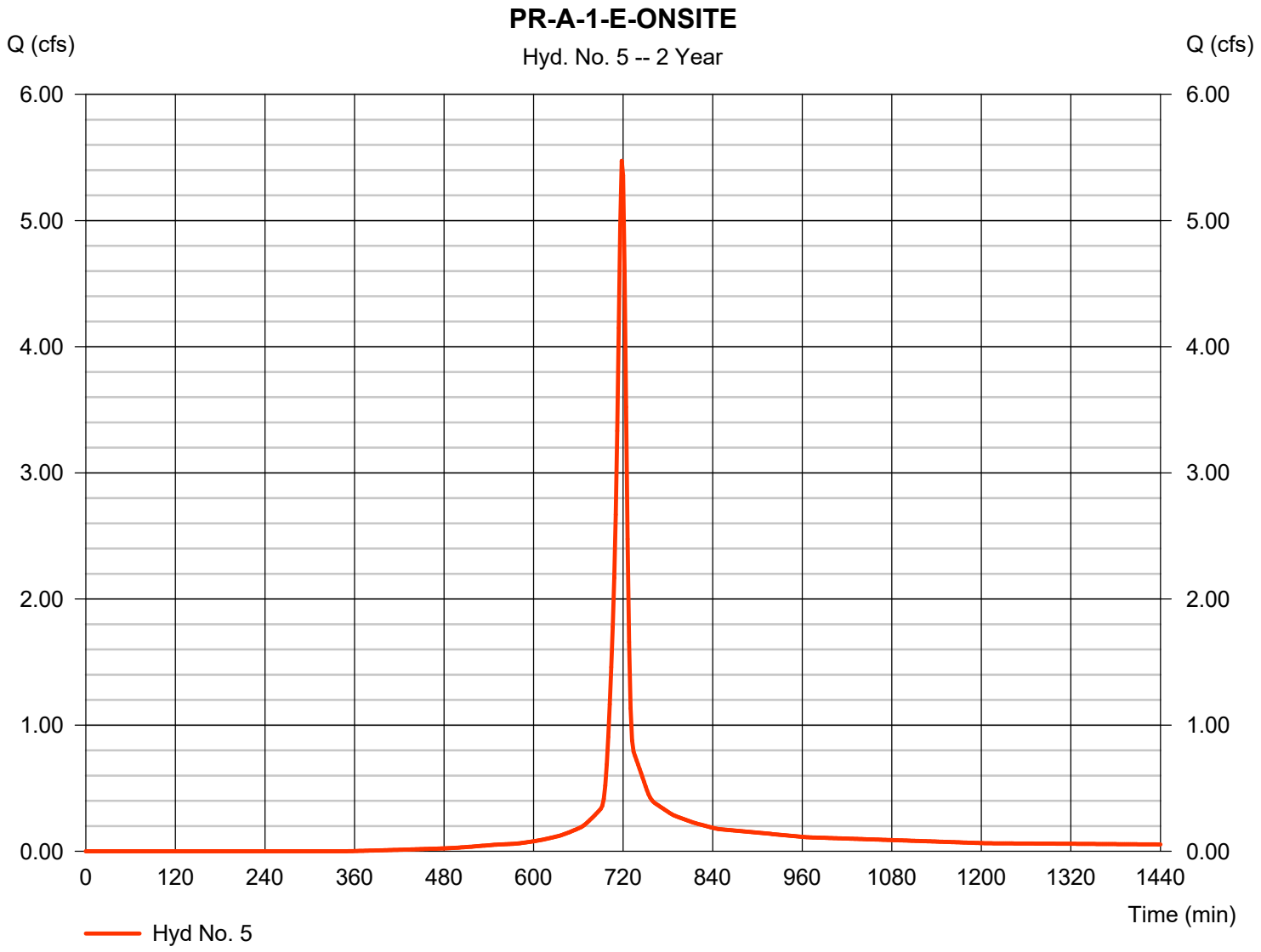
PR-A-1-E-ONSITE WATERSHED

Hydrograph Report

Hyd. No. 5

PR-A-1-E-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.473 cfs
Storm frequency	=	2 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	12,728 cuft
Drainage area	=	1.600 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	7.20 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

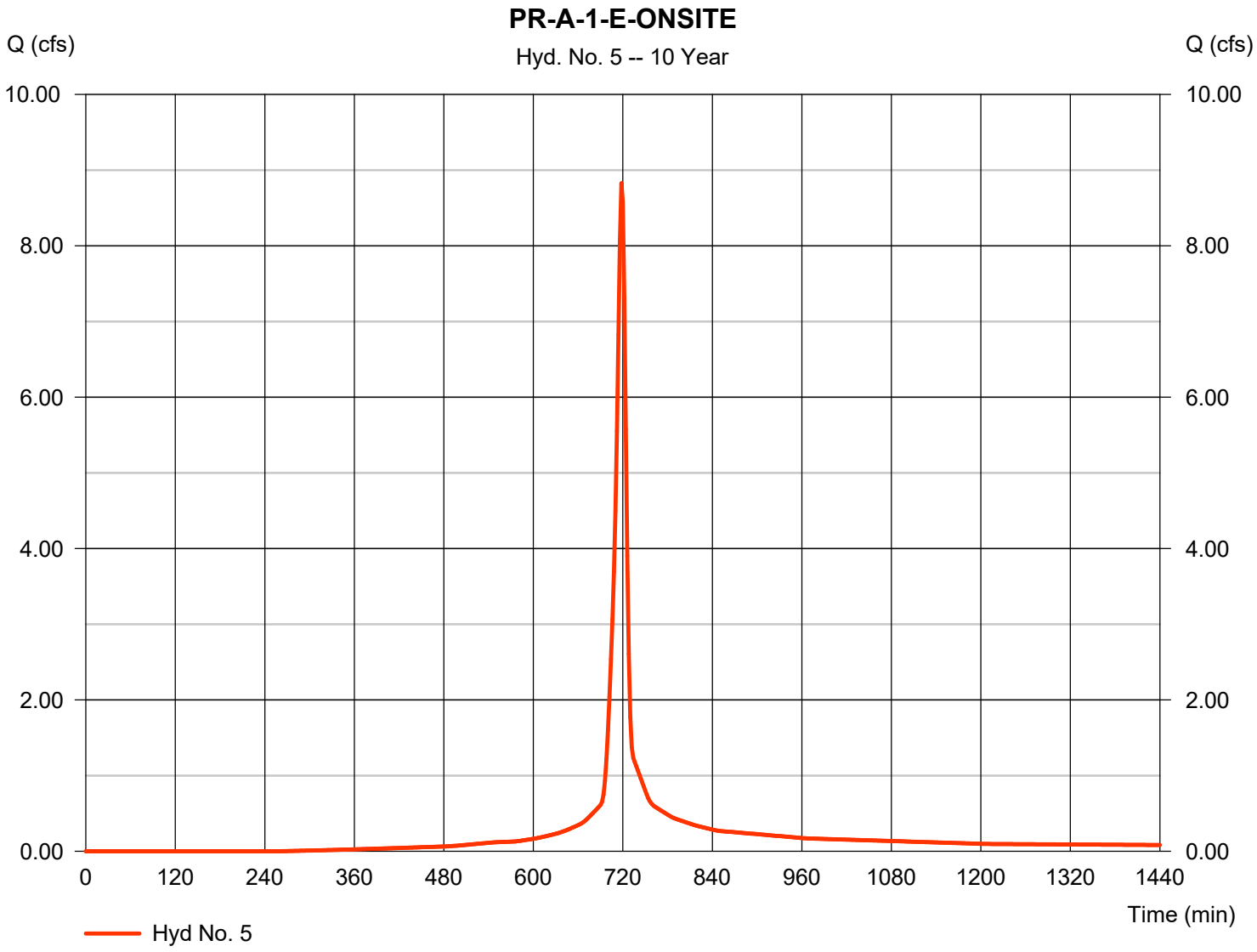


Hydrograph Report

Hyd. No. 5

PR-A-1-E-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.826 cfs
Storm frequency	=	10 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	21,019 cuft
Drainage area	=	1.600 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	7.20 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

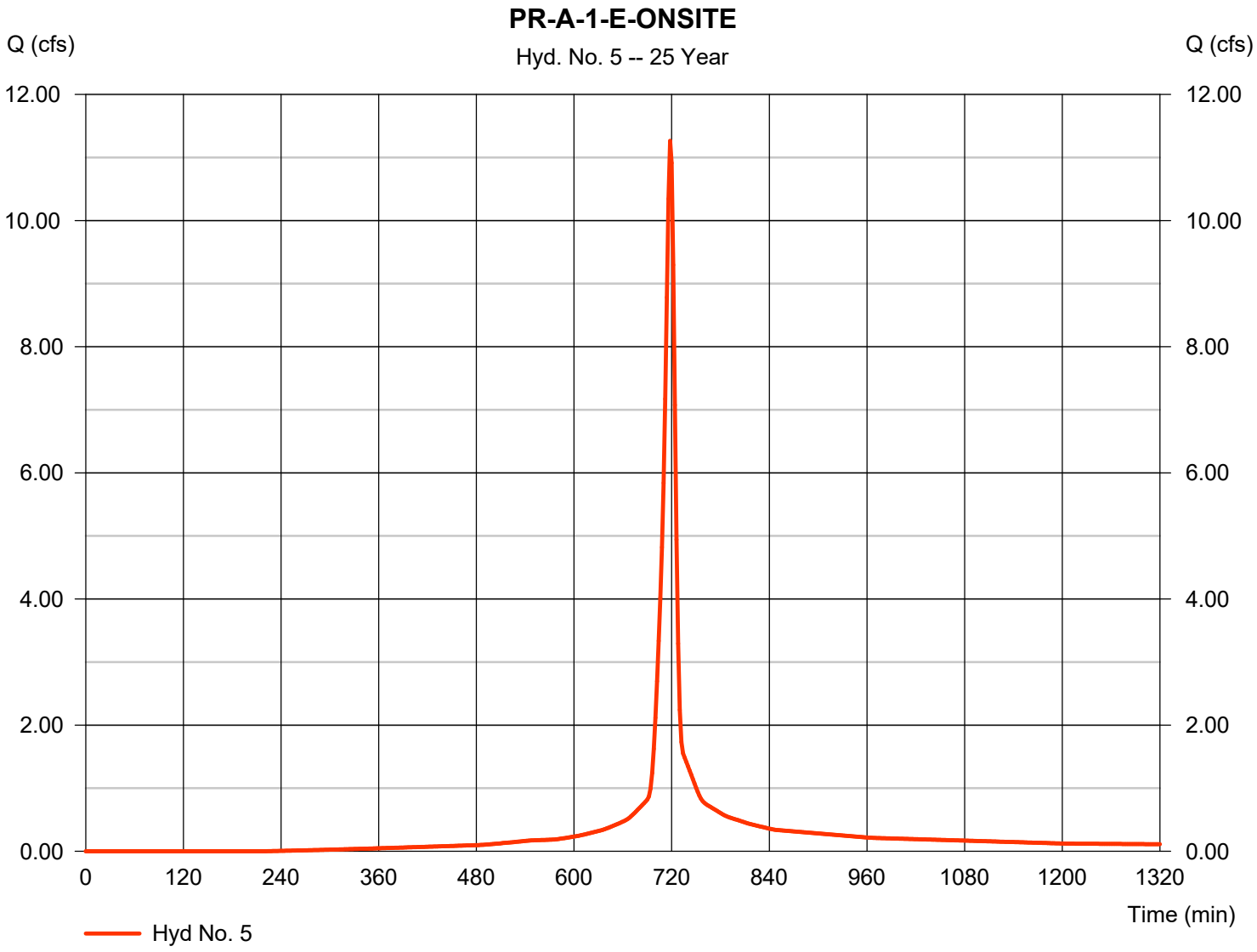


Hydrograph Report

Hyd. No. 5

PR-A-1-E-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.26 cfs
Storm frequency	=	25 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	27,222 cuft
Drainage area	=	1.600 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	7.20 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

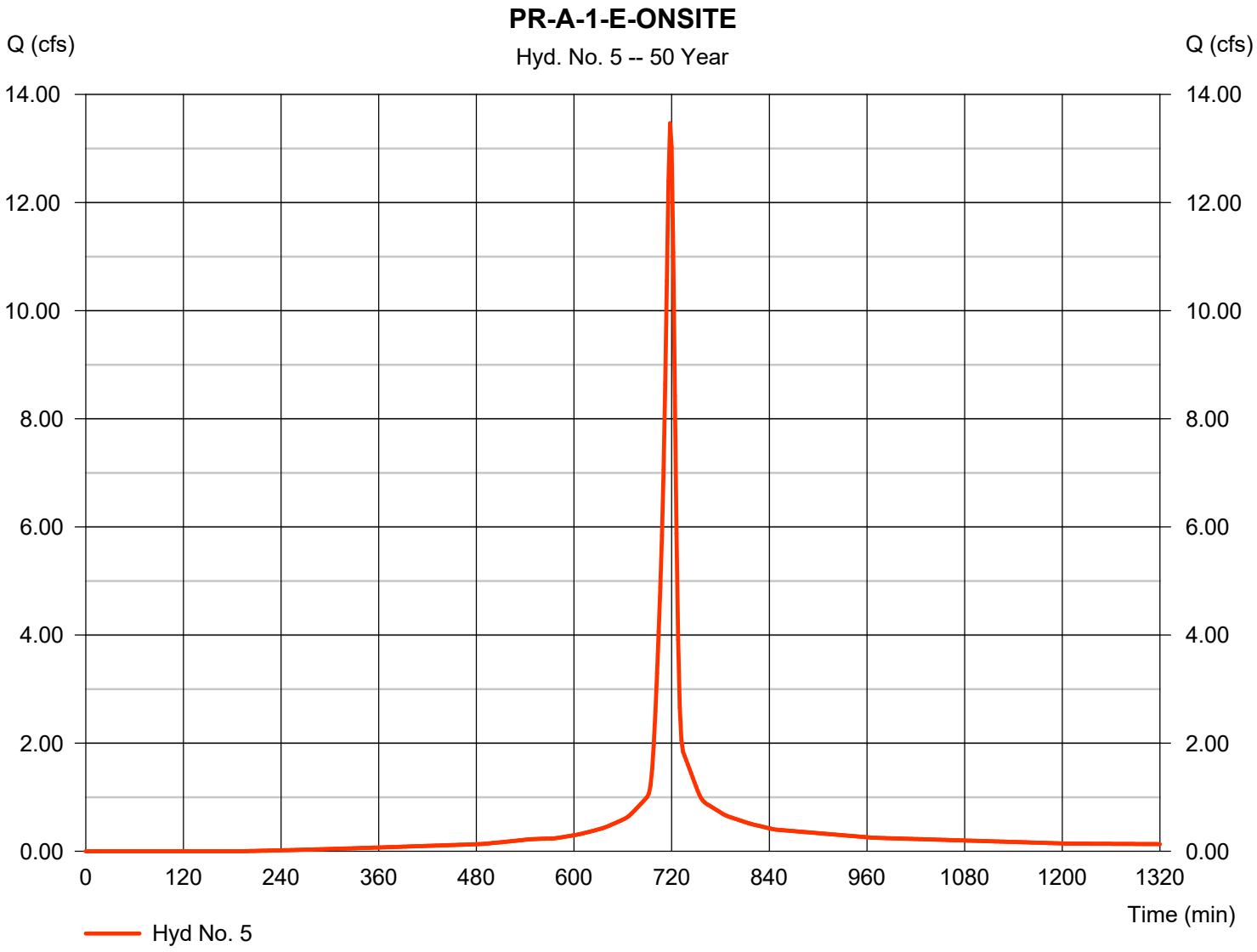


Hydrograph Report

Hyd. No. 5

PR-A-1-E-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	13.47 cfs
Storm frequency	=	50 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	32,926 cuft
Drainage area	=	1.600 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	7.20 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

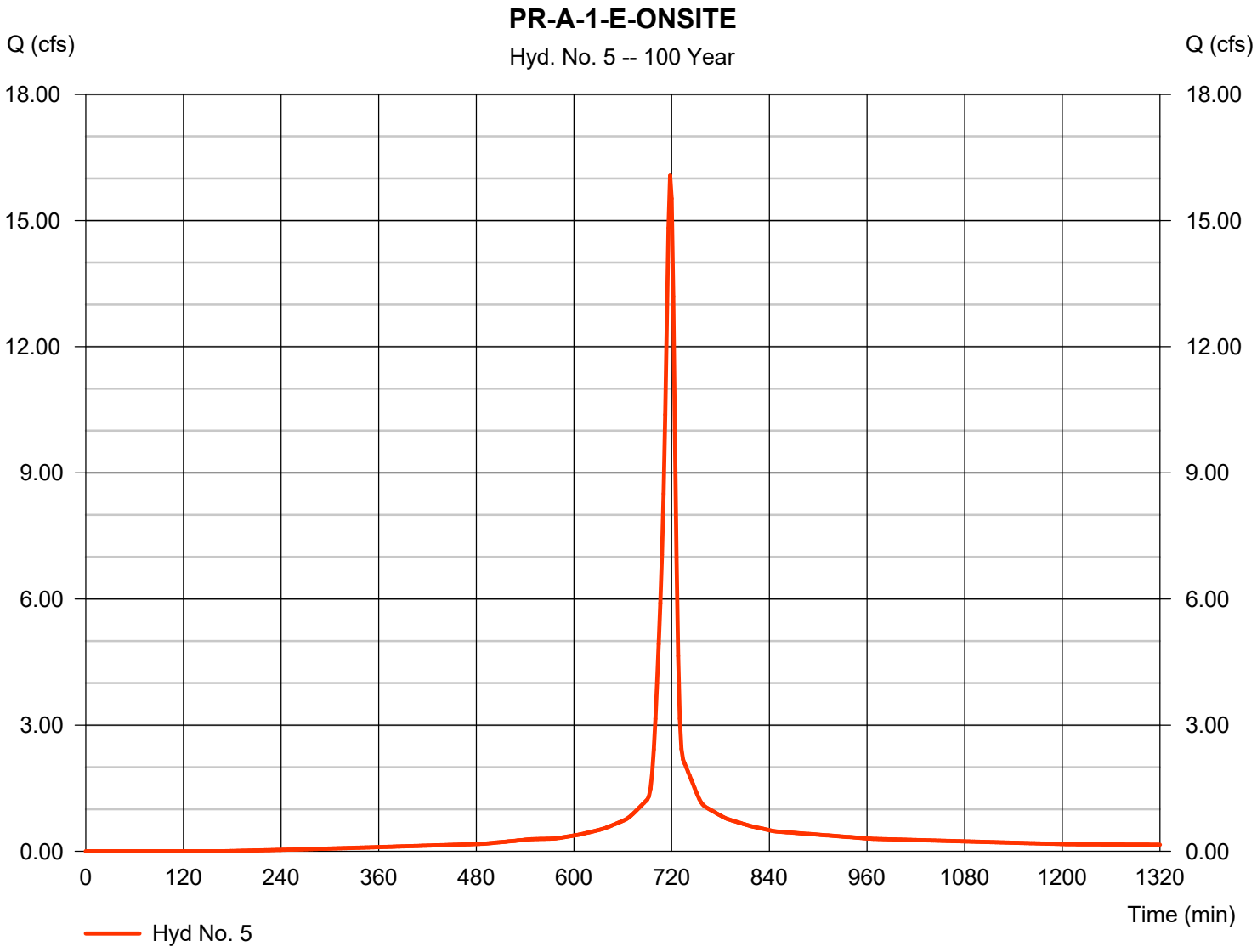


Hydrograph Report

Hyd. No. 5

PR-A-1-E-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	16.07 cfs
Storm frequency	=	100 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	39,749 cuft
Drainage area	=	1.600 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	7.20 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



COMBINED PROPOSED FLOW TO POA-A-1

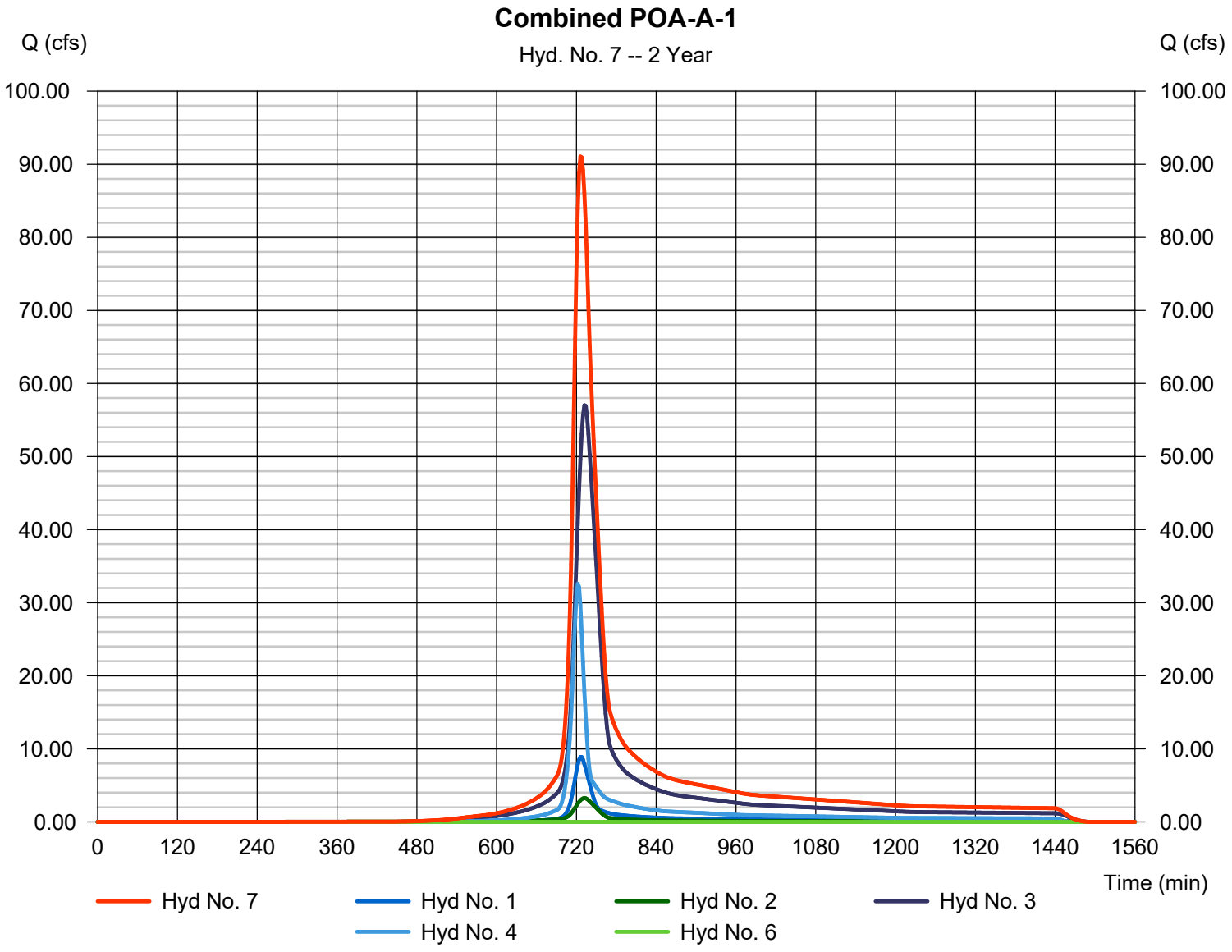
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 7

Combined POA-A-1

Hydrograph type	= Combine	Peak discharge	= 91.06 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 383,864 cuft
Inflow hyds.	= 1, 2, 3, 4, 6	Contrib. drain. area	= 59.010 ac

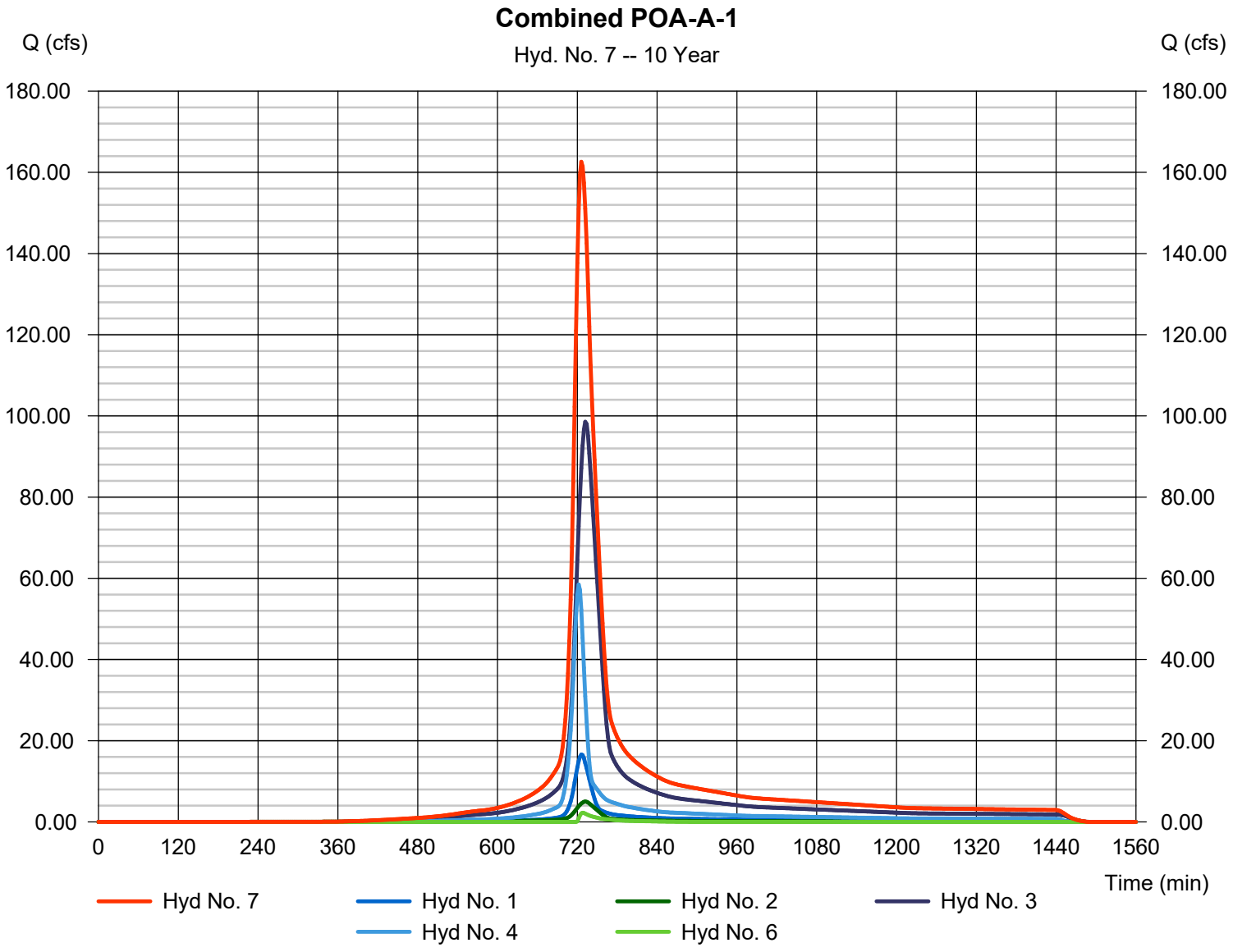


Hydrograph Report

Hyd. No. 7

Combined POA-A-1

Hydrograph type	=	Combine	Peak discharge	=	162.61 cfs
Storm frequency	=	10 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	676,339 cuft
Inflow hyds.	=	1, 2, 3, 4, 6	Contrib. drain. area	=	59.010 ac

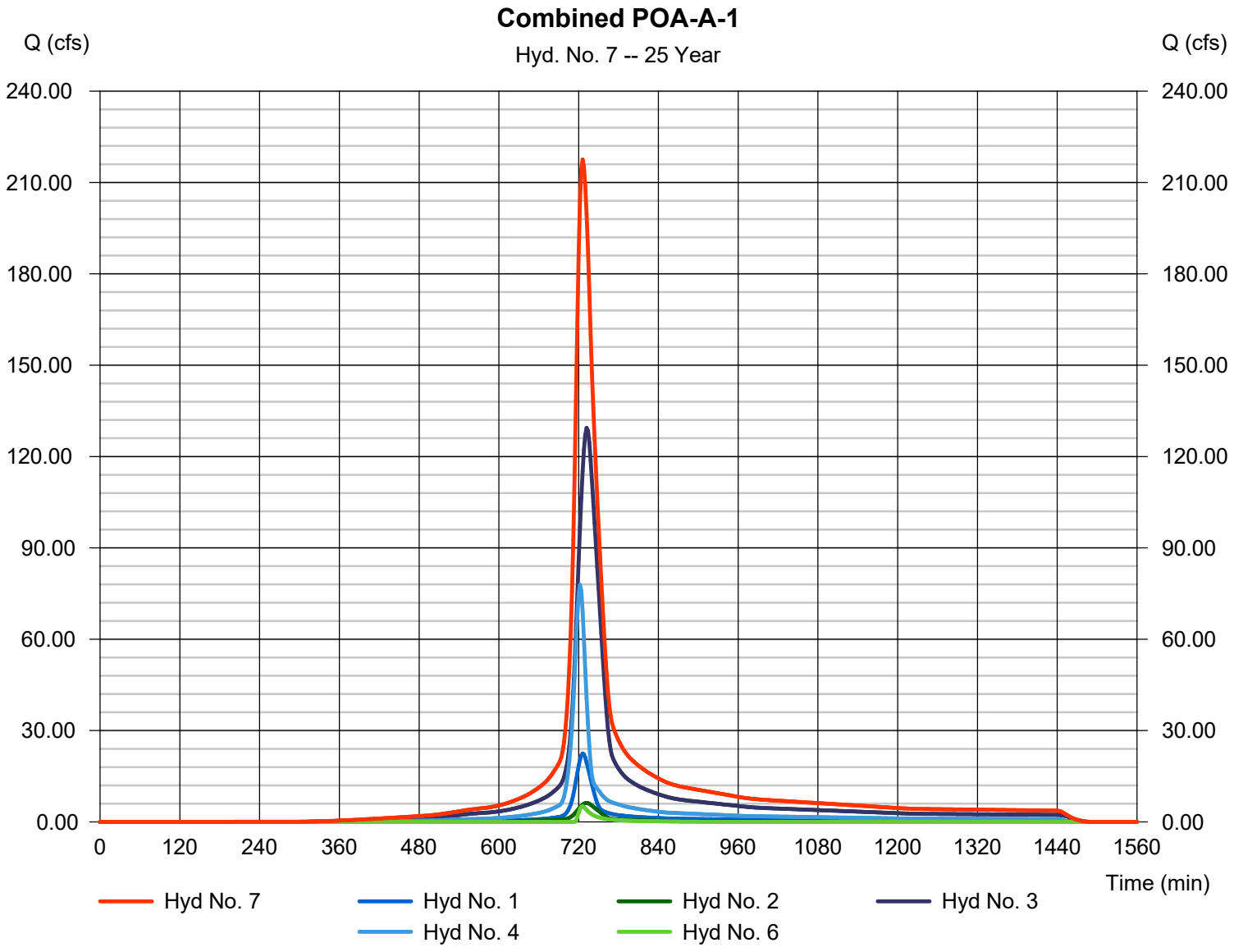


Hydrograph Report

Hyd. No. 7

Combined POA-A-1

Hydrograph type	= Combine	Peak discharge	= 217.59 cfs
Storm frequency	= 25 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 900,970 cuft
Inflow hyds.	= 1, 2, 3, 4, 6	Contrib. drain. area	= 59.010 ac

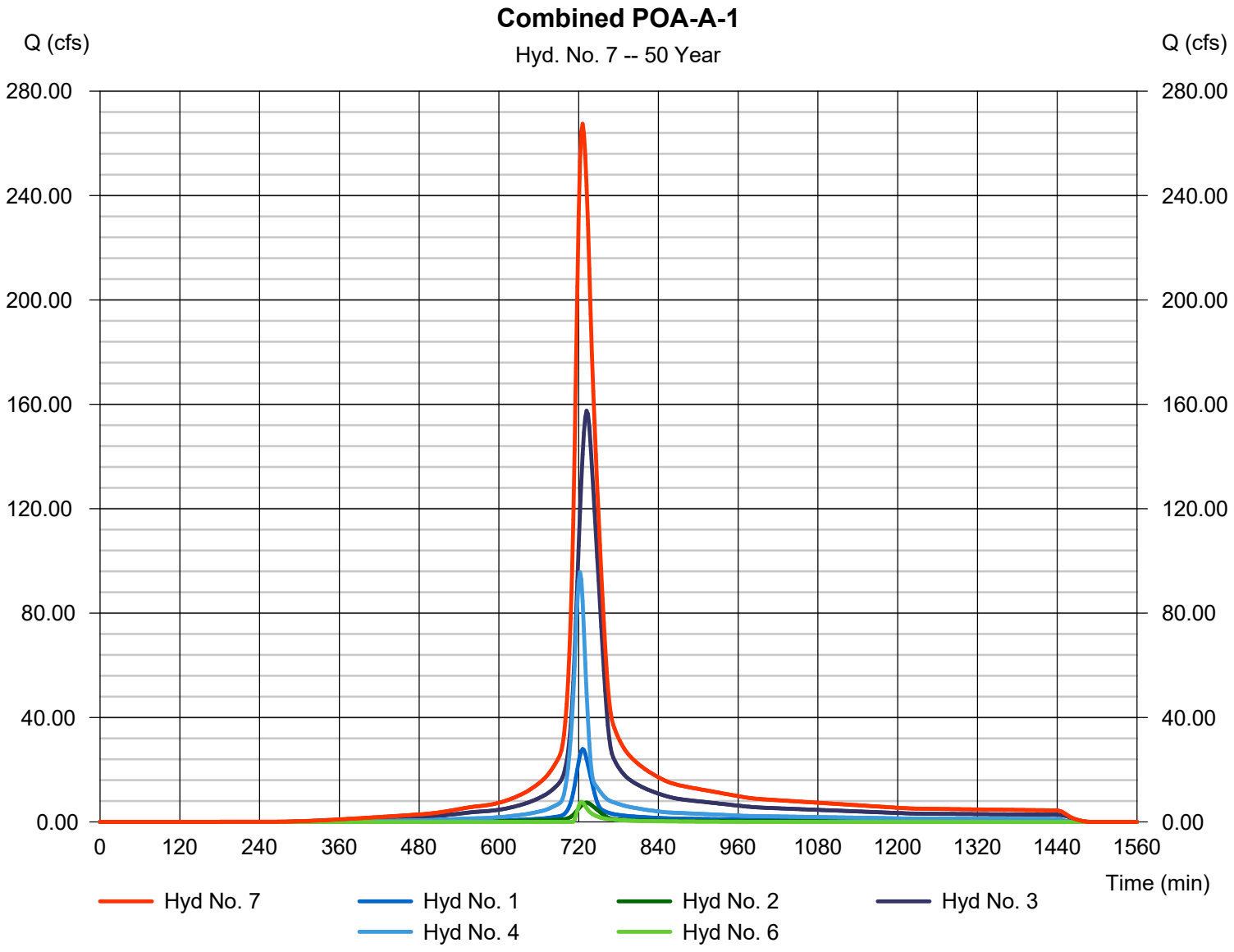


Hydrograph Report

Hyd. No. 7

Combined POA-A-1

Hydrograph type	= Combine	Peak discharge	= 267.49 cfs
Storm frequency	= 50 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 1,109,725 cuft
Inflow hyds.	= 1, 2, 3, 4, 6	Contrib. drain. area	= 59.010 ac

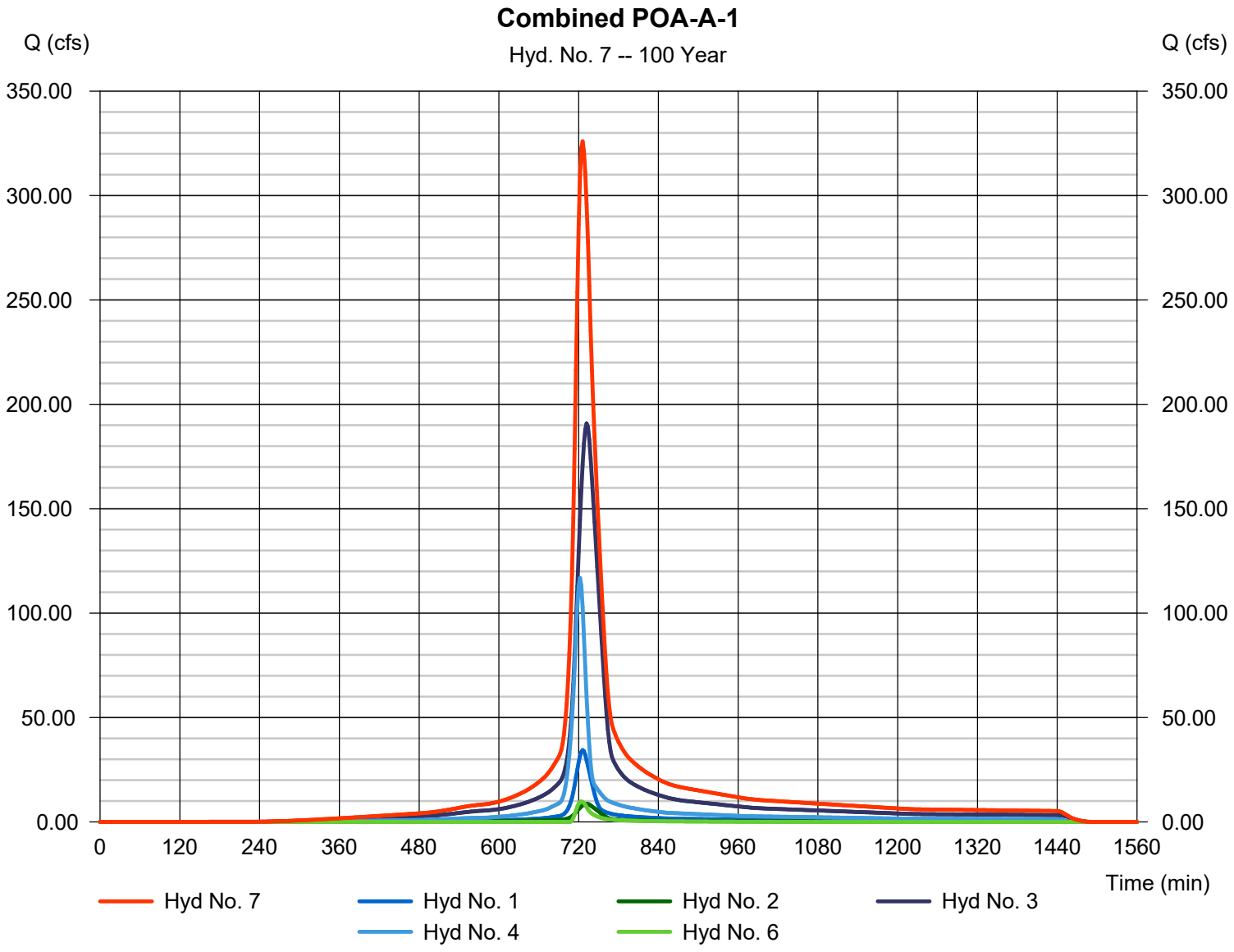


Hydrograph Report

Hyd. No. 7

Combined POA-A-1

Hydrograph type	= Combine	Peak discharge	= 326.00 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 1,361,365 cuft
Inflow hyds.	= 1, 2, 3, 4, 6	Contrib. drain. area	= 59.010 ac



PR-A-2-A-ONSITE WATERSHED

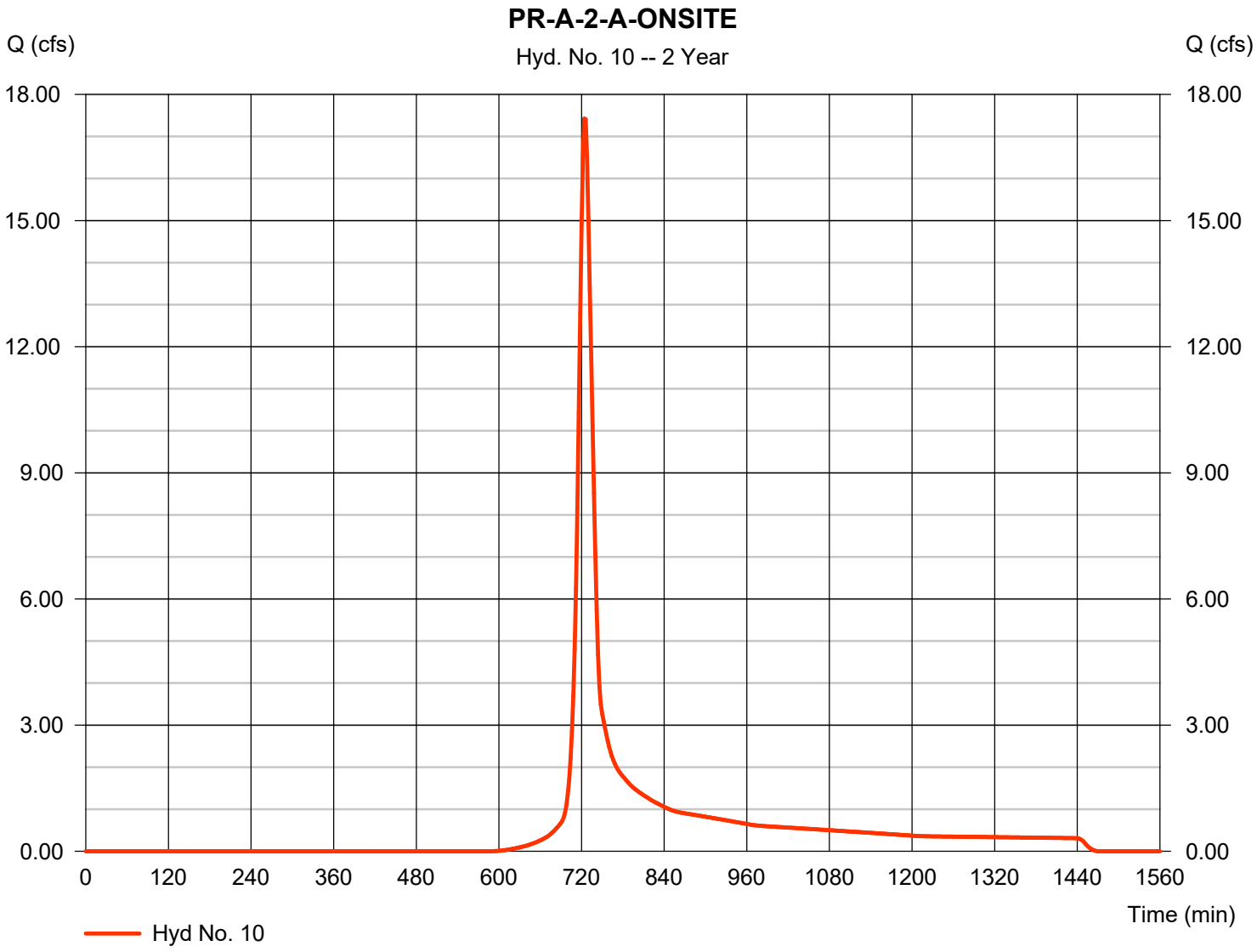
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 10

PR-A-2-A-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	17.42 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	55,620 cuft
Drainage area	=	11.250 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	19.70 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

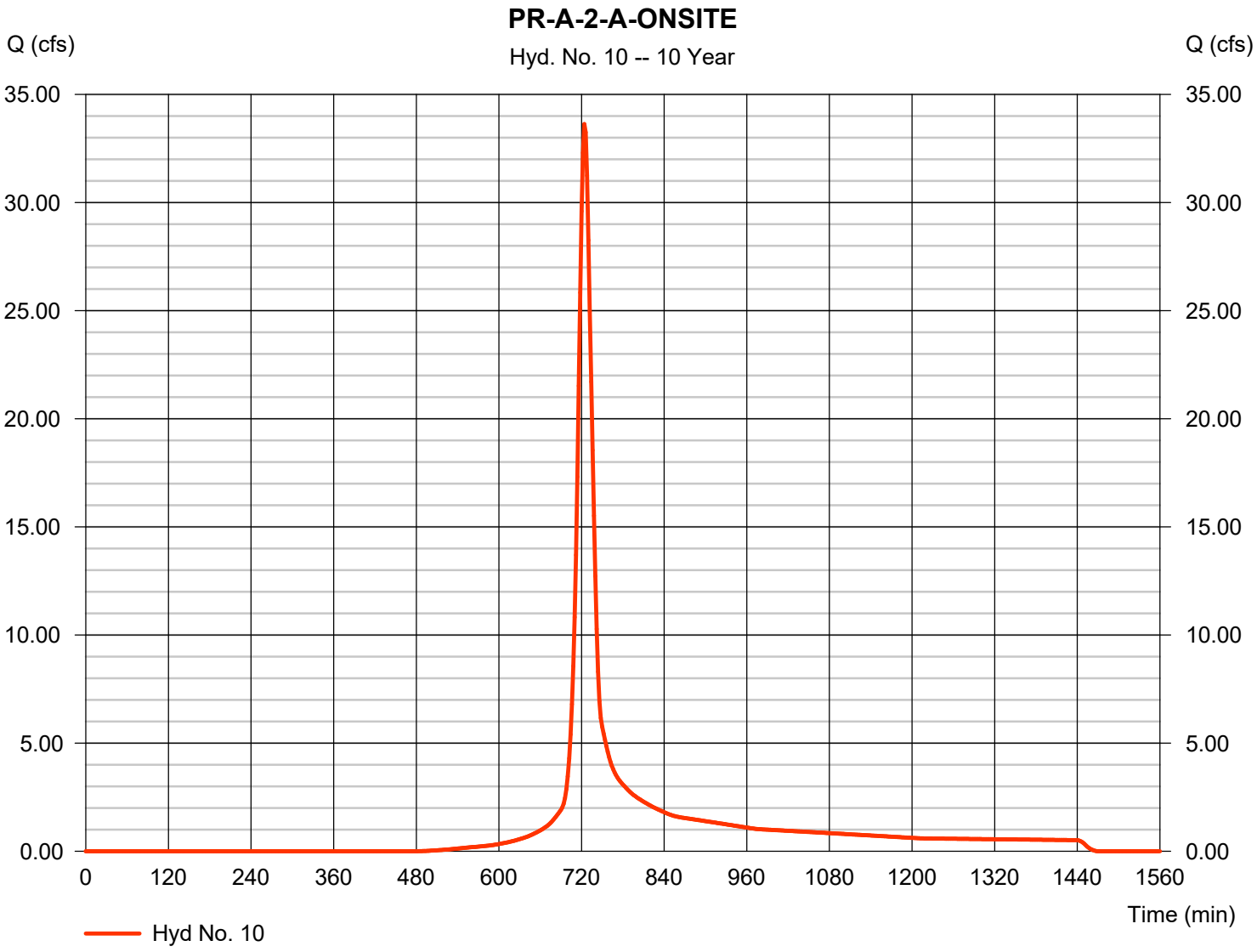


Hydrograph Report

Hyd. No. 10

PR-A-2-A-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	33.63 cfs
Storm frequency	=	10 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	105,214 cuft
Drainage area	=	11.250 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	19.70 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

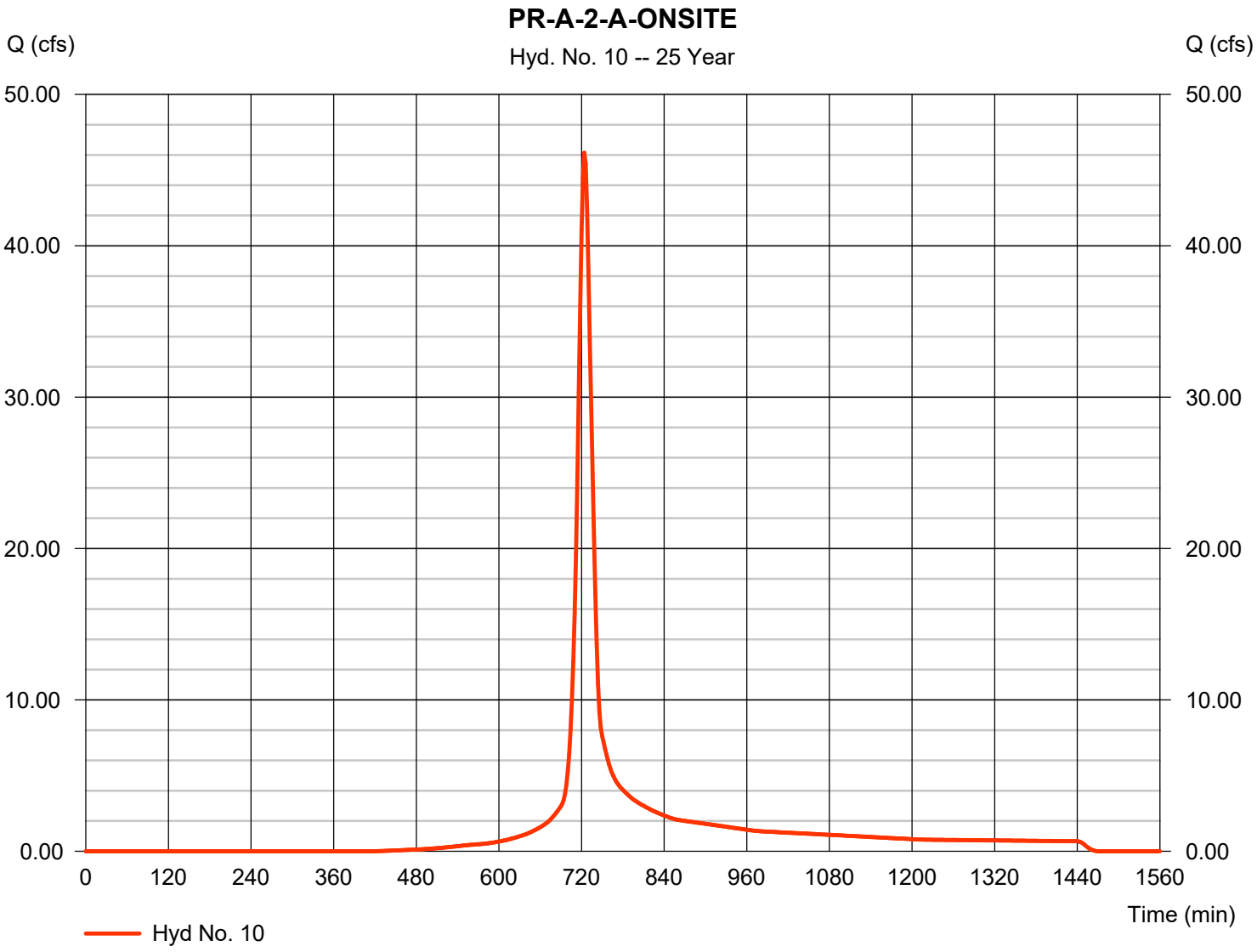


Hydrograph Report

Hyd. No. 10

PR-A-2-A-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	46.14 cfs
Storm frequency	=	25 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	144,352 cuft
Drainage area	=	11.250 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	19.70 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

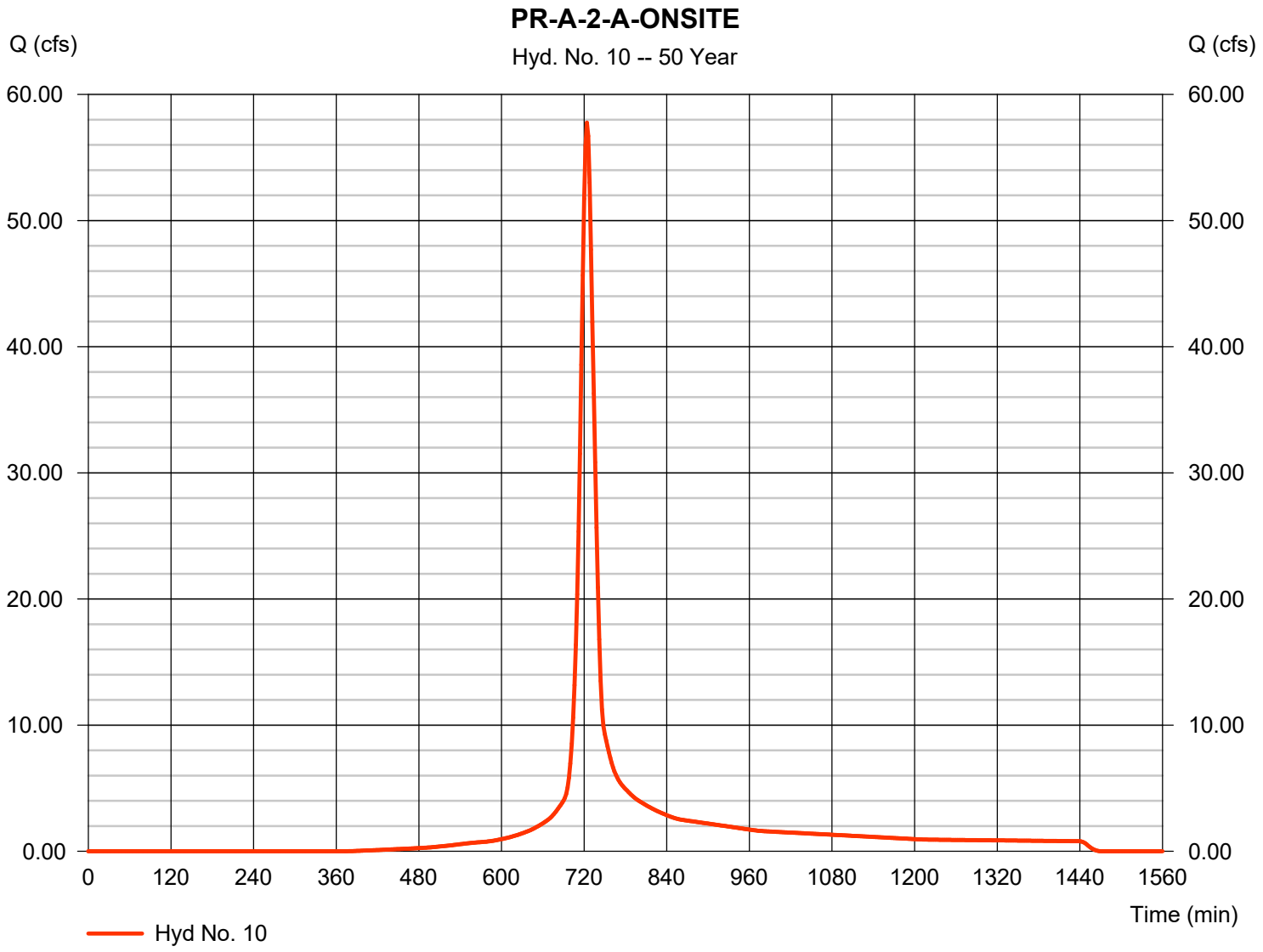


Hydrograph Report

Hyd. No. 10

PR-A-2-A-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	57.75 cfs
Storm frequency	=	50 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	181,259 cuft
Drainage area	=	11.250 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	19.70 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

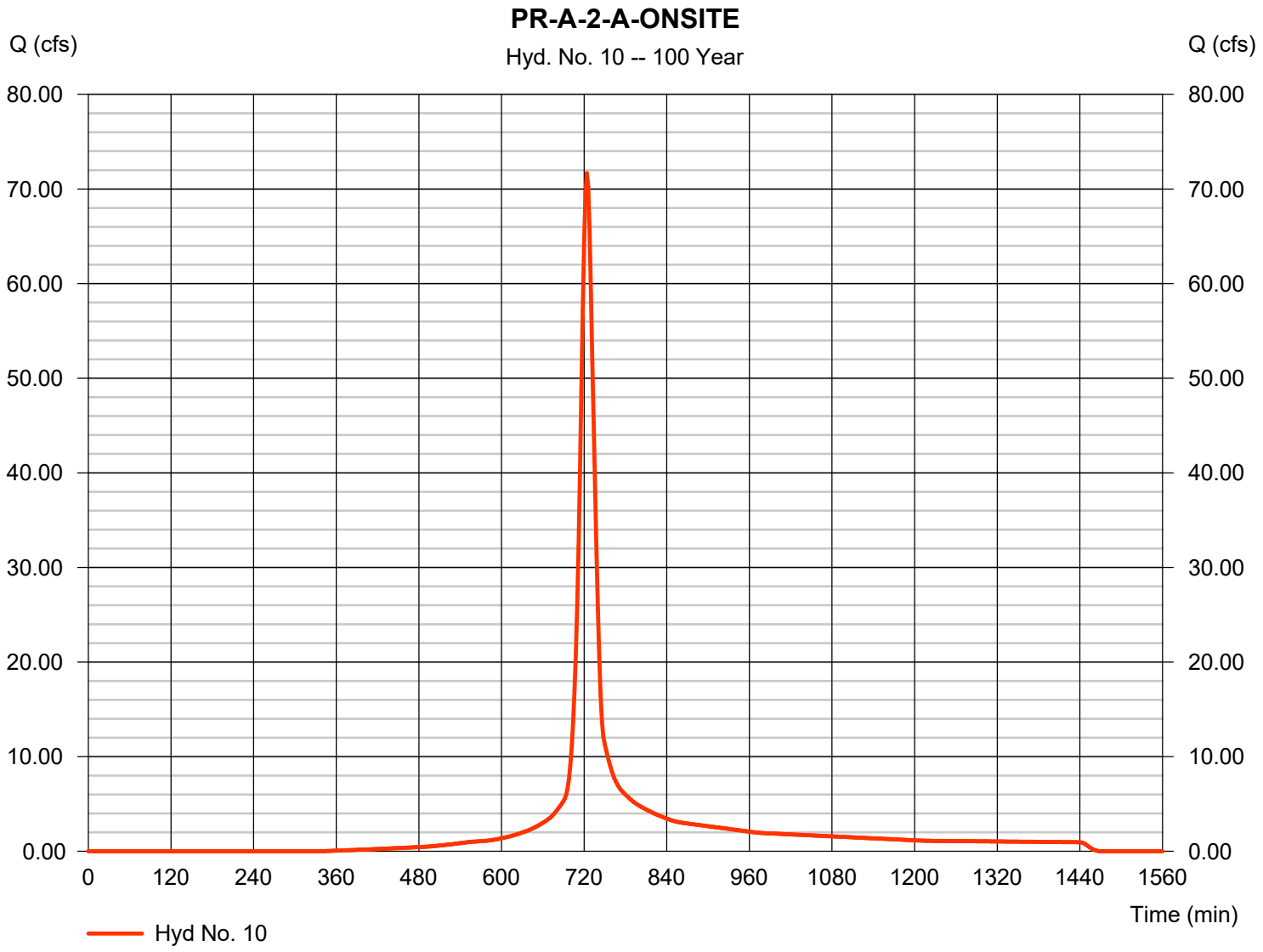


Hydrograph Report

Hyd. No. 10

PR-A-2-A-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	71.68 cfs
Storm frequency	=	100 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	226,204 cuft
Drainage area	=	11.250 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	19.70 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



PR-A-2-A-OFFSITE WATERSHED

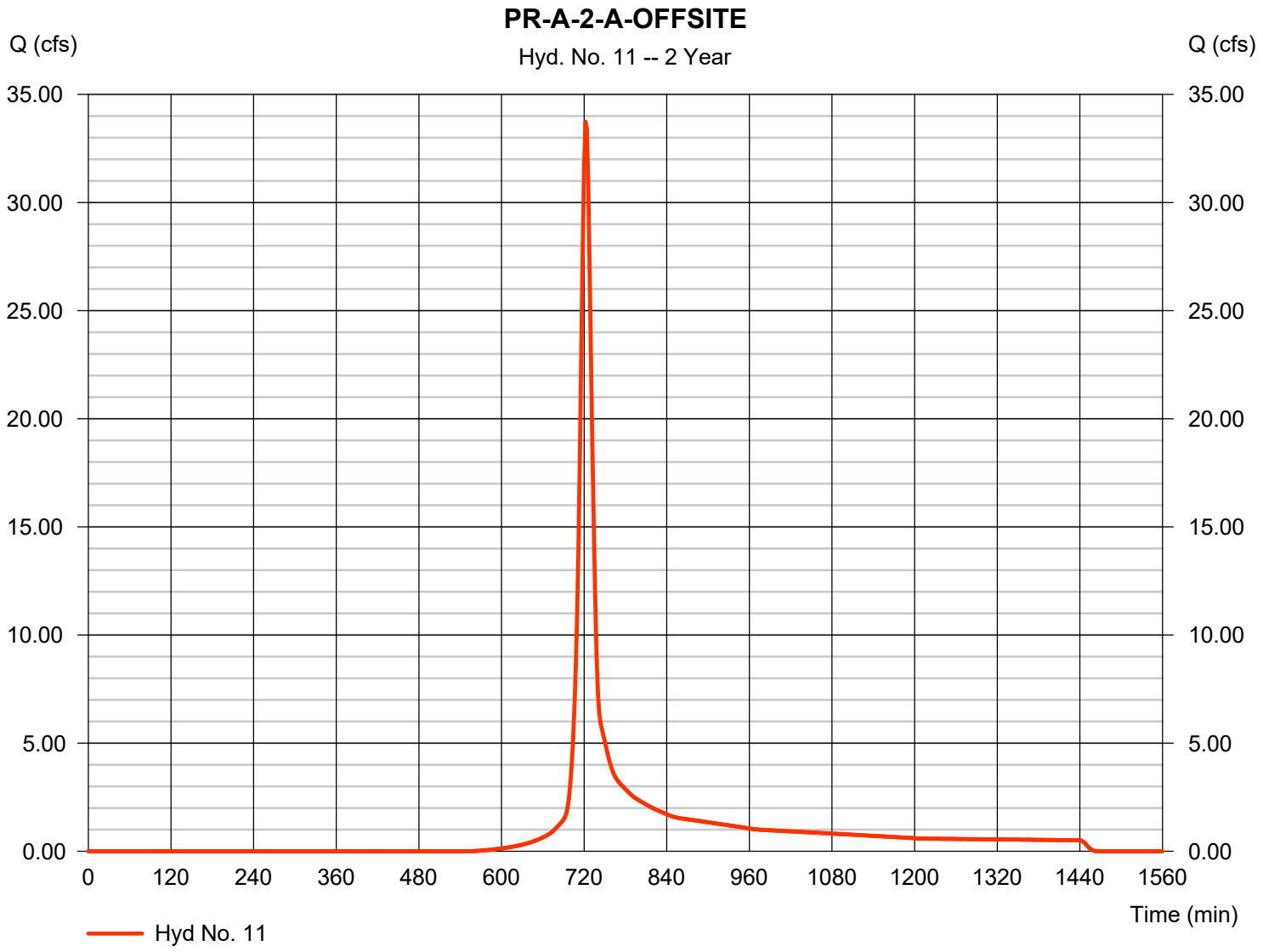
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 11

PR-A-2-A-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	33.73 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	95,176 cuft
Drainage area	=	17.990 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	16.60 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

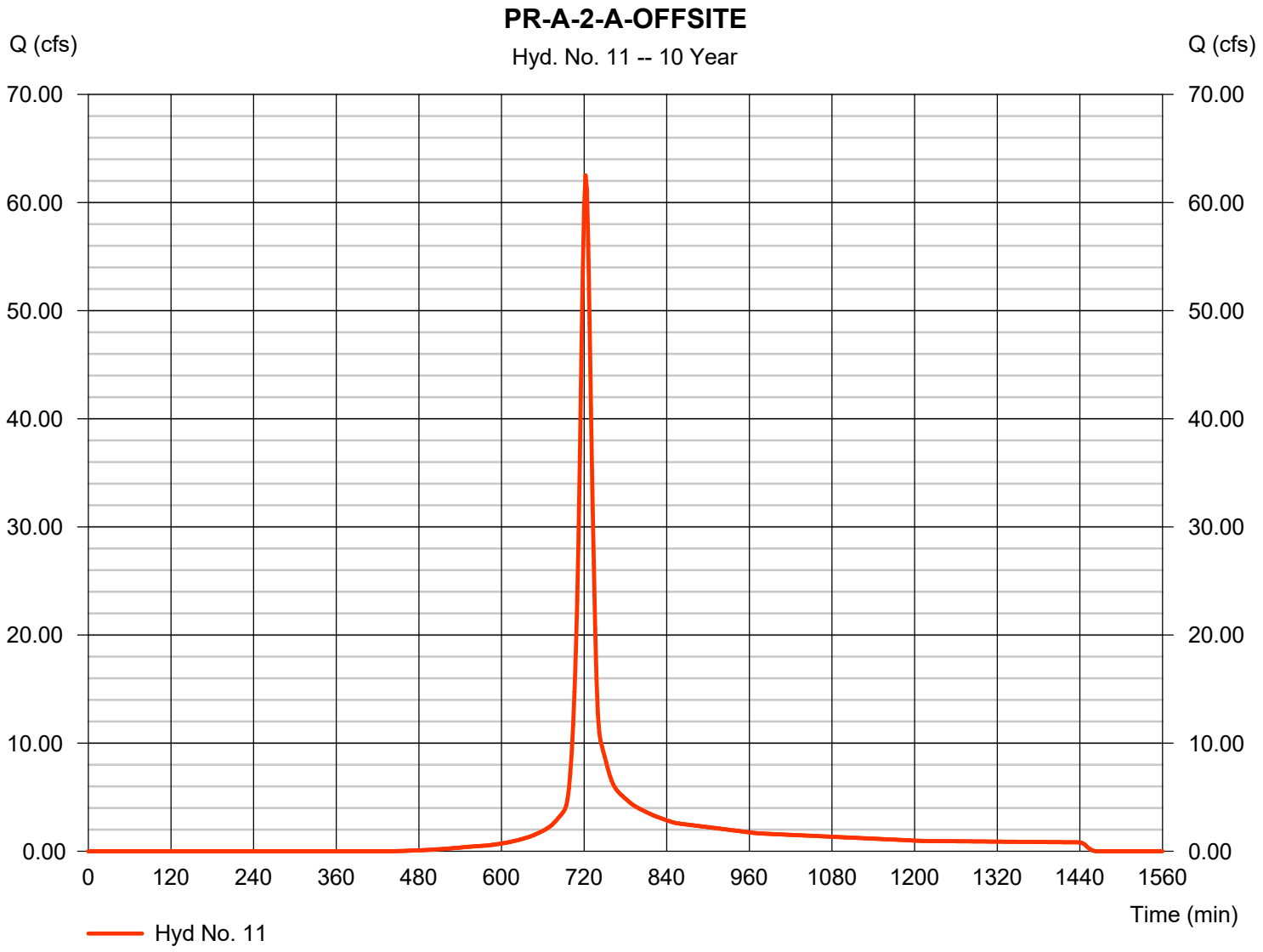


Hydrograph Report

Hyd. No. 11

PR-A-2-A-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	62.52 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	175,334 cuft
Drainage area	=	17.990 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	16.60 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

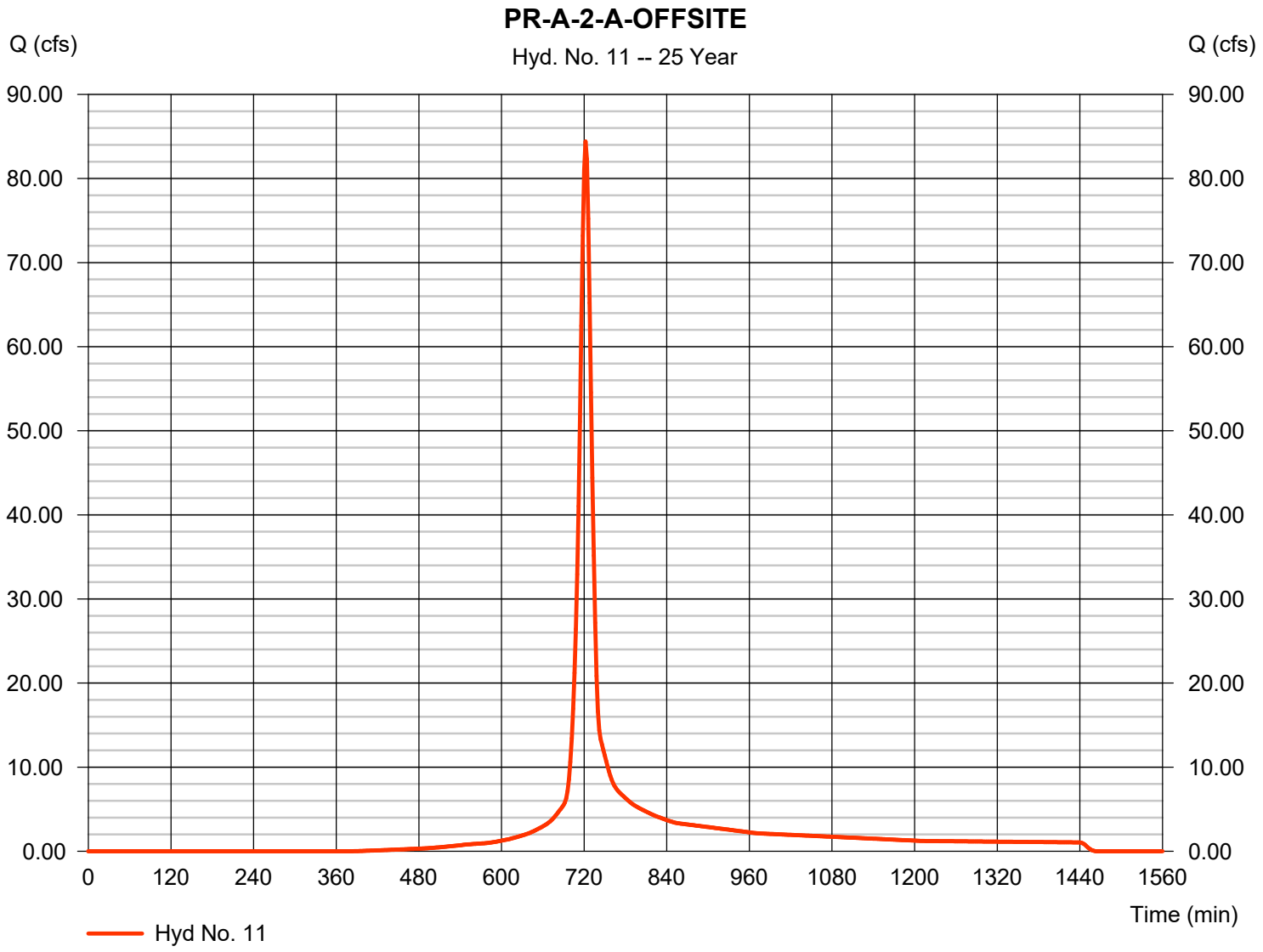


Hydrograph Report

Hyd. No. 11

PR-A-2-A-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	84.41 cfs
Storm frequency	=	25 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	237,886 cuft
Drainage area	=	17.990 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	16.60 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

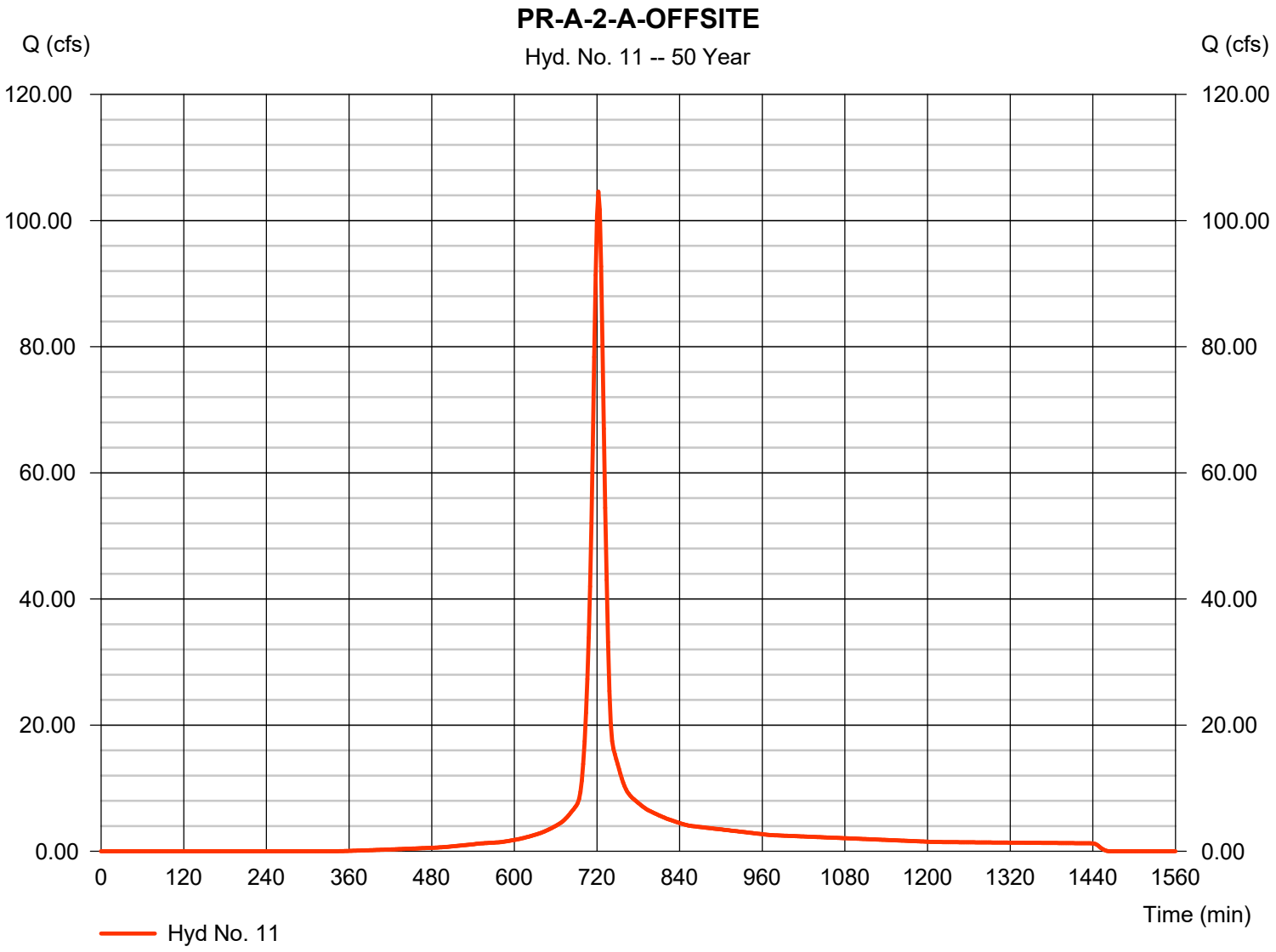


Hydrograph Report

Hyd. No. 11

PR-A-2-A-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	104.57 cfs
Storm frequency	=	50 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	296,551 cuft
Drainage area	=	17.990 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	16.60 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

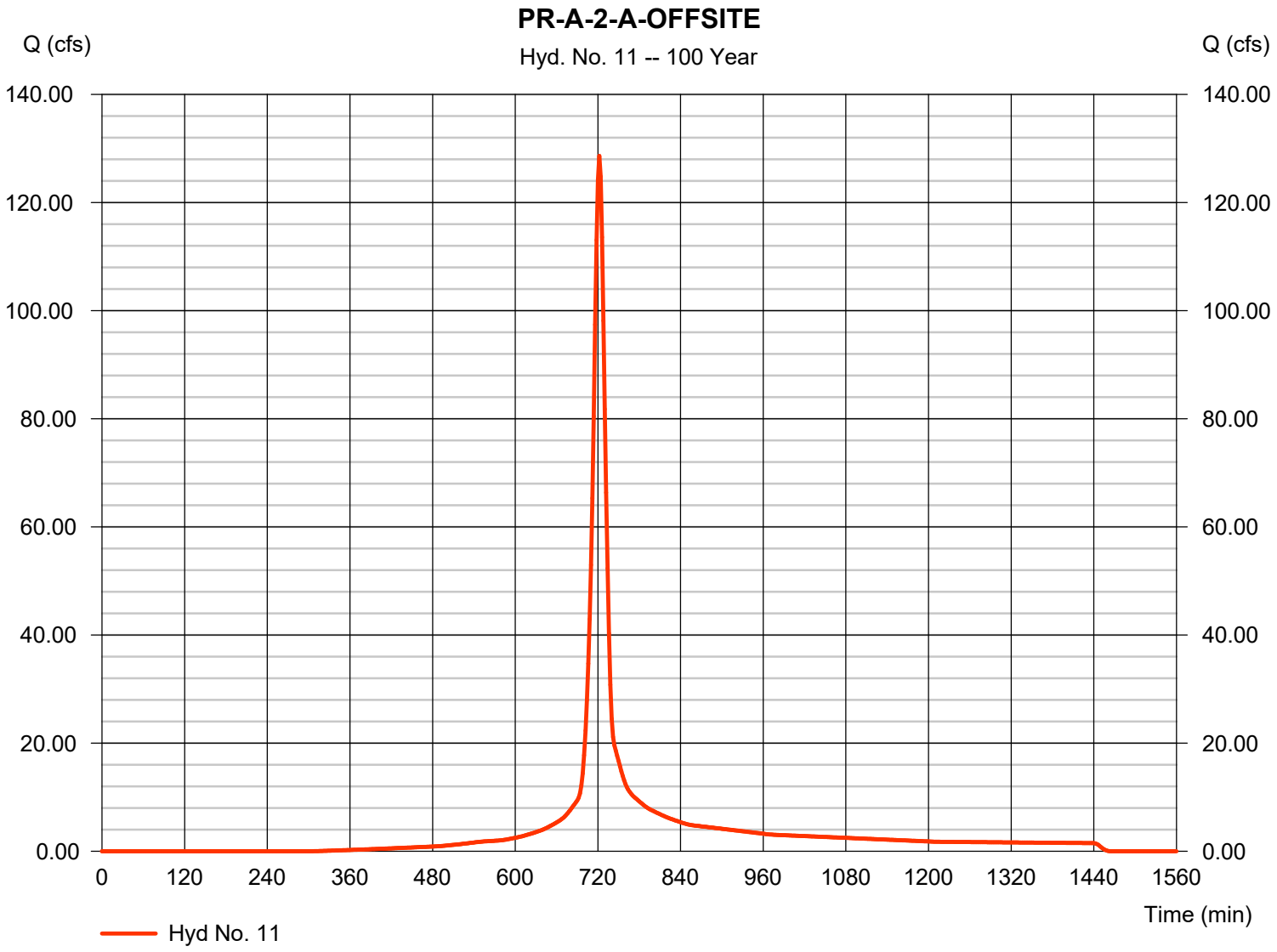


Hydrograph Report

Hyd. No. 11

PR-A-2-A-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	128.64 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	367,711 cuft
Drainage area	=	17.990 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	16.60 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



COMBINED PROPOSED FLOW TO POA-A-2

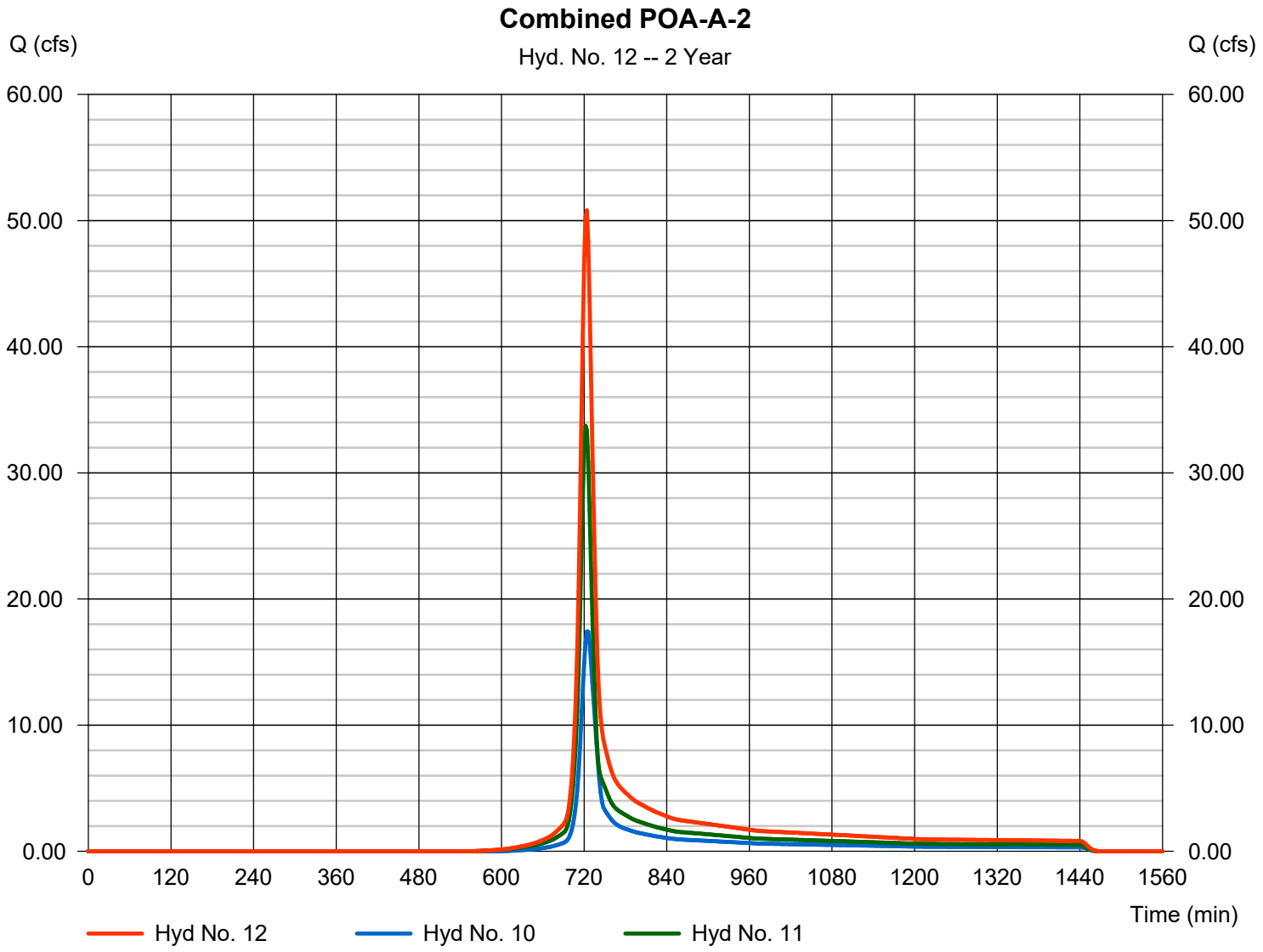
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 12

Combined POA-A-2

Hydrograph type	=	Combine	Peak discharge	=	50.81 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	150,796 cuft
Inflow hyds.	=	10, 11	Contrib. drain. area	=	29.240 ac

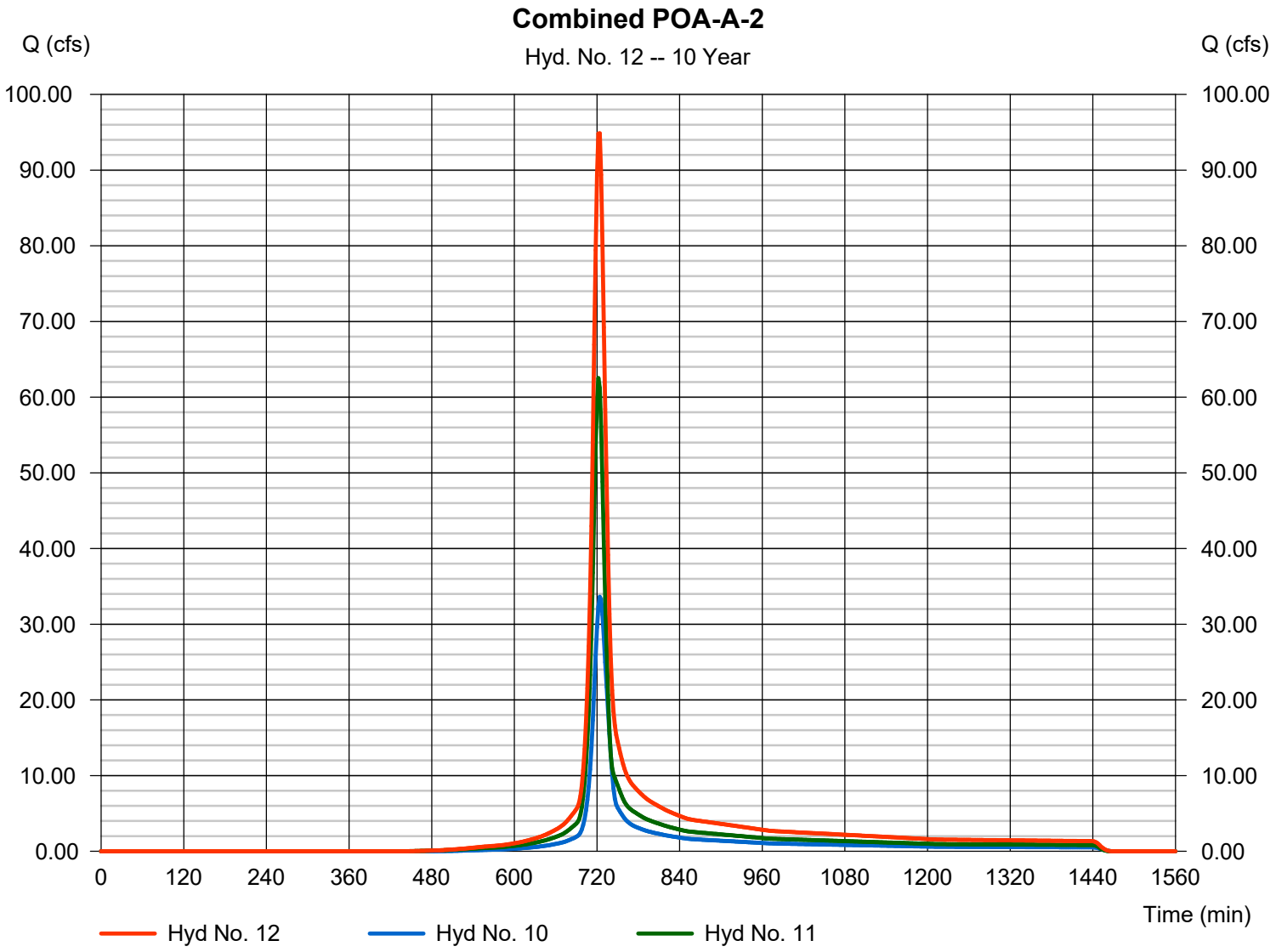


Hydrograph Report

Hyd. No. 12

Combined POA-A-2

Hydrograph type	=	Combine	Peak discharge	=	94.86 cfs
Storm frequency	=	10 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	280,548 cuft
Inflow hyds.	=	10, 11	Contrib. drain. area	=	29.240 ac

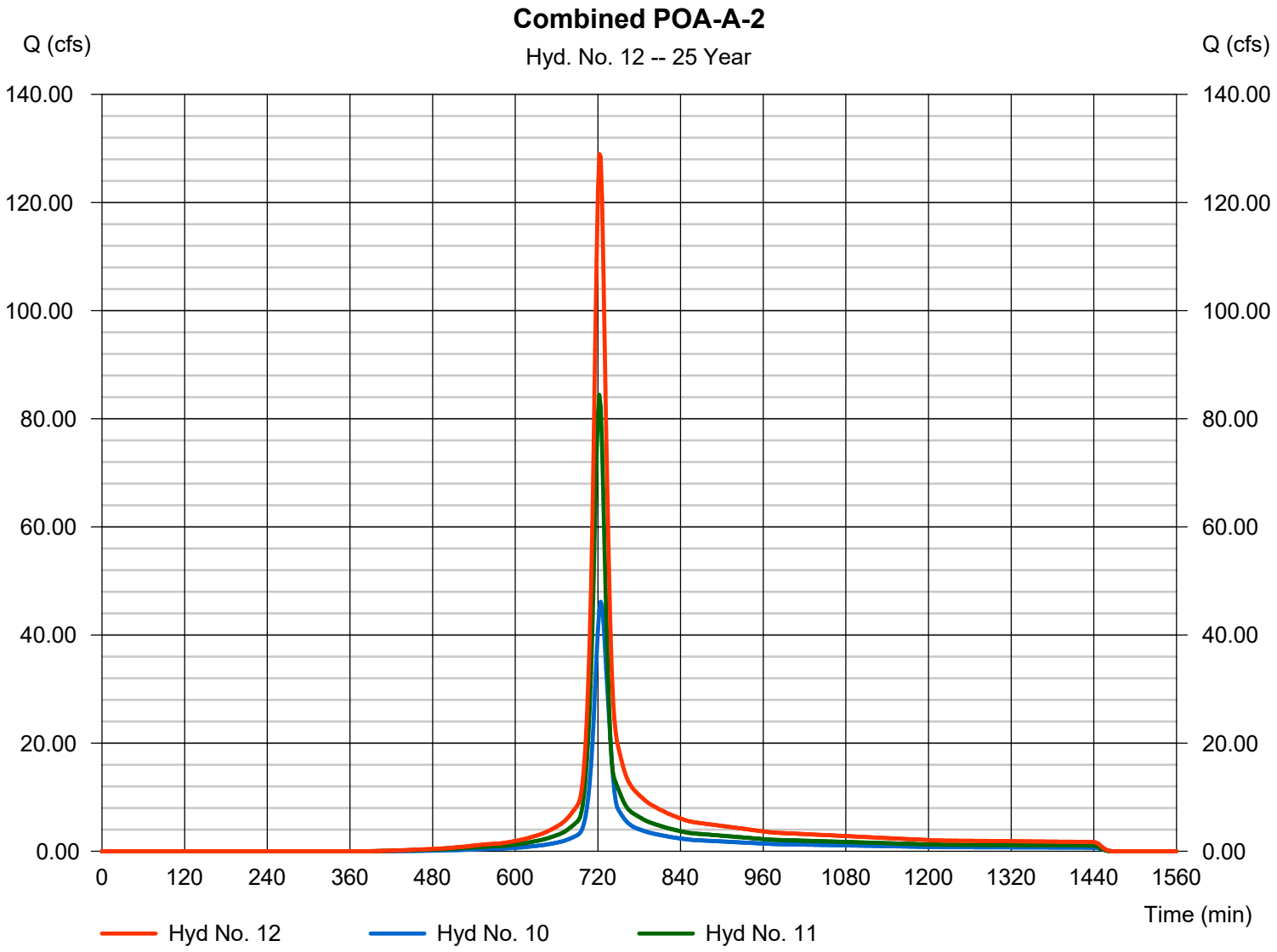


Hydrograph Report

Hyd. No. 12

Combined POA-A-2

Hydrograph type	=	Combine	Peak discharge	=	128.95 cfs
Storm frequency	=	25 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	382,237 cuft
Inflow hyds.	=	10, 11	Contrib. drain. area	=	29.240 ac

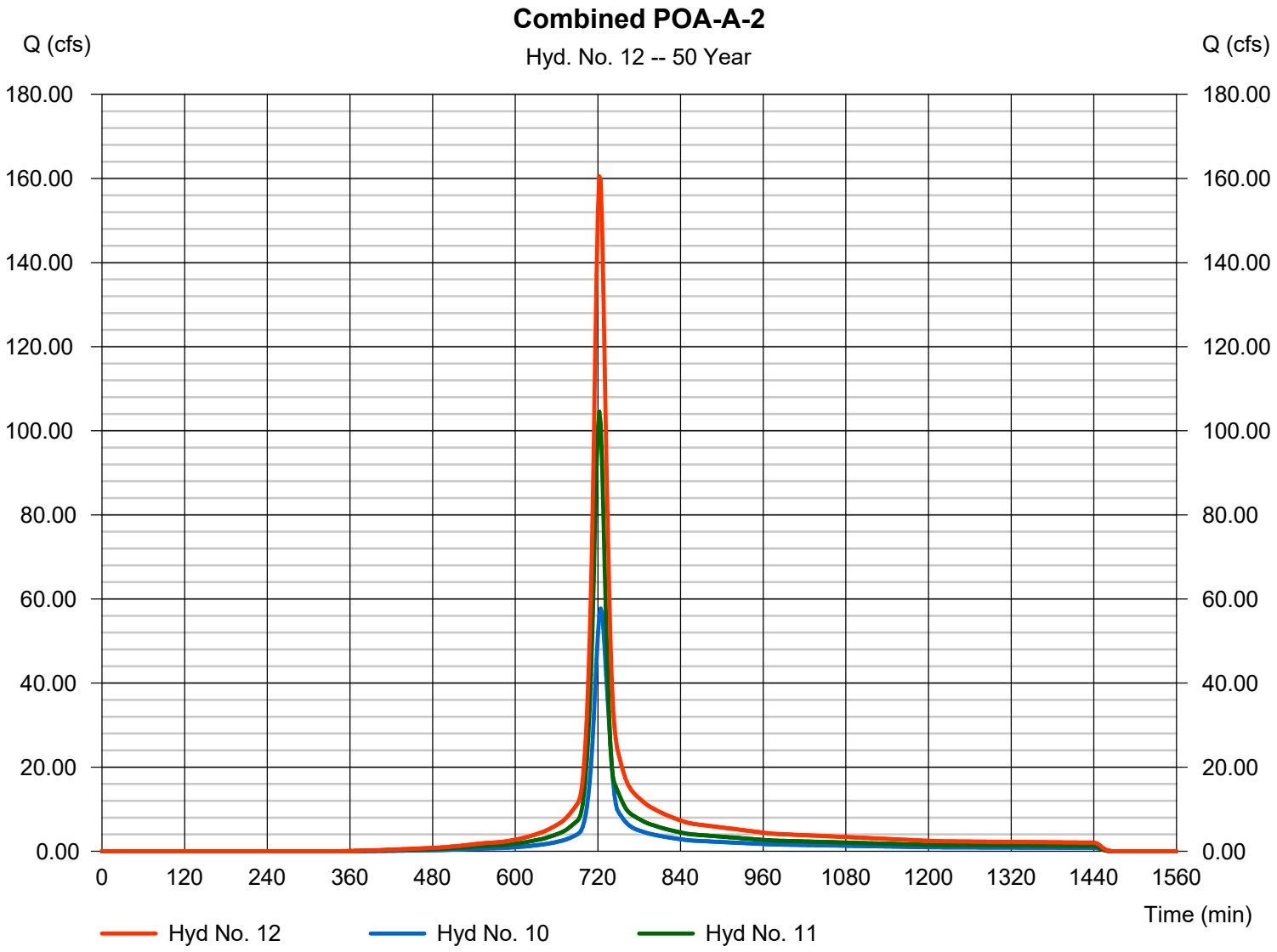


Hydrograph Report

Hyd. No. 12

Combined POA-A-2

Hydrograph type	= Combine	Peak discharge	= 160.50 cfs
Storm frequency	= 50 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 477,810 cuft
Inflow hyds.	= 10, 11	Contrib. drain. area	= 29.240 ac

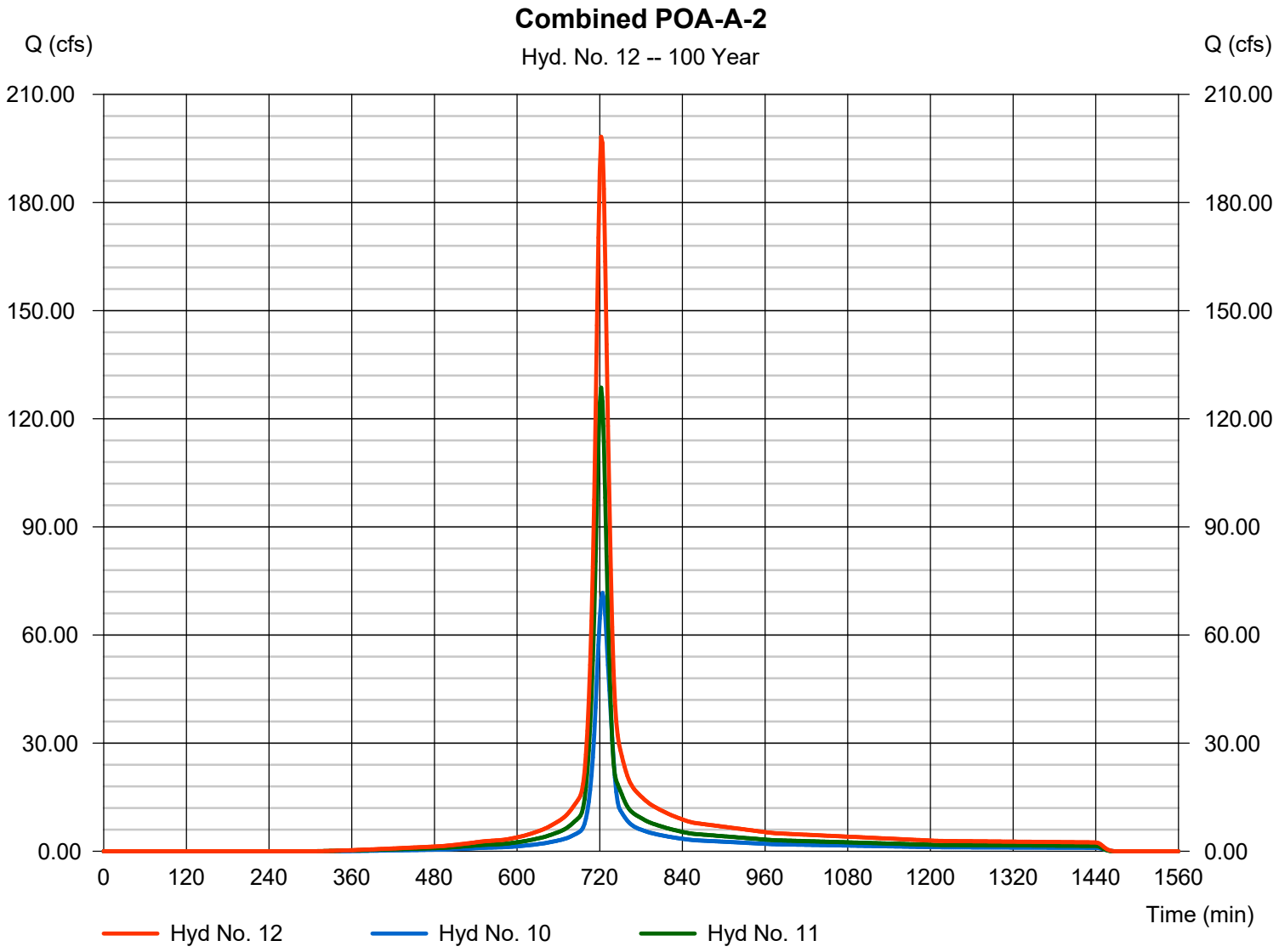


Hydrograph Report

Hyd. No. 12

Combined POA-A-2

Hydrograph type	=	Combine	Peak discharge	=	198.23 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	593,914 cuft
Inflow hyds.	=	10, 11	Contrib. drain. area	=	29.240 ac



PR-A-3-A-ONSITE WATERSHED

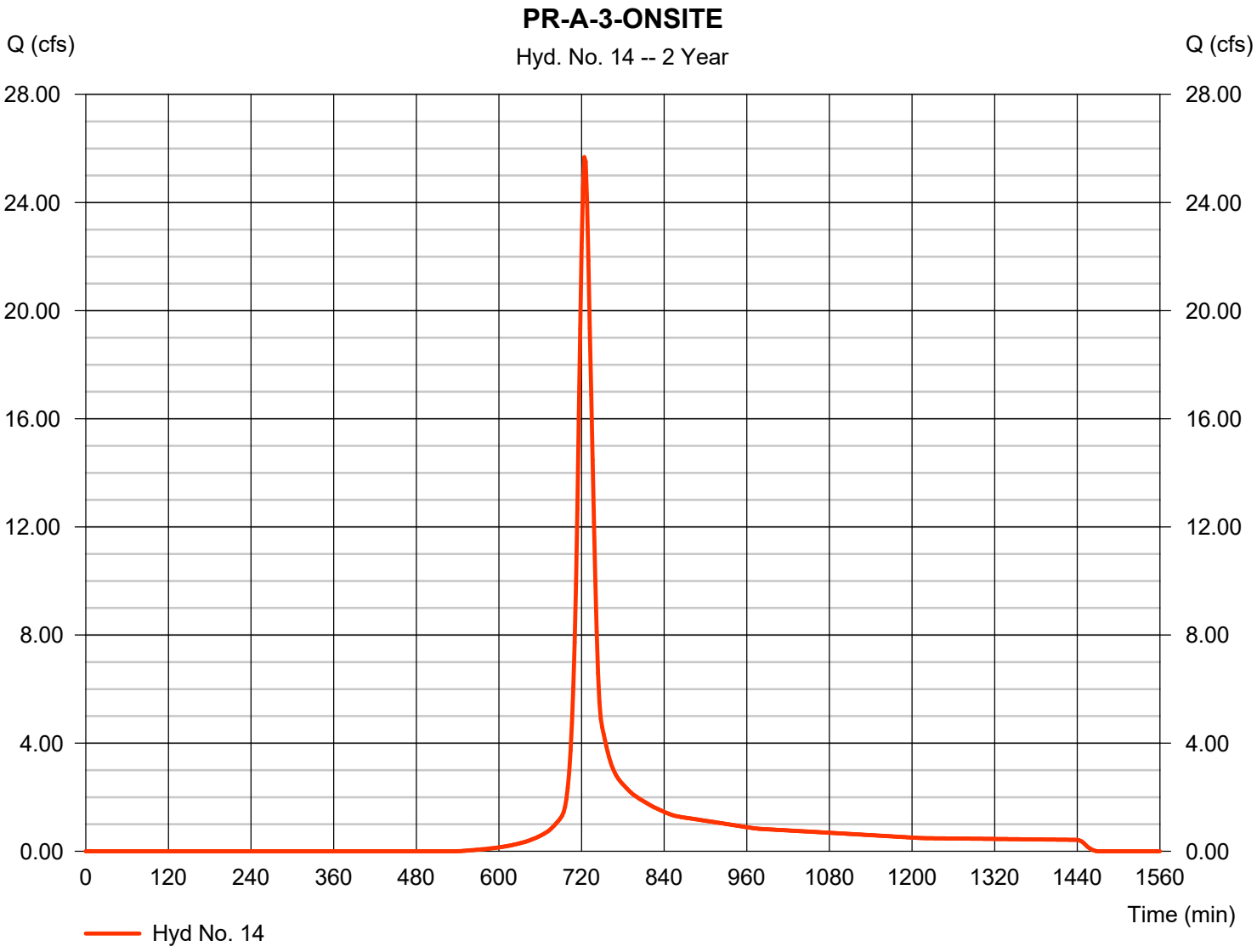
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 14

PR-A-3-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	25.68 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	80,845 cuft
Drainage area	=	14.240 ac	Curve number	=	81
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	19.70 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

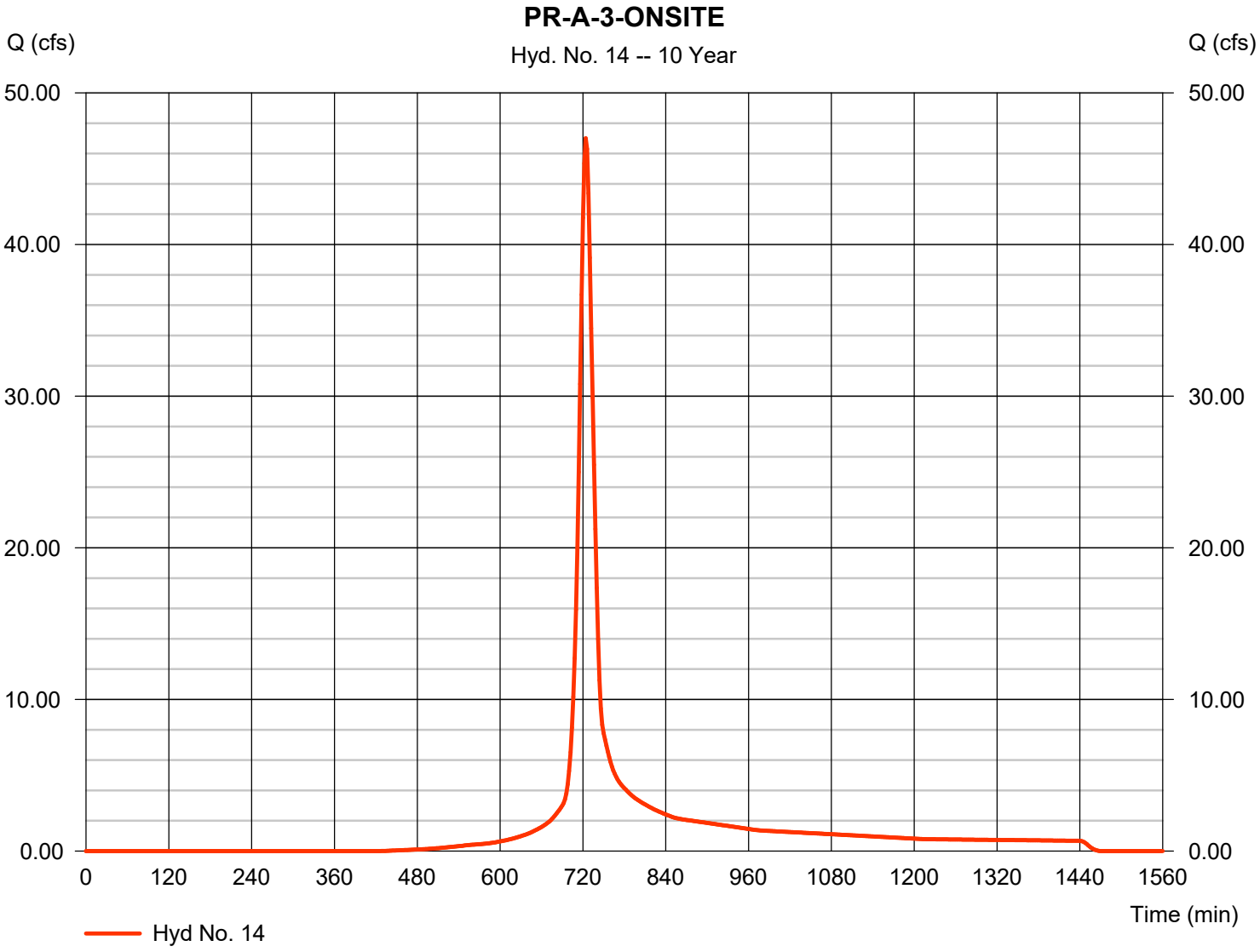


Hydrograph Report

Hyd. No. 14

PR-A-3-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	47.01 cfs
Storm frequency	=	10 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	147,030 cuft
Drainage area	=	14.240 ac	Curve number	=	81
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	19.70 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

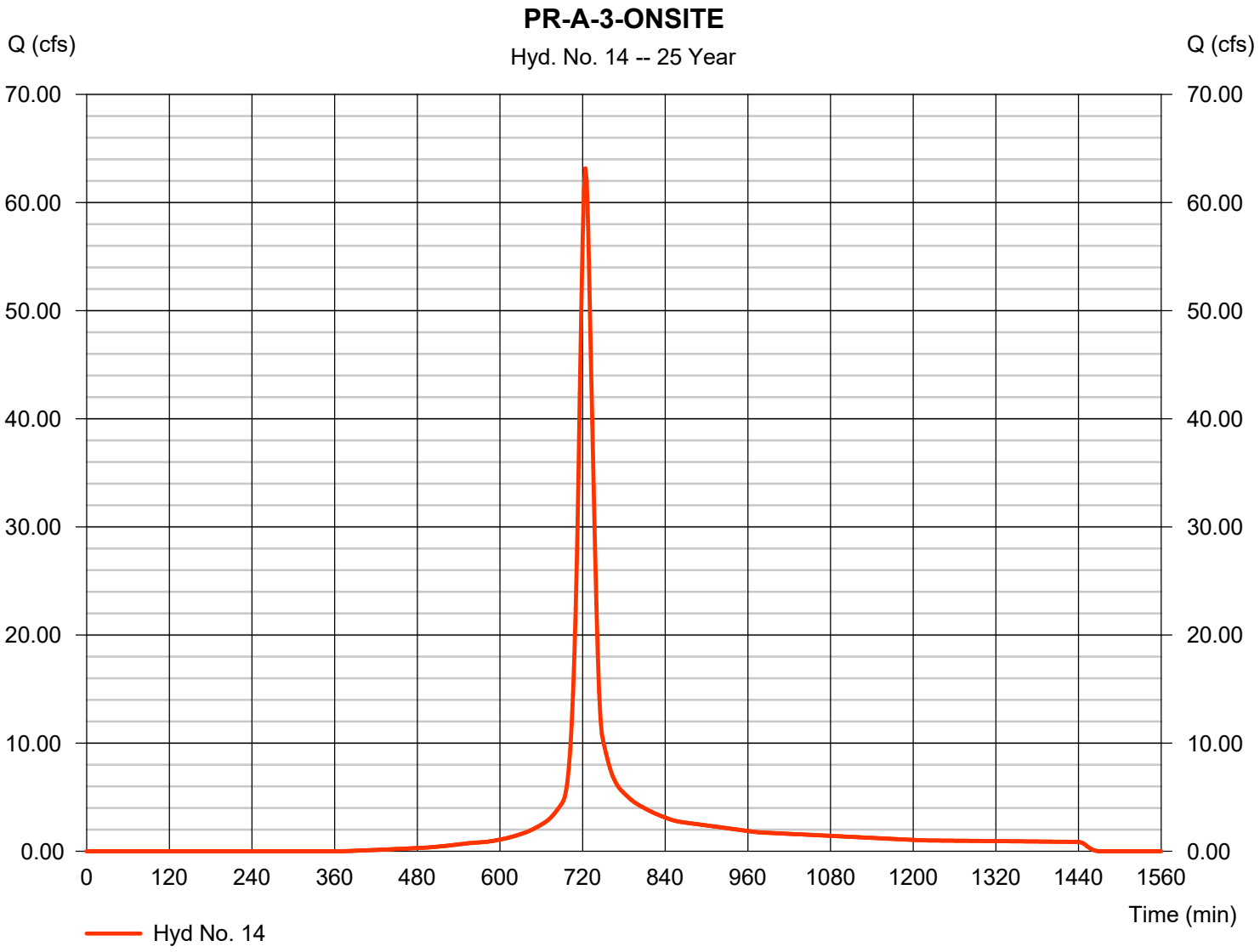


Hydrograph Report

Hyd. No. 14

PR-A-3-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	63.16 cfs
Storm frequency	=	25 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	198,401 cuft
Drainage area	=	14.240 ac	Curve number	=	81
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	19.70 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

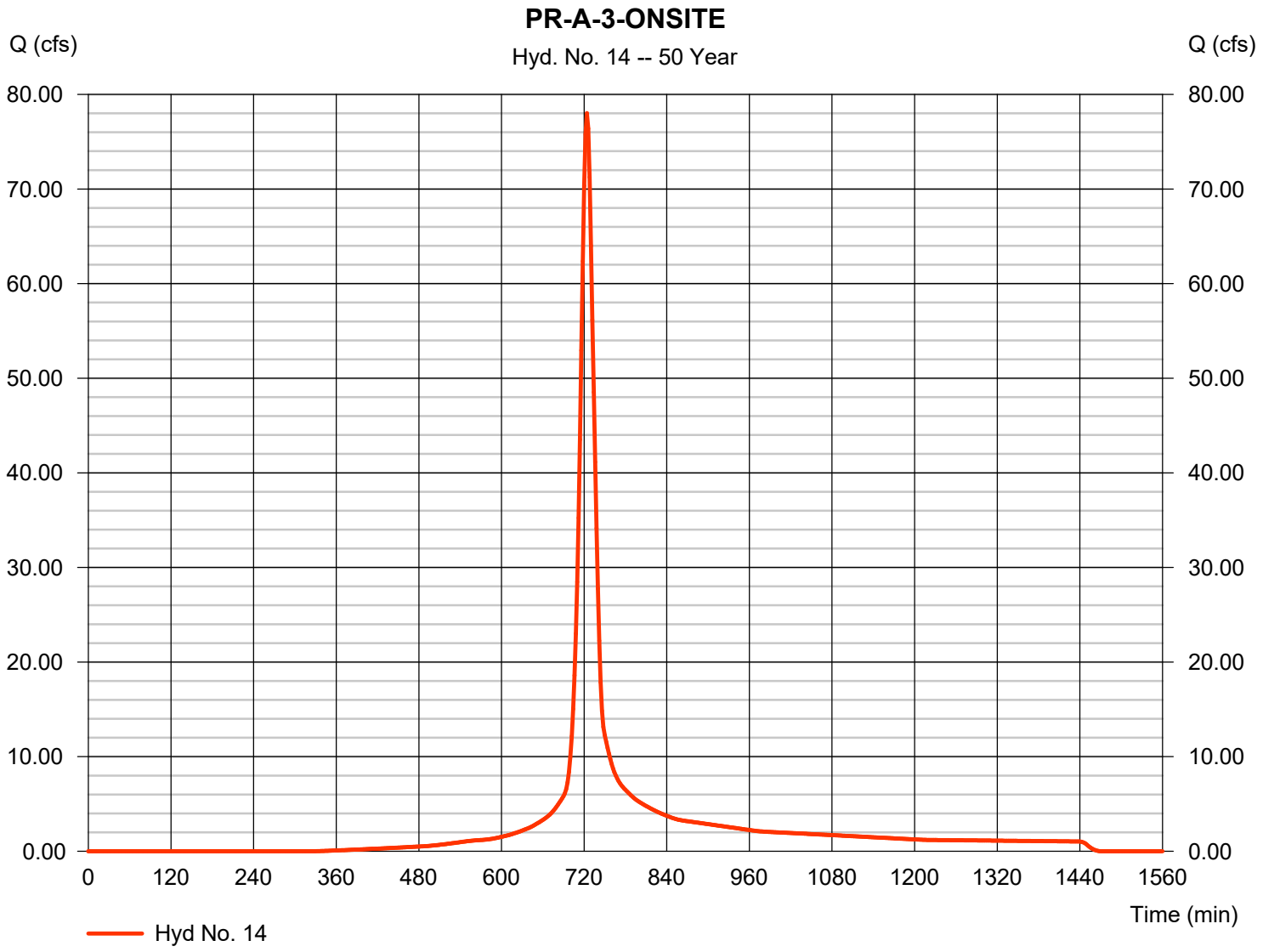


Hydrograph Report

Hyd. No. 14

PR-A-3-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	78.01 cfs
Storm frequency	=	50 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	246,456 cuft
Drainage area	=	14.240 ac	Curve number	=	81
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	19.70 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

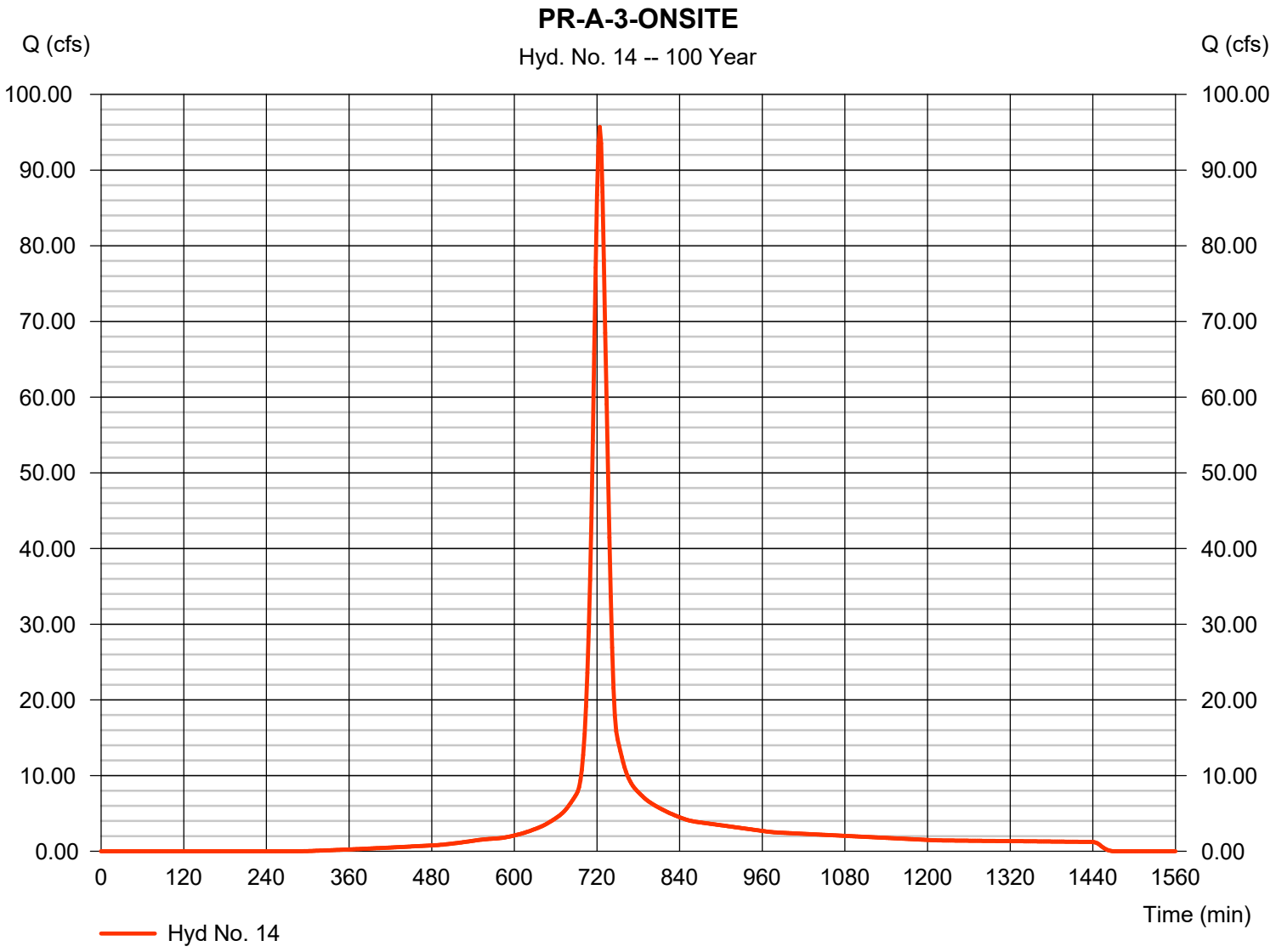


Hydrograph Report

Hyd. No. 14

PR-A-3-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	95.71 cfs
Storm frequency	=	100 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	304,637 cuft
Drainage area	=	14.240 ac	Curve number	=	81
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	19.70 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



PR-A-3-OFFSITE WATERSHED

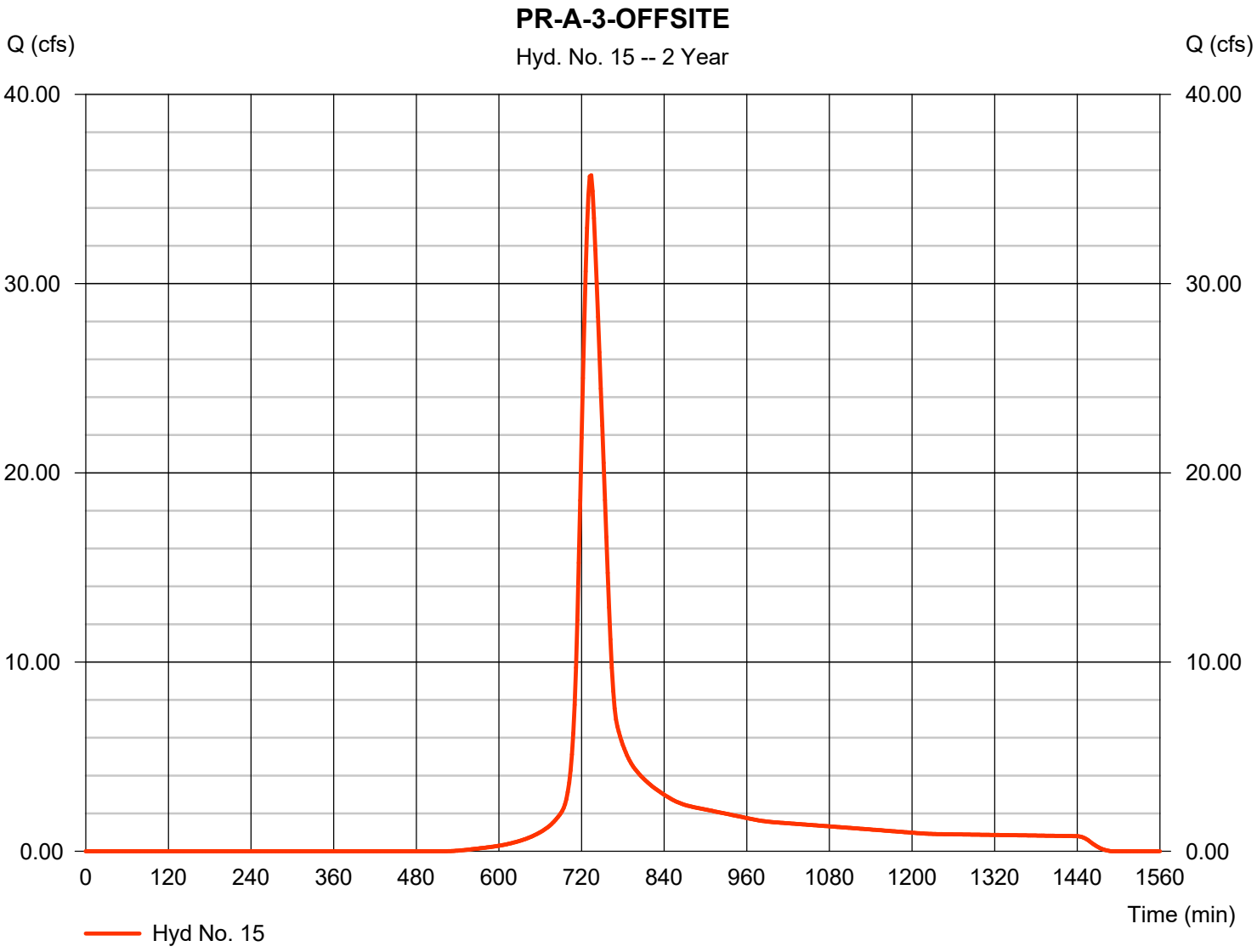
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 15

PR-A-3-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	35.72 cfs
Storm frequency	=	2 yrs	Time to peak	=	734 min
Time interval	=	2 min	Hyd. volume	=	155,590 cuft
Drainage area	=	25.890 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	33.00 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

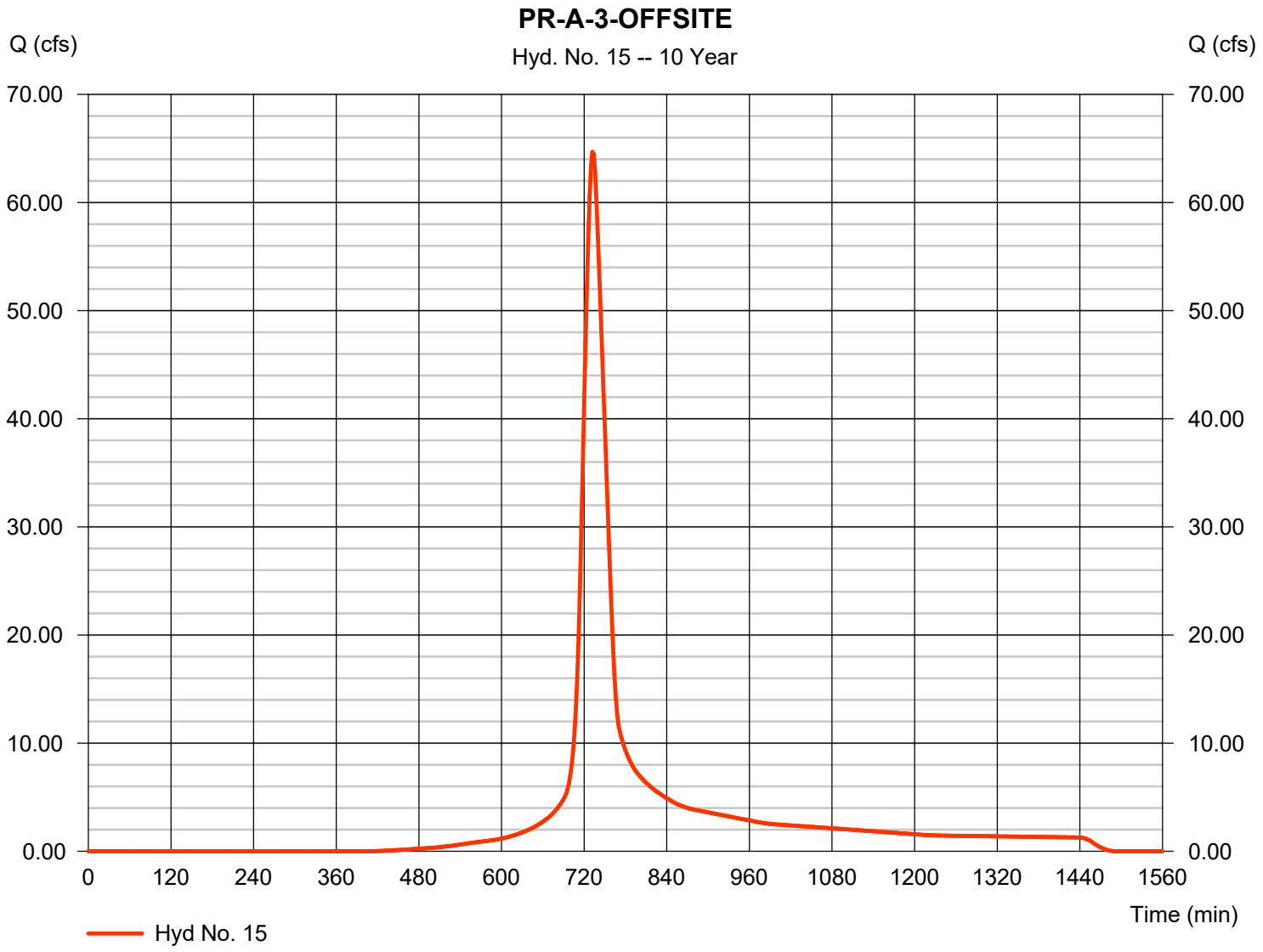


Hydrograph Report

Hyd. No. 15

PR-A-3-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	64.68 cfs
Storm frequency	=	10 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	279,412 cuft
Drainage area	=	25.890 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	33.00 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

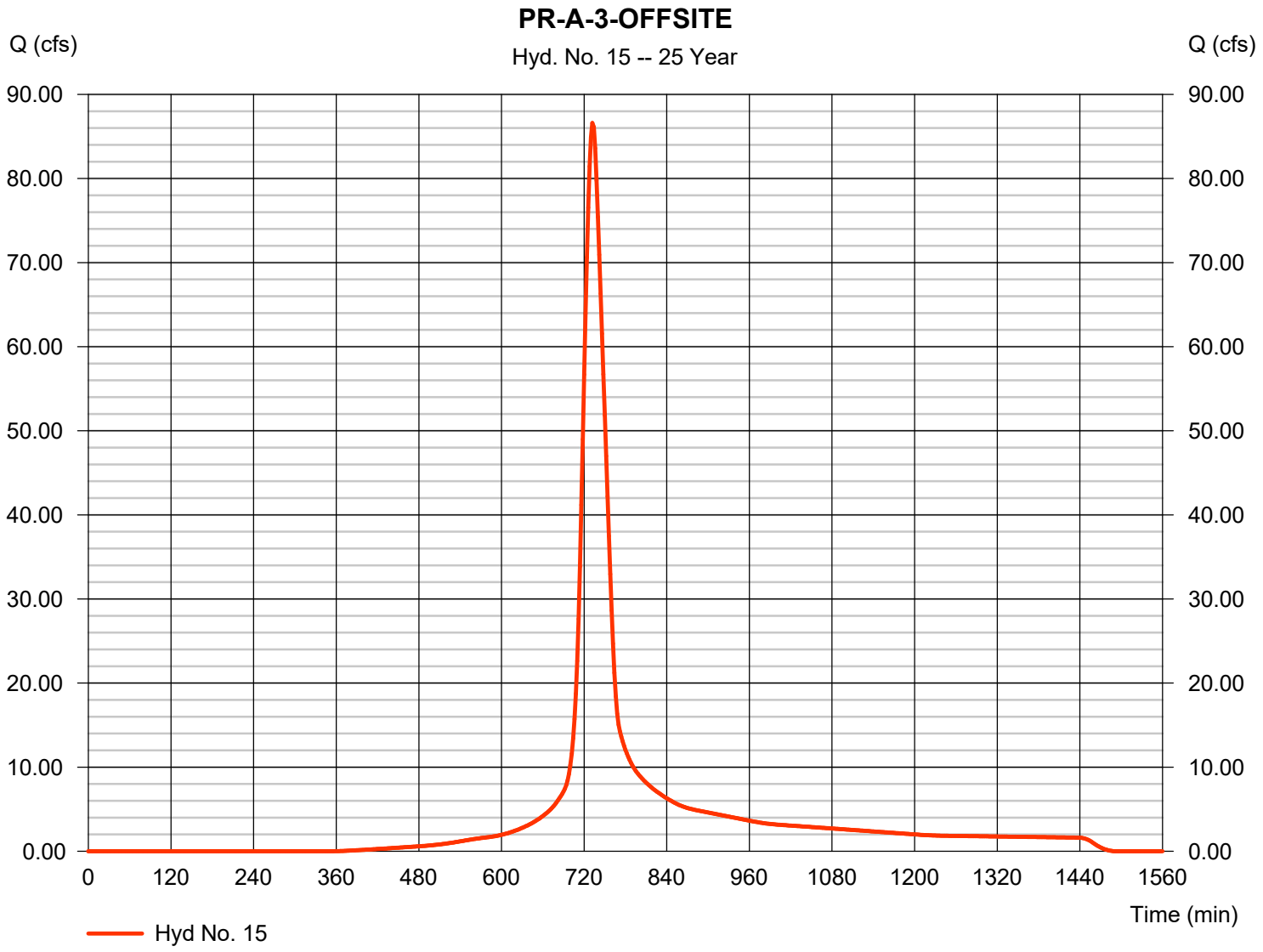


Hydrograph Report

Hyd. No. 15

PR-A-3-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	86.60 cfs
Storm frequency	=	25 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	375,021 cuft
Drainage area	=	25.890 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	33.00 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

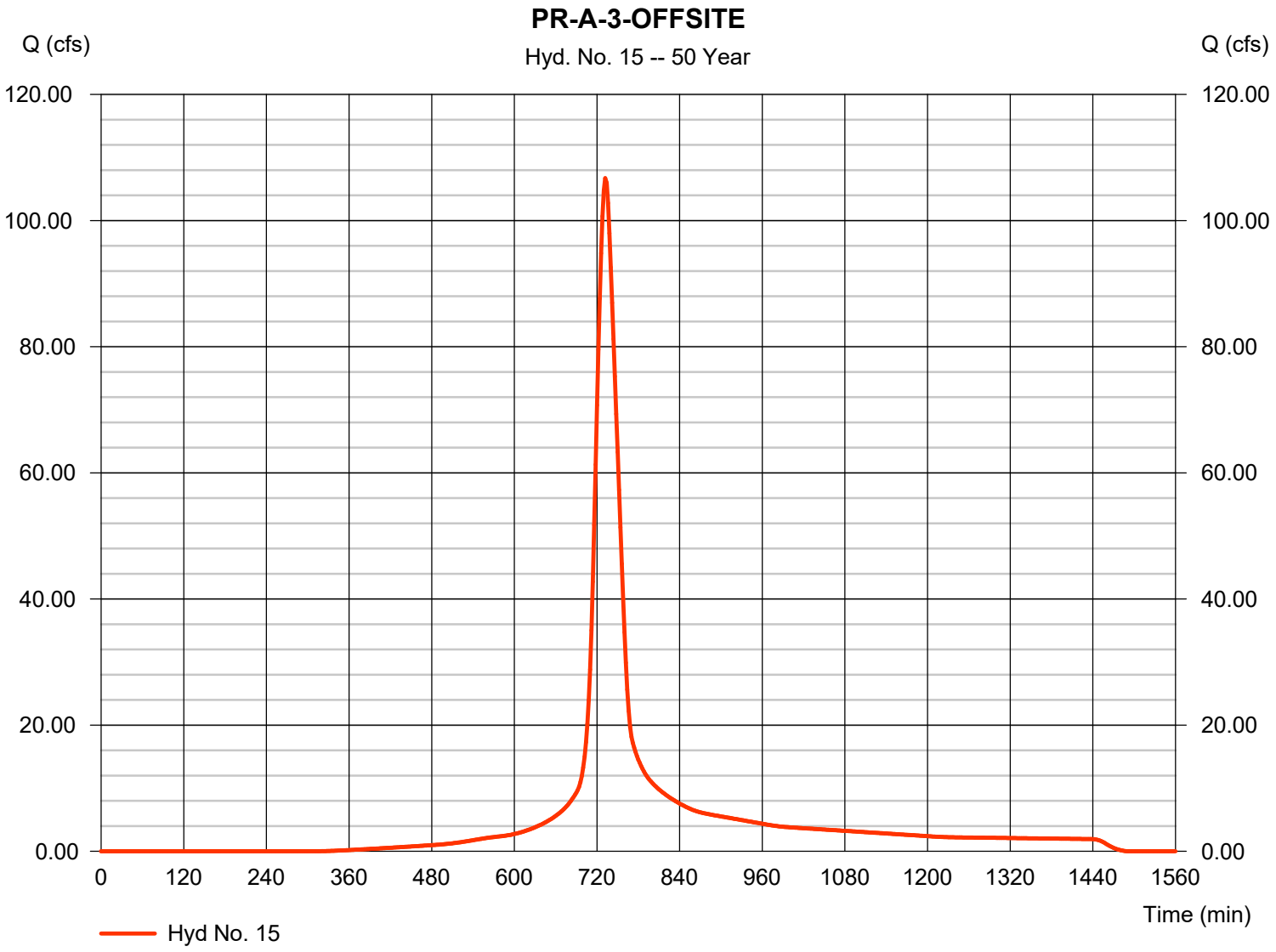


Hydrograph Report

Hyd. No. 15

PR-A-3-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	106.73 cfs
Storm frequency	=	50 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	464,234 cuft
Drainage area	=	25.890 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	33.00 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

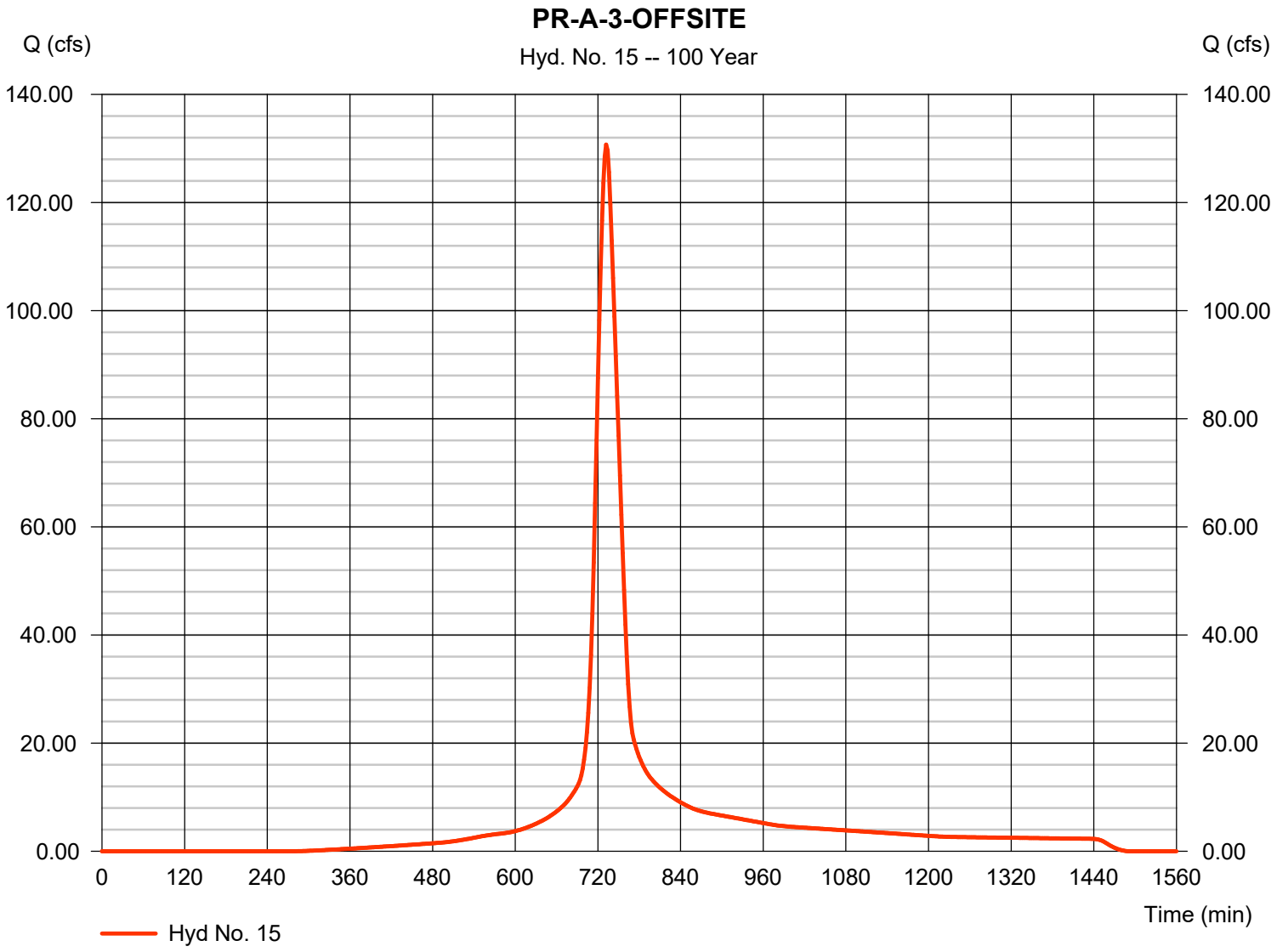


Hydrograph Report

Hyd. No. 15

PR-A-3-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	130.71 cfs
Storm frequency	=	100 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	572,055 cuft
Drainage area	=	25.890 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	33.00 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



TOTAL PROPOSED FLOW TO POA-A-3

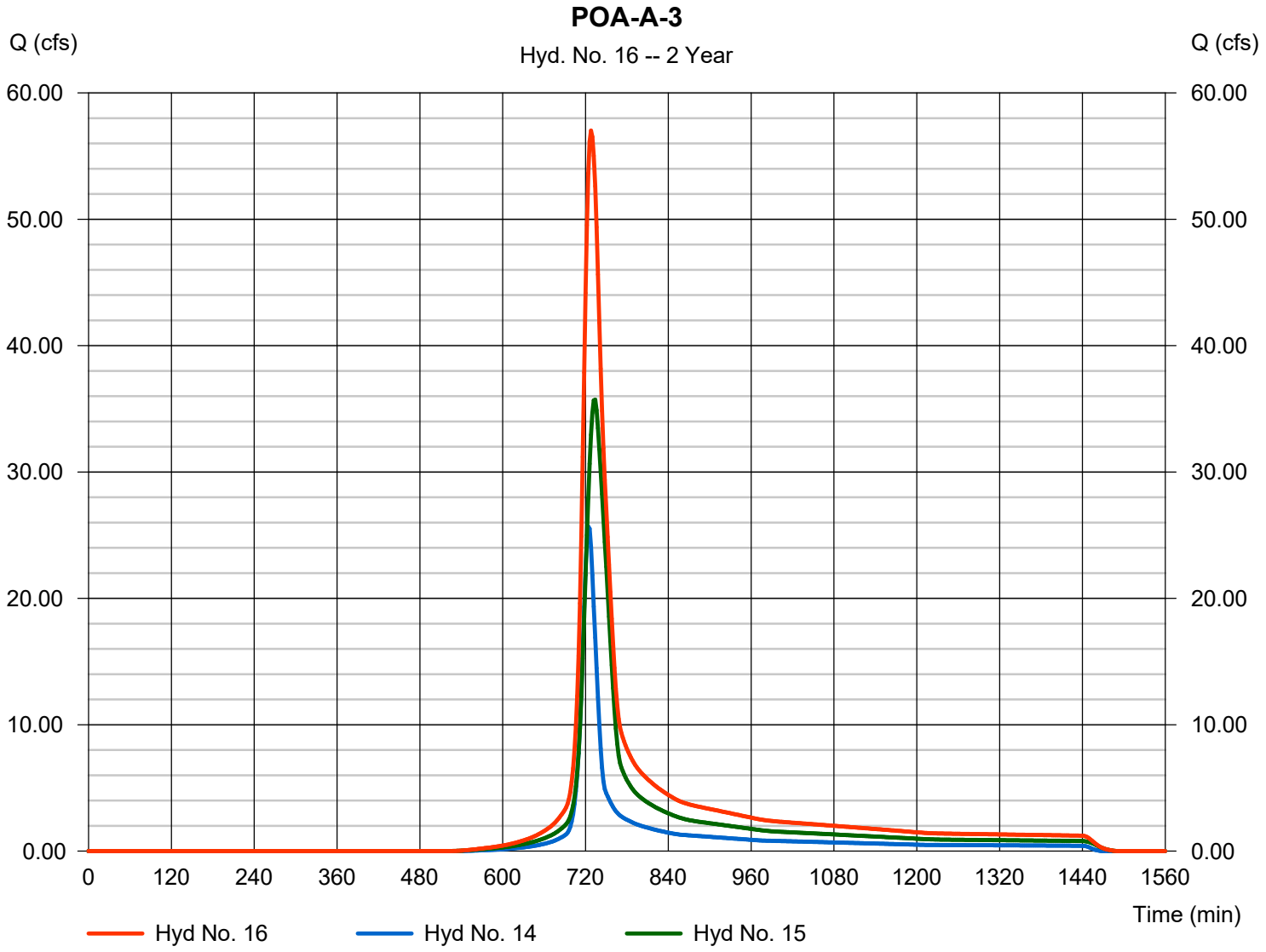
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 16

POA-A-3

Hydrograph type	= Combine	Peak discharge	= 57.01 cfs
Storm frequency	= 2 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 236,436 cuft
Inflow hyds.	= 14, 15	Contrib. drain. area	= 40.130 ac

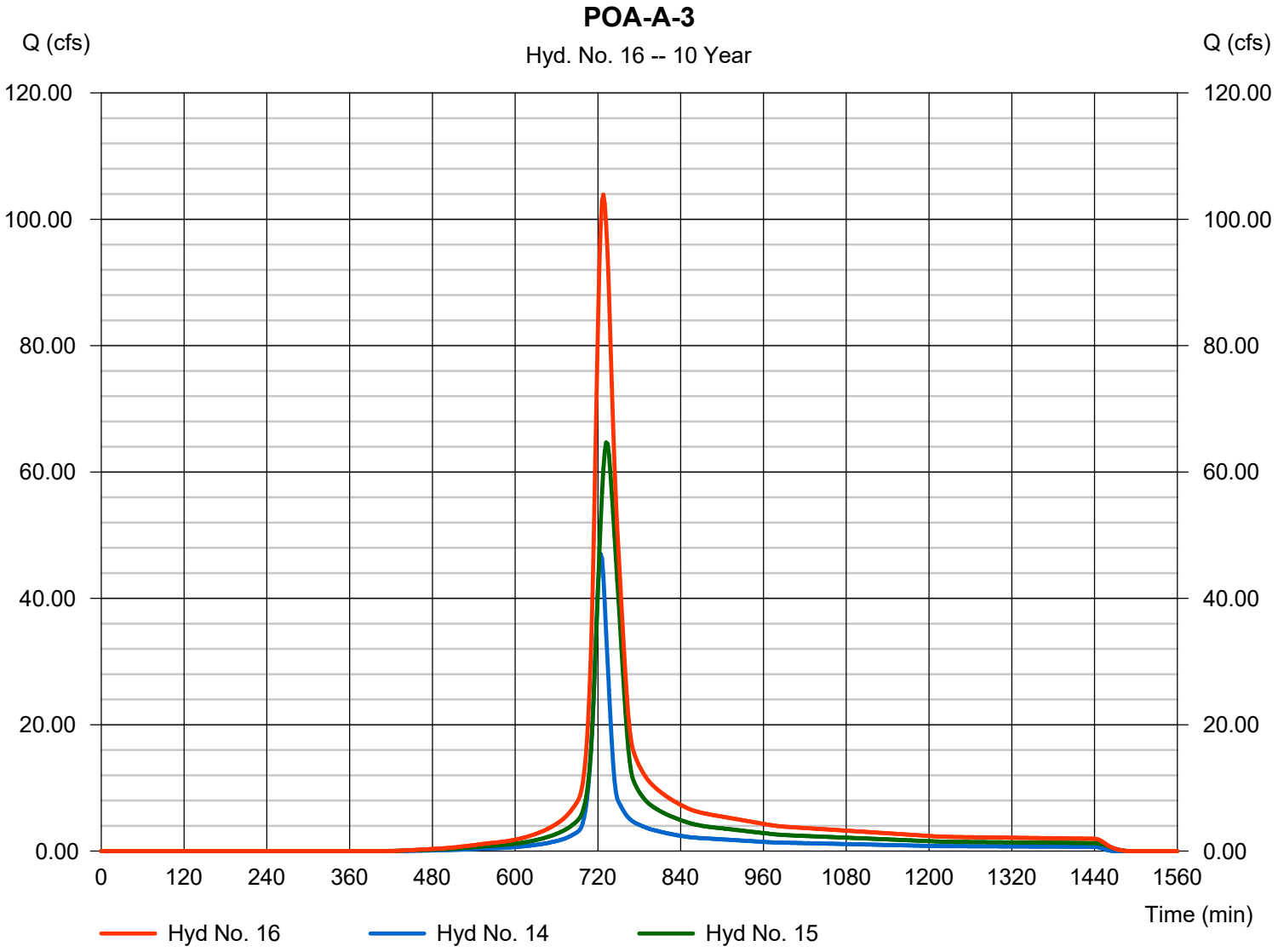


Hydrograph Report

Hyd. No. 16

POA-A-3

Hydrograph type	=	Combine	Peak discharge	=	103.88 cfs
Storm frequency	=	10 yrs	Time to peak	=	728 min
Time interval	=	2 min	Hyd. volume	=	426,442 cuft
Inflow hyds.	=	14, 15	Contrib. drain. area	=	40.130 ac

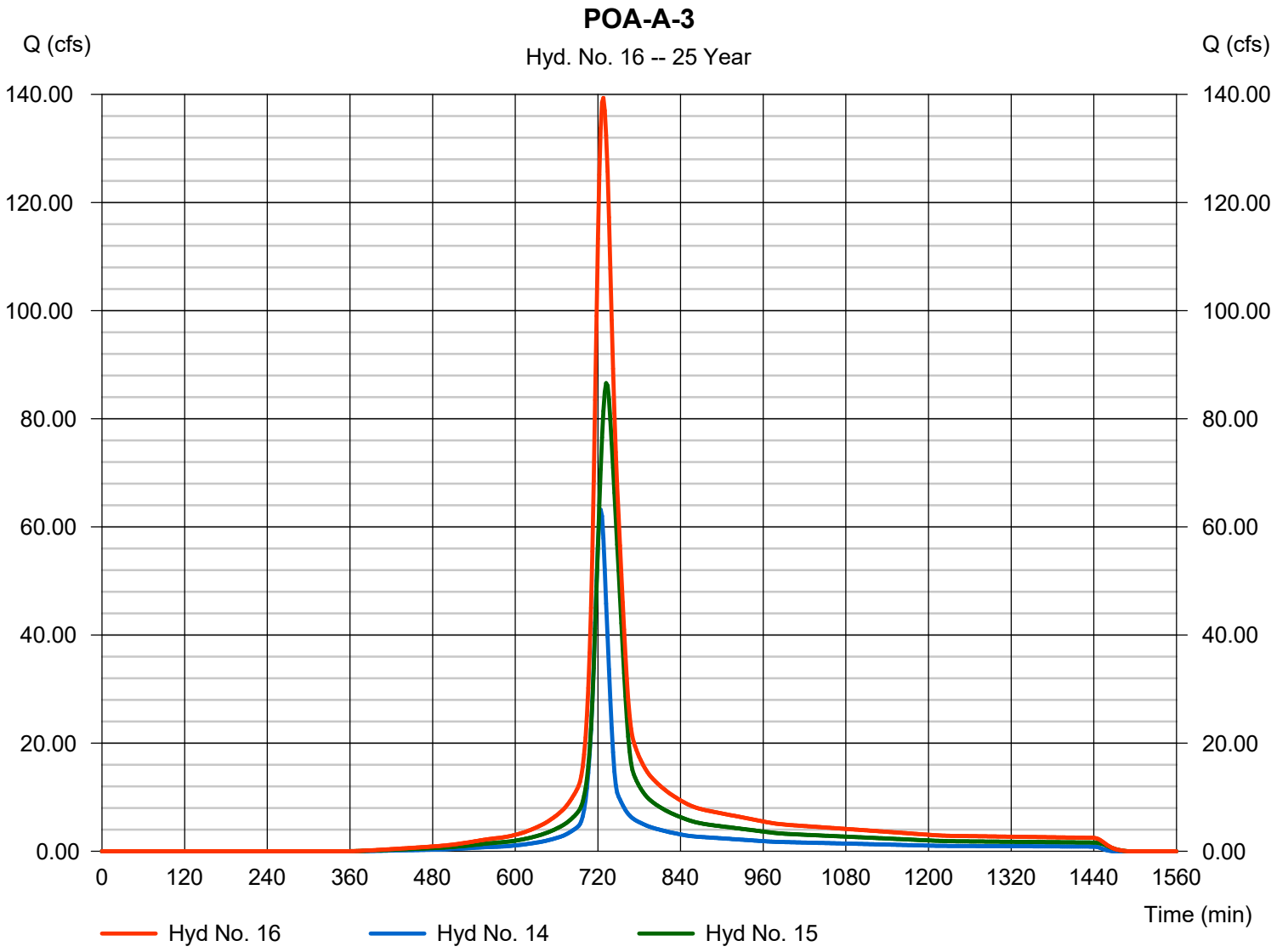


Hydrograph Report

Hyd. No. 16

POA-A-3

Hydrograph type	=	Combine	Peak discharge	=	139.34 cfs
Storm frequency	=	25 yrs	Time to peak	=	728 min
Time interval	=	2 min	Hyd. volume	=	573,423 cuft
Inflow hyds.	=	14, 15	Contrib. drain. area	=	40.130 ac

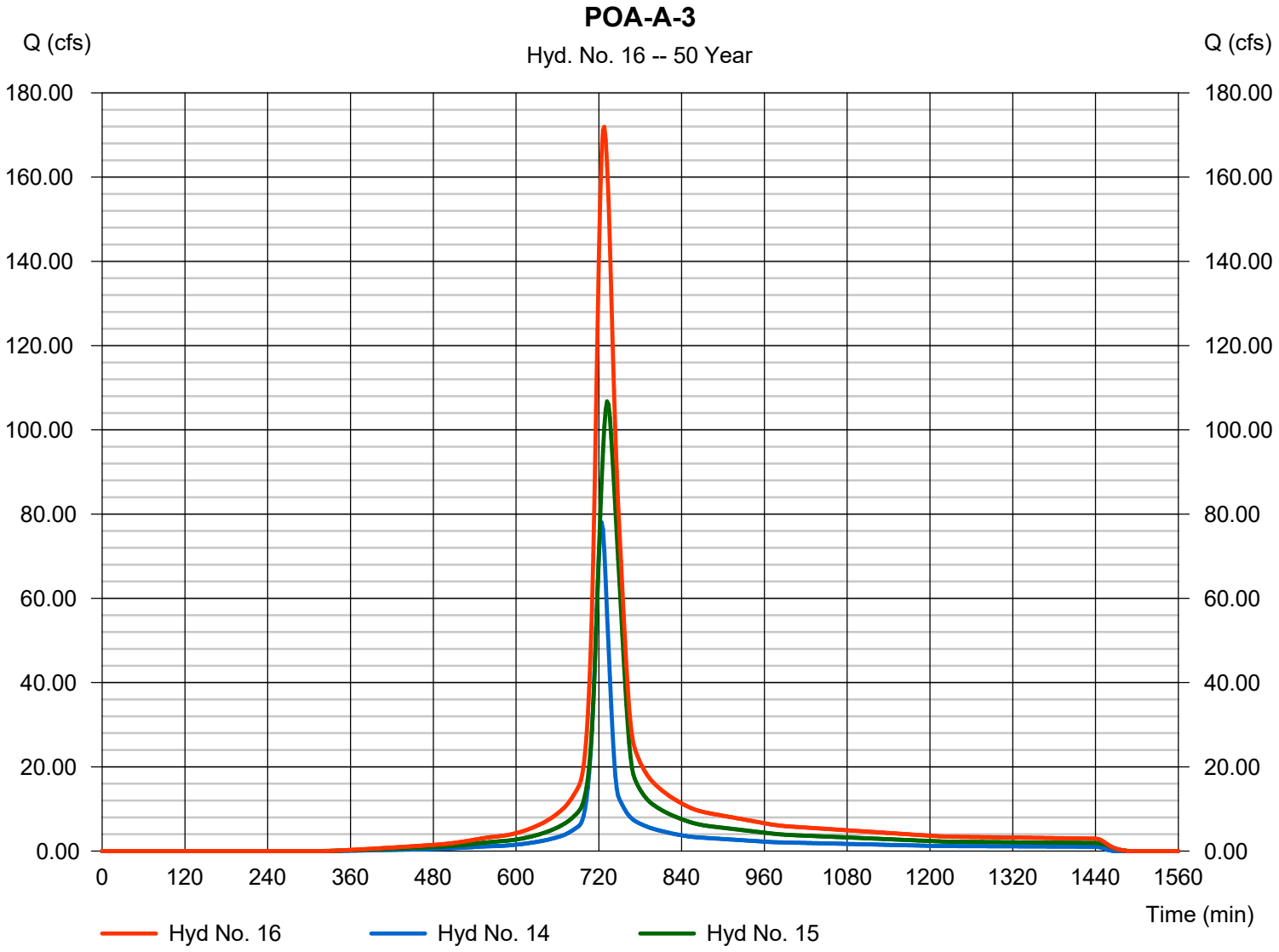


Hydrograph Report

Hyd. No. 16

POA-A-3

Hydrograph type	=	Combine	Peak discharge	=	171.92 cfs
Storm frequency	=	50 yrs	Time to peak	=	728 min
Time interval	=	2 min	Hyd. volume	=	710,689 cuft
Inflow hyds.	=	14, 15	Contrib. drain. area	=	40.130 ac

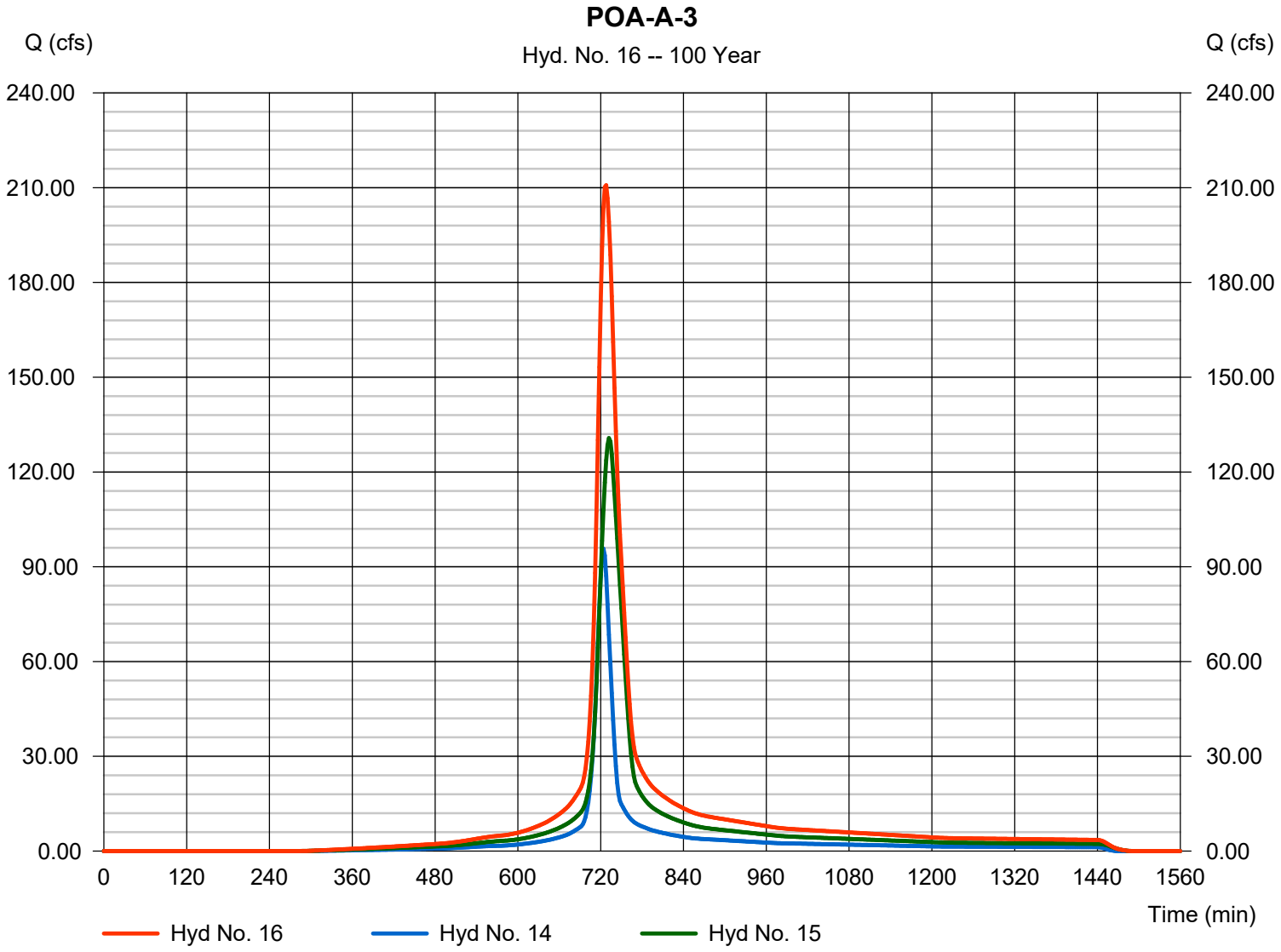


Hydrograph Report

Hyd. No. 16

POA-A-3

Hydrograph type	=	Combine	Peak discharge	=	210.76 cfs
Storm frequency	=	100 yrs	Time to peak	=	728 min
Time interval	=	2 min	Hyd. volume	=	876,691 cuft
Inflow hyds.	=	14, 15	Contrib. drain. area	=	40.130 ac



PR-A-4-ONSITE WATERSHED

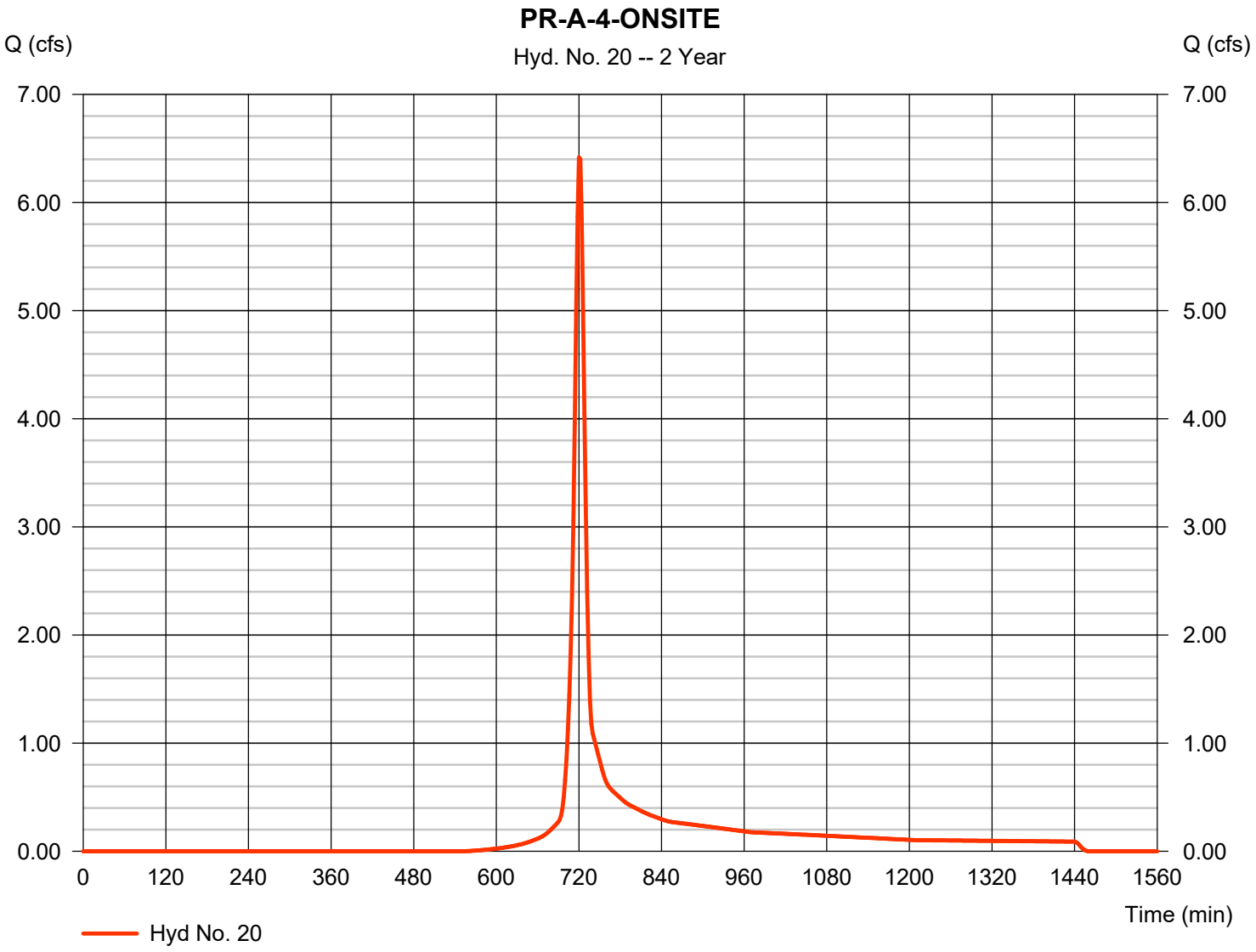
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 20

PR-A-4-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.417 cfs
Storm frequency	=	2 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	16,731 cuft
Drainage area	=	2.990 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.30 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

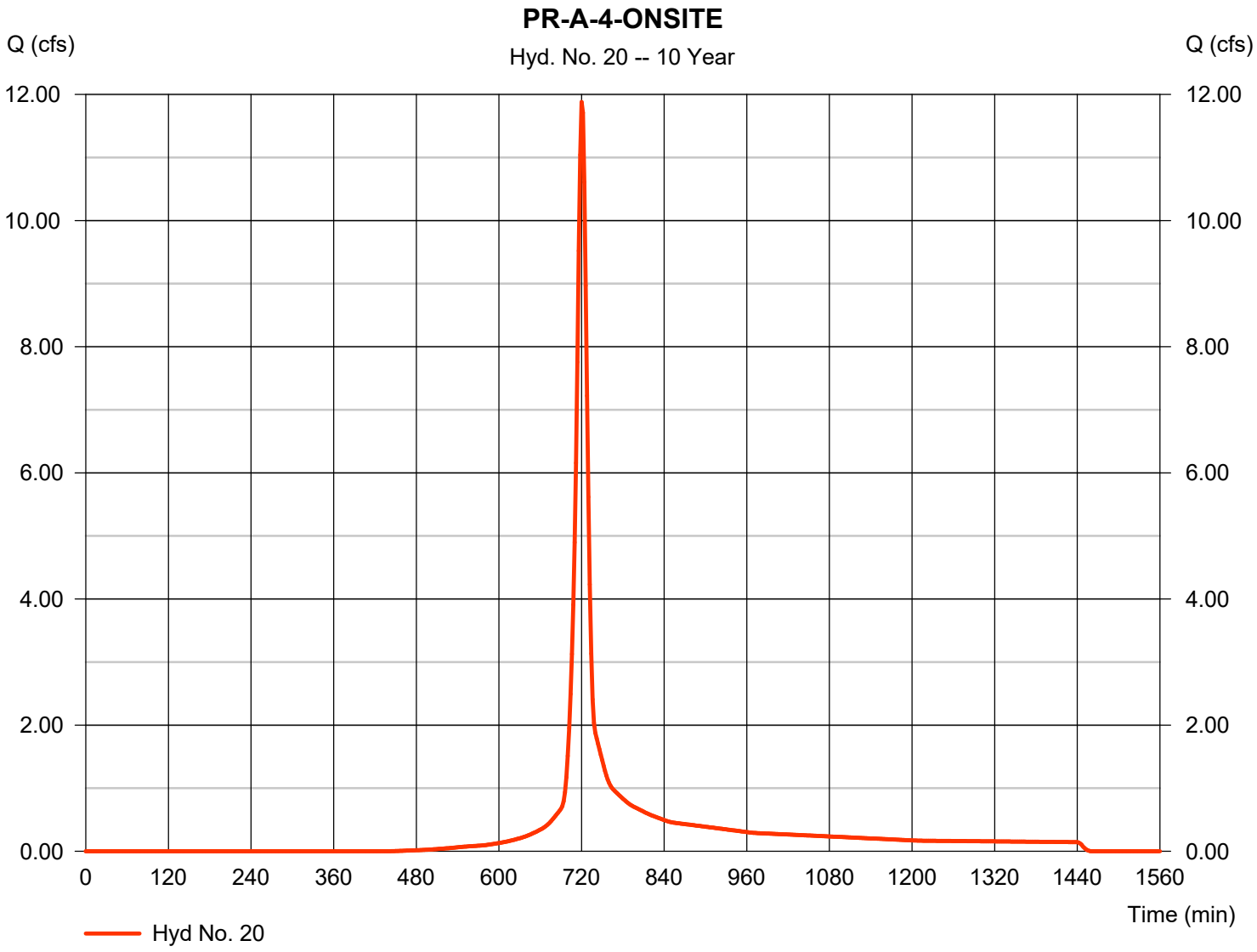


Hydrograph Report

Hyd. No. 20

PR-A-4-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.88 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	30,822 cuft
Drainage area	=	2.990 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.30 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

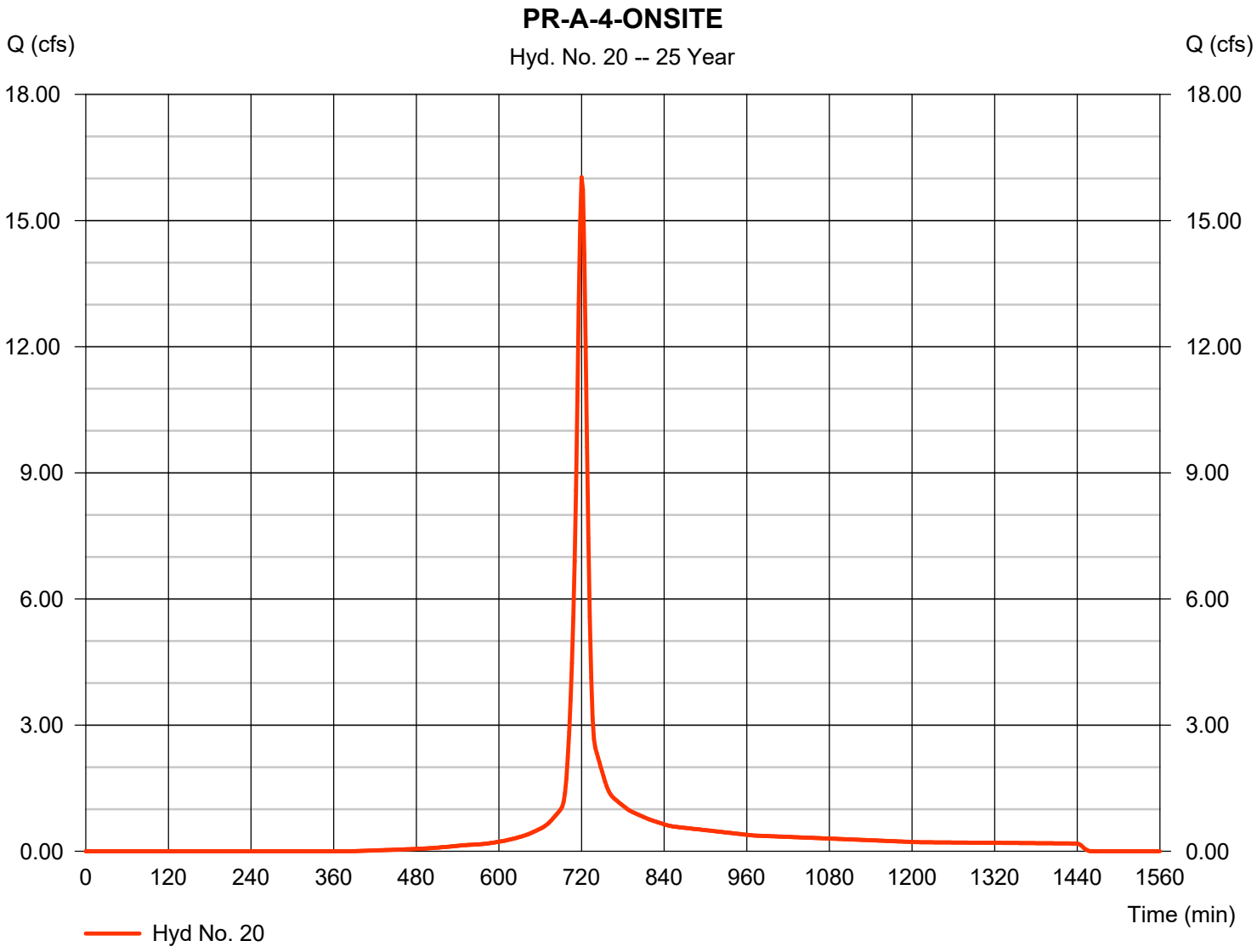


Hydrograph Report

Hyd. No. 20

PR-A-4-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	16.03 cfs
Storm frequency	=	25 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	41,818 cuft
Drainage area	=	2.990 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.30 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

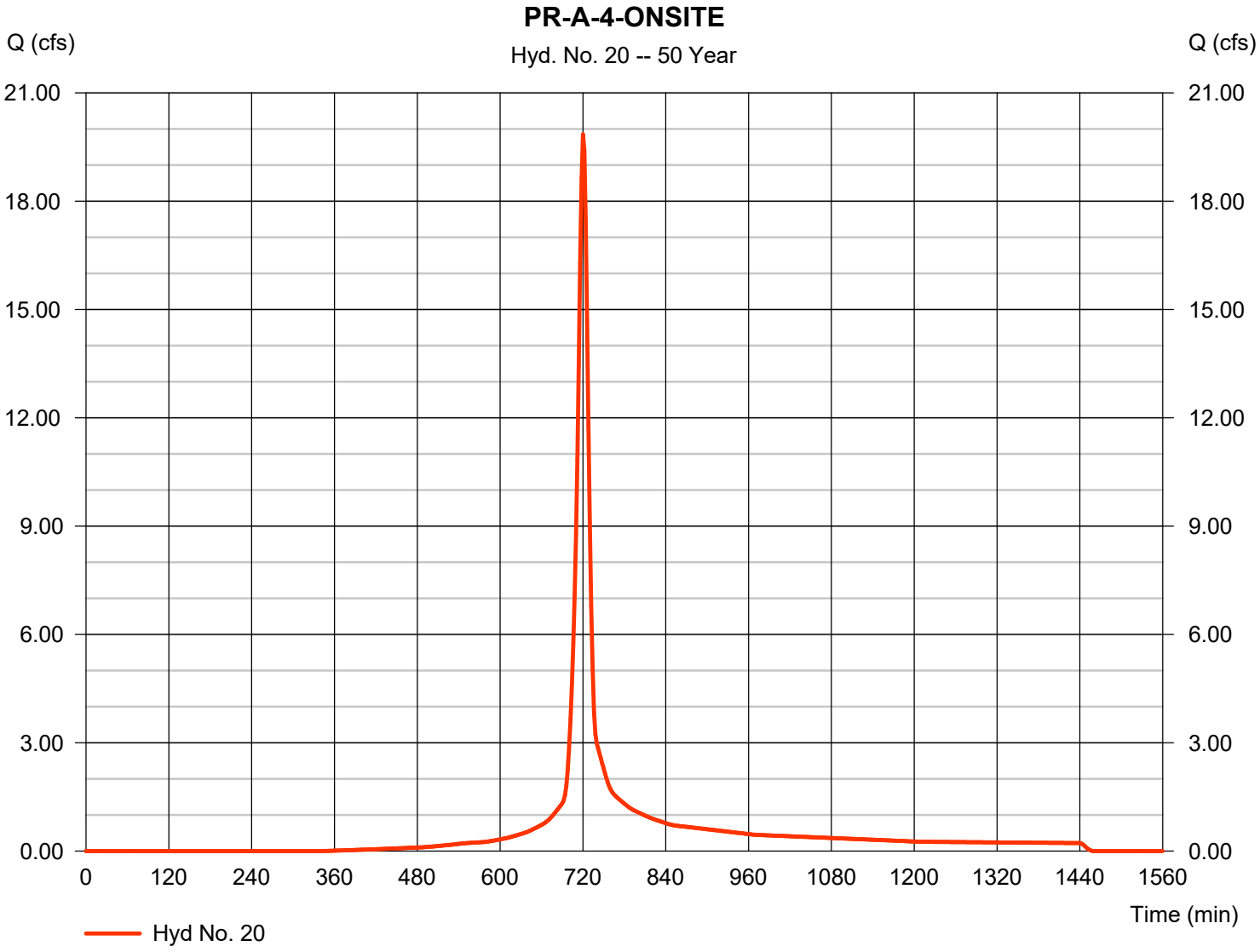


Hydrograph Report

Hyd. No. 20

PR-A-4-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	19.85 cfs
Storm frequency	=	50 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	52,131 cuft
Drainage area	=	2.990 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.30 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

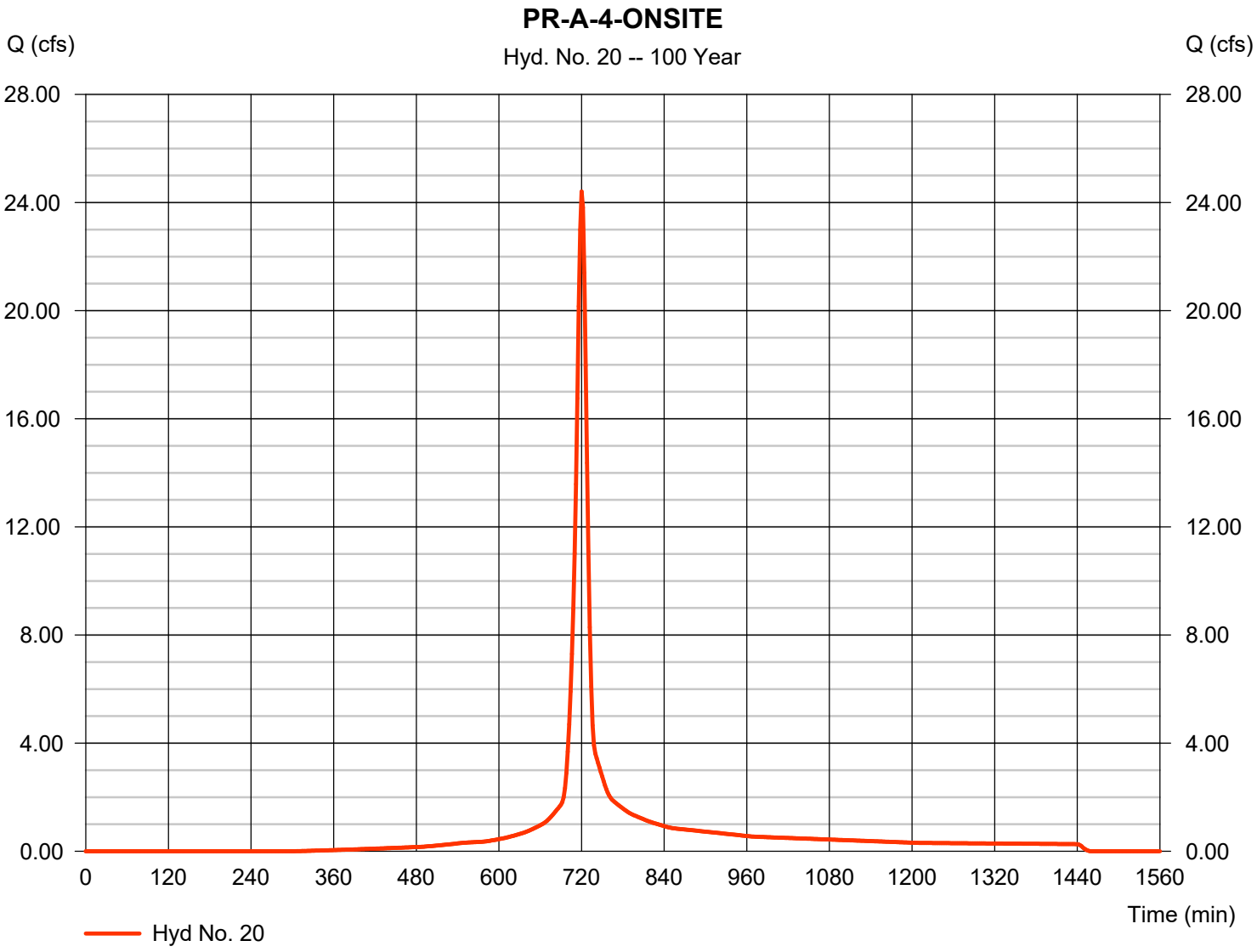


Hydrograph Report

Hyd. No. 20

PR-A-4-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	24.41 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	64,641 cuft
Drainage area	=	2.990 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.30 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



PR-B-1-ONSITE WATERSHED

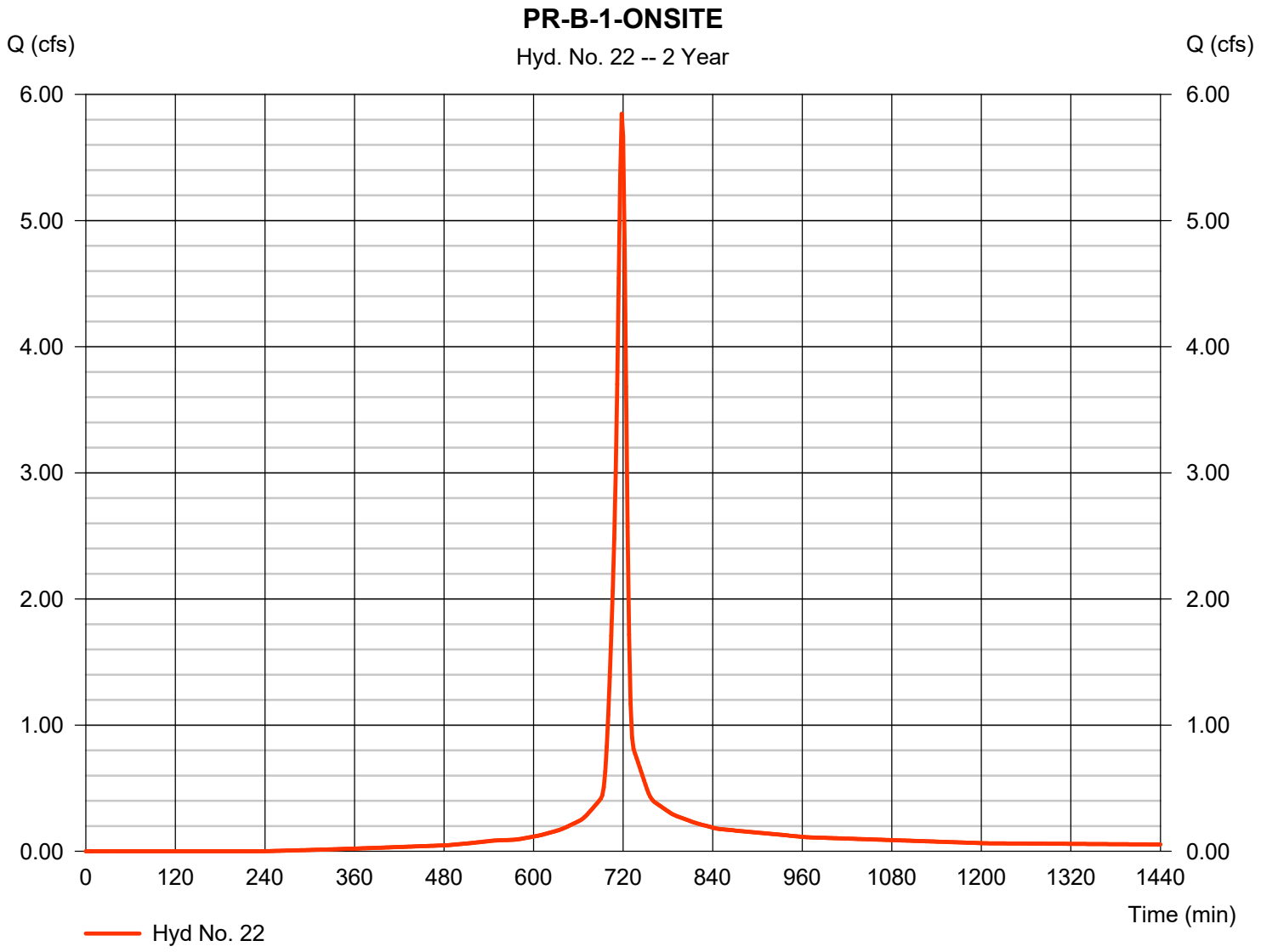
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 22

PR-B-1-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.846 cfs
Storm frequency	=	2 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	14,039 cuft
Drainage area	=	1.510 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	7.30 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

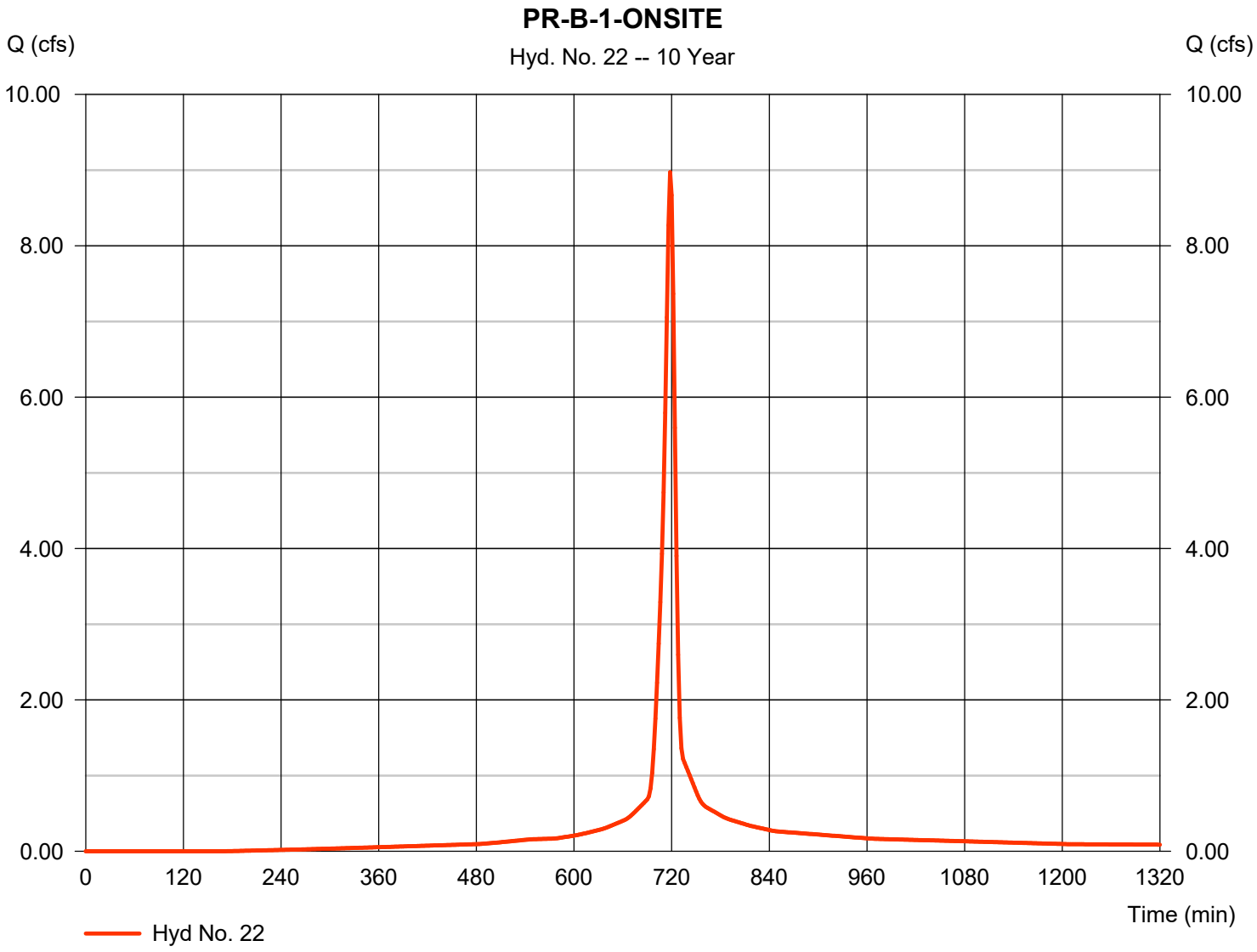


Hydrograph Report

Hyd. No. 22

PR-B-1-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.972 cfs
Storm frequency	=	10 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	22,149 cuft
Drainage area	=	1.510 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	7.30 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

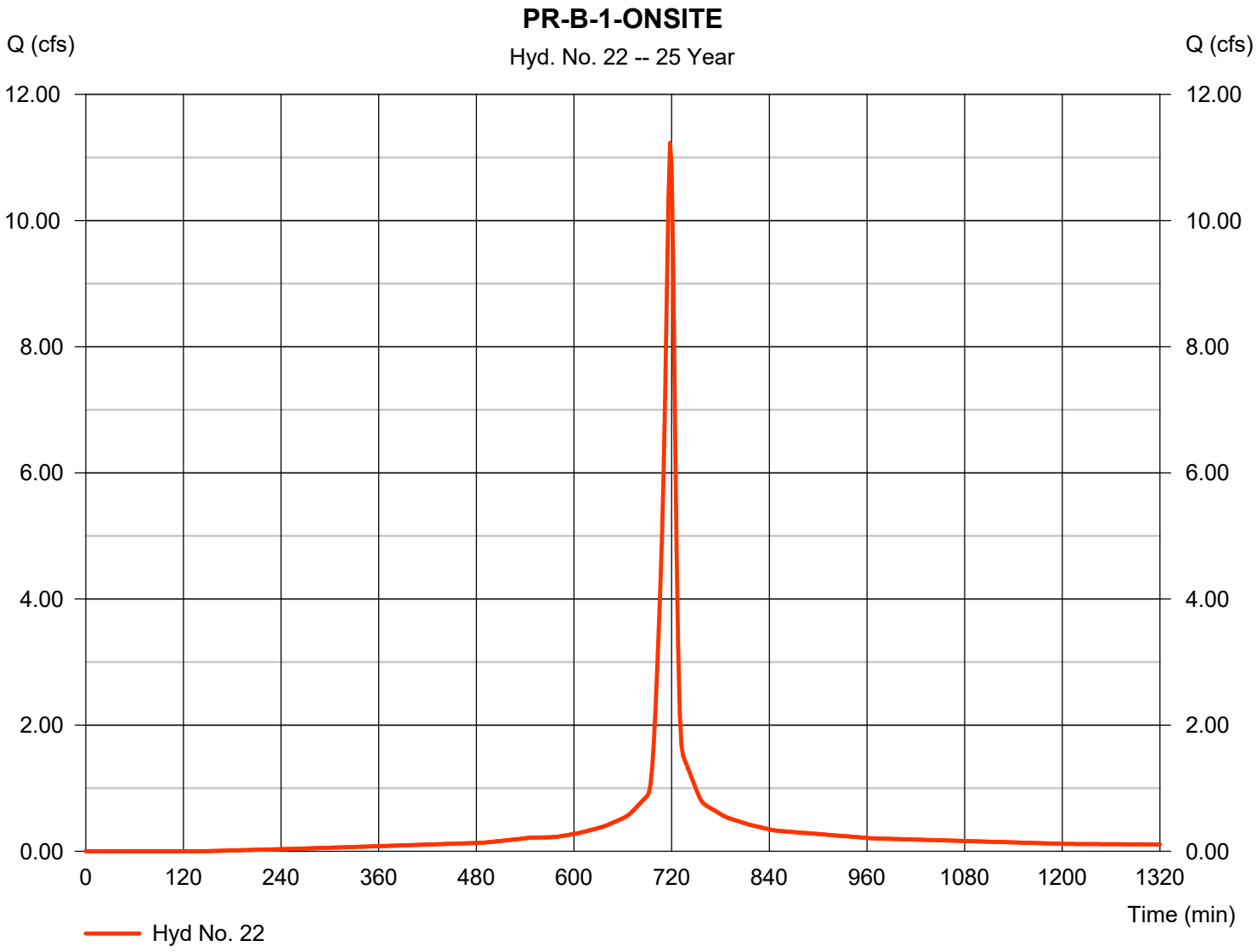


Hydrograph Report

Hyd. No. 22

PR-B-1-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.23 cfs
Storm frequency	=	25 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	28,137 cuft
Drainage area	=	1.510 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	7.30 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

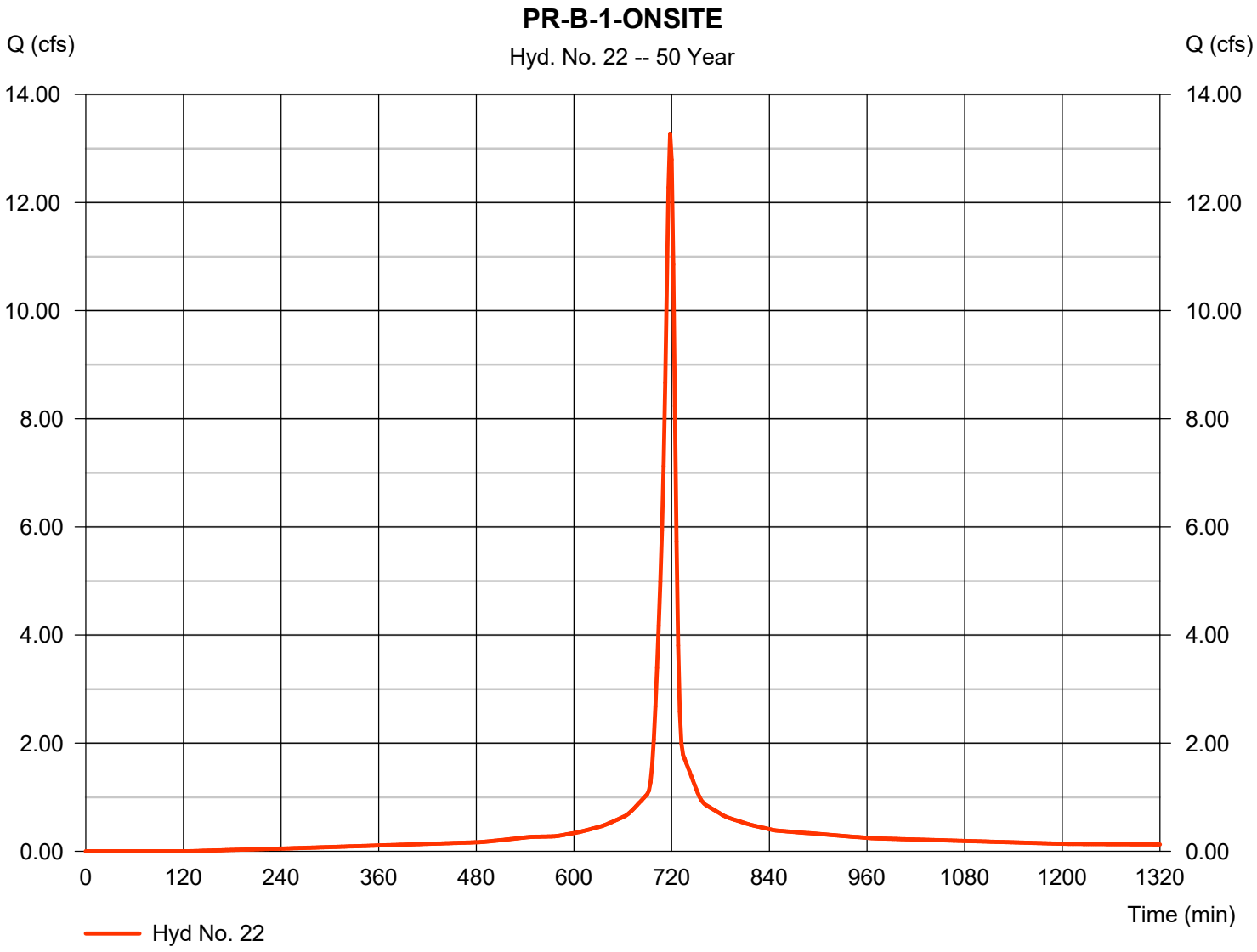


Hydrograph Report

Hyd. No. 22

PR-B-1-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	13.27 cfs
Storm frequency	=	50 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	33,610 cuft
Drainage area	=	1.510 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	7.30 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

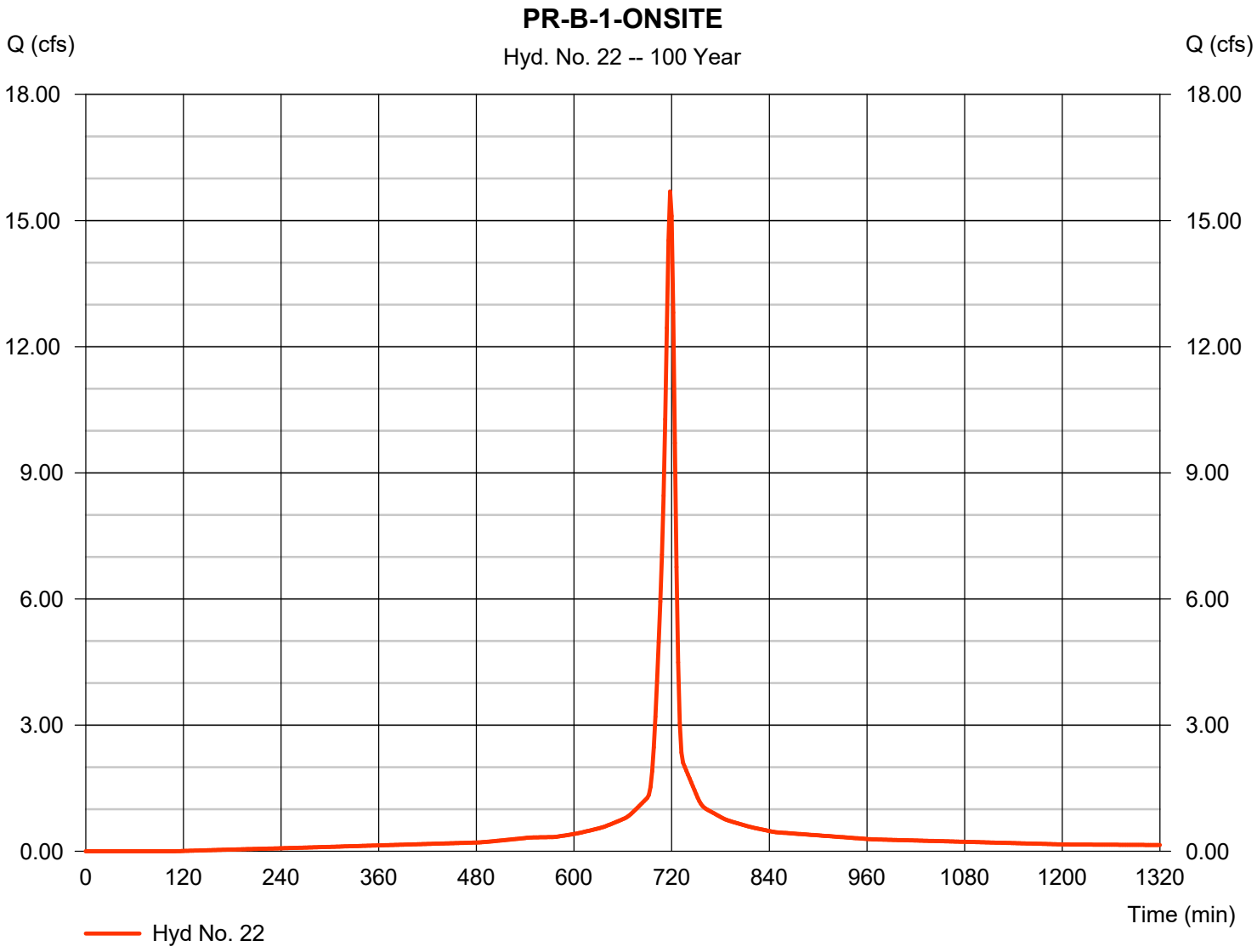


Hydrograph Report

Hyd. No. 22

PR-B-1-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	15.69 cfs
Storm frequency	=	100 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	40,131 cuft
Drainage area	=	1.510 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	7.30 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



PR-B-1-OFFSITE WATERSHED

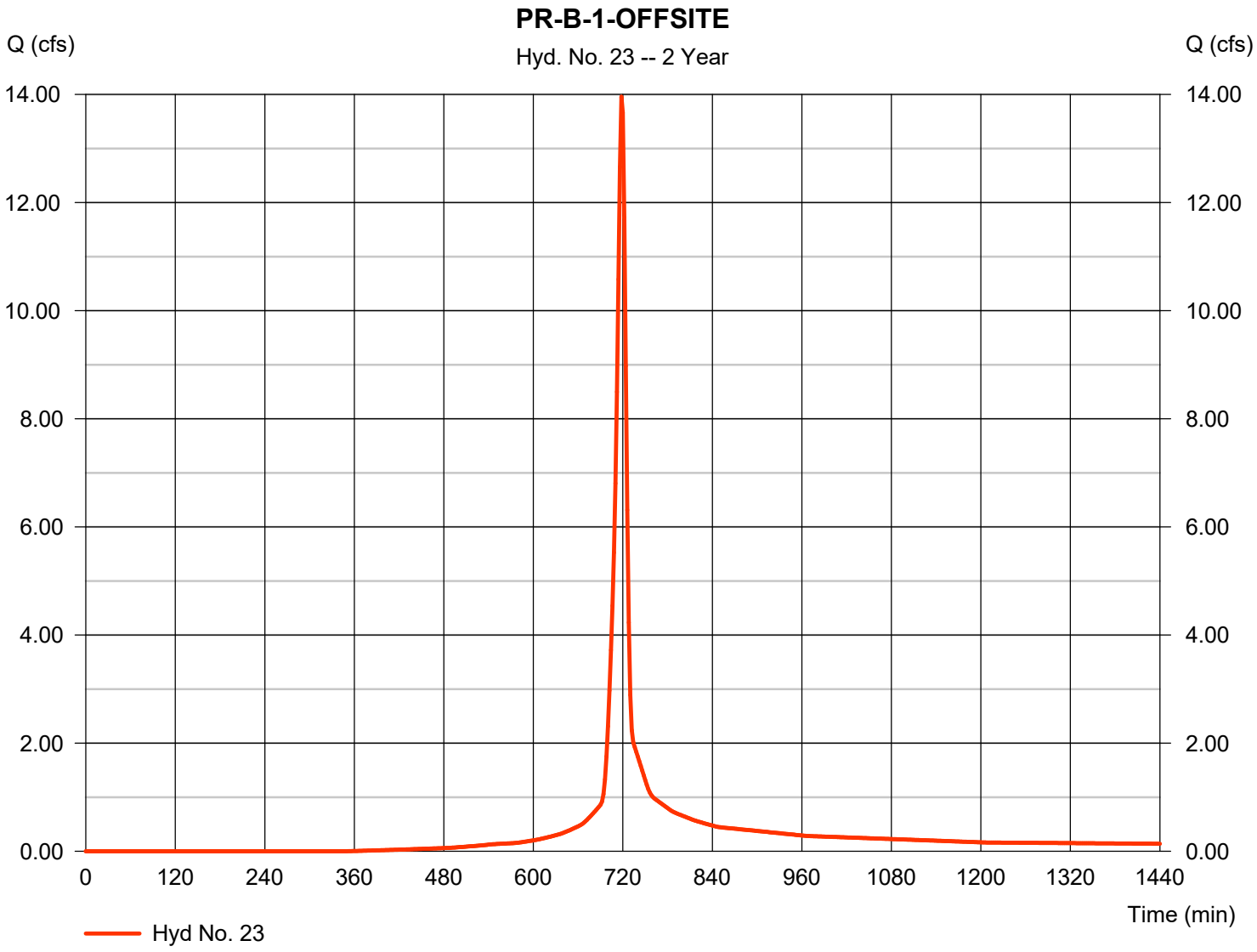
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 23

PR-B-1-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	13.96 cfs
Storm frequency	=	2 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	32,455 cuft
Drainage area	=	4.080 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	7.30 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

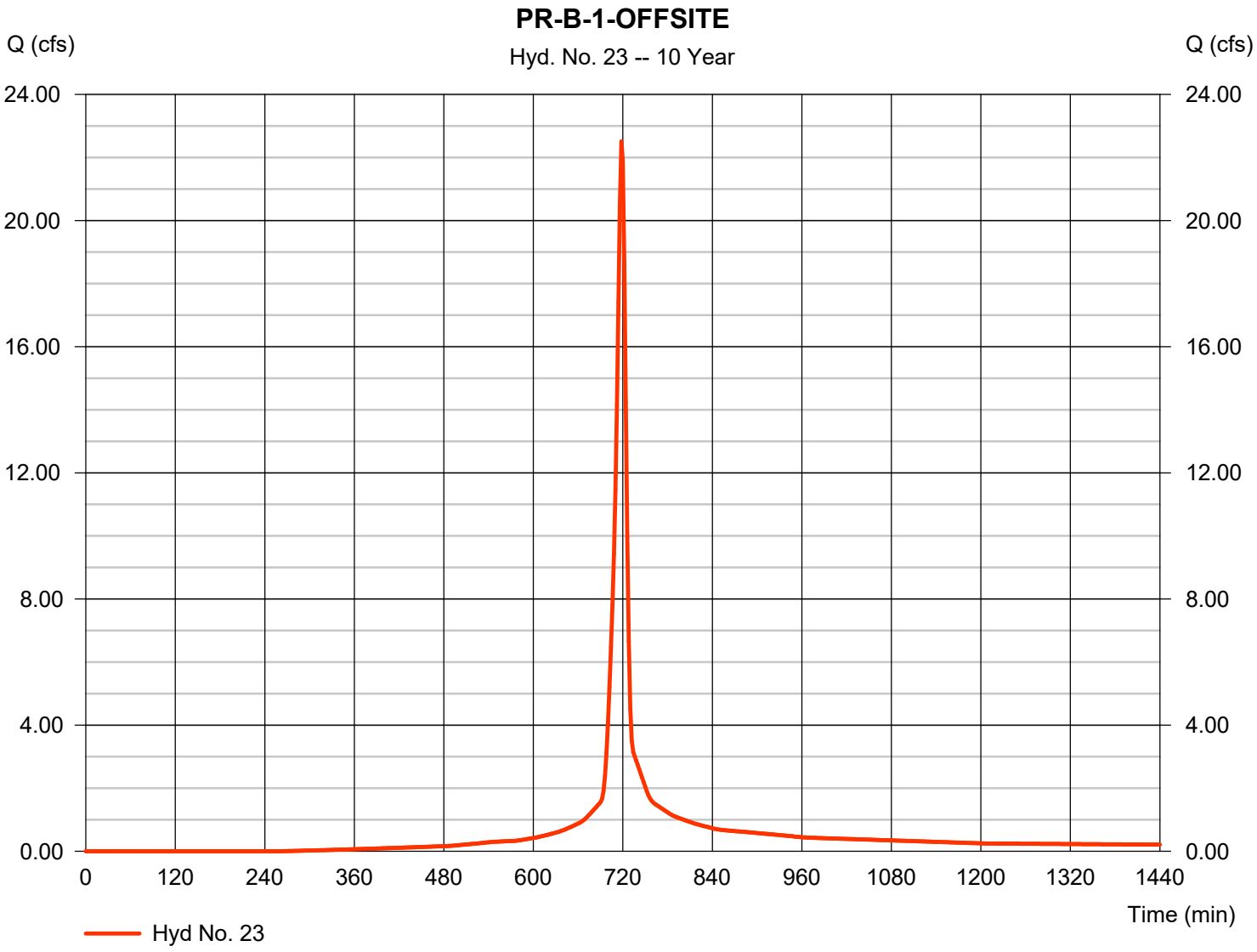


Hydrograph Report

Hyd. No. 23

PR-B-1-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	22.51 cfs
Storm frequency	=	10 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	53,598 cuft
Drainage area	=	4.080 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	7.30 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

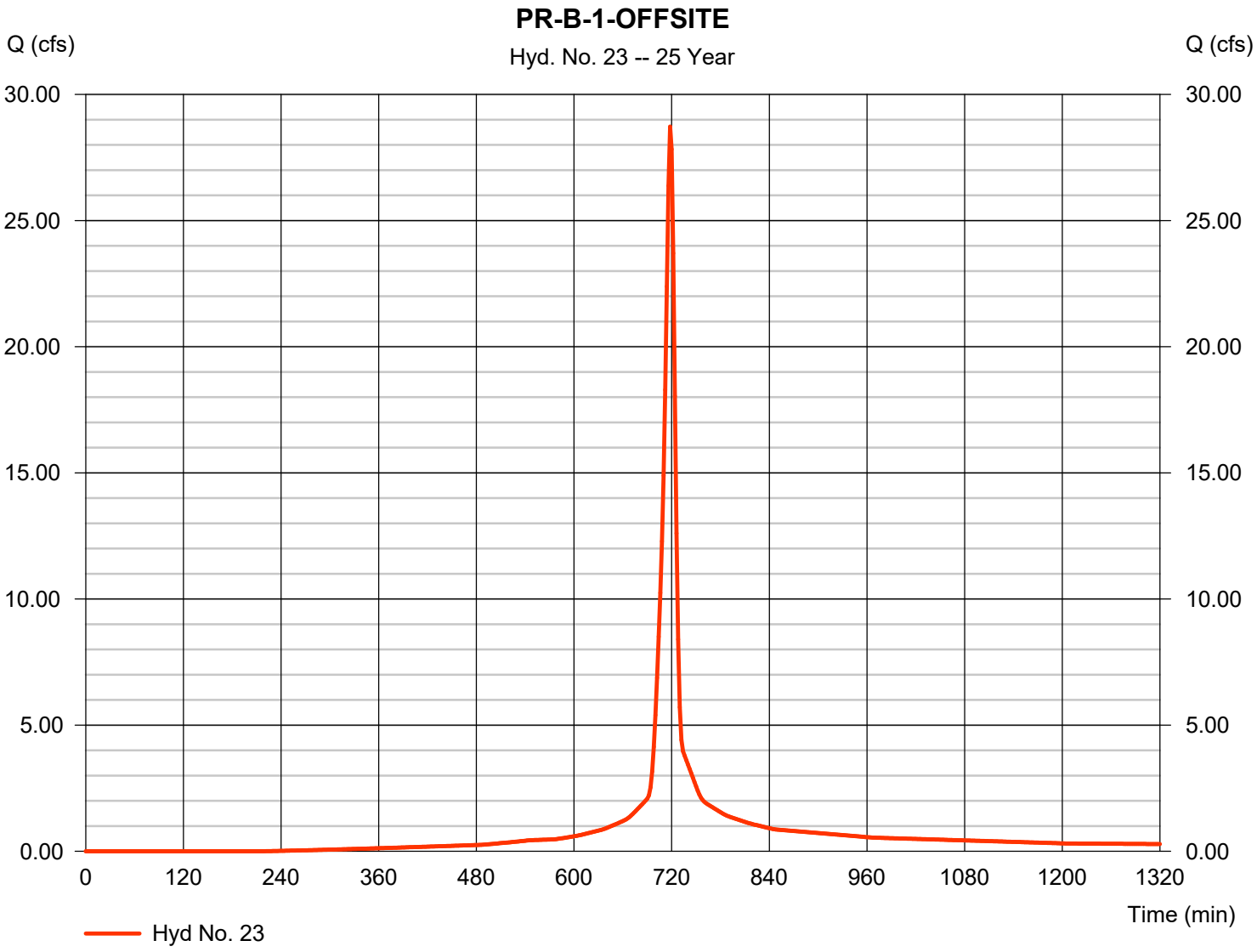


Hydrograph Report

Hyd. No. 23

PR-B-1-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	28.72 cfs
Storm frequency	=	25 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	69,416 cuft
Drainage area	=	4.080 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	7.30 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

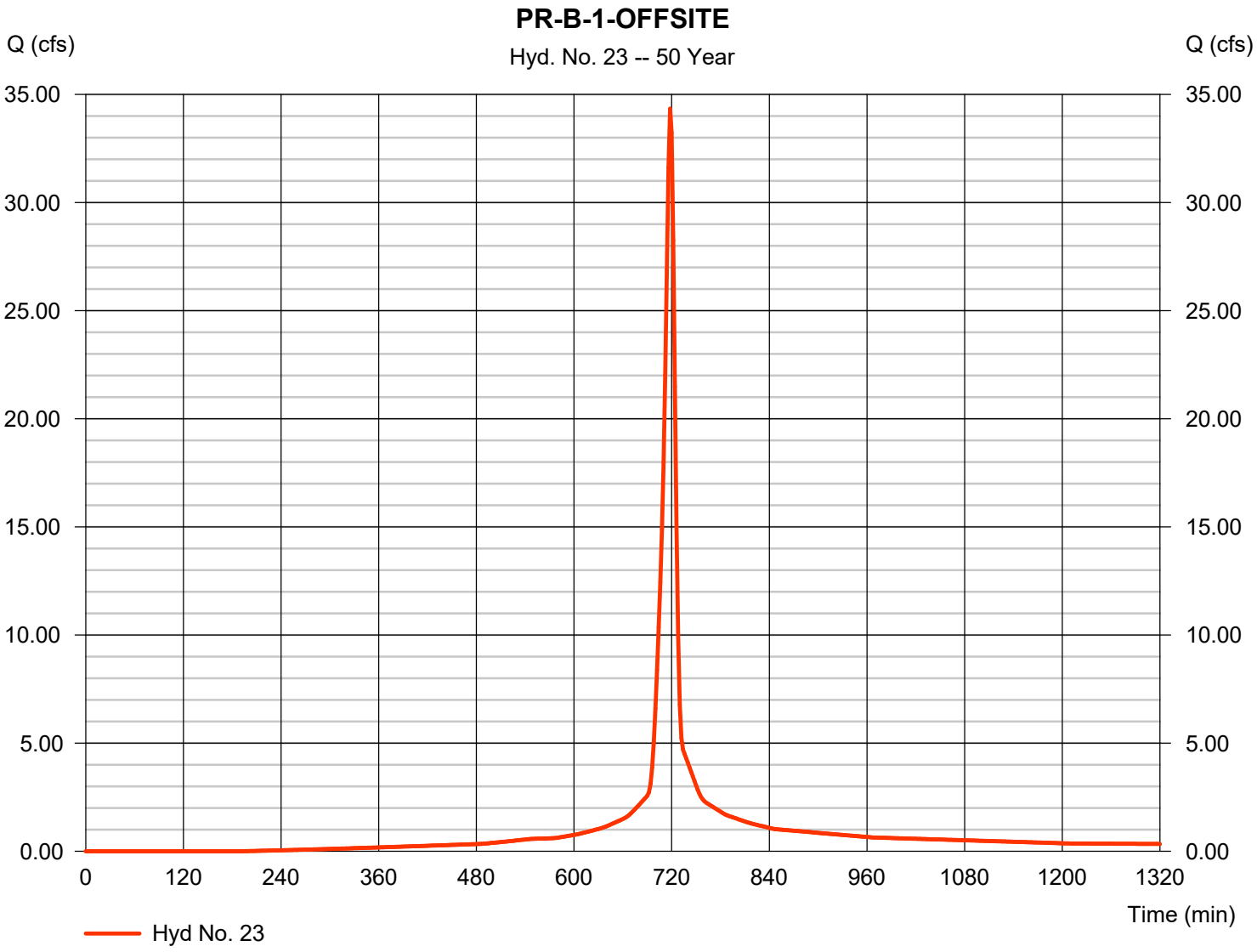


Hydrograph Report

Hyd. No. 23

PR-B-1-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	34.34 cfs
Storm frequency	=	50 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	83,961 cuft
Drainage area	=	4.080 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	7.30 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

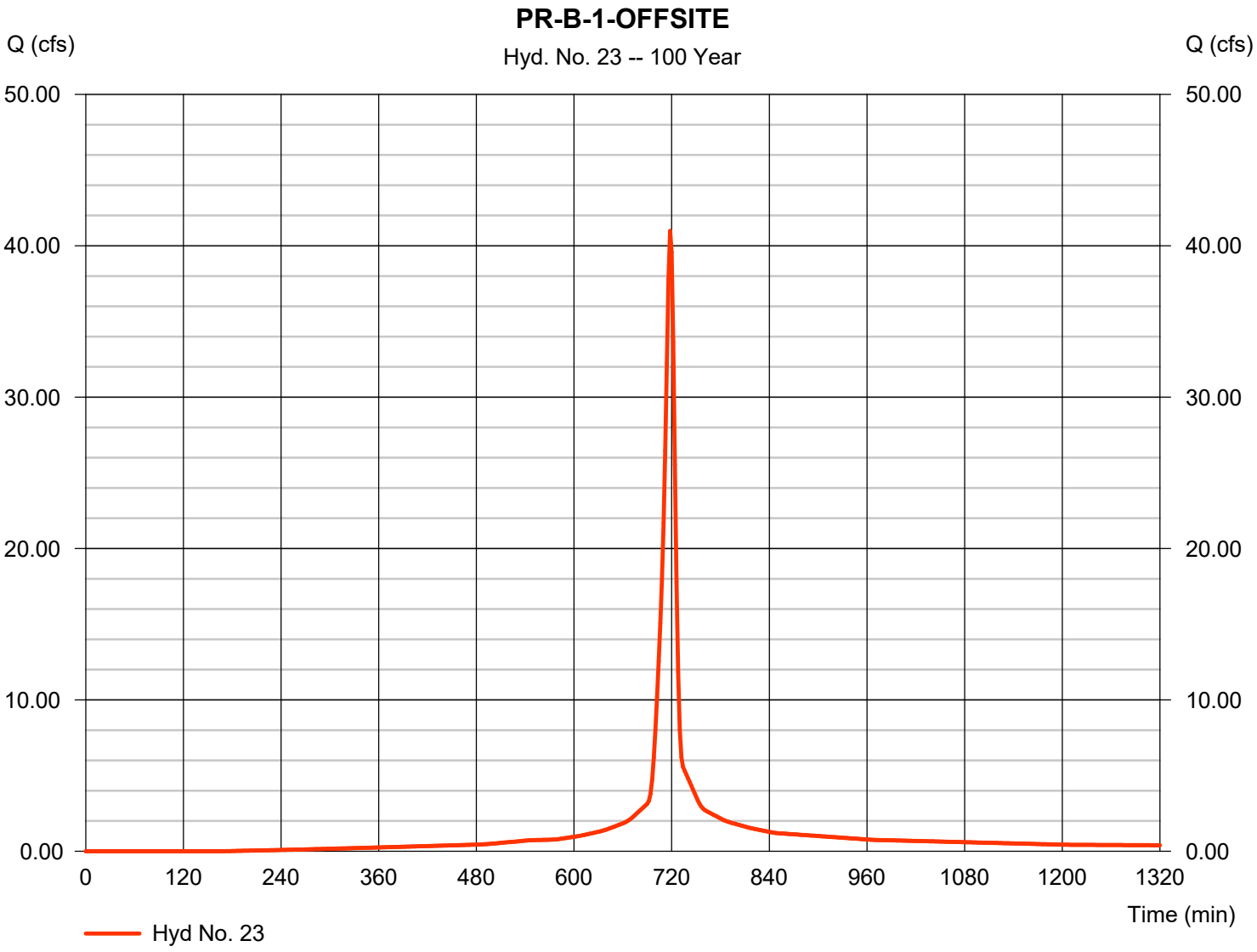


Hydrograph Report

Hyd. No. 23

PR-B-1-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	40.98 cfs
Storm frequency	=	100 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	101,360 cuft
Drainage area	=	4.080 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	7.30 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



PR-B-2-ONSITE WATERSHED

TR-55 TIME OF CONCENTRATION (Tc) OR TRAVEL TIME (Tt) CALCULATIONS

Project: Smithfield Gateway Phase 1A-1 **By:** MJV **Date:** 12/10/2020
Location: Smithfield Township, Monroe County, PA **Checked:** TH **Date:** 12/10/2020
Watershed: PR-B-2-ONSITE

Sheet Flow (Applicable to Tc only)													
1	Surface Description (table 3-1)		Grass										
2	Manning's roughness coeff., n (table 3-1)		0.150										
3	Flow length, L (total L<100 ft)	**ft**	100										
4	Two-yr 24-hr rainfall, P2	**in**	3.32										
5	Land Slope, s	**ft/ft**	0.0150										
6	$Tt = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5}(s)^{.04}}$	**Compute Tt, hr**	0.1799	+		+		+		+		+	0.1799 hr
Shallow Concentrated Flow													
7	Surface Description (Paved or Unpaved)		Unpaved										
8	Flow length, L	**ft**	598										
9	Watercourse slope, s	**ft/ft**	0.0100										
10	Average Velocity, V (figure 3-1)	**ft/sec**	1.61										
11	Tt = L / (3600V)	**Compute Tt , hr**	0.1030	+		+		+		+		+	0.1030 hr
Channel / Pipe Flow													
12	Cross Sectional flow area, a	**ft^2**											
13	Wetted Perimeter, p_w	**ft**											
14	Hydraulic radius, $r = a/p_w$	**ft**											
15	Channel slope, s	**ft/ft**											
16	Manning's roughness coeff., n (table 3-1)												
17	$V = (1.49*r^{2/3}*s^{1/2})/n$	**ft/s**											
18	Flow length, L	**ft**											
19	Tt = L / (3600V)	**Compute Tt , hr**		+		+		+		+		+	0.0000 hr
20	**Watershed or subarea Tc or Tt (add Tt in steps 6,11, and 19)**												0.28 hr
													17.0 min

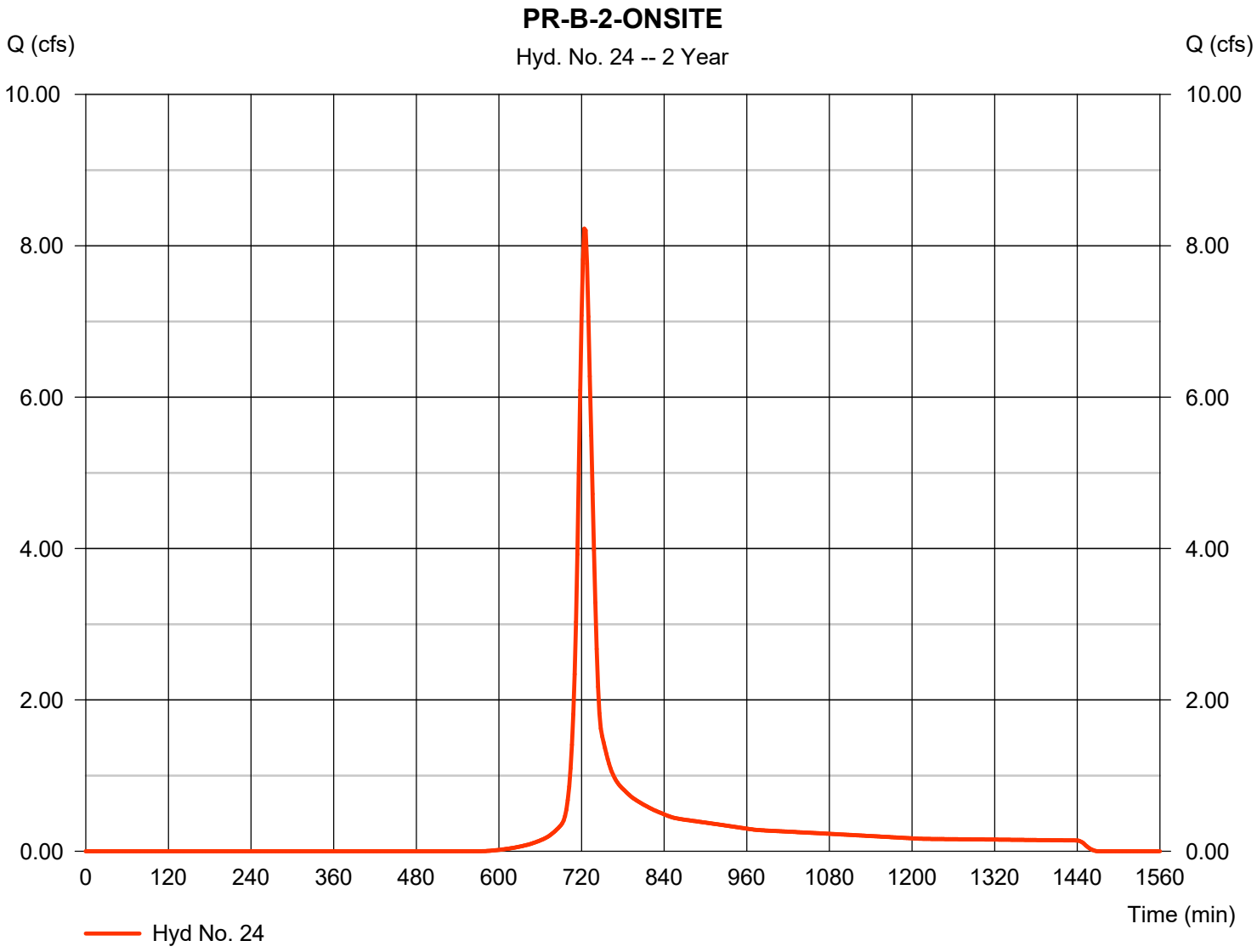
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 05 / 10 / 2021

Hyd. No. 24

PR-B-2-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.227 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	26,116 cuft
Drainage area	=	5.040 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	17.00 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

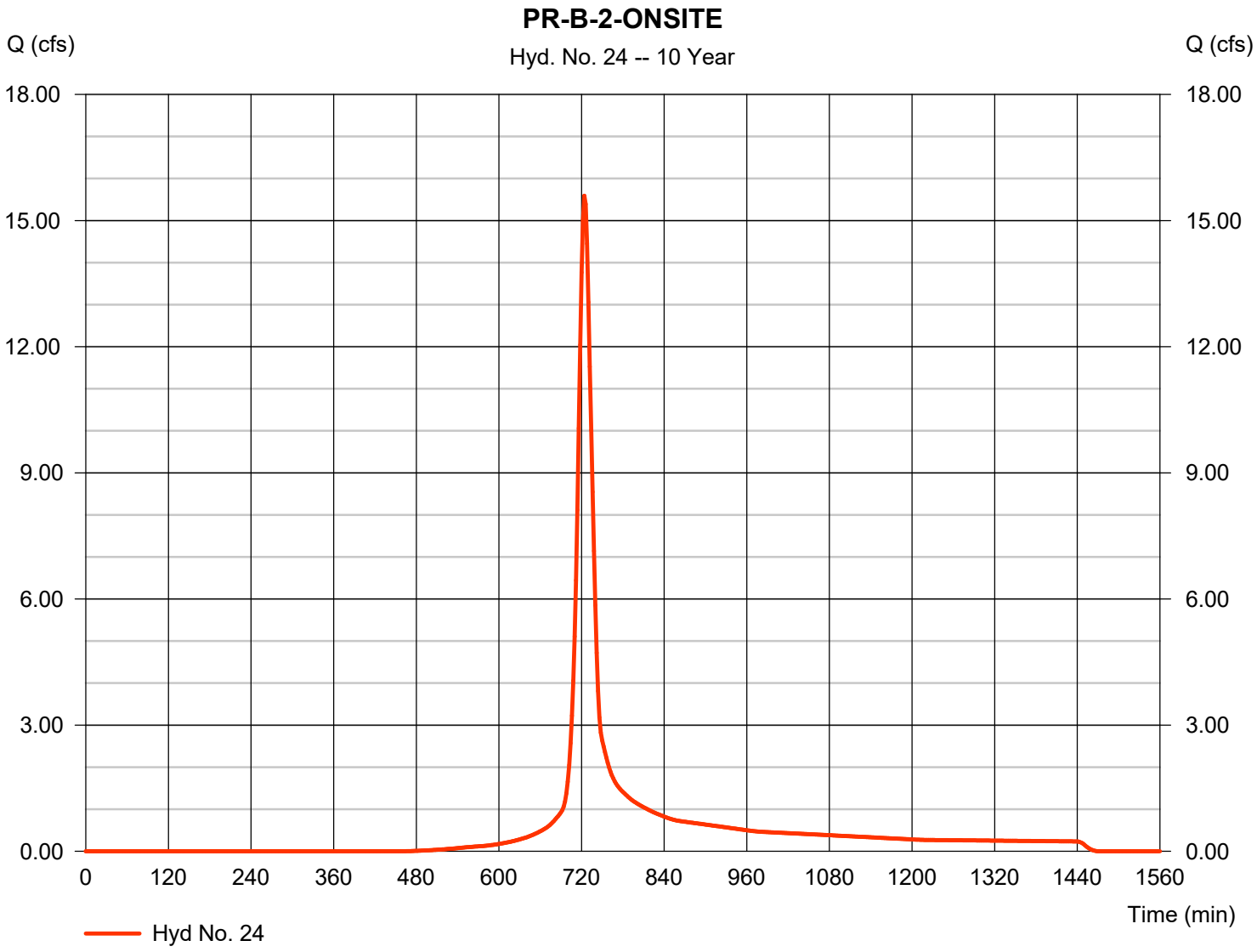


Hydrograph Report

Hyd. No. 24

PR-B-2-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	15.59 cfs
Storm frequency	=	10 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	48,746 cuft
Drainage area	=	5.040 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	17.00 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

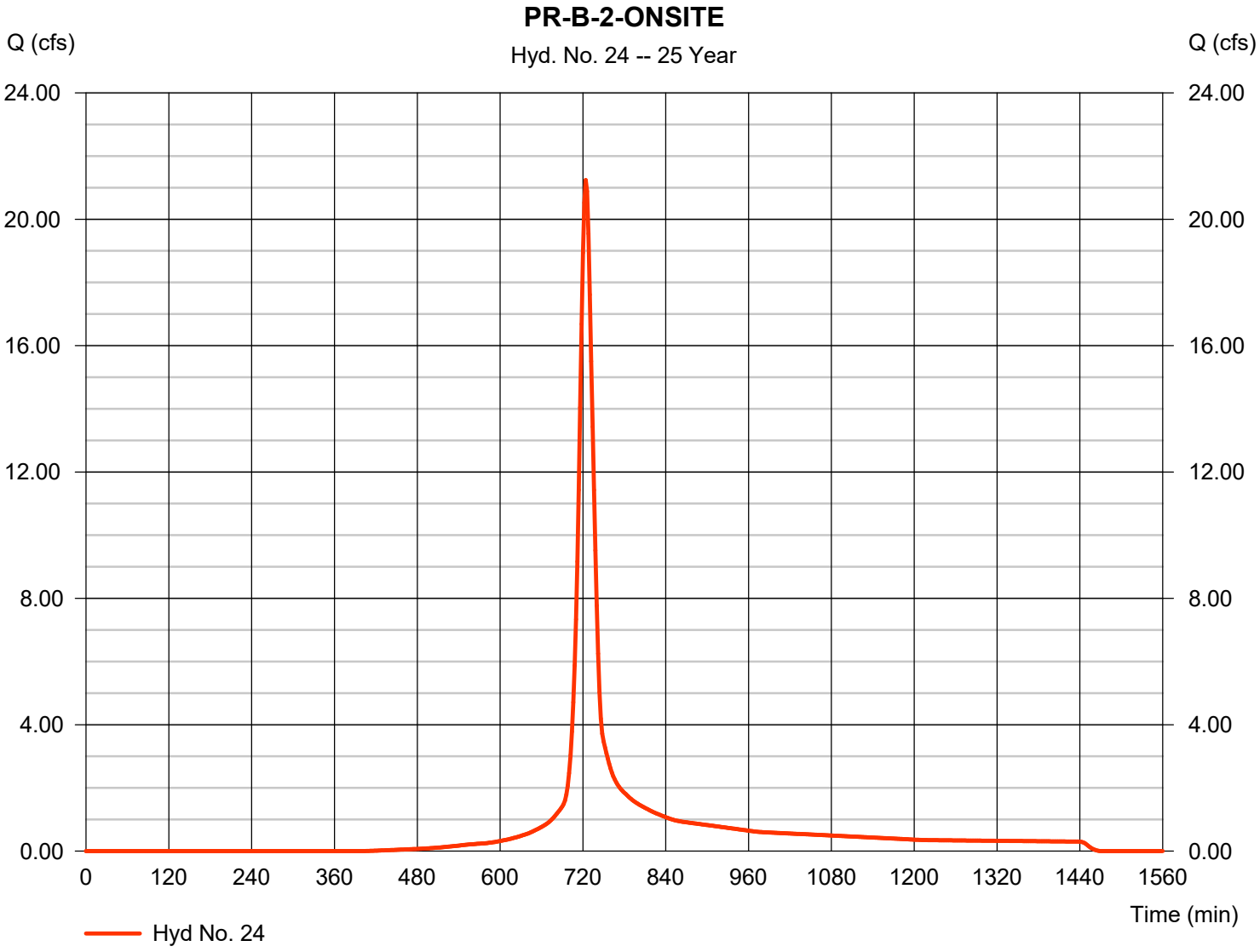


Hydrograph Report

Hyd. No. 24

PR-B-2-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	21.24 cfs
Storm frequency	=	25 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	66,503 cuft
Drainage area	=	5.040 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	17.00 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

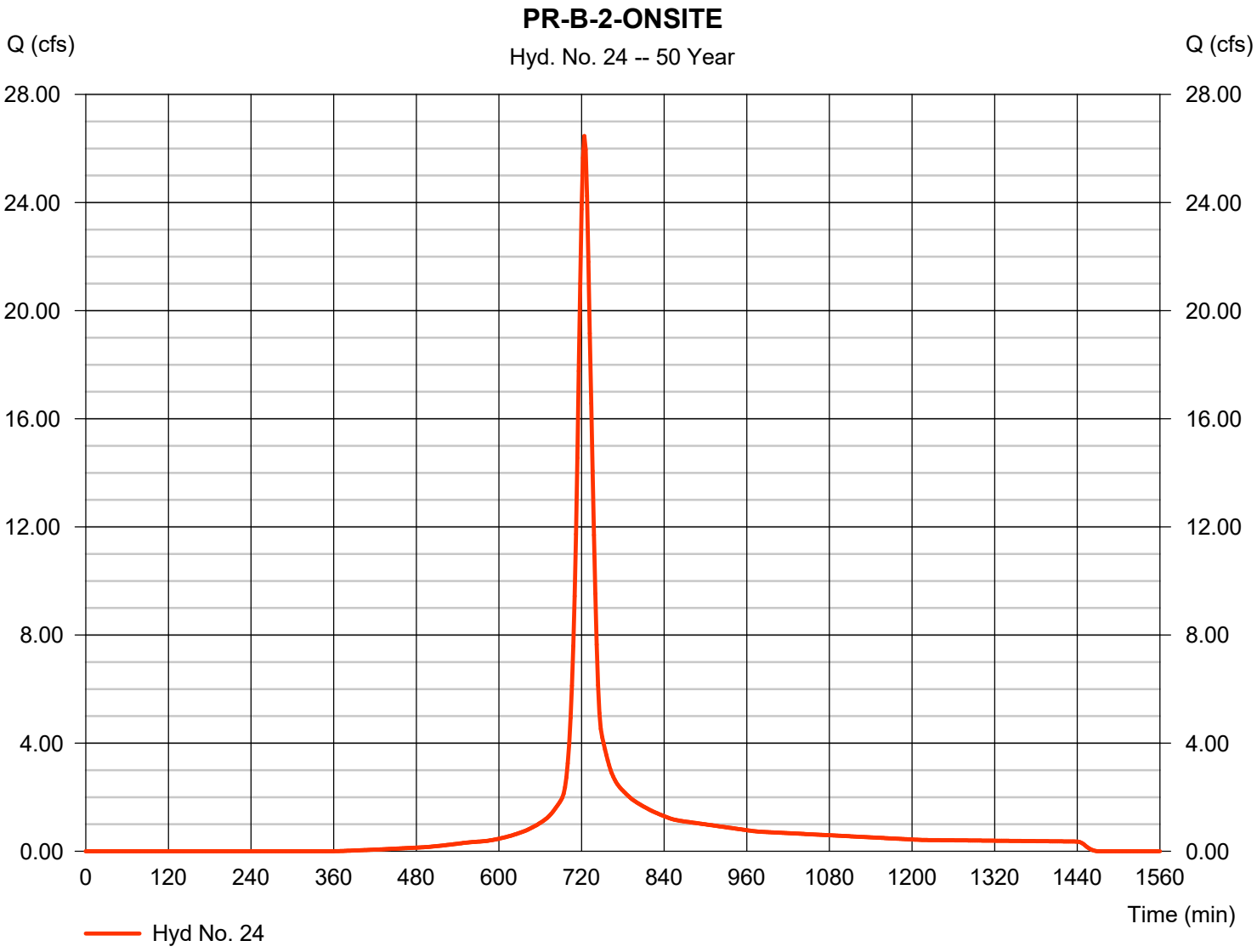


Hydrograph Report

Hyd. No. 24

PR-B-2-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	26.46 cfs
Storm frequency	=	50 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	83,202 cuft
Drainage area	=	5.040 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	17.00 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

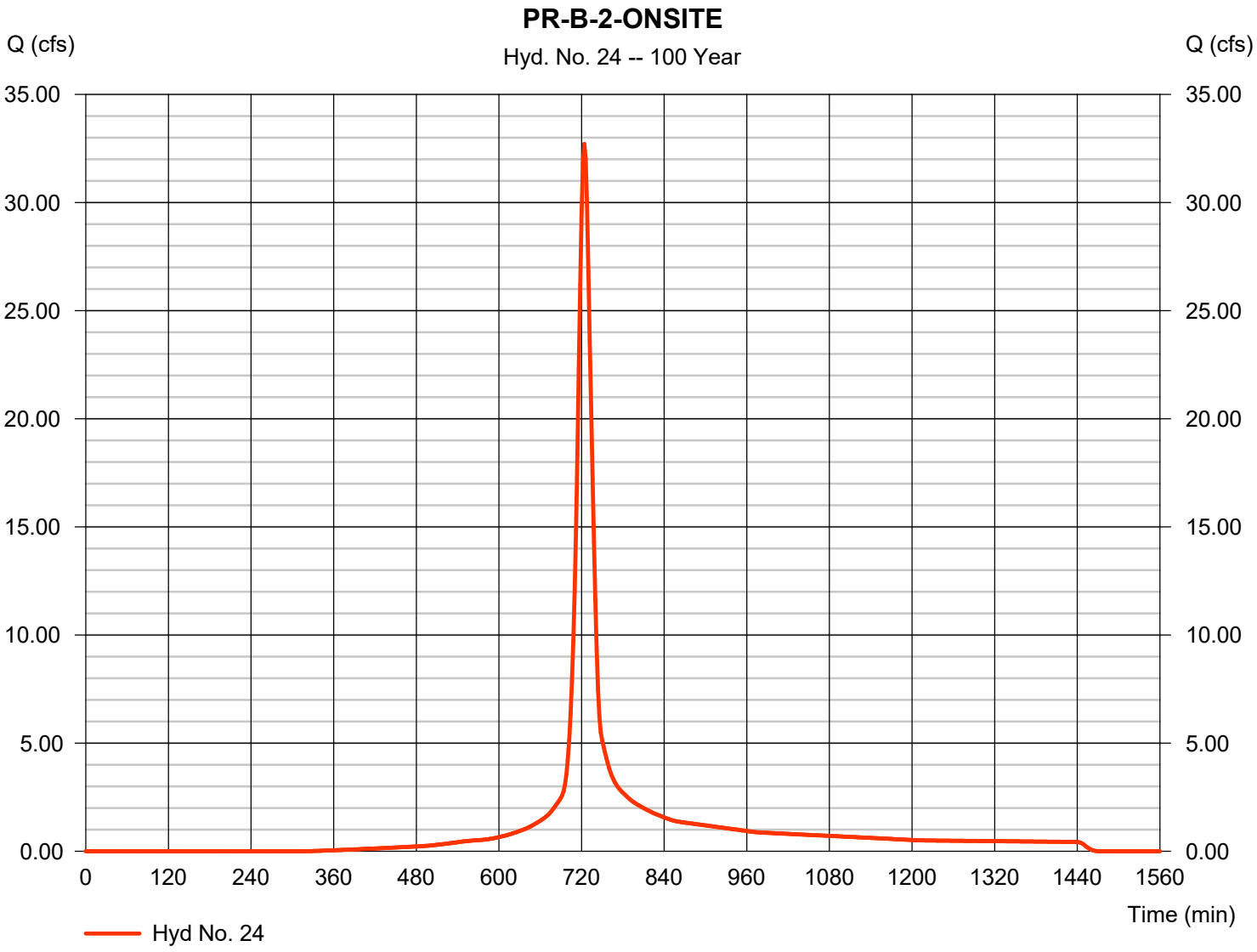


Hydrograph Report

Hyd. No. 24

PR-B-2-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	32.71 cfs
Storm frequency	=	100 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	103,497 cuft
Drainage area	=	5.040 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	17.00 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



PR-B-2-ONSITE ROUTING

Pond Report

Pond No. 14 - EX-B-2-ONSITE-POND

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 434.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	434.50	1,040	0	0
0.50	435.00	3,282	1,028	1,028
1.50	436.00	7,187	5,108	6,136
2.50	437.00	14,788	10,760	16,897
3.50	438.00	51,779	31,410	48,306
4.50	439.00	113,114	80,466	128,773
5.50	440.00	182,936	146,618	275,391

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

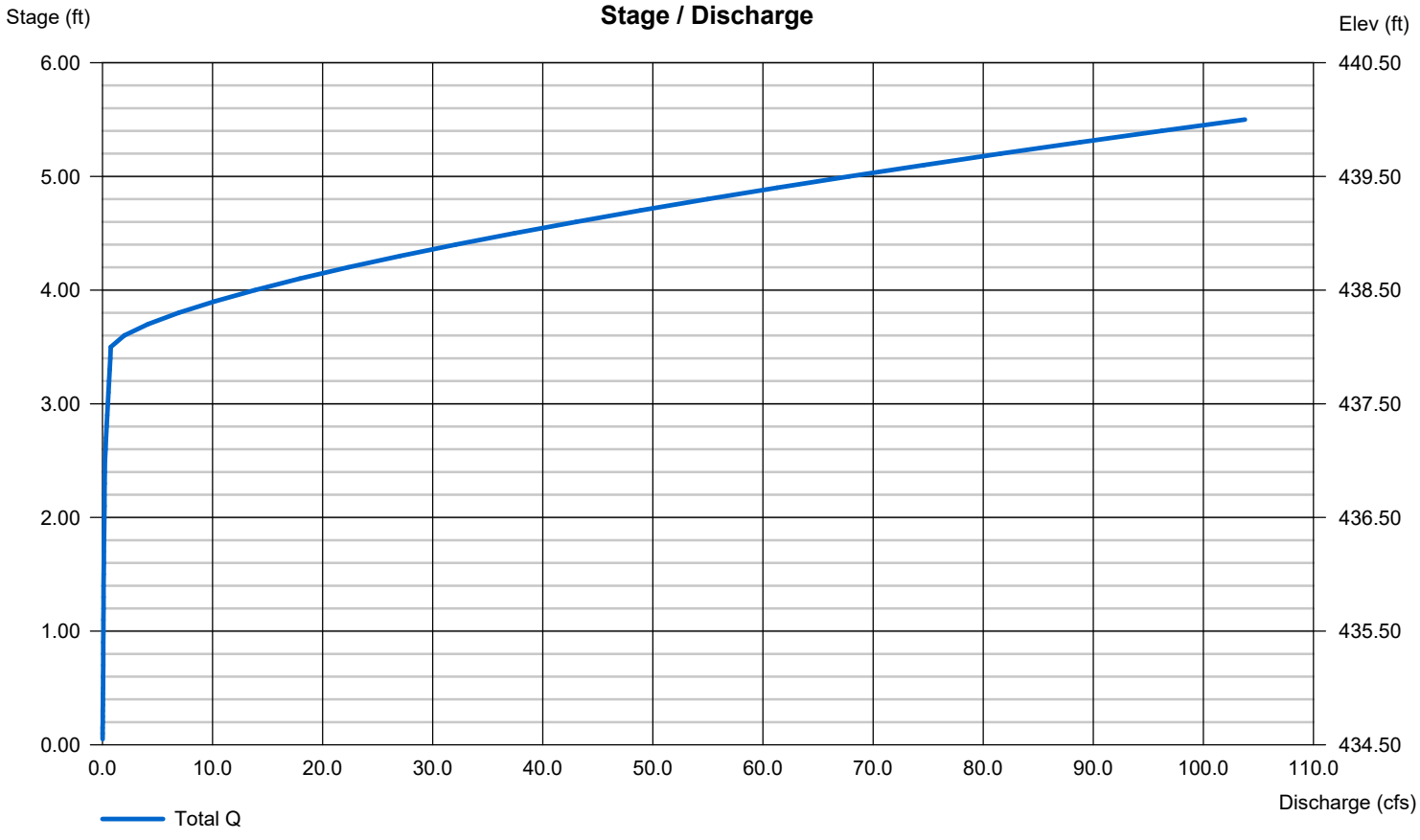
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 13.75	0.00	0.00	0.00
Crest El. (ft)	= 438.00	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) = 0.630 (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

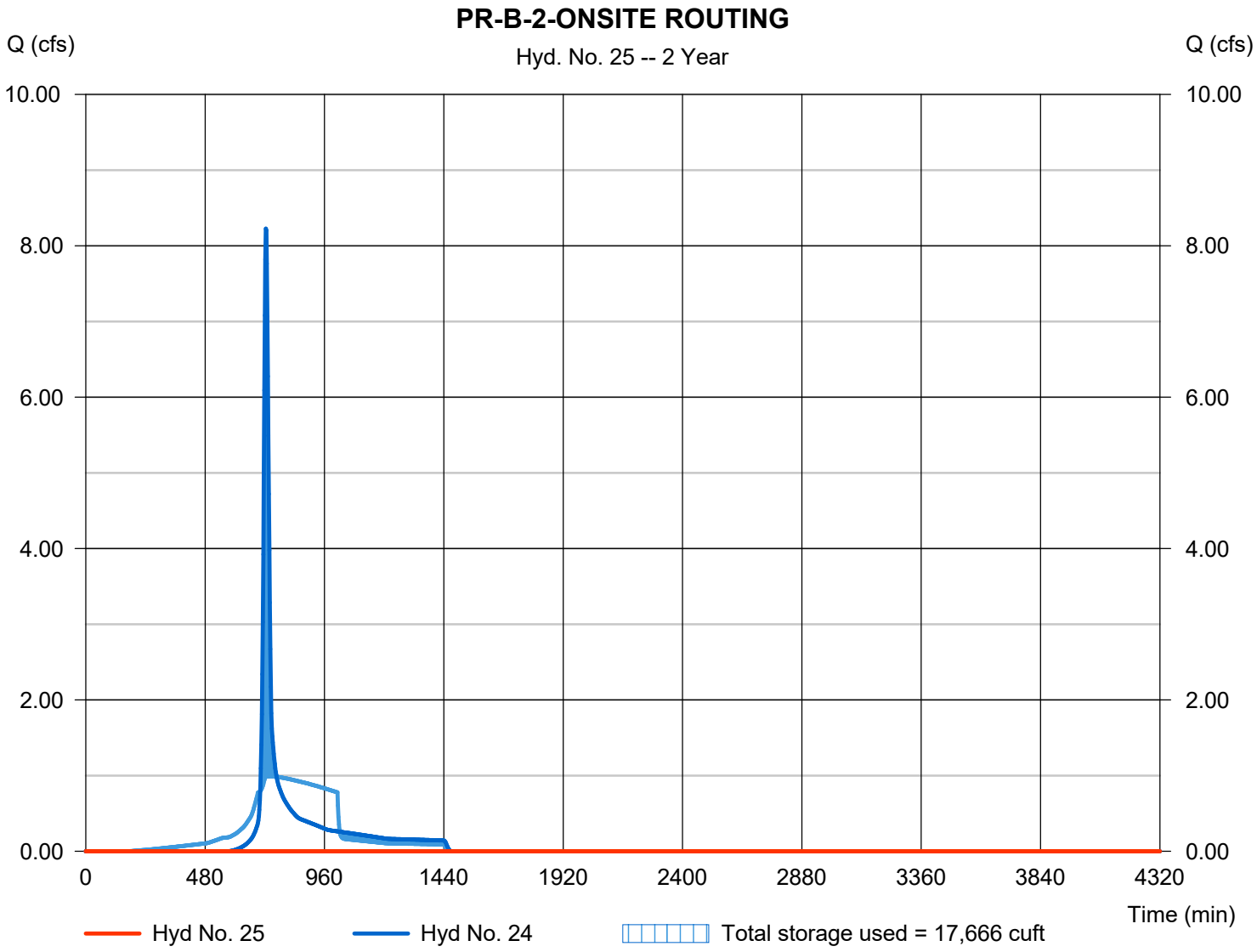
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 05 / 10 / 2021

Hyd. No. 25

PR-B-2-ONSITE ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 912 min
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 24 - PR-B-2-ONSITE	Max. Elevation	= 437.02 ft
Reservoir name	= EX-B-2-ONSITE-POND	Max. Storage	= 17,666 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

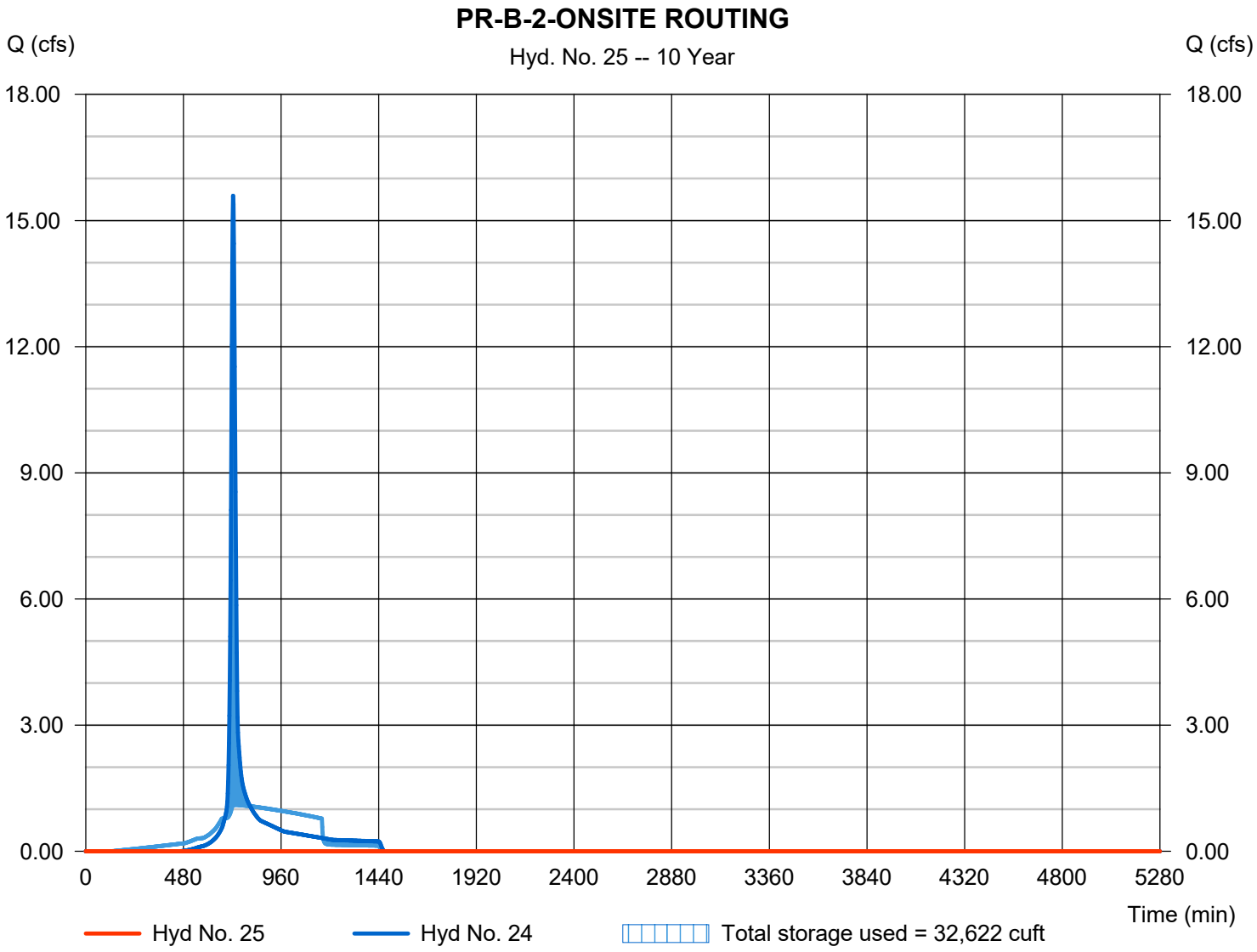
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 05 / 10 / 2021

Hyd. No. 25

PR-B-2-ONSITE ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	0.000 cfs
Storm frequency	=	10 yrs	Time to peak	=	744 min
Time interval	=	2 min	Hyd. volume	=	0 cuft
Inflow hyd. No.	=	24 - PR-B-2-ONSITE	Max. Elevation	=	437.50 ft
Reservoir name	=	EX-B-2-ONSITE-POND	Max. Storage	=	32,622 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



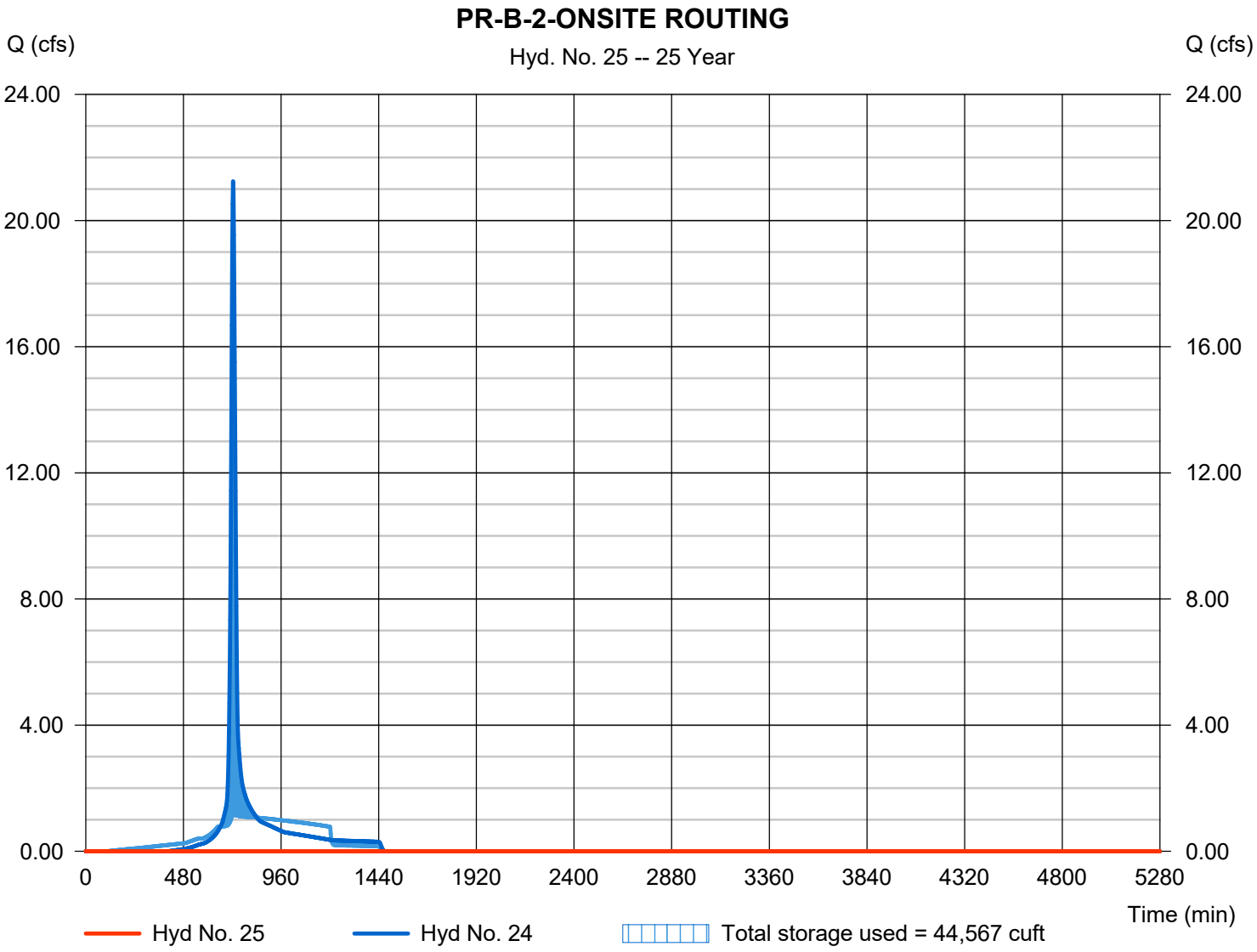
Hydrograph Report

Hyd. No. 25

PR-B-2-ONSITE ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	0.000 cfs
Storm frequency	=	25 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	0 cuft
Inflow hyd. No.	=	24 - PR-B-2-ONSITE	Max. Elevation	=	437.88 ft
Reservoir name	=	EX-B-2-ONSITE-POND	Max. Storage	=	44,567 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



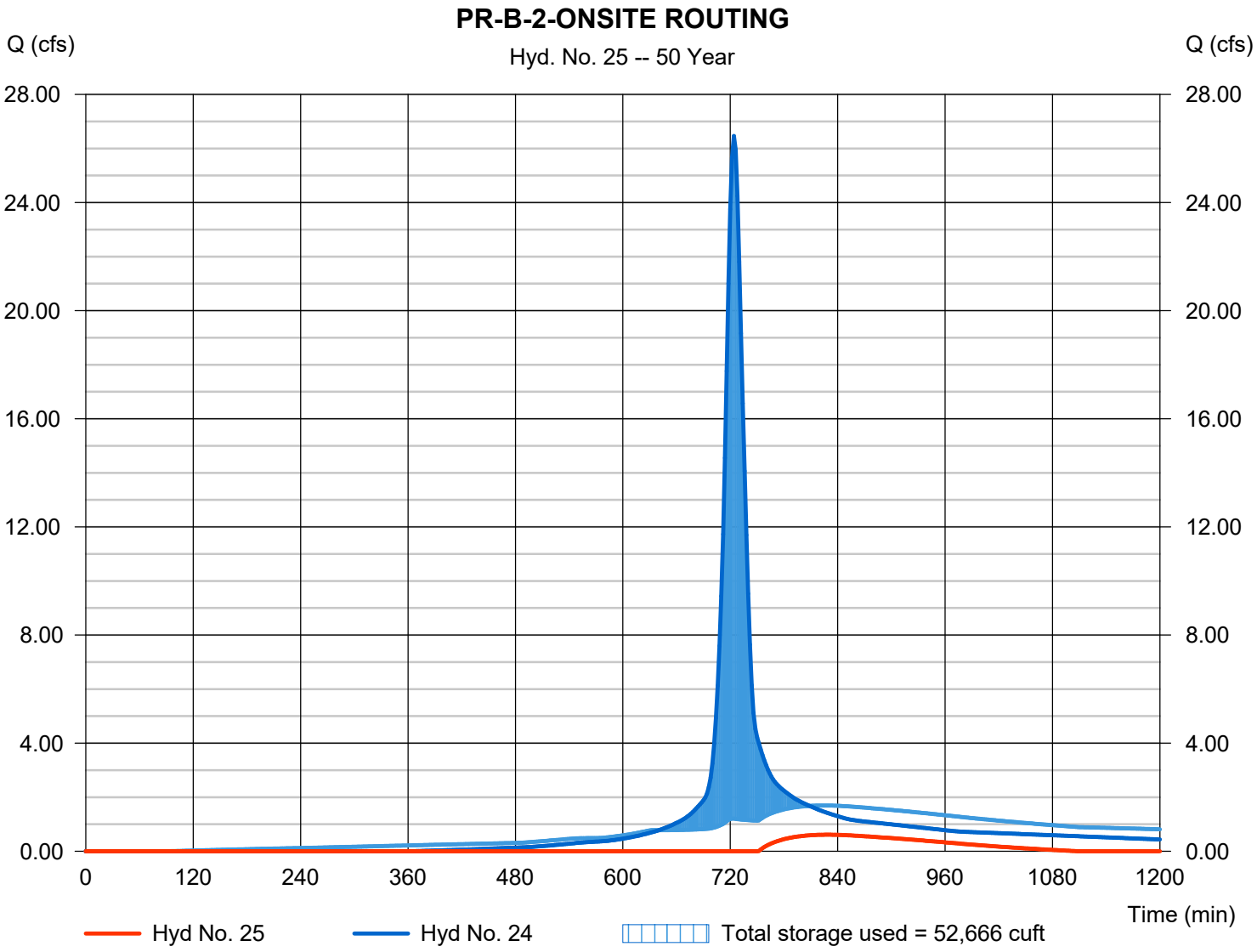
Hydrograph Report

Hyd. No. 25

PR-B-2-ONSITE ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	0.613 cfs
Storm frequency	=	50 yrs	Time to peak	=	828 min
Time interval	=	2 min	Hyd. volume	=	7,310 cuft
Inflow hyd. No.	=	24 - PR-B-2-ONSITE	Max. Elevation	=	438.05 ft
Reservoir name	=	EX-B-2-ONSITE-POND	Max. Storage	=	52,666 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



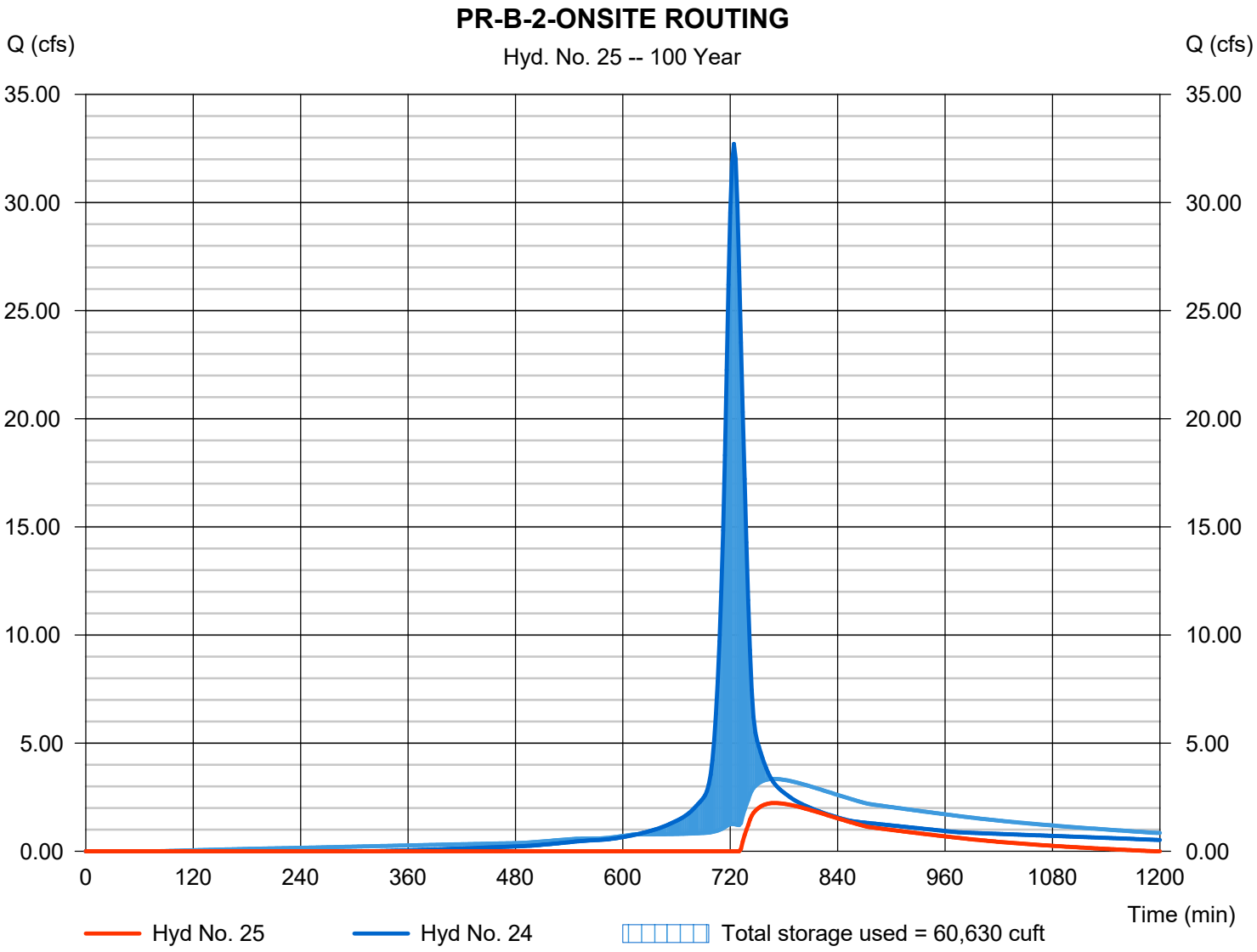
Hydrograph Report

Hyd. No. 25

PR-B-2-ONSITE ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	2.229 cfs
Storm frequency	=	100 yrs	Time to peak	=	770 min
Time interval	=	2 min	Hyd. volume	=	23,432 cuft
Inflow hyd. No.	=	24 - PR-B-2-ONSITE	Max. Elevation	=	438.15 ft
Reservoir name	=	EX-B-2-ONSITE-POND	Max. Storage	=	60,630 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



TOTAL PROPOSED FLOW TO POA-B

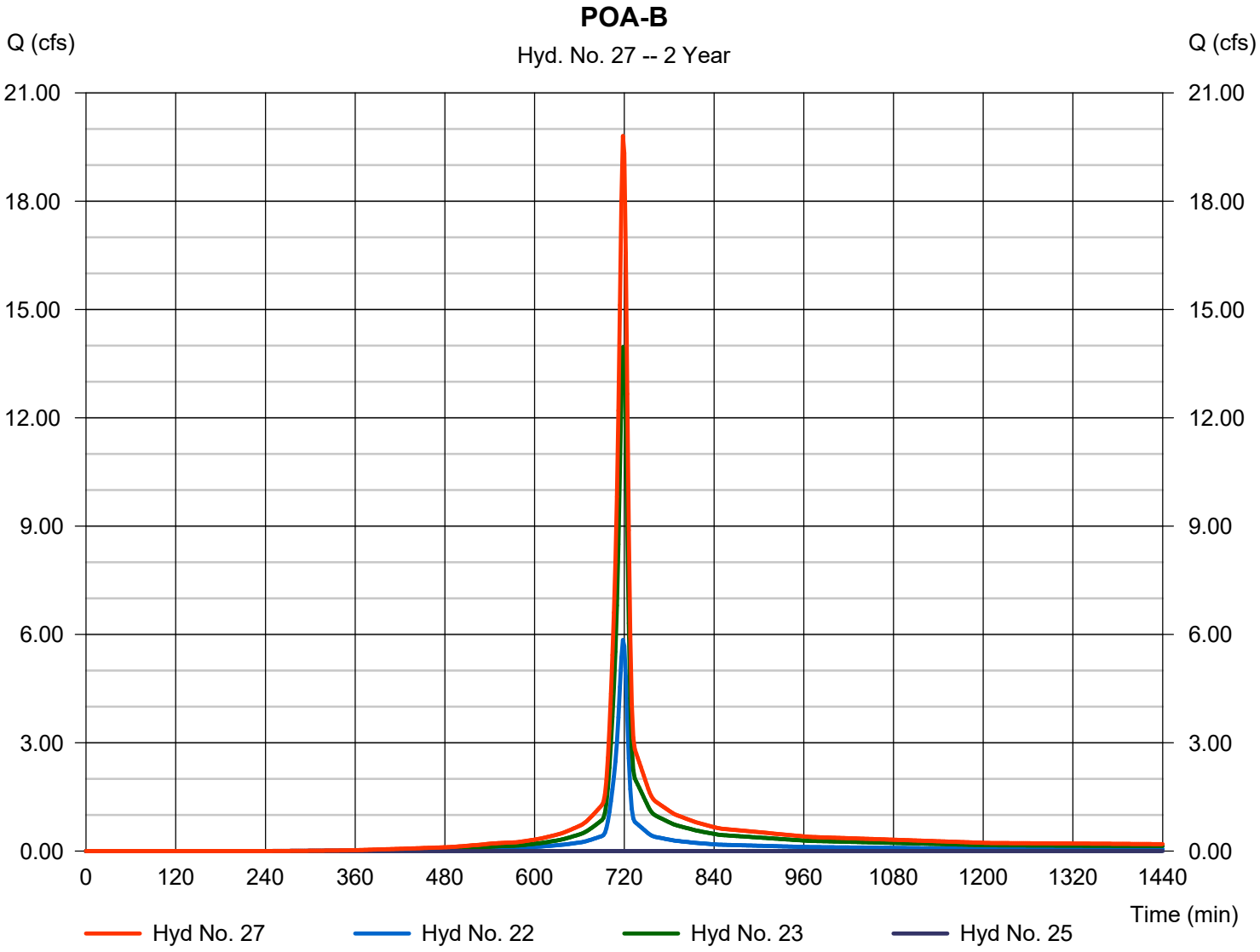
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 05 / 10 / 2021

Hyd. No. 27

POA-B

Hydrograph type	= Combine	Peak discharge	= 19.80 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 46,494 cuft
Inflow hyds.	= 22, 23, 25	Contrib. drain. area	= 5.590 ac

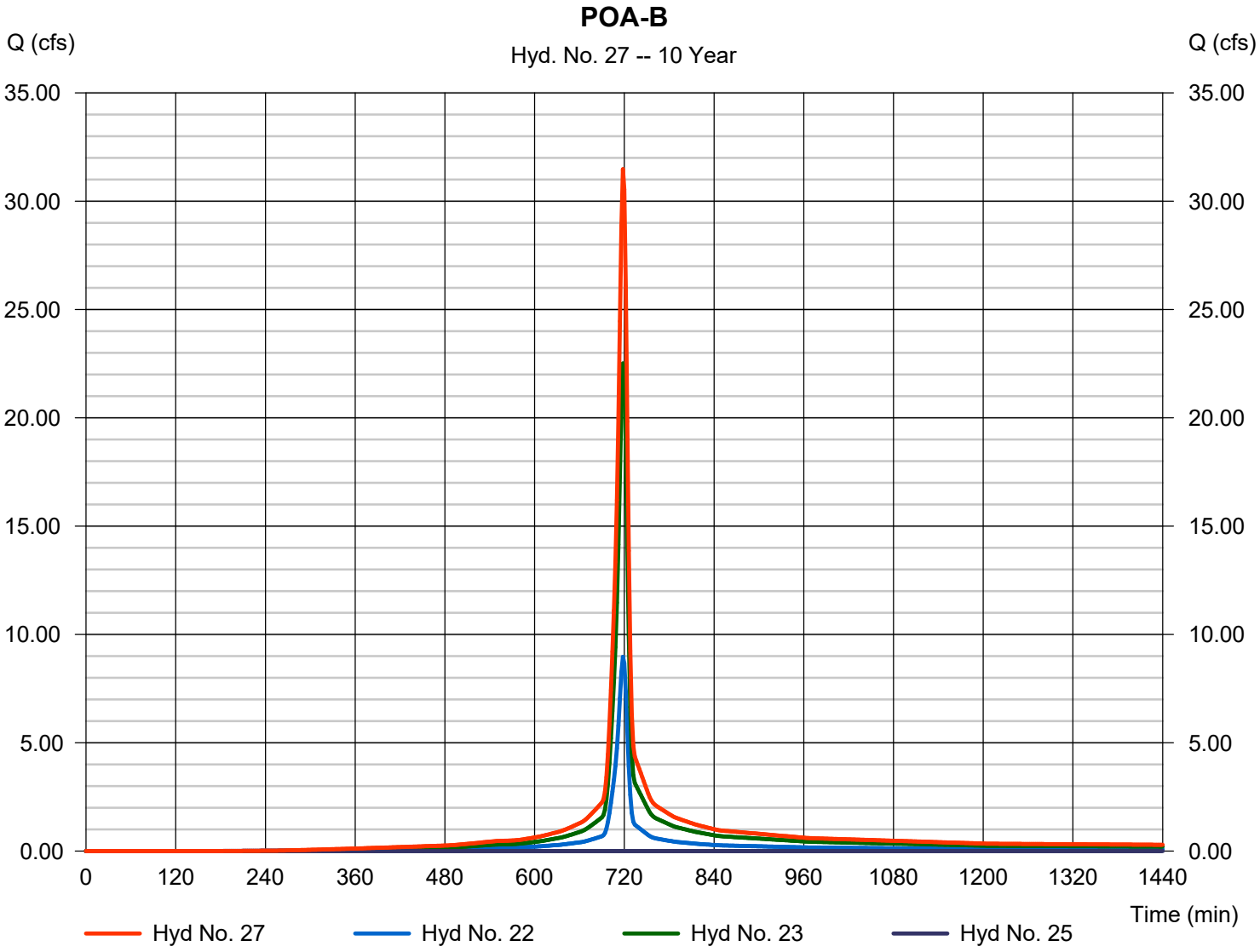


Hydrograph Report

Hyd. No. 27

POA-B

Hydrograph type	=	Combine	Peak discharge	=	31.48 cfs
Storm frequency	=	10 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	75,747 cuft
Inflow hyds.	=	22, 23, 25	Contrib. drain. area	=	5.590 ac

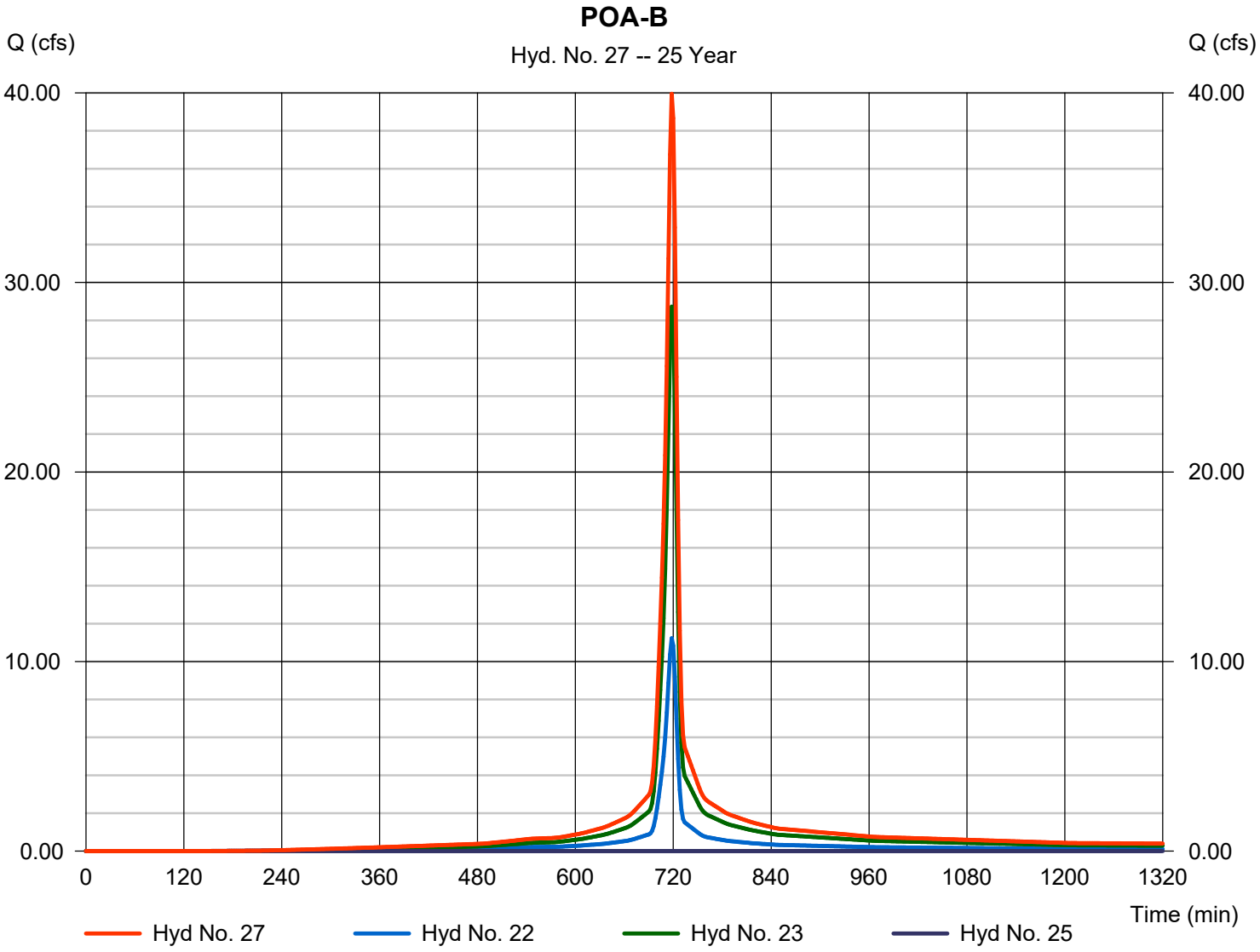


Hydrograph Report

Hyd. No. 27

POA-B

Hydrograph type	=	Combine	Peak discharge	=	39.95 cfs
Storm frequency	=	25 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	97,553 cuft
Inflow hyds.	=	22, 23, 25	Contrib. drain. area	=	5.590 ac

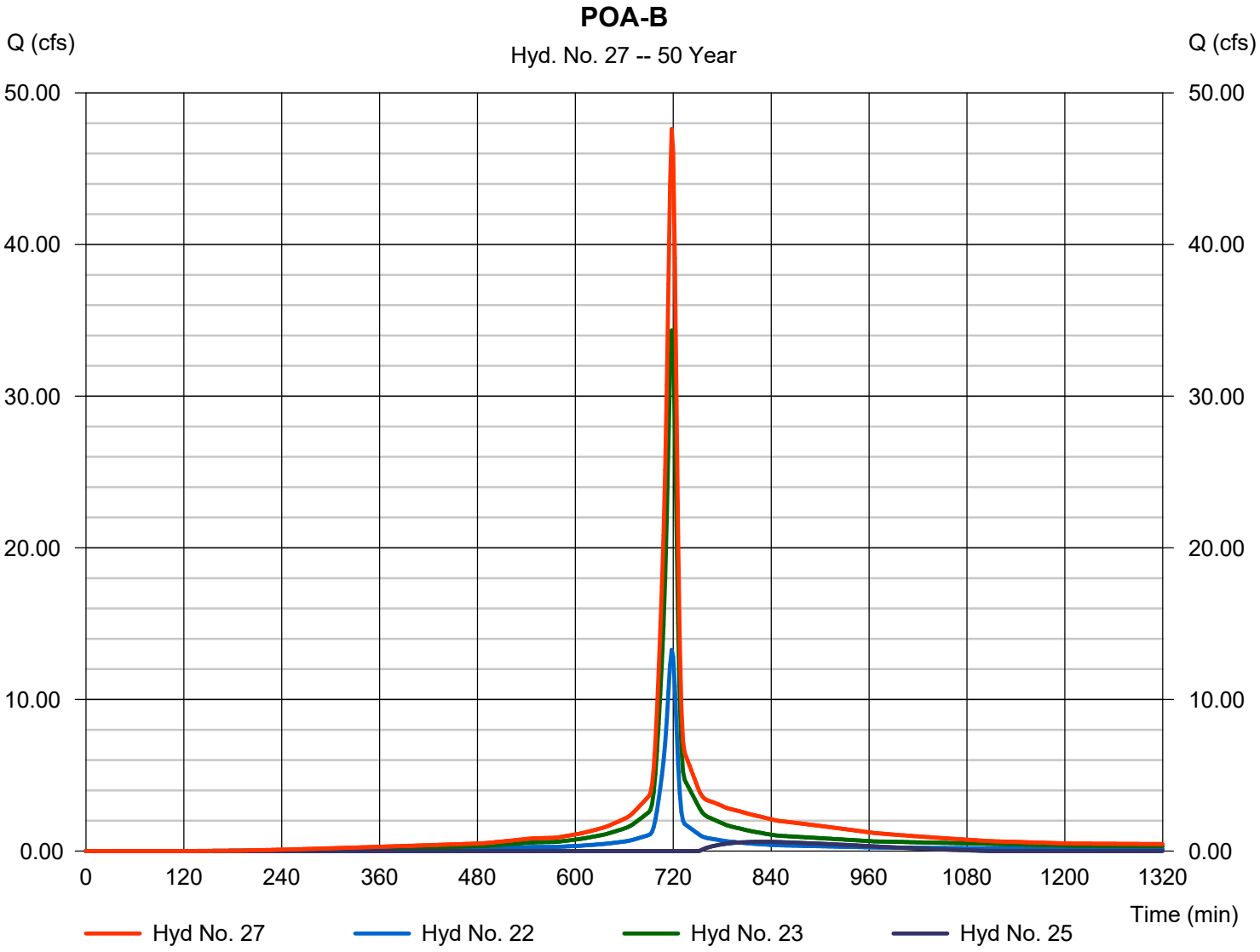


Hydrograph Report

Hyd. No. 27

POA-B

Hydrograph type	=	Combine	Peak discharge	=	47.62 cfs
Storm frequency	=	50 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	124,880 cuft
Inflow hyds.	=	22, 23, 25	Contrib. drain. area	=	5.590 ac

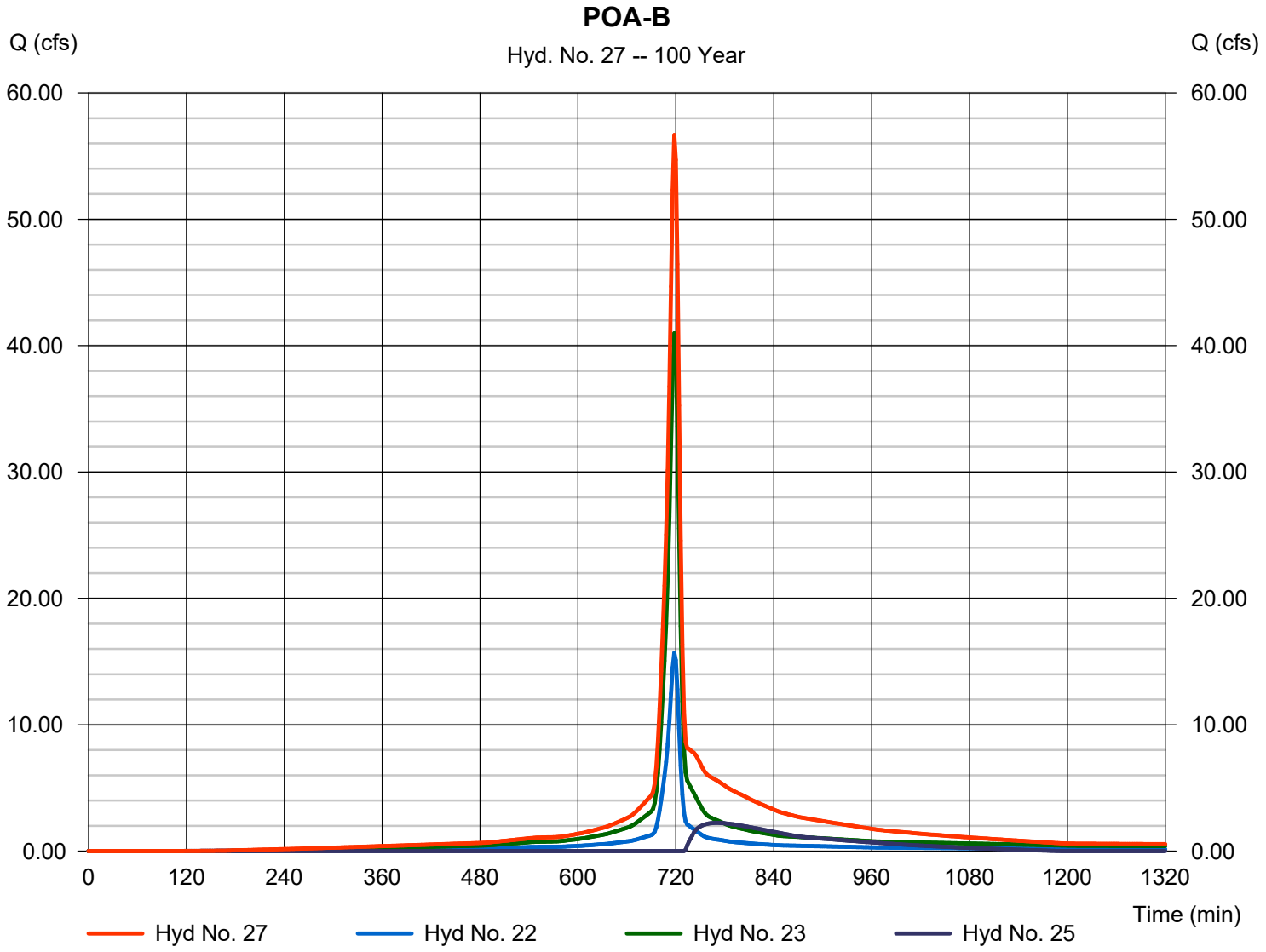


Hydrograph Report

Hyd. No. 27

POA-B

Hydrograph type	=	Combine	Peak discharge	=	56.67 cfs
Storm frequency	=	100 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	164,923 cuft
Inflow hyds.	=	22, 23, 25	Contrib. drain. area	=	5.590 ac



PR-C WATERSHED (TOTAL PROPOSED FLOW TO POA-C)

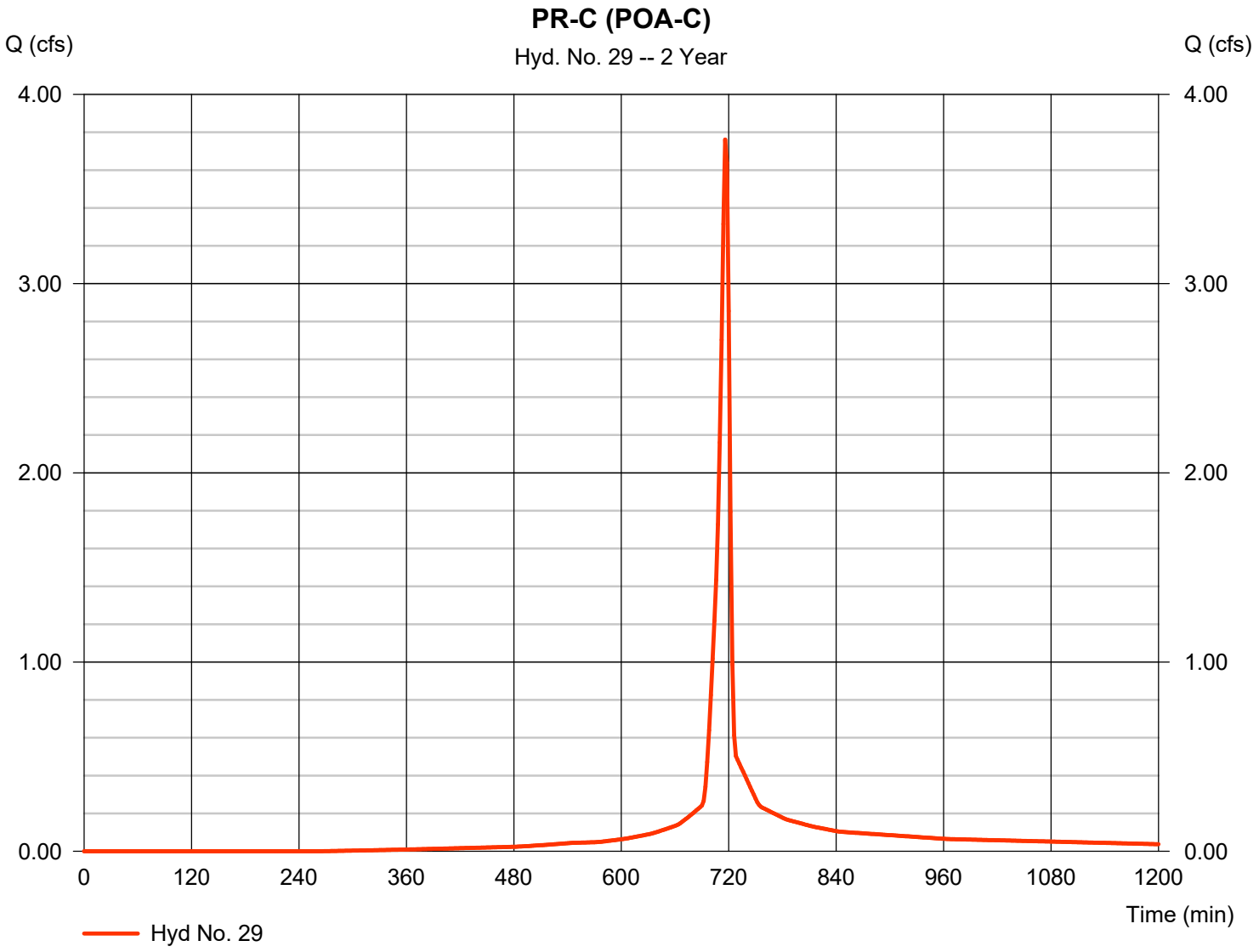
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 29

PR-C (POA-C)

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.762 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	7,969 cuft
Drainage area	=	0.950 ac	Curve number	=	92
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

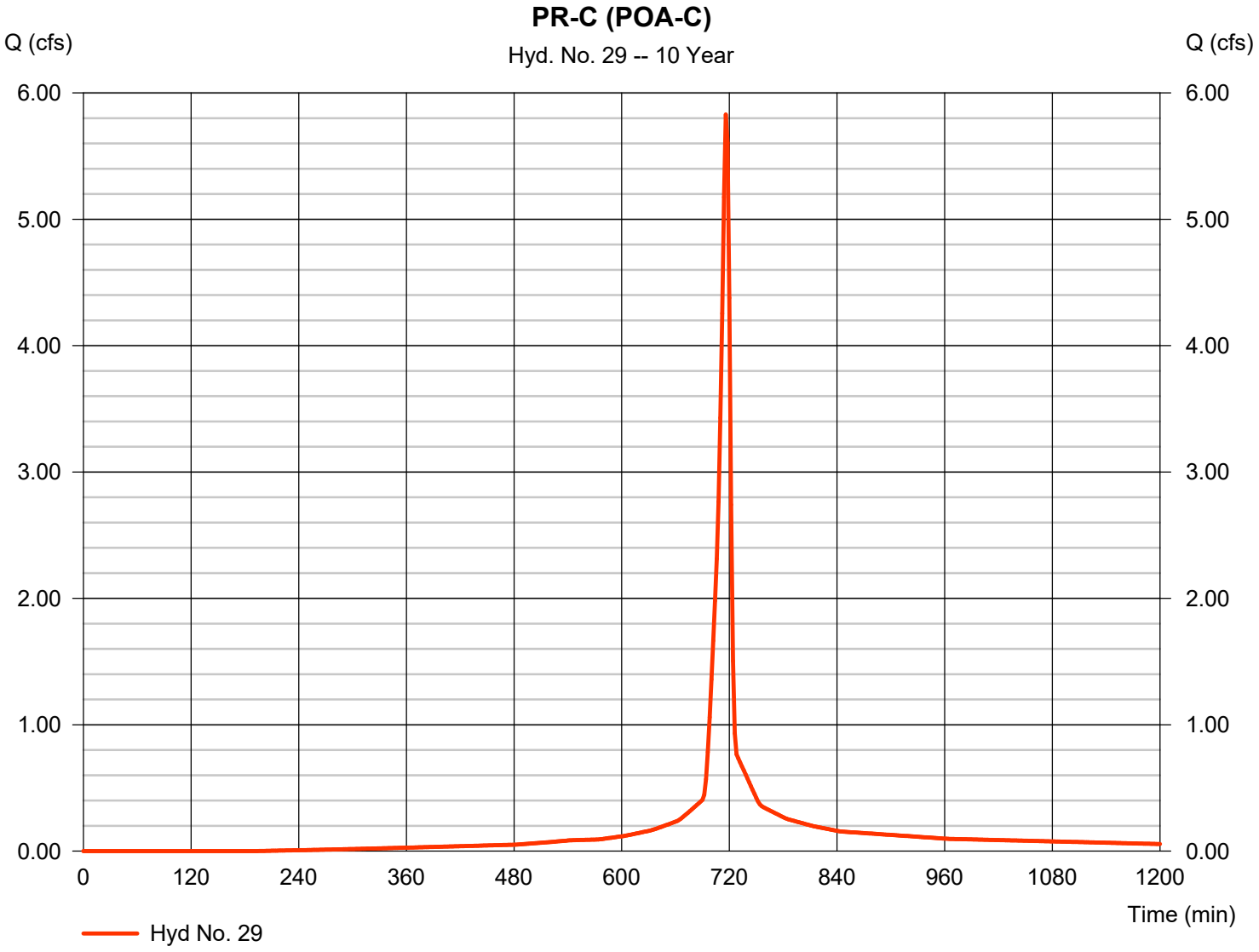


Hydrograph Report

Hyd. No. 29

PR-C (POA-C)

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.829 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	12,716 cuft
Drainage area	=	0.950 ac	Curve number	=	92
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

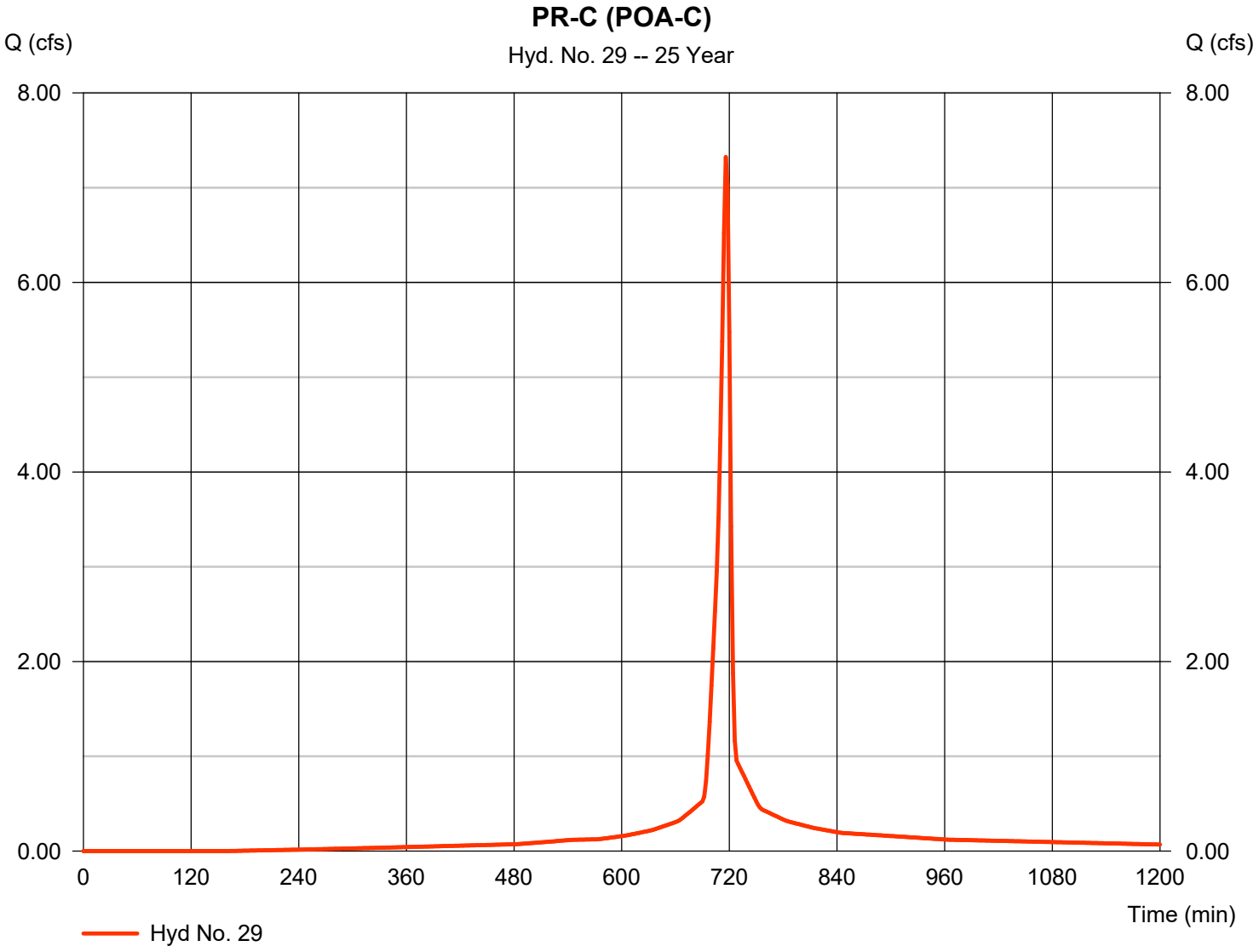


Hydrograph Report

Hyd. No. 29

PR-C (POA-C)

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.322 cfs
Storm frequency	=	25 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	16,230 cuft
Drainage area	=	0.950 ac	Curve number	=	92
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

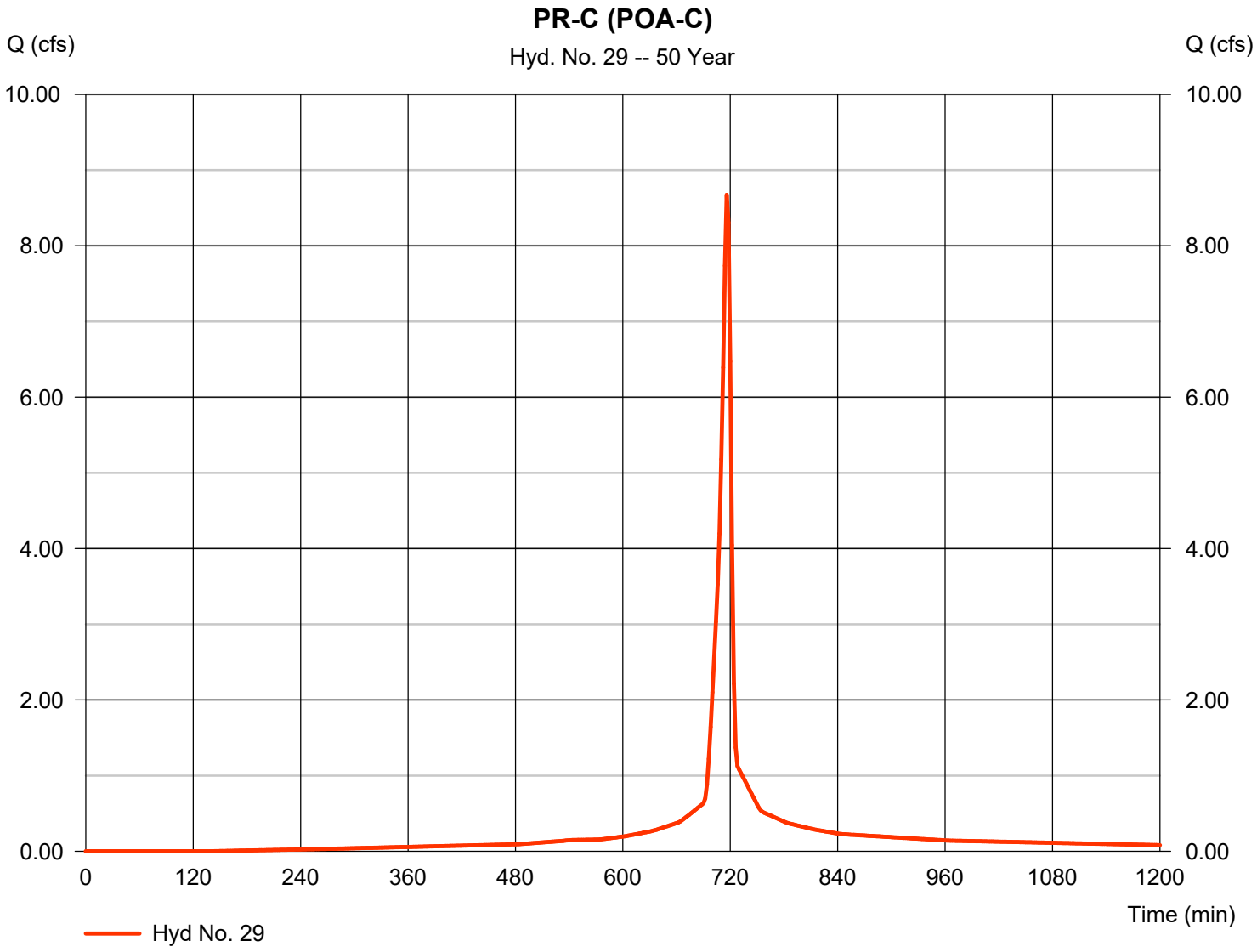


Hydrograph Report

Hyd. No. 29

PR-C (POA-C)

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.673 cfs
Storm frequency	=	50 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	19,447 cuft
Drainage area	=	0.950 ac	Curve number	=	92
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

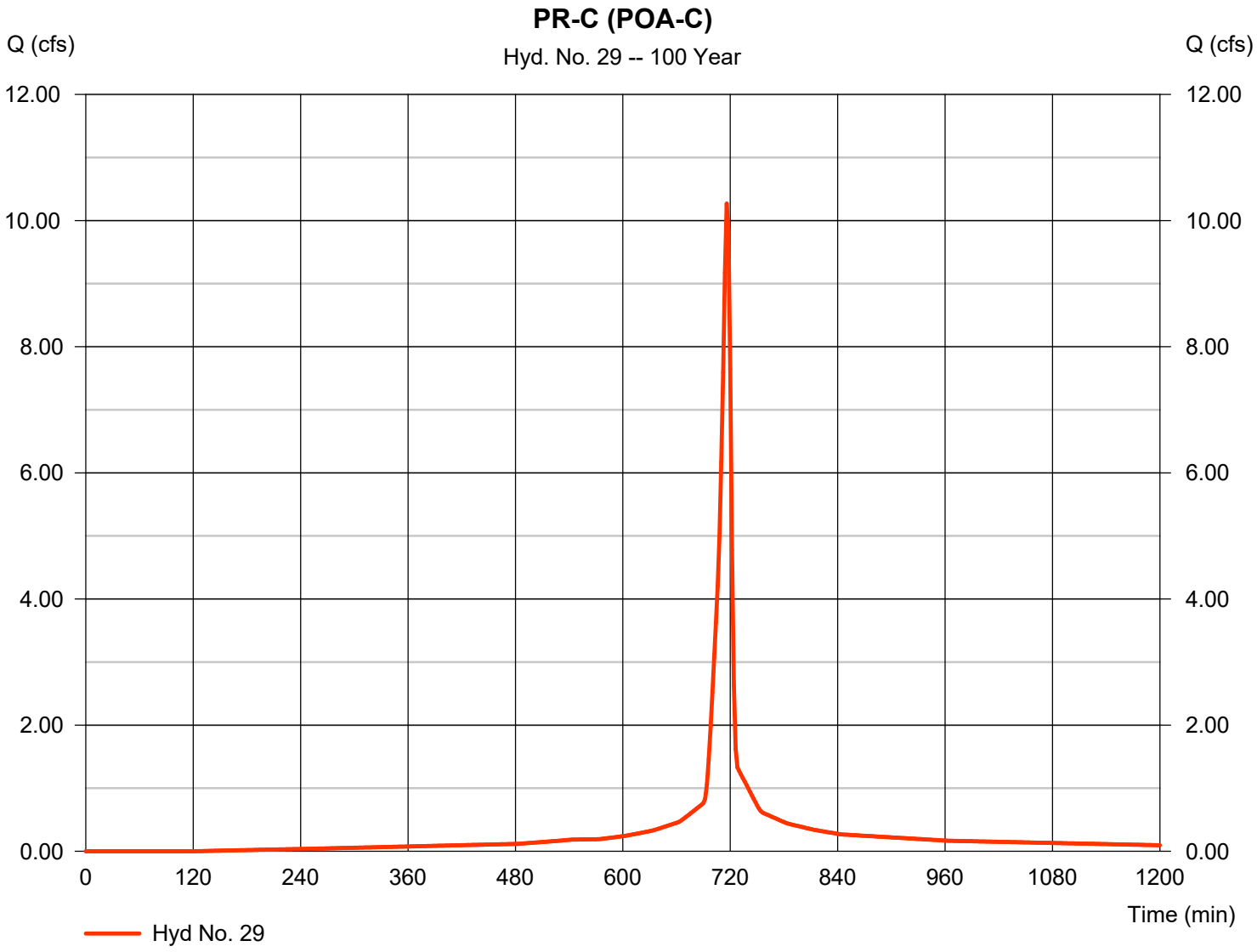


Hydrograph Report

Hyd. No. 29

PR-C (POA-C)

Hydrograph type	=	SCS Runoff	Peak discharge	=	10.27 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	23,284 cuft
Drainage area	=	0.950 ac	Curve number	=	92
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



COMBINED PROPOSED FLOW TO POA-ABC

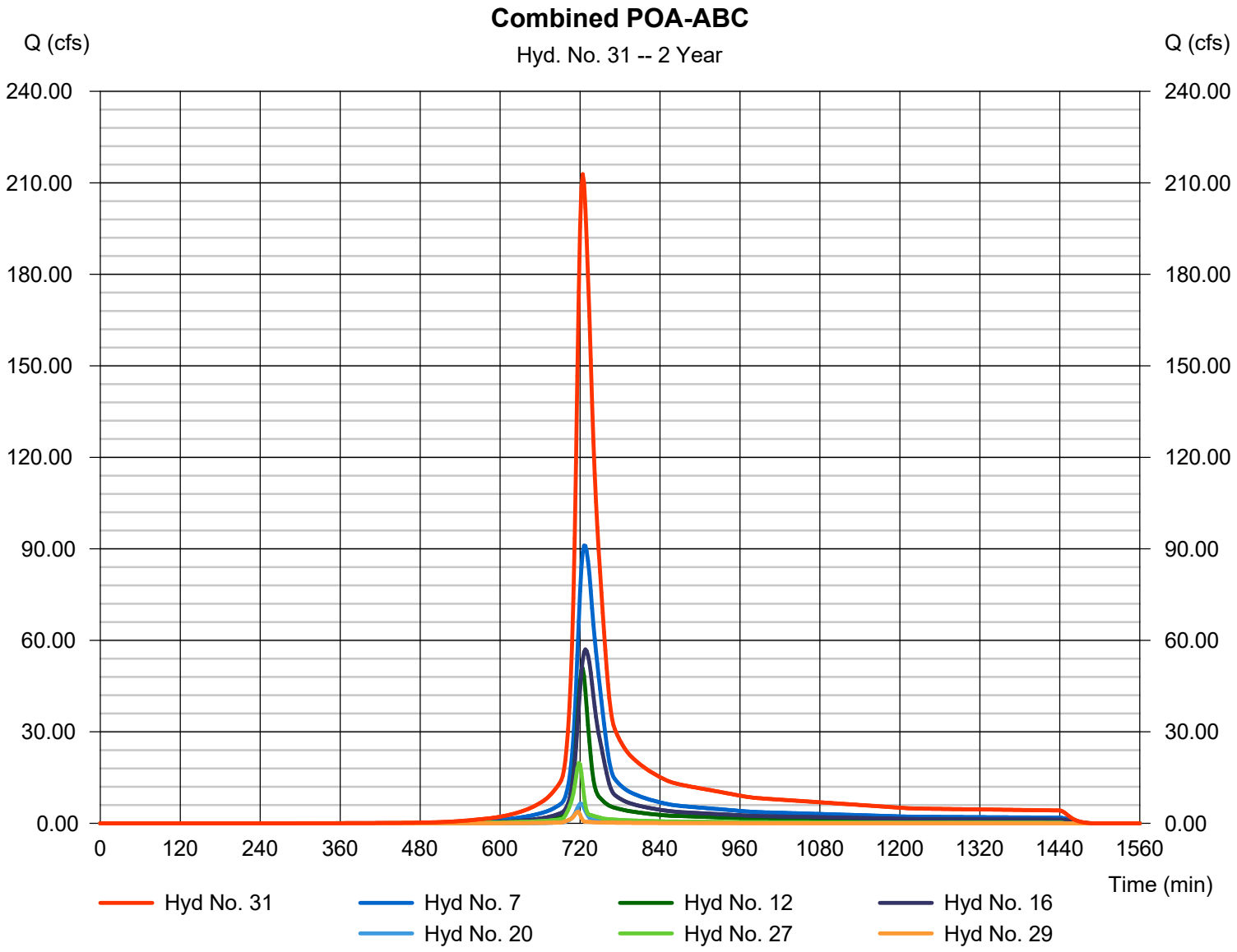
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 05 / 10 / 2021

Hyd. No. 31

Combined POA-ABC

Hydrograph type	= Combine	Peak discharge	= 212.82 cfs
Storm frequency	= 2 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 842,290 cuft
Inflow hyds.	= 7, 12, 16, 20, 27, 29	Contrib. drain. area	= 3.940 ac

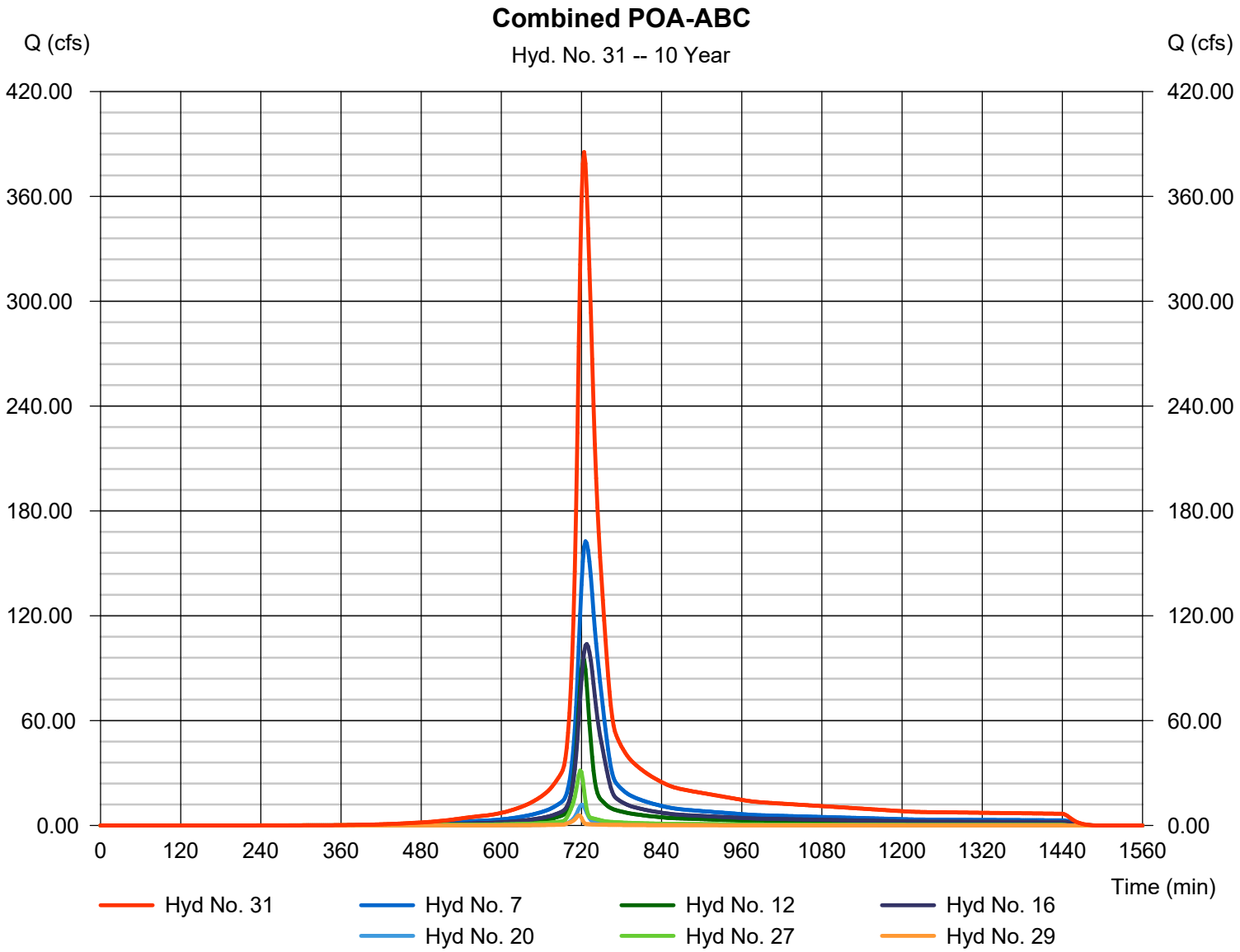


Hydrograph Report

Hyd. No. 31

Combined POA-ABC

Hydrograph type	= Combine	Peak discharge	= 385.35 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 1,502,613 cuft
Inflow hyds.	= 7, 12, 16, 20, 27, 29	Contrib. drain. area	= 3.940 ac

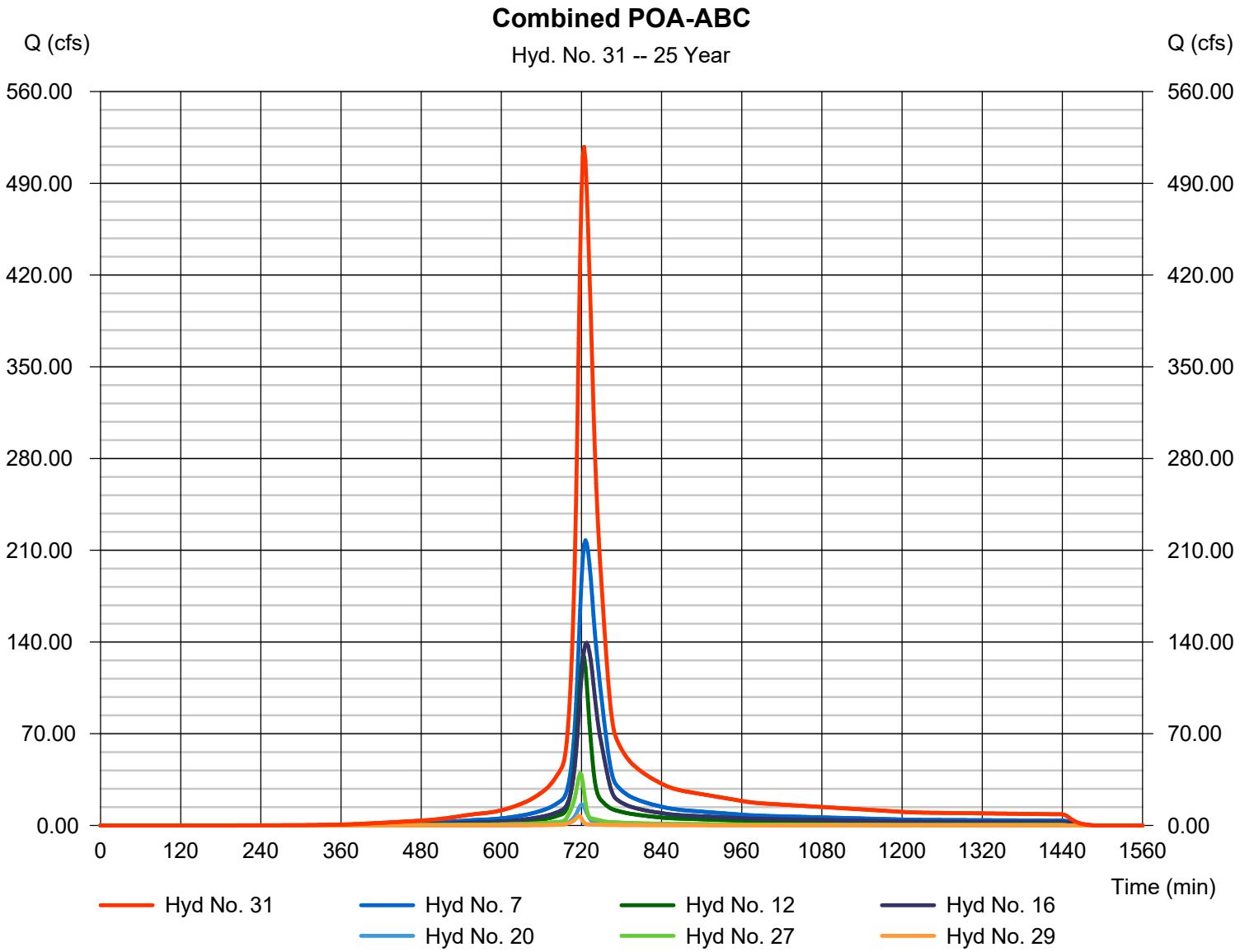


Hydrograph Report

Hyd. No. 31

Combined POA-ABC

Hydrograph type	= Combine	Peak discharge	= 517.76 cfs
Storm frequency	= 25 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 2,012,234 cuft
Inflow hyds.	= 7, 12, 16, 20, 27, 29	Contrib. drain. area	= 3.940 ac

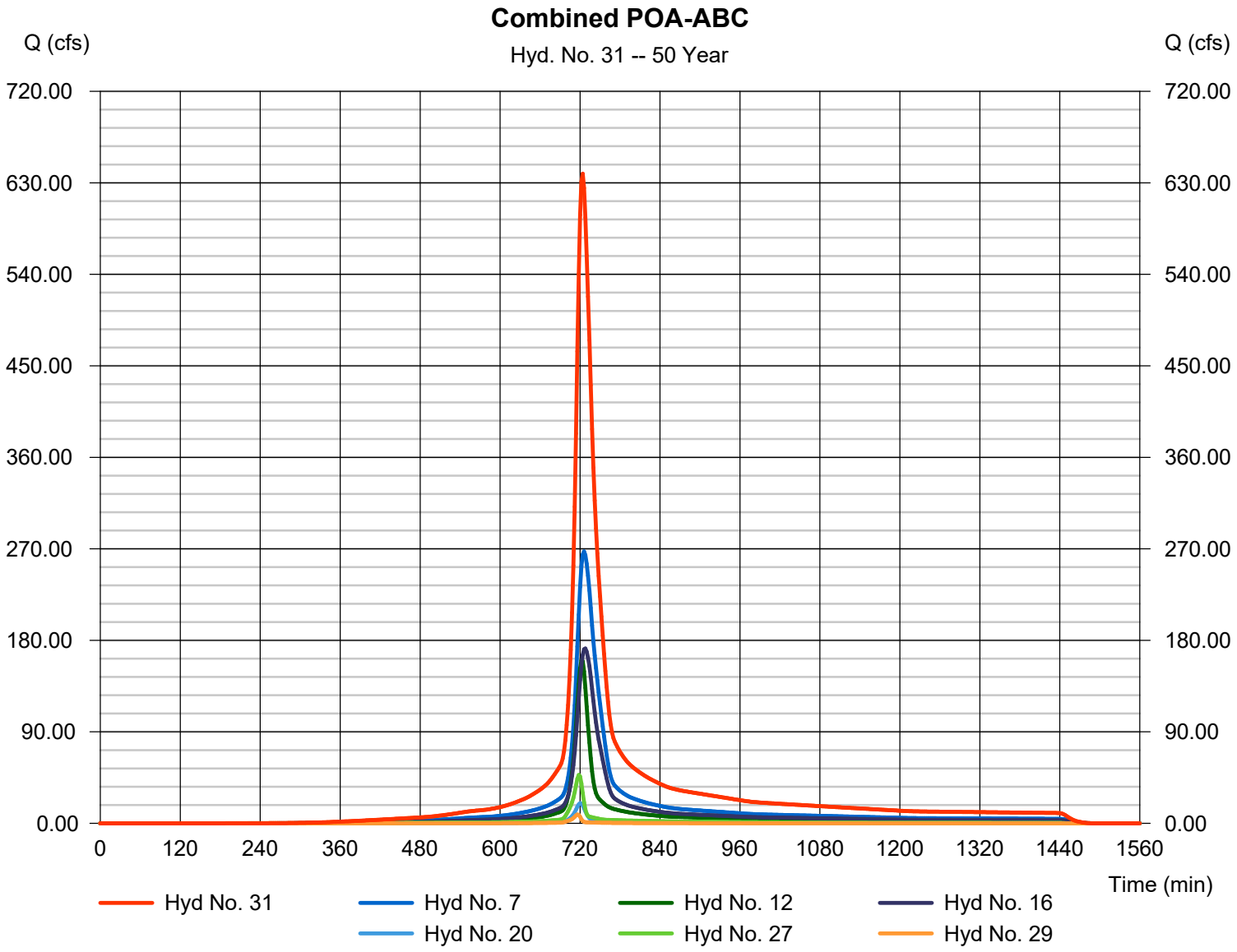


Hydrograph Report

Hyd. No. 31

Combined POA-ABC

Hydrograph type	= Combine	Peak discharge	= 638.99 cfs
Storm frequency	= 50 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 2,494,682 cuft
Inflow hyds.	= 7, 12, 16, 20, 27, 29	Contrib. drain. area	= 3.940 ac

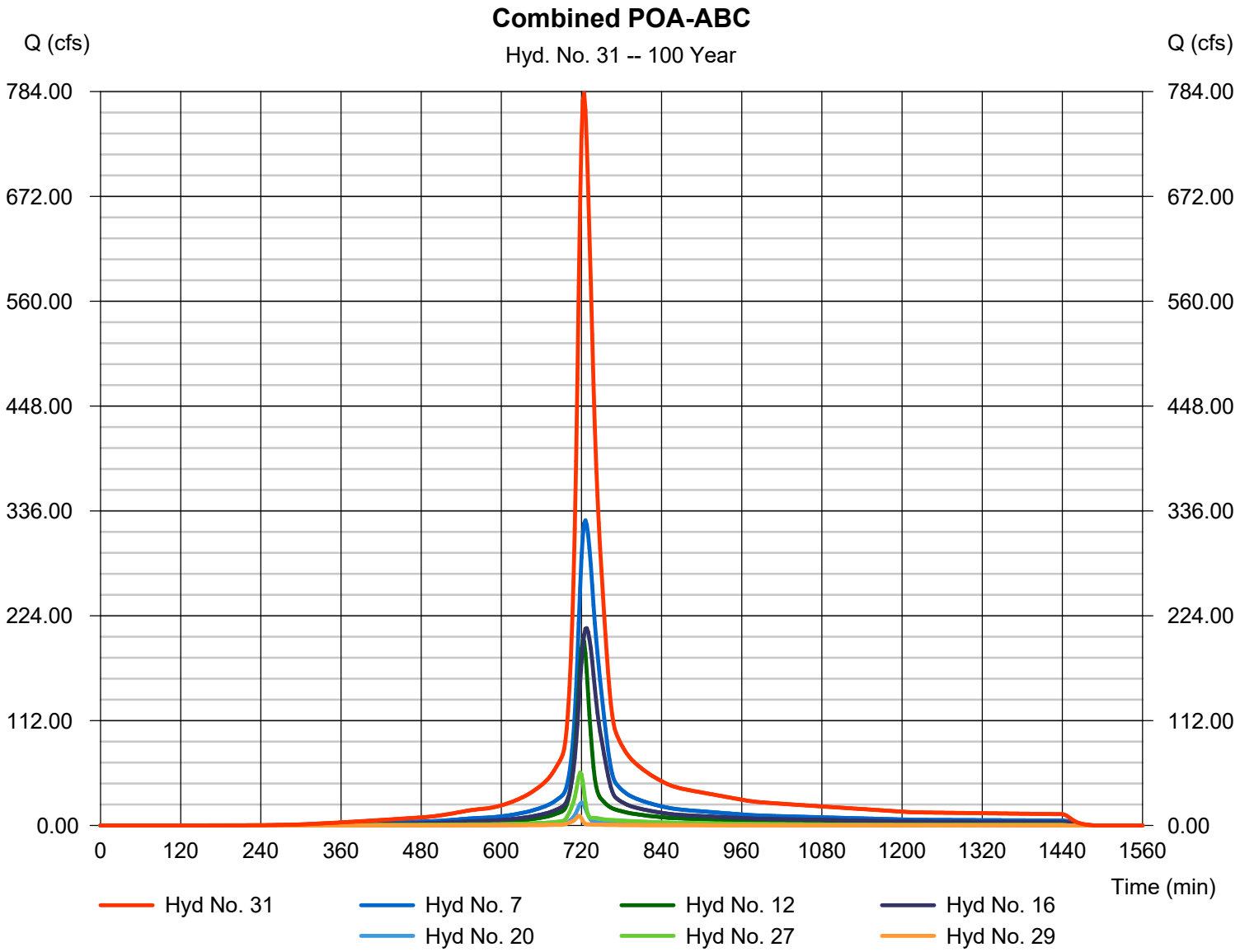


Hydrograph Report

Hyd. No. 31

Combined POA-ABC

Hydrograph type	=	Combine	Peak discharge	=	782.28 cfs
Storm frequency	=	100 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	3,084,818 cuft
Inflow hyds.	=	7, 12, 16, 20, 27, 29	Contrib. drain. area	=	3.940 ac



PR-D-1 WATERSHED

TR-55 TIME OF CONCENTRATION (Tc) OR TRAVEL TIME (Tt) CALCULATIONS

Project: Smithfield Gateway Phase 1A-1 **By:** MJV **Date:** 12/10/2020
Location: Smithfield Township, Monroe County, PA **Checked:** TH **Date:** 12/10/2020
Watershed: PR-D-1

Sheet Flow (Applicable to Tc only)													
1	Surface Description (table 3-1)		Grass										
2	Manning's roughness coeff., n (table 3-1)		0.150										
3	Flow length, L (total L<100 ft)	**ft**	100										
4	Two-yr 24-hr rainfall, P2	**in**	3.32										
5	Land Slope, s	**ft/ft**	0.0100										
6	$Tt = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5}(s)^{.04}}$	**Compute Tt, hr**	0.2115	+		+		+		+		+	0.2115 hr
Shallow Concentrated Flow													
7	Surface Description (Paved or Unpaved)		Unpaved										
8	Flow length, L	**ft**	190										
9	Watercourse slope, s	**ft/ft**	0.0150										
10	Average Velocity, V (figure 3-1)	**ft/sec**	1.98										
11	Tt = L / (3600V)	**Compute Tt , hr**	0.0267	+		+		+		+		+	0.0267 hr
Channel / Pipe Flow													
12	Cross Sectional flow area, a	**ft^2**											
13	Wetted Perimeter, p_w	**ft**											
14	Hydraulic radius, $r = a/p_w$	**ft**											
15	Channel slope, s	**ft/ft**											
16	Manning's roughness coeff., n (table 3-1)												
17	$V = (1.49*r^{2/3}*s^{1/2})/n$	**ft/s**											
18	Flow length, L	**ft**											
19	Tt = L / (3600V)	**Compute Tt , hr**		+		+		+		+		+	0.0000 hr
20	**Watershed or subarea Tc or Tt (add Tt in steps 6,11, and 19)**												0.24 hr
													14.3 min

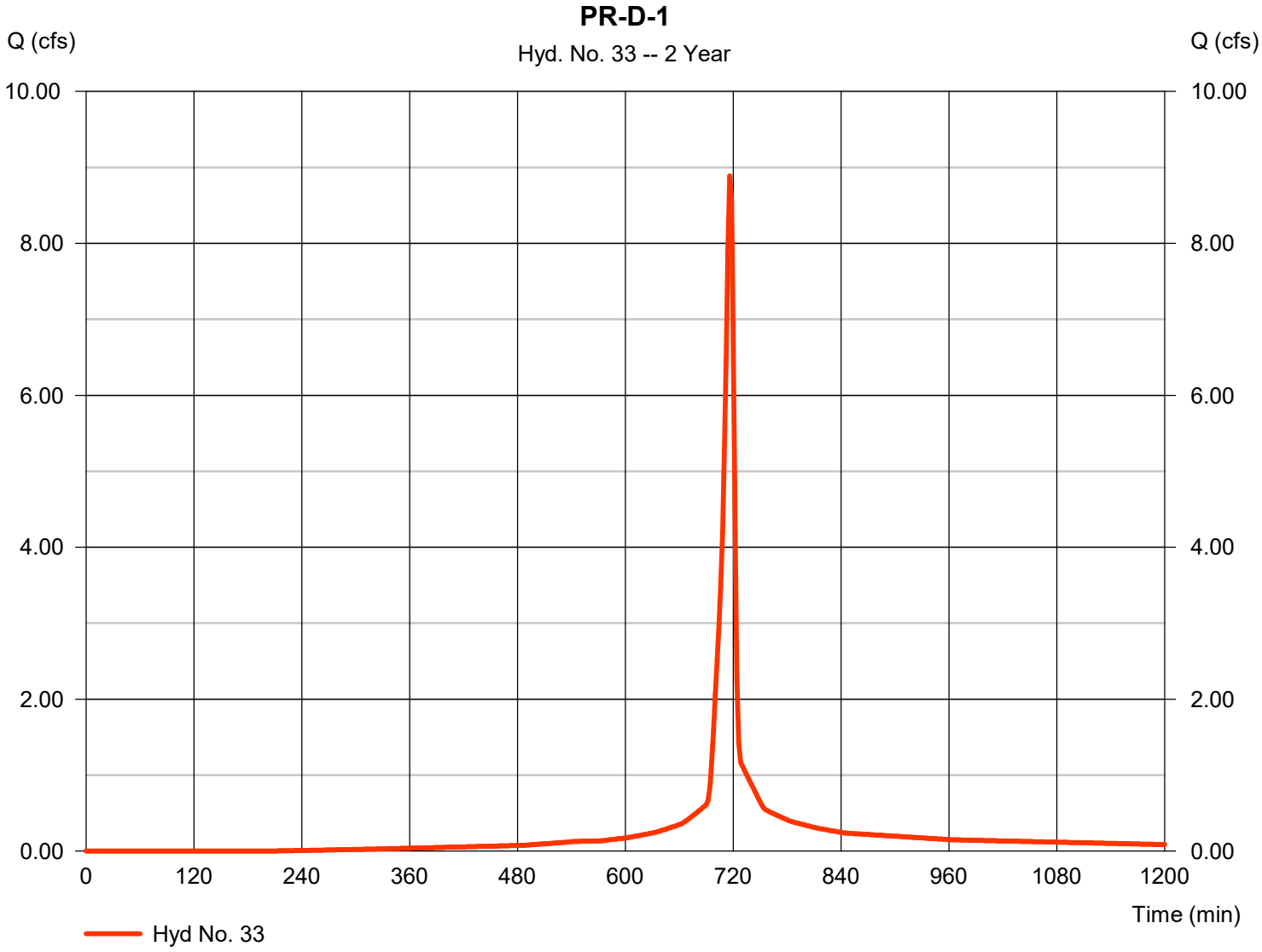
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 33

PR-D-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.887 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	19,284 cuft
Drainage area	=	2.130 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

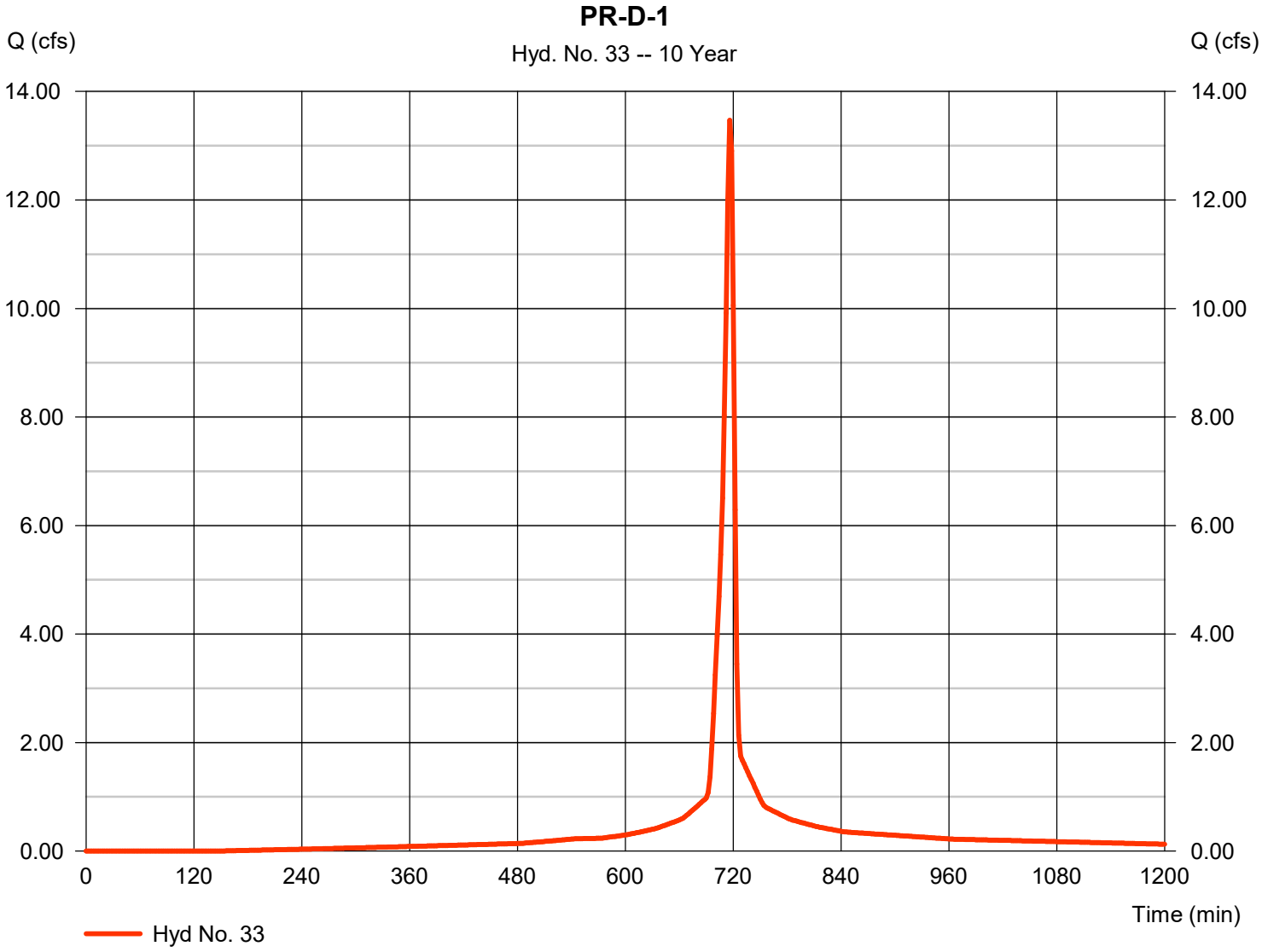


Hydrograph Report

Hyd. No. 33

PR-D-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	13.47 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	30,083 cuft
Drainage area	=	2.130 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

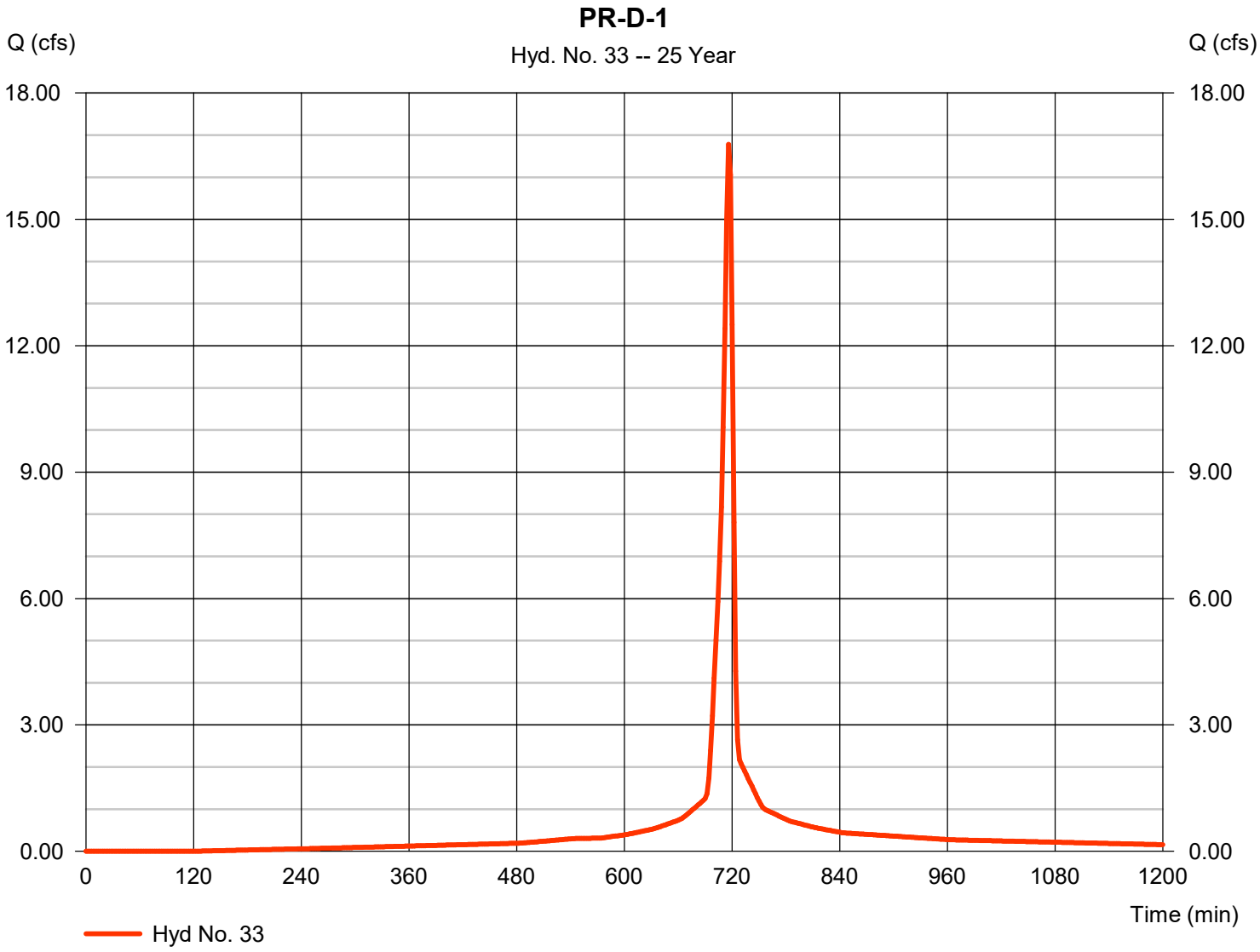


Hydrograph Report

Hyd. No. 33

PR-D-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	16.78 cfs
Storm frequency	=	25 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	38,034 cuft
Drainage area	=	2.130 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

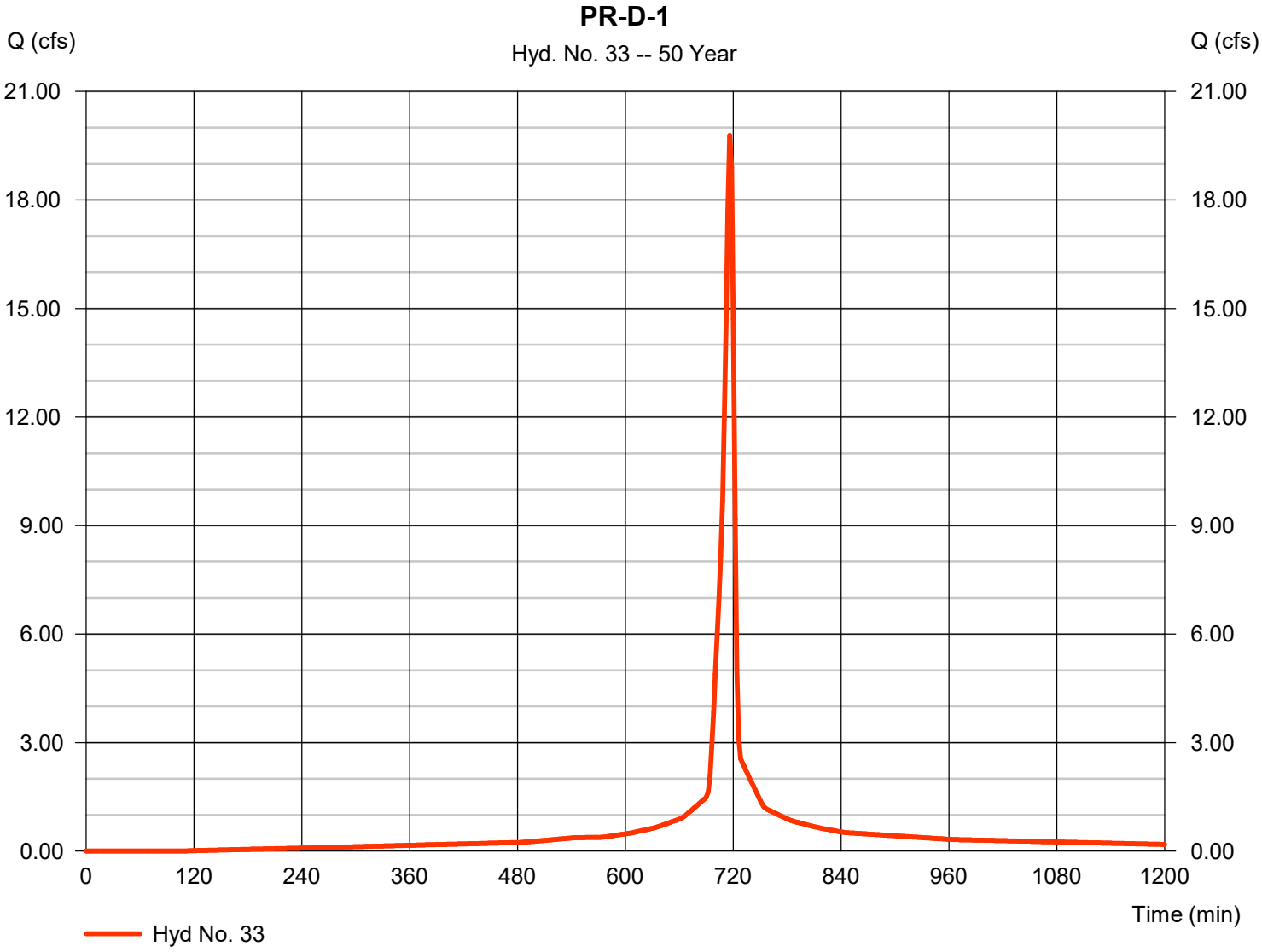


Hydrograph Report

Hyd. No. 33

PR-D-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	19.78 cfs
Storm frequency	=	50 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	45,294 cuft
Drainage area	=	2.130 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

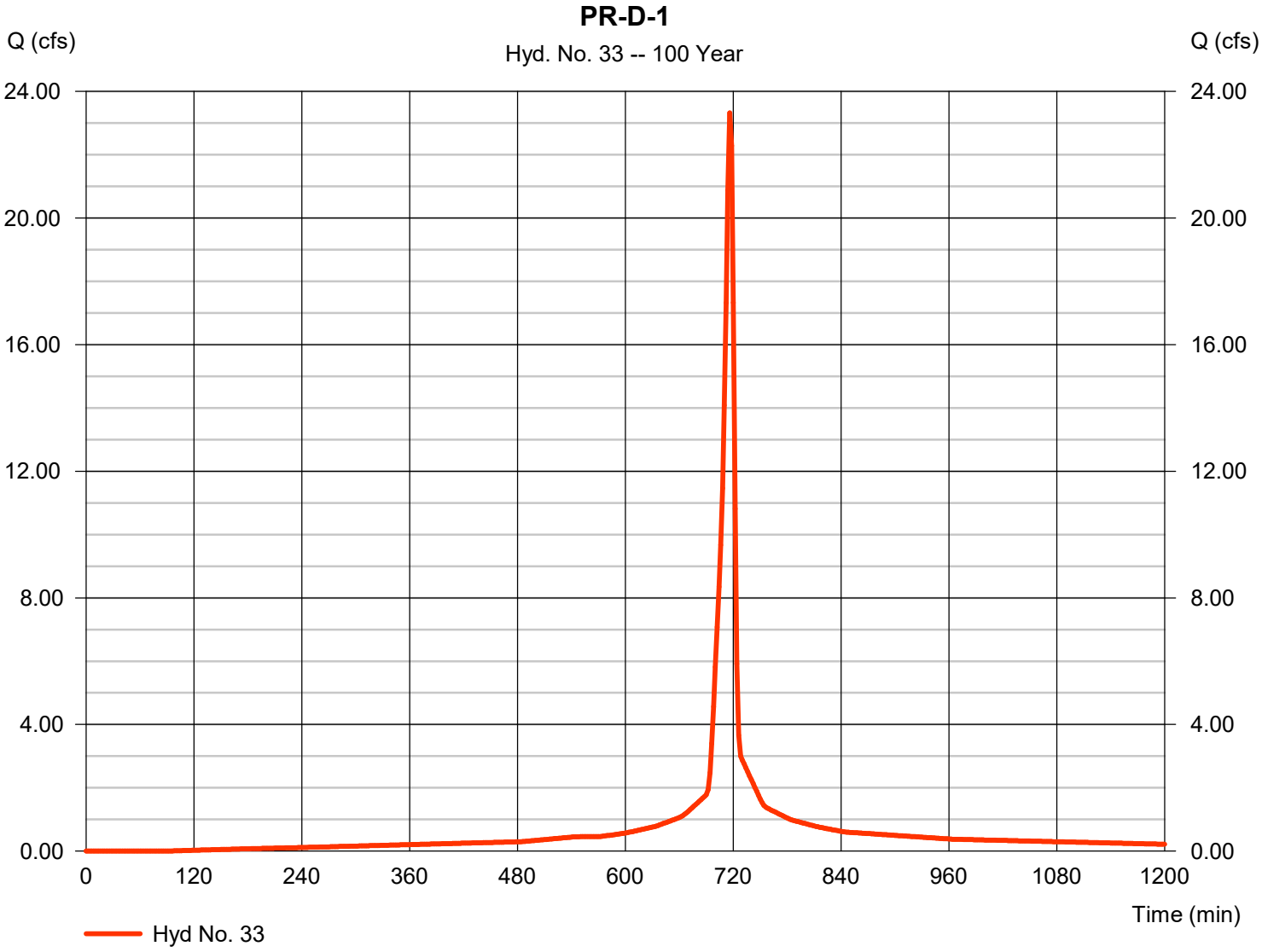


Hydrograph Report

Hyd. No. 33

PR-D-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	23.33 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	53,937 cuft
Drainage area	=	2.130 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



PR-D-2-DISTURBED WATERSHED

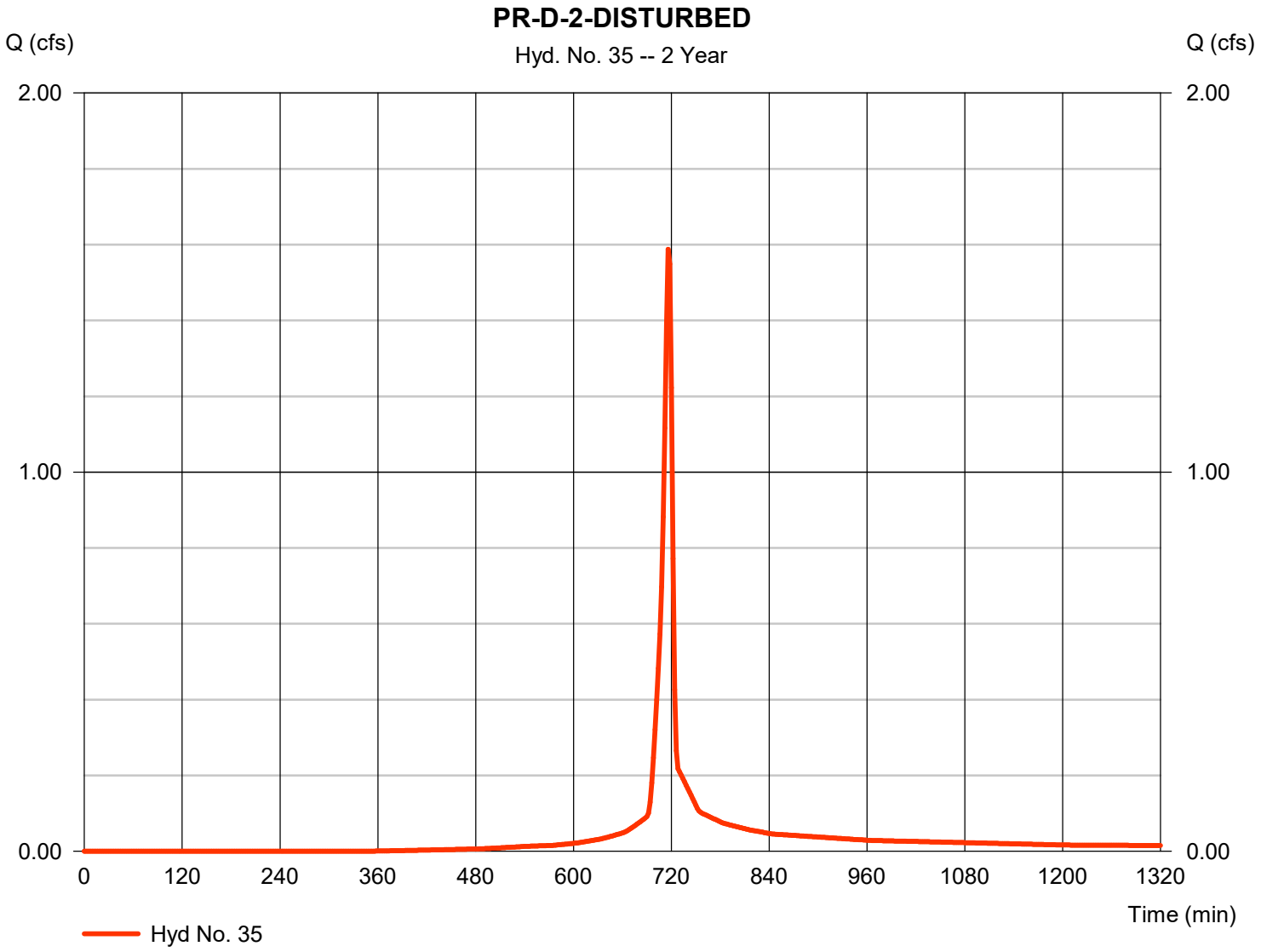
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 35

PR-D-2-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.588 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	3,281 cuft
Drainage area	=	0.440 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

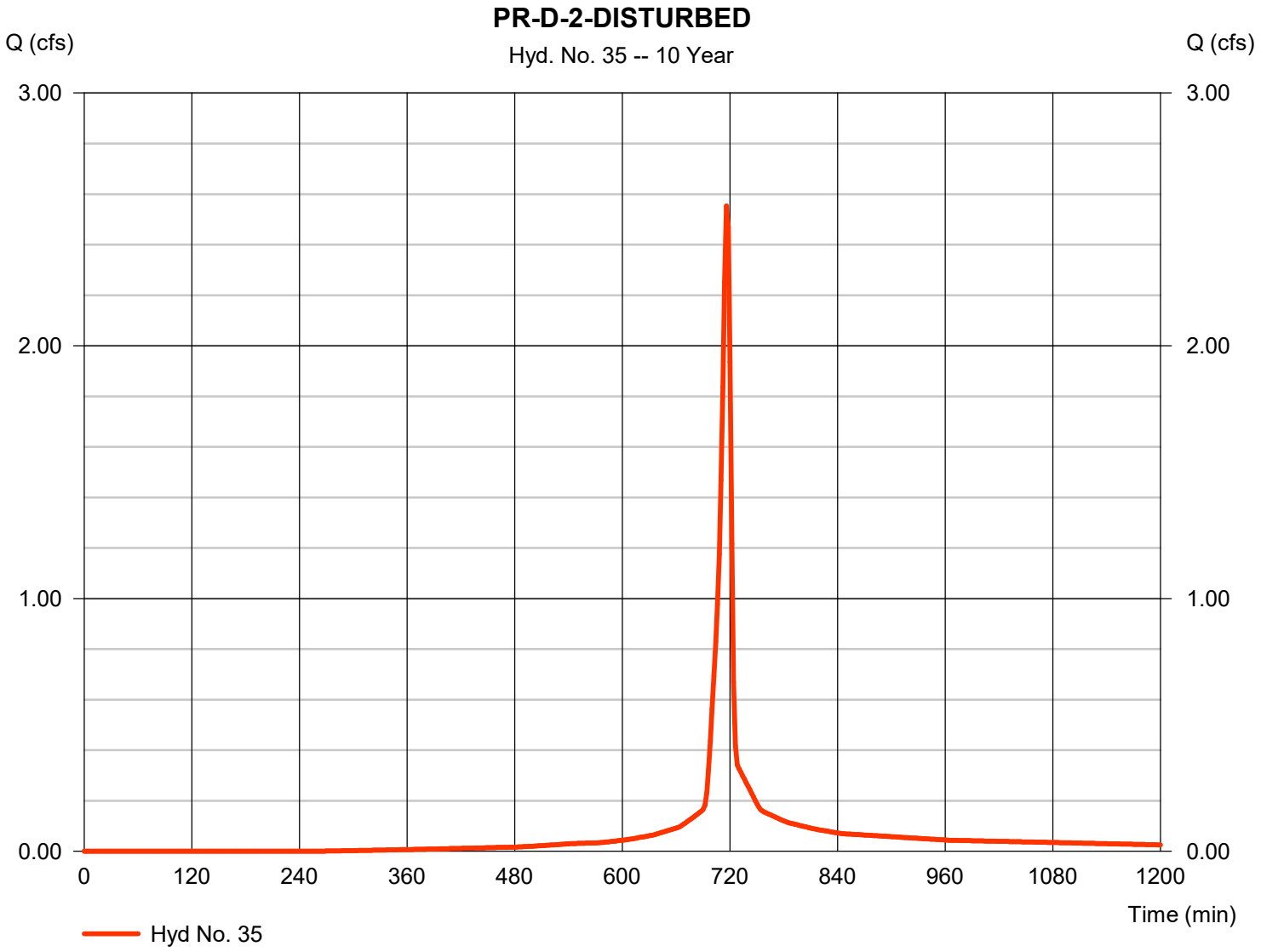


Hydrograph Report

Hyd. No. 35

PR-D-2-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.553 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	5,419 cuft
Drainage area	=	0.440 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

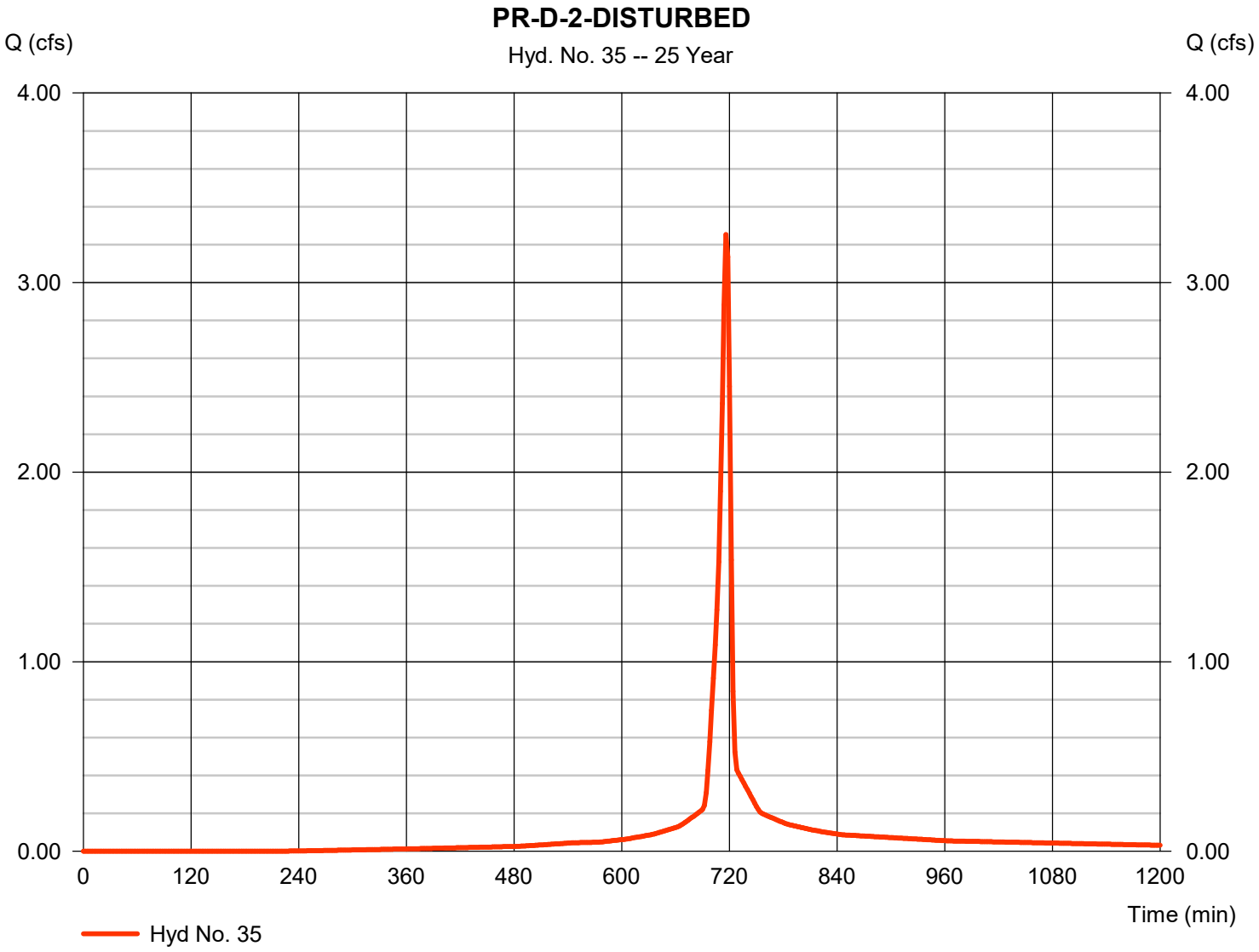


Hydrograph Report

Hyd. No. 35

PR-D-2-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.254 cfs
Storm frequency	=	25 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	7,018 cuft
Drainage area	=	0.440 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

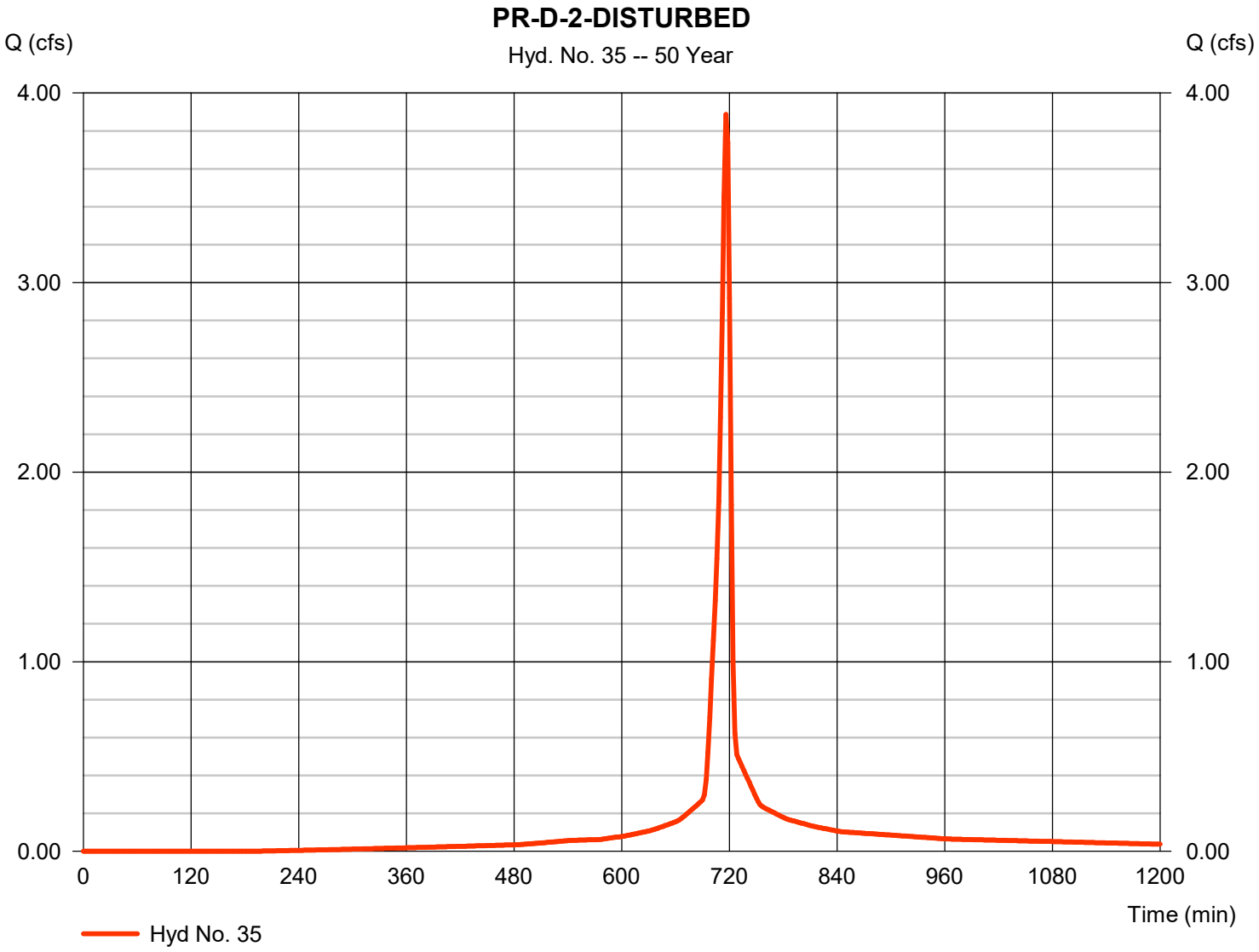


Hydrograph Report

Hyd. No. 35

PR-D-2-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.888 cfs
Storm frequency	=	50 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	8,489 cuft
Drainage area	=	0.440 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

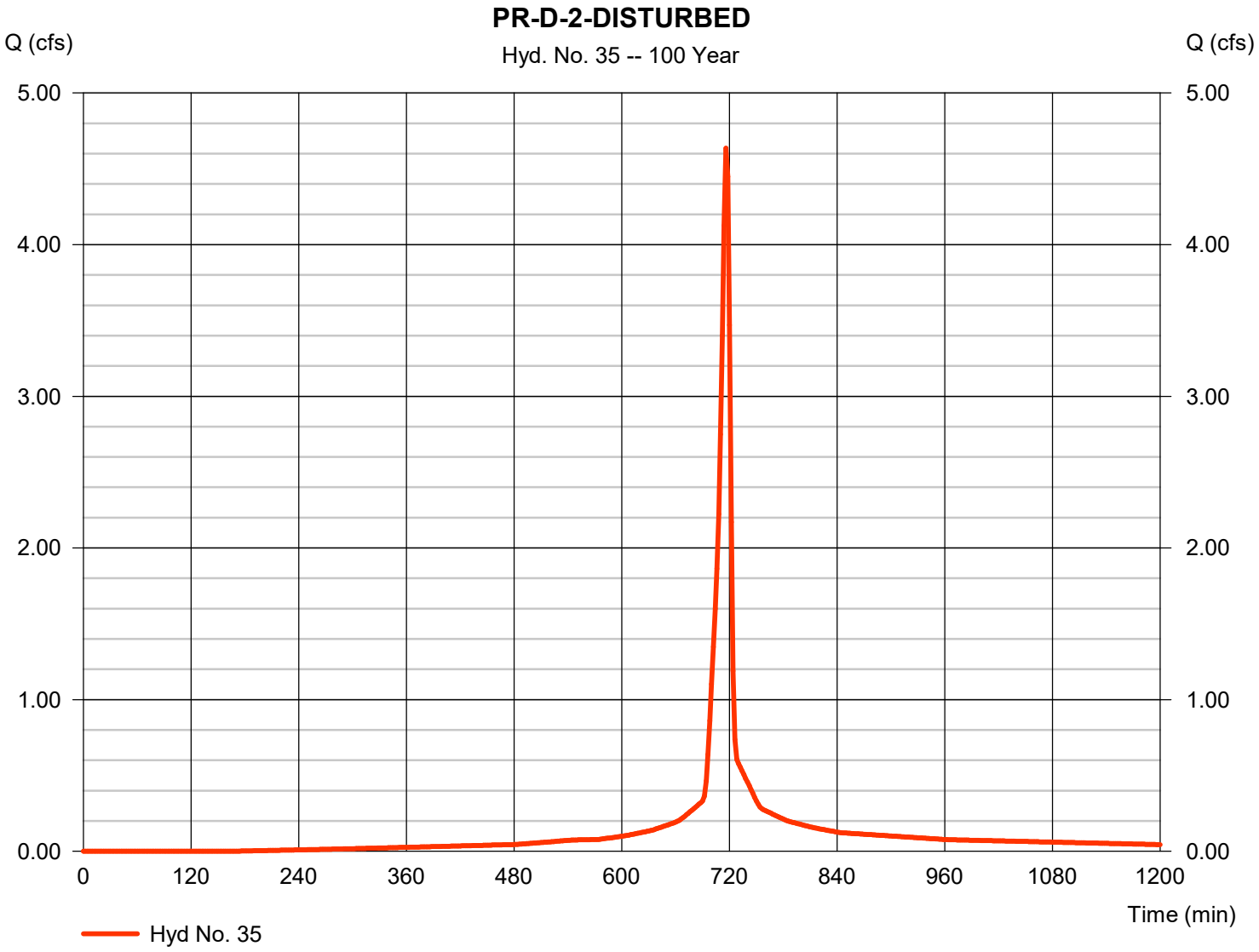


Hydrograph Report

Hyd. No. 35

PR-D-2-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.636 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	10,248 cuft
Drainage area	=	0.440 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



PR-D-2-UNDISTURBED WATERSHED

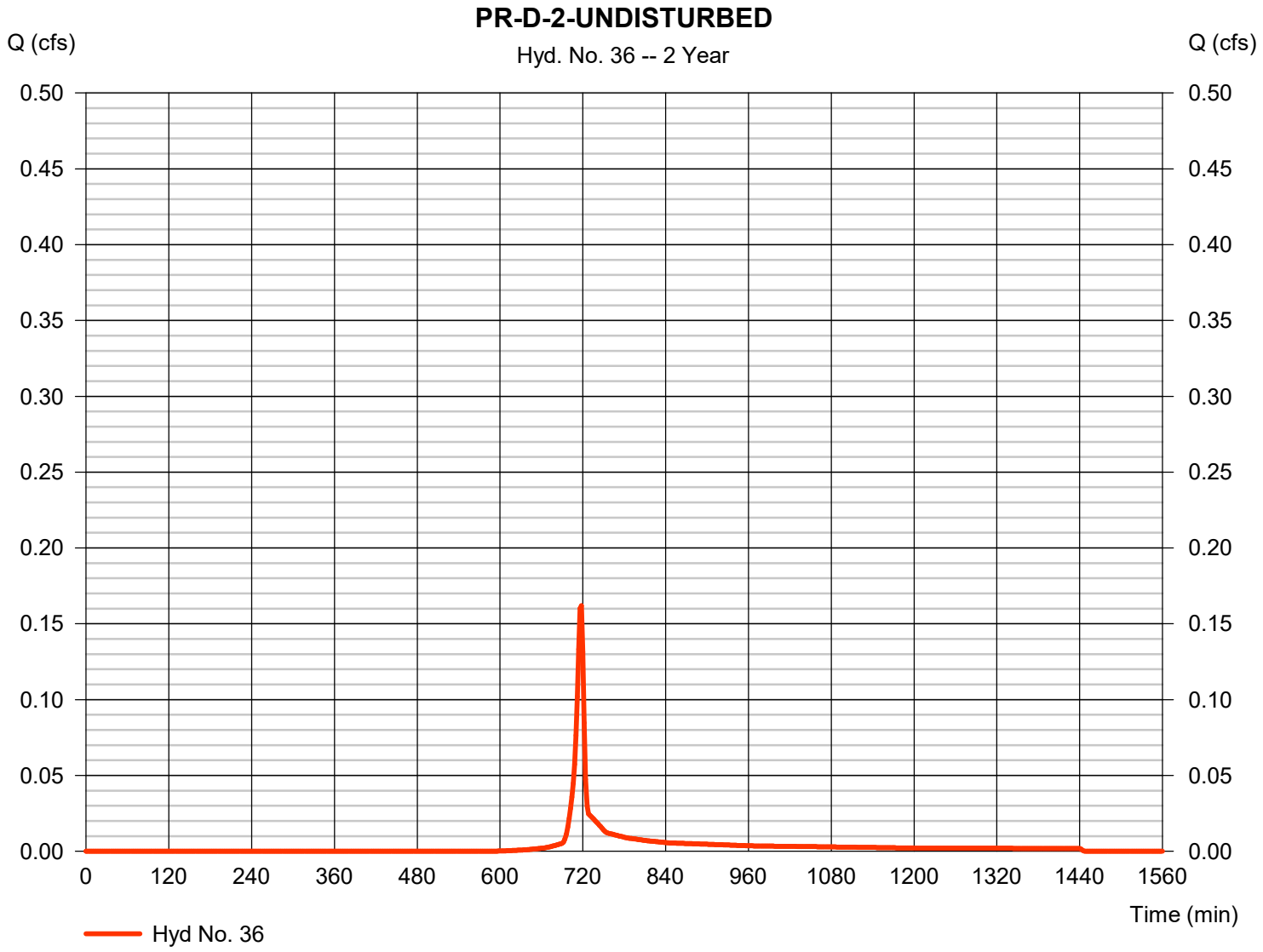
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 36

PR-D-2-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 0.162 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 324 cuft
Drainage area	= 0.070 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

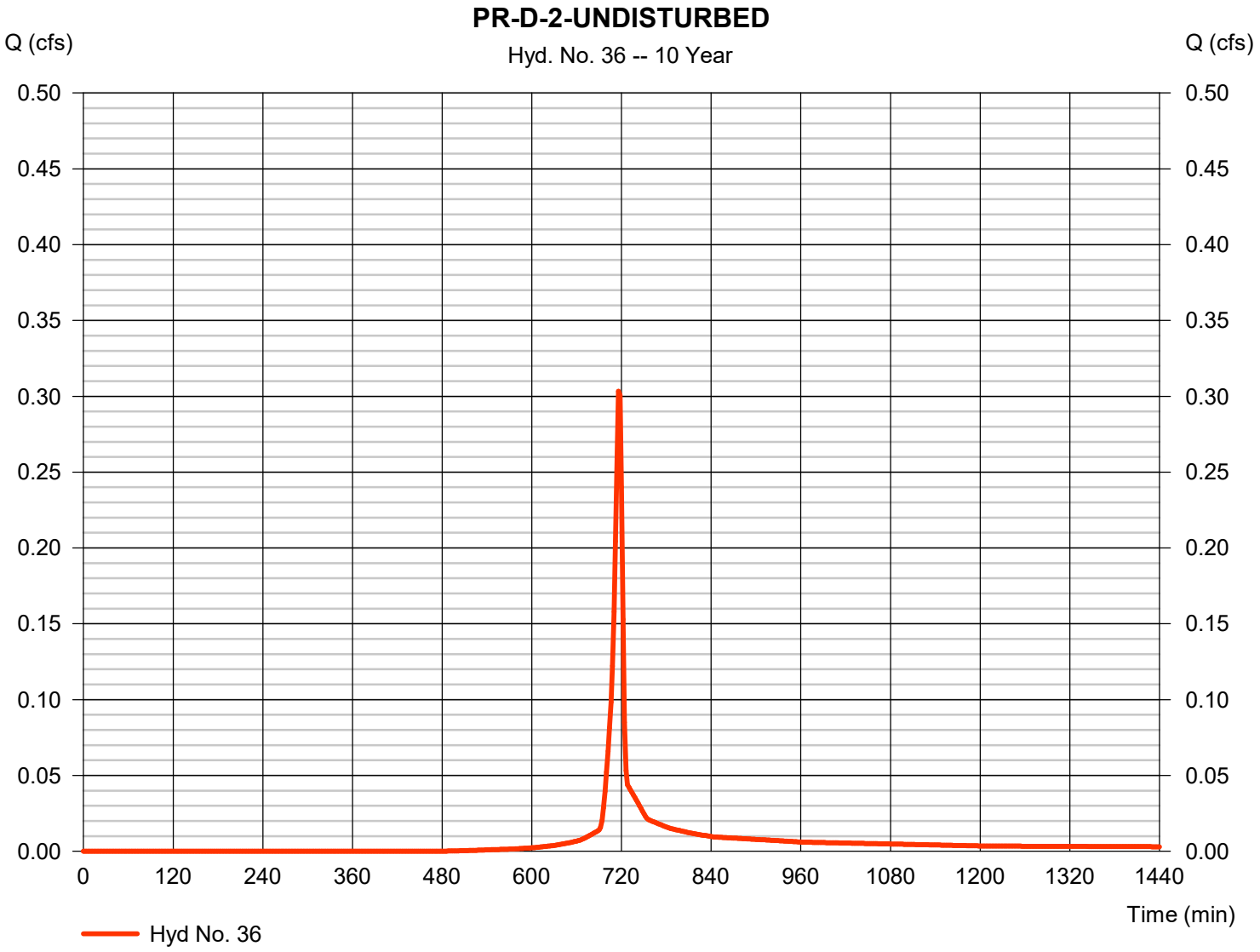


Hydrograph Report

Hyd. No. 36

PR-D-2-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 0.303 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 614 cuft
Drainage area	= 0.070 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 4.84 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

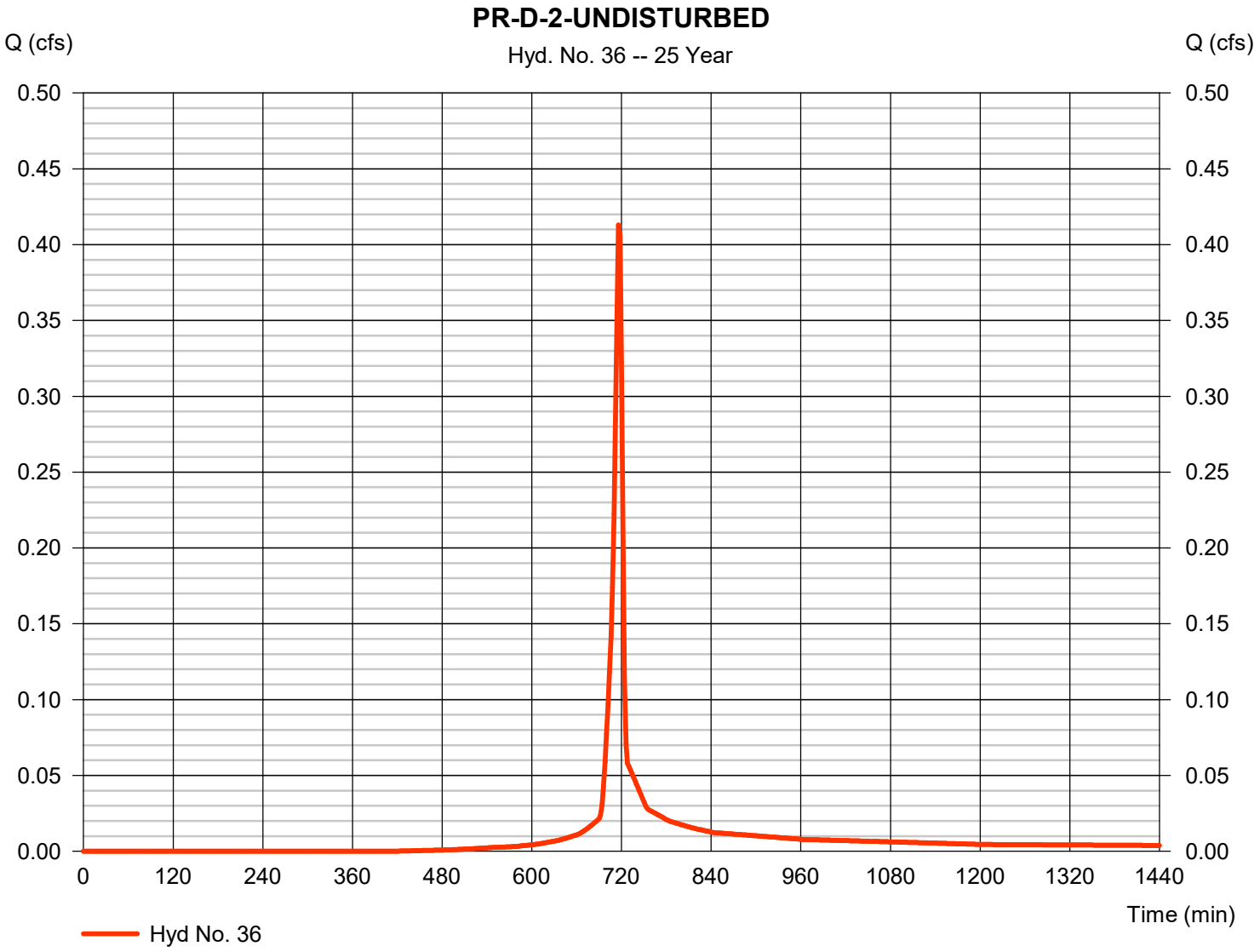


Hydrograph Report

Hyd. No. 36

PR-D-2-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.413 cfs
Storm frequency	=	25 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	842 cuft
Drainage area	=	0.070 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

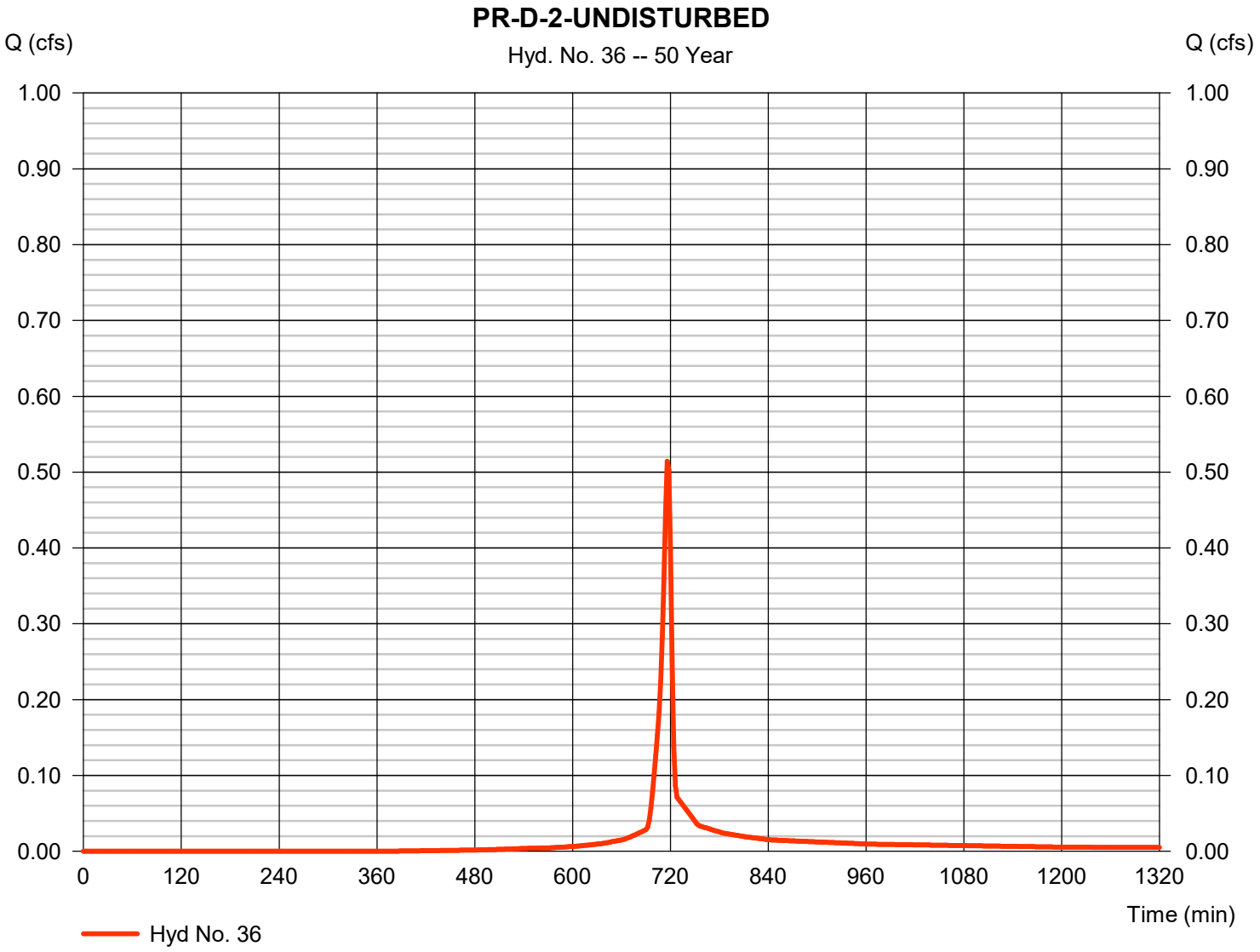


Hydrograph Report

Hyd. No. 36

PR-D-2-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.514 cfs
Storm frequency	=	50 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	1,057 cuft
Drainage area	=	0.070 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

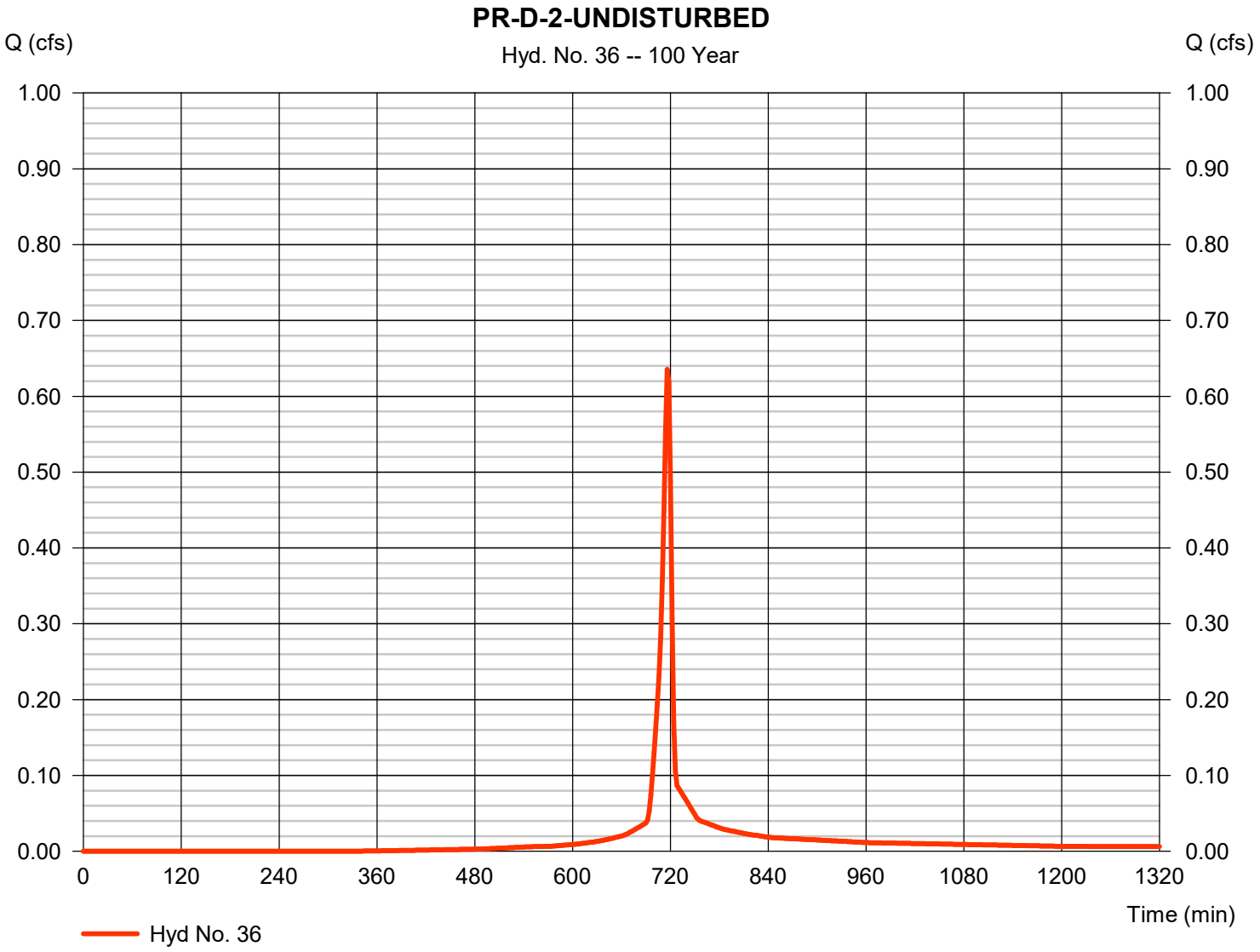


Hydrograph Report

Hyd. No. 36

PR-D-2-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.635 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	1,320 cuft
Drainage area	=	0.070 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



PR-D-2 COMBINED FLOW

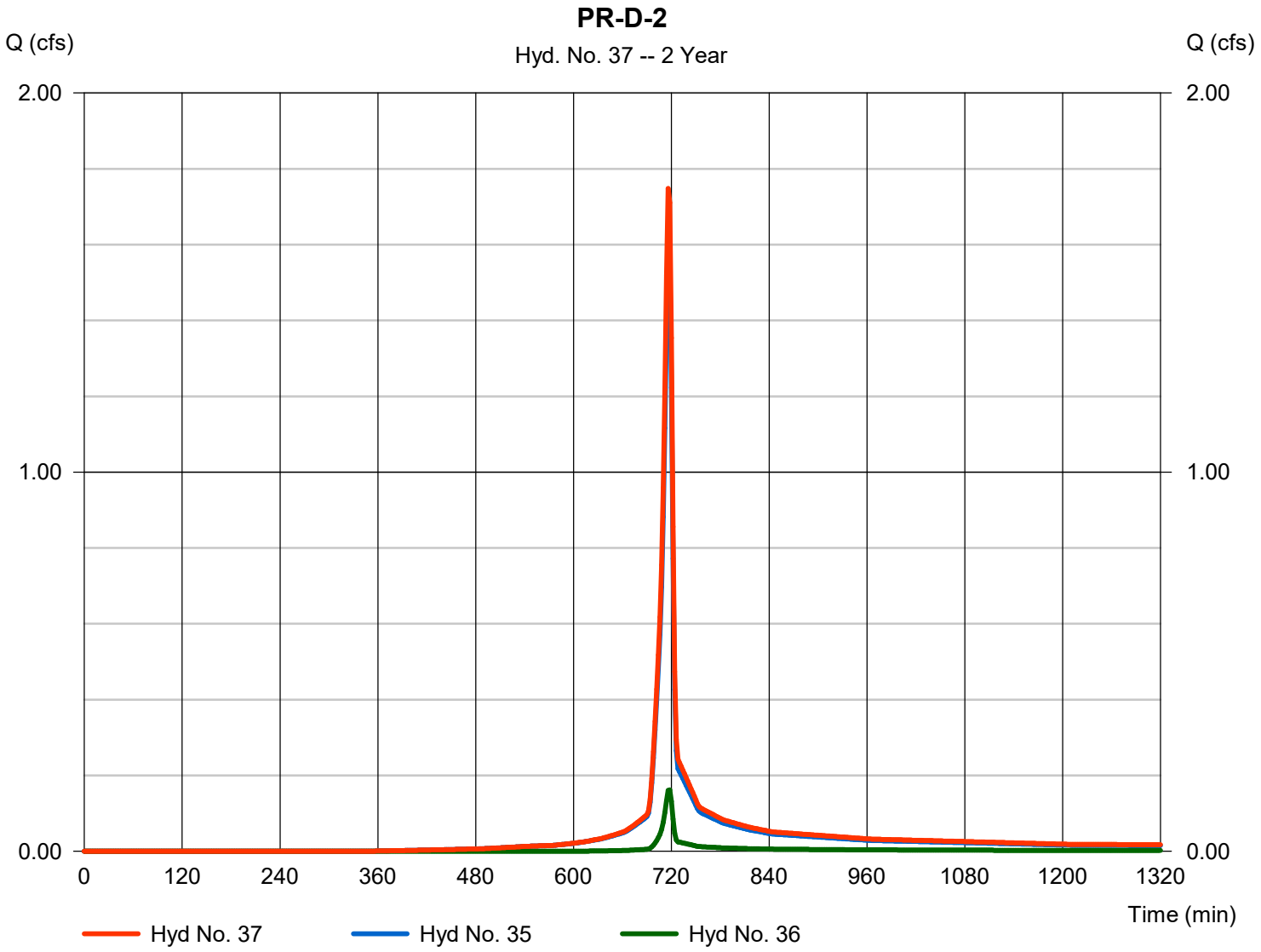
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 37

PR-D-2

Hydrograph type	=	Combine	Peak discharge	=	1.748 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	3,606 cuft
Inflow hyds.	=	35, 36	Contrib. drain. area	=	0.510 ac

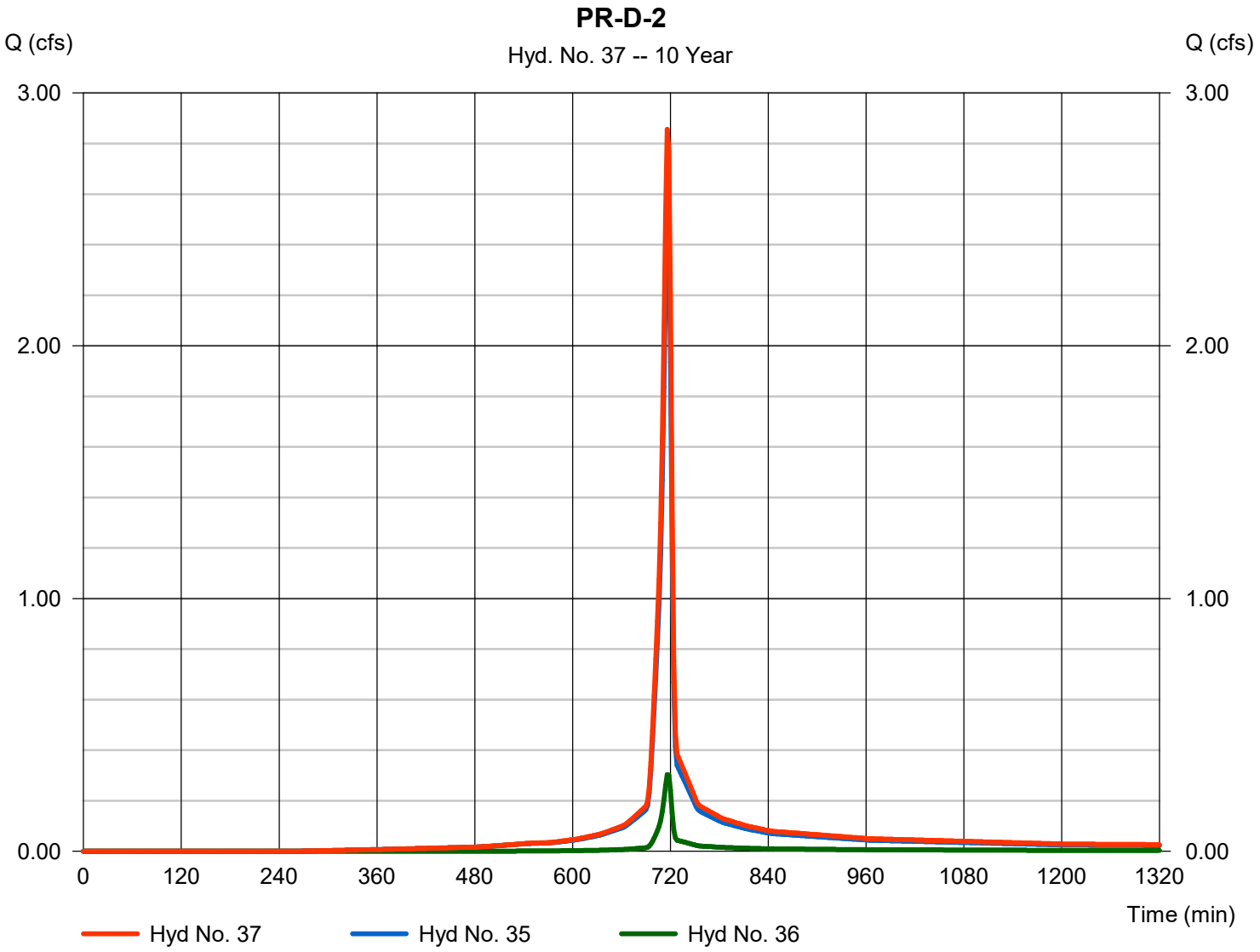


Hydrograph Report

Hyd. No. 37

PR-D-2

Hydrograph type	=	Combine	Peak discharge	=	2.856 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	6,033 cuft
Inflow hyds.	=	35, 36	Contrib. drain. area	=	0.510 ac

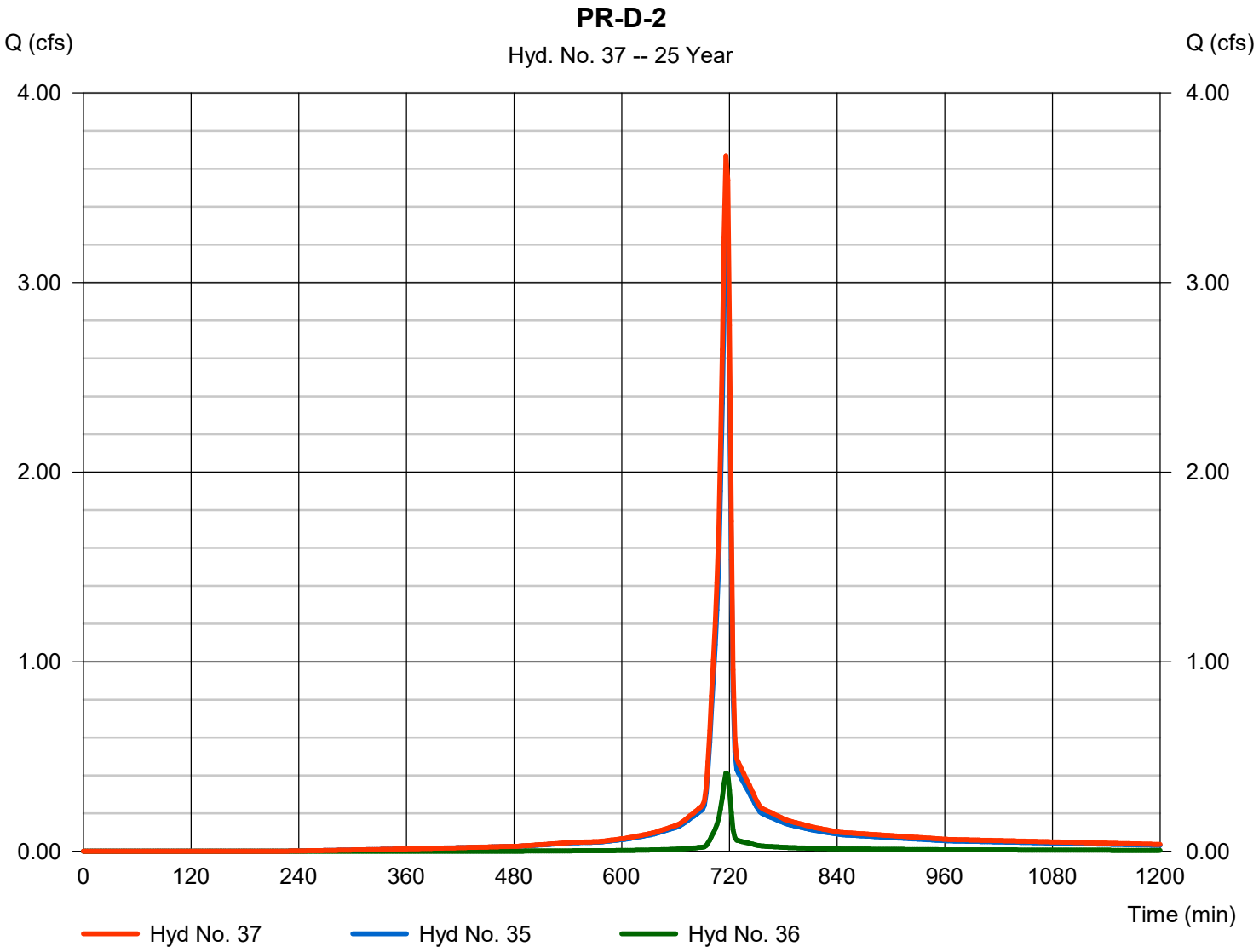


Hydrograph Report

Hyd. No. 37

PR-D-2

Hydrograph type	=	Combine	Peak discharge	=	3.667 cfs
Storm frequency	=	25 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	7,860 cuft
Inflow hyds.	=	35, 36	Contrib. drain. area	=	0.510 ac

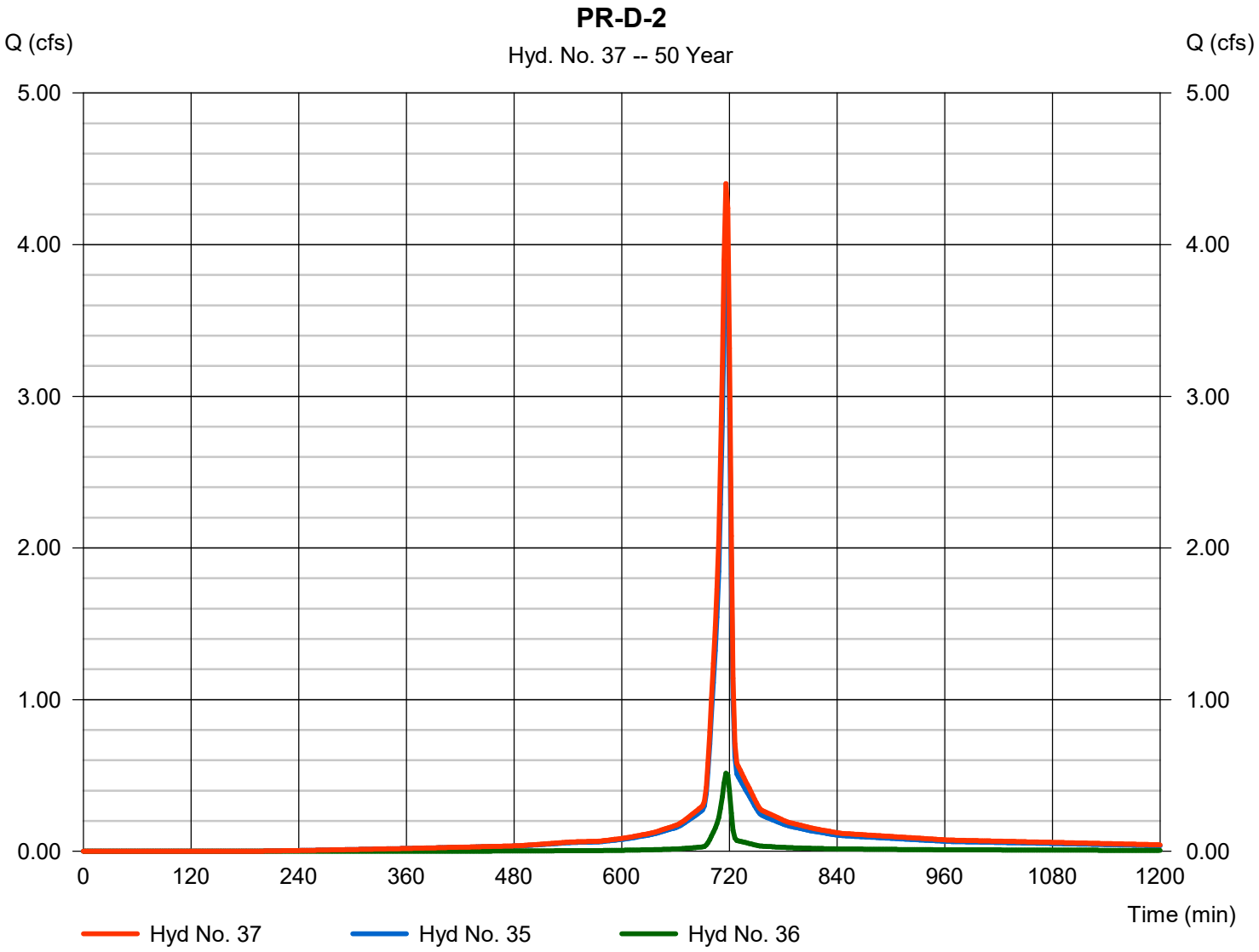


Hydrograph Report

Hyd. No. 37

PR-D-2

Hydrograph type	=	Combine	Peak discharge	=	4.402 cfs
Storm frequency	=	50 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	9,546 cuft
Inflow hyds.	=	35, 36	Contrib. drain. area	=	0.510 ac

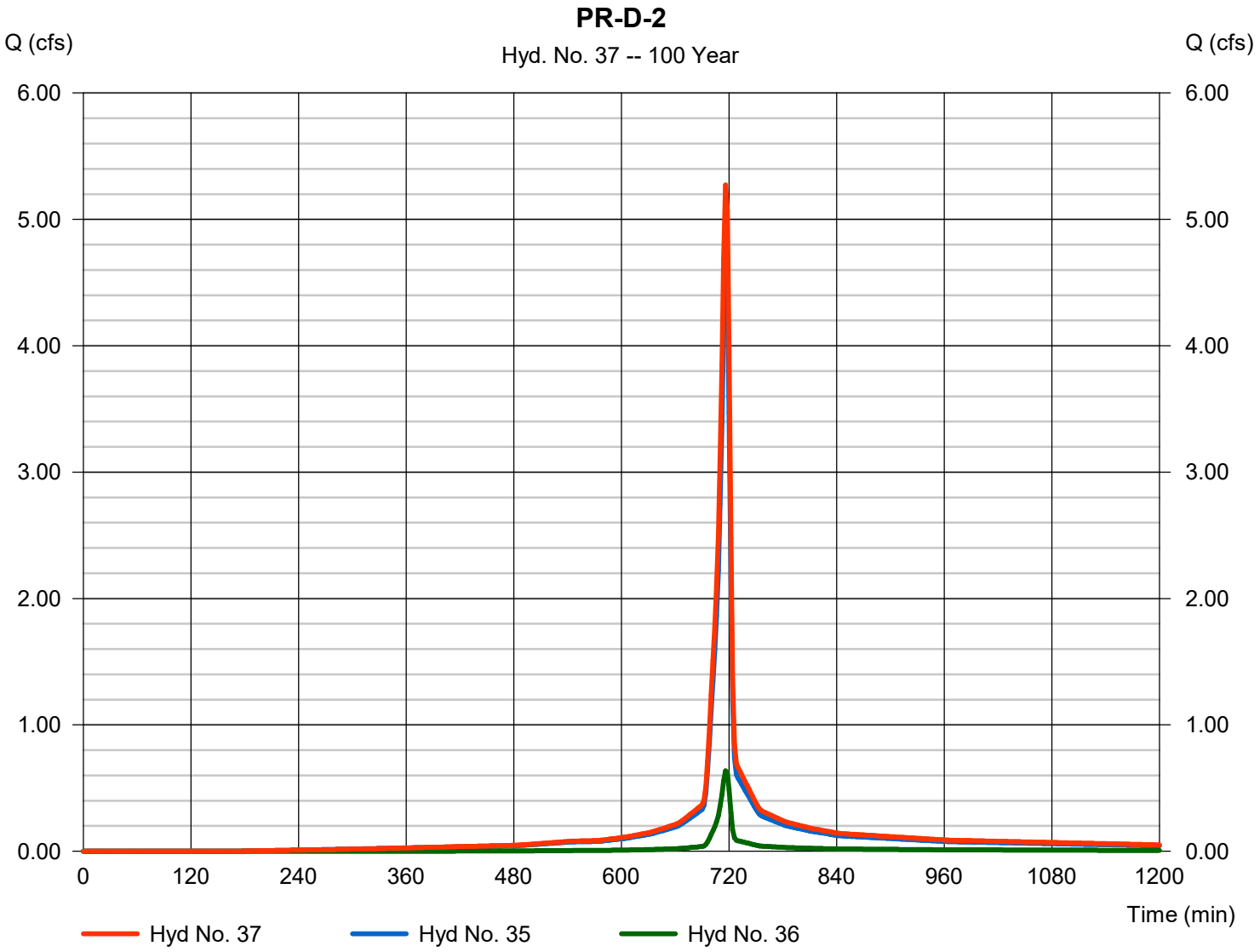


Hydrograph Report

Hyd. No. 37

PR-D-2

Hydrograph type	=	Combine	Peak discharge	=	5.271 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	11,567 cuft
Inflow hyds.	=	35, 36	Contrib. drain. area	=	0.510 ac



PR-D-3 WATERSHED

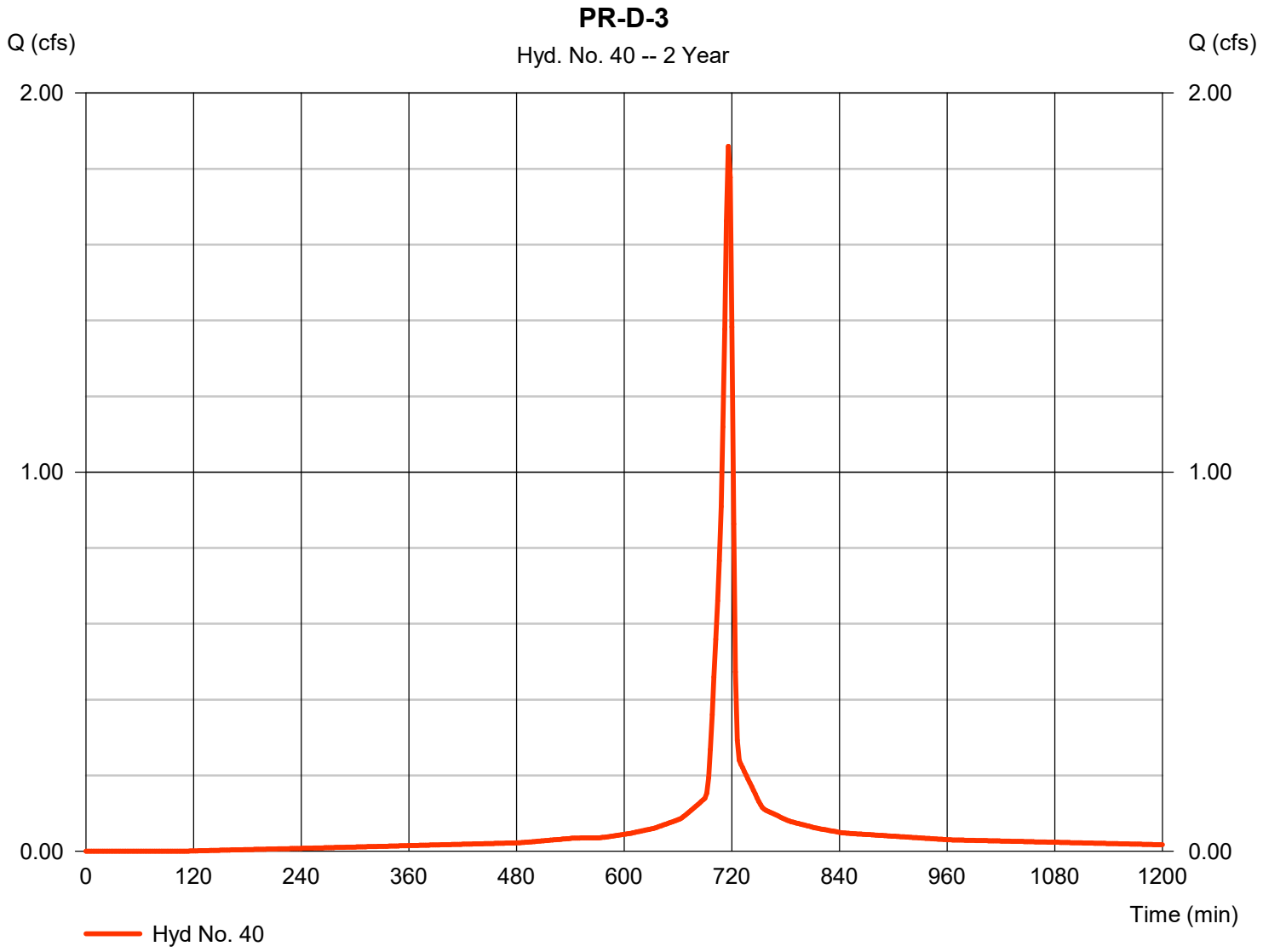
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 40

PR-D-3

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.859 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	4,253 cuft
Drainage area	=	0.420 ac	Curve number	=	97
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

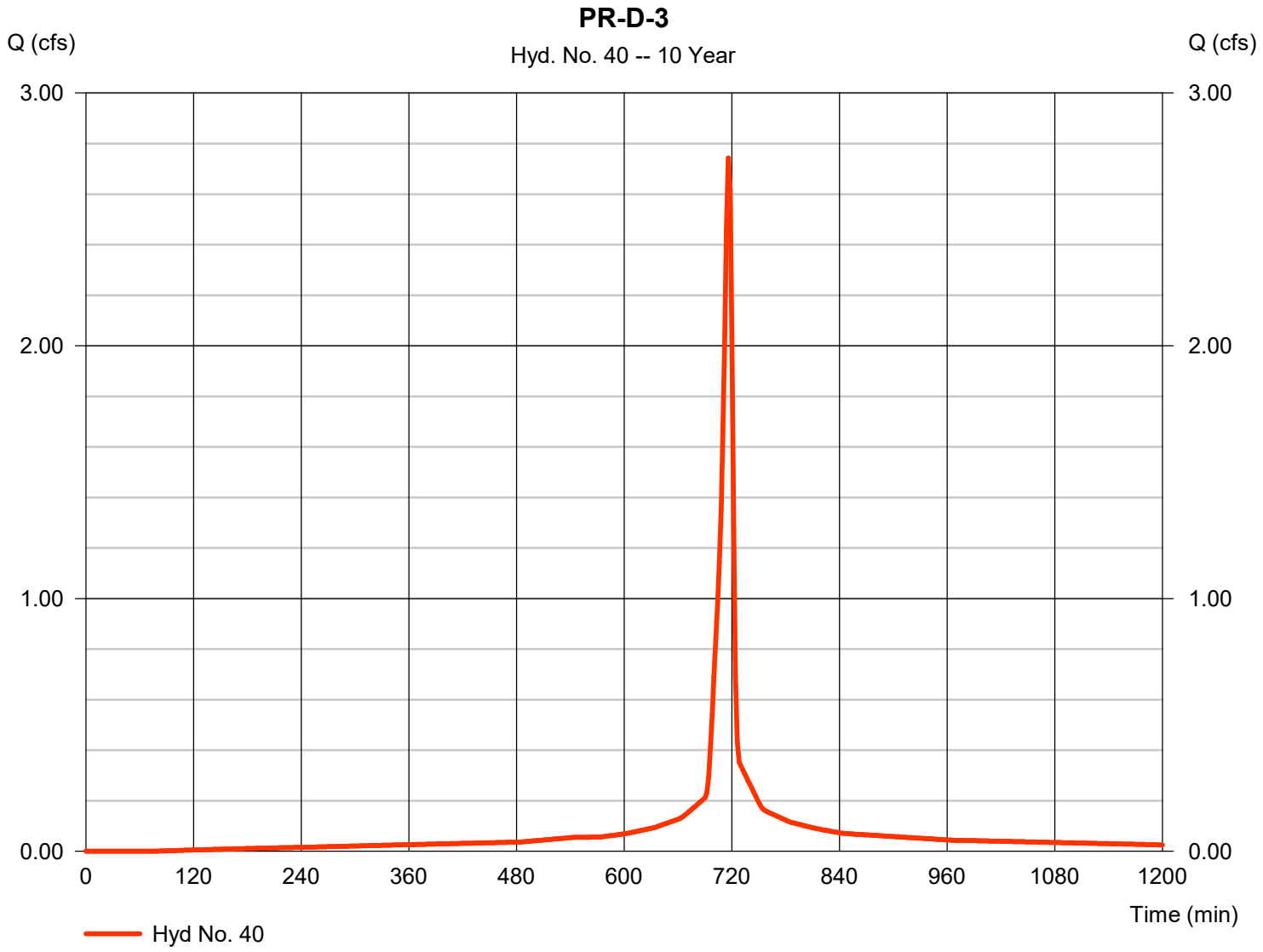


Hydrograph Report

Hyd. No. 40

PR-D-3

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.743 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	6,414 cuft
Drainage area	=	0.420 ac	Curve number	=	97
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

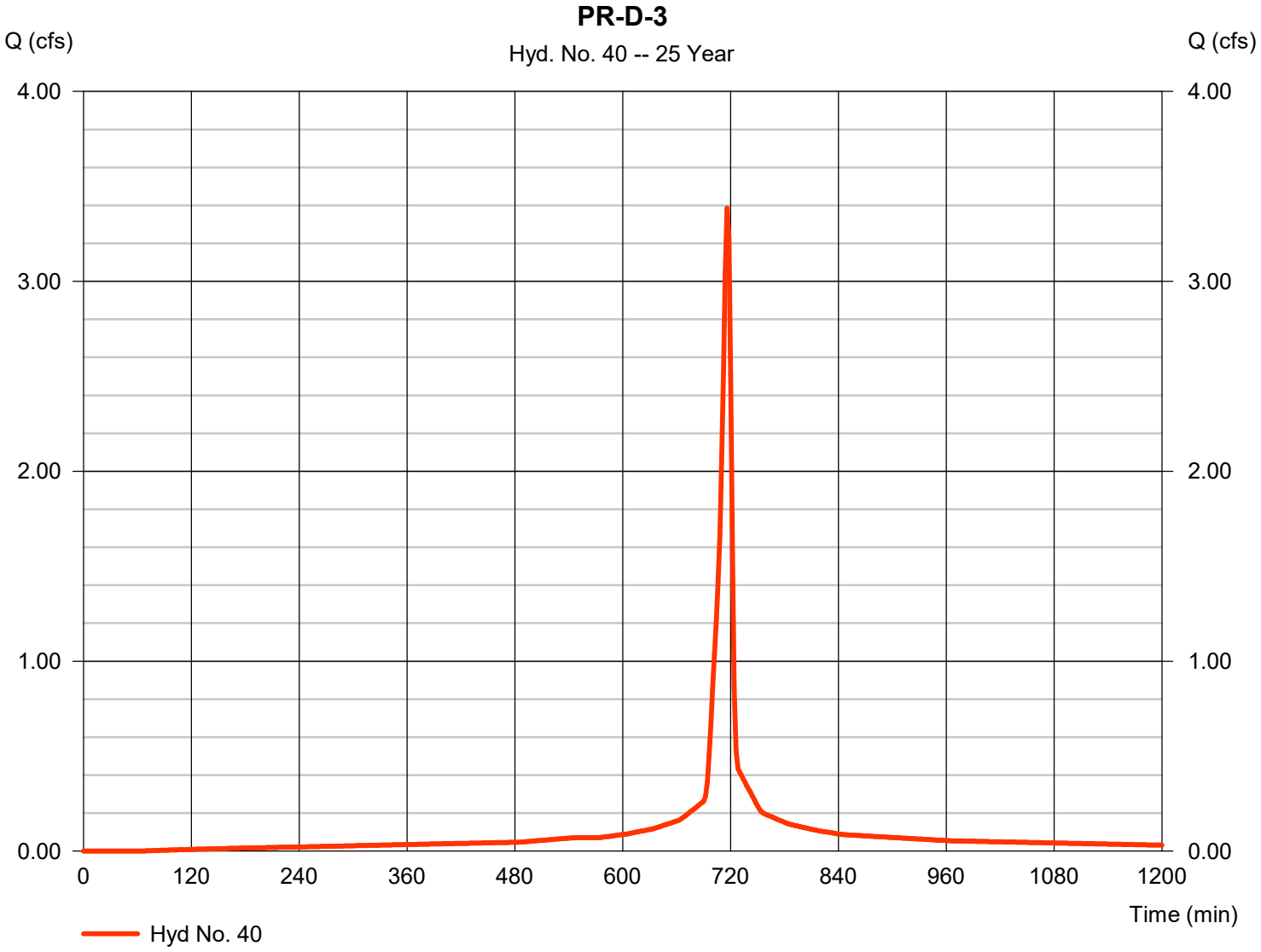


Hydrograph Report

Hyd. No. 40

PR-D-3

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.386 cfs
Storm frequency	=	25 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	7,996 cuft
Drainage area	=	0.420 ac	Curve number	=	97
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

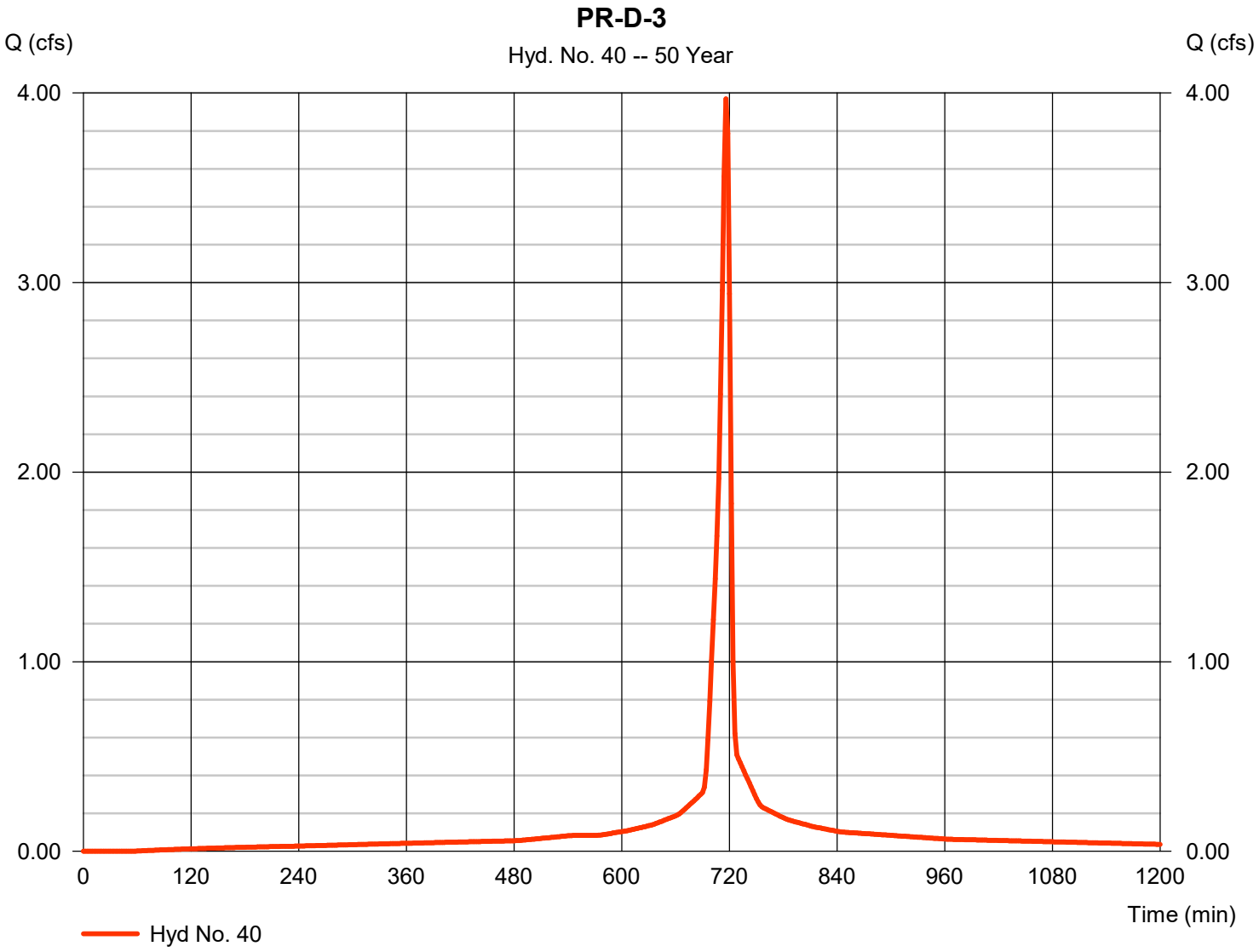


Hydrograph Report

Hyd. No. 40

PR-D-3

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.969 cfs
Storm frequency	=	50 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	9,437 cuft
Drainage area	=	0.420 ac	Curve number	=	97
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

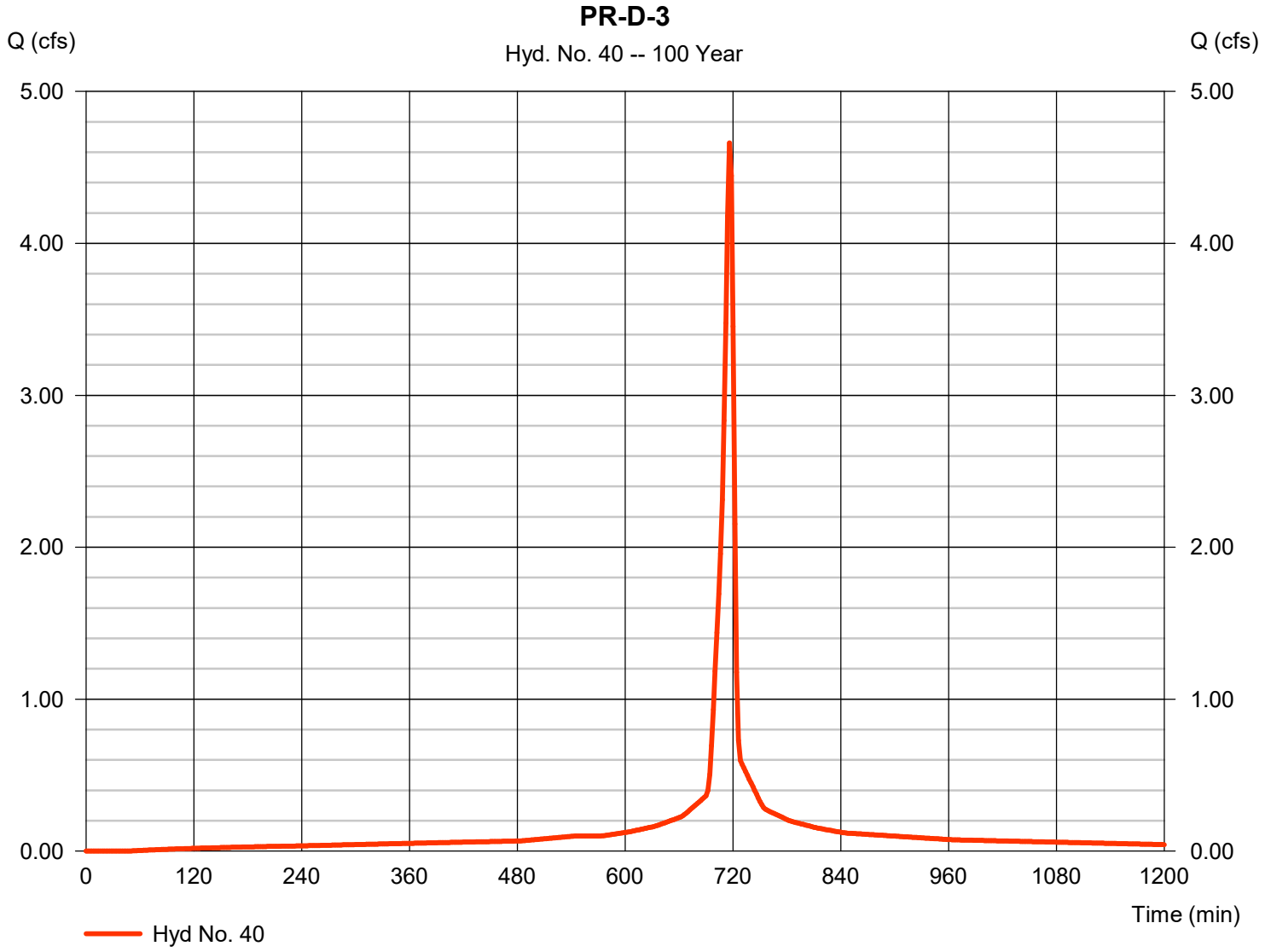


Hydrograph Report

Hyd. No. 40

PR-D-3

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.661 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	11,149 cuft
Drainage area	=	0.420 ac	Curve number	=	97
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



PR-D-4-ONSITE-DISTURBED WATERSHED

LANGAN

Langan Project #100748101

TR-55 TIME OF CONCENTRATION (Tc) OR TRAVEL TIME (Tt) CALCULATIONS

Project: Smithfield Gateway Phase 1A-2 **By:** TEG **Date:** 2/9/2023
Location: Smithfield Township, Monroe County, PA **Checked:** TH **Date:** 2/9/2023
Watershed: PR-D-4-ONSITE-DISTURBED

Sheet Flow (Applicable to Tc only)														
1	Surface Description (table 3-1)		Grass											
2	Manning's roughness coeff., n (table 3-1)		0.240											
3	Flow length, L (total L<100 ft)	**ft**	50											
4	Two-yr 24-hr rainfall, P2	**in**	3.32											
5	Land Slope, s	**ft/ft**	0.0450											
6	$Tt = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5}(s)^{.04}}$	**Compute Tt, hr**	0.0970	+		+		+		+		+	0.0970	hr
Shallow Concentrated Flow														
7	Surface Description (Paved or Unpaved)		Unpaved		Unpaved		Unpaved		Unpaved					
8	Flow length, L	**ft**	50		109		198		230					
9	Watercourse slope, s	**ft/ft**	0.0450		0.0100		0.0100		0.0900					
10	Average Velocity, V (figure 3-1)	**ft/sec**	3.42		1.61		1.61		4.84					
11	Tt = L / (3600V)	**Compute Tt , hr**	0.0041	+	0.0188	+	0.0341	+	0.0132	+		+	0.0701	hr
Channel / Pipe Flow														
12	Cross Sectional flow area, a	**ft^2**	1.57		1.57		0.88		0.88		1.57		1.57	
13	Wetted Perimeter, p_w	**ft**	3.10		3.10		2.40		2.40		3.10		3.10	
14	Hydraulic radius, $r = a/p_w$	**ft**	0.51		0.51		0.37		0.37		0.51		0.51	
15	Channel slope, s	**ft/ft**	0.0070		0.0108		0.0450		0.0200		0.0500		0.0300	
16	Manning's roughness coeff., n (table 3-1)		0.0130		0.0130		0.0130		0.0130		0.0130		0.0130	
17	$V = (1.49 * r^{2/3} * s^{1/2})/n$	**ft/s**	6.09		7.57		12.46		8.30		16.28		12.61	
18	Flow length, L	**ft**	145		58		68		9		133		43	
19	Tt = L / (3600V)	**Compute Tt , hr**	0.0066	+	0.0021	+	0.0015	+	0.0003	+	0.0023	+	0.0009	
													0.0138	hr
20	**Watershed or subarea Tc or Tt (add Tt in steps 6,11, and 19)**												0.18	hr
													10.9	**min**

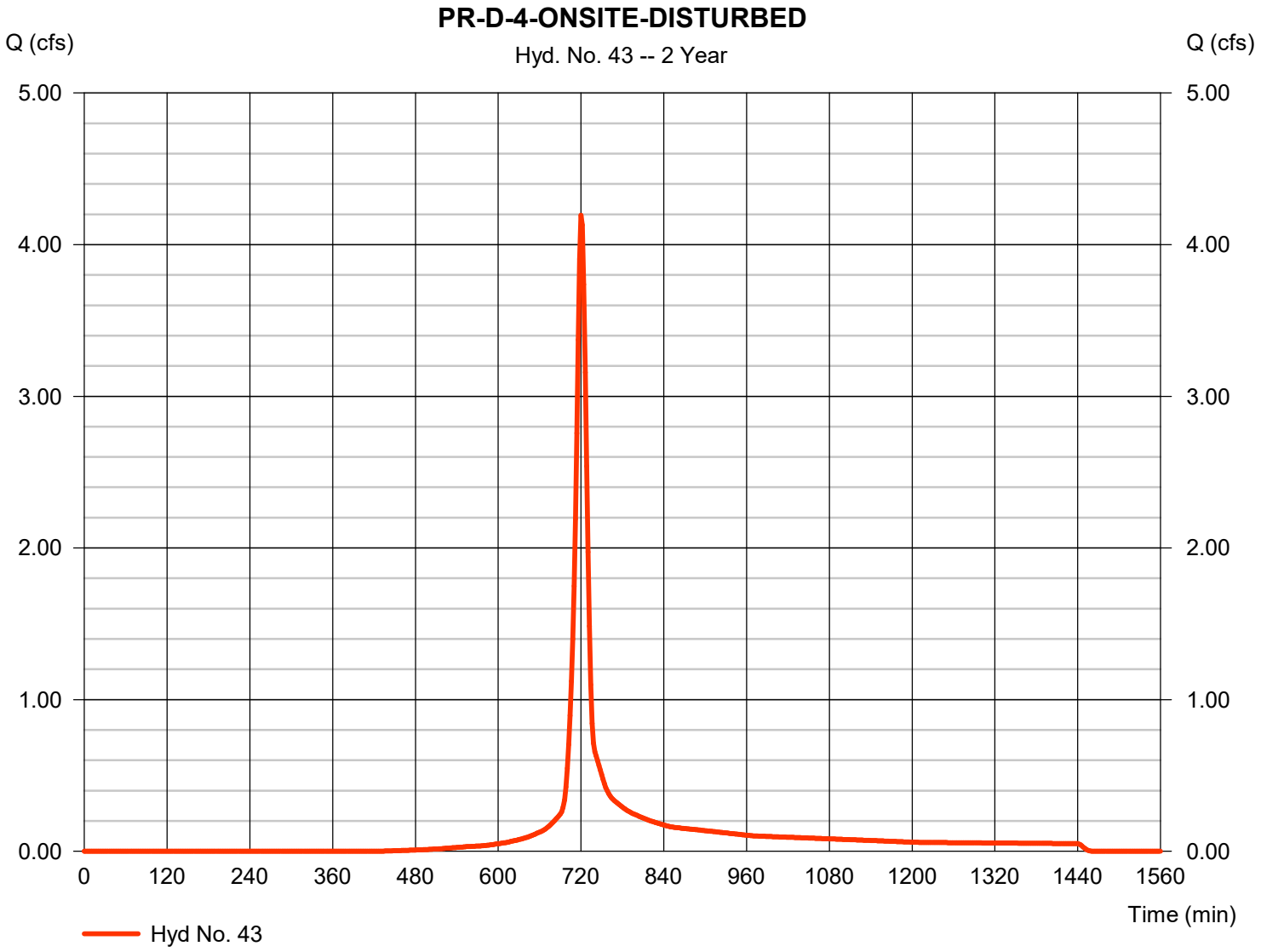
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 43

PR-D-4-ONSITE-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.194 cfs
Storm frequency	=	2 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	10,892 cuft
Drainage area	=	1.500 ac	Curve number	=	86
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.60 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

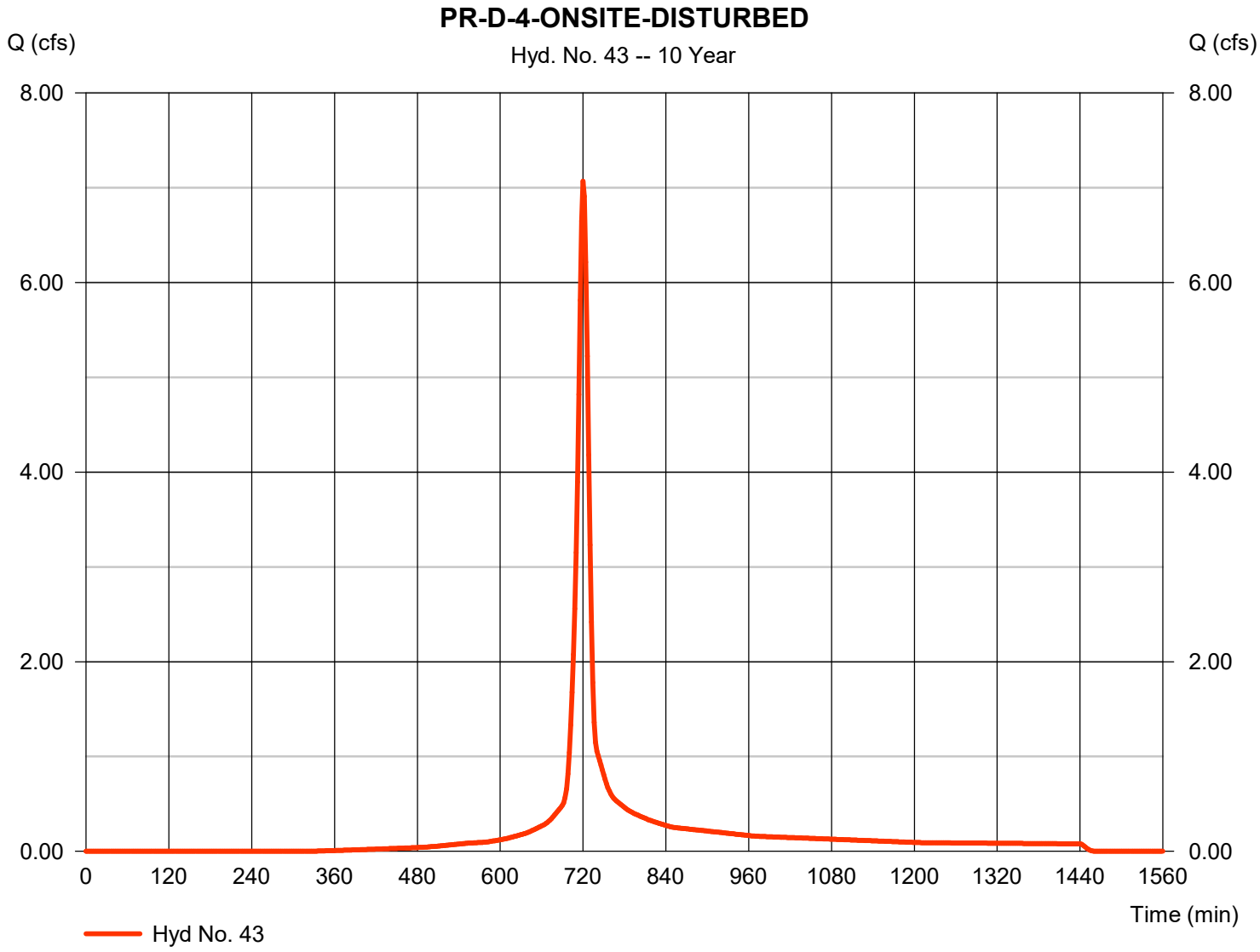


Hydrograph Report

Hyd. No. 43

PR-D-4-ONSITE-DISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 7.071 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 18,631 cuft
Drainage area	= 1.500 ac	Curve number	= 86
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.60 min
Total precip.	= 4.84 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

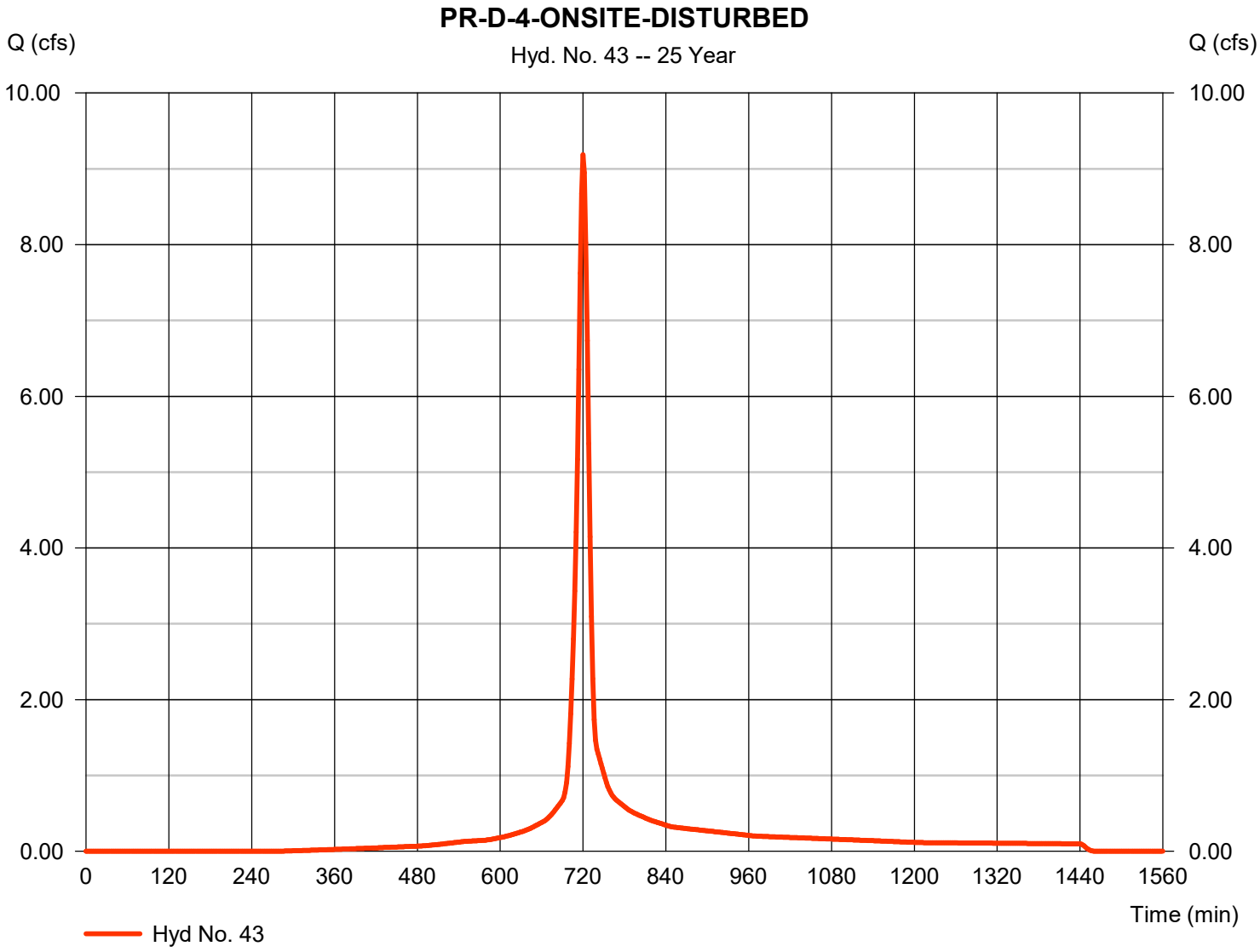


Hydrograph Report

Hyd. No. 43

PR-D-4-ONSITE-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.188 cfs
Storm frequency	=	25 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	24,493 cuft
Drainage area	=	1.500 ac	Curve number	=	86
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.60 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

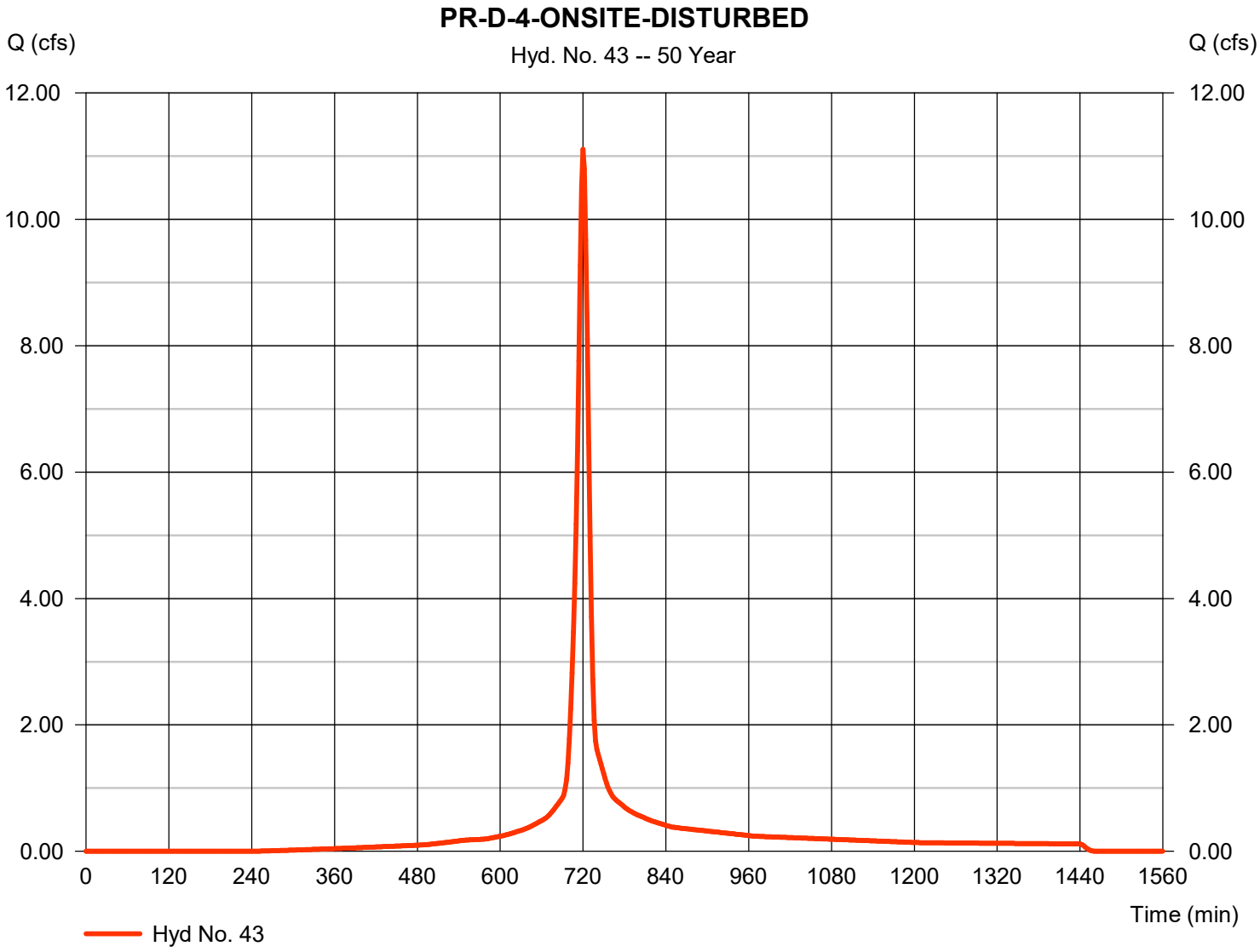


Hydrograph Report

Hyd. No. 43

PR-D-4-ONSITE-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.11 cfs
Storm frequency	=	50 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	29,913 cuft
Drainage area	=	1.500 ac	Curve number	=	86
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.60 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

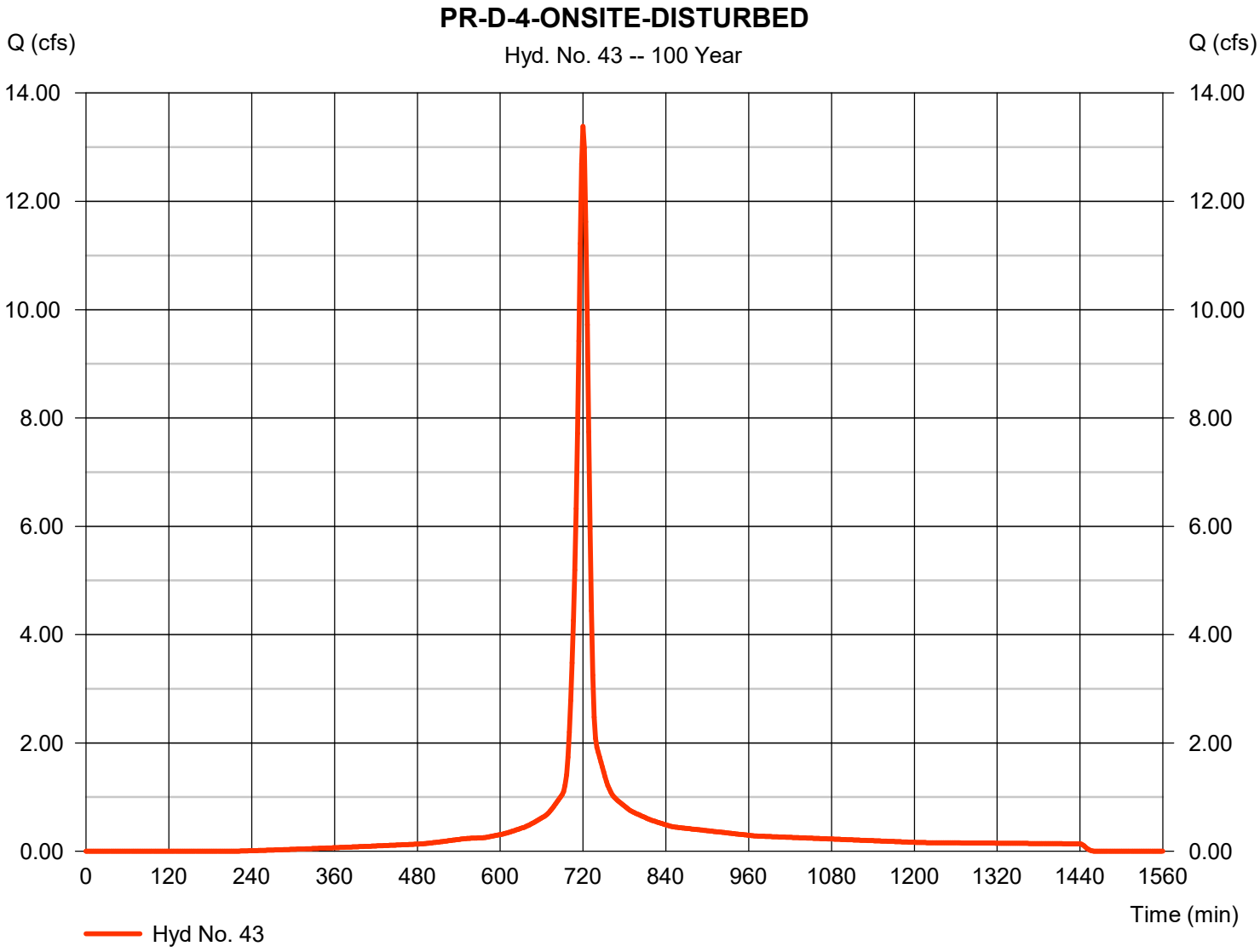


Hydrograph Report

Hyd. No. 43

PR-D-4-ONSITE-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	13.38 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	36,423 cuft
Drainage area	=	1.500 ac	Curve number	=	86
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.60 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



PR-D-4-ONSITE-UNDISTURBED WATERSHED

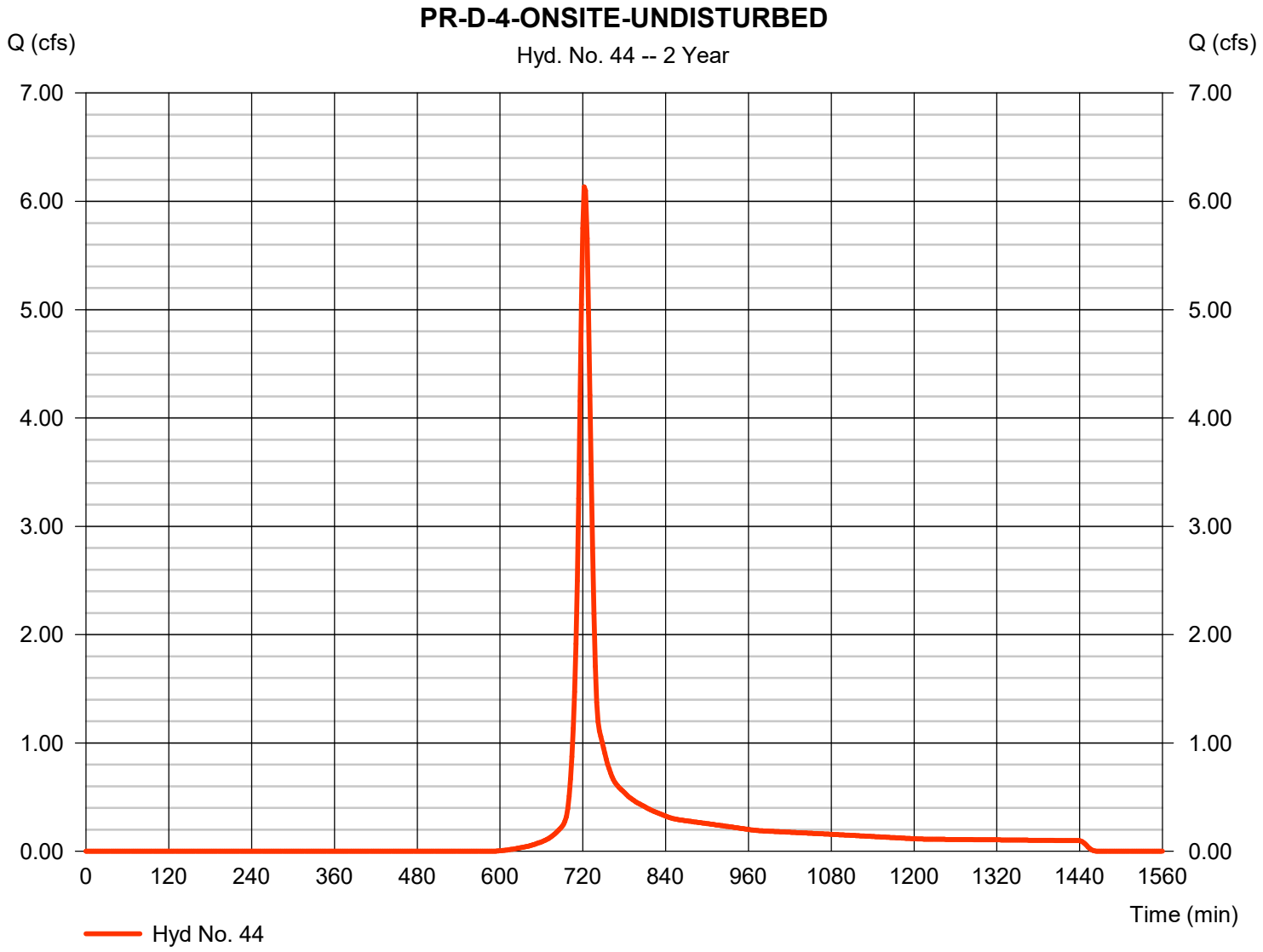
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 44

PR-D-4-ONSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 6.134 cfs
Storm frequency	= 2 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 17,450 cuft
Drainage area	= 3.620 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 14.60 min
Total precip.	= 3.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

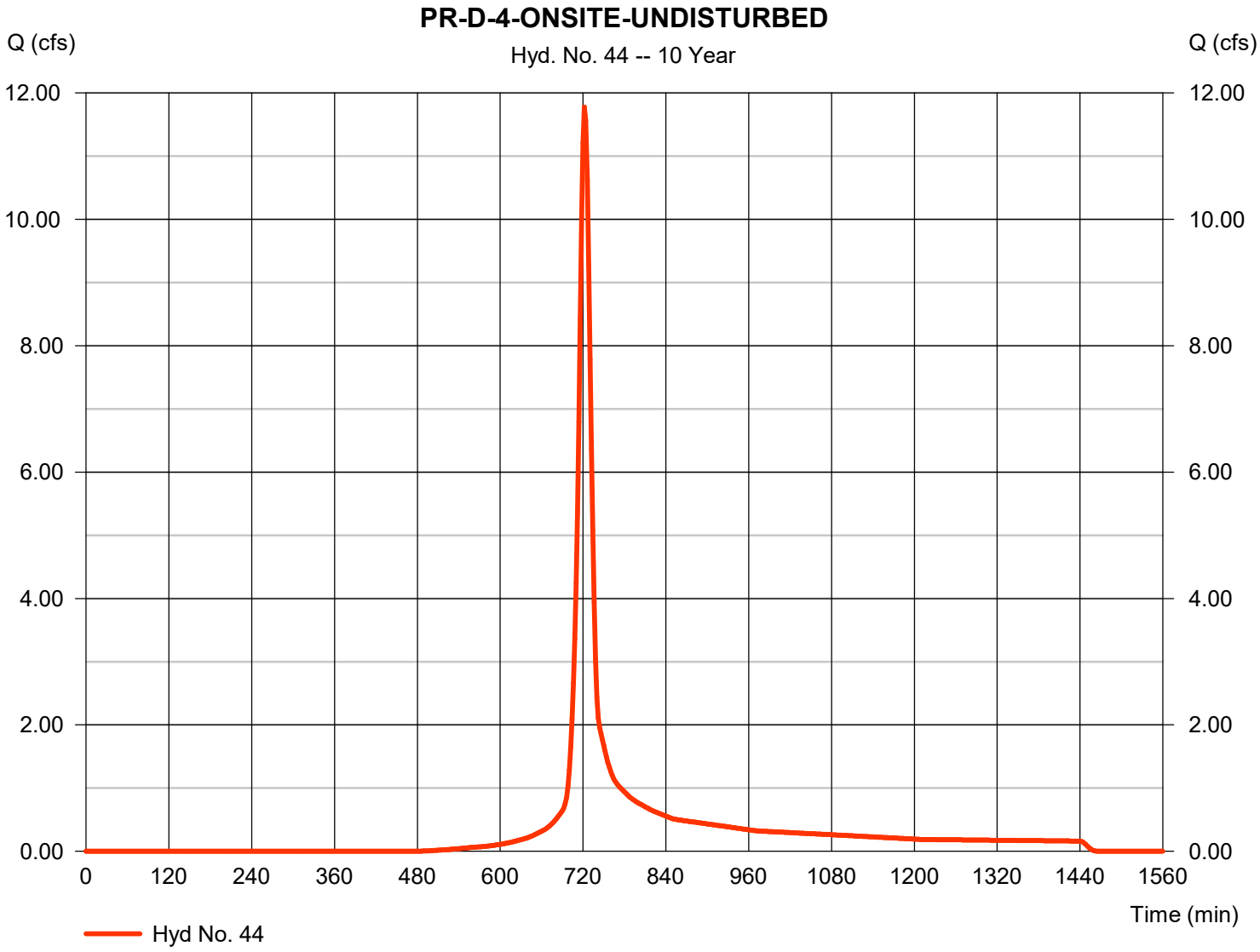


Hydrograph Report

Hyd. No. 44

PR-D-4-ONSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 11.78 cfs
Storm frequency	= 10 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 33,009 cuft
Drainage area	= 3.620 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 14.60 min
Total precip.	= 4.84 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

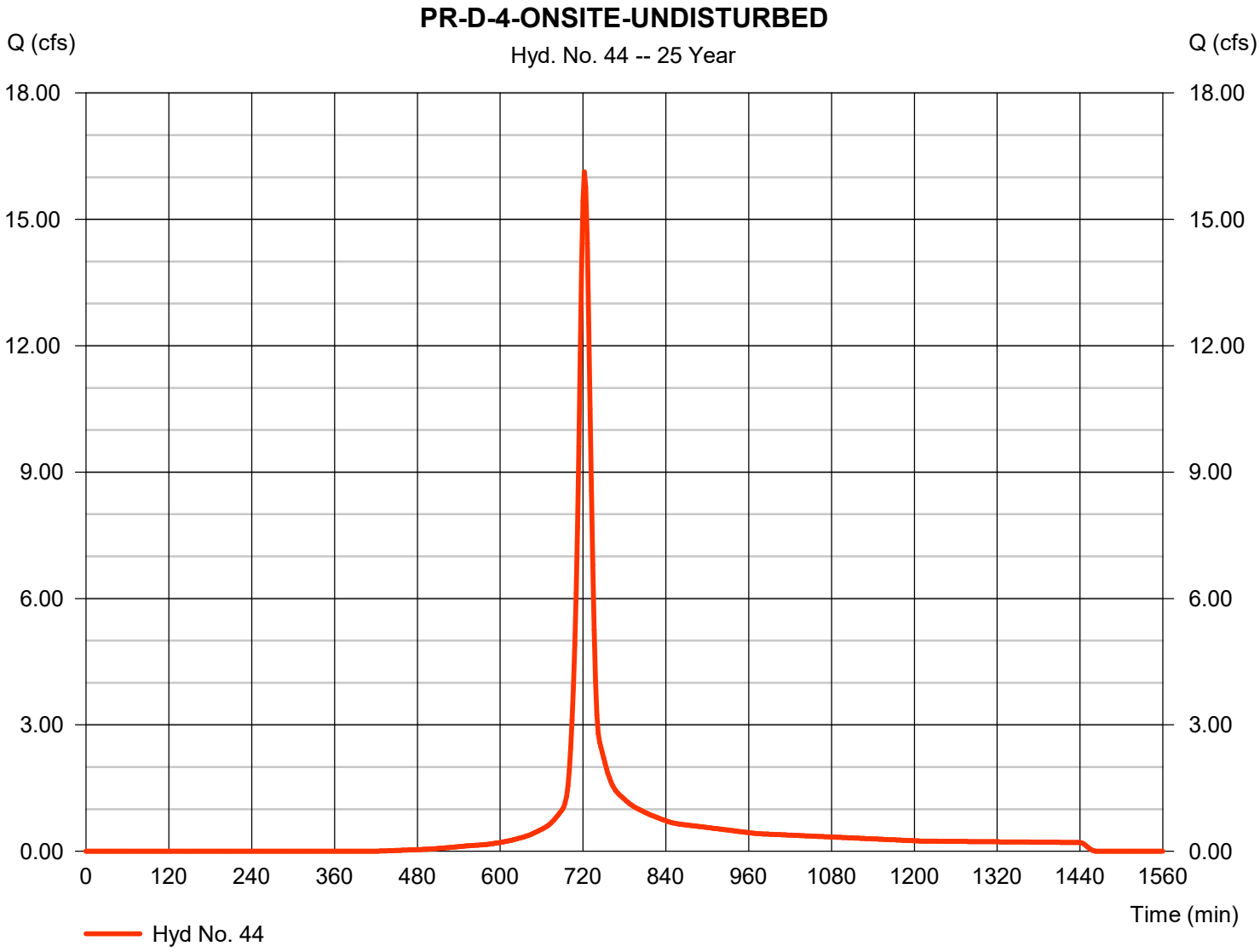


Hydrograph Report

Hyd. No. 44

PR-D-4-ONSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 16.12 cfs
Storm frequency	= 25 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 45,288 cuft
Drainage area	= 3.620 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 14.60 min
Total precip.	= 5.95 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

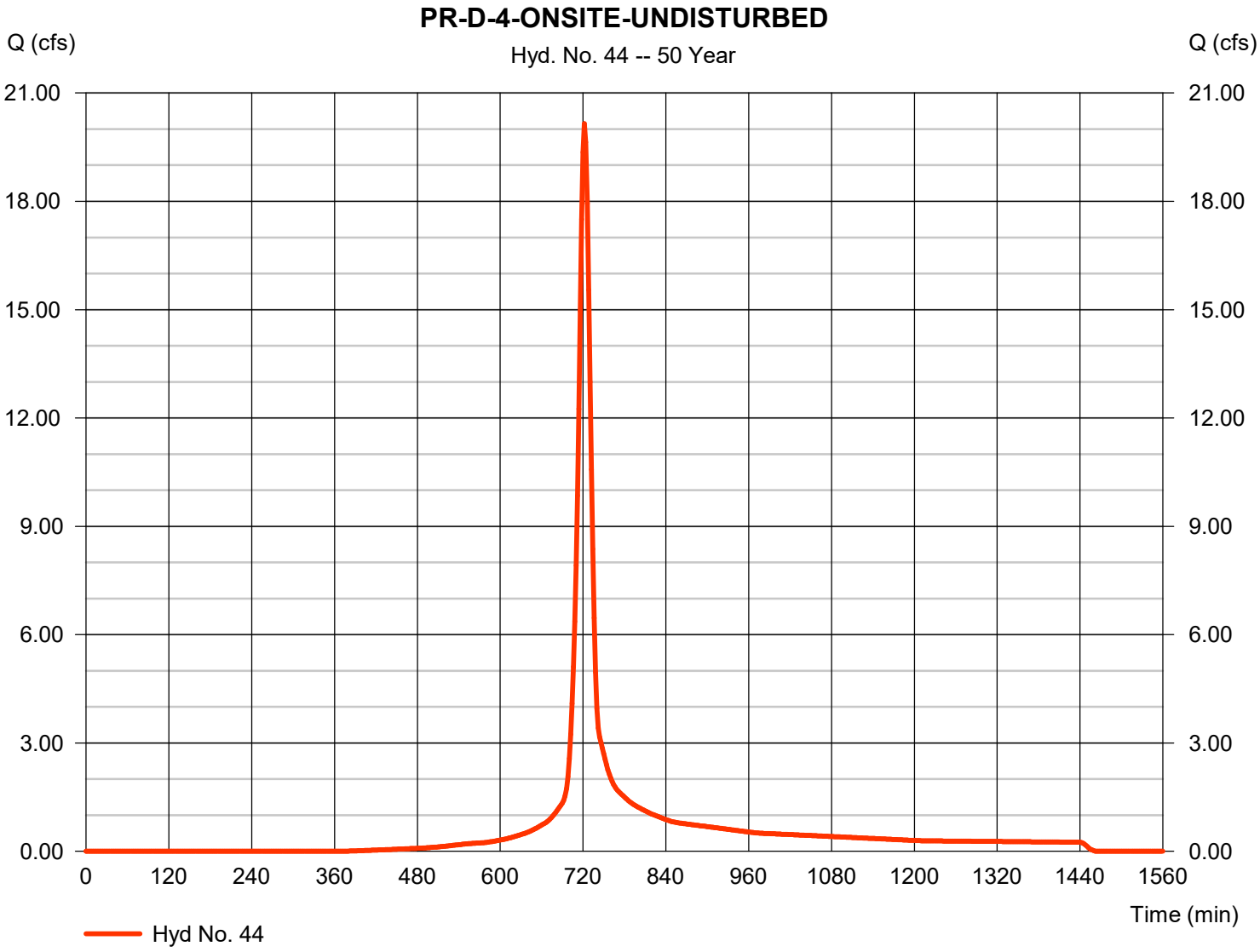


Hydrograph Report

Hyd. No. 44

PR-D-4-ONSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 20.15 cfs
Storm frequency	= 50 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 56,867 cuft
Drainage area	= 3.620 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 14.60 min
Total precip.	= 6.96 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

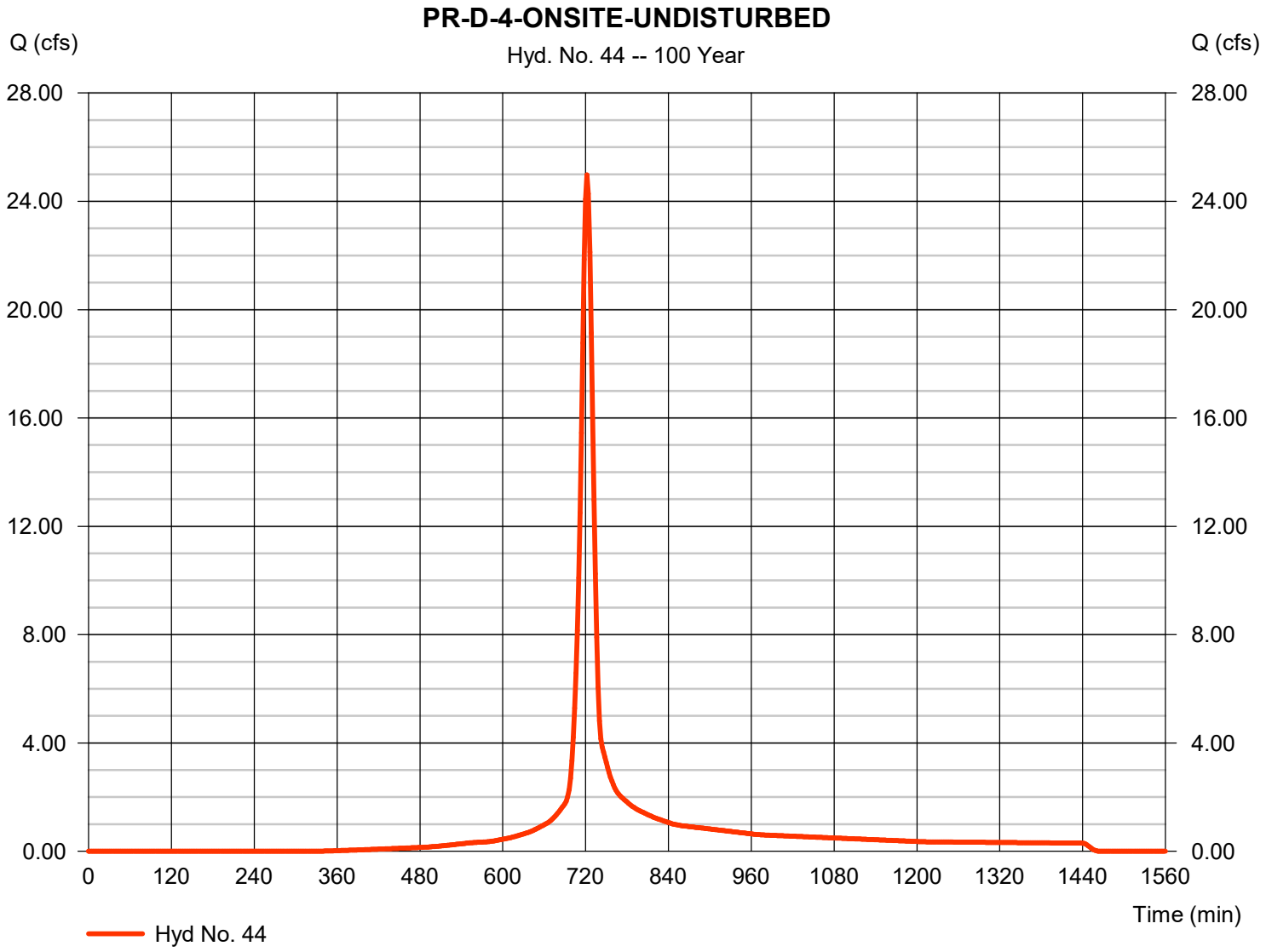


Hydrograph Report

Hyd. No. 44

PR-D-4-ONSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 24.98 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 70,968 cuft
Drainage area	= 3.620 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 14.60 min
Total precip.	= 8.16 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



PR-D-4-OFFSITE-DISTURBED WATERSHED

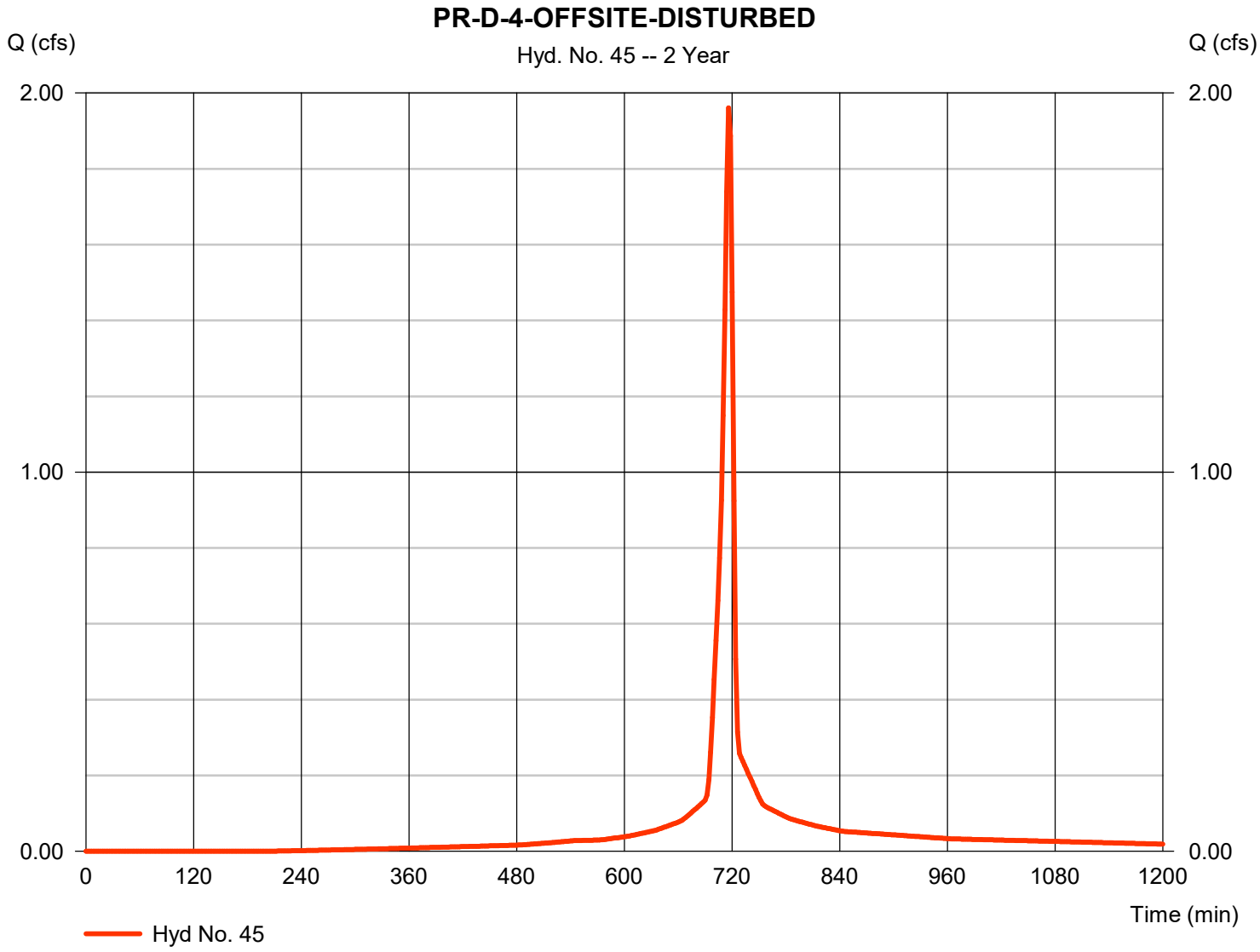
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 45

PR-D-4-OFFSITE-DISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 1.961 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 4,255 cuft
Drainage area	= 0.470 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

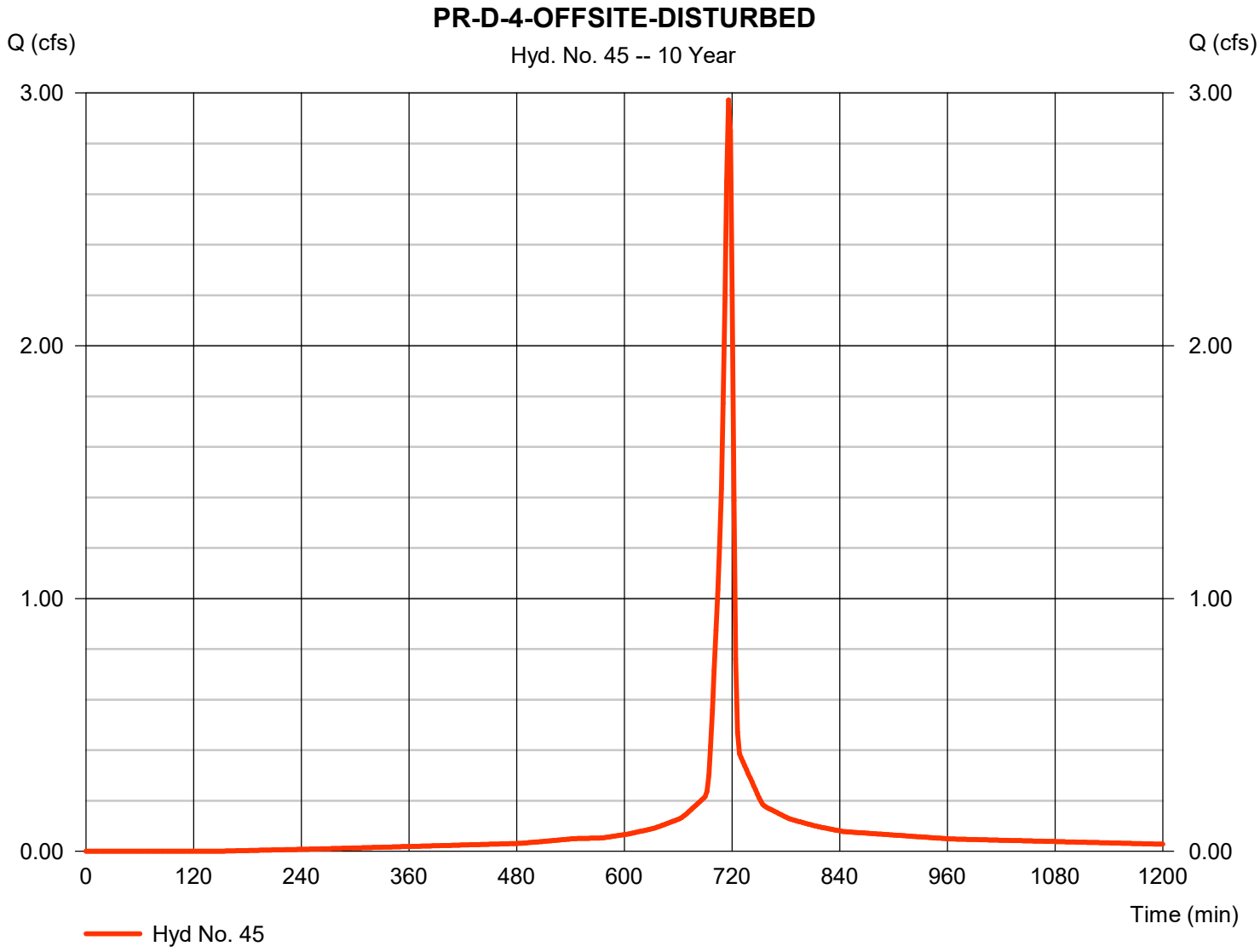


Hydrograph Report

Hyd. No. 45

PR-D-4-OFFSITE-DISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 2.972 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 6,638 cuft
Drainage area	= 0.470 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 4.84 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

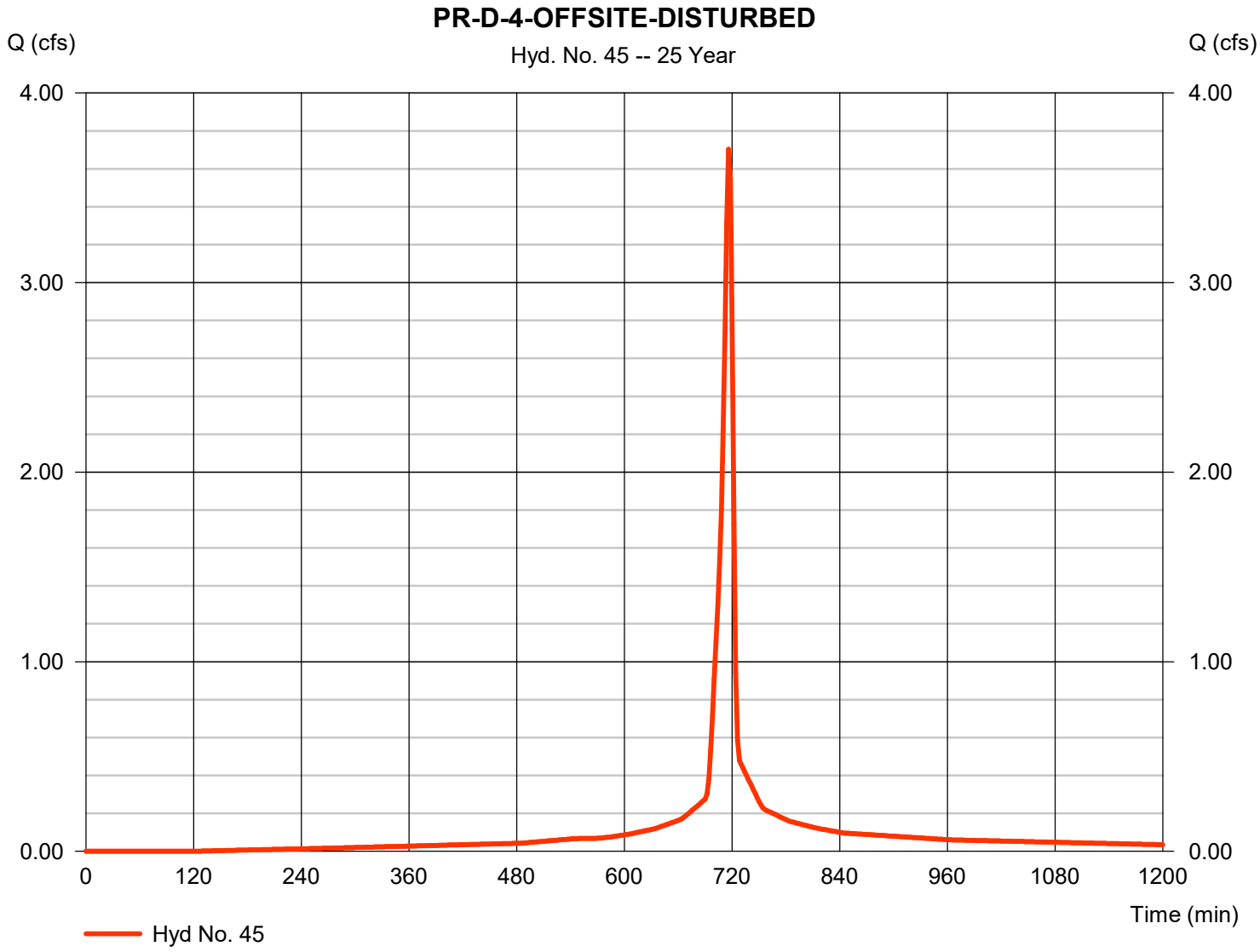


Hydrograph Report

Hyd. No. 45

PR-D-4-OFFSITE-DISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 3.703 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 8,393 cuft
Drainage area	= 0.470 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 5.95 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

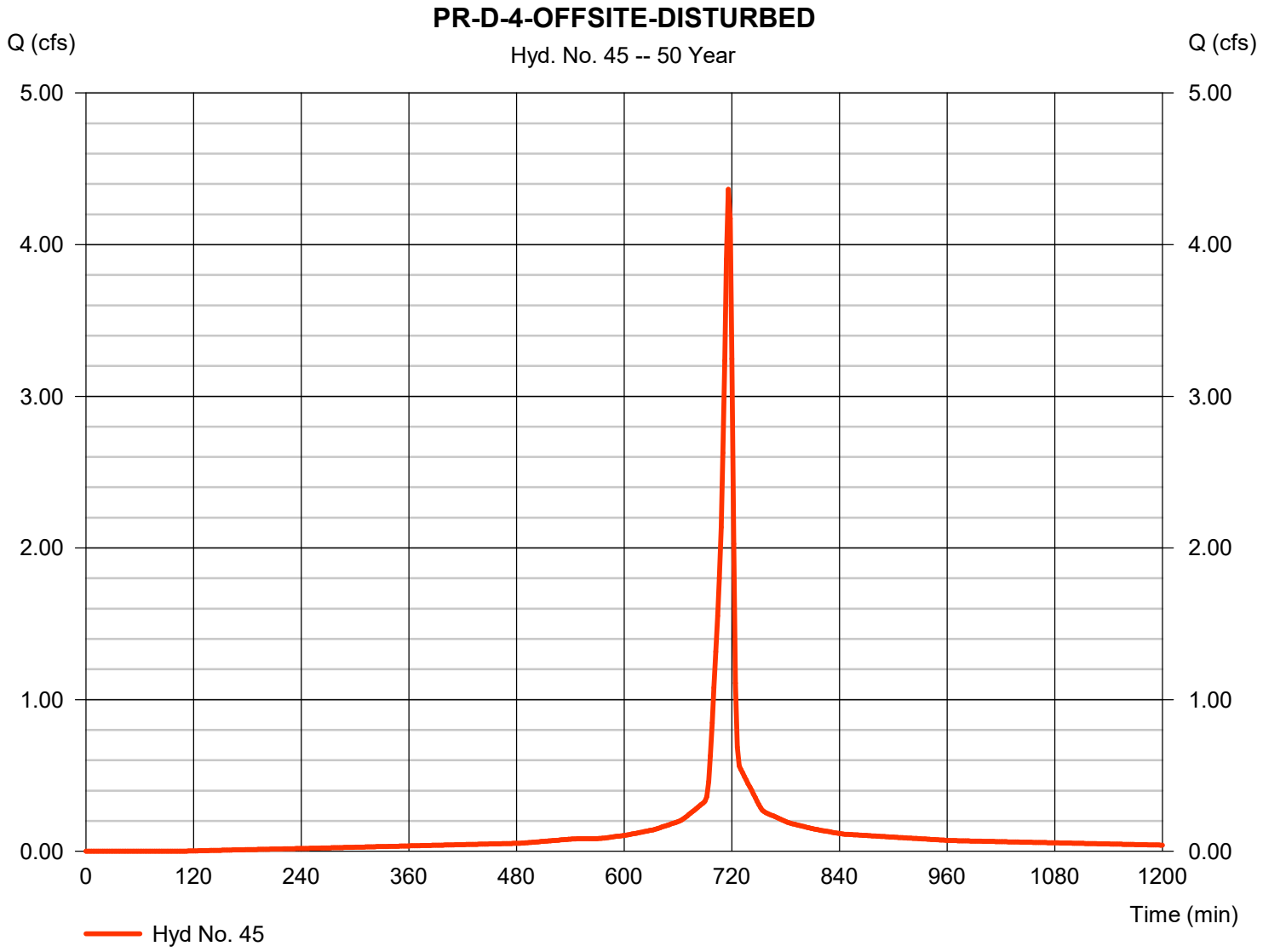


Hydrograph Report

Hyd. No. 45

PR-D-4-OFFSITE-DISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 4.364 cfs
Storm frequency	= 50 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 9,994 cuft
Drainage area	= 0.470 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 6.96 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

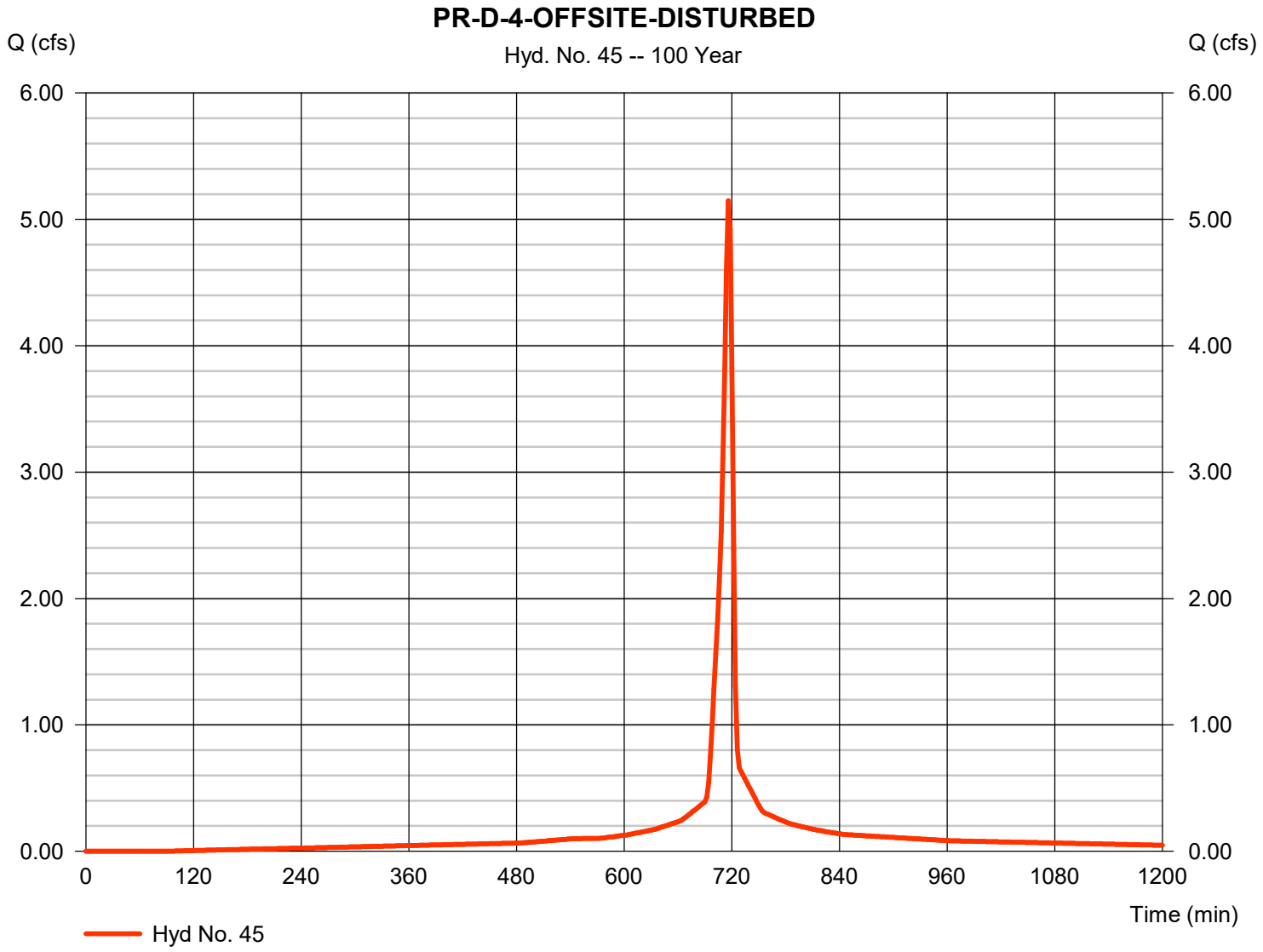


Hydrograph Report

Hyd. No. 45

PR-D-4-OFFSITE-DISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 5.147 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 11,902 cuft
Drainage area	= 0.470 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 8.16 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



PR-D-4-OFFSITE-UNDISTURBED WATERSHED

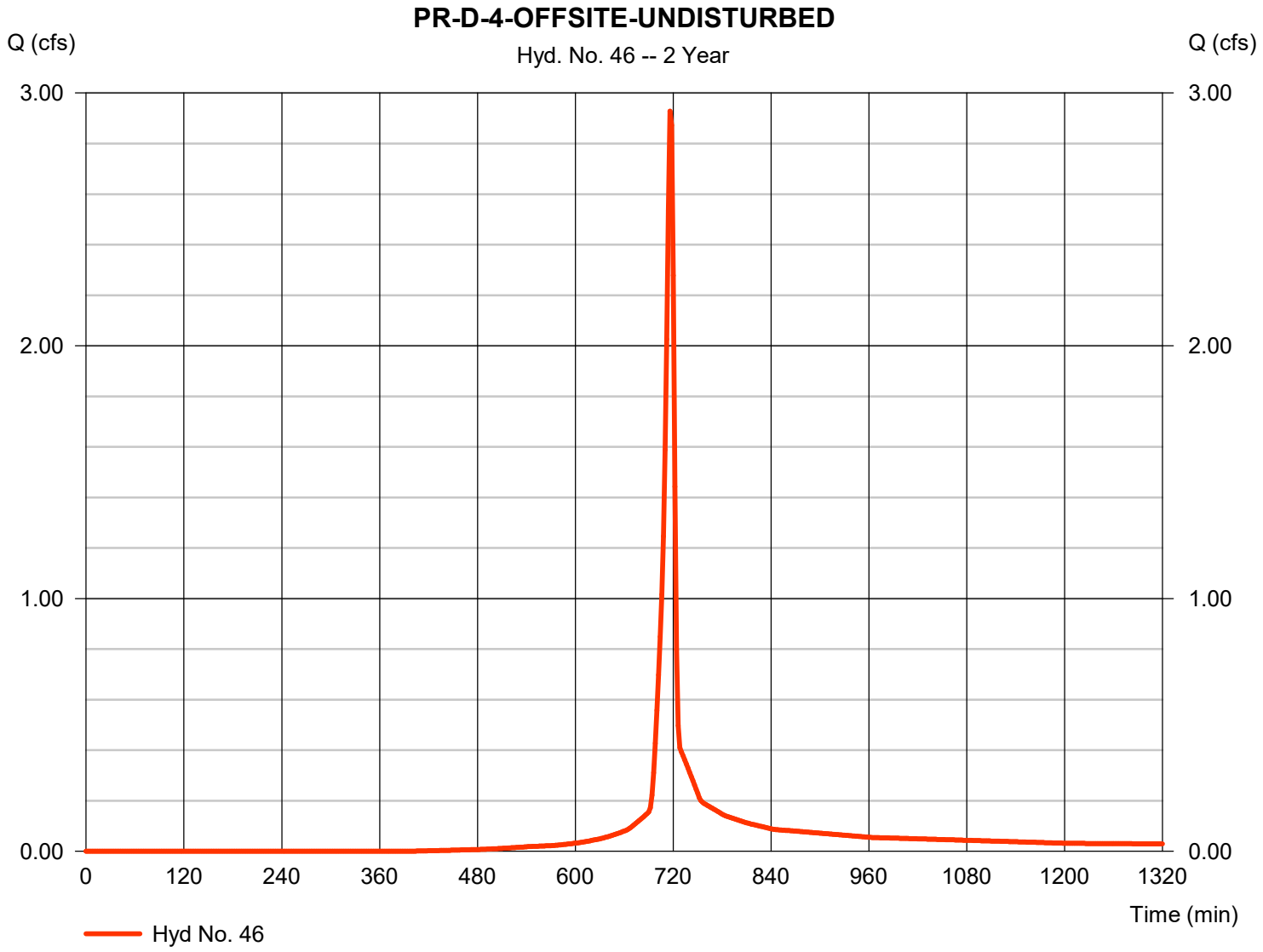
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 46

PR-D-4-OFFSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 2.928 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 5,985 cuft
Drainage area	= 0.870 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

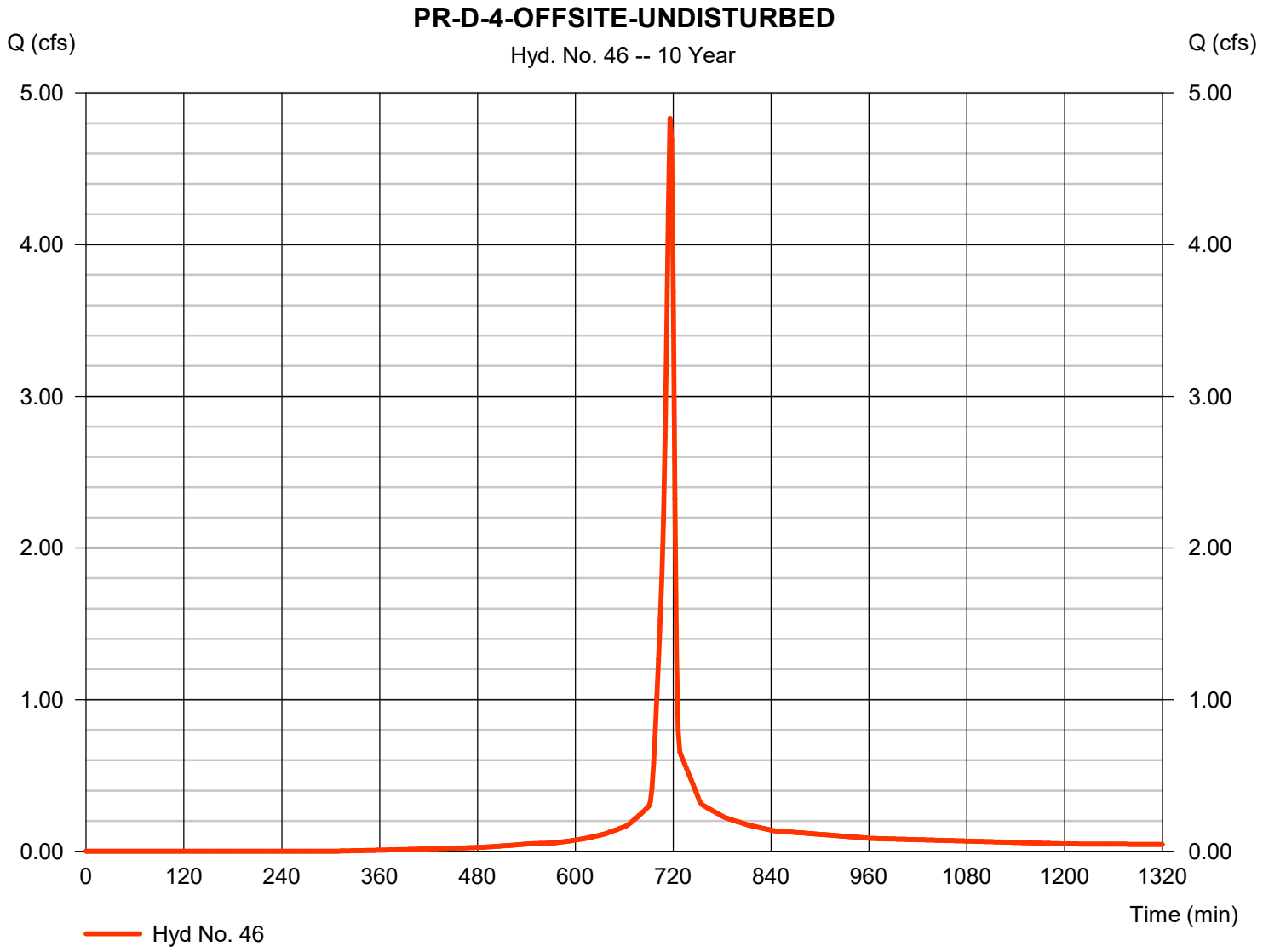


Hydrograph Report

Hyd. No. 46

PR-D-4-OFFSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 4.834 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 10,116 cuft
Drainage area	= 0.870 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 4.84 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

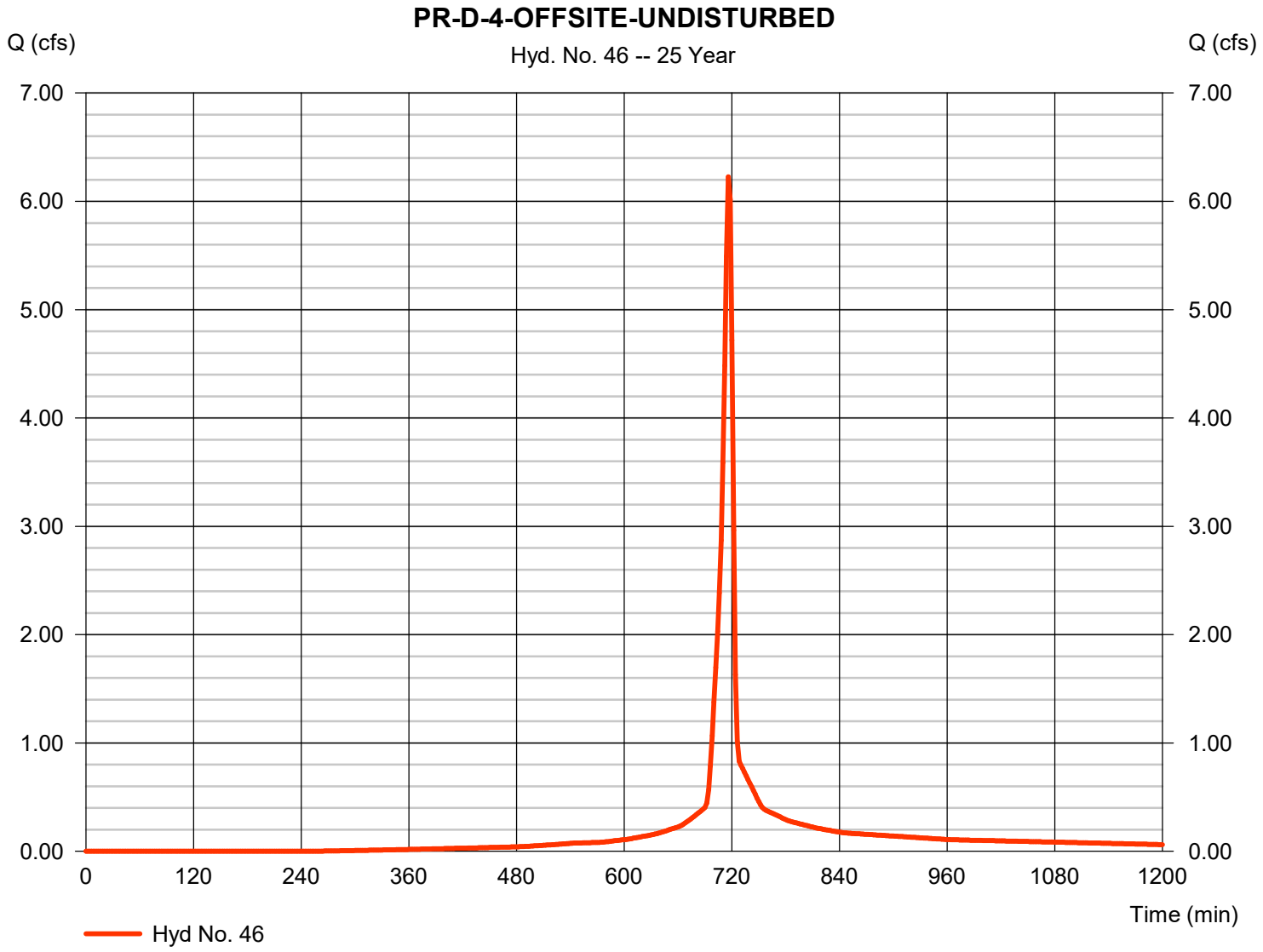


Hydrograph Report

Hyd. No. 46

PR-D-4-OFFSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 6.227 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 13,233 cuft
Drainage area	= 0.870 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 5.95 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

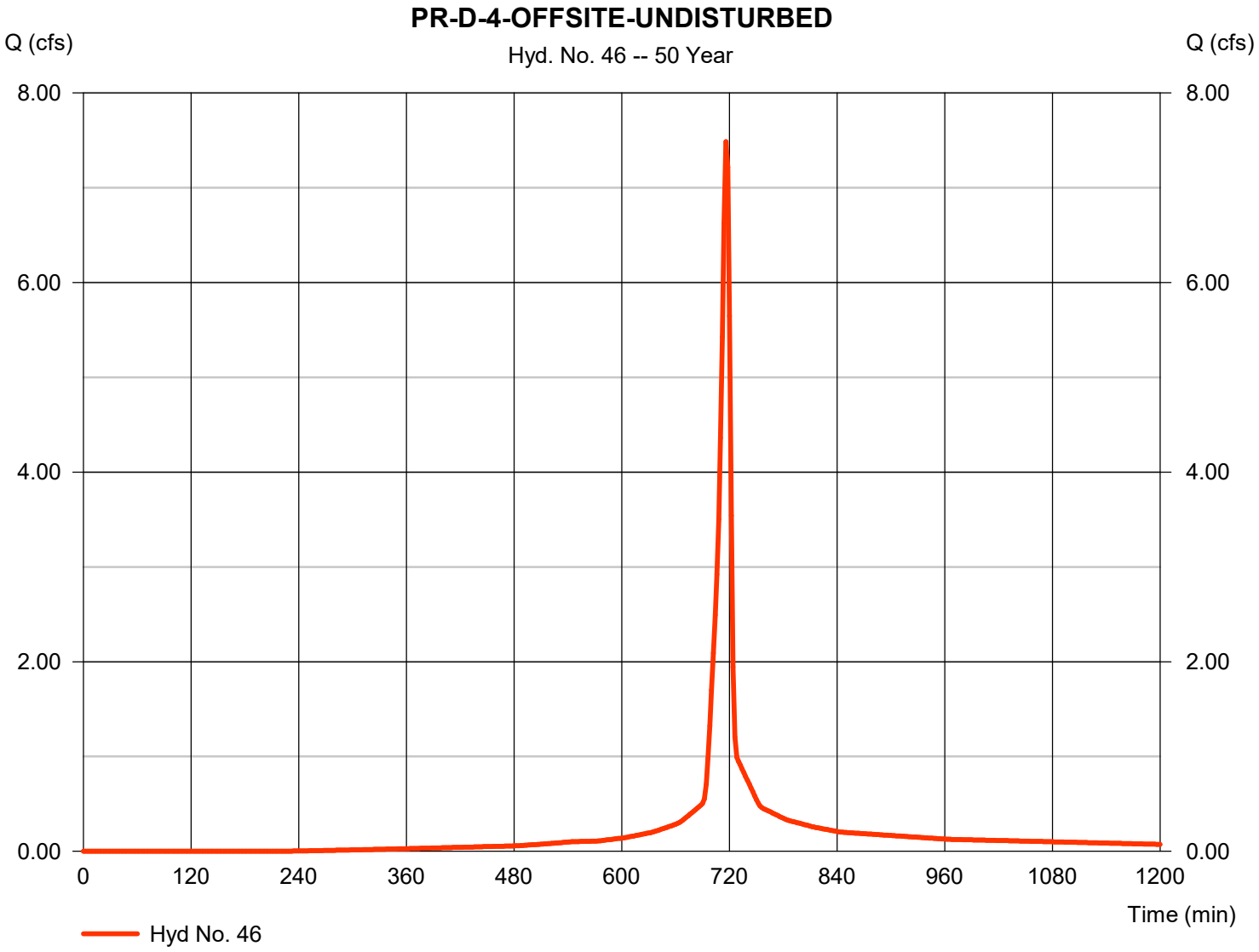


Hydrograph Report

Hyd. No. 46

PR-D-4-OFFSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 7.488 cfs
Storm frequency	= 50 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 16,108 cuft
Drainage area	= 0.870 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 6.96 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

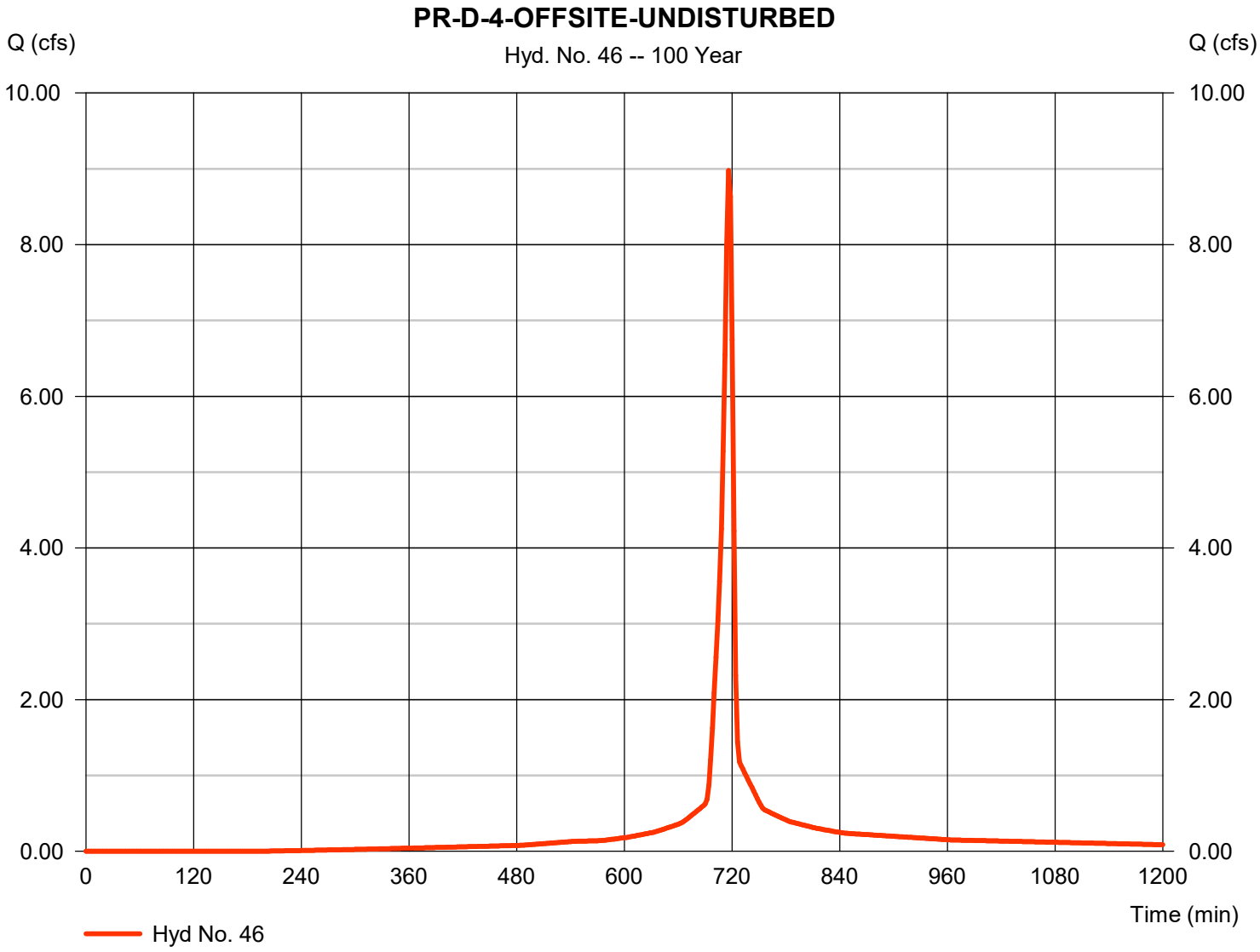


Hydrograph Report

Hyd. No. 46

PR-D-4-OFFSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 8.978 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 19,557 cuft
Drainage area	= 0.870 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 8.16 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



TOTAL PROPOSED FLOW TO POA-D-1

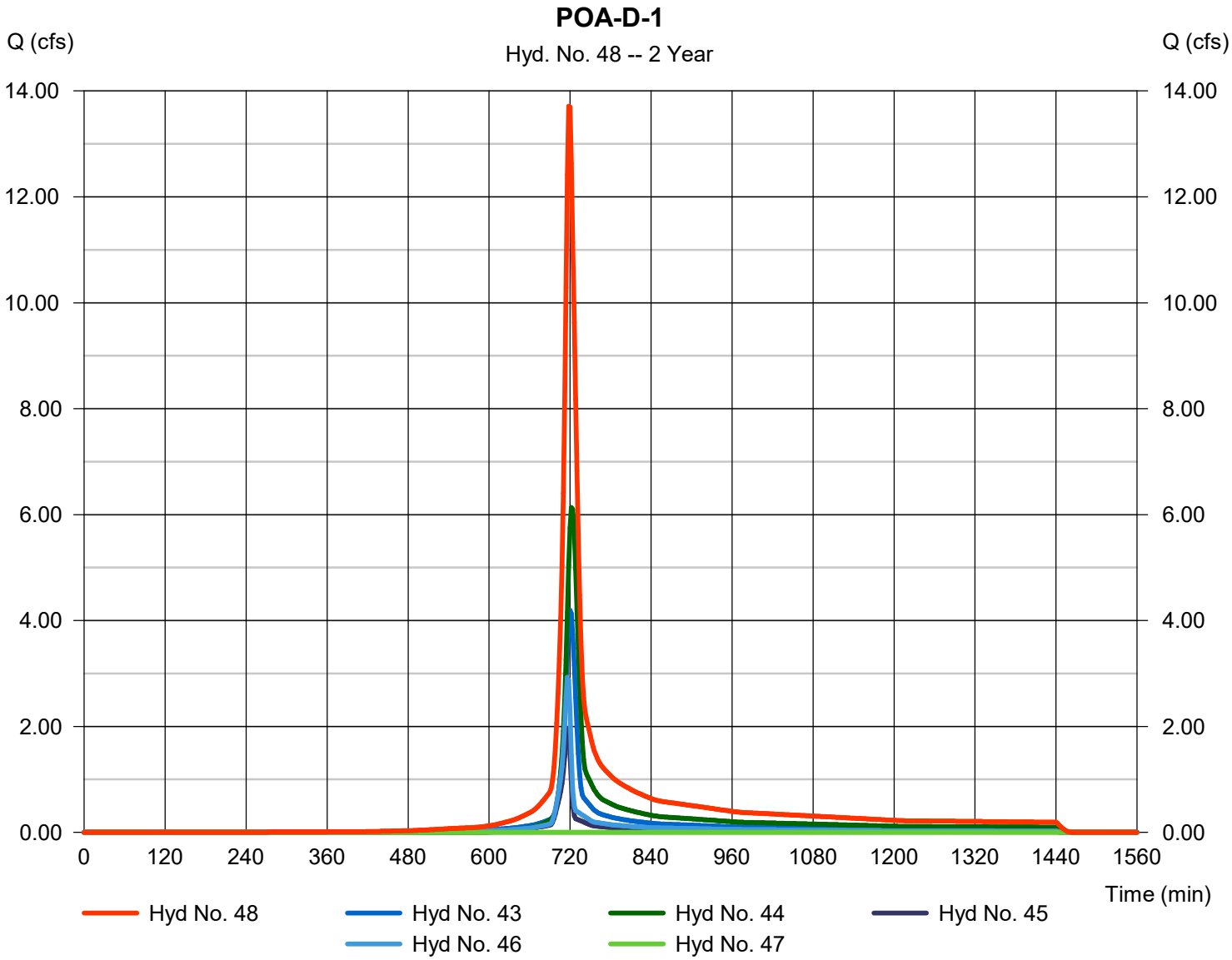
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 48

POA-D-1

Hydrograph type	= Combine	Peak discharge	= 13.71 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 38,582 cuft
Inflow hyds.	= 43, 44, 45, 46, 47	Contrib. drain. area	= 6.460 ac

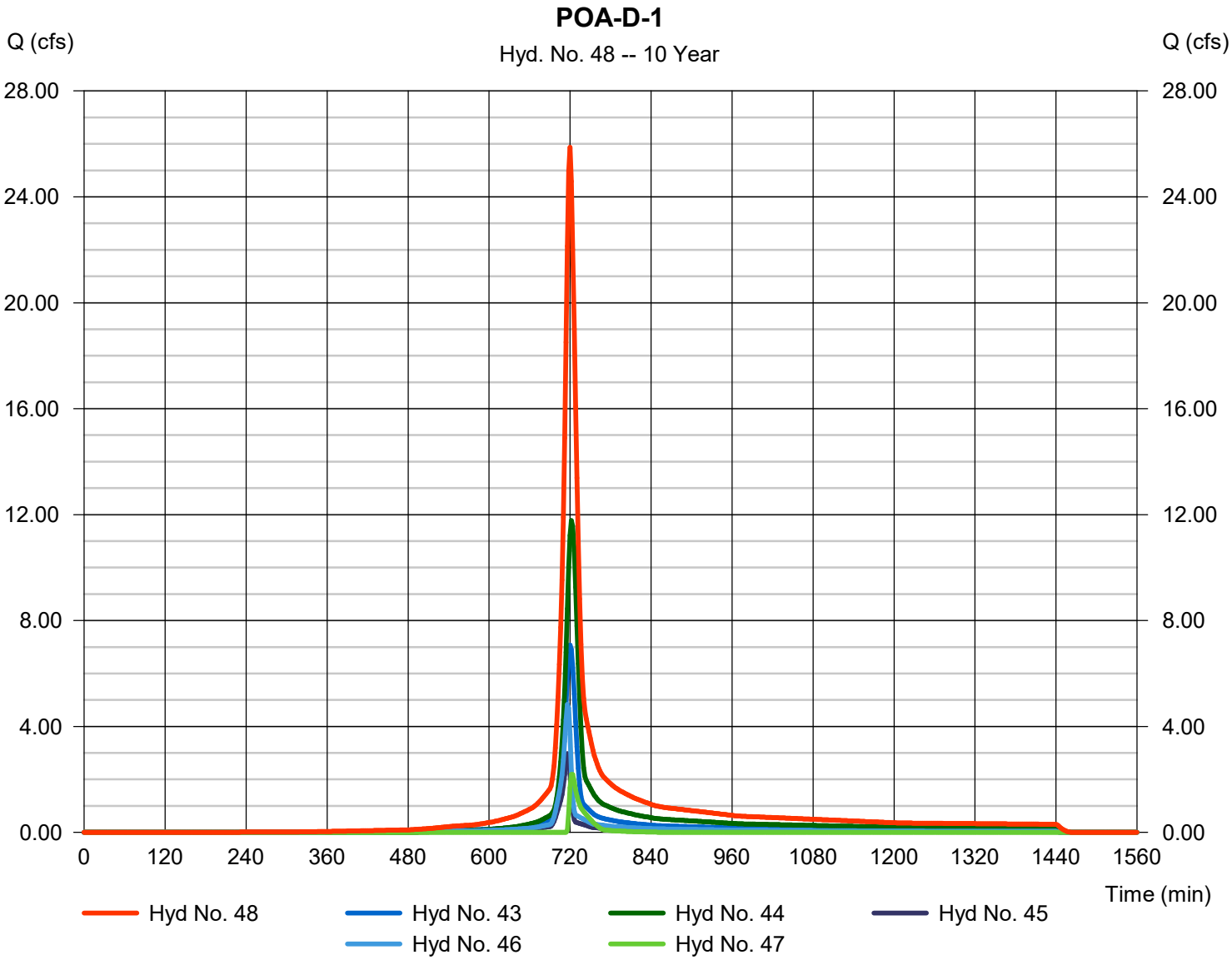


Hydrograph Report

Hyd. No. 48

POA-D-1

Hydrograph type	= Combine	Peak discharge	= 25.87 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 71,210 cuft
Inflow hyds.	= 43, 44, 45, 46, 47	Contrib. drain. area	= 6.460 ac

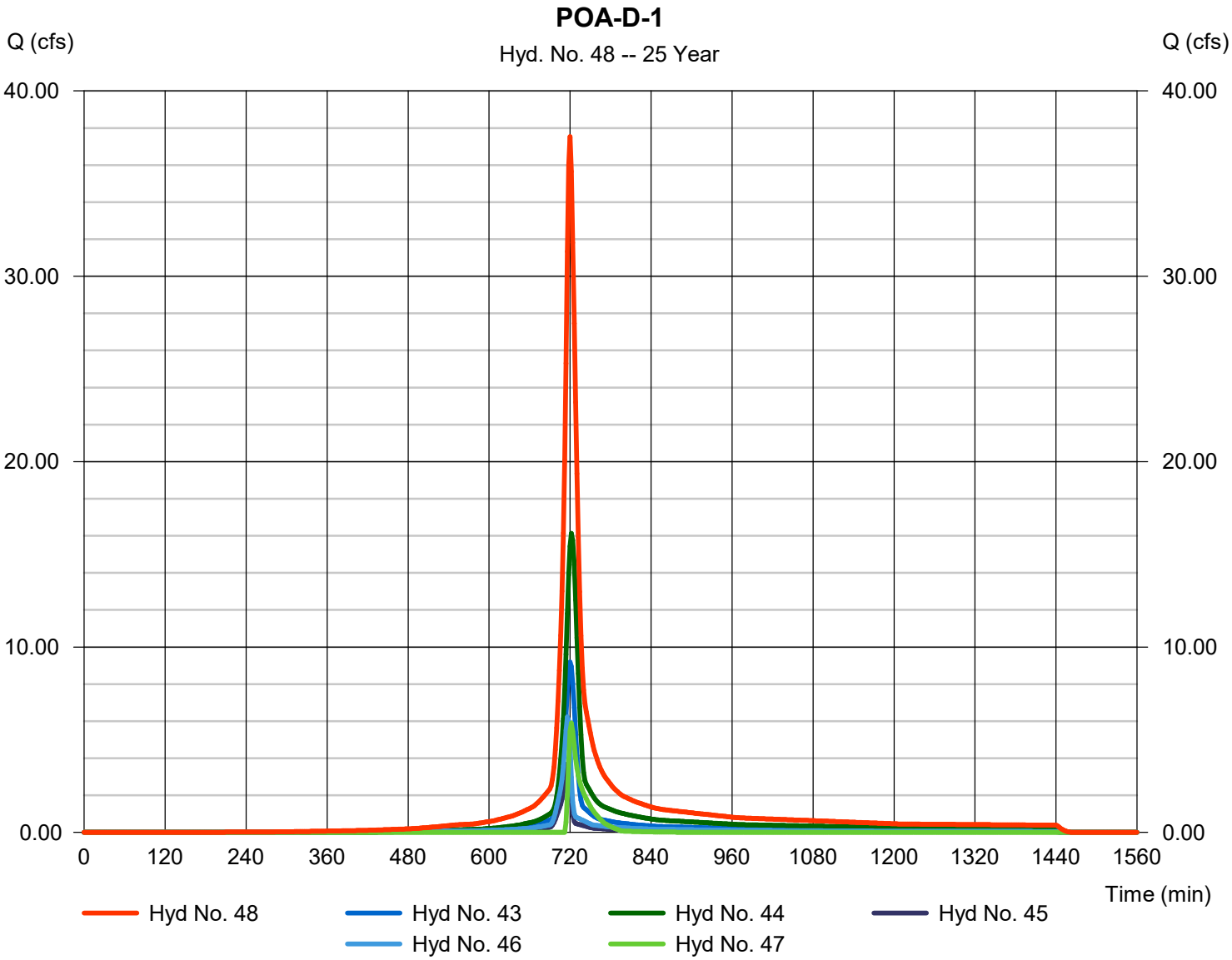


Hydrograph Report

Hyd. No. 48

POA-D-1

Hydrograph type	= Combine	Peak discharge	= 37.53 cfs
Storm frequency	= 25 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 99,796 cuft
Inflow hyds.	= 43, 44, 45, 46, 47	Contrib. drain. area	= 6.460 ac

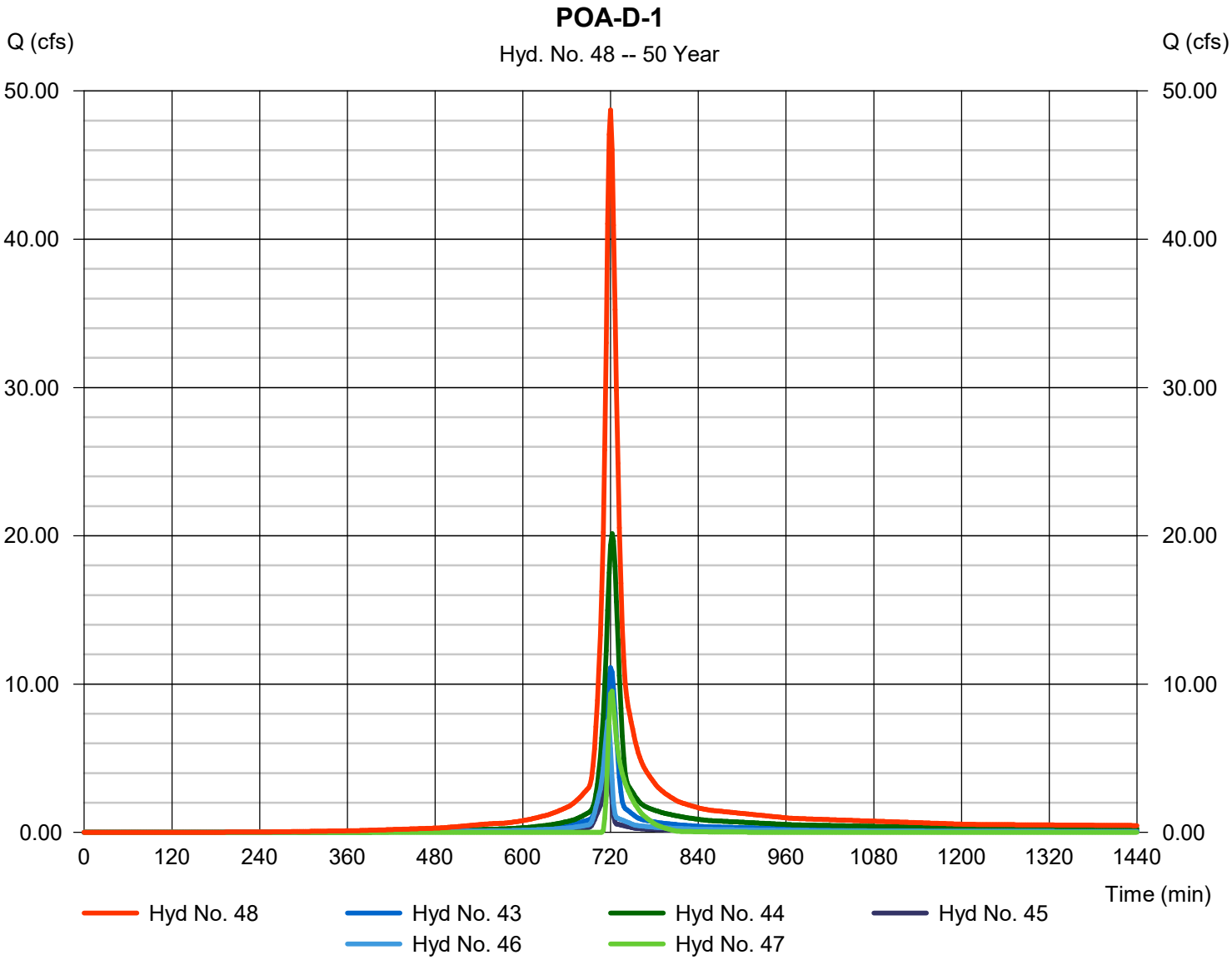


Hydrograph Report

Hyd. No. 48

POA-D-1

Hydrograph type	= Combine	Peak discharge	= 48.72 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 127,199 cuft
Inflow hyds.	= 43, 44, 45, 46, 47	Contrib. drain. area	= 6.460 ac

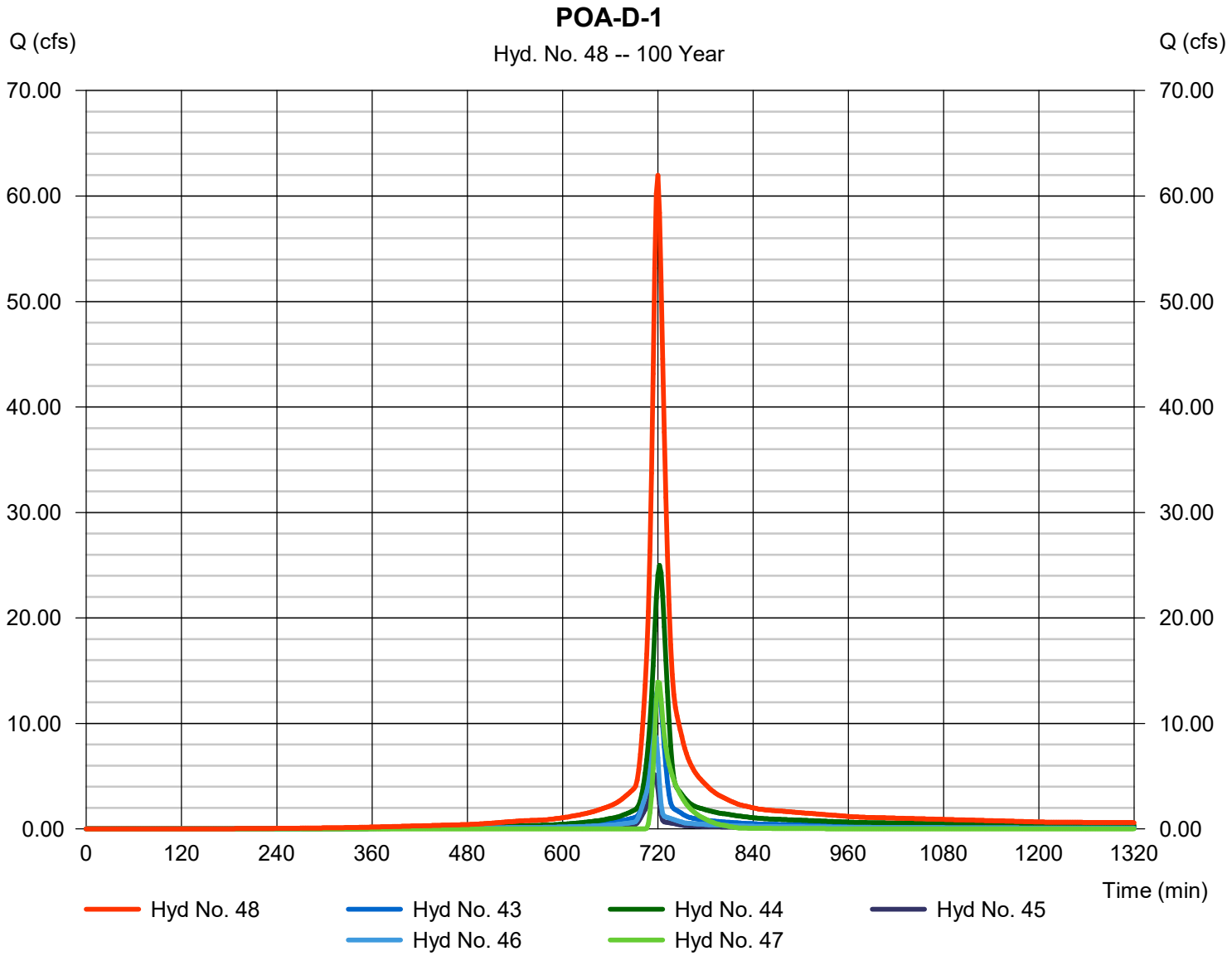


Hydrograph Report

Hyd. No. 48

POA-D-1

Hydrograph type	= Combine	Peak discharge	= 61.95 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 160,603 cuft
Inflow hyds.	= 43, 44, 45, 46, 47	Contrib. drain. area	= 6.460 ac



PR-D-5-OFFSITE WATERSHED

TR-55 TIME OF CONCENTRATION (Tc) OR TRAVEL TIME (Tt) CALCULATIONS

Project: Smithfield Gateway Phase 1A-1 **By:** MJV **Date:** 12/10/2020
Location: Smithfield Township, Monroe County, PA **Checked:** TH **Date:** 12/10/2020
Watershed: PR-D-5-OFFSITE

Sheet Flow (Applicable to Tc only)														
1	Surface Description (table 3-1)		Grass		Grass									
2	Manning's roughness coeff., n (table 3-1)		0.240		0.240									
3	Flow length, L (total L<100 ft)	**ft**	25		20									
4	Two-yr 24-hr rainfall, P2	**in**	3.32		3.32									
5	Land Slope, s	**ft/ft**	0.1600		0.3300									
6	Tt = $\frac{0.007(nL)^{0.8}}{(P_2)^{0.5}(s)^{.04}}$	**Compute Tt, hr**	0.0335	+	0.0210	+		+		+		+		
													0.0545	hr
Shallow Concentrated Flow														
7	Surface Description (Paved or Unpaved)		Unpaved		Unpaved		Unpaved							
8	Flow length, L	**ft**	200		207		150							
9	Watercourse slope, s	**ft/ft**	0.0800		0.0480		0.0100							
10	Average Velocity, V (figure 3-1)	**ft/sec**	4.56		3.53		1.61							
11	Tt = L / (3600V)	**Compute Tt , hr**	0.0122	+	0.0163	+	0.0258	+		+		+		
													0.0543	hr
Channel / Pipe Flow														
12	Cross Sectional flow area, a	**ft^2**	7.95											
13	Wetted Perimeter, p_w	**ft**	7.10											
14	Hydraulic radius, $r = a/p_w$	**ft**	1.12											
15	Channel slope, s	**ft/ft**	0.0080											
16	Manning's roughness coeff., n (table 3-1)		0.0130											
17	$V = (1.49 * r^{2/3} * s^{1/2})/n$	**ft/s**	11.05											
18	Flow length, L	**ft**	78											
19	Tt = L / (3600V)	**Compute Tt , hr**	0.0020	+		+		+		+		+		
													0.0020	hr
20	**Watershed or subarea Tc or Tt (add Tt in steps 6,11, and 19)**												0.11	hr
													6.6	**min**

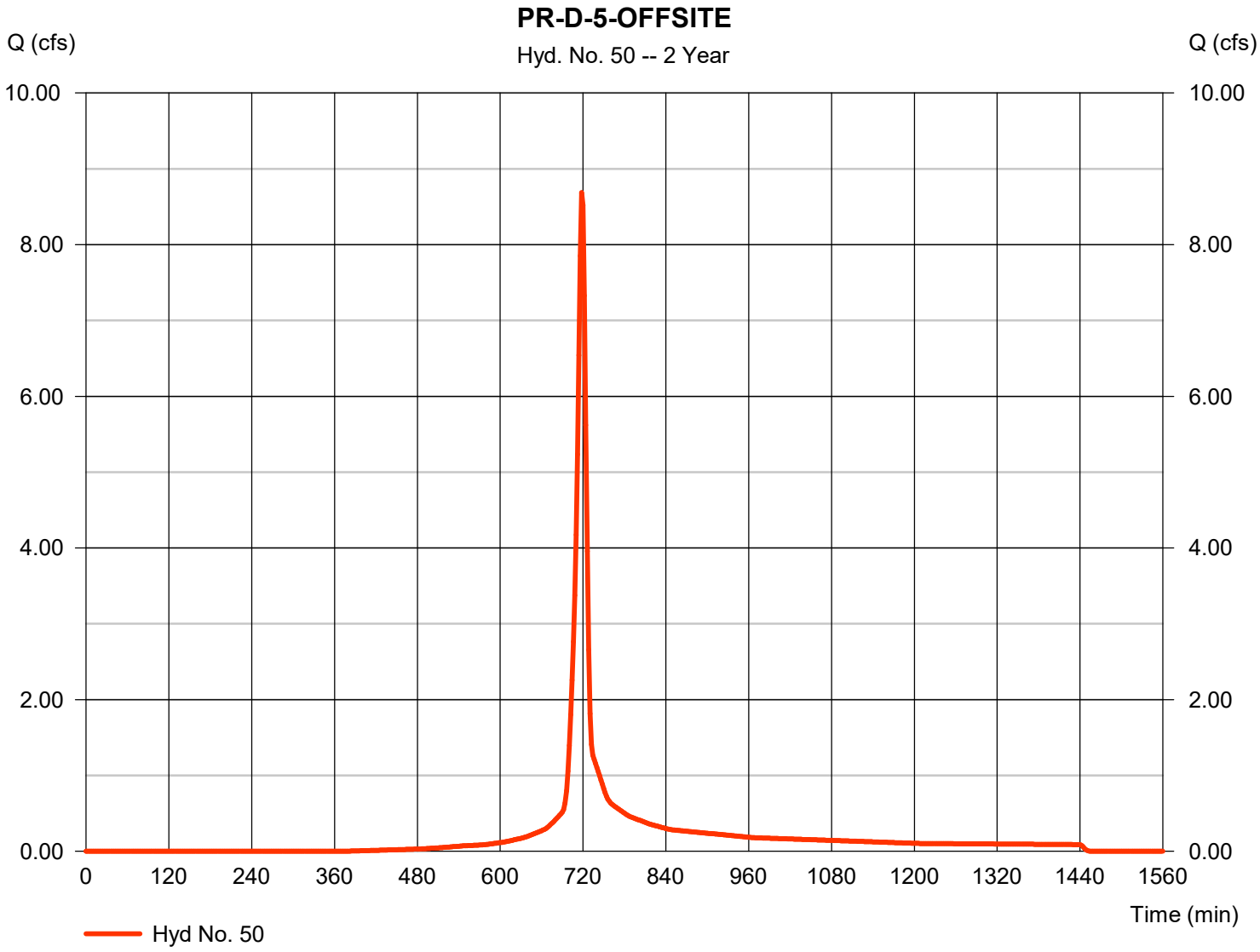
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Thursday, 02 / 23 / 2023

Hyd. No. 50

PR-D-5-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.686 cfs
Storm frequency	=	2 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	20,098 cuft
Drainage area	=	2.630 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.60 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

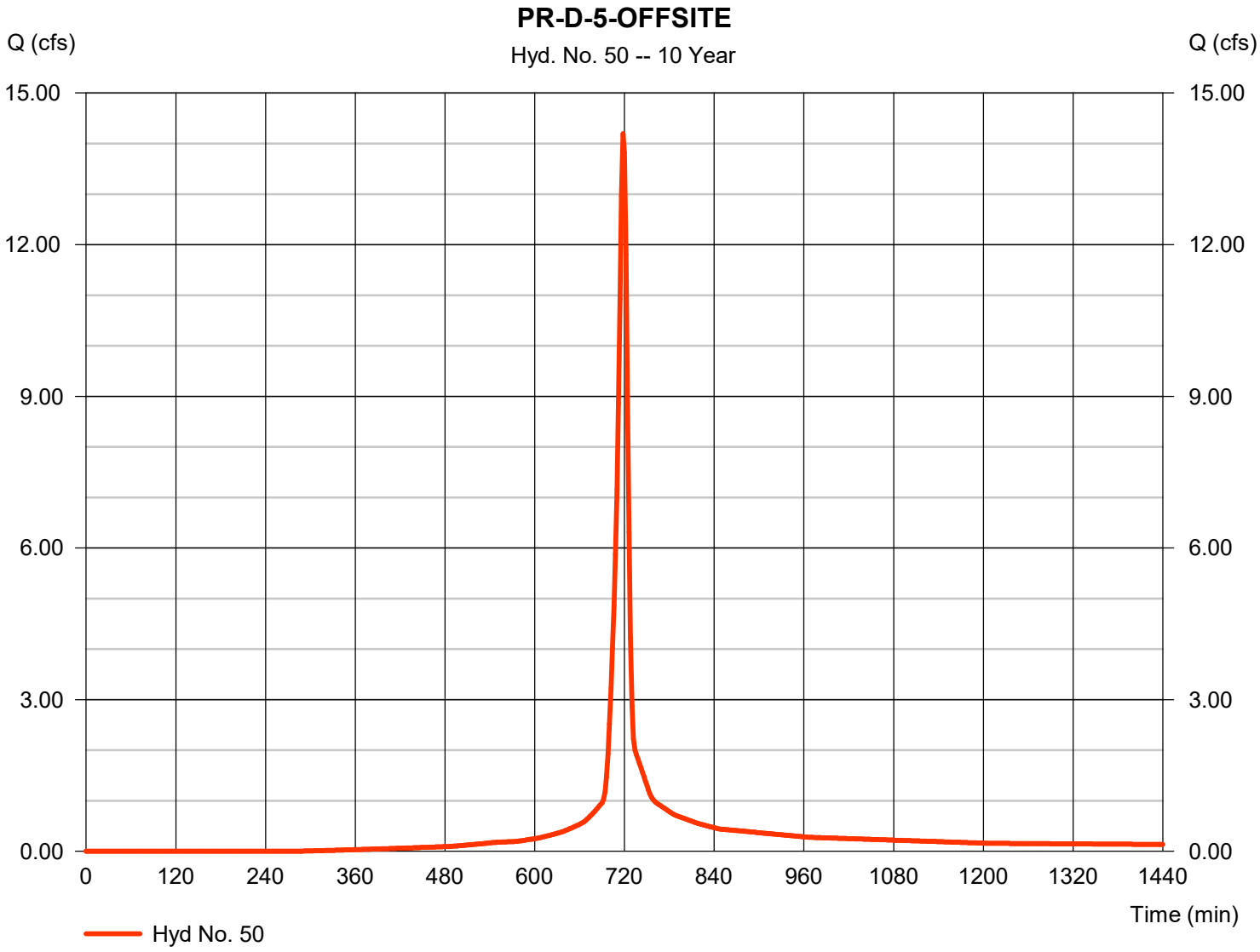


Hydrograph Report

Hyd. No. 50

PR-D-5-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	14.20 cfs
Storm frequency	=	10 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	33,578 cuft
Drainage area	=	2.630 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.60 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

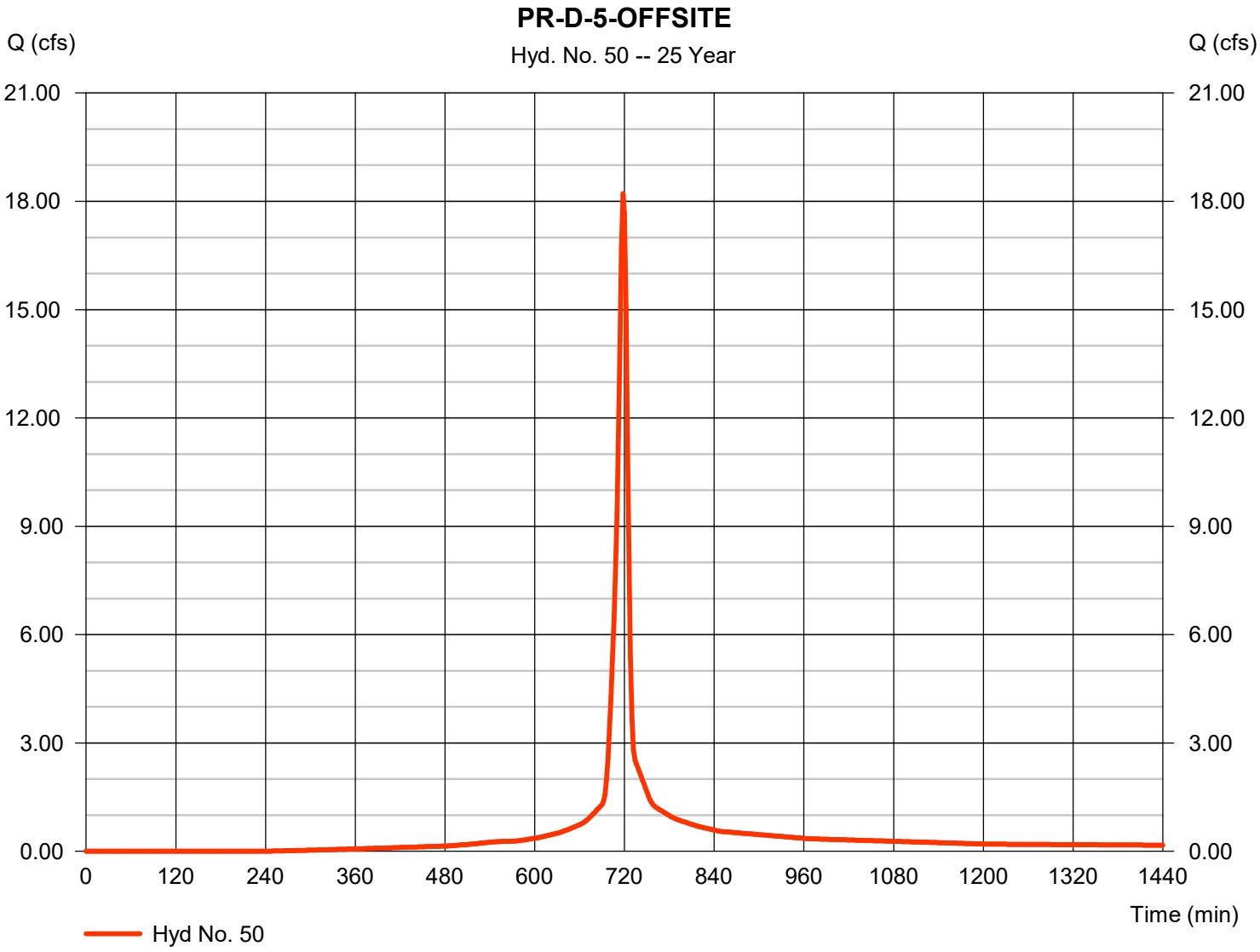


Hydrograph Report

Hyd. No. 50

PR-D-5-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	18.21 cfs
Storm frequency	=	25 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	43,703 cuft
Drainage area	=	2.630 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.60 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

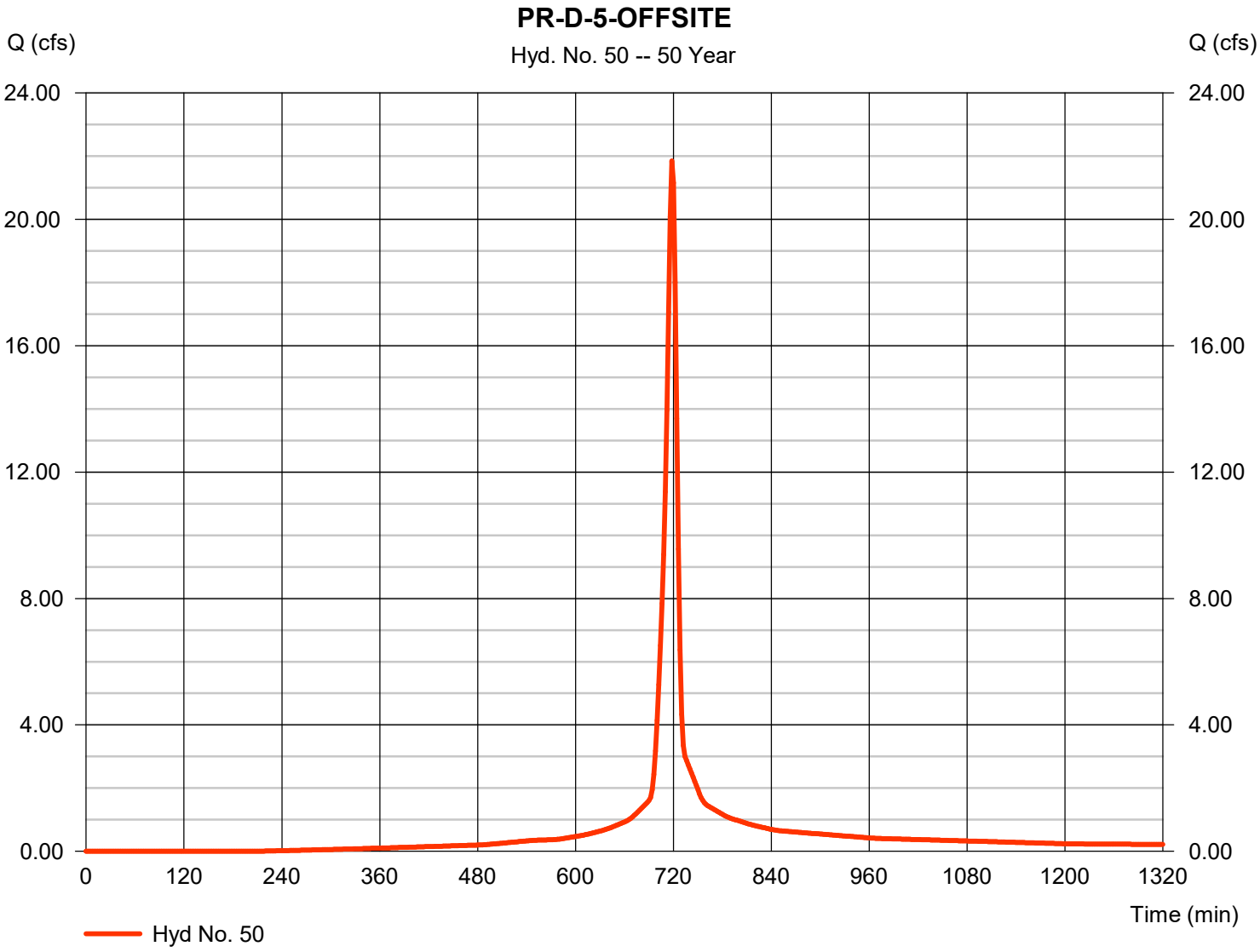


Hydrograph Report

Hyd. No. 50

PR-D-5-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	21.85 cfs
Storm frequency	=	50 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	53,029 cuft
Drainage area	=	2.630 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.60 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

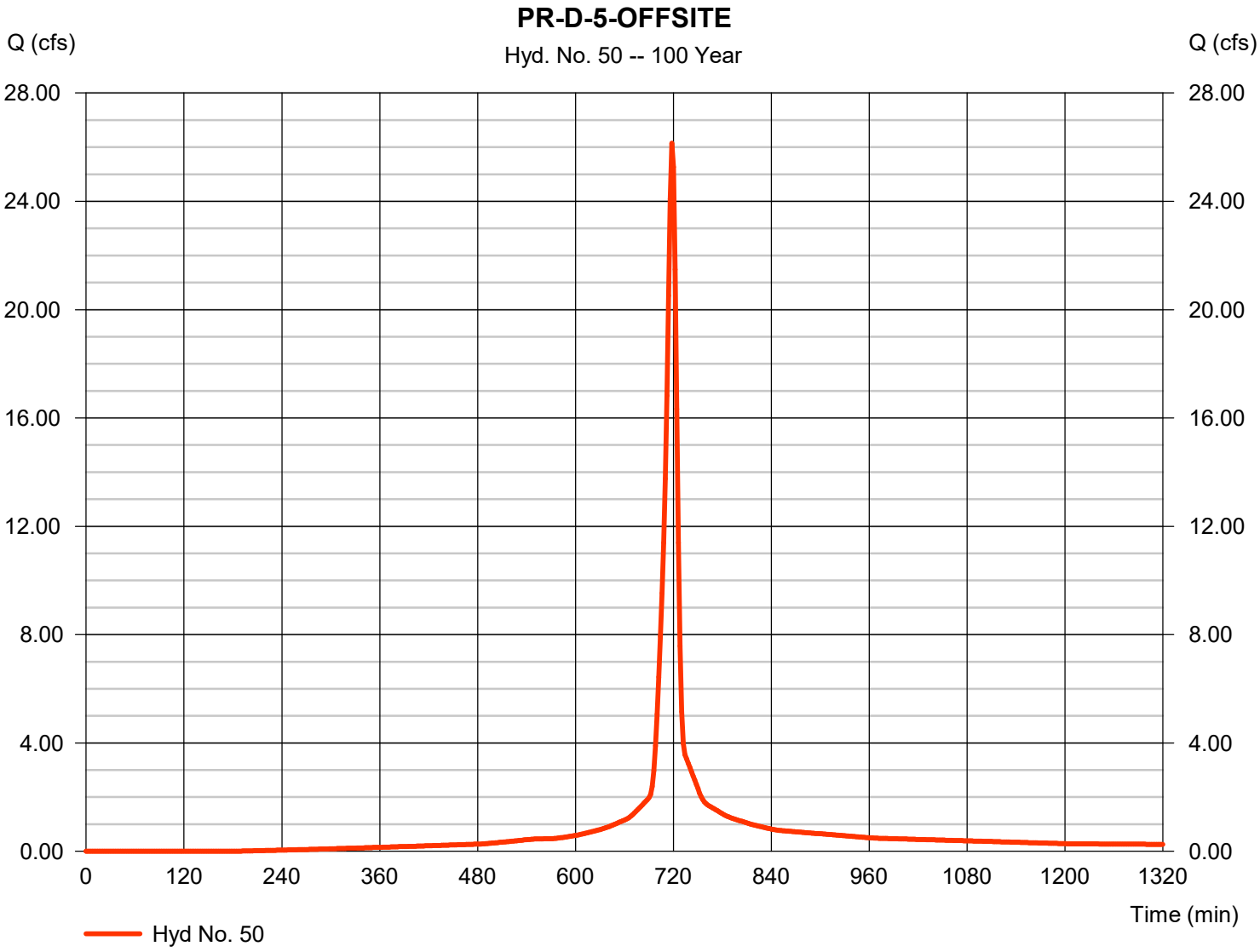


Hydrograph Report

Hyd. No. 50

PR-D-5-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	26.14 cfs
Storm frequency	=	100 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	64,199 cuft
Drainage area	=	2.630 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.60 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



TOTAL PROPOSED FLOW TO POA-D

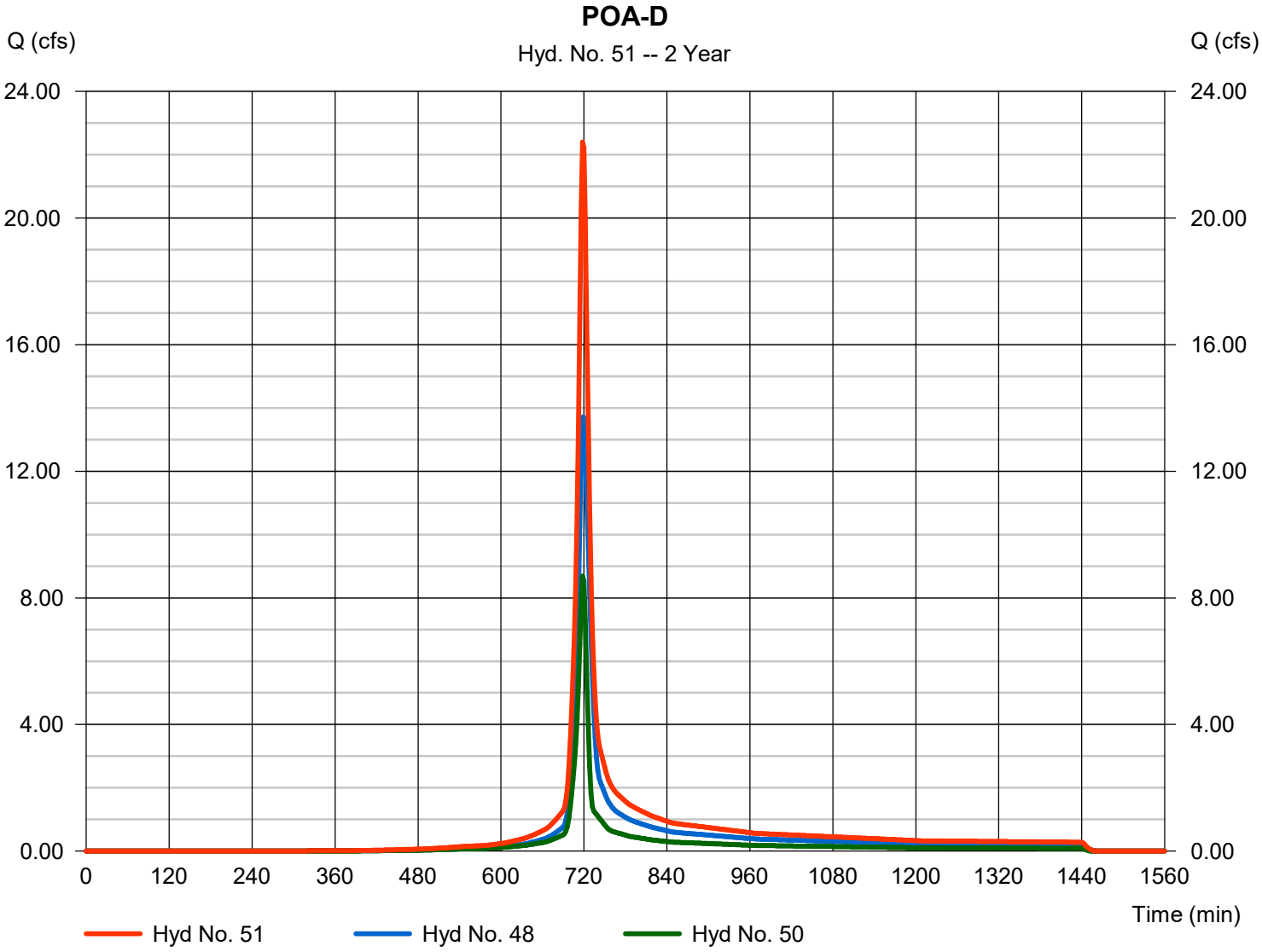
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 51

POA-D

Hydrograph type	= Combine	Peak discharge	= 22.40 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 58,680 cuft
Inflow hyds.	= 48, 50	Contrib. drain. area	= 2.630 ac

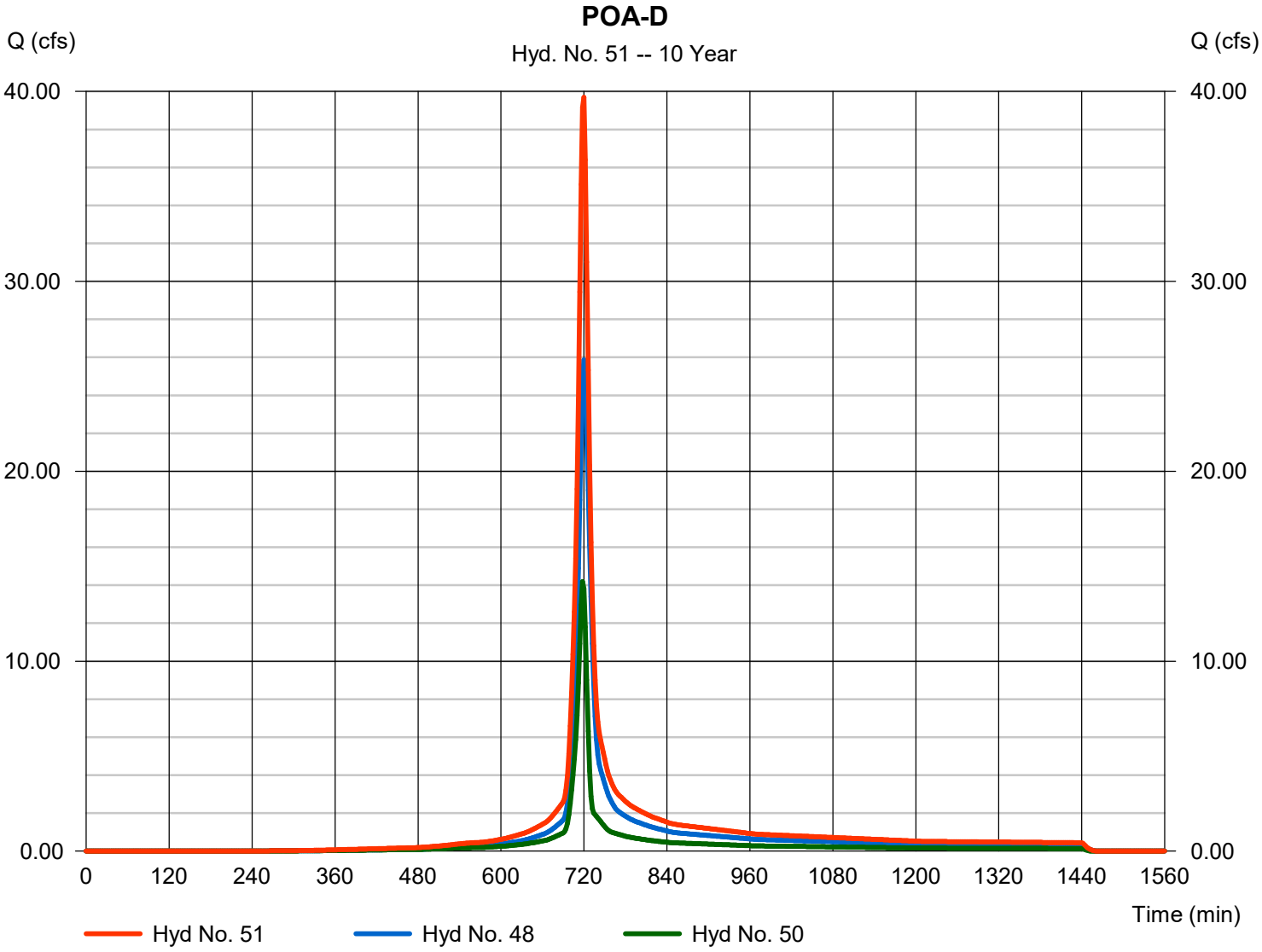


Hydrograph Report

Hyd. No. 51

POA-D

Hydrograph type	=	Combine	Peak discharge	=	39.68 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	104,788 cuft
Inflow hyds.	=	48, 50	Contrib. drain. area	=	2.630 ac

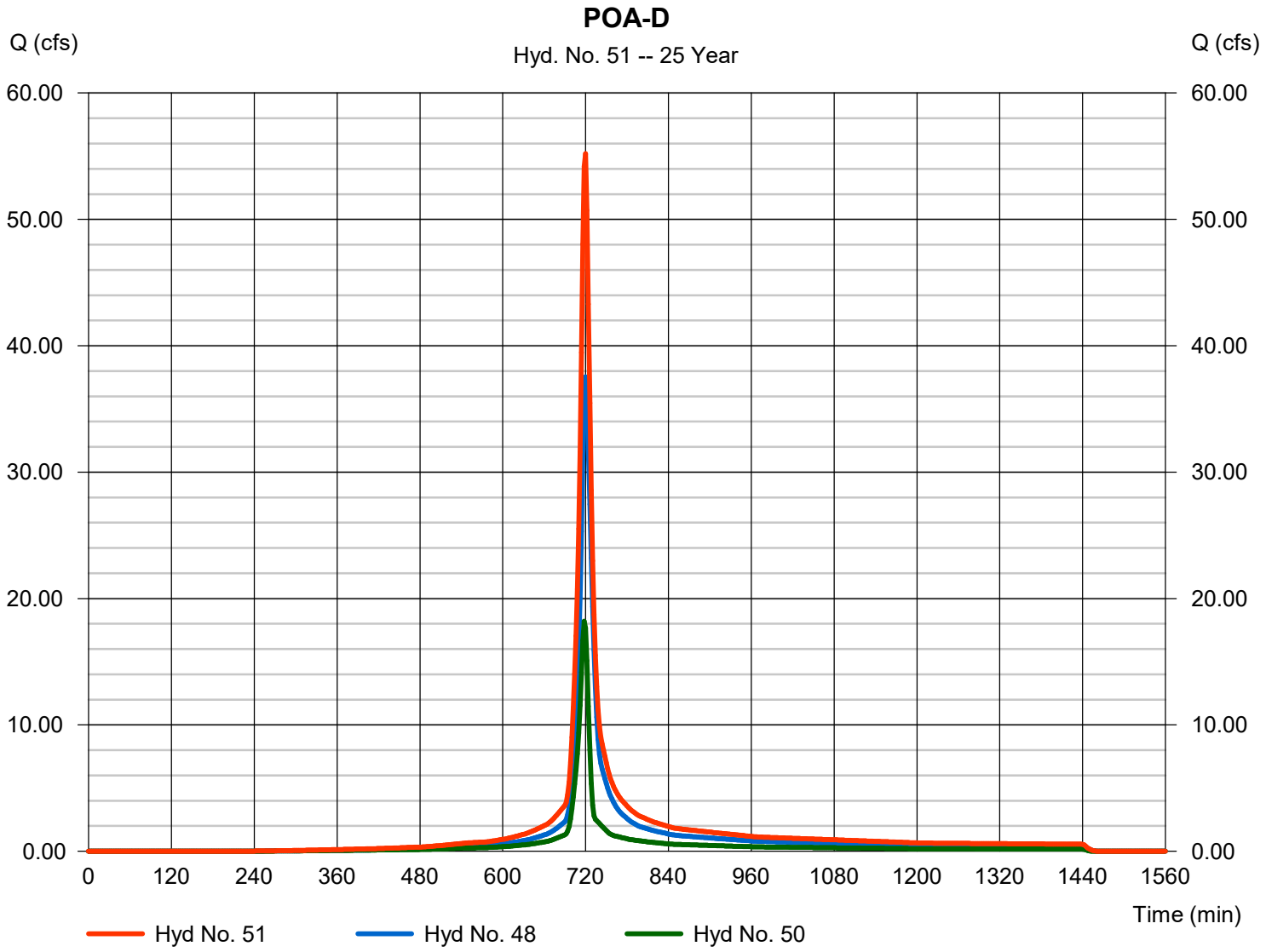


Hydrograph Report

Hyd. No. 51

POA-D

Hydrograph type	=	Combine	Peak discharge	=	55.20 cfs
Storm frequency	=	25 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	143,499 cuft
Inflow hyds.	=	48, 50	Contrib. drain. area	=	2.630 ac

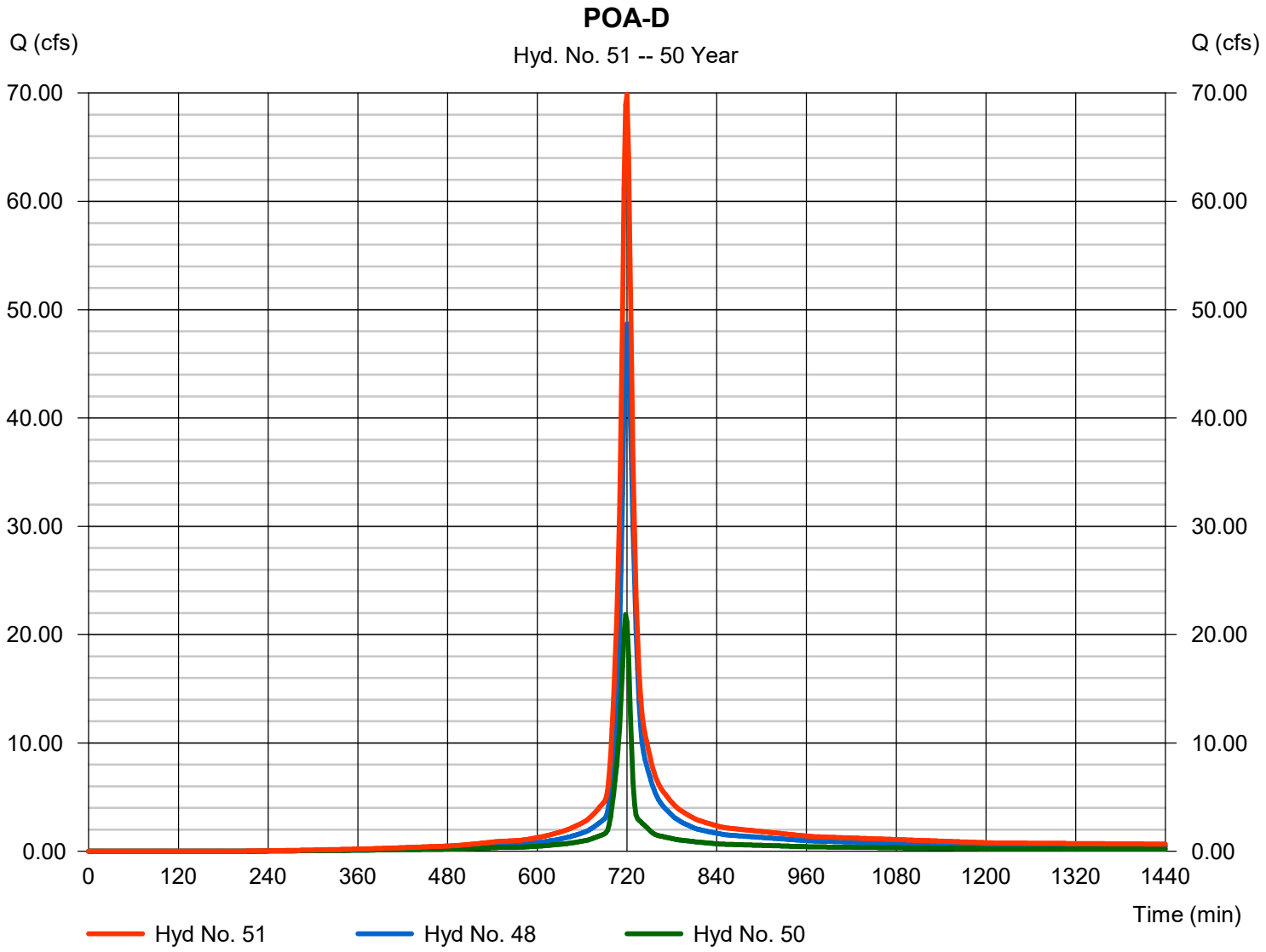


Hydrograph Report

Hyd. No. 51

POA-D

Hydrograph type	=	Combine	Peak discharge	=	69.87 cfs
Storm frequency	=	50 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	180,228 cuft
Inflow hyds.	=	48, 50	Contrib. drain. area	=	2.630 ac

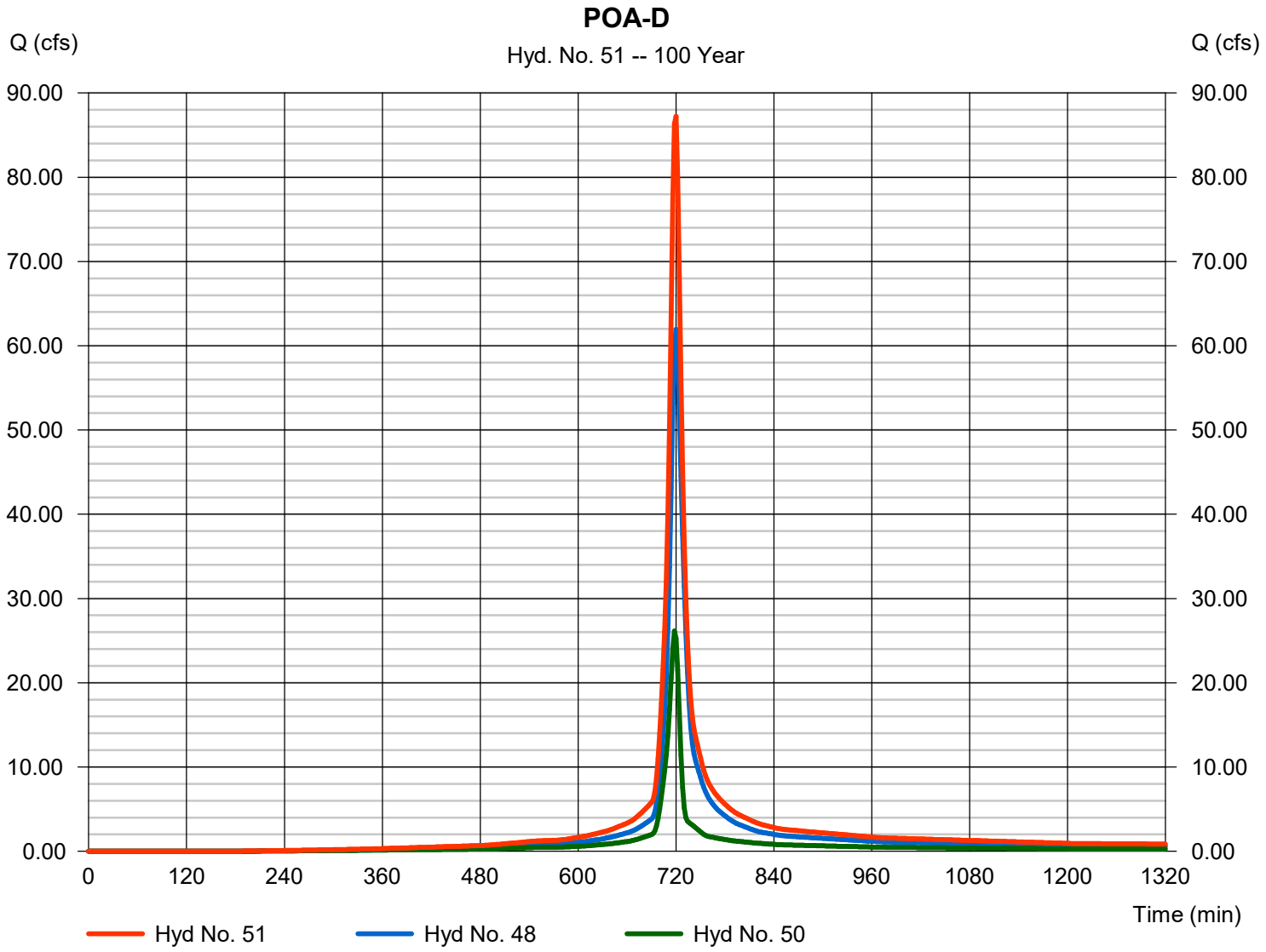


Hydrograph Report

Hyd. No. 51

POA-D

Hydrograph type	=	Combine	Peak discharge	=	87.22 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	224,803 cuft
Inflow hyds.	=	48, 50	Contrib. drain. area	=	2.630 ac



PR-E-1 WATERSHED

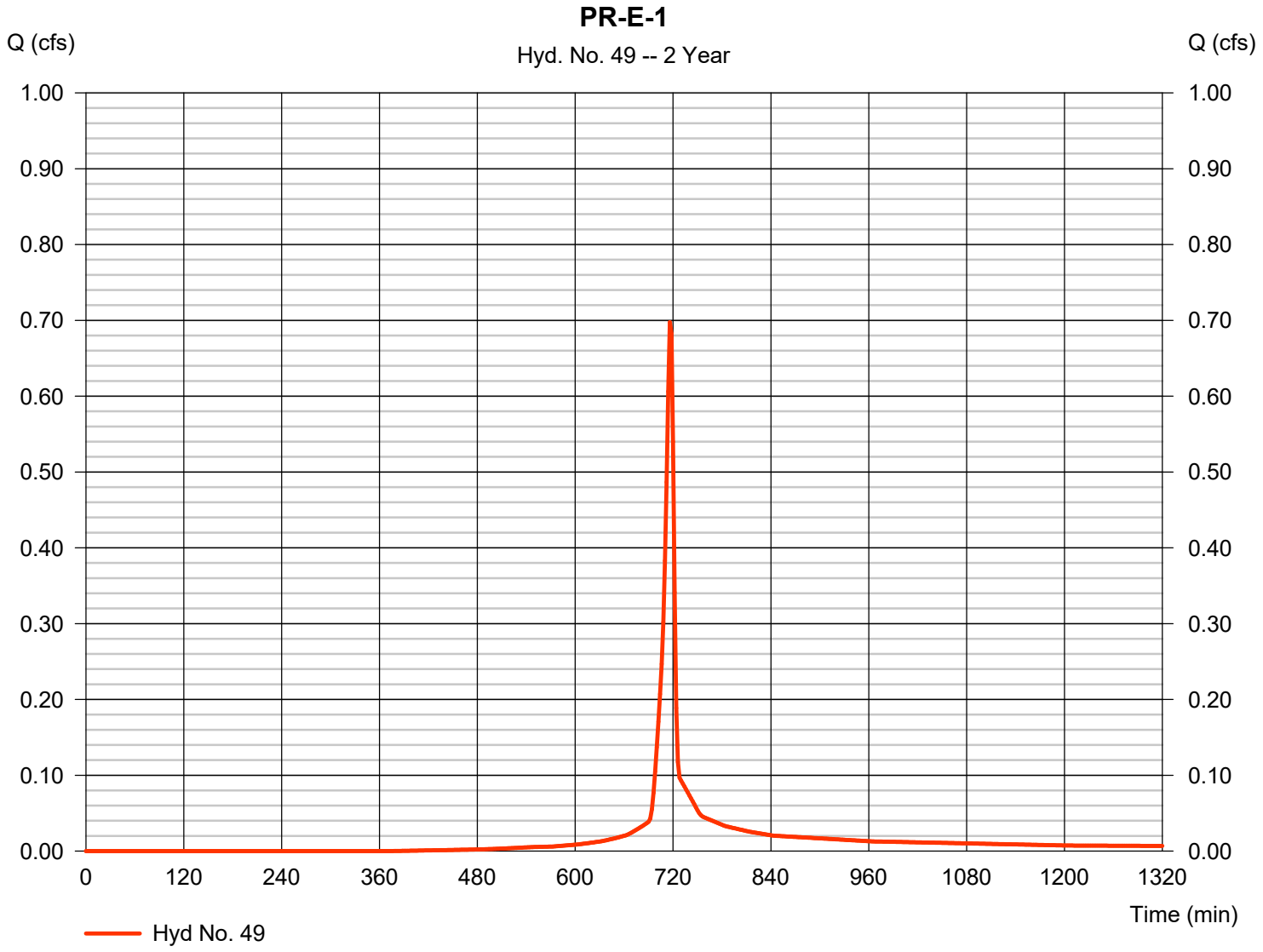
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 49

PR-E-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.698 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	1,433 cuft
Drainage area	=	0.200 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

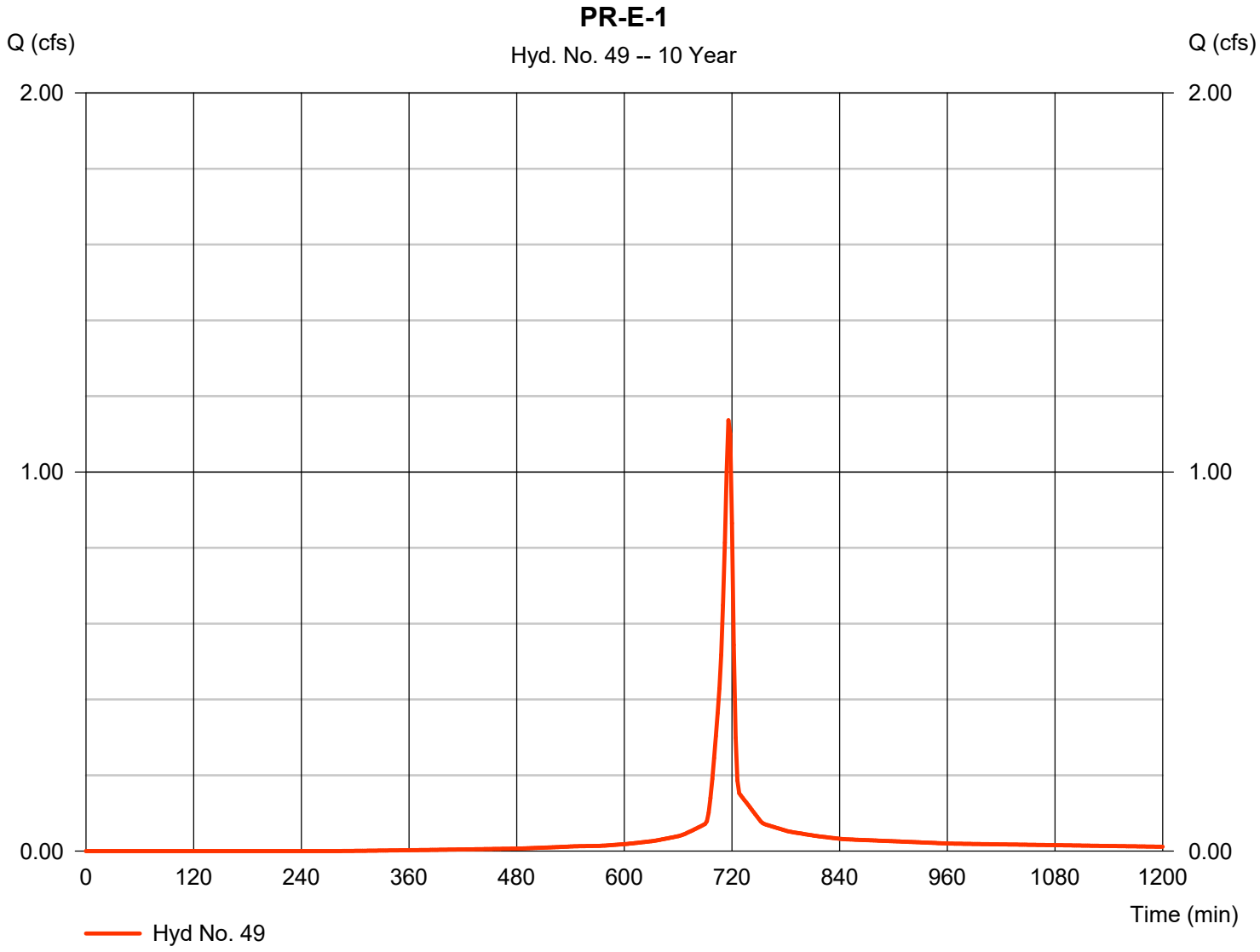


Hydrograph Report

Hyd. No. 49

PR-E-1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.136 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 2,394 cuft
Drainage area	= 0.200 ac	Curve number	= 88
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 4.84 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

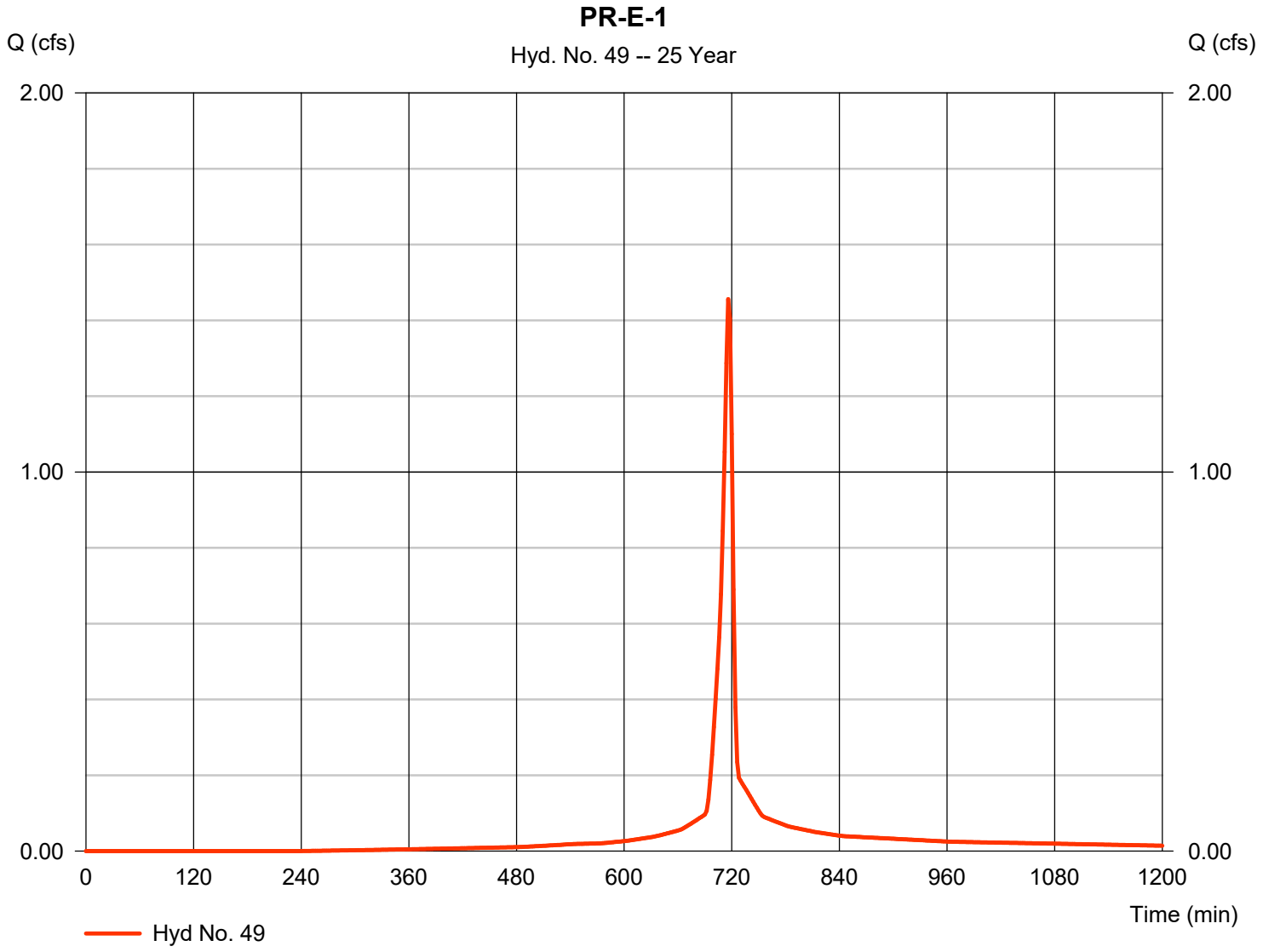


Hydrograph Report

Hyd. No. 49

PR-E-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.456 cfs
Storm frequency	=	25 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	3,116 cuft
Drainage area	=	0.200 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

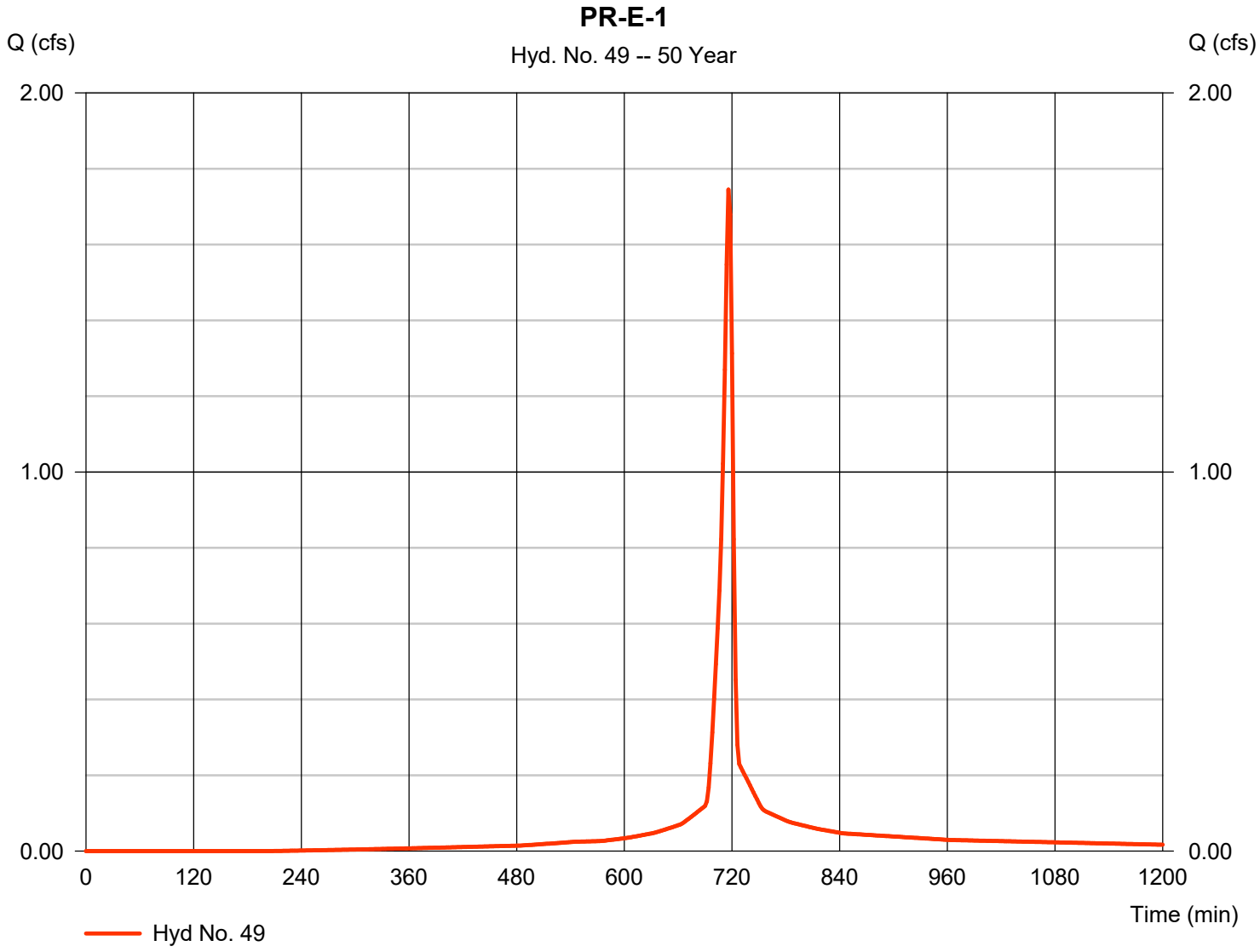


Hydrograph Report

Hyd. No. 49

PR-E-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.745 cfs
Storm frequency	=	50 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	3,781 cuft
Drainage area	=	0.200 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

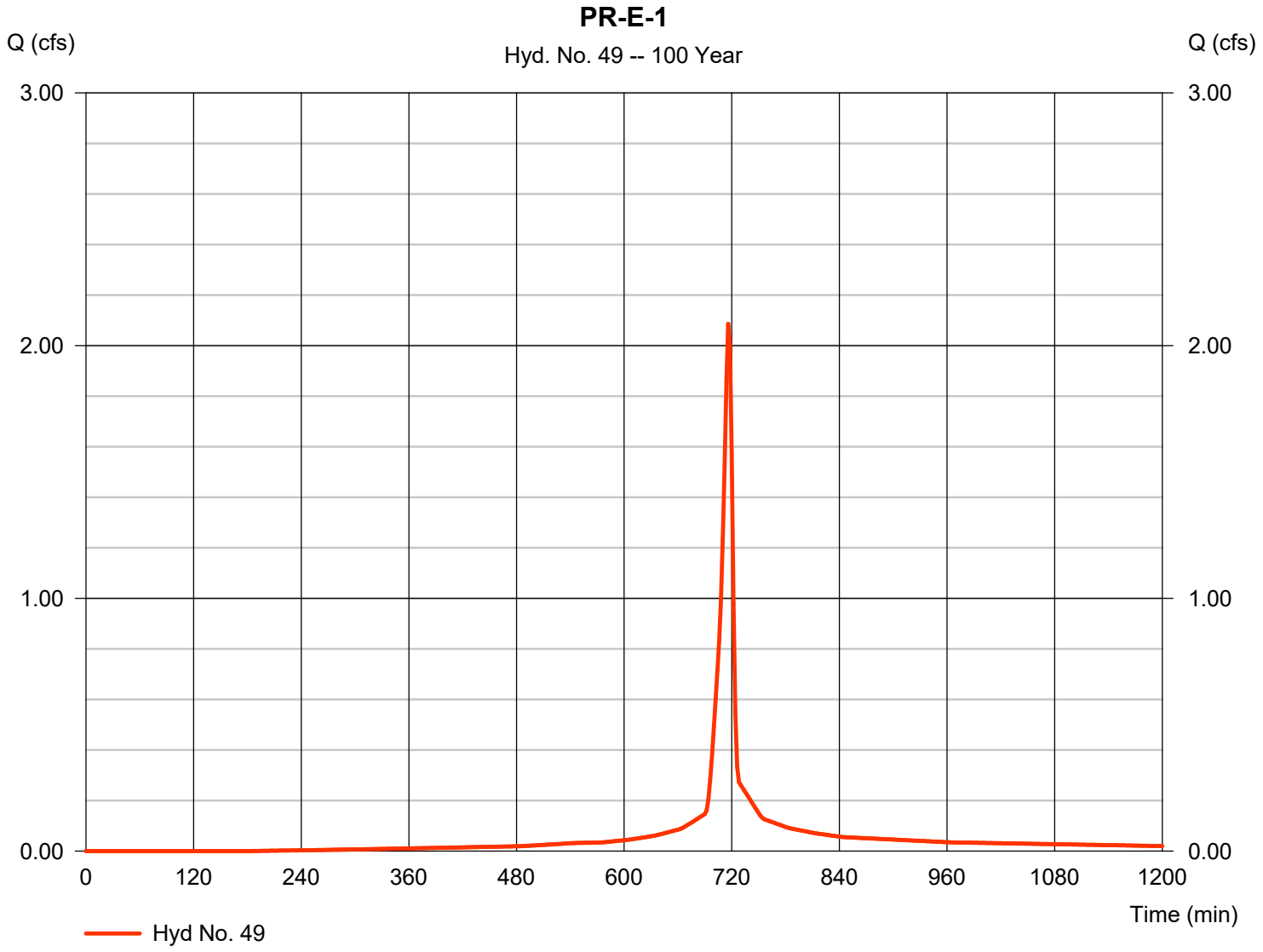


Hydrograph Report

Hyd. No. 49

PR-E-1

Hydrograph type	= SCS Runoff	Peak discharge	= 2.086 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 4,577 cuft
Drainage area	= 0.200 ac	Curve number	= 88
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 8.16 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



PR-E-2 WATERSHED

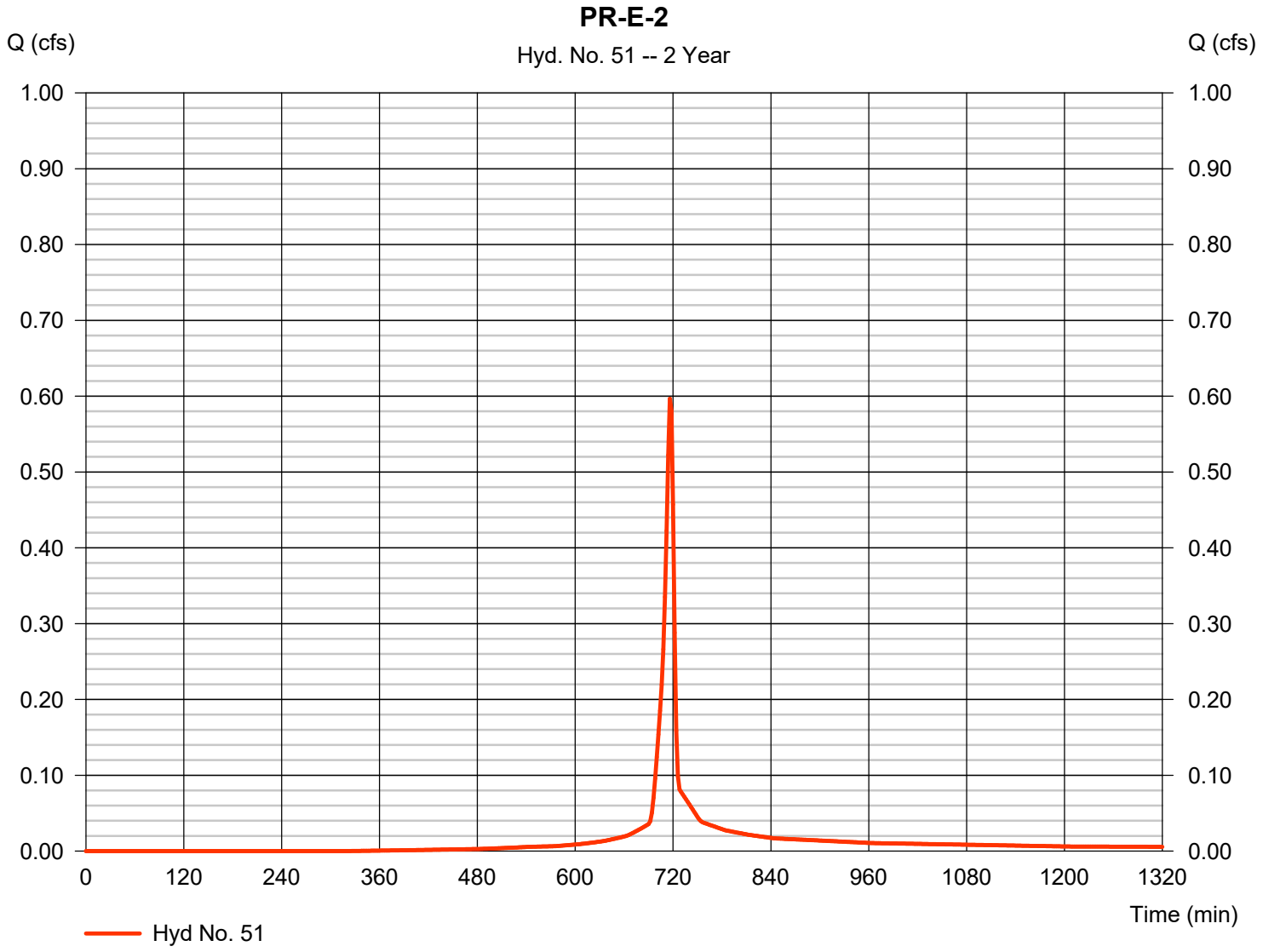
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 51

PR-E-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.597 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	1,241 cuft
Drainage area	=	0.160 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

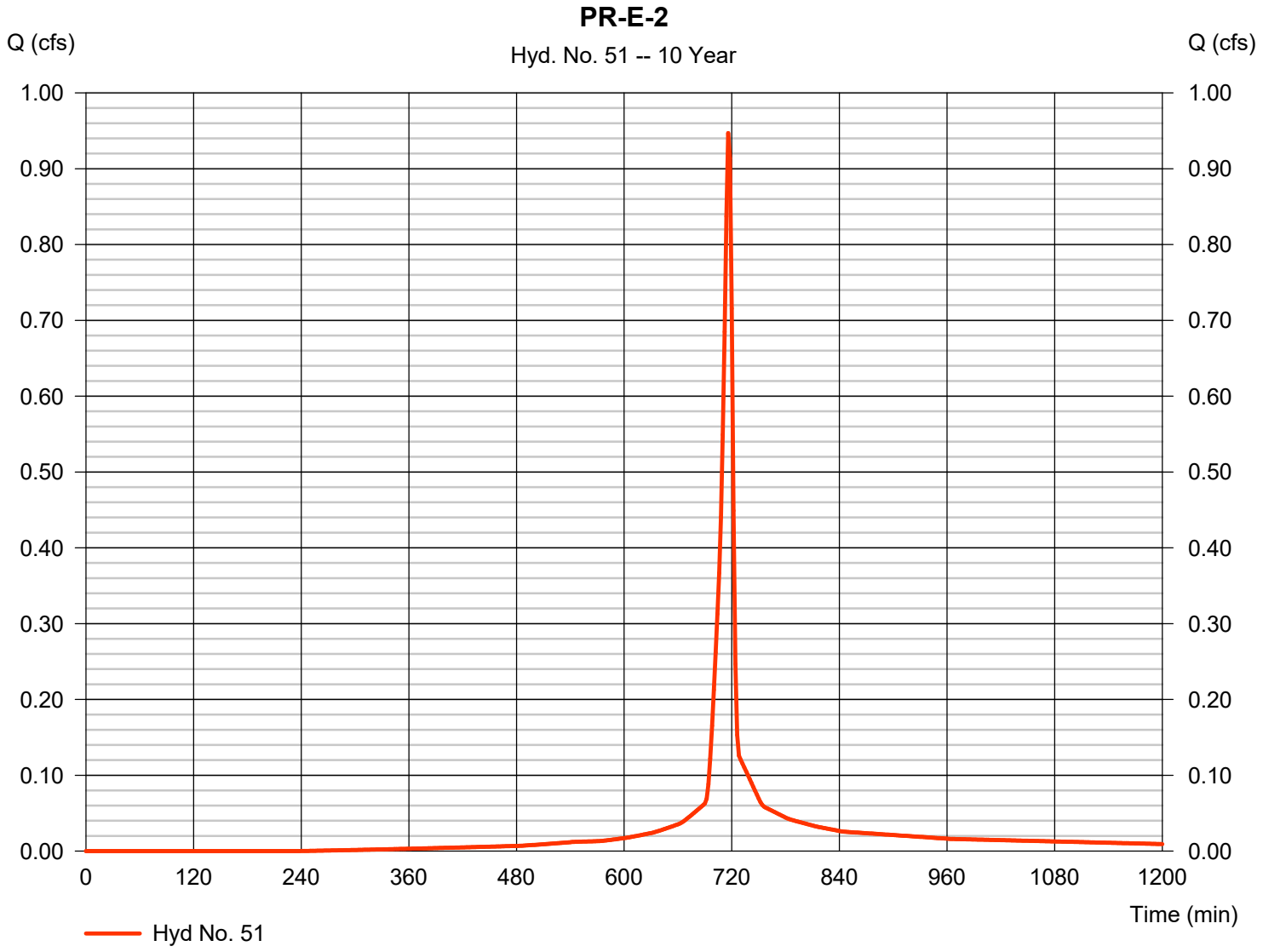


Hydrograph Report

Hyd. No. 51

PR-E-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.947 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	2,027 cuft
Drainage area	=	0.160 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

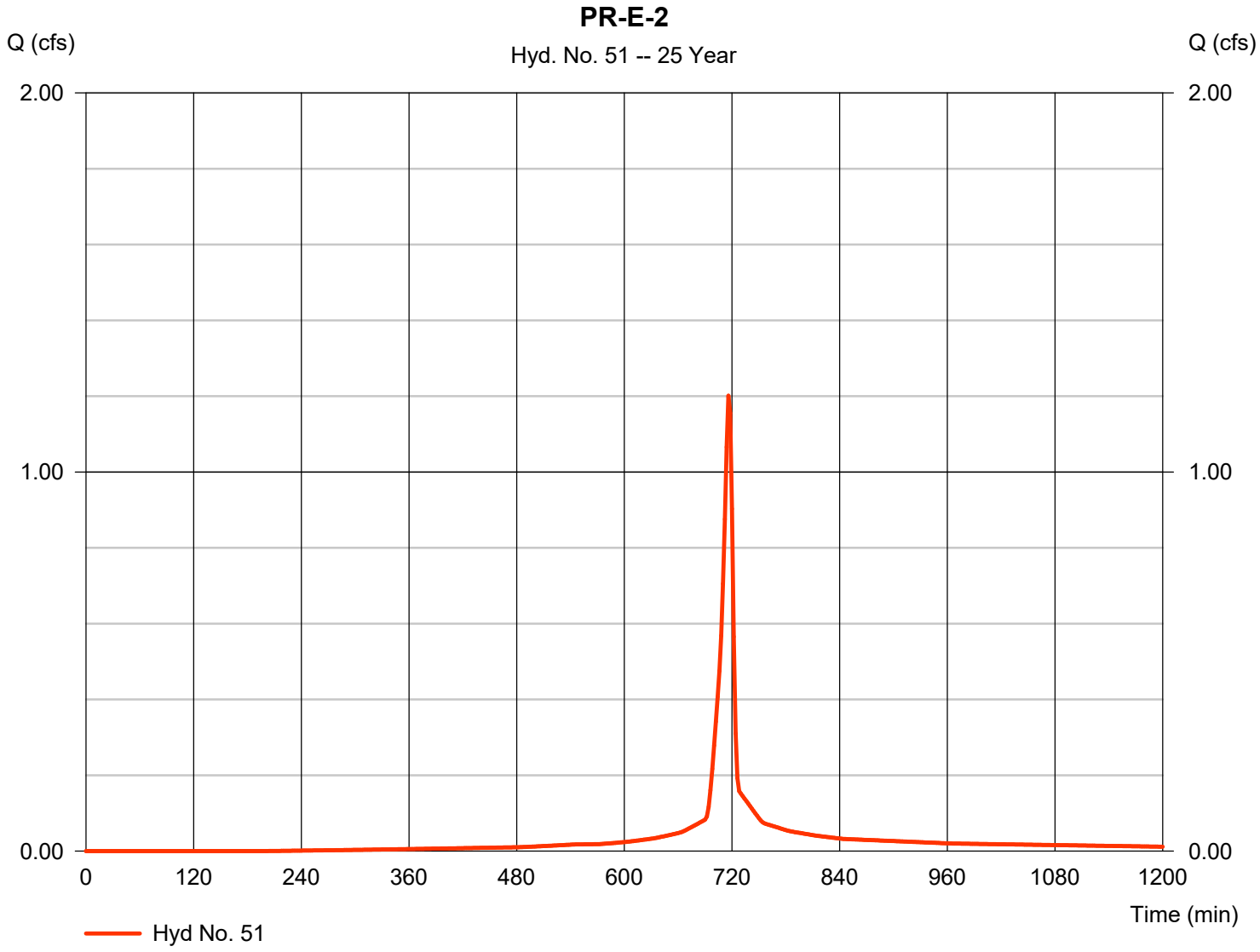


Hydrograph Report

Hyd. No. 51

PR-E-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.201 cfs
Storm frequency	=	25 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	2,612 cuft
Drainage area	=	0.160 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

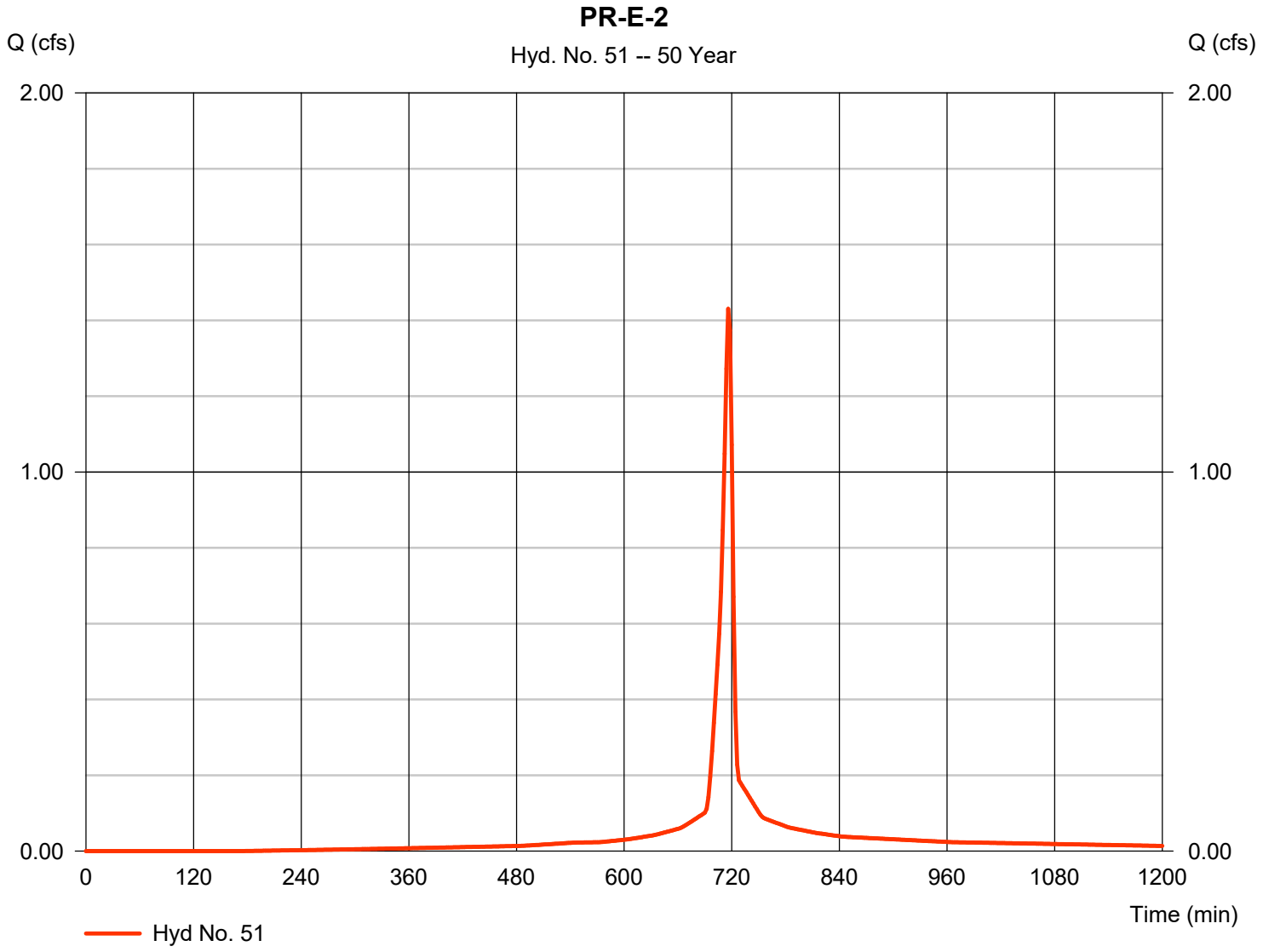


Hydrograph Report

Hyd. No. 51

PR-E-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.430 cfs
Storm frequency	=	50 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	3,149 cuft
Drainage area	=	0.160 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

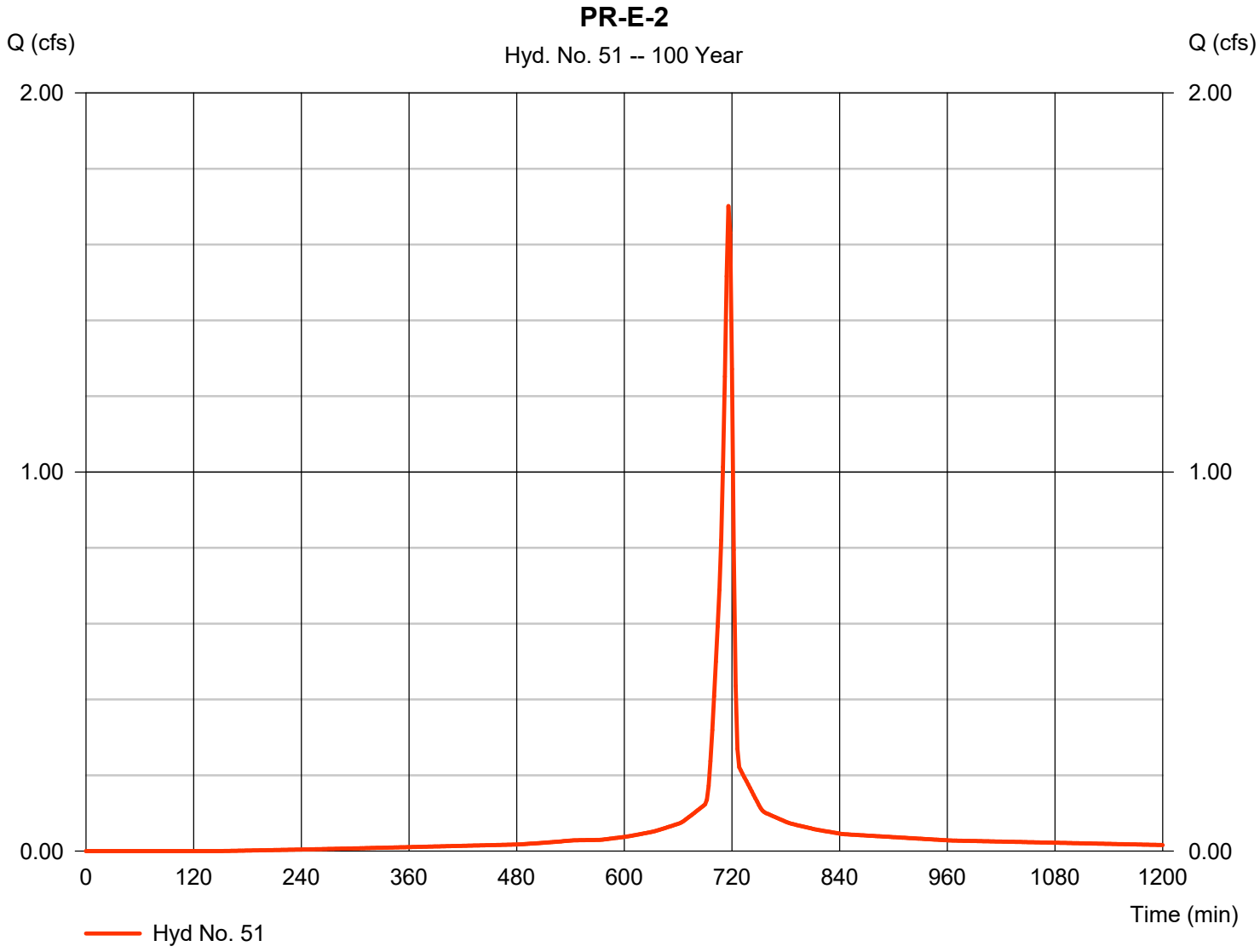


Hydrograph Report

Hyd. No. 51

PR-E-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.701 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	3,791 cuft
Drainage area	=	0.160 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



PR-E-3-DISTURBED WATERSHED

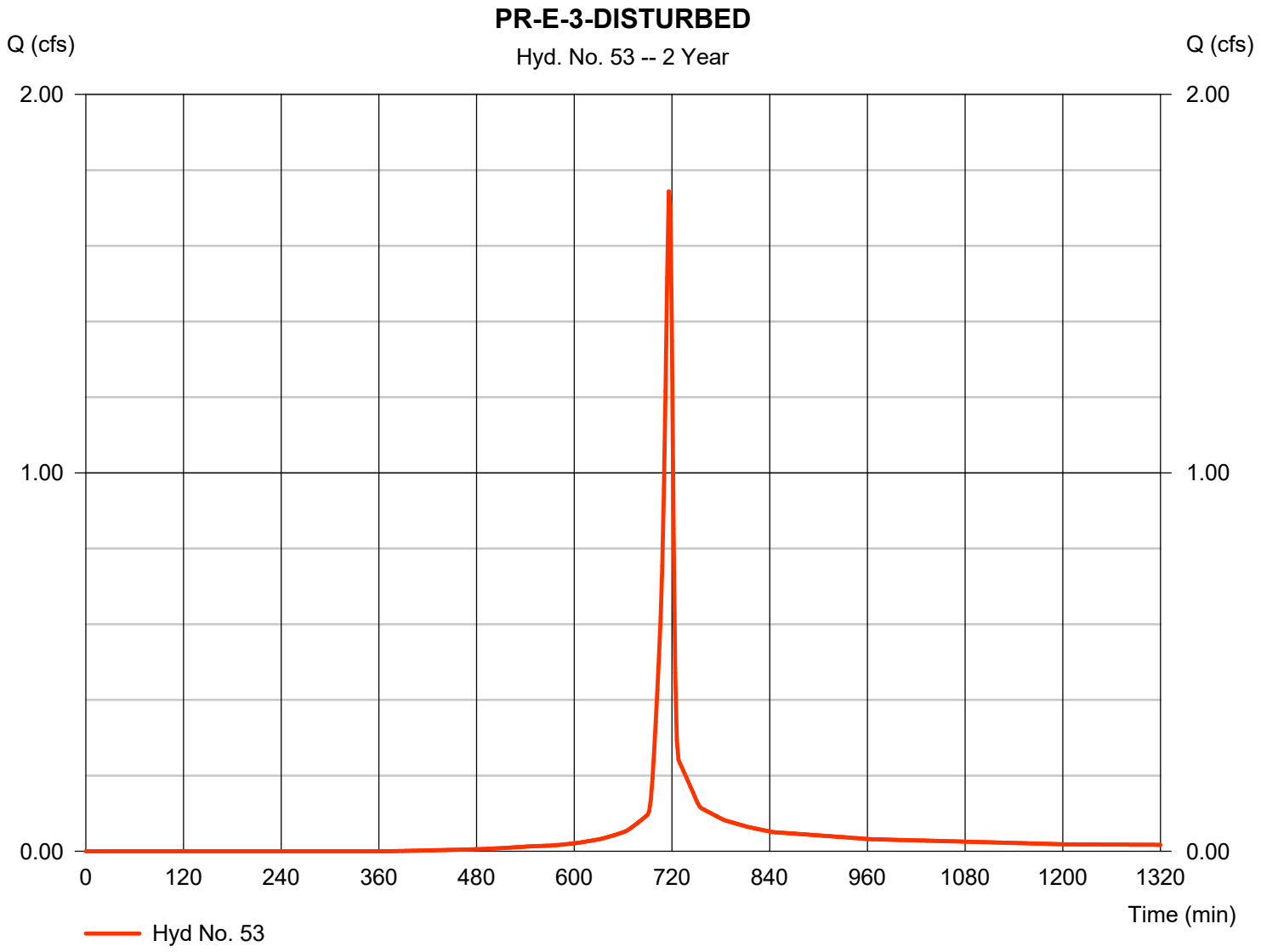
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 53

PR-E-3-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.744 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	3,582 cuft
Drainage area	=	0.500 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

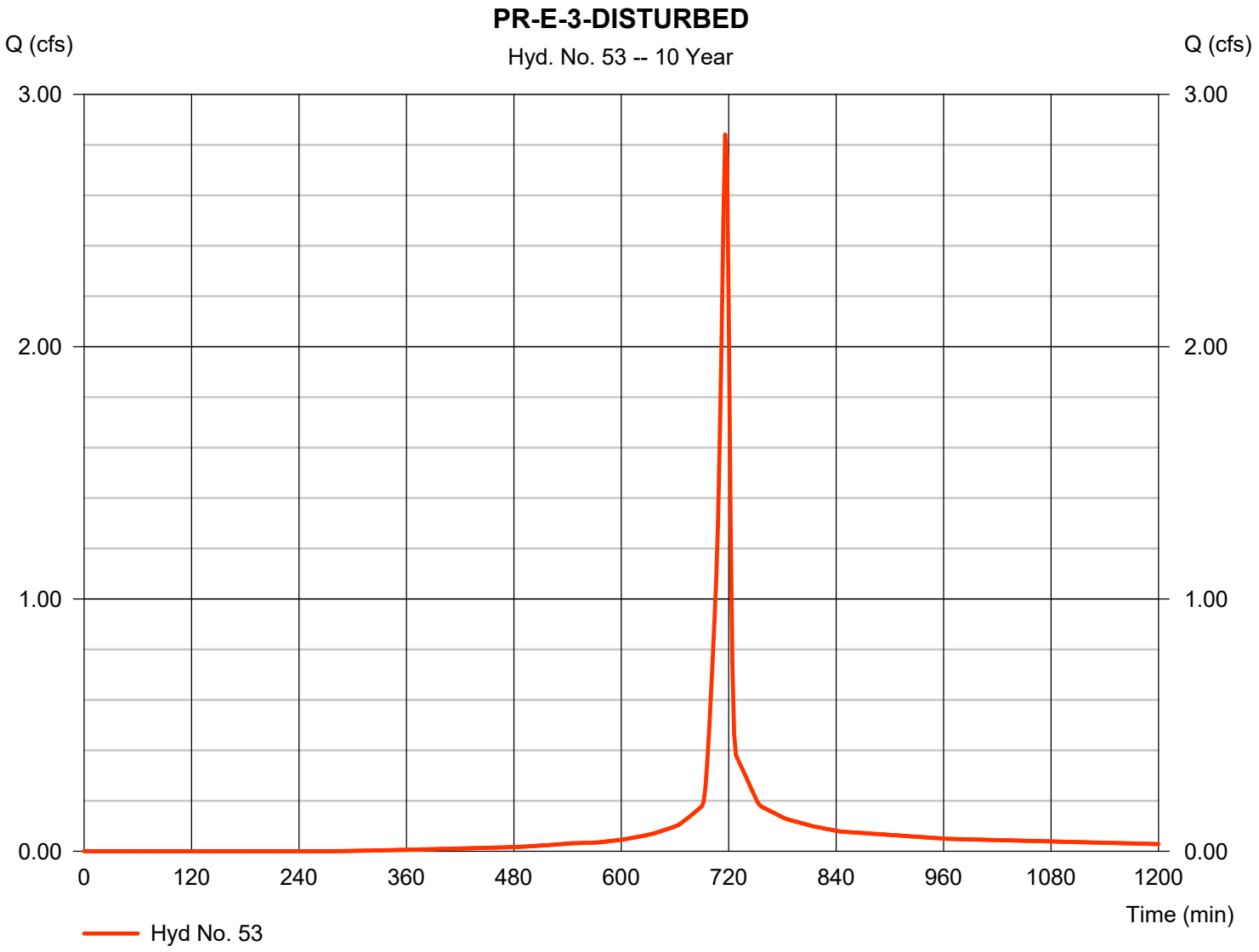


Hydrograph Report

Hyd. No. 53

PR-E-3-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.841 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	5,985 cuft
Drainage area	=	0.500 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

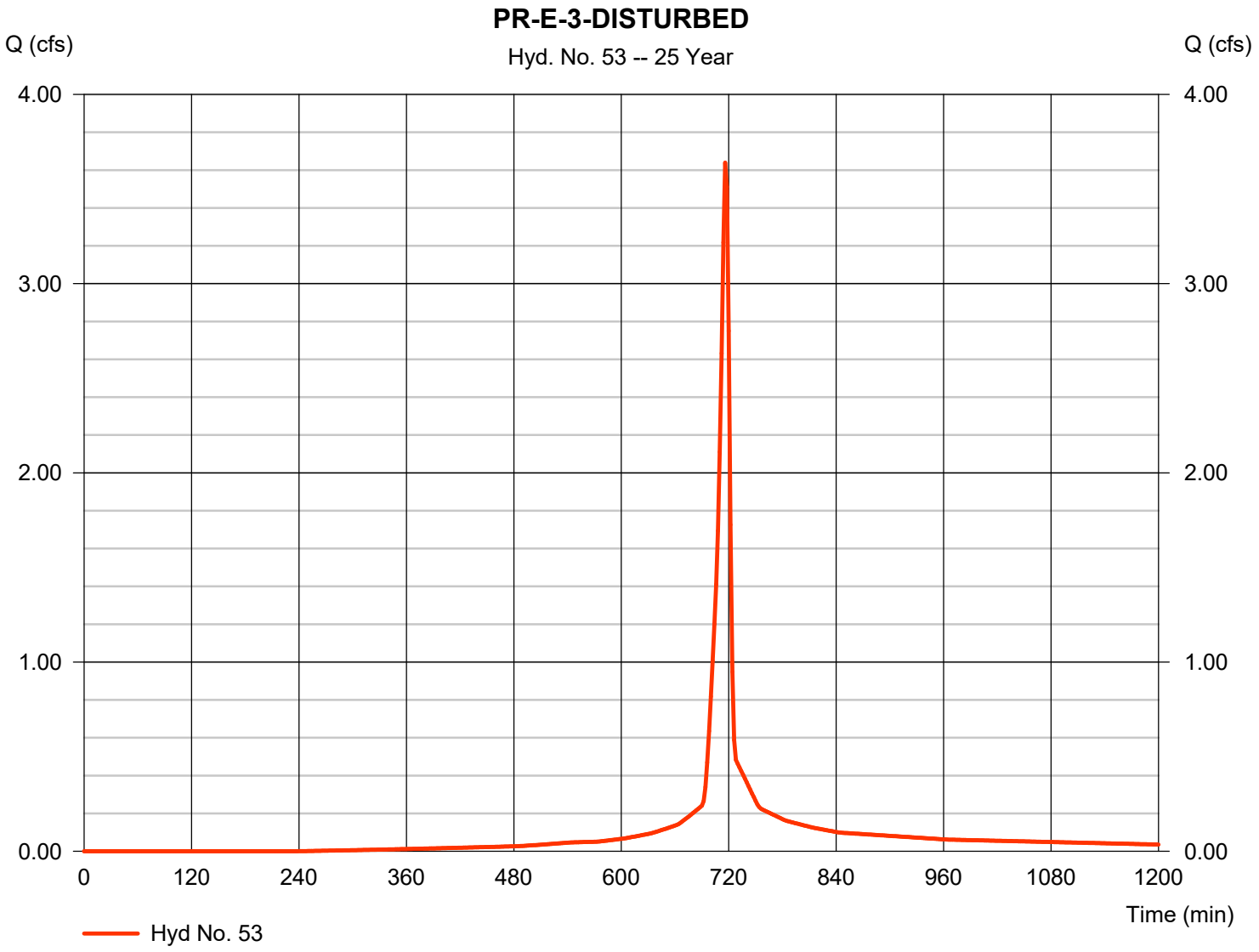


Hydrograph Report

Hyd. No. 53

PR-E-3-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.639 cfs
Storm frequency	=	25 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	7,789 cuft
Drainage area	=	0.500 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

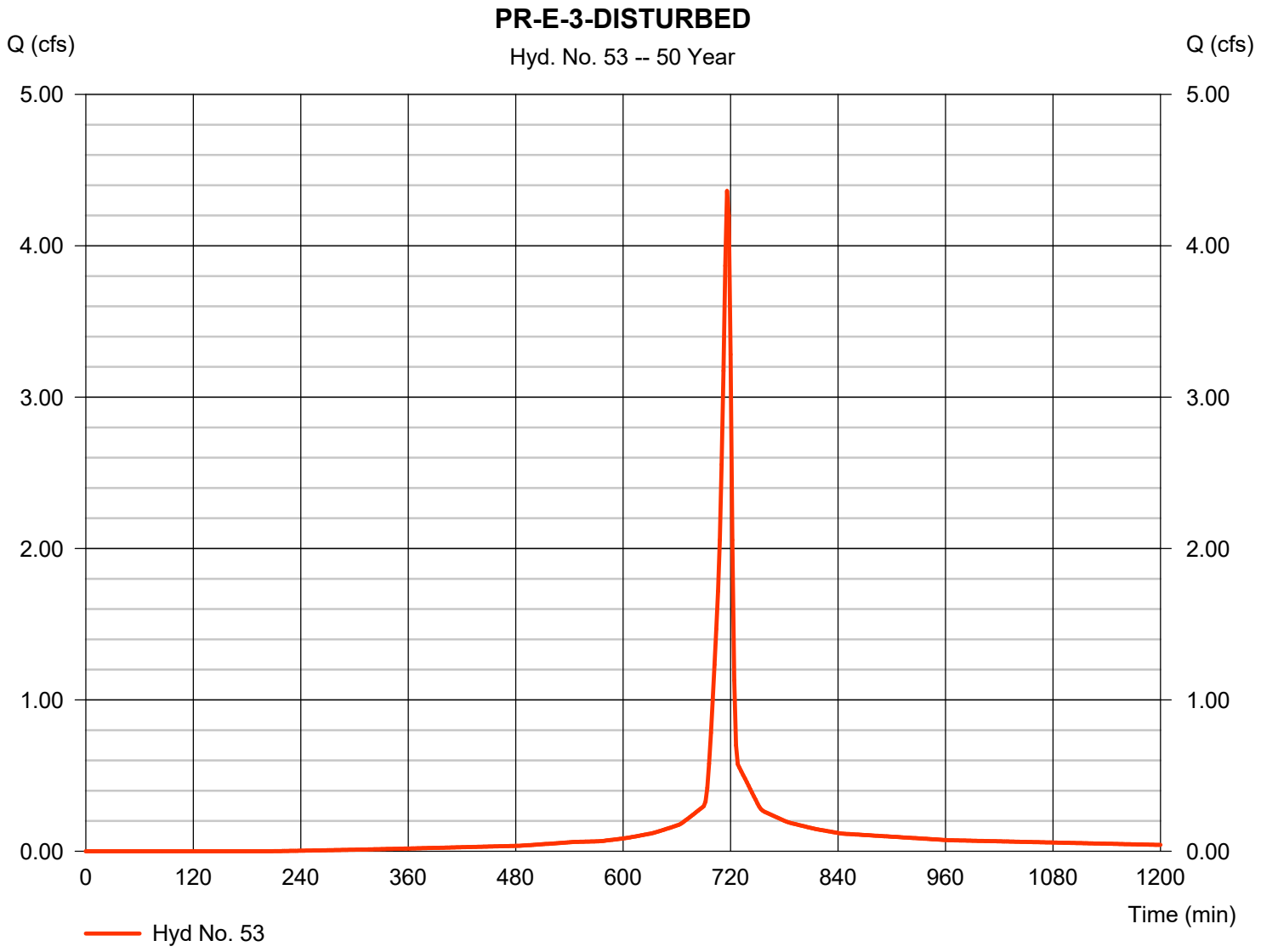


Hydrograph Report

Hyd. No. 53

PR-E-3-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.362 cfs
Storm frequency	=	50 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	9,452 cuft
Drainage area	=	0.500 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

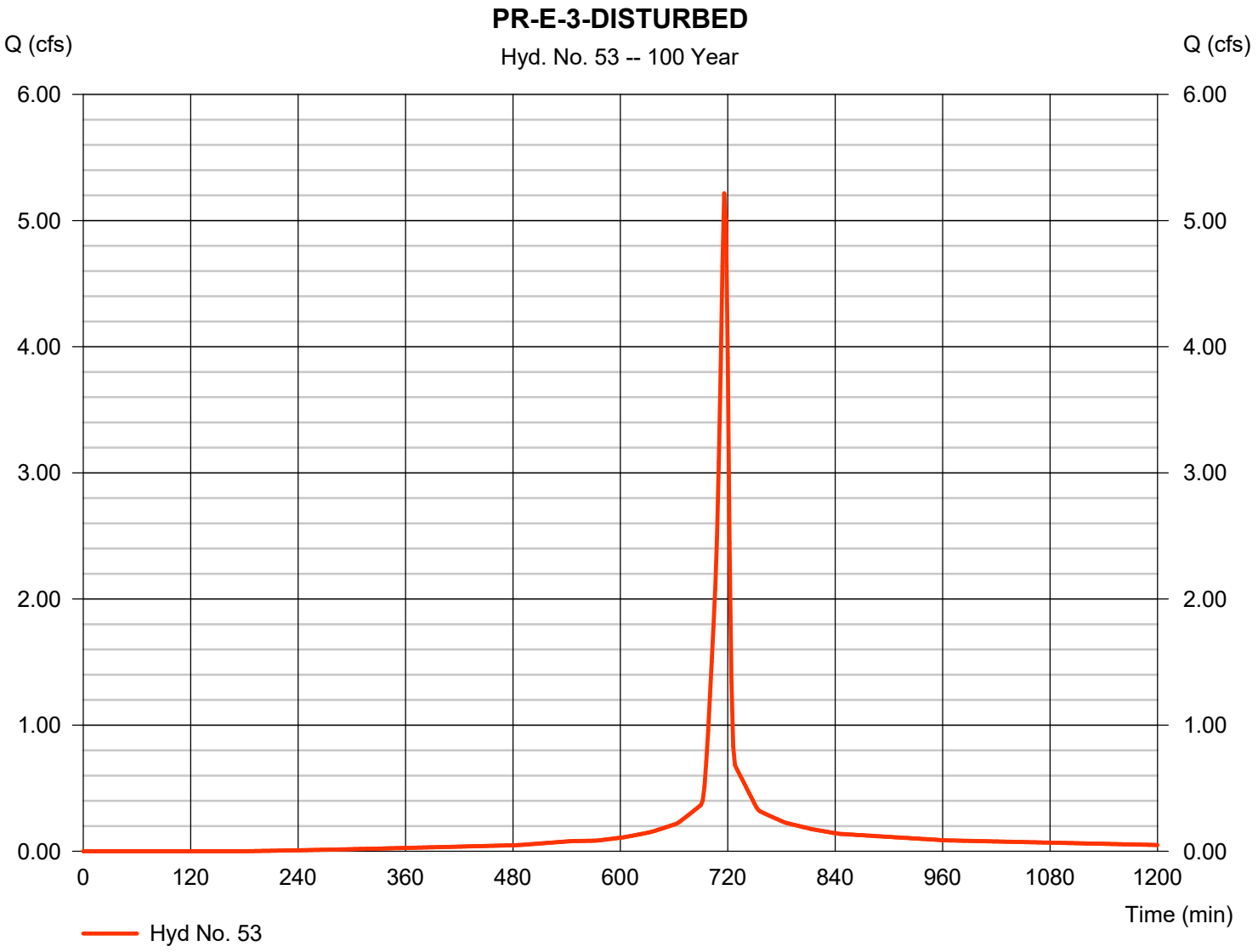


Hydrograph Report

Hyd. No. 53

PR-E-3-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.216 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	11,442 cuft
Drainage area	=	0.500 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



PR-E-3-UNDISTURBED WATERSHED

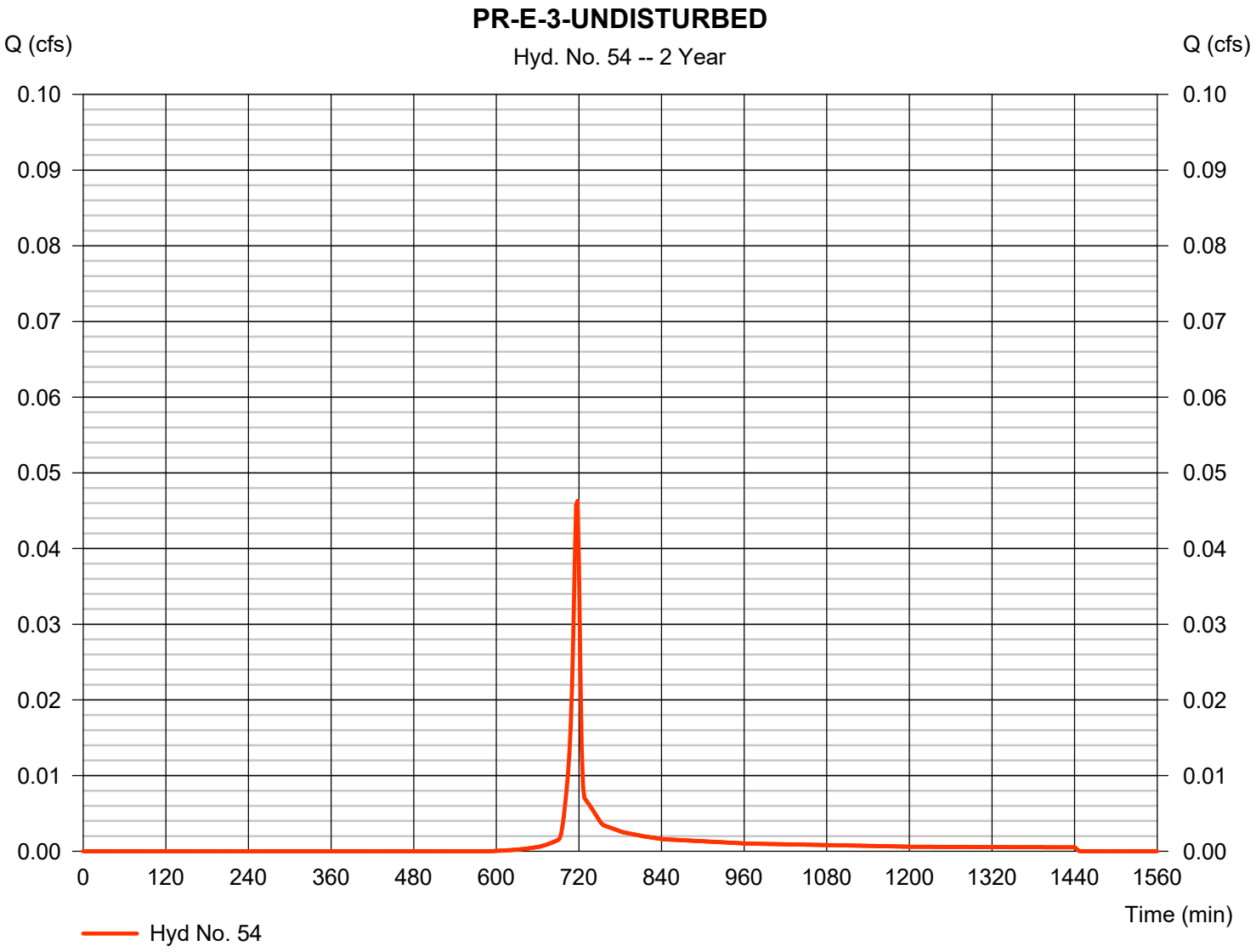
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 54

PR-E-3-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.046 cfs
Storm frequency	=	2 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	93 cuft
Drainage area	=	0.020 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

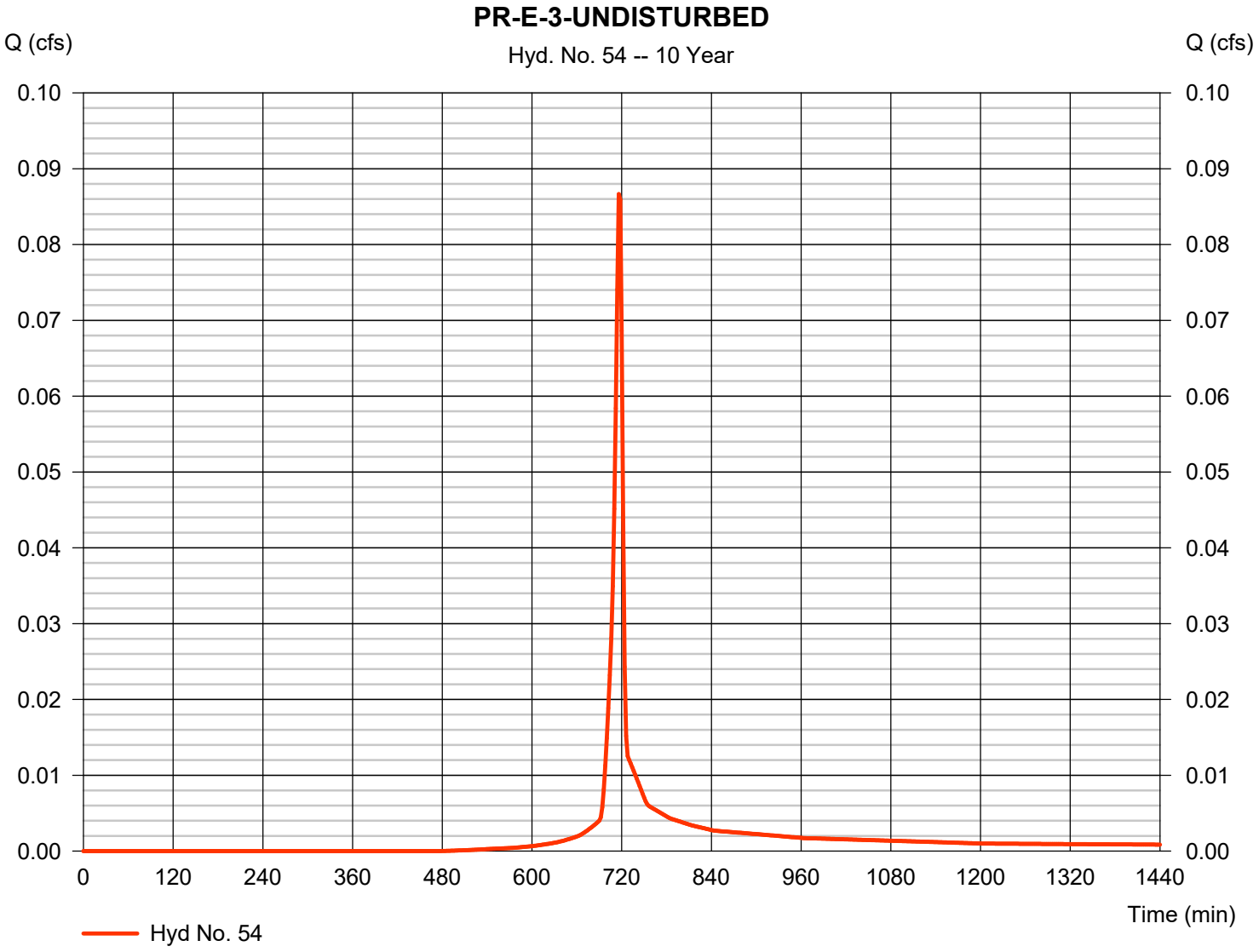


Hydrograph Report

Hyd. No. 54

PR-E-3-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.087 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	175 cuft
Drainage area	=	0.020 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

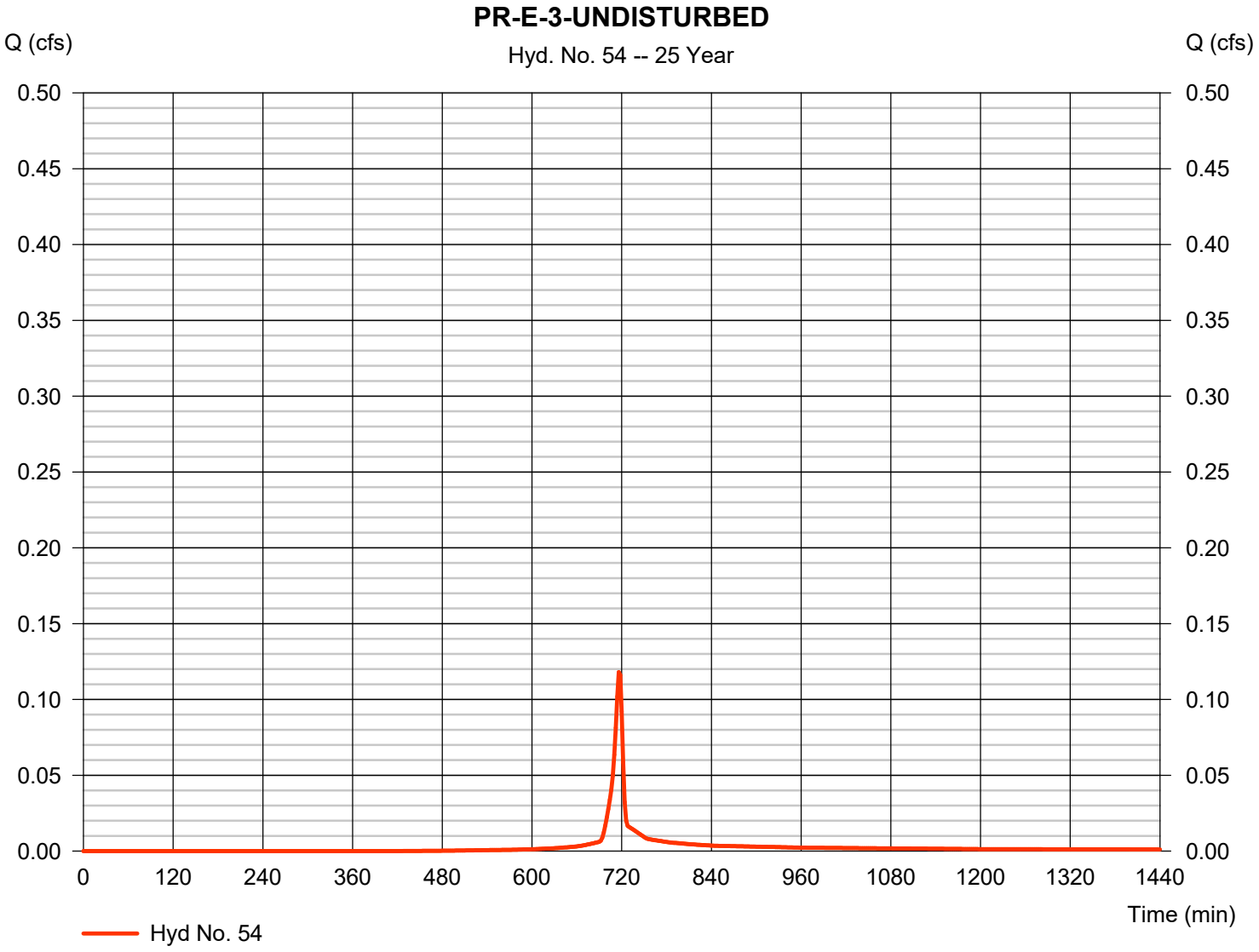


Hydrograph Report

Hyd. No. 54

PR-E-3-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.118 cfs
Storm frequency	=	25 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	241 cuft
Drainage area	=	0.020 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

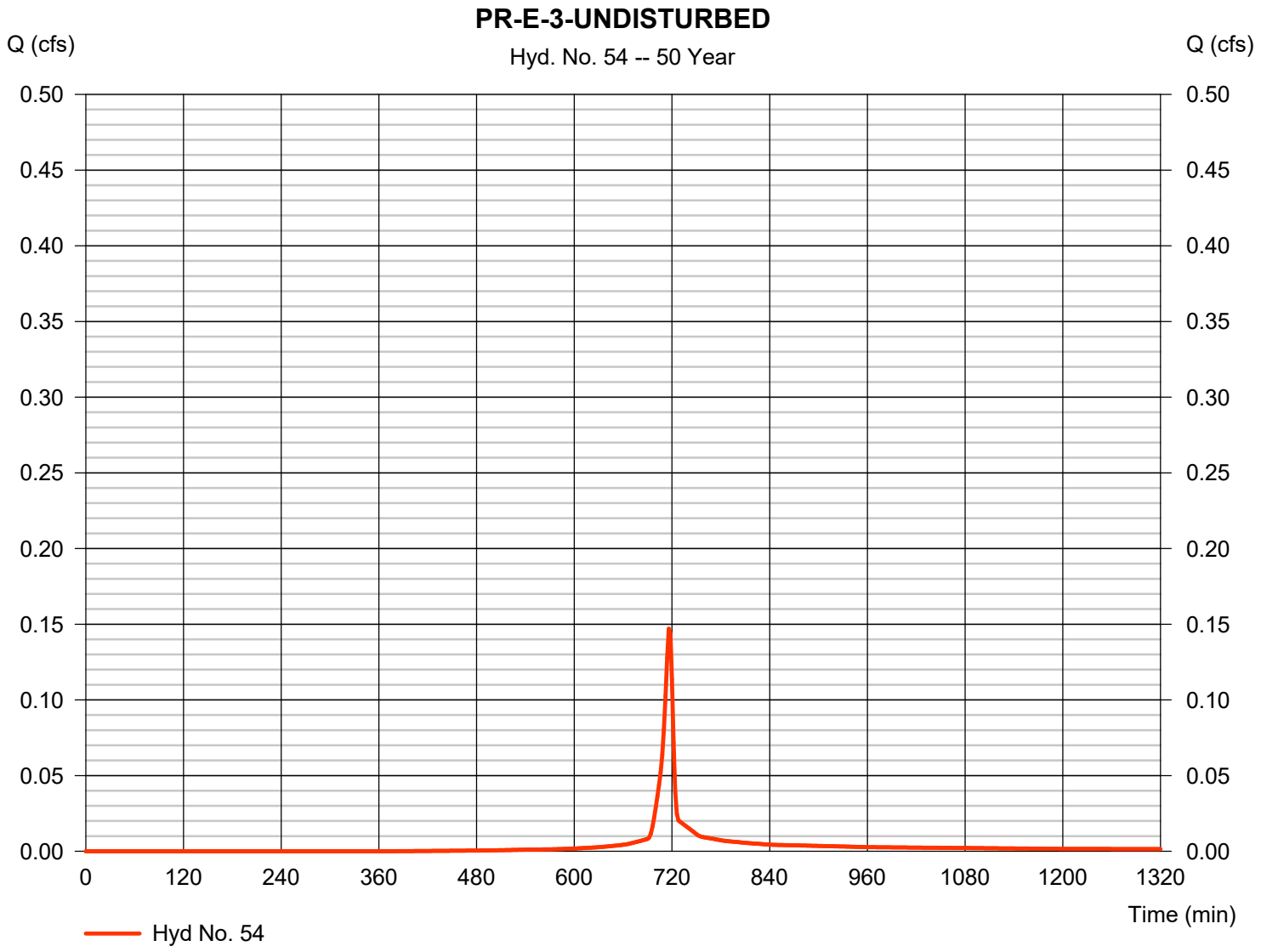


Hydrograph Report

Hyd. No. 54

PR-E-3-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.147 cfs
Storm frequency	=	50 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	302 cuft
Drainage area	=	0.020 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

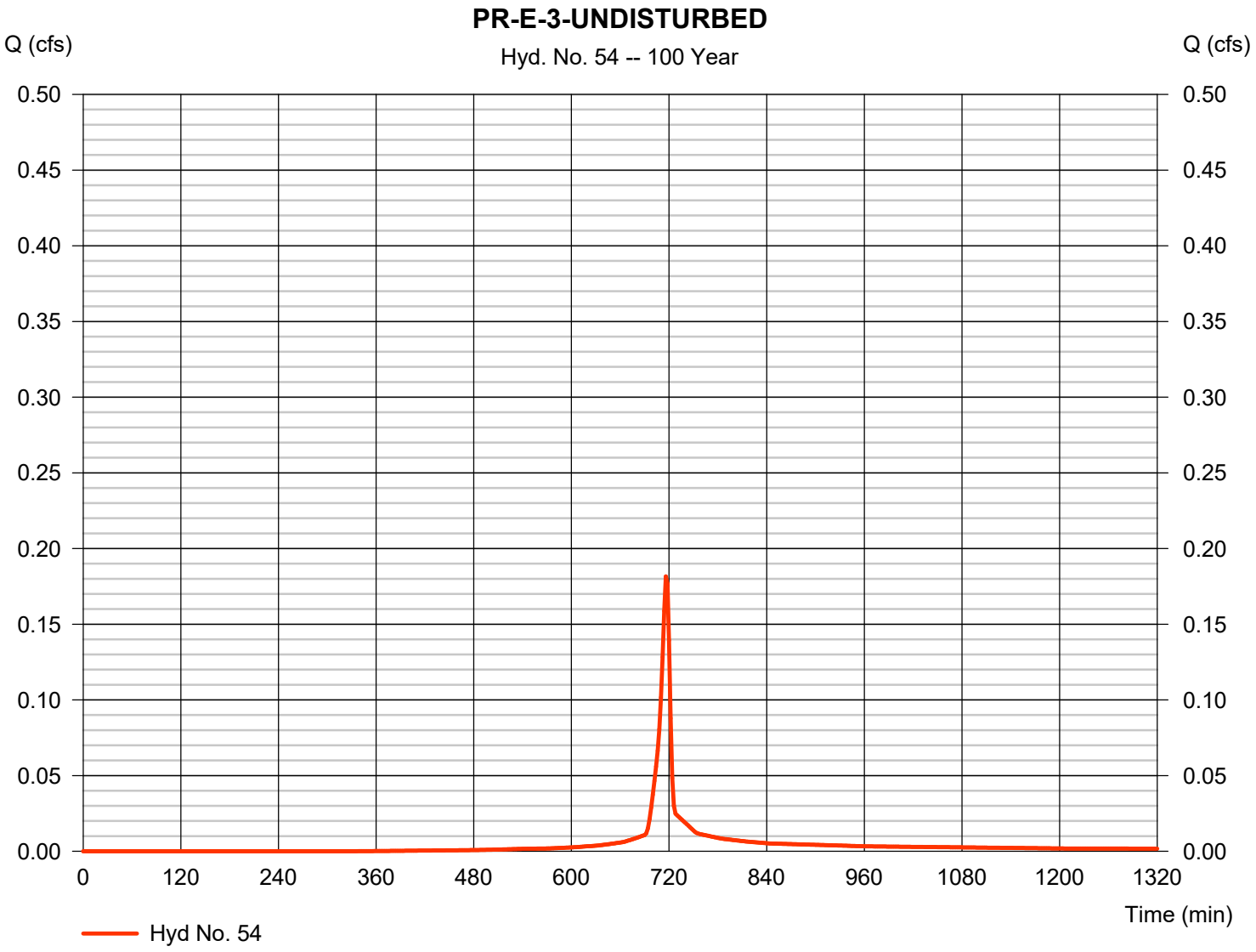


Hydrograph Report

Hyd. No. 54

PR-E-3-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.182 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	377 cuft
Drainage area	=	0.020 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



PR-E-3 COMBINED FLOW

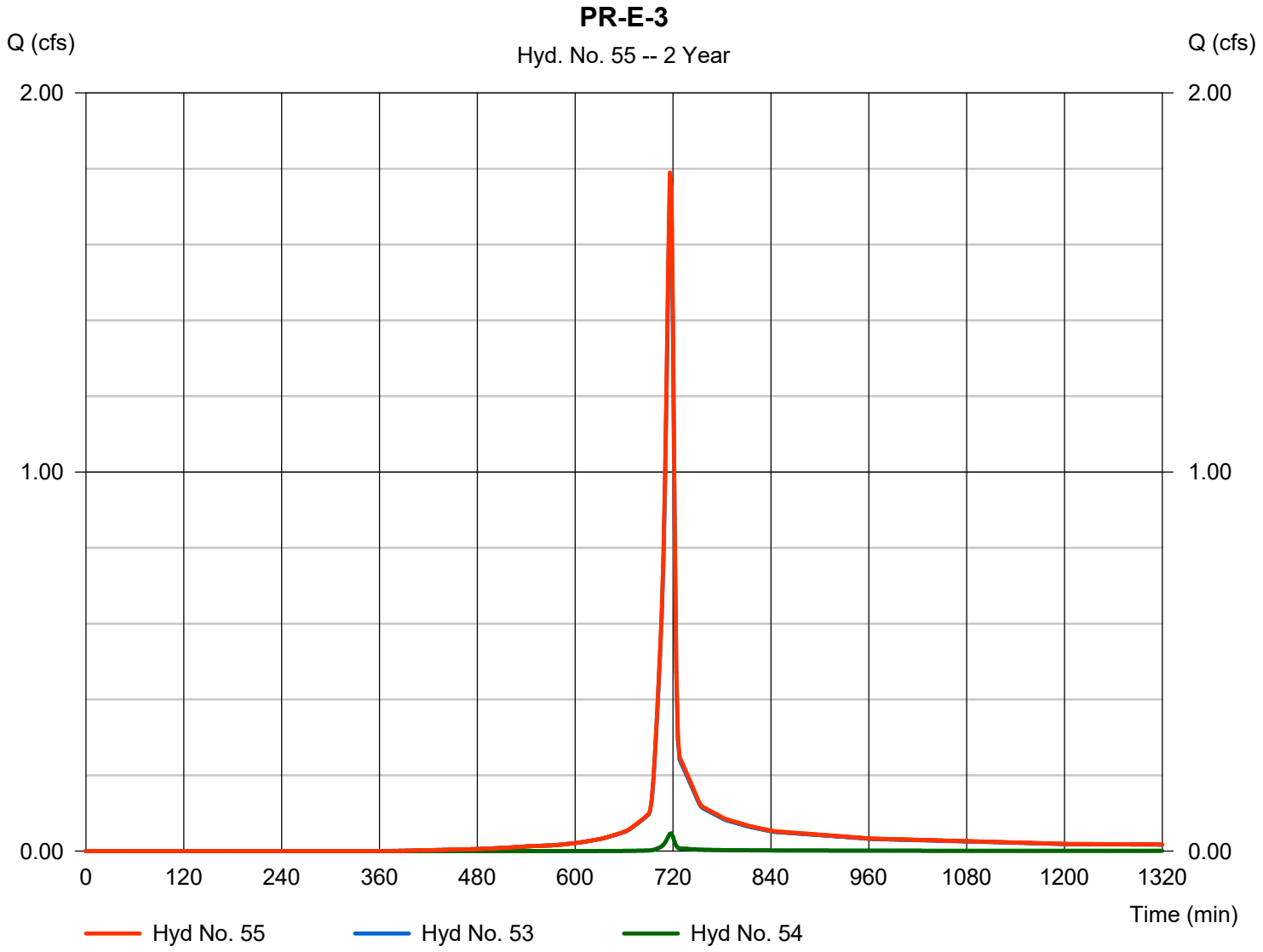
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 55

PR-E-3

Hydrograph type	=	Combine	Peak discharge	=	1.790 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	3,675 cuft
Inflow hyds.	=	53, 54	Contrib. drain. area	=	0.520 ac

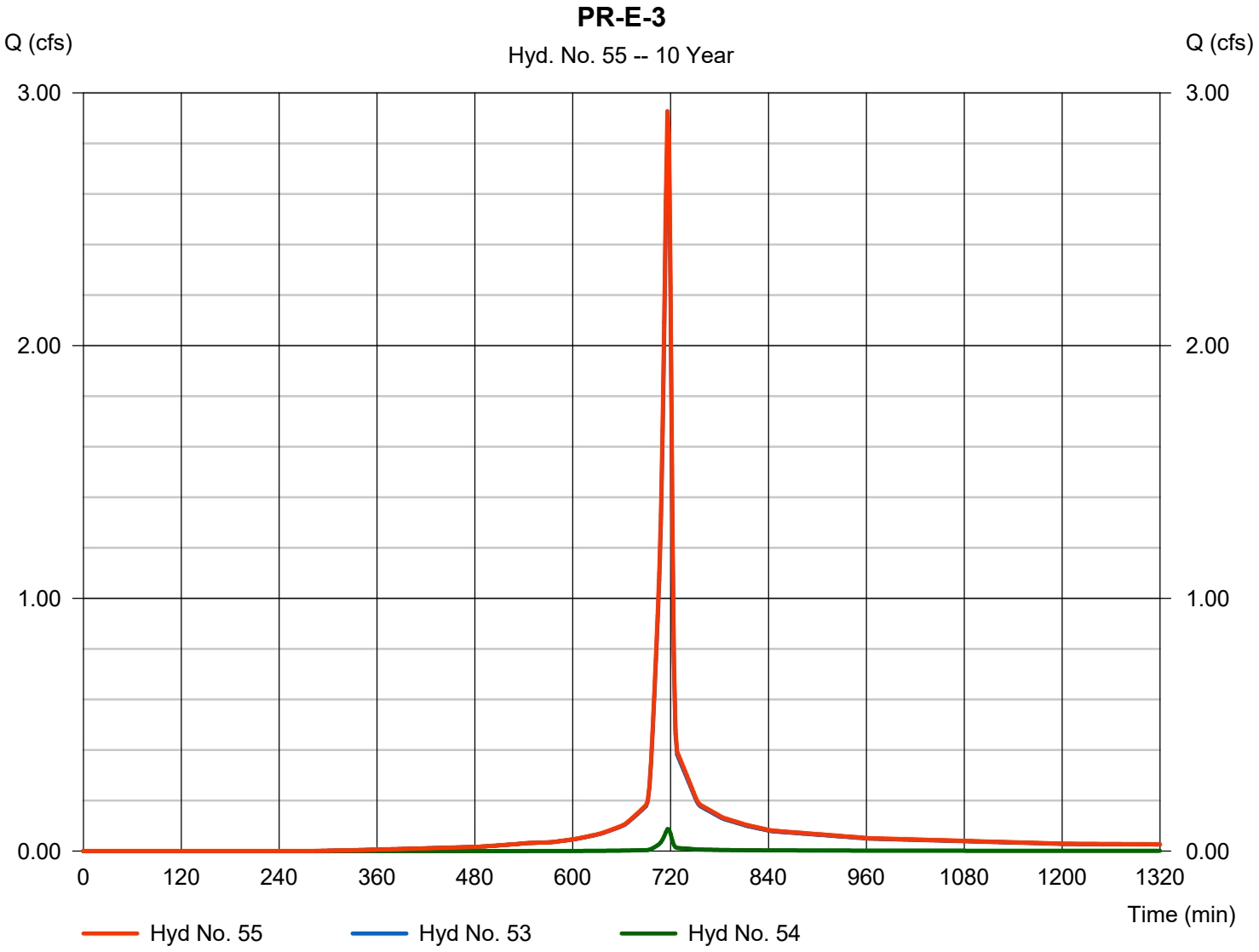


Hydrograph Report

Hyd. No. 55

PR-E-3

Hydrograph type	=	Combine	Peak discharge	=	2.927 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	6,160 cuft
Inflow hyds.	=	53, 54	Contrib. drain. area	=	0.520 ac

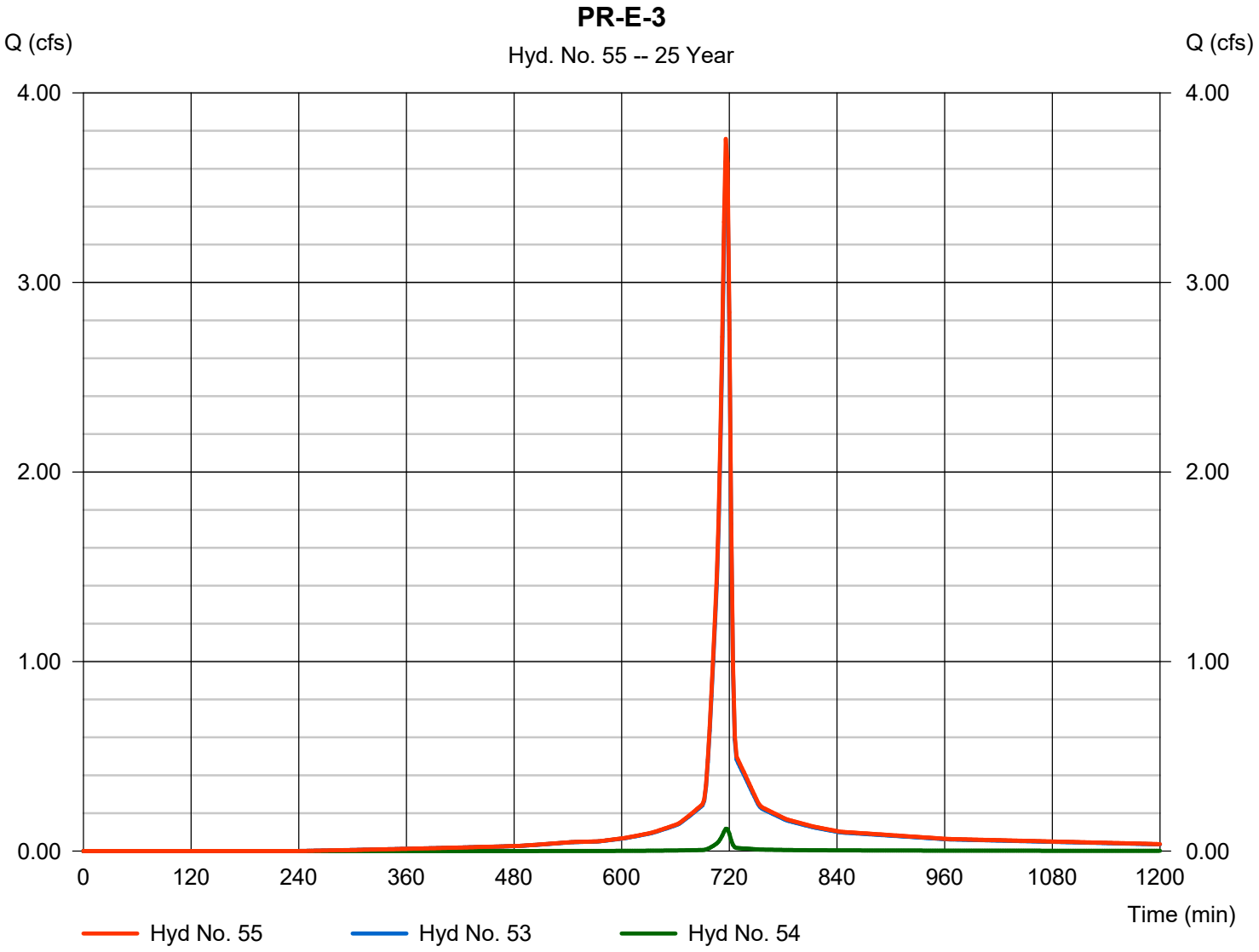


Hydrograph Report

Hyd. No. 55

PR-E-3

Hydrograph type	=	Combine	Peak discharge	=	3.757 cfs
Storm frequency	=	25 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	8,030 cuft
Inflow hyds.	=	53, 54	Contrib. drain. area	=	0.520 ac

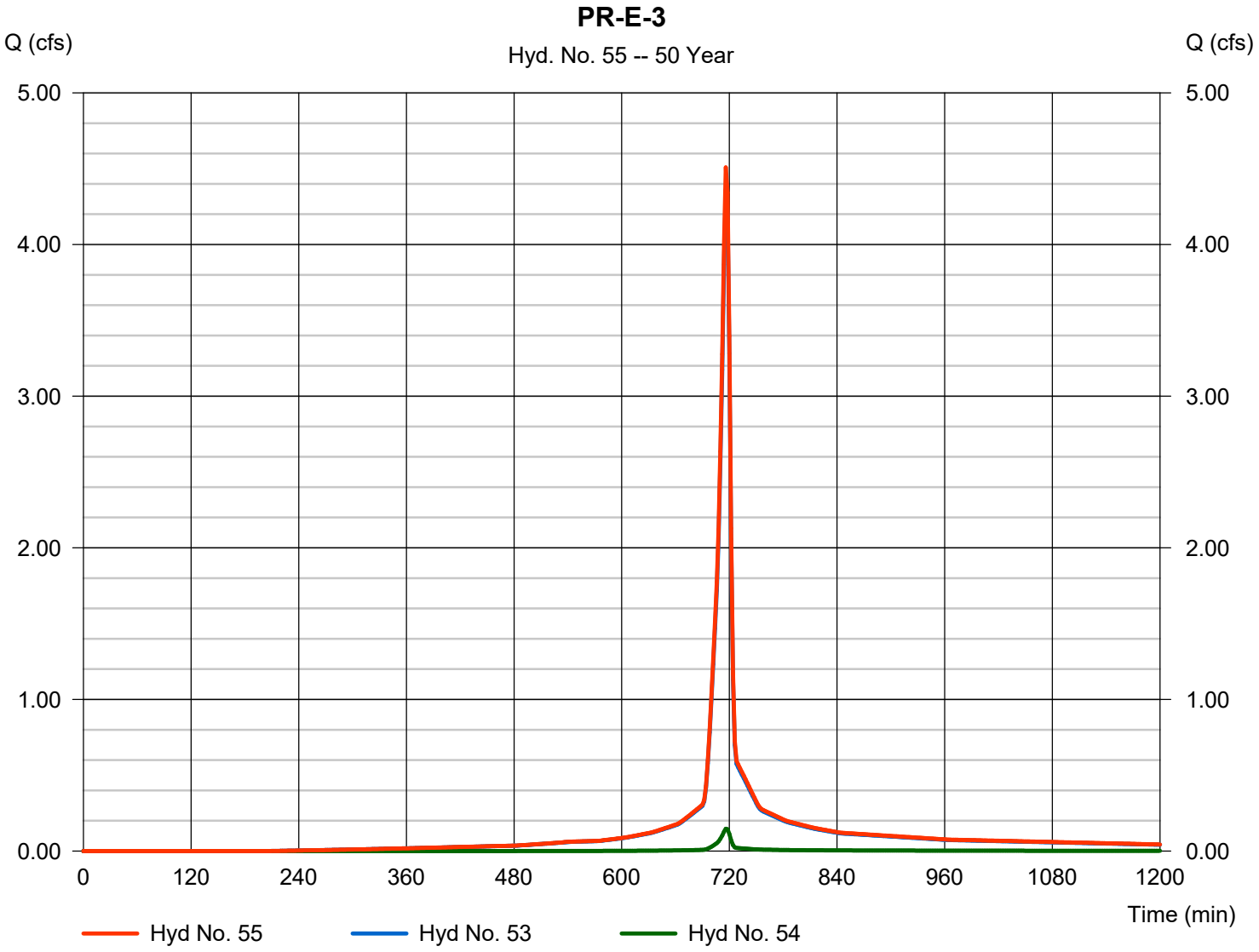


Hydrograph Report

Hyd. No. 55

PR-E-3

Hydrograph type	=	Combine	Peak discharge	=	4.509 cfs
Storm frequency	=	50 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	9,754 cuft
Inflow hyds.	=	53, 54	Contrib. drain. area	=	0.520 ac

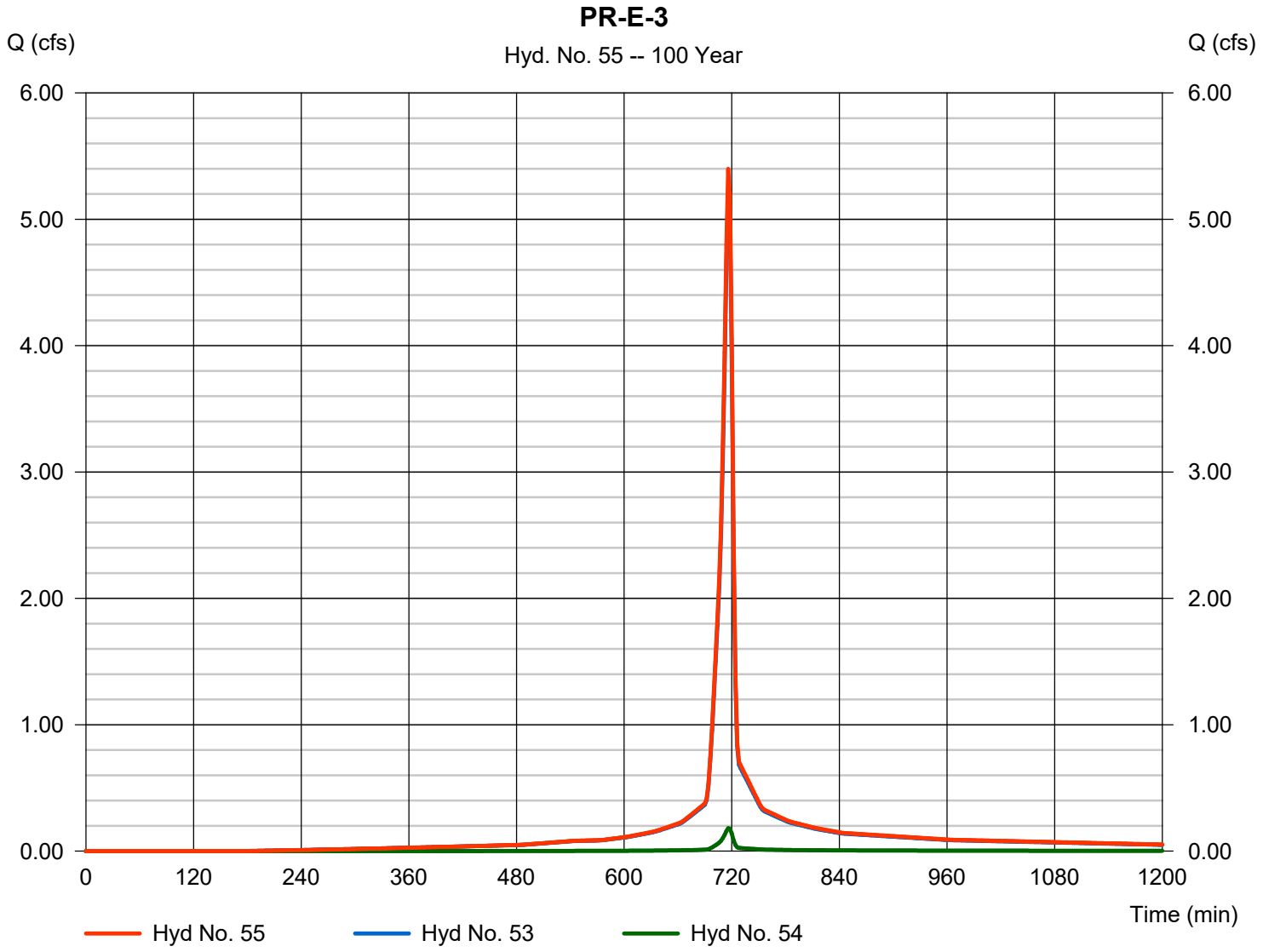


Hydrograph Report

Hyd. No. 55

PR-E-3

Hydrograph type	=	Combine	Peak discharge	=	5.397 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	11,819 cuft
Inflow hyds.	=	53, 54	Contrib. drain. area	=	0.520 ac



PR-E-4-DISTURBED WATERSHED

Hydrograph Report

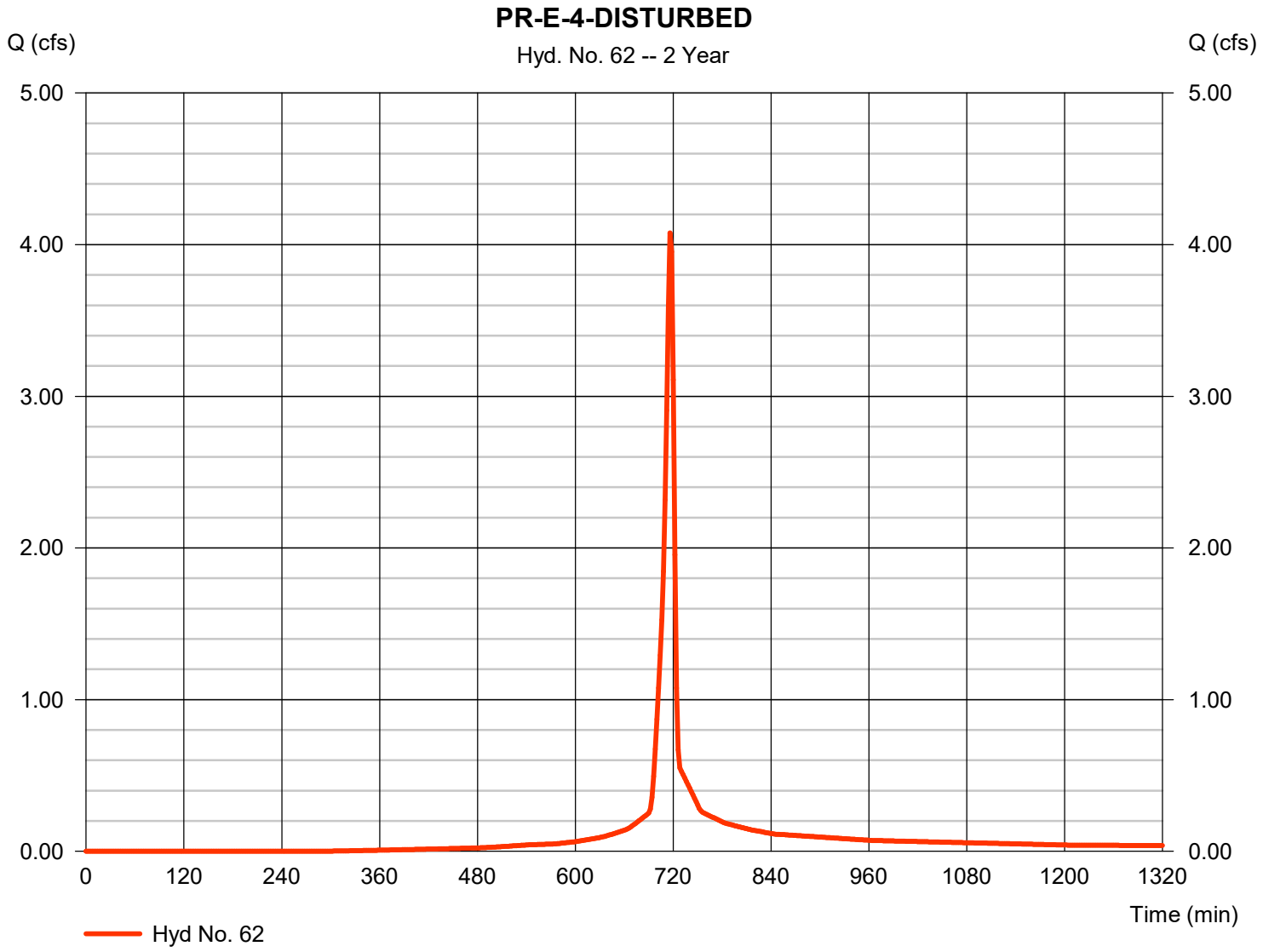
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 62

PR-E-4-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.077 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	8,553 cuft
Drainage area	=	1.060 ac	Curve number	=	91*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.350 x 98)] / 1.060



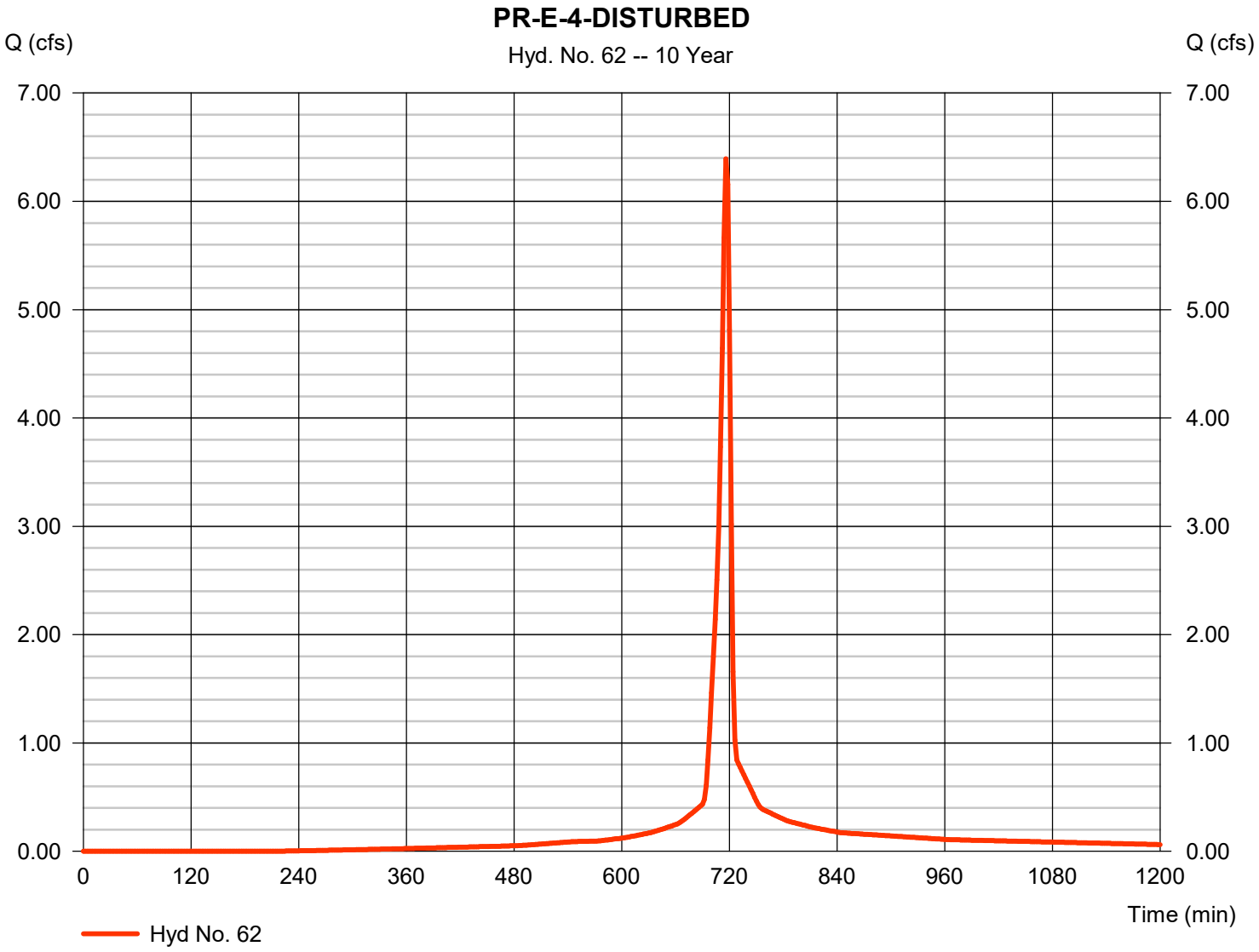
Hydrograph Report

Hyd. No. 62

PR-E-4-DISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 6.392 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 13,805 cuft
Drainage area	= 1.060 ac	Curve number	= 91*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 4.84 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.350 x 98)] / 1.060



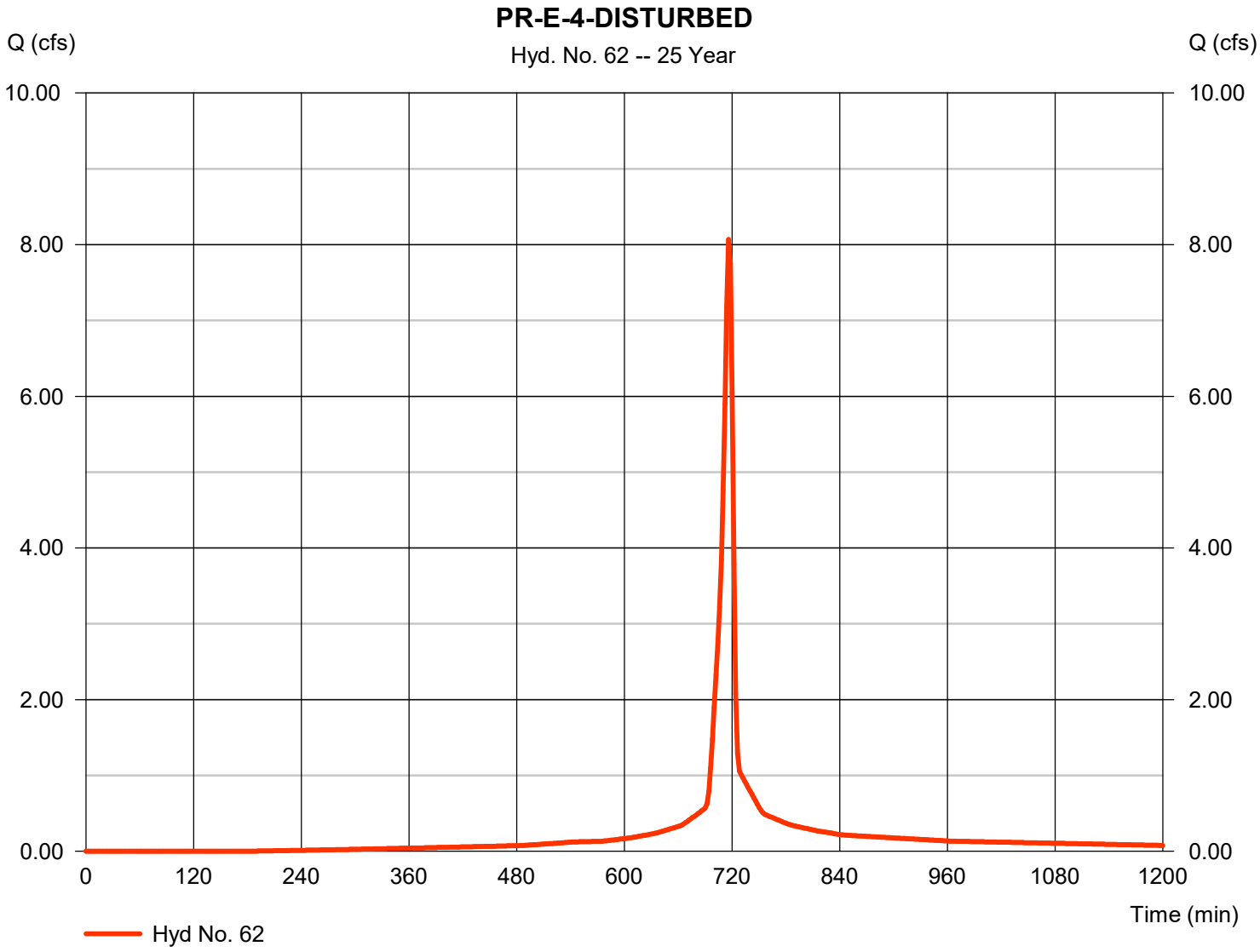
Hydrograph Report

Hyd. No. 62

PR-E-4-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.067 cfs
Storm frequency	=	25 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	17,706 cuft
Drainage area	=	1.060 ac	Curve number	=	91*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.350 x 98)] / 1.060



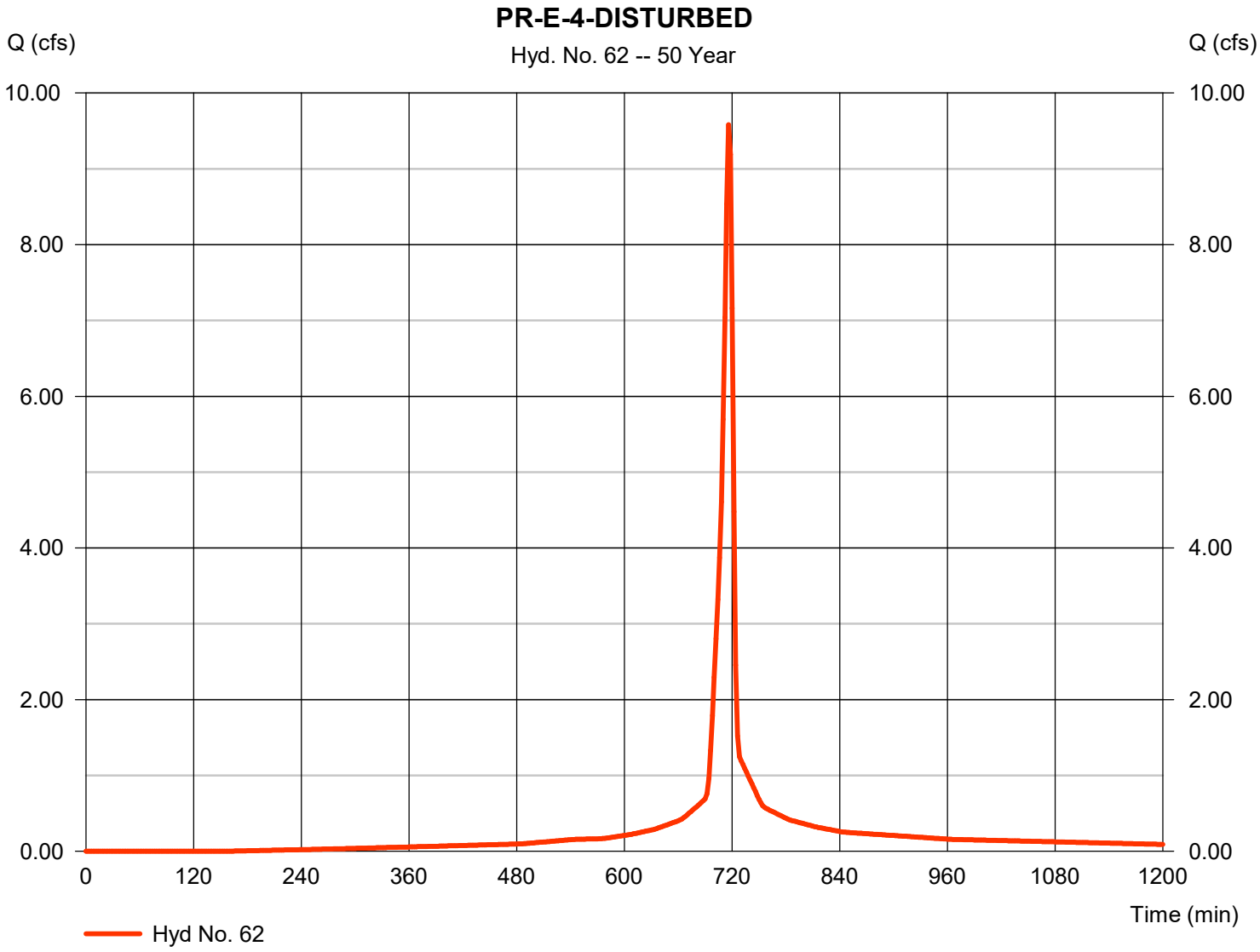
Hydrograph Report

Hyd. No. 62

PR-E-4-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.581 cfs
Storm frequency	=	50 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	21,281 cuft
Drainage area	=	1.060 ac	Curve number	=	91*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.350 x 98)] / 1.060



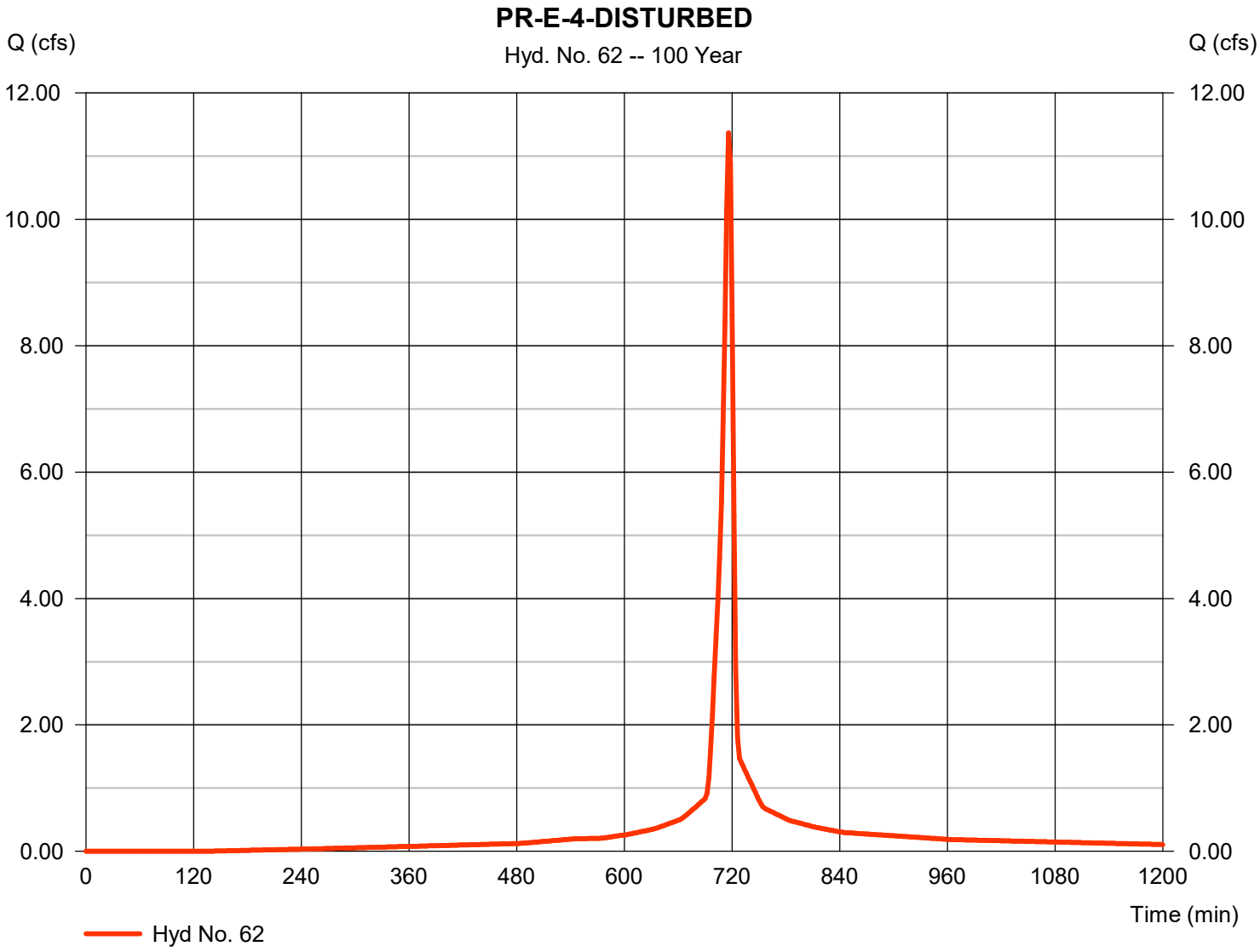
Hydrograph Report

Hyd. No. 62

PR-E-4-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.37 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	25,549 cuft
Drainage area	=	1.060 ac	Curve number	=	91*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.350 x 98)] / 1.060



PR-E-4-UNDISTURBED WATERSHED

TR-55 TIME OF CONCENTRATION (Tc) OR TRAVEL TIME (Tt) CALCULATIONS

Project: Smithfield Gateway Phase 1A-1 **By:** MJV **Date:** 4/1/2021
Location: Smithfield Township, Monroe County, PA **Checked:** TH **Date:** 4/1/2021
Watershed: PR-E-4-UNDISTURBED

Sheet Flow (Applicable to Tc only)													
1	Surface Description (table 3-1)		Grass										
2	Manning's roughness coeff., n (table 3-1)		0.240										
3	Flow length, L (total L<100 ft)	**ft**	100										
4	Two-yr 24-hr rainfall, P2	**in**	3.32										
5	Land Slope, s	**ft/ft**	0.0500										
6	$Tt = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5}(s)^{.04}}$	**Compute Tt, hr**	0.1618	+		+		+		+		+	0.1618 hr
Shallow Concentrated Flow													
7	Surface Description (Paved or Unpaved)		Unpaved		Paved								
8	Flow length, L	**ft**	173		153								
9	Watercourse slope, s	**ft/ft**	0.0500		0.0200								
10	Average Velocity, V (figure 3-1)	**ft/sec**	3.61		2.87								
11	Tt = L / (3600V)	**Compute Tt , hr**	0.0133	+	0.0148	+		+		+		+	0.0281 hr
Channel / Pipe Flow													
12	Cross Sectional flow area, a	**ft^2**											
13	Wetted Perimeter, p_w	**ft**											
14	Hydraulic radius, $r = a/p_w$	**ft**											
15	Channel slope, s	**ft/ft**											
16	Manning's roughness coeff., n (table 3-1)												
17	$V = (1.49*r^{2/3}*s^{1/2})/n$	**ft/s**											
18	Flow length, L	**ft**											
19	Tt = L / (3600V)	**Compute Tt , hr**		+		+		+		+		+	0.0000 hr

20 **Watershed or subarea Tc or Tt (add Tt in steps 6,11, and 19)** 0.19 hr

11.4 min

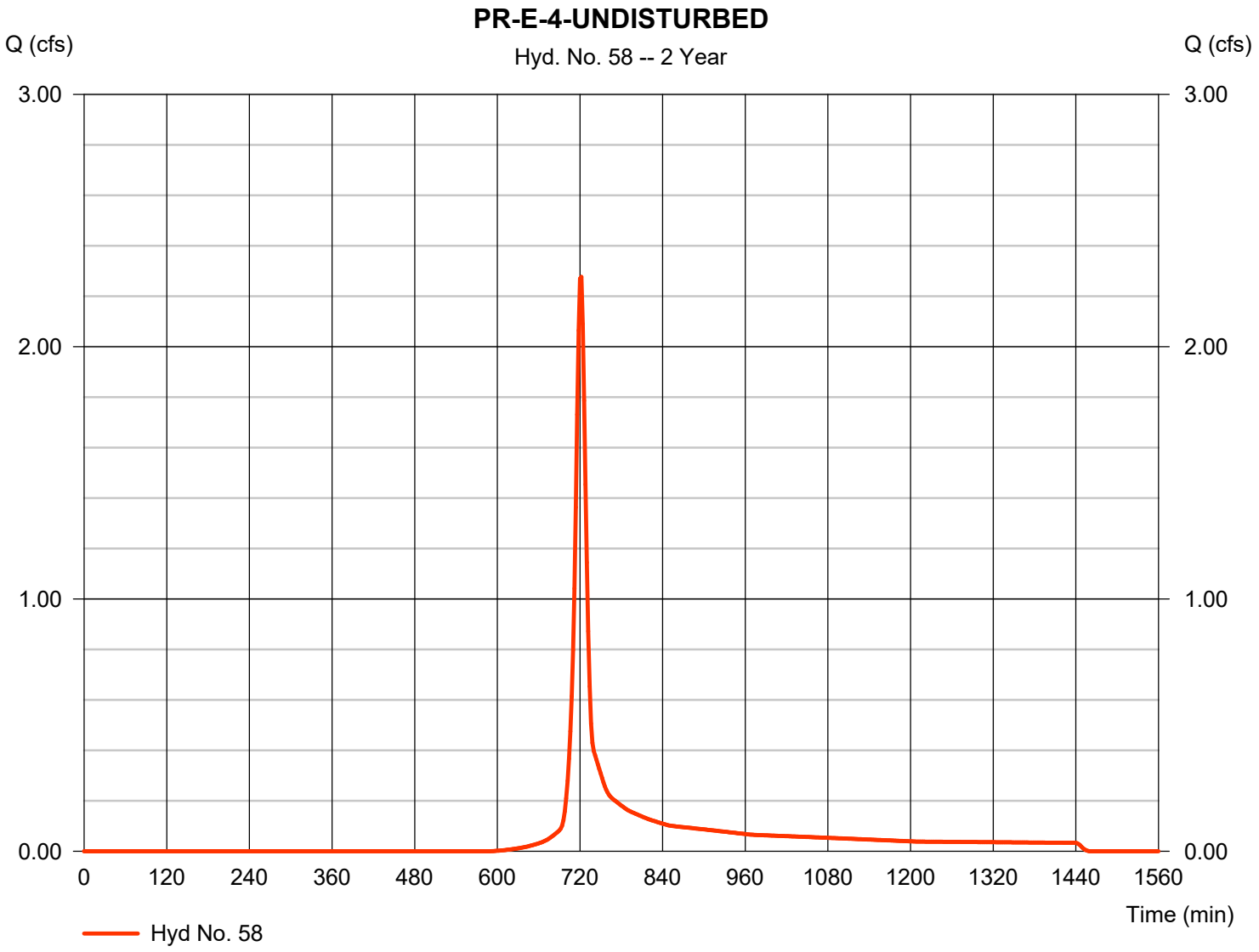
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 58

PR-E-4-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.276 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	5,965 cuft
Drainage area	=	1.170 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	11.40 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

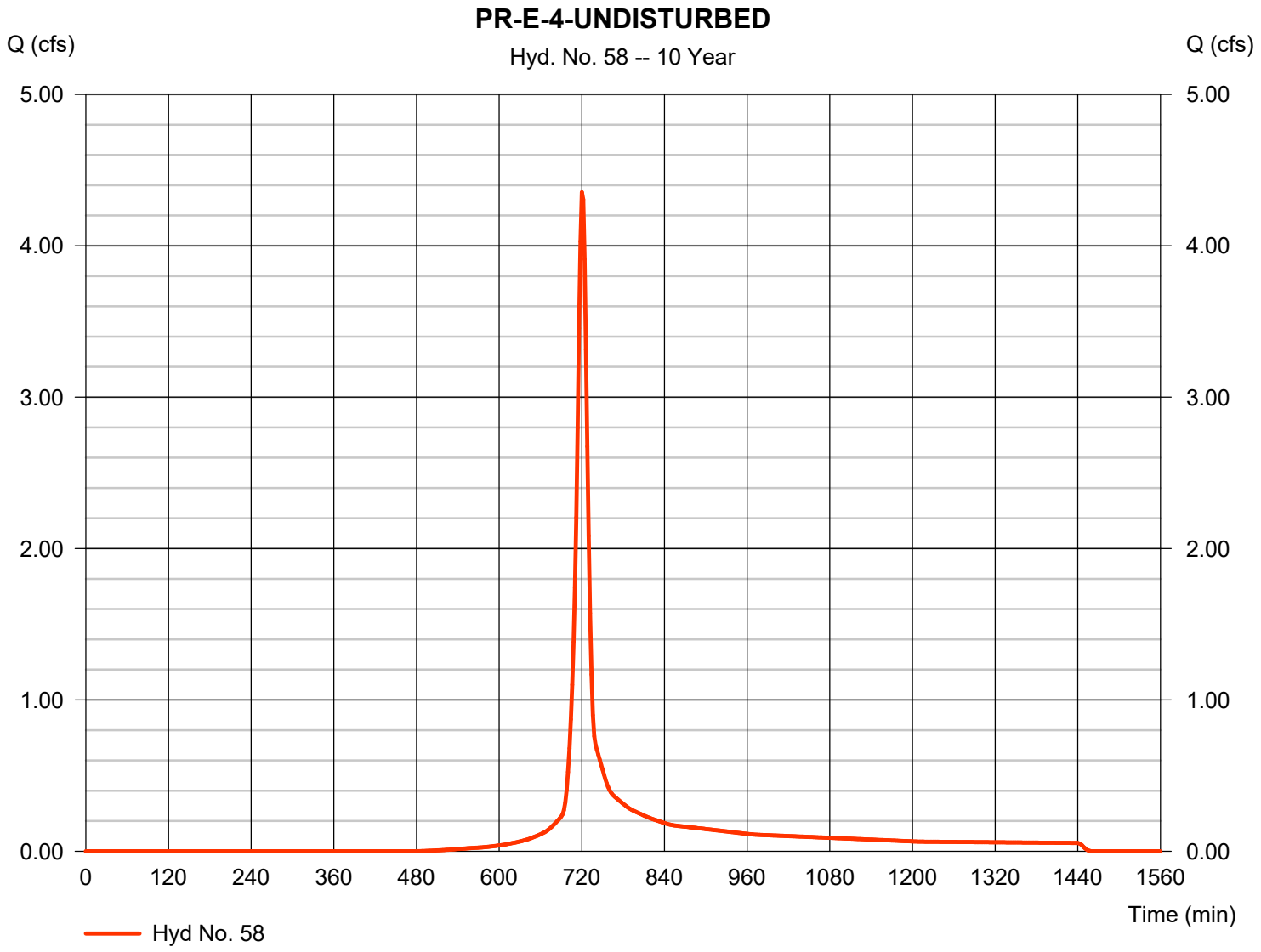


Hydrograph Report

Hyd. No. 58

PR-E-4-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 4.353 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 11,284 cuft
Drainage area	= 1.170 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 11.40 min
Total precip.	= 4.84 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

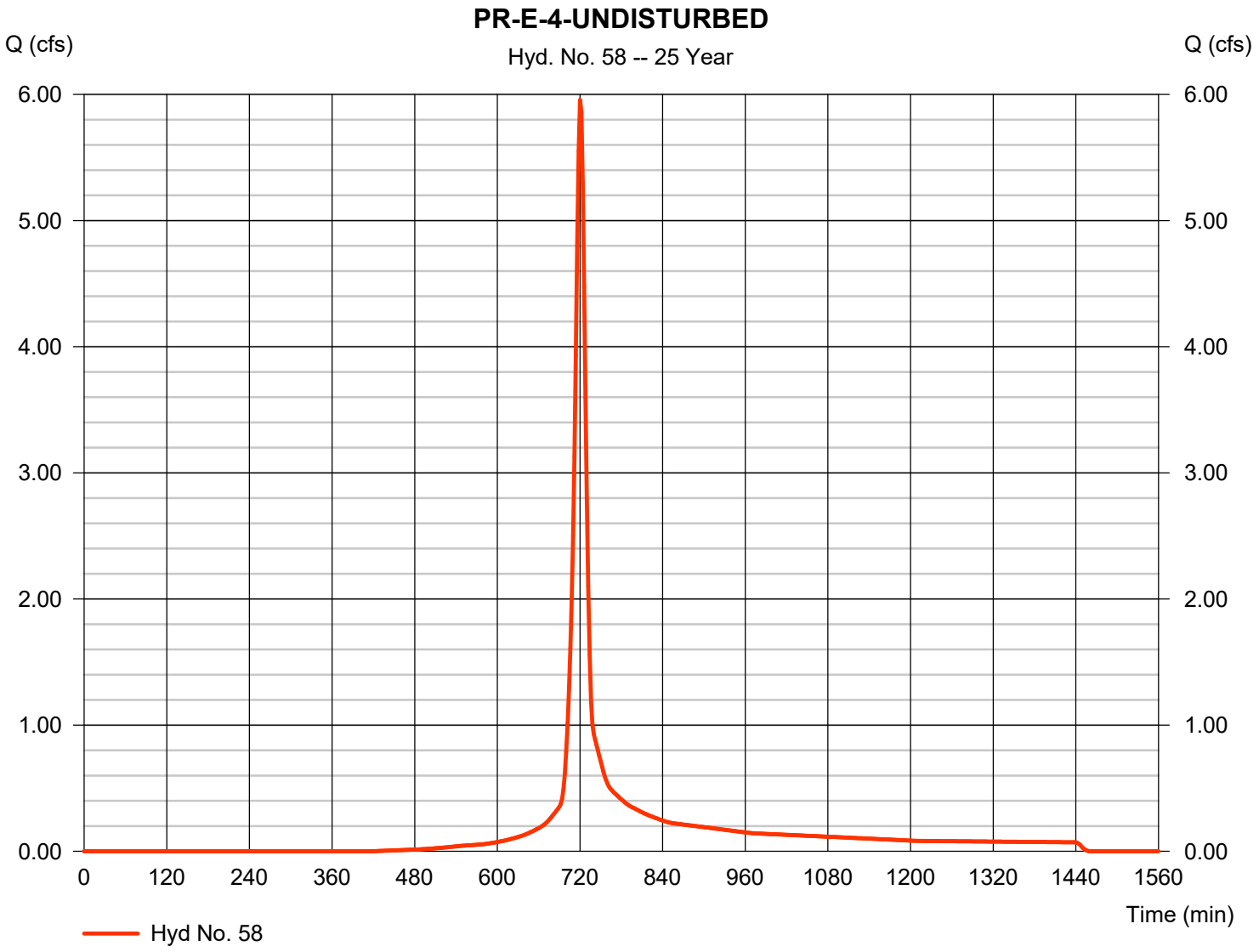


Hydrograph Report

Hyd. No. 58

PR-E-4-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.956 cfs
Storm frequency	=	25 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	15,482 cuft
Drainage area	=	1.170 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	11.40 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

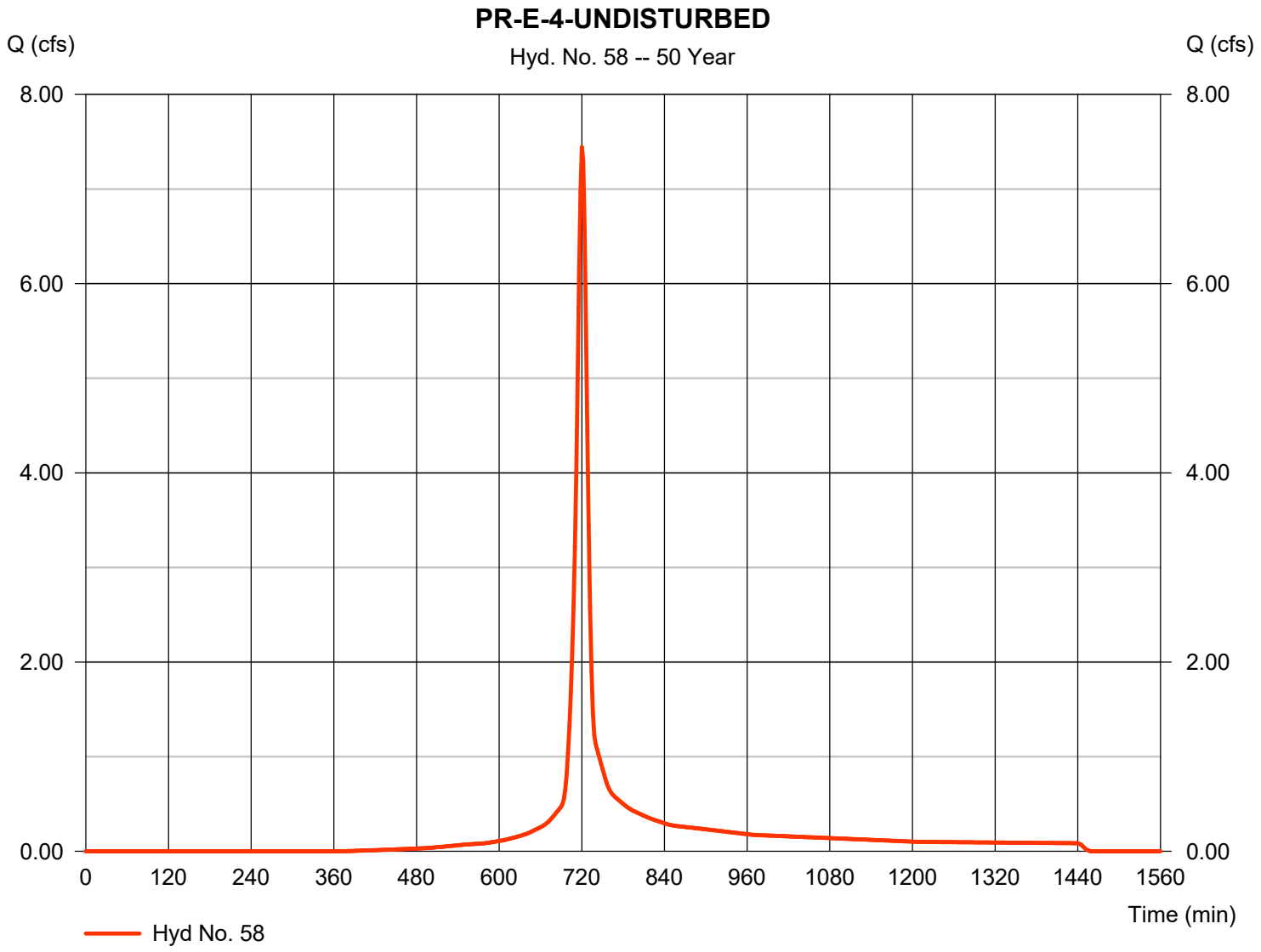


Hydrograph Report

Hyd. No. 58

PR-E-4-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.442 cfs
Storm frequency	=	50 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	19,440 cuft
Drainage area	=	1.170 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	11.40 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

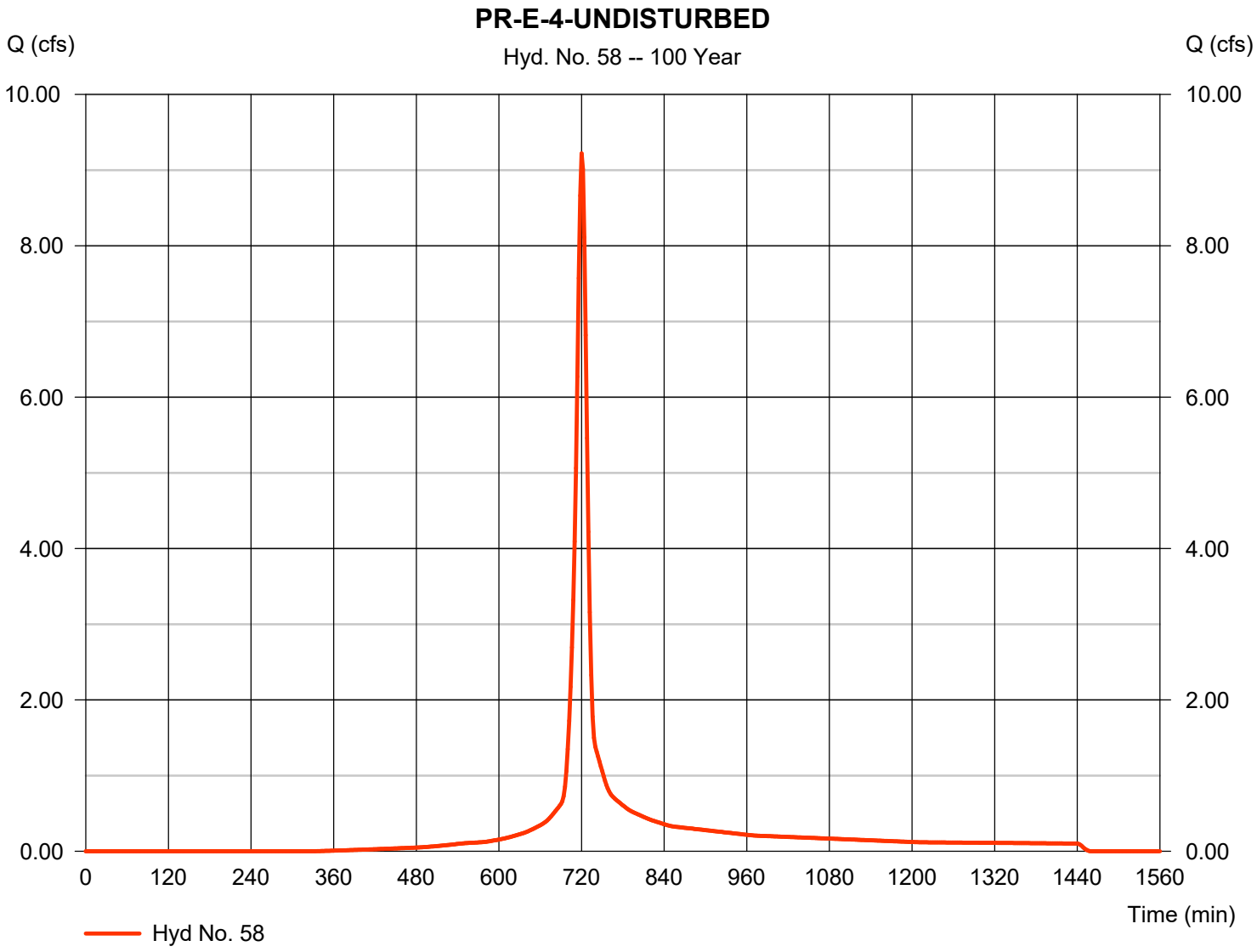


Hydrograph Report

Hyd. No. 58

PR-E-4-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.221 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	24,260 cuft
Drainage area	=	1.170 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	11.40 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



PR-E-4 COMBINED FLOW

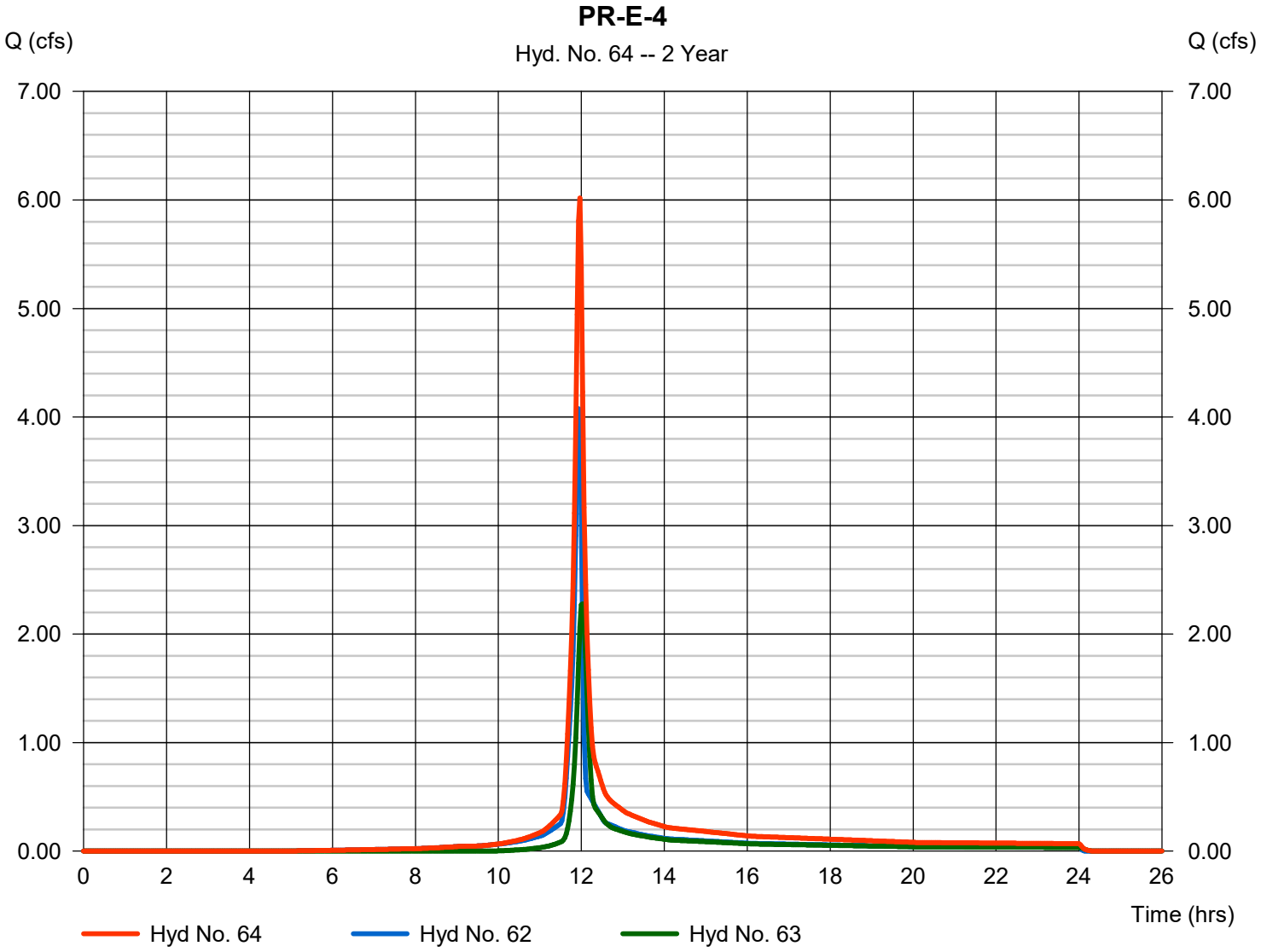
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 64

PR-E-4

Hydrograph type	= Combine	Peak discharge	= 6.018 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 14,519 cuft
Inflow hyds.	= 62, 63	Contrib. drain. area	= 2.230 ac

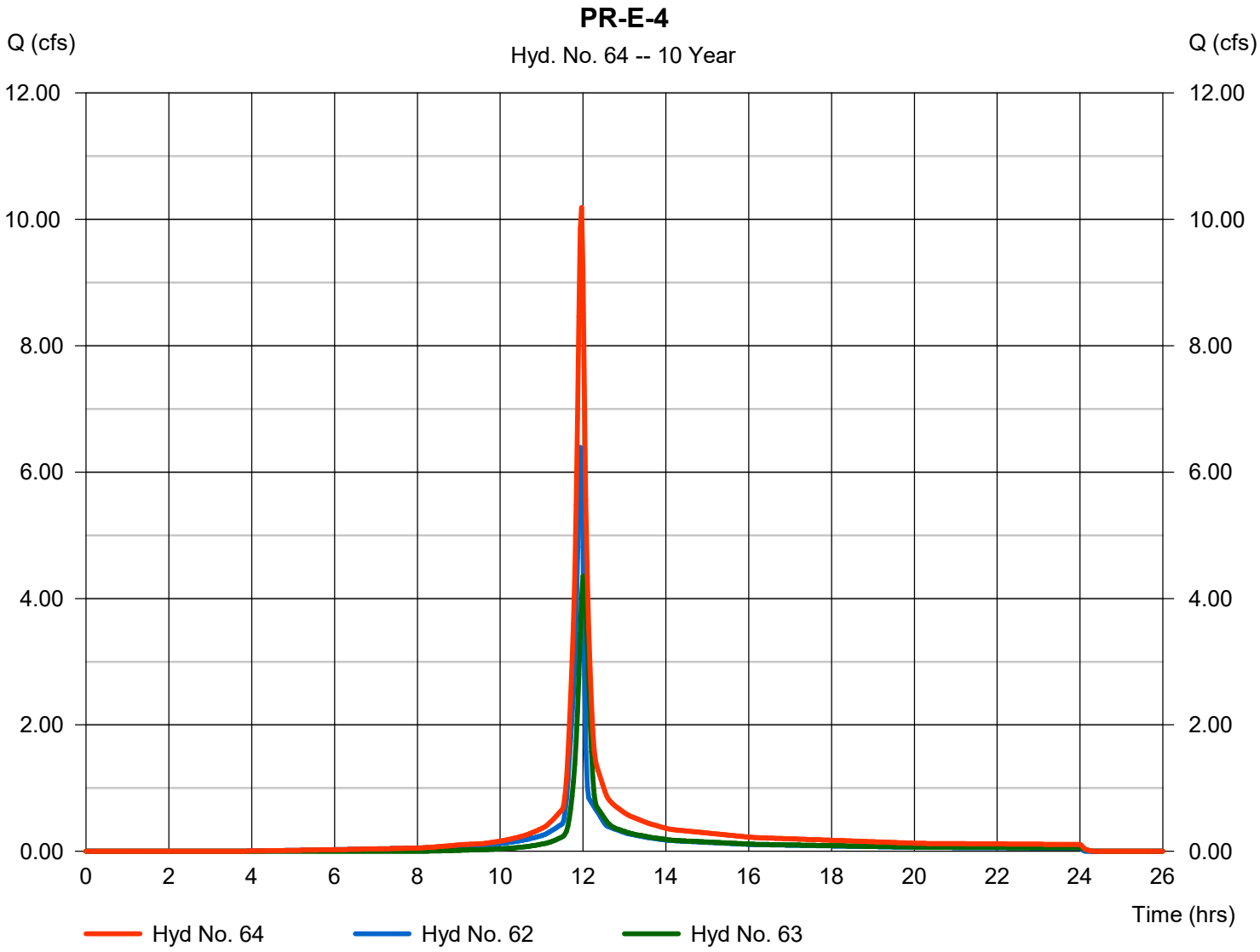


Hydrograph Report

Hyd. No. 64

PR-E-4

Hydrograph type	=	Combine	Peak discharge	=	10.18 cfs
Storm frequency	=	10 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	25,089 cuft
Inflow hyds.	=	62, 63	Contrib. drain. area	=	2.230 ac

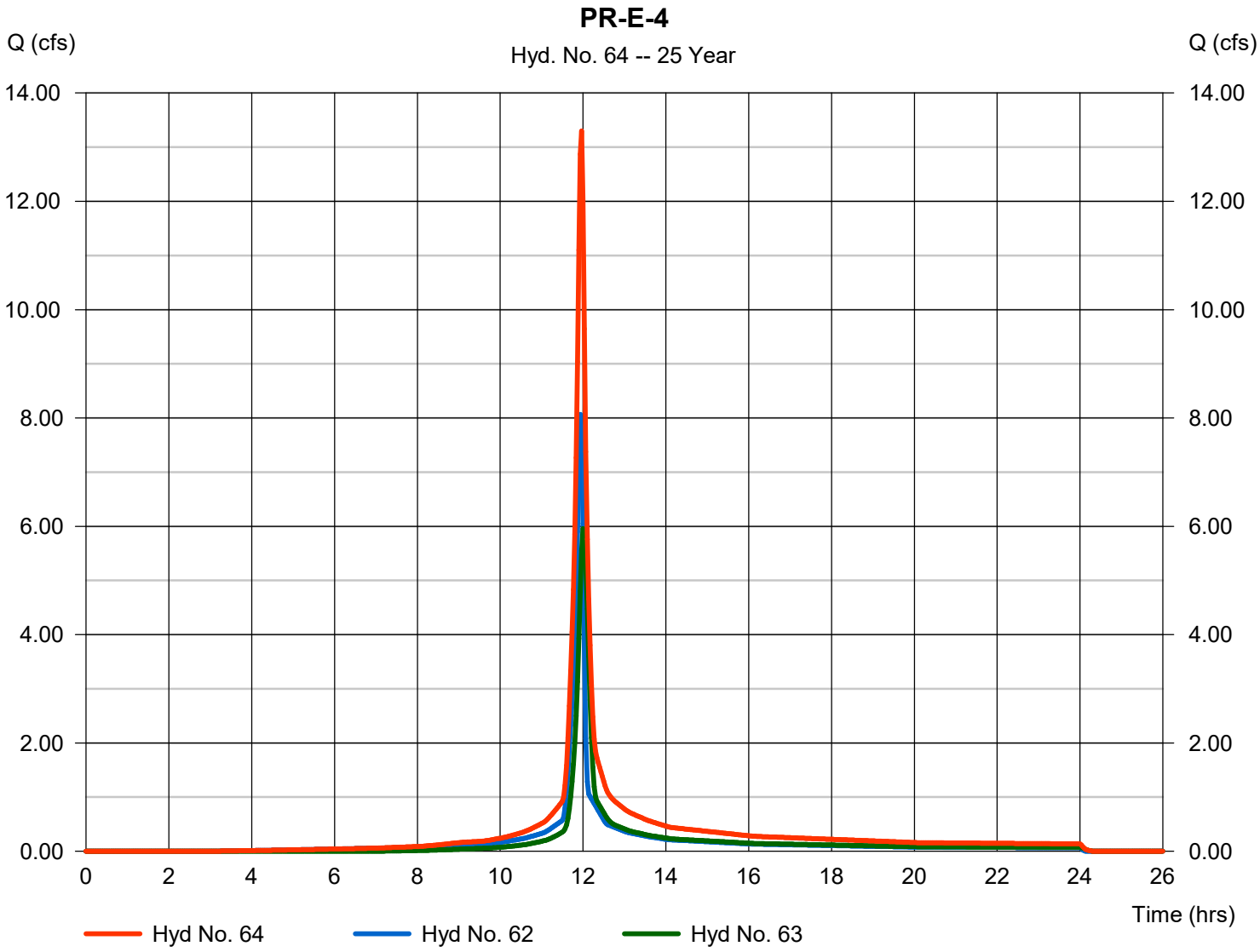


Hydrograph Report

Hyd. No. 64

PR-E-4

Hydrograph type	=	Combine	Peak discharge	=	13.30 cfs
Storm frequency	=	25 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	33,187 cuft
Inflow hyds.	=	62, 63	Contrib. drain. area	=	2.230 ac

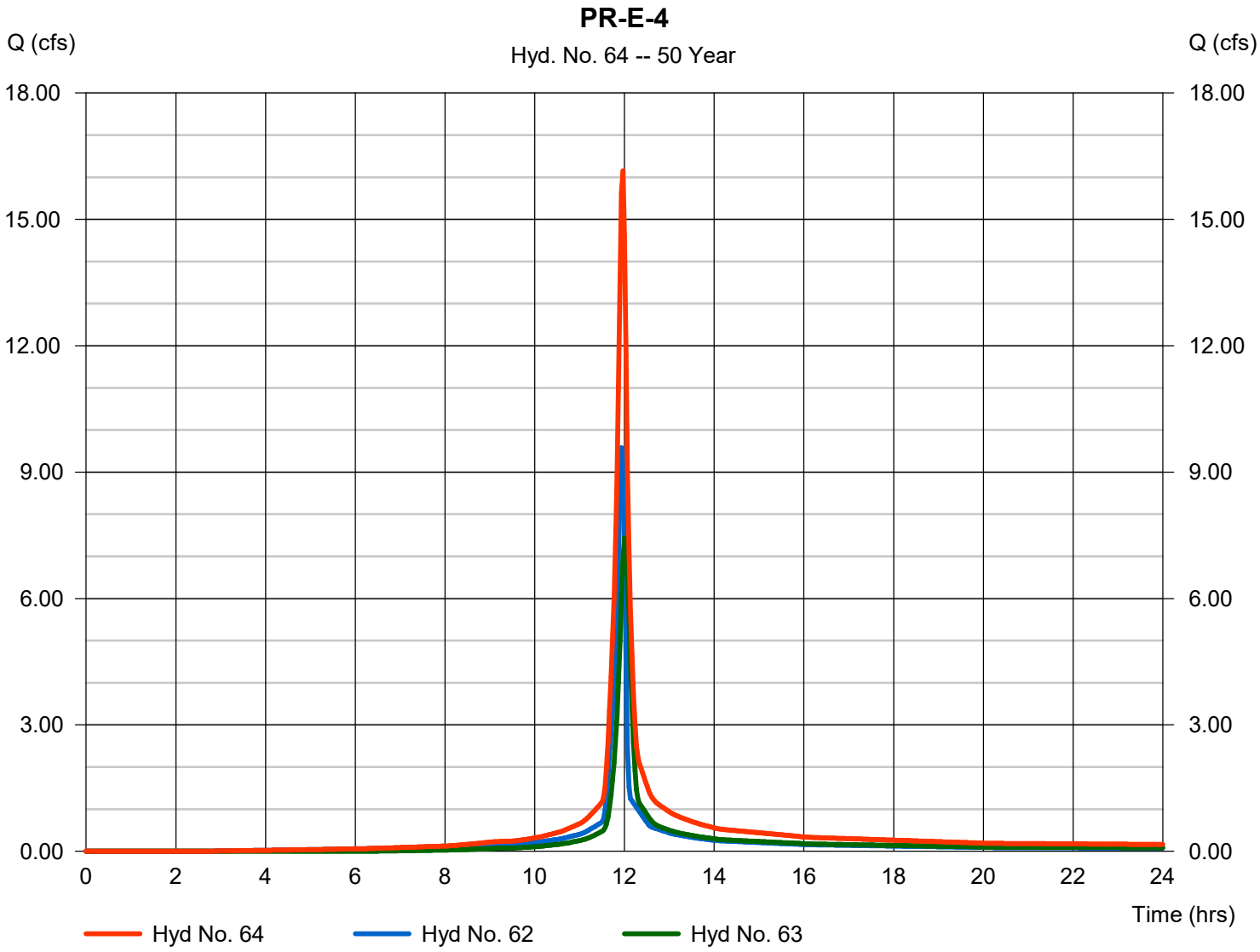


Hydrograph Report

Hyd. No. 64

PR-E-4

Hydrograph type	=	Combine	Peak discharge	=	16.15 cfs
Storm frequency	=	50 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	40,721 cuft
Inflow hyds.	=	62, 63	Contrib. drain. area	=	2.230 ac

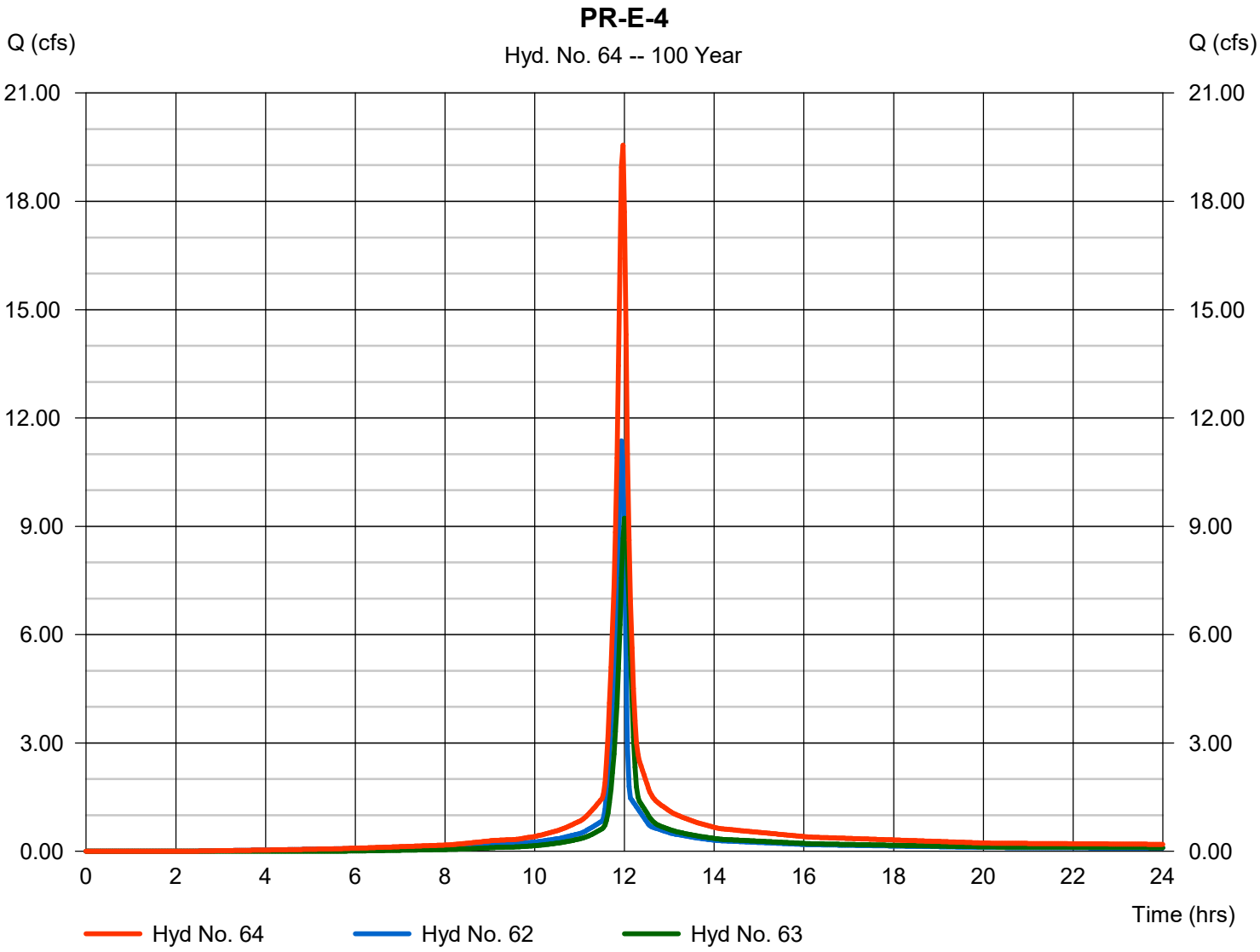


Hydrograph Report

Hyd. No. 64

PR-E-4

Hydrograph type	=	Combine	Peak discharge	=	19.55 cfs
Storm frequency	=	100 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	49,809 cuft
Inflow hyds.	=	62, 63	Contrib. drain. area	=	2.230 ac



PR-E-5 WATERSHED

TR-55 TIME OF CONCENTRATION (Tc) OR TRAVEL TIME (Tt) CALCULATIONS

Project: Smithfield Gateway Phase 1A-1 **By:** MJV **Date:** 12/10/2020
Location: Smithfield Township, Monroe County, PA **Checked:** TH **Date:** 12/10/2020
Watershed: PR-E-5

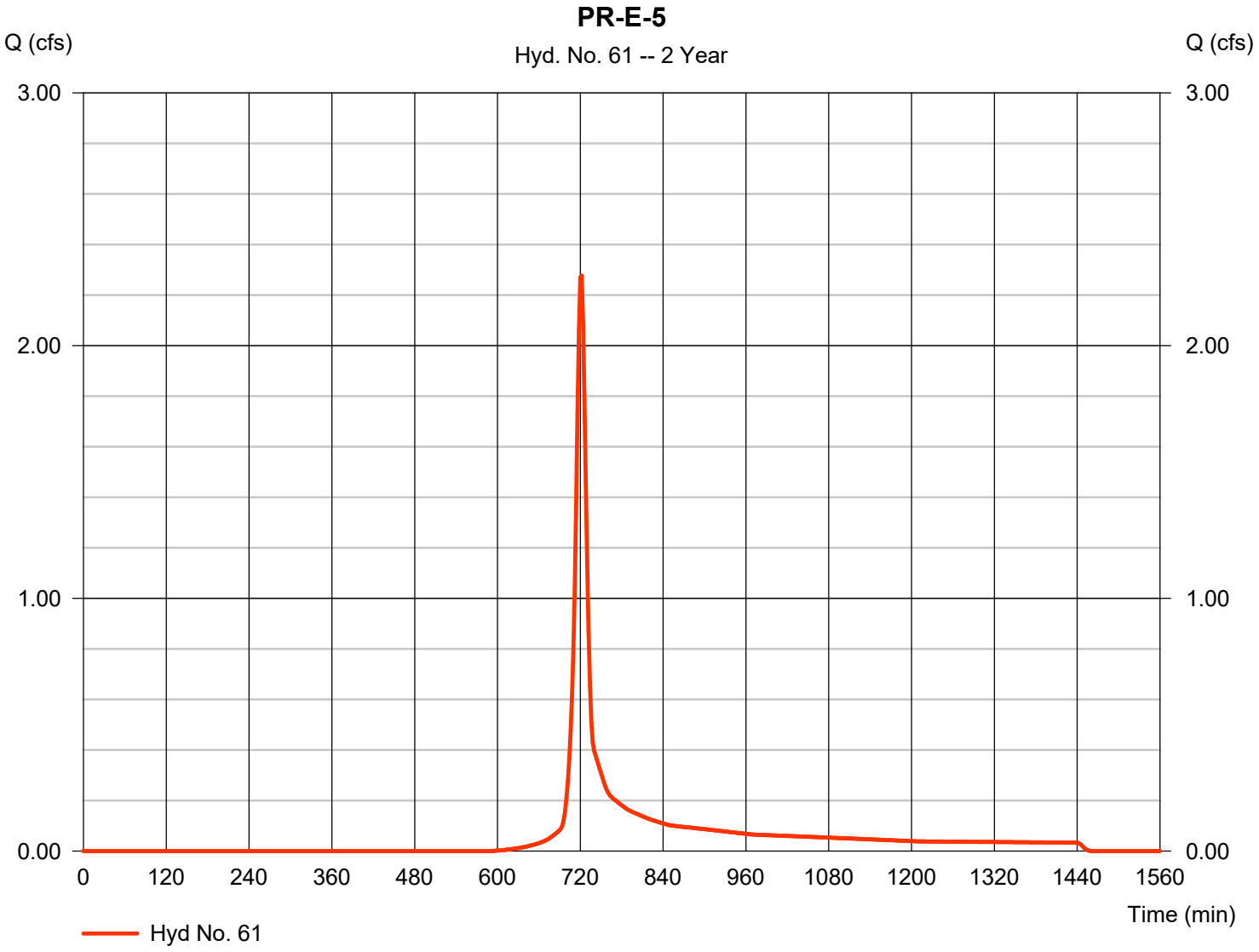
Sheet Flow (Applicable to Tc only)													
1	Surface Description (table 3-1)		Grass										
2	Manning's roughness coeff., n (table 3-1)		0.240										
3	Flow length, L (total L<100 ft)	**ft**	100										
4	Two-yr 24-hr rainfall, P2	**in**	3.32										
5	Land Slope, s	**ft/ft**	0.0450										
6	$Tt = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5}(s)^{.04}}$	**Compute Tt, hr**	0.1688	+		+		+		+		+	0.1688 hr
Shallow Concentrated Flow													
7	Surface Description (Paved or Unpaved)		Unpaved		Unpaved		Unpaved						
8	Flow length, L	**ft**	93		70		75						
9	Watercourse slope, s	**ft/ft**	0.0500		0.0150		0.0100						
10	Average Velocity, V (figure 3-1)	**ft/sec**	3.61		1.98		1.61						
11	Tt = L / (3600V)	**Compute Tt , hr**	0.0072	+	0.0098	+	0.0129	+		+		+	0.0299 hr
Channel / Pipe Flow													
12	Cross Sectional flow area, a	**ft^2**											
13	Wetted Perimeter, p_w	**ft**											
14	Hydraulic radius, $r = a/p_w$	**ft**											
15	Channel slope, s	**ft/ft**											
16	Manning's roughness coeff., n (table 3-1)												
17	$V = (1.49*r^{2/3}*s^{1/2})/n$	**ft/s**											
18	Flow length, L	**ft**											
19	Tt = L / (3600V)	**Compute Tt , hr**		+		+		+		+		+	0.0000 hr
20	**Watershed or subarea Tc or Tt (add Tt in steps 6,11, and 19)**												0.20 hr
													11.9 min

Hydrograph Report

Hyd. No. 61

PR-E-5

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.276 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	5,965 cuft
Drainage area	=	1.170 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	11.90 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

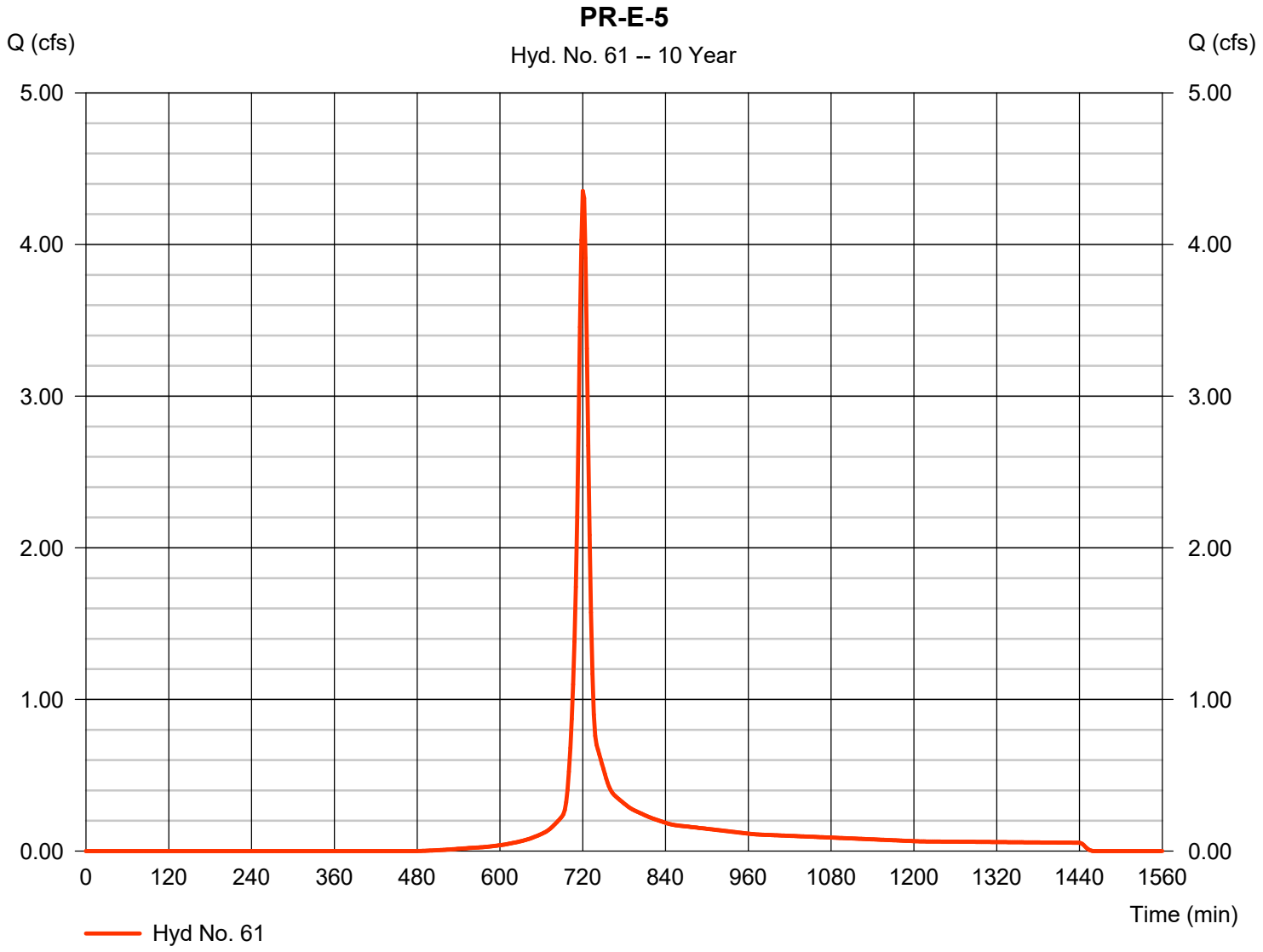


Hydrograph Report

Hyd. No. 61

PR-E-5

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.353 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	11,284 cuft
Drainage area	=	1.170 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	11.90 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

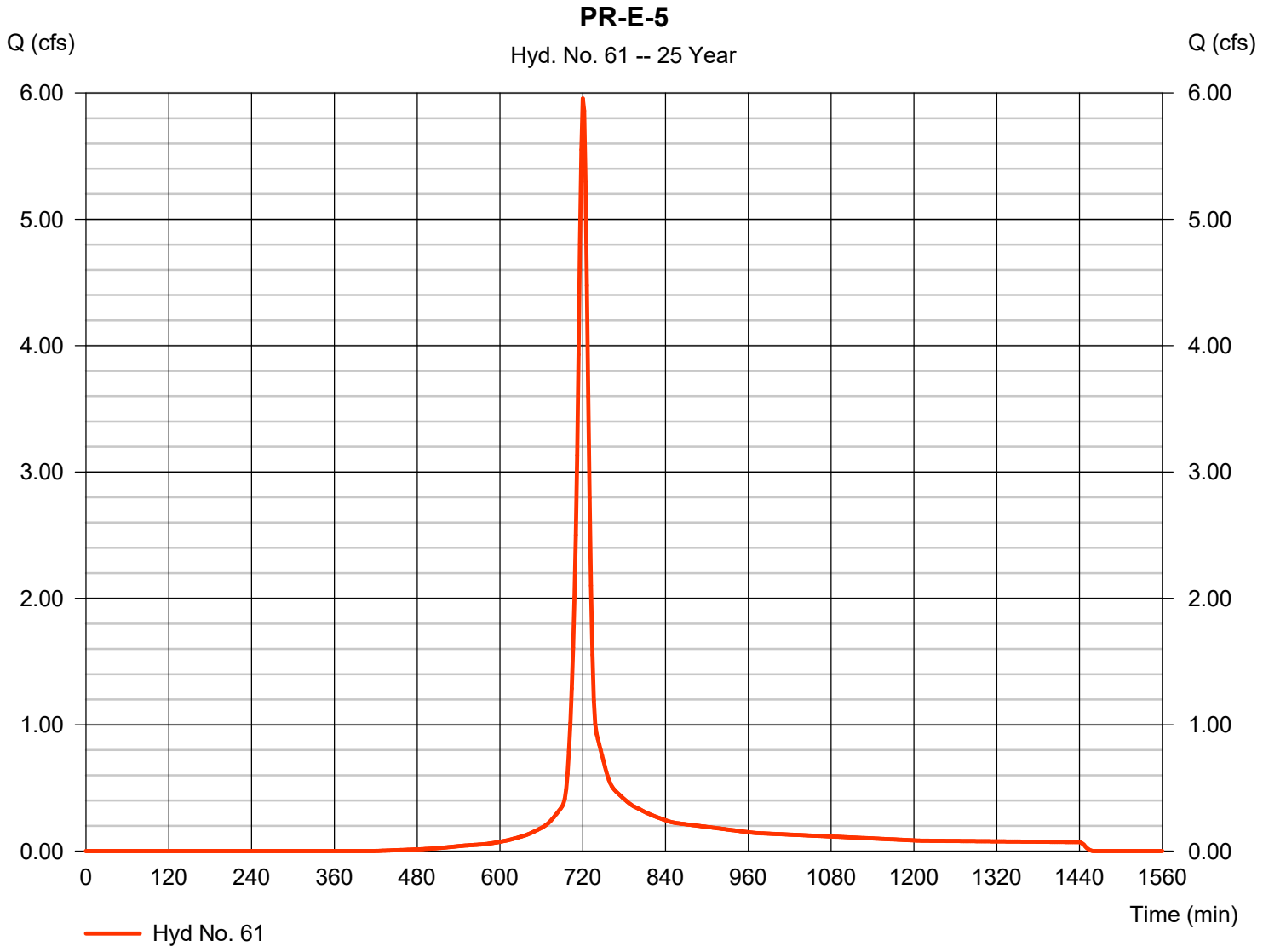


Hydrograph Report

Hyd. No. 61

PR-E-5

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.956 cfs
Storm frequency	=	25 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	15,482 cuft
Drainage area	=	1.170 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	11.90 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

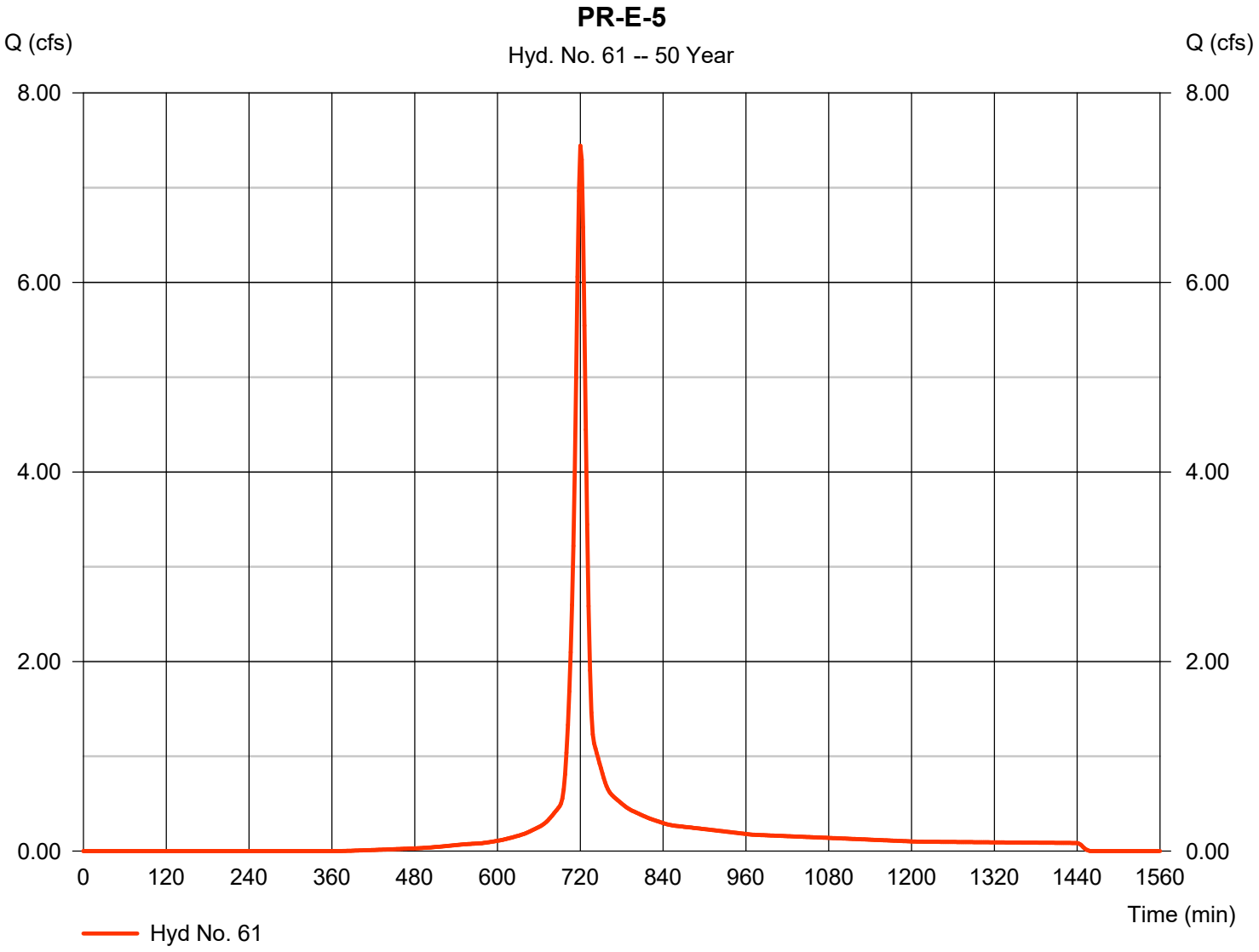


Hydrograph Report

Hyd. No. 61

PR-E-5

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.442 cfs
Storm frequency	=	50 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	19,440 cuft
Drainage area	=	1.170 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	11.90 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

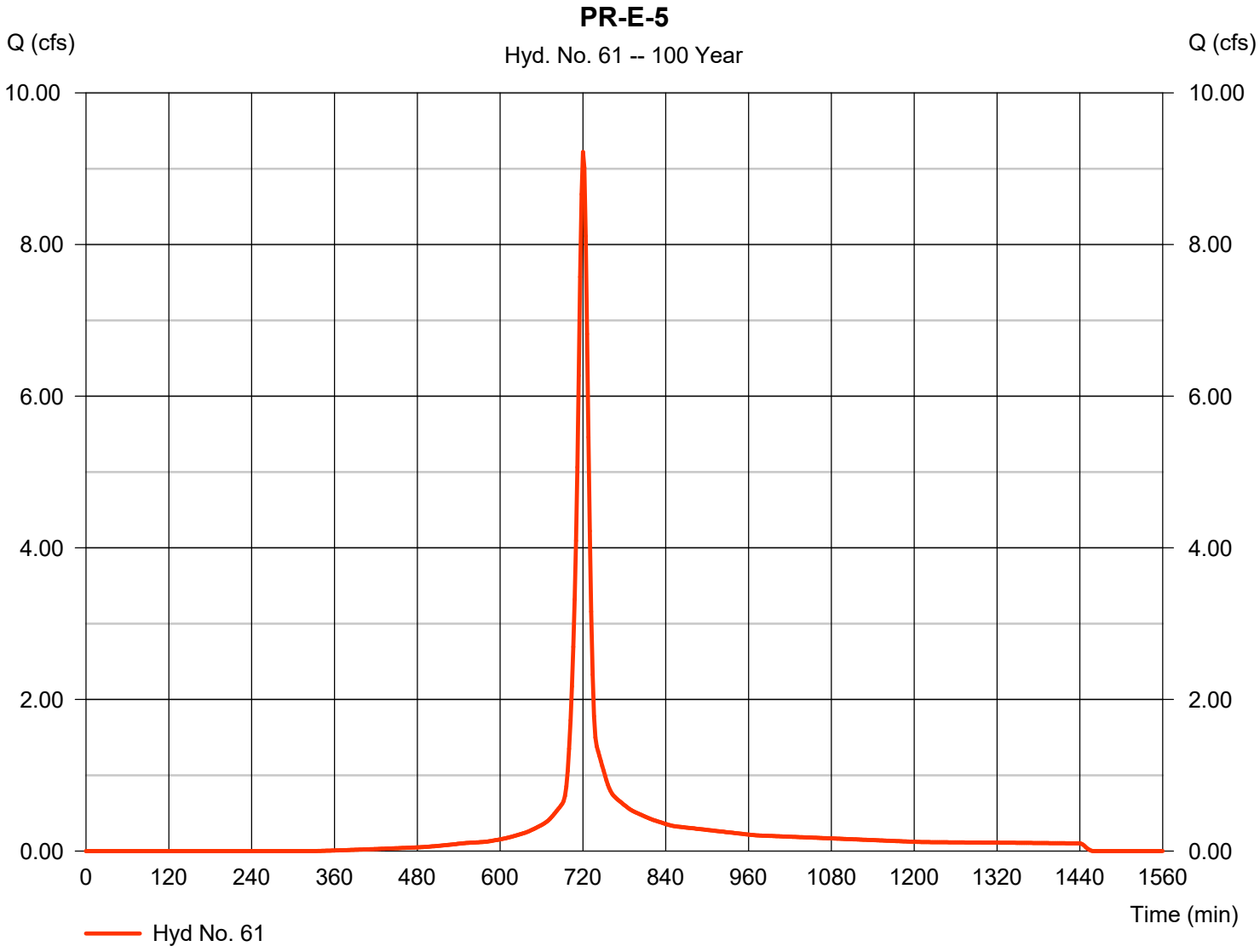


Hydrograph Report

Hyd. No. 61

PR-E-5

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.221 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	24,260 cuft
Drainage area	=	1.170 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	11.90 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



PR-E-6 WATERSHED

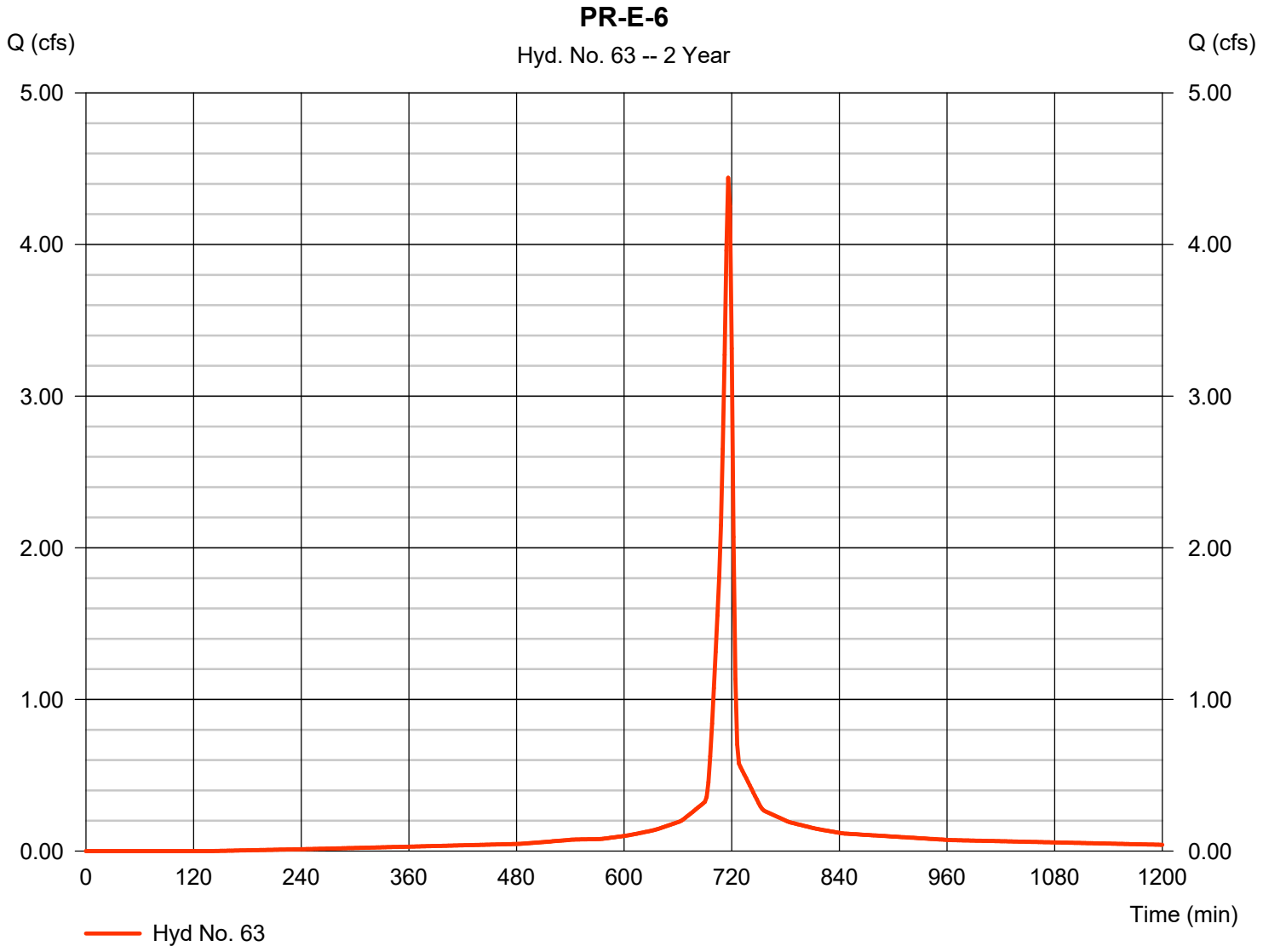
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 05 / 10 / 2021

Hyd. No. 63

PR-E-6

Hydrograph type	= SCS Runoff	Peak discharge	= 4.440 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 9,954 cuft
Drainage area	= 1.020 ac	Curve number	= 96
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

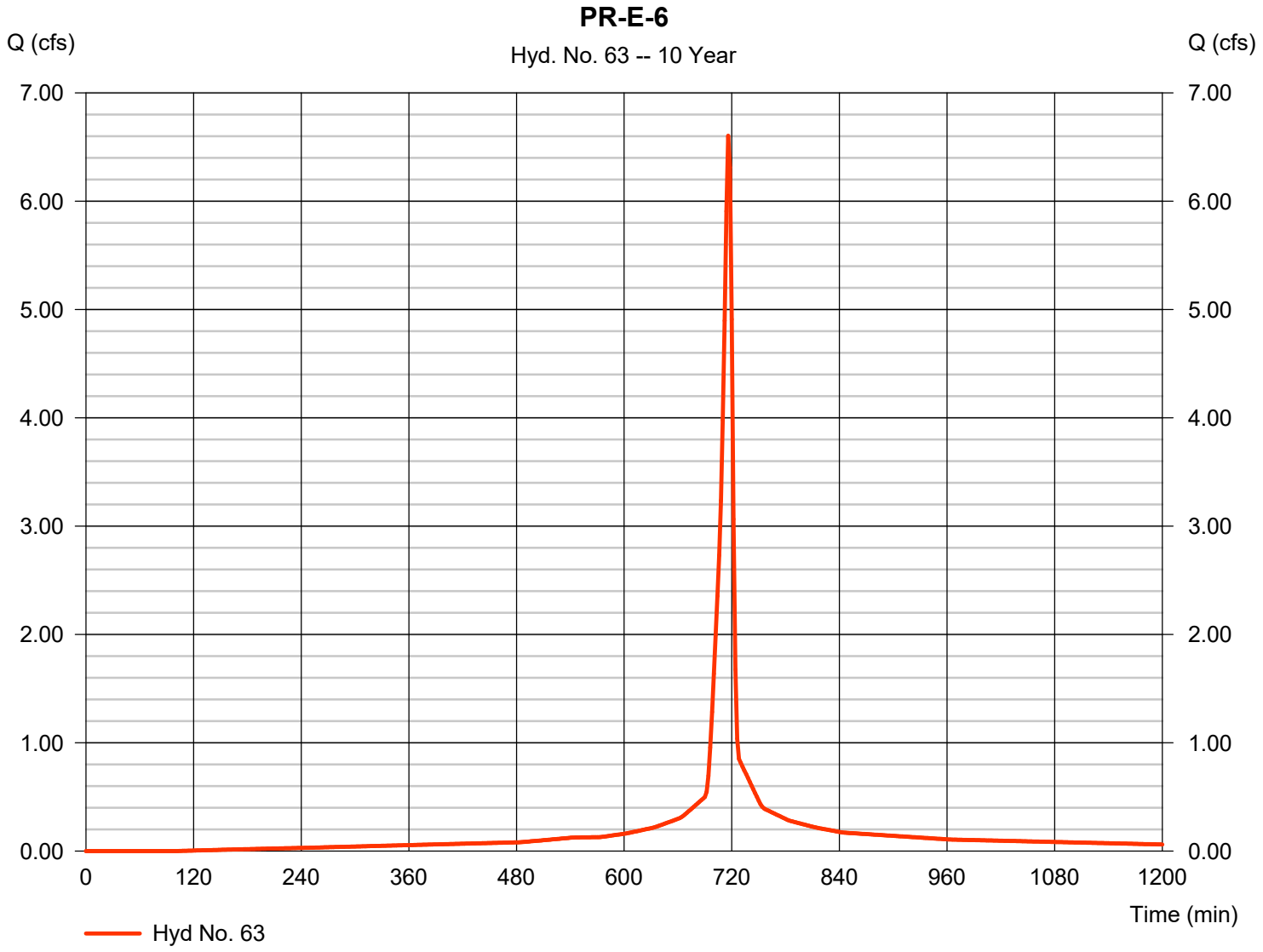


Hydrograph Report

Hyd. No. 63

PR-E-6

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.603 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	15,181 cuft
Drainage area	=	1.020 ac	Curve number	=	96
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

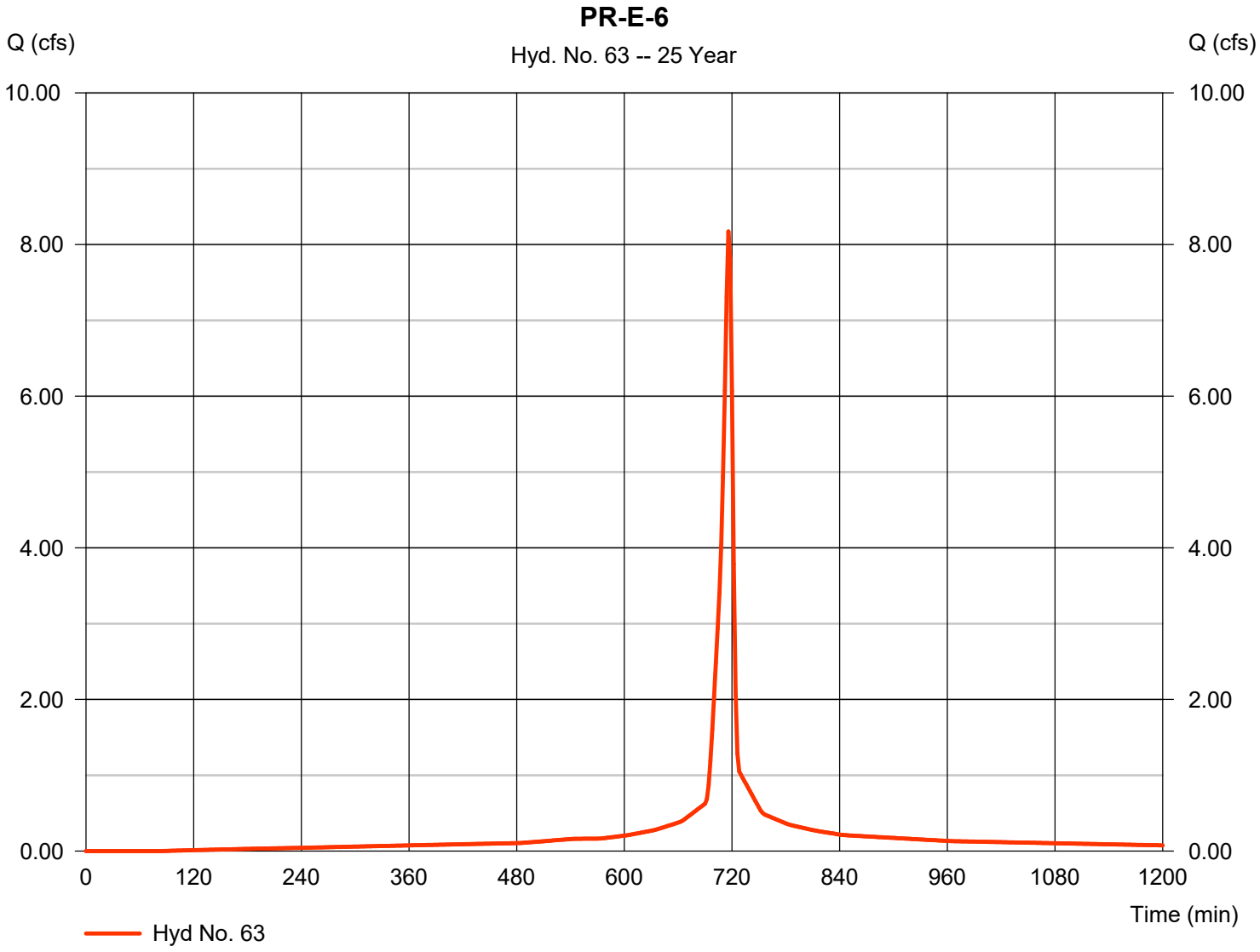


Hydrograph Report

Hyd. No. 63

PR-E-6

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.172 cfs
Storm frequency	=	25 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	19,014 cuft
Drainage area	=	1.020 ac	Curve number	=	96
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

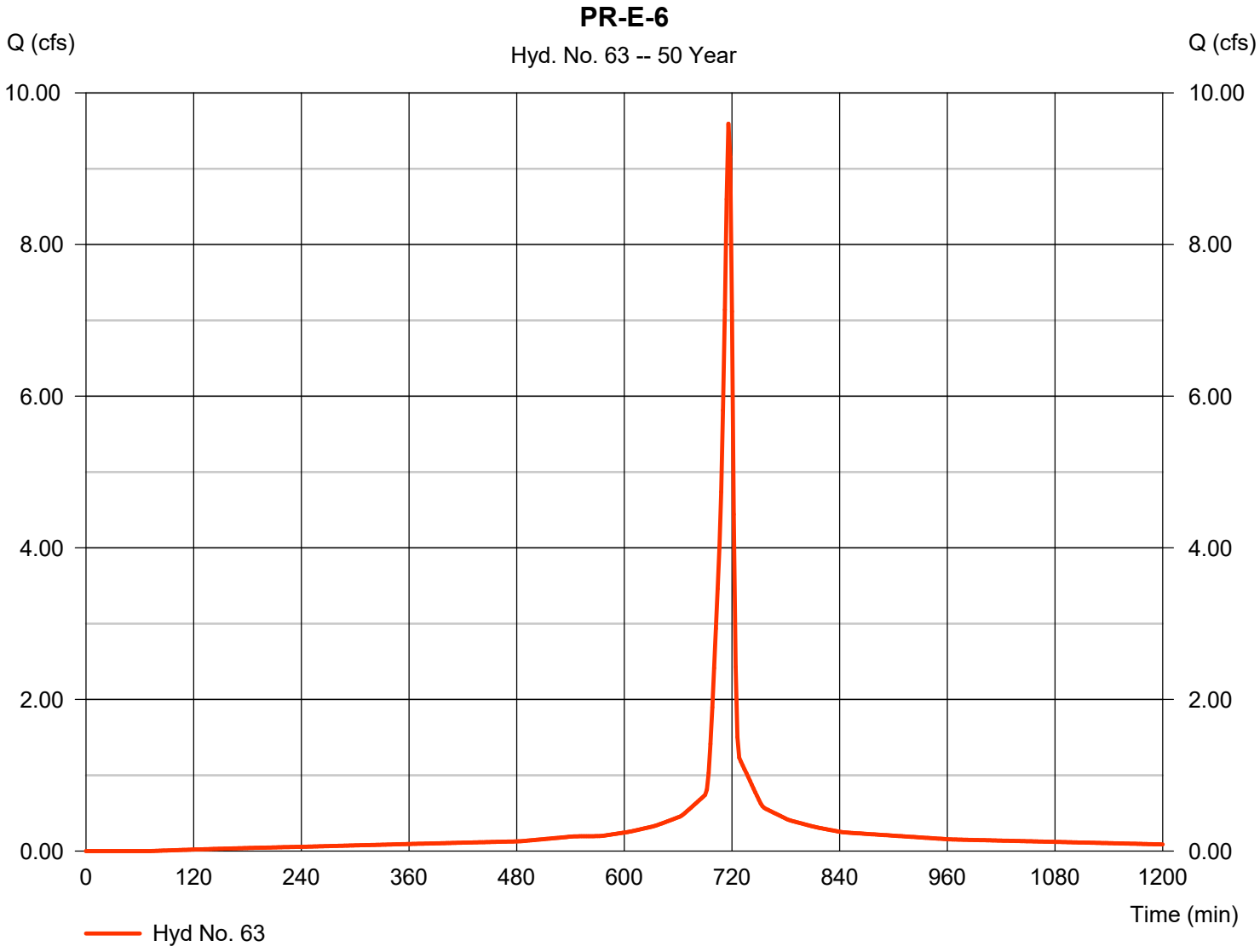


Hydrograph Report

Hyd. No. 63

PR-E-6

Hydrograph type	= SCS Runoff	Peak discharge	= 9.594 cfs
Storm frequency	= 50 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 22,507 cuft
Drainage area	= 1.020 ac	Curve number	= 96
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 6.96 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

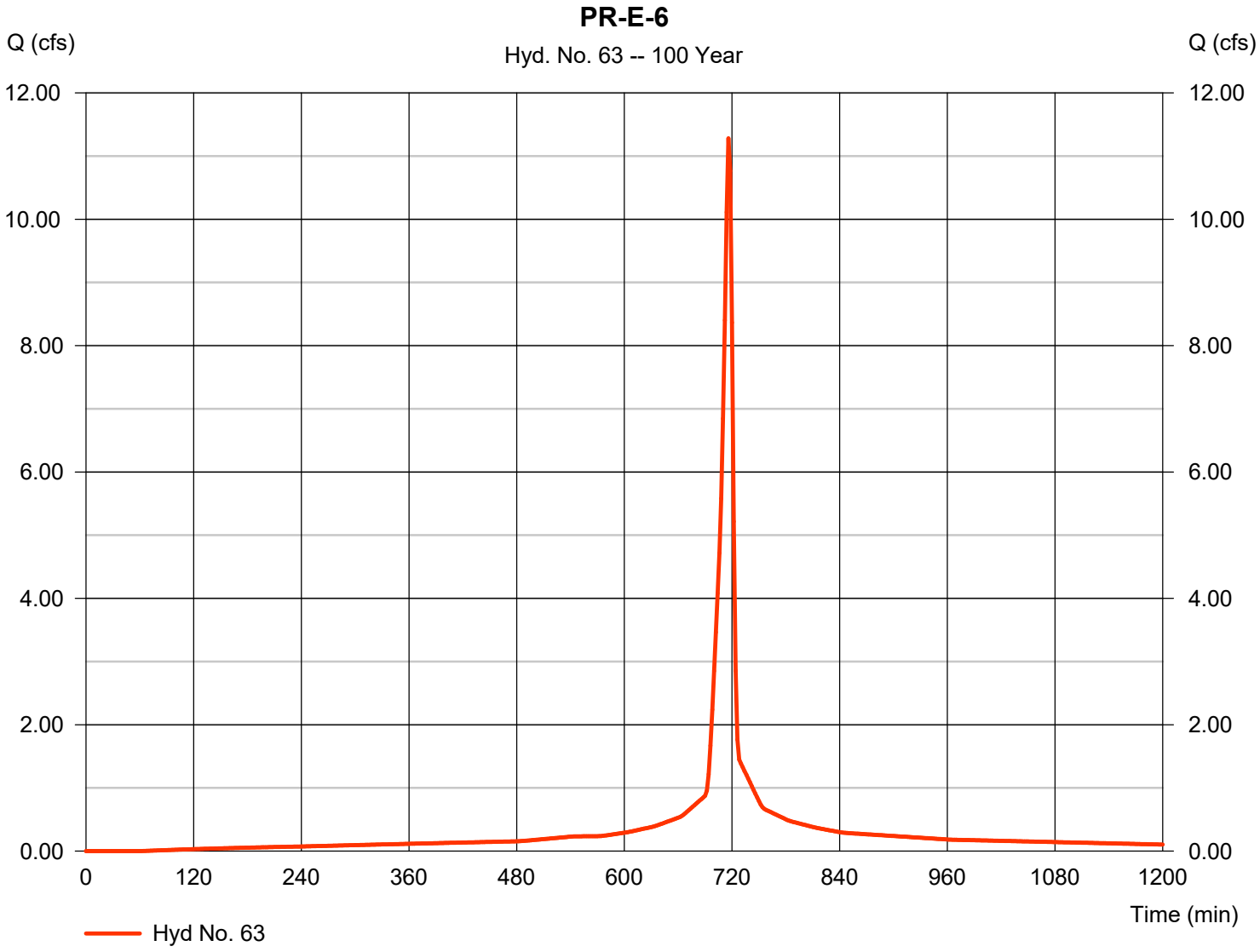


Hydrograph Report

Hyd. No. 63

PR-E-6

Hydrograph type	= SCS Runoff	Peak discharge	= 11.28 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 26,660 cuft
Drainage area	= 1.020 ac	Curve number	= 96
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 8.16 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



PR-E-7-WATERSHED

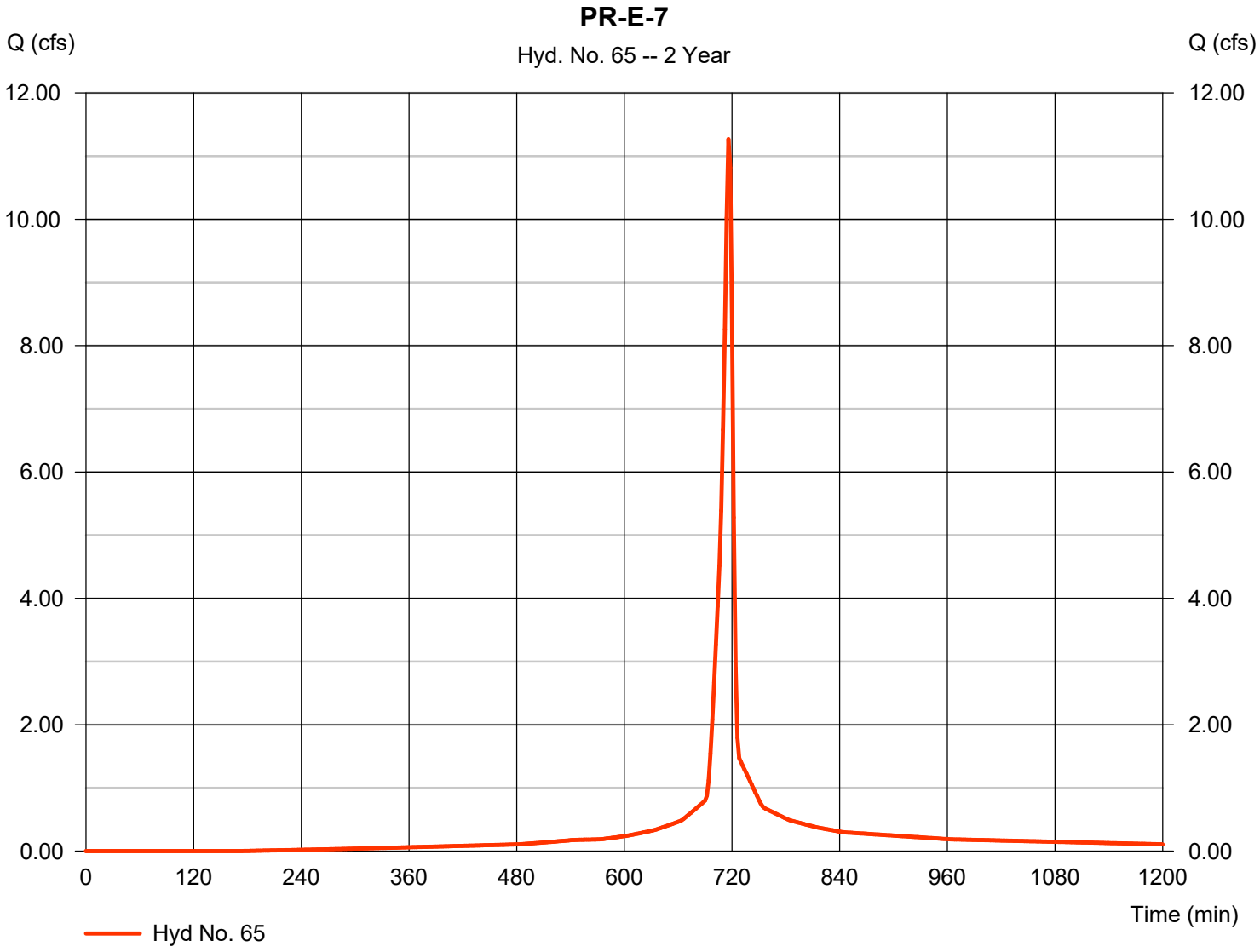
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 05 / 10 / 2021

Hyd. No. 65

PR-E-7

Hydrograph type	= SCS Runoff	Peak discharge	= 11.27 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 24,819 cuft
Drainage area	= 2.640 ac	Curve number	= 95
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

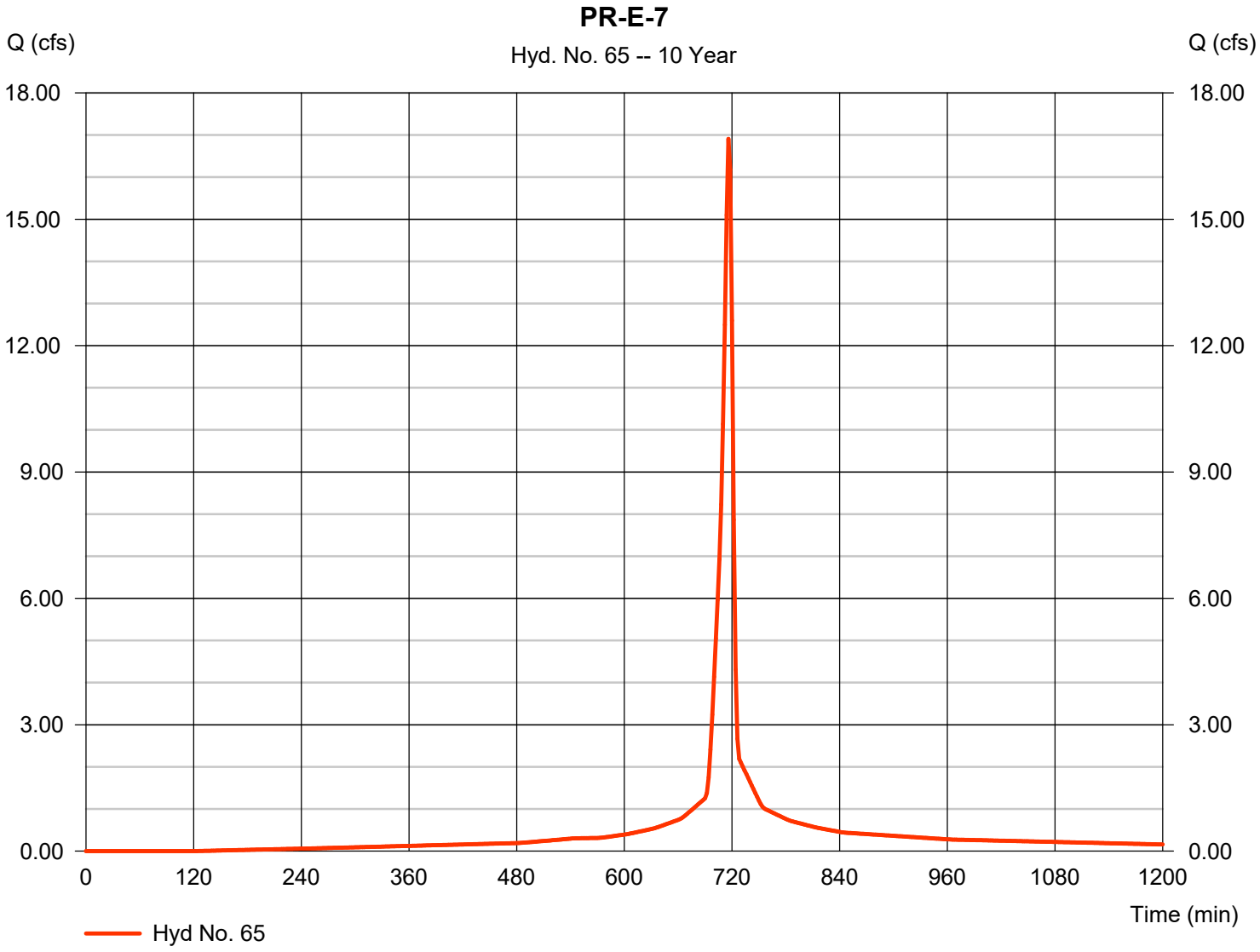


Hydrograph Report

Hyd. No. 65

PR-E-7

Hydrograph type	= SCS Runoff	Peak discharge	= 16.91 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 38,283 cuft
Drainage area	= 2.640 ac	Curve number	= 95
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 4.84 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

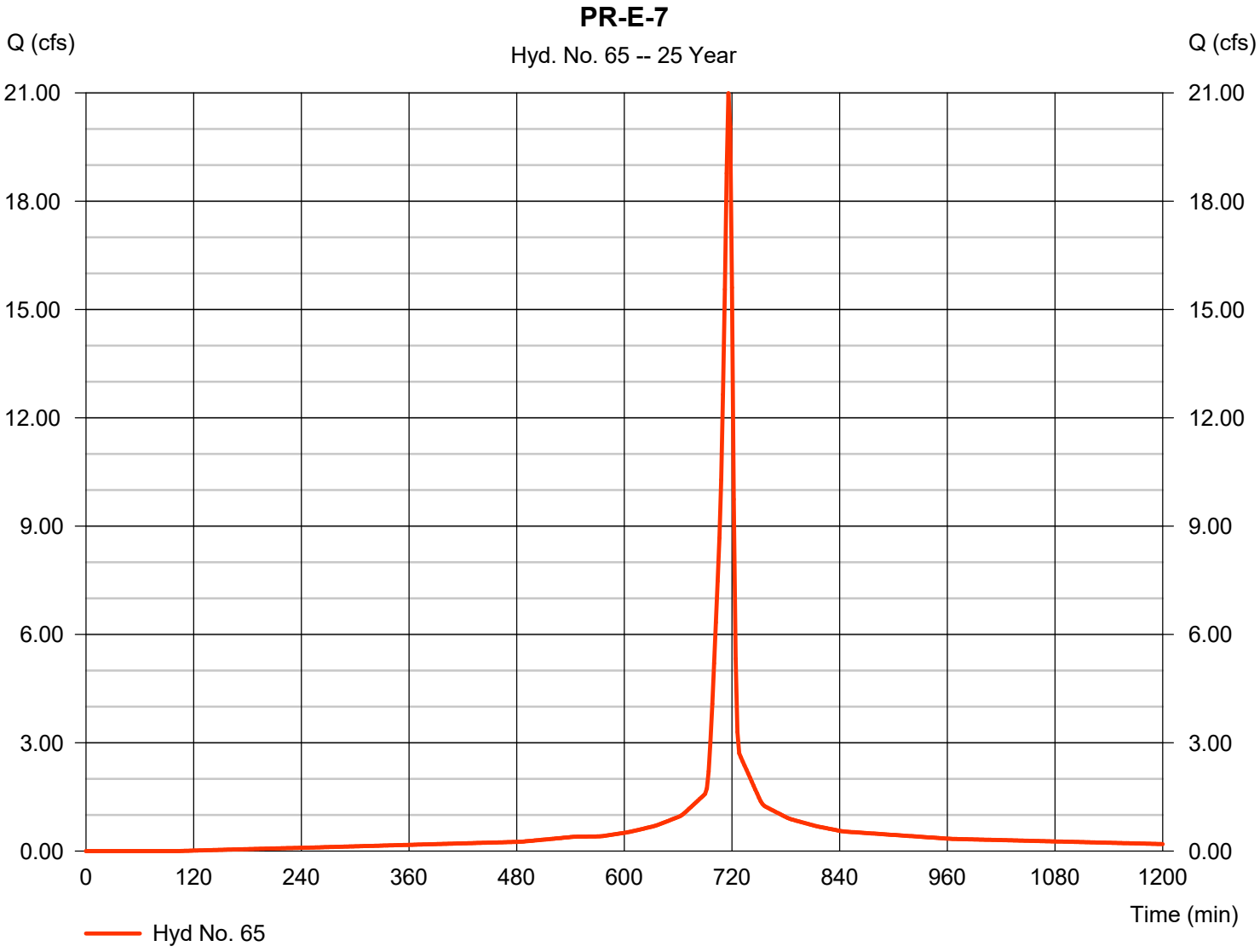


Hydrograph Report

Hyd. No. 65

PR-E-7

Hydrograph type	=	SCS Runoff	Peak discharge	=	20.99 cfs
Storm frequency	=	25 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	48,173 cuft
Drainage area	=	2.640 ac	Curve number	=	95
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

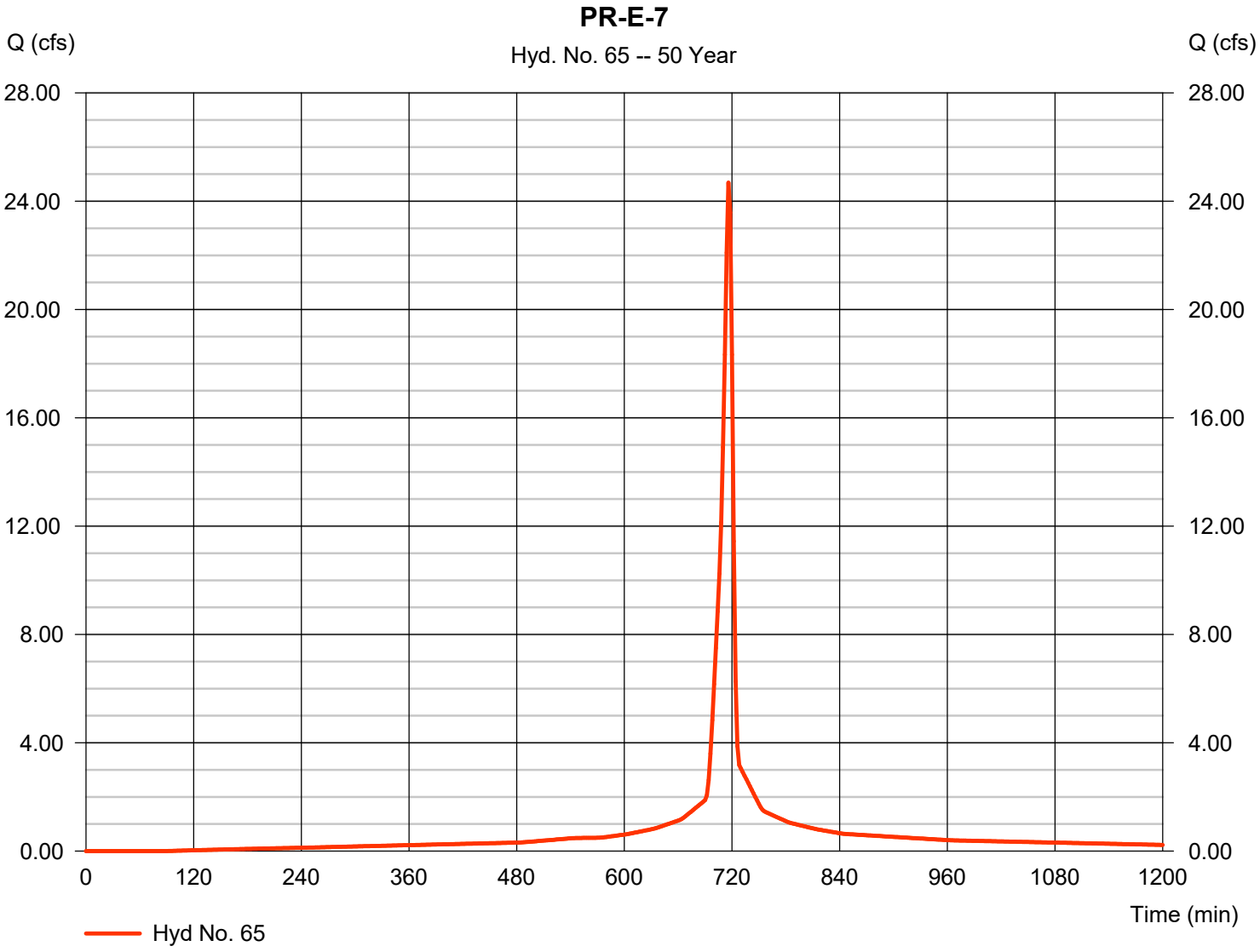


Hydrograph Report

Hyd. No. 65

PR-E-7

Hydrograph type	= SCS Runoff	Peak discharge	= 24.69 cfs
Storm frequency	= 50 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 57,193 cuft
Drainage area	= 2.640 ac	Curve number	= 95
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 6.96 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

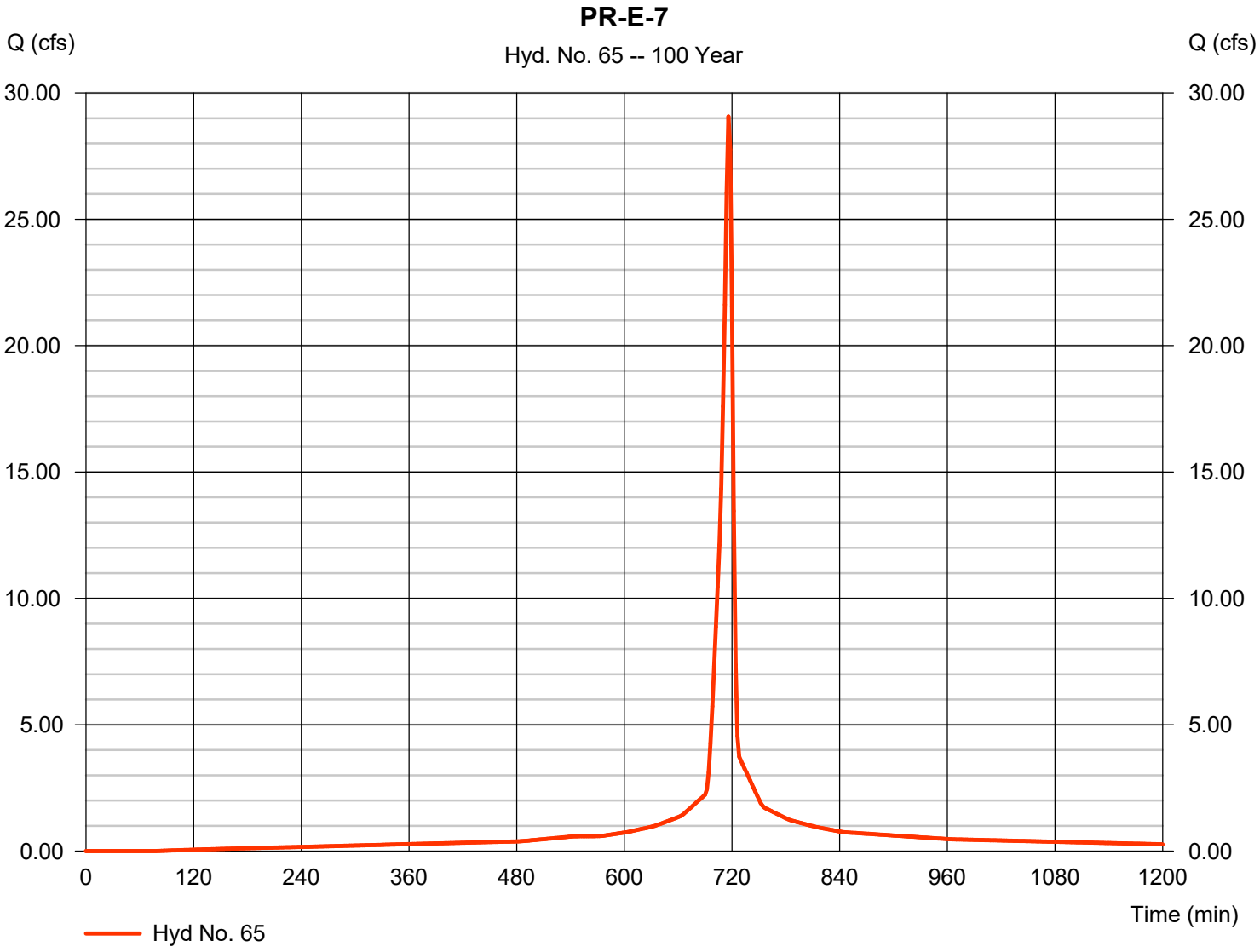


Hydrograph Report

Hyd. No. 65

PR-E-7

Hydrograph type	=	SCS Runoff	Peak discharge	=	29.07 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	67,927 cuft
Drainage area	=	2.640 ac	Curve number	=	95
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



PR-E-8 WATERSHED

TR-55 TIME OF CONCENTRATION (Tc) OR TRAVEL TIME (Tt) CALCULATIONS

Project: Smithfield Gateway Phase 1A-1 **By:** MJV **Date:** 12/10/2020
Location: Smithfield Township, Monroe County, PA **Checked:** TH **Date:** 12/10/2020
Watershed: PR-E-8

Sheet Flow (Applicable to Tc only)													
1	Surface Description (table 3-1)		Grass										
2	Manning's roughness coeff., n (table 3-1)		0.150										
3	Flow length, L (total L<100 ft)	**ft**	100										
4	Two-yr 24-hr rainfall, P2	**in**	3.32										
5	Land Slope, s	**ft/ft**	0.0700										
6	$Tt = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5}(s)^{.04}}$	**Compute Tt, hr**	0.0971	+		+		+		+		+	0.0971 hr
Shallow Concentrated Flow													
7	Surface Description (Paved or Unpaved)		Unpaved		Unpaved								
8	Flow length, L	**ft**	264		331								
9	Watercourse slope, s	**ft/ft**	0.0680		0.0100								
10	Average Velocity, V (figure 3-1)	**ft/sec**	4.21		1.61								
11	Tt = L / (3600V)	**Compute Tt , hr**	0.0174	+	0.0570	+		+		+		+	0.0744 hr
Channel / Pipe Flow													
12	Cross Sectional flow area, a	**ft^2**											
13	Wetted Perimeter, p_w	**ft**											
14	Hydraulic radius, $r = a/p_w$	**ft**											
15	Channel slope, s	**ft/ft**											
16	Manning's roughness coeff., n (table 3-1)												
17	$V = (1.49 * r^{2/3} * s^{1/2})/n$	**ft/s**											
18	Flow length, L	**ft**											
19	Tt = L / (3600V)	**Compute Tt , hr**		+		+		+		+		+	0.0000 hr
20	**Watershed or subarea Tc or Tt (add Tt in steps 6,11, and 19)**												0.17 hr
													10.3 min

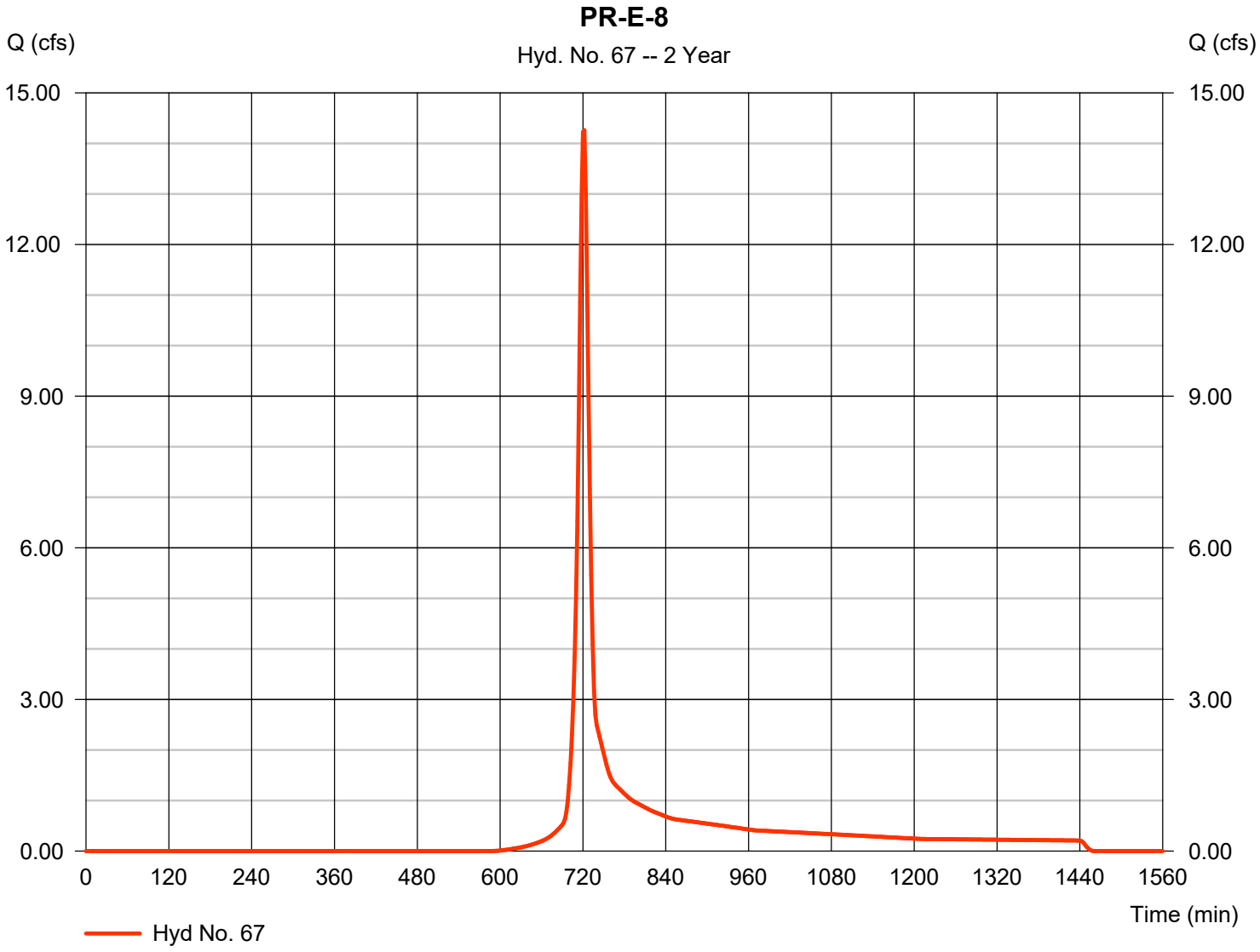
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 67

PR-E-8

Hydrograph type	=	SCS Runoff	Peak discharge	=	14.26 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	37,372 cuft
Drainage area	=	7.330 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.30 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

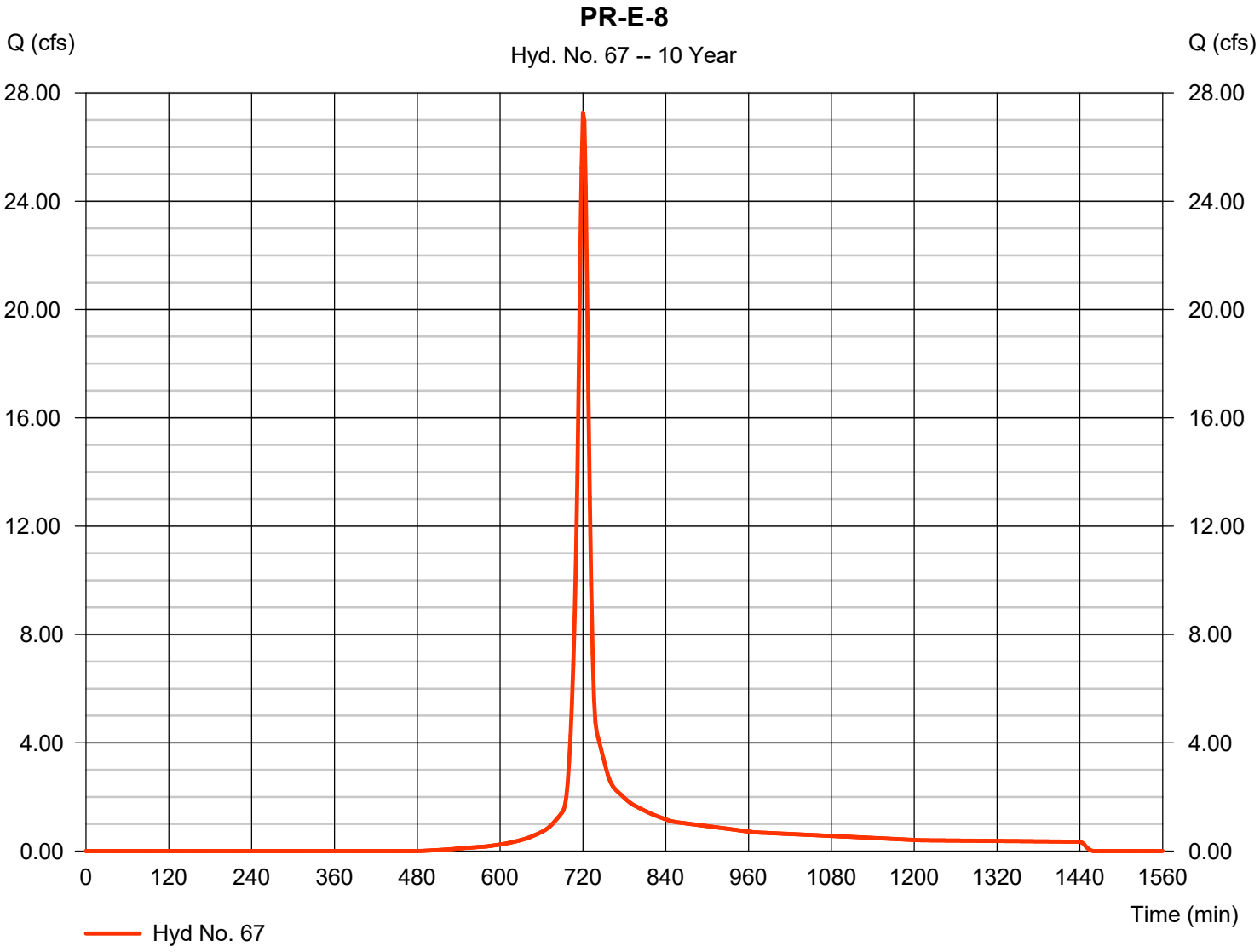


Hydrograph Report

Hyd. No. 67

PR-E-8

Hydrograph type	=	SCS Runoff	Peak discharge	=	27.27 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	70,695 cuft
Drainage area	=	7.330 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.30 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

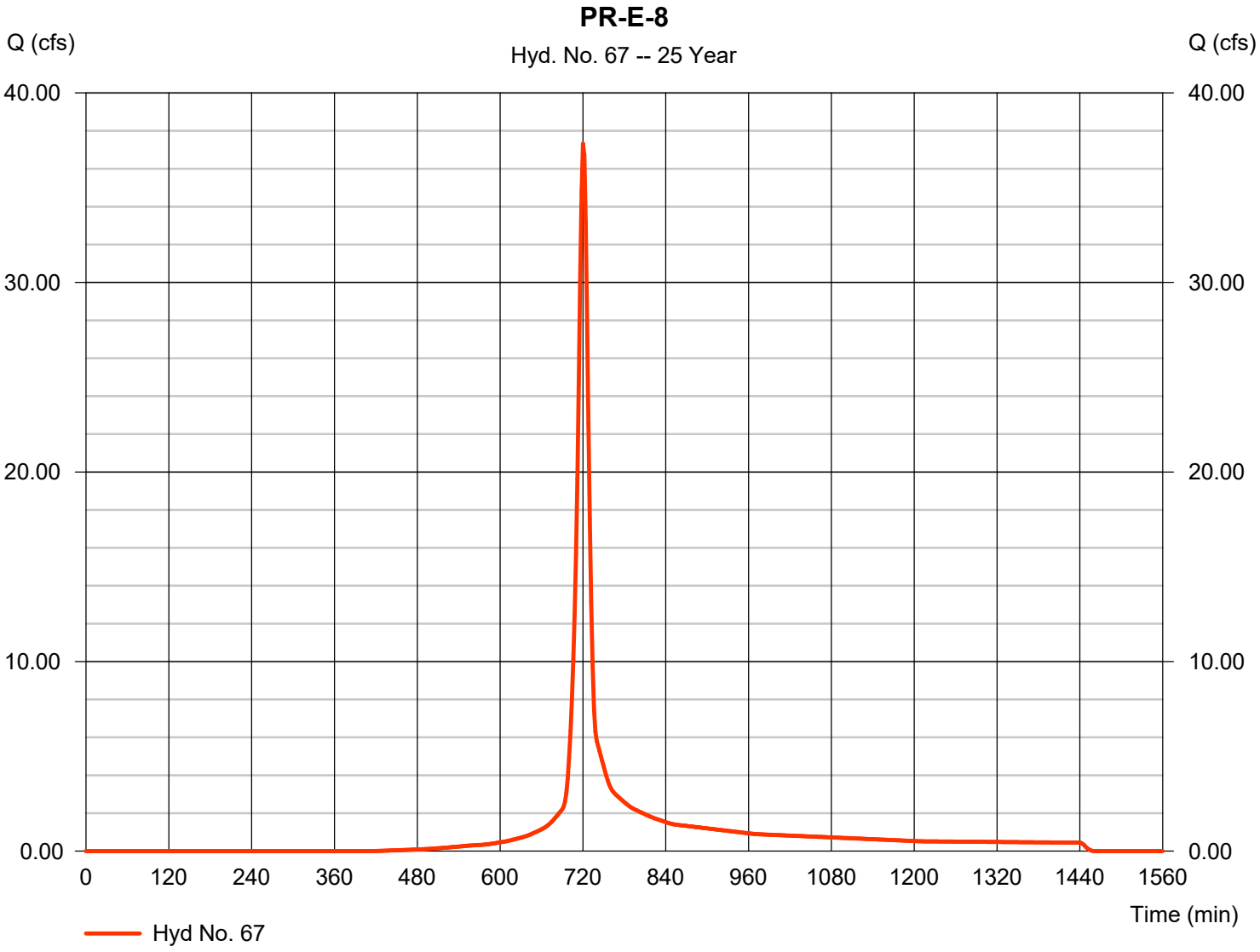


Hydrograph Report

Hyd. No. 67

PR-E-8

Hydrograph type	=	SCS Runoff	Peak discharge	=	37.32 cfs
Storm frequency	=	25 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	96,992 cuft
Drainage area	=	7.330 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.30 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

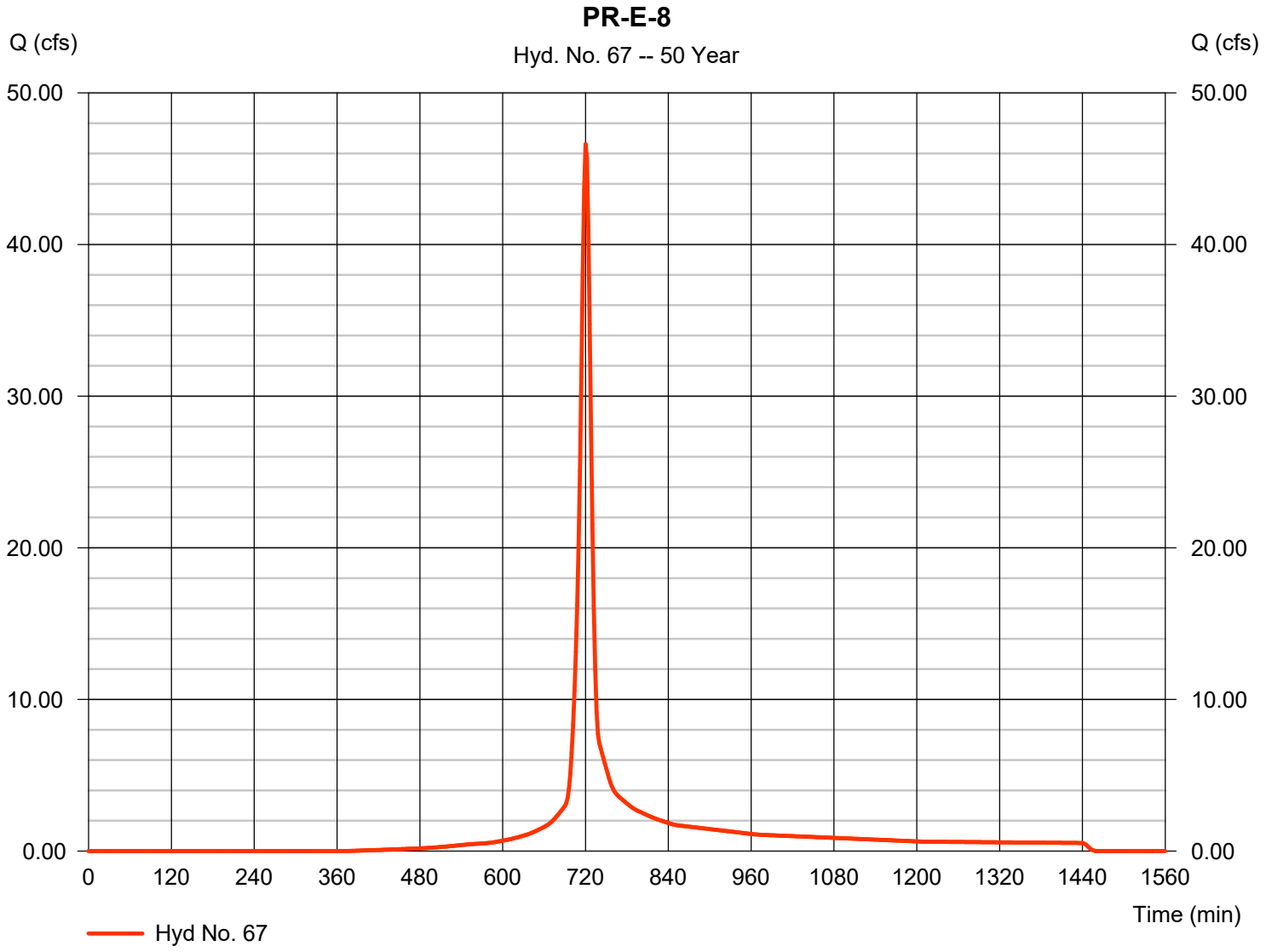


Hydrograph Report

Hyd. No. 67

PR-E-8

Hydrograph type	=	SCS Runoff	Peak discharge	=	46.62 cfs
Storm frequency	=	50 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	121,791 cuft
Drainage area	=	7.330 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.30 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

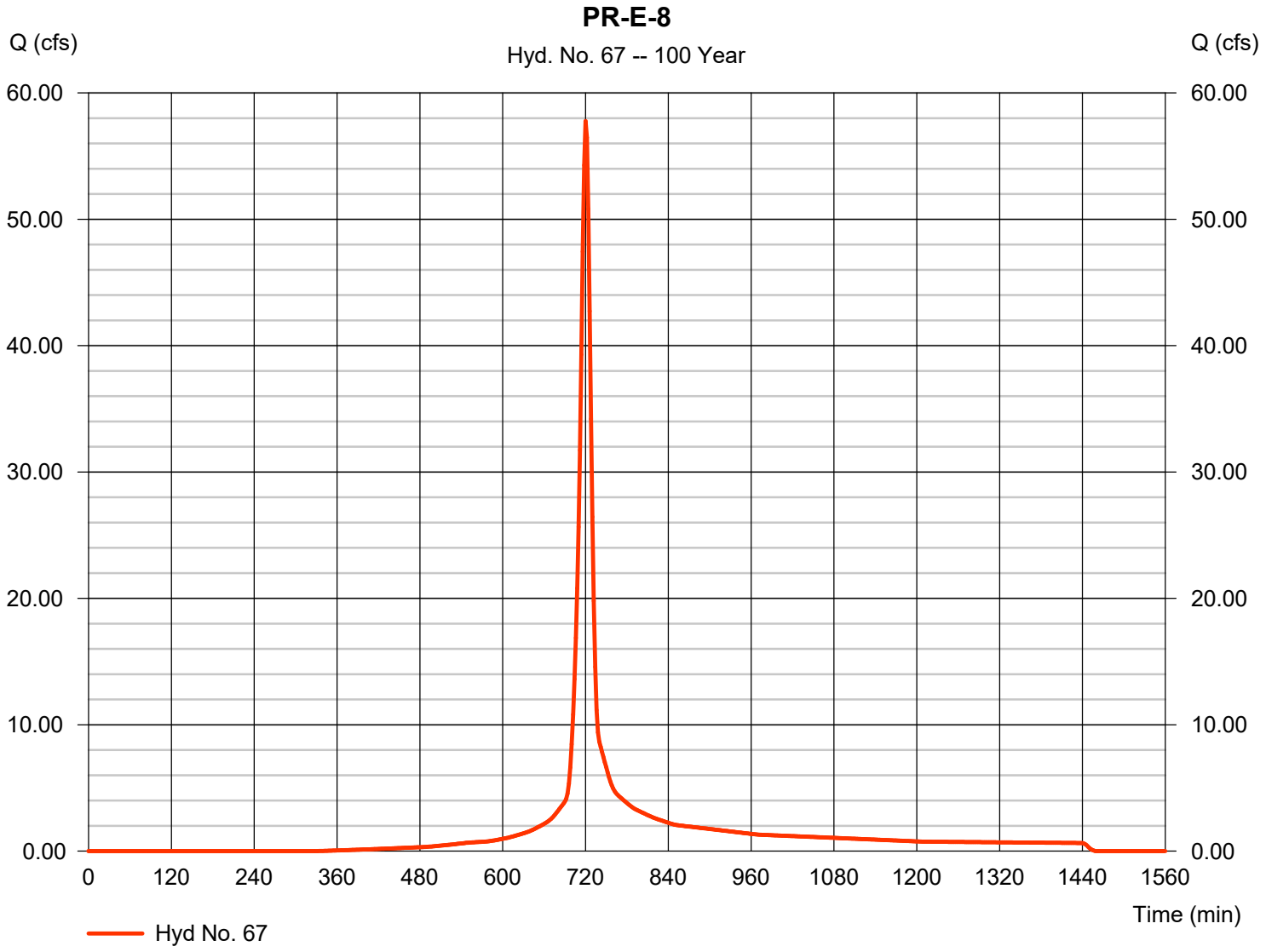


Hydrograph Report

Hyd. No. 67

PR-E-8

Hydrograph type	=	SCS Runoff	Peak discharge	=	57.77 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	151,990 cuft
Drainage area	=	7.330 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.30 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



PR-E-10-ONSITE-DISTURBED WATERSHED

TR-55 TIME OF CONCENTRATION (Tc) OR TRAVEL TIME (Tt) CALCULATIONS

Project: Smithfield Gateway Phase 1A-1 **By:** MJV **Date:** 12/10/2020
Location: Smithfield Township, Monroe County, PA **Checked:** TH **Date:** 12/10/2020
Watershed: PR-E-10-ONSITE-DISTURBED

Sheet Flow (Applicable to Tc only)														
1	Surface Description (table 3-1)		Grass		Grass									
2	Manning's roughness coeff., n (table 3-1)		0.240		0.150									
3	Flow length, L (total L<100 ft)	**ft**	30		15									
4	Two-yr 24-hr rainfall, P2	**in**	3.32		3.32									
5	Land Slope, s	**ft/ft**	0.2500		0.0150									
6	$Tt = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5}(s)^{.04}}$	**Compute Tt, hr**	0.0325	+	0.0394	+		+		+		+		0.0719 hr
Shallow Concentrated Flow														
7	Surface Description (Paved or Unpaved)		Paved		Unpaved									
8	Flow length, L	**ft**	130		220									
9	Watercourse slope, s	**ft/ft**	0.0100		0.3000									
10	Average Velocity, V (figure 3-1)	**ft/sec**	2.03		8.84									
11	Tt = L / (3600V)	**Compute Tt , hr**	0.0178	+	0.0069	+		+		+		+		0.0247 hr
Channel / Pipe Flow														
12	Cross Sectional flow area, a	**ft^2**	0.88		0.88		7.95		9.82		11.88		14.14	
13	Wetted Perimeter, p_w	**ft**	2.40		2.40		7.10		7.90		8.60		9.40	
14	Hydraulic radius, $r = a/p_w$	**ft**	0.37		0.37		1.12		1.24		1.38		1.50	
15	Channel slope, s	**ft/ft**	0.0050		0.0300		0.0100		0.0100		0.0100		0.0100	
16	Manning's roughness coeff., n (table 3-1)		0.0120		0.0120		0.0120		0.0120		0.0120		0.0120	
17	$V = (1.49 * r^{2/3} * s^{1/2})/n$	**ft/s**	4.50		11.02		13.39		14.35		15.40		16.30	
18	Flow length, L	**ft**	531		328		778		950		800		1227	
19	Tt = L / (3600V)	**Compute Tt , hr**	0.0328	+	0.0083	+	0.0161	+	0.0184	+	0.0144	+	0.0209	0.1109 hr

20 **Watershed or subarea Tc or Tt (add Tt in steps 6,11, and 19)** 0.21 hr

12.4 min

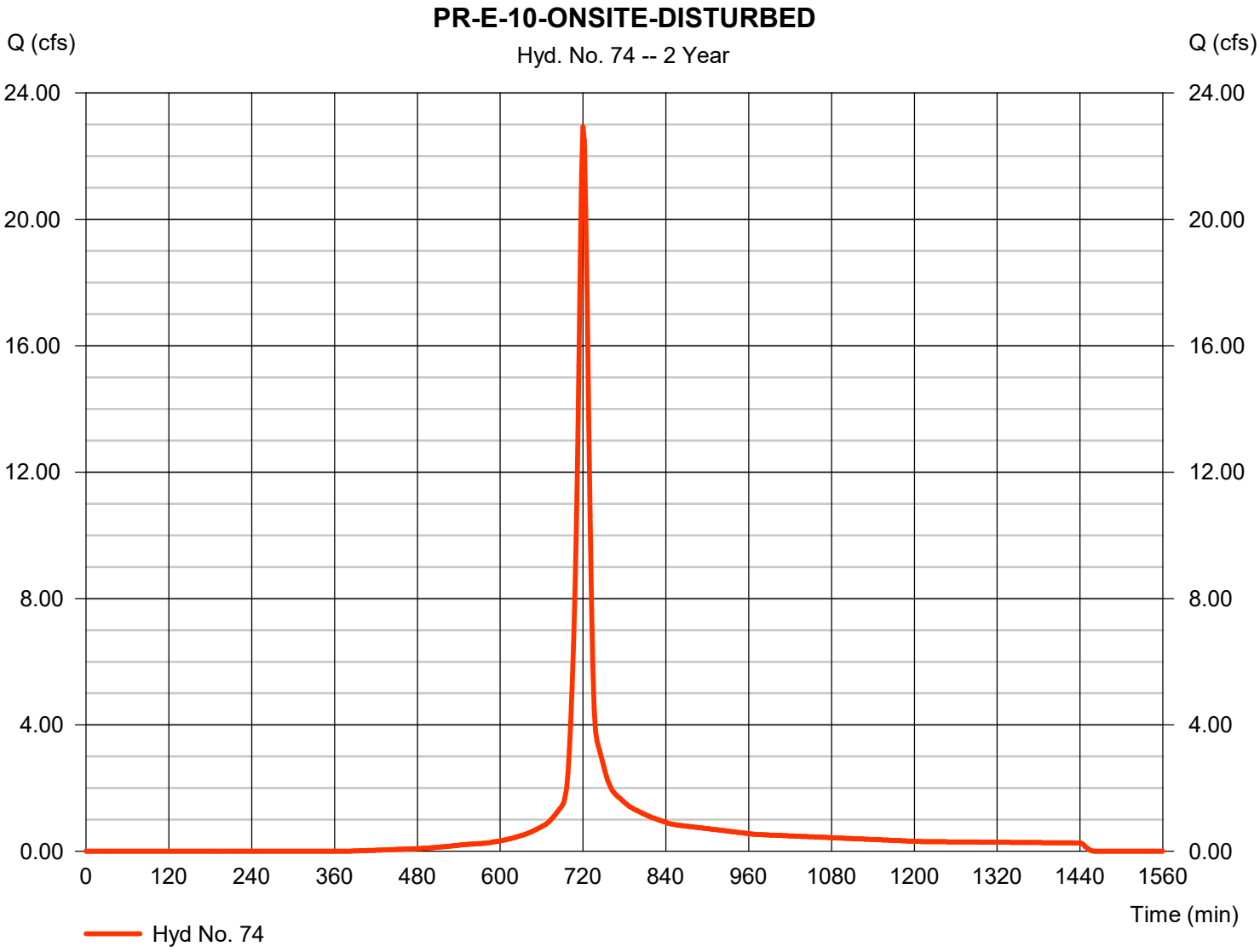
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 74

PR-E-10-ONSITE-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	22.94 cfs
Storm frequency	=	2 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	59,893 cuft
Drainage area	=	7.600 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.40 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

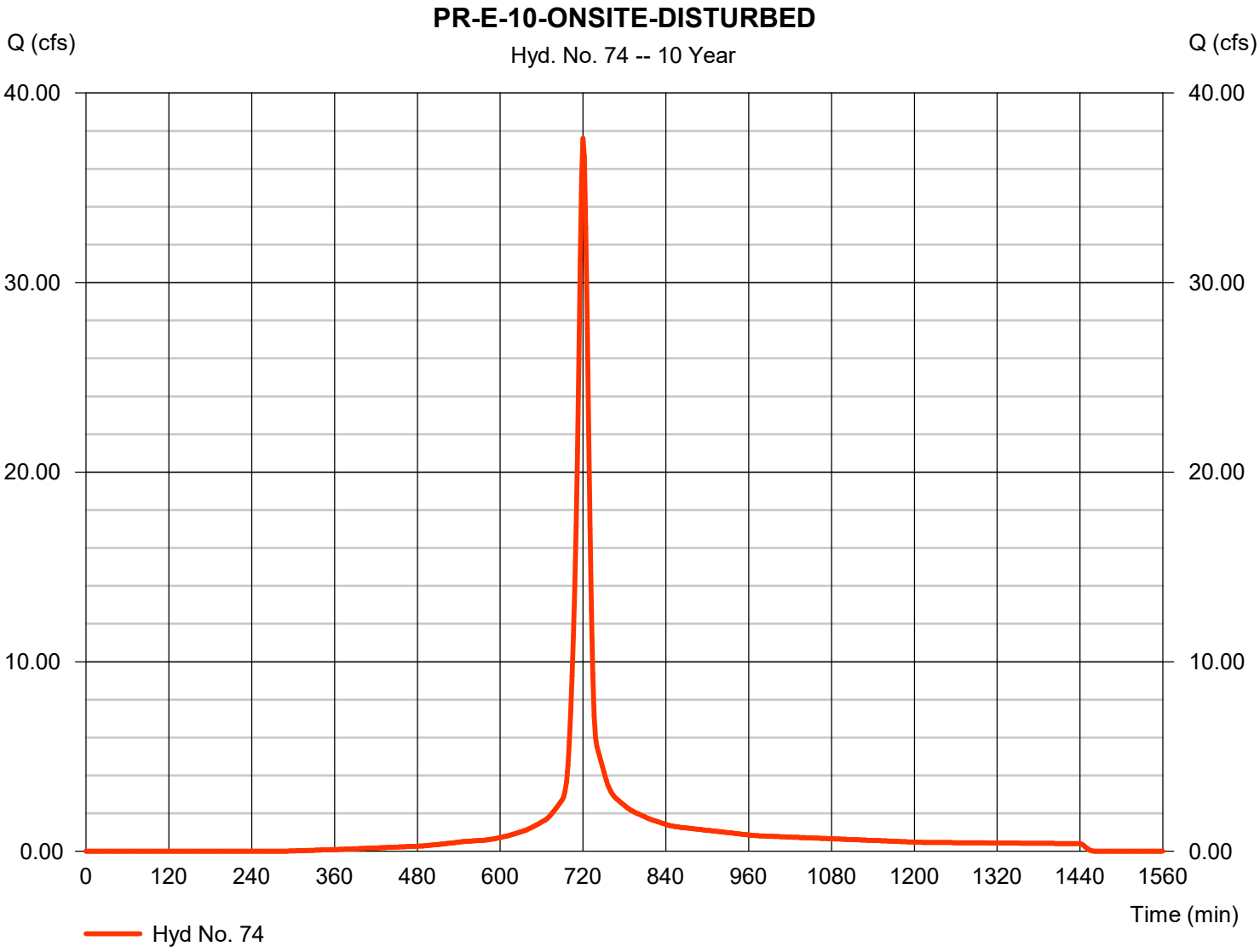


Hydrograph Report

Hyd. No. 74

PR-E-10-ONSITE-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	37.60 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	100,064 cuft
Drainage area	=	7.600 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.40 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

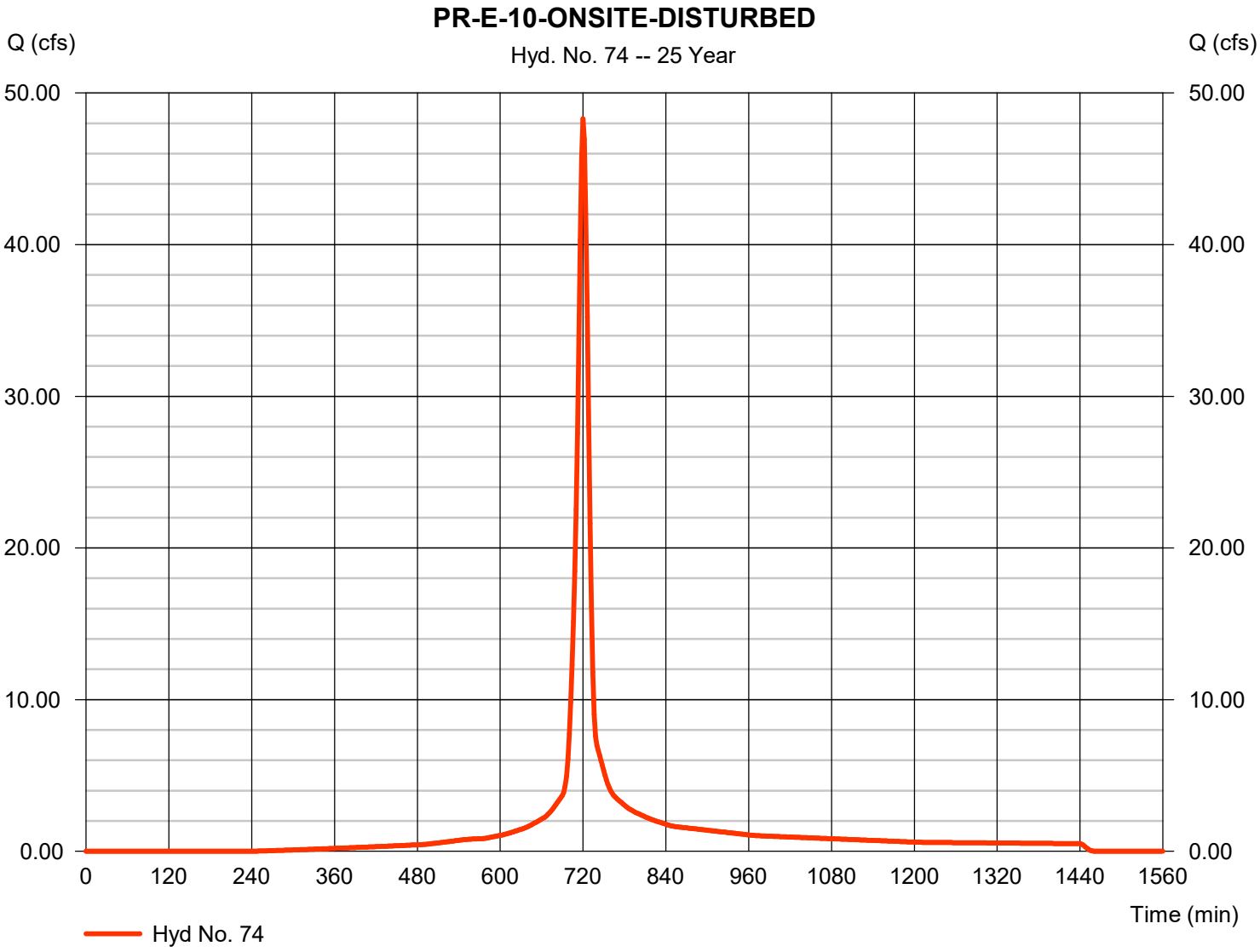


Hydrograph Report

Hyd. No. 74

PR-E-10-ONSITE-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	48.30 cfs
Storm frequency	=	25 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	130,237 cuft
Drainage area	=	7.600 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.40 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

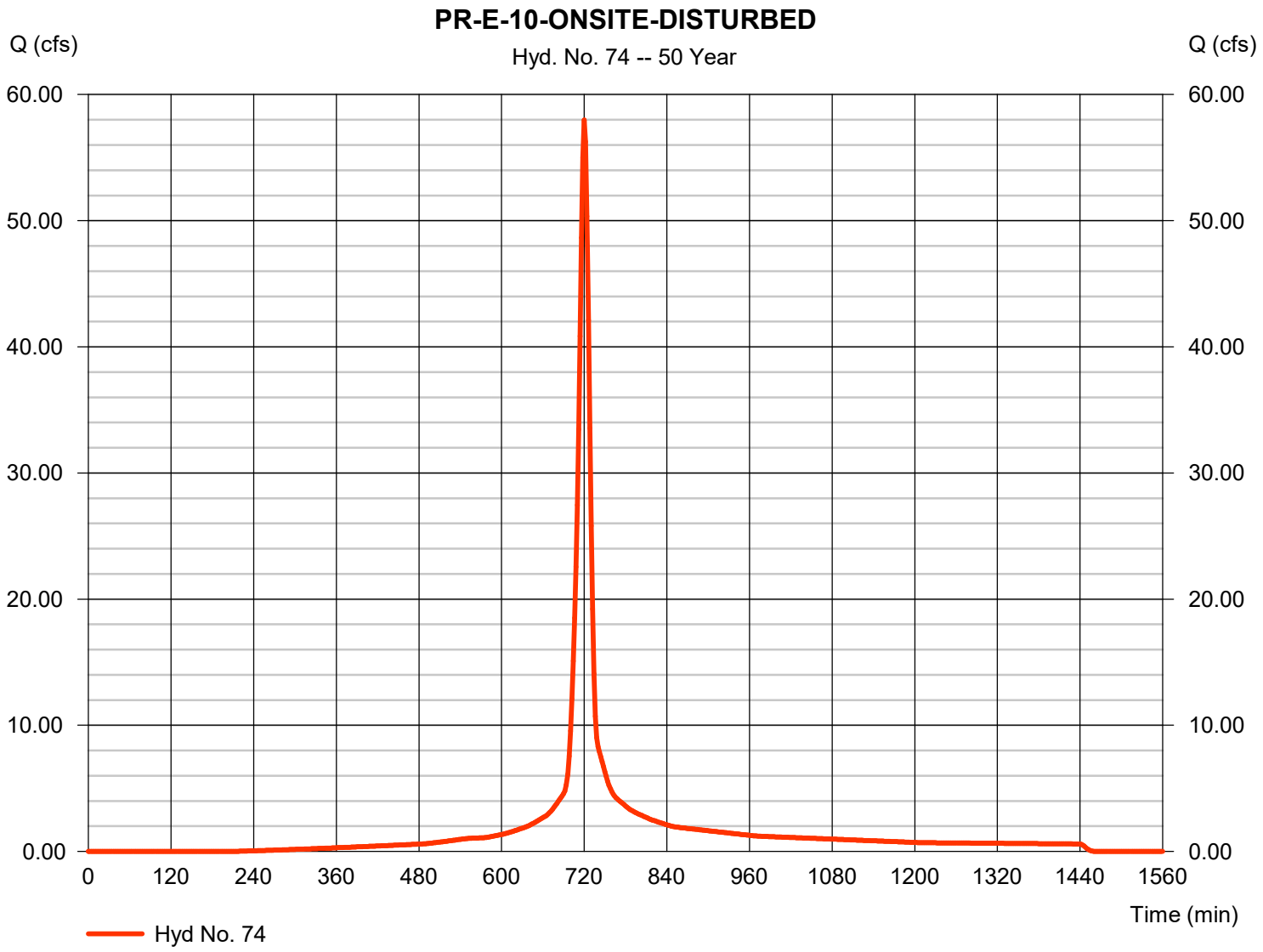


Hydrograph Report

Hyd. No. 74

PR-E-10-ONSITE-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	57.99 cfs
Storm frequency	=	50 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	158,029 cuft
Drainage area	=	7.600 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.40 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

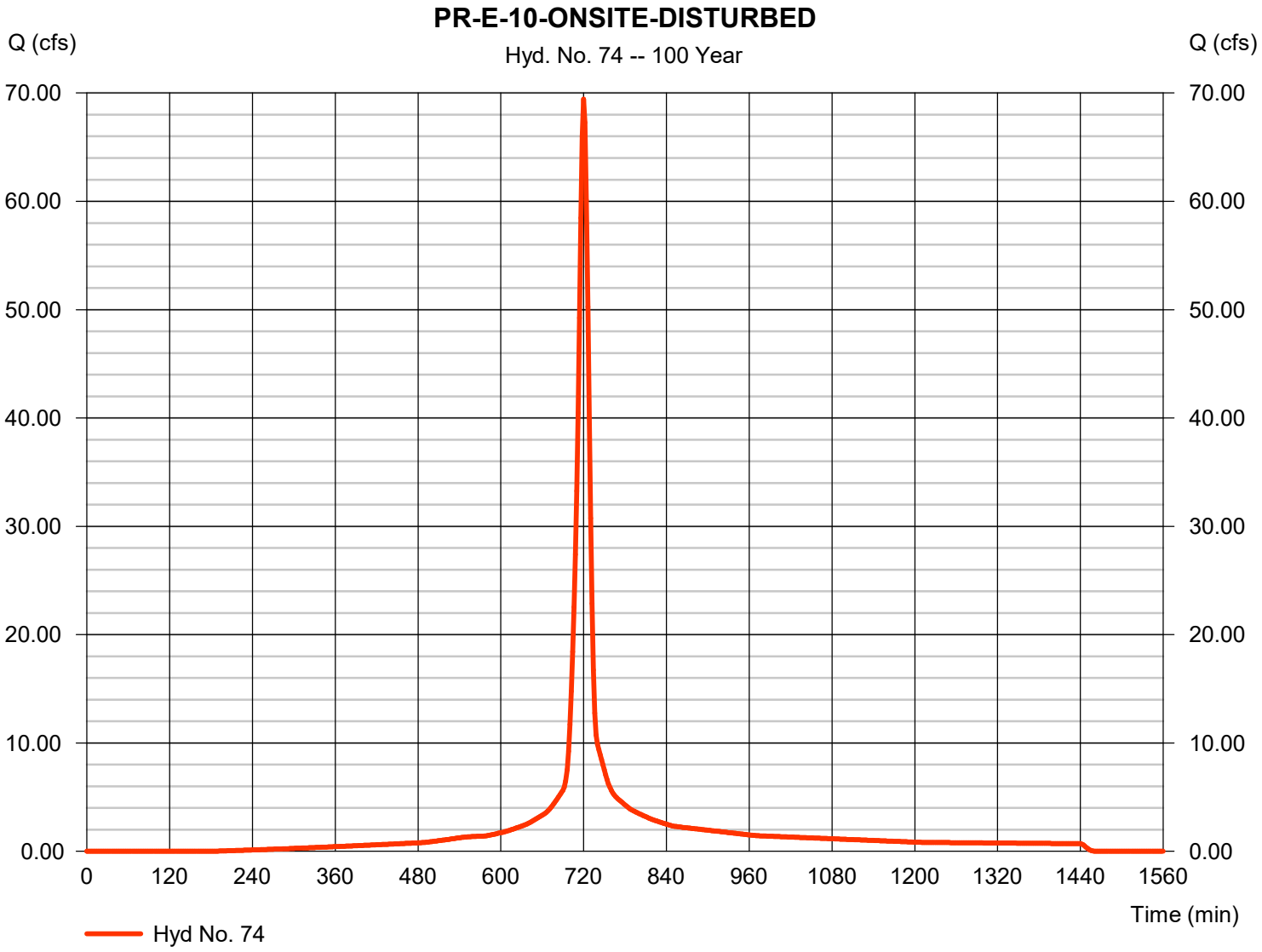


Hydrograph Report

Hyd. No. 74

PR-E-10-ONSITE-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	69.44 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	191,317 cuft
Drainage area	=	7.600 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.40 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



PR-E-10-ONSITE-UNDISTURBED WATERSHED

TR-55 TIME OF CONCENTRATION (Tc) OR TRAVEL TIME (Tt) CALCULATIONS

Project: Smithfield Gateway Phase 1A-1 **By:** MJV **Date:** 12/10/2020
Location: Smithfield Township, Monroe County, PA **Checked:** TH **Date:** 12/10/2020
Watershed: PR-E-10-ONSITE&OFFSITE-UNDISTURBED

Sheet Flow (Applicable to Tc only)													
1	Surface Description (table 3-1)		Woods										
2	Manning's roughness coeff., n (table 3-1)		0.400										
3	Flow length, L (total L<100 ft)	**ft**	100										
4	Two-yr 24-hr rainfall, P2	**in**	3.32										
5	Land Slope, s	**ft/ft**	0.0600										
6	$Tt = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5}(s)^{.04}}$	**Compute Tt, hr**	0.2264	+		+		+		+		+	0.2264 hr
Shallow Concentrated Flow													
7	Surface Description (Paved or Unpaved)		Unpaved		Unpaved		Unpaved						
8	Flow length, L	**ft**	300		515		312						
9	Watercourse slope, s	**ft/ft**	0.1533		0.0839		0.0224						
10	Average Velocity, V (figure 3-1)	**ft/sec**	6.32		4.67		2.41						
11	Tt = L / (3600V)	**Compute Tt , hr**	0.0132	+	0.0306	+	0.0359	+		+		+	0.0797 hr
Channel / Pipe Flow													
12	Cross Sectional flow area, a	**ft^2**											
13	Wetted Perimeter, p_w	**ft**											
14	Hydraulic radius, $r = a/p_w$	**ft**											
15	Channel slope, s	**ft/ft**											
16	Manning's roughness coeff., n (table 3-1)												
17	$V = (1.49*r^{2/3}*s^{1/2})/n$	**ft/s**											
18	Flow length, L	**ft**											
19	Tt = L / (3600V)	**Compute Tt , hr**		+		+		+		+		+	0.0000 hr
20	**Watershed or subarea Tc or Tt (add Tt in steps 6,11, and 19)**												0.31 hr
													18.4 min

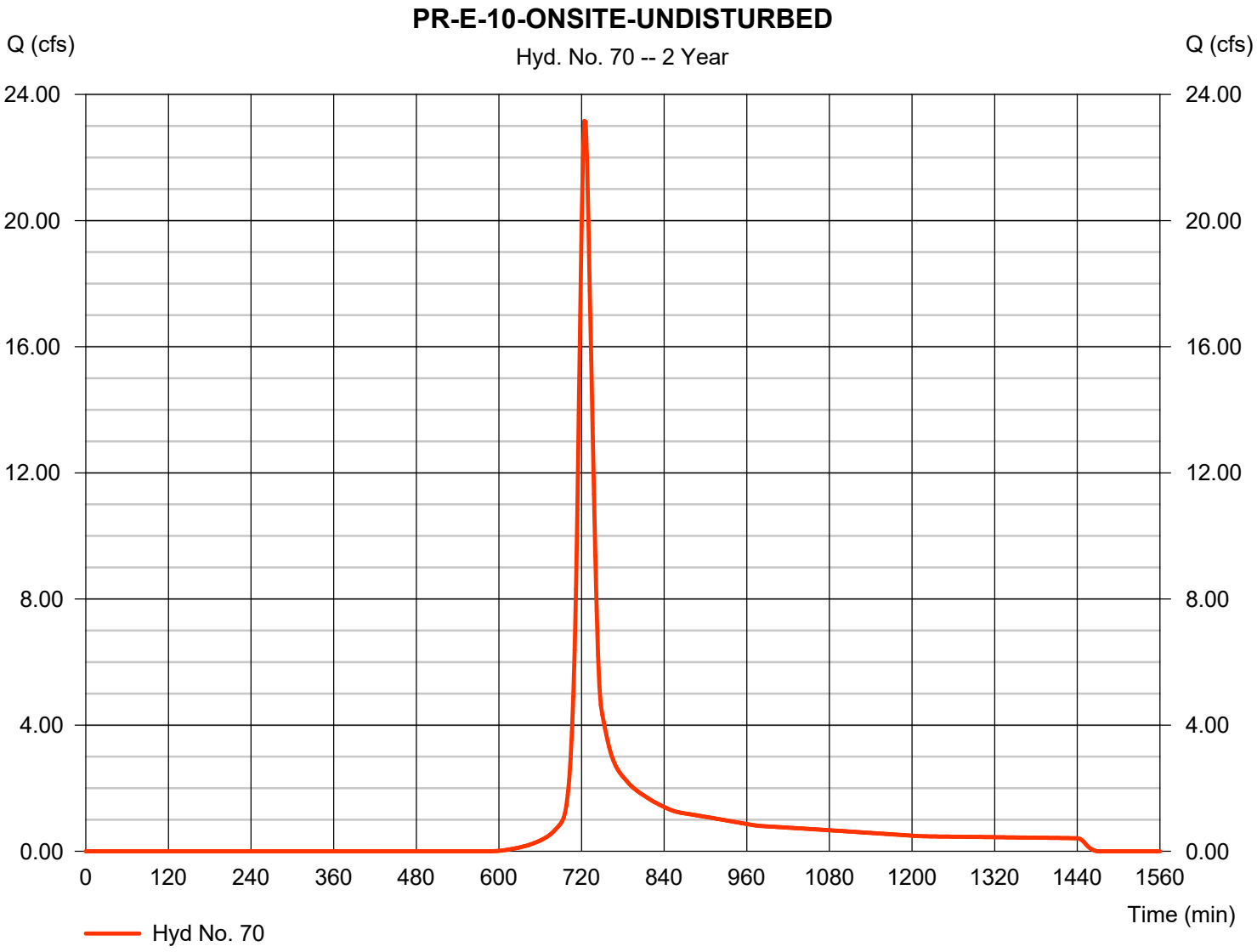
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 70

PR-E-10-ONSITE-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	23.16 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	73,913 cuft
Drainage area	=	14.950 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	18.40 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

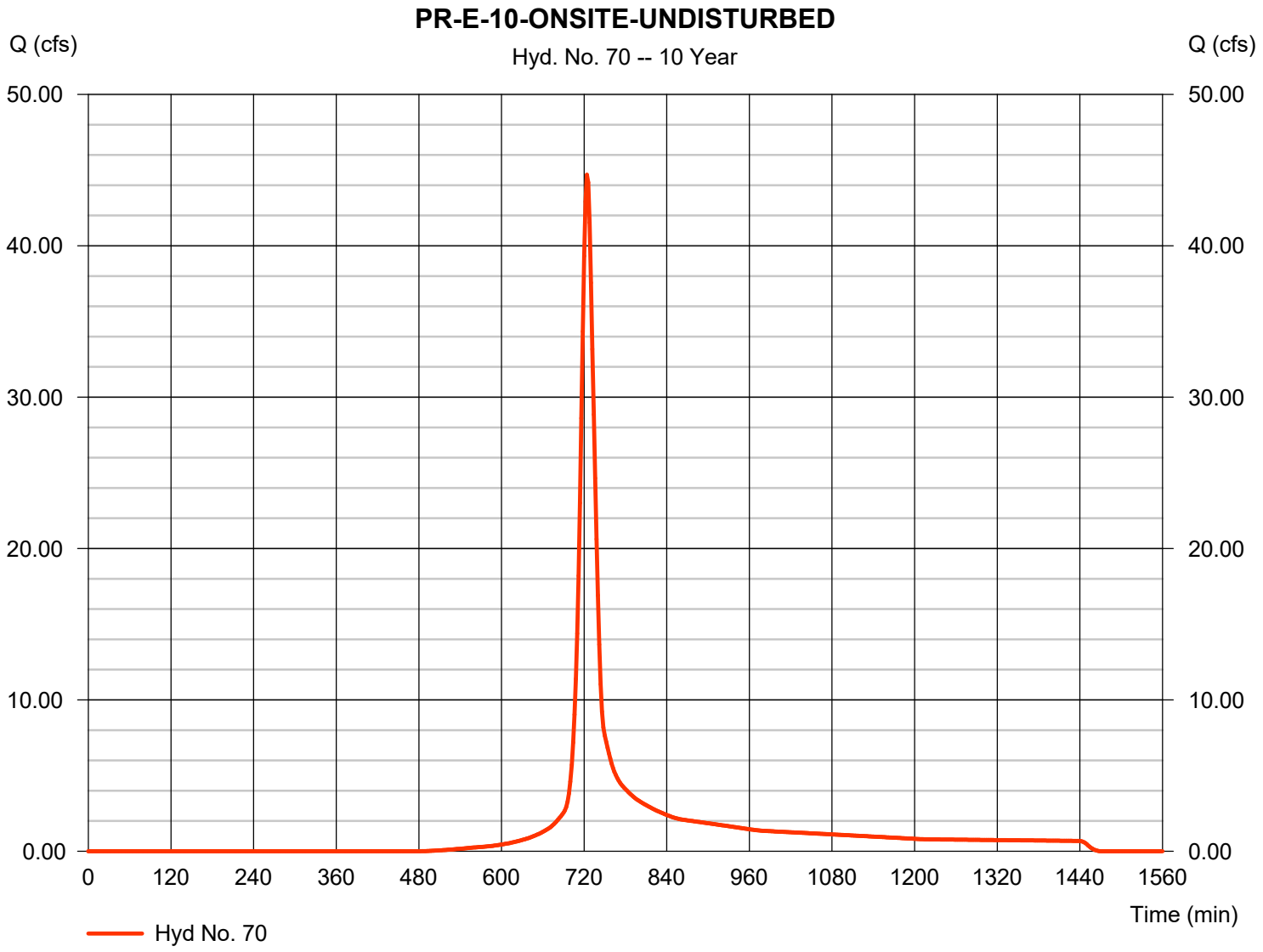


Hydrograph Report

Hyd. No. 70

PR-E-10-ONSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 44.69 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 139,818 cuft
Drainage area	= 14.950 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 18.40 min
Total precip.	= 4.84 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

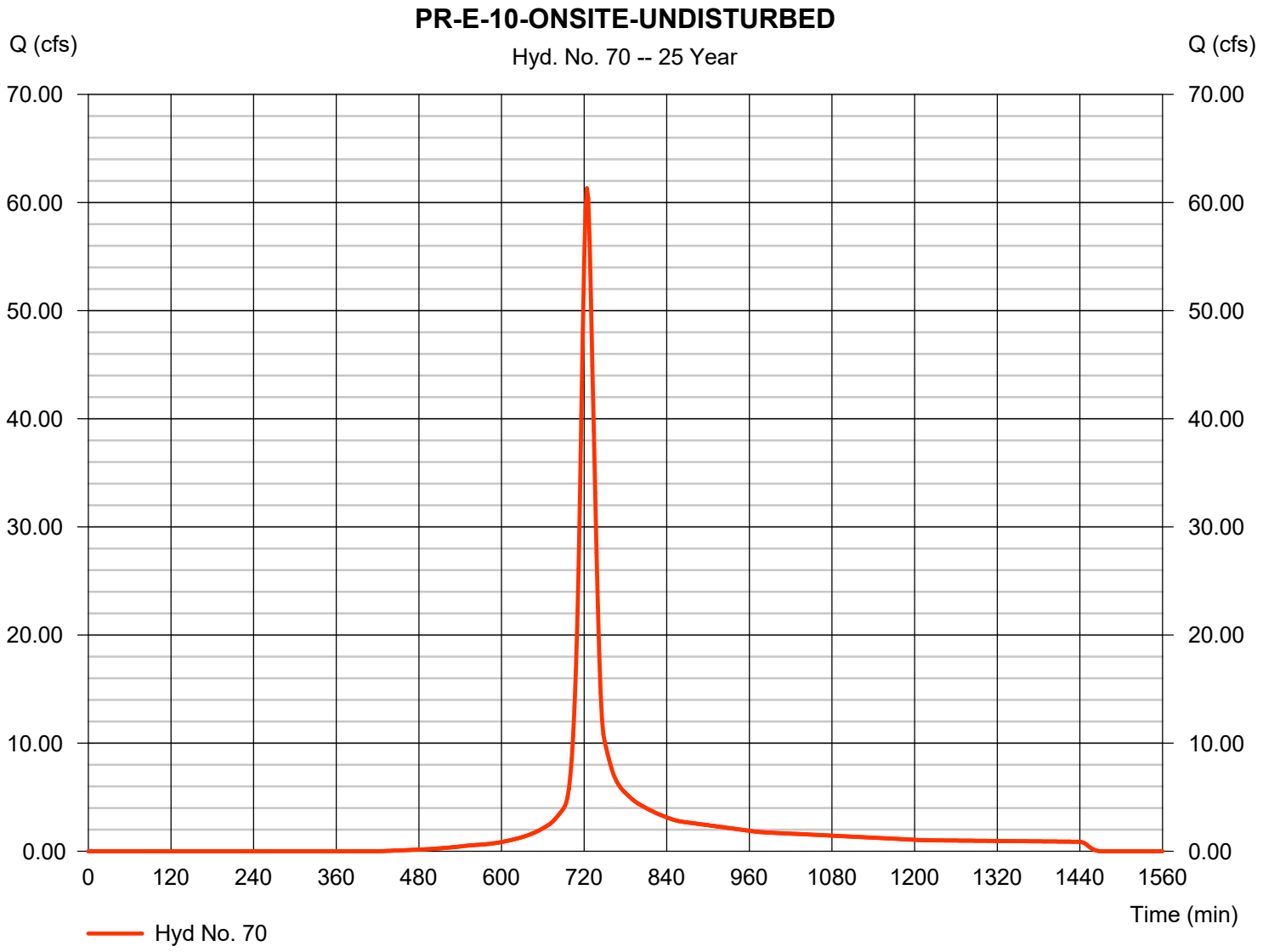


Hydrograph Report

Hyd. No. 70

PR-E-10-ONSITE-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	61.32 cfs
Storm frequency	=	25 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	191,828 cuft
Drainage area	=	14.950 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	18.40 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

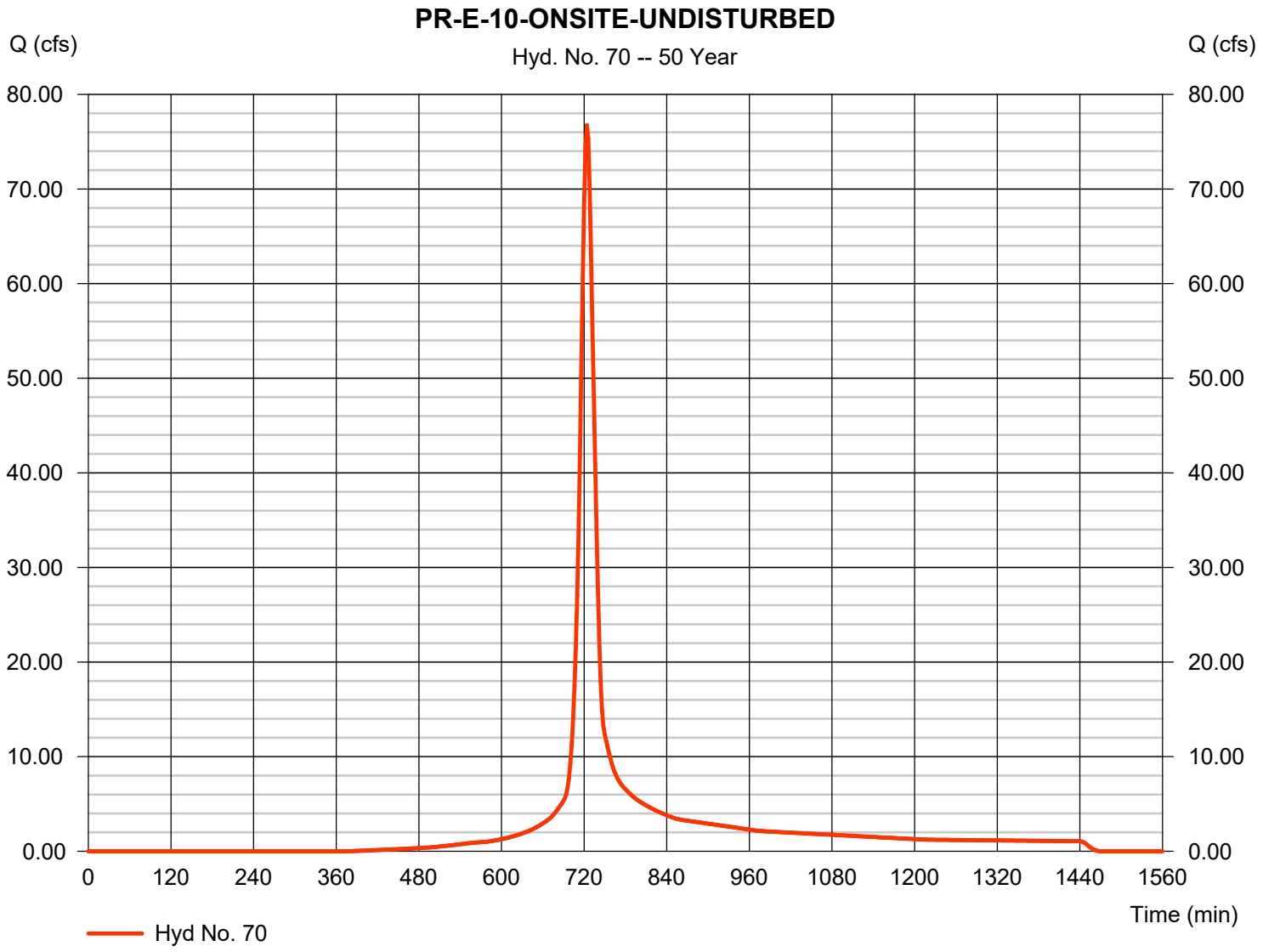


Hydrograph Report

Hyd. No. 70

PR-E-10-ONSITE-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	76.75 cfs
Storm frequency	=	50 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	240,873 cuft
Drainage area	=	14.950 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	18.40 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

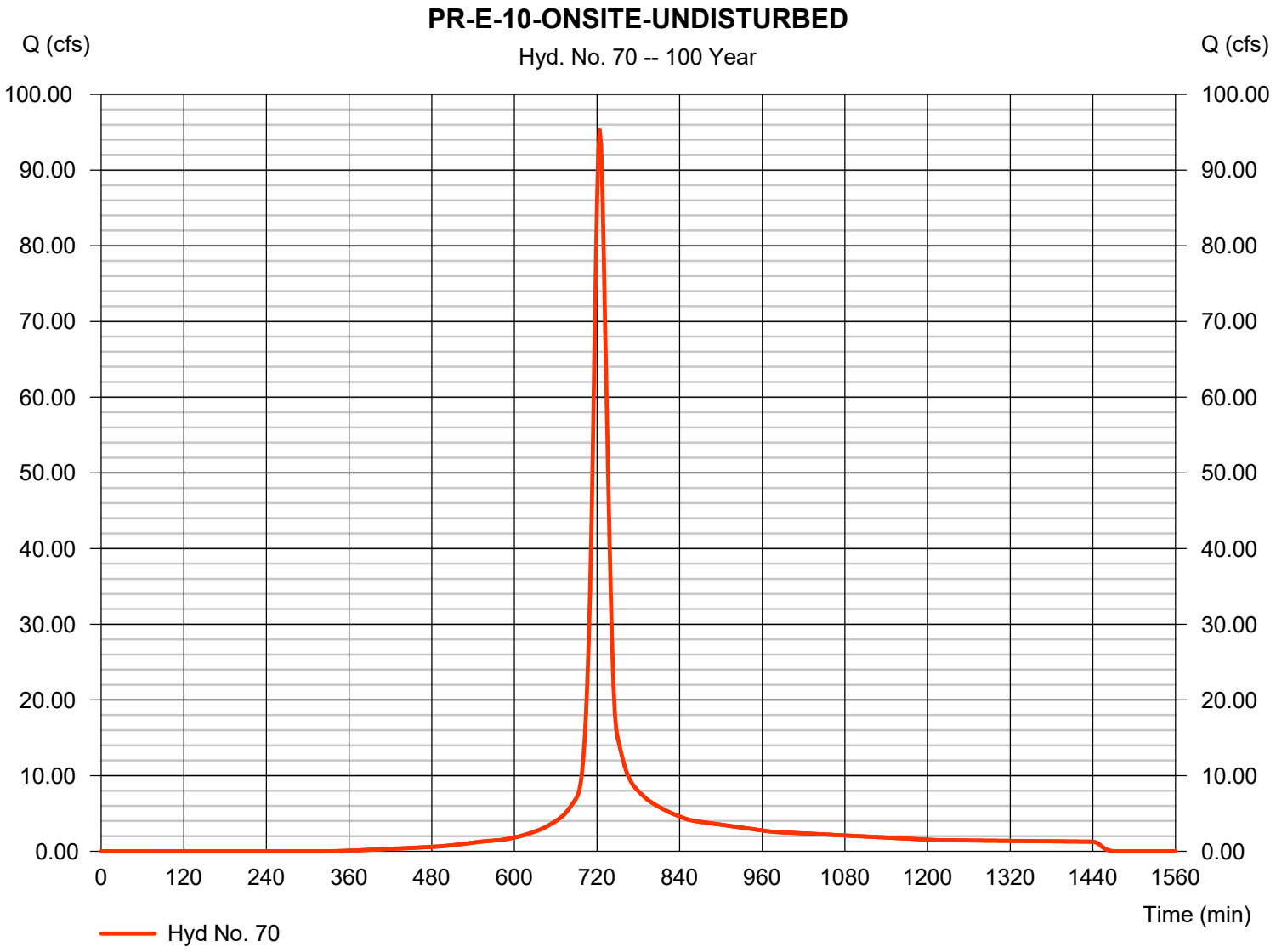


Hydrograph Report

Hyd. No. 70

PR-E-10-ONSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 95.25 cfs
Storm frequency	= 100 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 300,599 cuft
Drainage area	= 14.950 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 18.40 min
Total precip.	= 8.16 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



PR-E-10-OFFSITE-DISTURBED WATERSHED

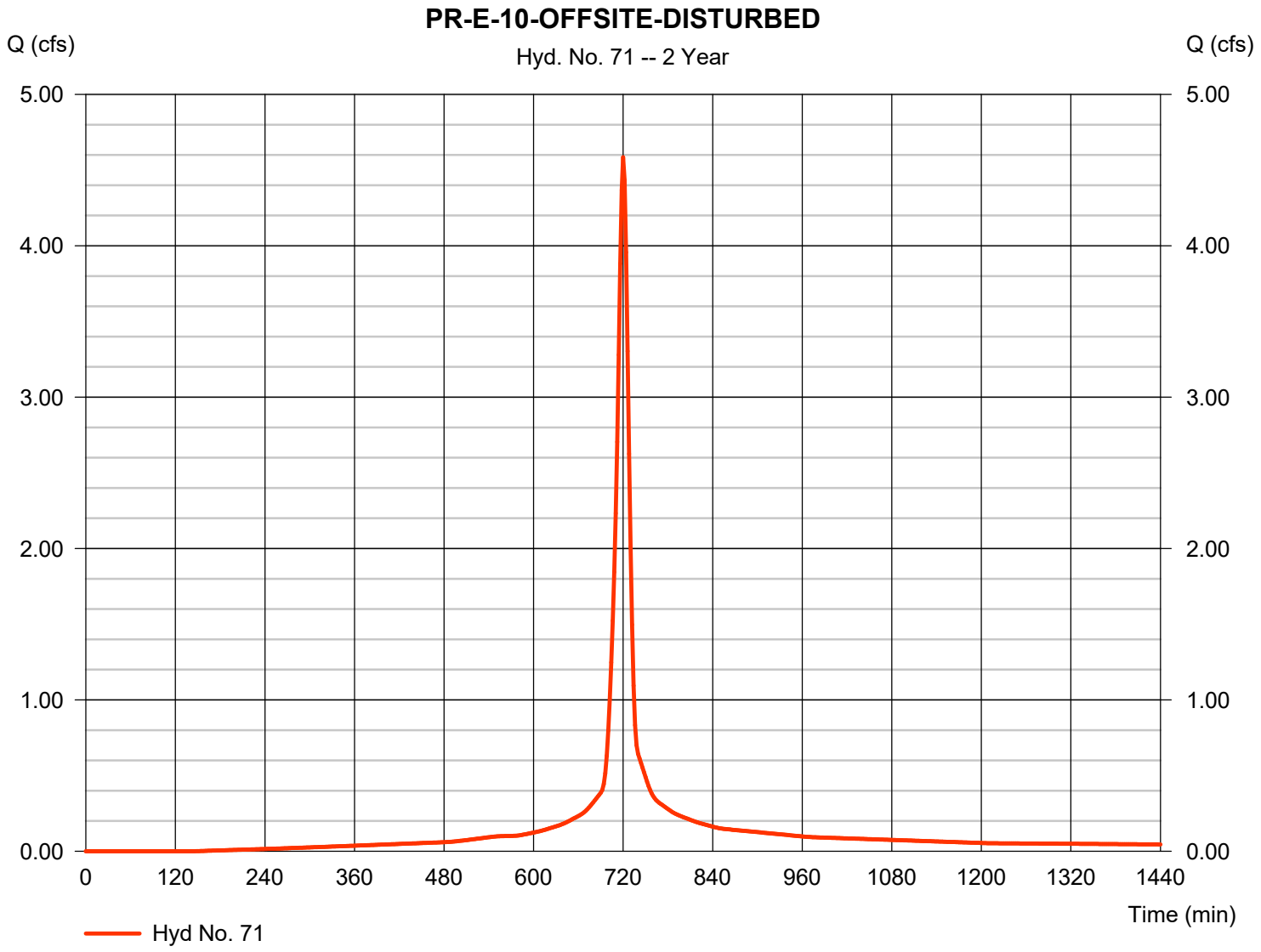
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 71

PR-E-10-OFFSITE-DISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 4.585 cfs
Storm frequency	= 2 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 12,881 cuft
Drainage area	= 1.200 ac	Curve number	= 96
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.40 min
Total precip.	= 3.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

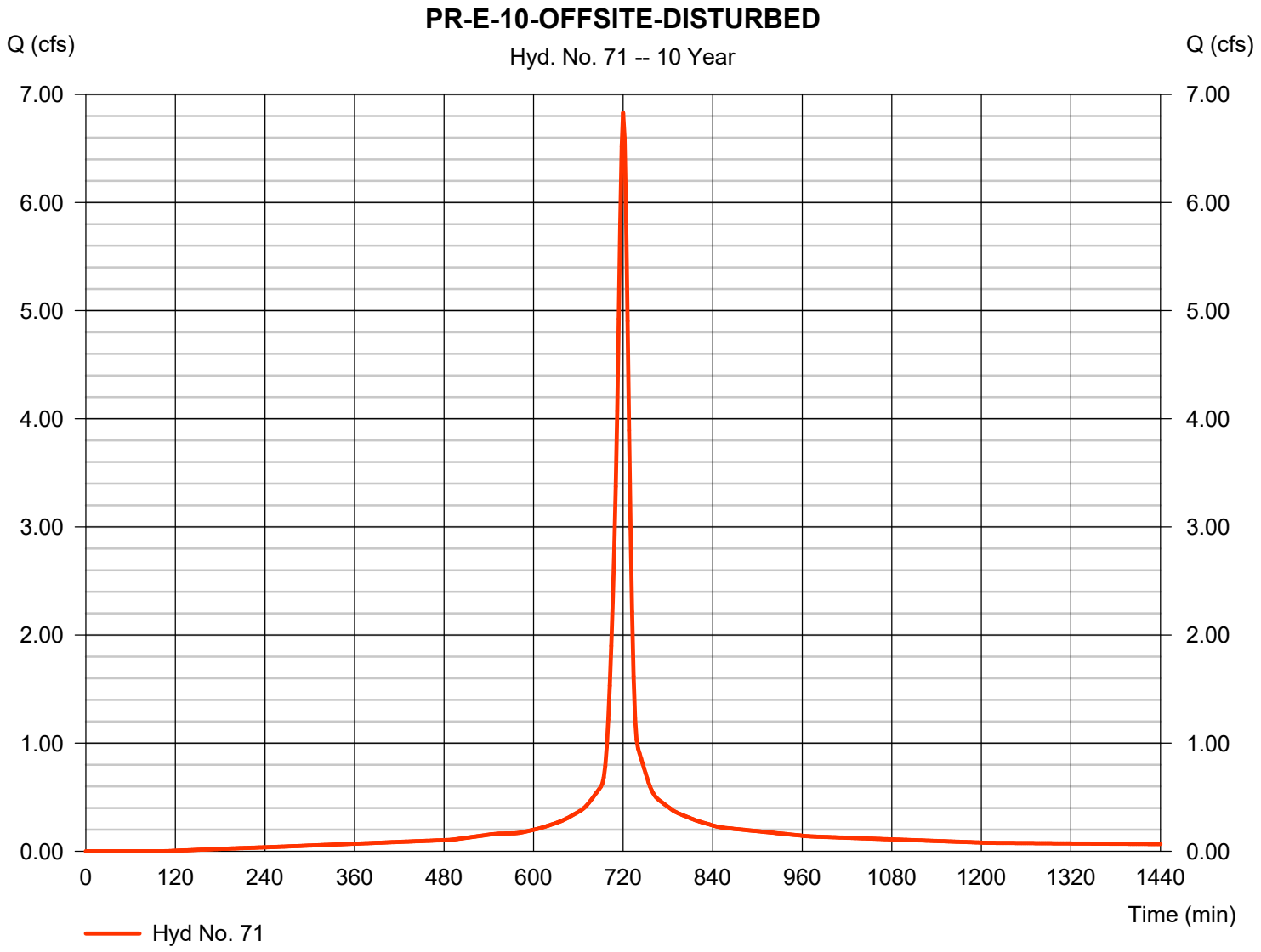


Hydrograph Report

Hyd. No. 71

PR-E-10-OFFSITE-DISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 6.830 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 19,647 cuft
Drainage area	= 1.200 ac	Curve number	= 96
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.40 min
Total precip.	= 4.84 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

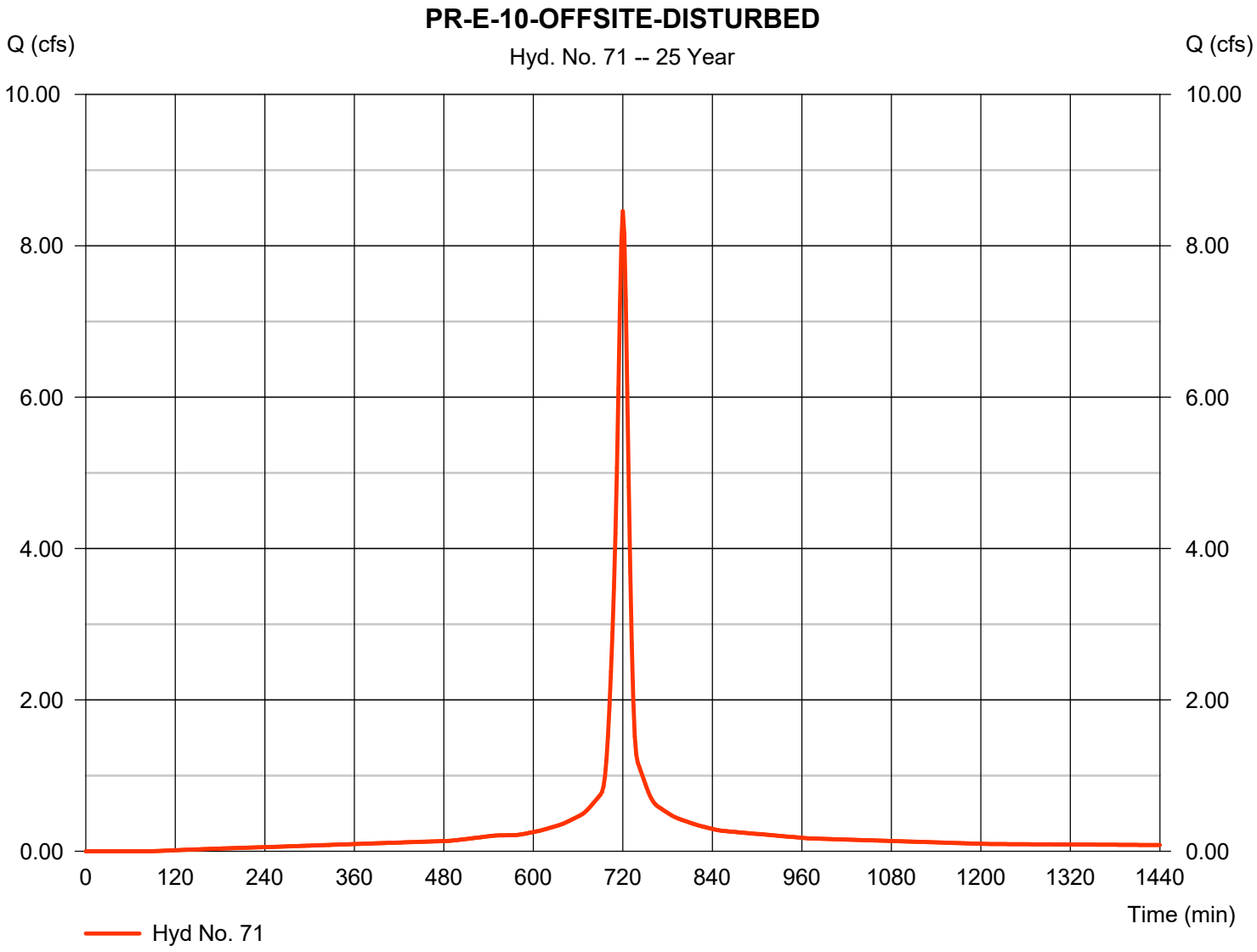


Hydrograph Report

Hyd. No. 71

PR-E-10-OFFSITE-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.458 cfs
Storm frequency	=	25 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	24,606 cuft
Drainage area	=	1.200 ac	Curve number	=	96
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.40 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

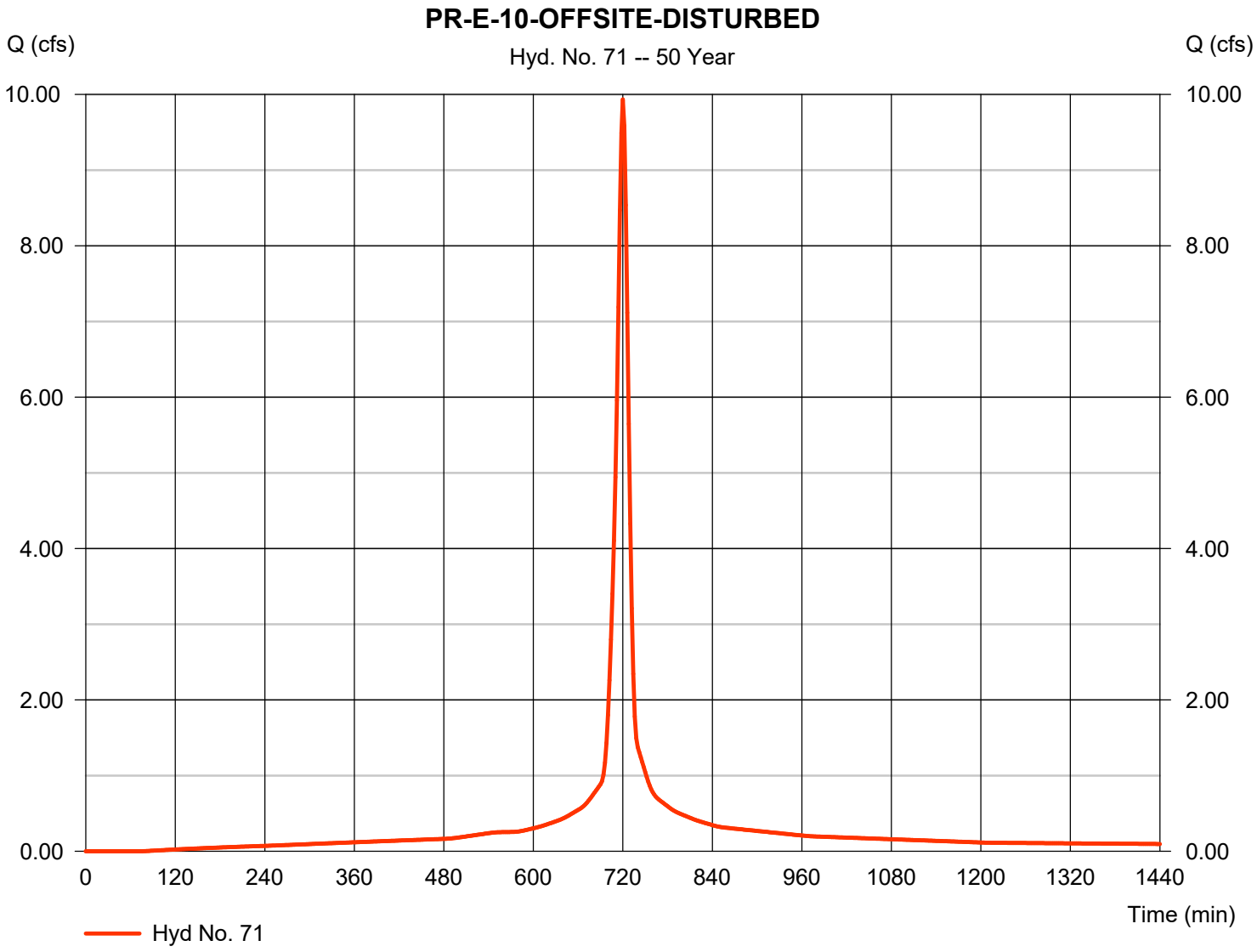


Hydrograph Report

Hyd. No. 71

PR-E-10-OFFSITE-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.934 cfs
Storm frequency	=	50 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	29,126 cuft
Drainage area	=	1.200 ac	Curve number	=	96
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.40 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

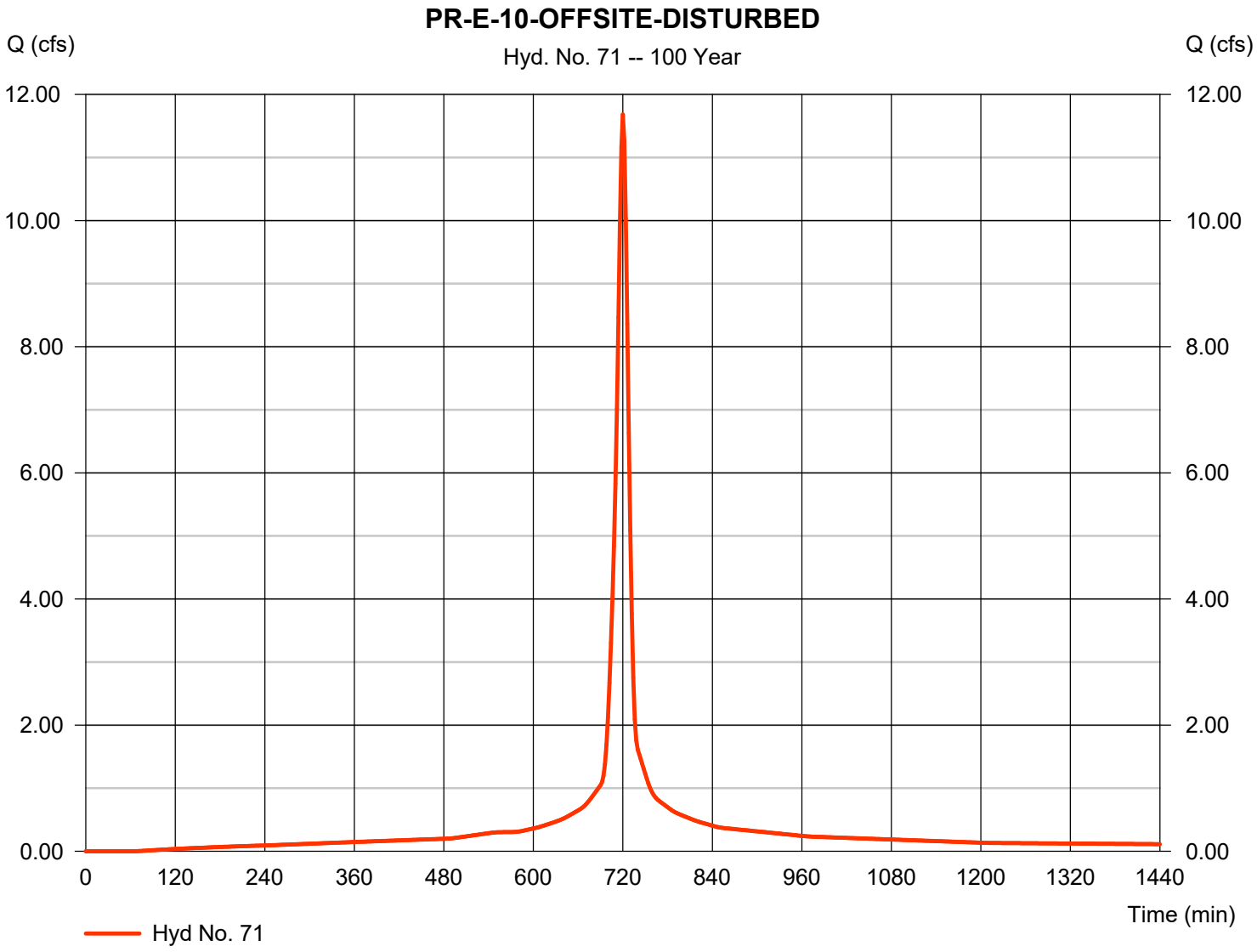


Hydrograph Report

Hyd. No. 71

PR-E-10-OFFSITE-DISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 11.68 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 34,502 cuft
Drainage area	= 1.200 ac	Curve number	= 96
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.40 min
Total precip.	= 8.16 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



PR-E-10-OFFSITE-UNDISTURBED WATERSHED

TR-55 TIME OF CONCENTRATION (Tc) OR TRAVEL TIME (Tt) CALCULATIONS

Project: Smithfield Gateway Phase 1A-1 **By:** MJV **Date:** 12/10/2020
Location: Smithfield Township, Monroe County, PA **Checked:** TH **Date:** 12/10/2020
Watershed: PR-E-10-ONSITE&OFFSITE-UNDISTURBED

Sheet Flow (Applicable to Tc only)													
1	Surface Description (table 3-1)		Woods										
2	Manning's roughness coeff., n (table 3-1)		0.400										
3	Flow length, L (total L<100 ft)	**ft**	100										
4	Two-yr 24-hr rainfall, P2	**in**	3.32										
5	Land Slope, s	**ft/ft**	0.0600										
6	$Tt = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5}(s)^{.04}}$	**Compute Tt, hr**	0.2264	+		+		+		+		+	0.2264 hr
Shallow Concentrated Flow													
7	Surface Description (Paved or Unpaved)		Unpaved		Unpaved		Unpaved						
8	Flow length, L	**ft**	300		515		312						
9	Watercourse slope, s	**ft/ft**	0.1533		0.0839		0.0224						
10	Average Velocity, V (figure 3-1)	**ft/sec**	6.32		4.67		2.41						
11	Tt = L / (3600V)	**Compute Tt , hr**	0.0132	+	0.0306	+	0.0359	+		+		+	0.0797 hr
Channel / Pipe Flow													
12	Cross Sectional flow area, a	**ft^2**											
13	Wetted Perimeter, p_w	**ft**											
14	Hydraulic radius, $r = a/p_w$	**ft**											
15	Channel slope, s	**ft/ft**											
16	Manning's roughness coeff., n (table 3-1)												
17	$V = (1.49*r^{2/3}*s^{1/2})/n$	**ft/s**											
18	Flow length, L	**ft**											
19	Tt = L / (3600V)	**Compute Tt , hr**		+		+		+		+		+	0.0000 hr
20	**Watershed or subarea Tc or Tt (add Tt in steps 6,11, and 19)**												0.31 hr
													18.4 min

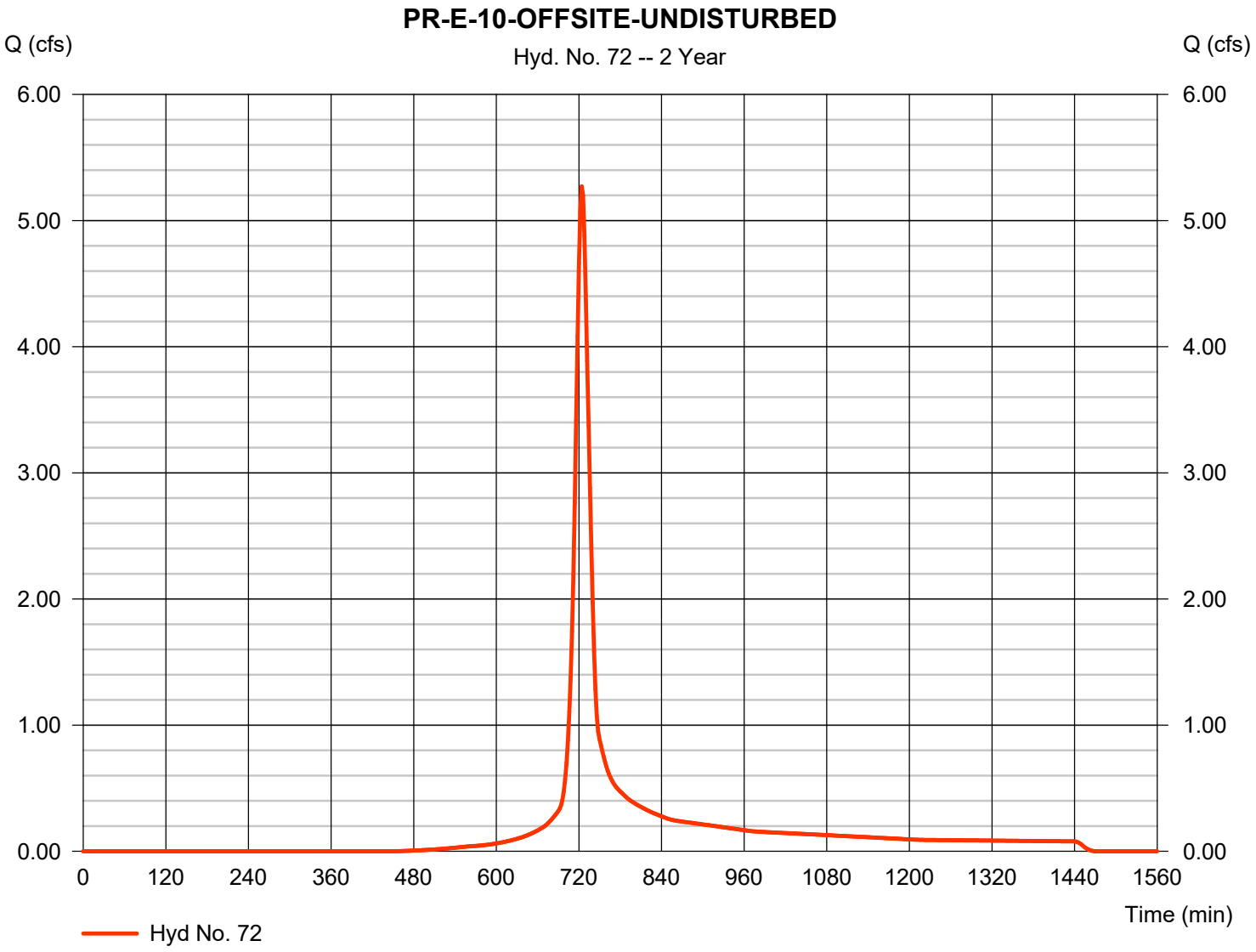
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 72

PR-E-10-OFFSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 5.271 cfs
Storm frequency	= 2 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 16,479 cuft
Drainage area	= 2.440 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 18.40 min
Total precip.	= 3.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

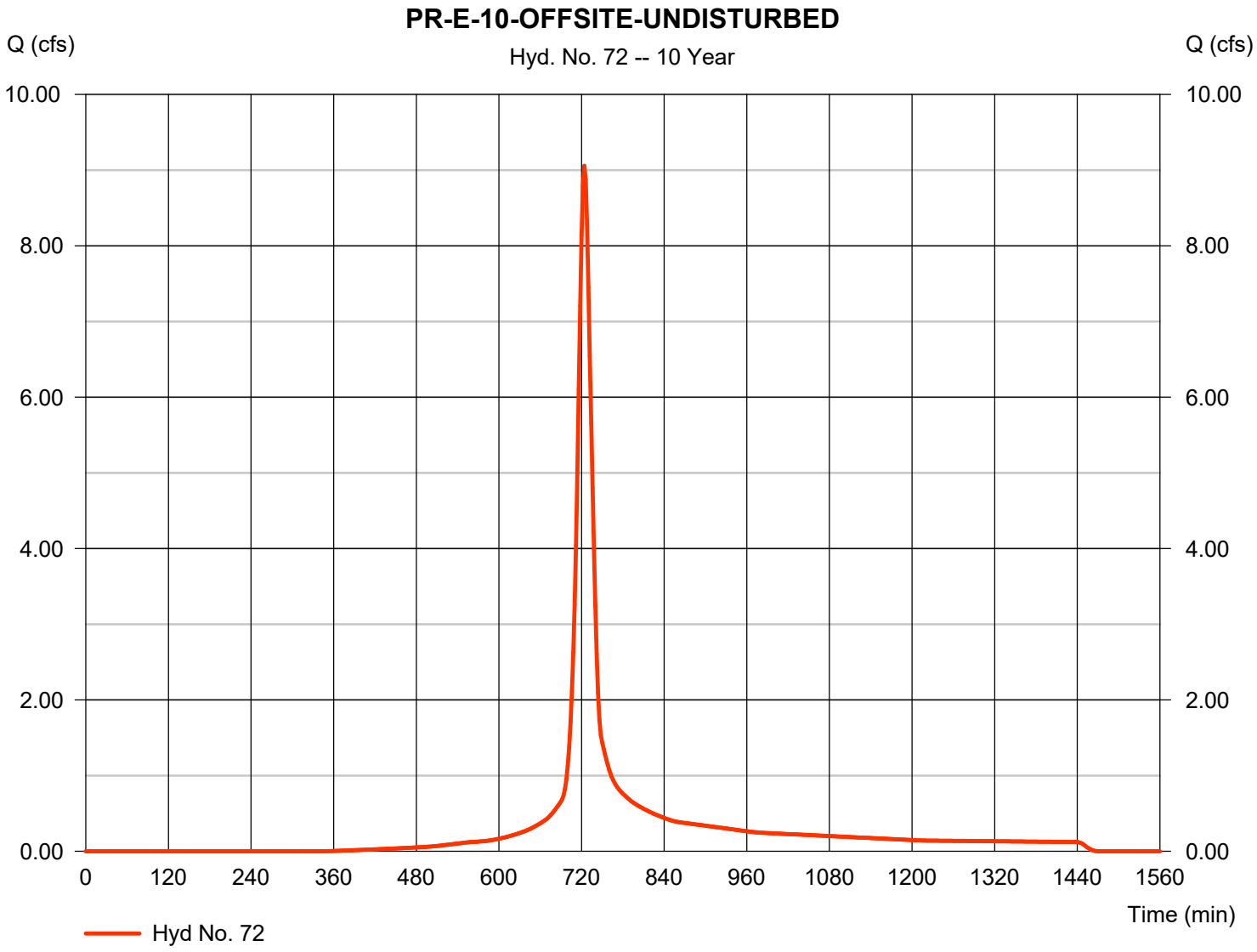


Hydrograph Report

Hyd. No. 72

PR-E-10-OFFSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 9.057 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 28,524 cuft
Drainage area	= 2.440 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 18.40 min
Total precip.	= 4.84 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

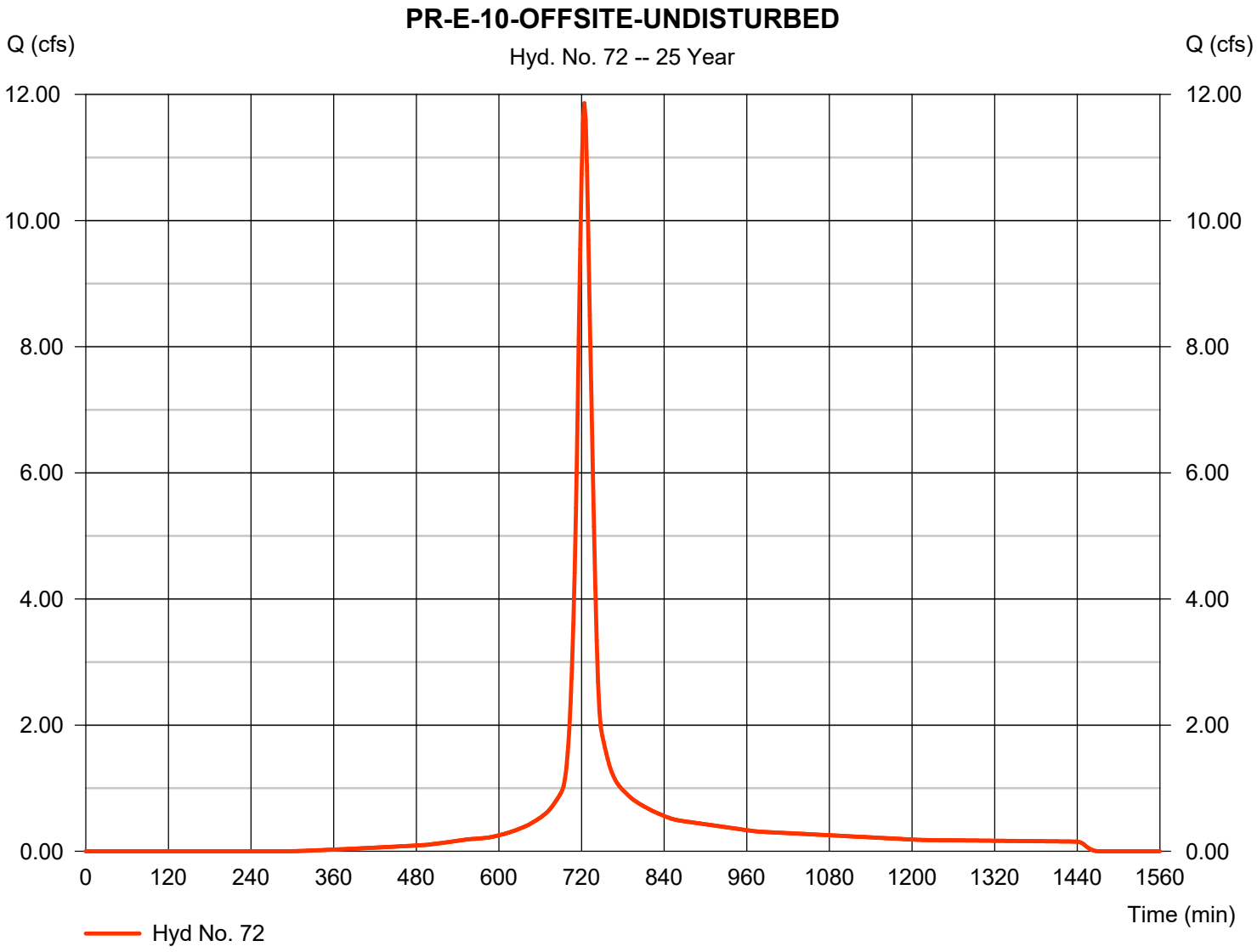


Hydrograph Report

Hyd. No. 72

PR-E-10-OFFSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 11.86 cfs
Storm frequency	= 25 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 37,691 cuft
Drainage area	= 2.440 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 18.40 min
Total precip.	= 5.95 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

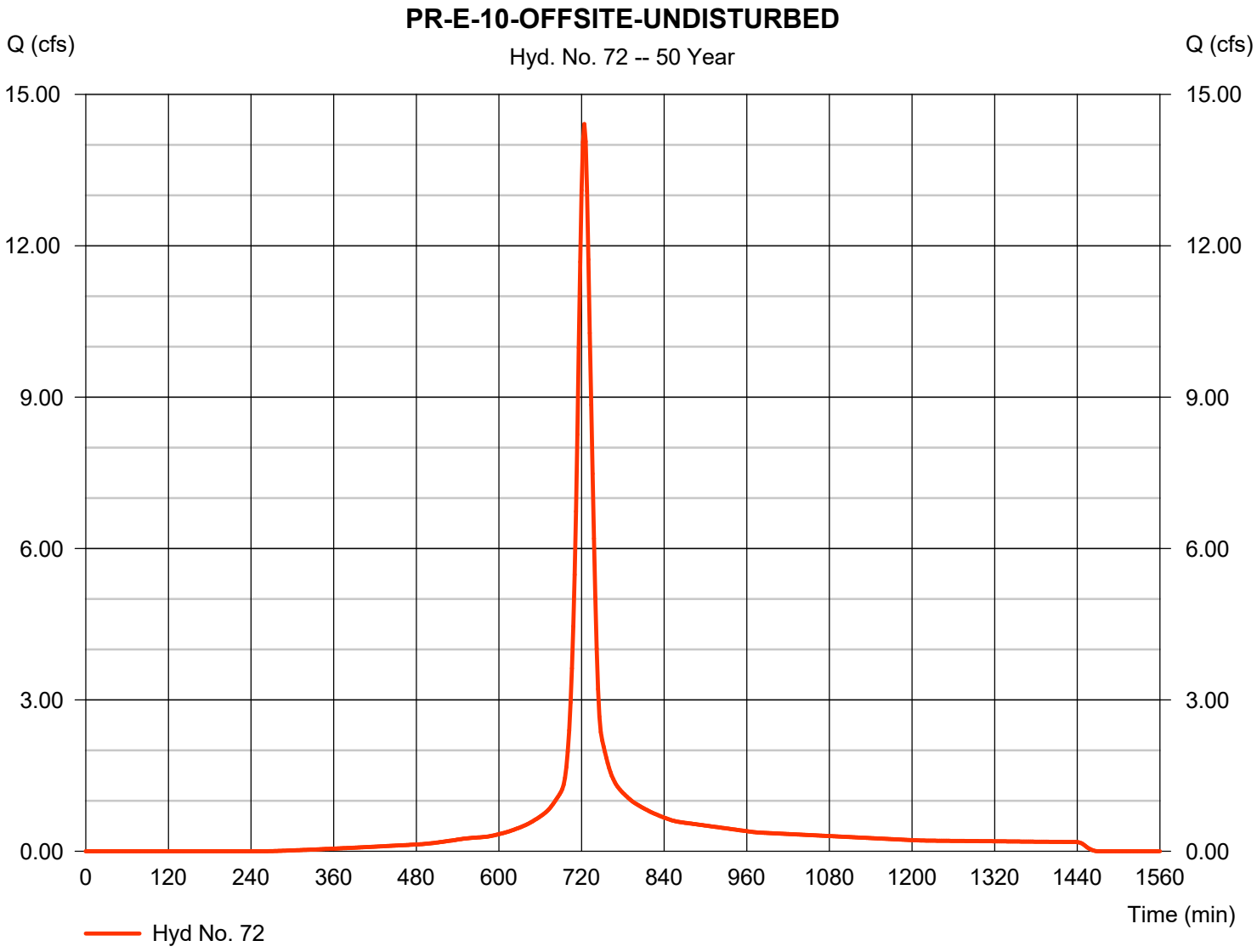


Hydrograph Report

Hyd. No. 72

PR-E-10-OFFSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 14.41 cfs
Storm frequency	= 50 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 46,184 cuft
Drainage area	= 2.440 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 18.40 min
Total precip.	= 6.96 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

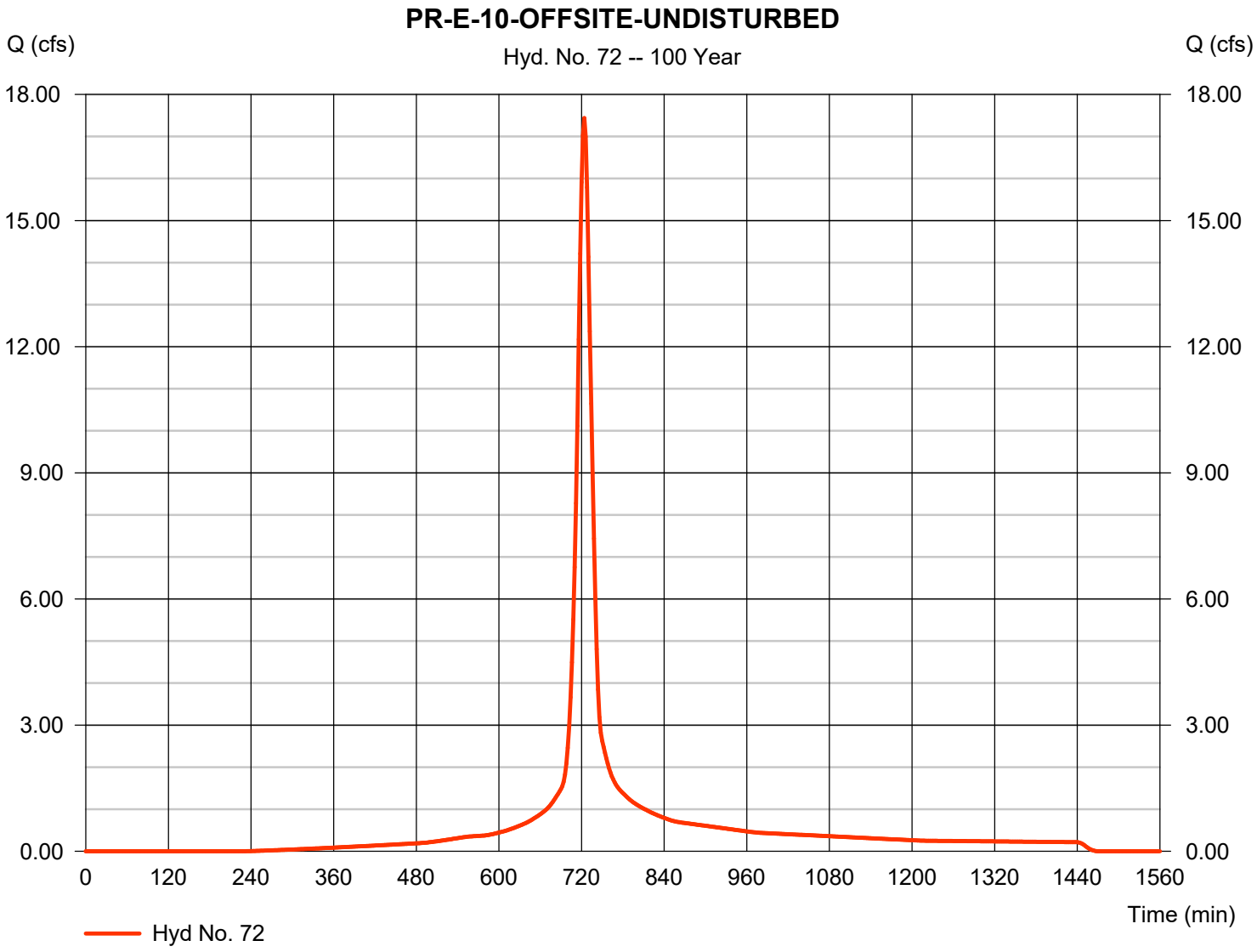


Hydrograph Report

Hyd. No. 72

PR-E-10-OFFSITE-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 17.44 cfs
Storm frequency	= 100 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 56,400 cuft
Drainage area	= 2.440 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 18.40 min
Total precip.	= 8.16 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



PR-E-11-DISTURBED WATERSHED

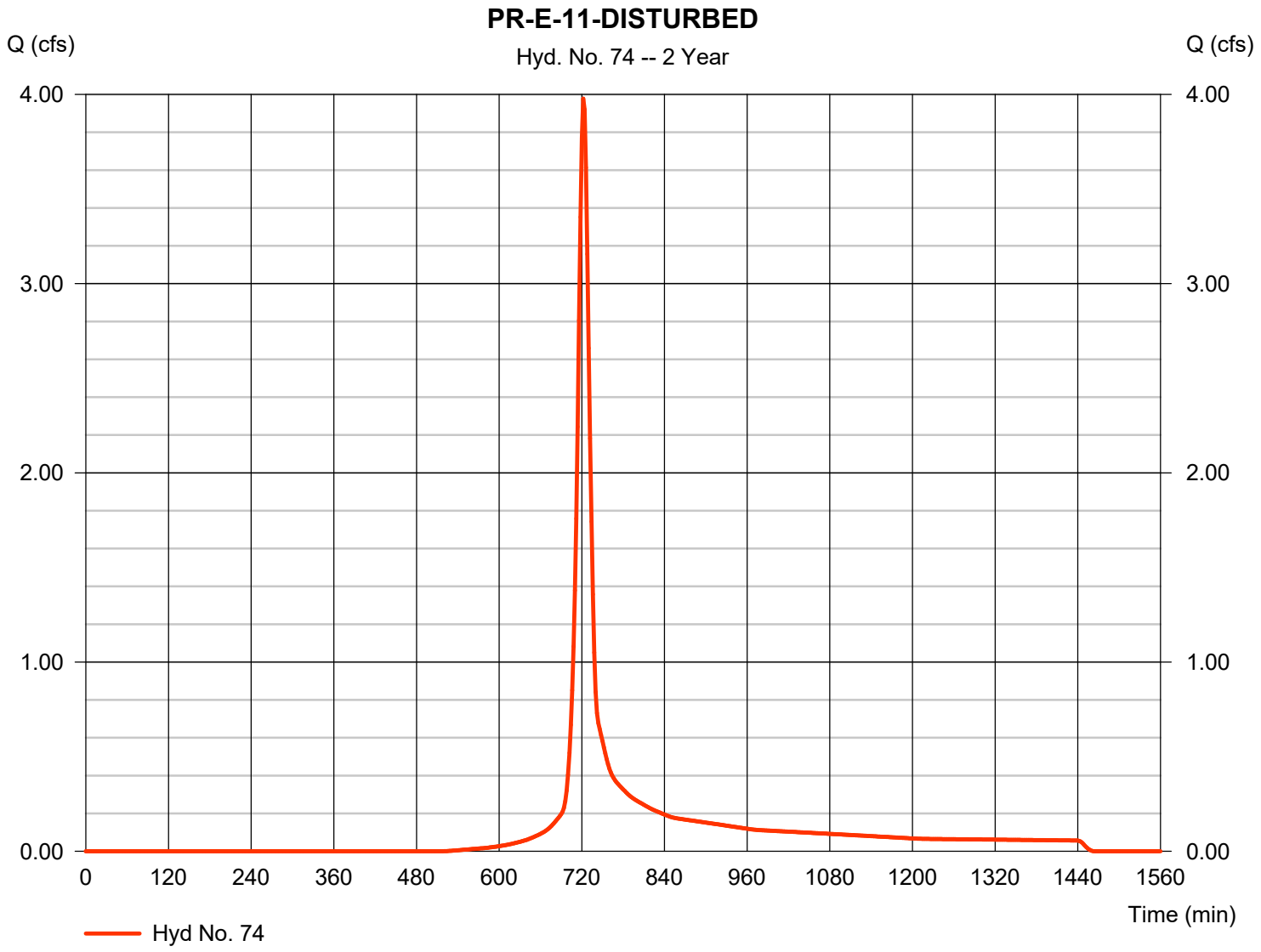
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 74

PR-E-11-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.978 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	11,169 cuft
Drainage area	=	1.930 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.90 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

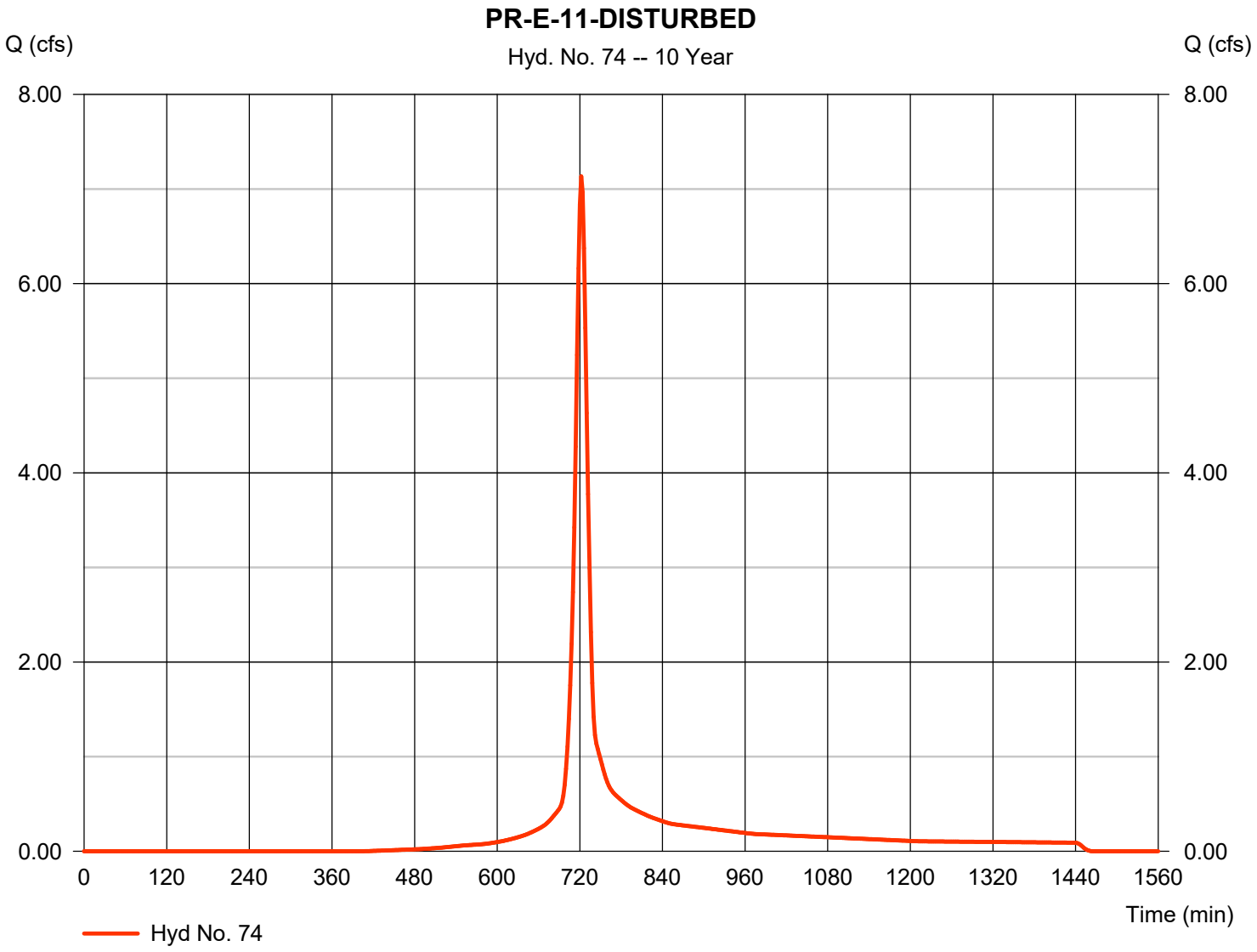


Hydrograph Report

Hyd. No. 74

PR-E-11-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.134 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	20,058 cuft
Drainage area	=	1.930 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.90 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

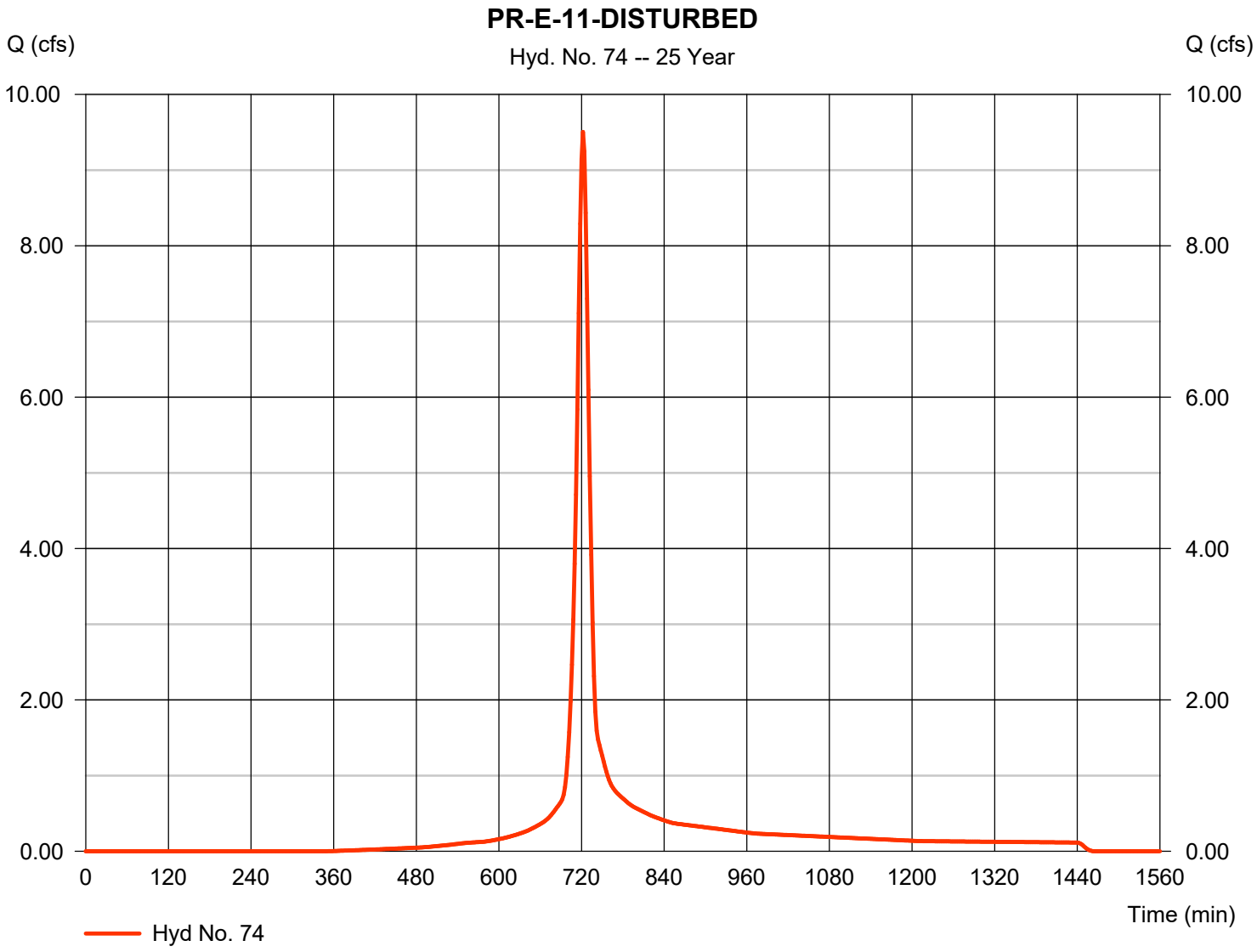


Hydrograph Report

Hyd. No. 74

PR-E-11-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.505 cfs
Storm frequency	=	25 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	26,921 cuft
Drainage area	=	1.930 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.90 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

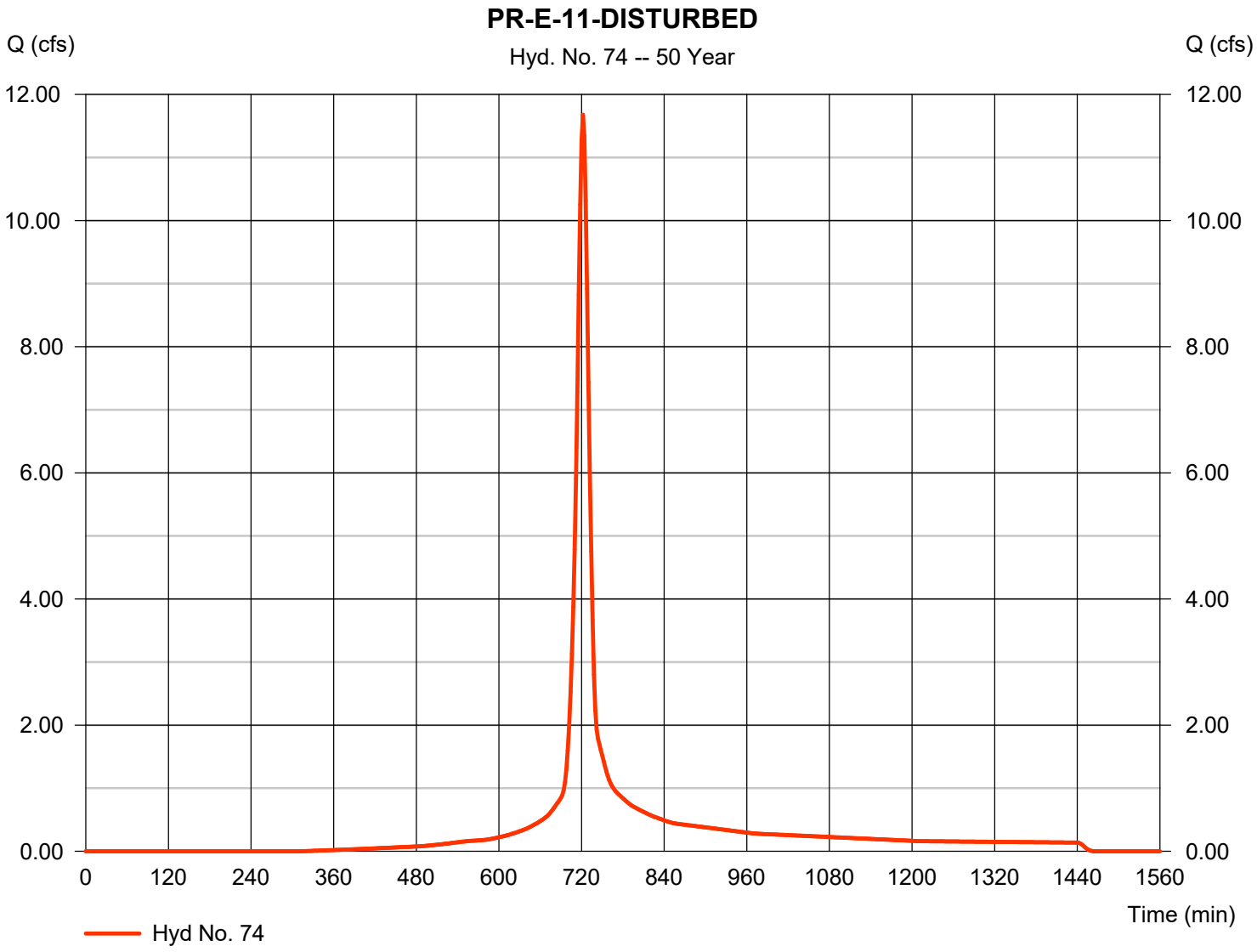


Hydrograph Report

Hyd. No. 74

PR-E-11-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.68 cfs
Storm frequency	=	50 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	33,325 cuft
Drainage area	=	1.930 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.90 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

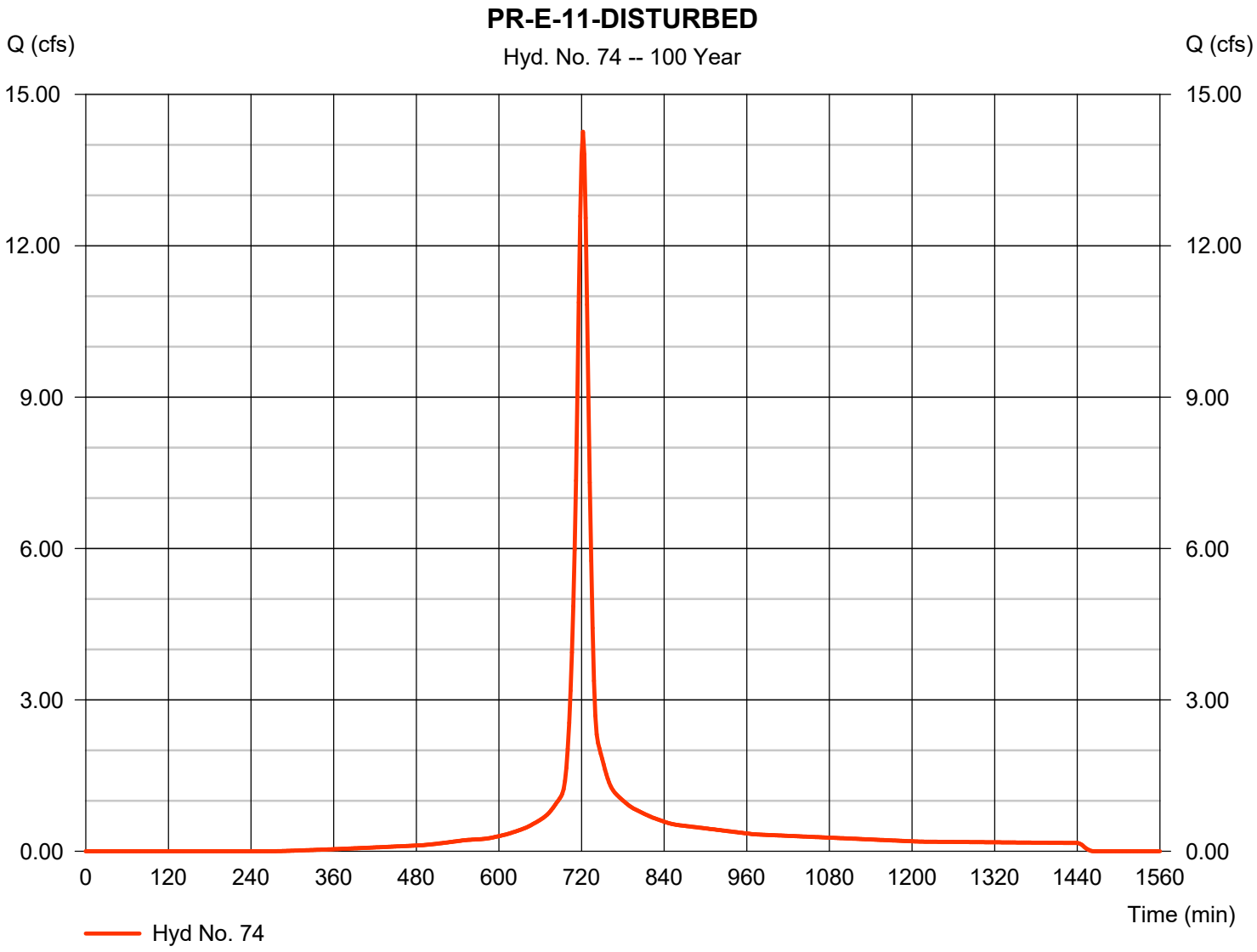


Hydrograph Report

Hyd. No. 74

PR-E-11-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	14.26 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	41,065 cuft
Drainage area	=	1.930 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.90 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



PR-E-11-UNDISTURBED WATERSHED

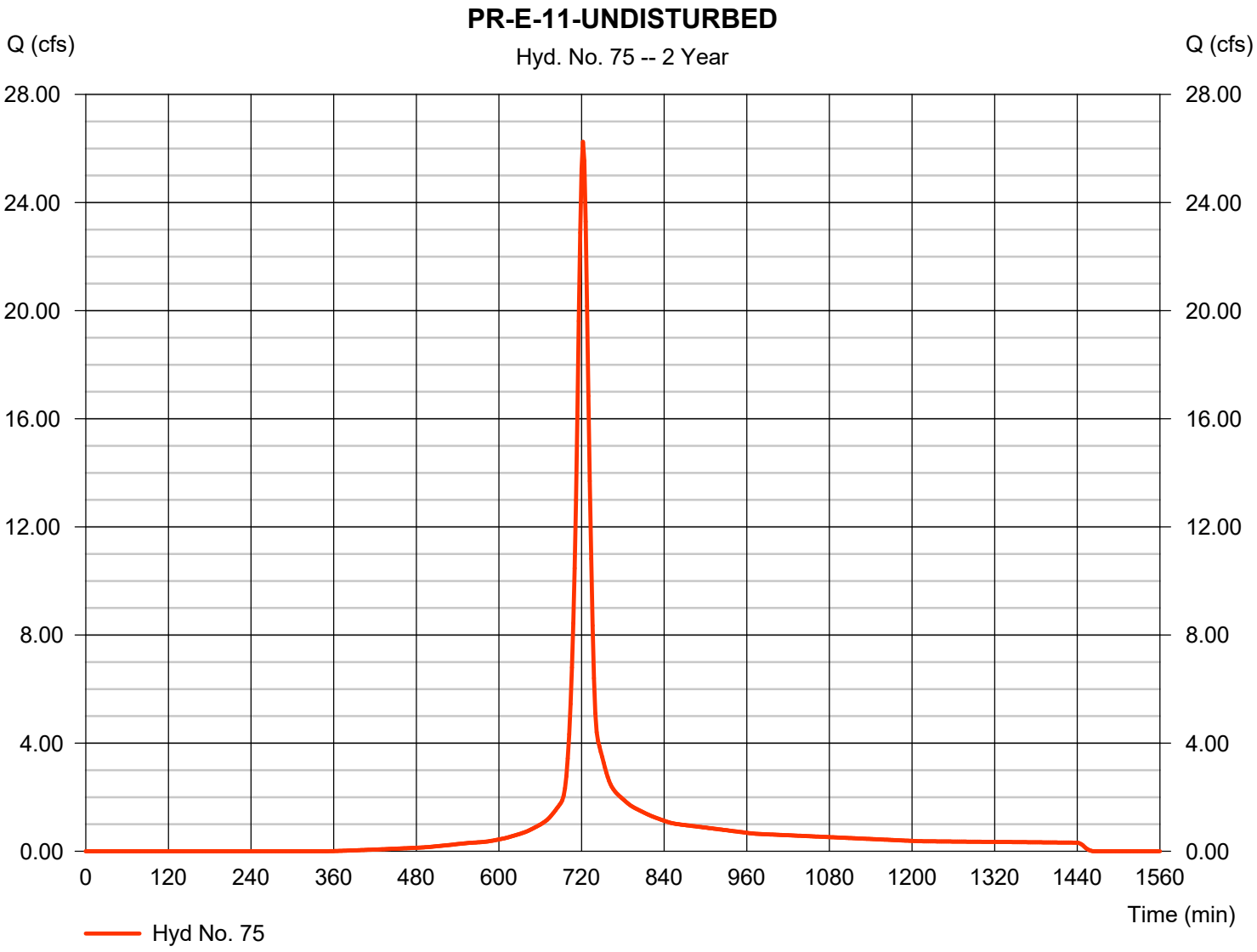
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 75

PR-E-11-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 26.24 cfs
Storm frequency	= 2 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 74,301 cuft
Drainage area	= 9.580 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.90 min
Total precip.	= 3.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

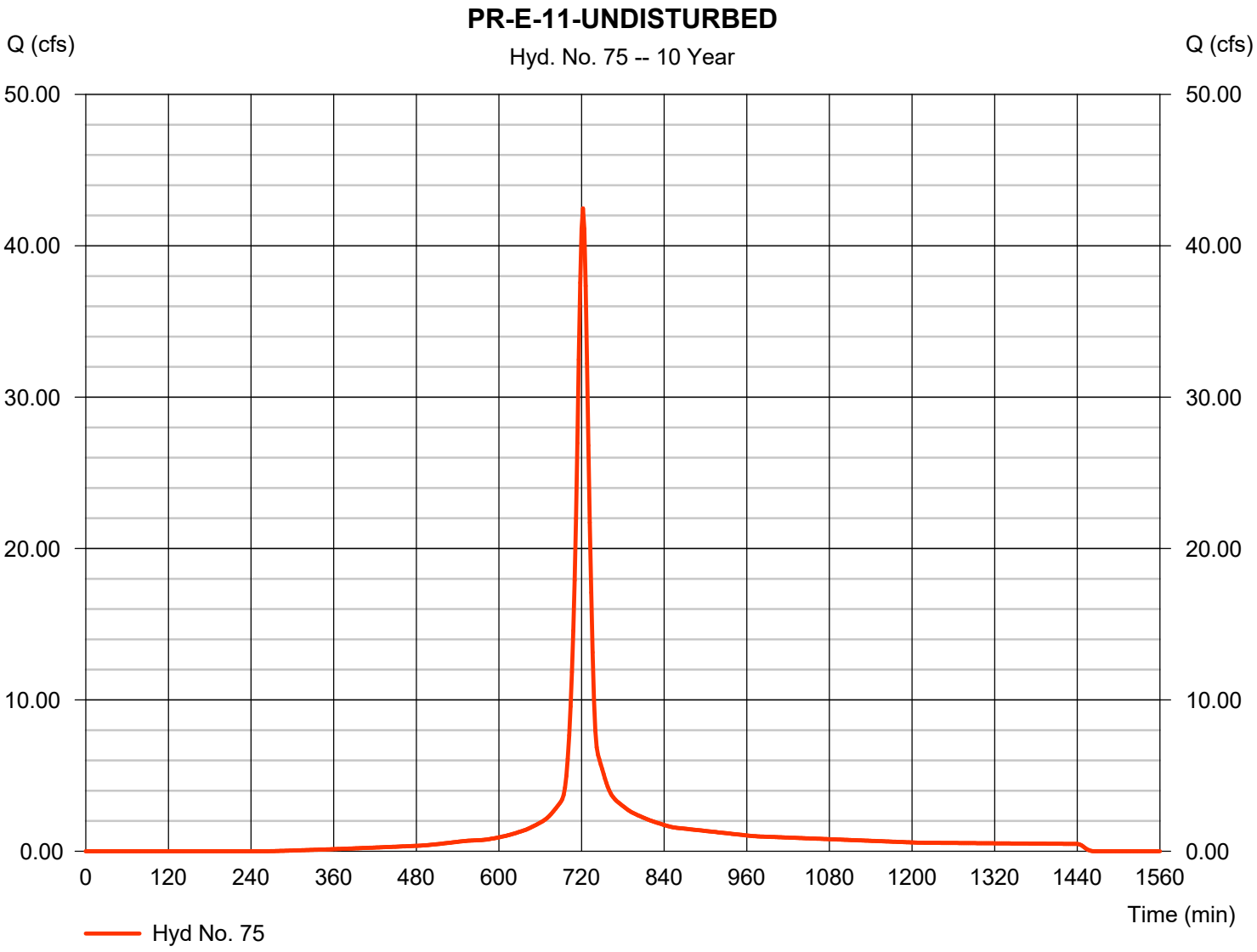


Hydrograph Report

Hyd. No. 75

PR-E-11-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	42.47 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	122,704 cuft
Drainage area	=	9.580 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.90 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

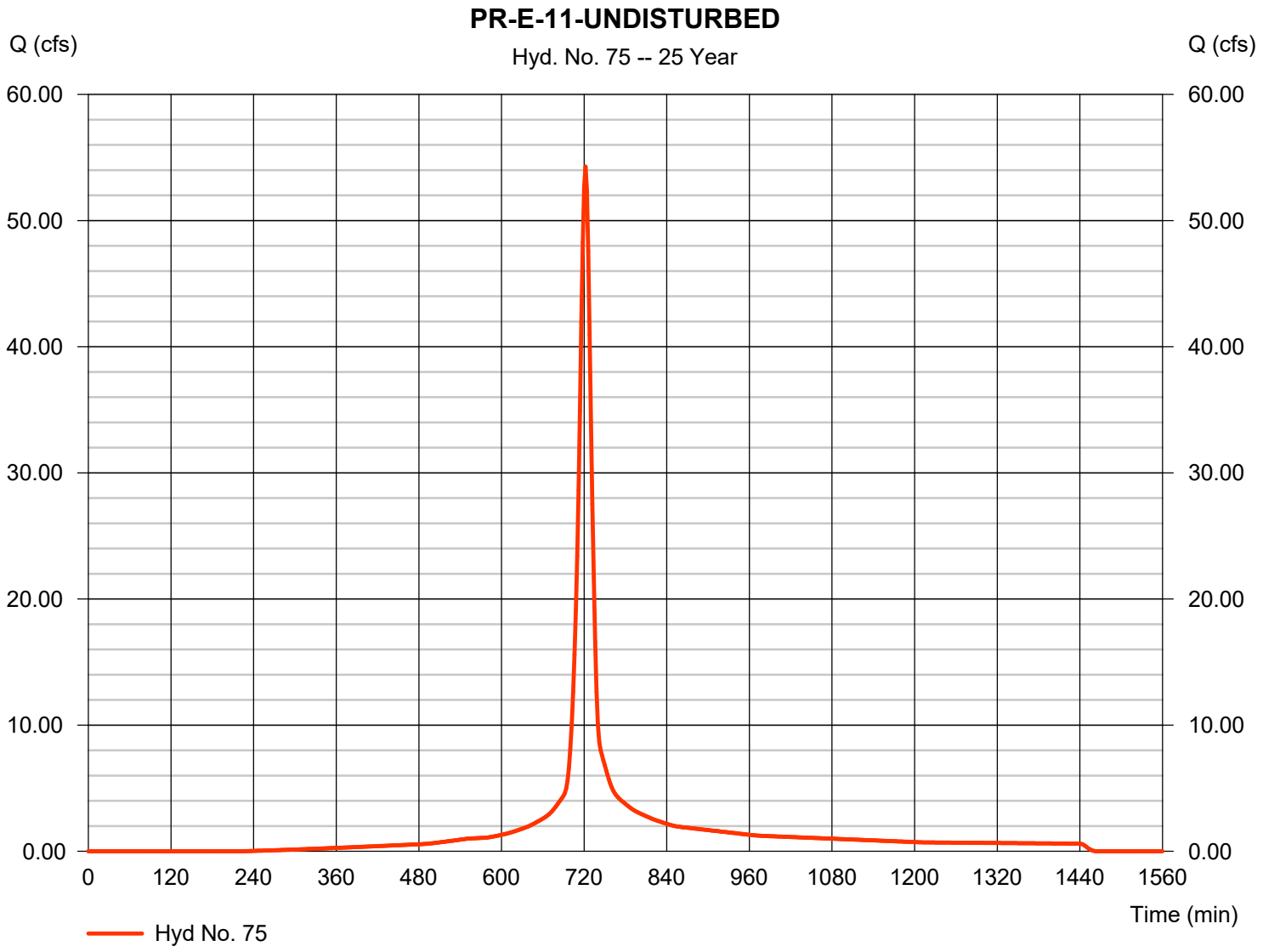


Hydrograph Report

Hyd. No. 75

PR-E-11-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	54.28 cfs
Storm frequency	=	25 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	158,918 cuft
Drainage area	=	9.580 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.90 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

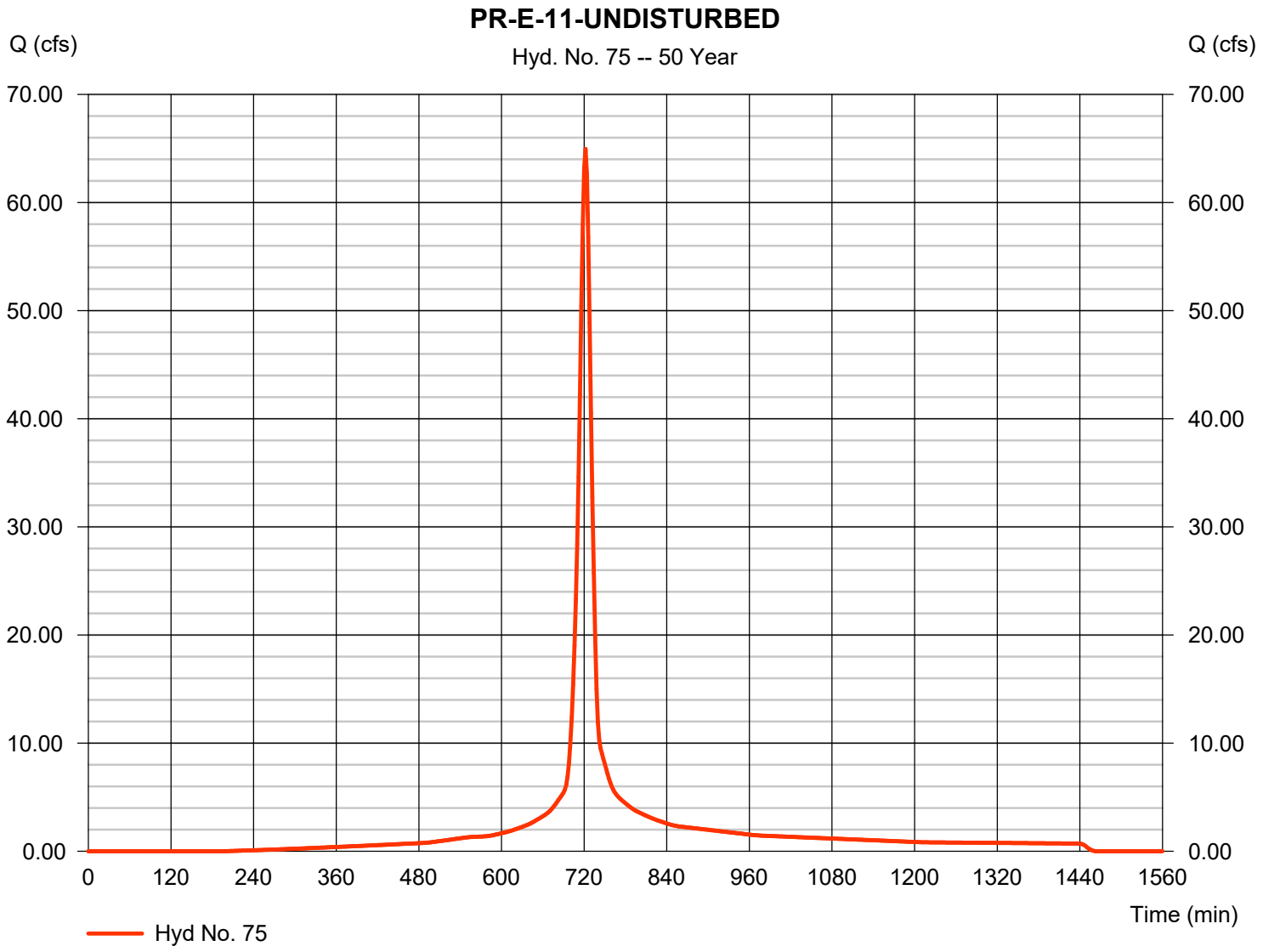


Hydrograph Report

Hyd. No. 75

PR-E-11-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	64.96 cfs
Storm frequency	=	50 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	192,214 cuft
Drainage area	=	9.580 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.90 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

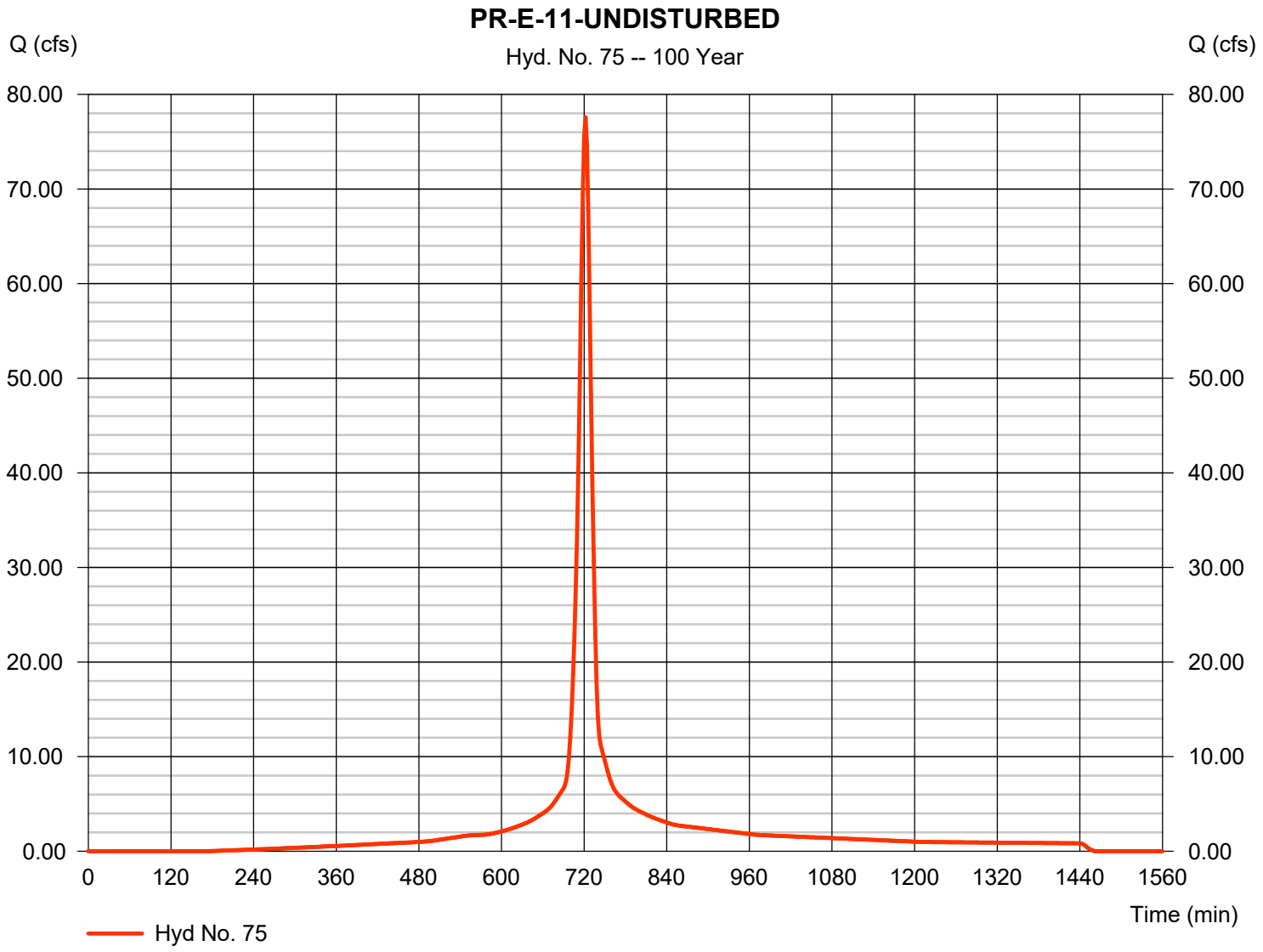


Hydrograph Report

Hyd. No. 75

PR-E-11-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	77.58 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	232,047 cuft
Drainage area	=	9.580 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.90 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



PR-E-12-DISTURBED WATERSHED

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No. 77

PR-E-12-DISTURBED

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.400		0.011		0.011		
Flow length (ft)	= 150.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.32		0.00		0.00		
Land slope (%)	= 10.67		0.00		0.00		
Travel Time (min)	**= 14.93**	**+**	**0.00**	**+**	**0.00**	**=**	**14.93**
Shallow Concentrated Flow							
Flow length (ft)	= 1290.00		0.00		0.00		
Watercourse slope (%)	= 12.97		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=5.81		0.00		0.00		
Travel Time (min)	**= 3.70**	**+**	**0.00**	**+**	**0.00**	**=**	**3.70**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 18.60 min

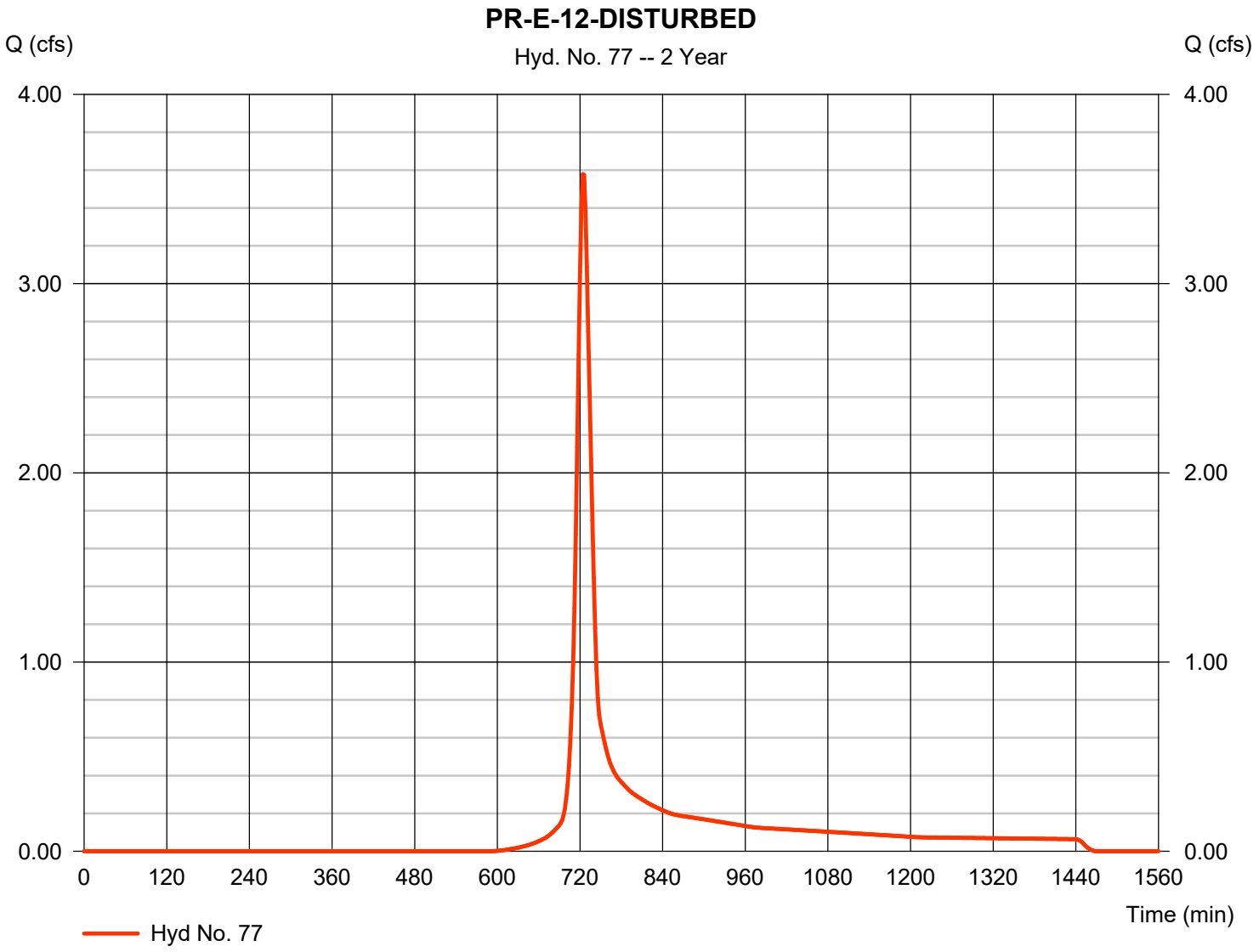
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 77

PR-E-12-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.578 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	11,421 cuft
Drainage area	=	2.310 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	18.60 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

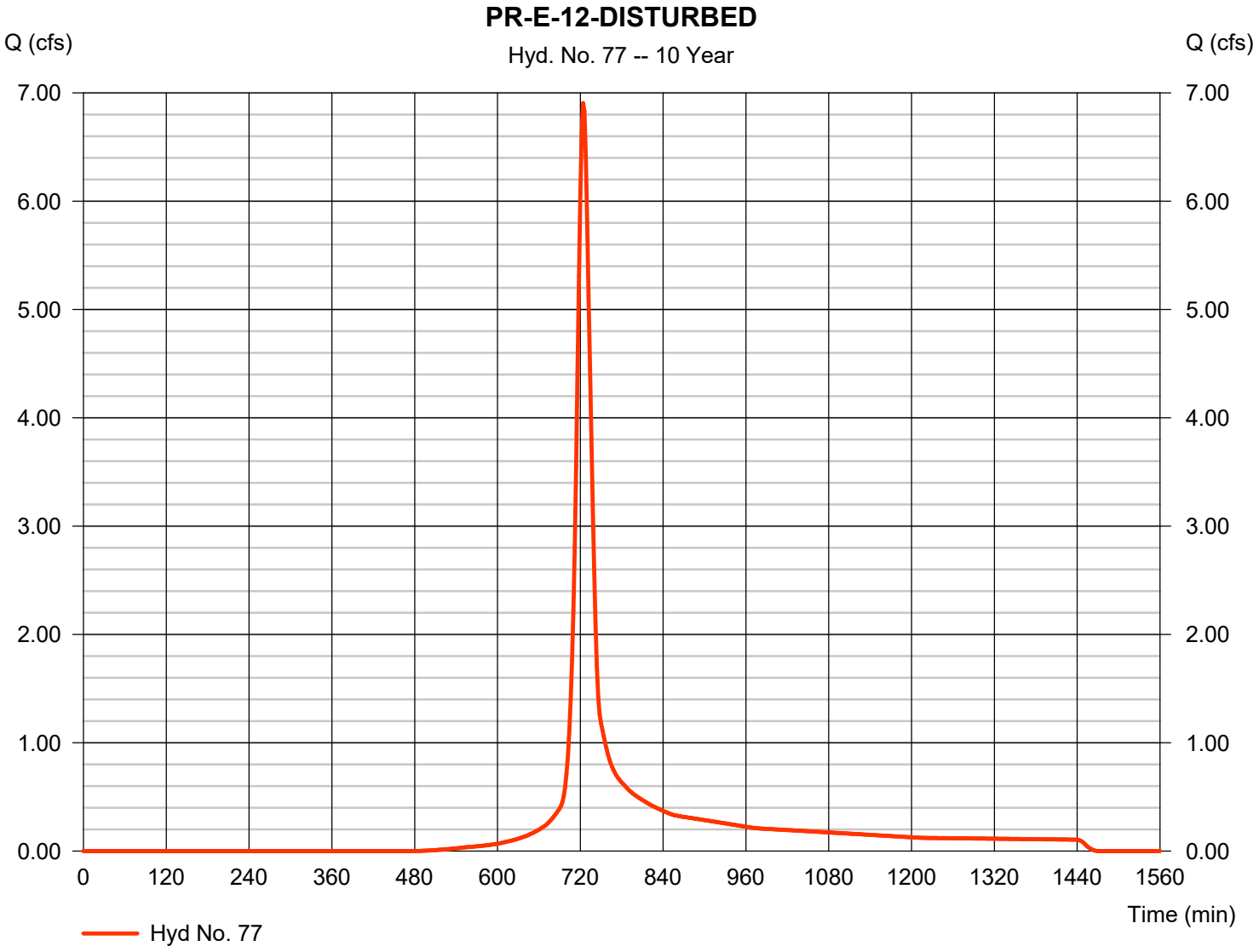


Hydrograph Report

Hyd. No. 77

PR-E-12-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.905 cfs
Storm frequency	=	10 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	21,604 cuft
Drainage area	=	2.310 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	18.60 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

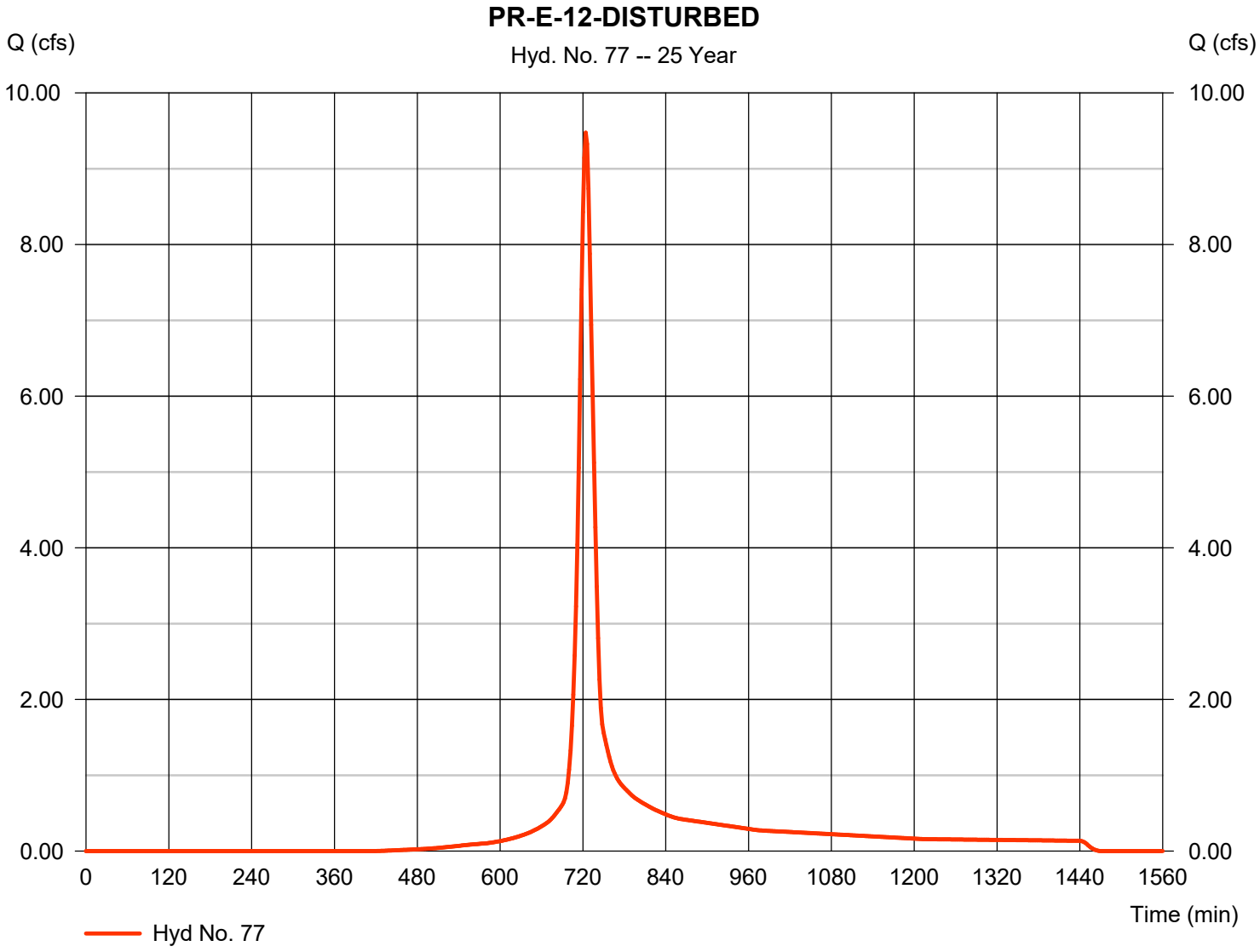


Hydrograph Report

Hyd. No. 77

PR-E-12-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.475 cfs
Storm frequency	=	25 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	29,640 cuft
Drainage area	=	2.310 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	18.60 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

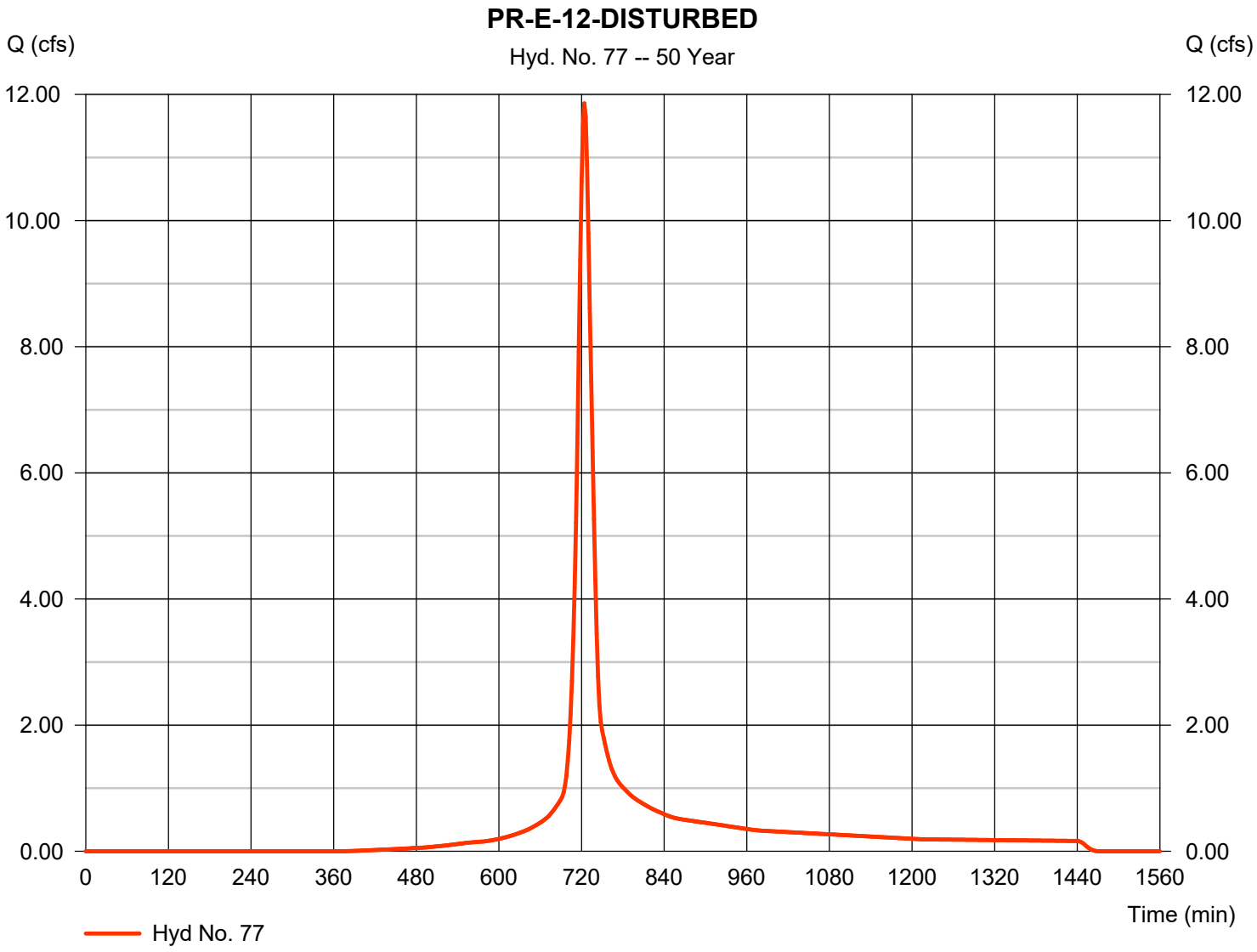


Hydrograph Report

Hyd. No. 77

PR-E-12-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.86 cfs
Storm frequency	=	50 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	37,219 cuft
Drainage area	=	2.310 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	18.60 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

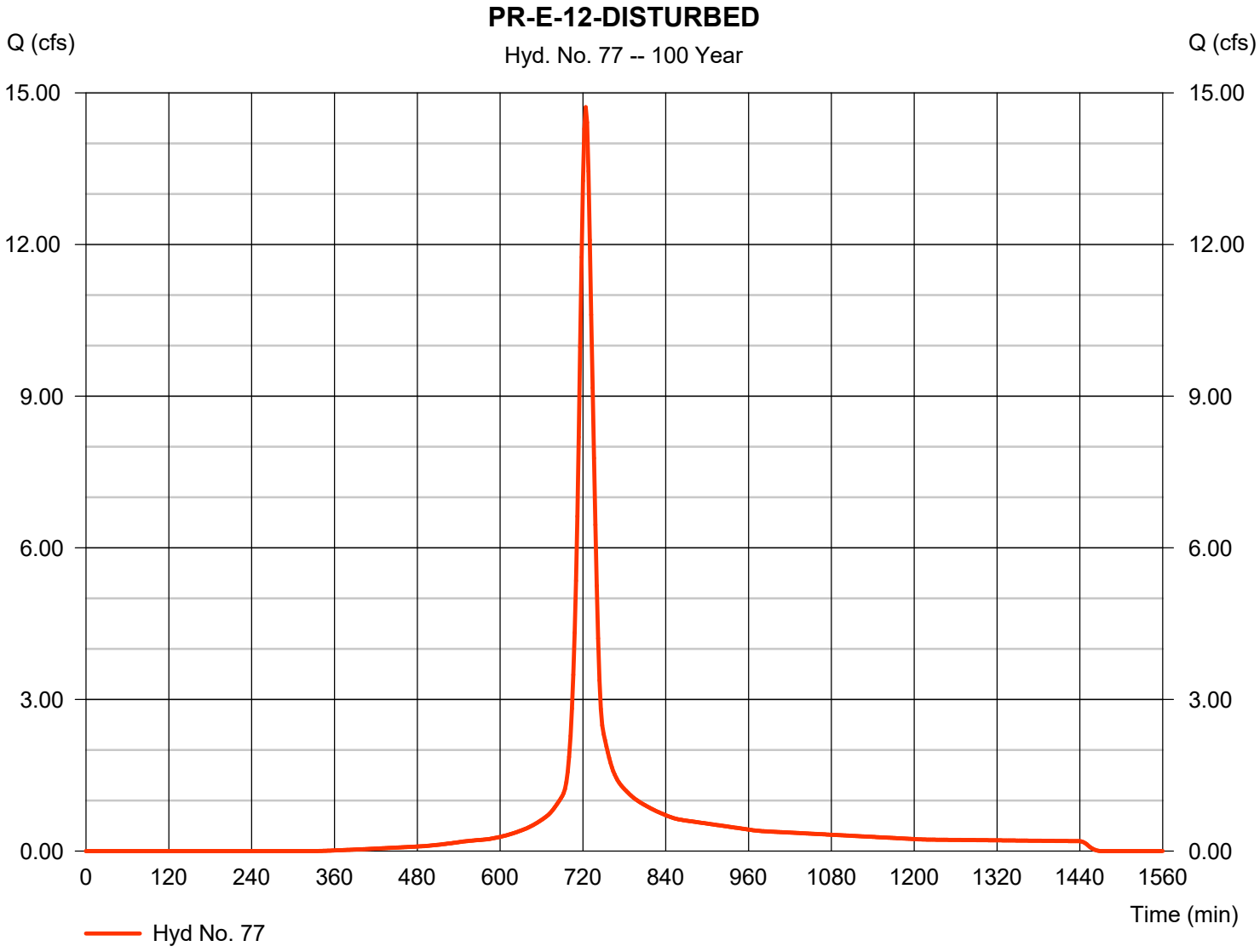


Hydrograph Report

Hyd. No. 77

PR-E-12-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	14.72 cfs
Storm frequency	=	100 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	46,447 cuft
Drainage area	=	2.310 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	18.60 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



PR-E-12-UNDISTURBED WATERSHED

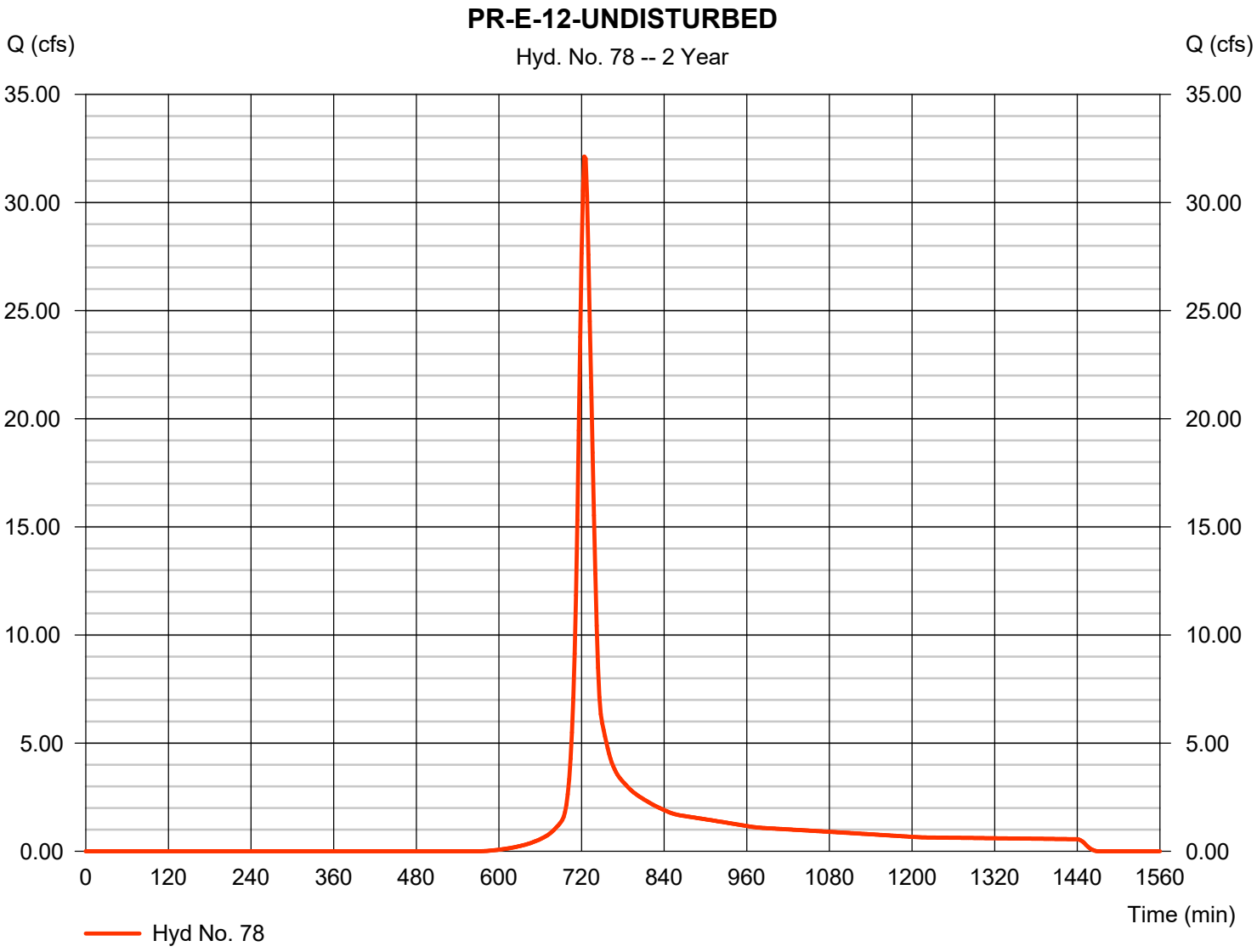
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 78

PR-E-12-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	32.12 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	101,977 cuft
Drainage area	=	19.680 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	18.60 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

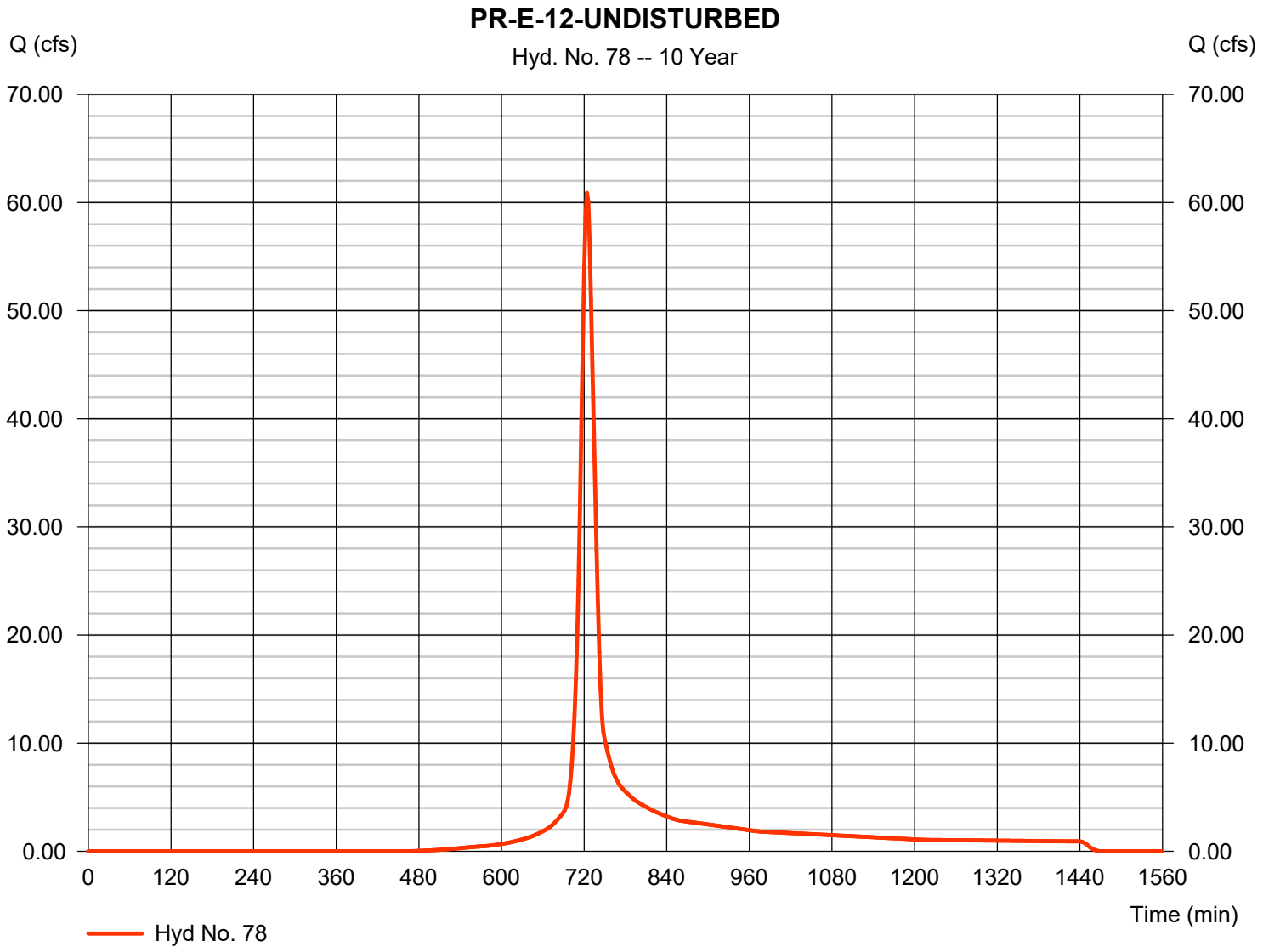


Hydrograph Report

Hyd. No. 78

PR-E-12-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 60.88 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 190,342 cuft
Drainage area	= 19.680 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 18.60 min
Total precip.	= 4.84 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

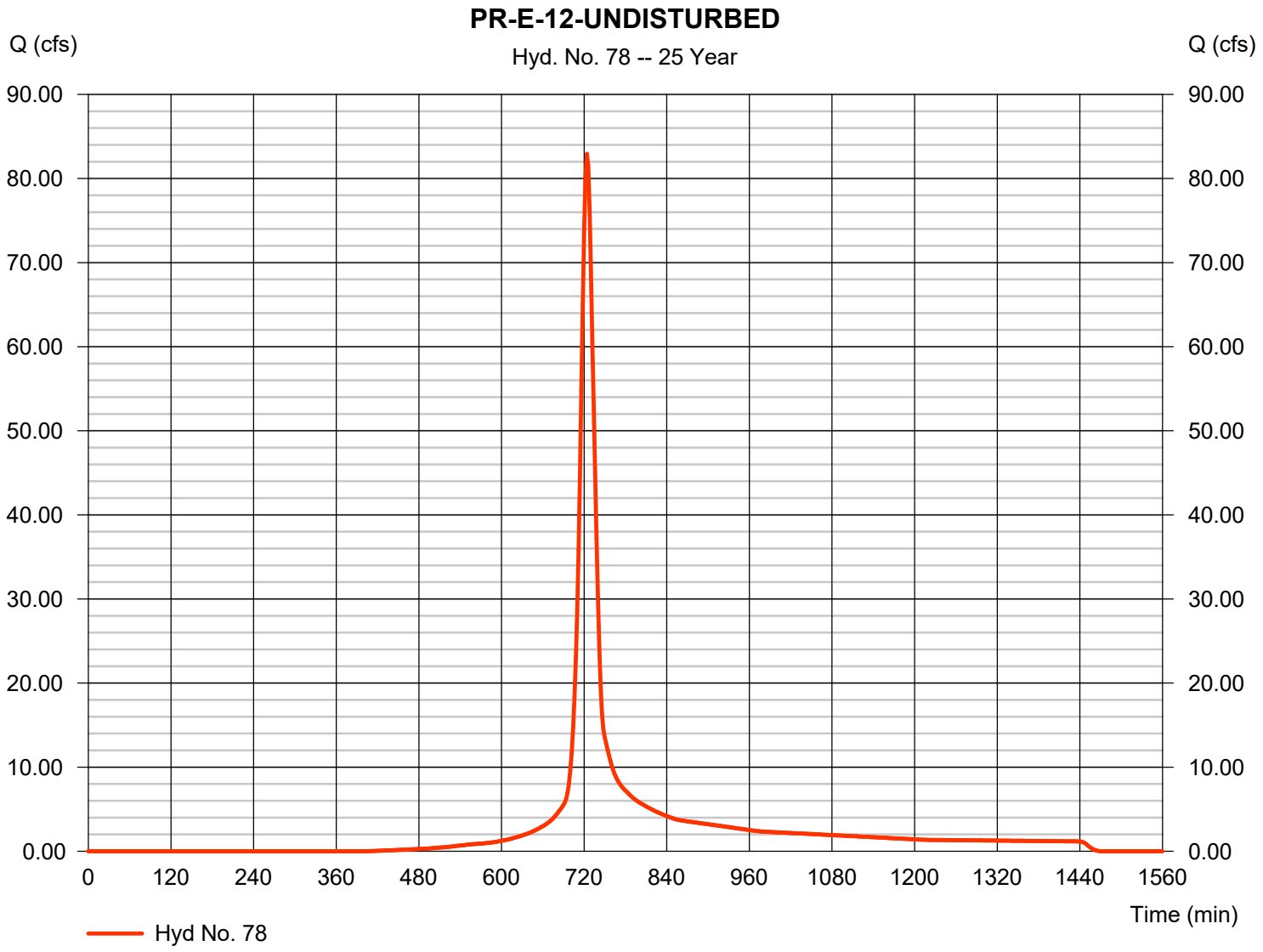


Hydrograph Report

Hyd. No. 78

PR-E-12-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	82.93 cfs
Storm frequency	=	25 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	259,680 cuft
Drainage area	=	19.680 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	18.60 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

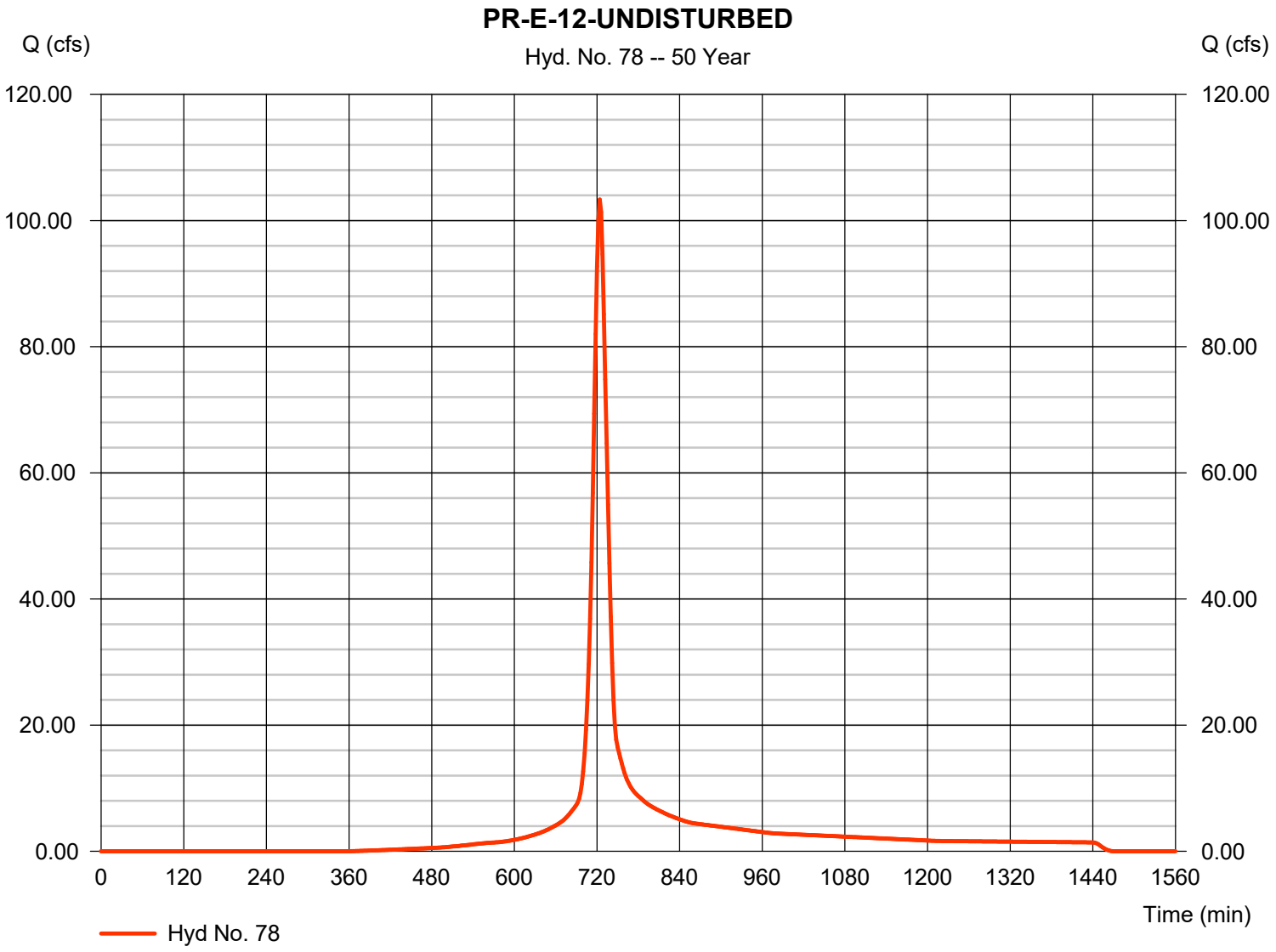


Hydrograph Report

Hyd. No. 78

PR-E-12-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	103.33 cfs
Storm frequency	=	50 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	324,886 cuft
Drainage area	=	19.680 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	18.60 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

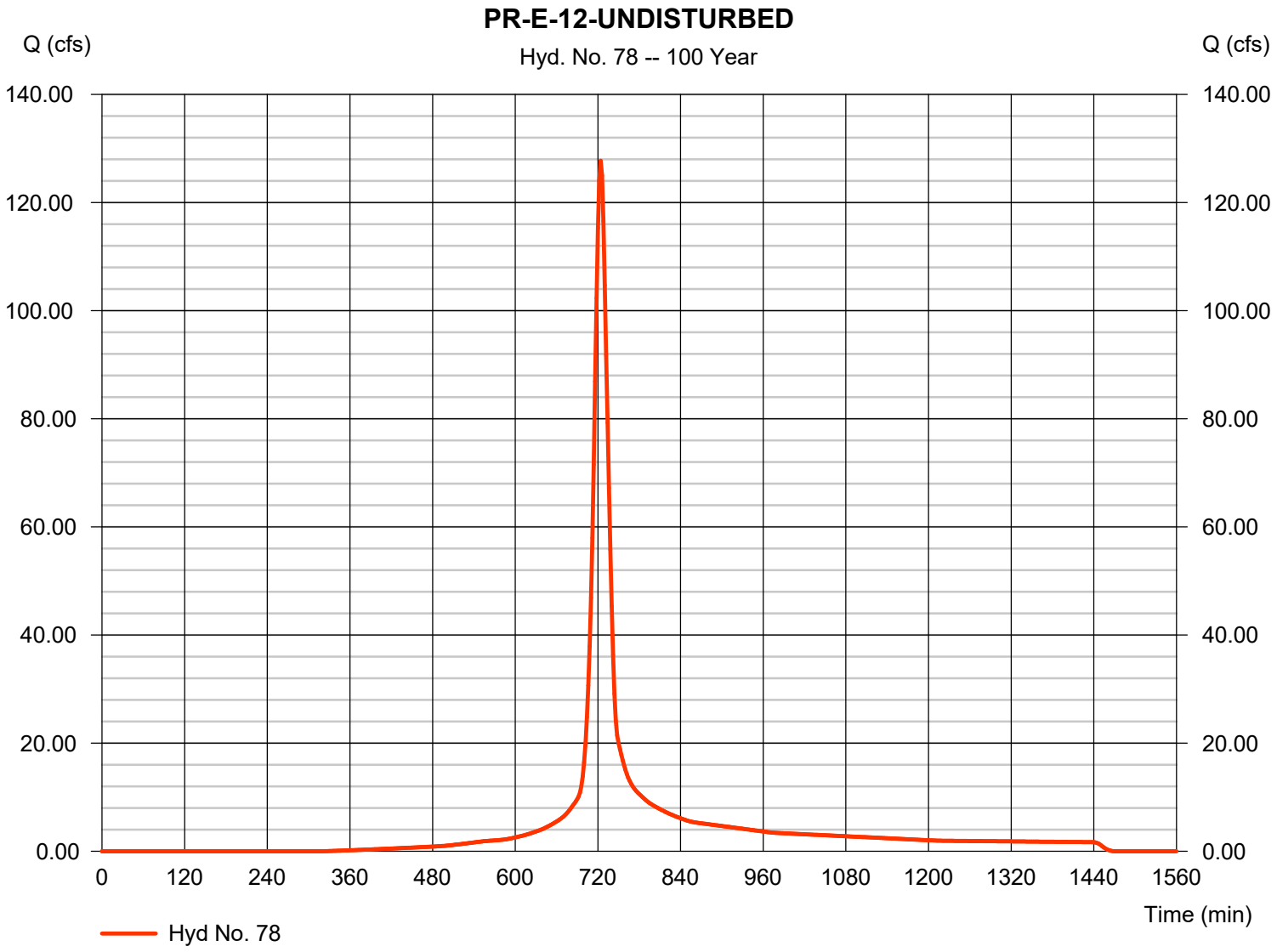


Hydrograph Report

Hyd. No. 78

PR-E-12-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	127.73 cfs
Storm frequency	=	100 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	404,131 cuft
Drainage area	=	19.680 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	18.60 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



TOTAL PROPOSED FLOW TO POA-E

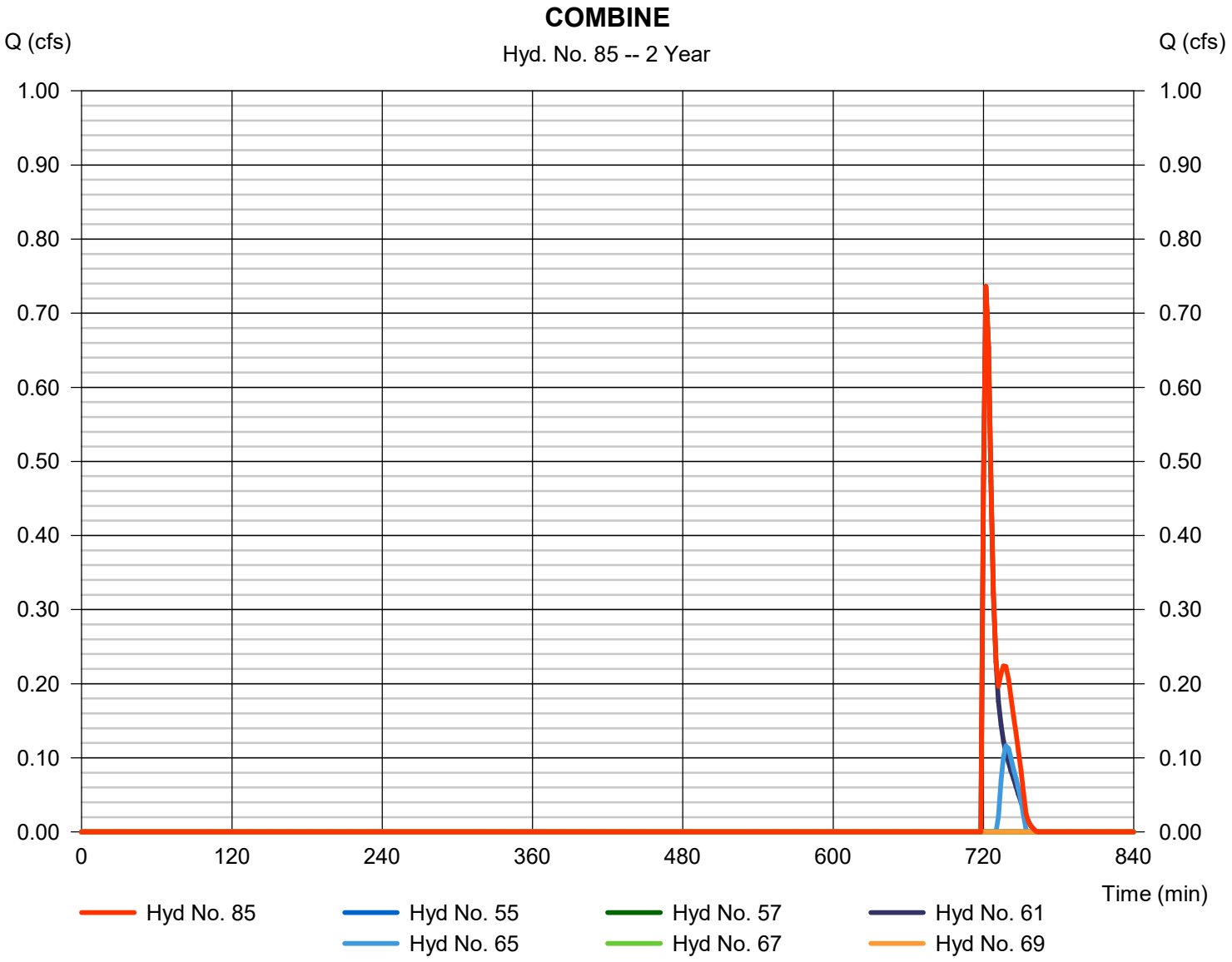
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 85

COMBINE

Hydrograph type	=	Combine	Peak discharge	=	0.736 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	567 cuft
Inflow hyds.	=	55, 57, 61, 65, 67, 69	Contrib. drain. area	=	0.000 ac

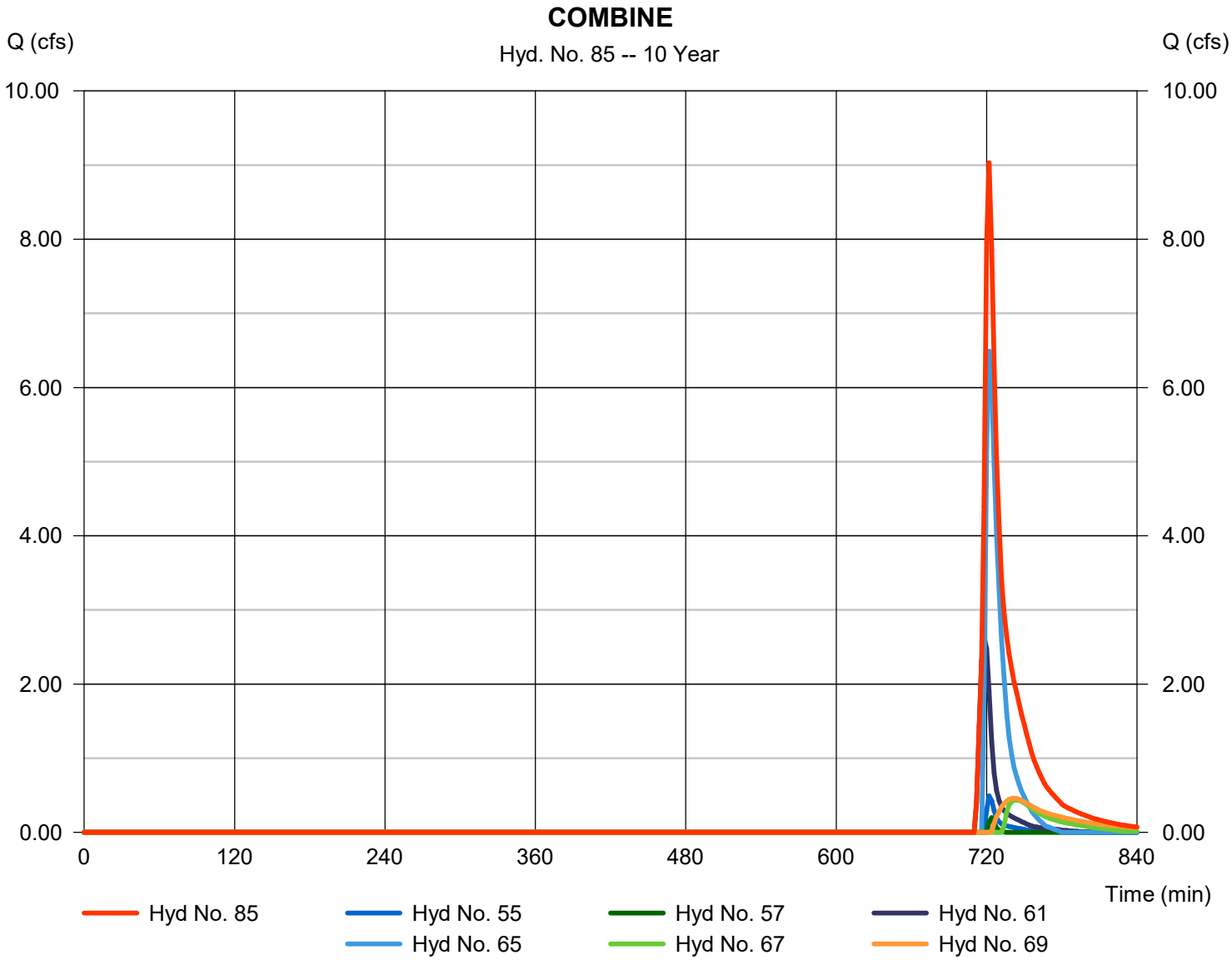


Hydrograph Report

Hyd. No. 85

COMBINE

Hydrograph type	=	Combine	Peak discharge	=	9.031 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	10,648 cuft
Inflow hyds.	=	55, 57, 61, 65, 67, 69	Contrib. drain. area	=	0.000 ac

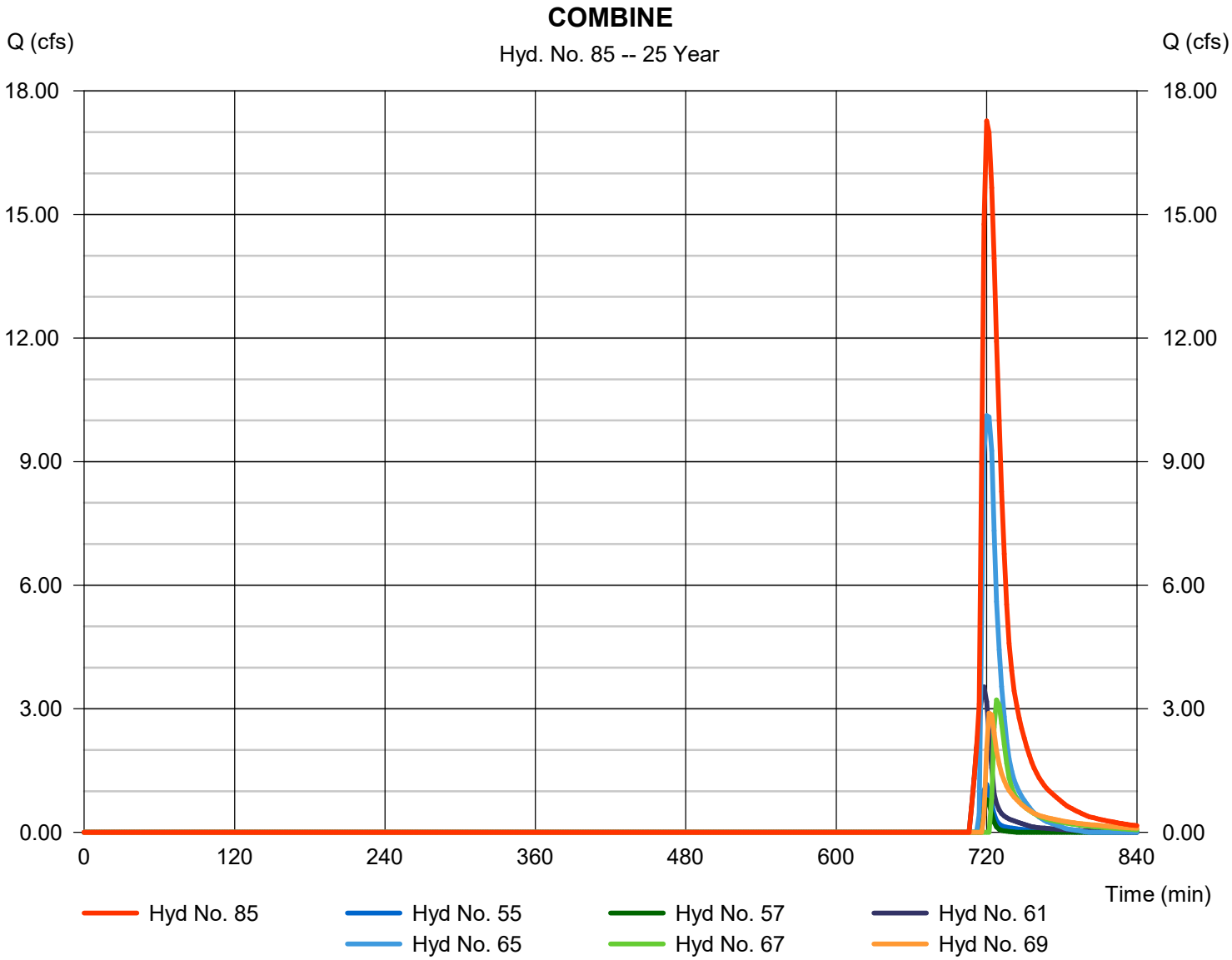


Hydrograph Report

Hyd. No. 85

COMBINE

Hydrograph type	=	Combine	Peak discharge	=	17.27 cfs
Storm frequency	=	25 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	23,080 cuft
Inflow hyds.	=	55, 57, 61, 65, 67, 69	Contrib. drain. area	=	0.000 ac

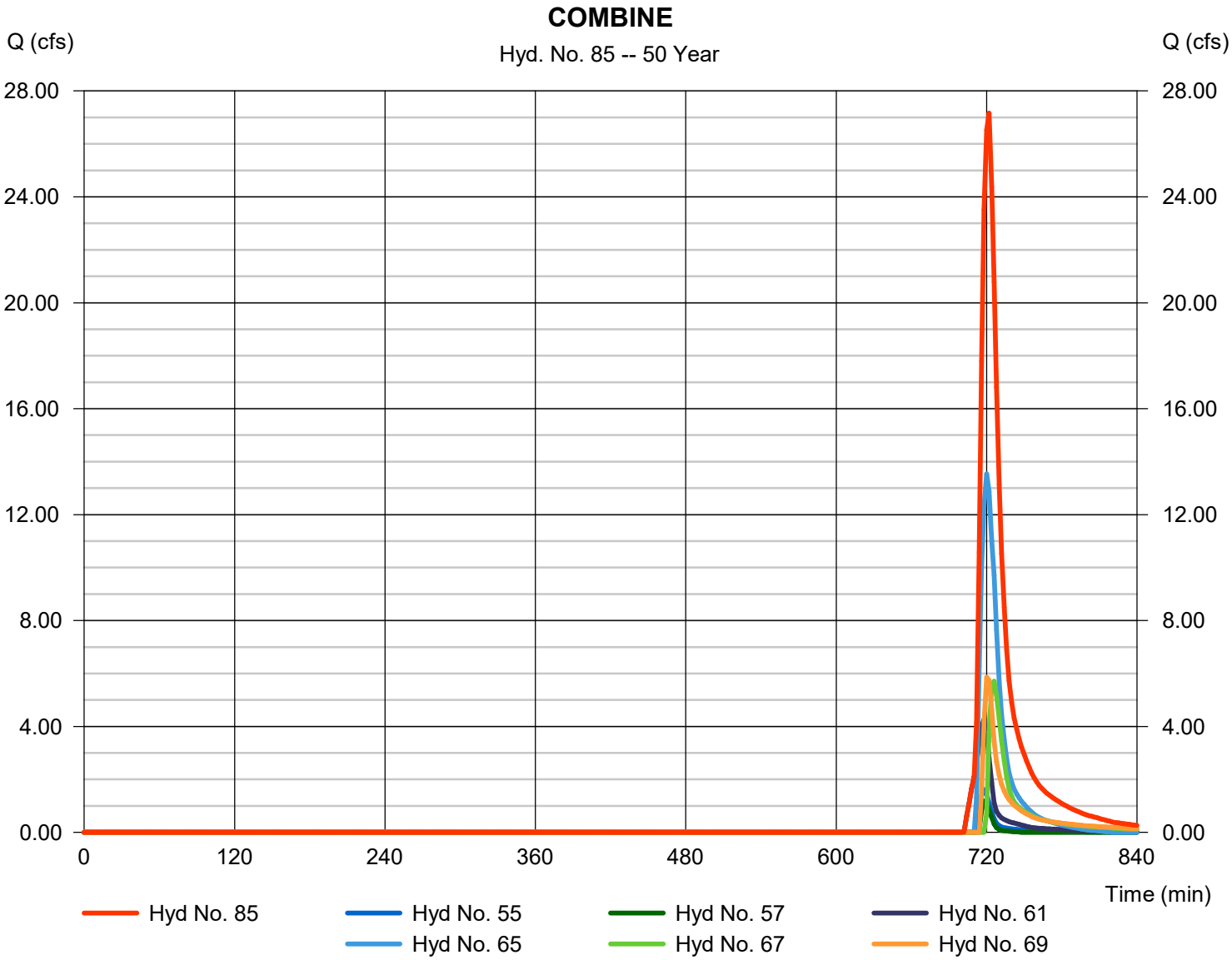


Hydrograph Report

Hyd. No. 85

COMBINE

Hydrograph type	=	Combine	Peak discharge	=	27.16 cfs
Storm frequency	=	50 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	35,278 cuft
Inflow hyds.	=	55, 57, 61, 65, 67, 69	Contrib. drain. area	=	0.000 ac

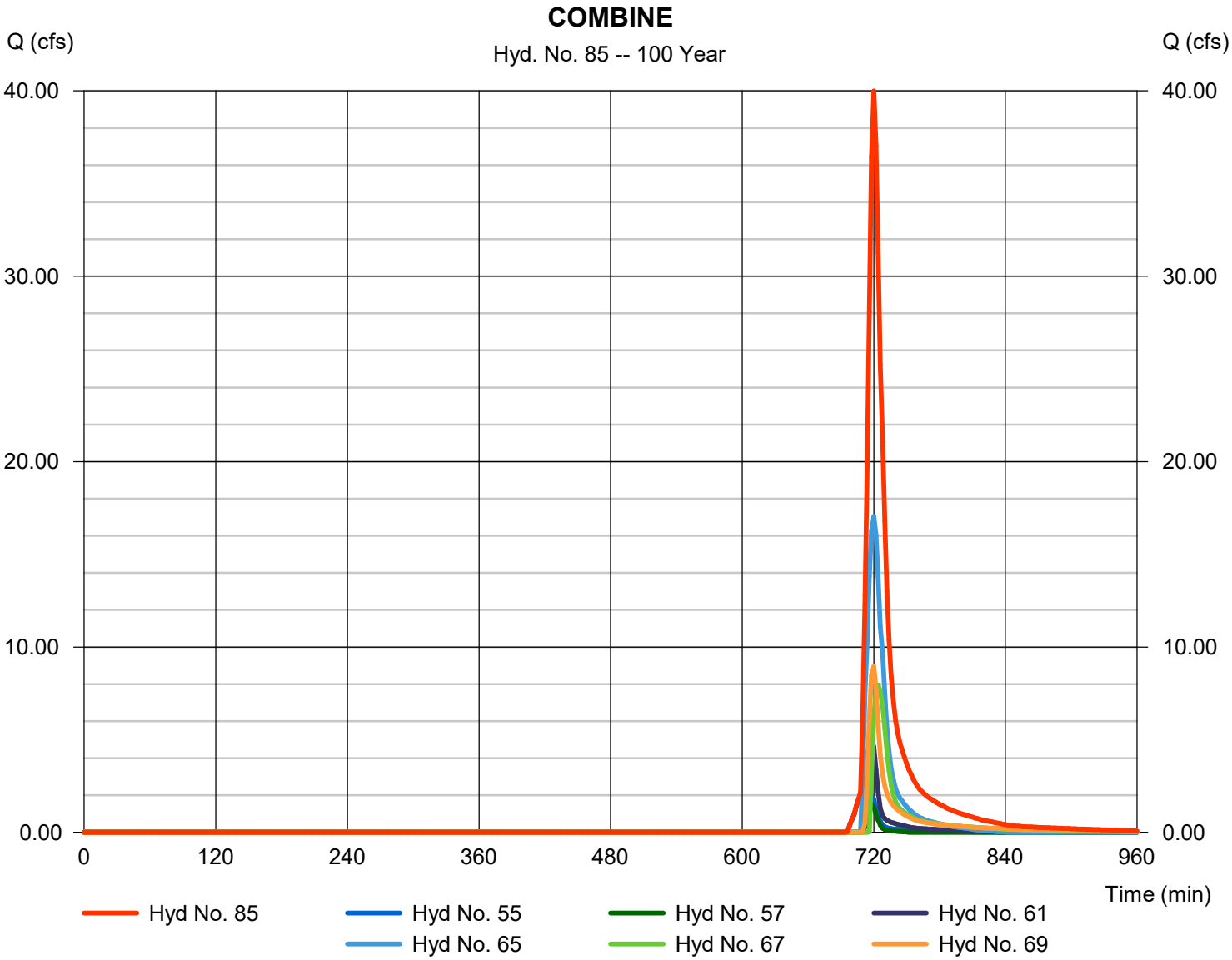


Hydrograph Report

Hyd. No. 85

COMBINE

Hydrograph type	=	Combine	Peak discharge	=	39.99 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	50,640 cuft
Inflow hyds.	=	55, 57, 61, 65, 67, 69	Contrib. drain. area	=	0.000 ac



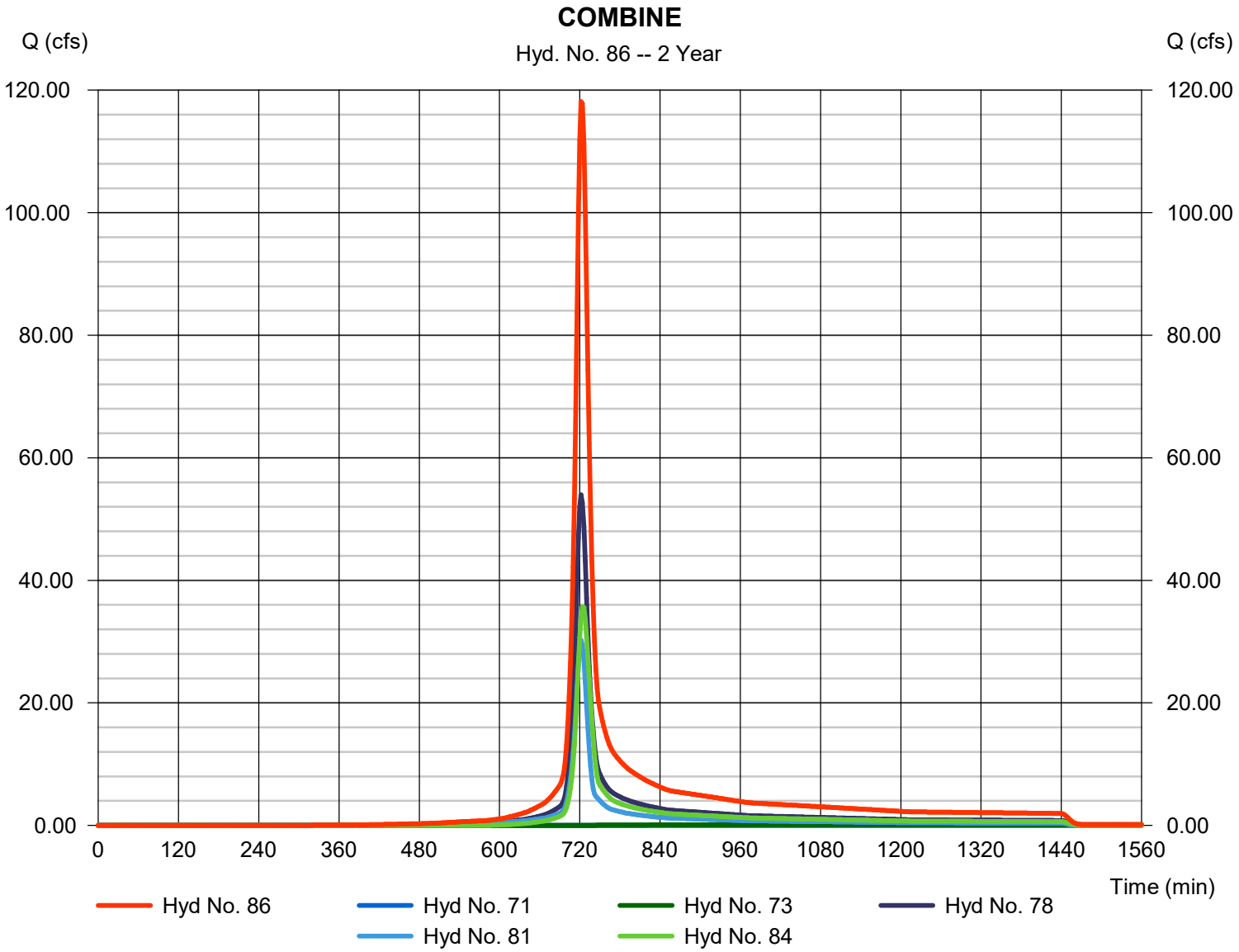
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 86

COMBINE

Hydrograph type	=	Combine	Peak discharge	=	118.12 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	382,045 cuft
Inflow hyds.	=	71, 73, 78, 81, 84	Contrib. drain. area	=	0.000 ac

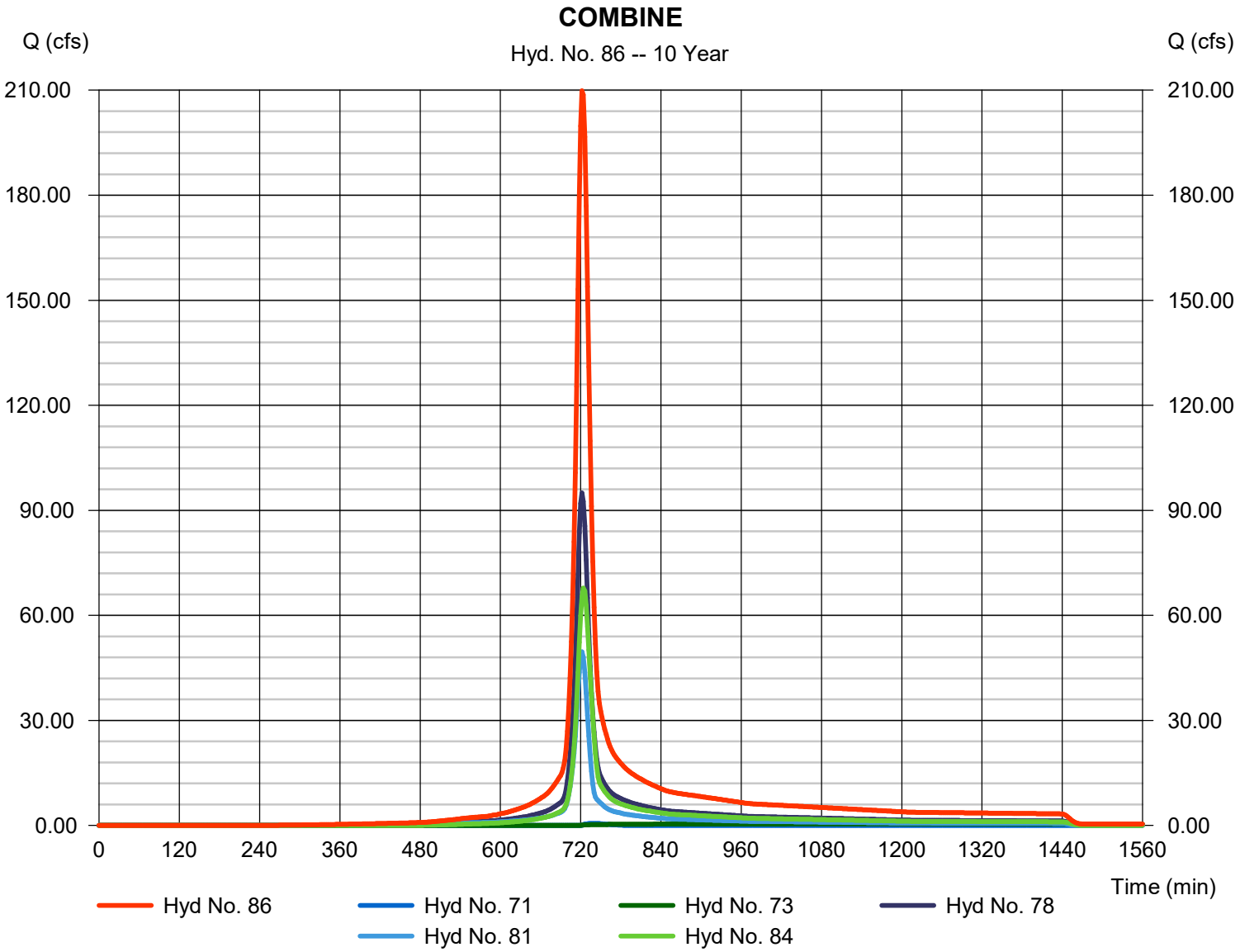


Hydrograph Report

Hyd. No. 86

COMBINE

Hydrograph type	= Combine	Peak discharge	= 209.82 cfs
Storm frequency	= 10 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 695,523 cuft
Inflow hyds.	= 71, 73, 78, 81, 84	Contrib. drain. area	= 0.000 ac

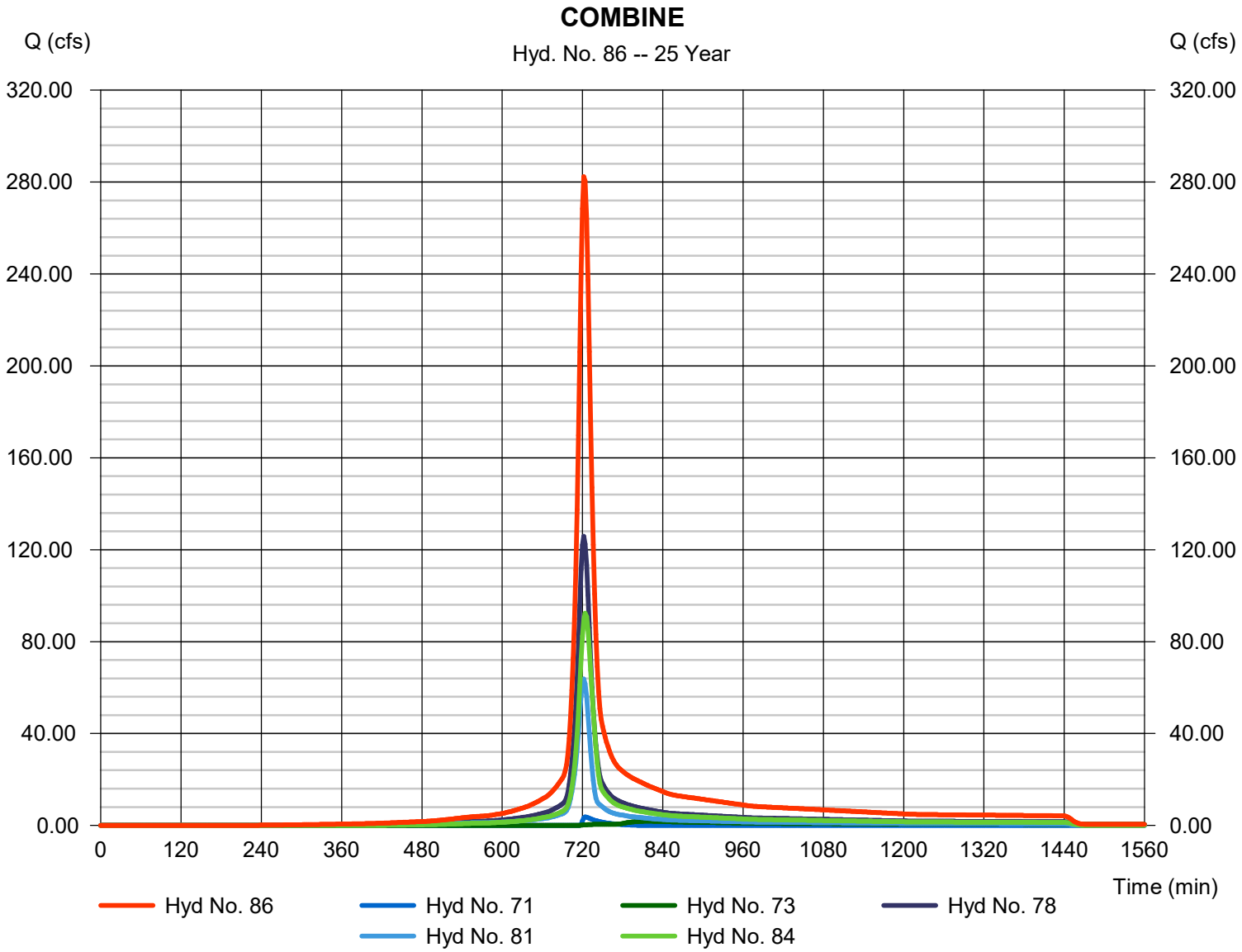


Hydrograph Report

Hyd. No. 86

COMBINE

Hydrograph type	=	Combine	Peak discharge	=	282.34 cfs
Storm frequency	=	25 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	943,168 cuft
Inflow hyds.	=	71, 73, 78, 81, 84	Contrib. drain. area	=	0.000 ac

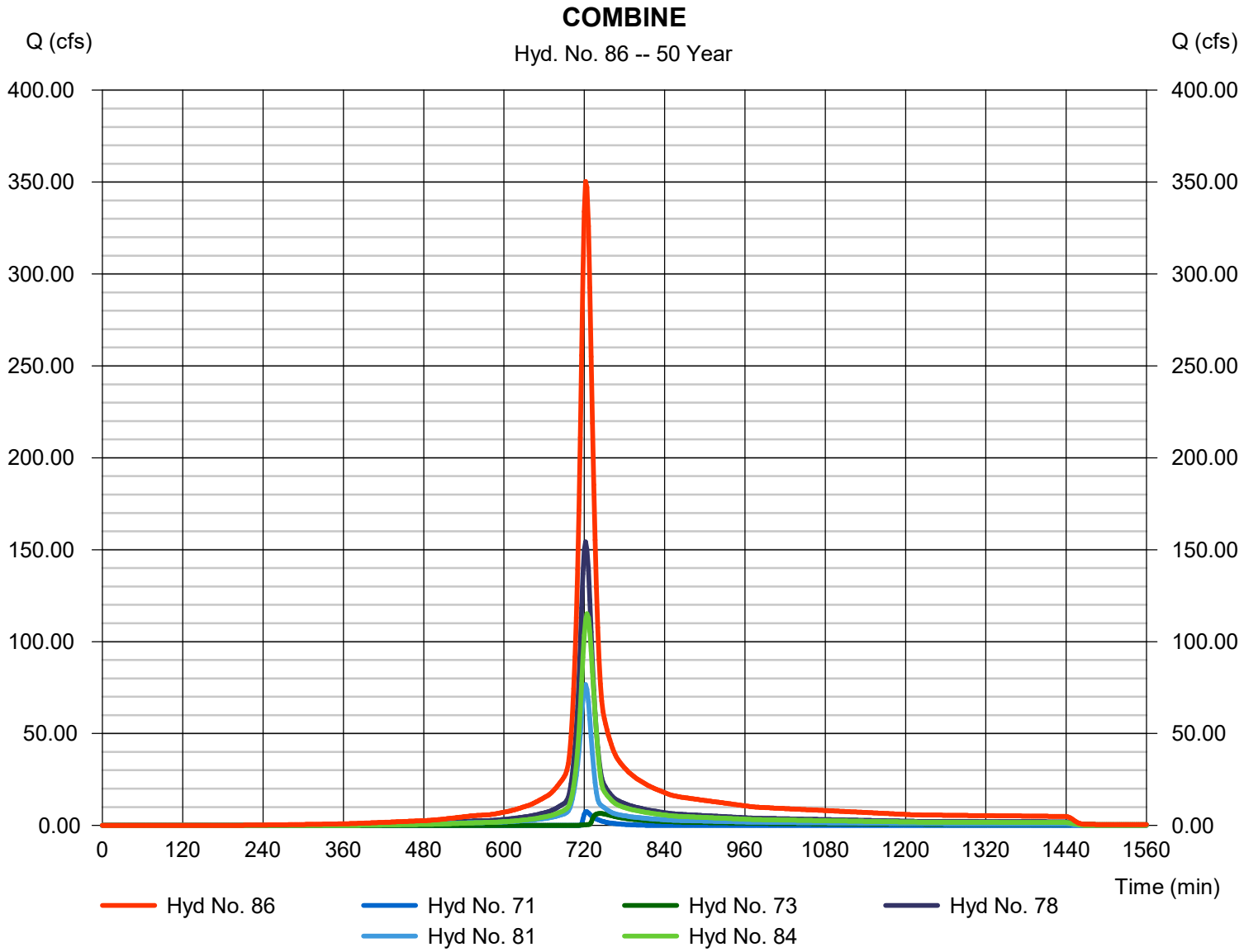


Hydrograph Report

Hyd. No. 86

COMBINE

Hydrograph type	=	Combine	Peak discharge	=	350.32 cfs
Storm frequency	=	50 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	1,175,317 cuft
Inflow hyds.	=	71, 73, 78, 81, 84	Contrib. drain. area	=	0.000 ac

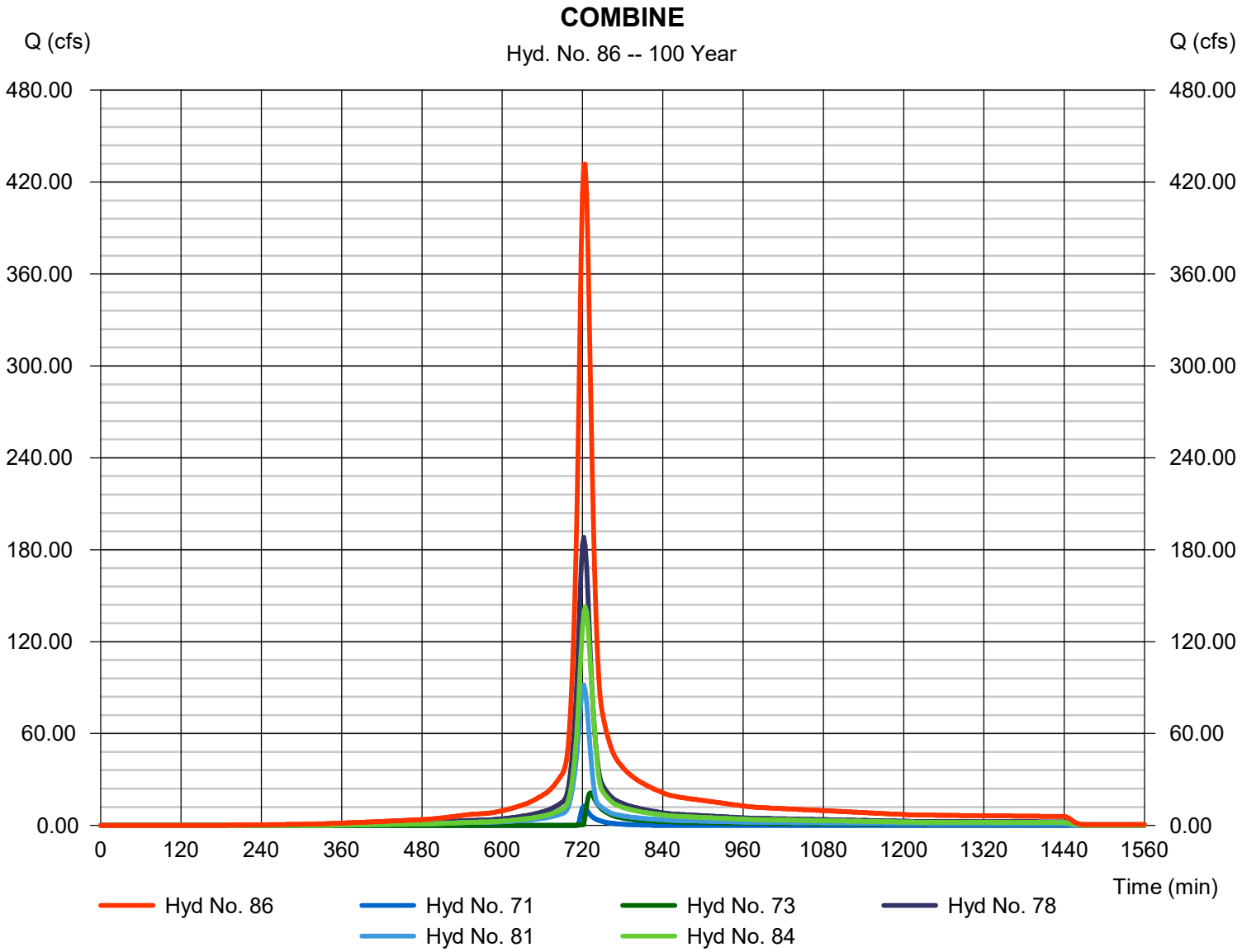


Hydrograph Report

Hyd. No. 86

COMBINE

Hydrograph type	=	Combine	Peak discharge	=	431.83 cfs
Storm frequency	=	100 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	1,456,480 cuft
Inflow hyds.	=	71, 73, 78, 81, 84	Contrib. drain. area	=	0.000 ac



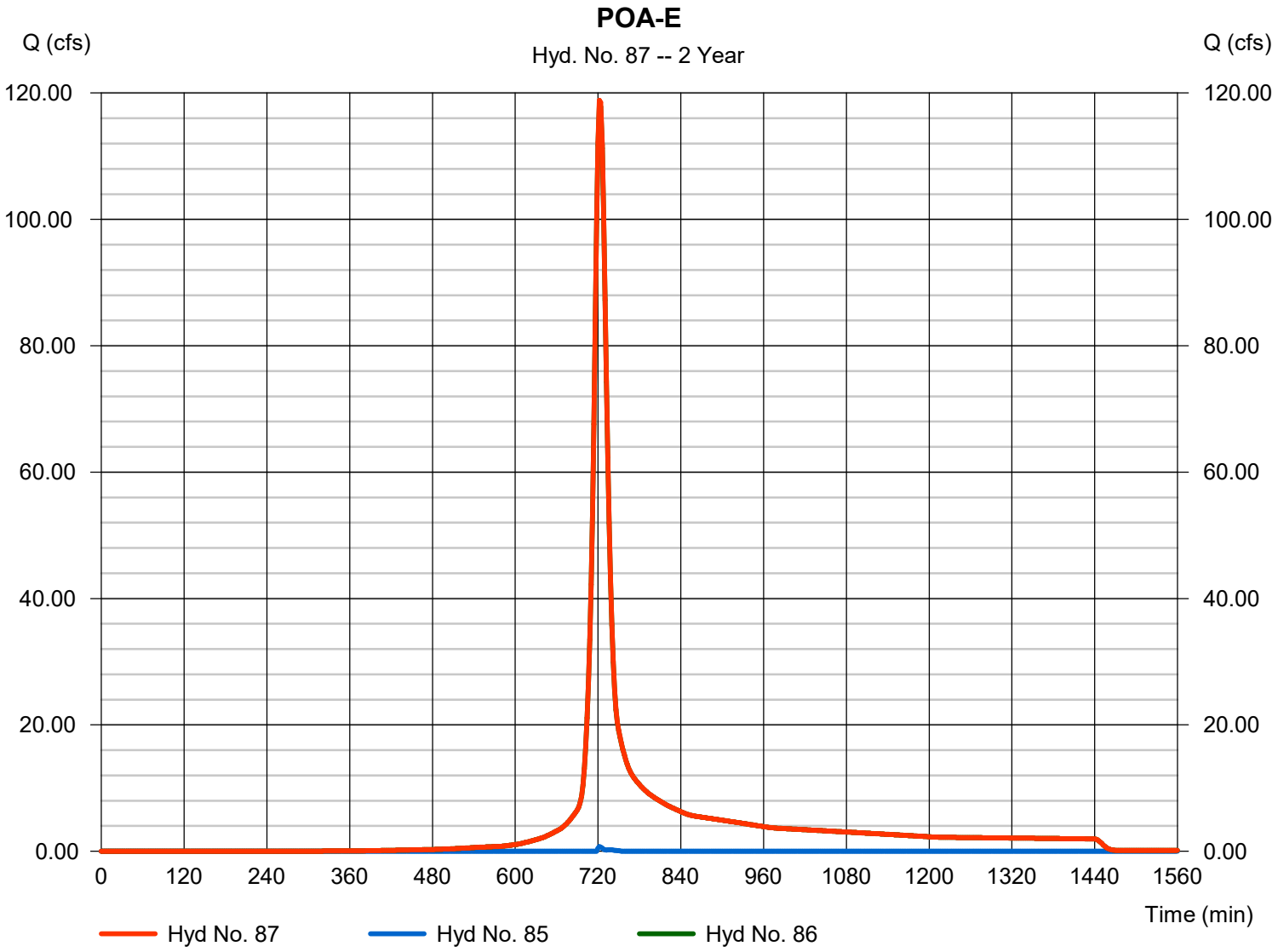
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 87

POA-E

Hydrograph type	=	Combine	Peak discharge	=	118.85 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	382,612 cuft
Inflow hyds.	=	85, 86	Contrib. drain. area	=	0.000 ac

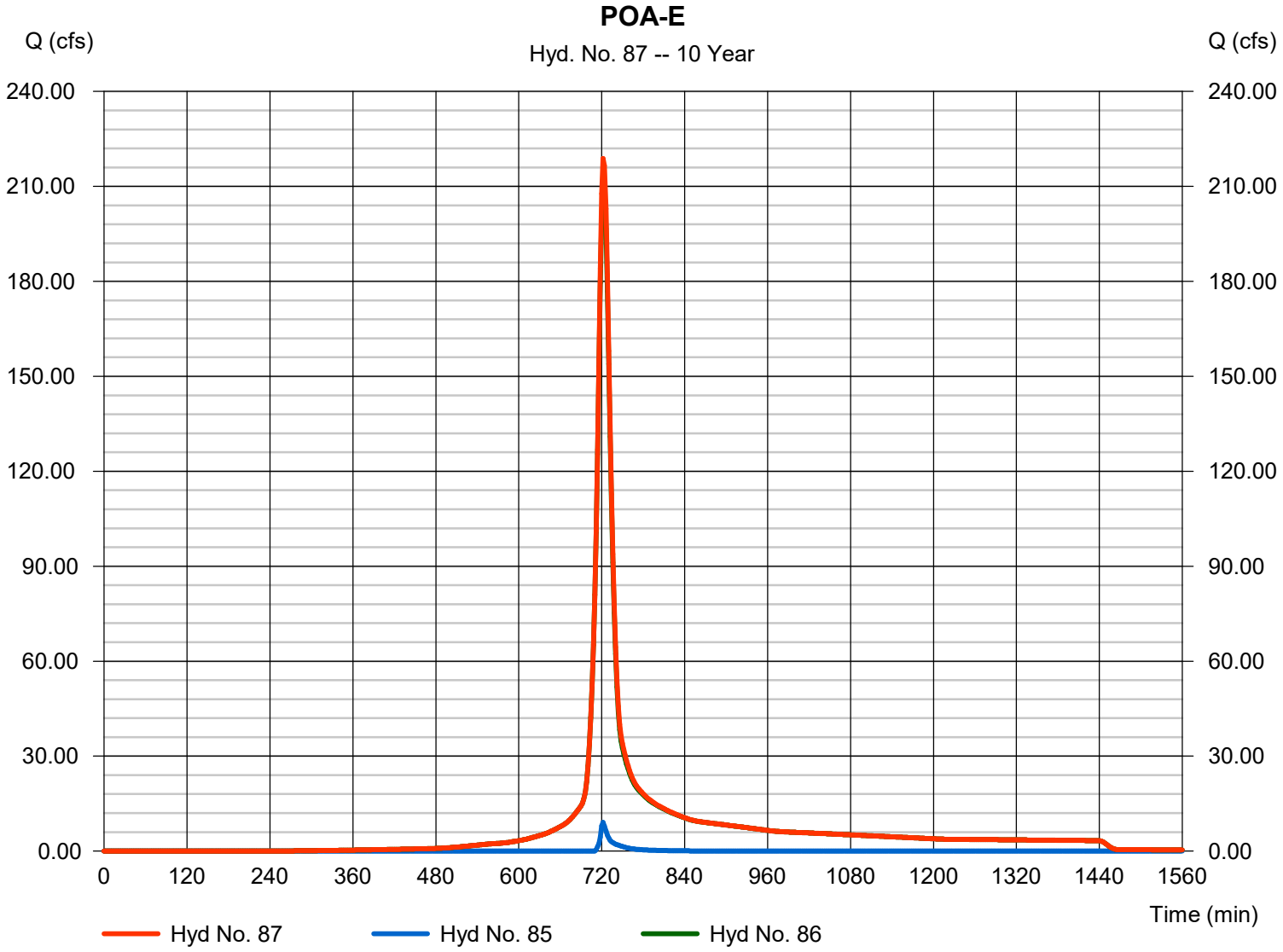


Hydrograph Report

Hyd. No. 87

POA-E

Hydrograph type	=	Combine	Peak discharge	=	218.85 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	706,171 cuft
Inflow hyds.	=	85, 86	Contrib. drain. area	=	0.000 ac

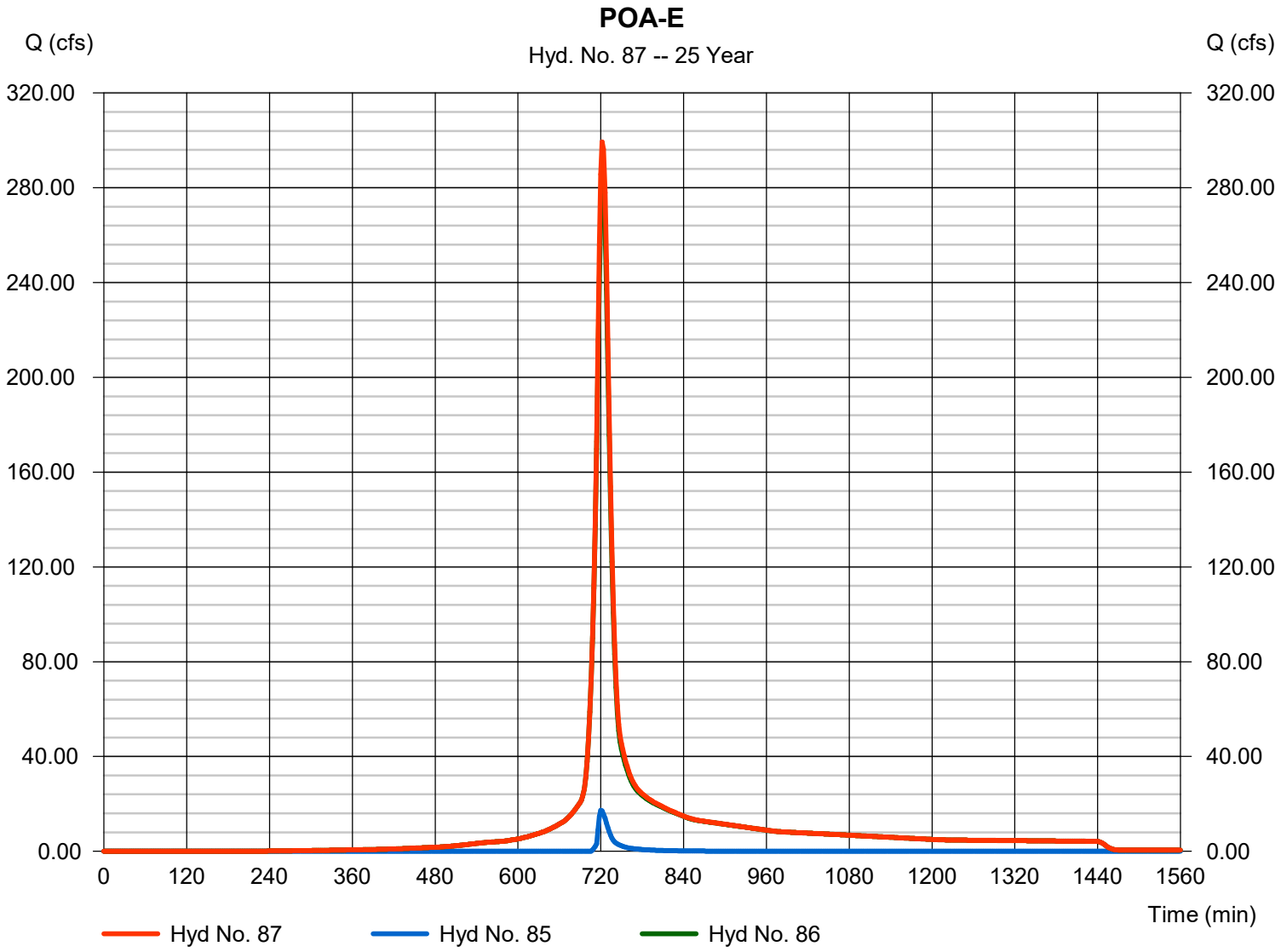


Hydrograph Report

Hyd. No. 87

POA-E

Hydrograph type	=	Combine	Peak discharge	=	299.33 cfs
Storm frequency	=	25 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	966,247 cuft
Inflow hyds.	=	85, 86	Contrib. drain. area	=	0.000 ac

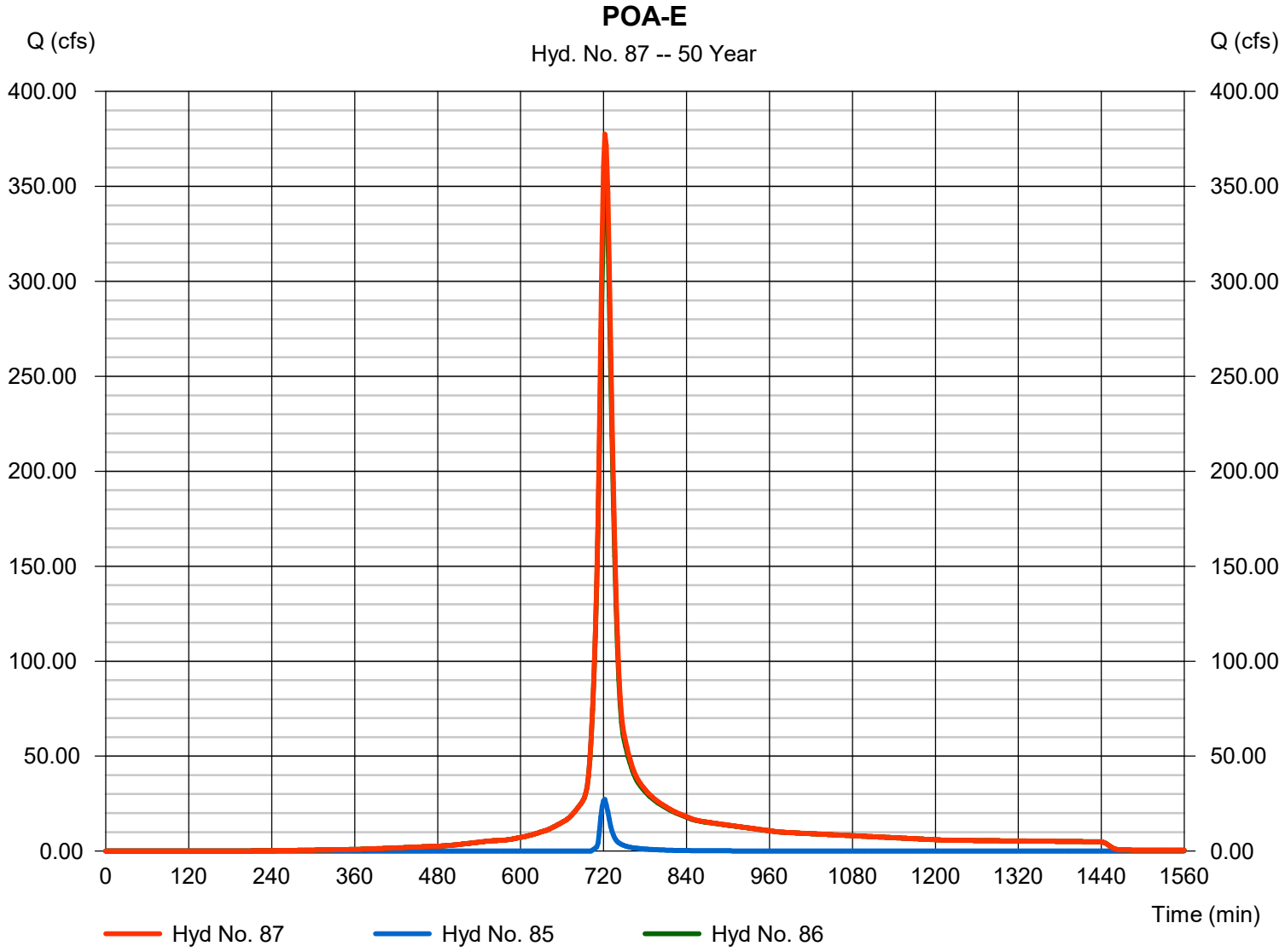


Hydrograph Report

Hyd. No. 87

POA-E

Hydrograph type	=	Combine	Peak discharge	=	377.48 cfs
Storm frequency	=	50 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	1,210,596 cuft
Inflow hyds.	=	85, 86	Contrib. drain. area	=	0.000 ac

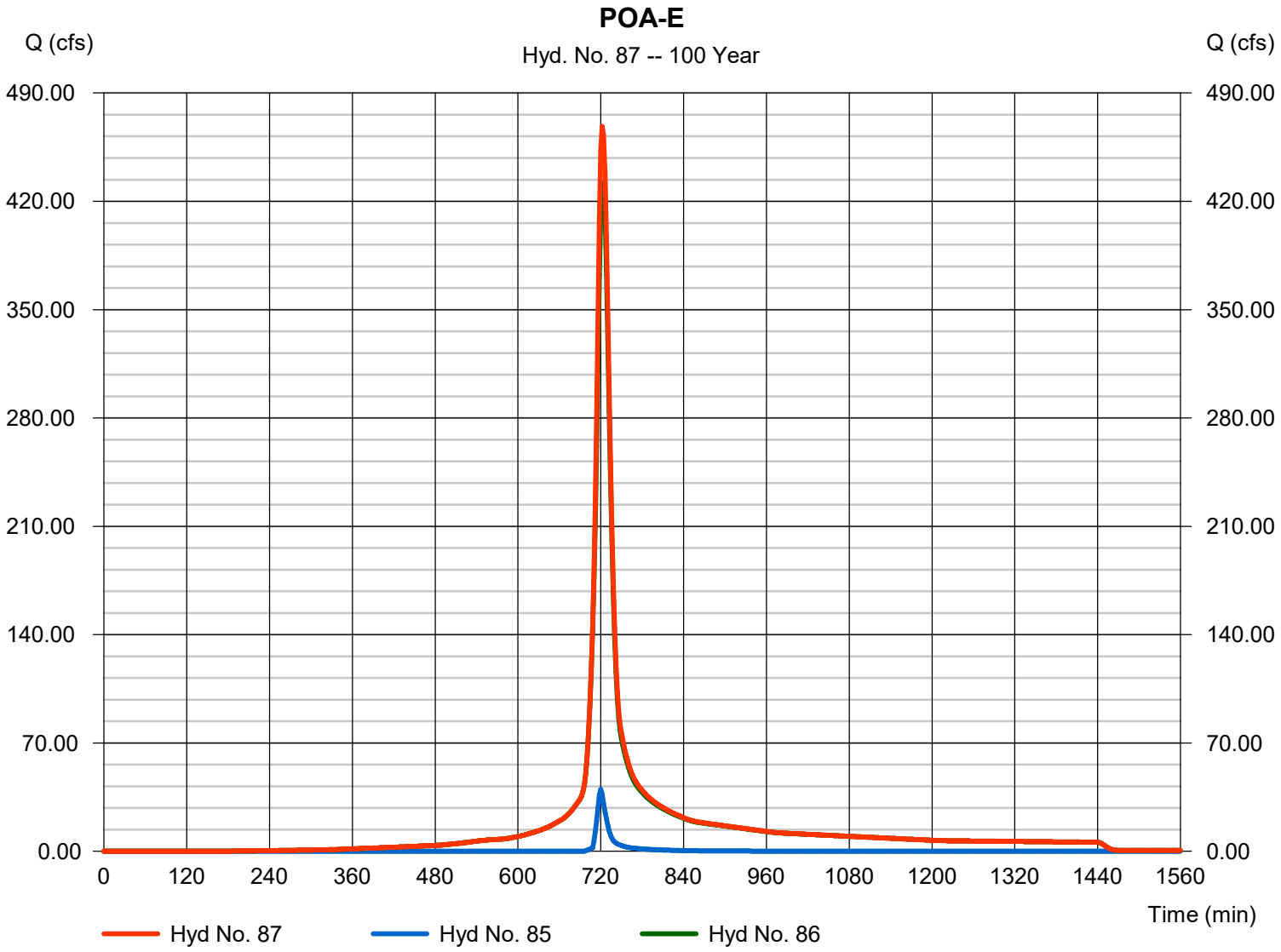


Hydrograph Report

Hyd. No. 87

POA-E

Hydrograph type	=	Combine	Peak discharge	=	468.49 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	1,507,120 cuft
Inflow hyds.	=	85, 86	Contrib. drain. area	=	0.000 ac



TOTAL PROPOSED FLOW TO BRODHEAD CREEK

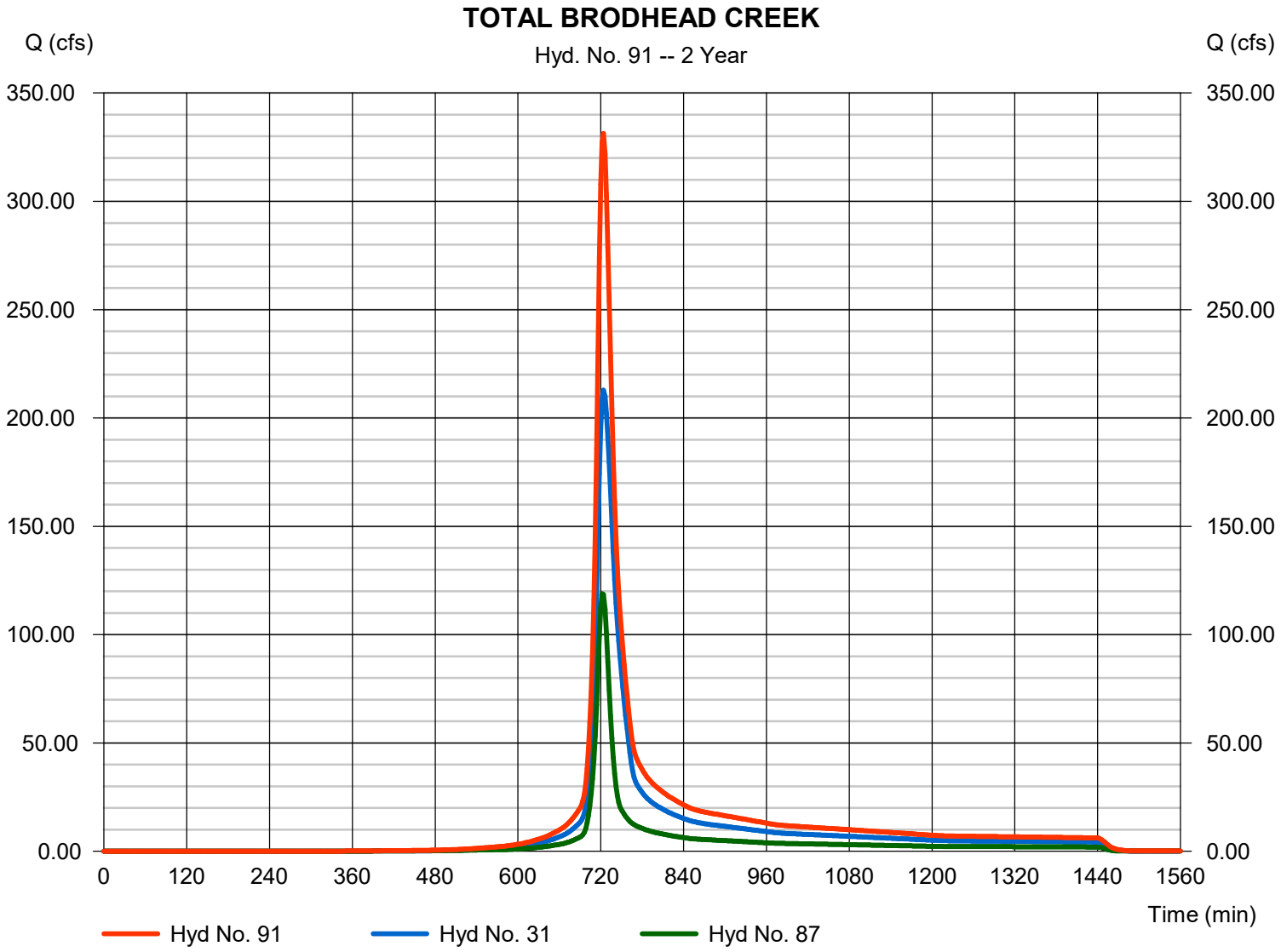
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 91

TOTAL BRODHEAD CREEK

Hydrograph type	= Combine	Peak discharge	= 331.32 cfs
Storm frequency	= 2 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 1,224,902 cuft
Inflow hyds.	= 31, 87	Contrib. drain. area	= 0.000 ac



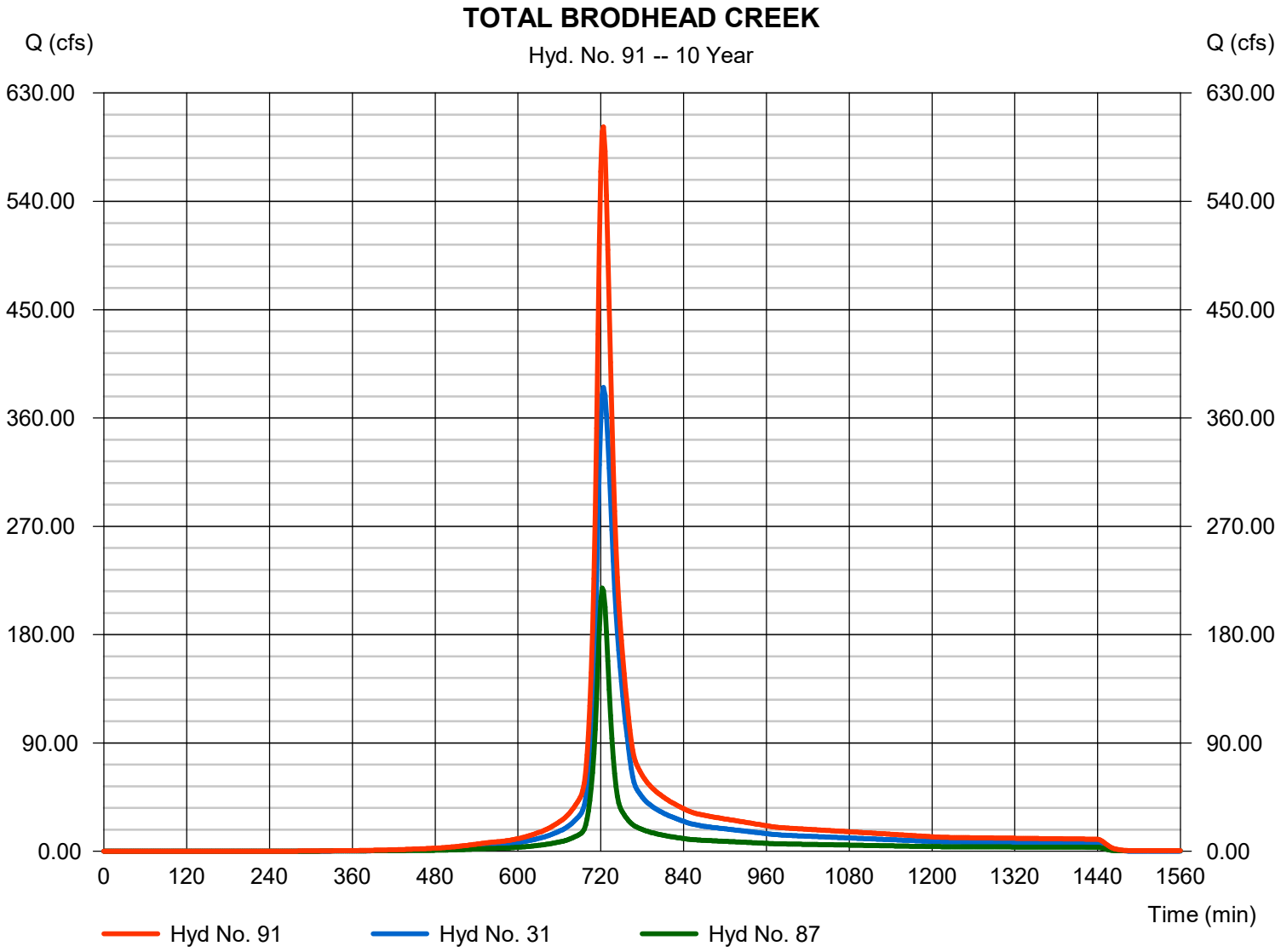
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 91

TOTAL BRODHEAD CREEK

Hydrograph type	= Combine	Peak discharge	= 601.90 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 2,208,786 cuft
Inflow hyds.	= 31, 87	Contrib. drain. area	= 0.000 ac

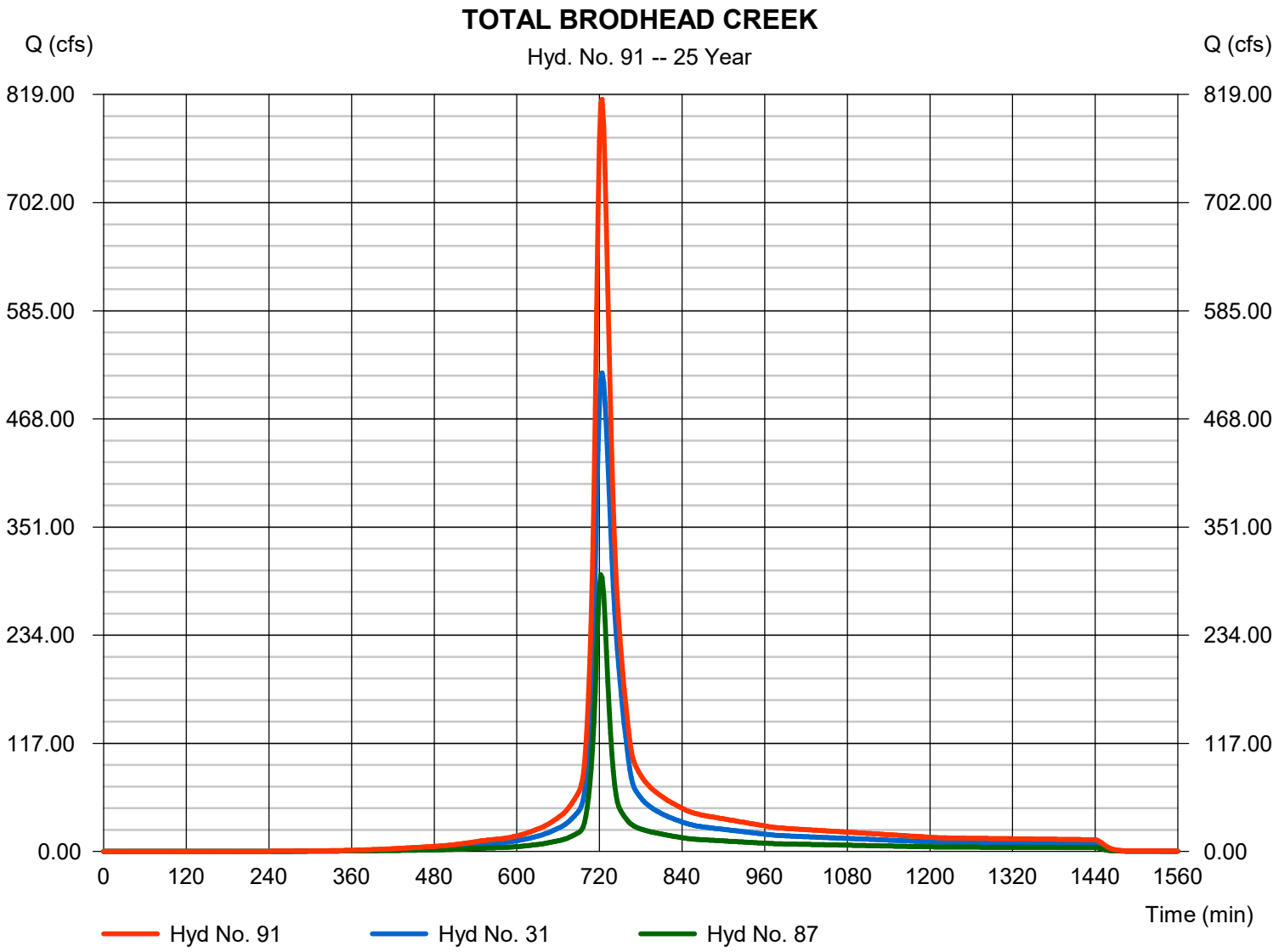


Hydrograph Report

Hyd. No. 91

TOTAL BRODHEAD CREEK

Hydrograph type	= Combine	Peak discharge	= 813.95 cfs
Storm frequency	= 25 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 2,978,480 cuft
Inflow hyds.	= 31, 87	Contrib. drain. area	= 0.000 ac

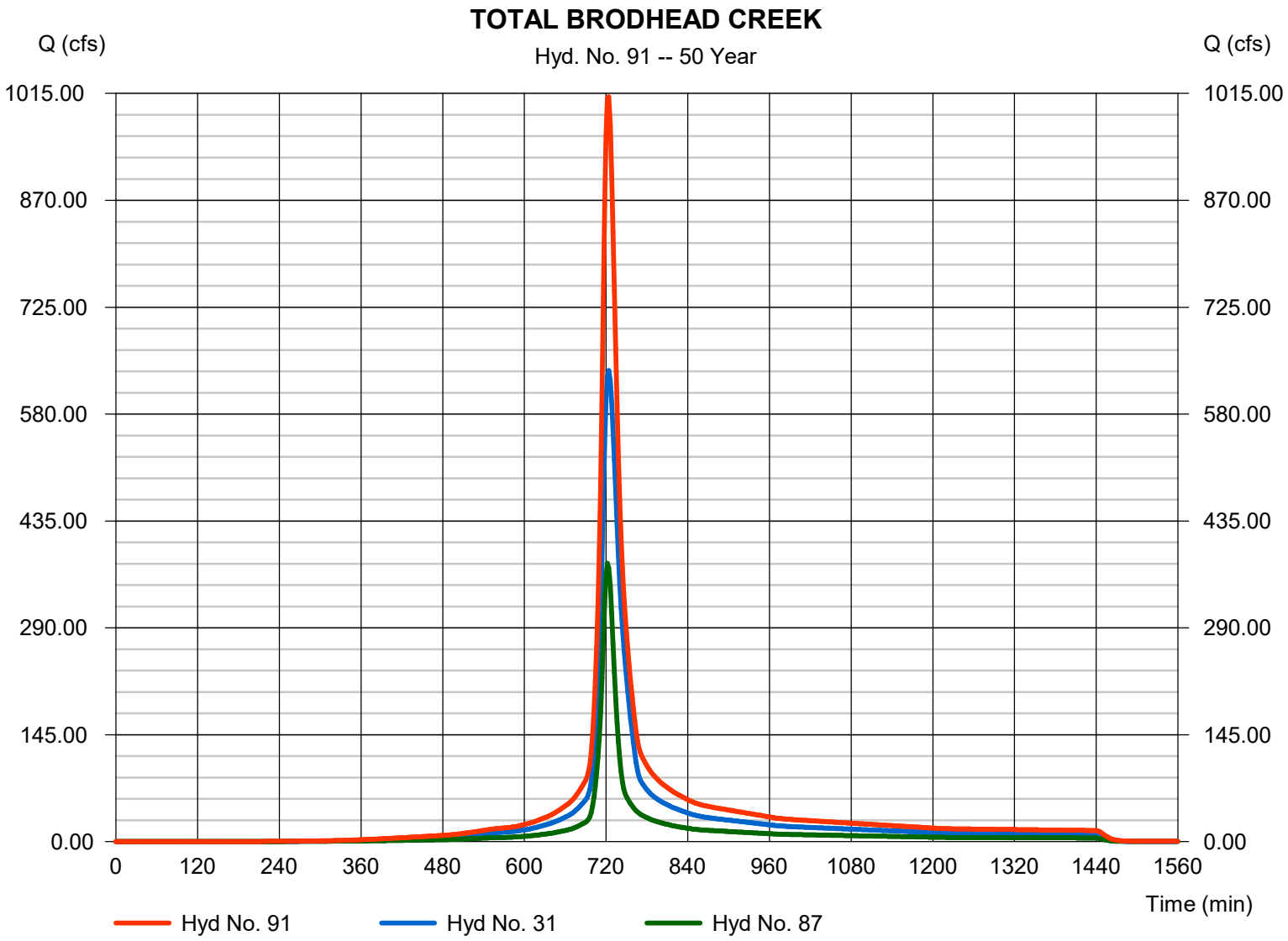


Hydrograph Report

Hyd. No. 91

TOTAL BRODHEAD CREEK

Hydrograph type	= Combine	Peak discharge	= 1010.53 cfs
Storm frequency	= 50 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 3,705,281 cuft
Inflow hyds.	= 31, 87	Contrib. drain. area	= 0.000 ac

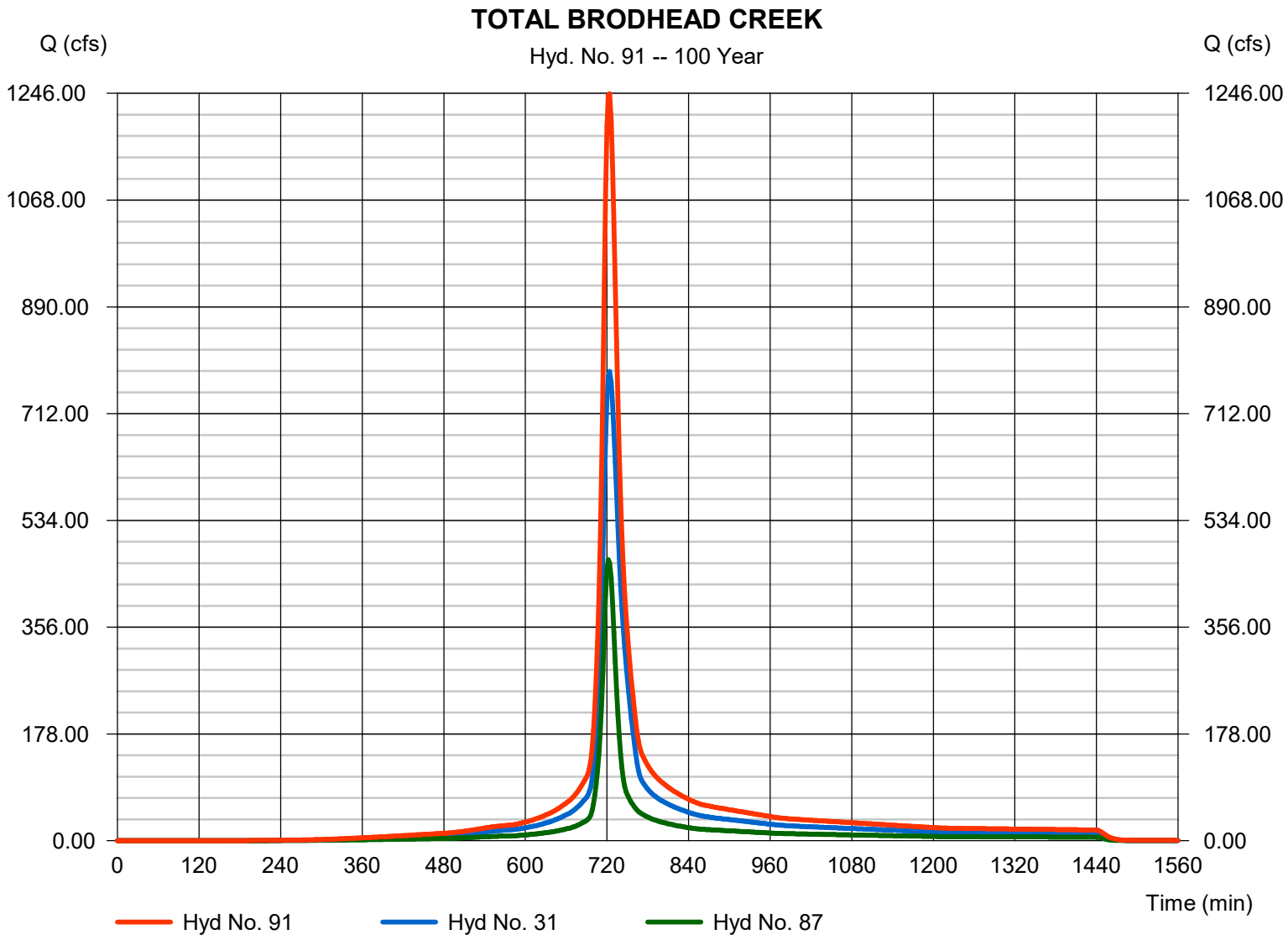


Hydrograph Report

Hyd. No. 91

TOTAL BRODHEAD CREEK

Hydrograph type	= Combine	Peak discharge	= 1245.40 cfs
Storm frequency	= 100 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 4,591,939 cuft
Inflow hyds.	= 31, 87	Contrib. drain. area	= 0.000 ac



SUMMARY OF PROPOSED PEAK DISCHARGES

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

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	8.880	2	726	31,095	------	------	------	PR-A-1-A-ONSITE
2	SCS Runoff	3.274	2	732	14,569	------	------	------	PR-A-1-A-OFFSITE-DISTURBED
3	SCS Runoff	57.01	2	732	246,648	------	------	------	PR-A-1-A-OFFSITE-UNDISTURBED
4	SCS Runoff	32.61	2	722	91,552	------	------	------	PR-A-1-D-OFFSITE
5	SCS Runoff	5.473	2	718	12,728	------	------	------	PR-A-1-E-ONSITE
6	Reservoir	0.000	2	730	0	5	486.44	7,367	TEMP-INF1-1 ROUTING
7	Combine	91.06	2	726	383,864	1, 2, 3, 4, 6	------	------	Combined POA-A-1
8	Combine	11.99	2	728	45,664	1, 2, 6,	------	------	POA-A-1 ONSITE & OFFSITE DISTU
10	SCS Runoff	17.42	2	724	55,620	------	------	------	PR-A-2-A-ONSITE
11	SCS Runoff	33.73	2	722	95,176	------	------	------	PR-A-2-A-OFFSITE
12	Combine	50.81	2	724	150,796	10, 11	------	------	Combined POA-A-2
14	SCS Runoff	25.68	2	724	80,845	------	------	------	PR-A-3-ONSITE
15	SCS Runoff	35.72	2	734	155,590	------	------	------	PR-A-3-OFFSITE
16	Combine	57.01	2	728	236,436	14, 15	------	------	POA-A-3
18	Combine	54.74	2	726	182,129	8, 10, 14,	------	------	POA-A ONSITE & OFFSITE DIST.
20	SCS Runoff	6.417	2	720	16,731	------	------	------	PR-A-4-ONSITE
22	SCS Runoff	5.846	2	718	14,039	------	------	------	PR-B-1-ONSITE
23	SCS Runoff	13.96	2	718	32,455	------	------	------	PR-B-1-OFFSITE
24	SCS Runoff	8.227	2	724	26,116	------	------	------	PR-B-2-ONSITE
25	Reservoir	0.000	2	912	0	24	437.02	17,666	PR-B-2-ONSITE ROUTING
26	Combine	5.846	2	718	14,039	22, 25	------	------	PR-B-ONSITE
27	Combine	19.80	2	718	46,494	22, 23, 25,	------	------	POA-B
29	SCS Runoff	3.762	2	716	7,969	------	------	------	PR-C (POA-C)
31	Combine	212.82	2	724	842,290	7, 12, 16, 20, 27, 29,	------	------	Combined POA-ABC
33	SCS Runoff	8.887	2	716	19,284	------	------	------	PR-D-1
34	Reservoir	0.000	2	726	0	33	458.83	9,095	PR-D-1 ROUTING
35	SCS Runoff	1.588	2	716	3,281	------	------	------	PR-D-2-DISTURBED
36	SCS Runoff	0.162	2	718	324	------	------	------	PR-D-2-UNDISTURBED
37	Combine	1.748	2	716	3,606	35, 36	------	------	PR-D-2
38	Reservoir	0.000	2	784	0	37	461.02	1,665	PR-D-2 ROUTING

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

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
40	SCS Runoff	1.859	2	716	4,253	------	------	------	PR-D-3
41	Reservoir	0.000	2	1044	0	40	460.03	2,017	PR-D-3 ROUTING
43	SCS Runoff	4.194	2	720	10,892	------	------	------	PR-D-4-ONSITE-DISTURBED
44	SCS Runoff	6.134	2	722	17,450	------	------	------	PR-D-4-ONSITE-UNDISTURBED
45	SCS Runoff	1.961	2	716	4,255	------	------	------	PR-D-4-OFFSITE-DISTURBED
46	SCS Runoff	2.928	2	716	5,985	------	------	------	PR-D-4-OFFSITE-UNDISTURBED
47	Combine	0.000	2	784	0	34, 38, 41,	------	------	COMBINE
48	Combine	13.71	2	718	38,582	43, 44, 45, 46, 47	------	------	POA-D-1
49	Combine	11.42	2	720	32,598	43, 44, 45, 47,	------	------	POA-D-1 ONSITE & OFFSITE DIST.
50	SCS Runoff	8.686	2	718	20,098	------	------	------	PR-D-5-OFFSITE
51	Combine	22.40	2	718	58,680	48, 50	------	------	POA-D
52	Combine	19.94	2	720	52,696	34, 38, 43, 44, 45, 50,	------	------	POA-D ONSITE & OFFSITE DIST.
54	SCS Runoff	0.698	2	716	1,433	------	------	------	PR-E-1
55	Reservoir	0.000	2	1520	0	54	452.65	787	RG5-1 ROUTING
56	SCS Runoff	0.597	2	716	1,241	------	------	------	PR-E-2
57	Reservoir	0.000	2	996	0	56	457.65	571	RG5-2 ROUTING
58	SCS Runoff	1.744	2	716	3,582	------	------	------	PR-E-3-DISTURBED
59	SCS Runoff	0.046	2	718	93	------	------	------	PR-E-3-UNDISTURBED
60	Combine	1.790	2	716	3,675	58, 59	------	------	PR-E-3
61	Reservoir	0.736	2	722	470	60	470.07	1,574	RG5-3 ROUTING
62	SCS Runoff	4.077	2	716	8,553	------	------	------	PR-E-4-DISTURBED
63	SCS Runoff	2.276	2	722	5,965	------	------	------	PR-E-4-UNDISTURBED
64	Combine	6.018	2	718	14,519	62, 63	------	------	PR-E-4
65	Reservoir	0.116	2	738	96	64	454.04	5,179	UGD-INF5-1 ROUTING
66	SCS Runoff	2.276	2	722	5,965	------	------	------	PR-E-5
67	Reservoir	0.000	2	924	0	66	454.15	2,554	UGD-INF5-2 ROUTING
68	SCS Runoff	4.440	2	716	9,954	------	------	------	PR-E-6
69	Reservoir	0.000	2	1184	0	68	449.02	5,285	UGD-INF5-3 ROUTING
70	SCS Runoff	11.27	2	716	24,819	------	------	------	PR-E-7
71	Reservoir	0.000	2	728	0	70	442.93	9,506	UGD-INF5-4 ROUTING
72	SCS Runoff	14.26	2	722	37,372	------	------	------	PR-E-8
73	Reservoir	0.155	2	1446	20,011	72	441.80	32,201	PR-E-8 ROUTING

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

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
74	SCS Runoff	22.94	2	720	59,893	------	------	------	PR-E-10-ONSITE-DISTURBED
75	SCS Runoff	23.16	2	724	73,913	------	------	------	PR-E-10-ONSITE-UNDISTURBED
76	SCS Runoff	4.585	2	720	12,881	------	------	------	PR-E-10-OFFSITE-DISTURBED
77	SCS Runoff	5.271	2	724	16,479	------	------	------	PR-E-10-OFFSITE-UNDISTURBED
78	Combine	53.96	2	722	163,166	74, 75, 76, 77	------	------	PR-E-10
79	SCS Runoff	3.978	2	722	11,169	------	------	------	PR-E-11-DISTURBED
80	SCS Runoff	26.24	2	722	74,301	------	------	------	PR-E-11-UNDISTURBED
81	Combine	30.22	2	722	85,470	79, 80	------	------	PR-E-11
82	SCS Runoff	3.578	2	724	11,421	------	------	------	PR-E-12-DISTURBED
83	SCS Runoff	32.12	2	724	101,977	------	------	------	PR-E-12-UNDISTURBED
84	Combine	35.70	2	724	113,398	82, 83	------	------	PR-E-12
85	Combine	0.736	2	722	567	55, 57, 61, 65, 67, 69, 71, 73, 78, 81, 84, 85, 86	------	------	COMBINE
86	Combine	118.12	2	722	382,045		------	------	COMBINE
87	Combine	118.85	2	722	382,612		------	------	POA-E
88	Combine	34.36	2	720	115,375	71, 73, 74, 76, 79, 82, 85, 88	------	------	POA-E DISTURBED COMBINE
89	Combine	35.03	2	722	115,942		------	------	POA-E DISTURBED
91	Combine	331.32	2	724	1,224,902	31, 87,	------	------	TOTAL BRODHEAD CREEK

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

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	16.59	2	726	57,283	------	------	------	PR-A-1-A-ONSITE
2	SCS Runoff	4.999	2	732	22,728	------	------	------	PR-A-1-A-OFFSITE-DISTURBED
3	SCS Runoff	98.56	2	732	426,942	------	------	------	PR-A-1-A-OFFSITE-UNDISTURBED
4	SCS Runoff	58.47	2	722	164,410	------	------	------	PR-A-1-D-OFFSITE
5	SCS Runoff	8.826	2	718	21,019	------	------	------	PR-A-1-E-ONSITE
6	Reservoir	2.255	2	728	4,976	5	486.97	10,352	TEMP-INF1-1 ROUTING
7	Combine	162.61	2	726	676,339	1, 2, 3, 4, 6	------	------	Combined POA-A-1
8	Combine	23.48	2	728	84,986	1, 2, 6,	------	------	POA-A-1 ONSITE & OFFSITE DISTU
10	SCS Runoff	33.63	2	724	105,214	------	------	------	PR-A-2-A-ONSITE
11	SCS Runoff	62.52	2	722	175,334	------	------	------	PR-A-2-A-OFFSITE
12	Combine	94.86	2	724	280,548	10, 11	------	------	Combined POA-A-2
14	SCS Runoff	47.01	2	724	147,030	------	------	------	PR-A-3-ONSITE
15	SCS Runoff	64.68	2	732	279,412	------	------	------	PR-A-3-OFFSITE
16	Combine	103.88	2	728	426,441	14, 15	------	------	POA-A-3
18	Combine	102.75	2	726	337,230	8, 10, 14,	------	------	POA-A ONSITE & OFFSITE DIST.
20	SCS Runoff	11.88	2	720	30,822	------	------	------	PR-A-4-ONSITE
22	SCS Runoff	8.972	2	718	22,149	------	------	------	PR-B-1-ONSITE
23	SCS Runoff	22.51	2	718	53,598	------	------	------	PR-B-1-OFFSITE
24	SCS Runoff	15.59	2	724	48,746	------	------	------	PR-B-2-ONSITE
25	Reservoir	0.000	2	744	0	24	437.50	32,622	PR-B-2-ONSITE ROUTING
26	Combine	8.972	2	718	22,149	22, 25	------	------	PR-B-ONSITE
27	Combine	31.48	2	718	75,747	22, 23, 25,	------	------	POA-B
29	SCS Runoff	5.829	2	716	12,716	------	------	------	PR-C (POA-C)
31	Combine	385.35	2	724	1,502,613	7, 12, 16, 20, 27, 29,	------	------	Combined POA-ABC
33	SCS Runoff	13.47	2	716	30,083	------	------	------	PR-D-1
34	Reservoir	0.243	2	732	444	33	459.28	14,236	PR-D-1 ROUTING
35	SCS Runoff	2.553	2	716	5,419	------	------	------	PR-D-2-DISTURBED
36	SCS Runoff	0.303	2	716	614	------	------	------	PR-D-2-UNDISTURBED
37	Combine	2.856	2	716	6,033	35, 36	------	------	PR-D-2
38	Reservoir	1.133	2	722	1,080	37	461.33	2,458	PR-D-2 ROUTING

Hydrograph Summary Report

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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
40	SCS Runoff	2.743	2	716	6,414	------	------	------	PR-D-3
41	Reservoir	0.978	2	722	1,291	40	460.33	2,536	PR-D-3 ROUTING
43	SCS Runoff	7.071	2	720	18,631	------	------	------	PR-D-4-ONSITE-DISTURBED
44	SCS Runoff	11.78	2	722	33,009	------	------	------	PR-D-4-ONSITE-UNDISTURBED
45	SCS Runoff	2.972	2	716	6,638	------	------	------	PR-D-4-OFFSITE-DISTURBED
46	SCS Runoff	4.834	2	716	10,116	------	------	------	PR-D-4-OFFSITE-UNDISTURBED
47	Combine	2.190	2	722	2,815	34, 38, 41,	------	------	COMBINE
48	Combine	25.87	2	720	71,210	43, 44, 45, 46, 47	------	------	POA-D-1
49	Combine	22.26	2	722	61,093	43, 44, 45, 47,	------	------	POA-D-1 ONSITE & OFFSITE DIST.
50	SCS Runoff	14.20	2	718	33,578	------	------	------	PR-D-5-OFFSITE
51	Combine	39.68	2	720	104,788	48, 50	------	------	POA-D
52	Combine	35.27	2	720	93,380	34, 38, 43, 44, 45, 50,	------	------	POA-D ONSITE & OFFSITE DIST.
54	SCS Runoff	1.136	2	716	2,394	------	------	------	PR-E-1
55	Reservoir	0.494	2	722	335	54	452.95	1,121	RG5-1 ROUTING
56	SCS Runoff	0.947	2	716	2,027	------	------	------	PR-E-2
57	Reservoir	0.199	2	724	68	56	458.02	899	RG5-2 ROUTING
58	SCS Runoff	2.841	2	716	5,985	------	------	------	PR-E-3-DISTURBED
59	SCS Runoff	0.087	2	716	175	------	------	------	PR-E-3-UNDISTURBED
60	Combine	2.927	2	716	6,160	58, 59	------	------	PR-E-3
61	Reservoir	2.641	2	718	2,089	60	470.19	1,793	RG5-3 ROUTING
62	SCS Runoff	6.392	2	716	13,805	------	------	------	PR-E-4-DISTURBED
63	SCS Runoff	4.353	2	720	11,284	------	------	------	PR-E-4-UNDISTURBED
64	Combine	10.18	2	718	25,089	62, 63	------	------	PR-E-4
65	Reservoir	6.491	2	722	5,483	64	454.53	6,546	UGD-INF5-1 ROUTING
66	SCS Runoff	4.353	2	720	11,284	------	------	------	PR-E-5
67	Reservoir	0.437	2	744	1,039	66	455.09	4,938	UGD-INF5-2 ROUTING
68	SCS Runoff	6.603	2	716	15,181	------	------	------	PR-E-6
69	Reservoir	0.460	2	742	1,633	68	449.61	7,550	UGD-INF5-3 ROUTING
70	SCS Runoff	16.91	2	716	38,283	------	------	------	PR-E-7
71	Reservoir	0.572	2	740	1,286	70	443.65	15,282	UGD-INF5-4 ROUTING
72	SCS Runoff	27.27	2	720	70,695	------	------	------	PR-E-8
73	Reservoir	0.441	2	1176	51,478	72	443.10	54,047	PR-E-8 ROUTING

Hydrograph Summary Report

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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
74	SCS Runoff	37.60	2	720	100,064	------	------	------	PR-E-10-ONSITE-DISTURBED
75	SCS Runoff	44.69	2	724	139,818	------	------	------	PR-E-10-ONSITE-UNDISTURBED
76	SCS Runoff	6.830	2	720	19,647	------	------	------	PR-E-10-OFFSITE-DISTURBED
77	SCS Runoff	9.057	2	724	28,524	------	------	------	PR-E-10-OFFSITE-UNDISTURBED
78	Combine	94.94	2	722	288,053	74, 75, 76, 77	------	------	PR-E-10
79	SCS Runoff	7.134	2	722	20,058	------	------	------	PR-E-11-DISTURBED
80	SCS Runoff	42.47	2	722	122,704	------	------	------	PR-E-11-UNDISTURBED
81	Combine	49.60	2	722	142,761	79, 80	------	------	PR-E-11
82	SCS Runoff	6.905	2	724	21,604	------	------	------	PR-E-12-DISTURBED
83	SCS Runoff	60.88	2	724	190,342	------	------	------	PR-E-12-UNDISTURBED
84	Combine	67.78	2	724	211,946	82, 83	------	------	PR-E-12
85	Combine	9.031	2	722	10,648	55, 57, 61, 65, 67, 69, 71, 73, 78, 81, 84, 85, 86	------	------	COMBINE
86	Combine	209.82	2	722	695,523		------	------	COMBINE
87	Combine	218.85	2	722	706,171		------	------	POA-E
88	Combine	57.39	2	720	214,136	71, 73, 74, 76, 79, 82, 85, 88	------	------	POA-E DISTURBED COMBINE
89	Combine	66.11	2	722	224,784		------	------	POA-E DISTURBED
91	Combine	601.90	2	724	2,208,786	31, 87,	------	------	TOTAL BRODHEAD CREEK

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

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	22.48	2	726	77,719	------	------	------	PR-A-1-A-ONSITE
2	SCS Runoff	6.246	2	732	28,735	------	------	------	PR-A-1-A-OFFSITE-DISTURBED
3	SCS Runoff	129.41	2	732	564,138	------	------	------	PR-A-1-A-OFFSITE-UNDISTURBED
4	SCS Runoff	77.91	2	722	220,668	------	------	------	PR-A-1-D-OFFSITE
5	SCS Runoff	11.26	2	718	27,222	------	------	------	PR-A-1-E-ONSITE
6	Reservoir	5.128	2	726	9,709	5	487.24	12,099	TEMP-INF1-1 ROUTING
7	Combine	217.59	2	726	900,970	1, 2, 3, 4, 6	------	------	Combined POA-A-1
8	Combine	33.26	2	726	116,163	1, 2, 6,	------	------	POA-A-1 ONSITE & OFFSITE DISTU
10	SCS Runoff	46.14	2	724	144,352	------	------	------	PR-A-2-A-ONSITE
11	SCS Runoff	84.41	2	722	237,886	------	------	------	PR-A-2-A-OFFSITE
12	Combine	128.95	2	722	382,237	10, 11	------	------	Combined POA-A-2
14	SCS Runoff	63.16	2	724	198,401	------	------	------	PR-A-3-ONSITE
15	SCS Runoff	86.60	2	732	375,021	------	------	------	PR-A-3-OFFSITE
16	Combine	139.34	2	728	573,423	14, 15	------	------	POA-A-3
18	Combine	141.38	2	724	458,916	8, 10, 14,	------	------	POA-A ONSITE & OFFSITE DIST.
20	SCS Runoff	16.03	2	720	41,818	------	------	------	PR-A-4-ONSITE
22	SCS Runoff	11.23	2	718	28,137	------	------	------	PR-B-1-ONSITE
23	SCS Runoff	28.72	2	718	69,416	------	------	------	PR-B-1-OFFSITE
24	SCS Runoff	21.24	2	724	66,503	------	------	------	PR-B-2-ONSITE
25	Reservoir	0.000	2	732	0	24	437.88	44,567	PR-B-2-ONSITE ROUTING
26	Combine	11.23	2	718	28,137	22, 25	------	------	PR-B-ONSITE
27	Combine	39.95	2	718	97,553	22, 23, 25,	------	------	POA-B
29	SCS Runoff	7.322	2	716	16,230	------	------	------	PR-C (POA-C)
31	Combine	517.76	2	724	2,012,234	7, 12, 16, 20, 27, 29,	------	------	Combined POA-ABC
33	SCS Runoff	16.78	2	716	38,034	------	------	------	PR-D-1
34	Reservoir	1.989	2	726	3,862	33	459.54	17,348	PR-D-1 ROUTING
35	SCS Runoff	3.254	2	716	7,018	------	------	------	PR-D-2-DISTURBED
36	SCS Runoff	0.413	2	716	842	------	------	------	PR-D-2-UNDISTURBED
37	Combine	3.667	2	716	7,860	35, 36	------	------	PR-D-2
38	Reservoir	2.236	2	720	2,158	37	461.47	2,797	PR-D-2 ROUTING

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

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
40	SCS Runoff	3.386	2	716	7,996	------	------	------	PR-D-3
41	Reservoir	2.041	2	720	2,371	40	460.50	2,838	PR-D-3 ROUTING
43	SCS Runoff	9.188	2	720	24,493	------	------	------	PR-D-4-ONSITE-DISTURBED
44	SCS Runoff	16.12	2	722	45,288	------	------	------	PR-D-4-ONSITE-UNDISTURBED
45	SCS Runoff	3.703	2	716	8,393	------	------	------	PR-D-4-OFFSITE-DISTURBED
46	SCS Runoff	6.227	2	716	13,233	------	------	------	PR-D-4-OFFSITE-UNDISTURBED
47	Combine	5.895	2	722	8,390	34, 38, 41,	------	------	COMBINE
48	Combine	37.53	2	720	99,796	43, 44, 45, 46, 47	------	------	POA-D-1
49	Combine	32.82	2	720	86,563	43, 44, 45, 47,	------	------	POA-D-1 ONSITE & OFFSITE DIST.
50	SCS Runoff	18.21	2	718	43,703	------	------	------	PR-D-5-OFFSITE
51	Combine	55.20	2	720	143,499	48, 50	------	------	POA-D
52	Combine	48.44	2	720	127,896	34, 38, 43, 44, 45, 50,	------	------	POA-D ONSITE & OFFSITE DIST.
54	SCS Runoff	1.456	2	716	3,116	------	------	------	PR-E-1
55	Reservoir	1.166	2	720	832	54	453.01	1,213	RG5-1 ROUTING
56	SCS Runoff	1.201	2	716	2,612	------	------	------	PR-E-2
57	Reservoir	0.797	2	720	373	56	458.08	976	RG5-2 ROUTING
58	SCS Runoff	3.639	2	716	7,789	------	------	------	PR-E-3-DISTURBED
59	SCS Runoff	0.118	2	716	241	------	------	------	PR-E-3-UNDISTURBED
60	Combine	3.757	2	716	8,030	58, 59	------	------	PR-E-3
61	Reservoir	3.531	2	718	3,378	60	470.23	1,868	RG5-3 ROUTING
62	SCS Runoff	8.067	2	716	17,706	------	------	------	PR-E-4-DISTURBED
63	SCS Runoff	5.956	2	720	15,482	------	------	------	PR-E-4-UNDISTURBED
64	Combine	13.30	2	718	33,187	62, 63	------	------	PR-E-4
65	Reservoir	10.12	2	720	10,085	64	454.79	7,217	UGD-INF5-1 ROUTING
66	SCS Runoff	5.956	2	720	15,482	------	------	------	PR-E-5
67	Reservoir	3.216	2	728	3,926	66	455.33	5,524	UGD-INF5-2 ROUTING
68	SCS Runoff	8.172	2	716	19,014	------	------	------	PR-E-6
69	Reservoir	2.895	2	722	4,486	68	449.86	8,468	UGD-INF5-3 ROUTING
70	SCS Runoff	20.99	2	716	48,173	------	------	------	PR-E-7
71	Reservoir	3.706	2	724	6,369	70	444.02	18,222	UGD-INF5-4 ROUTING
72	SCS Runoff	37.32	2	720	96,992	------	------	------	PR-E-8
73	Reservoir	1.819	2	818	77,278	72	443.62	63,443	PR-E-8 ROUTING

Hydrograph Summary Report

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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
74	SCS Runoff	48.30	2	720	130,237	------	------	------	PR-E-10-ONSITE-DISTURBED
75	SCS Runoff	61.32	2	724	191,827	------	------	------	PR-E-10-ONSITE-UNDISTURBED
76	SCS Runoff	8.458	2	720	24,606	------	------	------	PR-E-10-OFFSITE-DISTURBED
77	SCS Runoff	11.86	2	724	37,691	------	------	------	PR-E-10-OFFSITE-UNDISTURBED
78	Combine	125.83	2	722	384,362	74, 75, 76, 77	------	------	PR-E-10
79	SCS Runoff	9.505	2	722	26,921	------	------	------	PR-E-11-DISTURBED
80	SCS Runoff	54.28	2	722	158,918	------	------	------	PR-E-11-UNDISTURBED
81	Combine	63.78	2	722	185,839	79, 80	------	------	PR-E-11
82	SCS Runoff	9.475	2	724	29,640	------	------	------	PR-E-12-DISTURBED
83	SCS Runoff	82.93	2	724	259,680	------	------	------	PR-E-12-UNDISTURBED
84	Combine	92.41	2	724	289,321	82, 83	------	------	PR-E-12
85	Combine	17.27	2	720	23,080	55, 57, 61, 65, 67, 69, 71, 73, 78, 81, 84, 85, 86	------	------	COMBINE
86	Combine	282.34	2	722	943,168		------	------	COMBINE
87	Combine	299.33	2	722	966,247		------	------	POA-E
88	Combine	77.18	2	722	295,052	71, 73, 74, 76, 79, 82, 85, 88	------	------	POA-E DISTURBED COMBINE
89	Combine	94.17	2	722	318,132		------	------	POA-E DISTURBED
91	Combine	813.95	2	724	2,978,480	31, 87,	------	------	TOTAL BRODHEAD CREEK

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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	27.91	2	726	96,886	------	------	------	PR-A-1-A-ONSITE
2	SCS Runoff	7.374	2	732	34,219	------	------	------	PR-A-1-A-OFFSITE-DISTURBED
3	SCS Runoff	157.53	2	732	691,270	------	------	------	PR-A-1-A-OFFSITE-UNDISTURBED
4	SCS Runoff	95.71	2	722	273,162	------	------	------	PR-A-1-D-OFFSITE
5	SCS Runoff	13.47	2	718	32,926	------	------	------	PR-A-1-E-ONSITE
6	Reservoir	7.688	2	724	14,188	5	487.44	13,434	TEMP-INF1-1 ROUTING
7	Combine	267.49	2	726	1,109,725	1, 2, 3, 4, 6	------	------	Combined POA-A-1
8	Combine	42.12	2	726	145,293	1, 2, 6,	------	------	POA-A-1 ONSITE & OFFSITE DISTU
10	SCS Runoff	57.75	2	724	181,259	------	------	------	PR-A-2-A-ONSITE
11	SCS Runoff	104.57	2	722	296,551	------	------	------	PR-A-2-A-OFFSITE
12	Combine	160.50	2	722	477,810	10, 11	------	------	Combined POA-A-2
14	SCS Runoff	78.01	2	724	246,456	------	------	------	PR-A-3-ONSITE
15	SCS Runoff	106.73	2	732	464,234	------	------	------	PR-A-3-OFFSITE
16	Combine	171.92	2	728	710,689	14, 15	------	------	POA-A-3
18	Combine	176.85	2	724	573,008	8, 10, 14,	------	------	POA-A ONSITE & OFFSITE DIST.
20	SCS Runoff	19.85	2	720	52,131	------	------	------	PR-A-4-ONSITE
22	SCS Runoff	13.27	2	718	33,610	------	------	------	PR-B-1-ONSITE
23	SCS Runoff	34.34	2	718	83,961	------	------	------	PR-B-1-OFFSITE
24	SCS Runoff	26.46	2	724	83,202	------	------	------	PR-B-2-ONSITE
25	Reservoir	0.613	2	828	7,310	24	438.05	52,666	PR-B-2-ONSITE ROUTING
26	Combine	13.27	2	718	40,920	22, 25	------	------	PR-B-ONSITE
27	Combine	47.62	2	718	124,880	22, 23, 25,	------	------	POA-B
29	SCS Runoff	8.673	2	716	19,447	------	------	------	PR-C (POA-C)
31	Combine	638.99	2	724	2,494,682	7, 12, 16, 20, 27, 29,	------	------	Combined POA-ABC
33	SCS Runoff	19.78	2	716	45,294	------	------	------	PR-D-1
34	Reservoir	4.144	2	724	7,723	33	459.76	19,907	PR-D-1 ROUTING
35	SCS Runoff	3.888	2	716	8,489	------	------	------	PR-D-2-DISTURBED
36	SCS Runoff	0.514	2	716	1,057	------	------	------	PR-D-2-UNDISTURBED
37	Combine	4.402	2	716	9,546	35, 36	------	------	PR-D-2
38	Reservoir	3.159	2	720	3,183	37	461.56	3,037	PR-D-2 ROUTING

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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
40	SCS Runoff	3.969	2	716	9,437	------	------	------	PR-D-3
41	Reservoir	2.984	2	720	3,410	40	460.64	3,046	PR-D-3 ROUTING
43	SCS Runoff	11.11	2	720	29,913	------	------	------	PR-D-4-ONSITE-DISTURBED
44	SCS Runoff	20.15	2	722	56,867	------	------	------	PR-D-4-ONSITE-UNDISTURBED
45	SCS Runoff	4.364	2	716	9,994	------	------	------	PR-D-4-OFFSITE-DISTURBED
46	SCS Runoff	7.488	2	716	16,108	------	------	------	PR-D-4-OFFSITE-UNDISTURBED
47	Combine	9.527	2	722	14,316	34, 38, 41,	------	------	COMBINE
48	Combine	48.72	2	720	127,199	43, 44, 45, 46, 47	------	------	POA-D-1
49	Combine	43.07	2	720	111,091	43, 44, 45, 47,	------	------	POA-D-1 ONSITE & OFFSITE DIST.
50	SCS Runoff	21.85	2	718	53,029	------	------	------	PR-D-5-OFFSITE
51	Combine	69.87	2	720	180,228	48, 50	------	------	POA-D
52	Combine	61.24	2	720	160,710	34, 38, 43, 44, 45, 50,	------	------	POA-D ONSITE & OFFSITE DIST.
54	SCS Runoff	1.745	2	716	3,781	------	------	------	PR-E-1
55	Reservoir	1.609	2	718	1,304	54	453.03	1,251	RG5-1 ROUTING
56	SCS Runoff	1.430	2	716	3,149	------	------	------	PR-E-2
57	Reservoir	1.176	2	718	665	56	458.11	1,013	RG5-2 ROUTING
58	SCS Runoff	4.362	2	716	9,452	------	------	------	PR-E-3-DISTURBED
59	SCS Runoff	0.147	2	716	302	------	------	------	PR-E-3-UNDISTURBED
60	Combine	4.509	2	716	9,754	58, 59	------	------	PR-E-3
61	Reservoir	4.262	2	718	4,599	60	470.26	1,926	RG5-3 ROUTING
62	SCS Runoff	9.581	2	716	21,281	------	------	------	PR-E-4-DISTURBED
63	SCS Runoff	7.442	2	720	19,440	------	------	------	PR-E-4-UNDISTURBED
64	Combine	16.15	2	718	40,721	62, 63	------	------	PR-E-4
65	Reservoir	13.54	2	720	14,634	64	455.07	7,847	UGD-INF5-1 ROUTING
66	SCS Runoff	7.442	2	720	19,440	------	------	------	PR-E-5
67	Reservoir	5.703	2	726	6,843	66	455.50	5,890	UGD-INF5-2 ROUTING
68	SCS Runoff	9.594	2	716	22,507	------	------	------	PR-E-6
69	Reservoir	5.861	2	720	7,234	68	450.08	9,142	UGD-INF5-3 ROUTING
70	SCS Runoff	24.69	2	716	57,193	------	------	------	PR-E-7
71	Reservoir	7.521	2	724	11,437	70	444.33	20,655	UGD-INF5-4 ROUTING
72	SCS Runoff	46.62	2	720	121,791	------	------	------	PR-E-8
73	Reservoir	6.486	2	744	102,023	72	443.83	67,439	PR-E-8 ROUTING

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

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
74	SCS Runoff	57.99	2	720	158,029	------	------	------	PR-E-10-ONSITE-DISTURBED
75	SCS Runoff	76.75	2	724	240,873	------	------	------	PR-E-10-ONSITE-UNDISTURBED
76	SCS Runoff	9.934	2	720	29,126	------	------	------	PR-E-10-OFFSITE-DISTURBED
77	SCS Runoff	14.41	2	724	46,184	------	------	------	PR-E-10-OFFSITE-UNDISTURBED
78	Combine	154.21	2	722	474,213	74, 75, 76, 77	------	------	PR-E-10
79	SCS Runoff	11.68	2	722	33,325	------	------	------	PR-E-11-DISTURBED
80	SCS Runoff	64.96	2	722	192,214	------	------	------	PR-E-11-UNDISTURBED
81	Combine	76.64	2	722	225,540	79, 80	------	------	PR-E-11
82	SCS Runoff	11.86	2	724	37,219	------	------	------	PR-E-12-DISTURBED
83	SCS Runoff	103.33	2	724	324,886	------	------	------	PR-E-12-UNDISTURBED
84	Combine	115.19	2	724	362,105	82, 83	------	------	PR-E-12
85	Combine	27.16	2	722	35,278	55, 57, 61, 65, 67, 69, 71, 73, 78, 81, 84, 85, 86	------	------	COMBINE
86	Combine	350.32	2	722	1,175,317		------	------	COMBINE
87	Combine	377.48	2	722	1,210,596		------	------	POA-E
88	Combine	96.84	2	722	371,158	71, 73, 74, 76, 79, 82, 85, 88	------	------	POA-E DISTURBED COMBINE
89	Combine	124.00	2	722	406,437		------	------	POA-E DISTURBED
91	Combine	1010.53	2	724	3,705,281	31, 87,	------	------	TOTAL BRODHEAD CREEK

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

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	34.40	2	726	120,134	------	------	------	PR-A-1-A-ONSITE
2	SCS Runoff	8.709	2	732	40,749	------	------	------	PR-A-1-A-OFFSITE-DISTURBED
3	SCS Runoff	190.88	2	732	844,171	------	------	------	PR-A-1-A-OFFSITE-UNDISTURBED
4	SCS Runoff	116.88	2	722	336,606	------	------	------	PR-A-1-D-OFFSITE
5	SCS Runoff	16.07	2	718	39,749	------	------	------	PR-A-1-E-ONSITE
6	Reservoir	9.775	2	724	19,705	5	487.68	14,960	TEMP-INF1-1 ROUTING
7	Combine	326.00	2	726	1,361,365	1, 2, 3, 4, 6	------	------	Combined POA-A-1
8	Combine	51.89	2	726	180,589	1, 2, 6,	------	------	POA-A-1 ONSITE & OFFSITE DISTU
10	SCS Runoff	71.68	2	724	226,204	------	------	------	PR-A-2-A-ONSITE
11	SCS Runoff	128.64	2	722	367,711	------	------	------	PR-A-2-A-OFFSITE
12	Combine	198.23	2	722	593,914	10, 11	------	------	Combined POA-A-2
14	SCS Runoff	95.71	2	724	304,637	------	------	------	PR-A-3-ONSITE
15	SCS Runoff	130.71	2	732	572,055	------	------	------	PR-A-3-OFFSITE
16	Combine	210.76	2	728	876,691	14, 15	------	------	POA-A-3
18	Combine	218.09	2	724	711,429	8, 10, 14,	------	------	POA-A ONSITE & OFFSITE DIST.
20	SCS Runoff	24.41	2	720	64,641	------	------	------	PR-A-4-ONSITE
22	SCS Runoff	15.69	2	718	40,131	------	------	------	PR-B-1-ONSITE
23	SCS Runoff	40.98	2	718	101,360	------	------	------	PR-B-1-OFFSITE
24	SCS Runoff	32.71	2	724	103,497	------	------	------	PR-B-2-ONSITE
25	Reservoir	2.229	2	770	23,432	24	438.15	60,630	PR-B-2-ONSITE ROUTING
26	Combine	15.69	2	718	63,563	22, 25	------	------	PR-B-ONSITE
27	Combine	56.67	2	718	164,923	22, 23, 25,	------	------	POA-B
29	SCS Runoff	10.27	2	716	23,284	------	------	------	PR-C (POA-C)
31	Combine	782.28	2	724	3,084,818	7, 12, 16, 20, 27, 29,	------	------	Combined POA-ABC
33	SCS Runoff	23.33	2	716	53,937	------	------	------	PR-D-1
34	Reservoir	6.882	2	724	12,612	33	459.98	22,569	PR-D-1 ROUTING
35	SCS Runoff	4.636	2	716	10,248	------	------	------	PR-D-2-DISTURBED
36	SCS Runoff	0.635	2	716	1,320	------	------	------	PR-D-2-UNDISTURBED
37	Combine	5.271	2	716	11,567	35, 36	------	------	PR-D-2
38	Reservoir	4.097	2	720	4,445	37	461.65	3,258	PR-D-2 ROUTING

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

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
40	SCS Runoff	4.661	2	716	11,149	------	------	------	PR-D-3
41	Reservoir	3.765	2	720	4,696	40	460.75	3,227	PR-D-3 ROUTING
43	SCS Runoff	13.38	2	720	36,423	------	------	------	PR-D-4-ONSITE-DISTURBED
44	SCS Runoff	24.98	2	722	70,968	------	------	------	PR-D-4-ONSITE-UNDISTURBED
45	SCS Runoff	5.147	2	716	11,902	------	------	------	PR-D-4-OFFSITE-DISTURBED
46	SCS Runoff	8.978	2	716	19,557	------	------	------	PR-D-4-OFFSITE-UNDISTURBED
47	Combine	13.92	2	720	21,753	34, 38, 41,	------	------	COMBINE
48	Combine	61.95	2	720	160,603	43, 44, 45, 46, 47	------	------	POA-D-1
49	Combine	55.21	2	720	141,046	43, 44, 45, 47,	------	------	POA-D-1 ONSITE & OFFSITE DIST.
50	SCS Runoff	26.14	2	718	64,199	------	------	------	PR-D-5-OFFSITE
51	Combine	87.22	2	720	224,803	48, 50	------	------	POA-D
52	Combine	76.71	2	720	200,549	34, 38, 43, 44, 45, 50,	------	------	POA-D ONSITE & OFFSITE DIST.
54	SCS Runoff	2.086	2	716	4,577	------	------	------	PR-E-1
55	Reservoir	1.964	2	718	1,882	54	453.05	1,282	RG5-1 ROUTING
56	SCS Runoff	1.701	2	716	3,791	------	------	------	PR-E-2
57	Reservoir	1.536	2	718	1,020	56	458.13	1,038	RG5-2 ROUTING
58	SCS Runoff	5.216	2	716	11,442	------	------	------	PR-E-3-DISTURBED
59	SCS Runoff	0.182	2	716	377	------	------	------	PR-E-3-UNDISTURBED
60	Combine	5.397	2	716	11,819	58, 59	------	------	PR-E-3
61	Reservoir	5.122	2	718	6,115	60	470.30	1,995	RG5-3 ROUTING
62	SCS Runoff	11.37	2	716	25,549	------	------	------	PR-E-4-DISTURBED
63	SCS Runoff	9.221	2	720	24,260	------	------	------	PR-E-4-UNDISTURBED
64	Combine	19.55	2	718	49,809	62, 63	------	------	PR-E-4
65	Reservoir	17.03	2	720	20,392	64	455.35	8,427	UGD-INF5-1 ROUTING
66	SCS Runoff	9.221	2	720	24,260	------	------	------	PR-E-5
67	Reservoir	7.948	2	724	10,566	66	455.70	6,286	UGD-INF5-2 ROUTING
68	SCS Runoff	11.28	2	716	26,660	------	------	------	PR-E-6
69	Reservoir	8.959	2	720	10,665	68	450.27	9,702	UGD-INF5-3 ROUTING
70	SCS Runoff	29.07	2	716	67,927	------	------	------	PR-E-7
71	Reservoir	12.58	2	722	17,766	70	444.69	23,321	UGD-INF5-4 ROUTING
72	SCS Runoff	57.77	2	720	151,990	------	------	------	PR-E-8
73	Reservoir	21.22	2	732	132,205	72	444.26	75,899	PR-E-8 ROUTING

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

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
74	SCS Runoff	69.44	2	720	191,317	------	------	------	PR-E-10-ONSITE-DISTURBED
75	SCS Runoff	95.25	2	724	300,599	------	------	------	PR-E-10-ONSITE-UNDISTURBED
76	SCS Runoff	11.68	2	720	34,501	------	------	------	PR-E-10-OFFSITE-DISTURBED
77	SCS Runoff	17.44	2	724	56,400	------	------	------	PR-E-10-OFFSITE-UNDISTURBED
78	Combine	188.06	2	722	582,818	74, 75, 76, 77	------	------	PR-E-10
79	SCS Runoff	14.26	2	722	41,065	------	------	------	PR-E-11-DISTURBED
80	SCS Runoff	77.58	2	722	232,047	------	------	------	PR-E-11-UNDISTURBED
81	Combine	91.84	2	722	273,112	79, 80	------	------	PR-E-11
82	SCS Runoff	14.72	2	724	46,447	------	------	------	PR-E-12-DISTURBED
83	SCS Runoff	127.73	2	724	404,131	------	------	------	PR-E-12-UNDISTURBED
84	Combine	142.45	2	724	450,578	82, 83	------	------	PR-E-12
85	Combine	39.99	2	720	50,640	55, 57, 61, 65, 67, 69,	------	------	COMBINE
86	Combine	431.83	2	724	1,456,480	71, 73, 78, 81, 84,	------	------	COMBINE
87	Combine	468.49	2	722	1,507,120	85, 86	------	------	POA-E
88	Combine	120.27	2	720	463,302	71, 73, 74, 76, 79, 82,	------	------	POA-E DISTURBED COMBINE
89	Combine	160.27	2	720	513,941	85, 88	------	------	POA-E DISTURBED
91	Combine	1245.40	2	724	4,591,939	31, 87,	------	------	TOTAL BRODHEAD CREEK

APPENDIX D

Pond Routing Calculations

APPENDIX D
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PR-E-4 POND ROUTING (UGD-INF5-1)

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EMERGENCY SPILLWAY CALCULATIONS

ANTI-SEEP COLLAR CALCULATIONS

PR-A-1-E-ONSITE POND ROUTING (TEMP-INF1-1)

Pond Report

Pond No. 13 - TEMP-INF1-1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 485.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	485.00	4,465	0	0
1.00	486.00	5,255	4,854	4,854
2.00	487.00	6,101	5,672	10,526
3.00	488.00	7,005	6,547	17,073
4.00	489.00	7,964	7,479	24,552
4.93	489.93	8,909	7,841	32,393

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	0.00	0.00	0.00
Span (in)	= 18.00	0.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 485.00	0.00	0.00	0.00
Length (ft)	= 24.00	0.00	0.00	0.00
Slope (%)	= 4.19	0.00	0.00	n/a
N-Value	= .012	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

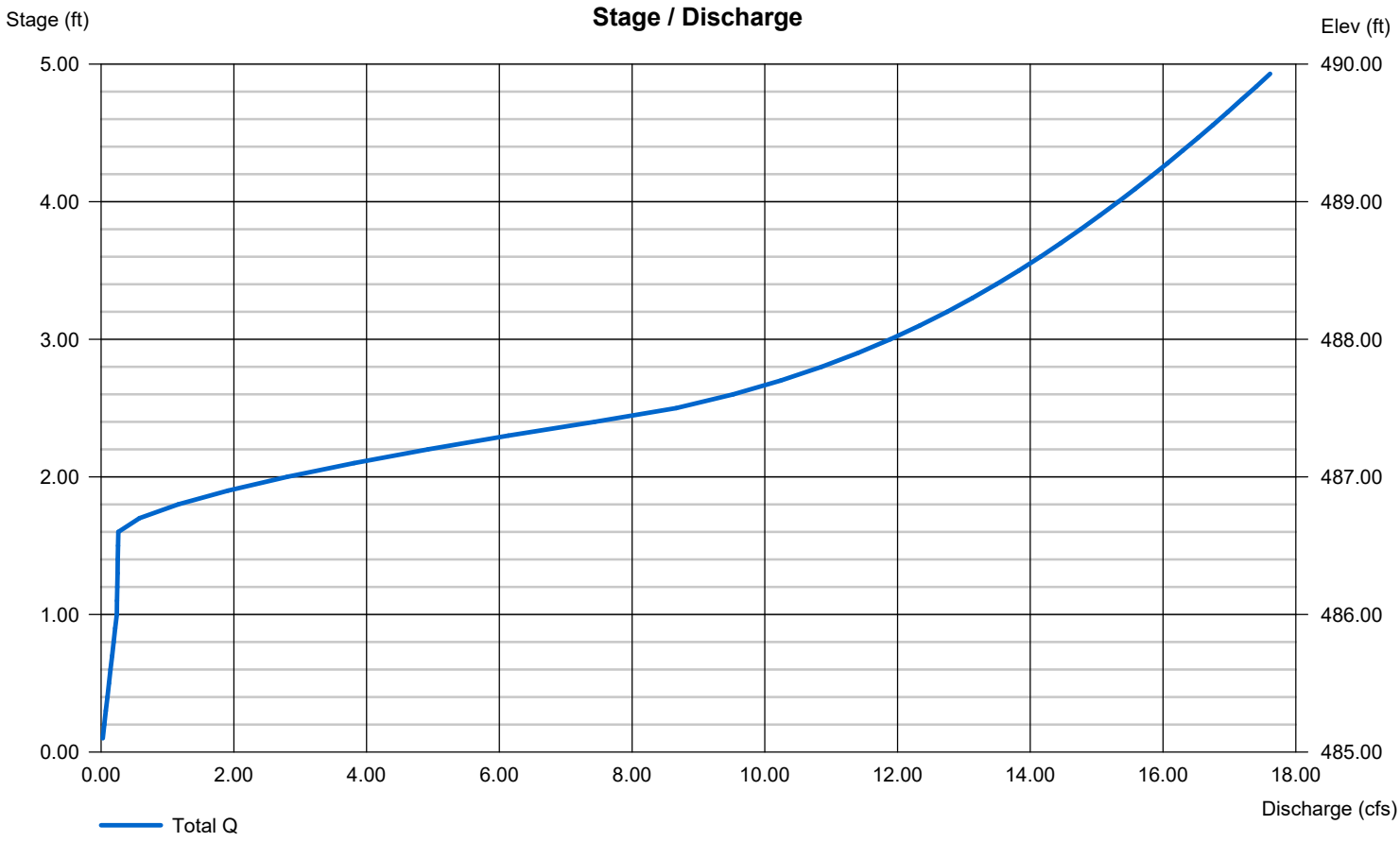
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 3.00	0.00	0.00	0.00
Crest El. (ft)	= 486.60	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 1.940 (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

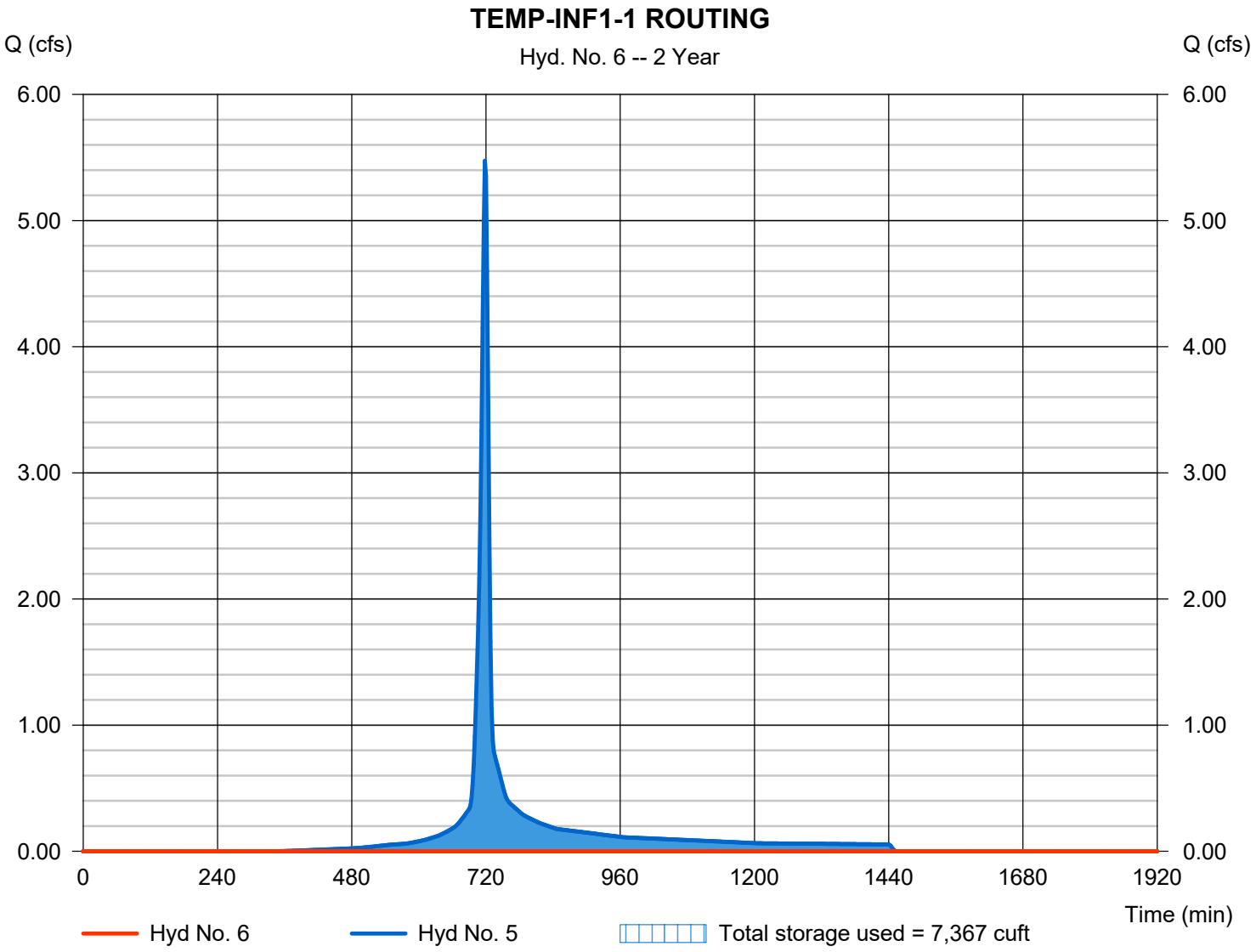
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 6

TEMP-INF1-1 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	0.000 cfs
Storm frequency	=	2 yrs	Time to peak	=	730 min
Time interval	=	2 min	Hyd. volume	=	0 cuft
Inflow hyd. No.	=	5 - PR-A-1-E-ONSITE	Max. Elevation	=	486.44 ft
Reservoir name	=	TEMP-INF1-1	Max. Storage	=	7,367 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



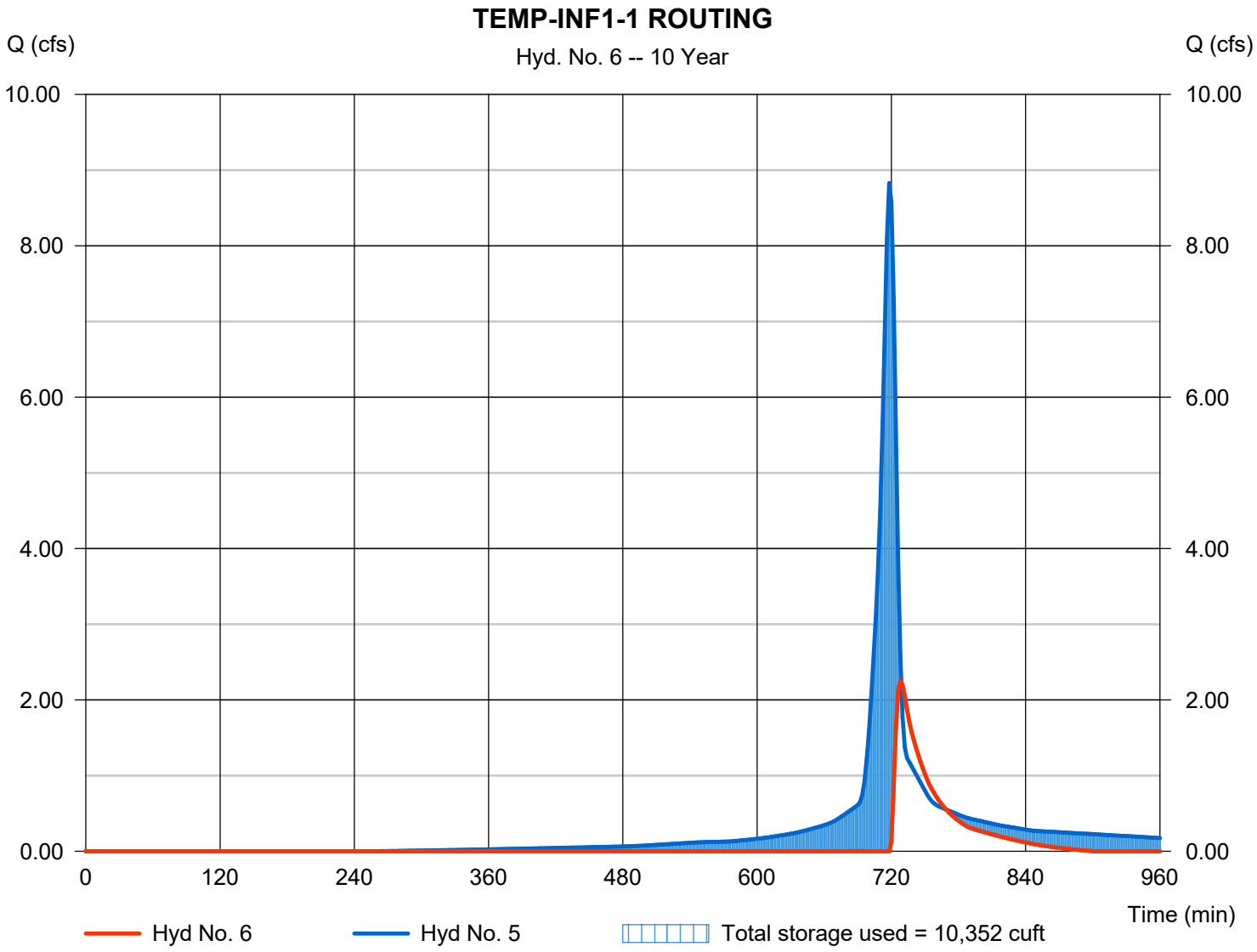
Hydrograph Report

Hyd. No. 6

TEMP-INF1-1 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	2.255 cfs
Storm frequency	=	10 yrs	Time to peak	=	728 min
Time interval	=	2 min	Hyd. volume	=	4,976 cuft
Inflow hyd. No.	=	5 - PR-A-1-E-ONSITE	Max. Elevation	=	486.97 ft
Reservoir name	=	TEMP-INF1-1	Max. Storage	=	10,352 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



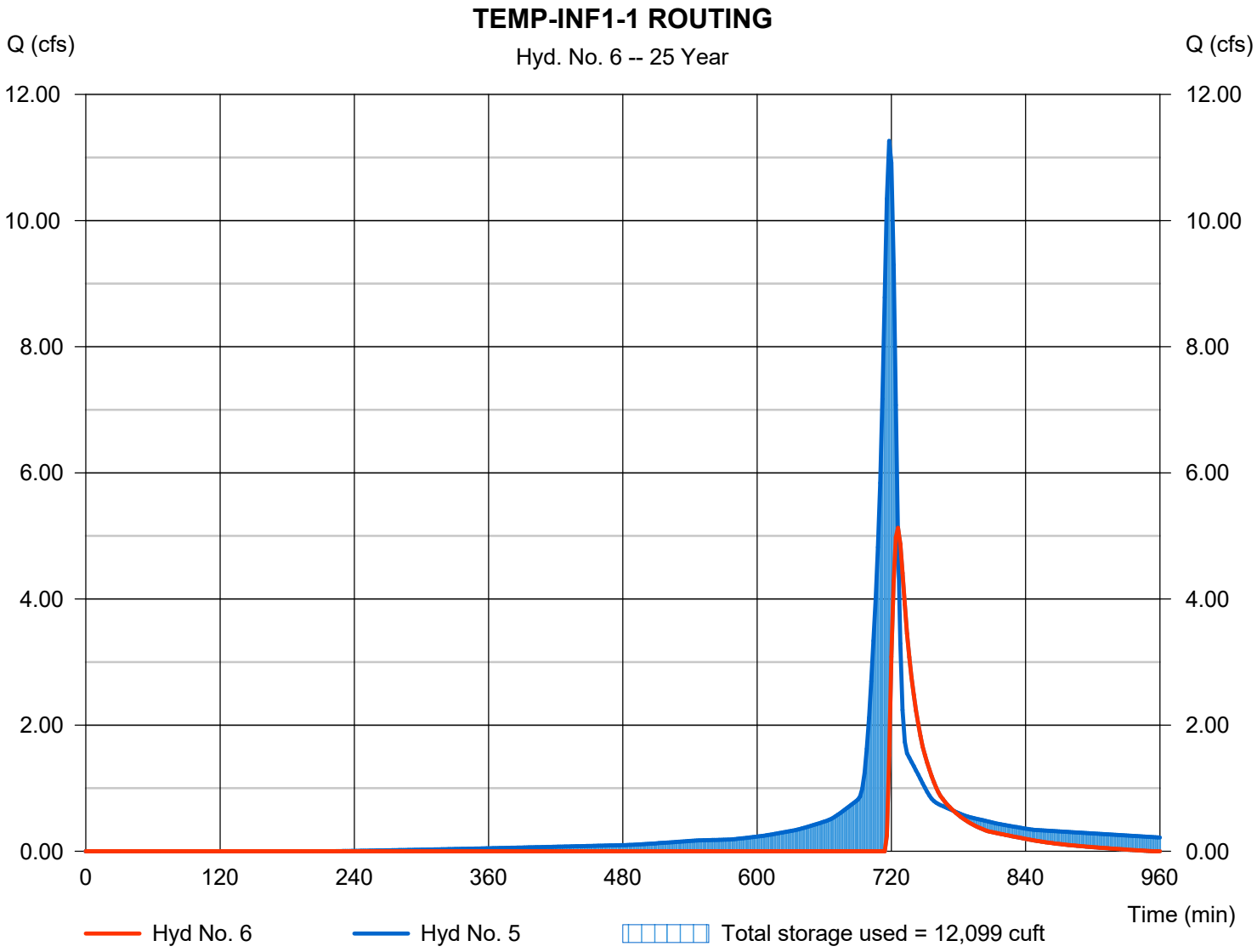
Hydrograph Report

Hyd. No. 6

TEMP-INF1-1 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	5.128 cfs
Storm frequency	=	25 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	9,709 cuft
Inflow hyd. No.	=	5 - PR-A-1-E-ONSITE	Max. Elevation	=	487.24 ft
Reservoir name	=	TEMP-INF1-1	Max. Storage	=	12,099 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



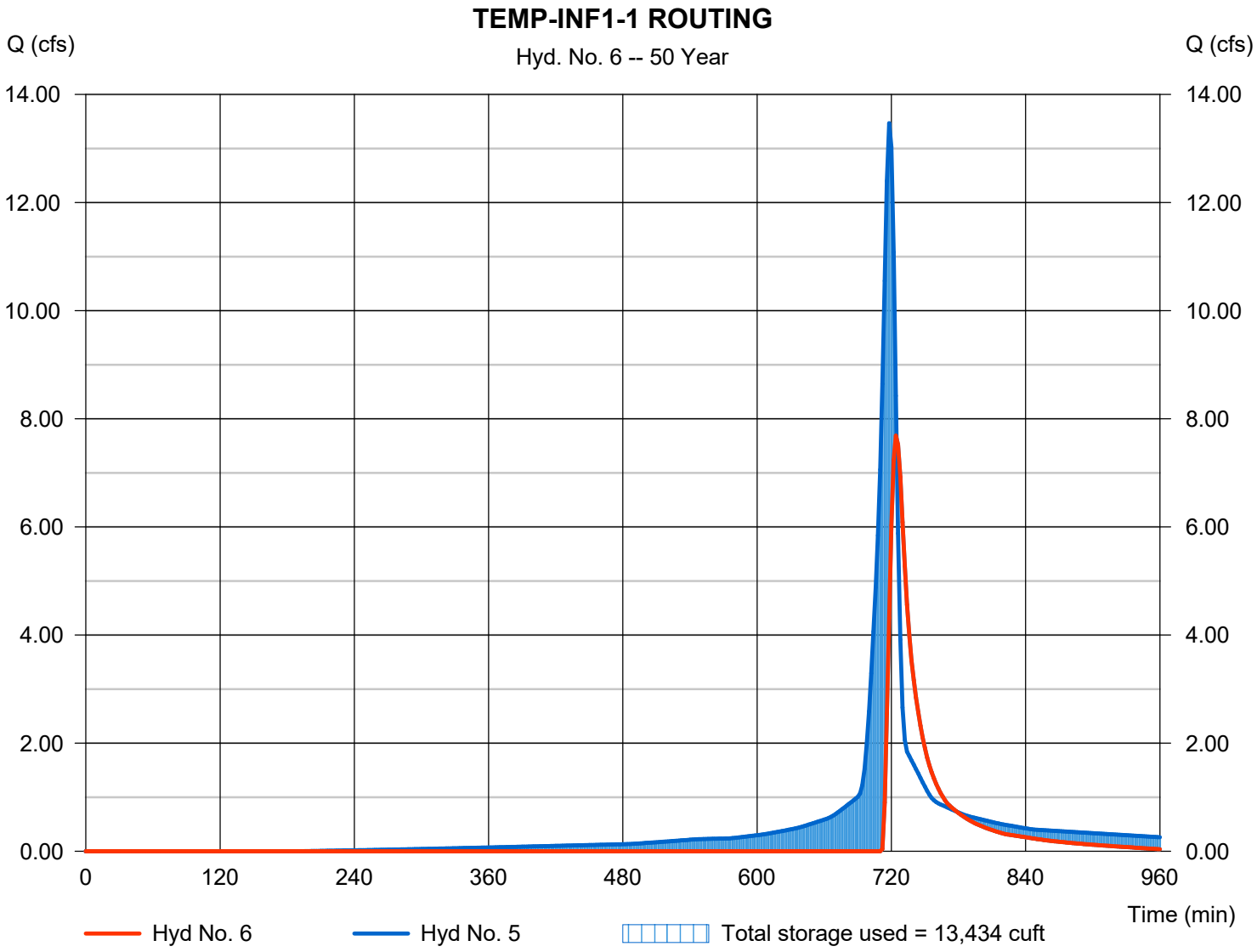
Hydrograph Report

Hyd. No. 6

TEMP-INF1-1 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	7.688 cfs
Storm frequency	=	50 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	14,188 cuft
Inflow hyd. No.	=	5 - PR-A-1-E-ONSITE	Max. Elevation	=	487.44 ft
Reservoir name	=	TEMP-INF1-1	Max. Storage	=	13,434 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



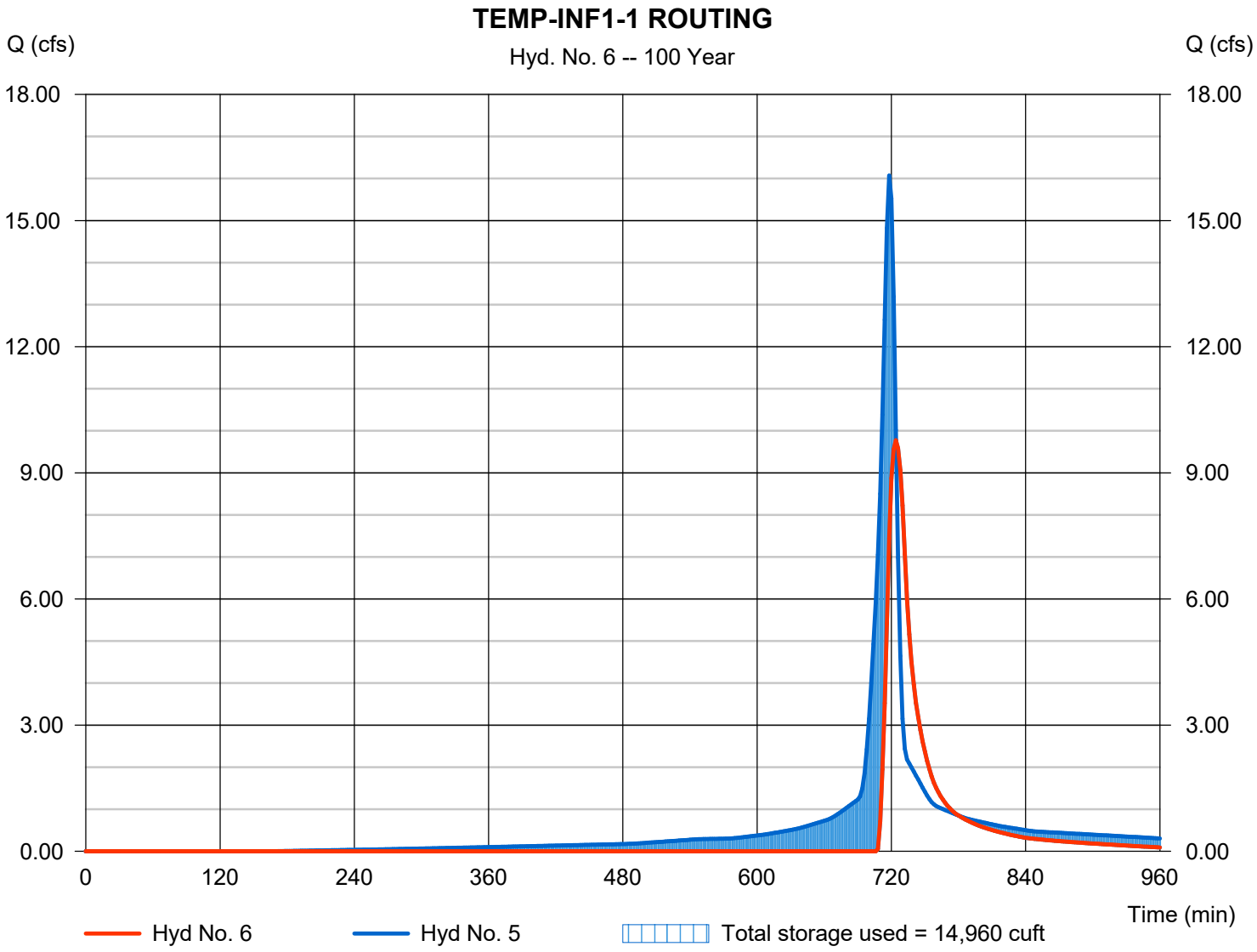
Hydrograph Report

Hyd. No. 6

TEMP-INF1-1 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	9.775 cfs
Storm frequency	=	100 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	19,705 cuft
Inflow hyd. No.	=	5 - PR-A-1-E-ONSITE	Max. Elevation	=	487.68 ft
Reservoir name	=	TEMP-INF1-1	Max. Storage	=	14,960 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



PR-D-1 POND ROUTING (INF 4-1)

Pond Report

Pond No. 1 - INF4-1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 458.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	458.00	10,511	0	0
1.00	459.00	11,401	10,952	10,952
2.00	460.00	12,328	11,860	22,812
3.00	461.00	13,287	12,803	35,615
4.00	462.00	14,275	13,777	49,392
4.50	462.50	14,959	7,307	56,699

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	0.00	0.00	0.00
Span (in)	= 18.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 457.00	0.00	0.00	0.00
Length (ft)	= 15.00	0.00	0.00	0.00
Slope (%)	= 2.00	0.00	0.00	n/a
N-Value	= .012	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

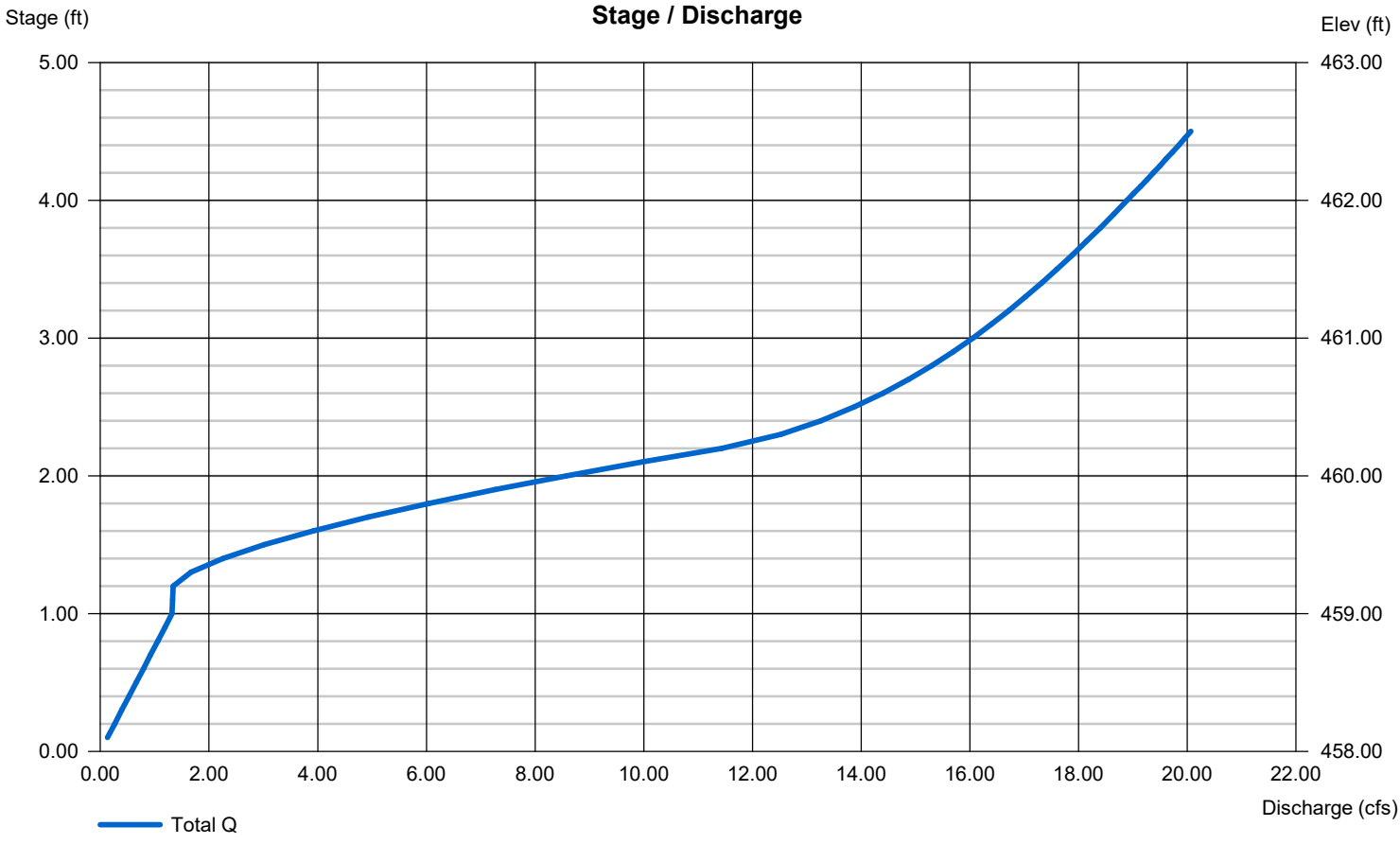
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 3.00	0.00	0.00	0.00
Crest El. (ft)	= 459.20	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 5.000 (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

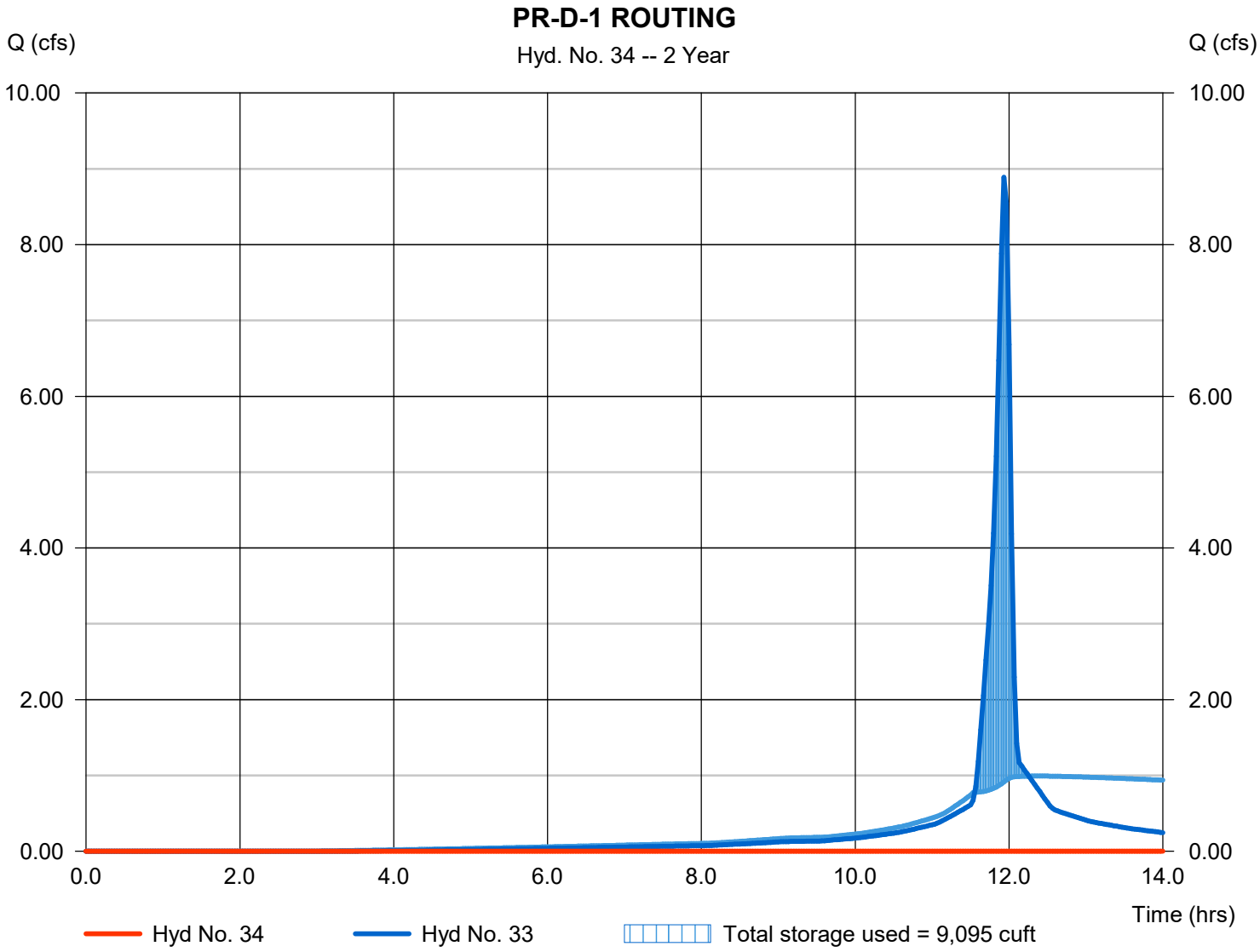
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 34

PR-D-1 ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 33 - PR-D-1	Max. Elevation	= 458.83 ft
Reservoir name	= INF4-1	Max. Storage	= 9,095 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



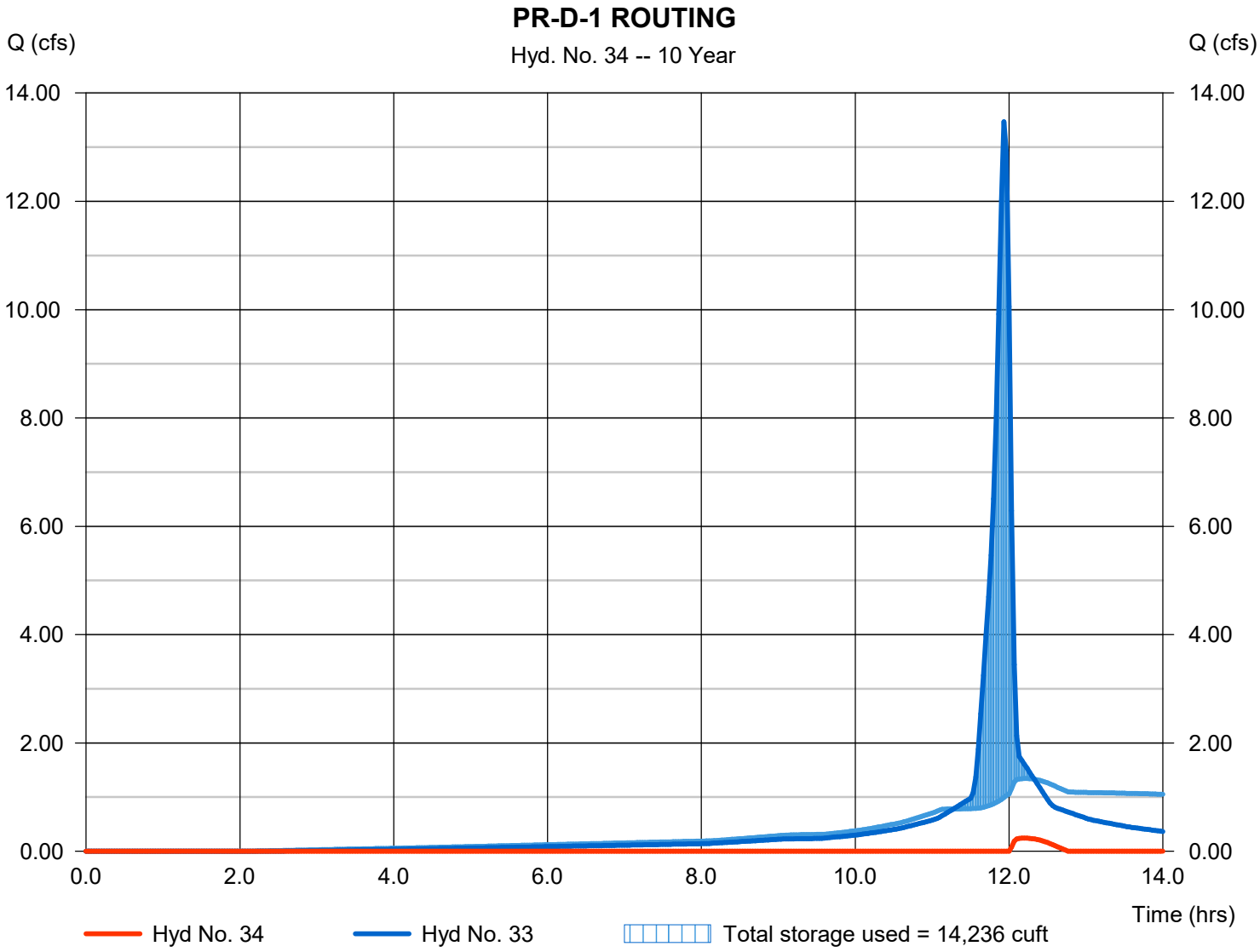
Hydrograph Report

Hyd. No. 34

PR-D-1 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	0.243 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.20 hrs
Time interval	=	2 min	Hyd. volume	=	444 cuft
Inflow hyd. No.	=	33 - PR-D-1	Max. Elevation	=	459.28 ft
Reservoir name	=	INF4-1	Max. Storage	=	14,236 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



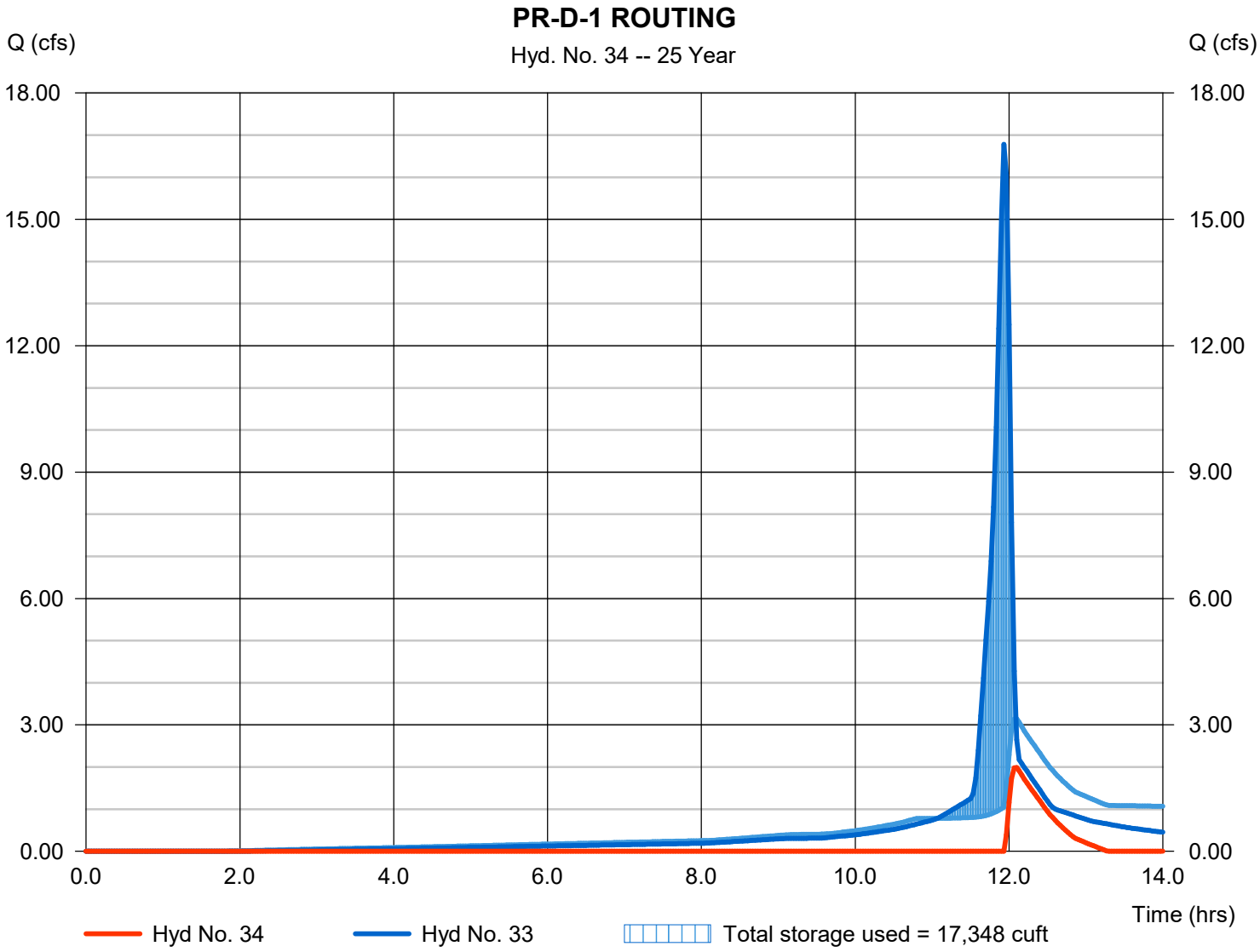
Hydrograph Report

Hyd. No. 34

PR-D-1 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	1.989 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	3,862 cuft
Inflow hyd. No.	=	33 - PR-D-1	Max. Elevation	=	459.54 ft
Reservoir name	=	INF4-1	Max. Storage	=	17,348 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



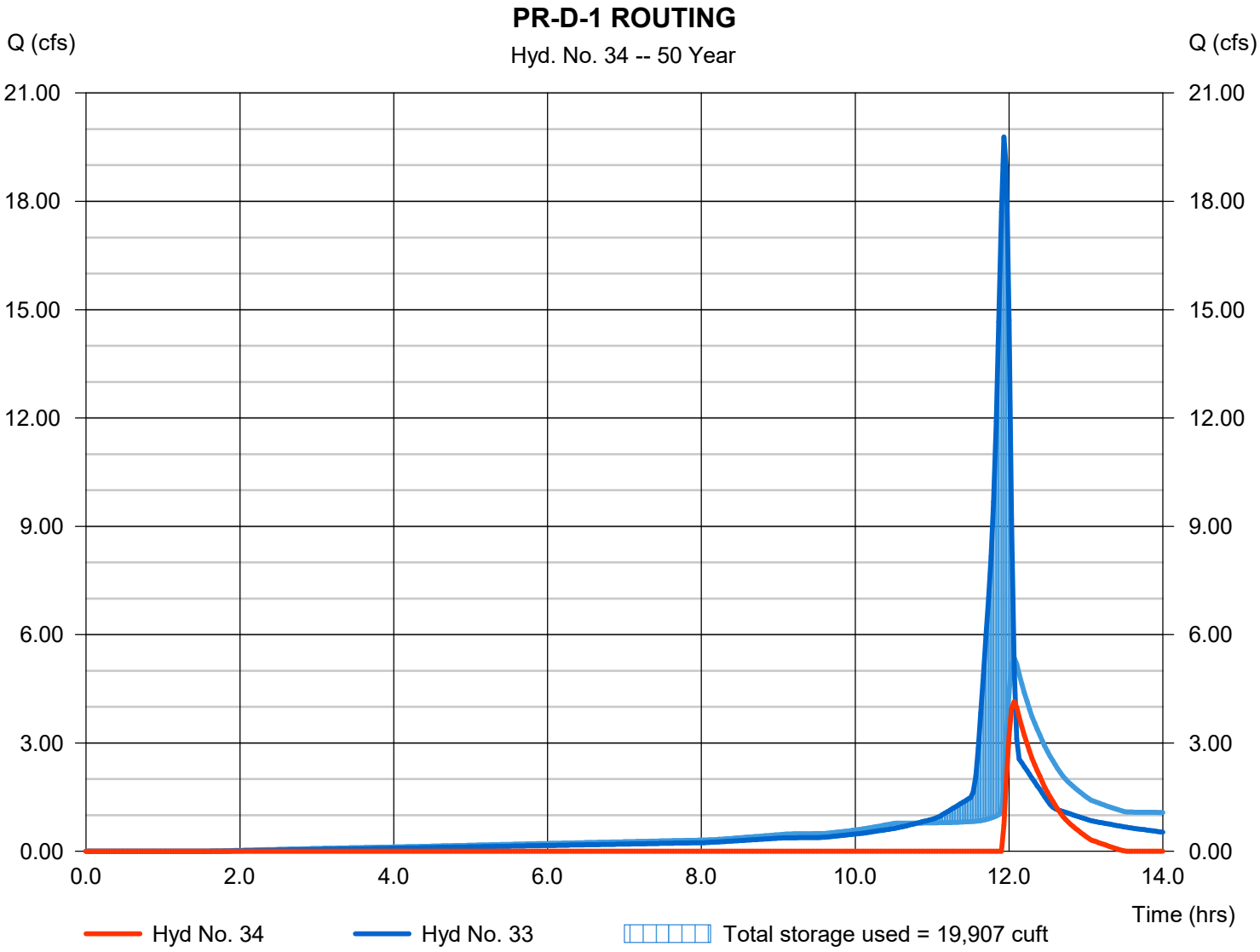
Hydrograph Report

Hyd. No. 34

PR-D-1 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	4.144 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	7,723 cuft
Inflow hyd. No.	=	33 - PR-D-1	Max. Elevation	=	459.76 ft
Reservoir name	=	INF4-1	Max. Storage	=	19,907 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

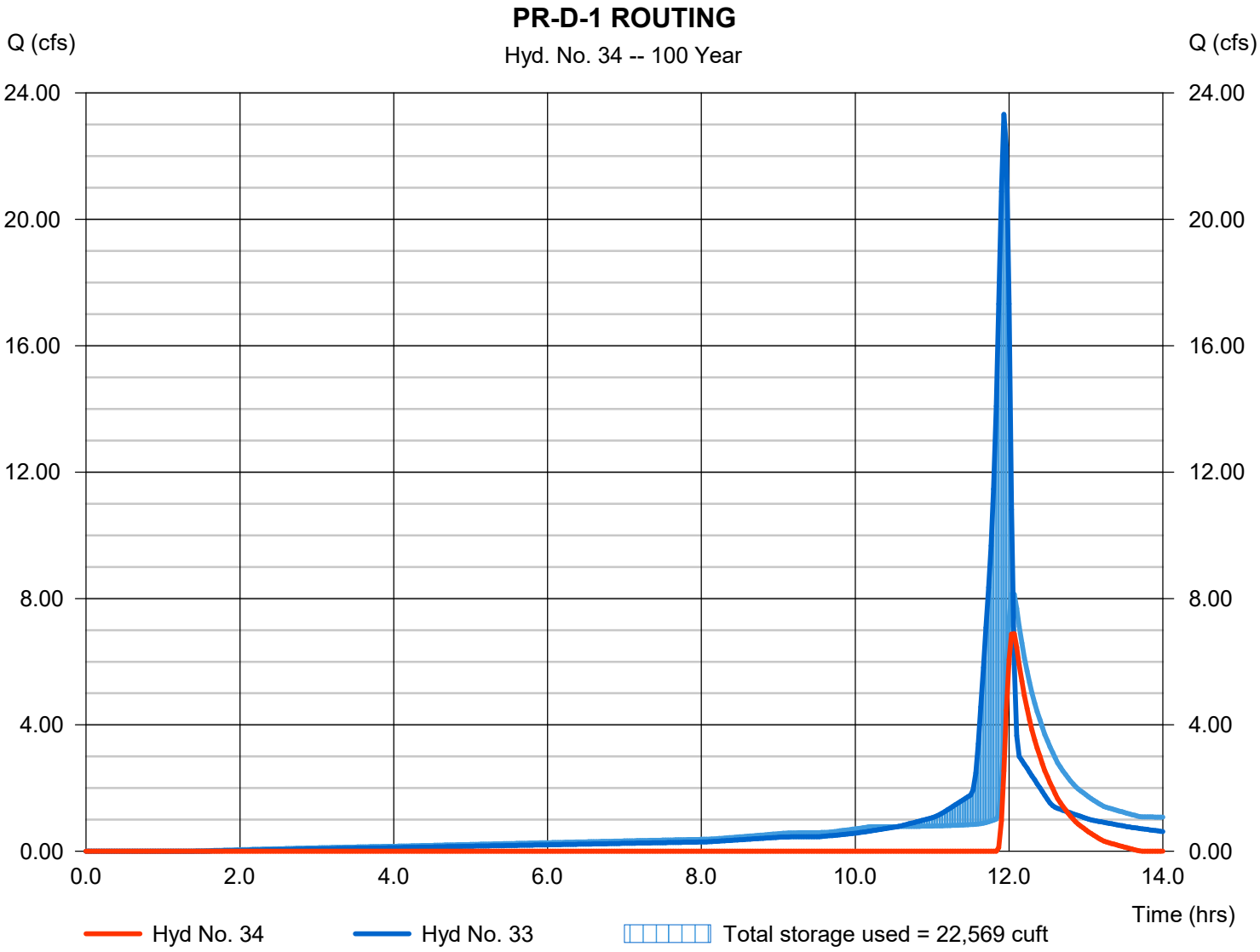
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 34

PR-D-1 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	6.882 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	12,612 cuft
Inflow hyd. No.	=	33 - PR-D-1	Max. Elevation	=	459.98 ft
Reservoir name	=	INF4-1	Max. Storage	=	22,569 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



PR-D-2 POND ROUTING (INF4-2)

Pond Report

Pond No. 2 - INF4-2

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 460.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	460.00	1,218	0	0
1.00	461.00	2,069	1,625	1,625
2.00	462.00	2,977	2,509	4,134
3.00	463.00	3,941	3,447	7,581
3.80	463.80	4,753	3,472	11,053

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	0.00	0.00	0.00
Span (in)	= 18.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 458.25	0.00	0.00	0.00
Length (ft)	= 14.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .012	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

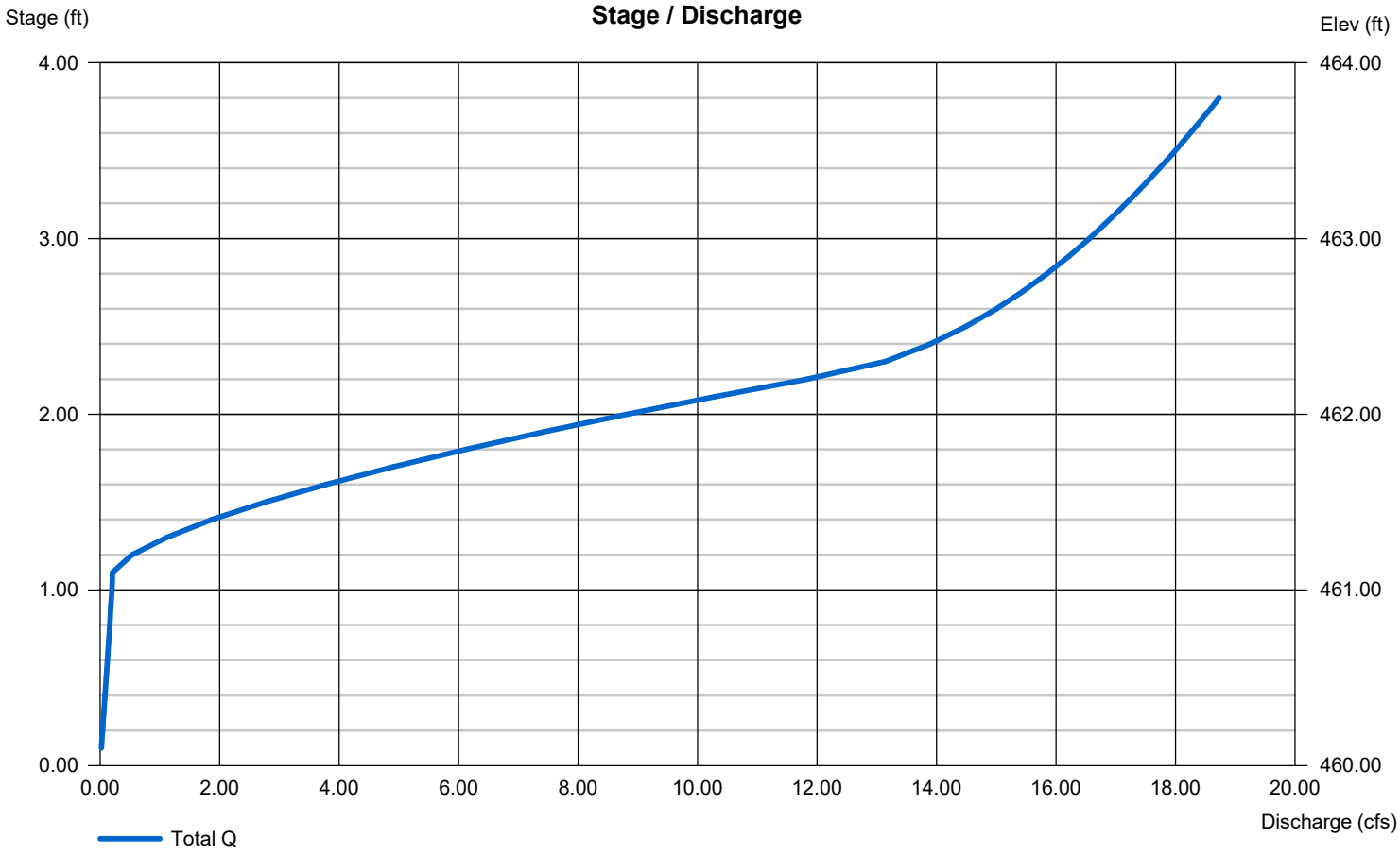
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 3.00	0.00	0.00	0.00
Crest El. (ft)	= 461.10	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 4.120 (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

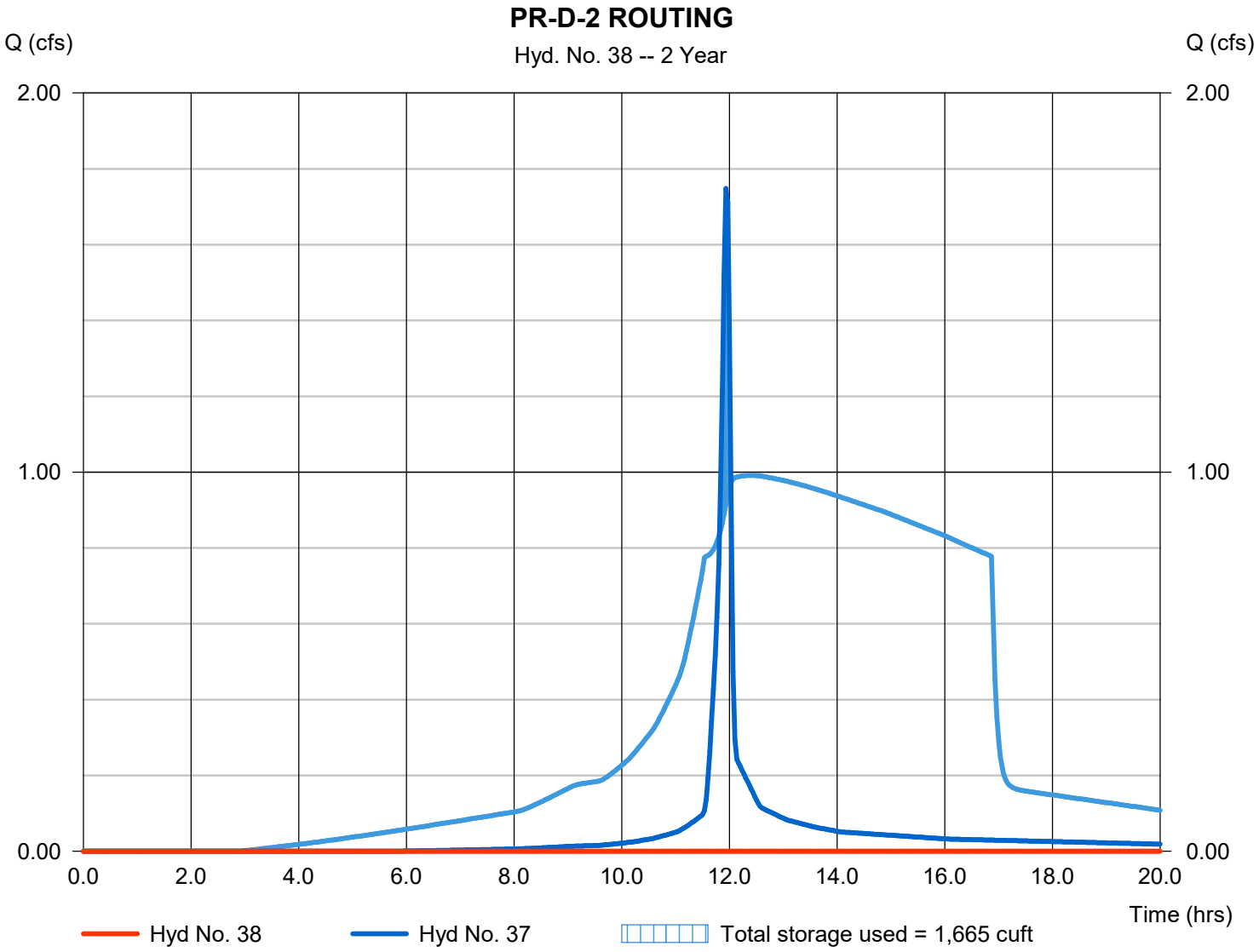
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 38

PR-D-2 ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 13.07 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 37 - PR-D-2	Max. Elevation	= 461.02 ft
Reservoir name	= INF4-2	Max. Storage	= 1,665 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

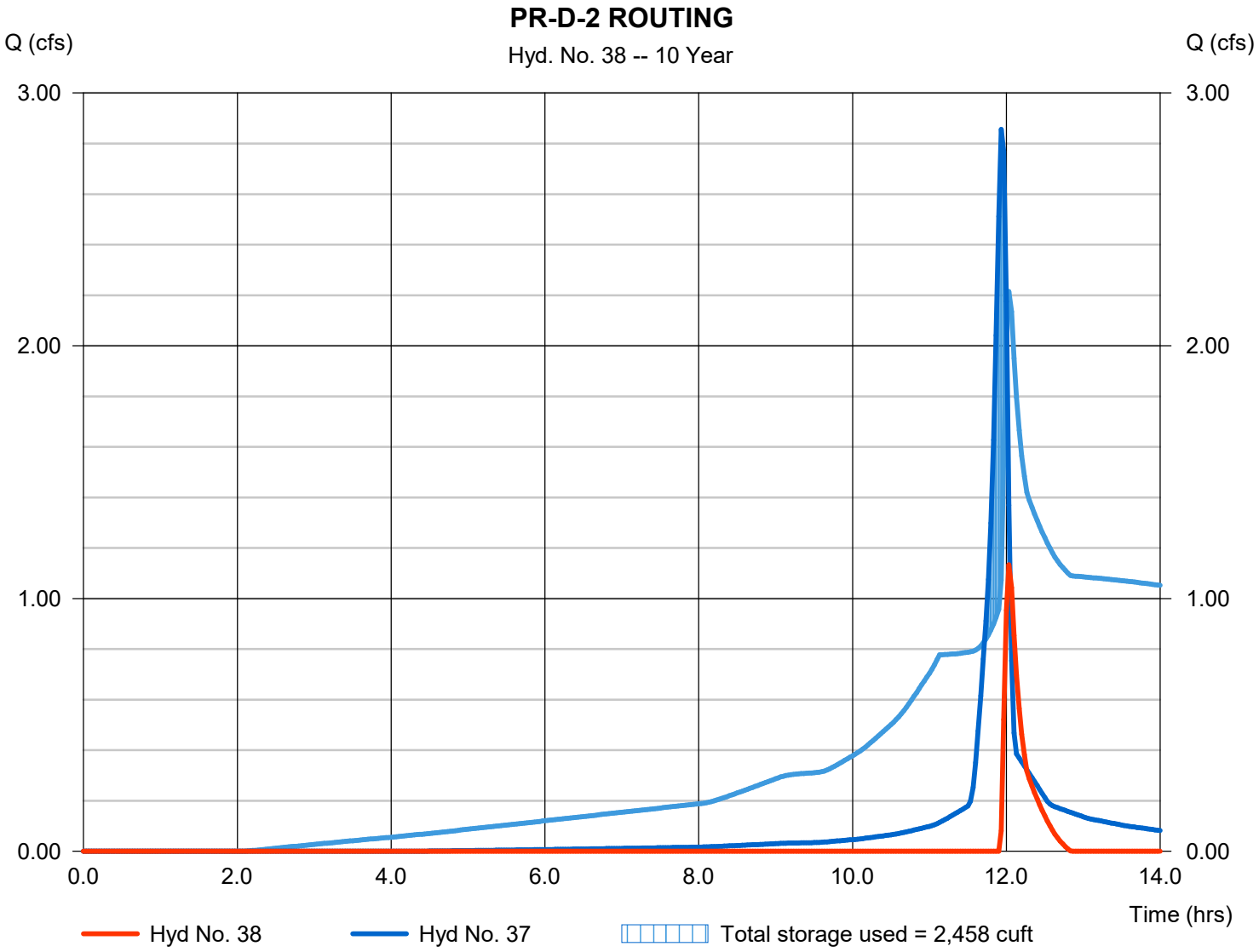
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 38

PR-D-2 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	1.133 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	1,080 cuft
Inflow hyd. No.	=	37 - PR-D-2	Max. Elevation	=	461.33 ft
Reservoir name	=	INF4-2	Max. Storage	=	2,458 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



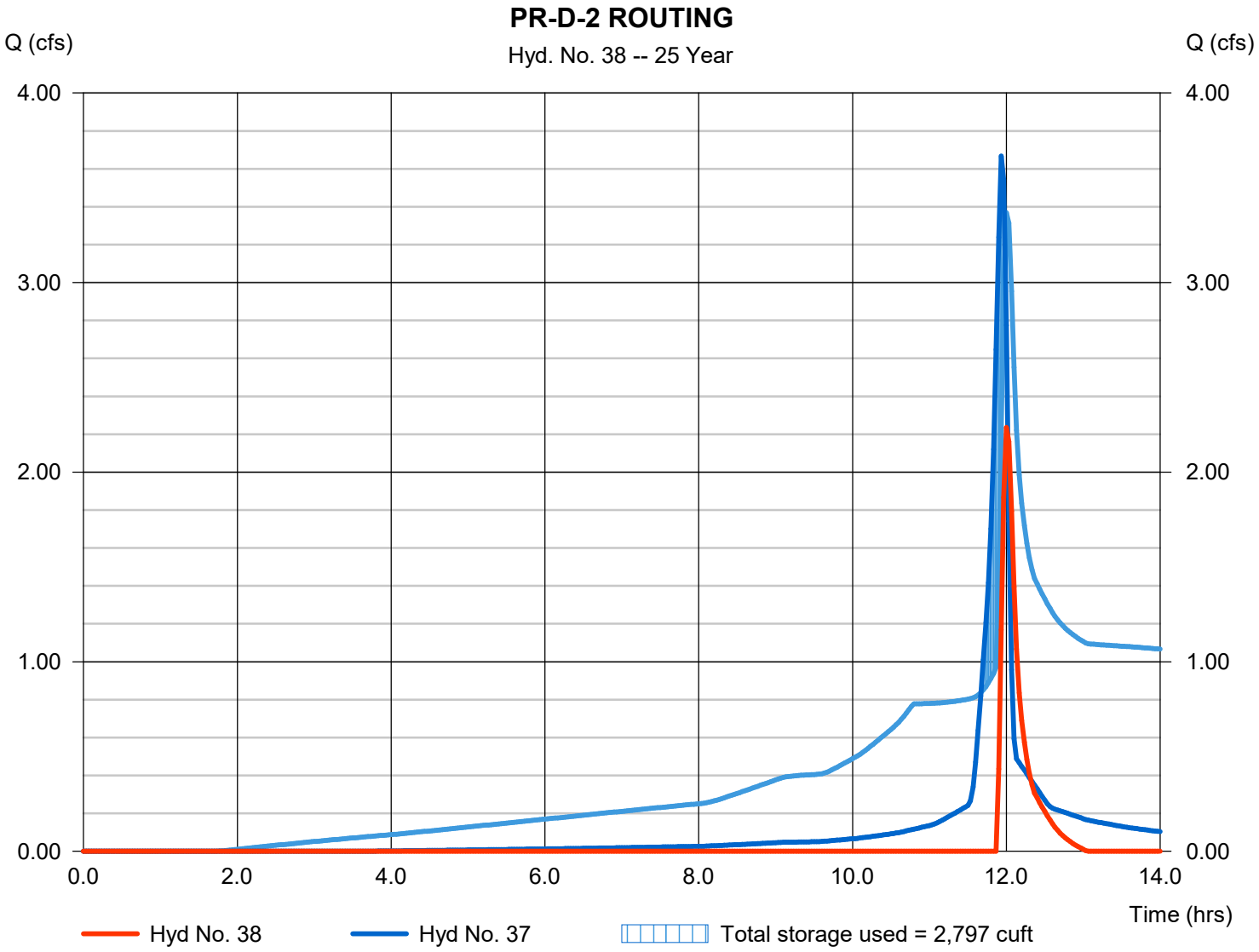
Hydrograph Report

Hyd. No. 38

PR-D-2 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	2.236 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	2,158 cuft
Inflow hyd. No.	=	37 - PR-D-2	Max. Elevation	=	461.47 ft
Reservoir name	=	INF4-2	Max. Storage	=	2,797 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

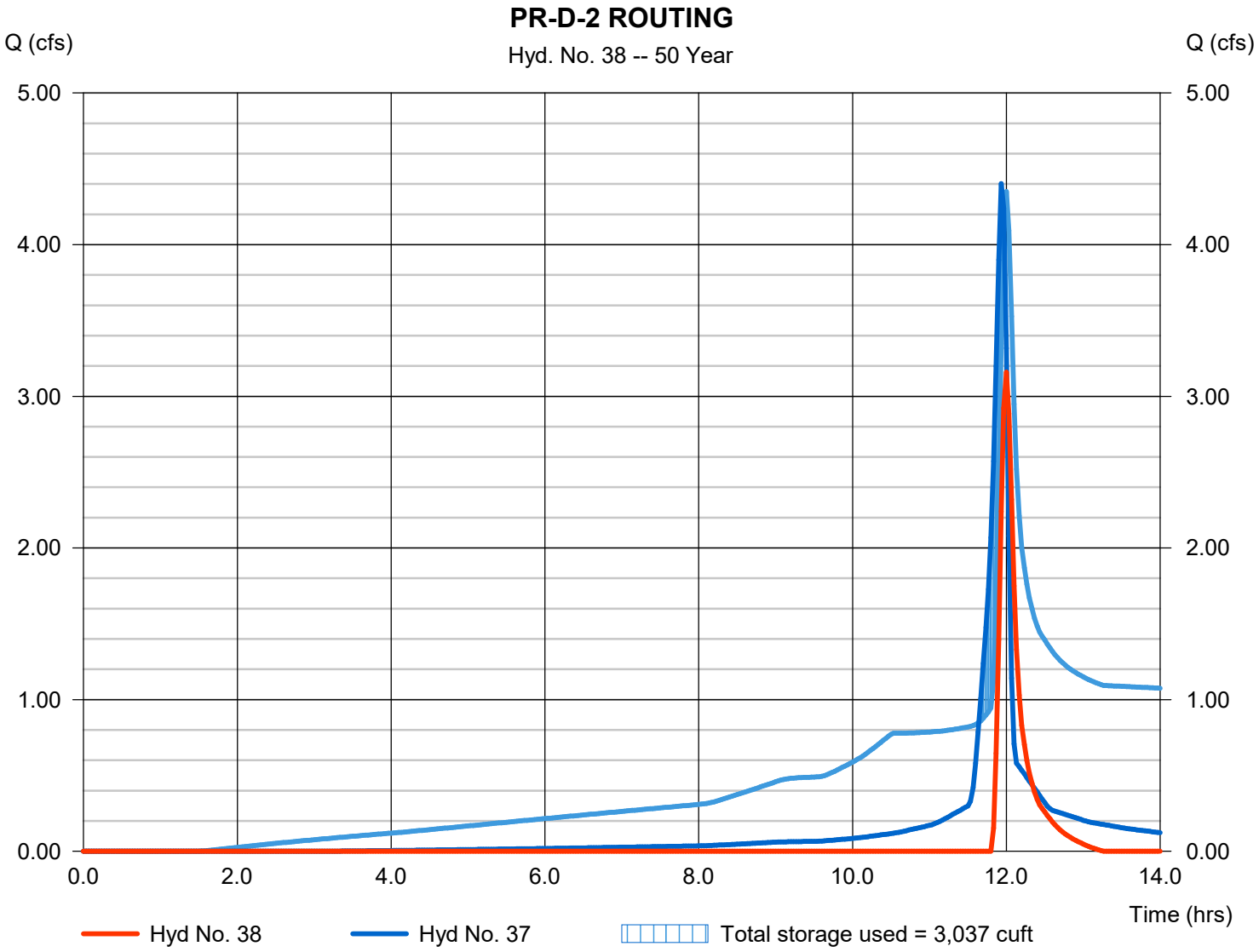
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 38

PR-D-2 ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 3.159 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 3,183 cuft
Inflow hyd. No.	= 37 - PR-D-2	Max. Elevation	= 461.56 ft
Reservoir name	= INF4-2	Max. Storage	= 3,037 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

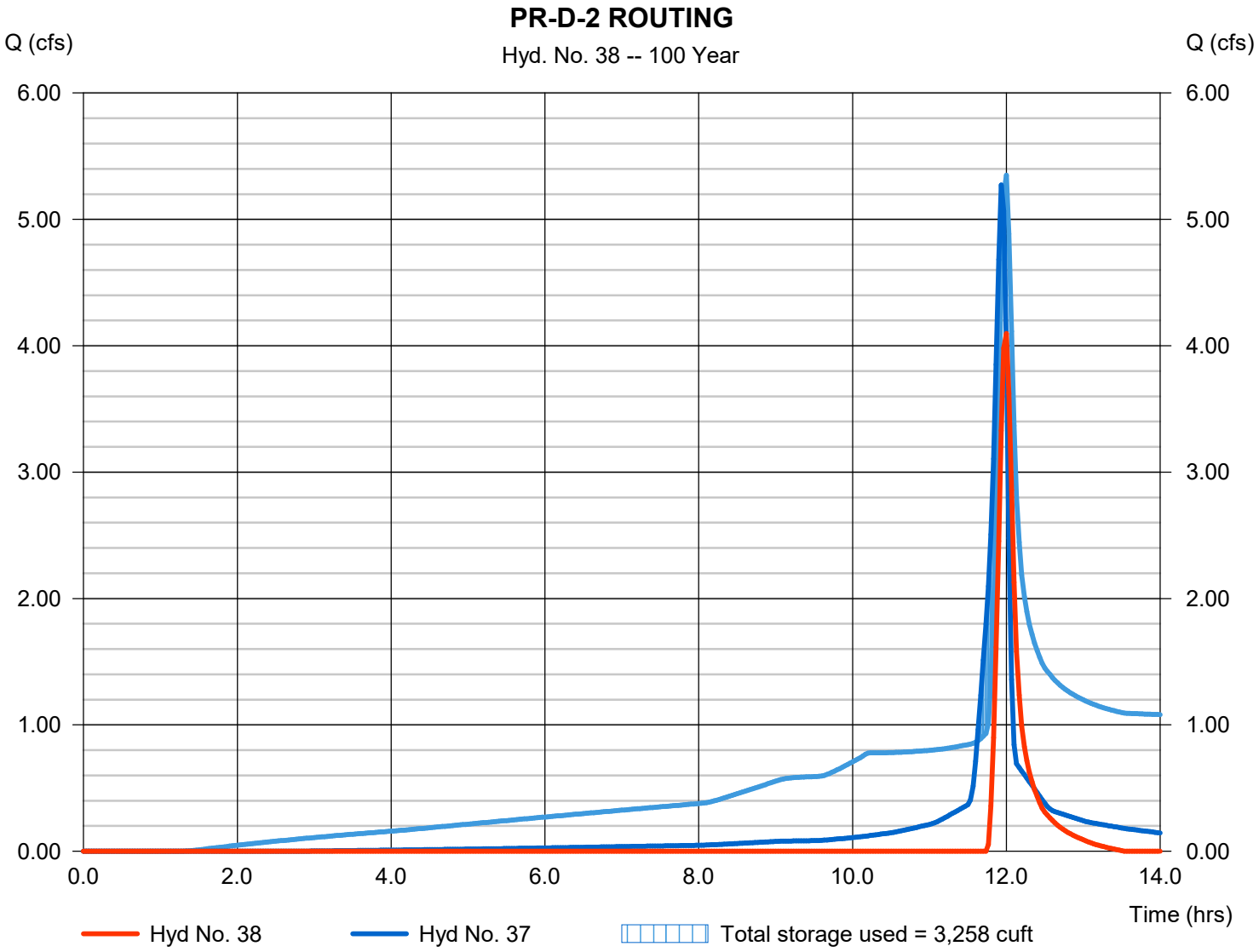
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 38

PR-D-2 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	4.097 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	4,445 cuft
Inflow hyd. No.	=	37 - PR-D-2	Max. Elevation	=	461.65 ft
Reservoir name	=	INF4-2	Max. Storage	=	3,258 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



PR-D-3 POND ROUTING (UGD-INF4-1)

Pond Report

Pond No. 17 - UGD-INF4-1

Pond Data

UG Chambers -Invert elev. = 459.25 ft, Rise x Span = 1.50 x 1.50 ft, Barrel Len = 70.50 ft, No. Barrels = 5, Slope = 0.00%, Headers = Yes
Encasement -Invert elev. = 458.75 ft, Width = 8.00 ft, Height = 2.50 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	458.75	n/a	0	0
0.25	459.00	n/a	346	346
0.50	459.25	n/a	346	692
0.75	459.50	n/a	396	1,088
1.00	459.75	n/a	430	1,518
1.25	460.00	n/a	442	1,960
1.50	460.25	n/a	442	2,401
1.75	460.50	n/a	430	2,831
2.00	460.75	n/a	396	3,227
2.25	461.00	n/a	346	3,573
2.50	461.25	n/a	346	3,919

Culvert / Orifice Structures

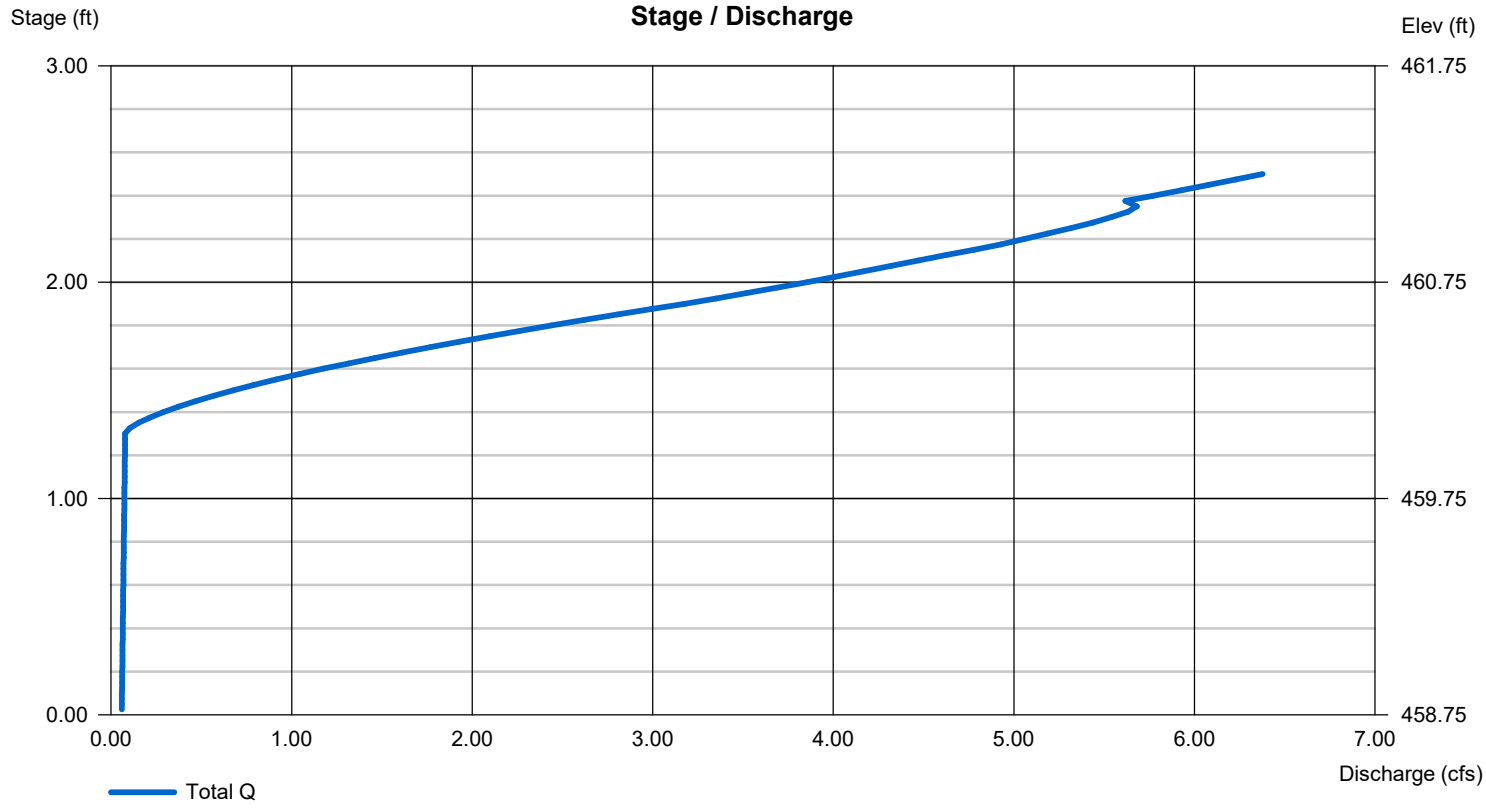
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	0.00	0.00	0.00
Span (in)	= 18.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 459.25	0.00	0.00	0.00
Length (ft)	= 82.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .012	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 2.00	0.00	0.00	0.00
Crest El. (ft)	= 460.05	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.810 (by Wet area)
TW Elev. (ft) = 0.00

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



Hydrograph Report

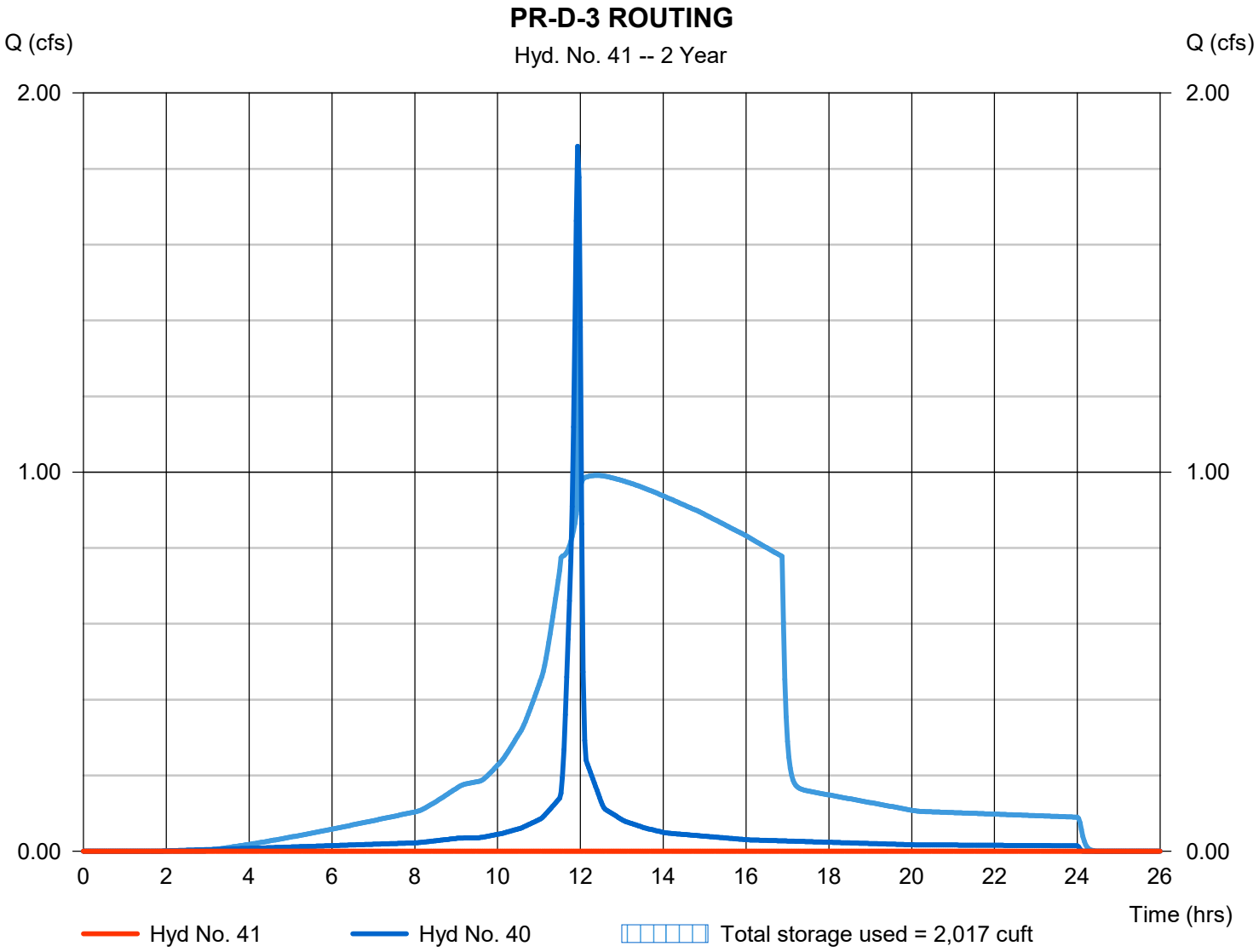
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 41

PR-D-3 ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 17.40 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 40 - PR-D-3	Max. Elevation	= 460.03 ft
Reservoir name	= UGD-INF4-1	Max. Storage	= 2,017 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

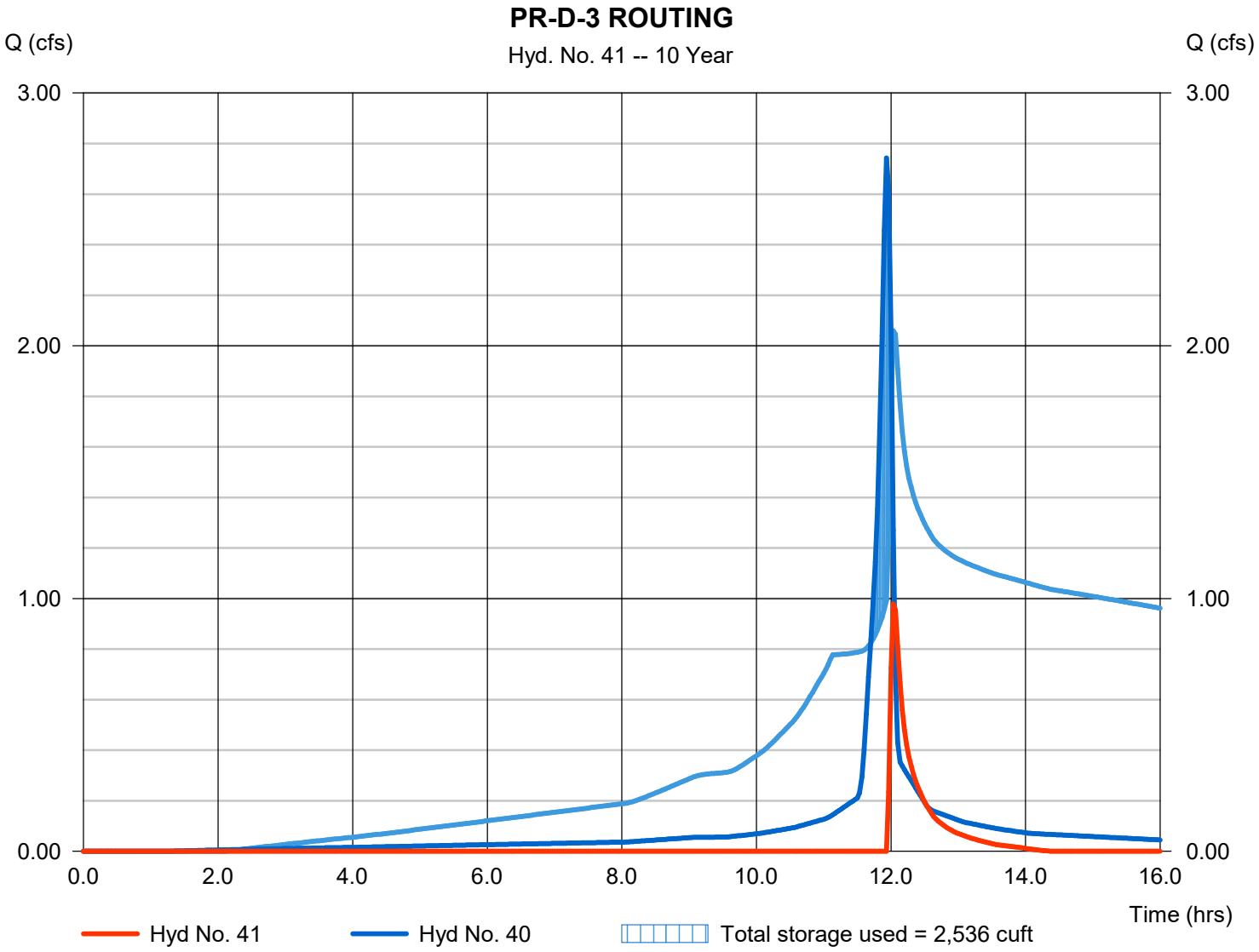
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 41

PR-D-3 ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 0.978 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 1,291 cuft
Inflow hyd. No.	= 40 - PR-D-3	Max. Elevation	= 460.33 ft
Reservoir name	= UGD-INF4-1	Max. Storage	= 2,536 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



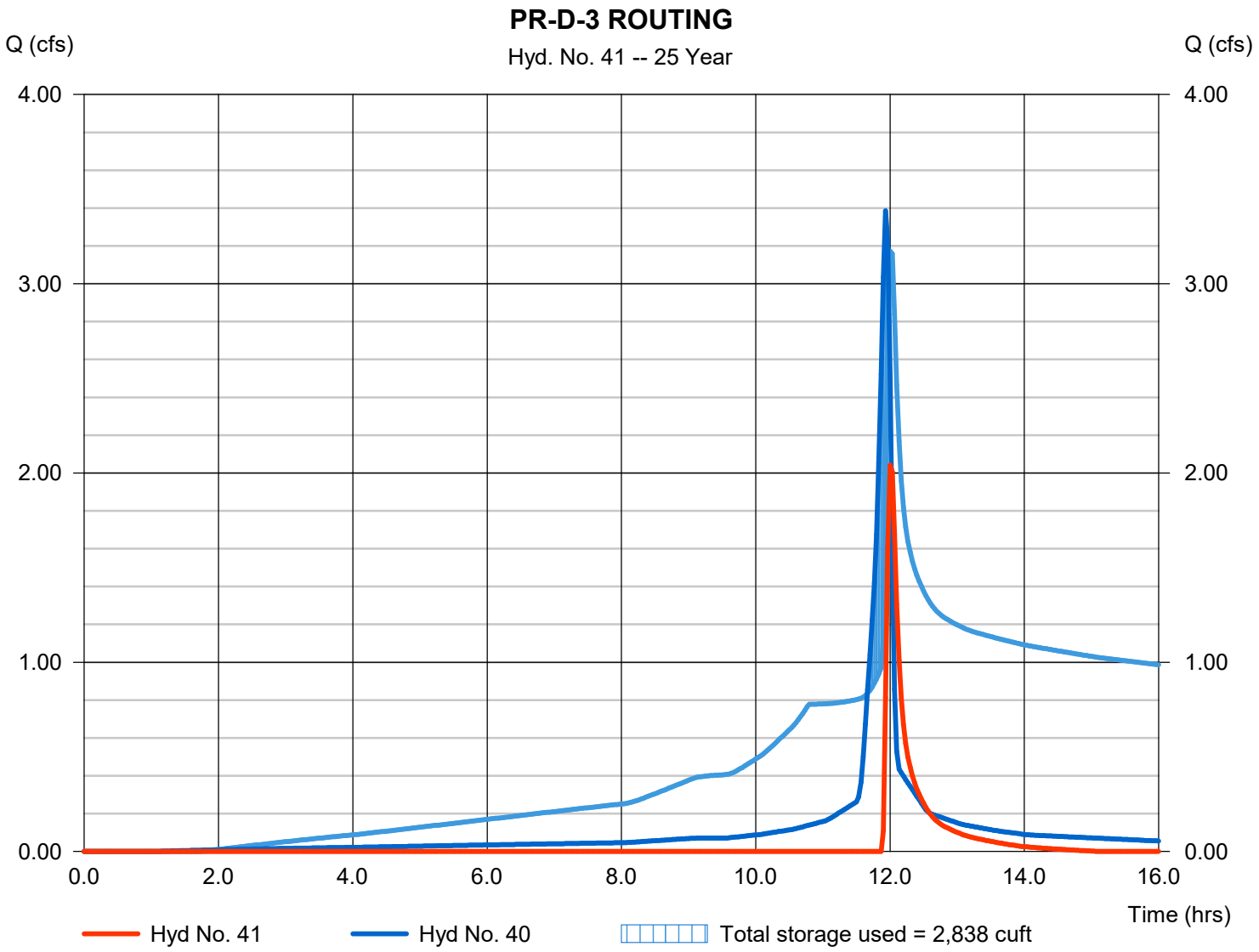
Hydrograph Report

Hyd. No. 41

PR-D-3 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	2.041 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	2,371 cuft
Inflow hyd. No.	=	40 - PR-D-3	Max. Elevation	=	460.50 ft
Reservoir name	=	UGD-INF4-1	Max. Storage	=	2,838 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

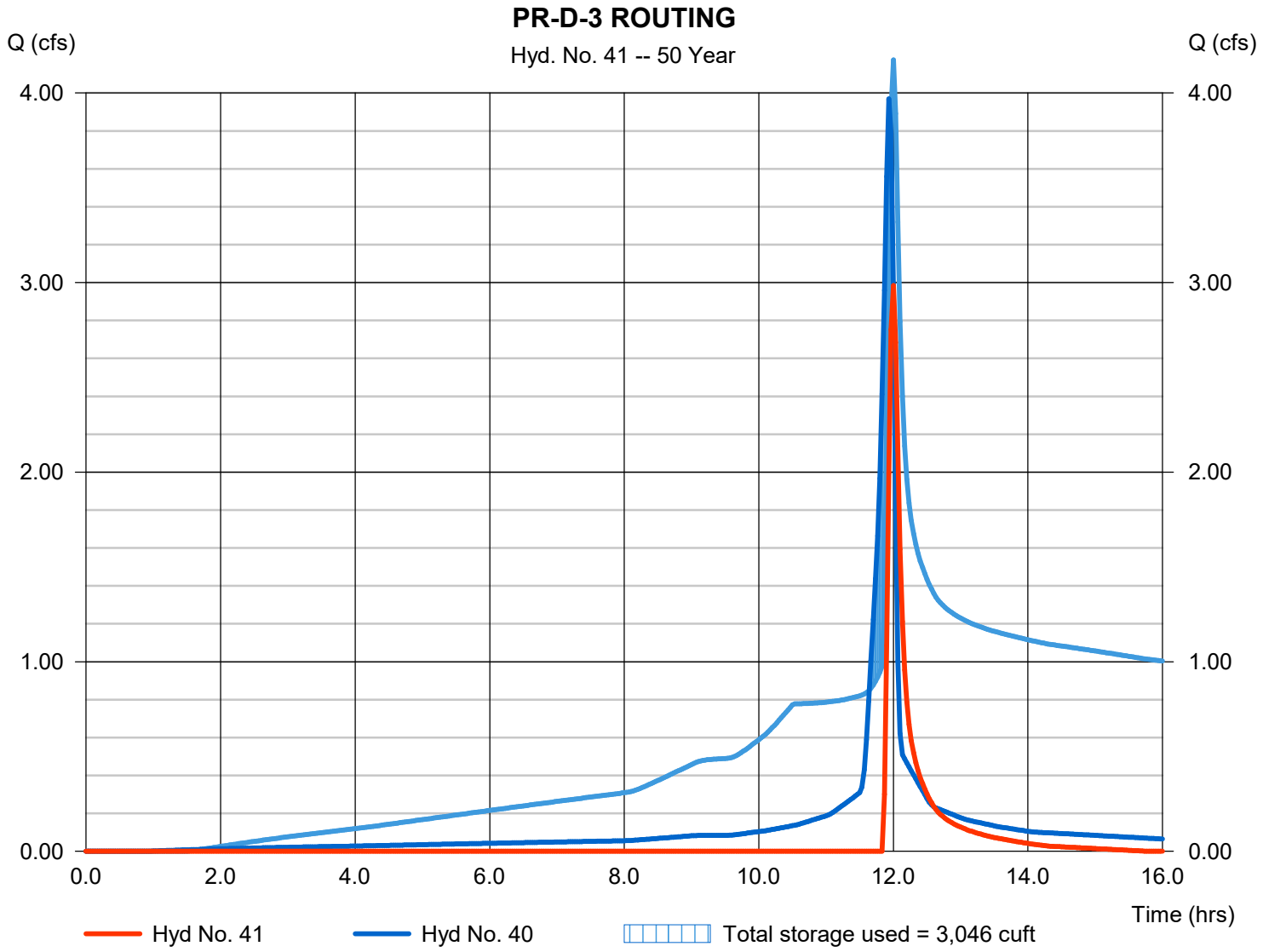
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 41

PR-D-3 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	2.984 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	3,410 cuft
Inflow hyd. No.	=	40 - PR-D-3	Max. Elevation	=	460.64 ft
Reservoir name	=	UGD-INF4-1	Max. Storage	=	3,046 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



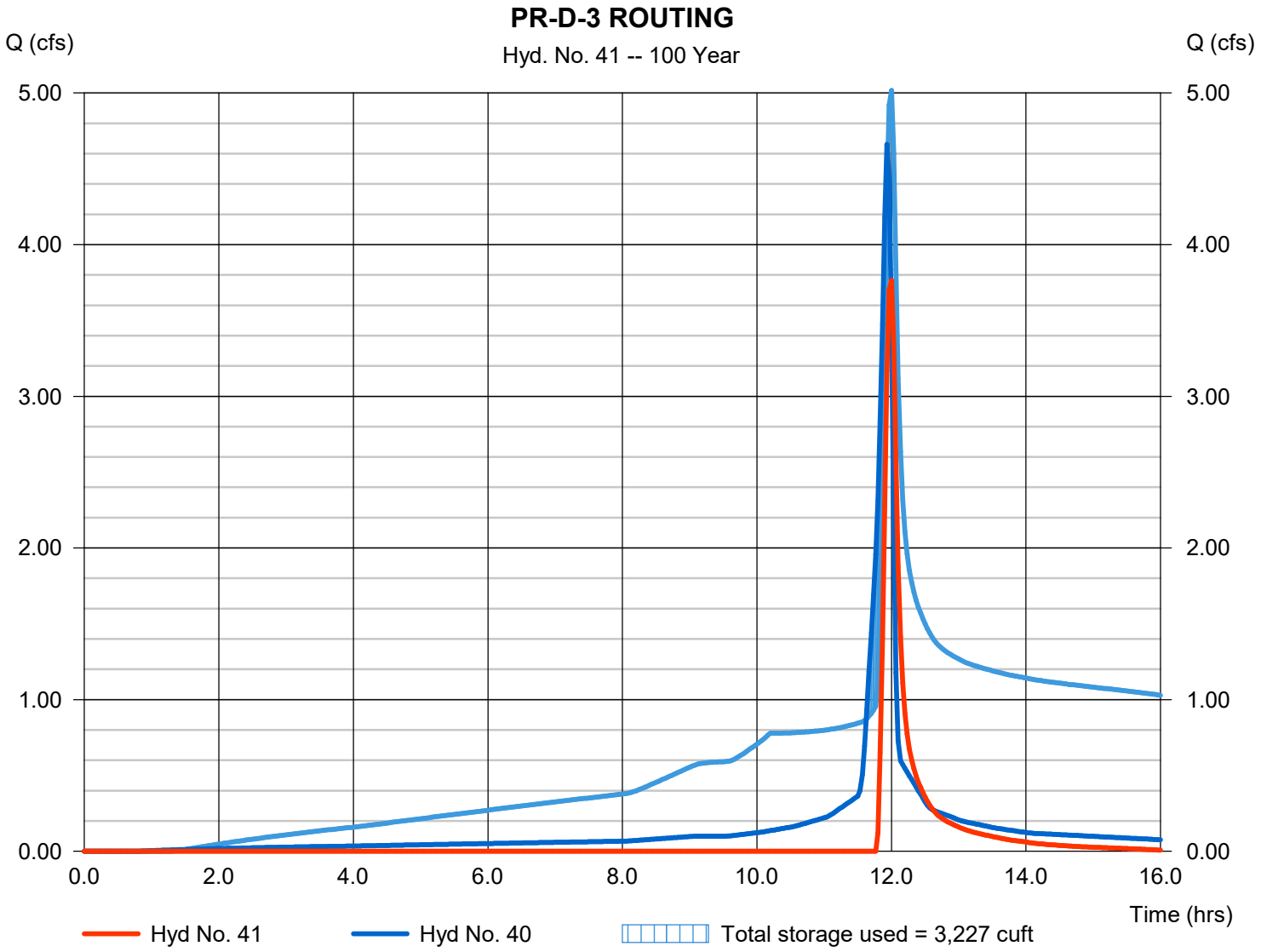
Hydrograph Report

Hyd. No. 41

PR-D-3 ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 3.765 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 4,696 cuft
Inflow hyd. No.	= 40 - PR-D-3	Max. Elevation	= 460.75 ft
Reservoir name	= UGD-INF4-1	Max. Storage	= 3,227 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



PR-E-1 POND ROUTING (RG5-1)

Pond Report

Pond No. 5 - RG5-1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 451.90 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	451.90	816	0	0
1.00	452.90	1,289	1,043	1,043
2.00	453.90	1,819	1,546	2,590

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	0.00	0.00	0.00
Span (in)	= 18.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 449.00	0.00	0.00	0.00
Length (ft)	= 9.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .012	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

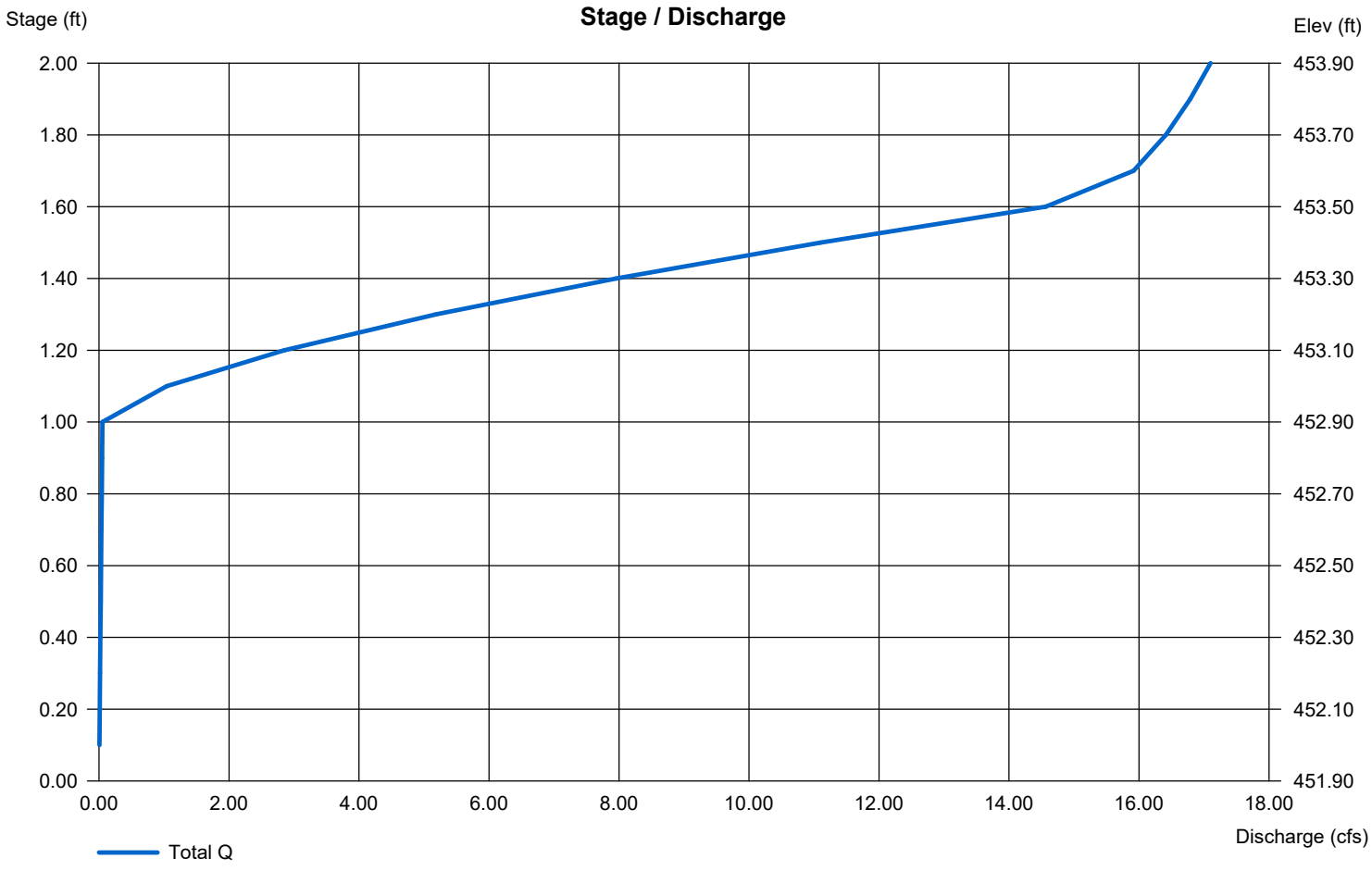
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.00	0.00	0.00	0.00
Crest El. (ft)	= 452.90	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 1.750 (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

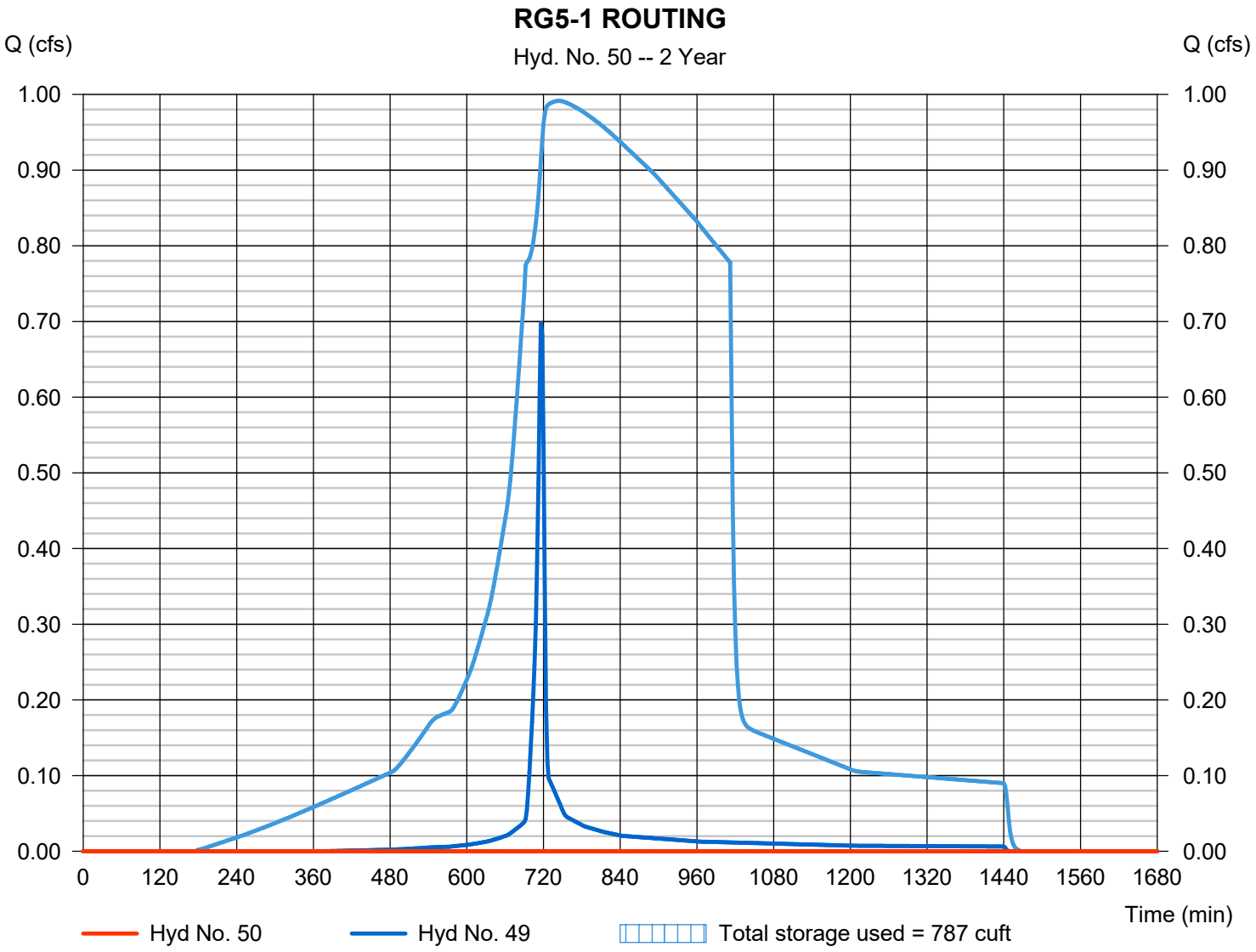
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 05 / 10 / 2021

Hyd. No. 50

RG5-1 ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 1520 min
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 49 - PR-E-1	Max. Elevation	= 452.65 ft
Reservoir name	= RG5-1	Max. Storage	= 787 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

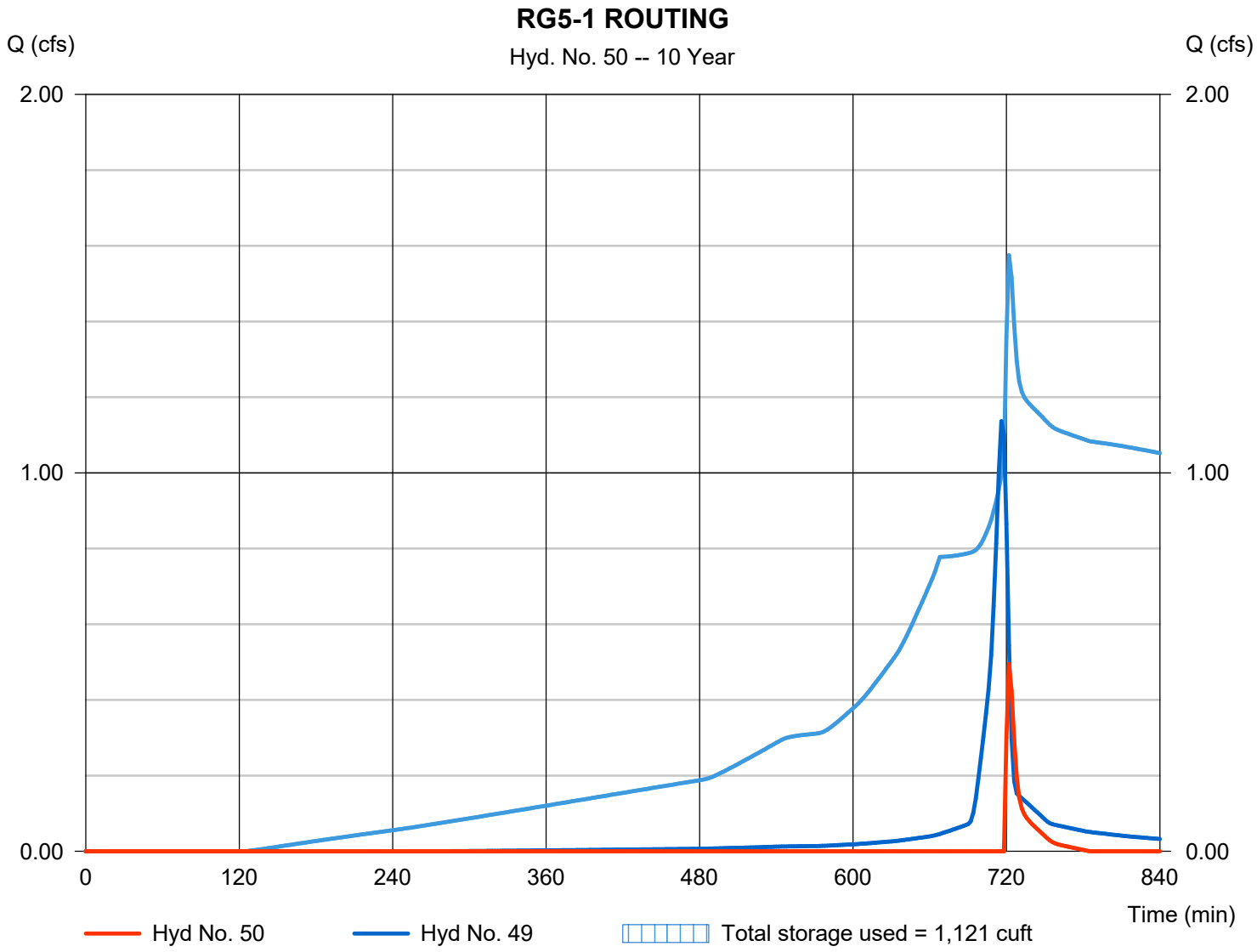
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 05 / 10 / 2021

Hyd. No. 50

RG5-1 ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 0.494 cfs
Storm frequency	= 10 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 335 cuft
Inflow hyd. No.	= 49 - PR-E-1	Max. Elevation	= 452.95 ft
Reservoir name	= RG5-1	Max. Storage	= 1,121 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



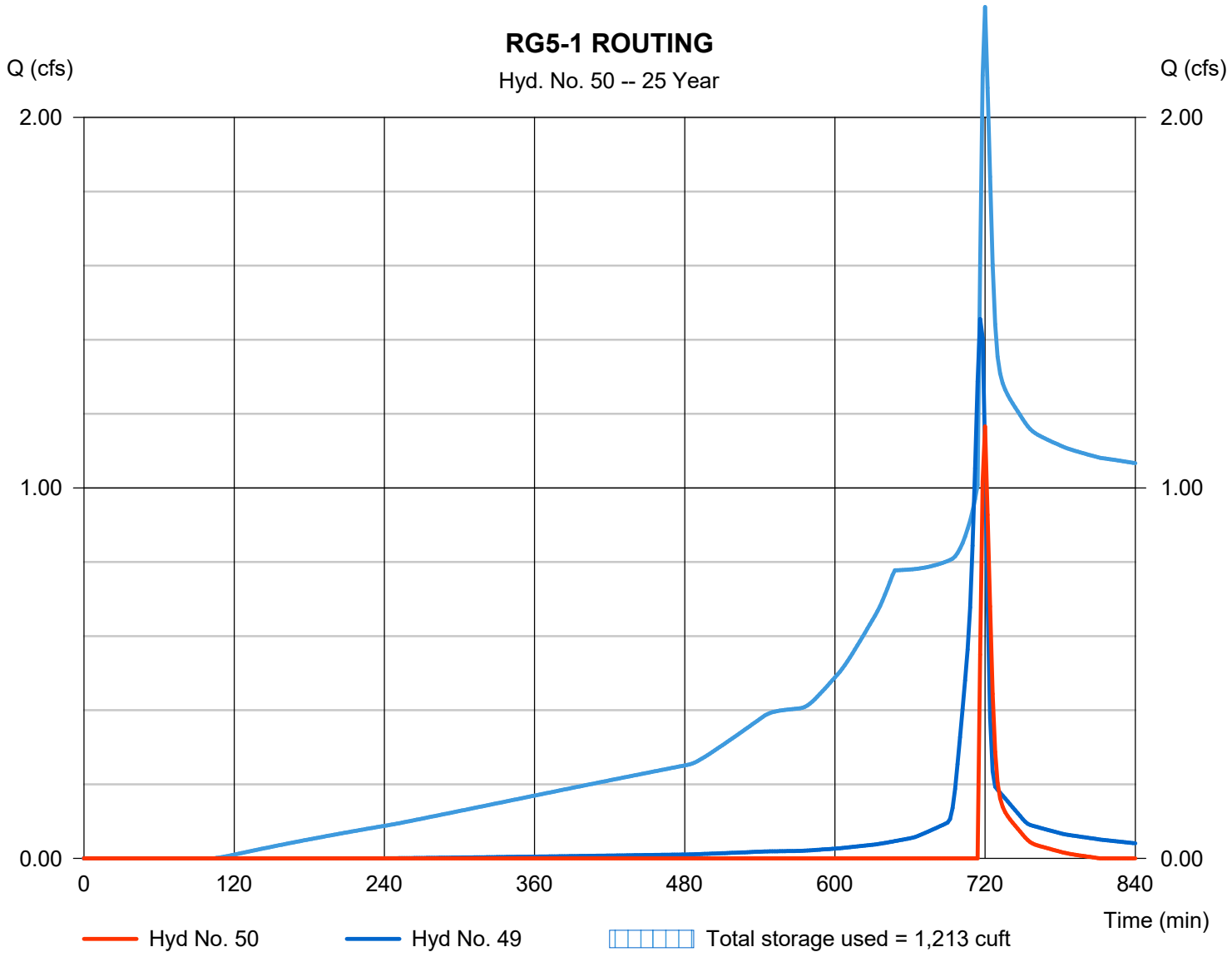
Hydrograph Report

Hyd. No. 50

RG5-1 ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 1.166 cfs
Storm frequency	= 25 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 832 cuft
Inflow hyd. No.	= 49 - PR-E-1	Max. Elevation	= 453.01 ft
Reservoir name	= RG5-1	Max. Storage	= 1,213 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



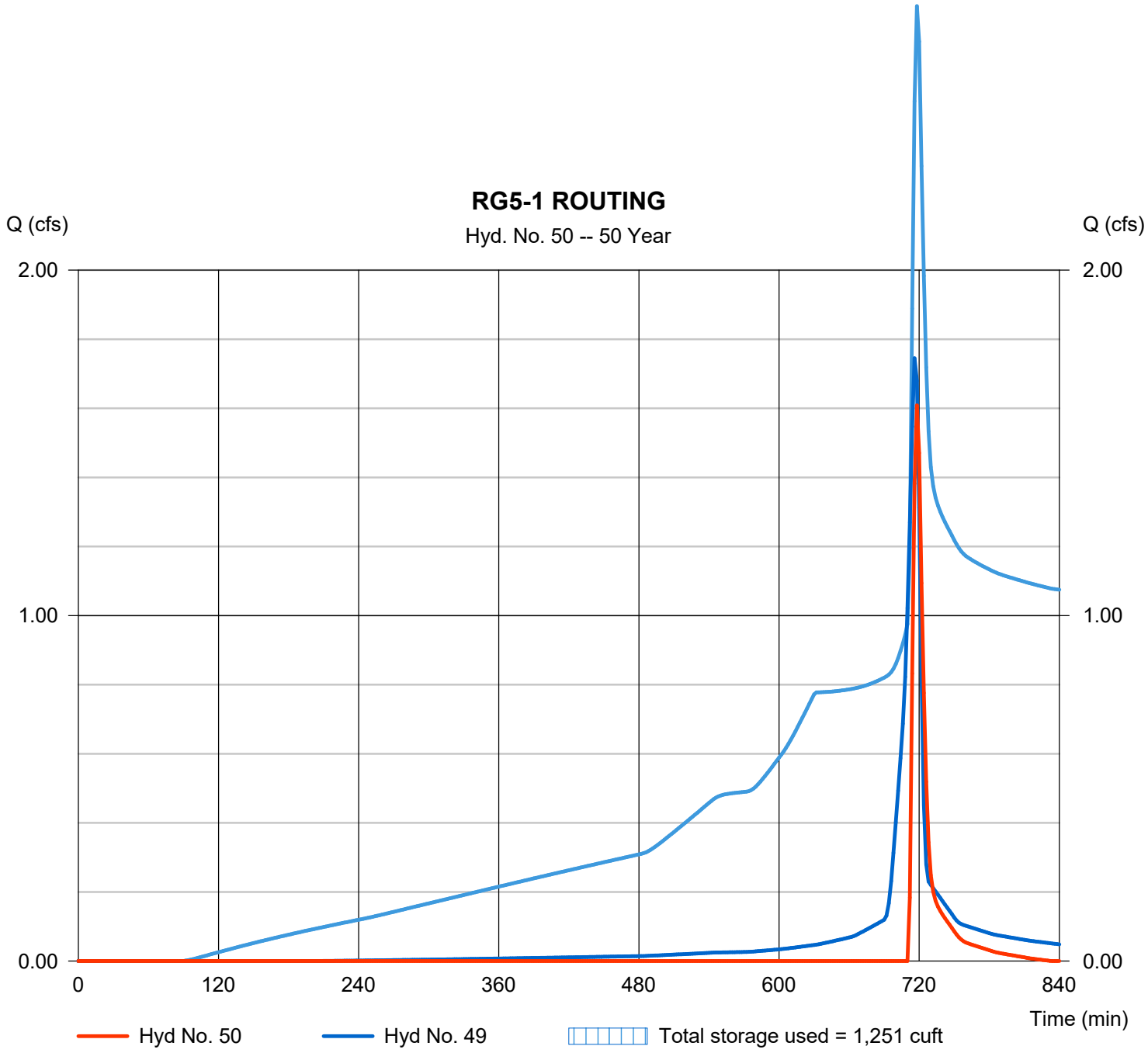
Hydrograph Report

Hyd. No. 50

RG5-1 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	1.609 cfs
Storm frequency	=	50 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	1,304 cuft
Inflow hyd. No.	=	49 - PR-E-1	Max. Elevation	=	453.03 ft
Reservoir name	=	RG5-1	Max. Storage	=	1,251 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



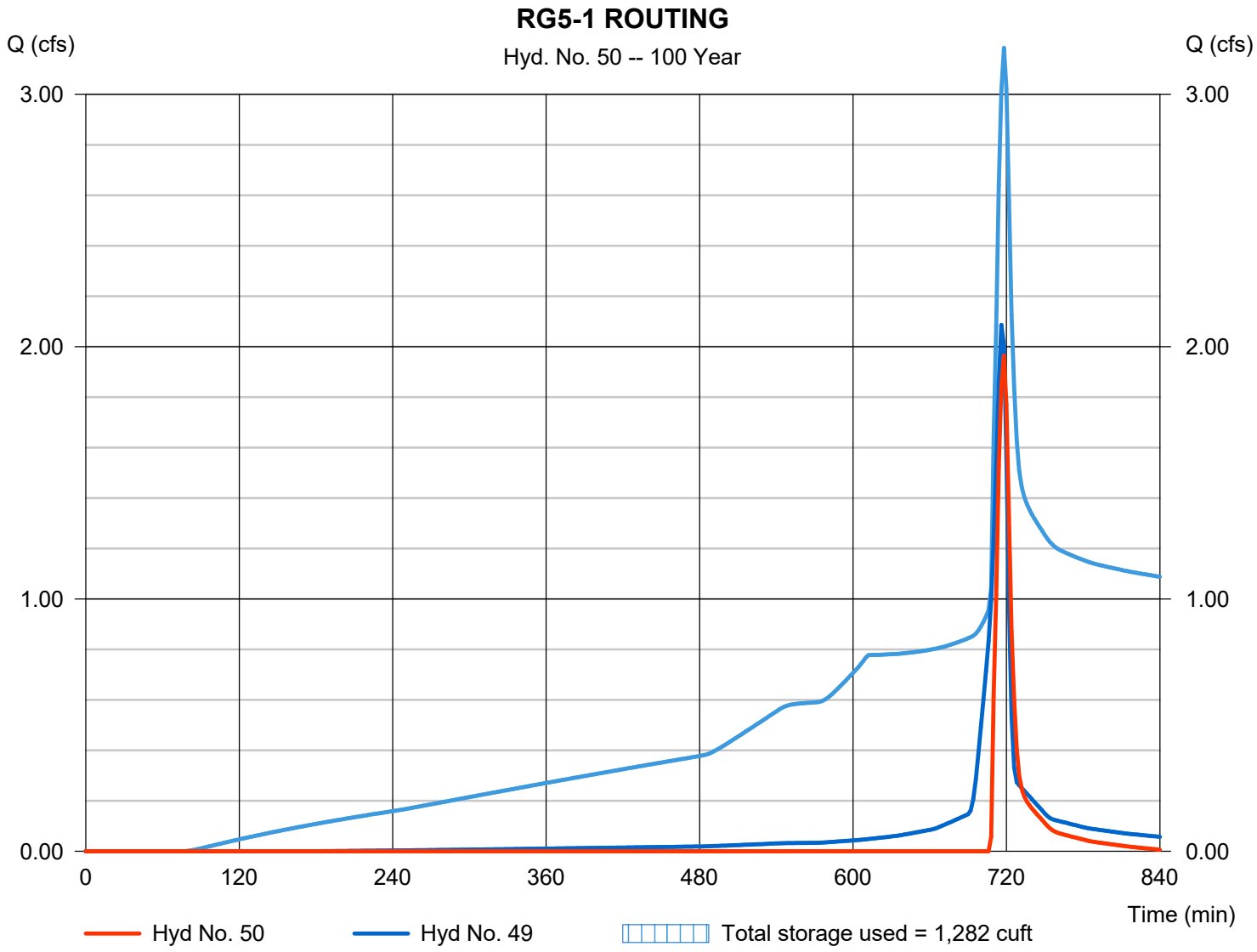
Hydrograph Report

Hyd. No. 50

RG5-1 ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 1.964 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 1,882 cuft
Inflow hyd. No.	= 49 - PR-E-1	Max. Elevation	= 453.05 ft
Reservoir name	= RG5-1	Max. Storage	= 1,282 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



PR-E-2 POND ROUTING (RG5-2)

Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Pond No. 6 - RG5-2

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 457.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	457.00	700	0	0
1.00	458.00	1,060	874	874
2.00	459.00	1,476	1,262	2,136

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	0.00	0.00	0.00
Span (in)	= 18.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 454.00	0.00	0.00	0.00
Length (ft)	= 18.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .012	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

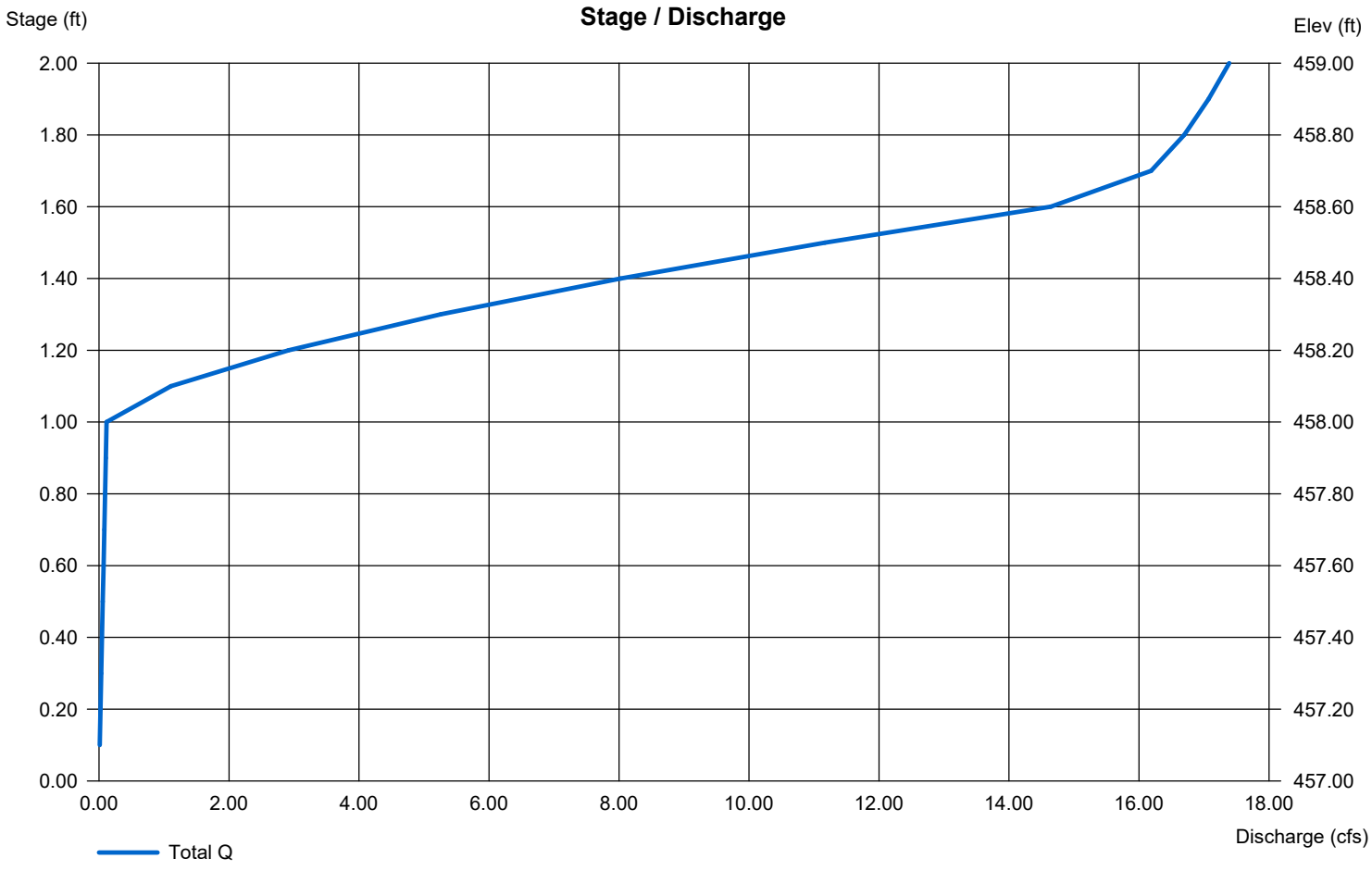
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.00	0.00	0.00	0.00
Crest El. (ft)	= 458.00	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 4.690 (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

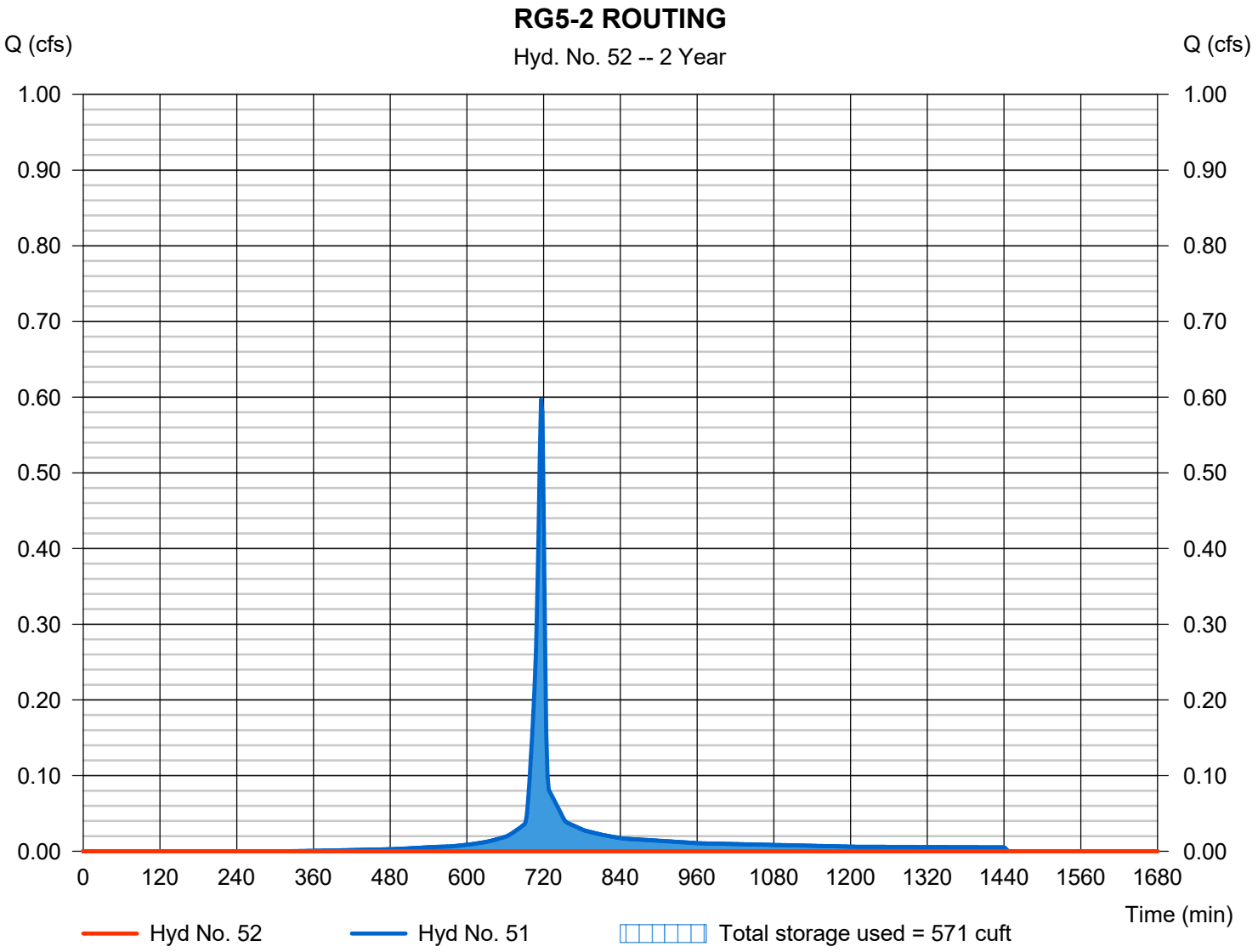
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 52

RG5-2 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	0.000 cfs
Storm frequency	=	2 yrs	Time to peak	=	996 min
Time interval	=	2 min	Hyd. volume	=	0 cuft
Inflow hyd. No.	=	51 - PR-E-2	Max. Elevation	=	457.65 ft
Reservoir name	=	RG5-2	Max. Storage	=	571 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



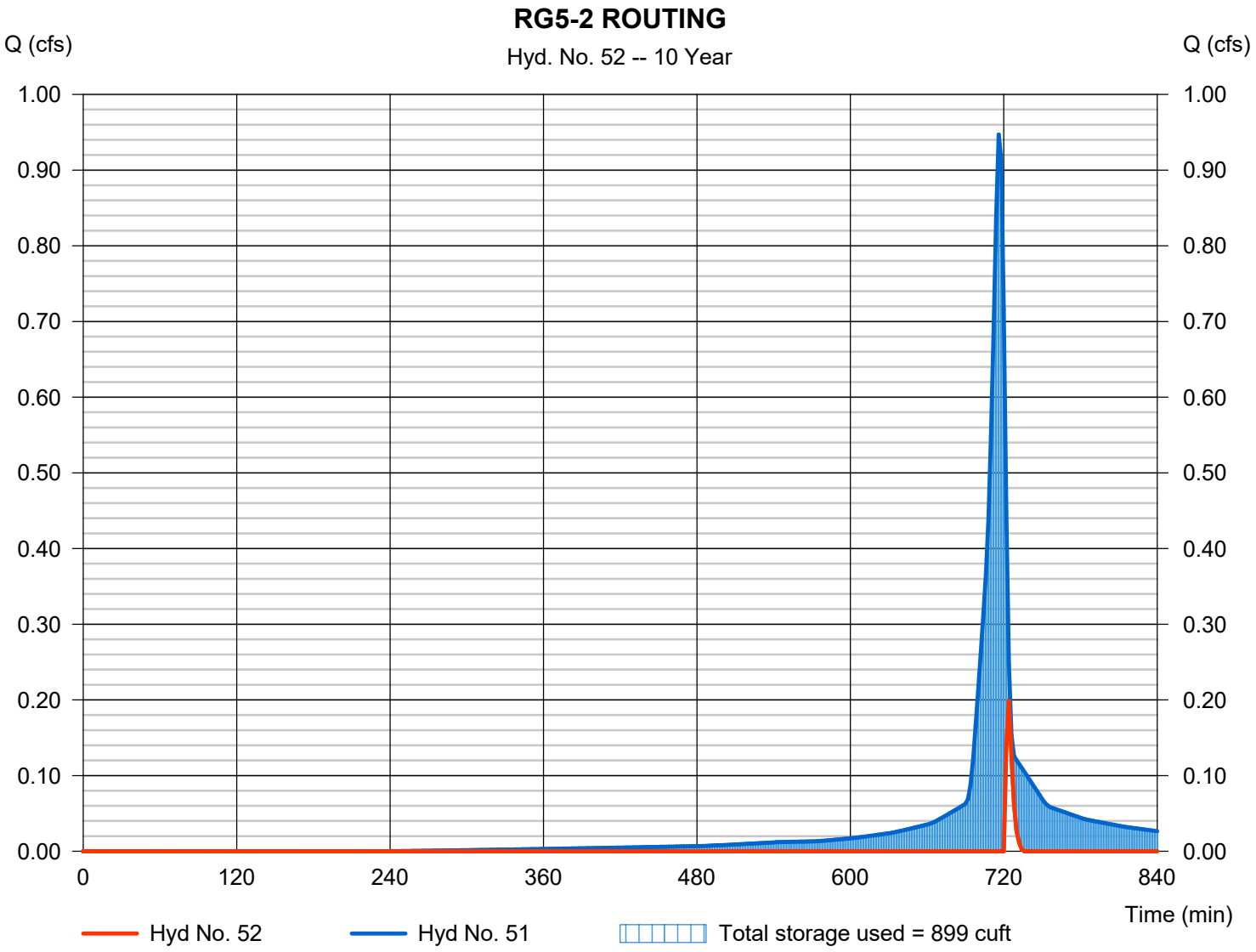
Hydrograph Report

Hyd. No. 52

RG5-2 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	0.199 cfs
Storm frequency	=	10 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	68 cuft
Inflow hyd. No.	=	51 - PR-E-2	Max. Elevation	=	458.02 ft
Reservoir name	=	RG5-2	Max. Storage	=	899 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



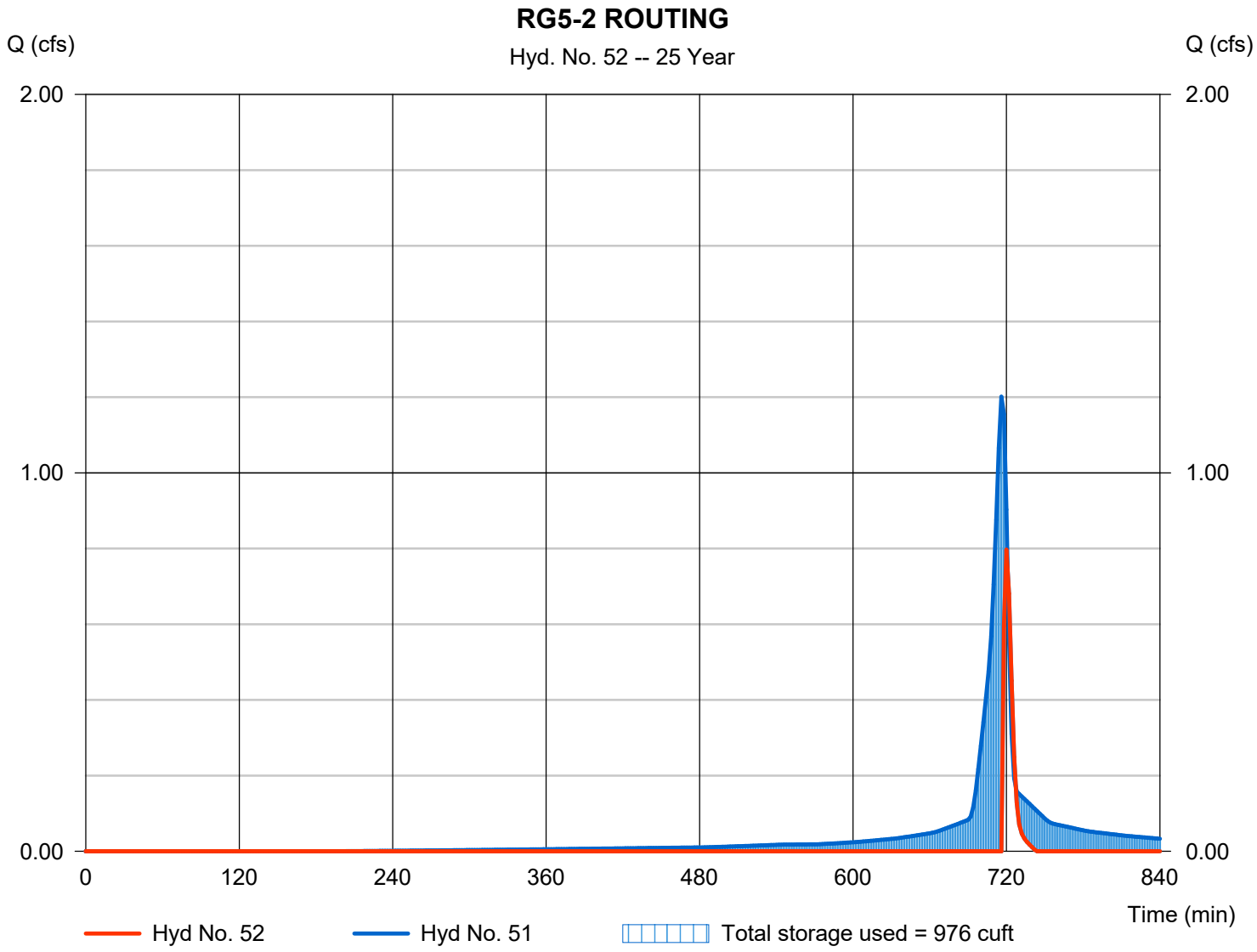
Hydrograph Report

Hyd. No. 52

RG5-2 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	0.797 cfs
Storm frequency	=	25 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	373 cuft
Inflow hyd. No.	=	51 - PR-E-2	Max. Elevation	=	458.08 ft
Reservoir name	=	RG5-2	Max. Storage	=	976 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

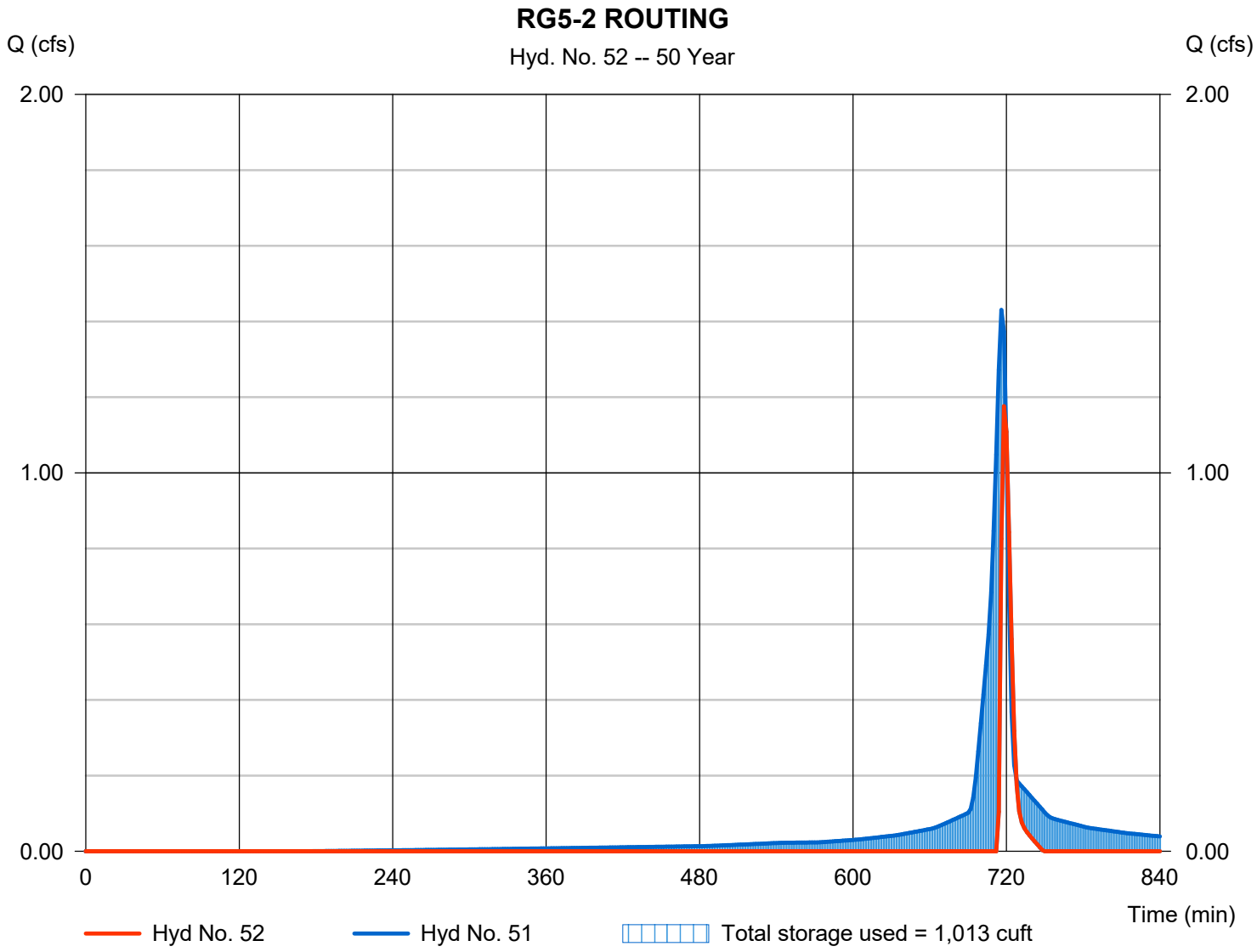
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 52

RG5-2 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	1.176 cfs
Storm frequency	=	50 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	665 cuft
Inflow hyd. No.	=	51 - PR-E-2	Max. Elevation	=	458.11 ft
Reservoir name	=	RG5-2	Max. Storage	=	1,013 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



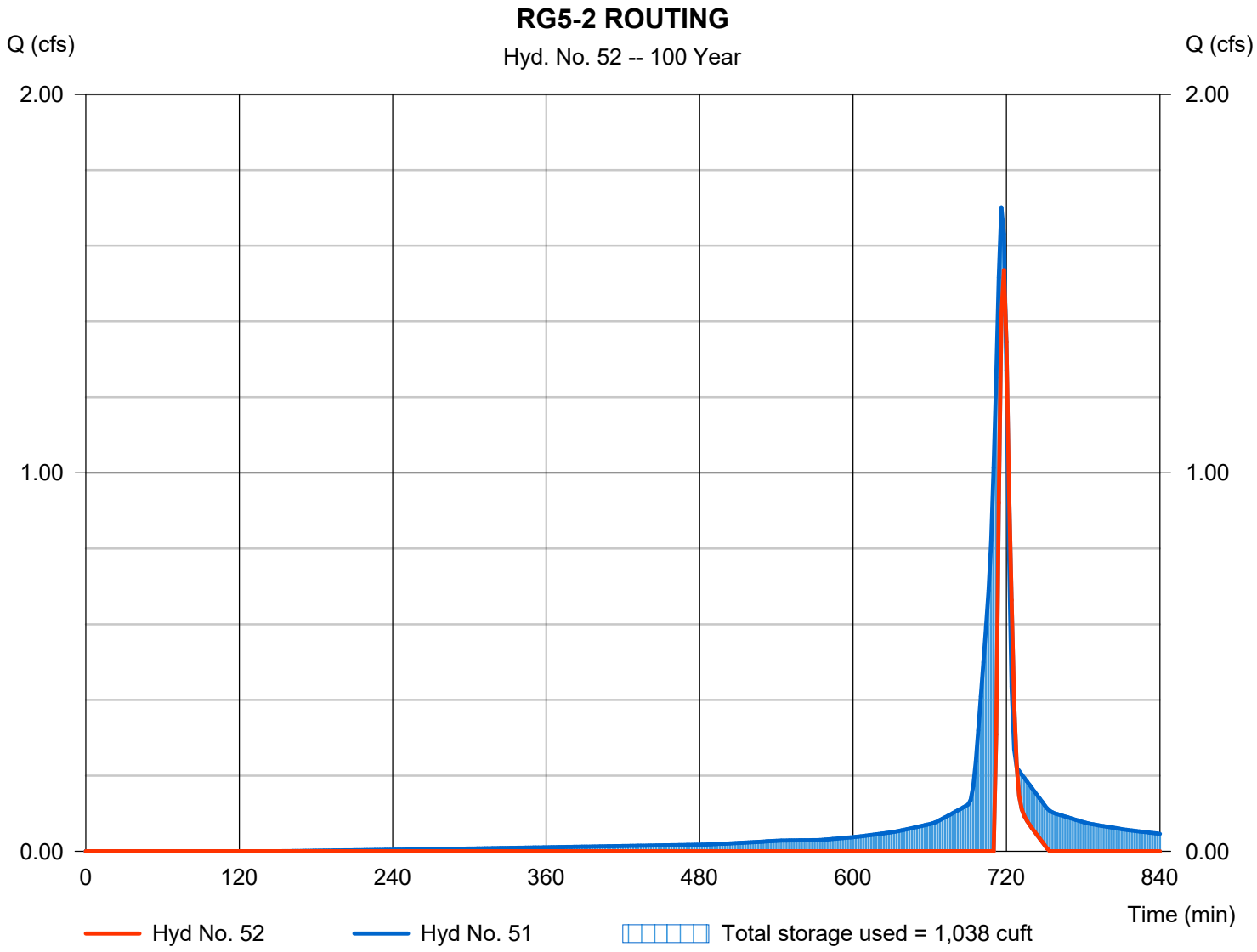
Hydrograph Report

Hyd. No. 52

RG5-2 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	1.536 cfs
Storm frequency	=	100 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	1,020 cuft
Inflow hyd. No.	=	51 - PR-E-2	Max. Elevation	=	458.13 ft
Reservoir name	=	RG5-2	Max. Storage	=	1,038 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



PR-E-3 POND ROUTING (RG5-3)

Pond Report

Pond No. 7 - RG5-3

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 469.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	469.00	1,234	0	0
1.00	470.00	1,644	1,434	1,434
2.00	471.00	2,110	1,872	3,306

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	0.00	0.00	0.00
Span (in)	= 18.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 466.50	0.00	0.00	0.00
Length (ft)	= 67.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .012	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

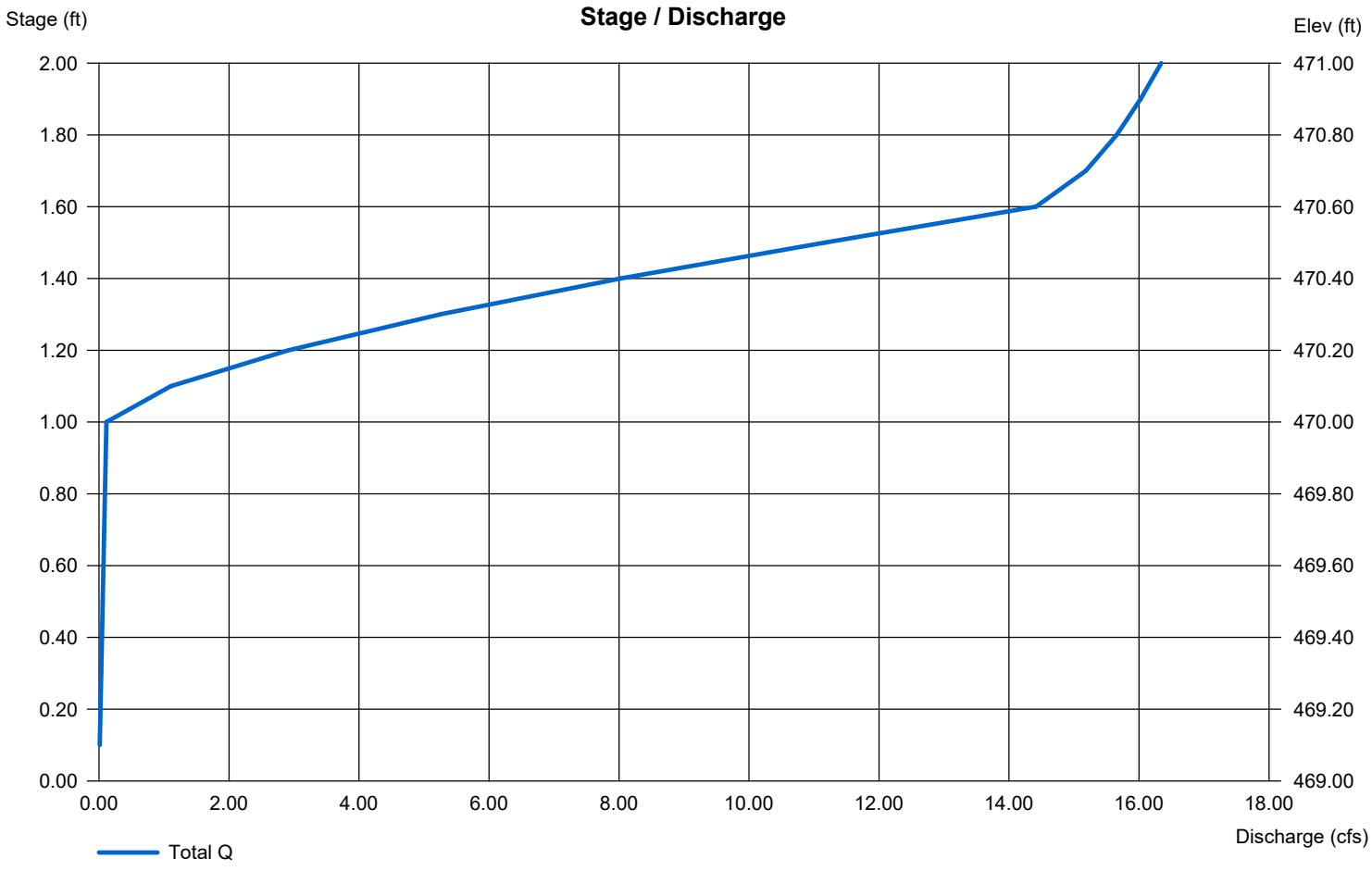
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.00	0.00	0.00	0.00
Crest El. (ft)	= 470.00	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 3.000 (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

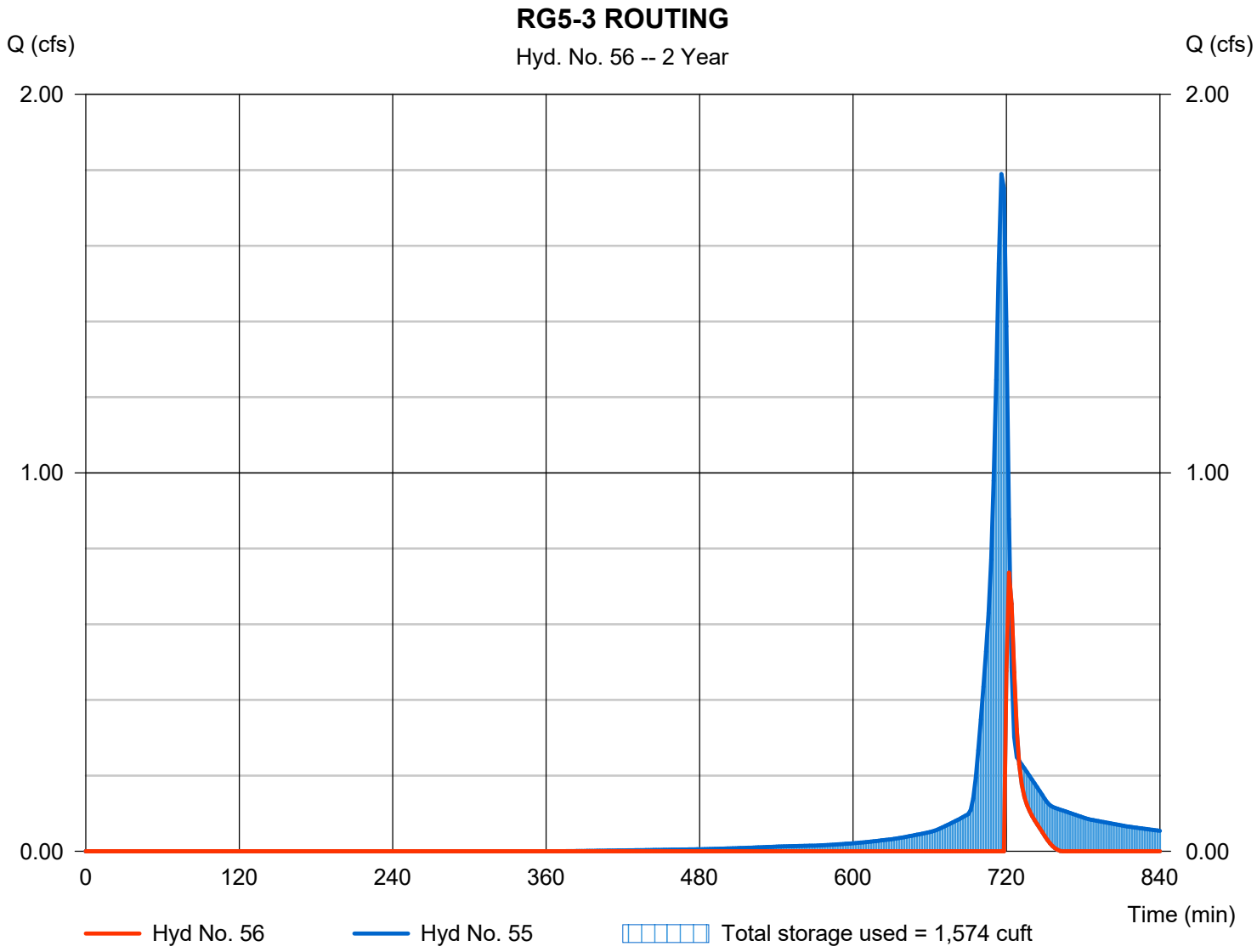
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 56

RG5-3 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	0.736 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	470 cuft
Inflow hyd. No.	=	55 - PR-E-3	Max. Elevation	=	470.07 ft
Reservoir name	=	RG5-3	Max. Storage	=	1,574 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



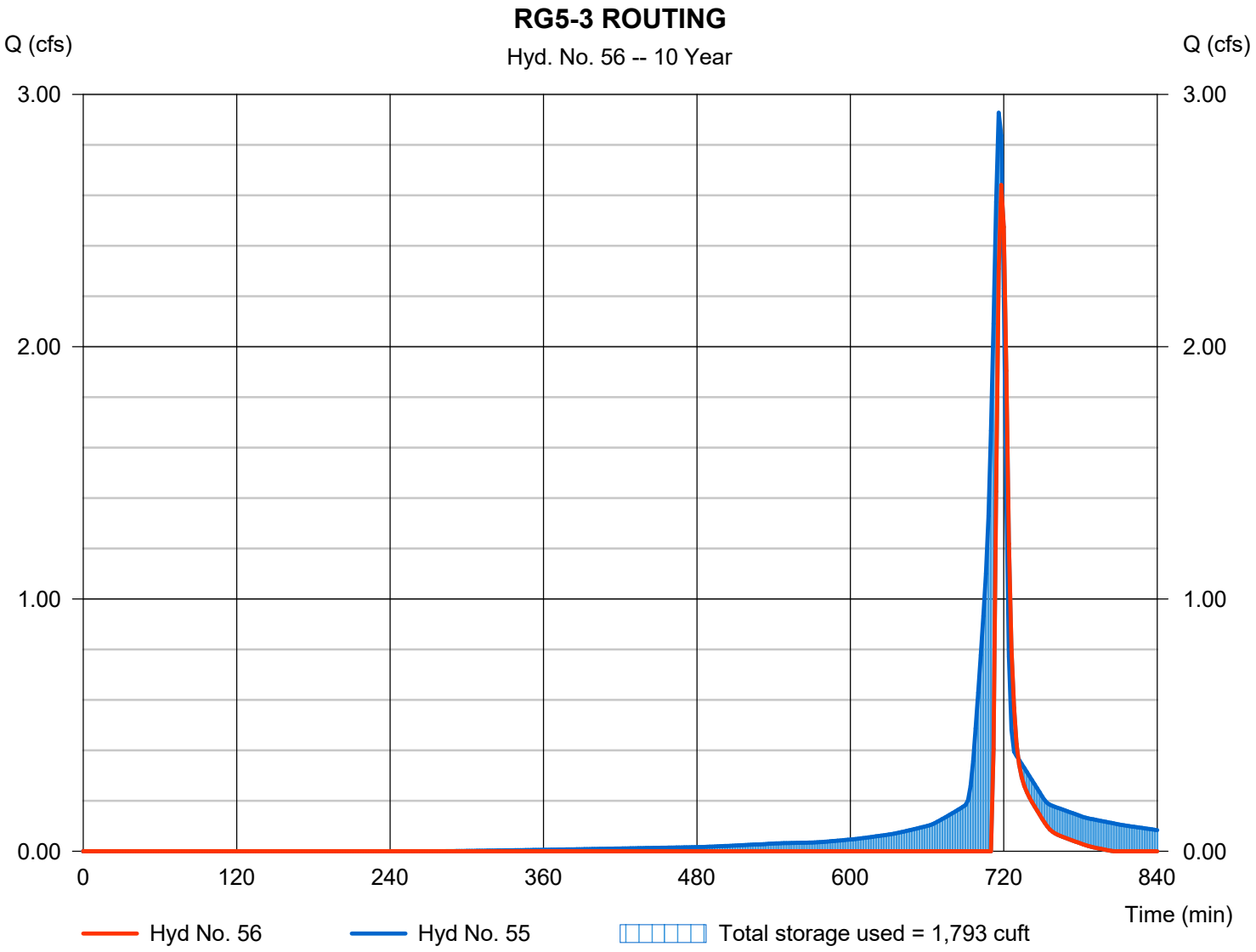
Hydrograph Report

Hyd. No. 56

RG5-3 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	2.641 cfs
Storm frequency	=	10 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	2,089 cuft
Inflow hyd. No.	=	55 - PR-E-3	Max. Elevation	=	470.19 ft
Reservoir name	=	RG5-3	Max. Storage	=	1,793 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



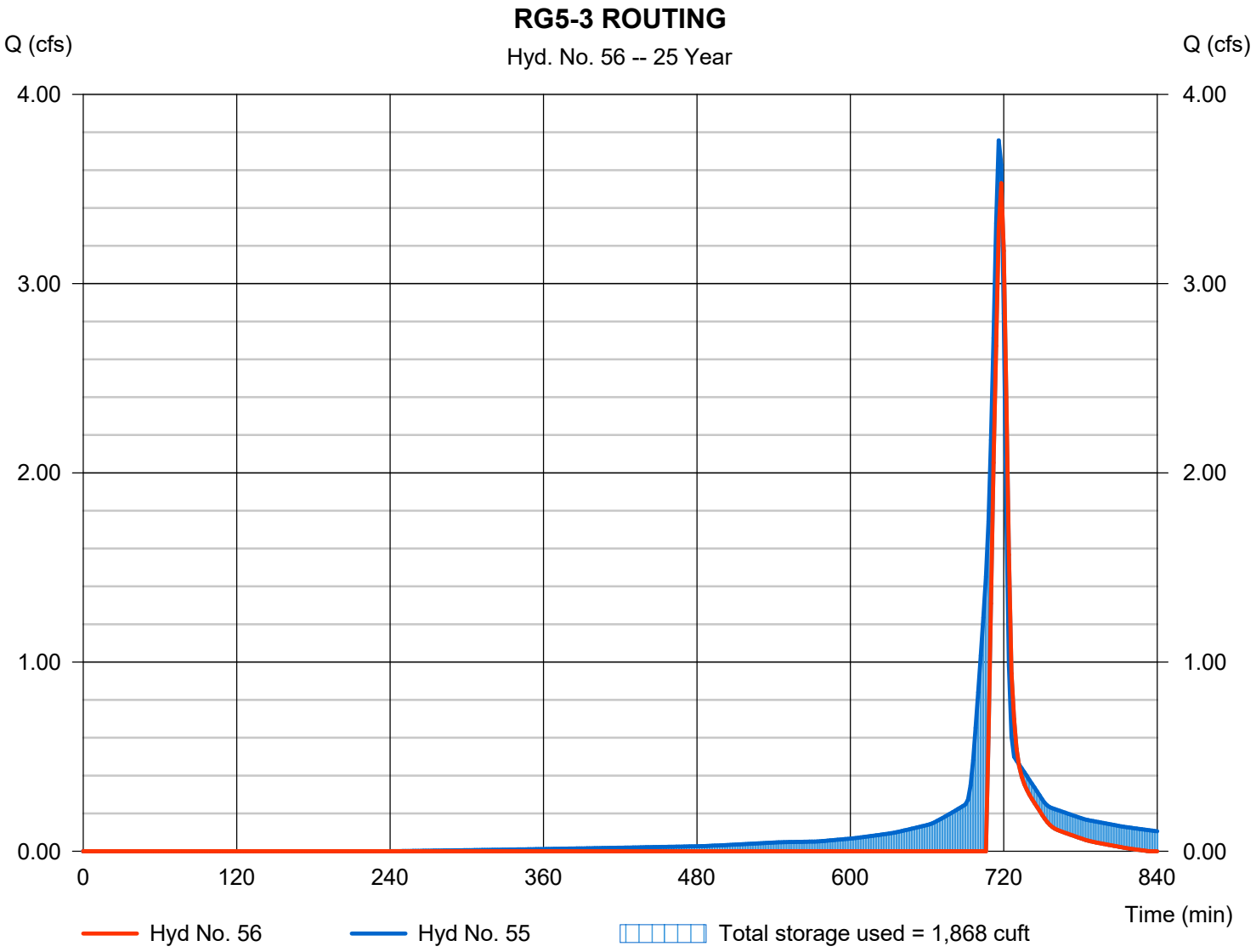
Hydrograph Report

Hyd. No. 56

RG5-3 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	3.531 cfs
Storm frequency	=	25 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	3,378 cuft
Inflow hyd. No.	=	55 - PR-E-3	Max. Elevation	=	470.23 ft
Reservoir name	=	RG5-3	Max. Storage	=	1,868 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



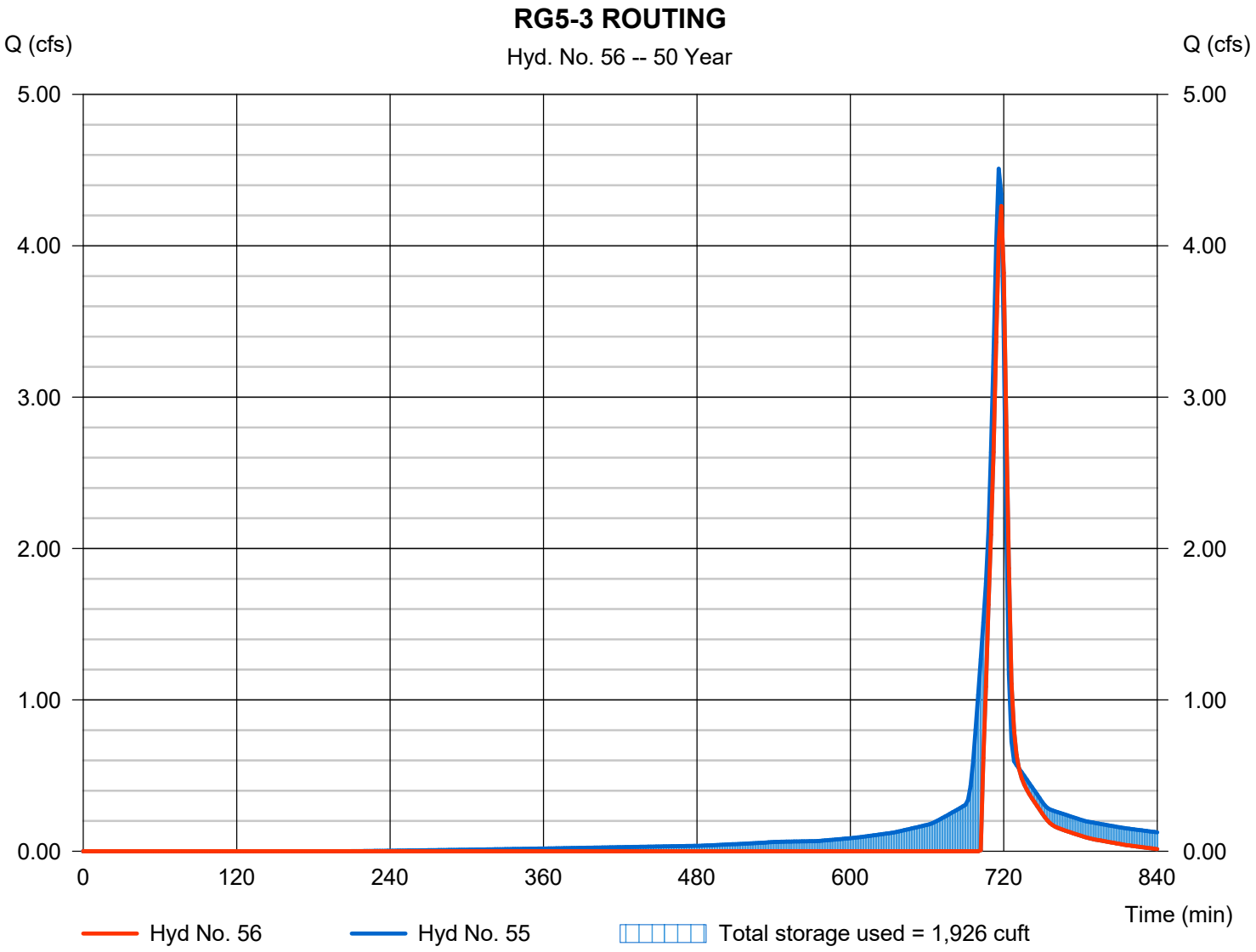
Hydrograph Report

Hyd. No. 56

RG5-3 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	4.262 cfs
Storm frequency	=	50 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	4,599 cuft
Inflow hyd. No.	=	55 - PR-E-3	Max. Elevation	=	470.26 ft
Reservoir name	=	RG5-3	Max. Storage	=	1,926 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



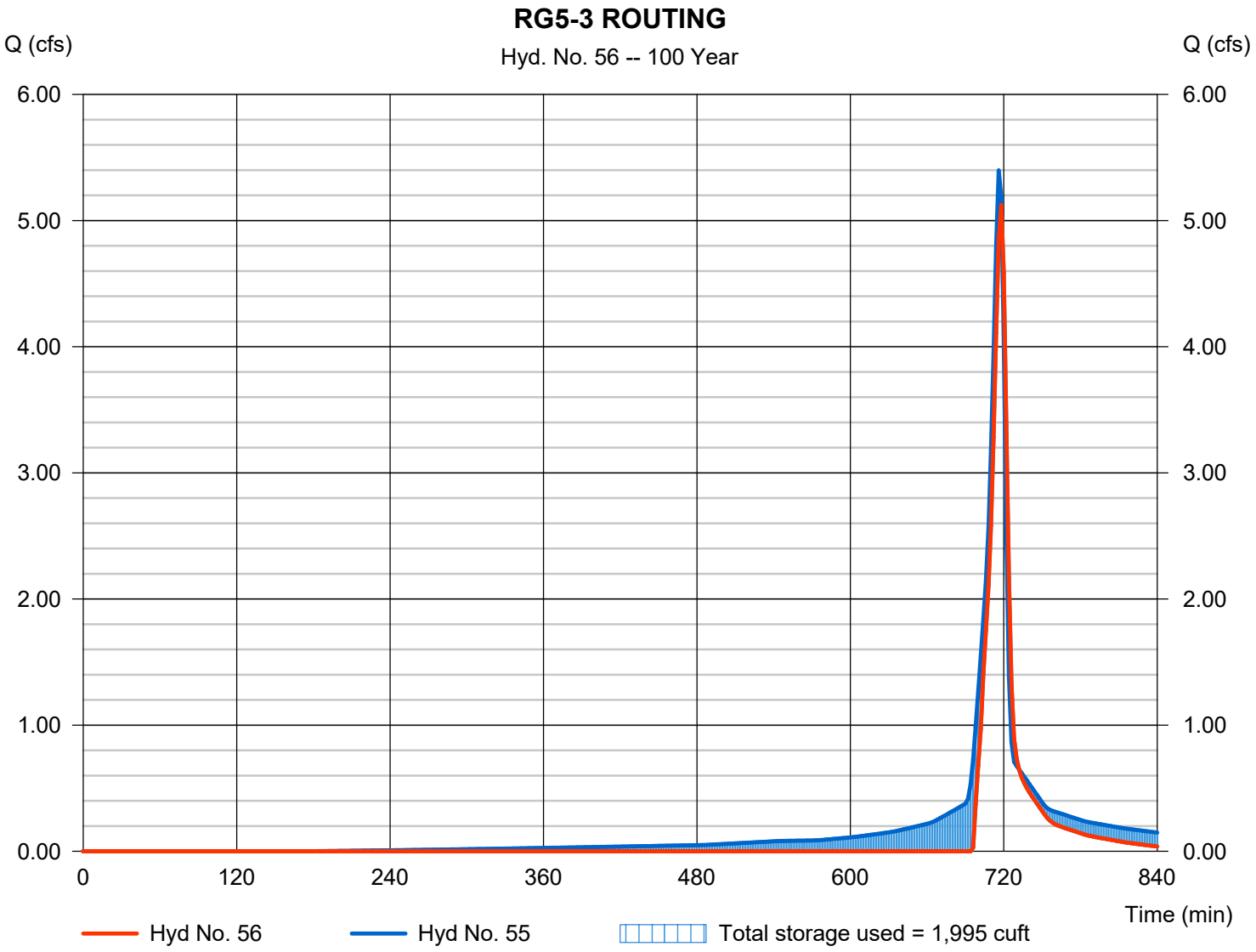
Hydrograph Report

Hyd. No. 56

RG5-3 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	5.122 cfs
Storm frequency	=	100 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	6,115 cuft
Inflow hyd. No.	=	55 - PR-E-3	Max. Elevation	=	470.30 ft
Reservoir name	=	RG5-3	Max. Storage	=	1,995 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



PR-E-4 POND ROUTING (UGD-INF5-1)

Pond Report

Pond No. 4 - UGD-INF5-1

Pond Data

UG Chambers -Invert elev. = 452.50 ft, Rise x Span = 2.50 x 2.50 ft, Barrel Len = 53.70 ft, No. Barrels = 7, Slope = 0.00%, Headers = Yes
Encasement -Invert elev. = 452.00 ft, Width = 10.00 ft, Height = 3.50 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	452.00	n/a	0	0
0.35	452.35	n/a	722	722
0.70	452.70	n/a	779	1,502
1.05	453.05	n/a	913	2,415
1.40	453.40	n/a	967	3,382
1.75	453.75	n/a	990	4,372
2.10	454.10	n/a	990	5,362
2.45	454.45	n/a	967	6,329
2.80	454.80	n/a	913	7,242
3.15	455.15	n/a	779	8,021
3.50	455.50	n/a	722	8,743

Culvert / Orifice Structures

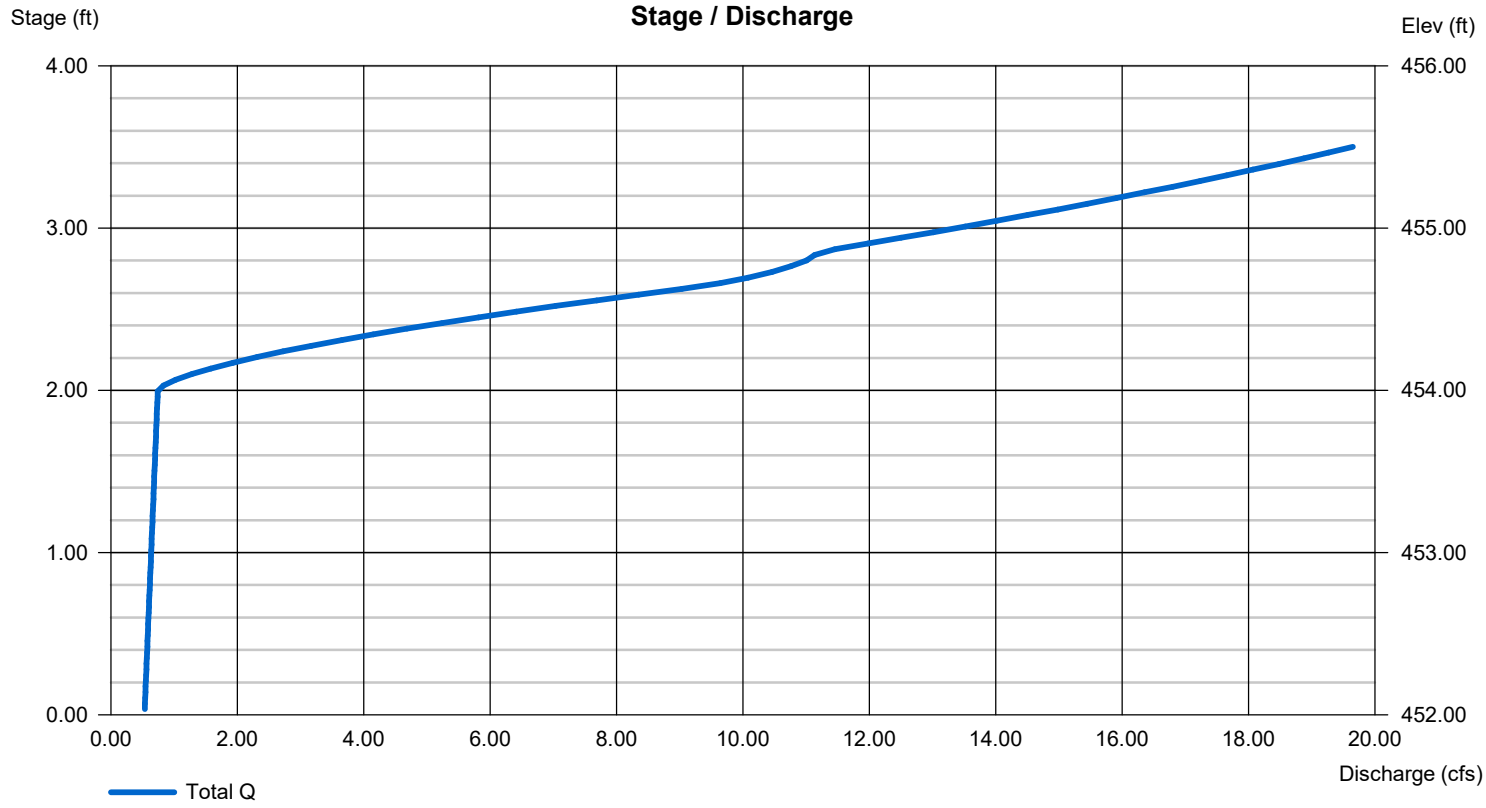
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	0.00	0.00	0.00
Span (in)	= 24.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 452.50	0.00	0.00	0.00
Length (ft)	= 30.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .012	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 5.00	0.00	0.00	0.00
Crest El. (ft)	= 454.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 5.120 (by Wet area)
TW Elev. (ft) = 0.00

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



Hydrograph Report

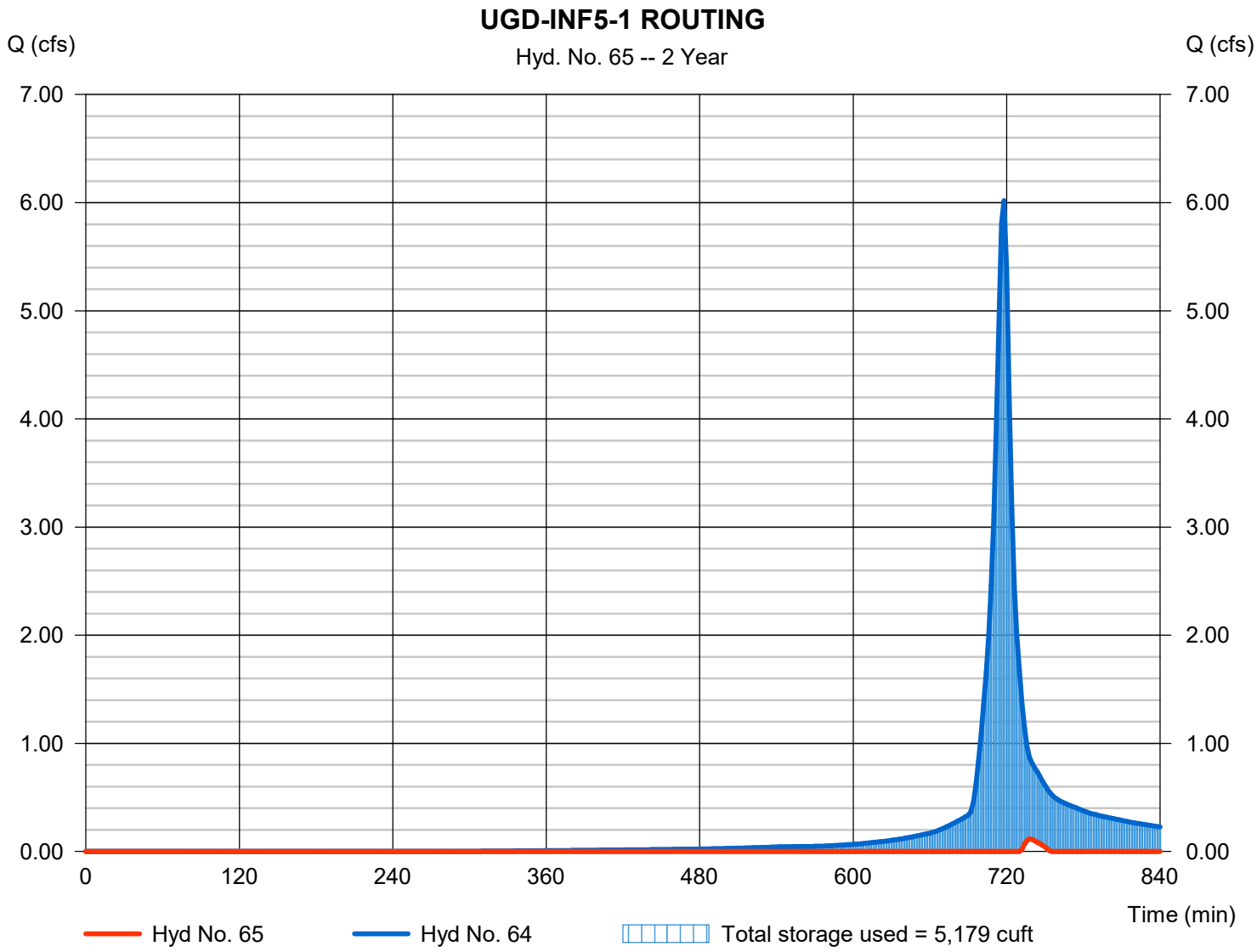
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 65

UGD-INF5-1 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	0.116 cfs
Storm frequency	=	2 yrs	Time to peak	=	738 min
Time interval	=	2 min	Hyd. volume	=	96 cuft
Inflow hyd. No.	=	64 - PR-E-4	Max. Elevation	=	454.04 ft
Reservoir name	=	UGD-INF5-1	Max. Storage	=	5,179 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



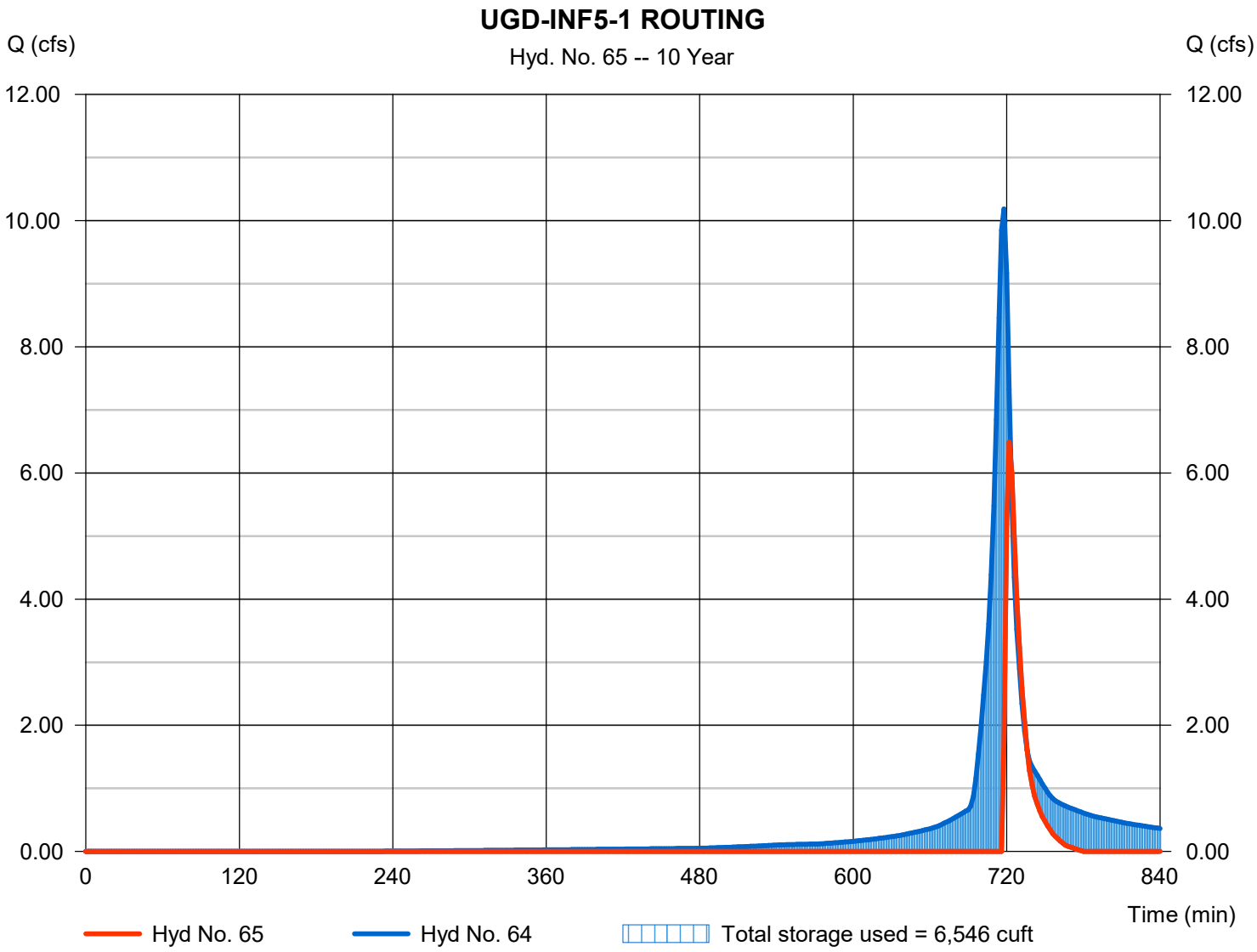
Hydrograph Report

Hyd. No. 65

UGD-INF5-1 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	6.491 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	5,483 cuft
Inflow hyd. No.	=	64 - PR-E-4	Max. Elevation	=	454.53 ft
Reservoir name	=	UGD-INF5-1	Max. Storage	=	6,546 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



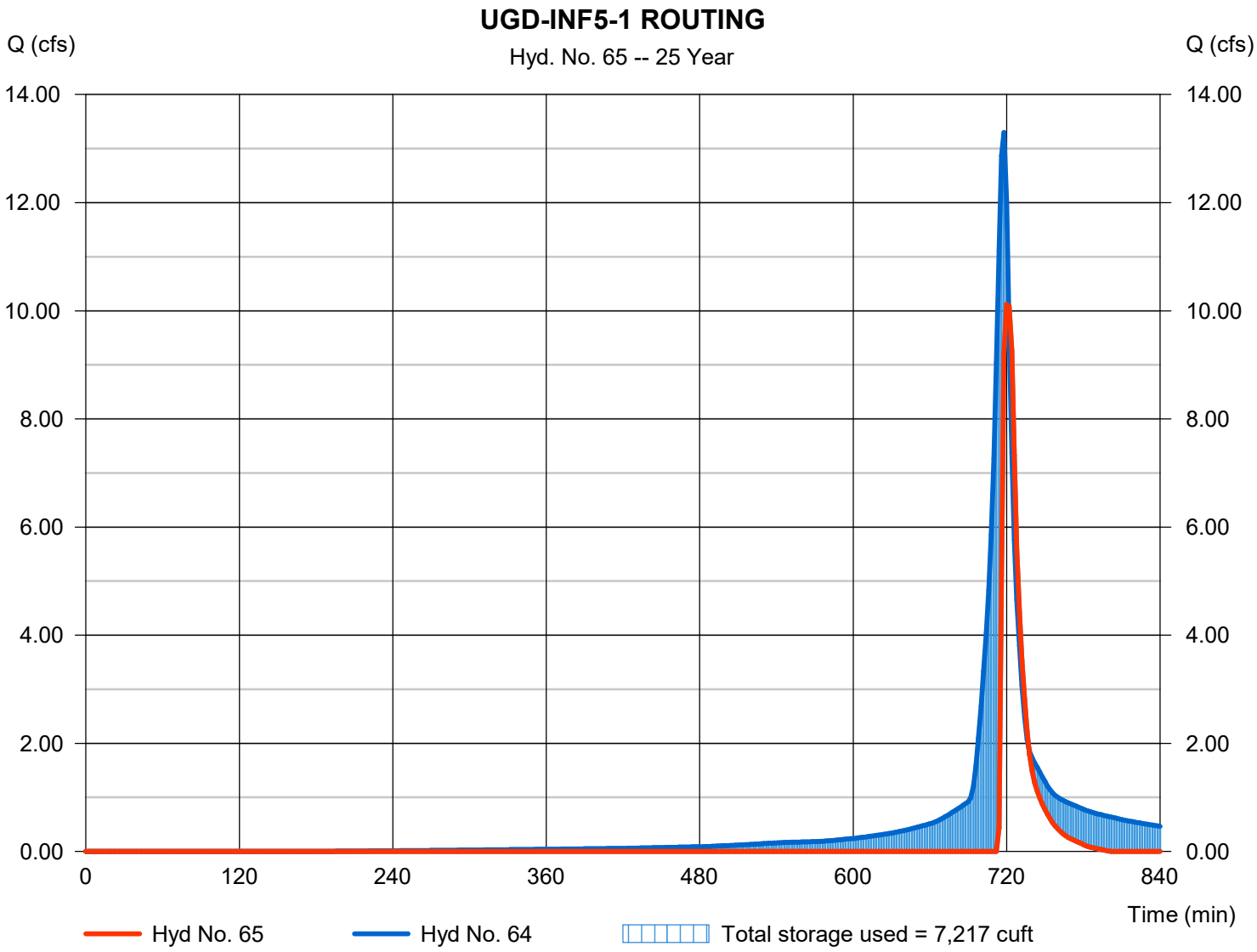
Hydrograph Report

Hyd. No. 65

UGD-INF5-1 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	10.12 cfs
Storm frequency	=	25 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	10,085 cuft
Inflow hyd. No.	=	64 - PR-E-4	Max. Elevation	=	454.79 ft
Reservoir name	=	UGD-INF5-1	Max. Storage	=	7,217 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



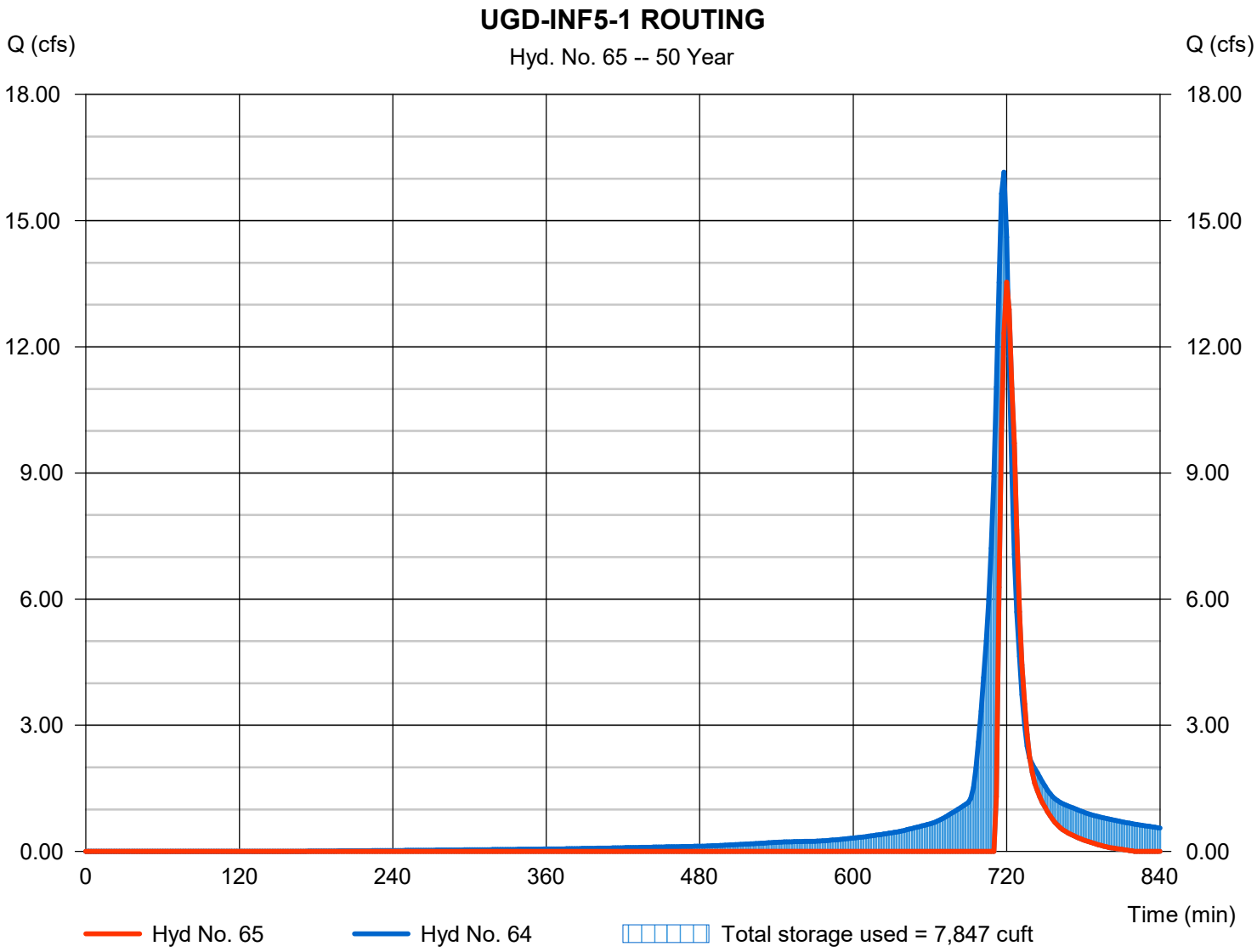
Hydrograph Report

Hyd. No. 65

UGD-INF5-1 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	13.54 cfs
Storm frequency	=	50 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	14,634 cuft
Inflow hyd. No.	=	64 - PR-E-4	Max. Elevation	=	455.07 ft
Reservoir name	=	UGD-INF5-1	Max. Storage	=	7,847 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



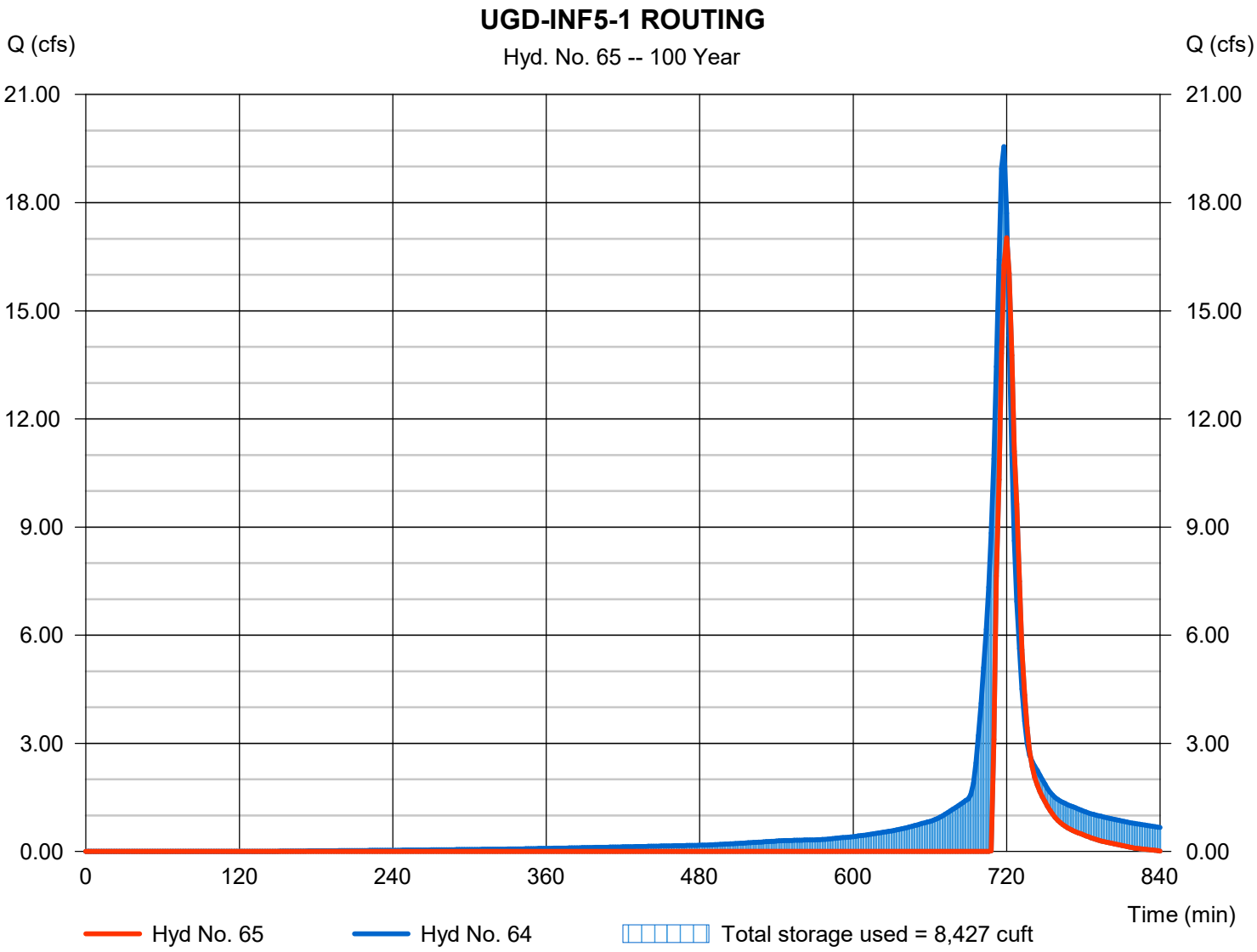
Hydrograph Report

Hyd. No. 65

UGD-INF5-1 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	17.03 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	20,392 cuft
Inflow hyd. No.	=	64 - PR-E-4	Max. Elevation	=	455.35 ft
Reservoir name	=	UGD-INF5-1	Max. Storage	=	8,427 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



PR-E-5 POND ROUTING (UGD-INF5-2)

Pond Report

Pond No. 8 - UGD-INF5-2

Pond Data

UG Chambers -Invert elev. = 453.50 ft, Rise x Span = 2.00 x 2.00 ft, Barrel Len = 104.00 ft, No. Barrels = 4, Slope = 0.00%, Headers = Yes
Encasement -Invert elev. = 453.00 ft, Width = 10.00 ft, Height = 3.00 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	453.00	n/a	0	0
0.30	453.30	n/a	595	595
0.60	453.60	n/a	613	1,208
0.90	453.90	n/a	711	1,919
1.20	454.20	n/a	754	2,673
1.50	454.50	n/a	771	3,444
1.80	454.80	n/a	771	4,215
2.10	455.10	n/a	754	4,969
2.40	455.40	n/a	711	5,680
2.70	455.70	n/a	613	6,293
3.00	456.00	n/a	595	6,888

Culvert / Orifice Structures

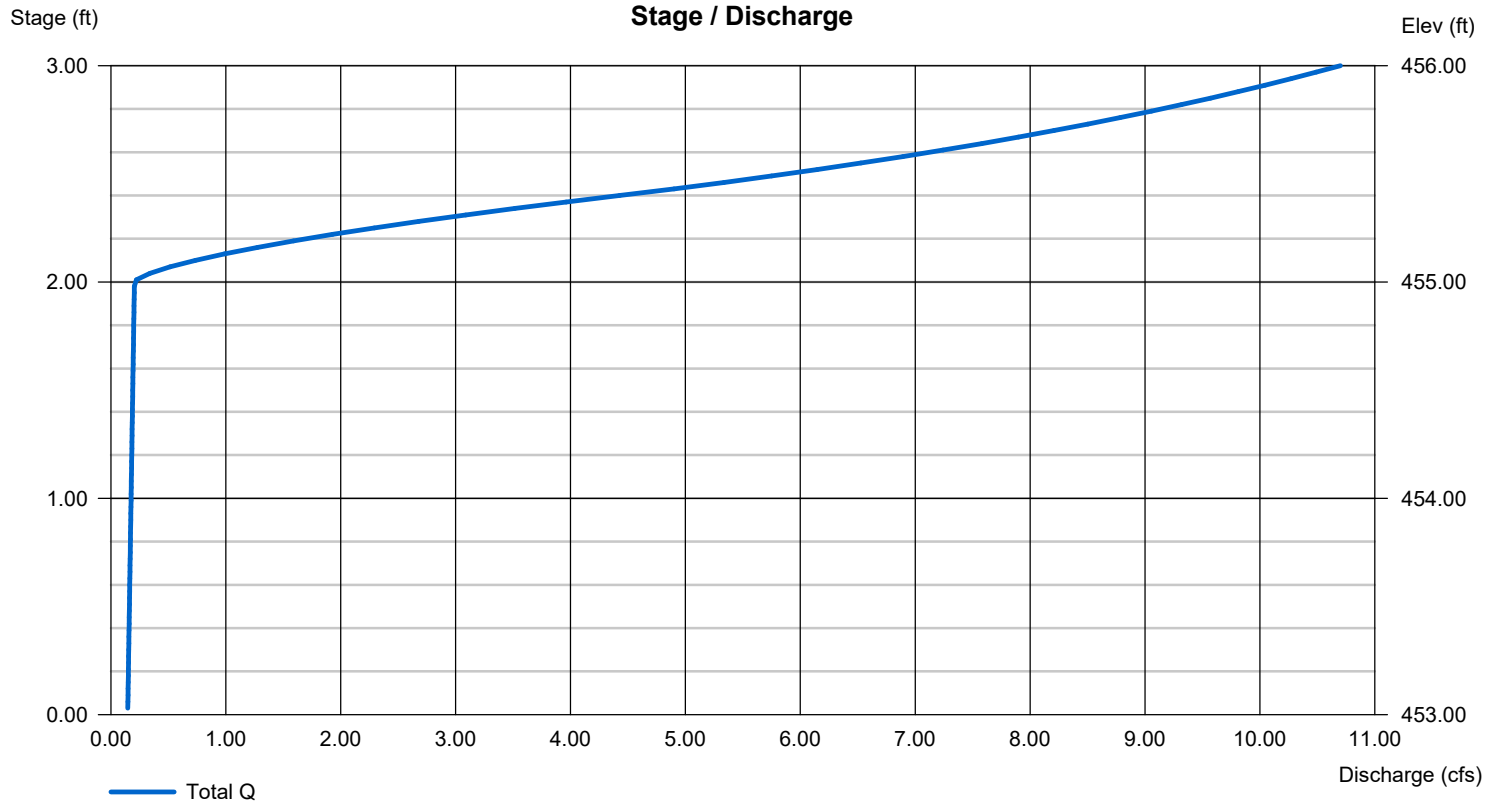
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	0.00	0.00	0.00
Span (in)	= 18.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 453.50	0.00	0.00	0.00
Length (ft)	= 18.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .012	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 5.00	0.00	0.00	0.00
Crest El. (ft)	= 455.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 1.380 (by Wet area)
TW Elev. (ft) = 0.00

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



Hydrograph Report

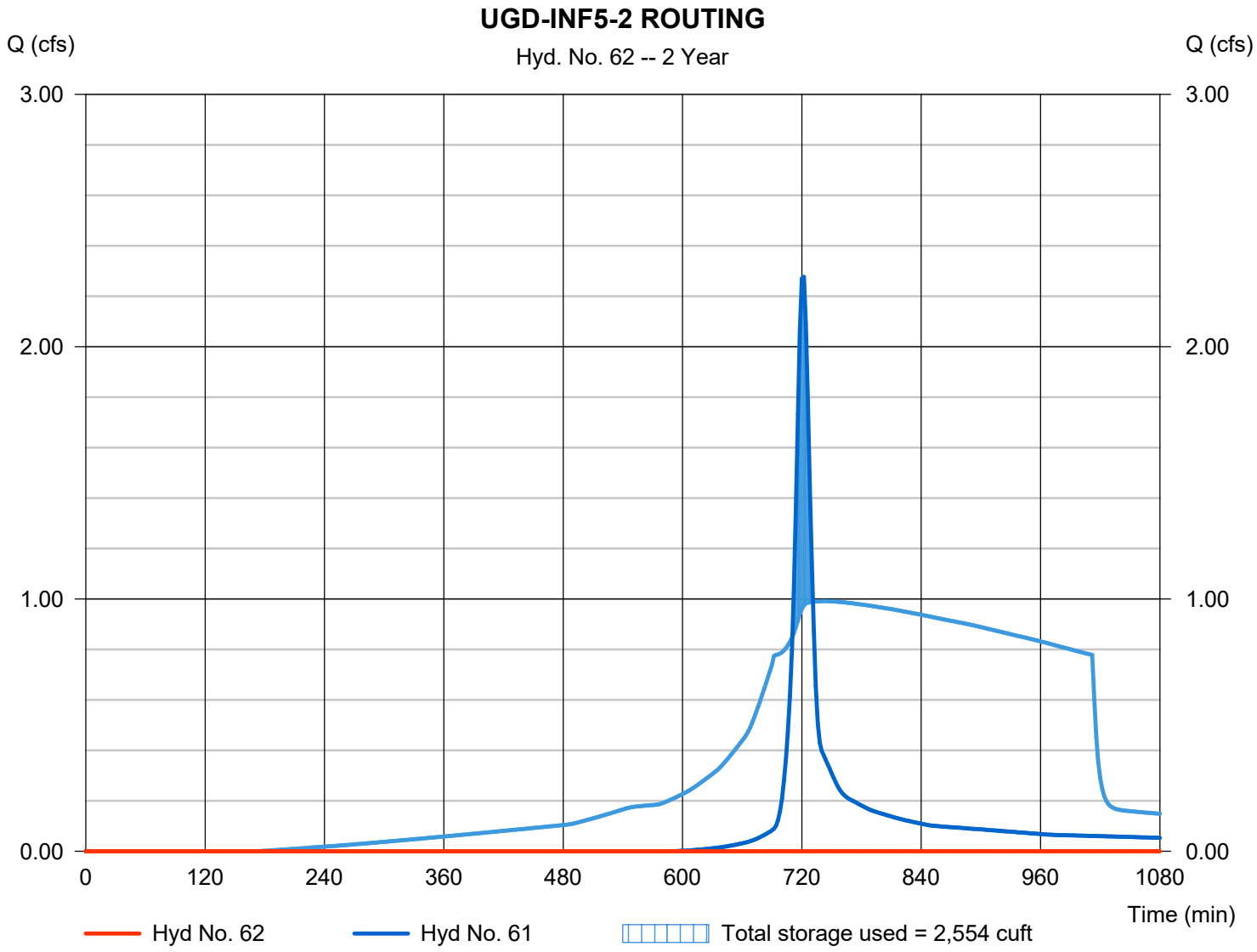
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 05 / 10 / 2021

Hyd. No. 62

UGD-INF5-2 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	0.000 cfs
Storm frequency	=	2 yrs	Time to peak	=	924 min
Time interval	=	2 min	Hyd. volume	=	0 cuft
Inflow hyd. No.	=	61 - PR-E-5	Max. Elevation	=	454.15 ft
Reservoir name	=	UGD-INF5-2	Max. Storage	=	2,554 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

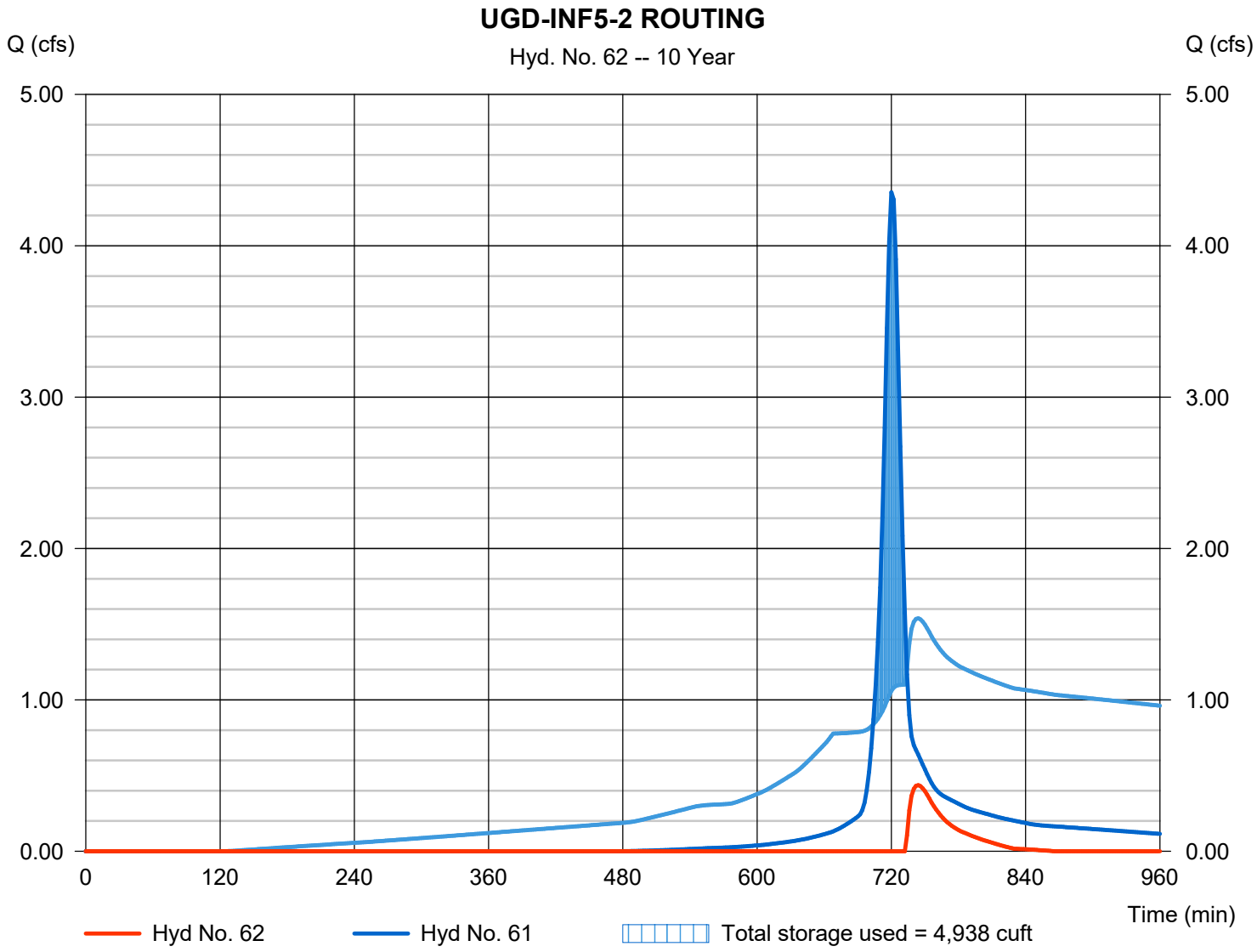
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 05 / 10 / 2021

Hyd. No. 62

UGD-INF5-2 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	0.437 cfs
Storm frequency	=	10 yrs	Time to peak	=	744 min
Time interval	=	2 min	Hyd. volume	=	1,039 cuft
Inflow hyd. No.	=	61 - PR-E-5	Max. Elevation	=	455.09 ft
Reservoir name	=	UGD-INF5-2	Max. Storage	=	4,938 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



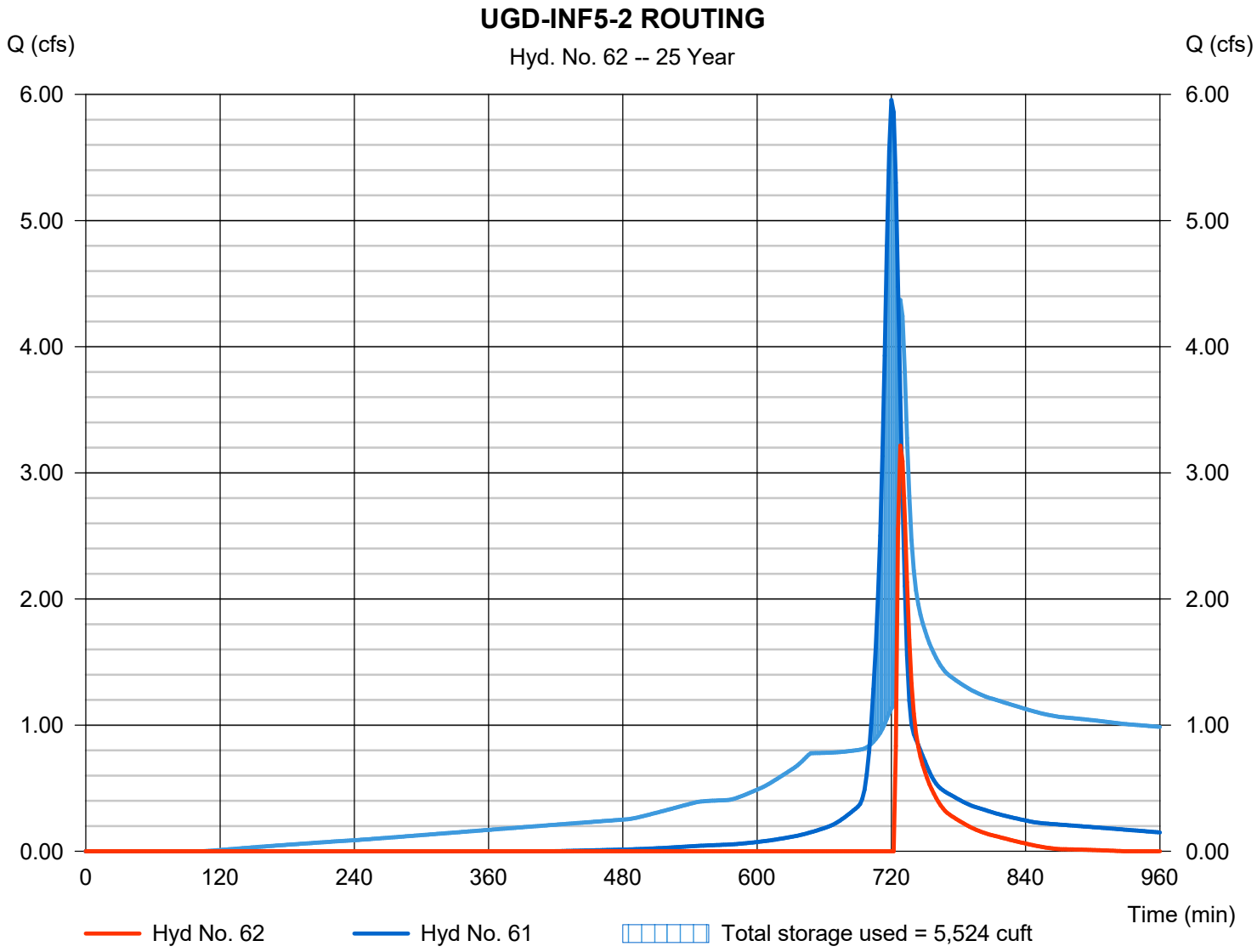
Hydrograph Report

Hyd. No. 62

UGD-INF5-2 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	3.216 cfs
Storm frequency	=	25 yrs	Time to peak	=	728 min
Time interval	=	2 min	Hyd. volume	=	3,926 cuft
Inflow hyd. No.	=	61 - PR-E-5	Max. Elevation	=	455.33 ft
Reservoir name	=	UGD-INF5-2	Max. Storage	=	5,524 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



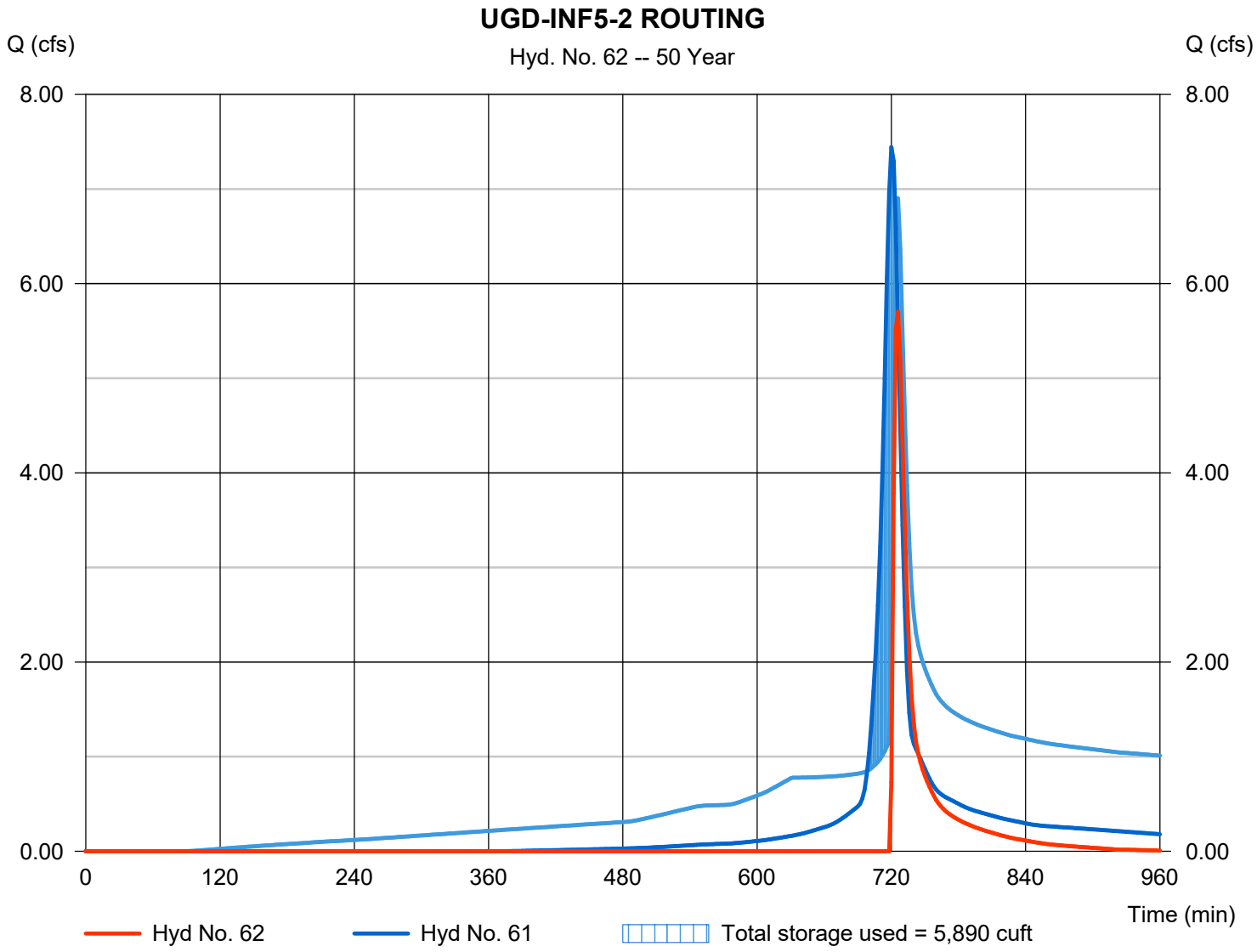
Hydrograph Report

Hyd. No. 62

UGD-INF5-2 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	5.703 cfs
Storm frequency	=	50 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	6,843 cuft
Inflow hyd. No.	=	61 - PR-E-5	Max. Elevation	=	455.50 ft
Reservoir name	=	UGD-INF5-2	Max. Storage	=	5,890 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



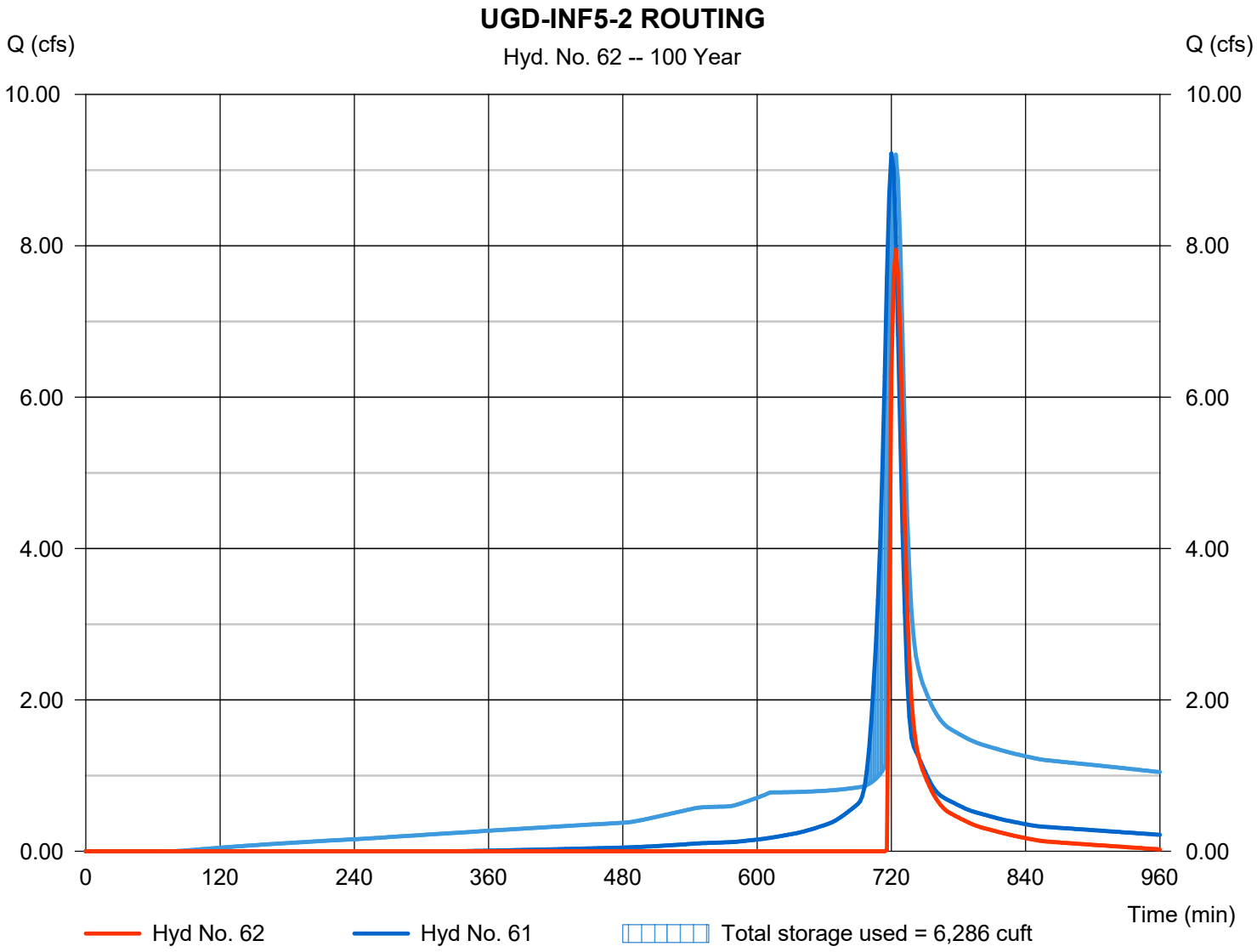
Hydrograph Report

Hyd. No. 62

UGD-INF5-2 ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 7.948 cfs
Storm frequency	= 100 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 10,566 cuft
Inflow hyd. No.	= 61 - PR-E-5	Max. Elevation	= 455.70 ft
Reservoir name	= UGD-INF5-2	Max. Storage	= 6,286 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



PR-E-6 POND ROUTING (UGD-INF5-3)

Pond Report

Pond No. 9 - UGD-INF5-3

Pond Data

UG Chambers -Invert elev. = 448.00 ft, Rise x Span = 2.00 x 2.00 ft, Barrel Len = 113.00 ft, No. Barrels = 7, Slope = 0.00%, Headers = Yes
Encasement -Invert elev. = 447.50 ft, Width = 8.00 ft, Height = 3.00 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	447.50	n/a	0	0
0.30	447.80	n/a	867	867
0.60	448.10	n/a	899	1,766
0.90	448.40	n/a	1,078	2,844
1.20	448.70	n/a	1,156	4,000
1.50	449.00	n/a	1,187	5,187
1.80	449.30	n/a	1,187	6,374
2.10	449.60	n/a	1,155	7,529
2.40	449.90	n/a	1,078	8,607
2.70	450.20	n/a	899	9,506
3.00	450.50	n/a	867	10,373

Culvert / Orifice Structures

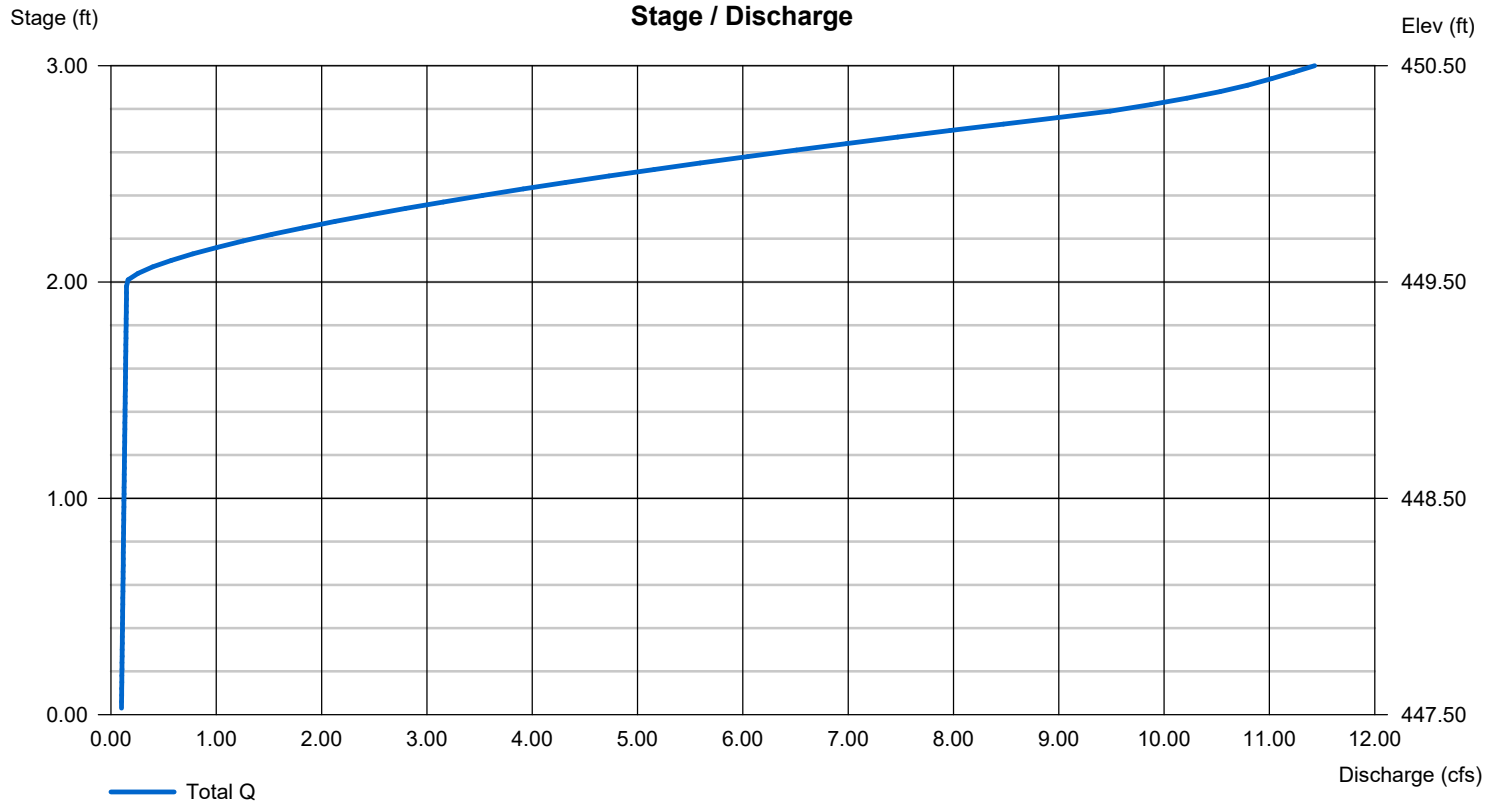
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	0.00	0.00	0.00
Span (in)	= 18.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 447.50	0.00	0.00	0.00
Length (ft)	= 34.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .012	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.00	0.00	0.00	0.00
Crest El. (ft)	= 449.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.630 (by Wet area)
TW Elev. (ft) = 0.00

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



Hydrograph Report

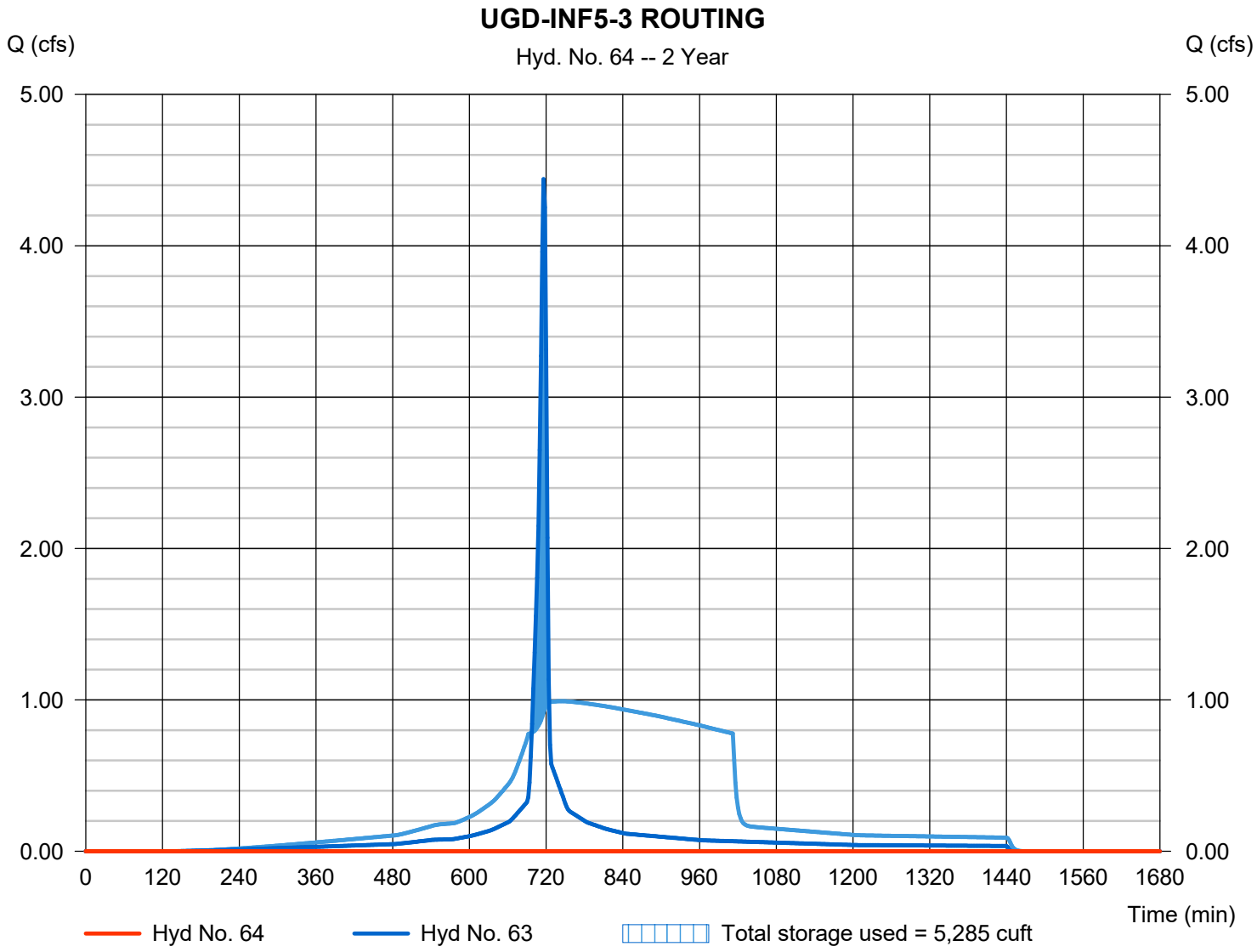
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 05 / 10 / 2021

Hyd. No. 64

UGD-INF5-3 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	0.000 cfs
Storm frequency	=	2 yrs	Time to peak	=	1184 min
Time interval	=	2 min	Hyd. volume	=	0 cuft
Inflow hyd. No.	=	63 - PR-E-6	Max. Elevation	=	449.02 ft
Reservoir name	=	UGD-INF5-3	Max. Storage	=	5,285 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



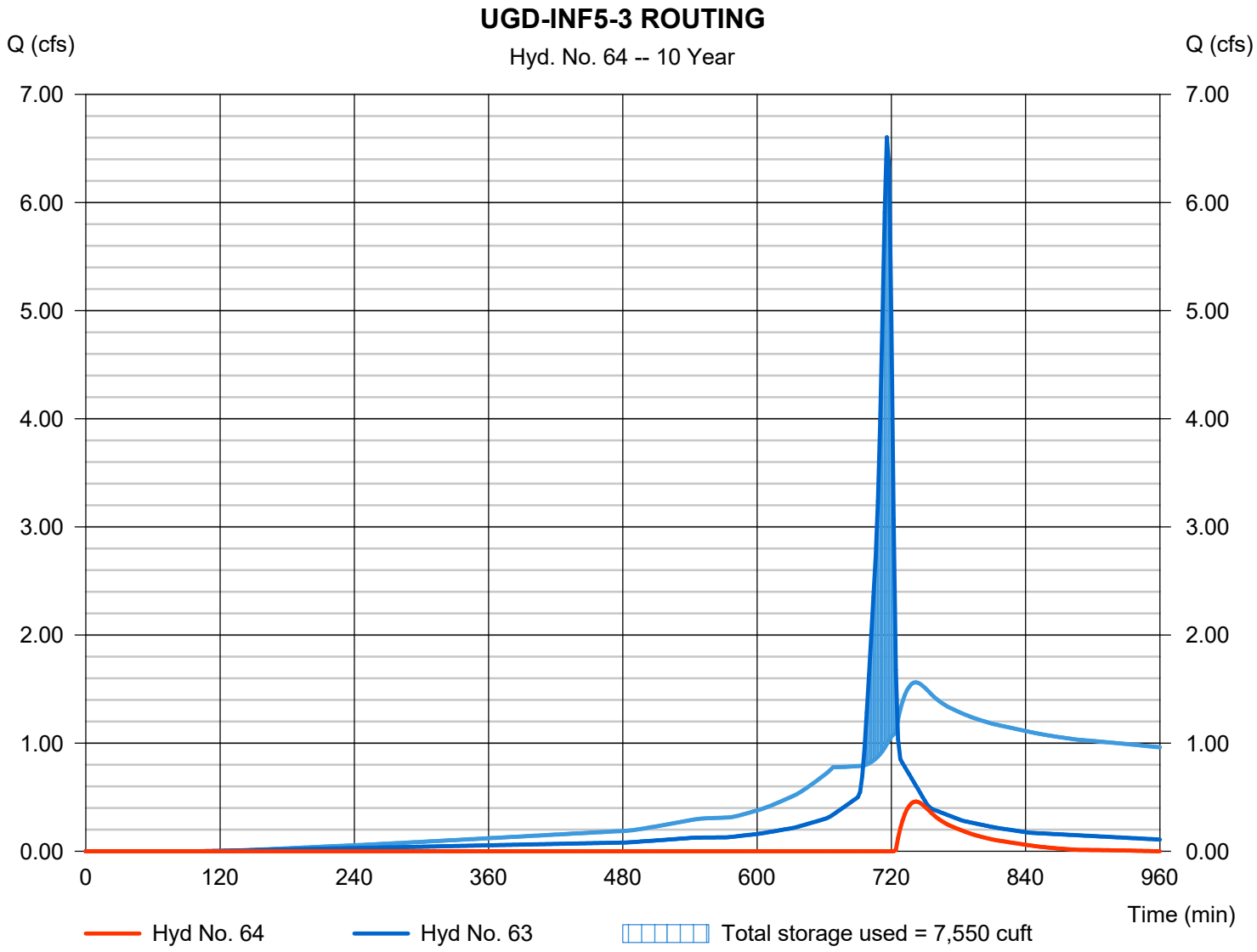
Hydrograph Report

Hyd. No. 64

UGD-INF5-3 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	0.460 cfs
Storm frequency	=	10 yrs	Time to peak	=	742 min
Time interval	=	2 min	Hyd. volume	=	1,633 cuft
Inflow hyd. No.	=	63 - PR-E-6	Max. Elevation	=	449.61 ft
Reservoir name	=	UGD-INF5-3	Max. Storage	=	7,550 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



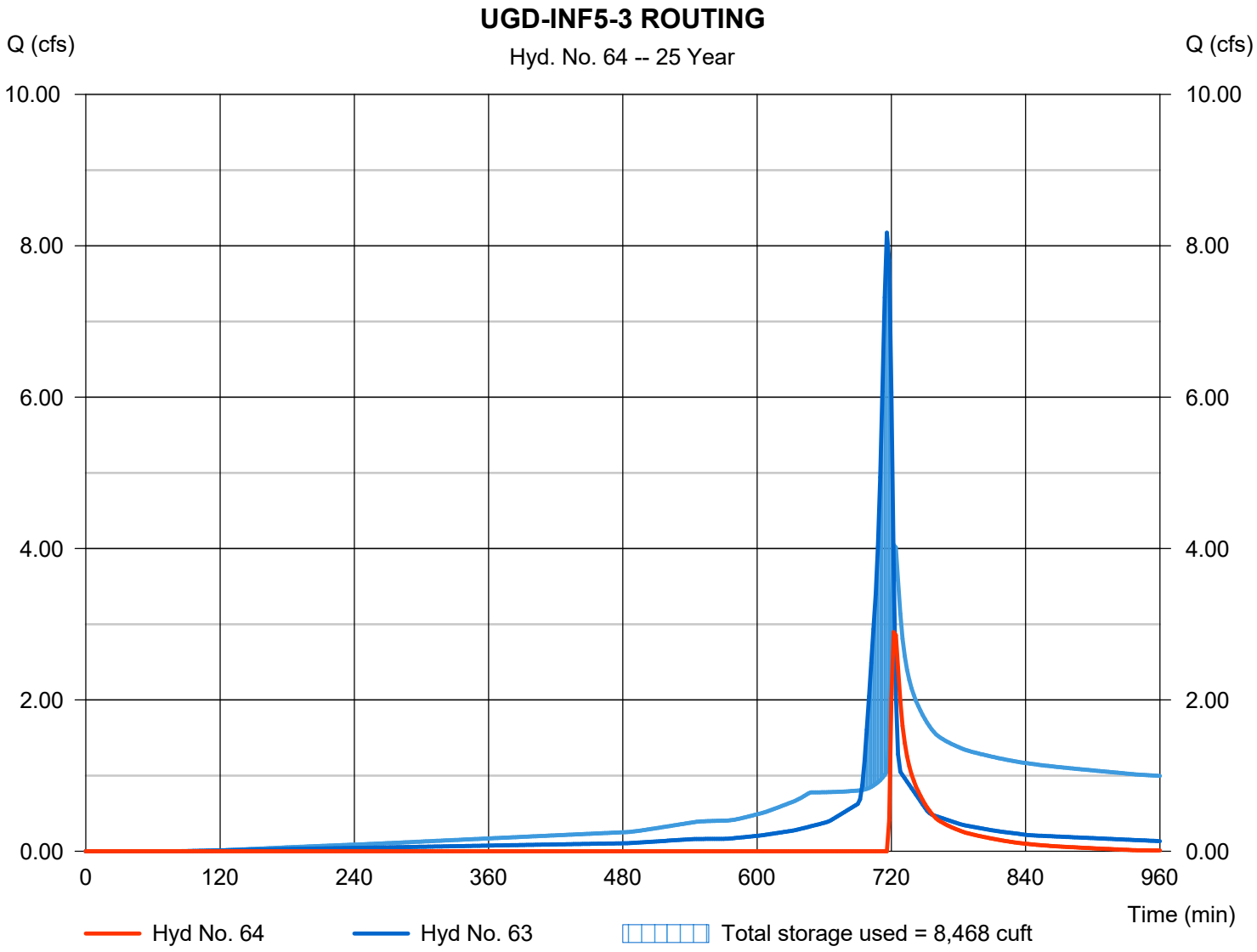
Hydrograph Report

Hyd. No. 64

UGD-INF5-3 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	2.895 cfs
Storm frequency	=	25 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	4,486 cuft
Inflow hyd. No.	=	63 - PR-E-6	Max. Elevation	=	449.86 ft
Reservoir name	=	UGD-INF5-3	Max. Storage	=	8,468 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



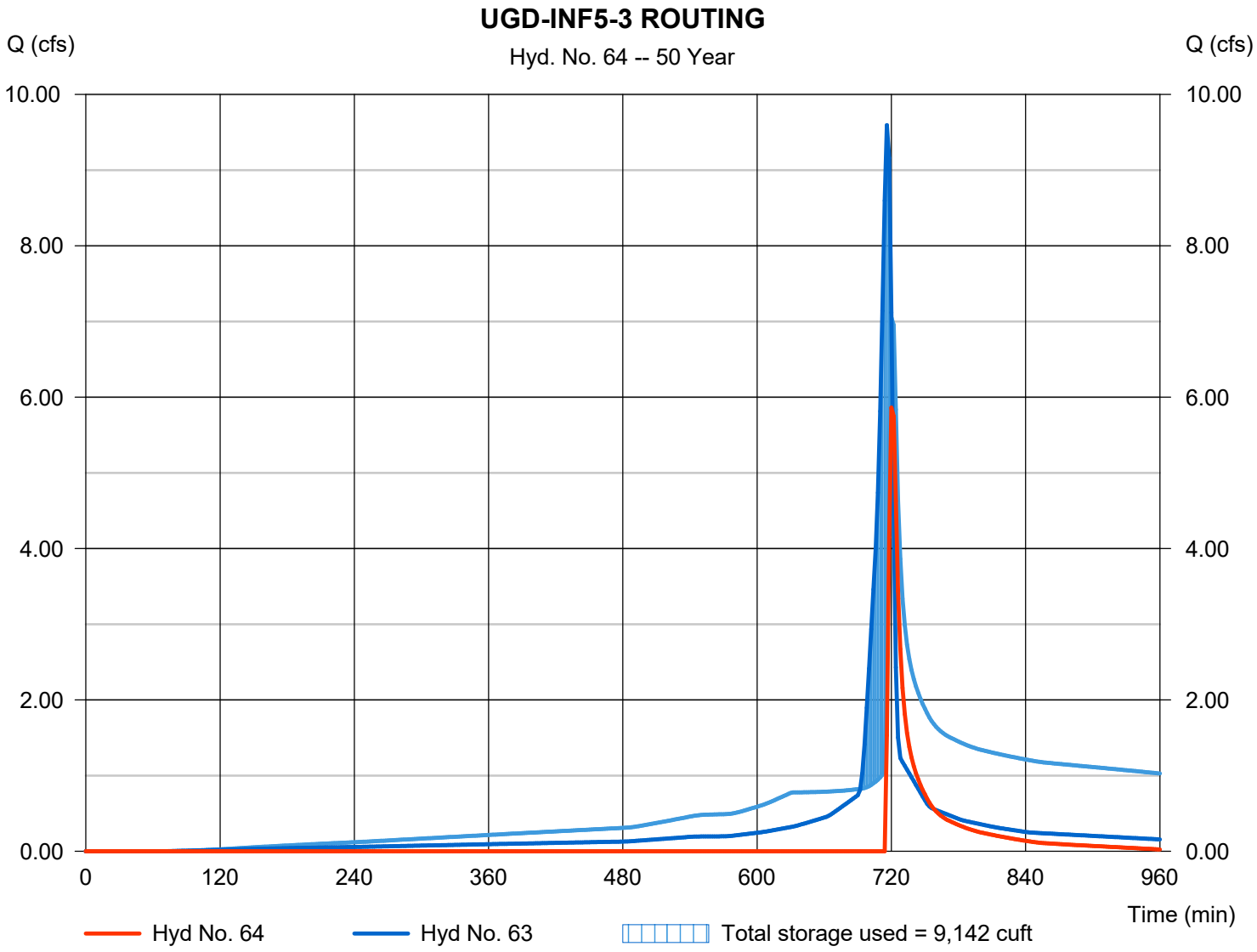
Hydrograph Report

Hyd. No. 64

UGD-INF5-3 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	5.861 cfs
Storm frequency	=	50 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	7,234 cuft
Inflow hyd. No.	=	63 - PR-E-6	Max. Elevation	=	450.08 ft
Reservoir name	=	UGD-INF5-3	Max. Storage	=	9,142 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



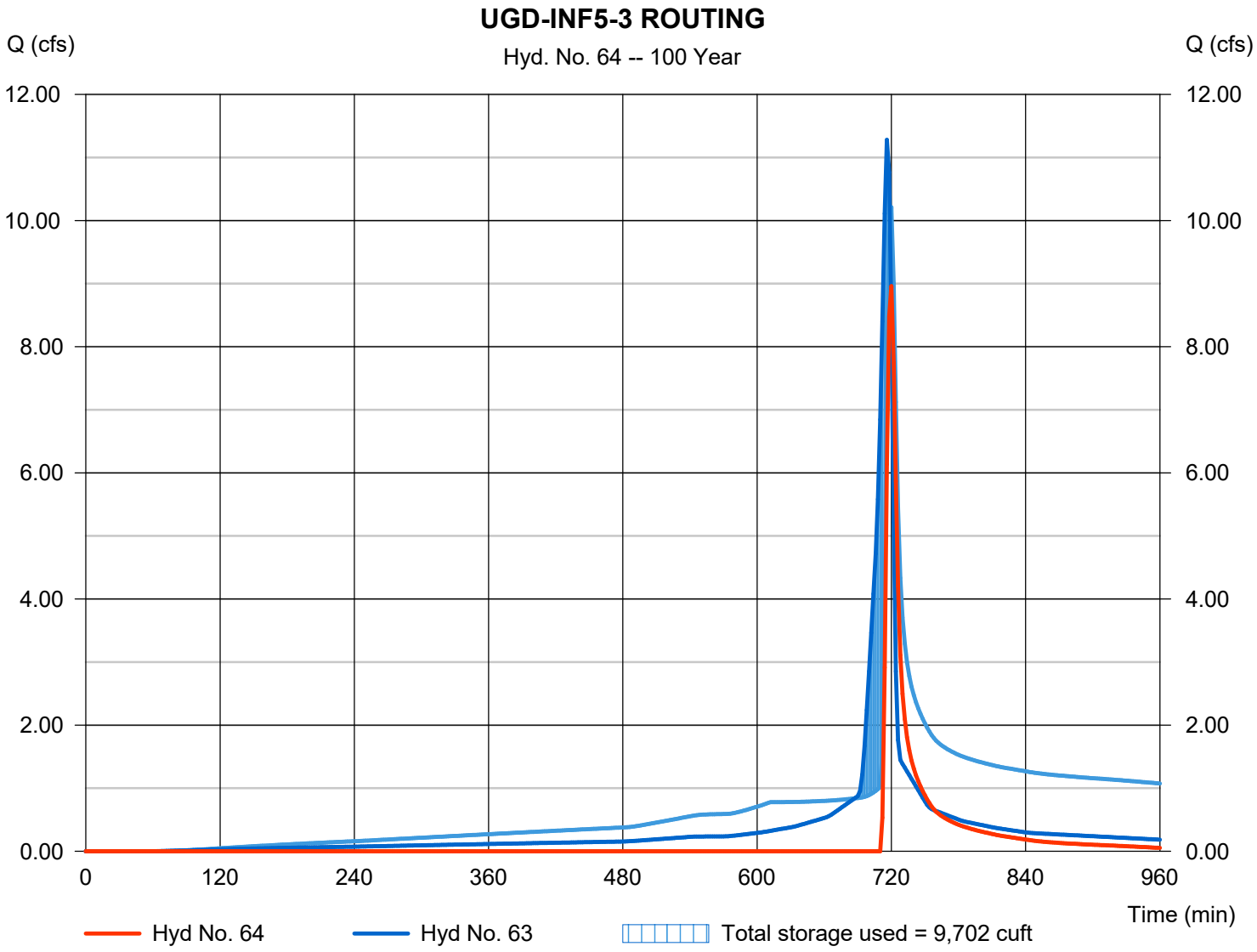
Hydrograph Report

Hyd. No. 64

UGD-INF5-3 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	8.959 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	10,665 cuft
Inflow hyd. No.	=	63 - PR-E-6	Max. Elevation	=	450.27 ft
Reservoir name	=	UGD-INF5-3	Max. Storage	=	9,702 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



PR-E-7 POND ROUTING (UGD-INF5-4)

Pond Report

Pond No. 10 - UGD-INF5-4

Pond Data

UG Chambers -Invert elev. = 442.00 ft, Rise x Span = 3.00 x 3.00 ft, Barrel Len = 154.00 ft, No. Barrels = 8, Slope = 0.00%, Headers = Yes
Encasement -Invert elev. = 441.50 ft, Width = 10.00 ft, Height = 4.00 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	441.50	n/a	0	0
0.40	441.90	n/a	2,228	2,228
0.80	442.30	n/a	2,535	4,762
1.20	442.70	n/a	2,968	7,731
1.60	443.10	n/a	3,142	10,873
2.00	443.50	n/a	3,218	14,091
2.40	443.90	n/a	3,218	17,309
2.80	444.30	n/a	3,142	20,451
3.20	444.70	n/a	2,968	23,419
3.60	445.10	n/a	2,534	25,953
4.00	445.50	n/a	2,228	28,181

Culvert / Orifice Structures

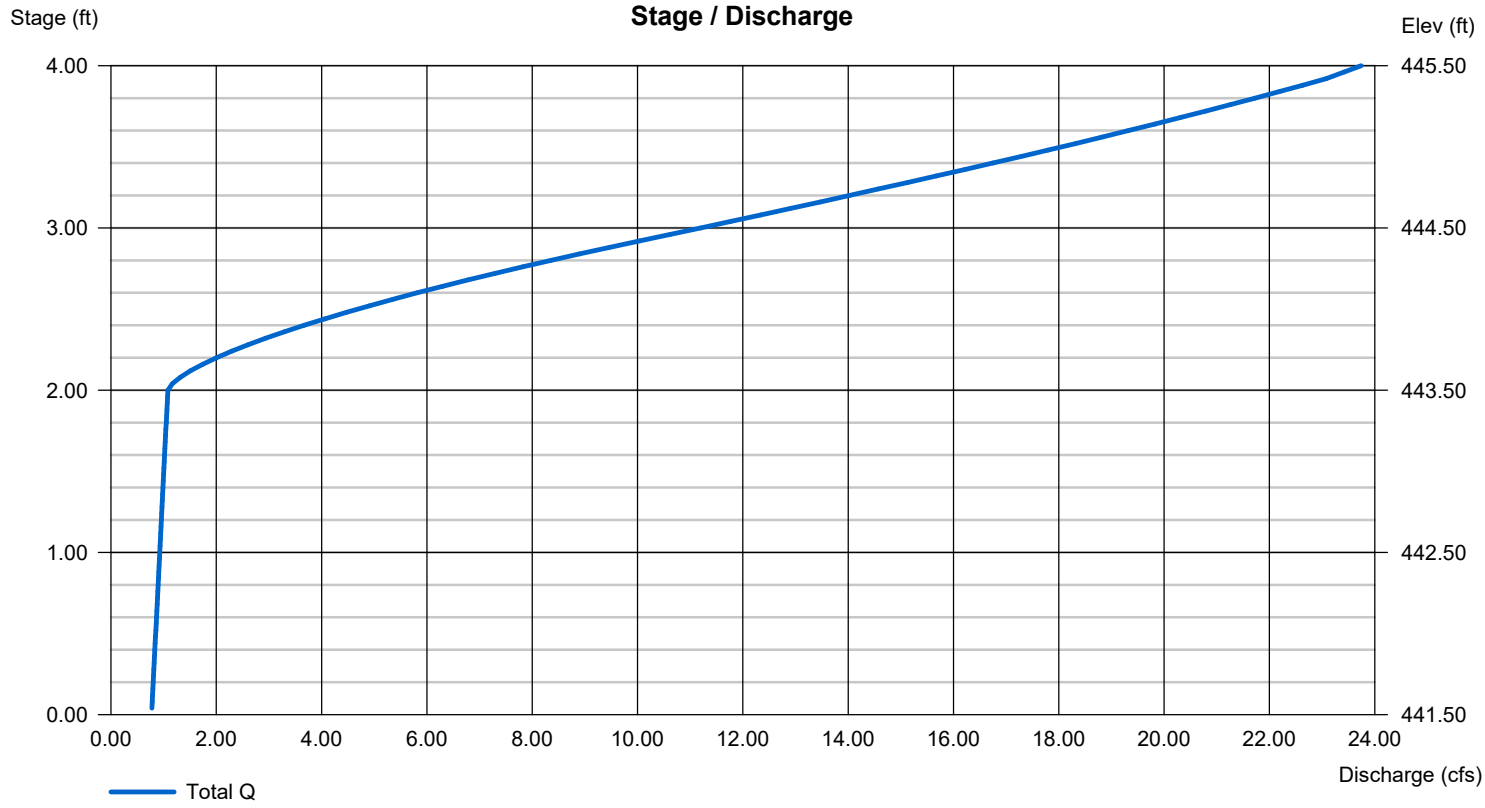
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	0.00	0.00	0.00
Span (in)	= 24.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 441.50	0.00	0.00	0.00
Length (ft)	= 24.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .012	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 3.00	0.00	0.00	0.00
Crest El. (ft)	= 443.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 2.540 (by Wet area)
TW Elev. (ft) = 0.00

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



Hydrograph Report

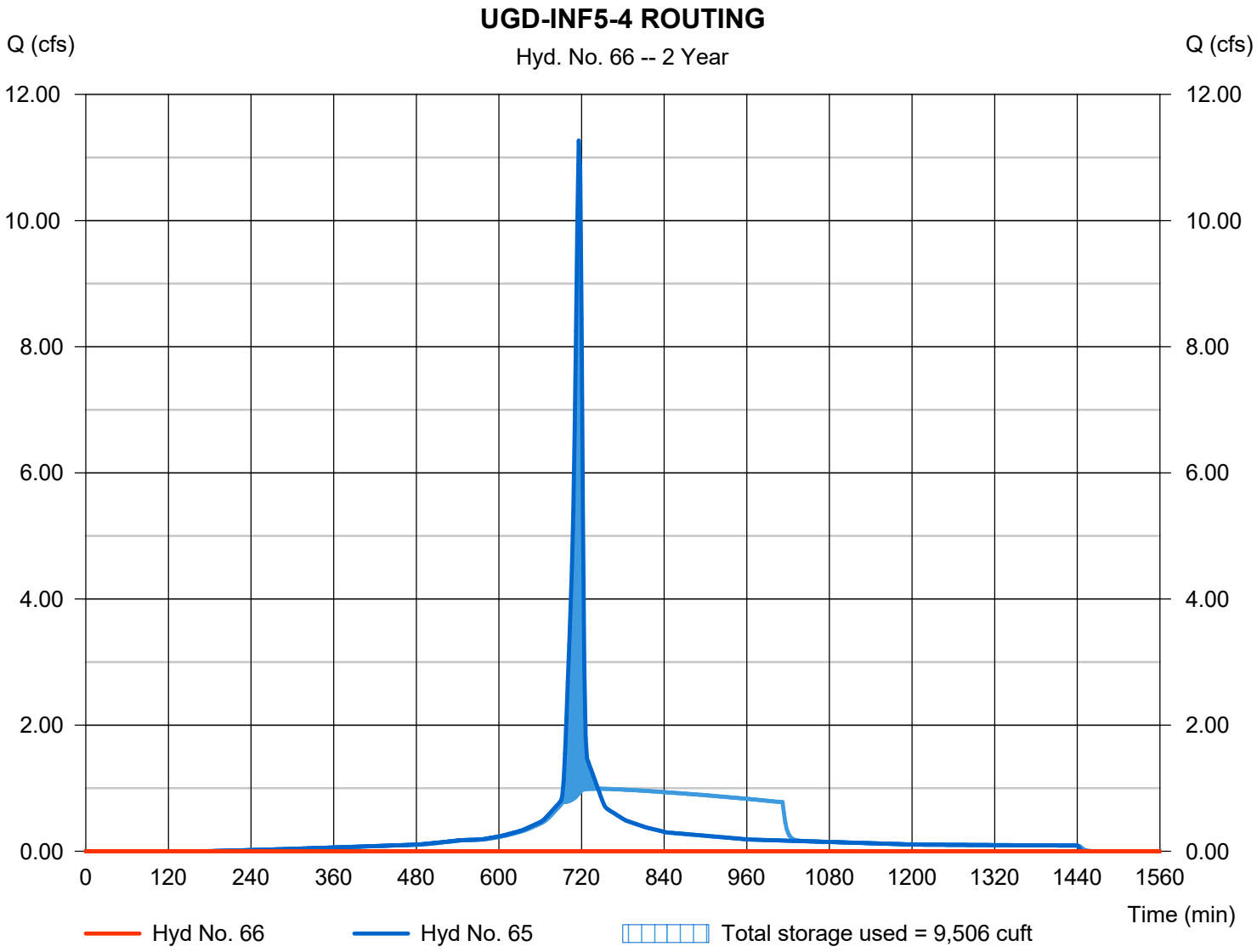
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Monday, 05 / 10 / 2021

Hyd. No. 66

UGD-INF5-4 ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 65 - PR-E-7	Max. Elevation	= 442.93 ft
Reservoir name	= UGD-INF5-4	Max. Storage	= 9,506 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



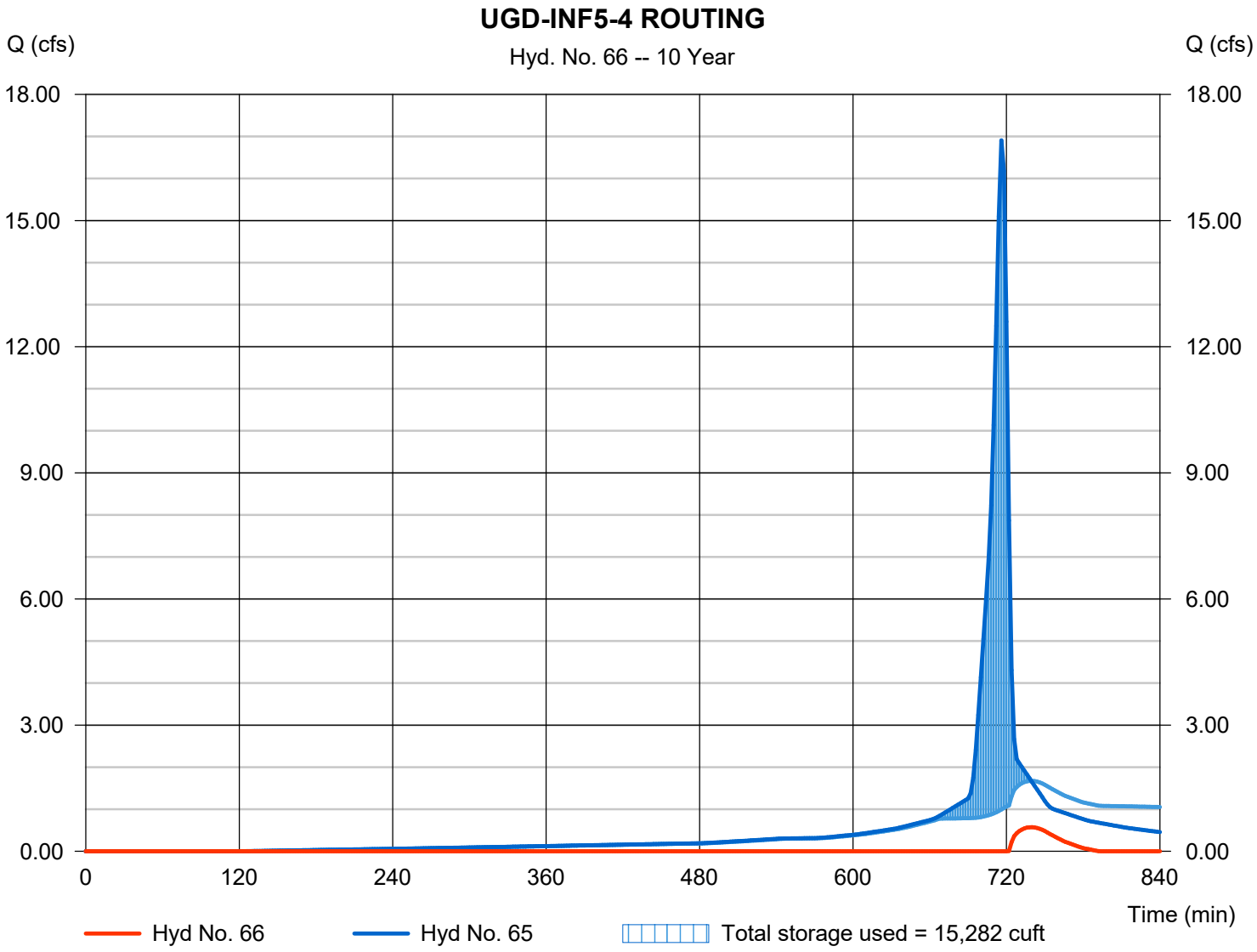
Hydrograph Report

Hyd. No. 66

UGD-INF5-4 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	0.572 cfs
Storm frequency	=	10 yrs	Time to peak	=	740 min
Time interval	=	2 min	Hyd. volume	=	1,286 cuft
Inflow hyd. No.	=	65 - PR-E-7	Max. Elevation	=	443.65 ft
Reservoir name	=	UGD-INF5-4	Max. Storage	=	15,282 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



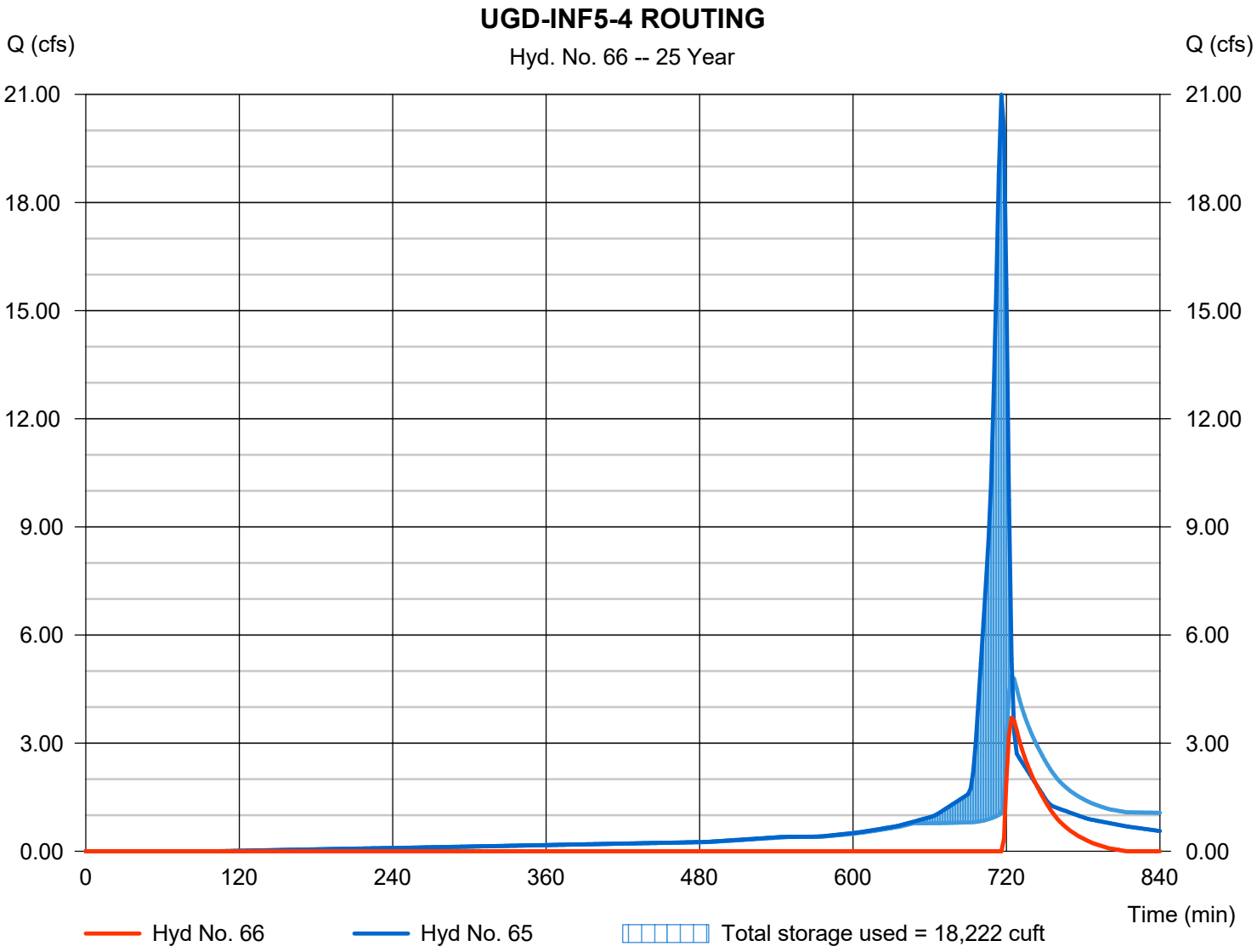
Hydrograph Report

Hyd. No. 66

UGD-INF5-4 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	3.706 cfs
Storm frequency	=	25 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	6,369 cuft
Inflow hyd. No.	=	65 - PR-E-7	Max. Elevation	=	444.02 ft
Reservoir name	=	UGD-INF5-4	Max. Storage	=	18,222 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



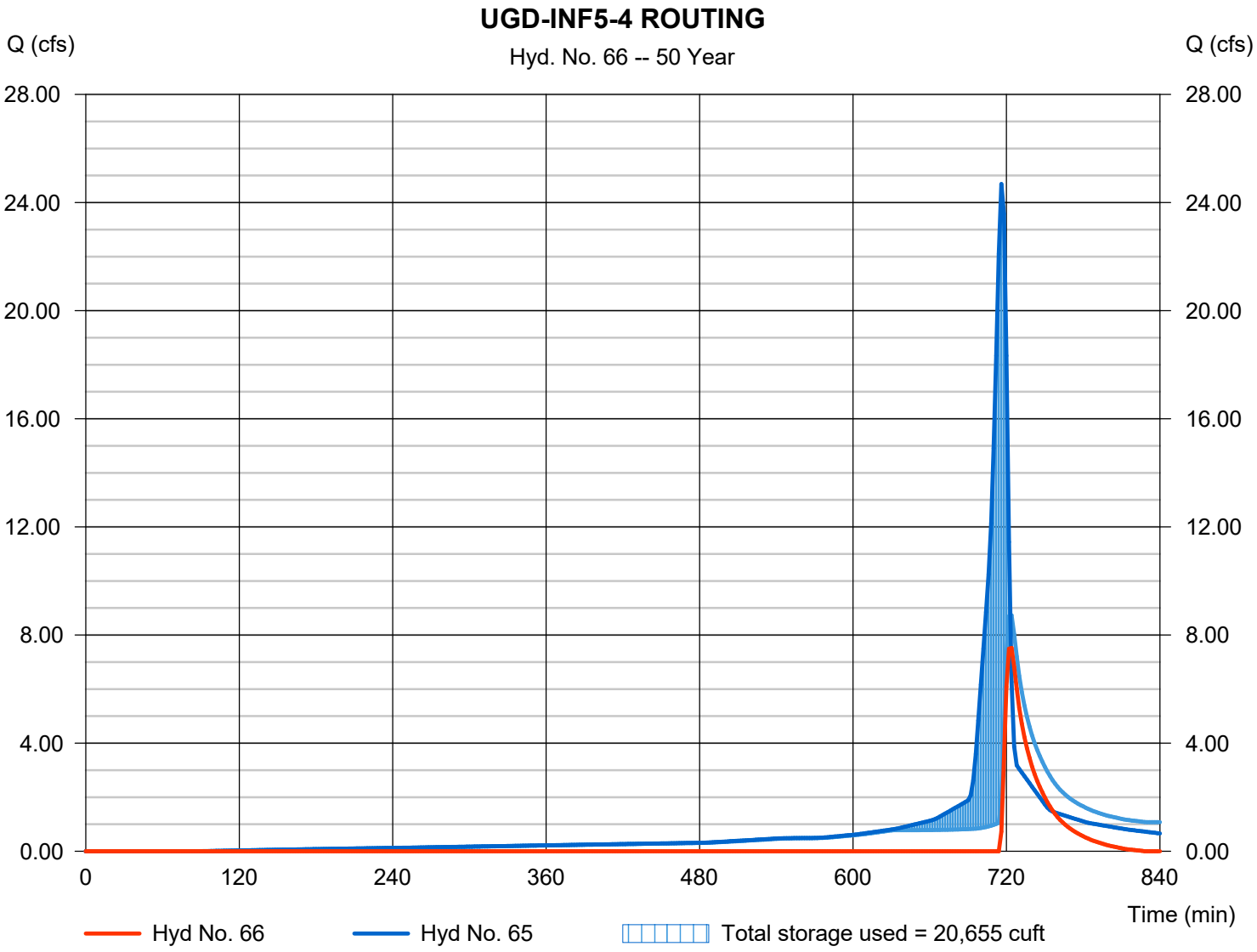
Hydrograph Report

Hyd. No. 66

UGD-INF5-4 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	7.521 cfs
Storm frequency	=	50 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	11,437 cuft
Inflow hyd. No.	=	65 - PR-E-7	Max. Elevation	=	444.33 ft
Reservoir name	=	UGD-INF5-4	Max. Storage	=	20,655 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



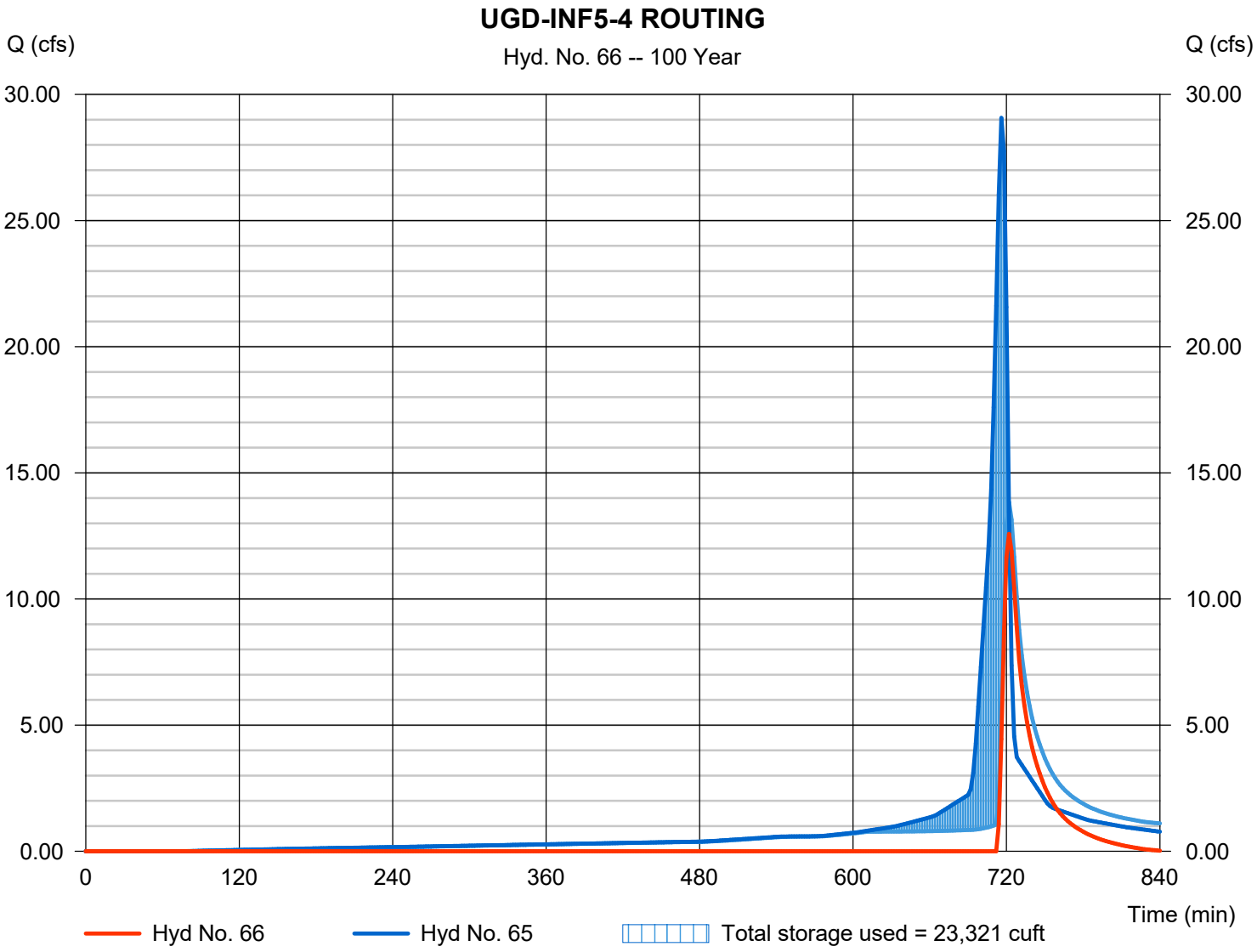
Hydrograph Report

Hyd. No. 66

UGD-INF5-4 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	12.58 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	17,766 cuft
Inflow hyd. No.	=	65 - PR-E-7	Max. Elevation	=	444.69 ft
Reservoir name	=	UGD-INF5-4	Max. Storage	=	23,321 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



PR-E-8 POND ROUTING (SEDIMENT BASIN 1-2)

Pond Report

Pond No. 16 - SED-BASIN1-2

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 439.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	439.50	12,286	0	0
0.50	440.00	13,020	6,325	6,325
1.00	440.50	13,753	6,692	13,017
1.50	441.00	14,515	7,065	20,082
2.00	441.50	15,277	7,446	27,529
2.50	442.00	16,068	7,835	35,363
3.00	442.50	16,858	8,230	43,593
3.50	443.00	17,677	8,632	52,225
4.00	443.50	18,495	9,041	61,267
4.50	444.00	19,335	9,456	70,722
5.00	444.50	20,189	9,879	80,602
5.50	445.00	21,057	10,310	90,911
6.00	445.50	21,939	10,747	101,658

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 30.00	0.00	0.00	1.00
Span (in)	= 30.00	0.00	0.00	1.00
No. Barrels	= 1	0	0	18
Invert El. (ft)	= 439.50	0.00	0.00	440.50
Length (ft)	= 50.00	0.00	0.00	3.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .012	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	Yes

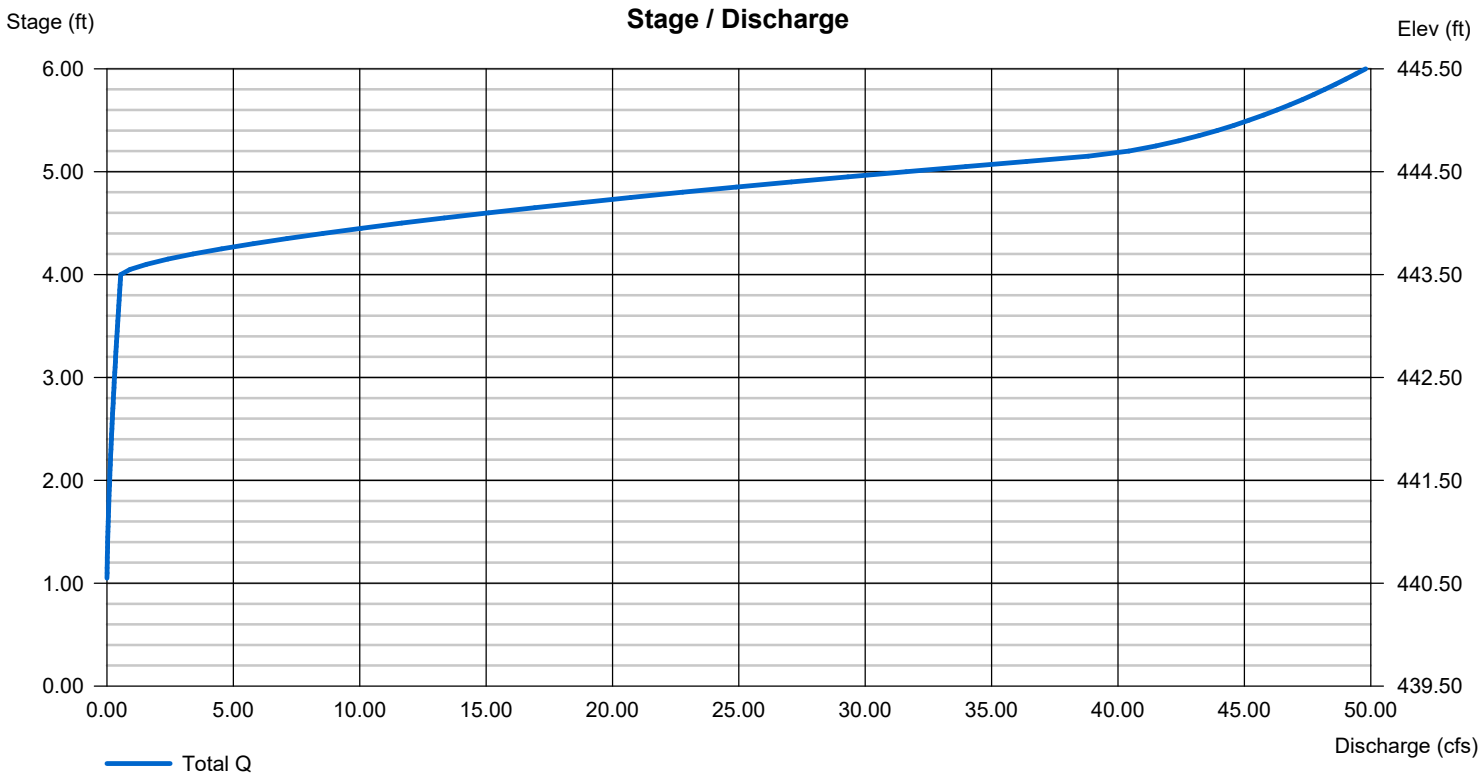
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 9.42	0.00	0.00	0.00
Crest El. (ft)	= 443.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

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

TW Elev. (ft) = 0.00

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



Hydrograph Report

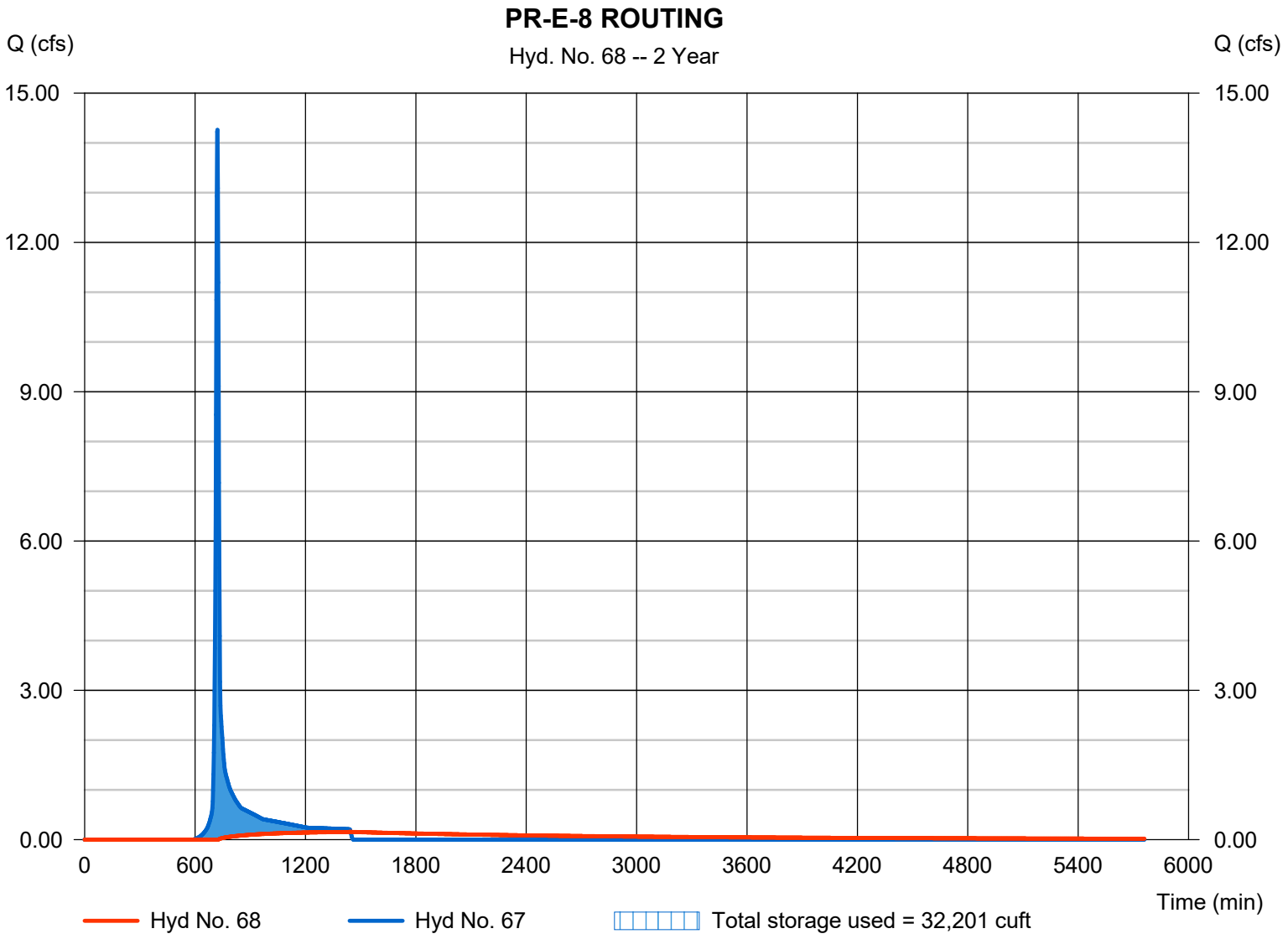
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 68

PR-E-8 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	0.155 cfs
Storm frequency	=	2 yrs	Time to peak	=	1446 min
Time interval	=	2 min	Hyd. volume	=	20,011 cuft
Inflow hyd. No.	=	67 - PR-E-8	Max. Elevation	=	441.80 ft
Reservoir name	=	SED-BASIN1-2	Max. Storage	=	32,201 cuft

Storage Indication method used.



Hydrograph Report

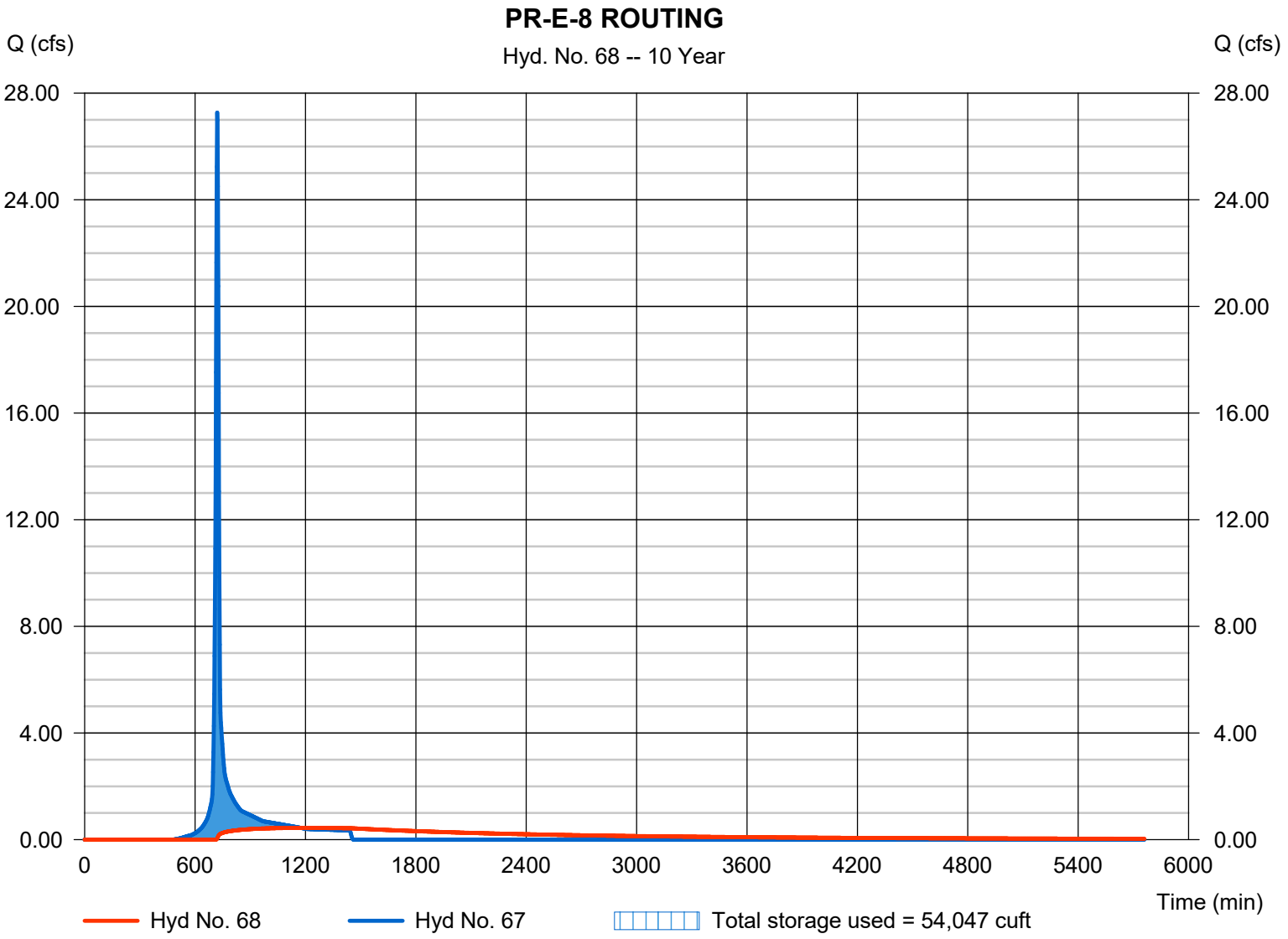
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 68

PR-E-8 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	0.441 cfs
Storm frequency	=	10 yrs	Time to peak	=	1176 min
Time interval	=	2 min	Hyd. volume	=	51,478 cuft
Inflow hyd. No.	=	67 - PR-E-8	Max. Elevation	=	443.10 ft
Reservoir name	=	SED-BASIN1-2	Max. Storage	=	54,047 cuft

Storage Indication method used.



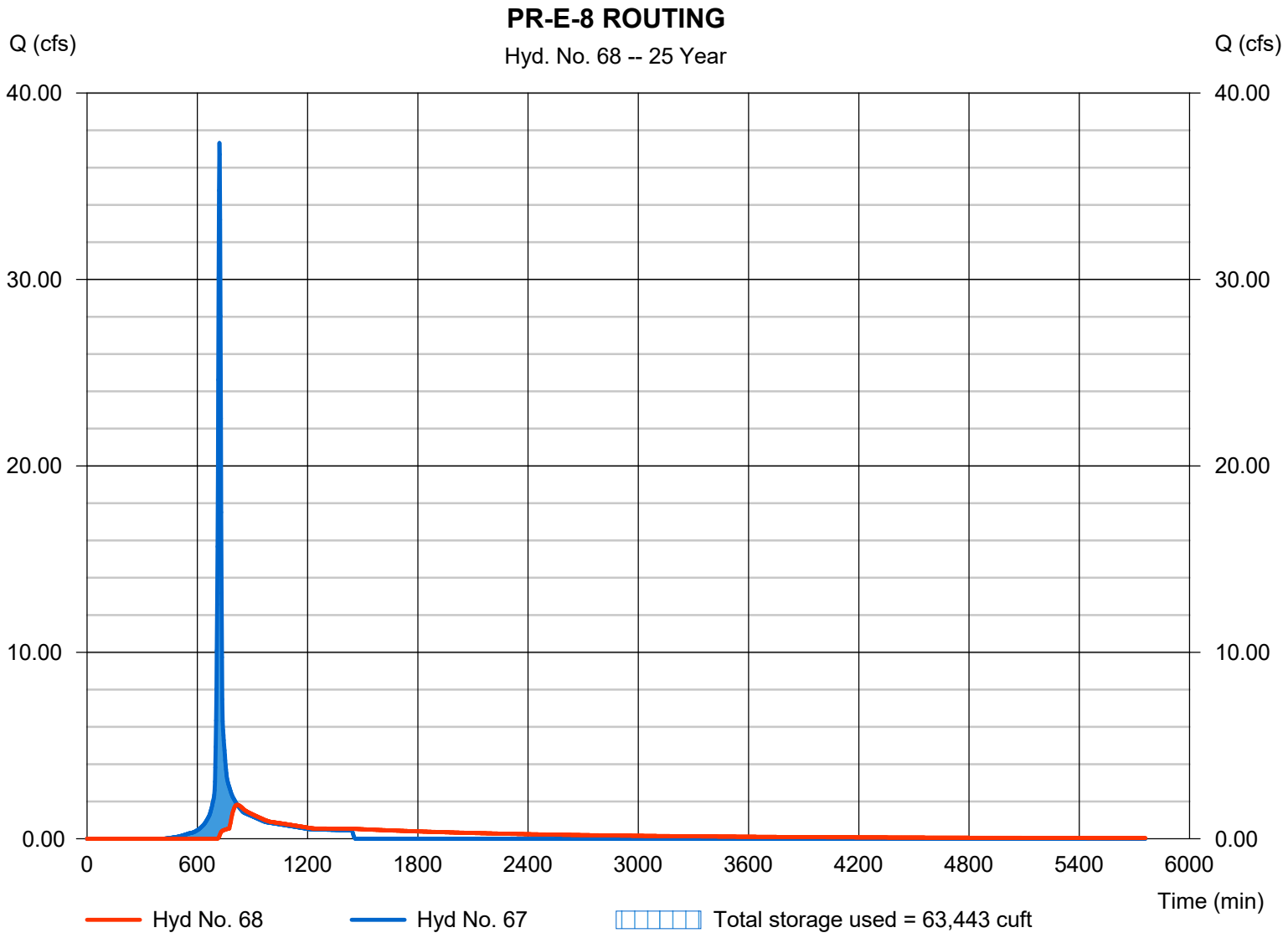
Hydrograph Report

Hyd. No. 68

PR-E-8 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	1.819 cfs
Storm frequency	=	25 yrs	Time to peak	=	818 min
Time interval	=	2 min	Hyd. volume	=	77,278 cuft
Inflow hyd. No.	=	67 - PR-E-8	Max. Elevation	=	443.62 ft
Reservoir name	=	SED-BASIN1-2	Max. Storage	=	63,443 cuft

Storage Indication method used.



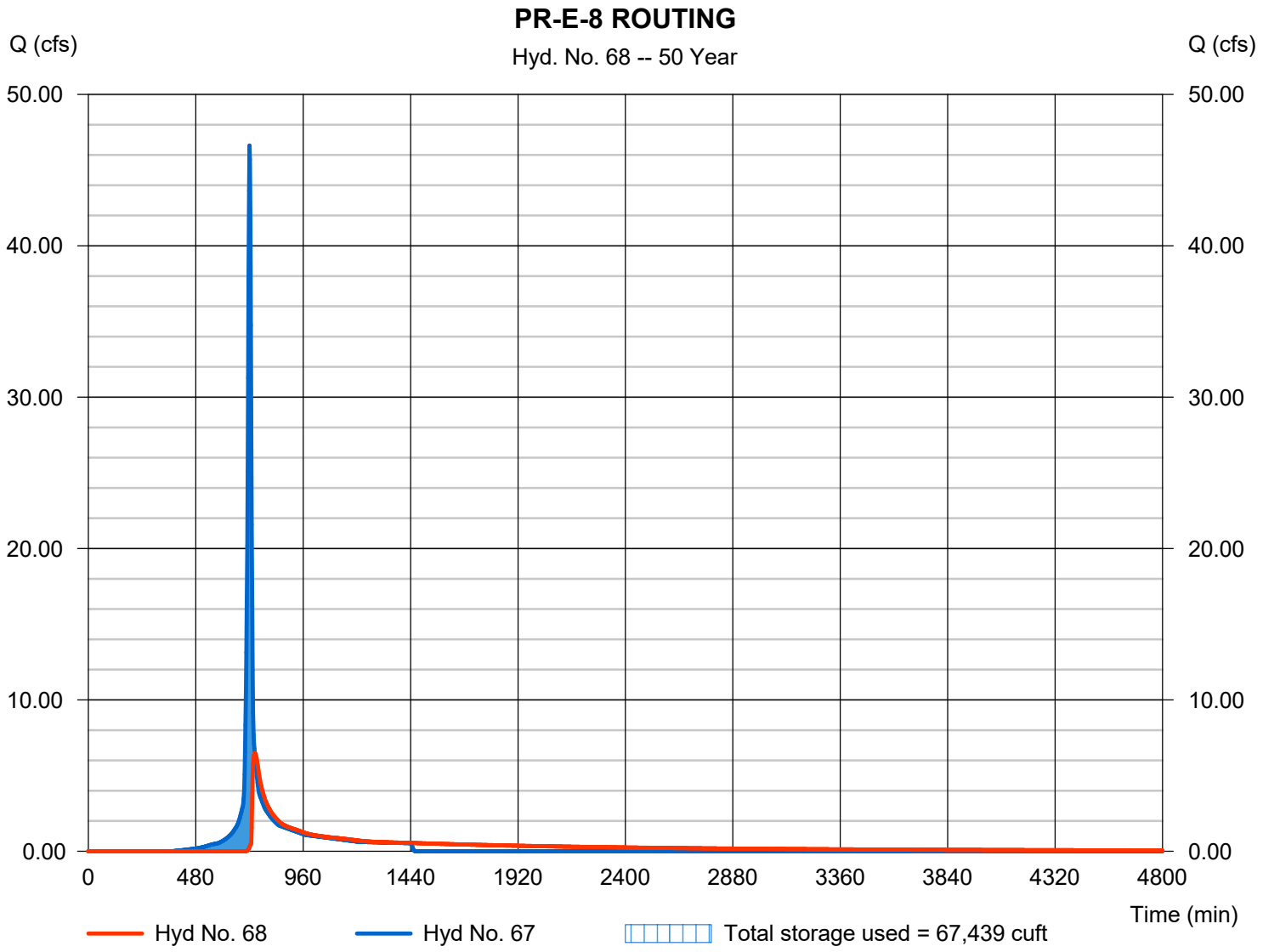
Hydrograph Report

Hyd. No. 68

PR-E-8 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	6.486 cfs
Storm frequency	=	50 yrs	Time to peak	=	744 min
Time interval	=	2 min	Hyd. volume	=	102,023 cuft
Inflow hyd. No.	=	67 - PR-E-8	Max. Elevation	=	443.83 ft
Reservoir name	=	SED-BASIN1-2	Max. Storage	=	67,439 cuft

Storage Indication method used.



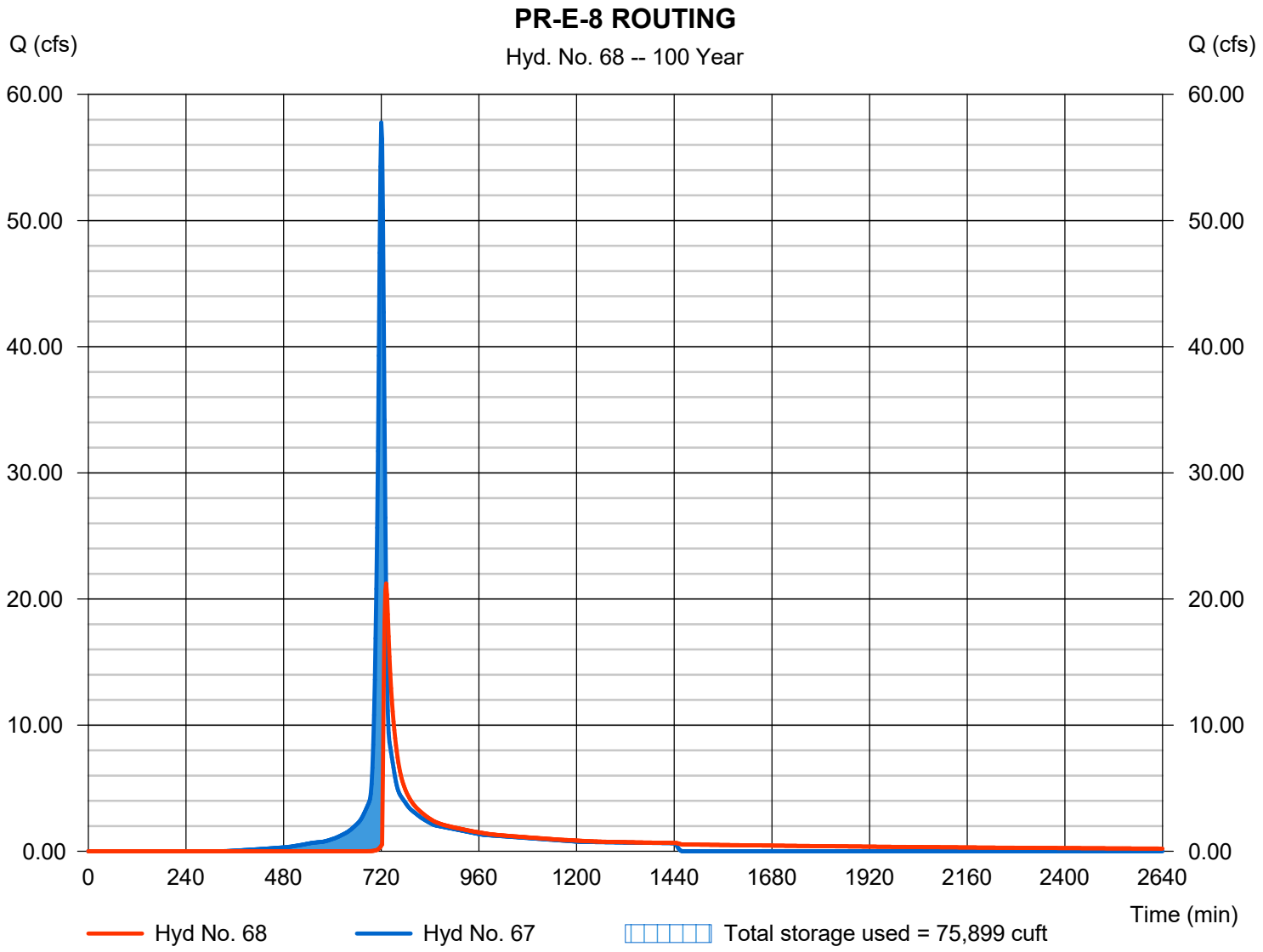
Hydrograph Report

Hyd. No. 68

PR-E-8 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	21.22 cfs
Storm frequency	=	100 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	132,205 cuft
Inflow hyd. No.	=	67 - PR-E-8	Max. Elevation	=	444.26 ft
Reservoir name	=	SED-BASIN1-2	Max. Storage	=	75,899 cuft

Storage Indication method used.



EMERGENCY SPILLWAY CALCULATIONS

Basin Emergency Spillway

BASIN: INF4-1
Project: 100501401
Date: 2/23/2023

The basin will use an emergency spillway over the proposed berm to serve as an emergency outflow device. The spillway has been designed to convey the respective 100 year design flow entirely through the spillway in the event that all primary outfall devices fail. The following calculations demonstrate the adequacy of the emergency spillway:

1. Q_{req} for the 100yr Flow Elevation = 23.33 CFS

z = 3.00
100-yr Elev. = 459.98

2. Spillway Capacity = Q_{design}

C = Weir Coefficient = 3.00
L = Weir Length = 64.00
H = Flow Depth = 0.25
Freeboard = 1.00

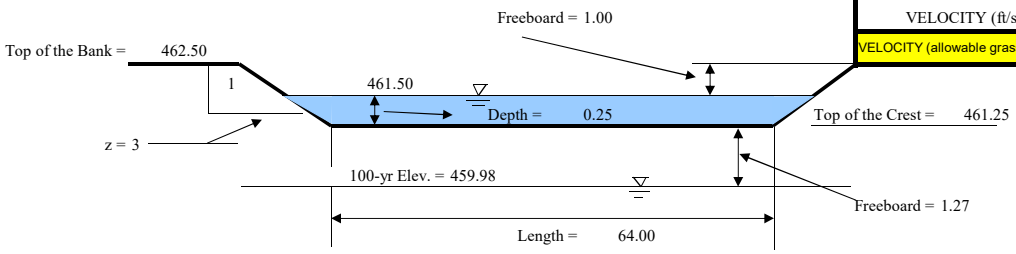
$Q = CLH^{3/2}$

Q (cfs) = 24.00

24.00 > 23.33 GOOD

3. Top of the Crest Elevation = 461.25
4. Top of the Berm Elevation = 462.50

Top Width (ft) = 71.50
AREA (SF)= 16.19
VELOCITY (ft/s)= 1.44
VELOCITY (allowable grass)= 3.00



Shear Stress Calculation

$\tau_d = 62.4\ (d*S)$

			Maximum Allowable Velocity		3	ft/sec
τ_d =	3.12	lb/ft^2		V_{MAX} =	1.44	ft/sec	Pass

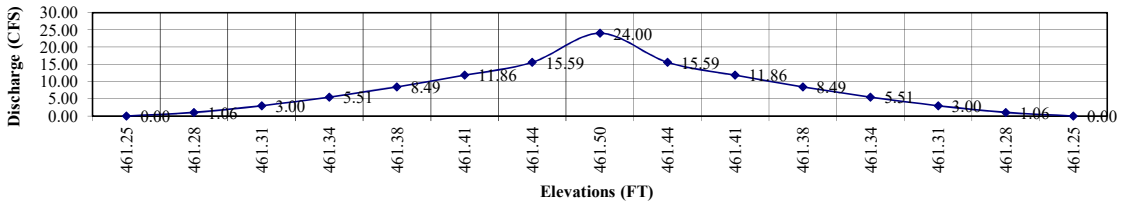
Variables

Channel Bed Slope	S	0.20	ft/ft
Depth of Water Over Spillway	d	0.25	ft

Velocity (ft/s)	Median Stone Size (in)	d_{50} (in)	Filter Size NSA-No.	Filter Thickness NSA-No.	*d (in)
1.44	**grass**	**N/A**	**N/A**	**N/A**	**N/A**

*d = 1.5 times the maximum stone diameter but not less than 6 inches.

Discharge Curve



Basin Emergency Spillway

BASIN: INF4-2
Project: 100501401
Date: 2/23/2023

The basin will use an emergency spillway over the proposed berm to serve as an emergency outflow device. The spillway has been designed to convey the respective 100 year design flow entirely through the spillway in the event that all primary outfall devices fail. The following calculations demonstrate the adequacy of the emergency spillway:

1. Q_{req} for the 100yr Flow Elevation = 5.27 CFS

z = 3.00
100-yr Elev. = 461.65

2. Spillway Capacity = Q_{design}

C = Weir Coefficient = 3.00
L = Weir Length = 30.00
H = Flow Depth = 0.17
Freeboard = 1.00

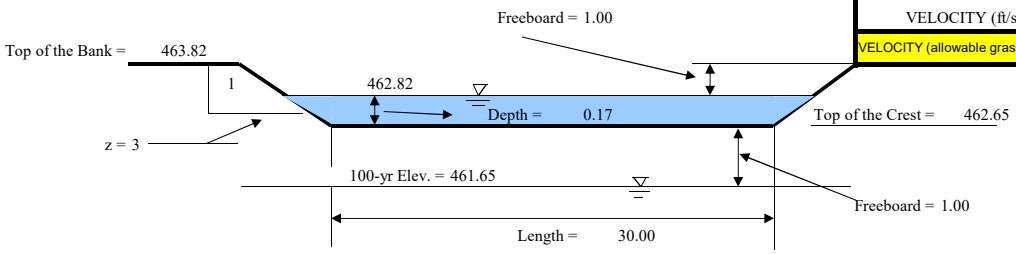
$Q = CLH^{3/2}$

Q (cfs) = 6.31

6.31 > 5.27 GOOD

3. Top of the Crest Elevation = 462.65
4. Top of the Berm Elevation = 463.82

Top Width (ft) = 37.02
AREA (SF)= 5.19
VELOCITY (ft/s)= 1.02
VELOCITY (allowable grass)= 3.00



Shear Stress Calculation

$\tau_d = 62.4\ (d*S)$

			Maximum Allowable Velocity		3	ft/sec
τ_d =	2.1216	lb/ft^2		V_{MAX} =	1.02	ft/sec	Pass

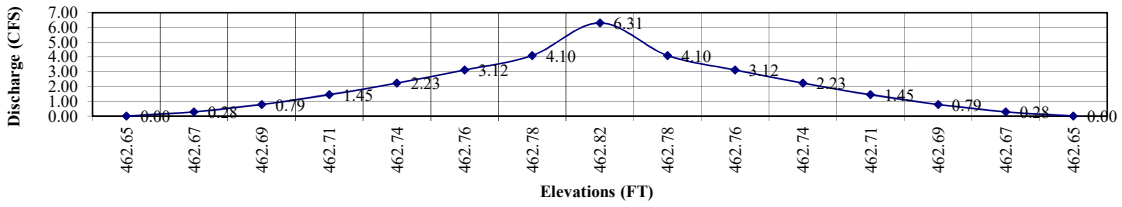
Variables

Channel Bed Slope	S	0.20	ft/ft
Depth of Water Over Spillway	d	0.17	ft

Velocity (ft/s)	Median Stone Size (in)	d_{50} (in)	Filter Size NSA-No.	Filter Thickness NSA-No.	*d (in)
1.02	**grass**	**N/A**	**N/A**	**N/A**	**N/A**

*d = 1.5 times the maximum stone diameter but not less than 6 inches.

Discharge Curve



ANTI-SEEP COLLAR CALCULATIONS

ANTI-SEEP COLLAR DESIGN

PROJECT NAME: Smithfield Gateway
PROJECT LOCATION: Smithfield Township, Monroe County, Pennsylvania
BASIN ID# INF4-1

DONE BY: TEG **DATE:** 2/21/23 **CHECKED:** TH **DATE:** 2/21/23

OUTLET PIPE:

INVERT UPSTREAM (Yup)	457.00	
INVERT DOWNSTREAM (Ydn)	456.69	
PIPE RISE:	18	inches
PIPE SPAN:	18	inches
PIPE LENGTH:	15	ft
PIPE SLOPE (So):	0.0200	

100-YEAR BASIN ELEV. (Y100):	459.98	
EMBANKMENT SLOPE (Z):	3	(EXAMPLE 3:1 SLOPE -> Z=3)

CALCULATIONS:

Y=Y100-Yup=	2.98	
Lsz=Y(Z+4)*(1+(So/0.25-So))=	22.11	ft
SAFETY FACTOR Lsz*1.15=	25.43	ft
USE Lsz=	25.00	ft

SPACING DESIGN:

COLLAR WIDTH(OR DIAM.):	1.50	ft	
NO. OF COLLARS REQ.:	0.96		=(L-Lsz)/2*collar width
USE	**1.00**	collars	
MAX. SPACING ALLOWED:	14.00	ft	=14ft*no. of collars
CALCULATED SPACING:	22.11	ft	=Lsz/(no. of collars)
USE LESSER OF MAX. OR CALCULATED SPACING:	**14.00**	ft	

COLLAR DIMENSIONS FOR 18" HDPE OUTLET PIPE:

USING RECTANGULAR COLLARS,
THE DIMENSION OF THE

HEIGHT SHOULD BE:	5.50	ft	=2*2'+pipe rise
WIDTH SHOULD BE:	5.50	ft	=2*2'+pipe span
THICKNESS TO BE:	12	inches	

ANTI-SEEP COLLAR DESIGN

PROJECT NAME: Smithfield Gateway
PROJECT LOCATION: Smithfield Township, Monroe County, Pennsylvania
BASIN ID# INF4-2

DONE BY: TEG **DATE:** 2/21/23 **CHECKED:** TH **DATE:** 2/21/23

OUTLET PIPE:

INVERT UPSTREAM (Yup)	458.25	
INVERT DOWNSTREAM (Ydn)	457.95	
PIPE RISE:	18	inches
PIPE SPAN:	18	inches
PIPE LENGTH:	25	ft
PIPE SLOPE (So):	0.0118	

100-YEAR BASIN ELEV. (Y100):	461.65	
EMBANKMENT SLOPE (Z):	3	(EXAMPLE 3:1 SLOPE -> Z=3)

CALCULATIONS:

Y=Y100-Yup=	3.40	
Lsz=Y(Z+4)*(1+(So/0.25-So))=	24.64	ft
SAFETY FACTOR Lsz*1.15=	28.34	ft
USE Lsz=	28.00	ft

SPACING DESIGN:

COLLAR WIDTH(OR DIAM.):	1.50	ft	
NO. OF COLLARS REQ.:	1.12		=(L-Lsz)/2*collar width
USE	**2.00**	collars	
MAX. SPACING ALLOWED:	28.00	ft	=14ft*no. of collars
CALCULATED SPACING:	12.32	ft	=Lsz/(no. of collars)
USE LESSER OF MAX. OR CALCULATED SPACING:	**12.32**	ft	

COLLAR DIMENSIONS FOR 18" HDPE OUTLET PIPE:

USING RECTANGULAR COLLARS,
THE DIMENSION OF THE

HEIGHT SHOULD BE:	5.50	ft	=2*2'+pipe rise
WIDTH SHOULD BE:	5.50	ft	=2*2'+pipe span
THICKNESS TO BE:	12	inches	

APPENDIX E

Post-Construction 2-Year Storm Versus Pre-Construction 1-Year Storm Analysis

APPENDIX E
TABLE OF CONTENTS

PR-E-5 POND ROUTING (UGD-INF5-2)

PR-E-6 POND ROUTING (UGD-INF5-3)

PR-E-7 POND ROUTING (UGD-INF5-4)

PR-E-8 POND ROUTING (SEDIMENT BASIN 1-2)

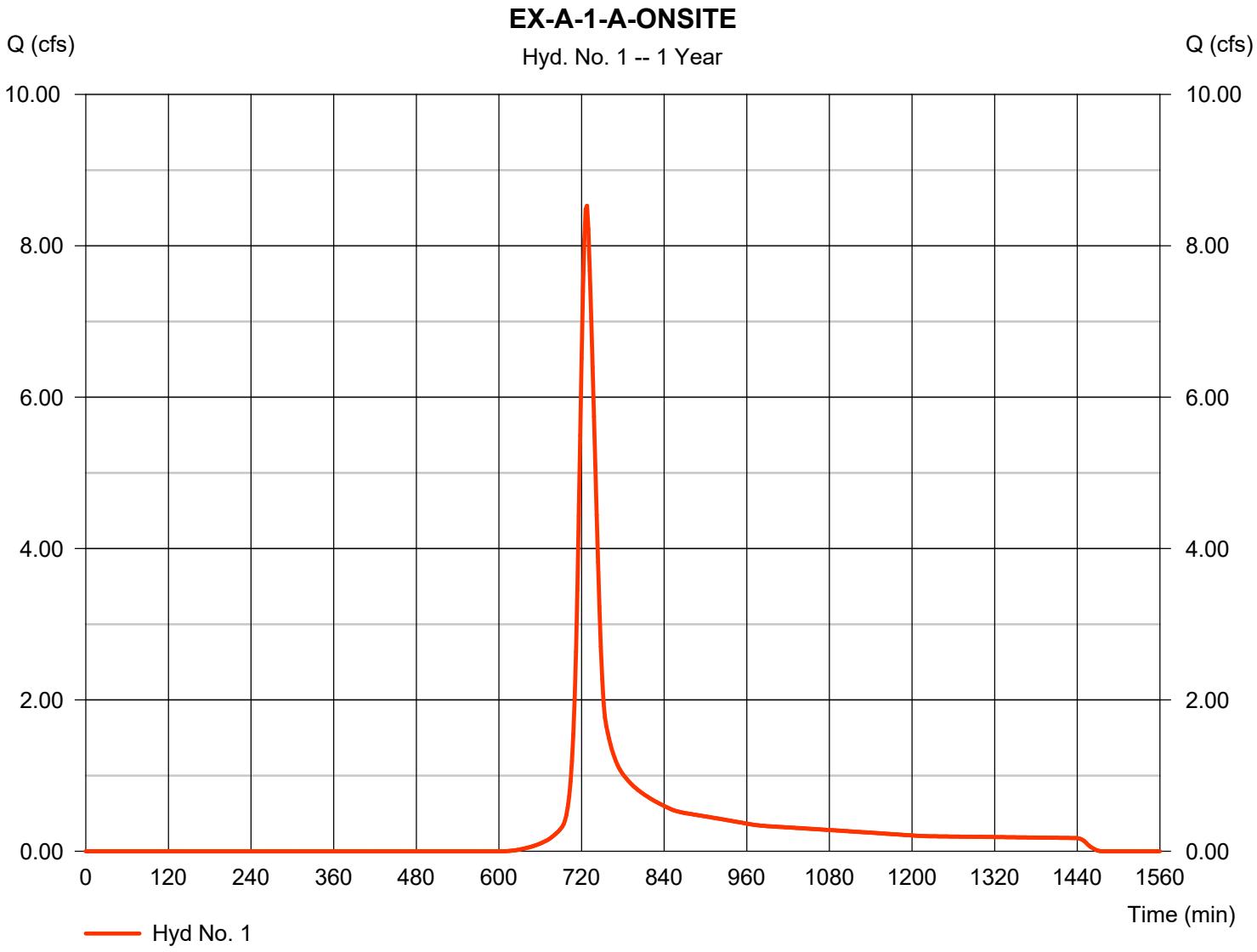
EXISTING DISCHARGE CALCULATIONS
1-YEAR 24-HOUR STORM

Hydrograph Report

Hyd. No. 1

EX-A-1-A-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.529 cfs
Storm frequency	=	1 yrs	Time to peak	=	728 min
Time interval	=	2 min	Hyd. volume	=	30,295 cuft
Drainage area	=	7.590 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	20.90 min
Total precip.	=	2.77 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

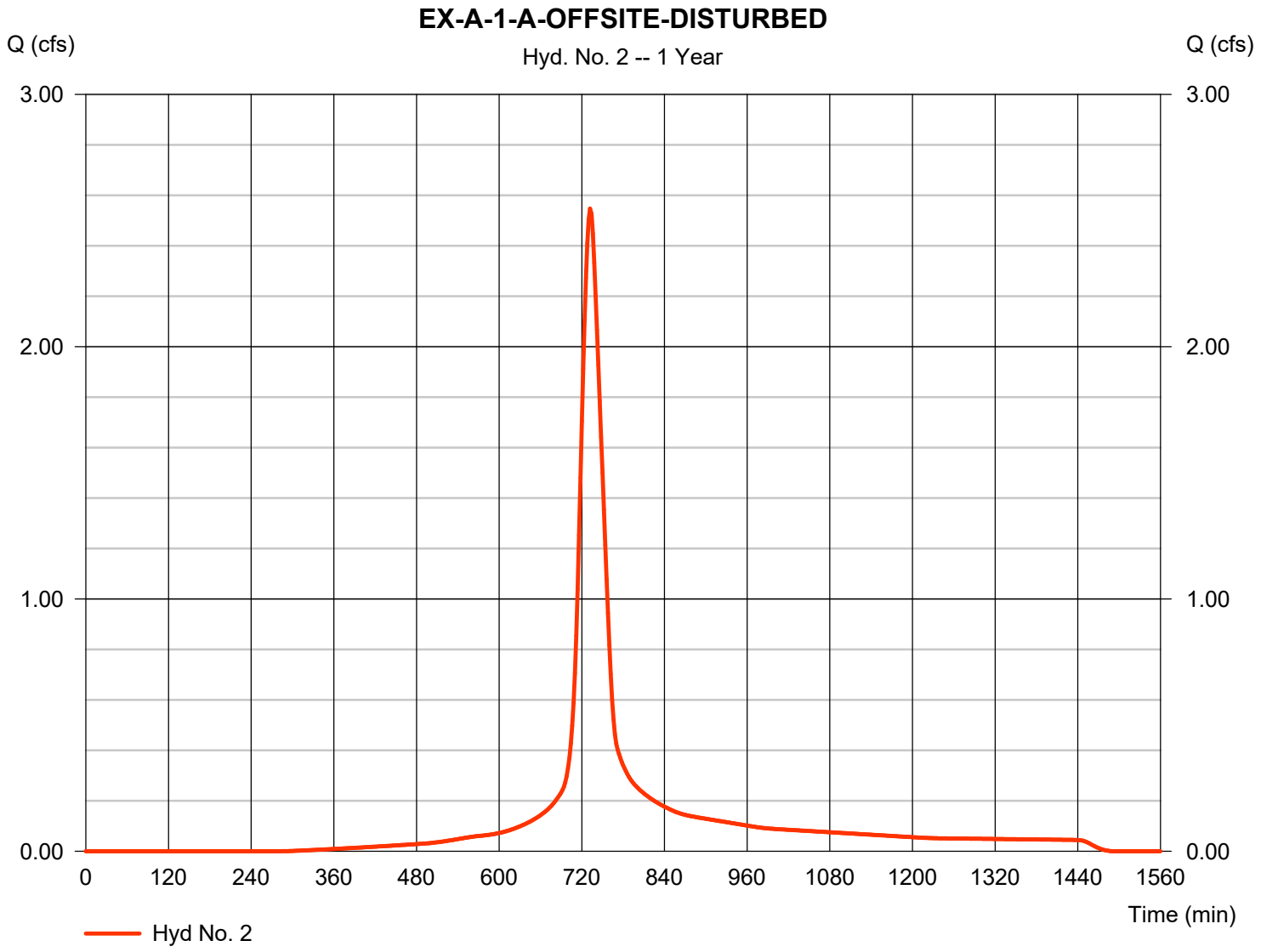


Hydrograph Report

Hyd. No. 2

EX-A-1-A-OFFSITE-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.547 cfs
Storm frequency	=	1 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	11,143 cuft
Drainage area	=	1.490 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	31.50 min
Total precip.	=	2.77 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

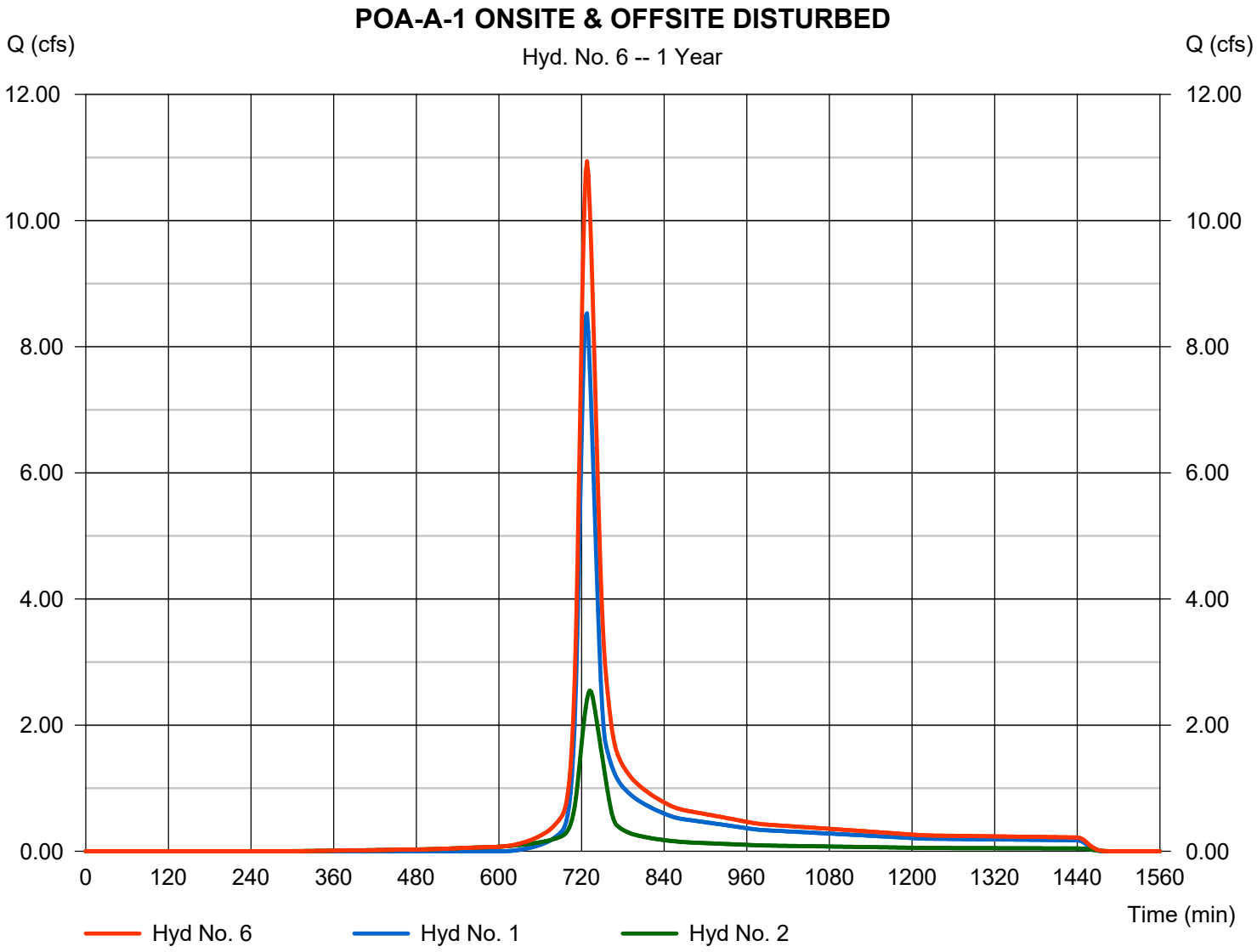


Hydrograph Report

Hyd. No. 6

POA-A-1 ONSITE & OFFSITE DISTURBED

Hydrograph type	= Combine	Peak discharge	= 10.94 cfs
Storm frequency	= 1 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 41,438 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 9.080 ac

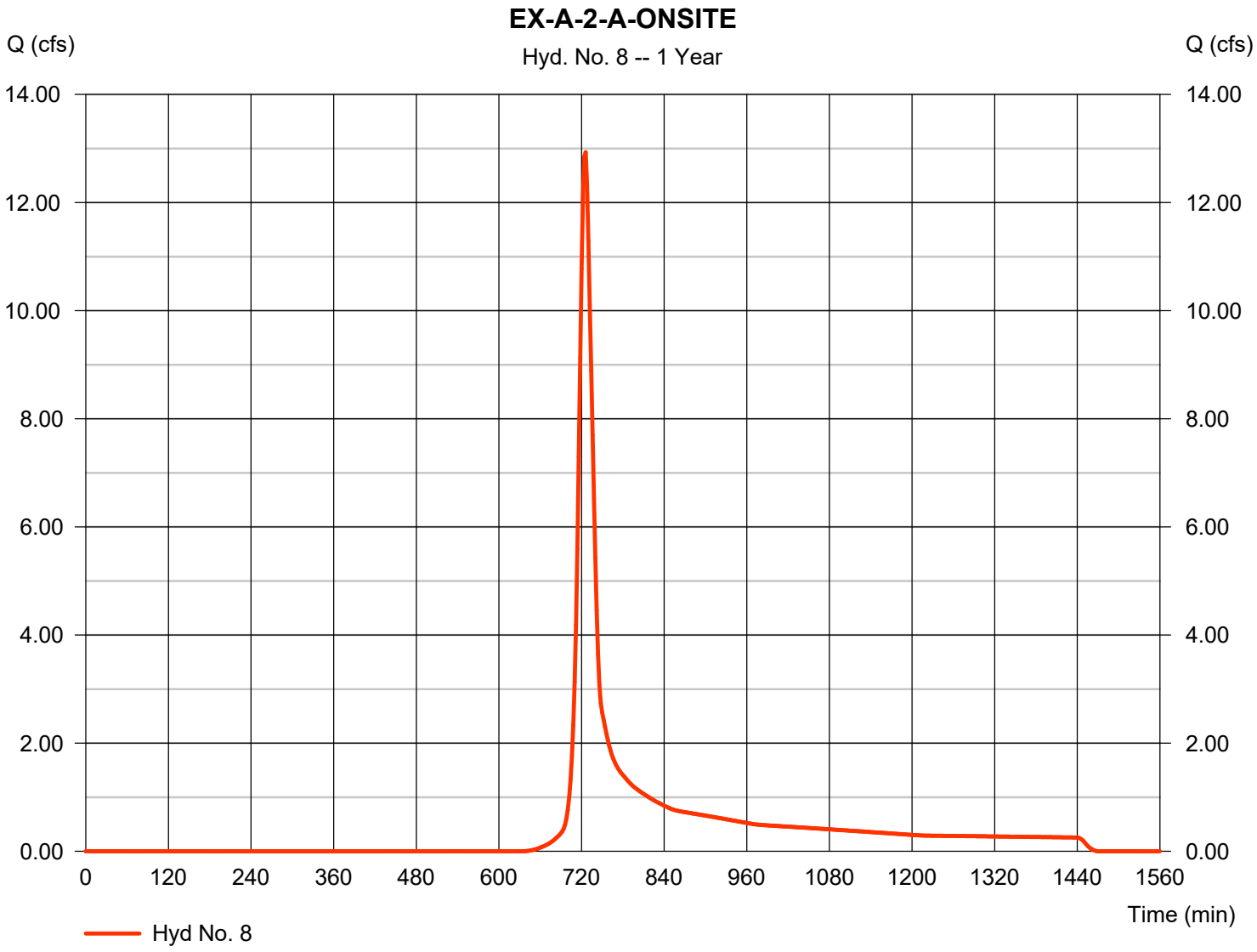


Hydrograph Report

Hyd. No. 8

EX-A-2-A-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	12.93 cfs
Storm frequency	=	1 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	42,064 cuft
Drainage area	=	11.970 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.70 min
Total precip.	=	2.77 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

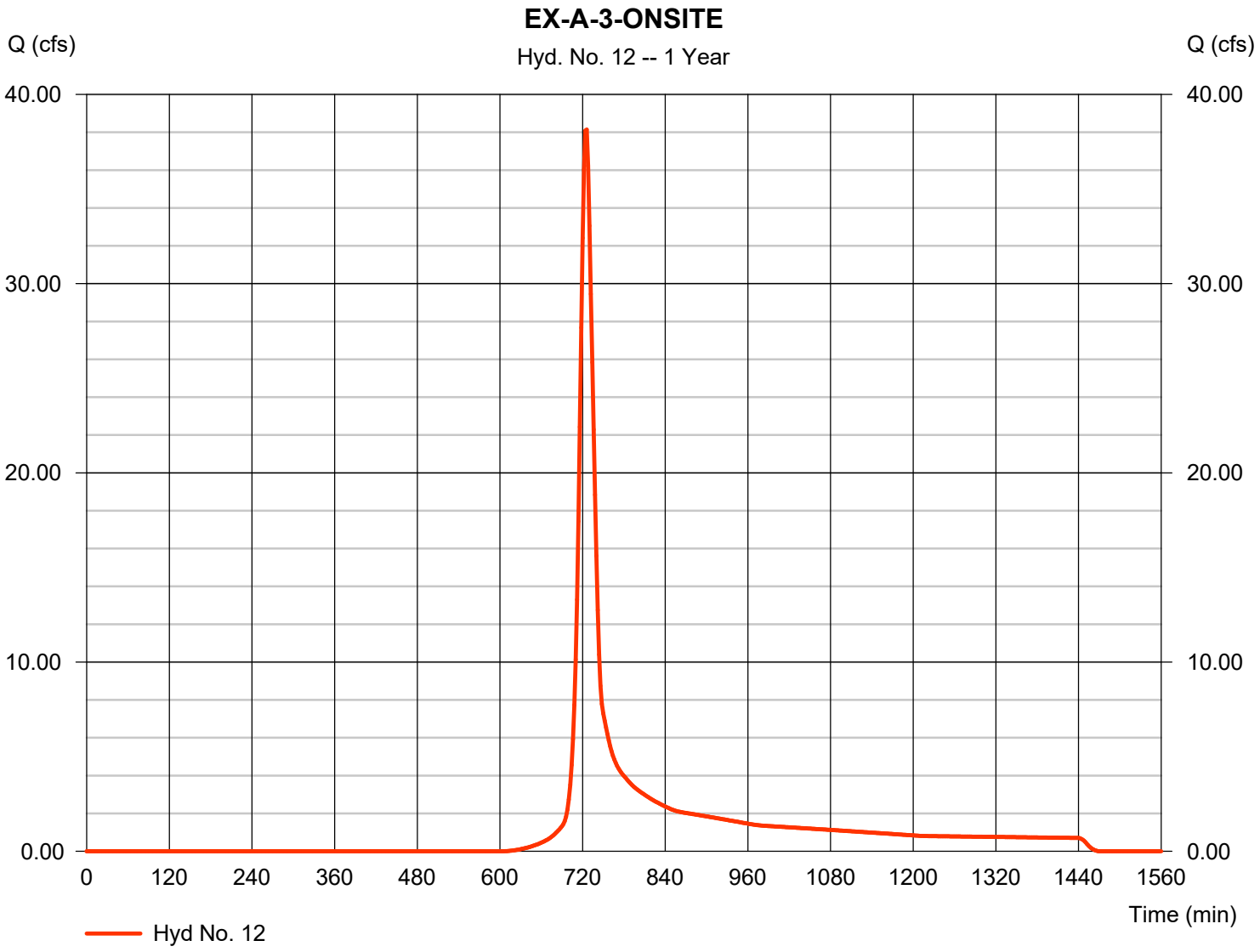


Hydrograph Report

Hyd. No. 12

EX-A-3-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	38.14 cfs
Storm frequency	=	1 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	122,426 cuft
Drainage area	=	31.220 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.70 min
Total precip.	=	2.77 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

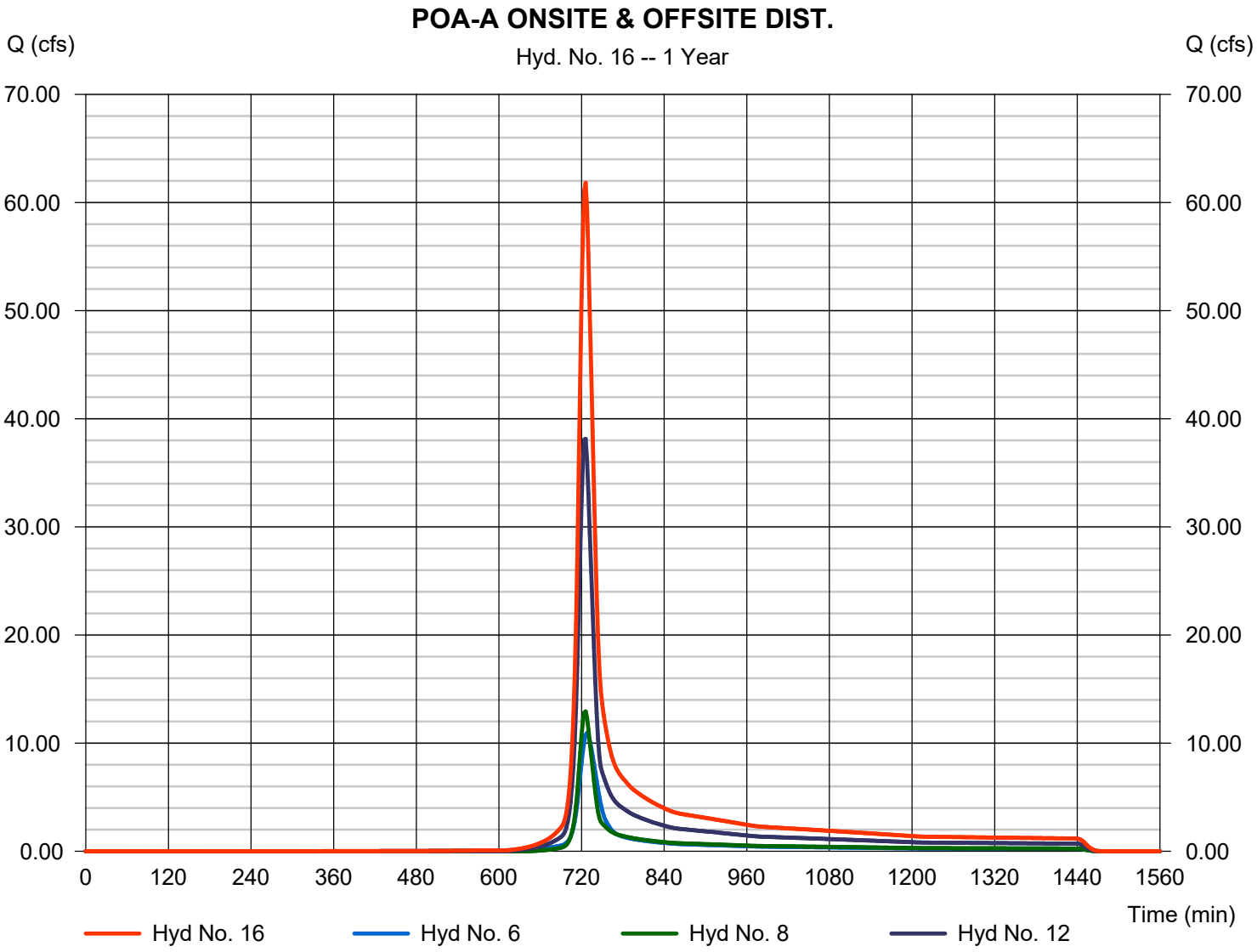


Hydrograph Report

Hyd. No. 16

POA-A ONSITE & OFFSITE DIST.

Hydrograph type	= Combine	Peak discharge	= 61.83 cfs
Storm frequency	= 1 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 205,928 cuft
Inflow hyds.	= 6, 8, 12	Contrib. drain. area	= 43.190 ac

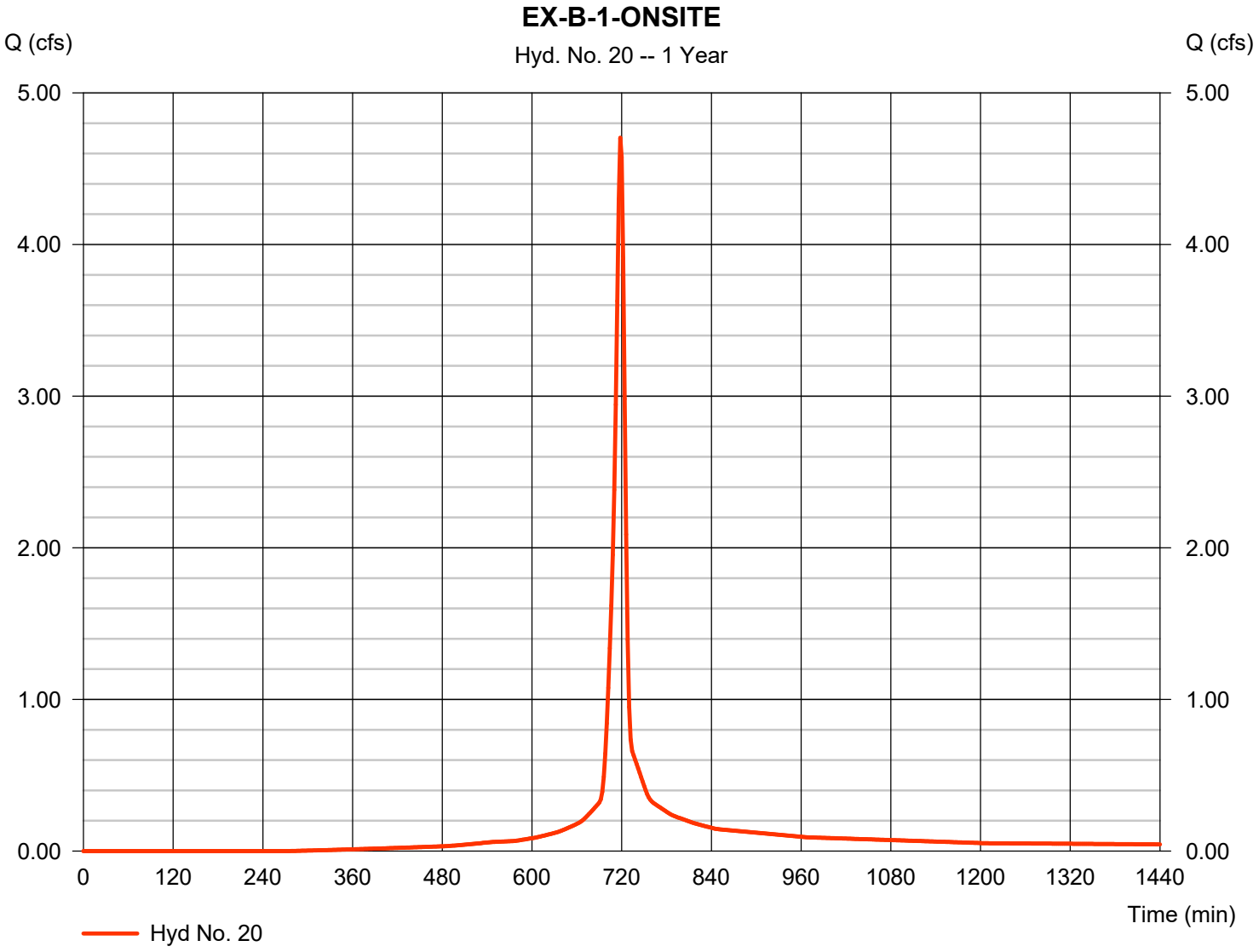


Hydrograph Report

Hyd. No. 20

EX-B-1-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.704 cfs
Storm frequency	=	1 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	11,153 cuft
Drainage area	=	1.510 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.30 min
Total precip.	=	2.77 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

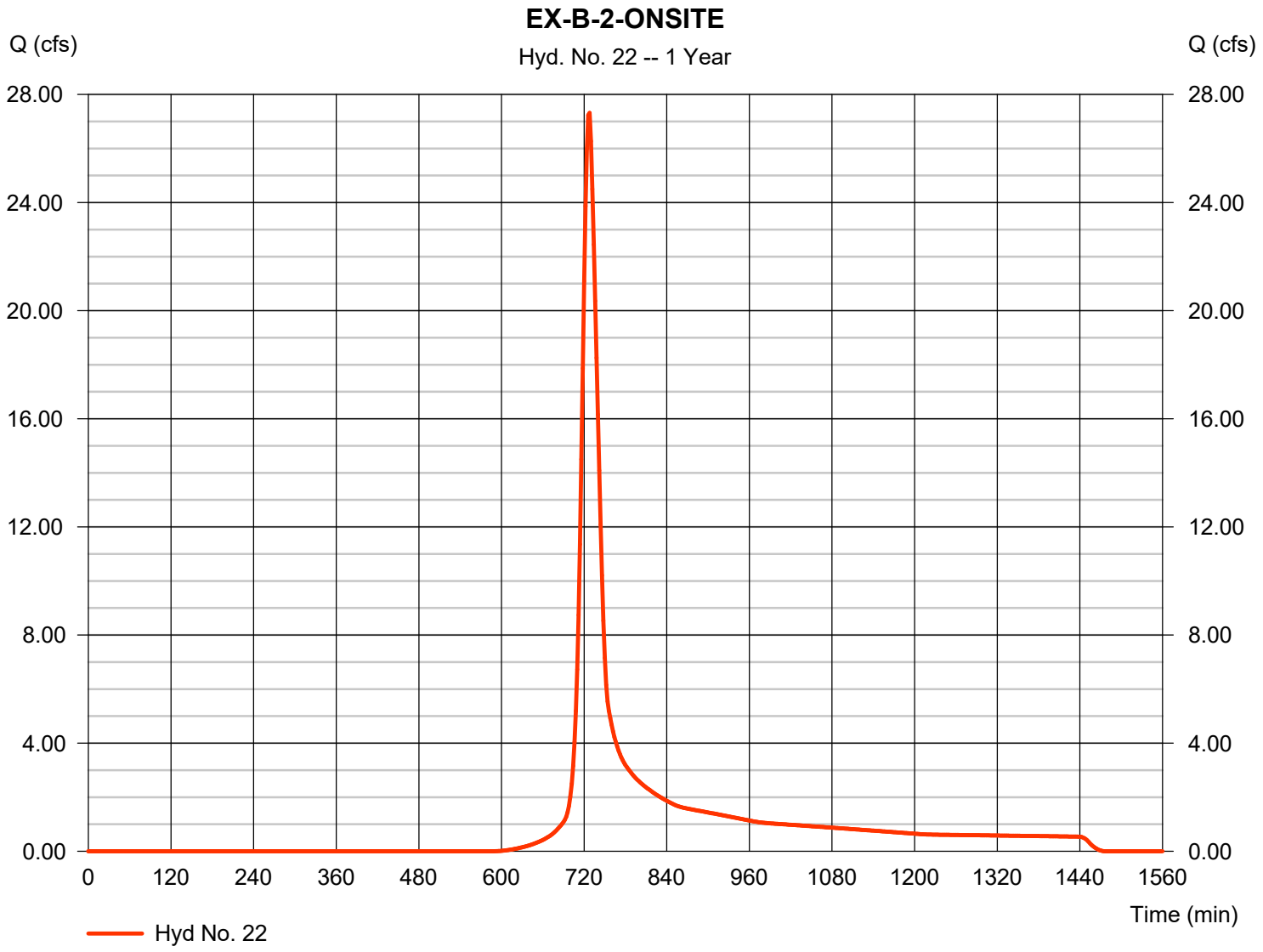


Hydrograph Report

Hyd. No. 22

EX-B-2-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	27.32 cfs
Storm frequency	=	1 yrs	Time to peak	=	728 min
Time interval	=	2 min	Hyd. volume	=	96,443 cuft
Drainage area	=	22.910 ac	Curve number	=	81
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	20.50 min
Total precip.	=	2.77 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

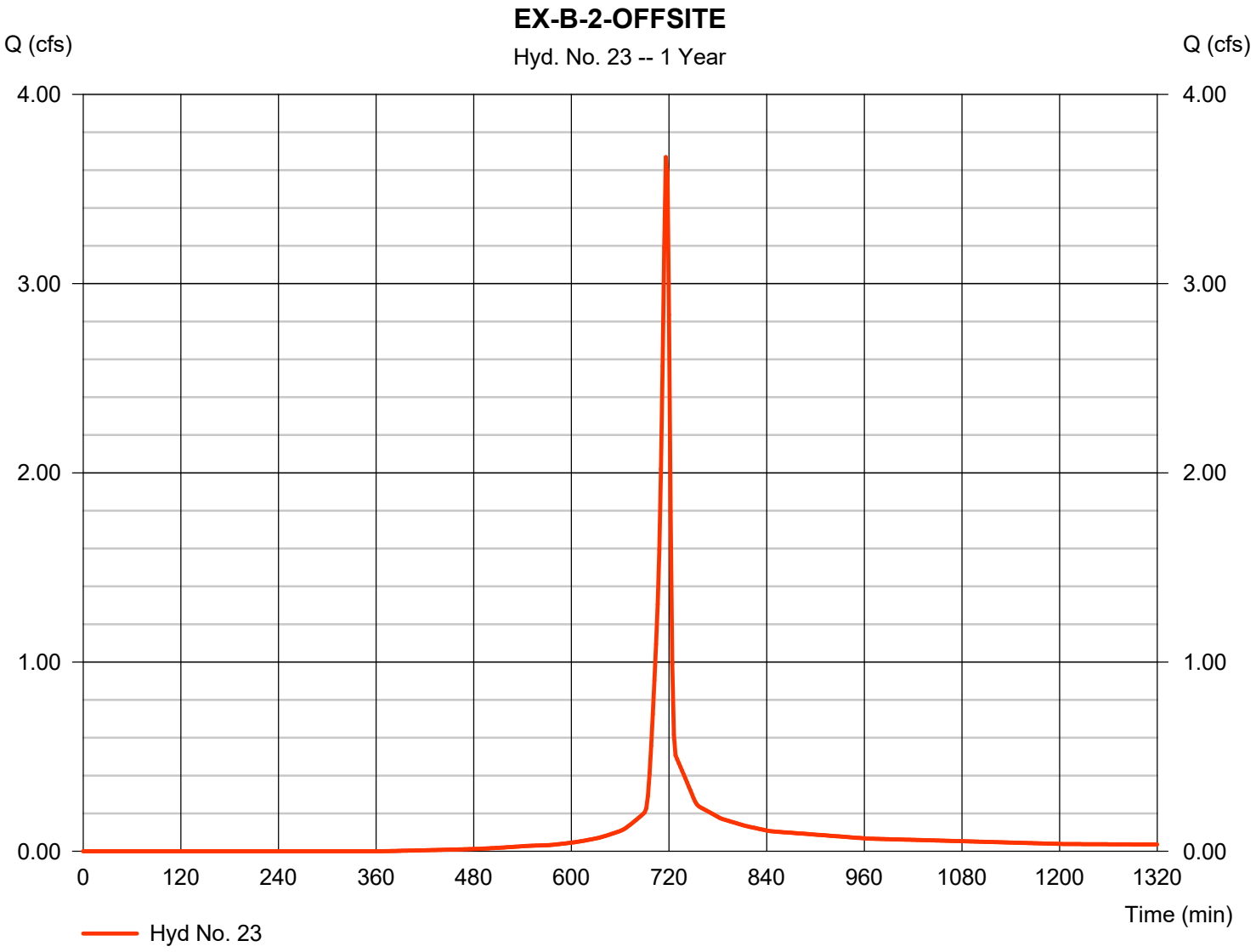


Hydrograph Report

Hyd. No. 23

EX-B-2-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.669 cfs
Storm frequency	=	1 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	7,547 cuft
Drainage area	=	1.250 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	2.77 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

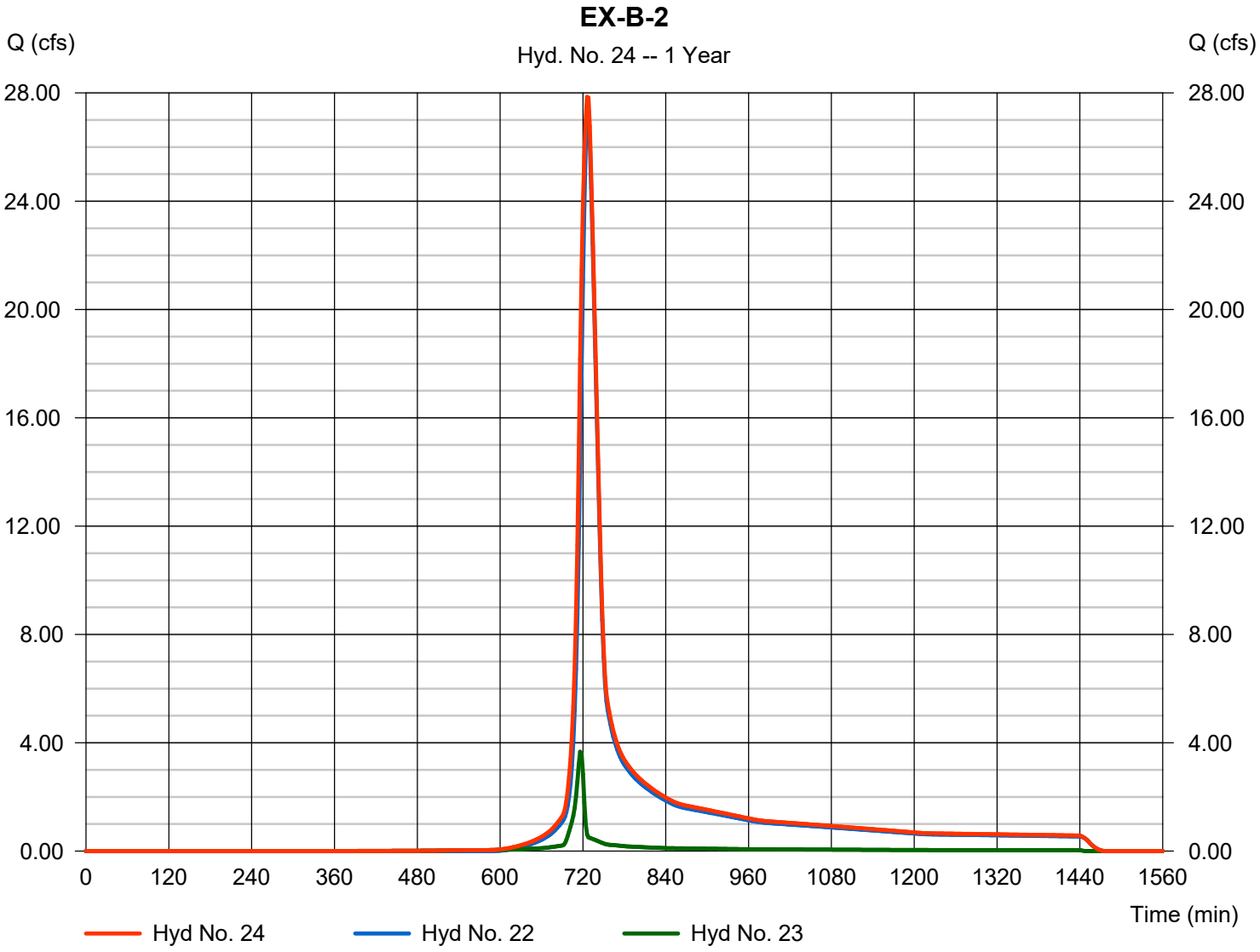


Hydrograph Report

Hyd. No. 24

EX-B-2

Hydrograph type	=	Combine	Peak discharge	=	27.85 cfs
Storm frequency	=	1 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	103,990 cuft
Inflow hyds.	=	22, 23	Contrib. drain. area	=	24.160 ac



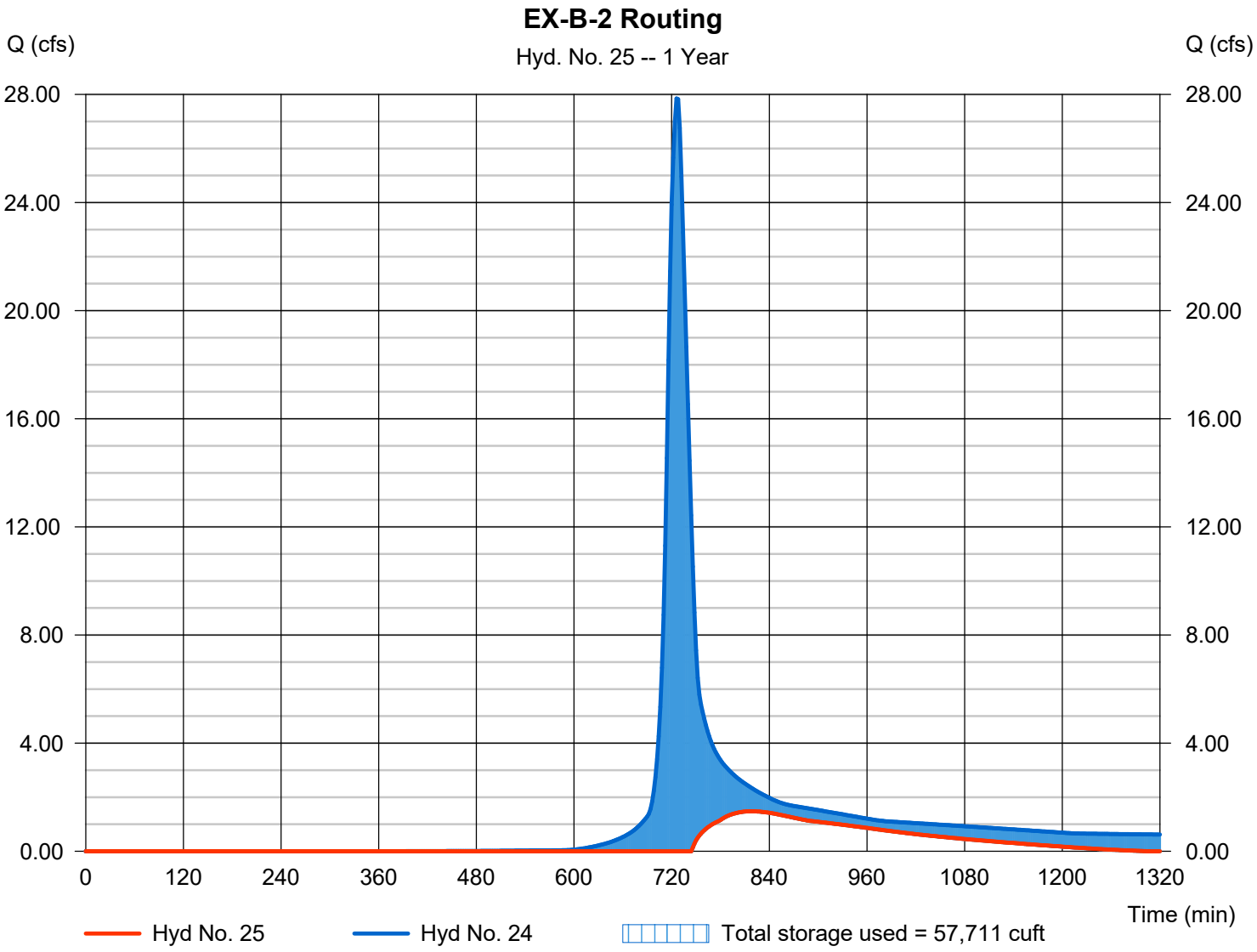
Hydrograph Report

Hyd. No. 25

EX-B-2 Routing

Hydrograph type	=	Reservoir	Peak discharge	=	1.480 cfs
Storm frequency	=	1 yrs	Time to peak	=	818 min
Time interval	=	2 min	Hyd. volume	=	22,055 cuft
Inflow hyd. No.	=	24 - EX-B-2	Max. Elevation	=	438.12 ft
Reservoir name	=	EX-B-2-ONSITE-POND	Max. Storage	=	57,711 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

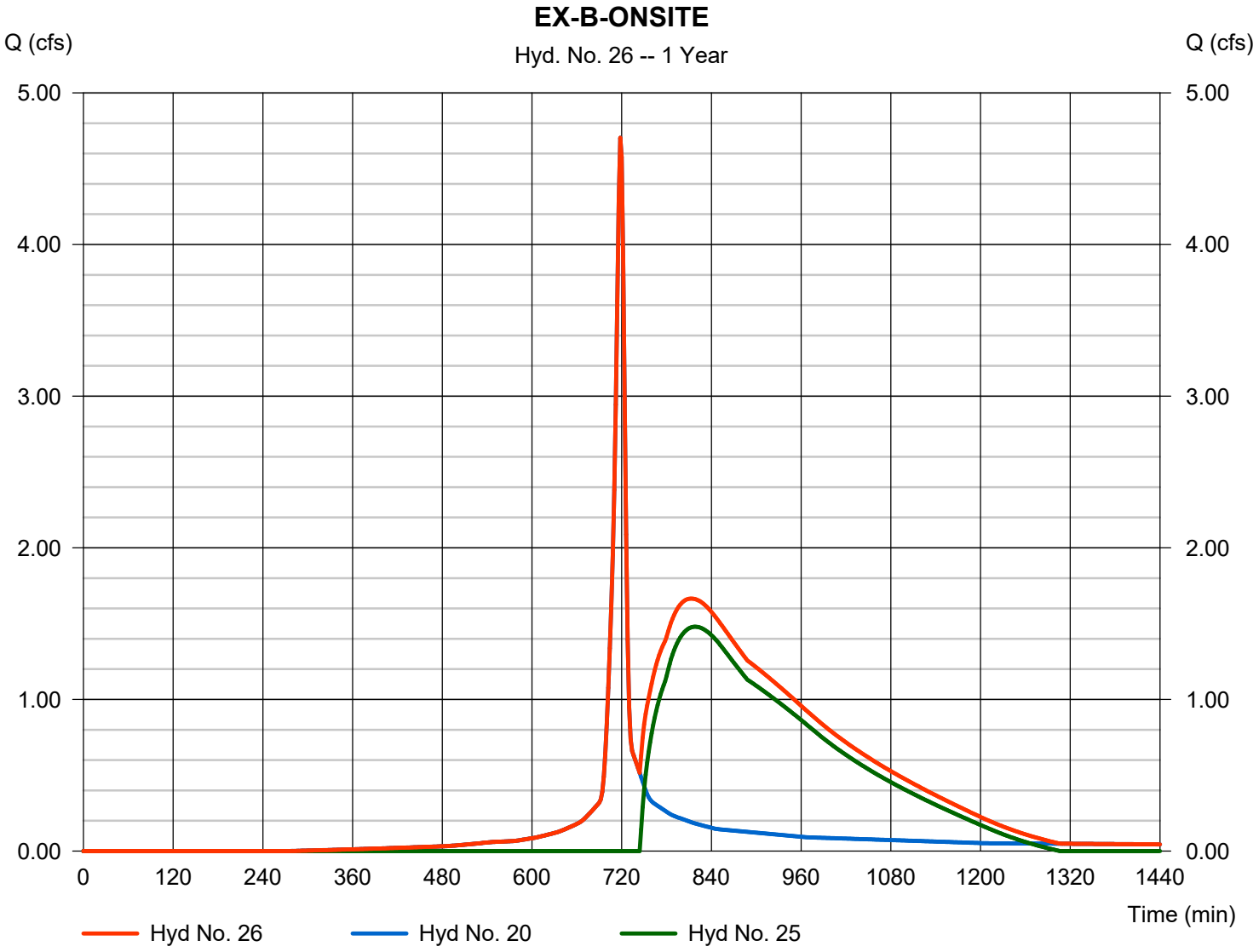


Hydrograph Report

Hyd. No. 26

EX-B-ONSITE

Hydrograph type	=	Combine	Peak discharge	=	4.704 cfs
Storm frequency	=	1 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	33,208 cuft
Inflow hyds.	=	20, 25	Contrib. drain. area	=	1.510 ac

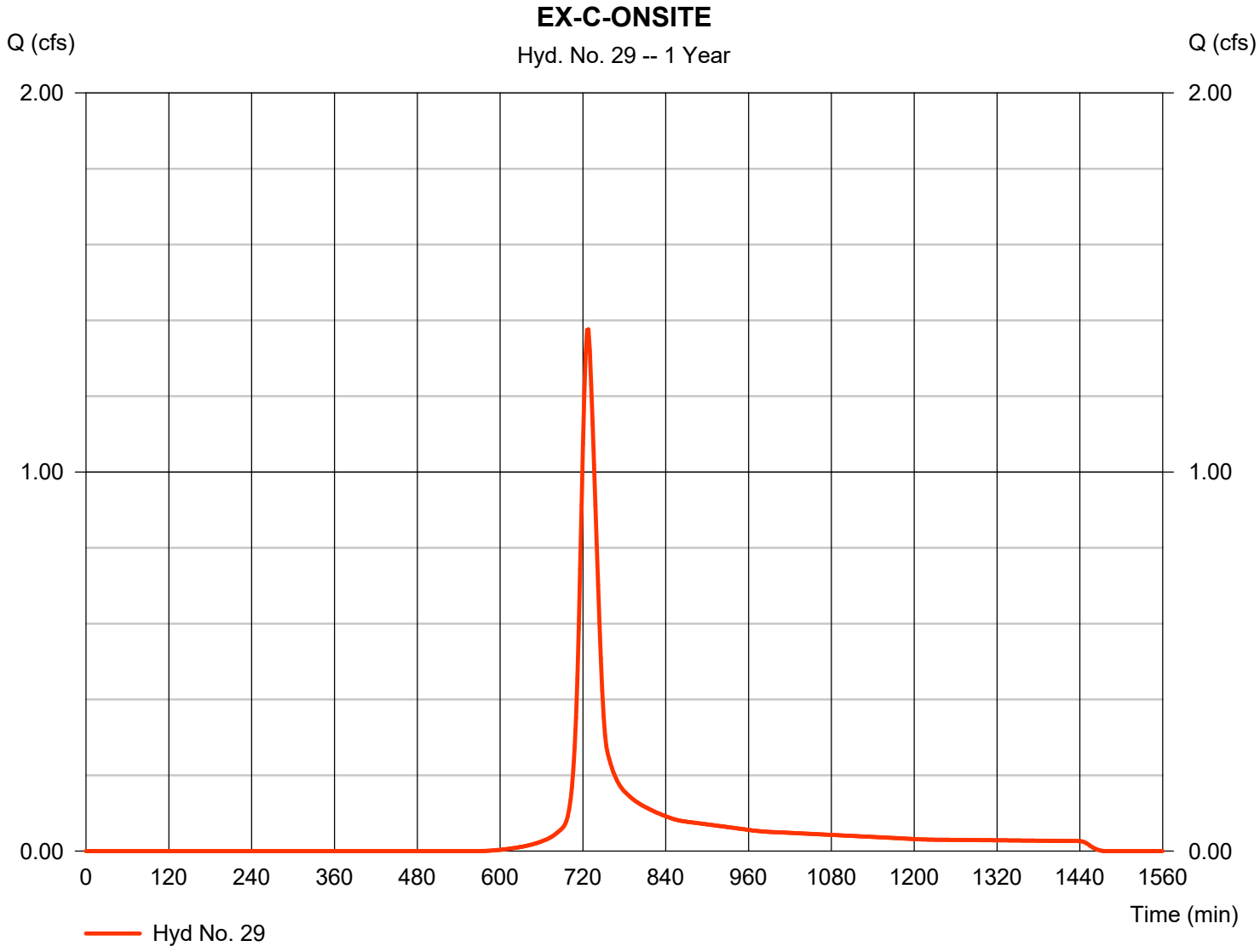


Hydrograph Report

Hyd. No. 29

EX-C-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.376 cfs
Storm frequency	=	1 yrs	Time to peak	=	728 min
Time interval	=	2 min	Hyd. volume	=	4,835 cuft
Drainage area	=	1.090 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	20.20 min
Total precip.	=	2.77 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

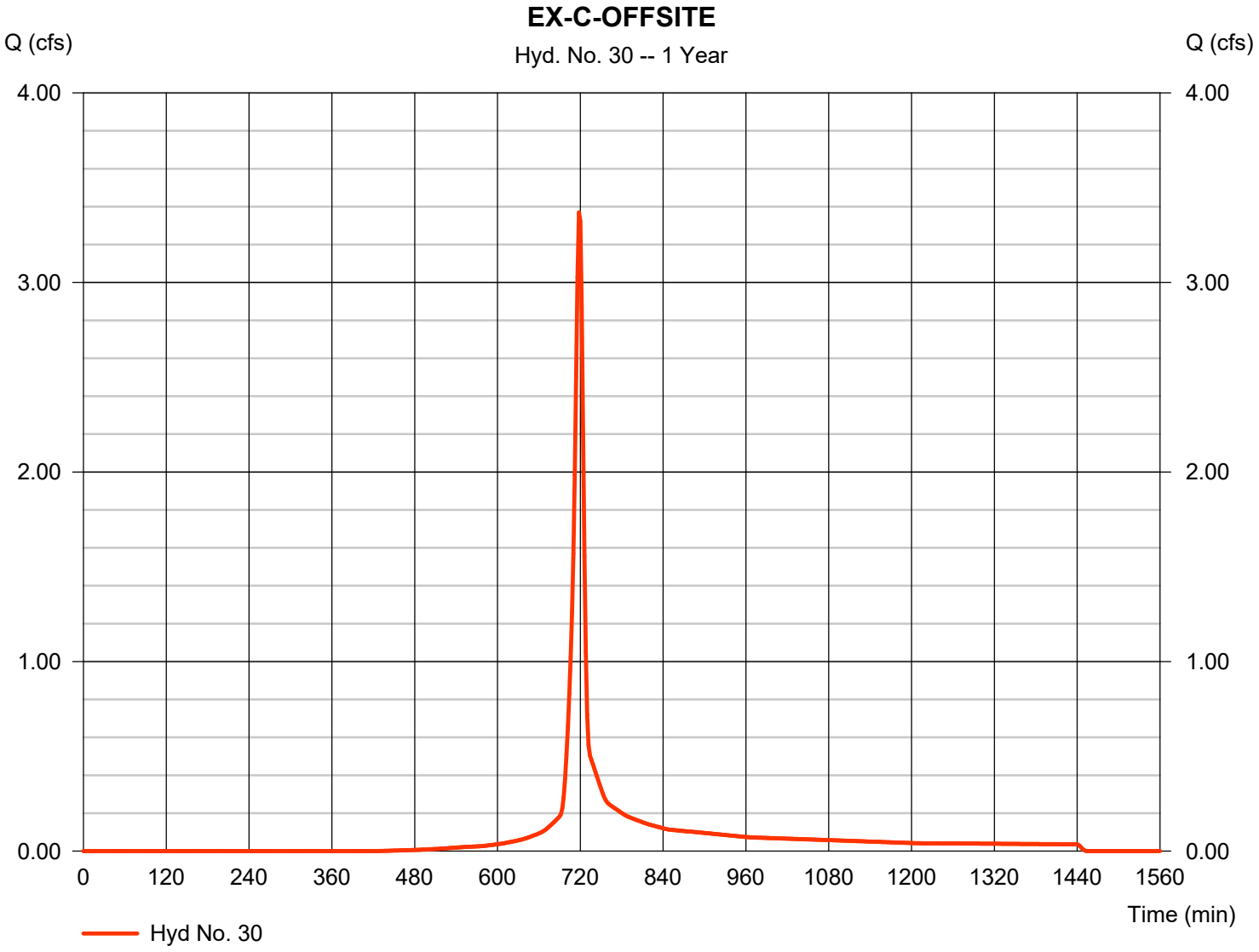


Hydrograph Report

Hyd. No. 30

EX-C-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.369 cfs
Storm frequency	=	1 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	7,740 cuft
Drainage area	=	1.320 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.50 min
Total precip.	=	2.77 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

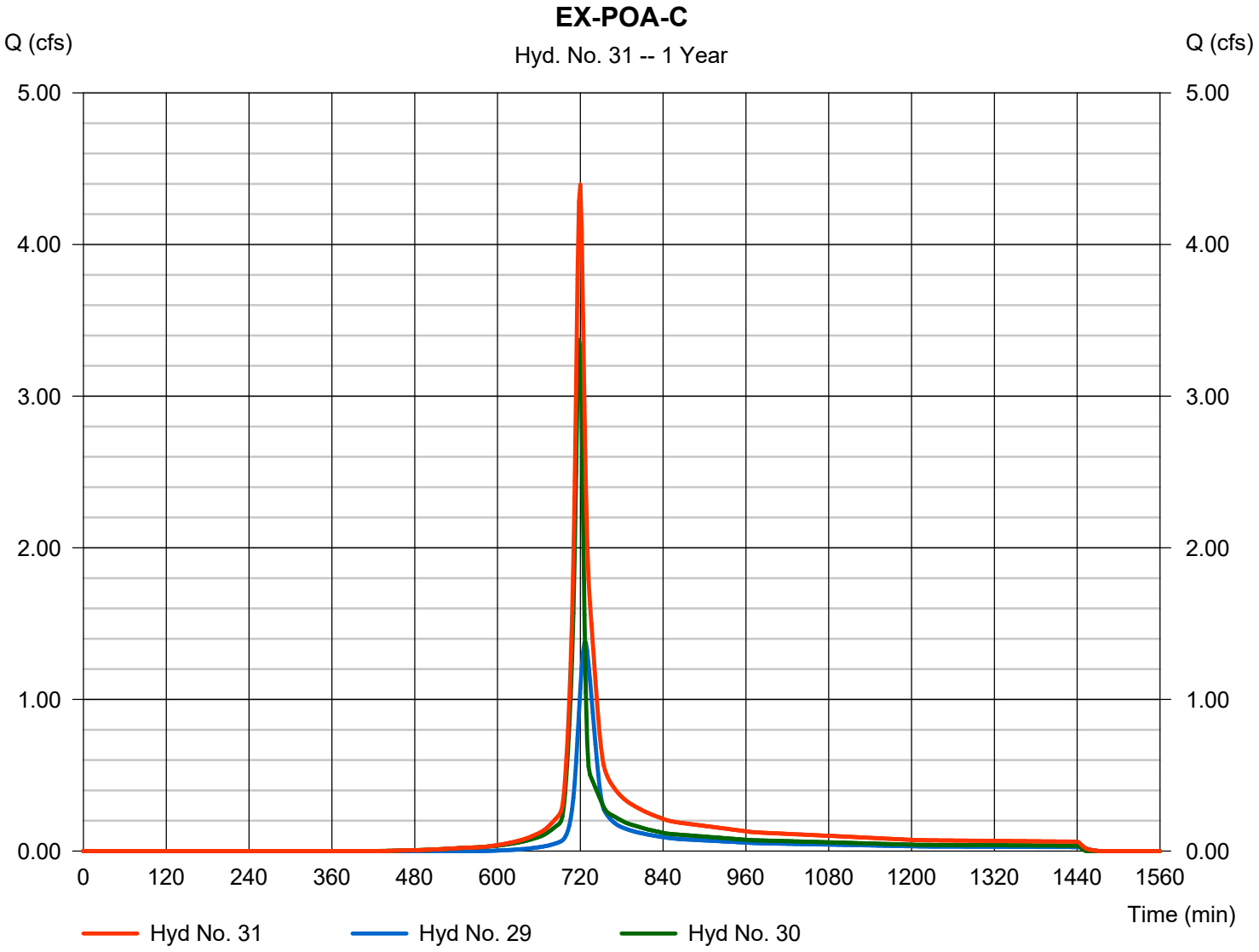


Hydrograph Report

Hyd. No. 31

EX-POA-C

Hydrograph type	=	Combine	Peak discharge	=	4.394 cfs
Storm frequency	=	1 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	12,574 cuft
Inflow hyds.	=	29, 30	Contrib. drain. area	=	2.410 ac

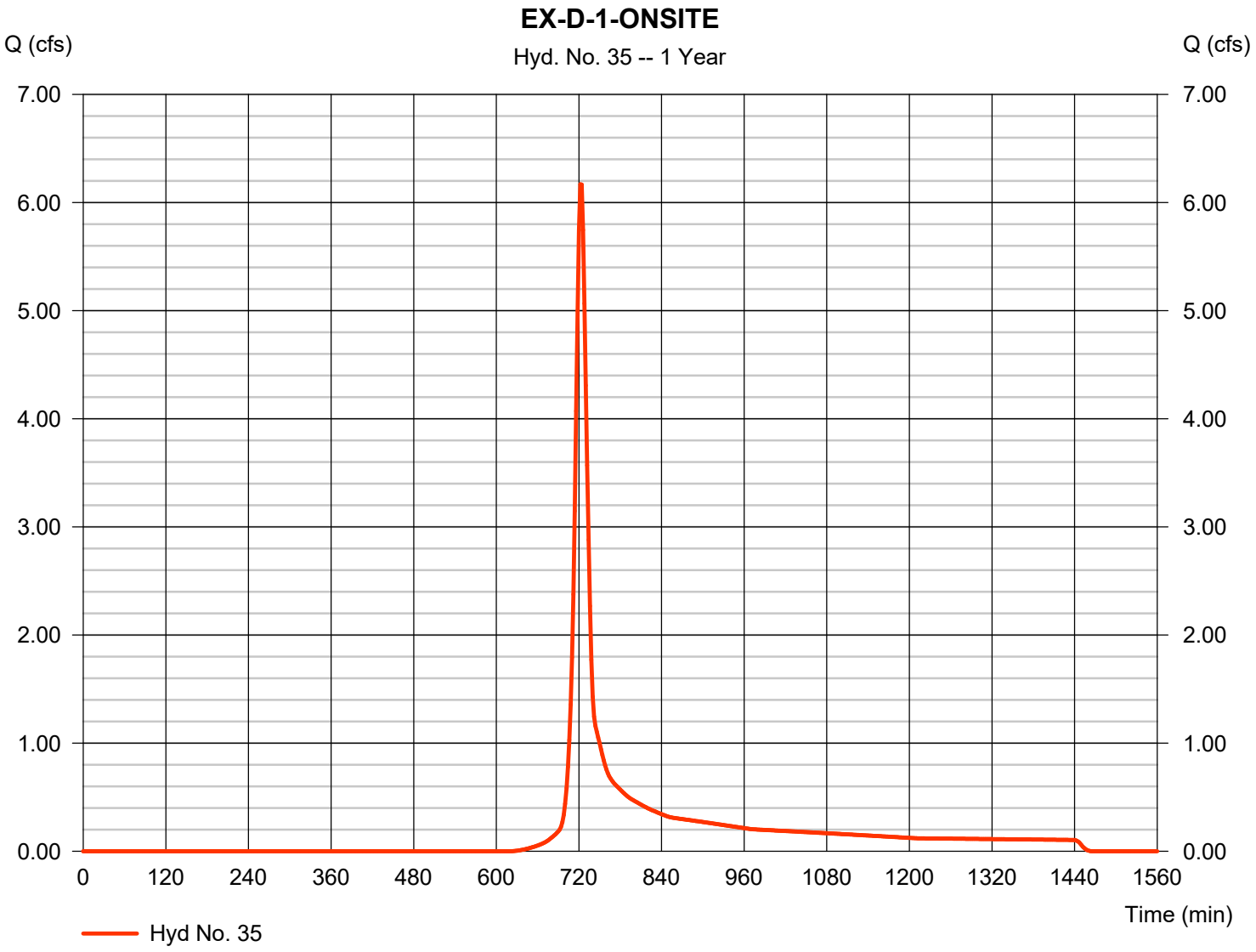


Hydrograph Report

Hyd. No. 35

EX-D-1-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.169 cfs
Storm frequency	=	1 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	17,781 cuft
Drainage area	=	4.910 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	14.60 min
Total precip.	=	2.77 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

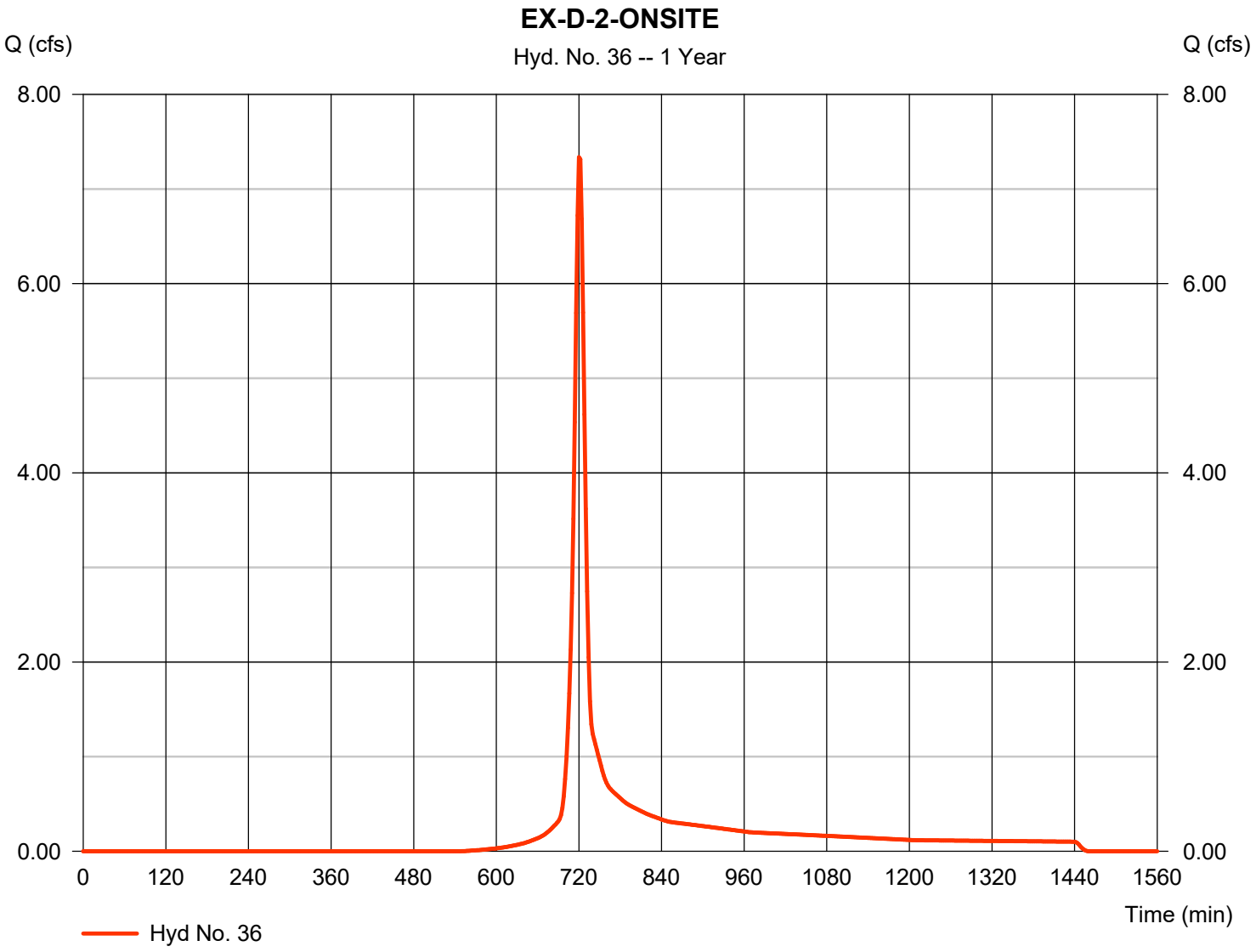


Hydrograph Report

Hyd. No. 36

EX-D-2-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.337 cfs
Storm frequency	=	1 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	19,112 cuft
Drainage area	=	4.040 ac	Curve number	=	83
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.90 min
Total precip.	=	2.77 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

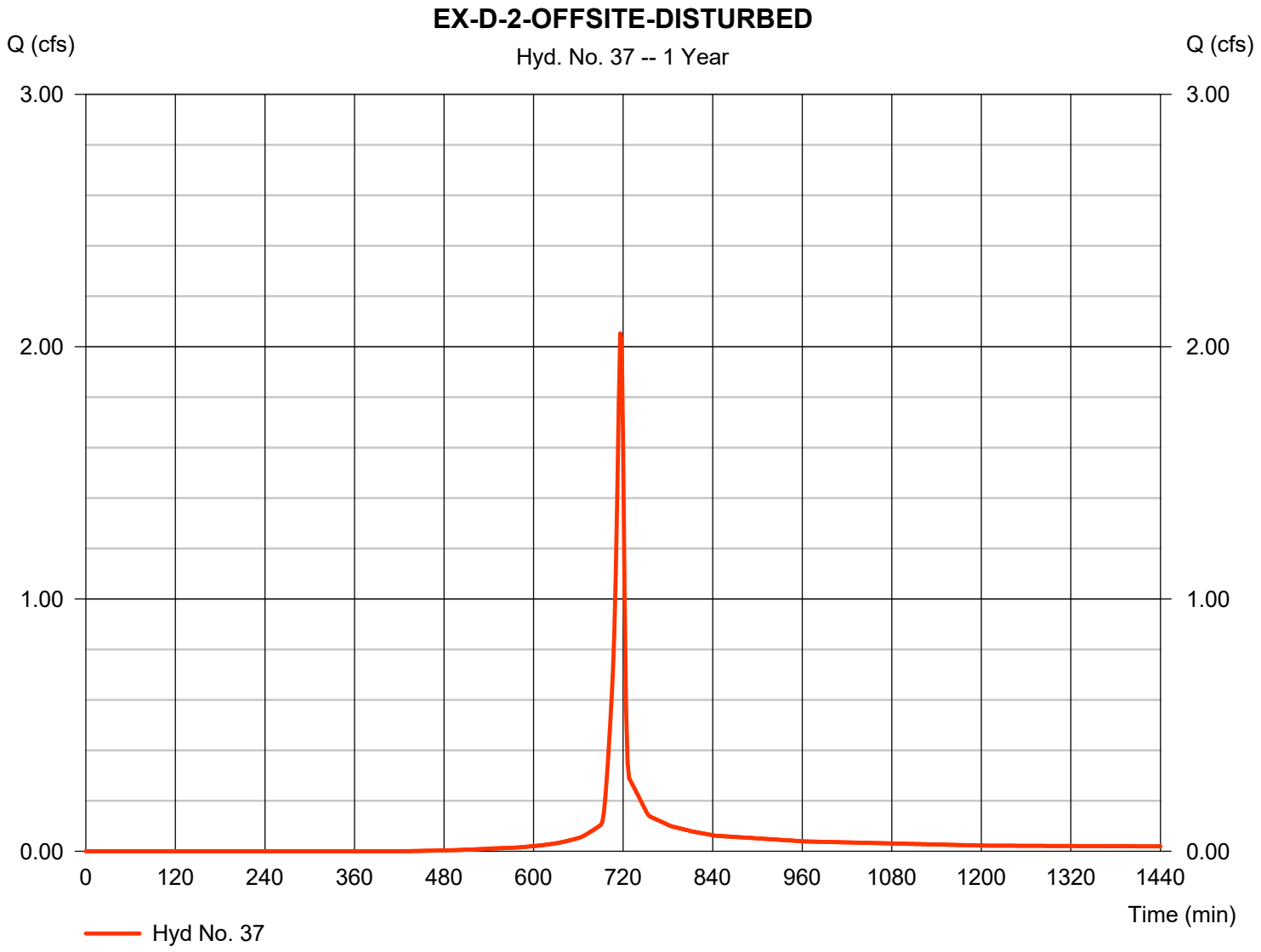


Hydrograph Report

Hyd. No. 37

EX-D-2-OFFSITE-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.052 cfs
Storm frequency	=	1 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	4,178 cuft
Drainage area	=	0.760 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	2.77 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

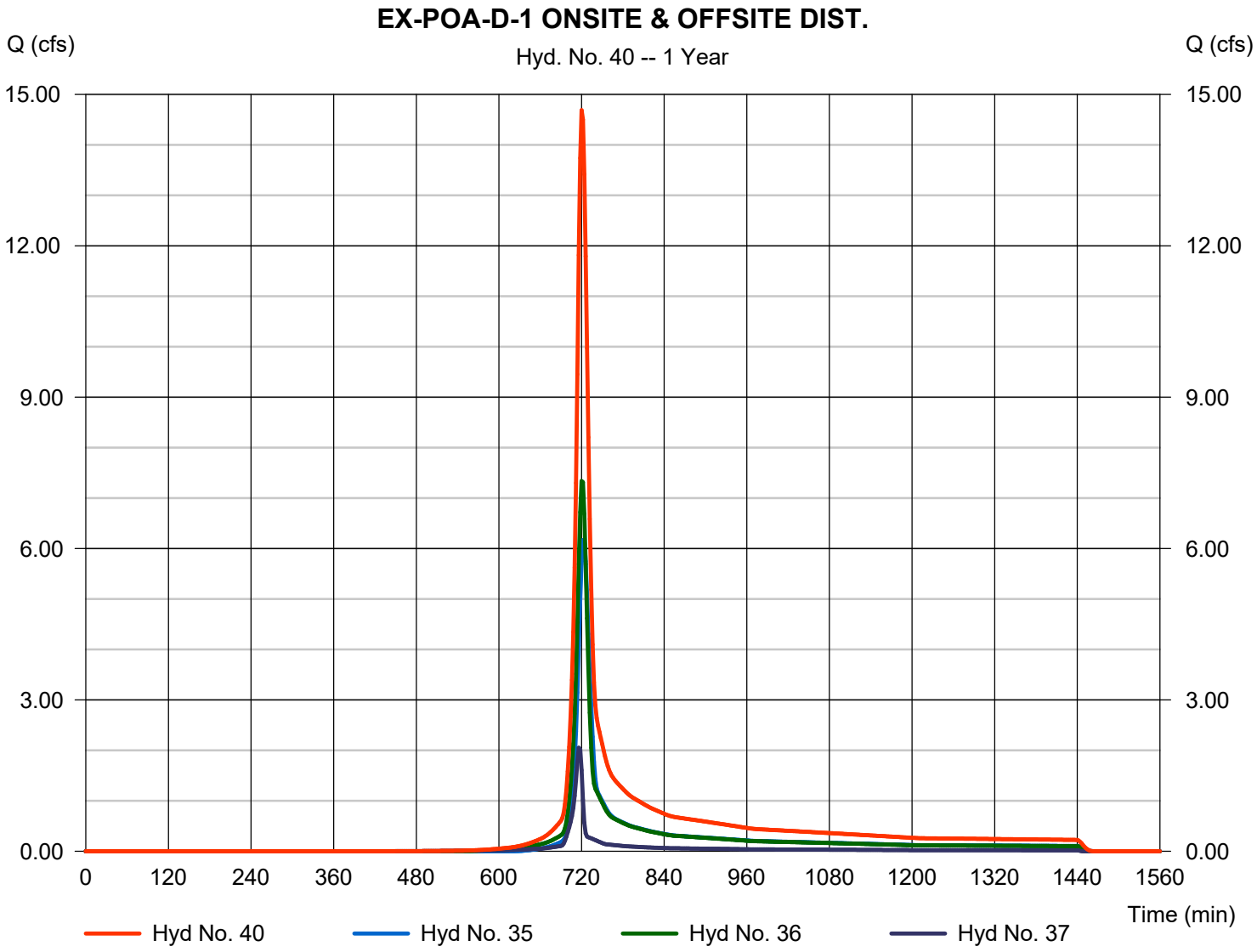


Hydrograph Report

Hyd. No. 40

EX-POA-D-1 ONSITE & OFFSITE DIST.

Hydrograph type	= Combine	Peak discharge	= 14.69 cfs
Storm frequency	= 1 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 41,071 cuft
Inflow hyds.	= 35, 36, 37	Contrib. drain. area	= 9.710 ac

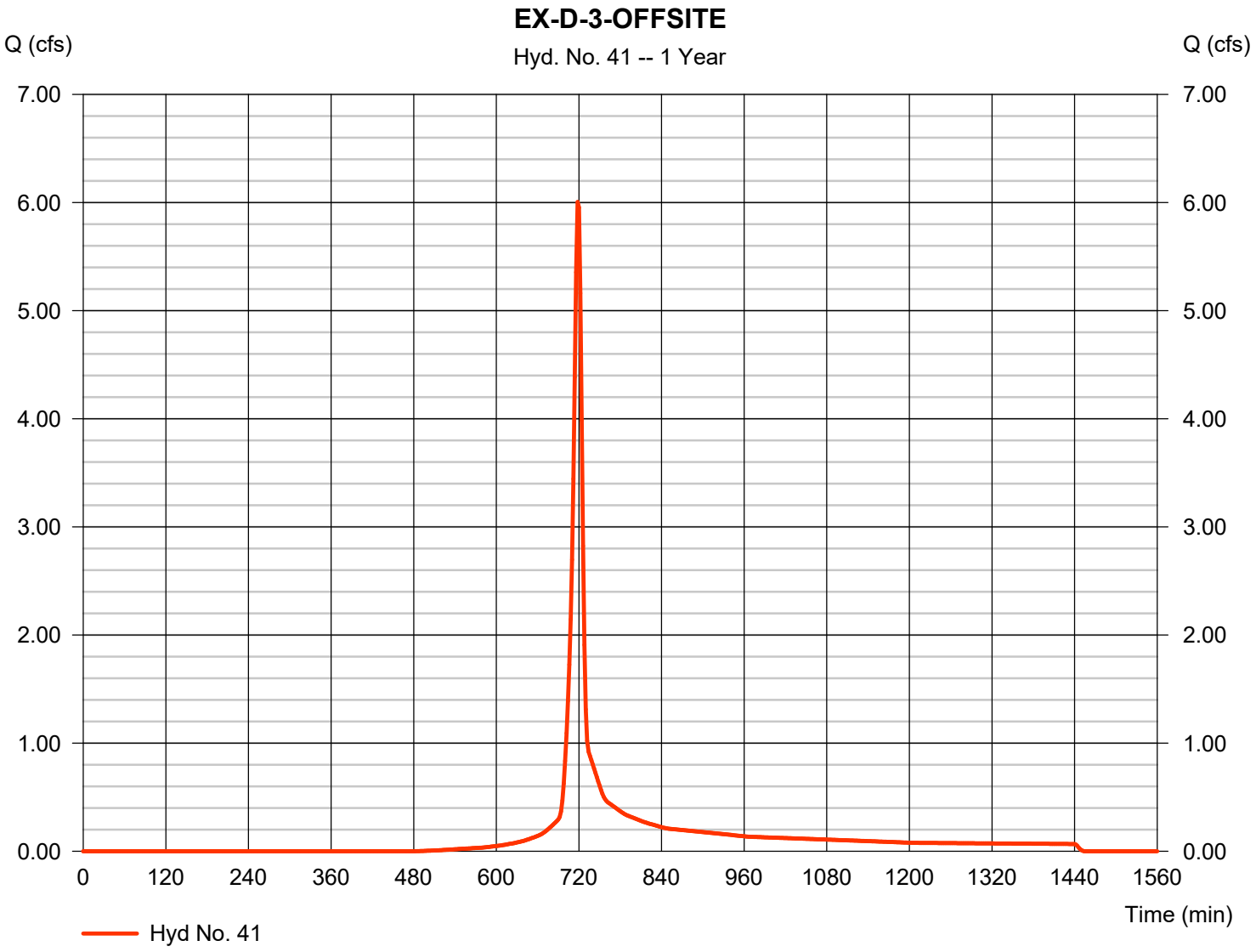


Hydrograph Report

Hyd. No. 41

EX-D-3-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.005 cfs
Storm frequency	=	1 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	13,742 cuft
Drainage area	=	2.580 ac	Curve number	=	86
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.60 min
Total precip.	=	2.77 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

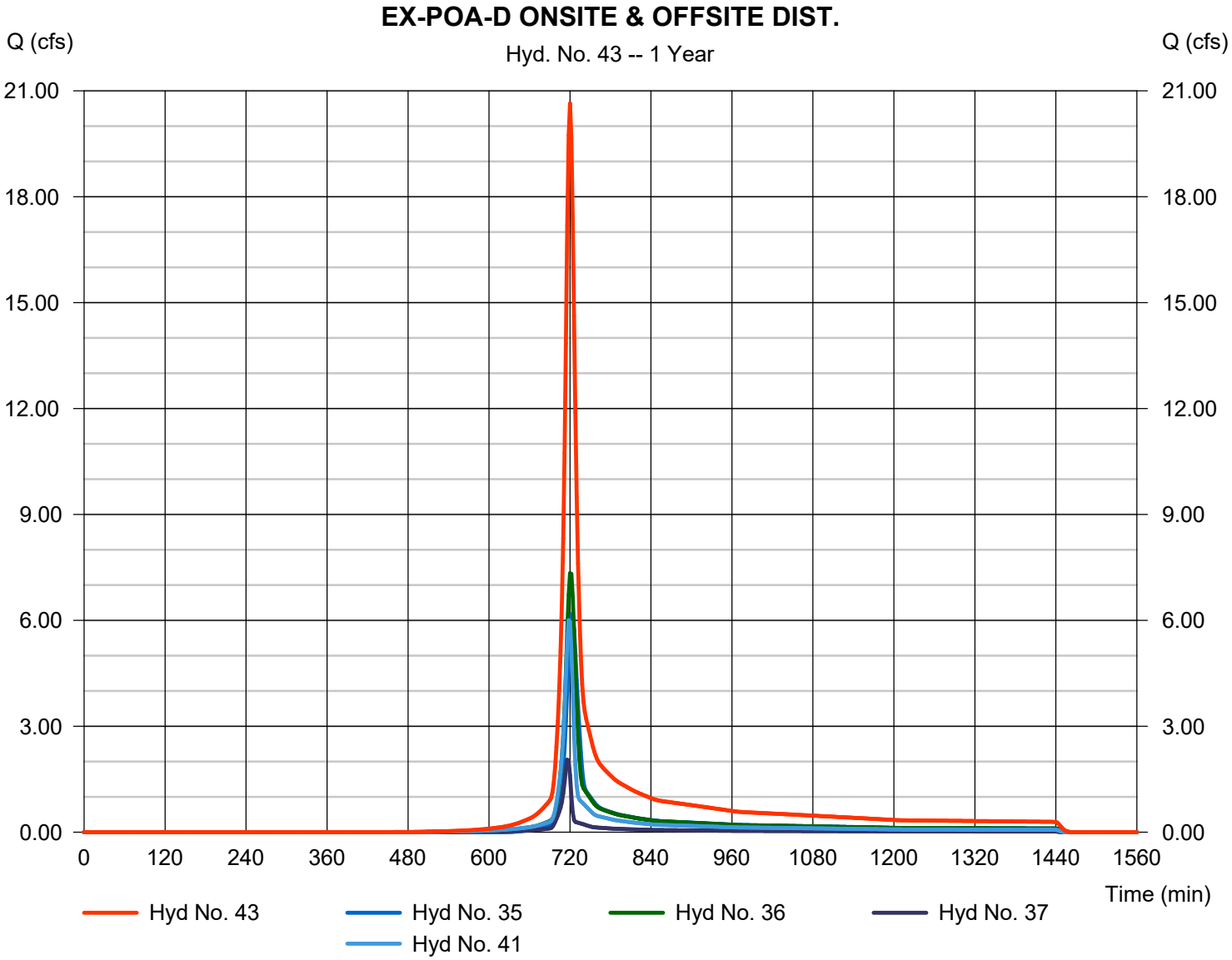


Hydrograph Report

Hyd. No. 43

EX-POA-D ONSITE & OFFSITE DIST.

Hydrograph type	= Combine	Peak discharge	= 20.64 cfs
Storm frequency	= 1 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 54,813 cuft
Inflow hyds.	= 35, 36, 37, 41	Contrib. drain. area	= 12.290 ac

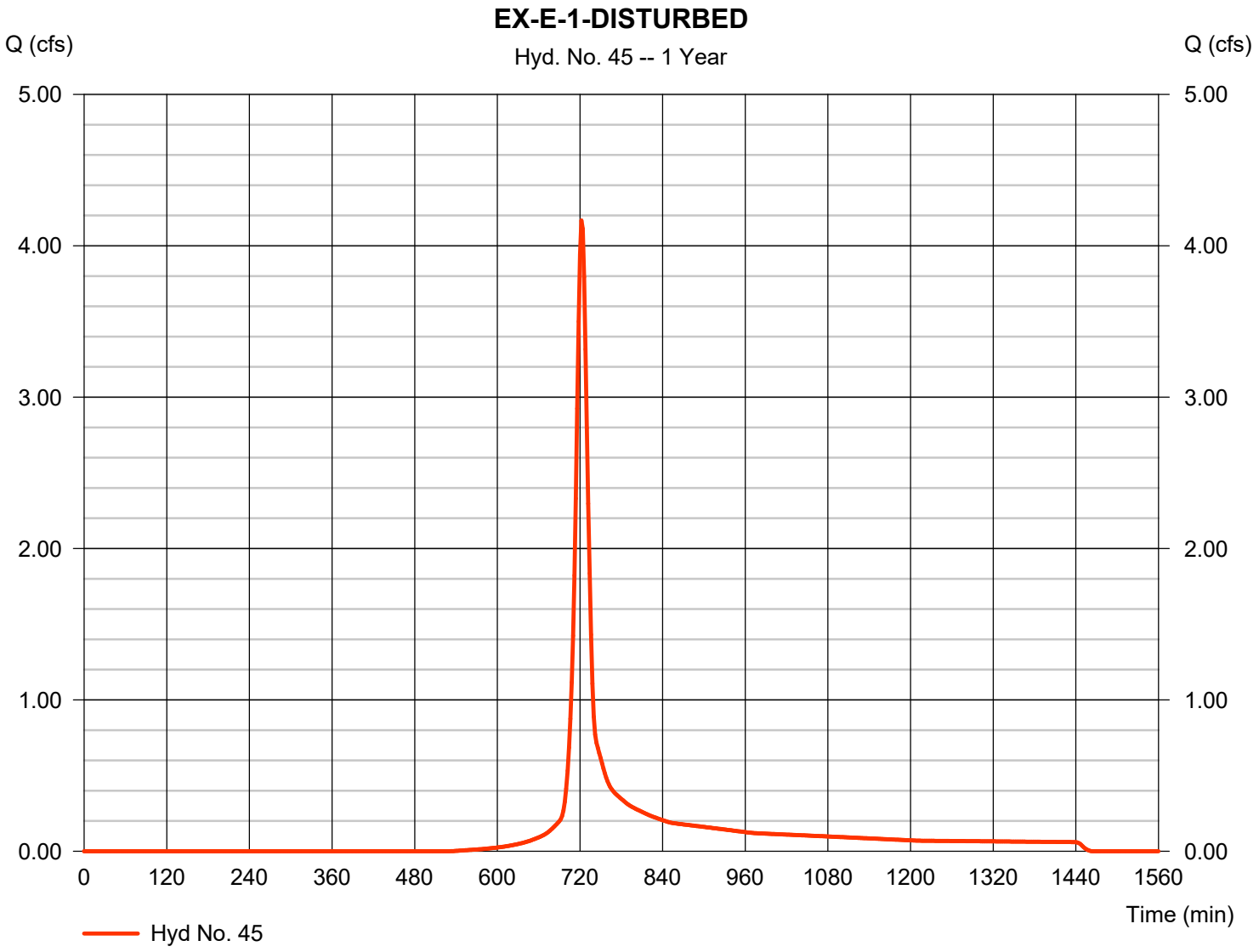


Hydrograph Report

Hyd. No. 45

EX-E-1-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.167 cfs
Storm frequency	=	1 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	11,714 cuft
Drainage area	=	2.490 ac	Curve number	=	84
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	15.90 min
Total precip.	=	2.77 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

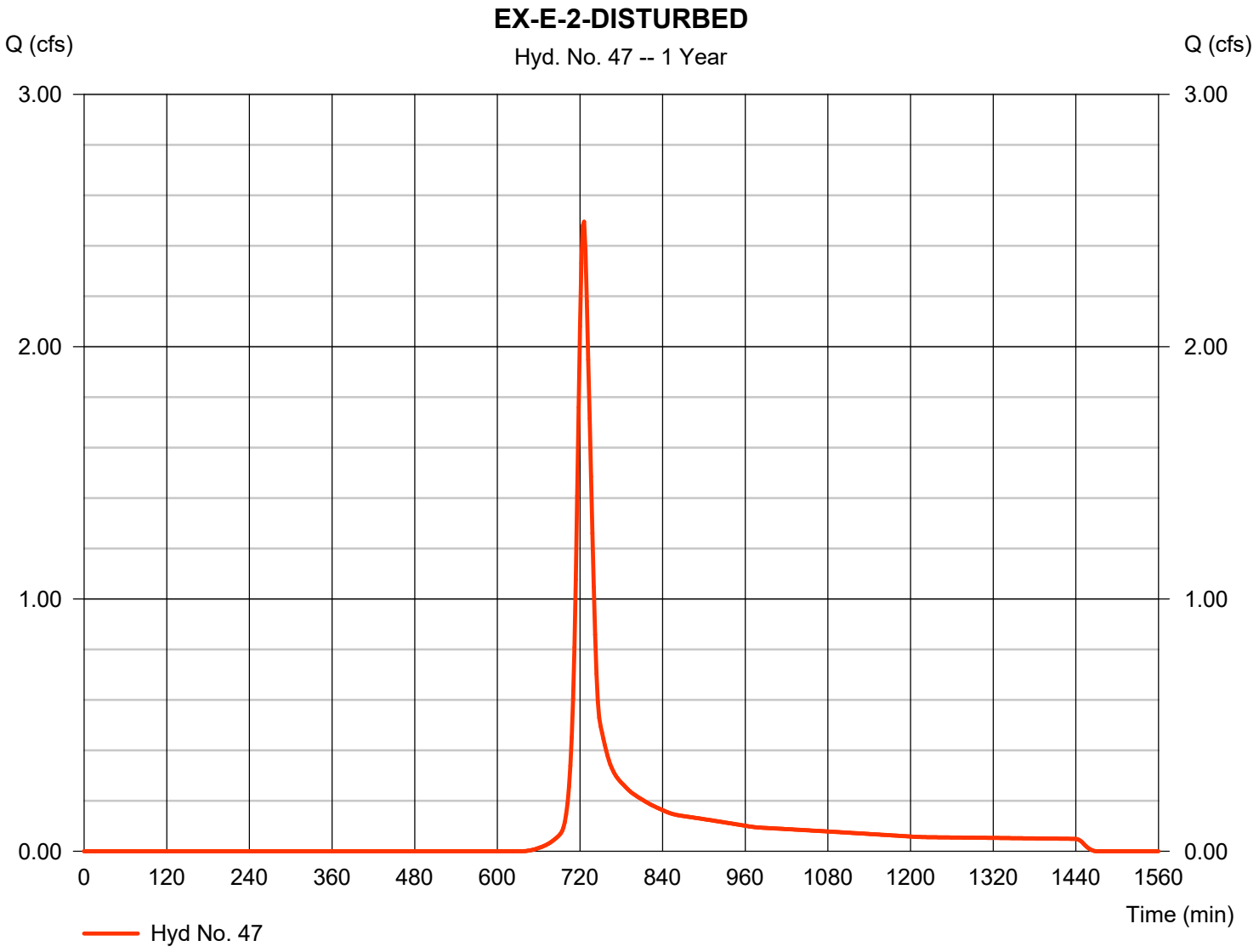


Hydrograph Report

Hyd. No. 47

EX-E-2-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.496 cfs
Storm frequency	=	1 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	8,118 cuft
Drainage area	=	2.310 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	18.60 min
Total precip.	=	2.77 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

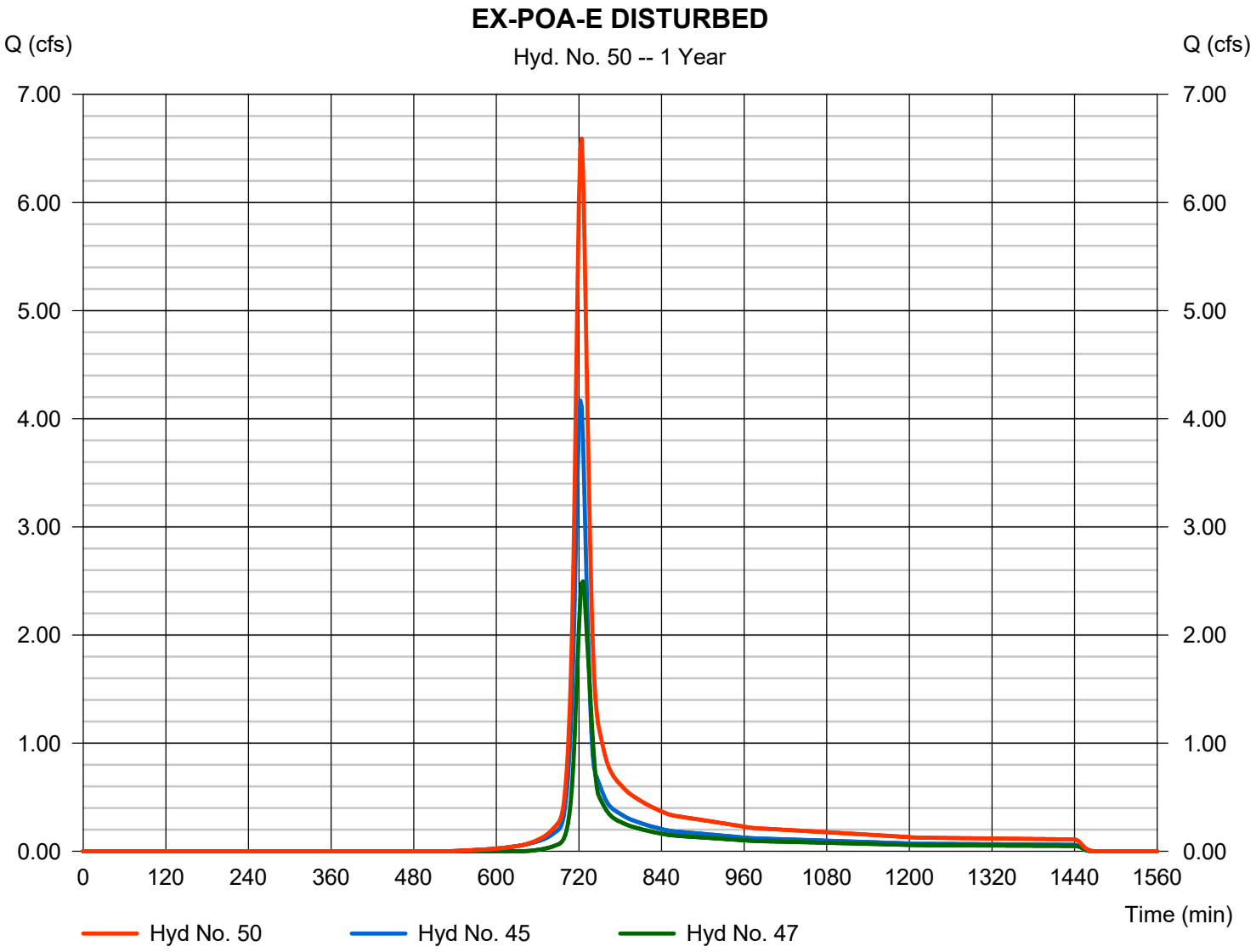


Hydrograph Report

Hyd. No. 50

EX-POA-E DISTURBED

Hydrograph type	= Combine	Peak discharge	= 6.592 cfs
Storm frequency	= 1 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 19,832 cuft
Inflow hyds.	= 45, 47	Contrib. drain. area	= 4.800 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	8.529	2	728	30,295	------	------	------	EX-A-1-A-ONSITE
2	SCS Runoff	2.547	2	732	11,143	------	------	------	EX-A-1-A-OFFSITE-DISTURBED
3	SCS Runoff	42.59	2	734	185,209	------	------	------	EX-A-1-A-OFFSITE-UNDISTURBED
4	SCS Runoff	23.75	2	722	67,215	------	------	------	EX-A-1-D-OFFSITE
5	Combine	69.41	2	728	293,863	1, 2, 3, 4	------	------	EX-POA-A-1
6	Combine	10.94	2	728	41,438	1, 2,	------	------	POA-A-1 ONSITE & OFFSITE DISTU
8	SCS Runoff	12.93	2	726	42,064	------	------	------	EX-A-2-A-ONSITE
9	SCS Runoff	24.04	2	722	68,782	------	------	------	EX-A-2-A OFFSITE
10	Combine	36.80	2	724	110,846	8, 9	------	------	EX-POA-A-2
12	SCS Runoff	38.14	2	726	122,426	------	------	------	EX-A-3-ONSITE
13	SCS Runoff	27.14	2	734	119,570	------	------	------	EX-A-3-OFFSITE
14	Combine	61.04	2	726	241,996	12, 13	------	------	EX-POA-A-3
16	Combine	61.83	2	726	205,928	6, 8, 12,	------	------	POA-A ONSITE & OFFSITE DIST.
18	SCS Runoff	4.602	2	722	12,091	------	------	------	EX-A-4-ONSITE
20	SCS Runoff	4.704	2	718	11,153	------	------	------	EX-B-1-ONSITE
21	SCS Runoff	10.88	2	718	25,078	------	------	------	EX-B-1-OFFSITE
22	SCS Runoff	27.32	2	728	96,443	------	------	------	EX-B-2-ONSITE
23	SCS Runoff	3.669	2	716	7,547	------	------	------	EX-B-2-OFFSITE
24	Combine	27.85	2	726	103,990	22, 23	------	------	EX-B-2
25	Reservoir	1.480	2	818	22,055	24	438.12	57,711	EX-B-2 Routing
26	Combine	4.704	2	718	33,208	20, 25	------	------	EX-B-ONSITE
27	Combine	15.58	2	718	58,286	20, 21, 25,	------	------	EX-POA-B
29	SCS Runoff	1.376	2	728	4,835	------	------	------	EX-C-ONSITE
30	SCS Runoff	3.369	2	718	7,740	------	------	------	EX-C-OFFSITE
31	Combine	4.394	2	720	12,574	29, 30	------	------	EX-POA-C
33	Combine	180.68	2	724	729,656	5, 10, 14, 18, 27, 31,	------	------	Combined EX-POA-ABC
35	SCS Runoff	6.169	2	722	17,781	------	------	------	EX-D-1-ONSITE
36	SCS Runoff	7.337	2	720	19,112	------	------	------	EX-D-2-ONSITE
37	SCS Runoff	2.052	2	716	4,178	------	------	------	EX-D-2-OFFSITE-DISTURBED
38	SCS Runoff	2.248	2	716	4,559	------	------	------	EX-D-2-OFFSITE-UNDISTURBED

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
39	Combine	16.46	2	720	45,630	35, 36, 37, 38	------	------	EX-POA-D-1
40	Combine	14.69	2	720	41,071	35, 36, 37,	------	------	EX-POA-D-1 ONSITE & OFFSITE DI
41	SCS Runoff	6.005	2	718	13,742	------	------	------	EX-D-3-OFFSITE
42	Combine	22.41	2	720	59,372	35, 36, 37, 38, 41	------	------	EX-POA-D
43	Combine	20.64	2	720	54,813	35, 36, 37, 41,	------	------	EX-POA-D ONSITE & OFFSITE DIST
45	SCS Runoff	4.167	2	722	11,714	------	------	------	EX-E-1-DISTURBED
46	SCS Runoff	20.41	2	722	57,412	------	------	------	EX-E-1-UNDISTURBED
47	SCS Runoff	2.496	2	726	8,118	------	------	------	EX-E-2-DISTURBED
48	SCS Runoff	22.64	2	726	73,096	------	------	------	EX-E-2-UNDISTURBED
49	Combine	49.07	2	724	150,340	45, 46, 47, 48	------	------	EX-POA-E
50	Combine	6.592	2	724	19,832	45, 47,	------	------	EX-POA-E DISTURBED
52	Combine	229.75	2	724	879,996	33, 49,	------	------	TOTAL BRODHEAD CREEK

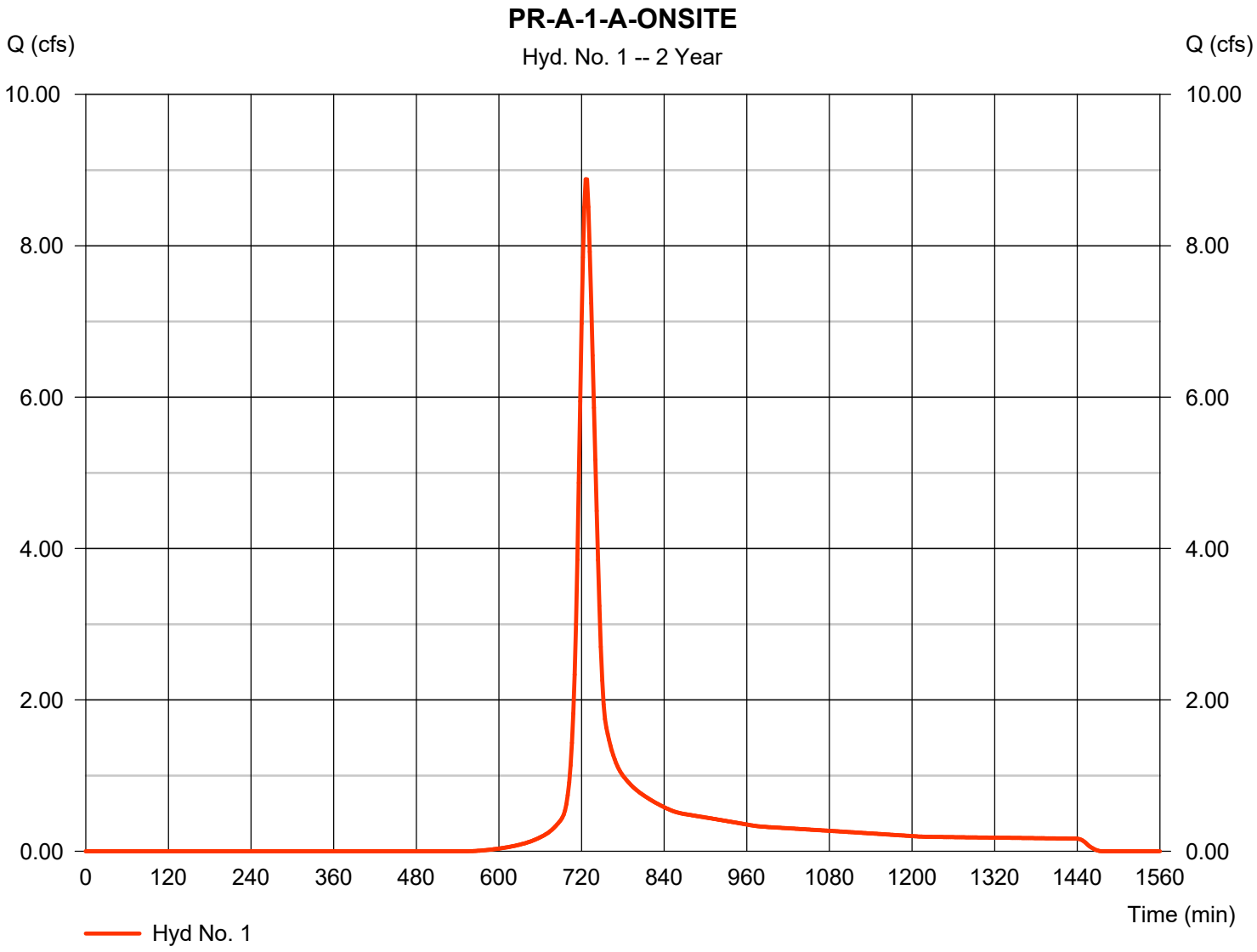
PROPOSED DISCHARGE CALCULATIONS
2-YEAR 24-HOUR STORM

Hydrograph Report

Hyd. No. 1

PR-A-1-A-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.880 cfs
Storm frequency	=	2 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	31,095 cuft
Drainage area	=	5.630 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	20.90 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

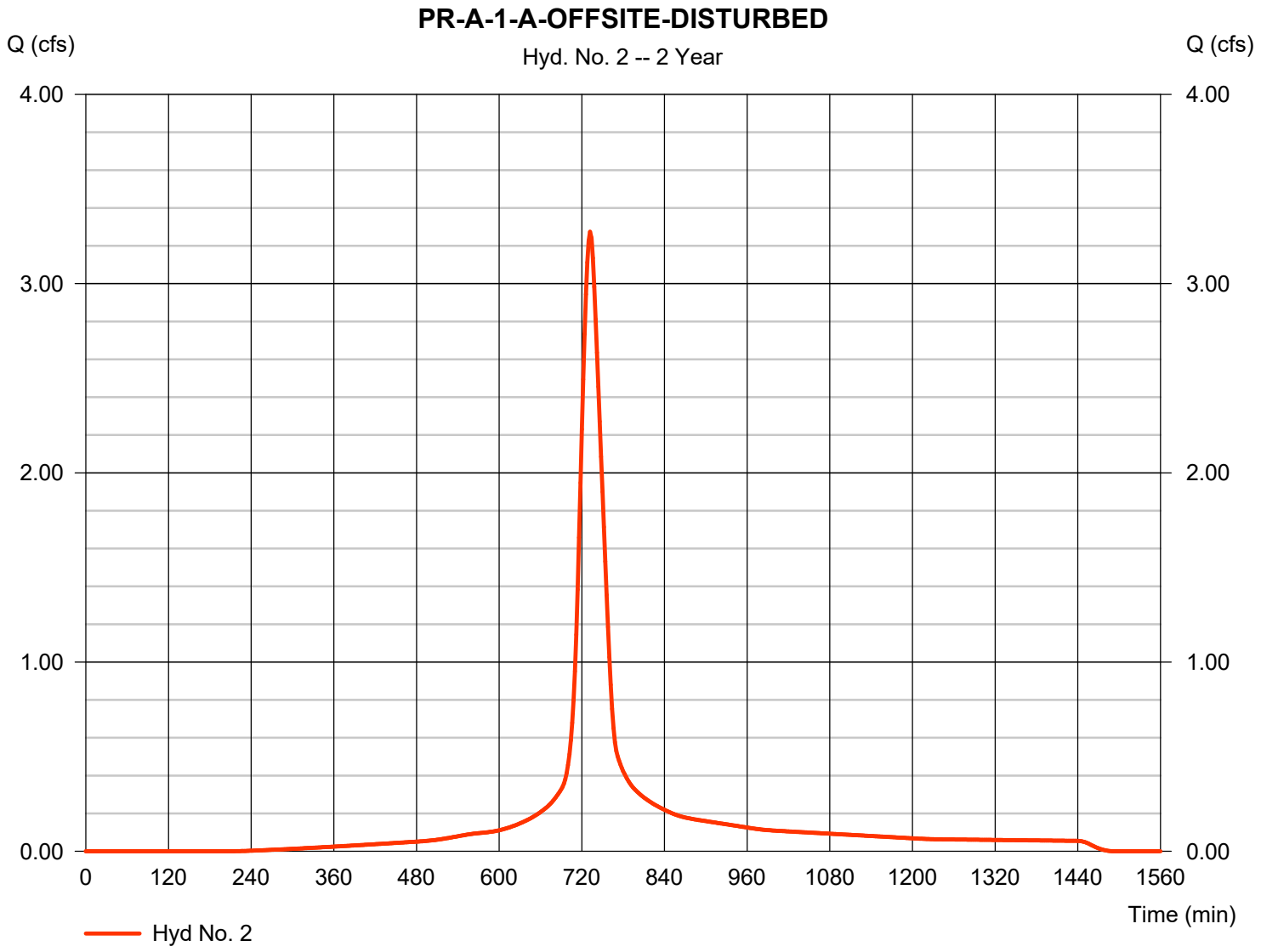


Hydrograph Report

Hyd. No. 2

PR-A-1-A-OFFSITE-DISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 3.274 cfs
Storm frequency	= 2 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 14,569 cuft
Drainage area	= 1.490 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 31.50 min
Total precip.	= 3.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

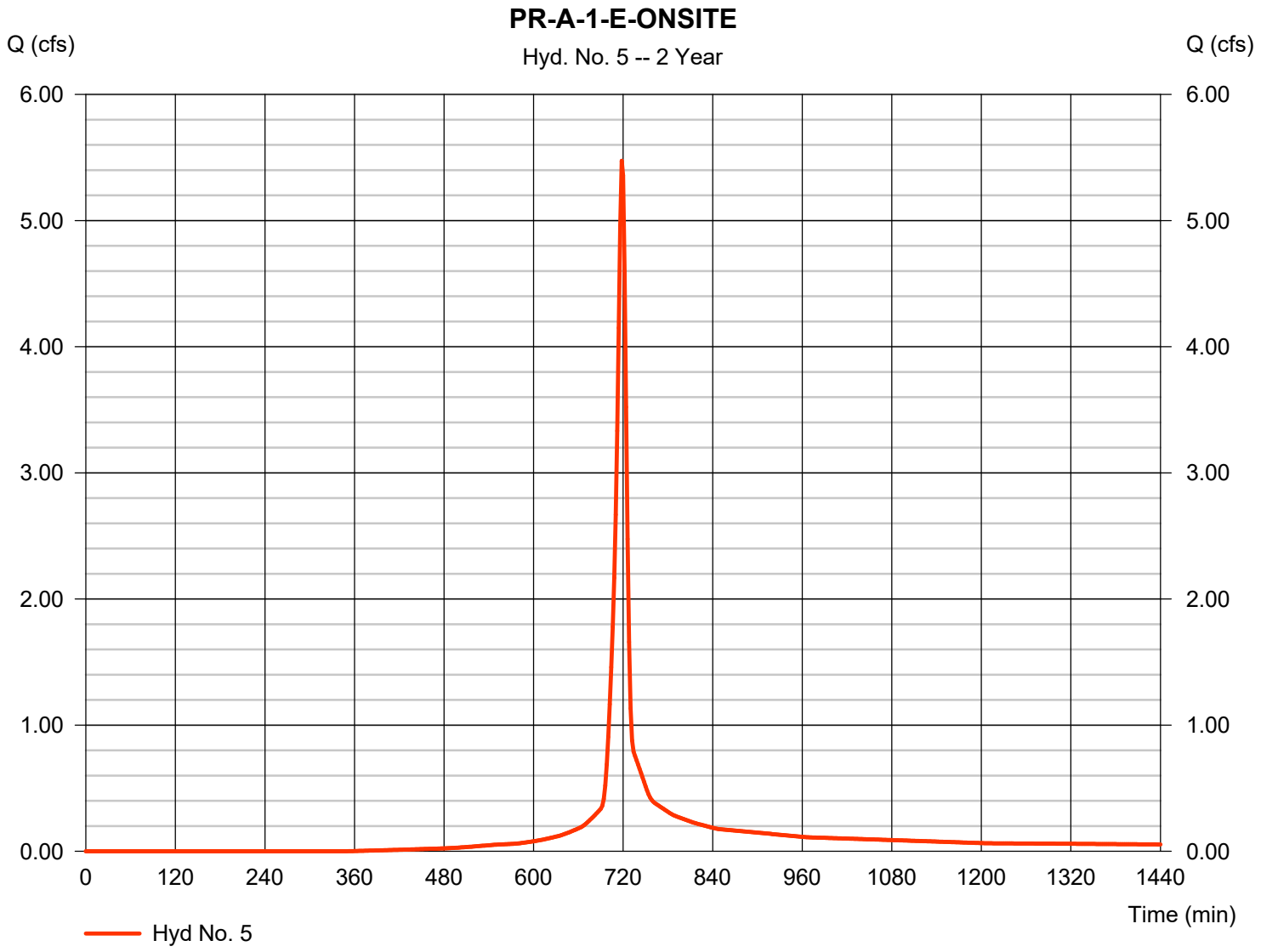


Hydrograph Report

Hyd. No. 5

PR-A-1-E-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.473 cfs
Storm frequency	=	2 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	12,728 cuft
Drainage area	=	1.600 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	7.20 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

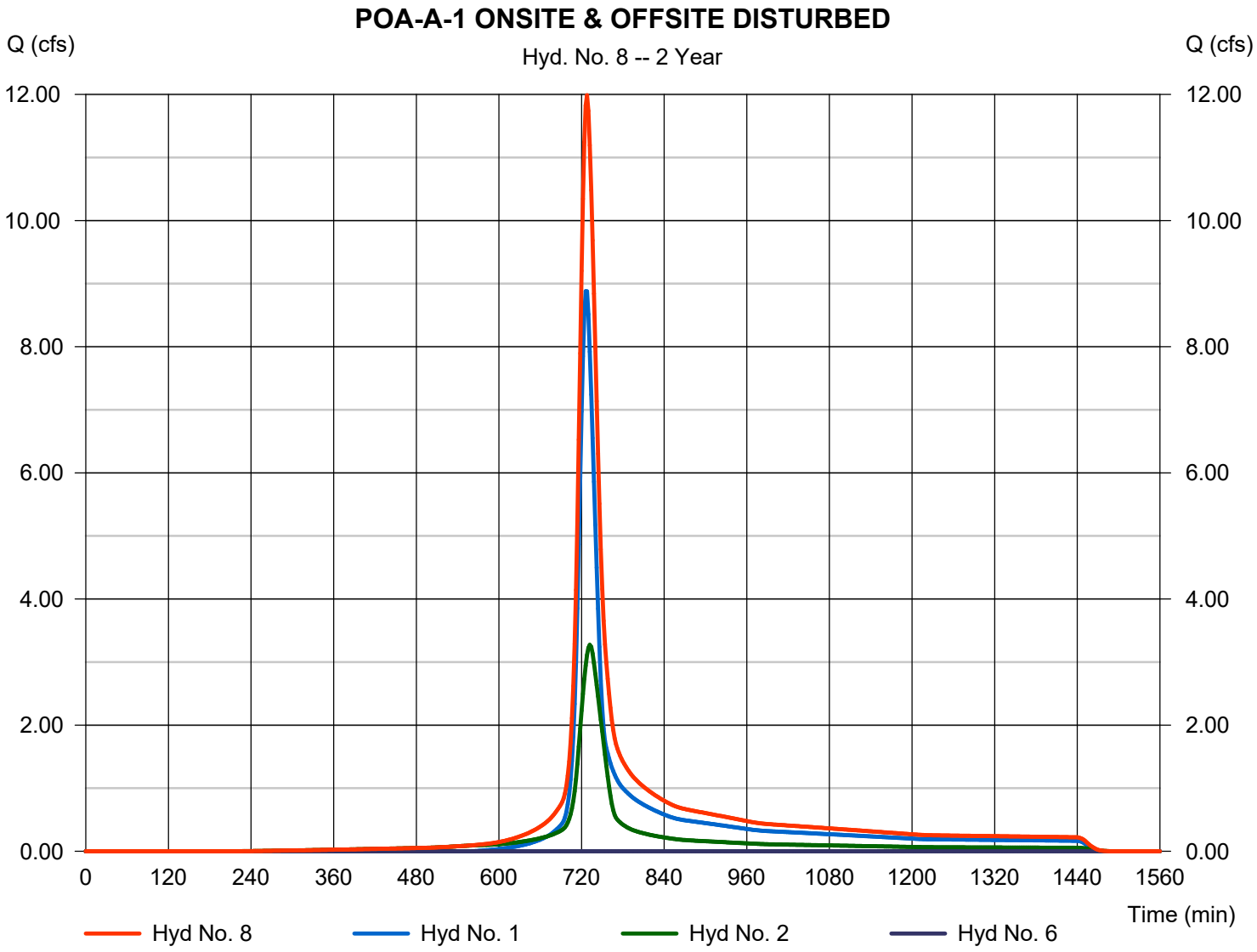


Hydrograph Report

Hyd. No. 8

POA-A-1 ONSITE & OFFSITE DISTURBED

Hydrograph type	= Combine	Peak discharge	= 11.99 cfs
Storm frequency	= 2 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 45,664 cuft
Inflow hyds.	= 1, 2, 6	Contrib. drain. area	= 7.120 ac

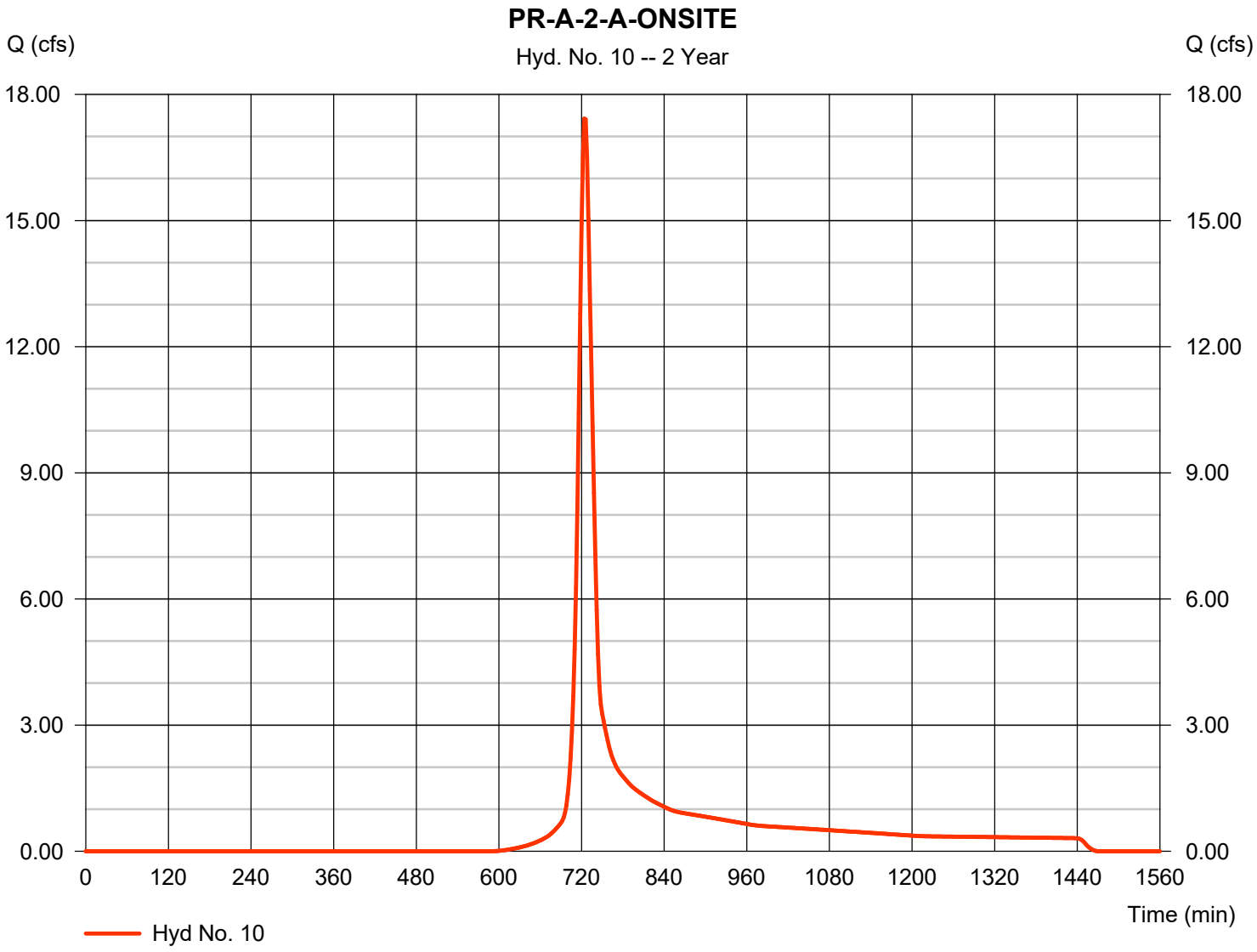


Hydrograph Report

Hyd. No. 10

PR-A-2-A-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	17.42 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	55,620 cuft
Drainage area	=	11.250 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	19.70 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

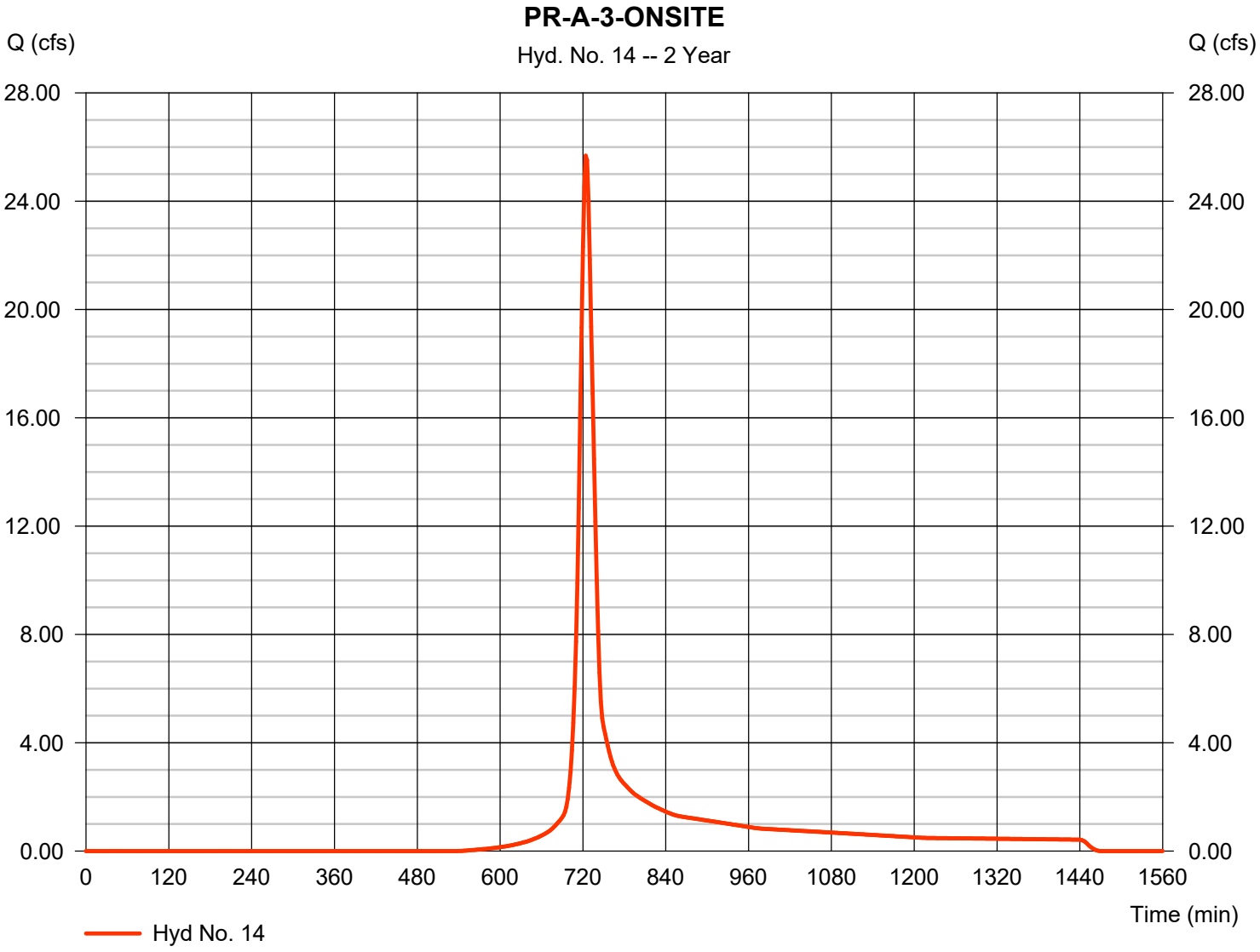


Hydrograph Report

Hyd. No. 14

PR-A-3-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	25.68 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	80,845 cuft
Drainage area	=	14.240 ac	Curve number	=	81
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	19.70 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

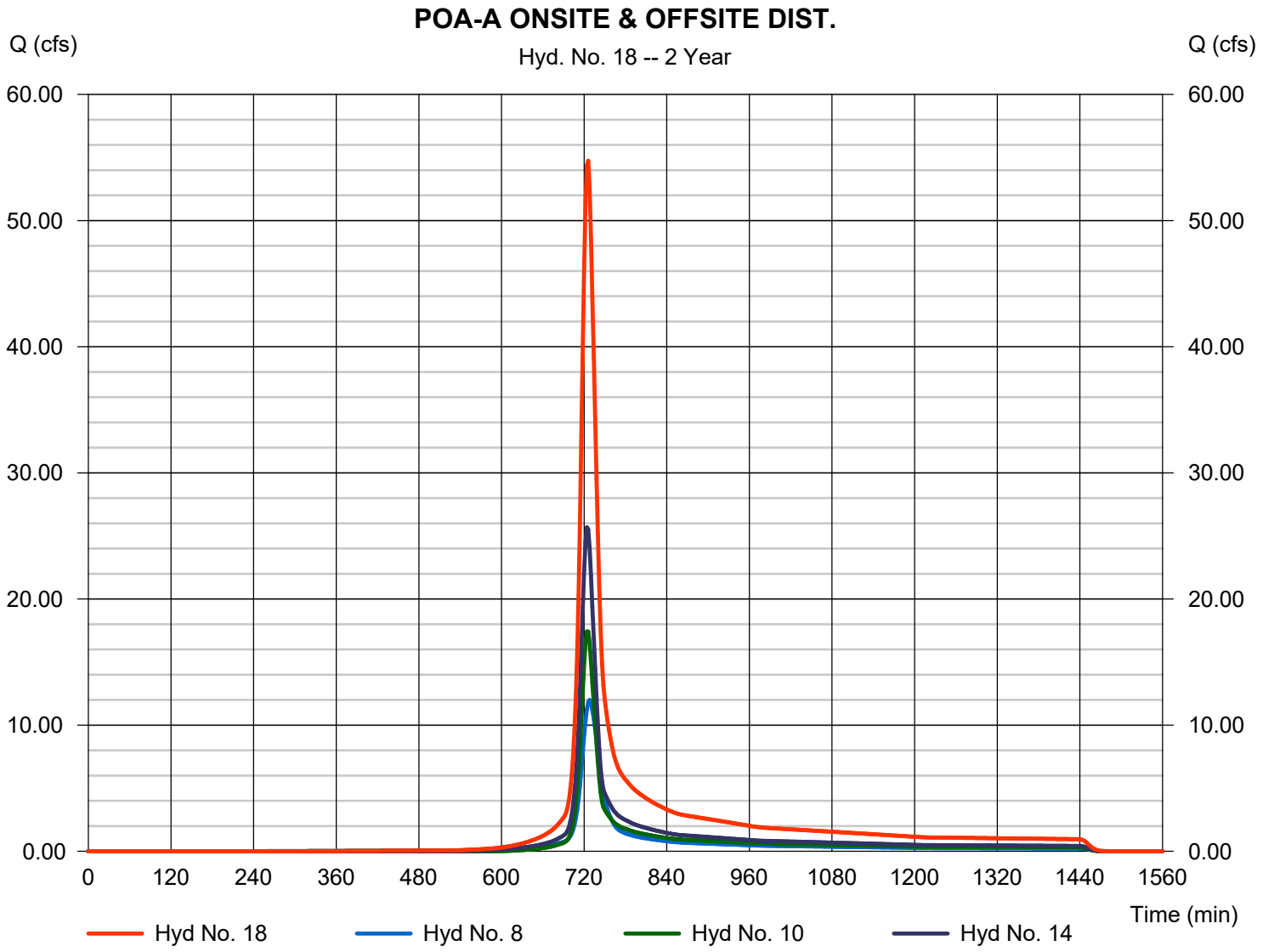


Hydrograph Report

Hyd. No. 18

POA-A ONSITE & OFFSITE DIST.

Hydrograph type	= Combine	Peak discharge	= 54.74 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 182,129 cuft
Inflow hyds.	= 8, 10, 14	Contrib. drain. area	= 25.490 ac

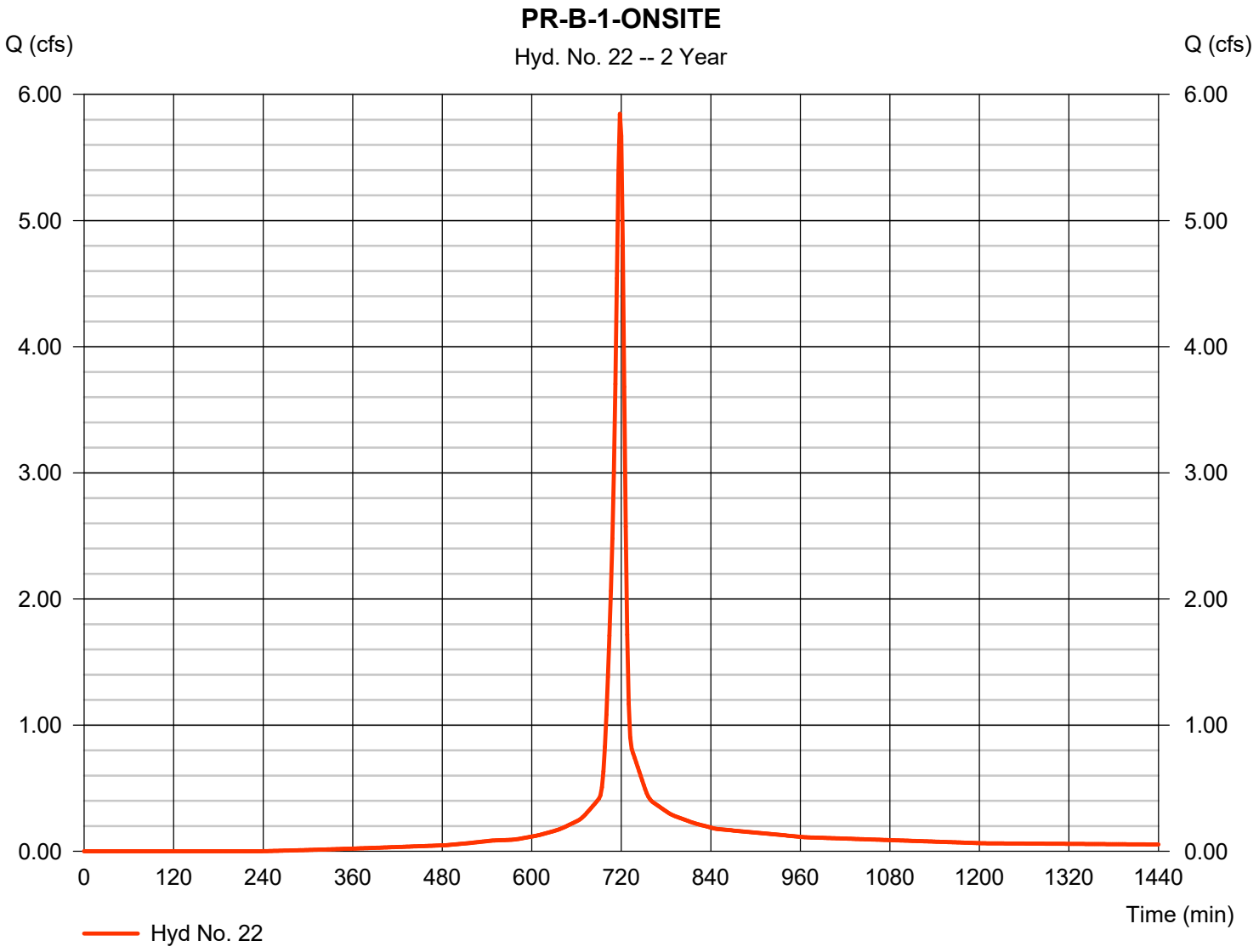


Hydrograph Report

Hyd. No. 22

PR-B-1-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.846 cfs
Storm frequency	=	2 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	14,039 cuft
Drainage area	=	1.510 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	7.30 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

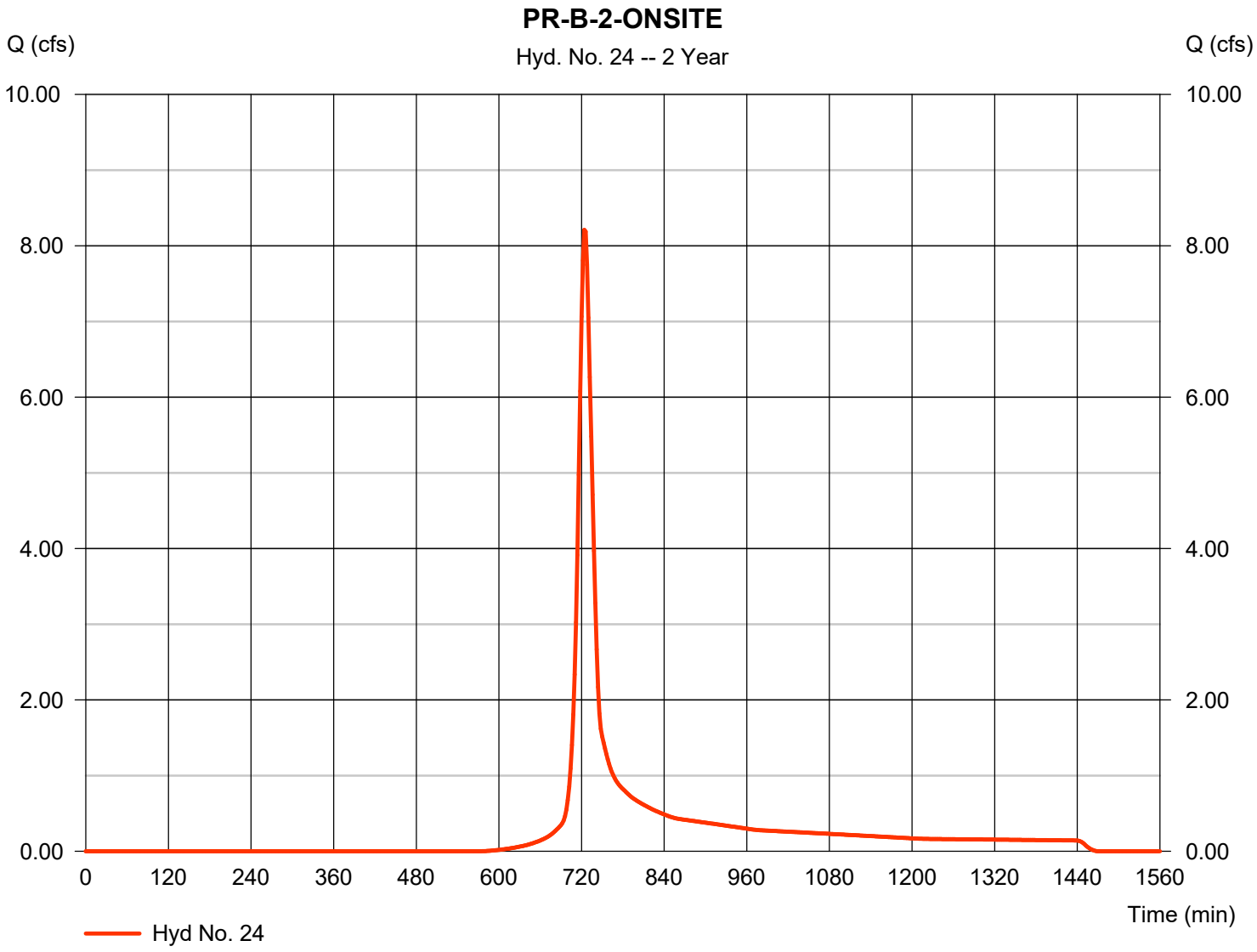


Hydrograph Report

Hyd. No. 24

PR-B-2-ONSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.211 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	26,064 cuft
Drainage area	=	5.030 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	17.00 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



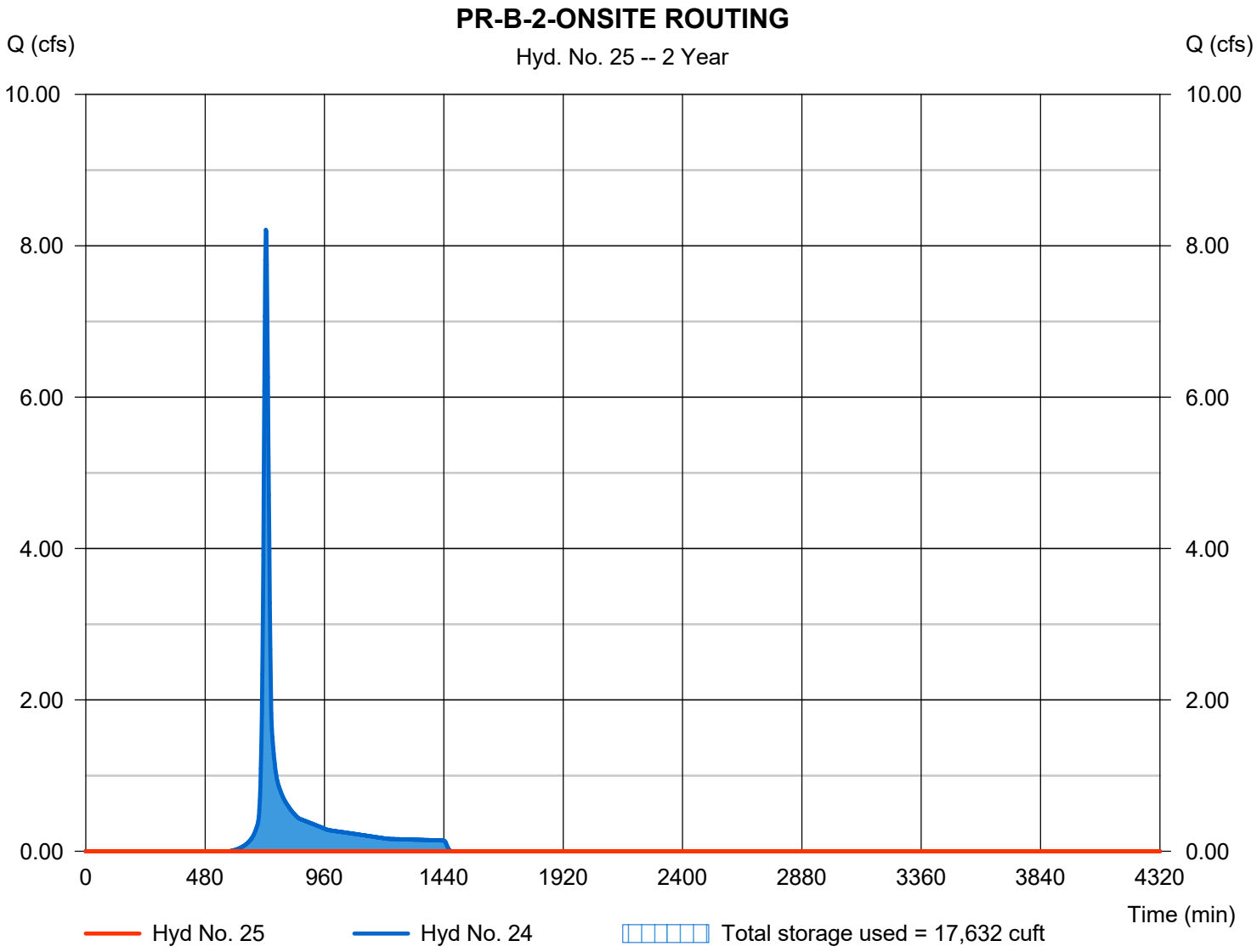
Hydrograph Report

Hyd. No. 25

PR-B-2-ONSITE ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	0.000 cfs
Storm frequency	=	2 yrs	Time to peak	=	910 min
Time interval	=	2 min	Hyd. volume	=	0 cuft
Inflow hyd. No.	=	24 - PR-B-2-ONSITE	Max. Elevation	=	437.02 ft
Reservoir name	=	EX-B-2-ONSITE-POND	Max. Storage	=	17,632 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

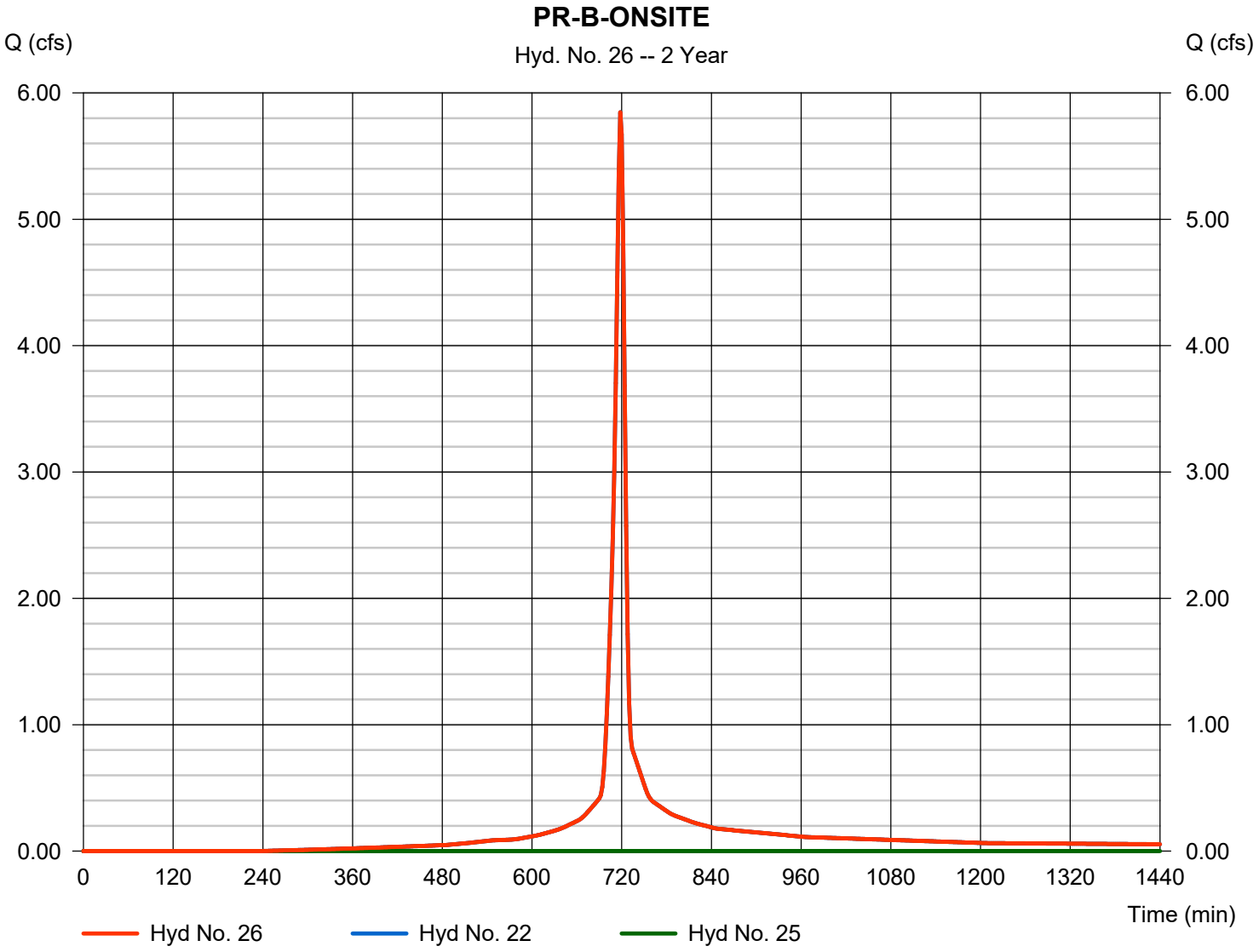


Hydrograph Report

Hyd. No. 26

PR-B-ONSITE

Hydrograph type	=	Combine	Peak discharge	=	5.846 cfs
Storm frequency	=	2 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	14,039 cuft
Inflow hyds.	=	22, 25	Contrib. drain. area	=	1.510 ac

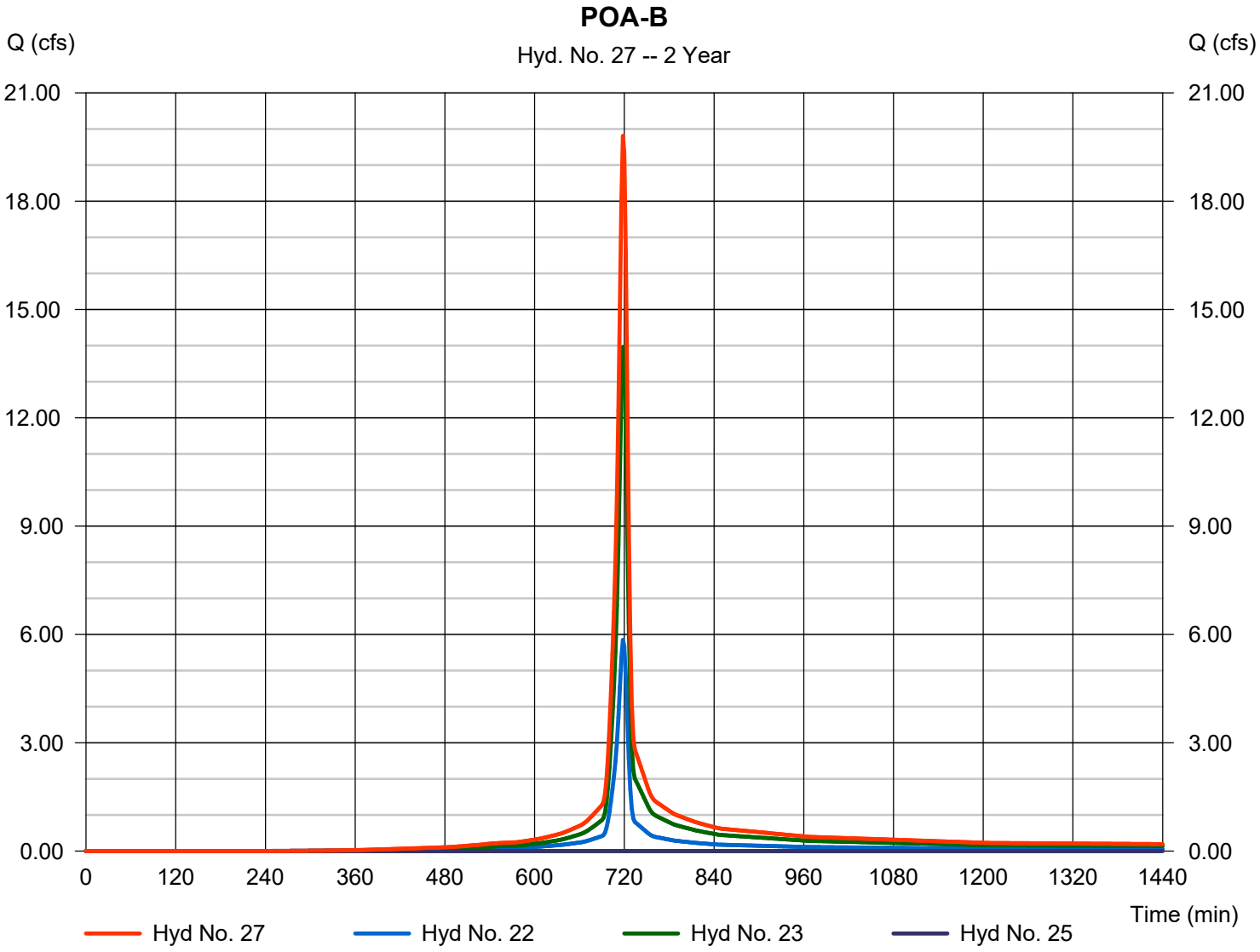


Hydrograph Report

Hyd. No. 27

POA-B

Hydrograph type	=	Combine	Peak discharge	=	19.80 cfs
Storm frequency	=	2 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	46,494 cuft
Inflow hyds.	=	22, 23, 25	Contrib. drain. area	=	5.590 ac

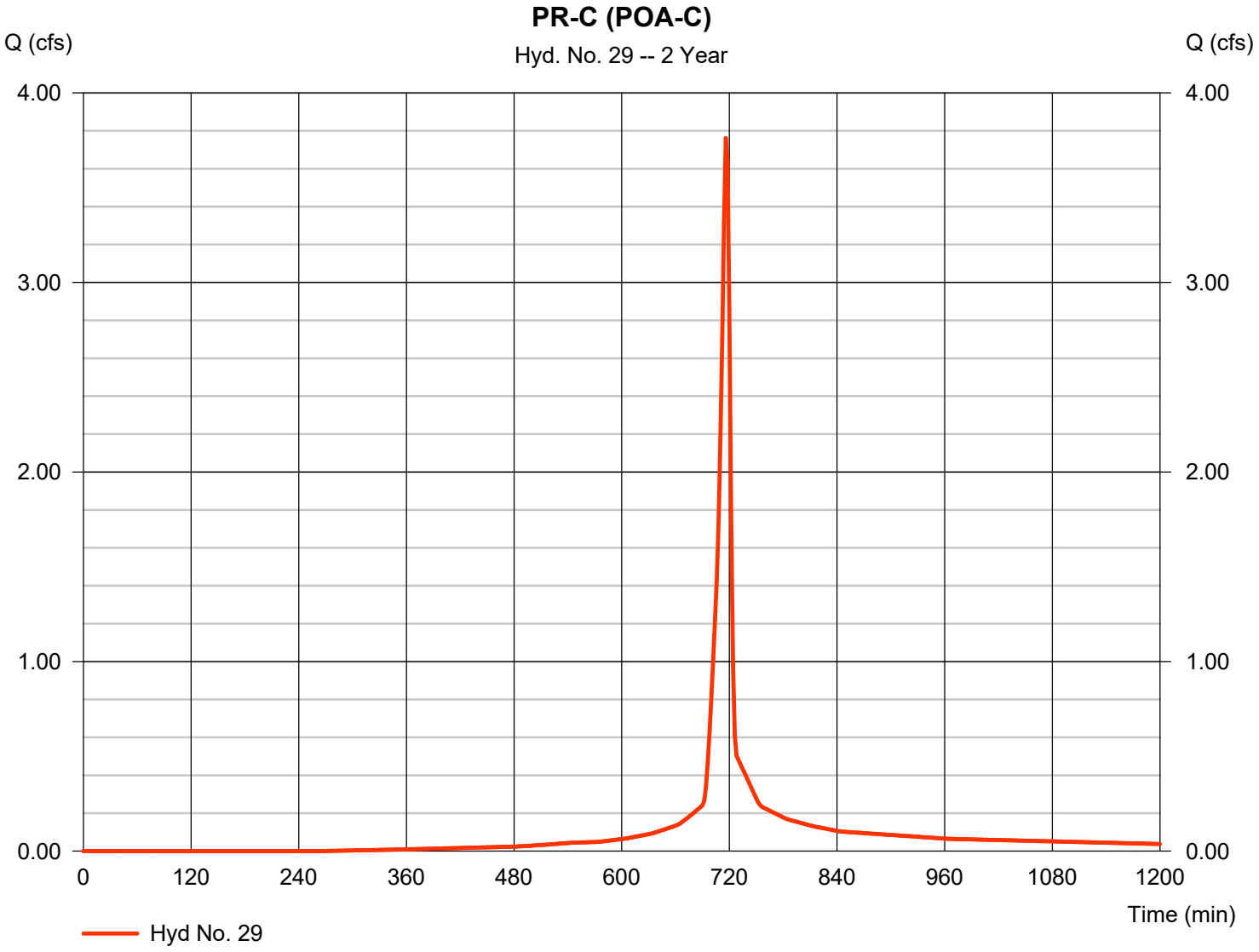


Hydrograph Report

Hyd. No. 29

PR-C (POA-C)

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.762 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	7,969 cuft
Drainage area	=	0.950 ac	Curve number	=	92
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



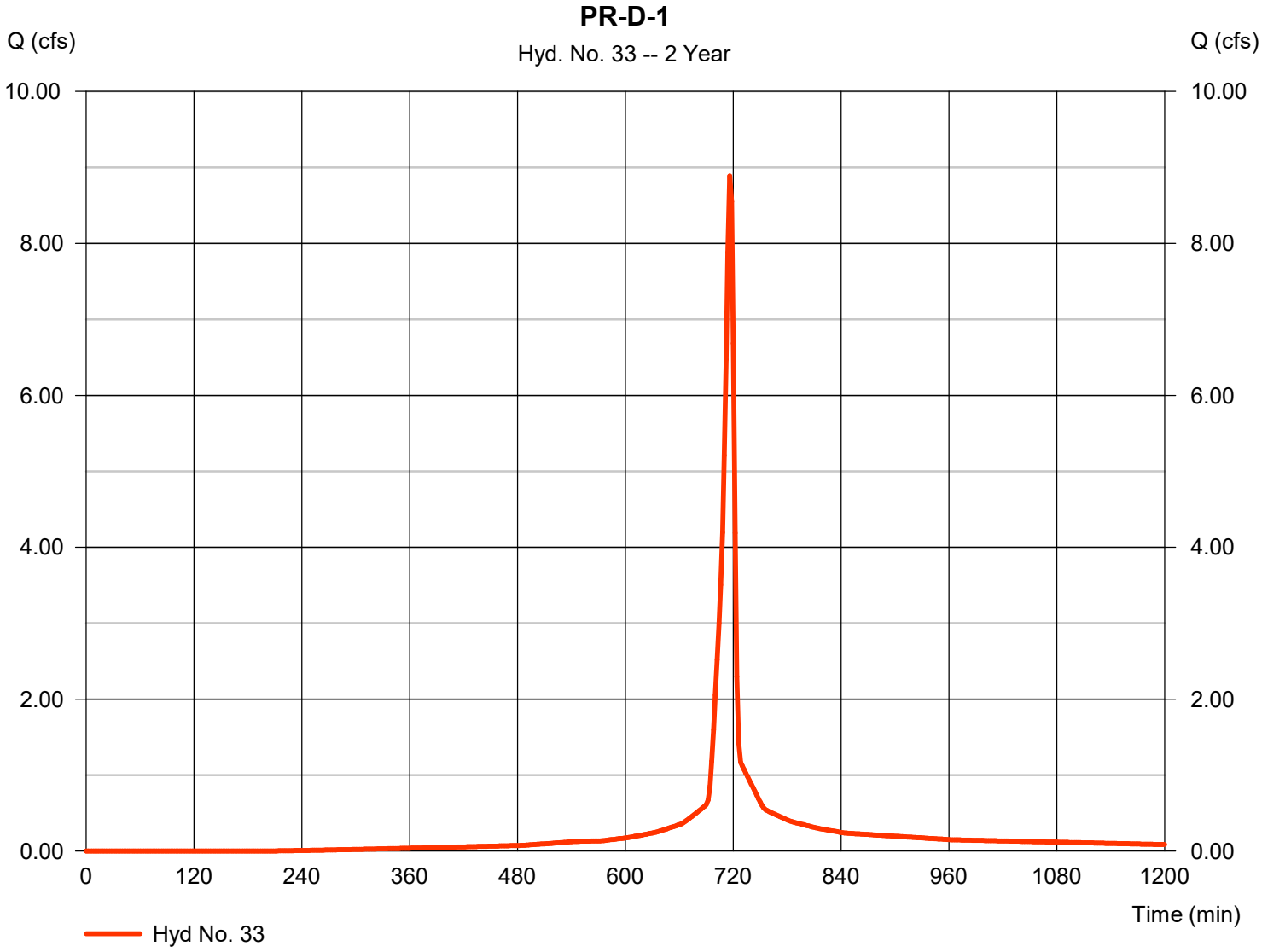
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 33

PR-D-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.887 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	19,284 cuft
Drainage area	=	2.130 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



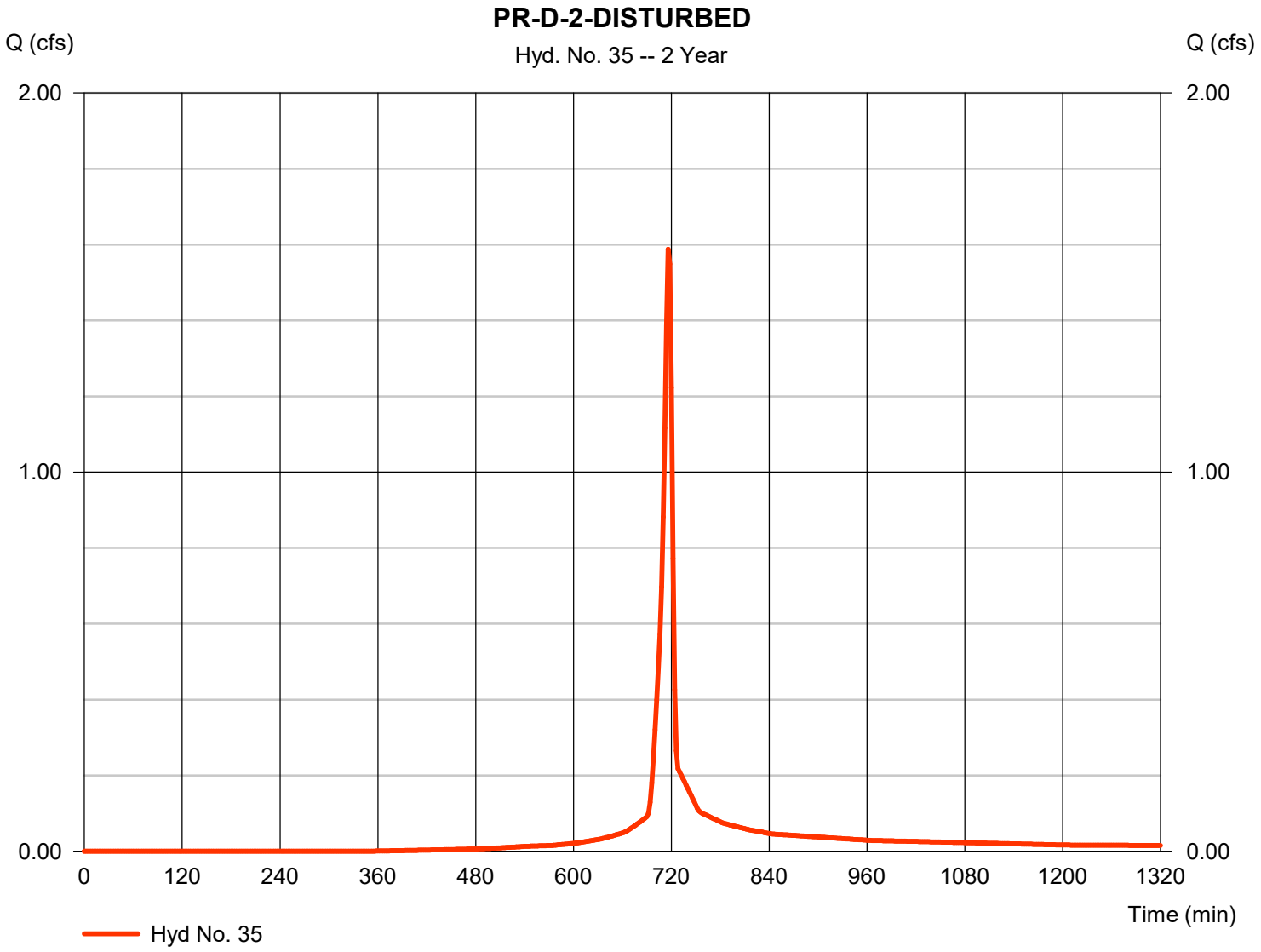
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 35

PR-D-2-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.588 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	3,281 cuft
Drainage area	=	0.440 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



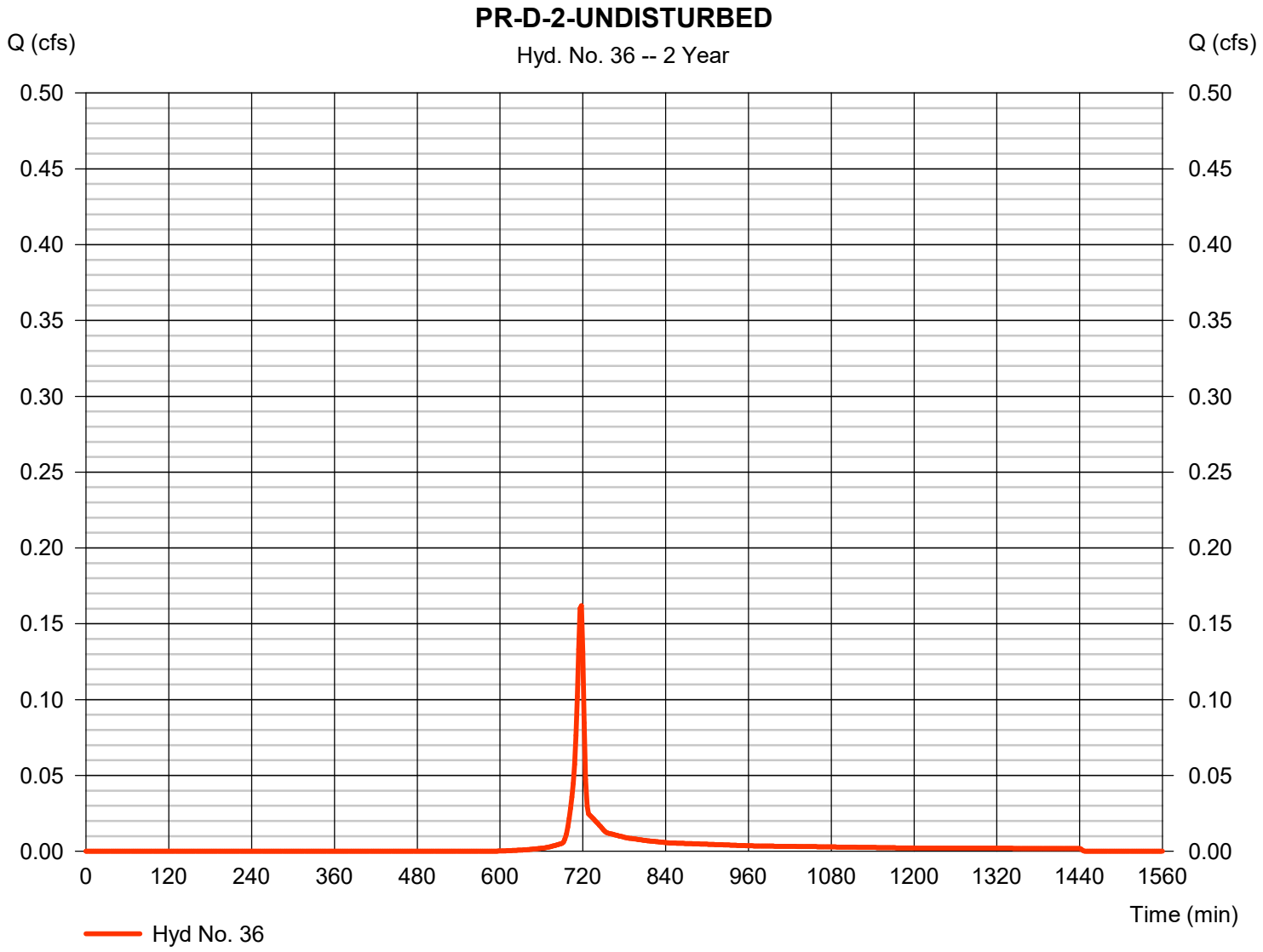
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 36

PR-D-2-UNDISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 0.162 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 324 cuft
Drainage area	= 0.070 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



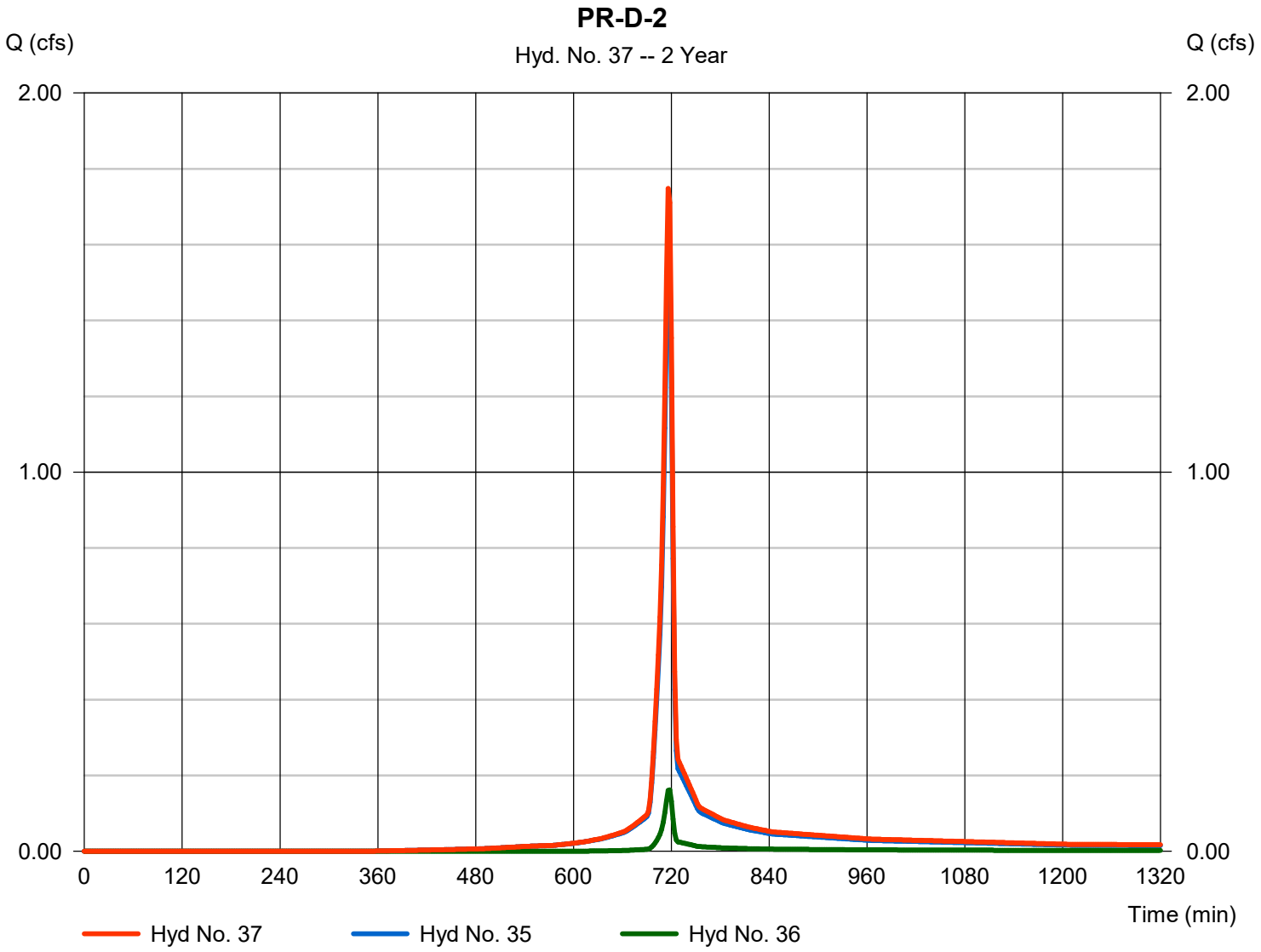
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 37

PR-D-2

Hydrograph type	=	Combine	Peak discharge	=	1.748 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	3,606 cuft
Inflow hyds.	=	35, 36	Contrib. drain. area	=	0.510 ac



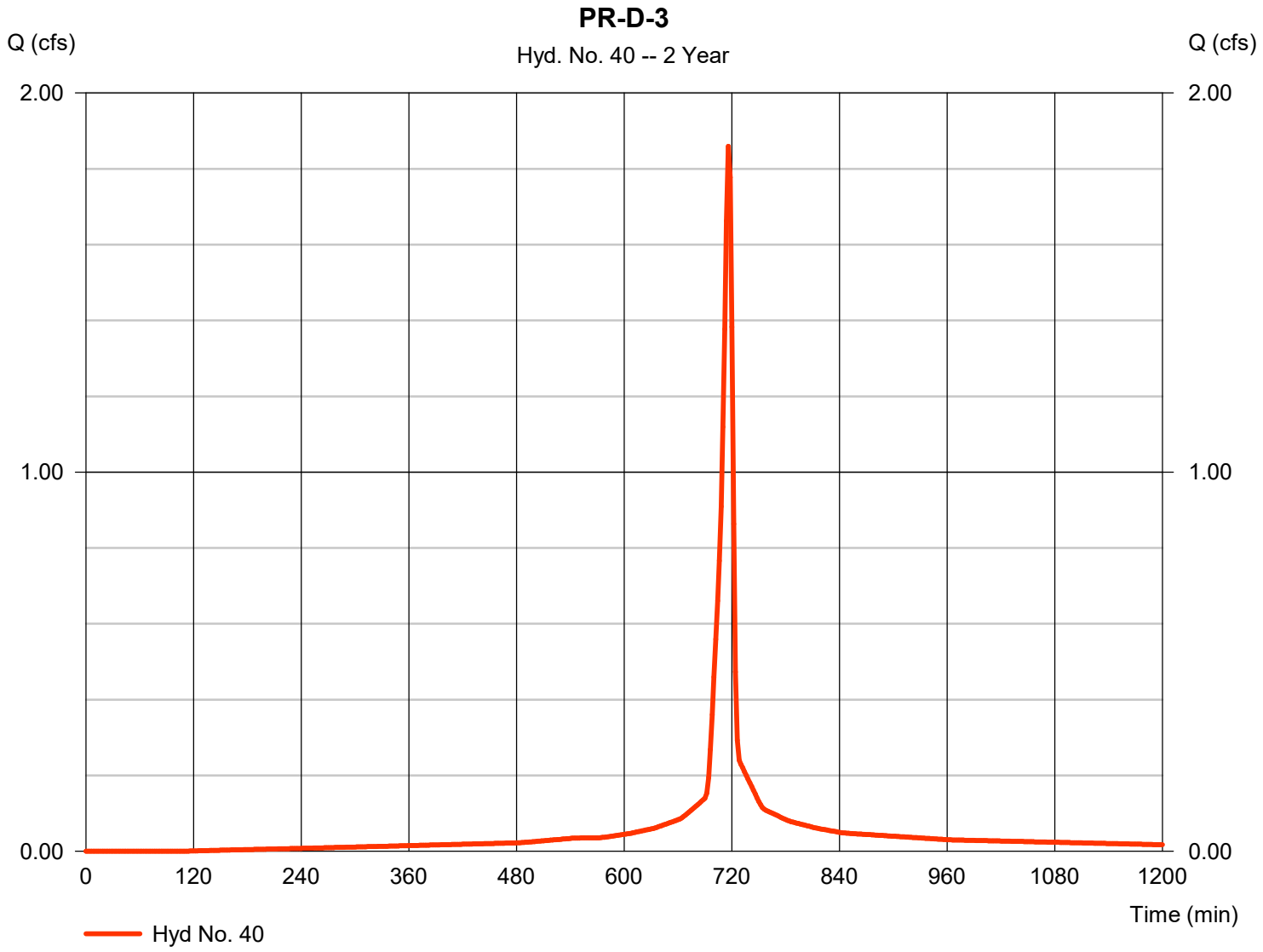
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 40

PR-D-3

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.859 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	4,253 cuft
Drainage area	=	0.420 ac	Curve number	=	97
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



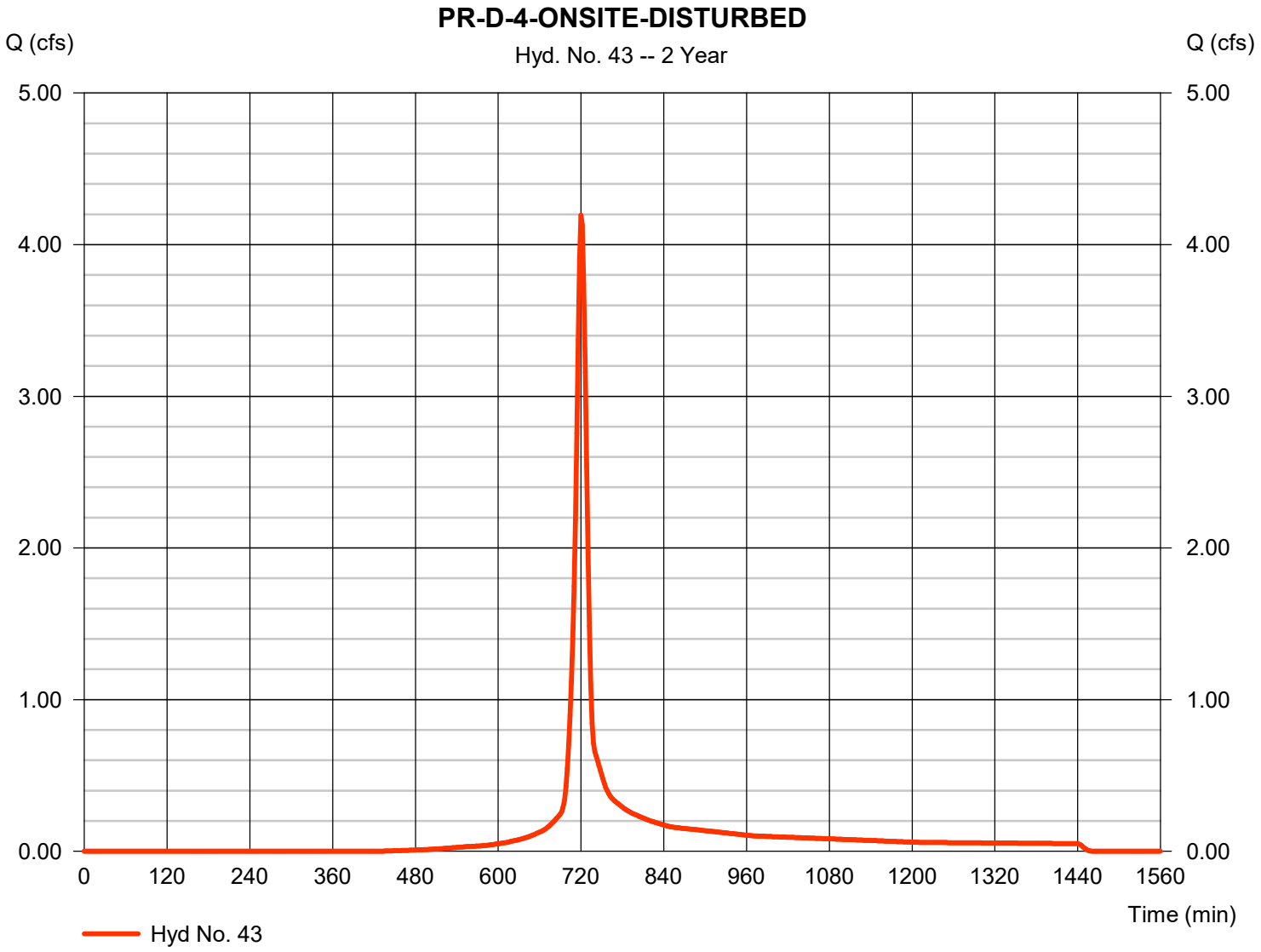
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 43

PR-D-4-ONSITE-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.194 cfs
Storm frequency	=	2 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	10,892 cuft
Drainage area	=	1.500 ac	Curve number	=	86
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.60 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



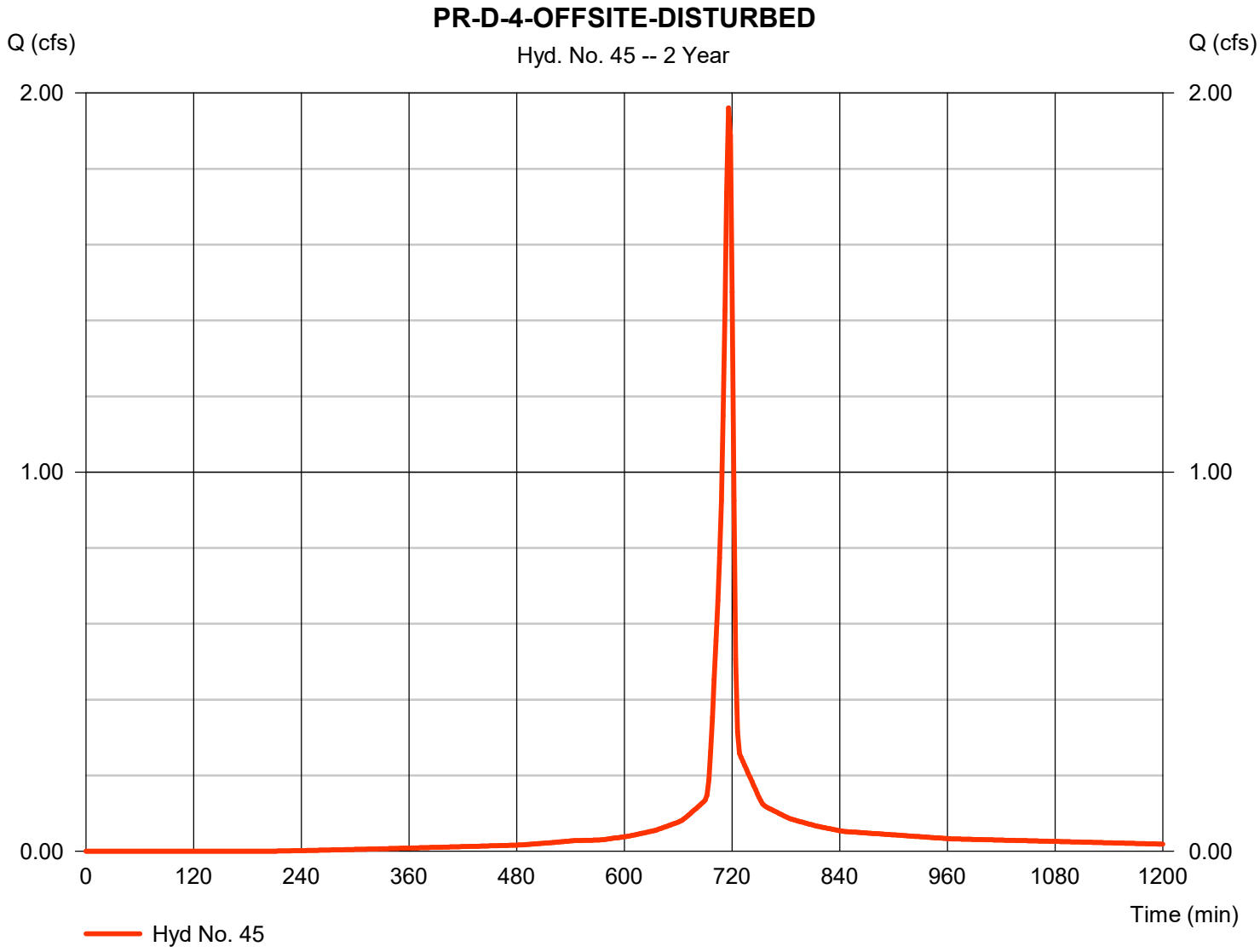
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 45

PR-D-4-OFFSITE-DISTURBED

Hydrograph type	= SCS Runoff	Peak discharge	= 1.961 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 4,255 cuft
Drainage area	= 0.470 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



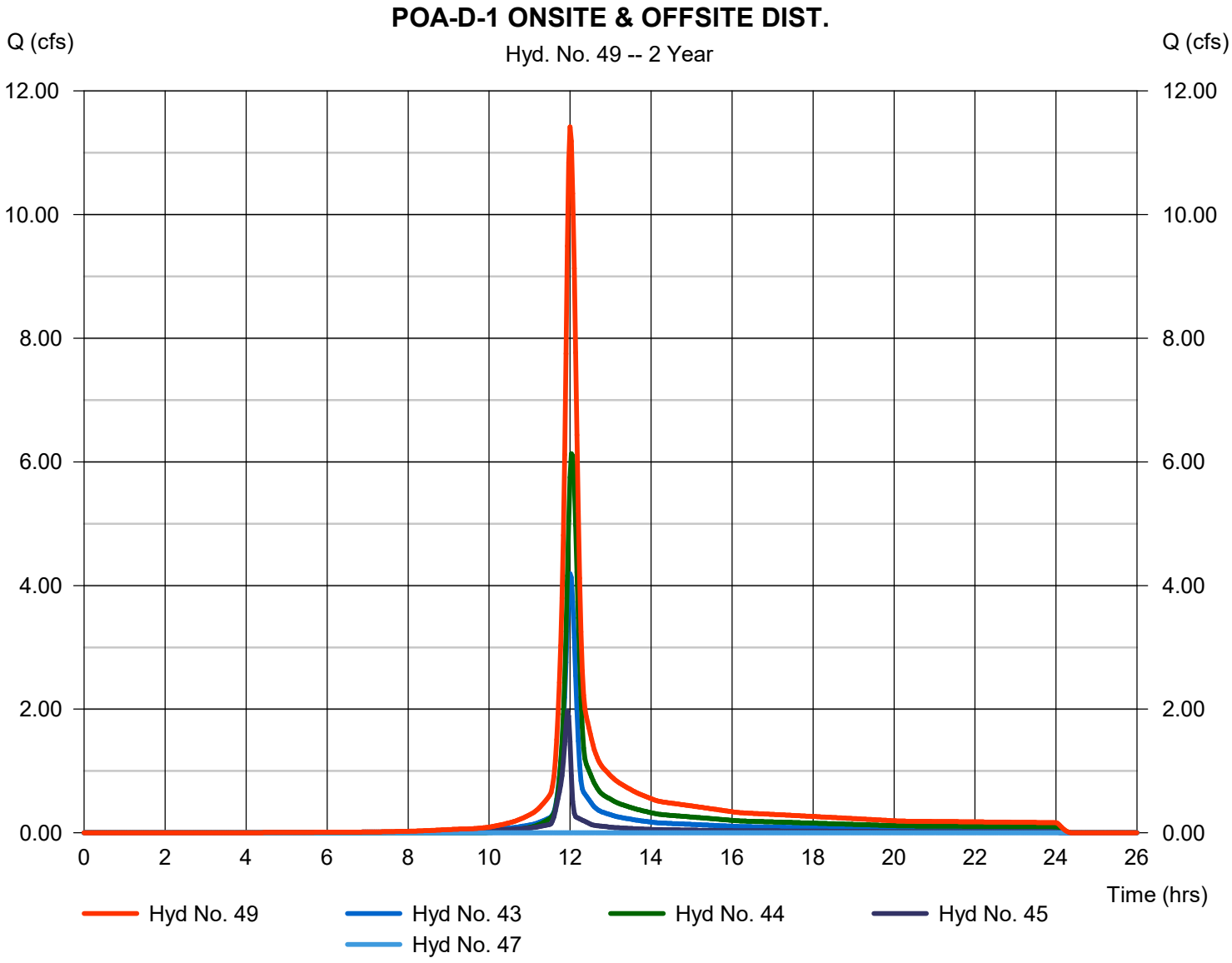
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 49

POA-D-1 ONSITE & OFFSITE DIST.

Hydrograph type	= Combine	Peak discharge	= 11.42 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 32,598 cuft
Inflow hyds.	= 43, 44, 45, 47	Contrib. drain. area	= 5.590 ac



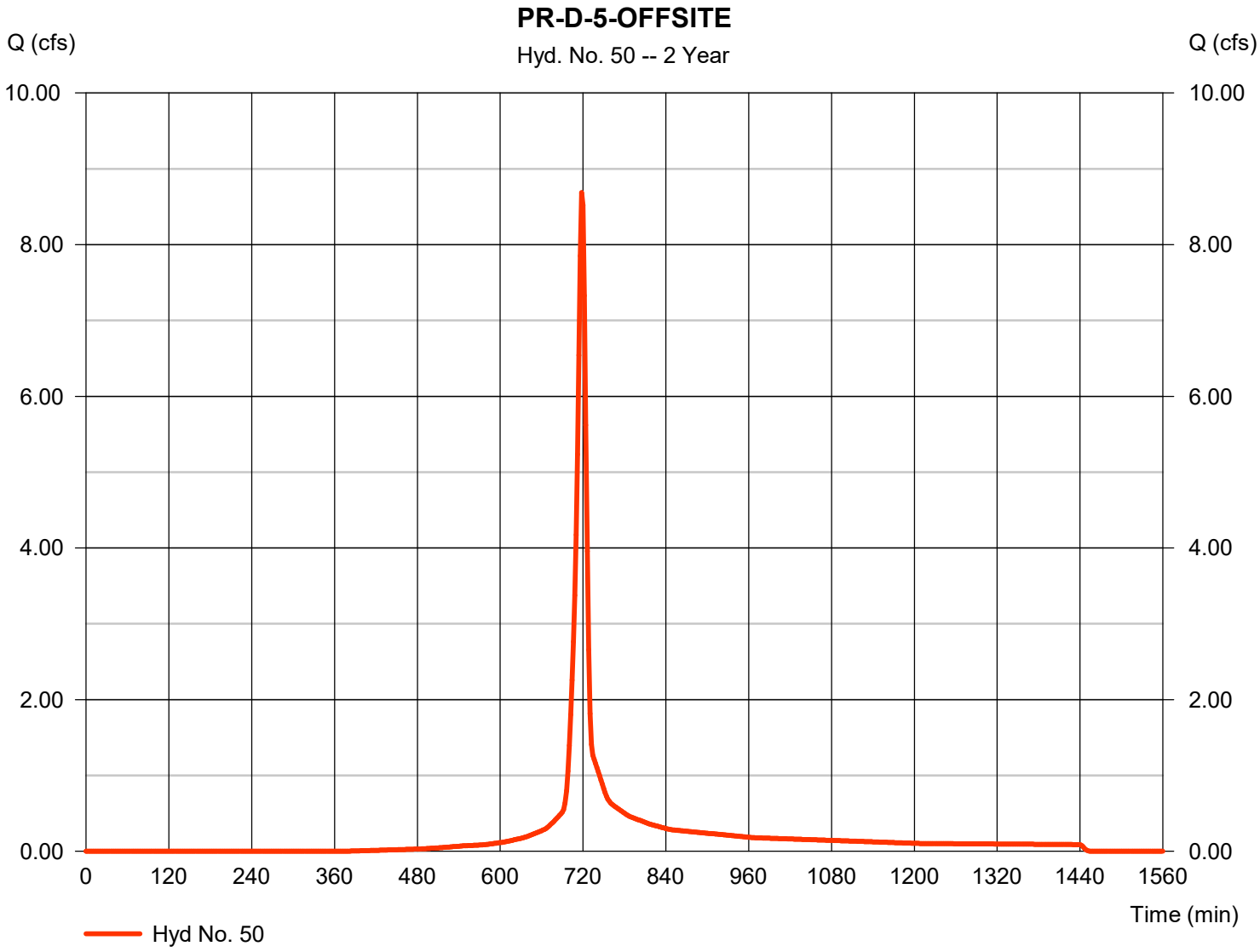
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Thursday, 02 / 23 / 2023

Hyd. No. 50

PR-D-5-OFFSITE

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.686 cfs
Storm frequency	=	2 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	20,098 cuft
Drainage area	=	2.630 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.60 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



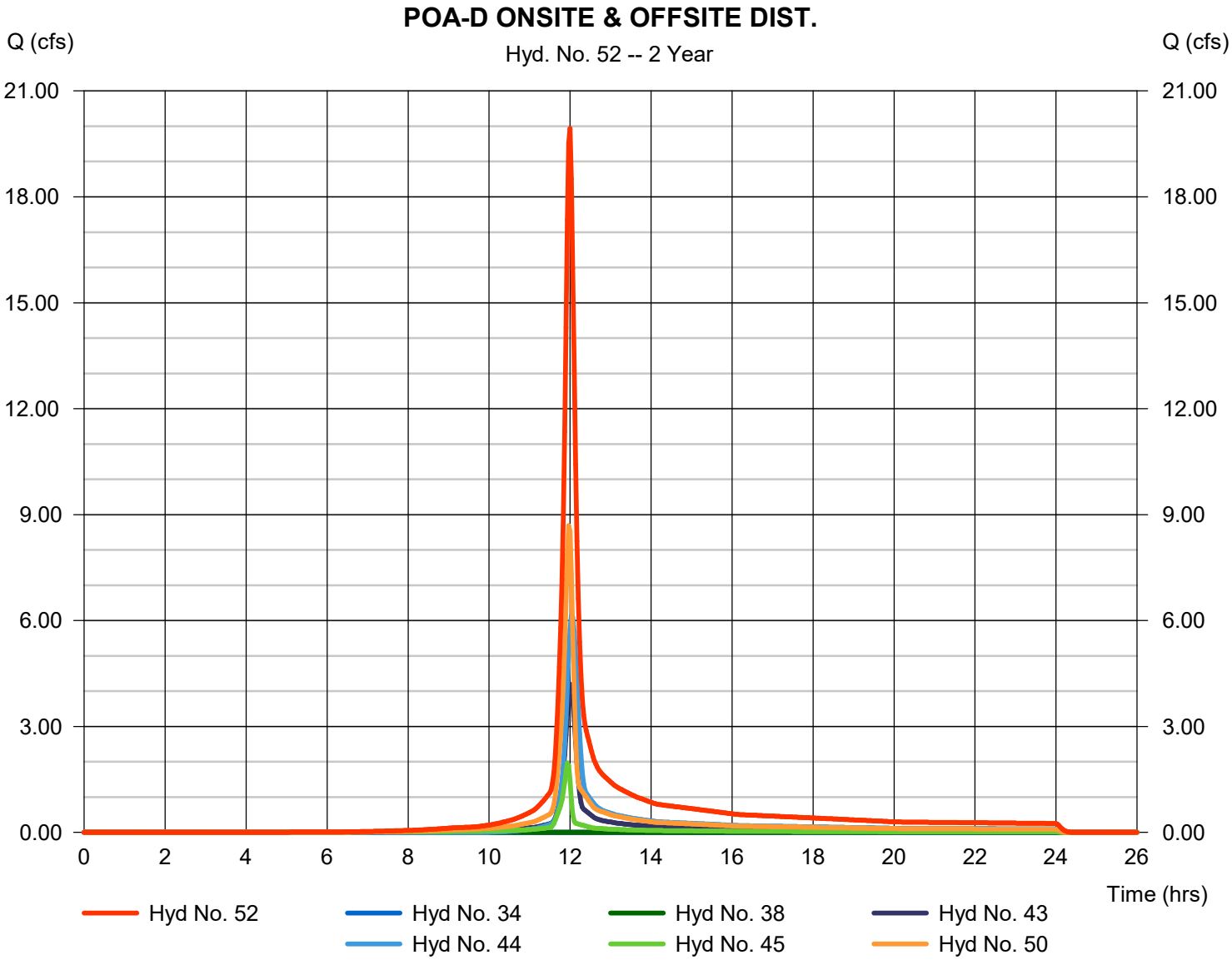
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 52

POA-D ONSITE & OFFSITE DIST.

Hydrograph type	= Combine	Peak discharge	= 19.94 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 52,696 cuft
Inflow hyds.	= 34, 38, 43, 44, 45, 50	Contrib. drain. area	= 8.220 ac

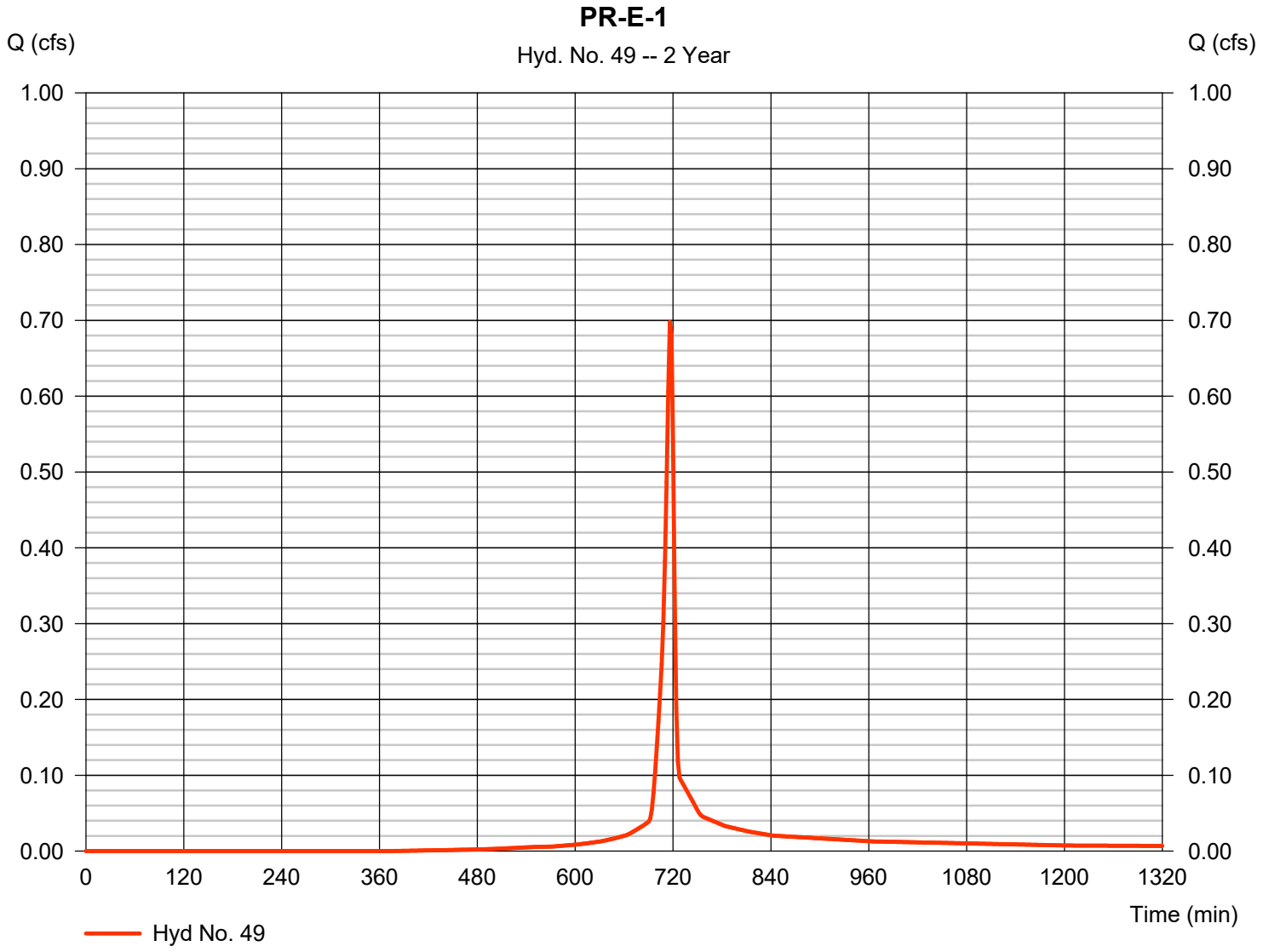


Hydrograph Report

Hyd. No. 49

PR-E-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.698 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	1,433 cuft
Drainage area	=	0.200 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

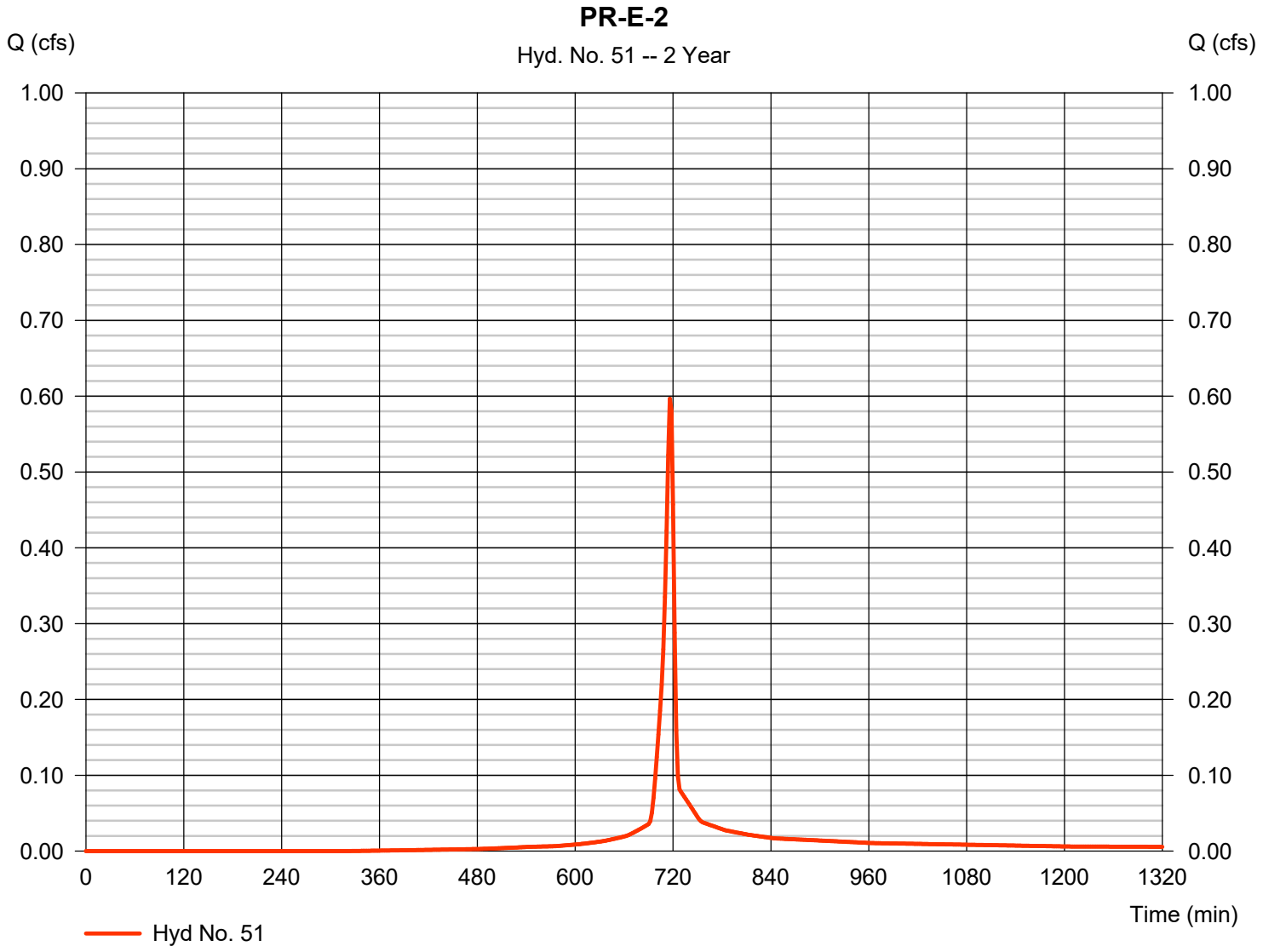


Hydrograph Report

Hyd. No. 51

PR-E-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.597 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	1,241 cuft
Drainage area	=	0.160 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

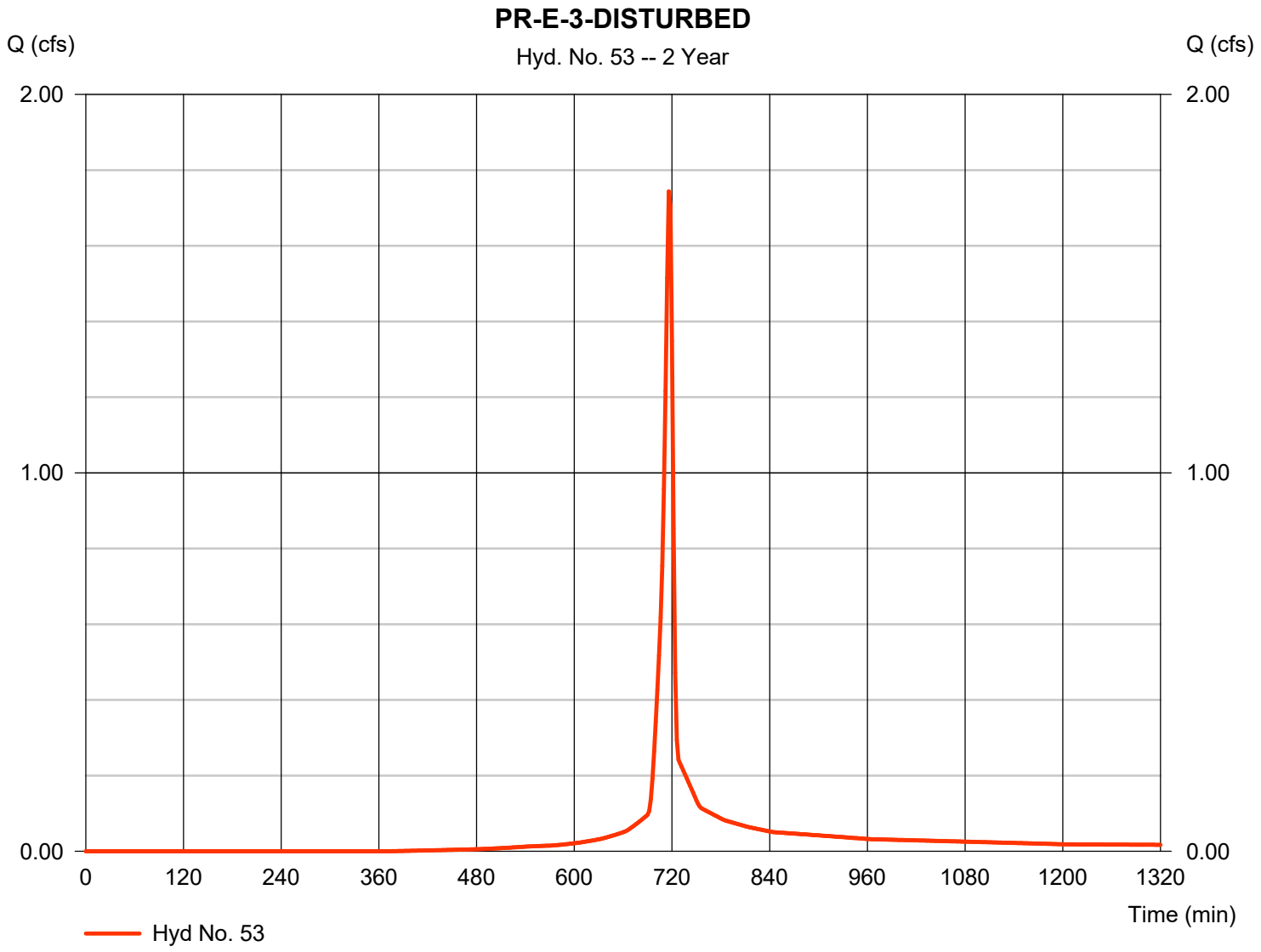


Hydrograph Report

Hyd. No. 53

PR-E-3-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.744 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	3,582 cuft
Drainage area	=	0.500 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

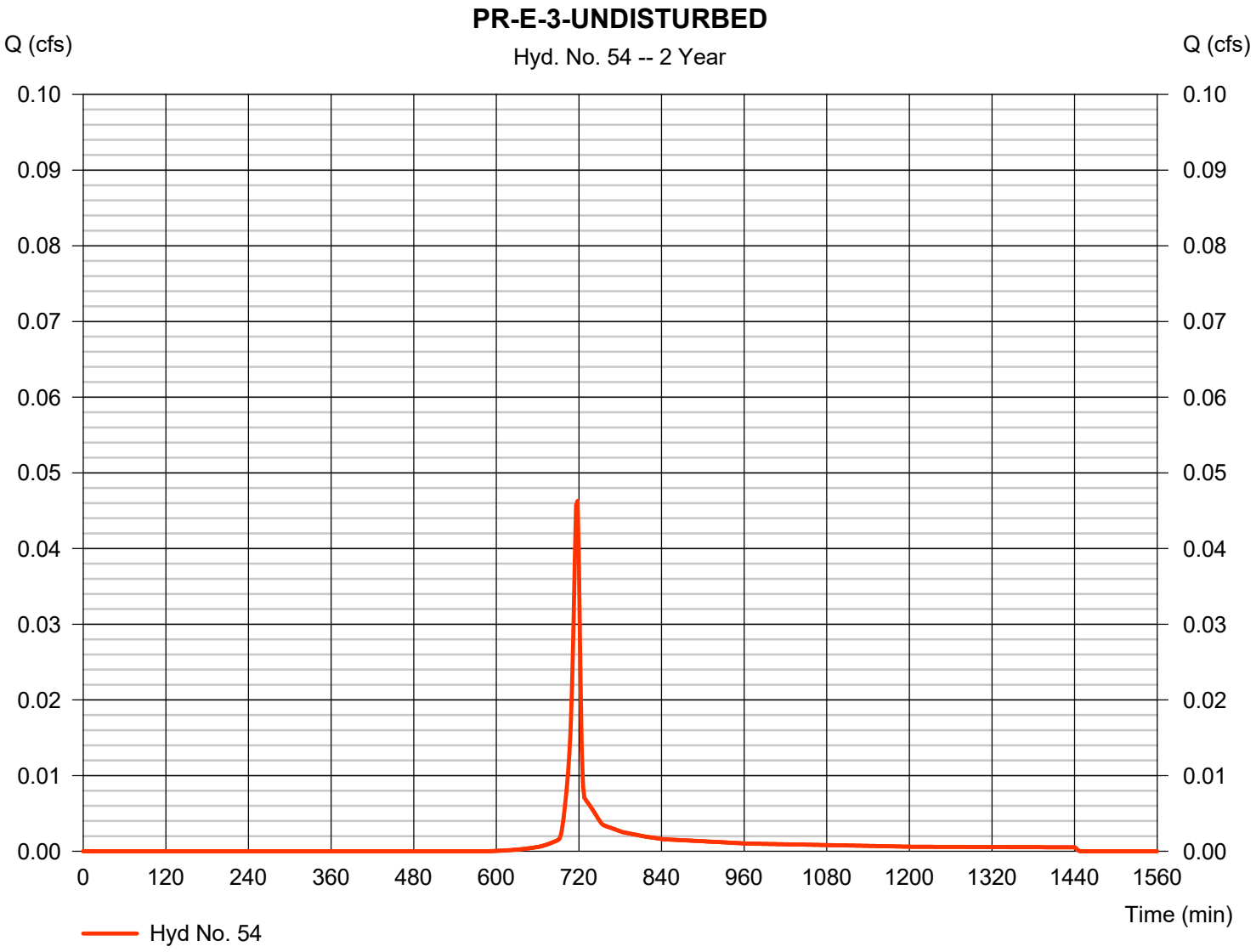


Hydrograph Report

Hyd. No. 54

PR-E-3-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.046 cfs
Storm frequency	=	2 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	93 cuft
Drainage area	=	0.020 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

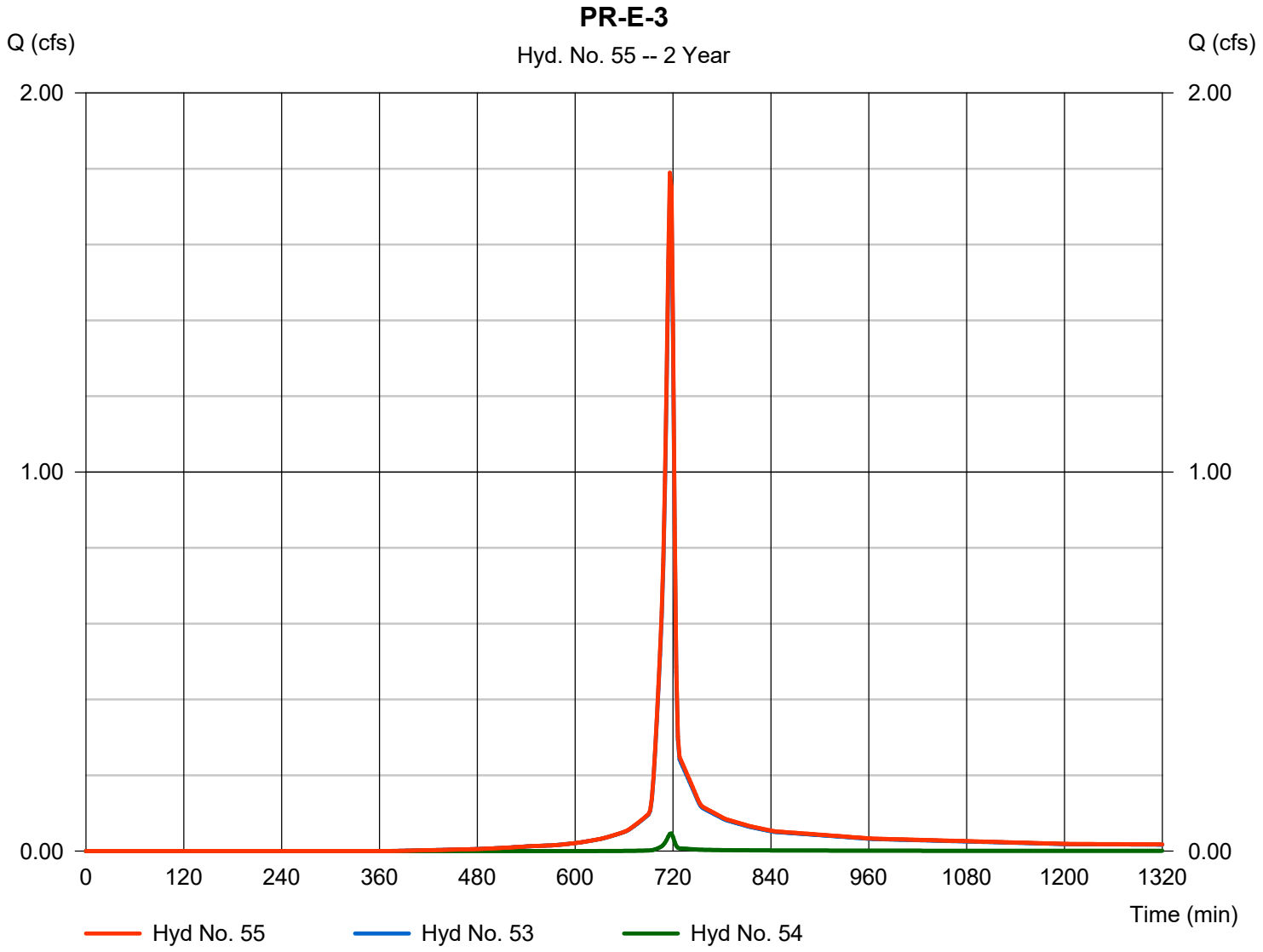


Hydrograph Report

Hyd. No. 55

PR-E-3

Hydrograph type	=	Combine	Peak discharge	=	1.790 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	3,675 cuft
Inflow hyds.	=	53, 54	Contrib. drain. area	=	0.520 ac



Hydrograph Report

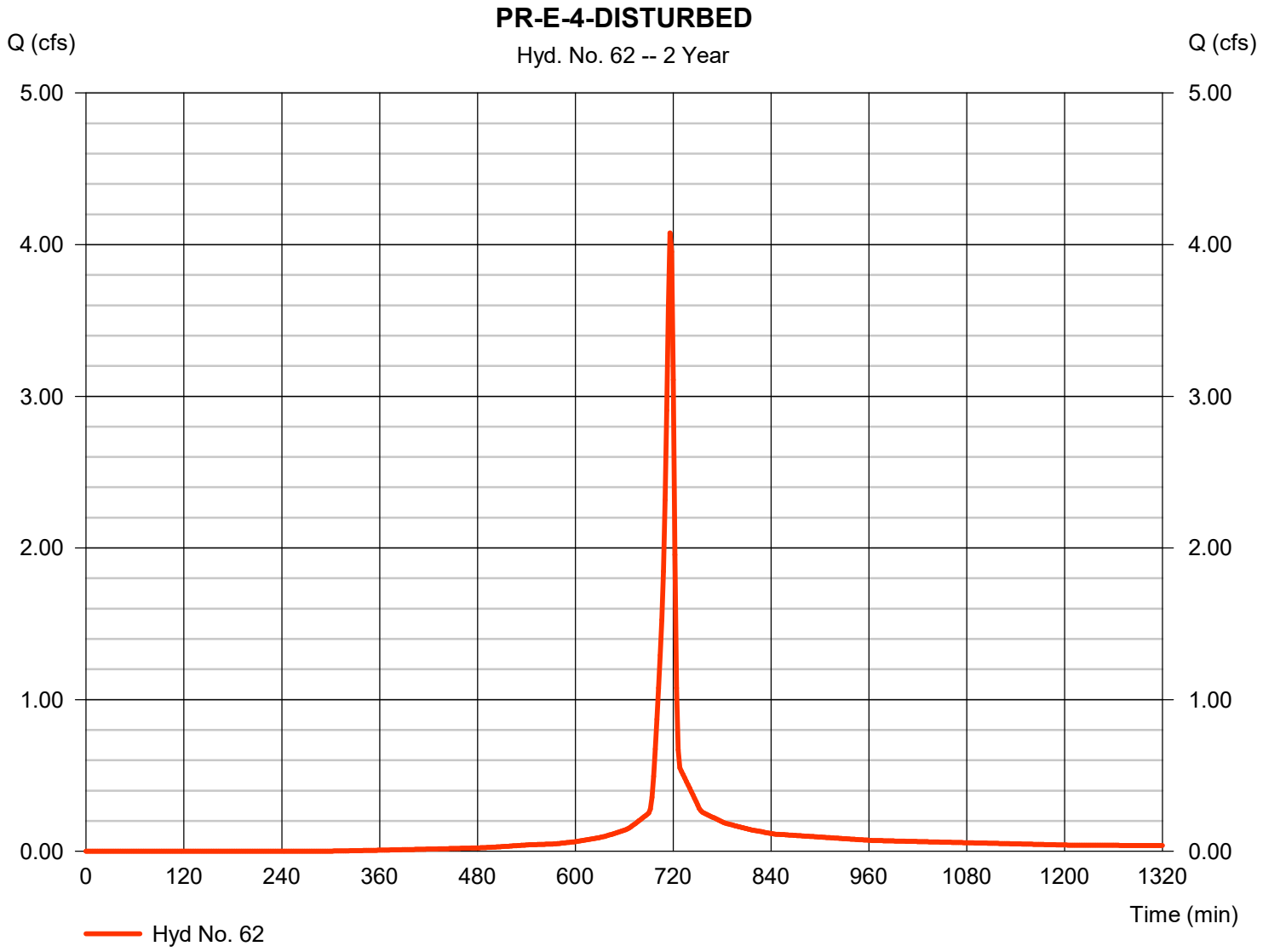
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 62

PR-E-4-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.077 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	8,553 cuft
Drainage area	=	1.060 ac	Curve number	=	91*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.350 x 98)] / 1.060

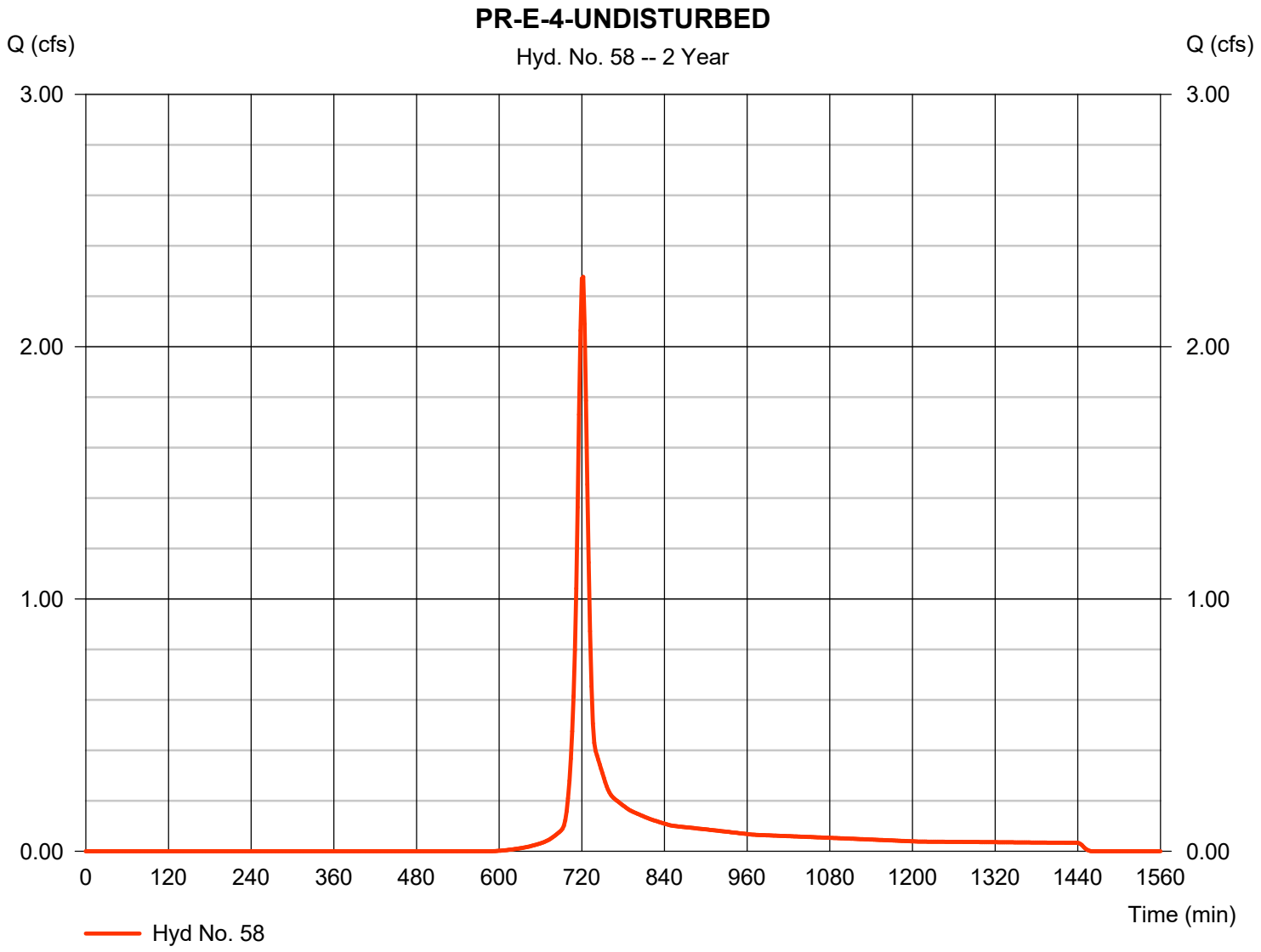


Hydrograph Report

Hyd. No. 58

PR-E-4-UNDISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.276 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	5,965 cuft
Drainage area	=	1.170 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	11.40 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



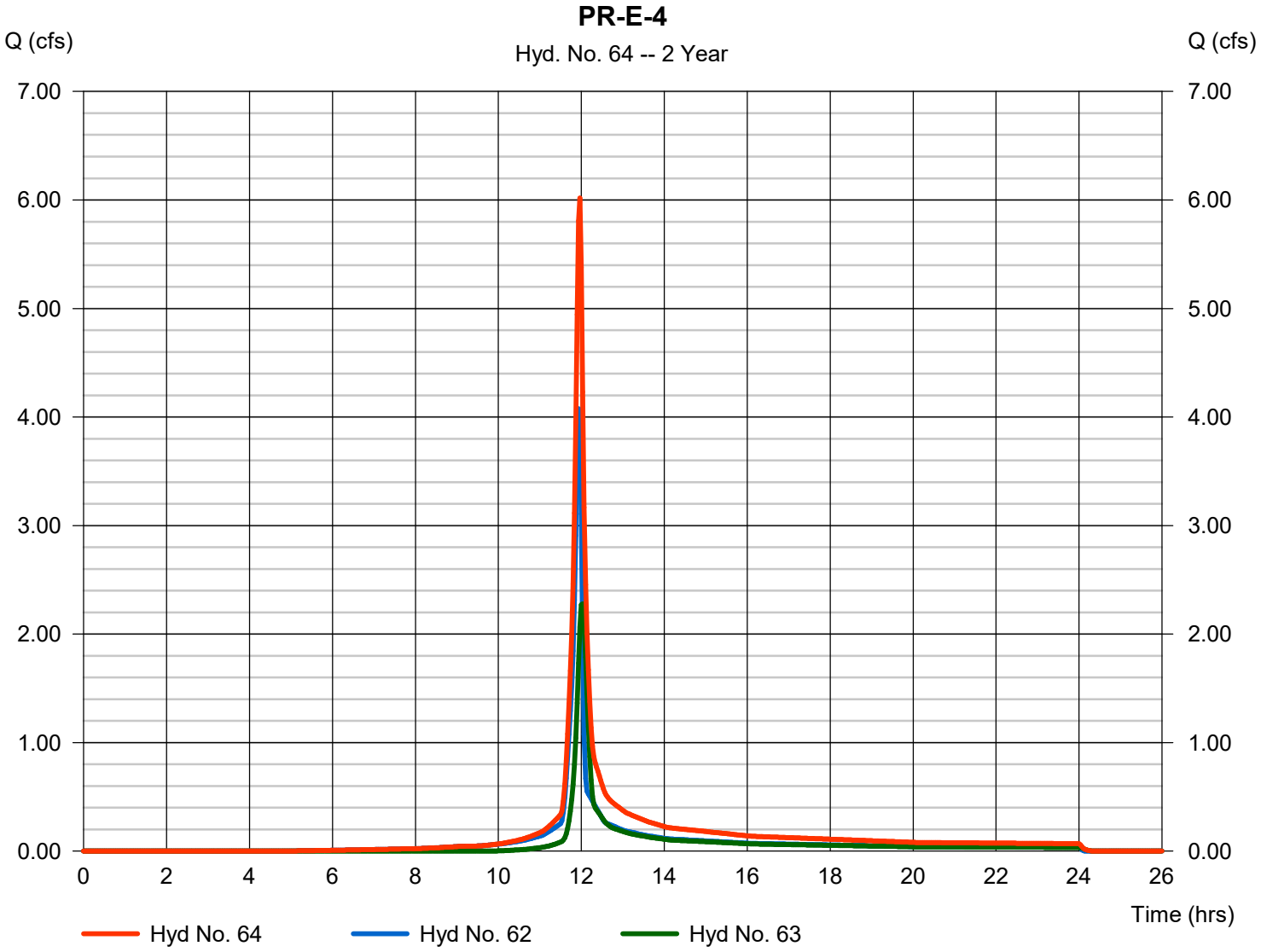
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 64

PR-E-4

Hydrograph type	= Combine	Peak discharge	= 6.018 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 14,519 cuft
Inflow hyds.	= 62, 63	Contrib. drain. area	= 2.230 ac

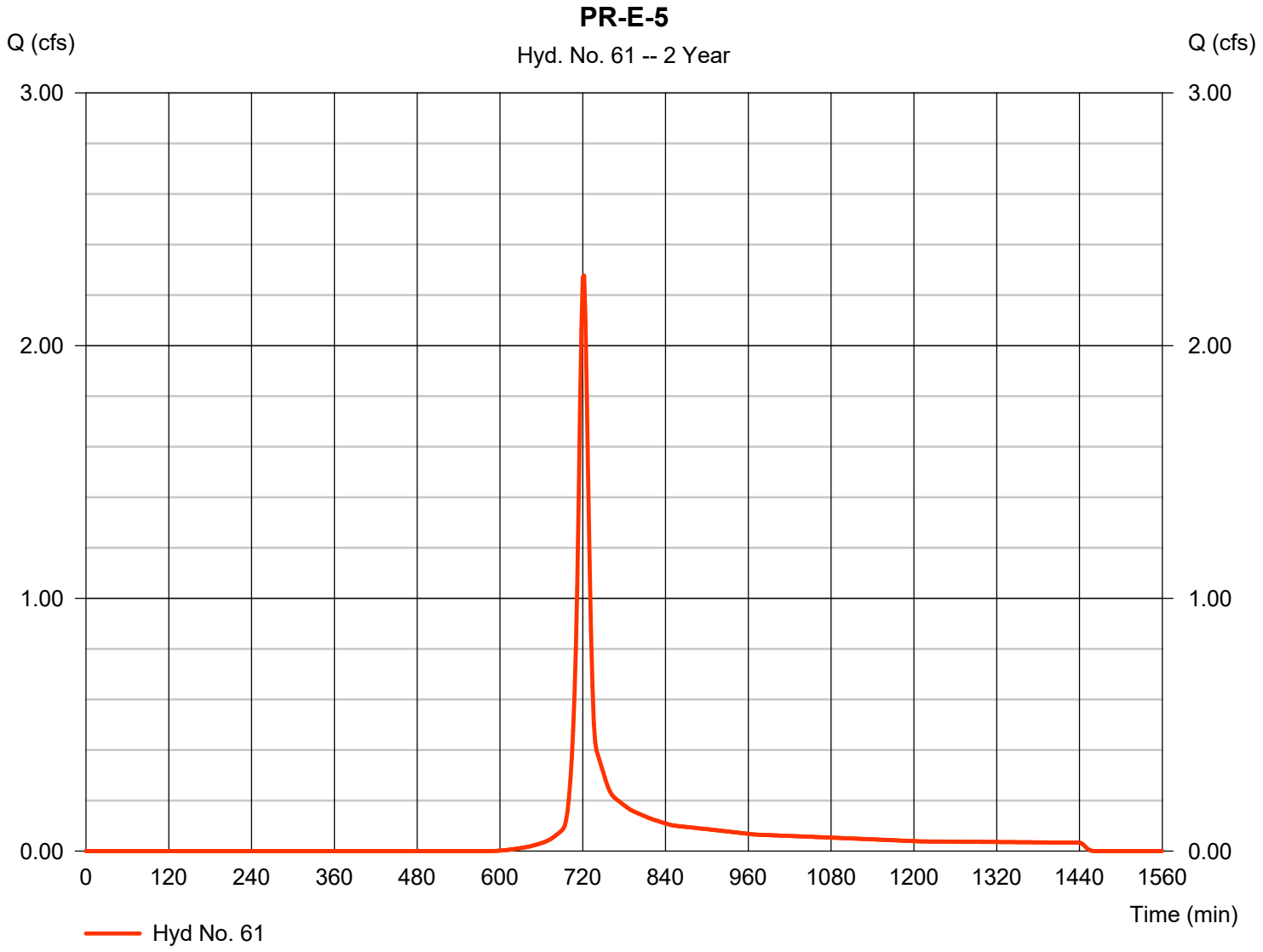


Hydrograph Report

Hyd. No. 61

PR-E-5

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.276 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	5,965 cuft
Drainage area	=	1.170 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	11.90 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

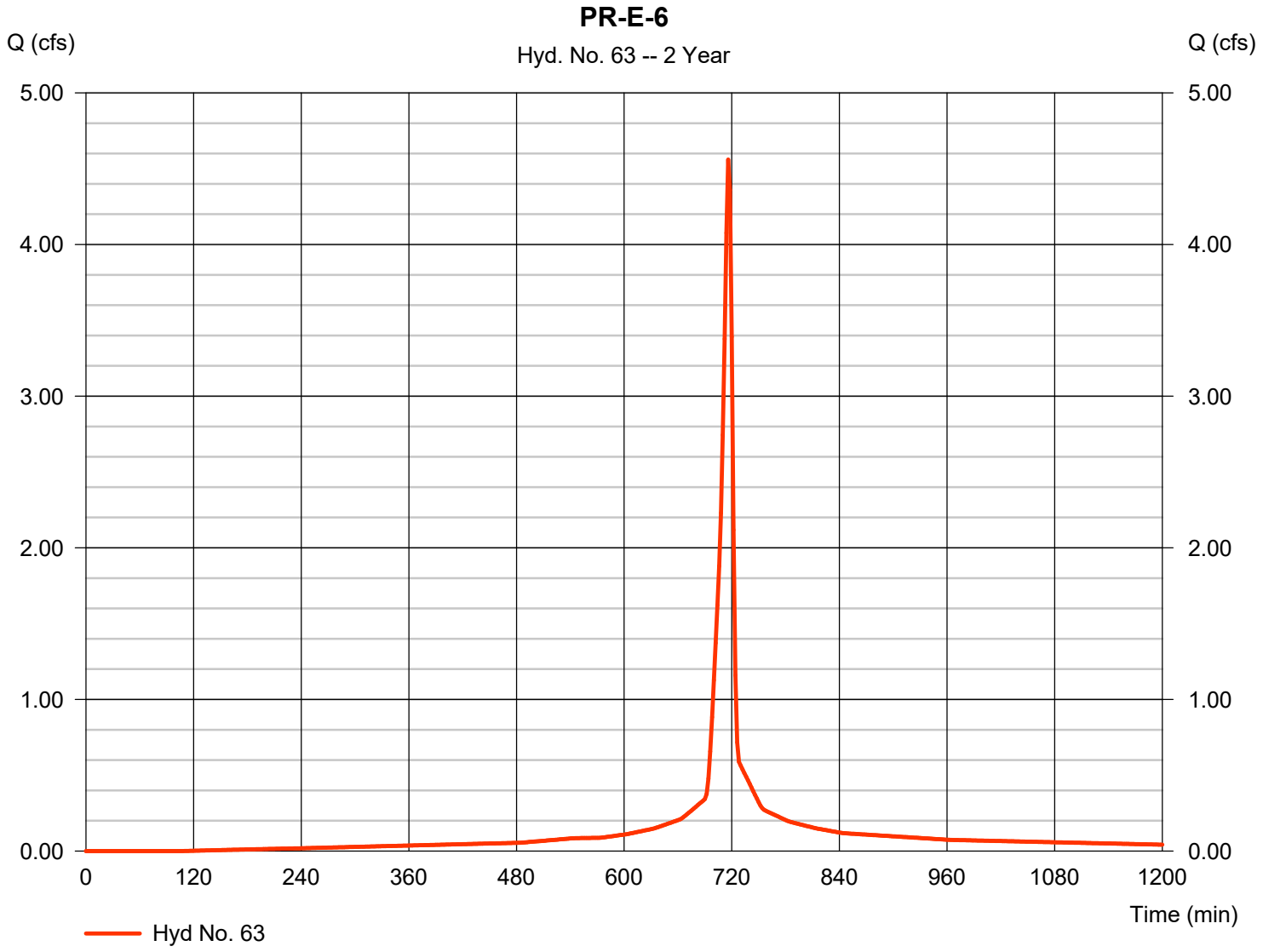


Hydrograph Report

Hyd. No. 63

PR-E-6

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.559 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	10,430 cuft
Drainage area	=	1.030 ac	Curve number	=	97
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

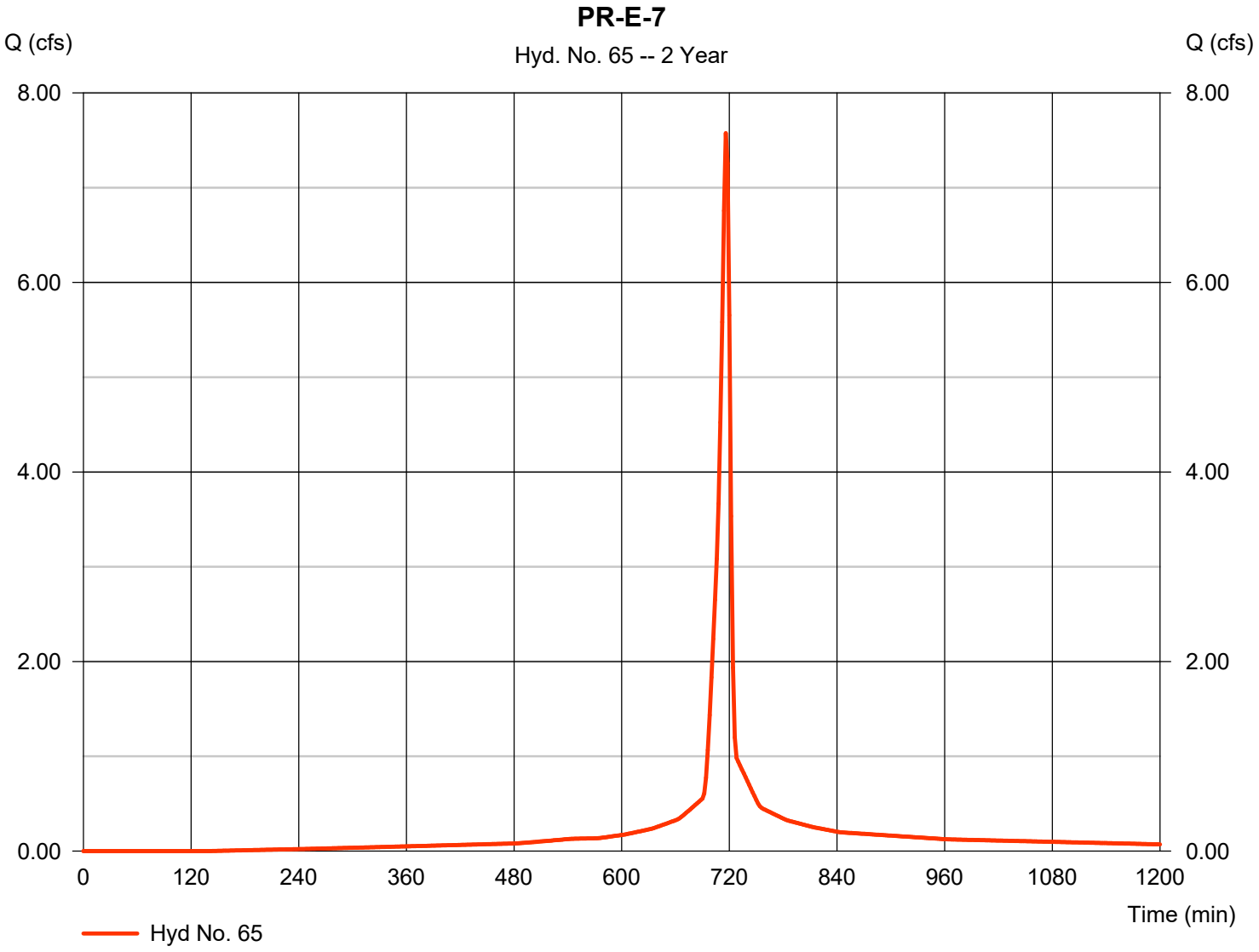


Hydrograph Report

Hyd. No. 65

PR-E-7

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.575 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	16,980 cuft
Drainage area	=	1.740 ac	Curve number	=	96
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

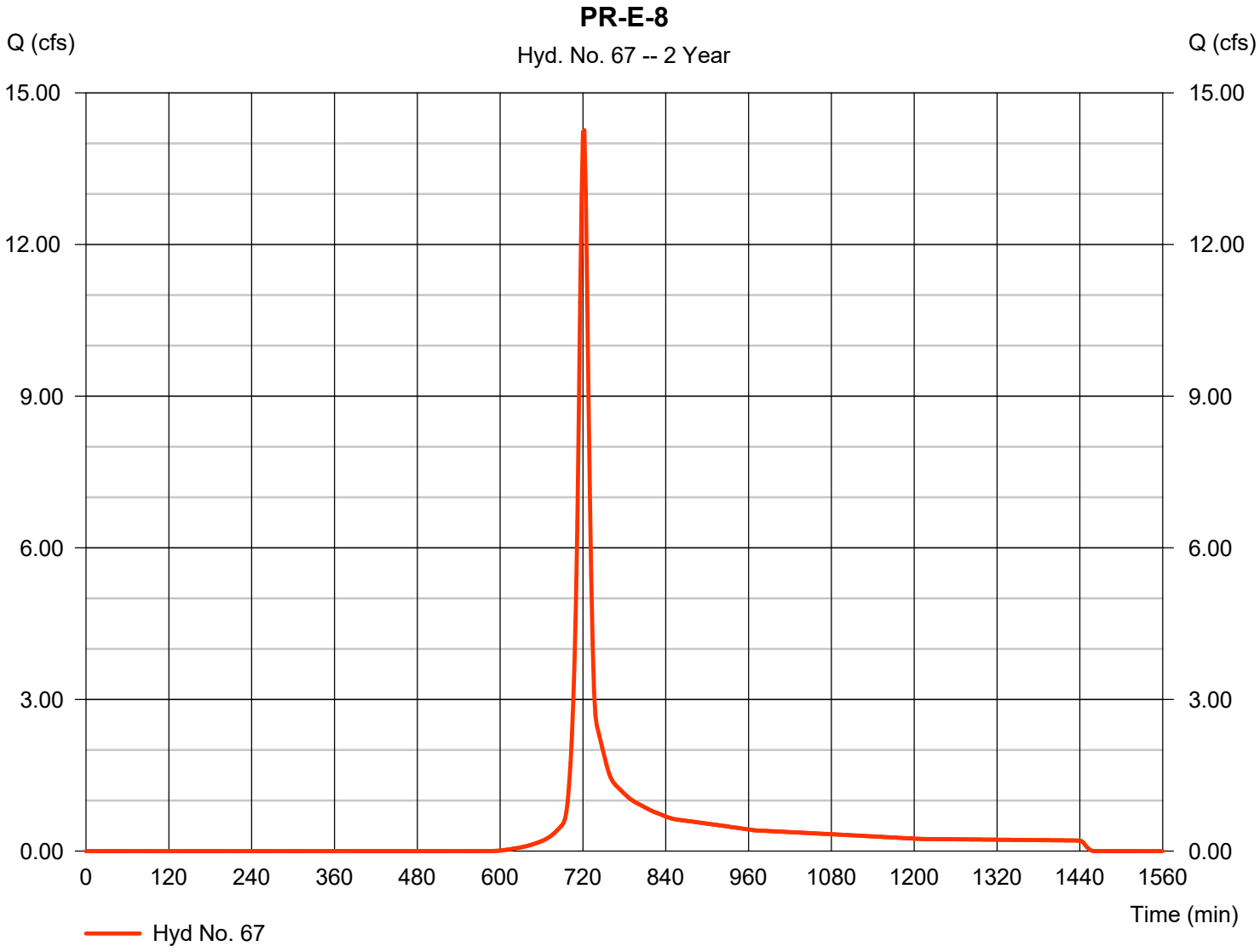


Hydrograph Report

Hyd. No. 67

PR-E-8

Hydrograph type	=	SCS Runoff	Peak discharge	=	14.26 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	37,372 cuft
Drainage area	=	7.330 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.30 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



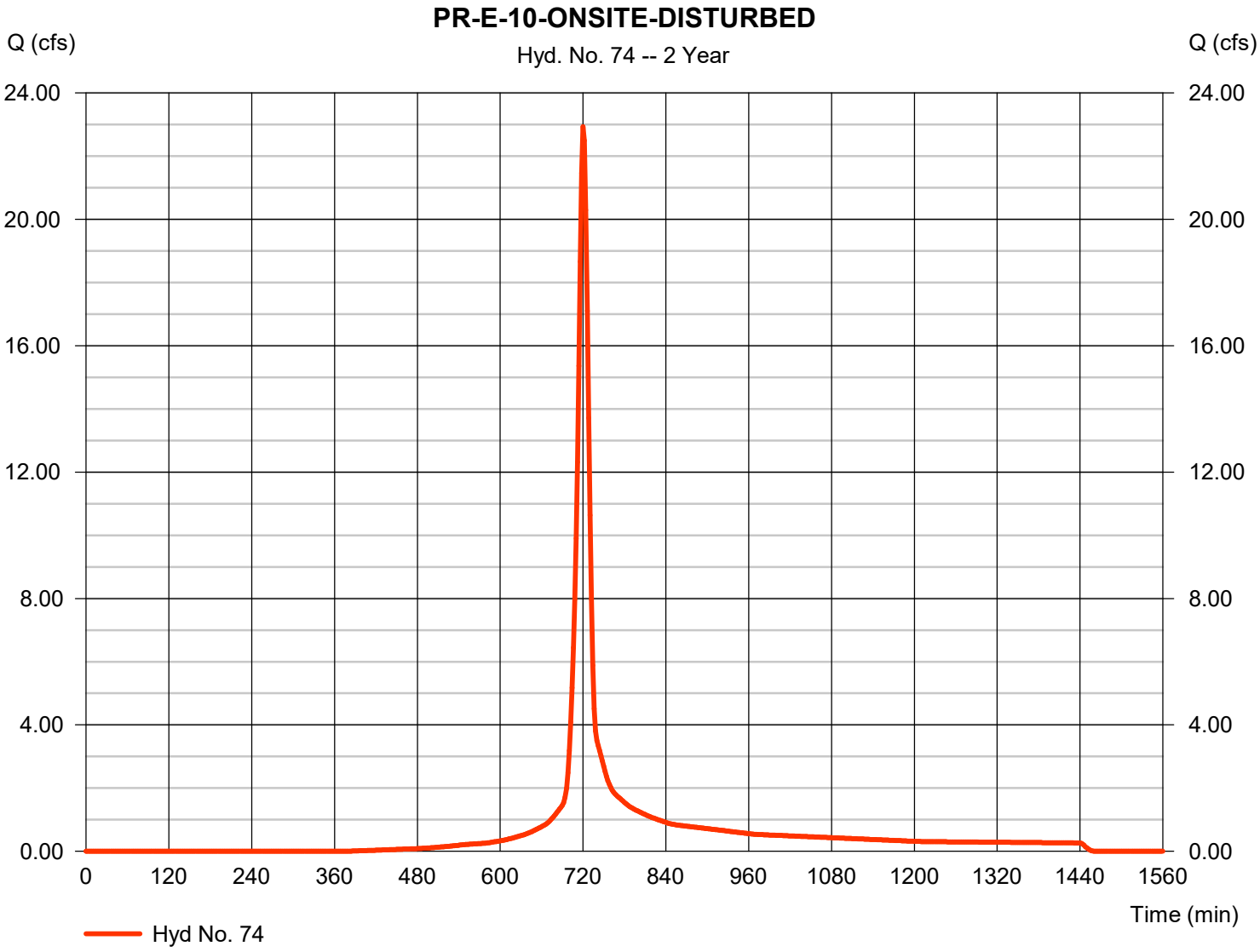
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 74

PR-E-10-ONSITE-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	22.94 cfs
Storm frequency	=	2 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	59,893 cuft
Drainage area	=	7.600 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.40 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

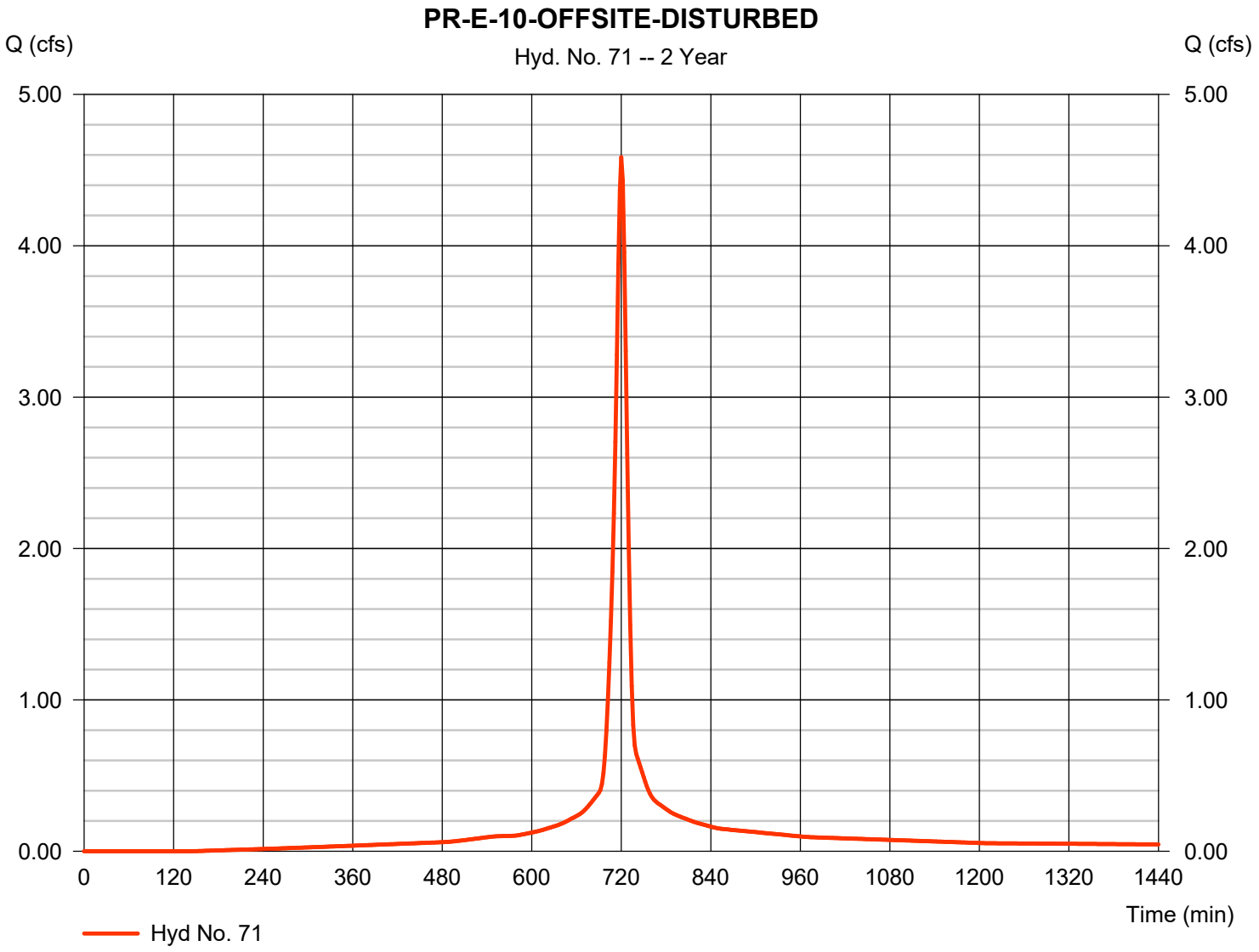


Hydrograph Report

Hyd. No. 71

PR-E-10-OFFSITE-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.585 cfs
Storm frequency	=	2 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	12,881 cuft
Drainage area	=	1.200 ac	Curve number	=	96
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.40 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

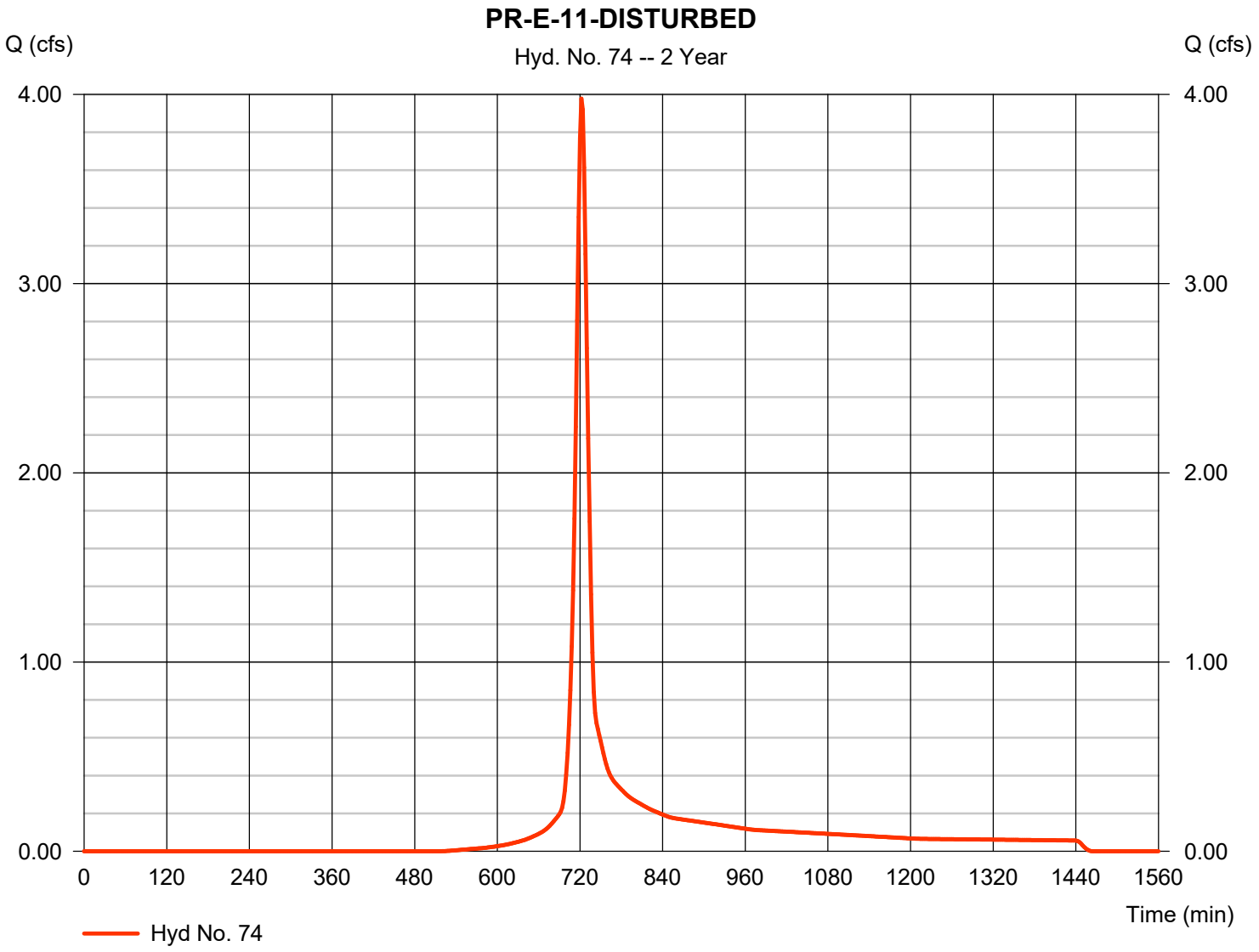


Hydrograph Report

Hyd. No. 74

PR-E-11-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.978 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	11,169 cuft
Drainage area	=	1.930 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.90 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

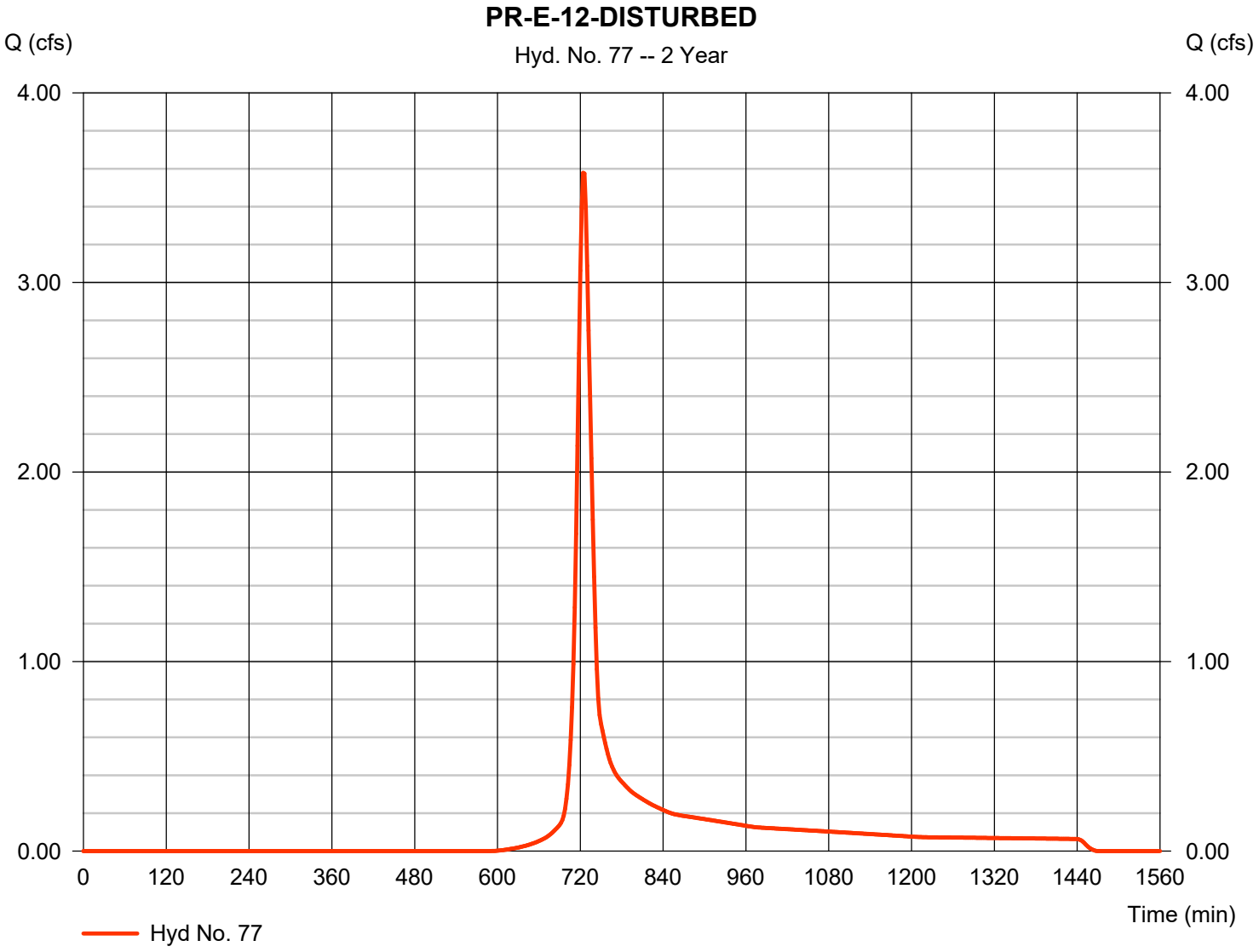


Hydrograph Report

Hyd. No. 77

PR-E-12-DISTURBED

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.578 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	11,421 cuft
Drainage area	=	2.310 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	18.60 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



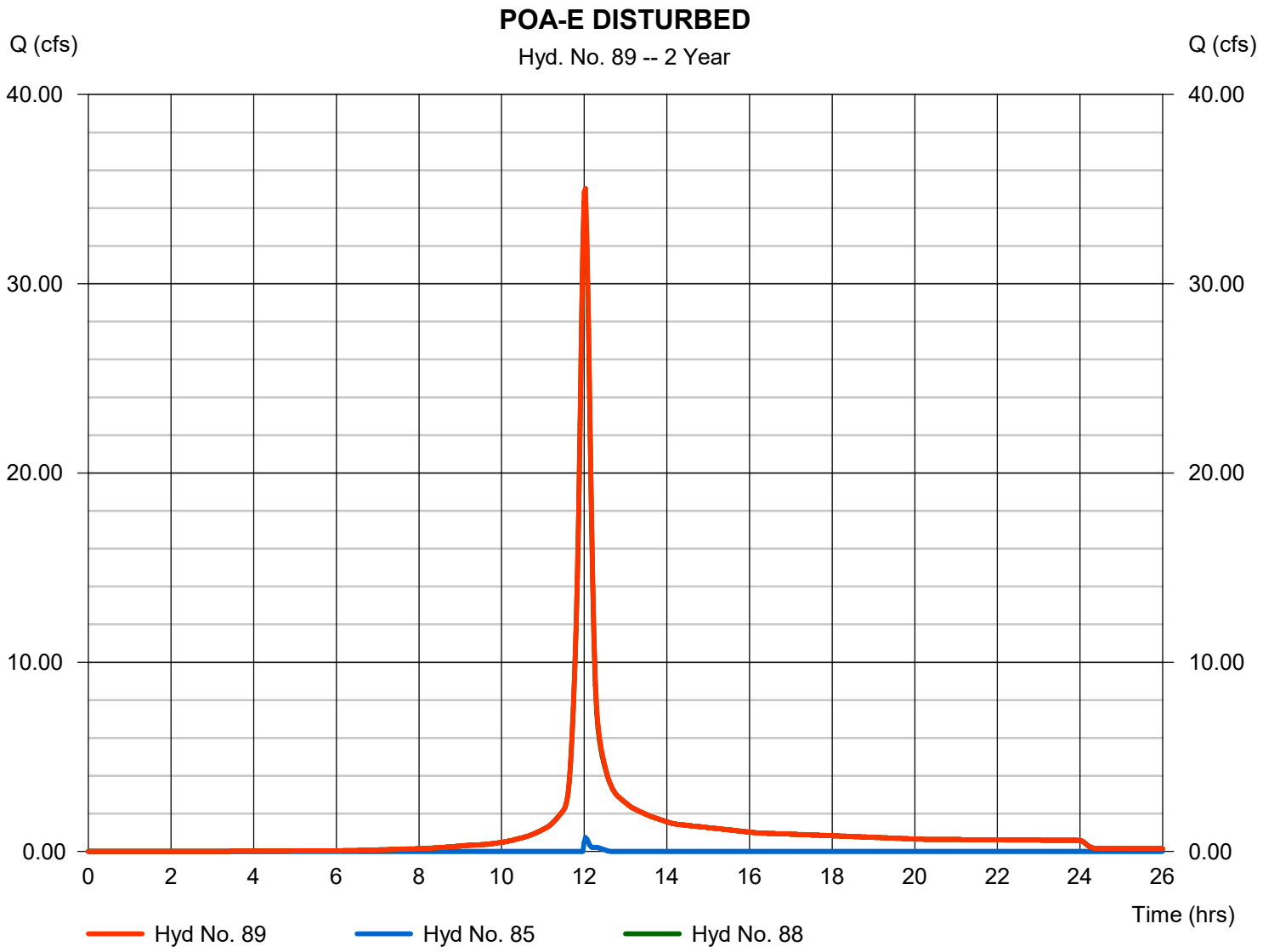
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 89

POA-E DISTURBED

Hydrograph type	= Combine	Peak discharge	= 35.03 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 115,942 cuft
Inflow hyds.	= 85, 88	Contrib. drain. area	= 0.000 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

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	8.880	2	726	31,095	------	------	------	PR-A-1-A-ONSITE
2	SCS Runoff	3.274	2	732	14,569	------	------	------	PR-A-1-A-OFFSITE-DISTURBED
3	SCS Runoff	57.01	2	732	246,648	------	------	------	PR-A-1-A-OFFSITE-UNDISTURBED
4	SCS Runoff	32.61	2	722	91,552	------	------	------	PR-A-1-D-OFFSITE
5	SCS Runoff	5.473	2	718	12,728	------	------	------	PR-A-1-E-ONSITE
6	Reservoir	0.000	2	730	0	5	486.44	7,367	TEMP-INF1-1 ROUTING
7	Combine	91.06	2	726	383,864	1, 2, 3, 4, 6	------	------	Combined POA-A-1
8	Combine	11.99	2	728	45,664	1, 2, 6,	------	------	POA-A-1 ONSITE & OFFSITE DISTU
10	SCS Runoff	17.42	2	724	55,620	------	------	------	PR-A-2-A-ONSITE
11	SCS Runoff	33.73	2	722	95,176	------	------	------	PR-A-2-A-OFFSITE
12	Combine	50.81	2	724	150,796	10, 11	------	------	Combined POA-A-2
14	SCS Runoff	25.68	2	724	80,845	------	------	------	PR-A-3-ONSITE
15	SCS Runoff	35.72	2	734	155,590	------	------	------	PR-A-3-OFFSITE
16	Combine	57.01	2	728	236,436	14, 15	------	------	POA-A-3
18	Combine	54.74	2	726	182,129	8, 10, 14,	------	------	POA-A ONSITE & OFFSITE DIST.
20	SCS Runoff	6.417	2	720	16,731	------	------	------	PR-A-4-ONSITE
22	SCS Runoff	5.846	2	718	14,039	------	------	------	PR-B-1-ONSITE
23	SCS Runoff	13.96	2	718	32,455	------	------	------	PR-B-1-OFFSITE
24	SCS Runoff	8.227	2	724	26,116	------	------	------	PR-B-2-ONSITE
25	Reservoir	0.000	2	912	0	24	437.02	17,666	PR-B-2-ONSITE ROUTING
26	Combine	5.846	2	718	14,039	22, 25	------	------	PR-B-ONSITE
27	Combine	19.80	2	718	46,494	22, 23, 25,	------	------	POA-B
29	SCS Runoff	3.762	2	716	7,969	------	------	------	PR-C (POA-C)
31	Combine	212.82	2	724	842,290	7, 12, 16, 20, 27, 29,	------	------	Combined POA-ABC
33	SCS Runoff	8.887	2	716	19,284	------	------	------	PR-D-1
34	Reservoir	0.000	2	726	0	33	458.83	9,095	PR-D-1 ROUTING
35	SCS Runoff	1.588	2	716	3,281	------	------	------	PR-D-2-DISTURBED
36	SCS Runoff	0.162	2	718	324	------	------	------	PR-D-2-UNDISTURBED
37	Combine	1.748	2	716	3,606	35, 36	------	------	PR-D-2
38	Reservoir	0.000	2	784	0	37	461.02	1,665	PR-D-2 ROUTING

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

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
40	SCS Runoff	1.859	2	716	4,253	------	------	------	PR-D-3
41	Reservoir	0.000	2	1044	0	40	460.03	2,017	PR-D-3 ROUTING
43	SCS Runoff	4.194	2	720	10,892	------	------	------	PR-D-4-ONSITE-DISTURBED
44	SCS Runoff	6.134	2	722	17,450	------	------	------	PR-D-4-ONSITE-UNDISTURBED
45	SCS Runoff	1.961	2	716	4,255	------	------	------	PR-D-4-OFFSITE-DISTURBED
46	SCS Runoff	2.928	2	716	5,985	------	------	------	PR-D-4-OFFSITE-UNDISTURBED
47	Combine	0.000	2	784	0	34, 38, 41,	------	------	COMBINE
48	Combine	13.71	2	718	38,582	43, 44, 45, 46, 47	------	------	POA-D-1
49	Combine	11.42	2	720	32,598	43, 44, 45, 47,	------	------	POA-D-1 ONSITE & OFFSITE DIST.
50	SCS Runoff	8.686	2	718	20,098	------	------	------	PR-D-5-OFFSITE
51	Combine	22.40	2	718	58,680	48, 50	------	------	POA-D
52	Combine	19.94	2	720	52,696	34, 38, 43, 44, 45, 50,	------	------	POA-D ONSITE & OFFSITE DIST.
54	SCS Runoff	0.698	2	716	1,433	------	------	------	PR-E-1
55	Reservoir	0.000	2	1520	0	54	452.65	787	RG5-1 ROUTING
56	SCS Runoff	0.597	2	716	1,241	------	------	------	PR-E-2
57	Reservoir	0.000	2	996	0	56	457.65	571	RG5-2 ROUTING
58	SCS Runoff	1.744	2	716	3,582	------	------	------	PR-E-3-DISTURBED
59	SCS Runoff	0.046	2	718	93	------	------	------	PR-E-3-UNDISTURBED
60	Combine	1.790	2	716	3,675	58, 59	------	------	PR-E-3
61	Reservoir	0.736	2	722	470	60	470.07	1,574	RG5-3 ROUTING
62	SCS Runoff	4.077	2	716	8,553	------	------	------	PR-E-4-DISTURBED
63	SCS Runoff	2.276	2	722	5,965	------	------	------	PR-E-4-UNDISTURBED
64	Combine	6.018	2	718	14,519	62, 63	------	------	PR-E-4
65	Reservoir	0.116	2	738	96	64	454.04	5,179	UGD-INF5-1 ROUTING
66	SCS Runoff	2.276	2	722	5,965	------	------	------	PR-E-5
67	Reservoir	0.000	2	924	0	66	454.15	2,554	UGD-INF5-2 ROUTING
68	SCS Runoff	4.440	2	716	9,954	------	------	------	PR-E-6
69	Reservoir	0.000	2	1184	0	68	449.02	5,285	UGD-INF5-3 ROUTING
70	SCS Runoff	11.27	2	716	24,819	------	------	------	PR-E-7
71	Reservoir	0.000	2	728	0	70	442.93	9,506	UGD-INF5-4 ROUTING
72	SCS Runoff	14.26	2	722	37,372	------	------	------	PR-E-8
73	Reservoir	0.155	2	1446	20,011	72	441.80	32,201	PR-E-8 ROUTING

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

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
74	SCS Runoff	22.94	2	720	59,893	------	------	------	PR-E-10-ONSITE-DISTURBED
75	SCS Runoff	23.16	2	724	73,913	------	------	------	PR-E-10-ONSITE-UNDISTURBED
76	SCS Runoff	4.585	2	720	12,881	------	------	------	PR-E-10-OFFSITE-DISTURBED
77	SCS Runoff	5.271	2	724	16,479	------	------	------	PR-E-10-OFFSITE-UNDISTURBED
78	Combine	53.96	2	722	163,166	74, 75, 76, 77	------	------	PR-E-10
79	SCS Runoff	3.978	2	722	11,169	------	------	------	PR-E-11-DISTURBED
80	SCS Runoff	26.24	2	722	74,301	------	------	------	PR-E-11-UNDISTURBED
81	Combine	30.22	2	722	85,470	79, 80	------	------	PR-E-11
82	SCS Runoff	3.578	2	724	11,421	------	------	------	PR-E-12-DISTURBED
83	SCS Runoff	32.12	2	724	101,977	------	------	------	PR-E-12-UNDISTURBED
84	Combine	35.70	2	724	113,398	82, 83	------	------	PR-E-12
85	Combine	0.736	2	722	567	55, 57, 61, 65, 67, 69, 71, 73, 78, 81, 84, 85, 86	------	------	COMBINE
86	Combine	118.12	2	722	382,045		------	------	COMBINE
87	Combine	118.85	2	722	382,612		------	------	POA-E
88	Combine	34.36	2	720	115,375	71, 73, 74, 76, 79, 82, 85, 88	------	------	POA-E DISTURBED COMBINE
89	Combine	35.03	2	722	115,942		------	------	POA-E DISTURBED
91	Combine	331.32	2	724	1,224,902	31, 87,	------	------	TOTAL BRODHEAD CREEK

POND ROUTING CALCULATIONS
2-YEAR 24-HOUR STORM

Hydrograph Report

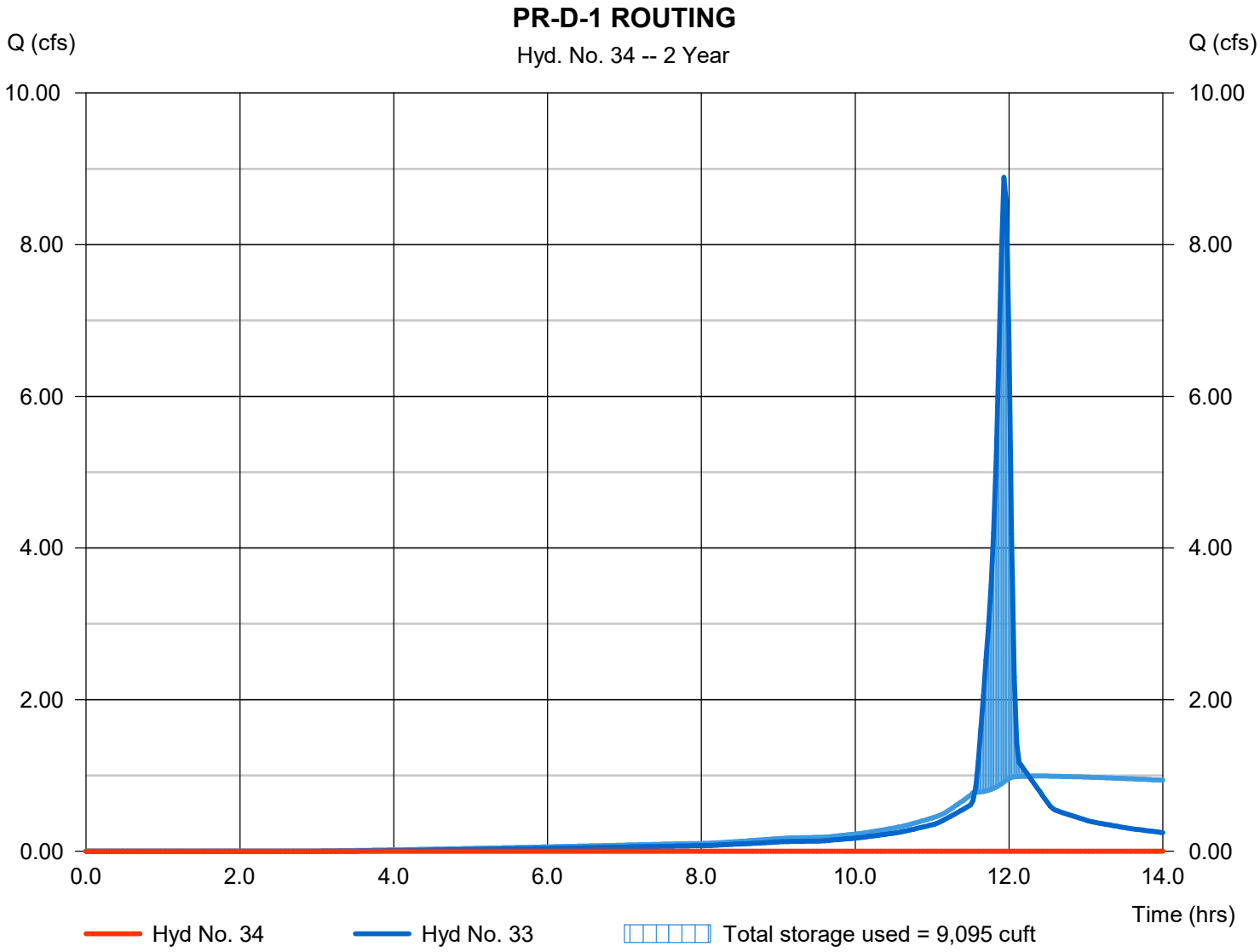
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 34

PR-D-1 ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 33 - PR-D-1	Max. Elevation	= 458.83 ft
Reservoir name	= INF4-1	Max. Storage	= 9,095 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

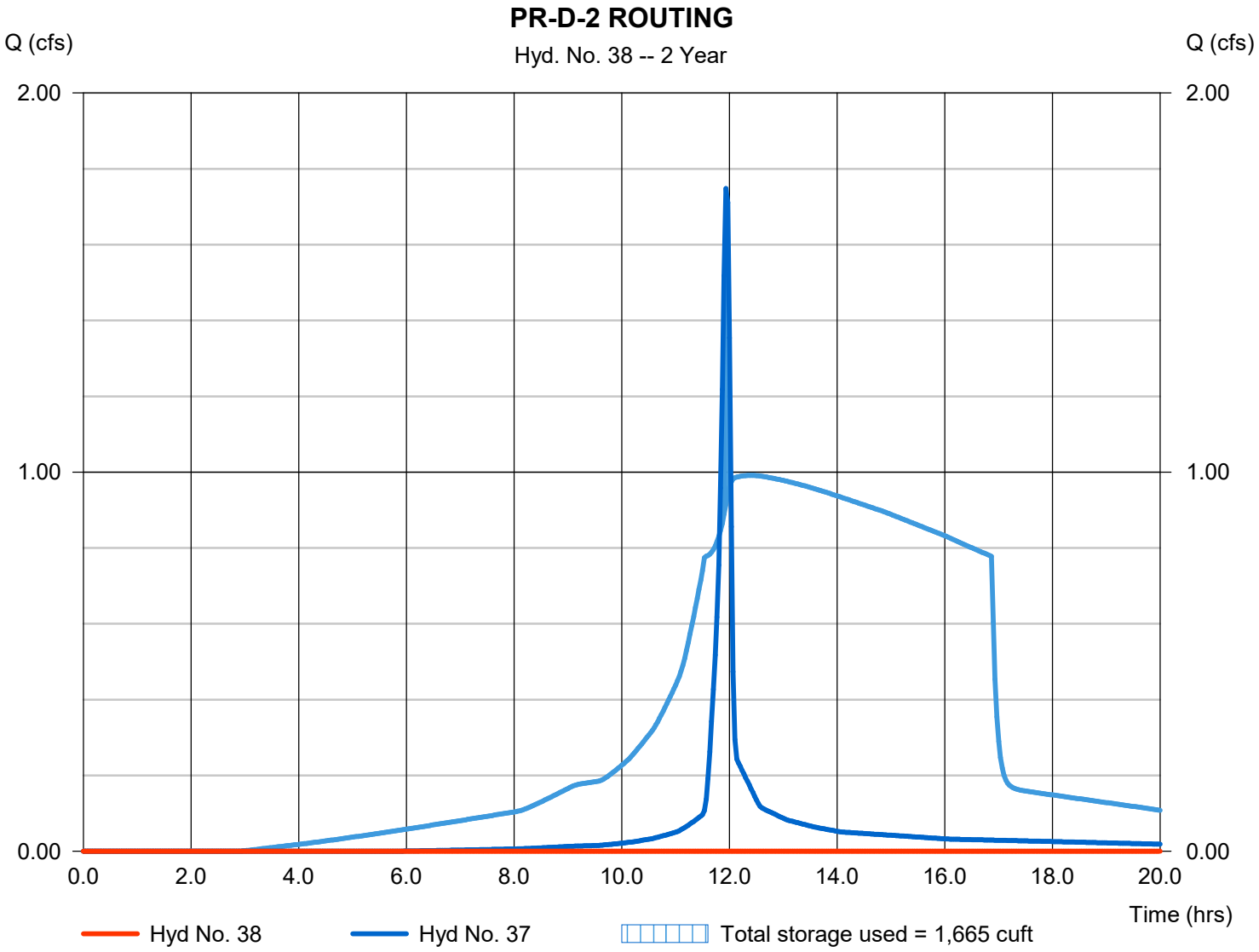
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 38

PR-D-2 ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 13.07 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 37 - PR-D-2	Max. Elevation	= 461.02 ft
Reservoir name	= INF4-2	Max. Storage	= 1,665 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

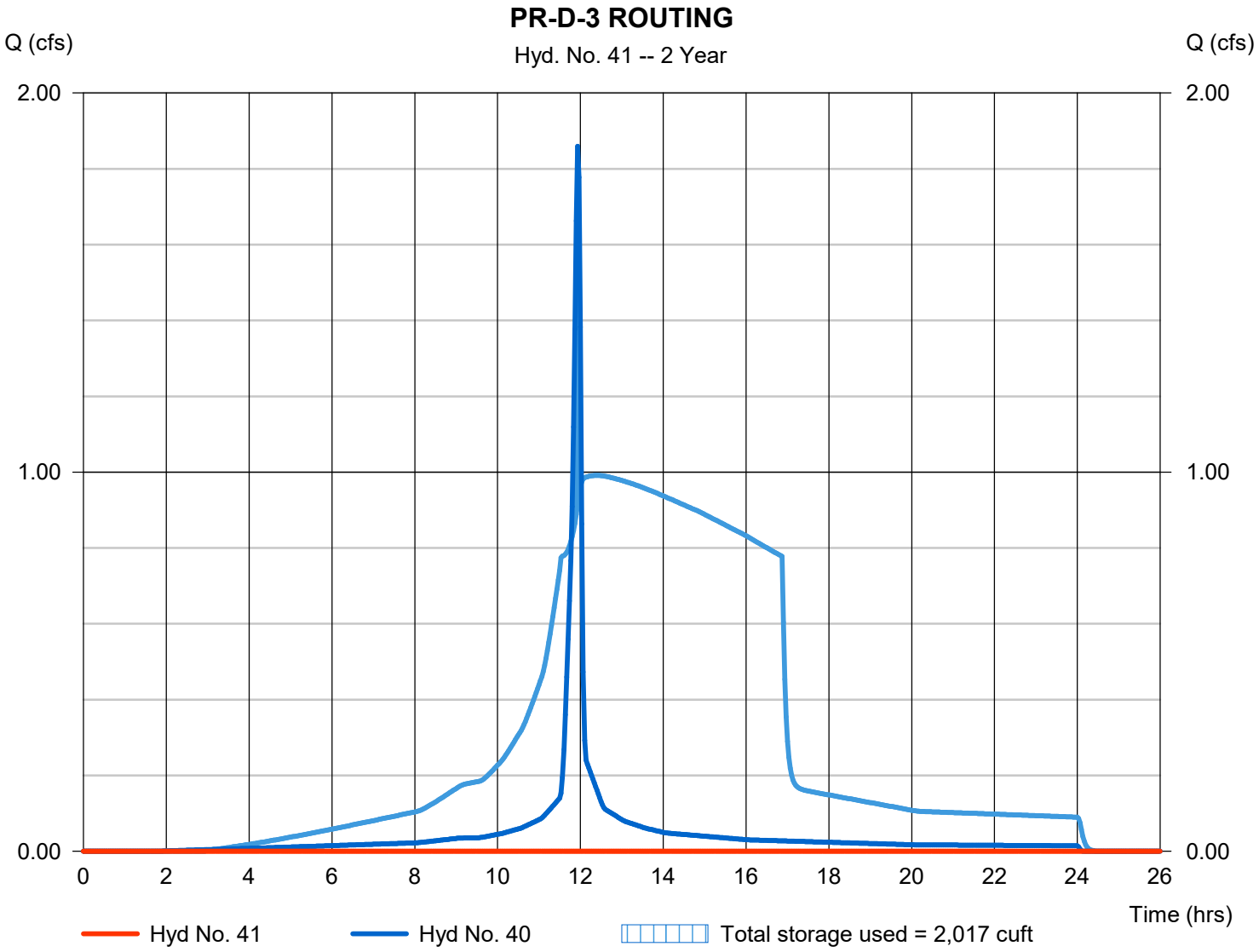
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 41

PR-D-3 ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 17.40 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 40 - PR-D-3	Max. Elevation	= 460.03 ft
Reservoir name	= UGD-INF4-1	Max. Storage	= 2,017 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



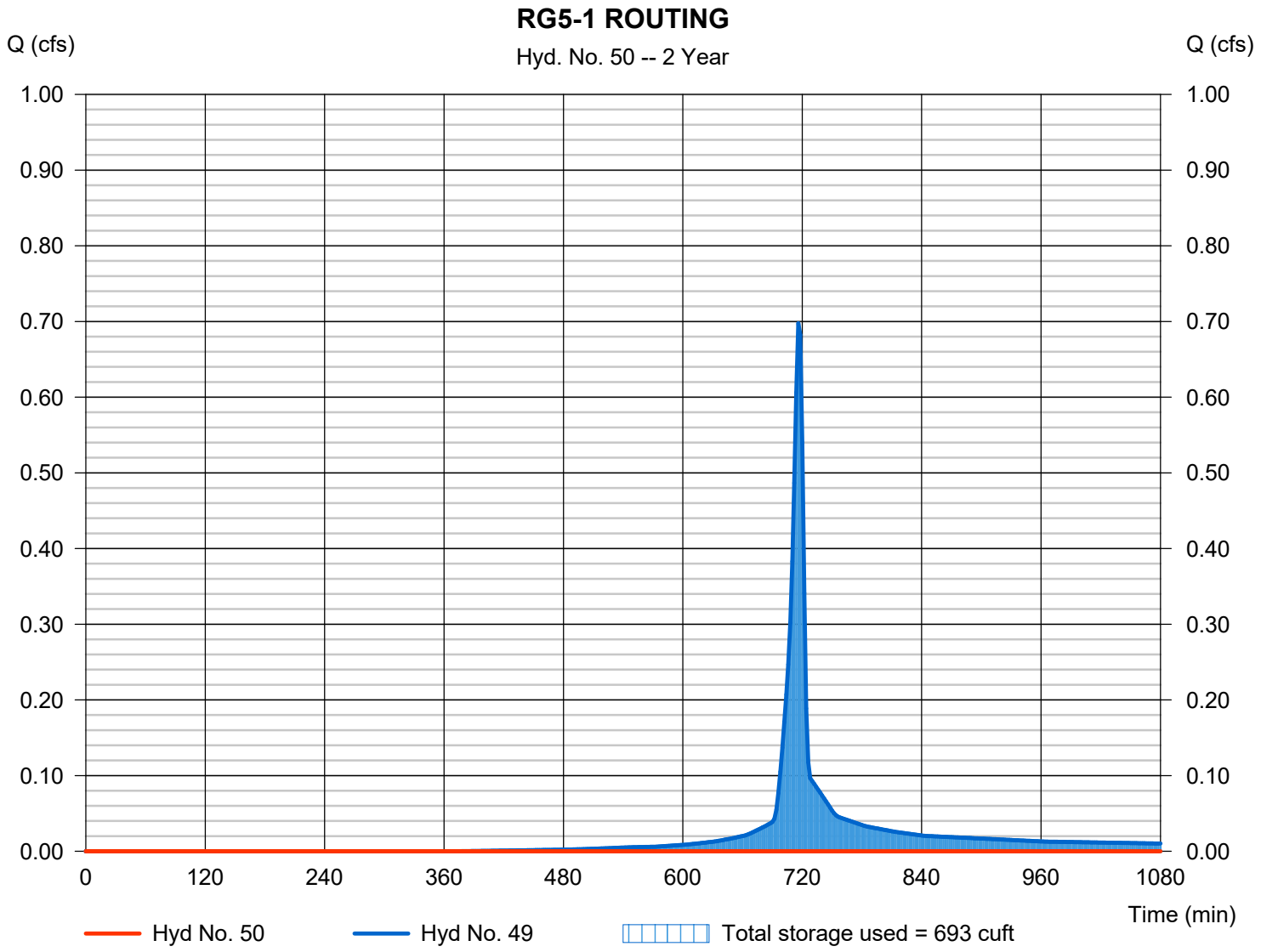
Hydrograph Report

Hyd. No. 50

RG5-1 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	0.000 cfs
Storm frequency	=	2 yrs	Time to peak	=	994 min
Time interval	=	2 min	Hyd. volume	=	0 cuft
Inflow hyd. No.	=	49 - PR-E-1	Max. Elevation	=	452.58 ft
Reservoir name	=	RG5-1	Max. Storage	=	693 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



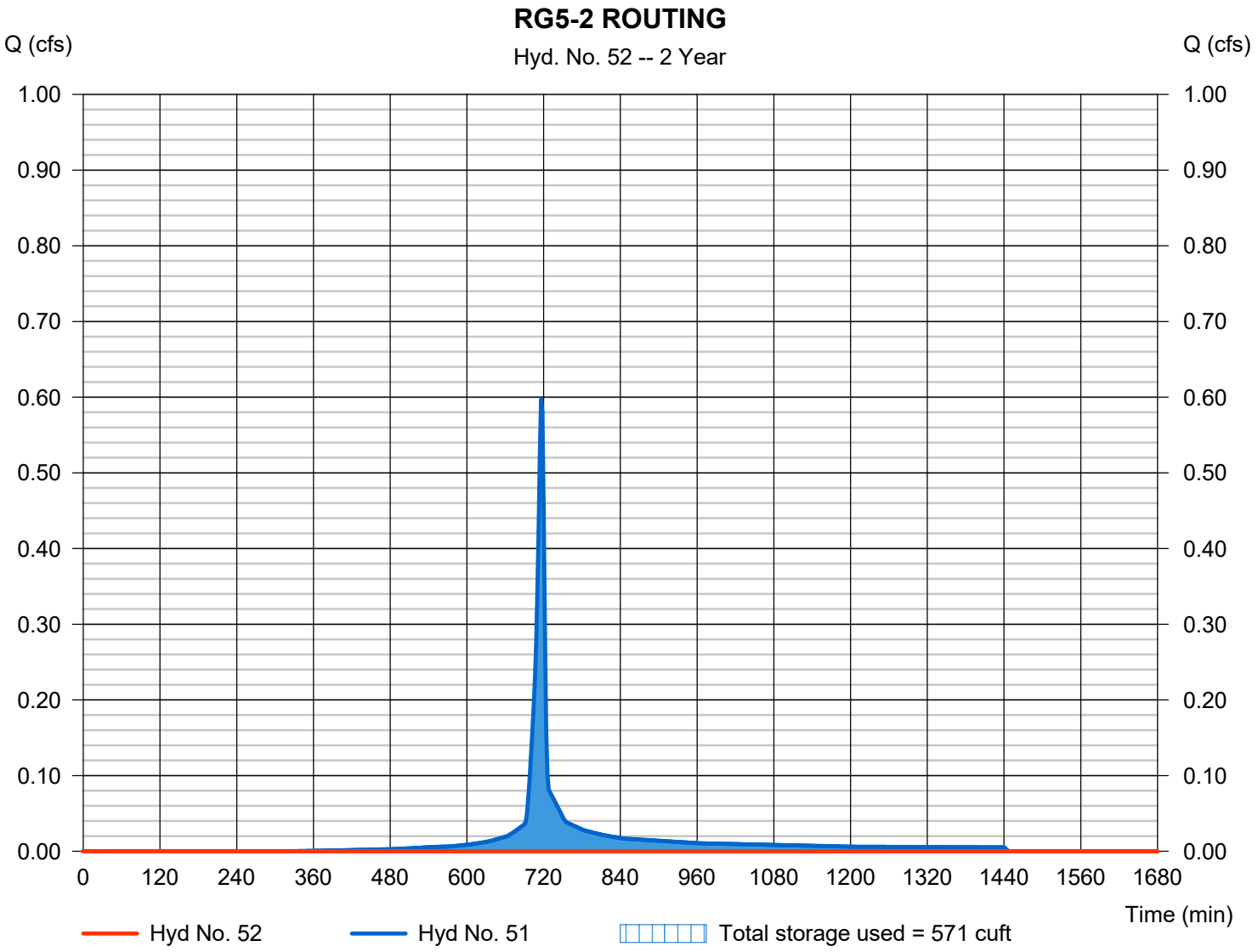
Hydrograph Report

Hyd. No. 52

RG5-2 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	0.000 cfs
Storm frequency	=	2 yrs	Time to peak	=	996 min
Time interval	=	2 min	Hyd. volume	=	0 cuft
Inflow hyd. No.	=	51 - PR-E-2	Max. Elevation	=	457.65 ft
Reservoir name	=	RG5-2	Max. Storage	=	571 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



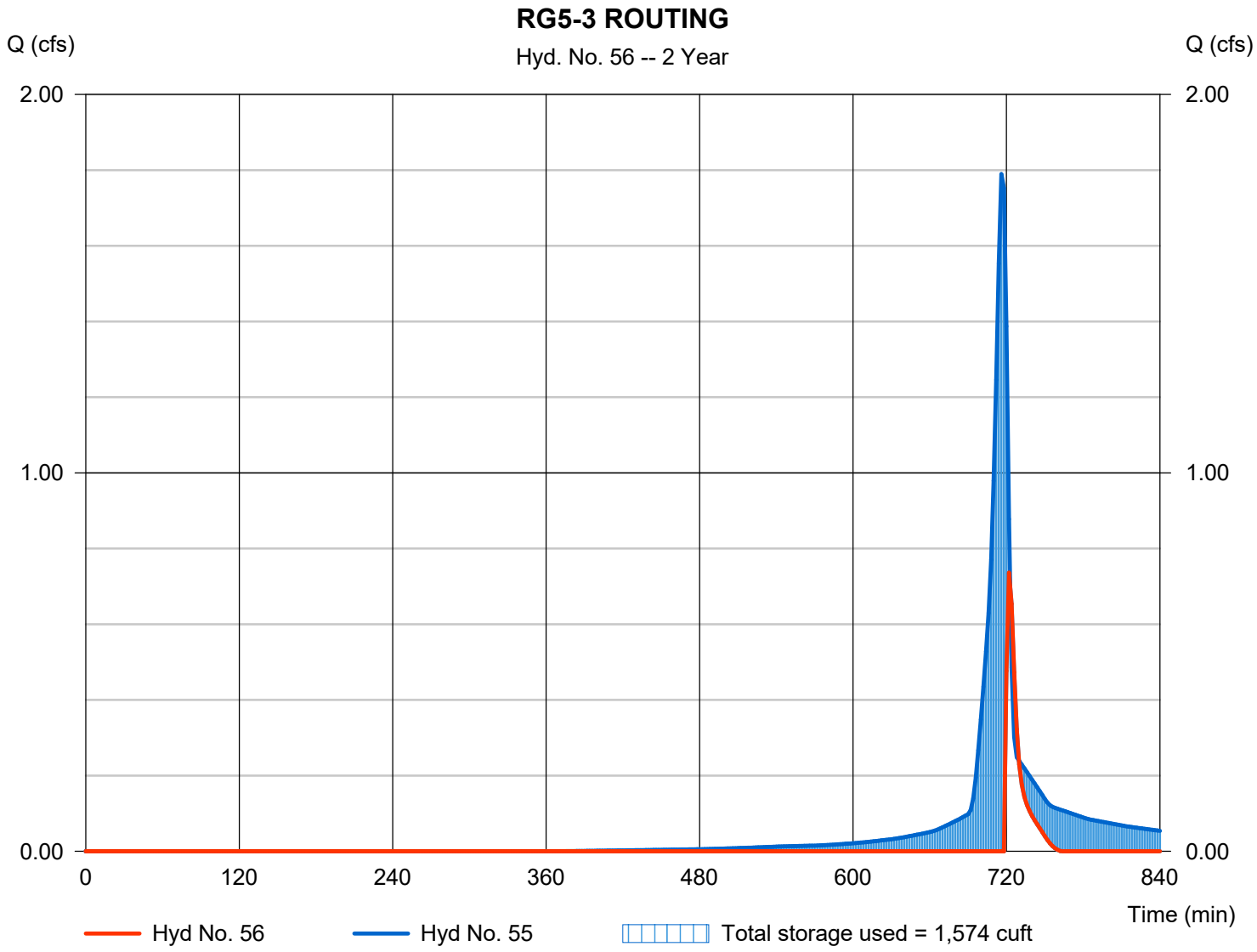
Hydrograph Report

Hyd. No. 56

RG5-3 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	0.736 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	470 cuft
Inflow hyd. No.	=	55 - PR-E-3	Max. Elevation	=	470.07 ft
Reservoir name	=	RG5-3	Max. Storage	=	1,574 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



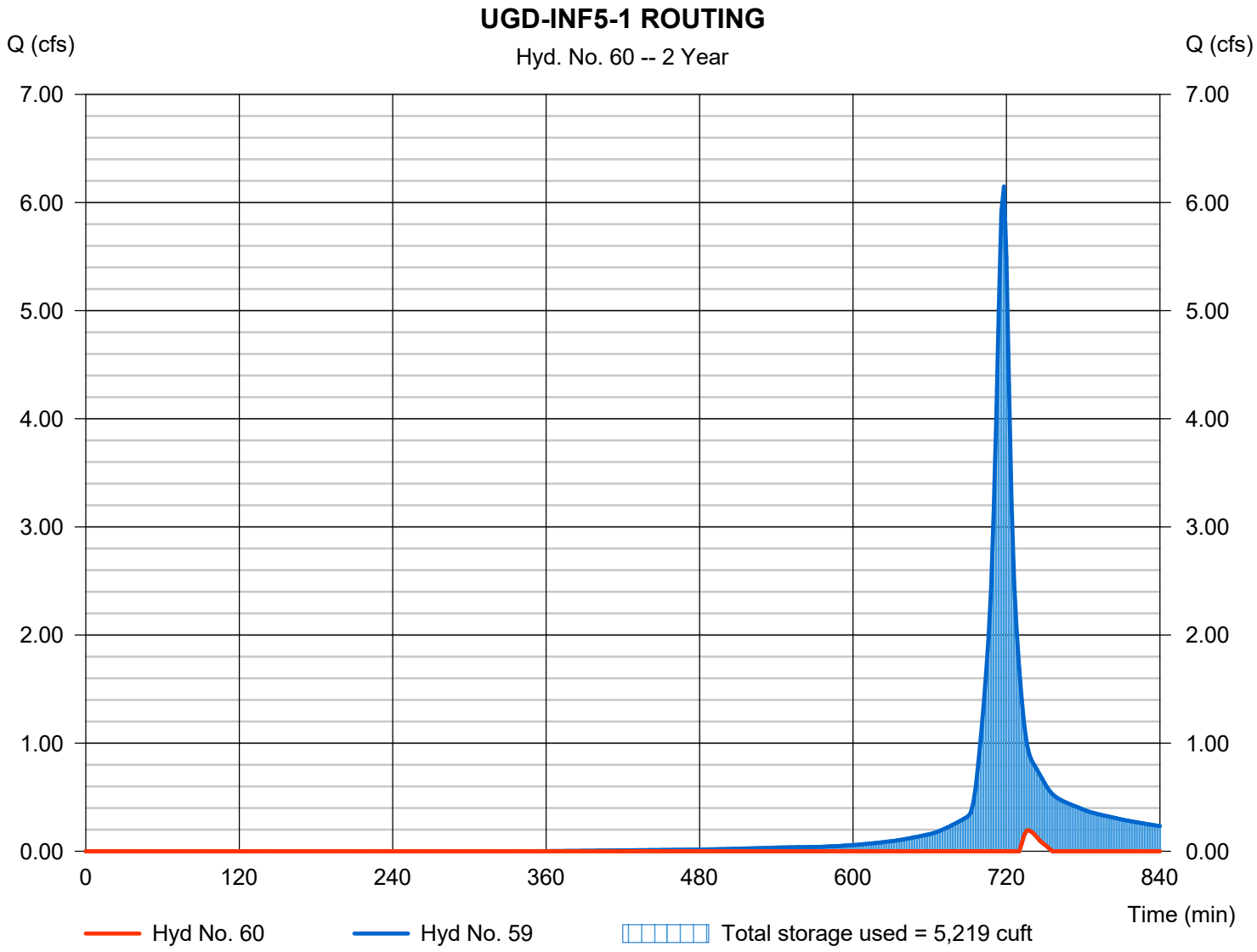
Hydrograph Report

Hyd. No. 60

UGD-INF5-1 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	0.192 cfs
Storm frequency	=	2 yrs	Time to peak	=	738 min
Time interval	=	2 min	Hyd. volume	=	165 cuft
Inflow hyd. No.	=	59 - PR-E-4	Max. Elevation	=	454.05 ft
Reservoir name	=	UGD-INF5-1	Max. Storage	=	5,219 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



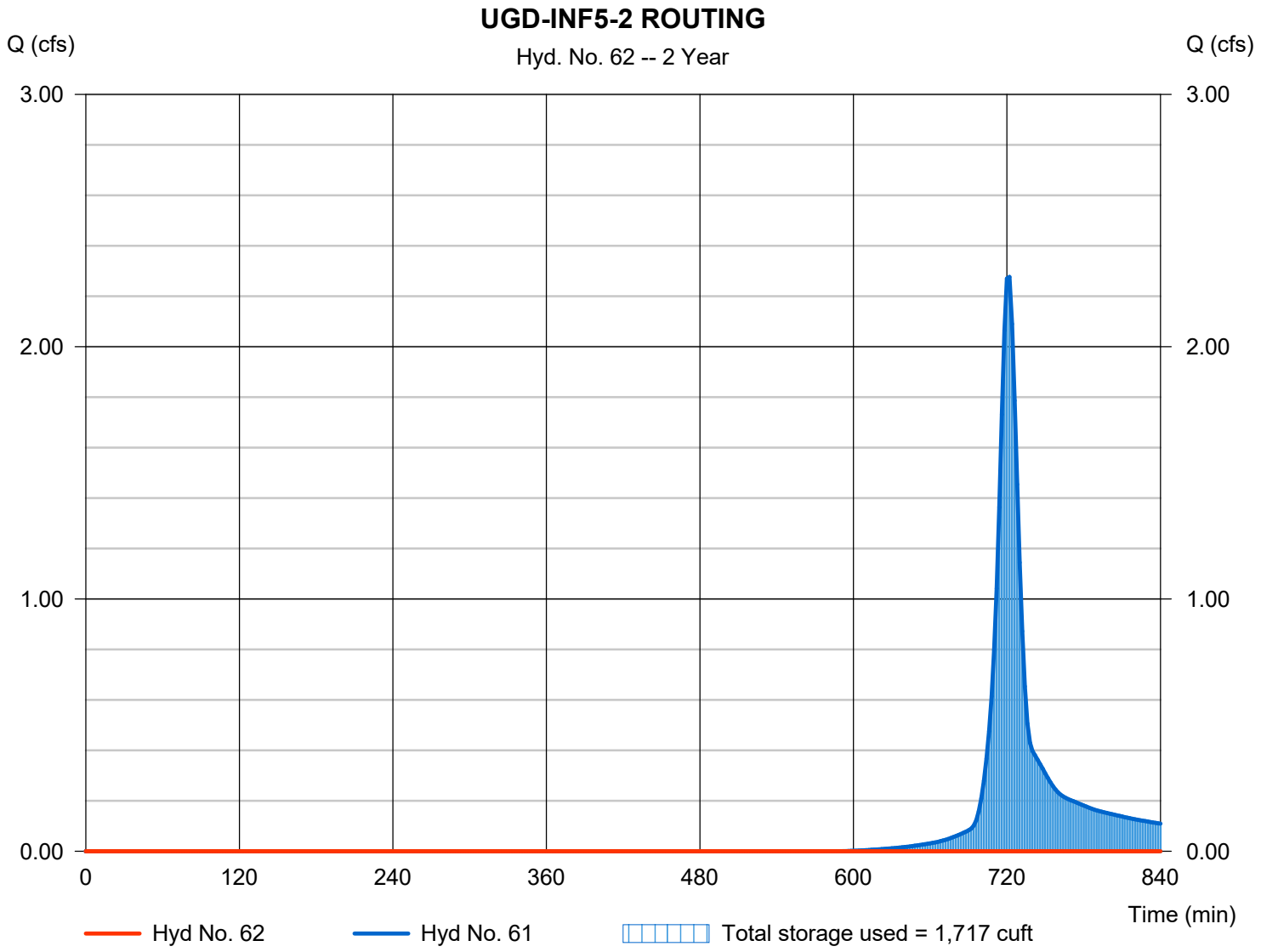
Hydrograph Report

Hyd. No. 62

UGD-INF5-2 ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 756 min
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 61 - PR-E-5	Max. Elevation	= 453.95 ft
Reservoir name	= UGD-INF5-2	Max. Storage	= 1,717 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



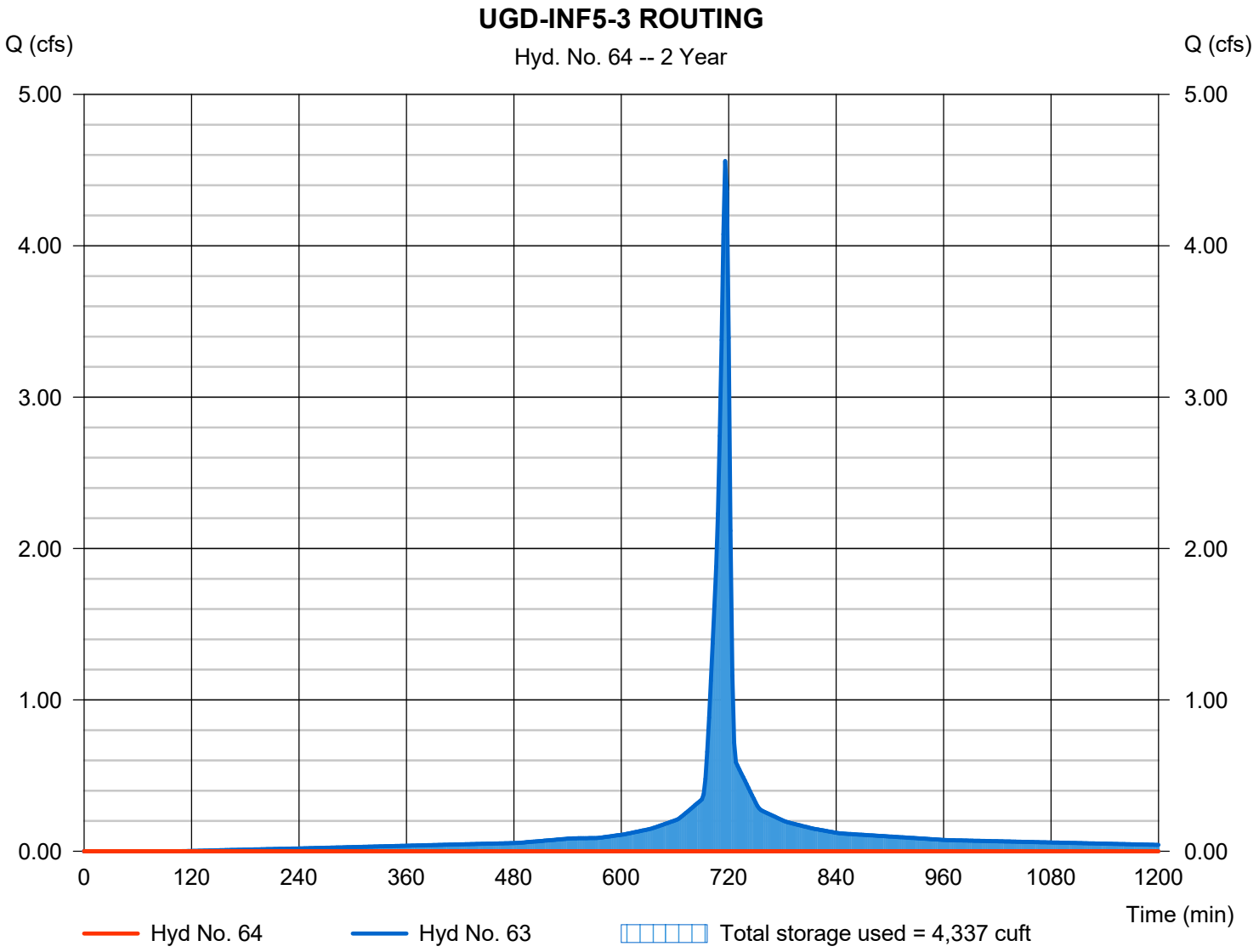
Hydrograph Report

Hyd. No. 64

UGD-INF5-3 ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 790 min
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 63 - PR-E-6	Max. Elevation	= 449.14 ft
Reservoir name	= UGD-INF5-3	Max. Storage	= 4,337 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



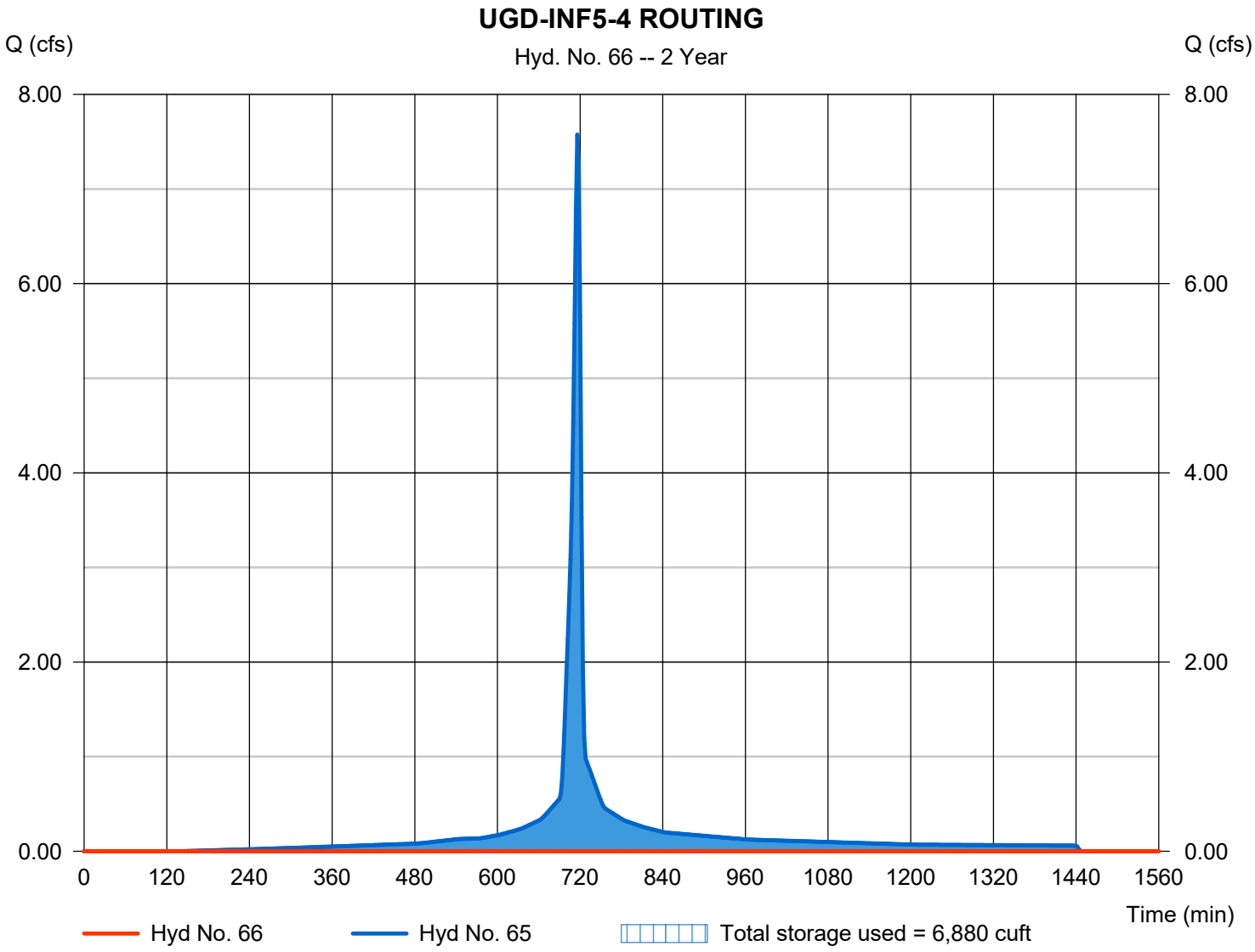
Hydrograph Report

Hyd. No. 66

UGD-INF5-4 ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 798 min
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 65 - PR-E-7	Max. Elevation	= 442.84 ft
Reservoir name	= UGD-INF5-4	Max. Storage	= 6,880 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



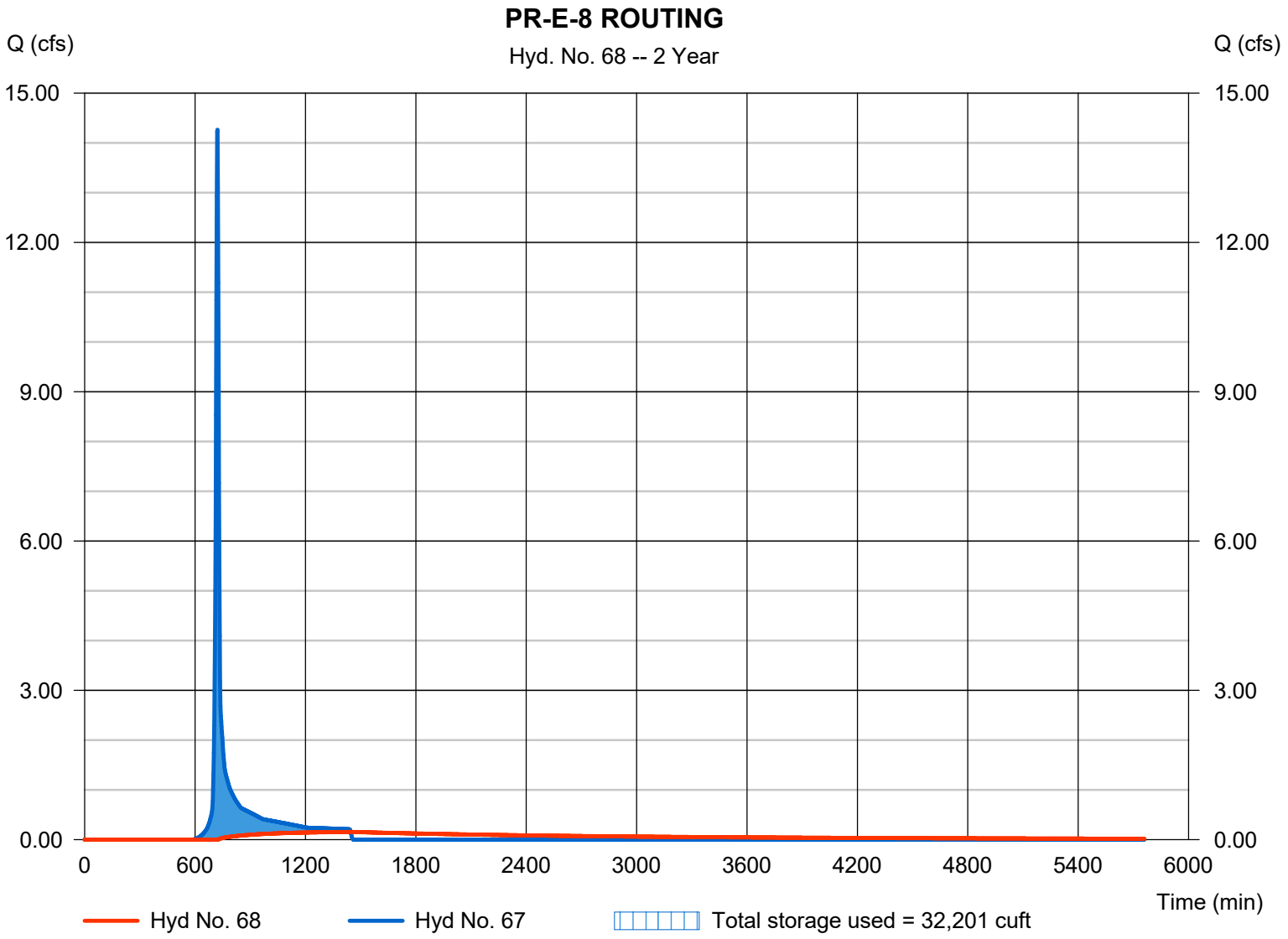
Hydrograph Report

Hyd. No. 68

PR-E-8 ROUTING

Hydrograph type	=	Reservoir	Peak discharge	=	0.155 cfs
Storm frequency	=	2 yrs	Time to peak	=	1446 min
Time interval	=	2 min	Hyd. volume	=	20,011 cuft
Inflow hyd. No.	=	67 - PR-E-8	Max. Elevation	=	441.80 ft
Reservoir name	=	SED-BASIN1-2	Max. Storage	=	32,201 cuft

Storage Indication method used.



APPENDIX F

DOWNSTREAM ANALYSIS

APPENDIX F
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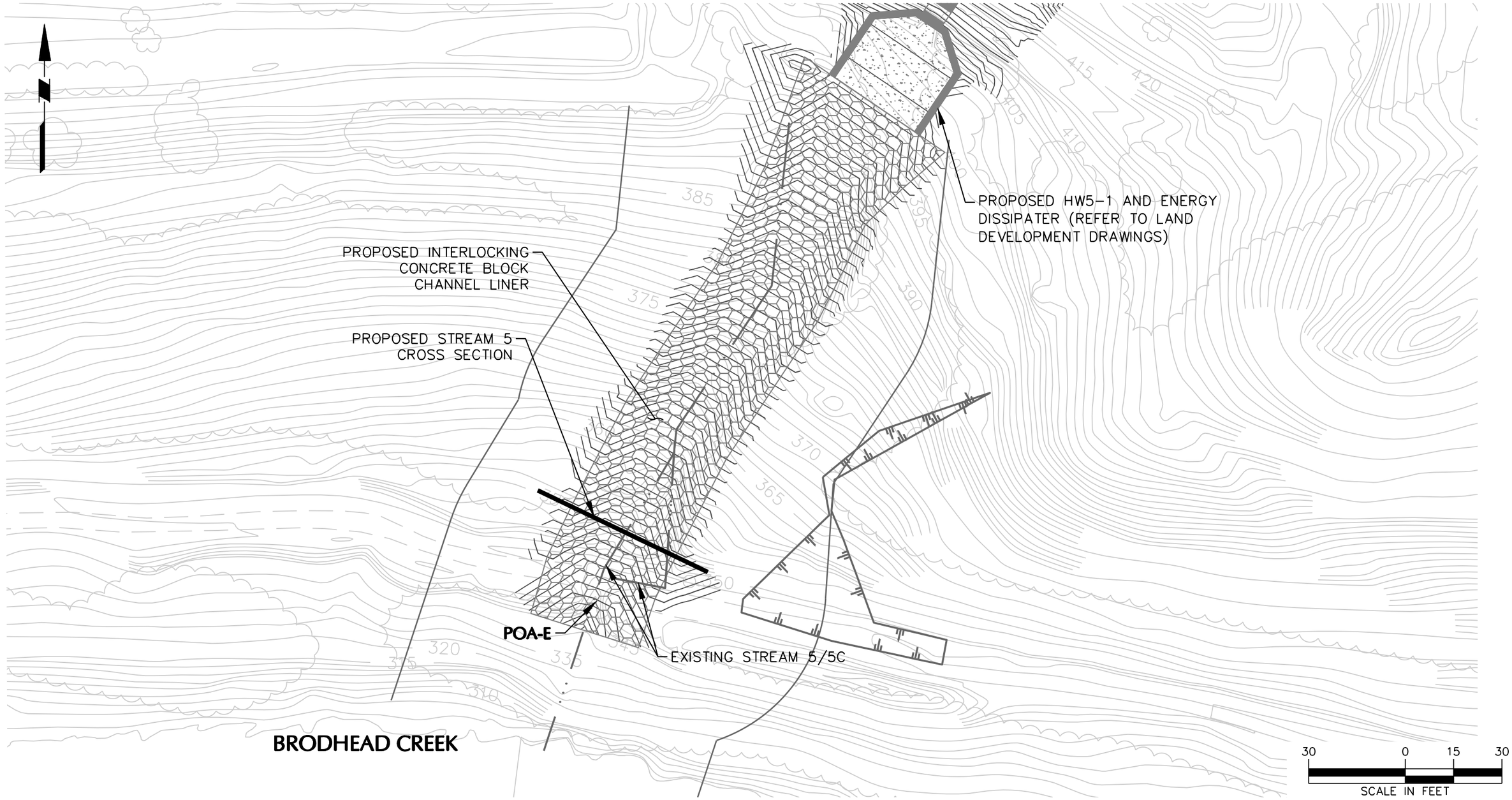
POINT OF ANALYSIS E (POA-E)



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Langan Engineering and Environmental Services, Inc.
Langan CT, Inc.
Langan International LLC
Collectively known as Langan

NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project

SMITHFIELD GATEWAY

SMITHFIELD TOWNSHIP
MONROE COUNTY PENNSYLVANIA

Drawing Title

POA-E DOWNSTREAM ANALYSIS

Project No. 100501401	Drawing No. F-1
Date JUNE 2, 2017	
Scale 1" = 30'	
Drawn By MJV / Checked By TH	
Submission Date APRIL 10, 2018	Sheet 1 of 1

Filename: \\langan.com\data\PAR\data4\100501401\Cadd Data - 100501401\SheetFiles\Figures\Stormwater\FG-F-1.dwg Date: 4/10/2018 Time: 11:02 User: mvitello Style Table: Langan.stb Layout: WF401-0101

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	20.440	0.00	102.4	0.00	0.00	84.46	0.0	19.5	2.8	249.9	649.9	10.70	72	2.01	398.80	399.21	403.78	403.54	407.80	417.34	HW5-1 TO MH5-1
2	1	30.000	0.00	102.4	0.00	0.00	84.46	0.0	19.5	2.8	250.1	649.0	16.45	72	2.00	404.71	405.31	407.29	409.64	417.34	448.00	MH5-1 TO MH5-2
3	2	53.039	18.82	102.4	0.89	16.75	84.46	10.0	19.4	2.8	250.5	648.7	16.46	72	2.00	410.81	411.87	413.40	416.20	448.00	448.50	MH5-2 TO MH5-3
4	3	260.000	0.00	83.58	0.00	0.00	67.71	0.0	19.1	2.8	205.3	459.8	13.15	72	1.00	416.87	419.48	419.68	423.39	448.50	450.90	MH5-3 TO MH5-4
5	4	96.972	5.17	83.58	0.79	4.08	67.71	10.0	18.9	2.9	206.2	458.9	10.70	72	1.00	419.58	420.55	423.39	424.47	450.90	452.33	MH5-4 TO MH5-5
6	5	216.121	0.00	78.41	0.00	0.00	63.63	0.0	18.6	2.9	196.5	458.7	10.33	72	1.00	420.65	422.81	424.47	426.64	452.33	454.60	MH5-5 TO MH5-6
7	6	238.559	0.00	78.41	0.00	0.00	63.63	0.0	18.2	2.9	198.8	459.3	10.57	72	1.00	422.91	425.30	426.64	429.15	454.60	458.31	MH5-6 TO MH5-7
8	7	204.104	0.00	72.06	0.00	0.00	58.55	6.0	17.9	3.0	185.8	458.8	10.05	72	1.00	425.40	427.44	429.15	431.16	458.31	454.71	MH5-7 TO MH5-8
9	8	108.405	0.00	71.18	0.00	0.00	57.73	0.0	17.7	3.0	184.4	458.0	10.21	72	1.00	427.54	428.62	431.16	432.32	454.71	455.41	MH5-8 TO MH5-9
10	9	299.601	0.00	62.65	0.00	0.00	50.15	0.0	17.2	3.0	153.0	364.1	9.52	66	1.00	428.72	431.72	432.32	435.17	455.41	452.61	MH5-10 TO MH5-
11	10	162.986	0.00	62.38	0.00	0.00	49.89	0.0	16.9	3.1	153.6	363.9	9.96	66	1.00	431.82	433.45	435.17	436.91	452.61	450.86	MH5-10 TO MH5-
12	11	203.182	0.00	60.03	0.00	0.00	47.98	0.0	16.6	3.1	149.5	363.7	9.76	66	1.00	433.55	435.58	436.91	438.99	450.86	453.95	MH5-11 TO MH5-
13	12	77.359	0.00	60.03	0.00	0.00	47.98	0.0	16.4	3.1	149.2	365.3	9.83	66	1.01	435.68	436.46	438.99	439.86	453.95	454.72	MH5-12 TO MH5-
14	13	56.863	0.00	60.03	0.00	0.00	47.98	0.0	16.3	3.1	149.7	364.3	9.86	66	1.00	436.56	437.13	439.86	440.54	454.72	455.99	MH5-14 TO MH5-
15	14	97.052	0.00	50.81	0.00	0.00	39.77	0.0	16.1	3.1	124.9	282.1	9.24	60	1.00	437.23	438.20	440.54	441.39	455.99	458.24	MH5-15 TO MH5-
16	15	74.996	0.00	50.45	0.00	0.00	39.55	0.0	16.0	3.2	124.6	282.2	11.67	60	1.00	442.25	443.00	444.58	446.19	458.24	464.15	MH5-16 TO MH5-
17	16	60.019	0.00	50.45	0.00	0.00	39.55	0.0	16.0	3.2	125.0	282.1	11.68	60	1.00	448.00	448.60	450.33	451.79	464.15	466.02	MH5-17 TO MH5-
18	17	230.753	0.00	50.45	0.00	0.00	39.55	0.0	15.6	3.2	126.5	282.3	11.73	60	1.00	453.60	455.91	455.95	459.12	466.02	474.92	MH5-18 TO MH5-
19	18	199.226	0.00	50.31	0.00	0.00	39.44	0.0	15.3	3.2	127.7	282.0	9.73	60	1.00	456.01	458.00	459.12	461.23	474.92	474.35	MH5-19 TO MH5-
20	19	135.000	0.00	50.01	0.00	0.00	39.21	0.0	15.1	3.3	128.1	282.2	9.71	60	1.00	458.10	459.45	461.23	462.69	474.35	472.74	MH5-20 TO MH5-
21	20	152.928	0.00	40.46	0.00	0.00	33.38	0.0	11.5	3.8	125.8	282.2	9.58	60	1.00	459.55	461.08	462.69	464.28	472.74	474.62	MH5-21 TO MH5-
22	21	128.398	0.00	34.92	0.00	0.00	28.45	0.0	11.3	3.8	108.3	212.7	9.33	54	1.00	461.18	462.46	464.28	465.52	474.62	476.48	MH5-22 TO MH5-

Project File: STRM-NTWK-05-2-YR-FULL-BUILD.stm | Number of lines: 152 | Run Date: 2/23/2023

NOTES:Intensity = 39.43 / (Inlet time + 6.70) ^ 0.81; Return period =Yrs. 2 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	20.440	0.00	102.4	0.00	0.00	84.46	0.0	19.0	3.8	335.5	649.9	13.38	72	2.01	398.80	399.21	403.78	404.18	407.80	417.34	HW5-1 TO MH5-1
2	1	30.000	0.00	102.4	0.00	0.00	84.46	0.0	19.0	3.8	335.8	649.0	18.27	72	2.00	404.71	405.31	407.77	410.29	417.34	448.00	MH5-1 TO MH5-2
3	2	53.039	18.82	102.4	0.89	16.75	84.46	10.0	18.9	3.8	336.2	648.7	18.27	72	2.00	410.81	411.87	413.88	416.85	448.00	448.50	MH5-2 TO MH5-3
4	3	260.000	0.00	83.58	0.00	0.00	67.71	0.0	18.6	3.9	274.3	459.8	14.47	72	1.00	416.87	419.48	420.21	424.01	448.50	450.90	MH5-3 TO MH5-4
5	4	96.972	5.17	83.58	0.79	4.08	67.71	10.0	18.5	3.9	275.3	458.9	12.15	72	1.00	419.58	420.55	424.01	425.09	450.90	452.33	MH5-4 TO MH5-5
6	5	216.121	0.00	78.41	0.00	0.00	63.63	0.0	18.2	3.9	261.8	458.7	11.69	72	1.00	420.65	422.81	425.09	427.24	452.33	454.60	MH5-5 TO MH5-6
7	6	238.559	0.00	78.41	0.00	0.00	63.63	0.0	17.9	4.0	264.3	459.3	11.93	72	1.00	422.91	425.30	427.24	429.75	454.60	458.31	MH5-6 TO MH5-7
8	7	182.000	0.00	72.06	0.00	0.00	58.55	6.0	17.6	4.0	246.1	458.9	11.29	72	1.00	425.40	427.22	429.75	431.51	458.31	455.11	MH5-7 TO MH5-8
9	8	130.000	0.00	71.18	0.00	0.00	57.73	0.0	17.4	4.0	244.2	458.9	11.45	72	1.00	427.32	428.62	431.51	432.90	455.11	455.41	MH5-8 TO MH5-9
10	9	299.601	0.00	62.65	0.00	0.00	50.15	0.0	16.9	4.1	205.2	364.1	10.83	66	1.00	428.72	431.72	432.90	435.73	455.41	452.61	MH5-10 TO MH5-
11	10	162.986	0.00	62.38	0.00	0.00	49.89	0.0	16.7	4.1	205.7	363.9	11.24	66	1.00	431.82	433.45	435.73	437.46	452.61	450.86	MH5-10 TO MH5-
12	11	203.182	0.00	60.03	0.00	0.00	47.98	0.0	16.4	4.1	199.8	363.7	10.99	66	1.00	433.55	435.58	437.46	439.53	450.86	453.95	MH5-11 TO MH5-
13	12	77.359	0.00	60.03	0.00	0.00	47.98	0.0	16.3	4.2	199.5	365.3	11.07	66	1.01	435.68	436.46	439.53	440.41	453.95	454.72	MH5-12 TO MH5-
14	13	56.863	0.00	60.03	0.00	0.00	47.98	0.0	16.2	4.2	200.1	364.3	11.10	66	1.00	436.56	437.13	440.41	441.09	454.72	455.99	MH5-14 TO MH5-
15	14	97.052	0.00	50.81	0.00	0.00	39.77	0.0	16.0	4.2	166.7	282.1	10.48	60	1.00	437.23	438.20	441.09	441.90	455.99	458.24	MH5-15 TO MH5-
16	15	74.996	0.00	50.45	0.00	0.00	39.55	0.0	15.9	4.2	166.3	282.2	12.82	60	1.00	442.25	443.00	445.01	446.69	458.24	464.15	MH5-16 TO MH5-
17	16	60.019	0.00	50.45	0.00	0.00	39.55	0.0	15.9	4.2	166.8	282.1	12.83	60	1.00	448.00	448.60	450.77	452.30	464.15	466.02	MH5-17 TO MH5-
18	17	230.753	0.00	50.45	0.00	0.00	39.55	0.0	15.6	4.3	168.4	282.3	12.88	60	1.00	453.60	455.91	456.38	459.63	466.02	474.92	MH5-18 TO MH5-
19	18	199.226	0.00	50.31	0.00	0.00	39.44	0.0	15.3	4.3	169.7	282.0	10.98	60	1.00	456.01	458.00	459.63	461.73	474.92	474.35	MH5-19 TO MH5-
20	19	135.000	0.00	50.01	0.00	0.00	39.21	0.0	15.1	4.3	169.9	282.2	10.96	60	1.00	458.10	459.45	461.73	463.18	474.35	472.74	MH5-20 TO MH5-
21	20	152.928	0.00	40.46	0.00	0.00	33.38	0.0	11.4	5.0	166.3	282.2	10.79	60	1.00	459.55	461.08	463.18	464.77	472.74	474.62	MH5-21 TO MH5-
22	21	128.398	0.00	34.92	0.00	0.00	28.45	0.0	11.2	5.0	142.9	212.7	10.62	54	1.00	461.18	462.46	464.77	465.97	474.62	476.48	MH5-22 TO MH5-

Project File: STRM-NTWK-05-10-YR-FULL-BUILD.stm | Number of lines: 153 | Run Date: 2/23/2023

NOTES:Intensity = 38.27 / (Inlet time + 5.80) ^ 0.72; Return period =Yrs. 10 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	20.440	0.00	102.4	0.00	0.00	84.46	0.0	18.7	4.4	399.9	649.9	15.07	72	2.01	398.80	399.21	404.13	404.54	407.80	417.34	HW5-1 TO MH5-1
2	1	30.000	0.00	102.4	0.00	0.00	84.46	0.0	18.7	4.4	400.2	649.0	19.60	72	2.00	404.71	405.31	408.12	410.64	417.34	448.00	MH5-1 TO MH5-2
3	2	53.039	18.82	102.4	0.89	16.75	84.46	10.0	18.7	4.4	400.7	648.7	19.61	72	2.00	410.81	411.87	414.22	417.20	448.00	448.50	MH5-2 TO MH5-3
4	3	260.000	0.00	83.58	0.00	0.00	67.71	0.0	18.4	4.5	328.6	459.8	15.45	72	1.00	416.87	419.48	420.62	424.41	448.50	450.90	MH5-3 TO MH5-4
5	4	96.972	5.17	83.58	0.79	4.08	67.71	10.0	18.2	4.5	329.7	458.9	13.38	72	1.00	419.58	420.55	424.41	425.49	450.90	452.33	MH5-4 TO MH5-5
6	5	216.121	0.00	78.41	0.00	0.00	63.63	0.0	18.0	4.5	313.6	458.7	12.85	72	1.00	420.65	422.81	425.49	427.64	452.33	454.60	MH5-5 TO MH5-6
7	6	238.559	0.00	78.41	0.00	0.00	63.63	0.0	17.7	4.6	316.1	459.3	13.08	72	1.00	422.91	425.30	427.64	430.14	454.60	458.32	MH5-6 TO MH5-7
8	7	182.000	0.00	72.06	0.00	0.00	58.55	6.0	17.4	4.6	294.8	458.9	12.36	72	1.00	425.40	427.22	430.14	431.91	458.32	455.11	MH5-7 TO MH5-8
9	8	130.000	0.00	71.18	0.00	0.00	57.73	0.0	17.2	4.6	292.4	458.9	12.49	72	1.00	427.32	428.62	431.91	433.29	455.11	455.41	MH5-8 TO MH5-9
10	9	299.601	0.00	62.65	0.00	0.00	50.15	0.0	16.8	4.7	241.4	364.1	11.72	66	1.00	428.72	431.72	433.29	436.06	455.41	452.61	MH5-10 TO MH5-
11	10	162.986	0.00	62.38	0.00	0.00	49.89	0.0	16.6	4.7	241.7	363.9	12.17	66	1.00	431.82	433.45	436.06	437.79	452.61	450.86	MH5-10 TO MH5-
12	11	203.182	0.00	60.03	0.00	0.00	47.98	0.0	16.3	4.8	234.7	363.7	11.89	66	1.00	433.55	435.58	437.79	439.86	450.86	453.95	MH5-11 TO MH5-
13	12	77.359	0.00	60.03	0.00	0.00	47.98	0.0	16.2	4.8	228.8	365.3	11.75	66	1.01	435.68	436.46	439.86	440.69	453.95	454.72	MH5-12 TO MH5-
14	13	56.863	0.00	60.03	0.00	0.00	47.98	0.0	16.1	4.8	229.4	364.3	11.84	66	1.00	436.56	437.13	440.69	441.36	454.72	455.99	MH5-14 TO MH5-
15	14	97.052	0.00	50.81	0.00	0.00	39.77	0.0	16.0	4.8	191.0	282.1	11.24	60	1.00	437.23	438.20	441.36	442.15	455.99	458.24	MH5-15 TO MH5-
16	15	74.996	0.00	50.45	0.00	0.00	39.55	0.0	15.9	4.8	190.5	282.2	13.45	60	1.00	442.25	443.00	445.26	446.94	458.24	464.15	MH5-16 TO MH5-
17	16	60.019	0.00	50.45	0.00	0.00	39.55	0.0	15.8	4.8	190.9	282.1	13.46	60	1.00	448.00	448.60	451.01	452.55	464.15	466.02	MH5-17 TO MH5-
18	17	230.753	0.00	50.45	0.00	0.00	39.55	0.0	15.5	4.9	192.6	282.3	13.50	60	1.00	453.60	455.91	456.63	459.87	466.02	474.92	MH5-18 TO MH5-
19	18	199.226	0.00	50.31	0.00	0.00	39.44	0.0	15.2	4.9	193.8	282.0	11.74	60	1.00	456.01	458.00	459.87	461.98	474.92	474.35	MH5-19 TO MH5-
20	19	135.000	0.00	50.01	0.00	0.00	39.21	0.0	15.0	4.9	193.8	282.2	11.72	60	1.00	458.10	459.45	461.98	463.43	474.35	472.74	MH5-20 TO MH5-
21	20	152.928	0.00	40.46	0.00	0.00	33.38	0.0	11.3	5.6	188.2	282.2	11.46	60	1.00	459.55	461.08	463.43	465.00	472.74	474.62	MH5-21 TO MH5-
22	21	128.398	0.00	34.92	0.00	0.00	28.45	0.0	11.1	5.7	161.6	212.7	11.37	54	1.00	461.18	462.46	465.00	466.17	474.62	476.48	MH5-22 TO MH5-

Project File: STRM-NTWK-05-25-YR-FULL-BUILD.stm

Number of lines: 153

Run Date: 2/23/2023

NOTES:Intensity = 48.83 / (Inlet time + 7.80) ^ 0.73; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	20.440	0.00	102.4	0.00	0.00	84.46	0.0	18.3	5.3	496.5	649.9	18.01	72	2.01	398.80	399.21	404.41	404.87	407.80	417.34	HW5-1 TO MH5-1
2	1	30.000	0.00	102.4	0.00	0.00	84.46	0.0	18.3	5.3	496.7	649.0	21.63	72	2.00	404.71	405.31	408.64	410.97	417.34	448.00	MH5-1 TO MH5-2
3	2	53.039	18.82	102.4	0.89	16.75	84.46	10.0	18.3	5.3	497.2	648.7	21.63	72	2.00	410.81	411.87	414.75	417.53	448.00	448.50	MH5-2 TO MH5-3
4	3	260.000	0.00	83.58	0.00	0.00	67.71	0.0	18.0	5.3	411.3	459.8	16.88	72	1.00	416.87	419.48	421.30	424.86	448.50	450.90	MH5-3 TO MH5-4
5	4	96.972	5.17	83.58	0.79	4.08	67.71	10.0	17.9	5.3	412.3	458.9	15.53	72	1.00	419.58	420.55	424.86	425.94	450.90	452.33	MH5-4 TO MH5-5
6	5	216.121	0.00	78.41	0.00	0.00	63.63	0.0	17.7	5.4	392.7	458.7	14.88	72	1.00	420.65	422.81	425.94	428.11	452.33	454.60	MH5-5 TO MH5-6
7	6	238.559	0.00	78.41	0.00	0.00	63.63	0.0	17.4	5.4	395.1	459.3	15.06	72	1.00	422.91	425.30	428.11	430.61	454.60	458.32	MH5-6 TO MH5-7
8	7	182.000	0.00	72.06	0.00	0.00	58.55	6.0	17.2	5.4	369.5	458.9	14.21	72	1.00	425.40	427.22	430.61	432.40	458.32	455.11	MH5-7 TO MH5-8
9	8	130.000	0.00	71.18	0.00	0.00	57.73	0.0	17.0	5.5	366.4	458.9	14.26	72	1.00	427.32	428.62	432.40	433.78	455.11	455.41	MH5-8 TO MH5-9
10	9	299.601	0.00	62.65	0.00	0.00	50.15	0.0	16.7	5.5	301.5	364.1	13.48	66	1.00	428.72	431.72	433.78	436.49	455.41	452.61	MH5-10 TO MH5-
11	10	162.986	0.00	62.38	0.00	0.00	49.89	0.0	16.5	5.5	301.6	363.9	13.90	66	1.00	431.82	433.45	436.49	438.22	452.61	450.86	MH5-10 TO MH5-
12	11	203.182	0.00	60.03	0.00	0.00	47.98	0.0	16.2	5.6	281.0	363.7	13.10	66	1.00	433.55	435.58	438.22	440.22	450.86	453.95	MH5-11 TO MH5-
13	12	77.359	0.00	60.03	0.00	0.00	47.98	0.0	16.1	5.6	268.4	365.3	12.79	66	1.01	435.68	436.46	440.22	441.01	453.95	454.72	MH5-12 TO MH5-
14	13	56.863	0.00	60.03	0.00	0.00	47.98	0.0	16.0	5.6	268.9	364.3	12.93	66	1.00	436.56	437.13	441.01	441.68	454.72	455.99	MH5-14 TO MH5-
15	14	97.052	0.00	50.81	0.00	0.00	39.77	0.0	15.9	5.6	223.8	282.1	12.37	60	1.00	437.23	438.20	441.68	442.44	455.99	458.24	MH5-15 TO MH5-
16	15	74.996	0.00	50.45	0.00	0.00	39.55	0.0	15.8	5.6	223.1	282.2	14.26	60	1.00	442.25	443.00	445.60	447.23	458.24	464.15	MH5-16 TO MH5-
17	16	60.019	0.00	50.45	0.00	0.00	39.55	0.0	15.7	5.7	223.5	282.1	14.27	60	1.00	448.00	448.60	451.36	452.83	464.15	466.02	MH5-17 TO MH5-
18	17	230.753	0.00	50.45	0.00	0.00	39.55	0.0	15.5	5.7	225.3	282.3	14.32	60	1.00	453.60	455.91	456.98	460.16	466.02	474.92	MH5-18 TO MH5-
19	18	199.226	0.00	50.31	0.00	0.00	39.44	0.0	15.2	5.7	226.4	282.0	12.86	60	1.00	456.01	458.00	460.16	462.26	474.92	474.35	MH5-19 TO MH5-
20	19	135.000	0.00	50.01	0.00	0.00	39.21	0.0	15.0	5.8	226.2	282.2	12.84	60	1.00	458.10	459.45	462.26	463.70	474.35	472.74	MH5-20 TO MH5-
21	20	152.928	0.00	40.46	0.00	0.00	33.38	0.0	11.2	6.5	217.8	282.2	12.44	60	1.00	459.55	461.08	463.70	465.27	472.74	474.62	MH5-21 TO MH5-
22	21	128.398	0.00	34.92	0.00	0.00	28.45	0.0	11.0	6.6	186.7	212.7	12.48	54	1.00	461.18	462.46	465.27	466.40	474.62	476.48	MH5-22 TO MH5-

Project File: STRM-NTWK-05-50-YR-FULL-BUILD.stm

Number of lines: 153

Run Date: 2/23/2023

NOTES:Intensity = 65.86 / (Inlet time + 10.50) ^ 0.75; Return period =Yrs. 50 ; c = cir e = ellip b = box

Standard E&S Worksheet #11
Channel Design Data

PROJECT NAME:	SMITHFIELD GATEWAY		
LOCATION:	SMITHFIELD TOWNSHIP, MONROE COUNTY, PA		
PREPARED BY:	MJV	DATE:	2/23/2023
CHECKED BY:	TH	DATE:	2/23/2023

CHANNEL OR CHANNEL SECTION		PROPOSED STREAM 5				
TEMPORARY OR PERMANENT	**(T OR P)**	P				
DESIGN STORM	**(2,5, OR 10 YR)**	25				
ACRES	**(AC)**					
MULTIPLIER	**(1.6, 2.25, OR 2.75)[1]**					
Q_r (REQUIRED CAPACITY)	**(CFS)**	399.90				
Q (CALCULATED AT FLOW DEPTH d)	**(CFS)**	413.43				
PROTECTIVE LINING[2,6]		Contech ArmorFlex 40-T				
n (MANNING'S COEFFICIENT)[2,7,8]		0.025				
V_a (ALLOWABLE VELOCITY)[6]	**(FPS)**					
V (CALCULATED AT FLOW DEPTH d)	**(FPS)**	26.99				
τ_a (MAX ALLOWABLE SHEAR STRESS)[6]	**(LB/FT^2)**	25.00				
τ_d (CALC'DSHEAR STRESS AT FLOW DEPTH d)	**(LB/FT^2)**	16.55				
CHANNEL BOTTOM WIDTH	**(FT)**	14.00				
CHANNEL SIDE SLOPES	**(H:V)**	3.00				
D (TOTAL DEPTH)	**(FT)**	3.00				
CHANNEL TOP WIDTH @ D	**(FT)**	32.00				
d (CALCULATED FLOW DEPTH)[9]	**(FT)**	0.91				
CHANNEL TOP WIDTH @ d	**(FT)**	19.49				
BOTTOM WIDTH: FLOW DEPTH RATIO	**(12:1 MAX)**	2.23				
d_{50} STONE SIZE	**(IN)**	-				
A (CROSS-SECTIONAL AREA)	**(SQ. FT.)**	15.32				
R (HYDRAULIC RADIUS)		0.77				
S (BED SLOPE)[3]	**(FT/FT)**	0.2900				
S_c (CRITICAL SLOPE)	**(FT/FT)**	0.010				
.7S_c	**(FT/FT)**	0.007				
1.3S_c	**(FT/FT)**	0.013				
STABLE FLOW?	**(Y/N)**	NO				
FREEBOARD BASED ON UNSTABLE FLOW	**(FT)**	1.842				
FREEBOARD BASED ON STABLE FLOW	**(FT)**	-				
MINIMUM REQUIRED FREEBOARD[4]	**(FT)**	0.75				
DESIGN METHOD FOR PROTECTIVE LINING[5] VELOCITY (V) OR SHEAR STRESS (S)	**PERMISSIBLE**	S				

Notes:

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter “N/A” and attach E&S Worksheets 9 and 10. For TR-55 enter “N/A” and attach appropriate Worksheets.
2. Adjust “n” value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater.
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.
6. The specified allowable velocity and maximum allowable shear stress for Contech ArmorFlex 40T interlocking concrete blocks taken from manufacturer.
7. Manning's "n" value for riprap-lined channels taken from Figure 6.2 of the PA Erosion and Sediment Pollution Control Program Manual, dated March 2012. Depth of Flow taken from Hydraflow Express calculations.
8. Manning's "n" value for ArmorFlex interlocking concrete blocks referenced from manufacturer's Hydraulic Analysis calculations.
9. Calculated flow depth taken from manufacturer's Hydraulic Analysis calculations.
10. Required capacity "Q" for Stream 5 taken from Hydraflow Storm Sewers conveyance calculations for HW5-1 for the proposed 25-year storm event for the full project build-out design.

Factor of Safety
Hydraulic Analysis

These calculations are an application of the Moment Stability Analysis technique presented in Julien (2010) a
as illustrated in the NCMA Manual (2010), listed in the References.
The factor of safety method is used in the selection of block sizes for ACB's for revetments or bed armor.
The following assumes that hydraulic testing has been performed for the block system to quantify a
critical shear stress; the use of Manning's equation conservatively assumes normal depth and critical velocity

References
1. Julien, Pierre Y. (2010) "Erosion and Sedimentation", 2nd Edition, Cambridge University Press

2. National Concrete Masonry Association (2010), "Design Manual for Articulating Concrete Block (ACB) Revetment Systems", NCMA Publication TR220A.

3. USDOT Federal Highway Administration Hydraulic Engineering Circular No. 15, Third Edition (2005) "Design of Roadside Channels with Flexible Linings", National Highway Institute.

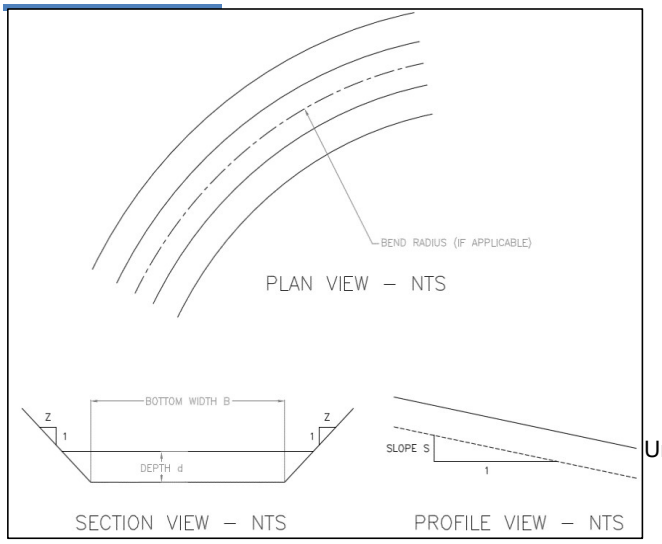
4. Cox, A.L. (2010), "Moment Stability Analysis Method for Determining Safety Factors for Articulated Concrete Blocks", Ph.D. Dissertation, Colorado State University

5. ASTM D 7276 & D7277 Testing and Analysis Compliant

Merlin 679283

Factor of Safety
Hydraulic Analysis

Project Data



Channel Bottom Width, B	14	ft	
Bed Slope, S_o	0.2900	ft/ft	
Friction Slope, S	0.2900	ft/ft	
Left Side Slope, Z_L	3	(_H:1V)	n/a
Right Side Slope, Z_R	3	(_H:1V)	n/a
Bend Radius, r	0	ft	
Depth of Flow d	0.91	ft	

The Depth of Flow is varied iteratively to obtain a given volumetric flow rate.

Top Surface Width ,T	19.49	ft

Other Constants		
Unit Weight of Water, γ	62.4	pcf
Unit Wt. of Concrete, Dry-Cast	130	pcf
Sp. Gr. Of Concrete, S_c	2.083	--
Gravitational Constant, g	32.2	ft/s^2

Calculated Channel Geometry Factors

Flow Area, A	15.32	ft^2
Wetted Perimeter, P	19.79	ft
Hydraulic Radius = R_H = A/P =	0.77	ft
Bend Coefficient, K_b	1	--
Froude Number, Fr	4.97	--
Flow Type	Supercritical	

Volumetric Flow Rate, Q: 413.43 cfs

The Volumetric Flow Rate is determined using Manning's equation:

$$Q = 1.486 / (n * A * R^{2/3} * S^{1/2})$$

Velocity, V: 26.99 ft/sec

		sin	cos	tan
Largest Side Slope Angle, θ_1	18.435 °	0.316	0.949	0.333
Bed Slope Angle, θ_0	16.172 °	0.279	0.960	0.290

ArmorFlex Block parameters

Class	40-T
SF	1.5

ϑ_1	0.198	ft	A_B	1.1
ϑ_2	0.725	ft	C_L	0.00834
ϑ_3	0.396	ft	Weight	58.1 lbs
ϑ_4	0.725	ft	Width	1.292 ft
ϑ_5	0.646		τ_c	25.0 psf
ϑ_6	0.646		ΔZ	0.0 in
ϑ_7	0.971		n	0.025 --
ϑ_8	0.971			

ARMORTEC
Erosion Control Solutions

Factor of Safety
Hydraulic Analysis

Detailed Calculations REFERENCE

Flow Area, $A = A_L + A_B + A_R$

$A_L = ½ * d^2 * Z_L =$	1.26	ft^2
$A_B = B * d =$	12.81	ft^2
$A_R = ½ * d^2 * Z_R =$	1.26	ft^2
$A =$	15.32	ft^2

Wetted Perimeter, $P = P_L + P_B + P_R$

$P_L = d * (Z_L^2 + 1)^{0.5} =$	2.89	ft
$P_B = B =$	14	ft
$P_R = d * (Z_R^2 + 1)^{0.5} =$	2.89	ft
$P =$	19.79	ft

Volumetric Flow Rate, Q

$Q = 1.486 / n * A * R_H^{2/3} * S^{1/2} =$	413.43	cfs	(Ref. 3 Eqn. 2.1)

Compute Factor of Safety Parameters

Submerged Weight, W_s	$W_s = W * ((S_c - 1) / S_c) =$	30.22	lb	(Ref. 2 Eqn 4.13a)
Applied Shear Stress, τ_o	$\tau_o = \gamma * d * S_o =$	16.55	psf	(Ref. 3 Eqn. 2.4)

Bend Coefficient Calculation

X = r/B = (Constrained to between 1.984 and 10)	1.984	--	
Calculated $K_b = 2.38\text{-}0.206(X)+0.0073(X)^2 =$	2.00	--	(Ref. 3 Eqn. 3.7)
Constrained K_b: $1.05 \le K_b \le 2 \rightarrow$	1.00		

(If no bend radius is present, $K_b = 1$)

(Design Shear Stress)	$\tau_o = K_b \gamma y \sin(\tan^{-1} S_o) =$	15.90	lbs/ft^2	(Ref. 3 Eqn 3.1 & 3.6)

Calculate Cox Parameters

	$\beta = \cos^{-1}((b/2)/\vartheta_8) =$	48.31	°	
$\sin\beta =$ 0.747	$\cos\beta =$	0.665		
	$W_{SX} = W_S * \sin\theta_0$	8.42	lb	(Ref. 4. Eqn. 7.1)
	$\theta_2 = \tan^{-1}(\tan\theta_1 * \cos\theta_0)$	17.752	°	(Ref. 4. Eqn. 7.3)
	$W_{SY} = W_S * \cos\theta_0 * \cos\theta_2$	27.64	lb	(Ref. 4. Eqn. 7.2)
	$W_{SZ} = W_S * \cos\theta_0 * \sin\theta_2$	8.85	lb	(Ref. 4. Eqn. 7.4)
	Applied $F_D = \tau_0 * A_B =$	17.82	lbs	(Ref. 4. Eqn. 7.10)
	Applied $F_L = 0.5 * C_{BL} * \rho * A_B * V^2 =$	6.60	lbs	(Ref. 4. Eqn. 7.11)
	$F_L' = F_D' = 0.5 \Delta Z b \rho V_{des}^2 =$	0.00	lbs	(Ref. 4. Eqn. 7.12)

$SF_M = (\vartheta_7 * W_{SY}) / [(\vartheta_1 * (W_{SX} * \sin\beta + W_{SZ} * \cos\beta)) + (\vartheta_3 * (F_D + F_D') * \sin\beta) + (\vartheta_8 * (F_L + F_L'))] =$

1.91 (Ref. 4. Eqn. 7.18)

$SF_P = (\vartheta_2 * W_{SY}) / [(\vartheta_1 * W_{SX}) + (\vartheta_3 * (F_D + F_D')) + (\vartheta_4 * (F_L + F_L'))] =$

1.48 (Ref. 4. Eqn. 7.20)

$SF_O = (\vartheta_5 * W_{SY}) / [(\vartheta_1 * W_{SZ}) + (\vartheta_6 * (F_L + F_L'))] =$

2.97 (Ref. 4. Eqn. 7.22)

$SF_{BED} = (\vartheta_2 * W_S * \cos\theta_0) / [(\vartheta_1 * (W_S * \sin\theta_0)) + (\vartheta_3 * (F_D + F_D')) + (\vartheta_4 * (F_L + F_L'))] =$

1.56 (Ref. 4. Eqn. 7.28)

Factor of Safety
Hydraulic Analysis

Parameters for Factor of Safety Calculations													
Block Class	Block Area	ϑ_1	ϑ_2	ϑ_3	ϑ_4	ϑ_5	ϑ_6	ϑ_7	ϑ_8	τ_c 0°	Width	Weight	Lift Coeff. C_L
	(SF)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(psf)	(ft)	(lbs)	
30-S	0.68	0.198	0.542	0.396	0.542	0.483	0.483	0.726	0.726	5.180	0.967	32.89	0.11045
40	1.23	0.198	0.725	0.396	0.725	0.646	0.646	0.971	0.971	11.200	1.292	59.02	0.04563
40-L	1.93	0.198	0.725	0.396	0.725	0.983	0.983	1.222	1.222	19.460	1.967	97.18	0.02455
40-T	1.12	0.198	0.725	0.396	0.725	0.646	0.646	0.971	0.971	25.022	1.292	58.12	0.00834
45	1.49	0.198	0.725	0.396	0.725	0.646	0.646	0.971	0.971	13.530	1.292	71.25	0.04563
45-L	2.31	0.198	0.725	0.396	0.725	0.983	0.983	1.222	1.222	21.860	1.967	109.15	0.02455
45-S	0.83	0.198	0.542	0.396	0.542	0.483	0.483	0.726	0.726	6.170	0.967	39.20	0.11045
50	1.23	0.250	0.725	0.500	0.725	0.646	0.646	0.971	0.971	13.610	1.292	76.29	0.04563
50-L	1.93	0.250	0.725	0.500	0.725	0.983	0.983	1.222	1.222	22.050	1.967	116.02	0.02455
50-S	0.68	0.250	0.542	0.500	0.542	0.483	0.483	0.726	0.726	6.130	0.967	42.03	0.11045
50-T	1.12	0.250	0.725	0.500	0.725	0.646	0.646	0.971	0.971	30.500	1.292	75.39	0.00834
55	1.49	0.250	0.725	0.500	0.725	0.646	0.646	0.971	0.971	16.290	1.292	91.37	0.04563
55-L	2.31	0.250	0.725	0.500	0.725	0.983	0.983	1.222	1.222	26.280	1.967	138.29	0.02455
55-S	0.83	0.250	0.542	0.500	0.542	0.483	0.483	0.726	0.726	7.330	0.967	50.25	0.11045
60	1.23	0.313	0.725	0.625	0.725	0.646	0.646	0.971	0.971	15.490	1.292	93.17	0.04563
60-T	1.12	0.313	0.725	0.625	0.725	0.646	0.646	0.971	0.971	35.200	1.292	93.42	0.00834
70	1.23	0.354	0.725	0.708	0.725	0.646	0.646	0.971	0.971	17.730	1.292	113.90	0.04563
70-L	1.93	0.354	0.725	0.708	0.725	0.983	0.983	1.222	1.222	29.520	1.967	174.46	0.02455
70-T	1.12	0.354	0.725	0.708	0.725	0.646	0.646	0.971	0.971	38.500	1.292	108.96	0.00834
75	1.49	0.313	0.725	0.625	0.725	0.646	0.646	0.971	0.971	18.620	1.292	112.02	0.04563
85	1.49	0.354	0.725	0.708	0.725	0.646	0.646	0.971	0.971	21.100	1.292	135.60	0.04563
85-L	2.31	0.354	0.725	0.708	0.725	0.983	0.983	1.222	1.222	35.060	1.967	207.23	0.02455

	A_B	ϑ_1	ϑ_2	ϑ_3	ϑ_4	ϑ_5	ϑ_6	ϑ_7	ϑ_8	τ_c 0°	Width	Weight	Lift Coeff. C_L
40-T	1.121	0.198	0.725	0.396	0.725	0.646	0.646	0.971	0.971	25.022	1.292	58.120	0.00834

POINT OF ANALYSIS ABC (POA-ABC)

TOTAL CONTRIBUTING WATERSHED TO UNNAMED TRIBUTARY TO BRODHEAD CREEK

EXISTING HYDROGRAPHS

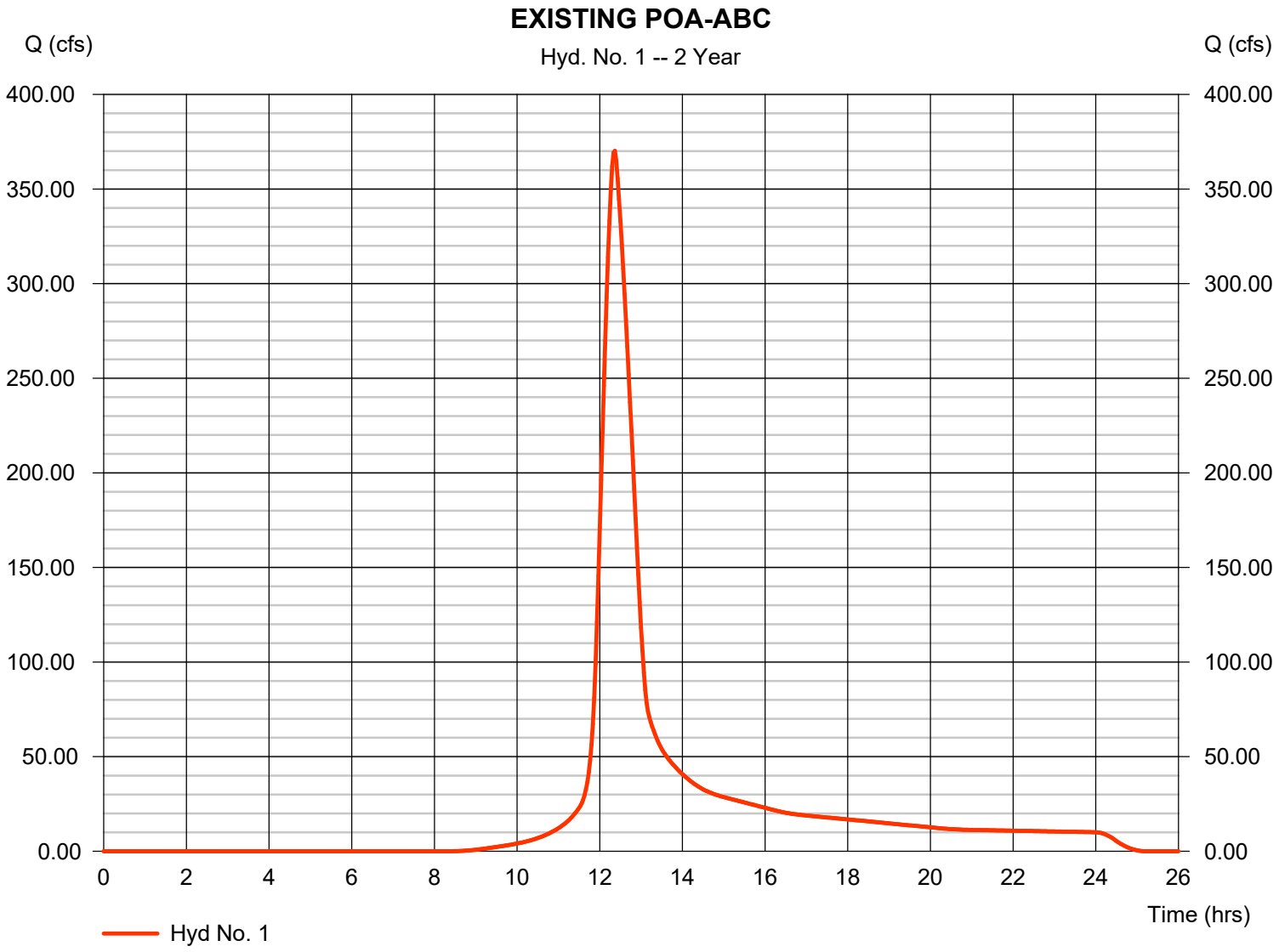
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 1

EXISTING POA-ABC

Hydrograph type	=	SCS Runoff	Peak discharge	=	370.16 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.37 hrs
Time interval	=	2 min	Hyd. volume	=	1,994,612 cuft
Drainage area	=	324.570 ac	Curve number	=	83
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	44.50 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

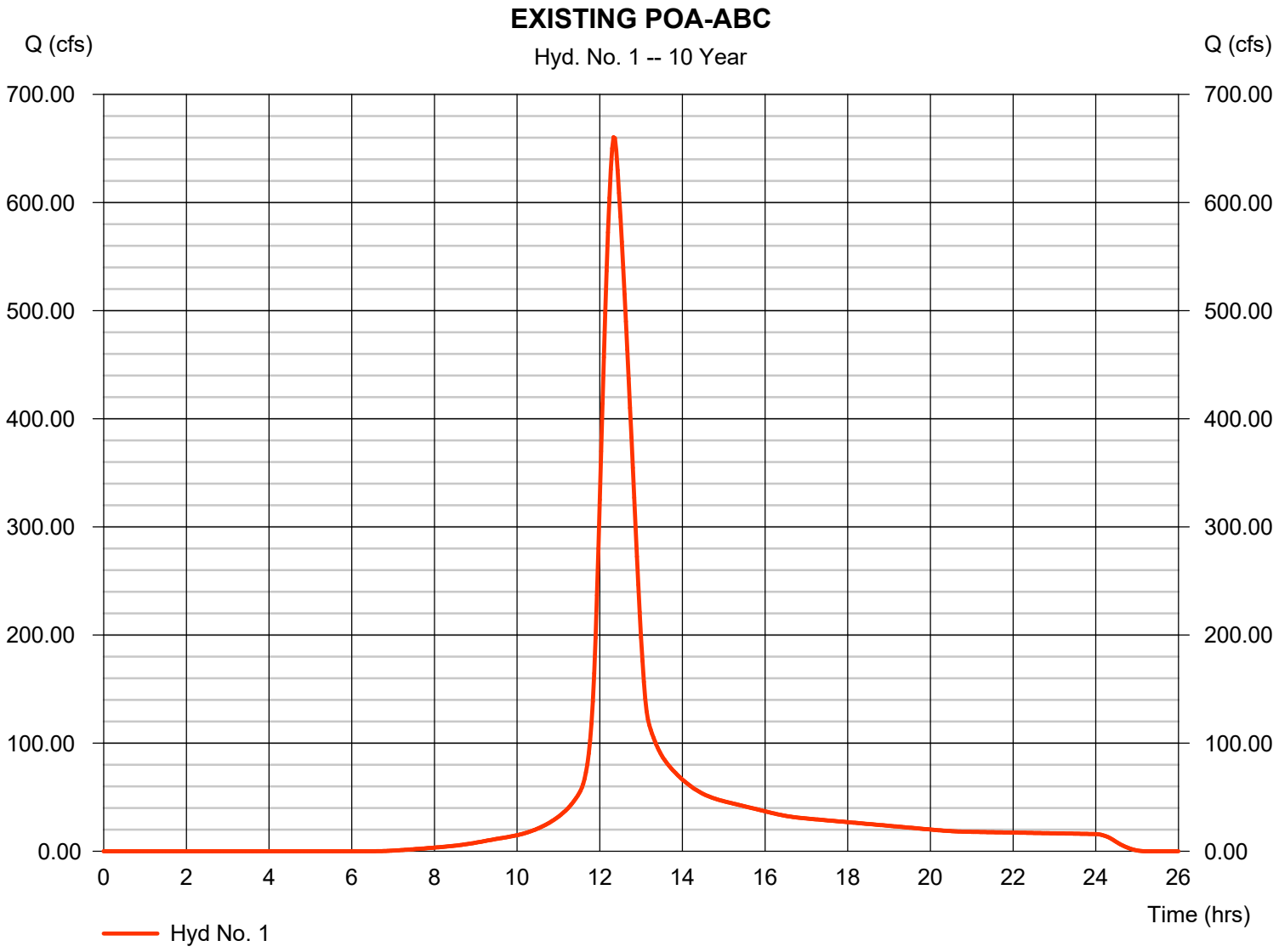


Hydrograph Report

Hyd. No. 1

EXISTING POA-ABC

Hydrograph type	=	SCS Runoff	Peak discharge	=	660.38 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.33 hrs
Time interval	=	2 min	Hyd. volume	=	3,537,691 cuft
Drainage area	=	324.570 ac	Curve number	=	83
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	44.50 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

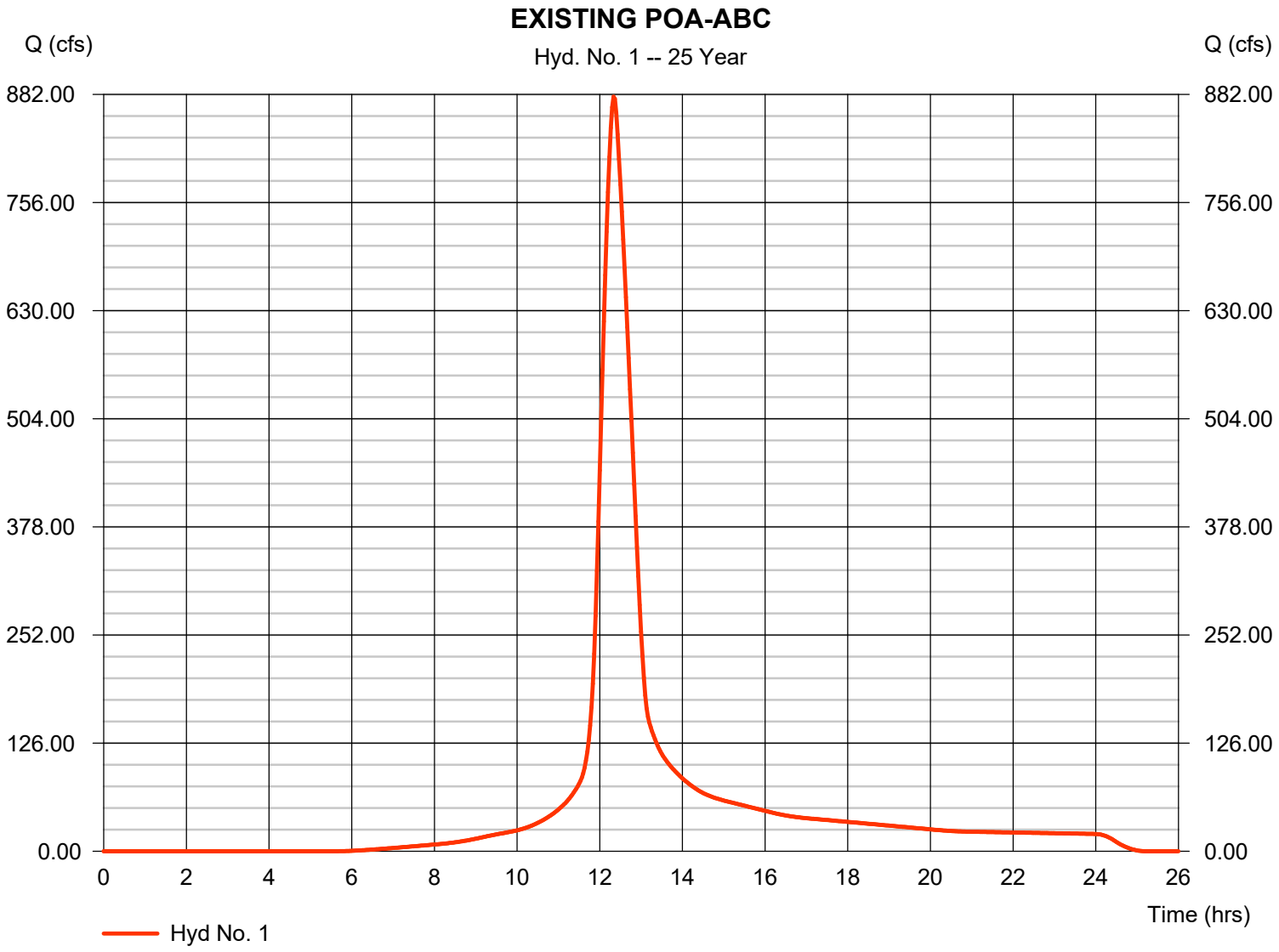


Hydrograph Report

Hyd. No. 1

EXISTING POA-ABC

Hydrograph type	=	SCS Runoff	Peak discharge	=	879.27 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.33 hrs
Time interval	=	2 min	Hyd. volume	=	4,723,205 cuft
Drainage area	=	324.570 ac	Curve number	=	83
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	44.50 min
Total precip.	=	5.95 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

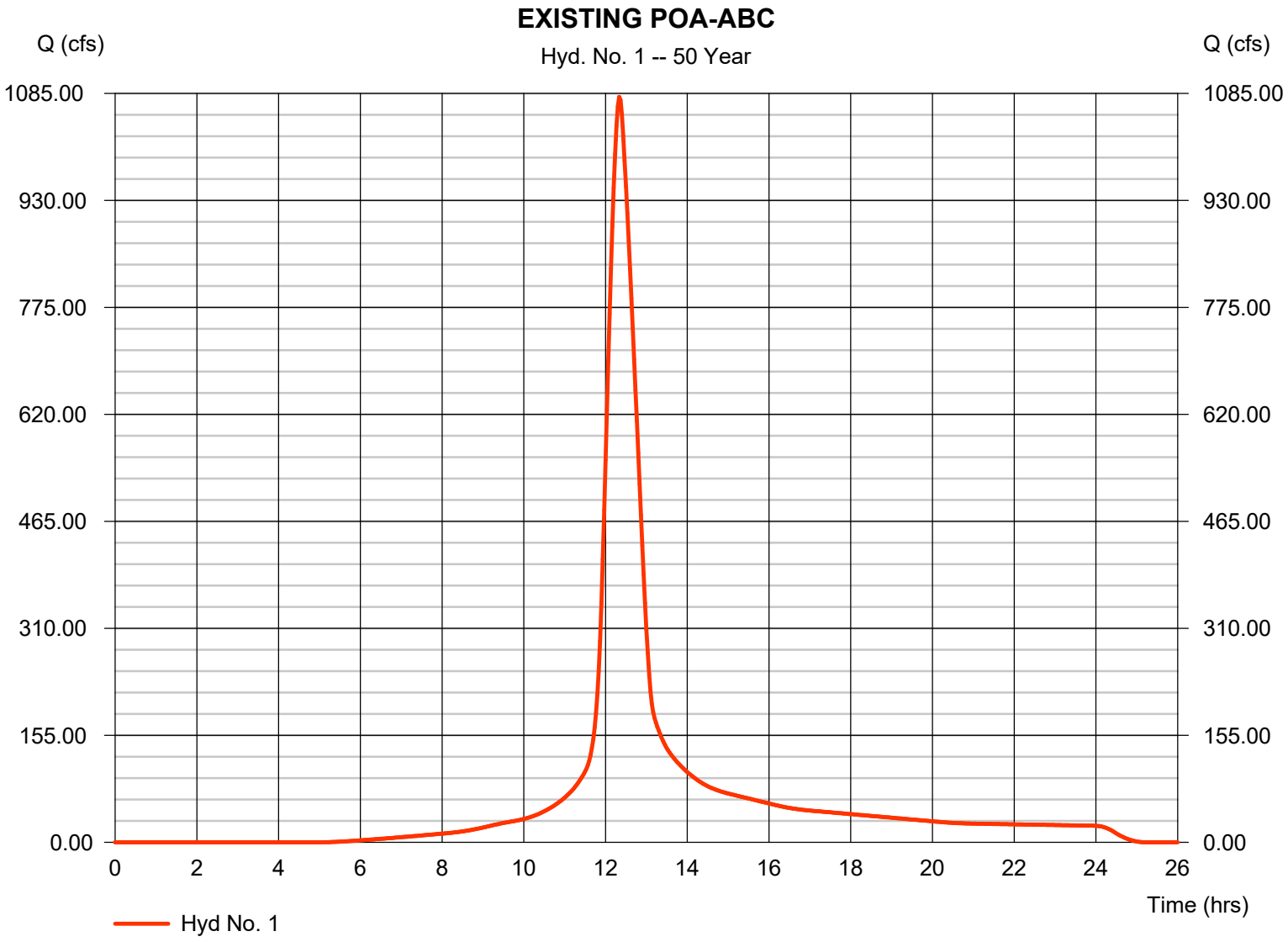


Hydrograph Report

Hyd. No. 1

EXISTING POA-ABC

Hydrograph type	= SCS Runoff	Peak discharge	= 1079.92 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.33 hrs
Time interval	= 2 min	Hyd. volume	= 5,826,729 cuft
Drainage area	= 324.570 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 44.50 min
Total precip.	= 6.96 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

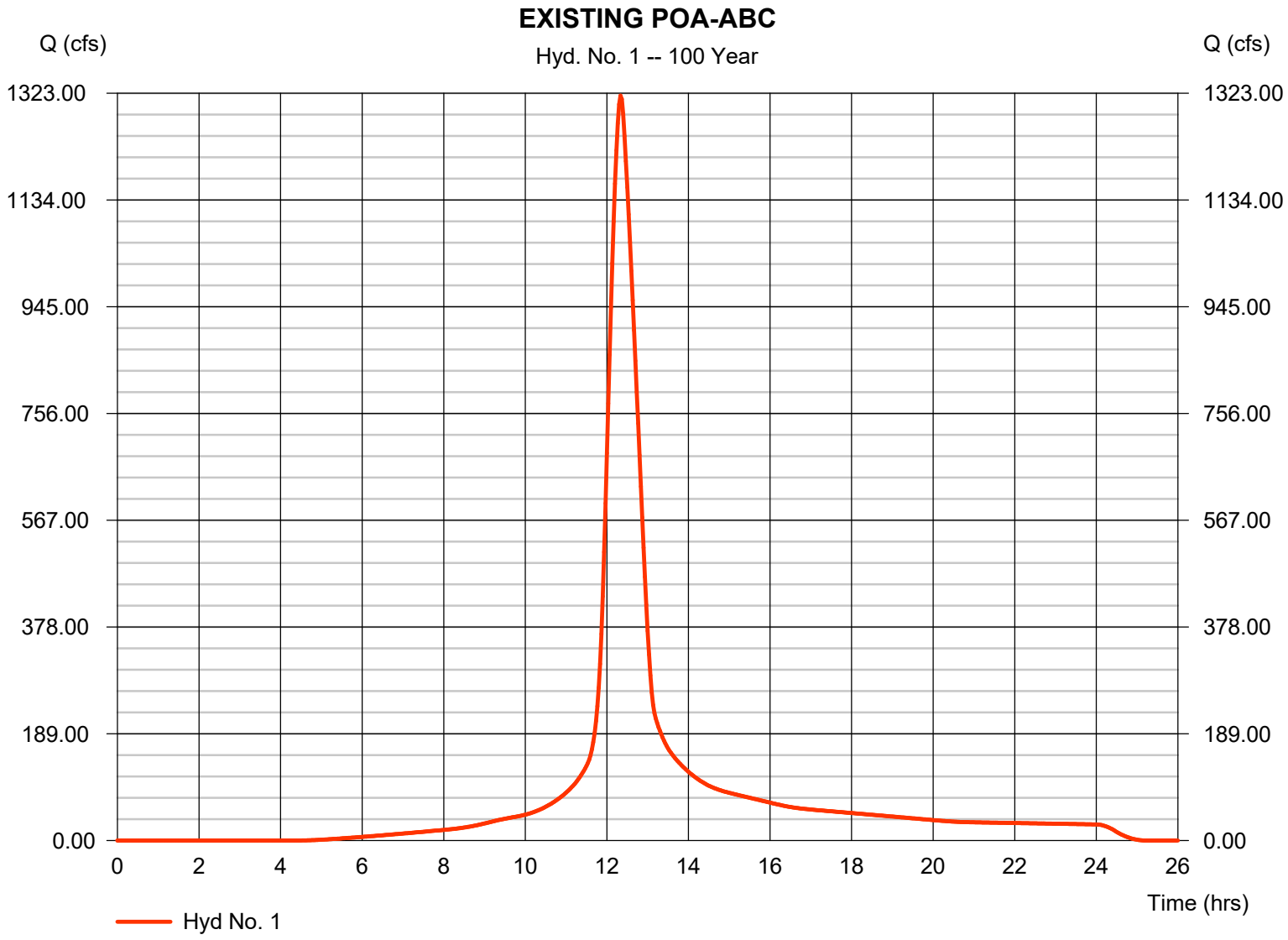


Hydrograph Report

Hyd. No. 1

EXISTING POA-ABC

Hydrograph type	=	SCS Runoff	Peak discharge	=	1318.69 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.33 hrs
Time interval	=	2 min	Hyd. volume	=	7,158,162 cuft
Drainage area	=	324.570 ac	Curve number	=	83
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	44.50 min
Total precip.	=	8.16 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



PROPOSED HYDROGRAPHS

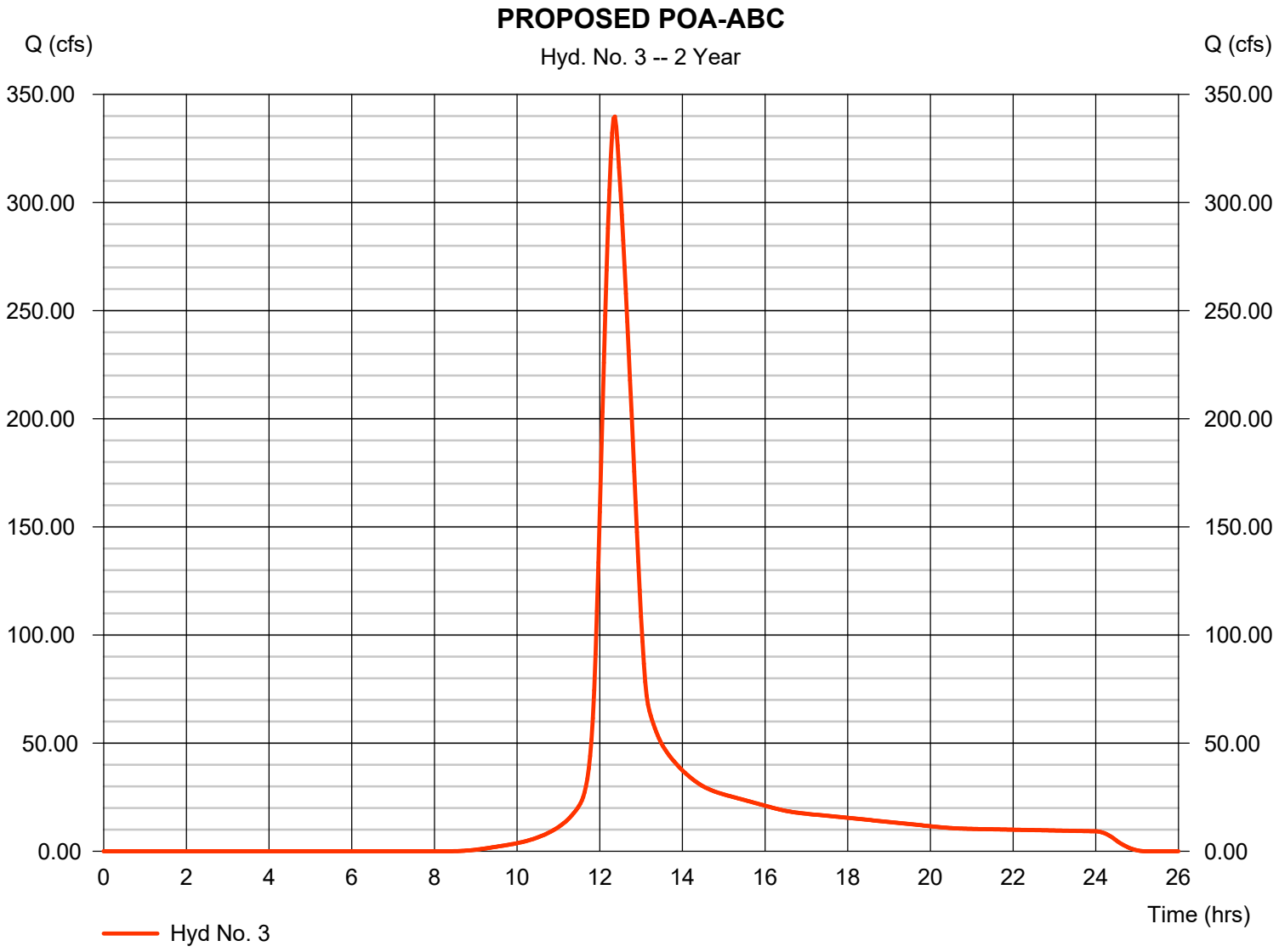
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 12 / 11 / 2020

Hyd. No. 3

PROPOSED POA-ABC

Hydrograph type	=	SCS Runoff	Peak discharge	=	339.76 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.37 hrs
Time interval	=	2 min	Hyd. volume	=	1,830,775 cuft
Drainage area	=	297.910 ac	Curve number	=	83
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	44.50 min
Total precip.	=	3.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

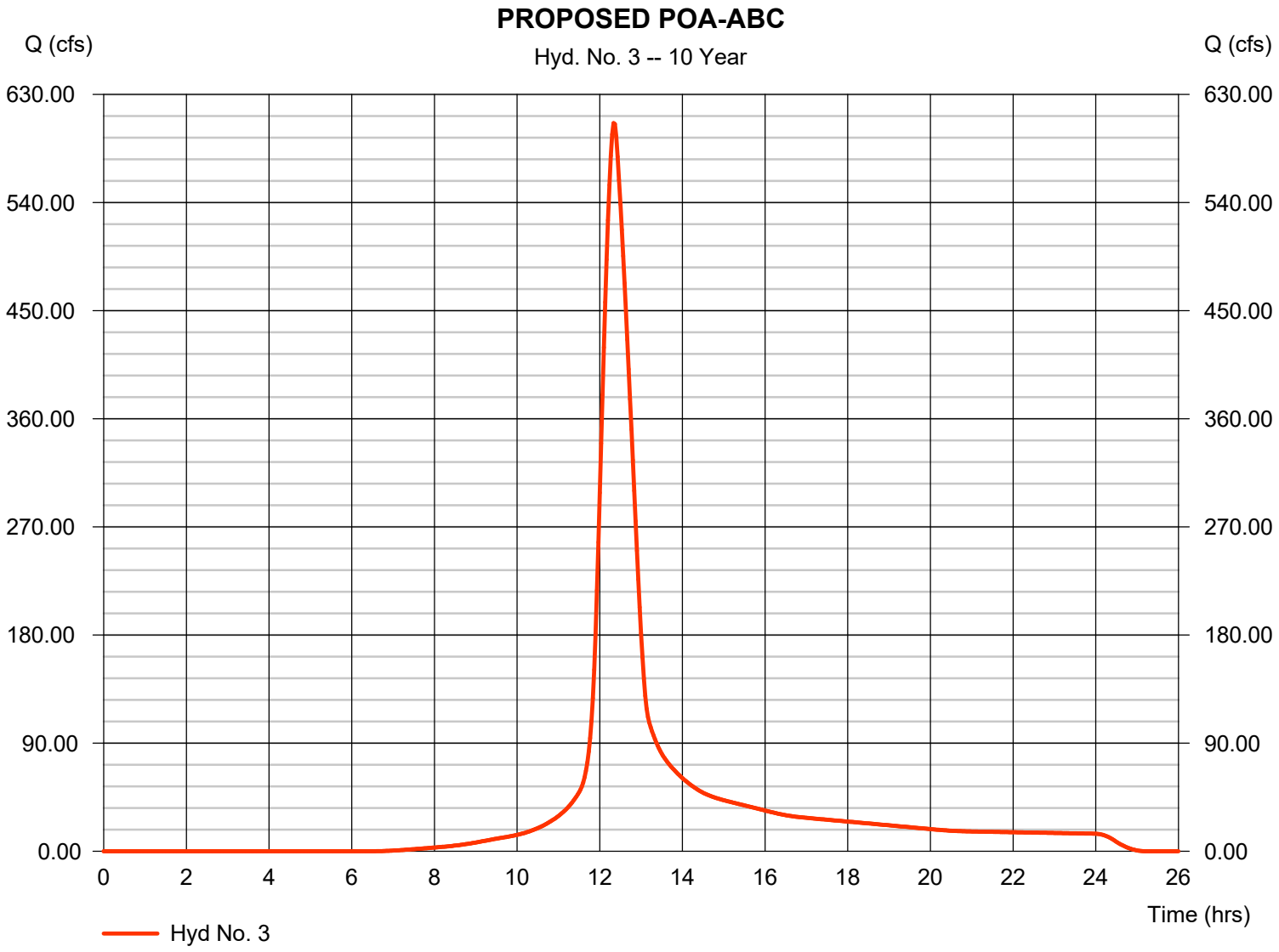


Hydrograph Report

Hyd. No. 3

PROPOSED POA-ABC

Hydrograph type	=	SCS Runoff	Peak discharge	=	606.14 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.33 hrs
Time interval	=	2 min	Hyd. volume	=	3,247,109 cuft
Drainage area	=	297.910 ac	Curve number	=	83
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	44.50 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

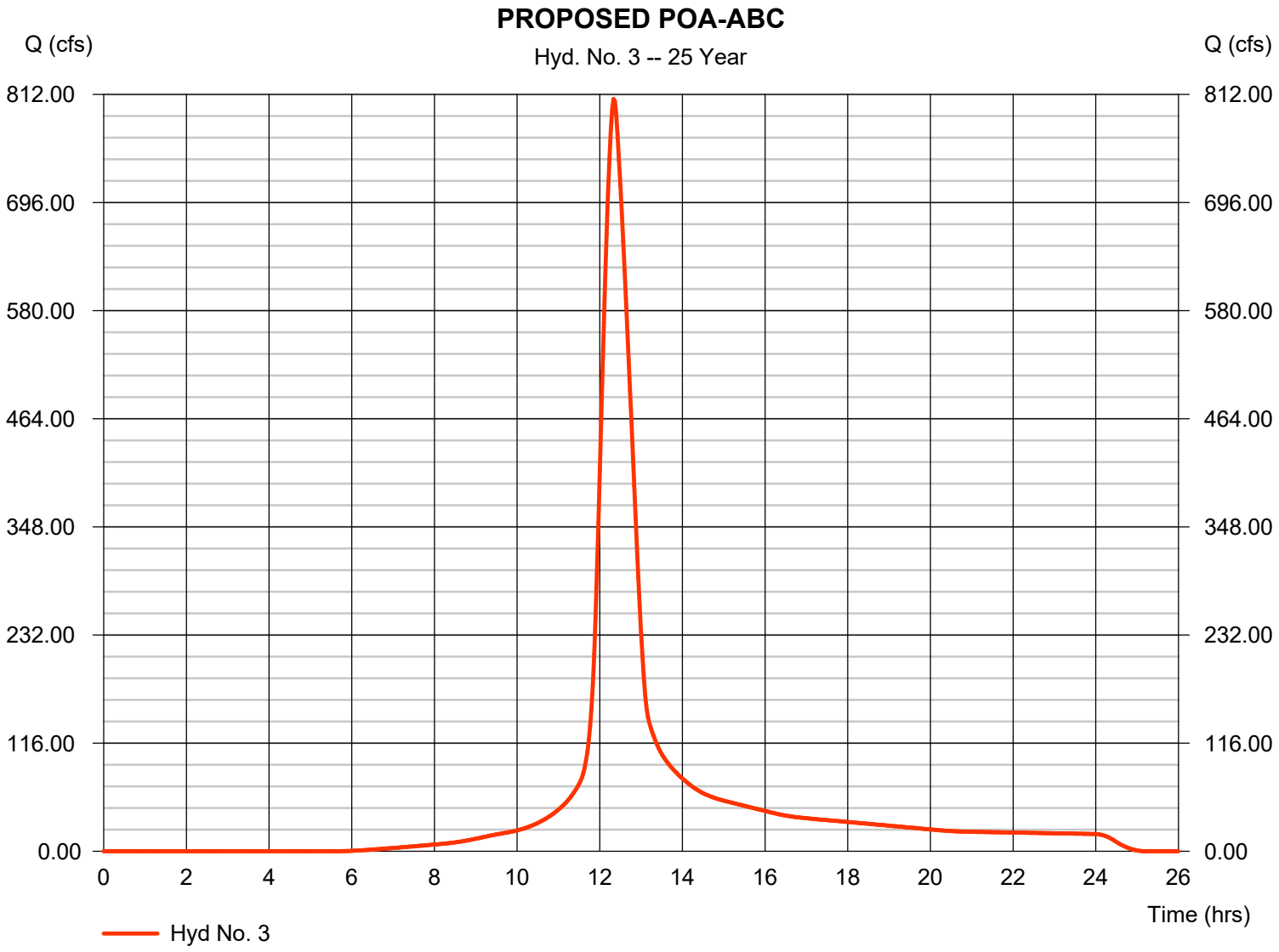


Hydrograph Report

Hyd. No. 3

PROPOSED POA-ABC

Hydrograph type	= SCS Runoff	Peak discharge	= 807.05 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.33 hrs
Time interval	= 2 min	Hyd. volume	= 4,335,245 cuft
Drainage area	= 297.910 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 44.50 min
Total precip.	= 5.95 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

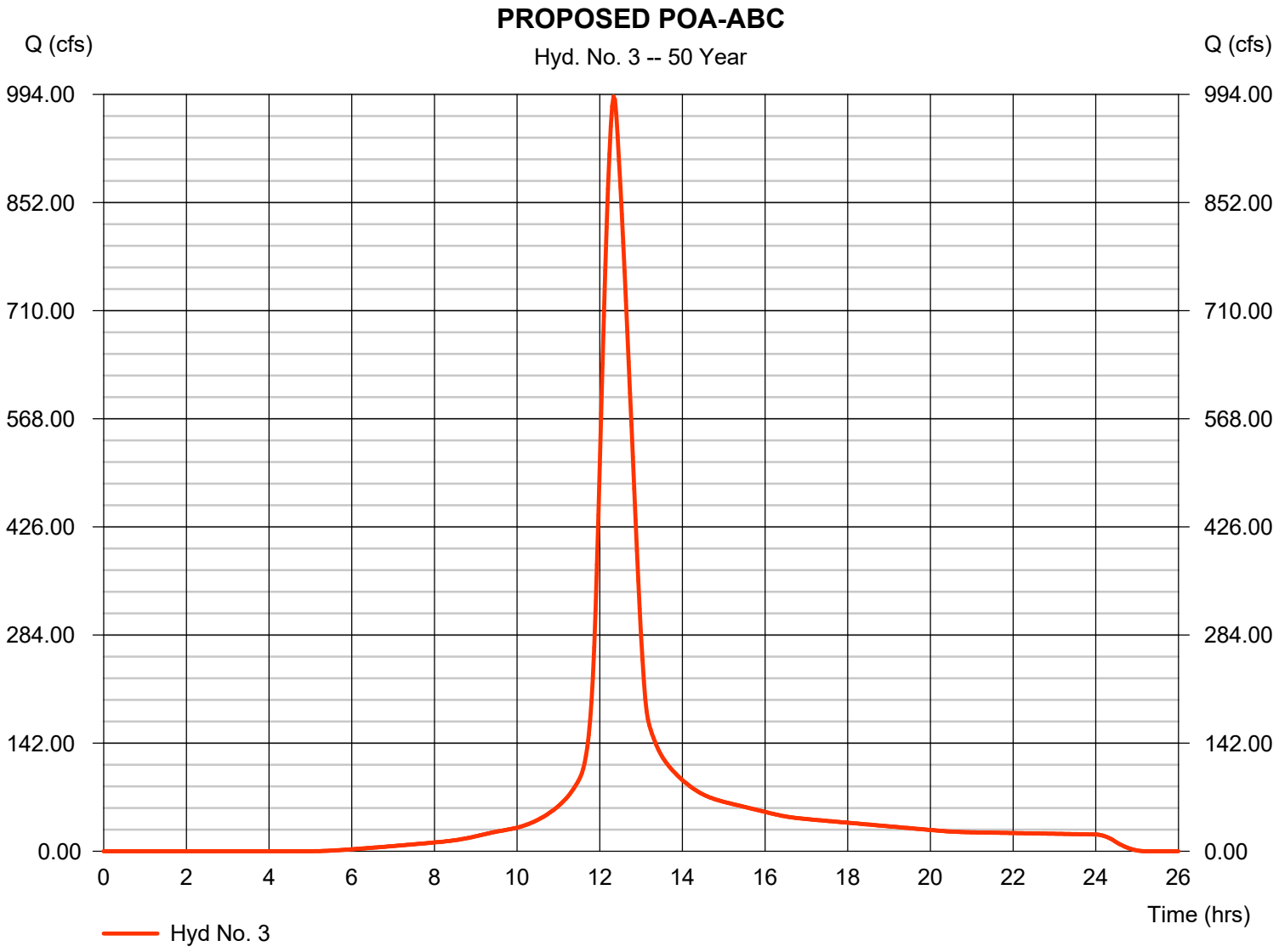


Hydrograph Report

Hyd. No. 3

PROPOSED POA-ABC

Hydrograph type	=	SCS Runoff	Peak discharge	=	991.22 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.33 hrs
Time interval	=	2 min	Hyd. volume	=	5,348,127 cuft
Drainage area	=	297.910 ac	Curve number	=	83
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	44.50 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

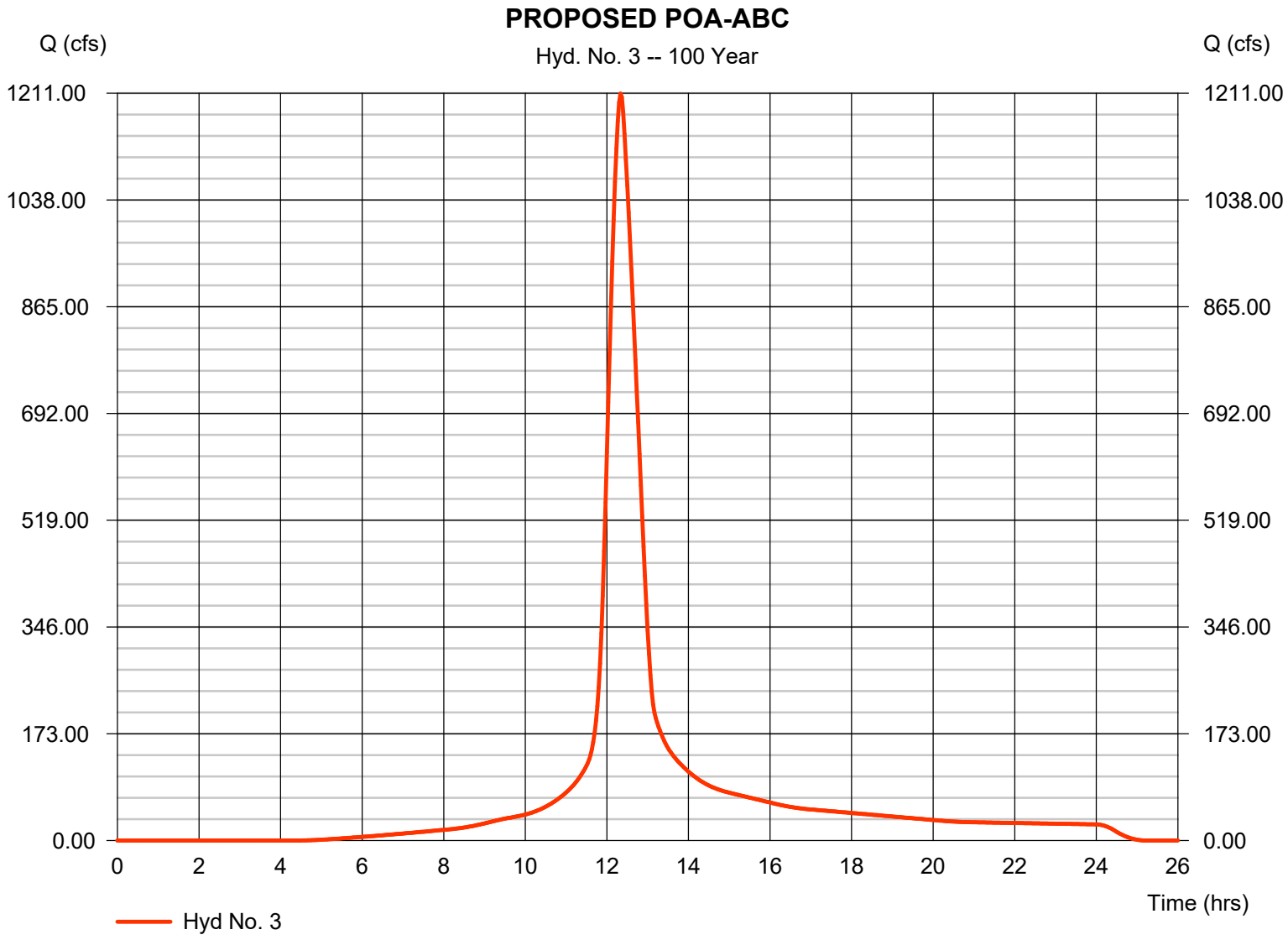


Hydrograph Report

Hyd. No. 3

PROPOSED POA-ABC

Hydrograph type	= SCS Runoff	Peak discharge	= 1210.38 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.33 hrs
Time interval	= 2 min	Hyd. volume	= 6,570,197 cuft
Drainage area	= 297.910 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 44.50 min
Total precip.	= 8.16 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



SUMMARY

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	370.16	2	742	1,994,612	------	------	------	EXISTING POA-ABC
3	SCS Runoff	339.76	2	742	1,830,775	------	------	------	PROPOSED POA-ABC

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	660.38	2	740	3,537,691	------	------	------	EXISTING POA-ABC
3	SCS Runoff	606.14	2	740	3,247,109	------	------	------	PROPOSED POA-ABC

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	879.27	2	740	4,723,205	------	------	------	EXISTING POA-ABC
3	SCS Runoff	807.05	2	740	4,335,245	------	------	------	PROPOSED POA-ABC

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	1079.92	2	740	5,826,729	------	------	------	EXISTING POA-ABC
3	SCS Runoff	991.22	2	740	5,348,127	------	------	------	PROPOSED POA-ABC

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	1318.69	2	740	7,158,162	------	------	------	EXISTING POA-ABC
3	SCS Runoff	1210.38	2	740	6,570,197	------	------	------	PROPOSED POA-ABC

POA-ABC UNNAMED TRIBUTARY BIOLOGICAL AND PHYSICAL CONDITIONS ASSESSMENT LETTER

December 19, 2017

Mr. Michael J. Wilk, PE
Monroe County Conservation District
8050 Running Valley Road
Stroudsburg, PA 18360

RE: Smithfield Gateway Project
DEPG Mosier Associates, L.P.
Smithfield Township, Monroe County, Pennsylvania
Langan Project No.: 100501401

Dear Mr. Wilk:

This letter is in response to the Monroe County Conservation District's (MCCD) Comment #15 for the Smithfield Gateway Project dated December 12, 2017. Comment #15 states:

> *"PCSM Narrative, page 30 regarding downstream analysis of UNT to Brodhead Creek: Provide evidence justifying UNT has "little function and value" or remove the statement. Also remove sentence regarding the availability of other resources for fish and macroinvertebrates. A biologist should comment on whether the reduction maintains the biologic and physical properties of the tributary."*

A field visit was conducted on December 18, 2017 for unnamed tributary (UNT) of Brodhead Creek at point of analysis ABC (POA-ABC). A Pennsylvania Riverine Condition Level 2 Rapid Assessment form was completed and the stream has a condition index of 0.70 (Attachment A). The stream is moderately entrenched and exhibits minimal erosion along its bank. The stream has an abundant amount of potential habitat cover for benthic macroinvertebrates and headwater fish species, including cobbles, boulders, woody debris, and pools. Photographs of the stream are provided in Attachment B.

A small reduction in runoff of 6.6% for a two year storm event is proposed at POA-ABC. This reduction is not significant and will not alter the biological and physical integrity of the stream. Due to the moderately entrenched characteristic of the stream, a small reduction in runoff will still allow aquatic species access to available habitat cover within the stream channel.

If you have any questions regarding the response or enclosed materials, please do not hesitate to contact me at 724-514-5107 or cday@langan.com.

Sincerely,
Langan Engineering and Environmental Services, Inc.

I.M. "Chip" Day IV, PWS
Senior Project Manager

Enclosures: Attachment A – Pennsylvania Riverine Condition Level 2 Rapid Assessment
Attachment B – Site Photographs

cc: James DePetris - DEPG Mosier Associates, L.P.
Ted Herbert, P.E., LEED-AP - Langan
John Coté, P.E., LEED-AP – Langan

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Attachment A
Pennsylvania Riverine Condition Level 2 Rapid Assessment

Riverine Assessment Form 1

Pennsylvania Riverine Condition Level 2 Rapid Assessment Protocol (Document No. 310-2137-003)

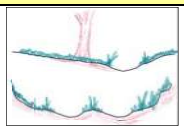
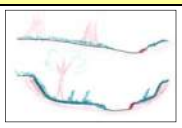
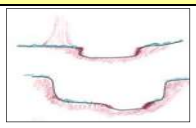
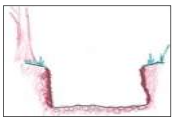
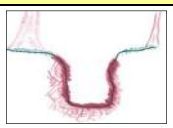
Pennsylvania Department of Environmental Protection

For use in intermittent or perennial watercourses with drainage areas ≤ 2,000 square mile drainage areas.

Project #	Project Name		Locality	Date	Ch 93 Classification		AA Id	Length
100501401	Smithfield Gateway		Monroe County	12-18-2017	Designated: TSF, MF	Existing: CWF		500 feet
Latitude	40.999117	Longitude	-75.150833	FGM Level 1 Channel Classification			B	

Evaluator(s)	Stream Name and Information	Notes:
Michael Tincher	POA-ABC (Perennial)	

1. CHANNEL/FLOODPLAIN: Assess the cross-section of the stream and prevailing conditions along the AA.

	Condition Category				
	Optimal	**Suboptimal**	**Marginal**	**Poor**	**Severe**
Channel / Floodplain	 **Channel Geometry:** These channels show very little incision or widening and little or no evidence of active erosion. Anastomosing channels may be present. **Channel Stability:** Visual indicators include: 1) the banks are not eroding along greater than 5% of the reach; 2) natural vegetative or rock stability features are present along greater than 80% of the banks; 2) stable point bars and bankfull benches may be present; 3) mid-channel bars and transverse bars are rare and if transient channel sediment deposition is present, it covers less than or equal to 10% of the stream bottom; 4) baseflow is connected to the rooting depths of vegetation in the active floodplain. **Active Floodplain Connection:** The bankfull stream flows have frequent access to the active floodplain and fully developed point bars or bankfull benches that are accessed at most flows greater than baseflow.	 **Channel Geometry:** These channels are slightly incised or overwidened and contain a few areas of active erosion. **Channel Stability:** Visual indicators include: 1) the banks are actively eroding along less than 25% of the reach; 2) depositional features such as point bars and bankfull benches are present and stable during high flows and occur along greater than 50% of the reach; 3) natural bank protection like vegetation or rock is providing stability along greater than 50% of the reach; 4) baseflow is connected to vegetated point bars and bankfull benches. **Active Floodplain Connection:** The bankfull stream flows frequently access bankfull benches, or point bars along portions of the reach and may frequently inundate the active floodplain.	 **Channel Geometry:** These channels are over-widened or incised, but to a lesser degree than the Severe and Poor channel conditions. **Channel Stability:** Visual indicators include: 1) the banks are eroding or severely undercut along greater than 25% and less than or equal to 50% of the reach; 2) depositional features like point bars or bankfull benches occur along greater than 25% and less than or equal to 50% of the reach; 3) the stream banks may consist of some vertical or undercut banks or nick points associated with head cuts; **Active Floodplain Connection:** The bankfull stream flows have infrequent connection to the active floodplain.	 **Channel Geometry:** These channels are over-widened or incised and eroding vertically and/or laterally. **Channel Stability:** Visual indicators include: 1) the banks are eroding or severely undercut along greater than 50% of the reach; 2) active or recent bank sloughing is present along greater than 50% of the reach; 3) natural bank protection like vegetation is not preventing bank erosion along the reach; 4) depositional features, such as point bars and bank full benches, are absent from the reach or newly developing along less than 25% of the reach; 5) bank full benches and point bars frequently scour during high flows; 6) baseflow is disconnected from plant rooting depths and the active floodplain. **Active Floodplain Connection:** The bankfull stream flows are not connected to the active floodplain.	 **Channel Geometry:** These channels are deeply incised and actively eroding vertically and/or laterally. Over widened channels may contain sections of unstable braided channels from aggradation. **Channel Stability:** Visual indicators include: 1) the banks are actively eroding or being undercut along greater than 80% of the reach; 2) active or recent bank sloughing is occurring along greater than 80% of the reach; 3) natural bank protection like vegetation is not preventing bank erosion or sloughing; 4) depositional features such as point bars and bankfull benches are absent; 5) flood flows are disconnected from the active floodplain. **Active Floodplain Connection:** The bankfull stream flows are never connected to the active floodplain.
SCORE	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1

Comments: Stream channel has small amounts of erosion.

CI = (Score)/20		CI
SCORE	14	0.70

2. RIPARIAN VEGETATION: Assess the floodplain along the entire AA (Visual estimates of areal coverage from aerial photos with field verification acceptable).

	Condition Category										Comments:
	Optimal	**Suboptimal**		**Marginal**		**Poor**					
Riparian Vegetation (Floodplain)	Riparian area vegetation consists of a tree stratum present (diameter at breast height (dbh) > 3 inches) with greater than or equal to 60% tree canopy cover. Areas comprised of stream channels, wetlands (regardless of classification or condition) and lacustrine resources ≥ 10 acres are scored as optimal.	**High Suboptimal:** Riparian area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory.	**Low Suboptimal:** Riparian area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover with a maintained understory.	**High Marginal:** Riparian area vegetation consists of non-maintained, dense herbaceous vegetation with either a shrub layer or a tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover.	**Low Marginal:** Riparian area vegetation consists of non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree stratum, areas of hay production, and ponds or open water areas (< 10 acres). If trees are present, tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover with maintained understory.	**High Poor:** Riparian area vegetation consists of lawns, mowed, and maintained areas, nurseries; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, pervious trails, recently seeded and stabilized, or other comparable condition.	**Low Poor:** Riparian area consists of impervious surfaces; mine spoil lands, denuded surfaces, row crops, active feed lots, impervious trails, or other comparable conditions.		
		High	Low	High	Low	High	Low				
SCORE	20 19 18 17 16	15 14 13	12 11	10 9 8	7 6	5 4 3	2 1				

1. Identify Condition Category areas along the floodplain using the descriptors above.
2. Estimate the % area within each condition category.
3. Enter the % Riparian Area in in decimal form (0.00) and Score for each category in the blocks below. Ensure the sum of the % Riparian Area Blocks equal 100

	Condition Category	Tree	Shrub	Herbaceous				Side Sub-Index	
Right Side	% Riparian Area:	60%	10%	30%	0%	0%	0%	0.75	Side Sub-Index = SUM(%Areas*Scores)/20
	Score:	15	15	15	0	0	0		
	Total Sub-score:	**9.00**	**1.50**	**4.50**	**0.00**	**0.00**	**0.00**		
	Condition Category	**Tree**	**Shrub**	**Herbaceous**					
Left Side	% Riparian Area:	60%	10%	30%	0%	0%	0%	0.75	CI = (Left Side CI + Right Side CI)/2
	Score:	15	15	15	0	0	0		
	Total Sub-score:	**9.00**	**1.50**	**4.50**	**0.00**	**0.00**	**0.00**		

CI
0.75

Riverine Assessment Form 1 - Page 2

2/4/2017

3. RIPARIAN ZONE OF INFLUENCE: Assess land cover along both sides, 100 feet from edge of floodplain into the upland along the entire AA. (rough measurements of length & width may be acceptable)

	Condition Category				Comments:
	Optimal	Suboptimal	Marginal	Poor	
Riparian ZOI	Riparian ZOI area vegetation consists of a tree stratum present (diameter at breast height (dbh) > 3 inches) with greater than or equal to 60% tree canopy cover. Areas comprised of stream channels, wetlands (regardless of classification or condition) and lacustrine resources ≥ 10 acres are scored as optimal.	**High Suboptimal:** Riparian ZOI area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory. **Low Suboptimal:** Riparian ZOI area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover with a maintained understory.	**High Marginal:** Riparian ZOI area vegetation consists of non-maintained, dense herbaceous vegetation with either a shrub layer or a tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover. **Low Marginal:** Riparian ZOI area vegetation consists of non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree stratum, areas of hay production, and ponds or open water areas (< 10 acres). If trees are present, tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover with maintained understory.	**High Poor:** Riparian ZOI area vegetation consists of lawns, mowed, and maintained areas, nurseries; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, pervious trails, recently seeded and stabilized, or other comparable condition. **Low Poor:** Riparian ZOI area consists of impervious surfaces; mine spoil lands, denuded surfaces, row crops, active feed lots, impervious trails, or other comparable conditions.	
		High / Low	High / Low	High / Low	
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	

1. Identify Condition Category areas along the floodplain using the descriptors above.
2. Estimate the % area within each condition category.
3. Enter the % Riparian Area in decimal form (0.00) and Score for each category in the blocks below. Ensure the sums of % Riparian ZOI Blocks equal 100

	Condition Category	Tree	Shrub	Herbaceous				Side Sub-Index
Right Side	% Riparian Area:	60%	10%	30%	0%	0%	0%	**0.75**
	Score:	15	15	15	0	0	0	
	Total Sub-score:	**9.00**	**1.50**	**4.50**	**0.00**	**0.00**	**0.00**	
	Condition Category	**Tree**	**Shrub**	**Herbaceous**				
Left Side	% Riparian Area:	60%	10%	30%	0%	0%	0%	**0.75**
	Score:	15	15	15	0	0	0	
	Total Sub-score:	**9.00**	**1.50**	**4.50**	**0.00**	**0.00**	**0.00**	

Side Sub-Index = SUM(%Areas*Scores)/20

CI = (Left Side CI + Right Side CI)/2	CI
	0.75

4. INSTREAM HABITAT: Varied substrate sizes, water velocity and depths, woody and leafy debris, stable substrate, low embeddedness, shade, undercut banks, root mats, SAV, macrophytes, emergent vegetation, riffle-pool complexes, stable features.

	Condition Category				Comments:	
	Optimal	Suboptimal	Marginal	Poor		
Instream Habitat/ Available Cover	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 50% of the reach. Substrate is favorable for colonization by a diverse and abundant epifaunal community, and there are many suitable areas for epifaunal colonization and/or fish cover.	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 30% and less than 50% of the reach. Conditions are mostly desirable and are generally suitable for full colonization by a moderately diverse and abundant epifaunal community.	Physical Elements that enhance a stream's ability to support aquatic organisms are present in greater than or equal to 10% and less than 30% of the reach. Conditions are generally suitable for partial colonization by epifaunal and/or fish communities.	Physical Elements that enhance a stream's ability to support aquatic organisms are present in less than 10% of the reach. Conditions are generally unsuitable for colonization by epifaunal and/or fish communities. The reach.		
					CI = (Score)/20	**CI**
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	**SCORE 12**	**0.60**

5. CHANNEL ALTERATION: Stream crossings, riprap, concrete, gabions, or concrete blocks, straightening of channel/channelization, embankments, spoil piles, constrictions, etc.

	Condition Category				Comments: Two culverts/small bridges are present.	
	Negligible	Minor	Moderate	Severe		
Channel Alteration	Channel alterations listed above are absent in the SAR. The stream has unaltered pattern or has normalized.	**Minor High:** Less than or equal to 20% of the stream reach is disrupted by any of the channel alterations listed above. Alteration or channelization present, usually adjacent to structures, (such as bridge abutments or culverts); evidence of past alteration, (i.e., channelization) may be present, but stream pattern and stability have recovered; recent alteration is not present. **Minor Low:** Greater than 20% and less than or equal to 40% of the stream reach is disrupted by any of the channel alterations listed above. Alteration or channelization present, usually adjacent to structures, (such as bridge abutments or culverts); evidence of past alteration, (i.e., channelization) may be present, but stream pattern and stability have recovered; recent alteration is not present.	**Moderate High:** Greater than 40% and less than or equal to 60% of reach is disrupted by any of the channel alterations listed above. If the stream has been channelized, normal stable stream meander pattern has not recovered. **Moderate Low:** Greater than 60% and less than or equal to 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If the stream has been channelized, normal stable stream meander pattern has not recovered.	Greater than 80% of reach is disrupted by any of the channel alterations listed above. Greater than 80% of banks shored with gabion, riprap, or concrete.		
		High / Low	High / Low		**CI = (Score)/20**	**CI**
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	**SCORE 14**	**0.70**

RIVERINE CONDITION INDEX (RCI)	RCI
NOTE: **The CIs and RCI should be rounded to 2 decimal places.**	**RCI = (Sum of all CI's)/5** **0.70**

If a CI is not applicable (e.g. due to use on intermittent watercourse or >100 sq. mile drainage area) in order to utilize the auto calculator feature the user will need to modify the RCI formula or enter the maximum score for that CI to achieve a CI of 1.0 which will offset the divisor difference.

General Comments:

Attachment B
Site Photograph

LANGAN

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
DEPG Mosier Associated, L.P.	Smithfield Township, Monroe County, Pennsylvania	100501401

Date	Photo No.
12/18/2017	1

Direction Photo Taken:

Northwest

Description:

Upstream view of UNT to Brodhead Creek near POA-ABC.

Date	Photo No.
12/18/2017	2

Direction Photo Taken:

East

Description:

View of a pool with overhanging rocks as suitable fish habitat near POA-ABC.

LANGAN

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
DEPG Mosier Associated, L.P.	Smithfield Township, Monroe County, Pennsylvania	100501401

Date	Photo No.
12/18/2017	3

Direction Photo Taken:

Southeast

Description:

Downstream view of UNT to Brodhead Creek near POA-ABC.

Date	Photo No.
12/18/2017	4

Direction Photo Taken:

Northwest

Description:

Upstream view of UNT to Brodhead Creek near POA-ABC.

APPENDIX G

BMP Worksheets and Calculations/Plan Preparer Record of Training and Experience

APPENDIX G
TABLE OF CONTENTS

PCSM SPREADSHEET

BRODHEAD CREEK

General Information

Instructions | *General* | Volume | Rate | Quality

Project Name:	**Smithfield Gateway Phase 1A-2 (Brodhead Creek)**	Application Type:	**PAG-02 NOI**
County:	**Monroe**	Municipality:	**Smithfield Township**
Project Type:	**Other**	○ New Project	◉ Minor / Major Amendment
Area: *(In Watershed)*	**94.80** acres	Total Earth Disturbance: *(In Watershed)*	**25.83** acres
No. of Post-Construction Discharge Points:	**1**	Start DP Numbering at:	**001**

Discharge Point (DP) No.	Drainage Area (DA) (acres)	Earth Disturbance in DA (acres)	Existing Impervious in DA (acres)	Proposed Impervious in DA (acres)	Receiving Waters	Ch. 93 Class	Structural BMP(s)
001	8.35	8.35	0.00	5.01	Discharge to MS4	TSF, MF	Yes
Undetained Areas	86.45	17.48	4.17	6.15	Discharge to MS4	TSF, MF	
Totals:	**94.80**	**25.83**	**4.17**	**11.16**			

Volume Management

Project: Smithfield Gateway Phase 1A-2 (Brodhead Creek)

Instructions | General | *Volume* | Rate | Quality

2-Year / 24-Hour Storm Event (NOAA Atlas 14): **3.32** inches

Alternative 2-Year / 24-Hour Storm Event _____ inches

Alternative Source: _____

Pre-Construction Conditions: *No. Rows:* **5** ☐ *Exempt from Meadow in Good Condition* ☑ *Automatically Calculate CN, Ia, Runoff and Volume*

Land Cover	Area (acres)	Soil Group	CN	Ia (in)	Q Runoff (in)	Runoff Volume (cf)
Forested (Good Condition)	4.09	D	77	0.597	1.30	19,253
Pervious as Meadow	16.53	D	78	0.564	1.36	81,701
Impervious as Meadow	0.55	D	78	0.564	1.36	2,704
Impervious Areas: Commercial	2.19	D	98	0.041	3.09	24,518
Impervious Areas: Streets and Roads - Paved; Curbs and Storm Sewers (Excluding ROW)	1.49	D	98	0.041	3.09	16,666
TOTAL (ACRES):	**24.83**				**TOTAL (CF):**	**144,843**

Post-Construction Conditions: *No. Rows:* **4**

Land Cover	Area (acres)	Soil Group	CN	Ia (in)	Q Runoff (in)	Runoff Volume (cf)
Meadow-Continuous Grass, Protected from Grazing and Generally Mowed for Hay	6.72	D	78	0.564	1.36	33,241
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	7.97	D	80	0.500	1.49	43,234

Impervious Areas: Commercial	5.81	D	98	0.041	3.09	65,131
Impervious Areas: Streets and Roads - Paved; Curbs and Storm Sewers (Excluding ROW)	5.33	D	98	0.041	3.09	59,714
TOTAL (ACRES):	**25.83**				**TOTAL (CF):**	**201,320**

NET CHANGE IN VOLUME TO MANAGE (CF): **56,477**

Non-Structural BMP Volume Credits:

☑ Tree Planting Credit

Number of new deciduous trees that will be planted within disturbed area: 263 — **CREDIT (CF):** **1,578**

Number of new evergreen trees that will be planted within disturbed area: — **CREDIT (CF):**

☐ Other (attach calculations):

Structural BMP Volume Credits: *No. Structural BMPs:* **8** *Start BMP Numbering at:* **1**

DP No.	BMP No.	BMP Name	MRC?	Discharge	Incremental BMP DA (acres)	Volume Routed to BMP (CF)	Infiltration / Vegetated Area (SF)	Infiltration Rate (in/hr)	Infiltration Period (hrs)	Vegeta-ted?	Media Depth (ft)	Storage Volume (CF)	Infiltration Credit (CF)	ET Credit (CF)
001	1	Rain Garden / Bioretention	-	to BMP No. 5	0.20	1,543	1,289	1.75	7	Yes	2.0	1,043	**1,184**	**359**
001	2	Rain Garden / Bioretention	-	Off-Site	0.16	1,402	1,060	4.69	3	Yes	2.0	874	**1,119**	**283**
001	3	Rain Garden / Bioretention	-	Off-Site	0.50	3,974	1,644	3.00	4	Yes	2.0	1,434	**1,480**	**865**
001	4	Infiltration Bed	-	Off-Site	1.06	9,363	4,635	5.12	5	No	3.5	5,079	**8,899**	
001	5	Infiltration Bed	-	Off-Site	1.02	10,939	7,257	0.63	38	No	3.0	7,144	**10,939**	
001	6	Infiltration Bed	-	Off-Site	2.64	27,215	14,534	2.54	10	No	4.0	14,091	**27,215**	
001	7	Infiltration Basin	-	Off-Site	1.60	13,354	5,763	1.94	10	Yes	1.0	8,257	**8,385**	**1,769**

001	8	Infiltration Bed	-	Off-Site	1.17	5,785	4,736	1.38	17	No	3.0	4,718	**5,785**	
												Totals:	**65,006**	**3,276**

INFILTRATION & ET CREDITS (CF):	**68,282**
NET CHANGE IN VOLUME TO MANAGE (CF):	**56,477**
TOTAL CREDITS (CF):	**69,860**

VOLUME REQUIREMENT SATISFIED

Rate Control

Project: Smithfield Gateway Phase 1A-2 (Brodhead Creek)

Instructions | General | Volume | *Rate* | Quality

Precipitation Amounts:

NOAA 2-Year 24-Hour Storm Event (in):	**3.32**	Alternative 2-Year 24-Hour Storm Event (in):	
NOAA 10-Year 24-Hour Storm Event (in):	**4.84**	Alternative 10-Year 24-Hour Storm Event (in):	
NOAA 50-Year 24-Hour Storm Event (in):	**6.96**	Alternative 50-Year 24-Hour Storm Event (in):	
NOAA 100-Year 24-Hour Storm Event (in):	**8.14**	Alternative 100-Year 24-Hour Storm Event (in):	

☑ **Report Summary of Peak Rates Only**

Attach model input and output data or other calculations to support the rates reported below.

	Peak Discharge Rates (cfs)			
	Pre-Construction	**Post-Construction**	**Net Change**	
2-Year Storm:	**316.45**	**331.32**	**14.87**	***Rate Control Not Satisfied***
10-Year Storm:	**576.84**	**601.90**	**25.06**	***Rate Control Not Satisfied***
50-Year Storm:	**972.81**	**1,010.53**	**37.72**	***Rate Control Not Satisfied***
100-Year Storm:	**1,195.26**	**1,245.40**	**50.14**	

DP No.	BMP No.	BMP Name	MRC?	Inflow to BMP (cfs)				Outflow from BMP (cfs)			
				2-yr	10-yr	50-yr	100-yr	2-yr	10-yr	50-yr	100-yr
001	1	Rain Garden / Bioretention	-	0.70	1.14	1.75	2.09	0.00	0.49	1.61	1.96

001	2	Rain Garden / Bioretention	-	0.60	0.95	1.43	1.70	0.00	0.20	1.18	1.54
001	3	Rain Garden / Bioretention	-	1.79	2.93	4.51	5.40	0.74	2.64	4.26	5.12
001	4	Infiltration Bed	-	6.02	10.18	16.15	19.55	0.12	6.49	13.54	17.03
001	5	Infiltration Bed	-	4.44	6.60	9.59	11.28	0.00	0.46	5.86	8.96
001	6	Infiltration Bed	-	11.27	16.91	24.69	29.07	0.00	0.57	7.52	12.58
001	7	Infiltration Basin	-	5.47	8.83	13.47	16.07	0.00	2.26	7.69	9.78
001	8	Infiltration Bed	-	2.28	4.35	7.44	9.22	0.00	0.44	5.70	7.95

Water Quality

Project: Smithfield Gateway Phase 1A-2 (Brodhead Creek)

PRINT

Instructions | General | Volume | Rate | *Quality*

Pre-Construction Pollutant Loads:

Land Cover (from Volume Worksheet)	Land Cover for Water Quality	Area (acres)	Soil Group	Runoff Volume (cf)	Pollutant Conc. (mg/L)			Pollutant Loads (lbs)		
					TSS	TP	TN	TSS	TP	TN
Forested (Good Condition)	Deciduous Forest/Evergreen Forest/Mixed Forest	4.09	D	19,253	45.0	0.13	1.05	54.10	0.16	1.26
Pervious as Meadow	Grassland/Herbaceous	16.53	D	81,701	48.8	0.22	2.30	248.96	1.12	11.73
Impervious as Meadow	Grassland/Herbaceous	0.55	D	2,704	48.8	0.22	2.30	8.24	0.04	0.39
Impervious Areas: Commercial	Commercial	2.19	D	24,518	61.7	0.22	2.02	94.49	0.34	3.09
Impervious Areas: Streets and Roads - Paved; Curbs and Storm Sewers (Excluding ROW)	Urban Highway	1.49	D	16,666	142.0	0.32	3.00	147.77	0.33	3.12
	TOTAL (ACRES):	**24.83**					**TOTALS:**	**553.57**	**1.99**	**19.60**

Post-Construction Pollutant Loads (without BMPs):

Land Cover (from Volume Worksheet)	Land Cover for Water Quality	Area (acres)	Soil Group	Runoff Volume (cf)	Pollutant Conc. (mg/L)			Pollutant Loads (lbs)		
					TSS	TP	TN	TSS	TP	TN

Meadow-Continuous Grass, Protected from Grazing and Generally Mowed for Hay	Grassland/Herbaceous	6.72	D	33,241	48.8	0.22	2.30	101.29	0.46	4.77
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	Open Space	7.97	D	43,234	78.0	0.25	1.25	210.57	0.67	3.37
Impervious Areas: Commercial	Commercial	5.81	D	65,131	61.7	0.22	2.02	251.01	0.89	8.22
Impervious Areas: Streets and Roads - Paved; Curbs and Storm Sewers (Excluding ROW)	Urban Highway	5.33	D	59,714	142.0	0.32	3.00	529.48	1.19	11.19
	TOTAL (ACRES):	**25.83**					**TOTALS:**	**######**	**3.22**	**27.55**

POLLUTANT LOAD REDUCTION REQUIREMENTS (LBS):	**538.79**	**1.23**	**7.95**

☑ **Characterize Undetained Areas (for Untreated Stormwater)** *No. Rows:* **4**

Land Cover	Area (acres)	Soil Group	CN	Ia (in)	Q Runoff (in)	Runoff Volume (cf)
Meadow-Continuous Grass, Protected from Grazing and Generally Mowed for Hay	**5.02**	**D**	**78**	**0.564**	**1.36**	**24,819**
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	**6.31**	**D**	**80**	**0.500**	**1.49**	**34,239**
Impervious Areas: Commercial	**2.54**	**D**	**98**	**0.041**	**3.09**	**28,463**
Impervious Areas: Streets and Roads - Paved; Curbs and Storm Sewers (Excluding ROW)	**3.61**	**D**	**98**	**0.041**	**3.09**	**40,454**

Non-Structural BMP Water Quality Credits:

☐ Pervious Undetained Area Credit

☑ Other (attach calculations)

TSS	TP	TN

Description:	Street Sweeping & Manufactured Treatment Devices	332.65	0.84	3.33

Structural BMP Water Quality Credits:

☑ *Use default BMP Outflows and Median BMP Outflow Concentrations*

DP No.	BMP No.	BMP Name	MRC?	BMP DA (acres)	Vol. Routed to BMP (CF)	Inf. & ET Credits (CF)	Capture & Buffer Credits (CF)	Outflow (CF)	Outflow Conc. (mg/L)			Pollutant Loads (lbs)		
									TSS	TP	TN	TSS	TP	TN
001	1	Rain Garden / Bioretention	-	0.20	1,543	1,543		0	-	-	-	-	-	-
001	2	Rain Garden / Bioretention	-	0.16	1,402	1,402		0	10.00	0.24	1.04	0.00	0.00	0.00
001	3	Rain Garden / Bioretention	-	0.50	3,974	2,344		1,630	10.00	0.24	1.04	1.02	0.02	0.11
001	4	Infiltration Bed	-	1.06	9,363	8,899		464	24.30	0.19	1.19	0.70	0.01	0.03
001	5	Infiltration Bed	-	1.02	10,939	10,939		0	24.30	0.19	1.19	0.00	0.00	0.00
001	6	Infiltration Bed	-	2.64	27,215	27,215		0	24.30	0.19	1.19	0.00	0.00	0.00
001	7	Infiltration Basin	-	1.60	13,354	10,154		3,200	10.00	0.24	1.04	2.00	0.05	0.21
001	8	Infiltration Bed	-	1.17	5,785	5,785		0	24.30	0.19	1.19	0.00	0.00	0.00

	TSS	TP	TN
POLLUTANT LOADS FROM STRUCTURAL BMP (TREATED) OUTFLOWS (LBS):	3.72	0.08	0.35
POLLUTANT LOADS FROM UNTREATED STORMWATER (LBS):	710.78	2.07	17.41
NON-STRUCTURAL BMP WATER QUALITY CREDITS (LBS):	332.65	0.84	3.33
NET POLLUTANT LOADS FROM SITE, POST-CONSTRUCTION (LBS):	381.85	1.31	14.42
POLLUTANT LOADS FROM SITE, PRE-CONSTRUCTION (LBS):	553.57	1.99	19.60

CERTIFICATION

I certify under penalty of law and subject to the penalties of 18 Pa.C.S. § 4904 (relating to unsworn falsification to authorities) that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I further certify that the structure, function, and calculations contained in this spreadsheet have not been modified in comparison to the spreadsheet DEP has posted to its website or, if modifications were made, an explanation of the modifications made is attached to this spreadsheet.

John Cote	2/23/2023
Spreadsheet User Name	Date

MARSHALLS CREEK

General Information

Instructions | *General* | Volume | Rate | Quality

Project Name:	**Smithfield Gateway Phase 1A-2 (Marshalls Creek)**	Application Type:	**PAG-02 NOI**
County:	**Monroe**	Municipality:	**Smithfield Township**
Project Type:	**Other**	○ New Project	◉ Minor / Major Amendment
Area: *(In Watershed)*	**11.27** acres	Total Earth Disturbance: *(In Watershed)*	**7.58** acres
No. of Post-Construction Discharge Points:	**1**	Start DP Numbering at:	**001**

Discharge Point (DP) No.	Drainage Area (DA) (acres)	Earth Disturbance in DA (acres)	Existing Impervious in DA (acres)	Proposed Impervious in DA (acres)	Receiving Waters	Ch. 93 Class	Structural BMP(s)
001	9.50	5.81	1.52	3.40	Discharge to MS4	HQ-CWF, MF	Yes
Undetained Areas	1.77	1.77	0.83	1.03	Discharge to MS4	HQ-CWF, MF	
Totals:	**11.27**	**7.58**	**2.35**	**4.43**			

Volume Management

Project: Smithfield Gateway Phase 1A-2 (Marshalls Creek)

Instructions | General | *Volume* | Rate | Quality

2-Year / 24-Hour Storm Event (NOAA Atlas 14): **3.32** inches

Alternative 2-Year / 24-Hour Storm Event: inches

Alternative Source:

Pre-Construction Conditions: *No. Rows:* **5** ☐ *Exempt from Meadow in Good Condition* ☑ *Automatically Calculate CN, Ia, Runoff and Volume*

Land Cover	Area (acres)	Soil Group	CN	Ia (in)	Q Runoff (in)	Runoff Volume (cf)
Forested (Good Condition)	1.46	D	77	0.597	1.30	6,874
Pervious as Meadow	4.78	D	78	0.564	1.36	23,614
Impervious as Meadow	0.12	D	78	0.564	1.36	570
Impervious Areas: Commercial	0.46	D	98	0.041	3.09	5,170
Impervious Areas: Streets and Roads - Paved; Curbs and Storm Sewers (Excluding ROW)	1.77	D	98	0.041	3.09	19,808
TOTAL (ACRES):	**8.58**				**TOTAL (CF):**	**56,035**

Post-Construction Conditions: *No. Rows:* **4**

Land Cover	Area (acres)	Soil Group	CN	Ia (in)	Q Runoff (in)	Runoff Volume (cf)
Meadow-Continuous Grass, Protected from Grazing and Generally Mowed for Hay	1.31	D	78	0.564	1.36	6,501
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	1.83	D	80	0.500	1.49	9,942

Impervious Areas: Commercial	2.28	D	98	0.041	3.09	25,578
Impervious Areas: Streets and Roads - Paved; Curbs and Storm Sewers (Excluding ROW)	2.15	D	98	0.041	3.09	24,096
TOTAL (ACRES):	**7.58**				**TOTAL (CF):**	**66,117**

NET CHANGE IN VOLUME TO MANAGE (CF): **10,081**

Non-Structural BMP Volume Credits:

☐ Tree Planting Credit

☐ Other (attach calculations):

Structural BMP Volume Credits: *No. Structural BMPs:* **4** *Start BMP Numbering at:* **8**

DP No.	BMP No.	BMP Name	MRC?	Discharge	Incremental BMP DA (acres)	Volume Routed to BMP (CF)	Infiltration / Vegetated Area (SF)	Infiltration Rate (in/hr)	Infiltration Period (hrs)	Vegeta-ted?	Media Depth (ft)	Storage Volume (CF)	Infiltration Credit (CF)	ET Credit (CF)
001	8	Infiltration Basin	-	Off-Site	0.51	4,040	2,087	4.12	12	Yes	1.0	1,876	**4,040**	**0**
001	9	Vegetated Swale	-	Off-Site	2.82	21,661	5,700			Yes	1.0			**1,750**
001	10	Infiltration Basin	-	Off-Site	2.13	21,055	11,249	5.00	12	Yes	1.0	13,324	**21,055**	**0**
001	11	Infiltration Bed	-	Off-Site	0.42	4,509	3,444	0.81	19	No	2.5	2,048	**3,975**	
												Totals:	**29,070**	**1,750**

INFILTRATION & ET CREDITS (CF): **30,820**

NET CHANGE IN VOLUME TO MANAGE (CF): **10,081**

TOTAL CREDITS (CF): **30,820**

VOLUME REQUIREMENT SATISFIED

Rate Control

Project: Smithfield Gateway Phase 1A-2 (Marshalls Creek)

Instructions | General | Volume | *Rate* | Quality

Precipitation Amounts:

NOAA 2-Year 24-Hour Storm Event (in):	**3.32**	Alternative 2-Year 24-Hour Storm Event (in):	
NOAA 10-Year 24-Hour Storm Event (in):	**4.84**	Alternative 10-Year 24-Hour Storm Event (in):	
NOAA 50-Year 24-Hour Storm Event (in):	**6.96**	Alternative 50-Year 24-Hour Storm Event (in):	
NOAA 100-Year 24-Hour Storm Event (in):	**8.14**	Alternative 100-Year 24-Hour Storm Event (in):	

☑ **Report Summary of Peak Rates Only**

Attach model input and output data or other calculations to support the rates reported below.

	Peak Discharge Rates (cfs)			
	Pre-Construction	**Post-Construction**	**Net Change**	
2-Year Storm:	**30.32**	**22.40**	**-7.92**	***Rate Control Satisfied***
10-Year Storm:	**53.26**	**39.68**	**-13.58**	***Rate Control Satisfied***
50-Year Storm:	**86.15**	**69.87**	**-16.28**	***Rate Control Satisfied***
100-Year Storm:	**104.84**	**87.22**	**-17.62**	***Rate Control Satisfied***

DP No.	BMP No.	BMP Name	MRC?	Inflow to BMP (cfs)				Outflow from BMP (cfs)			
				2-yr	10-yr	50-yr	100-yr	2-yr	10-yr	50-yr	100-yr
001	8	Infiltration Basin	-	1.75	2.86	4.40	5.27	0.00	1.13	3.16	4.10

001	9	Vegetated Swale	-								
001	10	Infiltration Basin	-	8.89	13.47	19.78	23.33	0.00	0.24	4.14	6.88
001	11	Infiltration Bed	-	1.86	2.74	3.97	4.66	0.00	0.98	2.98	3.77

Water Quality

Project: Smithfield Gateway Phase 1A-2 (Marshalls Creek)

PRINT

Instructions | General | Volume | Rate | *Quality*

Pre-Construction Pollutant Loads:

Land Cover (from Volume Worksheet)	Land Cover for Water Quality	Area (acres)	Soil Group	Runoff Volume (cf)	Pollutant Conc. (mg/L)			Pollutant Loads (lbs)		
					TSS	TP	TN	TSS	TP	TN
Forested (Good Condition)	Deciduous Forest/Evergreen Forest/Mixed Forest	1.46	D	6,874	45.0	0.13	1.05	19.31	0.06	0.45
Pervious as Meadow	Grassland/Herbaceous	4.78	D	23,614	48.8	0.22	2.30	71.96	0.32	3.39
Impervious as Meadow	Grassland/Herbaceous	0.12	D	570	48.8	0.22	2.30	1.74	0.01	0.08
Impervious Areas: Commercial	Commercial	0.46	D	5,170	61.7	0.22	2.02	19.93	0.07	0.65
Impervious Areas: Streets and Roads - Paved; Curbs and Storm Sewers (Excluding ROW)	Urban Highway	1.77	D	19,808	142.0	0.32	3.00	175.63	0.40	3.71
	TOTAL (ACRES):	**8.58**					**TOTALS:**	**288.56**	**0.85**	**8.29**

Post-Construction Pollutant Loads (without BMPs):

Land Cover (from Volume Worksheet)	Land Cover for Water Quality	Area (acres)	Soil Group	Runoff Volume (cf)	Pollutant Conc. (mg/L)			Pollutant Loads (lbs)		
					TSS	TP	TN	TSS	TP	TN

Meadow-Continuous Grass, Protected from Grazing and Generally Mowed for Hay	Grassland/Herbaceous	1.31	D	6,501	48.8	0.22	2.30	19.81	0.09	0.93
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	Open Space	1.83	D	9,942	78.0	0.25	1.25	48.43	0.16	0.78
Impervious Areas: Commercial	Commercial	2.28	D	25,578	61.7	0.22	2.02	98.58	0.35	3.23
Impervious Areas: Streets and Roads - Paved; Curbs and Storm Sewers (Excluding ROW)	Urban Highway	2.15	D	24,096	142.0	0.32	3.00	213.65	0.48	4.51
	TOTAL (ACRES):	**7.58**					**TOTALS:**	**380.46**	**1.08**	**9.45**

POLLUTANT LOAD REDUCTION REQUIREMENTS (LBS):	**91.90**	**0.22**	**1.16**

☑ **Characterize Undetained Areas (for Untreated Stormwater)** *No. Rows:* **3**

Land Cover	Area (acres)	Soil Group	CN	Ia (in)	Q Runoff (in)	Runoff Volume (cf)
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	**0**	**D**	**80**	**0.500**	**1.49**	**0**
Meadow-Continuous Grass, Protected from Grazing and Generally Mowed for Hay	**0.74**	**D**	**78**	**0.564**	**1.36**	**3,659**
Impervious Areas: Streets and Roads - Paved; Curbs and Storm Sewers (Excluding ROW)	**1.03**	**D**	**98**	**0.041**	**3.09**	**11,542**

Non-Structural BMP Water Quality Credits:

☐ Pervious Undetained Area Credit

☐ Other (attach calculations)

Structural BMP Water Quality Credits:

☑ *Use default BMP Outflows and Median BMP Outflow Concentrations*

DP No.	BMP No.	BMP Name	MRC?	BMP DA (acres)	Vol. Routed to BMP (CF)	Inf. & ET Credits (CF)	Capture & Buffer Credits (CF)	Outflow (CF)	Outflow Conc. (mg/L)			Pollutant Loads (lbs)		
									TSS	TP	TN	TSS	TP	TN
001	8	Infiltration Basin	-	0.51	4,040	4,040		0	10.00	0.24	0.96	0.00	0.00	0.00
001	9	Vegetated Swale	-	2.82	21,661	1,750		19,911	13.70	0.18	0.63	17.03	0.22	0.78
001	10	Infiltration Basin	-	2.13	21,055	21,055		0	10.00	0.24	0.96	0.00	0.00	0.00
001	11	Infiltration Bed	-	0.42	4,509	3,975		534	22.00	0.10	2.38	0.73	0.00	0.08

	TSS	TP	TN
POLLUTANT LOADS FROM STRUCTURAL BMP (TREATED) OUTFLOWS (LBS):	**17.77**	**0.23**	**0.86**
POLLUTANT LOADS FROM UNTREATED STORMWATER (LBS):	**113.49**	**0.28**	**2.69**
NON-STRUCTURAL BMP WATER QUALITY CREDITS (LBS):			
NET POLLUTANT LOADS FROM SITE, POST-CONSTRUCTION (LBS):	**131.26**	**0.51**	**3.55**
POLLUTANT LOADS FROM SITE, PRE-CONSTRUCTION (LBS):	**288.56**	**0.85**	**8.29**

WATER QUALITY REQUIREMENT SATISFIED

CERTIFICATION

I certify under penalty of law and subject to the penalties of 18 Pa.C.S. § 4904 (relating to unsworn falsification to authorities) that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I further certify that the structure, function, and calculations contained in this spreadsheet have not been modified in comparison to the spreadsheet DEP has posted to its website or, if modifications were made, an explanation of the modifications made is attached to this spreadsheet.

John Cote	2/22/2023
Spreadsheet User Name	Date

POA-ABC

General Information

Instructions | *General* | Volume | Rate | Quality

Project Name:	Smithfield Gateway Phase 1A-1 (POA-ABC)	Application Type:	PAG-02 NOI
County:	Monroe	Municipality:	Smithfield Township
Project Type:	Other	○ New Project	◉ Minor / Major Amendment
Area: *(In Watershed)*	20.03 acres	Total Earth Disturbance: *(In Watershed)*	20.03 acres
No. of Post-Construction Discharge Points:	1	Start DP Numbering at:	001

Discharge Point (DP) No.	Drainage Area (DA) (acres)	Earth Disturbance in DA (acres)	Existing Impervious in DA (acres)	Proposed Impervious in DA (acres)	Receiving Waters	Ch. 93 Class	Structural BMP(s)
001	1.60	1.60	0.40	0.86	Discharge to MS4	TSF, MF	Yes
Undetained Areas	3.24	3.24	0.45	0.62	Discharge to MS4	TSF, MF	
Totals:	**4.84**	**4.84**	**0.85**	**1.48**			

Volume Management

Project: Smithfield Gateway Phase 1A-1 (POA-ABC)

Instructions | General | *Volume* | Rate | Quality

2-Year / 24-Hour Storm Event (NOAA Atlas 14): **3.32** inches

Alternative 2-Year / 24-Hour Storm Even _____ inches

Alternative Source: _____

Pre-Construction Conditions: *No. Rows:* 5 ☐ *Exempt from Meadow in Good Condition* ☑ *Automatically Calculate CN, Ia, Runoff and Volume*

Land Cover	Area (acres)	Soil Group	CN	Ia (in)	Q Runoff (in)	Runoff Volume (cf)
Forested (Good Condition)	4.09	D	77	0.597	1.30	19,253
Pervious as Meadow	12.58	D	78	0.564	1.36	62,174
Impervious as Meadow	0.38	D	78	0.564	1.36	1,862
Impervious Areas: Commercial	1.51	D	98	0.041	3.09	16,879
Impervious Areas: Streets and Roads - Paved; Curbs and Storm Sewers (Excluding ROW)	1.49	D	98	0.041	3.09	16,666
TOTAL (ACRES):	**20.03**				**TOTAL (CF):**	**116,834**

Post-Construction Conditions: *No. Rows:* 4

Land Cover	Area (acres)	Soil Group	CN	Ia (in)	Q Runoff (in)	Runoff Volume (cf)
Meadow-Continuous Grass, Protected from Grazing and Generally Mowed for Hay	0.59	D	78	0.564	1.36	2,910
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	2.76	D	80	0.500	1.49	14,992
Impervious Areas: Commercial	0.42	D	98	0.041	3.09	4,762
Impervious Areas: Streets and Roads - Paved; Curbs and Storm Sewers (Excluding ROW)	1.06	D	98	0.041	3.09	11,870

TOTAL (ACRES): 4.84 **TOTAL (CF):** 34,534

ET CHANGE IN VOLUME TO MANAGE (CF): -82,301

Non-Structural BMP Volume Credits:

☑ Tree Planting Credit

Number of new deciduous trees that will be planted within disturbed area: 63 **CREDIT (CF):** 378

Number of new evergreen trees that will be planted within disturbed area: **CREDIT (CF):**

☐ Other (attach calculations):

Structural BMP Volume Credits: *No. Structural BMPs:* 1 *Start BMP Numbering at:* 7

DP No.	BMP No.	BMP Name	MRC?	Discharge	Incremental BMP DA (acres)	Volume Routed to BMP (CF)	Infiltration / Vegetated Area (SF)	Infiltration Rate (in/hr)	Infiltration Period (hrs)	Vegeta-ted?	Media Depth (ft)	Storage Volume (CF)	Infiltration Credit (CF)	ET Credit (CF)
001	7	Infiltration Basin	-	Off-Site	1.60	13,354	5,763	1.94	10	Yes	1.0	8,257	**8,385**	**1,769**
												Totals:	**8,385**	**1,769**

INFILTRATION & ET CREDITS (CF): 10,154

NET CHANGE IN VOLUME TO MANAGE (CF): -82,301

TOTAL CREDITS (CF): 10,532

VOLUME REQUIREMENT SATISFIED

Rate Control

Project: Smithfield Gateway Phase 1A-1 (POA-ABC)

Precipitation Amounts:

NOAA 2-Year 24-Hour Storm Event (in):	**3.32**	Alternative 2-Year 24-Hour Storm Event (in):	
NOAA 10-Year 24-Hour Storm Event (in):	**4.84**	Alternative 10-Year 24-Hour Storm Event (in):	
NOAA 50-Year 24-Hour Storm Event (in):	**6.96**	Alternative 50-Year 24-Hour Storm Event (in):	
NOAA 100-Year 24-Hour Storm Event (in):	**8.14**	Alternative 100-Year 24-Hour Storm Event (in):	

☑ **Report Summary of Peak Rates Only**

Attach model input and output data or other calculations to support the rates reported below.

	Peak Discharge Rates (cfs)			
	Pre-Construction	**Post-Construction**	**Net Change**	
2-Year Storm:	**265.33**	**228.45**	**-36.88**	***Rate Control Satisfied***
10-Year Storm:	**480.27**	**407.17**	**-73.10**	***Rate Control Satisfied***
50-Year Storm:	**829.49**	**688.67**	**-140.82**	***Rate Control Satisfied***
100-Year Storm:	**1,017.61**	**840.19**	**-177.42**	***Rate Control Satisfied***

Water Quality

Project: Smithfield Gateway Phase 1A-1 (POA-ABC)

PRINT

Instructions | General | Volume | Rate | *Quality*

Pre-Construction Pollutant Loads:

Land Cover (from Volume Worksheet)	Land Cover for Water Quality	Area (acres)	Soil Group	Runoff Volume (cf)	Pollutant Conc. (mg/L)			Pollutant Loads (lbs)		
					TSS	TP	TN	TSS	TP	TN
Forested (Good Condition)	Deciduous Forest/Evergreen Forest/Mixed Forest	4.09	D	19,253	45.0	0.13	1.05	54.10	0.16	1.26
Pervious as Meadow	Grassland/Herbaceous	12.58	D	62,174	48.8	0.22	2.30	189.46	0.85	8.93
Impervious as Meadow	Grassland/Herbaceous	0.38	D	1,862	48.8	0.22	2.30	5.67	0.03	0.27
Impervious Areas: Commercial	Commercial	1.51	D	16,879	61.7	0.22	2.02	65.05	0.23	2.13
Impervious Areas: Streets and Roads - Paved; Curbs and Storm Sewers (Excluding ROW)	Urban Highway	1.49	D	16,666	142.0	0.32	3.00	147.77	0.33	3.12
	TOTAL (ACRES):	**20.03**					**TOTALS:**	**462.06**	**1.60**	**15.71**

Post-Construction Pollutant Loads (without BMPs):

Land Cover (from Volume Worksheet)	Land Cover for Water Quality	Area (acres)	Soil Group	Runoff Volume (cf)	Pollutant Conc. (mg/L)			Pollutant Loads (lbs)		
					TSS	TP	TN	TSS	TP	TN
Meadow-Continuous Grass, Protected from Grazing and Generally Mowed for Hay	Grassland/Herbaceous	0.59	D	2,910	48.8	0.22	2.30	8.87	0.04	0.42

Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	Open Space	2.76	D	14,992	78.0	0.25	1.25	73.02	0.23	1.17
Impervious Areas: Commercial	Commercial	0.42	D	4,762	61.7	0.22	2.02	18.35	0.07	0.60
Impervious Areas: Streets and Roads - Paved; Curbs and Storm Sewers (Excluding ROW)	Urban Highway	1.06	D	11,870	142.0	0.32	3.00	105.25	0.24	2.22
	TOTAL (ACRES):	**4.84**					**TOTALS:**	**205.49**	**0.58**	**4.41**

POLLUTANT LOAD REDUCTION REQUIREMENTS (LBS):	**0.00**	**0.00**	**0.00**

☑ **Characterize Undetained Areas (for Untreated Stormwater)** *No. Rows:* **4**

Land Cover	Area (acres)	Soil Group	CN	Ia (in)	Q Runoff (in)	Runoff Volume (cf)
Meadow-Continuous Grass, Protected from Grazing and Generally Mowed for Hay	**0**	**D**	**78**	**0.564**	**1.36**	**0**
Open Space (Lawns, Parks, Golf Courses, Cemeteries, Etc.) - Good Condition (Grass Cover > 75%)	**2.62**	**D**	**80**	**0.500**	**1.49**	**14,217**
Impervious Areas: Commercial	**0.13**	**D**	**98**	**0.041**	**3.09**	**1,457**
Impervious Areas: Streets and Roads - Paved; Curbs and Storm Sewers (Excluding ROW)	**0.49**	**D**	**98**	**0.041**	**3.09**	**5,491**

Non-Structural BMP Water Quality Credits:

☐ Pervious Undetained Area Credit

☐ Other (attach calculations)

Description:

TSS	TP	TN

Structural BMP Water Quality Credits:

☑ *Use default BMP Outflows and Median BMP Outflow Concentrations*

DP No.	BMP No.	BMP Name	MRC?	BMP DA (acres)	Vol. Routed to BMP (CF)	Inf. & ET Credits (CF)	Capture & Buffer Credits (CF)	Outflow (CF)	Outflow Conc. (mg/L)			Pollutant Loads (lbs)		
									TSS	TP	TN	TSS	TP	TN
001	7	Infiltration Basin	-	1.60	13,354	10,154		3,200	10.00	0.24	1.04	2.00	0.05	0.21

	TSS	TP	TN
POLLUTANT LOADS FROM STRUCTURAL BMP (TREATED) OUTFLOWS (LBS):	**2.00**	**0.05**	**0.21**
POLLUTANT LOADS FROM UNTREATED STORMWATER (LBS):	**123.54**	**0.35**	**2.32**
NON-STRUCTURAL BMP WATER QUALITY CREDITS (LBS):			
NET POLLUTANT LOADS FROM SITE, POST-CONSTRUCTION (LBS):	**125.54**	**0.40**	**2.53**
POLLUTANT LOADS FROM SITE, PRE-CONSTRUCTION (LBS):	**462.06**	**1.60**	**15.71**

WATER QUALITY REQUIREMENT SATISFIED

CERTIFICATION

I certify under penalty of law and subject to the penalties of 18 Pa.C.S. § 4904 (relating to unsworn falsification to authorities) that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I further certify that the structure, function, and calculations contained in this spreadsheet have not been modified in comparison to the spreadsheet DEP has posted to its website or, if modifications were made, an explanation of the modifications made is attached to this spreadsheet.

John Cote	5/11/2021
Spreadsheet User Name	Date

INFILTRATION BMP VOLUME CALCULATIONS

VOLUME REDUCTION CALCULATION FOR RAINGARDEN AREAS AND INFILTRATION BASINS

TOTAL STORAGE VOLUME FOR RAIN GARDENS = SUM TOTAL OF 1) AND THE SMALLER OF 2a) or 2b)
TOTAL STORAGE VOLUME FOR INFILTRATION BASINS = SUM TOTAL OF 1) AND 2a)
1) SURFACE STORAGE VOLUME (CF) = BED AREA (FT2) X AVERAGE DESIGN WATER DEPTH
2a) INFILTRATION VOLUME = BED BOTTOM AREA X INFILTRATION DESIGN RATE X INFILTRATION PERIOD X (1/12) (ASSUME INFILTRATION PERIOD = DEWATERING TIME)
2b) VOLUME = BED BOTTOM AREA (FT^2) X SOIL MIX BED DEPTH X VOID SPACE (ASSUME 2' SOIL MIX BED DEPTH AND 20% VOID SPACE)
2-YEAR RAINFALL P = 3.32 inches
*TOTAL VOLUME REDUCTION FOR EACH RAIN GARDEN / INFILTRATION BASIN IS THE MINIMUM IN A COMPARISON BETWEEN THE CALCULATED TOTAL STORAGE VOLUME AND TOTAL RUNOFF VOLUME

RAIN GARDEN/ INFILTRATION BASIN	BED AREA (SF)	INFILTRATION RATE (IN/HR)*	AVERAGE DESIGN WATER DEPTH (FT)	INFILTRATION VOLUME (CF)	SURFACE/SUBSURFACE STORAGE VOLUME (CF)	VOLUME (CF)	TOTAL STORAGE VOLUME (CF)	TOTAL STORAGE VOLUME (AC-FT)	DEWATERING TIME (HRS)
INF4-1	11,249	5.00	1.20	13,499	13,324	4,500	**26,823**	0.616	2.9
INF4-2	2,087	4.12	1.10	2,296	1,876	835	**4,172**	0.096	3.2
UGD-INF4-1	3,444	0.81	1.30	4,477	2,048	1,378	**6,525**	0.150	19.3
UGD-INF5-1	4,635	5.12	2.00	**9,270**	5,079	1,854	**14,349**	0.329	4.7
UGD-INF5-2	4,736	1.38	2.00	**9,472**	4,718	1,894	**14,190**	0.326	17.4
UGD-INF5-3	7,257	0.63	2.00	**14,514**	7,144	2,903	**21,658**	0.497	38.1
UGD-INF5-4	14,534	2.54	2.00	**29,068**	14,091	5,814	**43,159**	0.991	9.4
RG5-1	1,289	1.75	1.00	1,289	1,043	**516**	**1,559**	0.036	6.9
RG5-2	1,060	4.69	1.00	1,060	874	**424**	**1,298**	0.030	2.6
RG5-3	1,644	3.00	1.00	1,644	1,434	**658**	**2,092**	0.048	4.0
TEMP-INF1-1	5,763	1.94	1.60	9,221	8,257	**1,153**	**9,410**	0.216	9.9
SWALE4-1	-	-	-	-	-	**-**	**-**	-	-

Notes:
1. The bed area of the above ground infiltration basins and rain gardens is the corresponding basin surface area at the elevation of the average design water depth.
2. The surface/subsurface storage volume values are taken from Hydraflow Hydrographs storage calculations at the average design water depth for each infiltration basin.

INF4-1	Cover Type	Soil Type	Area (ac)	Area (sf)	CN	S	Q Runoff (in)	Runoff Volume (CF)	Runoff Volume (ac-ft)
	Meadow	D	0.00	0	78	2.82	1.36	0	0.00
	Open Space/Grass	D	0.49	21,200	80	2.50	1.49	2,641	0.06
	Impervious	-	1.64	71,579	98	0.20	3.09	18,414	0.42
TOTAL:			**2.13**	**92,779**				**21,055**	**0.4834**

OVERALL LOADING RATIO (X:1) 8.25 **IMPERVIOUS LOADING RATIO (X:1) 6.36**

INF4-2	Cover Type	Soil Type	Area (ac)	Area (sf)	CN	S	Q Runoff (in)	Runoff Volume (CF)	Runoff Volume (ac-ft)
	Meadow	D	0.07	2,975	78	2.82	1.36	338	0.01
	Open Space/Grass	D	0.21	9,318	80	2.50	1.49	1,161	0.03
	Impervious	-	0.23	9,881	98	0.20	3.09	2,542	0.06
TOTAL:			**0.51**	**22,174**				**4,040**	**0.0928**

OVERALL LOADING RATIO (X:1) 10.62 **IMPERVIOUS LOADING RATIO (X:1) 4.73**

UGD-INF4-1	Cover Type	Soil Type	Area (ac)	Area (sf)	CN	S	Q Runoff (in)	Runoff Volume (CF)	Runoff Volume (ac-ft)
	Meadow	D	0.00	0	78	2.82	1.36	0	0.00
	Open Space/Grass	D	0.03	1,349	80	2.50	1.49	168	0.00
	Impervious	-	0.39	16,874	98	0.20	3.09	4,341	0.10
TOTAL:			**0.42**	**18,223**				**4,509**	**0.1035**

OVERALL LOADING RATIO (X:1) 5.29 **IMPERVIOUS LOADING RATIO (X:1) 4.90**

VOLUME REDUCTION CALCULATION FOR RAINGARDEN AREAS AND INFILTRATION BASINS

TOTAL STORAGE VOLUME FOR RAIN GARDENS = SUM TOTAL OF 1) AND THE SMALLER OF 2a) or 2b)
TOTAL STORAGE VOLUME FOR INFILTRATION BASINS = SUM TOTAL OF 1) AND 2a)
1) SURFACE STORAGE VOLUME (CF) = BED AREA (FT2) X AVERAGE DESIGN WATER DEPTH
2a) INFILTRATION VOLUME = BED BOTTOM AREA X INFILTRATION DESIGN RATE X INFILTRATION PERIOD X (1/12) (ASSUME INFILTRATION PERIOD = DEWATERING TIME)
2b) VOLUME = BED BOTTOM AREA (FT^2) X SOIL MIX BED DEPTH X VOID SPACE (ASSUME 2' SOIL MIX BED DEPTH AND 20% VOID SPACE)
2-YEAR RAINFALL P = 3.32 inches
*TOTAL VOLUME REDUCTION FOR EACH RAIN GARDEN / INFILTRATION BASIN IS THE MINIMUM IN A COMPARISON BETWEEN THE CALCULATED TOTAL STORAGE VOLUME AND TOTAL RUNOFF VOLUME

RAIN GARDEN/ INFILTRATION BASIN	BED AREA (SF)	INFILTRATION RATE (IN/HR)*	AVERAGE DESIGN WATER DEPTH (FT)	INFILTRATION VOLUME (CF)	SURFACE/SUBSURFACE STORAGE VOLUME (CF)	VOLUME (CF)	TOTAL STORAGE VOLUME (CF)	TOTAL STORAGE VOLUME (AC-FT)	DEWATERING TIME (HRS)
INF4-1	11,249	5.00	1.20	13,499	13,324	4,500	**26,823**	0.616	2.9
INF4-2	2,087	4.12	1.10	2,296	1,876	835	**4,172**	0.096	3.2
UGD-INF4-1	3,444	0.81	1.30	4,477	2,048	1,378	**6,525**	0.150	19.3
UGD-INF5-1	4,635	5.12	2.00	**9,270**	5,079	1,854	**14,349**	0.329	4.7
UGD-INF5-2	4,736	1.38	2.00	**9,472**	4,718	1,894	**14,190**	0.326	17.4
UGD-INF5-3	7,257	0.63	2.00	**14,514**	7,144	2,903	**21,658**	0.497	38.1
UGD-INF5-4	14,534	2.54	2.00	**29,068**	14,091	5,814	**43,159**	0.991	9.4
RG5-1	1,289	1.75	1.00	1,289	1,043	**516**	**1,559**	0.036	6.9
RG5-2	1,060	4.69	1.00	1,060	874	**424**	**1,298**	0.030	2.6
RG5-3	1,644	3.00	1.00	1,644	1,434	**658**	**2,092**	0.048	4.0
TEMP-INF1-1	5,763	1.94	1.60	9,221	8,257	**1,153**	**9,410**	0.216	9.9
SWALE4-1	-	-	-	-	-	**-**	**-**	-	-

Notes:
1. The bed area of the above ground infiltration basins and rain gardens is the corresponding basin surface area at the elevation of the average design water depth.
2. The surface/subsurface storage volume values are taken from Hydraflow Hydrographs storage calculations at the average design water depth for each infiltration basin.

UGD-INF5-1	Cover Type	Soil Type	Area (ac)	Area (sf)	CN	S	Q Runoff (in)	Runoff Volume (CF)	Runoff Volume (ac-ft)
	Meadow	D	0.00	0	78	2.82	1.36	0	0.00
	Open Space/Grass	D	0.43	18,799	80	2.50	1.49	2,342	0.05
	Impervious	-	0.63	27,292	98	0.20	3.09	7,021	0.16
TOTAL:			**1.06**	**46,091**				**9,363**	**0.2149**

OVERALL LOADING RATIO (X:1) 9.94 **IMPERVIOUS LOADING RATIO (X:1) 5.89**

UGD-INF5-2	Cover Type	Soil Type	Area (ac)	Area (sf)	CN	S	Q Runoff (in)	Runoff Volume (CF)	Runoff Volume (ac-ft)
	Meadow	D	1.17	50,968	78	2.82	1.36	5,785	0.13
	Open Space/Grass	D	0.00	0	80	2.50	1.49	0	0.00
	Impervious	-	0.00	0	98	0.20	3.09	0	0.00
TOTAL:			**1.17**	**50,968**				**5,785**	**0.1328**

OVERALL LOADING RATIO (X:1) 10.76 **IMPERVIOUS LOADING RATIO (X:1) 0.00**

UGD-INF5-3	Cover Type	Soil Type	Area (ac)	Area (sf)	CN	S	Q Runoff (in)	Runoff Volume (CF)	Runoff Volume (ac-ft)
	Open Space/Grass	D	0.09	3,746	80	2.50	1.49	467	0.01
	Impervious	-	0.93	40,710	98	0.20	3.09	10,473	0.24
TOTAL:			**1.02**	**44,456**				**10,939**	**0.2511**

OVERALL LOADING RATIO (X:1) 6.13 **IMPERVIOUS LOADING RATIO (X:1) 5.61**

VOLUME REDUCTION CALCULATION FOR RAINGARDEN AREAS AND INFILTRATION BASINS

TOTAL STORAGE VOLUME FOR RAIN GARDENS = SUM TOTAL OF 1) AND THE SMALLER OF 2a) or 2b)
TOTAL STORAGE VOLUME FOR INFILTRATION BASINS = SUM TOTAL OF 1) AND 2a)
1) SURFACE STORAGE VOLUME (CF) = BED AREA (FT2) X AVERAGE DESIGN WATER DEPTH
2a) INFILTRATION VOLUME = BED BOTTOM AREA X INFILTRATION DESIGN RATE X INFILTRATION PERIOD X (1/12) (ASSUME INFILTRATION PERIOD = DEWATERING TIME)
2b) VOLUME = BED BOTTOM AREA (FT^2) X SOIL MIX BED DEPTH X VOID SPACE (ASSUME 2' SOIL MIX BED DEPTH AND 20% VOID SPACE)
2-YEAR RAINFALL P = 3.32 inches
*TOTAL VOLUME REDUCTION FOR EACH RAIN GARDEN / INFILTRATION BASIN IS THE MINIMUM IN A COMPARISON BETWEEN THE CALCULATED TOTAL STORAGE VOLUME AND TOTAL RUNOFF VOLUME

RAIN GARDEN/ INFILTRATION BASIN	BED AREA (SF)	INFILTRATION RATE (IN/HR)*	AVERAGE DESIGN WATER DEPTH (FT)	INFILTRATION VOLUME (CF)	SURFACE/SUBSURFACE STORAGE VOLUME (CF)	VOLUME (CF)	TOTAL STORAGE VOLUME (CF)	TOTAL STORAGE VOLUME (AC-FT)	DEWATERING TIME (HRS)
INF4-1	11,249	5.00	1.20	13,499	13,324	4,500	**26,823**	0.616	2.9
INF4-2	2,087	4.12	1.10	2,296	1,876	835	**4,172**	0.096	3.2
UGD-INF4-1	3,444	0.81	1.30	4,477	2,048	1,378	**6,525**	0.150	19.3
UGD-INF5-1	4,635	5.12	2.00	**9,270**	5,079	1,854	**14,349**	0.329	4.7
UGD-INF5-2	4,736	1.38	2.00	**9,472**	4,718	1,894	**14,190**	0.326	17.4
UGD-INF5-3	7,257	0.63	2.00	**14,514**	7,144	2,903	**21,658**	0.497	38.1
UGD-INF5-4	14,534	2.54	2.00	**29,068**	14,091	5,814	**43,159**	0.991	9.4
RG5-1	1,289	1.75	1.00	1,289	1,043	**516**	**1,559**	0.036	6.9
RG5-2	1,060	4.69	1.00	1,060	874	**424**	**1,298**	0.030	2.6
RG5-3	1,644	3.00	1.00	1,644	1,434	**658**	**2,092**	0.048	4.0
TEMP-INF1-1	5,763	1.94	1.60	9,221	8,257	**1,153**	**9,410**	0.216	9.9
SWALE4-1	-	-	-	-	-	**-**	**-**	-	-

Notes:
1. The bed area of the above ground infiltration basins and rain gardens is the corresponding basin surface area at the elevation of the average design water depth.
2. The surface/subsurface storage volume values are taken from Hydraflow Hydrographs storage calculations at the average design water depth for each infiltration basin.

UGD-INF5-4	Cover Type	Soil Type	Area (ac)	Area (sf)	CN	S	Q Runoff (in)	Runoff Volume (CF)	Runoff Volume (ac-ft)
	Open Space/Grass	D	0.40	17,374	80	2.50	1.49	2,164	0.05
	Impervious	-	2.24	97,377	98	0.20	3.09	25,051	0.58
TOTAL:			**2.63**	**114,751**				**27,215**	**0.6248**
OVERALL LOADING RATIO (X:1) 7.90					**IMPERVIOUS LOADING RATIO (X:1) 6.70**				

RG5-1	Cover Type	Soil Type	Area (ac)	Area (sf)	CN	S	Q Runoff (in)	Runoff Volume (CF)	Runoff Volume (ac-ft)
	Open Space/Grass	D	0.11	4,866	80	2.50	1.49	606	0.01
	Impervious	-	0.08	3,643	98	0.20	3.09	937	0.02
TOTAL:			**0.20**	**8,509**				**1,543**	**0.0354**
OVERALL LOADING RATIO (X:1) 6.60					**IMPERVIOUS LOADING RATIO (X:1) 2.83**				

RG5-2	Cover Type	Soil Type	Area (ac)	Area (sf)	CN	S	Q Runoff (in)	Runoff Volume (CF)	Runoff Volume (ac-ft)
	Open Space/Grass	D	0.07	3,033	80	2.50	1.49	378	0.01
	Impervious	-	0.09	3,980	98	0.20	3.09	1,024	0.02
TOTAL:			**0.16**	**7,013**				**1,402**	**0.0322**
OVERALL LOADING RATIO (X:1) 6.62					**IMPERVIOUS LOADING RATIO (X:1) 3.75**				

VOLUME REDUCTION CALCULATION FOR RAINGARDEN AREAS AND INFILTRATION BASINS

TOTAL STORAGE VOLUME FOR RAIN GARDENS = SUM TOTAL OF 1) AND THE SMALLER OF 2a) or 2b)
TOTAL STORAGE VOLUME FOR INFILTRATION BASINS = SUM TOTAL OF 1) AND 2a)
1) SURFACE STORAGE VOLUME (CF) = BED AREA (FT2) X AVERAGE DESIGN WATER DEPTH
2a) INFILTRATION VOLUME = BED BOTTOM AREA X INFILTRATION DESIGN RATE X INFILTRATION PERIOD X (1/12) (ASSUME INFILTRATION PERIOD = DEWATERING TIME)
2b) VOLUME = BED BOTTOM AREA (FT^2) X SOIL MIX BED DEPTH X VOID SPACE (ASSUME 2' SOIL MIX BED DEPTH AND 20% VOID SPACE)
2-YEAR RAINFALL P = 3.32 inches
*TOTAL VOLUME REDUCTION FOR EACH RAIN GARDEN / INFILTRATION BASIN IS THE MINIMUM IN A COMPARISON BETWEEN THE CALCULATED TOTAL STORAGE VOLUME AND TOTAL RUNOFF VOLUME

RAIN GARDEN/ INFILTRATION BASIN	BED AREA (SF)	INFILTRATION RATE (IN/HR)*	AVERAGE DESIGN WATER DEPTH (FT)	INFILTRATION VOLUME (CF)	SURFACE/SUBSURFACE STORAGE VOLUME (CF)	VOLUME (CF)	TOTAL STORAGE VOLUME (CF)	TOTAL STORAGE VOLUME (AC-FT)	DEWATERING TIME (HRS)
INF4-1	11,249	5.00	1.20	13,499	13,324	4,500	**26,823**	0.616	2.9
INF4-2	2,087	4.12	1.10	2,296	1,876	835	**4,172**	0.096	3.2
UGD-INF4-1	3,444	0.81	1.30	4,477	2,048	1,378	**6,525**	0.150	19.3
UGD-INF5-1	4,635	5.12	2.00	**9,270**	5,079	1,854	**14,349**	0.329	4.7
UGD-INF5-2	4,736	1.38	2.00	**9,472**	4,718	1,894	**14,190**	0.326	17.4
UGD-INF5-3	7,257	0.63	2.00	**14,514**	7,144	2,903	**21,658**	0.497	38.1
UGD-INF5-4	14,534	2.54	2.00	**29,068**	14,091	5,814	**43,159**	0.991	9.4
RG5-1	1,289	1.75	1.00	1,289	1,043	**516**	**1,559**	0.036	6.9
RG5-2	1,060	4.69	1.00	1,060	874	**424**	**1,298**	0.030	2.6
RG5-3	1,644	3.00	1.00	1,644	1,434	**658**	**2,092**	0.048	4.0
TEMP-INF1-1	5,763	1.94	1.60	9,221	8,257	**1,153**	**9,410**	0.216	9.9
SWALE4-1	-	-	-	-	-	**-**	**-**	-	-

Notes:
1. The bed area of the above ground infiltration basins and rain gardens is the corresponding basin surface area at the elevation of the average design water depth.
2. The surface/subsurface storage volume values are taken from Hydraflow Hydrographs storage calculations at the average design water depth for each infiltration basin.

RG5-3	Cover Type	Soil Type	Area (ac)	Area (sf)	CN	S	Q Runoff (in)	Runoff Volume (CF)	Runoff Volume (ac-ft)
	Meadow	D	0.00	0	78	2.82	1.36	0	0.00
	Open Space/Grass	D	0.28	12,076	80	2.50	1.49	1,504	0.03
	Impervious	-	0.22	9,601	98	0.20	3.09	2,470	0.06
TOTAL:			**0.50**	**21,677**				**3,974**	**0.0912**

OVERALL LOADING RATIO (X:1) 13.19 **IMPERVIOUS LOADING RATIO (X:1) 5.84**

TEMP-INF1-1	Cover Type	Soil Type	Area (ac)	Area (sf)	CN	S	Q Runoff (in)	Runoff Volume (CF)	Runoff Volume (ac-ft)
	Meadow	D	0.59	25,640	78	2.82	1.36	2,910	0.07
	Open Space/Grass	D	0.15	6,423	80	2.50	1.49	800	0.02
	Impervious	-	0.86	37,486	98	0.20	3.09	9,643	0.22
TOTAL:			**1.60**	**69,549**				**13,354**	**0.3066**

OVERALL LOADING RATIO (X:1) 12.07 **IMPERVIOUS LOADING RATIO (X:1) 6.50**

SWALE4-1	Cover Type	Soil Type	Area (ac)	Area (sf)	CN	S	Q Runoff (in)	Runoff Volume (CF)	Runoff Volume (ac-ft)
	Meadow	D	0.58	25,122	78	2.82	1.36	2,851	0.07
	Open Space/Grass	D	1.10	47,950	80	2.50	1.49	5,973	0.14
	Impervious	-	1.15	49,898	98	0.20	3.09	12,836	0.29
TOTAL:			**2.82**	**122,970**				**21,661**	**0.4973**

OVERALL LOADING RATIO (X:1) - **IMPERVIOUS LOADING RATIO (X:1) -**

WATER QUALITY CALCULATIONS AND REFERENCE INFORMATION

SUPPORTING POLLUTANT REMOVAL CALCULATIONS

WORKSHEET 13. POLLUTANT REDUCTION THROUGH BMP APPLICATIONS*

BRODHEAD CREEK

** FILL THIS WORKSHEET OUT FOR EACH BMP TYPE WITH DIFFERENT POLLUTANT REMOVAL EFFICIENCIES. SUM POLLUTANT REDUCTION ACHIEVED FOR ALL BMP TYPES ON FINAL SHEET.*

BMP TYPE: AREA 1 - SNOUT (Hydrodynamic Treatment Device)

DISTURBED AREA CONTROLLED BY THIS BMP TYPE (Ac)	3.76

DISTURBED AREAS CONTROLLED BY THIS BMP TYPE:

	POLLUTANT					**POLLUTANT LOAD****		
LAND COVER CLASSIFICATION	**TSS EMC (mg/l)**	**TP EMC (mg/l)**	**Nitrate-Nitrate EMC (mg/l as N)**	**COVER (Acres)**	**RUNOFF VOLUME (CF)**	**TSS*** (LBS)**	**TP*** (LBS)**	**NO3 (LBS)**
Meadow	48.8	0.22	2.30	0.00	0	0.00	0.00	0.00
Open Space, Good Condition	78	0.25	1.25	2.85	15,438	74.64	0.24	1.20
Impervious Areas: Commercial	61.7	0.22	2.02	0.48	5,363	20.51	0.07	0.68
Impervious Areas: Street and Roads - Paved; Curbs and Storm Sewers	142	0.32	3.00	0.43	4,847	42.66	0.10	0.91
					TOTAL LOAD TO THIS BMP TYPE	137.80	0.41	2.79
					POLLUTANT REMOVAL EFFICIENCIES FROM TABLE A-4 (%)	**56.0%**	**46.0%**	**0.0%**
					POLLUTANT REDUCTION ACHIEVED BY THIS BMP TYPE (LBS)	77.17	0.19	0.00

Calculation for Removal Efficiencies in Series			
Formula	TSS	TP	NO3
R=UpStream +DownStream -[(UpStream xDownStream) /100]	56.0%	46.0%	0.0%

WORKSHEET 13. POLLUTANT REDUCTION THROUGH BMP APPLICATIONS*

BRODHEAD CREEK

** FILL THIS WORKSHEET OUT FOR EACH BMP TYPE WITH DIFFERENT POLLUTANT REMOVAL EFFICIENCIES. SUM POLLUTANT REDUCTION ACHIEVED FOR ALL BMP TYPES ON FINAL SHEET.*

BMP TYPE: AREA 2 - Street Sweeping

DISTURBED AREA CONTROLLED BY THIS BMP TYPE (Ac)	0.75

DISTURBED AREAS CONTROLLED BY THIS BMP TYPE:

	POLLUTANT					**POLLUTANT LOAD****		
LAND COVER CLASSIFICATION	**TSS EMC (mg/l)**	**TP EMC (mg/l)**	**Nitrate-Nitrate EMC (mg/l as N)**	**COVER (Acres)**	**RUNOFF VOLUME (CF)**	**TSS*** (LBS)**	**TP*** (LBS)**	**NO3 (LBS)**
Meadow	48.8	0.22	2.30	0.00	0	0.00	0.00	0.00
Open Space, Good Condition	78	0.25	1.25	0.00	0	0.00	0.00	0.00
Impervious Areas: Commercial	61.7	0.22	2.02	0.74	8,240	31.51	0.11	1.04
Impervious Areas: Street and Roads - Paved; Curbs and Storm Sewers	142	0.32	3.00	0.01	167	1.47	0.00	0.03
					TOTAL LOAD TO THIS BMP TYPE	32.98	0.12	1.07
					POLLUTANT REMOVAL EFFICIENCIES FROM TABLE A-4 (%)	**85.0%**	**85.0%**	**50.0%**
					POLLUTANT REDUCTION ACHIEVED BY THIS BMP TYPE (LBS)	28.03	0.10	0.54

Calculation for Removal Efficiencies in Series			
Formula	TSS	TP	NO3
R=UpStream +DownStream -[(UpStream xDownStream) /100]	85.0%	85.0%	50.0%

WORKSHEET 13. POLLUTANT REDUCTION THROUGH BMP APPLICATIONS*

BRODHEAD CREEK

** FILL THIS WORKSHEET OUT FOR EACH BMP TYPE WITH DIFFERENT POLLUTANT REMOVAL EFFICIENCIES. SUM POLLUTANT REDUCTION ACHIEVED FOR ALL BMP TYPES ON FINAL SHEET.*

BMP TYPE: AREA 3 - Street Sweeping + SNOUT

DISTURBED AREA CONTROLLED BY THIS BMP TYPE (Ac)	2.93

DISTURBED AREAS CONTROLLED BY THIS BMP TYPE:

	POLLUTANT					**POLLUTANT LOAD****		
LAND COVER CLASSIFICATION	**TSS EMC (mg/l)**	**TP EMC (mg/l)**	**Nitrate-Nitrate EMC (mg/l as N)**	**COVER (Acres)**	**RUNOFF VOLUME (CF)**	**TSS*** (LBS)**	**TP*** (LBS)**	**NO3 (LBS)**
Meadow	48.8	0.22	2.30	0.00	0	0.00	0.00	0.00
Open Space, Good Condition	78	0.25	1.25	0.00	0	0.00	0.00	0.00
Impervious Areas: Commercial	61.7	0.22	2.02	0.82	9,192	35.15	0.13	1.16
Impervious Areas: Street and Roads - Paved; Curbs and Storm Sewers	142	0.32	3.00	2.11	23,673	208.36	0.47	4.43
					TOTAL LOAD TO THIS BMP TYPE	243.52	0.60	5.59
					POLLUTANT REMOVAL EFFICIENCIES FROM TABLE A-4 (%)	**93.4%**	**91.9%**	**50.0%**
					POLLUTANT REDUCTION ACHIEVED BY THIS BMP TYPE (LBS)	227.45	0.55	2.80
					TOTAL POLLUTANT REDUCTION ACHIEVED (LBS)	332.65	0.84	3.33

Calculation for Removal Efficiencies in Series			
Formula	TSS	TP	NO3
R=UpStream +DownStream -[(UpStream xDownStream) /100]	93.4%	91.9%	50.0%

POLLUTANT REMOVAL EFFICIENCY CALCULATIONS

REMOVAL EFFICIENCY OF BMPS IN SERIES
SMITHFIELD GATEWAY
SMITHFIELD TOWNSHIP, MONROE COUNTY, PA
100501401

AREA 3 - STREET SWEEPING + SNOUT

Equation for Removal Efficiency of BMPs in Series

$R = A + B - [(A \times B) / 100]$ [1]

R = Total Removal Efficiency
A = Removal Efficiency of First BMP
B = Removal Efficiency of Second BMP

BMP	Removal Efficiency[2]		
	TSS	TP	NO_3
Street Sweeping	85	85	50
SNOUT	56	46	0

Total Removal Efficiency (AREA 3 - Street Sweeping + SNOUT)

Series	Removal Efficiency		
	TSS	TP	NO_3
Street Sweeping + SNOUT = R_1 (%)	**93.4**	**91.9**	**50.0**

Notes:

1. Removal Efficiency of BMPs in Series Equation taken from Table A-4, Pennsylvania Stormwater Best Management Practices Manual.

MECHANICAL TREATMENT DEVICE PEAK RATE CALCULATIONS

WATER QUALITY MECHANICAL TREATMENT DEVICE (SNOUT) CALCULATION SUMMARY
SMITHFIELD GATEWAY
SMITHFIELD TOWNSHIP, MONROE COUNTY, PENNSYLVANIA
100501401

WATER QUALITY STRUCTURE DESIGNATION	MECHANICAL TREATMENT DEVICE	OUTLET PIPE DIAMETER (IN)	50-YR STORM PEAK RATE (CFS)	MAX. RECOMMENDED FLOW RATE (CFS)	MIN. SUMP DEPTH (IN)
NETWORK-04					
CB4-9	Snout 30F	24"	8.06	11.0	60"
CB4-19	Snout 24F	18"	1.33	7.0	48"
CB4-21	Snout 24F	18"	0.73	7.0	48"
CB4-22	Snout 18F	15"	1.91	2.9	37.5"

Notes:

1. The Snout mechanical treatment device is sized based upon the inner diameter of the outlet pipe of the structure that it is specified within.
2. The maximum recommended flow rate is referenced from the manufacturer of the Snout device, BMP Inc.
3. Since the Snout is sized based upon the inner diameter of the outlet pipe, the sizing of the conveyance pipe dictates the size of the Snout. The conveyance pipes have been sized to provide capacity for the 50-year design storm event per Smithfield Township code.
4. The 50-year peak flow rate is referenced from the Hydraflow Storm Sewers capacity calculations located in Appendix B of the PCSM report.

WATER QUALITY MECHANICAL TREATMENT DEVICE CALCULATION SUMMARY
SMITHFIELD GATEWAY PHASE 1A-2
SMITHFIELD TOWNSHIP, MONROE COUNTY, PENNSYLVANIA
100501401

WATER QUALITY STRUCTURE	MECHANICAL TREATMENT DEVICE	TOTAL AREA (AC)	RUNOFF CURVE NUMBER (WEIGHTED)	WQ STORM FLOW RATE (CFS)	50-YR STORM BYPASS FLOW RATE (CFS)
NETWORK-04					
WQ4-14	Fabco StormBasin 9731-1E	0.18	98	0.39	1.50
WQ4-16	Fabco StormBasin 9731-1E	0.19	98	0.41	1.59
WQ4-17	Fabco StormBasin 9731-1E	0.09	98	0.19	0.75
WQ4-18	Fabco StormBasin 9731-1E	0.09	98	0.19	0.75

Notes:

1. The water quality storm event follows the guidelines set forth by New Jersey Department of Environmental Protection of using the 1.25 inch, 2 hour storm event for sizing mechanical treatment devices. The NRCS method with a time of concentration of 10 minutes was used to determine the peak water quality storm event flow rate for each device, using the IDF curve and rainfall distributions in Figure 5-2 and Table 5-1 of Chapter 5 of the New Jersey Stormwater Best Management Practices Manual.

2. The peak total flow rate has been calculated in conjunction with the Smithfield Township ordinance requirement that the storm conveyance system be sized for the 50-year storm event. The peak total flow rate was calculated using the NRCS method with a time of concentration of 10 minutes, using the Smithfield Township precipitation data for the 50-year storm event.

3. The Fabco StormFilter's maximum water quality treatment flow rate is 230 gpm (0.51 cfs) and maximum bypass capacity is 2,110 gpm (4.70 cfs) according to the manufacturer's specifications.

POST CONSTRUCTION STORMWATER MANAGEMENT
WEIGHTED CURVE NUMBER CALCULATIONS
SMITHFIELD GATEWAY PHASE 1A-2
LANGAN PROJECT #100501401

PROPOSED CONDITIONS

PROPOSED DRAINAGE AREAS	MEADOW SOIL GROUP C CN = 71 (SF)	MEADOW SOIL GROUP D CN = 78 (SF)	WOODS (FAIR) SOIL GROUP C CN = 73 (SF)	WOODS (FAIR) SOIL GROUP D CN = 79 (SF)	OPEN SPACE GRASS CN = 80 (SF)	TOTAL IMPERVIOUS CN = 98 (SF)	TOTAL AREA (SF)	TOTAL AREA (AC)	CURVE NUMBER CN (Weighted)
WQ4-14	0	0	0	0	0	8,036	8,036	0.18	98
WQ4-16	0	0	0	0	0	8,492	8,492	0.19	98
WQ4-17	0	0	0	0	0	3,875	3,875	0.09	98
WQ4-18	0	0	0	0	0	3,943	3,943	0.09	98

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

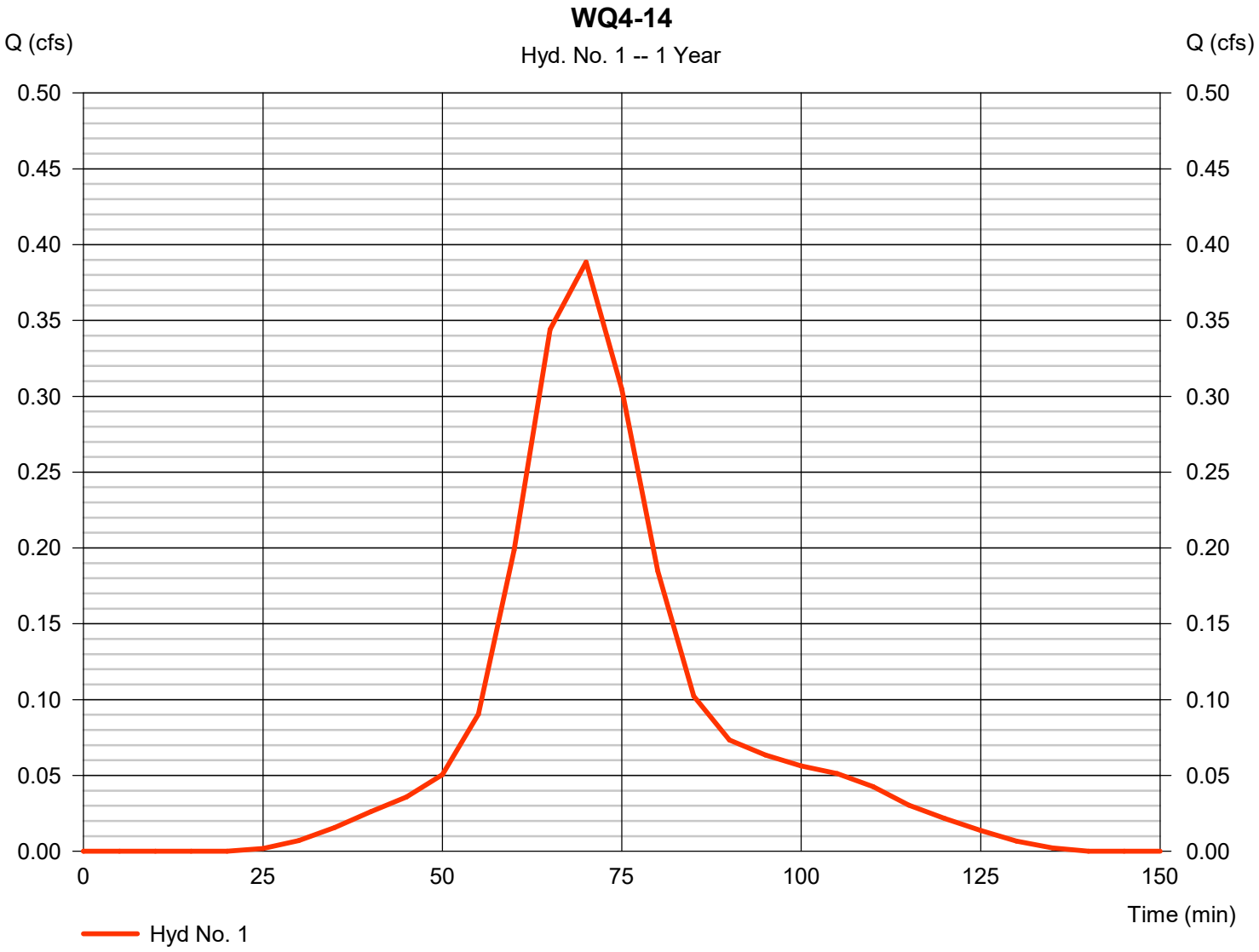
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.389	5	70	633	------	------	------	WQ4-14
2	SCS Runoff	0.410	5	70	669	------	------	------	WQ4-16
3	SCS Runoff	0.194	5	70	317	------	------	------	WQ4-17
4	SCS Runoff	0.194	5	70	317	------	------	------	WQ4-18

Hydrograph Report

Hyd. No. 1

WQ4-14

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.389 cfs
Storm frequency	=	1 yrs	Time to peak	=	70 min
Time interval	=	5 min	Hyd. volume	=	633 cuft
Drainage area	=	0.180 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	1.25 in	Distribution	=	Custom
Storm duration	=	\\langan.com\data\PAR\data4\[illegible]\Engineering Data\Site\Stormwater\Pha	Shape factor	=	484

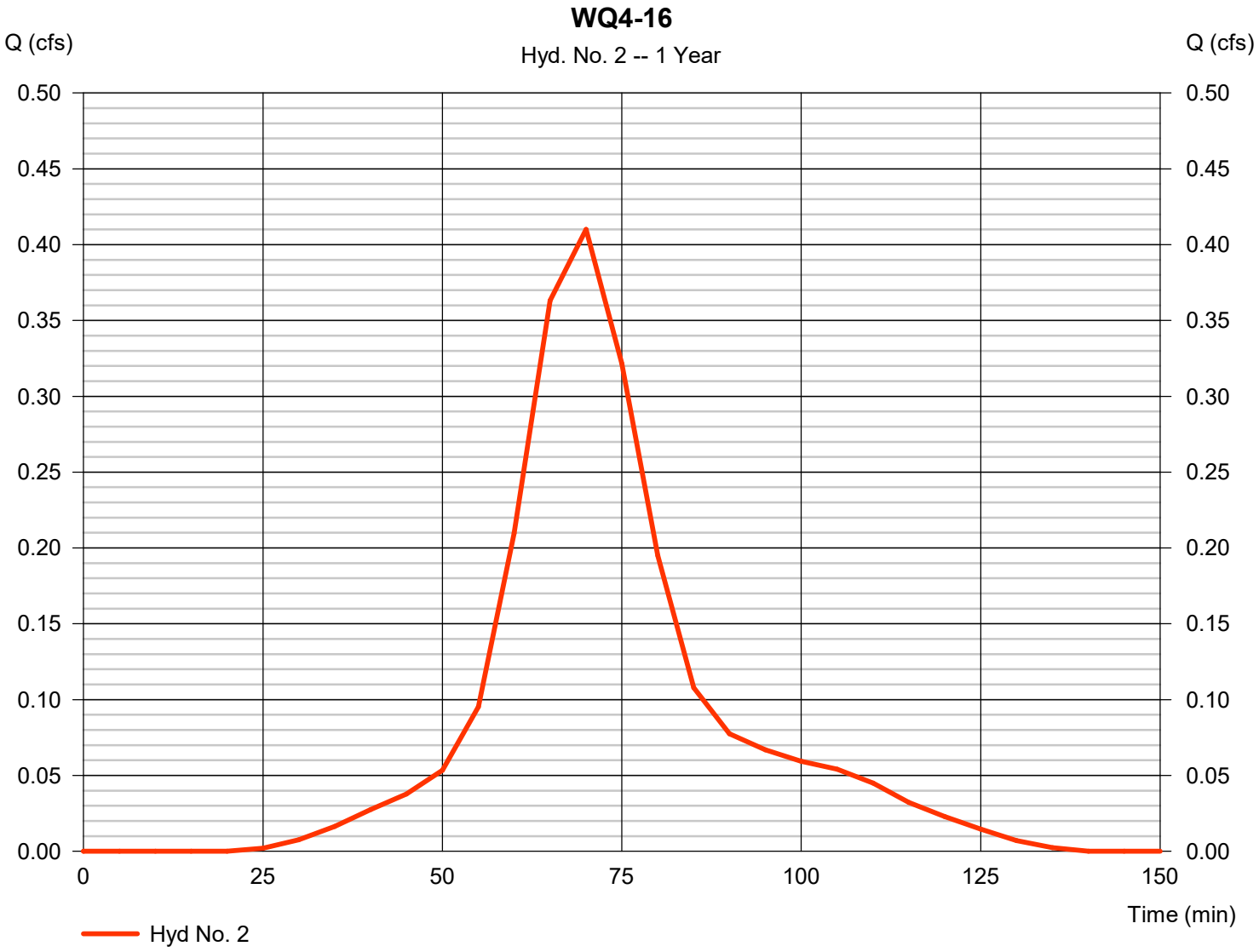


Hydrograph Report

Hyd. No. 2

WQ4-16

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.410 cfs
Storm frequency	=	1 yrs	Time to peak	=	70 min
Time interval	=	5 min	Hyd. volume	=	669 cuft
Drainage area	=	0.190 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	1.25 in	Distribution	=	Custom
Storm duration	=	\\langan.com\data\PAR\data4\[illegible]\Engineering Data\Site\Stormwater\Pha	Shape factor	=	484

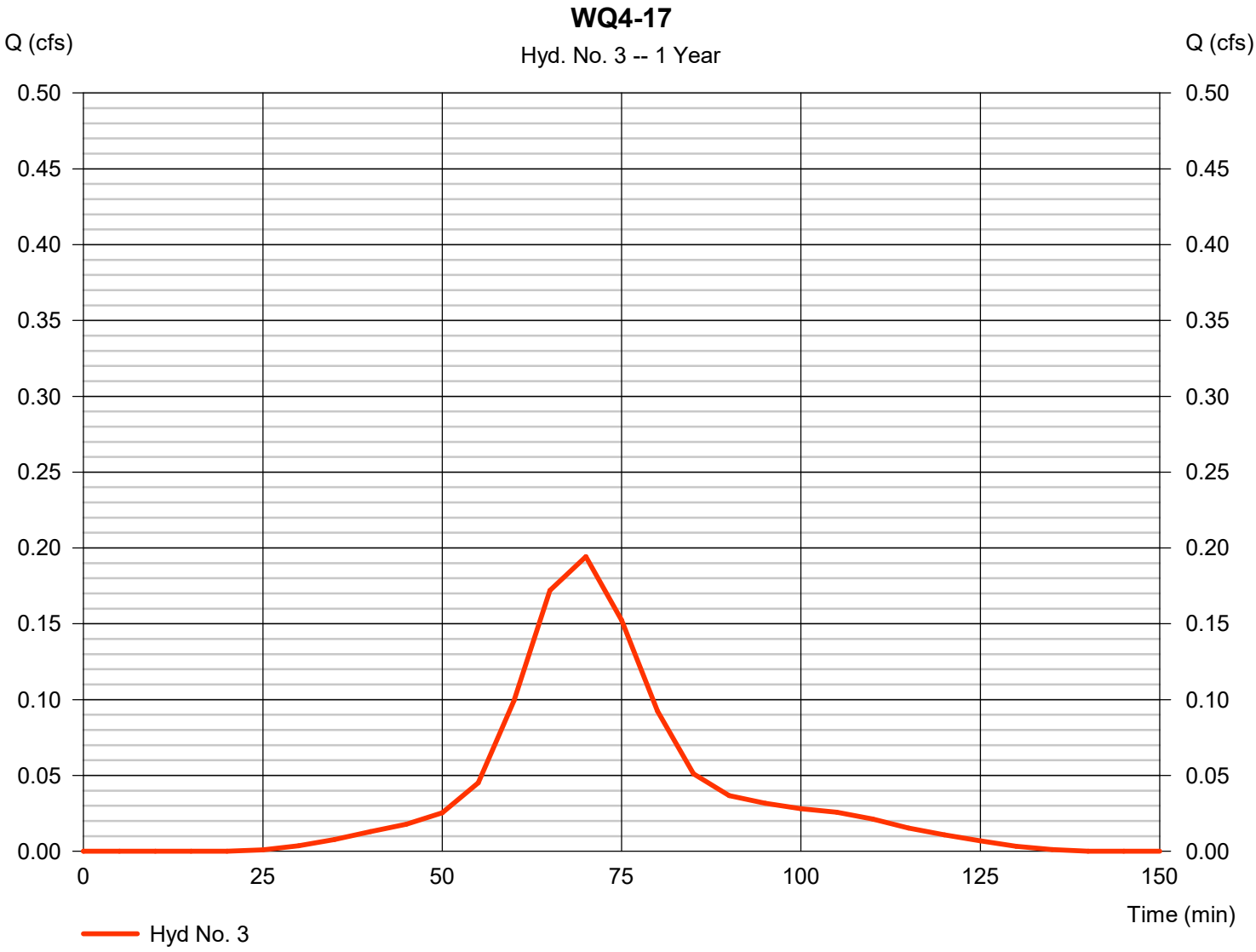


Hydrograph Report

Hyd. No. 3

WQ4-17

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.194 cfs
Storm frequency	=	1 yrs	Time to peak	=	70 min
Time interval	=	5 min	Hyd. volume	=	317 cuft
Drainage area	=	0.090 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	1.25 in	Distribution	=	Custom
Storm duration	=	\\langan.com\data\PAR\data4\[illegible]\Engineering Data\Site\Stormwater\Pha	Shape factor	=	484

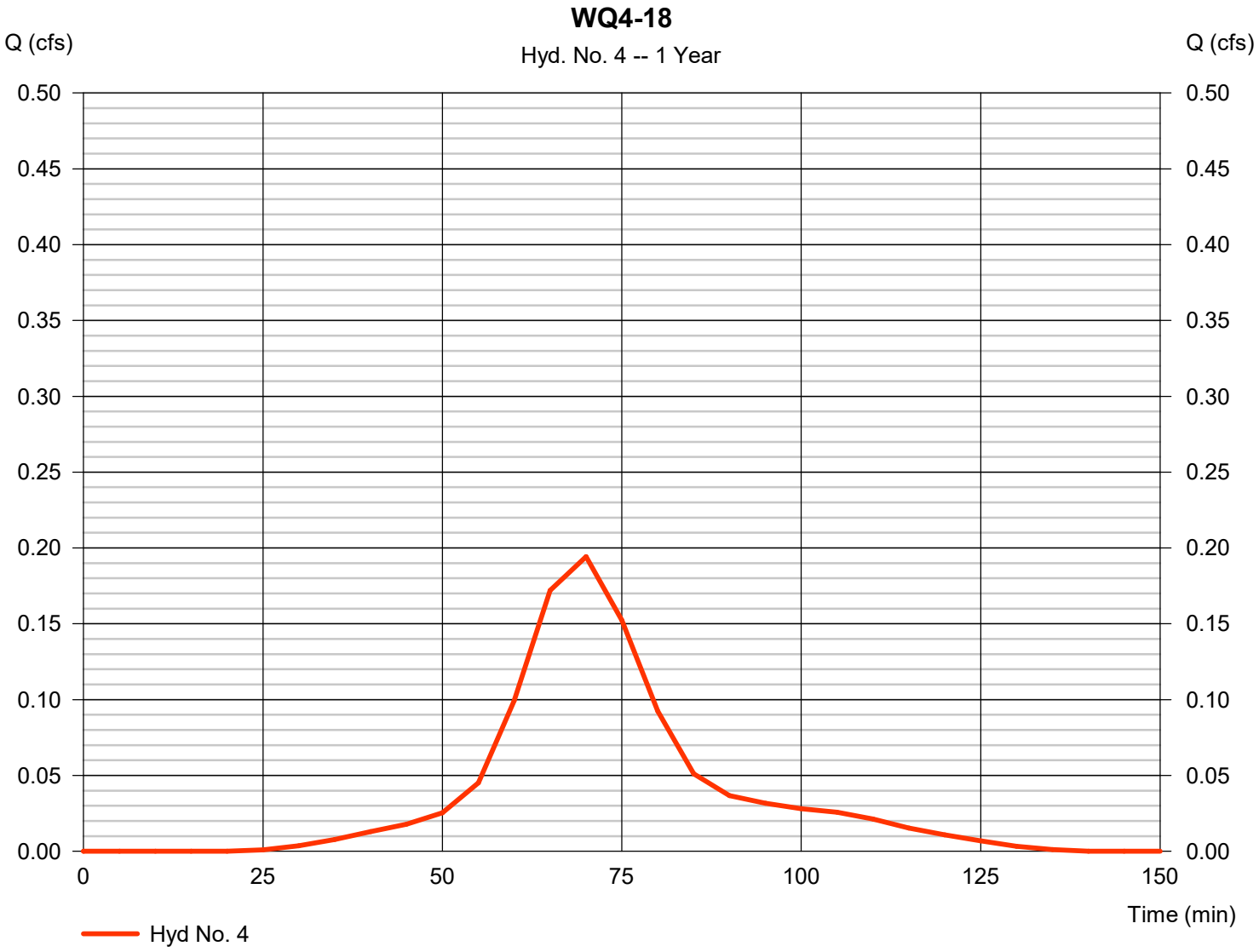


Hydrograph Report

Hyd. No. 4

WQ4-18

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.194 cfs
Storm frequency	=	1 yrs	Time to peak	=	70 min
Time interval	=	5 min	Hyd. volume	=	317 cuft
Drainage area	=	0.090 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	1.25 in	Distribution	=	Custom
Storm duration	=	\\langan.com\data\PAR\data4\[illegible]\Engineering Data\Site\Stormwater\Pha	Shape factor	=	484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

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	1.504	2	720	4,529	------	------	------	WQ4-14
2	SCS Runoff	1.587	2	720	4,780	------	------	------	WQ4-16
3	SCS Runoff	0.752	2	720	2,264	------	------	------	WQ4-17
4	SCS Runoff	0.752	2	720	2,264	------	------	------	WQ4-18

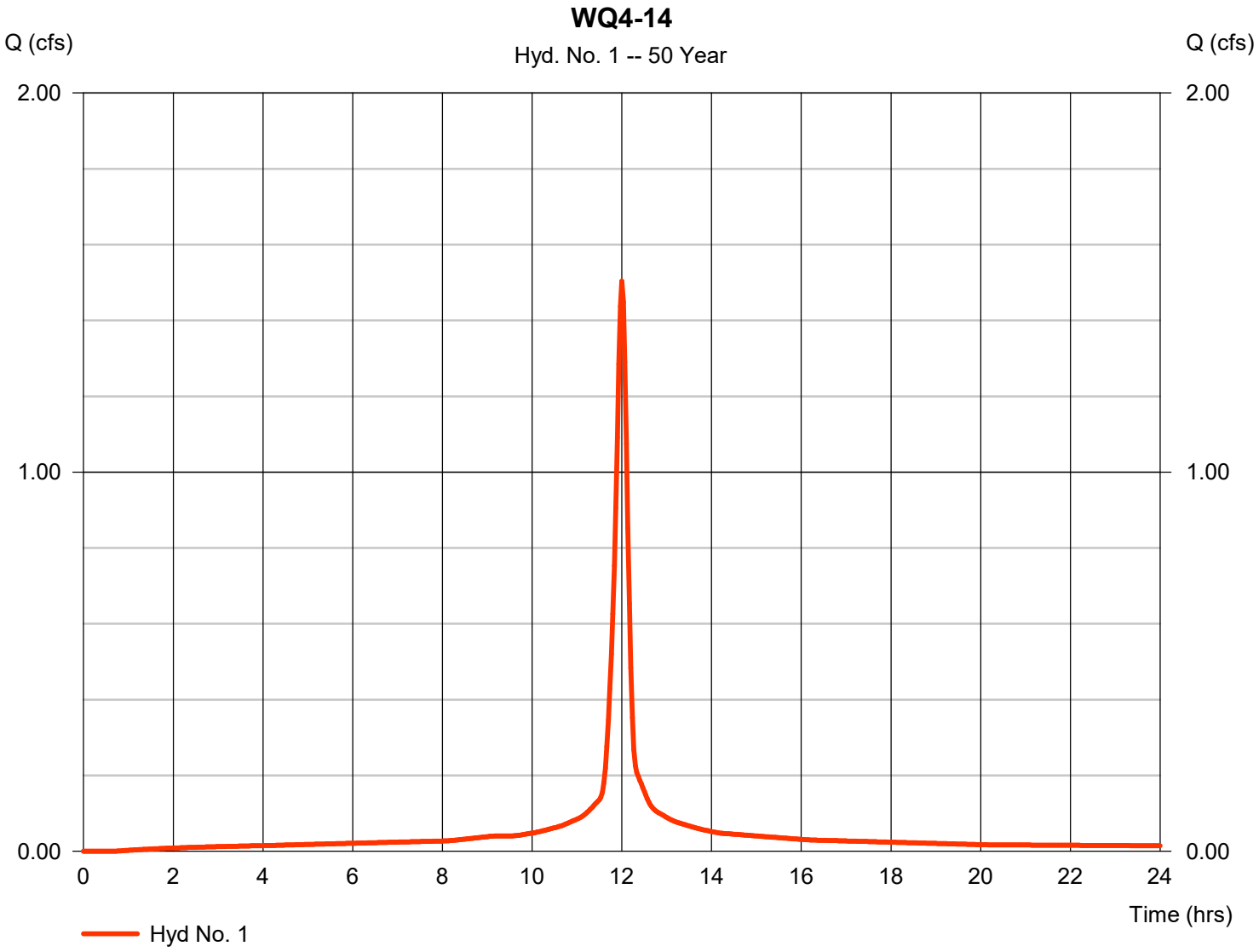
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 02 / 23 / 2023

Hyd. No. 1

WQ4-14

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.504 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	4,529 cuft
Drainage area	=	0.180 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

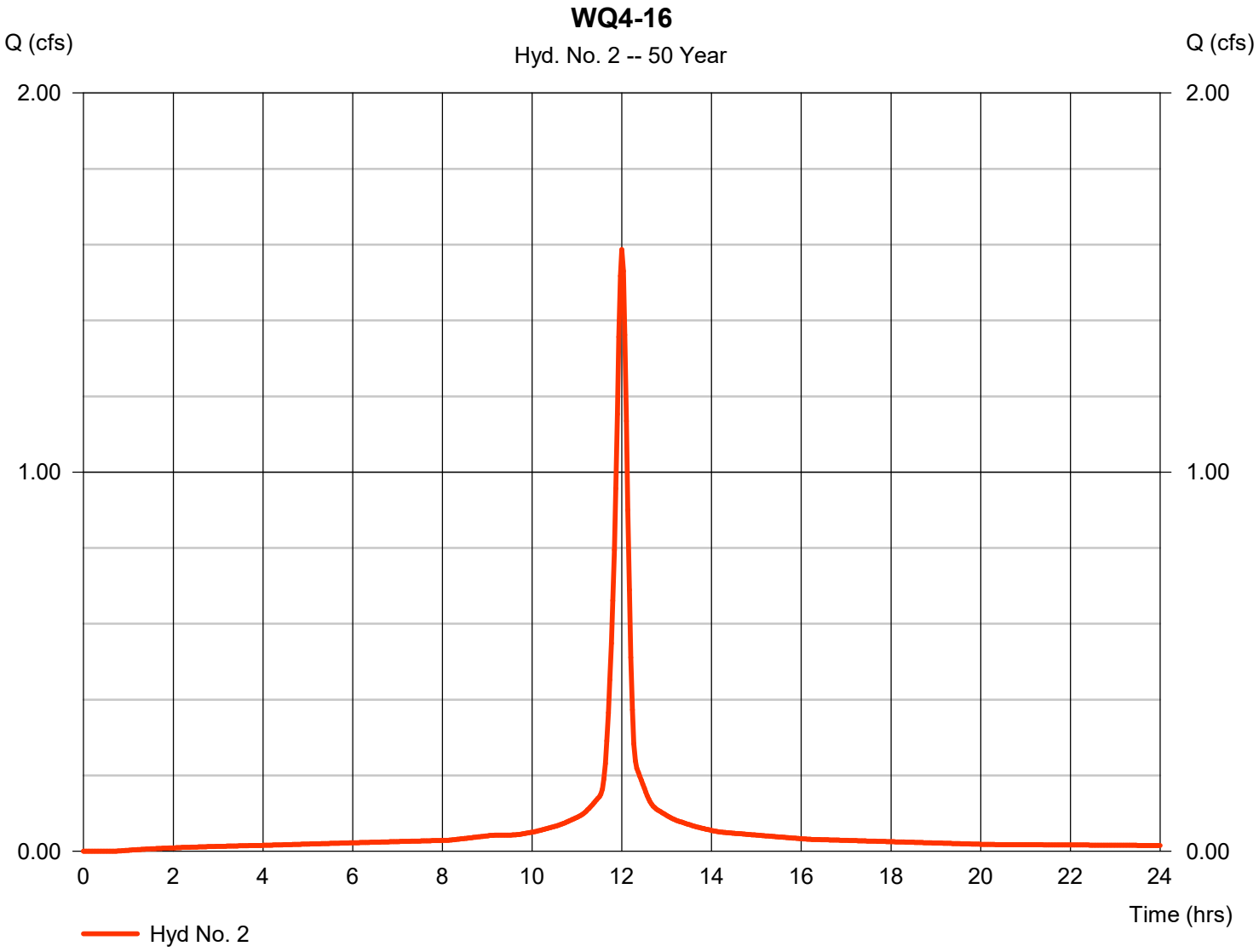


Hydrograph Report

Hyd. No. 2

WQ4-16

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.587 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	4,780 cuft
Drainage area	=	0.190 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

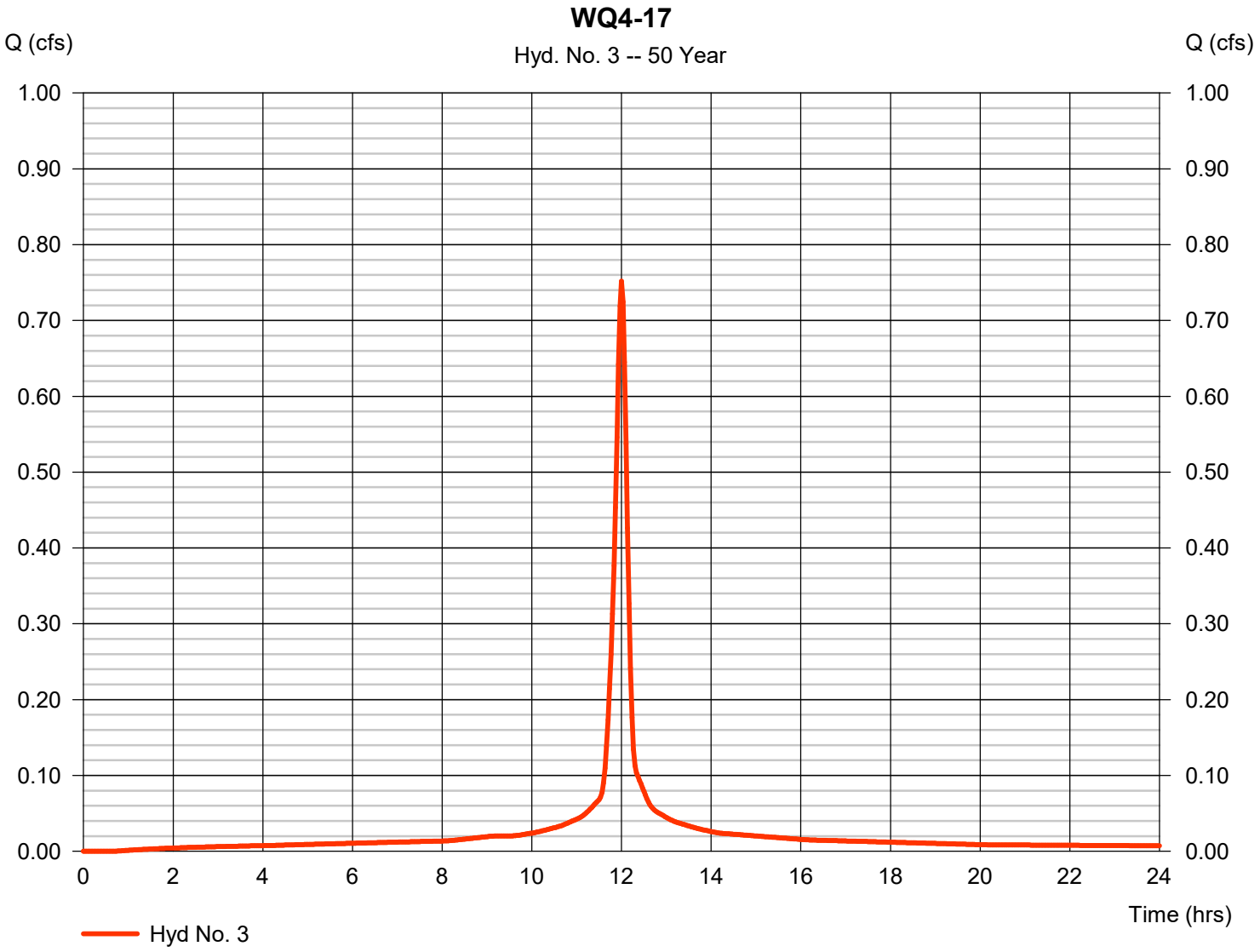


Hydrograph Report

Hyd. No. 3

WQ4-17

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.752 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	2,264 cuft
Drainage area	=	0.090 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

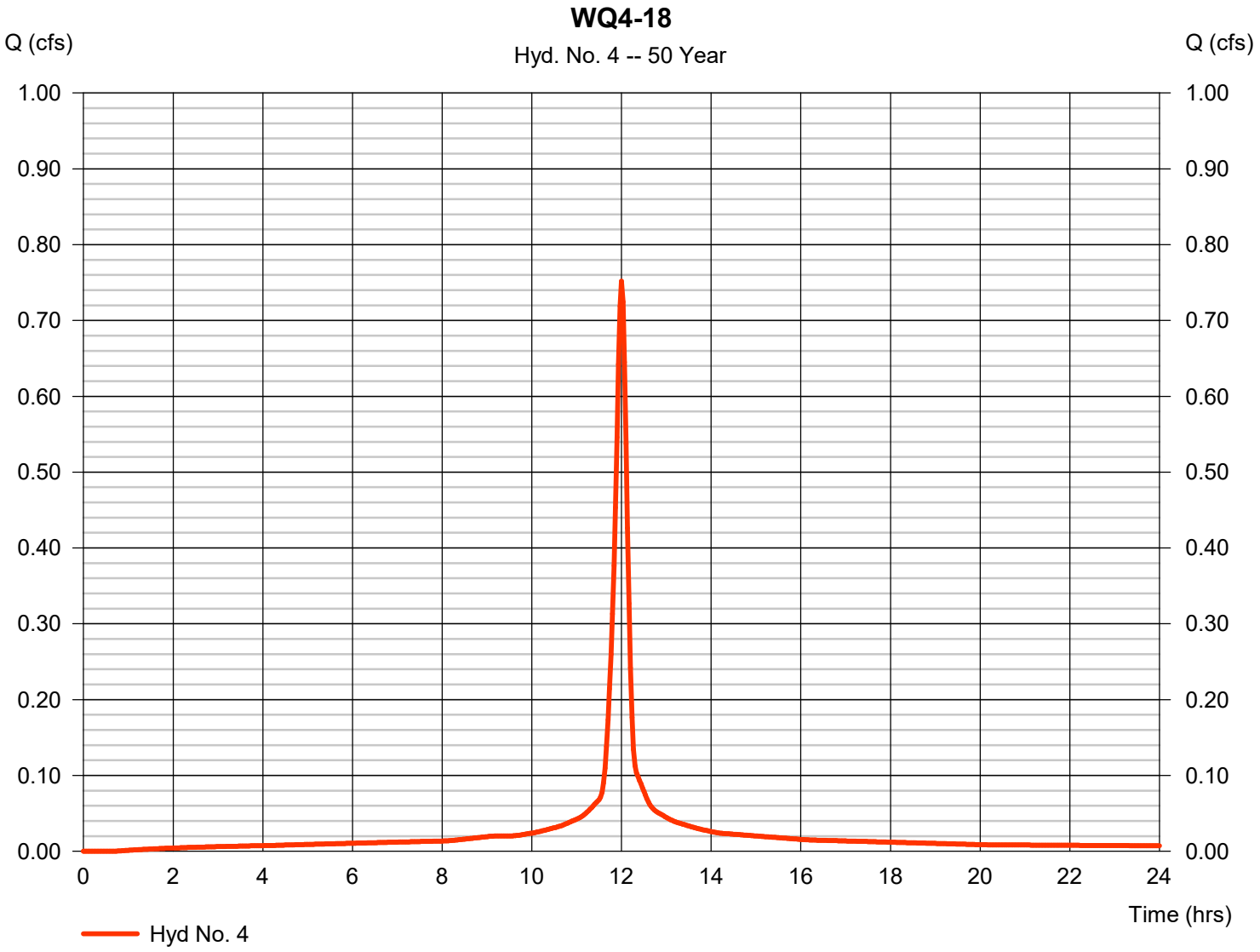


Hydrograph Report

Hyd. No. 4

WQ4-18

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.752 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	2,264 cuft
Drainage area	=	0.090 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	6.96 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



MECHANICAL TREATMENT DEVICE REMOVAL EFFICIENCY TESTING DATA

SNOUT

Princeton Hydro

13 November 2007

Mr. T.J. Mullen
Best Management Products, Inc.
53 Mount Archer Road
Lyme, Connecticut 06371

Dear Mr. Mullen:

As part of the 2002 – 2003 watershed project for Lake Peekskill, SNOUT stormwater retrofits were installed in the Town of Putnam Valley. These retrofits were chosen since large, structural Best Management Practices (BMPs) would be difficult to install these residential areas. On 9 May 2003, the Putnam Valley Department of Public Works installed two SNOUT devices into two previously identified catch basins. The SNOUTs were monitored four times during 2003; 18 September, 25 September, 12 December, and 29 December. Stormwater samples were collected entering and exiting the SNOUT retrofitted catch basins and were analyzed for total phosphorus (TP) and total suspended solids (TSS). In order to estimate the pollutant loads entering and exiting the devices, rainfall data (Northeast Regional Climate Center: http://climod.nrcc.cornell.edu/), measured pollutant concentrations, and the immediate drainage area were used. Specifically, the following equation was used to estimate the pollutant load entering and exiting the SNOUT devices:

$$L = R * A * C$$

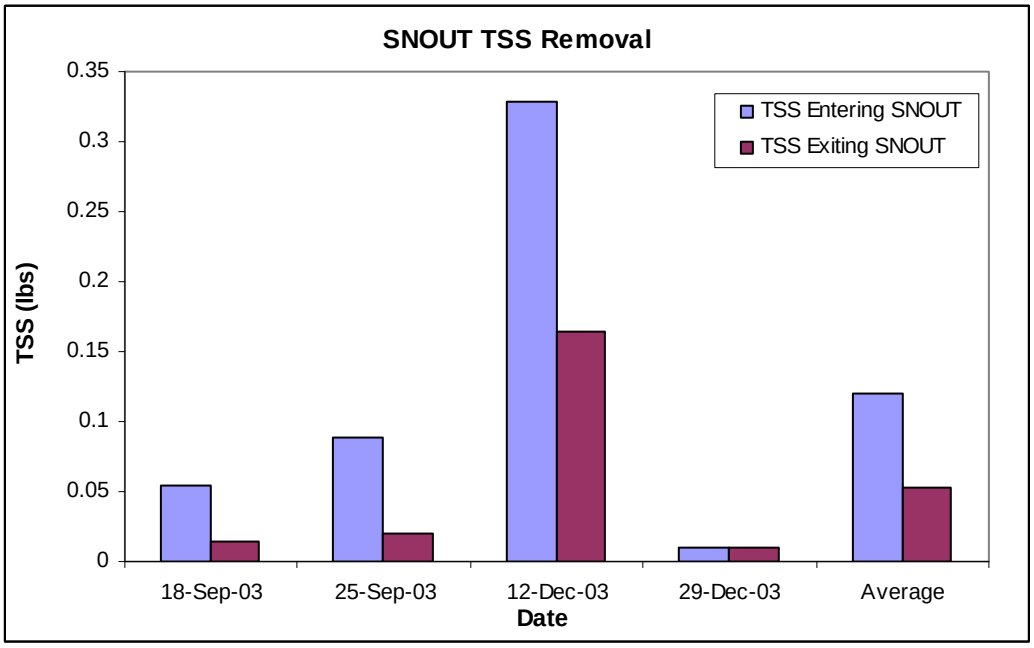
Where L = Pollutant load (lbs)
R = Rainfall during sampling event (meters)
A = Drainage area (m^2)
C = pollutant concentration (mg/ L)

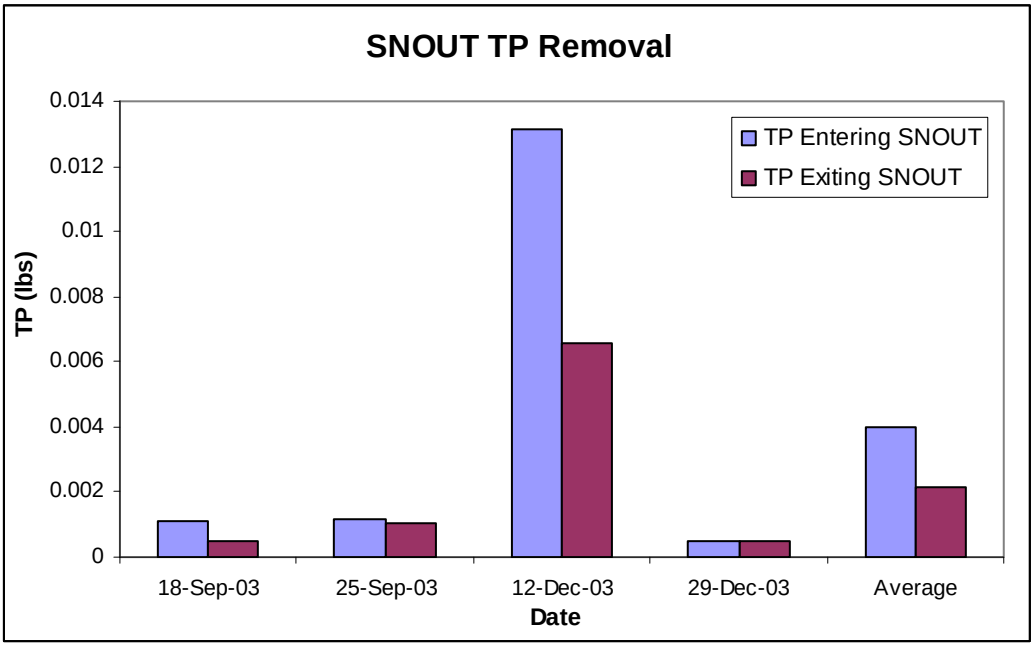
It should be noted that rainfall data during the 29 December 2003 sampling event was not available through the Cornell Climod database; thus, Princeton Hydro estimated the amount of rainfall to be 0.1 inches. In addition, the area of land draining into the SNOUT devices were estimated to be 880 m^2, using ArcGIS and the limited existing topographic data. The SNOUT devices removed both TSS and TP from stormwater entering the SNOUT devices from the surrounding drainage area. On average the SNOUTs reduced TSS by 56% and TP by 46%. Please refer to the figures at the end of this document for additional removal data. Please note that these are rough estimates since the exact drainage area and amount of rainfall were approximated.

Based on these data, the SNOUT-modified catch basins demonstrated the potential to remove the TSS and TP pollutant loads originating from surface runoff. If you have any questions or comments, please contact us at (610) 524 – 4220.

Sincerely,

Mary Lambert
GIS Specialist/ Scientist


SNOUT TSS Removal
TSS (lbs)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
TSS Entering SNOUT
TSS Exiting SNOUT
18-Sep-03
25-Sep-03
12-Dec-03
29-Dec-03
Average
Date


SNOUT TP Removal
TP (lbs)
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
TP Entering SNOUT
TP Exiting SNOUT
18-Sep-03
25-Sep-03
12-Dec-03
29-Dec-03
Average
Date

FABCO STORMFILTER

LONG
ISLAND
ANALYTICAL
LABORATORIES INC.
"TOMORROWS ANALYTICAL SOLUTIONS TODAY"

NYSDOH ELAP# 11693
USEPA# NY01273
CTDOH# PH-0284
NJDEP# NY012
PADEP# 68-2943

SUSPENDED SOILDS REMOVAL TEST

Of Stormwater Filtration System

Prepared For:

FABCO INDUSTRIES INC.

66 Central Avenue
Farmingdale, NY 11735

June 2015

Prepared By:
Long Island Analytical Laboratories Inc.
110 Colin Drive
Holbrook, NY 11741

Michael Veraldi, President, Director of Laboratories

1 Table of Contents

2 Introduction

Long Island Analytical Laboratories Inc. (LIAL) has been retained by Fabco Industries Inc. to conduct a sediment removal efficiency test for a storm water filtration system's cartridge; identified as Fabco Industries Inc. Standard Filter Cartridge, part number 9718-1-000. [1] The efficiency test was conducted at the Fabco Industries location in Farmingdale, N.Y., using OK-85 silica sand.

3 Overview of Test Apparatus

The testing apparatus is composed of two reinforced wooden boxes, each wrapped with a PVC liner to create two water tight vessels. The boxes are vertically stacked so that the lower box, hereafter referred to as the collection tank, will collect the effluent water from the filter test cartridge which is contained in the upper box, hereafter referred to as the testing tank. The testing tank included a standard aluminum cartridge attachment plate of which configuration is typically used in Fabco Industries standard products to securely lock and seal cartridges in place. [2] Clean water is then pumped from a 5,000 GAL holding tank through a series of control valves and through an initial (coarse) flow meter. The water is then piped to a second meter, at the testing tank inlet, where a butterfly valve is used for fine flow adjustment. The regulated influent water is immediately allowed to freefall into the testing tank, where a calibrated lead screw auger introduces the OK-85 Silica Sand. Furthermore, the testing tank incorporates a propeller style mixer to keep the tank in a turbulent state during testing, thereby preventing the silica sand from falling out of suspension. The homogeneous mixture is then filtered through the test cartridge and discharges (freefall) into the collection tank below, which in turn drains into a 2,000 GAL discharge tank. [3]

Testing Equipment	
Burks 7.5 HP Centrifugal Pump	CAT. 469-4
Blue-White Industries Digital Flow Monitoring System (2)	F-2000
Lead-Screw Auger Feeder [Calibrated by Fabco Industries]	NA
Butterfly Valves	NA
Leeson Agitator Speed: 1725 RPM	CAT. 102954.00

Table 1: Equipment used for sediment removal testing.

4 Test Sediment:

The OK-85 silica sand used for the sediment removal efficiency testing was produced by U.S. Silica Company at a plant in Mill Creek, Oklahoma. The sediment was produced by screening the crystalline silica through different sized sieves and then mixing a percentage of the silica that was retained on each sieve together (Figure 1). The OK-85 silica sand is a fairly homogeneous, inert material composed of 99.8% Silicon Dioxide (SiO_2) and has the following physical properties. [4]

pH	6.7
AFS Grain Fineness	81.8
Grain Shape	Round
Hardness	7 Mohs
Specific Gravity	2.65
Moisture Content	<0.50%
Mineral	Quartz
Color	White
Melting Point	3100°F

Table 2: Typical physical properties of OK-85 Silica sand. [4]

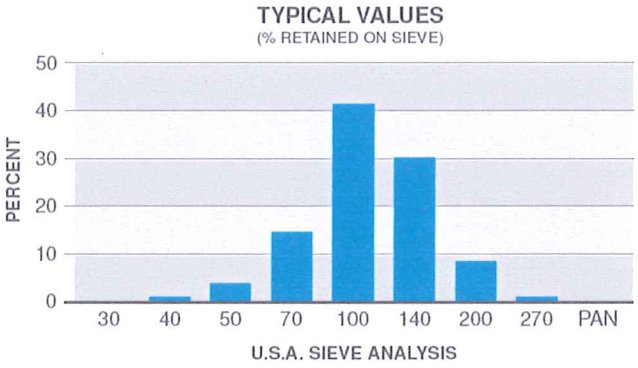
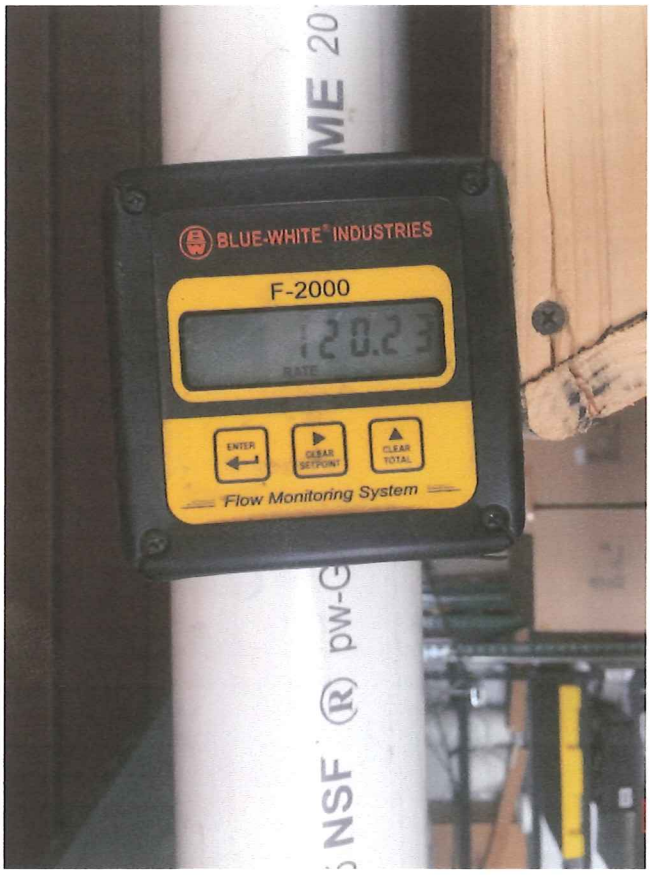


Figure 1: Sieve analysis for OK-85 Silica sand. [4]

5 Testing Procedure

Prior to sampling, Fabco Industries, Inc. conducted calibration tests on the lead screw auger and the flow meters to ensure proper functionality and accuracy. The calibration test for the "lead screw auger was conducted through timed trials of sediment expulsion and collection." [5] The calibration test for the flow meters "was conducted through a timed volume displacement trial." [5] The sampling procedure consisted of recirculating water through the pump to achieve a flow rate of 120 GPM; this was done utilizing an external piping system as diagramed in the plumbing schematic (Attachment 4). Then the water was diverted into the testing tank where it was allowed to stabilize at a constant head height and thus creating constant flow through the filter cartridge. After 60 seconds the lead screw auger and propeller mixer were activated and the testing tank was left to mix for an additional 60 to 90 seconds. A total of eight samples were then collected, four at the influent and four at the effluent of the filter cartridge, by a trained Long Island Analytical Laboratories technician. All sampling and preservation techniques were done in strict compliance with NYSDOH ELAP protocols. [5]



6 Sample Analysis Method

The eight samples, each approximately 500 mL, were analyzed at Long Island Analytical Laboratories using the Standard Test Methods for Determining Sediment Concentration in Water Samples, ASTM Designation: D3977-97. From the ASTM specification Test Method B – Filtration was found to be most suitable for analyzing the samples. Test Method B "can be used only on samples containing sand concentrations less than about 10,000 ppm and clay concentrations less than about 200 ppm. The sediment need not be settleable because filters are used to separate water from the sediment." Then "the sample consisting of water, sediment and dissolved solids were weighed and then filtered through a glass-fiber disk. The disk and sediment were dried and weighed" then the sediment concentration was calculated. [6]

7 Laboratory Results

$$P_{Removal} = \frac{S_{Before} - S_{After}}{S_{Before}}$$

Sample #	Influent [mg/L]	Effluent [mg/L]	Efficiency (%)
1	954	232	75.7
2	2060	217	89.5
3	1150	258	77.6
4	1970	266	86.5
Mean	1533.50	243.25	82.3

Table 3: Sediment Removal Efficiency Results.

8 References

[1] Fabco Industries, Inc., *Cartridge, Standard,* Farmingdale, New York, 2007.

[2] Fabco Industries, Inc, *TSS Testing Fabco Cartridge,* Farmingdale, NY, 2014.

[3] Fabco Industries, Inc., *Testing Plumbing Schematic,* Farmingdale, NY, 2014.

[4] U.S. Silica Company, "Product Data OK-85 Unground Silica," U.S. Silica Company, [Online]. Available: http://www.ussilica.com. [Accessed 18 June 2015].

[5] Fabco Industries, Inc., *Total Suspended Solids (TSS) - Outline,* Farmingville, NY, 2014.

[6] ASTM International, "Standard Test Methods for Determining Sediment Concentration in Water Samples," 2013. [Online]. Available: http://www.ASTM.org. [Accessed 2 March 2015].

9 Appendix

9.1 Attachment 1: Fabco Industries, Inc. Standard Cartridge

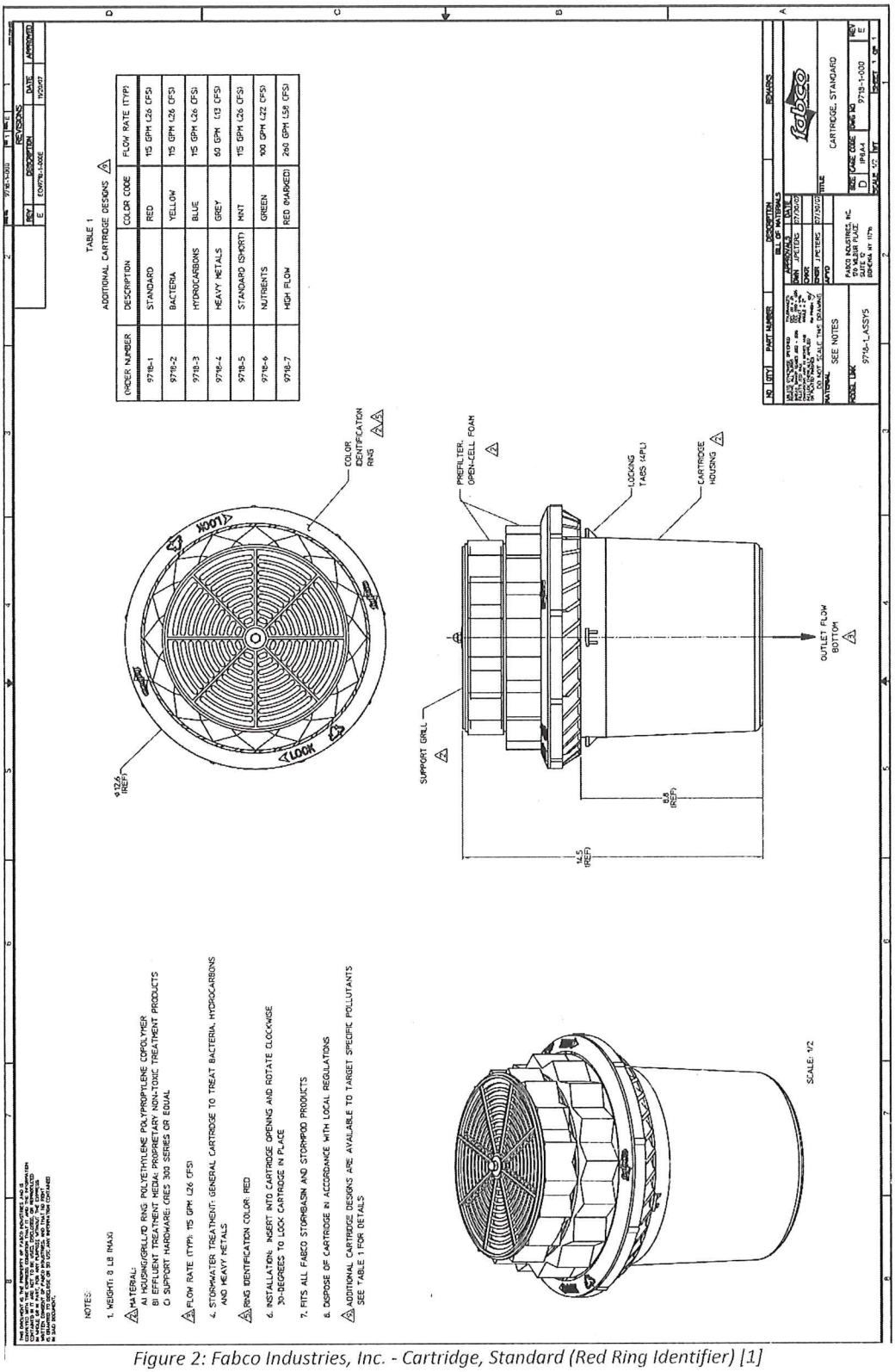


Figure 2: Fabco Industries, Inc. - Cartridge, Standard (Red Ring Identifier) [1]

9.2 Attachment 2: U.S. Silica Company: OK-85 Silica, Unground

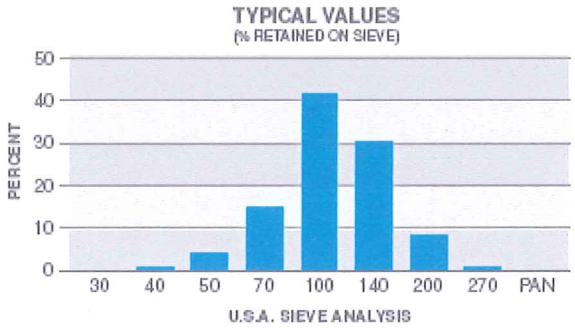
Product Data

US SILICA

OK-85

UNGROUND SILICA

PLANT: MILL CREEK, OKLAHOMA



USA STD SIEVE SIZE		TYPICAL VALUES		
		% RETAINED		% PASSING
MESH	MILLIMETERS	INDIVIDUAL	CUMULATIVE	CUMULATIVE
30	0.600	0.0	0.0	100.0
40	0.425	0.8	0.8	99.2
50	0.300	4.0	4.8	95.2
70	0.212	14.8	19.6	80.4
100	0.150	41.0	60.6	39.4
140	0.106	30.0	90.6	9.4
200	0.075	8.4	99.0	1.0
270	0.053	0.9	99.9	0.1
Pan		0.1	100.0	0.0

TYPICAL PHYSICAL PROPERTIES	
AFS[1] Acid Demand (@pH 7)	0.4
AFS[1] Grain Fineness	61.8
Color	White
Grain Shape	Round
Hardness (Mohs)	7
Melting Point (Degrees F)	3100
Mineral	Quartz
Moisture Content (%)	<0.50
pH	6.7
Specific Gravity	2.65

(1) American Foundrymen's Society

TYPICAL CHEMICAL ANALYSIS, %	
SiO_2 (Silicon Dioxide)	99.8
Fe_2O_3 (Iron Oxide)	0.017
Al_2O_3 (Aluminum Oxide)	0.09
TiO_2 (Titanium Dioxide)	<0.01
CaO (Calcium Oxide)	<0.01
MgO (Magnesium Oxide)	<0.01
Na_2O (Sodium Oxide)	<0.01
K_2O (Potassium Oxide)	0.04
LOI (Loss On Ignition)	0.1

July 1, 2008

U.S. Silica Company
8490 Progress Drive, Suite 300
Frederick, MD 21701
(301) 682-0600 (phone)
(800) 243-7500 (toll-free)
ussilica.com

Figure 3: U.S. Silica Company - MSDS for OK-85, unground [4]

9.3 Attachment 3: Fabco Industries, Inc. Cartridge Testing Fixture (P/N: 10111-1-000)

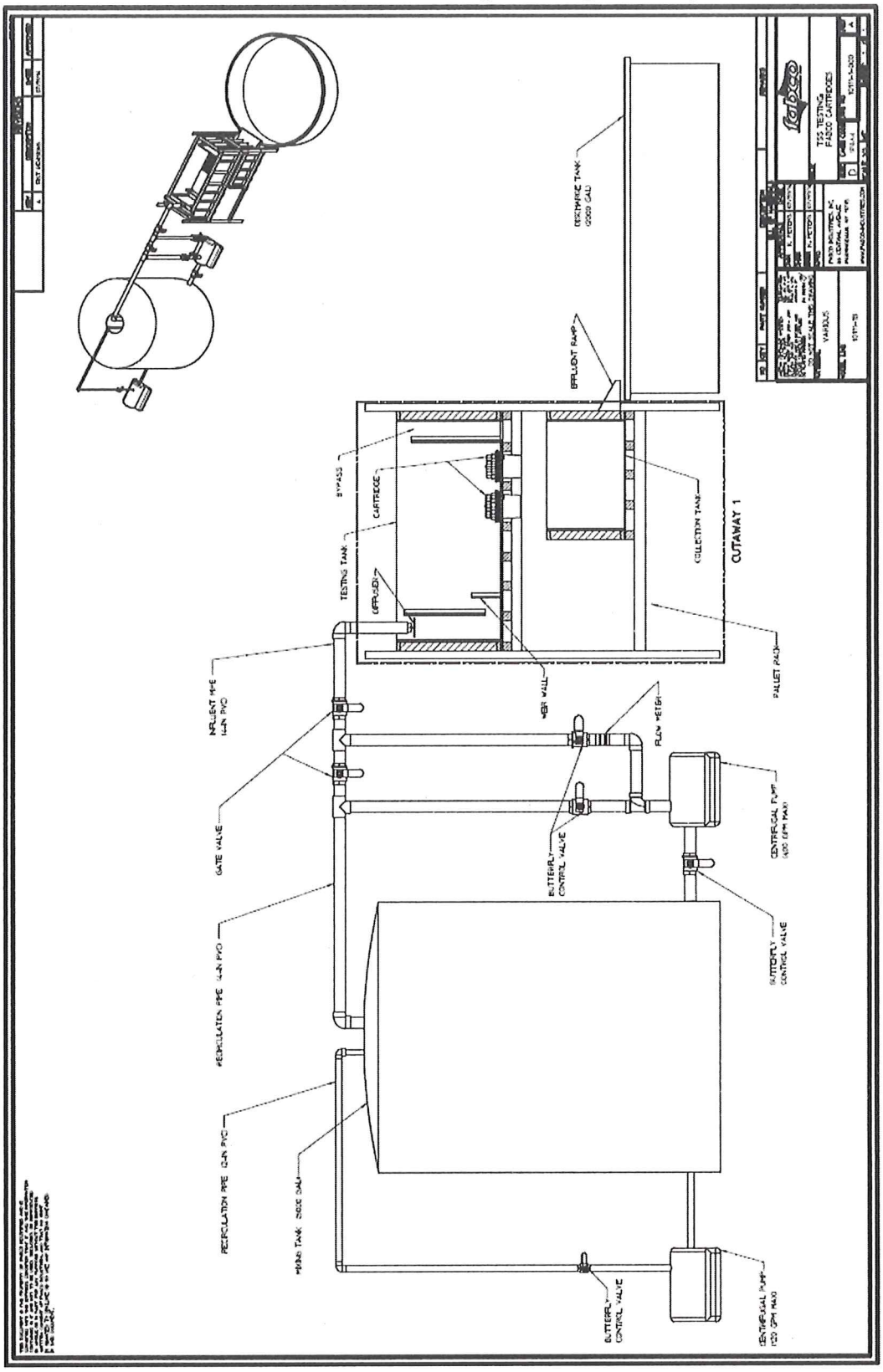
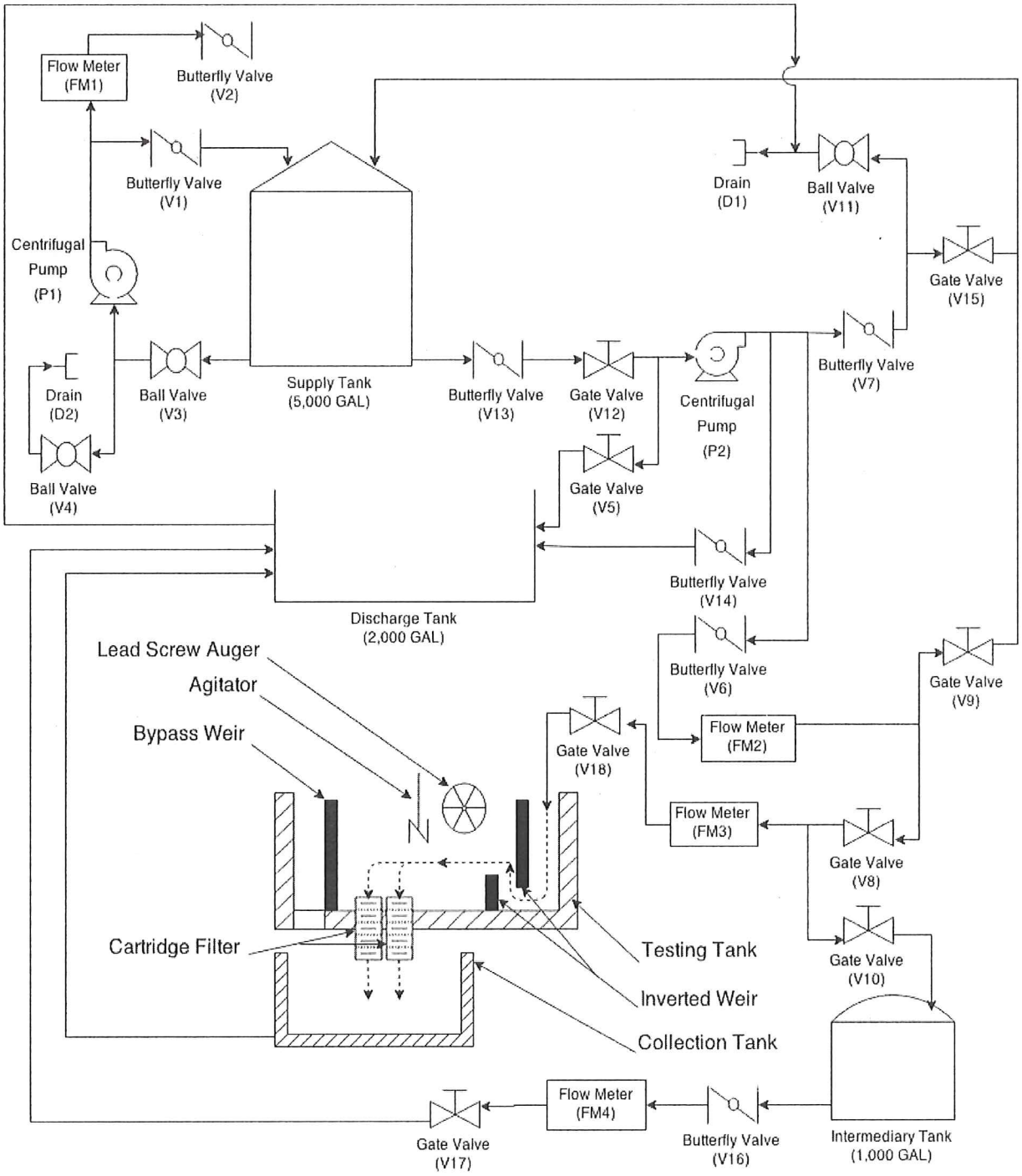


Figure 4: Fabco Industries, Inc. cartridge fixture for sediment removal testing. [2]

9.4 Attachment 4: Fabco Industries, Inc. Testing Fixture Plumbing Schematic



Notes:

- FM1: GPI, TM Series, Water Meter, Great Plains Industries, Inc. Wichita, KS.
- FM2, FM3, FM4: Blue-White Industries, F-2000, Flow Monitoring System
- P1: US Motors, SN: C55CXJZB-4757, Power: 1 HP, Speed: 3450 RPM
- P2: Burks Pumps, SN: 0305, CAT: 469-4, Power: 7.5 HP, Speed: 1760 RPM

Figure 5: Fabco Industries, Inc. Plumbing Schematic. [3]

9.5 Attachment 5: Fabco Industries, Inc. Total Suspended Solids (TSS) – Outline

Figure 6: Fabco Industries, Inc. Testing Procedure. [5]

Total Suspended Solids (TSS)- Outline

Written by:

Kevin C. Peters

Prior to Sampling:

1st.: The testing setup was constructed to the TSS Plumbing Schematic featured at the conclusion of this document. (Figure 1)

2nd.: The cartridge test fixture (Figure 1) was cleaned and rinsed of all sediment and particulates.

3rd.: The 5,000 gallon supply tank (Figure 1) was filled with clean water to the 4,500 gallon mark. (Previous sediment testing for a single cartridge assembly has been shown to use no more than 2,000 gallons)

4th.: The water level in the 2,000 gallon discharge tank (Figure 1) was drained to readily accommodate the total volume of water used during the experiment.

5th.: Calibration of the lead screw auger was conducted through timed trials of sediment expulsion and collection. The lead screw auger was run for one minute and the sediment excreted from the auger was collected in a beaker and massed using a digital balance.

6th.: Calibration of flow meter 3 (Figure 1) was conducted through a timed volume displacement trial. The flow meter was held at a constant flow rate of 60 gallons per minute for one minute to stabilize and then a 30 gallon, marked, drum was used to collect the dispensed water. A stop watch was used to measure the required time to fill the drum to the 30 gallon marker.

66 Central Ave Farmingdale, NY 11735 ■ Telephone: 1 (631) 393-6024 ■ Fax: 1 (631) 501-5528 ■ www.Fabco-Industries.com

Concurrent to Sampling:

1st.: A new Standard Fabco Cartridge was inserted into the Testing Tank as shown in Figure 1.

2nd.: The testing setup was configured to the valve positions specified in the table Valve Positioning – Sediment Testing, Start column (Table 1).

3rd.: The centrifugal pump, P2, (Figure 1) was started. With the valves in the Start position this allows the water to be recirculated through the 5,000 gallon Supply Tank (Figure 1).

4th.: Using flow meter FM2 (Figure 1) and butterfly valves V6 and V7, (Figure 1), here forth referred to as the control valves, the flow rate is adjusted roughly 15 to 20 gallons per minute higher than the desired flow rate. For sediment testing the desired flow rate was 120 gallons per minute, thus the flow rate obtained by the control valves was roughly 145 gallons per minute.

5th.: Once the flow rate was maintained, the valve positions were reconfigured to correspond with the Test column of the Valve Position – Sediment Testing Table (Table 1). This configuration redirects the flow of water that was passing though the flow meter, FM2, (Figure 1) away from the 5,000 gallon Supply Tank and into the Testing Tank (Figure 1).

6th.: Using flow meter FM3 and gate valve V18 (Figure 1), thus forth referred to as the regulatory valve, the flow rate was readjusted to the desired rate. For the total suspended solids (TSS) testing the desired flow rate was 120 gallons per minute.

7th.: Once the desired flow rate was obtained, the lead screw auger filled with OK-85 sand and the water agitator were turned on. The water and sediment was then allowed to mix in the testing for between 60 and 90 seconds.

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8th.: A total of ten samples were taken during testing, five inlet and five outlet. The inlet and outlet samples were taken concurrently at 20 second intervals between samples. The inlet samples were taken at the invert of a half pipe which was placed so that both the inlet water and OK-85 sediment would thoroughly mix. The outlet samples were taken at the exit of the standard cartridge filter (Figure 1) which was between the testing Tank and the Collection Tank (Figure 1).

9th.: Once all samples had been taken the centrifugal pump P2 was turned off and the valves were reconfigured to the positions specified in the End column of the Valve Positioning – Sediment Testing table (Table 1).

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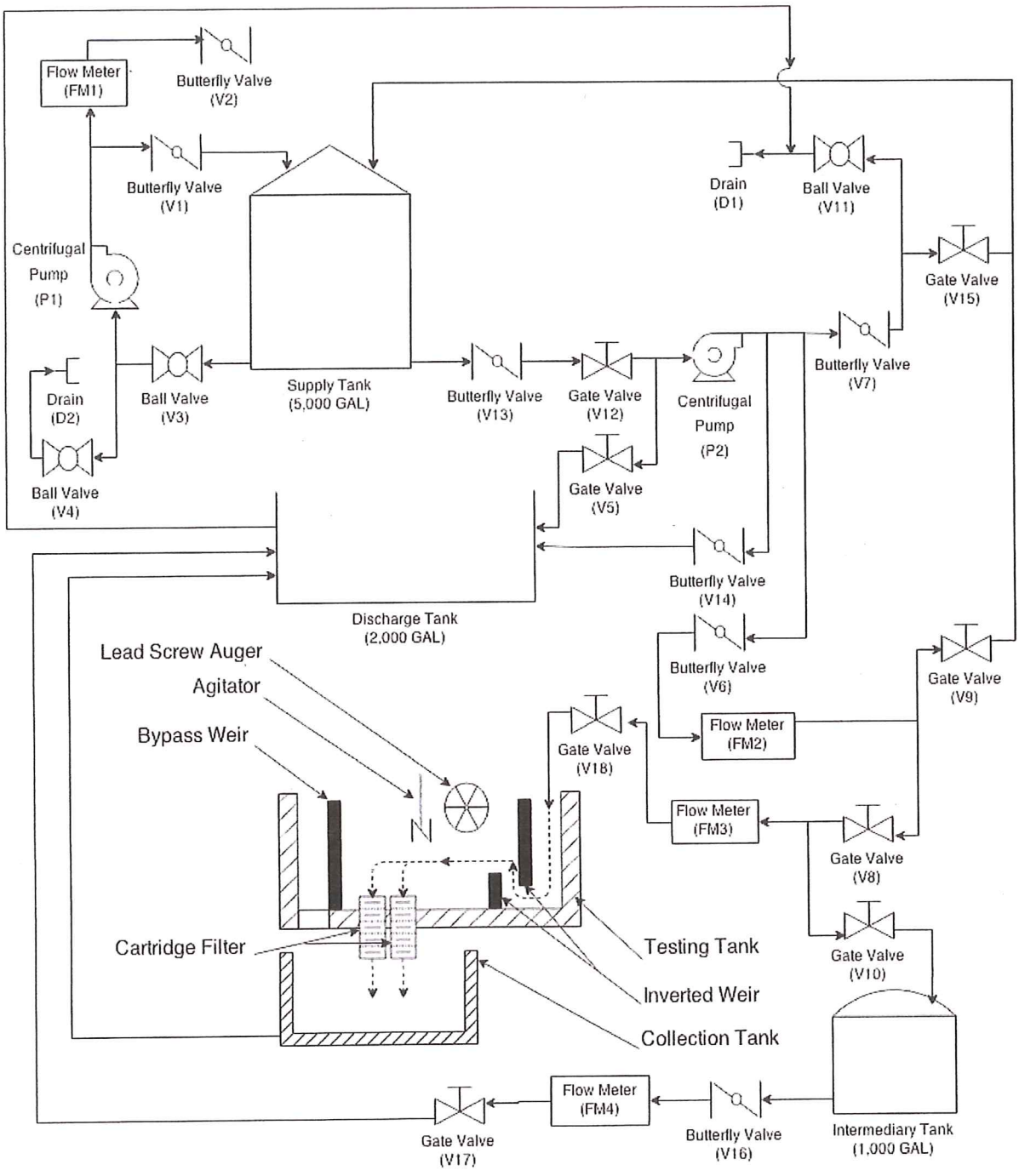
TSS Plumbing Schematic



Notes:

- FM1: GPI, TM Series, Water Meter, Great Plains Industries, Inc. Wichita, KS.
- FM2, FM3, FM4: Blue-White Industries, F-2000, Flow Monitoring System
- P1: US Motors, SN: C55CXJZB-4757, Power: 1 HP, Speed: 3450 RPM
- P2: Burks Pumps, SN: 0305, CAT: 469-4, Power: 7.5 HP, Speed: 1760 RPM

Figure 1: Plumbing schematic for total suspended solids testing.

VALVE POSITION - SEDIMENT TESTING				
VALVE #	START	TEST	DRAIN	END
V1	OPEN	OPEN	N/A	N/A
V2	CLOSED	CLOSED	CLOSED	CLOSED
V3	OPEN	OPEN	CLOSED	CLOSED
V4	CLOSED	CLOSED	CLOSED	CLOSED
V5	CLOSED	CLOSED	OPEN IF DRAINING POOL	N/A
V6	CLOSED	ADJ. W/ V7 TO OBT. FL. RT.	CLOSED	CLOSED
V7	OPEN	ADJ. W/ V6 TO OBT. FL. RT.	OPEN	OPEN
V8	CLOSED	OPEN AT CORRECT FL. RT.	N/A	N/A
V9	OPEN	CLOSE AT CORRECT FL. RT.	N/A	N/A
V10	CLOSED	CLOSED	N/A	N/A
V11	CLOSED	CLOSED	OPEN	N/A
V14	CLOSED	CLOSED	OPEN	OPEN
V15	OPEN	OPEN	CLOSED	CLOSED
V12	OPEN	OPEN	OPEN IF DRAINING CIELO	N/A
V13	OPEN	OPEN	OPEN IF DRAINING CIELO	CLOSED

Table 1: Valve positioning for sediment testing to be used in cognizance with TSS Plumbing Schematic (Figure 1)

9.6 Attachment 6: Standard Test Methods for Determining Sediment Concentration in Water Samples, ASTM Designation D3977-97

TEST METHOD B—FILTRATION

14. Scope

14.1 Test Method B can be used only on samples containing sand concentrations less than about 10 000 ppm and clay concentrations less than about 200 ppm. The sediment need not be settleable because filters are used to separate water from the sediment. Correction factors for dissolved solids are not required.

14.2 Even though a high-concentration sample may filter slowly, users should not divide the sample and use two or more filters. Instead, the entire sample should be filtered through one disk.

15. Summary of Test Method

15.1 The sample consisting of river water, sediment, and dissolved solids is weighed and then filtered through a glass-fiber disk. The disk and sediment are dried and weighed, then the sediment concentration is calculated in accordance with Section 18.

16. Apparatus

16.1 *Gooch Crucibles*—Porcelain or borosilicate glass crucibles with fritted glass bases are required for holding the filters. Capacities of the crucibles are optional; sizes in the 25 to 130-mL range work best with 1-L samples. Small crucibles have the advantage of requiring less oven space during drying and absorbing less moisture during weighing; large crucibles are needed if filtering proceeds slowly.

16.2 *Glass-fiber Filter Disks*—Filter diameter and filter retention rating, sometimes referred to as filter pore size, are critical to this analysis. The sediment that accumulates on a filter traps some particles that are smaller than the filter's retention rating. As filtration proceeds and the sediment layer thickens, the retention rating of the sediment and filter acting as a unit gradually decreases. Users should use filters with retention ratings of 1.5 µm to agree with practices in many sediment laboratories.[8] Filter diameters should equal or exceed 24 mm. Filters as large as 42 mm may be required to avoid filter plugging at high concentrations. Record filter retention rating in micrometres and filter diameter in millimetres at a convenient place on the laboratory form.

16.3 *Vacuum System*—See 10.2.

16.4 *Drying Oven*—See 10.3.

16.5 *Desiccator*—See 10.4.

16.6 *Laboratory Balances*—See 10.5 and 10.6.

17. Procedure

17.1 Wash the filter with water to remove soluble compounds; then dry the filter and its crucible at 105°C for at least 1 h.

17.2 Transfer the crucible and filter to the desiccator, then, after the parts have cooled to room temperature, weigh them to the nearest 0.0001 g and record the reading on the laboratory form under the heading Weight of Sediment—Tare.

17.3 While a vacuum is being applied to the bottom of the crucible, decant supernate from the sample into the crucible. Flush the inner surfaces of the sample bottle with water to complete the transfer.

17.4 As filtering proceeds, inspect the filtrate. If it is turbid, pour the filtrate back through the filter a second and possibly a third time. If the filtrate is still turbid, the filter may be leaking. In this case, substitute a new filter and repeat the process. If the filtrate is transparent but discolored, a natural dye is present; refiltration is not necessary.

17.5 When filtration is complete, place the crucible and its contents in the drying oven set for 105°C.

17.6 When the crucible and its contents are dry, transfer to a desiccator. After the crucible has cooled, weigh to the nearest 0.0001 g and record the reading on the laboratory form under the heading Weight of Sediment—Gross.

17.7 Refer to 11.6 for a discussion of multiple drying and weighing cycles.

18. Calculation

18.1 Subtract Weight of Sediment—Tare from Weight of Sediment—Gross and record the difference under the heading Weight of Sediment—Net. No dissolved-solids correction is required.

18.2 Refer to 12.3 and 12.4 for computations.

19. Precision and Bias for Test Method B (Filtration)

19.1 These precision and bias data meet requirements of Practice D2777.

19.2 Samples for collaborative testing were prepared by dispersing a specially prepared dry powder in approximately 350 mL of water. Mixtures were shipped in sealed glass containers to the nine participating laboratories where three Youden pairs at each of three concentrations were tested.

19.3 Bias was influenced not only by analytical procedures such as filtering, drying, and weighing but also by failure to remove all sediment from the containers and by losing particles through dissolution.

19.4 The following table shows precision and bias for Test Method B:

Concentration Added, mg/L	Concentration Recovered, mg/L	Standard Deviation of Test Method (St)	Standard Deviation of Single Operator (So)	Bias, %
10	8	2.6	2	−20
100	91	5.3	5.1	−9
1000	961	20.4	14.1	−3.9

TEST METHOD C—WET-SIEVING-FILTRATION

20. Scope

20.1 This test method covers concentration measurements of two particle-size fractions. The term fine fraction refers to

[8] The sole source of supply of the apparatus known to the committee at this time is Whatman type 934-AH, Whatman Lab Sales Inc., Hillsboro, OR. If you are aware of alternative suppliers, please provide this information to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,[1] which you may attend.

Figure 7: Test Method B - Filtration from ASTM Designation D3977-97. [6]

FABCO INDUSTRIES, INC
STORMWATER NUTRIENTS: P & N
TEST PROGRAM

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Len Emma
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John Peters

Executive Summary

Under a contract between a local municipality and Fabco Industries, Inc, Bohemia, NY, from October 2006 to December 2007 a series of field tests were conducted on the Fabco StormBasin and StormPod catch basin inserts to evaluate their effectiveness in reducing phosphorus and nitrogen compounds in stormwater runoff. The testing took place at 3 different sites and involved 5 different filter cartridge configurations.

The testing protocol called for testing under realistic field conditions; all test units were installed into existing roadside storm drains, only minimal maintenance was performed during a test sequence and the same filtering cartridge was used from start to finish better simulating expected results. All samples of treated and untreated stormwater were collected during the first 15 minutes – "first flush" of a rain event. Many published studies (example: First Flush Phenomenon, CalTrans, Aug 2005) have concluded that first flush runoff water contains the highest expected concentrations of pollutants during a storm event.

The data presented in the report confirms that the Fabco StormBasin and StormPod units were highly effective in reducing both phosphorus and nitrogen compounds. Specifically:

- Total phosphates were reduced an average 66% - exceeding the 40% required by many states including: New York, Maryland, Virginia and New Jersey.
- Total nitrogen compounds were reduced an average 44%

Additionally, although not required by the study, the report contains information on the type and quantity of solid debris; sediments, trash, leaves, sticks and other material that were collected in the units between tests. Using a separate laboratory analysis on this type

of debris, the report concludes significant concentrations of nutrients maybe stored in this captured material that is not included in the reported reductions.

FABCO INDUSTRIES, INC
STORMWATER NUTRIENTS: P & N
TEST PROGRAM

Introduction:

At the request of a local municipality, a stormwater monitoring program was initiated by Fabco Industries, Bohemia NY, to investigate the efficacy of using the Fabco StormBasin to reduce the levels of nitrogen and phosphate nutrients in stormwater runoff. These chemical species, which typically result from agricultural/landscaping activities, can give rise to eutrophication and subsequent growth of aquatic plant life in receiving waters. This growth tends to deplete vital dissolved oxygen reserves and can result in fish kills.

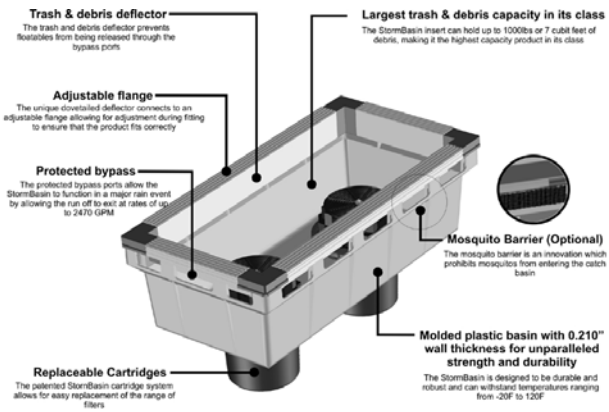
Although both nutrient types are important to plant growth many state stormwater programs require stormwater Best Management Practices (BMPs) to reduce only phosphate levels by a specific amount. For example New York State requires a 40% reduction of Total Phosphates. Specific reductions also come into play within the EPA's TMDL program (Total Maximum Daily Load).

Background:

The Fabco Industries StormBasin is a water treatment system that installs below the iron grate of an existing roadside or parking lot stormwater sewer drain. The StormBasin can be installed into most existing storm water drains without construction or other modifications. In this position the StormBasin intercepts and treats pollutants suspended and/or contained in surface water runoff including: sediments, trash and debris, oils, grease and other toxic hydrocarbon-based chemicals as well as potentially harmful bacteria.

The Technology:

The Fabco StormBasin system consists of a large, injection-molded basin for the collection of raw water, sediments and debris and one or more filtering cartridges located at the bottom of the tub, which treat and discharge the clean water into the storm water system. (Appendix A: StormBasin brochure)



The StormBasin cartridges are selected based on actual pollutant loads expected and are user replaceable.

Currently there are five standard cartridge configurations to choose from: General purpose, Heavy-hydrocarbons (oils & grease), Bacteria, Metals, and Nutrients. Each cartridge type applies one or more filtering technologies in varying degrees to treat specific pollutants. (Appendix B: Filter cartridge brochure)

At the start of the project, Fabco's original nutrient cartridge, although effective on both nitrogen and phosphorous compounds, would not consistently meet the 40%

phosphorous reduction required by many states, including New York. To improve performance on these nutrient compounds Fabco evaluated the use of ten different commercially available filter media in various combinations. Using a series of preliminary, bench scale experiments five were selected for testing within this program.

The media used in this study are identified as:

CHZ – A granular, highly active zeolite mineral which has proven abilities as an ion exchange media.

IC – A fine granular, iron based material specifically produced for efficient removal of phosphates, arsenic and silicates from fresh and salt water. Developed in Germany for treating main water supplies

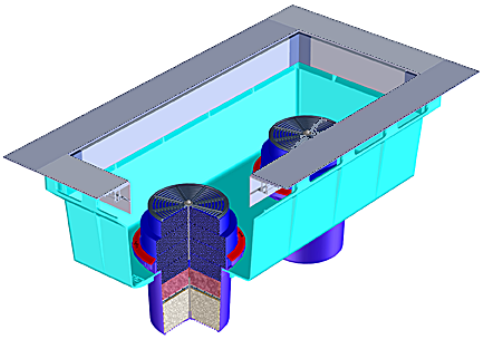
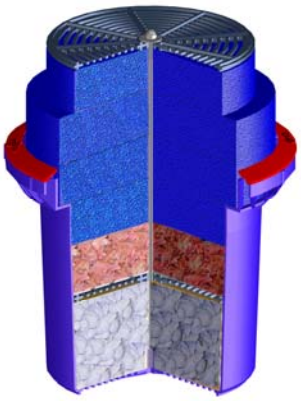
NP – A filter material that has found wide acceptance in large scale commercial aquariums over the past 20 years. NP is effective on ammonia, heavy metals, phosphates and toxic organics.

FP – Fabco's proprietary FabPhos product that combines the effectiveness and many of the properties of the "IC" and "NP" products.

FPAM – Fabco's antimicrobial treatment applied to FabPhos filter media. The antimicrobial surface reduces bacterial build up and slimes.

Using these materials Fabco assembled and tested 4 types of cartridges, which were designated

1. ICCHZ = Combination of layers of IC and CHZ
2. NP = Nutrient Pad material used as sole media type
3. FPCHZ = Combination of layers of FabPhos and CHZ
4. FPAM = Single layer of unique FabPhos material with an additional antimicrobial treatment.

Fabco StormBasin sectional view.	Fabco filtering cartridge. Volume above red ring is considered a "Pre-Filter"
	

Locations:

The sites selected for StormBasin installation were chosen from a list of approximately 15 locations provided by the municipality.

Under the terms of the contract Fabco Industries provided and installed 10 StormBasin units during the spring of 2005 in preparation for the testing. Fabco selected 3 sites for nutrients testing:

Site descriptions:

Site1 community Beach: Base line Nutrient values

The test drain was located in the Northeast corner of the beach parking field and serviced approximately 5900 square feet of black top paving. The parking field was slightly sloped towards the drain causing considerable accumulations of sediments, trash and debris to flow towards the drain. Most importantly for the bacteria study, the parking lot attracts numerous seagulls that leave behind unmistakable evidence of their visits.

Each sewer drain selected at this site had a 24”x48” grate and featured a rear open box inset into the concrete curb. Depth of the vault below the grate was approximately 40”.

Fabco Industries installed a 22”x 44” StormBasins (p/n 9731- 1E) which was configured for the rear open curb box. This configuration features a formed rubber flap that extends from the back edge of the tub into the rear open box. This flap enhances the unit’s ability to capture the very low flows that are generated during the first flush period of a storm. The StormBasin selected featured two (2) Bacteria filtering cartridges p/n 9718-2 (Yellow ring).

As the waterway adjacent to the beach is federally classified as an impacted waterway (303d) due to pathogens/bacteria pollution this was considered an ideal site for Fabco’s bacteria study. The final bacteria report provided by Fabco Industries was completed in December 2006 and is available on the Fabco Industries website (www.fabco-industries.com).

During the bacteria testing phase Fabco engineers had two sets of water samples analyzed for nutrients. It is important to remember that the cartridges used at the beach were optimized for bacteria treatment and as such had no nutrient treatment media in the filter cartridge. The purpose of this sampling was to identify and measure the baseline nutrient values at that site. With virtually no surrounding lawns or landscaped yards in the vicinity, low nutrient levels were expected

Site 2 community beach:

The drains at this site were located at the bottom of a steeply sloped driveway entering a popular beach front park. The driveway is narrow, heavily shaded, and does not attract any seagulls. Runoff entering the drains flows very quickly and contains considerable sediment loads. The drains empty directly into the harbor located approximately 400 feet away.

The two (2) storm drains selected had the same configuration and size as the drains at Site 1. However the two grates were situated next to each other and shared a common underground vault.

Fabco Industries installed two (2) 22”x 44” StormBasins (p/n 9731-1E) which were configured similarly to the units at Site 1 except for the cartridges.

As this site was similar to many other sites located along the north shore of Long Island New York it was considered a good site for nutrient testing.

Site 3: Residential neighborhood adjacent to waterway

A relatively short dead-end road was selected for the test as it had four well-landscaped properties running parallel to the road surface and the installed storm drains empty into a nearby pond located at the end of the road. Based on direct observations, it is suspected that the vegetation on these properties receives a considerable amount of fertilizer. Inasmuch as the storm drains on this road are routed to an estuarial body of water that ultimately drains to Long Island Sound, the impacts associated with the discharge of nutrients in stormwater are potentially significant.

The drain selected for testing was a 24” round grated inlet very similar to the ones you would see in commercial parking lots. This drain had sufficient depth for the unit and the testing apparatus.

Fabco installed a Round StormPod unit, p/n 9734-1A, which would accept a single Nutrients cartridge.

Methods

The sampling protocol called for the simultaneous collection of both an untreated and treated sample during a rain event. The samples collected were then transported to an independent laboratory[1] for analysis of the following analytes:

3 nitrogen compounds

- Total Kjeldahl or organic nitrogen: animal or human waste, decaying organic matter
- Nitrates (NO_3): inorganic nitrogen from two (2) sources breakdown of nitrites (NO_2) by nitrifying bacteria and chemical fertilizers
- Total Nitrogen: representing the sum of inorganic and organic nitrogen

Two types of phosphates

- Total phosphates: Combined organic and inorganic phosphates
- Ortho-phosphates: inorganic, soluble phosphates

Explanation of phosphate analytes:

Phosphorous is usually present in water in the form of phosphates. Phosphates can be organic or inorganic. Organic phosphate is phosphate that is bound to plant tissue, waste solids or other organic material. Inorganic phosphate is not bound to organic material. It can exist as free ions available for immediate plant uptake or attached to sediments. However, plants can only use inorganic free ions also called Ortho-phosphates directly. Organic phosphates must be decomposed into inorganic phosphate before plants can use it for growth.

The monitoring would take place over an indefinite time period with little or no maintenance being performed on the unit during the monitoring period. All samples represent a first flush capture.

Automatic sampling at sites 1 & 2

Water samples at sites 1 and 2 were collected automatically using a battery powered, Global Water, Model SS201 Storm water sampler (Appendix C).

The Global unit features a large, watertight plastic case and dual individually controlled peristaltic sampling pumps with 2 sample bottles. For this test, the standard 1-gallon sampling bottles were replaced with smaller 1 liter bottles.

To collect the effluent samples special collection “pails” or “buckets” were designed to attach and seal directly to the bottom of the standard Fabco Cartridge body.

[1] Ecotest Laboratories, Inc, 377 Sheffield Ave, N. Babylon, NY 11703, Tel: 631/422-5777

In the pictures on the right, the standard cartridge body is dark blue. The collection pail area is a light green color and is sealed to the cartridge body with a sealing adhesive.

Collection pail features:

Each collection pail was constructed with the following features:

1) A vertical over-flow pipe – To maintain approximately 2 liters of water in the pail while allowing excess water to escape.
2) A quick connect coupling – Connects pail to the supply line of the peristaltic pump and sample bottle.
3) A sensor switch - Activates pumps when the minimum level of water has accumulated in the pail.

Two collection pails were fabricated. The first was attached to the standard Fabco filtering cartridge under test. The second was attached to an empty cartridge body. These two filters were then installed into the bottom of the StormBasin unit with the supply lines routed to the Global Sampler.

Sample collection:

During a storm event surface water enters the StormBasin, flows into and through the cartridges and collects in the pails. When approximately two liters of water has collected, the sensor switch activates the pumps and two **First Flush** water samples are collected. The cartridge with the media left in place would supply a sample of treated water. The empty cartridge would collect a sample of untreated raw water.

Semi-Automatic Testing /Sampling at Site 3

The sampling program was set-up to simultaneously collect both the untreated and treated streams of stormwater flowing through the unit. The equipment used was the NALGENE (I-CHEM) Storm Water Sampler (Appendix D). The use of this device permits the remote collection of a sample from the first flush of a qualifying event.

The Nalgene sampler assembly consists of a round black mounting tube and a translucent one liter, plastic sampling bottle that is inserted down into the mounting tube.

Two samplers were used per unit; one was attached to the plastic collection tub and a second was attached to the bottom of the cartridge.

Prior to attaching the mounting tubes, a small hole (3”dia) was drilled in the bottom of the StormPod tub to allow water to pass out and into the sample bottle. This sampler would collect raw untreated water entering the StormPod

To prepare the cartridge a piece of round plastic material with a four inch diameter hole in the center was glued to the bottom of the filter cartridge. This flat plastic washer-like

device insured that water leaving the cartridge would be directed out of a central hole into the mounting tube and to the sample bottles.

The black Nalgene tubes were mounted vertically (extending downwards) from the bottom of the StormPod basin and filter cartridge using clevis pins so that they could be removed when required.

After completing these preparatory steps the white sample bottles were then inserted into the mounting tubes and the assembly was fixed, using the clevis pins, to the StormPod basin and cartridge body. In this configuration the bottle under the Basin would collect the sample of untreated water whereas the bottle under the cartridge would catch a sample of treated water.

Sediment Analysis:

As part of the contract, Fabco provided maintenance between testing cycles on the StormBasins to remove collected sediments and debris.

Numerous studies including the National Urban Runoff Program (NURP), which was used as the basis for the NPDES amendments to the Clean Water Act, sight the variety of pollutants, including nutrients that are attached to sediments in runoff.

As part of this study Fabco will include data from one of the maintenance visits.

Additionally, although we did not request a lab analysis of this particular collected waste, we will provide an analysis of a similar waste collected at a Fabco StormBasin site located along the water in Bayville, NY (Appendix E)

Field testing

Testing/sample collections took place during 5 time periods spanning 2006 and 2007.

Table 1: Stormwater sampling

Test	Site	Cartridge	Start Date	End Date	# Samples
1	Site 1 (2006)	Bacteria	10/2/06	10/17/06	2
2	Site 3 – Test 1 (2006)	ICCHZ	9/18/06	10/20/06	3
3	Site 3 – Test 2 (2006)	NP	11/16/06	12/19/06	2
4	Site 2 (2007)	FPCHZ	7/06/07	8/02/07	3
5	Site 3 (2007)	FP-AM	11/01/07	11/27/07	3

This section provides a brief discussion of the testing that took place during each of the 5 tests. For a quick overview, see individual appendices for each location/Test.

1. **Site 1:**

Testing was performed at this site in October of 2006. As expected the bacteria cartridges installed in the unit during the test were ineffective on these chemicals. Again the purpose of the test was to obtain a baseline for the runoff concentrations at the site.

Analysis of the raw samples verified that the runoff contained both Phosphorous and Nitrogen compounds in excess of the National median concentrations. The site recorded the highest levels of organic nitrogen (Kjeldahl) in the test. This is probably attributable to the large number of mostly seagulls that inhabit the site. (See appendix F for data)

2. **Site 3 (2006): Test 1**

Testing was performed during October of 2006. Analysis of the raw samples verified that the runoff contained both Phosphorous and Nitrogen compounds in excess of the National median concentrations.

The cartridge being used for test 1 was a combination of a commercially available Iron rich compound (IC) normally used for Phosphorous control and a zeolite compound (CHZ), which had shown an affinity for nitrogen compounds during in-house testing. Both filtering compounds were granular particles. (Cartridge designated ICCHZ)

Analysis of the results shows good performance on both phosphorus compounds with Total phosphorous being reduced an average 63% and Ortho phosphates being reduced by 69%.

Performance on nitrogen compounds was lower than expected due to poor results obtained in sample set #2.

Sample set 2			Untreated	Treated	% Change
Tot. Kjeldahl N.	mg/L		11.00	19.0	-72.73
Nitrate as N	mg/L		0.49	0.49	0.00
Nitrogen, total as N	mg/L		11.00	19.0	-72.73

Based on an analysis of the filtering cartridge, the poor results were probably related to the CHZ compound.

If we disregard this data point, nitrogen compounds were reduced by the ICCHZ cartridge as follows:

Tot. Kjeldahl reduced an average 36.63%
Nitrate reduced an average 29.2%
Nitrogen reduced an average 38%

Review of test 2:

The IC compound applied in the cartridge consistently reduced phosphorus compounds by greater than 40%. This supports traditional claims regarding the use of Fe compounds in waste water applications and large aquariums.

Results on the nitrogen compounds although encouraging were erratic. Additional testing on the CHZ filter compound is required to confirm effectiveness. (Appendix G for data)

3. Site 3 (2006): Test 2

The second set of tests performed at Site 3 was completed in November-December of 2006. For this test a commercially available filter pad called a Nutrient Pad (NP) was tested in the Fabco filter. The NP pad is a woven, mat-type product made up of bonded thin filaments that have been treated with a proprietary technology. (Cartridge designated NP)

This filter media performed very well in the first sampling for all compounds

First sampling	0330 (OUT)	Value	% reduction
Tot. Kjeldahl N.	mg/L	3.00	25.00%
Nitrate as N	mg/L	0.49	59.17%
Nitrogen, total as N	mg/L	3.00	42.31%
Ortho Phosphate as P	mg/L	0.02	96.36%
Tot. Phosphate as P	mg/L	0.15	72.73%

However, there was a decrease in performance during the second sampling set

Second sampling	0338 (OUT)	Value	% reduction
Tot. Kjeldahl N.	mg/L	9.20	8.00%
Nitrate as N	mg/L	2.00	4.76%
Nitrogen, total as N	mg/L	11.00	8.33%
Ortho Phosphate as P	mg/L	0.35	18.60%
Tot. Phosphate as P	mg/L	0.45	50.00%

Review of test 3:

Testing with the Nutrient pad verified that a product of this type has the potential to treat both phosphates and nitrogen compounds. It would be ideal if it could be improved or enhanced to offer more treatment ability/capacity. For the two tests reductions were: Tot Phosphate 61%; Ortho Phosphates 57%; Tot Kjeldahl 16%; Nitrate 31%; Nitrogen 25%. (Appendix G for data)

4. Site 2 (2007):

Testing on nutrients commenced in July of 2007. The cartridge under test contained the new Fabco enhanced Nutrient Pad, FabPhos (FP) that had been under development.

.since 2006. A secondary layer of the CHZ zeolite filter media was also added to the cartridge to aid in Nitrogen compound treatment. (Cartridge designated FPCHZ)

Testing verified good reductions on phosphorous with Total phosphorous (TP) being reduced an average 62% and Ortho-phosphates reduced 40%. Performance on Orthophosphate was a little less than the previous tests using the IC compound but over all effectiveness was good.

The reductions for nitrogen compounds although better than the first test with the CHZ granular media again were less than expected.

One aspect that affected the nitrogen results was the very rural, heavily wooded nature of the site. Unlike Site 3, Site 2 has virtually no landscaped lawns or properties on its perimeter. As a result, soluble nitrates, commonly found in commercial fertilizers were undetectable in 3 out of 4 samples resulting in zero percent reductions being included in the average.

Reductions on Total Kjeldahl and Total nitrogen were an unexceptional 16.7% and 2.5% respectively. Data for Nitrates was inconclusive.

Review of Test 4:

The 3rd set of samples with an iron enriched filter media demonstrated that this media is capable of effectively reducing Phosphate levels by greater than 40%. The FabPhos has more capacity than the NP and performed as well as the IC media. Therefore, additional testing by Fabco would be focused on the optimization of the FabPhos media.

For Nitrogen compounds, testing of the CHZ zeolite media had demonstrated that effectiveness could vary greatly from sample set to sample set. One theory from a micro-biologist suggested that natural bacteria captured in the granular media bed would continue to thrive inside the cartridge, using entrapped organic material for food. This continued growth between rain events would result in an increase of nitrate and Total nitrogen levels stored within the media. As a result first flush samples of the treated effluent could have nitrogen concentrations significantly higher than the raw untreated samples.

To test this theory additional field trials outside the scope of this report, using a cartridge of mainly CHZ zeolite, were completed. In these tests, a new cartridge performed well but subsequent testing over a twenty day period, showed as predicted, substantial increases in both Nitrates and Total Nitrogen. The collected data supports the theory that using granular zeolite media may actually promote the growth of bacteria. As a result CHZ was removed from further testing. (Appendix H for data)

5. Site 2 (2007):

Final testing at this site took place in November 2007. In this test we returned to the concept of a single media technology to isolate effectiveness. Based on the previous results the cartridge consisted of the standard antimicrobial treated pre-filter and FabPhos filter media only.

Previous data collected in the first four tests, confirmed the ability of the iron rich FabPhos material to reduce Total Phosphates and Ortho Phosphates by greater than 40%. Its ability on nitrogen compounds was so far untested.

Earlier in these trials the original Nutrient pad had shown some ability to reduce both nitrogen and phosphate concentrations. As a related product with many of the same properties as the NP media, this testing implied the FabPhos material by itself may be effective on Nitrogen compounds.

To reduce the possibility of bacterial action within the cartridge, the FabPhos material was also treated with our proprietary antimicrobial solution.

Review of test 5:

Table 2: Tests results at Site 3 - 2007

Site 3		IN	OUT	% Change
Tot. Kjeldahl N.	mg/L	3.80	2.40	36.84%
Nitrate as N	mg/L	1.40	0.49	65.00%
Nitrogen, total as N	mg/L	5.20	2.90	44.23%
Ortho Phosphate as P	mg/L	0.58	0.17	70.69%
Tot. Phosphate as P	mg/L	0.57	0.34	40.35%
Site 3		IN	OUT	% Change
Tot. Kjeldahl N.	mg/L	0.80	0.60	25.00%
Nitrate as N	mg/L	0.49	0.49	0.00%
Nitrogen, total as N	mg/L	0.80	0.60	25.00%
Ortho Phosphate as P	mg/L	0.49	0.09	81.63%
Tot. Phosphate as P	mg/L	0.33	0.09	72.73%
Site 3		IN	OUT	% Change
Tot. Kjeldahl N.	mg/L	3.00	1.00	66.67%
Nitrate as N	mg/L	1.00	0.50	50.00%
Nitrogen, total as N	mg/L	4.00	1.50	62.50%
Ortho Phosphate as P	mg/L	1.90	0.26	86.32%
Tot. Phosphate as P	mg/L	2.10	0.30	85.71%

In average the data shows excellent reductions for each of the 4 chemicals

Tot. Kjeldahl N.	Reduced	42.84%
Nitrate as N	Reduced	38.33%
Nitrogen, total as N	Reduced	43.91%
Ortho Phosphate as P	Reduced	79.55%
Tot. Phosphate as P	Reduced	66.26%

These tests demonstrate that the FabPhos material far exceeded the 40% TP reduction required by New York State. And, more importantly the soluble phosphate, which is directly available for plant growth, is reduced by nearly 80%.

Nitrogen levels of all types were also reduced an average of nearly 40%. This data confirms the initial test data obtained in 2006 at Site 3, where the nutrient pad by itself, was very effective on Nitrogen compounds.

Starting with the technology of the Nutrients pad, the iron infused FabPhos offers better performance on phosphates while still treating nitrogen compounds effectively.

The antimicrobial treatment will continue to maintain effectiveness of the filter media by reducing the growth of bacteria and slimes within the cartridge, improving the longevity and service cycle. (Appendix I) (Appendix J summary of all results)

Conclusion

Under the terms of the contract a total of ten (10) StormBasin or StormPod units were installed at designated locations within the town. Fabco Industries was contracted to install, maintain/service and provide testing at three sites. Testing was broken up into two phases: 1) Effectiveness on pathogens/bacteria and 2) treatment of nutrients: phosphorous and nitrogen.

In the first half of the testing program "Beach/Harbor stormwater test program" StormBasin effectiveness was measured using 3 common bacteria indicator organism: E.coli, Fecal Coliform and Enterococcus. This study completed in 2006 is available on the Fabco website www.fabco-industries.com. This report focuses on Test Phase 2: Nutrient treatment and reductions.

Testing for effectiveness on nutrients:

3 sites in the Town were designated for evaluation:

Site 1: a popular and busy town beach
Site 2: another popular beach with different terrain and environmental conditions than Site 1
Site 3: a small, affluent community with highly landscaped and maintained yards located near a sensitive waterway.

Testing process: 5 independent tests were run at the 3 sites; each test lasted about one (1) month in duration

Site 1 – Base line nutrient levels only
Site 2 – filtering effectiveness using 1 filter configuration
Site 3: 3 tests – evaluating filtering effectiveness with 3 types of filter media

A total of 13 sets of influent and effluent samples were collected and analyzed by:

Ecotest Laboratories, Inc.
377 Sheffield Ave
North Babylon, NY 11703
Tel: 631/422-5777

Baseline concentrations at each site:

Analysis of untreated raw samples from all three sites confirmed that nutrient values in nearly every case, exceeded the National Median Concentrations as indicated in Chapter 2, pg 2-3 in the New York State Stormwater design manual.

Table 3: Nutrient concentrations at test sites (Appendix K baseline values)

	mg/l	Nat'l Median	Site 1	% > median	Site 3	% > median	Site 2	% > median
Tot. Kjeldahl N.		1.47	**7.40**	**403%**	5.73	290%	4.60	212.93%
Nitrate as N		0.53	**1.15**	**117%**	1.06	100%	0.50	-5.66%
Nitrogen, total as N		2.00	8.55	328%	6.67	233%	4.60	130.00%
Ortho Phosphate as P		0.10	0.03	-75%	**0.94**	**836%**	0.50	400.00%
Tot. Phosphate as P		0.26	0.16	-40%	**1.22**	**369%**	0.78	200.00%

(Appendix L National Median Concentrations, NYS Stormwater Manual)

StormBasin and StormPod effectiveness

Based on the raw nutrient analysis, the majority of the sampling was performed at Site 3. This site provided the second highest nitrogen levels and the highest measured phosphorous concentrations in the study.

All samples were first flush samples which typically contain the highest levels of contamination during a single storm event.

3 tests were run at the Site 3 location. A total of 3 cartridge types were evaluated.

The final cartridge featured Fabco's new proprietary filtering media FabPhos-AM. In November 2007, the StormPod unit installed on the site reduced Total nitrogen compounds by over 40% and Total Phosphorous compounds by over 66%

Table 4 Final results:

Average of 3 events	Units	**Unfiltered**	**Filtered**	**% Reduction**	**Nat'l Median**
Tot. Kjeldahl N.	mg/l	**2.53**	**1.33**	42.84%	1.47
Nitrate as N		**0.96**	**0.49**	38.33%	0.53
Nitrogen, total as N		**3.33**	**1.67**	43.91%	2.00
Ortho Phosphate as P		**0.99**	**0.17**	79.55%	0.10
Tot. Phosphate as P		**1.00**	**0.24**	66.26%	0.26

The results show that the Fabco Industries StormBasin and FabPhos-AM reduced nutrients in stormwater flowing from fertilized, landscaped properties down below the median national average. **The 66% reduction in Total Phosphorous comfortably exceeds typical State requirements of 40%.**

It is important to realize that these reductions do not include the nutrients attached to sediments and bound to organic matter that are captured and stored in the StormBasin/StormPod collection tub. Maintenance records show over 750 pound of trash, debris and sediments being removed from the site 1 unit annually. With Site 2 contributing over 1100lbs. 100 similar installed units would collect between 37.5 and 55 tons of sediments annually.

Nutrient contributions from Sediments and Organic matter:

A coarse analysis of the debris captured at Site 3 showed approximately 150 pounds of trash and debris along with 950 pounds of sediments.

The trash component contained mostly leaves, twigs and grass. In his Nov 2007 article (Stormwater, Nov/Dec 2007, Vol. 8, No. 8, Stormwater pollution: Getting at the Source) L.A Baker estimates a single Maple leaf would contribute 0.3 kilograms of phosphorous per year and that a tree lined road could have greater input than lawns. Capturing and retaining this organic material relatively dry in the StormBasin will significantly reduce the availability of these stored nutrients to the environment. To further aid effectiveness, maintenance activities should be coordinated to clean out the units in the fall months.

Due to the quantity of sediment collected Fabco investigated the size distribution and chemical composition of the load both of which are reported.

Sediment reductions are mandated by most states including New York and for good reason. Many studies have identified nearly every type of pollutant attached to the particles including nutrients.

In our study, Fabco Industries evaluated typical sediments collected in StormBasins located in two Long Island communities

Table 5: Analysis of sediments collected in Fabco StormBasins

Time period 3-4 mo	Location 1	Location 2
Sediments	120.65 Kg	70.3 Kg
Tot. Kjeldahl	590 mg/Kg	780 mg/Kg
Nitrate	8.2 mg/Kg	< 1.0 mg/Kg
Nitrogen	600 mg/Kg	780 mg/Kg
Tot Phosphate	200 mg/Kg	180 mg/Kg

Using the total weights and concentrations indicated in the chart above, the total amounts of nitrogen and phosphorous retained in the captured sediment is shown below.

Location	Total Nitrogen/Total Phoshorous	Yearly (3 cleanout)
1	2.55 / 0.85oz	7.65 / 2.55oz
2	1.93 / 0.45oz	5.79 / 1.35oz

Using the average of these two sites (6.72 TN / 1.95 TP) if we had 100 units the amount of nutrients stored in the captured sediments (yearly) would be equal to 42 pounds of nitrogen and 12 pounds of phosphorous. The State Environmental Resource center (www.serconline.org) suggests that one pound of phosphorous can result in the growth of 350-700 pounds of green algae. 12 pounds would grow 2 ½ to 4 ½ tons of algae.

Again, the nutrient reductions reported earlier reflect reductions in the water samples only and do not include these substantial amounts collected in the debris and in this sediment load.

Recommendations:

As part of a series of simple Best Management Practices the StormBasin can assist the stormwater manager in complying with State and Federal water quality goals in terms of nutrient reductions.

1) StormBasins can be installed quickly at impacted sites using existing drains without additional construction costs. (As an added benefit, pre-installation site surveys can be used to inspect for illicit dumping activities which is also a suggested Stormwater BMP).
2) The StormBasin can help meet State Stormwater and Federal TMDL regulations by reducing nutrients using three methods:
    a. Capturing sediments which can contain many pollutants including nutrients.
    b. Treating the important soluble nutrient compounds including the Ortho-phosphates, which are immediately available to plant growth and have potentially the biggest impact on waterways.

c. Retaining organic debris, keeping it dry and available for easy cleanout before decomposition, and subsequent release of stored nutrients

3) The StormBasin will improve existing street sweeping and spill prevention programs by treating the soluble pollutants and capturing sediments and debris that collect or are deposited between scheduled sweeping.

   The sweeping program would also keep the StormBasin cleaner, maintaining effectiveness and reducing the maintenance frequency. And in terms of servicing, many new sweepers are equipped with catch basin cleaning attachments that can quickly service the units. This eliminates additional staffing and equipment.

   Used as a total solution, spill prevention, sweeping and StormBasin inserts, would keep the paved areas cleaner, minimize the pollutants loads available to first flush action, and reduce the pollutants entering waterways either through the drains or directly from sheet flow off surrounding surfaces.

PLAN PREPARER RECORD OF TRAINING AND EXPERIENCE

STANDARD E&S WORKSHEET # 22
PLAN PREPARER RECORD OF TRAINING AND EXPERIENCE IN EROSION AND SEDIMENT POLLUTION CONTROL METHODS AND TECHNIQUES

NAME OF PLAN PREPARER: John C. Cote, P.E.

FORMAL EDUCATION:

Name of College or Technical Institute: Stevens Institute of Technology

Curriculum or Program: Civil Engineering

Dates of Attendance: **From:** _____ **To:** _____

Degree Received Bachelor of Science

OTHER TRAINING:

Name of Training:		
Presented By:		
Date:		

EMPLOYMENT HISTORY:

Current Employer:	Langan Engineering and Environmental Services, Inc.
Telephone:	(973) 560-4900
Former Employer:	N/A
Telephone:	N/A

RECENT E&S PLANS PREPARED:

Name of Project:	Arbor Woods	PRBC III - ESHC	Pocono Premium Outlets
County:	Monroe	Monroe	Monroe
Municipality:	Stroud Township	Smithfield Township	Smithfield Township
Permit Number:			
Approving Agency:	Monroe County Con. Dist.	Monroe County Con. Dist	Monroe County Con. Dist

APPENDIX H

Infiltration Testing Results – By Midlantic Engineering, Inc.

APPENDIX H
TABLE OF CONTENTS

MIDLANTIC ENGINEERING, INC.
120 COMMERCE ROAD
PITTSTON TOWNSHIP, PA 18640-9552

GEOTECHNICAL ENGINEERING REPORT

STORMWATER MANAGEMENT AND INFILTRATION TESTING
SMITHFIELD GATEWAY DEVELOPMENT SITE
SMITHFIELD TOWNSHIP, PA

(Project #16051-SWM)

PREPARED FOR:

DEPG MOSIER ASSOCIATES, LP
521 PLYMOUTH ROAD
SUITE 118
PLYMOUTH MEETING, PA 19462

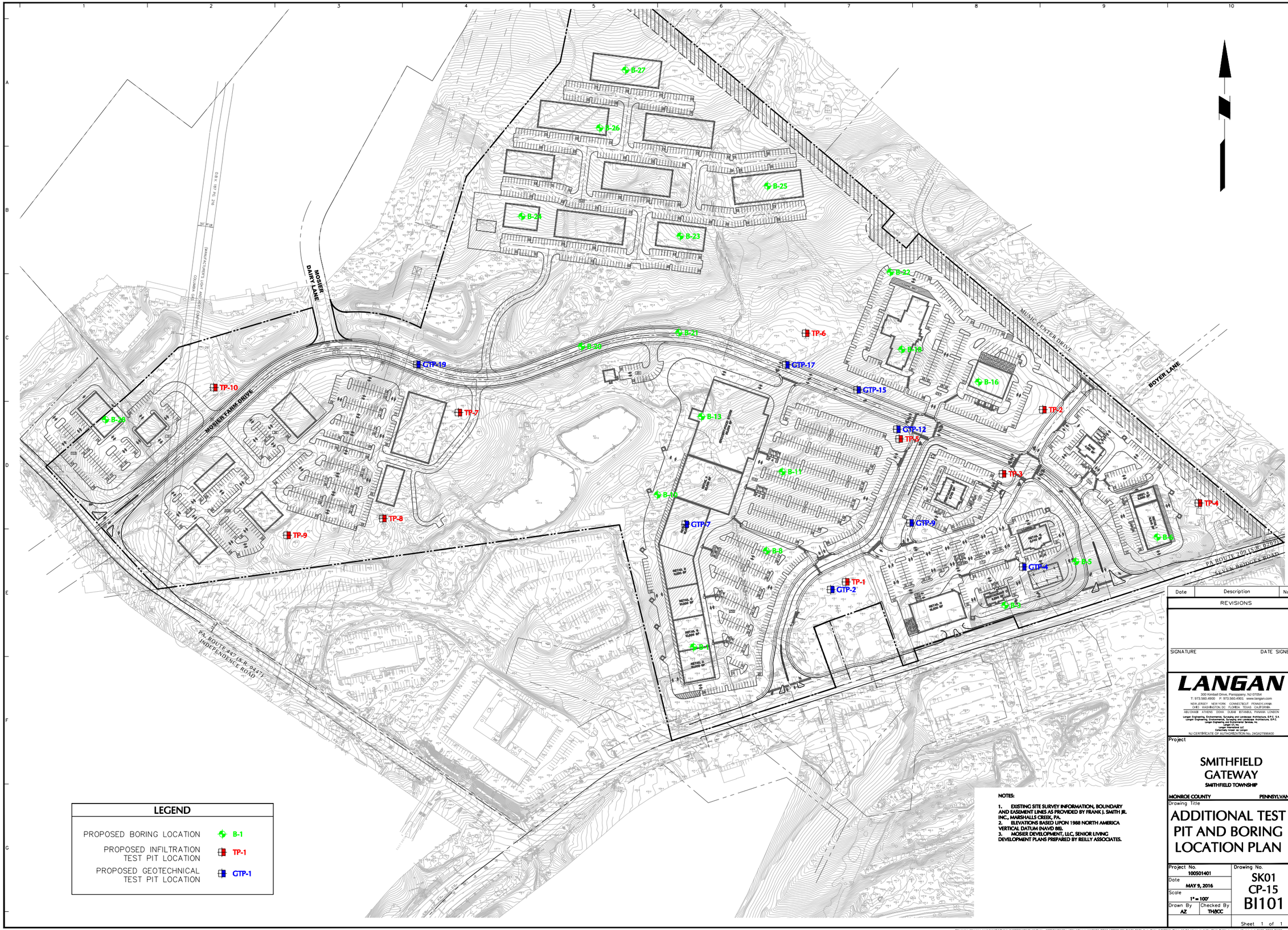
JUNE 23, 2016

Measurements were taken at the appropriate time interval for a total of 8 readings obtained or until a stabilized rate of drop was obtained, whichever occurred first. A stabilized rate of drop is defined by Protocol 1 as a difference of ¼-inch or less of drop between the highest and lowest readings of four consecutive readings. The water level in the infiltration test casing was re-established after each reading.

The final in-situ infiltration rate was calculated as the average stabilized rate or the drop in water level during the final time period, expressed as inches per hour. Infiltration rates listed as zero includes tests where the rate of infiltration was below a measurable rate, less than 1/16 of an inch per hour.

The observed in-situ infiltration rates at the test locations and depths are summarized below:

Test Pit	Surface Grade	Test Depth	Infiltration Test Grade	Stratum	Soil Type	Average In-situ Infiltration Rate (in/hr.)
TP-1	438.9	6.0’	432.9	B	silty SAND with gravel (SM)	1¼ in/hr.
TP-2	468.6	3.0’	465.6	B	silty GRAVEL with sand (GM)	⅝ in/hr.
TP-3	457.8	4.0’	453.8	B	silty GRAVEL with sand (GM)	9¼ in/hr.
TP-4	458.8	4.0’	454.8	F	silty GRAVEL with sand (GM) – FILL	>10 in/hr.
TP-5	468.2	1.0’	467.2	B	silty SAND with gravel (SM)	6 in/hr.
TP-6	471.7	1.0’	470.7	B	silty SAND with gravel (SM)	8¼ in/hr.
TP-7	488.3	3.5’	484.8	B	silty GRAVEL with sand (GM)	¼ in/hr.
TP-8	480.0	2.0’	478.0	B	silty SAND with gravel (SM)	5/16 in/hr.
TP-9	489.1	6.0’	483.1	B	silty SAND with gravel (SM)	3⅞ in/hr.
TP-10	507.6	4.0’	503.6	F	silty GRAVEL with sand GM) – FILL	10 in/hr.



LEGEND

PROPOSED BORING LOCATION	B-1
PROPOSED INFILTRATION TEST PIT LOCATION	TP-1
PROPOSED GEOTECHNICAL TEST PIT LOCATION	GTP-1

NOTES:

1. EXISTING SITE SURVEY INFORMATION, BOUNDARY AND EASEMENT LINES AS PROVIDED BY FRANK J. SMITH JR. INC., MARSHALLS CREEK, PA.
2. ELEVATIONS BASED UPON 1988 NORTH AMERICA VERTICAL DATUM (NAVD 88).
3. MOSIER DEVELOPMENT, LLC, SENIOR LIVING DEVELOPMENT PLANS PREPARED BY REILLY ASSOCIATES.

Date	Description	No.

REVISIONS

SIGNATURE DATE SIGNED

LANGAN

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OHIO WASHINGTON DC FLORIDA TEXAS CALIFORNIA
ABU DHABI ATHENS DOHA DUBAI ISTANBUL PANAMA LONDON

Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. is a Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. Langan Engineering and Environmental Services, Inc. is a Langan Affiliate. Langan International LLC Collectively known as Langan

NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project

SMITHFIELD GATEWAY

SMITHFIELD TOWNSHIP

MONROE COUNTY **PENNSYLVANIA**

Drawing Title

ADDITIONAL TEST PIT AND BORING LOCATION PLAN

Project No.	100501401
Date	MAY 9, 2016
Scale	1" = 100'
Drawn By	AZ
Checked By	TH/JCC

Drawing No.

SK01
CP-15
BI101

Sheet 1 of 1

PROJECT No. 100501401

MIDLANTIC ENGINEERING

May 22, 2017

DEPG Mosier Associates, LP
580 West Germantown Pike
Suite 103
Plymouth Meeting, PA 19462

ATTENTION: Mr. Douglas Olmstead, Jr., P.E.
dolmstead@lpre.com

SUBJECT: ADDENDUM #1 –
GEOTECHNICAL ENGINEERING SERVICES (#16051.1-SWM)
Stormwater Management and Infiltration Testing
Smithfield Gateway Development Site
Smithfield Township, PA

Mr. Olmstead:

Submitted herewith is Addendum #1 to the geotechnical engineering report to address the proposed stormwater management areas of the initial phases of the development. A series of nine test pits with in-situ infiltration testing have been complete for this phase of the study. Our services have been performed as a part of our proposal/agreement dated January 26, 2017 and your subsequent authorization to proceed of April 18, 2017.

- **Scope of Services**

Services performed for this phase of the study included site reconnaissance, observation and logging of nine test pits, in-situ infiltration testing and preparation of our report. Our geotechnical engineering analysis and addendum #1 report for the potential stormwater management development areas includes the following:

a. Our evaluation of the estimated subsurface conditions within the proposed stormwater management infiltration areas based on the data obtained.

b. Analysis of subgrade conditions, soil laboratory testing, and in-situ infiltration testing to provide design parameters for infiltration devices.

c. Comments concerning the use of infiltration practices at the designated areas tested.

A test pit was excavated to the test depth at each of the study locations. A solid 4-inch I.D. PVC casing was installed and seated approximately 2 inches into the underlying soil subgrades. The outer ring of the infiltration test casing was sealed with a water-bentonite soil mixture. The test location was presoaked for 1 hour with a 12-inch depth of water immediately prior to testing with the water level re-established at 30-minute intervals. The drop in the water level during the last 30 minutes of the presoak period was used to determine the time interval used for the infiltration test in accordance with Protocol

Measurements were taken at the appropriate time interval for a total of 8 readings obtained or until a stabilized rate of drop was obtained, whichever occurred first. A stabilized rate of drop is defined by Protocol 1 as a difference of ¼-inch or less of drop between the highest and lowest readings of four consecutive readings. The water level in the infiltration test casing was re-established after each reading.

The final in-situ infiltration rate was calculated as the average stabilized rate or the drop in water level during the final time period, expressed as inches per hour. Infiltration rates listed as zero includes tests where the rate of infiltration was below a measurable rate, less than 1/16 of an inch per hour.

The observed in-situ infiltration rates at the test locations and depths are summarized below:

Test Pit	Surface Grade	Infiltration Test Depth	Test Elev.	Stratum	Soil Type	Average In-situ Infiltration Rate (in/hr.)
INF-4-1	459.1	1.0’	458.1	F	silty sand with gravel – FILL	⅜ in/hr.
INF 4-2	463.2	3.0’	460.2	B	silty SAND (SM)	8¼ in.hr.
UGD-INF-5-1	451.3	1.0’	450.3	B	silty SAND (SM)	10¼ in/hr.
UGD-INF-5-5	441.9	2.0’	439.9	B	silty SAND with gravel (SM)	1½ in/hr.
UGD-INF-5-6	439.8	1.5’	438.3	B	silty SAND (SM)	1½ in/hr.
RG 4-1	462.3	0.9’	461.4	B	silty GRAVEL with sand (GM)	1⅝ in/hr.
RG 5-1	462.6	0.8’	461.8	F	silty gravel with sand – FILL	⅞ in/hr.
RG 5-1*	462.6	3.0’	459.6	B	silty SAND (SM)	3¾ in/hr.
RG 5-2	457.3	0.8’	456.5	A	sandy SILT (ML)	9⅜ in/hr.
RG 5-3	469.6	0.8’	468.8	B	silty SAND with gravel (SM)	4⅛ in/hr.

*An additional test was performed at RG 5-1 below the shallow existing fill materials.

MIDLANTIC ENGINEERING, INC.
120 COMMERCE ROAD
PITTSTON TOWNSHIP, PA 18640-9552

GEOTECHNICAL ENGINEERING REPORT

STORMWATER MANAGEMENT AND INFILTRATION TESTING
SMITHFIELD GATEWAY, PHASE 1A-1
SMITHFIELD TOWNSHIP, PA

(Project #20301.1-SWM)

PREPARED FOR:

DEPG/LEGEND PROPERTIES
1000 FAYETTE STREET
CONSHOHOCKEN, PA 19428

FEBRUARY 3, 2021

Measurements were taken at the appropriate time interval for a total of 8 readings obtained or until a stabilized rate of drop was obtained, whichever occurred first. A stabilized rate of drop is defined by Protocol 1 as a difference of ¼-inch or less of drop between the highest and lowest readings of four consecutive readings. The water level in the infiltration test casing was re-established after each reading.

The final in-situ infiltration rate was calculated as the average stabilized rate or the drop in water level during the final time period, expressed as inches per hour. Infiltration rates listed as zero includes tests where the rate of infiltration was below a measurable rate, less than $^{1}/_{16}$ of an inch per hour.

The observed in-situ infiltration rates at the test locations and depths are summarized below:

Test Pit	Estimated Surface Grade	Infiltration Test Grade	Stratum	Soil Type	Average In-situ Infiltration Rate (in/hr)
TP-SW-1	El 452.4	El 450.0 (2.4')	B	silty GRAVEL with sand (GM)	3½ in/hr
TP-SW-2	El 455.2	El 453.0 (2.2')	B	silty GRAVEL with sand (GM)	2¾ in/hr
TP-SW-3	El 448.1	El 447.5 (0.6')	A	sandy SILT with gravel (ML)	1¼ in/hr
TP-SW-4	El 441.4	El 440.9 (0.5)	F	poorly graded gravel with silt (GP-GM) – FILL	14 in/hr

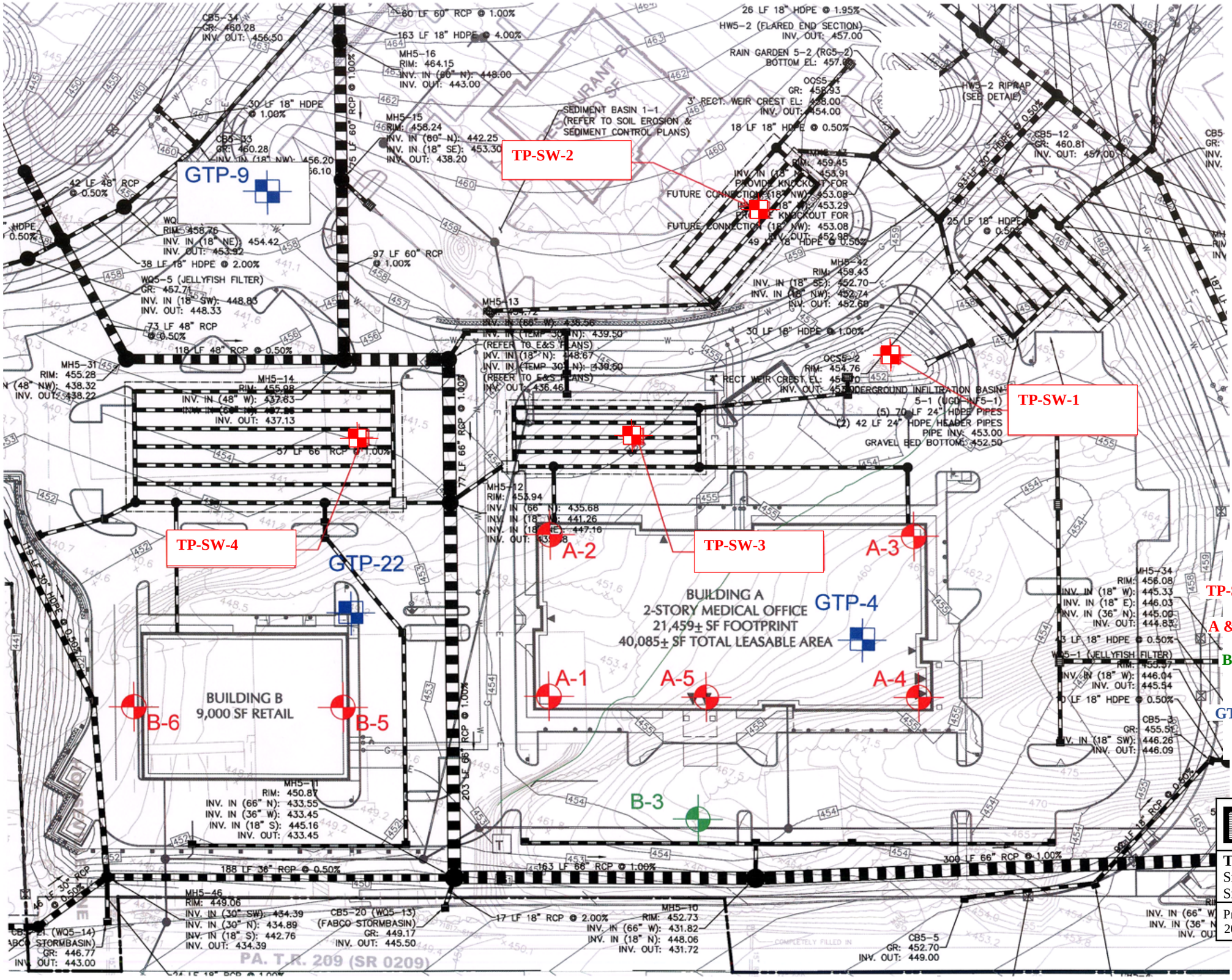
Based upon the recommended infiltration rates in Protocol 2, infiltration facilities are considered to be feasible in the natural soil subgrades of Stratum B and Stratum A.

4.4 Safety Factors

Protocol 2 recommends the minimum safety factor that may be used is two (2). It further recommends that a minimum safety factor of three (3) be used for soils which classify as silty loam, clay loam, silty clay loam, sandy clay loam or clay under the USDA classification system if the percolation test methodology is used.

Based on the gradation and classification of subgrade materials encountered, we recommend a safety factor of two (2) in the fill materials of Stratum F and natural soils of Stratum B; and a safety factor of three (3) in the natural soil of Stratum A.

Enclosure (4)
Figure No. 4-1



N

LEGEND

- TP-SW = Test Pit Location (#20301.1)
- A & B = Test Boring Location (#20301)
- B-3 = Previous Test Boring Location (#16051)
- GTP = Previous Geotechnical Test Pits (#16051)

MIDLANTIC ENGINEERING

Test Pit Location Plan
Smithfield Gateway, Phase 1A-1
Smithfield Township, PA

Project:	Date:	Scale:
20301.1-SWM	02/03/2021	1" = 50'