STORMWATER MANAGEMENT REPORT

Prepared for:

CSH Old Tappan, LLC

Proposed Assisted Living Facility
Block 1606, Lot 3
244 Old Tappan Road (C.R. 116)
Borough of Old Tappan
Bergen County, NJ

Prepared by:

DYNAMIC ENGINEERING

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I. INTRODUCTION

The intent of this study is to analyze the stormwater drainage conditions that will occur as a result of the proposed assisted living and memory care building, parking facilities, and associated site improvements for the site located at 244 Old Tappan in the Borough of Old Tappan, Bergen County, New Jersey and specifically identified as Block 1606, Lot 3 on the Borough of Old Tappan Tax Maps. The majority of the site is undeveloped and contains wooded and wetlands areas. The southern portion of the site is partially developed with a barn, frame dwelling, and gravel drive.

Under proposed conditions, the site will be developed to contain one (1) assisted living and memory care building with surface level parking and associated driveway, as shown on the accompanying engineering drawings. The western portion of the lot, approximately 1.8 acres, is to remain undisturbed.

II. EXISTING DRAINAGE CONDITIONS

The overall subject site consists of 5.46 acres and contains wooded areas, wetlands, and two existing structures along the Old Tappan Road frontage.

Based on the Bergen County Soil Survey, the soil types native to the site include:

SOIL TYPE (SYMBOL)	SOIL TYPE (NAME)	HYDROLOGIC SOIL GROUP
DuuB	Dunellen-Urban land complex, 3 to 8 percent slopes	A
DuuC	Dunellen-Urban land complex, 8 to 15 percent slopes	A
RkrC	Riverhead sandy loam, 8 to 15 percent slopes	B

The site has been evaluated using the TR-55 'Urban Hydrology for Small Watersheds' standards and with the following existing drainage sub-watershed areas as depicted on the Existing Drainage Area Map:

EX-DA 1 DET.:

This study area includes the central portion of the subject property, consisting primarily of undisturbed wooded areas. Runoff generated by this area flows towards an existing depression where it is temporarily stored until it spills over and flows towards the northeast corner of the subject site, to be identified as Point of Analysis 1 (POA #1). Soils within this area belong to hydrologic group B and the time of concentration was calculated to be 16.6 minutes. The Runoff Curve Numbers, included within the Appendix of this Report, were chosen to best reflect the existing site conditions as outlined in the USDA's "Urban Hydrology for Small Watersheds: TR-55". 0

EX-DA 1 UNDET.:

This study area includes the northeastern portion of the subject property, consisting primarily of undisturbed wooded areas. Runoff generated by this area flows overland towards the northeast corner of the subject site, identified as Point of Analysis 1 (POA #1). Soils within this area belong to hydrologic group B and the time of concentration was calculated to be 22.2 minutes. The Runoff Curve Numbers, included within the Appendix of this Report, were chosen to best reflect the existing site conditions as outlined in the USDA's "Urban Hydrology for Small Watersheds: TR-55".

EX-DA 2:

This study area includes the western and southern majorities of the subject property, consisting primarily of undisturbed wooded areas and two (2) existing structures. The stormwater runoff generated from this area ultimately flows towards the existing on-site wetlands areas along the western property line, to be identified as Point of Analysis 2 (POA #2). The Runoff Curve Numbers, included within the Appendix of this Report, were chosen to best reflect the existing site conditions as outlined in the USDA's "Urban Hydrology for Small Watersheds: TR-55". This drainage area includes two (2) subareas identified as EX-DA-2A and EX-DA-2B, described below:

EX DA-2A: This subarea consists of the southern portion of the subject site, which is comprised of primarily wooded areas and the existing frame dwelling and barn. Runoff generated by this area flows in a southwesterly direction towards the Old Tappan Road right-of-way, is collected by existing inlets within the right-of-way, and is ultimately discharged to the wetlands areas along the western property line of the subject site. This area falls within the limits of disturbance and is subject to the runoff quantity reduction criteria set forth by the Borough of Old Tappan and NJAC 7:8. Soils within this area belong to hydrologic soil groups A and B and the time of concentration was calculated to be 18.0 minutes.

EX DA-2B: This subarea consists of the western portions of Existing Drainage Area 2, which is comprised of primarily wooded and wetlands areas. Runoff generated by this area flows towards the wetlands area, which is considered POA #2. This subarea contains areas to remain undisturbed, and is therefore exempt from the reduction criteria set forth by the Borough of Old Tappan and NJAC 7:8. Soils within this area belong to hydrologic soil groups A and B and the time of concentration was calculated to be 13.8 minutes.

III. PROPOSED DRAINAGE CONDITIONS

Under proposed conditions, the site will be developed with an assisted living and memory care building, surface level parking and associated site improvements. Additionally, the existing stone dwelling will be relocated to the southwestern corner of the site, and a small surface parking area for same is being proposed. The proposed improvements will result in an overall increase in impervious coverage of approximately 72,000 SF (1.7 acres). The proposed design serves to match the existing drainage patterns to the maximum extent practical. The site has been evaluated using the TR-55 'Urban Hydrology for Small Watersheds' standards and with the following proposed drainage sub-watershed areas as depicted on the Proposed Drainage Area Map:

PR-DA 1:

This area includes the majority of the subject site within the limits of development, consisting of the proposed parking areas, sidewalks, and landscaped areas. The stormwater generated from this area is collected by proposed on-site inlets and is conveyed to a proposed above-ground infiltration/detention basin (Basin #1) near the northern property line. The runoff is either infiltrated or detained and released at a controlled rate to POA #1. Soils within this study area belong to hydrologic groups A and B and the minimum time of concentration of 6 minutes was utilized for this area.

PR-DA 1 UNDET:

This area includes a portion of wooded and open space areas along the eastern and northern property lines. The stormwater generated from this area flows overland in a northeasterly direction and contributes to POA #1. A minimum time of concentration of 6 minutes has been utilized for this drainage area. Soils within this study area belong to hydrologic groups A and B.

PR- BUILDING:

This area includes the roof area of the proposed building. The stormwater generated from this area is collected and conveyed to the proposed above-ground basin (Basin #1) near the northern property line of the site. The minimum time of concentration of 6 minutes has been utilized for this drainage area.

PR-DA 2:

This study area consists of wetlands to remain undisturbed, the existing barn and relocated historic building, paved driveway, and landscaped areas along the Old Tappan Road frontage. Runoff generated by the paved driveway within this area flows in a southwesterly direction to a proposed Filterra water quality unit before flowing into the existing conveyance system within the Old Tappan Road right-of-way. There it is captured by existing inlets and ultimately conveyed to the isolated wetlands in the northwest portion of the site (POA #2). Soils from this area belong to hydrologic soil groups A and B, and the runoff curve numbers, included within

the Appendix of this Report, were chosen to best reflect the proposed site conditions as outlined in the USDA's "Urban Hydrology for Small Watersheds: TR-55." The minimum time of concentration of 6.0 minutes has been calculated and utilized for this analysis.

IV. DESIGN METHODOLOGY

The primary design constraints for this project are based on requirements established in the Borough of Old Tappan Land Development Ordinance, New Jersey Soil Erosion and Sediment Control Standards, and NJAC 7:8. More specifically, the stormwater management design will serve to maintain existing drainage patterns to the maximum extent practical and reduce proposed runoff rates when compared to pre-development runoff rates for disturbed areas. The proposed project will disturb more than 1 acre of land and impervious surface coverage will be increased by more than ¼ acre when compared to existing conditions. As a result, the project meets the definition of a "major development" as defined NJAC 7:8. Furthermore, the project has been designed to meet green infrastructure, groundwater recharge, and water quality standards, as well as the allowable post-development peak flow rates for the disturbed area of 50%, 75% and 80% for the 2-, 10- and 100- year storms set forth by the Borough of Old Tappan and NJAC 7:8.

In order to prepare the stormwater calculations for the project, extensive initial investigation of the property and topographic survey was performed. Schwanewede/Hals Engineering was contracted to prepare an ALTA/NSPS Land Title Survey of the existing site. Based on a review of the existing site conditions and the Survey, the Drainage Area Maps for the existing and proposed conditions as defined within this report were established. The grading plan within the accompanying engineering drawings was developed for the proposed site improvements with consideration to the existing drainage patterns.

The 2-, 10- and 100-year quantity design storms are based upon the New Jersey 24 Hour Rainfall Frequency Data for Bergen County as published by the NOAA Atlas 14 Type D rainfall distribution. Curve number calculations have been included within the Appendix and are based upon hydrologic soil groups A and B. Pervious and impervious areas were modeled separately as recommended within the NJDEP Stormwater Management Best Management Practices (BMP) Manual.

The Borough of Old Tappan and NJDEP flow reduction requirements are as follows:

2-year:	50% reduction (50% of Existing)
10-year:	25% reduction (75% of Existing)
100-year:	20% reduction (80% of Existing)

V. DETENTION/INFILTRATION BASIN #1

The stormwater runoff generated by PR-DA 1 and PR-Building is collected by various proposed on-site inlets and conveyed to the aboveground basin located near the northern property line. The basin has been designed to accommodate the 100-year design storm, providing a maximum storage of approximately 56,500 cubic feet, and includes a sand filter to provide water quality treatment, designed in accordance with the New Jersey Stormwater Best Management Practices Manual (BMP). Runoff generated by the Water Quality Design Storm is allowed to pass through the sand filter and infiltrate into the underlying soils. Runoff volume generated by larger storm events is detained and released at a controlled rate to POA #1 through the use of an outlet control structure. Associated calculations are included in the Appendix of this report and details have been provided on the accompanying engineering drawings.

VI. WATER QUANTITY

As required by the Borough of Old Tappan Land Use Ordinance and NJAC 7:8, the proposed development is subject to runoff quantity reduction requirements. Two methods which may be used to achieve the runoff quantity reductions are the following:

1. Demonstrate through hydrologic and hydraulic analysis that for stormwater leaving the site, post-construction runoff hydrographs for the two-, 10-, and 100-year storm events do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events;
2. Design stormwater management measures so that the post-construction peak runoff rates for the two-, 10-, and 100-year storm events are 50, 75, and 80 percent, respectively, of the pre-construction peak runoff rates. The percentages apply only to the post-construction stormwater runoff that is attributable to the portion of the site on which the proposed development or project is to be constructed;

The two aforementioned points of analysis have been used to analyze and ensure the satisfaction of the runoff quantity requirements using one of the above methods. POA #1 was analyzed using method 2 described above. The following table demonstrates the results of these calculations:

POA-1 (CFS)				
	Existing	Allowable	Proposed	Reduction
2-Year	0.58	0.29	0.17	70.7%
10-Year	1.71	1.28	0.60	64.9%
25-Year	2.52	N/S	0.86	65.9%
100-Year	3.85	3.08	1.55	59.7%

POA #2 was analyzed using method 1 described above. The following table represents the results of these calculations:

POA-2 (CFS)		
	Existing	Proposed
2-Year	1.37	1.27
10-Year	4.48	3.69
25-Year	6.82	5.44
100-Year	10.76	8.35

As indicated above, the peak flows for each point of analysis have been reduced when compared to existing conditions as required, thus meeting the requirements set forth in the Borough ordinance and N.J.A.C. 7:8.

VII. WATER QUALITY

The development proposes more than one-quarter (1/4) acre of impervious coverage and is therefore required to meet the 80% TSS removal rate requirement set forth by the Borough of Old Tappan and NJAC 7:8. Areas within Proposed Drainage Area 1 Undet. do not contain motor vehicle surfaces, therefore are not required to be treated for water quality per NJAC 7:8.

As shown on the Drainage and Utility Plan (Sheet 7), a portion of the runoff generated by the proposed driveway to the relocated historic building will be conveyed to the proposed Filterra water quality unit located at the southwestern corner of the site. The Filterra unit has been designed to provide a TSS removal rate of 80%. It is designed to treat the runoff volume generated by the Water Quality Design Storm and allow larger storm events to bypass internally, after which flow is conveyed to the existing stormwater conveyance system within the Old Tappan Right-of-Way. The remainder of areas within Proposed Drainage Area 2 do not contain motor vehicle surfaces, and therefore runoff generated by the remainder of this drainage area is not subject to water quality treatment requirements.

Runoff generated by Proposed Drainage Area 1 and Building is conveyed to Basin 1, which includes a sand filter designed in accordance with the NJDEP BMP Manual to provide 80% TSS removal. Runoff generated by the Water Quality Design Storm is allowed to pass through the sand filter and infiltrate into the underlying soils. Runoff generated by larger storm events is detained and released at a controlled rate to POA #1 through the use of an outlet control structure.

VIII. GROUNDWATER RECHARGE

As mentioned above, the project is considered a "major development" under the guidelines set forth by the Borough of Old Tappan and NJAC 7:8, and is therefore subject to groundwater recharge requirements set forth in same. It has been calculated that the post-development conditions provide an annual recharge deficit

of approximately 108,000 cubic feet. The proposed improvements implement the previously mentioned sand filter within Basin 1, which has been designed to provide approximately 108,000 cubic feet of annual recharge volume, thus satisfying the groundwater recharge requirements.

IX. CONCLUSION

The proposed development has been designed with provisions for the safe and efficient control of stormwater runoff in a manner that will not adversely impact the existing drainage patterns, adjacent roadways, or adjacent parcels.

The stormwater management design reduces peak flow rates for the proposed development area and meets the minimum peak flow reduction for the 2, 10 and 100-year storm frequencies and/or reduces runoff to be under the curve of the existing hydrographs at all times as required by the Borough of Old Tappan and NJAC 7:8. The water quality TSS removal requirements and groundwater recharge requirements have been satisfied by use of a sand filter, to achieve the 80% TSS required removal rate under post-development conditions.

APPENDIX

USGS MAP

DYNAMIC ENGINEERING

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Lake Como, NJ 07719
Ph: (732) 974-0198
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245 Main Street, Suite 204
Chester, NJ 07930
Ph: (908) 879-9229
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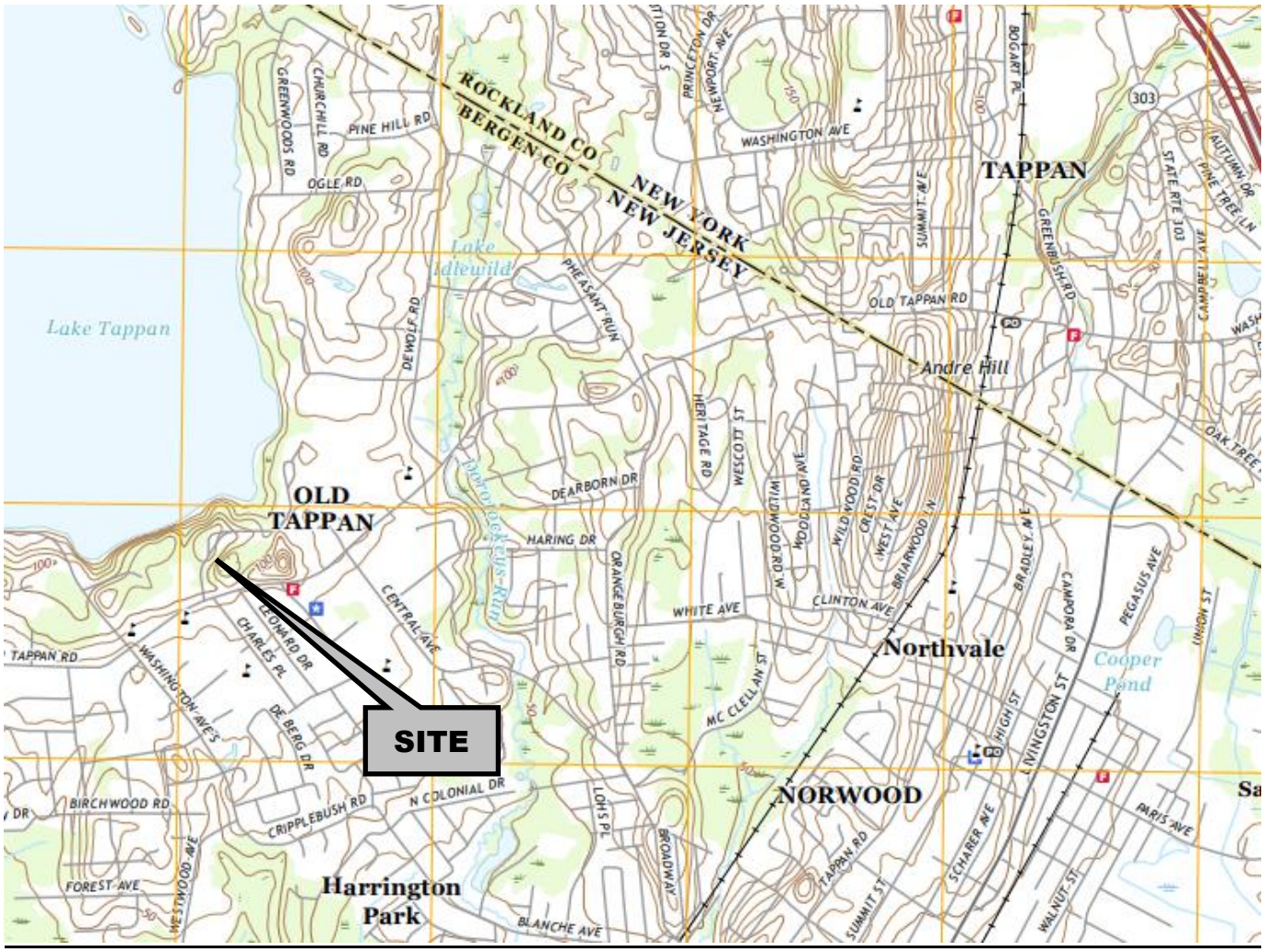
USGS Map

Nyack Quad



CONDUIT OUTLET PROTECTION CALCULATIONS

DYNAMIC ENGINEERING

245 Main Street, Suite 110, Chester, NJ 07930
(908) 879-9229

Date: 3/23/2022
Project: CSH Old Tappan
Project No: 1423-99-006

Calculated By: GL
Checked By: DRL

Conduit Outlet Protection Calculations

Rip Rap Pad # 10

Design Parameters:

Design Storm Flow for 25 Year, Q	3.43	cfs
Vertical Dimension of Outlet Pipe, D_o	18	in
Horizontal Dimension of Outlet Pipe, W_o	18	in
Tailwater Depth, TW[1]	0.25	ft

Apron Dimension Calculations:

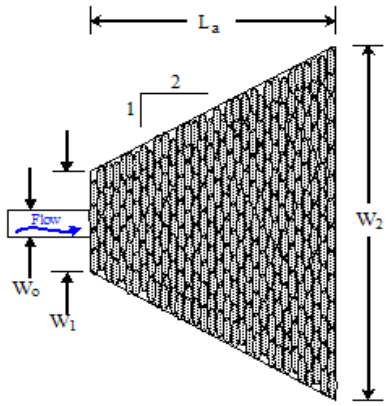
Unit Dicharge, $q = Q/D_o$ = 2.29 cfs per foot

- **Case I: $TW < 1/2\ D_o$**

Apron Length, $L_a = \frac{1.8q}{D_o^{1/2}} + 7D_o$ = 13.86 ft or L_a = **14 ft**

Width, $W_1 = 3W_o$ = 4.5 ft or W_1 = **5 ft**

Width, $W_2 = 3W_o + L_a$ = 18.36 ft or W_2 = **19 ft**

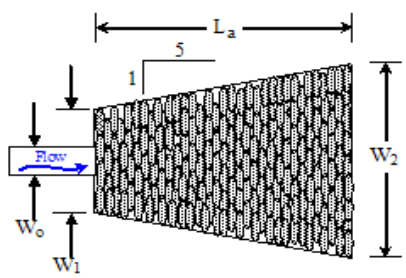


- **Case II: $TW \geq 1/2\ D_o$**

Apron Length, $L_a = \frac{3q}{D_o^{1/2}}$ = L_a =

Width, $W_1 = 3W_o$ = W_1 =

Width, $W_2 = 3W_o + 0.4L_a$ = W_2 =



Rip Rap Stone Size Calculations:

Median Stone, $d_{50} = \frac{0.02q^{1.33}}{TW}$ = 2.88 in d_{50} = **6 in**

Notes:

1. Where there is a well-defined channel downstream of the apron, the bottom width of the apron shall be at least equal to the bottom width of the channel and the structural lining shall extend at least one foot above the tailwater elevation, but no lower than two-thirds of the vertical conduit dimension above the conduit invert.
2. The side slopes shall be 2:1 or flatter.
3. The bottom grade shall be 0.0% (level).
4. There shall be no overfall at the end of the apron or at the end of the culvert.
5. Fifty (50) percent by weight of the rip-rap mixture shall be smaller than the median size stone designated as d_{50}. The largest stone size in the mixture shall be 1.5 times the d_{50} size. The rip-rap shall be reasonably well graded.
6. The thickness of the rip-rap apron may be two (2) times the median stone diameter provided that the apron is constructed on a bedding of four (4) inches of 3/4 inch clean stone on approved filter fabric material.
7. Rip-rap and filter fabric shall meet the standards of the governing Soil Conservation District as well as the requirements of the local municipality.
8. No bends or curves at the intersection of the conduit and apron will be permitted.

Footnote:

1. Tailwater depth shall be the 2-year storm if discharging into a detention basin. For areas where tailwater cannot be computed, use $TW = 0.2D_o$.
2. For multiple pipes, increase rip-rap sizes by 25% when pipe spacing is greater than or equal to $1/4W_o$.

DYNAMIC ENGINEERING
245 Main Street, Suite 110, Chester, NJ 07930
(908) 879-9229

Date: 3/23/2022
Project: CSH Old Tappan
Project No: 1423-99-006

Calculated By: GL
Checked By: DRL

Conduit Outlet Protection Calculations

Rip Rap Pad # 20

Design Parameters:

Design Storm Flow for 25 Year, Q	7.31	cfs
Vertical Dimension of Outlet Pipe, D_o	24	in
Horizontal Dimension of Outlet Pipe, W_o	24	in
Tailwater Depth, TW[1]	0.25	ft

Apron Dimension Calculations:

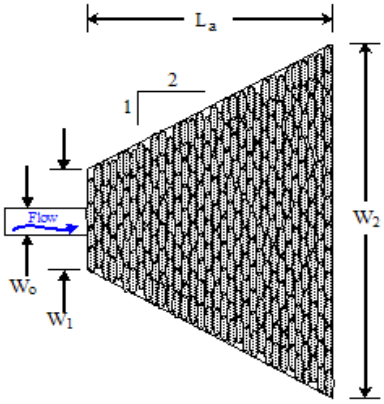
Unit Dicharge, $q = Q/D_o$ = 3.66 cfs per foot

- **Case I: $TW < 1/2\ D_o$**

Apron Length, $L_a = \dfrac{1.8q}{D_o^{1/2}} + 7D_o$ = 18.65 ft or L_a = 19 ft

Width, $W_1 = 3W_o$ = 6. ft or W_1 = 6 ft

Width, $W_2 = 3W_o + L_a$ = 24.65 ft or W_2 = 25 ft

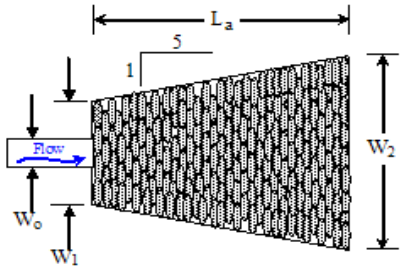


- **Case II: $TW \geq 1/2\ D_o$**

Apron Length, $L_a = \dfrac{3q}{D_o^{1/2}}$ = L_a =

Width, $W_1 = 3W_o$ = W_1 =

Width, $W_2 = 3W_o + 0.4L_a$ = W_2 =



Rip Rap Stone Size Calculations:

Median Stone, $d_{50} = \dfrac{0.02q^{1.33}}{TW}$ = 5.38 in d_{50} = 6 in

Notes:

1. Where there is a well-defined channel downstream of the apron, the bottom width of the apron shall be at least equal to the bottom width of the channel and the structural lining shall extend at least one foot above the tailwater elevation, but no lower than two-thirds of the vertical conduit dimension above the conduit invert.
2. The side slopes shall be 2:1 or flatter.
3. The bottom grade shall be 0.0% (level).
4. There shall be no overfall at the end of the apron or at the end of the culvert.
5. Fifty (50) percent by weight of the rip-rap mixture shall be smaller than the median size stone designated as d_{50}. The largest stone size in the mixture shall be 1.5 times the d_{50} size. The rip-rap shall be reasonably well graded.
6. The thickness of the rip-rap apron may be two (2) times the median stone diameter provided that the apron is constructed on a bedding of four (4) inches of 3/4 inch clean stone on approved filter fabric material.
7. Rip-rap and filter fabric shall meet the standards of the governing Soil Conservation District as well as the requirements of the local municipality.
8. No bends or curves at the intersection of the conduit and apron will be permitted.

Footnote:

1. Tailwater depth shall be the 2-year storm if discharging into a detention basin. For areas where tailwater cannot be computed, use $TW = 0.2D_o$.
2. For multiple pipes, increase rip-rap sizes by 25% when pipe spacing is greater than or equal to $1/4W_o$.

SOIL SURVEY

Hydrologic Soil Group—Bergen County, New Jersey

Map Scale: 1:1,480 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

Streams and Canals

Transportation

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

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Bergen County, New Jersey
Survey Area Data: Version 17, Jun 1, 2020

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

Date(s) aerial images were photographed: Oct 7, 2013—Feb 26, 2017

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
DuuB	Dunellen-Urban land complex, 3 to 8 percent slopes	A	1.1	19.3%
DuuC	Dunellen-Urban land complex, 8 to 15 percent slopes	A	0.2	4.0%
RkrC	Riverhead sandy loam, 8 to 15 percent slopes	B	4.5	76.5%
UdkttB	Udorthents, loamy, 0 to 8 percent slopes, frequently flooded	D	0.0	0.2%
Totals for Area of Interest			**5.9**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

RUNOFF CURVE NUMBER (CN) CALCULATIONS

DYNAMIC ENGINEERING

EXISTING DRAINAGE AREA SUMMARY AND AVERAGE CURVE NUMBER(CN) CALCULATIONS

Project: Capital Seniors Housing - Old Tappan
Job #: 1423-99-006
Location: 24 Old Tappan Rd, Old Tappan, NJ

Computed By: CP
Checked By: DRL
Date: 4/14/2021

Drainage Area	Impervious Area (acre)	Impervious Area (sf)	Curve Number (CN) Used	HSG A - Open Space Area (acre)	HSG A - Open Space Area (sf)	Curve Number (CN) Used	HSG A - Wooded Area (acre)	HSG A - Wooded Area (sf)	Curve Number (CN) Used	HSG B - Open Space Area (acre)	HSG B - Open Space Area (sf)	Curve Number (CN) Used	HSG B - Wooded Area (acre)	HSG B - Wooded Area (sf)	Curve Number (CN) Used	Avg. Perv. Curve Number	Total Pervious Area (acres)	Total Area (acres)	TC (Min.)
EX-DA 1 DET.	0.00	-	98	0.00		68	0.00	-	45	0.00		79	0.97	42,329	66	66	0.97	0.97	16.6
EX-DA 1 UNDET.	0.00	-	98	0.00		68	0.00	-	45	0.00		79	1.24	54,217	66	66	1.24	1.24	22.2
EX-DA 2A	0.12	5,176	98	0.50	21,642	68	0.58	25,207	45	0.00		79	0.20	8,719	66	57	1.28	1.39	18.0
EX-DA 2B	0.00		98	0.00		68	0.19	8,203	45	0.00		79	1.66	72,479	66	64	1.85	1.85	13.8
Total	**0.12**	**5176.00**		**0.50**	**21642.00**		**0.77**	**33410.00**		**0.00**	**0.00**		**4.08**	**177744.00**			**5.34**	**5.46**	

Per Bergen County Soil Survey -	DuuB	HSG	A	Hazen-Paulins Kill complex
Per Bergen County Soil Survey -	DuuC	HSG	A	Washington silt loam
Per Bergen County Soil Survey -	RkrC	HSG	B	Rock outcrop-Farmington-Galway complex

Description	Runoff Curve Number (CN) (HSG A)	Runoff Curve Number (CN) (HSG B)
Impervious Surface	98	98
Woods (poor)	45	66
Open Space (poor)	68	79

DYNAMIC ENGINEERING

Proposed Drainage Area Summary and Average Curve Number(CN) Calculations

Project: Capital Seniors Housing - Old Tappan
Job #: 1423-99-006
Location: 24 Old Tappan Rd, Old Tappan, NJ

Computed By: GL
Checked By: DRL
Date: 2/11/2022

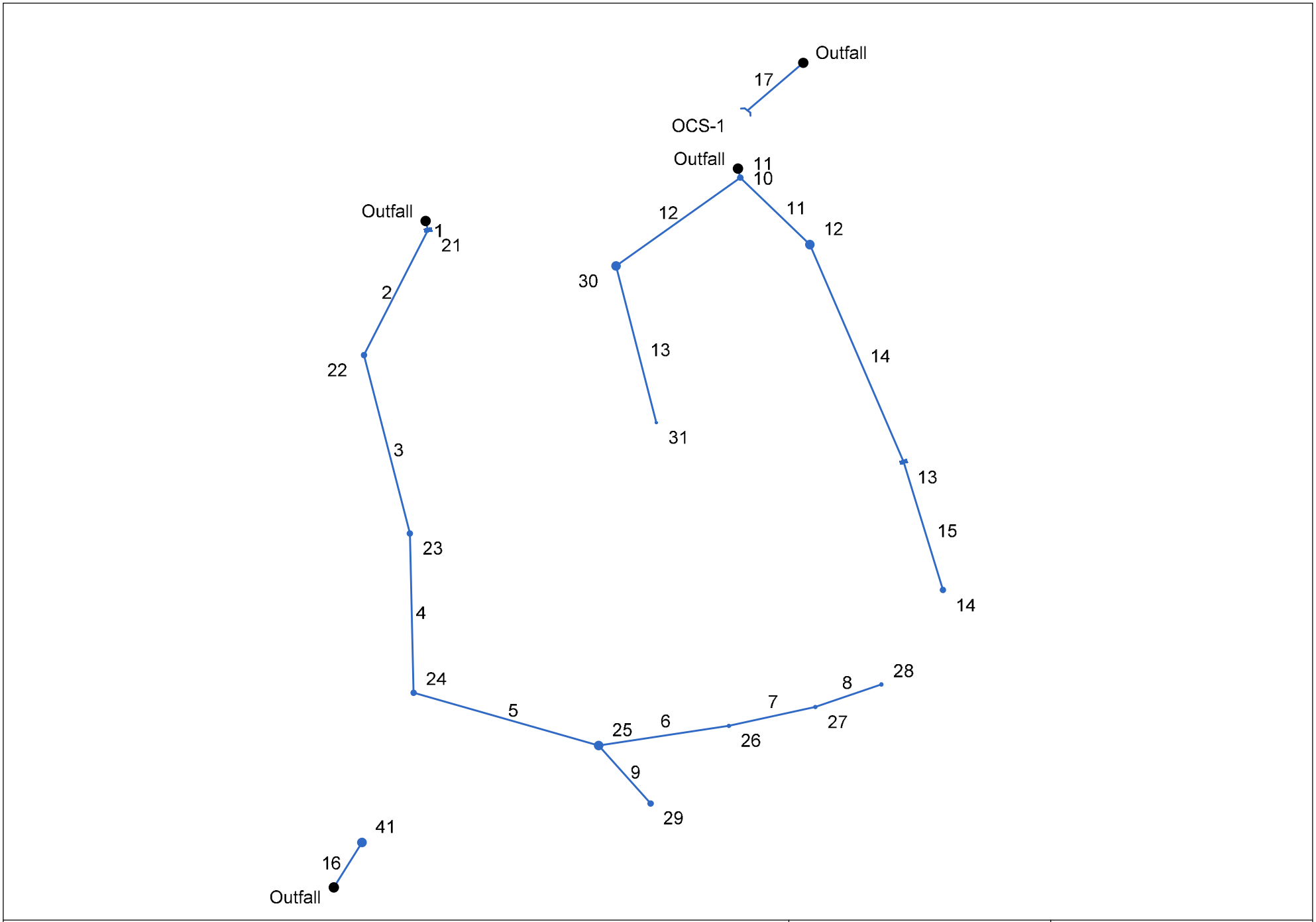
Drainage Area	Impervious Area (acre)	Impervious Area (sf)	Curve Number (CN) Used	HSG A - Open Space Area (acre)	HSG A - Open Space Area (sf)	Curve Number (CN) Used	HSG A - Wooded Area (acre)	HSG A - Wooded Area (sf)	Curve Number (CN) Used	HSG B - Open Space Area (acre)	HSG B - Open Space Area (sf)	Curve Number (CN) Used	HSG B - Wooded Area (acre)	HSG B - Wooded Area (sf)	Curve Number (CN) Used	Avg. Perv. Curve Number	Total Pervious Area (acres)	Total Area (acres)	TC (Min.)
PR-DA 1	0.96	41,609	98	0.32	13,870	68	0.00	-	45	0.76	33,264	79	0.00	-	66	76	1.08	2.04	6.0
PR-DA 1 UD	0.00	-	98	0.00		68	0.00	-	45	0.00	-	79	0.30	12,944	66	66	0.30	0.30	6.0
PR-DA 2	0.11	4,606	98	0.36	15,747	68	0.25	10,779	45	0.00	-	79	1.70	74,165	66	64	2.31	2.42	15.2
PR-BUILDING	0.71	30,937	98	0.00		68	0.00	-	45	0.00	-	79	0.00	-	66	N/A	0.00	0.71	6.0
Total	**1.77**	**77152.00**		**0.68**	**29617.00**		**0.25**	**10779.00**		**0.76**	**33264.00**		**2.00**	**87109.00**			**3.69**	**5.46**	

Per Bergen County Soil Survey -	DuuB	HSG	A	Hazen-Paulins Kill complex
Per Bergen County Soil Survey -	DuuC	HSG	A	Washington silt loam
Per Bergen County Soil Survey -	RkrC	HSG	B	Rock outcrop-Farmington-Galway complex

Description	Runoff Curve Number (CN) (HSG A)	Runoff Curve Number (CN) (HSG B)
Impervious Surface	98	98
Woods (poor)	45	66
Open Space (poor)	68	79

PIPE SIZING CALCULATIONS

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



Project File: 2022-02-08 - CSH Old Tappan Pipe Sizing.stm	Number of lines: 17	Date: 3/31/2022

Storm Sewers v2020.00

Report

Line No.	Line ID	Inlet ID	Drng Area (ac)	Runoff Coeff (C)	Incr CxA	Total CxA	Inlet Time (min)	Tc (min)	i Sys (in/hr)	Line Size (in)	Line Length (ft)	Line Slope (%)	Line Type	Capac Full (cfs)	Flow Rate (cfs)	Vel Ave (ft/s)
1	21 to 20	21	0.31	0.74	0.23	1.21	6.0	10.3	7.96	24	6.000	0.75	Cir	21.41	9.66	5.92
2	22 to 21	22	0.25	0.95	0.24	0.99	6.0	9.8	8.18	24	87.102	0.30	Cir	13.54	8.08	4.47
3	23 to 22	23	0.37	0.91	0.34	0.75	6.0	9.3	8.41	18	117.447	0.30	Cir	6.30	6.31	4.03
4	24 to 23	24	0.10	0.63	0.06	0.41	6.0	8.5	8.80	18	102.613	0.30	Cir	6.30	3.62	2.50
5	25 to 24	25	0.00	0.00	0.00	0.35	0.0	7.6	9.29	18	102.163	0.30	Cir	6.30	3.23	2.62
6	26 to 25	26	0.04	0.29	0.01	0.21	6.0	6.9	9.72	15	68.948	0.30	Cir	3.85	2.01	3.18
7	27 to 26	27	0.06	0.38	0.02	0.20	6.0	6.4	10.04	15	46.620	0.30	Cir	3.82	1.97	3.14
8	28 to 27	28	0.23	0.75	0.17	0.17	6.0	6.0	10.35	15	37.304	0.29	Cir	3.79	1.79	3.02
9	29 to 25	29	0.20	0.70	0.14	0.14	6.0	6.0	10.35	12	46.102	0.30	Cir	2.18	1.45	2.06
10	11 to 10	11	0.25	0.80	0.20	0.66	6.0	13.0	7.01	18	6.000	0.36	Cir	6.86	4.62	4.47
11	12 to 11	12	0.16	0.99	0.16	0.43	6.0	9.0	8.54	18	56.317	0.30	Cir	6.30	3.64	2.62
12	30 to 11	30	0.00	0.00	0.00	0.04	0.0	9.8	8.19	12	86.083	0.50	Cir	2.82	0.29	1.40
13	31 to 30	31	0.06	0.56	0.04	0.04	6.0	6.0	10.35	12	103.123	0.50	Cir	2.82	0.37	2.40
14	13 to 12	13	0.19	0.76	0.15	0.27	6.0	7.4	9.41	18	148.133	0.30	Cir	6.30	2.54	2.58
15	14 to 13	14	0.16	0.78	0.12	0.12	6.0	6.0	10.35	15	85.091	0.30	Cir	3.82	1.26	2.24
16	41 to 42	41	0.12	1.00	0.12	0.12	6.0	6.0	10.35	15	32.490	0.98	Cir	6.41	1.24	3.63
17	OCS-1 to HW-1	OCS-1	0.00	0.00	0.00	0.00	0.0	0.0	0.00	18	42.266	0.31	Cir	6.31	2.78	1.57

Project File: 2022-02-08 - CSH Old Tappan Pipe Sizing.stm | Number of lines: 17 | Date: 3/31/2022

NOTES: Intensity = 51.45 / (Inlet time + 3.60) ^ 0.71 -- Return period = 100 Yrs. ; ** Critical depth

TIME OF CONCENTRATION (Tc) CALCULATIONS

DYNAMIC ENGINEERING
1904 Main Street, Lake Como, NJ 07719
(732) 974-0198

Date:	4/30/2021
Project:	CSH - Old Tappan
Project No:	1423-99-006
Calculated By:	DRL
Checked By:	DTS

Worksheet 3: Time of Concentration (T_c) Calculations

Land Condition: Existing
Drainage Area: DA-1 DET.

• ***Sheet Flow*** :	AB						
1. Surface Description	Woods, Dense Underbrush						
2. Manning's Roughness Coefficient, n	0.8						
3. Flow Length, L { total $L \leq 100$ ft }	100.0 ft						
4. Two-Year 24-hour Rainfall, p_2 for . . . Bergen County	3.34 in		3.34 in		3.34 in		
5. Land Slope, s (ft/ft)	0.150 ft/ft						
6. Travel Time, $T_t = \frac{0.007\,(n\,L)^{0.8}}{p_2^{0.5}\,s^{0.4}}$	0.272 hr	+	0.000 hr	+	0.000 hr	=	0.272 hr

• ***Shallow Concentrated Flow*** :	BC						
7. Surface Description	Unpaved						
8. Flow Length, L	90.0 ft						
9. Watercourse Slope, s	0.110 ft/ft						
10. Average velocity, V { see Figure 3.1)	5.35 ft/s						
11. Travel Time, $T_t = \frac{L}{3600\,V}$	0.005 hr	+	0.000 hr	+	0.000 hr	=	0.005 hr

• ***Channel Flow*** :							
12. Pipe Diameter, D							
13. Cross-Sectional Flow Area, A							
14. Wetted Perimeter, p_w							
15. Hydraulic Radius, $r = A / p_w$							
16. Channel Slope, s							
17. Pipe Material							
18. Manning's Roughness Coefficient, n							
19. Velocity, $V = \frac{1.49\,r^{2/3}\,s^{1/2}}{n}$							
20. Flow Length, L							
21. Travel Time, $T_t = \frac{L}{3600\,V}$	0.000 hr	+	0.000 hr	+	0.000 hr	=	0.000 hr
22. Watershed or subarea Time of Concentration, T_c { add T_t in steps 6, 11 and 21 }							0.277 hr
							16.6 min

DYNAMIC ENGINEERING
1904 Main Street, Lake Como, NJ 07719
(732) 974-0198

Date:	4/14/2021
Project:	CSH - Old Tappan
Project No:	1423-99-006
Calculated By:	DRL
Checked By:	DTS

Worksheet 3: Time of Concentration (T_c) Calculations

Land Condition: Existing
Drainage Area: DA-1 UNDET.

• ***Sheet Flow*** :	AB						
1. Surface Description	Woods, Dense Underbrush						
2. Manning's Roughness Coefficient, n	0.8						
3. Flow Length, L { total $L \leq 100$ ft }	100.0 ft						
4. Two-Year 24-hour Rainfall, p_2 for . . . Bergen County	3.34 in		3.34 in		3.34 in		
5. Land Slope, s (ft/ft)	0.080 ft/ft						
6. Travel Time, $T_t = \frac{0.007\,(n\,L)^{0.8}}{p_2^{0.5}\,s^{0.4}}$	0.350 hr	+	0.000 hr	+	0.000 hr	=	0.350 hr

• ***Shallow Concentrated Flow*** :	BC						
7. Surface Description	Unpaved						
8. Flow Length, L	290.0 ft						
9. Watercourse Slope, s	0.065 ft/ft						
10. Average velocity, V { see Figure 3.1)	4.11 ft/s						
11. Travel Time, $T_t = \frac{L}{3600\,V}$	0.020 hr	+	0.000 hr	+	0.000 hr	=	0.020 hr

• ***Channel Flow*** :							
12. Pipe Diameter, D							
13. Cross-Sectional Flow Area, A							
14. Wetted Perimeter, p_w							
15. Hydraulic Radius, $r = A / p_w$							
16. Channel Slope, s							
17. Pipe Material							
18. Manning's Roughness Coefficient, n							
19. Velocity, $V = \frac{1.49\,r^{2/3}\,s^{1/2}}{n}$							
20. Flow Length, L							
21. Travel Time, $T_t = \frac{L}{3600\,V}$	0.000 hr	+	0.000 hr	+	0.000 hr	=	0.000 hr
22. Watershed or subarea Time of Concentration, T_c { add T_t in steps 6, 11 and 21 }							0.370 hr
							22.2 min

DYNAMIC ENGINEERING
1904 Main Street, Lake Como, NJ 07719
(732) 974-0198

Date:	4/30/2021
Project:	CSH - Old Tappan
Project No:	1423-99-006
Calculated By:	CMP
Checked By:	KHC

Worksheet 3: Time of Concentration (T_c) Calculations

Land Condition: Existing
Drainage Area: DA-2A

• ***Sheet Flow*** :	AB						
1. Surface Description	Woods, Dense Underbrush						
2. Manning's Roughness Coefficient, n	0.8						
3. Flow Length, L { total $L \leq 100$ ft }	100.0 ft						
4. Two-Year 24-hour Rainfall, p_2 for . . . Bergen County	3.34 in		3.34 in		3.34 in		
5. Land Slope, s (ft/ft)	0.121 ft/ft						
6. Travel Time, $T_t = \frac{0.007\,(n\,L)^{0.8}}{p_2^{0.5}\,s^{0.4}}$	0.297 hr	+	0.000 hr	+	0.000 hr	=	0.297 hr

• ***Shallow Concentrated Flow*** :	BC						
7. Surface Description	Unpaved						
8. Flow Length, L	51.9 ft						
9. Watercourse Slope, s	0.164 ft/ft						
10. Average velocity, V { see Figure 3.1)	6.53 ft/s						
11. Travel Time, $T_t = \frac{L}{3600\,V}$	0.002 hr	+	0.000 hr	+	0.000 hr	=	0.002 hr

• ***Channel Flow*** :							
12. Pipe Diameter, D							
13. Cross-Sectional Flow Area, A							
14. Wetted Perimeter, p_w							
15. Hydraulic Radius, $r = A / p_w$							
16. Channel Slope, s							
17. Pipe Material							
18. Manning's Roughness Coefficient, n							
19. Velocity, $V = \frac{1.49\,r^{2/3}\,s^{1/2}}{n}$							
20. Flow Length, L							
21. Travel Time, $T_t = \frac{L}{3600\,V}$	0.000 hr	+	0.000 hr	+	0.000 hr	=	0.000 hr
22. Watershed or subarea Time of Concentration, T_c { add T_t in steps 6, 11 and 21 }							0.299 hr
							18.0 min

DYNAMIC ENGINEERING
1904 Main Street, Lake Como, NJ 07719
(732) 974-0198

Date:	4/30/2021
Project:	CSH - Old Tappan
Project No:	1423-99-006
Calculated By:	CMP
Checked By:	KHC

Worksheet 3: Time of Concentration (T_c) Calculations

Land Condition: Existing
Drainage Area: DA-2B

	AB						
• *Sheet Flow*:							
1. Surface Description	Woods, Dense Underbrush						
2. Manning's Roughness Coefficient, n	0.8						
3. Flow Length, L { *total L ≤ 100 ft* }	85.0 ft						
4. Two-Year 24-hour Rainfall, p_2 for . . . Bergen County	3.34 in						
5. Land Slope, s *(ft/ft)*	0.166 ft/ft						
6. Travel Time, $T_t = \frac{0.007\,(n\,L)^{0.8}}{p_2^{0.5}\,s^{0.4}}$	0.230 hr	+	0.000 hr	+	0.000 hr	=	0.230 hr
• *Shallow Concentrated Flow*:							
7. Surface Description							
8. Flow Length, L							
9. Watercourse Slope, s							
10. Average velocity, V { *see Figure 3.1)*							
11. Travel Time, $T_t = \frac{L}{3600\,V}$	0.000 hr	+	0.000 hr	+	0.000 hr	=	0.000 hr
• *Channel Flow*:							
12. Pipe Diameter, D							
13. Cross-Sectional Flow Area, A							
14. Wetted Perimeter, p_w							
15. Hydraulic Radius, $r = A / p_w$							
16. Channel Slope, s							
17. Pipe Material							
18. Manning's Roughness Coefficient, n							
19. Velocity, $V = \frac{1.49\,r^{2/3}\,s^{1/2}}{n}$							
20. Flow Length, L							
21. Travel Time, $T_t = \frac{L}{3600\,V}$	0.000 hr	+	0.000 hr	+	0.000 hr	=	0.000 hr
22. Watershed or subarea Time of Concentration, T_c { *add T_t in steps 6, 11 and 21* }							0.230 hr
							13.8 min

DYNAMIC ENGINEERING
1904 Main Street, Lake Como, NJ 07719
(732) 974-0198

Date:	12/9/2021
Project:	CSH Old Tappan NJ
Project No:	1423-99-006
Calculated By:	JD
Checked By:	KHC

Worksheet 3: Time of Concentration (T_c) Calculations

Land Condition: Proposed
Drainage Area: PR-DA 1

• Sheet Flow:

	AB									
1. Surface Description	Dense Grasses									
2. Manning's Roughness Coefficient, n	0.24									
3. Flow Length, L { total $L \leq 100$ ft }	54.0 ft									
4. Two-Year 24-hour Rainfall, p_2 for Bergen County	3.34 in									
5. Land Slope, s (ft/ft)	0.151 ft/ft									
6. Travel Time, $T_t = \frac{0.007\,(n\,L)^{0.8}}{p_2^{0.5}\,s^{0.4}}$	0.063 hr	+	0.000 hr	+	0.000 hr	+	0.000 hr	=	0.063 hr	

• Shallow Concentrated Flow:

7. Surface Description										
8. Flow Length, L										
9. Watercourse Slope, s										
10. Average velocity, V { see Figure 3.1)										
11. Travel Time, $T_t = \frac{L}{3600\,V}$	0.000 hr	+	0.000 hr	+	0.000 hr	+	0.000 hr	=	0.000 hr	

• Channel Flow:

	BC	CD	DE	EF		
12. Pipe Diameter, D	15 in	18 in	24 in	24 in		
13. Cross-Sectional Flow Area, A	1.227 sf	1.767 sf	3.142 sf	3.142 sf		
14. Wetted Perimeter, p_w	3.9 ft	4.7 ft	6.3 ft	6.3 ft		
15. Hydraulic Radius, $r = A / p_w$	0.3 ft	0.4 ft	0.5 ft	0.5 ft		
16. Channel Slope, s	0.003 ft/ft	0.003 ft/ft	0.003 ft/ft	0.0083 ft/ft		
17. Pipe Material	HDPE	HDPE	HDPE	HDPE		
18. Manning's Roughness Coefficient, n	0.010	0.010	0.010	0.010		
19. Velocity, $V = \frac{1.49\,r^{2/3}\,s^{1/2}}{n}$	3.76 ft/s	4.24 ft/s	5.14 ft/s	8.55 ft/s		
20. Flow Length, L	153.0	322.0	87.0	6.0		
21. Travel Time, $T_t = \frac{L}{3600\,V}$	0.011 hr +	0.021 hr +	0.005 hr +	0.000 hr	=	0.037 hr
22. Watershed or subarea Time of Concentration, T_c { add T_t in steps 6, 11 and 21 }						0.101 hr
						6.0 min

DYNAMIC ENGINEERING
1904 Main Street, Lake Como, NJ 07719
(732) 974-0198

Date:	4/30/2021
Project:	CSH - Old Tappan
Project No:	1423-99-006
Calculated By:	CMP
Checked By:	KHC

Worksheet 3: Time of Concentration (T_c) Calculations

Land Condition: Proposed
Drainage Area: PR-DA 2

● ***Sheet Flow*** :	AB						
1. Surface Description	Woods, Dense Underbrush						
2. Manning's Roughness Coefficient, n	0.8						
3. Flow Length, L { *total L ≤ 100 ft* }	96.0 ft						
4. Two-Year 24-hour Rainfall, p_2 for . . . Bergen County	3.34 in						
5. Land Slope, s *(ft/ft)*	0.166 ft/ft						
6. Travel Time, $T_t = \frac{0.007\,(n\,L)^{0.8}}{p_2^{0.5}\,s^{0.4}}$	0.253 hr	+	0.000 hr	+	0.000 hr	=	0.253 hr

● ***Shallow Concentrated Flow*** :							
7. Surface Description							
8. Flow Length, L							
9. Watercourse Slope, s							
10. Average velocity, V { *see Figure 3.1)*							
11. Travel Time, $T_t = \frac{L}{3600\,V}$	0.000 hr	+	0.000 hr	+	0.000 hr	=	0.000 hr

● ***Channel Flow*** :							
12. Pipe Diameter, D							
13. Cross-Sectional Flow Area, A							
14. Wetted Perimeter, p_w							
15. Hydraulic Radius, $r = A / p_w$							
16. Channel Slope, s							
17. Pipe Material							
18. Manning's Roughness Coefficient, n							
19. Velocity, $V = \frac{1.49\,r^{2/3}\,s^{1/2}}{n}$							
20. Flow Length, L							
21. Travel Time, $T_t = \frac{L}{3600\,V}$	0.000 hr	+	0.000 hr	+	0.000 hr	=	0.000 hr
22. Watershed or subarea Time of Concentration, T_c { *add T_t in steps 6, 11 and 21* }							0.253 hr
							15.2 min

HYDROGRAPH SUMMARY REPORTS – EXISTING VS PROPOSED CONDITIONS 2-YR, 10-YR, 25-YR, & 100-YR

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	0.517	3	735	2,847	-----	----	-----	EX - DA 1 DET.
2	Reservoir	0.000	3	786	0	1	85.90	433	EXIST. DEPRESSION
4	SCS Runoff	0.579	3	741	3,441	-----	----	-----	EX-DA 1 UNDET.
5	Combine	0.579	3	741	3,441	2, 4	----	-----	EX-DA 1 (POA 1)
7	SCS Runoff	0.270	3	735	1,454	-----	----	-----	EX-DA 2A IMP.
8	SCS Runoff	0.231	3	741	1,938	-----	----	-----	EX-DA 2A PERV
9	Combine	0.474	3	738	3,392	7, 8	----	-----	EX-DA 2A
11	SCS Runoff	0.925	3	732	4,633	-----	----	-----	EX-DA 2B
13	Combine	1.371	3	735	8,025	9, 11,	----	-----	EX-DA 2 (POA 2)
15	Combine	1.911	3	735	11,466	5, 13,	----	-----	Overall Existing
19	SCS Runoff	1.913	3	726	7,820	-----	----	-----	PROP BUILDING
21	SCS Runoff	2.586	3	726	10,574	-----	----	-----	PROP DA-1 IMP.
22	SCS Runoff	1.361	3	729	4,938	-----	----	-----	PROP DA-1 PER
23	Combine	3.910	3	726	15,512	21, 22	----	-----	PROP DA-1
25	Combine	5.823	3	726	23,332	19, 23,	----	-----	BASIN 1
26	Reservoir	0.058	3	771	254	25	85.80	8,949	BASIN 1
28	SCS Runoff	0.167	3	729	667	-----	----	-----	PROP DA-1 UNDET.
30	Combine	0.167	3	729	921	26, 28,	----	-----	PROP (POA 1)
32	SCS Runoff	0.248	3	735	1,333	-----	----	-----	PROP DA-2 IMP.
33	SCS Runoff	1.028	3	738	5,966	-----	----	-----	PROP DA-2 PER.
34	Combine	1.269	3	735	7,299	32, 33	----	-----	PROP DA-2 (POA 2)
37	Combine	1.387	3	735	8,220	30, 34,	----	-----	Overall Proposed

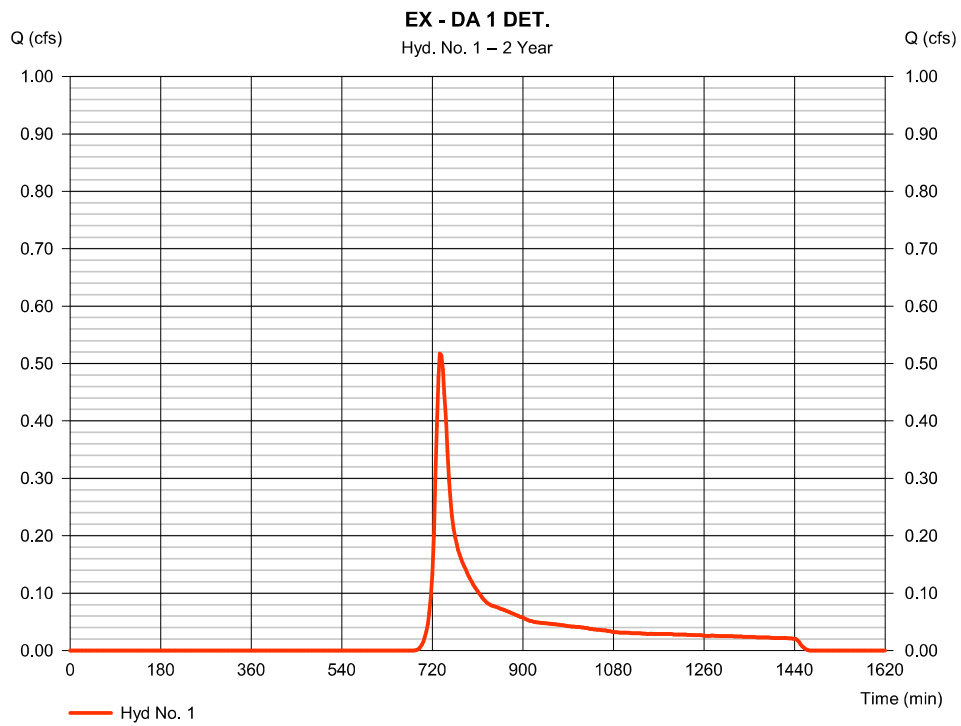
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Thursday, 03 / 31 / 2022

Hyd. No. 1

EX - DA 1 DET.

Hydrograph type	= SCS Runoff	Peak discharge	= 0.517 cfs
Storm frequency	= 2 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 2,847 cuft
Drainage area	= 0.970 ac	Curve number	= 66
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 16.60 min
Total precip.	= 3.47 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Geotechnical Engineering References\Stormwater	Shape factor	= 484



Hydrograph Report

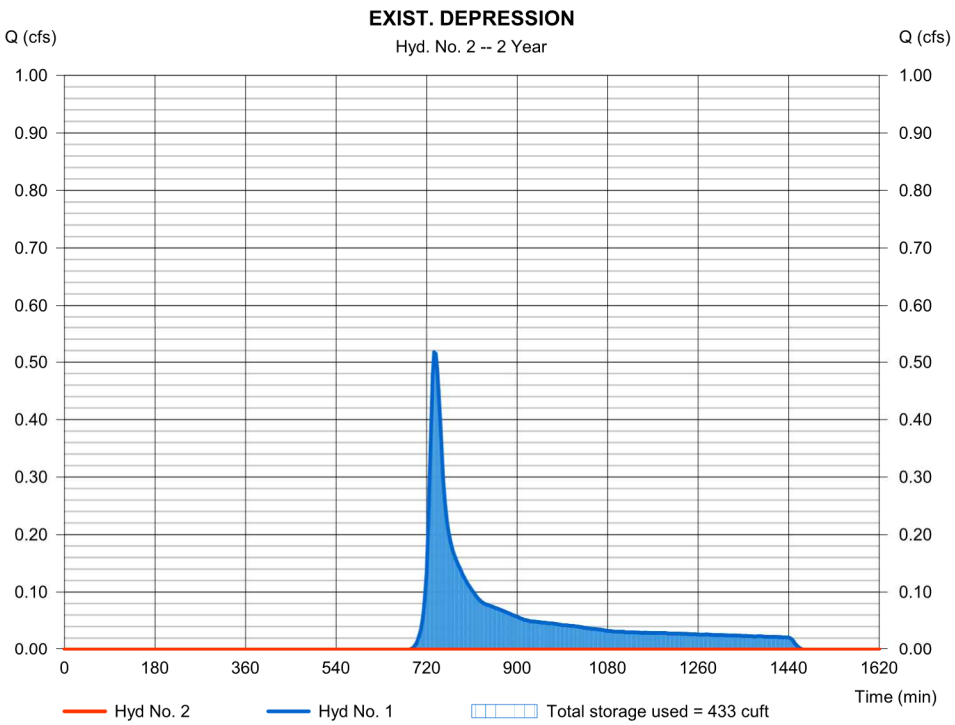
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Thursday, 03 / 31 / 2022

Hyd. No. 2

EXIST. DEPRESSION

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 786 min
Time interval	= 3 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 1 - EX - DA 1 DET.	Max. Elevation	= 85.90 ft
Reservoir name	= Exist. Depression	Max. Storage	= 433 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Thursday, 03 / 31 / 2022

Pond No. 1 - Exist. Depression

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 85.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	85.50	00	0	0
0.50	86.00	3,218	536	536
1.50	87.00	5,730	4,414	4,950
2.50	88.00	9,392	7,485	12,435

Culvert / Orifice Structures

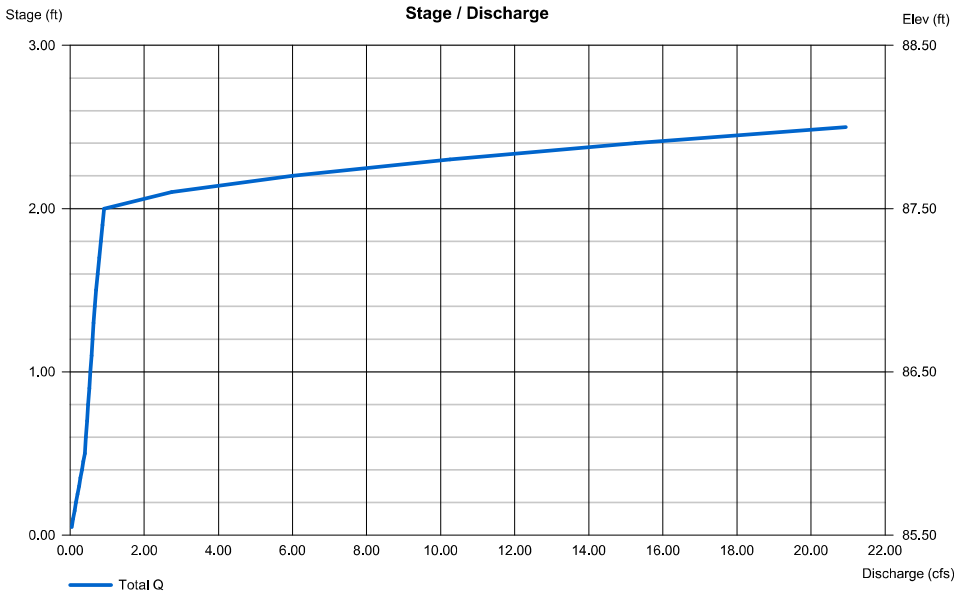
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 6.00	0.00	0.00	0.00
Span (in)	= 80.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 87.50	0.00	0.00	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 3.50	0.00	0.00	n/a
N-Value	= .030	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.00	0.00	0.00	0.00
Crest El. (ft)	= 87.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 5.250 (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).



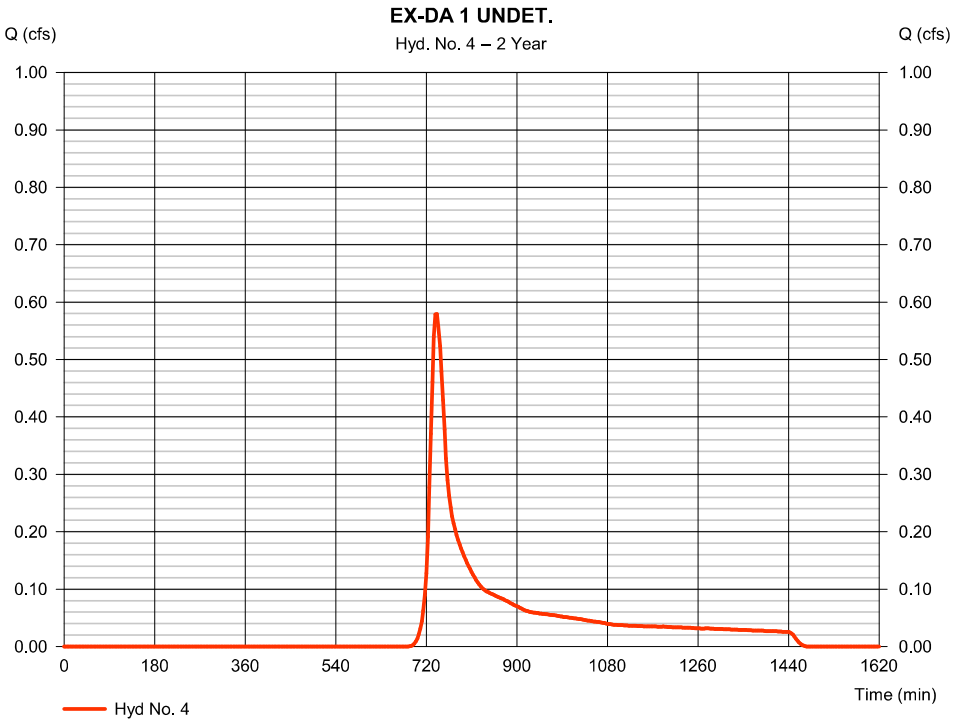
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 4

EX-DA 1 UNDET.

Hydrograph type	= SCS Runoff	Peak discharge	= 0.579 cfs
Storm frequency	= 2 yrs	Time to peak	= 741 min
Time interval	= 3 min	Hyd. volume	= 3,441 cuft
Drainage area	= 1.240 ac	Curve number	= 66
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 22.20 min
Total precip.	= 3.47 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Central Engineering References\Stormwater	Shape factor	= 484



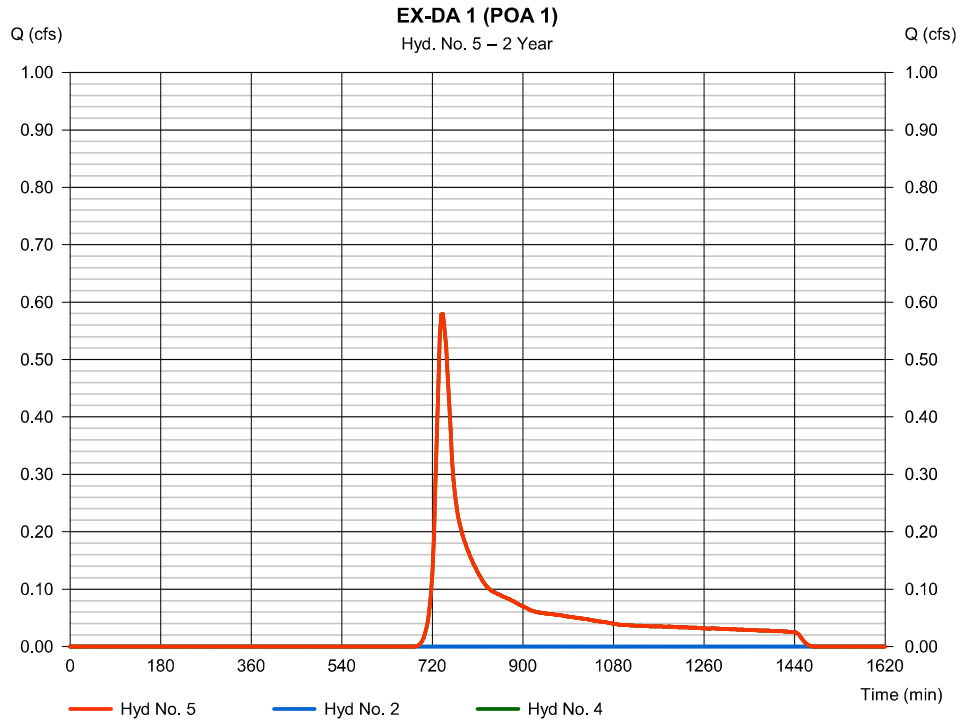
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 5

EX-DA 1 (POA 1)

Hydrograph type	= Combine	Peak discharge	= 0.579 cfs
Storm frequency	= 2 yrs	Time to peak	= 741 min
Time interval	= 3 min	Hyd. volume	= 3,441 cuft
Inflow hyds.	= 2, 4	Contrib. drain. area	= 1.240 ac



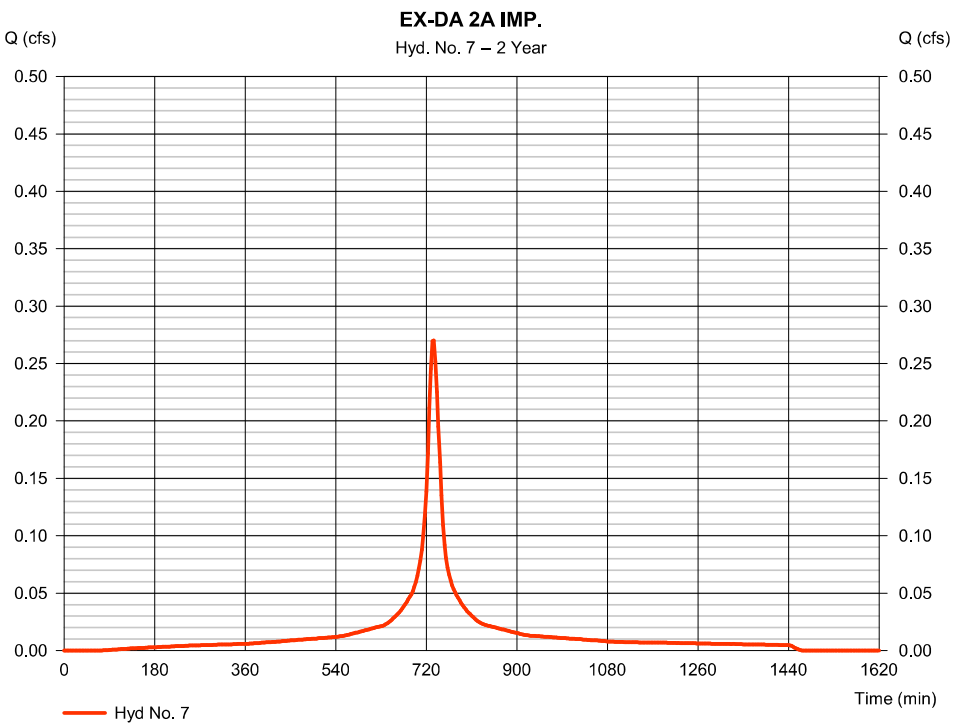
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 7

EX-DA 2A IMP.

Hydrograph type	= SCS Runoff	Peak discharge	= 0.270 cfs
Storm frequency	= 2 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 1,454 cuft
Drainage area	= 0.120 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 18.00 min
Total precip.	= 3.47 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\General Engineering References\Stormwater	Shape factor	= 484



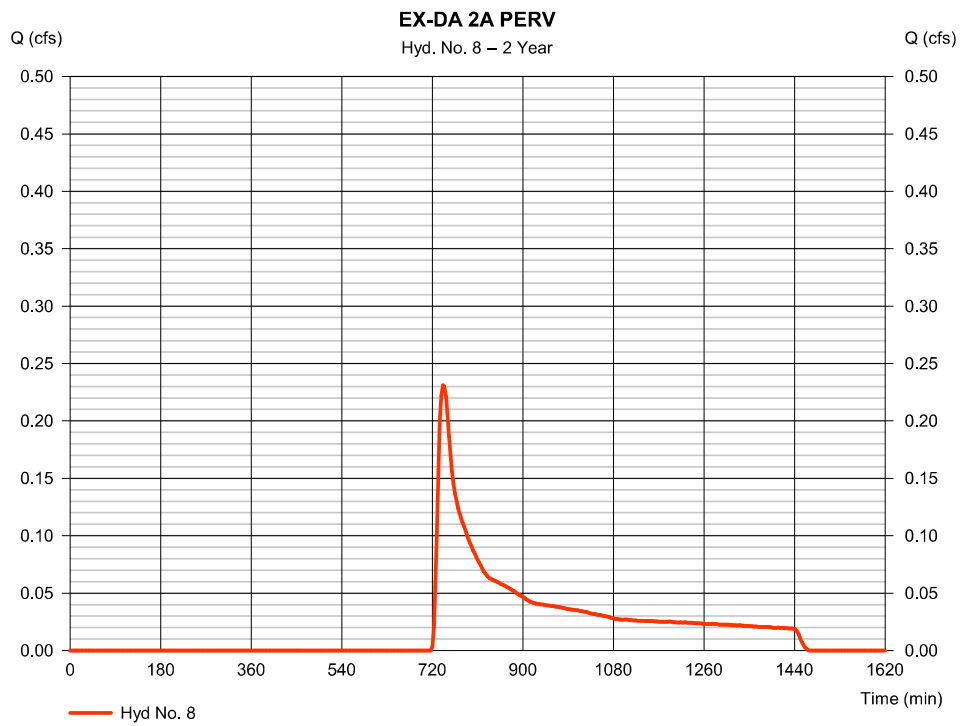
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 8

EX-DA 2A PERV

Hydrograph type	= SCS Runoff	Peak discharge	= 0.231 cfs
Storm frequency	= 2 yrs	Time to peak	= 741 min
Time interval	= 3 min	Hyd. volume	= 1,938 cuft
Drainage area	= 1.280 ac	Curve number	= 57
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 18.00 min
Total precip.	= 3.47 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\General Engineering References\Stormwater	Shape factor	= 484



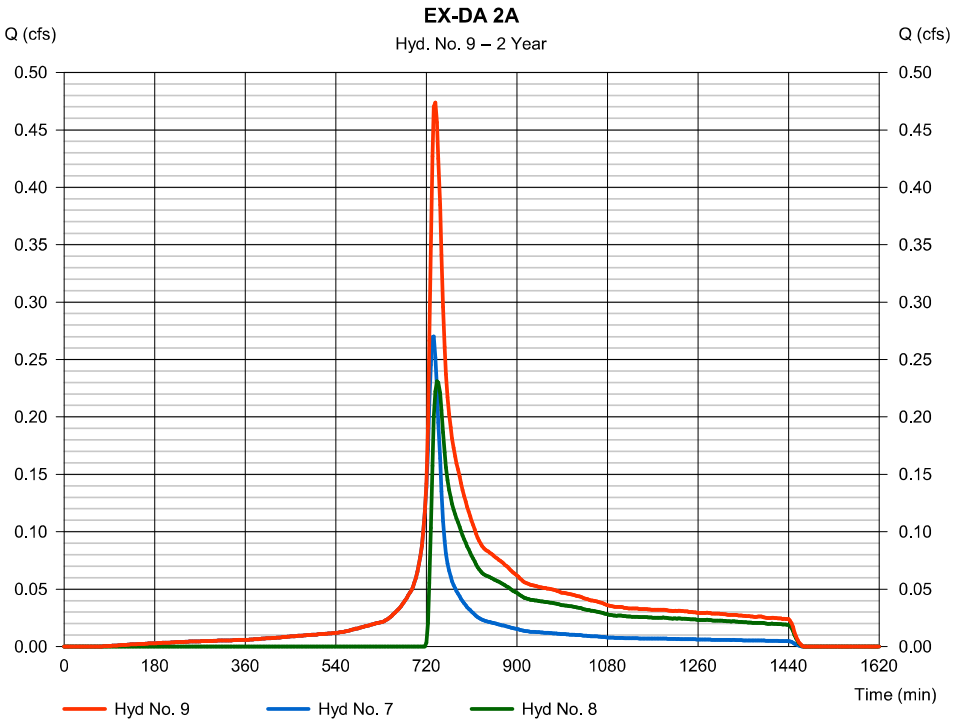
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 9

EX-DA 2A

Hydrograph type	= Combine	Peak discharge	= 0.474 cfs
Storm frequency	= 2 yrs	Time to peak	= 738 min
Time interval	= 3 min	Hyd. volume	= 3,392 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 1.400 ac



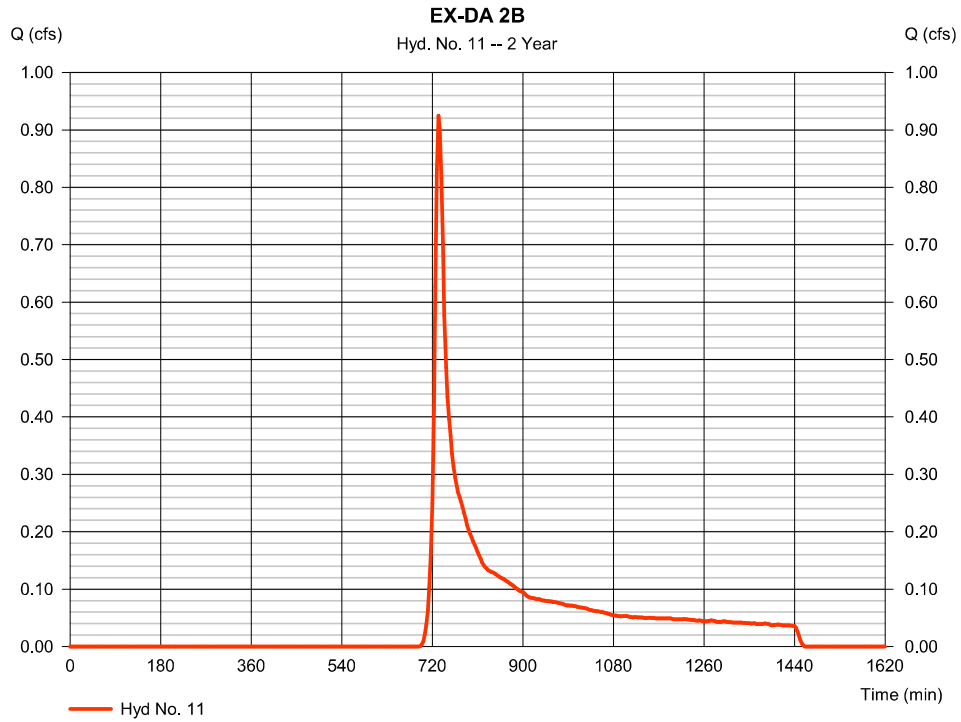
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 11

EX-DA 2B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.925 cfs
Storm frequency	= 2 yrs	Time to peak	= 732 min
Time interval	= 3 min	Hyd. volume	= 4,633 cuft
Drainage area	= 1.850 ac	Curve number	= 64
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 13.80 min
Total precip.	= 3.47 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Geotechnical Engineering References\Stormwater	Shape factor	= 484



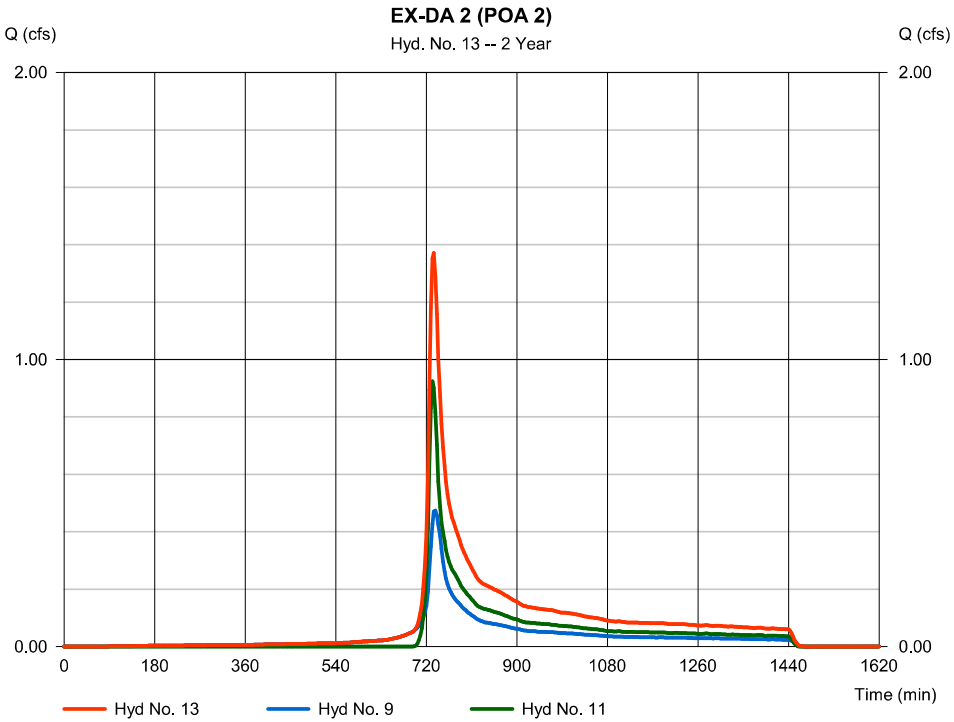
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 13

EX-DA 2 (POA 2)

Hydrograph type	= Combine	Peak discharge	= 1.371 cfs
Storm frequency	= 2 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 8,025 cuft
Inflow hyds.	= 9, 11	Contrib. drain. area	= 1.850 ac



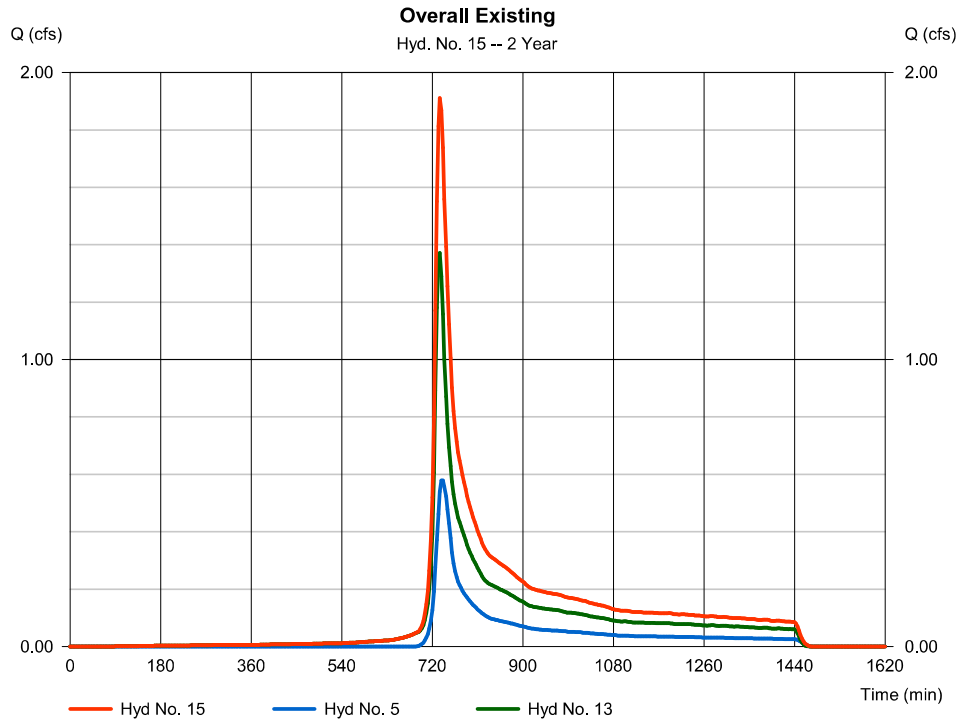
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 15

Overall Existing

Hydrograph type	= Combine	Peak discharge	= 1.911 cfs
Storm frequency	= 2 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 11,466 cuft
Inflow hyds.	= 5, 13	Contrib. drain. area	= 0.000 ac



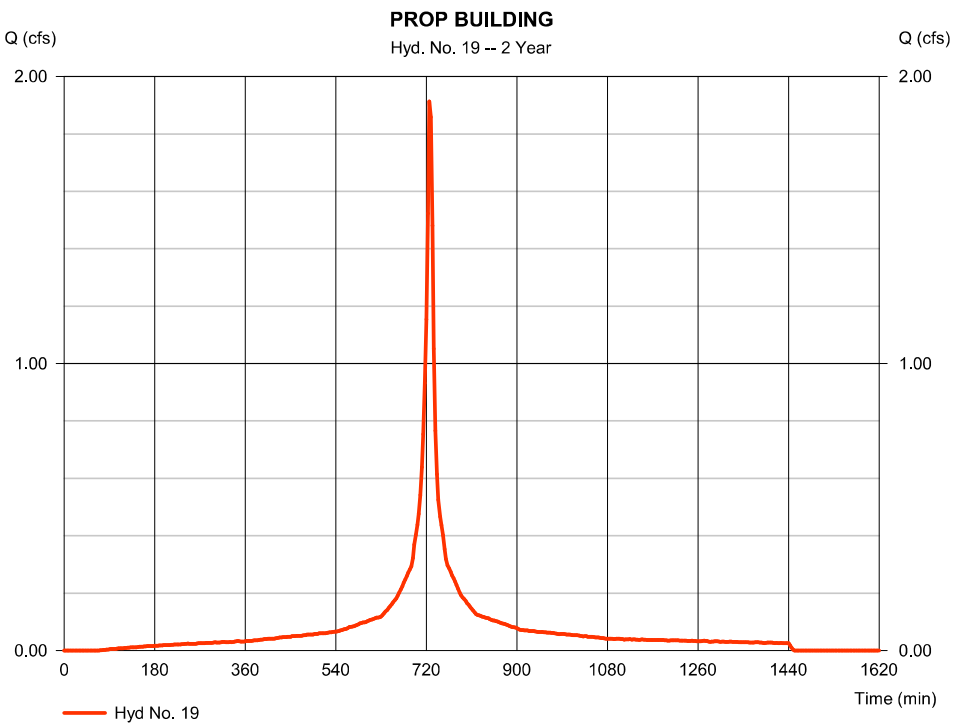
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 19

PROP BUILDING

Hydrograph type	= SCS Runoff	Peak discharge	= 1.913 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 7,820 cuft
Drainage area	= 0.710 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.47 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Structural Engineering References\Stormwater	Shape factor	= 484



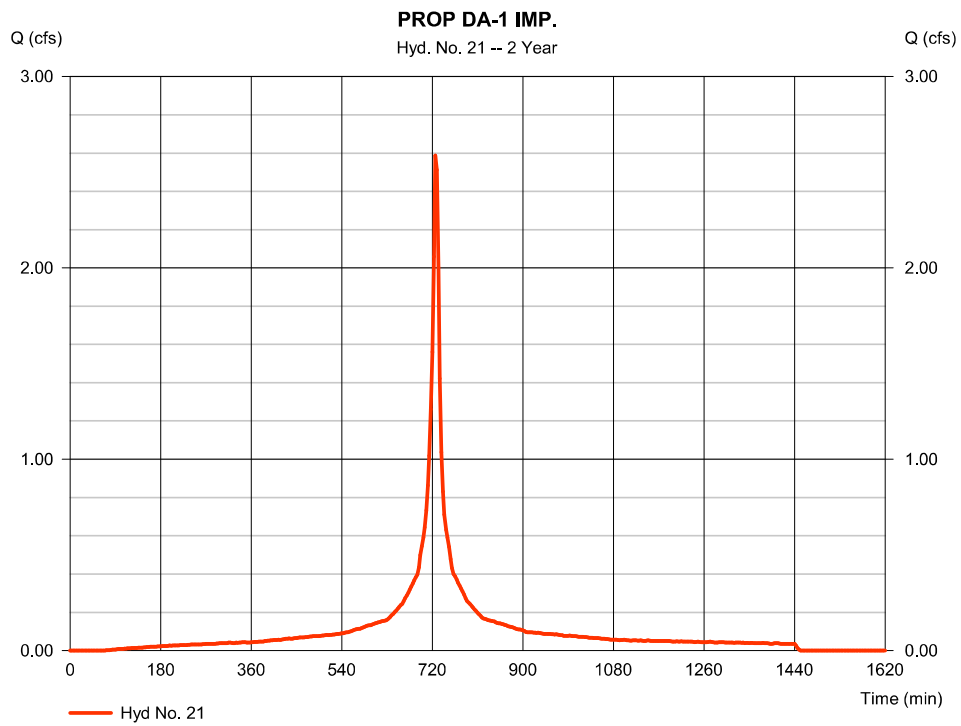
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 21

PROP DA-1 IMP.

Hydrograph type	= SCS Runoff	Peak discharge	= 2.586 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 10,574 cuft
Drainage area	= 0.960 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.47 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Structural Engineering References\Stormwater	Shape factor	= 484



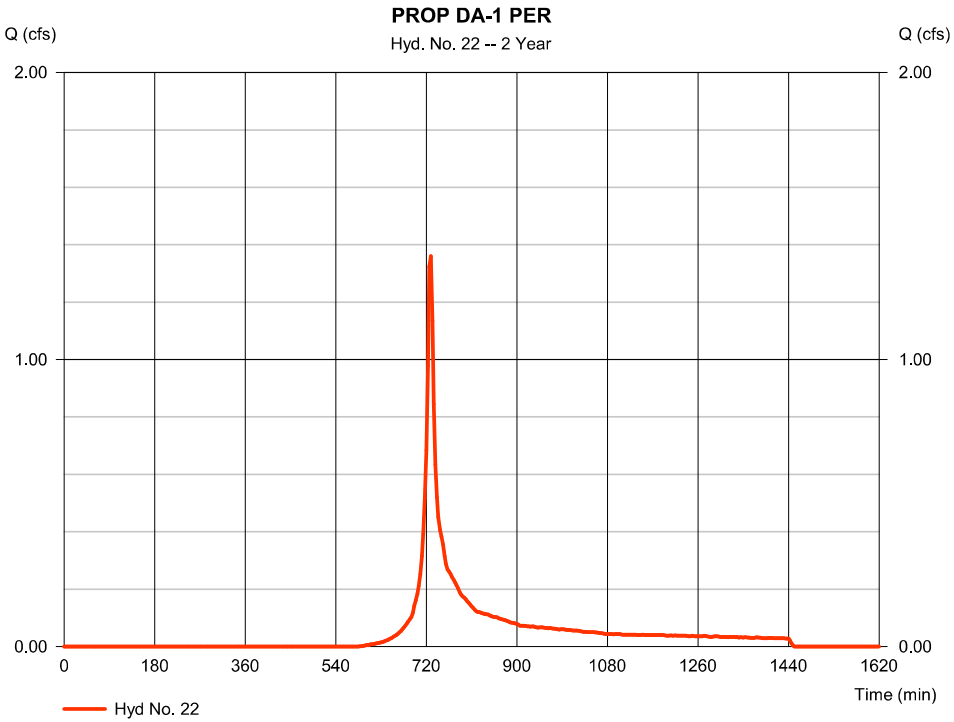
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 22

PROP DA-1 PER

Hydrograph type	= SCS Runoff	Peak discharge	= 1.361 cfs
Storm frequency	= 2 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 4,938 cuft
Drainage area	= 1.080 ac	Curve number	= 76
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.47 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Central Engineering References\Stormwater	Shape factor	= 484



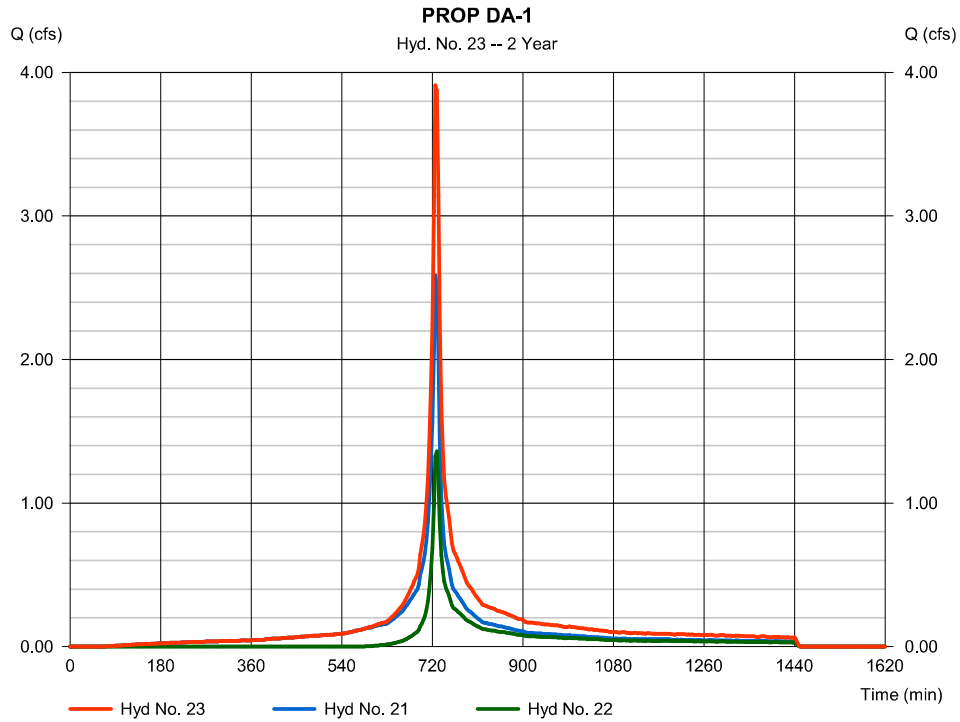
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 23

PROP DA-1

Hydrograph type	= Combine	Peak discharge	= 3.910 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 15,512 cuft
Inflow hyds.	= 21, 22	Contrib. drain. area	= 2.040 ac



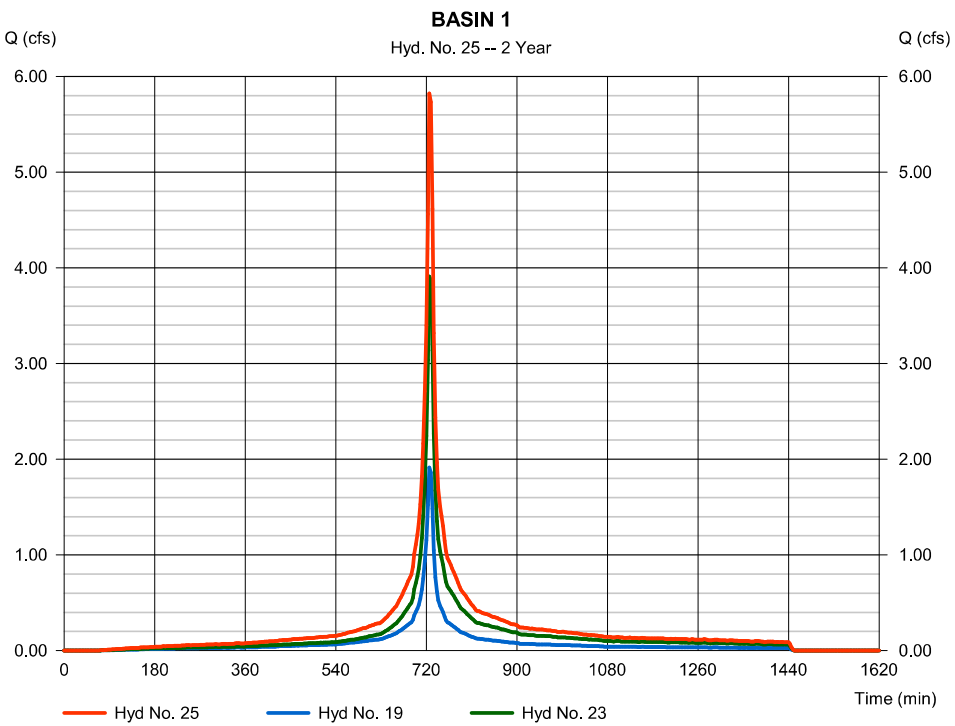
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 25

BASIN 1

Hydrograph type	= Combine	Peak discharge	= 5.823 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 23,332 cuft
Inflow hyds.	= 19, 23	Contrib. drain. area	= 0.710 ac



Hydrograph Report

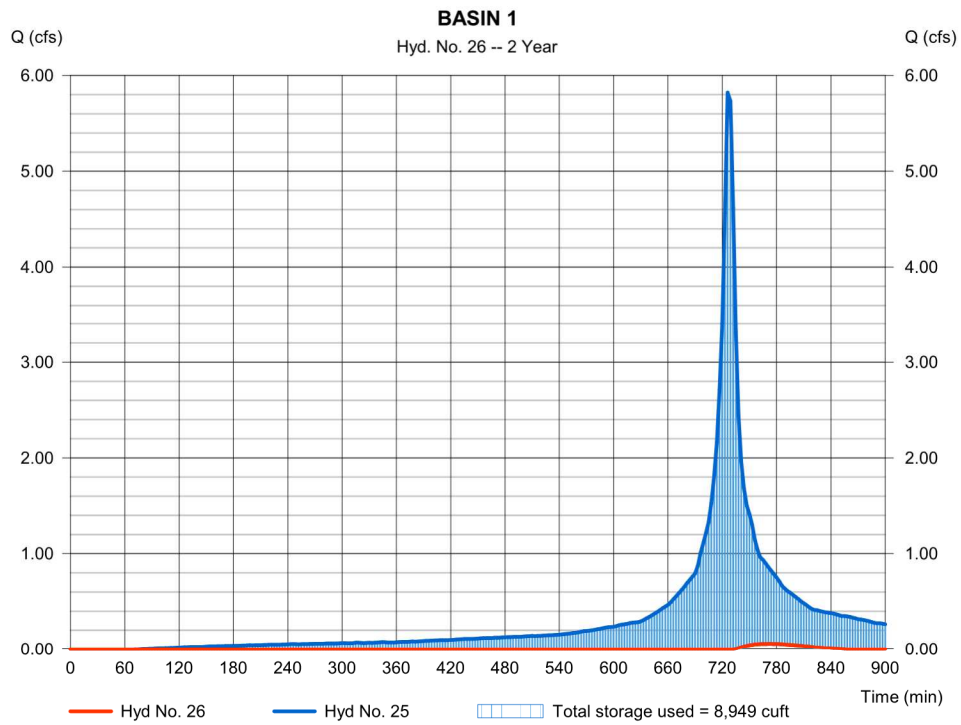
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 26

BASIN 1

Hydrograph type	= Reservoir	Peak discharge	= 0.058 cfs
Storm frequency	= 2 yrs	Time to peak	= 771 min
Time interval	= 3 min	Hyd. volume	= 254 cuft
Inflow hyd. No.	= 25 - BASIN 1	Max. Elevation	= 85.80 ft
Reservoir name	= Pond 1	Max. Storage	= 8,949 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Thursday, 03 / 31 / 2022

Pond No. 3 - Pond 1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 84.25 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	84.25	1,523	0	0
0.75	85.00	6,061	2,655	2,655
1.75	86.00	9,856	7,881	10,537
2.75	87.00	10,648	10,248	20,785
3.75	88.00	11,477	11,059	31,844
4.75	89.00	12,333	11,901	43,745
5.75	90.00	13,295	12,810	56,555

Culvert / Orifice Structures

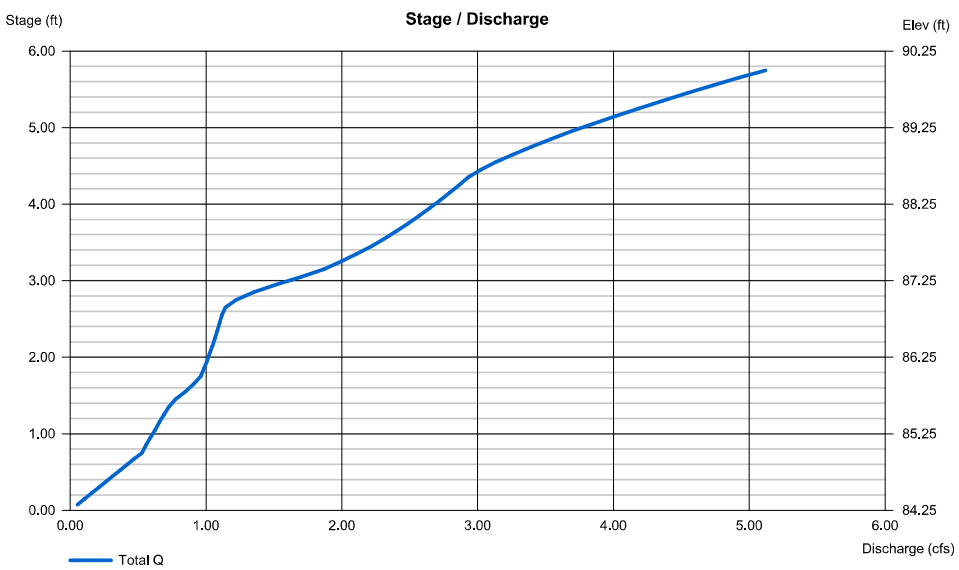
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	2.75	7.00	0.00
Span (in)	= 15.00	2.75	7.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 82.61	85.60	86.85	0.00
Length (ft)	= 38.00	0.50	0.50	0.00
Slope (%)	= 0.30	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	Yes

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.25	Inactive	Inactive	Inactive
Crest El. (ft)	= 88.60	89.70	94.50	94.50
Weir Coeff.	= 3.33	2.61	3.33	3.33
Weir Type	= Rect	Rect	Rect	Rect
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 3.750 (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).



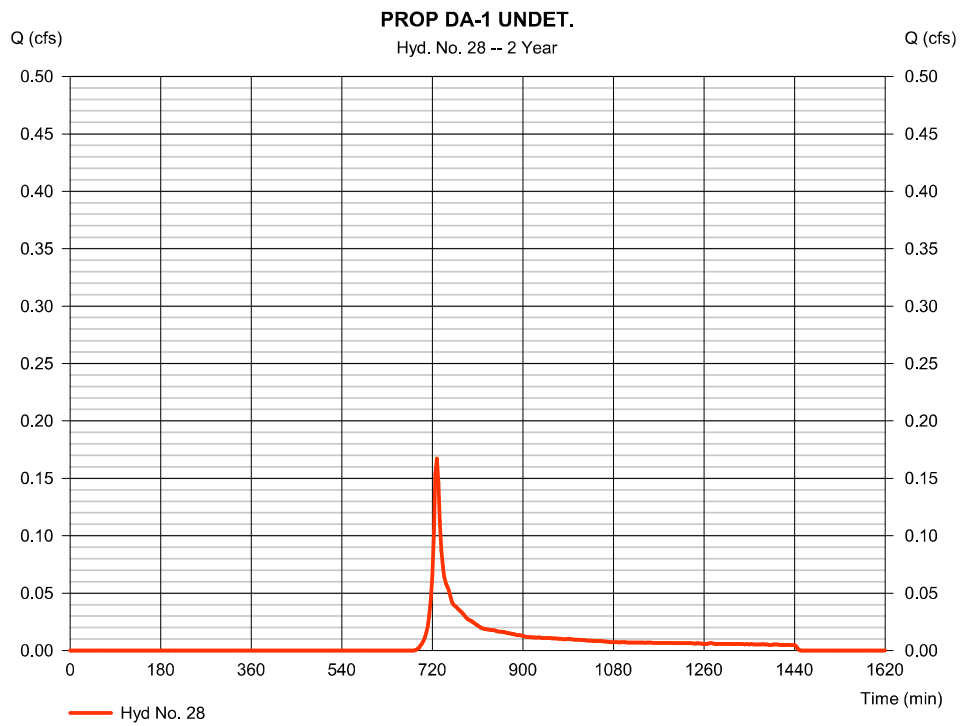
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Thursday, 03 / 31 / 2022

Hyd. No. 28

PROP DA-1 UNDET.

Hydrograph type	= SCS Runoff	Peak discharge	= 0.167 cfs
Storm frequency	= 2 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 667 cuft
Drainage area	= 0.250 ac	Curve number	= 66
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.47 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Civil Engineering References\Stormwater	Storm frequency	= 48



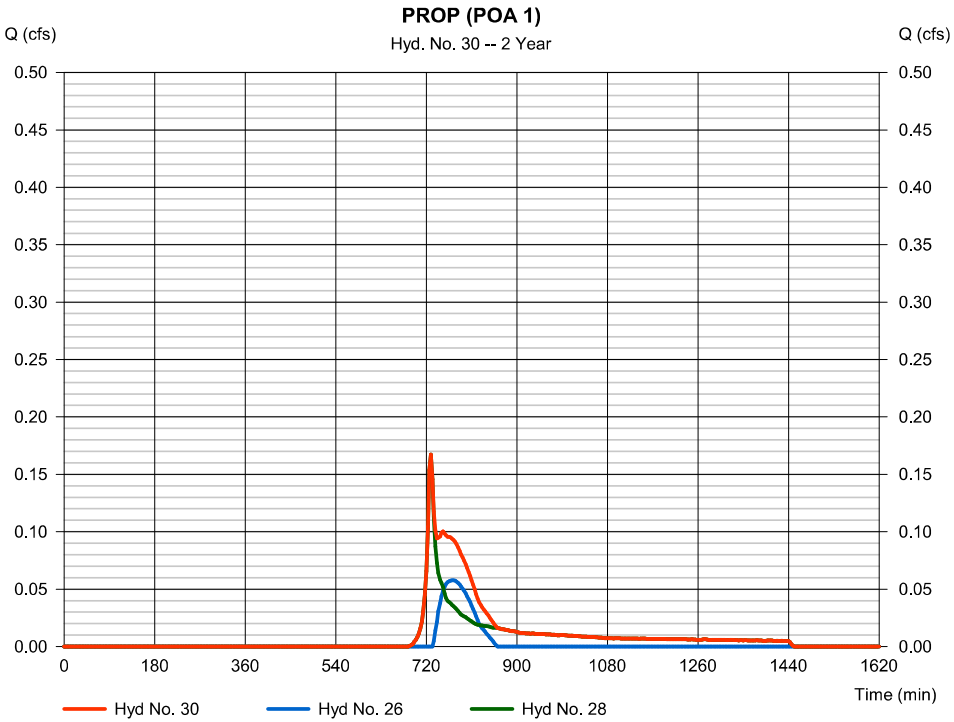
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 30

PROP (POA 1)

Hydrograph type	= Combine	Peak discharge	= 0.167 cfs
Storm frequency	= 2 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 921 cuft
Inflow hyds.	= 26, 28	Contrib. drain. area	= 0.250 ac



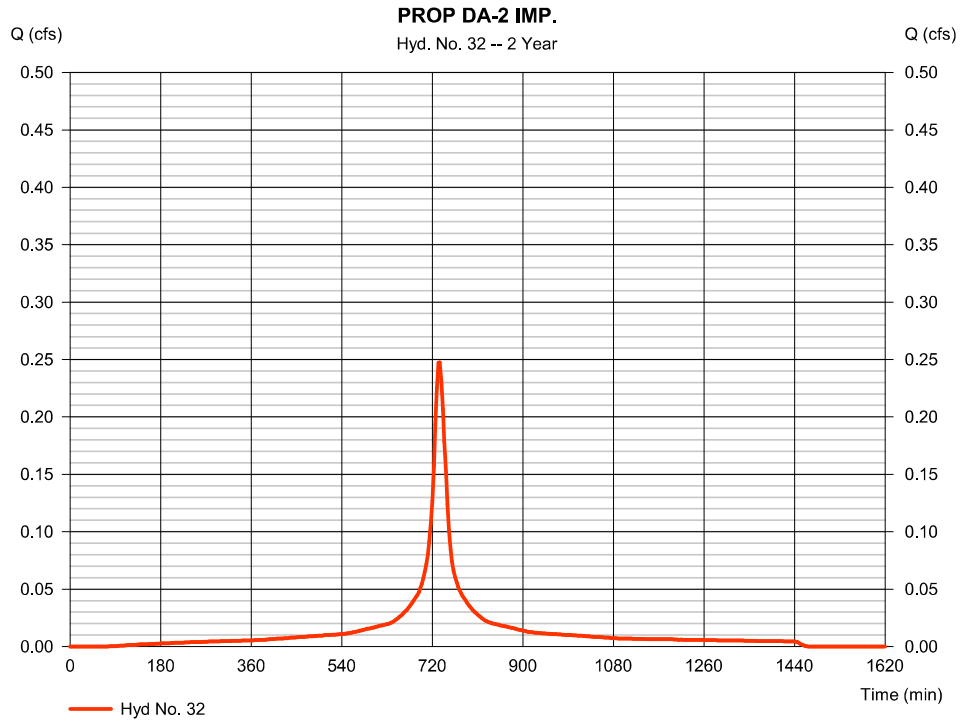
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 32

PROP DA-2 IMP.

Hydrograph type	= SCS Runoff	Peak discharge	= 0.248 cfs
Storm frequency	= 2 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 1,333 cuft
Drainage area	= 0.110 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.20 min
Total precip.	= 3.47 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Structural Engineering References\Stormwater	Shape factor	= 484



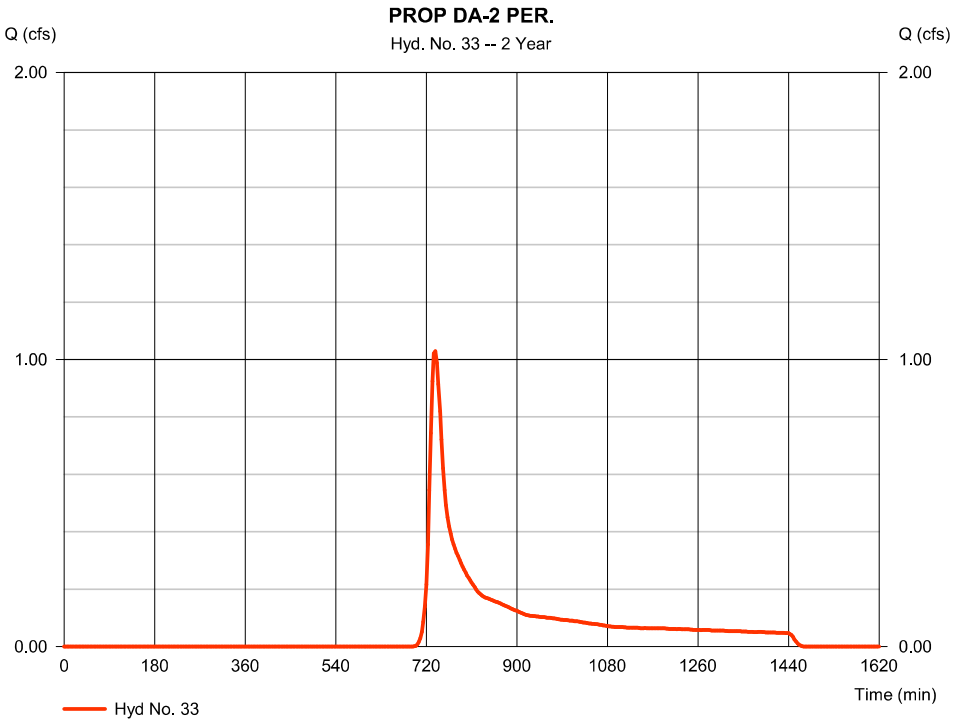
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 33

PROP DA-2 PER.

Hydrograph type	= SCS Runoff	Peak discharge	= 1.028 cfs
Storm frequency	= 2 yrs	Time to peak	= 738 min
Time interval	= 3 min	Hyd. volume	= 5,966 cuft
Drainage area	= 2.310 ac	Curve number	= 64
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.20 min
Total precip.	= 3.47 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Central Engineering References\Stormwater	Shape factor	= 484



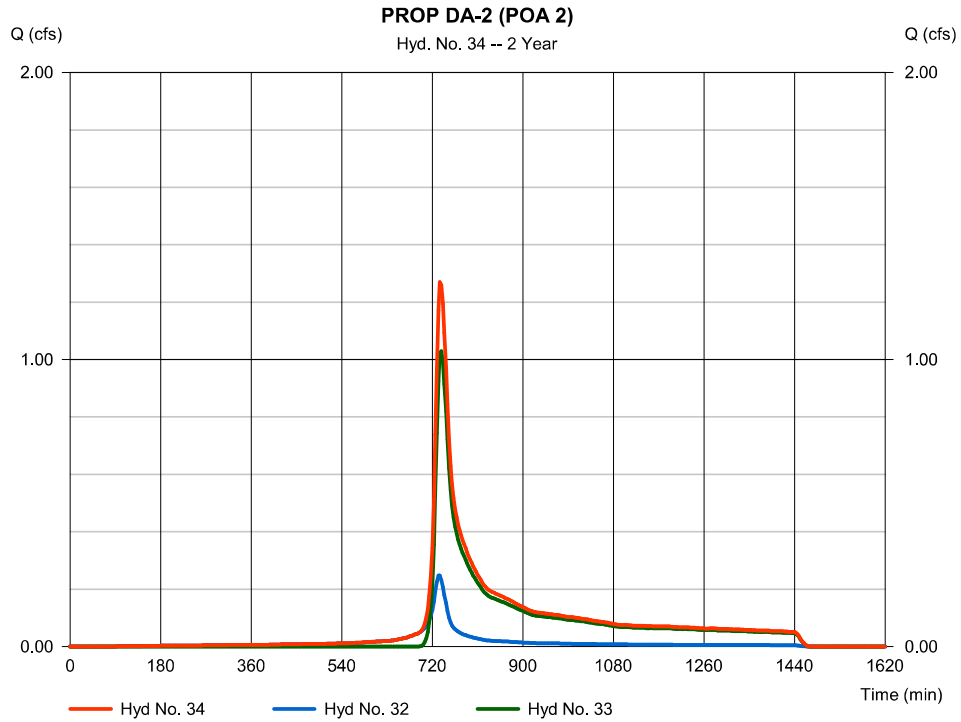
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 34

PROP DA-2 (POA 2)

Hydrograph type	= Combine	Peak discharge	= 1.269 cfs
Storm frequency	= 2 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 7,299 cuft
Inflow hyds.	= 32, 33	Contrib. drain. area	= 2.420 ac



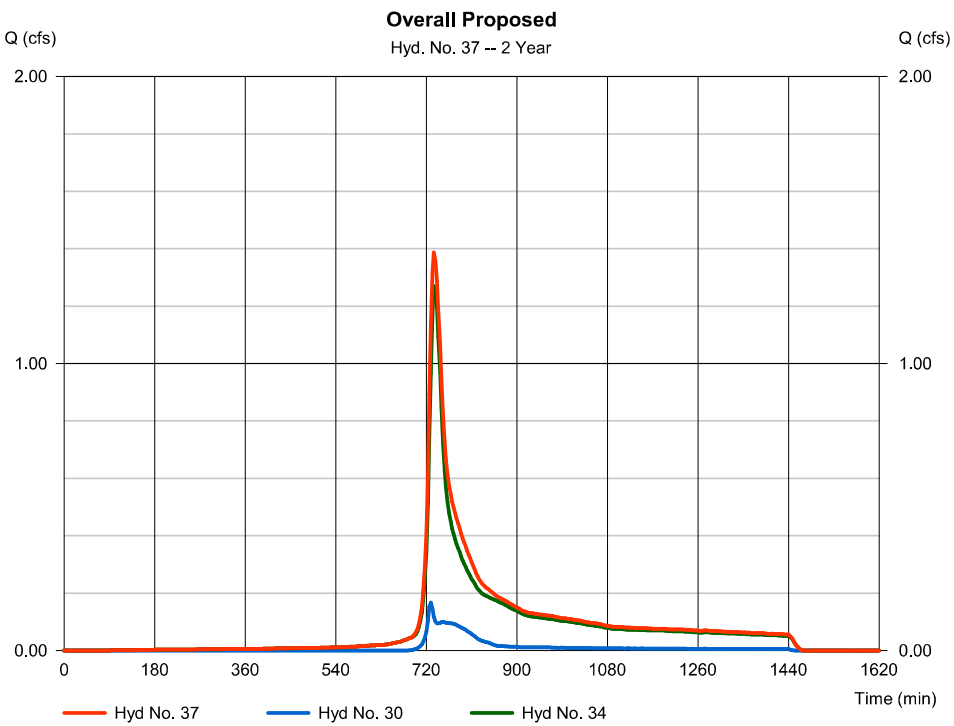
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 37

Overall Proposed

Hydrograph type	= Combine	Peak discharge	= 1.387 cfs
Storm frequency	= 2 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 8,220 cuft
Inflow hyds.	= 30, 34	Contrib. drain. area	= 0.000 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	1.523	3	735	7,385	-----	----	-----	EX - DA 1 DET.
2	Reservoir	0.000	3	717	0	1	86.30	1,868	EXIST. DEPRESSION
4	SCS Runoff	1.707	3	738	8,926	-----	----	-----	EX-DA 1 UNDET.
5	Combine	1.707	3	738	8,926	2, 4	----	-----	EX-DA 1 (POA 1)
7	SCS Runoff	0.426	3	735	2,337	-----	----	-----	EX-DA 2A IMP.
8	SCS Runoff	1.213	3	735	6,453	-----	----	-----	EX-DA 2A PERV
9	Combine	1.640	3	735	8,790	7, 8	----	-----	EX-DA 2A
11	SCS Runoff	2.932	3	732	12,579	-----	----	-----	EX-DA 2B
13	Combine	4.484	3	732	21,369	9, 11,	----	-----	EX-DA 2 (POA 2)
15	Combine	6.022	3	735	30,295	5, 13,	----	-----	Overall Existing
19	SCS Runoff	3.019	3	726	12,570	-----	----	-----	PROP BUILDING
21	SCS Runoff	4.082	3	726	16,997	-----	----	-----	PROP DA-1 IMP.
22	SCS Runoff	2.949	3	729	10,667	-----	----	-----	PROP DA-1 PER
23	Combine	7.019	3	726	27,664	21, 22	----	-----	PROP DA-1
25	Combine	10.04	3	726	40,234	19, 23,	----	-----	BASIN 1
26	Reservoir	0.191	3	789	2,946	25	86.64	17,069	BASIN 1
28	SCS Runoff	0.476	3	729	1,730	-----	----	-----	PROP DA-1 UNDET.
30	Combine	0.597	3	729	4,676	26, 28,	----	-----	PROP (POA 1)
32	SCS Runoff	0.391	3	735	2,142	-----	----	-----	PROP DA-2 IMP.
33	SCS Runoff	3.300	3	735	16,198	-----	----	-----	PROP DA-2 PER.
34	Combine	3.691	3	735	18,340	32, 33	----	-----	PROP DA-2 (POA 2)
37	Combine	4.143	3	735	23,016	30, 34,	----	-----	Overall Proposed

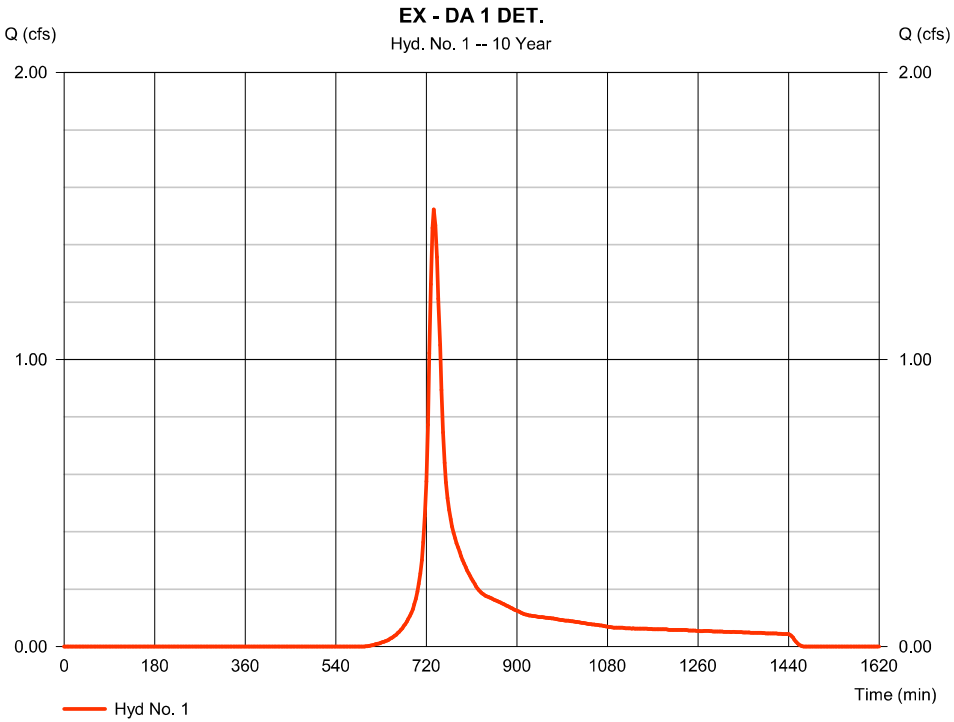
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 1

EX - DA 1 DET.

Hydrograph type	= SCS Runoff	Peak discharge	= 1.523 cfs
Storm frequency	= 10 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 7,385 cuft
Drainage area	= 0.970 ac	Curve number	= 66
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 16.60 min
Total precip.	= 5.44 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Structural Engineering References\Stormwater	Shape factor	= 484



Hydrograph Report

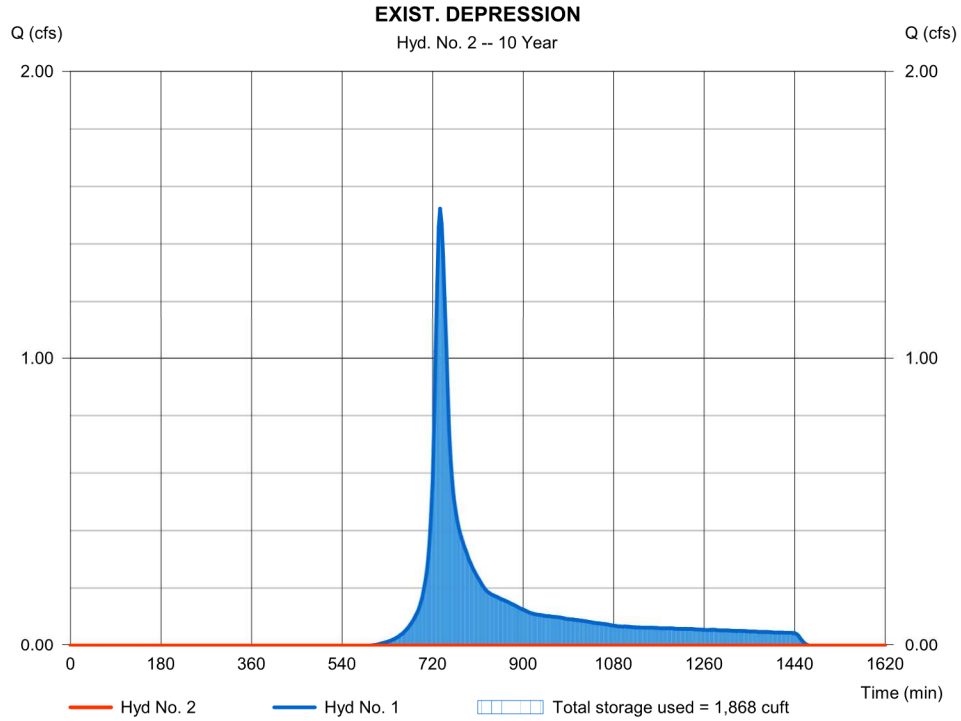
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 2

EXIST. DEPRESSION

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= 717 min
Time interval	= 3 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 1 - EX - DA 1 DET.	Max. Elevation	= 86.30 ft
Reservoir name	= Exist. Depression	Max. Storage	= 1,868 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



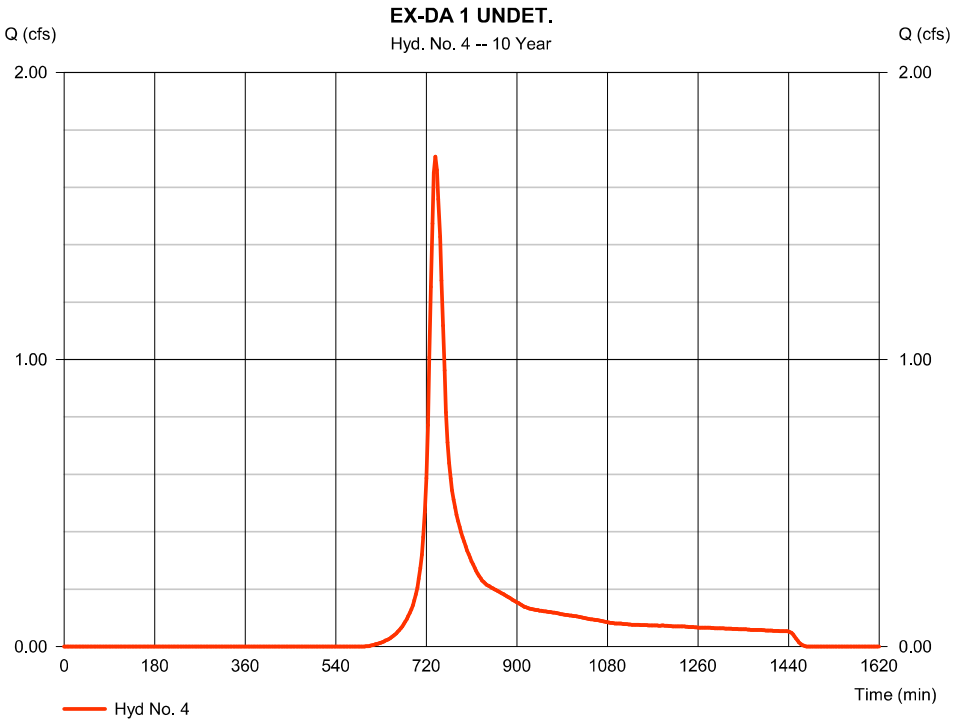
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 4

EX-DA 1 UNDET.

Hydrograph type	= SCS Runoff	Peak discharge	= 1.707 cfs
Storm frequency	= 10 yrs	Time to peak	= 738 min
Time interval	= 3 min	Hyd. volume	= 8,926 cuft
Drainage area	= 1.240 ac	Curve number	= 66
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 22.20 min
Total precip.	= 5.44 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Central Engineering References\Stormwater	Shape factor	= 484



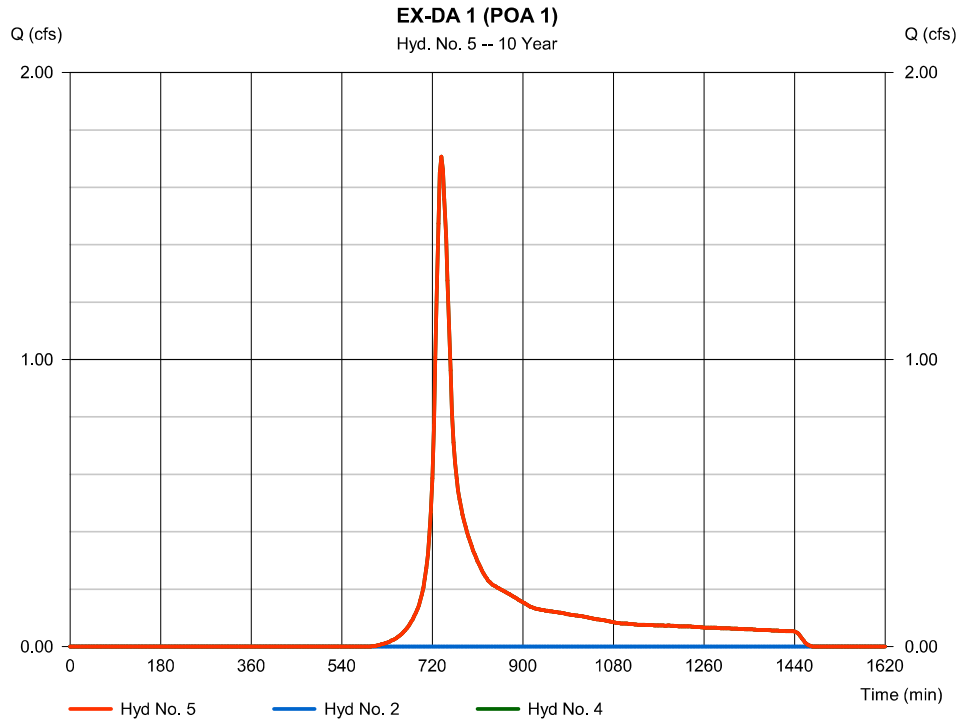
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 5

EX-DA 1 (POA 1)

Hydrograph type	= Combine	Peak discharge	= 1.707 cfs
Storm frequency	= 10 yrs	Time to peak	= 738 min
Time interval	= 3 min	Hyd. volume	= 8,926 cuft
Inflow hyds.	= 2, 4	Contrib. drain. area	= 1.240 ac



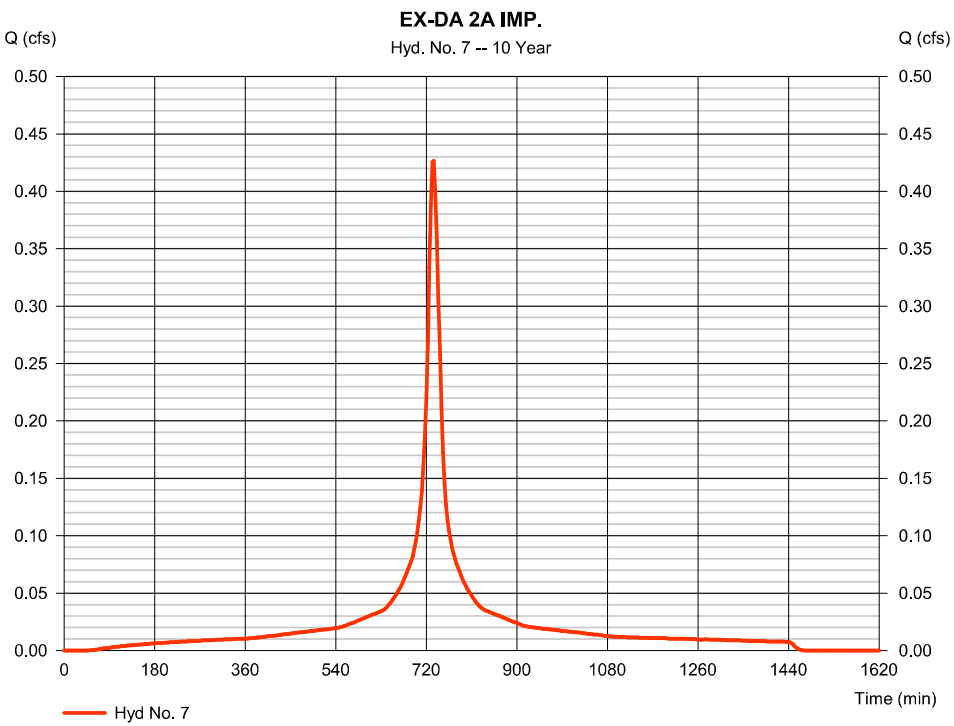
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 7

EX-DA 2A IMP.

Hydrograph type	= SCS Runoff	Peak discharge	= 0.426 cfs
Storm frequency	= 10 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 2,337 cuft
Drainage area	= 0.120 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 18.00 min
Total precip.	= 5.44 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Structural Engineering References\Stormwater	Shape factor	= 484



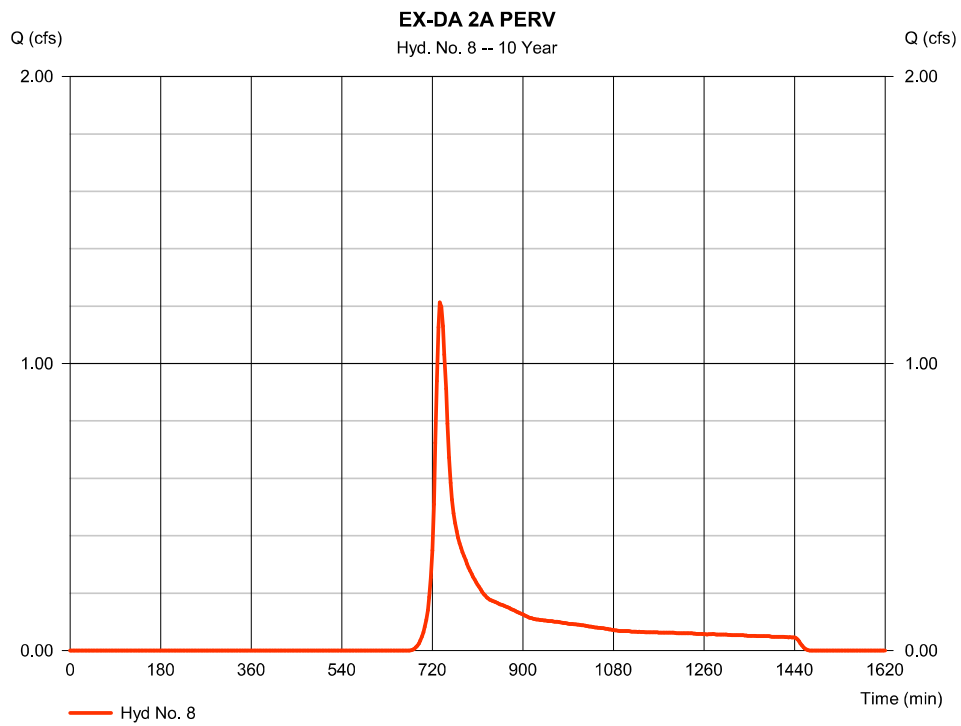
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 8

EX-DA 2A PERV

Hydrograph type	= SCS Runoff	Peak discharge	= 1.213 cfs
Storm frequency	= 10 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 6,453 cuft
Drainage area	= 1.280 ac	Curve number	= 57
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 18.00 min
Total precip.	= 5.44 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Structural Engineering References\Stormwater	Shape factor	= 484



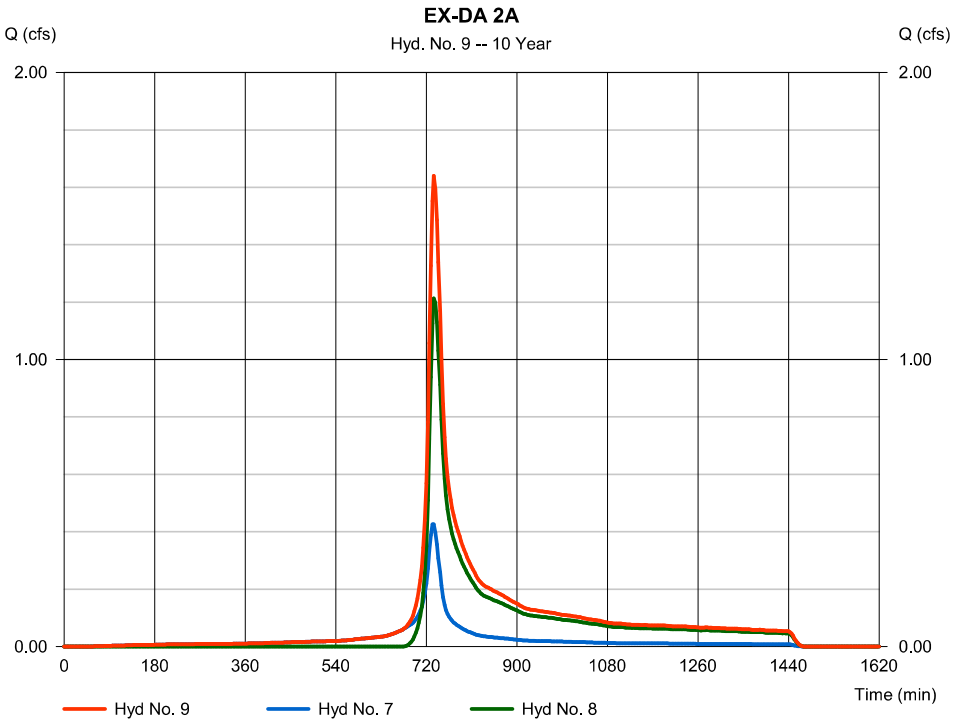
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 9

EX-DA 2A

Hydrograph type	= Combine	Peak discharge	= 1.640 cfs
Storm frequency	= 10 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 8,790 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 1.400 ac



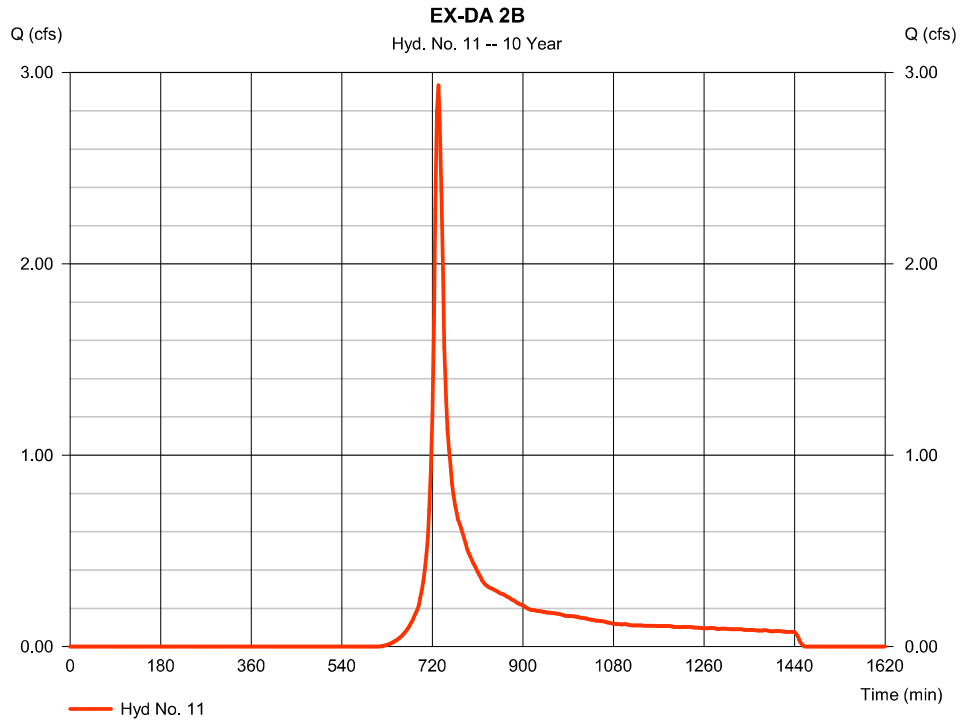
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 11

EX-DA 2B

Hydrograph type	= SCS Runoff	Peak discharge	= 2.932 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 3 min	Hyd. volume	= 12,579 cuft
Drainage area	= 1.850 ac	Curve number	= 64
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 13.80 min
Total precip.	= 5.44 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Structural Engineering References\Stormwater	Shape factor	= 484



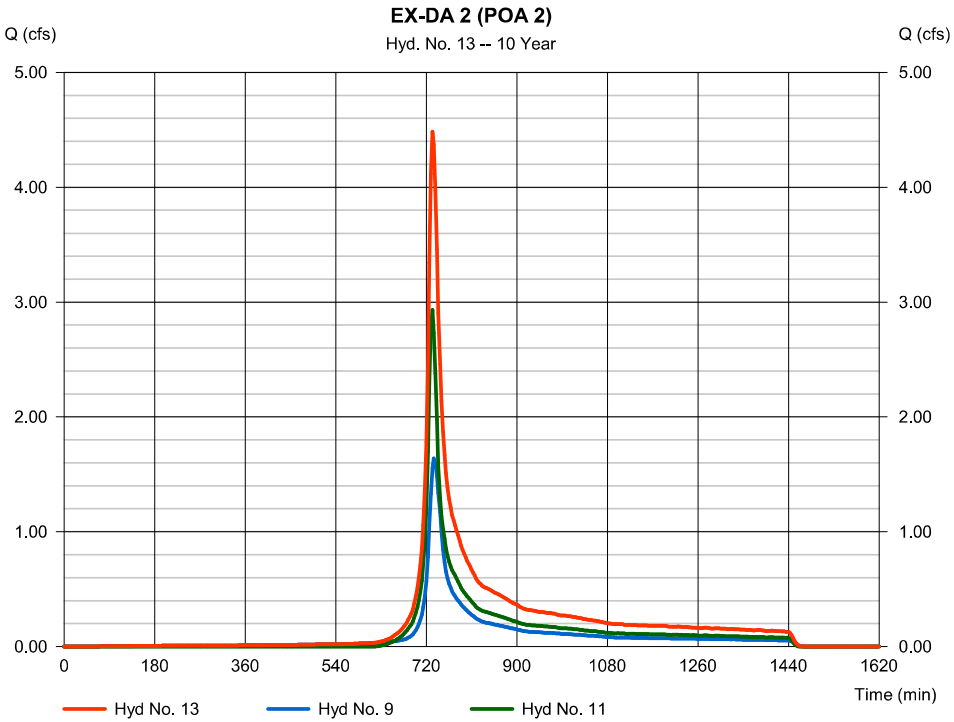
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 13

EX-DA 2 (POA 2)

Hydrograph type	= Combine	Peak discharge	= 4.484 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 3 min	Hyd. volume	= 21,369 cuft
Inflow hyds.	= 9, 11	Contrib. drain. area	= 1.850 ac



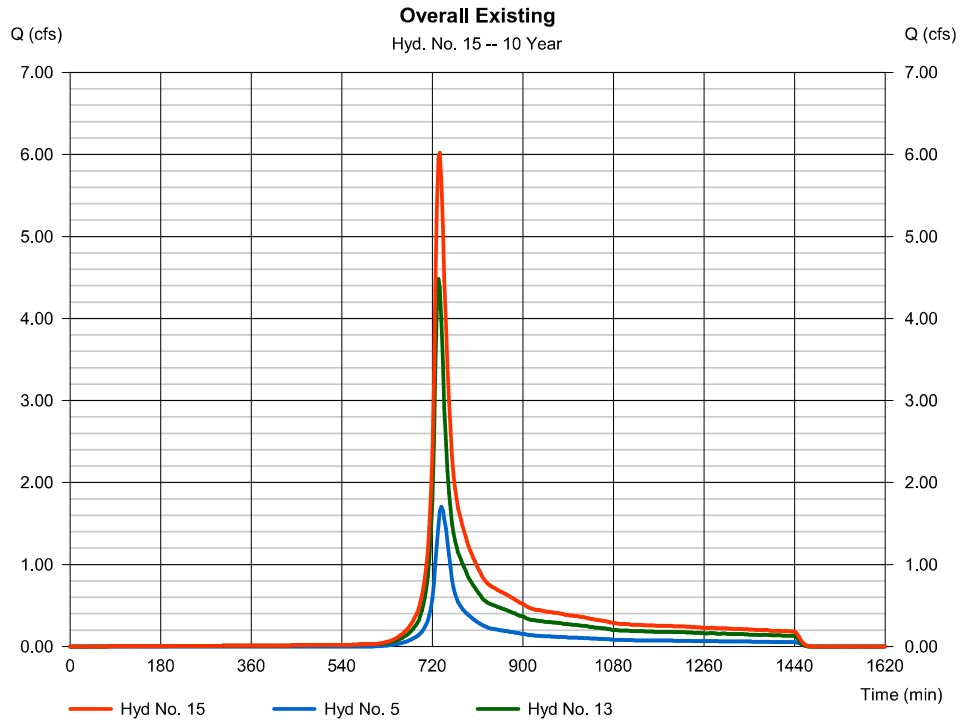
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 15

Overall Existing

Hydrograph type	= Combine	Peak discharge	= 6.022 cfs
Storm frequency	= 10 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 30,295 cuft
Inflow hyds.	= 5, 13	Contrib. drain. area	= 0.000 ac



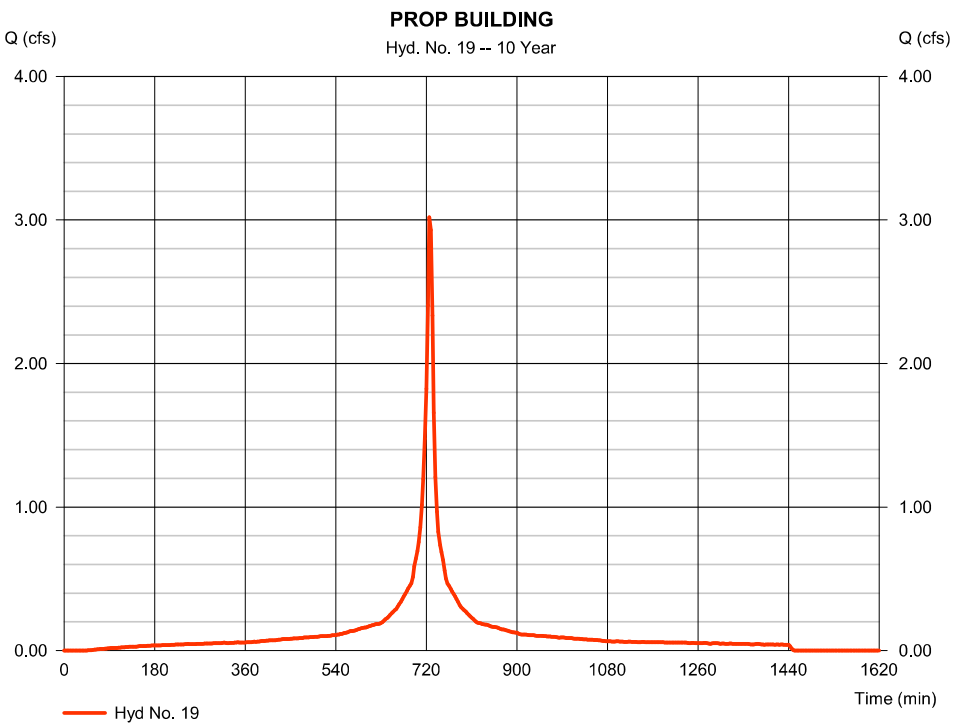
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 19

PROP BUILDING

Hydrograph type	= SCS Runoff	Peak discharge	= 3.019 cfs
Storm frequency	= 10 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 12,570 cuft
Drainage area	= 0.710 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 5.44 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Structural Engineering References\Stormwater	Shape factor	= 484



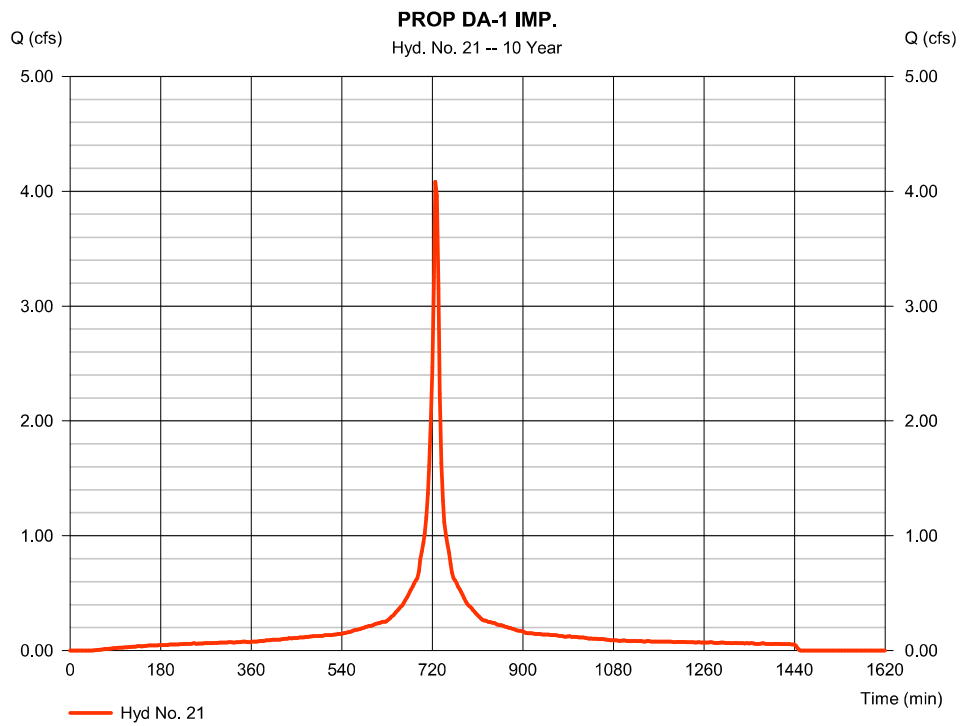
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 21

PROP DA-1 IMP.

Hydrograph type	= SCS Runoff	Peak discharge	= 4.082 cfs
Storm frequency	= 10 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 16,997 cuft
Drainage area	= 0.960 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 5.44 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Structural Engineering References\Stormwater	Shape factor	= 484



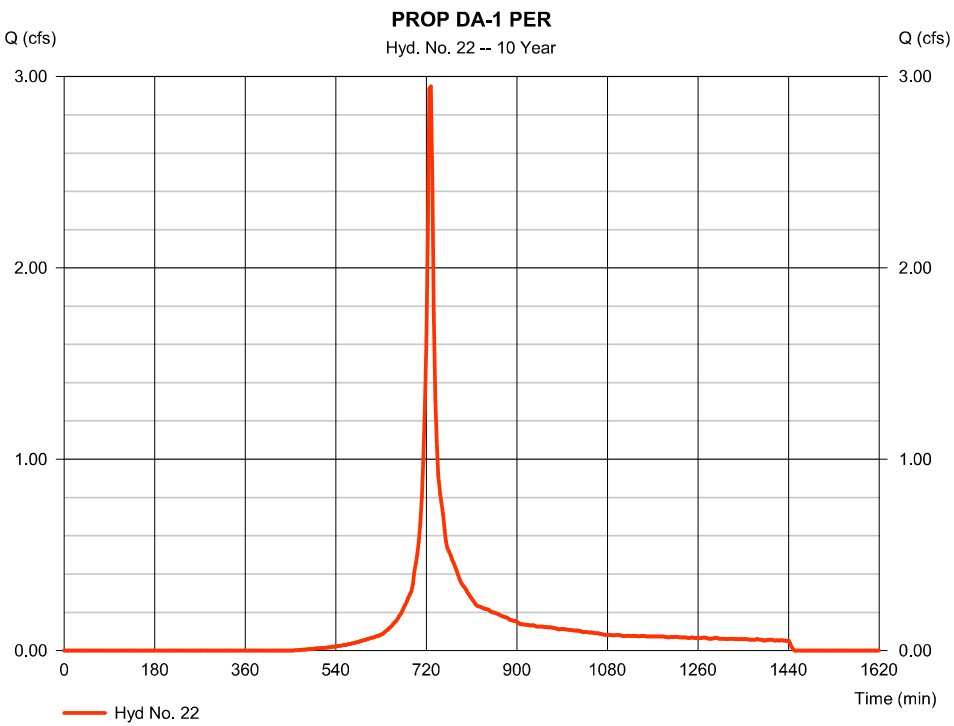
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 22

PROP DA-1 PER

Hydrograph type	= SCS Runoff	Peak discharge	= 2.949 cfs
Storm frequency	= 10 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 10,667 cuft
Drainage area	= 1.080 ac	Curve number	= 76
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 5.44 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Central Engineering References\Stormwater	Shape factor	= 484



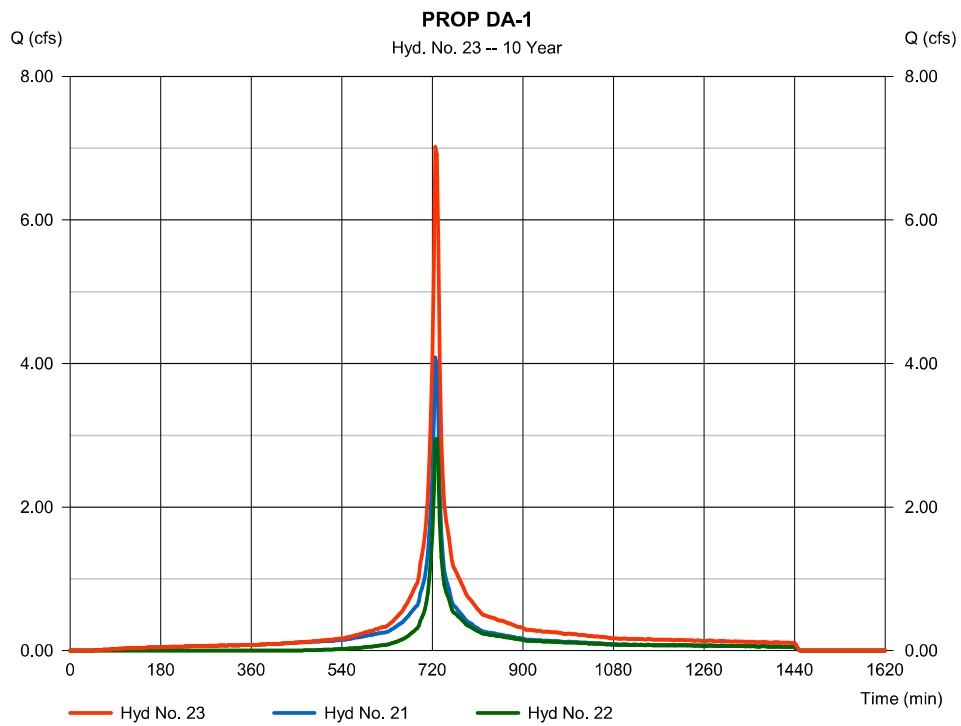
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 23

PROP DA-1

Hydrograph type	= Combine	Peak discharge	= 7.019 cfs
Storm frequency	= 10 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 27,664 cuft
Inflow hyds.	= 21, 22	Contrib. drain. area	= 2.040 ac



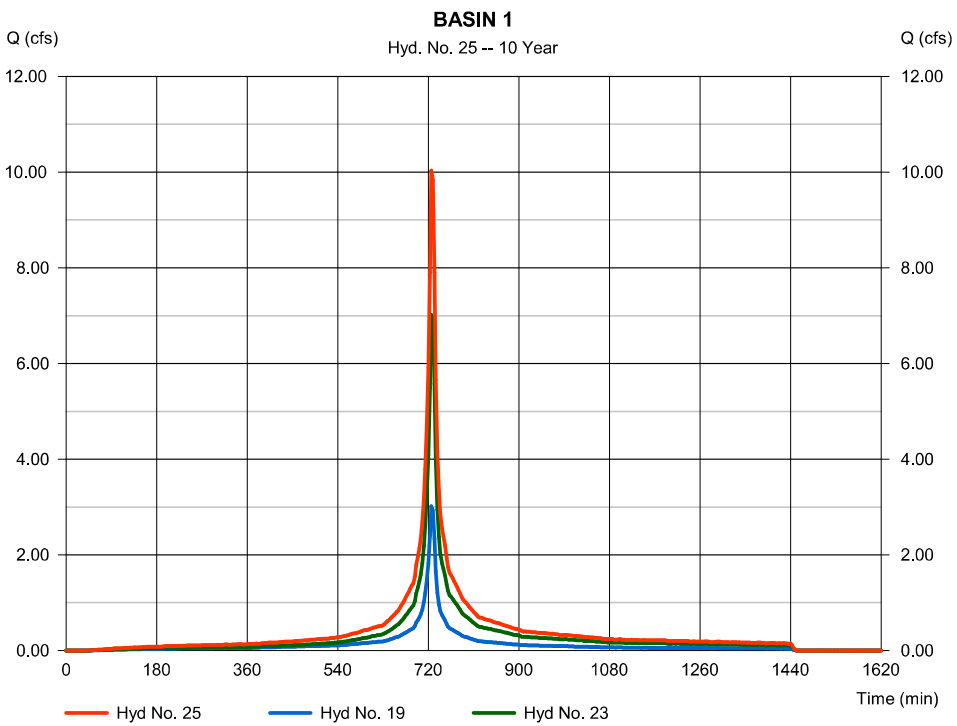
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 25

BASIN 1

Hydrograph type	= Combine	Peak discharge	= 10.04 cfs
Storm frequency	= 10 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 40,234 cuft
Inflow hyds.	= 19, 23	Contrib. drain. area	= 0.710 ac



Hydrograph Report

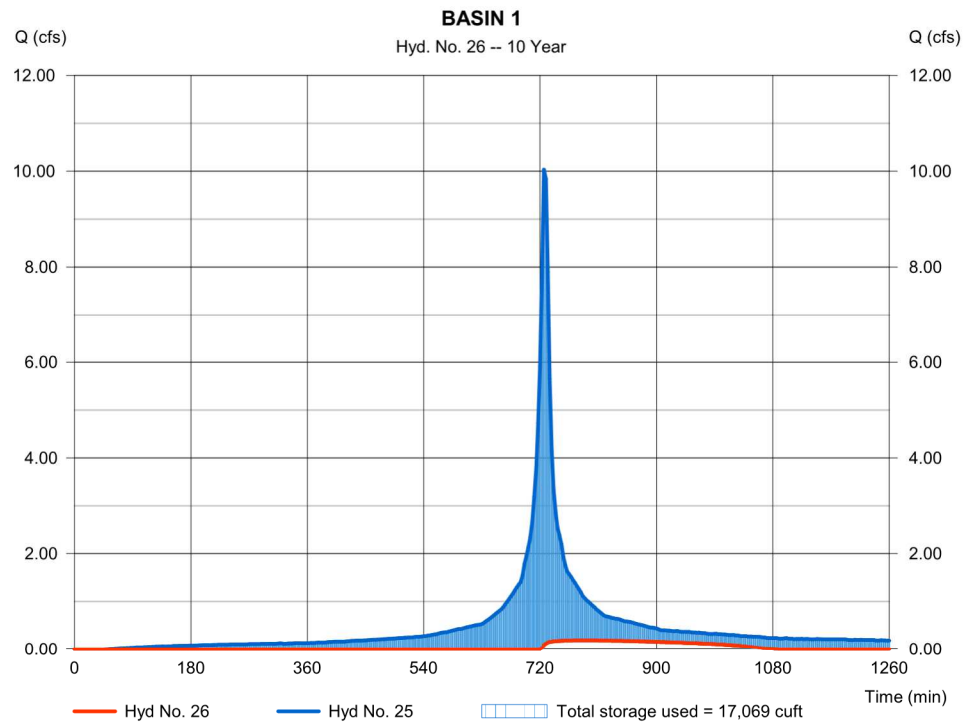
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 26

BASIN 1

Hydrograph type	= Reservoir	Peak discharge	= 0.191 cfs
Storm frequency	= 10 yrs	Time to peak	= 789 min
Time interval	= 3 min	Hyd. volume	= 2,946 cuft
Inflow hyd. No.	= 25 - BASIN 1	Max. Elevation	= 86.64 ft
Reservoir name	= Pond 1	Max. Storage	= 17,069 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



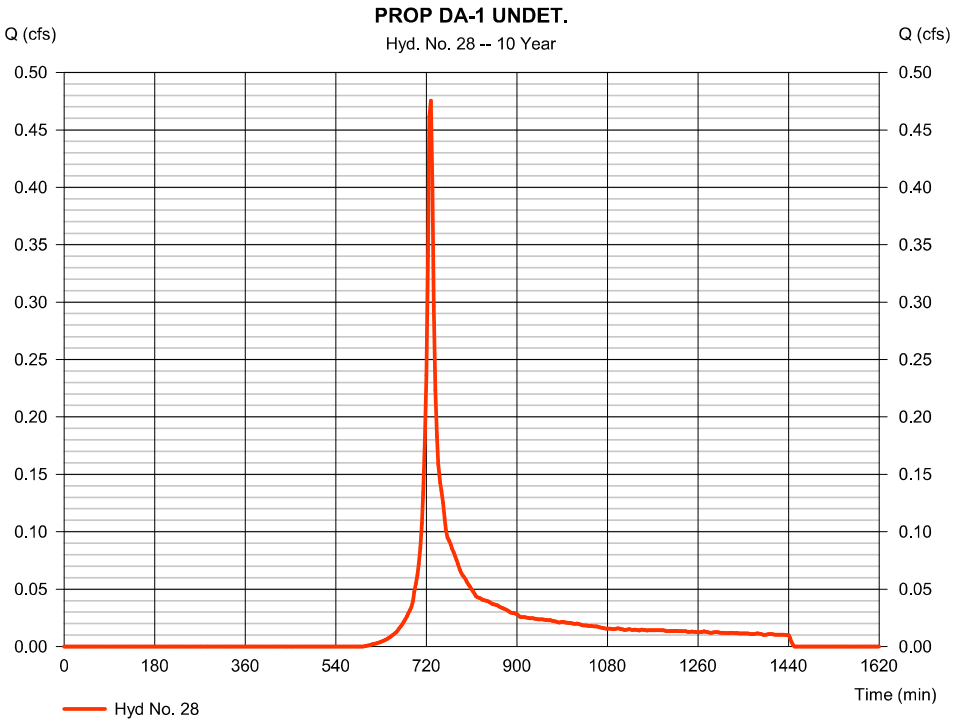
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 28

PROP DA-1 UNDET.

Hydrograph type	= SCS Runoff	Peak discharge	= 0.476 cfs
Storm frequency	= 10 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 1,730 cuft
Drainage area	= 0.250 ac	Curve number	= 66
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 5.44 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Central Engineering References\Stormwater	Shape factor	= 484



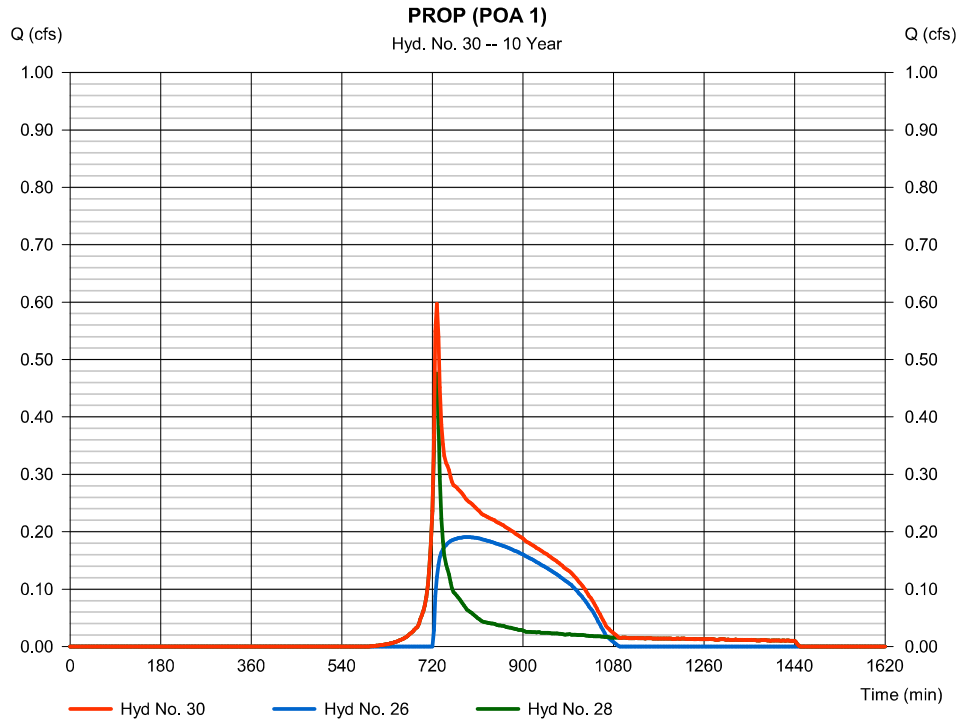
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 30

PROP (POA 1)

Hydrograph type	= Combine	Peak discharge	= 0.597 cfs
Storm frequency	= 10 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 4,676 cuft
Inflow hyds.	= 26, 28	Contrib. drain. area	= 0.250 ac



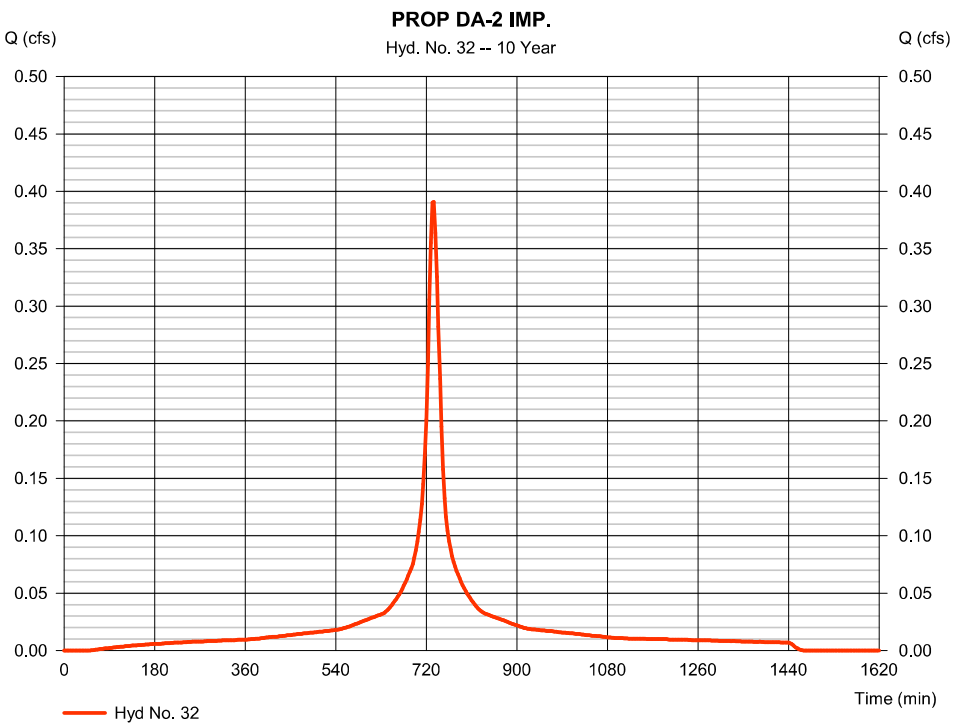
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 32

PROP DA-2 IMP.

Hydrograph type	= SCS Runoff	Peak discharge	= 0.391 cfs
Storm frequency	= 10 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 2,142 cuft
Drainage area	= 0.110 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.20 min
Total precip.	= 5.44 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\General Engineering References\Stormwater	Shape factor	= 484



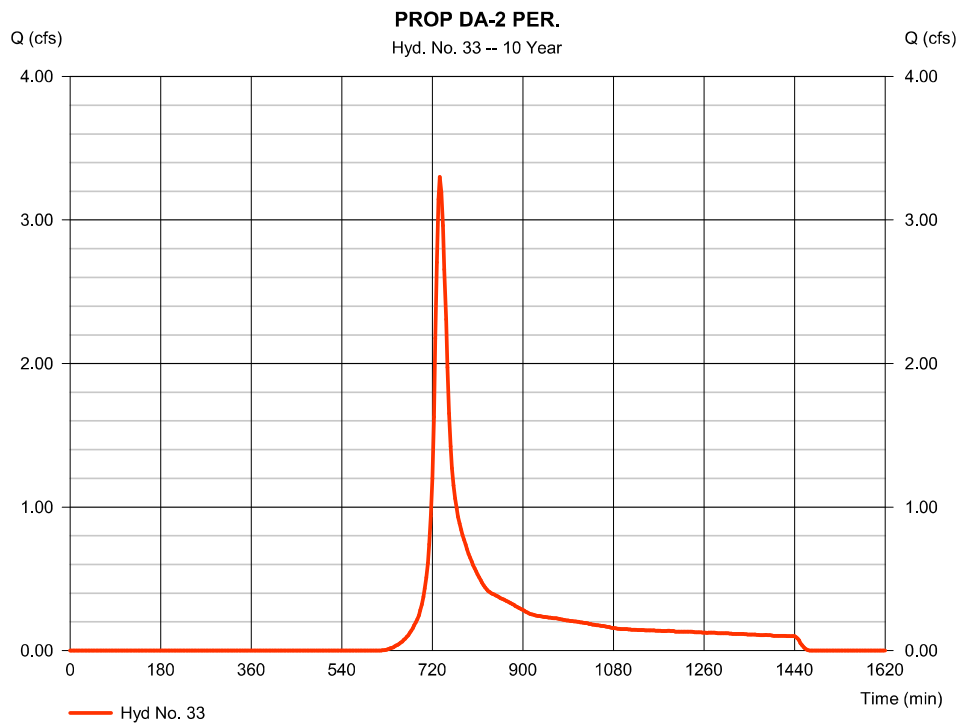
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 33

PROP DA-2 PER.

Hydrograph type	= SCS Runoff	Peak discharge	= 3.300 cfs
Storm frequency	= 10 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 16,198 cuft
Drainage area	= 2.310 ac	Curve number	= 64
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.20 min
Total precip.	= 5.44 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\General Engineering References\Stormwater	Shape factor	= 484



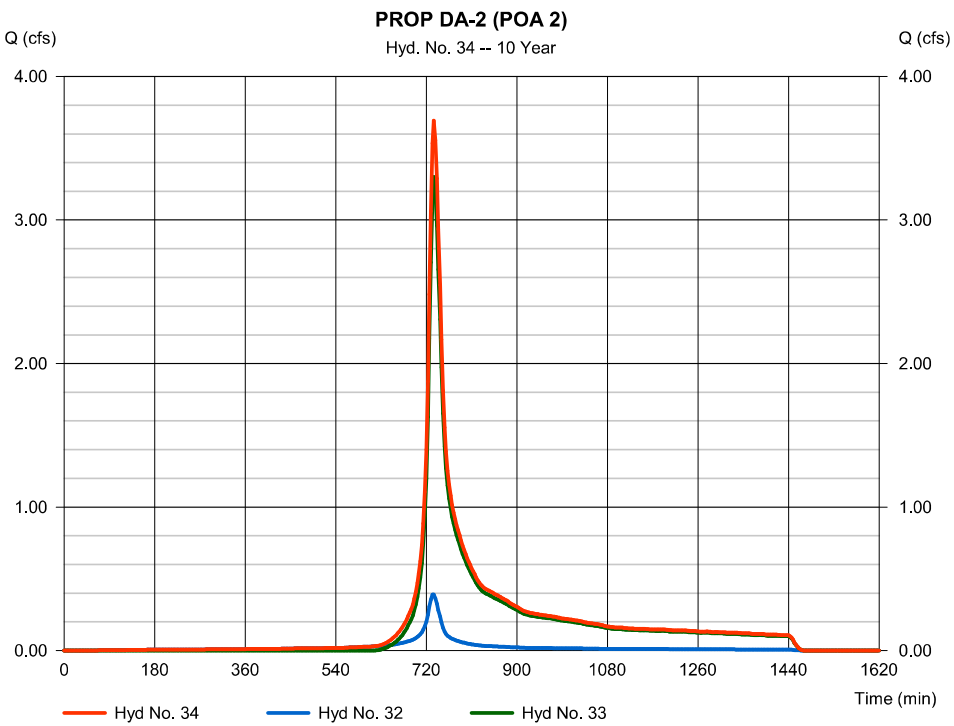
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 34

PROP DA-2 (POA 2)

Hydrograph type	= Combine	Peak discharge	= 3.691 cfs
Storm frequency	= 10 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 18,340 cuft
Inflow hyds.	= 32, 33	Contrib. drain. area	= 2.420 ac



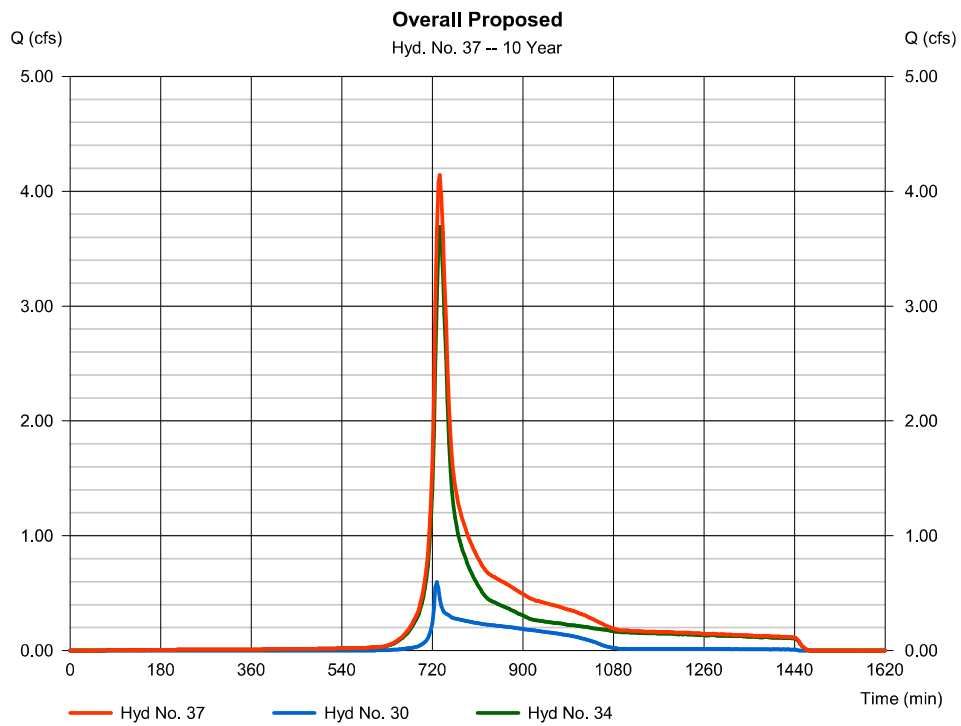
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 37

Overall Proposed

Hydrograph type	= Combine	Peak discharge	= 4.143 cfs
Storm frequency	= 10 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 23,016 cuft
Inflow hyds.	= 30, 34	Contrib. drain. area	= 0.000 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	2.245	3	735	10,702	-----	----	-----	EX - DA 1 DET.
2	Reservoir	0.000	3	663	0	1	86.60	3,173	EXIST. DEPRESSION
4	SCS Runoff	2.517	3	738	12,935	-----	----	-----	EX-DA 1 UNDET.
5	Combine	2.517	3	738	12,935	2, 4	----	-----	EX-DA 1 (POA 1)
7	SCS Runoff	0.524	3	735	2,889	-----	----	-----	EX-DA 2A IMP.
8	SCS Runoff	2.013	3	735	10,046	-----	----	-----	EX-DA 2A PERV
9	Combine	2.536	3	735	12,935	7, 8	----	-----	EX-DA 2A
11	SCS Runoff	4.393	3	732	18,485	-----	----	-----	EX-DA 2B
13	Combine	6.822	3	732	31,421	9, 11,	----	-----	EX-DA 2 (POA 2)
15	Combine	9.042	3	735	44,356	5, 13,	----	-----	Overall Existing
19	SCS Runoff	3.708	3	726	15,539	-----	----	-----	PROP BUILDING
21	SCS Runoff	5.013	3	726	21,011	-----	----	-----	PROP DA-1 IMP.
22	SCS Runoff	4.009	3	726	14,573	-----	----	-----	PROP DA-1 PER
23	Combine	9.022	3	726	35,583	21, 22	----	-----	PROP DA-1
25	Combine	12.73	3	726	51,122	19, 23,	----	-----	BASIN 1
26	Reservoir	0.488	3	786	6,165	25	87.14	22,359	BASIN 1
28	SCS Runoff	0.695	3	729	2,508	-----	----	-----	PROP DA-1 UNDET.
30	Combine	0.864	3	729	8,673	26, 28,	----	-----	PROP (POA 1)
32	SCS Runoff	0.480	3	735	2,648	-----	----	-----	PROP DA-2 IMP.
33	SCS Runoff	4.964	3	735	23,803	-----	----	-----	PROP DA-2 PER.
34	Combine	5.444	3	735	26,451	32, 33	----	-----	PROP DA-2 (POA 2)
37	Combine	6.070	3	735	35,124	30, 34,	----	-----	Overall Proposed

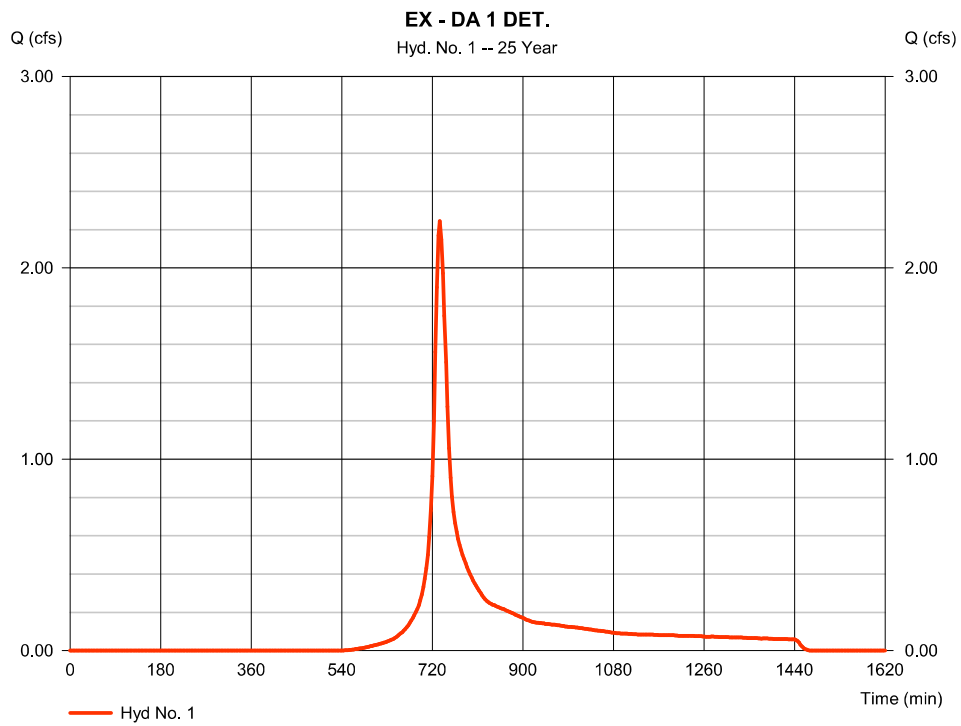
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 | Thursday, 03 / 31 / 2022

Hyd. No. 1

EX - DA 1 DET.

Hydrograph type	= SCS Runoff	Peak discharge	= 2.245 cfs
Storm frequency	= 25 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 10,702 cuft
Drainage area	= 0.970 ac	Curve number	= 66
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 16.60 min
Total precip.	= 6.67 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Geotechnical Engineering References\Stormwater	Shape factor	= 484



Hydrograph Report

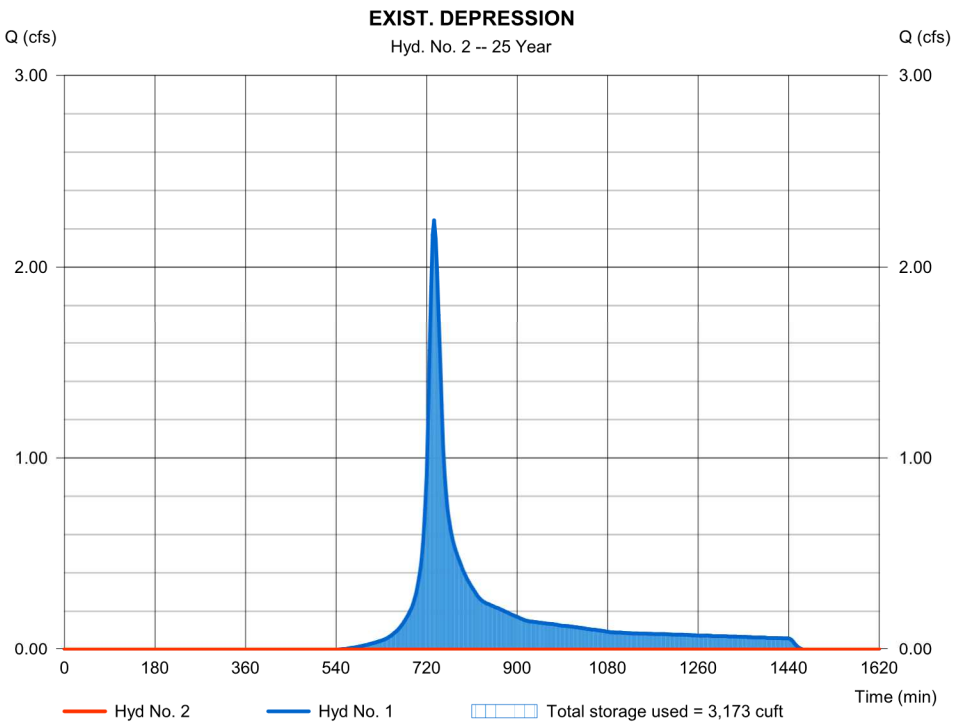
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 2

EXIST. DEPRESSION

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 25 yrs	Time to peak	= 663 min
Time interval	= 3 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 1 - EX - DA 1 DET.	Max. Elevation	= 86.60 ft
Reservoir name	= Exist. Depression	Max. Storage	= 3,173 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



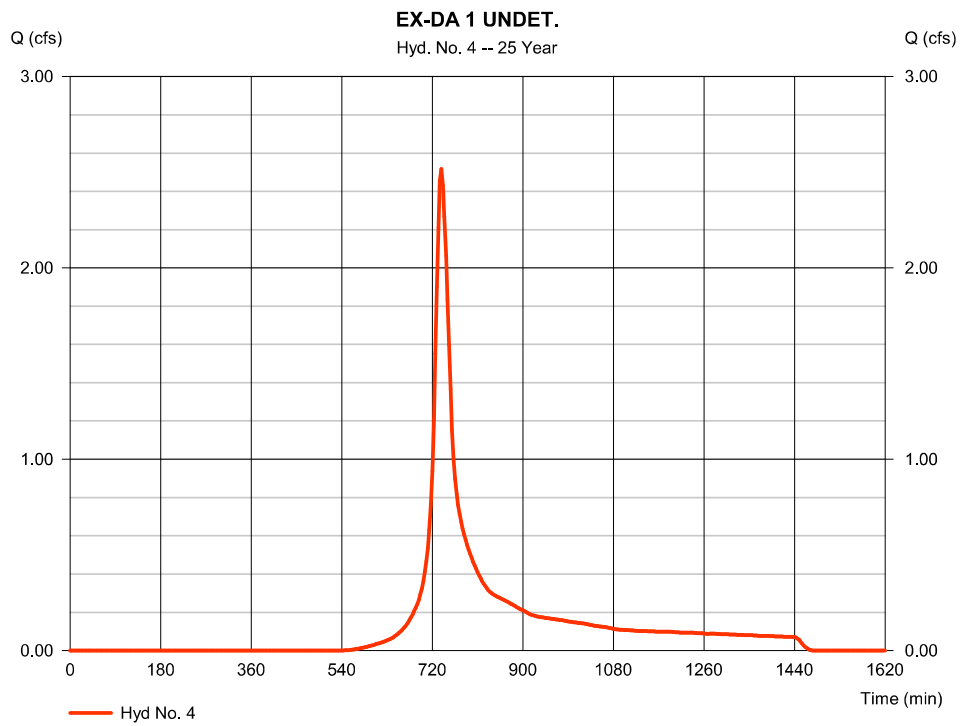
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 4

EX-DA 1 UNDET.

Hydrograph type	= SCS Runoff	Peak discharge	= 2.517 cfs
Storm frequency	= 25 yrs	Time to peak	= 738 min
Time interval	= 3 min	Hyd. volume	= 12,935 cuft
Drainage area	= 1.240 ac	Curve number	= 66
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 22.20 min
Total precip.	= 6.67 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Structural Engineering References\Stormwater	Shape factor	= 484



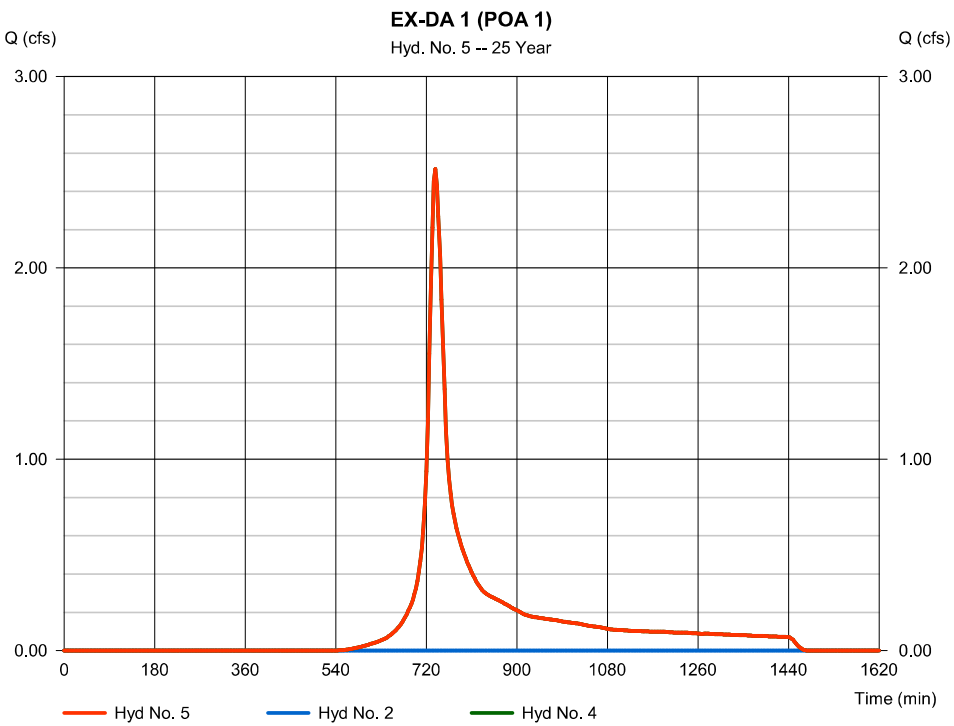
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 5

EX-DA 1 (POA 1)

Hydrograph type	= Combine	Peak discharge	= 2.517 cfs
Storm frequency	= 25 yrs	Time to peak	= 738 min
Time interval	= 3 min	Hyd. volume	= 12,935 cuft
Inflow hyds.	= 2, 4	Contrib. drain. area	= 1.240 ac



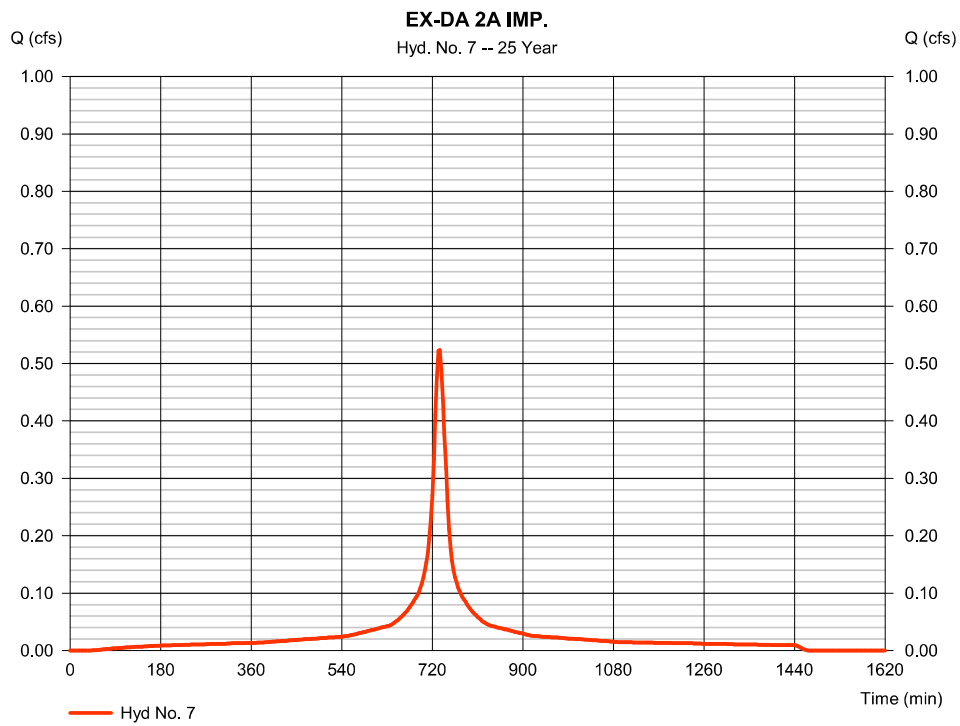
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 7

EX-DA 2A IMP.

Hydrograph type	= SCS Runoff	Peak discharge	= 0.524 cfs
Storm frequency	= 25 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 2,889 cuft
Drainage area	= 0.120 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 18.00 min
Total precip.	= 6.67 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Geotechnical Engineering References\Stormwater	Shape factor	= 484



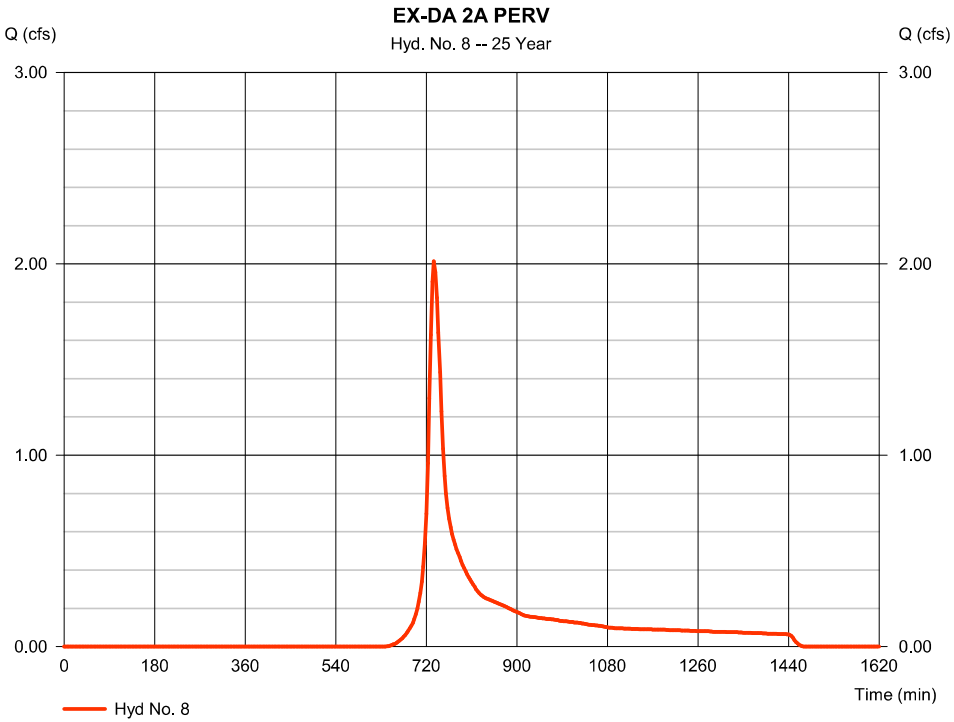
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 8

EX-DA 2A PERV

Hydrograph type	= SCS Runoff	Peak discharge	= 2.013 cfs
Storm frequency	= 25 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 10,046 cuft
Drainage area	= 1.280 ac	Curve number	= 57
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 18.00 min
Total precip.	= 6.67 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Central Engineering References\Stormwater	Shape factor	= 484



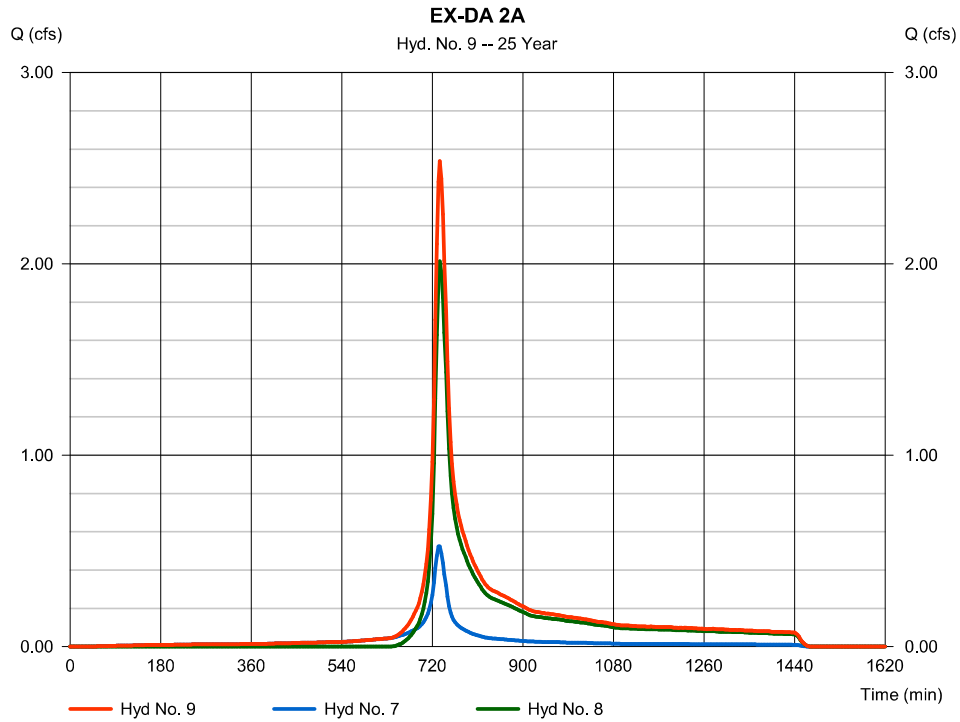
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 9

EX-DA 2A

Hydrograph type	= Combine	Peak discharge	= 2.536 cfs
Storm frequency	= 25 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 12,935 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 1.400 ac



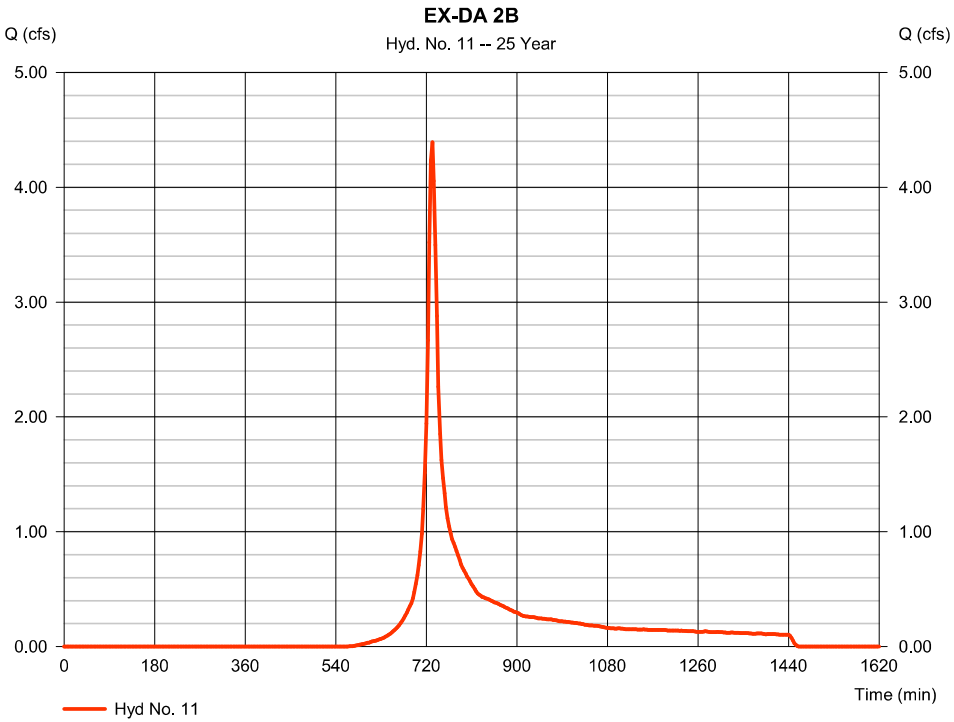
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 11

EX-DA 2B

Hydrograph type	= SCS Runoff	Peak discharge	= 4.393 cfs
Storm frequency	= 25 yrs	Time to peak	= 732 min
Time interval	= 3 min	Hyd. volume	= 18,485 cuft
Drainage area	= 1.850 ac	Curve number	= 64
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 13.80 min
Total precip.	= 6.67 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Central Engineering References\Stormwater Study\Central	Shape factor	= 484



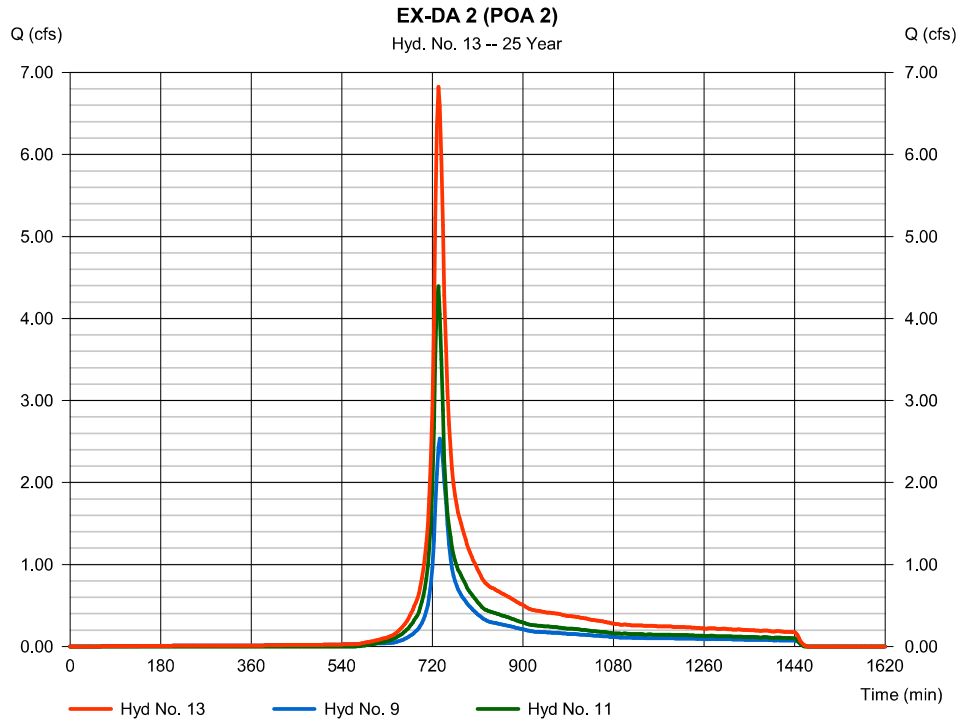
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 13

EX-DA 2 (POA 2)

Hydrograph type	= Combine	Peak discharge	= 6.822 cfs
Storm frequency	= 25 yrs	Time to peak	= 732 min
Time interval	= 3 min	Hyd. volume	= 31,421 cuft
Inflow hyds.	= 9, 11	Contrib. drain. area	= 1.850 ac



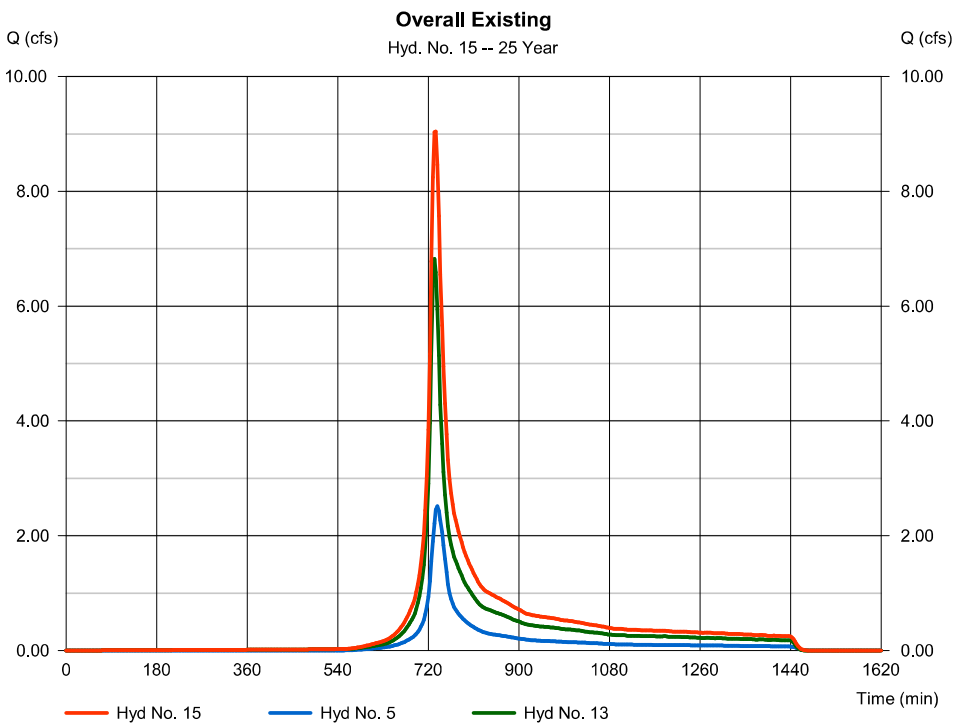
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 15

Overall Existing

Hydrograph type	= Combine	Peak discharge	= 9.042 cfs
Storm frequency	= 25 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 44,356 cuft
Inflow hyds.	= 5, 13	Contrib. drain. area	= 0.000 ac



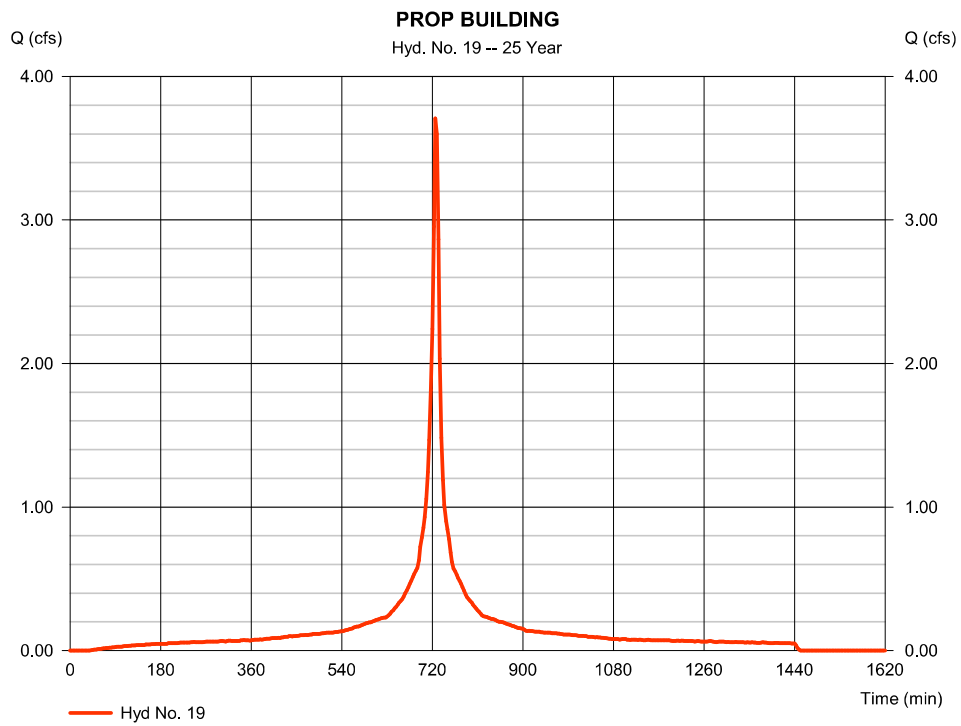
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 19

PROP BUILDING

Hydrograph type	= SCS Runoff	Peak discharge	= 3.708 cfs
Storm frequency	= 25 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 15,539 cuft
Drainage area	= 0.710 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 6.67 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Geotechnical Engineering References\Stormwater	Shape factor	= 484



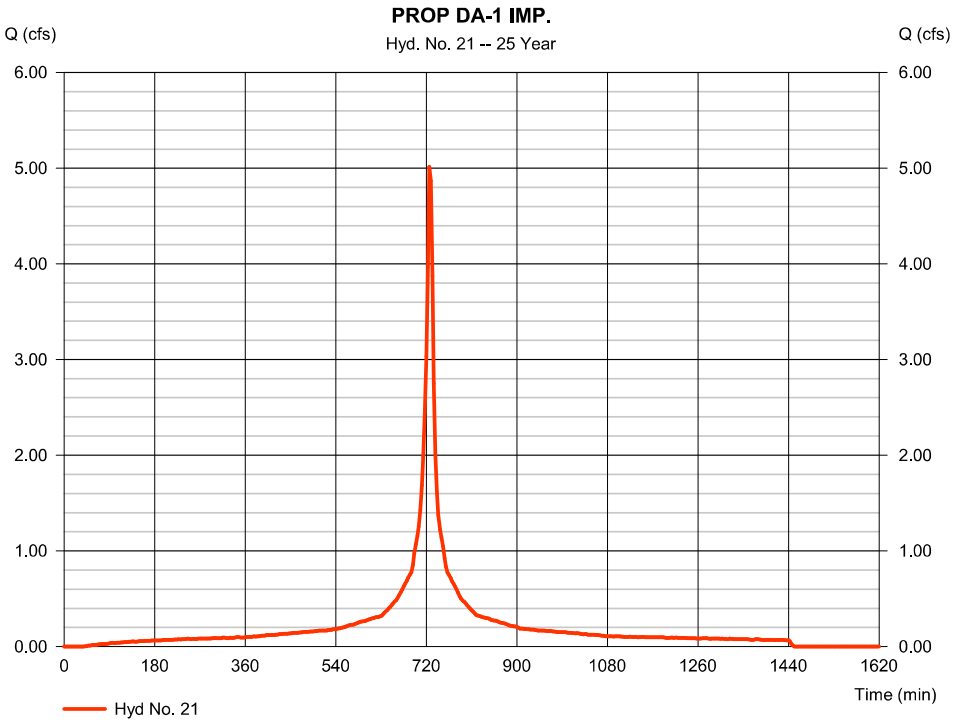
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 21

PROP DA-1 IMP.

Hydrograph type	= SCS Runoff	Peak discharge	= 5.013 cfs
Storm frequency	= 25 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 21,011 cuft
Drainage area	= 0.960 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 6.67 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Structural Engineering References\Stormwater	Shape factor	= 484



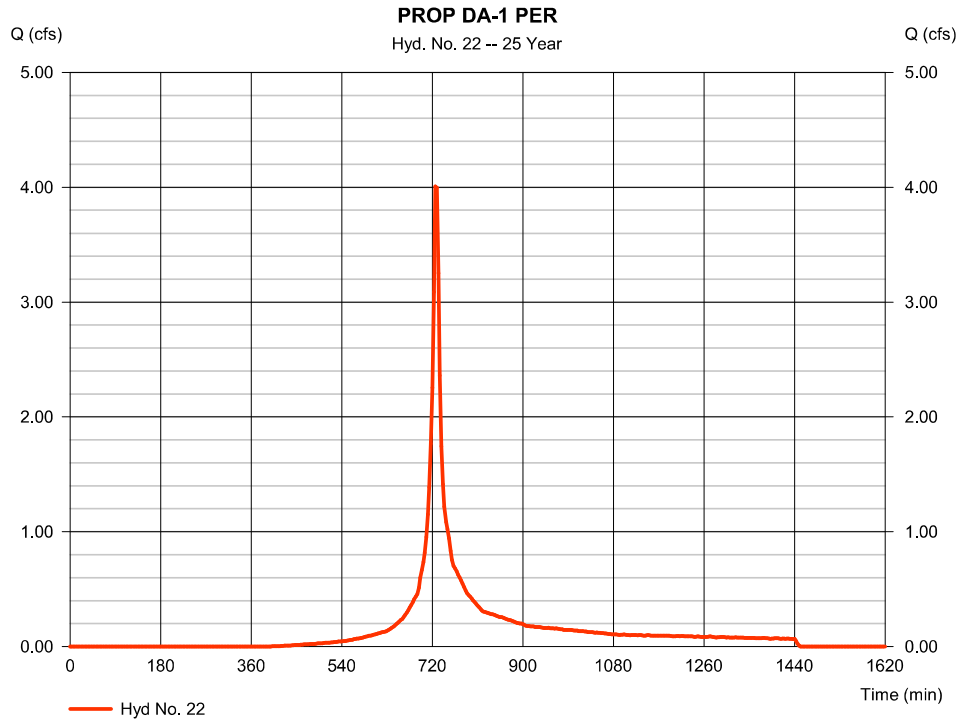
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 22

PROP DA-1 PER

Hydrograph type	= SCS Runoff	Peak discharge	= 4.009 cfs
Storm frequency	= 25 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 14,573 cuft
Drainage area	= 1.080 ac	Curve number	= 76
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 6.67 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Structural Engineering References\Stormwater	Shape factor	= 484



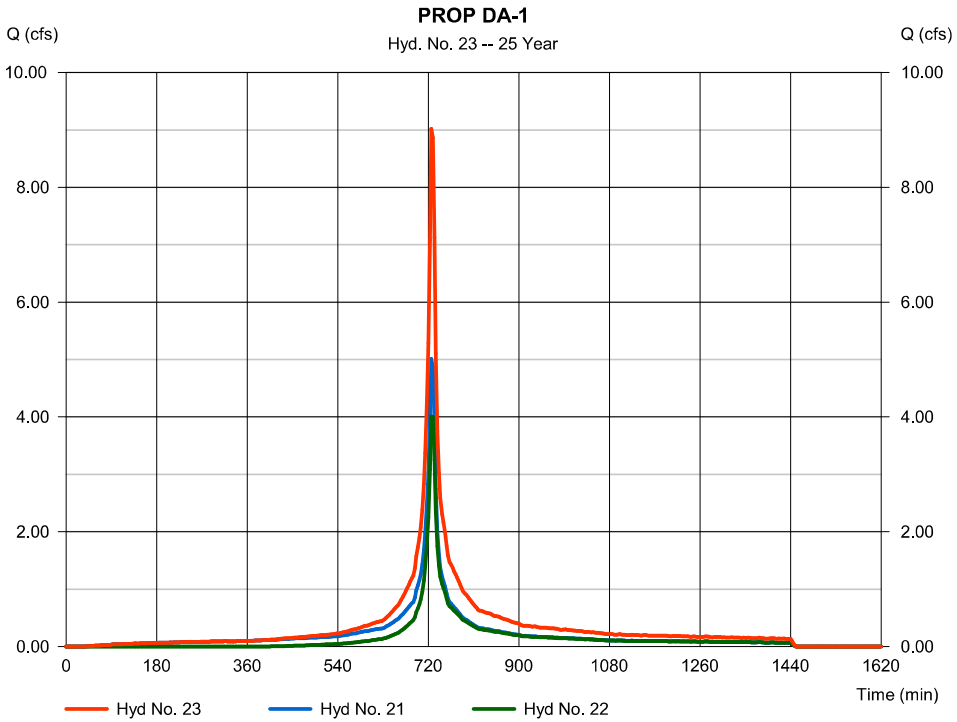
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 23

PROP DA-1

Hydrograph type	= Combine	Peak discharge	= 9.022 cfs
Storm frequency	= 25 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 35,583 cuft
Inflow hyds.	= 21, 22	Contrib. drain. area	= 2.040 ac



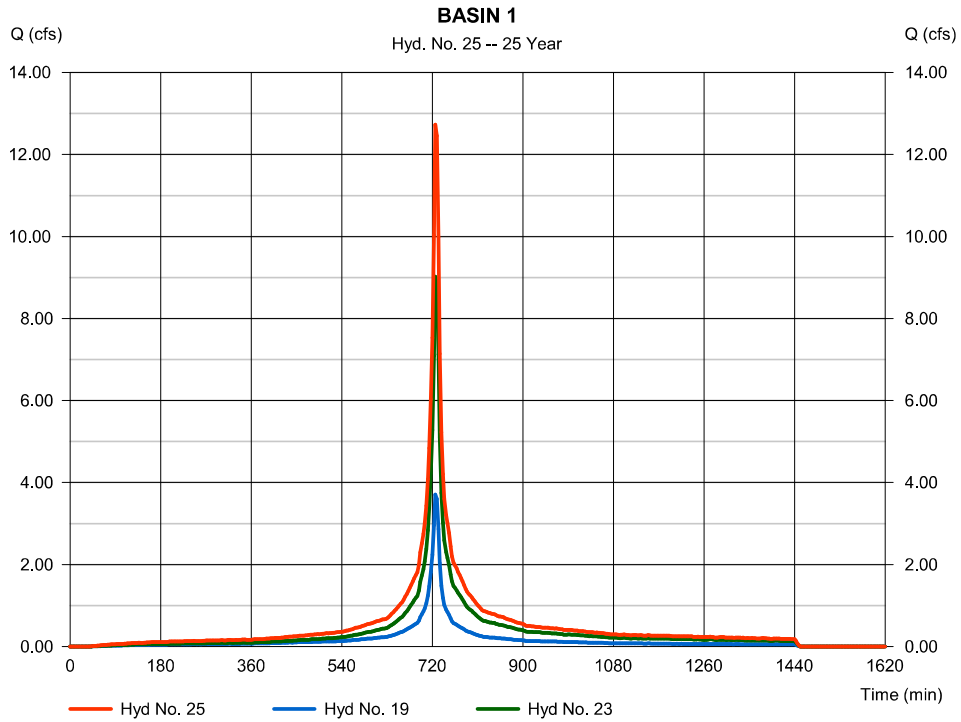
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 25

BASIN 1

Hydrograph type	= Combine	Peak discharge	= 12.73 cfs
Storm frequency	= 25 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 51,122 cuft
Inflow hyds.	= 19, 23	Contrib. drain. area	= 0.710 ac



Hydrograph Report

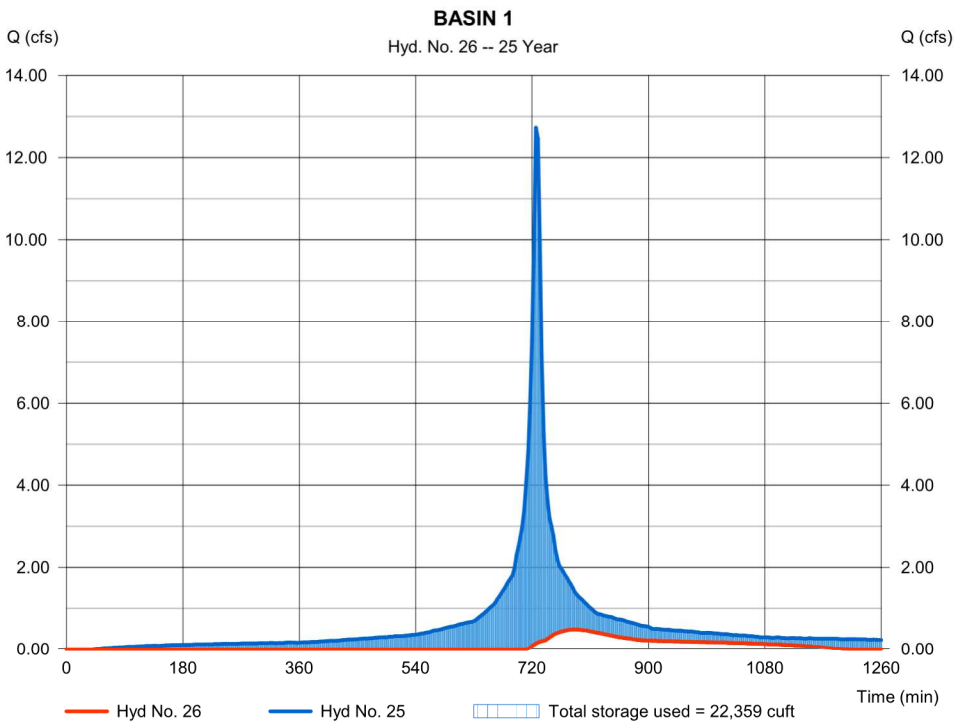
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 26

BASIN 1

Hydrograph type	= Reservoir	Peak discharge	= 0.488 cfs
Storm frequency	= 25 yrs	Time to peak	= 786 min
Time interval	= 3 min	Hyd. volume	= 6,165 cuft
Inflow hyd. No.	= 25 - BASIN 1	Max. Elevation	= 87.14 ft
Reservoir name	= Pond 1	Max. Storage	= 22,359 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



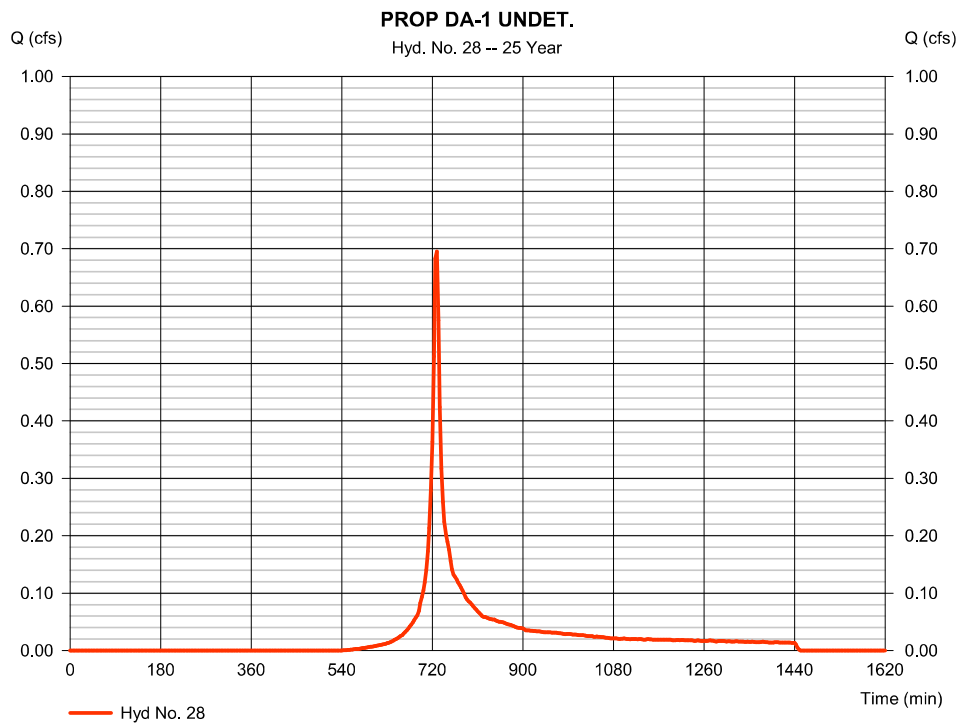
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 28

PROP DA-1 UNDET.

Hydrograph type	= SCS Runoff	Peak discharge	= 0.695 cfs
Storm frequency	= 25 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 2,508 cuft
Drainage area	= 0.250 ac	Curve number	= 66
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 6.67 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Civil Engineering References\Stormwater	Shape factor	= 484



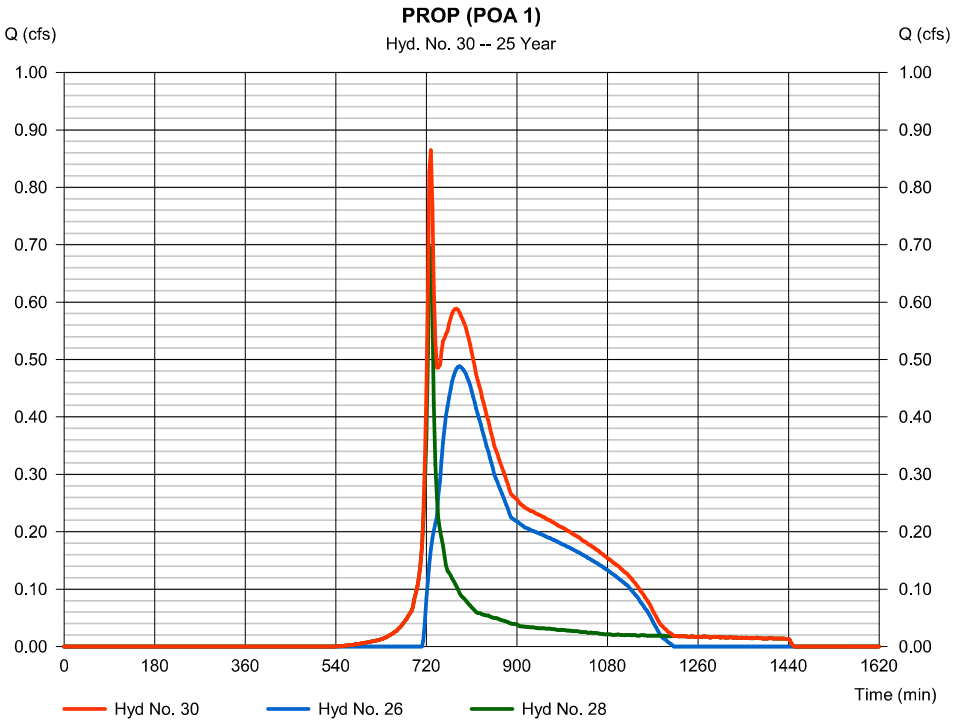
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 30

PROP (POA 1)

Hydrograph type	= Combine	Peak discharge	= 0.864 cfs
Storm frequency	= 25 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 8,673 cuft
Inflow hyds.	= 26, 28	Contrib. drain. area	= 0.250 ac



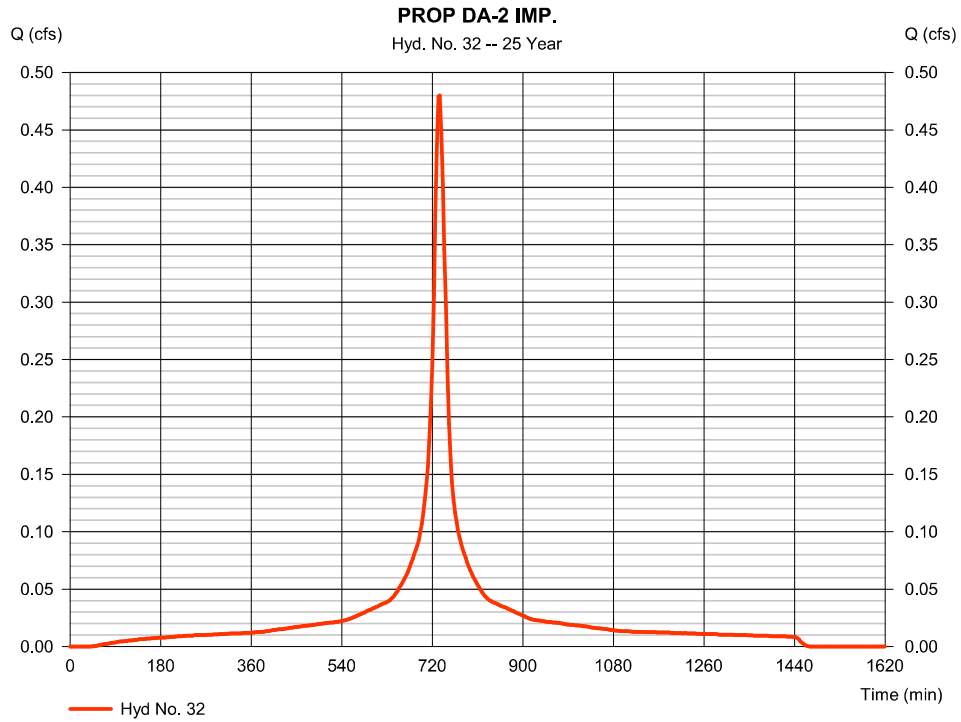
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 32

PROP DA-2 IMP.

Hydrograph type	= SCS Runoff	Peak discharge	= 0.480 cfs
Storm frequency	= 25 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 2,648 cuft
Drainage area	= 0.110 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.20 min
Total precip.	= 6.67 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Structural Engineering References\Stormwater	Shape factor	= 484



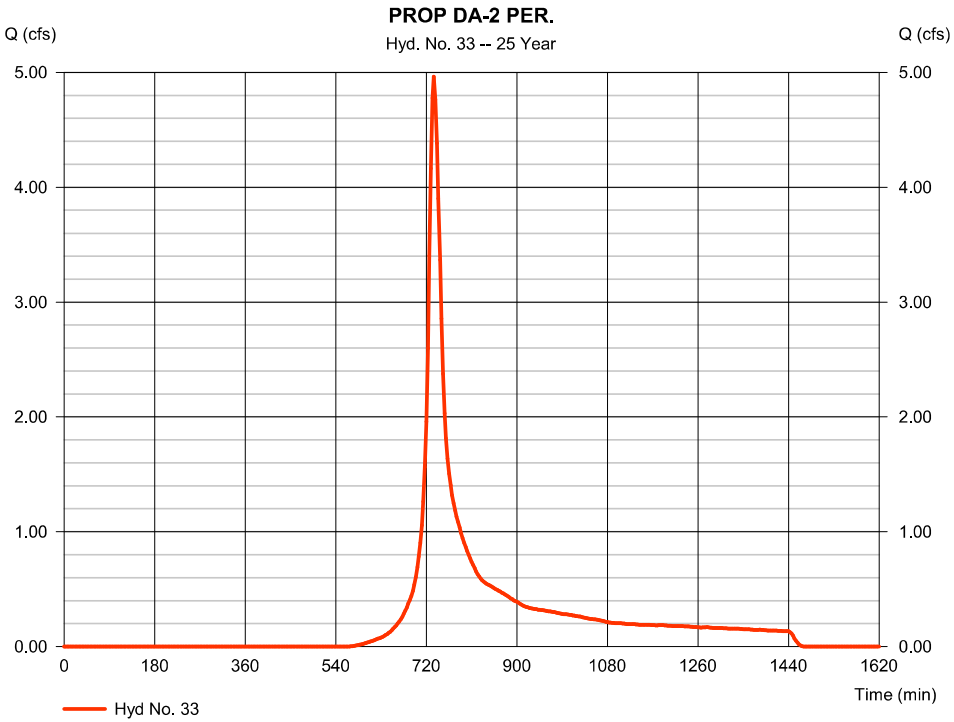
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 33

PROP DA-2 PER.

Hydrograph type	= SCS Runoff	Peak discharge	= 4.964 cfs
Storm frequency	= 25 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 23,803 cuft
Drainage area	= 2.310 ac	Curve number	= 64
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.20 min
Total precip.	= 6.67 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Central Engineering References\Stormwater	Shape factor	= 484



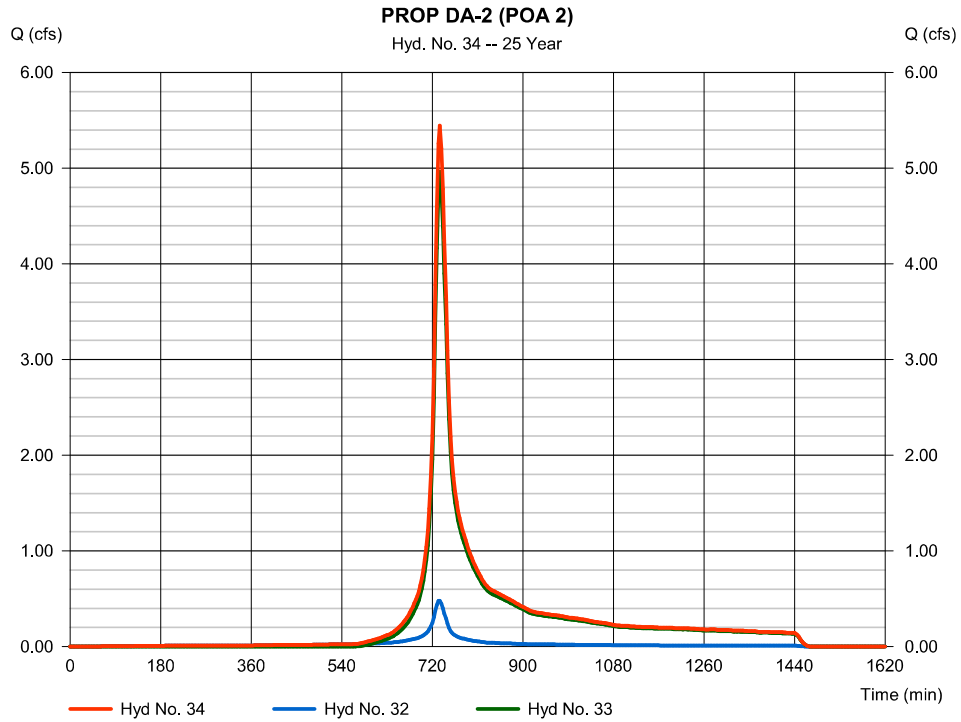
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 34

PROP DA-2 (POA 2)

Hydrograph type	= Combine	Peak discharge	= 5.444 cfs
Storm frequency	= 25 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 26,451 cuft
Inflow hyds.	= 32, 33	Contrib. drain. area	= 2.420 ac



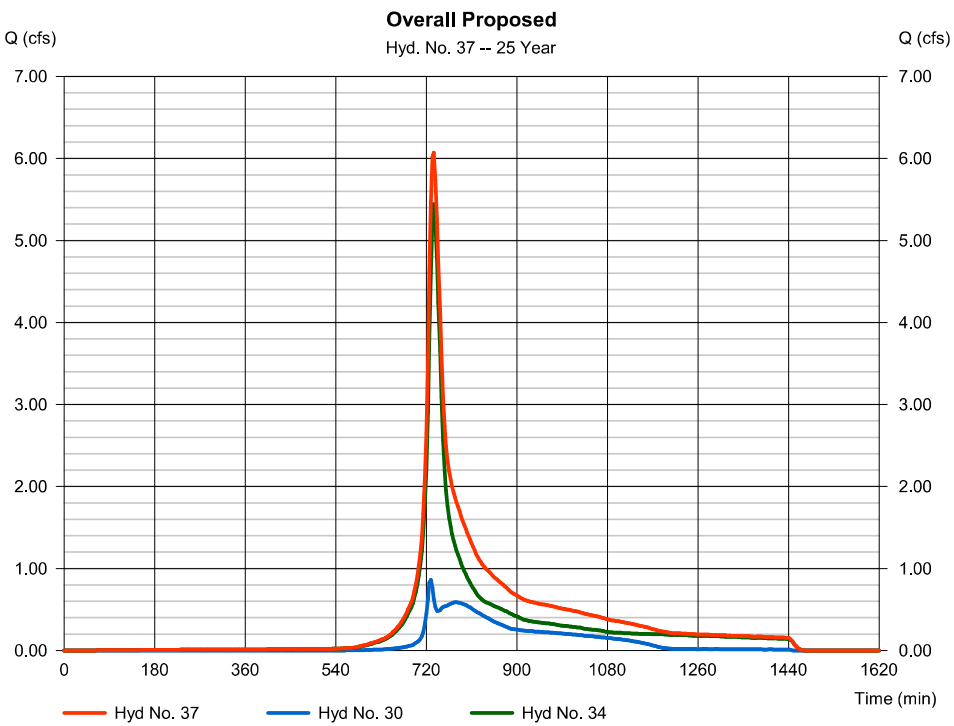
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 37

Overall Proposed

Hydrograph type	= Combine	Peak discharge	= 6.070 cfs
Storm frequency	= 25 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 35,124 cuft
Inflow hyds.	= 30, 34	Contrib. drain. area	= 0.000 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	3.433	3	735	16,265	-----	----	-----	EX - DA 1 DET.
2	Reservoir	0.000	3	1080	0	1	87.07	5,502	EXIST. DEPRESSION
4	SCS Runoff	3.852	3	738	19,658	-----	----	-----	EX-DA 1 UNDET.
5	Combine	3.852	3	738	19,658	2, 4	----	-----	EX-DA 1 (POA 1)
7	SCS Runoff	0.674	3	735	3,742	-----	----	-----	EX-DA 2A IMP.
8	SCS Runoff	3.399	3	735	16,358	-----	----	-----	EX-DA 2A PERV
9	Combine	4.073	3	735	20,100	7, 8	----	-----	EX-DA 2A
11	SCS Runoff	6.819	3	732	28,479	-----	----	-----	EX-DA 2B
13	Combine	10.76	3	732	48,580	9, 11,	----	-----	EX-DA 2 (POA 2)
15	Combine	14.20	3	732	68,237	5, 13,	----	-----	Overall Existing
19	SCS Runoff	4.770	3	726	20,127	-----	----	-----	PROP BUILDING
21	SCS Runoff	6.450	3	726	27,214	-----	----	-----	PROP DA-1 IMP.
22	SCS Runoff	5.699	3	726	20,873	-----	----	-----	PROP DA-1 PER
23	Combine	12.15	3	726	48,087	21, 22	----	-----	PROP DA-1
25	Combine	16.92	3	726	68,214	19, 23,	----	-----	BASIN 1
26	Reservoir	1.302	3	774	15,631	25	87.77	29,277	BASIN 1
28	SCS Runoff	1.055	3	729	3,811	-----	----	-----	PROP DA-1 UNDET.
30	Combine	1.546	3	735	19,442	26, 28,	----	-----	PROP (POA 1)
32	SCS Runoff	0.617	3	735	3,430	-----	----	-----	PROP DA-2 IMP.
33	SCS Runoff	7.733	3	735	36,672	-----	----	-----	PROP DA-2 PER.
34	Combine	8.351	3	735	40,102	32, 33	----	-----	PROP DA-2 (POA 2)
37	Combine	9.897	3	735	59,544	30, 34,	----	-----	Overall Proposed

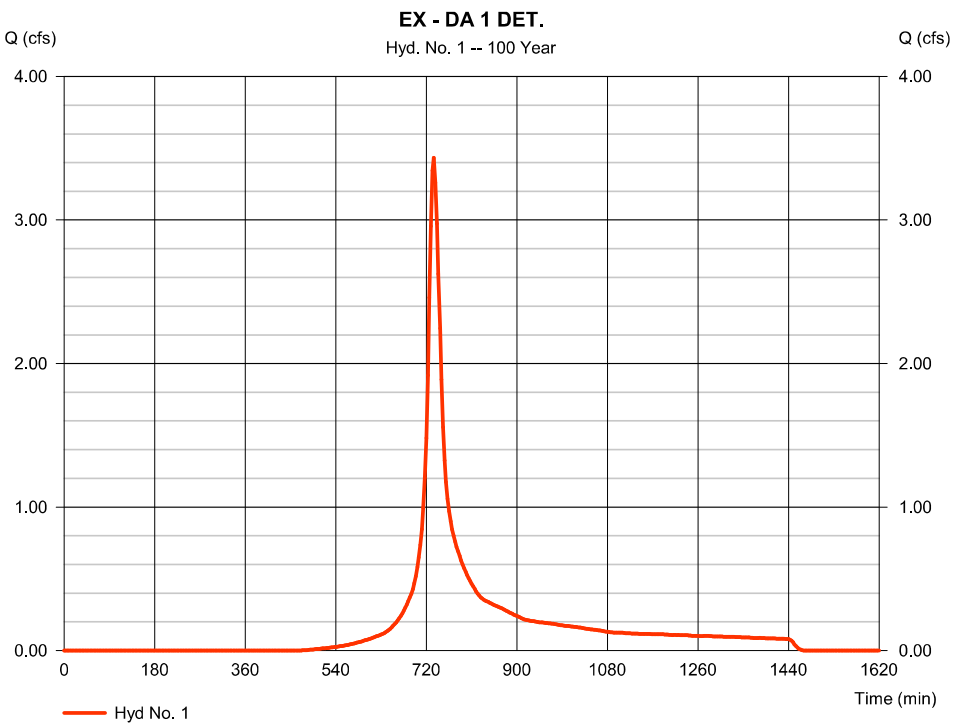
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 1

EX - DA 1 DET.

Hydrograph type	= SCS Runoff	Peak discharge	= 3.433 cfs
Storm frequency	= 100 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 16,265 cuft
Drainage area	= 0.970 ac	Curve number	= 66
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 16.60 min
Total precip.	= 8.57 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Central Engineering References\Stormwater	Shape factor	= 484



Hydrograph Report

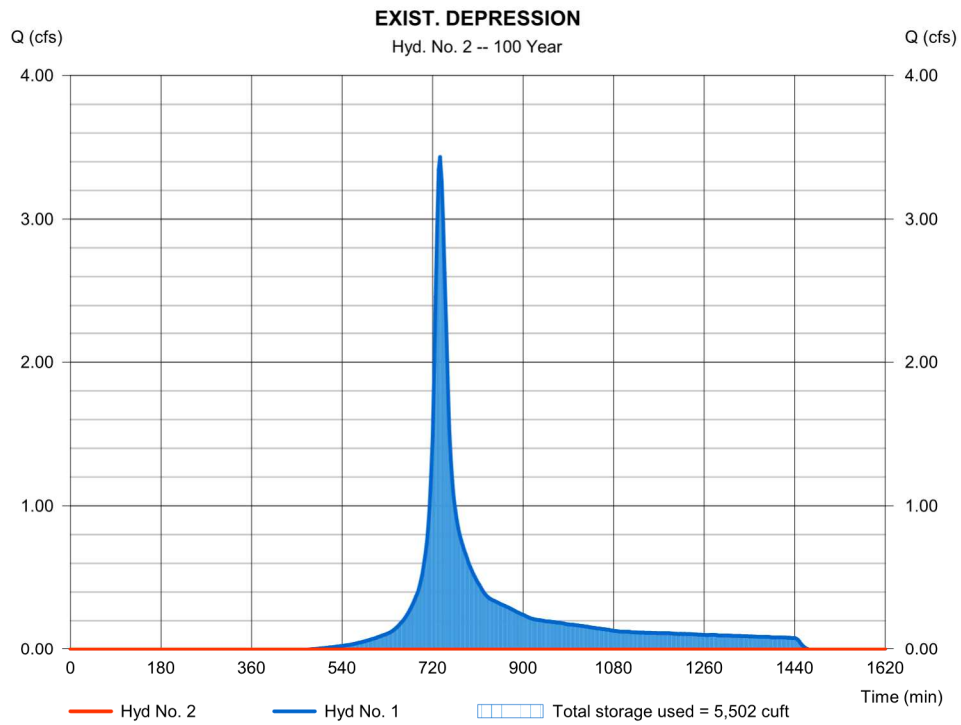
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 2

EXIST. DEPRESSION

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 100 yrs	Time to peak	= 1080 min
Time interval	= 3 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 1 - EX - DA 1 DET.	Max. Elevation	= 87.07 ft
Reservoir name	= Exist. Depression	Max. Storage	= 5,502 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



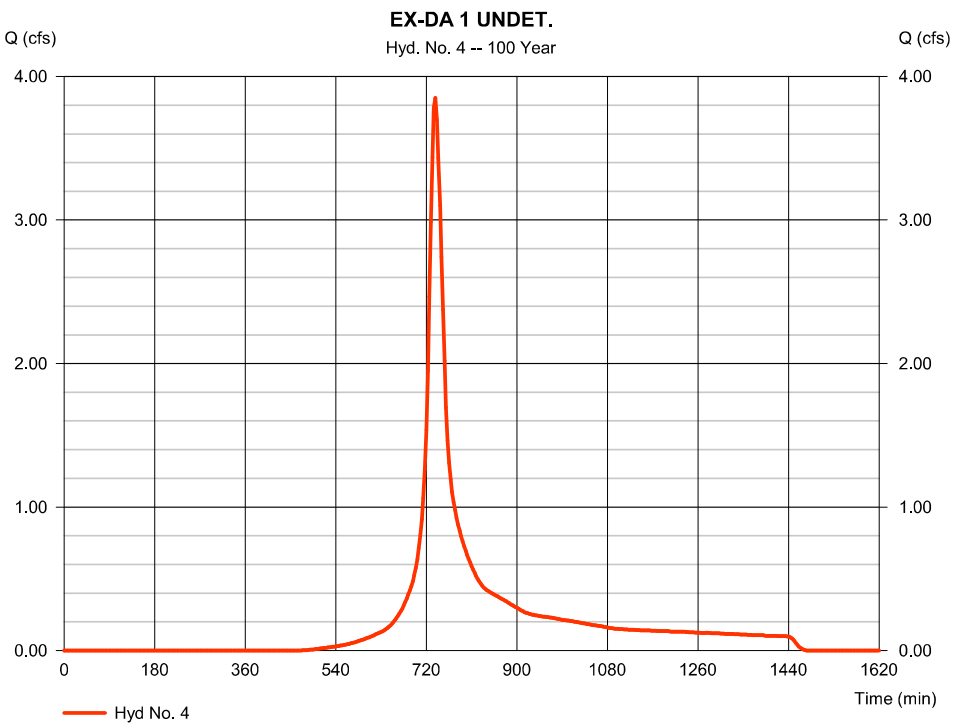
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 4

EX-DA 1 UNDET.

Hydrograph type	= SCS Runoff	Peak discharge	= 3.852 cfs
Storm frequency	= 100 yrs	Time to peak	= 738 min
Time interval	= 3 min	Hyd. volume	= 19,658 cuft
Drainage area	= 1.240 ac	Curve number	= 66
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 22.20 min
Total precip.	= 8.57 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Central Engineering References\Stormwater	Shape factor	= 484



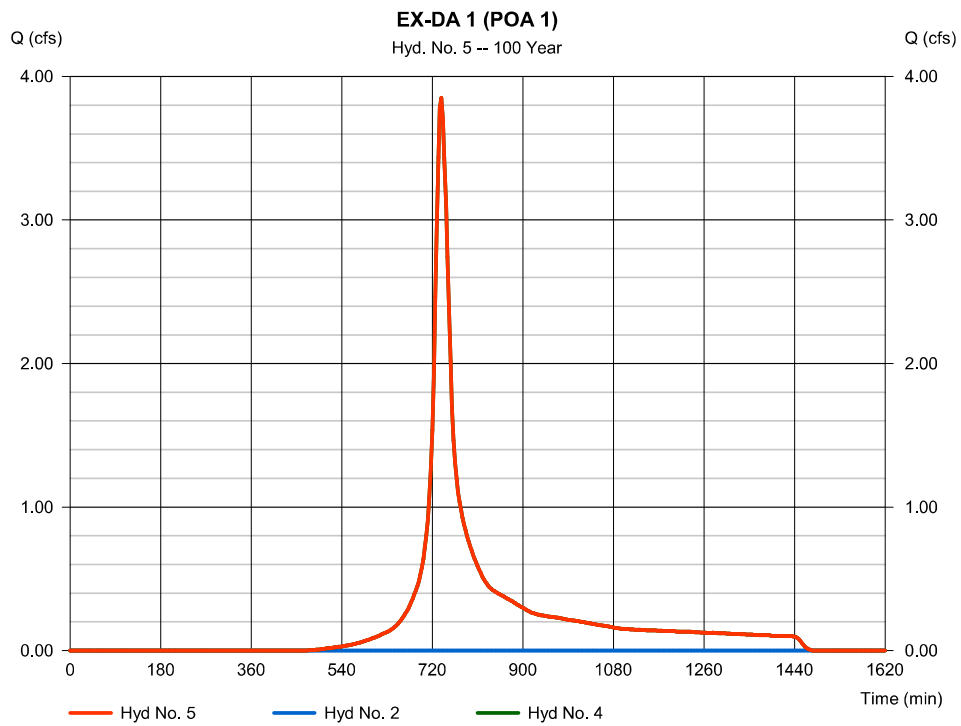
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 5

EX-DA 1 (POA 1)

Hydrograph type	= Combine	Peak discharge	= 3.852 cfs
Storm frequency	= 100 yrs	Time to peak	= 738 min
Time interval	= 3 min	Hyd. volume	= 19,658 cuft
Inflow hyds.	= 2, 4	Contrib. drain. area	= 1.240 ac



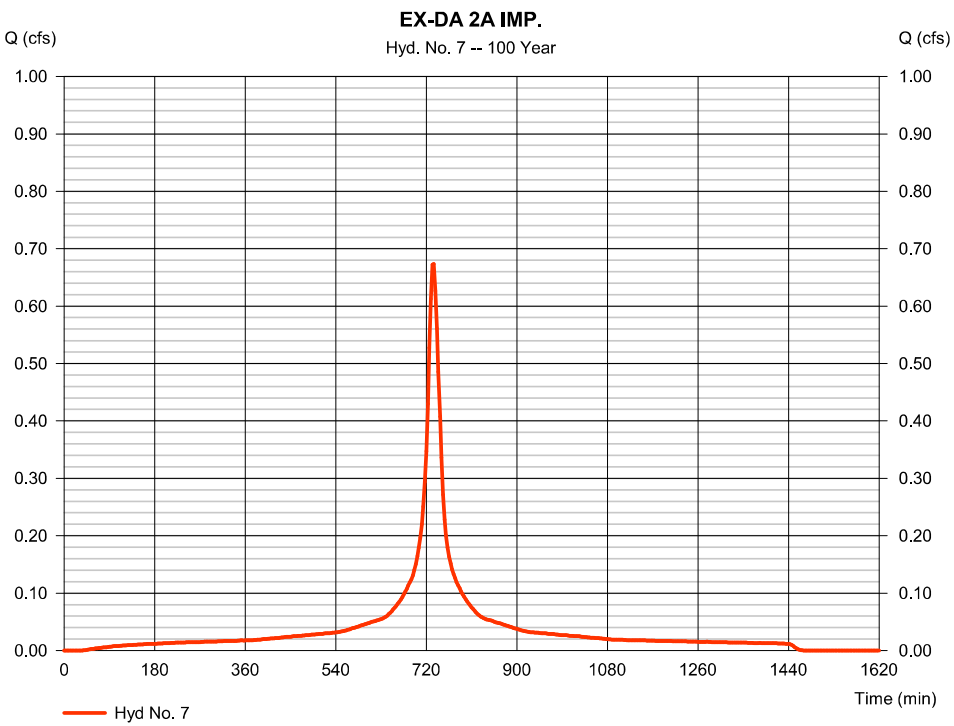
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 7

EX-DA 2A IMP.

Hydrograph type	= SCS Runoff	Peak discharge	= 0.674 cfs
Storm frequency	= 100 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 3,742 cuft
Drainage area	= 0.120 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 18.00 min
Total precip.	= 8.57 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\General Engineering References\Stormwater	Shape factor	= 484



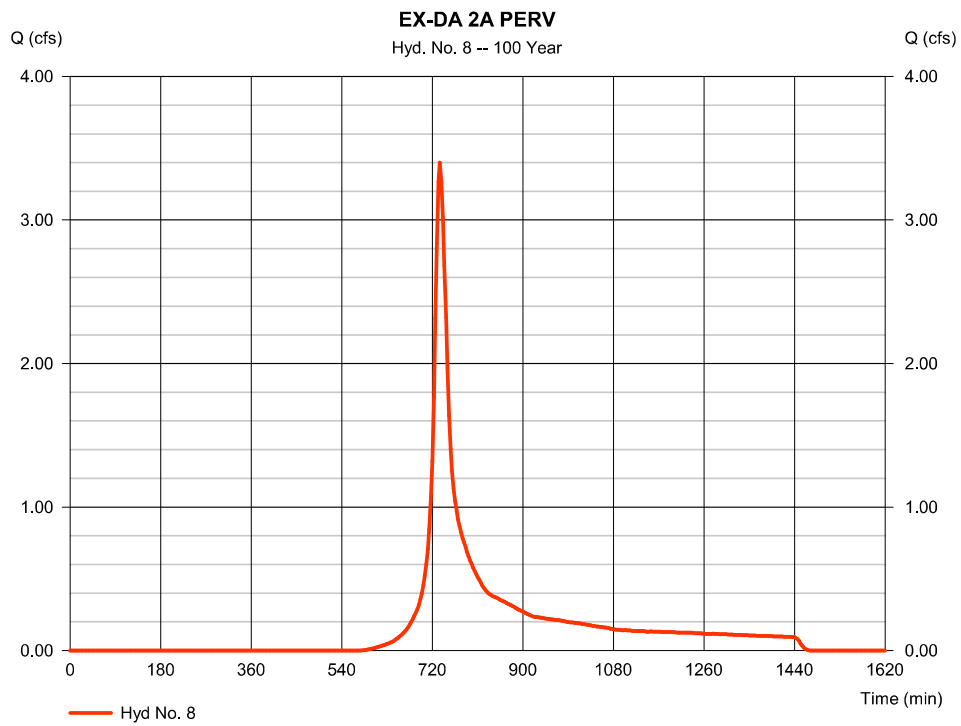
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 8

EX-DA 2A PERV

Hydrograph type	= SCS Runoff	Peak discharge	= 3.399 cfs
Storm frequency	= 100 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 16,358 cuft
Drainage area	= 1.280 ac	Curve number	= 57
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 18.00 min
Total precip.	= 8.57 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\General Engineering References\Stormwater	Shape factor	= 484



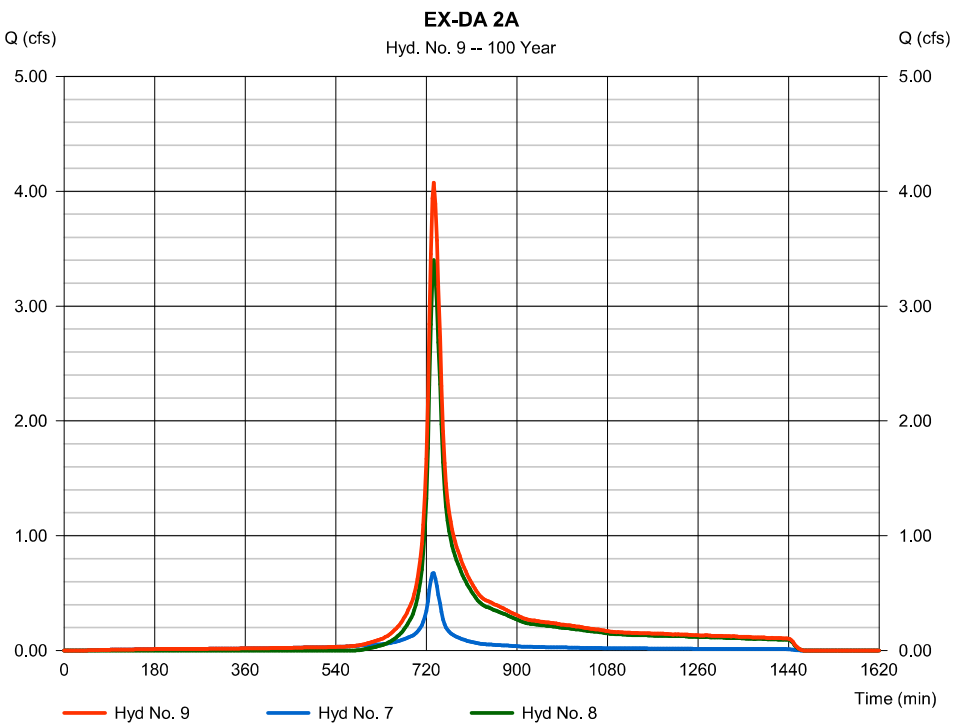
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 9

EX-DA 2A

Hydrograph type	= Combine	Peak discharge	= 4.073 cfs
Storm frequency	= 100 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 20,100 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 1.400 ac



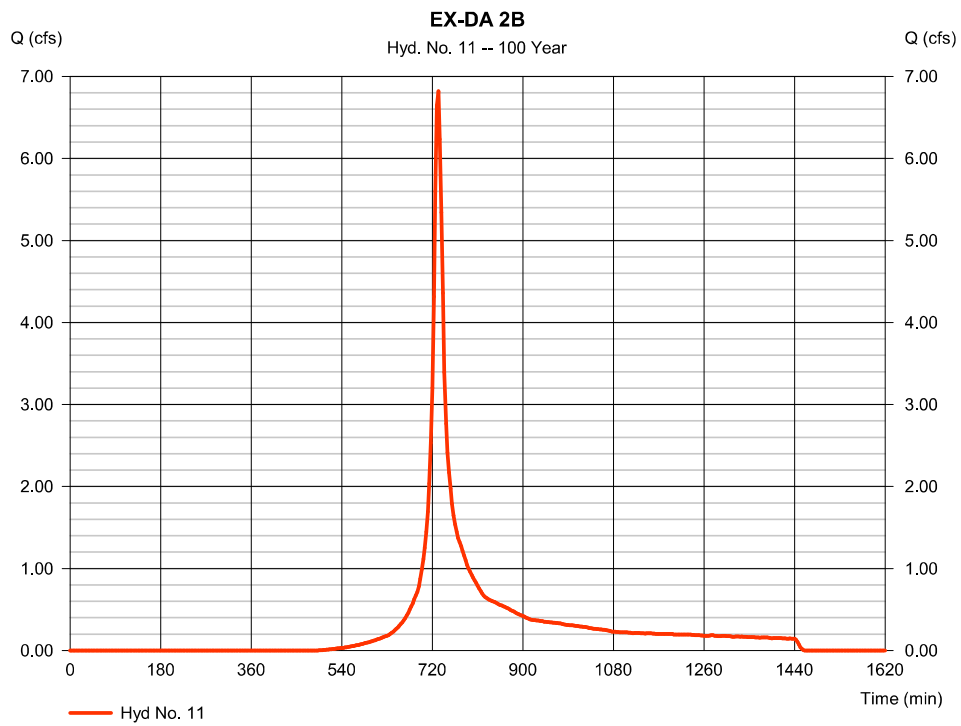
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 11

EX-DA 2B

Hydrograph type	= SCS Runoff	Peak discharge	= 6.819 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 3 min	Hyd. volume	= 28,479 cuft
Drainage area	= 1.850 ac	Curve number	= 64
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 13.80 min
Total precip.	= 8.57 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Geotechnical Engineering References\Stormwater	Shape factor	= 484



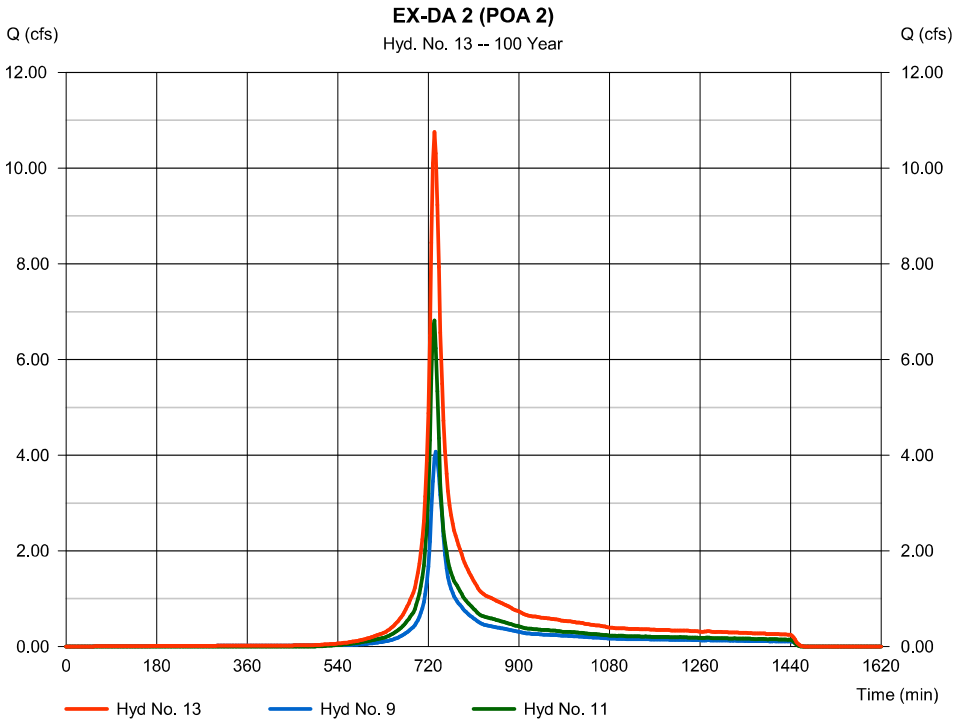
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 13

EX-DA 2 (POA 2)

Hydrograph type	= Combine	Peak discharge	= 10.76 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 3 min	Hyd. volume	= 48,580 cuft
Inflow hyds.	= 9, 11	Contrib. drain. area	= 1.850 ac



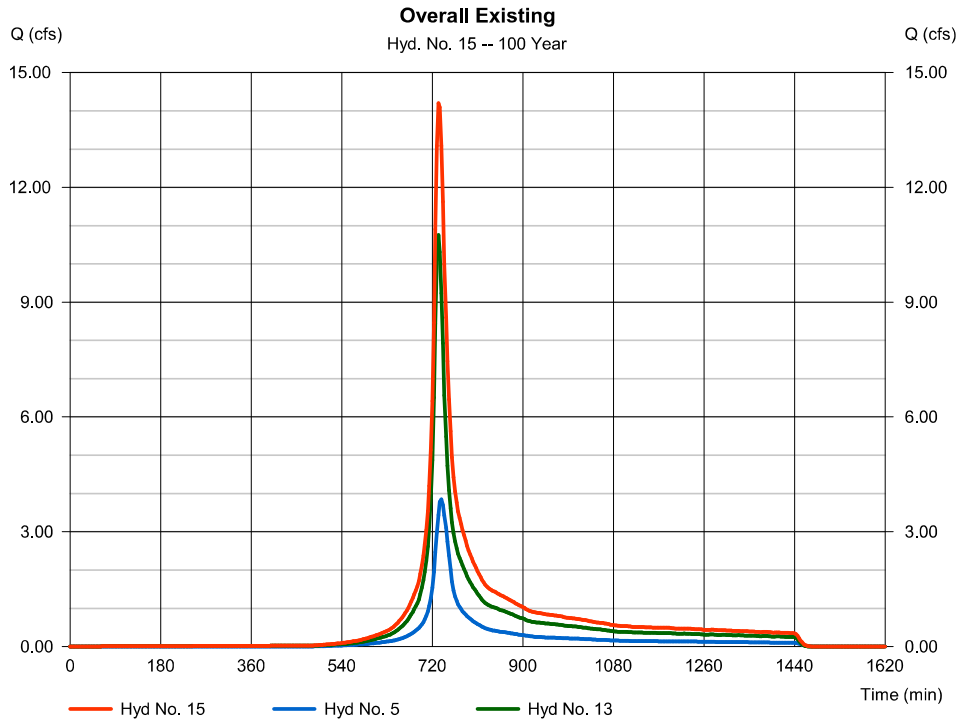
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 15

Overall Existing

Hydrograph type	= Combine	Peak discharge	= 14.20 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 3 min	Hyd. volume	= 68,237 cuft
Inflow hyds.	= 5, 13	Contrib. drain. area	= 0.000 ac



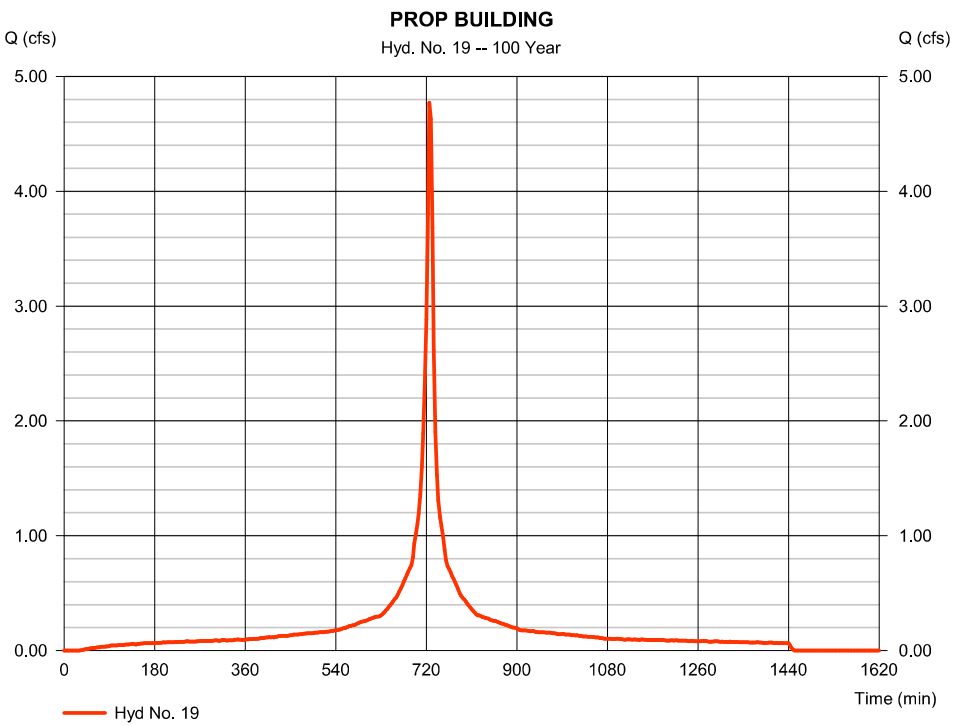
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 19

PROP BUILDING

Hydrograph type	= SCS Runoff	Peak discharge	= 4.770 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 20,127 cuft
Drainage area	= 0.710 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 8.57 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\General Engineering References\Stormwater	Shape factor	= 484



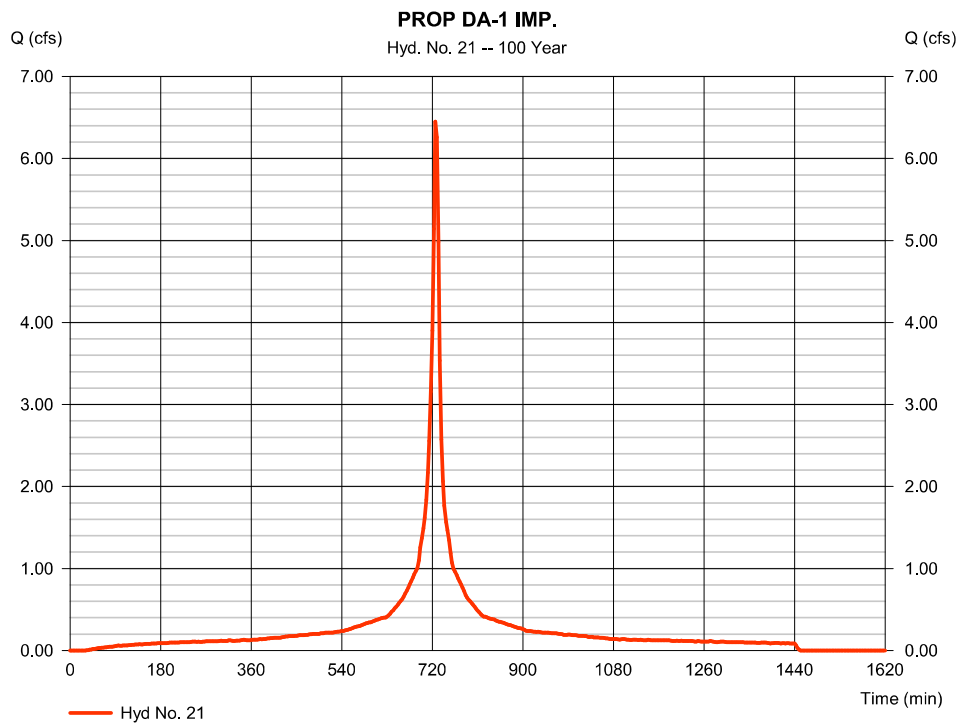
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 21

PROP DA-1 IMP.

Hydrograph type	= SCS Runoff	Peak discharge	= 6.450 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 27,214 cuft
Drainage area	= 0.960 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 8.57 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\General Engineering References\Stormwater	Shape factor	= 484



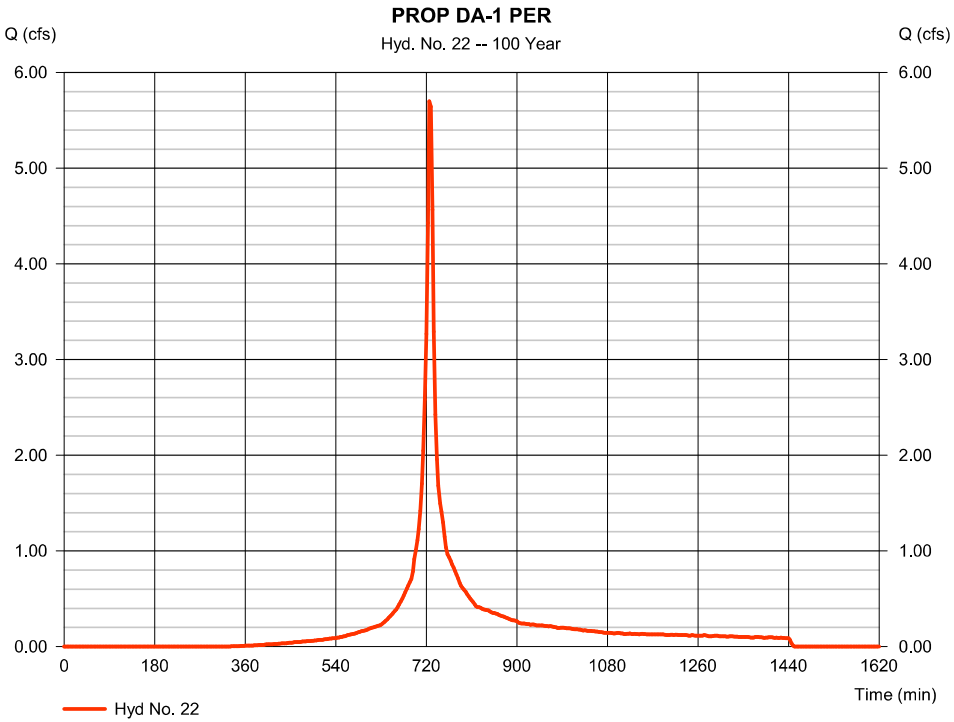
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 22

PROP DA-1 PER

Hydrograph type	= SCS Runoff	Peak discharge	= 5.699 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 20,873 cuft
Drainage area	= 1.080 ac	Curve number	= 76
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 8.57 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Central Engineering References\Stormwater	Shape factor	= 484



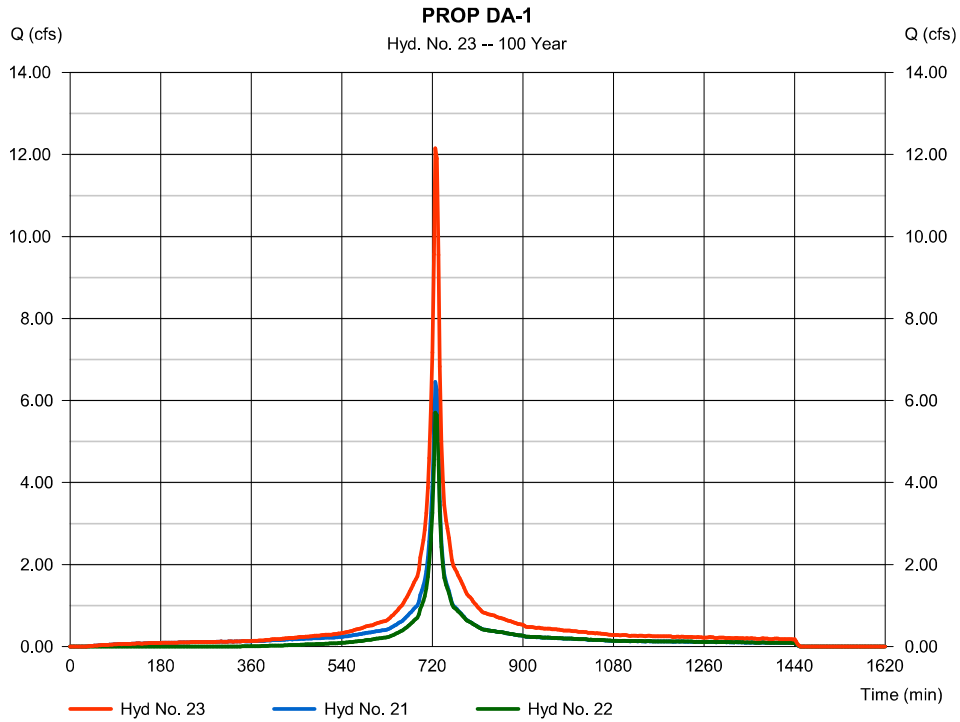
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 23

PROP DA-1

Hydrograph type	= Combine	Peak discharge	= 12.15 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 48,087 cuft
Inflow hyds.	= 21, 22	Contrib. drain. area	= 2.040 ac



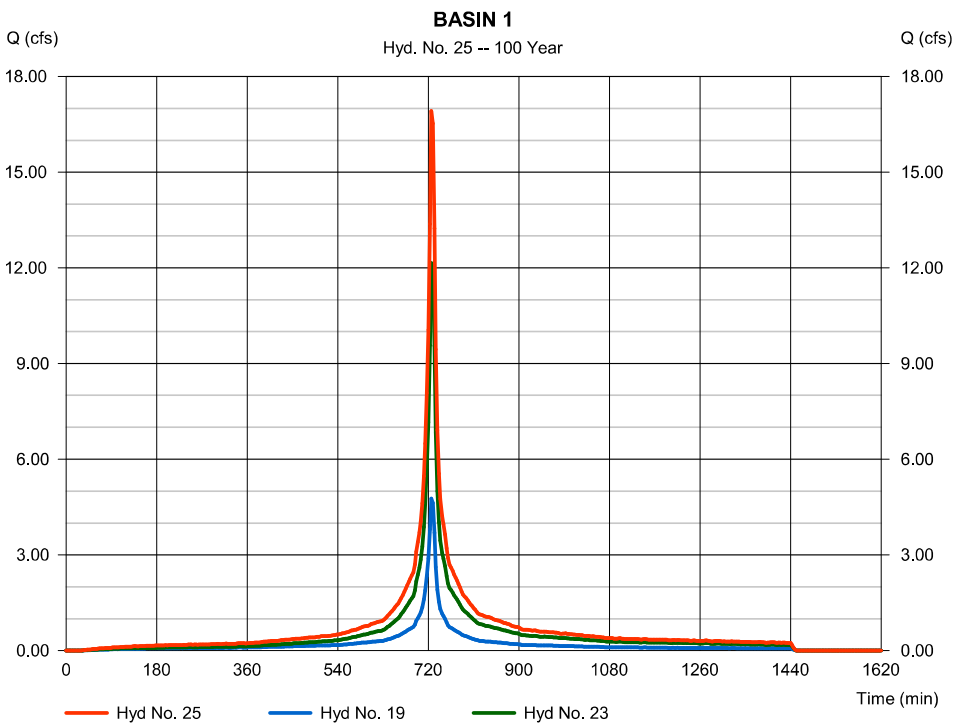
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 25

BASIN 1

Hydrograph type	= Combine	Peak discharge	= 16.92 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 68,214 cuft
Inflow hyds.	= 19, 23	Contrib. drain. area	= 0.710 ac



Hydrograph Report

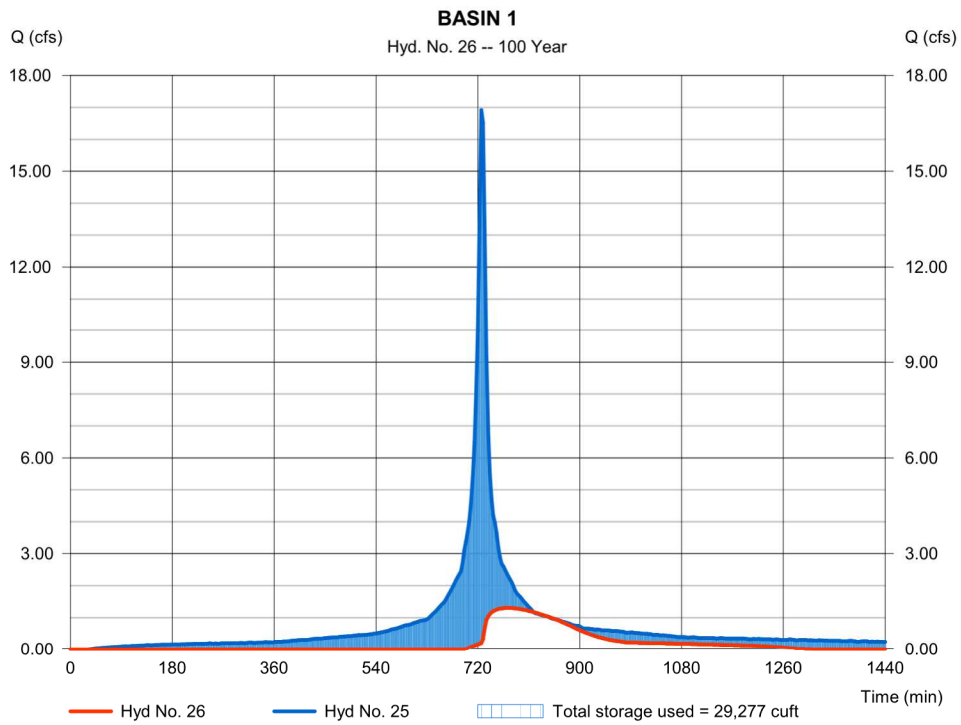
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 26

BASIN 1

Hydrograph type	= Reservoir	Peak discharge	= 1.302 cfs
Storm frequency	= 100 yrs	Time to peak	= 774 min
Time interval	= 3 min	Hyd. volume	= 15,631 cuft
Inflow hyd. No.	= 25 - BASIN 1	Max. Elevation	= 87.77 ft
Reservoir name	= Pond 1	Max. Storage	= 29,277 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



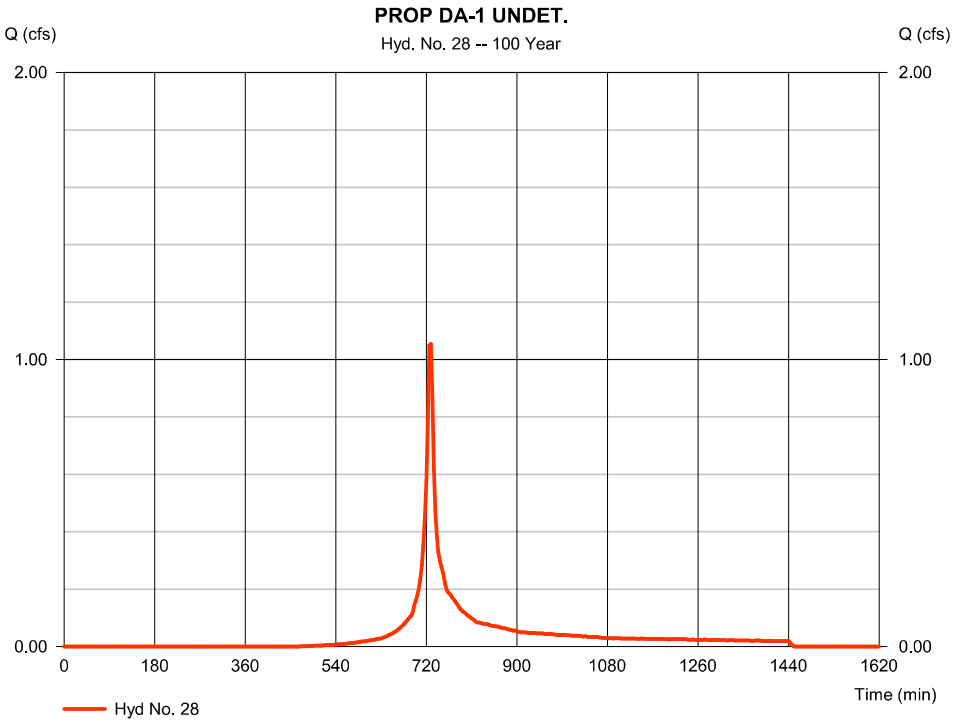
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 28

PROP DA-1 UNDET.

Hydrograph type	= SCS Runoff	Peak discharge	= 1.055 cfs
Storm frequency	= 100 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 3,811 cuft
Drainage area	= 0.250 ac	Curve number	= 66
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 8.57 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Central Engineering References\Stormwater	Shape factor	= 484



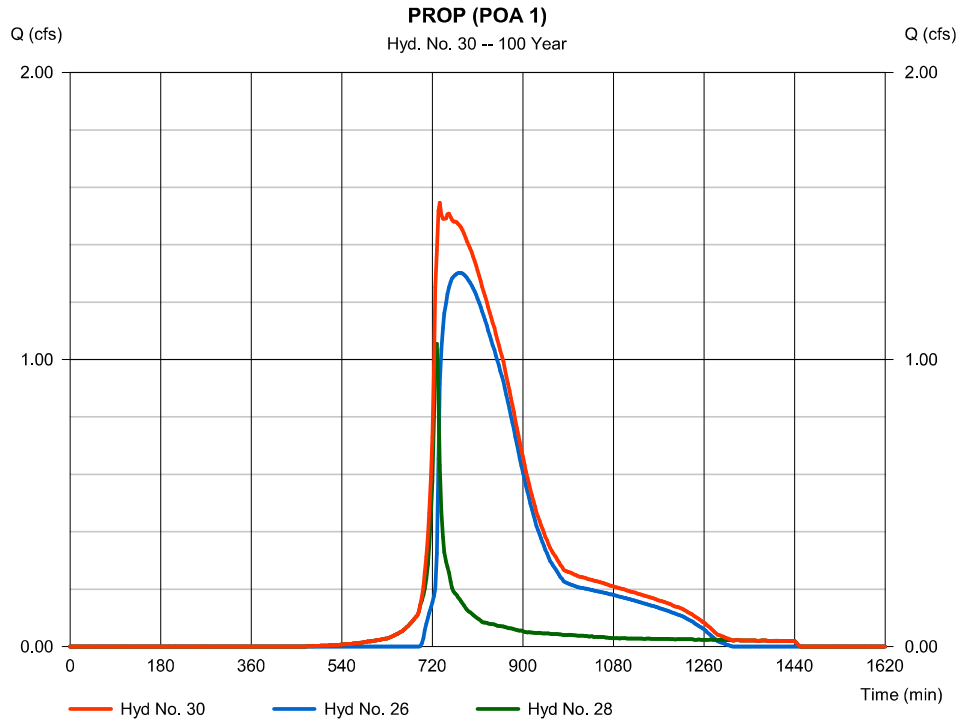
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 30

PROP (POA 1)

Hydrograph type	= Combine	Peak discharge	= 1.546 cfs
Storm frequency	= 100 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 19,442 cuft
Inflow hyds.	= 26, 28	Contrib. drain. area	= 0.250 ac



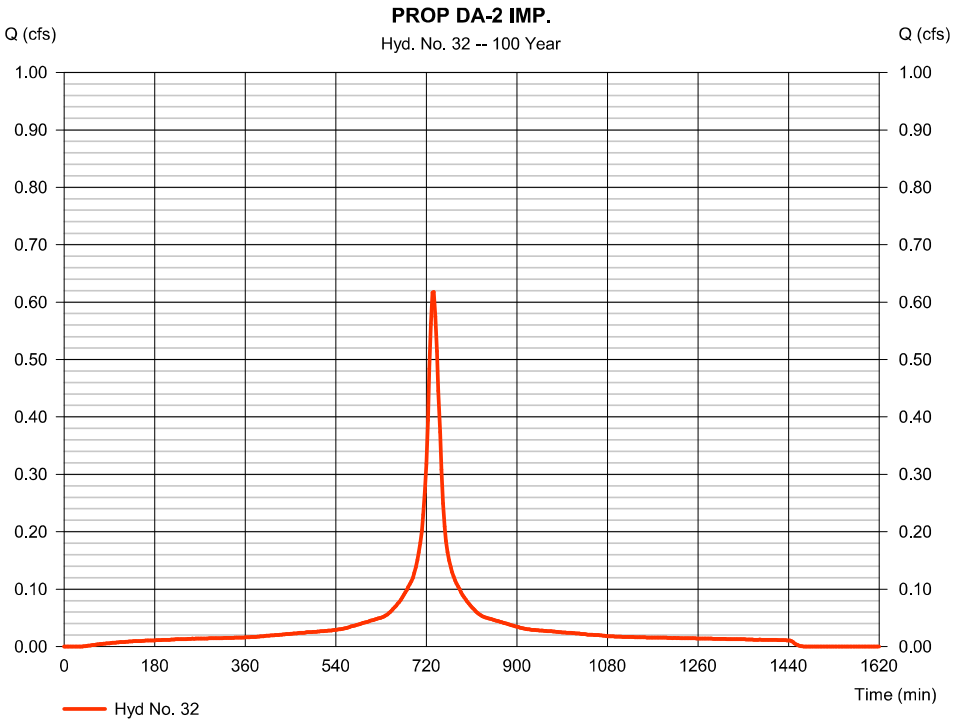
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 32

PROP DA-2 IMP.

Hydrograph type	= SCS Runoff	Peak discharge	= 0.617 cfs
Storm frequency	= 100 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 3,430 cuft
Drainage area	= 0.110 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.20 min
Total precip.	= 8.57 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Structural Engineering References\Stormwater	Shape factor	= 484



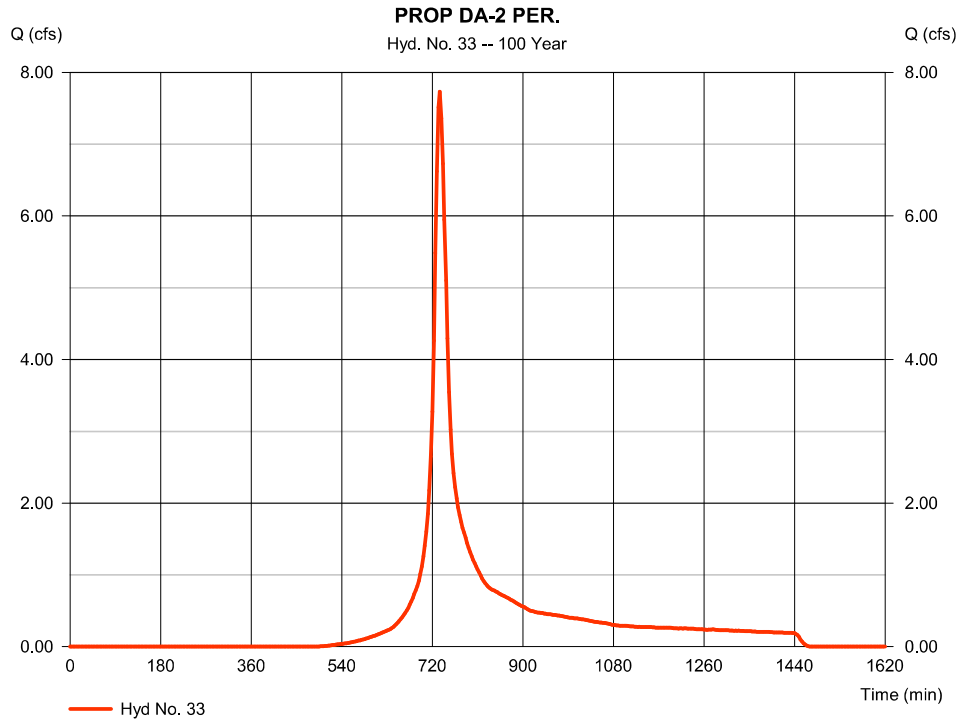
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 33

PROP DA-2 PER.

Hydrograph type	= SCS Runoff	Peak discharge	= 7.733 cfs
Storm frequency	= 100 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 36,672 cuft
Drainage area	= 2.310 ac	Curve number	= 64
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.20 min
Total precip.	= 8.57 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Structural Engineering References\Stormwater	Shape factor	= 484



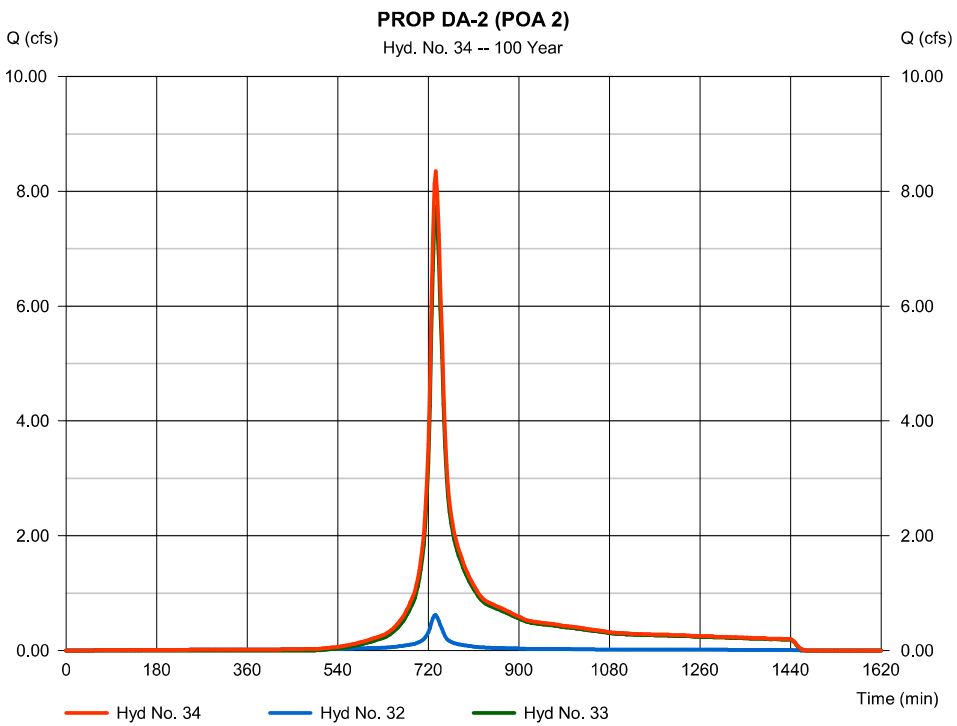
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 34

PROP DA-2 (POA 2)

Hydrograph type	= Combine	Peak discharge	= 8.351 cfs
Storm frequency	= 100 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 40,102 cuft
Inflow hyds.	= 32, 33	Contrib. drain. area	= 2.420 ac



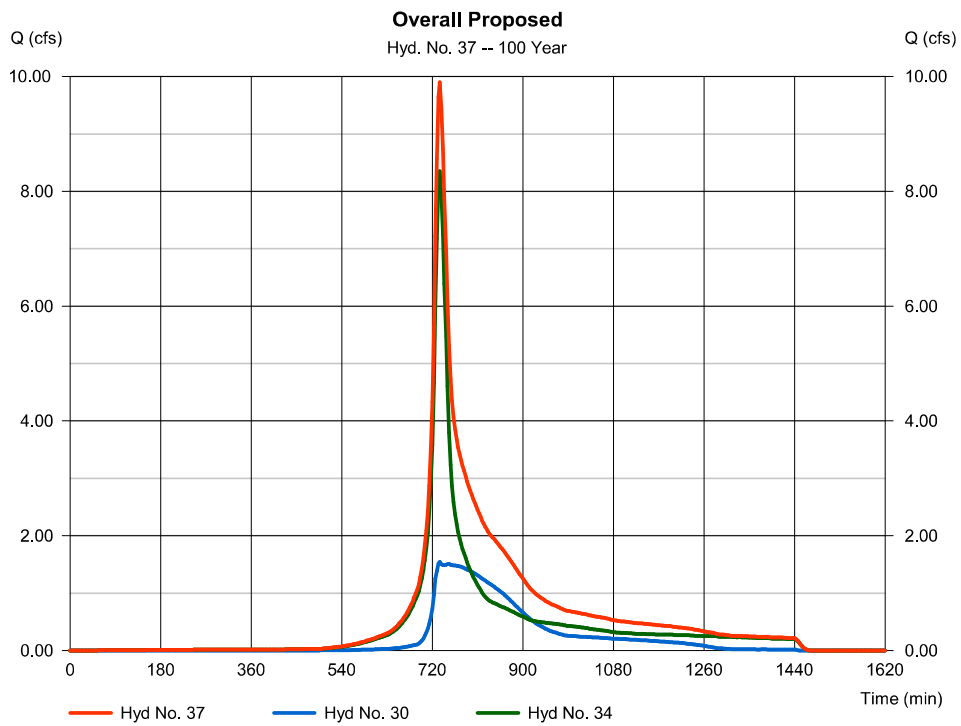
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Hyd. No. 37

Overall Proposed

Hydrograph type	= Combine	Peak discharge	= 9.897 cfs
Storm frequency	= 100 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 59,544 cuft
Inflow hyds.	= 30, 34	Contrib. drain. area	= 0.000 ac



Hydraflow Rainfall Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 31 / 2022

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	20.4657	3.8000	0.7101	------
2	24.4188	3.9000	0.7130	------
3	0.0000	0.0000	0.0000	------
5	29.1858	3.6000	0.7038	------
10	34.7403	3.7000	0.7099	------
25	41.4212	3.7000	0.7099	------
50	47.0297	3.7000	0.7122	------
100	51.4499	3.6000	0.7089	------

File name: Old Tappan.idf

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	4.37	3.17	2.55	2.16	1.88	1.68	1.52	1.40	1.29	1.21	1.13	1.07
2	5.14	3.74	3.00	2.54	2.22	1.98	1.79	1.65	1.52	1.42	1.34	1.26
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.42	4.65	3.73	3.15	2.76	2.46	2.23	2.05	1.90	1.77	1.66	1.57
10	7.48	5.42	4.34	3.67	3.21	2.86	2.59	2.38	2.20	2.05	1.93	1.82
25	8.92	6.46	5.18	4.38	3.82	3.41	3.09	2.84	2.63	2.45	2.30	2.17
50	10.07	7.29	5.84	4.93	4.31	3.84	3.48	3.19	2.95	2.76	2.59	2.44
100	11.19	8.09	6.48	5.47	4.78	4.26	3.86	3.54	3.28	3.06	2.87	2.71

Tc = time in minutes. Values may exceed 60.

PROJECTS\1423 Capitol Seniors Housing\99-006 Old Tappan\Design\Drainage\2021-04 Drainage\IDF\Old Tappan.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	3.47	0.00	0.00	5.44	6.67	0.00	8.57
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	1.25	3.47	0.00	0.00	5.44	6.67	0.00	8.57

HYDROGRAPH SUMMARY REPORTS –WATER QUALITY DESIGN STORM

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	0.016	3	108	32	-----	-----	-----	EX - DA 1 DET.
2	Reservoir	0.000	3	n/a	0	1	85.55	32.5	EXIST. DEPRESSION
4	SCS Runoff	0.018	3	111	39	-----	-----	-----	EX-DA 1 UNDET.
5	Combine	0.018	3	111	39	2, 4	-----	-----	EX-DA 1 (POA 1)
7	SCS Runoff	0.244	3	72	465	-----	-----	-----	EX-DA 2A IMP.
8	SCS Runoff	0.000	3	n/a	0	-----	-----	-----	EX-DA 2A PERV
9	Combine	0.244	3	72	465	7, 8	-----	-----	EX-DA 2A
11	SCS Runoff	0.012	3	111	18	-----	-----	-----	EX-DA 2B
13	Combine	0.244	3	72	483	9, 11,	-----	-----	EX-DA 2 (POA 2)
16	SCS Runoff	1.859	3	66	2,500	-----	-----	-----	PROP BUILDING
18	SCS Runoff	2.514	3	66	3,380	-----	-----	-----	PROP DA-1 IMP.
19	SCS Runoff	0.233	3	72	389	-----	-----	-----	PROP DA-1 PER
20	Combine	2.641	3	66	3,769	18, 19	-----	-----	PROP DA-1
22	Combine	4.501	3	66	6,269	16, 20,	-----	-----	BASIN 1
23	Reservoir	0.000	3	207	0	22	85.21	4,330	BASIN 1
25	SCS Runoff	0.004	3	105	8	-----	-----	-----	PROP DA-1 UNDET.
27	Combine	0.004	3	105	8	23, 25,	-----	-----	PROP (POA 1)
29	SCS Runoff	0.223	3	72	426	-----	-----	-----	PROP DA-2 IMP.
30	SCS Runoff	0.014	3	114	23	-----	-----	-----	PROP DA-2 PER.
31	Combine	0.223	3	72	449	29, 30	-----	-----	PROP DA-2 (POA 2)
33	SCS Runoff	0.236	1	22	106	-----	-----	-----	FIL-IMP
34	SCS Runoff	0.002	1	35	1	-----	-----	-----	FIL-PER
35	Combine	0.236	1	22	107	33, 34	-----	-----	FILT

CSH-Old Tappan - WQ Design Storm.gpw	Return Period: 1 Year	Tuesday, 03 / 29 / 2022

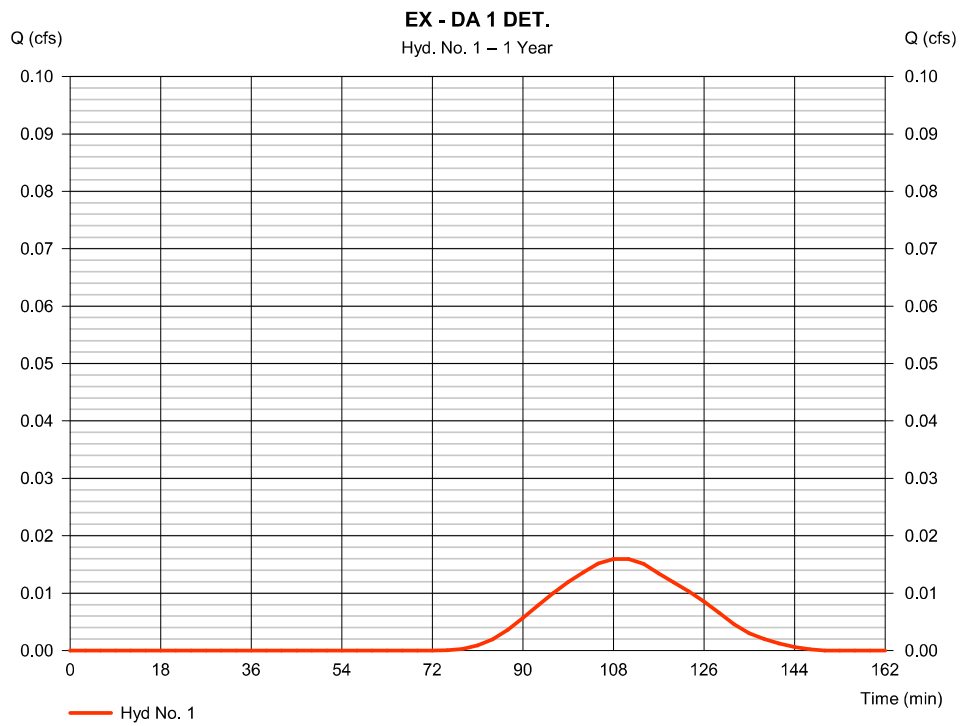
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 03 / 29 / 2022

Hyd. No. 1

EX - DA 1 DET.

Hydrograph type	= SCS Runoff	Peak discharge	= 0.016 cfs
Storm frequency	= 1 yrs	Time to peak	= 108 min
Time interval	= 3 min	Hyd. volume	= 32 cuft
Drainage area	= 0.970 ac	Curve number	= 66
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 16.60 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Structural Engineering References\Stormwater	Shape factor	= 484



Hydrograph Report

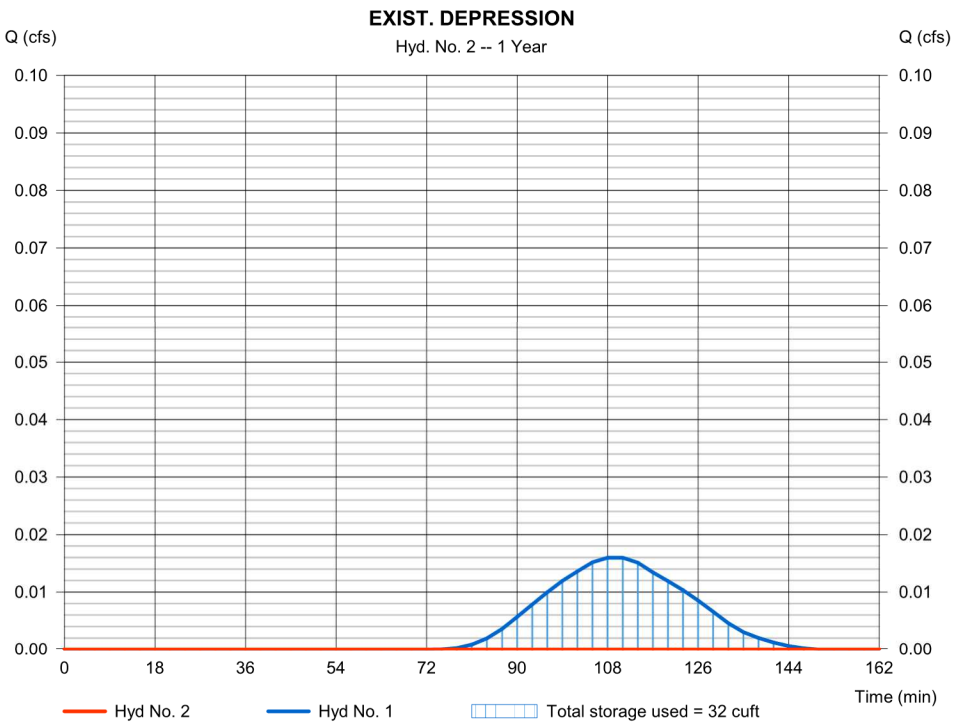
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Tuesday, 03 / 29 / 2022

Hyd. No. 2

EXIST. DEPRESSION

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 3 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 1 - EX - DA 1 DET.	Max. Elevation	= 85.55 ft
Reservoir name	= Exist. Depression	Max. Storage	= 32 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Tuesday, 03 / 29 / 2022

Pond No. 1 - Exist. Depression

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 85.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	85.50	00	0	0
0.50	86.00	3,218	536	536
1.50	87.00	5,730	4,414	4,950
2.50	88.00	9,392	7,485	12,435

Culvert / Orifice Structures

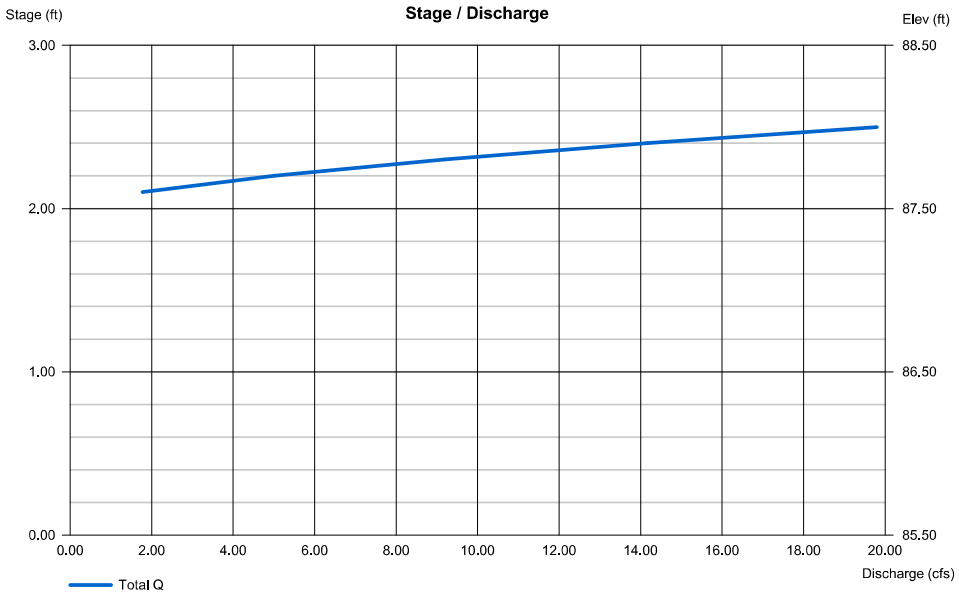
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 6.00	0.00	0.00	0.00
Span (in)	= 80.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 87.50	0.00	0.00	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 3.50	0.00	0.00	n/a
N-Value	= .030	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.00	0.00	0.00	0.00
Crest El. (ft)	= 87.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)
TW Elev. (ft) = 0.00

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



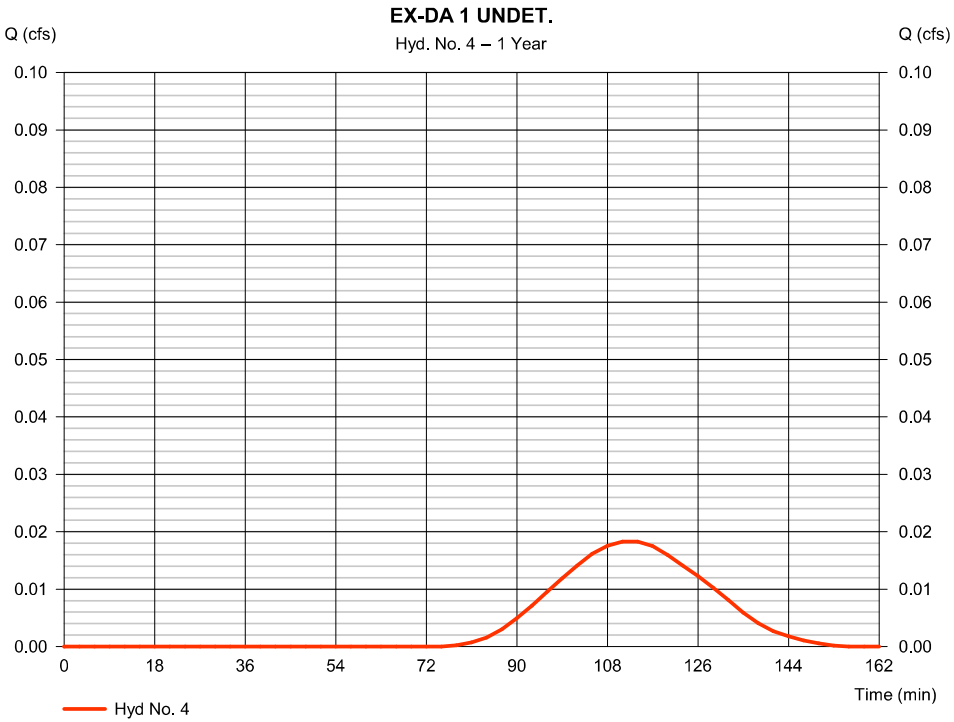
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 03 / 29 / 2022

Hyd. No. 4

EX-DA 1 UNDET.

Hydrograph type	= SCS Runoff	Peak discharge	= 0.018 cfs
Storm frequency	= 1 yrs	Time to peak	= 111 min
Time interval	= 3 min	Hyd. volume	= 39 cuft
Drainage area	= 1.240 ac	Curve number	= 66
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 22.20 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Central Engineering References\Stormwater	Shape factor	= 484



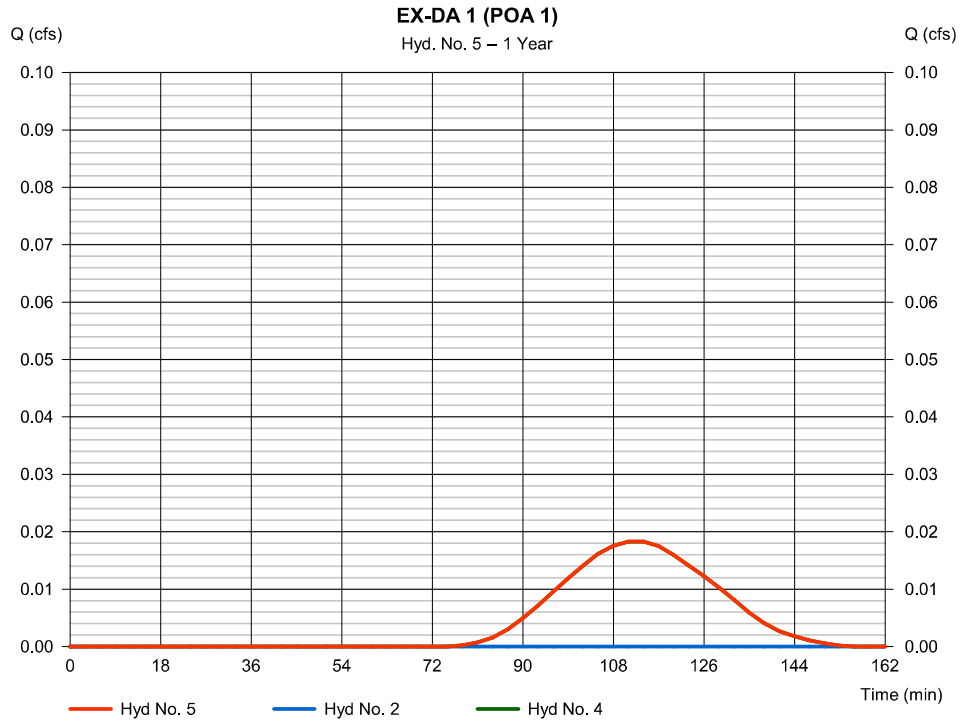
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 03 / 29 / 2022

Hyd. No. 5

EX-DA 1 (POA 1)

Hydrograph type	= Combine	Peak discharge	= 0.018 cfs
Storm frequency	= 1 yrs	Time to peak	= 111 min
Time interval	= 3 min	Hyd. volume	= 39 cuft
Inflow hyds.	= 2, 4	Contrib. drain. area	= 1.240 ac



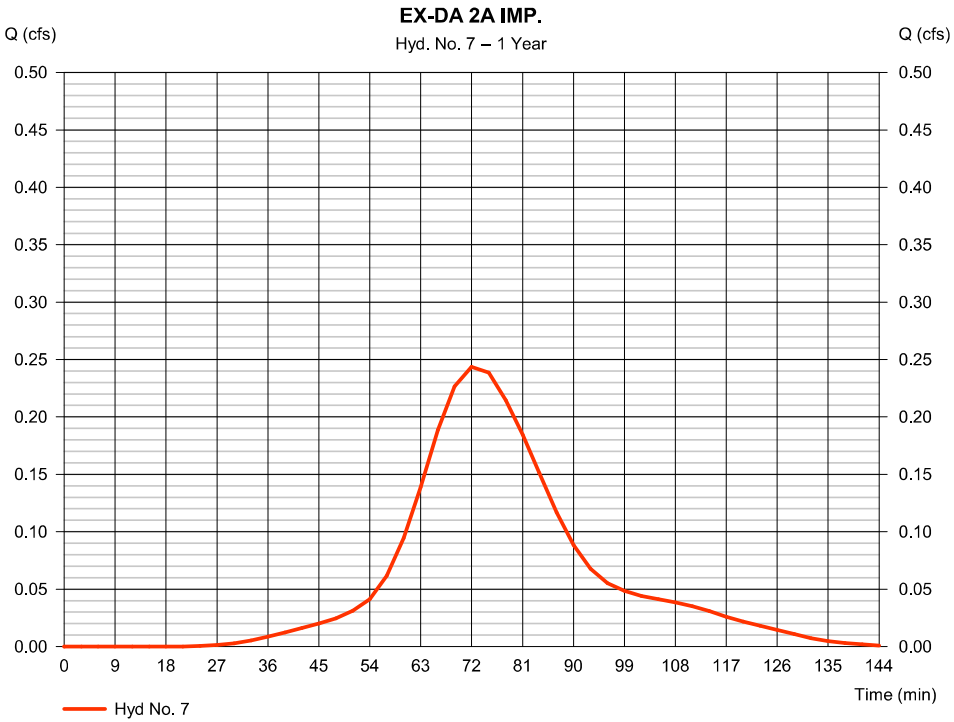
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 03 / 29 / 2022

Hyd. No. 7

EX-DA 2A IMP.

Hydrograph type	= SCS Runoff	Peak discharge	= 0.244 cfs
Storm frequency	= 1 yrs	Time to peak	= 72 min
Time interval	= 3 min	Hyd. volume	= 465 cuft
Drainage area	= 0.120 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 18.00 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Structural Engineering References\Stormwater	Shape factor	= 484



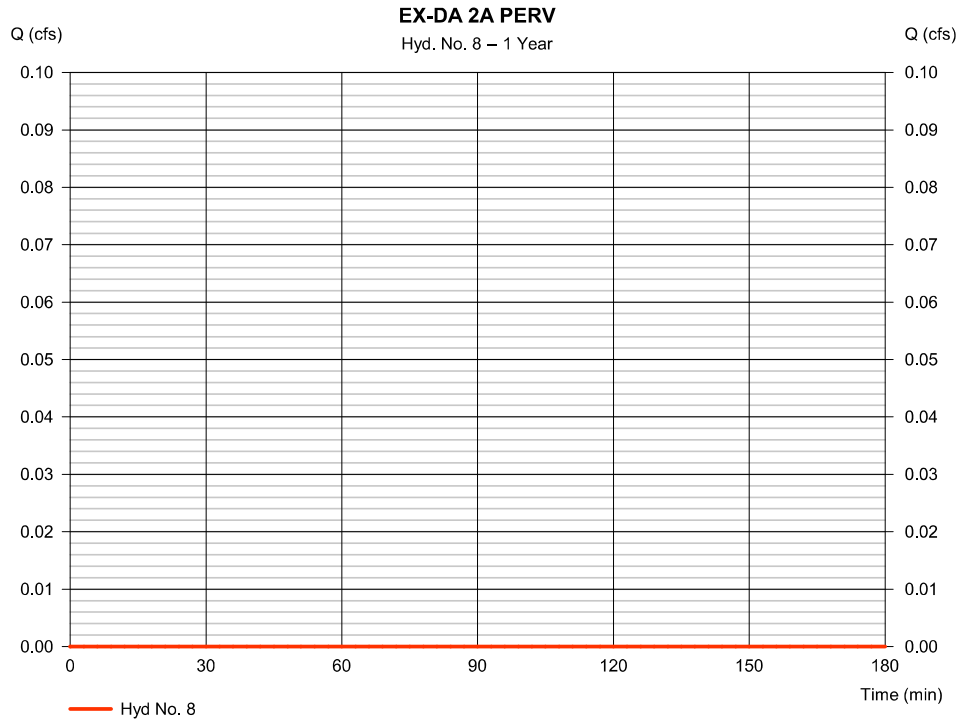
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 03 / 29 / 2022

Hyd. No. 8

EX-DA 2A PERV

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 3 min	Hyd. volume	= 0 cuft
Drainage area	= 1.280 ac	Curve number	= 57
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 18.00 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Structural Engineering References\Stormwater	Shape factor	= 484



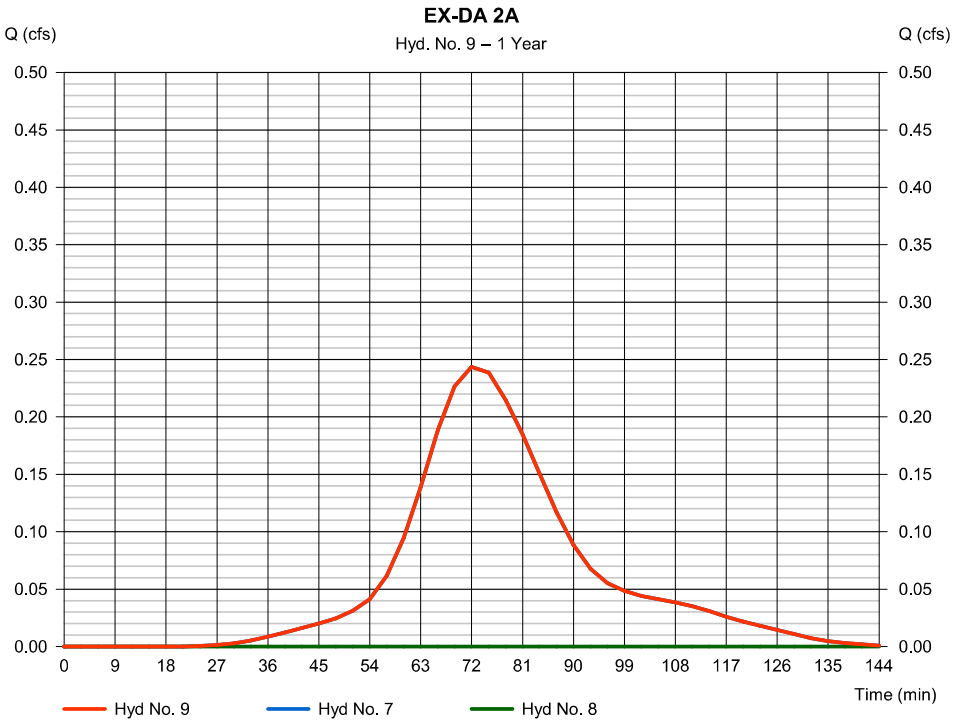
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 03 / 29 / 2022

Hyd. No. 9

EX-DA 2A

Hydrograph type	= Combine	Peak discharge	= 0.244 cfs
Storm frequency	= 1 yrs	Time to peak	= 72 min
Time interval	= 3 min	Hyd. volume	= 465 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 1.400 ac



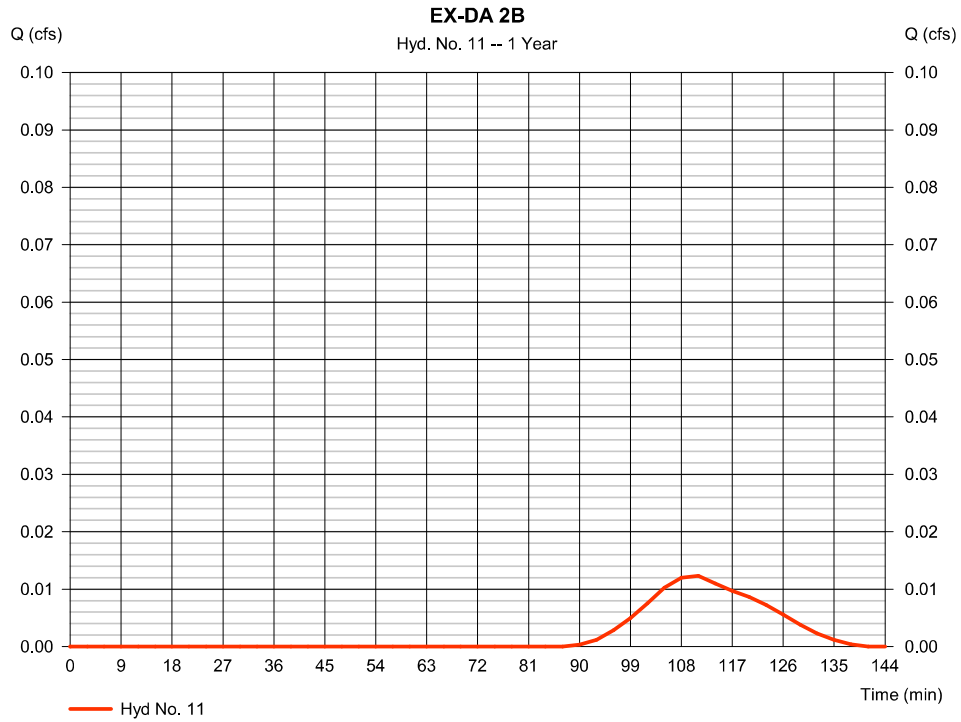
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 03 / 29 / 2022

Hyd. No. 11

EX-DA 2B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.012 cfs
Storm frequency	= 1 yrs	Time to peak	= 111 min
Time interval	= 3 min	Hyd. volume	= 18 cuft
Drainage area	= 1.850 ac	Curve number	= 64
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 13.80 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Structural Engineering References\Stormwater	Shape factor	= 484



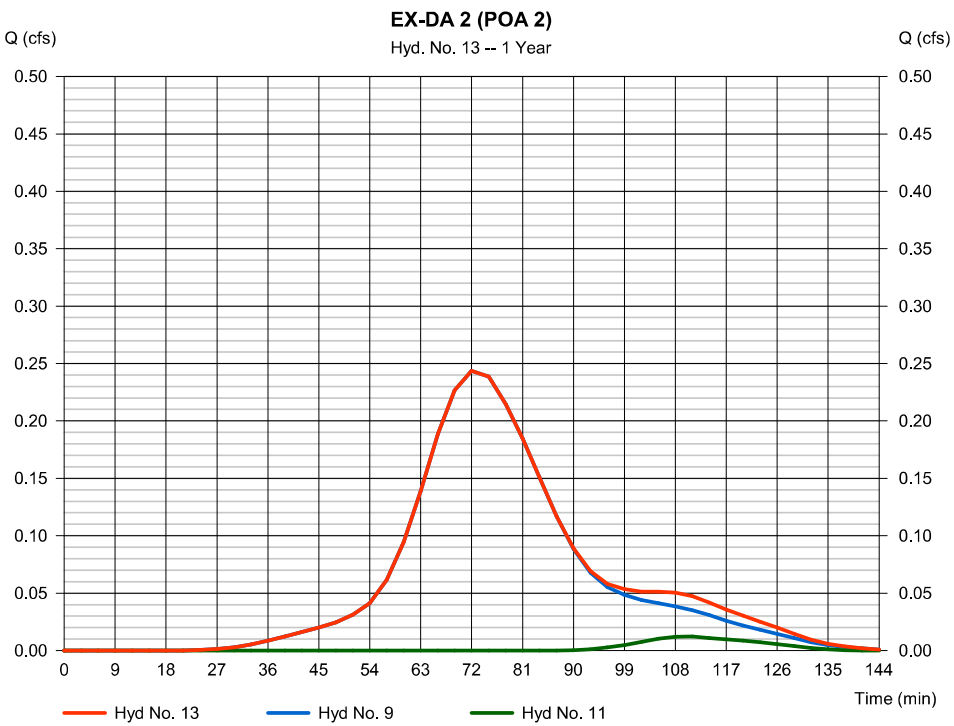
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 03 / 29 / 2022

Hyd. No. 13

EX-DA 2 (POA 2)

Hydrograph type	= Combine	Peak discharge	= 0.244 cfs
Storm frequency	= 1 yrs	Time to peak	= 72 min
Time interval	= 3 min	Hyd. volume	= 483 cuft
Inflow hyds.	= 9, 11	Contrib. drain. area	= 1.850 ac



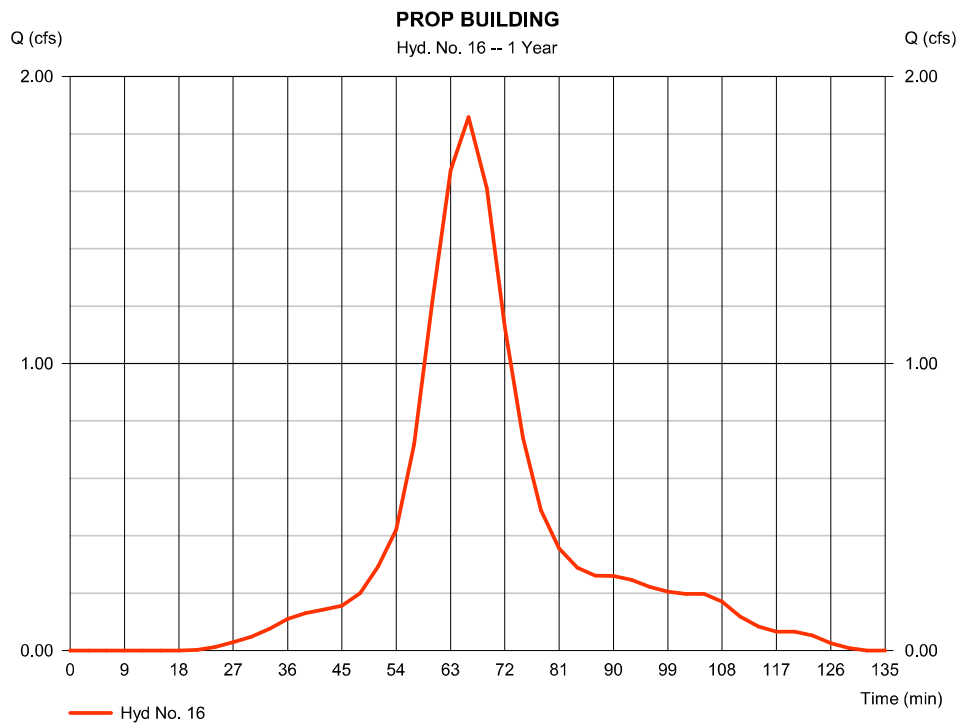
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 03 / 29 / 2022

Hyd. No. 16

PROP BUILDING

Hydrograph type	= SCS Runoff	Peak discharge	= 1.859 cfs
Storm frequency	= 1 yrs	Time to peak	= 66 min
Time interval	= 3 min	Hyd. volume	= 2,500 cuft
Drainage area	= 0.710 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Structural Engineering References\Stormwater	Shape factor	= 484



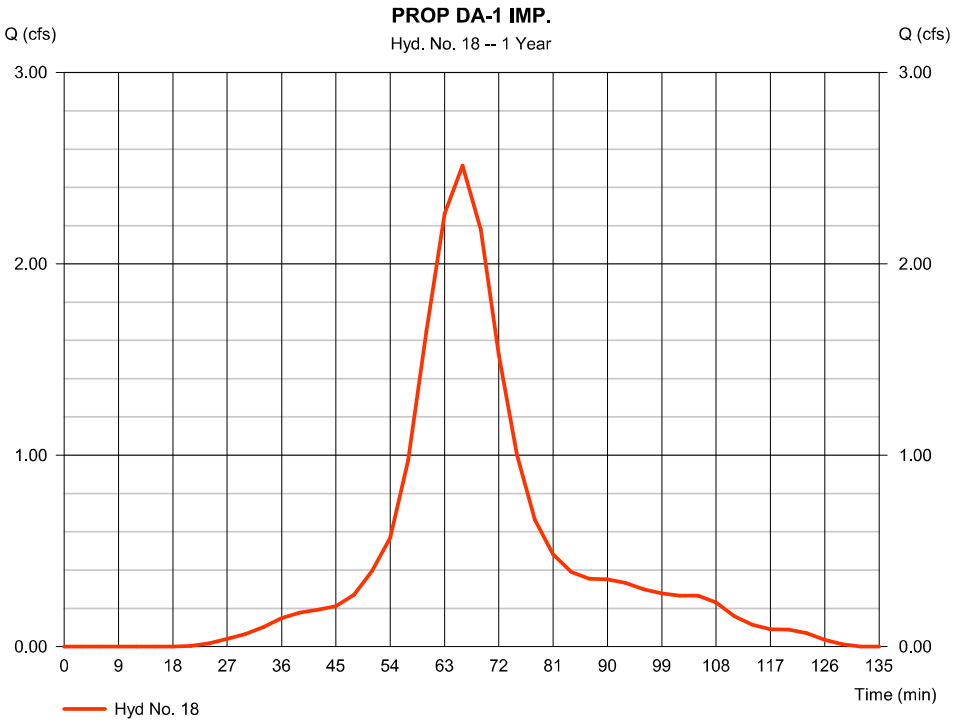
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 03 / 29 / 2022

Hyd. No. 18

PROP DA-1 IMP.

Hydrograph type	= SCS Runoff	Peak discharge	= 2.514 cfs
Storm frequency	= 1 yrs	Time to peak	= 66 min
Time interval	= 3 min	Hyd. volume	= 3,380 cuft
Drainage area	= 0.960 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Structural Engineering References\Stormwater	Shape factor	= 484



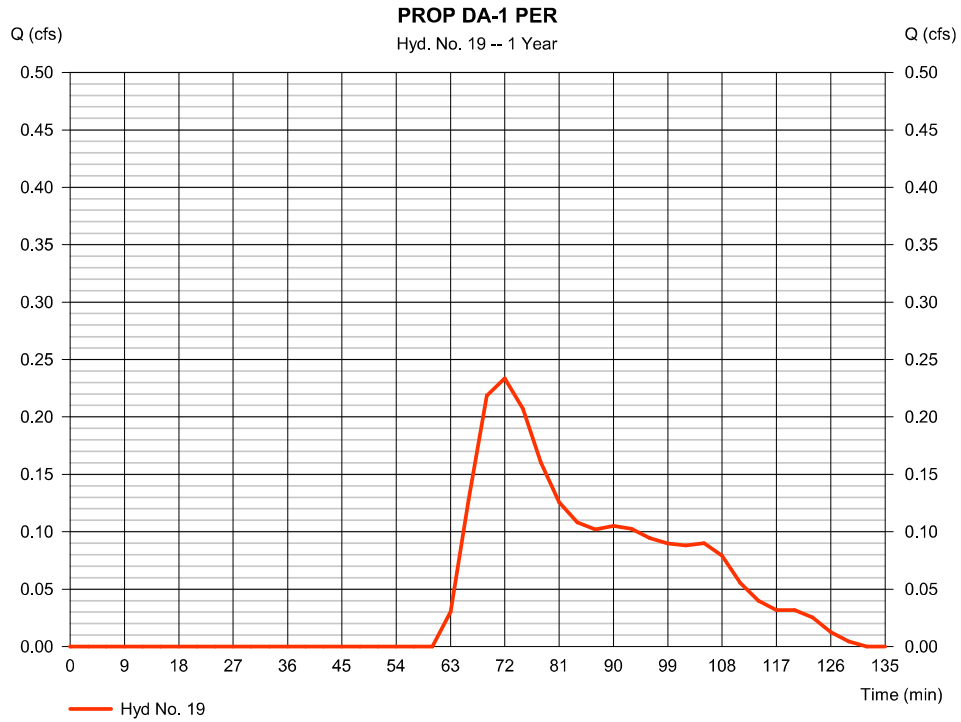
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 03 / 29 / 2022

Hyd. No. 19

PROP DA-1 PER

Hydrograph type	= SCS Runoff	Peak discharge	= 0.233 cfs
Storm frequency	= 1 yrs	Time to peak	= 72 min
Time interval	= 3 min	Hyd. volume	= 389 cuft
Drainage area	= 1.130 ac	Curve number	= 76
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Structural Engineering References\Stormwater	Shape factor	= 484



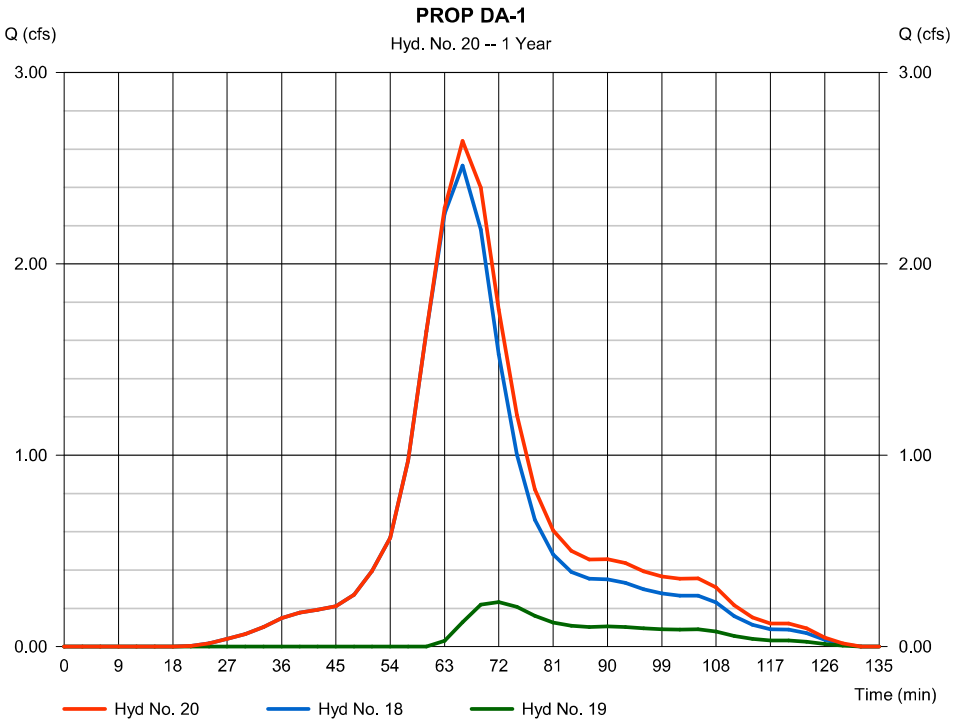
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 03 / 29 / 2022

Hyd. No. 20

PROP DA-1

Hydrograph type	= Combine	Peak discharge	= 2.641 cfs
Storm frequency	= 1 yrs	Time to peak	= 66 min
Time interval	= 3 min	Hyd. volume	= 3,769 cuft
Inflow hyds.	= 18, 19	Contrib. drain. area	= 2.090 ac



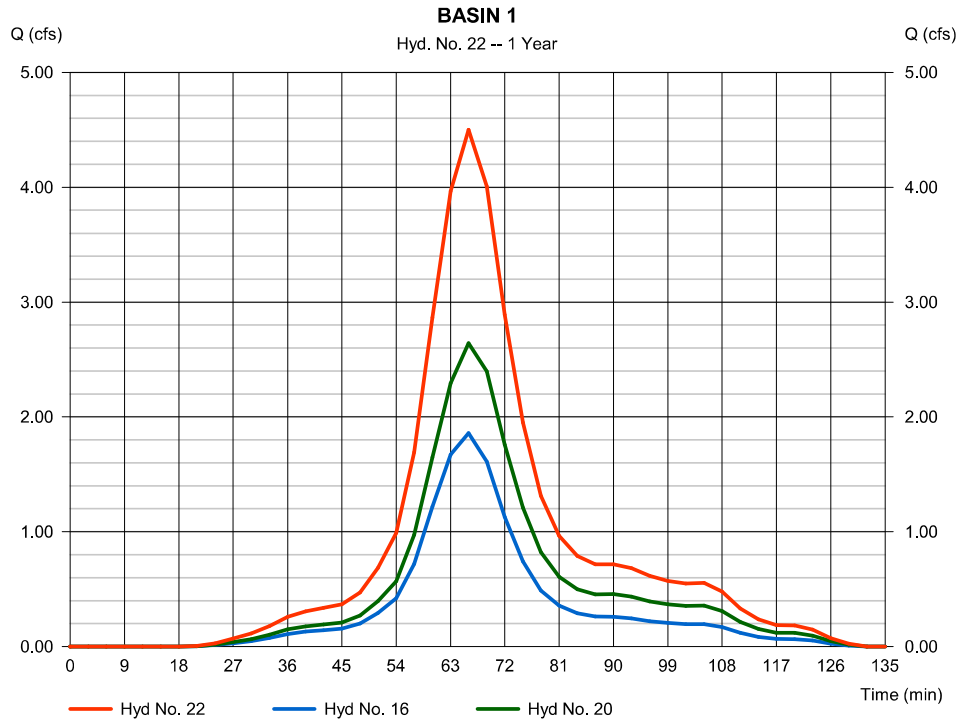
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 03 / 29 / 2022

Hyd. No. 22

BASIN 1

Hydrograph type	= Combine	Peak discharge	= 4.501 cfs
Storm frequency	= 1 yrs	Time to peak	= 66 min
Time interval	= 3 min	Hyd. volume	= 6,269 cuft
Inflow hyds.	= 16, 20	Contrib. drain. area	= 0.710 ac



Hydrograph Report

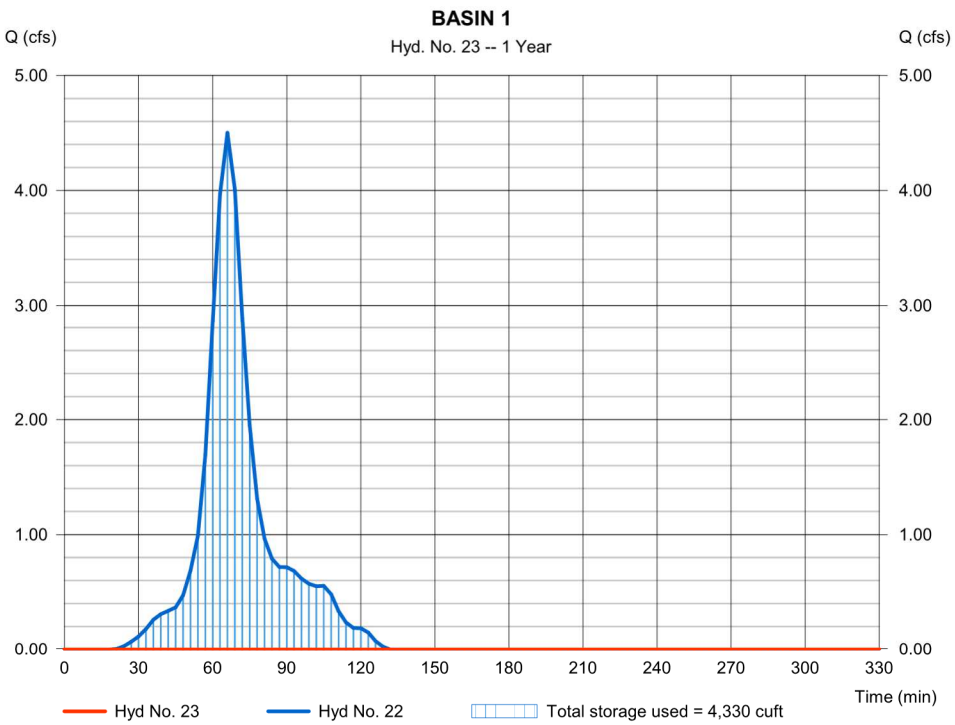
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Tuesday, 03 / 29 / 2022

Hyd. No. 23

BASIN 1

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= 207 min
Time interval	= 3 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 22 - BASIN 1	Max. Elevation	= 85.21 ft
Reservoir name	= Pond 1	Max. Storage	= 4,330 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Tuesday, 03 / 29 / 2022

Pond No. 3 - Pond 1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 84.25 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	84.25	1,523	0	0
0.75	85.00	6,061	2,655	2,655
1.75	86.00	9,856	7,881	10,537
2.75	87.00	10,648	10,248	20,785
3.75	88.00	11,477	11,059	31,844
4.75	89.00	12,333	11,901	43,745
5.75	90.00	13,295	12,810	56,555

Culvert / Orifice Structures

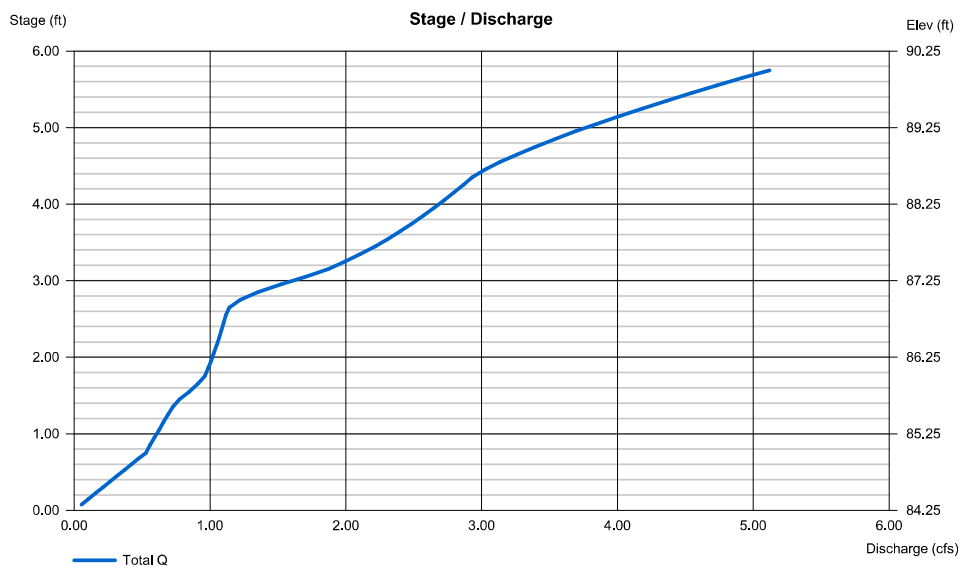
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	2.75	7.00	0.00
Span (in)	= 15.00	2.75	7.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 82.61	85.60	86.85	0.00
Length (ft)	= 38.00	0.50	0.50	0.00
Slope (%)	= 0.30	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	Yes

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.25	Inactive	Inactive	Inactive
Crest El. (ft)	= 88.60	89.70	94.50	94.50
Weir Coeff.	= 3.33	2.61	3.33	3.33
Weir Type	= Rect	Rect	Rect	Rect
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 3.750 (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).



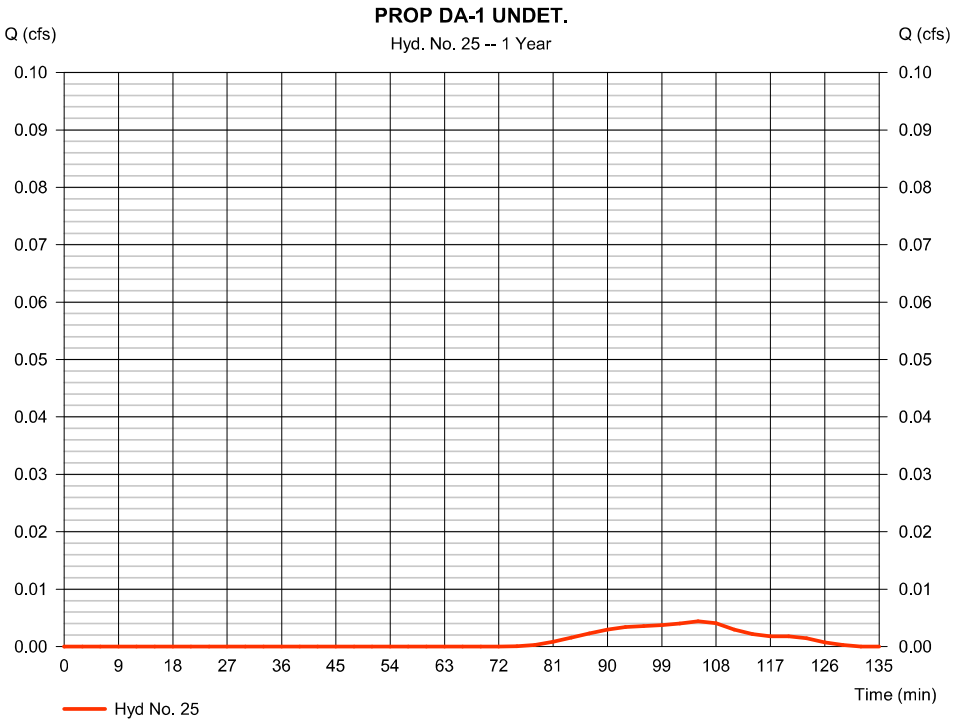
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 03 / 29 / 2022

Hyd. No. 25

PROP DA-1 UNDET.

Hydrograph type	= SCS Runoff	Peak discharge	= 0.004 cfs
Storm frequency	= 1 yrs	Time to peak	= 105 min
Time interval	= 3 min	Hyd. volume	= 8 cuft
Drainage area	= 0.250 ac	Curve number	= 66
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Central Engineering References\Stormwater	Shape factor	= 484



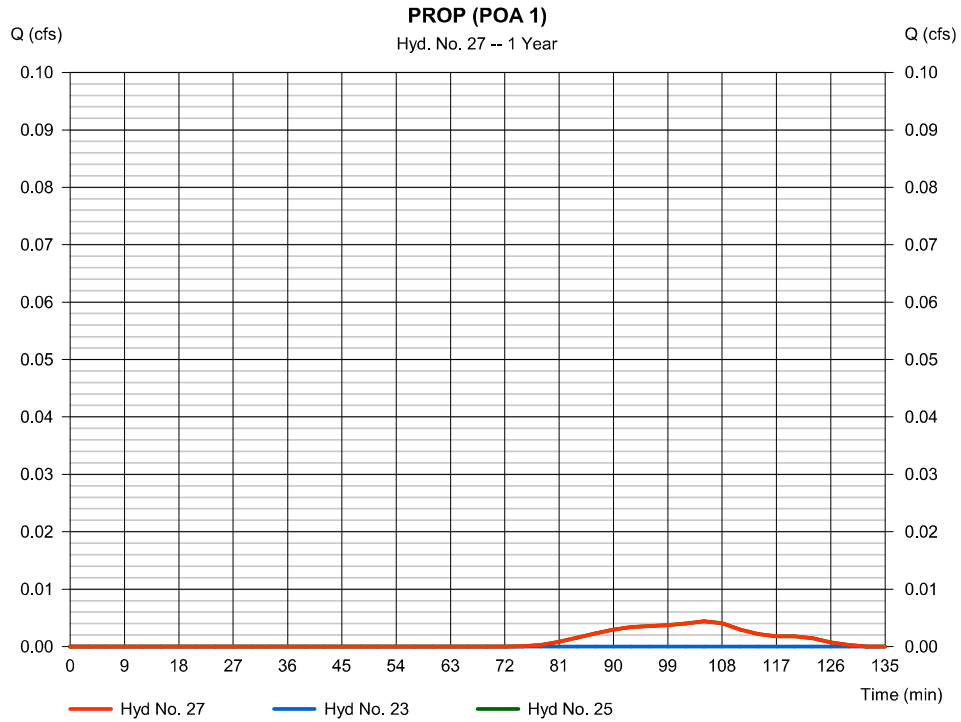
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 03 / 29 / 2022

Hyd. No. 27

PROP (POA 1)

Hydrograph type	= Combine	Peak discharge	= 0.004 cfs
Storm frequency	= 1 yrs	Time to peak	= 105 min
Time interval	= 3 min	Hyd. volume	= 8 cuft
Inflow hyds.	= 23, 25	Contrib. drain. area	= 0.250 ac



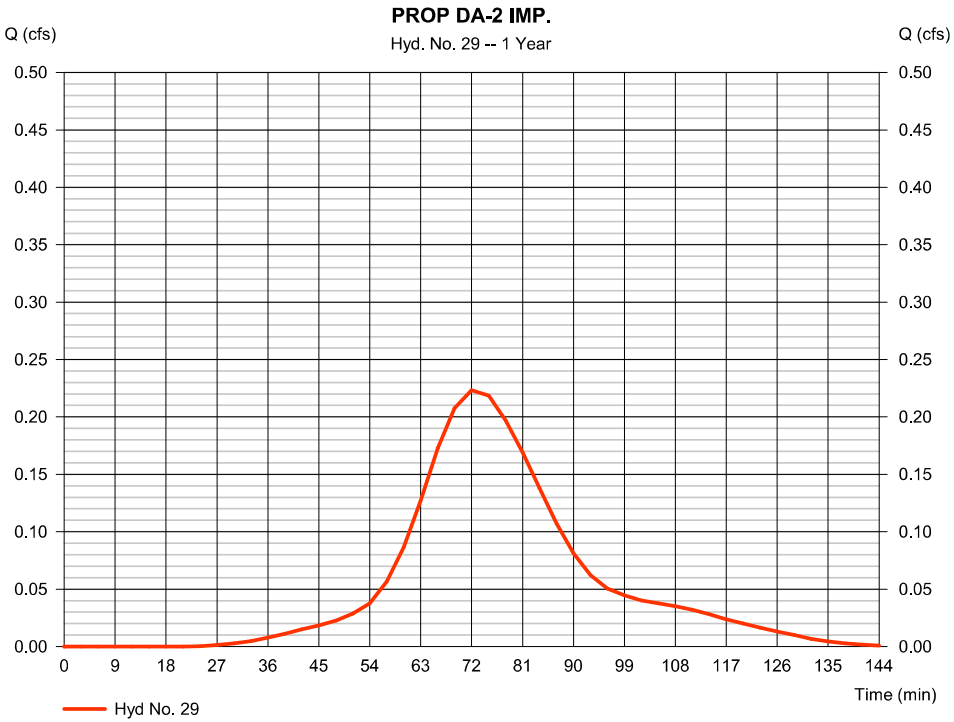
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 03 / 29 / 2022

Hyd. No. 29

PROP DA-2 IMP.

Hydrograph type	= SCS Runoff	Peak discharge	= 0.223 cfs
Storm frequency	= 1 yrs	Time to peak	= 72 min
Time interval	= 3 min	Hyd. volume	= 426 cuft
Drainage area	= 0.110 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.20 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Structural Engineering References\Stormwater	Shape factor	= 484



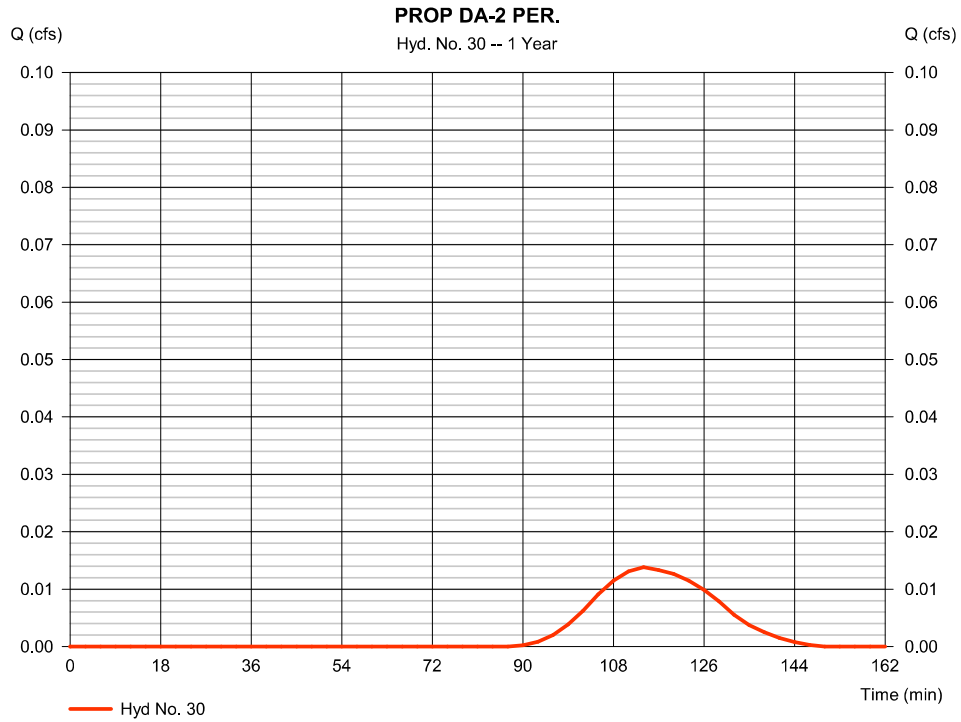
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 03 / 29 / 2022

Hyd. No. 30

PROP DA-2 PER.

Hydrograph type	= SCS Runoff	Peak discharge	= 0.014 cfs
Storm frequency	= 1 yrs	Time to peak	= 114 min
Time interval	= 3 min	Hyd. volume	= 23 cuft
Drainage area	= 2.310 ac	Curve number	= 64
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.20 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Structural Engineering References\Stormwater	Shape factor	= 484



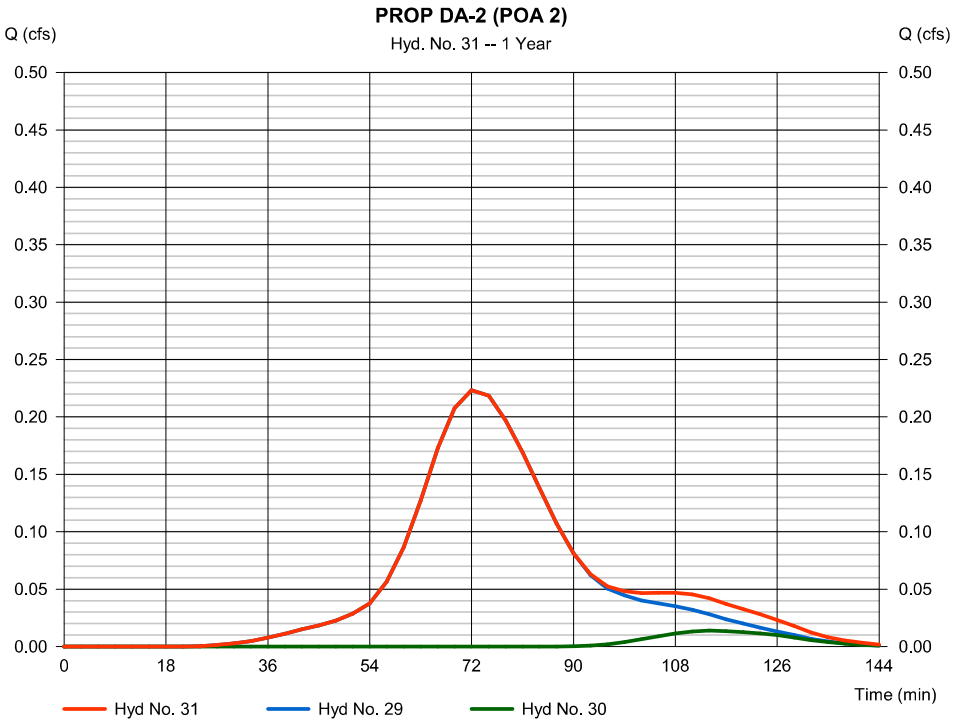
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 03 / 29 / 2022

Hyd. No. 31

PROP DA-2 (POA 2)

Hydrograph type	= Combine	Peak discharge	= 0.223 cfs
Storm frequency	= 1 yrs	Time to peak	= 72 min
Time interval	= 3 min	Hyd. volume	= 449 cuft
Inflow hyds.	= 29, 30	Contrib. drain. area	= 2.420 ac



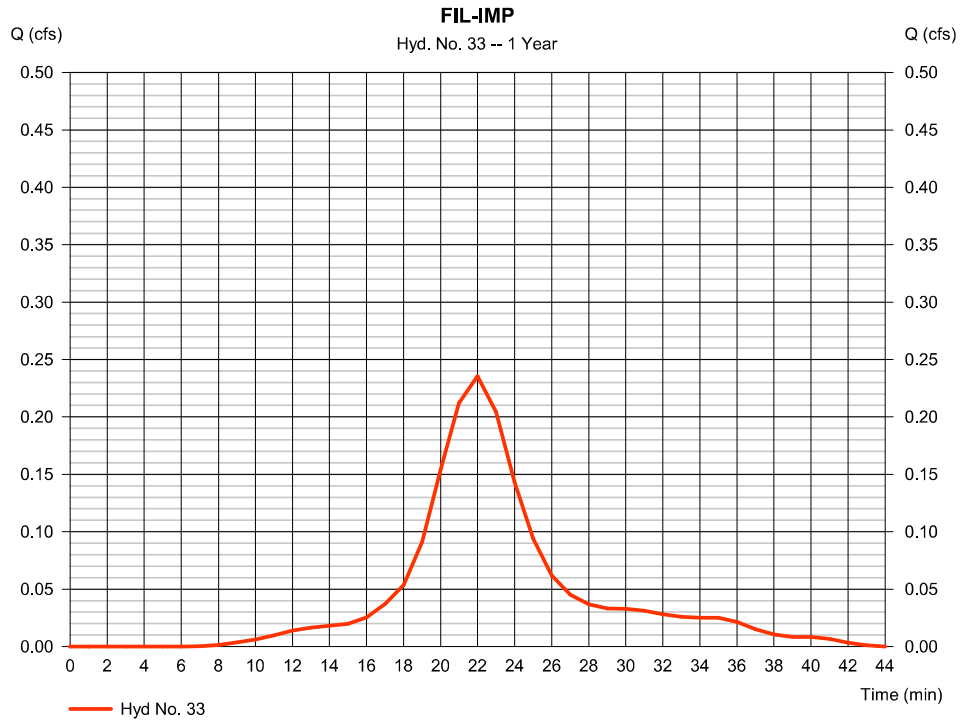
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 03 / 29 / 2022

Hyd. No. 33

FIL-IMP

Hydrograph type	= SCS Runoff	Peak discharge	= 0.236 cfs
Storm frequency	= 1 yrs	Time to peak	= 22 min
Time interval	= 1 min	Hyd. volume	= 106 cuft
Drainage area	= 0.030 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 2.00 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Structural Engineering References\Stormwater	Shape factor	= 484



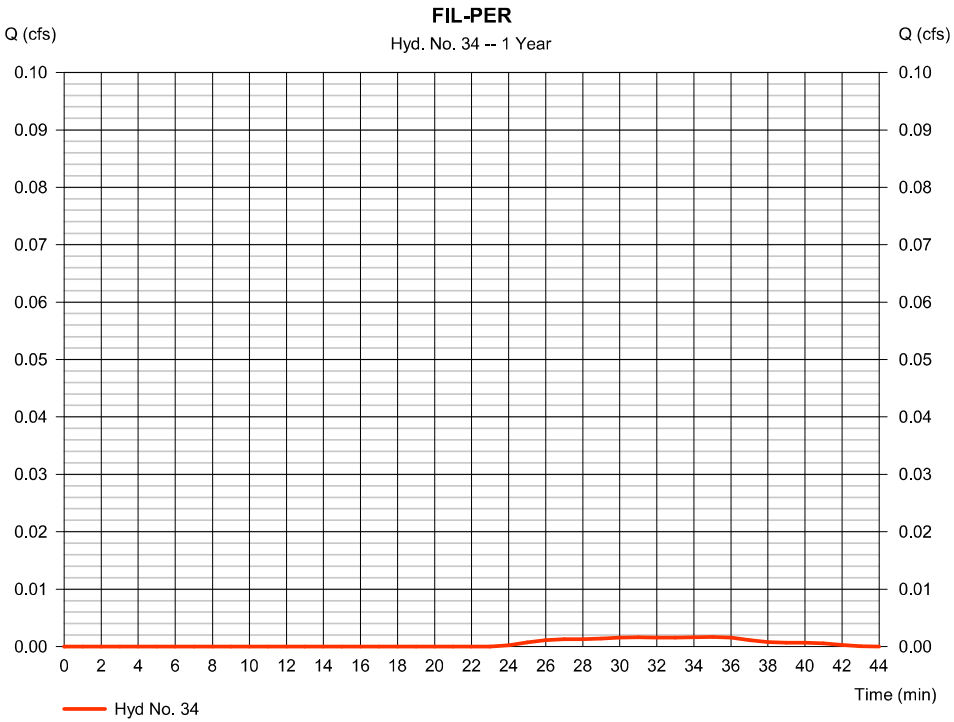
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 03 / 29 / 2022

Hyd. No. 34

FIL-PER

Hydrograph type	= SCS Runoff	Peak discharge	= 0.002 cfs
Storm frequency	= 1 yrs	Time to peak	= 35 min
Time interval	= 1 min	Hyd. volume	= 1 cuft
Drainage area	= 0.020 ac	Curve number	= 68
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 2.00 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= P:\Engineering Reference Materials\Structural Engineering References\Stormwater	Shape factor	= 484



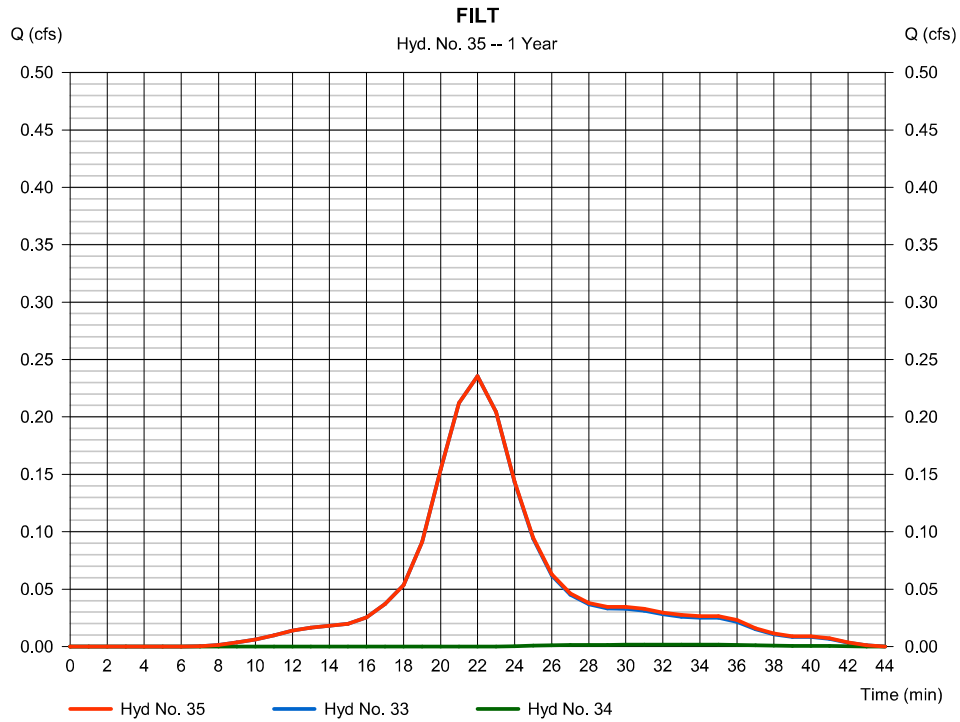
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 03 / 29 / 2022

Hyd. No. 35

FILT

Hydrograph type	= Combine	Peak discharge	= 0.236 cfs
Storm frequency	= 1 yrs	Time to peak	= 22 min
Time interval	= 1 min	Hyd. volume	= 107 cuft
Inflow hyds.	= 33, 34	Contrib. drain. area	= 0.050 ac



Hydraflow Rainfall Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 03 / 29 / 2022

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	20.4657	3.8000	0.7101	------
2	24.4188	3.9000	0.7130	------
3	0.0000	0.0000	0.0000	------
5	29.1858	3.6000	0.7038	------
10	34.7403	3.7000	0.7099	------
25	41.4212	3.7000	0.7099	------
50	47.0297	3.7000	0.7122	------
100	51.4499	3.6000	0.7089	------

File name: Old Tappan.idf

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	4.37	3.17	2.55	2.16	1.88	1.68	1.52	1.40	1.29	1.21	1.13	1.07
2	5.14	3.74	3.00	2.54	2.22	1.98	1.79	1.65	1.52	1.42	1.34	1.26
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.42	4.65	3.73	3.15	2.76	2.46	2.23	2.05	1.90	1.77	1.66	1.57
10	7.48	5.42	4.34	3.67	3.21	2.86	2.59	2.38	2.20	2.05	1.93	1.82
25	8.92	6.46	5.18	4.38	3.82	3.41	3.09	2.84	2.63	2.45	2.30	2.17
50	10.07	7.29	5.84	4.93	4.31	3.84	3.48	3.19	2.95	2.76	2.59	2.44
100	11.19	8.09	6.48	5.47	4.78	4.26	3.86	3.54	3.28	3.06	2.87	2.71

Tc = time in minutes. Values may exceed 60.

General Engineering References\Stormwater Management\- New Jersey\Design Storms\Hydraflow\Bergen County.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	3.34	0.00	0.00	5.07	6.28	0.00	8.47
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	1.25	3.34	0.00	0.00	5.07	6.28	0.00	8.47

GROUNDWATER RECHARGE SPREADSHEET

New Jersey Groundwater Recharge Spreadsheet
Version 2.0
November 2003

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
BERGEN CO., OLD TAPPAN BORO	49.2	1.59

Project Name:	CSH Old Tappan
Description:	Proposed Assisted Living
Analysis Date:	05/04/21

Pre-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	0.12	Impervious areas	Dunellen	0.0	-
2	0.5	Open space	Dunellen	16.4	29,739
3	0.77	Woods	Dunellen	16.7	46,704
4	4.08	Woods	Riverhead	16.7	247,620
5					
6					
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	5.5			Total Annual Recharge (in)	Total Annual Recharge (cu-ft)
				16.3	324,062

Post-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	1.88	Impervious areas	Riverhead	0.0	-
2	0.59	Open space	Dunellen	16.4	35,092
3	0.11	Woods	Dunellen	16.7	6,672
4	0.94	Open space	Riverhead	16.4	55,910
5	1.95	Woods	Riverhead	16.7	118,348
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	5.5			Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
				10.9	216,022

Annual Recharge Requirements Calculation ↓

% of Pre-Developed Annual Recharge to Preserve =	100%	Total Impervious Area (sq.ft)	81,893
Post-Development Annual Recharge Deficit=	***108,041***	(cubic feet)	

Recharge Efficiency Parameters Calculations (area averages)

RWC=	4.41	(in)	DRWC=	4.41	(in)
ERWC =	0.90	(in)	EDRWC=	0.90	(in)

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

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

Project Name	Description	Analysis Date	BMP or LID Type
CSH Old Tappan	Proposed Assisted Living	05/04/21	Basin 1

Recharge BMP Input Parameters

Parameter	Symbol	Value	Unit
BMP Area	ABMP	1377.2	sq.ft
BMP Effective Depth, this is the design variable	dBMP	16.2	in
Upper level of the BMP surface (negative if above ground)	dBMPu	-16.2	in
Depth of lower surface of BMP, must be>=dBMPu	dEXC	0.0	in
Post-development Land Segment Location of BMP , Input Zero if Location is distributed or undetermined	SegBMP	4	unitless

Root Zone Water capacity Calculated Parameters

Parameter	Symbol	Value	Unit
Empty Portion of RWC under Post-D Natural Recharge	ERWC	0.87	in
ERWC Modified to consider dEXC	EDRWC	0.87	in
Empty Portion of RWC under Infilt. BMP	RERWC	0.68	in

Recharge Design Parameters

Parameter	Symbol	Value	Unit
Inches of Runoff to capture	Qdesign	0.28	in
Inches of Rainfall to capture	Pdesign	0.37	in
Recharge Provided Avg. over Imp. Area		15.8	in
Runoff Captured Avg. over imp. Area		16.7	in

BMP Calculated Size Parameters

ABMP/Aimp	Aratio	0.02	unitless
BMP Volume	VBMP	1,859	cu.ft

CALCULATION CHECK MESSAGES

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

Parameters from Annual Recharge Worksheet

Post-D Deficit Recharge (or desired recharge volume)	Vdef	108,041	cu.ft
Post-D Impervious Area (or target Impervious Area)	Aimp	81,893	sq.ft
Root Zone Water Capacity	RWC	4.24	in
RWC Modified to consider dEXC	DRWC	4.24	in
Climatic Factor	C-factor	1.59	no units
Average Annual P	Pavg	49.2	in
Recharge Requirement over Imp. Area	dr	15.8	in

System Performance Calculated Parameters

Annual BMP Recharge Volume		108,041	cu.ft
Avg BMP Recharge Efficiency		94.6%	Represents % Infiltration Recharged
%Rainfall became Runoff		78.5%	%
%Runoff Infiltrated		43.3%	%
%Runoff Recharged		41.0%	%
%Rainfall Recharged		32.2%	%

OTHER NOTES

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

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

SAND FILTER CALCULATIONS

Sand Filter Sizing Calculations

Project:	CSH Old Tappan	Calctulated By:	DRL
Municipality:	Old Tappan	Checked By:	DTS
Job #:	1423-99-006	Date:	3/23/2022

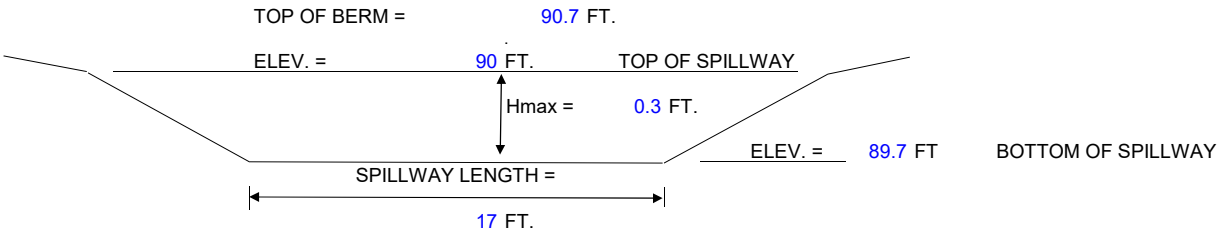
Basin 1

Design Storm Analyzed:	1-Year Water Quality
Tributary Drainage Area (AC):	2.44
Water Quality Design Storm Runoff Volume (CFS):	6,269
Required Forebay Storage - Total (cu ft):	627
Proposed Forebay Volume - Total (cu ft):	840
Proposed Sand Filter Storage Depth (ft):	1.35
2' Max Storage Depth for WQDS	
Min. Sand Surface Area per GWR Spreadsheet (SF):	1,377
Proposed Sand Filter Surface Area (SF):	4,170
Drain Time = (WQDS Volume)/(Sand Surface Area)(Sand Permeability)	< 36 Hours
Proposed Drain Time:	9.0 <36 Hours

EMERGENCY SPILLWAY CALCULATIONS

EMERGENCY SPILLWAY CALCULATIONS

Detention/Infiltration Basin



- **Spillway Capacity:**

Spillway calculation based on weir equation: Q = CLH**3/2

'C' = weir coefficient: Use 2.61

Qmax through spillway = 0.8

Spillway designed to pass 100 year flow

100-year flow = 16.92 CFS HEADWATER DEPTH = 0.53 FT.

ALLOWABLE HEADWATER DEPTH = 0.3 FT. WHICH IS GREATER THAN REQUIERED THEREFORE WEIR HAS CAPACITY

FREEBOARD FOR 100-YR = 0.47 FT.

Flow Velocity = 1.89 FPS (Less than 2.0 FPS OK)

*Rock Chute to be provided downstream of the spillway in accordance with the Soil Erosion and Sedmient Standards.

ANTI-SEEP COLLAR DESIGN CALCULATIONS

DYNAMIC ENGINEERING

Anti Seep Collar Design

Based on Standards for Soil Erosion and Sediment Control in New Jersey , July 2013

Project:	CSH Old Tappan	Computed By:	DRL
Job #:	1423-99-006	Checked By:	DTS
Location:	Old Tappan, NJ	Date:	3/1/2022

Basin Name: **Basin A**

The length of the seepage = (L+2*n*V), where:

V = Vertical projection and minimum horizontal projection of the antiseep collar (ft)
L = Length (ft) of the conduit within the zone of saturation, measured from the downstream side of the riser to the tow drain or point where the phreatic line intercepts the conduit, whichever is shorter.
n = Number of antiseep collars

Note : Antiseep collars should be equally spaced along the part of the barrel within the saturated zone at distances of not more that 25 feet.

Proposed Anti Seep Collar

V =	1.00	feet
L =	38.00	feet
n =	3.00	collars

Collar spacing = 12.67 feet

Spacing is less than 25 FT, therefore design is OK

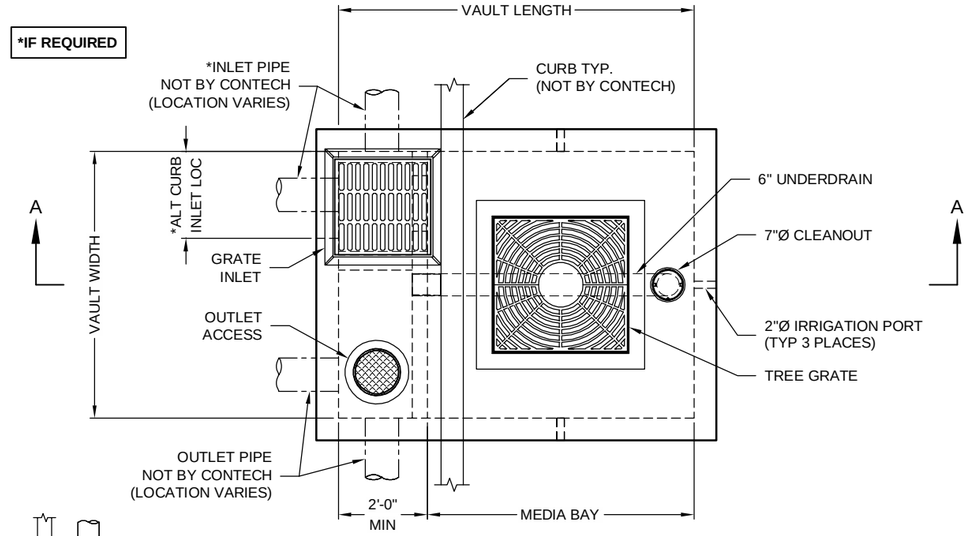
Length of seepage = 44 feet

Ratio of length of seepage to L = 1.158

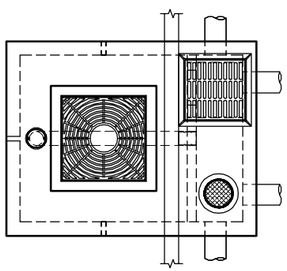
Ratio is greater than 1.15, therefore design is OK

Therefore, use antiseep collars with min. vertical and horizontal projection of **1.00** ***feet and spacing of*** **13** ***feet.***

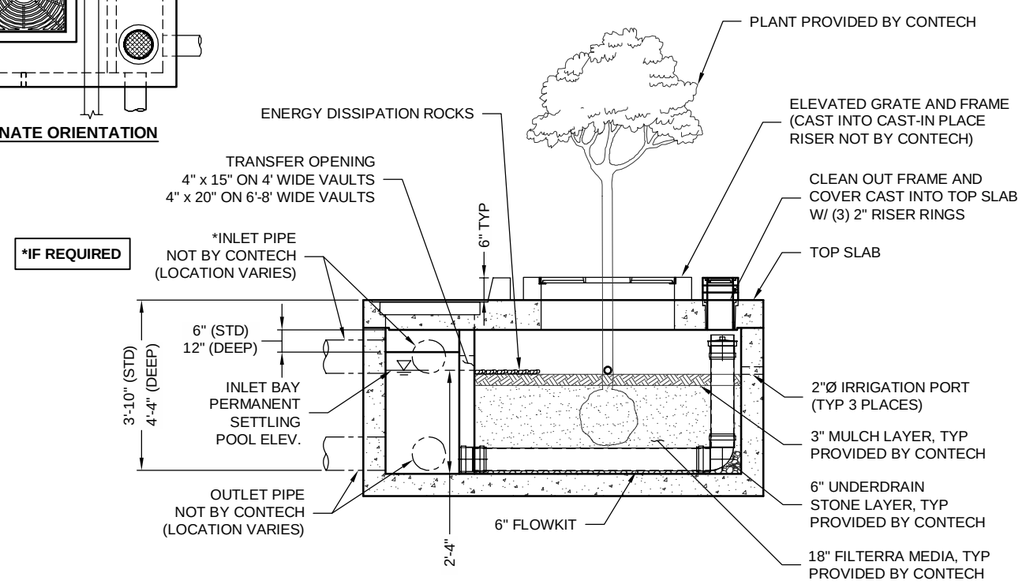
WATER QUALITY TREATMENT DEVICE



PLAN VIEW



ALTERNATE ORIENTATION



SECTION A-A
(STANDARD DEPTH SHOWN)

INTERNAL PIPE CONFIGURATION MAY VARY
DEPENDING UPON OUTLET LOCATION.

FTPD-G-HC STANDARD HEIGHT CONFIGURATION

DESIGNATION (OPTIONS: -P)	AVAILABILITY	MEDIA BAY SIZE	VAULT SIZE (W x L)	WEIR LENGTH/ MAX CURB OPENING	*MAX BYPASS FLOW (CFS)	GRATE INLET/ OUTLET ACCESS SIZE	TREE GRATE QTY & SIZE
FTPD0404-G-HC	N/A CA	4 x 4	4 x 6	1'-8"	1.4	12"SQ/12"Ø	(1) 2.5' x 2.5'
FTPD04045-G-HC	CA ONLY	4 x 4.5	4 x 6.5	1'-8"	1.4	12"SQ/12"Ø	(1) 2.5' x 2.5'
FTPD0406-G-HC	N/A DE, MD, NJ, PA, VA, WV	4 x 6	4 x 8	1'-8"	1.4	12"SQ/12"Ø	(1) 3' x 3'
FTPD045058-G-HC	DE, MD, NJ, PA, VA, WV ONLY	4.5 x 5.83	4.5 x 7.83	1'-8"	1.4	12"SQ/12"Ø	(1) 3' x 3'
FTPD0604-G-HC	ALL	6 x 4	6 x 6	1'-8"	1.4	24"SQ/12"Ø	(1) 2.5' x 2.5'
FTPD0606-G-HC	ALL	6 x 6	6 x 8	1'-8"	1.4	24"SQ/12"Ø	(1) 3' x 3'
FTPD0608-G-HC	ALL	6 x 8	6 x 10	1'-8"	1.4	24"SQ/12"Ø	(1) 4' x 4'
FTPD0610-G-HC	ALL	6 x 10	6 x 12	1'-8"	1.4	24"SQ/12"Ø	(1) 4' x 4'
FTPD0710-G-HC	ALL	7 x 10	7 x 13	2'-6"	2.1	24"SQ/24"Ø	(1) 4' x 4'
FTPD08105-G-HC	ALL	8 x 10.5	8 x 14	3'-0"	2.5	24"SQ/24"Ø	(1) 4' x 4'
FTPD08125-G-HC	N/A OR, WA	8 x 12.5	8 x 16	3'-0"	2.5	24"SQ/24"Ø	(2) 4' x 4'
FTPD09115-G-HC	OR, WA ONLY	9 x 11.5	9 x 15	3'-0"	2.5	24"SQ/24"Ø	(2) 4' x 4'

N/A = NOT AVAILABLE

FTPD-GD-HC DEEP OPTION CONFIGURATION

DESIGNATION (OPTIONS: -P)	AVAILABILITY	MEDIA BAY SIZE	VAULT SIZE (W x L)	WEIR LENGTH/ MAX CURB OPENING	*MAX BYPASS FLOW (CFS)	GRATE INLET/ OUTLET ACCESS SIZE	TREE GRATE QTY & SIZE
FTPD0404-GD-HC	N/A CA	4 x 4	4 x 6	1'-8"	4.6	12"SQ/12"Ø	(1) 2.5' x 2.5'
FTPD04045-GD-HC	CA ONLY	4 x 4.5	4 x 6.5	1'-8"	4.6	12"SQ/12"Ø	(1) 2.5' x 2.5'
FTPD0406-GD-HC	N/A DE, MD, NJ, PA, VA, WV	4 x 6	4 x 8	1'-8"	4.6	12"SQ/12"Ø	(1) 3' x 3'
FTPD045058-GD-HC	DE, MD, NJ, PA, VA, WV ONLY	4.5 x 5.83	4.5 x 7.83	1'-8"	4.6	12"SQ/12"Ø	(1) 3' x 3'
FTPD0604-GD-HC	ALL	6 x 4	6 x 6	1'-8"	4.6	24"SQ/12"Ø	(1) 2.5' x 2.5'
FTPD0606-GD-HC	ALL	6 x 6	6 x 8	1'-8"	4.6	24"SQ/12"Ø	(1) 3' x 3'
FTPD0608-GD-HC	ALL	6 x 8	6 x 10	1'-8"	4.6	24"SQ/12"Ø	(1) 4' x 4'
FTPD0610-GD-HC	ALL	6 x 10	6 x 12	1'-8"	4.6	24"SQ/12"Ø	(1) 4' x 4'
FTPD0710-GD-HC	ALL	7 x 10	7 x 13	2'-6"	6.8	24"SQ/24"Ø	(1) 4' x 4'
FTPD08105-GD-HC	ALL	8 x 10.5	8 x 14	3'-0"	8.2	24"SQ/24"Ø	(1) 4' x 4'
FTPD08125-GD-HC	N/A OR, WA	8 x 12.5	8 x 16	3'-0"	8.2	24"SQ/24"Ø	(2) 4' x 4'
FTPD09115-GD-HC	OR,WA ONLY	9 x 11.5	9 x 15	3'-0"	8.2	24"SQ/24"Ø	(2) 4' x 4'

N/A = NOT AVAILABLE

*MAX BYPASS FLOW IS INTERNAL WEIR FLOW . SITE SPECIFIC ANALYSIS IS REQUIRED TO DETERMINE GRATE INLET FLOW CAPACITY

filterra

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 6,277,274; 6,589,321; 7,625,485; 7,425,261; 7,833,412; RELATED FOREIGN PATENTS.

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800-338-1122 513-645-7000 513-645-7993 FAX

FILTERRA HC PEAK DIVERSION - GRATE (FTPD-G-HC)
CONFIGURATION DETAIL

I:\COMMON\CAD\CAD STANDARDS\CAD\PROGRAMS\DEVELOPMENT\STORMWATER\FILTERRA\NJ HC STANDARD CONFIG DETAILS\FTPD-G-HC - FILTERRA PEAK DIVERSION - GRATE CONFIG DTL.DWG 4/6/2021 11:26 AM

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER QUALITY
Bureau of Stormwater Permitting
401 East State Street
P.O. Box 420 Mail Code 401-02B
Trenton, NJ 08625-0420
Tel. (609) 633-7021 • Fax (609) 777-0432
www.nj.gov/dep/dwq/bnpc_home.htm

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

SHAWN M. LATOURETTE
Acting Commissioner

February 12, 2021

Derek M. Berg
Director – Stormwater Regulatory Management - East
Contech Engineered Solutions LLC
71 US Route 1, Suite F
Scarborough, ME 04074

Re: MTD Lab Certification
Filterra® HC Bioretention System
Off-line Installation Approved

TSS Removal Rate 80%

Dear Mr. Berg:

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7(c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Contech Engineered Solutions LLC has requested a Laboratory Certification for the Filterra® HC Bioretention System (Filterra® HC.)

The project falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advance Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device" dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the aforementioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix (dated January 2021) for this device is published online at http://www.njcat.org/uploads/newDocs/NJCATFilterraTechnologyVerificationReportFinal._.pdf.

The NJDEP certifies the use of the Filterra® HC stormwater treatment unit by Contech Engineered Solutions LLC at a TSS removal rate of 80% when designed, operated, and maintained in accordance with the information provided in the Verification Appendix and the following conditions:

1. The maximum treatment flow rate (MTFR) for the manufactured treatment device (MTD) is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs) in N.J.A.C. 7:8-5.5. The MTFR is calculated based on a verified loading rate of 3.12 gpm/ft^2 of effective filtration treatment area.

2. The Filterra® HC stormwater treatment unit shall be installed using the same configuration reviewed by NJCAT, and sized in accordance with the criteria specified in item 7 below.

3. This device cannot be used in series with another MTD or a media filter (such as a sand filter) to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.

4. Additional design criteria for MTDs can be found in the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual, which can be found online at www.njstormwater.org.

5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the Filterra® HC. A copy of the maintenance plan is attached to this certification. However, it is recommended to review the maintenance website at https://www.conteches.com/Portals/0/Documents/Maintenance%20Guides/Filterra%20HC%20OM%20Packet.pdf for any changes to the maintenance requirements.

6. For an MTD to be considered "green infrastructure" (GI) in accordance with the March 2, 2020 amendments to the Stormwater Management rules at N.J.A.C. 7:8, the MTD must meet the GI definition noted at amended N.J.A.C. 7:8-1.2. Specifically, the MTD shall (1) treat stormwater runoff through infiltration into subsoil; and/or (2) treat stormwater runoff through filtration by vegetation or soil; or (3) store stormwater runoff for reuse.

   The Filterra® HC filters stormwater runoff through an engineered biofiltration soil media and, thus, meets the definition of GI. Filterra® HC can be configured with or without a precast vault. Installations that will not include a precast vault will additionally need to comply the NJDEP Stormwater BMP Manual conditions regarding separation from the seasonal high water table and, if infiltration is proposed as an outlet, minimum vertical saturated hydraulic conductivity of the subsoil. Installations without a precast vault that do not rely on infiltration are required to maintain at least a one-foot separation from the seasonal high water table measured from the lowest point of the system. Installations without a precast vault that utilize infiltration are required to have the most hydraulically restrictive soil layer below the MTD meet the minimum tested vertical saturated hydraulic conductivity of one inch per hour and have at least two feet of separation from the seasonal high water table measured from the lowest point of the system.

7. Sizing Requirement:

The example below demonstrates the sizing procedure for the Filterra® HC:

Example: A 0.25-acre impervious site is to be treated to 80% TSS removal using the Filterra® HC. The impervious site runoff (Q) based on the New Jersey Water Quality Design Storm was determined to be 0.79 cfs.

The selection of the appropriate model of Filterra® HC is based upon both the maximum inflow drainage area and the MTFR. It is necessary to calculate the required model using both methods and to use the largest model determined by the two methods.

Inflow Drainage Area Evaluation:

The drainage area to the Filterra® HC in this example is 0.25 acres. Included in Table 1 below, all of the Filterra® HC models are designed with a maximum allowable drainage area greater than 0.25 acres. Specifically, the Filterra® HC with a 4'x4' media bay and a maximum allowable drainage area of 0.40 acres would be the smallest model able to treat runoff without exceeding the maximum allowable drainage area.

Maximum Treatment Flow Rate (MTFR) Evaluation:

The site runoff (Q) was based on the following:

time of concentration = 10 minutes
i = 3.2 in/hr (page 5-8, Fig. 5-3 of the NJ Stormwater BMP Manual)
c = 0.99 (runoff coefficient for impervious)
Q = ciA = 0.99 x 3.2 x 0.25 = 0.79 cfs

Given the site runoff is 0.79 cfs and based on the MTFR's listed in Table 1 below, the Filterra® HC with a 16'x8' media bay and an MTFR of 0.889 cfs would be the smallest model that could be used to treat the impervious area without exceeding the MTFR. If using more than one unit for treating runoff, the units should be configured such that the flowrate to each unit does not exceed the design MTFR for each unit and ensuring the entire 0.25 acre area is treated.

The MTFR evaluation results will be used since that method results in the highest minimum configuration determined by the two methods.

The sizing table corresponding to the available system models is noted below:

Table 1. Filterra® HC MTFRs and Maximum Allowable Drainage Areas

	Available Filterra® Media Bay Sizes (feet)	Effective Filtration Treatment Area (ft^2)	Treatment Flow Rate (cfs)	Maximum Allowable Drainage Area (ac)
Standard Configuration Filterra and Filterra Biosape Vaults	4x4	16	0.111	0.40
	4x6 or 6x4	24	0.167	0.60
	4.5x7.83 or 7.83x4.5 (Nominal 4x8/8x4)	35.24	0.245	0.89
	6x6	36	0.250	0.91
	6x8 or 8x6	48	0.333	1.21
	6x10 or 10x6	60	0.417	1.51
	6x12 or 12x6	72	0.500	1.81
	7x13 or 13x7	91	0.632	2.29
	14x8	112	0.778	2.82
	16x8	128	0.889	3.22
	18x8	144	1.000	3.62
	20x8	160	1.111	4.03
	22x8	176	1.222	4.43
Peak Diversion Filterra Vaults	4x4	16	0.111	0.40
	4.5x5.83 (Nominal 4x6)	26.24	0.182	0.66
	6x4	24	0.167	0.60
	6x6	36	0.250	0.91
	6x8	48	0.333	1.21
	6x10 or 10x6	60	0.417	1.51
	7x10	70	0.486	1.76
	8x10.5	84	0.583	2.11
	8x12.5	100	0.694	2.52
	Custom and/or Filterra Bioscape	Media Area in ft^2	0.00694 * (Media Area in ft^2)	0.0252 * (Media Area in ft^2)

Be advised a detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management rules, N.J.A.C. 7:8. The plan must include all of the items identified in the Stormwater Management rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of inspection and maintenance equipment and tools, specific corrective and preventative maintenance tasks, indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance and Retrofit of Stormwater Management Measures.

If you have any questions regarding the above information, please contact me at (609) 633-7021.

Sincerely,

Gabriel Mahon

Gabriel Mahon, Chief
Bureau of Stormwater Permitting

Attachment: Maintenance Plan
cc: Chron File
Richard Magee, NJCAT
Vince Mazzei, NJDEP – Water & Land Management
Nancy Kempel, NJDEP– BSTP
Keith Stampfel, NJDEP – DLRP
Dennis Contois, NJDEP – DLRP

Filterra HC
Owner's Manual

filterra®
Bioretention Systems

CONTECH®
ENGINEERED SOLUTIONS

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Introduction

Thank you for your purchase of the Filterra® HC Bioretention System. Filterra HC is a specially engineered stormwater treatment system incorporating high performance biofiltration media to remove pollutants from stormwater runoff. All components of the system work together to provide a sustainable long-term solution for treating stormwater runoff.

The Filterra HC system has been delivered to you with protection in place to resist intrusion of construction related sediment which can contaminate the biofiltration media and result in inadequate system performance. These protection devices are intended as a best practice and cannot fully prevent contamination. It is the purchaser's responsibility to provide adequate measures to prevent construction related runoff from entering the Filterra HC system.

Included with your purchase is Activation of the Filterra HC system by the manufacturer as well as a 1-year warranty from delivery of the system and 1-year of routine maintenance (mulch replacement, debris removal, and pruning of vegetation) up to twice during the first year after activation.

Design and Installation

Each project presents different scopes for the use of Filterra HC systems. Information and help may be provided to the design engineer during the planning process. Correct Filterra HC box sizing (per local regulations) is essential to predict pollutant removal rates for a given area. The engineer shall submit calculations for approval by the local jurisdiction. The contractor is responsible for the correct installation of Filterra HC units as shown in approved plans. A comprehensive installation manual covering all Filterra configurations is available at www.ContechES.com.

Activation Overview

Activation of the Filterra HC system is a procedure completed by the manufacturer to place the system into working condition. This involves the following items:

- Removal of construction runoff protection devices
- Planting of the system's vegetation
- Placement of pretreatment mulch layer using mulch certified for use in Filterra HC systems.

Activation MUST be provided by the manufacturer to ensure proper site conditions are met for Activation, proper installation of the vegetation, and use of pretreatment mulch certified for use in Filterra HC systems.

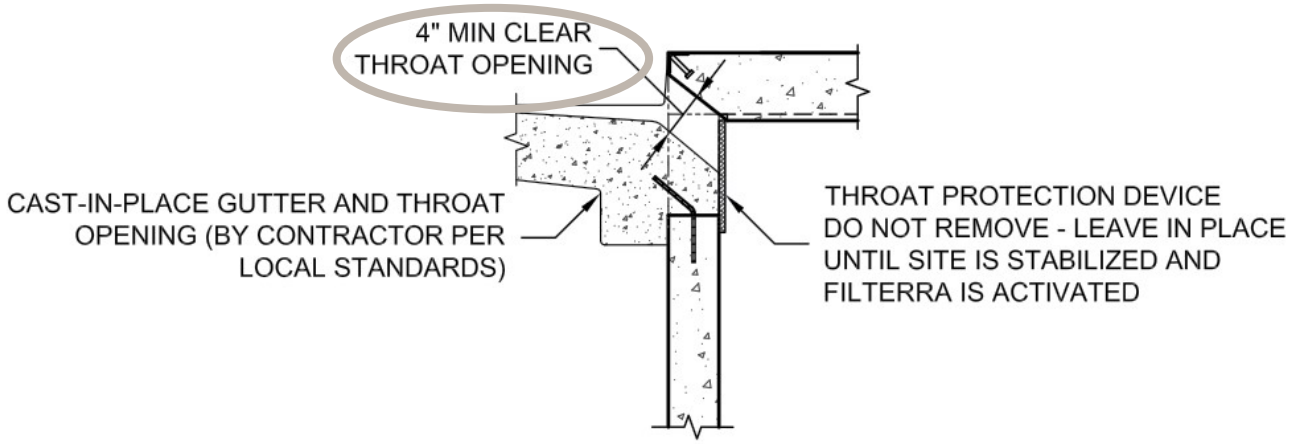
Minimum Requirements

The minimum requirements for Filterra HC Activation are as follows:

1. The site landscaping must be fully stabilized, i.e. full landscaping installed and some grass cover (not just straw and seed) is required to reduce sediment transport. Construction debris and materials should be removed from surrounding area.

2. Final paving must be completed. Final paving ensures that paving materials will not enter and contaminate the Filterra HC system during the paving process, and that the plant will receive runoff from the drainage area, assisting with plant survival for the Filterra HC system.

3. Filterra HC throat opening (if applicable) should be at least 4″ in order to ensure adequate capacity for inflow and debris.



An Activation Checklist is included on page 12 to ensure proper conditions are met for Contech to perform the Activation services. A charge of $500.00 will be invoiced for each Activation visit requested by Customer where Contech determines that the site does not meet the conditions required for Activation.

Filterra HC Plant Selection Overview

Plant Lists are available on the Contech website highlighting recommended plants for Filterra systems in your area. Keep in mind that plants are subject to availability due to seasonality and required minimum size for the Filterra HC system. Plants installed in the Filterra HC system are container plants (max 15 gallon) from nursery stock and will be immature in height and spread at Activation.

It is the responsibility of the owner to provide adequate irrigation when necessary to the plant of the Filterra HC system.

The "Planting Requirements for Filterra HC Systems" document is included as an appendix and discusses proper selection and care of the plants within Filterra HC systems.

Warranty Overview

Refer to the Contech Engineered Solutions LLC Stormwater Treatment System LIMITED WARRANTY for further information. The following conditions may void the Filterra HC system's warranty and waive the manufacturer provided Activation and Maintenance services:

- Unauthorized activation or performance of any of the items listed in the activation overview
- Any tampering, modifications or damage to the Filterra HC system or runoff protection devices
- Removal of any Filterra HC system components
- Failure to prevent construction related runoff from entering the Filterra HC system
- Failure to properly store and protect any Filterra HC components (including media and underdrain stone) that may be shipped separately from the vault

Routine Maintenance Guidelines

Routine maintenance is included by the manufacturer on all Filterra HC systems for the first year after activation. This includes a maximum of 2 visits to remove debris, replace pretreatment mulch, and prune the vegetation. More information is provided in the Operations and Maintenance Guidelines. Some Filterra HC systems also contain diversion bypass or outlet bays. Depending on site pollutant loading, these bays may require periodic removal of debris, however this is not included in the first year of maintenance and would likely not be required within the first year of operation.

These services, as well as routine maintenance outside of the included first year, can be provided by certified maintenance providers listed on the Contech website. Training can also be provided to other stormwater maintenance or landscape providers.

Why Maintain?

All stormwater treatment systems require maintenance for effective operation. This necessity is often incorporated in your property's permitting process as a legally binding BMP maintenance agreement. Other reasons to maintain are:

- Avoiding legal challenges from your jurisdiction's maintenance enforcement program.
- Prolonging the expected lifespan the media in the Filterra HC system.
- Avoiding more costly media replacement.
- Helping reduce pollutant loads leaving your property.

Simple maintenance of the Filterra HC is required to continue effective pollutant removal from stormwater runoff before discharge into downstream waters. This procedure will also extend the longevity of the living biofilter system. The Filterra HC system is also subjected to various materials entering the inlet, including trash, silt, leaves, etc. which will be contained above the mulch layer. Too much silt may inhibit the Filterra HC system flow rate, which is the reason for site stabilization before activation. Regular replacement of the mulch stops accumulation of such sediment.

If the system is not maintained on regular intervals, is subject to a catastrophic spill or other event, or subject to unusual pollutant loading, full media bed replacement could be required. Please contact Contech for further evaluation if you feel this may be necessary.

When to Maintain?

Contech includes a 1-year maintenance plan with each system purchase. Annual included maintenance consists of a maximum of two (2) scheduled visits. Additional maintenance may be necessary depending on sediment and trash loading (by Owner or at additional cost). The start of the maintenance plan begins when the system is activated.

Maintenance visits are scheduled seasonally; the spring visit aims to clean up after winter loads including salts and sands while the fall visit helps the system by removing excessive leaf litter.

It has been found that in regions which receive between 30-50 inches of annual rainfall, (2) two visits are generally required; regions with less rainfall often only require (1) one visit per annum. Varying land uses can affect maintenance frequency;

e.g. some fast food restaurants require more frequent trash removal. Contributing drainage areas which are subject to new development wherein the recommended erosion and sediment control measures have not been implemented may require additional maintenance visits.

Some sites may be subjected to extreme sediment or trash loads, requiring more frequent maintenance visits. This is the reason for detailed notes of maintenance actions per unit, helping the Supplier and Owner predict future maintenance frequencies, reflecting individual site conditions.

Owners must promptly notify the (maintenance) Supplier of any damage to the plant(s), which constitute(s) an integral part of the bioretention technology. Owners should also advise other landscape or maintenance contractors to leave all maintenance to the Supplier (i.e. no pruning or fertilizing) during the first year.

Exclusion of Services

Clean up due to major contamination such as oils, chemicals, toxic spills, etc. will result in additional costs and are not covered under the Supplier maintenance contract. Should a major contamination event occur the Owner must block off the outlet pipe of the Filterra HC (where the cleaned runoff drains to, such as drop inlet) and block off the inlet of the Filterra HC. The Supplier should be informed immediately.

Maintenance Visit Summary

Each maintenance visit consists of the following simple tasks (detailed instructions below).

1. Inspection of Filterra HC and surrounding area
2. Removal of tree grate and erosion control stones
3. Removal of debris, trash and mulch
4. Mulch replacement
5. Plant health evaluation & pruning or replacement as necessary
6. Clean area around Filterra HC
7. Complete paperwork

Maintenance Tools, Safety Equipment and Supplies

Ideal tools include camera, bucket, shovel, broom, pruners, hoe/rake, and tape measure. Appropriate Personal Protective Equipment (PPE) should be used in accordance with local or company procedures. This may include impervious gloves where the type of trash is unknown, high visibility clothing and barricades when working near traffic and also safety hats and shoes. A T-Bar or crowbar should be used for moving the tree grates (up to 170 lbs ea.). Most visits require minor trash removal and a full replacement of mulch. See below for actual number of bagged mulch that is required in each media bay size. Mulch should be a double shredded, hardwood variety. Some visits may require additional Filterra engineered soil media for the Filterra HC system, available from the Supplier.

	Available Filterra® HC Media Bay Sizes (feet)	Filter Surface Area (ft^2)	Mulch Volume at 3" Depth (ft^2)	# of 2 ft^2 Mulch Bags
Standard Configuration Filterra and Filterra Biosape Vaults	4x4	16	4	2
	4x6 or 6x4	24	6	3
	4.5x7.83 or 7.83x4.5 (Nominal 4x8/8x4)	35.24	9	5
	6x6	36	9	5
	6x8 or 8x6	48	12	6
	6x10 or 10x6	60	15	8
	6x12 or 12x6	72	18	9
	7x13 or 13x7	91	23	12
	14x8	112	28	14
	16x8	128	32	16
	18x8	144	36	18
	20x8	160	40	20
	22x8	176	44	22
Peak Diversion Filterra Vaults	4x4	16	4	2
	4.5x5.83 or 5.83x4.5 (Nominal 4x6/6x4)	26.24	7	4
	6x6	36	9	5
	6x8	48	12	6
	6x10 or 10x6	60	15	8
	7x10	70	18	9
	8x10.5	84	21	11
	8x12.5	100	25	13
	Custom and/or Filterra Bioscape	Media Area in ft^2	0.25 x (Media Area in ft^2)	0.125 x (Media Area in ft^2)

Maintenance Visit Procedure

Keep sufficient documentation of maintenance actions to predict location specific maintenance frequencies and needs. An example Maintenance Report is included in this manual.

1. Inspection of Filterra HC and surrounding area

- Record individual unit before maintenance with photograph (numbered). Record on Maintenance Report (see example in this document) the following:

Record on Maintenance Report the following:

Standing Water	yes | no
Damage to Box Structure	yes | no
Damage to Grate	yes | no
Is Bypass Clear	yes | no

If yes answered to any of these observations, record with close-up photograph (numbered).

2. Removal of tree grate and erosion control stones

- Remove cast iron grates for access into Filterra HC box.
- Dig out silt (if any) and mulch and remove trash & foreign items.

3. Removal of debris, trash and mulch

Record on Maintenance Report the following:

Silt/Clay	yes | no
Cups/ Bags	yes | no
Leaves	yes | no
Buckets Removed	_____

- After removal of mulch and debris, measure distance from the top of the Filterra engineered media soil to the top of the top slab. Compare the measured distance to the distance shown on the approved Contract Drawings for the system. Add Filterra media (not top soil or other) to bring media up as needed to distance indicated on drawings.

Record on Maintenance Report the following:

Distance to Top of Top Slab (inches)	_____
Inches of Media Added	_____

4. Mulch replacement

- Add double shredded mulch evenly across the entire unit to a depth of 3″.
- Refer to Filterra Mulch Specifications for information on acceptable sources.
- Ensure correct repositioning of erosion control stones by the Filterra HC inlet to allow for entry of trash during a storm event.
- Replace Filterra HC grates correctly using appropriate lifting or moving tools, taking care not to damage the plant.

5. Plant health evaluation and pruning or replacement as necessary

- Examine the plant's health and replace if necessary.
- Prune as necessary to encourage growth in the correct directions

Record on Maintenance Report the following:

Height above Grate	_____ (ft)
Width at Widest Point	_____ (ft)
Health	healthy | unhealthy
Damage to Plant	yes | no
Plant Replaced	yes | no

6. Clean area around Filterra HC

- Clean area around unit and remove all refuse to be disposed of appropriately.

7. Complete paperwork

- Deliver Maintenance Report and photographs to appropriate location (normally Contech during maintenance contract period).
- Some jurisdictions may require submission of maintenance reports in accordance with approvals. It is the responsibility of the Owner to comply with local regulations.

Maintenance Checklist

Drainage System Failure	Problem	Conditions to Check	Condition that Should Exist	Actions
Inlet	Excessive sediment or trash accumulation.	Accumulated sediments or trash impair free flow of water into Filterra HC.	Inlet should be free of obstructions allowing free distributed flow of water into Filterra HC HC.	Sediments and/or trash should be removed.
Mulch Cover	Trash and floatable debris accumulation.	Excessive trash and/or debris accumulation.	Minimal trash or other debris on mulch cover.	Trash and debris should be removed and mulch cover raked level. Ensure bark nugget mulch is not used.
Mulch Cover	"Ponding" of water on mulch cover.	"Ponding" in unit could be indicative of clogging due to excessive fine sediment accumulation or spill of petroleum oils.	Stormwater should drain freely and evenly through mulch cover.	Recommend contact manufacturer and replace mulch as a minimum.
Vegetation	Plants not growing or in poor condition.	Soil/mulch too wet, evidence of spill. Incorrect plant selection. Pest infestation. Vandalism to plants.	Plants should be healthy and pest free.	Contact manufacturer for advice.
Vegetation	Plant growth excessive.	Plants should be appropriate to the species and location of Filterra HC.		Trim/prune plants in accordance with typical landscaping and safety needs.
Structure	Structure has visible cracks.	Cracks wider than 1/2 inch or evidence of soil particles entering the structure through the cracks.		Vault should be repaired.
Maintenance is ideally to be performed twice annually.				

Filterra HC Inspection & Maintenance Log

Filterra HC System Size/Model: _____ **Location:** _____

Date	Mulch & Debris Removed	Depth of Mulch Added	Mulch Brand	Height of Vegetation Above Grate	Vegetation Species	Issues with System	Comments
1/1/17	*5 – 5 gal Buckets*	*3″*	*Lowe's Premium Brown Mulch*	*4′*	*Galaxy Magnolia*	*- Standing water in downstream structure*	*- Removed blockage in downstream structure*

Appendix 1 – Filterra® Activation Checklist

CONTECH® ENGINEERED SOLUTIONS

Project Name: _____ Company: _____

Site Contact Name: _____ Site Contact Phone/Email: _____

Site Owner/End User Name: _____ Site Owner/End User Phone/Email: _____

Preferred Activation Date: _____ (provide 2 weeks minimum from date this form is submitted)

Site Designation	System Size	Final Pavement / Top Coat Complete	Landscaping Complete / Grass Emerging	Construction materials / Piles / Debris Removed	Throat Opening Measures 4" Min. Height	Plant Species Requested
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	

Attach additional sheets as necessary.

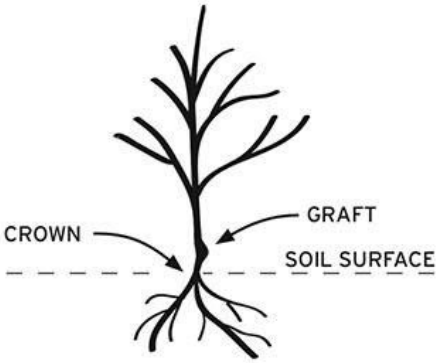
NOTE: A charge of $500.00 will be invoiced for each Activation visit requested by Customer where Contech determines that the site does not meet the conditions required for Activation. ONLY Contech authorized representatives can perform Activation of Filterra HC systems; unauthorized Activations will void the system warranty and waive manufacturer supplied Activation and 1st Year Maintenance.

_____ _____

Signature Date

Appendix 2 – Planting Requirements for Filterra® HC Systems

Plant Material Selection



- Select plant(s) as specified in the engineering plans and specifications.
- Select plant(s) with full root development but not to the point where root bound.
- Use local nursery container plants only. Ball and burlapped plants are not permitted.
- For precast Filterra HC systems with a tree grate, plant(s) must not have scaffold limbs at least 14 inches from the crown due to spacing between the top of the mulch and the tree grate. Lower branches can be pruned away provided there are sufficient scaffold branches for tree or shrub development.
- For precast Filterra HC systems with a tree grate, at the time of installation, it is required that plant(s) must be at least 6" above the tree grate opening at installation for all Filterra configurations. This DOES NOT apply to Full Grate Cover designs.
- Plant(s) shall not have a mature height greater than 25-30 feet.
- A 7-15 gallon container size shall be used.
- For precast Filterra HC systems, plant(s) should have a single trunk at installation, and pruning may be necessary at activation and maintenance for some of the faster growing species, or species known to produce basal sprouts

Plant Installation

- During transport protect the plant leaves from wind and excessive jostling.
- Prior to removing the plant(s) from the container, ensure the soil moisture is sufficient to maintain the integrity of the root ball. If needed, pre-wet the container plant.
- Cut away any roots which are growing out of the container drain holes. Plants with excessive root growth from the drain holes should be rejected.
- Plant(s) should be carefully removed from the pot by gently pounding on the sides of the container with the fist to loosen root ball. Then carefully slide out. Do not lift plant(s) by trunk as this can break roots and cause soil to fall off. Extract the root ball in a horizontal position and support it to prevent it from breaking apart. Alternatively, the pot can be cut away to minimize root ball disturbance.
- Remove any excess soil from above the root flare after removing plant(s) from container.
- Excavate a hole with a diameter 4" greater than the root ball, gently place the plant(s).
- If plant(s) have any circling roots from being pot bound, gently tease them loose without breaking them.
- If root ball has a root mat on the bottom, it should be shaved off with a knife just above the mat line.
- Plant the tree/shrub/grass with the top of the root ball 1" above surrounding media to allow for settling.
- All plants should have the main stem centered in the tree grate (where applicable) upon completion of installation.
- With all trees/shrubs, remove dead, diseased, crossed/rubbing, sharply crotched branches or branches growing excessively long or in wrong direction compared to majority of branches.
- To prevent transplant shock (especially if planting takes place in the hot season), it may be necessary to prune some of the foliage to compensate for reduced root uptake capacity. This is accomplished by pruning away some of the smaller secondary branches or a main scaffold branch if there are too many. Too much foliage relative to the root ball can dehydrate and damage the plant.
- Plant staking may be required.

Mulch Installation

- Only mulch that has been meeting Contech Engineered Solutions' mulch specifications can be used in the Filterra HC system.
- Mulch must be applied to a depth of 3″ evenly over the surface of the media.

Irrigation Requirements

- Each Filterra HC system must receive adequate irrigation to ensure survival of the living system during periods of drier weather.
- Irrigation sources include rainfall runoff from downspouts and/or gutter flow, applied water through the tree grate or in some cases from an irrigation system with emitters installed during construction.
- At Activation: Apply about one (cool climates) to two (warm climates) gallons of water per inch of trunk diameter over the root ball.
- During Establishment: In common with all plants, each Filterra HC plant will require more frequent watering during the establishment period. One inch of applied water per week for the first three months is recommended for cooler climates (2 to 3 inches for warmer climates). If the system is receiving rainfall runoff from the drainage area, then irrigation may not be needed. Inspection of the soil moisture content can be evaluated by gently brushing aside the mulch layer and feeling the soil. Be sure to replace the mulch when the assessment is complete. Irrigate as needed**.
- Established Plants: Established plants have fully developed root systems and can access the entire water column in the media. Therefore, irrigation is less frequent but requires more applied water when performed. For a mature system assume 3.5 inches of available water within the media matrix. Irrigation demand can be estimated as 1″ of irrigation demand per week. Therefore, if dry periods exceed 3 weeks, irrigation may be required. It is also important to recognize that plants which are exposed to windy areas and reflected heat from paved surfaces may need more frequent irrigation. Long term care should develop a history which is more site specific.

** Five gallons per square yard approximates 1 inch of water. Therefore, for a 6′ by 6′ Filterra HC approximately 20-60 gallons of water is needed. To ensure even distribution of water it needs to be evenly sprinkled over the entire surface of the filter bed, with special attention to make sure the root ball is completely wetted. NOTE: if needed, measure the time it takes to fill a five-gallon bucket to estimate the applied water flow rate then calculate the time needed to irrigate the Filterra HC system. For example, if the flow rate of the sprinkler is 5 gallons/minute then it would take 12 minutes to irrigate a 6′ by 6′ filter.

Notes

filterra®
Bioretention Systems

CONTECH®
ENGINEERED SOLUTIONS

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BERGEN COUNTY LID CHECKLIST

APPENDIX H:

LOW IMPACT DEVELOPMENT (LID) CHECKLIST

Please fill out this checklist for identifying Low Impact Development Activities incorporated into the proposed land development.

Part 1 - Vegetation and landscaping

1. Has an inventory of existing site vegetation been performed? YES
If yes, was the inventory a factor in the site's layout and design? YES
2. Does the site utilize any of these non-structural LID-BMPs:
a. Preservation of natural areas: YES If yes, specify location WEST and % of site 32%
b. Use of native ground cover: YES If yes, specify location WEST and % of site 32%
c. Use of vegetated buffers: YES If yes, specify location WEST and % of site 32%
3. Specify percentage of total building roof area that will be vegetated: 0%.
4. How many trees will be planted on site? 174 How many deciduous 83 coniferous 91
How many trees will be removed? 210
How many *street* trees will be planted? 11 What types: ARMSTRONG RED MAPLE

Part 2 – Minimizing site disturbance

5. Have inventories of existing site soils and slopes been performed? YES If yes, were the inventories a factor in the site's layout and design? YES. Please explain PROPOSE TO SUPPLEMENT AND MAINTAIN EXISTING VEGETATION TO MAXIMUM EXTENT POSSIBLE
6. Explain how site disturbance will be minimized during construction phases
USE OF PROPOSED RETAINING WALLS TO MINIMIZE DISTURBANCE; WETLAND/VETATED AREA IS BEING PRESERVED
7. Specify the percent of site to be cleared: 68%. For buildings: 15%. For driveways 19%.
Specify % of site to be re-graded: 34%.
8. Specify the site's hydrologic soil group (HSG) percentages:
HSG A: 23% HSG B: 77% HSG C: _____ HSG D: _____
9. Specify percentage of each HSG that will be permanently disturbed:
HSG A: 100% HSG B: 57% HSG C: _____ HSG D: _____

10. Explain how site disturbance will be minimized within areas with greater permeable soils (HSG A and B) to maintain groundwater recharge rates and reduce stormwater volume increases.
THE ENTIRE SITE IS COMPRISED OF TYPES A AND B SOILS; OVERALL DISTURBANCE IS MINIMIZED

Part 3 – Impervious area management

11. Specify the following with regards to impervious coverage:
a. Maximum site impervious coverage (%) permitted by local regulations 30%
b. Existing (%) (pre-project) impervious coverage at the site: 2%
c. Proposed (%) impervious coverage for the site: 33%
d. Is the site designed to achieve minimum impervious coverage? YES
12. Specify percentage of parking area that will be porous: 0%. Please explain which site areas will be porous: _____
13. Provide the following with regards to the number of parking spaces:
a. The number of parking spaces required by local regulations for the development 44 (RSIS)
b. The number of parking spaces being provided 53
c. Is the site designed to minimize the number of parking spaces to reduce impervious surface? YES
14. Specify the following with regard to the size of parking stalls:
a. The size of parking spaces required by local regulations 10'X20'
b. The size of parking stalls being provided 10'X20'
15. Specify percentage of total parking area that will be:
a. Located beneath buildings 0
b. Within a multi-level parking deck 0
c. Only for compact cars 0
16. Specify the number of parking spaces provided for bicycle parking 0

Part 4 - Circulation Improvements

17. Explain how the project will impair or improve vehicular traffic flow? _____
NO REDUCTION IN LEVEL OF SERVICE FOR OLD TAPPAN ROAD
18. Provide the pre-project Level of Service (LOS) A Post-project LOS A

19. Explain how roadway safety and the pedestrian environment will be improved for each of the following:

a. Placement and type of intersection signals N/A

b. Pedestrian features PROP. CROSSWALK AND ACCESSIBLE RAMPS AT DRIVEWAY APRON IMPROVE EXISTING PEDESTRIAN FEATURES

c. Sidewalk replacement PROP. CROSSWALK AND ACCESSIBLE RAMPS AT DRIVEWAY APRON IMPROVE EXISTING PEDESTRIAN FEATURES

d. Access control PROPOSED STOP BAR AND SIGN AT ACCESS DRIVEWAY

e. Aesthetic treatments ENHANCED LANDSCAPING ALONG OLD TAPPAN ROAD FRONTAGE

f. Improved sight distance N/A

g. Street and sidewalk lighting N/A

h. Pedestrian- and bicyclist-activated signals N/A

i. Landscaped planters N/A

j. Bus pullout lanes and transit shelters N/A

20. Explain how bicycle use will be promoted for the development. Will bicycle accessories (bike racks, secure storage, showers, etc.) be provided? NO; NOT APPLICABLE FOR THE PROPOSED USE

21. Explain how public transit will be promoted for the development N/A

22. Will Transportation Demand Management techniques be provided? Please explain:

A PRIVATE VAN SERVICE WILL BE USED ON SITE TO TRANSPORT RESIDENTS IN GROUPS TO FURTHER REDUCE INDIVIDUAL TRIPS ON SITE

Part 5 – Source Control and Pollution Prevention

23. Specify number of outdoor trash receptacles provided 1. Number of recycling receptacles provided 0.

24. Is a recycling plan being submitted NO?

25. Identify stormwater management measures on the site that prevent discharge of large trash and debris.

PROPOSED ONSITE INLETS AND ABOVEGROUND BASIN WITH TRASH RACK COLLECT RUNOFF AND PREVENT LARGE TRASH AND DEBRIS FROM LEAVING THE SITE

Part 6 – Energy and Environmental Control

26. Indicate what is being done to reduce the site's contribution to the urban heat island effect (i.e., light-colored/high albedo pavement surface with a minimum albedo of 0.3; use of porous pavement; substantial increase of tree canopy) PROPOSED PAVEMENT IS MINIMIZED TO THE MAXIMUM EXTENT PRACTICABLE; PRESERVATION OF NATURAL AREAS IS MAXIMIZED

27. Will outdoor lighting fixtures be installed with energy-efficient fixtures in conformance with the Bergen County Land Development Regulations and as outlined by the International Dark Sky Association (IDSA) www.darksy.org to preserve and protect the nighttime environment? Please explain.

YES; FULL CUTOFF FIXTURES PROPOSED TO REDUCE GLARE AND LIGHT SPILLOVER

28. What percentage of the total electricity for the site will be from renewable sources? TBD. Please explain

Part 7 – Construction Materials

29. Is there a plan for the processing, transportation and disposal of waste? Provide a description of all material being disposed and location of disposal.

SOLID WASTE WILL BE STORED WITHIN AN ON-SITE TRASH ENCLOSURE AND WILL BE REMOVED REGULARLY BY LOCAL WASTE MANAGEMENT

30. What percentage of non-hazardous construction and demolition debris from the project will be recycled? TBD Salvaged back into the site? TBD

Part 8 – Community

31. Explain how meaningful public input was incorporated into the project. Provide evidence of how community values (historic preservation, cultural, neighborhood preservation, environmental) were integrated into the design process.

THE APPLICANT IS WORKING CLOSELY WITH THE RESIDENTS OF THE TOWNSHIP TO MAKE ARCHITECTURAL DESIGN DECISIONS AND TO PROVIDE SITE FEATURES WHICH WILL MINIMIZE NEGATIVE IMPACTS TO THE ADJACENT LOT OWNERS.

32. Explain how the project is consistent with the Bergen County Master Plan

THE PROPOSED PROJECT FITS IN WITH THE CHARACTER OF THE NEIGHBORHOOD AND TOWNSHIP

Part 9 – Narrative

33. In narrative form, provide an overall description of the LID-BMP approach to stormwater management and strategies incorporated into the proposed site design. Attach additional pages as necessary.

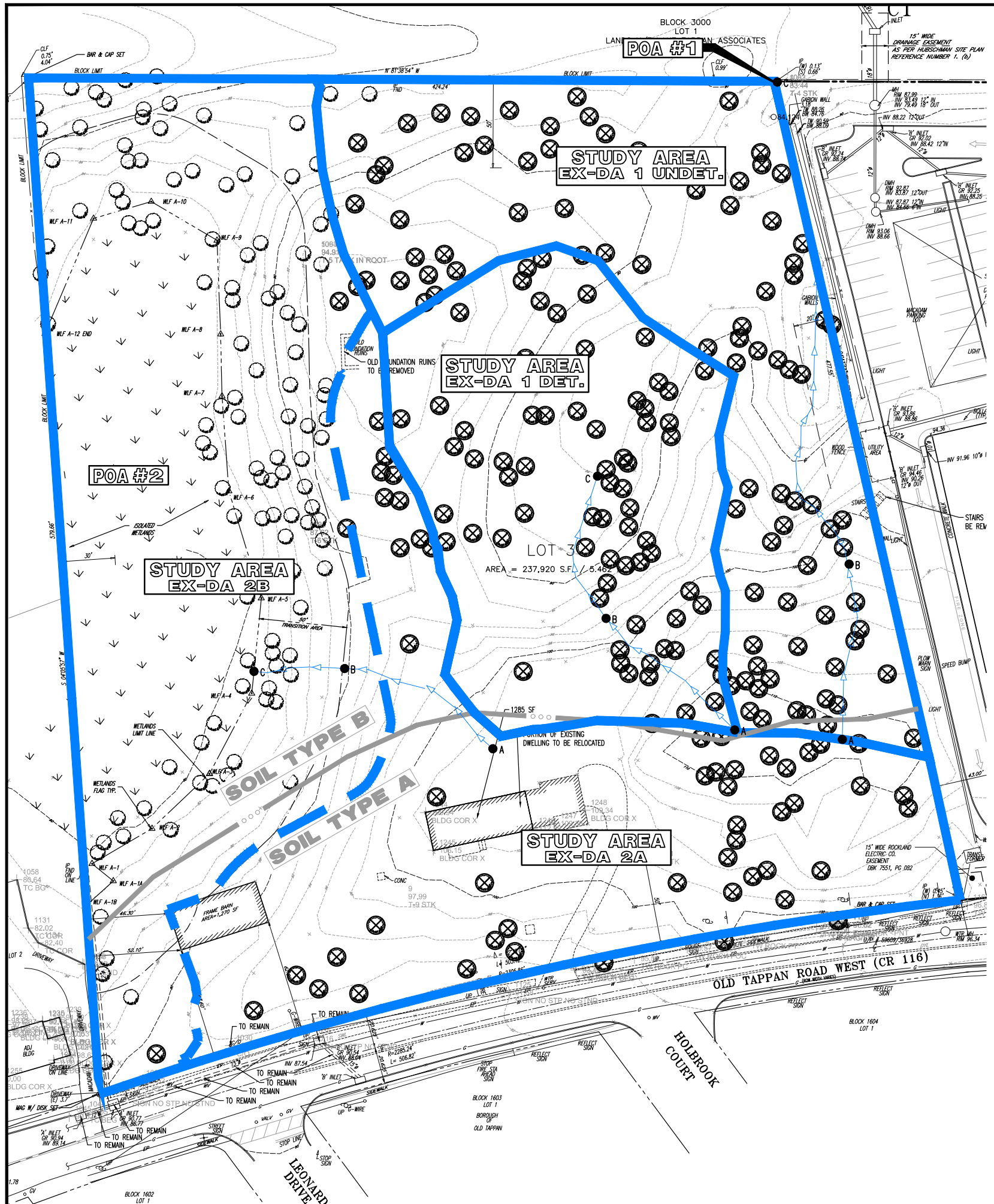
THROUGH LIMITING THE PROPOSED DISTURBANCE TO THE AREA OF PREVIOUS DISTURBANCE, THIS PROJECT IS ABLE TO PERSERVE NATURAL AREAS TO THE MAXIMUM EXTENT POSSIBLE. THE PROJECT ALSO PROPOSES TO MAINTAIN EXISTING DRAINAGE AND GRADING CONDITIONS TO THE MAXIMUM EXTENT POSSIBLE.

Part 10 – Compliance with Non-structural Requirements of NJDEP Stormwater Management Rules

N.J.A.C. 7:8-5.3(b)

No.	Nonstructural Strategy	Yes	No
1	Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss. *Please explain*: PROP. RIP-RAP AT THE STORMWATER DISCHARGE POINT DOWNSTREAM OF THE ABOVEGROUND BASIN	X	
2.	Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces. *Please explain:* IMPERVIOUS SURFACES ARE MINIMUZED AND NATURAL/LANDSCAPED AREAS ARE MAXIMIZED	X	
3.	Maximize the protection of natural drainage features and vegetation. *Please explain*: EXISTING WETLANDS/VEGETATED AREA IS REMAINING UNDISTURBED	X	
4.	Minimize the decrease in pre-construction time of concentration. *Please explain*: EXTENSIVE LANDSCAPE PLAN TO PROVIDE SUPPLEMENTAL VEGETATION AND MINIMAL DISTURBANCE TO NATURAL AREAS	X	
5.	Minimize land disturbance including clearing and grading. *Please explain*: VETEGATED/WETLANDS AREA IS NOT BEING DISTURBED. PROPOSED RETAINING WALLS MINIMIZE DISTURBANCE FOR GRADING/CLEARING	X	
6.	Minimize soil compaction. *Please explain*: USE OF RETAINING WALLS MINIMIZES DISTURBED/COMPACTED SOILS	X	
7.	Provide low maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides. *Please explain*: PLEASE REFER TO LANDSCAPE PLAN PREPARED BY LONGSTONE GARDENS.	X	
8.	Provide vegetated open-channel conveyance systems that discharge into and through stable vegetated areas. *Please explain*:		X
9.	Provide preventative source controls. *Please explain*: PROPOSED STORM DRAIN INLETS PREVENT LARGE DEPRIS FROM FLOWING INTO THE DOWNSTREAM CONVEYANCE SYSTEM	X	

DRAINAGE AREA MAPS



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1 INCH = 30 FT.

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3	12/20/21	REVISED PER SCD COMMENTS	MS
2	10/29/21	REVISED PER BOROUGH, CAFRY	GL
1	07/29/21	REVISED PER SCD & COUNTY COMMENTS	GL

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CHECKED BY: DTS
APPROVED BY: ___

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PROPOSED ASSISTED LIVING FACILITY
BLOCK 3000, LOT 1
244 OLD TAPPAN ROAD
BOROUGH OF OLD TAPPAN, BERGEN COUNTY, NEW JERSEY

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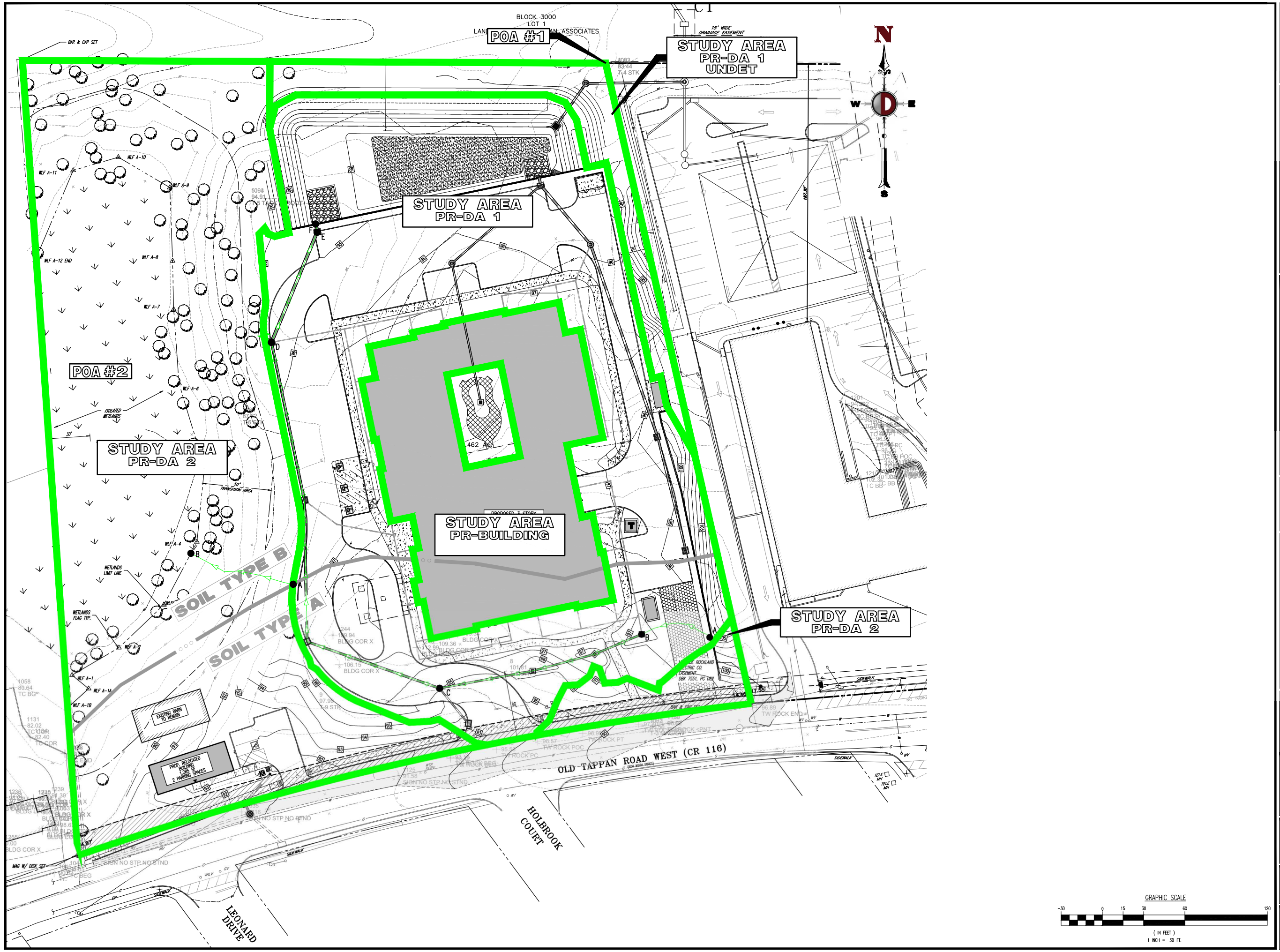
TITLE: EXISTING DRAINAGE AREA MAP

SCALE: (H) 1"=30' (V) ___
DATE: 05/18/2021
PROJECT No: 1423-99-006

SHEET No: 1 OF 3
Rev. #: 5



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CHECKED BY: DTS
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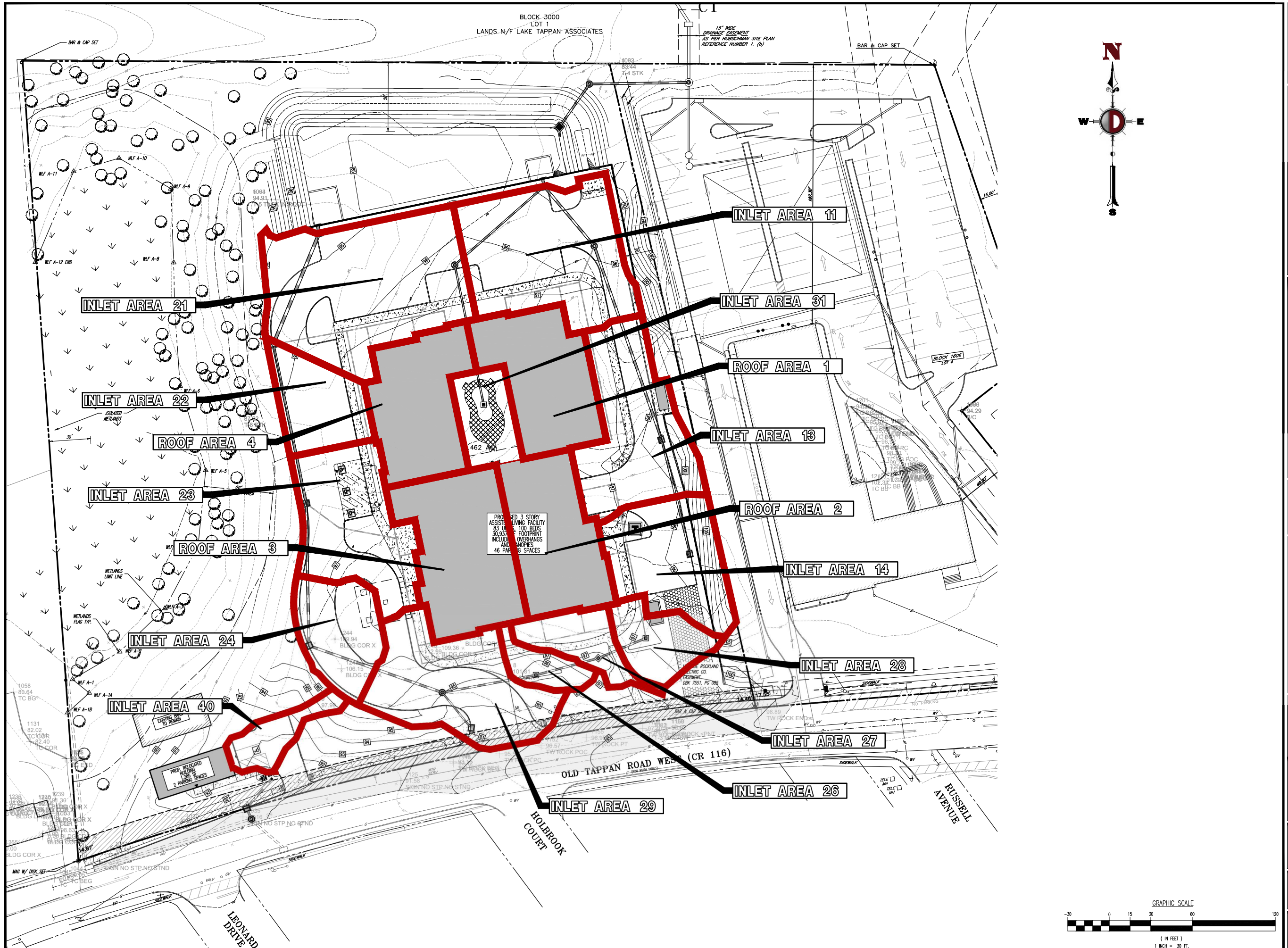
TITLE: PROPOSED DRAINAGE AREA MAP

SCALE: (H) 1"=30' (V)
DATE: 05/18/2021
PROJECT No: 1423-99-006

SHEET No: 2 OF 3
Rev. #: 5



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TITLE: INLET AREA MAP

SCALE: (H) 1" = 30' (V)
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PROJECT No: 1423-99-006

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Rev. #: 5