McNett Flats Subdivision

Major Subdivision Application

Section 11: Grading and Drainage Report

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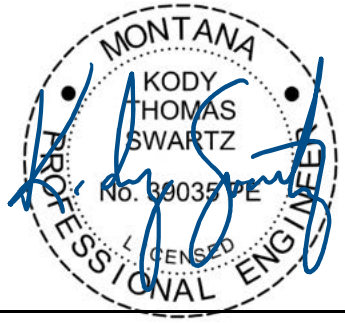
MCNETT FLATS SUBDIVISION

Storm Drainage System Design Report

Missoula, Montana

CERTIFICATION

I hereby state that this Drainage Report has been prepared by me or under my supervision and meets the standard of care and expertise which is usual and customary in this community of professional engineers. The analysis has been prepared utilizing procedures and practices within the standard accepted practices, and in accordance with the Missoula City Public Works Standards and Specifications Manual.



October 30, 2020

Approved By *Date*

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1. INTRODUCTION

Tollefson Properties, LLC. proposes subdividing the 20.21-acre parcel described as Parcel 8A of C.O.S. 6109, Section 12, Township 13 North, Range 20 West, Principal Meridian Montana in Missoula County into seven mixed-use commercial lots. The proposed subdivision will include new streets, sidewalks, water and sanitary sewer utilities, and electrical and communication services to serve the proposed seven lots. The property is currently undeveloped.

A. Location

The proposed subdivision is located at the northern terminus of George Elmer Drive. George Elmer Drive is classified as an Urban Collector (with parking) and connects to Mullan Road approximately one-half mile to the south. Old Ranch Road and Pius Way, existing Urban Local Streets, connect the parcel to the Flynn Ranch Subdivision to the south. The property will also be served by Remington Drive and Winchester Drive, two proposed Urban Local Streets planned within the proposed Remington Flats Subdivision immediately to the west.

Onsite streets and roads will include a proposed extension of George Elmer Drive through the parcel, and three new Urban Local Streets – Briar Way, Abby Lane, and an extension of Old Ranch Road. Refer to the Preliminary Plat, included in Appendix 1, for a map of existing and proposed streets and roads serving the subdivision.

The adjacent parcel to the north is currently located in Missoula County and is zoned C-A3 Agricultural Residential and C-RR1 Residential. It is presently used for agricultural purposes. Similarly, the parcel to the east is zoned C-C1 Neighborhood Commercial and is used for agricultural purposes. The parcel to the west is currently undergoing subdivision review as the Remington Flats Subdivision, a proposed residential development. The tracts to the south are in the City of Missoula and include the Flynn Ranch and 44 Ranch residential subdivisions. Flynn Ranch is zoned RM1-45 with a PUD, and 44 Ranch is part of a special zoning district.

B. Description of Property

The proposed subdivision, and this Storm Drainage System Design report, encompass the 20.21-acre parcel described as Parcel 8A of C.O.S. 6109, Section 12, Township 13 North, Range 20 West. The existing ground cover of the parcel predominantly includes meadow of continuous grass, which is protected from grazing and generally mowed for hay. According to the NRCS Soils Survey of the property, the soils are within the Desmet Loam formation and are classed in hydrologic soil group B. Historically, the property has been used agriculturally for the production of hay and alfalfa. The proposed subdivision will include seven mixed-use commercial lots, zoned B2-2, which will allow for a wide range of potential future land uses. The property generally slopes to the north and west at less than 0.5% slope. There are no slopes exceeding 25%.

The parcel does not include any major existing drainage ways or receiving channels. A former channel of Grant Creek crosses the southern portion of the property, forming a series of long, shallow depressions which gently slope to the west and continue to the present channel of Grant

Creek. The channel has not conveyed water since the 1950s, when Grant Creek was channelized and rerouted to its present location to the north of the parcel. The historic arm of the creek will not impact the proposed development and no mitigation measures are needed for adverse impacts. Existing drainage facilities on the parcel include the outfall from the existing detention facility serving the Flynn Ranch development. The measures that are required to address this existing facility and prevent adverse impacts to any existing or proposed development are discussed in detail in Section B and 0. According to FEMA Flood Insurance Rate Map 30063C1190E, the proposed subdivision is not within a FEMA-designated 100-year or Shaded Zone X floodplain.

The parcel is presently and historically served by an existing agricultural irrigation system, which also serves the adjacent parcels to the north. The existing ditch is a privately-owned lateral irrigation ditch branches from the east-west Flynn-Lowney Ditch at a head gate near the end of Tipperary Way. This non-enclosed, non-lined ditch flows north from the Flynn-Lowney ditch, providing the house at 2315 Flynn Lane with lawn and garden irrigation. It is active from May 1 through November 1. A pump system at approximately 1,300 feet to the north of the proposed subdivision boundary, supplies irrigation water to the center pivots visible on the parcels to the north, as well as a buried irrigation lateral pipe, which returns water south to the subdivision property. All stormwater runoff generated by the new impervious surfaces (roads, sidewalks, parking lots, buildings, etc.) will be retained onsite through installation of stormwater sumps. The standard 8’ sumps will be constructed per City of Missoula STD-302 and will retain stormwater runoff onsite through infiltration. Stormwater will be routed to the sumps through lot grading, and roadside gutters, thus preventing stormwater from flowing into any adjacent agricultural water user facilities, and thus mitigating any potential adverse impacts to these facilities.

There are no major geologic or topographic limitations on the property which may limit the capability for building or excavation of storm drainage facilities using ordinary and reasonable construction techniques.

C. Previous Drainage Studies

The design of the existing outfall from the detention basin serving the Flynn Ranch development, which is located on the parcel, is detailed in the drainage study for the Flynn Ranch Subdivision. This drainage study is included in Appendix 1. In addition, the proposed subdivision parcel is included within the scope of a larger drainage study prepared by IMEG for the Mullan Area Master Plan in 2020. This drainage study is also included in Appendix 1. The relevant aspects of these drainage studies are discussed in Section A and B. There are no other prior known drainage studies for the property.

D. General Project Description

The proposed subdivision will include seven commercial lots zoned B2-2. The exact future land uses of these lots are not known at this time and will depend on future market conditions. The proposed B2-2 zoning will allow the land uses of the parcels within the proposed subdivision to maintain flexibility to meet variable current and future market needs.

The project will include approximately 3,250 lineal feet of new public roadways. The section of George Elmer Drive bisecting the parcel will have an 80-foot wide right-of-way and minimum of 10-foot wide northbound and southbound travel lanes. The other proposed public roadways will be classified as Urban Local Streets with 64-foot wide rights-of-way and a minimum of 10-foot wide travel lanes. All public roadways will include 8-foot wide parking lanes on both sides. In addition, the improvements will include sidewalks and bike lanes. The extension of George Elmer Drive will include a 6-foot wide bike lane adjacent to both the northbound and southbound lane. All public roadways within the proposed subdivision will include boulevard sidewalks – the minimum boulevard width will be seven feet and the minimum sidewalk width will be five feet.

E. Local and State Regulations

The project is regulated under The Missoula City Public Works Standards and Specifications Manual, Chapter 6 – Storm Water System, and the Montana Department of Environmental Quality, Circular 8, Montana Standards for Subdivision Storm Drainage.

F. Geotechnical Investigation

A geotechnical investigation of the property has been completed by Lorenzen Soil Mechanics, Inc. It is dated May 4, 2020 and included in Appendix 2. In addition, a hydrogeologic evaluation was completed by Newfields, Inc., to determine potential impacts to groundwater. This technical memorandum is also included in Appendix 2.

2. EXISTING SITE CONDITIONS

A. Major Basin Description

A major drainage basin planning study, prepared by IMEG for Missoula City and County, has been conducted for the region of the Mullan Area Master Plan. The Mullan Area Master Plan is an effort to plan future land use for roughly 2,000 acres on the western edge of the City of Missoula, split between the City and County. The proposed subdivision is located within the Focus Area of this drainage study.

Presently, most of the Focus Area of IMEG's study, including the subject parcel, is comprised of undeveloped land. The study area is comprised of multiple drainage ways which convey stormwater to the west and into Grant Creek. In the past, before any development within the area, all stormwater flowed from northeast to southwest. Historically, irrigation ditches have been installed in the area to convey stormwater around agricultural land [1]. This infrastructure will need to remain because farmland downstream depends on them. The proposed subdivision is crossed by an existing irrigation ditch lateral, which is discussed in detail in the project Environmental Assessment and will remain in place.

According to the study, Grant Creek is located on the western boundary of the focus area. During large run-off events, the creek may flood. In 2005, a design report was prepared by HDR to help reduce the flooding hazards, improve fish passage & habitat, and improve recreation opportunities

and the aesthetic value of the creek. The floodplain mitigation performed on Grant Creek was completed without any accommodation for future development and therefore, new development will need to be completed in a way not to contribute to the 100-year flooding [1].

Areas within IMEG's focus area are known to have groundwater that can be influenced from interaction with infiltrated flood waters. For this reason, the high groundwater elevations determined in the hydrogeologic evaluation prepared for the proposed subdivision were compared to the bottom elevations of the proposed stormwater drywells. The comparison is shown in Exhibit C, included in Appendix 3.

The report prepared by IMEG found that, preliminarily, areas on the east side of the focus area, southern Mary Jane Avenue, and south of the Flynn-Lowney Ditch are likely suitable for sumps. The study recommends that developers have multiple percolation tests conducted in areas where sumps are proposed [1]. The results of the percolation tests are shown on Exhibit C and outlined in a memo prepared by Lorenzen Soil Mechanics. The hydrogeologic evaluation prepared for the proposed subdivision analyzed the cumulative effect of groundwater mounding due to sumps in the proposed Heron's Landing and Remington Flats subdivisions, in addition to the Mcnett Flats subdivision. The percolation testing, in addition to the hydrogeologic evaluation, confirm that sumps are a feasible storm water management practice for the Mcnett Flats subdivision.

B. Sub-basin Description

The drainage sub-basin includes 20.21 acres of undeveloped land which has historically been used for agriculture. Drainage across the property generally flows from east to west, with areas along the northern parcel boundary draining to the north. A former channel of Grant Creek crosses the southern portion of the property, forming a series of long, shallow depressions which gently slope to the west and continue to the present channel of Grant Creek. The channel has not conveyed water since the 1950s, when Grant Creek was channelized and rerouted to its present location to the north of the parcel.

Offsite flows from adjacent parcels of land are limited to the existing outfall from the detention basin serving the Flynn Ranch development. Any overland flows from the parcel to the east cannot reach the subject property due to the existing irrigation ditch. The offsite flows from the existing detention basin outfall must be routed through the proposed subdivision. The configuration of the existing detention pond is analyzed in this section to ensure it is adequately managed in the design of Mcnett Flats' storm drainage system.

Topographic survey data was used to accurately determine the geometry of the detention pond as constructed. Using AutoCAD Civil3D software, the volume of water stored in the pond was determined at incremental depths to construct a stage-storage relationship curve, shown in Figure 1. At a depth of 4.34 feet, the detention pond will begin overtopping the emergency overflow weir, consisting of a beehive grate, to drain through the 18" outlet pipe. The configuration of the outlet control structure is shown in Figure 2.

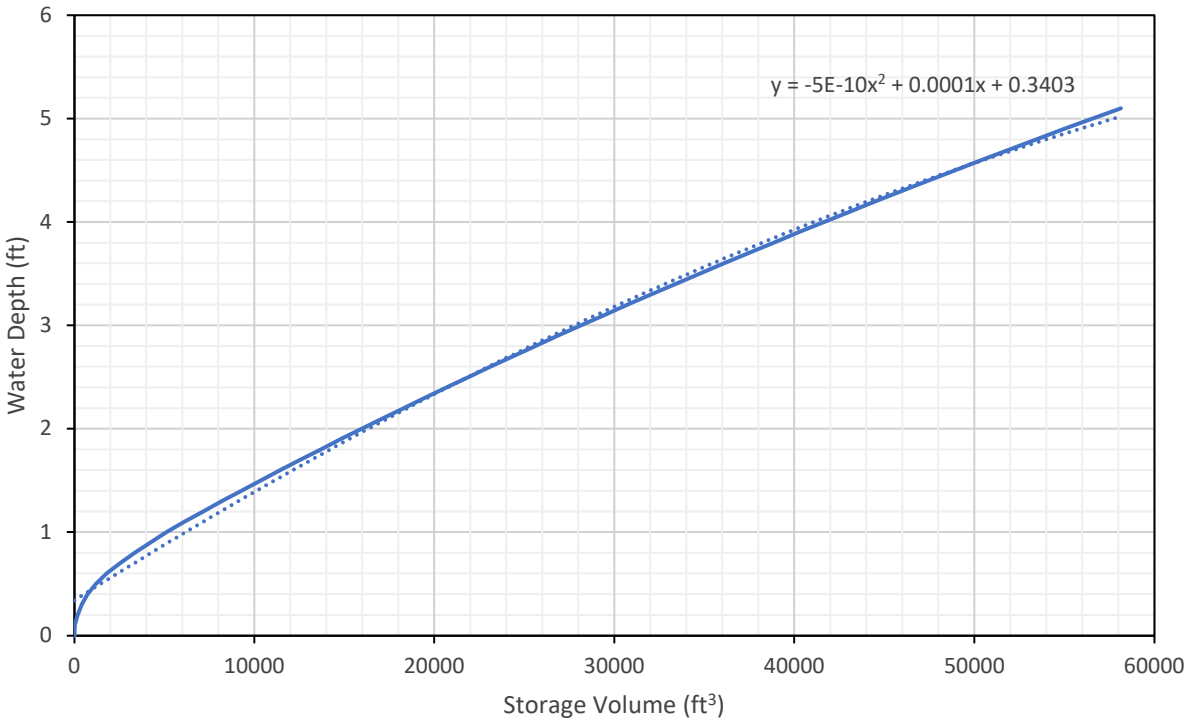

Figure 1. Stage-storage relationship curve for the existing detention basin serving the Flynn Ranch development. Determined using topographic survey data.

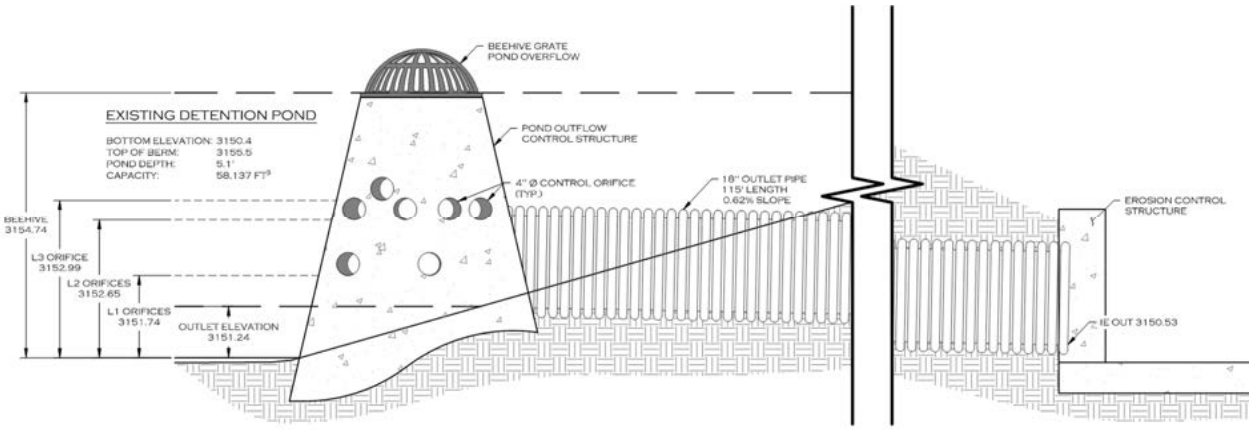

Figure 2. Outfall configuration of the existing Flynn Ranch detention basin. Determined using topographic survey data and field measurements of the concrete outlet control structure.

It is necessary to determine the volume of runoff produced by the Flynn Ranch subdivision to determine the offsite flows discharged to Mcnett Flats through the detention pond outfall. According to the storm drainage report for the Flynn Ranch subdivision, the 100-year, 24-hour volume is 70,642 cubic feet. Autodesk Storm and Sanitary Analysis was used to create a model of the existing subdivision, detention pond, and control structure to determine the offsite flows for the 2-year, 10-year, and 100-year rainfall events with a duration of 24 hours. To represent the Flynn Ranch subdivision, a drainage basin was modeled with an area of 24.35 acres, time of concentration of 40 minutes, and composite curve number of 81.06. These parameters produce

a 100-year, 24-hour runoff volume of 71,000 cubic feet, which compares with the volume determined of 70,642 cubic feet determined in the Flynn Ranch storm report.

The existing detention basin and outlet control structure were modeled using Autodesk Storm and Sanitary Analysis. An infiltration rate was determined as outlined in Appendix 4. A safety factor of five [2] was applied to the measured six inches per hour, for a design infiltration rate of 1.2 inches per hour. For the 100-year, 24-hour storm, the peak inflow to the existing detention pond is 13.32 cubic feet per second, and the water stored in the pond will reach a maximum depth of 2.84 feet. Using this representative subdivision drainage basin and model of the detention pond, the offsite flows entering Mcnett Flats from the Flynn Ranch pond were determined, shown in Table 1.

Table 1. Operation of the existing Flynn Ranch detention basin and offsite flows discharged to Mcnett Flats under existing conditions.

Design Storm (24-hour)	Flynn Ranch Runoff Volume (ft^3)	Maximum Depth in Pond (ft)	Peak Inflow (cfs)	Peak Discharge to Mcnett Flats (cfs)	Drawdown Time (hours)
2-year	14,358	0.50	1.86	0.00	14.17
10-year	35,634	1.69	6.11	0.43	26.82
100-year	70,016	2.84	13.32	2.71	28.46

The subdivision parcel has an area of 20.21 acres, and an existing land cover of non-grazed meadow. According to the NRCS Soils Survey, the soils on the property are classified in hydrologic group B. Therefore, a curve number of 58, representative of non-grazed meadow, is appropriate for the pre-developed drainage basin. The time of concentration for the pre-developed basin is calculated as 70.76 minutes, shown in Table 2.

Table 2. Time of concentration calculation for the existing 20.21-acre parcel.

Sheet Flow		Shallow Concentrated Flow	
Roughness	0.15	Length	1332 ft.
Length	300 ft.	Slope	1%
Slope	2%	Surface Type	Shortgrass Pasture
Rainfall	1.17 in.	Velocity	0.7 ft/s
Time	39.02 min.	Time	31.74 min.

The pre-developed runoff volumes, infiltration volumes, and discharge rates are shown in Table 3. The pre-developed discharge rates shown include the offsite discharge from the Flynn Ranch detention basin, which will be allowed to pass through the proposed subdivision. The pre-developed discharge point corresponds to a low point on the western boundary of the parcel, within the former Grant Creek channel.

Table 3. Pre-developed runoff conditions for the existing parcel.

Design Storm	Runoff Volume (FT^3)	Infiltration Volume (FT^3)	Offsite Pass-through (CFS)	Allowable Peak Surface Discharge (CFS)
2-year, 24-hour	0	167,266	0.00	0.00
10-year, 24-hour	438	166,828	0.43	0.45
100-year, 24-hour	6,284	160,982	2.71	2.93

According to the Missoula City Public Works Standards, the developed storm drainage system must detain the entire 2-year, 24-hour storm. The proposed subdivision will not see any offsite flows discharged from Flynn Ranch for the 2-year storm event. At a minimum, provisions will be made to ensure that the offsite flows from the 10-year and 100-year events are allowed to pass through the proposed storm drainage system, as needed, without the overall peak discharge exceeding the pre-developed peak discharge for either the 10-year or 100-year storm event.

C. Groundwater

According to the hydrogeologic evaluation of the property completed by NewFields, the parcel lies above the Missoula Aquifer, a highly conductive, unconfined, shallow sand and gravel aquifer. A 2005 study completed by HDR divided the groundwater into two major water-bearing zones: shallow local aquifer and the deeper regional Missoula Aquifer. The regional Missoula Aquifer underlies the shallow aquifer, with the two being separated by a sequence of fine-grained sediments. The hydrostratigraphy encountered on the parcel by NewFields generally agrees with this sequence; as a result, hydraulic communication between the two aquifer appears to be minimal [3]. Groundwater in the local shallow aquifer, which stormwater will be discharged into through drywells (sumps), eventually discharges to alluvium associated with the Clark Fork River and then into the river south and southwest of the site [3].

Grant Creek is a major source of recharge to the shallow aquifer, along with leakage from irrigation ditches and infiltration [3]. The site stormwater will be discharged through drywells to contribute to aquifer recharge. NewFields developed a groundwater flow model to simulate groundwater flow in the Grant Creek watershed. This model was used to simulate groundwater mounding from stormwater discharge produced by the proposed subdivision, and to evaluate depth to groundwater at the site under typical seasonal high-water elevations.

The analysis included the known volumes of water infiltrated from the proposed sumps within the right-of-way, as well as estimates of the volumes infiltrated from the proposed Lots, based on the maximum area of hardscaping permitted by the requested B2-2 zoning. The analysis concludes that predicted mounding of the groundwater table from the use of sumps in the proposed subdivision during a 2-year storm event will be minimal, with 0.6 feet or less of increased groundwater levels on the site [3]. The depth to groundwater beneath the proposed subdivision is predicted to range from 14.5 to 19.5 feet under typical seasonal high groundwater conditions [3]. The predicted high groundwater elevations are compared to the elevation of the bottom of the drain rock in each proposed sump on Exhibit C, in Appendix 3. Generally, each sump will have

between five and six feet of clearance between the bottom of the drain rock and the seasonal high groundwater elevation.

D. Waterways and Wetlands

The boundary of the proposed subdivision is approximately 2,400 feet to the south of Grant Creek and approximately 7,000 feet to the north of the Clark Fork River. According to FEMA Flood Insurance Rate Map 30063C1190E, the property is not within a FEMA-designated 100-year or Shaded Zone X floodplain.
The property is within the Grant Creek drainage basin; according to the FIRM map, the property is in Zone "A", or area where no base flood elevations have been determined. However, there are no proposed building sites, and no portion of the subject property, within 20 vertical feet and 1,000 horizontal feet of Grant Creek.

A small private irrigation ditch runs along the eastern boundary of the property. This ditch is supplied by Flynn-Lowney ditch, at a head gate located at the end of Tipperary Way, approximately 1,500 feet to the south of the proposed subdivision. From the head gate, the irrigation ditch runs approximately 6,200 feet to the north, where it drains into Grant Creek. It provides lawn and garden irrigation for the house at 2315 Flynn Lane, and agricultural irrigation for the agricultural parcels adjacent to it north of the proposed subdivision. It is active from May 1 to November 1 annually.

Impacts to surface waterways will be mitigated through the use of sumps for stormwater management. Stormwater runoff from new impervious surfaces will not be allowed to flow directly into the irrigation ditch. There are no wetlands present on or adjacent to the subject property.

3. STORM WATER DESIGN CRITERIA

A. Design Concepts

The proposed subdivision will include new public streets and create seven commercial Lots. Due to the fact that the exact future usage and layout of each proposed Lot is not known at the time of this writing, the report will provide calculations for the storm drainage system within the proposed right-of way. *Upon their development, each of the Lots will need to show that they retain their storm water on-site and only discharge to the pre-development levels.* This report will analyze the following specific design goals:

- Provide adequate runoff infiltration and detention storage within the rights-of-way for the entire post-developed 100-year storm event.
- Provide, at a minimum, one eight-foot drywell per 10,000 square feet of impervious surface within the rights-of-way.
- Ensure infiltration or evapotranspiration of the first half-inch of runoff from all impervious surfaces within the rights-of-way in accordance with the City of Missoula's MS4 permit.
- Manage offsite flows from the existing Flynn Ranch detention pond, which is adjacent to the proposed development and whose outfall discharges onto the subject property.

B. Drainage Criteria

The application standard for the proposed subdivision is the Missoula City Public Works Standards and Specifications Manual. The project must also comply with the Montana Department of Environmental Quality Circular 8, Montana Standards for Subdivision Storm Drainage.

This report will include analysis of the 2-year, 10-year, and 100-year rainfall events. The design storm depths, shown in Table 4, are based on the 24-hour storm duration at the Missoula International Airport as published in MDT Hydraulics Manual Chapter 7, Appendix B.

Table 4. Rainfall depths per design storm return period [2] [4].

	2-YEAR, 24-HOUR STORM	10-YEAR, 24-HOUR STORM	100-YEAR, 6-HOUR STORM	100-YEAR, 24-HOUR STORM
Depth (inches)	1.17	1.66	1.53	2.28

The runoff calculations are performed using the SCS Curve Number Method within the Autodesk Storm and Sanitary Analysis software. The time of concentration is calculated using the SCS TR-55 Method. In general, the most accurate results using the SCS curve number method are obtained when each subbasin is homogenous. Each proposed subbasin will have an area of finished right-of-way, including roads, boulevards, and sidewalks, within it, in addition to a large area of vacant land on the adjacent proposed Lot. Therefore, the runoff volume and peak flow rates will be calculated separately for the right-of-way and vacant lot area of each subbasin, to maintain homogeneity and produce more accurate results.

Design storms were created using SCS synthetic hydrographs. The Type II distribution is a typical time distribution from rainfall records in Montana, however, Type I and Type IA distributions can be appropriate for parts of Montana. The appropriate distribution was determined by comparing the 6-hour rainfall total to the 24-hour rainfall total [4]:

$$\frac{P_6}{P_{24}} = \frac{1.53}{2.28} = 0.67$$

If P_6/P_{24} ranges between 0.518 and 0.639, the Type I distribution should be selected. The Type II distribution should be selected for all values between 0.640 and 0.767 [4]. Therefore, the SCS Type II storm was selected as the design storm for this project. The design storm hyetograph for each of the 2-year, 10-year, and 100-year design storms were prepared using the SCS dimensionless rainfall distribution and the rainfall depths shown above.

Autodesk Storm and Sanitary Analysis was used to calculate runoff flow rates and volumes from each of the proposed subbasins for each of the design storms. The proposed sumps were modelled in Autodesk Storm and Sanitary Analysis using stage-storage relationship curves. The curves vary depending on the sump configuration; as examples, Figure 3 shows the relationship for a standard 8' sump, and Figure 4 shows the relationship for a sump with additional storage provided by four ChamberMaxx storage chambers. ChamberMaxx is a corrugated plastic, open-

bottom infiltration chamber system which can be used to incrementally add additional storage and infiltrative capacity to a standard 8' sump [5].

The exfiltration rate from each standard sump, which neglects exfiltration from the sides of the sumps, was calculated as follows:

$$Q_{EX} = A_B * H_W * FS = \left(\left(\left(\frac{\pi}{4}8^2\right)\right) * \frac{10}{12} * 0.2\right) = 8.38\ \frac{ft^3}{hr} = 0.0023\ cfs$$

Where: A_B = Base area of sump.
H_W = Design infiltration rate, 10 inches per hour.
FS = Safety factor for infiltrative facilities of 5 [2].

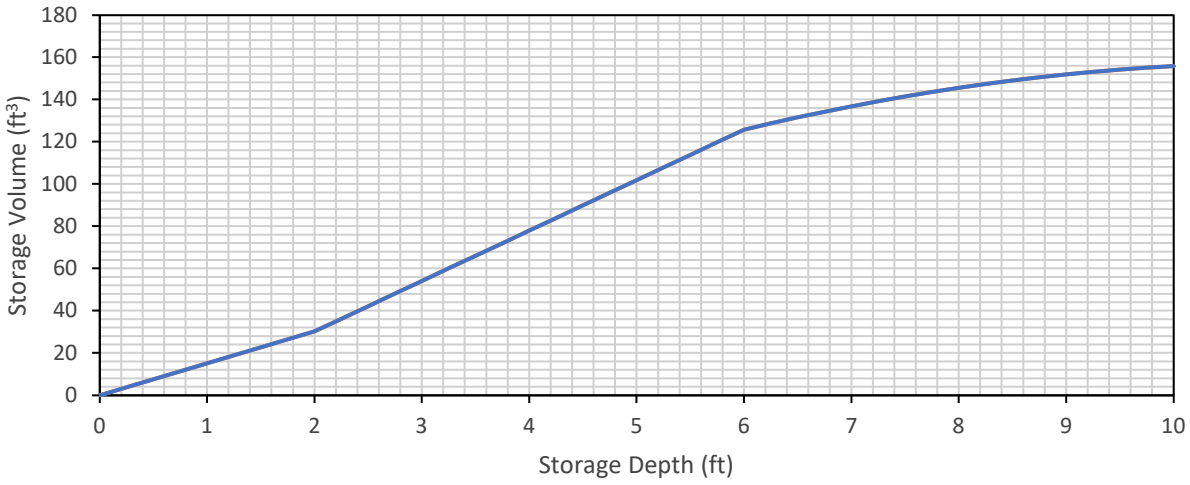

Figure 3. Stage-storage relationship curve for a standard 8' drywell sump per City of Missoula standard drawing STD-302. Assumes drain rock void ratio of 0.3.

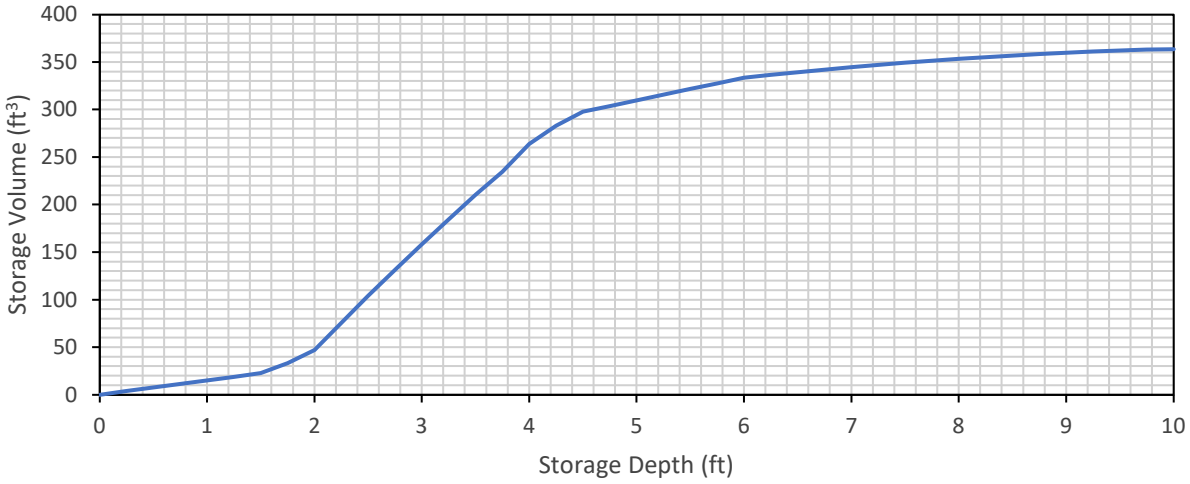

Figure 4. Stage-storage relationship curve for a standard 8' drywell, with four additional connected ChamberMaxx chambers. Assumes drain rock void ratio of 0.3.

Sumps with additional ChamberMaxx storage chambers gain infiltrative capacity from the additional footprint of the chamber. Each ChamberMaxx has a footprint area of 32 square feet [5]. The exfiltration rate from each installed ChamberMaxx chamber is calculated as follows:

$$Q_{EX} = A_B * H_W * FS = \left(32 * \frac{10}{12} * 0.2\right) = 5.33 \frac{ft^3}{hr} = 0.0015 \text{ cfs}$$

Where: A_B = Infiltrative footprint of ChamberMaxx
H_W = Design infiltration rate, 10 inches per hour.
FS = Safety factor for infiltrative facilities of 5 [2].

Note that certain areas of the site, at the bottom of the former Grant Creek channel, have a soil infiltrative capacity of five inches per hour. Thus, the exfiltration rate will vary for each sump depending on the number of additional ChamberMaxx chambers and its location on the parcel. The calculated exfiltration rates are shown in Table 5.

Table 5. Exfiltration rate per sump configuration and infiltrative capacity of underlying soils.

Infiltrative Capacity, Inches per Hour	Exfiltration Rate, CFS	
	10	5
Standard sump	0.0023	0.0012
Sump and 1 chamber	0.0038	0.0019
Sump and 2 chambers	0.0053	0.0026
Sump and 3 chambers	0.0068	0.0033
Sump and 4 chambers	0.0083	0.0040

4. Proposed Design

A. Subbasin Hydrology

The first step in analysis of the proposed storm drainage system is an analysis of the hydrology of the areas contributing to each proposed sump. Each sump will have an area of right-of-way and an area of vacant lot contributing runoff to it. The runoff from these areas is calculated separately. Each right-of-way area is assumed to have the minimum time of concentration of five minutes, and a curve number of 98 for paved roads with curbs and storm sewers in hydrologic soil group B. The vacant lot areas have a much longer time of concentration, calculated based on the flow path from the most hydraulically distant point to the sump. The vacant lot areas will have a curve number of 58 for non-grazed meadow in hydrologic soil group B. The curve number for the vacant lots matches the curve number for the pre-developed basin. Table 6 shows the hydrologic parameters for the areas contributing to each sump. The layout of the proposed sumps is shown on Exhibit C in the Appendix.

Table 6. Hydrologic parameters for each sump's contributing area.

Sump ID	Total Area		Right-of-Way Area		ROW CN	ROW TOC	Vacant Lot Area		Vacant Lot CN	Vacant TOC
	(FT^2)	(Acre)	(FT^2)	(Acre)		(Min.)	(FT^2)	(Acre)		(Min.)
1	0	0.00	0	0.000	N/A	N/A	0	0.000	N/A	N/A
2	27637	0.63	7817	0.179	98	5	19820	0.455	58	56.9
3	18284	0.42	6364	0.146	98	5	11920	0.274	58	56.9
4	4471	0.10	2617	0.060	98	5	1854	0.043	58	23.77
5	57185	1.31	8518	0.196	98	5	48667	1.117	58	57.6
6	26135	0.60	7000	0.161	98	5	19135	0.439	58	47.01
7	19503	0.45	4976	0.114	98	5	14527	0.333	58	39.29
8	15821	0.36	4506	0.103	98	5	11315	0.260	58	50.48
9	14982	0.34	4294	0.099	98	5	10688	0.245	58	53.89
10	15530	0.36	4304	0.099	98	5	11226	0.258	58	53.89
11	37562	0.86	6381	0.146	98	5	31181	0.716	58	64
12	23025	0.53	5522	0.127	98	5	17503	0.402	58	42.15
13	22888	0.53	5884	0.135	98	5	17004	0.390	58	47.01
14	39648	0.91	6640	0.152	98	5	33008	0.758	58	64
15	25401	0.58	5643	0.130	98	5	19758	0.454	58	43.66
16	26630	0.61	5643	0.130	98	5	20987	0.482	58	43.66
17	19994	0.46	5258	0.121	98	5	14736	0.338	58	57.95
18	18284	0.42	4792	0.110	98	5	13492	0.310	58	59
19	5918	0.14	3398	0.078	98	5	2520	0.058	58	23.99
20	22001	0.51	5322	0.122	98	5	16679	0.383	58	60.39
21	24328	0.56	5317	0.122	98	5	19011	0.436	58	63.66
22	37094	0.85	6080	0.140	98	5	31014	0.712	58	51.02
23	33738	0.77	6102	0.140	98	5	27636	0.634	58	47.93
24	17487	0.40	4955	0.114	98	5	12532	0.288	58	56.55
25	18704	0.43	5637	0.129	98	5	13067	0.300	58	53.18
26	24829	0.57	7186	0.165	98	5	17643	0.405	58	52.82
27	2658	0.06	2218	0.051	98	5	440	0.010	58	9.32
28	25343	0.58	5263	0.121	98	5	20080	0.461	58	50.84
29	23595	0.54	5263	0.121	98	5	18332	0.421	58	47.75
30	34130	0.78	6579	0.151	98	5	27551	0.632	58	64
31	37381	0.86	6615	0.152	98	5	30766	0.706	58	59.52
32	28006	0.64	5376	0.123	98	5	22630	0.520	58	54.6
33	28695	0.66	5370	0.123	98	5	23325	0.535	58	56.37
34	25343	0.58	3033	0.070	98	5	22310	0.512	58	45.9
35	17701	0.41	3101	0.071	98	5	14600	0.335	58	43.28
36	20448	0.47	5438	0.125	98	5	15010	0.345	58	44.41
37	24484	0.56	5338	0.123	98	5	19146	0.440	58	45.34
38	15175	0.35	4101	0.094	98	5	11074	0.254	58	51.74

The peak runoff flow rate and the total runoff volume produced by each contributing area were calculated in Autodesk Storm and Sanitary Analysis. Table 7 shows the peak runoff flow rate and volume for each of the design storm events. Note that Sump 1 is associated with the system intended to convey the offsite flows from Flynn Ranch; therefore, it does not receive any surface flow form the Mcnett Flats subdivision.

Table 7. Peak runoff inflow and volume entering each sump from its contributing area for each design storm.

Sump ID	Peak Runoff Inflow (CFS)			Runoff Volume (FT^3)		
	2-year	10-year	100-year	2-year	10-year	100-year
1	0	0	0	0	0	0
2	0.26	0.38	0.54	616.7	932.2	1468.9
3	0.21	0.31	0.43	506.0	765.6	1173.1
4	0.08	0.12	0.17	174.7	289.4	427.3
5	0.21	0.31	0.43	506.0	773.0	1443.8
6	0.18	0.27	0.37	441.5	664.7	1083.2
7	0.10	0.15	0.21	226.7	357.1	624.9
8	0.15	0.21	0.30	345.3	528.6	837.3
9	0.14	0.20	0.28	321.3	496.8	785.7
10	0.14	0.20	0.28	321.3	496.8	788.8
11	0.21	0.31	0.43	506.0	765.6	1318.5
12	0.13	0.19	0.26	300.2	465.3	787.5
13	0.19	0.28	0.39	462.0	700.5	1119.9
14	0.22	0.32	0.45	527.5	797.2	1373.8
15	0.18	0.27	0.37	441.5	664.7	1085.5
16	0.18	0.27	0.37	441.5	664.7	1093.8
17	0.17	0.25	0.36	421.1	628.9	1007.6
18	0.15	0.23	0.32	372.2	560.9	905.0
19	0.11	0.16	0.22	255.8	396.2	566.7
20	0.17	0.25	0.36	421.1	628.9	1019.0
21	0.17	0.25	0.36	421.1	628.9	1032.8
22	0.20	0.29	0.41	483.9	733.8	1272.0
23	0.20	0.29	0.41	483.9	733.8	1240.7
24	0.16	0.24	0.34	398.1	593.7	937.5
25	0.18	0.27	0.37	441.5	664.7	1047.5
26	0.24	0.35	0.49	569.3	863.8	1360.9
27	0.07	0.11	0.15	152.7	252.3	371.2
28	0.17	0.25	0.36	421.1	628.9	1037.4
29	0.17	0.25	0.36	421.1	628.9	1030.4
30	0.22	0.32	0.45	527.5	797.2	1333.5
31	0.22	0.32	0.45	527.5	797.2	1362.4
32	0.17	0.25	0.36	421.1	628.9	1066.7
33	0.17	0.25	0.36	421.1	628.9	1070.5
34	0.10	0.15	0.21	226.7	357.1	683.3
35	0.10	0.15	0.21	226.7	357.1	624.6
36	0.18	0.27	0.37	441.5	664.7	1058.9
37	0.17	0.25	0.36	421.1	628.9	1034.1
38	0.14	0.20	0.28	321.3	496.8	788.9

B. Analysis of Sump Performance

Next, the performance of the proposed sumps and their ability to accommodate the runoff produced by their contributing areas is analyzed. Sumps will be designed to detain the entire two-year and ten-year runoff volumes without overtopping the rim of their inlet grates. They will be designed to accommodate the 100-year runoff volume through additional ponding in streets. The design must accommodate the 100-year volume without overtopping any curbs.

The proposed road profiles create a series of shallow sag curve basins centered around the proposed sumps. The downstream crest of each sag curve will be 0.4 feet above the elevation of the sump inlet, which will ensure that any excess runoff can overtop the basin before it overtops the curb adjacent to the sump (see Figure 5). The basins allow overflows to flow across the site from east to west, where they will continue along Winchester Drive. However, the sag curves will be designed with sufficient capacity to detain the 100-year rainfall event and allow it to infiltrate through the sumps. Each sag curve will be able to detain 162 cubic feet of water, based on the roadway geometry, before it overtops a downstream crest curve. The capacity of the sumps was analyzed in Autodesk Storm and Sanitary Analysis for each design storm. The results are shown in Table 8.

Each sump will be provided with sufficient ChamberMaxx chambers to limit the street ponding volume to 162 cubic feet. The effects of the overflows produced by the 100-year rainfall event are analyzed in Table 9. All street ponding will subside within 72 hours, and no curbs will overtop. Should any sump fail completely in an emergency situation, runoff will be able to overflow into an adjacent basin. A conceptual sketch of the maximum ponding area for Sump 15 is shown in Figure 5, in blue. Before overtopping to a downstream basin, the maximum depth of water in the curb is 5 inches.

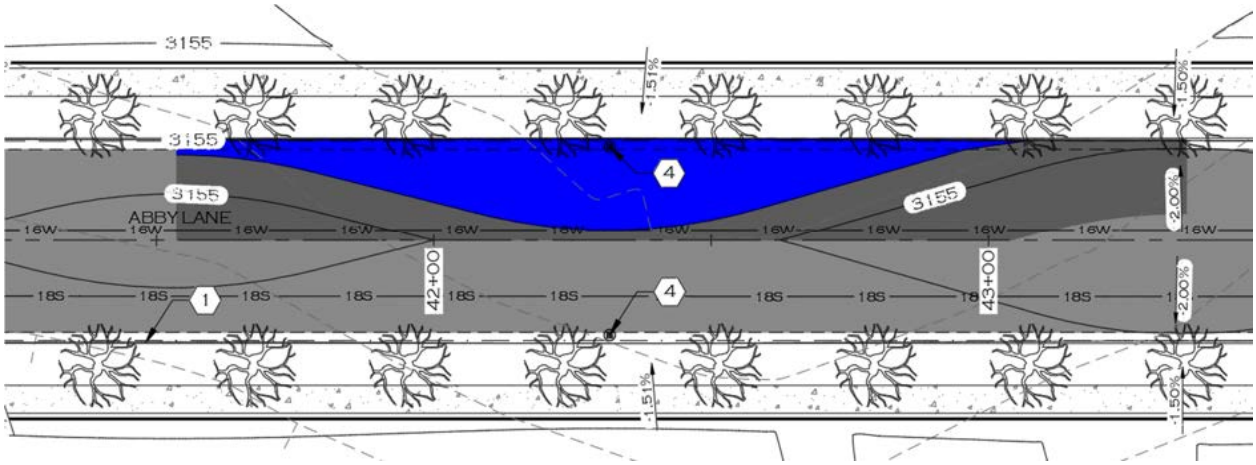

Figure 5. Conceptual sketch of maximum possible street ponding at Sump 15 prior to overflow to downstream basin. Gray hatches represent dry asphalt, and blue hatches represent ponded water around the sump.

Table 8. Chambermaxx quantity, exfiltration rate, and water depth per sump per design storm.

Sump ID	No. of Chambers	Total Volume (FT^3)	Exfiltration Rate (CFS)	Max. Water Depth in Sump (Ft.)		
				2-year	10-year	100-year
1	0	155.88	0.0012	0	0	0
2	0	155.88	0.0023	5.15	6.15	7.25
3	0	155.88	0.0023	5.24	6.24	7.34
4	0	155.88	0.0023	6.03	7.03	8.13
5	1	225.15	0.0038	6.10	9.99	10.00
6	2	294.42	0.0053	4.20	5.87	10.00
7	0	155.88	0.0023	4.33	6.65	10.00
8	1	225.15	0.0038	4.34	6.30	10.00
9	1	225.15	0.0038	4.12	5.89	10.00
10	1	225.15	0.0019	4.70	6.97	10.00
11	3	363.69	0.0068	4.02	5.41	9.84
12	1	225.15	0.0019	4.44	6.48	10.00
13	3	363.69	0.0033	4.23	5.82	10.00
14	3	363.69	0.0068	4.14	5.63	10.00
15	2	294.42	0.0053	4.20	5.87	10.00
16	2	294.42	0.0053	4.20	5.87	10.00
17	2	294.42	0.0053	4.05	5.58	9.26
18	1	225.15	0.0038	4.57	6.74	10.00
19	0	155.88	0.0012	5.58	8.87	10.00
20	2	294.42	0.0026	4.59	6.60	10.00
21	2	294.42	0.0053	4.05	5.58	9.64
22	3	363.69	0.0068	3.91	5.20	9.30
23	3	363.69	0.0068	3.91	5.20	8.92
24	1	225.15	0.0038	4.81	7.21	10.00
25	2	294.42	0.0053	4.20	5.87	9.86
26	3	363.69	0.0068	4.37	6.09	10.00
27	0	155.88	0.0023	3.06	4.69	6.83
28	2	294.42	0.0053	4.05	5.58	9.73
29	2	294.42	0.0053	4.05	5.58	9.63
30	3	363.69	0.0068	4.14	5.63	10.00
31	3	363.69	0.0068	4.14	5.63	10.00
32	3	363.69	0.0033	3.97	5.31	9.45
33	3	363.69	0.0033	3.97	5.31	9.49
34	1	225.15	0.0019	3.66	5.10	10.00
35	1	225.15	0.0019	3.66	5.10	9.23
36	2	294.42	0.0053	4.20	5.87	10.00
37	2	294.42	0.0053	4.05	5.58	9.69
38	1	225.15	0.0038	4.12	5.89	10.00

Table 9. Depth of water, ponded volume, and drawdown time for runoff ponded in streets during the 100-year rainfall event.

Sump ID	Depth	Ponded Volume	Street Ponding Drawdown Time
	100-year	(FT^3)	(Hours)
1	0	0.00	0.00
2	7.25	0.00	0.00
3	7.34	0.00	0.00
4	8.13	0.00	0.00
5	10.00	72.60	14.17
6	10.00	36.30	7.85
7	10.00	108.90	23.78
8	10.00	36.30	12.50
9	10.00	36.30	4.82
10	10.00	108.90	27.92
11	9.84	0.00	0.00
12	10.00	108.90	27.03
13	10.00	36.30	2.63
14	10.00	36.30	7.73
15	10.00	36.30	8.12
16	10.00	36.30	8.97
17	9.26	0.00	0.00
18	10.00	108.90	18.75
19	10.00	108.90	40.57
20	10.00	145.20	22.87
21	9.64	0.00	0.00
22	9.30	0.00	0.00
23	8.92	0.00	0.00
24	10.00	145.20	21.70
25	9.86	0.00	0.00
26	10.00	36.30	8.57
27	6.83	0.00	0.00
28	9.73	0.00	0.00
29	9.63	0.00	0.00
30	10.00	36.30	1.83
31	10.00	36.30	5.27
32	9.45	0.00	0.00
33	9.49	0.00	0.00
34	10.00	36.30	0.57
35	9.23	0.00	0.00
36	10.00	36.30	2.85
37	9.69	0.00	0.00
38	10.00	36.30	5.48

C. Accommodation of Offsite Flows

As discussed in prior sections, the offsite flows produced by the Flynn Ranch subdivision must be conveyed through the proposed subdivision. This will be accomplished by connecting the existing 18" outfall pipe to sumps 1, 2, 3, and 4. The connection will be made with an 18" pipe, matching the diameter and 0.62% slope of the existing outfall pipe. The connection of the overflow will impact the operation of sumps 1, 2, 3, and 4, adding runoff volumes that need to be accounted for in addition to those produced by their tributary area. Table 10 shows the water depth in sumps when the outfall from the existing detention pond is connected to the system.

Table 10. Impact of connecting the Flynn Ranch detention basin outfall to the proposed sumps 1, 2, 3, and 4.

Sump ID	No. of Chambers	Total Volume (FT^3)	Exfiltration Rate (CFS)	Max. Water Depth in Sump (FT.)		
				2-year	10-year	100-year
1	0	155.88	0.0012	0	6.00	8.45
2	0	155.88	0.0023	4.54	7.01	9.46
3	0	155.88	0.0023	4.54	7.01	9.46
4	0	155.88	0.0023	5.09	7.56	10.00

During 100-year rainfall events, the outfall from the detention pond will cause the bioretention basin associated with Sump 4 to overflow. The flow from the detention pond will move through the 18" pipe, under George Elmer, and resurface at Sump 4. The overflow is driven by the elevation head difference between the water surface elevation in the Flynn Ranch detention basin and the curb cut near Sump 4. Next, the overflow will exit the curb cut into the Abby Lane street gutter, where it can eventually flow offsite to the west. The 100-year event will create an overflow from the existing pond of 21,381 cubic feet, with a peak flow rate of 1.89 cubic feet per second.

Overflows from the detention pond will exit the curb cut, at elevation 3154.95', and flow in Abby Lane for the 100-year event. For all events exceeding the 25-year storm, the water depth in the detention pond will be sufficient to overtop Sump 4, but it will not reach a depth to overflow through the curb cut and flow in Abby Lane. Using the model of Flynn Ranch and the detention pond outlined in Section B, the post-developed operation of the existing pond and offsite flows entering Mcnett Flats were determined, shown in Table 11.

Table 11. Operation of the existing Flynn Ranch detention basin and offsite flows discharged to Mcnett Flats under developed conditions.

Design Storm (24-hour)	Flynn Ranch Runoff Volume (FT^3)	Maximum Depth in Pond (FT)	Maximum Pond WSEL (FT)	Peak Inflow (CFS)	Peak Discharge to Mcnett Flats (CFS)	Drawdown Time (HOURS)
2-year	14,358	0.50	3150.9	1.86	0.00	14.17
10-year	35,634	2.11	3152.51	6.11	0.37	34.52
25-year	48,674	3.24	3153.64	8.85	0.67	47.13
50-year	58,778	4.10	3154.5	10.99	0.79	57.12
100-year	70,016	4.57	3154.97	13.32	1.89	62.76

Street gutters will be used to convey the overflows during the 100-year event – therefore the spread width must be analyzed for the 0.5% grade of the road profiles to ensure adequate capacity. For the 100-year overflow rate of 1.89 cfs, the depth of gutter flow is calculated as follows:

$$y = z\left(\frac{QnS_x}{s^{0.5}}\right)^{3/8} = 1.24\left(\frac{1.89(0.013)(0.02)}{0.005^{0.5}}\right)^{3/8} = 0.192\ ft.$$

Where y = Depth of Water in Gutter Cross-Section (feet)
Q = Gutter Flow Rate (CFS)
n = Manning's Roughness Coefficient (0.013 for Smooth Concrete or Asphalt)
s = Longitudinal Slope of Gutter (ft/ft)
S_x = Pavement Cross Slope (ft/ft)
z = 1.24 for English Units

The depth of flow can be translated to a spread width using the following equation:

$$T = \frac{y}{S_x} = \frac{0.192}{0.02} = 9.6\ ft.$$

Where T = Spread Width of Flow in Street (feet)
Y = Depth of Water in Gutter Cross-Section (feet)
S_x = Pavement Cross Slope (ft/ft)

For the overflow produced during the 100-year storm event of 1.89 cubic feet per second, the street gutters along the overflow path will convey water with a maximum depth of 2.3 inches and a spread width of 9.6 feet. The overflows will not reach the crown centerline along the overflow path.

5. Post-Construction Water Quality

Historical rainfall data supports the characterization that, on average, 90 percent of the rainfall events occurring across Montana's MS4 areas are 0.5 inches or less. Therefore, the Montana Department of Environmental Quality MS4 General Permit requires that all regulated projects implement Post-Construction stormwater Best Management Practices that are designed to infiltrate, evapotranspire, and/or capture for reuse the post-construction runoff generated from the first 0.5 inches of rainfall from a 24-hour storm preceded by 48 hours of no measurable precipitation [6]. Any portion of this runoff not infiltrated, evapotranspired, or captured for reuse must be treated by Best Management Practices (BMPs) expected to remove 80 percent Total Suspended Solids (TSS).

The runoff reduction volume (RRV), or the volume of storm water runoff generated from the first 0.5 inches of rainfall, was calculated using the procedure outlined in Chapter 3 of the Montana Post-Construction Storm Water BMP Design Guidance Manual:

$$\text{RRV} = \frac{\text{PR}_\text{V}\text{A}}{12} = \frac{(0.5)(0.211)(20.21)}{12} = 0.18 \text{ acre} - \text{feet}$$

Where RRV = Runoff Reduction Volume (Acre-feet)
P = Water Quality Rainfall Depth (Inches)
R_V = Dimensionless Runoff Coefficient, $R_V = 0.05 + 0.9(I)$
I = Percent Impervious Cover Draining to the Facility = 0.179
A = Basin Area (Acres)

The RRV accounts for the entire area of the post-developed basin. In accordance with the City of Missoula's Storm Drainage Design Standards, all runoff produced by the subdivision will be retained onsite and infiltrated at the proposed sumps. Therefore, the MS4 General Permit requirement is being met.

To meet the goals and preliminary designs of the Mullan Area BUILD Grant, the project will include curb bulb-outs at all proposed intersections to provide additional pretreatment before storm water enters the sumps at those locations. Runoff flow in the curb will enter the basin through curb cuts, where it will percolate through landscaping to reach the sump through an underdrain. The preliminary cross-section of the bioretention basins is shown in Figure 6.

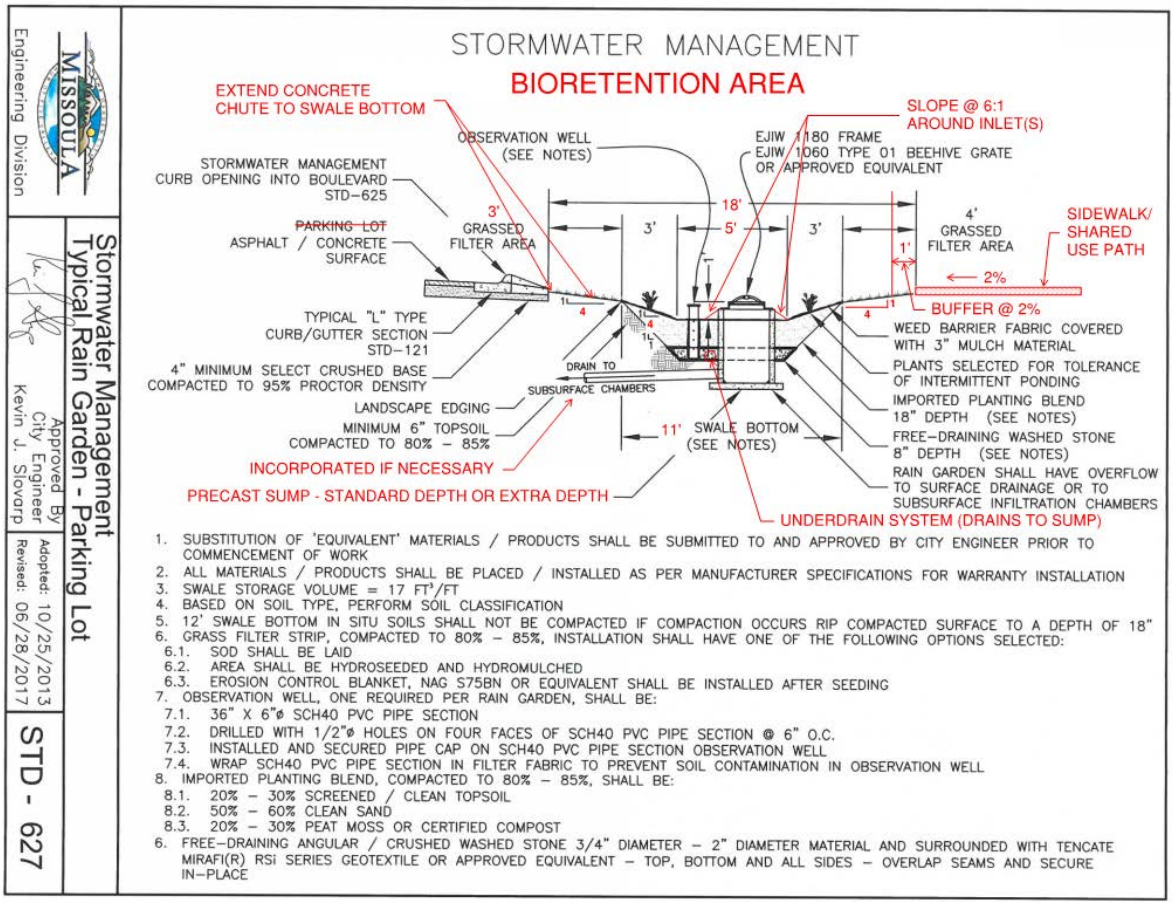

Figure 6. Preliminary design of bioretention basin cross-section to be constructed at proposed intersection locations.

6. Compliance with Design Goals

This report shows that the four specific design goals of the project are being met:

- Provide adequate runoff infiltration and detention storage within the rights-of-way for the entire post-development 100-year storm event.
  Adequate storage is provided within the roadway sag curves to handle overflows from sumps during large rainfall events. Runoff will be stored in the sag curves, without overtopping any curbs, until it infiltrates via the sumps.

- Provide, at a minimum, one eight-foot drywell per 10,000 square feet of impervious surface within the rights-of-way.
  The project includes a total of 197,851 square feet of proposed right-of-way. The proposed 38 drywells have an average contributing impervious area of 5,206 square feet.

- Ensure infiltration or evapotranspiration of the first half-inch of runoff from all impervious surfaces within the rights-of-way in accordance with the City of Missoula's MS4 permit.
  All runoff will be retained on site and infiltrated through drywells.

- Manage offsite flows and provide an overflow path from the existing Flynn Ranch detention pond, which is adjacent to the proposed development and whose outfall discharges onto the subject property.
  Offsite flows from the existing detention pond will be routed to Sump 4 at the intersection of George Elmer Drive and Abby Lane. For rainfall events greater than the 25-year storm, they will overflow through Sump 4 where they will exit into the street gutter and fill sequential basins until they move offsite to the west on Winchester Drive.

7. REFERENCES

[1] Territorial-Landworks, Now IMEG, "Drainage and Infrastructure Recommendation Memo for Mullan Area Master Plan," Territorial-Landworks, Now IMEG, Missoula, 2020.

[2] City of Missoula, "Missoula City Public Works Standards and Specifications Manual," City of Missoula, Missoula, 2020.

[3] G. Andres and C. Stringer, "Technical Memorandum - Hydrogeologic Evaluation, Mcnett Flats," Newfields, Inc., Missoula, 2020.

[4] Montana Department of Transportation, Hydraulics Manual, 2017.

[5] Contech Engineered Solutions, LLC., "ChamberMaxx Stormwater Chamber System," 2019. [Online]. [Accessed 7 October 2020].

[6] HDR, Inc., Montana Post-Construction Storm Water BMP Design Guidance Manual, Montana Department of Environmental Quality, 2017.

APPENDIX 1

BACKGROUND INFORMATION

Memorandum of Understanding

Between

Woith Engineering, Inc.
Mcnett Flats Subdivision

and

406 Engineering, Inc.
Remington Flats Subdivision

This Memorandum of Understanding confirms the understanding between Woith Engineering, Inc., and 406 Engineering, Inc. acknowledging the location of the storm water emergency overflow path between the Mcnett Flats subdivision and Remington Flats Subdivision.

Purpose

To ensure storm water flows exceeding the 100-year storm event can overflow from east to west across the Mcnett Flats subdivision and the Remington Flats Subdivision, an overflow path will be coordinated between Woith Engineering, Inc. and 406 Engineering, Inc., allowing flows to overtop the road high points from east to west along **Winchester Drive**.

Reporting

The City of Missoula has requested this Memorandum of Understanding to ensure storm water overflows are accommodated at Winchester Drive between the two proposed developments.

Duration

This Memorandum of Understanding is at-will and may be modified by mutual consent of authorized officials from Woith Engineering, Inc. and 406 Engineering, Inc. This Memorandum of Understanding shall become effective upon signature by the authorized officials from Woith Engineering, Inc. and 406 Engineering, Inc. and will remain in effect until modified or terminated by any one of the partners by mutual consent.

Contact Information

Woith Engineering, Inc.
Kody Swartz, PE, LSI
Missoula Operations Manager
3860 O'Leary Street, Suite A
Missoula, MT 59808
(406) 203-0869
kody@woitheng.com

Date: 10/19/2020

406 Engineering, Inc.
Brian Throckmorton, PE
Vice President
1201 South 6th Street West No. 102
Missoula, MT 59801
(406) 317-1131
briant@406eng.com

Date: 10/20/20

PRELIMINARY PLAT OF

MCNETT FLATS

A MAJOR SUBDIVISION LOCATED IN THE SOUTH ONE-HALF OF SECTION 12, TOWNSHIP 13 NORTH, RANGE 20 WEST, P.M.M., MISSOULA COUNTY, MONTANA

OWNER OF RECORD:
TOLLEFSON PROPERTIES LLC

SUBDIVIDER:
TOLLEFSON PROPERTIES LLC

TOTAL SUBDIVISION AREA:
20.19 ACRES (GROSS)
15.42 ACRES (NET)

PERIMETER LEGAL DESCRIPTION

TRACT 8A OF CERTIFICATE OF SURVEY 6109, RECORDS OF MISSOULA COUNTY, LOCATED IN THE SOUTH ONE-HALF OF SECTION 12, TOWNSHIP 13 NORTH, RANGE 20 WEST, PRINCIPAL MERIDIAN MONTANA, MISSOULA COUNTY, MONTANA.

KEY NOTES:

1. 60' PRIVATE ROAD & PUBLIC UTILITY EASEMENT PER MICRO BOOK 549, PAGE 1716
2. PROPOSED 20' IRRIGATION EASEMENT
3. 20' ALLEY PER 44 RANCH, PHASES 1 AND 2
4. 10' X 50' DRAINAGE EASEMENT PER BOOK 864, PAGE 382
5. 5' PUBLIC ACCESS & UTILITY EASEMENT
6. 6' PUBLIC RIGHT-OF-WAY
7. 16' PUBLIC RIGHT-OF-WAY

NOTES:

1. PROPOSED BEARINGS & DISTANCES AND PROPOSED EASEMENTS ARE PRELIMINARY AND MAY BE SUBJECT TO CHANGE PRIOR TO SUBMITTAL OF FINAL PLAT.
2. A PUBLC PEDESTRIAN ACCESS EASEMENT WILL BE CREATED ON LOT 1 & LOT 6 DURING THE BUILDING PERMIT PROCESS TO ENSURE BLOCK LENGTHS DO NOT EXCEED 480'.

N

0 60 120
IN FEET

BASIS OF BEARING:
MONTANA STATE PLANE - 2500
GRID NORTH - GROUND DISTANCES

VERTICAL DATUM
NAVD88

CERTIFICATE OF SURVEYOR

I HEREBY CERTIFY THAT THIS PRELIMINARY PLAT WAS PREPARED UNDER MY SUPERVISION.

MICHAEL D. SHAYLOR, PLS
MONTANA REGISTRATION NO. 19110 LS

DATE

WOITH ENGINEERING, INC.
ENGINEERS & SURVEYORS
405 3RD STREET NW, SUITE 206 • GREAT FALLS, MT 59404 • 406-761-1955
3860 O'LEARY STREET, SUITE A • MISSOULA, MT 59808 • 406-203-9565
• WWW.WOITHENG.COM •

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1/4	SECTION	TOWNSHIP	RANGE
	12	13 N	20 W

PRINCIPAL MERIDIAN MONTANA
MISSOULA COUNTY, MONTANA
WEI JOB#: 1931
DRAWN: CRH
QA: MDS
DATE: OCTOBER 20, 2020
FILENAME: PRELIM-PLAT.DWG
SHEET 1 OF 1

I. GENERAL

Flynn Ranch is a proposed 52 lot major subdivision, located in Missoula, Montana, in the southwest 1/4 of Section 12, T13N, R20W, P.M.M., Missoula County, Montana. Access to Flynn Ranch is via George Elmer Drive from Mullan Road.

The proposed subdivision will cause an increase in storm water run-off caused by the addition of new streets, driveways, and house roofs when compared to the existing conditions. Calculations completed in this report will determine what additional facilities are necessary to convey and detain the additional storm water.

Run-off and drainage calculations for the Flynn Ranch Subdivision are completed for a 1-hour event with both a 10-year recurrence interval and a 100-year recurrence interval in accordance with Missoula City Subdivision Regulations. The 10-year storm rainfall is used to size the detention/retention basin and design the storm water facilities. The facilities are checked with the 100-year storm rainfall amount to ensure negative effects of the greater intensity storm are mitigated. The intensity values were obtained from the Montana Department of Transportation Hydrology Manual.

The subdivision will be divided into fifteen drainage areas for analysis purposes. The fifteen drainage areas are shown on the Drainage Area Exhibit in the Appendix of this report. Each drainage area has a corresponding curb inlet in the curb and gutter system that directs the storm water run-off into the storm sewer system. A detention basin will be constructed to the north of the property in an area that is not proposed for development at this time. The detention basin is located in an area where the storm water run-off naturally collects. The detention basin will be sized to detain the increase in storm water runoff caused by the improvements in the corresponding drainage area. This basin will be built with an outlet structure that will limit the post-development flow rate to the pre-development condition while storing the additional run-off caused by the storm events. The basin will empty into the natural drainage swale, while temporarily storing the additional runoff volume.

II. RUN-OFF CALCULATIONS

The rational method, which provides a good estimate of storm water run-off for relatively small drainage areas (<200 acres) will be used for these calculations. The rational method equation is:

$$Q = C * I * A$$

Equation 2.1

Q = Maximum rate of run-off (cfs)

C = Run-off coefficient. This coefficient represents the ratio of runoff to rainfall based on the characteristics of ground surfaces within the drainage area. Runoff coefficients are determined from Table A-1 in the Appendix

of this report. Weighted values are calculated based on the percentage of areas of each surface type within the drainage area.

I = Average rainfall intensity (in/hr). Values of I are based on historical measurements taken at weather stations around the state and are documented in the Montana Department of Transportation's Hydrology Manual. Values for Missoula County for various return periods and durations can be found in Tables A-2 and A-3 in the Appendix of this report.

A = Size of drainage area in (acres). The Drainage Area exhibit in the Appendix of this report shows the limits of the areas used for calculations in this report.

A. RUN-OFF COEFFICIENT

The following runoff coefficients were used in determining the runoff at this site:

Impervious surfaces (streets, driveways and roofs)	0.90
Undeveloped conditions (flat)	0.20
Lawn surfaces (flat)	0.15

A weighted coefficient is calculated for after-development conditions using the following equation:

$$C = \frac{\sum (C_x A_x)}{A}$$

Equation 2.2

C= Weighted runoff coefficient
C_x= Runoff coefficients for each surface type
A_x= Individual surface type area
A= Total drainage area

The following areas and dimensions are assumed for the post-development impervious areas related to the house sites:

Single Family Residences

Driveways = 20 feet wide, 20 feet long =	400 ft²
House roof area =	1,600 ft²
TOTAL Impervious Area per Home=	2,000 ft²

Multi Family Units (8-plex)

Parking = 8 spaces per unit(9x16.5) =	1,200 ft²

Unit roof area =	4,900 ft²
TOTAL Impervious Area per Uni t =	6,100 ft²

Garage/Single Units Over Garage

Unit roof area =	1,170ft²
TOTAL Impervious Area per Home=	1,170 ft²

Contributing asphalt roadway and concrete sidewalk areas are also included as post-development impervious areas for each drainage area.

Detailed calculations of the weighted run-off coefficients for each Drainage Areas can be found in the Appendix. A summary is provided in Table 2.1 below.

Post-Development Weighted C Values									
Area 1	0.58	Area 6	0.66	Area 11	0.44				
Area 2	0.52	Area 7	0.67	Area 12	0.44				
Area 3	0.32	Area 8	0.50	Area 13	0.50				
Area 4	0.41	Area 9	0.45	Area 14	0.56				
Area 5	0.47	Area 10	0.5	Area 15	0.52				

Table 2.1 - Area 1 Post-Development C Values

B. RAINFALL INTENSITY

Rainfall intensities for these calculations are obtained from data contained in the Montana Department of Transportation (MDT) Hydrology Manual (please see Tables A-2 and A-3 in the Appendix). The City of Missoula subdivision regulations specify that a storm drainage system be designed using the 10-year, 1-hour storm intensity of 0.72 in/hr as specified in the MDT Hydrology Manual. The subdivision regulations also specify that measures be taken to mitigate adverse affects from a 100-year, 1-hour storm, which has an intensity of 1.14 in/hr. These values obtained from the MDT Hydrology Manual are actually an average intensity for the specified storm. It is possible that varying intensities may be experienced during the design storm. These varying intensities are accounted for by using equation 2.8, which is discussed later in this report.

The rainfall intensity at a particular concentration point of interest depends upon the time it takes for water to reach the point of concentration from the farthest point away in the defined drainage area. This time is defined as the time of concentration. In order to take into account the different hydraulic flow conditions within a watershed, the time of concentration is broken into travel times for the following flow conditions: sheet flow, shallow concentrated flow, and channel flow. Sheet flow typically only occurs in the first 300 feet or less of a drainage area. After the first 300 feet, the runoff will form into shallow concentrated flow as it travels across the natural ground. Channel flow conditions occur when the run-off enters a constructed ditch, curb, or swale.

The time of concentration is computed by summing the travel times for each of the three flow conditions, if applicable. Time of concentration is defined in Equation 2.3 below.

$$T_c = T_1 + T_2 + T_3$$

Equation 2.3

T_c= Total Time of Concentration
T_1= Time of Travel, Sheet Flow
T_2= Time of Travel, Shallow Concentrated Flow
T_3= Time of Travel, Channel Flow

Equations for computing Sheet Flow, Shallow Concentrated Flow, and Channel Flow taken from the Montana Department of Transportation Hydrology Manual, Appendix D and are detailed below.

Sheet Flow

$$T_t = \frac{0.007(n * L)^{0.8}}{(P_2)^{0.5}(S)^{0.4}}$$

Equation 2.4

n = Manning's Coefficient
= 0.17 for cultivated land with greater than 20% residue
L = Length of longest flow path in drainage area, feet
P_2 = 2-year, 24-hour rainfall, inches
= 1.15 inches for Missoula County
S = Slope of drainage area, feet/foot
= 0.003 feet/foot, typical for entire subdivision

Shallow Concentrated Flow

$$T_2 = \frac{L}{60 * V}$$

Equation 2.5

L = Length of longest flow path in drainage area, feet
V = Velocity of flow, feet/second

$$V = K_u * k * S_p^{0.5}$$

Equation 2.6

K_u = Constant = 3.28 in English units
k = Intercept Coefficient
= 0.274 for cultivated overland flow
S_p = slope, percent
= 0.3%, typical for entire subdivision

Channel Flow

Time of travel for channel flow is calculated with Equation 2.5 above with

Manning's Equation (Equation 2.7) used to calculate the flow velocity.

$$V = \frac{K_n}{n} * R^{2/3} * S^{0.5}$$

Equation 2.7

K_n = Constant = 1.486 in English units
n = Roughness coefficient
= 0.013 for concrete curb and gutter
R = Hydraulic Radius = $\frac{A}{P}$
A = Flow Area, square feet
P = Wetted Perimeter, feet
S = slope, feet/foot
= 0.5%, typical for all curb and gutter and roads in subdivision

The time of concentration for the property before development is 135 minutes. The calculations for pre-development time of concentration can be found in the Appendix.

Detailed calculations for the time of concentration for each Drainage Area after development can be found in the Appendix. A summary is provided in Table 2.2 below.

Time of Concentration Values, After Development (minutes)									
Area 1	37	Area 6	19	Area 11	64				
Area 2	56	Area 7	37	Area 12	55				
Area 3	101	Area 8	37	Area 13	48				
Area 4	62	Area 9	49	Area 14	39				
Area 5	62	Area 10	50	Area 15	38				

Table 2.2 - Time of Concentration Values, After Development

However, in this subdivision some of the Drainage Areas have a time of concentration that is greater than the duration of the 1-hour event being investigated. Therefore, the entire drainage area will not contribute to the flow at the point of interest during the storm duration. To account for this condition, the rainfall intensity for the 1-hour event is multiplied by the ratio of the event duration to time of concentration to obtain an effective rainfall intensity. This is detailed in Equation 2.8 below.

$$I_{effective} = I_{1-hour} * \frac{D}{T_c}$$

Equation 2.8

$I_{effective}$ = Effective rainfall intensity for point of interest

$I_{1\text{-hour}}$ = Rainfall intensity of 1-hour storm event
D = Storm event duration
T_c = Total Time of Concentration

The effective rainfall intensity is used to calculate the run-off flow rates and storage volume in the next section.

C. RUN-OFF FLOW RATES & VOLUMES

Calculations for the before development condition can be seen in the Appendix. The before development calculations are done for the entire subdivision as one area since the conditions are the same over the entire tract of land. The before development flow rate is used to determine the rate at which storm water can be discharged from the subdivision after development. The before development peak flow rate can be seen in Table 2.3.

Calculations of the flow rates for each Drainage Area after development can also be found in the Appendix. The calculations in the appendix include hydographs showing how the flow rate for each respective drainage area builds to the maximum flow rate, remains constant while the entire area is contributing and then tapers off to as the flow subsides. The total run-off volume is derived by calculating the area under the curve. Table 2.3 summarizes these calculations. Refer to table 3.1 for peak flows at specific concentration points.

Run-Off Flow Rates and Volumes 10 Year Storm						
Before Development Peak Run-Off Flow Rate = 1.56 cfs Volume = 0.129 ac-ft						
After Dev. Areas	Peak Flow Rate (cfs)	Run-Off Volume (acre-ft)		After Dev. Areas	Peak Flow Rate (cfs)	Run-Off Volume (acre-ft)
Area 1	0.31	0.025		Area 11	0.37	0.029
Area 2	1.05	0.082		Area 12	0.73	0.05
Area 3	1.11	0.154		Area 13	0.57	0.045
Area 4	0.39	0.031		Area 14	0.27	0.022
Area 5	0.42	0.034		Area 15	0.23	0.019
Area 6	0.13	0.011				
Area 7	0.22	0.018				
Area 8	0.48	0.039				

Area 9	0.40	0.033				
Area 10	0.25	0.021		TOTAL VOLUME		0.613

Table 2.3 - Run-Off Flow Rates and Volumes

III. STORM SEWER CULVERT SIZING

As the storm water run-off travels through the subdivision it is collected in catch basins and distributed into the underground storm sewer system. The culverts in this storm sewer can be sized by assigning concentration points and sizing the culverts according to the peak flow rates. These concentration points for the storm sewer can be seen on the Drainage Area map in the Appendix.

By using another form of Manning's equation, maximum flow rates for 12 inch and 18 inch culverts can be calculated. With a minimum slope of 0.25%, a 12 inch culvert can convey 2.1 cfs and an 18 inch culvert can carry up to 6.0 cfs. Required culvert sizes can then determined using the flow rates that have collected in the system upstream of the corresponding concentration points. The Manning's calculations for the culvert can be found in the Appendix. Table 3.1 summarizes the contributing areas to each concentration point and the corresponding flow rate and pipe size.

Concentration Point (CP) Flow Rates and Corresponding Pipe Sizes for 10-year Storm			
	Contributing Drainage Areas	Peak Flow Rate at Concentration Point	Pipe Size Required
CP 1	1 & 2	1.36	12 inch
CP 2	2	1.05	12 inch
CP 3	3	1.11	12 inch
CP 4	3,4 & 5	1.92	12 inch
CP 5	5	0.42	12 inch
CP 6	1,2 & 6	1.49	12 inch
CP 7	7	0.22	12 inch
CP 8	1,2,6,7,8 & 9	2.19	18 inch
CP 9	9	0.40	12 inch
CP 10	10	0.25	12 inch
CP 11	3,4,5,10, & 11	2.54	18 inch
CP 12	3,4,5,10,11,12 & 13	3.84	18 inch

CP 13	13	0.57	12 inch
CP 14	14	0.27	12 inch
CP 15	3,4,5,10,11,12,13,14 & 15	4.34	18 inch

Table 3.1 - Concentration Point (CP) Flow Rates and Corresponding Pipe Sizes for a 10-Year Storm

IV. DETENTION BASIN LOCATION AND SIZING

As described above, the pre-development run-off flow rate is 1.56 cfs and the total run-off volume after development for a 1-hour storm with a recurrence interval of 10-years is 0.613 acre-ft. This flow rate and volume will be used to design the detention basin size and outlet structure. The detention basin is located outside the Flynn Ranch Subdivision to the north. The developer currently owns the property to the north. The tract of land where the detention basin will be located will include a drainage easement for the storm water from the Flynn Ranch Subdivision. A Drainage swale will be built from the outlet pipe at the north end of the property to the detention basin the storm drain that runs along George Elmer Drive will continue and outlet directly into the detention basin. The swale will have a 6" flat bottom with 6:1 side slopes and slope at a 0.2% grade towards the detention basin. (Refer to the appendix for the capacity calculations.) The location and drainage easement can be seen on the Grading and Drainage Plan in the Appendix.

The detention basin will have 3 to 1 side slopes and a bottom area of 7570 ft^2. In the detention basin, an outlet structure will be built to limit the outlet flow rate to the before development peak flow rate. To limit the flow rate, the structure will have orifices or small holes drilled into it which will restrict the flow rate to a predetermined flow rate. The bottom elevation of the detention pond will be excavated to 3151, and the outlet orifices on the structure will be set at 3152, allowing for 1 foot of storage at all times in the detention basin. The detention basin will have a top of bank elevation of 3154.5, which will allow for 3.5 ft. of total storage should the orifices become clogged with debris. With 3 ft. of total storage available, the detention basin would hold up to 0.80 acre-ft of storm water run-off. This storage capacity would totally contain the total run-off from a 10-year storm even if the orifices on the structure were not functioning or not used.

We have calculated the pre-development flows and volumes at a concentration point referred to as station 26+00 as depicted on the Plan and Profile sheet prepared by WGM Group and is located in the appendix of this report. At this concentration point we have calculated the pre-development flow to be 3.46 cfs and a pre-development volume of 0.286 acre feet for a 10 year event. The height of the high point is approximately 8" and would back up water along the drainage swale 160'. The side slopes of the swale are 0.8% on the right and 0.5% on the left. From this information we have calculated the volume to be 0.13 acre feet of water would back up prior to overtopping. From this calculation we can expect a 10 year event pre-development flows to overtop this area and continue to Grant Creek. (Refer to the appendix for the flow and volume calculations.)

V. 100-YEAR STORM MITIGATION PLANS

Plans have been made to mitigate the adverse affects from a 100-year storm in the subdivision. These precautions include checking the culvert sizing against the 100-year storm. The calculations are the same for those summarized in table 3.1 with the exception of the intensity value being 1.14 in/hr for a 100-year storm. The run-off flow rates at each concentration point for a 100-year storm are summarized in table 4.1.

Concentration Point (CP) Flow Rates and Corresponding Pipe Sizes for 100-year Storm			
	Contributing Drainage Areas	Peak Flow Rate at Concentration Point	Pipe Size Required
CP 1	1 & 2	2.15	18 inch
CP 2	2	1.67	12 inch
CP 3	3	1.75	12 inch
CP 4	3,4 & 5	3.03	18 inch
CP 5	5	0.66	12 inch
CP 6	1,2 & 6	2.36	18 inch
CP 7	7	0.34	12 inch
CP 8	1,2,6,7,8 & 9	4.10	18 inch
CP 9	9	0.64	12 inch
CP 10	10	0.4	12 inch
CP 11	3,4,5,10 & 11	4.02	18 inch
CP 12	3,4,5,10,11,12 & 13	6.09	18 inch
CP 13	13	0.91	12 inch
CP 14	14	0.43	12 inch
CP 15	3,4,5,10,11,12,13,14 & 15	6.78	18 inch

Table 4.1 - Concentration Point (CP) Flow Rates and Corresponding Pipe Sizes for a 100-Year Storm

The only pipes that will require a larger size to handle the 100-year storm are those at CP 1,4 &6. The pipes will be sized according to the 100-year storm in order to mitigate against adverse affects. Concentration points 12 & 15 are above or at the capacity for an 18 inch pipe flowing full in an channel type condition, which means the storm water may back up into the pipes and catch basins. In the event that the storm water backs up enough to gather in the curb and gutter, the street grades at concentration points 12 & 15 are designed in such a way that the storm water will flow out of the subdivision to the north and into the drainage easement, without affecting any homes in the subdivision. The will also be head place on the pipes in these areas which will significantly increase the flows of the pipes.

During the 100-year storm, the flow volume leaving the subdivision will be greater than the drainage basin can contain. In order to mitigate adverse affects to the drainage basin, the outlet structure will have orifices sized to allow pre-development 100 year flows from the drainage basin and into the natural swale that exits to Grant Creek. If the orifices were to become plugged a large overflow weir at an elevation of 3155 will be placed. This overflow weir will allow the 100-year storm flows to pass through the drainage basin safely without overflowing the basin and eroding the side slopes.

VI. 100- year 24hr Storm Volume Calculations

DRAINAGE CALCULATIONS

100-year: 24 hr Storm (Pre - Development)

Weighted C= 0.20 See Appendix

a) Volume of Runoff

$A = 24.35 \text{ acres} = 1{,}060{,}686 \text{ ft}^2$

$C_b = 0.20$

$i = 2.15 \text{ in} = 0.18 \text{ feet}$

$V_b = (0.20)(0.18)(1{,}060{,}686) = \underline{\underline{38{,}185 \text{ ft}^3}}$

=0.88 acre/feet

100-year: 24 hr Storm (After - Development)

Weighted C= 0.37 See Appendix

a) Volume of Runoff

$A = 24.35 \text{ acres} = 1{,}060{,}686 \text{ ft}^2$

$C_b = 0.37$

$i = 2.15 \text{ in} = 0.18 \text{ feet}$

$V_b = (0.37)(0.18)(1{,}060{,}686) = \underline{\underline{70{,}642 \text{ ft}^3}}$

=1.62 acre/feet

Difference = 1.62 - 0.88 = 0.74 acres of required storage.

VII. SUMMARY

Flynn Ranch Subdivision consists of improvements being made on 19.94 acres of agricultural land. These improvements will cause an increase in storm water run-off from the proposed subdivision site. It is essential to plan for additional run-off and to design drainage structures whenever improvements are made to existing conditions. Calculations have been made to show that the run-off generated by a 10-year, 1-hour storm will be contained within the storm sewer system of culverts and drainage basin located in a drainage easement to the north of the subdivision and that 10-year, 1-hour storm pre-development flows and volumes will overtop existing contours and flow into Grant Creek.

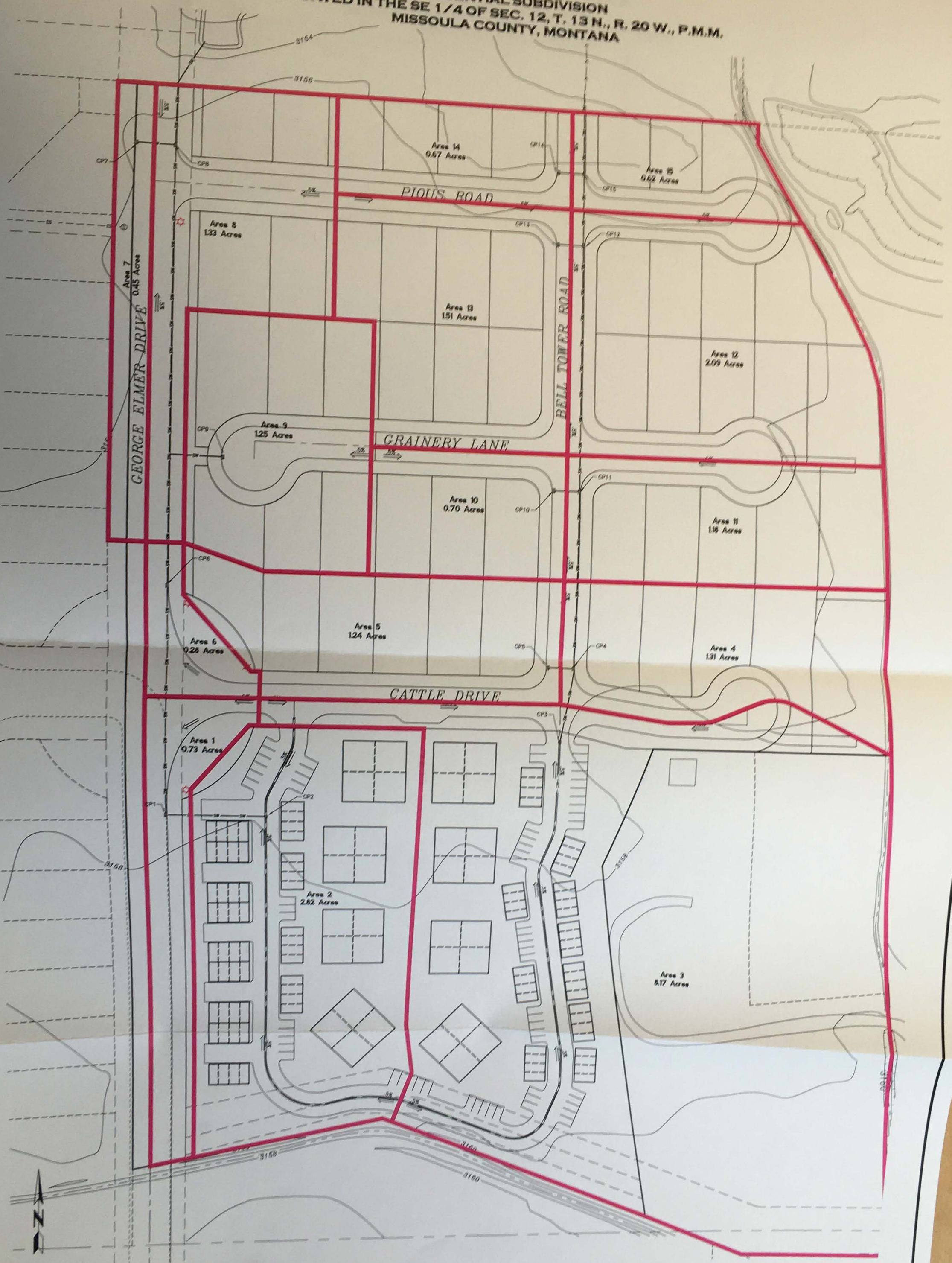
Calculations have also been made to show that the storm sewer system and drainage basin are capable of conveying the run-off from a 100-year, 1-hour storm without any adverse affects to the homes in the subdivision. All storm water from the subdivision is routed to the existing drainage basin to the north of the property, with a controlled outlet to the natural drainage path.

Calculation show that the project can be retained in the designed drainage basin provide that the inlet orifices are not put in until approval for a detention basin is given. The calculation show that a 100 yr 24 hr storm can be retained completely in the drainage basin and flow thru volumes from existing areas can flow thru the designed overflow weir and outlet structure can handle these flows.

These calculations are considered to be conservative for this subdivision considering that the volume calculations and flow rate calculations at each concentration point do not consider the time it takes for water to travel from one concentration point to the next. Infiltration rates were also not used in this report to allow for a certain safety factor to be retained in the calculations.

DRAINAGE AREAS
FLYNN RANCH

A RESDENTIAL SUBDIVISION
LOCATED IN THE SE 1/4 OF SEC. 12, T. 13 N., R. 20 W., P.M.M.,
MISSOULA COUNTY, MONTANA



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DJ&A, P.C.
CONSULTING ENGINEERS & LAND SURVEYORS

JULY 2007

SITE GRADING AND DRAINAGE PLAN
FOR
FLYNN RANCH

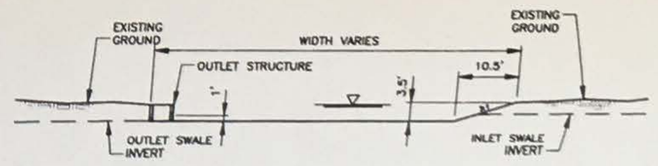
A RESDENTIAL SUBDIVISION
LOCATED IN THE SE 1/4 OF SEC. 12, T. 13 N., R. 20 W., P.M.M.
MISSOULA COUNTY, MONTANA

FOLLOWS EXISTING SWALE INTO GRANT CREEK
OUTLET STRUCTURE
DETENTION BASIN AREA = 7,570 SQ. FT.
DRAINAGE SWALE
DRAINAGE SWALE
FUTURE DEVELOPMENT
Common Area 2
PIOUS ROAD
GEORGE ELMER DRIVE
BELL TOWER ROAD
Common Area 1
GRAINERY LANE
CATTLE DRIVE
BLOCK 1
BLOCK 2
Lot 1 Lot 2 Lot 3 Lot 4 Lot 5 Lot 6 Lot 7 Lot 8 Lot 9
Lot 10 Lot 11 Lot 12 Lot 13 Lot 14 Lot 15 Lot 16 Lot 17 Lot 18 Lot 19
Lot 20 Lot 21 Lot 22 Lot 23 Lot 24 Lot 25 Lot 26 Lot 27 Lot 28 Lot 29 Lot 30
Lot 31 Lot 32 Lot 33 Lot 34 Lot 35 Lot 36 Lot 37 Lot 38 Lot 39 Lot 40 Lot 41
Lot 42 Lot 43 Lot 44 Lot 45 Lot 46 Lot 47 Lot 48 Lot 49 Lot 50 Lot 51
Lot 1
FL 3156.1 I.E. 3153.4
FL 3156.0 I.E. 3153.2
FL 3156.1 I.E. 3152.9
FL 3156.1 I.E. 3152.7
FL 3156.1 I.E. 3153.1
FL 3156.1 I.E. 3152.9
FL 3157.3 I.E. 3154.3
FL 3157.1 I.E. 3153.3
FL 3157.1 I.E. 3153.3
FL 3157.7 I.E. 3154.8
FL 3157.1 I.E. 3153.9
FL 3157.1 I.E. 3153.7
FL 3156.8 I.E. 3154.0
FL 3157.7 I.E. 3155.2
FL 3157.7 I.E. 3154.7
MAIL BOXES
ROUNDABOUT DESIGN FROM WGM GROUP, INC.
INVERTED ROAD SECTION
CONCRETE COVE GUTTER
EXISTING HOMESTEAD
16' WIDE DRIVEWAY TO LOTS 30 & 41
12' WIDE DRIVEWAY TO LOT 51
R35' TYP
3154 3156 3158 3160

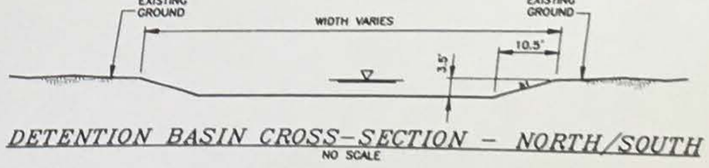
LEGEND

- 5% = ROAD SLOPE AND DIRECTION
- SW = 12" STORM WATER MAIN
- SW 18 = 18" STORM WATER MAIN
- = STORM WATER INTAKE
- = RIDGE LINE
- = SURFACE WATER FLOW DIRECTION (AFTER FINAL GRADING)

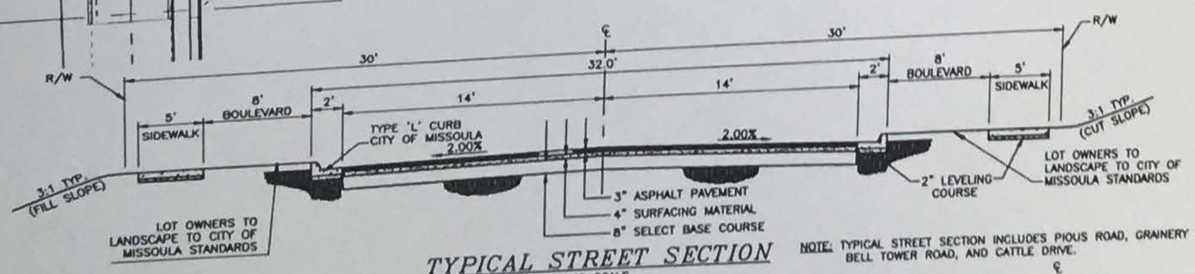
CONTOURS PER MISSOULA COUNTY BASE MAP (2' INTERVAL)



DETENTION BASIN CROSS-SECTION - EAST/WEST
NO SCALE

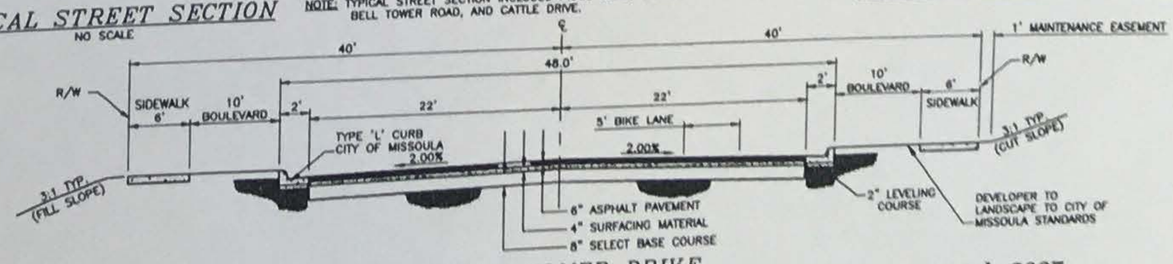


DETENTION BASIN CROSS-SECTION - NORTH/SOUTH
NO SCALE



TYPICAL STREET SECTION
NO SCALE

NOTE: TYPICAL STREET SECTION INCLUDES PIOUS ROAD, GRAINERY ROAD, BELL TOWER ROAD, AND CATTLE DRIVE.



GEORGE ELMER DRIVE
NO SCALE

NOTES:
1. ALL ITEMS SHOWN ON LOT 1, BLOCK 2 ARE CONCEPTUAL AND ARE SUBJECT TO ZONING COMPLIANCE REVIEW FOR FINAL CONSTRUCTION DRAWINGS.
2. GRADING OF LOTS TO BE APPROVED BY THE CITY OF MISSOULA PUBLIC WORKS DEPARTMENT DURING THE ZONING COMPLIANCE REVIEW PORTION OF THE BUILDING PERMIT PROCESS.

1/4	SEC.	T.	R.
	12	13 N.	20 W.

SHEET 3 OF 3

PRINCIPAL MERIDIAN, MONTANA

0 60 120
SCALE IN FEET

July 2007

DJ&A, P.C.
CONSULTING ENGINEERS & LAND SURVEYORS
3203 Russell Street, Missoula, Montana 59801-8591
Phone 406/721-4320 Fax 406/549-6571

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Time Of Concentration Values

PRE -DEVELOPMENT

Sheet Flow

$$T_t = \frac{0.007(n * L)^{0.8}}{(P_2)^{0.5}(S)^{0.4}}$$

Tt (sheet flow travel time, min)i=	solved below
Manning's n=	0.17
L (flow length, ft)=	300
P2 (2-year, 24-hour rainfall, in)=	1.15
S (slope, ft/ft)=	0.0033
Tt (hrs)=	1.49 hrs
Tt (min)=	89 min

Shallow Concentrated Flow

$$V = K_u * k * S_p^{0.5}$$

Ku (constant)=	3.28
k (intercept coefficient, Table 3-4)=	0.274
Sp (slope, percent)=	0.33 %
V (ft/sec)=	0.516

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	1400
V (velocity, ft/sec)=	solved below
Tt (min)=	45 min

Channel Flow

$$V = \frac{1.486 * \left(\frac{A}{P_w}\right)^{2/3} * S^{1/2}}{n}$$

A (X-sectional Area, ft^2)=	0.3
Pw (wetted perimeter, ft)=	2.5
S (channel slope, ft/ft)=	0.005
n (Manning's coefficient)=	0.013
V (ft/sec)=	1.966

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	0
V (velocity, ft/sec)=	1.966
Tt (min)=	0 min

Total Time of Concentration

$$T_c = T_1 + T_2 + T_3$$

Tc (min)=	**135 min**

Time Of Concentration Values

PRE -DEVELOPMENT (26+00)

Sheet Flow

$$T_t = \frac{0.007(n * L)^{0.8}}{(P_2)^{0.5}(S)^{0.4}}$$

Tt (sheet flow travel time, min)i=	solved below
Manning's n=	0.17
L (flow length, ft)=	300
P2 (2-year, 24-hour rainfall, in)=	1.15
S (slope, ft/ft)=	0.0033
Tt (hrs)=	1.49 hrs
Tt (min)=	89 min

Shallow Concentrated Flow

$$V = K_u * k * S_p^{0.5}$$

Ku (constant)=	3.28
k (intercept coefficient, Table 3-4)=	0.274
Sp (slope, percent)=	0.33 %
V (ft/sec)=	0.516

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	1400
V (velocity, ft/sec)=	solved below
Tt (min)=	45 min

Channel Flow

$$V = \frac{1.486 * \left(\frac{A}{P_w}\right)^{2/3} * S^{1/2}}{n}$$

A (X-sectional Area, ft^2)=	2.8
Pw (wetted perimeter, ft)=	23.6
S (channel slope, ft/ft)=	0.005
n (Manning's coefficient)=	0.02
V (ft/sec)=	1.269

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	2500
V (velocity, ft/sec)=	1.269
Tt (min)=	33 min

Total Time of Concentration

$$T_c = T_1 + T_2 + T_3$$

Tc (min)=	**167 min**

Time Of Concentration Values

AREA 2

Sheet Flow

$$T_t = \frac{0.007(n * L)^{0.8}}{(P_2)^{0.5}(S)^{0.4}}$$

Tt (sheet flow travel time, min)i=	solved below
Manning's n=	0.17
L (flow length, ft)=	160
P2 (2-year, 24-hour rainfall, in)=	1.15
S (slope, ft/ft)=	0.0033
Tt (hrs)=	0.90 hrs
Tt (min)=	54 min

Shallow Concentrated Flow

$$V = K_u * k * S_p^{0.5}$$

Ku (constant)=	3.28
k (intercept coefficient, Table 3-4)=	0.274
Sp (slope, percent)=	0.33 %
V (ft/sec)=	0.516

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	0
V (velocity, ft/sec)=	solved below
Tt (min)=	0 min

Channel Flow

$$V = \frac{1.486 * \left(\frac{A}{P_w}\right)^{2/3} * S^{1/2}}{n}$$

A (X-sectional Area, ft^2)=	0.3
Pw (wetted perimeter, ft)=	2.5
S (channel slope, ft/ft)=	0.005
n (Manning's coefficient)=	0.013
V (ft/sec)=	1.966

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	280
V (velocity, ft/sec)=	1.966
Tt (min)=	2 min

Total Time of Concentration

$$T_c = T_1 + T_2 + T_3$$

Tc (min)=	**56 min**

Time Of Concentration Values

AREA 3

Sheet Flow

$$T_t = \frac{0.007(n * L)^{0.8}}{(P_2)^{0.5}(S)^{0.4}}$$

Tt (sheet flow travel time, min)i=	solved below
Manning's n=	0.17
L (flow length, ft)=	300
P2 (2-year, 24-hour rainfall, in)=	1.15
S (slope, ft/ft)=	0.0033
Tt (hrs)=	1.49 hrs
Tt (min)=	89 min

Shallow Concentrated Flow

$$V = K_u * k * S_p^{0.5}$$

Ku (constant)=	3.28
k (intercept coefficient, Table 3-4)=	0.274
Sp (slope, percent)=	0.33 %
V (ft/sec)=	0.516

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	360
V (velocity, ft/sec)=	solved below
Tt (min)=	12 min

Channel Flow

$$V = \frac{1.486 * \left(\frac{A}{P_w}\right)^{2/3} * S^{1/2}}{n}$$

A (X-sectional Area, ft^2)=	0.3
Pw (wetted perimeter, ft)=	2.5
S (channel slope, ft/ft)=	0.005
n (Manning's coefficient)=	0.013
V (ft/sec)=	1.966

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	0
V (velocity, ft/sec)=	1.966
Tt (min)=	0 min

Total Time of Concentration

$$T_c = T_1 + T_2 + T_3$$

Tc (min)=	**101 min**

Time Of Concentration Values

AREA 4

Sheet Flow

$$T_t = \frac{0.007(n * L)^{0.8}}{(P_2)^{0.5}(S)^{0.4}}$$

Tt (sheet flow travel time, min)i=	solved below
Manning's n=	0.17
L (flow length, ft)=	180
P2 (2-year, 24-hour rainfall, in)=	1.15
S (slope, ft/ft)=	0.0033
Tt (hrs)=	0.99 hrs
Tt (min)=	59 min

Shallow Concentrated Flow

$$V = K_u * k * S_p^{0.5}$$

Ku (constant)=	3.28
k (intercept coefficient, Table 3-4)=	0.274
Sp (slope, percent)=	0.33 %
V (ft/sec)=	0.516

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	0
V (velocity, ft/sec)=	solved below
Tt (min)=	0 min

Channel Flow

$$V = \frac{1.486 * \left(\frac{A}{P_w}\right)^{2/3} * S^{1/2}}{n}$$

A (X-sectional Area, ft^2)=	0.3
Pw (wetted perimeter, ft)=	2.5
S (channel slope, ft/ft)=	0.005
n (Manning's coefficient)=	0.013
V (ft/sec)=	1.966

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	260
V (velocity, ft/sec)=	1.966
Tt (min)=	2 min

Total Time of Concentration

$$T_c = T_1 + T_2 + T_3$$

Tc (min)=	**62 min**

Time Of Concentration Values

AREA 5

Sheet Flow

$$T_t = \frac{0.007(n * L)^{0.8}}{(P_2)^{0.5}(S)^{0.4}}$$

Tt (sheet flow travel time, min)i=	solved below
Manning's n=	0.17
L (flow length, ft)=	180
P2 (2-year, 24-hour rainfall, in)=	1.15
S (slope, ft/ft)=	0.0033
Tt (hrs)=	0.99 hrs
Tt (min)=	59 min

Shallow Concentrated Flow

$$V = K_u * k * S_p^{0.5}$$

Ku (constant)=	3.28
k (intercept coefficient, Table 3-4)=	0.274
Sp (slope, percent)=	0.33 %
V (ft/sec)=	0.516

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	0
V (velocity, ft/sec)=	solved below
Tt (min)=	0 min

Channel Flow

$$V = \frac{1.486 * \left(\frac{A}{P_w}\right)^{2/3} * S^{1/2}}{n}$$

A (X-sectional Area, ft^2)=	0.3
Pw (wetted perimeter, ft)=	2.5
S (channel slope, ft/ft)=	0.005
n (Manning's coefficient)=	0.013
V (ft/sec)=	1.966

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	270
V (velocity, ft/sec)=	1.966
Tt (min)=	2 min

Total Time of Concentration

$$T_c = T_1 + T_2 + T_3$$

Tc (min)=	**62 min**

Time Of Concentration Values

AREA 6

Sheet Flow

$$T_t = \frac{0.007(n * L)^{0.8}}{(P_2)^{0.5}(S)^{0.4}}$$

Tt (sheet flow travel time, min)i=	solved below
Manning's n=	0.17
L (flow length, ft)=	40
P2 (2-year, 24-hour rainfall, in)=	1.15
S (slope, ft/ft)=	0.0033
Tt (hrs)=	0.30 hrs
Tt (min)=	18 min

Shallow Concentrated Flow

$$V = K_u * k * S_p^{0.5}$$

Ku (constant)=	3.28
k (intercept coefficient, Table 3-4)=	0.274
Sp (slope, percent)=	0.33 %
V (ft/sec)=	0.516

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	0
V (velocity, ft/sec)=	solved below
Tt (min)=	0 min

Channel Flow

$$V = \frac{1.486 * \left(\frac{A}{P_w}\right)^{2/3} * S^{1/2}}{n}$$

A (X-sectional Area, ft^2)=	0.3
Pw (wetted perimeter, ft)=	2.5
S (channel slope, ft/ft)=	0.005
n (Manning's coefficient)=	0.013
V (ft/sec)=	1.966

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	130
V (velocity, ft/sec)=	1.966
Tt (min)=	1 min

Total Time of Concentration

$$T_c = T_1 + T_2 + T_3$$

Tc (min)=	**19 min**

Time Of Concentration Values

AREA 7

Sheet Flow

$$T_t = \frac{0.007(n * L)^{0.8}}{(P_2)^{0.5}(S)^{0.4}}$$

Tt (sheet flow travel time, min)i=	solved below
Manning's n=	0.17
L (flow length, ft)=	90
P2 (2-year, 24-hour rainfall, in)=	1.15
S (slope, ft/ft)=	0.0033
Tt (hrs)=	0.57 hrs
Tt (min)=	34 min

Shallow Concentrated Flow

$$V = K_u * k * S_p^{0.5}$$

Ku (constant)=	3.28
k (intercept coefficient, Table 3-4)=	0.274
Sp (slope, percent)=	0.33 %
V (ft/sec)=	0.516

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	0
V (velocity, ft/sec)=	solved below
Tt (min)=	0 min

Channel Flow

$$V = \frac{1.486 * \left(\frac{A}{P_w}\right)^{2/3} * S^{1/2}}{n}$$

A (X-sectional Area, ft^2)=	0.3
Pw (wetted perimeter, ft)=	2.5
S (channel slope, ft/ft)=	0.005
n (Manning's coefficient)=	0.013
V (ft/sec)=	1.966

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	320
V (velocity, ft/sec)=	1.966
Tt (min)=	3 min

Total Time of Concentration

$$T_c = T_1 + T_2 + T_3$$

Tc (min)=	**37 min**

Time Of Concentration Values

AREA 8

Sheet Flow

$$T_t = \frac{0.007(n * L)^{0.8}}{(P_2)^{0.5}(S)^{0.4}}$$

Tt (sheet flow travel time, min)i=	solved below
Manning's n=	0.17
L (flow length, ft)=	90
P2 (2-year, 24-hour rainfall, in)=	1.15
S (slope, ft/ft)=	0.0033
Tt (hrs)=	0.57 hrs
Tt (min)=	34 min

Shallow Concentrated Flow

$$V = K_u * k * S_p^{0.5}$$

Ku (constant)=	3.28
k (intercept coefficient, Table 3-4)=	0.274
Sp (slope, percent)=	0.33 %
V (ft/sec)=	0.516

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	0
V (velocity, ft/sec)=	solved below
Tt (min)=	0 min

Channel Flow

$$V = \frac{1.486 * \left(\frac{A}{P_w}\right)^{2/3} * S^{1/2}}{n}$$

A (X-sectional Area, ft^2)=	0.3
Pw (wetted perimeter, ft)=	2.5
S (channel slope, ft/ft)=	0.005
n (Manning's coefficient)=	0.013
V (ft/sec)=	1.966

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	315
V (velocity, ft/sec)=	1.966
Tt (min)=	3 min

Total Time of Concentration

$$T_c = T_1 + T_2 + T_3$$

Tc (min)=	**37 min**

Time Of Concentration Values

AREA 9

Sheet Flow

$$T_t = \frac{0.007(n * L)^{0.8}}{(P_2)^{0.5}(S)^{0.4}}$$

Tt (sheet flow travel time, min)i=	solved below
Manning's n=	0.17
L (flow length, ft)=	140
P2 (2-year, 24-hour rainfall, in)=	1.15
S (slope, ft/ft)=	0.0033
Tt (hrs)=	0.81 hrs
Tt (min)=	49 min

Shallow Concentrated Flow

$$V = K_u * k * S_p^{0.5}$$

Ku (constant)=	3.28
k (intercept coefficient, Table 3-4)=	0.274
Sp (slope, percent)=	0.33 %
V (ft/sec)=	0.516

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	0
V (velocity, ft/sec)=	solved below
Tt (min)=	0 min

Channel Flow

$$V = \frac{1.486 * \left(\frac{A}{P_w}\right)^{2/3} * S^{1/2}}{n}$$

A (X-sectional Area, ft^2)=	0.3
Pw (wetted perimeter, ft)=	2.5
S (channel slope, ft/ft)=	0.005
n (Manning's coefficient)=	0.013
V (ft/sec)=	1.966

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	100
V (velocity, ft/sec)=	1.966
Tt (min)=	1 min

Total Time of Concentration

$$T_c = T_1 + T_2 + T_3$$

Tc (min)=	**49 min**

Time Of Concentration Values

AREA 10

Sheet Flow

$$T_t = \frac{0.007(n * L)^{0.8}}{(P_2)^{0.5}(S)^{0.4}}$$

Tt (sheet flow travel time, min)i=	solved below
Manning's n=	0.17
L (flow length, ft)=	140
P2 (2-year, 24-hour rainfall, in)=	1.15
S (slope, ft/ft)=	0.0033
Tt (hrs)=	0.81 hrs
Tt (min)=	49 min

Shallow Concentrated Flow

$$V = K_u * k * S_p^{0.5}$$

Ku (constant)=	3.28
k (intercept coefficient, Table 3-4)=	0.274
Sp (slope, percent)=	0.33 %
V (ft/sec)=	0.516

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	0
V (velocity, ft/sec)=	solved below
Tt (min)=	0 min

Channel Flow

$$V = \frac{1.486 * \left(\frac{A}{P_w}\right)^{2/3} * S^{1/2}}{n}$$

A (X-sectional Area, ft^2)=	0.3
Pw (wetted perimeter, ft)=	2.5
S (channel slope, ft/ft)=	0.005
n (Manning's coefficient)=	0.013
V (ft/sec)=	1.966

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	180
V (velocity, ft/sec)=	1.966
Tt (min)=	2 min

Total Time of Concentration

$$T_c = T_1 + T_2 + T_3$$

Tc (min)=	**50 min**

Time Of Concentration Values

AREA 11

Sheet Flow

$$T_t = \frac{0.007(n * L)^{0.8}}{(P_2)^{0.5}(S)^{0.4}}$$

Tt (sheet flow travel time, min)i=	solved below
Manning's n=	0.17
L (flow length, ft)=	190
P2 (2-year, 24-hour rainfall, in)=	1.15
S (slope, ft/ft)=	0.0033
Tt (hrs)=	1.03 hrs
Tt (min)=	62 min

Shallow Concentrated Flow

$$V = K_u * k * S_p^{0.5}$$

Ku (constant)=	3.28
k (intercept coefficient, Table 3-4)=	0.274
Sp (slope, percent)=	0.33 %
V (ft/sec)=	0.516

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	0
V (velocity, ft/sec)=	solved below
Tt (min)=	0 min

Channel Flow

$$V = \frac{1.486 * \left(\frac{A}{P_w}\right)^{2/3} * S^{1/2}}{n}$$

A (X-sectional Area, ft^2)=	0.3
Pw (wetted perimeter, ft)=	2.5
S (channel slope, ft/ft)=	0.005
n (Manning's coefficient)=	0.013
V (ft/sec)=	1.966

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	230
V (velocity, ft/sec)=	1.966
Tt (min)=	2 min

Total Time of Concentration

$$T_c = T_1 + T_2 + T_3$$

Tc (min)=	**64 min**

Time Of Concentration Values

AREA 12

Sheet Flow

$$T_t = \frac{0.007(n * L)^{0.8}}{(P_2)^{0.5}(S)^{0.4}}$$

Tt (sheet flow travel time, min)i=	solved below
Manning's n=	0.17
L (flow length, ft)=	155
P2 (2-year, 24-hour rainfall, in)=	1.15
S (slope, ft/ft)=	0.0033
Tt (hrs)=	0.88 hrs
Tt (min)=	53 min

Shallow Concentrated Flow

$$V = K_u * k * S_p^{0.5}$$

Ku (constant)=	3.28
k (intercept coefficient, Table 3-4)=	0.274
Sp (slope, percent)=	0.33 %
V (ft/sec)=	0.516

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	0
V (velocity, ft/sec)=	solved below
Tt (min)=	0 min

Channel Flow

$$V = \frac{1.486 * \left(\frac{A}{P_w}\right)^{2/3} * S^{1/2}}{n}$$

A (X-sectional Area, ft^2)=	0.3
Pw (wetted perimeter, ft)=	2.5
S (channel slope, ft/ft)=	0.005
n (Manning's coefficient)=	0.013
V (ft/sec)=	1.966

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	230
V (velocity, ft/sec)=	1.966
Tt (min)=	2 min

Total Time of Concentration

$$T_c = T_1 + T_2 + T_3$$

Tc (min)=	**55 min**

Time Of Concentration Values

AREA 13

Sheet Flow

$$T_t = \frac{0.007(n * L)^{0.8}}{(P_2)^{0.5}(S)^{0.4}}$$

Tt (sheet flow travel time, min)i=	solved below
Manning's n=	0.17
L (flow length, ft)=	130
P2 (2-year, 24-hour rainfall, in)=	1.15
S (slope, ft/ft)=	0.0033
Tt (hrs)=	0.76 hrs
Tt (min)=	46 min

Shallow Concentrated Flow

$$V = K_u * k * S_p^{0.5}$$

Ku (constant)=	3.28
k (intercept coefficient, Table 3-4)=	0.274
Sp (slope, percent)=	0.33 %
V (ft/sec)=	0.516

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	0
V (velocity, ft/sec)=	solved below
Tt (min)=	0 min

Channel Flow

$$V = \frac{1.486 * \left(\frac{A}{P_w}\right)^{2/3} * S^{1/2}}{n}$$

A (X-sectional Area, ft^2)=	0.3
Pw (wetted perimeter, ft)=	2.5
S (channel slope, ft/ft)=	0.005
n (Manning's coefficient)=	0.013
V (ft/sec)=	1.966

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	230
V (velocity, ft/sec)=	1.966
Tt (min)=	2 min

Total Time of Concentration

$$T_c = T_1 + T_2 + T_3$$

Tc (min)=	**48 min**

Time Of Concentration Values

AREA 14

Sheet Flow

$$T_t = \frac{0.007(n * L)^{0.8}}{(P_2)^{0.5}(S)^{0.4}}$$

Tt (sheet flow travel time, min)i=	solved below
Manning's n=	0.17
L (flow length, ft)=	100
P2 (2-year, 24-hour rainfall, in)=	1.15
S (slope, ft/ft)=	0.0033
Tt (hrs)=	0.62 hrs
Tt (min)=	37 min

Shallow Concentrated Flow

$$V = K_u * k * S_p^{0.5}$$

Ku (constant)=	3.28
k (intercept coefficient, Table 3-4)=	0.274
Sp (slope, percent)=	0.33 %
V (ft/sec)=	0.516

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	0
V (velocity, ft/sec)=	solved below
Tt (min)=	0 min

Channel Flow

$$V = \frac{1.486 * \left(\frac{A}{P_w}\right)^{2/3} * S^{1/2}}{n}$$

A (X-sectional Area, ft^2)=	0.3
Pw (wetted perimeter, ft)=	2.5
S (channel slope, ft/ft)=	0.005
n (Manning's coefficient)=	0.013
V (ft/sec)=	1.966

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	200
V (velocity, ft/sec)=	1.966
Tt (min)=	2 min

Total Time of Concentration

$$T_c = T_1 + T_2 + T_3$$

Tc (min)=	**39 min**

Time Of Concentration Values

AREA 15

Sheet Flow

$$T_t = \frac{0.007(n * L)^{0.8}}{(P_2)^{0.5}(S)^{0.4}}$$

Tt (sheet flow travel time, min)i=	solved below
Manning's n=	0.17
L (flow length, ft)=	100
P2 (2-year, 24-hour rainfall, in)=	1.15
S (slope, ft/ft)=	0.0033
Tt (hrs)=	0.62 hrs
Tt (min)=	37 min

Shallow Concentrated Flow

$$V = K_u * k * S_p^{0.5}$$

Ku (constant)=	3.28
k (intercept coefficient, Table 3-4)=	0.274
Sp (slope, percent)=	0.33 %
V (ft/sec)=	0.516

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	0
V (velocity, ft/sec)=	solved below
Tt (min)=	0 min

Channel Flow

$$V = \frac{1.486 * \left(\frac{A}{P_w}\right)^{2/3} * S^{1/2}}{n}$$

A (X-sectional Area, ft^2)=	0.3
Pw (wetted perimeter, ft)=	2.5
S (channel slope, ft/ft)=	0.005
n (Manning's coefficient)=	0.013
V (ft/sec)=	1.966

$$T_t = \frac{L}{60 * V}$$

Tt (sheet flow travel time, min)i=	solved below
L (flow length, ft)=	160
V (velocity, ft/sec)=	1.966
Tt (min)=	1 min

Total Time of Concentration

$$T_c = T_1 + T_2 + T_3$$

Tc (min)=	**38 min**

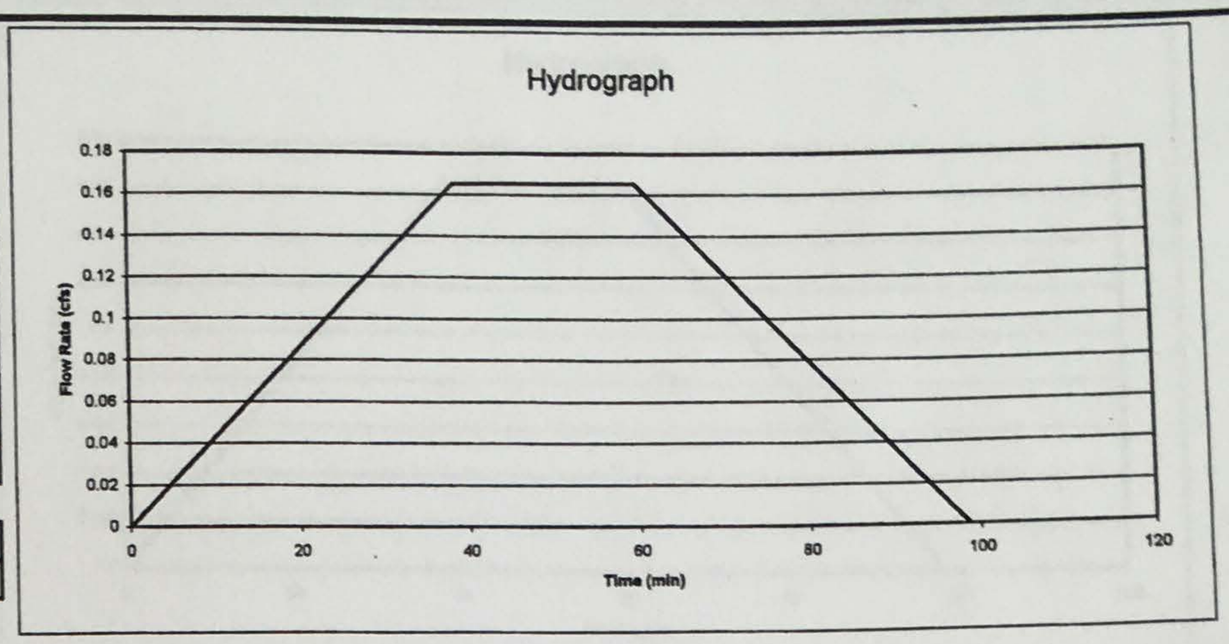
10-Year Storm Run-Off Flow Rates and Volumes

Pre-Development

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.20
I (railfall intensity, in/hr)=	0.72
A (area, acres)=	24.35
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	135

Q=	**1.56**
Runoff Volume (acre-ft)=	**0.129**

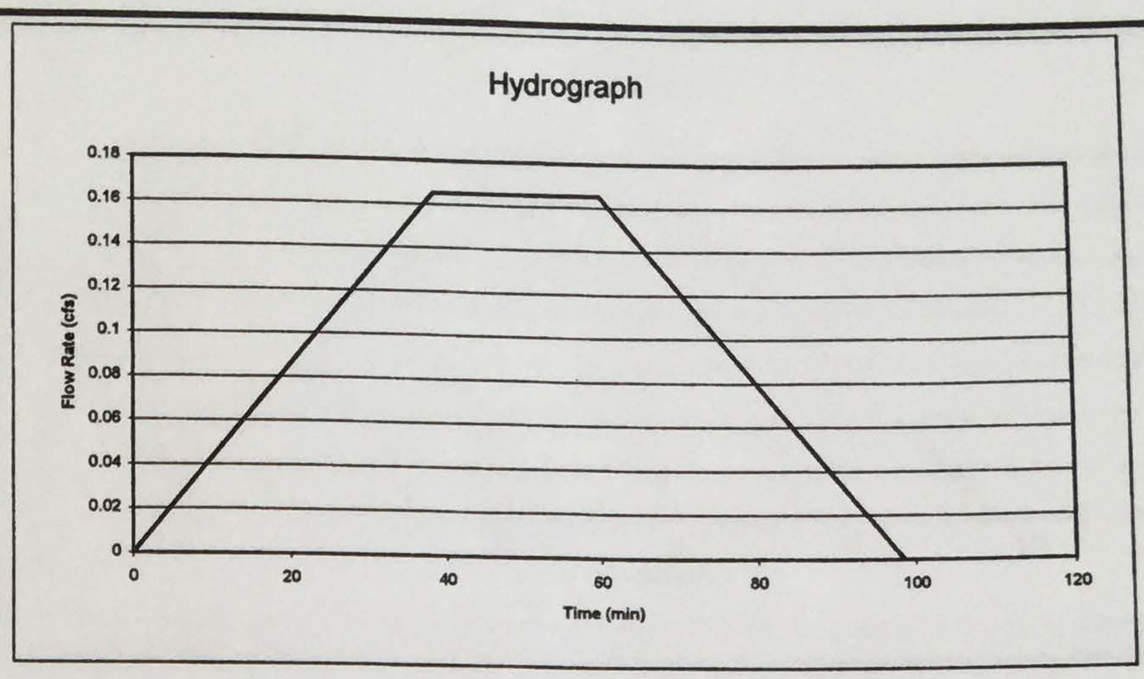


10-Year Storm Run-Off Flow Rates and Volumes

Pre-Development(26+00)

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.20
I (railfall intensity, in/hr)=	0.72
A (area, acres)=	66.96
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	167
Q=	**3.46**
Runoff Volume (acre-ft)=	**0.286**

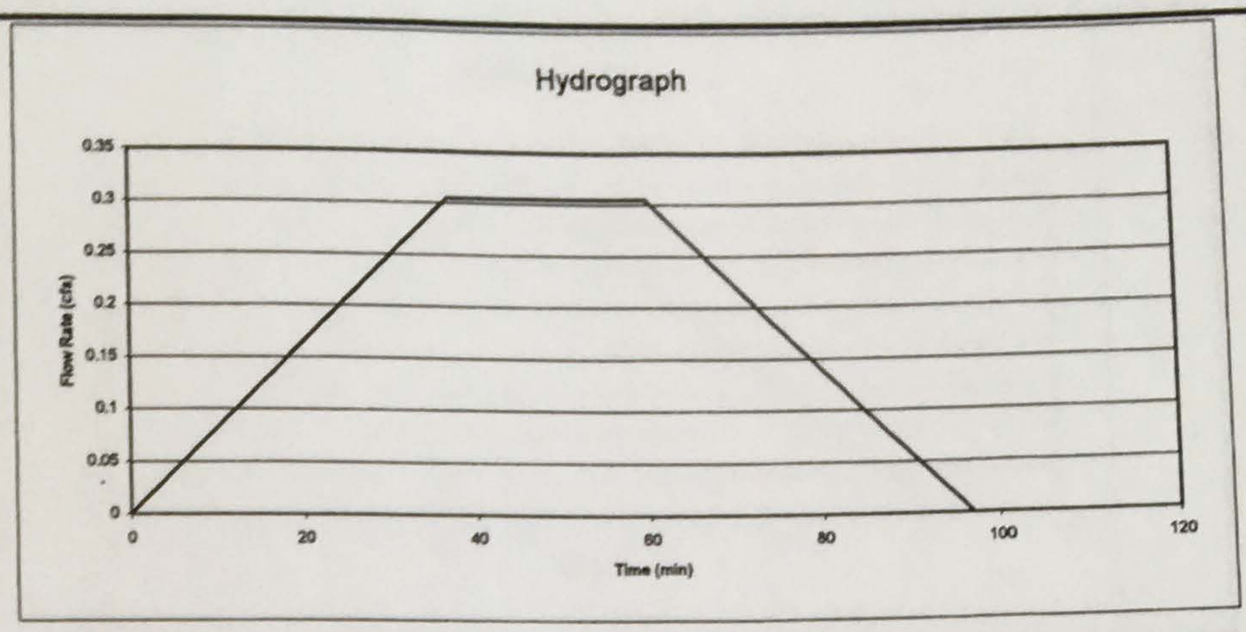


10-Year Storm Run-Off Flow Rates and Volumes

Area 1

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

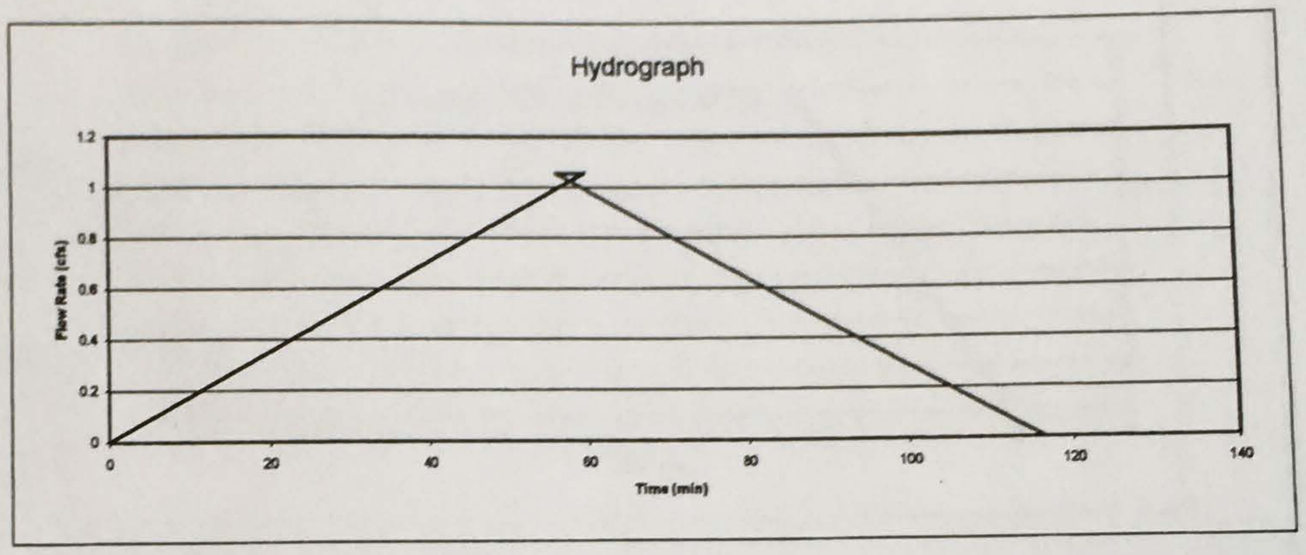
Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.58
I (railfall intensity, in/hr)=	0.72
A (area, acres)=	0.73
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	37
Q=	**0.31**
Runoff Volume (acre-ft)=	**0.025**



Area 2

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

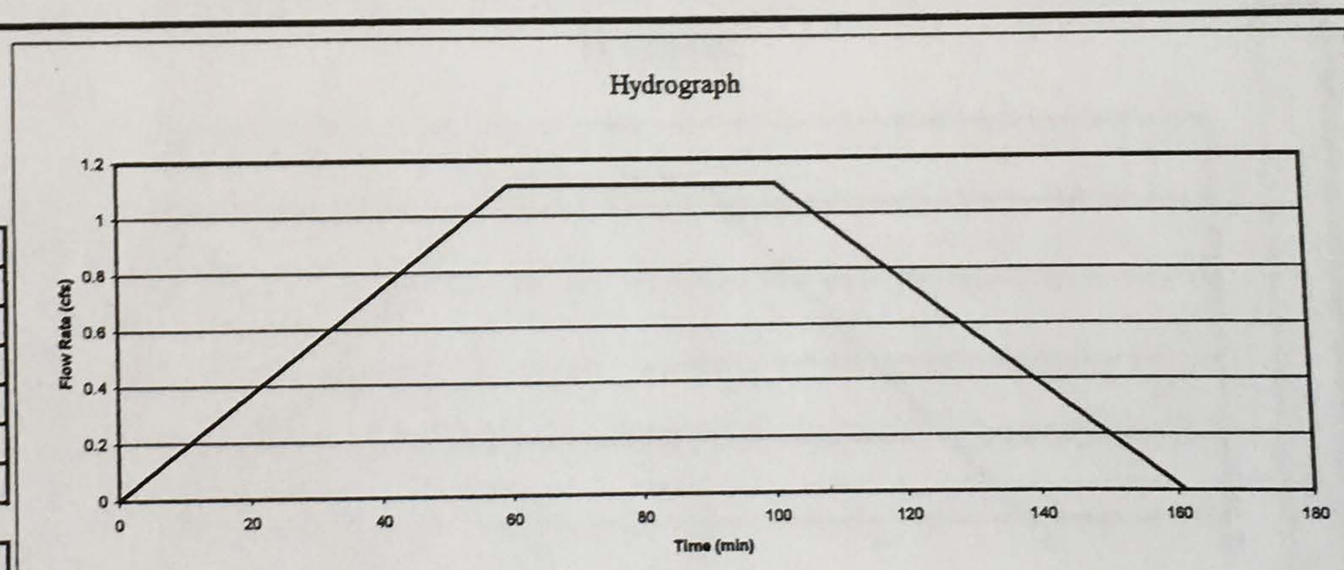
Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.52
I (railfall intensity, in/hr)=	0.72
A (area, acres)=	2.82
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	56
Q=	**1.05**
Runoff Volume (acre-ft)=	**0.082**



Area 3

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

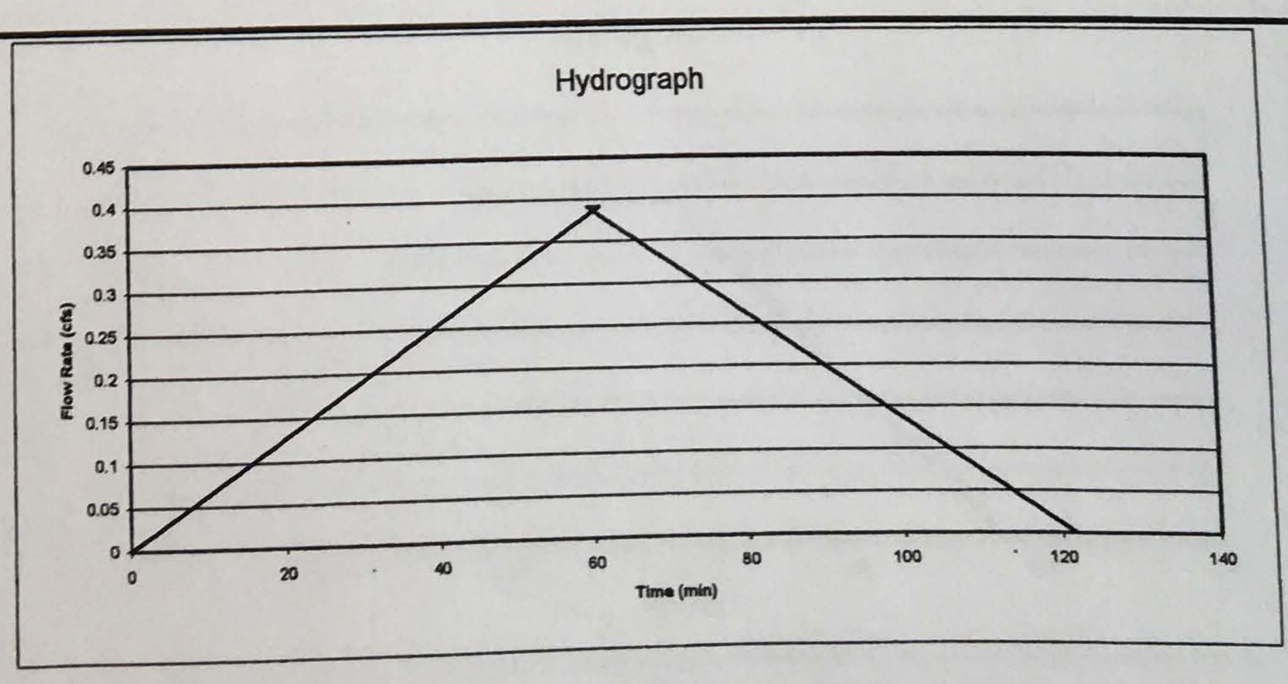
Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.32
I (railfall intensity, in/hr)=	0.72
A (area, acres)=	8.17
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	101
Q=	**1.11**
Runoff Volume (acre-ft)=	**0.154**



Area 4

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.41
I (railfall intensity, in/hr)=	0.72
A (area, acres)=	1.31
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	62
Q=	**0.39**
Runoff Volume (acre-ft)=	**0.031**

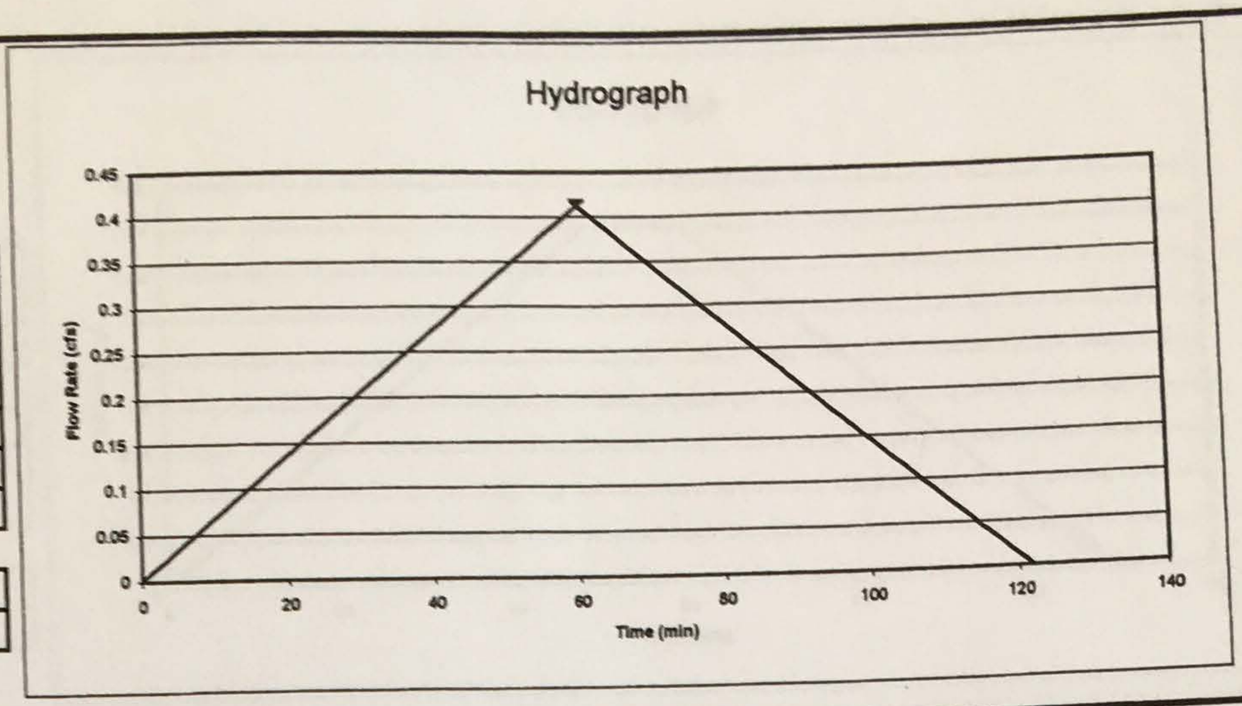


10-Year Storm Run-Off Flow Rates and Volumes

Area 5

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

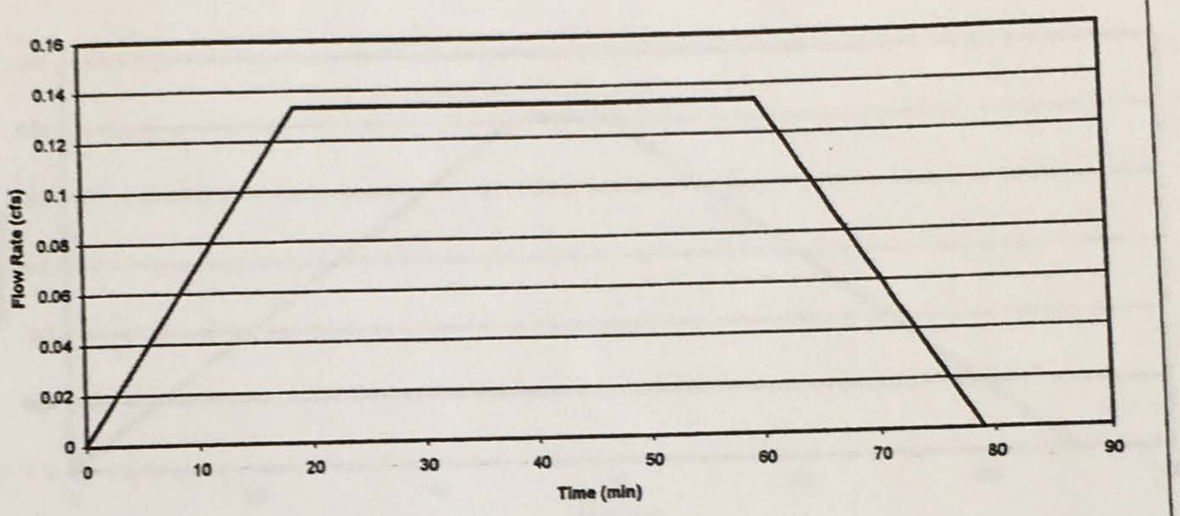
Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.47
I (railfall intensity, in/hr)=	0.72
A (area, acres)=	1.24
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	62
Q=	**0.42**
Runoff Volume (acre-ft)=	**0.034**



Area 6

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

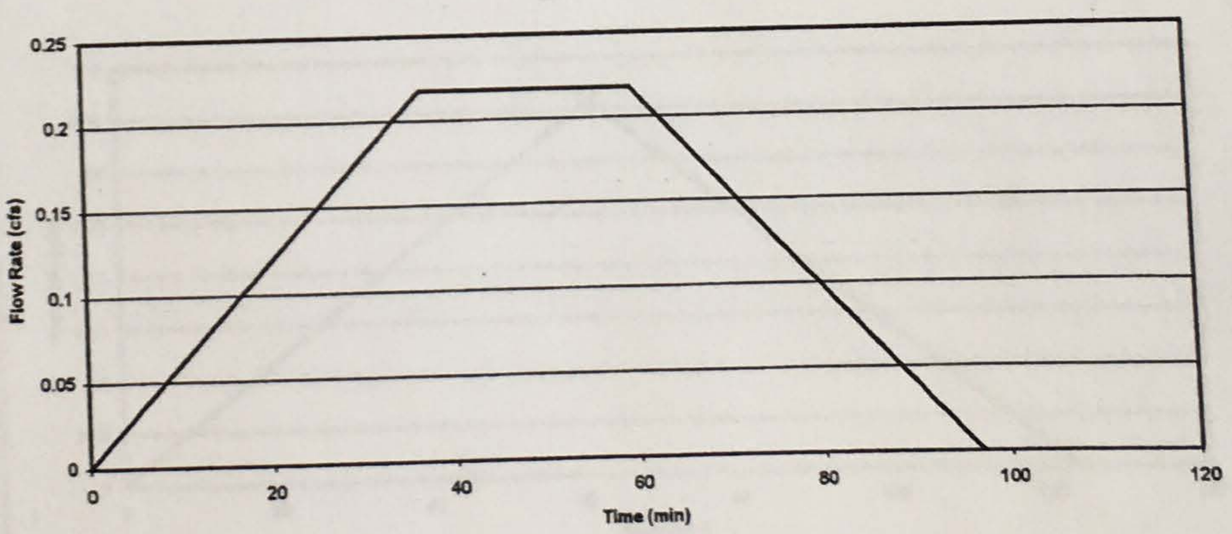
Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.66
I (railfall intensity, in/hr)=	0.72
A (area, acres)=	0.28
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	19
Q=	**0.13**
Runoff Volume (acre-ft)=	**0.011**



Area 7

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

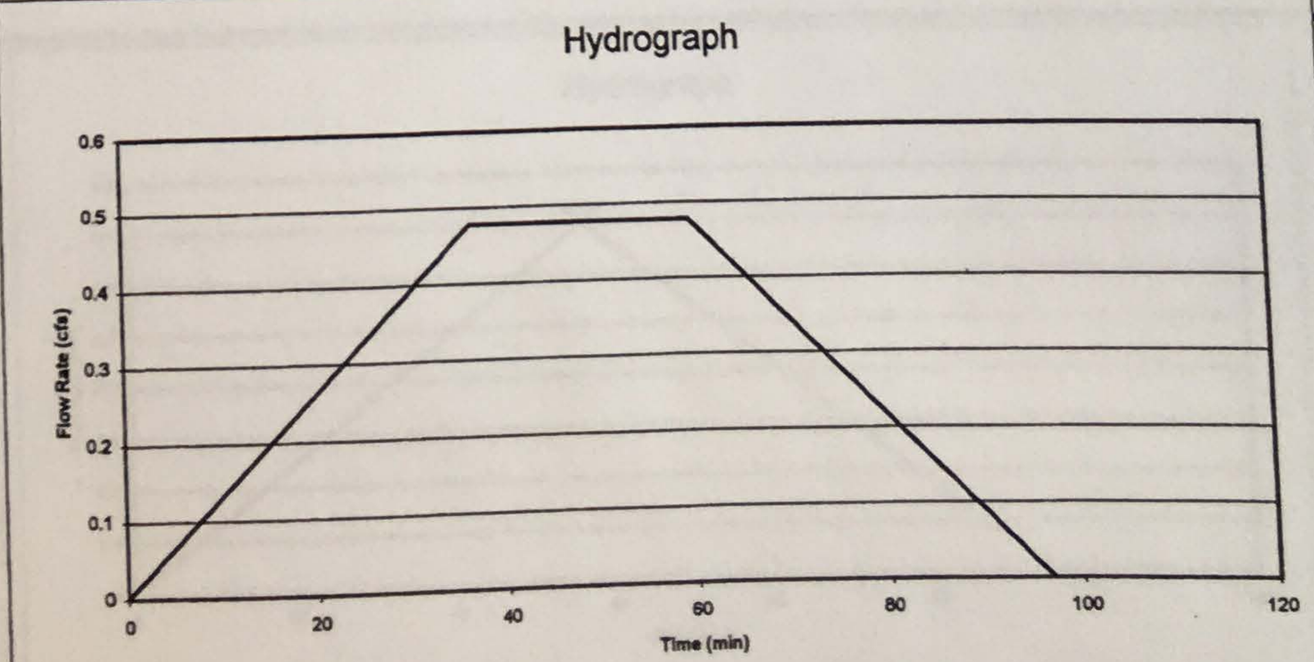
Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.67
I (railfall intensity, in/hr)=	0.72
A (area, acres)=	0.45
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	37
Q=	**0.22**
Runoff Volume (acre-ft)=	**0.018**



Area 8

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.50
I (railfall intensity, in/hr)=	0.72
A (area, acres)=	1.33
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	37
Q=	**0.48**
Runoff Volume (acre-ft)=	**0.039**

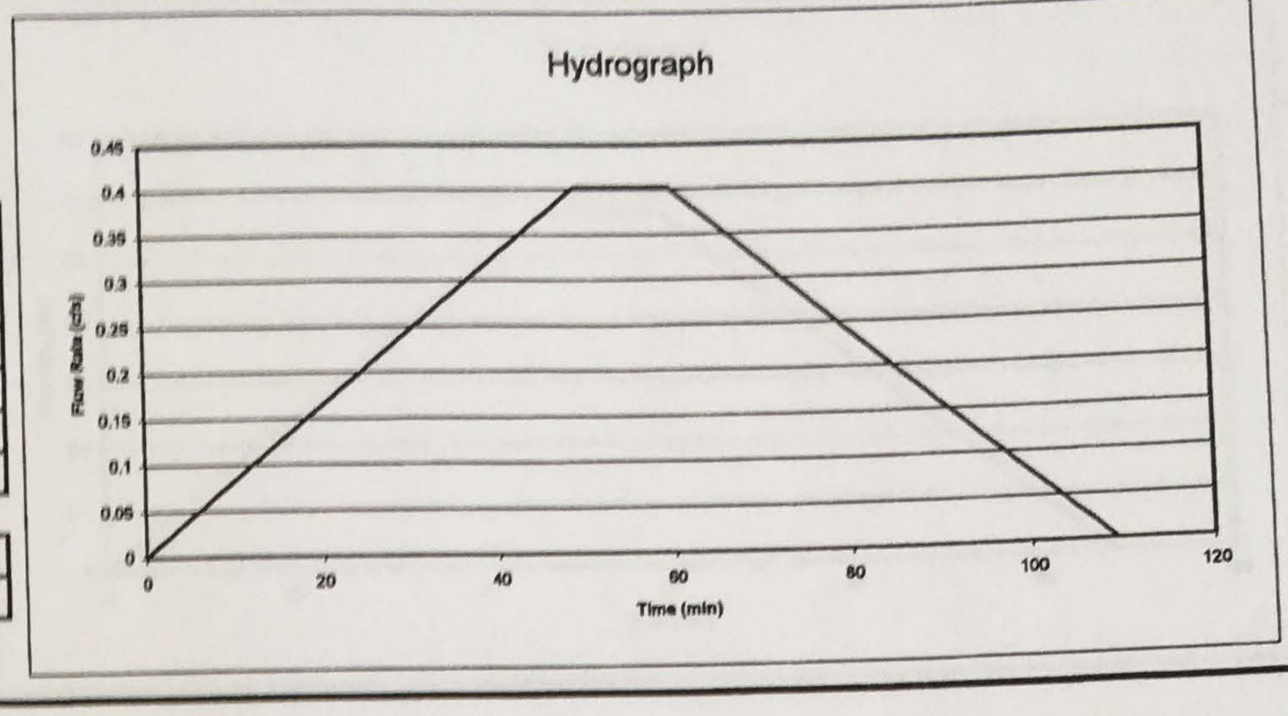


10-Year Storm Run-Off Flow Rates and Volumes

Area 9

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

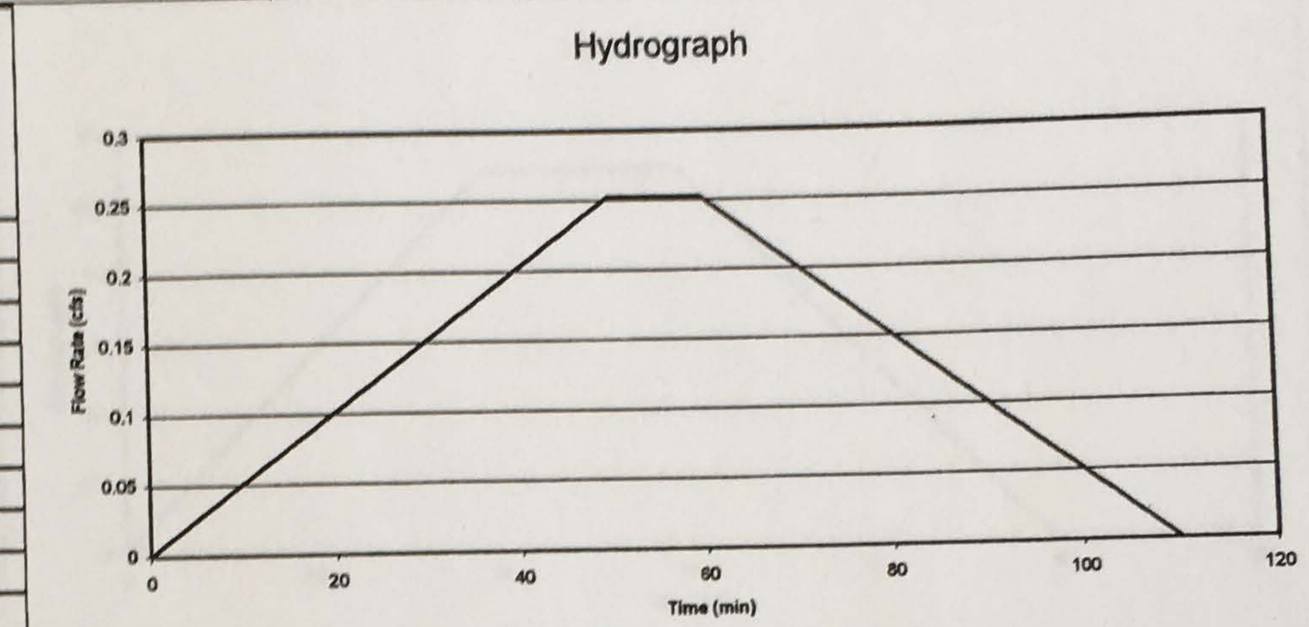
Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.45
I (railfall intensity, in/hr)=	0.72
A (area, acres)=	1.25
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	49
Q=	**0.40**
Runoff Volume (acre-ft)=	**0.033**



Area 10

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

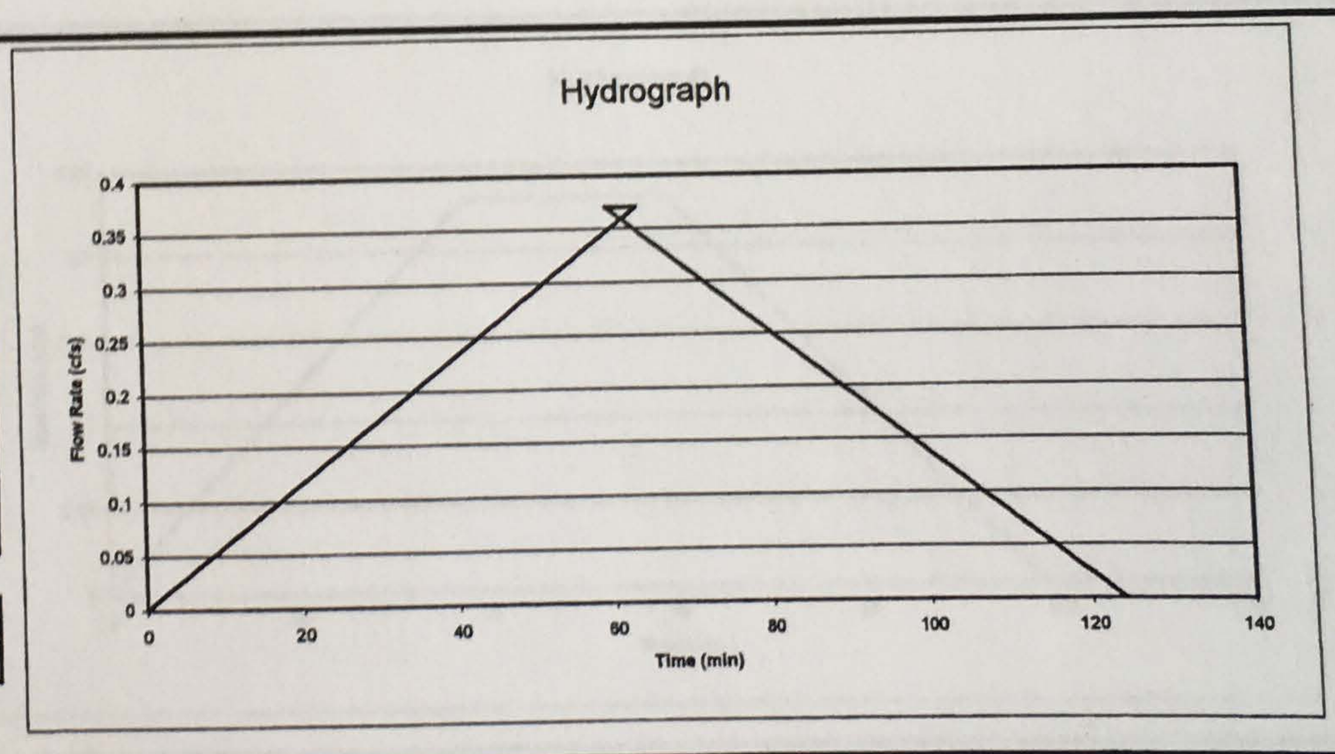
Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.50
I (railfall intensity, in/hr)=	0.72
A (area, acres)=	0.70
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	50
Q=	**0.25**
Runoff Volume (acre-ft)=	**0.021**



Area 11

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

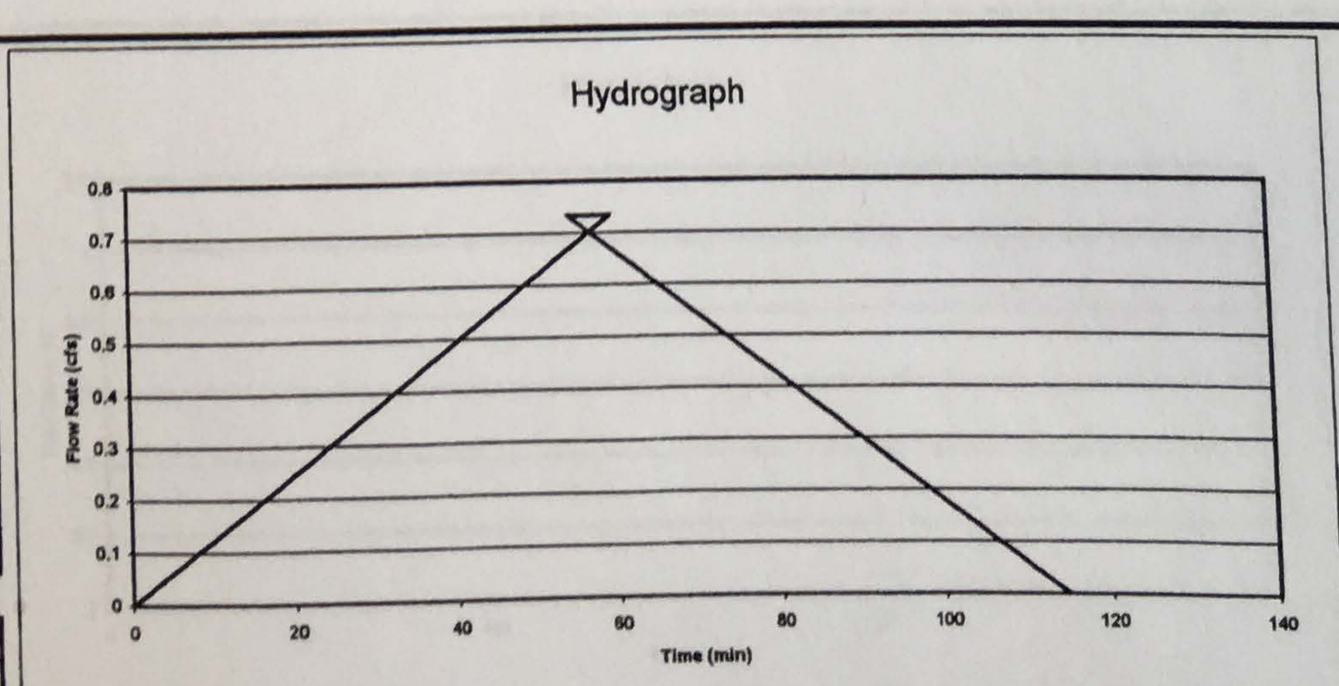
Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.44
I (railfall intensity, in/hr)=	0.72
A (area, acres)=	1.18
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	64
Q=	**0.37**
Runoff Volume (acre-ft)=	**0.029**



Area 12

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.44
I (railfall intensity, in/hr)=	0.72
A (area, acres)=	2.09
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	55
Q=	**0.73**
Runoff Volume (acre-ft)=	**0.050**

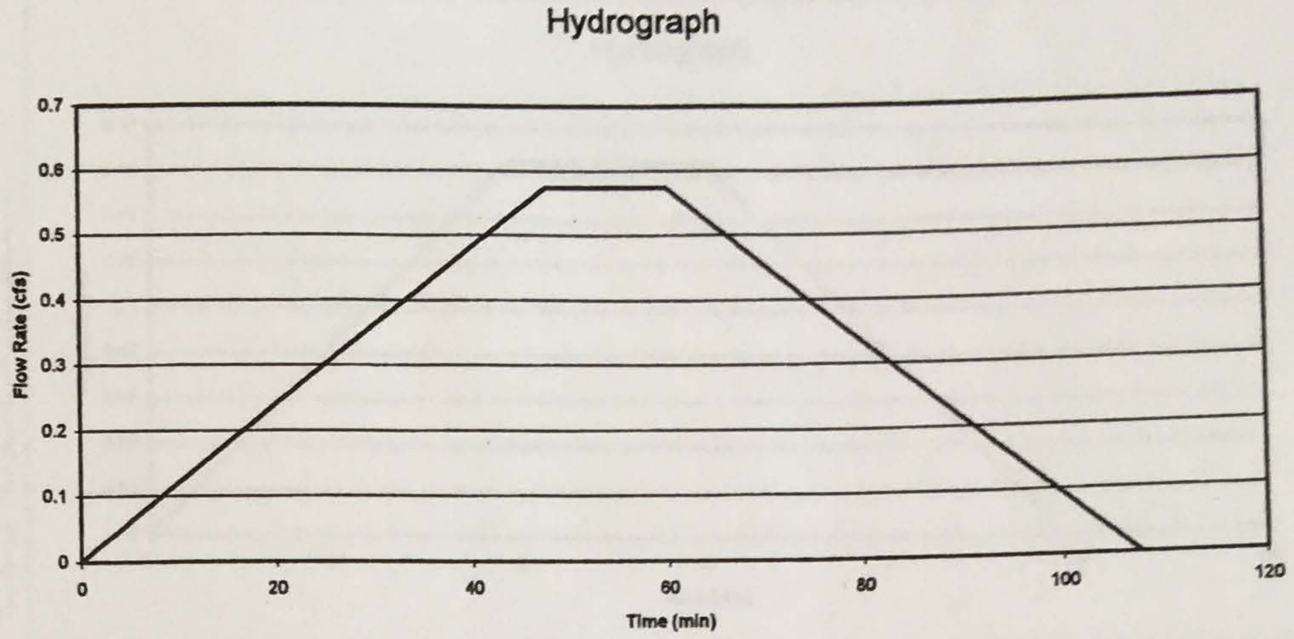


Area 13

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.50
I (railfall intensity, in/hr)=	0.72
A (area, acres)=	1.61
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	48

Q=	**0.57**
Runoff Volume (acre-ft)=	**0.045**

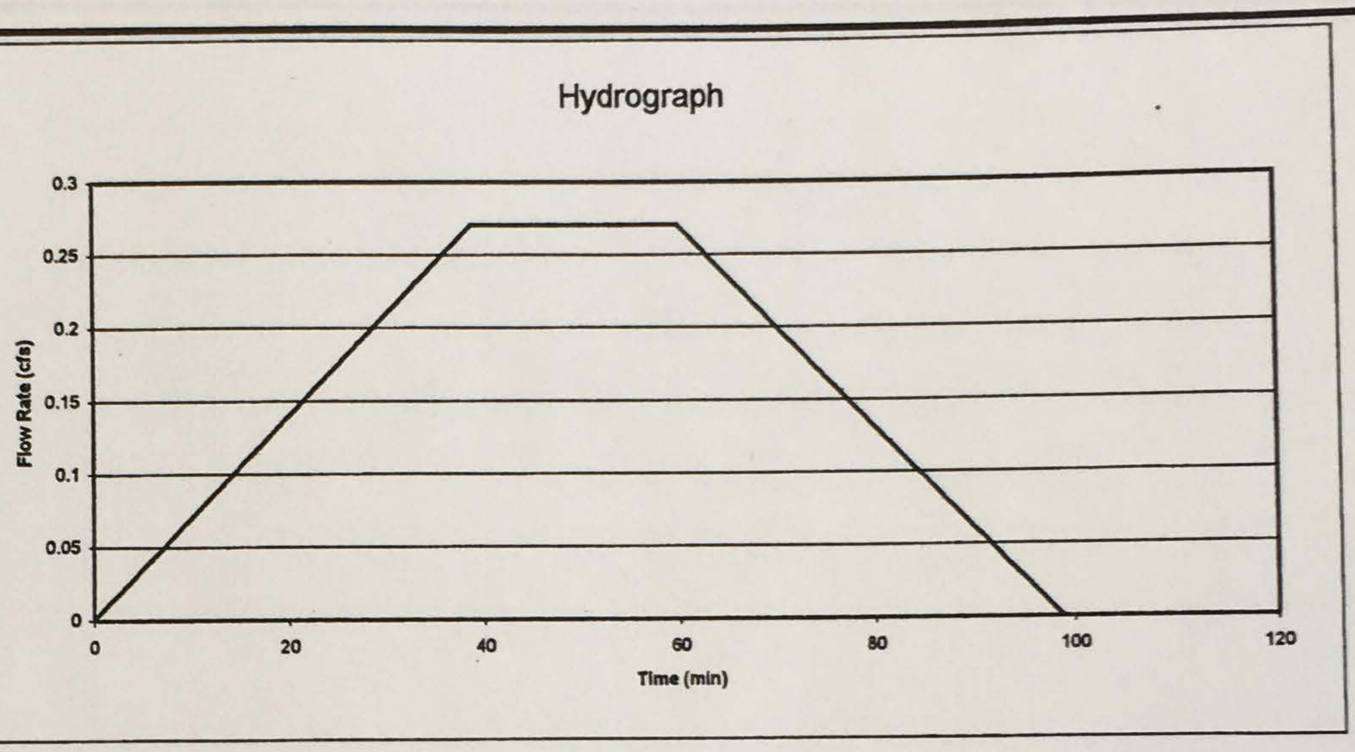


Area 14

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.56
I (railfall intensity, in/hr)=	0.72
A (area, acres)=	0.67
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	39

Q=	**0.27**
Runoff Volume (acre-ft)=	**0.022**

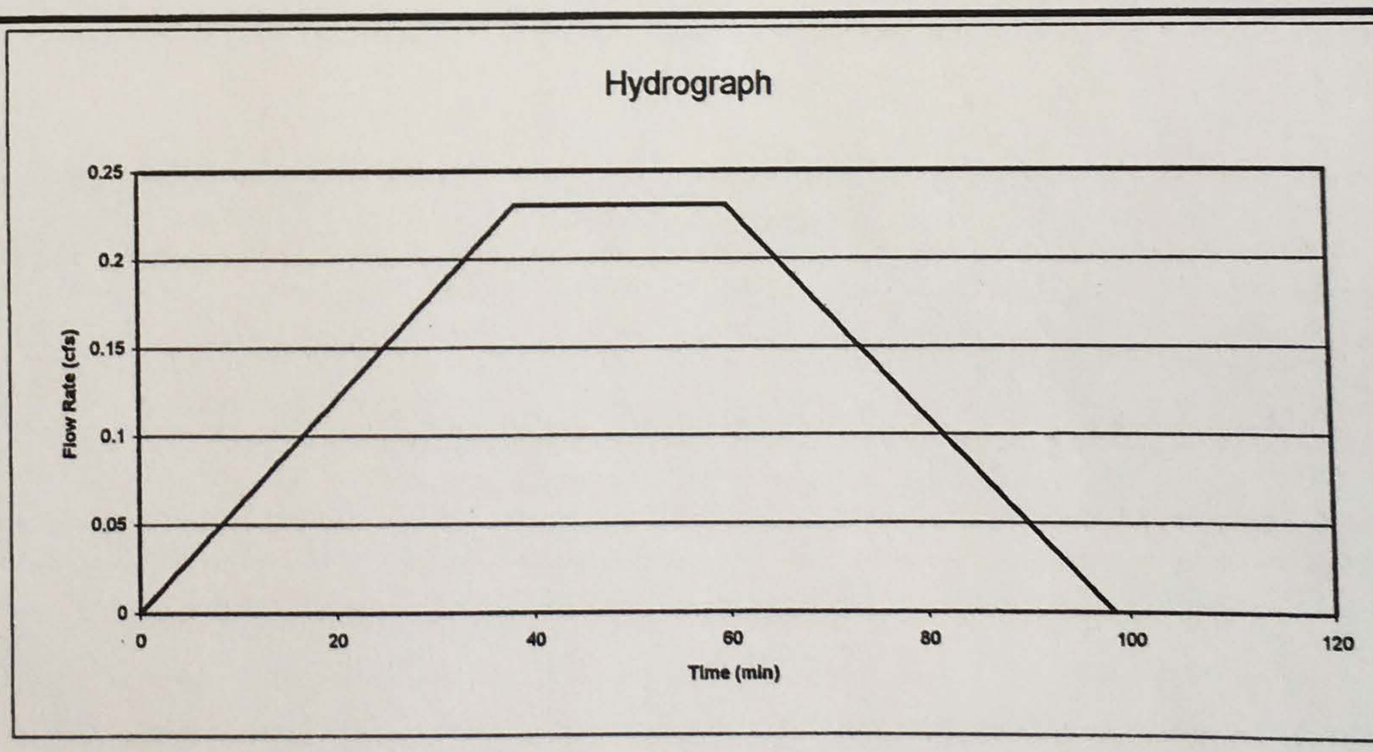


Area 15

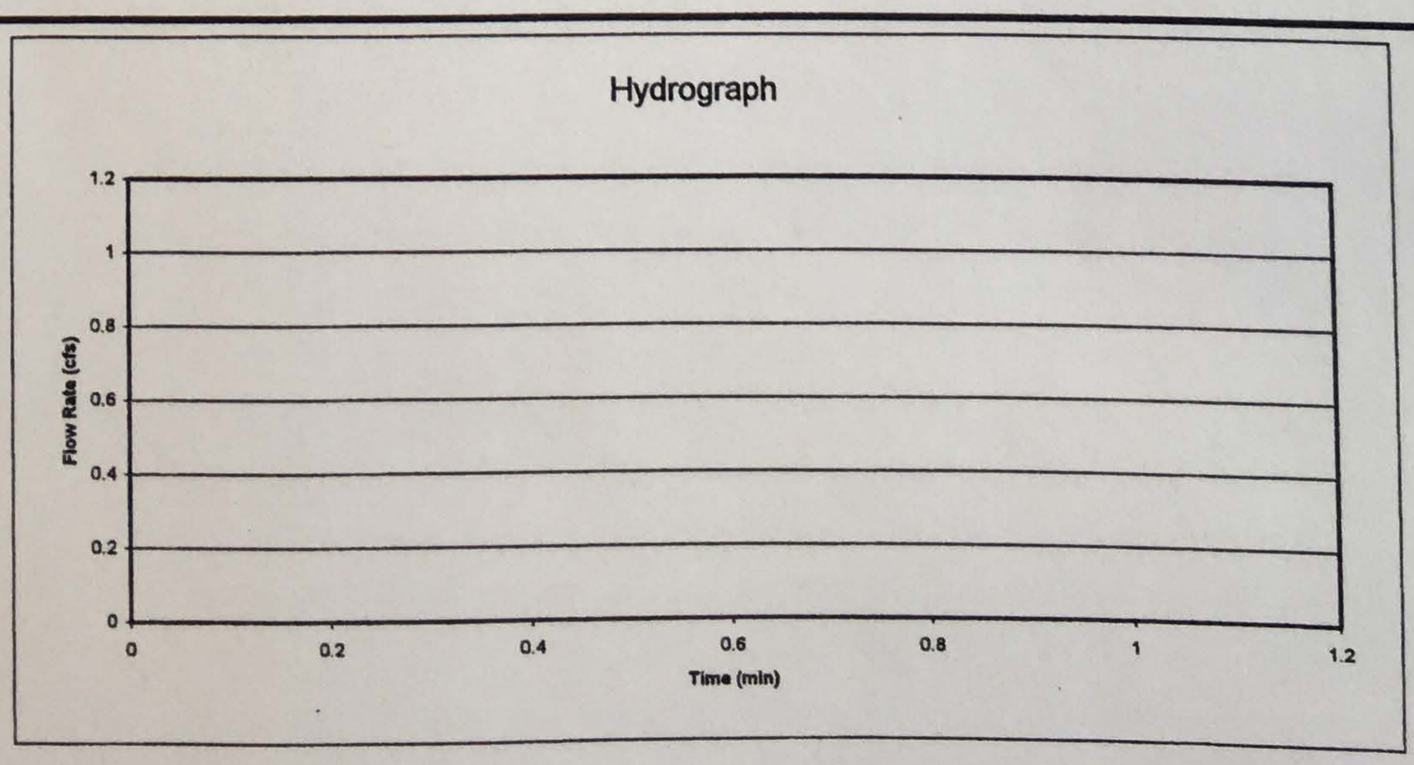
$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.52
I (railfall intensity, in/hr)=	0.72
A (area, acres)=	0.62
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	38

Q=	**0.23**
Runoff Volume (acre-ft)=	**0.019**



$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

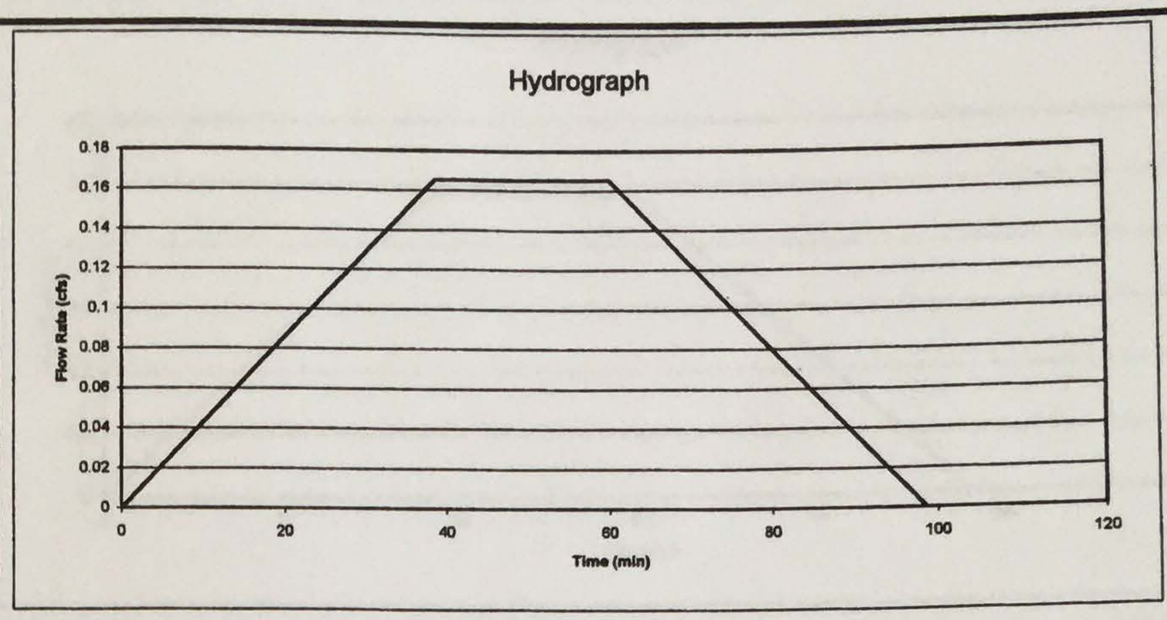


100-Year Storm Run-Off Flow Rates and Volumes

Pre-Development

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.20
I (railfall intensity, in/hr)=	1.14
A (area, acres)=	24.35
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	135
Q=	**2.47**
Runoff Volume (acre-ft)=	**0.204**



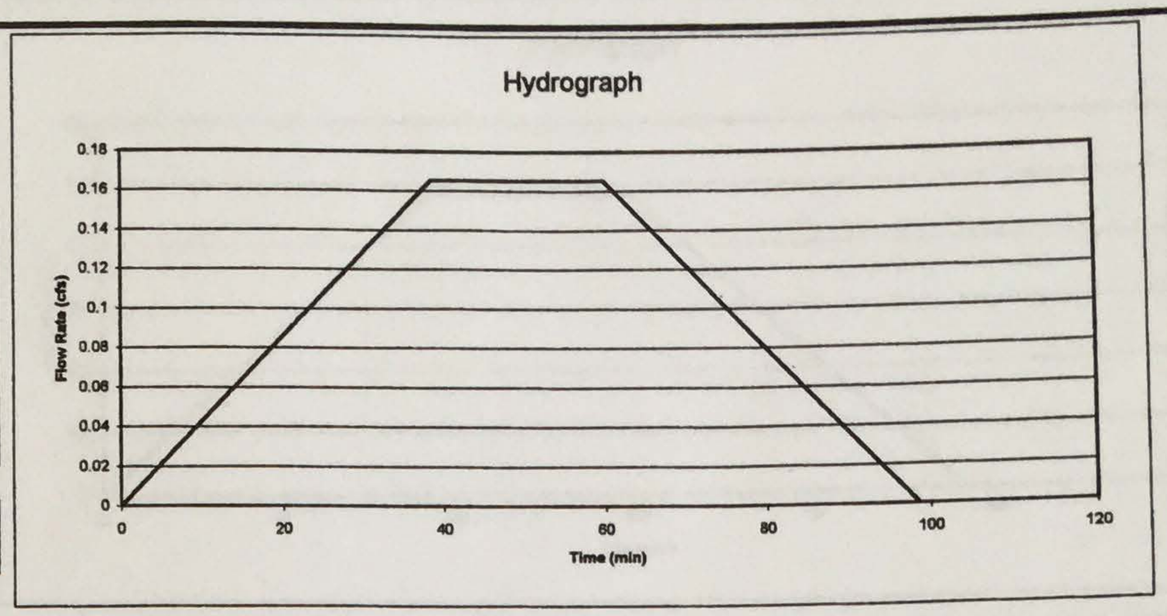
100-Year Storm Run-Off Flow Rates and Volumes

Pre-Development

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.20
I (railfall intensity, in/hr)=	1.14
A (area, acres)=	24.35
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	135

Q=	**2.47**
Runoff Volume (acre-ft)=	**0.204**

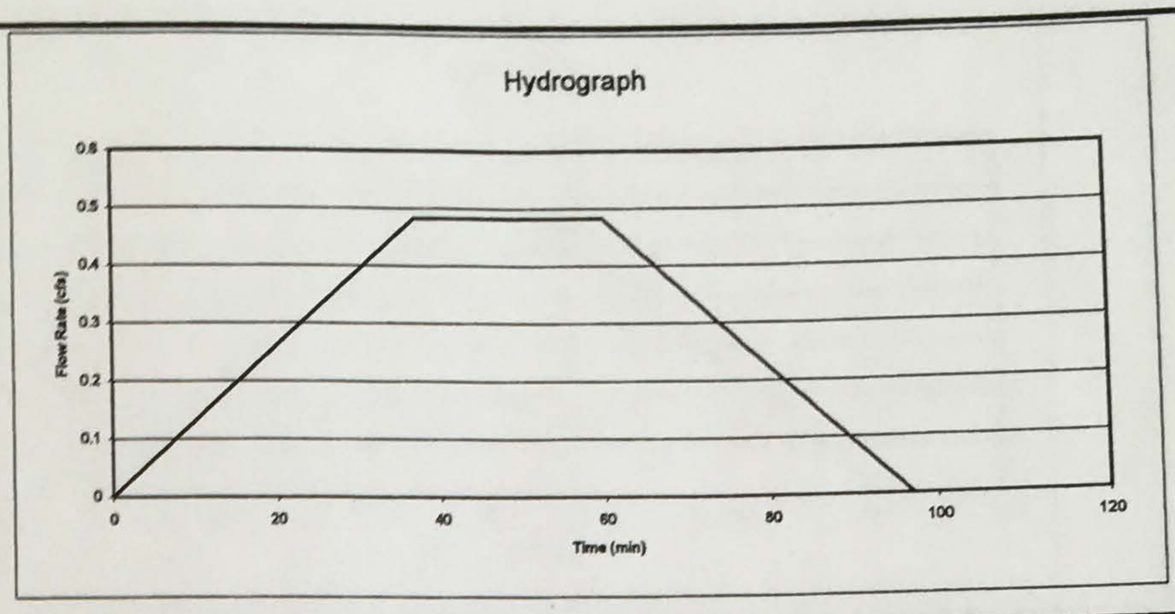


100-Year Storm Run-Off Flow Rates and Volumes

Area 1

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

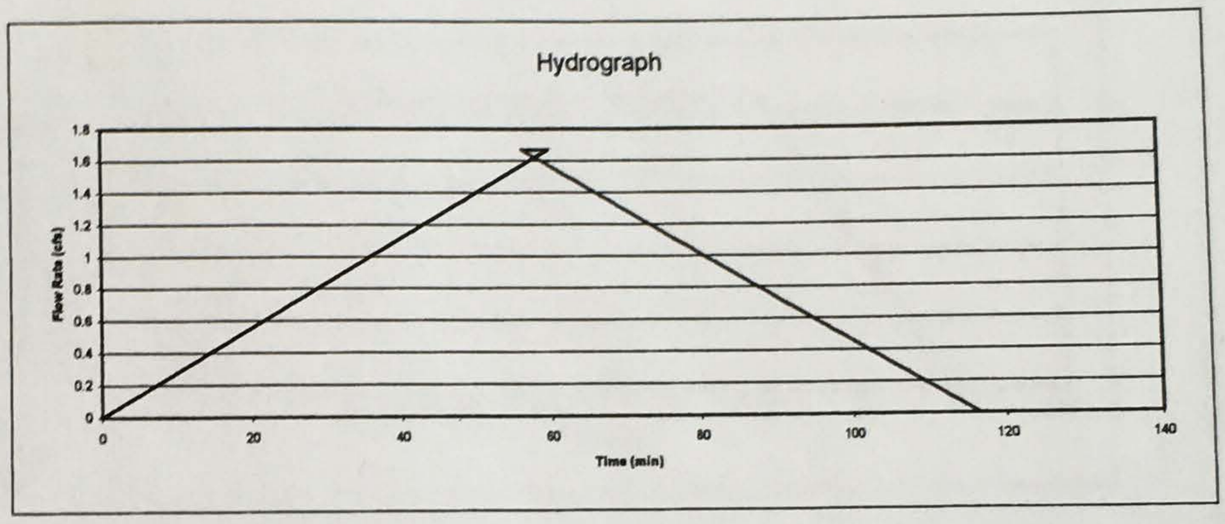
Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.58
I (railfall intensity, in/hr)=	1.14
A (area, acres)=	0.73
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	37
Q=	**0.48**
Runoff Volume (acre-ft)=	**0.040**



Area 2

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

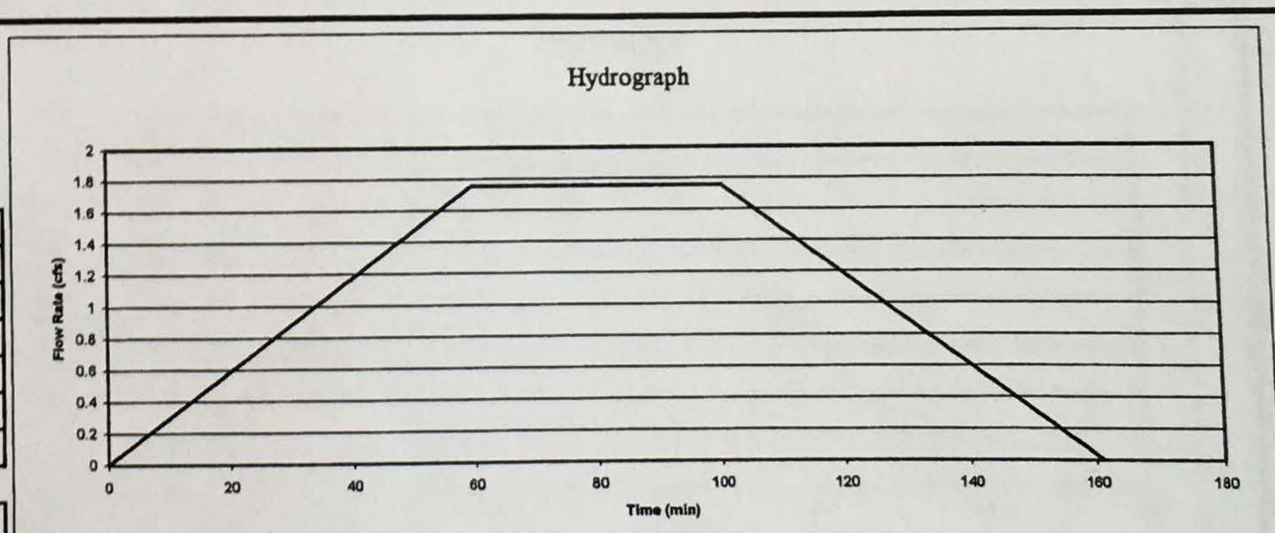
Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.52
I (railfall intensity, in/hr)=	1.14
A (area, acres)=	2.82
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	56
Q=	**1.67**
Runoff Volume (acre-ft)=	**0.130**



Area 3

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

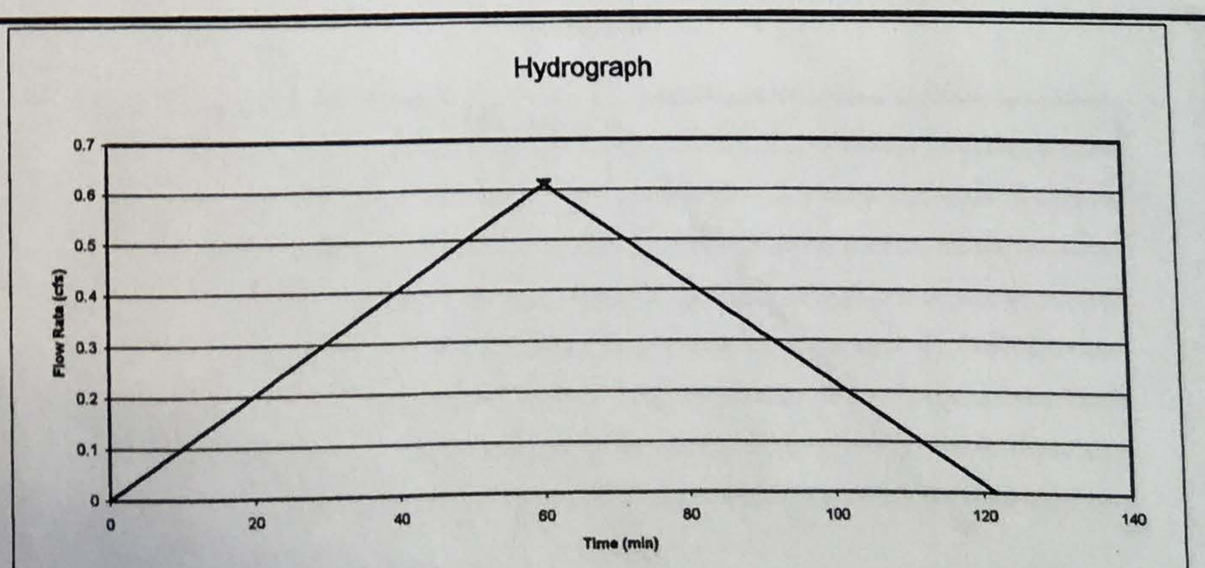
Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.32
I (railfall intensity, in/hr)=	1.14
A (area, acres)=	8.17
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	101
Q=	**1.75**
Runoff Volume (acre-ft)=	**0.244**



Area 4

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.41
I (railfall intensity, in/hr)=	1.14
A (area, acres)=	1.31
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	62
Q=	**0.62**
Runoff Volume (acre-ft)=	**0.050**

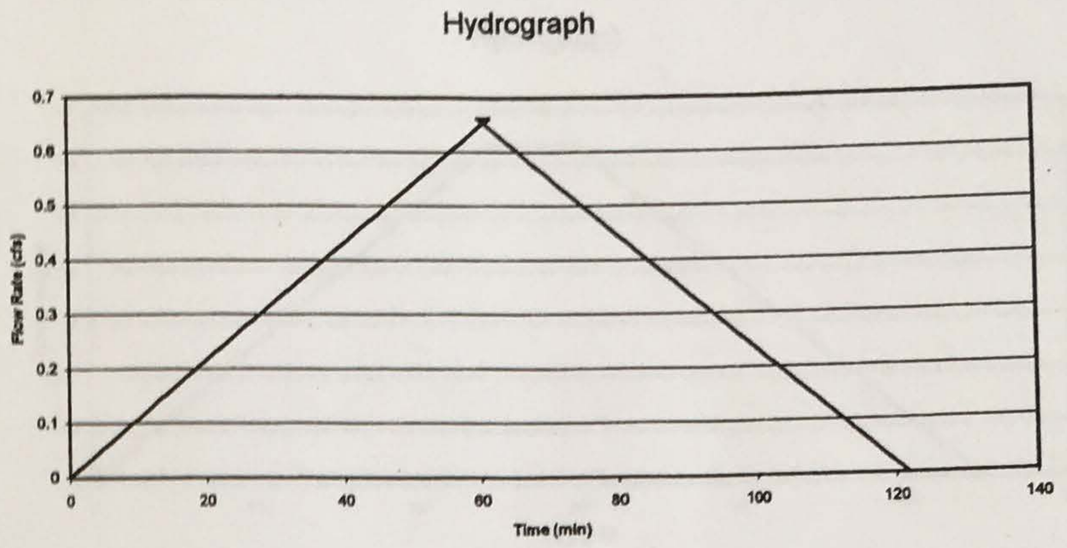


100-Year Storm Run-Off Flow Rates and Volumes

Area 5

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

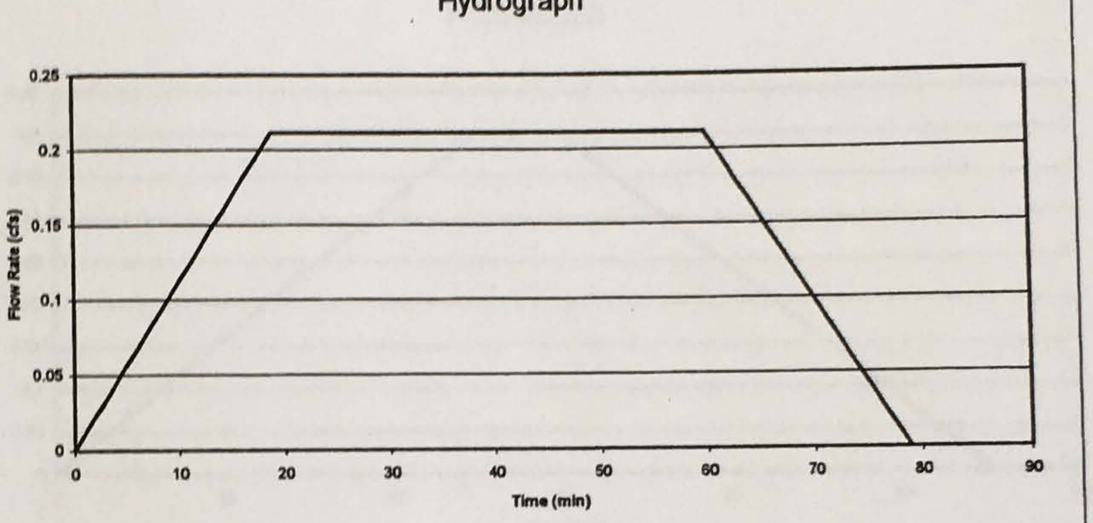
Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.47
I (railfall intensity, in/hr)=	1.14
A (area, acres)=	1.24
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	62
Q=	**0.66**
Runoff Volume (acre-ft)=	**0.053**



Area 6

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

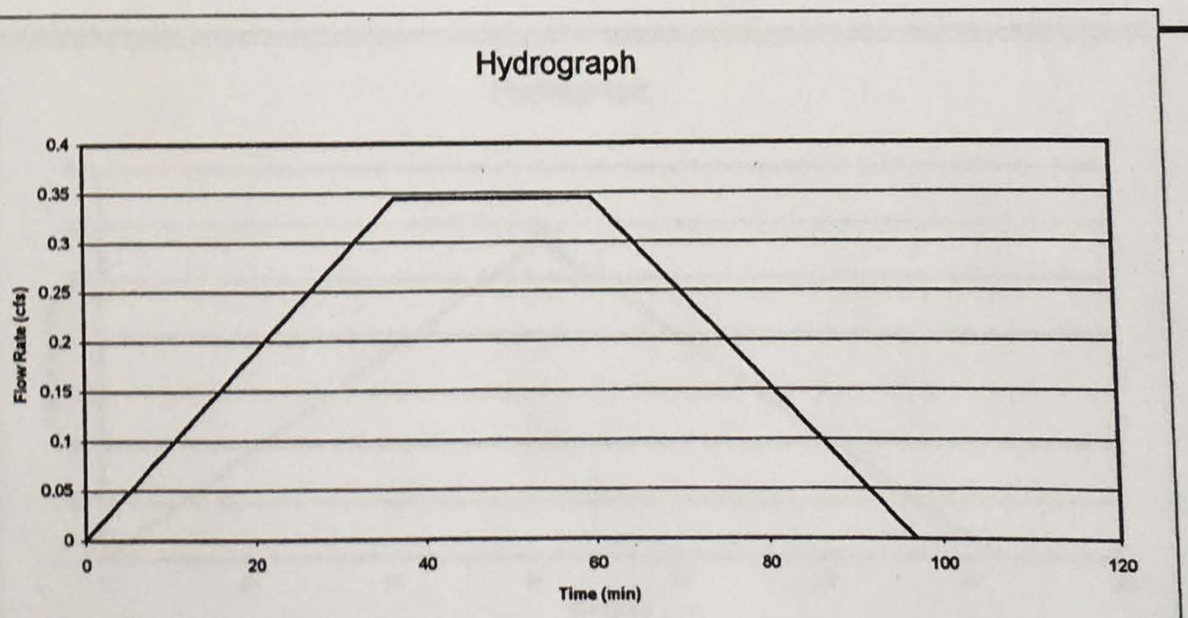
Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.66
I (railfall intensity, in/hr)=	1.14
A (area, acres)=	0.28
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	19
Q=	**0.21**
Runoff Volume (acre-ft)=	**0.017**



Area 7

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

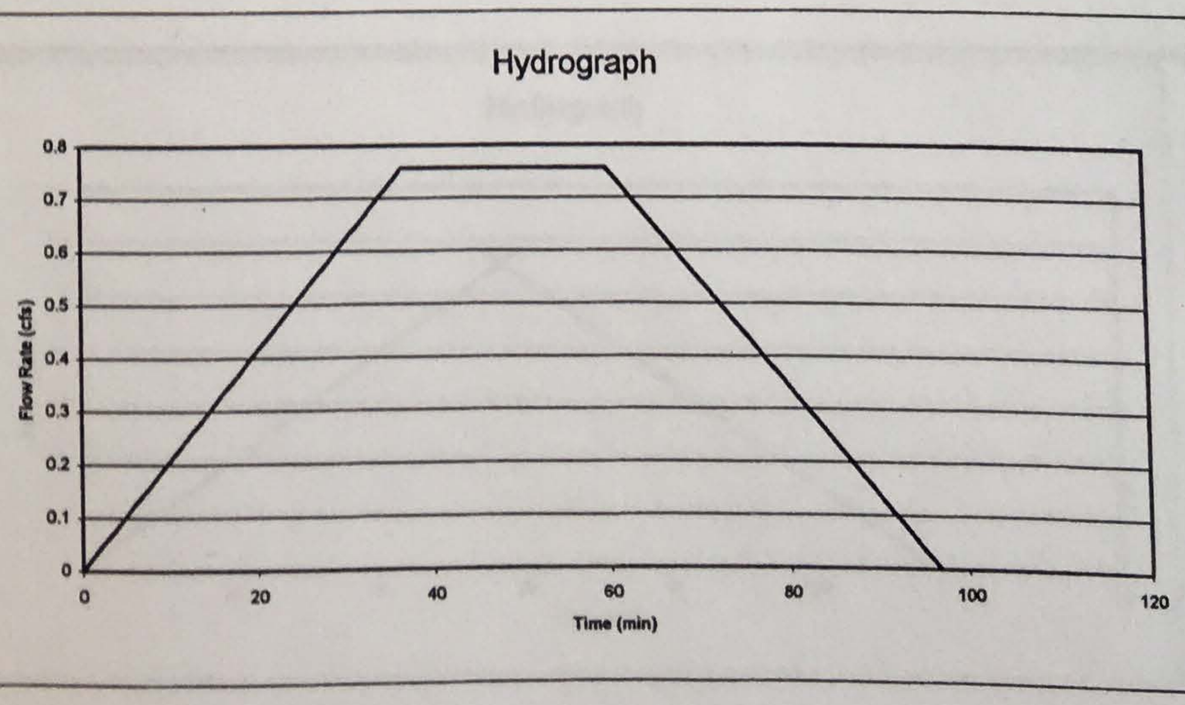
Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.67
I (railfall intensity, in/hr)=	1.14
A (area, acres)=	0.45
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	37
Q=	**0.34**
Runoff Volume (acre-ft)=	**0.028**



Area 8

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.50
I (railfall intensity, in/hr)=	1.14
A (area, acres)=	1.33
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	37
Q=	**0.76**
Runoff Volume (acre-ft)=	**0.062**

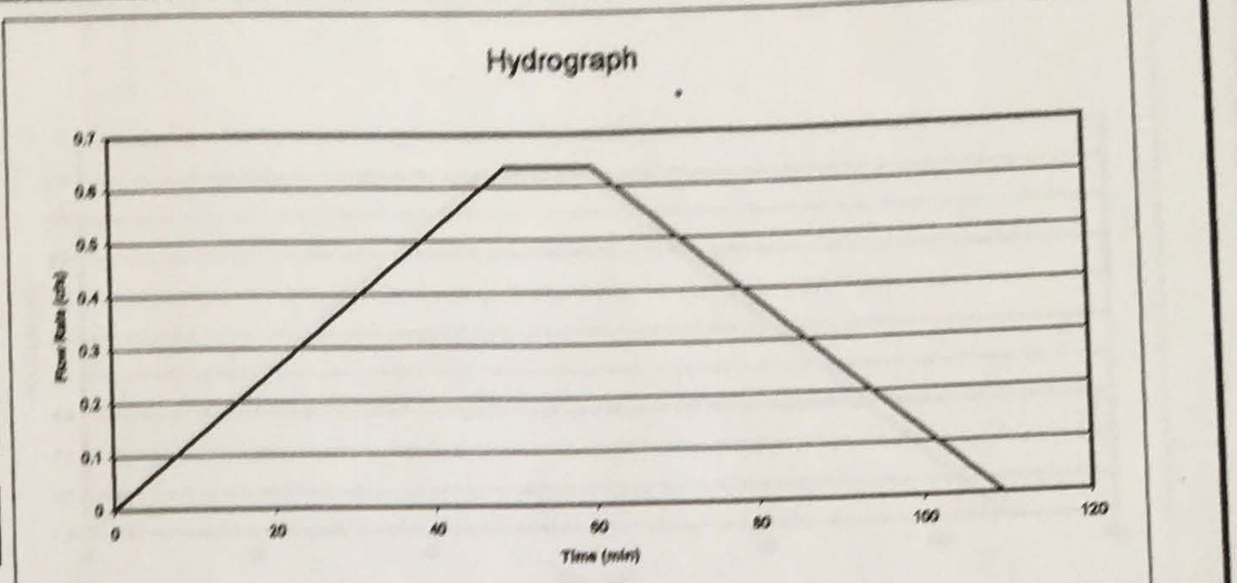


100-Year Storm Run-Off Flow Rates and Volumes

Area 9

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

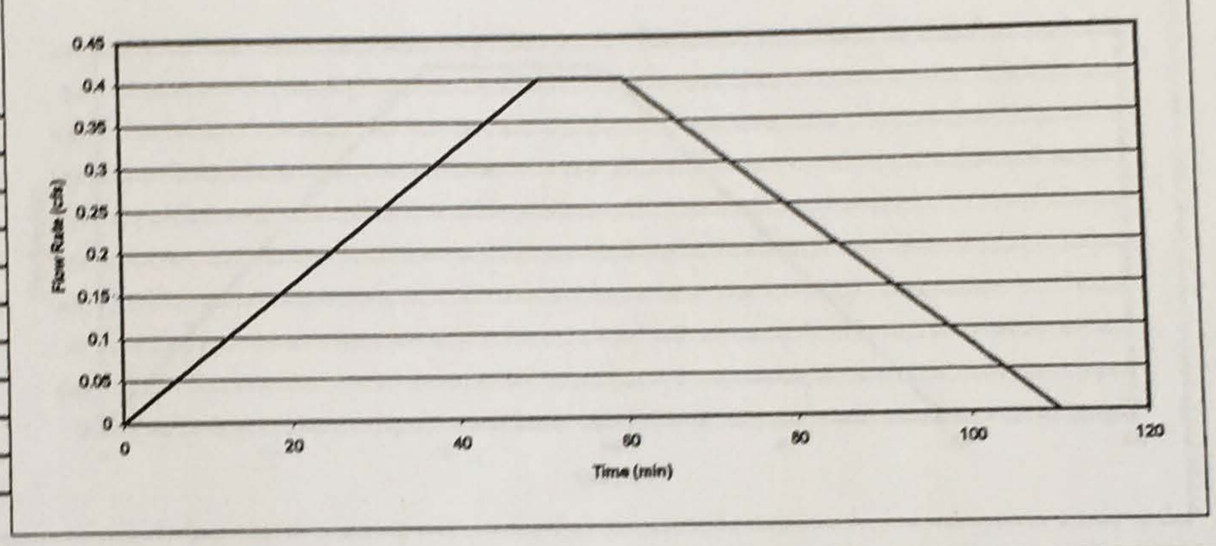
Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.45
I (railfall intensity, in/hr)=	1.14
A (area, acres)=	1.25
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	49
Q=	**0.64**
Runoff Volume (acre-ft)=	**0.053**



Area 10

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

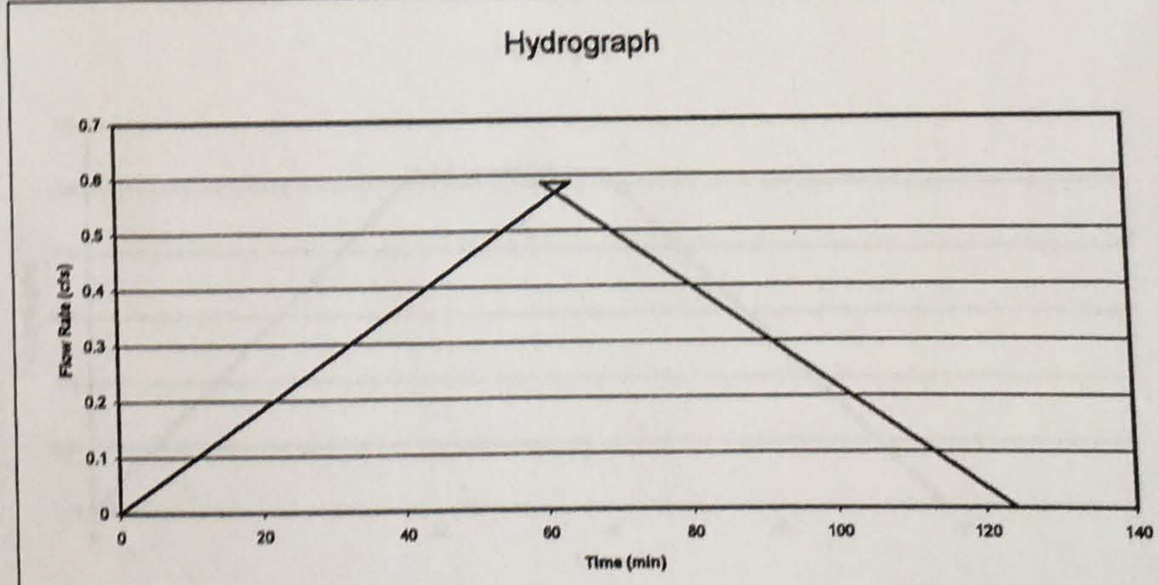
Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.50
I (railfall intensity, in/hr)=	1.14
A (area, acres)=	0.70
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	50
Q=	**0.40**
Runoff Volume (acre-ft)=	**0.033**



Area 11

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

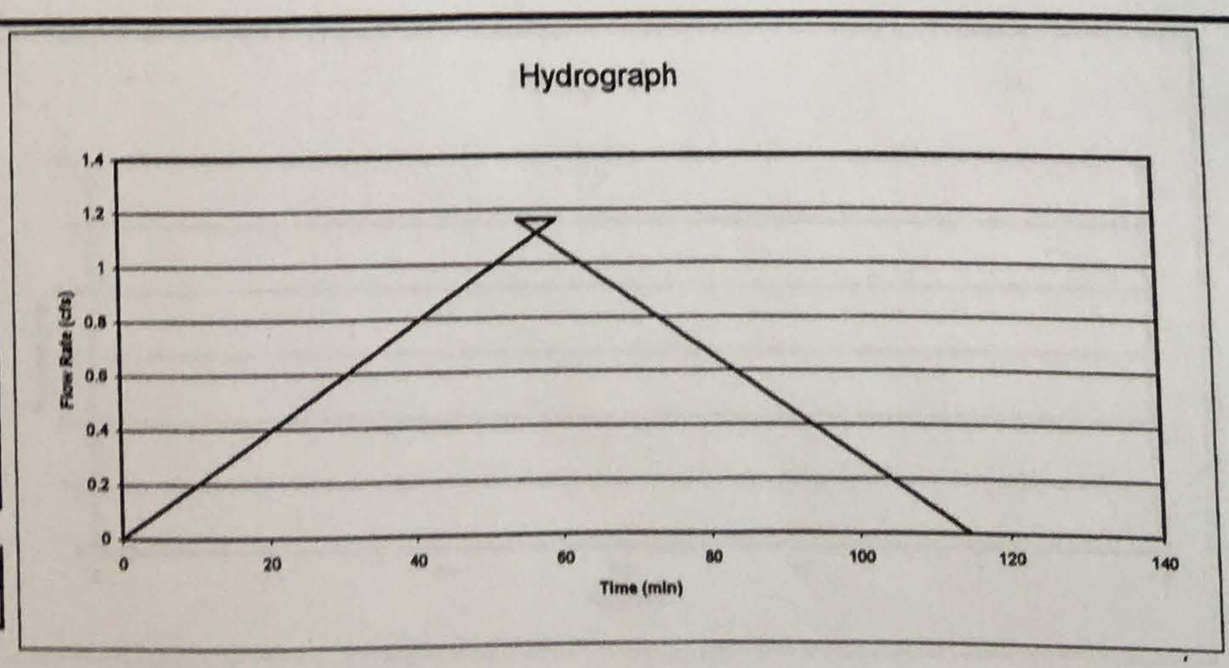
Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.44
I (railfall intensity, in/hr)=	1.14
A (area, acres)=	1.18
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	64
Q=	**0.59**
Runoff Volume (acre-ft)=	**0.045**



Area 12

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.44
I (railfall intensity, in/hr)=	1.14
A (area, acres)=	2.09
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	55
Q=	**1.16**
Runoff Volume (acre-ft)=	**0.080**

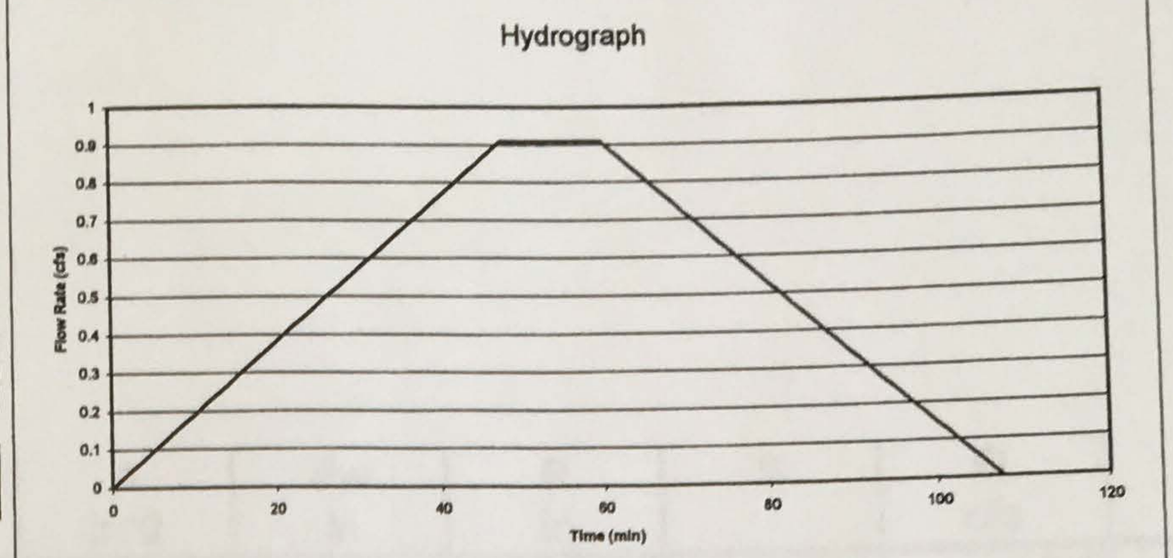


100-Year Storm Run-Off Flow Rates and Volumes

Area 13

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

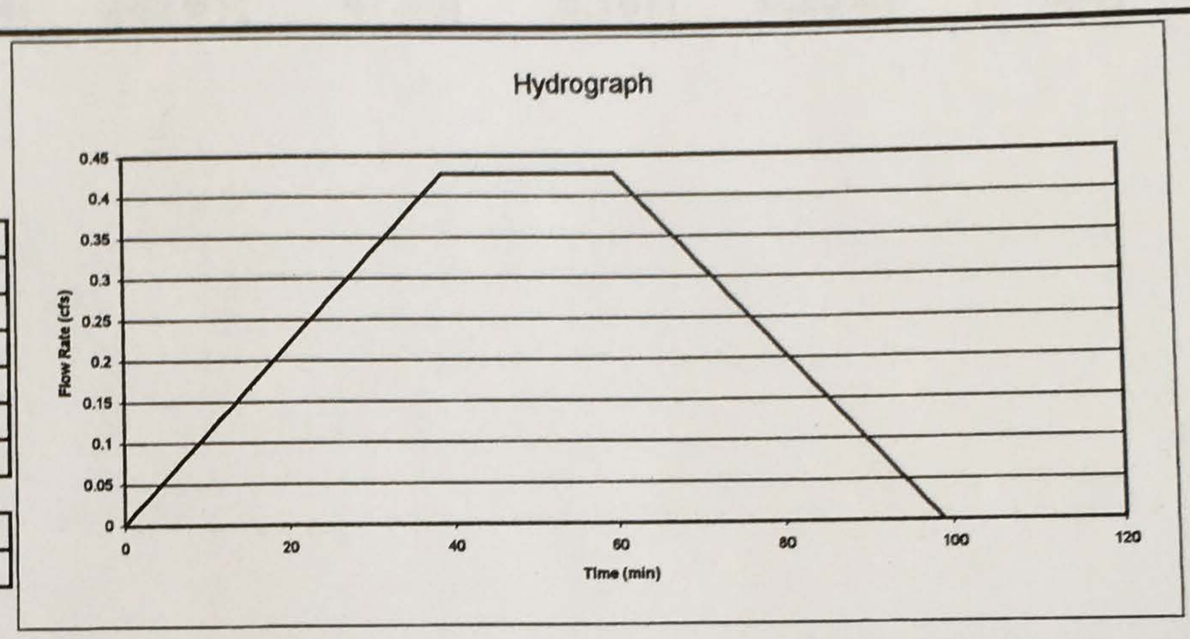
Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.50
I (railfall intensity, in/hr)=	1.14
A (area, acres)=	1.61
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	48
Q=	**0.91**
Runoff Volume (acre-ft)=	**0.070**



Area 14

$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

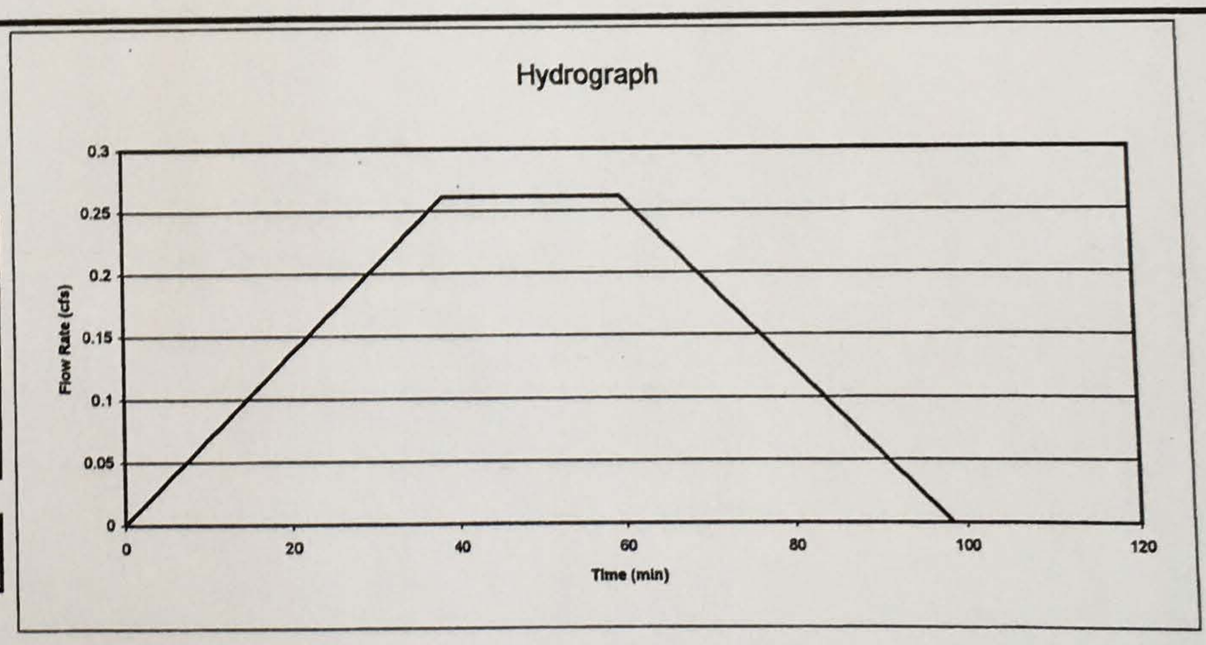
Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.56
I (railfall intensity, in/hr)=	1.14
A (area, acres)=	0.67
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	39
Q=	**0.43**
Runoff Volume (acre-ft)=	**0.035**



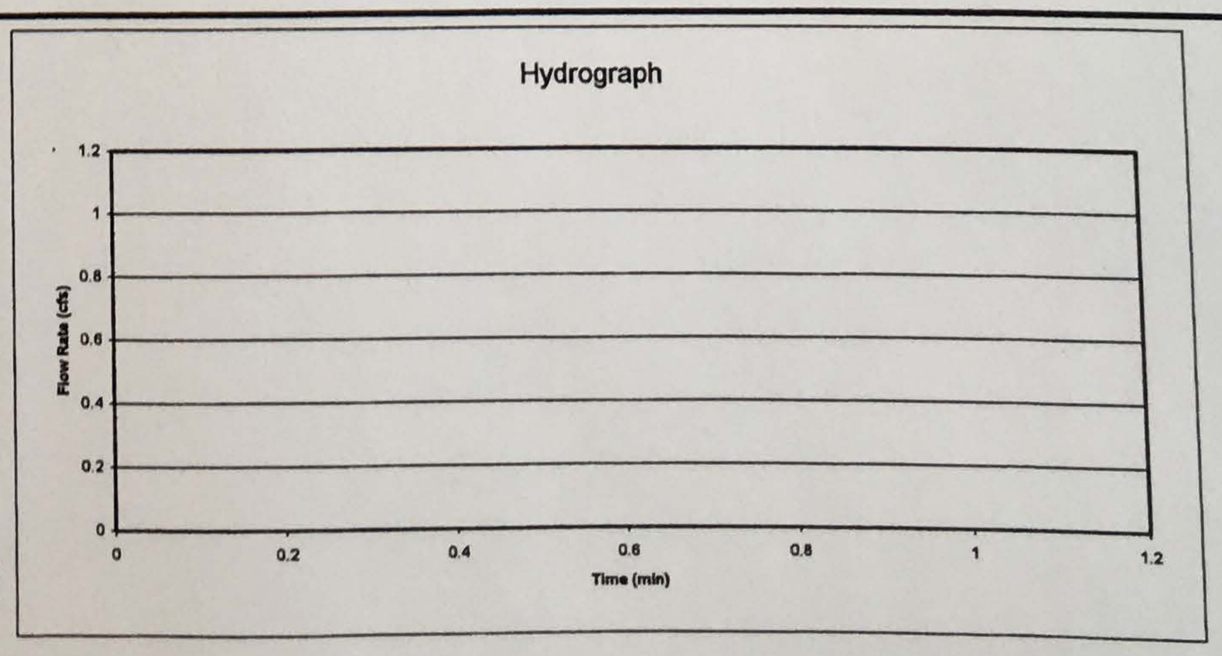
Area 15

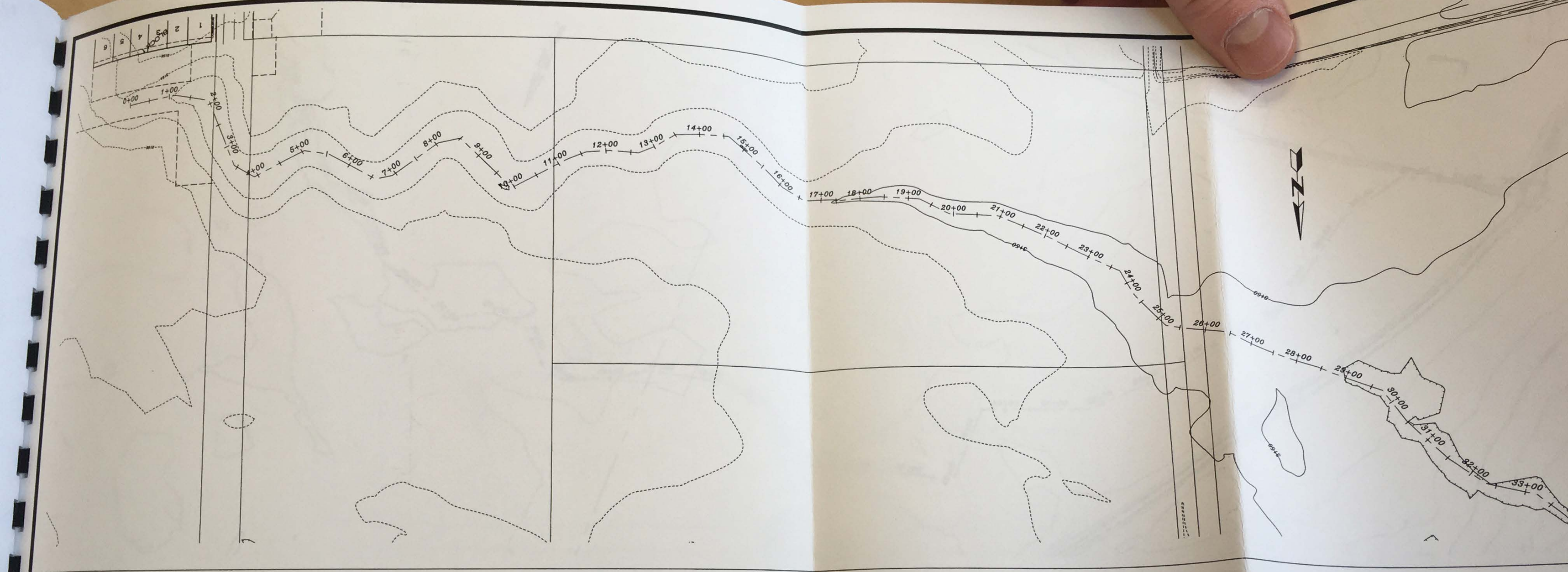
$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$

Q (peak flowrate, cfs)=	solved below
C (runoff coefficient)=	0.37
I (railfall intensity, in/hr)=	1.14
A (area, acres)=	0.62
Ku (conversion factor, english)=	1
D (duration, min)=	60
Tc (time of concentration, min)=	38
Q=	**0.26**
Runoff Volume (acre-ft)=	**0.022**



$$Q = \frac{C * I * A}{K_u}\left(\frac{D}{T_c}\right)$$



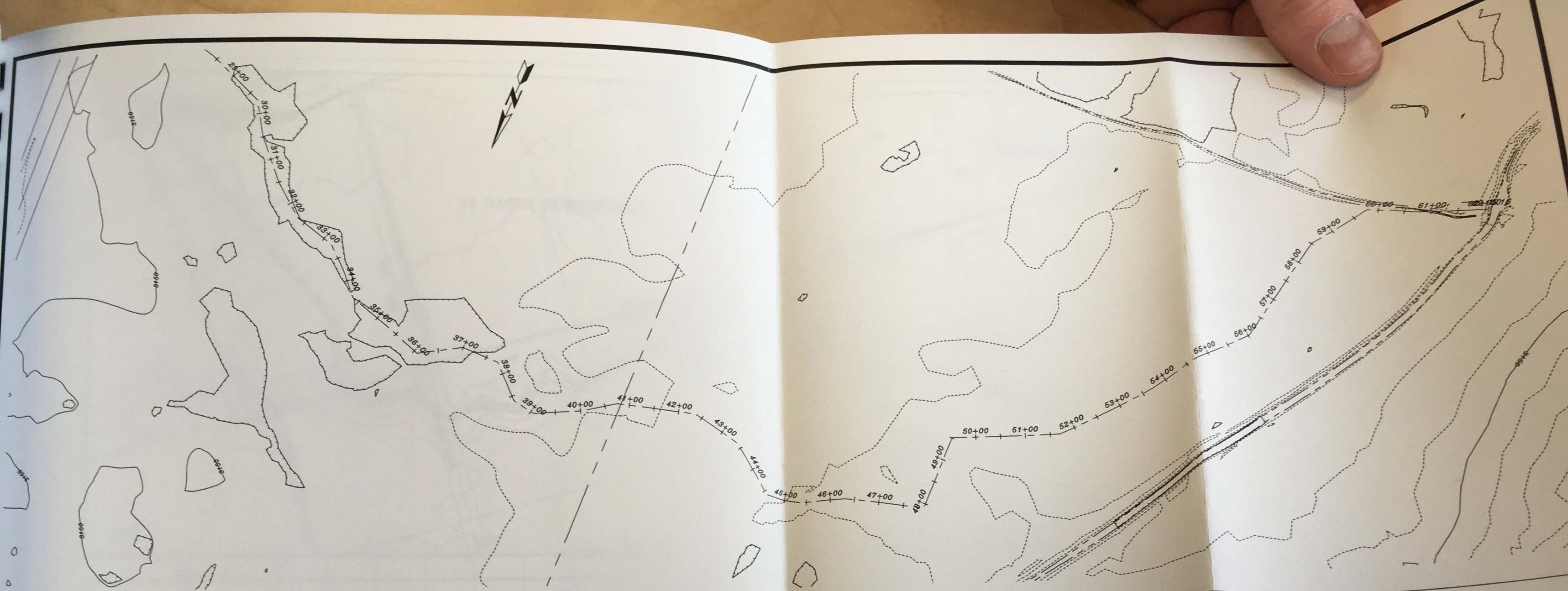


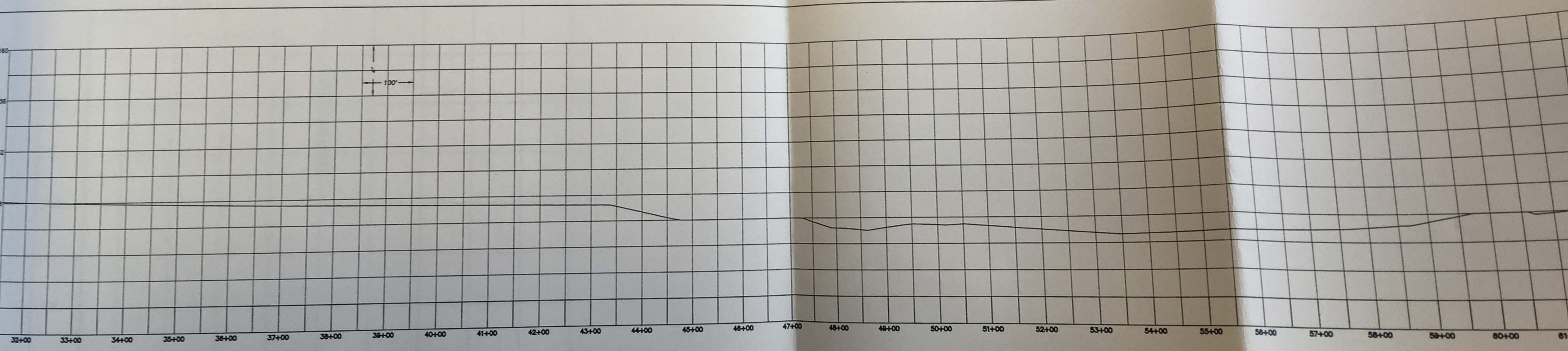
BY	DATE	REVISION DESCRIPTION

DESIGN ____ PROJ. NO. ____
DRAWN PRC DATE ____
CHECKED ____

DJ&A, P.C.
CONSULTING ENGINEERS & LAND SURVEYORS
3203 Russell Street, Missoula, Montana 59801-4591
Phone 406/721-4320 Fax 406/549-6371

GRANT CREEK OUTLET
PLAN AND PROFILE
STA 0+00 TO STA 31+50





DATE	REVISION DESCRIPTION

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CHECKED ____

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GRANT CREEK OUTLET
PLAN AND PROFILE
STA 31+50 TO END

Appendix 2

REFERENCE REPORTS

DRAINAGE AND INFRASTRUCTURE RECOMMENDATION MEMO

for

MULLAN AREA MASTER PLAN

Missoula, Montana

July 2020

Prepared For:
Missoula City and County via
Dover Kohl & Partners
1571 Sunset Drive
Coral Gables, FL 33143

Prepared By:
Territorial-Landworks, Inc. now IMEG
1817 South Ave W, Suite A
Missoula, MT 59806

1.0 GENERAL

The Mullan Area Master Plan and Implementation is a planning and design process for roughly 2,000 acres on the western edge of the City of Missoula, split between the City and County. The master plan is a chance to set the land use patterns and put into place regulations that are in alignment with the community's values. Road systems are currently being designed as a part of the Mullan Area BUILD Grant. Coordination between the Build Grant Designers and the Mullan Area Master Plan has been ongoing to ensure both projects work with each other.

The process in developing the Drainage and Infrastructure Recommendations outlined below was developed through a multi-phase process. The first phase of the process was to gather big-picture input from the citizens of the City and County to establish what the shared vision for this area would be. The virtual charrette revealed that the community wanted to be able to both maximize developable land in the area and incorporate green infrastructure to treat stormwater. Research was completed to determine methods to achieve both interests. The second phase involved incorporating this vision into a plan for the area. Former project experience in the Mullan Area was considered in the preliminary master plan. By combining what has worked in the area in the past and what the community expects to see in the future, a preliminary plan was developed. Once the plan was developed, in depth meetings with the City of Missoula and the Missoula Airport were conducted to refine the plan from a vision to a plan closer to reality. Throughout the process, there has been much time spent meeting with stakeholders to ensure that all of the surrounding communities concerns, and wishes have been heard.

2.0 DRAINAGE PHILOSOPHY

Urbanization of an area that is predominantly open fields with minimal hard surfaces will increase stormwater runoff. Management of this increase in stormwater will be critical as the Missoula community develops a plan for the focus area. Recommendations for a common policy for this area have been developed to make the build out consistent and harmonious throughout. These recommendations have considered the need to maximize developable land for attainable housing within the City of Missoula. A common management plan will allow for optimization of this limited resource.

Typical development will disrupt the historical routing of stormwater through the Mullan Road Area, in addition to increasing stormwater volumes. Mitigation of the increase in stormwater and providing routing for the stormwaters that were present prior to development will be required with development. Therefore, a plan for how we mitigate the increase and how we route stormwater needs to be developed.

Recommendations on stormwater mitigation and infrastructure will be made within this report as a guideline. Limited calculations regarding 10- and 100-year storm events for basins within the focus area have been made and will be included as examples as well as volume quantities for the first 0.5" of rainfall as per the MS4 requirements for stormwater treatment. These calculations are for demonstrative purposes only. For the design of the regional detention ponds, more formal calculations should be made using the most up to date master plan of the area. All development in the area should provide their own stormwater runoff calculations for their properties. This report will cover recommendations for the use and implementation of micro-storage areas to harvest initial runoff, and regional detention swales to collect and detain larger storm events. In addition, recommendations for green infrastructure, above ground stormwater conveyance, and water quality treatment methods will be made.

3.0 FOCUS AREA EXISTING CONDITIONS

The following information pertains to the identified focus area, where detailed boundaries are shown within the Focus Area Exhibit in Appendix A. The focus area is located between Mullan Road to the south and W Broadway to the north. Grant Creek is essentially the western boundary and existing development is the eastern boundary. Within the focus area there exists a floodplain, areas of high groundwater, clay soils and an impaired state waterbody. These will be discussed in the subsections below.

3.1 LAND USE

Currently, most of the focus area is comprised of undeveloped land. However, there are areas of existing development within the focus area, whose drainage plans will be discussed later in the report. Some of the undeveloped land will have restrictions on development as there is an Airport Influence Zone as well as a floodplain for Grant Creek in the western portion of the focus area. There also exists multiple roads within the focus area which are planned for future development.

3.2 RUNOFF PATTERNS

The study area is comprised of multiple drainage ways which convey stormwater to the west and into Grant Creek. In the past, before any development within the area, all stormwater flowed from northeast to southwest. Historically, irrigation ditches have been installed in the area to convey stormwater around agricultural land. This infrastructure will need to remain as farmland down gradient depends on them. In addition, multiple natural drainage paths exist to convey stormwater to Grant Creek. These drainage paths may be relocated with the development of the area, although all stormwater runoff on the surface will eventually outlet into Grant Creek. The existing and recently proposed developments within the focus area have individual drainage plans to mitigate the increase in stormwater due to impervious area. Detention ponds and outfall locations have been called out on the attached Topography Map in Appendix A. Look to this Topography Map for more detailed information regarding the drainage ways for the focus area.

3.3 SOIL DATA

The focus area soil types are mostly loam with some areas of silty clay loam. Loam is generally classified as Soil Type B (83% of the focus area) and silty clay loam is classified as Soil Type D (11.4% of the focus area). The rest of the focus area is made up of Aquic Haplocerolls, which is the soil located in floodplains. Generally, Type B soil is more pervious than Type D soil. Therefore, we can assume based on soil type that most of the focus area has a curve number of 69, while the Type D areas will have a curve number of 84 (fair condition vegetative coverage assumed). To simply the calculations, we have chosen to model the entire area as Type B. This will result in lower pre-development flow rates, but larger storage requirements as pre-development volumes will be lower.

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The presence of free draining soils indicates that the existing overall peak flow rate for the basin is low. With the addition of impervious coverage (roads, houses, parking lots) the difference in the peak flow rate and volume will be larger than if the existing soils were not free draining. While the topsoil is generally free draining according to USGS data, this does not guarantee that the soil will have large capacity to infiltrate stormwater over long periods of time. Silt lenses are present in the area at varying elevations throughout the entire focus area. Certain areas will have larger availability to infiltrate stormwater runoff over time.

3.4 FLOODPLAIN

Grant Creek is located on the western boundary of the focus area. During large run-off events, the creek may flood. There was floodplain mitigation constructed with Grant Creek. In 2005, a design report was prepared by HDR to help reduce the flooding hazards, improve fish passage & habitat, and improve recreation opportunities & aesthetic value of the creek. The floodplain mitigation performed on Grant Creek was completed without any accommodation for future development and therefore, new development will need to be completed in a way not to contribute to the 100-year flooding.

As a side note, the reason that flood plain mitigation was provided was that the flooding was contributing waters to sand lenses that resulted in water in basements, drainfield failures, and flooding down gradient of the study area. This is an important consideration that needs to be accounted for when considering infiltration of storm water discussed further below.

Additionally, the HDR study recommended re-aligning Grant Creek from West Broadway to a point where the stream becomes more natural as compared to the segment that had been re-aligned around agricultural properties. Due to an inability to acquire easements, the approximately 3,000 lineal feet of realignment did not get completed and the area was designated as Zone A floodplain which significantly limits the area for development. The BUILD grant contemplates realigning this section and converting a large land area to buildable ground. This would need to include flood mitigation for a portion of the Zone A that is due to an uncertified levy on the north side of West Broadway.

This would require gaining a CLOM-R from FEMA to reduce approximately 111 acres of Zone A floodplain to approximately 11 acres of Zone AE floodplain freeing up 100 acres for development. Additionally, the new stream channel would be constructed to reduce erosion and improve fish and wildlife habitat. The BUILD grant also contemplates using this channel corridor as a park and pedestrian route. Streamside vegetation should be designed to slow run-off velocities to help remove sediment and cool storm waters.

3.5 GROUNDWATER & INFILTRATION CAPACITY

Areas within the focus area are known to have groundwater that can be influenced from interaction with infiltrated flood waters as discussed above. In terms of stormwater, high groundwater can be an issue due to the inability to utilize groundwater infiltration for stormwater mitigation as the soil between the injection point and the groundwater is used for treatment. Territorial Landworks, Now IMEG has not performed any recent studies regarding the infiltration capacity of the soil or the elevation of groundwater in the focus area. Although, soil profile information for multiple projects within the focus area have been reviewed. In our experience, there exist silt lenses throughout the area which can impede the infiltration of stormwater into the ground. In general, these silt lenses are found near gravelly soils. Therefore, it is impossible to give one recommendation with regards to the use of drywell injection wells, commonly referred to as “sumps” in Missoula for the entire area, as the location of the silt lenses are generally unknown.

Since there is some gravelly soil within the focus area, there are areas in which infiltration is a suitable stormwater mitigation strategy. Although, there are areas with silts which have slow infiltration. Therefore, sumps can be recommended in some areas, but we cannot recommend them for the entire focus area. There are some instances where sumps can be used in areas silty soils to reduce frost heave, settling and ponding stormwater. If sumps are proposed to be used on a larger scale for the development, an extensive soil study should be completed.

Preliminarily, it has been found that areas on the east side of the focus area, southern Mary Jane Ave and south of the Flynn-Lowry Ditch are likely suitable for sumps. Although, due to these intermittent silt lenses and areas of high groundwater, it is highly recommended that developers be required to have multiple percolation tests conducted in areas where sumps are proposed.

We recommend that a comprehensive hydrogeological study be completed to analyze which areas in the focus area will allow for the use of drywell sumps. It is not recommended to approve the use of drywell sumps on a property by property basis as groundwater levels will rise as more properties utilize drywell sumps. It would be difficult to track how the drywell sumps are affecting the groundwater levels, which puts the area at risk for a flooding event. By predetermining which areas can handle large amounts of infiltration, the chance of a flooding event occurring will be low.

At the writing of this report, the City was in negotiations to hire a hydrogeologist to perform a groundwater study of the area. Following this report, better recommendations will be able to be made regarding the availability of sumps throughout the focus area.

3.6 WATER QUALITY

Grant Creek was identified by the Montana Department of Environmental Quality (DEQ) as being impaired due to elevated water temperatures and an excess of sediment & nutrients. This impairment was attributed to loss of riparian habitat and flow alterations from water diversions. With potential development in the area, it is possible that temperatures could rise even further without any mitigation. Therefore, water quality treatment is an important parameter for this report.

3.7 EXISTING INFASTRUCTURE AND DEVELOPMENT

The focus area has both water and sewer main infrastructure. Sewer main has been installed along the Dougherty Drive and Mary Jane Boulevard rights-of way. Water mains have been installed to serve the Hellgate School District and the 44 Ranch Subdivision. There was also a water main extension installed along Mary Jane Boulevard. These utilities have been sized to accommodate future development. Additionally, irrigation ditches exist within the focus area to provide water to farmland located to the west of the focus area. The stormwater designs for the subdivisions located in the focus area are as follows:

The 44 Ranch Subdivision is in the southern area of the focus area. The stormwater design incorporates a storm sewer pipe network and a local stormwater pond to mitigate the 100-year storm. The stormwater pond has been designed to also act as open space for the development. The proposed Remington Flats Subdivision is located near the center of the focus area. The stormwater design incorporates drywell sumps to infiltrate stormwater runoff into the groundwater. The difference between the pre- and post-development 100-year storm will be retained and infiltrated entirely onsite without overtopping.

The proposed Herons Landing subdivision is in the southern area of the focus area. The stormwater design primarily incorporates drywell sumps to infiltrate and treat stormwater runoff. There are also

two proposed stormwater ponds to capture excess flow from the existing irrigation ditch and any overflow from the sumps.

Drywell sumps continue to be a popular method for treating and mitigating stormwater in large storm events. In areas of fast draining soil without any clay lenses, drywell sumps continue to be an effective way to mitigate stormwater. Although, due to the uncertainty of the location of these silt lenses or impacts to downgradient ground water elevations, drywell sumps cannot be recommended everywhere within this memo.

3.8 AIRPORT INFLUENCE AREA

The Missoula Airport has a new runway planned which will be located to the southwest of the existing runway. There is no current timeline on this runway, and it is not proposed for the immediate future. This future runway has been considered regarding planning and stormwater infrastructure of the focus area.

The focus area is located entirely within the Missoula Airport Influence Area, as the runway is located directly to the west. This provides some restrictions for what can be done within the area in terms of stormwater mitigation. As we know, sitting water is an attractant to flock birds and waterfowl. Additionally, increased riparian area will attract more birds of prey as the area will attract smaller mammals. The airport is primarily concerned with minimizing the risk of airplane strikes with birds, especially large birds and flocking birds such as geese and birds of prey.

The FAA Circular for Hazardous Wildlife Attractants on or near airports states that all new stormwater mitigation facilities are required to have a maximum time to drain of 48 hours. The FAA Circular also recommends various wildlife mitigation strategies such as steep-sided, riprap or concrete lined, narrow, linear-shaped water detention basins. All ponds which have been shown in exhibits within this report have been designed to comply with the maximum drain time. Additionally, the ponds have been recommended to be narrow and allow for a drain time less than the maximum of 48 hours. It is also recommended that the City investigate plans for future mitigation should the birds become problematic. Additional risk management as it pertains to the airport will be discussed later in the report under Section 4.

4.0 RECOMMENDED STORMWATER MITIGATION STRATEGY

Due to the variable soils within the focus area as described above in Section 3.3 and the presence of groundwater in some areas as described above in Section 3.5, drywell sumps are not recommended as the sole stormwater mitigation facility for the entire focus area. Although in areas of well-draining soil and low groundwater, drywell sumps are useful in mitigating smaller storm events and for making sure ponds empty during frost events. Unless a comprehensive hydrogeological study be performed on the focus area, the decision to utilize drywell sumps will have to be made by the design engineer and the City at the time of permitting. As discussed in Section 3, it is not recommended to approve the use of drywell sumps on a subdivision by subdivision basis.

The following stormwater mitigation strategy utilizes local micro-storage facilities on properties as well as larger regional 100-year detention facilities to serve the entire focus area. This method will ensure that developers may be able to achieve maximum density on their property, as the micro-storage facilities will be much smaller than the usual individual stormwater ponds we have seen recently. Shown below is an exhibit explaining this strategy:

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On-site Storage ($10\text{-Year}_{post} - 10\text{-Year}_{pre}$) → **Conveyance** (All Storms Greater Than the 10-Year) → **Regional Storage** ($100\text{-Year}_{post} - 100\text{-Year}_{pre}$) - ($10\text{-Year}_{post} - 10\text{-Year}_{pre}$)

This mitigation strategy puts an emphasis on maximizing the developable land by only requiring the mitigation of the 10-year storm. Historically, developers have had to mitigate the 100-year storm, which dedicates a large area of their property as a stormwater facility. In order to implement this strategy, the City of Missoula will need to either acquire land or easements along the western boundary of the focus area for the regional detention facilities. Since the western boundary of the focus area is located close to the Missoula Airport, this property is not recommended for high residential density. Therefore, it is recommended that the City of Missoula acquire this land for the use of regional stormwater detention.

It is possible to share the cost of the recommended regional detention facilities by requiring developers pay a utility fee in order to connect to the system. Another option is to require developers increase capacity of the regional pond in order to connect to the system. Either of these options will help to offset the cost of this infrastructure for the City. In general, land is very valuable to the developer and therefore, we feel that they will be mostly happy to pay a utility fee to use the regional stormwater mitigation facilities. As historically was the case with on-site stormwater mitigation facilities, the property owner will be responsible for any micro-storage pond on their property.

4.1 ON-SITE MICRO-STORAGE FACILITIES

To maximize the amount of developable land on each property, it has been recommended that the focus area utilize small bio-retention stormwater ponds to mitigate the 10-year storm as well as treat the first 0.5" of rainfall as per the MS4 area requirements. These ponds are designed to retain the difference between the pre- and post-development 10-year storm and allow any additional stormwater runoff to overflow and be conveyed to the west side of the focus area where it will be detained by regional detention ponds and eventually outlet into Grant Creek. The Missoula Airport has confirmed that while stormwater ponds are not preferable within the airport influence area, if they drain in under 48-hours they can be permitted. The design standards for these bio-retention ponds as well as other stormwater mitigation facilities are described in more detail in Section 5.1. The use of smaller localized ponds will achieve both small scale stormwater mitigation as well as water quality treatment before being conveyed to Grant Creek via grassed swales and storm sewer networks, see section 4.2 for a description on recommended conveyance. Studies have been conducted by communities around the United States to quantify the difference in peak flow with and without micro ponds. Preliminary estimates from these studies show a 20% reduction in the post-development peak flow of an entire drainage basin during the 100-year storm when utilizing micro-storage for smaller storm events.

The end goal of requiring localized micro-storage for the 10-year storm is to reduce the peak flow of water during larger storm events, treat stormwater runoff closer to the source, and reduce the amount of developable land taken up by stormwater mitigation facilities as would be required for the 100-year storm. These ponds will contribute to smaller regional ponds, cleaner water discharged into Grant Creek and a higher density of development.

4.2 OPEN CHANNEL CONVEYANCE

Where possible, grass lined swales should be used to convey stormwater runoff from impervious areas to the stormwater mitigation facilities. Swales are green infrastructure which are effective at reducing sediment transport, lowering the temperature of stormwater, reducing nutrient concentration and increasing the time of concentration for the watershed. Additionally, grass lined swales are easier to maintain than storm sewer networks and are generally more aesthetically

pleasing. The water quality treatment advantages of grass lined swales will be discussed in further detail in Section 5.2 of the memo.

The general slope of land across the focus area is from east to west. This allows for open channel conveyance across the focus area without a large amount of grading, as the land is already sloping this way. Due to the flat nature of the site, crossing intersections will prove to be a tough design parameter. Intersections are discussed in further detail in Section 6.2 of the memo.

The soil in this area of Missoula is known for causing frost heave in roads due to the presence of silts. Grassed swales allow for some water to be infiltrated during stormwater conveyance. Water which infiltrates close to the roads will have the potential to cause frost heave as well as settling in areas of silt and clay soils. Addressed in Section 6.2 will be recommendations of the implementation of designs which will minimize the risk of frost heave and settling for roads with adjacent grassed swales.

Understandably, grassed swales may not be feasible in all regions of the focus area due to a variety of factors including available right-of-way, ground slope and intersections. In these cases, storm sewer networks should be utilized to convey stormwater to the regional detention ponds. Installing storm sewer mains is generally more expensive than utilizing grass swales and should be avoided unless necessary.

In order to get the full water quality treatment benefits from grassed swales, fertilization of the vegetation should be properly managed to reduce potential for excess nutrients. Care should be taken to utilize the correct soil mixture (as noted in "Grassed Swale Design Recommendations" in Appendix B). Where at all possible, fertilization shall be avoided in any grassed swale designed to convey stormwater.

4.3 REGIONAL DETENTION PONDS

To detain the difference between the pre- and post-development storm for events larger than the 10-year storm, we recommend that the focus area utilize regional shallow detention ponds and swales. These regional ponds will store the stormwater runoff which overflows from the local micro-storage ponds, which is then conveyed via open channels (grass lined swales and storm sewer networks) to the western edge of the focus area.

The use of regional detention ponds ~~which are also~~ incorporated in community parks and green space will maximize the amount of developable land within the focus area. These will also act as a final water quality treatment method before stormwater is discharged into Grant Creek. Although regional detention ponds will increase cost upfront for the City, it is possible to mitigate these increased costs by charging developers to connect to the stormwater mitigation system. The Missoula Airport has stated that for now, they will not allow detention ponds to be constructed on their property. Therefore, regional detention swales have been shown along the property boundary. These detention swales are located such that stormwater runoff will be captured before leaving the focus area to be discharged onto the airport property. Due to swales being much narrower than ponds, these will be able to fit within the available area on the edge of the focus area.

5.0 GREEN INFASTRUCTURE RECOMMENDATIONS

Stormwater runoff must be treated for excess sediment, temperature, nutrients, and other pollutants associated with infrastructure such as VOCs. Green infrastructure is crucial in order to treat stormwater before it is discharged into bodies of water. For the most part, the recommended green infrastructure consists of stormwater infiltration through root layers to reduce nutrients and treat VOCs, as well as the

overall slowing down of stormwater to treat temperature and excess sediment. The following are descriptions of the stormwater mitigation facilities mentioned in Section 4 and how they pertain to stormwater quality treatment. Also discussed within this section will be recommendations on optimal plants and the design of these facilities.

5.1 RAIN GARDENS & MICRO-STORAGE BIO-RETENTION PONDS

In highly dense areas where on-site storage may not be possible, rain gardens provide a design option to treat stormwater before being discharged into Grant Creek. Rain gardens are designed to treat the initial stormwater runoff which is generated from impervious coverage. This initial runoff has generally the highest concentration of pollutants and therefore is important to treat as close to the source as possible. In urban regions of the focus area with storm sewer access nearby, or in areas where infiltration is not advised, bio-retention ponds should utilize an underdrain to avoid infiltration. Likewise, in areas where utilizing infiltration is encouraged, bio-retention ponds can infiltrate retained stormwater, so long as stormwater infiltrates within 48 hours.

The micro-storage ponds recommended for mitigation of the 10-year storm may also be considered as rain gardens to treat stormwater. For the most part, these ponds should be designed with the same design parameters as rain gardens.

We recommend in highly dense areas the incorporation of rain gardens with landscape islands to treat stormwater. Design criteria for rain gardens and a landscape planter rain garden exhibit has been included in Appendix B. Design criteria has considered based on the City of Missoula's: Stormwater Management in Areas of Shallow Groundwater Report completed in 2010 by WGM Group. Some design aspects have changed, as design practices have changed since the report was completed.

Included in the design criteria are recommendations on native plant species which will optimize plant uptake and thrive in Missoula's climate. The most important design aspect of rain gardens are having full vegetative cover. The plants listed in Appendix B can be used in an combination as far as there is full cover.

5.2 GRASSED SWALES

Along roadways where the right-of-way width allows grassed swales are recommended to be installed adjacent to roadways. These swales will provide water quality treatment for the stormwater runoff directly from the roads, as well as increase the time of concentration during storm events for the entire focus area. Grassed swales are especially effective at reducing excess sediment and lowering the temperature of stormwater. Both sediment and temperature are pollutants highly associated with stormwater runoff from roads.

Design criteria for grassed swales has been included in Appendix B. Design criteria has been considered based on the City of Missoula's: Stormwater Management in Areas of Shallow Groundwater Report completed in 2010 by WGM Group. Some design aspects have changed, as design practices have changed since the report was completed.

Also included in Appendix B are recommendations for trees which can be planted within grass swales. This list was provided by the Missoula Parks and Recreation Department and is meant to be a preliminary recommendation guideline. Developers should consult with the Missoula Parks and Recreation Department before any trees are installed within a grass swale located in City right-of-way.

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5.3 REGIONAL DETENTION FACILITIES

~~In theory, most of the stormwater runoff should be treated before reaching the regional detention ponds at the western boundary of the focus area.~~ The primary focus of the regional detention ponds are to mitigate the volume difference between the pre- and post-100-year storm event. These ponds can be incorporated in green space located on the western border of the focus area, as the focus area generally slopes from east to west.

The regional ponds will provide stormwater quality treatment through infiltration. The grass cover from the detention pond will provide some plant uptake to treat nutrients and VOCs, and excess sediment will be deposited at the pond bottom.

Design criteria for detention ponds have been included in Appendix B. Design criteria has been considered based on the City of Missoula's: Stormwater Management in Areas of Shallow Groundwater Report completed in 2010 by WGM Group. Some design aspects have changed, as design practices have changed since the report was completed.

6.0 STORMWATER MITIGATION STRATAGY IMPLEMENTATION

The following subsections address recommendations on the implementation of the stormwater mitigation strategy outlined above in Section 4. Included as attachments are design guidelines for the recommended stormwater mitigation facilities. These calculations were performed using TR-55 and are conceptual by nature. It is recommended that design engineers utilize the SCS Curve Number Method for projects within the focus area for consistency.

6.1 MICRO-STORAGE

In the attached Appendix C, multiple exhibits are shown for micro-storage options of storing the 10-year storm on-site for both residential and commercial applications. Stormwater calculations were performed on example sites to represent how large these micro-storage ponds will need to be to mitigate the 10-year storm.

Sheet 1 of Appendix B shows three different examples of micro-storage options for a high-density residential subdivision. Each of these examples mitigate the 10-year storm, the purpose is to show how storage can be achieved both on the residential lot as well as within greenspace. The shallower on-site ponds will be of a greater benefit to stormwater quality treatment, as there is more pond bottom surface area per cubic foot of water. Therefore, there is a greater opportunity for the treatment of nutrients through the vegetative root layer. Additionally, personal micro-storage ponds have the potential to be a visually attractive feature to neighborhoods as homeowners can customize what plants are located inside.

Sheet 2 of Appendix C shows how a commercial lot can maximize density by incorporating landscaped islands and retention swales to mitigate the 10-year storm. The landscaped islands shown on the commercial lot were required by the City of Missoula according to their parking lot specifications. While each micro-pond may be designed to be a certain volume, the design engineer will have to verify that this volume of runoff is conveyed to each micro-pond. Below is a table made to credit storage volume per square foot of impervious coverage that drains to a micro-storage pond:

Micro-Storage Pond Volume	
Impervious Area (sf)	Volume (cf)
3000	147
4000	218
5000	273
6000	337
7000	405
8000	477
9000	553
10000	633

The purpose of this table is to ensure that the storage volume credited for stormwater micro-ponds will be represented by the area of impervious coverage that drains to it. For example, to be credited with 146.5 cubic feet of storage, a site must prove that 3000 square feet of impervious area drains directly to the micro-pond. The runoff volume was developed using TR-55 to calculate runoff amounts per square footage of impervious area during a 10-year storm.

Sheet 3 attached in Appendix C represents how much space a 10-year pond would take up on the commercial development property with no micro-storage. This is a representation of how useful micro-storage can be to maximize the developable land on a site. While a 10-year pond is still substantially smaller than a 100-year pond, it still takes up much more space than micro-storage ponds in landscape islands.

6.2 OPEN CHANNEL CONVEYANCE

Attached in Appendix D are general cross sections showing examples of different swale configurations which can convey stormwater runoff to regional detention ponds. Sheet 1 shows configurations for swales on both sides of the street, one side of the street and a center boulevard street. In general, road cross sections have been designed with either 6', 8' or 12' landscaped areas suitable for grassed swales. The following paragraphs discuss some of the design difficulties associated with grassed swales in the Mullan Area.

The silt and clay soils which are found in small areas within the focus area may cause frost heave and settling in areas where stormwater runoff infiltrates too close to roads and sidewalks. As roadside grassed swales have been recommended as the main conveyance option for the area, it is important to address this concern. ~~Ensuring that the flowline is setback from the adjacent road by at least 15 feet will help in preventing stormwater from infiltrating under the road.~~ We recommend a mechanism to ensure road sections do not become saturated to minimize the chance of settlement and frost heave. Developers are encouraged to submit their ideas on how to mitigate this. Detail B on Sheet 2 of Appendix D shows an example of how an underdrain can be incorporated into the storm sewer network to act as this mechanism.

~~As mentioned in Section 4,~~ Stormwater runoff crossing at intersections will be the toughest part of design of the open channel conveyance strategy. A storm sewer pipe network could be installed along with the swale to capture water at intersections and convey it to the regional detention ponds. Another solution would be to install crossing pipes under intersections, where stormwater

will enter the pipe and daylight on the other side of the intersection (where possible) and continue to be conveyed in the grass lined swale. Where it is not possible to daylight stormwater, a drywell sump shall be installed which will be designed to overflow across the intersection during larger storm events. Storm inlet rims within the grassed swales should be set 4 to 6 inches above the bottom of the swale. This will allow smaller storm events to be treated by infiltration within the swale as well as allow for some excess sediment to settle before entering the inlet in larger events. In areas where infiltration is not feasible, the infiltrated water shall be captured by an underdrain and conveyed to a storm sewer network or drywell injection well. Sheet 2 in Appendix D shows an example plan and profile view of a storm pipe crossing at an intersection. This example is shown for a center boulevard swale, although the concept can be applied to any roadside swale configuration.

6.3 REGIONAL DETENTION FACILITIES

Stormwater mitigation for storms larger than the 10-year is recommended to be constructed on the western edge of the focus area. Attached in Appendix D is an exhibit which shows the focus area broken up into drainage basins, with subsequent stormwater mitigation facilities for each basin on the western edge of the focus area. Calculations for peak flow and stormwater runoff volume were performed using TR-55. The difference between the pre- and post- 10-year storm was deducted from the 100-year storm storage volume to size the detention ponds. The purpose of this exhibit is to roughly show that shallow large area retention ponds are feasible within the western area of the focus area.

Due to the proximity of the Missoula Airport to the focus area, there are limitations on the maximum amount of time that stormwater can be held in storm ponds after a rain event~~. It has been verbally expressed by the Missoula Airport that 48 hours should be the maximum time, while the FAA regulations require a maximum time of 48 hours~~. FAA regulations require a maximum time to infiltrate of 48 hours for stormwater mitigation facilities. Communications with the Missoula Airport's Wildlife Biologist have confirmed that 48 hours will be the maximum time to infiltrate for the focus area. Attached in Appendix D is the soils map for the focus area, these results were cross checked with the soil profile holes for multiple development projects within the focus area, and a recommended infiltration rate for soil was determined. ~~This rate was taken from MT DEQ-8 and we feel as though it is conservative for the soils in the area. An infiltration rate of 0.7 inches per hour has been recommended for the area, which means that no stormwater pond should be no deeper than 16 inches to drain within 24 hours and 33 inches to drain within 48 hours.~~ Table 2: Infiltration Rates from MT DEQ-8 has been used to determine the infiltration rate for the area. Due to the importance of ensuring every stormwater facility in the focus area drains within 48-hours, we feel that using Table 2 provides a conservative infiltration rate for the area. We have determined the soil type to be a Silt Loam based on soils data taken from the Herons Landing, RMB, and Remington Flats Subdivisions. The infiltration rate taken from Table 2 of MT DEQ-8 for Silt Loam is 0.7 inches per hour. This allows for a maximum pond depth of 33 inches in order to drain in 48 hours. This is assuming that no landscaped sumps are installed within the facility to enable faster infiltration. The Mullan BUILD Grant project has shown infiltration rates for the western area of the focus area as high as 37.5 inches per hour. Therefore, 0.7 inches per hour is extremely conservative towards designing rengional detention facilities which will be ideal for the airport. Ideally, we recommend that stormwater ponds be as shallow as the volume requirements and available space will allow for.

In addition to limiting the time in which sitting water is stored in the pond, detention ponds must also be as uninviting to migratory and large birds as possible. Where possible, detention swales should be utilized to avoid designing large pond areas which will be more attractive to birds. ~~Additionally, in order to minimize the risk of an airplane striking a bird, detention ponds should be designed to be out of the direct path of the runway, whenever possible~~. Attached in Appendix E is

Section 2.3.2 "New Stormwater Management Facilities" of the FAA Advisory Circular on Hazardous Wildlife Attractants on or near airports. This sheet shall provide guidance on the design on detention ponds near airports.

7.0 REGIONAL STORMWATER FACILITY IMPLEMENTATION

Due to the nature of this Master Plan occurring along the same time frame as the Mullan Build Grant road design and construction, the implementation of a phasing plan is recommended to the City. Some options for phasing will be presented below, each option makes some assumptions based on what is possible for the City within their budget and opportunity to acquire land.

7.1 ACQUIRING LAND ON WEST EDGE OF AREA

In order to design and implement regional stormwater facilities, the City would acquire land or an easement to construct these facilities on. The obvious option would be for the City to purchase this land from the landowners, although it is understood that the budget for stormwater mitigation is limited. Additionally, any fees collected from future developers would come later, forcing the City to bear most of the cost upfront.

There are multiple owners who own property along the western edge of the focus area. Should they want to annex into the City of Missoula, it could be possible to acquire the land through annexation. Potentially, the City could acquire temporary easements from these property owners to construct the regional stormwater facilities. As these regional facilities are designed to be shallow swales along the entire perimeter, no designed conveyance will be needed as the 100-year storm will be conveyed across the properties as it has been historically.

7.2 CONSTRUCTION OF REGIONAL STORMWATER FACILITIES

As the Mullan BUILD Grant roads (England Blvd, George Elmer Dr, and Mary Jane Blvd) will be constructed before most development will be done in the area. Stormwater mitigation for the 100-year storm will be needed for the road improvements. As discussed above, it is not guaranteed that the City obtains the land needed for regional stormwater facilities while the roads are constructed. One possible solution for this would be to construct temporary stormwater mitigation facilities at the termination of these roads within the right-of-way which is already dedicated. Once the area has begun to be developed and the roads are to be extended, these facilities can be reclaimed for roads. Generally, England Boulevard west of George Elmer Dr would be a good location to construct these temporary detention facilities as it is most likely the focus area will be built out from the east to west.

The cost of regional stormwater facilities as mentioned above will be a substantial cost for the City. In order to offset this cost, the City could either require the developer to increase the capacity of the regional facility or a "connection" fee could be charged to the developer. We feel that either option would be welcome by developers, as not requiring 100-year stormwater ponds on each property will increase their developable land substantially.

Attached in Appendix E of this Report is an exhibit which shows potential sizing and placement of stormwater mitigation facilities within the focus area. Curve numbers were assigned to each recommended form-based zoning within the focus area. Stormwater runoff calculations were then made using the SCS Curve Number Method. The calculations made are based on a full build out of the focus area, which is in line with the recommended zoning. Additionally, the curve numbers used were conservative for each zoning district. Since form-based zoning is being recommended, road conveyance will depend on final grading. Depending on what the build out looks like, stormwater will be conveyed to these ponds either entirely above ground or above ground and in pipes.

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Therefore, calculating road cross section capacities is not appropriate at this time due to the uncertainty of the future road designs.

It is recommended that the City of Missoula reserve the entire area needed for the storm ponds/swales as exhibited in Appendix E. Although, it is not necessary to completely build out all storm ponds/swales until the entire focus area has been built out. The City of Missoula may build out 70-80% of the stormwater mitigation facilities to start and add onto the ponds, as necessary. As the 10-year storm for the entire drainage basin was calculated in sizing the 100-year stormwater mitigation facilities, there will be some discrepancy with what each development calculates as the storage required. It is recommended that the City of Missoula record the storage volume provided by each development and factor this into the size of their regional stormwater mitigation facilities as part of the ultimate build out of the area.

8.0 EROSION CONTROL

An area as large as the Mullan Area Master Plan will have multiple different developers working at the same time. It is of the upmost importance that developers implement a SWPPP (Stormwater Pollution Prevention Plan) to avoid pollutants and sediment from being discharged into Grant Creek. Green infrastructure requires more vegetation than typical stormwater mitigation practices, extra effort will need to be taken to ensure adequate growth. This is important as there will be pre-installed down gradient infrastructure which will need to be protected from excess sediment.

8.0 CONCLUSIONS & RECOMMENDATIONS

This design report has been prepared to provide recommendations for stormwater runoff mitigation within the Mullan Area Plan. There has been extensive community outreach, and we hope this memo helped to address the community's desires and concerns.

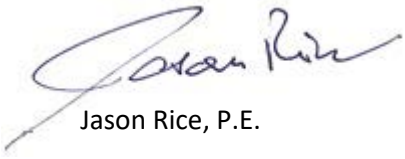
Recommendations made within this memo are to be used as a reference during development of the Mullan area. To truly come up stormwater guidelines for the area, we feel that additional work will need to be done. The following are recommendations for additional phases of work to be completed in the future to provide more detail for the stormwater mitigation plan for the Mullan Area:

- GIS/Data tracking to verify cumulative sizing and expansion needs for the regional stormwater facilities.
- Coordination with a geotechnical engineer to determine minimum setbacks of flowlines in roadside swales to the curb line. A guideline shall be produced to determine whether an underdrain is crucial or not, due to the added cost to projects which must install underdrains.
- A comprehensive hydrogeological study to be completed to analyze the infiltration capacity. (negotiations currently underway with Hydrogeologist.)
- Once the City of Missoula Development Services approval has been gained, begin drafting code and standard detail recommendations to be adopted for the Mullan Area.

Prepared by:
TERRITORIAL-LANDWORKS now IMEG

Mike Mayen, E.I.

Reviewed by:
TERRITORIAL- LANDWORKS now IMEG



Jason Rice, P.E.

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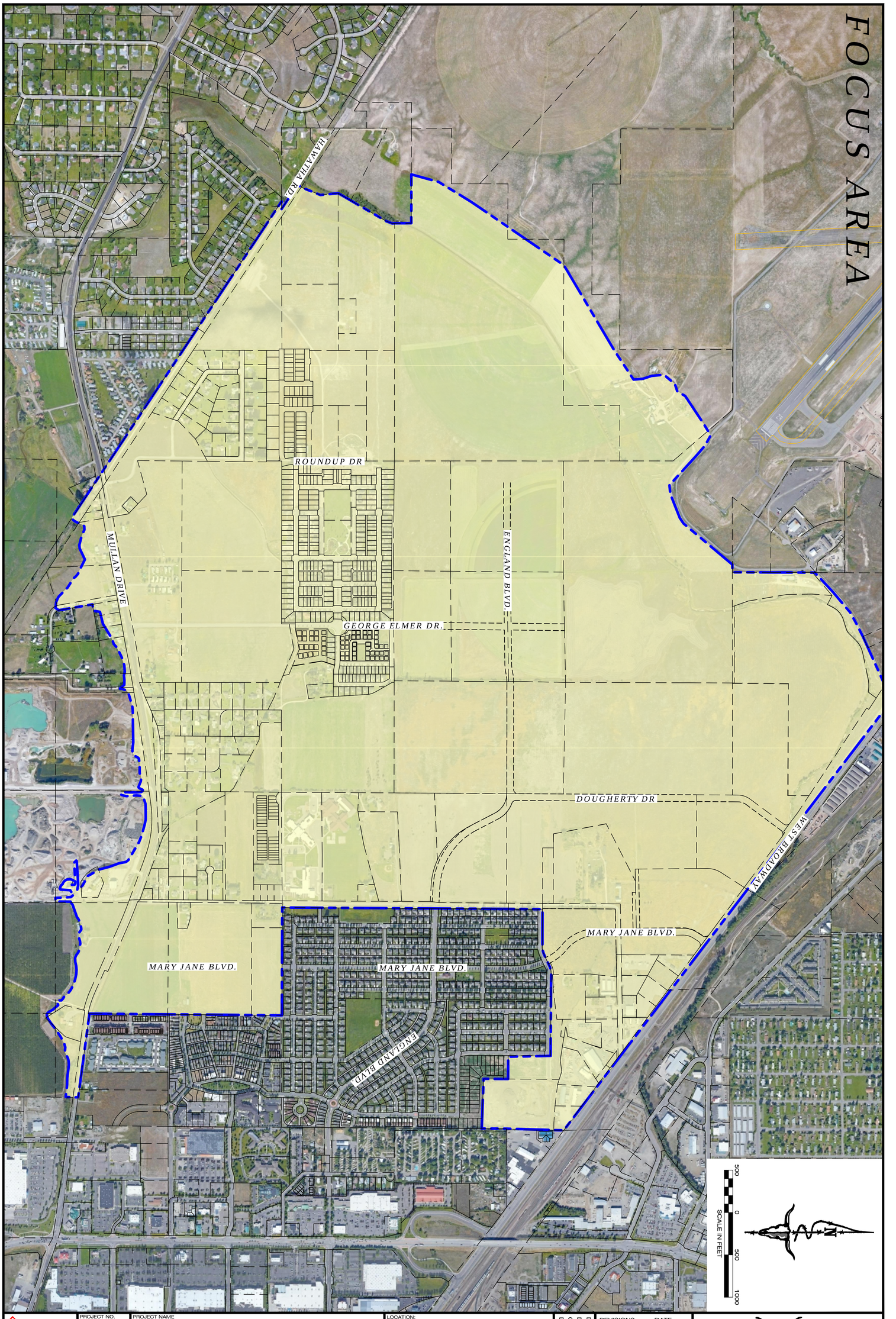
Appendix A:

Focus Area Exhibit
Soils Map Exhibit
Floodplain Exhibit
Topography Exhibit
Utilities and Road Network Exhibit
Airport Influence Area Exhibit



PRELIMINARY

PROJECT NO.	PROJECT NAME	LOCATION:
20-5580	DOVER KOHL MULLEN MASTER PLAN RFP	
SHEET:	SHEET TITLE:	PREPARED FOR:
1 OF 1	FOCUS AREA	

DESIGNED: ___ DRAFTED: AE CHECKED: MG DATE: 7/8/2020

REVISIONS	DATE

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Fax: 406/721-5224
P.O. Box 3851
Missoula, MT 59806

SOILS MAP

45-GRASSVALLEY SILTY CLAY LOAM

47-GRASSVALLEY SILITY CLAY LOAM

44-GRANTSDALE LOAM

34-DESMET LOAM

72-MOISE GRAVELLY LOAM

4-AQUIC HAPLOXEROLLS

44-GRANTSDALE LOAM

72-MOISE GRAVELLY LOAM

44-GRANTSDALE LOAM

N

500 0 500 1000

SCALE IN FEET

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PLOT DATE: 3/16/2020 3:37 PM

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DESIGNED:
DRAFTED: AE
CHECKED: MB
DATE: FEB 2020

LOCATION:

PREPARED FOR:

PROJECT NAME: DOVER KOHL MULLEN MASTER PLAN RFP

SHEET TITLE: OVERALL BASE MAP

PROJECT NO. 20-5580

SHEET: 1 OF 1

PRELIMINARY

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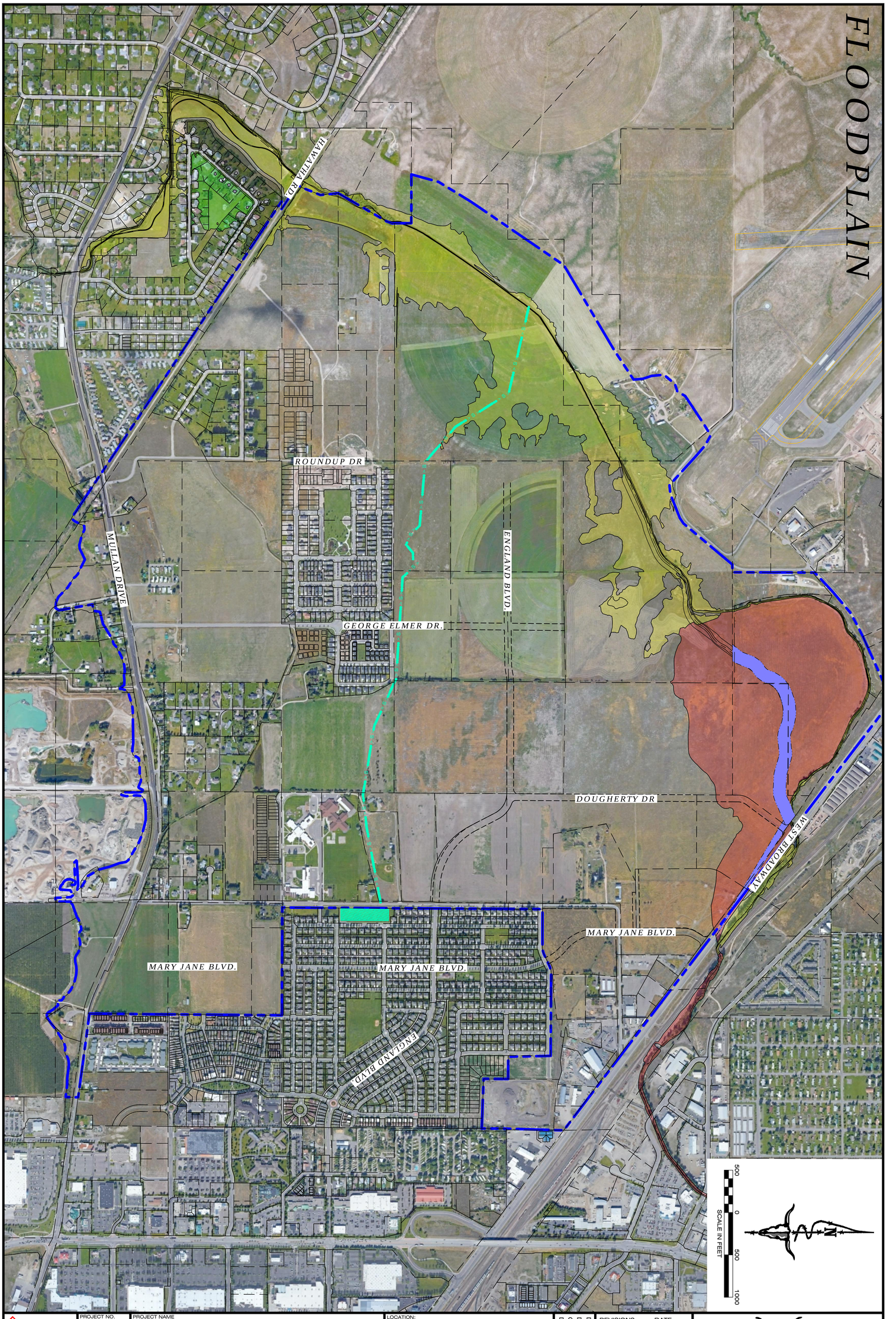

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SHEET:	SHEET TITLE:	PREPARED FOR:
1 OF 1	OVERALL BASE MAP	

DESIGNED: ---
DRAFTED: AE
CHECKED: MB
DATE: 3/18/2020

REVISIONS	DATE

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MISSOULA INTERNATIONAL AIRPORT

(E) OFFSITE CONVEYANCE OF STORMWATER FROM EAST OF W. BROADWAY INTO GRANT CREEK

FOCUS AREA BOUNDARY

(E) STORMWATER DIRECTION ARROW

(E) PROPERTY BOUNDARY

(E) STORMWATER MITIGATION FACILITY

WHIPPOORWILL DRIVE

GRANT CREEK

WEST BROADWAY

EXPRESSWAY

FLYNN LANE

CAMDEN STREET

PLEASANT VIEW HOMES

ENGLAND BLVD

RESERVE STREET

44 RANCH

GEORGE ELMER DRIVE

HELLGATE SCHOOL DISTRICT

HELLGATE GARDENS

HIAWATHA ROAD

MULLEN ROAD

500 0 500 1000

SCALE IN FEET

LEGEND

EXISTING DRAINAGE BASIN BOUNDARY

STORMWATER DIRECTION ARROW

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REVISIONS DATE

DESIGNED: MM

DRAFTED: MM

CHECKED: JR

DATE: FEB 2020

PROJECT NO. 20-5580

SHEET: 1 OF 1

PROJECT NAME: DOVER KOHL MULLEN MASTER PLAN RFP

SHEET TITLE: EXISTING TOPOGRAPHY SHEET STORMWATER BASINS & FLOWPATHES

LOCATION:

PREPARED FOR:

PRELIMINARY

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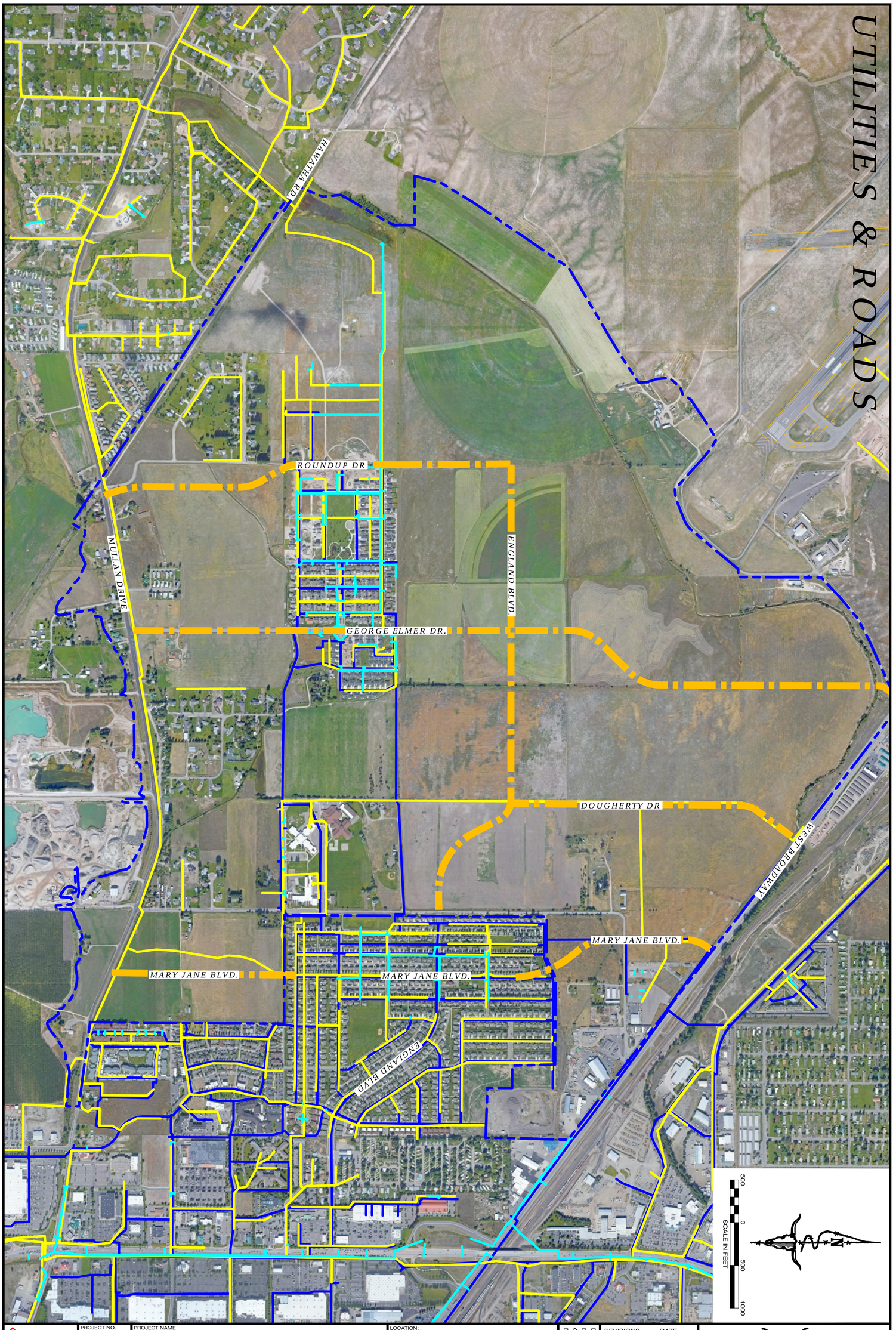

PRELIMINARY

PROJECT NO.	PROJECT NAME	LOCATION:
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SHEET: 1 OF 1	SHEET TITLE: OVERALL BASE MAP	PREPARED FOR:

DESIGNED: ___ DRAFTED: ___ CHECKED: ___ DATE: 3/18/2020

REVISIONS	DATE

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AIRPORT INFLUENCE AREA

20:1
APPROACH 50:1
20:1
20:1
HORIZONTAL SURFACE 150' ABOVE ESTABLISHED AIRPORT ELEVATION (3,350')
(3,350')
CONICAL SURFACE
(3,600')
HORIZONTAL SURFACE 150' ABOVE ESTABLISHED AIRPORT ELEVATION (3,350')
PRIMARY SURFACE (3,200')
(3,200')
20:1
(3,350')
CONICAL SURFACE
(3,600')
APPROACH 50:1
20:1
(3,350')
20:1
(3,600')
APPROACH 40:1

FOCUS AREA ELEVATION
= ±3,146 - ±3,188

NOT TO SCALE

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DESIGNED:
DRAFTED: AE
CHECKED: MB
DATE: FEB. 2020

LOCATION:

PREPARED FOR:

PROJECT NAME: DOVER KOHL MULLEN MASTER PLAN RFP

SHEET TITLE: OVERALL BASE MAP

PROJECT NO.: 20-5580

SHEET: 1 OF 1

PRELIMINARY

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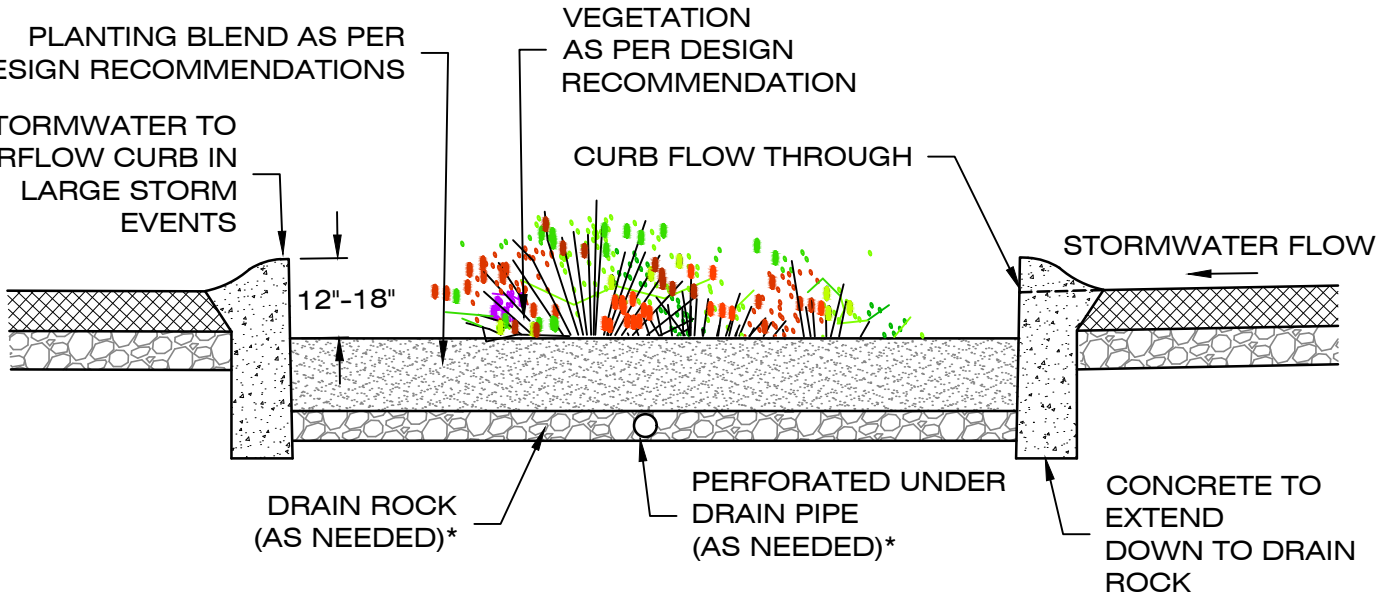
Appendix B:

Rain Garden Landscaped Planter Exhibit
Rain Garden Design Criteria
Grassed Swale Design Criteria
Regional Detention Pond Design Criteria



*UNDERDRAIN IN SILTY SOILS UNLESS A GEOTECHNICAL ENGINEER GIVES APPROVAL. DRAINS COULD BE CONVEYED TO DEEPER INJECTION SUMPS.

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Missoula, MT 59806

PARKING LOT RAIN GARDEN EXHIBIT
MULLAN AREA MASTER PLAN

PREPARED FOR:
CITY OF MISSOULA

PROJECT#: 20-5580
TAB: RAIN GARDEN
DRAFTER: MM
DATE: JUNE 2020
SHEET OF 1

PLOT DATE: 8/14/2020 2:46 PM
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Rain Garden Design Recommendations

Micro-Storage Pond Volume	
Minimum Impervious Area (sf)	Volume (cf)
3000	147
4000	218
5000	273
6000	337
7000	405
8000	477
9000	553
10000	633

On-Site storage should be credited based on the amount of stormwater runoff conveyed to the stormwater facility. The above table allows for a simple guide for design engineers to follow. For example, the engineer shall prove that 6,000 square feet of parking lot should drain to a micro-storage pond and in turn be credited with 337 cubic feet of storage toward the mitigation of the 10-year storm, and water quality treatment of the first 0.5" of rainfall. The water quality treatment should happen more often than the need to mitigate a 10-year storm. Therefore, these rain gardens will be primarily used to satisfy the requirement of capturing the first 0.5" of rainfall for water quality treatment. The SCS Curve Number Method should be utilized by design engineers when calculating stormwater runoff volumes for consistency.

Grassed Swale Design Recommendations

Concentrated runoff may be directed from roads or parking areas towards grassed areas through curb cuts and concrete channels. A concrete apron should be constructed where water is discharged to the grass, with a vertical drop of 3 inches to prevent thick vegetation from impeding the flow of water.

Cross sections shall be either trapezoidal or triangular with side slopes not exceeding 3:1 (horizontal:vertical), preferably flatter. Where possible, swales shall be trapezoidal with a bottom section of at least 0.75 feet in width. Larger bottom sections allow for increased stormwater treatment.

Check dams should be utilized on long stretches of grassed swale to slow the overall velocity and promote the settling of sediment.

Maximum flow depth should not exceed one foot at the 2-year peak flow rate to ensure proper stormwater quality treatment.

Should there not be adequate separation between the swale and road/sidewalk in areas of silt and clay soils, an underdrain shall be installed. The purpose of minimum separation/underdrain installation is to avoid frost heave and the settling of adjacent roads.

The finished surface of the grassed swale shall have at least 4 inches of sandy loam topsoil and shall be seeded with a native turf grass mixture. Bunch grasses shall be avoided as a full vegetative cover is an important design factor.

The rim of swale outlets shall be set 4 to 6 inches above the swale bottom, to allow for sediment capture and storage.

The tree recommendations below are for trees which can be planted at the bottom of grassed swales. Trees planted within grassed swales can act as natural check dams for stormwater. Trees can also be planted on the swale side slopes to allow for optimal capacity of swales.

Grassed Swale Tree Recommendations

This list is preliminary, consultation shall be made with Missoula Parks and Recreation before planting trees in City right-of-way. Boulevard spaces at a minimum of 10’ and up to 20’ are ideal for creating the large tree lined streets. The more growth space, the better the trees will grow and create a walkway with a canopy. A larger growth space will also absorb future impacts such as excavation. Root barriers shall be installed along the tree side edges of sidewalks to prevent damage to the infrastructure.

Class 1 (Small Species):

Snowcloud Serviceberry, Hawthorn, Cultivers Including: Cockspur and English, Crabapple, Cultivers Including: Prairiefire, Springsnow, Sugartyme, and Thunderchild

Class 2 (Medium Species):

Subapline Fir, Hedge Maple, Freeman Maple, River Birch, European Hornbeam, Katusura Tree, Yellowwood, Filbert, Honeylocust, American Hornbeam

Class 3 (Large Species)

Black Spruce, Siberian Spruce, Sycamore, Bur Oak, Valley Forge American Elm

Regional Detention Pond Design Recommendations

Ponds shall be kept as shallow as possible, with a maximum depth of 33 inches or as needed to drain within 48 hours. The maximum time to drain of 48 hours is taken from Section 2.3.2 of the FAA Advisory Circular on Hazardous Wildlife Attractants.

Where possible, detention swales should be designed to deter waterfowl. Ponds shall be kept as shallow as the site area and topography allows. Dense Vegetation around ponds will deter waterfowl from landing on the pond while stormwater is present.

The design infiltration rate for detention ponds within the Mullan Area Master Plan shall not exceed 0.7 inches/hour per DEQ-8 Table 2 unless substantiated with on-site testing.

Detention ponds should be incorporated into public parks wherever possible to increase aesthetics of the area.

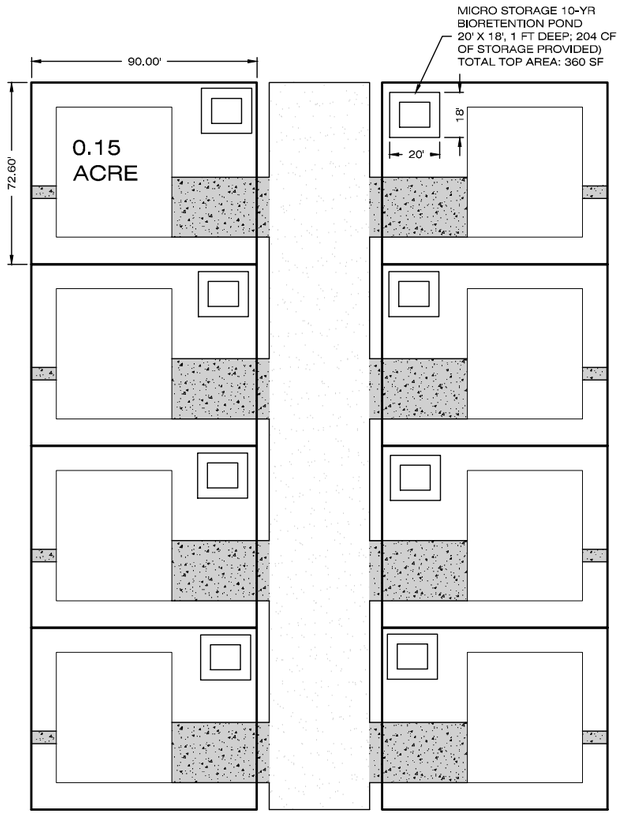
The floor of the detention pond shall be sloped towards the outlet, with side slopes not exceeding a steepness of 3:1 (horizontal:vertical).

Appendix C:

Residential Micro-Storage Exhibit
Commercial Micro-Storage Exhibits

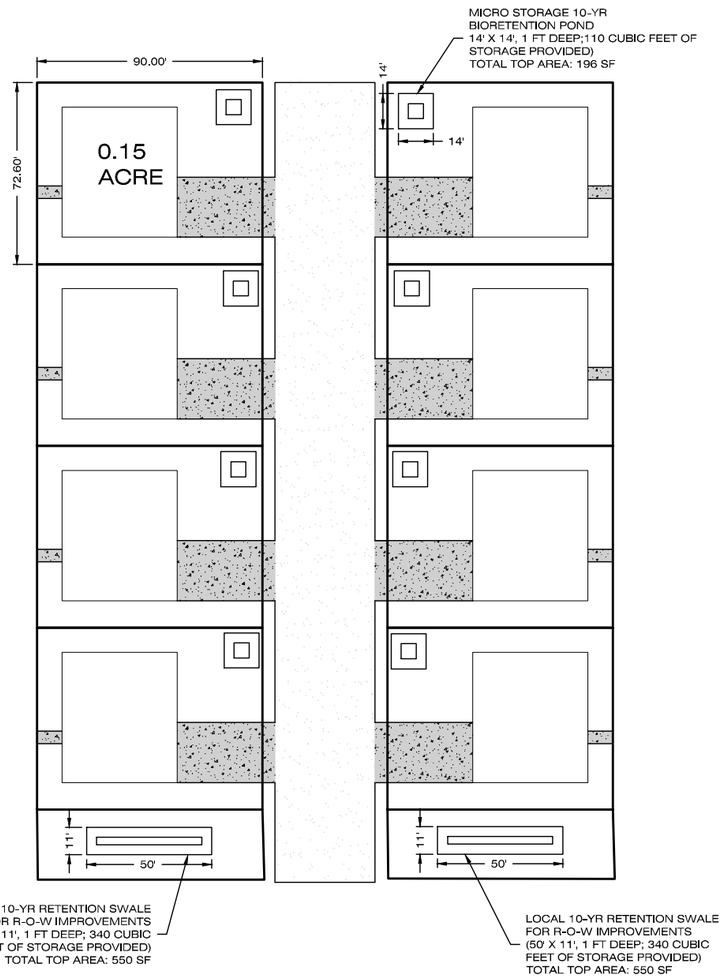
RESIDENTIAL DEVELOPMENT LOCAL STORMWATER MITIGATION EXHIBIT
(50% LOT COVERAGE)

10-YEAR STORAGE ON-SITE



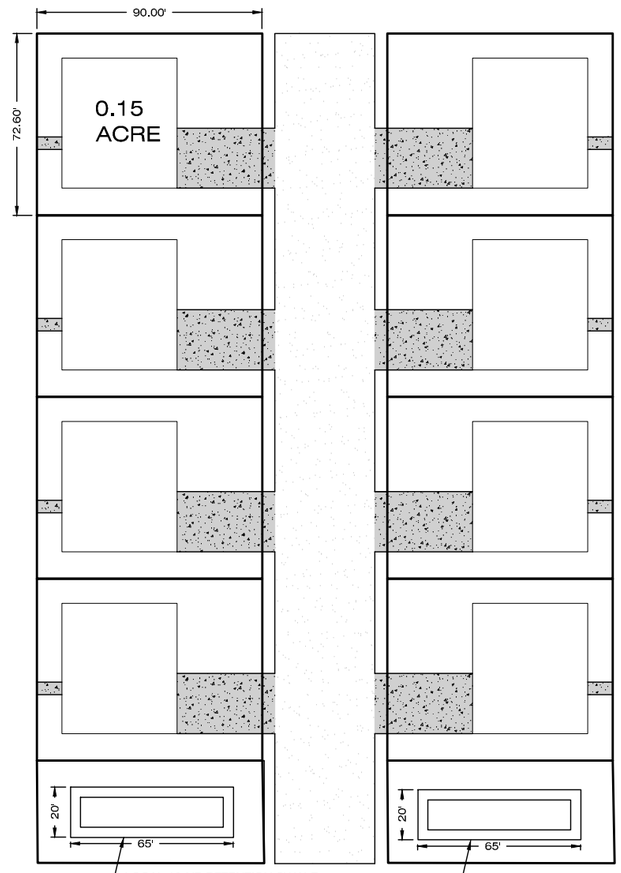
TOTAL LOT AREA: 1.2 ACRES
TOTAL R-O-W AREA: 0.36 ACRES
TOTAL AREA NEEDED FOR PONDS: N/A
TOTAL AREA: 1.53 ACRES

10-YEAR MICRO STORAGE W/ LOCAL 10-YEAR R-O-W IMPROVEMENTS POND



TOTAL LOT AREA: 1.2 ACRES
TOTAL R-O-W AREA: 0.36 ACRES
TOTAL AREA NEEDED FOR PONDS: 0.11 ACRES
TOTAL AREA: 1.68 ACRES

LOCAL NEIGHBORHOOD 10-YEAR POND



TOTAL LOT AREA: 1.2 ACRES
TOTAL R-O-W AREA: 0.36 ACRES
TOTAL AREA NEEDED FOR PONDS: 0.17 ACRES
TOTAL AREA: 1.75 ACRES

10-YEAR STORM TR-55 CALCULATION SUMMARY:

PRE-DEVELOPMENT LOT
LOT AREA: 0.15 ACRES
SOIL TYPE: B
VEGETATIVE CONDITION : FAIR
TIME OF CONCENTRATION: 0.267 HR

POST-DEVELOPMENT LOT
IMPERVIOUS LOT AREA: 0.078 ACRES
UNDEVELOPED LOT AREA: .072 ACRES
SOIL TYPE: B
VEGETATIVE CONDITION: FAIR
TIME OF CONCENTRATION: 0.177 HR
RUNOFF VOLUME: 110 CUBIC FEET

ROAD RIGHT-OF-WAY
IMPERVIOUS AREA: 0.27 ACRE
TIME OF CONCENTRATION: 0.1 HR (MINIMUM TC)
RUNOFF VOLUME: 750 CUBIC FEET

NOTES:

1. ASSUME THAT EVERY LOT IS IDENTICAL. THE POST-DEVELOPMENT CONDITION OF THE LOT IS SHOWN.
2. CALCULATIONS WERE MADE BASED ON THE SCS EQUATION FOR STORMWATER RUNOFF CALCULATION.
3. 10-YEAR STORAGE ON-SITE ASSUMES THAT THE STORMWATER RUNOFF FROM THE ROAD WILL BE SPLIT EQUALLY BETWEEN ALL 8 LOTS. VOLUME HAS BEEN ADDED TO EACH POND TO FACILITATE THIS.

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PLOT DATE: 6/4/2020 2:51 PM

REVISIONS | DATE

DESIGNED: MM
DRAFTED: MM
CHECKED: JR
DATE: JUNE 2020

LOCATION:

PREPARED FOR:

PROJECT NAME: STORMWATER CALCULATION EXHIBIT

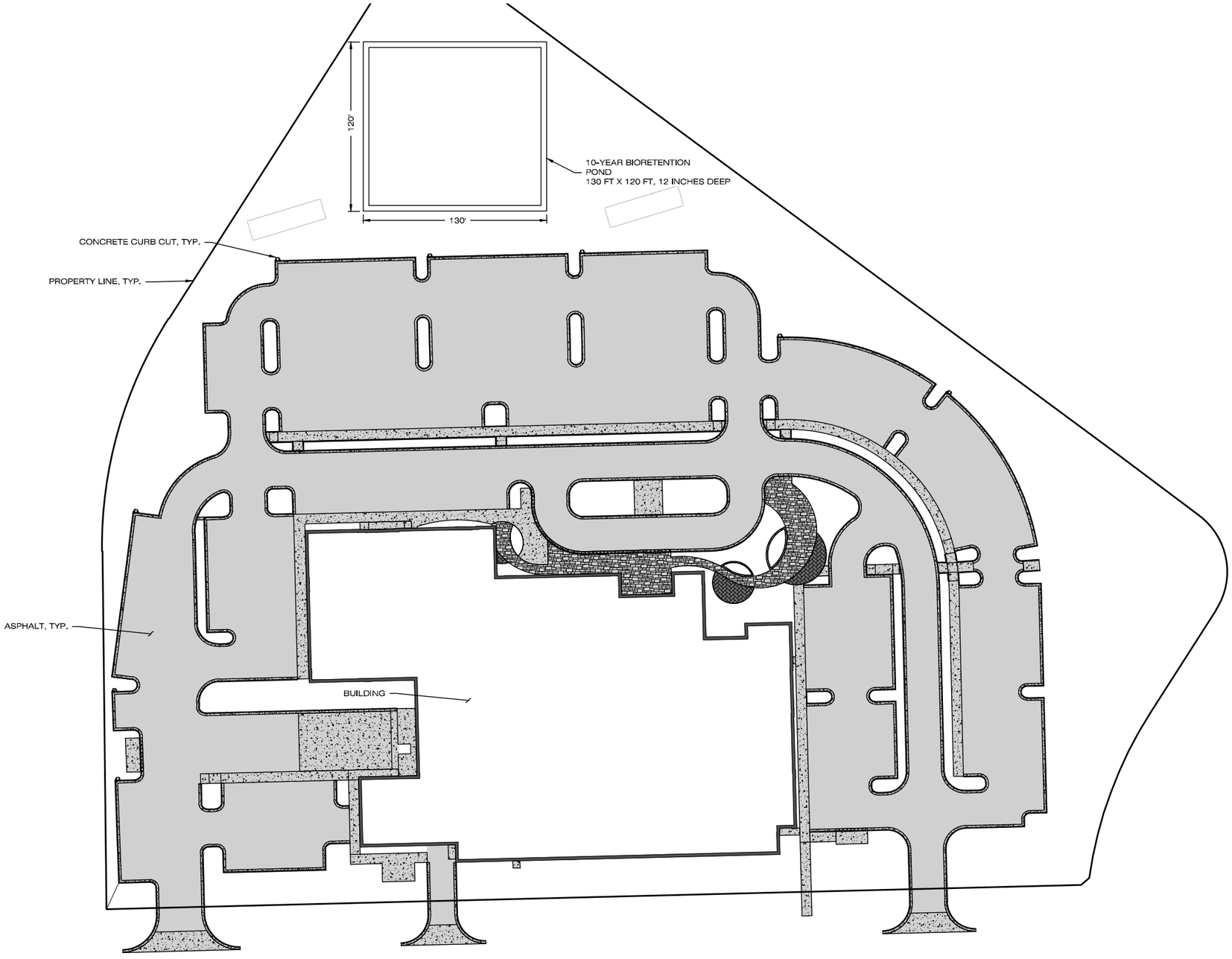
SHEET TITLE: HIGH DENSITY RESIDENTIAL EXHIBIT

PROJECT NO. 20-5580

SHEET: 1 OF 3

DWG LOCATION: I:\MISSOULA\PROJECTS_ACTIVE\19JUL\20-5580\PROJECTS\5580 • DOWD-KOHL MULLAN MASTER PLAN
R:\PFA_DRAFTING\A_1_DRAWINGS\AUTOCAD\DWG\PLOTS\20-5580T.DWG

COMMERCIAL DEVELOPMENT LOCAL 10-YEAR POND



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P.LOT DATE: 6/29/2020 2:14 PM

REVISIONS | DATE

DESIGNED: MM
DRAFTED: MM
CHECKED: JR
DATE: JUNE 2020

LOCATION:

PREPARED FOR:

PROJECT NO. 20-5580

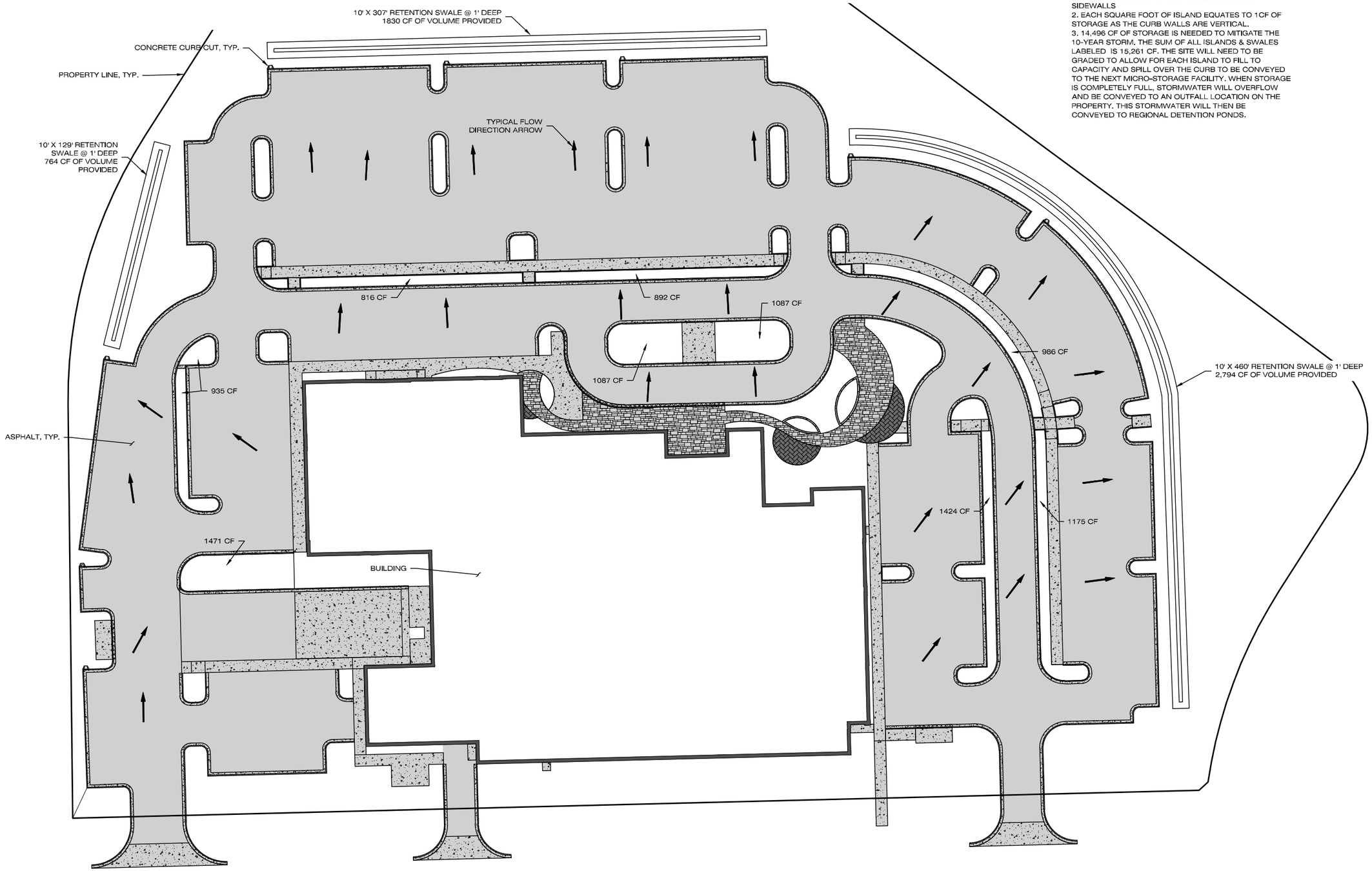
PROJECT NAME: STORMWATER CALCULATION EXHIBIT

SHEET: 2 OF 3

SHEET TITLE: COMMERCIAL DEVELOPMENT 10-YEAR LOCAL POND EXHIBIT

P:\20-5580\04 T-1_ACTIVE FILES\2020 PROJECTS\5580 - DOSER ROAD, MULLAN MASTER P-A\MPDs_DRAFTING\SLS_DRAWINGS\AUTOCAD\5580MPLE.DWG
EXHIBIT.DWG

COMMERCIAL DEVELOPMENT LOCAL MICRO-STORAGE PONDS



NOTES:

1. ASSUME ISLANDS WHICH ARE LABELED, ALLOW FOR 1 FOOT OF STORAGE W/ STRUCTURAL CONCRETE SIDEWALLS
2. EACH SQUARE FOOT OF ISLAND EQUATES TO 1CF OF STORAGE AS THE CURB WALLS ARE VERTICAL.
3. 14,496 CF OF STORAGE IS NEEDED TO MITIGATE THE 10-YEAR STORM. THE SUM OF ALL ISLANDS & SWALES LABELED IS 15,261 CF. THE SITE WILL NEED TO BE GRADED TO ALLOW FOR EACH ISLAND TO FILL TO CAPACITY AND SPILL OVER THE CURB TO BE CONVEYED TO THE NEXT MICRO-STORAGE FACILITY. WHEN STORAGE IS COMPLETELY FULL, STORMWATER WILL OVERFLOW AND BE CONVEYED TO AN OUTFALL LOCATION ON THE PROPERTY. THIS STORMWATER WILL THEN BE CONVEYED TO REGIONAL DETENTION PONDS.

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PLOT DATE: 5/29/2020 2:14 PM

REVISIONS	DATE

DESIGNED: ____
DRAFTED: MM
CHECKED: JR
DATE: JUNE 2020

LOCATION:

PREPARED FOR:

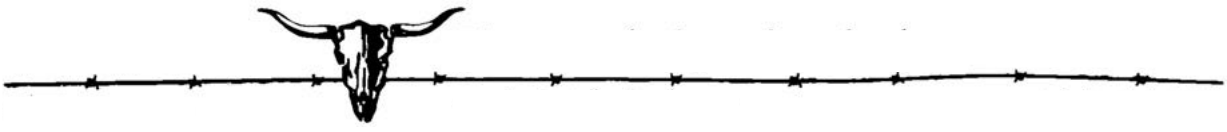
PROJECT NO. 20-5580

PROJECT NAME: STORMWATER CALCULATION EXHIBIT

SHEET: 3 OF 3

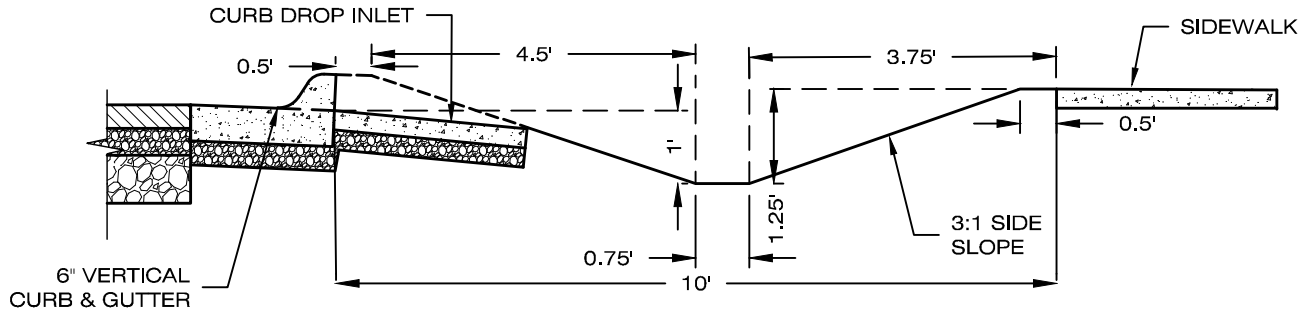
SHEET TITLE: COMMERCIAL DEVELOPMENT MICRO-STORAGE EXHIBIT

DWG LOCATION: P:_ACTIVE FILES\2020 PROJECTS\5580 - DOVER KOH_NO LAN\MASTER PLAN FPH_DRAFTING\5.1_DRAWINGS\AUTOCAD\EXAMPLE LOTS EXHIBIT.DWG



Appendix D:

Grassed Swale Cross Sections
Curb Drop Inlet Detail Exhibit
Intersection Plan and Profile Exhibit



A – TYPICAL ROADSIDE SWALE

NOT TO SCALE

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Jul 6 2020

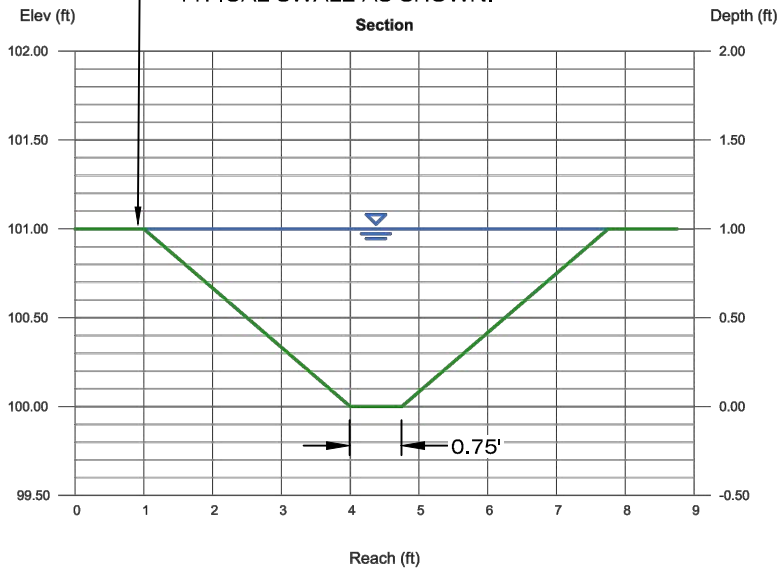
Typical Road Side Swale Capacity

Trapezoidal	
Bottom Width (ft)	= 0.75
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.022

Calculations	
Compute by:	Q vs Depth
No. Increments	= 10

Highlighted	
Depth (ft)	= 1.00
Q (cfs)	= 16.59
Area (sqft)	= 3.75
Velocity (ft/s)	= 4.42
Wetted Perim (ft)	= 7.07
Crit Depth, Yc (ft)	= 1.00
Top Width (ft)	= 6.75
EGL (ft)	= 1.30

SWALE MODELED ONLY FOR CAPACITY BEFORE OVERTOPPING. THEREFORE, ACTUAL WIDTH VARIES FROM THE TYPICAL SWALE AS SHOWN.



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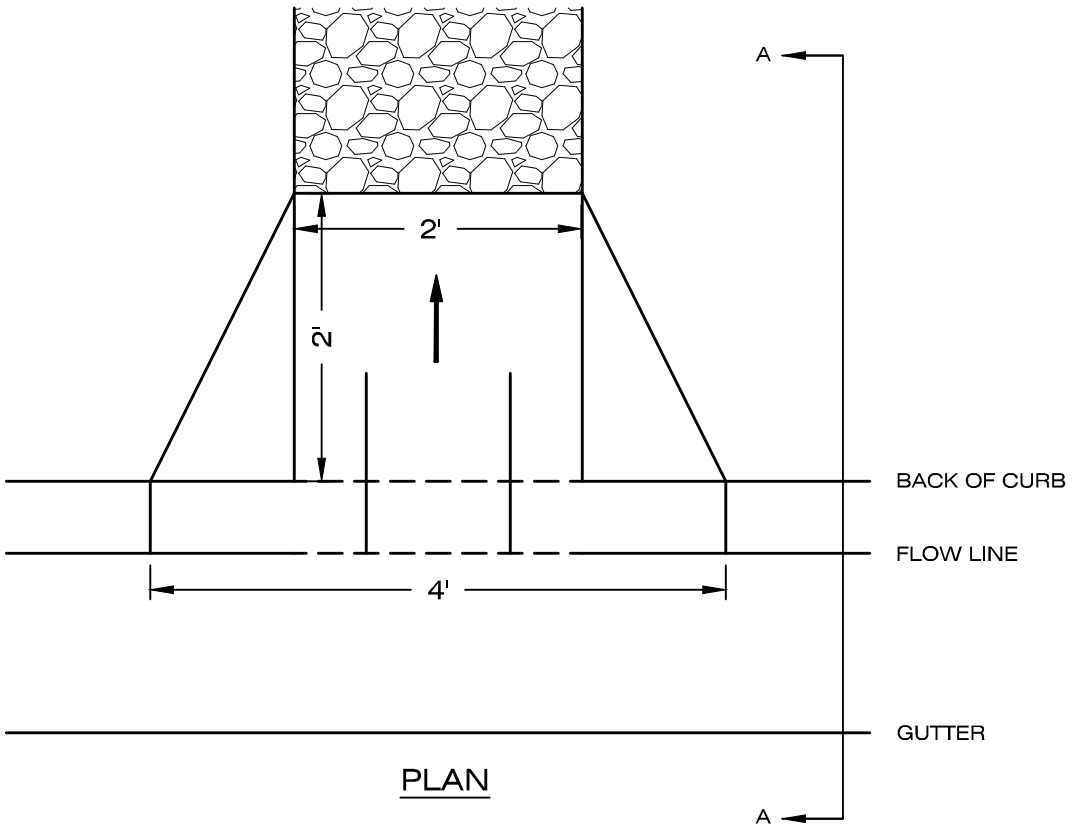
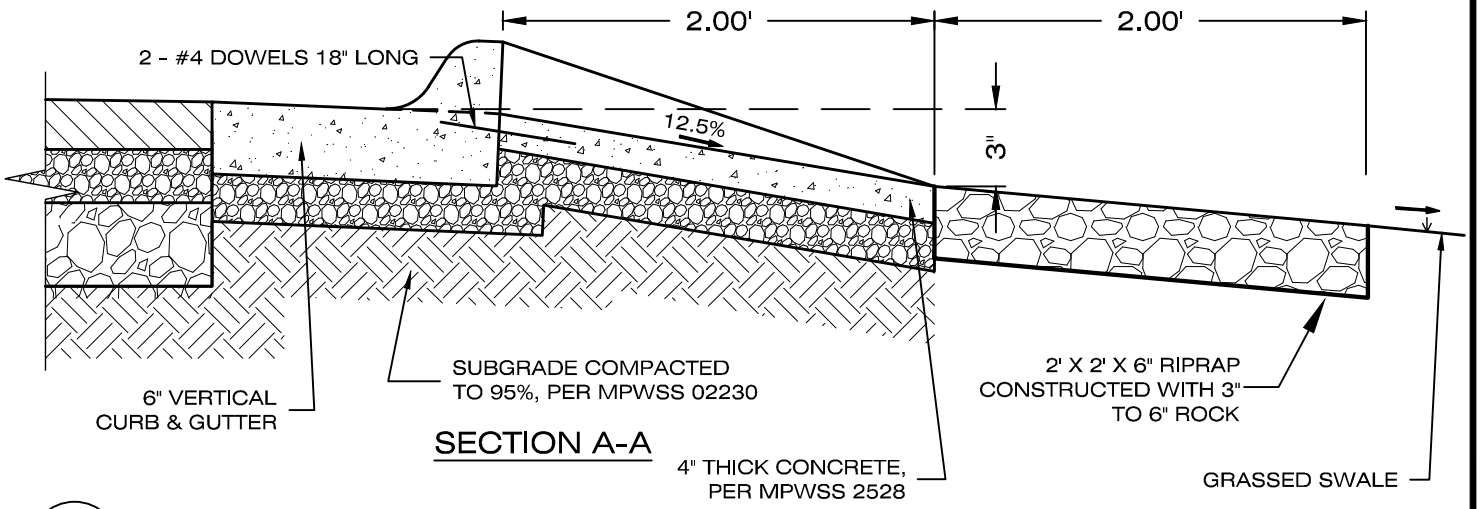
TYPICAL SWALE PROFILE
MULLAN AREA MASTER PLAN
PREPARED FOR:
CITY OF MISSOULA

PROJECT#: 20-5580
TAB: SWALE PROFILE
DRAFTER: MM
DATE: JULY 2020
SHEET OF



PLAN



SECTION A-A

A
–

CURB SWALE OUTLET

NOT TO SCALE

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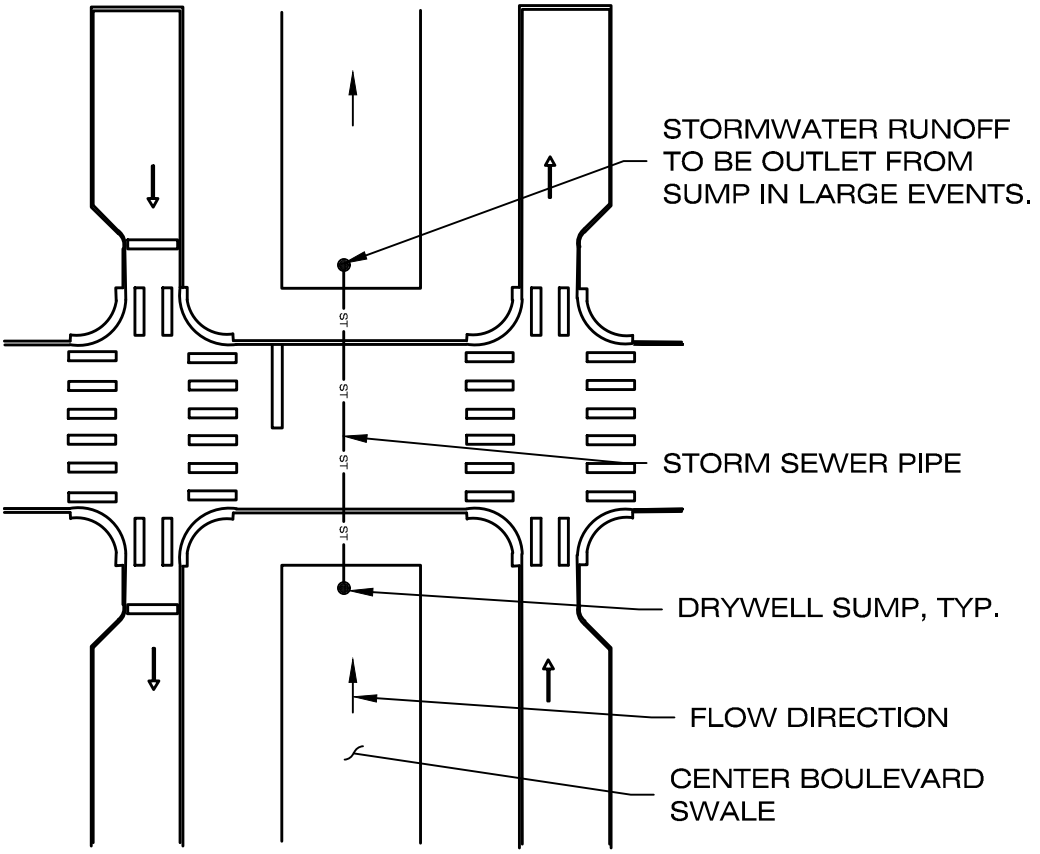
Missoula, MT 59806

CURB SWALE OUTLET DETAIL
MULLAN AREA MASTER PLAN
PREPARED FOR:
CITY OF MISSOULA

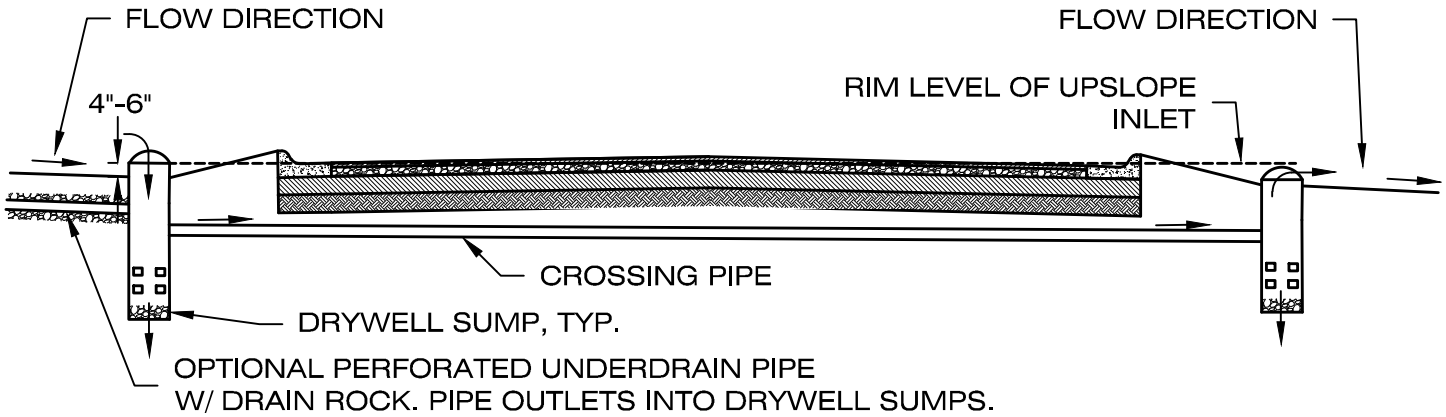
PROJECT#: 20-5580
TAB: CURB OUTLET
DRAFTER: MM
DATE: JULY 2020
SHEET OF 2



NOTE: CENTER BOULEVARD SWALE SHOWN, CROSSING CONFIGURATION CAN WORK FOR SWALES WITHIN BOULEVARDS

A – INTERSECTION CROSSING PLAN VIEW

NOT TO SCALE



B – INTERSECTION CROSSING PROFILE

NOT TO SCALE

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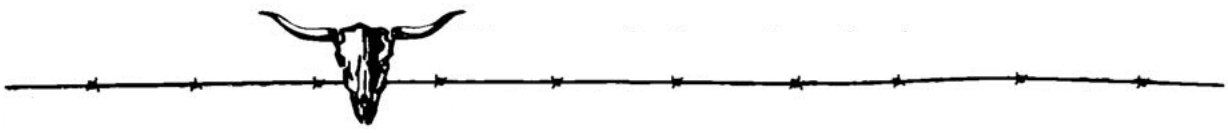
SWALE INTERSECTION EXHIBIT
MULLAN AREA MASTER PLAN
PREPARED FOR:
CITY OF MISSOULA

PROJECT#: 20-5580
TAB: SWALE INT.
DRAFTER: MM
DATE: JULY 2020
SHEET OF 1

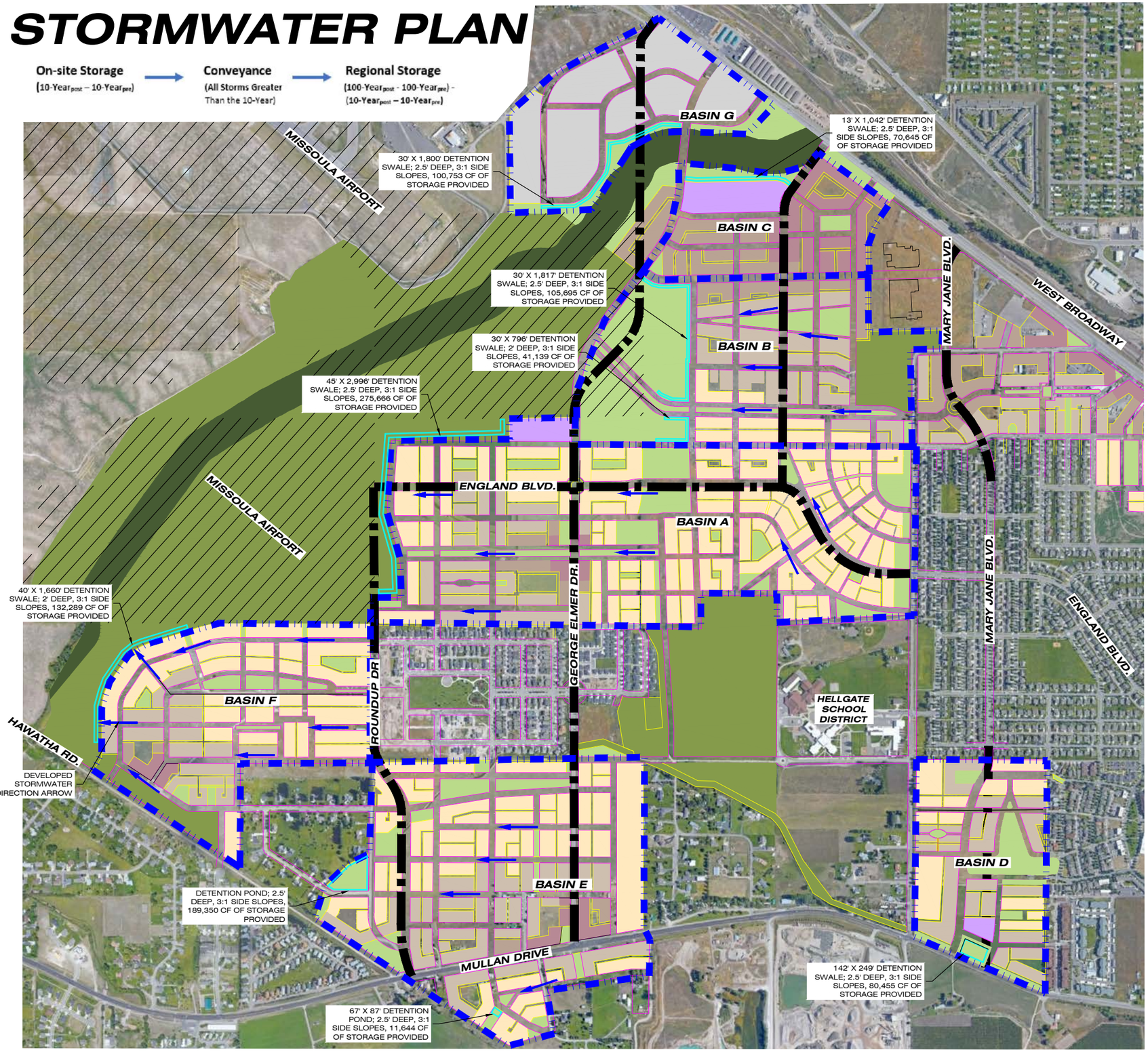


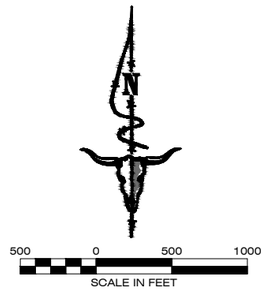
Appendix E:

Focus Area Drainage Basin and Retention Pond Exhibit
Stormwater Runoff Calculation Summary
NRCS Soil Data Map
Section 2.3.2 of the FAA Advisory Circular on Hazardous Wildlife Attractants

STORMWATER PLAN

On-site Storage ($10\text{-Year}_{post} - 10\text{-Year}_{pre}$) → **Conveyance** (All Storms Greater Than the 10-Year) → **Regional Storage** ($100\text{-Year}_{post} - 100\text{-Year}_{pre}$) - ($10\text{-Year}_{post} - 10\text{-Year}_{pre}$)





LEGEND

DRAINAGE BASIN BOUNDARY

STORMWATER DIRECTION ARROW

ZONING HATCH LEGEND WITH CORRESPONDING LOT COVERAGE

- T5 Mixed Use Core — 90% COVERAGE, CN: 92
- T4-O Neighborhood Center - Open — 70% COVERAGE, CN: 85
- T4-R Neighborhood Center - Restricted — 70% COVERAGE, CN: 85
- T3 Neighborhood Edge — 60% COVERAGE, CN: 85
- T2 Rural — VARIES
- T1 Natural — 0% COVERAGE
- Civic – Open Space — 0% COVERAGE
- Civic – Building — VARIES, CN: 85
- SD – Special District Industrial — 60% COVERAGE, CN: 92

NOTES:
1. STORMWATER RUNOFF QUANTITIES CALCULATED USING THE SCS CURVE NUMBER METHOD (TR-55).
2. CURVE NUMBERS USED FOR STORAGE CALCULATIONS ARE VERY CONSERVATIVE. IT IS RECOMMENDED THAT THE CITY OF MISSOULA RESERVE THE LAND NECESSARY FOR THE FULL STORMWATER POND AREA CALCULATED. ALTHOUGH THESE CAN BE BUILT IN PHASES ACCORDING TO DEVELOPMENT IN THE AREA.
3. TIME OF CONCENTRATIONS WERE CALCULATED BY ASSUMED FLOWPATHES BASED ON BUILD GRANT ROAD CONFIGURATION. THESE SHOULD BE CONSIDERED PRELIMINARY AND SUBJECT TO CHANGE.

Outputs (from TR-55 Program) - 10-YR, 24-HR Storm Event

	PRE-DEVELOPMENT			POST-DEVELOPMENT		
Basin ID	Qpeak (cfs)	V_{total} (inches)	V_{total} (cubic feet)	Qpeak (cfs)	V_{total} (inches)	V_{total} (cubic feet)
Pre Dev Basin A	6.34	0.151	111,270			
Post-Dev Basin A				106.13	0.652	480,452
Pre Dev Basin B	6.23	0.151	61,391			
Post-Dev Basin B				69.93	0.652	265,077
Pre Dev Basin C	4.72	0.151	26,639			
Post-Dev Basin C				44.64	0.752	132,666
Pre Dev Basin D	4.56	0.151	32,022			
Post-Dev Basin D				54.05	0.652	138,266
Pre Dev Basin E	5.06	0.151	83,042			
Post-Dev Basin E				24.58	0.652	358,564
Pre Dev Basin F	3.55	0.15	50,911			
Post-Dev Basin F				72.3	0.652	221,292
Pre Dev Basin G	2.85	0.15	32,076			
Post-Dev Basin G				74.98	0.926	198,019
Total			**397,351**			**1,794,337**

Outputs (from TR-55 Program) - 100-YR, 24-HR Storm Event

	PRE-DEVELOPMENT			POST-DEVELOPMENT		
Basin ID	Qpeak (cfs)	V_{total} (inches)	V_{total} (cubic feet)	Qpeak (cfs)	V_{total} (inches)	V_{total} (cubic feet)
Pre Dev Basin A	37.35	0.565	416,343			
Post-Dev Basin A				241.63	1.422	1,047,858
Pre Dev Basin B	43.85	0.565	229,706			
Post-Dev Basin B				157.74	1.422	578,128
Pre Dev Basin C	31.78	0.565	99,676			
Post-Dev Basin C				93.43	1.566	276,271
Pre Dev Basin D	32.5	0.565	119,816			
Post-Dev Basin D				120.52	1.422	301,556
Pre Dev Basin E	30.57	0.565	310,719			
Post-Dev Basin E				56.61	1.421	781,472
Pre Dev Basin F	22.43	0.565	191,764			
Post-Dev Basin F				160.99	1.422	482,634
Pre Dev Basin G	19.41	0.565	120,821			
Post-Dev Basin G				144.25	1.801	385,132
Total			**1,488,846**			**3,853,050**

Preliminary Storage Volume Required	
Basin A	262333 Cubic Feet
Basin B	144745 Cubic Feet
Basin C	70567 Cubic Feet
Basin D	75495 Cubic Feet
Basin E	195230 Cubic Feet
Basin F	120489 Cubic Feet
Basin G	98368 Cubic Feet

*These storage volumes account for the 10-year storm being stored on-site for private developments

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PLOT DATE: 8/14/2020 2:24 PM

REVISIONS | DATE

DESIGNED: MM
DRAFTED: MM
CHECKED: JR
DATE: AUG. 2020

LOCATION:

PREPARED FOR:

PROJECT NAME: DOVER KOHL MULLEN MASTER PLAN RFP

SHEET TITLE: OVERALL BASE MAP

PROJECT NO.: 20-5580

SHEET: 1 OF 1

PRELIMINARY

DWG LOCATION: O:\MISSOULA\TJPROJECTS_ACTIVE PJS\5500 PROJECTS\5580 - DOVER KOHL MULLAN MASTER PLAN RFP\8_DRAFTING\8.1_DRAWING\8A\AUTOCAD\DESIGN\MASTER PLAN EXHIBIT 3-27-20\EXH-20-5580 MASTER PLAN.DWG

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Stormwater Calculations Summary

Project Name: Mullan Area Master Plan Preliminary Stormwater Calculations
Project # : 20-5580
Date: 8/14/2020

Inputs (into TR-55 Program)	
Storm Data	
Map: NOAA Atlas 2 Type: SCS Type II	
Storm & Duration	NOAA ATLAS 2 Precipitation Value (inches)
2-year, 24-hour	1.2
10-year, 24-hour	1.8
100-year, 24-hour	2.8

Overall Site Data		
Area (acres)	725.93	site only analyzed for the areas contributing to the basins for development
Hydrologic Soil Class	B	from NRCS soils data predominant around site
Tc	TBD*	*see attached WinTR-55 inputs/outputs for results for different basins; calculated by TR-55 program based on longest path and slope from site
Pre-Development CN	69	standard for impervious areas (buildings, concrete, asphalt, etc.)
Basin A CN	85	gravel (w/ right-of-way)
Basin B CN	85	fair condition; grass cover 50% to 75%
Basin C CN	87	
Basin D CN	85	
Basin E CN	85	
Basin F CN	85	
Basin G CN	90	good condition; grass cover > 75%

Basin Site Data			
Basin ID	**Area (acres)**	**Impervious Area (acres)**	**Runoff from 1st .5" of Rainfall (cubic feet)**
Pre Dev Basin A	203.00		
Post-Dev Basin A	203.00	132	239,489
Pre Dev Basin B	112.00		-
Post-Dev Basin B	112.00	73	132,132
Pre Dev Basin C	48.60		-
Post-Dev Basin C	48.60	34	61,746
Pre Dev Basin D	58.42		-
Post-Dev Basin D	58.42	38	68,921
Pre Dev Basin E	151.50		-
Post-Dev Basin E	151.50	103	186,981
Pre Dev Basin F	93.50		-
Post-Dev Basin F	93.50	63	113,701
Pre Dev Basin G	58.91		-
Post-Dev Basin G	58.91	50	90,883

*Impervious area assumed based on TR-55 average values for curve numbers used.

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Missoula, MT 59806

Outputs (from TR-55 Program) - 10-YR, 24-HR Storm Event						
	PRE-DEVELOPMENT			POST-DEVELOPMENT		
Basin ID	**Qpeak (cfs)**	**V_{total} (inches)**	**V_{total} (cubic feet)**	**Qpeak (cfs)**	**V_{total} (inches)**	**V_{total} (cubic feet)**
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Pre Dev Basin E	5.06	0.151	83,042			
Post-Dev Basin E				24.58	0.652	358,564
Pre Dev Basin F	3.55	0.15	50,911			
Post-Dev Basin F				72.3	0.652	221,292
Pre Dev Basin G	2.85	0.15	32,076			
Post-Dev Basin G				74.98	0.926	198,019
Total			**397,351**			**1,794,337**

Outputs (from TR-55 Program) - 100-YR, 24-HR Storm Event						
	PRE-DEVELOPMENT			POST-DEVELOPMENT		
Basin ID	**Qpeak (cfs)**	**V_{total} (inches)**	**V_{total} (cubic feet)**	**Qpeak (cfs)**	**V_{total} (inches)**	**V_{total} (cubic feet)**
Pre Dev Basin A	37.35	0.565	416,343			
Post-Dev Basin A				241.63	1.422	1,047,858
Pre Dev Basin B	43.85	0.565	229,706			
Post-Dev Basin B				157.74	1.422	578,128
Pre Dev Basin C	31.78	0.565	99,676			
Post-Dev Basin C				93.43	1.566	276,271
Pre Dev Basin D	32.5	0.565	119,816			
Post-Dev Basin D				120.52	1.422	301,556
Pre Dev Basin E	30.57	0.565	310,719			
Post-Dev Basin E				56.61	1.421	781,472
Pre Dev Basin F	22.43	0.565	191,764			
Post-Dev Basin F				160.99	1.422	482,634
Pre Dev Basin G	19.41	0.565	120,821			
Post-Dev Basin G				144.25	1.801	385,132
Total			**1,488,846**			**3,853,050**

Preliminary Storage Volume Required		
Basin A	262333	Cubic Feet
Basin B	144735	Cubic Feet
Basin C	70567	Cubic Feet
Basin D	75495	Cubic Feet
Basin E	195230	Cubic Feet
Basin F	120489	Cubic Feet
Basin G	98368	Cubic Feet

***These storage volumes account for the 10-year storm being stored on-site for private developments**

Territorial-Landworks Inc.
(406) 721-0142

P.O. Box 3851
Missoula, MT 59806

Basin A Storage Calculations - 100 yr., 24 hr. Storm

Project Name: Mullan Area Master Plan Preliminary Stormwater Calculations
Project # : 20-5580
Date: 8/14/2020

Storage Provided: Regional Detention Pond

Volume Provided by On-Site Storage *(difference between the pre and post-development 10-year storm)*	369,182	CF
Runoff Volume Difference Between Pre- and Post- Development 100-Year Storm	631,515	CF
Required Storage Volume in Regional Detention Pond *(Total Difference Between Pre- and Post-Development 100-Year Storm - On-Site Storage)*	**262,333**	**CF**

Detention Pond Sizing:*(based on preliminary design)*

Area of Top of Pond:	132,590	SF
Area of Bottom of Pond:	87,943	SF
Average Area:	110,267	SF
Depth of Pond	2.50	FT
Storage Provided:	275,666	CF

Territorial-Landworks Inc.
(406) 721-0142

P.O. Box 3851
Missoula, MT 59806

Basin B Storage Calculations - 100 yr., 24 hr. Storm

Project Name: Mullan Area Master Plan Preliminary Stormwater Calculations
Project # : 20-5580
Date: 8/14/2020

Storage Provided: Regional Detention Pond

Volume Provided by On-Site Storage *(difference between the pre and post-development 10-year storm)*	203,687	CF
Runoff Volume Difference Between Pre- and Post- Development 100-Year Storm	348,422	CF
Required Storage Volume in Regional Detention Pond *(Total Difference Between Pre- and Post-Development 100-Year Storm - On-Site Storage)*	**144,735**	**CF**

Detention Pond Sizing:*(based on preliminary design)*

Area of Top of Pond:	56,521	SF
Area of Bottom of Pond:	28,035	SF
Average Area:	42,278	SF
Depth of Pond	2.50	FT
Storage Provided:	105,695	CF

Territorial-Landworks Inc.
(406) 721-0142

P.O. Box 3851
Missoula, MT 59806

Basin C Storage Calculations - 100 yr., 24 hr. Storm

Project Name: Mullan Area Master Plan Preliminary Stormwater Calculations
Project # : 20-5580
Date: 8/14/2020

Storage Provided: Regional Detention Pond

Volume Provided by On-Site Storage *(difference between the pre and post-development 10-year storm)*	106,027	CF
Runoff Volume Difference Between Pre- and Post- Development 100-Year Storm	176,594	CF
Required Storage Volume in Regional Detention Pond *(Total Difference Between Pre- and Post-Development 100-Year Storm - On-Site Storage)*	**70,567**	**CF**

Detention Pond Sizing:*(based on preliminary design)*

Area of Top of Pond:	36,155	SF
Area of Bottom of Pond:	20,361	SF
Average Area:	28,258	SF
Depth of Pond	2.50	FT
Storage Provided:	70,645	CF

Territorial-Landworks Inc.
(406) 721-0142

P.O. Box 3851
Missoula, MT 59806

Basin D Storage Calculations - 100 yr., 24 hr. Storm

Project Name: Mullan Area Master Plan Preliminary Stormwater Calculations
Project # : 20-5580
Date: 8/14/2020

Storage Provided: Regional Detention Pond

Volume Provided by On-Site Storage *(difference between the pre and post-development 10-year storm)*	106,244	CF
Runoff Volume Difference Between Pre- and Post- Development 100-Year Storm	181,739	CF
Required Storage Volume in Regional Detention Pond *(Total Difference Between Pre- and Post-Development 100-Year Storm - On-Site Storage)*	**75,495**	**CF**

Detention Pond Sizing:*(based on preliminary design)*

Area of Top of Pond:	34,992	SF
Area of Bottom of Pond:	29,372	SF
Average Area:	32,182	SF
Depth of Pond	2.50	FT
Storage Provided:	80,455	CF

Territorial-Landworks Inc.
(406) 721-0142

P.O. Box 3851
Missoula, MT 59806

Basin E Storage Calculations - 100 yr., 24 hr. Storm

Project Name: Mullan Area Master Plan Preliminary Stormwater Calculations
Project # : 20-5580
Date: 8/14/2020

Storage Provided: Regional Detention Pond

Volume Provided by On-Site Storage *(difference between the pre and post-development 10-year storm)*	275,522	CF
Runoff Volume Difference Between Pre- and Post- Development 100-Year Storm	470,753	CF
Required Storage Volume in Regional Detention Pond *(Total Difference Between Pre- and Post-Development 100-Year Storm - On-Site Storage)*	**195,230**	**CF**

Detention Pond Sizing:*(based on preliminary design)*

Area of Top of Pond:	80,249	SF
Area of Bottom of Pond:	71,231	SF
Average Area:	75,740	SF
Depth of Pond	2.50	FT
Storage Provided:	189,350	CF

Territorial-Landworks Inc.
(406) 721-0142

P.O. Box 3851
Missoula, MT 59806

Basin F Storage Calculations - 100 yr., 24 hr. Storm

Project Name: Mullan Area Master Plan Preliminary Stormwater Calculations
Project # : 20-5580
Date: 8/14/2020

Storage Provided: Regional Detention Pond

Volume Provided by On-Site Storage *(difference between the pre and post-development 10-year storm)*	170,381	CF
Runoff Volume Difference Between Pre- and Post- Development 100-Year Storm	290,870	CF
Required Storage Volume in Regional Detention Pond *(Total Difference Between Pre- and Post-Development 100-Year Storm - On-Site Storage)*	**120,489**	**CF**

Detention Pond Sizing:*(based on preliminary design)*

Area of Top of Pond:	65,356	SF
Area of Bottom of Pond:	40,473	SF
Average Area:	52,915	SF
Depth of Pond	2.50	FT
Storage Provided:	132,286	CF

Territorial-Landworks Inc.
(406) 721-0142

P.O. Box 3851
Missoula, MT 59806

Basin G Storage Calculations - 100 yr., 24 hr. Storm

Project Name: Mullan Area Master Plan Preliminary Stormwater Calculations
Project # : 20-5580
Date: 8/14/2020

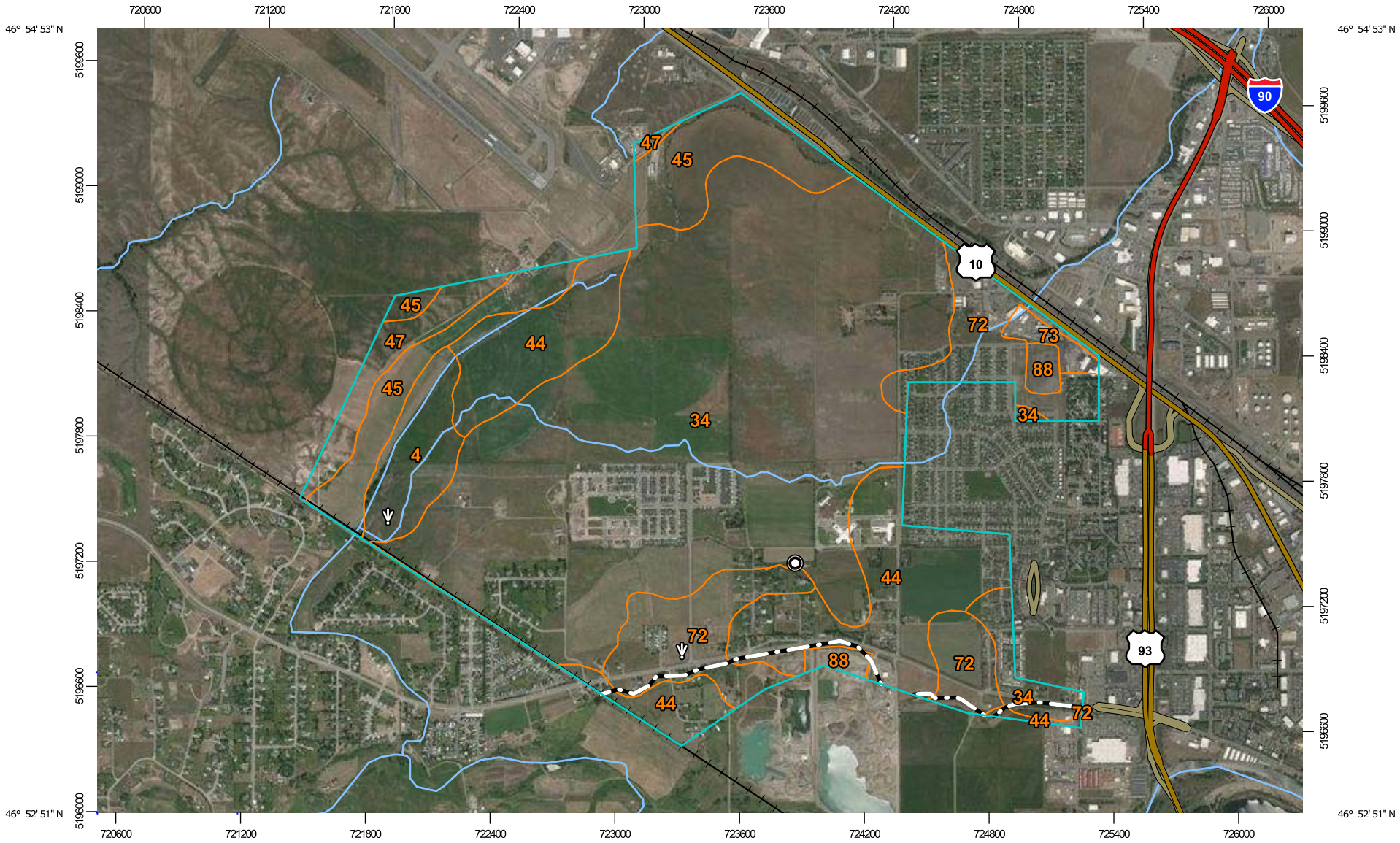
Storage Provided: Regional Detention Pond

Volume Provided by On-Site Storage *(difference between the pre and post-development 10-year storm)*	165,942	CF
Runoff Volume Difference Between Pre- and Post- Development 100-Year Storm	264,310	CF
Required Storage Volume in Regional Detention Pond *(Total Difference Between Pre- and Post-Development 100-Year Storm - On-Site Storage)*	**98,368**	**CF**

Detention Pond Sizing:*(based on preliminary design)*

Area of Top of Pond:	53,885	SF
Area of Bottom of Pond:	26,717	SF
Average Area:	40,301	SF
Depth of Pond	2.50	FT
Storage Provided:	100,753	CF

Soil Map—Missoula County Area, Montana
(Mullan Master Plan NRCS Soils Map)



MAP LEGEND

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

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

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.

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: Missoula County Area, Montana
Survey Area Data: Version 17, Sep 16, 2019

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

Date(s) aerial images were photographed: Aug 6, 2014—Nov 2, 2016

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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
4	Aquic Haploxerolls, 0 to 2 percent slopes	63.3	3.7%
34	Desmet loam, 0 to 2 percent slopes	935.9	55.4%
44	Grantsdale loam, 0 to 2 percent slopes	276.3	16.3%
45	Grassvalley silty clay loam, 0 to 4 percent slopes	146.8	8.7%
47	Grassvalley silty clay loam, 8 to 15 percent slopes	46.0	2.7%
72	Moiese gravelly loam, 0 to 2 percent slopes	190.9	11.3%
73	Orthents, 0 to 4 percent slopes	13.9	0.8%
88	Pits, gravel	17.8	1.1%
Totals for Area of Interest		**1,690.9**	**100.0%**

or netting, to deter birds and other hazardous wildlife. When physical barriers are proposed, airport operators must evaluate their use, effectiveness and maintenance requirements. Airport operators must also ensure physical barriers will not adversely affect water rescue. Before installing any physical barriers over detention ponds on Part 139 airports, airport operators must get approval from the appropriate FAA Regional Airports Division Office.

2.3.1.4 The FAA recommends that airport operators encourage off-airport stormwater treatment facility operators to incorporate appropriate wildlife hazard mitigation techniques into stormwater treatment facility operating practices when their facility is located within the separation criteria specified in Paragraphs 1.2 through 1.4.

2.3.2 New Stormwater Management Facilities.

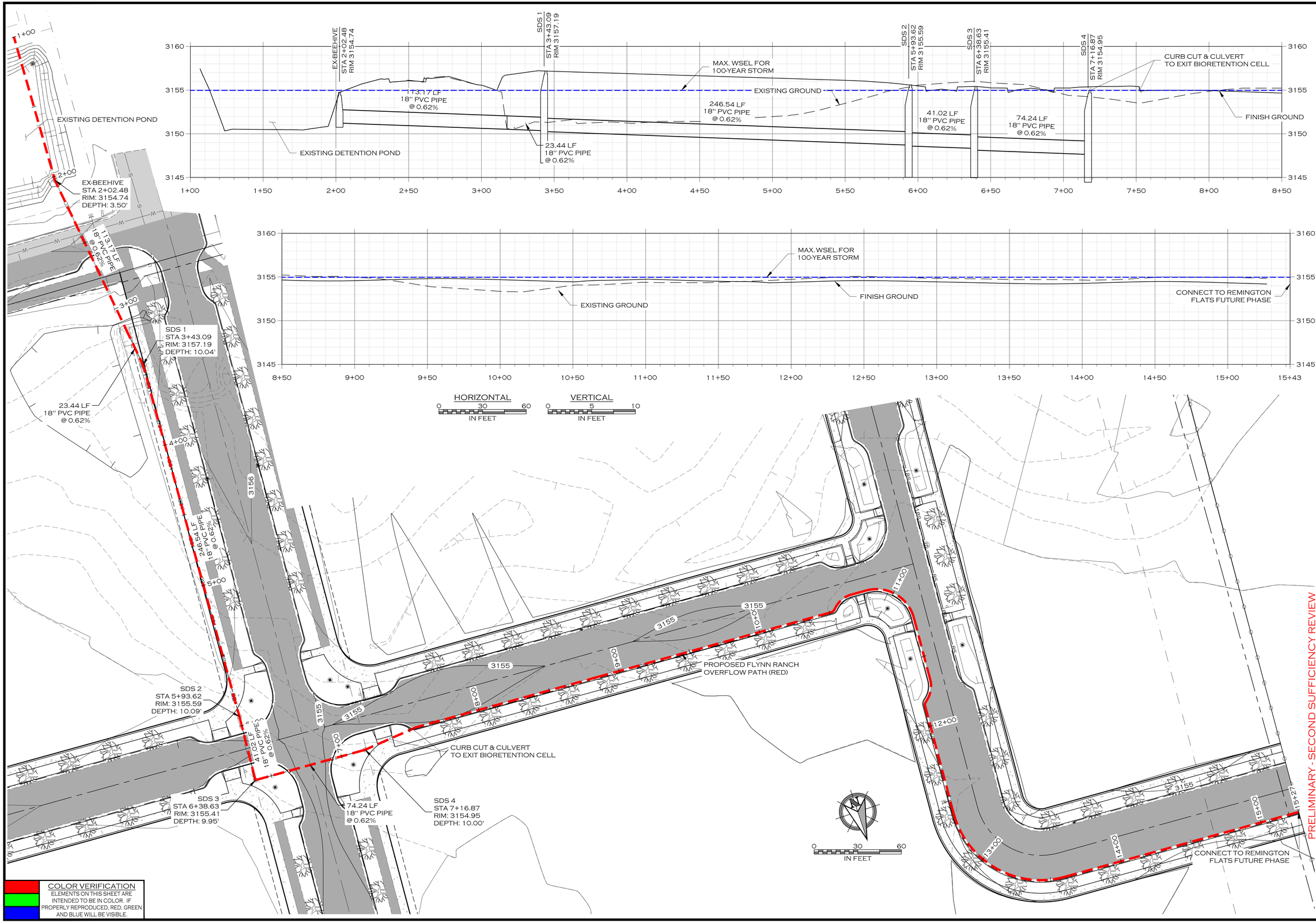
The FAA recommends that storm water management systems located within the separations identified in Paragraphs 1.2 through 1.4 be designed and operated so as not to create above-ground standing water. Stormwater detention ponds should be designed, engineered, constructed, and maintained for a maximum 48–hour detention period after the design storm and to remain completely dry between storms. To facilitate the control of hazardous wildlife, the FAA recommends the use of steep-sided, rip-rap or concrete lined, narrow, linear-shaped water detention basins. When it is not possible to place these ponds away from an airport's aircraft operations area (but still on airport property), airport operators may use physical barriers, such as bird balls, wire grids, floating covers, vegetation barriers (bottom liners), or netting, to prevent access of hazardous wildlife to open water and minimize aircraft-wildlife interactions. Caution is advised when nets or wire grids are used for deterring birds from attractants. Mesh size should be < 5 cm (2") to avoid entangling and killing birds and should not be made of a monofilament material. Grids installed above and across water to deter hazardous birds (e.g., waterfowl, cormorants, etc.) are different than using a small mesh covering but also provides an effective deterrent. Grid material, size, pattern and height above water may differ on a case-by-case basis. When physical barriers are used, airport operators must evaluate their use and ensure they will not adversely affect water rescue. Before installing any physical barriers over detention ponds on Part 139 airports, a review by a Qualified Airport Wildlife Biologist should be conducted, prior to approval from the appropriate FAA Regional Airports Division Office. All vegetation in or around detention basins that provide food or cover for hazardous wildlife should be eliminated. If soil conditions and other requirements allow, the FAA encourages the use of underground storm water infiltration systems because they are less attractive to wildlife.

2.3.3 Existing Wastewater Treatment Facilities.

2.3.3.1 The FAA recommends that airport operators immediately correct any wildlife hazards arising from existing wastewater treatment facilities located on or near the airport.

Appendix 3

EXHIBITS



JOB #:	1931
DRAWN:	CRH
DESIGN:	MH/AH
QA:	KTS
DATE:	10/16/2020

#	DESCRIPTION	DATE

WOITH ENGINEERING, INC.
ENGINEERS & SURVEYORS
403 3RD STREET NW, SUITE 206 • GREAT FALLS, MT 59404 • 406-761-1955
3860 O'LEARY STREET, SUITE A • MISSOULA, MT 59808 • 406-203-9565
• WWW.WOITHENG.COM •

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PRELIMINARY - SECOND SUFFICIENCY REVIEW

MCNETT FLATS
MISSOULA MONTANA

FLYNN RANCH OVERFLOW PATH

EX-B

EX-B FLYNN RANCH OVERFLOW PATH.DWG PLOTTED BY WEI MSLA2 ON Oct 30, 2020

NOTE:

SEASONAL HIGH GROUNDWATER ELEVATION DATA ARE FROM JUNE 2004 MEASUREMENTS PLUS 2.85 FEET. REFER TO FIGURE 4 OF NEWFIELDS HYDREOGEOLOGIC EVALUATION TECHNICAL MEMORANDUM FOR MCNETT FLATS SUBDIVISION.

SUMP BOTTOM ELEVATION REPRESENTS 8' PRECAST SUMP CONE PLUS 2' THICK WASHED DRAIN ROCK BASE INFILTRATIVE LAYER.

SDS 5
RIM: 3154.21
BOTTOM: 3144.21'
GW: 3138.14'

SDS 6
RIM: 3154.21
BOTTOM: 3144.21'
GW: 3138.12'

INFILTRATION TEST
CONDUCTED @ 10' DEPTH
10 INCHES PER HOUR

SDS 7
RIM: 3153.69
BOTTOM: 3143.69'
GW: 3138.07'

SDS 8
RIM: 3153.69
BOTTOM: 3143.69'
GW: 3138.11'

SDS 9
RIM: 3153.70
BOTTOM: 3143.70'
GW: 3138.10'

SDS 15
RIM: 3154.55
BOTTOM: 3144.55'
GW: 3138.32'

SDS 30
RIM: 3155.71
BOTTOM: 3145.71'
GW: 3138.61'

SDS 17
RIM: 3155.35
BOTTOM: 3145.39'
GW: 3138.52'

SDS 4
RIM: 3155.37
BOTTOM: 3145.37'
GW: 3138.51'

SDS 31
RIM: 3155.71
BOTTOM: 3145.71'
GW: 3138.66'

INFILTRATION TESTS COMPLETED
WITHIN 300' OF ALL PROPOSED
INFILTRATIVE FACILITIES

SDS 18
RIM: 3155.38
BOTTOM: 3148.86'
GW: 3138.58'

SDS 3
RIM: 3155.41
BOTTOM: 3145.46'
GW: 3138.59'

SDS 36
RIM: 3155.60
BOTTOM: 3145.60'
GW: 3138.90'

SDS 22
RIM: 3156.24
BOTTOM: 3146.24'
GW: 3139.18'

SDS 24
RIM: 3155.20
BOTTOM: 3145.20'
GW: 3139.04'

SDS 23
RIM: 3156.24
BOTTOM: 3146.24'
GW: 3139.22'

SDS 25
RIM: 3155.39
BOTTOM: 3145.39'
GW: 3139.10'

INFILTRATION TEST
CONDUCTED @ 10' DEPTH
>20 INCHES PER HOUR

INFILTRATION TEST
CONDUCTED @ 10' DEPTH
>20 INCHES PER HOUR

SDS 38
RIM: 3155.53
BOTTOM: 3145.53'
GW: 3139.09'

SDS 12
RIM: 3154.06
BOTTOM: 3149.06'
GW: 3137.99'

SDS 10
RIM: 3153.65
BOTTOM: 3143.65'
GW: 3138.06'

SDS 11
RIM: 3153.57
BOTTOM: 3143.57'
GW: 3138.03'

SDS 16
RIM: 3154.55
BOTTOM: 3144.55'
GW: 3138.30'

SDS 19
RIM: 3155.56
BOTTOM: 3145.31'
GW: 3138.48'

SDS 20
RIM: 3155.65
BOTTOM: 3145.52'
GW: 3138.48'

SDS 2
RIM: 3155.59
BOTTOM: 3145.51'
GW: 3138.56'

SDS 21
RIM: 3155.68
BOTTOM: 3145.35'
GW: 3138.54'

SDS 37
RIM: 3155.60
BOTTOM: 3145.60'
GW: 3138.88'

SDS 27
RIM: 3155.19
BOTTOM: 3145.19'
GW: 3139.00'

SDS 26
RIM: 3155.44
BOTTOM: 3145.44'
GW: 3139.06'

SDS 13
RIM: 3154.90
BOTTOM: 3144.90'
GW: 3137.80'

INFILTRATION TEST
CONDUCTED @ 10' DEPTH
7.2 INCHES PER HOUR

SDS 32
RIM: 3156.45
BOTTOM: 3146.45'
GW: 3138.38'

SDS 33
RIM: 3156.45
BOTTOM: 3146.45'
GW: 3138.43'

SDS 28
RIM: 3155.81
BOTTOM: 3145.80'
GW: 3138.94'

SDS 29
RIM: 3155.81
BOTTOM: 3145.80'
GW: 3138.98'

SDS 14
RIM: 3154.90
BOTTOM: 3144.90'
GW: 3137.78'

INFILTRATION TEST
CONDUCTED @ 10' DEPTH
14 INCHES PER HOUR

SDS 1
RIM: 3157.19
BOTTOM: 3147.15'
GW: 3138.40'

SDS 34
RIM: 3156.21
BOTTOM: 3156.21'
GW: 3138.82'

SDS 35
RIM: 3156.19
BOTTOM: 3146.19'
GW: 3138.87'

COLOR VERIFICATION
ELEMENTS ON THIS SHEET ARE INTENDED TO BE IN COLOR. IF PROPERLY REPRODUCED, RED, GREEN AND BLUE WILL BE VISIBLE.

PRELIMINARY - SECOND SUFFICIENCY REVIEW

JOB #:	1931	
DRAWN:	CRH	
DESIGN:	MH/AH	
QA:	KTS	
DATE:	10/16/2020	

#	DESCRIPTION	DATE

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MCNETT FLATS
MISSOULA MONTANA

SUMP BOTTOM TO GROUNDWATER ELEVATION EXHIBIT

EX-C

EX-C SUMP TO GROUNDWATER DEPTH.DWG PLOTTED BY:WEIMSLA2 ON OCT 29, 2020

APPENDIX 4

INFILTRATION TEST PROCEDURES

On October 6, 2020, Woith Engineering, Inc. performed a percolation test to determine the infiltration capacity of the existing detention basin serving the Flynn Ranch subdivision. The test was performed in approximately the center of the existing pond. The test procedure was based upon the procedure found in Appendix A of the Montana Department of Environmental Quality Circular 4 – Standards for On-Site Subsurface Sewage Treatment Systems (2013 Edition).

The test was performed by preparing an 8-inch diameter hole, 17 inches deep, shown in FIGURE. The bottom and sides of the hole were scratched to provide natural, unsmeared surfaces. The bottom of the hole was filled with two inches of pea gravel to prevent scouring, and a nail was driven into the side of the hole 12 inches above the pea gravel to serve as a measurement reference point.

Figure 7. Percolation test hole for the existing Flynn Ranch detention pond.

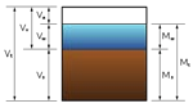
The soaking period began at 8:31 AM by filling the hole with clear water to the reference point elevation. The first soak was allowed to percolate until 9:31 AM, at which point water remained in the hole, so it was again filled to the reference point elevation. At 10:31, water again remained in the hole, so it was filled back to the reference point elevation and the infiltration test was begun. The measurements are shown in TABLE on the following page.

Table 12. Record of percolation test measurements for the existing Flynn Ranch detention pond.

Start Time	End Time	Time Interval (minutes)	Initial Distance Below Reference Point (inches)	Final Distance Below Reference Point (inches)	Drop in Water Level (inches)	Percolation Rate (mpi)
10:21	10:31	10	0	1.5	1.5	6.67
10:31	10:41	10	1.5	2.5	1	10
10:41	10:51	10	2.5	3.6	1.1	9.09
10:51	11:01	10	3.6	5	1.4	7.14
11:01	11:11	10	5	6	1	10
11:11	11:21	10	6	7	1	10
11:31	11:41	10	7	8	1	10

The test was stopped when the final three measurements did not vary by more than 10% and the time exceeded an hour. The infiltration rate of the soils in the existing detention pond was measured as 6 inches per hour. A factor of safety of five, as discussed in the Storm Drainage Design Report, was applied, for a design infiltration rate of **1.2 inches per hour**.

Lorenzen Soil Mechanics, Inc.
2720 Palmer Street Unit C
Missoula, MT 59808
Phone (406) 830-0633
tlorenzen76@charter.net



October 19, 2020

Mr. Kody Swartz, P.E.
Woith Engineering
3860 O'Leary Street Suite A
Missoula, MT 59808

RE: McNett's Flats September 20202 Percolation Testing

Dear Kody;

This letter report presents percolation testing results for boreholes that were drilled to 9.5 feet and information for boreholes that were drilled to 20 feet. This report supplements a stamped geotechnical report prepared on May 4, 2020. In that earlier report, test pitting was completed to depths of 10.5 to 11.75 feet. The purpose of that report was to obtain subsurface information regarding the soil at the expected dry well sump elevations. Using engineering soil classifications and USDA soil textural classifications, LSM had applied correlations to arrive at expected infiltration rates and then applied a safety factor of 2 for a design infiltration rate.

Boland Drilling from Great Falls, Montana arrived on site September 8 to auger-drill five percolation test boreholes (BH) and to auger-drill three boreholes to depths of 20 feet to evaluate the groundwater table depth. The drilling and percolation testing was completed on September 9. The three 20-foot deep boreholes are associated with the percolation testing at BH-01, BH-04, and BH-05. BH-04 was drilled in a swale. Figure 1 presents the February test pit locations and the September boreholes.

The percolation testing was conducted in general accordance with MT DEQ Circular No. 4 within five boreholes that had been drilled to a depth of 9.5 feet to represent the stratum around the 8- to 10-foot depth. A 4-inch diameter, 10-foot long PVC pipe, slotted over the bottom 2 feet was installed in each of the percolation boreholes. In three of the boreholes (BH-02, BH-03, BH-05) the boreholes collapsed as the augers were pulled. The collapses tended to fill the bottom 3 to 4 feet of the borehole. It is noted that it is difficult to keep open boreholes in sandy gravels with few fines from collapsing.

LSM also points out that the drilling action, using either an auger drill or a down-the-hole ODEX hammer system, alters the makeup of the underlying soil materials at the bottom of the hole. The auger bits grind into the gravel and cobbles and a hammer system pounds the coarse particles into much finer materials. This change in material gradation will produce slower percolation rates. Conversely, if one were to conduct percolation testing in a test pit within these materials, the excavation would require something of a 'glory hole' to provide safe dimensions in which to conduct a percolation test at the 8- to 10-foot depth. Backfilling holes of this size would require rigorous compaction efforts to limit the amount of settlement.

Table 1 presents the results of the September percolation testing and the depths to the groundwater table.

TABLE 1: Percolation Testing Results

Perc Test Borehole	Percolation Rate (minutes/inch)	Infiltration Rate (inches/hour)	GW Depth/Elev.
BH-01	6.0	10.0	17.9 / 3136.6
BH-02	<3.0	>20.0	-
BH-03	<3.0	>20.0	-
BH-04	8.5	7.1	13.5 / 3137.5
BH-05	4.3	14.0	19.25 / 3137.75

The general infiltration rate value of 10 inches per hour provided in the May 2020 geotechnical report appears to have been a valid design value. The slower percolation rate of 7.1 inches per hour in BH-04 is within a swale and would likely be graded to receive a higher elevation, putting the bottom of the dry well sump a few feet higher above the groundwater table.

If you have any questions regarding this percolation testing letter report, please contact me at 406-830-0633.

Sincerely,
Lorenzen Soil Mechanics, Inc.

Todd Lorenzen, P.E.
Geotechnical Engineer

Figure 1: February Test Pit and September Percolation Test/Borehole Locations

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon - 1-3/8" I.D., 2" O.D., unless otherwise noted	CA:	Casing Advancer
ST:	Thin-Walled Tube - 2" O.D., unless otherwise noted	DA:	Drill Auger
CB:	California Sampler - 2" I.D., 2.5" O.D., unless otherwise noted	HA:	Hand Auger
DB:	Diamond Bit Coring - 4", NX, unless otherwise noted	RB:	Rock Bit
BS:	Bulk Sample or Auger Sample	GS:	Grab Sample

The number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the "Standard Penetration" or "N-value". The field blow counts are reported for each 6-inch interval, or portion thereof if greater than 50 blows are required to advance the full 6-inch interval. For over-sized split spoon samplers, non-standard hammers, or non-standard drop heights, the field penetration values are reported on the bore log. The values must be corrected to obtain the N-value.

WL:	Water Level	WS:	While Sampling	NE:	Not Encountered
WCl:	Wet Cave-In	WD:	While Drilling		
DCI:	Dry Cave-In	BCR:	Before Casing Removal		
AB:	After Boring	ACR:	After Casing Removal		

Groundwater table levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater table levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater table levels may not be possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION: Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: gravel or sand. Cobbles and boulders are not part of the USCS system but are included, when present, as percentages. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; depending on their plasticity, they are described as clay or silt. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils are defined on the basis of their consistency.

CONSISTENCY OF FINE-GRAINED SOILS

Unconfined Compressive Strength, Qu, psf	Standard Penetration or N-value (SS) Blows/Ft.	Consistency
< 500	0 - 1	Very Soft
500 - 1,000	2 - 4	Soft
1,001 - 2,000	5 - 8	Medium Stiff
2,001 - 4,000	9 - 15	Stiff
4,001 - 8,000	16 - 30	Very Stiff
8,000 +	30 +	Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Standard Penetration or N-value (SS) Blows/Ft.	California Barrel (CB) Blows/Ft.	Relative Density
0 - 4	0 - 6	Very Loose
5 - 10	7 - 18	Loose
11 - 30	19 - 58	Medium Dense
31 - 50	59 - 98	Dense
50 +	99 +	Very Dense

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of Other Constituents	Percent of Dry Weight
Trace	< 15
With	15 - 30
Modifier	> 30

USCS* GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75 mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

*For AASHTO grain size the #4 sieve is replaced with the #10 sieve

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of Other Constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifiers	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-Plastic	0
Slightly	1 - 5
Low	6 - 10
Medium	11 - 20
Highly	21 - 40
Very Highly	> 40

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]				Soil Classification	
				Group Symbol	Group Name [B]
Coarse Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines	Cu ≥ 4 and 1≤ Cc ≤ 3	GW	Well-graded Gravel [F]
			Cu < 4 and/or 1 > Cc > 3	GP	Poorly graded gravel [F]
		Gravels with Fines More than 12% fines	Fines classify as ML or MH	GM	Silty Gravel [F,G,H]
			Fines classify as CL or CH	GC	Clayey Gravel [F,G,H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines	Cu ≥ 6 and 1 ≤ Cc ≤ 3	SW	Well-graded Sand [I]
			Cu < 6 and/or 1 > Cc > 3	SP	Poorly graded Sand [I]
		Sands with Fines More than 12% fines	Fines classify as ML or MH	SM	Silty Sand [G,H,I]
			Fines classify as CL or CH	SC	Clayey Sand [G,H,I]
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	inorganic	PI > 7 and plots on or above "A" line	CL	Lean Clay [K,L,M]
			PI < 4 or plots below "A" line	ML	Silt [K,L,M]
		organic	Liquid limit - oven dried / Liquid limit - not dried < 0.75	OL	Organic Clay [K,L,M,N]
					Organic Silt [K,L,M,O]
	Silts and Clays Liquid Limit 50 or more	inorganic	PI plots on or above "A" Line	CH	Fat Clay [K,L,M]
			PI plots below "A" line	MH	Elastic Silt [K,L,M]
		organic	Liquid limit - oven dried / Liquid limit - not dried < 0.75	OH	Organic Clay [K,L,M,P]
					Organic Silt [K,L,M,Q]
Highly organic soils	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve

[B] If field sample contains cobbles and/or boulders, add "with cobbles or boulders, or both" as necessary to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt. GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

[E] $Cu = D_{60} / D_{10} \quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200, predominantly sand, add "sandy" to group name.

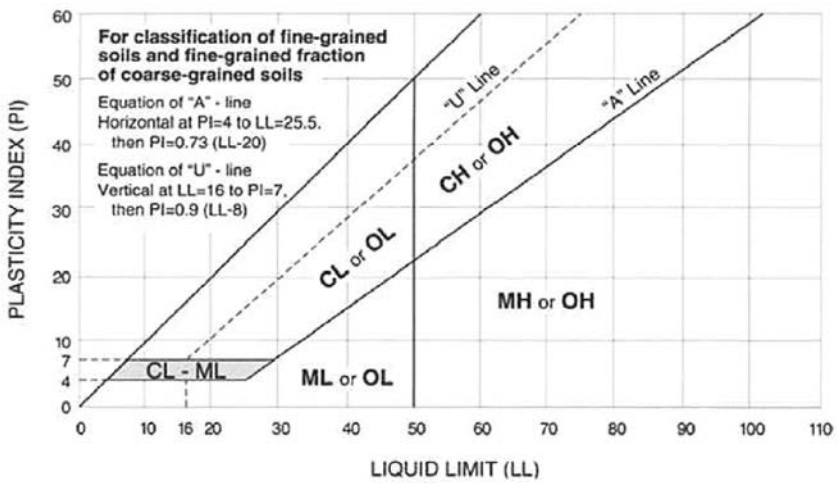
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

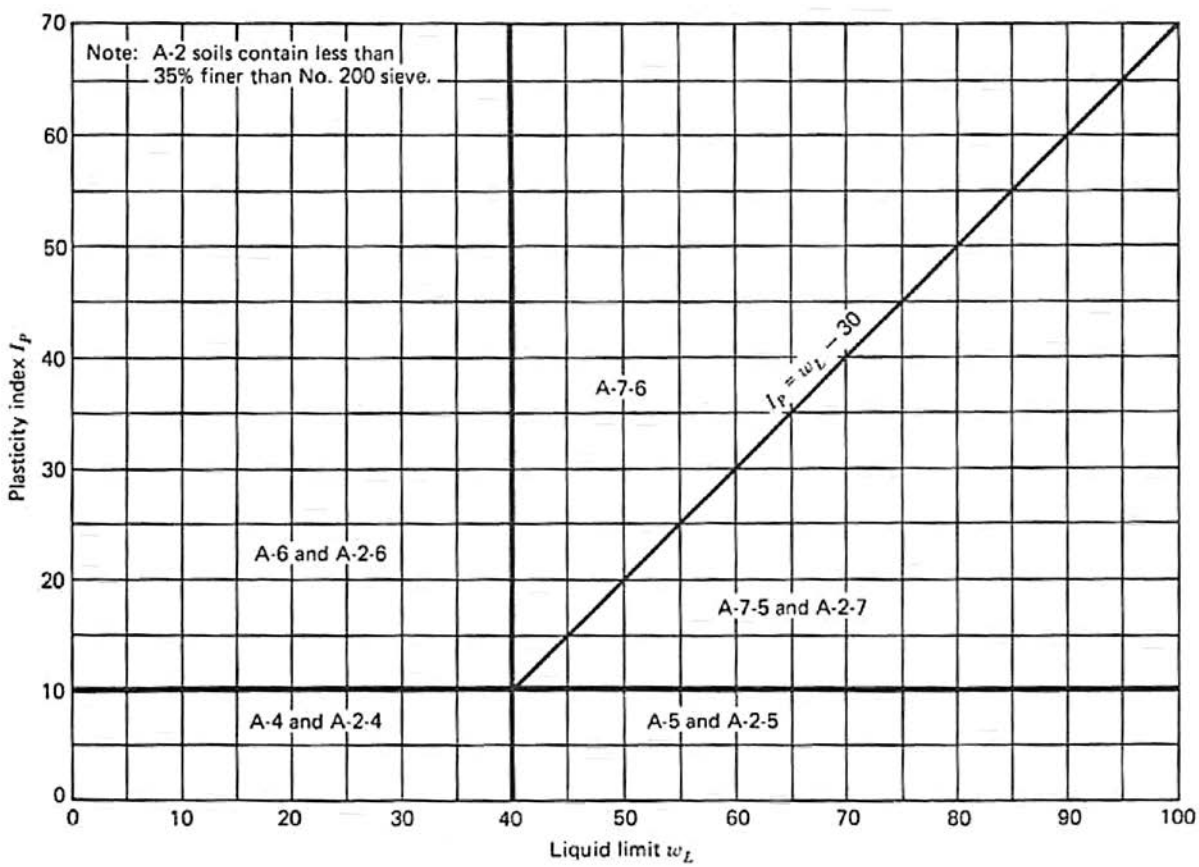
[Q] PI plots below "A" line.



AASHTO SOIL CLASSIFICATION SYSTEM

General classification	**Granular materials** (35 percent or less of total sample passing No. 200)							**Silt-clay material** (More than 35 percent of total sample passing No. 200)			
Group classification	A-1		A-3	A-2				A-4	A-5	A-6	A-7 [1]
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6
Sieve analysis percent passing No. 10 No. 40 No. 200	 50 max 30 max 15 max	 50 max 25 max	 51 max 10 max	 35 max	 35 max	 35 max	 35 max	 36 min	 36 min	 36 min	 36 min
Characteristics of fraction passing No. 40 Liquid limit, w_L Plastic Index, I_P	 6 max		 NP	 40 max 10 max	 41 min 10 max	 40 max 11 min	 41 min 11 min	 40 max 10 max	 41 min 10 max	 40 max 11 min	 41 min 11 min
Significant constituent materials	gravel and sand		fine sand	silty and clayey gravel and sand				silty soils		clayey soils	

[1] Plasticity index of A-7-5 subgroup is equal to or less than LL minus 30. Plasticity index of A-7-6 subgroup is greater than LL minus 30.



Lorenzen Soil Mechanics, Inc.
2720 Palmer Street, Unit C
Missoula, MT 59808
Telephone: 406-830-0633

BORING NUMBER BH-01

CLIENT Tollefson Construction
PROJECT NAME McNett Flats
PROJECT NUMBER BS2020
PROJECT LOCATION
DATE STARTED 9/8/20 **COMPLETED** 9/9/20
GROUND ELEVATION 3154.5 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Boland Drilling
GROUND WATER LEVELS:
DRILLING METHOD Mobile B59
AT TIME OF DRILLING 17.90 ft / Elev 3136.60 ft
LOGGED BY Lorenzen **CHECKED BY** Lorenzen
AT END OF DRILLING 17.90 ft / Elev 3136.60 ft
NOTES N46° 53' 50.4"; W114° 04' 12.8"
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(ML) TOPSOIL, Silty Loa with Vegetative Organics; damp; very dark brown 910YR 2/2).										
		(ML) Sandy SILT [A-4]; damp to dry; pale brown (10YR 6/3); medium dense; no reaction to 10% HCl solution; non-plastic; low dry stregth, friable.										
		Drill rate from 0 to 5 feet = 245 ft/hr										
5		(SM) Silty SAND [A-2]; dry; brown (10YR 5/3); medium dense - inferred.	SPT	83	5-6-5 (11)			5				
		(GW-GM) Well-Graded GRAVEL with Silt and Sand [A-1-a], occasional Cobble; subrounded, flat; dry to damp; brown (10YR 5/3) to grayish brown (10YR 5/2) matrices with white (10YR 8/1) coatings; medium dense; no reaction to 10% HCl solution. Fines are non-plastic.	SPT	72	4-11-16 (27)			3				
10		Drill rate from 5 to 10 feet = 160 ft/hr										
		Percolation Test Rate = 6.0 minutes per inch (Infiltration Rate ~ 10 inches per hour)	SPT	50	4-5-14 (19)			3				
		Drill rate from 10 to 15 feet = 140 ft/hr										
15		(GW-GM) Well-Graded GRAVEL with Silt and Sand [A-1-a], occasional Cobble; subrounded, flat; damp to moist; dark brown (10YR 3/3) matrix; medium dense; no reaction to 10% HCl solution. Fines are non-plastic.	SPT	72	5-12-17 (29)			4				
		Drill rate from 15 to 20 feet = 115 ft/hr										
		(GW) Well-Graded GRAVEL with Sand [A-1-], occasional Cobble; subrounded, flat; wet; brown (10YR 5/3) and light yellowish brown (10YR 6/4) matrices; dense; no reaction to 10% HCl solution.										
20			SPT	61	9-15-22 (37)			11				

Bottom of borehole at 21.5 feet.

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Lorenzen Soil Mechanics, Inc.
2720 Palmer Street, Unit C
Missoula, MT 59808
Telephone: 406-830-0633

BORING NUMBER BH-02

CLIENT Tollefson Construction
PROJECT NAME McNett Flats
PROJECT NUMBER BS2020
PROJECT LOCATION
DATE STARTED 9/8/20 **COMPLETED** 9/8/20
GROUND ELEVATION 3156.5 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Boland Drilling
GROUND WATER LEVELS:
DRILLING METHOD Mobile B59
AT TIME OF DRILLING --- GW table was not encountered.
LOGGED BY Lorenzen **CHECKED BY** Lorenzen
AT END OF DRILLING --- GW table was not encountered.
NOTES N46° 53' 49.1"; W114° 04' 6.5"
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(ML) TOPSOIL, Silty Loa with Vegetative Organics; damp; very dark brown 910YR 2/2).										
		(ML) Sandy SILT [A-4]; damp to dry; brown (10YR 5/3); medium dense - inferred; no reaction to 10% HCl solution; non-plastic; low dry stregth, friable.										
		Drill rate from 0 to 5 feet = 170 ft/hr										
5			SPT	78	3-4-11 (15)			2				
		(GW) Well-Graded GRAVEL with Sand [A-1-], occasional Cobble; subrounded, flat; dry; yellowish brown (10YR 5/4) matrix; very dense; no reaction to 10% HCl solution.										
		Drill rate from 5 to 8 feet = 125 ft/hr	SPT	67	29-27-30 (57)			1				
		Percolation Test Rate = <3.0 minutes per inch (Infiltration Rate >20 inches per hour)										
		Bottom of borehole at 9.5 feet.										

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Lorenzen Soil Mechanics, Inc.
2720 Palmer Street, Unit C
Missoula, MT 59808
Telephone: 406-830-0633

BORING NUMBER BH-03

CLIENT Tollefson Construction
PROJECT NAME McNett Flats
PROJECT NUMBER BS2020
PROJECT LOCATION
DATE STARTED 9/8/20 **COMPLETED** 9/8/20
GROUND ELEVATION 3157 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Boland Drilling
GROUND WATER LEVELS:
DRILLING METHOD Mobile B59
AT TIME OF DRILLING --- GW table was not encountered.
LOGGED BY Lorenzen **CHECKED BY** Lorenzen
AT END OF DRILLING --- GW table was not encountered.
NOTES N46° 53' 48.8"; W114° 03' 59.3"
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(ML) TOPSOIL, Silty Loa with Vegetative Organics; damp; very dark brown 910YR 2/2).										
		(ML) Sandy SILT [A-4]; damp to dry; brown (10YR 5/3); medium dense - inferred; no reaction to 10% HCl solution; non-plastic; low dry stregth, friable.										
		Drill rate from 0 to 5 feet = 235 ft/hr										
5			SPT	50 (39)	8-5			2				
		(GW) Well-Graded GRAVEL with Sand [A-1-], occasional Cobble; subrounded, flat; dry; dark yellowish brown (10YR 4/4) matrix; medium dense; no reaction to 10% HCl solution.										
		Drill rate from 5 to 8 feet = 150 ft/hr	SPT	78 (39)	11-11			3				
		Percolation Test Rate = <3.0 minutes per inch (Infiltration Rate >20 inches per hour)										

Bottom of borehole at 9.5 feet.

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2720 Palmer Street, Unit C
Missoula, MT 59808
Telephone: 406-830-0633

BORING NUMBER BH-04

CLIENT Tollefson Construction
PROJECT NAME McNett Flats
PROJECT NUMBER BS2020
PROJECT LOCATION
DATE STARTED 9/8/20 **COMPLETED** 9/9/20
GROUND ELEVATION 3151 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Boland Drilling
GROUND WATER LEVELS:
DRILLING METHOD Mobile B59
AT TIME OF DRILLING 14.00 ft / Elev 3137.00 ft
LOGGED BY Lorenzen **CHECKED BY** Lorenzen
AT END OF DRILLING 14.00 ft / Elev 3137.00 ft
NOTES N46° 53' 47.2"; W114° 04' 12.8"
1hrs AFTER DRILLING 13.50 ft / Elev 3137.50 ft

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(ML) TOPSOIL, Silty Loa with Vegetative Organics; damp; very dark brown 910YR 2/2).										
		(ML) Sandy SILT [A-4]; damp; brown (10YR 5/3) auger cuttings.										
		Drill rate from 0 to 5 feet = 155 ft/hr										
5		(GW-GM) Well-Graded GRAVEL with Silt and Sand [A-1-a], occasional Cobble; subrounded, flat; dry; yellowish brown (10YR 5/4) matrix; medium dense; no reaction to 10% HCl solution. Fines are non-plastic.	SPT	72	6-7-14 (21)			4				
		Drill rate from 5 to 10 feet = 75 ft/hr										
		(GW-GM) Well-Graded GRAVEL with Silt and Sand [A-1-a], occasional Cobble; subrounded, flat; dry to damp; dark yellowish brown (10YR 3/4) matrix; dense; no reaction to 10% HCl solution. Fines are non-plastic.	SPT	83	12-16-15 (31)			5				
10		Percolation Test Rate = 8.5 minutes per inch (Infiltration Rate ~ 7.1 inches per hour)	SPT	67	15-18-20 (38)			3				
		Drill rate from 10 to 15 feet = 115 ft/hr										
15		(SW) Well-Graded SAND with Gravel [A-1-], occasional Cobble; wet; dark yellowish brown (10YR 4/4) matrix; medium dense; no reaction to 10% HCl solution. Gravels are subrounded, flat.	SPT	33	5-6-11 (17)			10				
		Drill rate from 15 to 20 feet = 290 ft/hr										
20		(CL-ML) SILTY CLAY; moist; yellowish brown (10YR 5/4); medium stiff; no reaction to 10% HCl solution; low plasticity.	SPT	78	3-2-3 (5)			21 27				
		Bottom of borehole at 21.5 feet.										

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Lorenzen Soil Mechanics, Inc.
2720 Palmer Street, Unit C
Missoula, MT 59808
Telephone: 406-830-0633

BORING NUMBER BH-05

CLIENT Tollefson Construction
PROJECT NAME McNett Flats
PROJECT NUMBER BS2020
PROJECT LOCATION
DATE STARTED 9/9/20 **COMPLETED** 9/9/20
GROUND ELEVATION 3157 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Boland Drilling
GROUND WATER LEVELS:
DRILLING METHOD Mobile B59
AT TIME OF DRILLING 21.00 ft / Elev 3136.00 ft
LOGGED BY Lorenzen **CHECKED BY** Lorenzen
AT END OF DRILLING 21.00 ft / Elev 3136.00 ft
NOTES N46° 53' 45.6"; W114° 04' 05.2"
1hrs AFTER DRILLING 19.25 ft / Elev 3137.75 ft

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		(ML) TOPSOIL, Silty Loa with Vegetative Organics; damp; very dark brown 910YR 2/2).										
		(ML) Sandy SILT [A-4]; damp to dry; very pale brown (10YR 7/3); medium dense; no reaction to 10% HCl solution; non-plastic; low dry stregth, friable.										
		Drill rate from 0 to 5 feet = 300 ft/hr										
5			SPT	72	6-9-10 (19)			5				
		(GW) Well-Graded GRAVEL with Sand [A-1-a], occasional Cobble; subrounded to subangular, flat; dry to damp; brown (10YR 4/3) to yellowish brown (10YR 5/4) matrices; very dense to dense; no reaction to 10% HCl solution.	SPT	78	13-25-27 (52)			2				
10		Drill rate from 5 to 10 feet = 60 ft/hr										
		Percolation Test Rate = 4.3 minutes per inch (Infiltration Rate ~ 14 inches per hour)	SPT	72	20-21-26 (47)			4				
		Drill rate from 10 to 15 feet = 45 ft/hr										
		(GW) Well-Graded GRAVEL with Sand [A-1-], occasional Cobble; subrounded, flat; damp; dark yellowish brown (10YR 4/6) to brown (7.5YR 4/3) matrices; dense; no reaction to 10% HCl solution.										
15			SPT	67	13-17-29 (46)			4				
		Drill rate from 15 to 20 feet = 55 ft/hr										
20			SPT	67	20-26-23 (49)			4				
		(GW) Well-Graded GRAVEL with Sand [A-1-], occasional Cobble; subrounded, flat; wet; brown (7.5YR 4/3) matrix; dense - inferred; no reaction to 10% HCl solution.										
		Bottom of borehole at 21.5 feet.										

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Lorenzen Soil Mechanics, Inc.
2720 Palmer Street, Unit C
Missoula, MT 59808
Telephone: 406-830-0633

TEST PIT NUMBER TP-01

CLIENT Tollefson Construction
PROJECT NAME George Elmer Drive
PROJECT NUMBER P2020
PROJECT LOCATION Missoula
DATE STARTED 2/25/20 **COMPLETED** 2/25/20
GROUND ELEVATION 3153.7 ft **TEST PIT SIZE** 36 inches
EXCAVATION CONTRACTOR Owner
GROUND WATER LEVELS:
EXCAVATION METHOD CASE 580M Turbo Backhoe
AT TIME OF EXCAVATION --- GW table was not encountered.
LOGGED BY Lorenzen **CHECKED BY** Lorenzen
AT END OF EXCAVATION --- GW table was not encountered.
NOTES N46° 53' 48.6": W114° 04' 14.1"
69hrs AFTER EXCAVATION --- GW table was not encountered.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		(ML) TOPSOIL, Silty Loam with Vegetative Organics; damp; very dark brown (10YR 2/2); no reaction to 10% HCl solution; slightly plastic; low dry strength.										
		(ML) Sandy SILT [A-4]; damp to dry; dark yellowish brown (10YR 4/4); no reaction to 10% HCl solution; non-plastic; low dry strength, friable. USDA Soil Texture = LOAM.	GB					16	NP	NP	NP	56
2.5		Army Corps of Engineers Cone Penetrometer was pushed 6 inches under a 320 psi loading at 3 feet.	GB					7				
5.0		(ML) SILT with Sand [A-4]; dry; yellowish brown (10YR 6/4); light yellowish brown; no reaction to 10% HCl solution; slightly plastic; low dry strength. USDA Soil Texture = SILTY LOAM.	GB					11				
			GB					6	NP	NP	NP	85
7.5		(GW-GM) Well-Graded GRAVEL with Silt and Sand [A-1-a], frequent Cobbles; rounded to subrounded, flat; damp; yellowish brown (10YR 5/4) to dark yellowish brown (10YR 3/6) matrices; no reaction to 10% HCl solution.	GB					2				
			GB						NP	NP	NP	6
10.0			GB					2				
			GB					3				

Bottom of test pit at 11.5 feet.

GEOTECH BH COLUMNS - GINT STD US LAB.GDT - 10/18/20 06:34 - C:\USERS\TODD LORENZEN\DOCUMENTS\LORENZEN SOIL MECHANICS\WOITH ENGINEERING\TOLLEFSON - GEORGE ELMER DR\5.0 DELIVERABLES\GEORGE ELMER DRIVE.GPJ

Lorenzen Soil Mechanics, Inc.
2720 Palmer Street, Unit C
Missoula, MT 59808
Telephone: 406-830-0633

TEST PIT NUMBER TP-02

CLIENT Tollefson Construction
PROJECT NAME George Elmer Drive
PROJECT NUMBER P2020
PROJECT LOCATION Missoula
DATE STARTED 2/25/20 **COMPLETED** 2/25/20
GROUND ELEVATION 3156.4 ft **TEST PIT SIZE** 36 inches
EXCAVATION CONTRACTOR Owner
GROUND WATER LEVELS:
EXCAVATION METHOD CASE 580M Turbo Backhoe
AT TIME OF EXCAVATION --- GW table was not encountered.
LOGGED BY Lorenzen **CHECKED BY** Lorenzen
AT END OF EXCAVATION --- GW table was not encountered.
NOTES N46° 53' 49.1": W114° 04' 06.5
69hrs AFTER EXCAVATION --- GW table was not encountered.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		(ML) TOPSOIL, Silty Loam with Vegetative Organics; damp; very dark brown (10YR 2/2); no reaction to 10% HCl solution; slightly plastic; low dry strength.	GB					15				
		(SM) Silty SAND [A-4]; damp; brown (10YR 4/3); strong reaction to 10% HCl solution; low dry strength, friable. Fines are slightly to non-plastic.	GB					12				
2.5		Army Corps of Engineers Cone Penetrometer was pushed its full 21 inches under a 260 psi loading at 3 feet.	GB					10				
5.0		(SM) Silty SAND [A-4]; damp; dark yellowish brown (10YR 4/6); no reaction to 10% HCl solution; low dry strength, friable. Fines are slightly to non-plastic.	GB					11				
7.5		(GW-GM) Well-Graded GRAVEL with Silt and Sand [A-1-a], frequent Cobbles; rounded to subrounded, flat; damp; yellowish brown (10YR 5/6) to dark yellowish brown (10YR 3/6) matrices; strong to no reaction to 10% HCl solution.	GB					4				
10.0			GB					5				
			GB					3				

Bottom of test pit at 10.5 feet.

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Lorenzen Soil Mechanics, Inc.
2720 Palmer Street, Unit C
Missoula, MT 59808
Telephone: 406-830-0633

TEST PIT NUMBER TP-03

CLIENT Tollefson Construction
PROJECT NAME George Elmer Drive
PROJECT NUMBER P2020
PROJECT LOCATION Missoula
DATE STARTED 2/25/20 **COMPLETED** 2/25/20
GROUND ELEVATION 3256.5 ft **TEST PIT SIZE** 36 inches
EXCAVATION CONTRACTOR Owner
GROUND WATER LEVELS:
EXCAVATION METHOD CASE 580M Turbo Backhoe
AT TIME OF EXCAVATION --- GW table was not encountered.
LOGGED BY Lorenzen **CHECKED BY** Lorenzen
AT END OF EXCAVATION --- GW table was not encountered.
NOTES N46° 53' 50.8": W114° 04' 06.8"
69hrs AFTER EXCAVATION --- GW table was not encountered.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		(ML) TOPSOIL, Silty Loam with Vegetative Organics; frozen to 1 foot; very dark brown (10YR 2/2); no reaction to 10% HCl solution; slightly plastic; low dry strength.										
		(ML) Sandy SILT [A-4]; damp to dry; dark yellowish brown (10YR 4/4) to yellowish brown (10YR 5/4); strong to weak reaction to 10% HCl solution; non-plastic; low dry strength, friable. USDA Soil Texture = SANDY LOAM.	GB					12	NP	NP	NP	51
2.5		Army Corps of Engineers Cone Penetrometer was pushed 2.5 inches under a 320 psi loading at 3 feet.	GB					10				
		(ML) Sandy SILT [A-4]; damp to dry; brown (10YR 4/3) to yellowish brown (10YR 5/4); strong to weak reaction to 10% HCl solution; non-plastic; low dry strenth, friable.										
5.0			GB					9				
7.5		(GP-GM) Poorly Graded GRAVEL with Silt and Sand [A-1-a], frequent Cobbles; rounded to subrounded, flat; damp; yellowish brown (10YR 5/4) to dark yellowish brown (10YR 4/6) matrices; no reaction to 10% HCl solution. Fines are non-plastic.	GB					3				
10.0			GB						18	18	NP	10
			GB					3				

Bottom of test pit at 11.0 feet.

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Lorenzen Soil Mechanics, Inc.
2720 Palmer Street, Unit C
Missoula, MT 59808
Telephone: 406-830-0633

TEST PIT NUMBER TP-04

CLIENT Tollefson Construction
PROJECT NAME George Elmer Drive
PROJECT NUMBER P2020
PROJECT LOCATION Missoula
DATE STARTED 2/25/20 **COMPLETED** 2/25/20
GROUND ELEVATION 3156.9 ft **TEST PIT SIZE** 36 inches
EXCAVATION CONTRACTOR Owner
GROUND WATER LEVELS:
EXCAVATION METHOD CASE 580M Turbo Backhoe
AT TIME OF EXCAVATION --- GW table was not encountered.
LOGGED BY Lorenzen **CHECKED BY** Lorenzen
AT END OF EXCAVATION --- GW table was not encountered.
NOTES N46° 53' 51.4": W114° 03' 59.8"
69hrs AFTER EXCAVATION --- GW table was not encountered.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		(ML) TOPSOIL, Silty Loam with Vegetative Organics; damp; very dark brown (10YR 2/2); no reaction to 10% HCl solution; slightly plastic; low dry strength.										
		(SM) Silty SAND [A-4]; damp; dark yellowish brown (10YR 4/4); no reaction to 10% HCl solution; non-plastic; low dry strength, friable. USDA Soil Texture = SANDY LOAM.	GB					10	NP	NP	NP	45
2.5		(SP) Pooly Graded SAND with Gravel [A-1-a]; damp; dark yellowish brown (10YR 4/4); no reaction to 10% HCl solution. Gravels are fine-grained and rounded to subrounded, flat. Fines are non-plastic. Army Corps of Engineers Cone Penetrometer was pushed 7.25 inches under a 320 psi loading at 2.4 feet.	GB					4				
			GB						NP	NP	NP	1
5.0		(SP-SM) Poorly Graded SAND with Silt and Gravel [A-1-a]; damp; dark yellowish brown (10YR 3/6); no reaction to 10% HCl solution. Fines are non-plastic.										
7.5		(GP-GM) Poorly Graded GRAVEL with Silt and Sand [A-1-a], frequent Cobbles; rounded to subrounded, flat; damp; dark yellowish brown (10YR 4/6) matrix; no reaction to 10% HCl solution. Fines are non-plastic.	GB					7				
10.0			GB					3				

Bottom of test pit at 11.5 feet.

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Lorenzen Soil Mechanics, Inc.
2720 Palmer Street, Unit C
Missoula, MT 59808
Telephone: 406-830-0633

TEST PIT NUMBER TP-05

CLIENT Tollefson Construction
PROJECT NAME George Elmer Drive
PROJECT NUMBER P2020
PROJECT LOCATION Missoula
DATE STARTED 2/25/20 **COMPLETED** 2/25/20
GROUND ELEVATION 3157.1 ft **TEST PIT SIZE** 36 inches
EXCAVATION CONTRACTOR Owner
GROUND WATER LEVELS:
EXCAVATION METHOD CASE 580M Turbo Backhoe
AT TIME OF EXCAVATION --- GW table was not encountered.
LOGGED BY Lorenzen **CHECKED BY** Lorenzen
AT END OF EXCAVATION --- GW table was not encountered.
NOTES N46° 53' 49.4": W114° 04' 00.0"
69hrs AFTER EXCAVATION --- GW table was not encountered.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		(SM) TOPSOIL, Sandy Loam with Vegetative Organics; damp; very dark grayish brown (10YR 3/2); no reaction to 10% HCl solution; slightly plastic; low dry strength. USDA Soil Texture = SANDY LOAM.	GB					16	NP	NP	NP	47
		(SM) Silty SAND [A-4]; damp; brown (10YR 4/3) to yellowish brown (10YR 5/8); no reaction to 10% HCl solution; non-plastic; low dry strength, friable. Fines are non-plastic. USDA Soil Texture = SANDY LOAM.	GB					15				
2.5		Army Corps of Engineers Cone Penetrometer was pushed its full 21 inches under a 240 psi loading at 3 feet.	GB					13	NP	NP	NP	43
5.0			GB					13				
7.5		(SP-SM) Poorly Graded SAND with Silt and Gravel [A-1-a]; damp; dark yellowish brown (10YR 4/6); no reaction to 10% HCl solution. Gravels are rounded to subrounded, flat. Fines are non-plastic.	GB					6				
10.0			GB					3				

Bottom of test pit at 11.8 feet.

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Lorenzen Soil Mechanics, Inc.
2720 Palmer Street, Unit C
Missoula, MT 59808
Telephone: 406-830-0633

TEST PIT NUMBER TP-06

CLIENT Tollefson Construction
PROJECT NAME George Elmer Drive
PROJECT NUMBER P2020
PROJECT LOCATION Missoula
DATE STARTED 2/25/20 **COMPLETED** 2/25/20
GROUND ELEVATION 3151.6 ft **TEST PIT SIZE** 36 inches
EXCAVATION CONTRACTOR Owner
GROUND WATER LEVELS:
EXCAVATION METHOD CASE 580M Turbo Backhoe
AT TIME OF EXCAVATION --- GW table was not encountered.
LOGGED BY Lorenzen **CHECKED BY** Lorenzen
AT END OF EXCAVATION --- GW table was not encountered.
NOTES N46° 53' 46.6": W114° 04' 06.3"
69hrs AFTER EXCAVATION --- GW table was not encountered.

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		(SM) FILL, Sandy Loam with Vegetative Organics; damp; very dark grayish brown (10YR 3/2); no reaction to 10% HCl solution; slightly plastic; low dry strength.										
		(SM) Silty SAND [A-4]; damp; brown (10YR 5/3); no reaction to 10% HCl solution; non-plastic; low dry strength, friable. Fines are non-plastic.	GB					8				
2.5		(SP-SM) Poorly Graded SAND with Silt and Gravel [A-1-a]; damp; dark yellowish brown (10YR 4/6); no reaction to 10% HCl solution. Fines are non-plastic. Gravels are rounded to subrounded, flat.										
		Army Corps of Engineers Cone Penetrometer was pushed 6 inches under a 320 psi loading at 3 feet.	GB					3				
			GB						NP	NP	NP	7
5.0			GB					5				
		(GP-GM) Poorly Graded GRAVEL with Silt and Sand [A-1-a], frequent Cobbles; rounded to subrounded, flat; damp; dark yellowish brown (10YR 4/4) matrix; no reaction to 10% HCl solution. Fines are non-plastic.	GB					5				
7.5												
10.0			GB					3				

Bottom of test pit at 11.5 feet.

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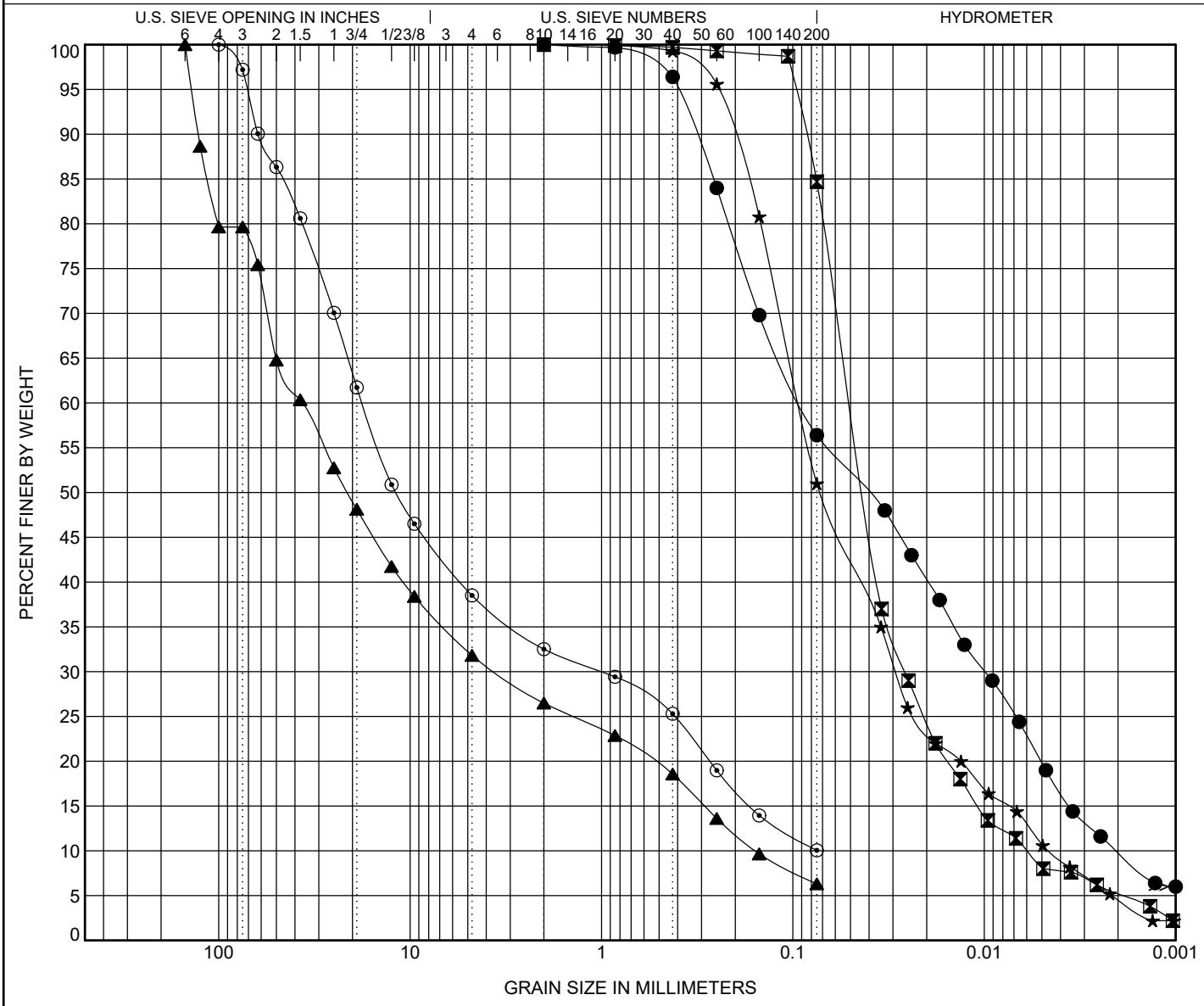
GRAIN SIZE DISTRIBUTION

Lorenzen Soil Mechanics, Inc.
2720 Palmer Street, Unit C
Missoula, MT 59808
Telephone: 406-830-0633

CLIENT Tollefson Construction **PROJECT NAME** George Elmer Drive

PROJECT NUMBER P2020 **PROJECT LOCATION** Missoula



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	TP-01	1.0	SANDY SILT(ML)	NP	NP	NP	0.54	44.80
⊠	TP-01	6.0	SILT with SAND(ML)	NP	NP	NP	2.24	8.39
▲	TP-01	8.0	WELL-GRADED GRAVEL with SILT and SAND(GW-GM)	NP	NP	NP	2.17	234.51
★	TP-03	1.5	SANDY SILT(ML)	NP	NP	NP	1.99	20.25
⊙	TP-03	9.0	POORLY GRADED GRAVEL with SILT and SAND(GP-GM)	18	18	NP	0.75	239.21

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	TP-01	1.0	2	0.09	0.01	0.002	0.0	43.6	36.6	19.8
⊠	TP-01	6.0	2	0.05	0.026	0.006	0.0	15.3	76.5	8.2
▲	TP-01	8.0	150	36.794	3.536	0.157	47.8	25.5	6.3	
★	TP-03	1.5	2	0.092	0.029	0.005	0.0	49.0	40.3	10.7
⊙	TP-03	9.0	100	17.779	0.996		58.7	28.5	10.1	

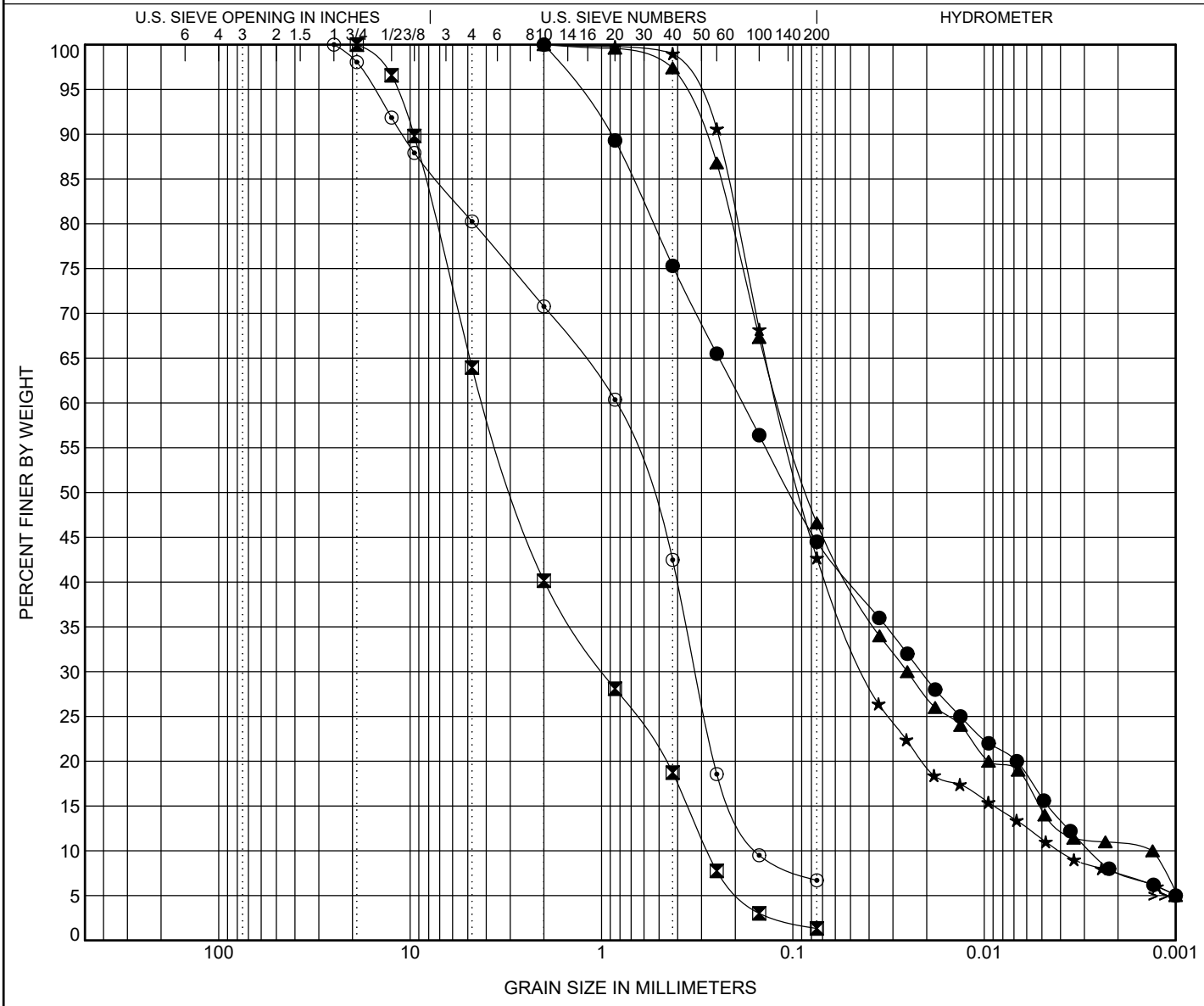
GRAIN SIZE - GINT STD US LAB.GDT - 5/3/20 20:17 - C:\USERS\TODD LORENZEN\DOCUMENTS\LORENZEN SOIL MECHANICS\WOITH ENGINEERING\TOLLEFSON - GEORGE ELMER DR\5.0 DELIVERABLES\GEORGE ELMER DRIVE.GPJ

GRAIN SIZE DISTRIBUTION

Lorenzen Soil Mechanics, Inc.
2720 Palmer Street, Unit C
Missoula, MT 59808
Telephone: 406-830-0633

CLIENT Tollefson Construction **PROJECT NAME** George Elmer Drive

PROJECT NUMBER P2020 **PROJECT LOCATION** Missoula



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	TP-04	1.0	SILTY SAND(SM)	NP	NP	NP	0.89	65.98
⊠	TP-04	2.5	POORLY GRADED SAND with GRAVEL(SP)	NP	NP	NP	0.83	14.77
▲	TP-05	0.5	SILTY SAND(SM)	NP	NP	NP	4.11	89.06
★	TP-05	3.0	SILTY SAND(SM)	NP	NP	NP	3.66	29.77
⊙	TP-06	3.5	POORLY GRADED SAND with SILT and GRAVEL(SP-SM)	NP	NP	NP	0.80	5.43

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	TP-04	1.0	2	0.184	0.021	0.003	0.0	55.5	28.6	15.9
⊠	TP-04	2.5	19	4.114	0.973	0.279	36.0	62.6	1.3	
▲	TP-05	0.5	2	0.117	0.025	0.001	0.0	53.4	32.1	14.5
★	TP-05	3.0	2	0.12	0.042	0.004	0.0	57.3	31.4	11.3
⊙	TP-06	3.5	25	0.838	0.322	0.154	19.7	73.6	6.7	

GRAIN SIZE - GINT STD US LAB.GDT - 5/3/20 20:17 - C:\USERS\TODD LORENZEN\DOCUMENTS\LORENZEN SOIL MECHANICS\WOITH ENGINEERING\TOLLEFSON - GEORGE ELMER DR\5.0 DELIVERABLES\GEORGE ELMER DRIVE.GPJ

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
PERCOLATION TEST FORM

Owner Name Tollefson Construction

Project Name McNett's Flats

Lot of Tract Number _____ Test Number Perc Test - 01

Diameter of Test Hole 4 inches Depth of Test Hole 9.5 feet

Date and Time Soak Period Began 09/08/20 12:55 p.m Ended 2nd Soak 09/08/20 2:35 p.m.

Date Test Began 09/08/2020

Distance of the reference point above the bottom of the hole 6 inches at 9.0-foot depth

Test Results

Start Time of Day	End Time of Day	Time Interval (Minutes)	Initial Distance Below Reference Point	Final Distance Below Reference Point	Drop in Water Level (inches)	Percolation Rate (minutes/inch)
2:40	2:55	15	0	2.75	2.75	5.5
2:57	3:12	15	0	2.5	2.5	6.0
3:15	3:30	15	0	2.5	2.5	6.0
3:33	3:48	15	0	2.5	2.5	6.0

I certify that this percolation test was done in general accordance with DEQ-4, Appendix A.

Groundwater table is located at 17.9 below the ground surface on 9/09/2020 [El. 3136.6].

Todd Lorenzen	Todd Lorenzen	10/16/2020
Name (printed)	Signature	Date

Lorenzen Soil Mechanics, Inc.
Company

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
PERCOLATION TEST FORM

Owner Name Tollefson Construction

Project Name McNett's Flats

Lot of Tract Number _____ Test Number Perc Test - 02

Diameter of Test Hole 4 inches Depth of Test Hole 9.5 feet...collapsed bottom 3.5 feet

Date and Time Soak Period Began 09/08/20 4:40 p.m Date Ended No column of water could be sustained

Test Began 09/08/2020

Distance of the reference point above the bottom of the hole 6 inches at 6-foot depth

Test Results

Start Time of Day	End Time of Day	Time Interval (Minutes)	Initial Distance Below Reference Point	Final Distance Below Reference Point	Drop in Water Level (inches)	Percolation Rate (minutes/inch)
4:40	4:55	15	6	6	-	<3.0

I certify that this percolation test was done in general accordance with DEQ-4, Appendix A.

Todd Lorenzen	Todd Lorenzen	10/16/2020
Name (printed)	Signature	Date

Lorenzen Soil Mechanics, Inc.
Company

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
PERCOLATION TEST FORM

Owner Name Tollefson Construction

Project Name McNett's Flats

Lot of Tract Number _____ Test Number Perc Test - 03

Diameter of Test Hole 4 inches Depth of Test Hole 9.5 feet...collapsed bottom 4 feet

Date and Time Soak Period Began 09/08/20 5:40 p.m Date Ended No column of water could be sustained

Test Began 09/08/2020

Distance of the reference point above the bottom of the hole 6 inches at 6-foot depth

Test Results

Start Time of Day	End Time of Day	Time Interval (Minutes)	Initial Distance Below Reference Point	Final Distance Below Reference Point	Drop in Water Level (inches)	Percolation Rate (minutes/inch)
5:40	5:55	15	6	6	-	<3.0

I certify that this percolation test was done in general accordance with DEQ-4, Appendix A.

Todd Lorenzen	Todd Lorenzen	10/16/2020
Name (printed)	Signature	Date

Lorenzen Soil Mechanics, Inc.
Company

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
PERCOLATION TEST FORM

Owner Name Tollefson Construction

Project Name McNett's Flats

Lot of Tract Number _____ Test Number Perc Test - 04

Diameter of Test Hole 4 inches Depth of Test Hole 9.5 feet

Date and Time Soak Period Began 09/08/20 6:40 p.m Date Ended 2nd Soak 09/09/20 11:15 a.m.

Test Began 09/09/2020

Distance of the reference point above the bottom of the hole 6 inches at 9.0-foot depth

Test Results

Start Time of Day	End Time of Day	Time Interval (Minutes)	Initial Distance Below Reference Point	Final Distance Below Reference Point	Drop in Water Level (inches)	Percolation Rate (minutes/inch)
11:22	11:37	15	0	2.0	2.0	7.5
11:39	11:54	15	0	1.75	1.75	8.5
11:57	12:12	15	0	3.5	1.75	8.5
12:14	12:29	15	0	3.5	1.75	8.5

I certify that this percolation test was done in general accordance with DEQ-4, Appendix A.

Groundwater table is located at 13.5 below the ground surface on 9/09/2020 [El. 3137.5].

Todd Lorenzen	Todd Lorenzen	10/16/2020
Name (printed)	Signature	Date

Lorenzen Soil Mechanics, Inc.
Company

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
PERCOLATION TEST FORM

Owner Name Tollefson Construction

Project Name McNett's Flats

Lot of Tract Number _____ Test Number Perc Test - 05

Diameter of Test Hole 4 inches Depth of Test Hole 9.5 feet

Date and Time Soak Period Began 09/09/20 8:40 a.m Date Ended 2nd Soak 09/09/20 9:40 a.m. bottom 3.5' of hole collapsed

Test Began 09/09/2020

Distance of the reference point above the bottom of the hole 6 inches at 6.0-foot depth

Test Results

Start Time of Day	End Time of Day	Time Interval (Minutes)	Initial Distance Below Reference Point	Final Distance Below Reference Point	Drop in Water Level (inches)	Percolation Rate (minutes/inch)
9:42	9:57	15	0	3.5	3.5	4.3
9:59	10:14	15	0	3.5	3.5	4.3
10:16	10:31	15	0	3.5	3.5	4.3
10:33	10:48	15	0	3.5	3.5	4.3

I certify that this percolation test was done in general accordance with DEQ-4, Appendix A.

Groundwater table is located at 19.25 below the ground surface on 9/09/2020 [El. 3175.75].

Todd Lorenzen	Todd Lorenzen	10/16/2020
Name (printed)	Signature	Date

Lorenzen Soil Mechanics, Inc.
Company

Description: BH-01 Perc Test Location. View is to the south.

Description: BH-01 Perc Test Location. View is to the east.

Lorenzen Soil Mechanics, Inc.

Project: McNett's Flats Percolation Testing – September 8-9, 2020

Description: BH-01 Split Spoon (SS) sample from the 5- to 6.5-foot depth.

Description: BH-01 SS sample from the 8- to 9.5-foot depth. Percolation test was completed at the 9.5-foot depth after drilling to that depth.

Description: BH-01 Perc test stand pipe installed.

Description: Moved the drill a few feet to drill to the 20-foot depth.

Lorenzen Soil Mechanics, Inc.

Project: McNett's Flats Percolation Testing – September 8-9, 2020

Description: BH-01 20-foot hole location in relation to the perc test hole. View is to the east.

Description: BH-01 SS sample from the 10- to 11.5-foot depth. The duct tape on the lid is mislabeled.

Lorenzen Soil Mechanics, Inc.

Project: McNett's Flats Percolation Testing – September 8-9, 2020

Description: BH-01 SS sample from the 15- to 16.5-foot depth.

Description: BH-01 SS sample from the 20- to 21.5-foot depth.

Lorenzen Soil Mechanics, Inc.

Project: McNett's Flats Percolation Testing – September 8-9, 2020

Description: BH-02 Location. View is to the east from BH-01 perc test pipe.

Description: BH-02 Location. View is to the east.

Lorenzen Soil Mechanics, Inc.

Project: McNett's Flats Percolation Testing – September 8-9, 2020

Description: BH-02 Location. View is to the south. TP-02 location from earlier investigation is in the foreground.

Description: BH-02 SS sample from the 5- to 6.5-foot depth.

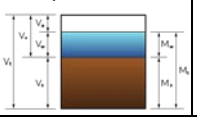
Lorenzen Soil Mechanics, Inc.

Project: McNett's Flats Percolation Testing – September 8-9, 2020

Description: BH-02 SS sample from the 8- to 9.5-foot depth.

Description: BH-02 Perc test hole collapsed by 3 feet after pulling the augers and prior to getting the PVC stand pipe in. Percolation test was conducted but no standing water could be kept inside the standpipe.

Lorenzen Soil Mechanics, Inc.



Project: McNett's Flats Percolation Testing – September 8-9, 2020

Description: BH-03 Location in the background. View is to the east from the BH-02 perc test location.

Description: BH-03 Location. View is to the east.

Lorenzen Soil Mechanics, Inc.

Project: McNett's Flats Percolation Testing – September 8-9, 2020

Description: BH-03 Location. View is to the south from the earlier TP-05 location.

Description: Bh-03 SS sample from the 5- to 6.5-fot depth.

Lorenzen Soil Mechanics, Inc.

Project: McNett's Flats Percolation Testing – September 8-9, 2020

Description: BH-03 Location. View is to the 8- to 9.5-foot depth.

Description: BH-03 Removing auger prior to placing the PVC standpipe for the perc testing. Similar to BH-02, there was a collapse of 3.5 feet in the open hole after pulling the augers prior to installing the standpipe.

Description: BH-04 Location. View is to the south.

Description: BH-04 Location. View is to the northeast.

Lorenzen Soil Mechanics, Inc.

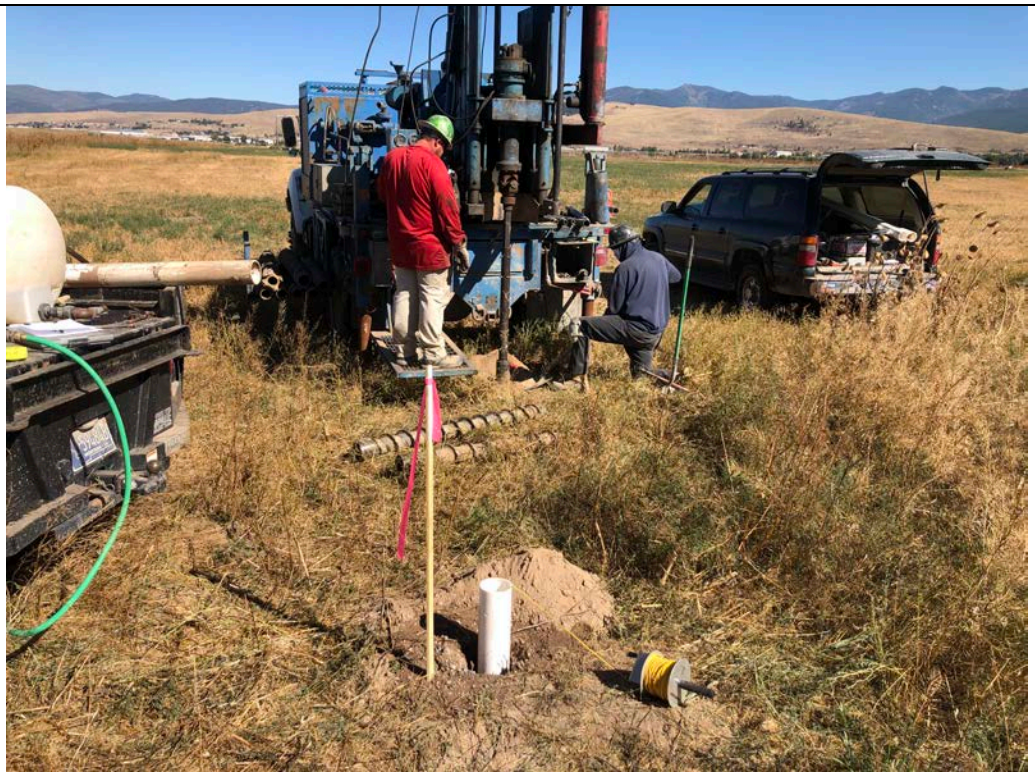
Project: McNett's Flats Percolation Testing – September 8-9, 2020

Description: BH-04 SS sample from the 5- to 6.5-foot depth.

Description: BH-04 SS sample from the 8- to the 9.5-foot depth.

Lorenzen Soil Mechanics, Inc.

Project: McNett's Flats Percolation Testing – September 8-9, 2020



Description: BH-04 20-foot deep hole in relation to the perc test hole. Testing was in progress during the drilling.

Description: BH-04 SS sample from the 10- to 11.5-foot depth.

Description: BH-04 SS sample from the 15- to 16.5-foot depth.

Description: BH-04 SS sample from the 20- to 21.5-foot depth.

Lorenzen Soil Mechanics, Inc.

Project: McNett's Flats Percolation Testing – September 8-9, 2020

Description: BH-05 Location. View is to the east.

Description: BH-05 Location. View is to the north.

Lorenzen Soil Mechanics, Inc.

Project: McNett's Flats Percolation Testing – September 8-9, 2020

Description: BH-05 Location. View is to the north from the detention pond.

Description: BH-05 SS sample from the 5- to 6.5-foot depth.

Lorenzen Soil Mechanics, Inc.

Project: McNett's Flats Percolation Testing – September 8-9, 2020

Description: BH-05 SS sample from the 8- to 9.5-foot depth.

Description: BH-05 Perc test hole collapsed 3 feet after pulling the augers prior to getting the PVC standpipe installed.

Lorenzen Soil Mechanics, Inc.

Project: McNett's Flats Percolation Testing – September 8-9, 2020

Description: BH-05 20-foot deep borehole I relation to the percolation test borehole.

Description: BH-05 SS sample from the 10- to 11.5-fot depth.

Lorenzen Soil Mechanics, Inc.

Project: McNett's Flats Percolation Testing – September 8-9, 2020

Description: BH-05 SS sample from the 15- to 16.5-foot depth.

Description: BH-05 SS sample from the 20- to 21.5-foot depth.

Description: BH-01 Moisture content samples prior to being placed into the drying oven.

Description: BH-01 Moisture content samples after being taken out of the drying oven.

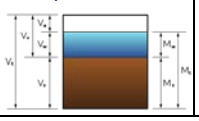
Lorenzen Soil Mechanics, Inc.

Project: McNett's Flats Percolation Testing – September 8-9, 2020

Description: BH-02 Moisture content samples prior to being placed into the drying oven.

Description: BH-02 Moisture content samples after being taken out of the drying oven.

Lorenzen Soil Mechanics, Inc.

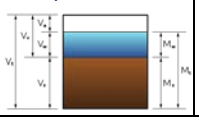


Project: McNett's Flats Percolation Testing – September 8-9, 2020

Description: BH-03 Moisture content samples prior to being placed into the drying oven.

Description: BH-03 Moisture content samples after being taken out of the drying oven.

Lorenzen Soil Mechanics, Inc.



Project: McNett's Flats Percolation Testing – September 8-9, 2020

Description: BH-04 Moisture content samples prior to being placed into the drying oven.

Description: BH-04 Moisture content samples after being taken out of the drying oven.

Lorenzen Soil Mechanics, Inc.

Project: McNett's Flats Percolation Testing – September 8-9, 2020

Description: BH-05 Moisture content samples prior to being placed into the drying oven.

Description: BH-05 Moisture content samples after being taken out of the drying oven.

Description:	
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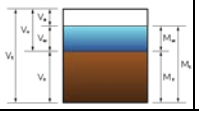
Lorenzen Soil Mechanics, Inc. 	Project: McNett's Flats
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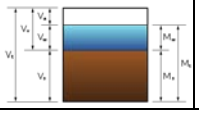
Lorenzen Soil Mechanics, Inc. 	Project: McNett's Flats
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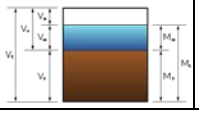
Lorenzen Soil Mechanics, Inc. 	Project: McNett's Flats

Appendix 5

STORM AND SANITARY ANALYSIS SOFTWARE OUTPUT

Project Description

File Name ..... 1931 - SWMM V4.SPF

Project Options

Flow Units ..... CFS
Elevation Type ..... Elevation
Hydrology Method ..... SCS TR-55
Time of Concentration (TOC) Method ..... SCS TR-55
Link Routing Method ..... Hydrodynamic
Enable Overflow Ponding at Nodes ..... YES
Skip Steady State Analysis Time Periods ..... YES

Analysis Options

Start Analysis On ..... Oct 01, 2020 00:00:00
End Analysis On ..... Oct 05, 2020 00:00:00
Start Reporting On ..... Oct 01, 2020 00:00:00
Antecedent Dry Days ..... 0 days
Runoff (Dry Weather) Time Step ..... 0 01:00:00 days hh:mm:ss
Runoff (Wet Weather) Time Step ..... 0 00:05:00 days hh:mm:ss
Reporting Time Step ..... 0 00:00:30 days hh:mm:ss
Routing Time Step ..... 2 seconds

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1		Time Series	MSLA 2YR/24HR	Intensity	inches	Montana	Missoula	2	1.17	SCS Type II 24-hr

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	BASIN_10_ROW	0.10	484.00	98.00	1.17	0.94	0.09	0.14	0 00:05:00
2	BASIN_10_VACANT	0.26	484.00	58.00	1.17	0.00	0.00	0.00	0 00:53:53
3	BASIN_11_ROW	0.15	484.00	98.00	1.17	0.95	0.14	0.21	0 00:05:00
4	BASIN_11_VACANT	0.72	484.00	58.00	1.17	0.00	0.00	0.00	0 01:04:00
5	BASIN_12_ROW	0.09	484.00	98.00	1.17	0.94	0.08	0.13	0 00:05:00
6	BASIN_12_VACANT	0.40	484.00	58.00	1.17	0.00	0.00	0.00	0 00:42:09
7	BASIN_13_ROW	0.14	484.00	98.00	1.17	0.95	0.13	0.19	0 00:05:00
8	BASIN_13_VACANT	0.39	484.00	58.00	1.17	0.00	0.00	0.00	0 00:47:00
9	BASIN_14_ROW	0.15	484.00	98.00	1.17	0.95	0.14	0.22	0 00:05:00
10	BASIN_14_VACANT	0.76	484.00	58.00	1.17	0.00	0.00	0.00	0 01:04:00
11	BASIN_15_ROW	0.13	484.00	98.00	1.17	0.95	0.12	0.18	0 00:05:00
12	BASIN_15_VACANT	0.45	484.00	58.00	1.17	0.00	0.00	0.00	0 00:43:39
13	BASIN_16_ROW	0.13	484.00	98.00	1.17	0.95	0.12	0.18	0 00:05:00
14	BASIN_16_VACANT	0.48	484.00	58.00	1.17	0.00	0.00	0.00	0 00:43:39
15	BASIN_17_ROW	0.12	484.00	98.00	1.17	0.94	0.11	0.17	0 00:05:00
16	BASIN_17_VACANT	0.34	484.00	58.00	1.17	0.00	0.00	0.00	0 00:57:57
17	BASIN_18_ROW	0.11	484.00	98.00	1.17	0.94	0.10	0.16	0 00:05:00
18	BASIN_18_VACANT	0.31	484.00	58.00	1.17	0.00	0.00	0.00	0 00:59:00
19	BASIN_19_ROW	0.08	484.00	98.00	1.17	0.92	0.07	0.11	0 00:05:00
20	BASIN_19_VACANT	0.06	484.00	58.00	1.17	0.00	0.00	0.00	0 00:23:59
21	BASIN_2_ROW	0.18	484.00	98.00	1.17	0.95	0.17	0.26	0 00:05:00
22	BASIN_2_VACANT	0.46	484.00	58.00	1.17	0.00	0.00	0.00	0 00:56:54
23	BASIN_20_ROW	0.12	484.00	98.00	1.17	0.94	0.12	0.17	0 00:05:00
24	BASIN_20_VACANT	0.38	484.00	58.00	1.17	0.00	0.00	0.00	0 01:00:23
25	BASIN_21_ROW	0.12	484.00	98.00	1.17	0.94	0.12	0.17	0 00:05:00
26	BASIN_21_VACANT	0.44	484.00	58.00	1.17	0.00	0.00	0.00	0 01:03:39
27	BASIN_22_ROW	0.14	484.00	98.00	1.17	0.95	0.13	0.20	0 00:05:00
28	BASIN_22_VACANT	0.71	484.00	58.00	1.17	0.00	0.00	0.00	0 00:51:01
29	BASIN_23_ROW	0.14	484.00	98.00	1.17	0.95	0.13	0.20	0 00:05:00
30	BASIN_23_VACANT	0.63	484.00	58.00	1.17	0.00	0.00	0.00	0 00:47:55
31	BASIN_24_ROW	0.11	484.00	98.00	1.17	0.94	0.11	0.16	0 00:05:00
32	BASIN_24_VACANT	0.29	484.00	58.00	1.17	0.00	0.00	0.00	0 00:56:33
33	BASIN_25_ROW	0.13	484.00	98.00	1.17	0.95	0.12	0.18	0 00:05:00
34	BASIN_25_VACANT	0.30	484.00	58.00	1.17	0.00	0.00	0.00	0 00:53:10
35	BASIN_26_ROW	0.17	484.00	98.00	1.17	0.95	0.16	0.24	0 00:05:00
36	BASIN_26_VACANT	0.41	484.00	58.00	1.17	0.00	0.00	0.00	0 00:52:49
37	BASIN_27_ROW	0.05	484.00	98.00	1.17	0.83	0.04	0.07	0 00:05:00
38	BASIN_27_VACANT	0.01	484.00	58.00	1.17	0.00	0.00	0.00	0 00:09:19
39	BASIN_28_ROW	0.12	484.00	98.00	1.17	0.94	0.11	0.17	0 00:05:00
40	BASIN_28_VACANT	0.46	484.00	58.00	1.17	0.00	0.00	0.00	0 00:50:50
41	BASIN_29_ROW	0.12	484.00	98.00	1.17	0.94	0.11	0.17	0 00:05:00
42	BASIN_29_VACANT	0.42	484.00	58.00	1.17	0.00	0.00	0.00	0 00:47:45
43	BASIN_3_ROW	0.15	484.00	98.00	1.17	0.95	0.14	0.21	0 00:05:00
44	BASIN_3_VACANT	0.27	484.00	58.00	1.17	0.00	0.00	0.00	0 00:56:54
45	BASIN_30_ROW	0.15	484.00	98.00	1.17	0.95	0.14	0.22	0 00:05:00
46	BASIN_30_VACANT	0.63	484.00	58.00	1.17	0.00	0.00	0.00	0 01:04:00
47	BASIN_31_ROW	0.15	484.00	98.00	1.17	0.95	0.14	0.22	0 00:05:00
48	BASIN_31_VACANT	0.71	484.00	58.00	1.17	0.00	0.00	0.00	0 00:59:31
49	BASIN_32_ROW	0.12	484.00	98.00	1.17	0.94	0.12	0.17	0 00:05:00
50	BASIN_32_VACANT	0.52	484.00	58.00	1.17	0.00	0.00	0.00	0 00:54:36
51	BASIN_33_ROW	0.12	484.00	98.00	1.17	0.94	0.12	0.17	0 00:05:00
52	BASIN_33_VACANT	0.54	484.00	58.00	1.17	0.00	0.00	0.00	0 00:56:22
53	BASIN_34_ROW	0.07	484.00	98.00	1.17	0.89	0.06	0.10	0 00:05:00
54	BASIN_34_VACANT	0.51	484.00	58.00	1.17	0.00	0.00	0.00	0 00:45:54
55	BASIN_35_ROW	0.07	484.00	98.00	1.17	0.89	0.06	0.10	0 00:05:00
56	BASIN_35_VACANT	0.34	484.00	58.00	1.17	0.00	0.00	0.00	0 00:43:16
57	BASIN_36_ROW	0.13	484.00	98.00	1.17	0.95	0.12	0.18	0 00:05:00
58	BASIN_36_VACANT	0.35	484.00	58.00	1.17	0.00	0.00	0.00	0 00:44:24
59	BASIN_37_ROW	0.12	484.00	98.00	1.17	0.94	0.12	0.17	0 00:05:00
60	BASIN_37_VACANT	0.44	484.00	58.00	1.17	0.00	0.00	0.00	0 00:45:20
61	BASIN_38_ROW	0.09	484.00	98.00	1.17	0.94	0.09	0.14	0 00:05:00
62	BASIN_38_VACANT	0.25	484.00	58.00	1.17	0.00	0.00	0.00	0 00:51:44
63	BASIN_4_ROW	0.06	484.00	98.00	1.17	0.85	0.05	0.08	0 00:05:00
64	BASIN_4_VACANT	0.04	484.00	58.00	1.17	0.00	0.00	0.00	0 00:23:46
65	BASIN_5_ROW	0.15	484.00	98.00	1.17	0.95	0.14	0.21	0 00:05:00
66	BASIN_5_VACANT	1.12	484.00	58.00	1.17	0.00	0.00	0.00	0 00:57:36
67	BASIN_6_ROW	0.13	484.00	98.00	1.17	0.95	0.12	0.18	0 00:05:00
68	BASIN_6_VACANT	0.44	484.00	58.00	1.17	0.00	0.00	0.00	0 00:47:00
69	BASIN_7_ROW	0.07	484.00	98.00	1.17	0.89	0.06	0.10	0 00:05:00
70	BASIN_7_VACANT	0.33	484.00	58.00	1.17	0.00	0.00	0.00	0 00:39:17
71	BASIN_8_ROW	0.10	484.00	98.00	1.17	0.94	0.10	0.15	0 00:05:00
72	BASIN_8_VACANT	0.26	484.00	58.00	1.17	0.00	0.00	0.00	0 00:50:28
73	BASIN_9_ROW	0.10	484.00	98.00	1.17	0.94	0.09	0.14	0 00:05:00
74	BASIN_9_VACANT	0.25	484.00	58.00	1.17	0.00	0.00	0.00	0 00:53:53
75	FLYNNRANCH	24.35	484.00	81.06	1.17	0.16	3.94	1.86	0 00:40:00

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Jun-02	Junction	3151.24	3155.50	3151.24	3155.50	0.00	0.00	3151.24	0.00	4.34	0 00:00	0.00	0.00
2	Out-02	Outfall	0.00					0.00	0.00					
3	OUTFALL	Outfall	0.00					0.00	0.00					
4	EX-POND	Storage Node	3150.40	3155.50	3150.40		10000.00	1.86	3150.90				0.00	0.00
5	Out-1SDP 4	Storage Node	3144.95	3154.95	3144.95		0.00	0.49	3150.04				0.00	0.00
6	SDS 1	Storage Node	3146.51	3156.51	3146.51		0.00	0.00	3146.51				0.00	0.00
7	SDS 10	Storage Node	3144.15	3154.15	3144.15		1000.00	0.14	3148.85				0.00	0.00
8	SDS 11	Storage Node	3144.06	3154.06	3144.06		1000.00	0.21	3148.08				0.00	0.00
9	SDS 12	Storage Node	3144.06	3154.06	3144.06		1000.00	0.13	3148.50				0.00	0.00
10	SDS 13	Storage Node	3145.41	3155.41	3145.41		1000.00	0.19	3149.64				0.00	0.00
11	SDS 14	Storage Node	3145.41	3155.41	3145.41		1000.00	0.22	3149.55				0.00	0.00
12	SDS 15	Storage Node	3145.06	3155.06	3145.06		1000.00	0.18	3149.26				0.00	0.00
13	SDS 16	Storage Node	3145.06	3155.06	3145.06		1000.00	0.18	3149.26				0.00	0.00
14	SDS 17	Storage Node	3144.38	3154.38	3144.38		1000.00	0.17	3148.43				0.00	0.00
15	SDS 18	Storage Node	3144.37	3154.37	3144.37		1000.00	0.15	3148.94				0.00	0.00
16	SDS 19	Storage Node	3144.52	3154.52	3144.52		1000.00	0.11	3150.10				0.00	0.00
17	SDS 2	Storage Node	3145.50	3155.50	3145.50		0.00	0.42	3150.04				0.00	0.00
18	SDS 20	Storage Node	3144.64	3154.64	3144.64		1000.00	0.17	3149.23				0.00	0.00
19	SDS 21	Storage Node	3144.66	3154.66	3144.66		1000.00	0.17	3148.71				0.00	0.00
20	SDS 22	Storage Node	3146.75	3156.75	3146.75		1000.00	0.20	3150.66				0.00	0.00
21	SDS 23	Storage Node	3146.75	3156.75	3146.75		1000.00	0.20	3150.66				0.00	0.00
22	SDS 24	Storage Node	3145.70	3155.70	3145.70		1000.00	0.16	3150.51				0.00	0.00
23	SDS 25	Storage Node	3145.96	3155.96	3145.96		1000.00	0.18	3150.16				0.00	0.00
24	SDS 26	Storage Node	3145.93	3155.93	3145.93		1000.00	0.24	3150.30				0.00	0.00
25	SDS 27	Storage Node	3145.69	3155.69	3145.69		1000.00	0.07	3148.75				0.00	0.00
26	SDS 28	Storage Node	3146.31	3156.31	3146.31		1000.00	0.17	3150.36				0.00	0.00
27	SDS 29	Storage Node	3146.31	3156.31	3146.31		1000.00	0.17	3150.36				0.00	0.00
28	SDS 3	Storage Node	3145.50	3155.50	3145.50		0.00	0.57	3150.04				0.00	0.00
29	SDS 30	Storage Node	3145.07	3155.07	3145.07		0.00	0.22	3149.21				0.00	0.00
30	SDS 31	Storage Node	3145.07	3155.07	3145.07		0.00	0.22	3149.21				0.00	0.00
31	SDS 32	Storage Node	3145.81	3155.81	3145.81		0.00	0.17	3149.78				0.00	0.00
32	SDS 33	Storage Node	3145.81	3155.81	3145.81		0.00	0.17	3149.78				0.00	0.00
33	SDS 34	Storage Node	3145.71	3155.71	3145.71		1000.00	0.10	3149.37				0.00	0.00
34	SDS 35	Storage Node	3145.69	3155.69	3145.69		1000.00	0.10	3149.35				0.00	0.00
35	SDS 36	Storage Node	3145.61	3155.61	3145.61		1000.00	0.18	3149.81				0.00	0.00
36	SDS 37	Storage Node	3145.61	3155.61	3145.61		1000.00	0.17	3149.66				0.00	0.00
37	SDS 5	Storage Node	3144.22	3154.22	3144.22		1000.00	0.21	3150.33				0.00	0.00
38	SDS 6	Storage Node	3144.22	3154.22	3144.22		1000.00	0.18	3148.43				0.00	0.00
39	SDS 7	Storage Node	3144.19	3154.19	3144.19		1000.00	0.10	3148.52				0.00	0.00
40	SDS 8	Storage Node	3144.19	3154.19	3144.19		1000.00	0.15	3148.53				0.00	0.00
41	SDS 9	Storage Node	3144.20	3154.20	3144.20		1000.00	0.14	3148.32				0.00	0.00
42	SDS_38	Storage Node	3145.96	3155.96	3145.96		1000.00	0.14	3150.08				0.00	0.00

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	Link-01	Pipe	SDS 5	OUTFALL	29.78	3154.22	3154.00	0.7500	18.000	0.0150	0.00	7.87	0.00	0.00	0.00	0.00	0.00	Calculated
2	Link-02	Pipe	Jun-02	SDS 1	140.60	3151.24	3150.37	0.6200	18.000	0.0110	0.00	9.76	0.00	0.00	0.00	0.00	0.00	Calculated
3	SDP 2	Pipe	SDS 1	SDS 2	250.54	3150.27	3148.71	0.6200	18.000	0.0120	0.00	8.96	0.00	0.00	0.66	0.44	0.00	Calculated
4	SDP 3	Pipe	SDS 2	SDS 3	45.01	3148.62	3148.34	0.6200	18.000	0.0120	0.25	8.96	0.03	1.95	1.46	0.98	0.00	Calculated
5	SDP 4	Pipe	SDS 3	Out-1SDP 4	78.23	3148.14	3147.65	0.6200	18.000	0.0120	0.41	8.96	0.05	2.17	1.50	1.00	957.00	SURCHARGED
6	L1-1	Orifice	EX-POND	Jun-02		3150.40	3151.24		4.500		0.00							
7	L1-2	Orifice	EX-POND	Jun-02		3150.40	3151.24		4.500		0.00							
8	L2-1	Orifice	EX-POND	Jun-02		3150.40	3151.24		4.500		0.00							
9	L2-2	Orifice	EX-POND	Jun-02		3150.40	3151.24		4.500		0.00							
10	L2-3	Orifice	EX-POND	Jun-02		3150.40	3151.24		4.500		0.00							
11	L2-4	Orifice	EX-POND	Jun-02		3150.40	3151.24		4.500		0.00							
12	L3	Orifice	EX-POND	Jun-02		3150.40	3151.24		4.500		0.00							
13	Orifice-10	Outlet	EX-POND	Jun-02		3150.40	3151.24				0.00							

Subbasin Hydrology

Subbasin : BASIN_10_ROW

Input Data

Area (ac) 0.10
Peak Rate Factor 484.00
Weighted Curve Number 98.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.10	B	98.00
Composite Area & Weighted CN	0.10		98.00

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

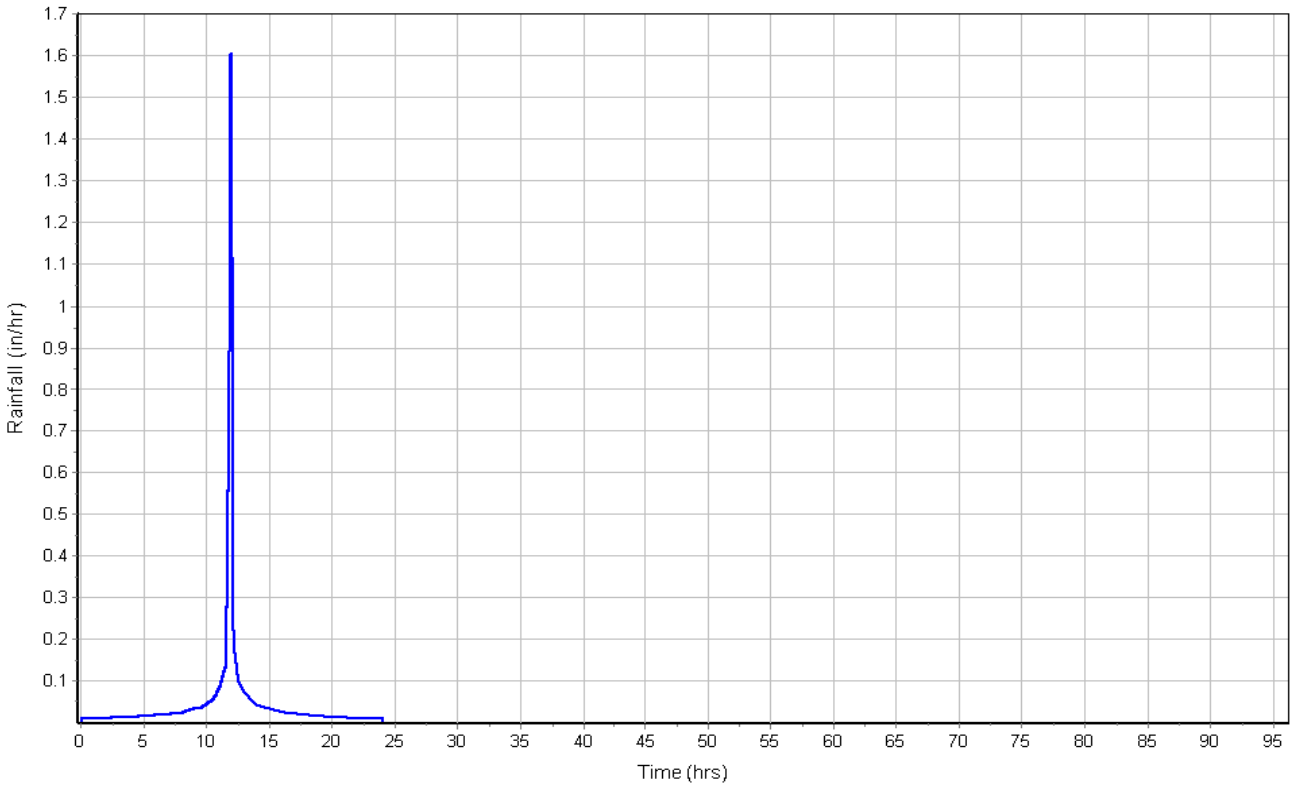
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

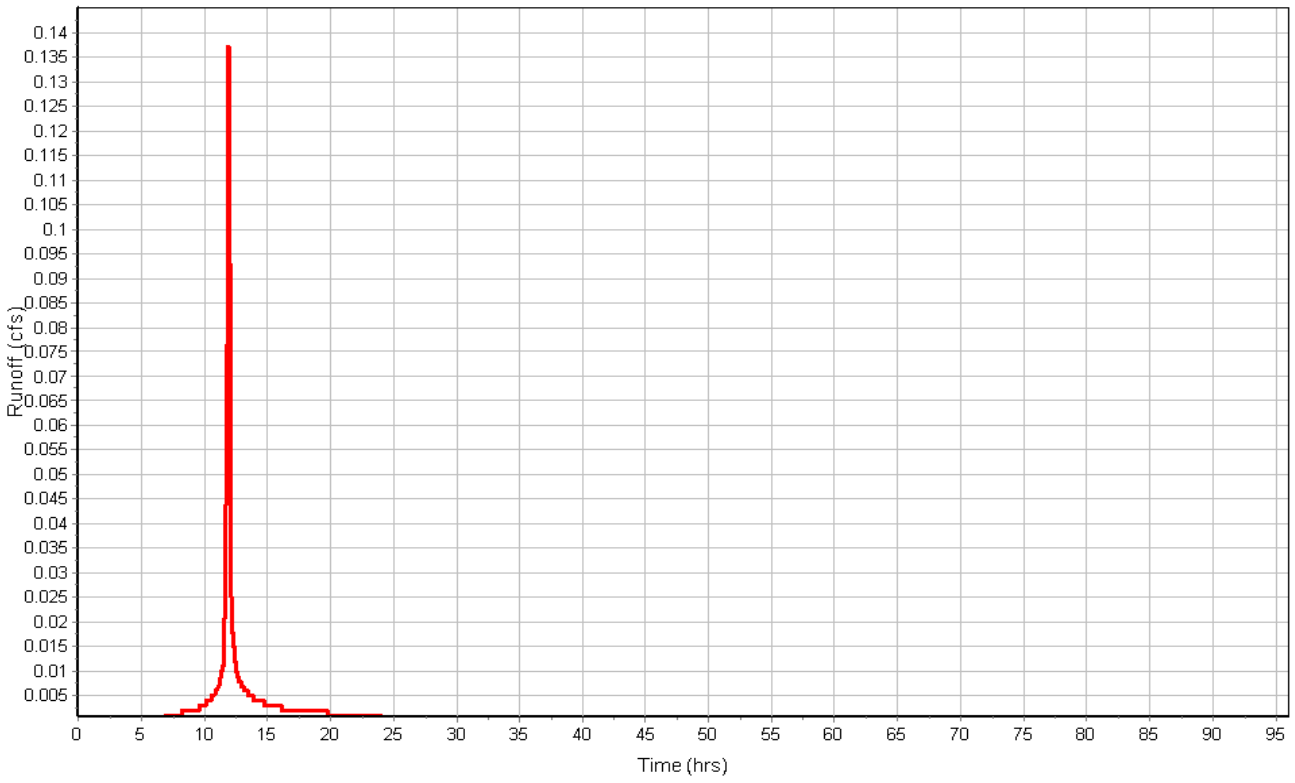
Total Rainfall (in) 1.17
Total Runoff (in) 0.94
Peak Runoff (cfs) 0.14
Weighted Curve Number 98.00
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : BASIN_10_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_10_VACANT

Input Data

Area (ac) 0.26
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.26	B	58.00
Composite Area & Weighted CN	0.26		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	242	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	53.89	0.00	0.00

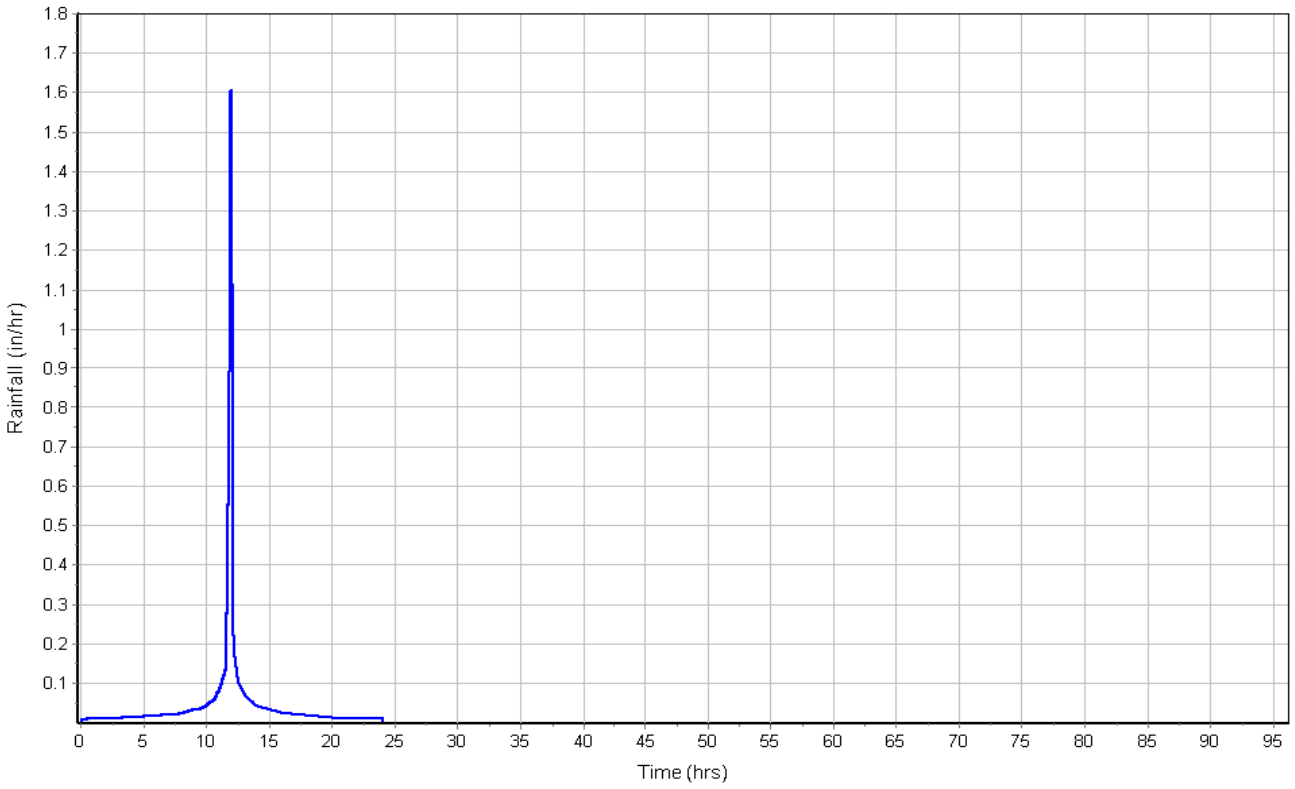
Total TOC (min) 53.89

Subbasin Runoff Results

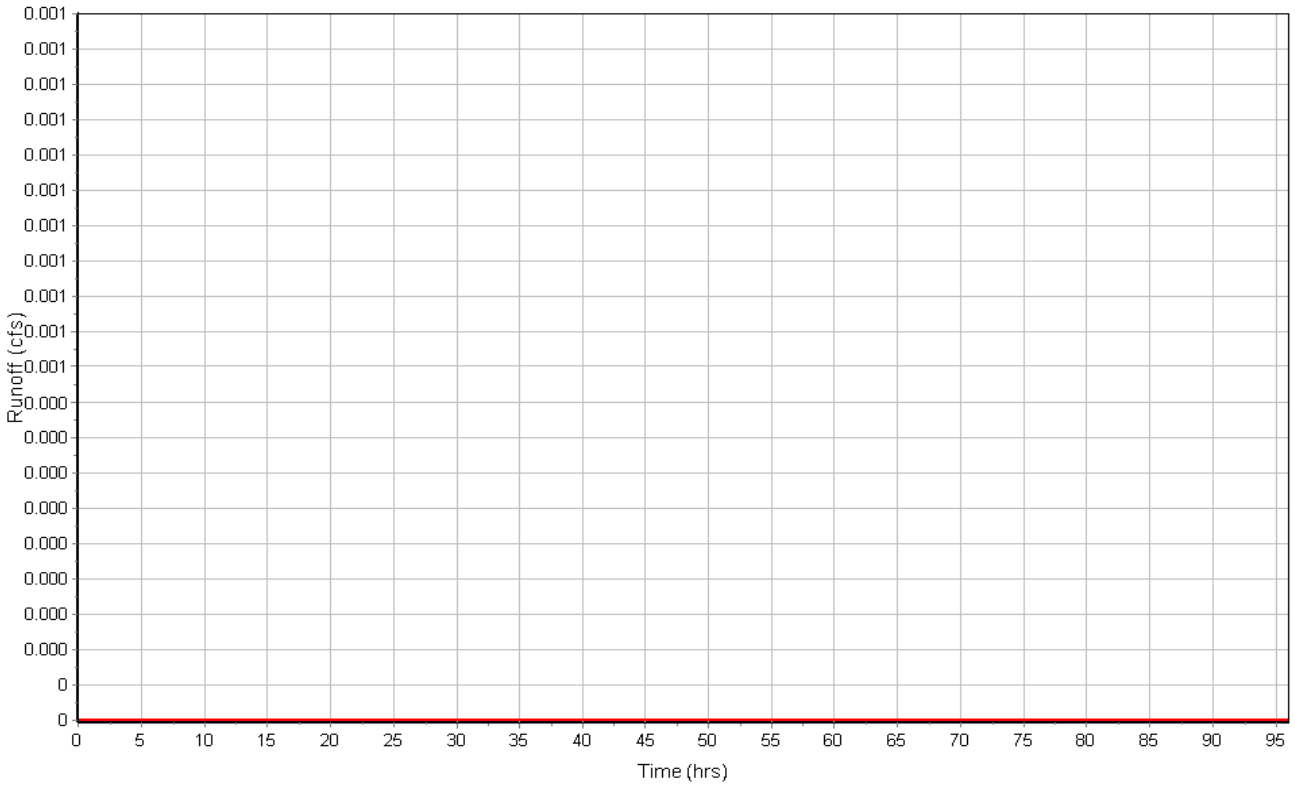
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:53:53

Subbasin : BASIN_10_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_11_ROW

Input Data

Area (ac)	0.15
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.15	B	98.00
Composite Area & Weighted CN	0.15		98.00

Time of Concentration

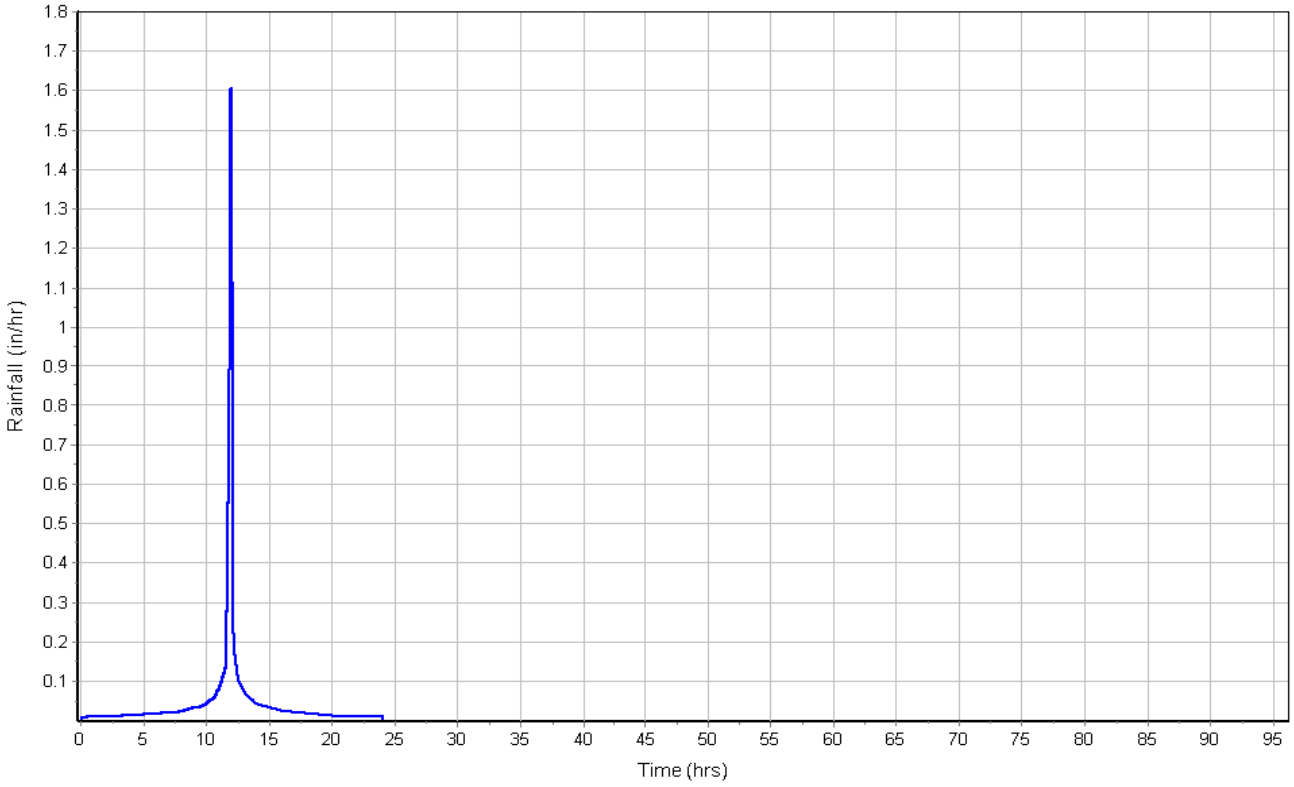
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

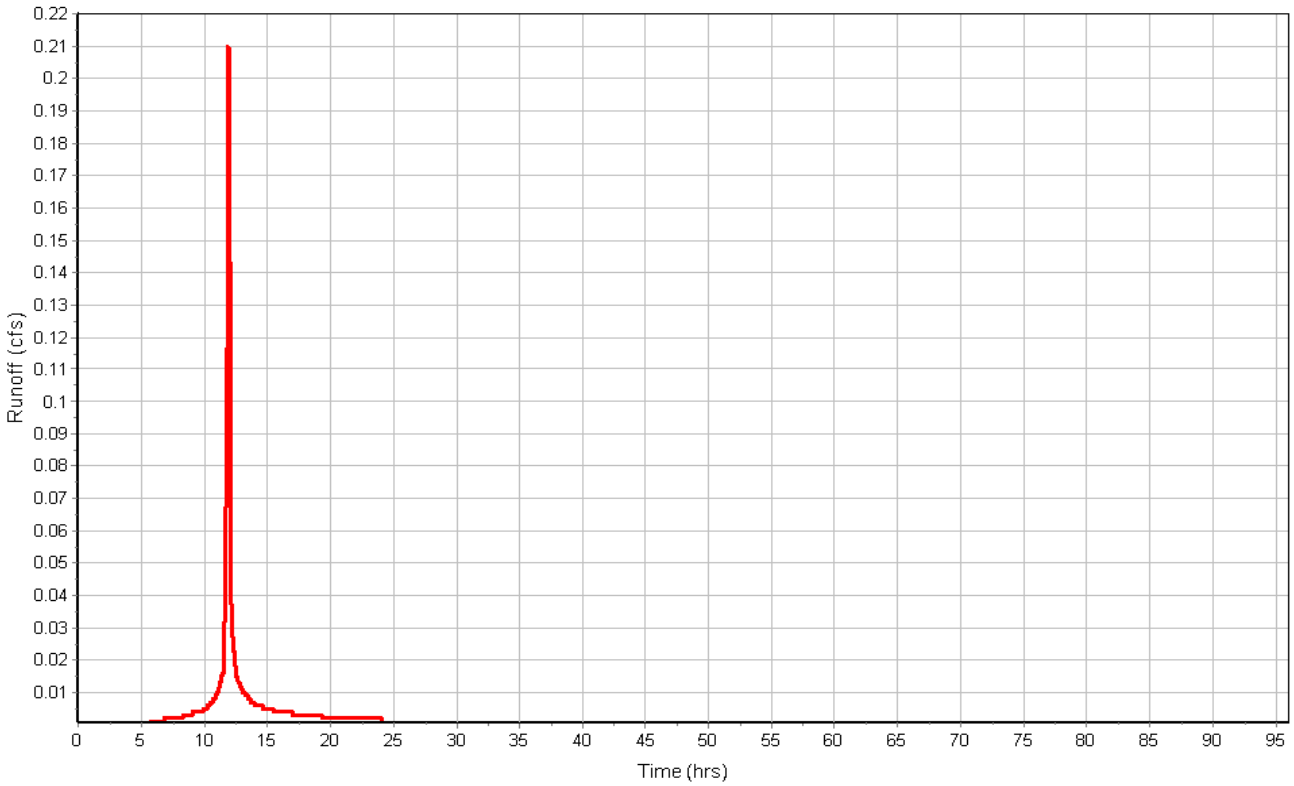
Total Rainfall (in)	1.17
Total Runoff (in)	0.95
Peak Runoff (cfs)	0.21
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_11_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_11_VACANT

Input Data

Area (ac) 0.72
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.72	B	58.00
Composite Area & Weighted CN	0.72		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	300	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	64.00	0.00	0.00

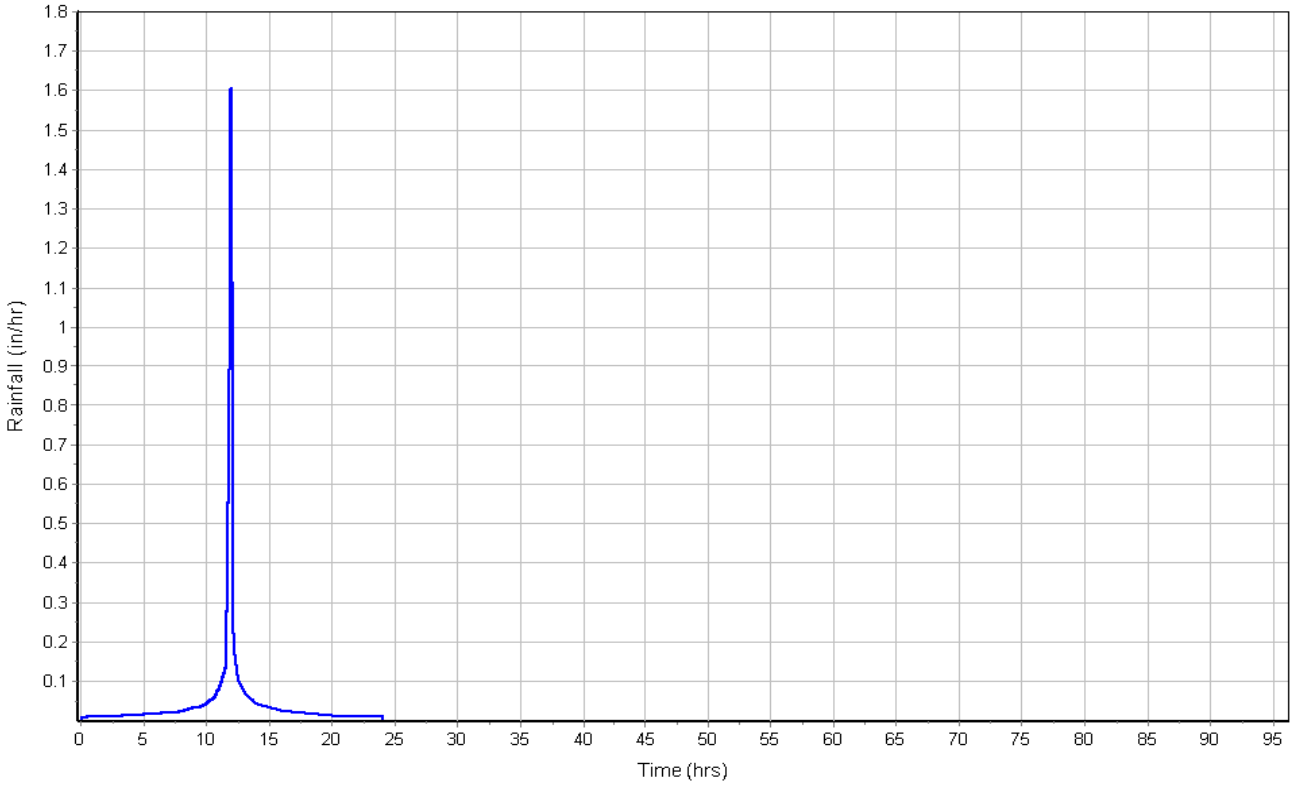
Total TOC (min) 64.00

Subbasin Runoff Results

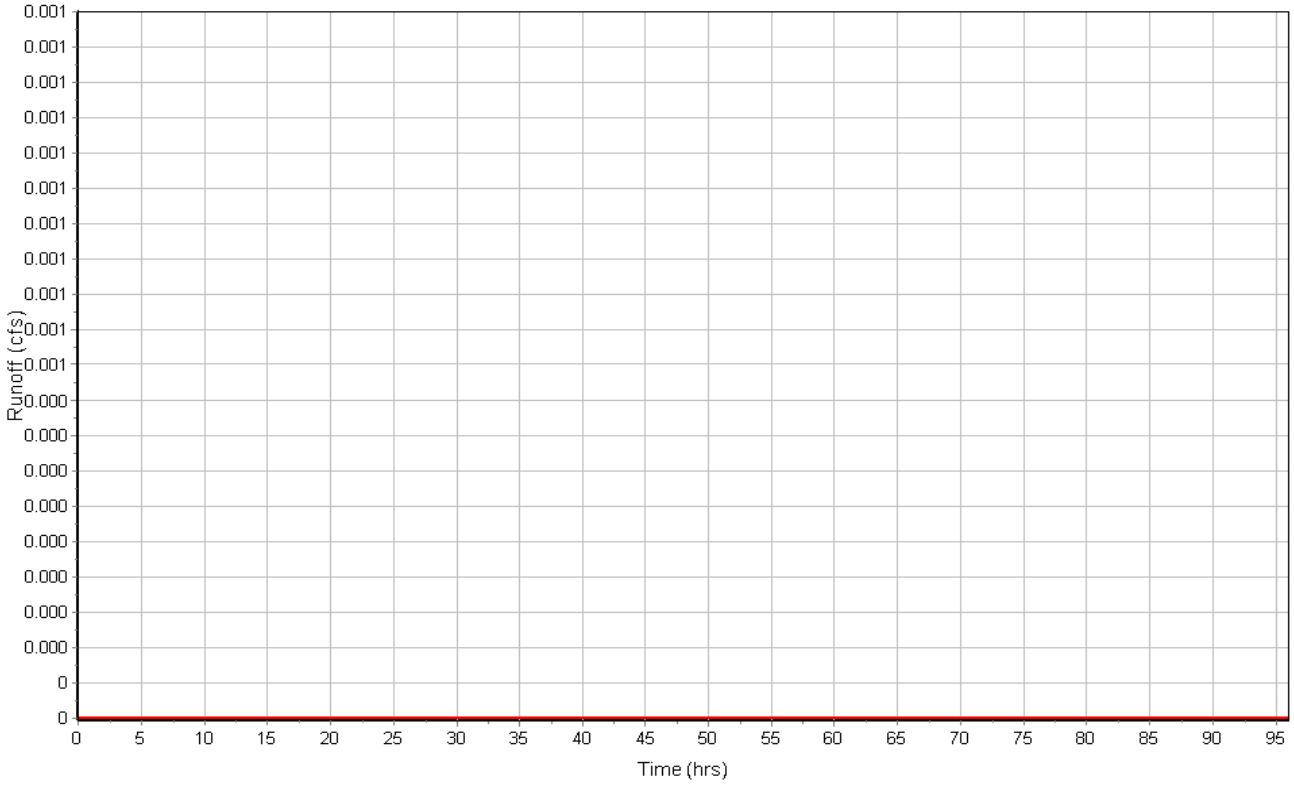
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 01:04:00

Subbasin : BASIN_11_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_12_ROW

Input Data

Area (ac)	0.09
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.09	B	98.00
Composite Area & Weighted CN	0.09		98.00

Time of Concentration

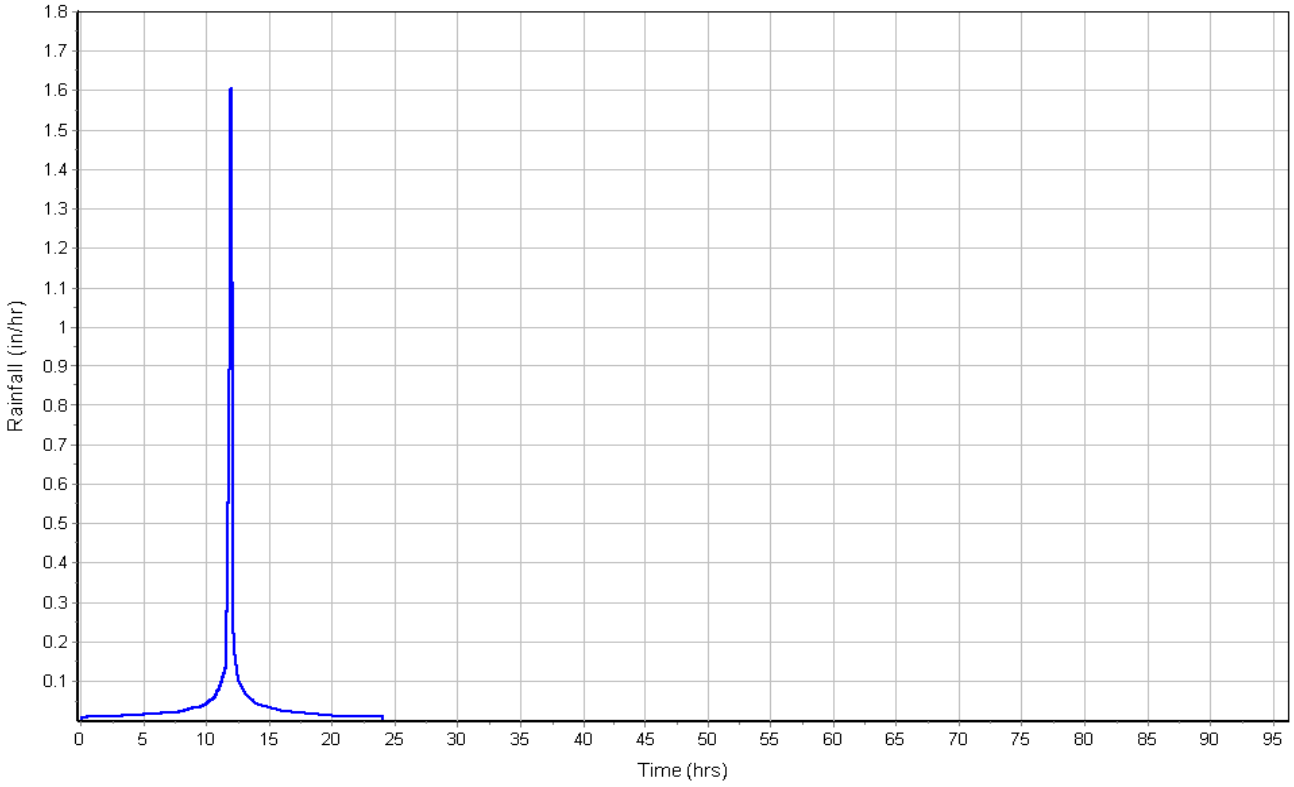
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

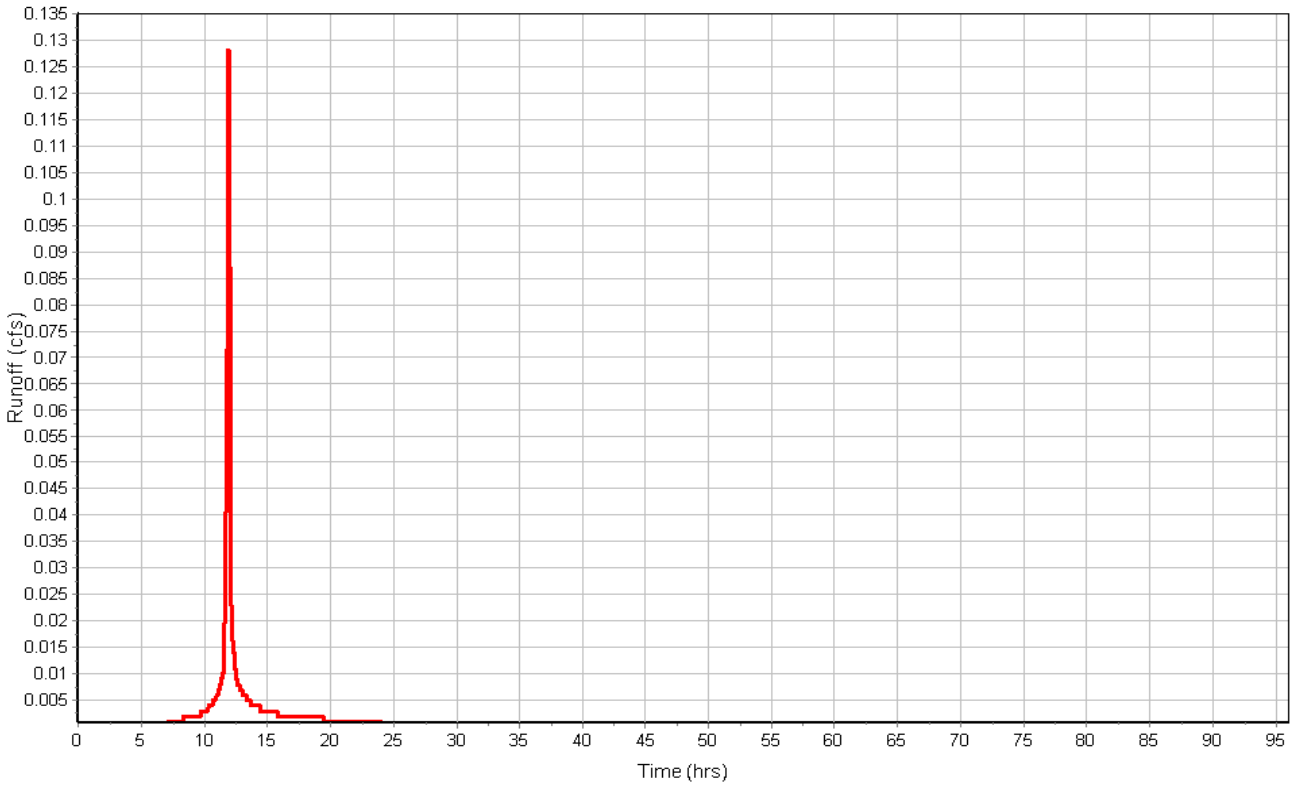
Total Rainfall (in)	1.17
Total Runoff (in)	0.94
Peak Runoff (cfs)	0.13
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_12_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_12_VACANT

Input Data

Area (ac) 0.40
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.40	B	58.00
Composite Area & Weighted CN	0.40		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	178	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	42.15	0.00	0.00

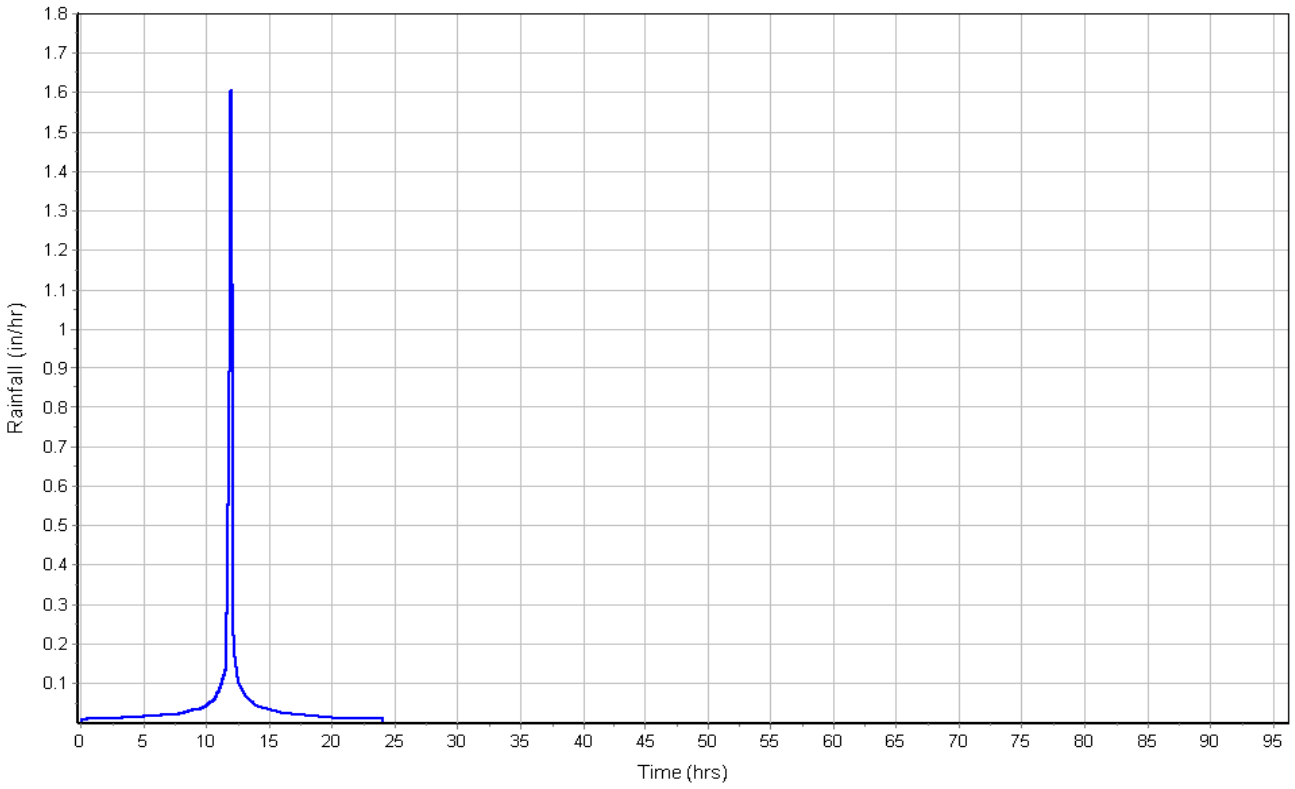
Total TOC (min) 42.15

Subbasin Runoff Results

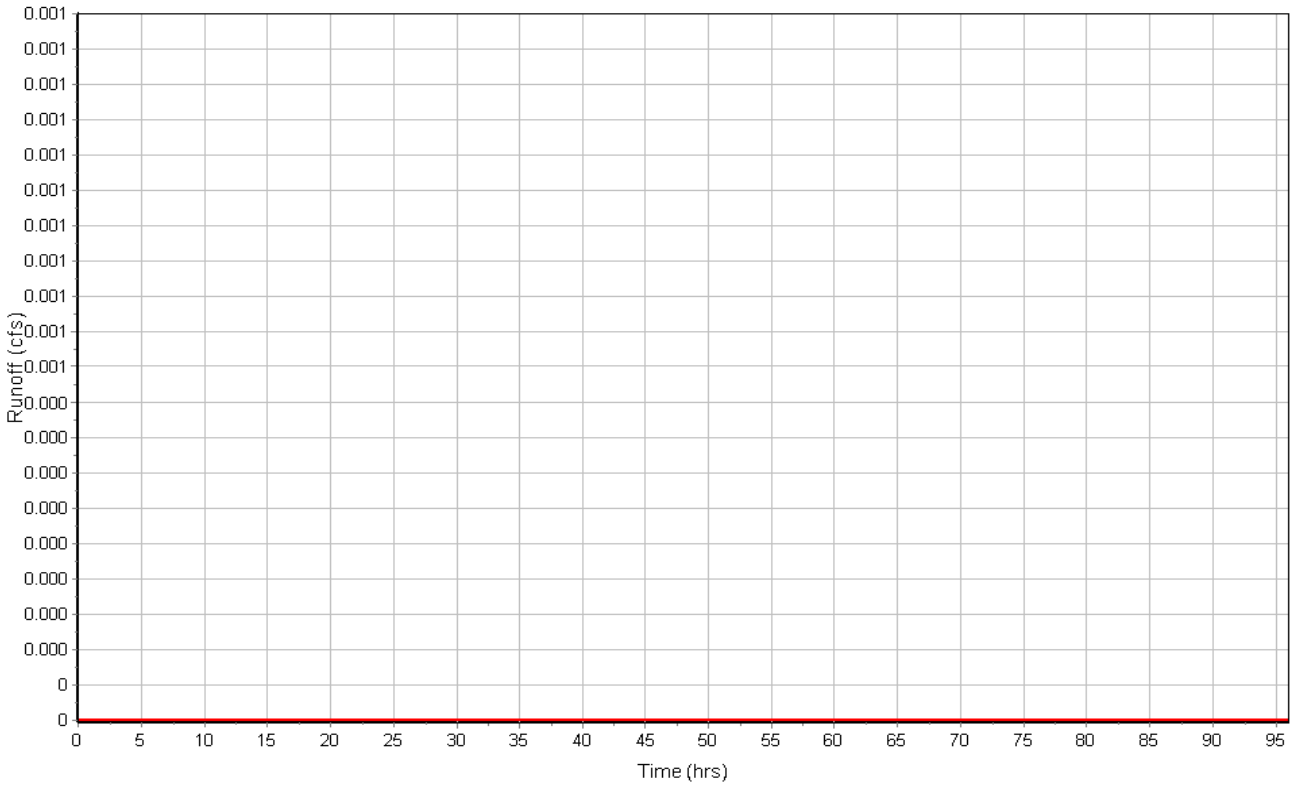
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:42:09

Subbasin : BASIN_12_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_13_ROW

Input Data

Area (ac)	0.14
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.14	B	98.00
Composite Area & Weighted CN	0.14		98.00

Time of Concentration

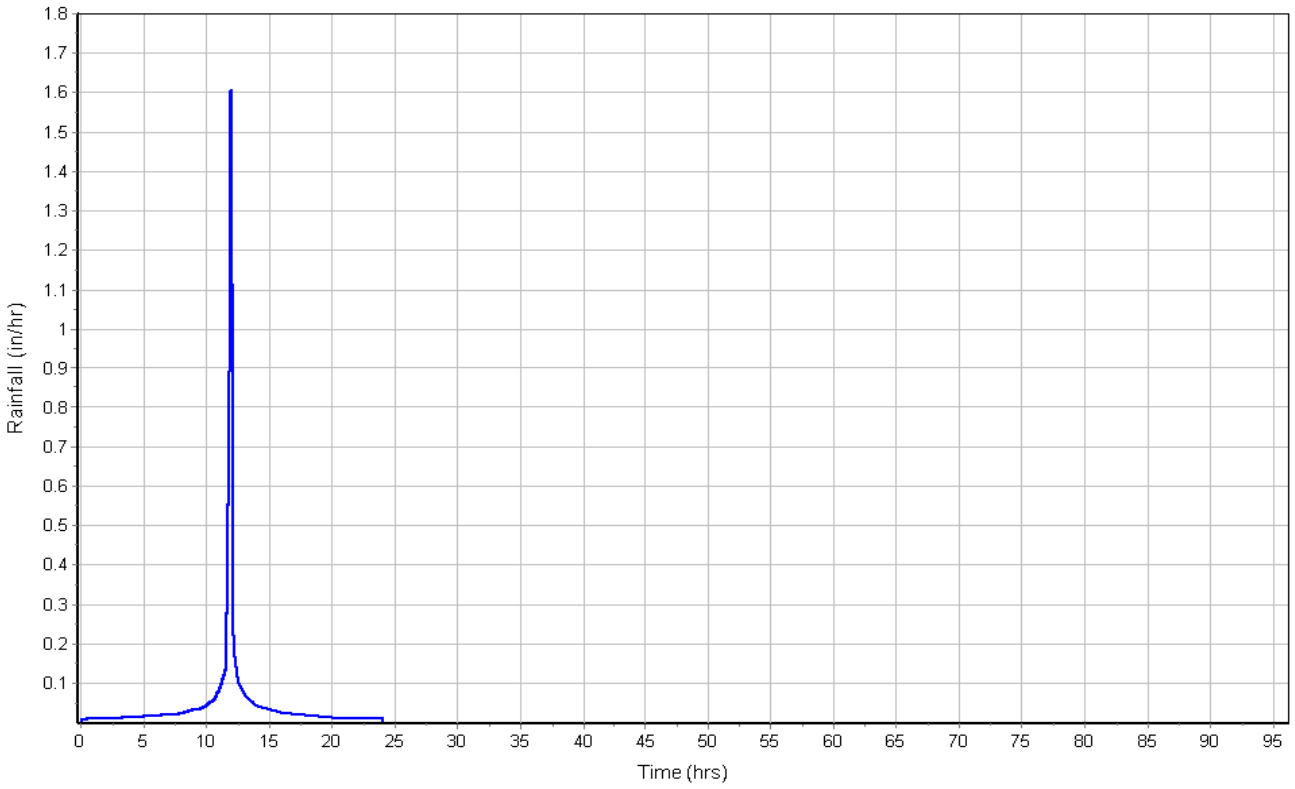
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

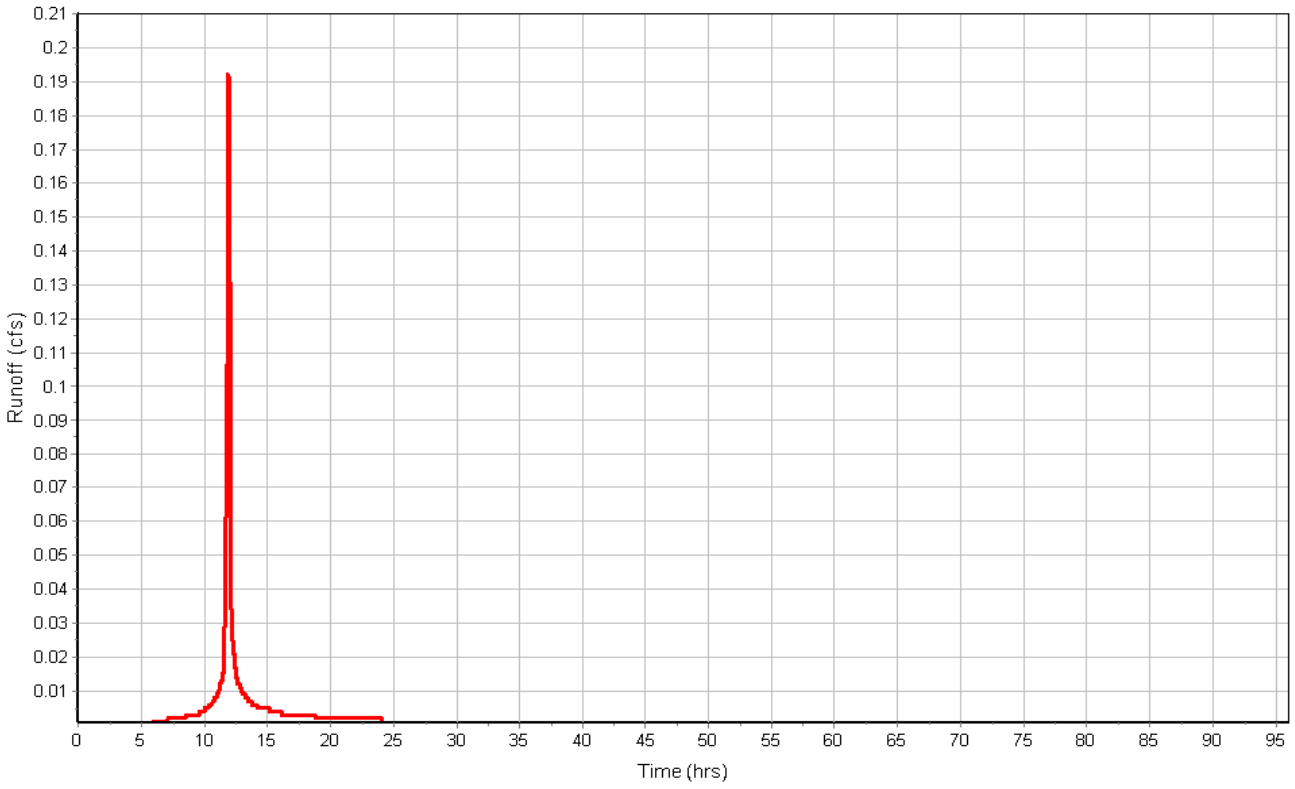
Total Rainfall (in)	1.17
Total Runoff (in)	0.95
Peak Runoff (cfs)	0.19
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_13_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_13_VACANT

Input Data

Area (ac) 0.39
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.39	B	58.00
Composite Area & Weighted CN	0.39		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	204	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	47.01	0.00	0.00

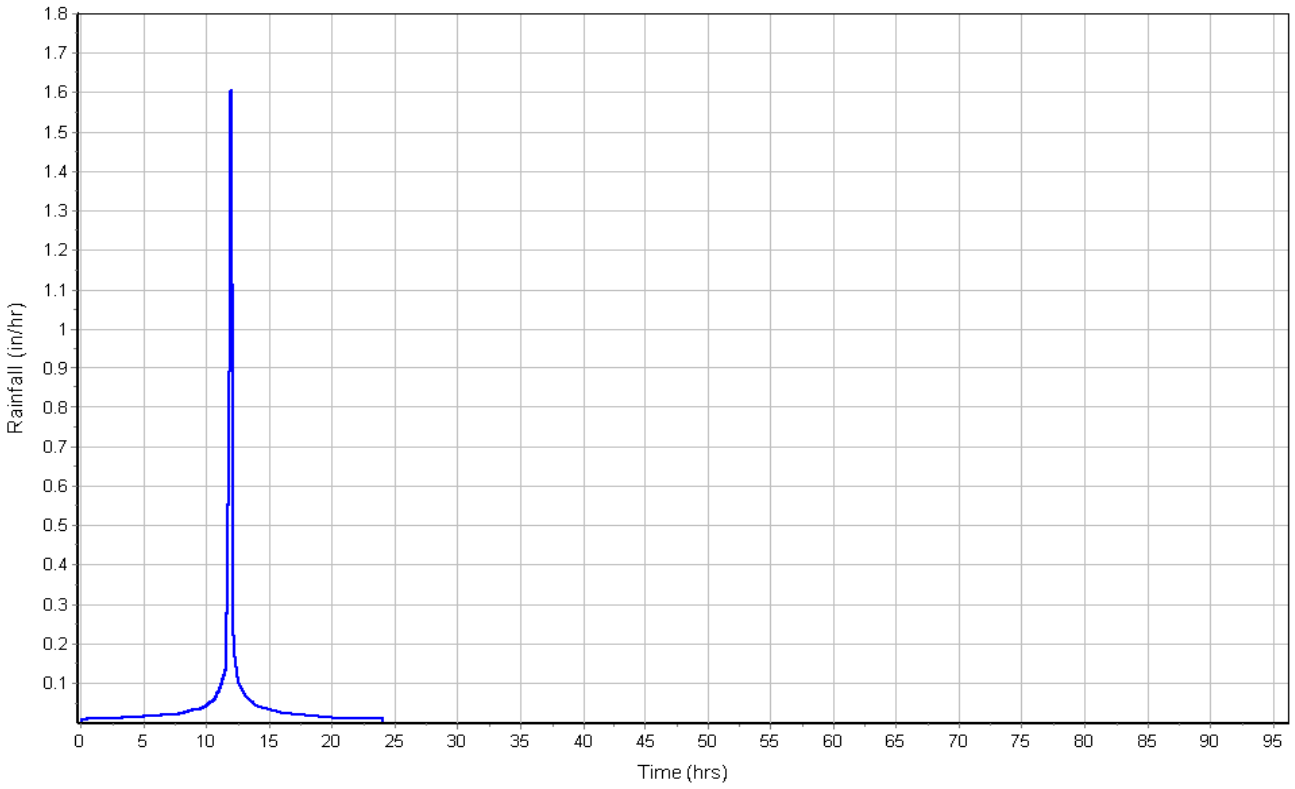
Total TOC (min) 47.01

Subbasin Runoff Results

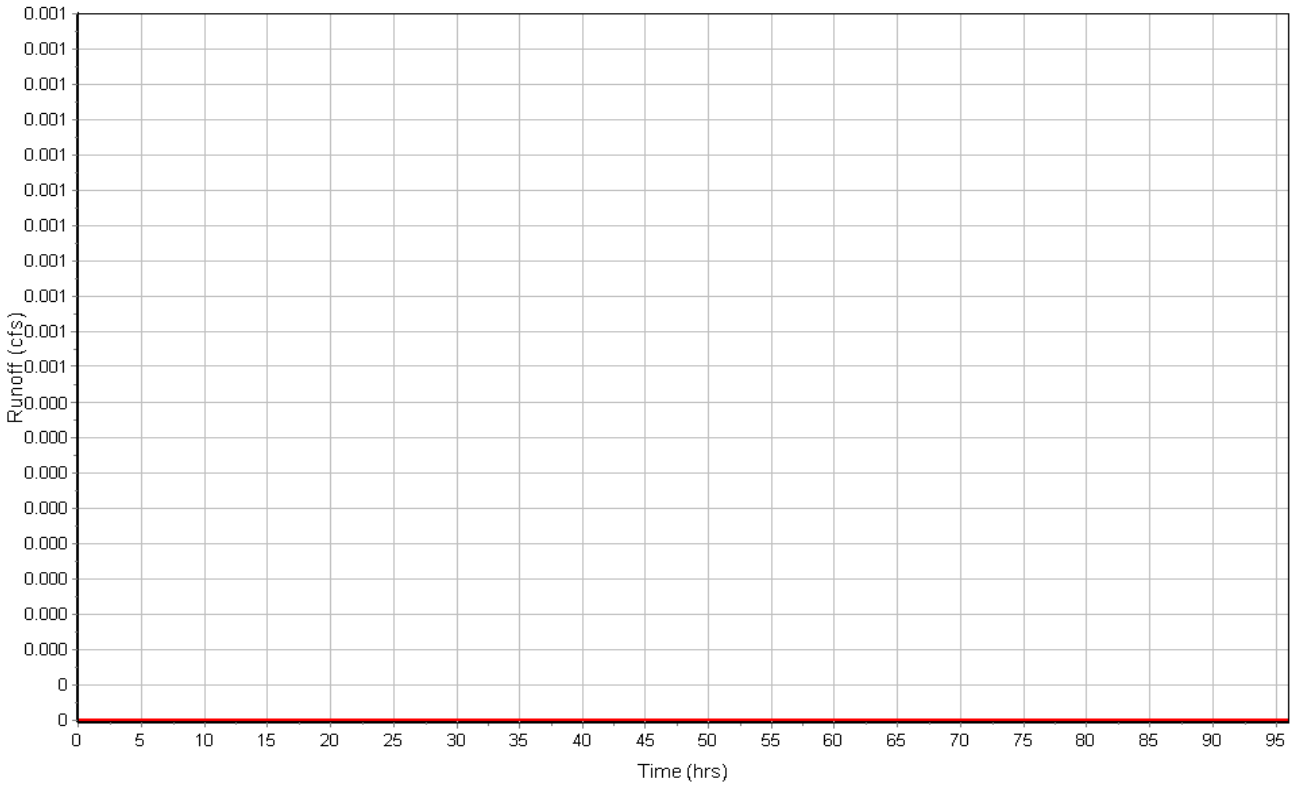
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:47:01

Subbasin : BASIN_13_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_14_ROW

Input Data

Area (ac) 0.15
Peak Rate Factor 484.00
Weighted Curve Number 98.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.15	B	98.00
Composite Area & Weighted CN	0.15		98.00

Time of Concentration

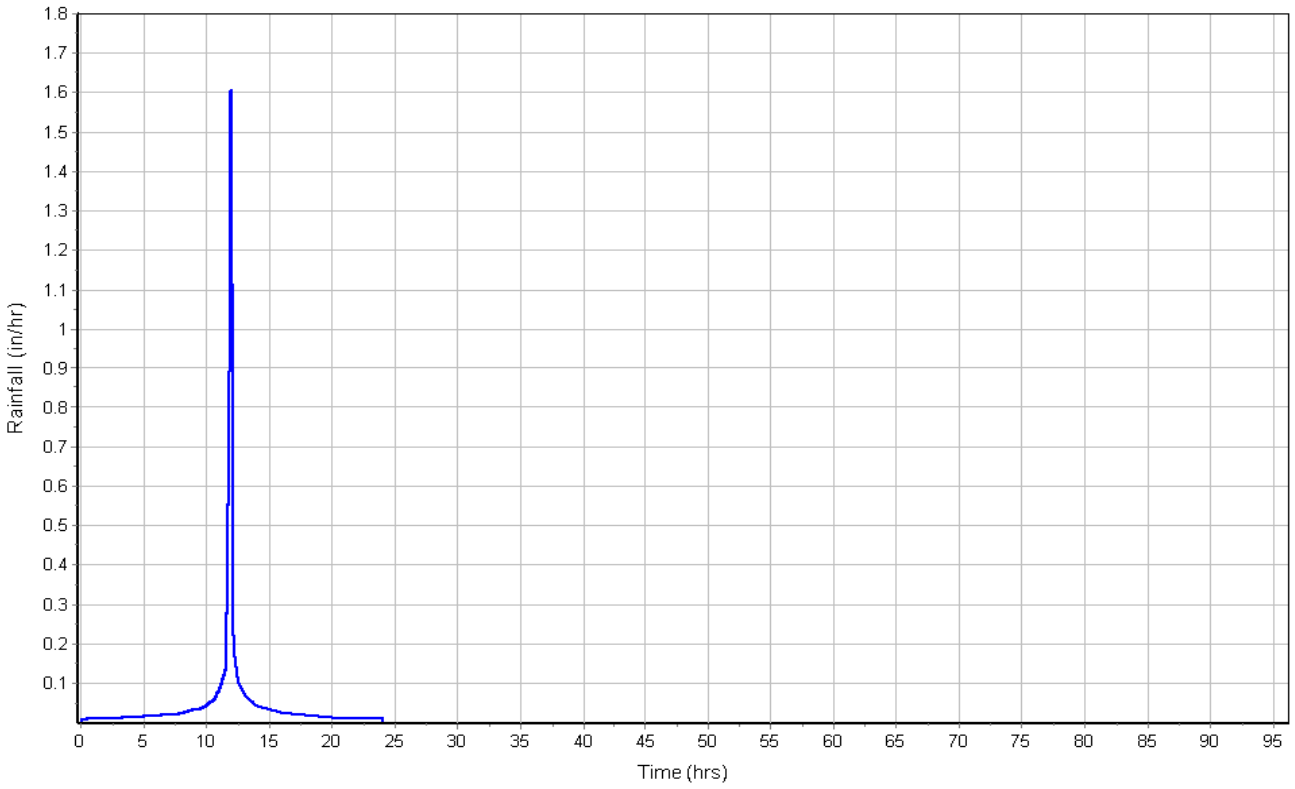
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

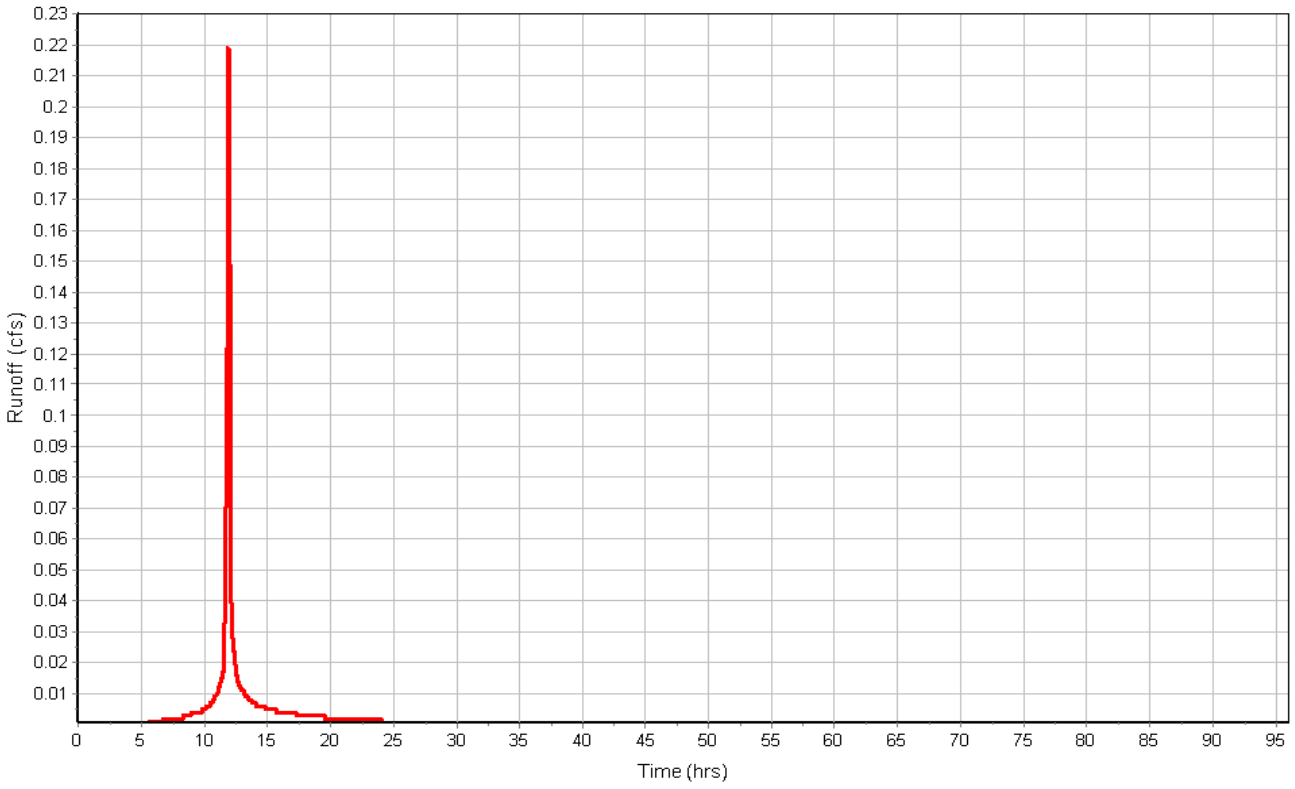
Total Rainfall (in) 1.17
Total Runoff (in) 0.95
Peak Runoff (cfs) 0.22
Weighted Curve Number 98.00
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : BASIN_14_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_14_VACANT

Input Data

Area (ac) 0.76
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.76	B	58.00
Composite Area & Weighted CN	0.76		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	300	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	64.00	0.00	0.00

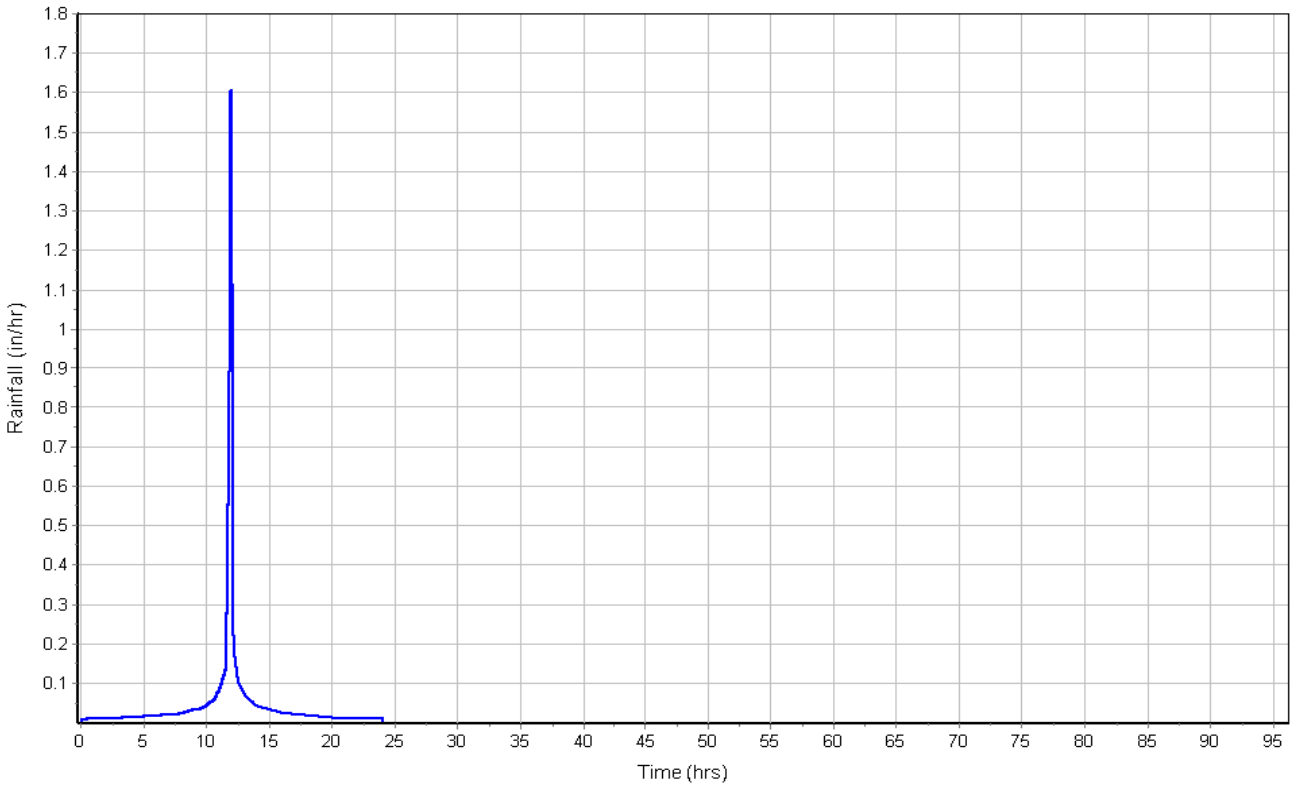
Total TOC (min) 64.00

Subbasin Runoff Results

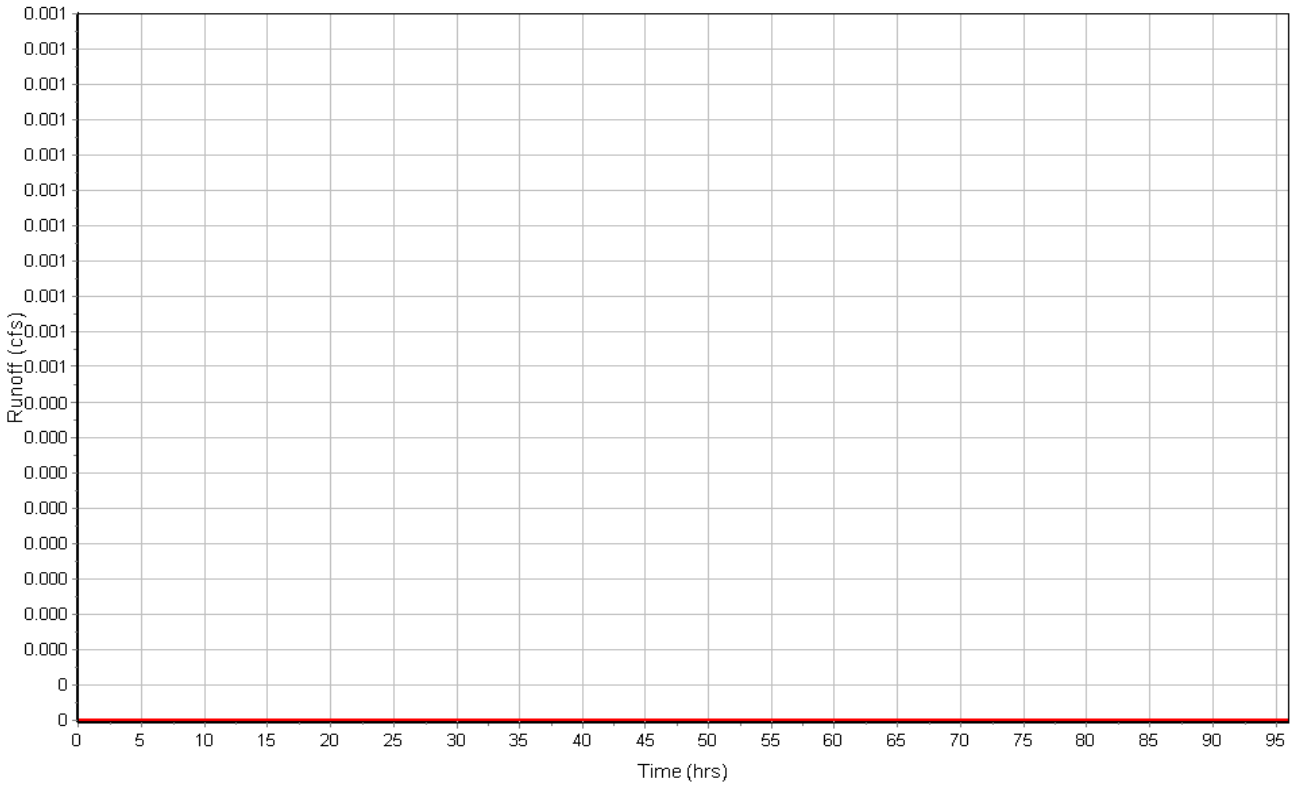
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 01:04:00

Subbasin : BASIN_14_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_15_ROW

Input Data

Area (ac)	0.13
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.13	B	98.00
Composite Area & Weighted CN	0.13		98.00

Time of Concentration

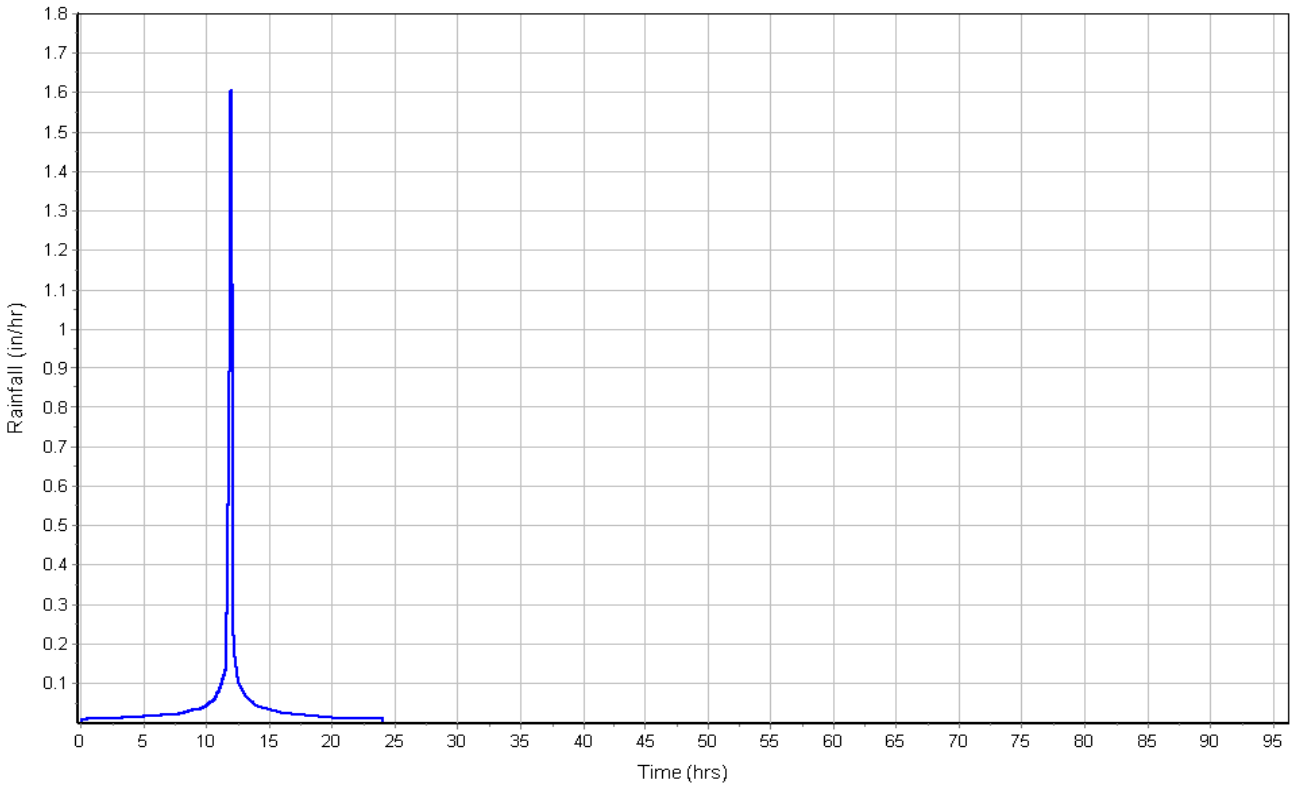
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

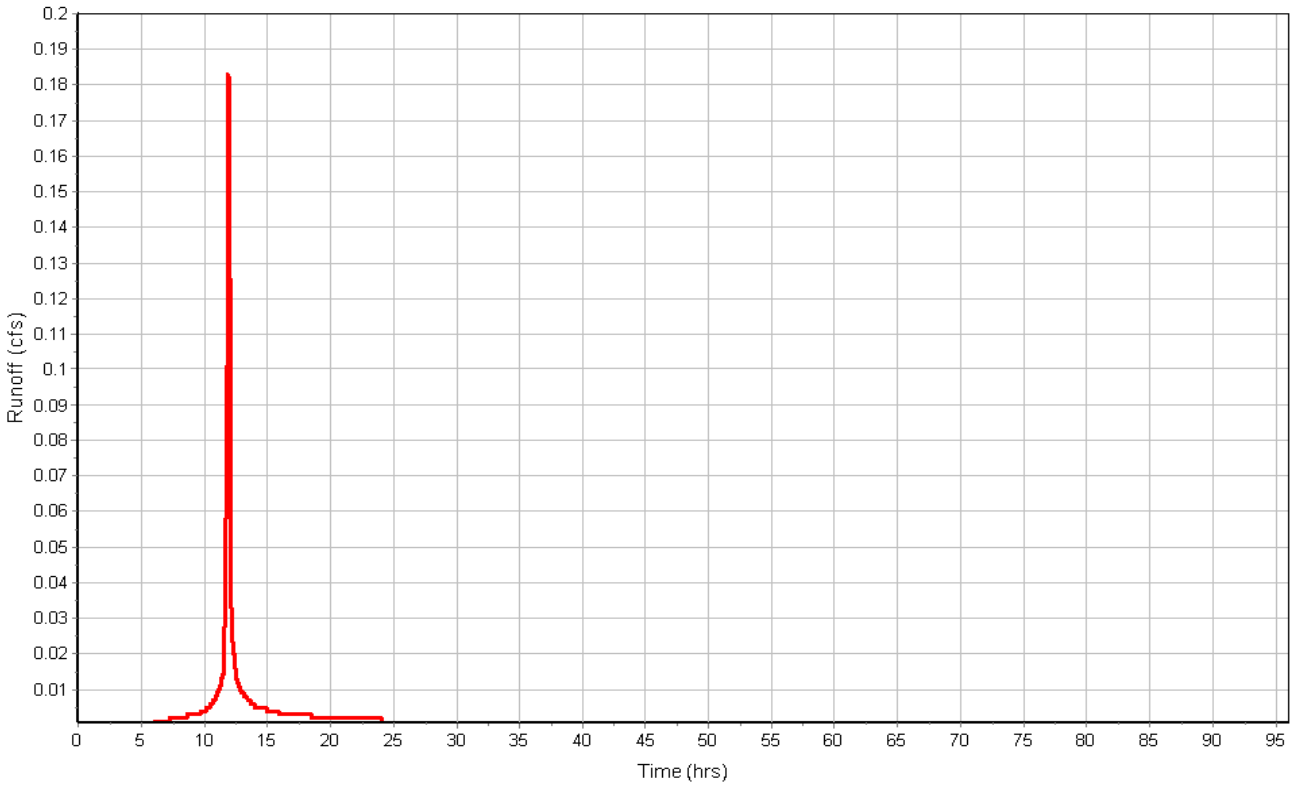
Total Rainfall (in)	1.17
Total Runoff (in)	0.95
Peak Runoff (cfs)	0.18
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_15_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_15_VACANT

Input Data

Area (ac) 0.45
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.45	B	58.00
Composite Area & Weighted CN	0.45		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	186	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	43.66	0.00	0.00

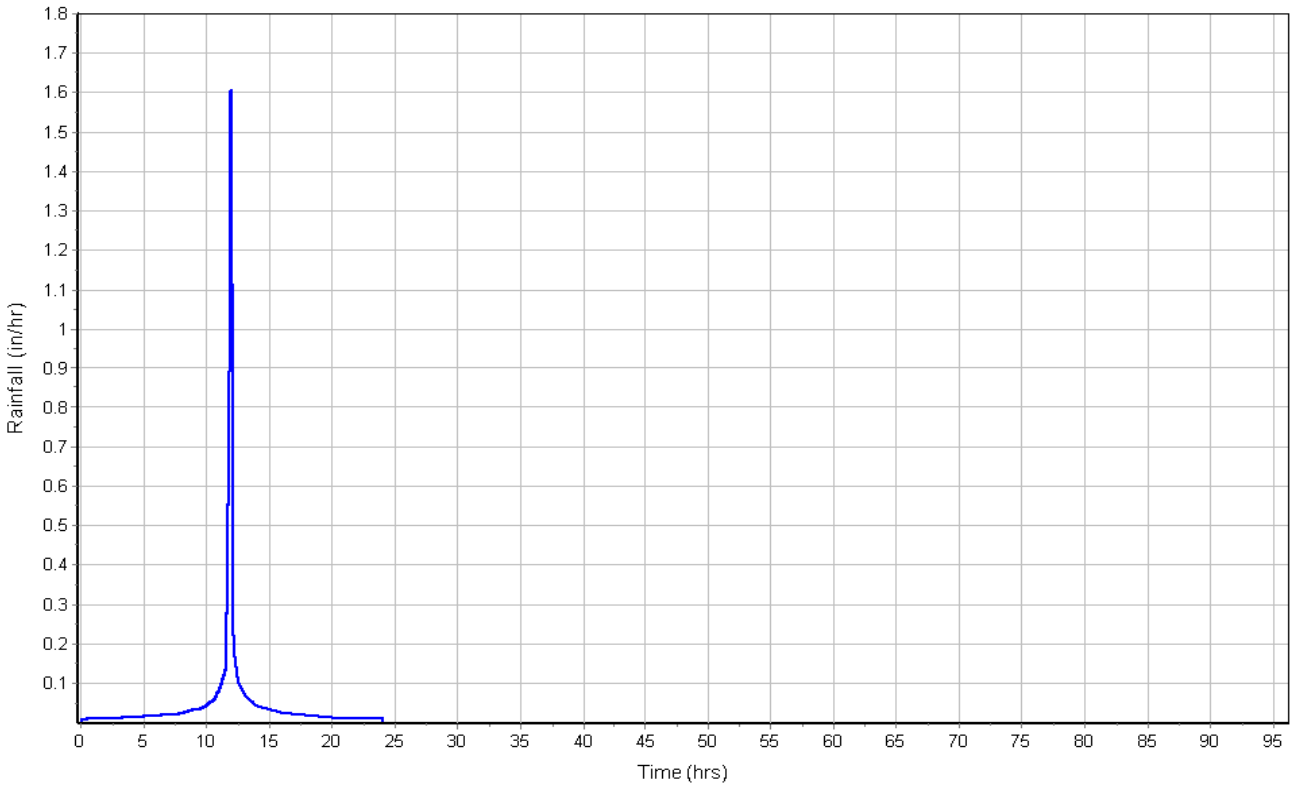
Total TOC (min) 43.66

Subbasin Runoff Results

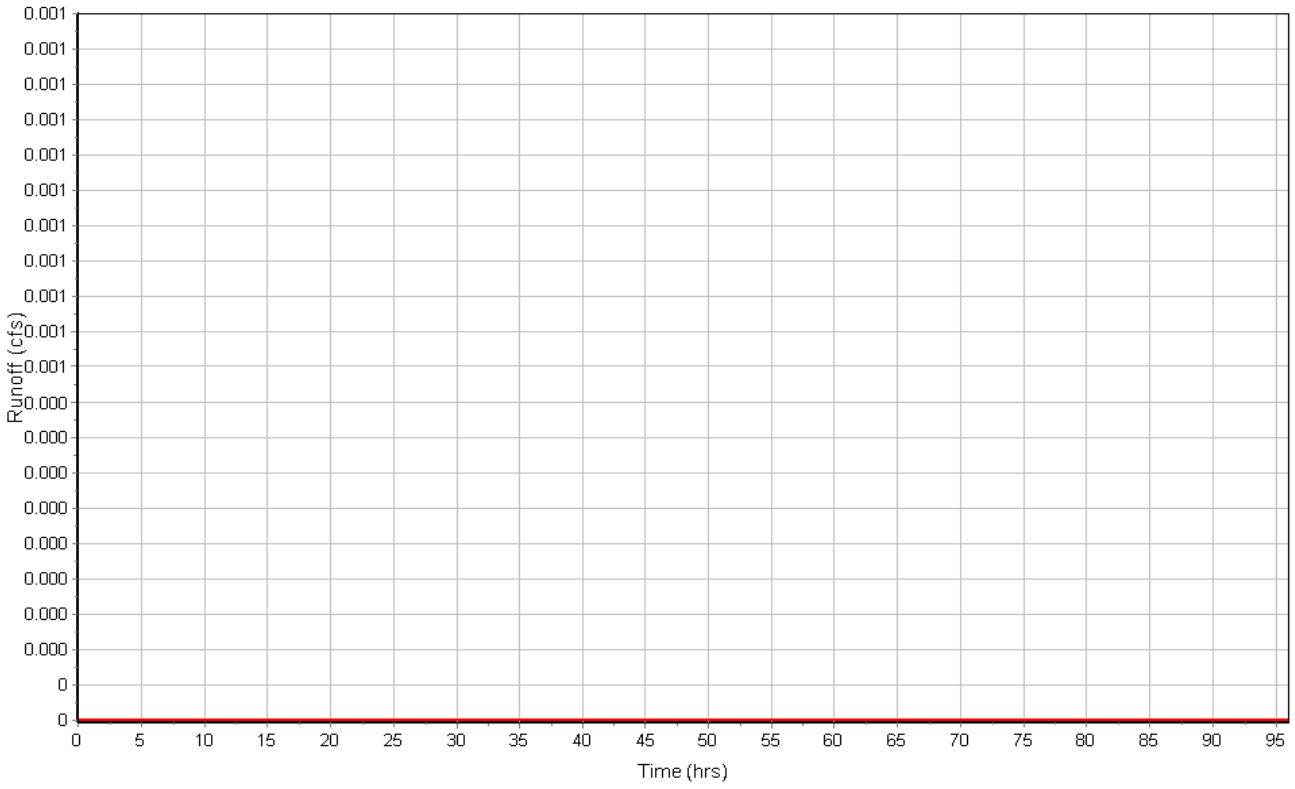
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:43:40

Subbasin : BASIN_15_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_16_ROW

Input Data

Area (ac)	0.13
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.13	B	98.00
Composite Area & Weighted CN	0.13		98.00

Time of Concentration

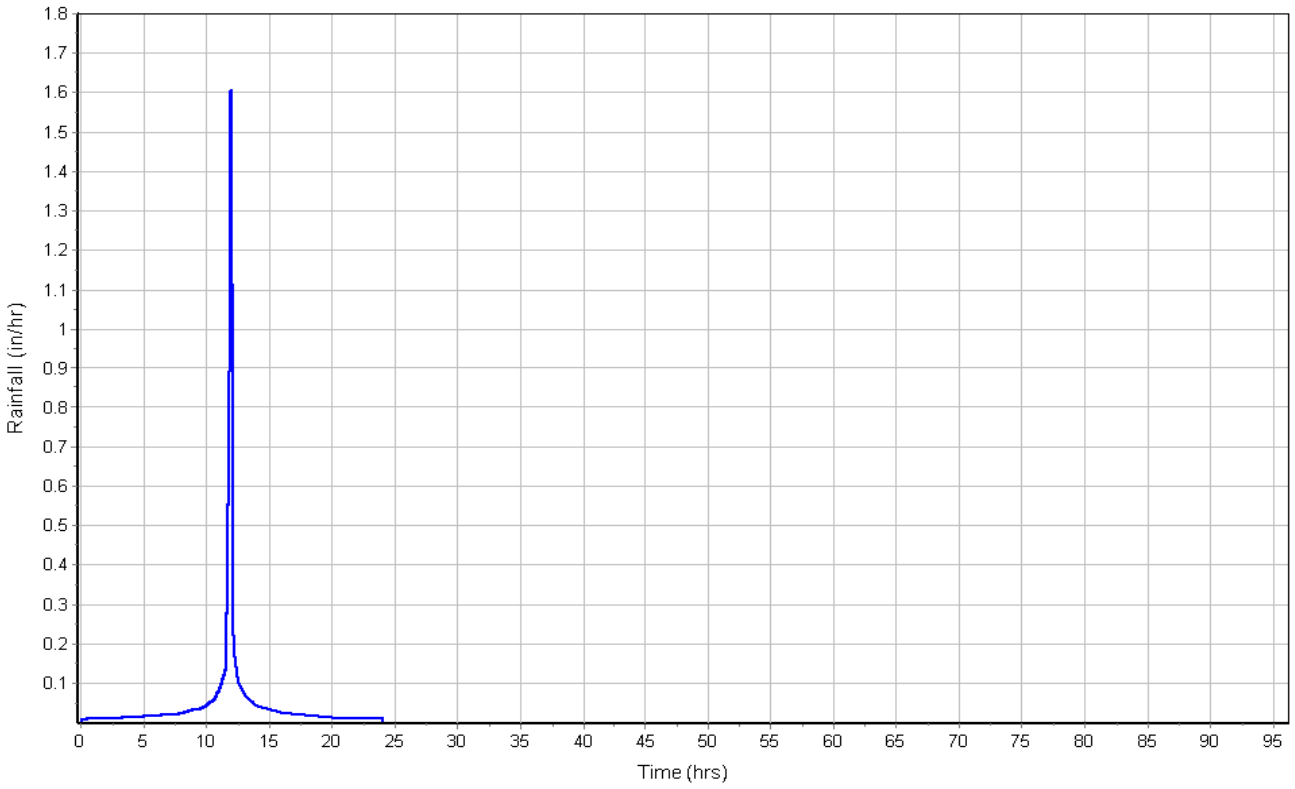
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

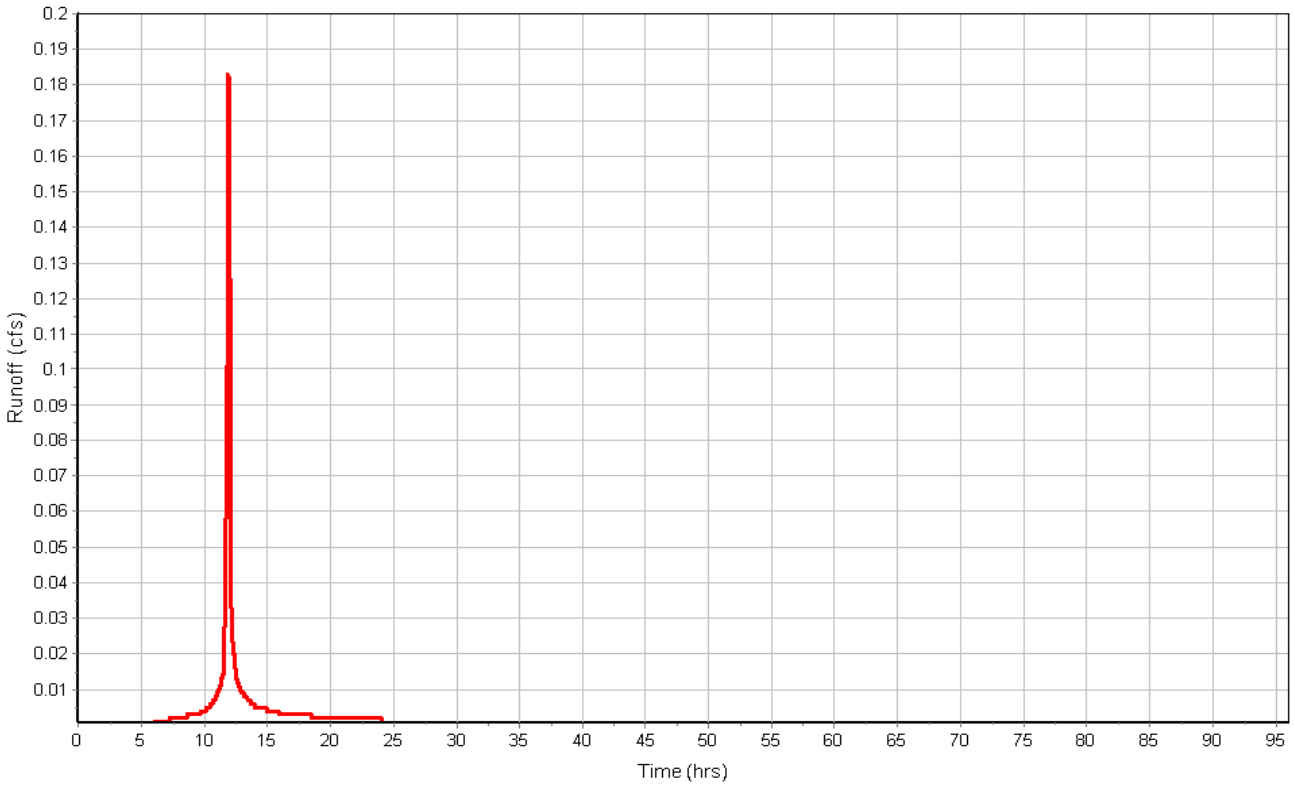
Total Rainfall (in)	1.17
Total Runoff (in)	0.95
Peak Runoff (cfs)	0.18
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_16_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_16_VACANT

Input Data

Area (ac) 0.48
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.48	B	58.00
Composite Area & Weighted CN	0.48		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	186	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	43.66	0.00	0.00

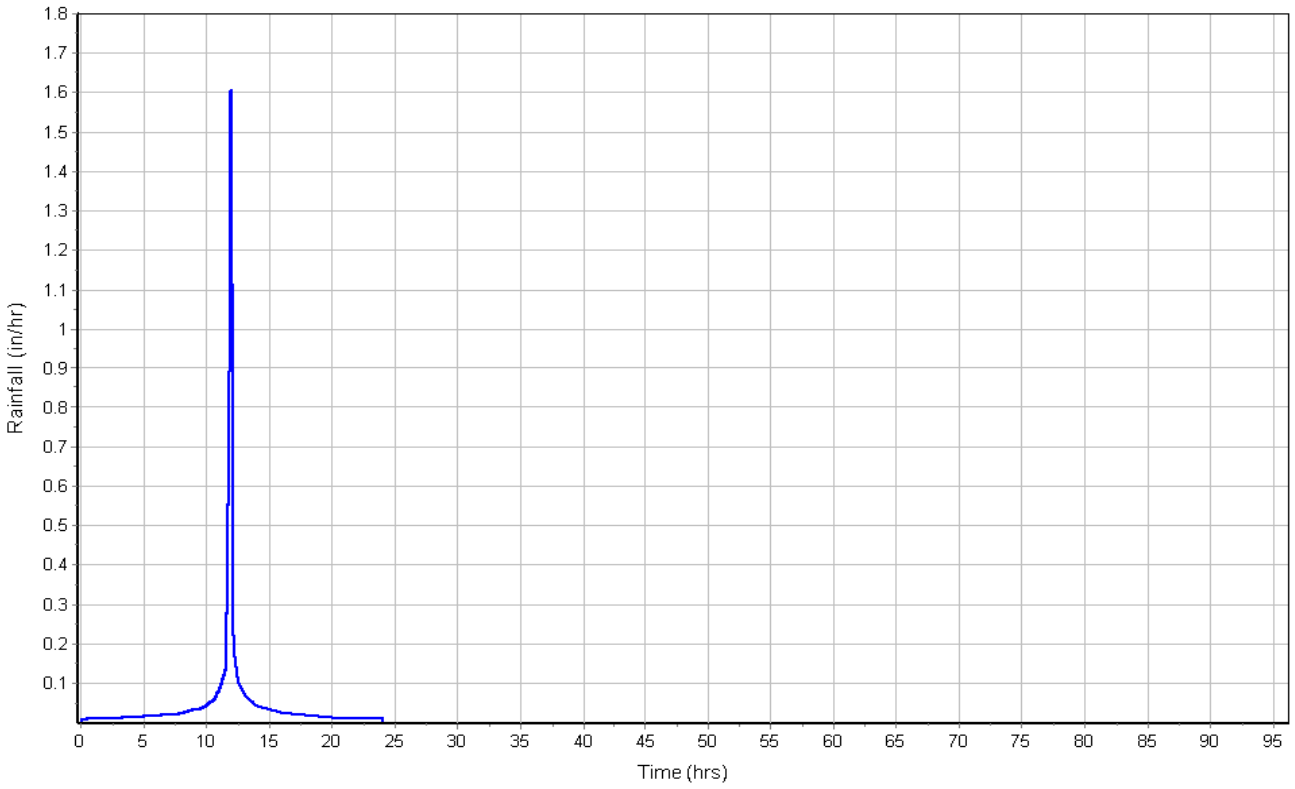
Total TOC (min) 43.66

Subbasin Runoff Results

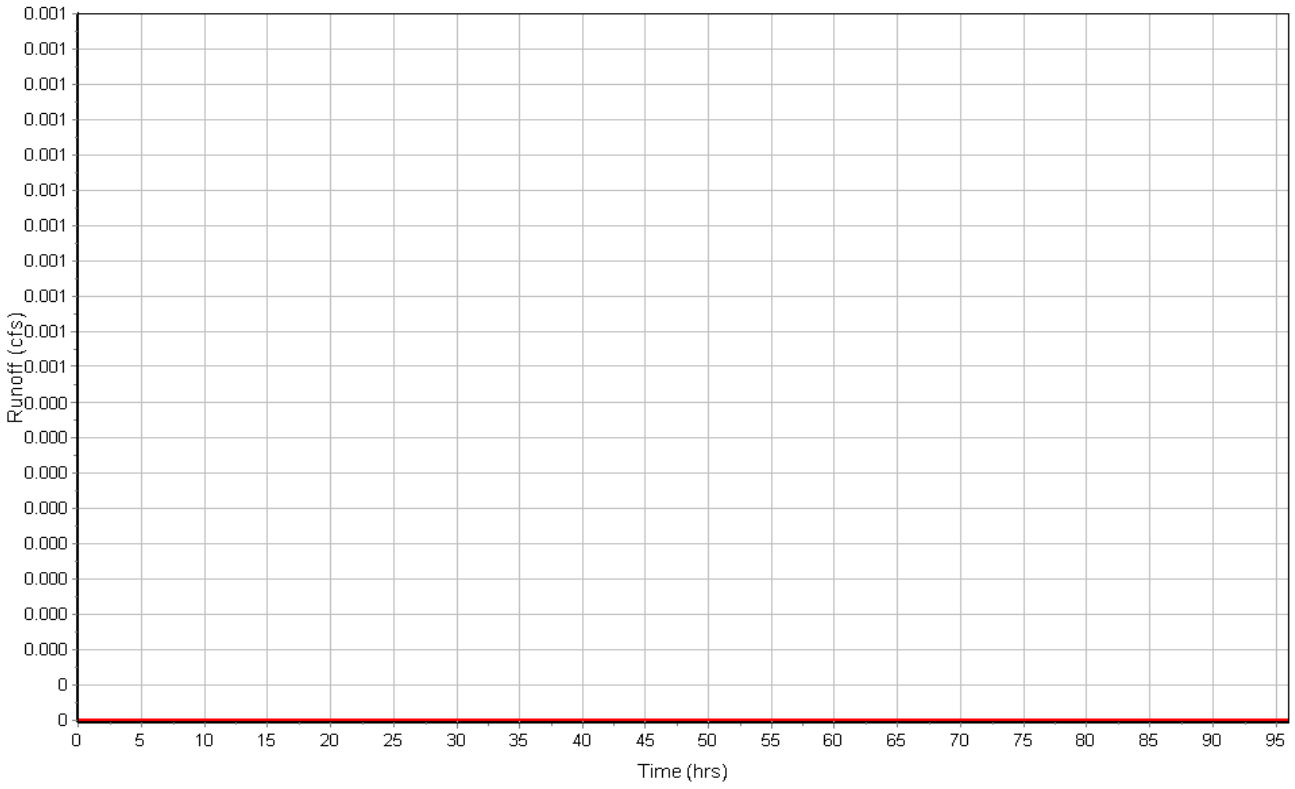
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:43:40

Subbasin : BASIN_16_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_17_ROW

Input Data

Area (ac) 0.12
Peak Rate Factor 484.00
Weighted Curve Number 98.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.12	B	98.00
Composite Area & Weighted CN	0.12		98.00

Time of Concentration

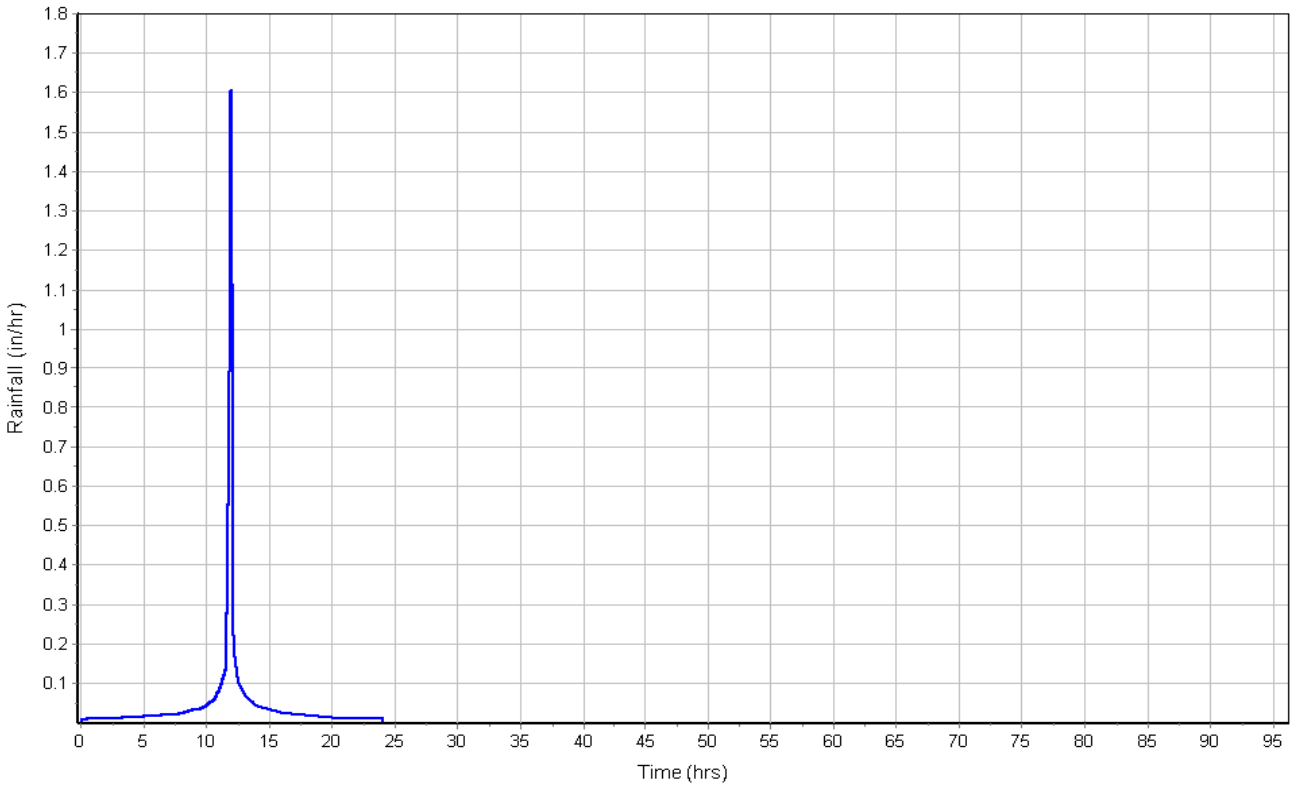
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

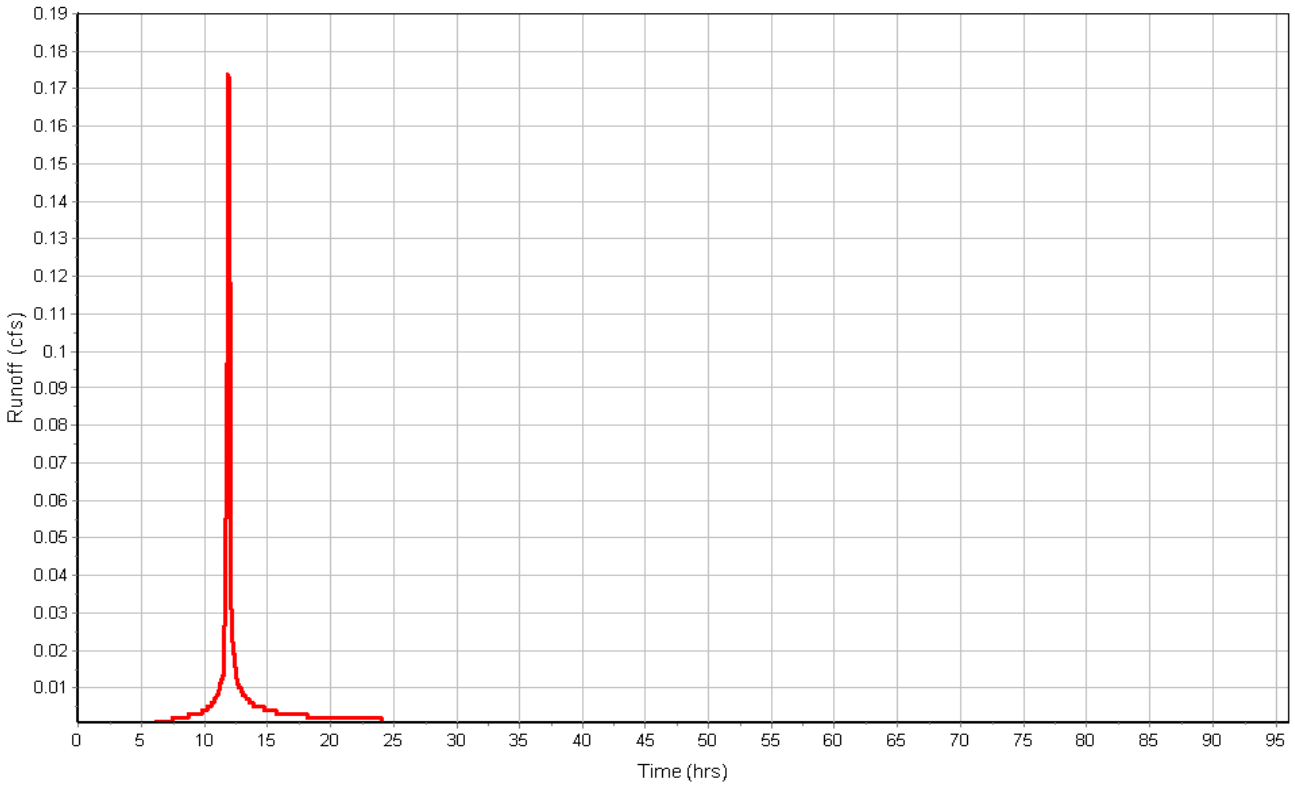
Total Rainfall (in) 1.17
Total Runoff (in) 0.94
Peak Runoff (cfs) 0.17
Weighted Curve Number 98.00
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : BASIN_17_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_17_VACANT

Input Data

Area (ac) 0.34
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.34	B	58.00
Composite Area & Weighted CN	0.34		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	265	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	57.95	0.00	0.00

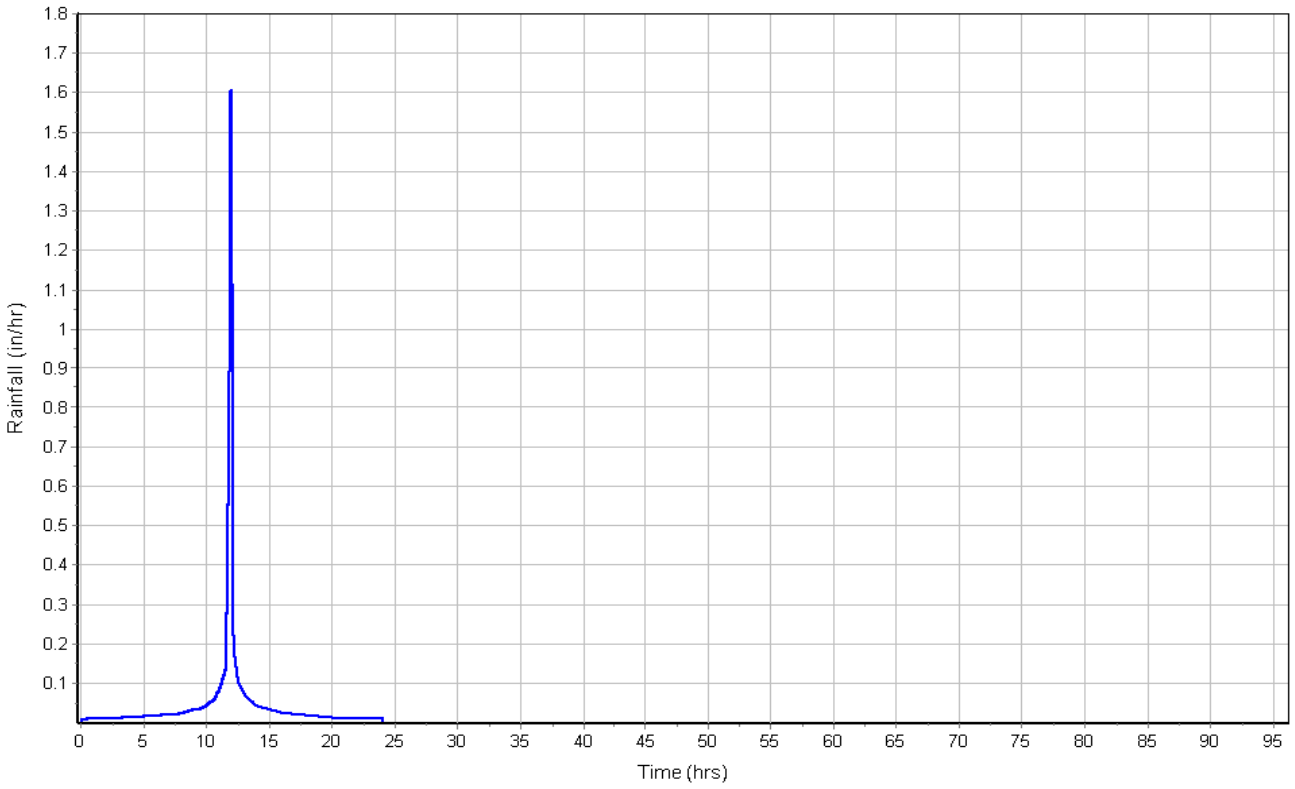
Total TOC (min) 57.95

Subbasin Runoff Results

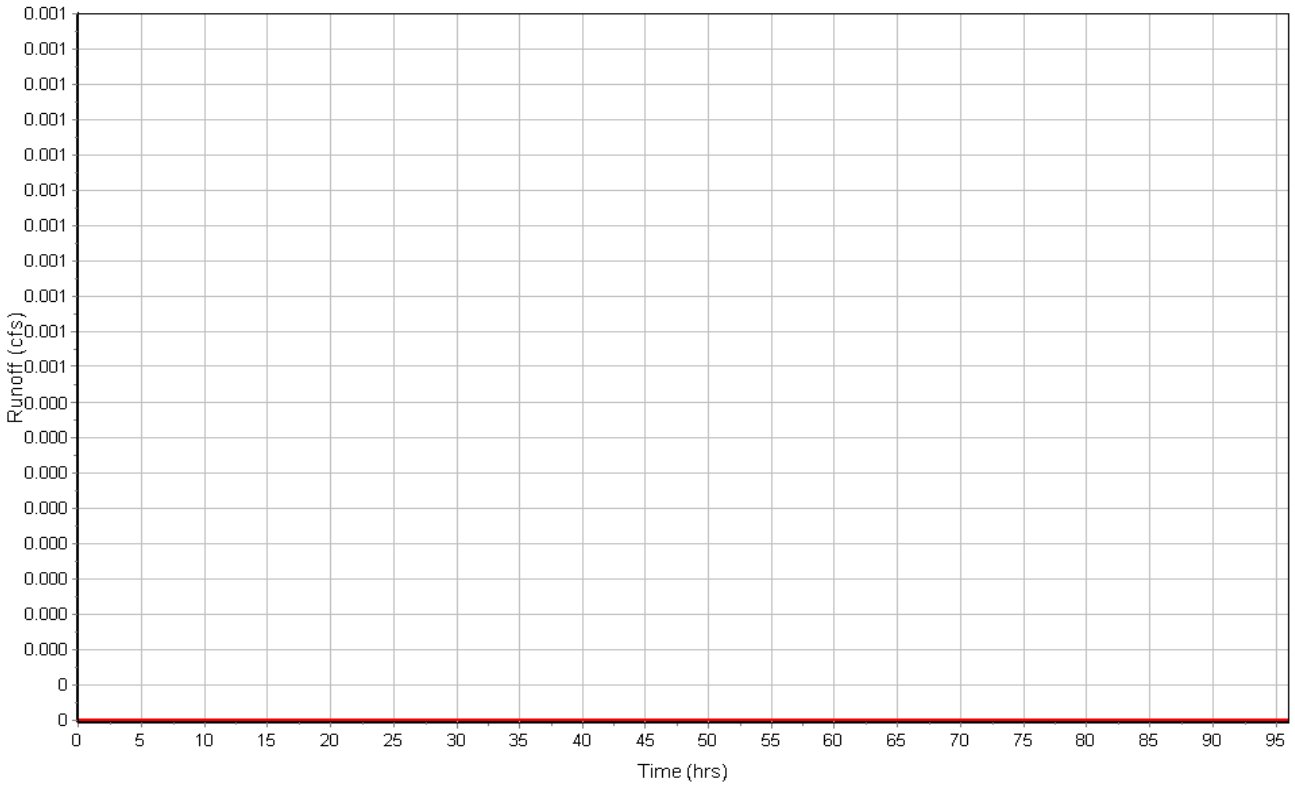
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:57:57

Subbasin : BASIN_17_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_18_ROW

Input Data

Area (ac)	0.11
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.11	B	98.00
Composite Area & Weighted CN	0.11		98.00

Time of Concentration

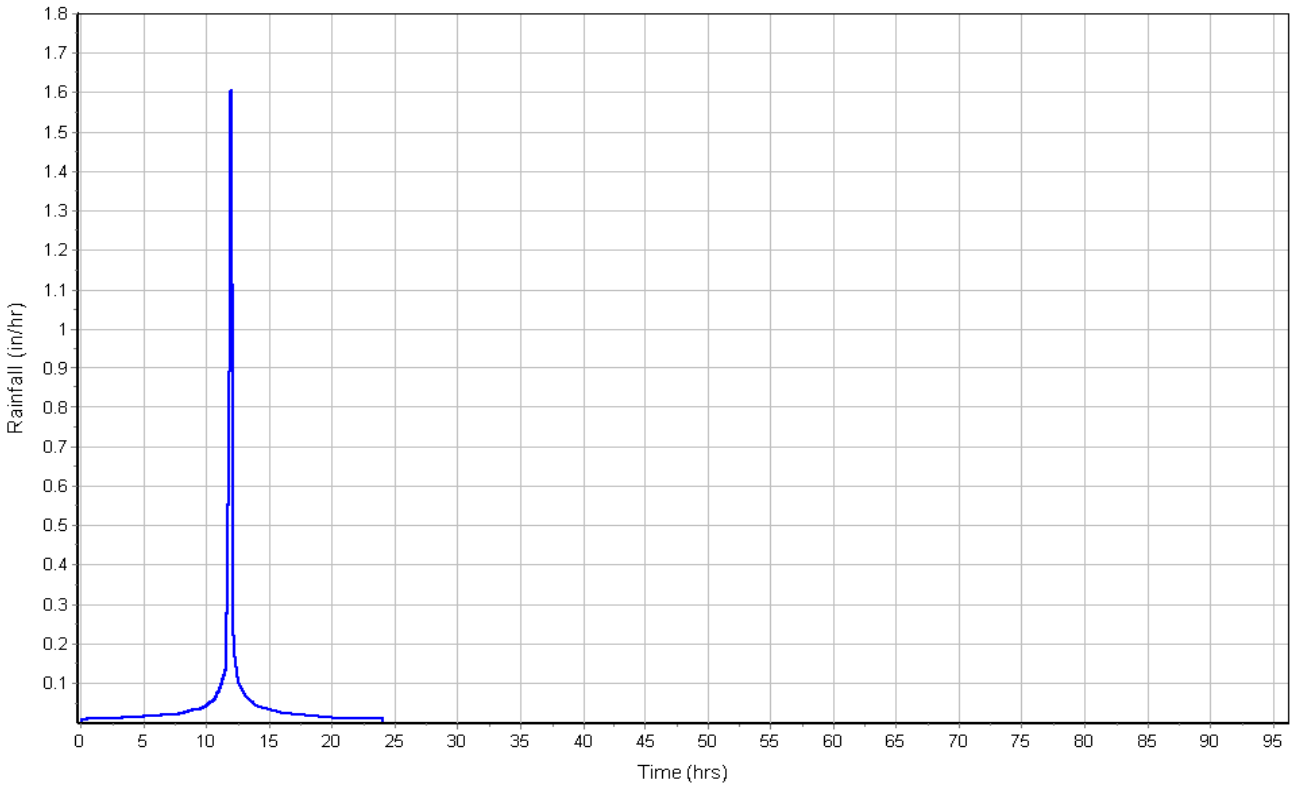
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

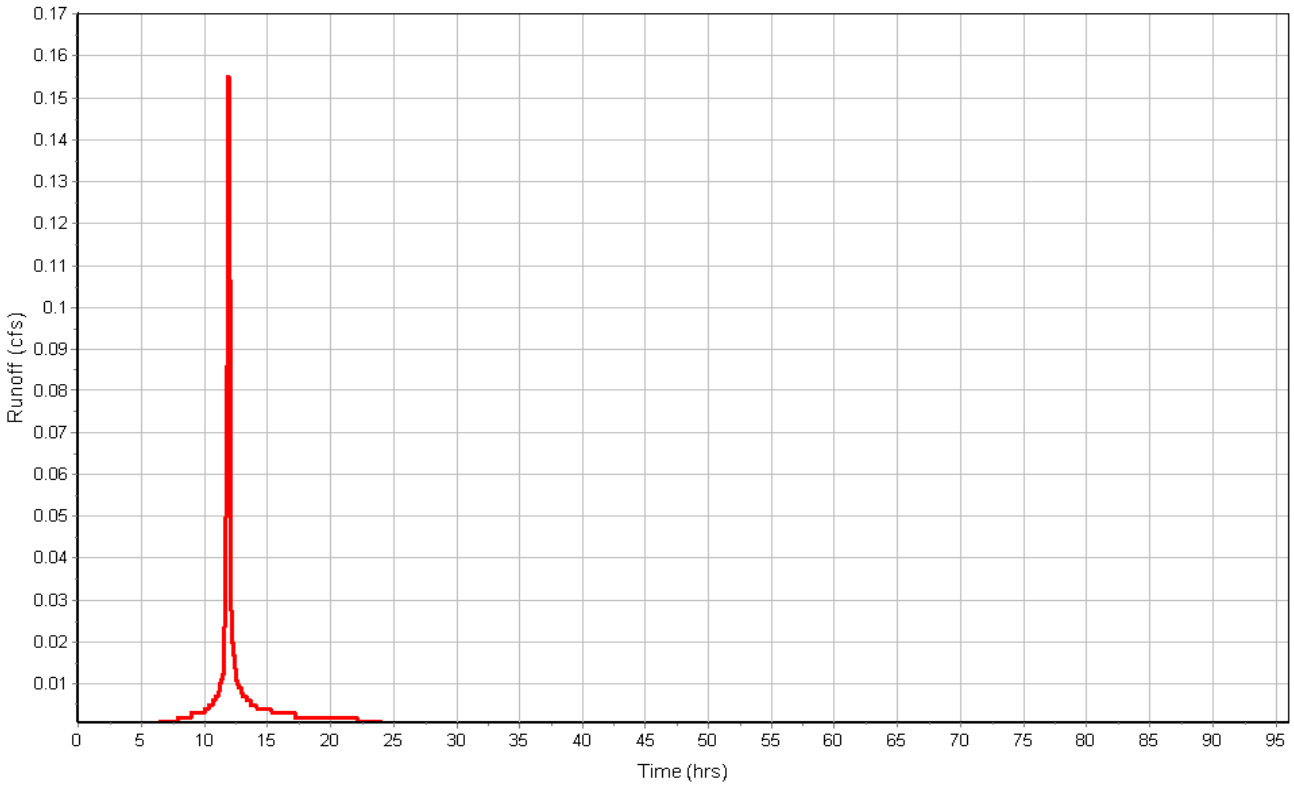
Total Rainfall (in)	1.17
Total Runoff (in)	0.94
Peak Runoff (cfs)	0.16
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_18_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_18_VACANT

Input Data

Area (ac) 0.31
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.31	B	58.00
Composite Area & Weighted CN	0.31		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	271	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	59.00	0.00	0.00

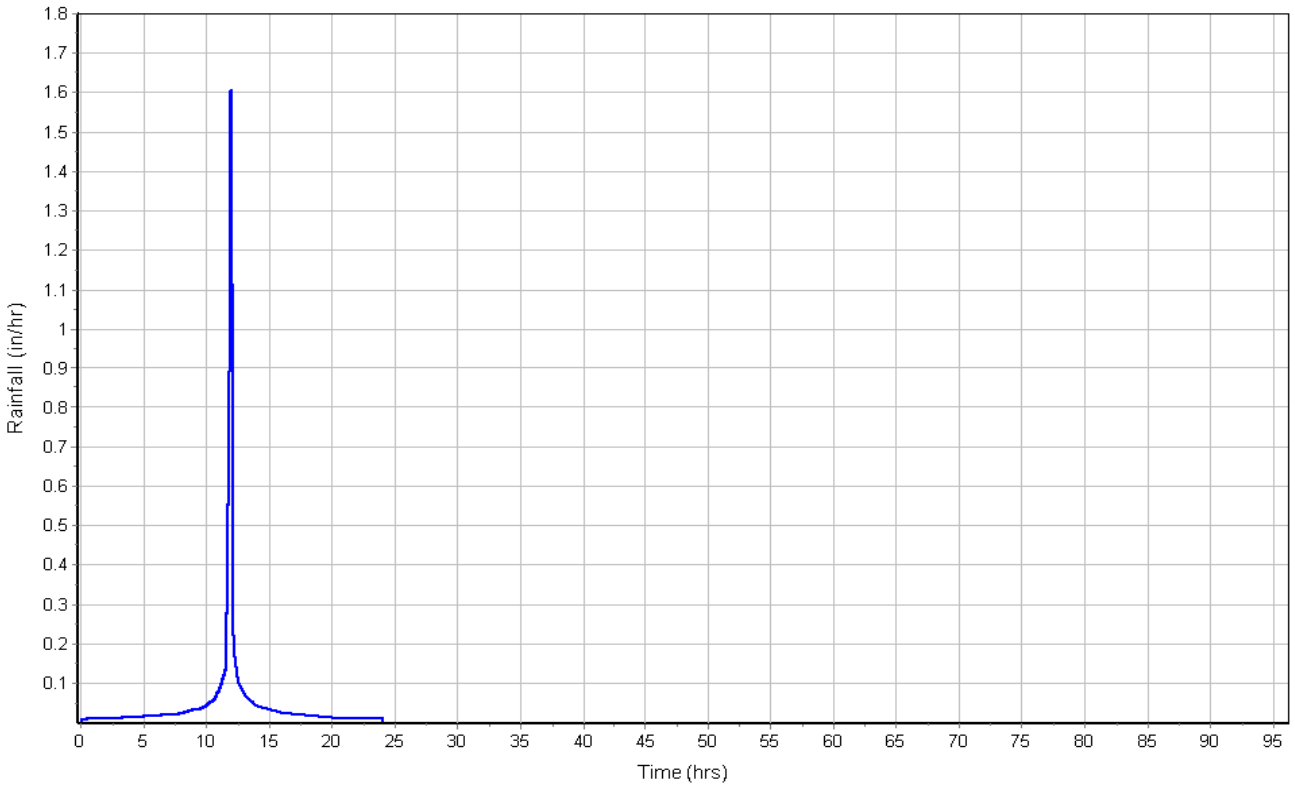
Total TOC (min) 59.00

Subbasin Runoff Results

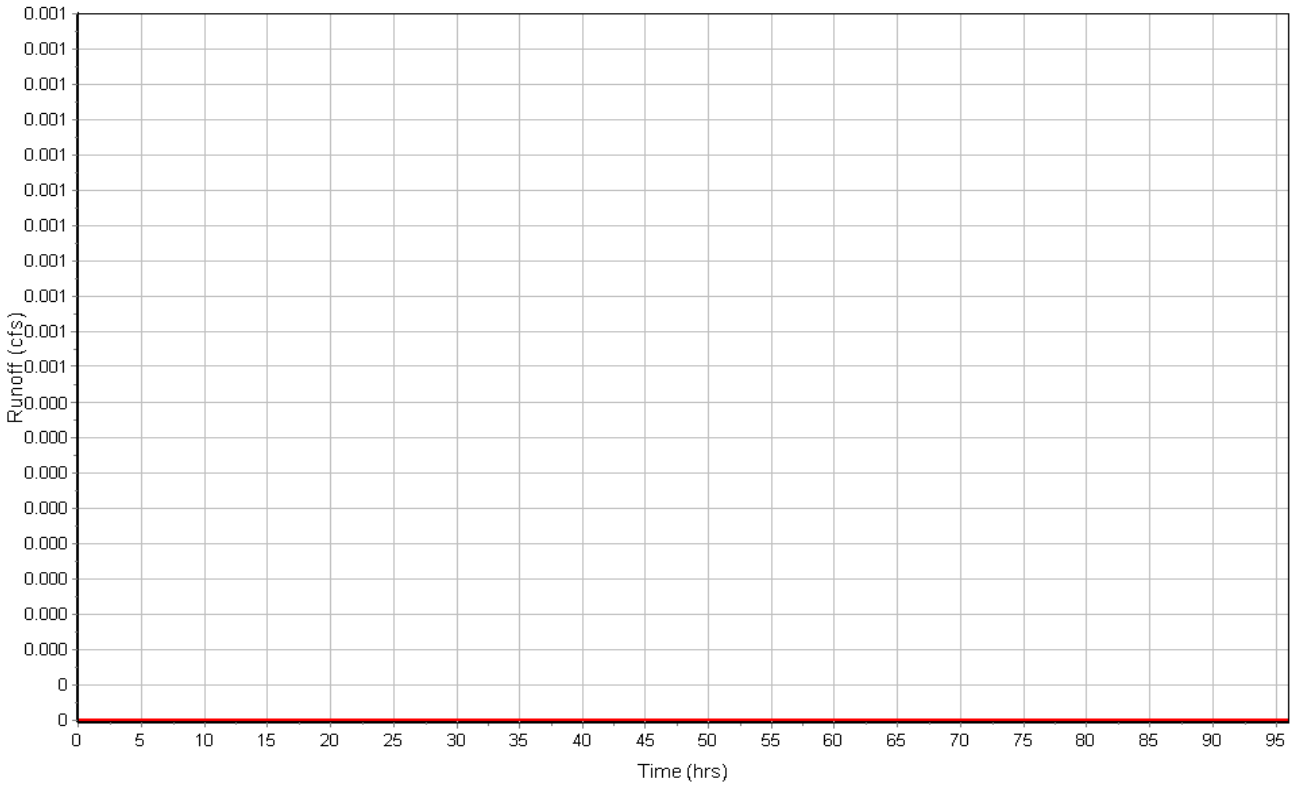
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:59:00

Subbasin : BASIN_18_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_19_ROW

Input Data

Area (ac)	0.08
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.08	B	98.00
Composite Area & Weighted CN	0.08		98.00

Time of Concentration

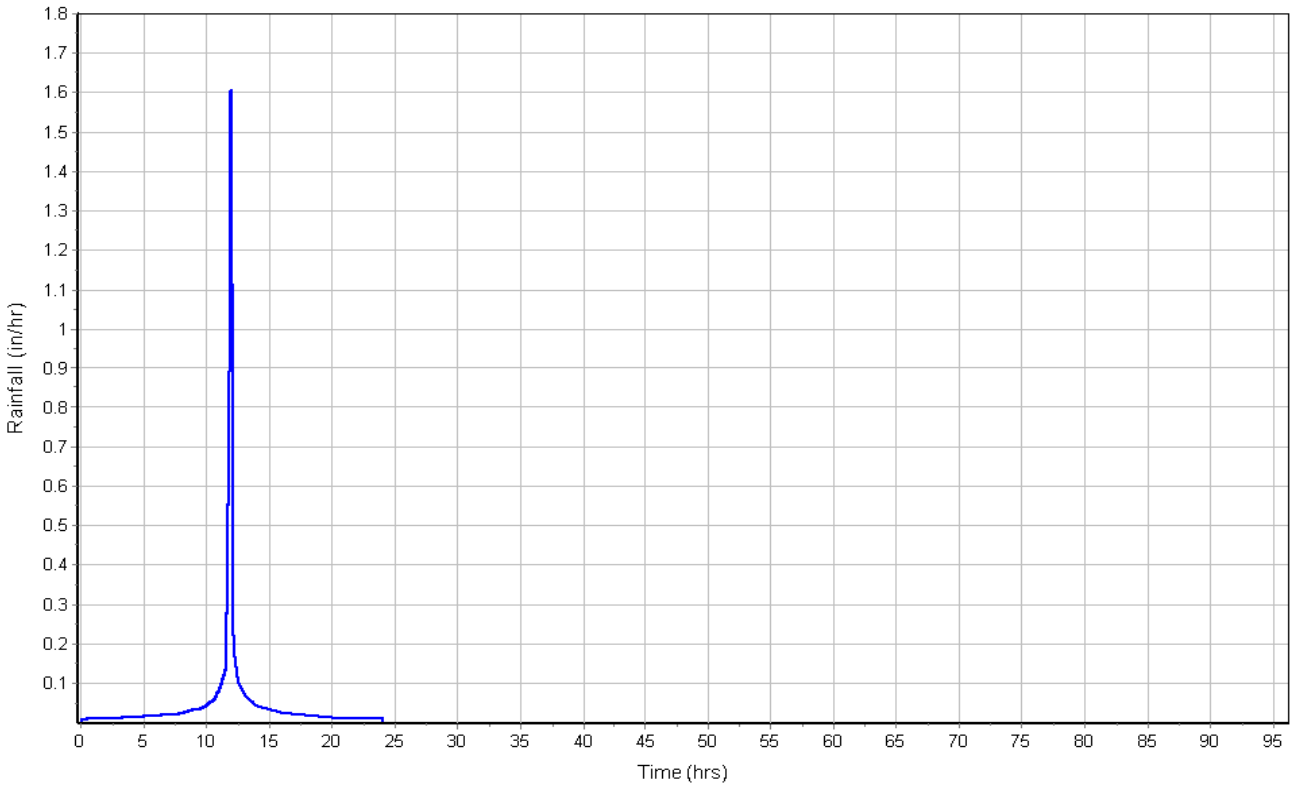
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

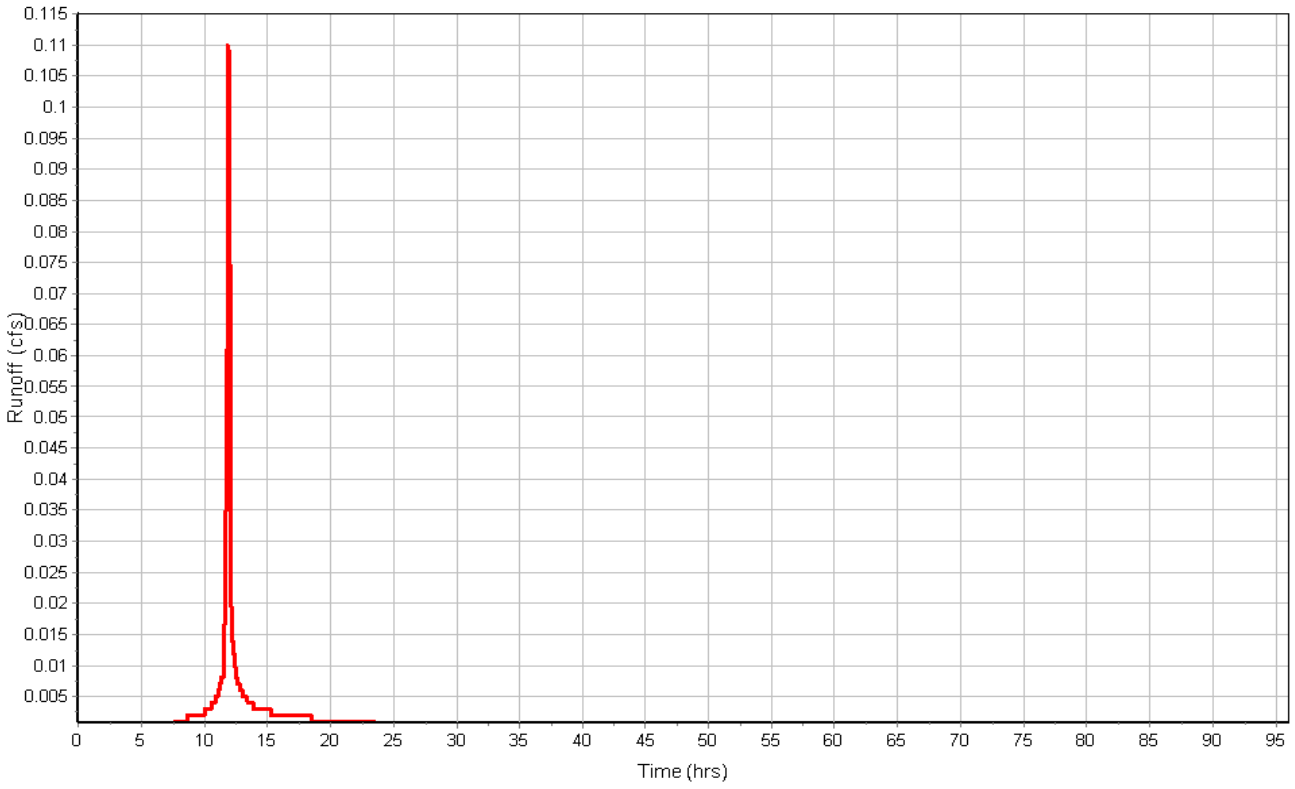
Total Rainfall (in)	1.17
Total Runoff (in)	0.92
Peak Runoff (cfs)	0.11
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_19_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_19_VACANT

Input Data

Area (ac) 0.06
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.06	B	58.00
Composite Area & Weighted CN	0.06		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	88	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.06	0.00	0.00
Computed Flow Time (min) :	23.99	0.00	0.00

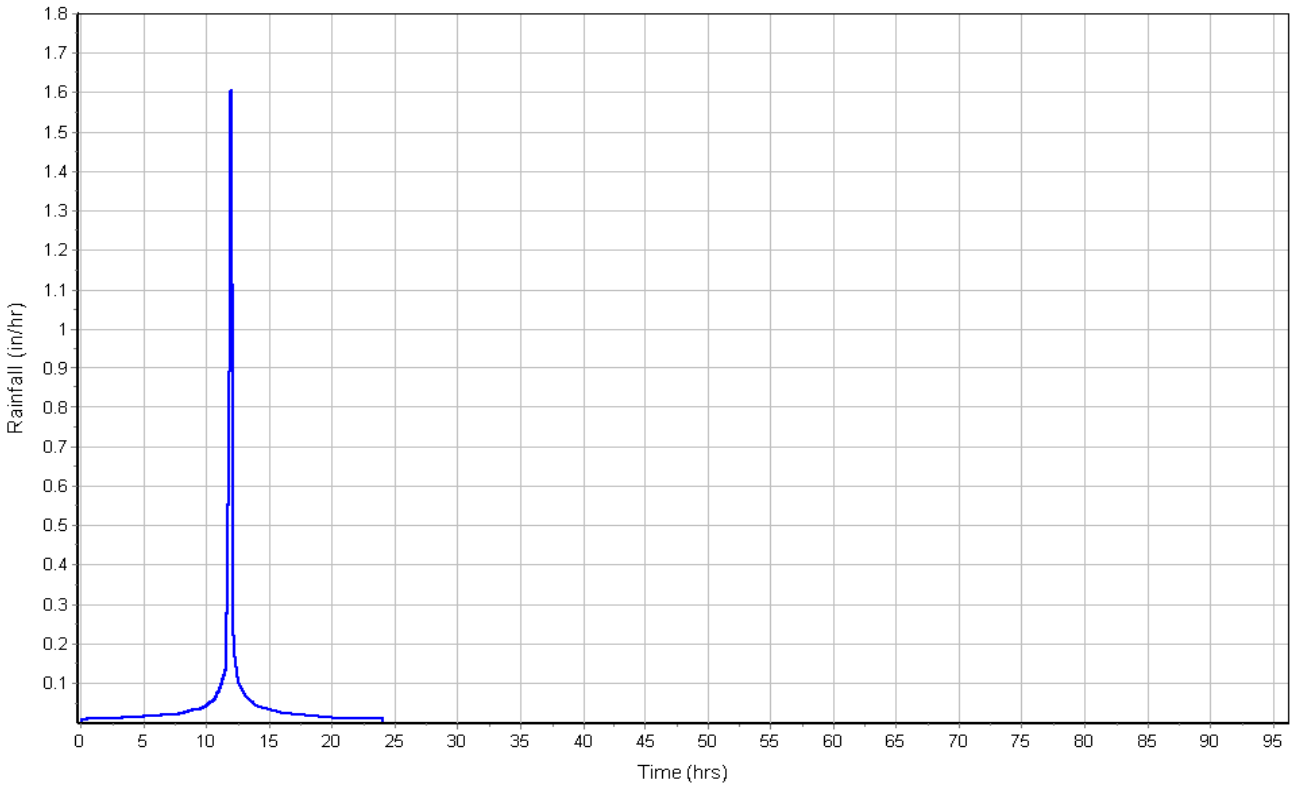
Total TOC (min) 23.99

Subbasin Runoff Results

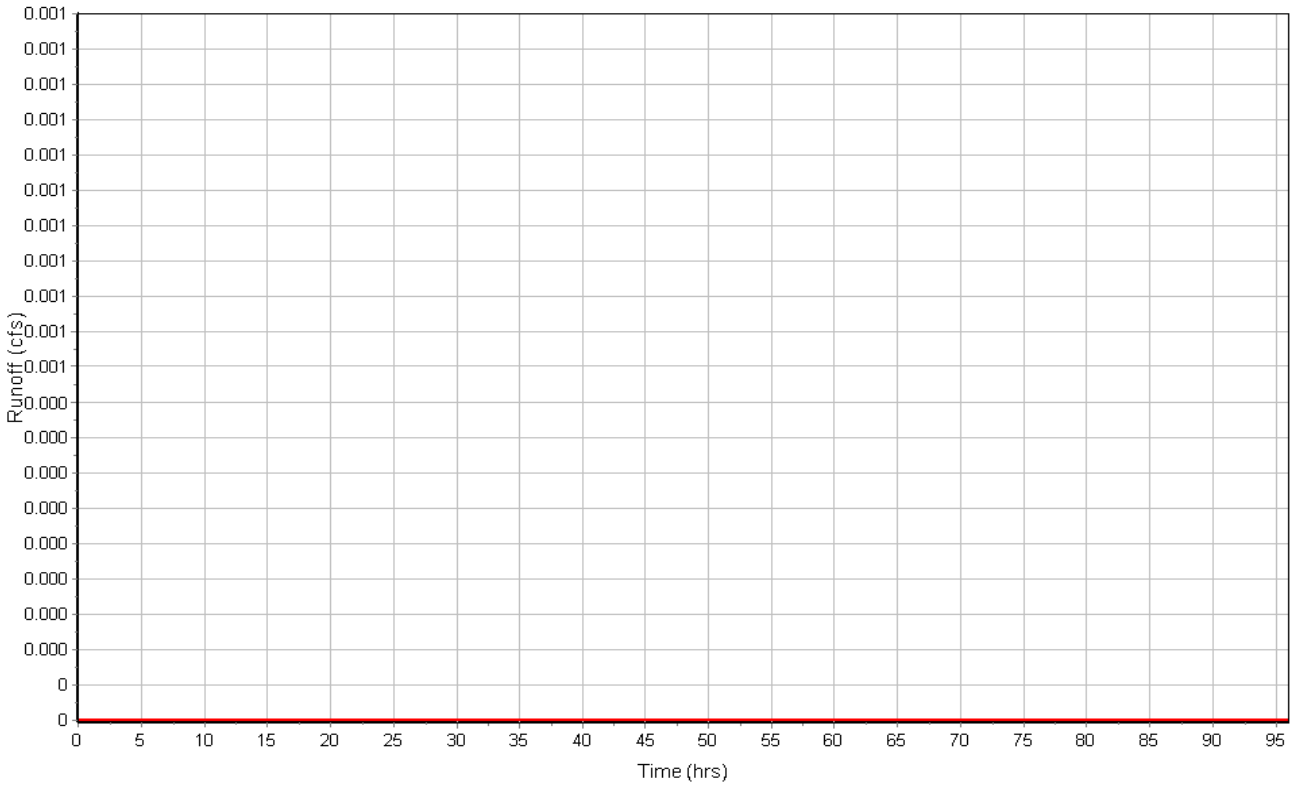
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:23:59

Subbasin : BASIN_19_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_2_ROW

Input Data

Area (ac)	0.18
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.18	B	98.00
Composite Area & Weighted CN	0.18		98.00

Time of Concentration

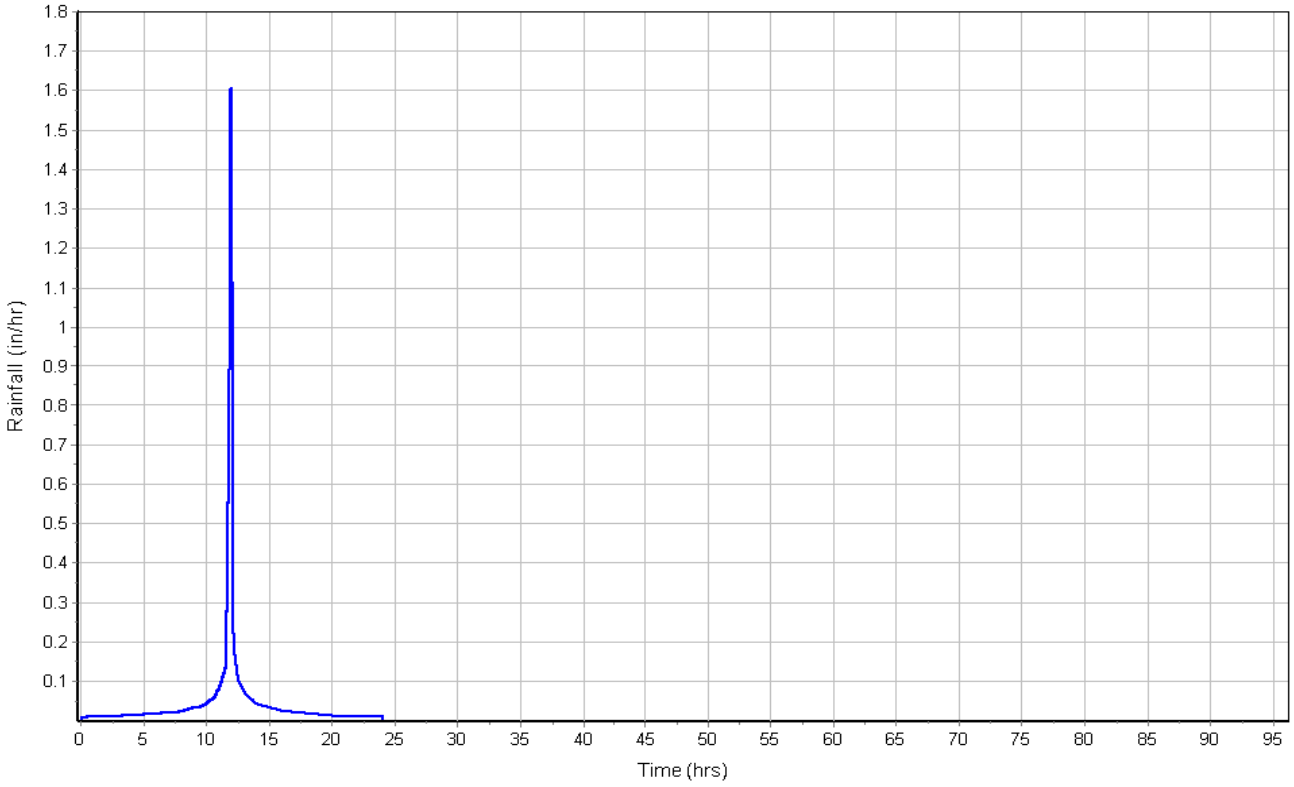
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

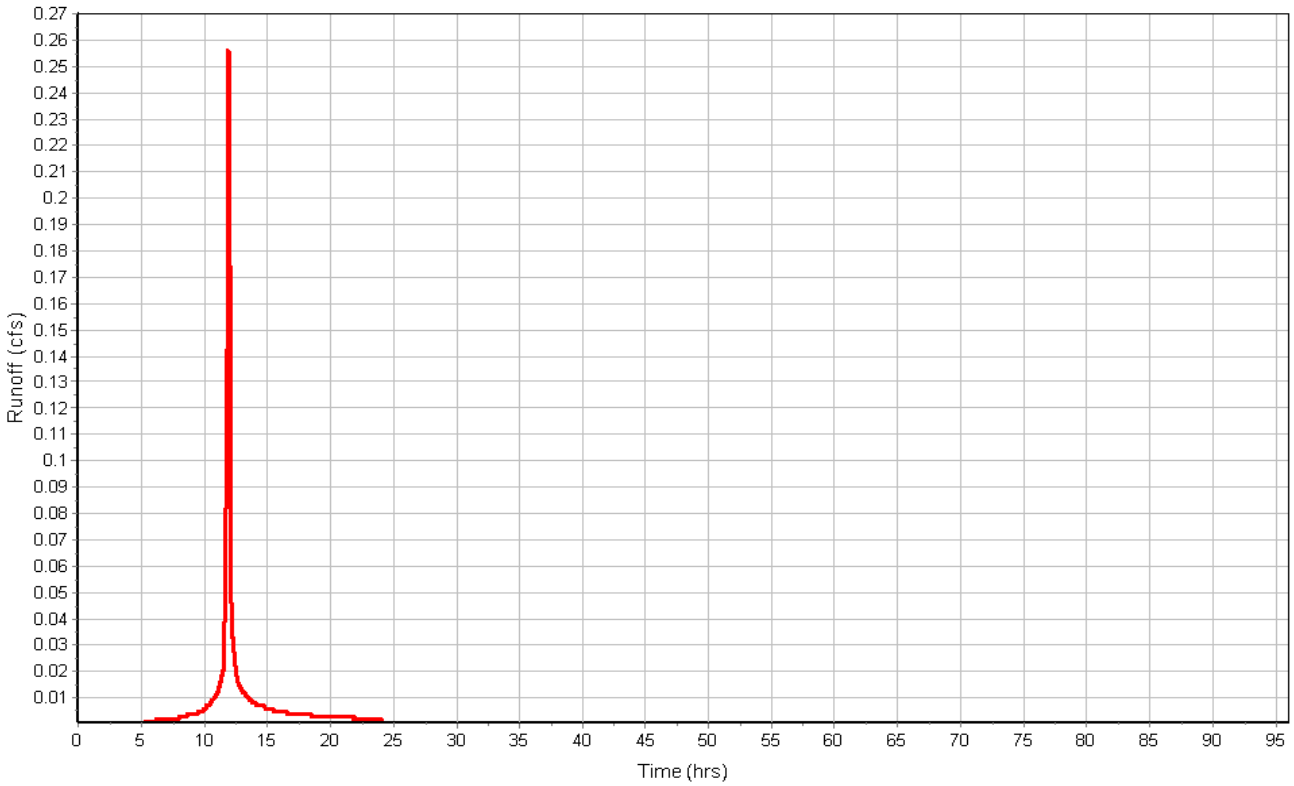
Total Rainfall (in)	1.17
Total Runoff (in)	0.95
Peak Runoff (cfs)	0.26
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_2_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_2_VACANT

Input Data

Area (ac) 0.46
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.46	B	58.00
Composite Area & Weighted CN	0.46		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	259	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	56.90	0.00	0.00

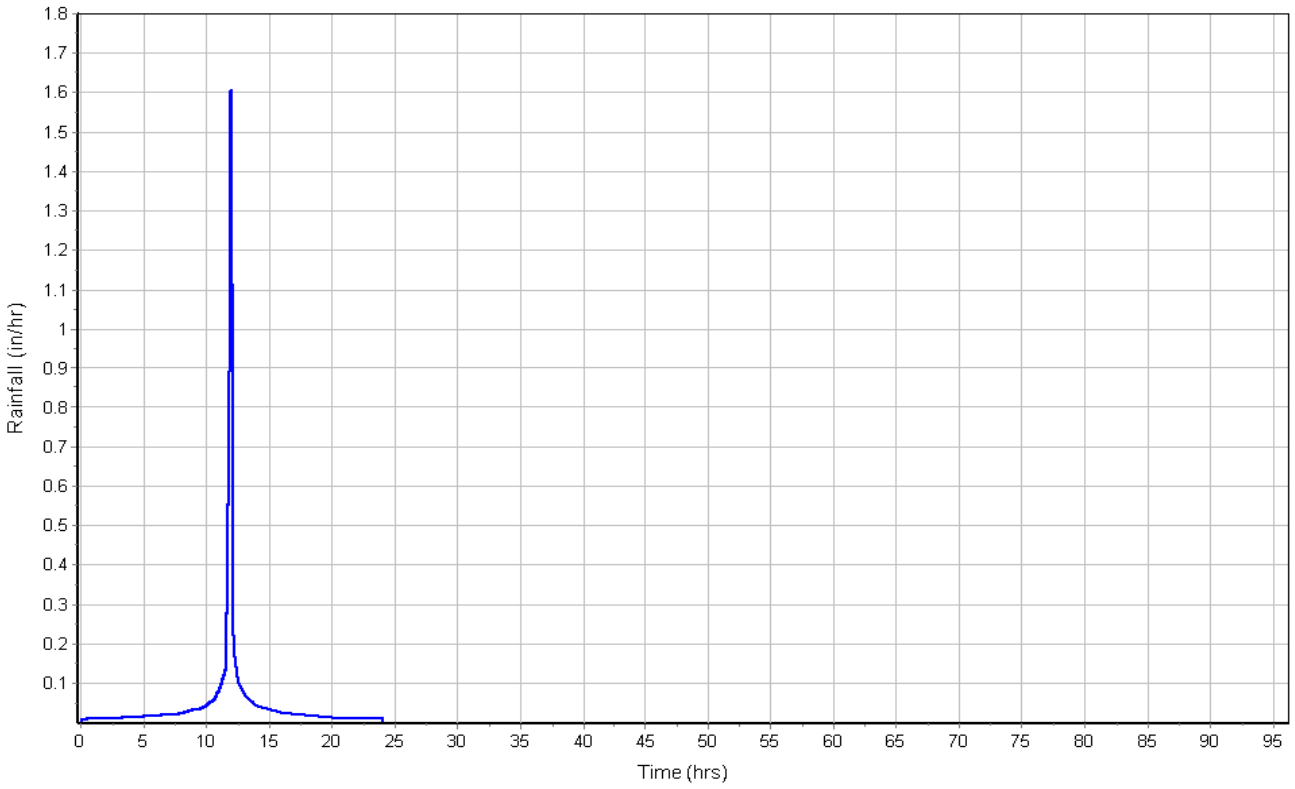
Total TOC (min) 56.90

Subbasin Runoff Results

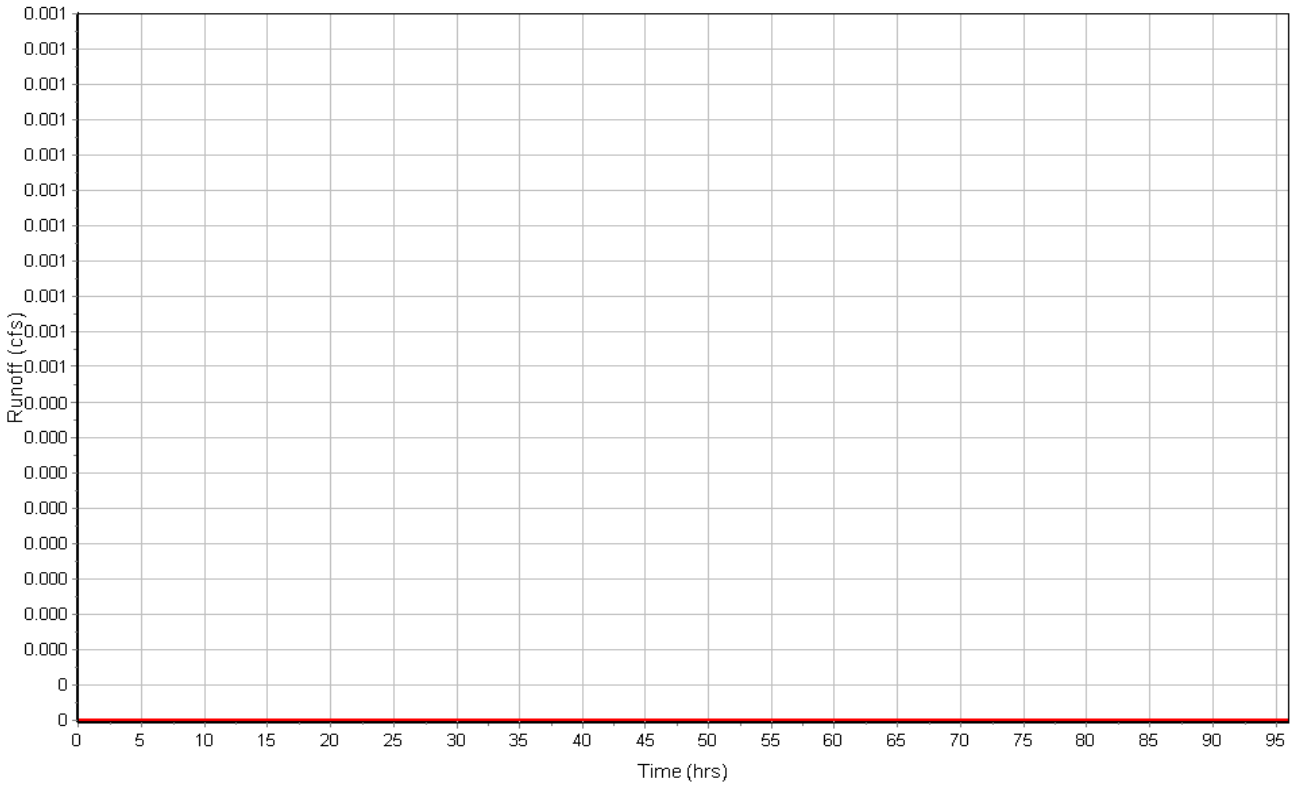
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:56:54

Subbasin : BASIN_2_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_20_ROW

Input Data

Area (ac)	0.12
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.12	B	98.00
Composite Area & Weighted CN	0.12		98.00

Time of Concentration

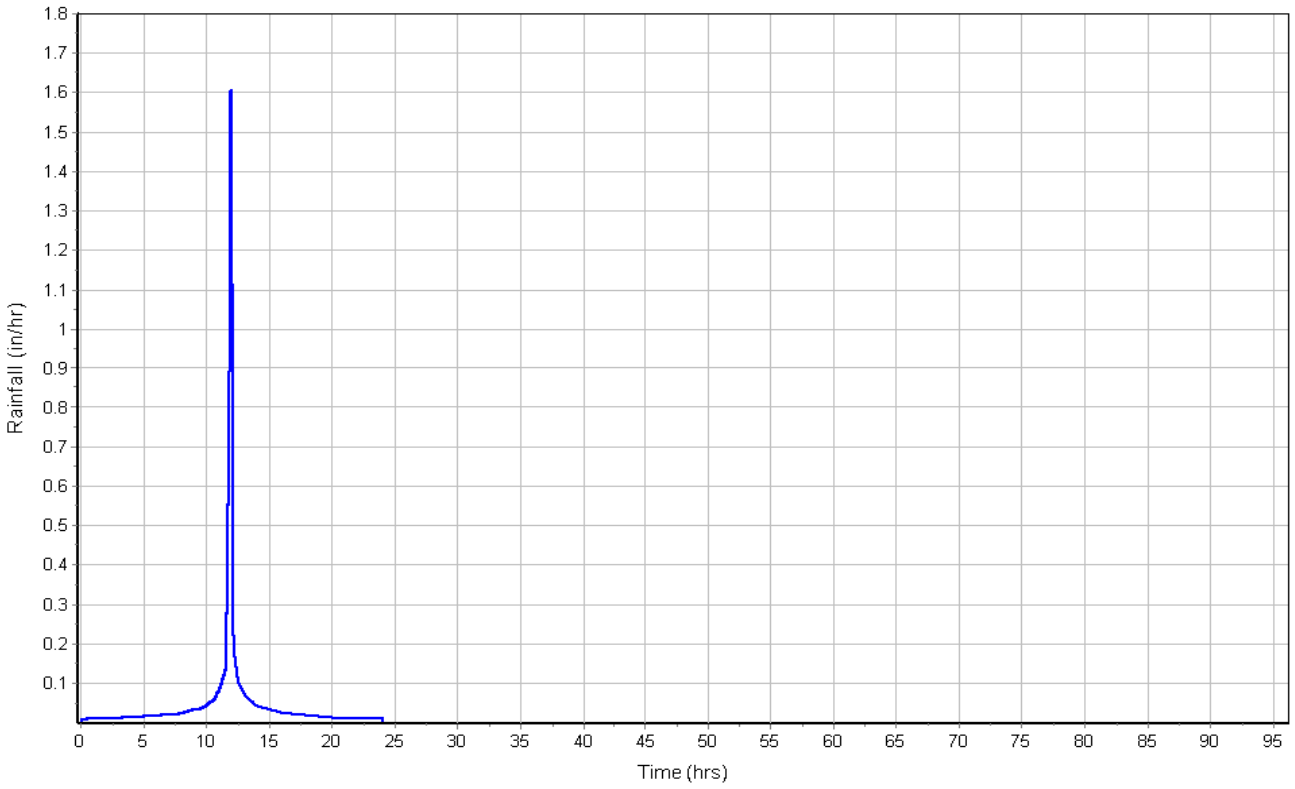
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

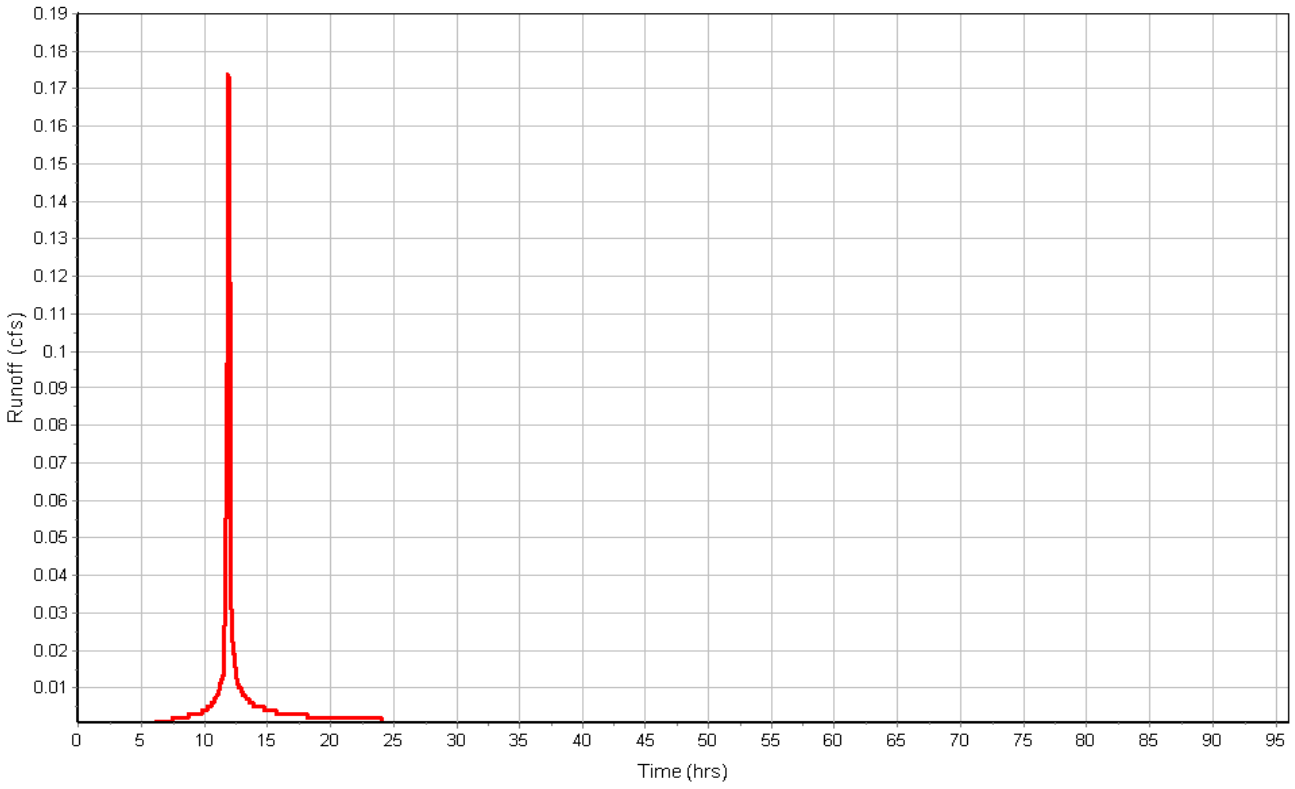
Total Rainfall (in)	1.17
Total Runoff (in)	0.94
Peak Runoff (cfs)	0.17
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_20_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_20_VACANT

Input Data

Area (ac) 0.38
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.38	B	58.00
Composite Area & Weighted CN	0.38		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	279	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	60.39	0.00	0.00

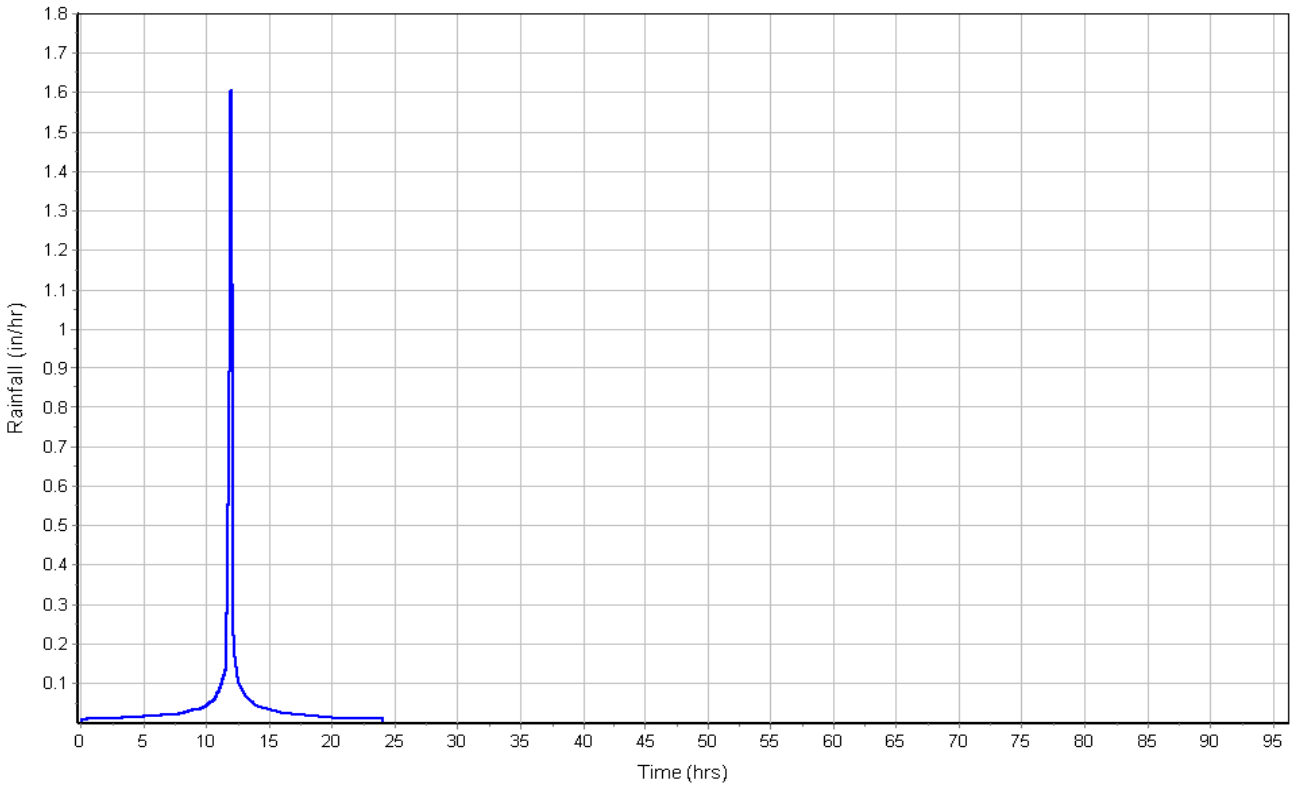
Total TOC (min) 60.39

Subbasin Runoff Results

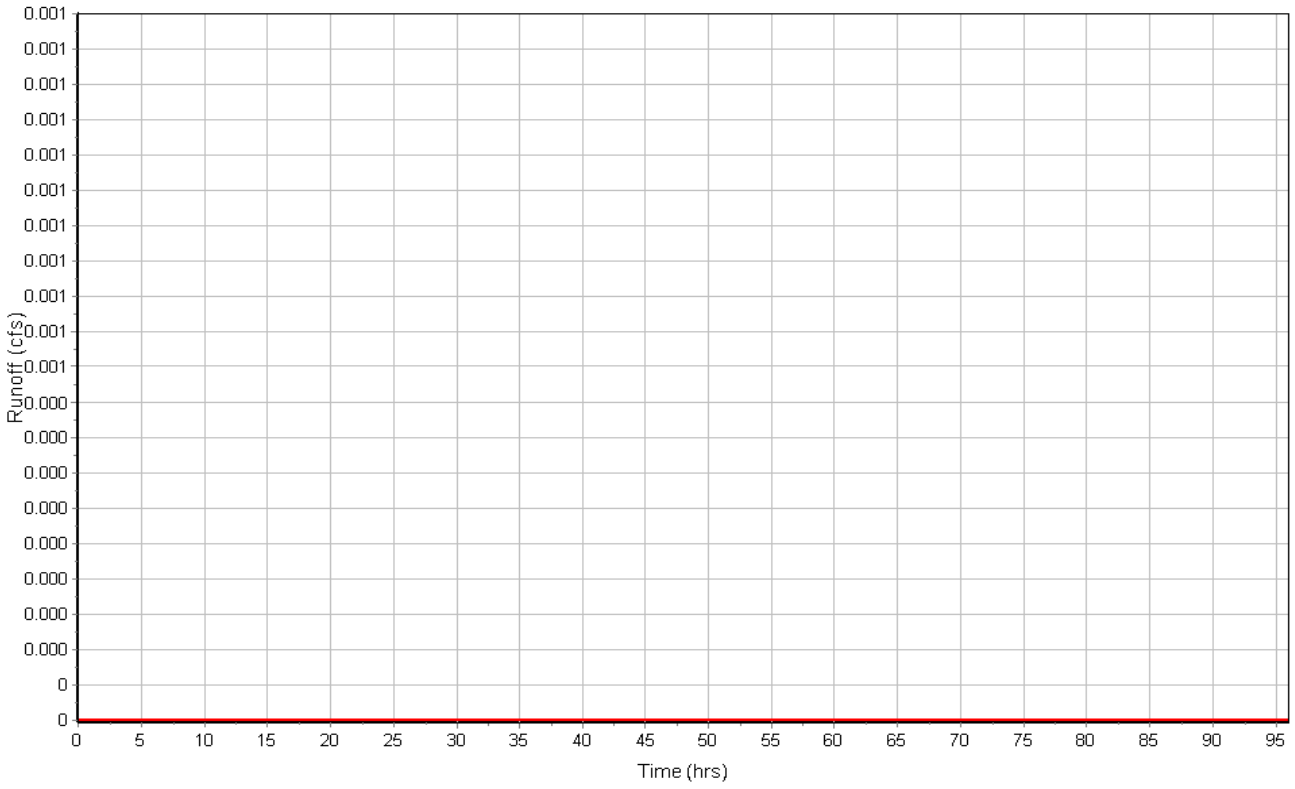
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 01:00:23

Subbasin : BASIN_20_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_21_ROW

Input Data

Area (ac) 0.12
Peak Rate Factor 484.00
Weighted Curve Number 98.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.12	B	98.00
Composite Area & Weighted CN	0.12		98.00

Time of Concentration

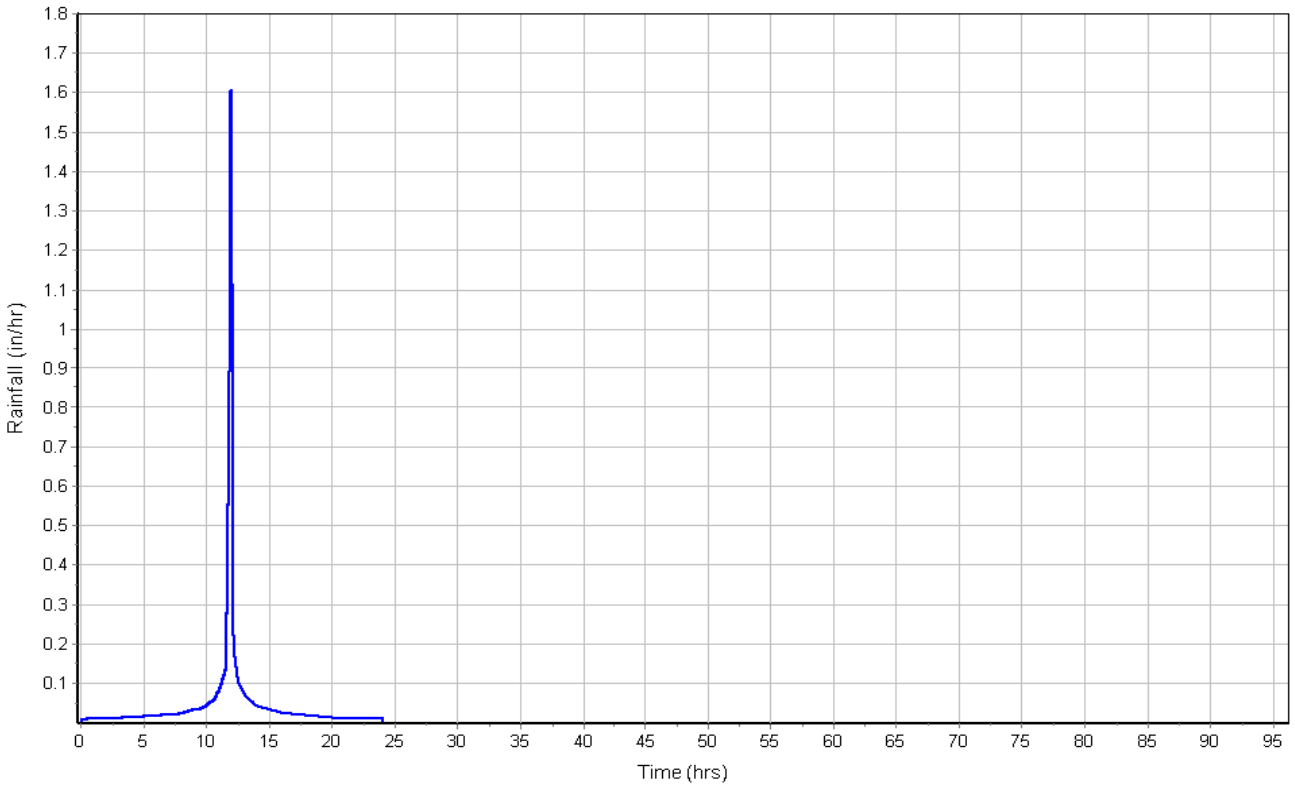
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

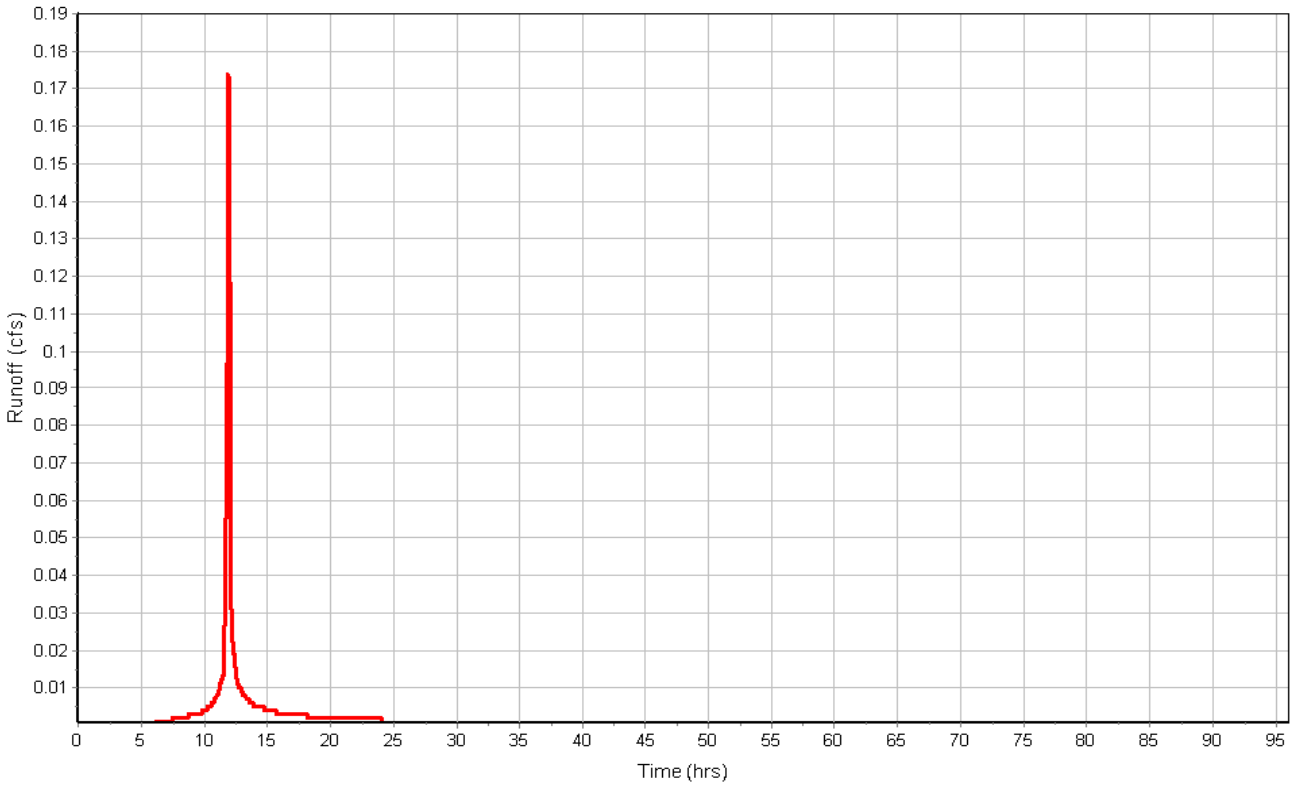
Total Rainfall (in) 1.17
Total Runoff (in) 0.94
Peak Runoff (cfs) 0.17
Weighted Curve Number 98.00
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : BASIN_21_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_21_VACANT

Input Data

Area (ac) 0.44
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.44	B	58.00
Composite Area & Weighted CN	0.44		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	298	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	63.66	0.00	0.00

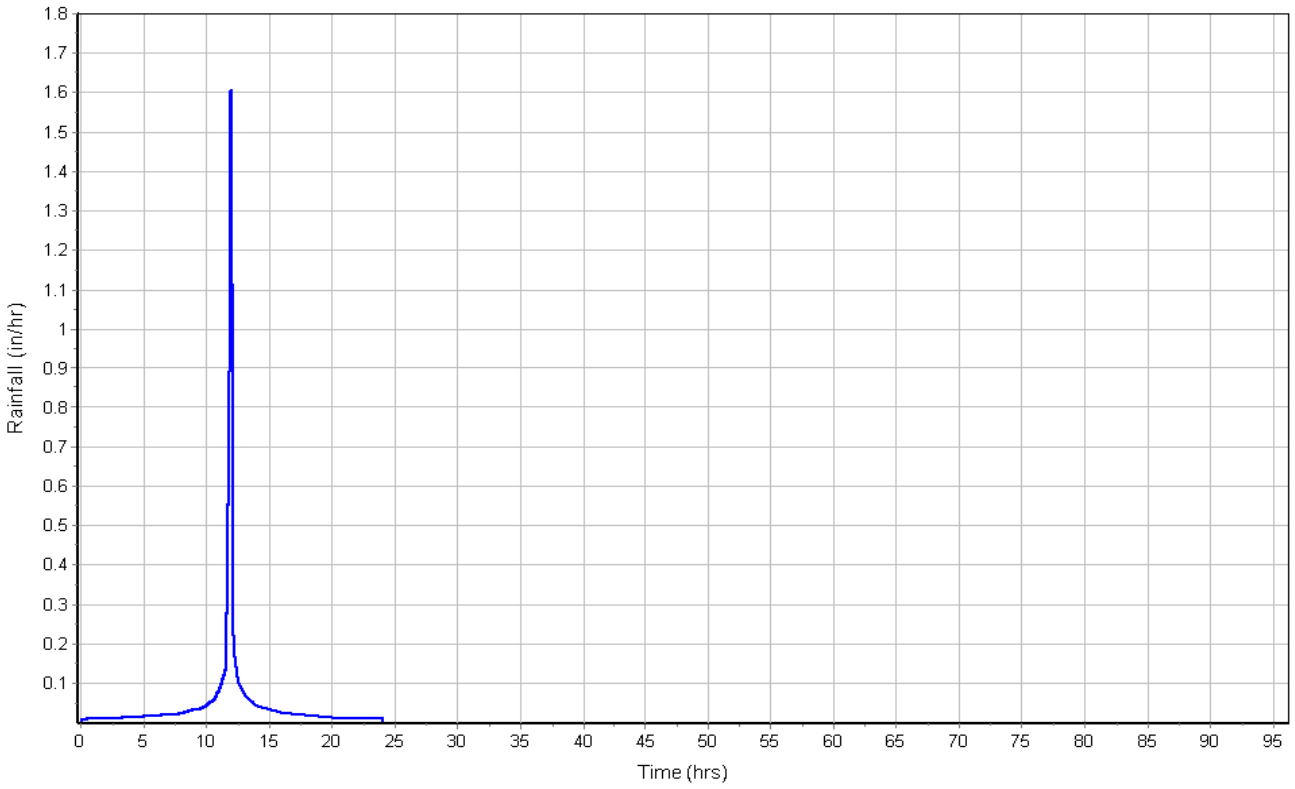
Total TOC (min) 63.66

Subbasin Runoff Results

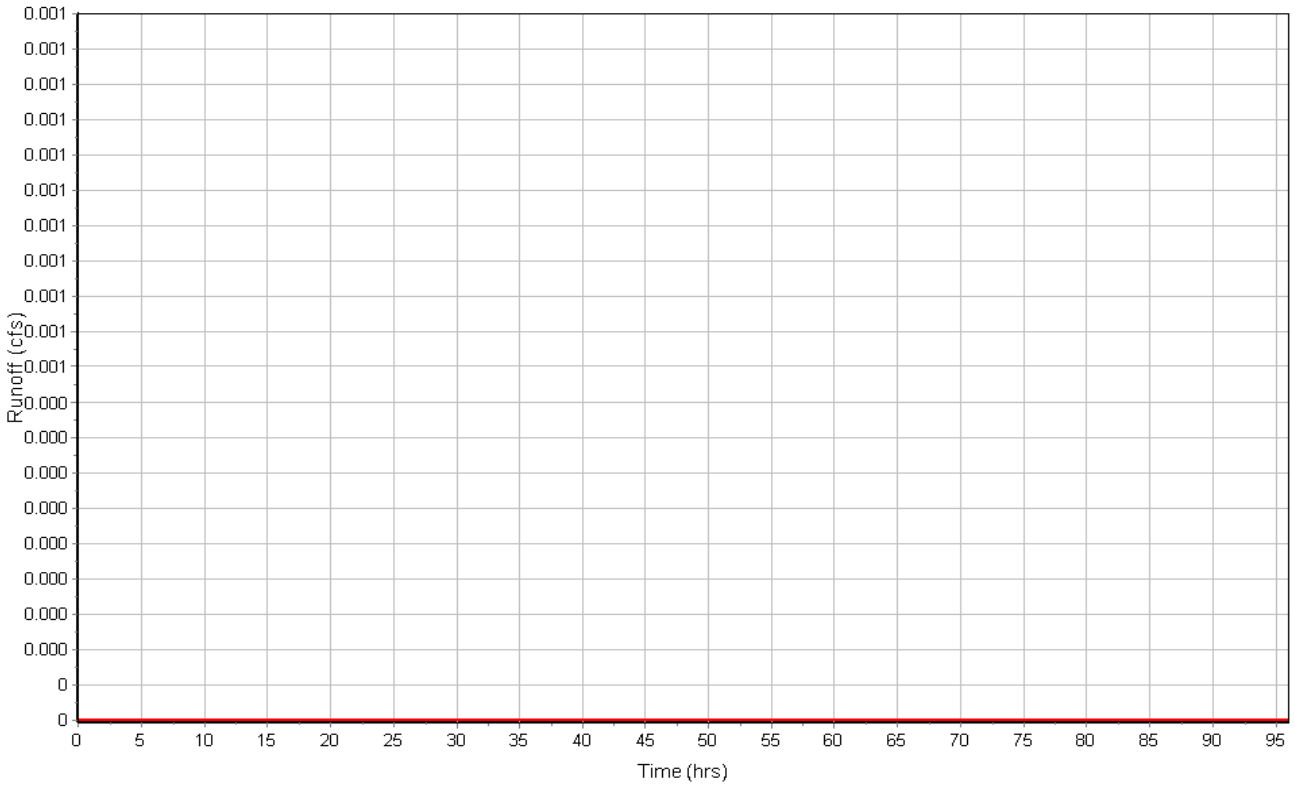
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 01:03:40

Subbasin : BASIN_21_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_22_ROW

Input Data

Area (ac)	0.14
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.14	B	98.00
Composite Area & Weighted CN	0.14		98.00

Time of Concentration

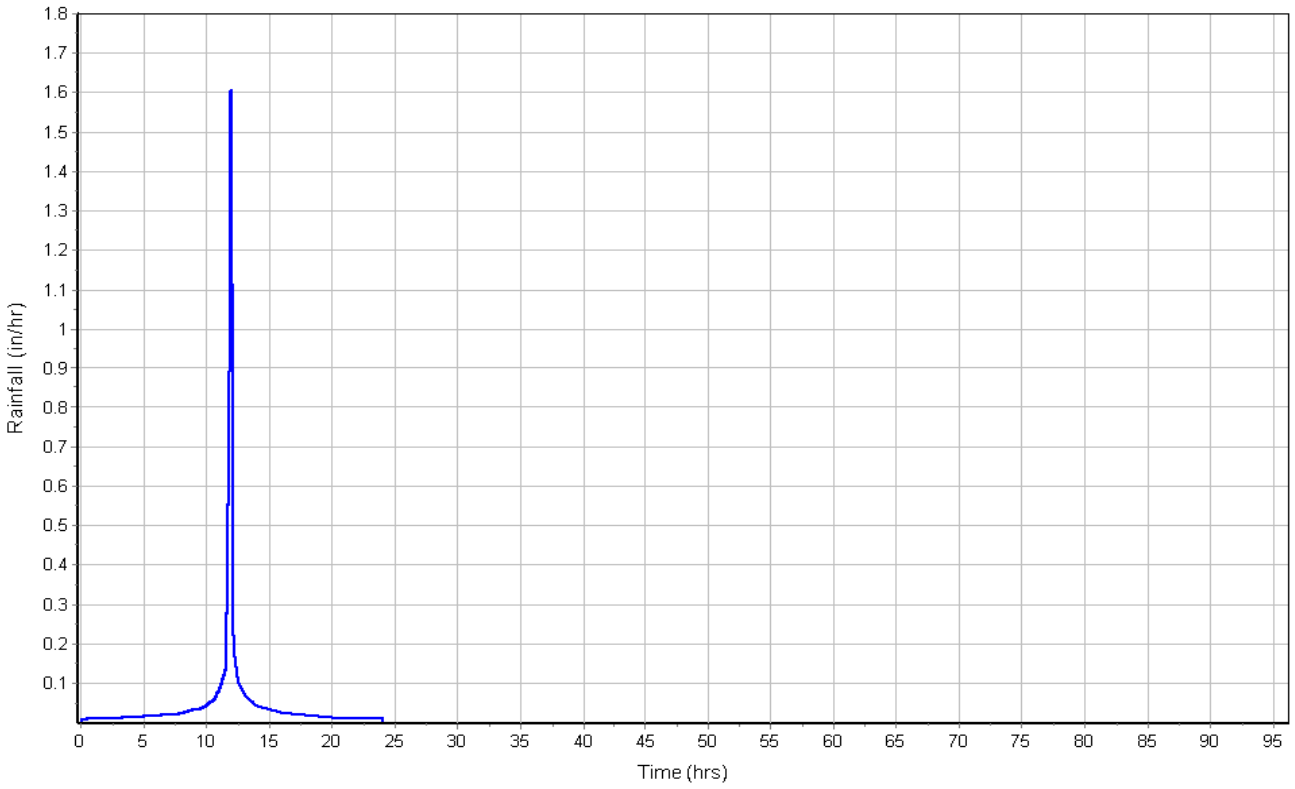
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

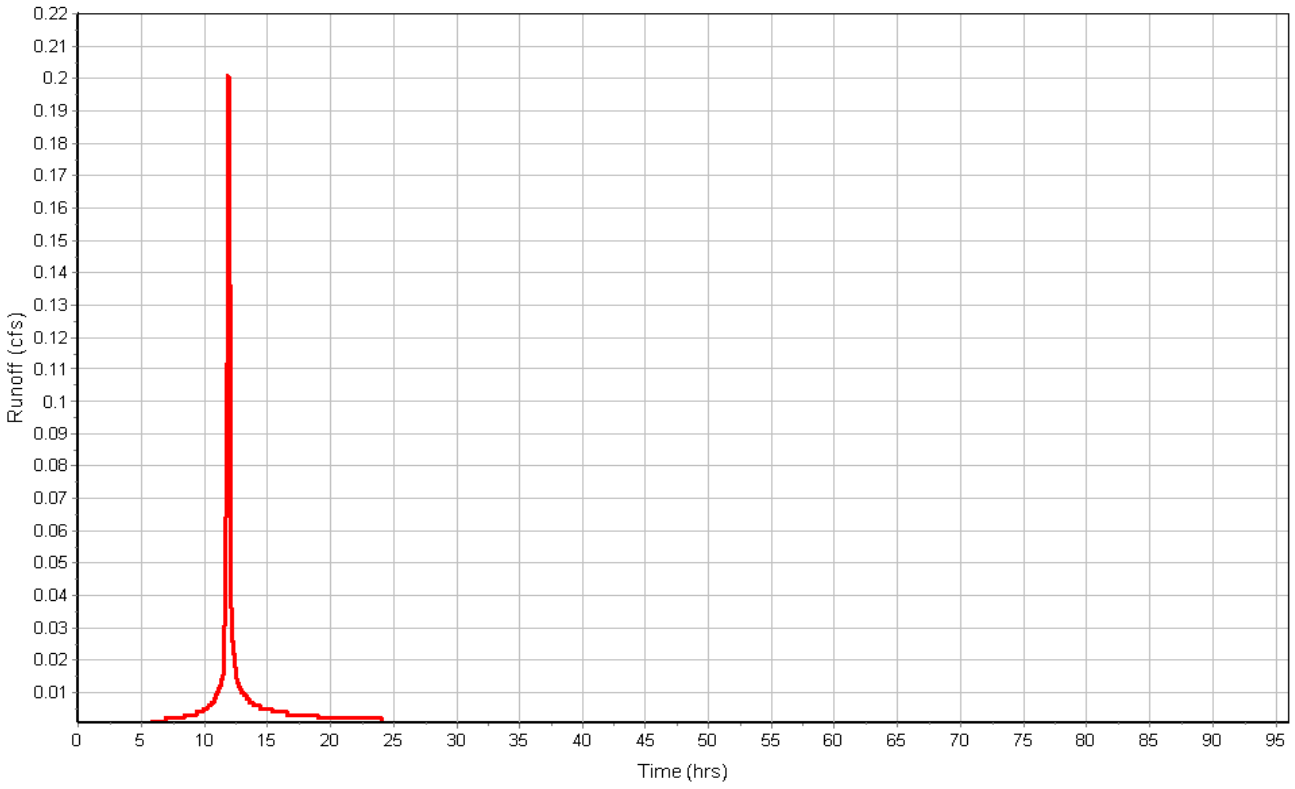
Total Rainfall (in)	1.17
Total Runoff (in)	0.95
Peak Runoff (cfs)	0.20
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_22_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_22_VACANT

Input Data

Area (ac) 0.71
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.71	B	58.00
Composite Area & Weighted CN	0.71		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	226	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	51.02	0.00	0.00

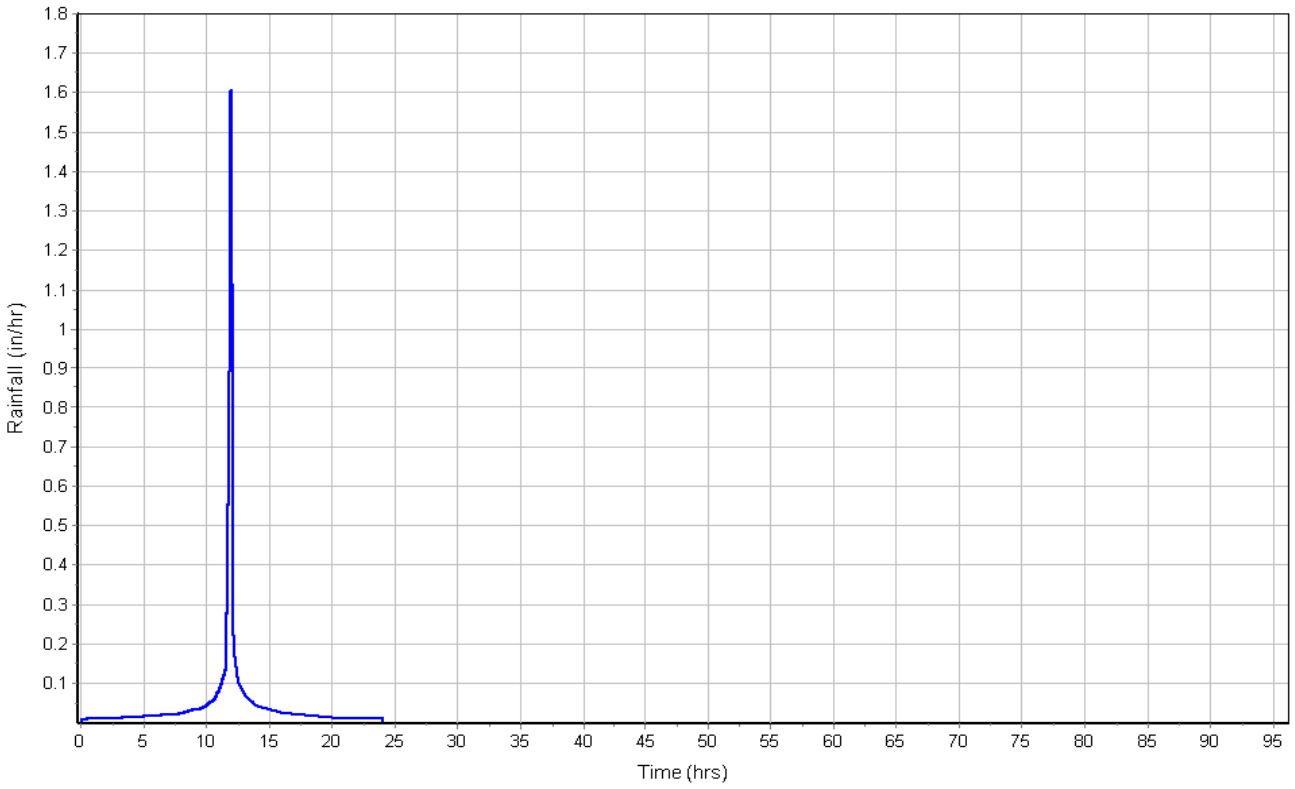
Total TOC (min) 51.02

Subbasin Runoff Results

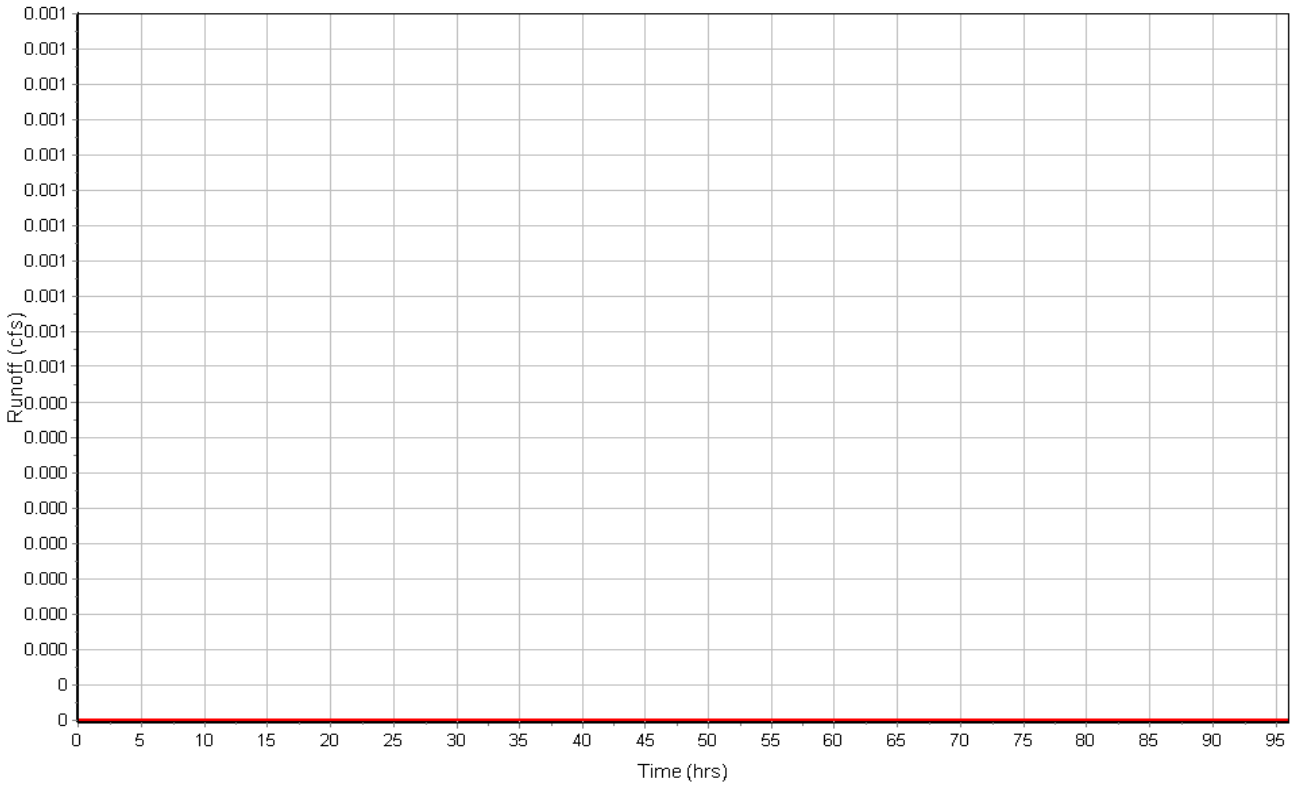
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:51:01

Subbasin : BASIN_22_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_23_ROW

Input Data

Area (ac) 0.14
Peak Rate Factor 484.00
Weighted Curve Number 98.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.14	B	98.00
Composite Area & Weighted CN	0.14		98.00

Time of Concentration

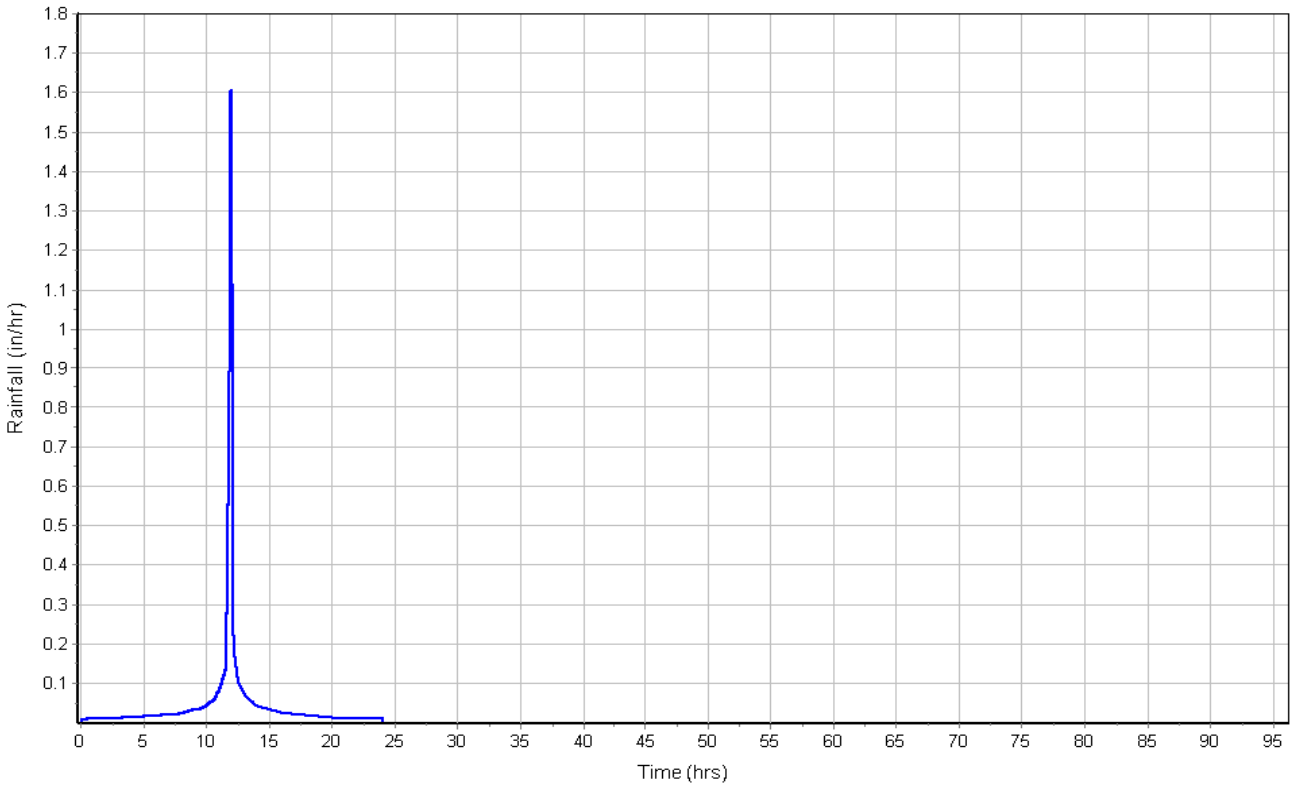
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

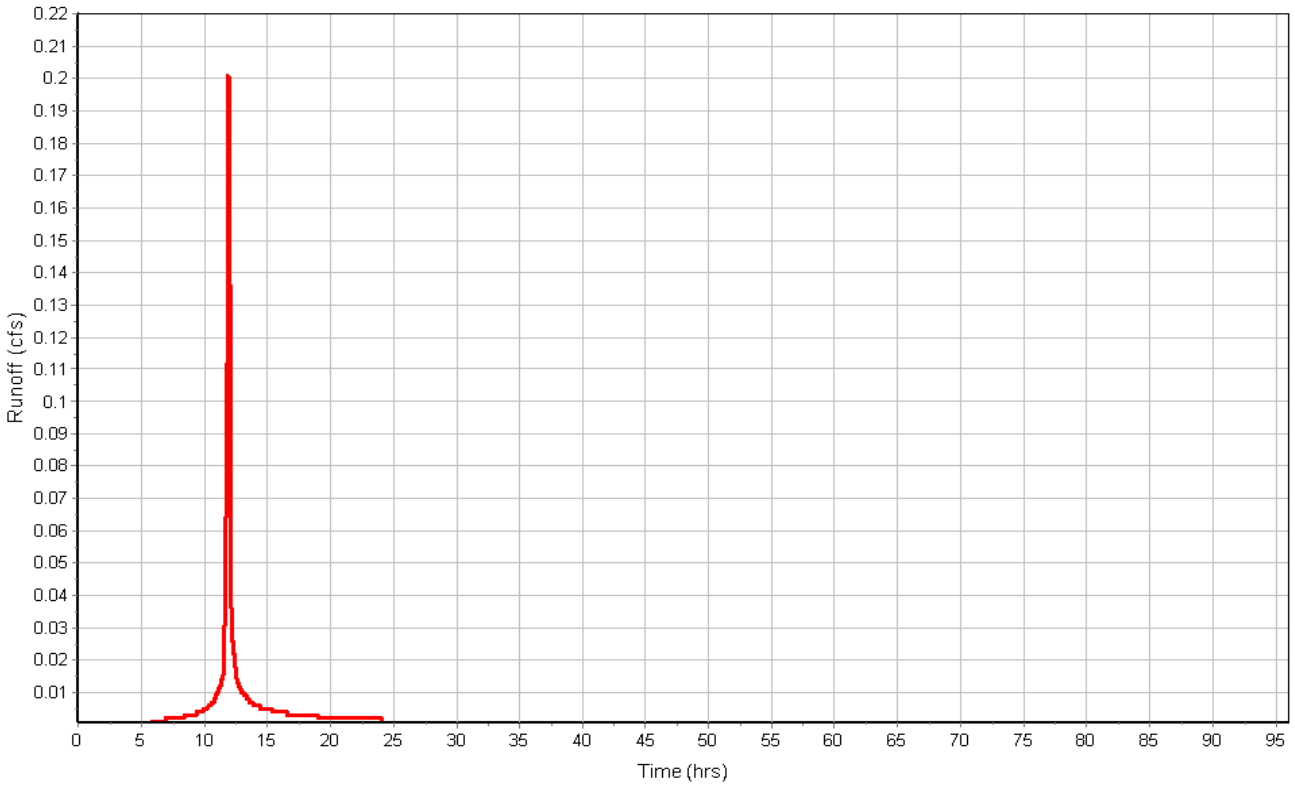
Total Rainfall (in) 1.17
Total Runoff (in) 0.95
Peak Runoff (cfs) 0.20
Weighted Curve Number 98.00
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : BASIN_23_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_23_VACANT

Input Data

Area (ac) 0.63
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.63	B	58.00
Composite Area & Weighted CN	0.63		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	209	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	47.93	0.00	0.00

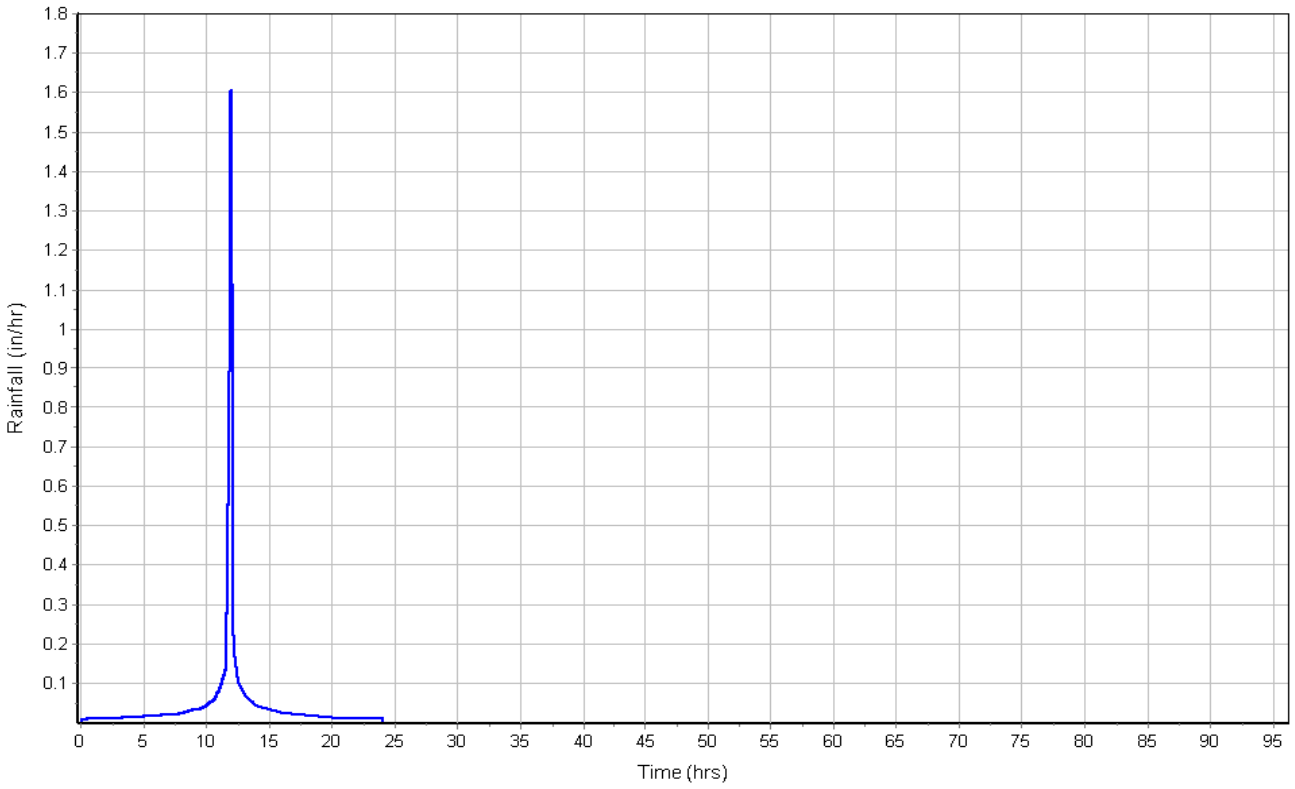
Total TOC (min) 47.93

Subbasin Runoff Results

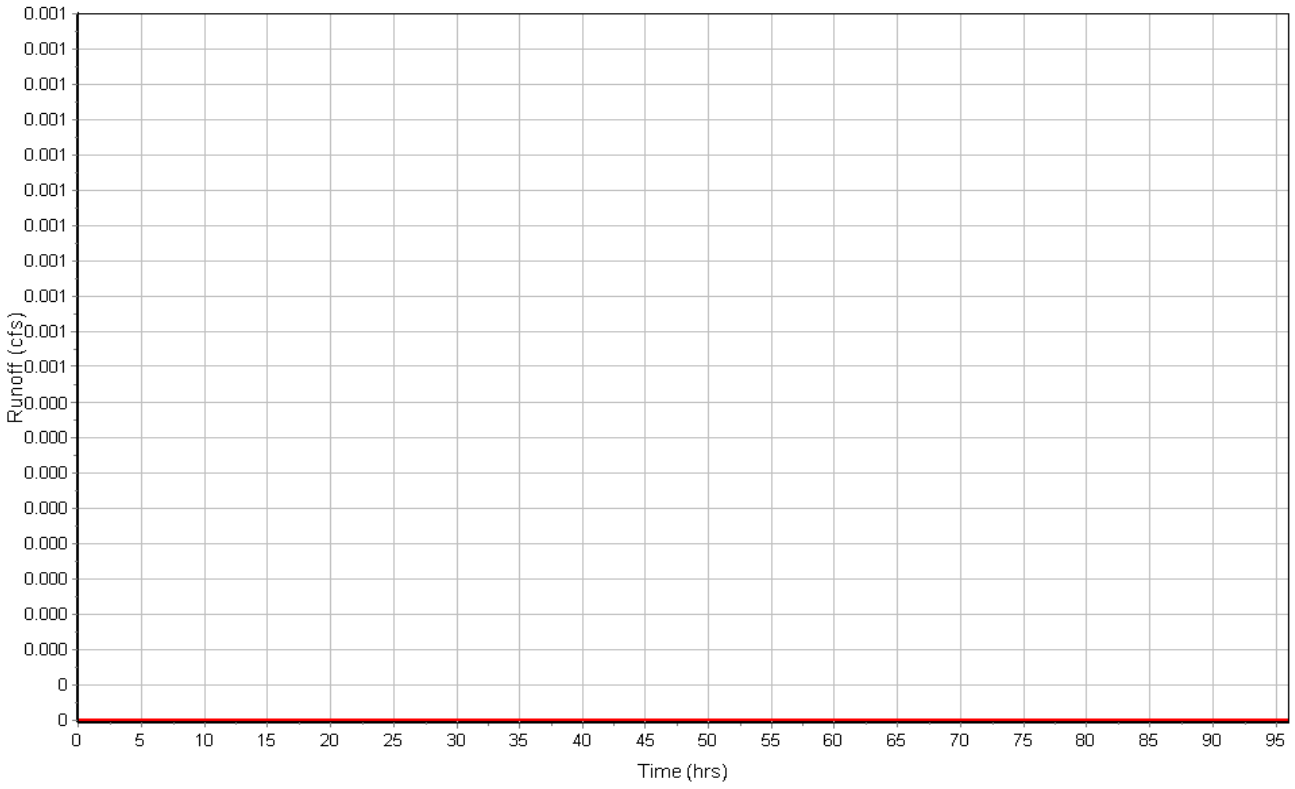
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:47:56

Subbasin : BASIN_23_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_24_ROW

Input Data

Area (ac)	0.11
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.11	B	98.00
Composite Area & Weighted CN	0.11		98.00

Time of Concentration

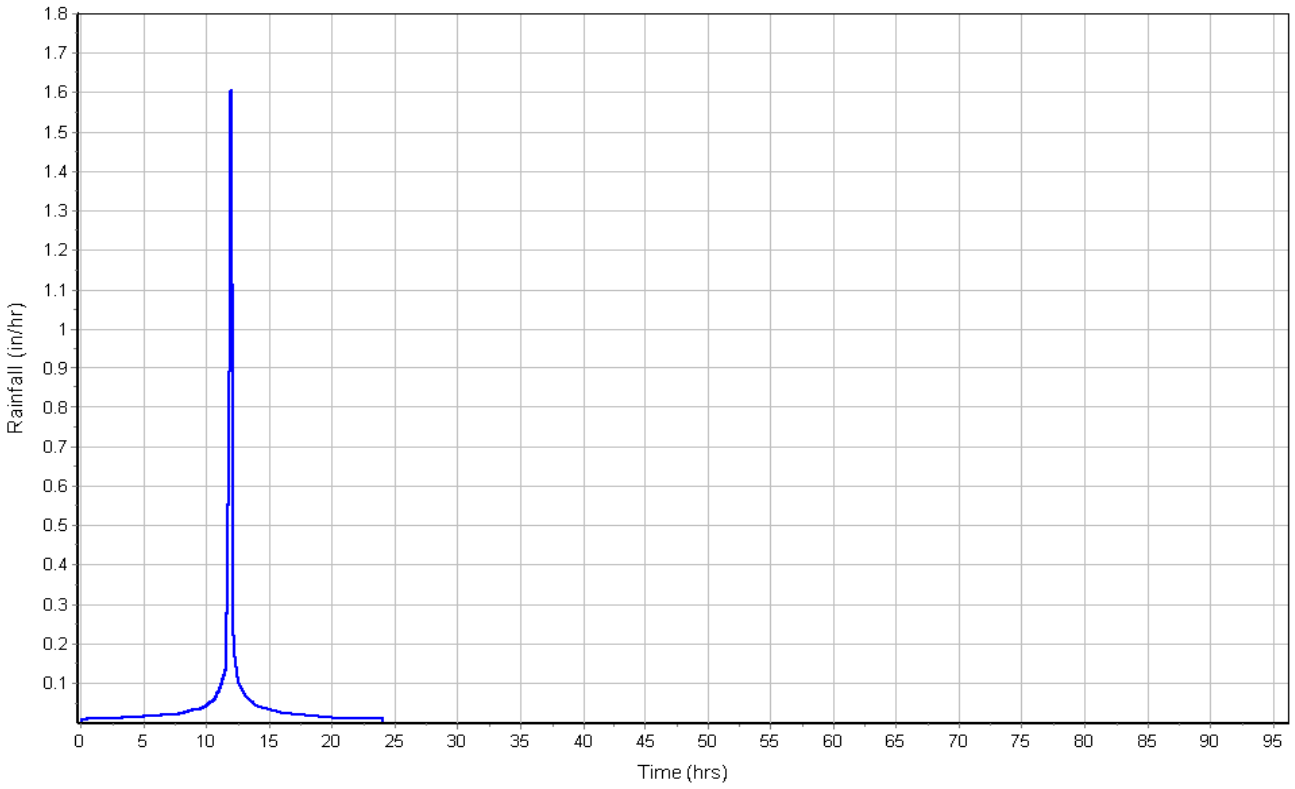
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

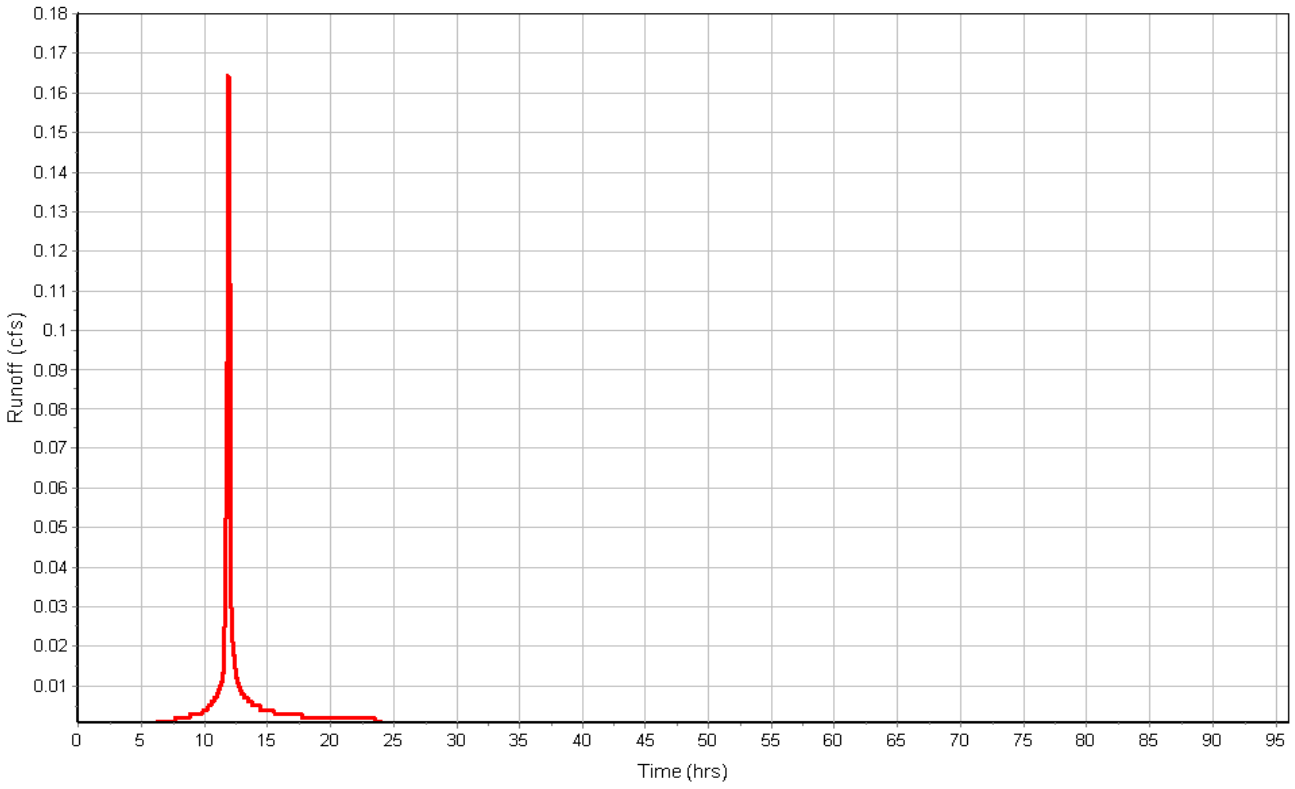
Total Rainfall (in)	1.17
Total Runoff (in)	0.94
Peak Runoff (cfs)	0.16
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_24_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_24_VACANT

Input Data

Area (ac) 0.29
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.29	B	58.00
Composite Area & Weighted CN	0.29		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	257	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	56.55	0.00	0.00

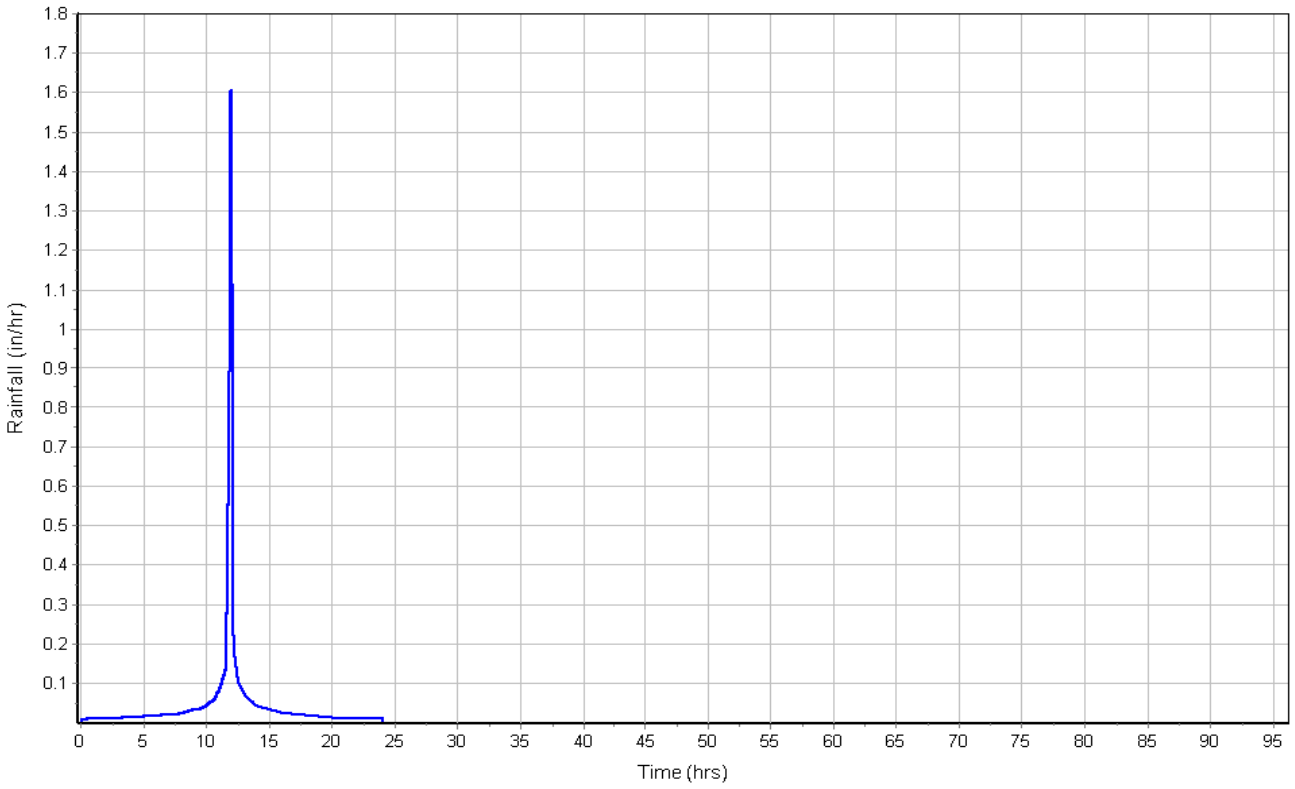
Total TOC (min) 56.55

Subbasin Runoff Results

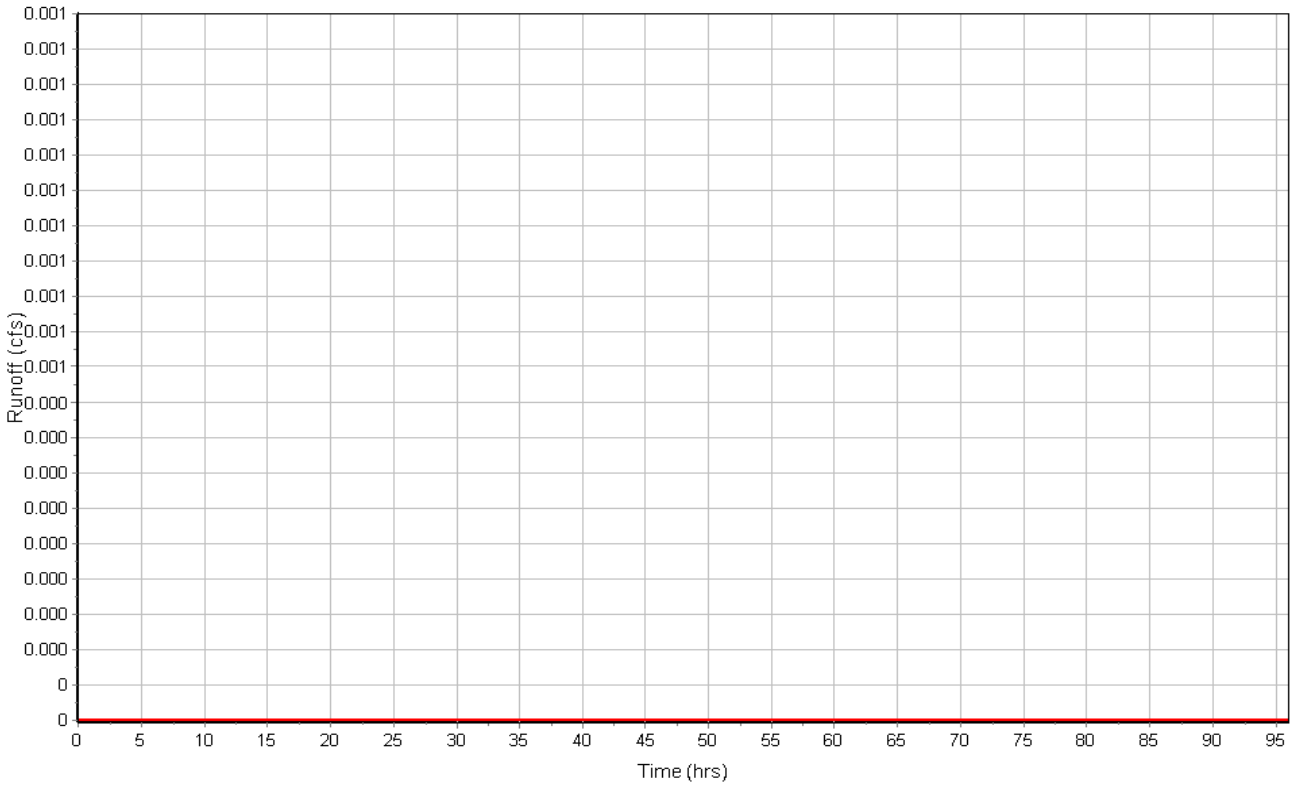
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:56:33

Subbasin : BASIN_24_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_25_ROW

Input Data

Area (ac)	0.13
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.13	B	98.00
Composite Area & Weighted CN	0.13		98.00

Time of Concentration

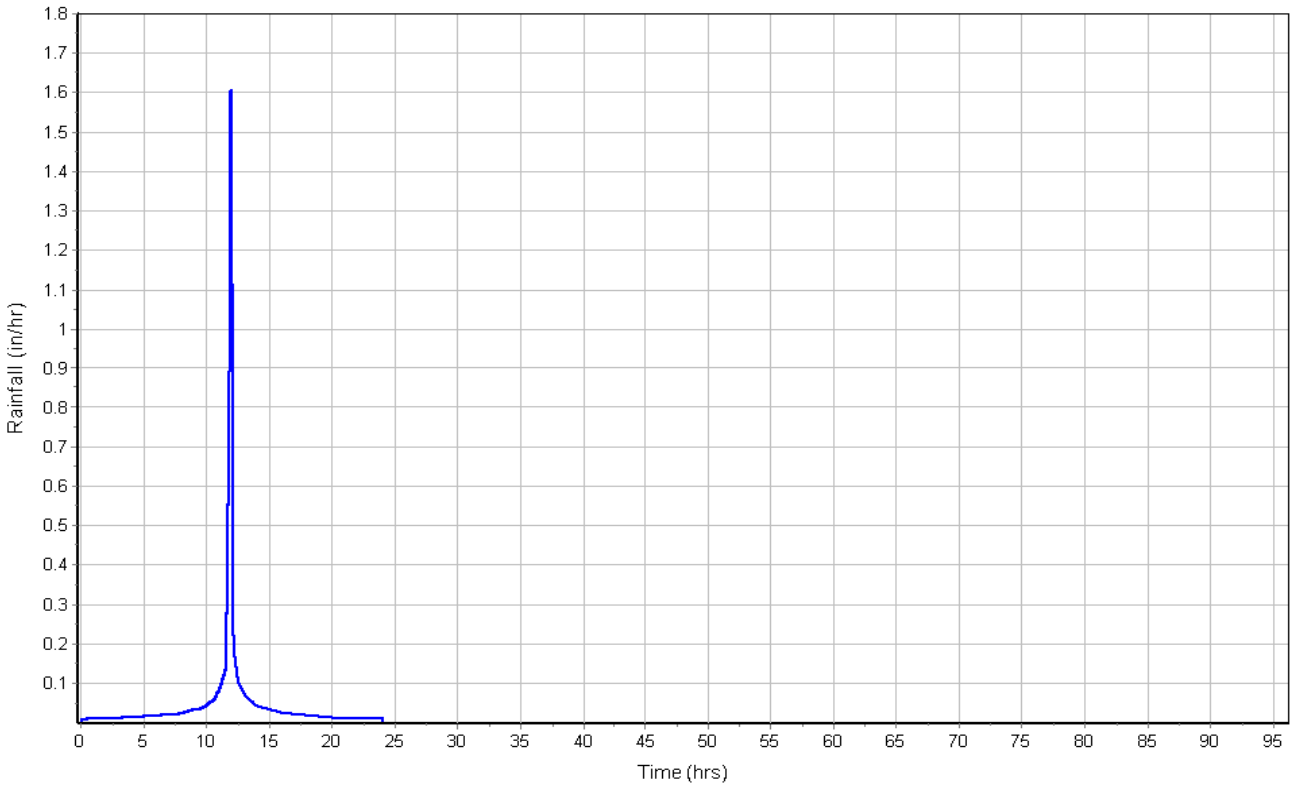
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

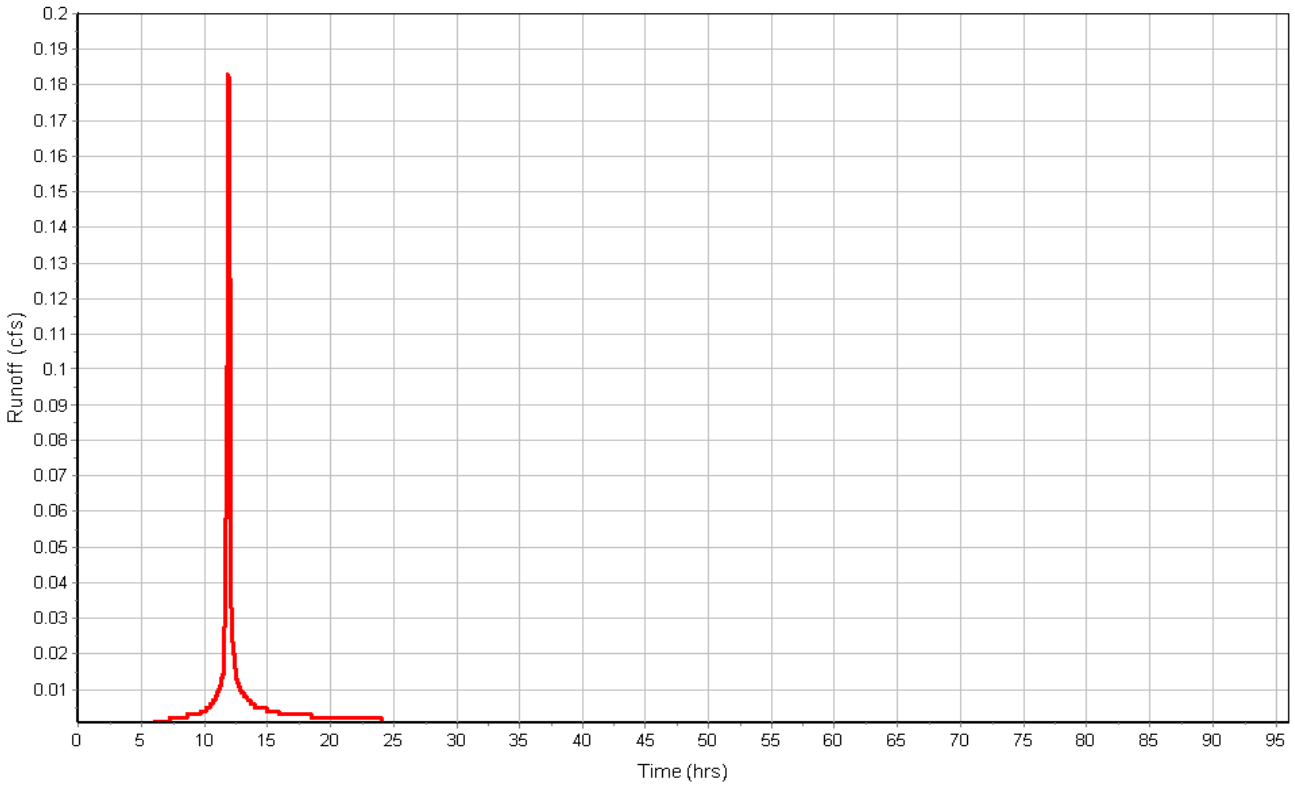
Total Rainfall (in)	1.17
Total Runoff (in)	0.95
Peak Runoff (cfs)	0.18
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_25_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_25_VACANT

Input Data

Area (ac) 0.30
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.30	B	58.00
Composite Area & Weighted CN	0.30		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	238	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	53.18	0.00	0.00

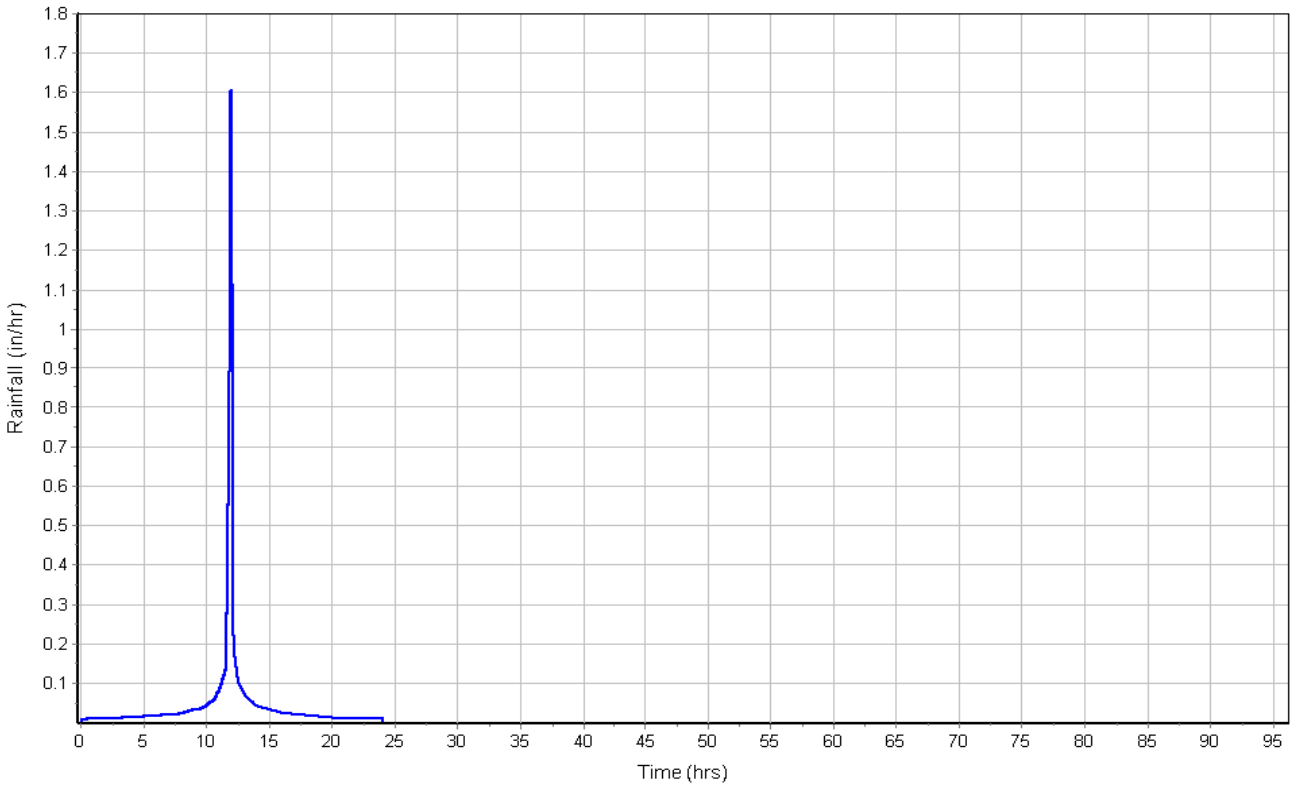
Total TOC (min) 53.18

Subbasin Runoff Results

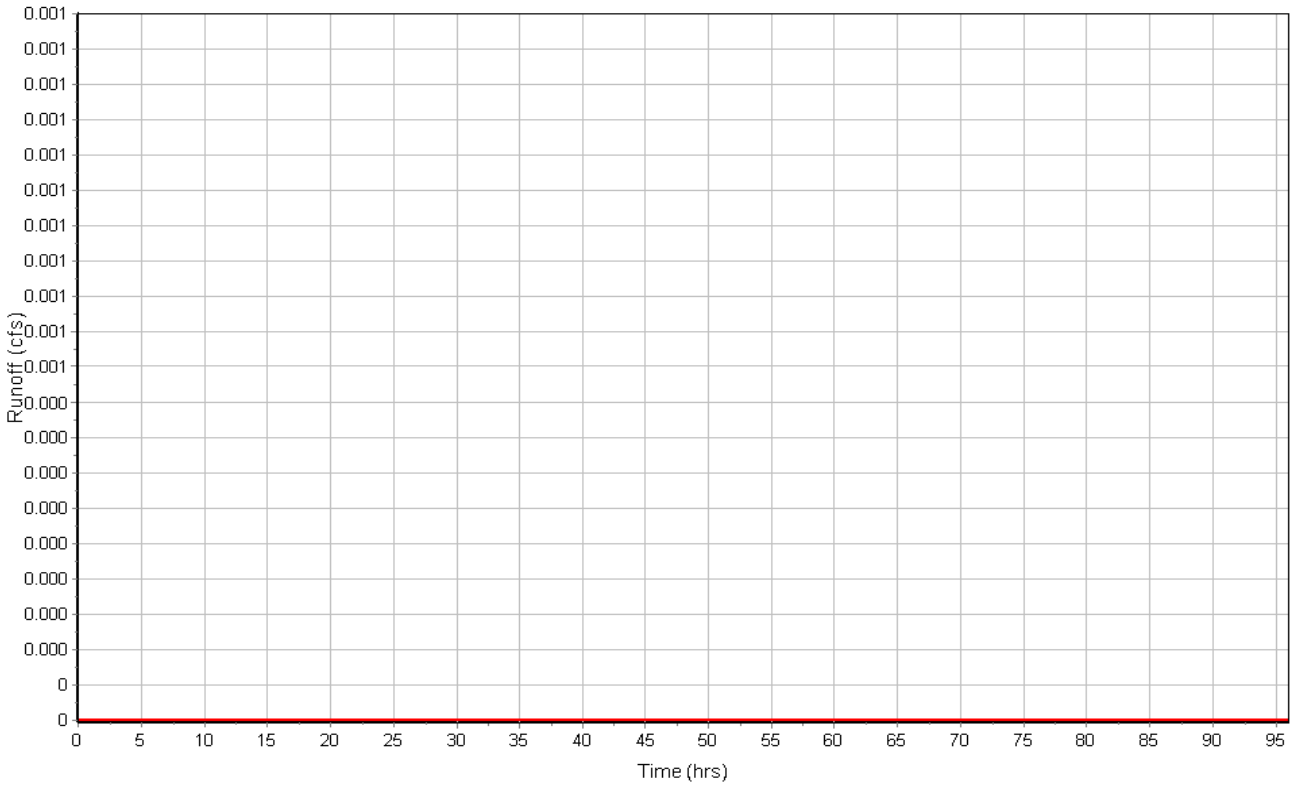
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:53:11

Subbasin : BASIN_25_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_26_ROW

Input Data

Area (ac)	0.17
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.17	B	98.00
Composite Area & Weighted CN	0.17		98.00

Time of Concentration

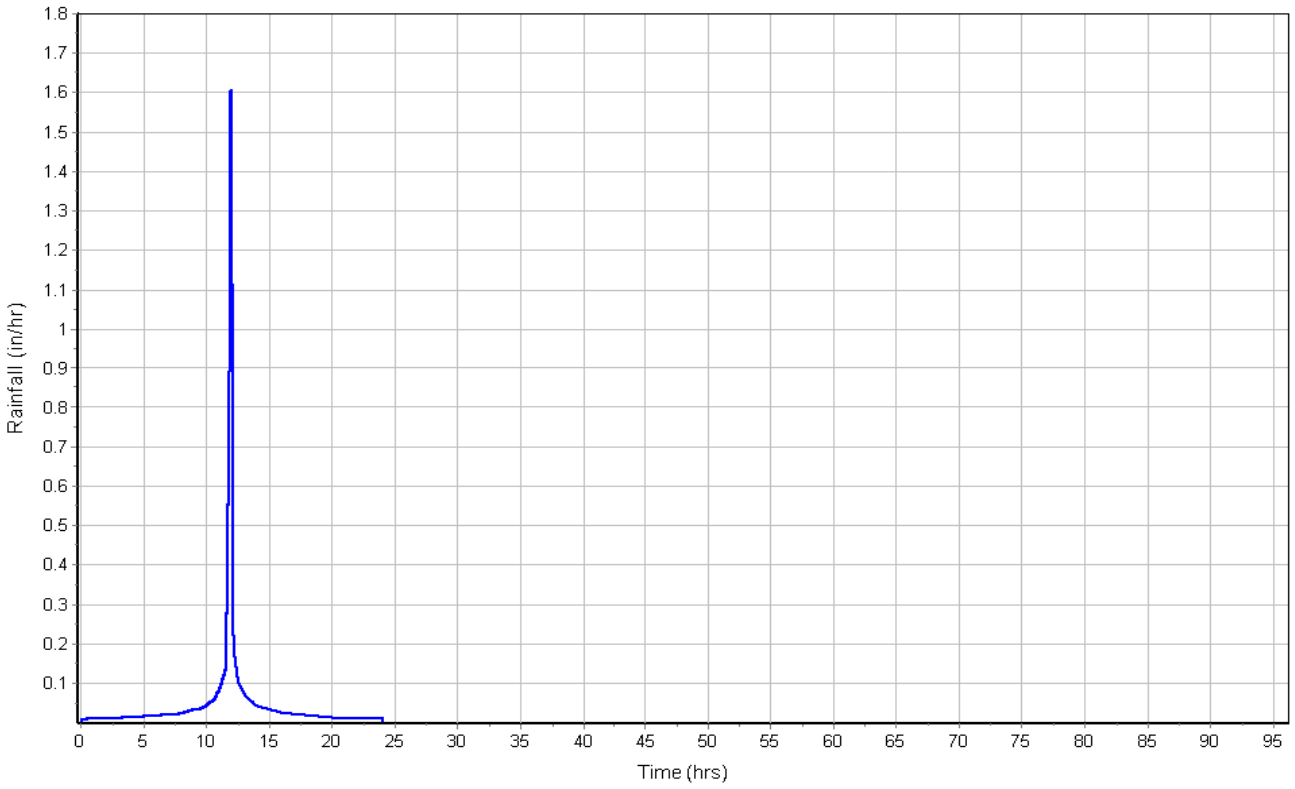
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

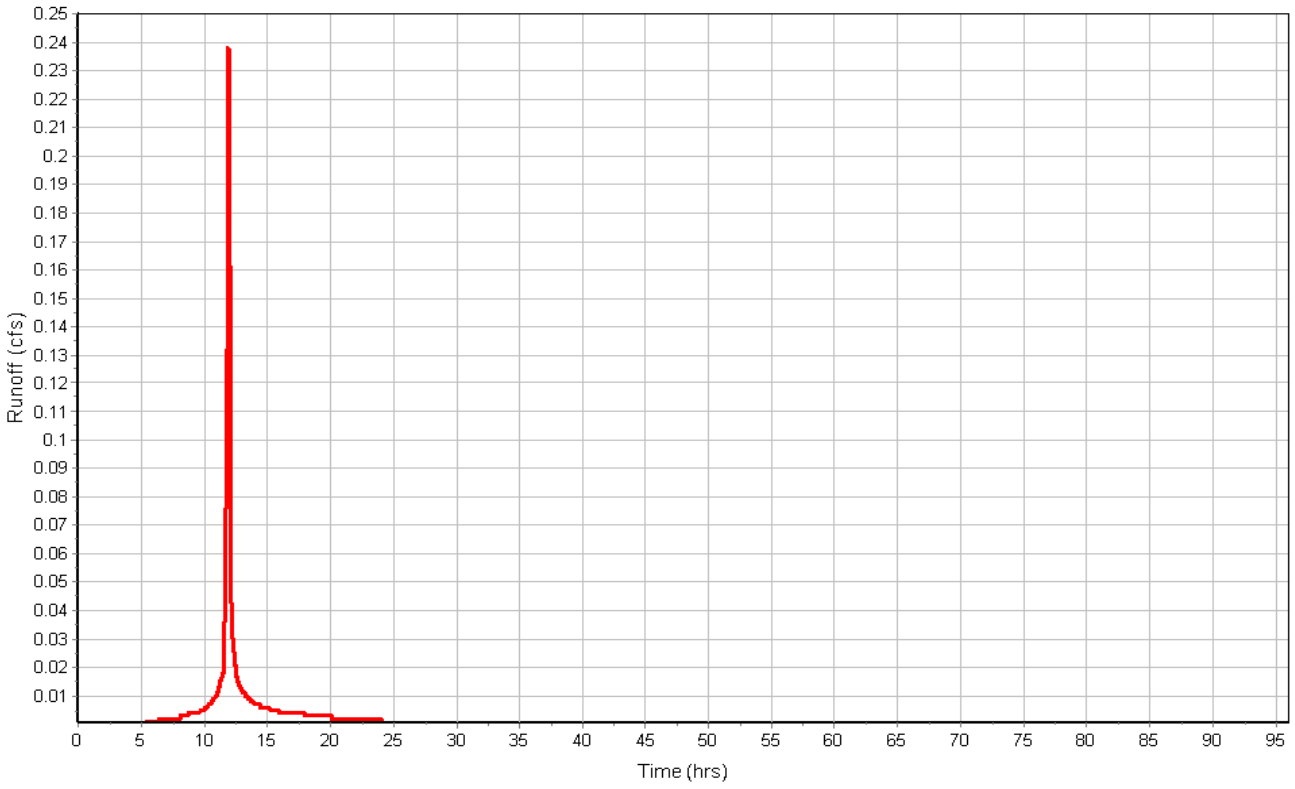
Total Rainfall (in)	1.17
Total Runoff (in)	0.95
Peak Runoff (cfs)	0.24
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_26_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_26_VACANT

Input Data

Area (ac) 0.41
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.41	B	58.00
Composite Area & Weighted CN	0.41		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	236	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	52.82	0.00	0.00

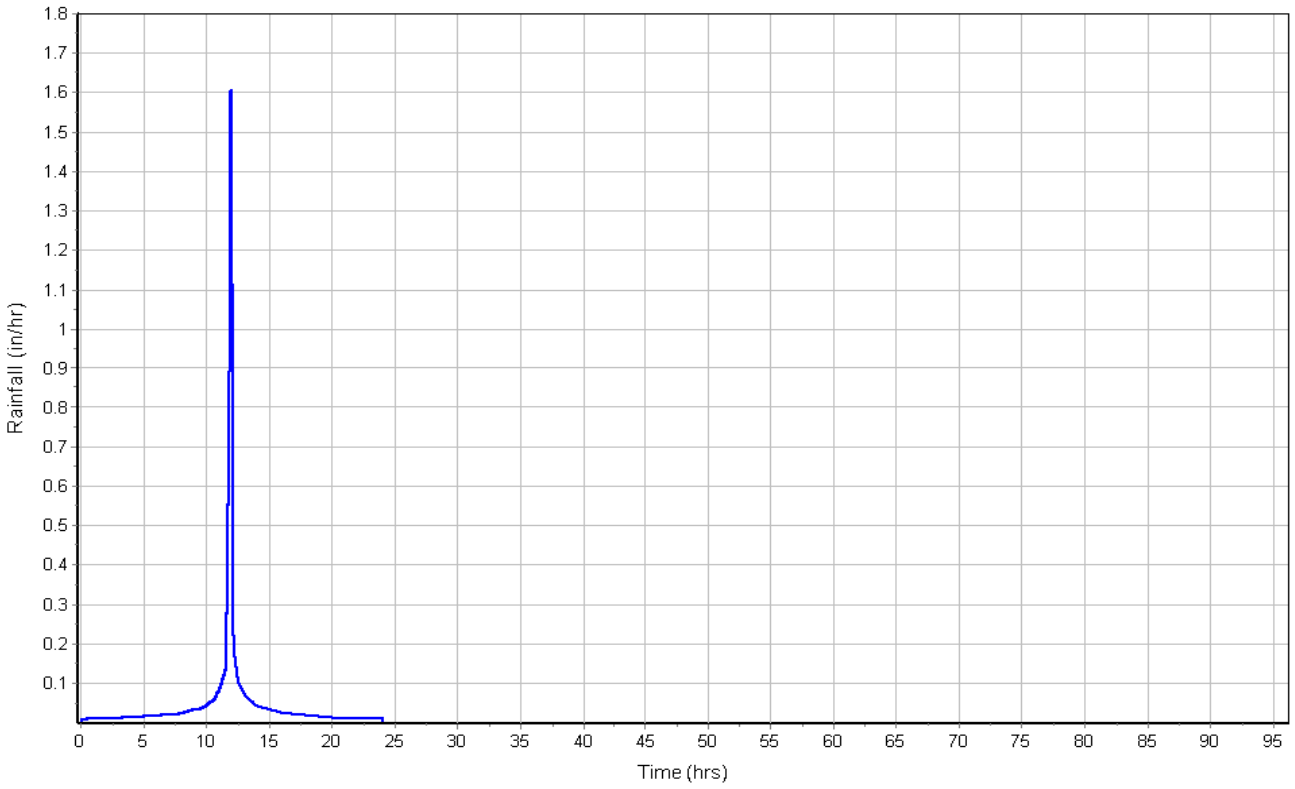
Total TOC (min) 52.82

Subbasin Runoff Results

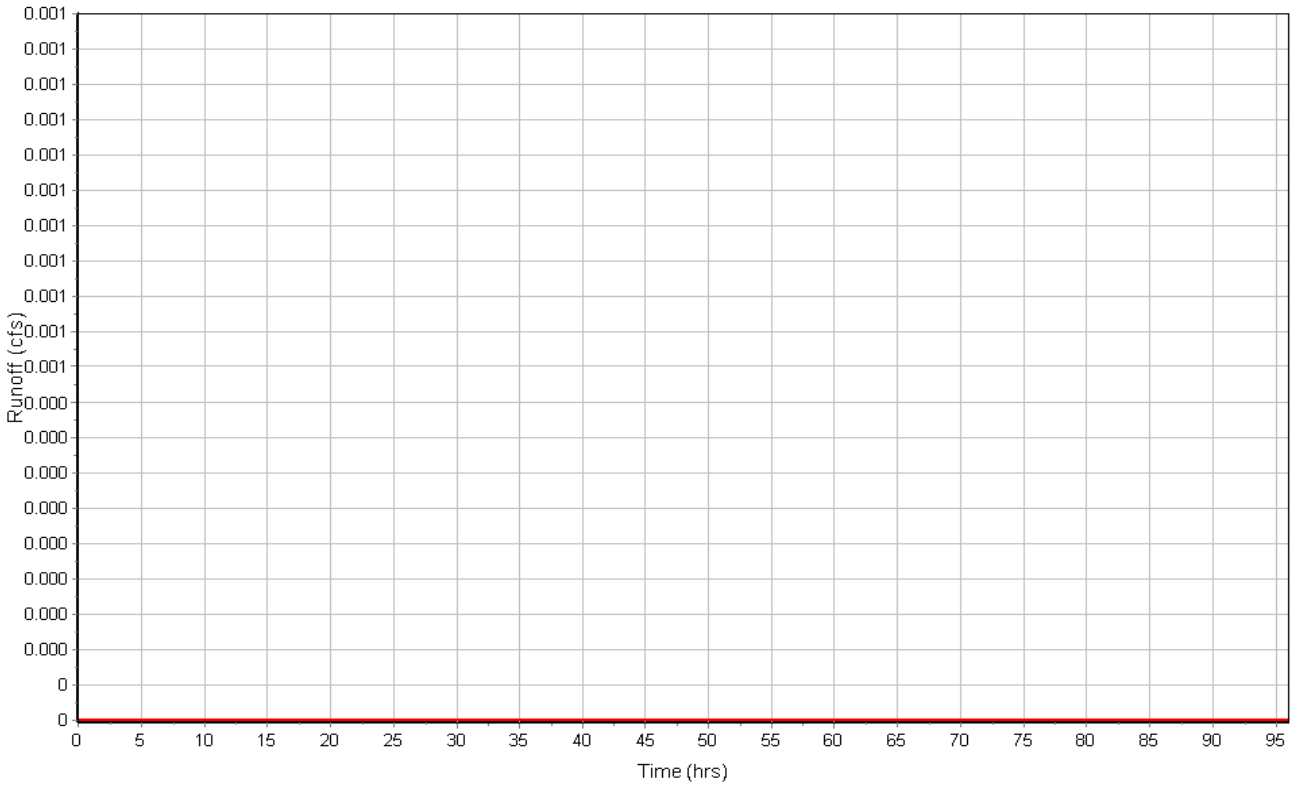
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:52:49

Subbasin : BASIN_26_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_27_ROW

Input Data

Area (ac)	0.05
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.05	B	98.00
Composite Area & Weighted CN	0.05		98.00

Time of Concentration

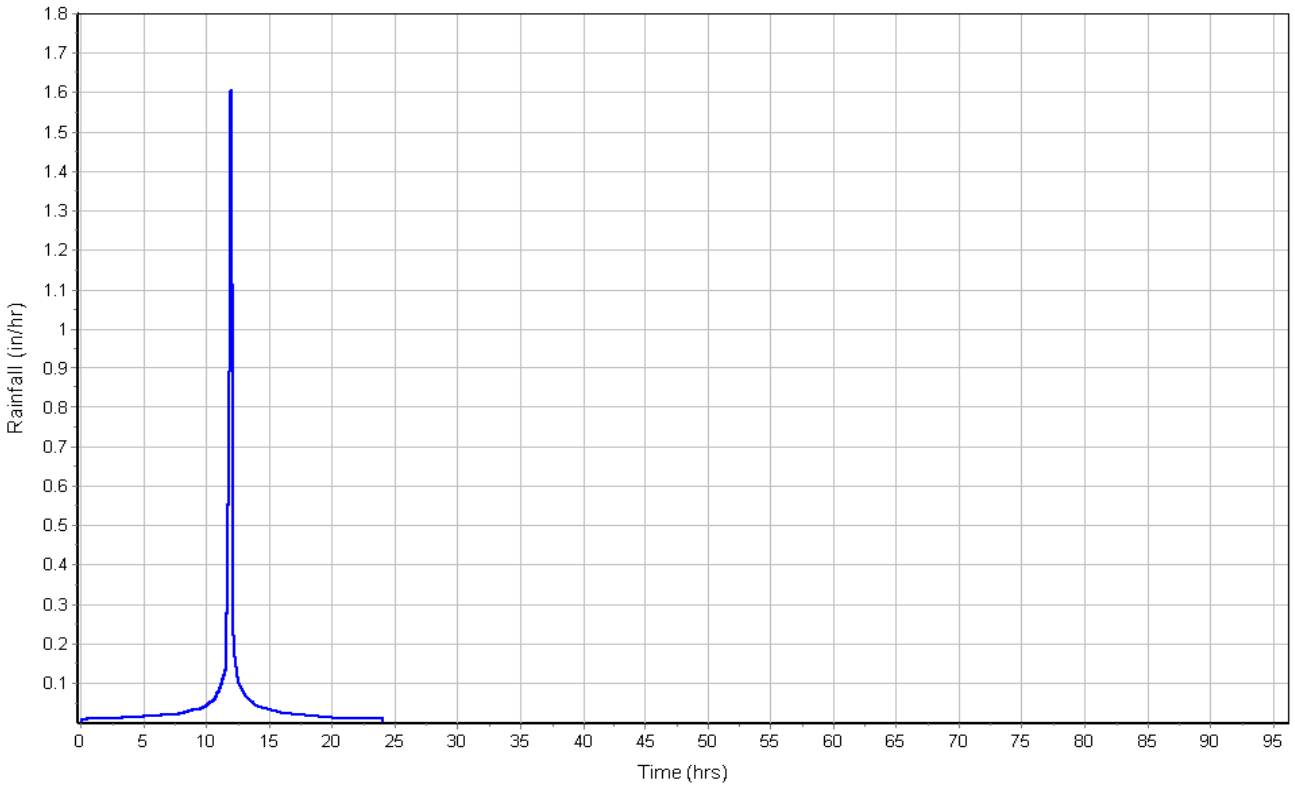
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

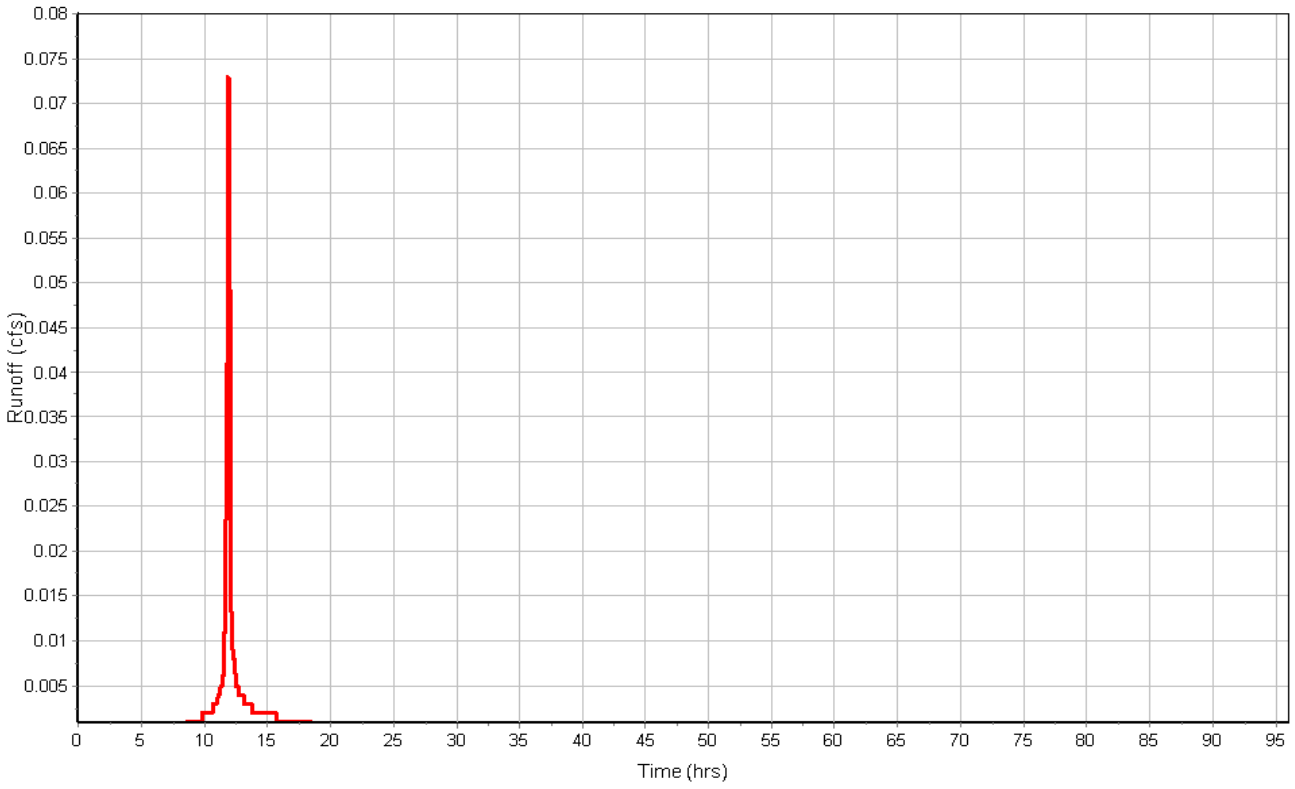
Total Rainfall (in)	1.17
Total Runoff (in)	0.83
Peak Runoff (cfs)	0.07
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_27_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_27_VACANT

Input Data

Area (ac) 0.01
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.01	B	58.00
Composite Area & Weighted CN	0.01		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	27	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.05	0.00	0.00
Computed Flow Time (min) :	9.32	0.00	0.00

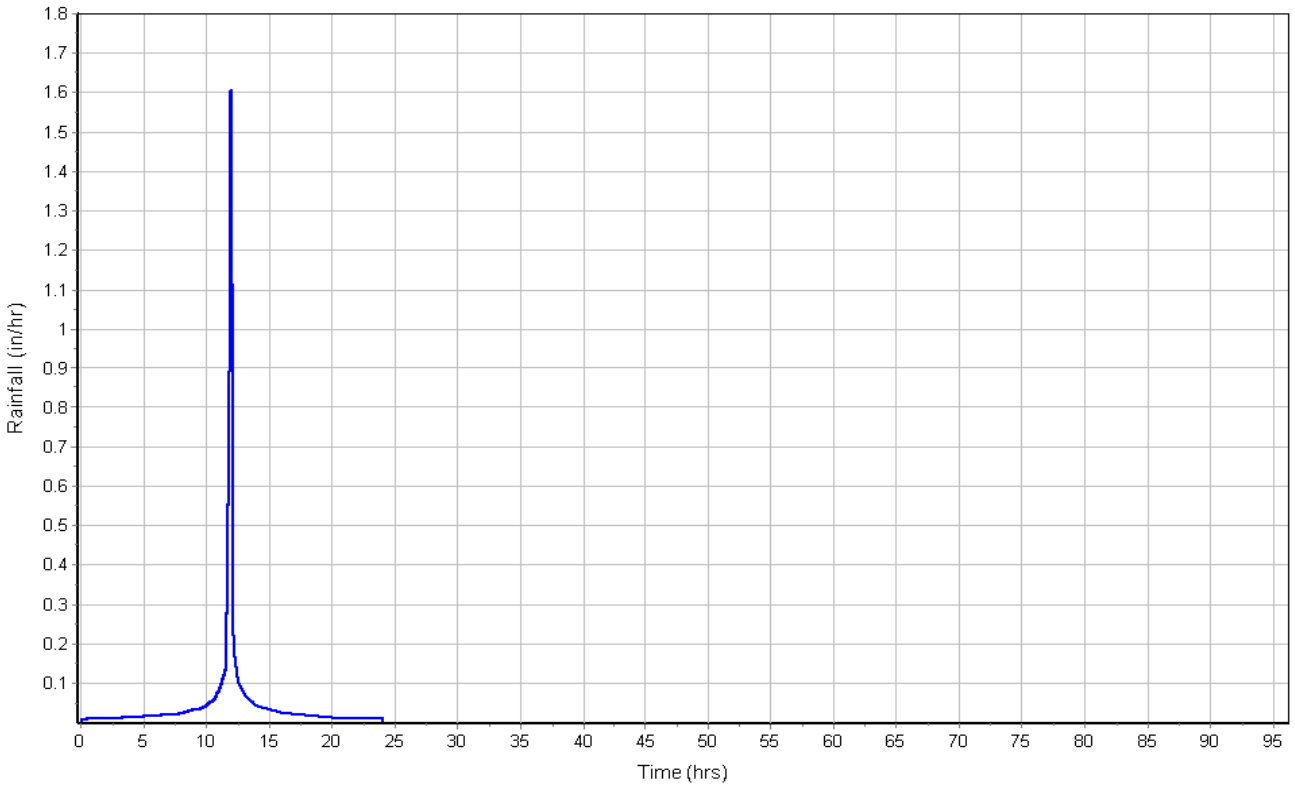
Total TOC (min) 9.32

Subbasin Runoff Results

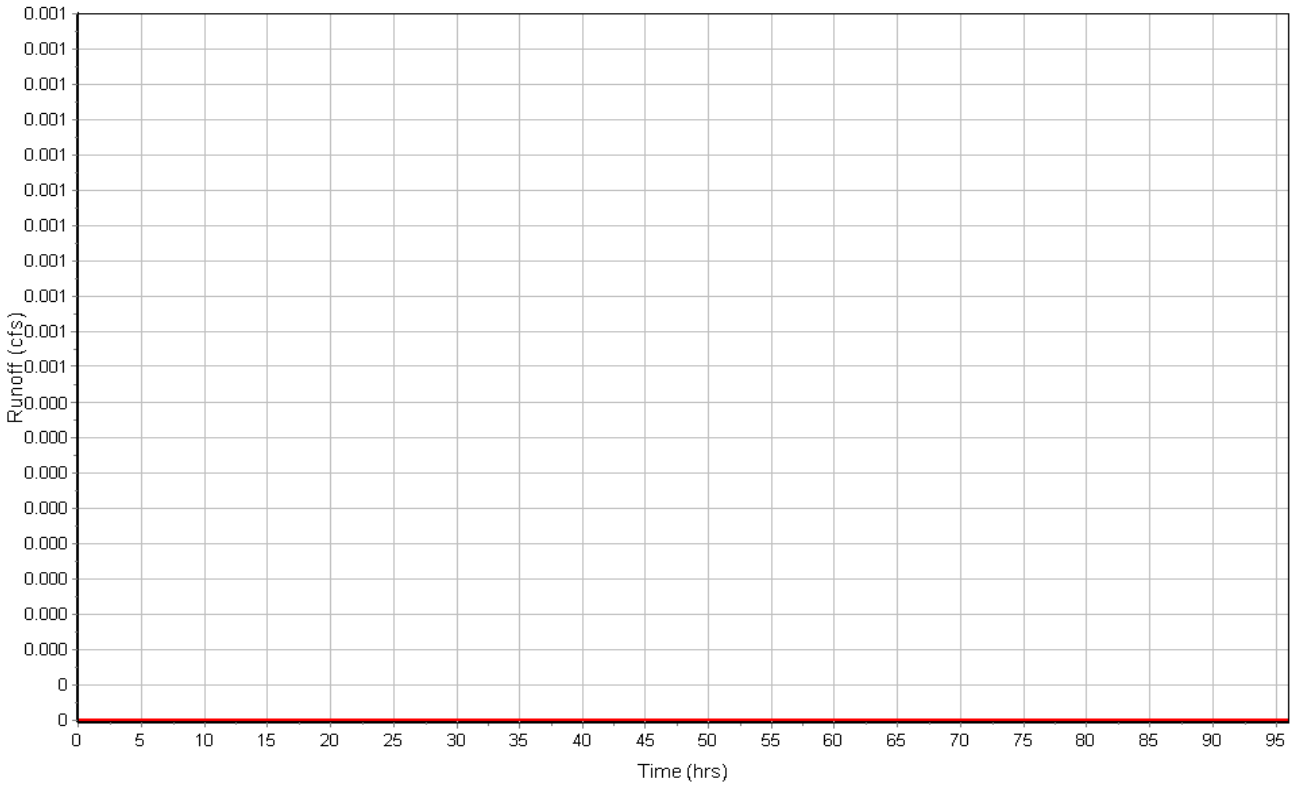
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:09:19

Subbasin : BASIN_27_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_28_ROW

Input Data

Area (ac)	0.12
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.12	B	98.00
Composite Area & Weighted CN	0.12		98.00

Time of Concentration

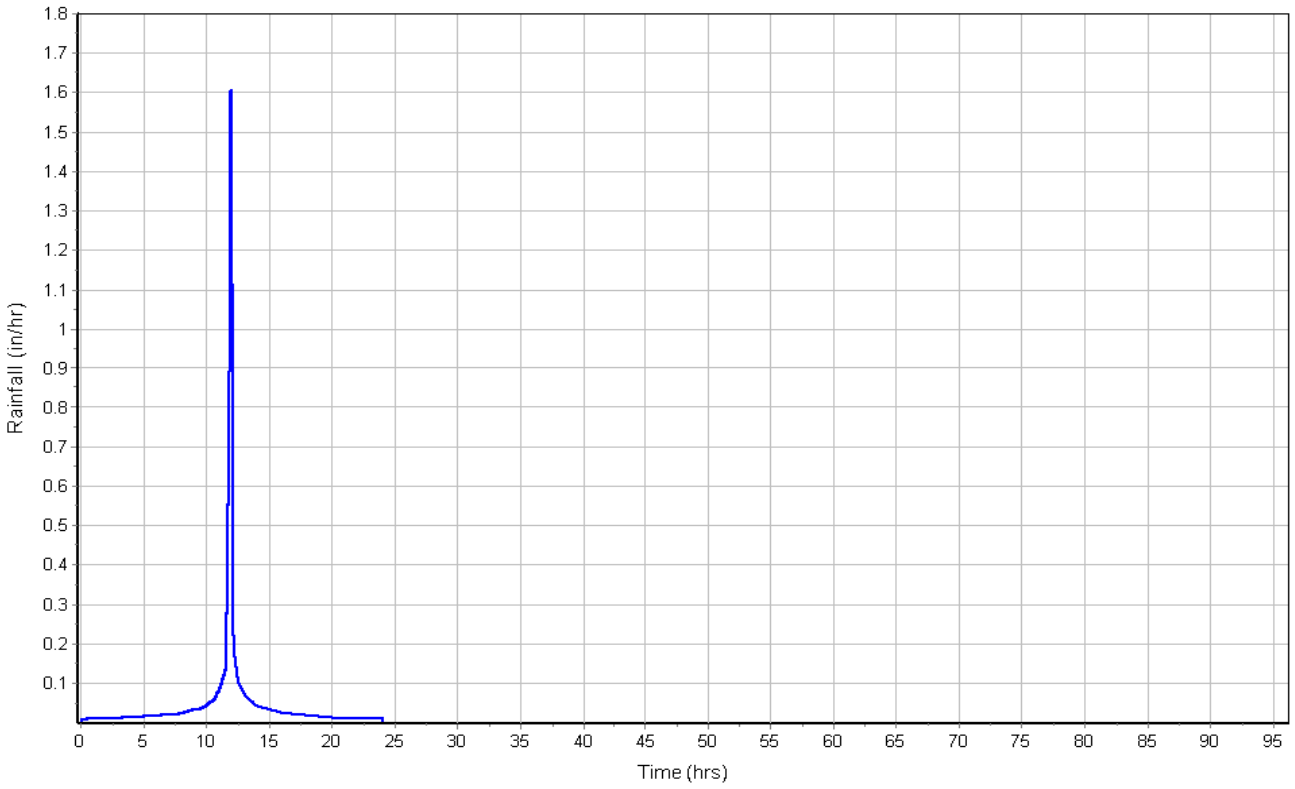
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

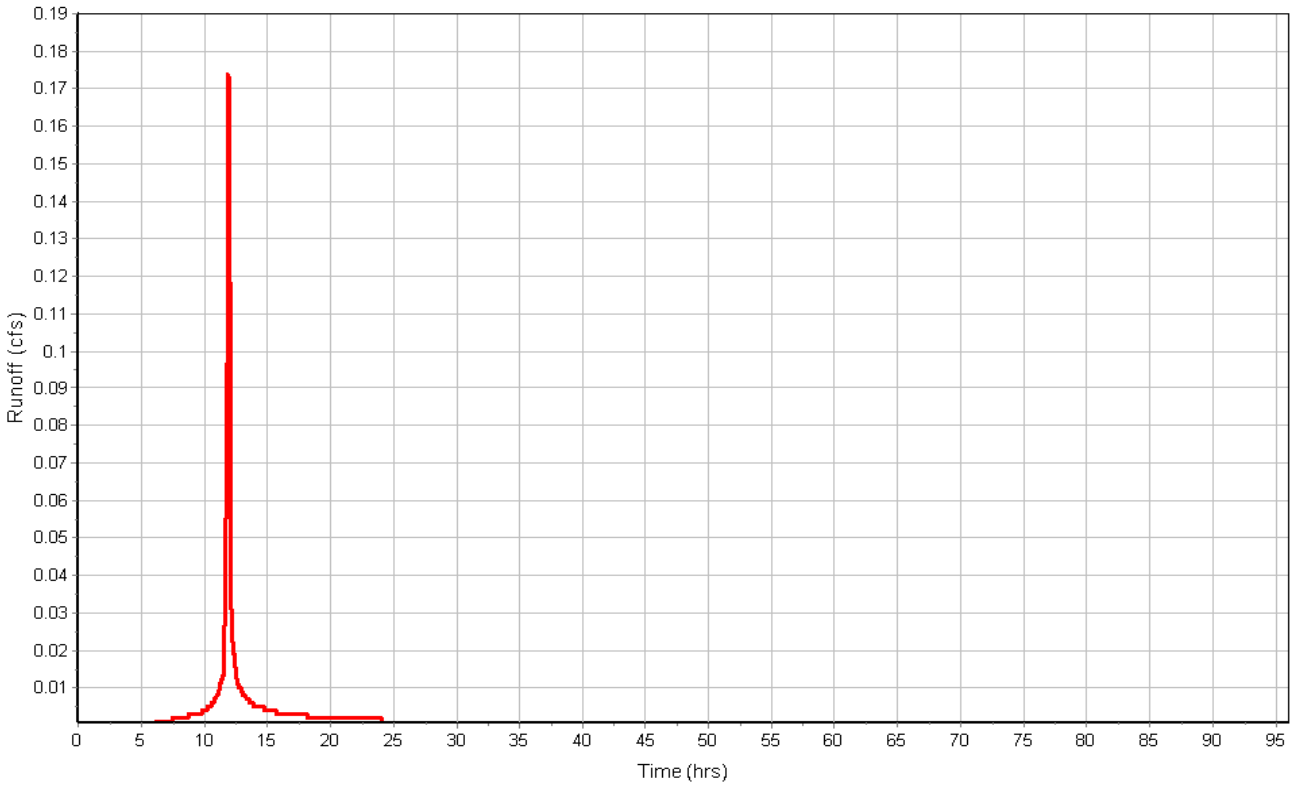
Total Rainfall (in)	1.17
Total Runoff (in)	0.94
Peak Runoff (cfs)	0.17
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_28_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_28_VACANT

Input Data

Area (ac) 0.46
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.46	B	58.00
Composite Area & Weighted CN	0.46		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	225	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	50.84	0.00	0.00

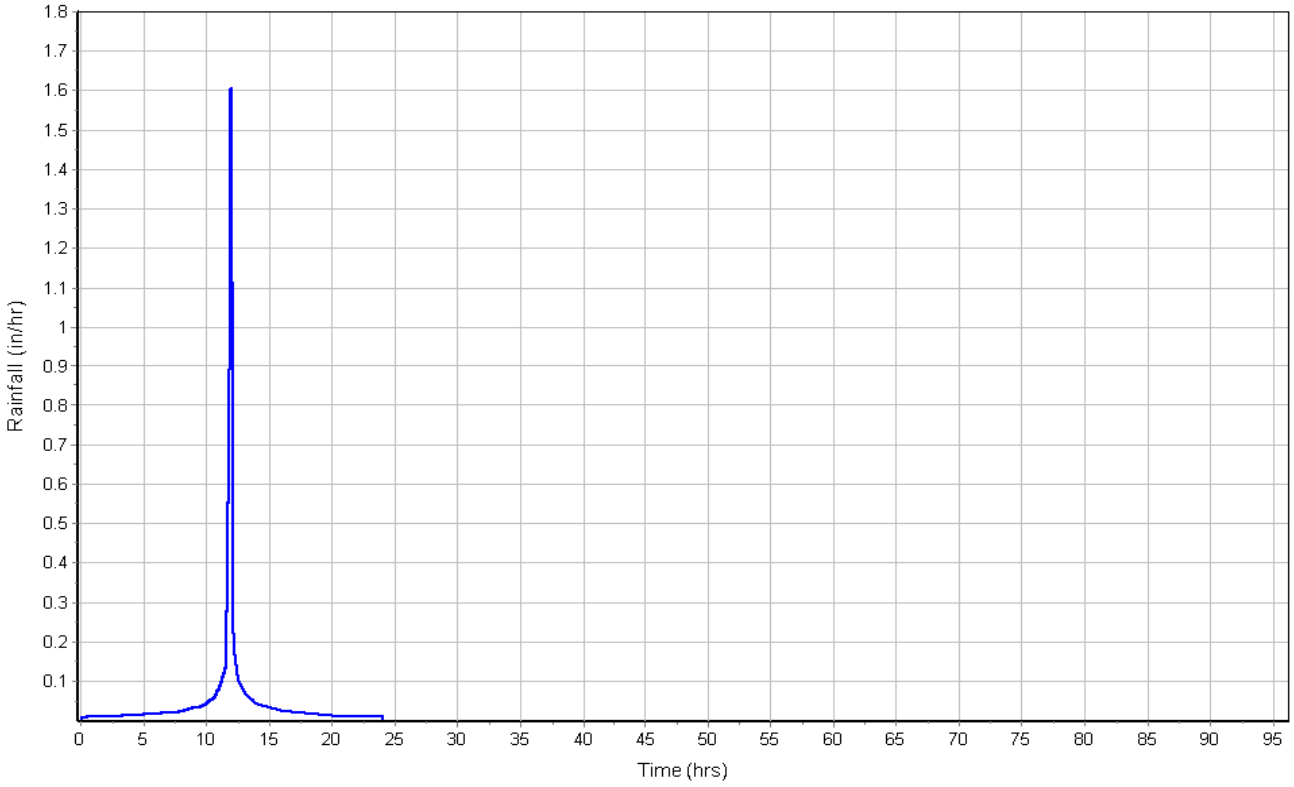
Total TOC (min) 50.84

Subbasin Runoff Results

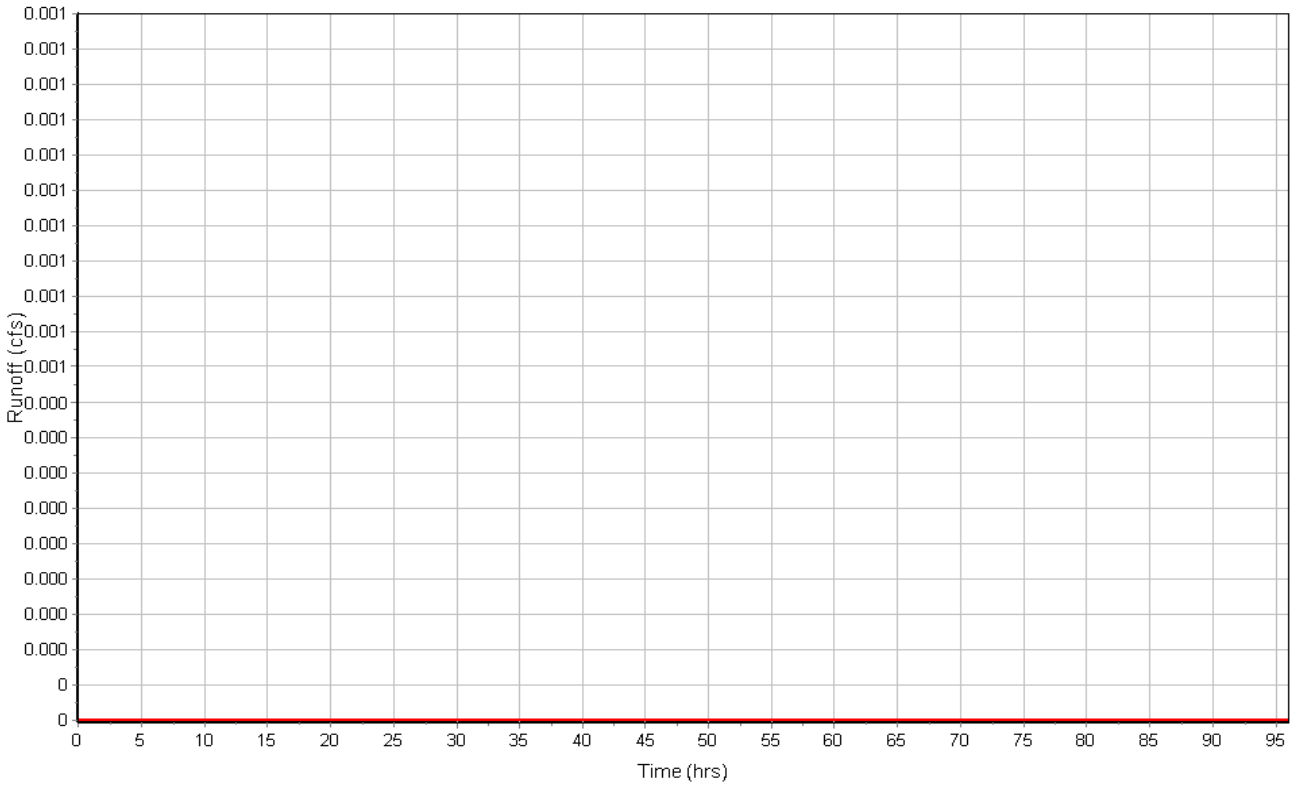
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:50:50

Subbasin : BASIN_28_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_29_ROW

Input Data

Area (ac)	0.12
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.12	B	98.00
Composite Area & Weighted CN	0.12		98.00

Time of Concentration

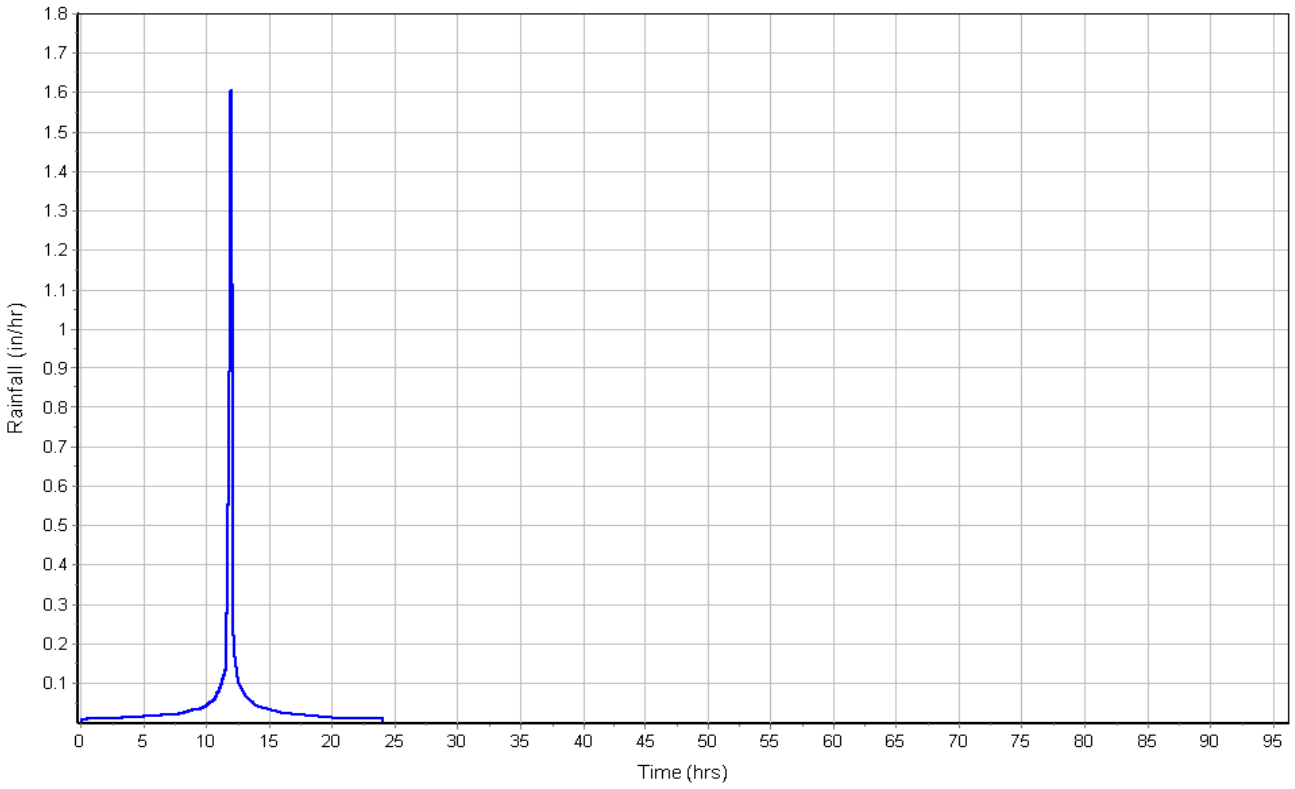
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

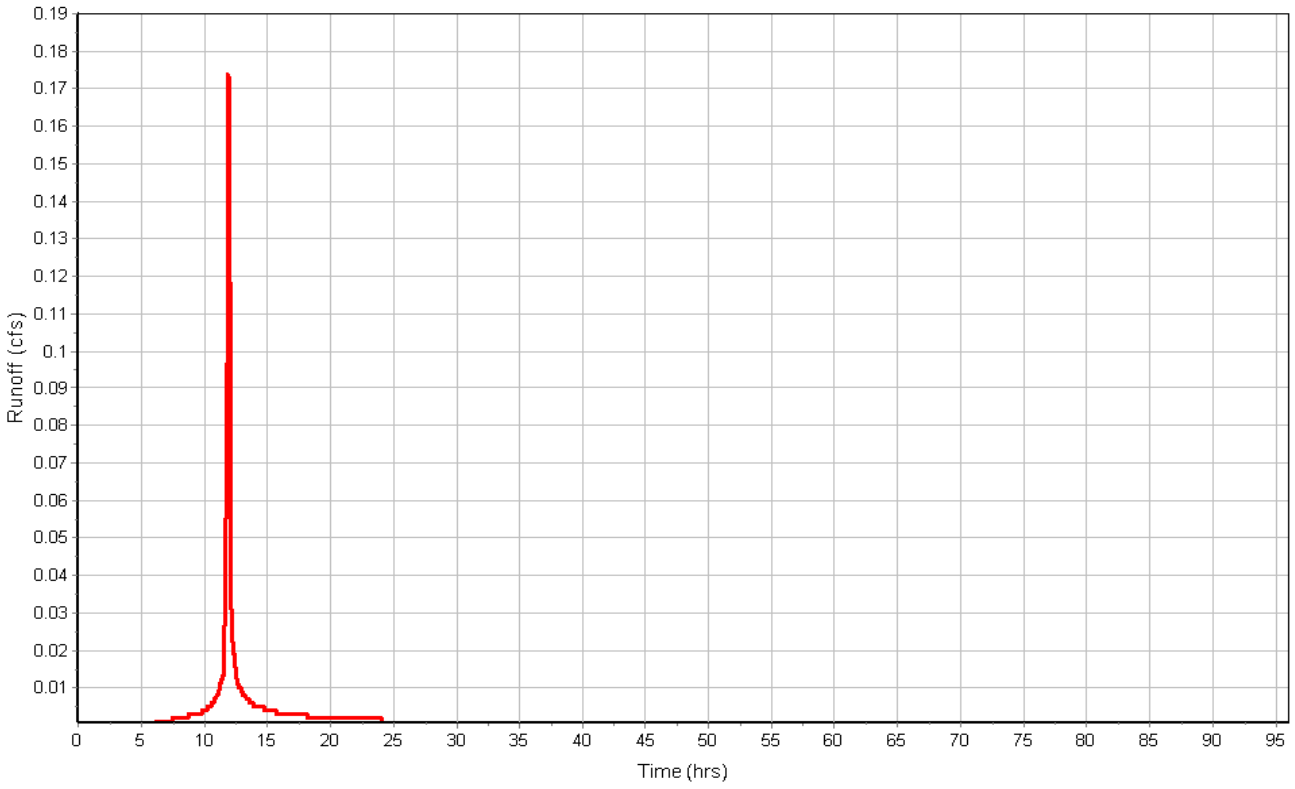
Total Rainfall (in)	1.17
Total Runoff (in)	0.94
Peak Runoff (cfs)	0.17
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_29_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_29_VACANT

Input Data

Area (ac) 0.42
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.42	B	58.00
Composite Area & Weighted CN	0.42		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	208	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	47.75	0.00	0.00

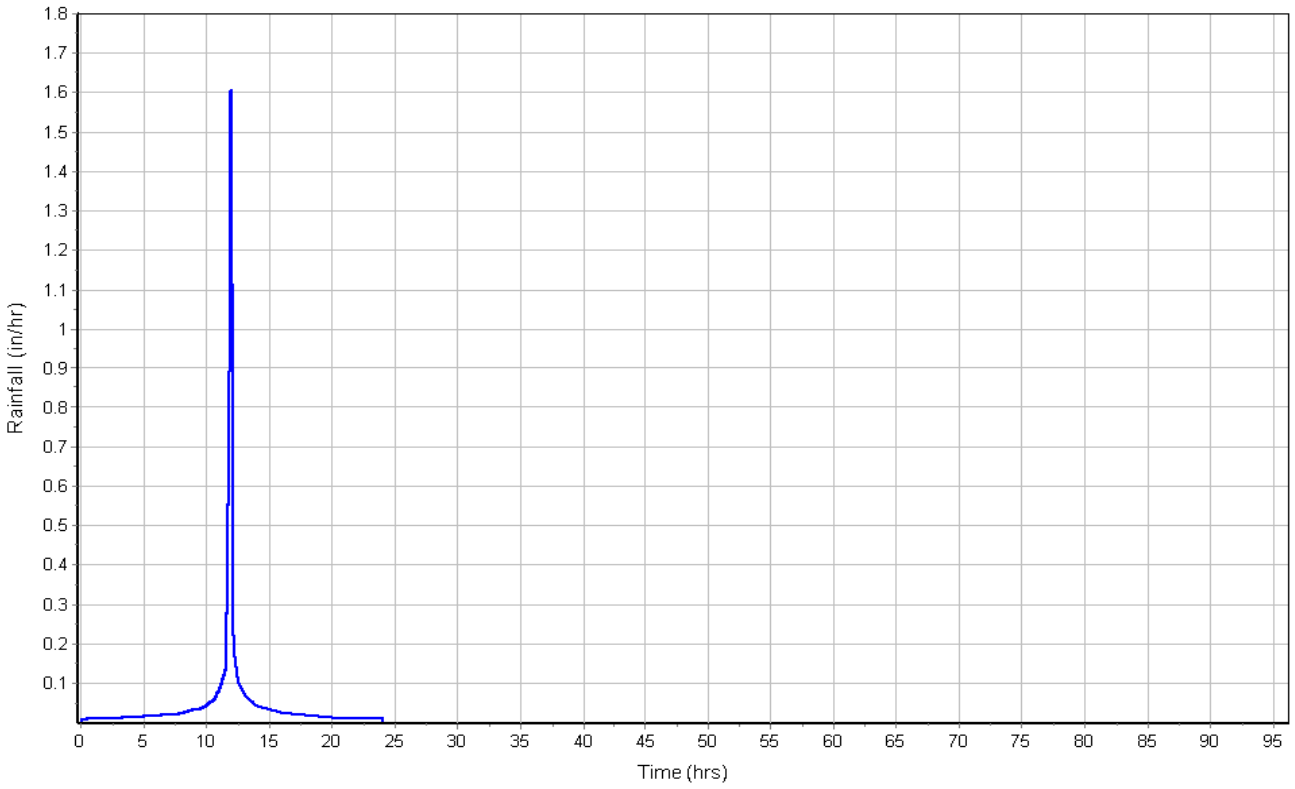
Total TOC (min) 47.75

Subbasin Runoff Results

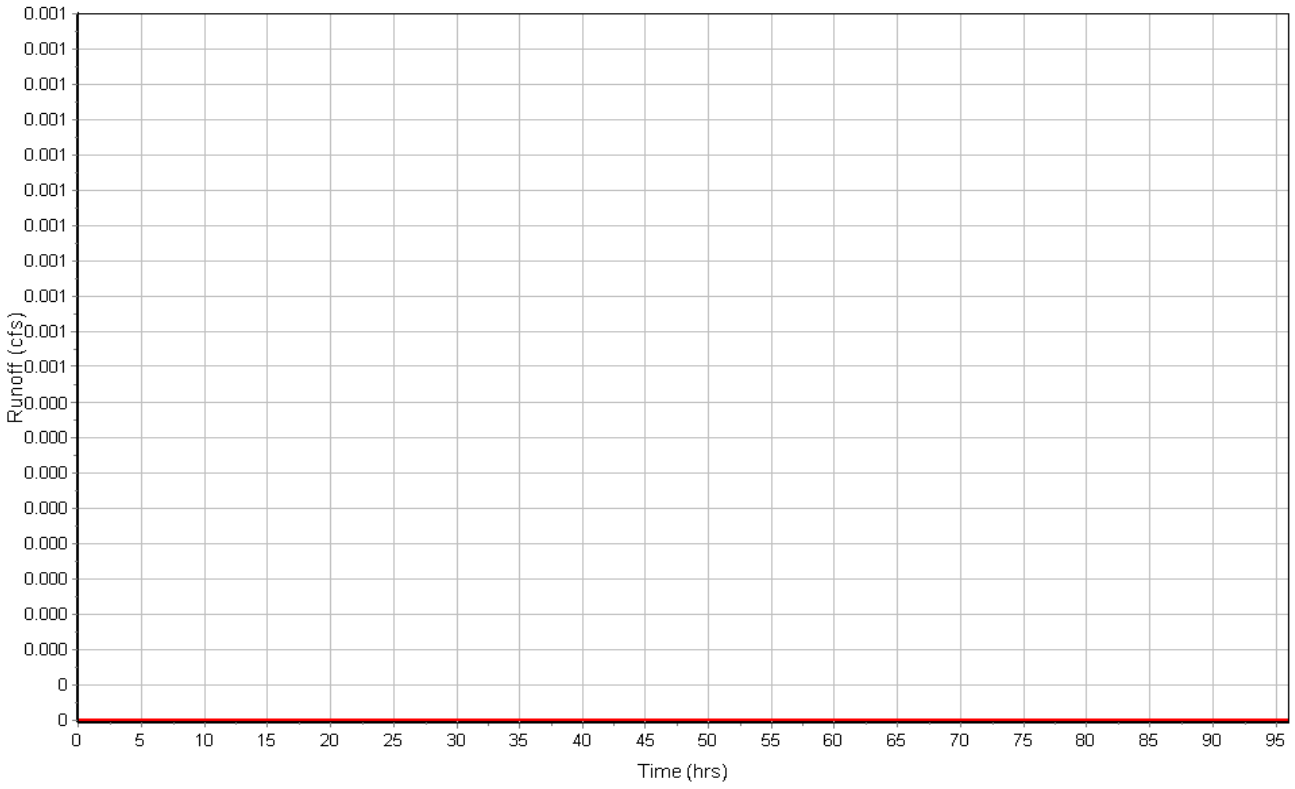
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:47:45

Subbasin : BASIN_29_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_3_ROW

Input Data

Area (ac)	0.15
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.15	B	98.00
Composite Area & Weighted CN	0.15		98.00

Time of Concentration

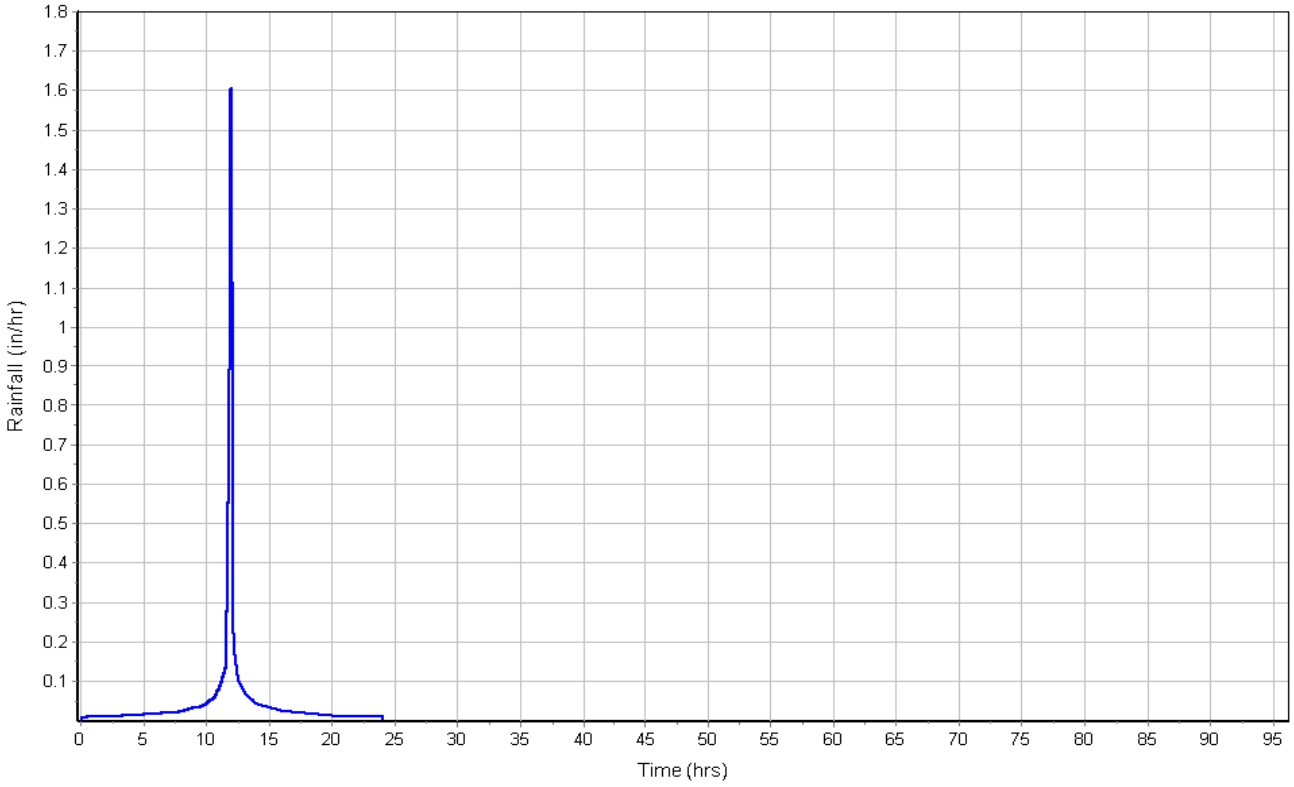
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

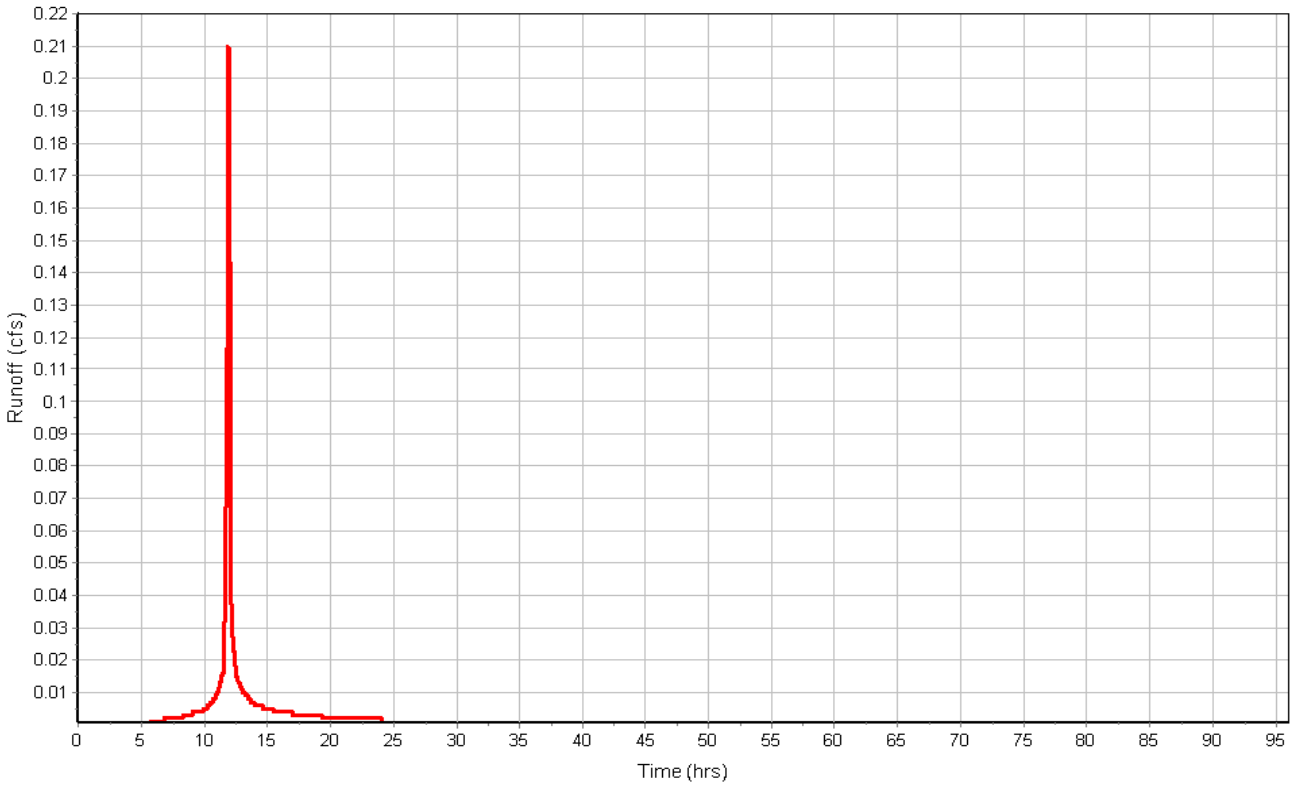
Total Rainfall (in)	1.17
Total Runoff (in)	0.95
Peak Runoff (cfs)	0.21
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_3_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_3_VACANT

Input Data

Area (ac) 0.27
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.27	B	58.00
Composite Area & Weighted CN	0.27		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	259	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	56.90	0.00	0.00

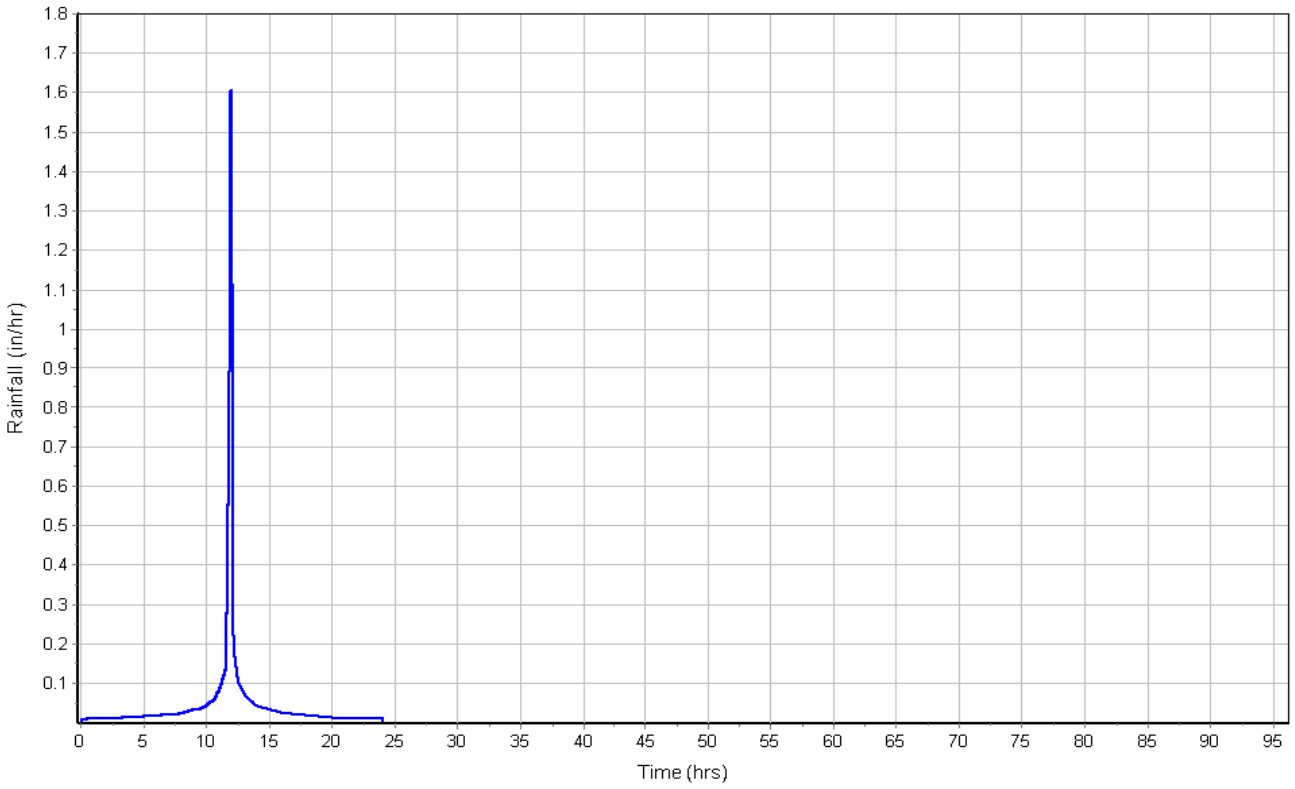
Total TOC (min) 56.90

Subbasin Runoff Results

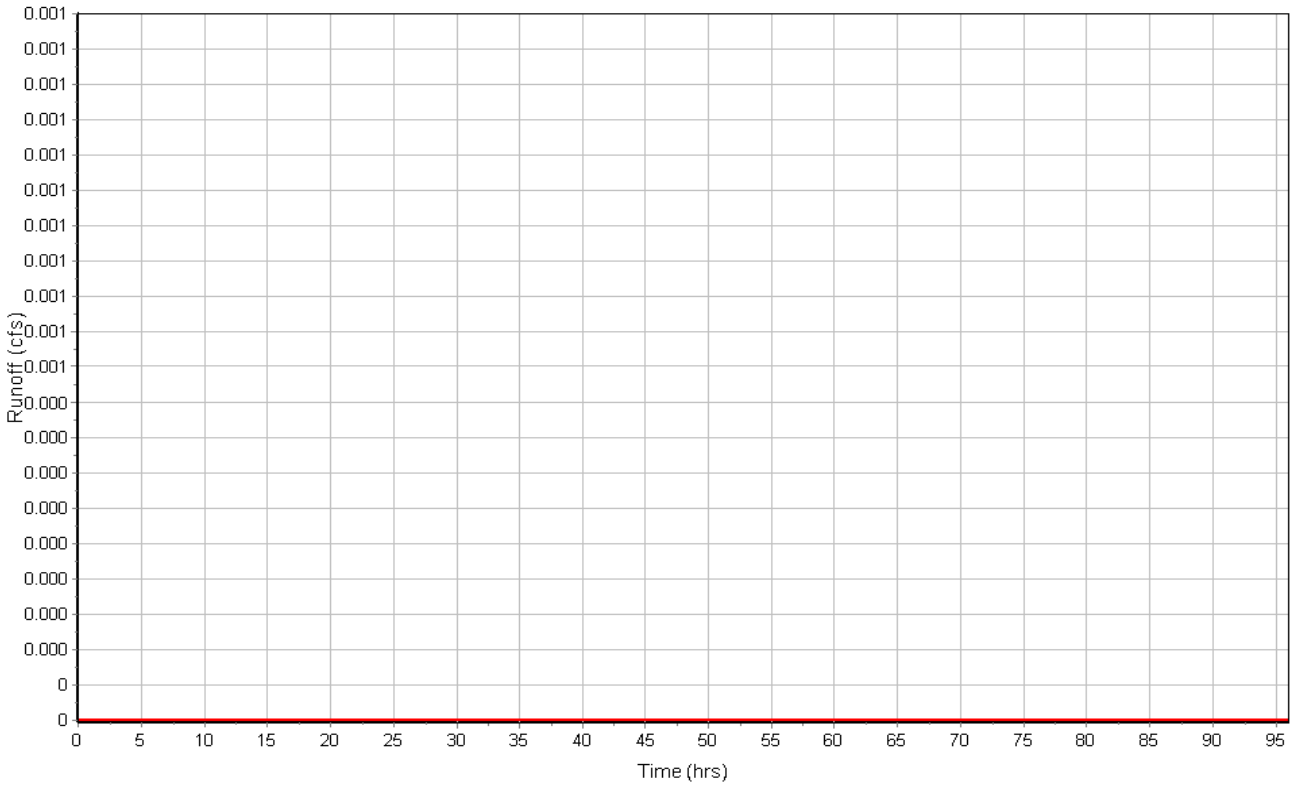
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:56:54

Subbasin : BASIN_3_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_30_ROW

Input Data

Area (ac)	0.15
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.15	B	98.00
Composite Area & Weighted CN	0.15		98.00

Time of Concentration

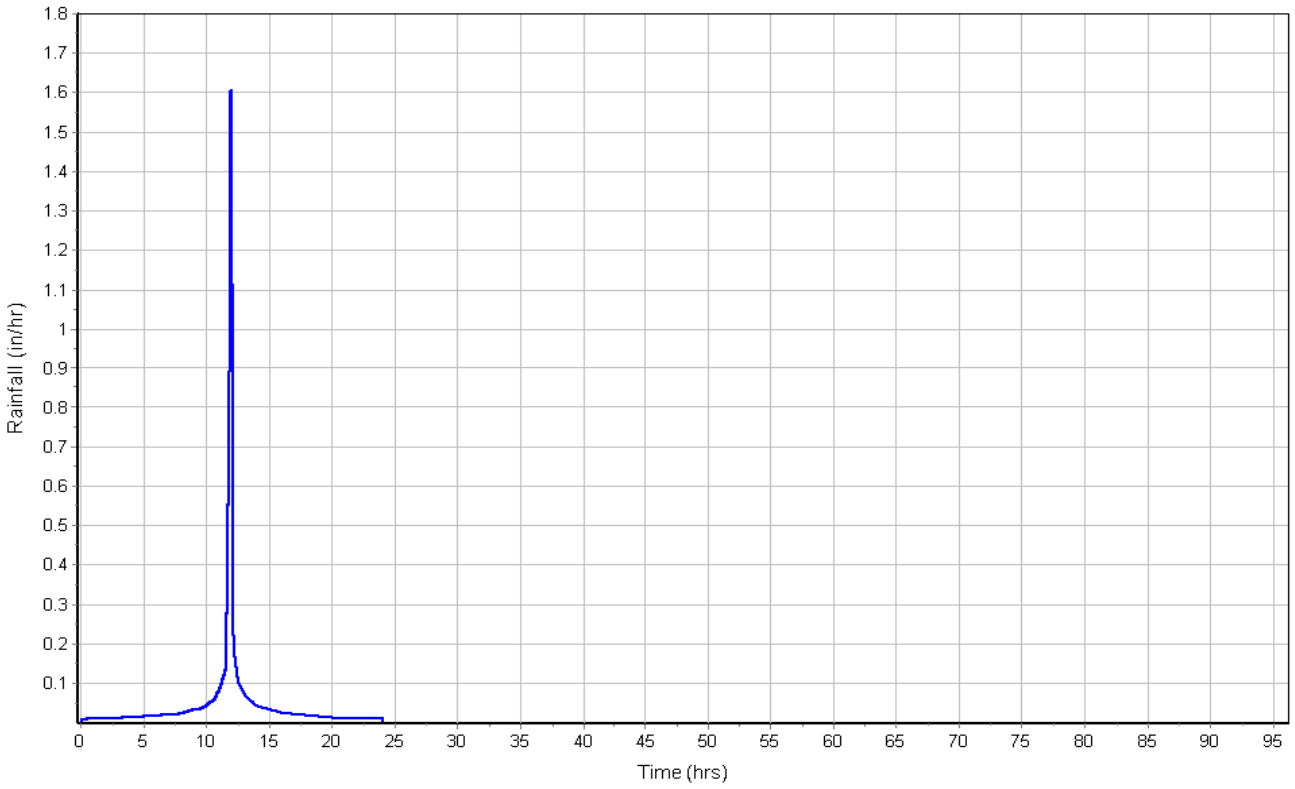
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

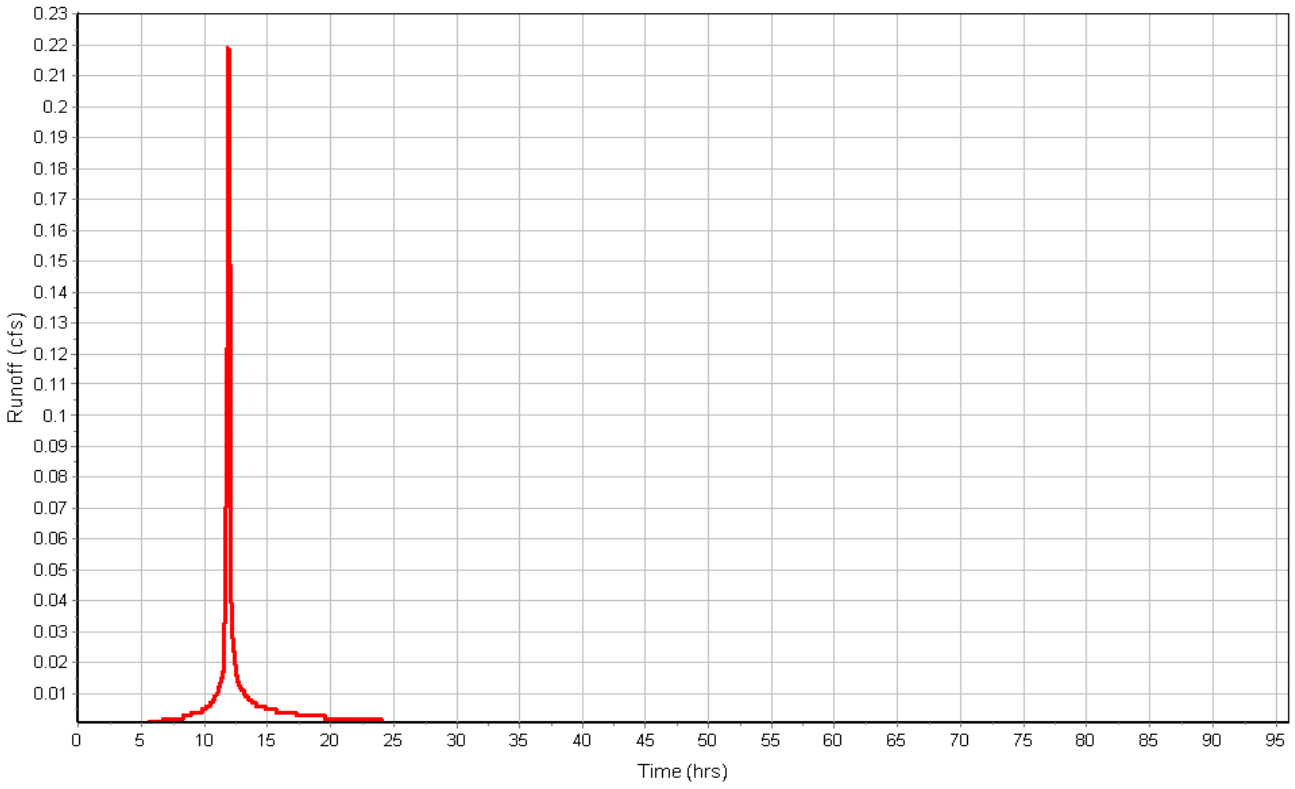
Total Rainfall (in)	1.17
Total Runoff (in)	0.95
Peak Runoff (cfs)	0.22
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_30_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_30_VACANT

Input Data

Area (ac) 0.63
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.63	B	58.00
Composite Area & Weighted CN	0.63		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	300	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	64.00	0.00	0.00

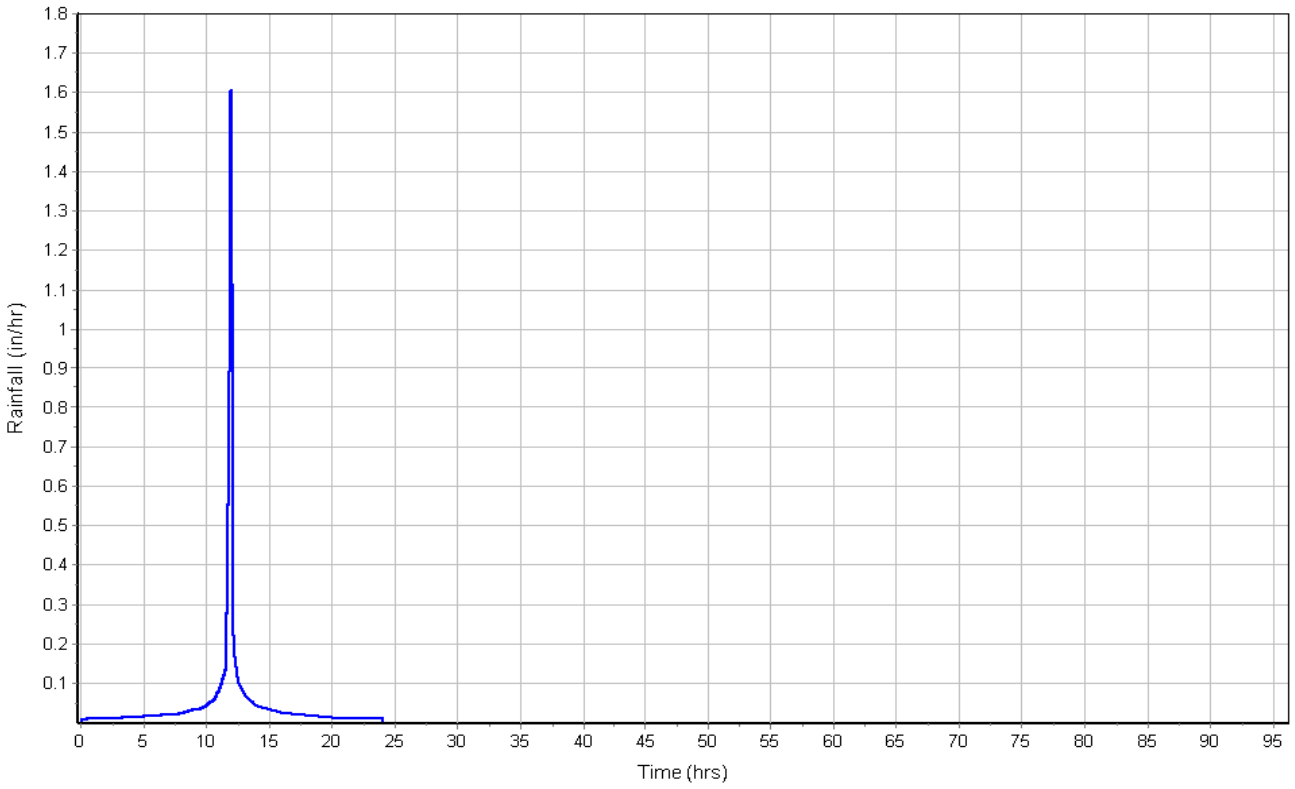
Total TOC (min) 64.00

Subbasin Runoff Results

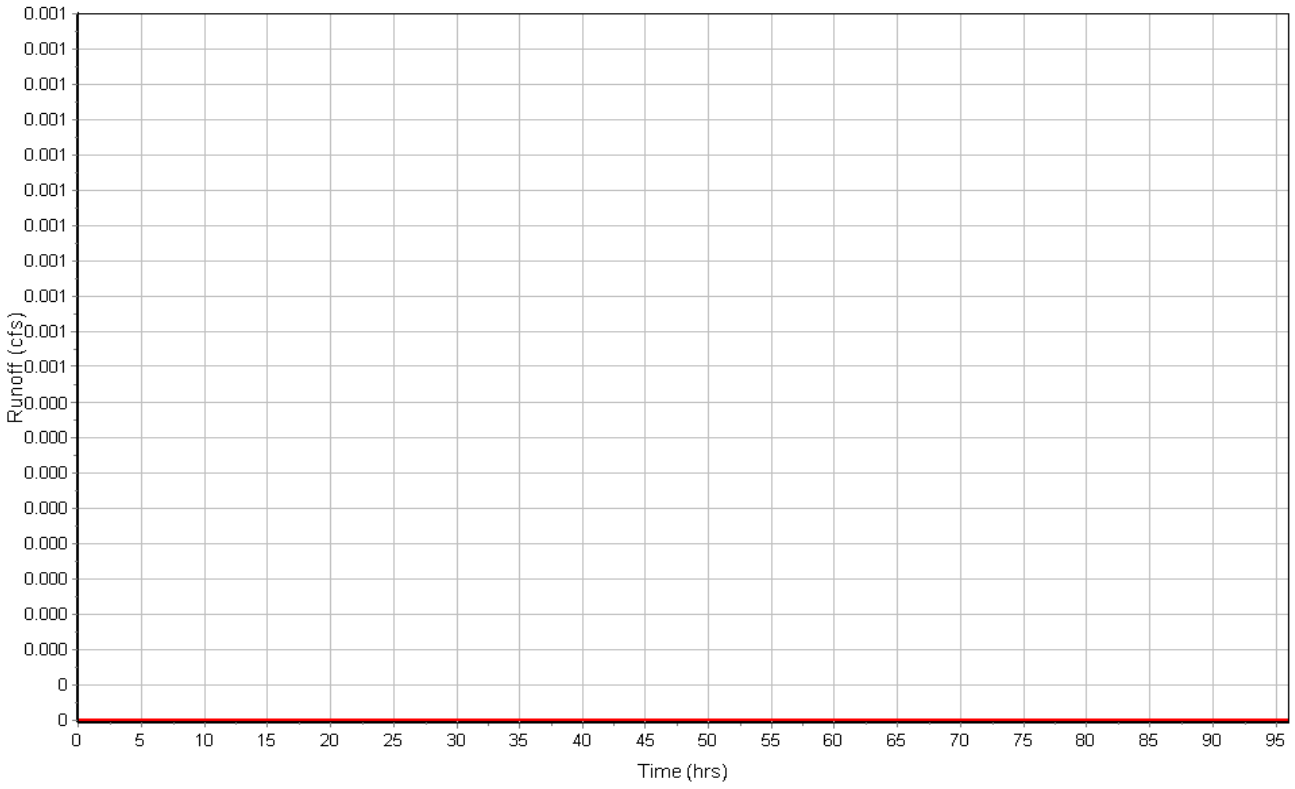
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 01:04:00

Subbasin : BASIN_30_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_31_ROW

Input Data

Area (ac) 0.15
Peak Rate Factor 484.00
Weighted Curve Number 98.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.15	B	98.00
Composite Area & Weighted CN	0.15		98.00

Time of Concentration

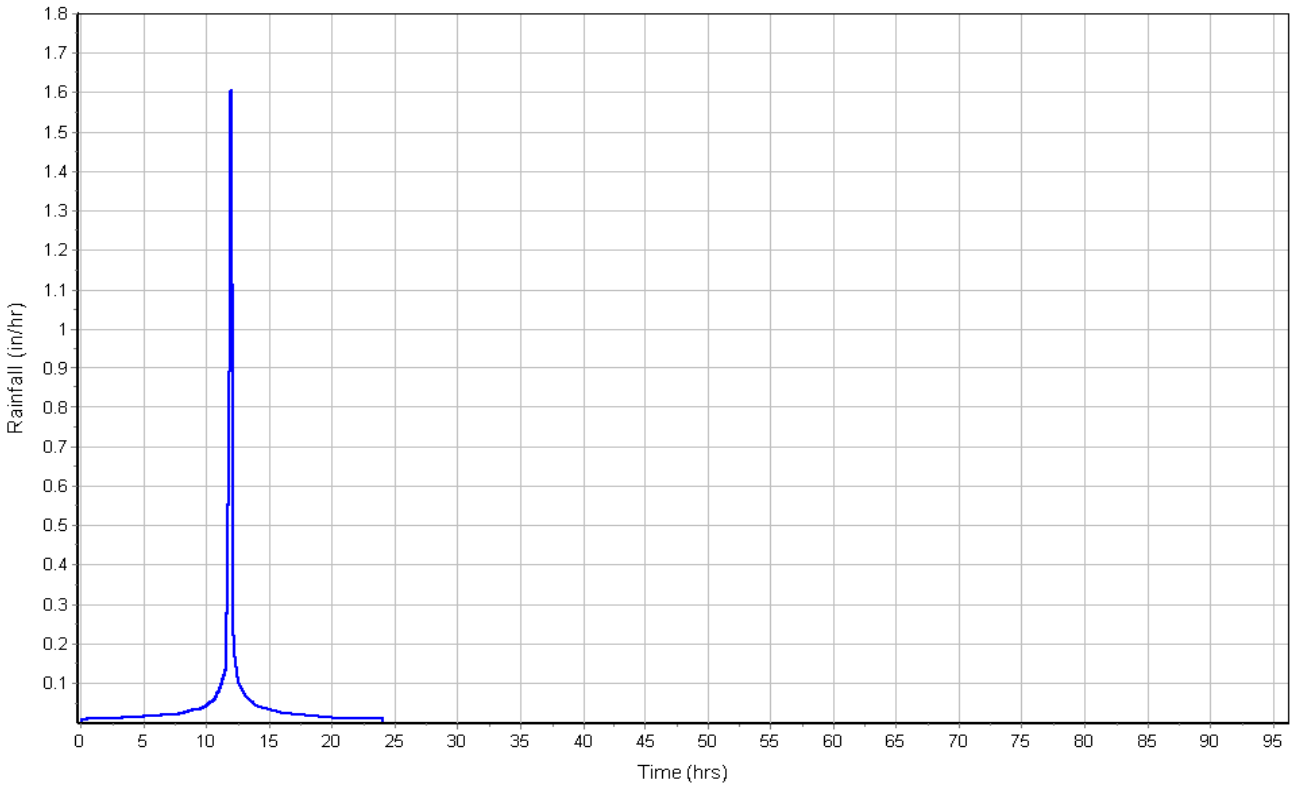
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

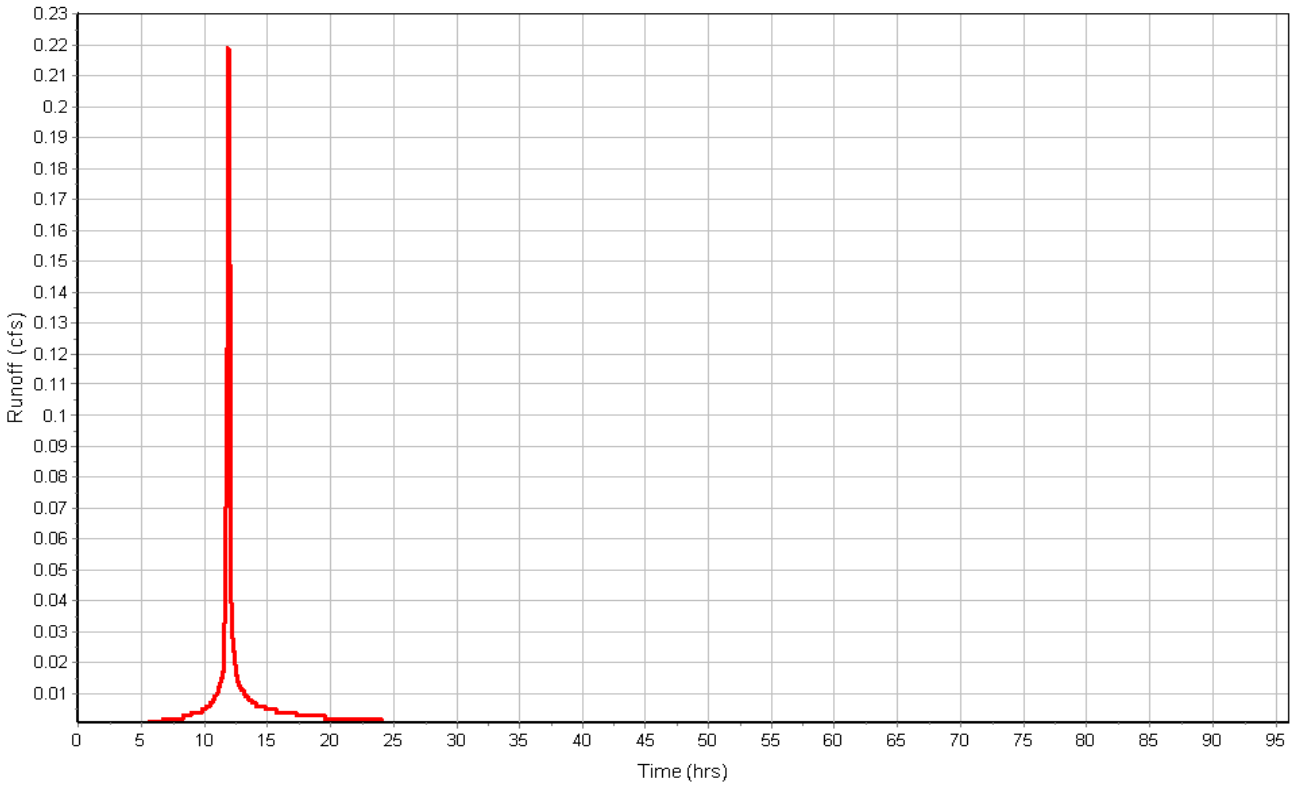
Total Rainfall (in) 1.17
Total Runoff (in) 0.95
Peak Runoff (cfs) 0.22
Weighted Curve Number 98.00
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : BASIN_31_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_31_VACANT

Input Data

Area (ac) 0.71
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.71	B	58.00
Composite Area & Weighted CN	0.71		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	274	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	59.52	0.00	0.00

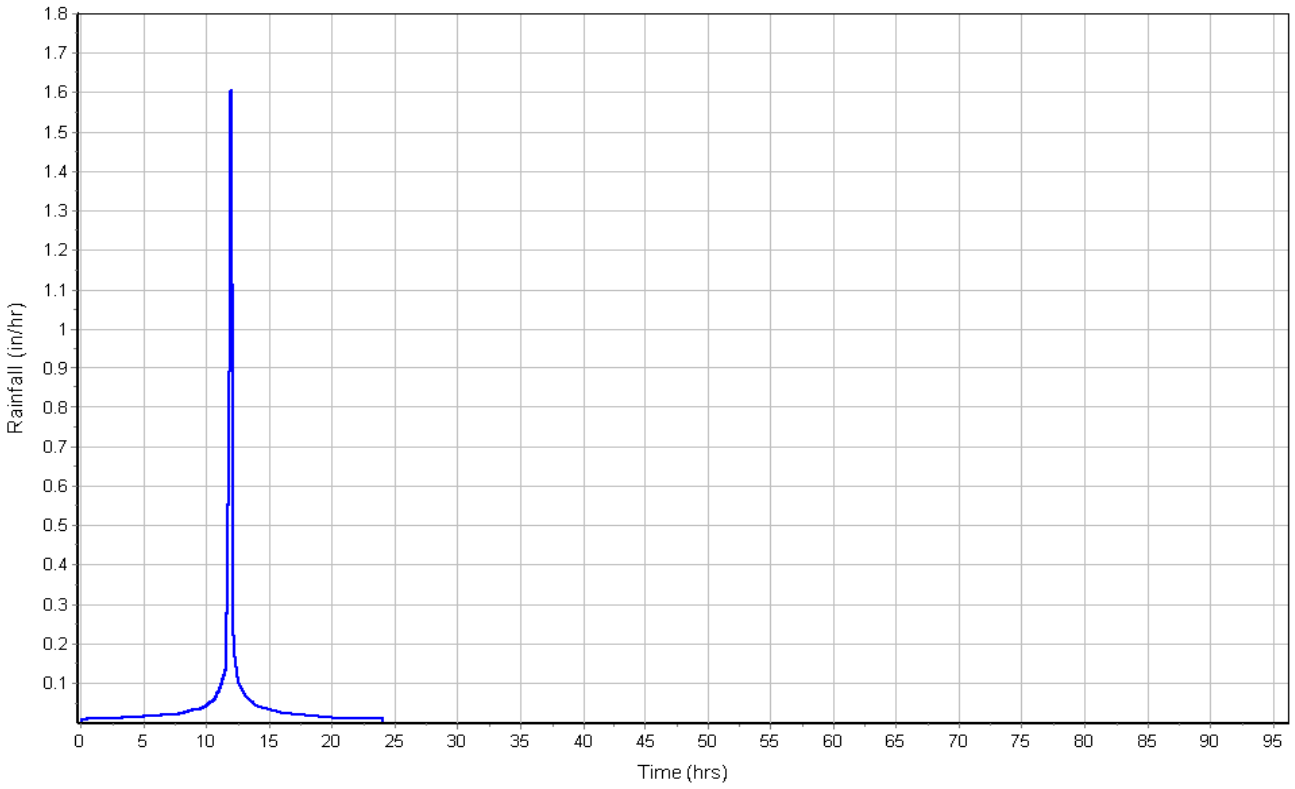
Total TOC (min) 59.52

Subbasin Runoff Results

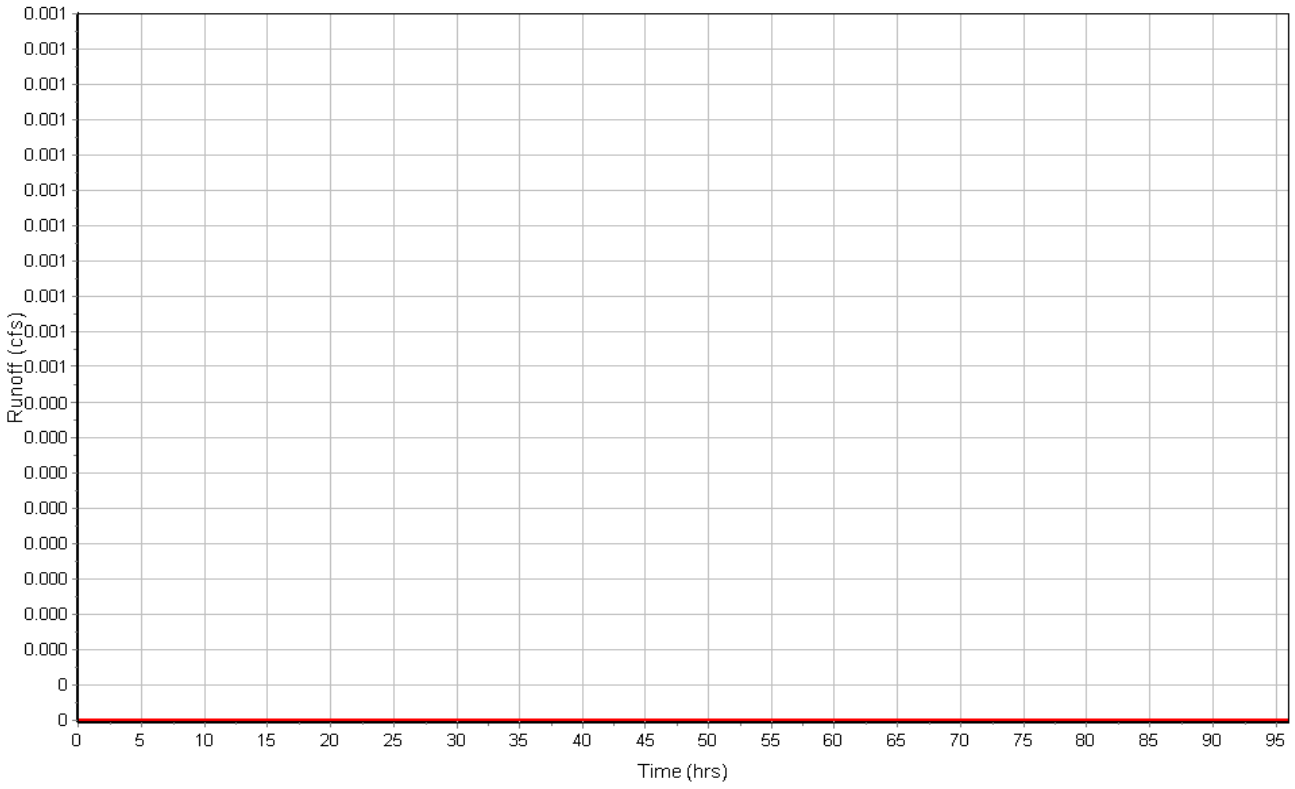
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:59:31

Subbasin : BASIN_31_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_32_ROW

Input Data

Area (ac) 0.12
Peak Rate Factor 484.00
Weighted Curve Number 98.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.12	B	98.00
Composite Area & Weighted CN	0.12		98.00

Time of Concentration

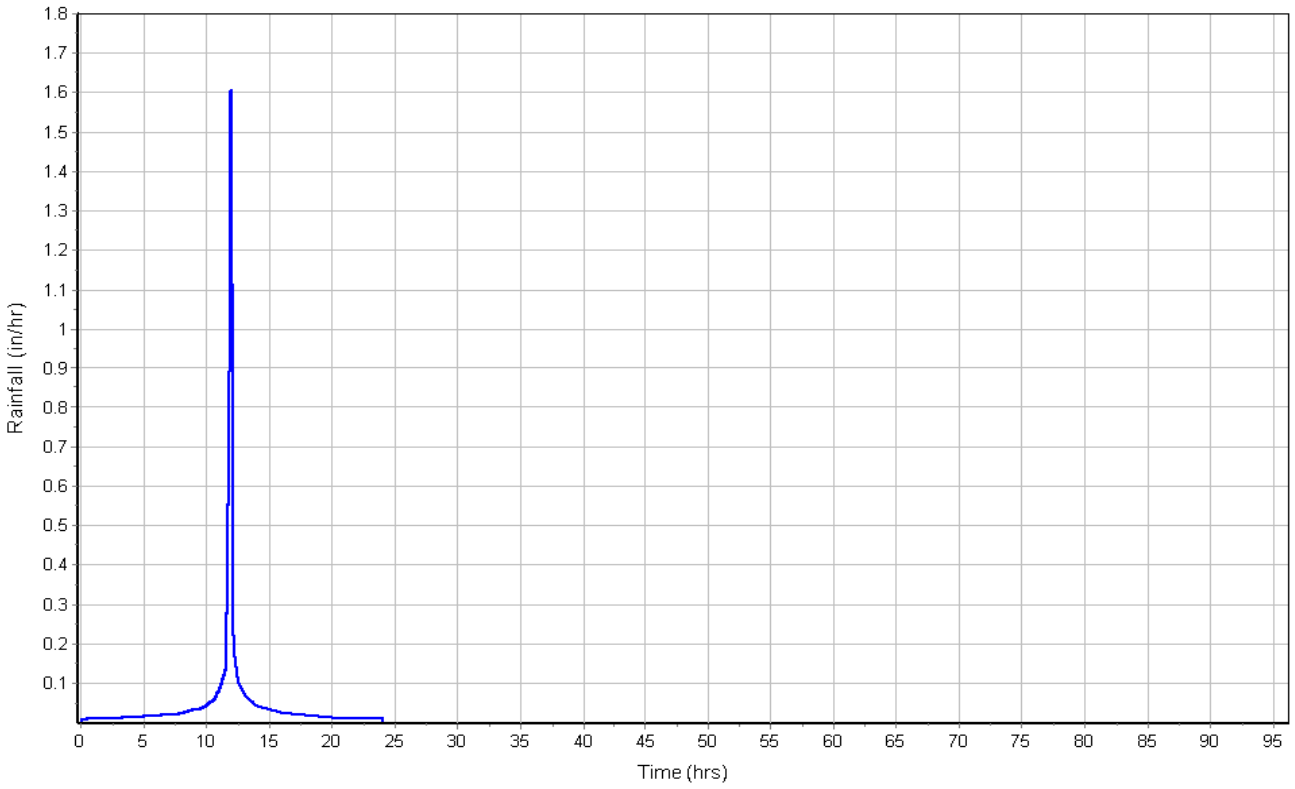
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

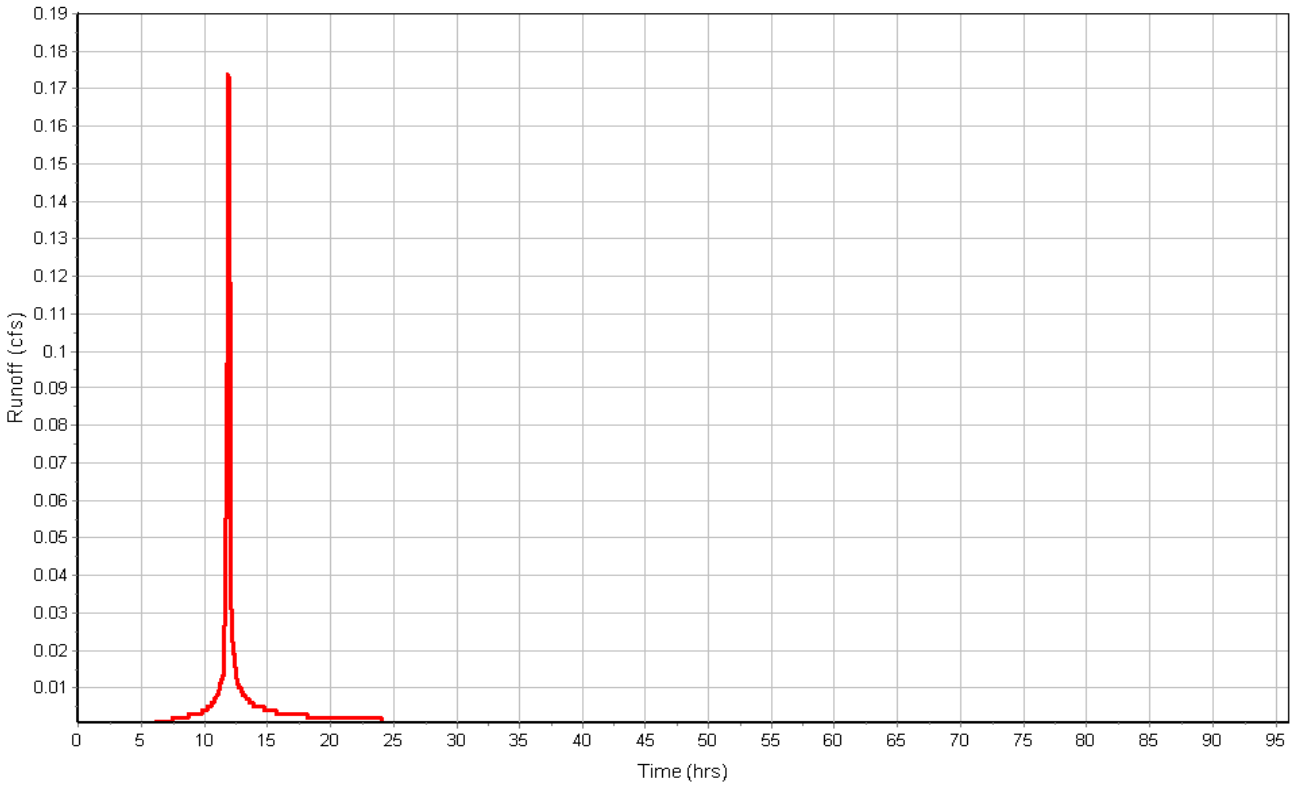
Total Rainfall (in) 1.17
Total Runoff (in) 0.94
Peak Runoff (cfs) 0.17
Weighted Curve Number 98.00
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : BASIN_32_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_32_VACANT

Input Data

Area (ac) 0.52
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.52	B	58.00
Composite Area & Weighted CN	0.52		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	246	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	54.60	0.00	0.00

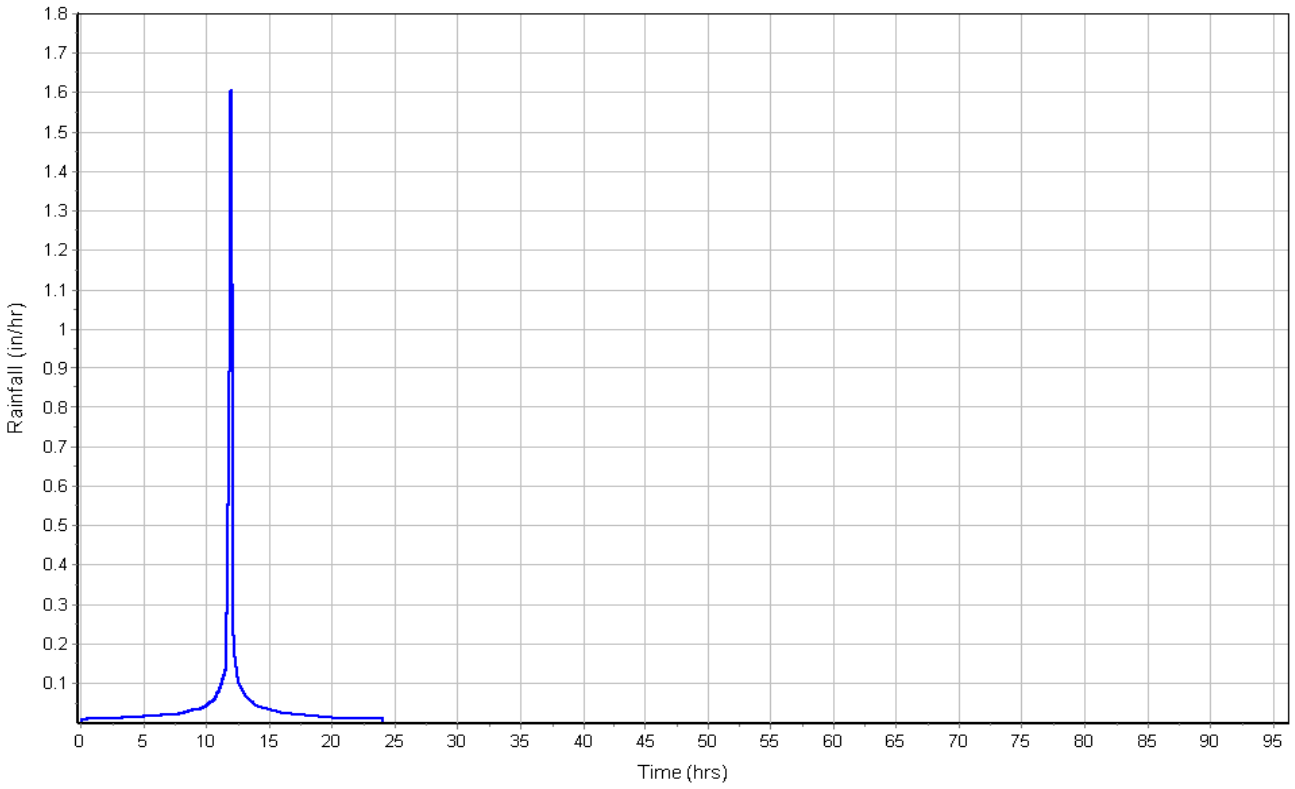
Total TOC (min) 54.60

Subbasin Runoff Results

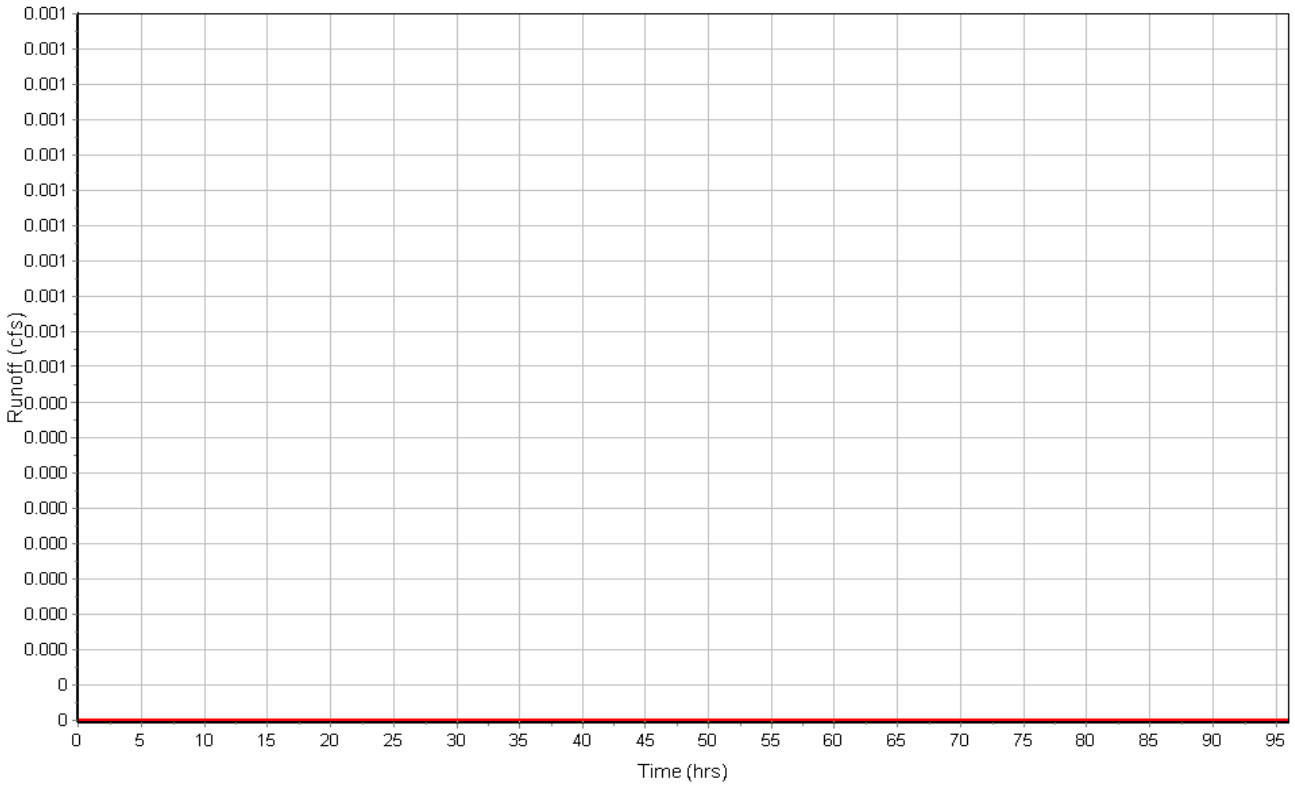
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:54:36

Subbasin : BASIN_32_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_33_ROW

Input Data

Area (ac)	0.12
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.12	B	98.00
Composite Area & Weighted CN	0.12		98.00

Time of Concentration

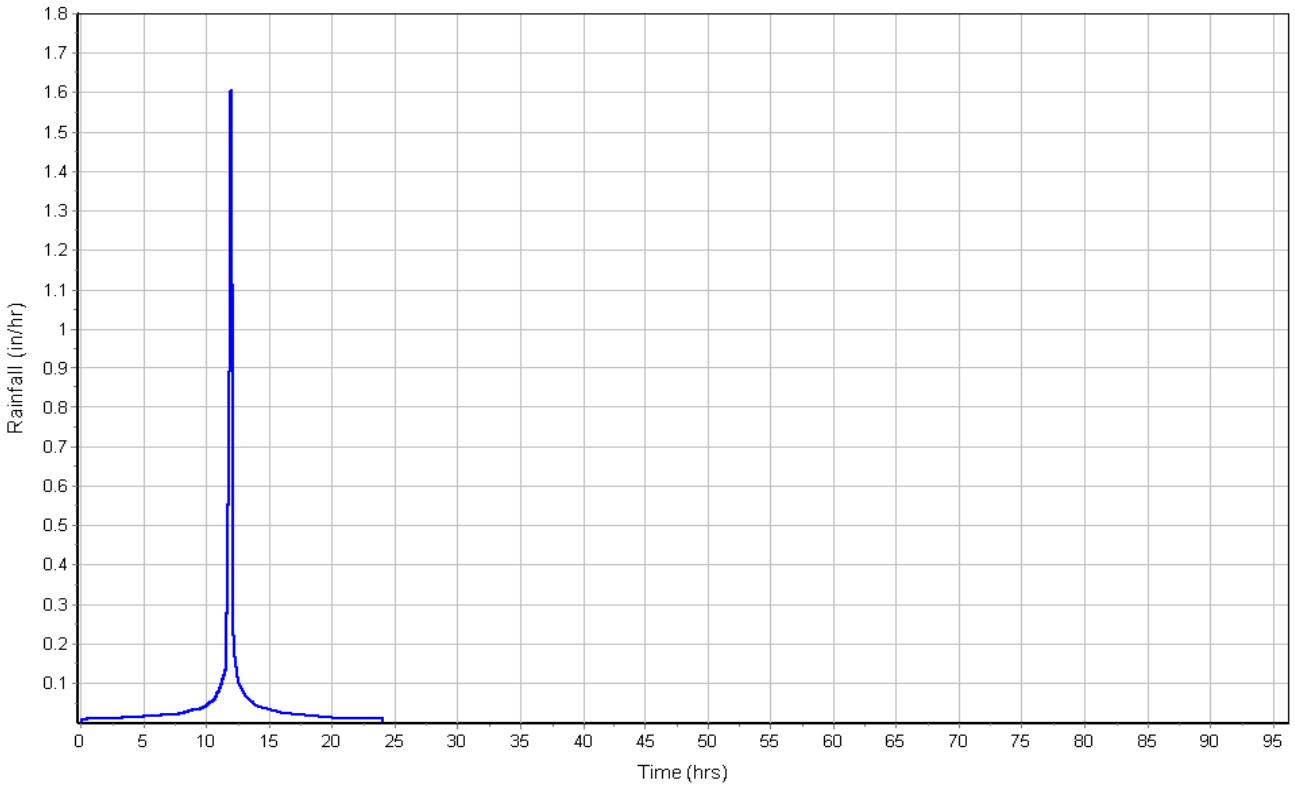
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

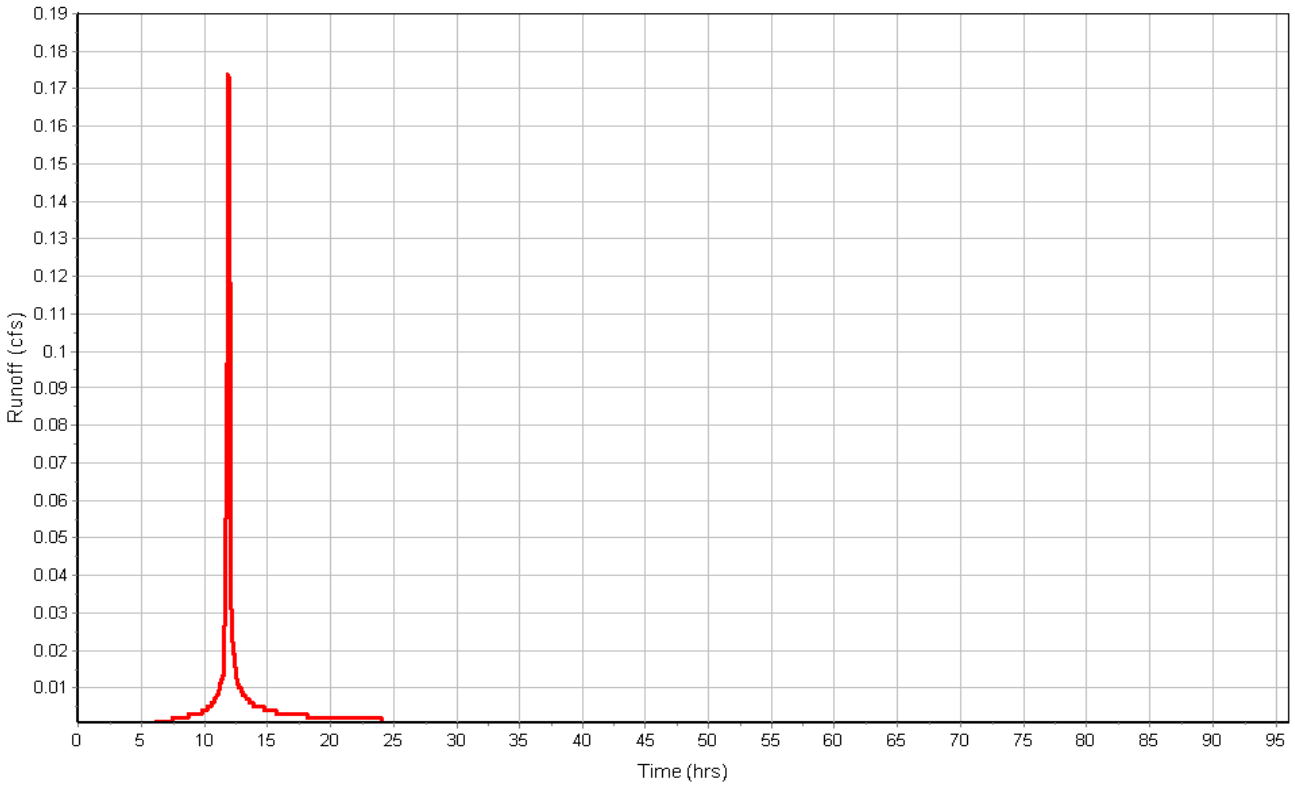
Total Rainfall (in)	1.17
Total Runoff (in)	0.94
Peak Runoff (cfs)	0.17
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_33_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_33_VACANT

Input Data

Area (ac) 0.54
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.54	B	58.00
Composite Area & Weighted CN	0.54		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	256	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	56.37	0.00	0.00

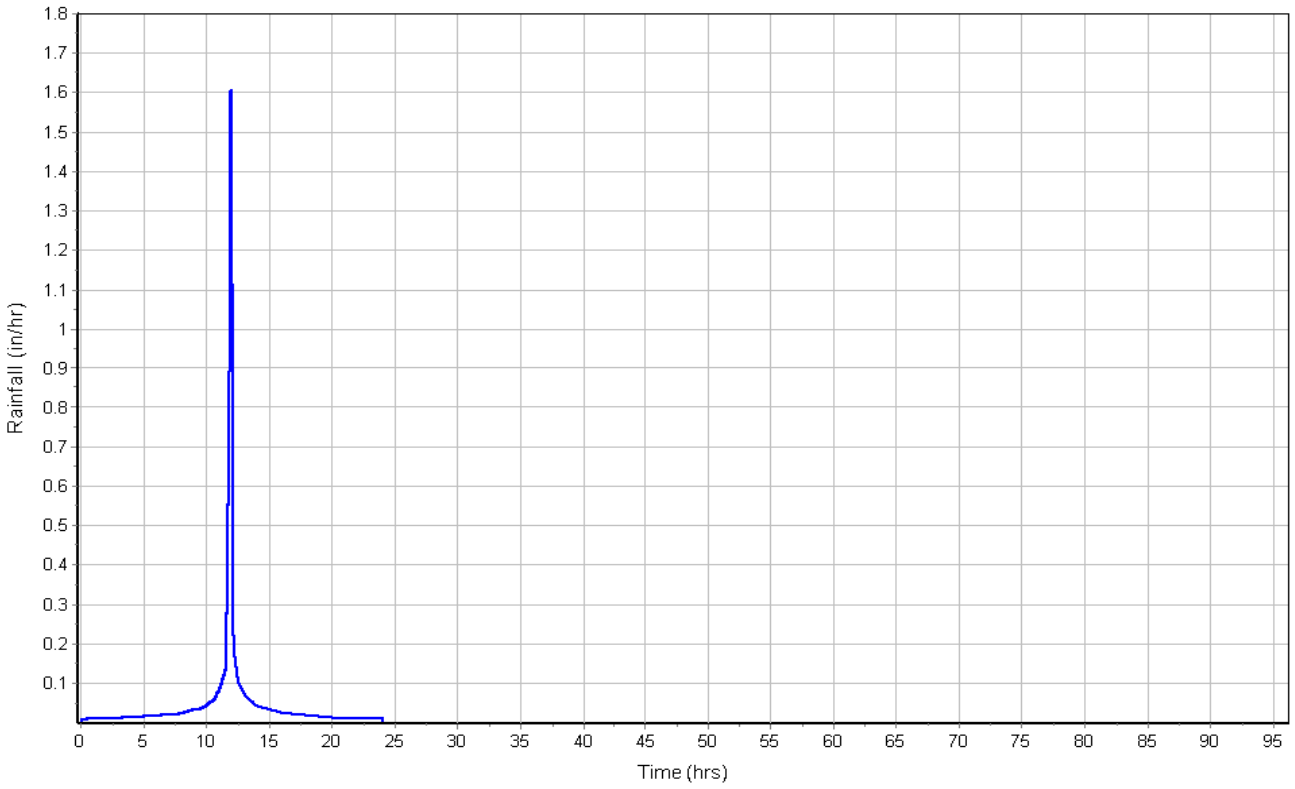
Total TOC (min) 56.37

Subbasin Runoff Results

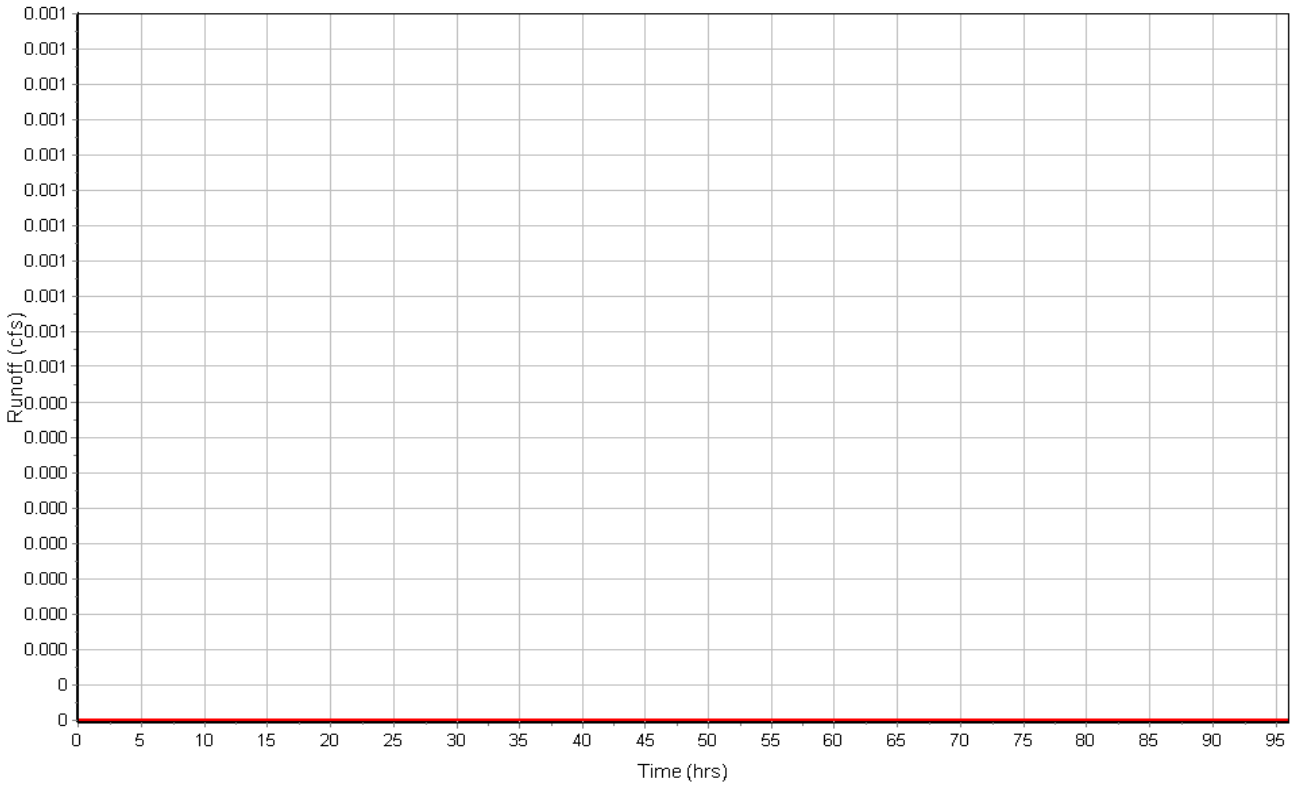
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:56:22

Subbasin : BASIN_33_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_34_ROW

Input Data

Area (ac)	0.07
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.07	B	98.00
Composite Area & Weighted CN	0.07		98.00

Time of Concentration

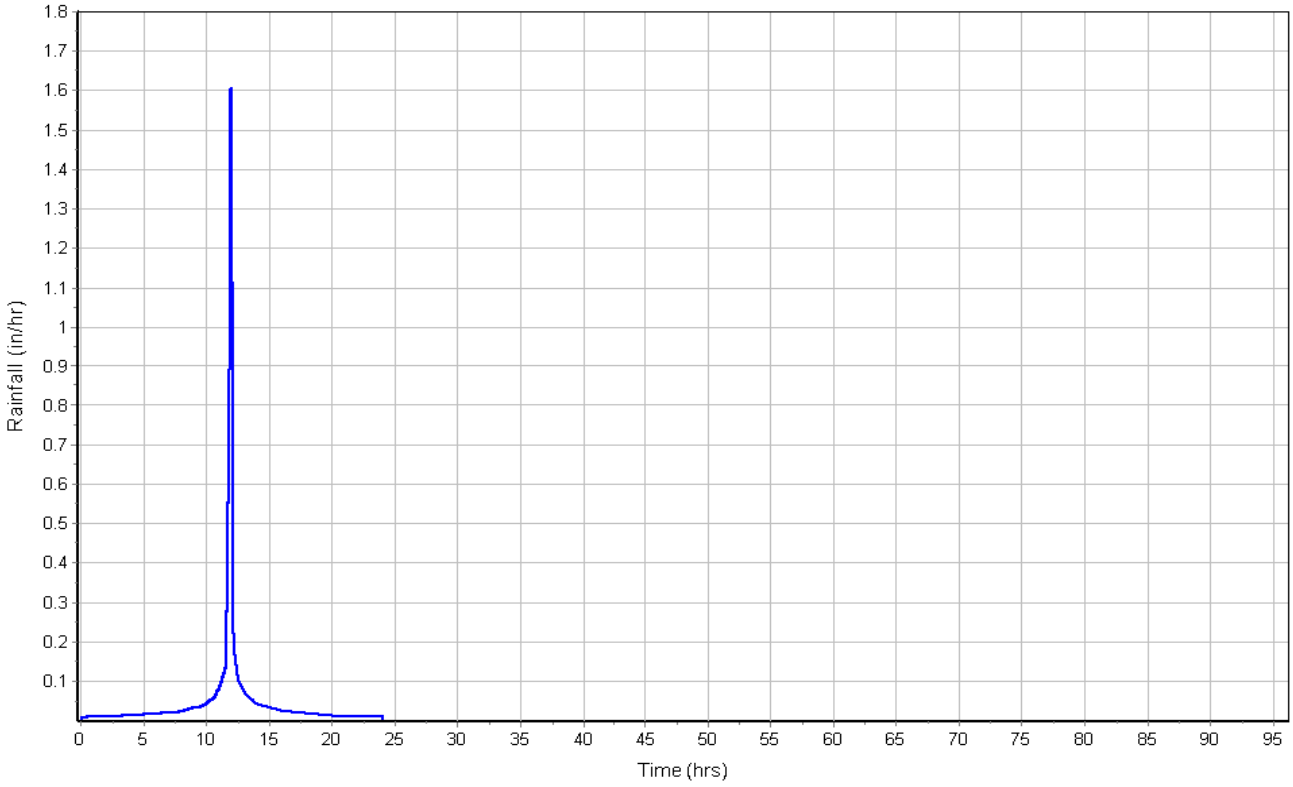
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

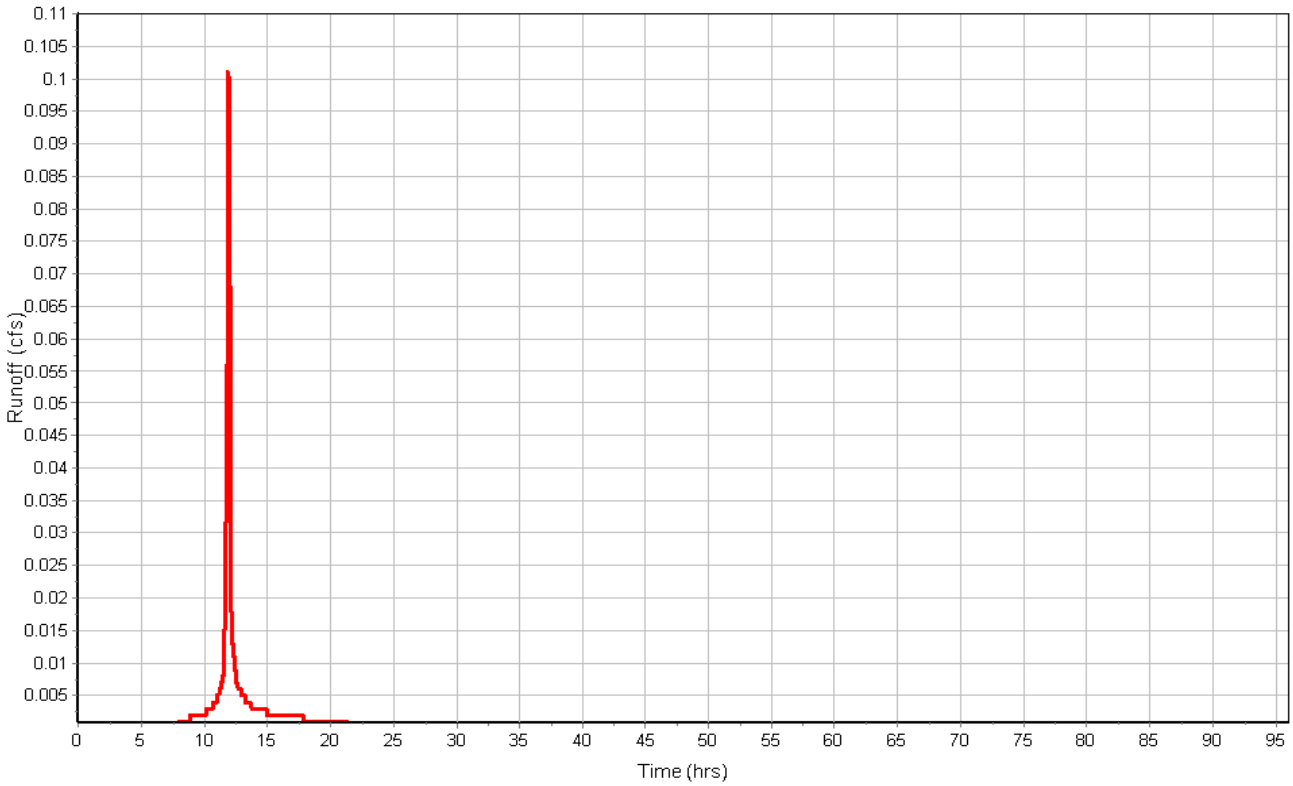
Total Rainfall (in)	1.17
Total Runoff (in)	0.89
Peak Runoff (cfs)	0.10
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_34_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_34_VACANT

Input Data

Area (ac) 0.51
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.51	B	58.00
Composite Area & Weighted CN	0.51		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	198	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	45.90	0.00	0.00

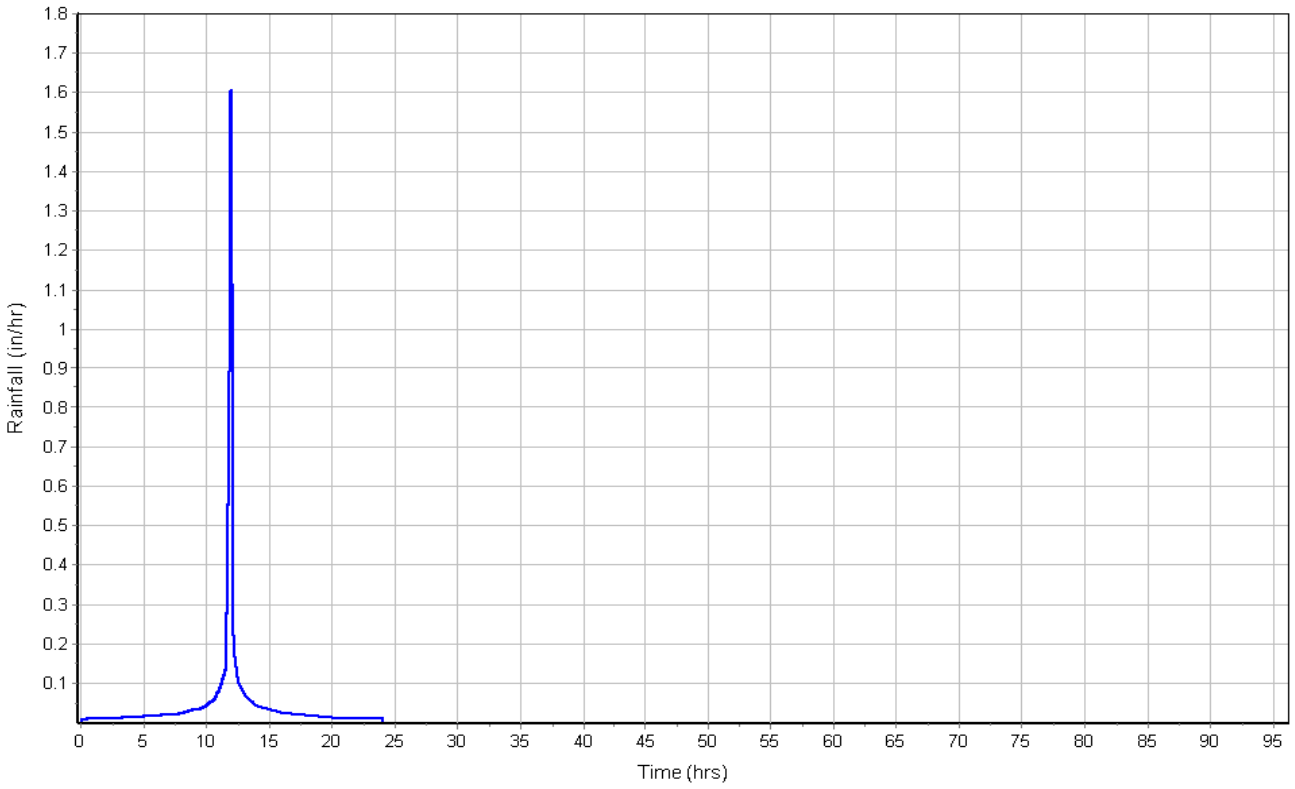
Total TOC (min) 45.90

Subbasin Runoff Results

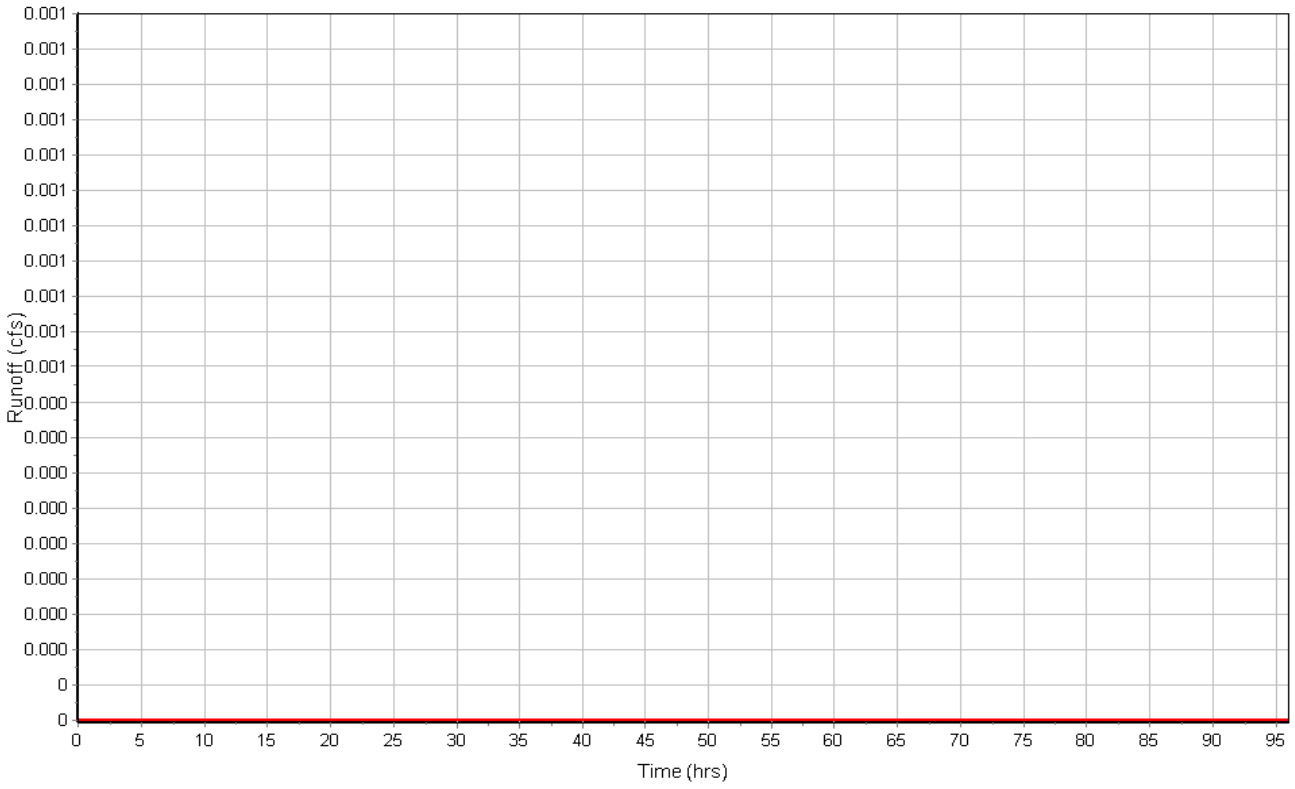
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:45:54

Subbasin : BASIN_34_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_35_ROW

Input Data

Area (ac)	0.07
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.07	B	98.00
Composite Area & Weighted CN	0.07		98.00

Time of Concentration

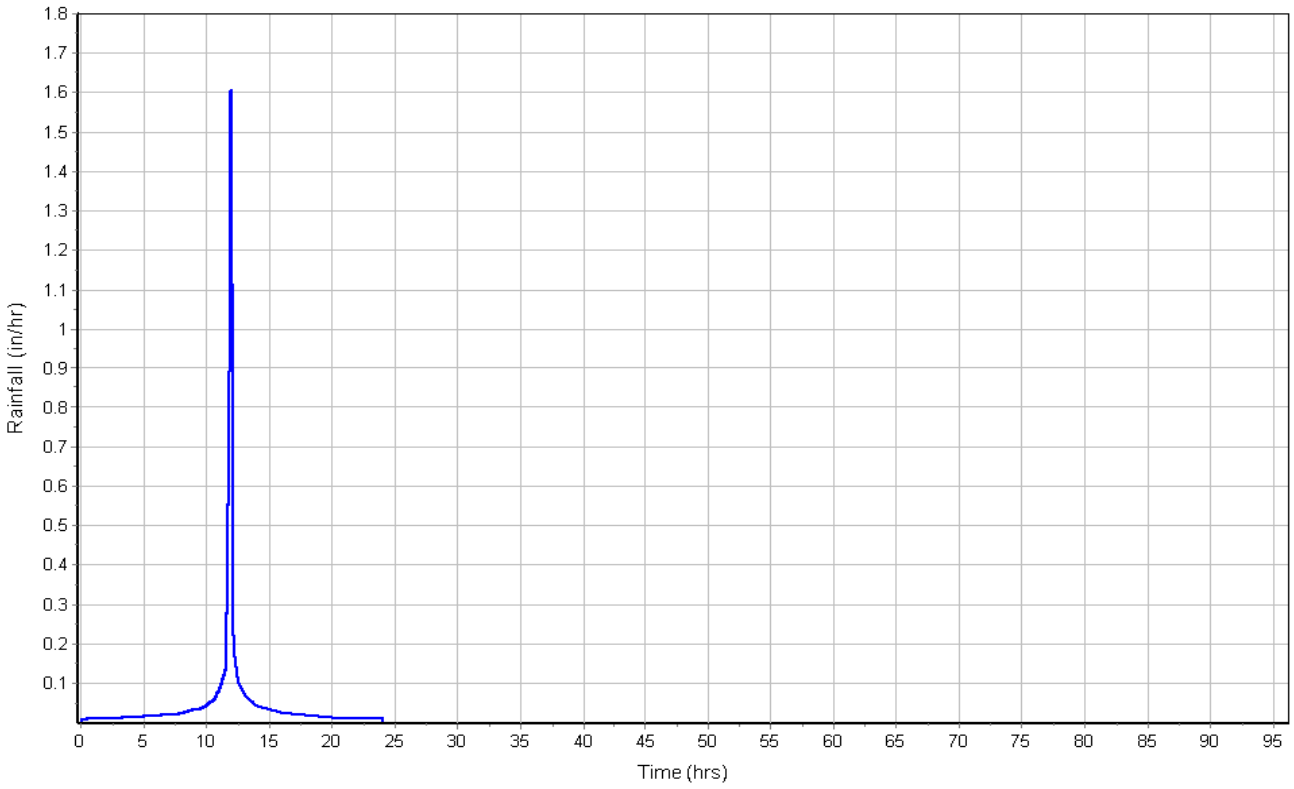
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

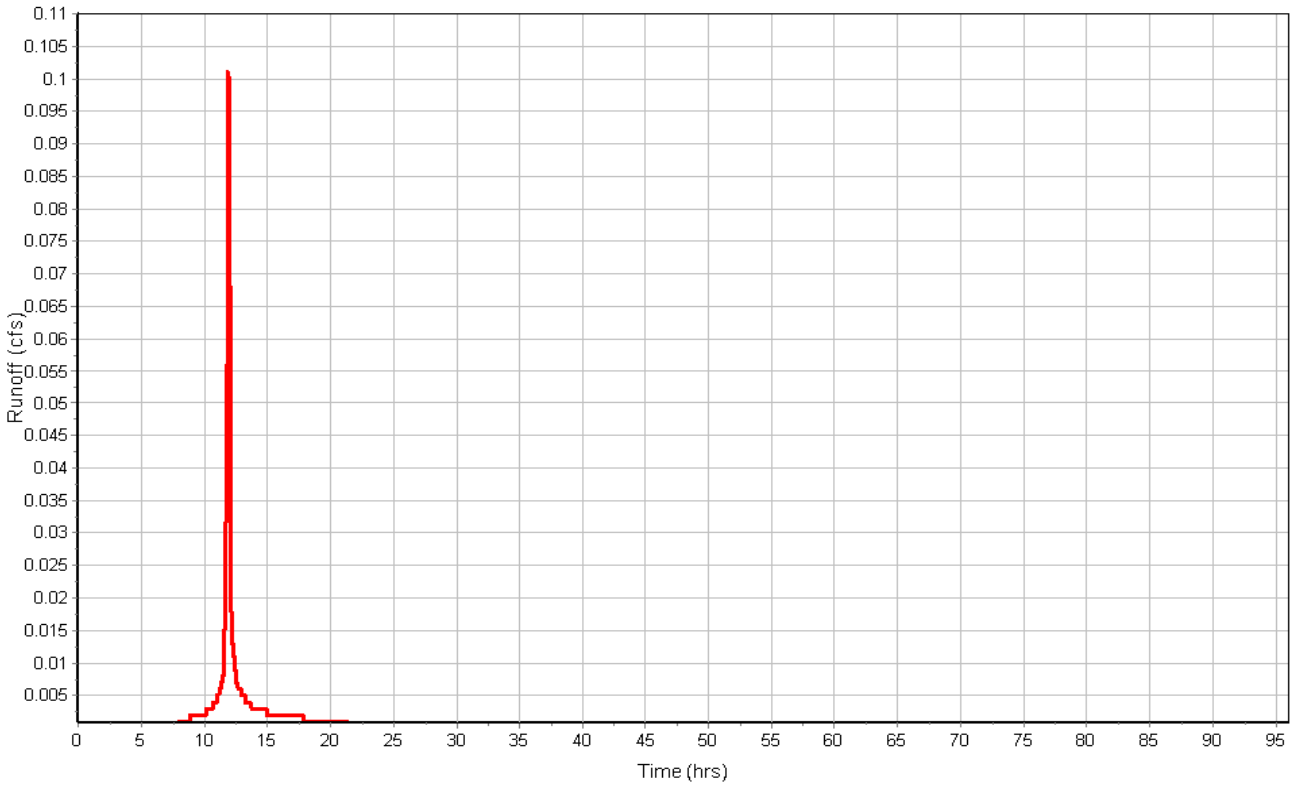
Total Rainfall (in)	1.17
Total Runoff (in)	0.89
Peak Runoff (cfs)	0.10
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_35_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_35_VACANT

Input Data

Area (ac) 0.34
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.34	B	58.00
Composite Area & Weighted CN	0.34		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	184	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	43.28	0.00	0.00

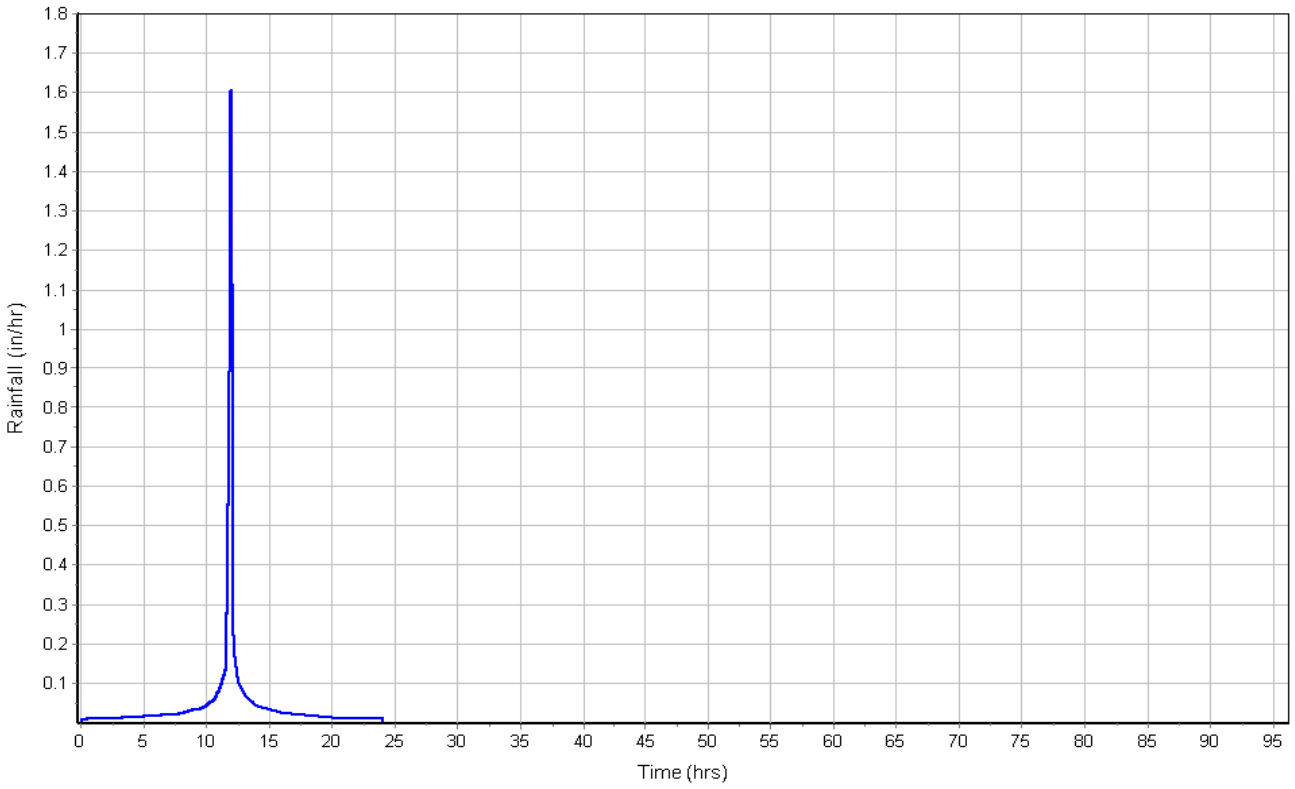
Total TOC (min) 43.28

Subbasin Runoff Results

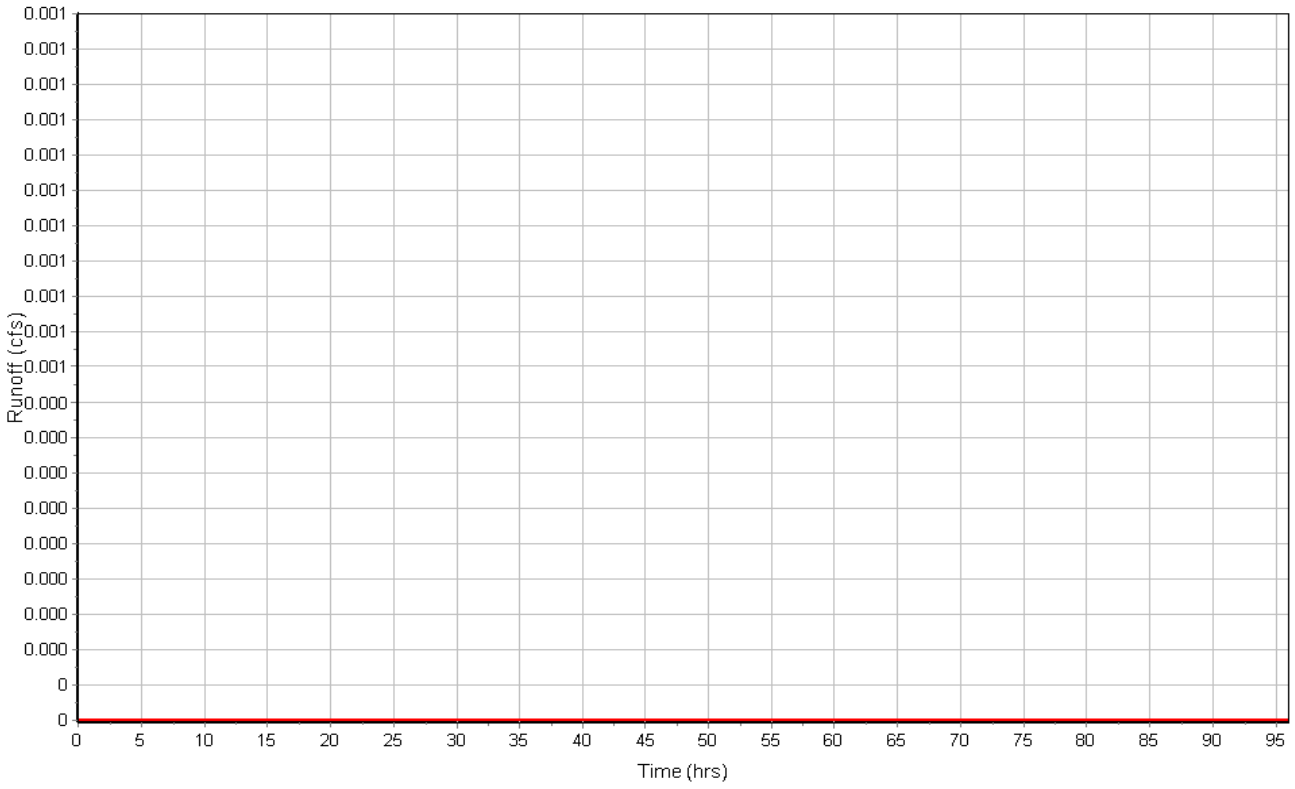
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:43:17

Subbasin : BASIN_35_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_36_ROW

Input Data

Area (ac) 0.13
Peak Rate Factor 484.00
Weighted Curve Number 98.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.13	B	98.00
Composite Area & Weighted CN	0.13		98.00

Time of Concentration

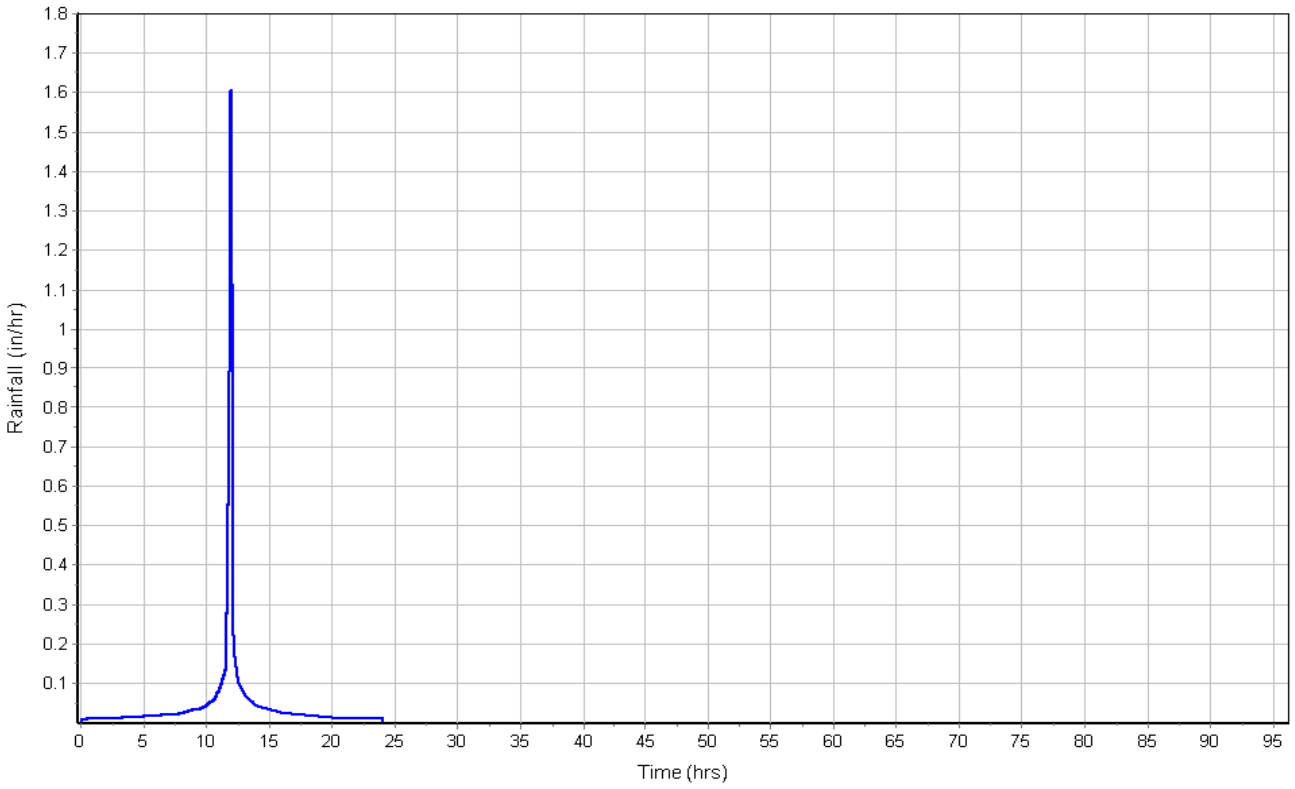
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

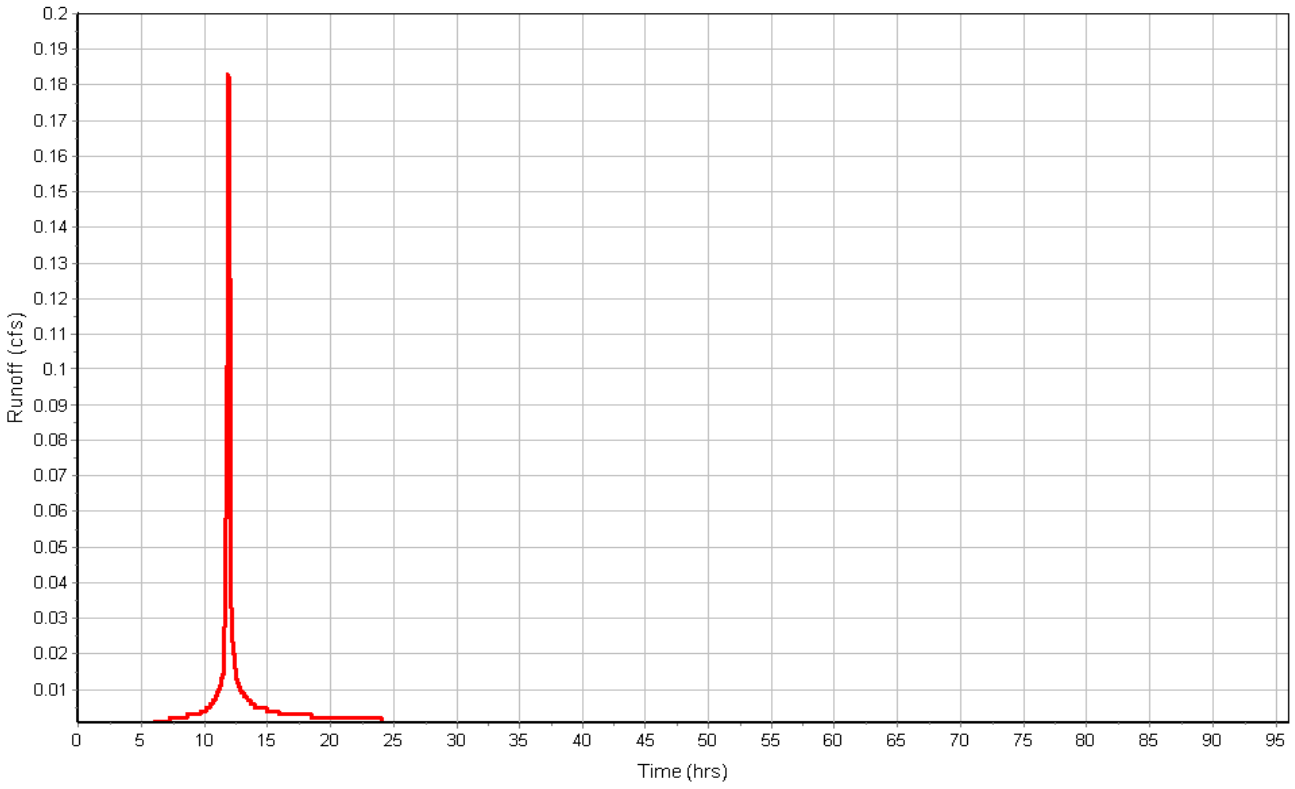
Total Rainfall (in) 1.17
Total Runoff (in) 0.95
Peak Runoff (cfs) 0.18
Weighted Curve Number 98.00
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : BASIN_36_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_36_VACANT

Input Data

Area (ac) 0.35
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.35	B	58.00
Composite Area & Weighted CN	0.35		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	190	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	44.41	0.00	0.00

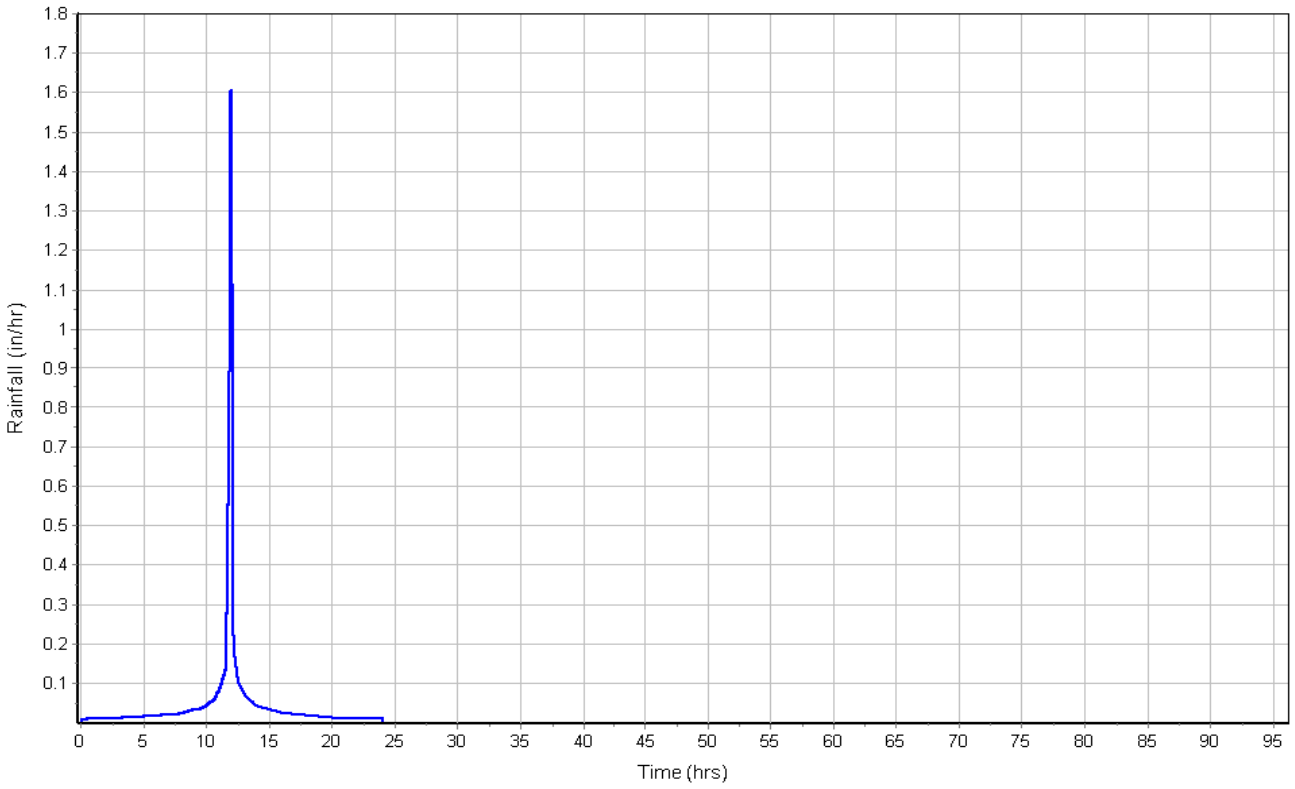
Total TOC (min) 44.41

Subbasin Runoff Results

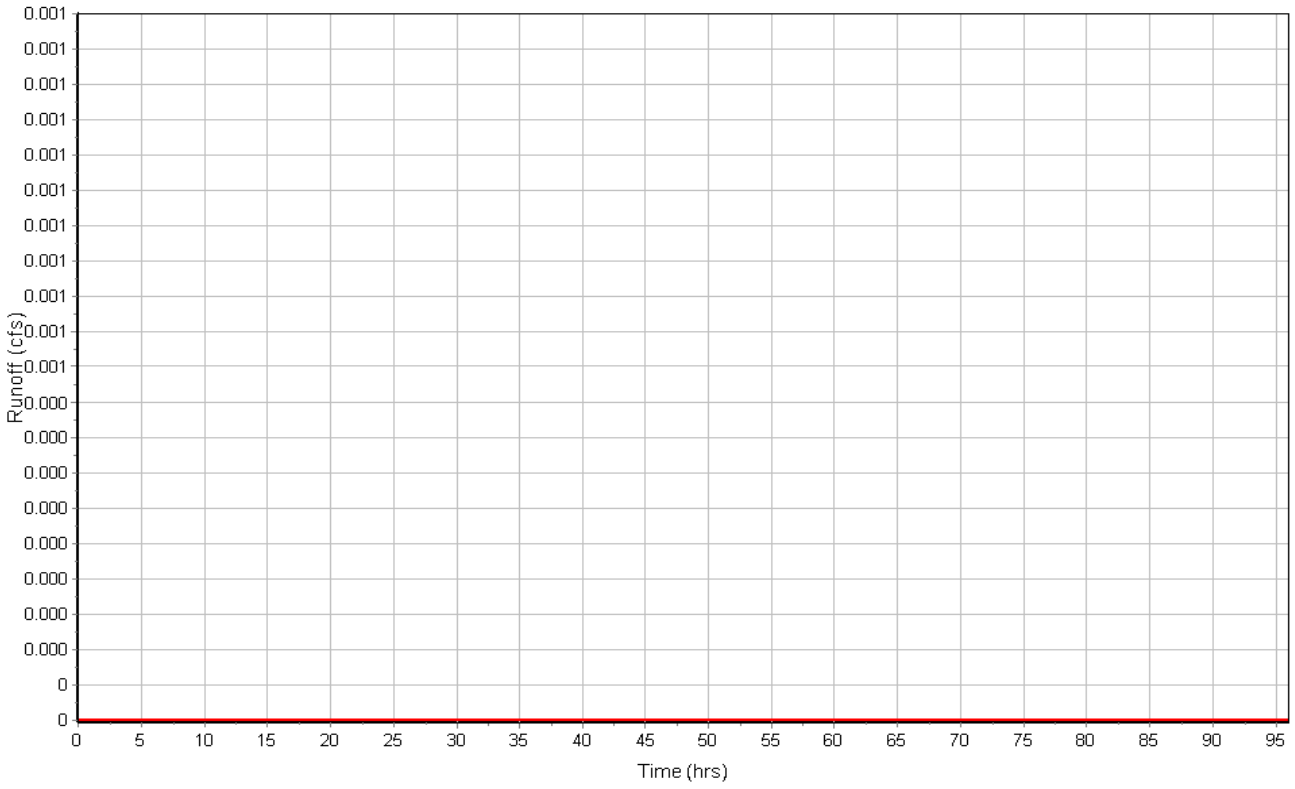
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:44:25

Subbasin : BASIN_36_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_37_ROW

Input Data

Area (ac)	0.12
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.12	B	98.00
Composite Area & Weighted CN	0.12		98.00

Time of Concentration

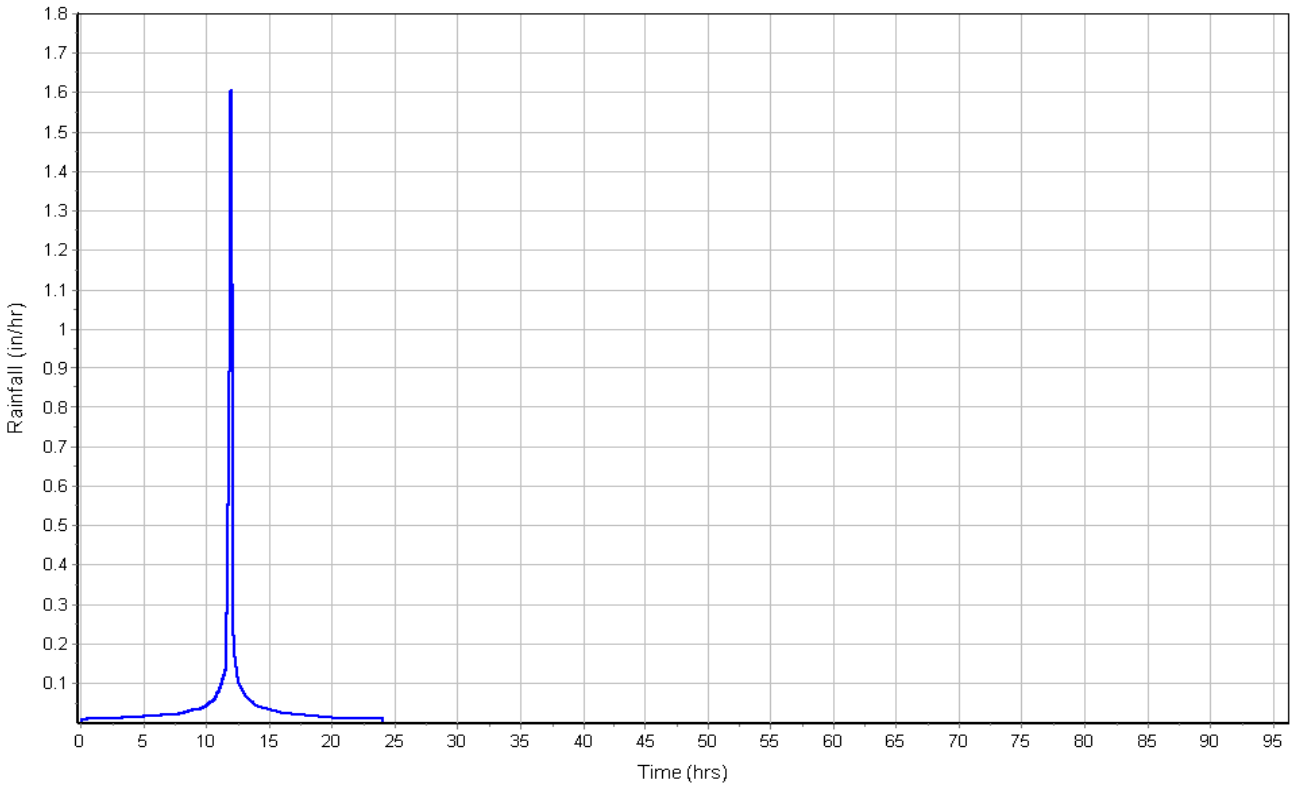
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

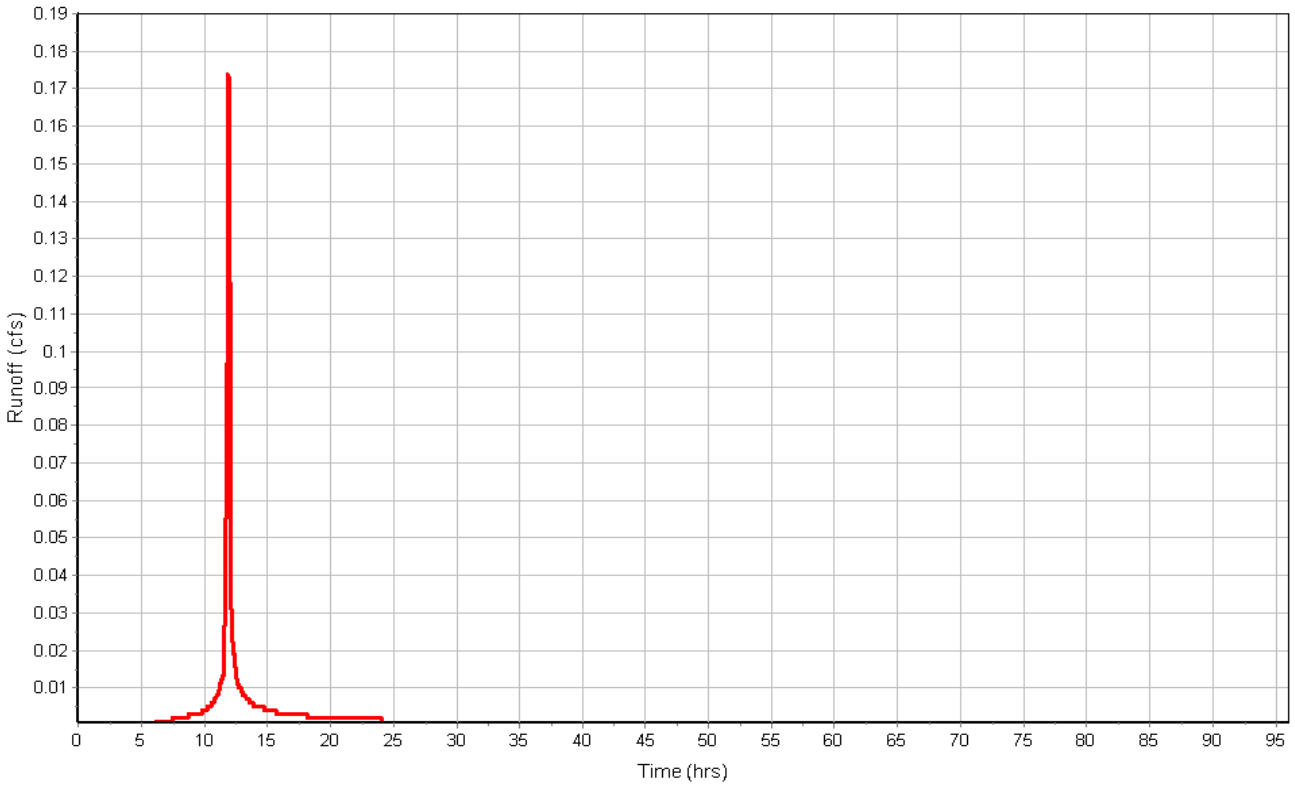
Total Rainfall (in)	1.17
Total Runoff (in)	0.94
Peak Runoff (cfs)	0.17
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_37_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_37_VACANT

Input Data

Area (ac) 0.44
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.44	B	58.00
Composite Area & Weighted CN	0.44		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	195	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	45.34	0.00	0.00

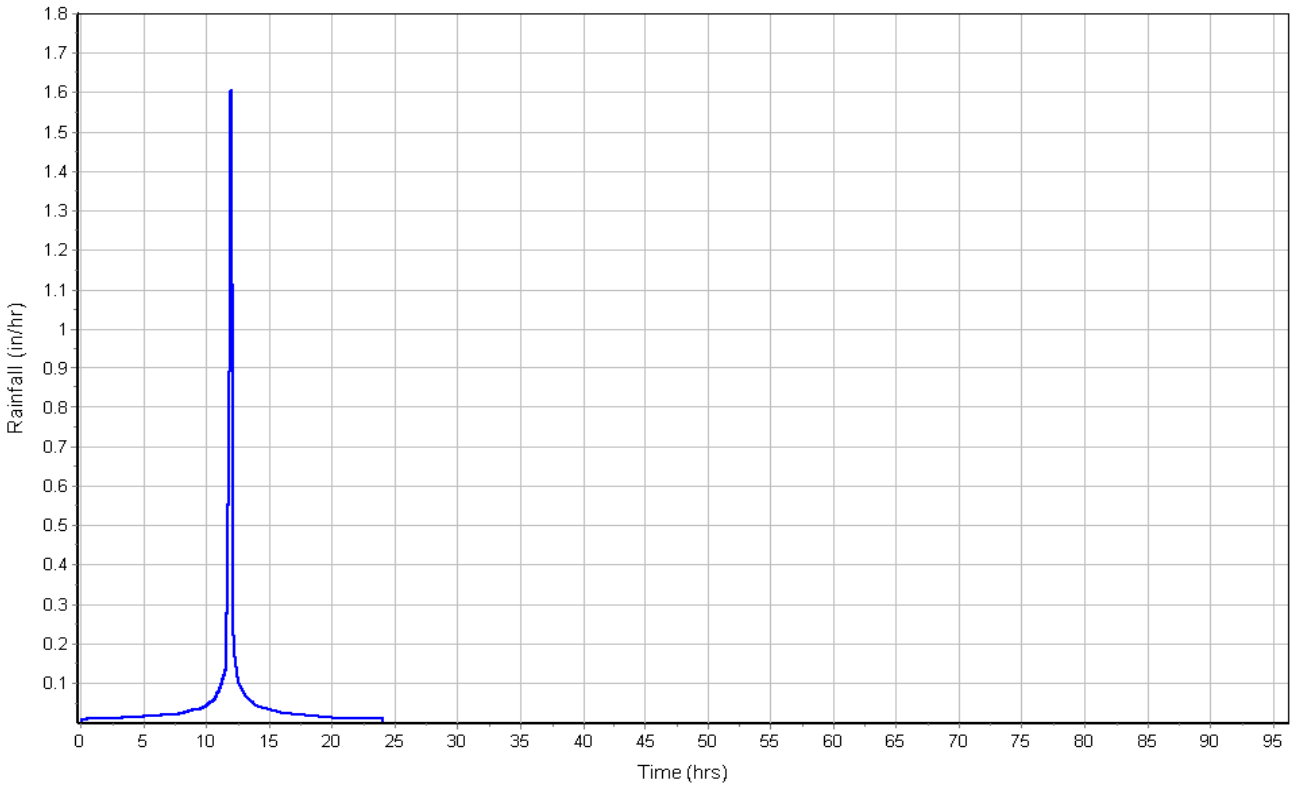
Total TOC (min) 45.34

Subbasin Runoff Results

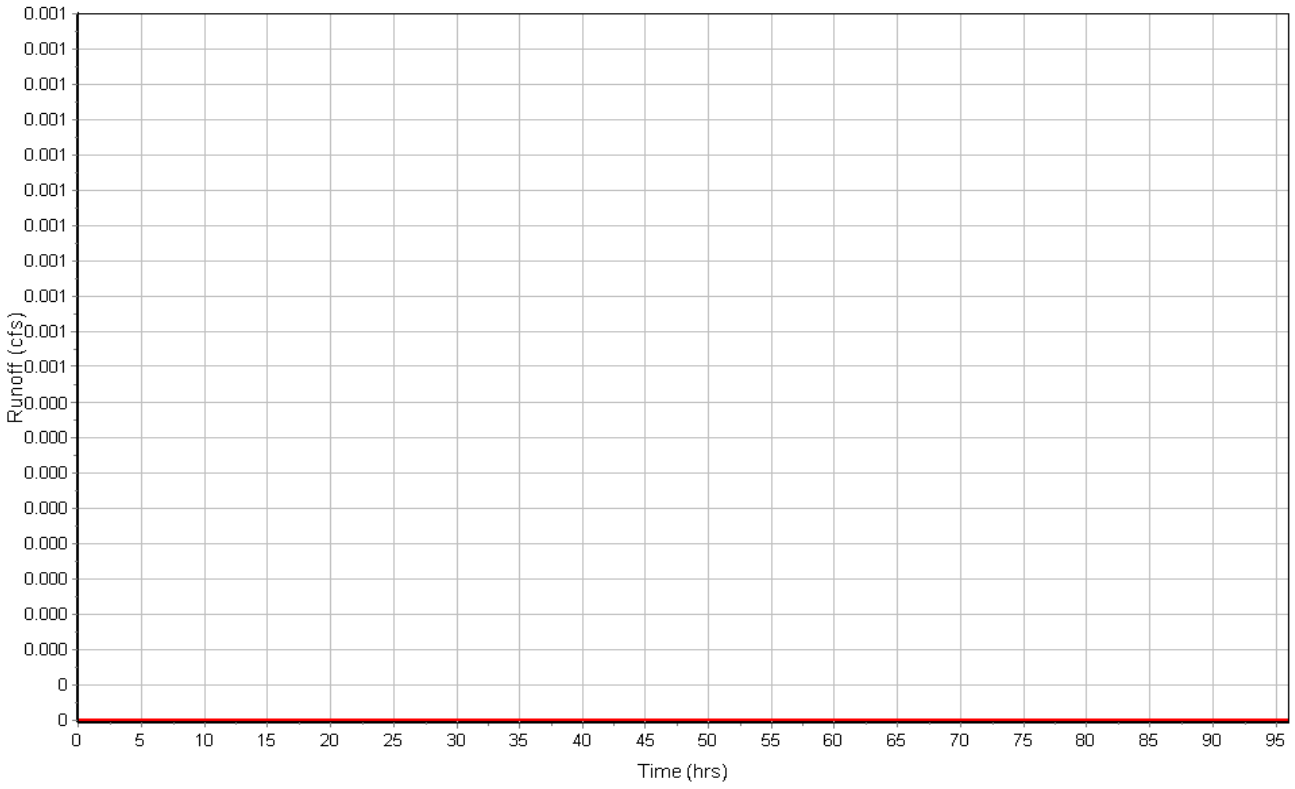
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:45:20

Subbasin : BASIN_37_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_38_ROW

Input Data

Area (ac)	0.09
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.09	B	98.00
Composite Area & Weighted CN	0.09		98.00

Time of Concentration

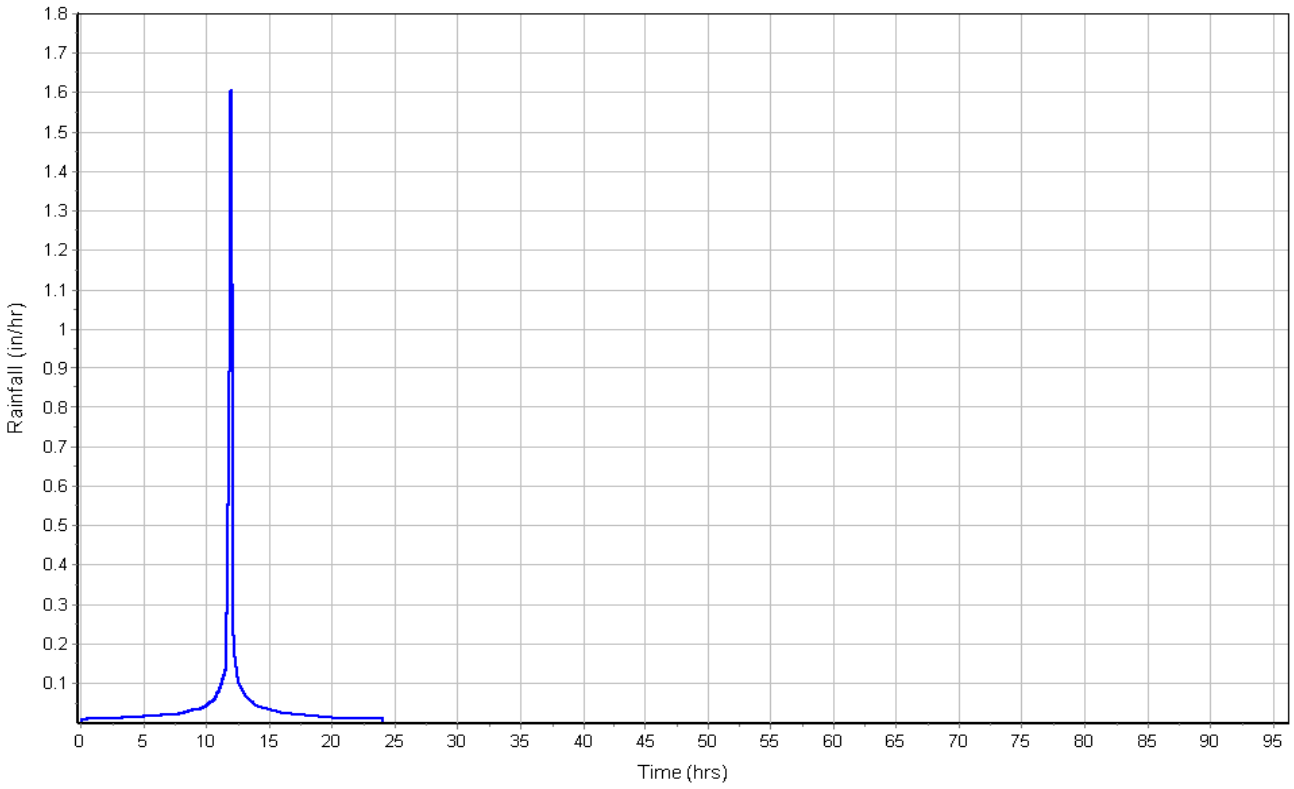
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

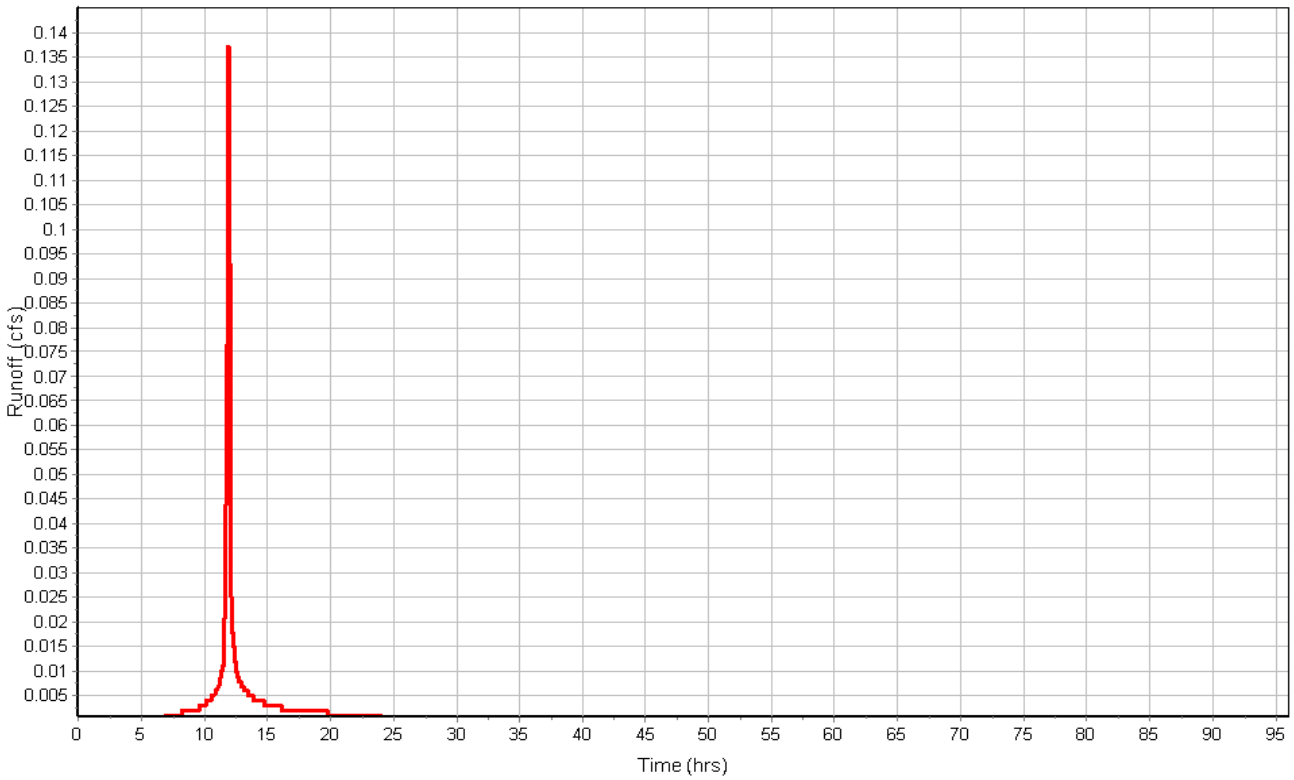
Total Rainfall (in)	1.17
Total Runoff (in)	0.94
Peak Runoff (cfs)	0.14
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_38_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_38_VACANT

Input Data

Area (ac) 0.25
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.25	B	58.00
Composite Area & Weighted CN	0.25		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	230	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	51.74	0.00	0.00

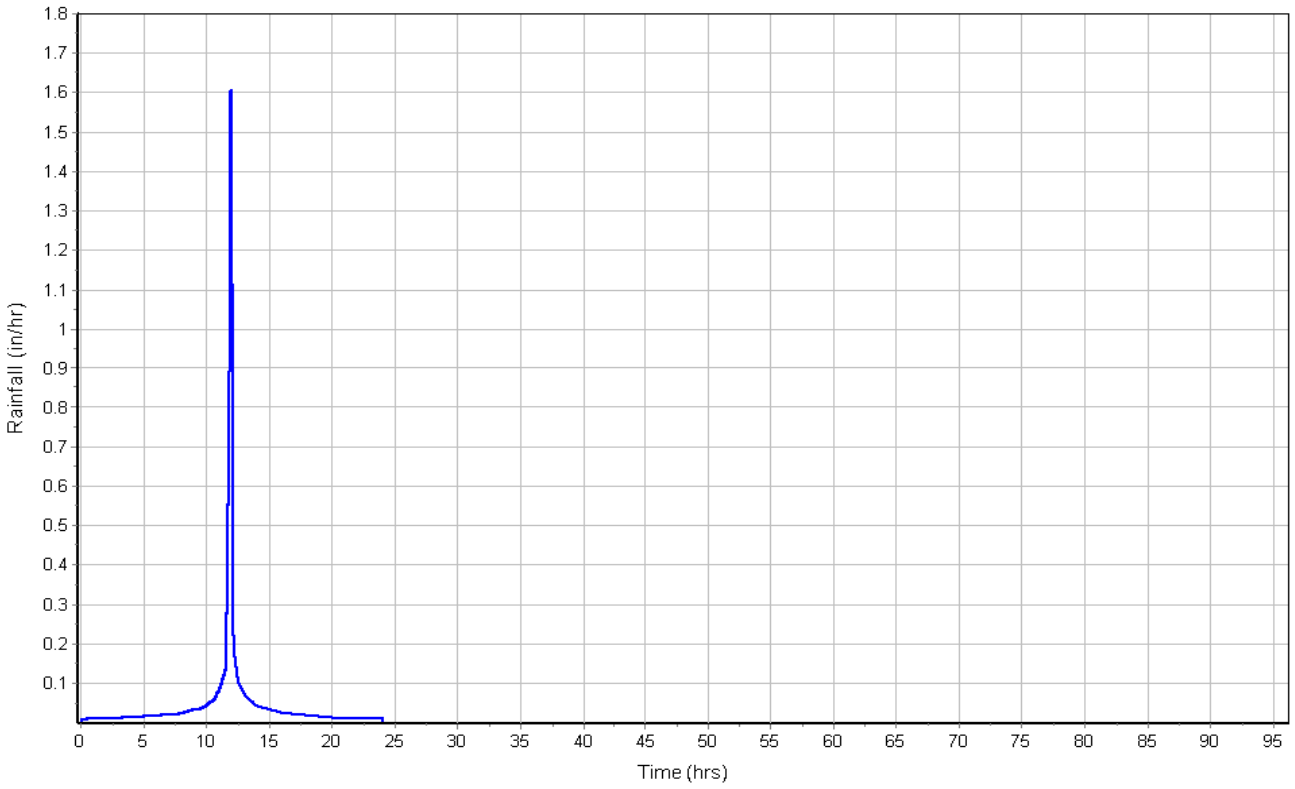
Total TOC (min) 51.74

Subbasin Runoff Results

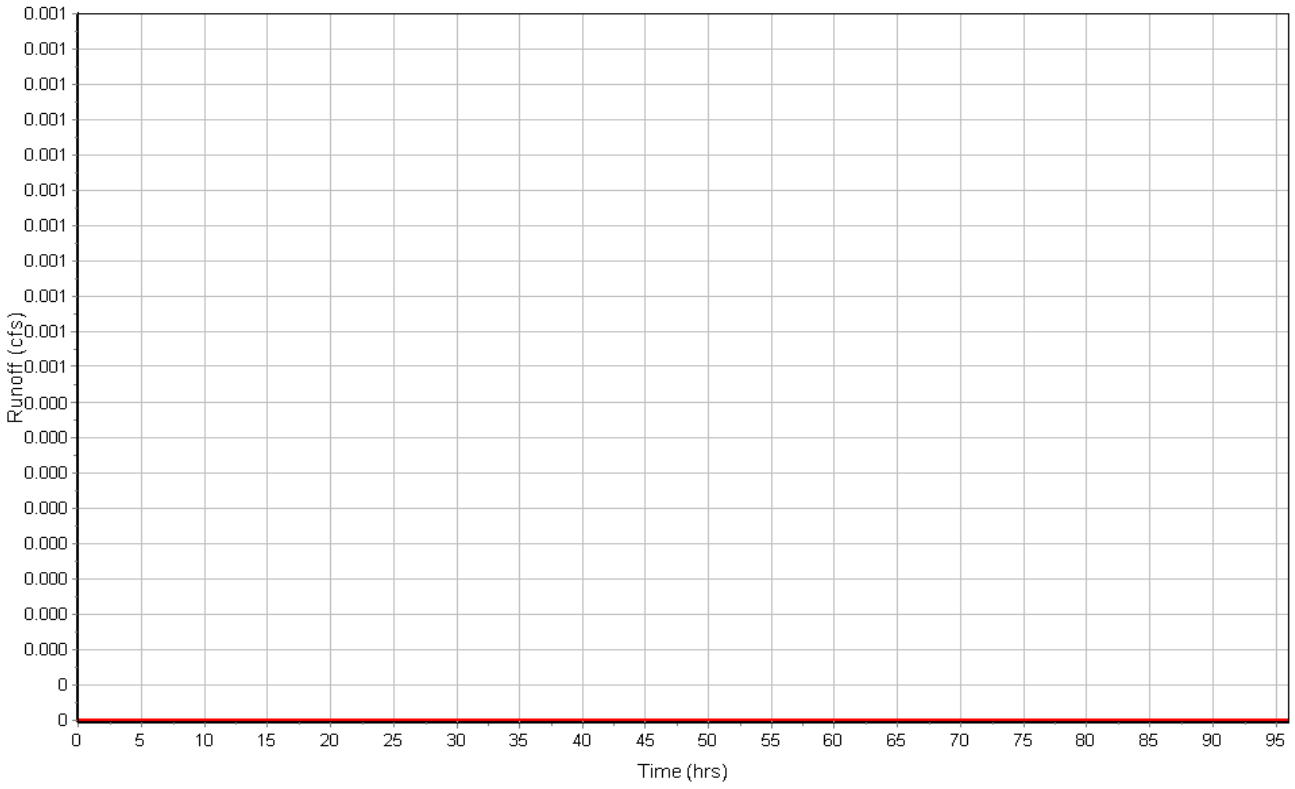
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:51:44

Subbasin : BASIN_38_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_4_ROW

Input Data

Area (ac)	0.06
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.06	B	98.00
Composite Area & Weighted CN	0.06		98.00

Time of Concentration

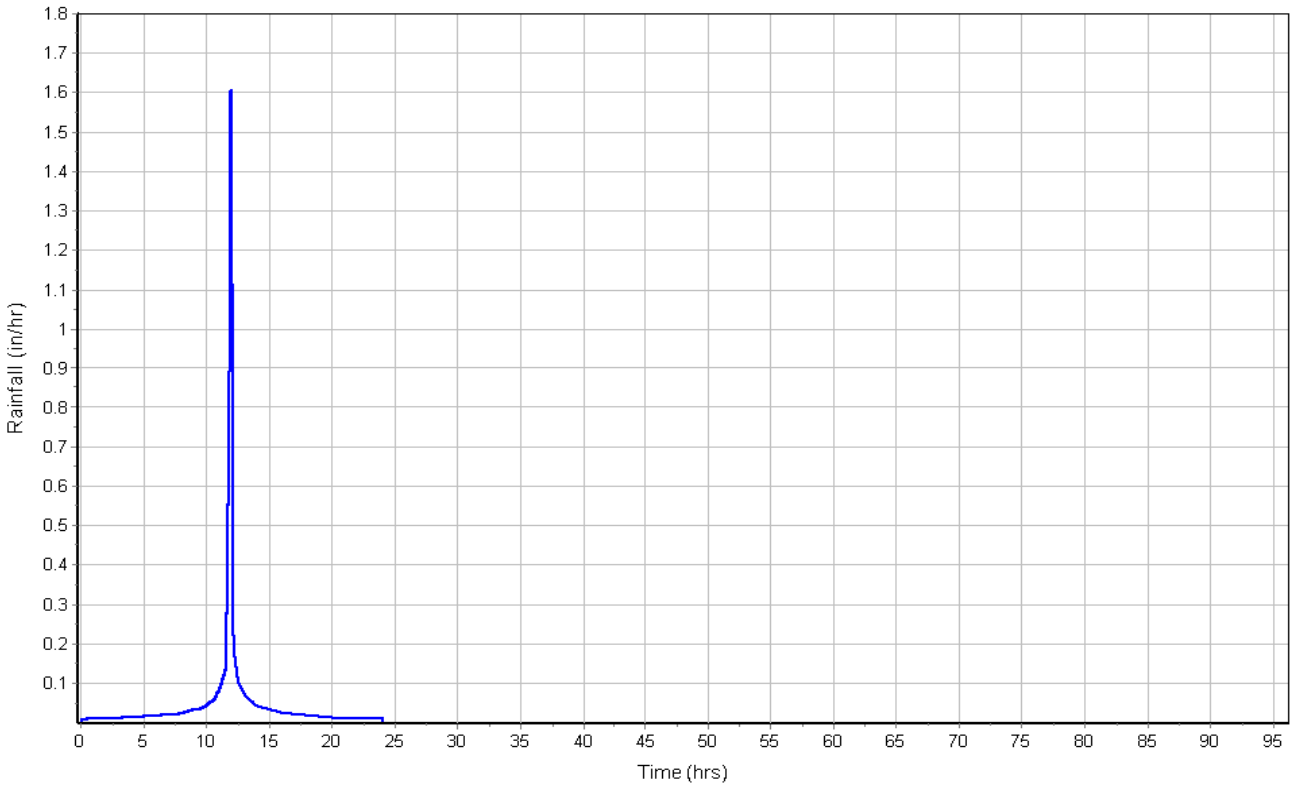
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

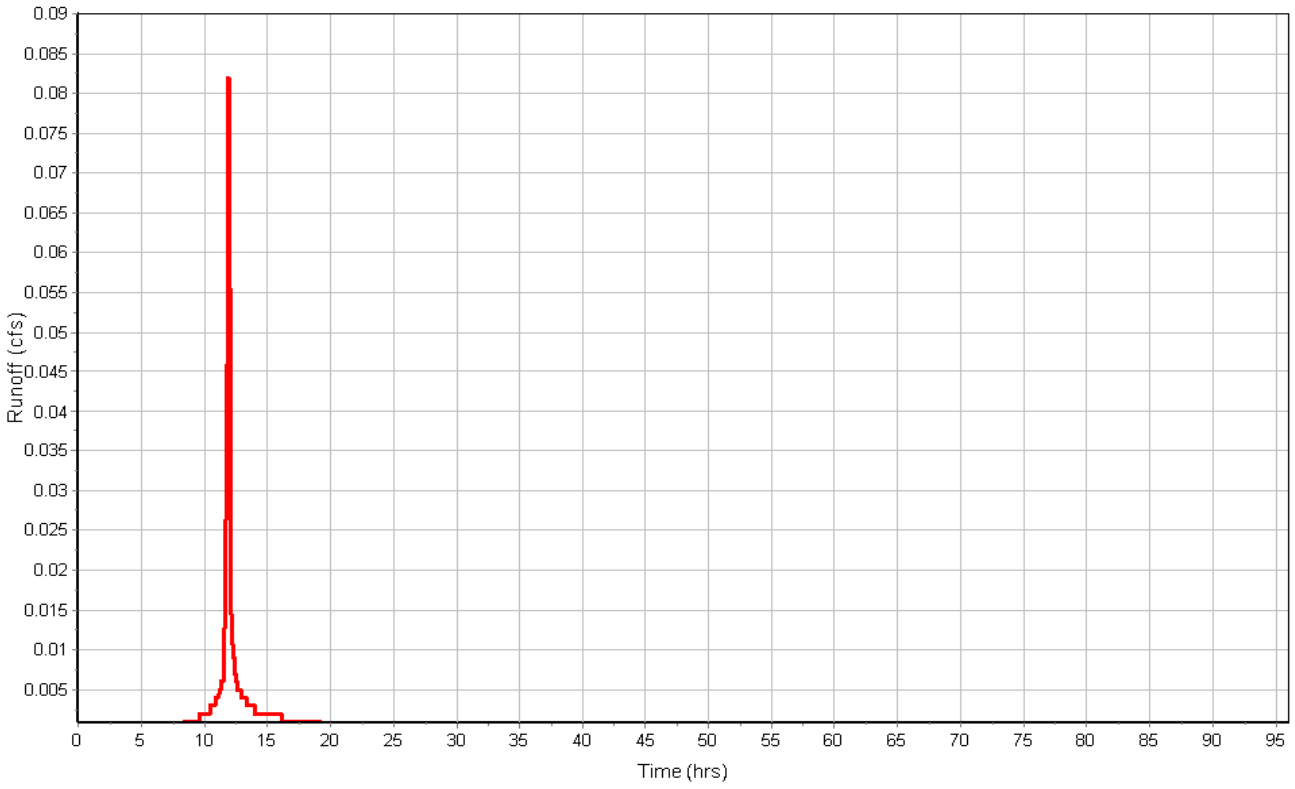
Total Rainfall (in)	1.17
Total Runoff (in)	0.85
Peak Runoff (cfs)	0.08
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_4_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_4_VACANT

Input Data

Area (ac) 0.04
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.04	B	58.00
Composite Area & Weighted CN	0.04		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	87	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.06	0.00	0.00
Computed Flow Time (min) :	23.77	0.00	0.00

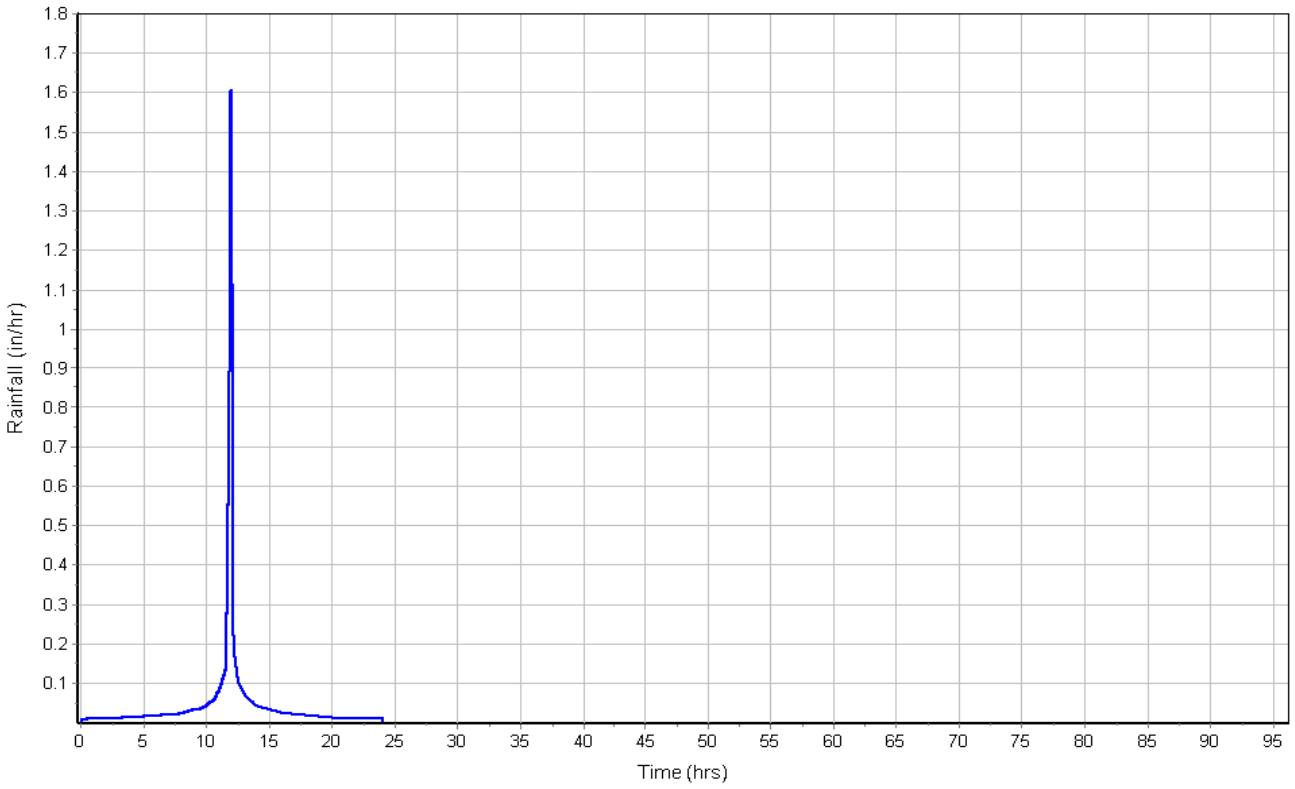
Total TOC (min) 23.77

Subbasin Runoff Results

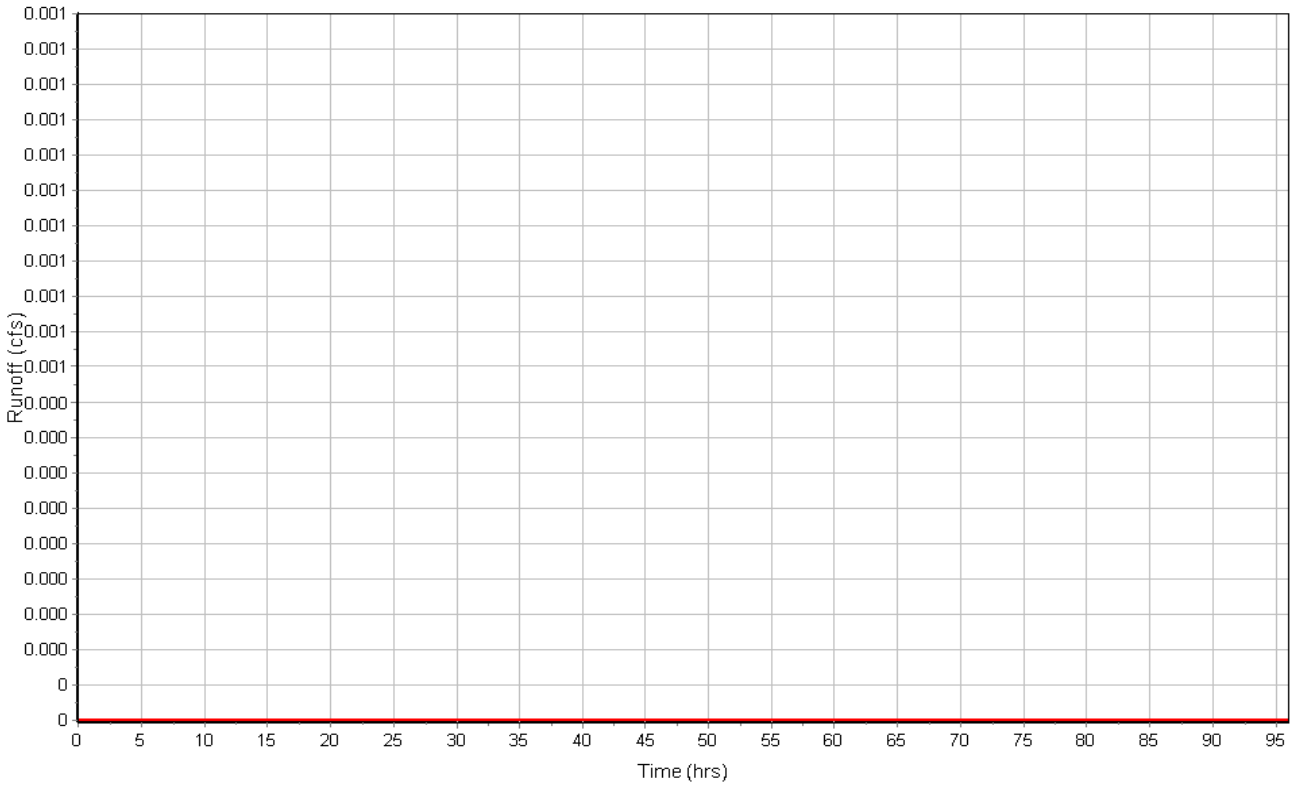
Total Rainfall (in) 1.17
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:23:46

Subbasin : BASIN_4_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_5_ROW

Input Data

Area (ac) 0.15
Peak Rate Factor 484.00
Weighted Curve Number 98.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.15	B	98.00
Composite Area & Weighted CN	0.15		98.00

Time of Concentration

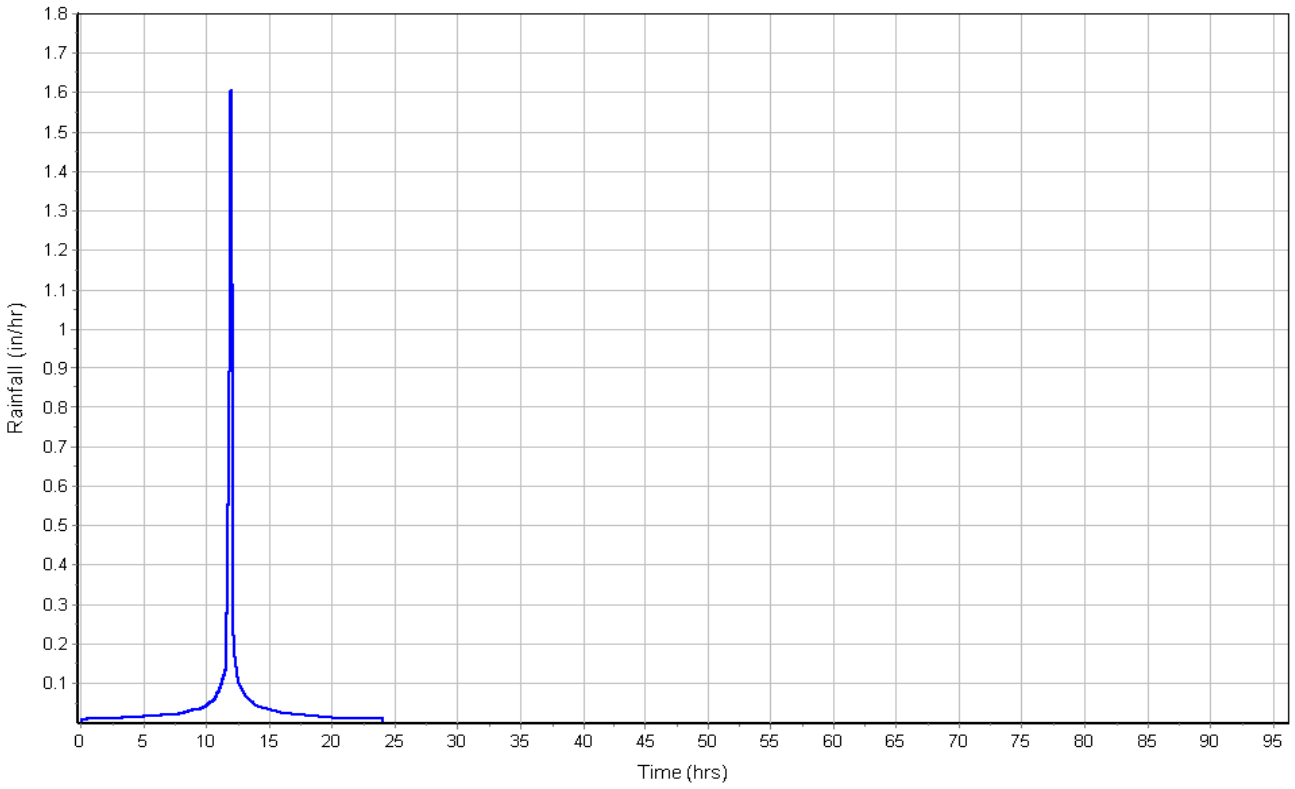
User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

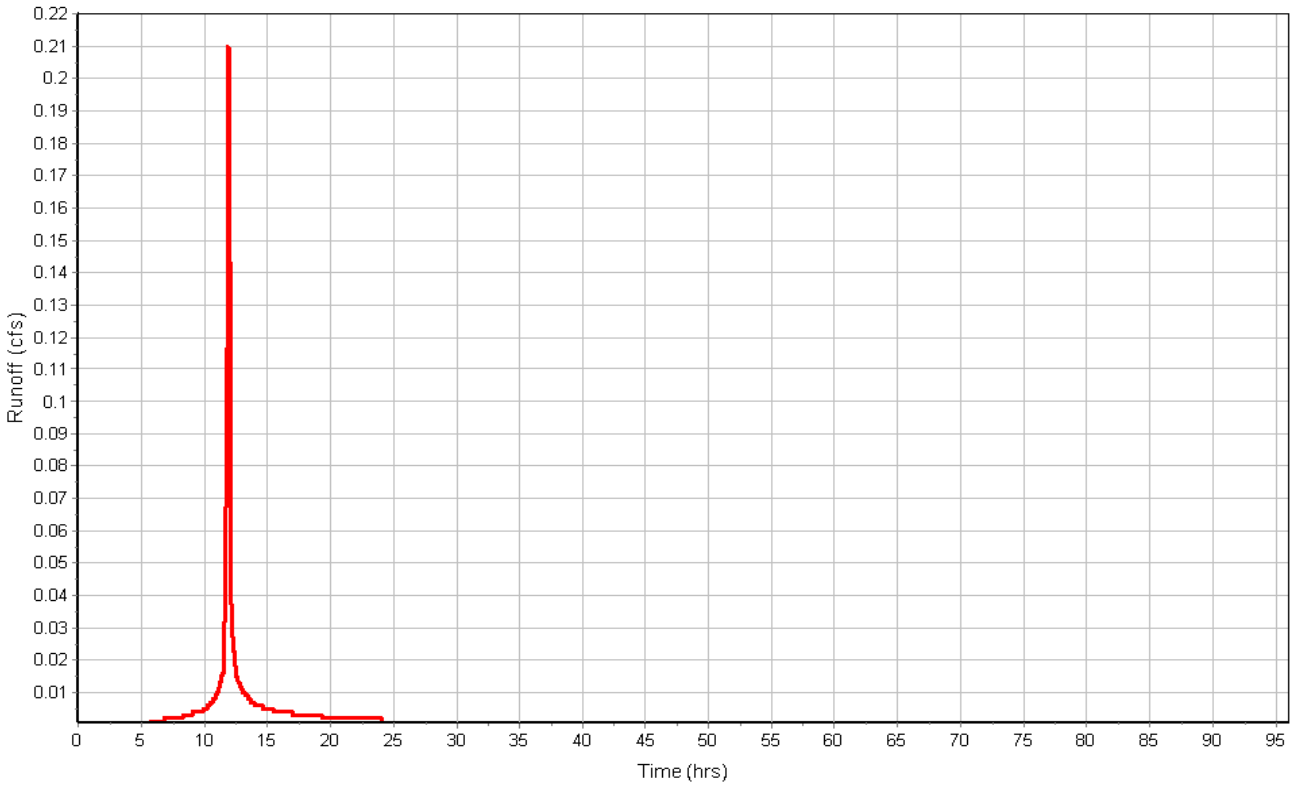
Total Rainfall (in) 1.17
Total Runoff (in) 0.95
Peak Runoff (cfs) 0.21
Weighted Curve Number 98.00
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : BASIN_5_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_5_VACANT

Input Data

Area (ac)	1.12
Peak Rate Factor	484.00
Weighted Curve Number	58.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	1.12	B	58.00
Composite Area & Weighted CN	1.12		58.00

Time of Concentration

Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft²)	Minimum Pipe Cover (in)
1	Jun-02	3151.24	3155.50	4.26	3151.24	0.00	3155.50	0.00	0.00	0.00

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Jun-02	0.00	0.00	3151.24	0.00	0.00	4.34	3151.24	0.00	0 00:00	0 00:00	0.00	0.00

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	Link-01	29.78	3154.22	10.00	3154.00	3154.00	0.22	0.7500	CIRCULAR	18.000	18.000	0.0150	0.5000	0.5000	0.0000	0.00	No
2	Link-02	140.60	3151.24	0.00	3150.37	3.86	0.87	0.6200	CIRCULAR	18.000	18.000	0.0110	0.5000	0.5000	0.0000	0.00	No
3	SDP 2	250.54	3150.27	3.76	3148.71	3.21	1.55	0.6200	CIRCULAR	18.000	18.000	0.0120	0.5000	0.5000	0.0000	0.00	No
4	SDP 3	45.01	3148.62	3.12	3148.34	2.84	0.28	0.6200	CIRCULAR	18.000	18.000	0.0120	0.5000	0.5000	0.0000	0.00	No
5	SDP 4	78.23	3148.14	2.64	3147.65	2.70	0.49	0.6200	CIRCULAR	18.000	18.000	0.0120	0.5000	0.5000	0.0000	0.00	No

No. of Barrels
1
1
1
1
1

Pipe Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	Link-01	0.00	0 00:00	7.87	0.00	0.00		0.00	0.00	0.00		Calculated
2	Link-02	0.00	0 00:00	9.76	0.00	0.00		0.00	0.00	0.00		Calculated
3	SDP 2	0.00	0 00:00	8.96	0.00	0.00		0.66	0.44	0.00		Calculated
4	SDP 3	0.25	0 11:55	8.96	0.03	1.95	0.38	1.46	0.98	0.00		Calculated
5	SDP 4	0.41	0 11:55	8.96	0.05	2.17	0.60	1.50	1.00	957.00		SURCHARGED

Storage Nodes

Storage Node : EX-POND

Input Data

Invert Elevation (ft) 3150.40
Max (Rim) Elevation (ft) 3155.50
Max (Rim) Offset (ft) 5.10
Initial Water Elevation (ft) 3150.40
Initial Water Depth (ft) 0.00
Ponded Area (ft²) 10000.00
Evaporation Loss 0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs) 0.2800

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	L1-1	Side	CIRCULAR	No	4.50			3151.74	0.60
2	L1-2	Side	CIRCULAR	No	4.50			3151.74	0.60
3	L2-1	Side	CIRCULAR	No	4.50			3152.65	0.60
4	L2-2	Side	CIRCULAR	No	4.50			3152.65	0.60
5	L2-3	Side	CIRCULAR	No	4.50			3152.65	0.60
6	L2-4	Side	CIRCULAR	No	4.50			3152.65	0.60
7	L3	Side	CIRCULAR	No	4.50			3152.99	0.60

Output Summary Results

Peak Inflow (cfs) 1.86
Peak Lateral Inflow (cfs) 1.86
Peak Outflow (cfs) 0.00
Peak Exfiltration Flow Rate (cfm) 16.80
Max HGL Elevation Attained (ft) 3150.90
Max HGL Depth Attained (ft) 0.5
Average HGL Elevation Attained (ft) 3150.45
Average HGL Depth Attained (ft) 0.05
Time of Max HGL Occurrence (days hh:mm) 0 15:42
Total Exfiltration Volume (1000-ft³) 14.358
Total Flooded Volume (ac-in) 0
Total Time Flooded (min) 0
Total Retention Time (sec) 0.00

Storage Node : Out-1SDP 4

Input Data

Invert Elevation (ft)	3144.95
Max (Rim) Elevation (ft)	3154.95
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.95
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0023

Output Summary Results

Peak Inflow (cfs)	0.49
Peak Lateral Inflow (cfs)	0.08
Peak Outflow (cfs)	0.28
Peak Exfiltration Flow Rate (cfm)	0.14
Max HGL Elevation Attained (ft)	3150.04
Max HGL Depth Attained (ft)	5.09
Average HGL Elevation Attained (ft)	3146.97
Average HGL Depth Attained (ft)	2.02
Time of Max HGL Occurrence (days hh:mm)	0 19:13
Total Exfiltration Volume (1000-ft³)	0.450
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 1

Input Data

Invert Elevation (ft)	3146.51
Max (Rim) Elevation (ft)	3156.51
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3146.51
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0012

Output Summary Results

Peak Inflow (cfs)	0.00
Peak Lateral Inflow (cfs)	0.00
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.07
Max HGL Elevation Attained (ft)	3146.51
Max HGL Depth Attained (ft)	0
Average HGL Elevation Attained (ft)	3146.51
Average HGL Depth Attained (ft)	0
Time of Max HGL Occurrence (days hh:mm)	0 00:00
Total Exfiltration Volume (1000-ft³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 10

Input Data

Invert Elevation (ft)	3144.15
Max (Rim) Elevation (ft)	3154.15
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.15
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0019

Output Summary Results

Peak Inflow (cfs)	0.14
Peak Lateral Inflow (cfs)	0.14
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.11
Max HGL Elevation Attained (ft)	3148.85
Max HGL Depth Attained (ft)	4.7
Average HGL Elevation Attained (ft)	3145.61
Average HGL Depth Attained (ft)	1.46
Time of Max HGL Occurrence (days hh:mm)	0 19:49
Total Exfiltration Volume (1000-ft³)	0.321
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 11

Input Data

Invert Elevation (ft)	3144.06
Max (Rim) Elevation (ft)	3154.06
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.06
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0068

Output Summary Results

Peak Inflow (cfs)	0.21
Peak Lateral Inflow (cfs)	0.21
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.41
Max HGL Elevation Attained (ft)	3148.08
Max HGL Depth Attained (ft)	4.02
Average HGL Elevation Attained (ft)	3144.63
Average HGL Depth Attained (ft)	0.57
Time of Max HGL Occurrence (days hh:mm)	0 13:58
Total Exfiltration Volume (1000-ft³)	0.506
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 12

Input Data

Invert Elevation (ft)	3144.06
Max (Rim) Elevation (ft)	3154.06
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.06
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0019

Output Summary Results

Peak Inflow (cfs)	0.13
Peak Lateral Inflow (cfs)	0.13
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.11
Max HGL Elevation Attained (ft)	3148.50
Max HGL Depth Attained (ft)	4.44
Average HGL Elevation Attained (ft)	3145.35
Average HGL Depth Attained (ft)	1.29
Time of Max HGL Occurrence (days hh:mm)	0 19:27
Total Exfiltration Volume (1000-ft³)	0.300
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 13

Input Data

Invert Elevation (ft)	3145.41
Max (Rim) Elevation (ft)	3155.41
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.41
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0033

Output Summary Results

Peak Inflow (cfs)	0.19
Peak Lateral Inflow (cfs)	0.19
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.20
Max HGL Elevation Attained (ft)	3149.64
Max HGL Depth Attained (ft)	4.23
Average HGL Elevation Attained (ft)	3146.56
Average HGL Depth Attained (ft)	1.15
Time of Max HGL Occurrence (days hh:mm)	0 16:10
Total Exfiltration Volume (1000-ft³)	0.462
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 14

Input Data

Invert Elevation (ft)	3145.41
Max (Rim) Elevation (ft)	3155.41
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.41
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0068

Output Summary Results

Peak Inflow (cfs)	0.22
Peak Lateral Inflow (cfs)	0.22
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.41
Max HGL Elevation Attained (ft)	3149.55
Max HGL Depth Attained (ft)	4.14
Average HGL Elevation Attained (ft)	3146.02
Average HGL Depth Attained (ft)	0.61
Time of Max HGL Occurrence (days hh:mm)	0 14:04
Total Exfiltration Volume (1000-ft³)	0.528
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 15

Input Data

Invert Elevation (ft)	3145.06
Max (Rim) Elevation (ft)	3155.06
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.06
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.18
Peak Lateral Inflow (cfs)	0.18
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3149.26
Max HGL Depth Attained (ft)	4.2
Average HGL Elevation Attained (ft)	3145.72
Average HGL Depth Attained (ft)	0.66
Time of Max HGL Occurrence (days hh:mm)	0 14:03
Total Exfiltration Volume (1000-ft³)	0.442
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 16

Input Data

Invert Elevation (ft)	3145.06
Max (Rim) Elevation (ft)	3155.06
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.06
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.18
Peak Lateral Inflow (cfs)	0.18
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3149.26
Max HGL Depth Attained (ft)	4.2
Average HGL Elevation Attained (ft)	3145.72
Average HGL Depth Attained (ft)	0.66
Time of Max HGL Occurrence (days hh:mm)	0 14:03
Total Exfiltration Volume (1000-ft³)	0.442
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 17

Input Data

Invert Elevation (ft)	3144.38
Max (Rim) Elevation (ft)	3154.38
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.38
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.17
Peak Lateral Inflow (cfs)	0.17
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3148.43
Max HGL Depth Attained (ft)	4.05
Average HGL Elevation Attained (ft)	3144.98
Average HGL Depth Attained (ft)	0.6
Time of Max HGL Occurrence (days hh:mm)	0 13:56
Total Exfiltration Volume (1000-ft³)	0.421
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 18

Input Data

Invert Elevation (ft)	3144.37
Max (Rim) Elevation (ft)	3154.37
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.37
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0038

Output Summary Results

Peak Inflow (cfs)	0.15
Peak Lateral Inflow (cfs)	0.15
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.23
Max HGL Elevation Attained (ft)	3148.94
Max HGL Depth Attained (ft)	4.57
Average HGL Elevation Attained (ft)	3145.19
Average HGL Depth Attained (ft)	0.82
Time of Max HGL Occurrence (days hh:mm)	0 15:20
Total Exfiltration Volume (1000-ft³)	0.372
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 19

Input Data

Invert Elevation (ft)	3144.52
Max (Rim) Elevation (ft)	3154.52
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.52
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0012

Output Summary Results

Peak Inflow (cfs)	0.11
Peak Lateral Inflow (cfs)	0.11
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.07
Max HGL Elevation Attained (ft)	3150.10
Max HGL Depth Attained (ft)	5.58
Average HGL Elevation Attained (ft)	3146.53
Average HGL Depth Attained (ft)	2.01
Time of Max HGL Occurrence (days hh:mm)	0 18:28
Total Exfiltration Volume (1000-ft³)	0.256
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 2

Input Data

Invert Elevation (ft)	3145.50
Max (Rim) Elevation (ft)	3155.50
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.50
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0023

Output Summary Results

Peak Inflow (cfs)	0.42
Peak Lateral Inflow (cfs)	0.26
Peak Outflow (cfs)	0.25
Peak Exfiltration Flow Rate (cfm)	0.14
Max HGL Elevation Attained (ft)	3150.04
Max HGL Depth Attained (ft)	4.54
Average HGL Elevation Attained (ft)	3147.10
Average HGL Depth Attained (ft)	1.6
Time of Max HGL Occurrence (days hh:mm)	0 19:14
Total Exfiltration Volume (1000-ft³)	0.412
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 20

Input Data

Invert Elevation (ft)	3144.64
Max (Rim) Elevation (ft)	3154.64
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.64
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0026

Output Summary Results

Peak Inflow (cfs)	0.17
Peak Lateral Inflow (cfs)	0.17
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.16
Max HGL Elevation Attained (ft)	3149.23
Max HGL Depth Attained (ft)	4.59
Average HGL Elevation Attained (ft)	3146.06
Average HGL Depth Attained (ft)	1.42
Time of Max HGL Occurrence (days hh:mm)	0 18:08
Total Exfiltration Volume (1000-ft³)	0.421
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 21

Input Data

Invert Elevation (ft)	3144.66
Max (Rim) Elevation (ft)	3154.66
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.66
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.17
Peak Lateral Inflow (cfs)	0.17
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3148.71
Max HGL Depth Attained (ft)	4.05
Average HGL Elevation Attained (ft)	3145.26
Average HGL Depth Attained (ft)	0.6
Time of Max HGL Occurrence (days hh:mm)	0 13:56
Total Exfiltration Volume (1000-ft³)	0.421
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 22

Input Data

Invert Elevation (ft)	3146.75
Max (Rim) Elevation (ft)	3156.75
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3146.75
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0068

Output Summary Results

Peak Inflow (cfs)	0.20
Peak Lateral Inflow (cfs)	0.20
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.41
Max HGL Elevation Attained (ft)	3150.66
Max HGL Depth Attained (ft)	3.91
Average HGL Elevation Attained (ft)	3147.27
Average HGL Depth Attained (ft)	0.52
Time of Max HGL Occurrence (days hh:mm)	0 13:53
Total Exfiltration Volume (1000-ft³)	0.484
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 23

Input Data

Invert Elevation (ft)	3146.75
Max (Rim) Elevation (ft)	3156.75
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3146.75
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0068

Output Summary Results

Peak Inflow (cfs)	0.20
Peak Lateral Inflow (cfs)	0.20
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.41
Max HGL Elevation Attained (ft)	3150.66
Max HGL Depth Attained (ft)	3.91
Average HGL Elevation Attained (ft)	3147.27
Average HGL Depth Attained (ft)	0.52
Time of Max HGL Occurrence (days hh:mm)	0 13:53
Total Exfiltration Volume (1000-ft³)	0.484
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 24

Input Data

Invert Elevation (ft)	3145.70
Max (Rim) Elevation (ft)	3155.70
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.70
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0038

Output Summary Results

Peak Inflow (cfs)	0.16
Peak Lateral Inflow (cfs)	0.16
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.23
Max HGL Elevation Attained (ft)	3150.51
Max HGL Depth Attained (ft)	4.81
Average HGL Elevation Attained (ft)	3146.62
Average HGL Depth Attained (ft)	0.92
Time of Max HGL Occurrence (days hh:mm)	0 15:33
Total Exfiltration Volume (1000-ft³)	0.398
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 25

Input Data

Invert Elevation (ft)	3145.96
Max (Rim) Elevation (ft)	3155.96
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.96
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.18
Peak Lateral Inflow (cfs)	0.18
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3150.16
Max HGL Depth Attained (ft)	4.2
Average HGL Elevation Attained (ft)	3146.62
Average HGL Depth Attained (ft)	0.66
Time of Max HGL Occurrence (days hh:mm)	0 14:03
Total Exfiltration Volume (1000-ft³)	0.442
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 26

Input Data

Invert Elevation (ft)	3145.93
Max (Rim) Elevation (ft)	3155.93
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.93
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0068

Output Summary Results

Peak Inflow (cfs)	0.24
Peak Lateral Inflow (cfs)	0.24
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.41
Max HGL Elevation Attained (ft)	3150.30
Max HGL Depth Attained (ft)	4.37
Average HGL Elevation Attained (ft)	3146.63
Average HGL Depth Attained (ft)	0.7
Time of Max HGL Occurrence (days hh:mm)	0 14:27
Total Exfiltration Volume (1000-ft³)	0.569
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 27

Input Data

Invert Elevation (ft)	3145.69
Max (Rim) Elevation (ft)	3155.69
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.69
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0023

Output Summary Results

Peak Inflow (cfs)	0.07
Peak Lateral Inflow (cfs)	0.07
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.14
Max HGL Elevation Attained (ft)	3148.75
Max HGL Depth Attained (ft)	3.06
Average HGL Elevation Attained (ft)	3146.03
Average HGL Depth Attained (ft)	0.34
Time of Max HGL Occurrence (days hh:mm)	0 13:46
Total Exfiltration Volume (1000-ft³)	0.153
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 28

Input Data

Invert Elevation (ft)	3146.31
Max (Rim) Elevation (ft)	3156.31
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3146.31
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.17
Peak Lateral Inflow (cfs)	0.17
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3150.36
Max HGL Depth Attained (ft)	4.05
Average HGL Elevation Attained (ft)	3146.91
Average HGL Depth Attained (ft)	0.6
Time of Max HGL Occurrence (days hh:mm)	0 13:56
Total Exfiltration Volume (1000-ft³)	0.421
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 29

Input Data

Invert Elevation (ft)	3146.31
Max (Rim) Elevation (ft)	3156.31
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3146.31
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.17
Peak Lateral Inflow (cfs)	0.17
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3150.36
Max HGL Depth Attained (ft)	4.05
Average HGL Elevation Attained (ft)	3146.91
Average HGL Depth Attained (ft)	0.6
Time of Max HGL Occurrence (days hh:mm)	0 13:56
Total Exfiltration Volume (1000-ft³)	0.421
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 3

Input Data

Invert Elevation (ft)	3145.50
Max (Rim) Elevation (ft)	3155.50
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.50
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0023

Output Summary Results

Peak Inflow (cfs)	0.57
Peak Lateral Inflow (cfs)	0.21
Peak Outflow (cfs)	0.41
Peak Exfiltration Flow Rate (cfm)	0.14
Max HGL Elevation Attained (ft)	3150.04
Max HGL Depth Attained (ft)	4.54
Average HGL Elevation Attained (ft)	3147.19
Average HGL Depth Attained (ft)	1.69
Time of Max HGL Occurrence (days hh:mm)	0 19:13
Total Exfiltration Volume (1000-ft³)	0.436
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 30

Input Data

Invert Elevation (ft)	3145.07
Max (Rim) Elevation (ft)	3155.07
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.07
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0068

Output Summary Results

Peak Inflow (cfs)	0.22
Peak Lateral Inflow (cfs)	0.22
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.41
Max HGL Elevation Attained (ft)	3149.21
Max HGL Depth Attained (ft)	4.14
Average HGL Elevation Attained (ft)	3145.68
Average HGL Depth Attained (ft)	0.61
Time of Max HGL Occurrence (days hh:mm)	0 14:04
Total Exfiltration Volume (1000-ft³)	0.528
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 31

Input Data

Invert Elevation (ft)	3145.07
Max (Rim) Elevation (ft)	3155.07
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.07
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0068

Output Summary Results

Peak Inflow (cfs)	0.22
Peak Lateral Inflow (cfs)	0.22
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.41
Max HGL Elevation Attained (ft)	3149.21
Max HGL Depth Attained (ft)	4.14
Average HGL Elevation Attained (ft)	3145.68
Average HGL Depth Attained (ft)	0.61
Time of Max HGL Occurrence (days hh:mm)	0 14:04
Total Exfiltration Volume (1000-ft³)	0.528
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 32

Input Data

Invert Elevation (ft)	3145.81
Max (Rim) Elevation (ft)	3155.81
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.81
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0033

Output Summary Results

Peak Inflow (cfs)	0.17
Peak Lateral Inflow (cfs)	0.17
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.20
Max HGL Elevation Attained (ft)	3149.78
Max HGL Depth Attained (ft)	3.97
Average HGL Elevation Attained (ft)	3146.80
Average HGL Depth Attained (ft)	0.99
Time of Max HGL Occurrence (days hh:mm)	0 15:46
Total Exfiltration Volume (1000-ft³)	0.421
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 33

Input Data

Invert Elevation (ft)	3145.81
Max (Rim) Elevation (ft)	3155.81
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.81
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0033

Output Summary Results

Peak Inflow (cfs)	0.17
Peak Lateral Inflow (cfs)	0.17
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.20
Max HGL Elevation Attained (ft)	3149.78
Max HGL Depth Attained (ft)	3.97
Average HGL Elevation Attained (ft)	3146.80
Average HGL Depth Attained (ft)	0.99
Time of Max HGL Occurrence (days hh:mm)	0 15:46
Total Exfiltration Volume (1000-ft³)	0.421
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 34

Input Data

Invert Elevation (ft)	3145.71
Max (Rim) Elevation (ft)	3155.71
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.71
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0019

Output Summary Results

Peak Inflow (cfs)	0.10
Peak Lateral Inflow (cfs)	0.10
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.11
Max HGL Elevation Attained (ft)	3149.37
Max HGL Depth Attained (ft)	3.66
Average HGL Elevation Attained (ft)	3146.51
Average HGL Depth Attained (ft)	0.8
Time of Max HGL Occurrence (days hh:mm)	0 17:49
Total Exfiltration Volume (1000-ft³)	0.227
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 35

Input Data

Invert Elevation (ft)	3145.69
Max (Rim) Elevation (ft)	3155.69
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.69
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0019

Output Summary Results

Peak Inflow (cfs)	0.10
Peak Lateral Inflow (cfs)	0.10
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.11
Max HGL Elevation Attained (ft)	3149.35
Max HGL Depth Attained (ft)	3.66
Average HGL Elevation Attained (ft)	3146.49
Average HGL Depth Attained (ft)	0.8
Time of Max HGL Occurrence (days hh:mm)	0 17:49
Total Exfiltration Volume (1000-ft³)	0.227
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 36

Input Data

Invert Elevation (ft)	3145.61
Max (Rim) Elevation (ft)	3155.61
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.61
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.18
Peak Lateral Inflow (cfs)	0.18
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3149.81
Max HGL Depth Attained (ft)	4.2
Average HGL Elevation Attained (ft)	3146.27
Average HGL Depth Attained (ft)	0.66
Time of Max HGL Occurrence (days hh:mm)	0 14:03
Total Exfiltration Volume (1000-ft³)	0.442
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 37

Input Data

Invert Elevation (ft)	3145.61
Max (Rim) Elevation (ft)	3155.61
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.61
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.17
Peak Lateral Inflow (cfs)	0.17
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3149.66
Max HGL Depth Attained (ft)	4.05
Average HGL Elevation Attained (ft)	3146.21
Average HGL Depth Attained (ft)	0.6
Time of Max HGL Occurrence (days hh:mm)	0 13:56
Total Exfiltration Volume (1000-ft³)	0.421
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 5

Input Data

Invert Elevation (ft)	3144.22
Max (Rim) Elevation (ft)	3154.22
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.22
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0038

Output Summary Results

Peak Inflow (cfs)	0.21
Peak Lateral Inflow (cfs)	0.21
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.23
Max HGL Elevation Attained (ft)	3150.33
Max HGL Depth Attained (ft)	6.11
Average HGL Elevation Attained (ft)	3145.68
Average HGL Depth Attained (ft)	1.46
Time of Max HGL Occurrence (days hh:mm)	0 16:57
Total Exfiltration Volume (1000-ft³)	0.506
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 6

Input Data

Invert Elevation (ft)	3144.22
Max (Rim) Elevation (ft)	3154.22
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.22
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.18
Peak Lateral Inflow (cfs)	0.18
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3148.43
Max HGL Depth Attained (ft)	4.21
Average HGL Elevation Attained (ft)	3144.88
Average HGL Depth Attained (ft)	0.66
Time of Max HGL Occurrence (days hh:mm)	0 14:03
Total Exfiltration Volume (1000-ft³)	0.442
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 7

Input Data

Invert Elevation (ft)	3144.19
Max (Rim) Elevation (ft)	3154.19
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.19
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0023

Output Summary Results

Peak Inflow (cfs)	0.10
Peak Lateral Inflow (cfs)	0.10
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.14
Max HGL Elevation Attained (ft)	3148.52
Max HGL Depth Attained (ft)	4.33
Average HGL Elevation Attained (ft)	3144.92
Average HGL Depth Attained (ft)	0.73
Time of Max HGL Occurrence (days hh:mm)	0 14:56
Total Exfiltration Volume (1000-ft³)	0.227
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 8

Input Data

Invert Elevation (ft)	3144.19
Max (Rim) Elevation (ft)	3154.19
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.19
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0038

Output Summary Results

Peak Inflow (cfs)	0.15
Peak Lateral Inflow (cfs)	0.15
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.23
Max HGL Elevation Attained (ft)	3148.53
Max HGL Depth Attained (ft)	4.34
Average HGL Elevation Attained (ft)	3144.91
Average HGL Depth Attained (ft)	0.72
Time of Max HGL Occurrence (days hh:mm)	0 15:04
Total Exfiltration Volume (1000-ft³)	0.345
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 9

Input Data

Invert Elevation (ft)	3144.20
Max (Rim) Elevation (ft)	3154.20
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.20
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0038

Output Summary Results

Peak Inflow (cfs)	0.14
Peak Lateral Inflow (cfs)	0.14
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.23
Max HGL Elevation Attained (ft)	3148.32
Max HGL Depth Attained (ft)	4.12
Average HGL Elevation Attained (ft)	3144.83
Average HGL Depth Attained (ft)	0.63
Time of Max HGL Occurrence (days hh:mm)	0 14:46
Total Exfiltration Volume (1000-ft³)	0.321
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS_38

Input Data

Invert Elevation (ft)	3145.96
Max (Rim) Elevation (ft)	3155.96
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.96
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0038

Output Summary Results

Peak Inflow (cfs)	0.14
Peak Lateral Inflow (cfs)	0.14
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.23
Max HGL Elevation Attained (ft)	3150.08
Max HGL Depth Attained (ft)	4.12
Average HGL Elevation Attained (ft)	3146.59
Average HGL Depth Attained (ft)	0.63
Time of Max HGL Occurrence (days hh:mm)	0 14:46
Total Exfiltration Volume (1000-ft³)	0.321
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Project Description

File Name ..... 1931 - SWMM V4.SPF

Project Options

Flow Units ..... CFS
Elevation Type ..... Elevation
Hydrology Method ..... SCS TR-55
Time of Concentration (TOC) Method ..... SCS TR-55
Link Routing Method ..... Hydrodynamic
Enable Overflow Ponding at Nodes ..... YES
Skip Steady State Analysis Time Periods ..... YES

Analysis Options

Start Analysis On ..... Oct 01, 2020 00:00:00
End Analysis On ..... Oct 05, 2020 00:00:00
Start Reporting On ..... Oct 01, 2020 00:00:00
Antecedent Dry Days ..... 0 days
Runoff (Dry Weather) Time Step ..... 0 01:00:00 days hh:mm:ss
Runoff (Wet Weather) Time Step ..... 0 00:05:00 days hh:mm:ss
Reporting Time Step ..... 0 00:00:30 days hh:mm:ss
Routing Time Step ..... 2 seconds

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1		Time Series	MSLA 10YR/24HR	Intensity	inches	Montana	Missoula	10	1.66	SCS Type II 24-hr

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	BASIN_10_ROW	0.10	484.00	98.00	1.66	1.42	0.14	0.20	0 00:05:00
2	BASIN_10_VACANT	0.26	484.00	58.00	1.66	0.00	0.00	0.00	0 00:53:53
3	BASIN_11_ROW	0.15	484.00	98.00	1.66	1.43	0.21	0.31	0 00:05:00
4	BASIN_11_VACANT	0.72	484.00	58.00	1.66	0.00	0.00	0.00	0 01:04:00
5	BASIN_12_ROW	0.09	484.00	98.00	1.66	1.42	0.13	0.19	0 00:05:00
6	BASIN_12_VACANT	0.40	484.00	58.00	1.66	0.00	0.00	0.00	0 00:42:09
7	BASIN_13_ROW	0.14	484.00	98.00	1.66	1.43	0.19	0.28	0 00:05:00
8	BASIN_13_VACANT	0.39	484.00	58.00	1.66	0.00	0.00	0.00	0 00:47:00
9	BASIN_14_ROW	0.15	484.00	98.00	1.66	1.43	0.22	0.32	0 00:05:00
10	BASIN_14_VACANT	0.76	484.00	58.00	1.66	0.00	0.00	0.00	0 01:04:00
11	BASIN_15_ROW	0.13	484.00	98.00	1.66	1.43	0.19	0.27	0 00:05:00
12	BASIN_15_VACANT	0.45	484.00	58.00	1.66	0.00	0.00	0.00	0 00:43:39
13	BASIN_16_ROW	0.13	484.00	98.00	1.66	1.43	0.19	0.27	0 00:05:00
14	BASIN_16_VACANT	0.48	484.00	58.00	1.66	0.00	0.00	0.00	0 00:43:39
15	BASIN_17_ROW	0.12	484.00	98.00	1.66	1.43	0.17	0.25	0 00:05:00
16	BASIN_17_VACANT	0.34	484.00	58.00	1.66	0.00	0.00	0.00	0 00:57:57
17	BASIN_18_ROW	0.11	484.00	98.00	1.66	1.43	0.16	0.23	0 00:05:00
18	BASIN_18_VACANT	0.31	484.00	58.00	1.66	0.00	0.00	0.00	0 00:59:00
19	BASIN_19_ROW	0.08	484.00	98.00	1.66	1.42	0.11	0.16	0 00:05:00
20	BASIN_19_VACANT	0.06	484.00	58.00	1.66	0.00	0.00	0.00	0 00:23:59
21	BASIN_2_ROW	0.18	484.00	98.00	1.66	1.43	0.26	0.38	0 00:05:00
22	BASIN_2_VACANT	0.46	484.00	58.00	1.66	0.00	0.00	0.00	0 00:56:54
23	BASIN_20_ROW	0.12	484.00	98.00	1.66	1.43	0.17	0.25	0 00:05:00
24	BASIN_20_VACANT	0.38	484.00	58.00	1.66	0.00	0.00	0.00	0 01:00:23
25	BASIN_21_ROW	0.12	484.00	98.00	1.66	1.43	0.17	0.25	0 00:05:00
26	BASIN_21_VACANT	0.44	484.00	58.00	1.66	0.00	0.00	0.00	0 01:03:39
27	BASIN_22_ROW	0.14	484.00	98.00	1.66	1.43	0.20	0.30	0 00:05:00
28	BASIN_22_VACANT	0.71	484.00	58.00	1.66	0.00	0.00	0.00	0 00:51:01
29	BASIN_23_ROW	0.14	484.00	98.00	1.66	1.43	0.20	0.30	0 00:05:00
30	BASIN_23_VACANT	0.63	484.00	58.00	1.66	0.00	0.00	0.00	0 00:47:55
31	BASIN_24_ROW	0.11	484.00	98.00	1.66	1.43	0.16	0.24	0 00:05:00
32	BASIN_24_VACANT	0.29	484.00	58.00	1.66	0.00	0.00	0.00	0 00:56:33
33	BASIN_25_ROW	0.13	484.00	98.00	1.66	1.43	0.18	0.27	0 00:05:00
34	BASIN_25_VACANT	0.30	484.00	58.00	1.66	0.00	0.00	0.00	0 00:53:10
35	BASIN_26_ROW	0.17	484.00	98.00	1.66	1.43	0.24	0.35	0 00:05:00
36	BASIN_26_VACANT	0.41	484.00	58.00	1.66	0.00	0.00	0.00	0 00:52:49
37	BASIN_27_ROW	0.05	484.00	98.00	1.66	1.36	0.07	0.11	0 00:05:00
38	BASIN_27_VACANT	0.01	484.00	58.00	1.66	0.00	0.00	0.00	0 00:09:19
39	BASIN_28_ROW	0.12	484.00	98.00	1.66	1.43	0.17	0.25	0 00:05:00
40	BASIN_28_VACANT	0.46	484.00	58.00	1.66	0.00	0.00	0.00	0 00:50:50
41	BASIN_29_ROW	0.12	484.00	98.00	1.66	1.43	0.17	0.25	0 00:05:00
42	BASIN_29_VACANT	0.42	484.00	58.00	1.66	0.00	0.00	0.00	0 00:47:45
43	BASIN_3_ROW	0.15	484.00	98.00	1.66	1.43	0.21	0.31	0 00:05:00
44	BASIN_3_VACANT	0.27	484.00	58.00	1.66	0.00	0.00	0.00	0 00:56:54
45	BASIN_30_ROW	0.15	484.00	98.00	1.66	1.43	0.22	0.32	0 00:05:00
46	BASIN_30_VACANT	0.63	484.00	58.00	1.66	0.00	0.00	0.00	0 01:04:00
47	BASIN_31_ROW	0.15	484.00	98.00	1.66	1.43	0.22	0.32	0 00:05:00
48	BASIN_31_VACANT	0.71	484.00	58.00	1.66	0.00	0.00	0.00	0 00:59:31
49	BASIN_32_ROW	0.12	484.00	98.00	1.66	1.43	0.18	0.25	0 00:05:00
50	BASIN_32_VACANT	0.52	484.00	58.00	1.66	0.00	0.00	0.00	0 00:54:36
51	BASIN_33_ROW	0.12	484.00	98.00	1.66	1.43	0.18	0.25	0 00:05:00
52	BASIN_33_VACANT	0.54	484.00	58.00	1.66	0.00	0.00	0.00	0 00:56:22
53	BASIN_34_ROW	0.07	484.00	98.00	1.66	1.41	0.10	0.15	0 00:05:00
54	BASIN_34_VACANT	0.51	484.00	58.00	1.66	0.00	0.00	0.00	0 00:45:54
55	BASIN_35_ROW	0.07	484.00	98.00	1.66	1.41	0.10	0.15	0 00:05:00
56	BASIN_35_VACANT	0.34	484.00	58.00	1.66	0.00	0.00	0.00	0 00:43:16
57	BASIN_36_ROW	0.13	484.00	98.00	1.66	1.43	0.18	0.27	0 00:05:00
58	BASIN_36_VACANT	0.35	484.00	58.00	1.66	0.00	0.00	0.00	0 00:44:24
59	BASIN_37_ROW	0.12	484.00	98.00	1.66	1.43	0.18	0.25	0 00:05:00
60	BASIN_37_VACANT	0.44	484.00	58.00	1.66	0.00	0.00	0.00	0 00:45:20
61	BASIN_38_ROW	0.09	484.00	98.00	1.66	1.42	0.13	0.20	0 00:05:00
62	BASIN_38_VACANT	0.25	484.00	58.00	1.66	0.00	0.00	0.00	0 00:51:44
63	BASIN_4_ROW	0.06	484.00	98.00	1.66	1.40	0.08	0.12	0 00:05:00
64	BASIN_4_VACANT	0.04	484.00	58.00	1.66	0.00	0.00	0.00	0 00:23:46
65	BASIN_5_ROW	0.15	484.00	98.00	1.66	1.43	0.21	0.31	0 00:05:00
66	BASIN_5_VACANT	1.12	484.00	58.00	1.66	0.00	0.00	0.00	0 00:57:36
67	BASIN_6_ROW	0.13	484.00	98.00	1.66	1.43	0.19	0.27	0 00:05:00
68	BASIN_6_VACANT	0.44	484.00	58.00	1.66	0.00	0.00	0.00	0 00:47:00
69	BASIN_7_ROW	0.07	484.00	98.00	1.66	1.41	0.10	0.15	0 00:05:00
70	BASIN_7_VACANT	0.33	484.00	58.00	1.66	0.00	0.00	0.00	0 00:39:17
71	BASIN_8_ROW	0.10	484.00	98.00	1.66	1.43	0.15	0.21	0 00:05:00
72	BASIN_8_VACANT	0.26	484.00	58.00	1.66	0.00	0.00	0.00	0 00:50:28
73	BASIN_9_ROW	0.10	484.00	98.00	1.66	1.42	0.14	0.20	0 00:05:00
74	BASIN_9_VACANT	0.25	484.00	58.00	1.66	0.00	0.00	0.00	0 00:53:53
75	FLYNNRANCH	24.35	484.00	81.06	1.66	0.40	9.81	6.12	0 00:40:00

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Jun-02	Junction	3151.24	3155.50	3151.24	3155.50	0.00	0.36	3152.51	0.00	3.06	0 00:00	0.00	0.00
2	Out-02	Outfall	0.00					0.00	0.00					
3	OUTFALL	Outfall	0.00					0.00	0.00					
4	EX-POND	Storage Node	3150.40	3155.50	3150.40		10000.00	6.11	3152.51				0.00	0.00
5	Out-1SDP 4	Storage Node	3144.95	3154.95	3144.95		0.00	0.32	3152.51				0.00	0.00
6	SDS 1	Storage Node	3146.51	3156.51	3146.51		0.00	0.32	3152.51				0.00	0.00
7	SDS 10	Storage Node	3144.15	3154.15	3144.15		1000.00	0.20	3151.12				0.00	0.00
8	SDS 11	Storage Node	3144.06	3154.06	3144.06		1000.00	0.31	3149.47				0.00	0.00
9	SDS 12	Storage Node	3144.06	3154.06	3144.06		1000.00	0.19	3150.54				0.00	0.00
10	SDS 13	Storage Node	3145.41	3155.41	3145.41		1000.00	0.28	3151.23				0.00	0.00
11	SDS 14	Storage Node	3145.41	3155.41	3145.41		1000.00	0.32	3151.03				0.00	0.00
12	SDS 15	Storage Node	3145.06	3155.06	3145.06		1000.00	0.27	3150.93				0.00	0.00
13	SDS 16	Storage Node	3145.06	3155.06	3145.06		1000.00	0.27	3150.93				0.00	0.00
14	SDS 17	Storage Node	3144.38	3154.38	3144.38		1000.00	0.25	3149.96				0.00	0.00
15	SDS 18	Storage Node	3144.37	3154.37	3144.37		1000.00	0.23	3151.11				0.00	0.00
16	SDS 19	Storage Node	3144.52	3154.52	3144.52		1000.00	0.16	3153.39				0.00	0.00
17	SDS 2	Storage Node	3145.50	3155.50	3145.50		0.00	0.66	3152.51				0.00	0.00
18	SDS 20	Storage Node	3144.64	3154.64	3144.64		1000.00	0.25	3151.24				0.00	0.00
19	SDS 21	Storage Node	3144.66	3154.66	3144.66		1000.00	0.25	3150.24				0.00	0.00
20	SDS 22	Storage Node	3146.75	3156.75	3146.75		1000.00	0.29	3151.95				0.00	0.00
21	SDS 23	Storage Node	3146.75	3156.75	3146.75		1000.00	0.29	3151.95				0.00	0.00
22	SDS 24	Storage Node	3145.70	3155.70	3145.70		1000.00	0.24	3152.91				0.00	0.00
23	SDS 25	Storage Node	3145.96	3155.96	3145.96		1000.00	0.27	3151.83				0.00	0.00
24	SDS 26	Storage Node	3145.93	3155.93	3145.93		1000.00	0.35	3152.02				0.00	0.00
25	SDS 27	Storage Node	3145.69	3155.69	3145.69		1000.00	0.11	3150.38				0.00	0.00
26	SDS 28	Storage Node	3146.31	3156.31	3146.31		1000.00	0.25	3151.89				0.00	0.00
27	SDS 29	Storage Node	3146.31	3156.31	3146.31		1000.00	0.25	3151.89				0.00	0.00
28	SDS 3	Storage Node	3145.50	3155.50	3145.50		0.00	0.49	3152.51				0.00	0.00
29	SDS 30	Storage Node	3145.07	3155.07	3145.07		0.00	0.32	3150.70				0.00	0.00
30	SDS 31	Storage Node	3145.07	3155.07	3145.07		0.00	0.32	3150.70				0.00	0.00
31	SDS 32	Storage Node	3145.81	3155.81	3145.81		0.00	0.25	3151.12				0.00	0.00
32	SDS 33	Storage Node	3145.81	3155.81	3145.81		0.00	0.25	3151.12				0.00	0.00
33	SDS 34	Storage Node	3145.71	3155.71	3145.71		1000.00	0.15	3150.81				0.00	0.00
34	SDS 35	Storage Node	3145.69	3155.69	3145.69		1000.00	0.15	3150.79				0.00	0.00
35	SDS 36	Storage Node	3145.61	3155.61	3145.61		1000.00	0.27	3151.48				0.00	0.00
36	SDS 37	Storage Node	3145.61	3155.61	3145.61		1000.00	0.25	3151.19				0.00	0.00
37	SDS 5	Storage Node	3144.22	3154.22	3144.22		1000.00	0.31	3154.22				0.00	112.00
38	SDS 6	Storage Node	3144.22	3154.22	3144.22		1000.00	0.27	3150.09				0.00	0.00
39	SDS 7	Storage Node	3144.19	3154.19	3144.19		1000.00	0.15	3150.84				0.00	0.00
40	SDS 8	Storage Node	3144.19	3154.19	3144.19		1000.00	0.21	3150.49				0.00	0.00
41	SDS 9	Storage Node	3144.20	3154.20	3144.20		1000.00	0.20	3150.09				0.00	0.00
42	SDS_38	Storage Node	3145.96	3155.96	3145.96		1000.00	0.20	3151.85				0.00	0.00

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	Link-01	Pipe	SDS 5	OUTFALL	29.78	3154.22	3154.00	0.7500	18.000	0.0150	0.00	7.87	0.00	0.00	0.00	0.00	0.00	Calculated
2	Link-02	Pipe	Jun-02	SDS 1	140.60	3151.24	3150.37	0.6200	18.000	0.0110	0.32	9.76	0.03	0.79	1.39	0.92	0.00	Calculated
3	SDP 2	Pipe	SDS 1	SDS 2	250.54	3150.27	3148.71	0.6200	18.000	0.0120	0.18	8.96	0.02	0.14	1.50	1.00	1113.00	SURCHARGED
4	SDP 3	Pipe	SDS 2	SDS 3	45.01	3148.62	3148.34	0.6200	18.000	0.0120	0.30	8.96	0.03	1.74	1.50	1.00	3221.00	SURCHARGED
5	SDP 4	Pipe	SDS 3	Out-1SDP 4	78.23	3148.14	3147.65	0.6200	18.000	0.0120	0.26	8.96	0.03	1.68	1.50	1.00	3655.00	SURCHARGED
6	L1-1	Orifice	EX-POND	Jun-02		3150.40	3151.24		4.500		0.18							
7	L1-2	Orifice	EX-POND	Jun-02		3150.40	3151.24		4.500		0.18							
8	L2-1	Orifice	EX-POND	Jun-02		3150.40	3151.24		4.500		0.00							
9	L2-2	Orifice	EX-POND	Jun-02		3150.40	3151.24		4.500		0.00							
10	L2-3	Orifice	EX-POND	Jun-02		3150.40	3151.24		4.500		0.00							
11	L2-4	Orifice	EX-POND	Jun-02		3150.40	3151.24		4.500		0.00							
12	L3	Orifice	EX-POND	Jun-02		3150.40	3151.24		4.500		0.00							
13	Orifice-10	Outlet	EX-POND	Jun-02		3150.40	3151.24				0.00							

Subbasin Hydrology

Subbasin : BASIN_10_ROW

Input Data

Area (ac) 0.10
Peak Rate Factor 484.00
Weighted Curve Number 98.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.10	B	98.00
Composite Area & Weighted CN	0.10		98.00

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

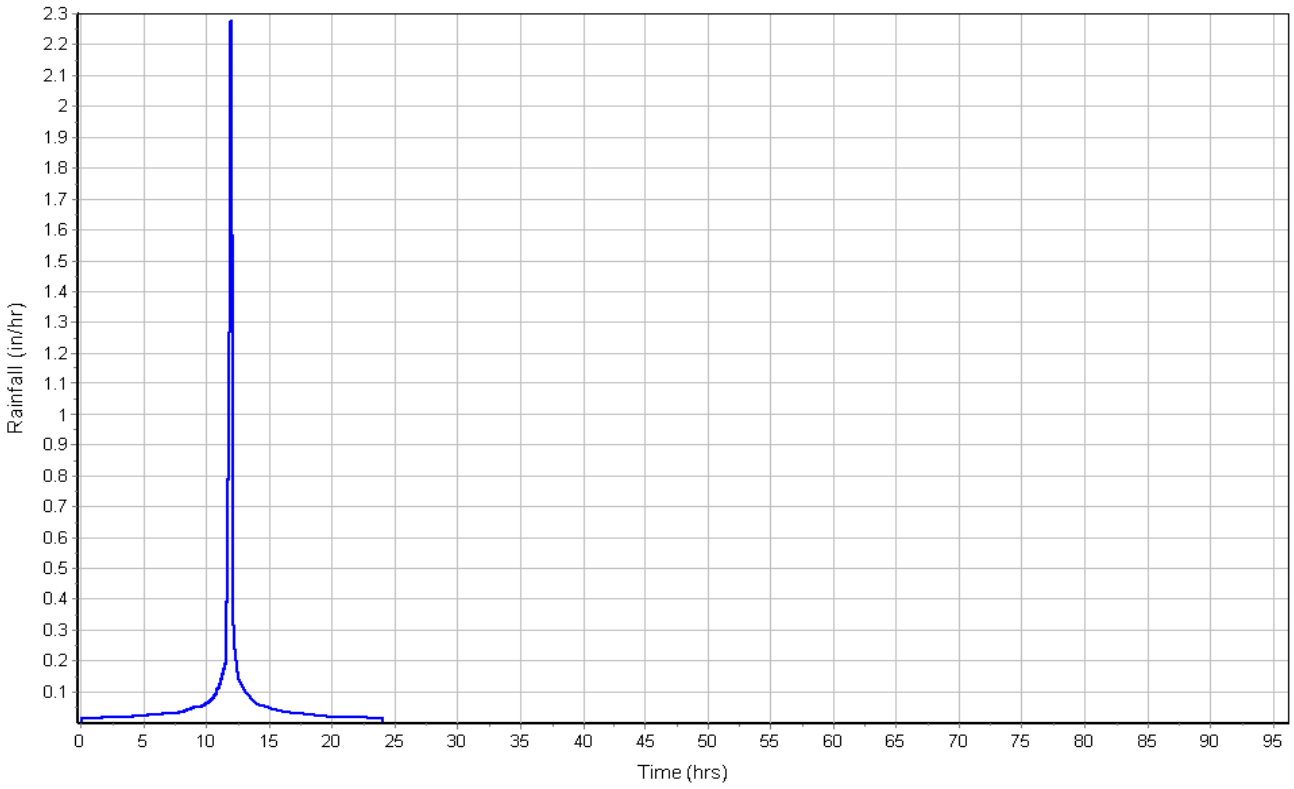
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

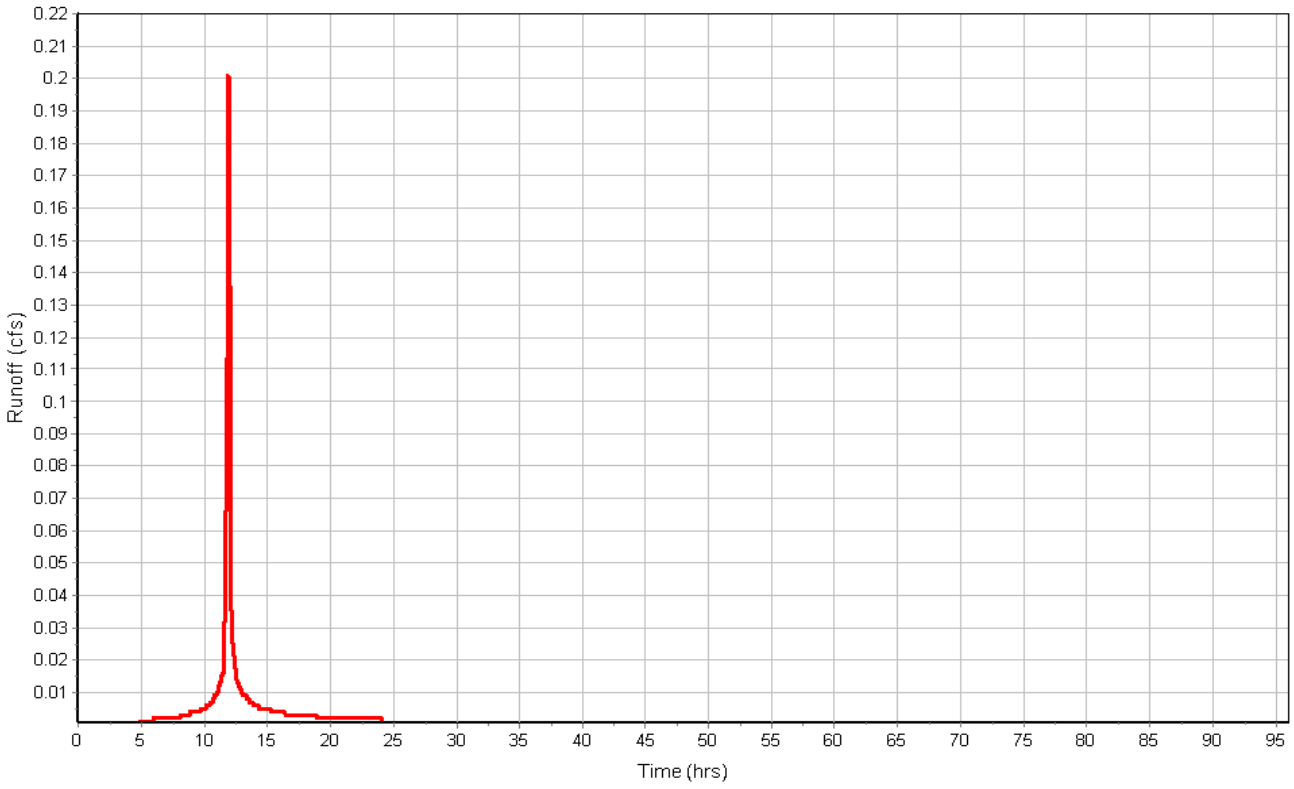
Total Rainfall (in) 1.66
Total Runoff (in) 1.42
Peak Runoff (cfs) 0.20
Weighted Curve Number 98.00
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : BASIN_10_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_10_VACANT

Input Data

Area (ac) 0.26
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.26	B	58.00
Composite Area & Weighted CN	0.26		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	242	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	53.89	0.00	0.00

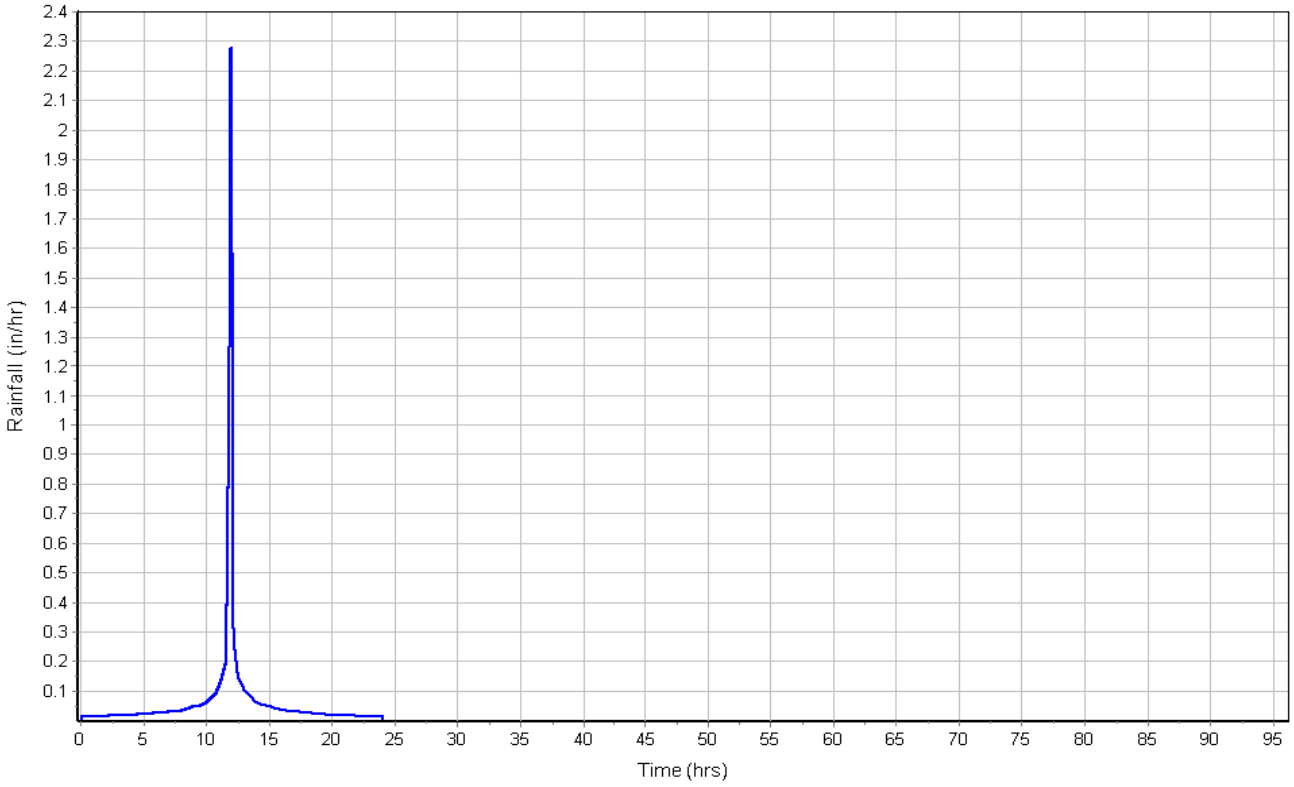
Total TOC (min) 53.89

Subbasin Runoff Results

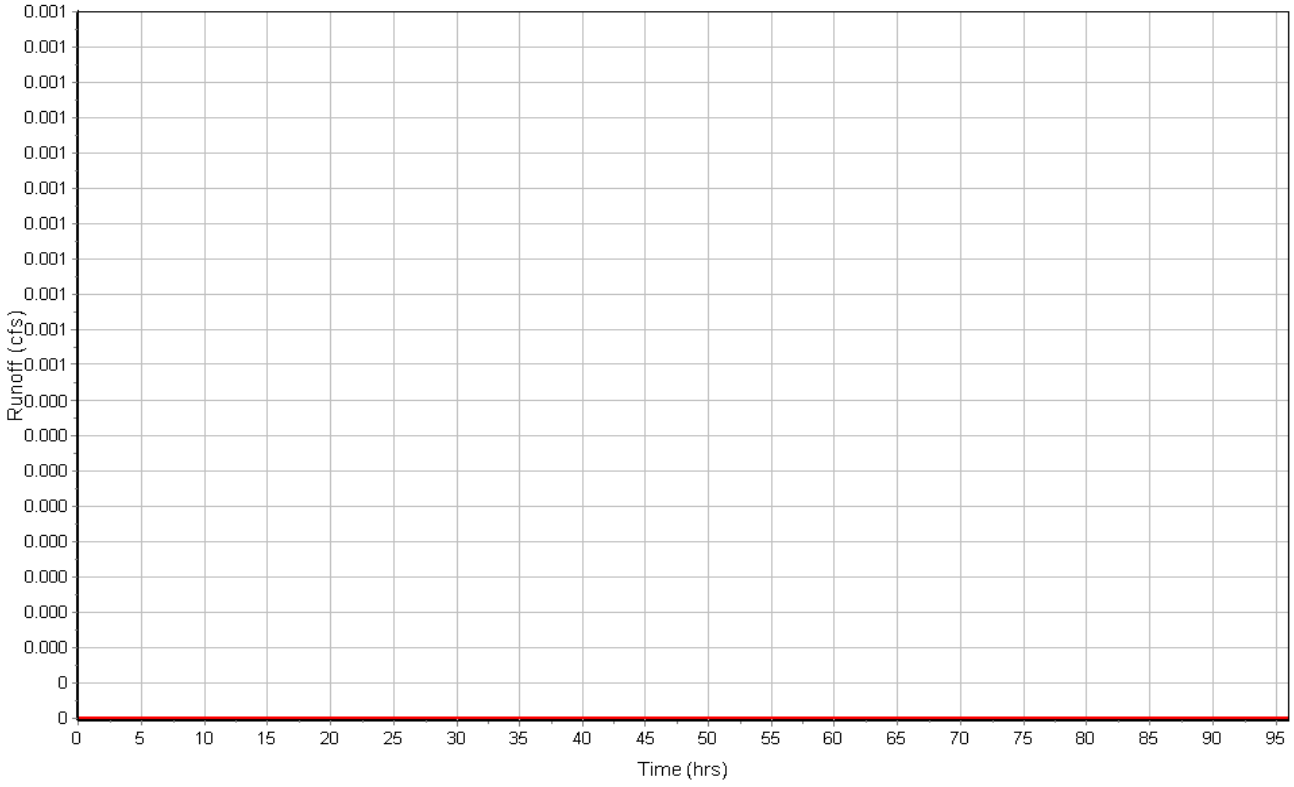
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:53:53

Subbasin : BASIN_10_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_11_ROW

Input Data

Area (ac)	0.15
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.15	B	98.00
Composite Area & Weighted CN	0.15		98.00

Time of Concentration

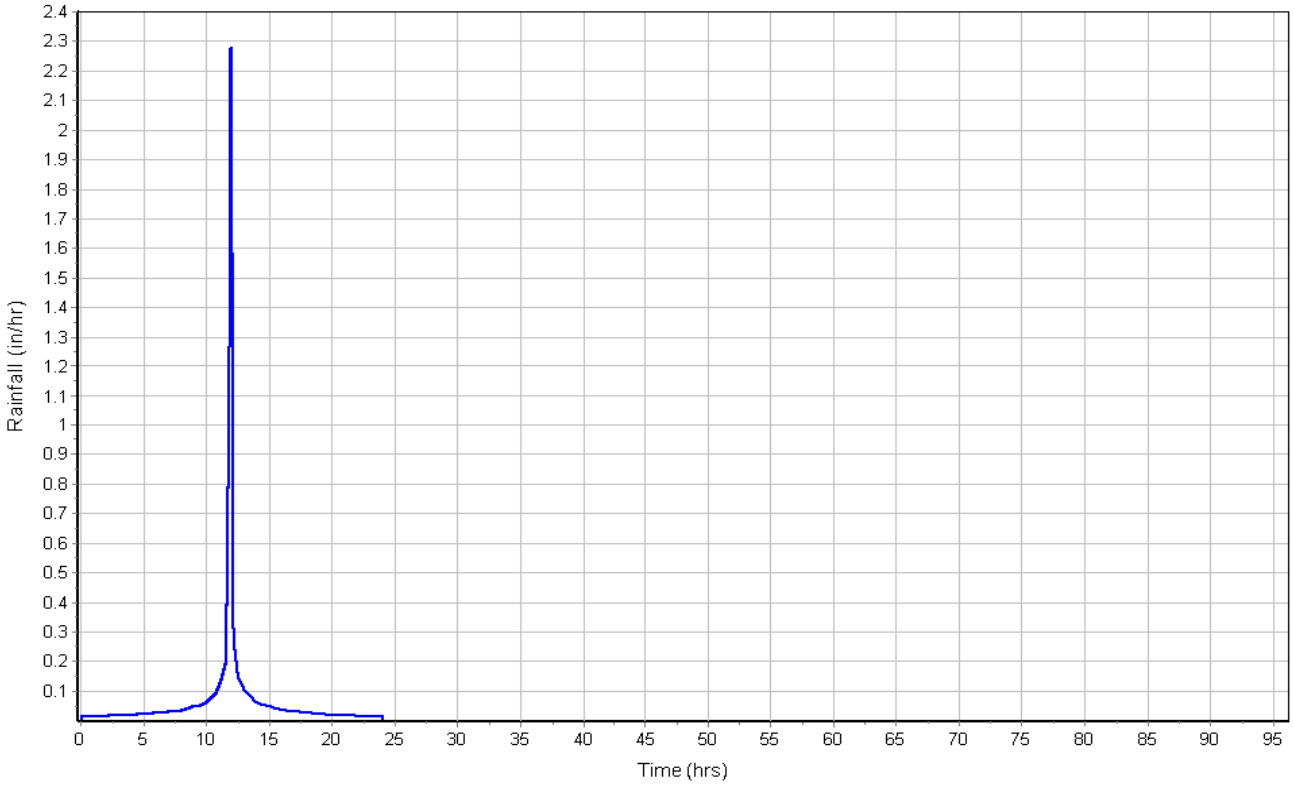
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

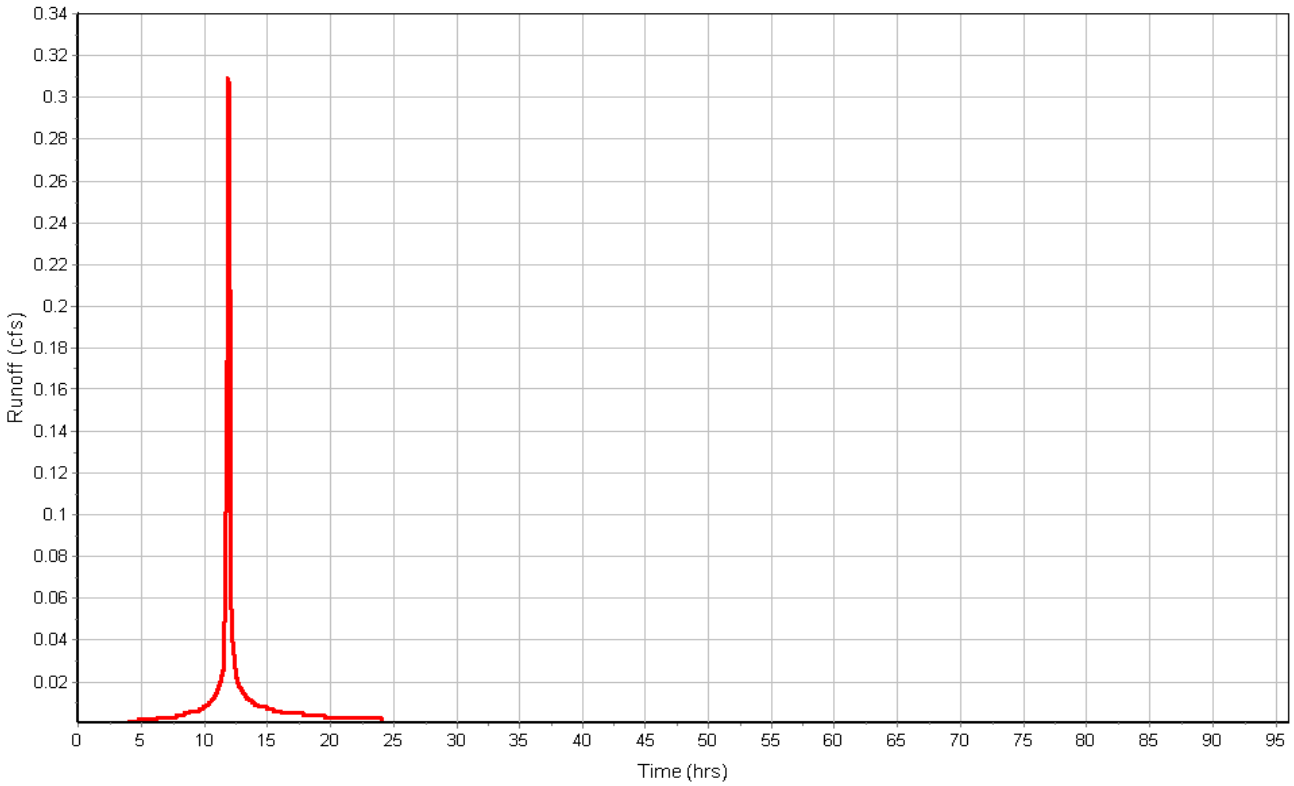
Total Rainfall (in)	1.66
Total Runoff (in)	1.43
Peak Runoff (cfs)	0.31
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_11_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_11_VACANT

Input Data

Area (ac) 0.72
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.72	B	58.00
Composite Area & Weighted CN	0.72		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	300	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	64.00	0.00	0.00

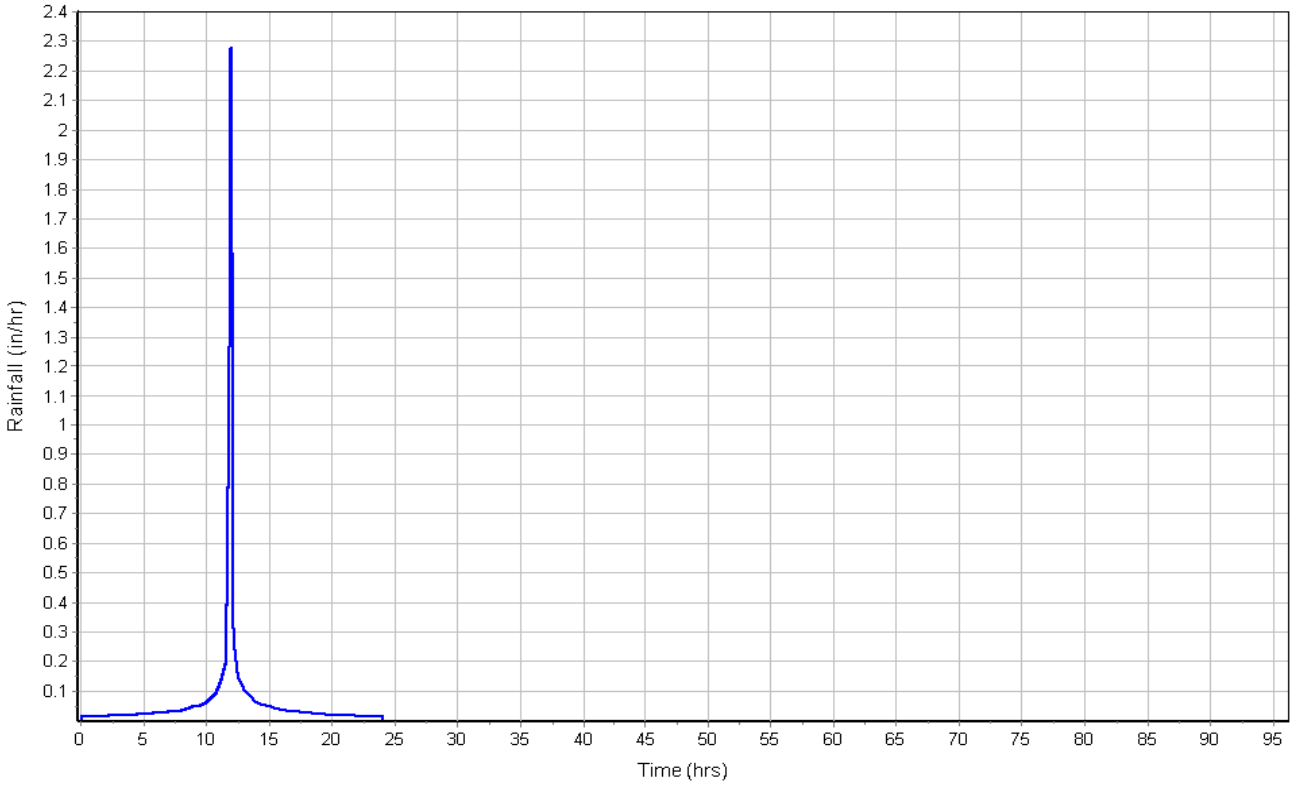
Total TOC (min) 64.00

Subbasin Runoff Results

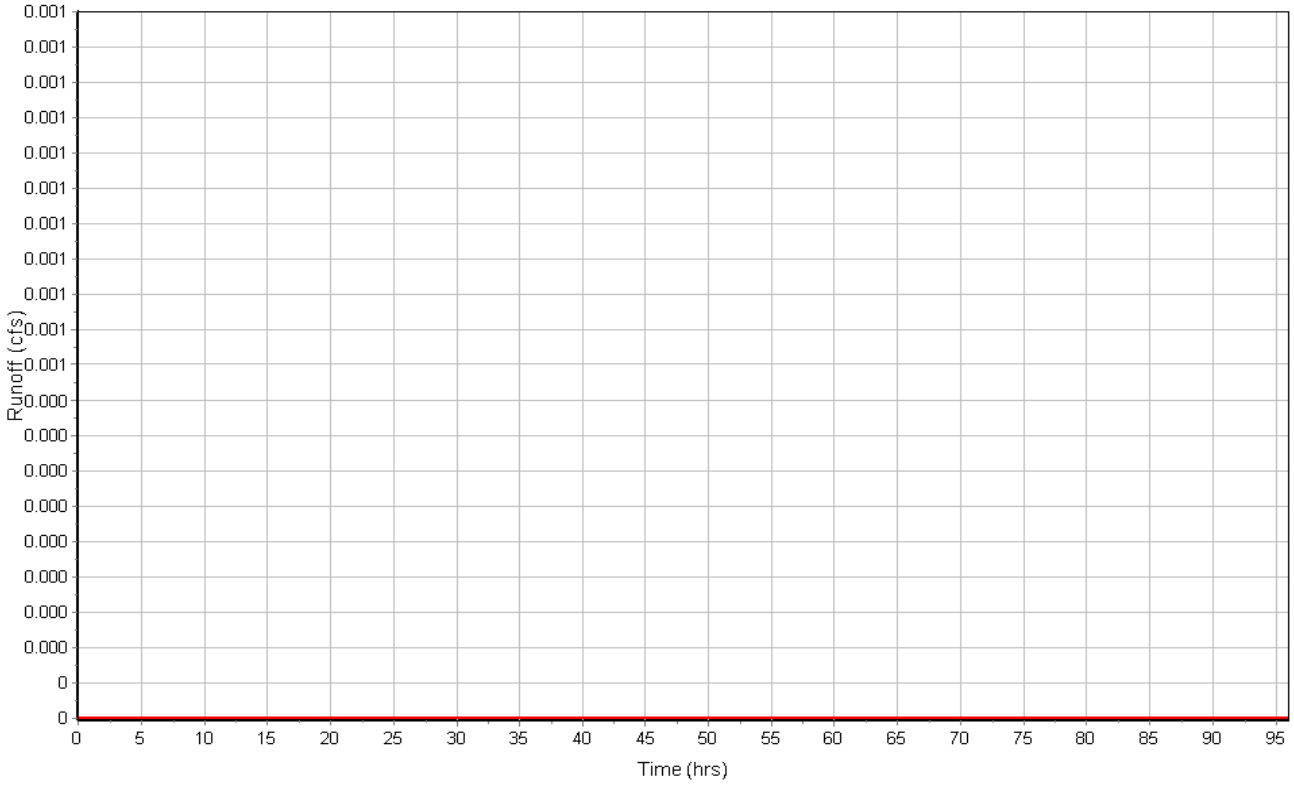
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 01:04:00

Subbasin : BASIN_11_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_12_ROW

Input Data

Area (ac)	0.09
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.09	B	98.00
Composite Area & Weighted CN	0.09		98.00

Time of Concentration

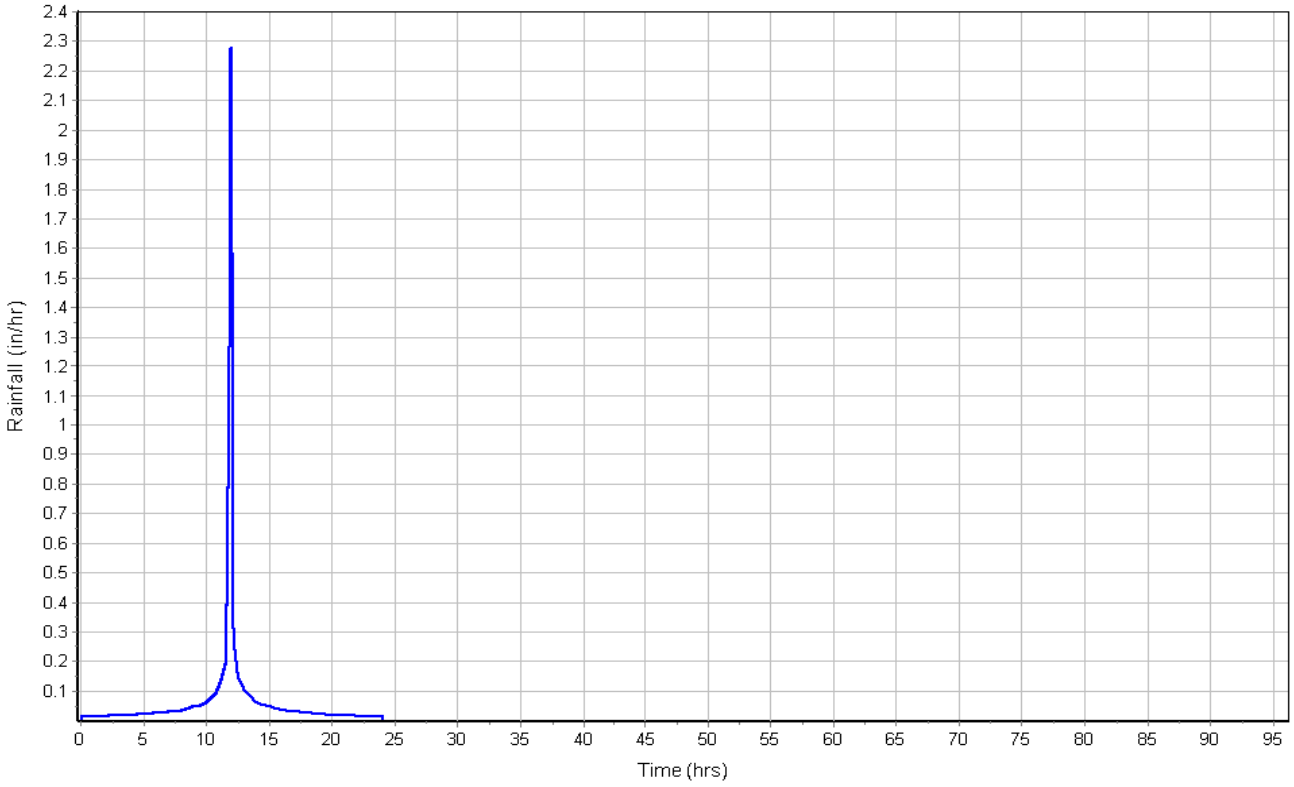
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

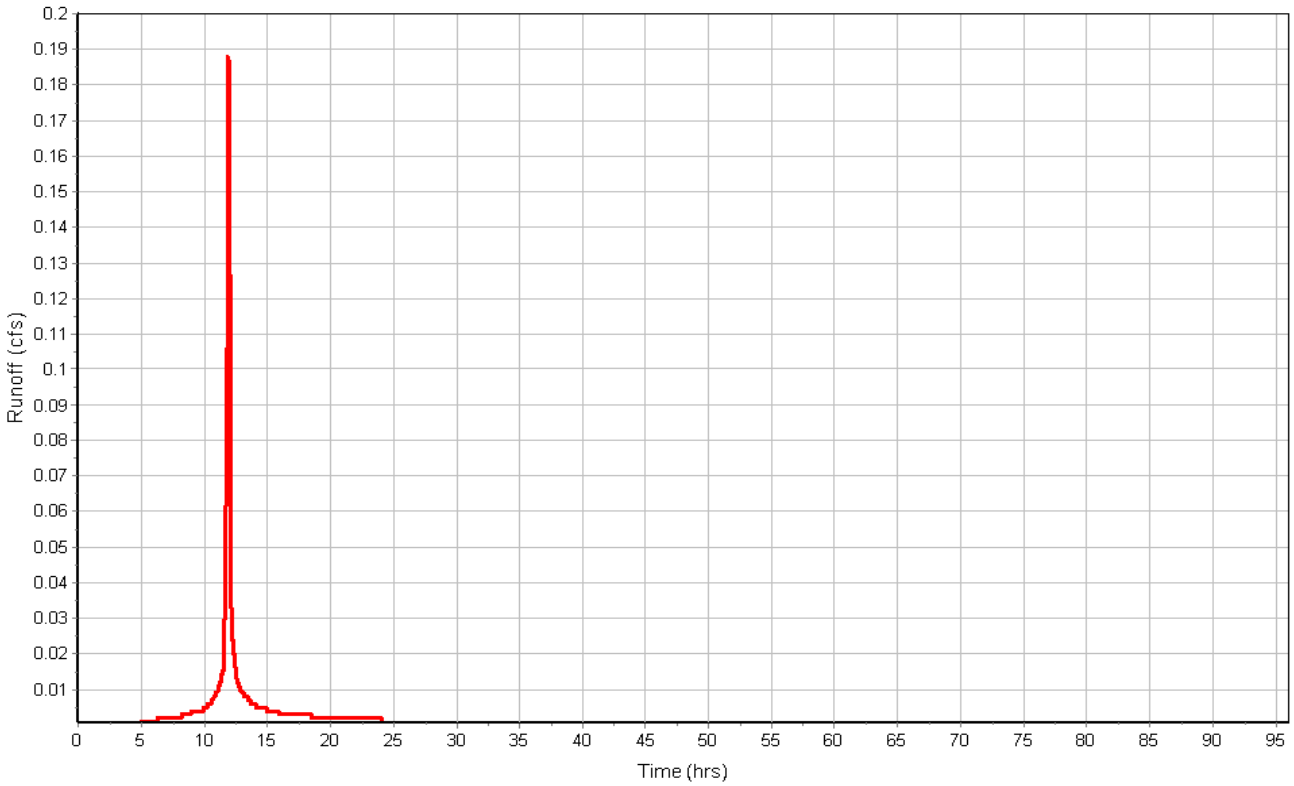
Total Rainfall (in)	1.66
Total Runoff (in)	1.42
Peak Runoff (cfs)	0.19
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_12_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_12_VACANT

Input Data

Area (ac) 0.40
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.40	B	58.00
Composite Area & Weighted CN	0.40		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	178	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	42.15	0.00	0.00

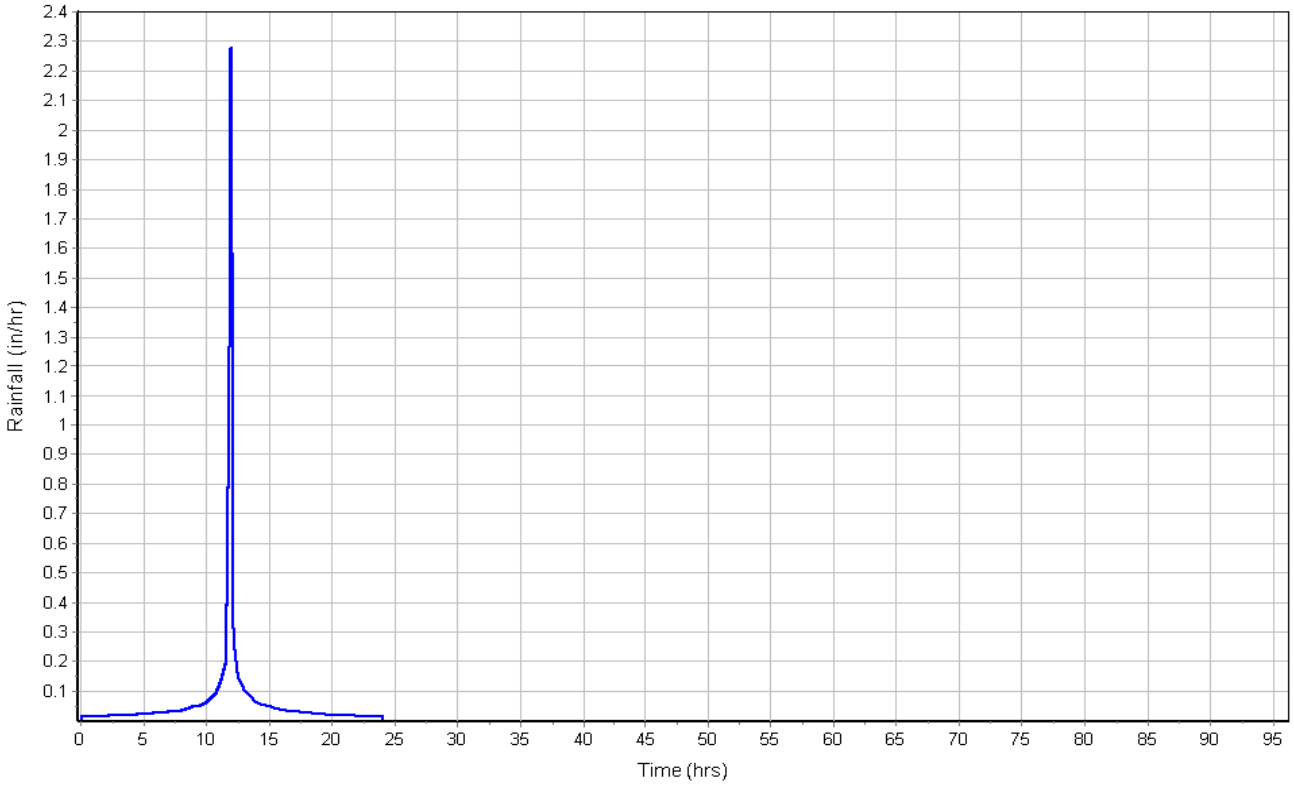
Total TOC (min) 42.15

Subbasin Runoff Results

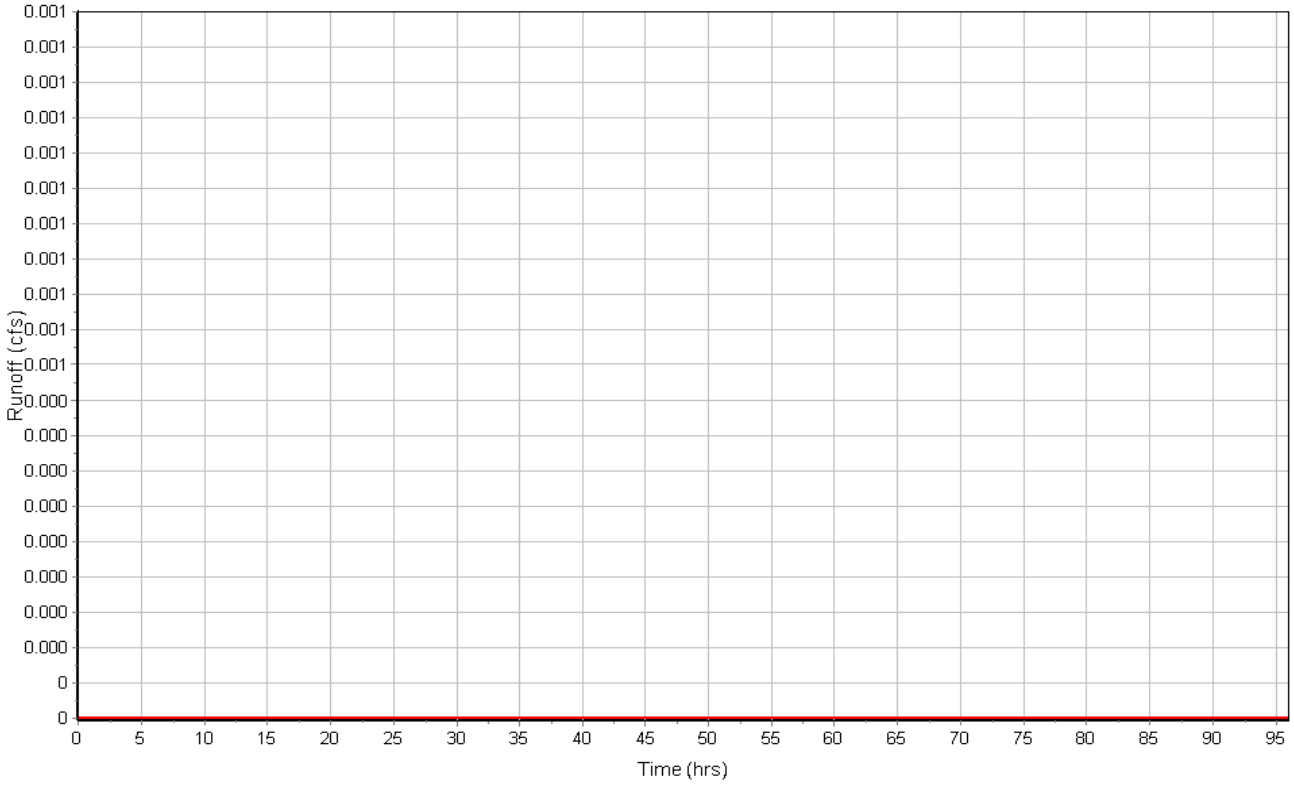
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:42:09

Subbasin : BASIN_12_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_13_ROW

Input Data

Area (ac) 0.14
Peak Rate Factor 484.00
Weighted Curve Number 98.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.14	B	98.00
Composite Area & Weighted CN	0.14		98.00

Time of Concentration

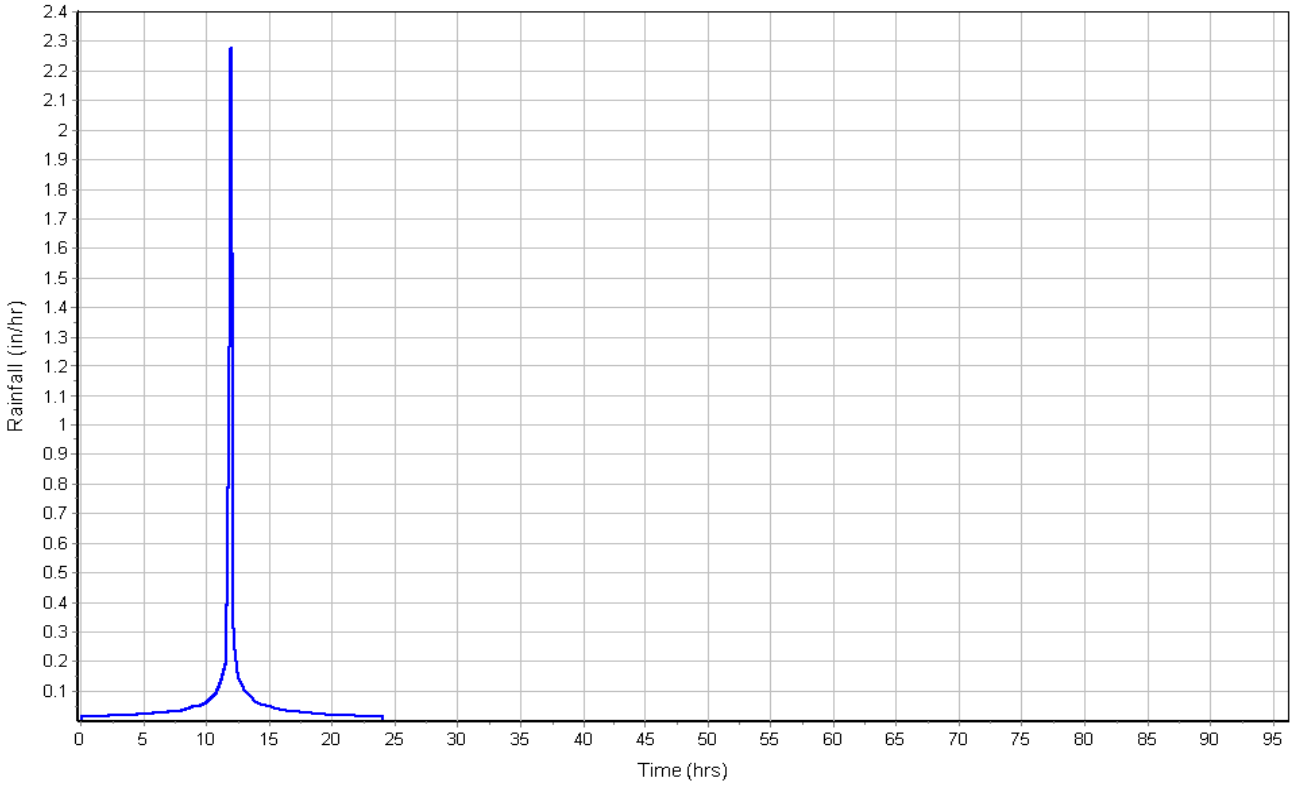
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

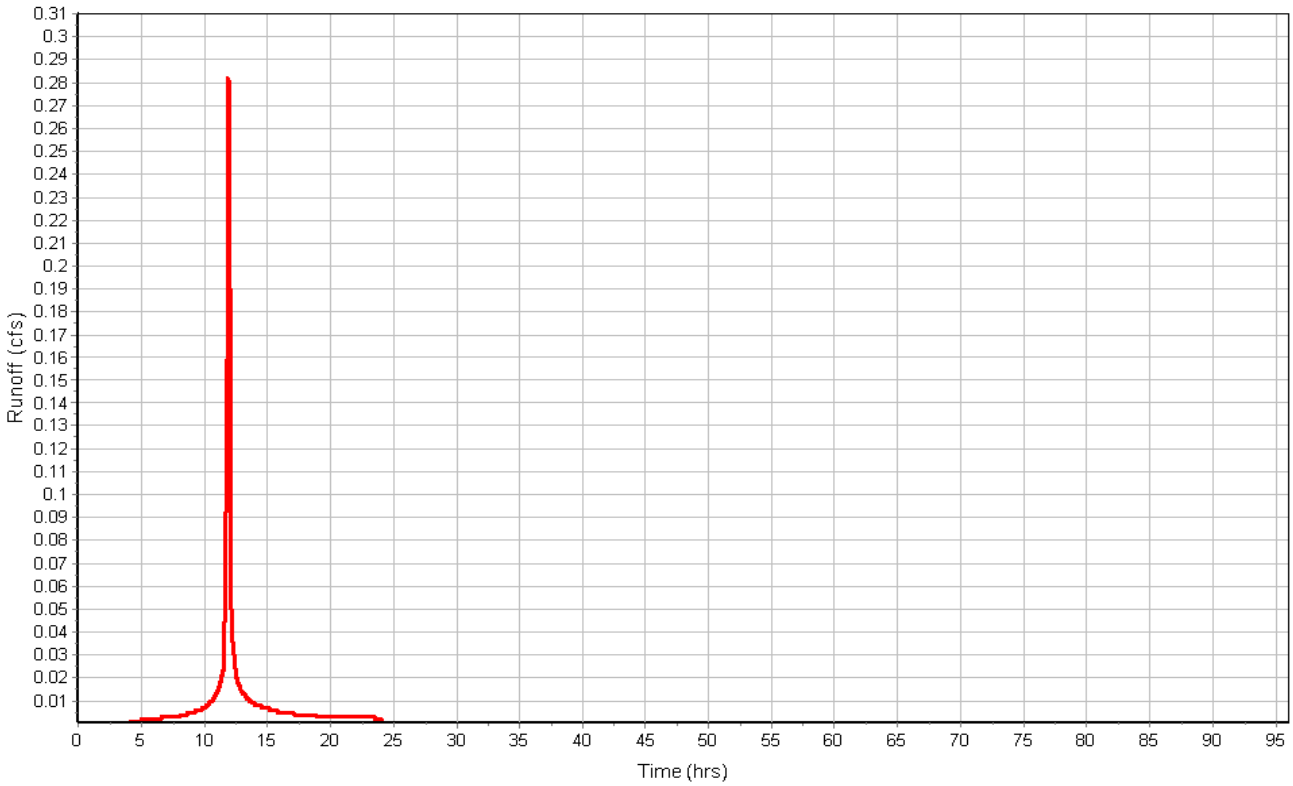
Total Rainfall (in) 1.66
Total Runoff (in) 1.43
Peak Runoff (cfs) 0.28
Weighted Curve Number 98.00
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : BASIN_13_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_13_VACANT

Input Data

Area (ac) 0.39
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.39	B	58.00
Composite Area & Weighted CN	0.39		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	204	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	47.01	0.00	0.00

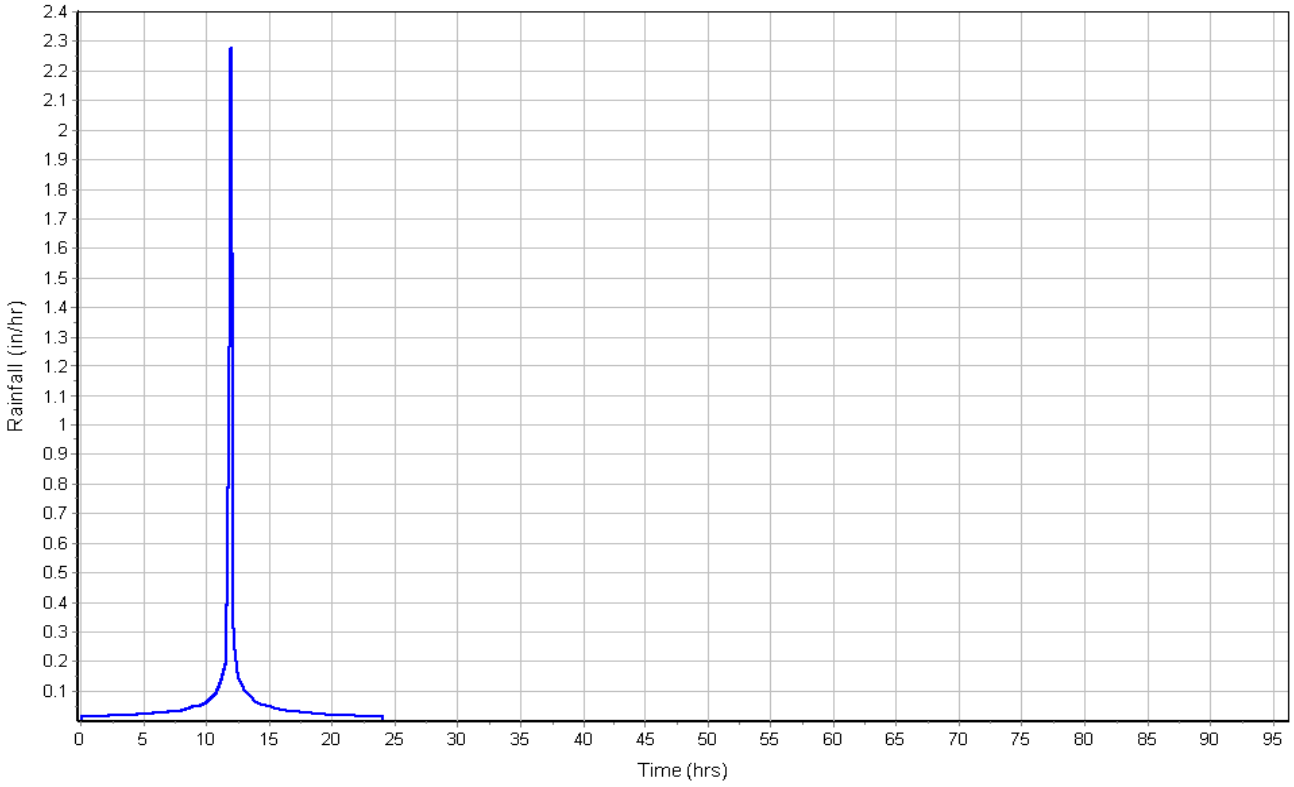
Total TOC (min) 47.01

Subbasin Runoff Results

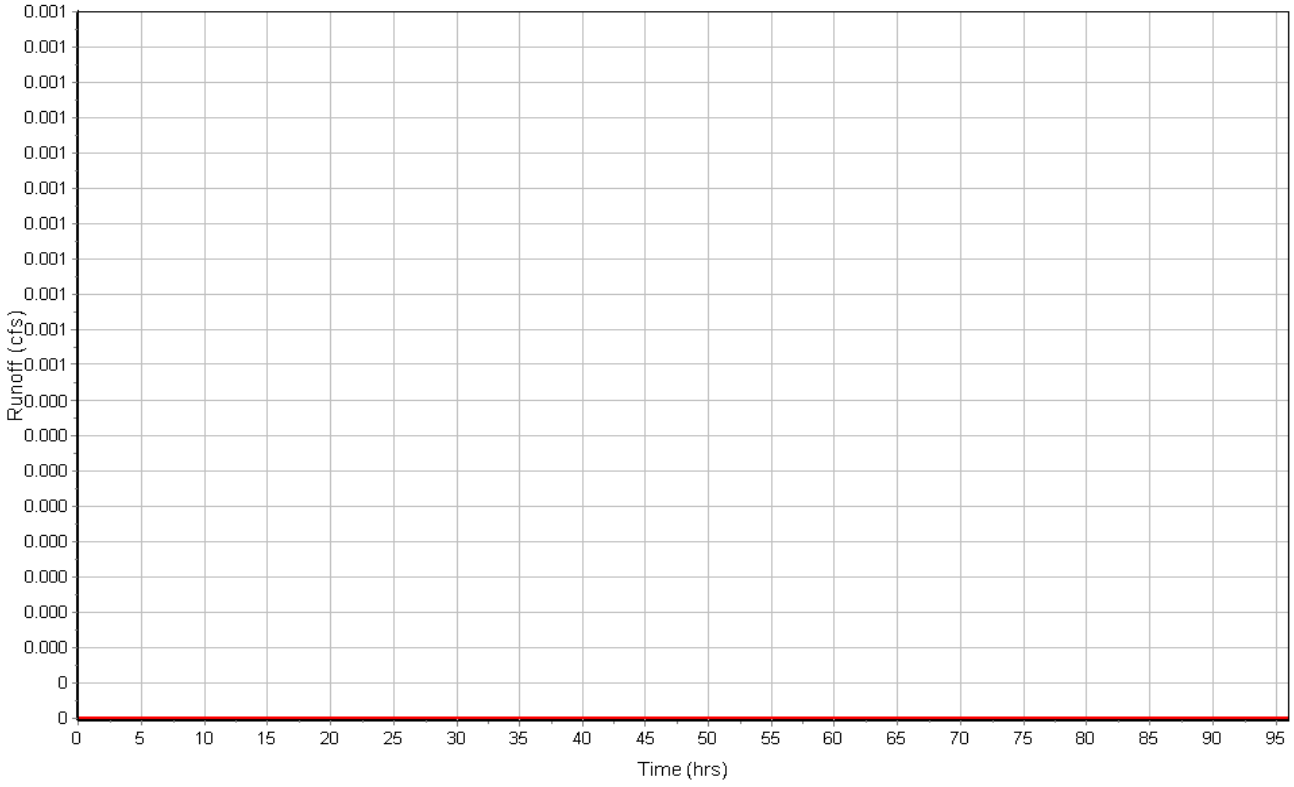
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:47:01

Subbasin : BASIN_13_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_14_ROW

Input Data

Area (ac)	0.15
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.15	B	98.00
Composite Area & Weighted CN	0.15		98.00

Time of Concentration

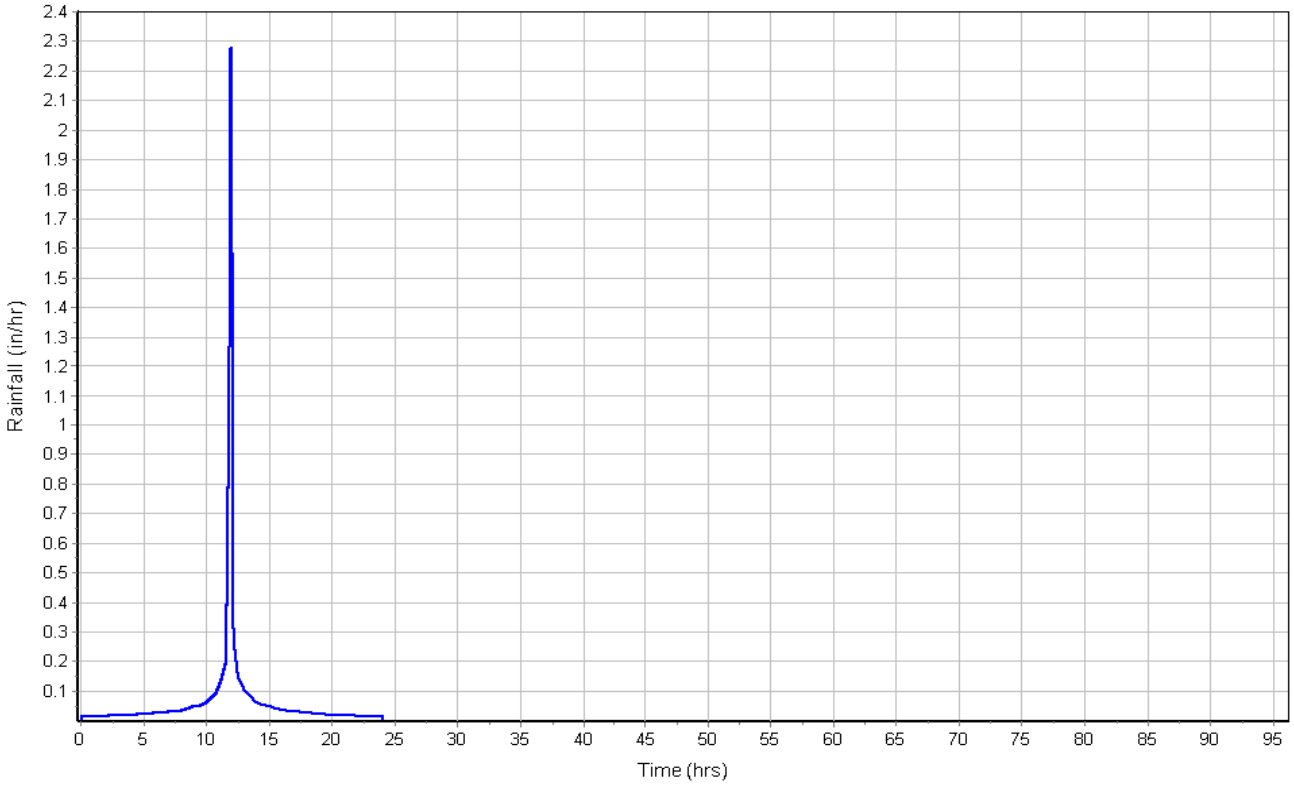
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

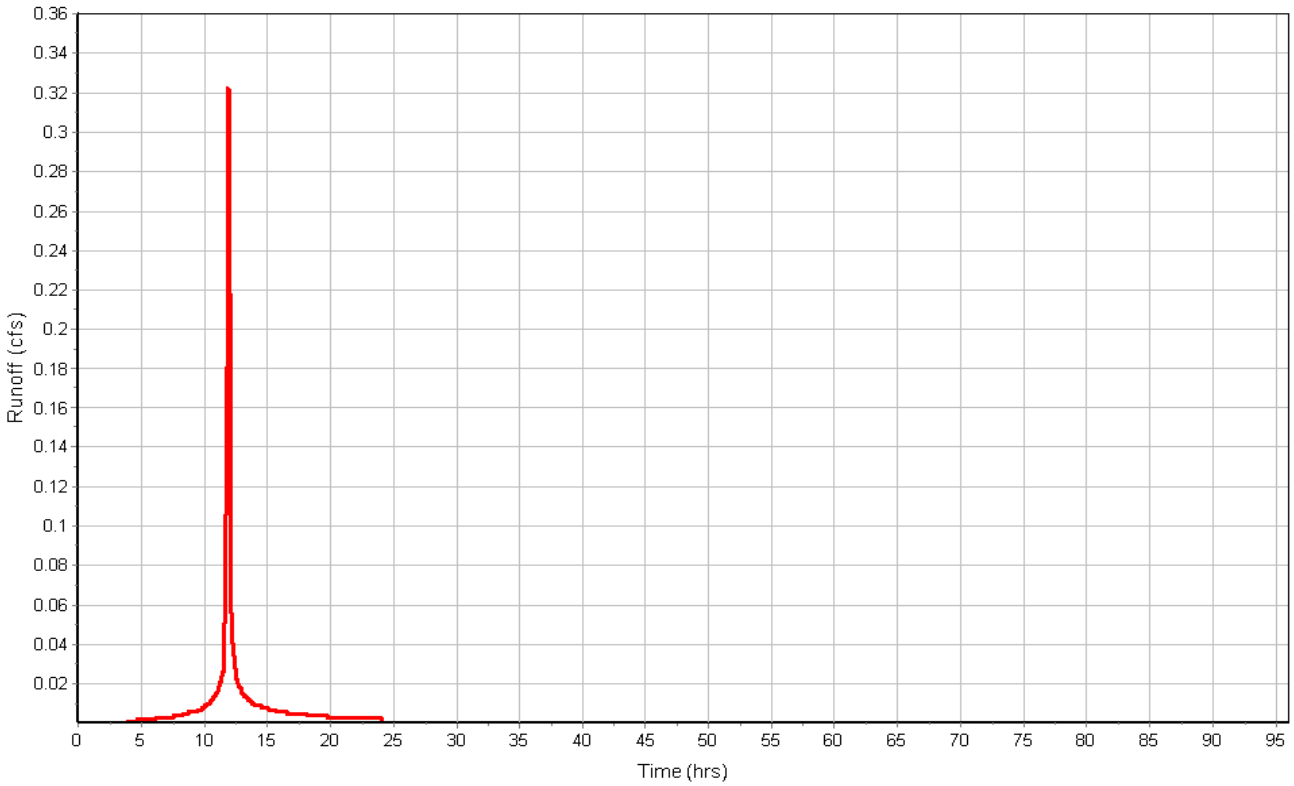
Total Rainfall (in)	1.66
Total Runoff (in)	1.43
Peak Runoff (cfs)	0.32
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_14_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_14_VACANT

Input Data

Area (ac) 0.76
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.76	B	58.00
Composite Area & Weighted CN	0.76		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	300	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	64.00	0.00	0.00

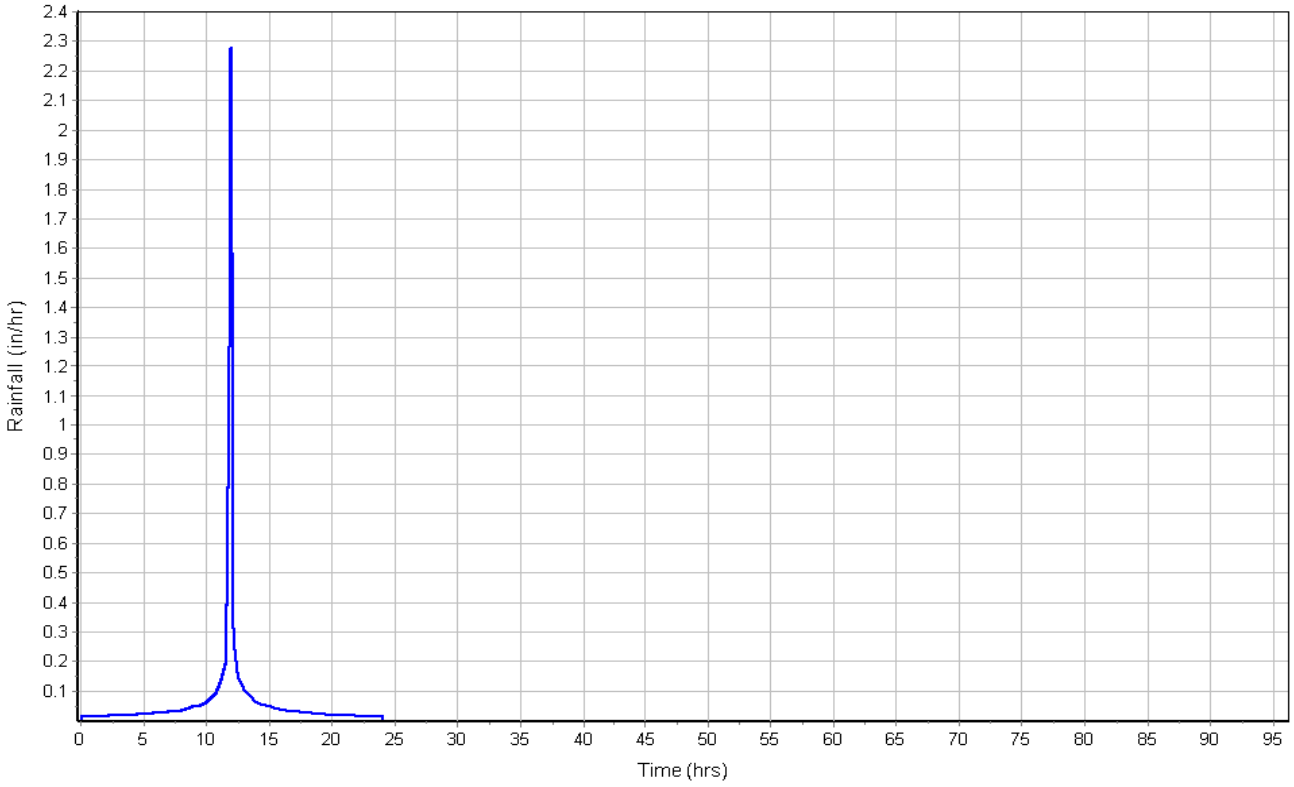
Total TOC (min) 64.00

Subbasin Runoff Results

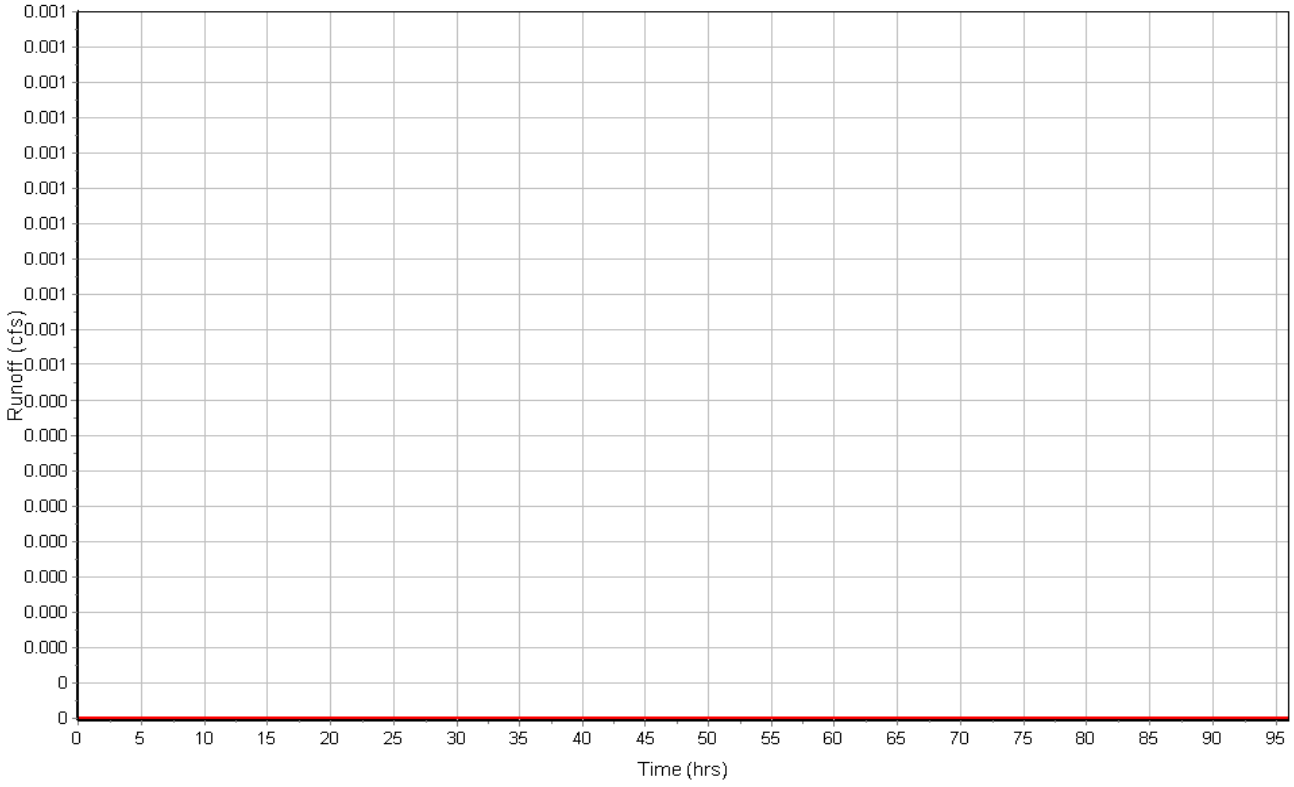
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 01:04:00

Subbasin : BASIN_14_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_15_ROW

Input Data

Area (ac)	0.13
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.13	B	98.00
Composite Area & Weighted CN	0.13		98.00

Time of Concentration

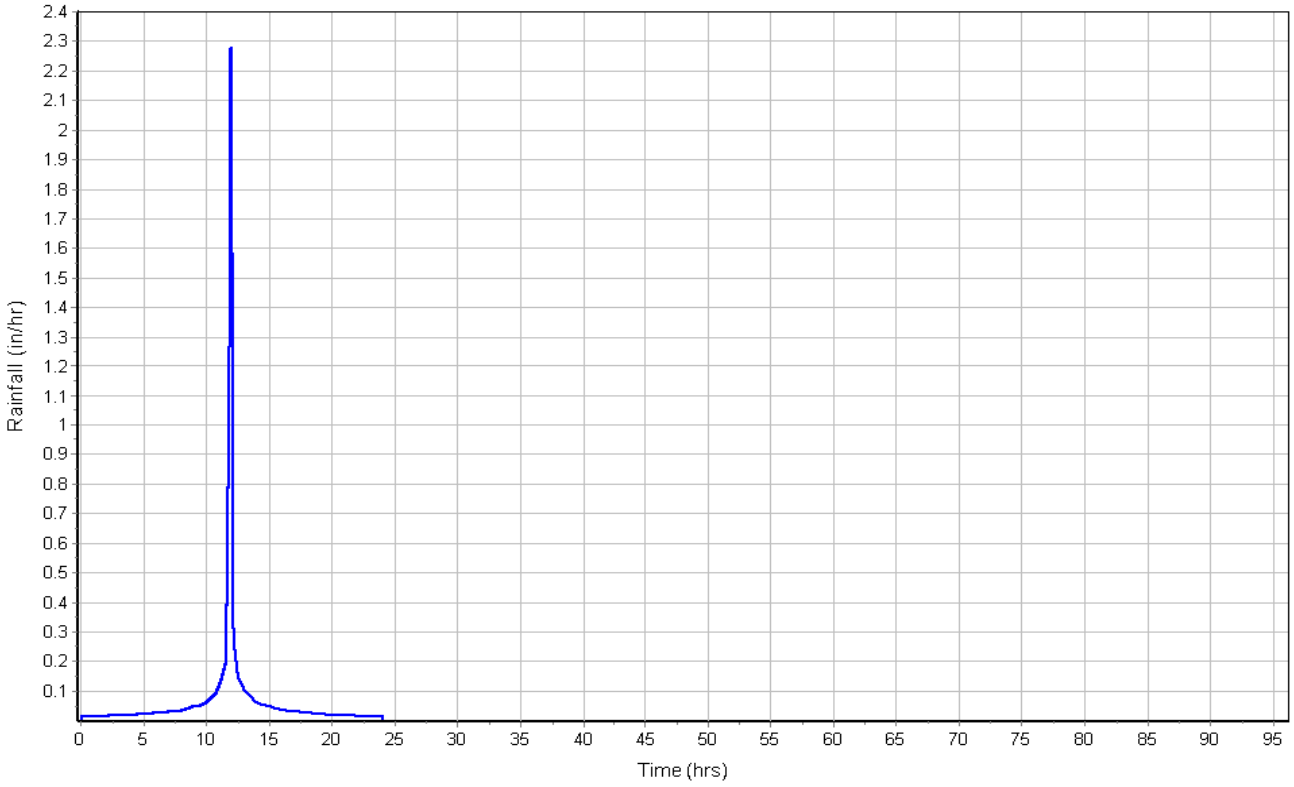
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

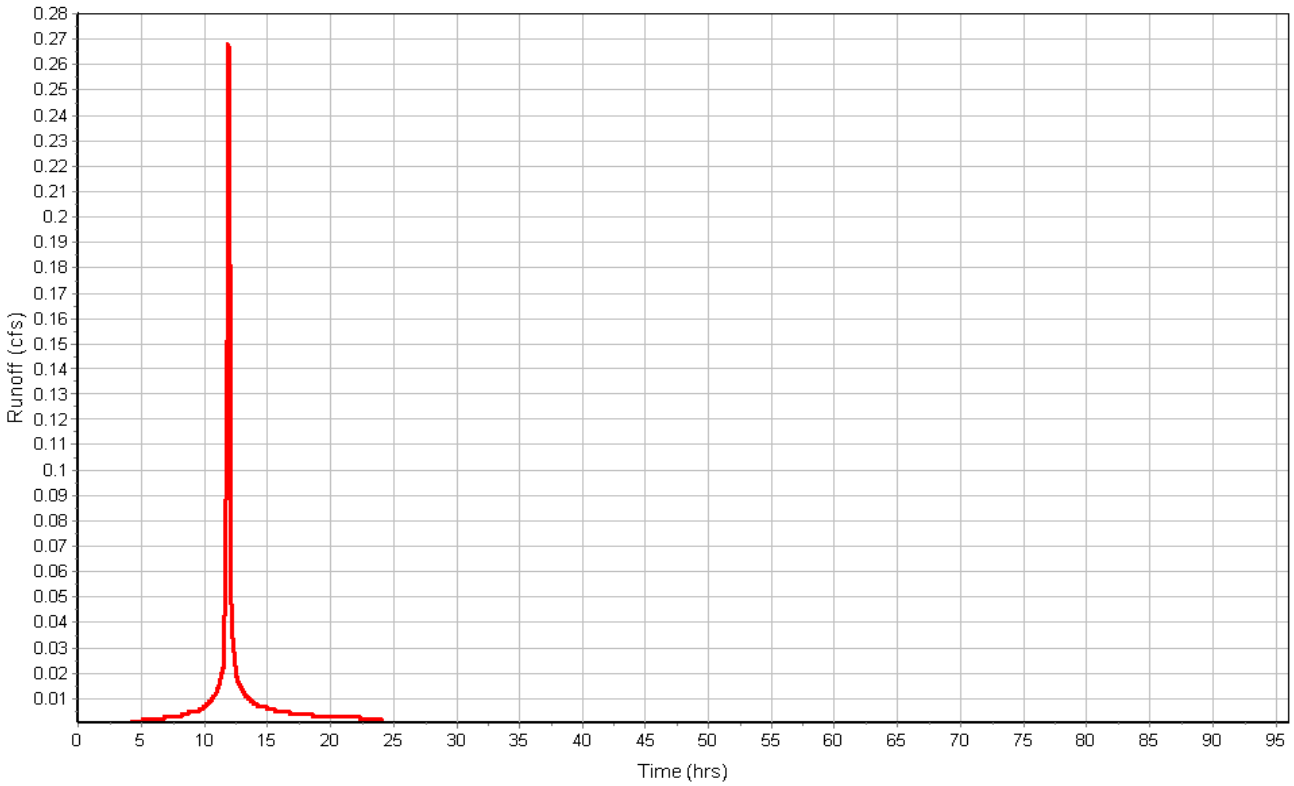
Total Rainfall (in)	1.66
Total Runoff (in)	1.43
Peak Runoff (cfs)	0.27
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_15_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_15_VACANT

Input Data

Area (ac) 0.45
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.45	B	58.00
Composite Area & Weighted CN	0.45		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	186	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	43.66	0.00	0.00

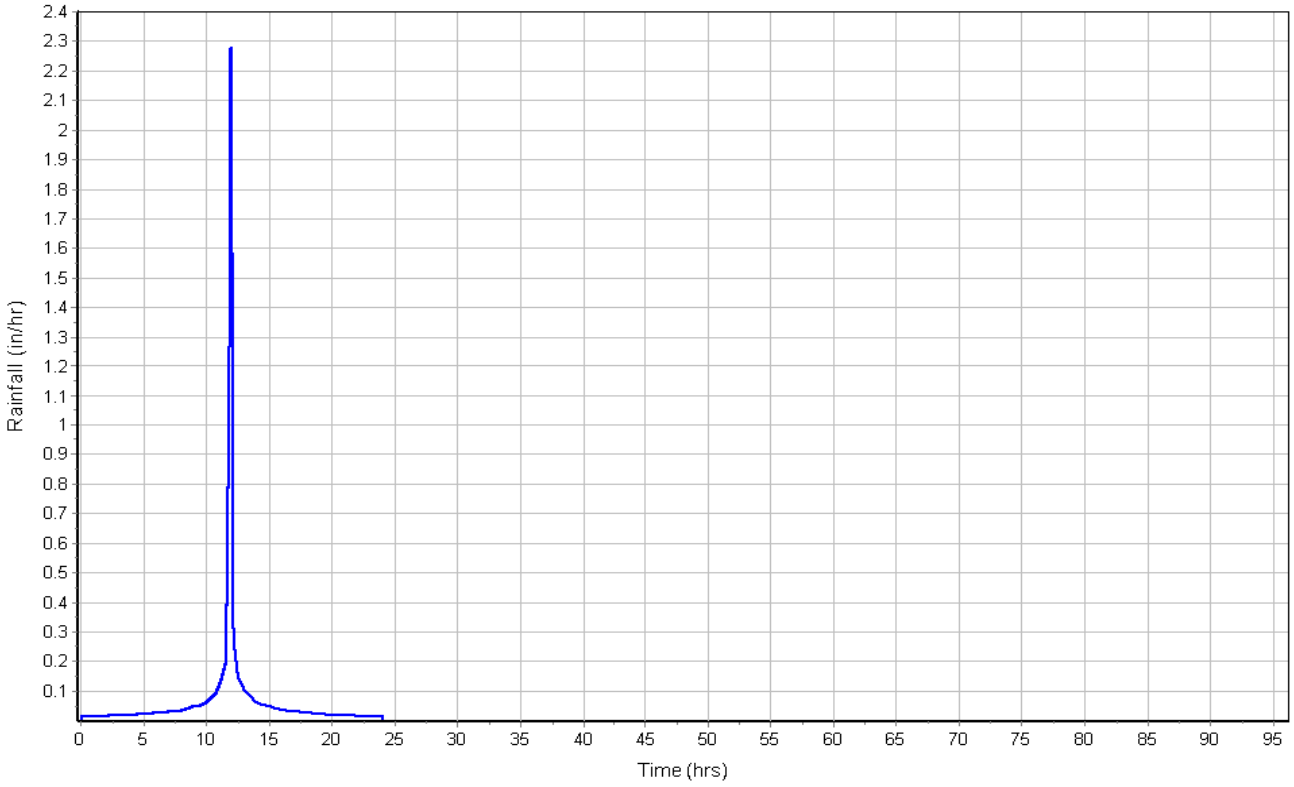
Total TOC (min) 43.66

Subbasin Runoff Results

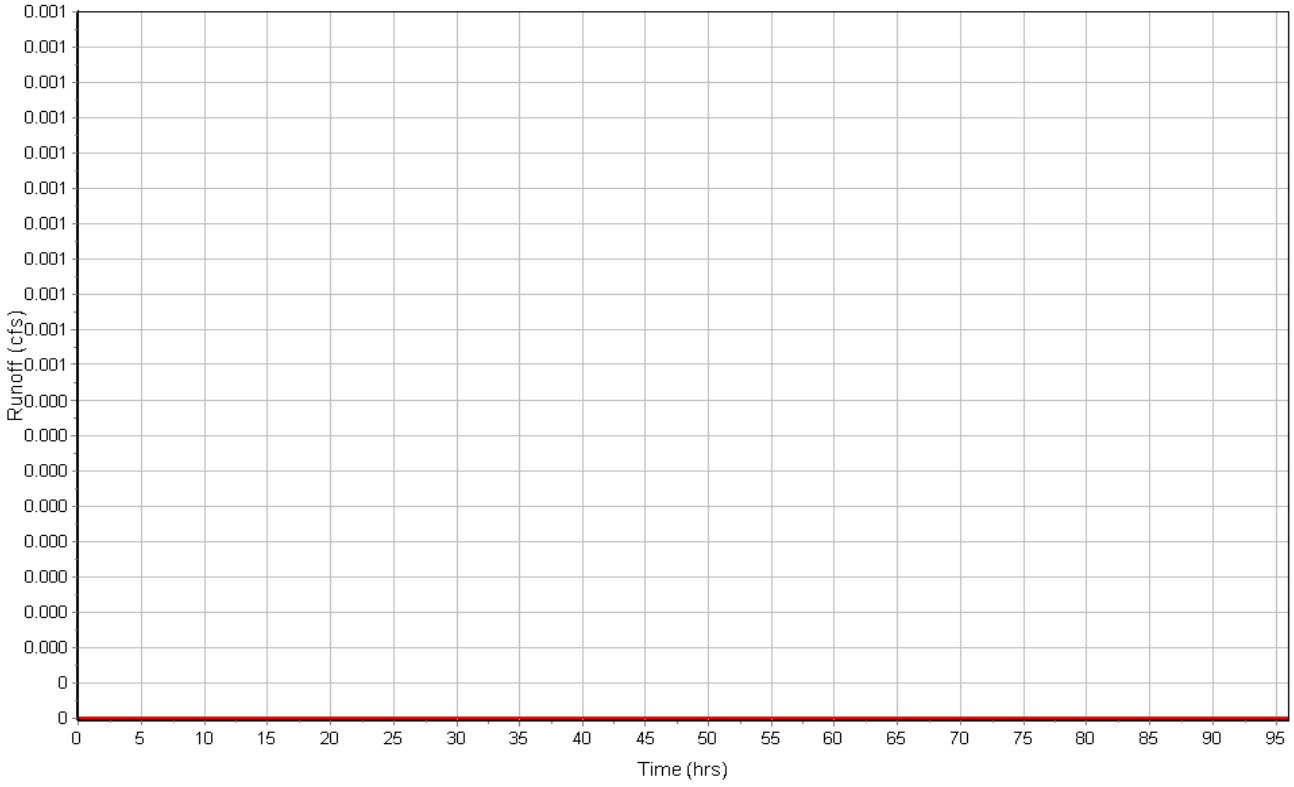
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:43:40

Subbasin : BASIN_15_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_16_ROW

Input Data

Area (ac)	0.13
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.13	B	98.00
Composite Area & Weighted CN	0.13		98.00

Time of Concentration

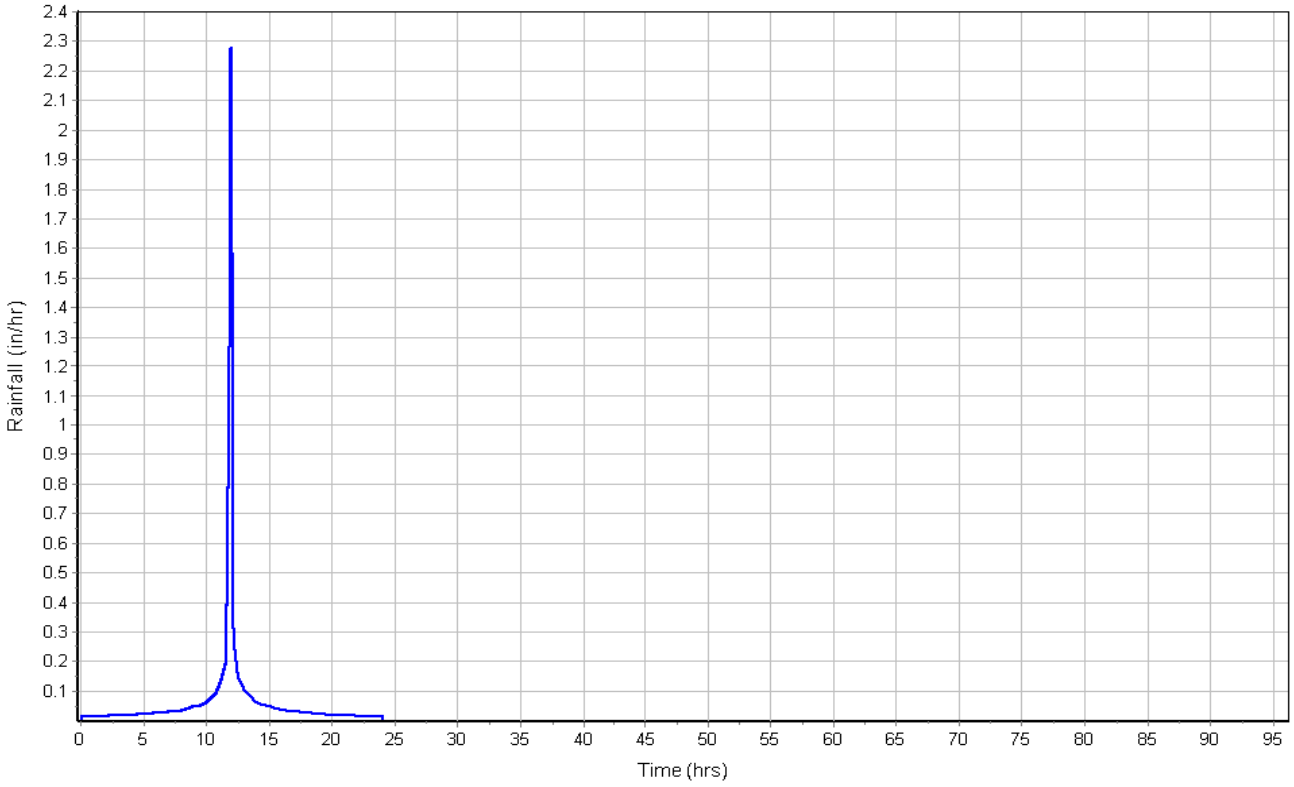
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

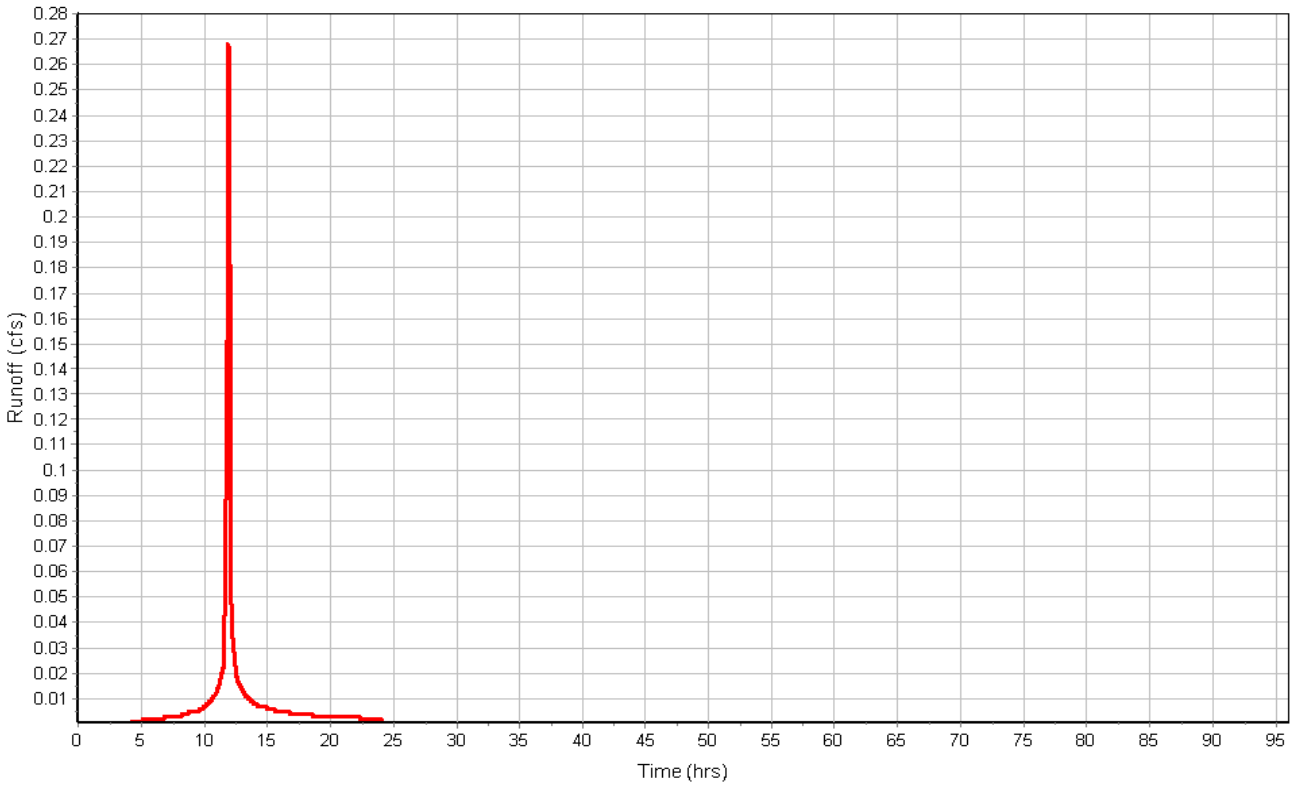
Total Rainfall (in)	1.66
Total Runoff (in)	1.43
Peak Runoff (cfs)	0.27
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_16_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_16_VACANT

Input Data

Area (ac) 0.48
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.48	B	58.00
Composite Area & Weighted CN	0.48		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	186	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	43.66	0.00	0.00

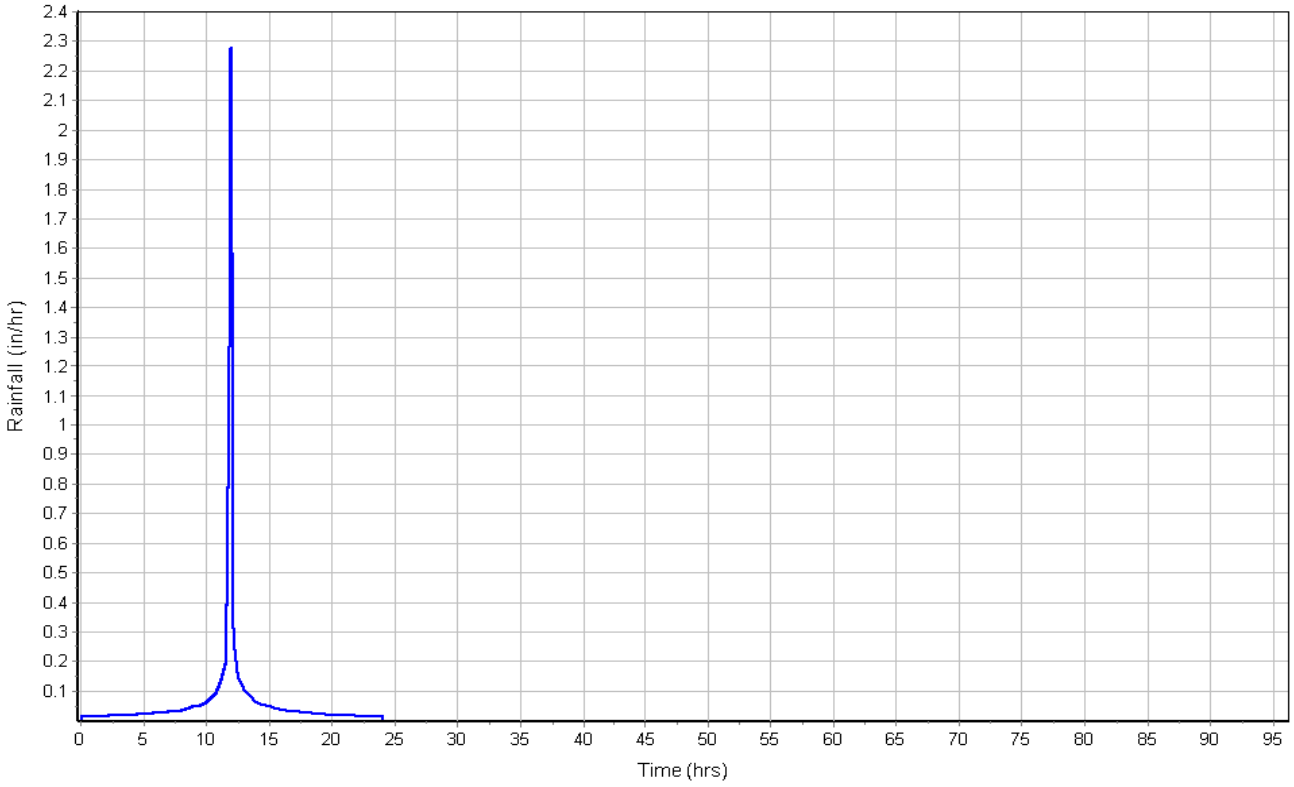
Total TOC (min) 43.66

Subbasin Runoff Results

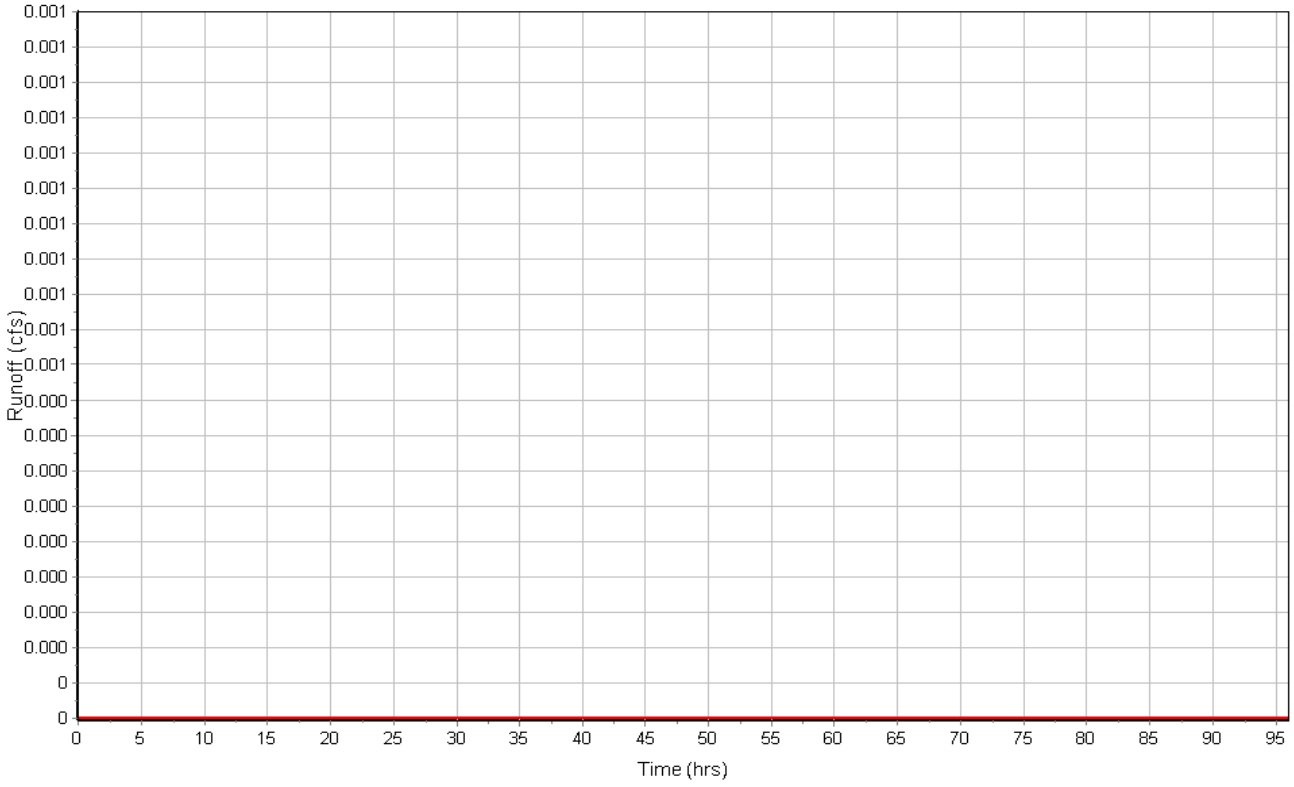
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:43:40

Subbasin : BASIN_16_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_17_ROW

Input Data

Area (ac)	0.12
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.12	B	98.00
Composite Area & Weighted CN	0.12		98.00

Time of Concentration

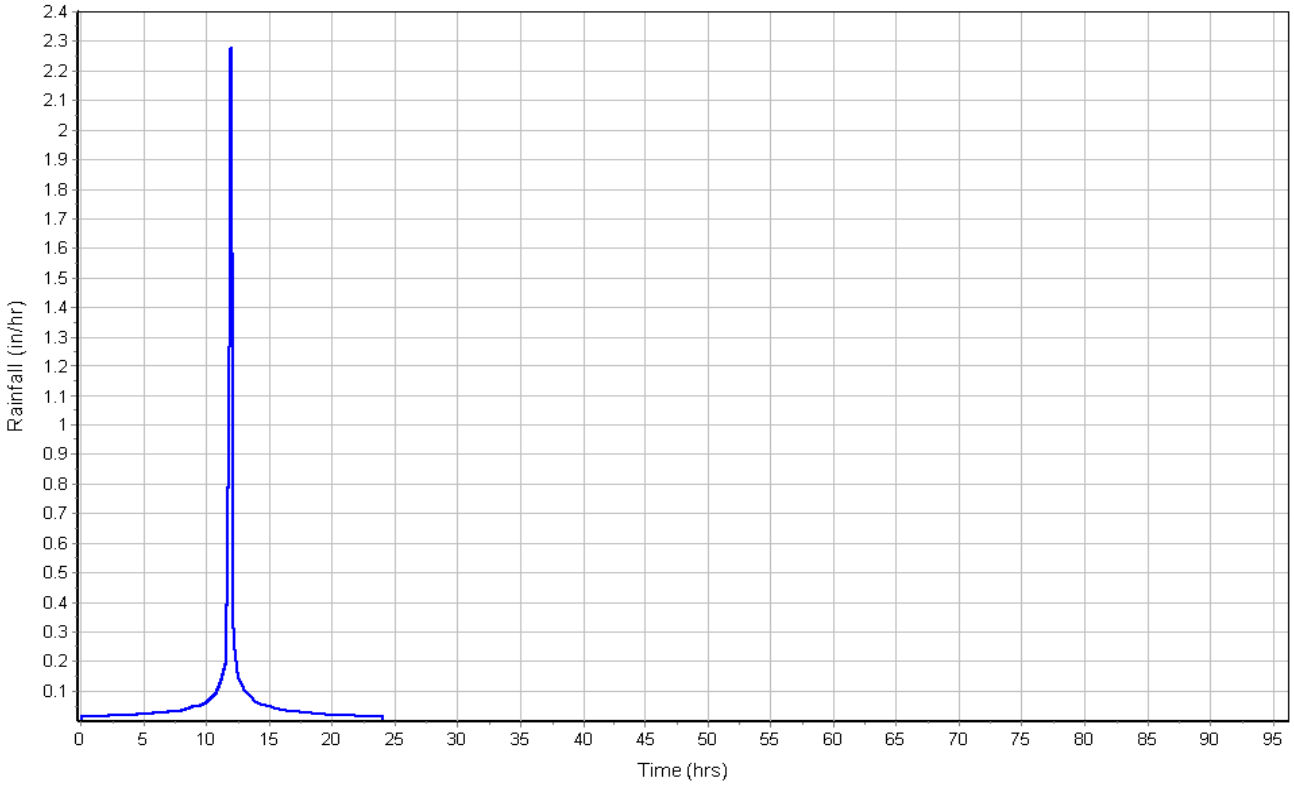
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

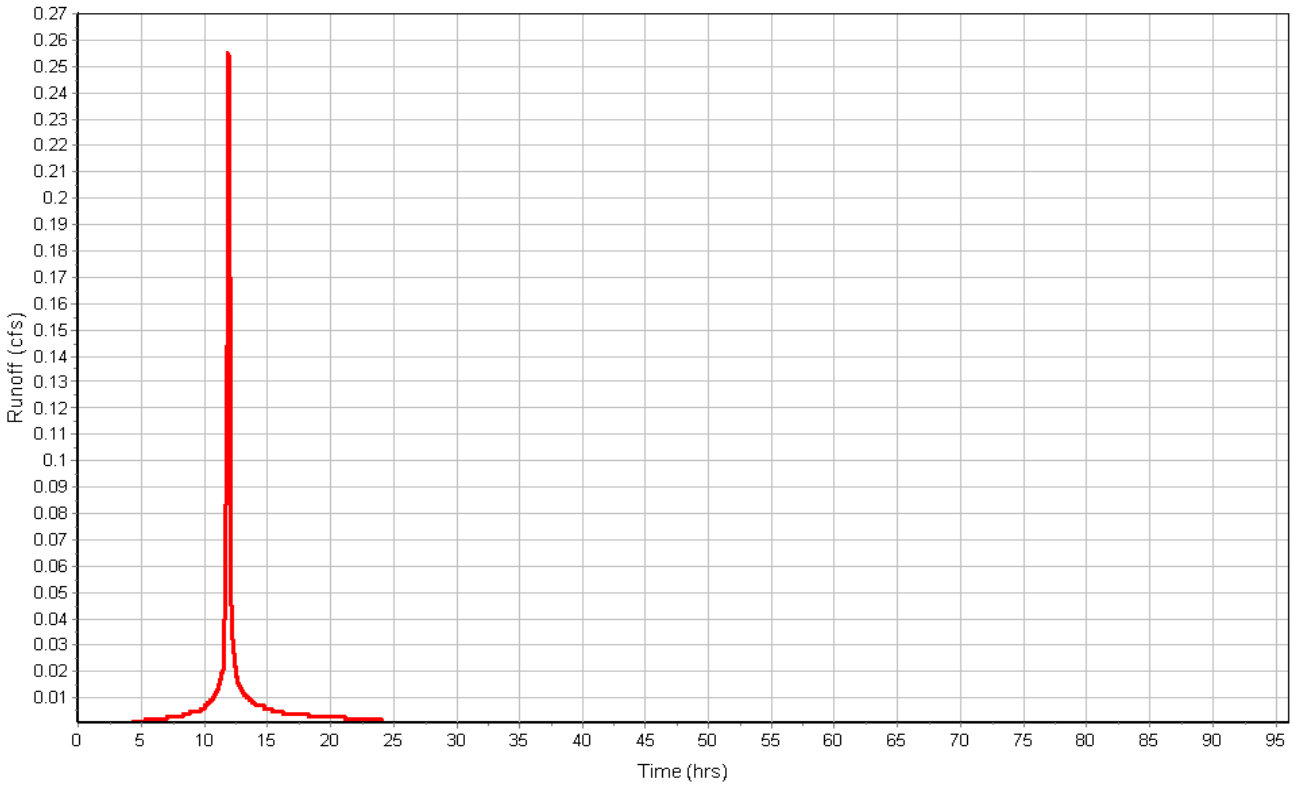
Total Rainfall (in)	1.66
Total Runoff (in)	1.43
Peak Runoff (cfs)	0.25
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_17_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_17_VACANT

Input Data

Area (ac) 0.34
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.34	B	58.00
Composite Area & Weighted CN	0.34		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	265	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	57.95	0.00	0.00

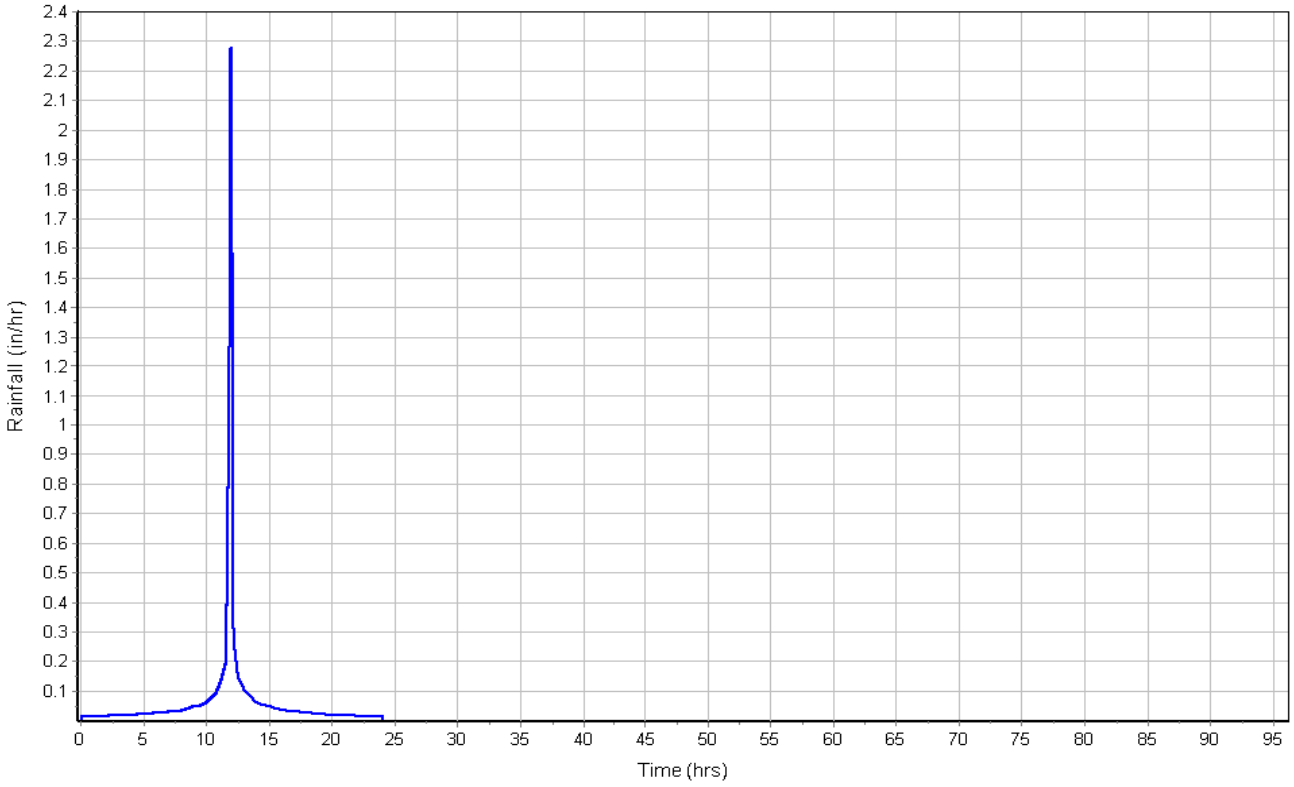
Total TOC (min) 57.95

Subbasin Runoff Results

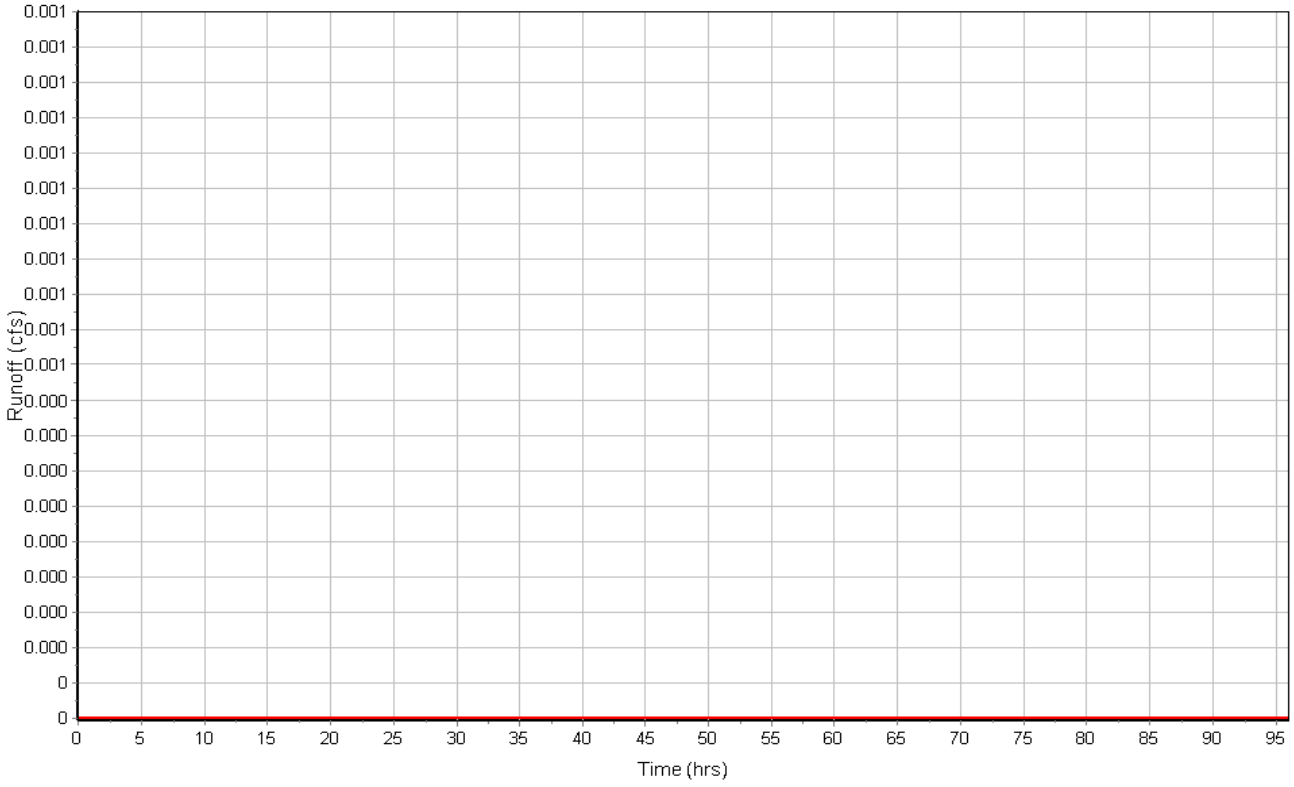
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:57:57

Subbasin : BASIN_17_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_18_ROW

Input Data

Area (ac)	0.11
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.11	B	98.00
Composite Area & Weighted CN	0.11		98.00

Time of Concentration

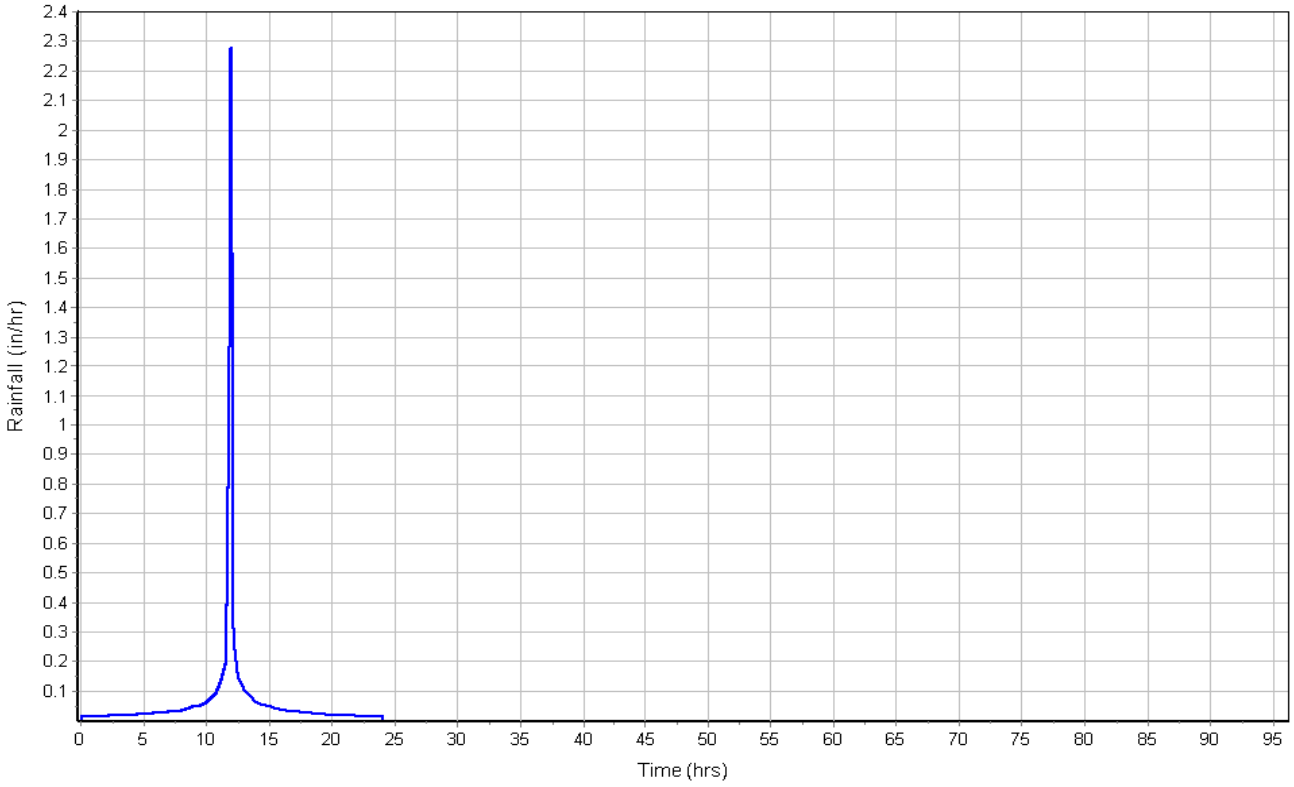
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

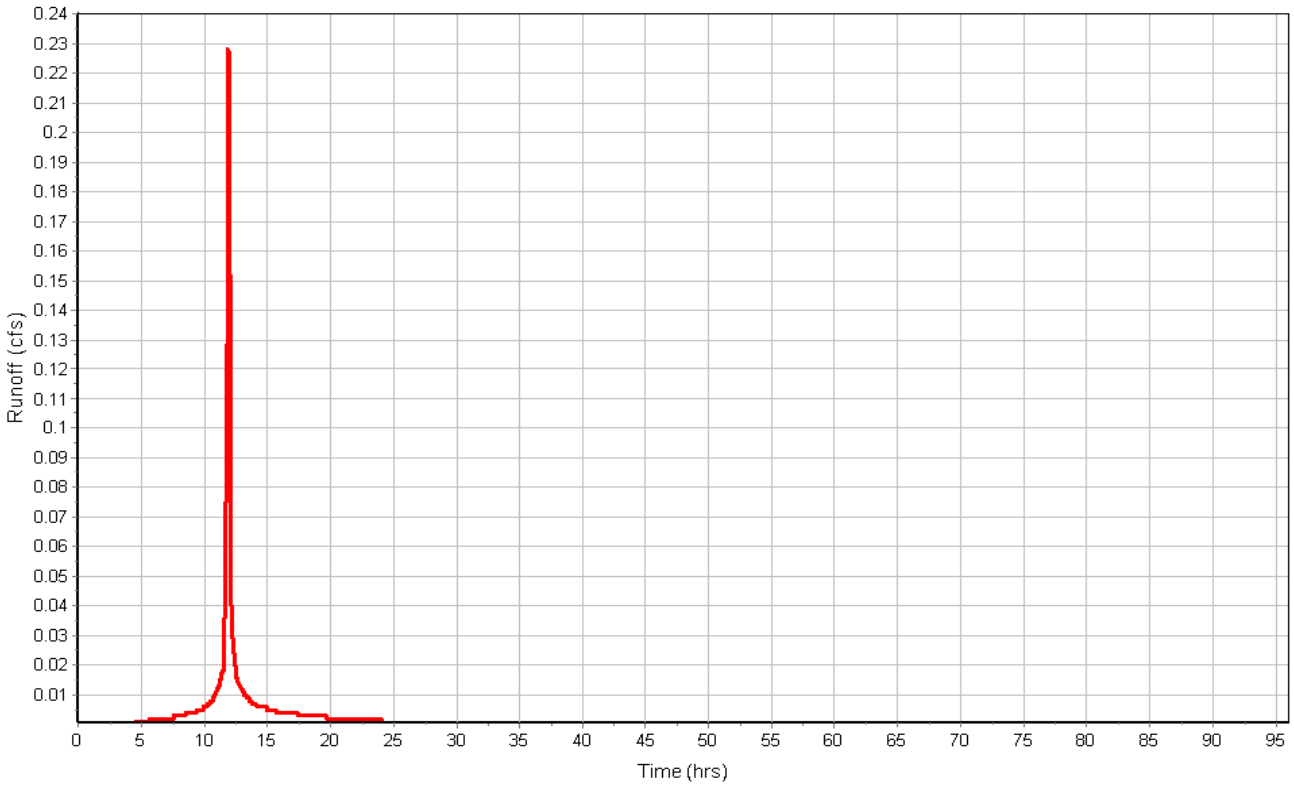
Total Rainfall (in)	1.66
Total Runoff (in)	1.43
Peak Runoff (cfs)	0.23
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_18_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_18_VACANT

Input Data

Area (ac) 0.31
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.31	B	58.00
Composite Area & Weighted CN	0.31		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	271	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	59.00	0.00	0.00

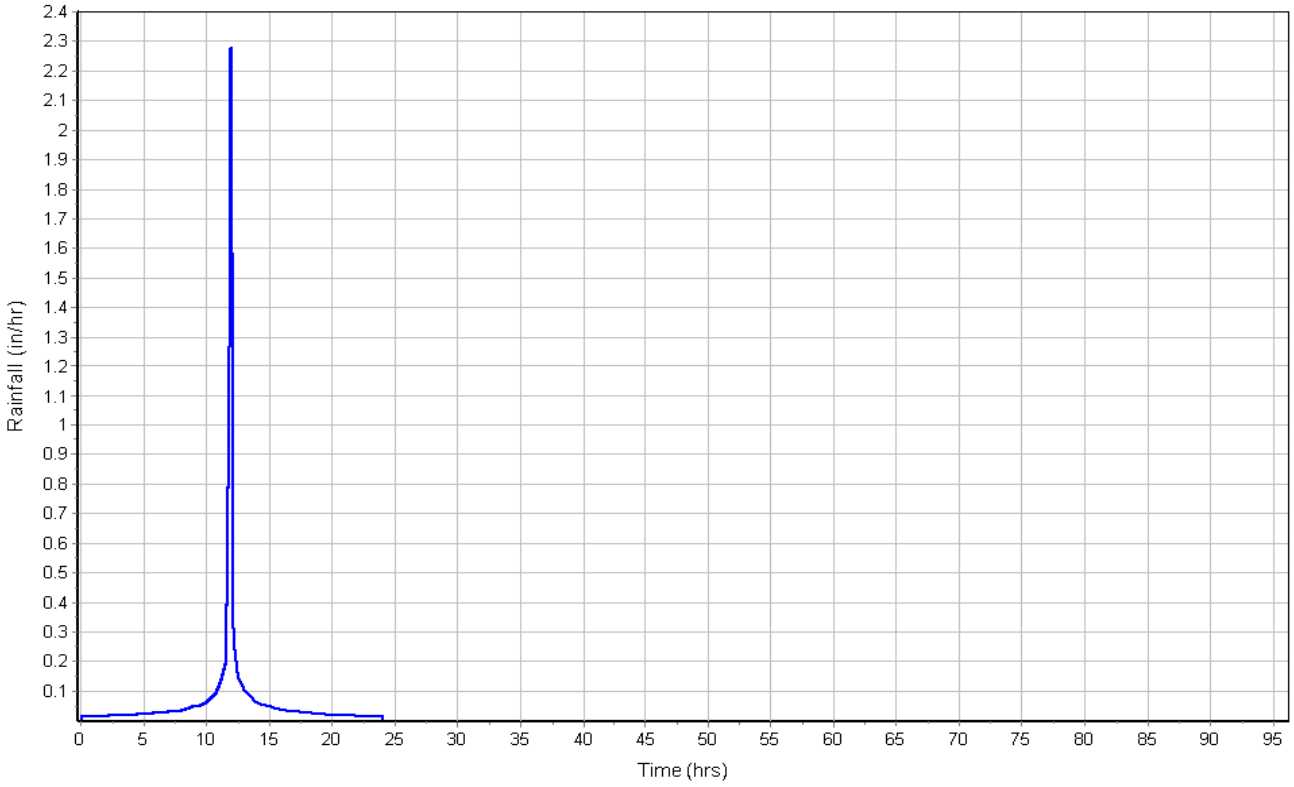
Total TOC (min) 59.00

Subbasin Runoff Results

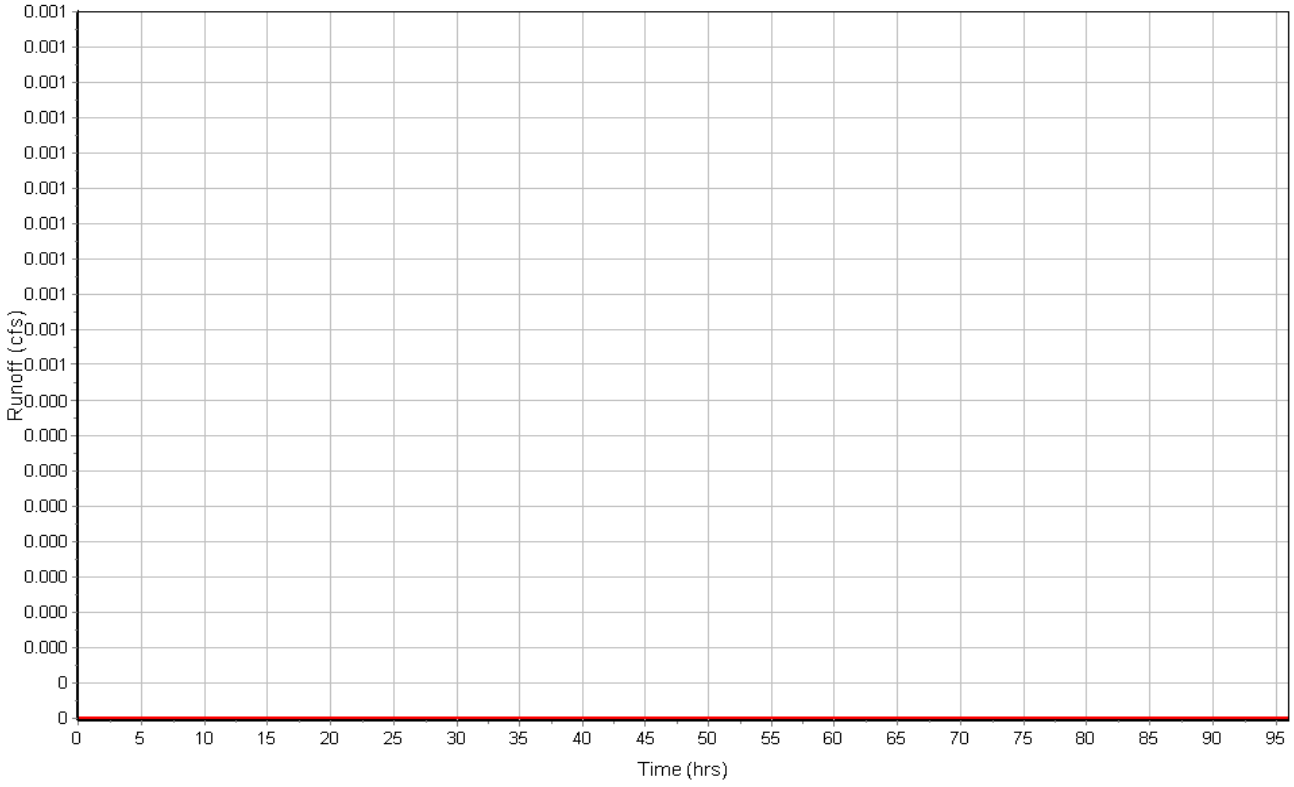
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:59:00

Subbasin : BASIN_18_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_19_ROW

Input Data

Area (ac)	0.08
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.08	B	98.00
Composite Area & Weighted CN	0.08		98.00

Time of Concentration

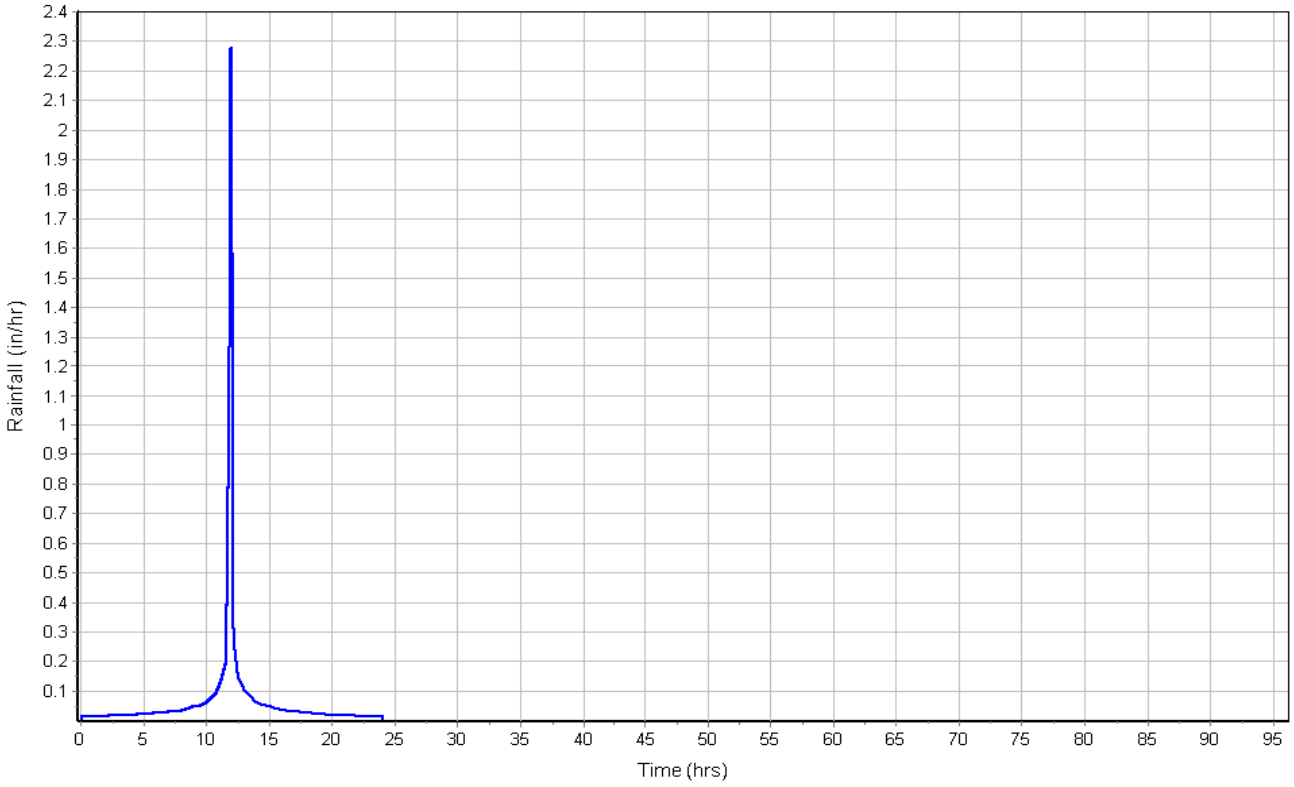
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

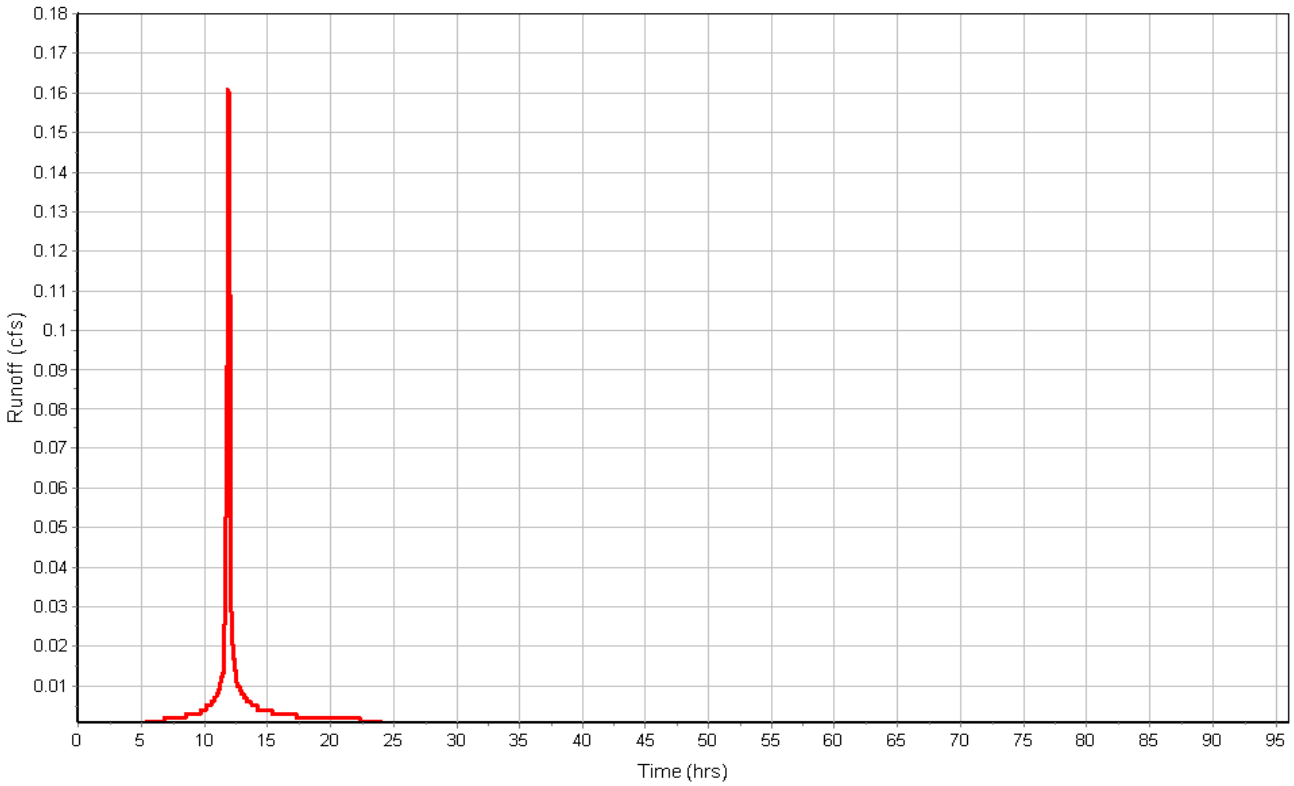
Total Rainfall (in)	1.66
Total Runoff (in)	1.42
Peak Runoff (cfs)	0.16
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_19_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_19_VACANT

Input Data

Area (ac) 0.06
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.06	B	58.00
Composite Area & Weighted CN	0.06		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	88	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.06	0.00	0.00
Computed Flow Time (min) :	23.99	0.00	0.00

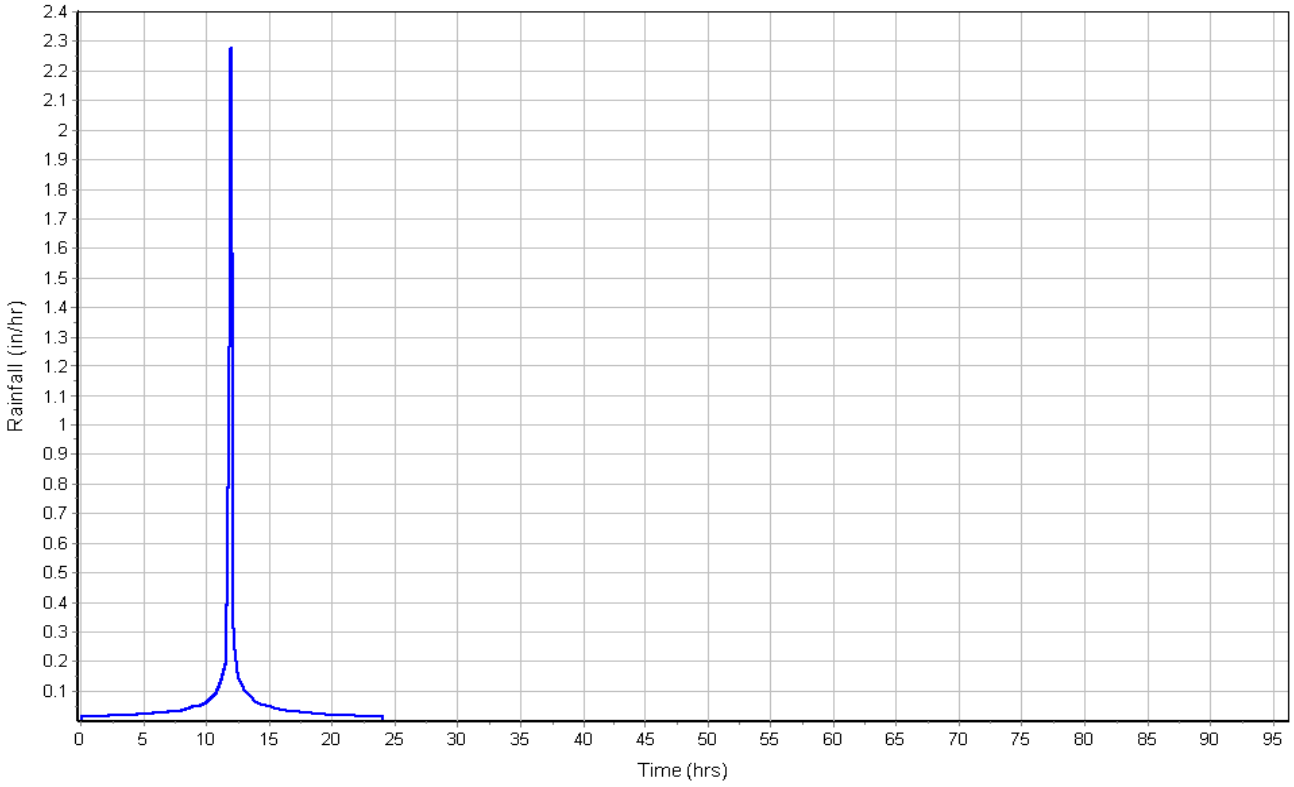
Total TOC (min) 23.99

Subbasin Runoff Results

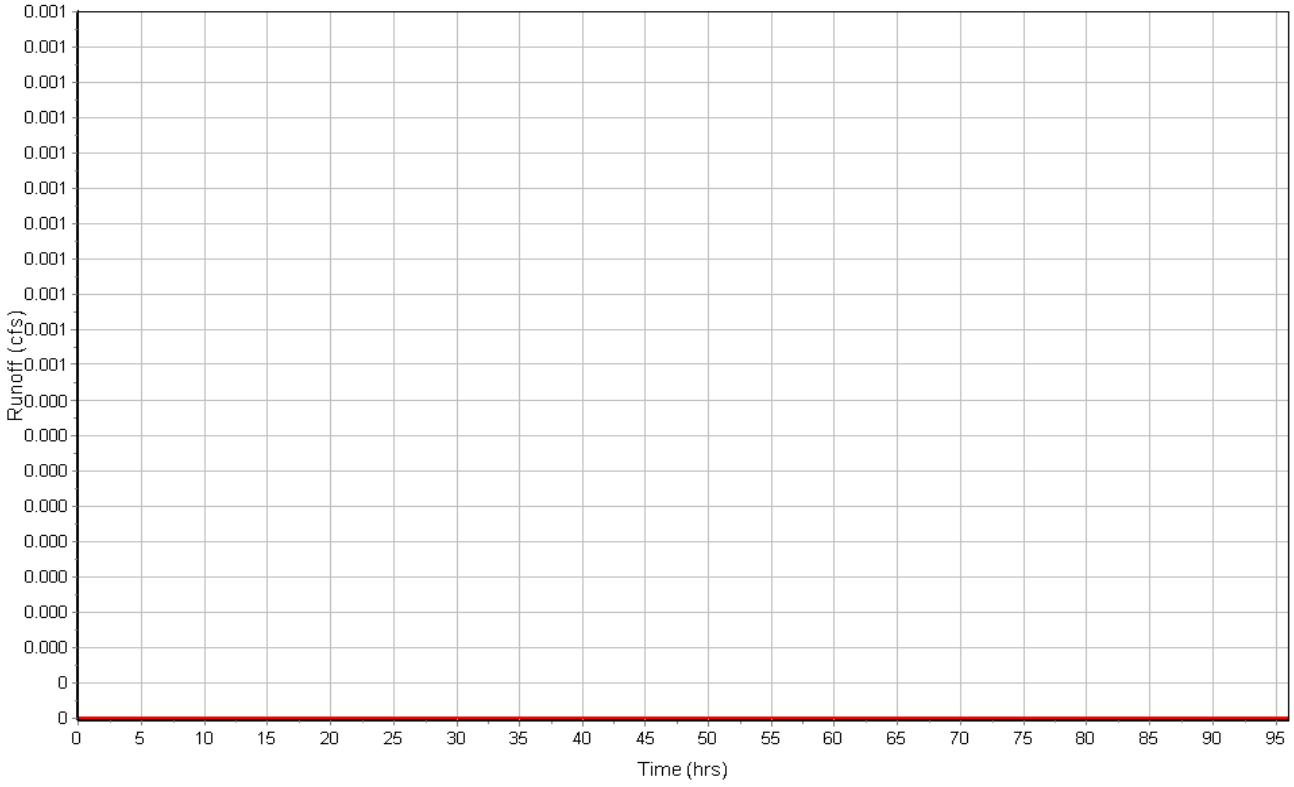
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:23:59

Subbasin : BASIN_19_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_2_ROW

Input Data

Area (ac)	0.18
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.18	B	98.00
Composite Area & Weighted CN	0.18		98.00

Time of Concentration

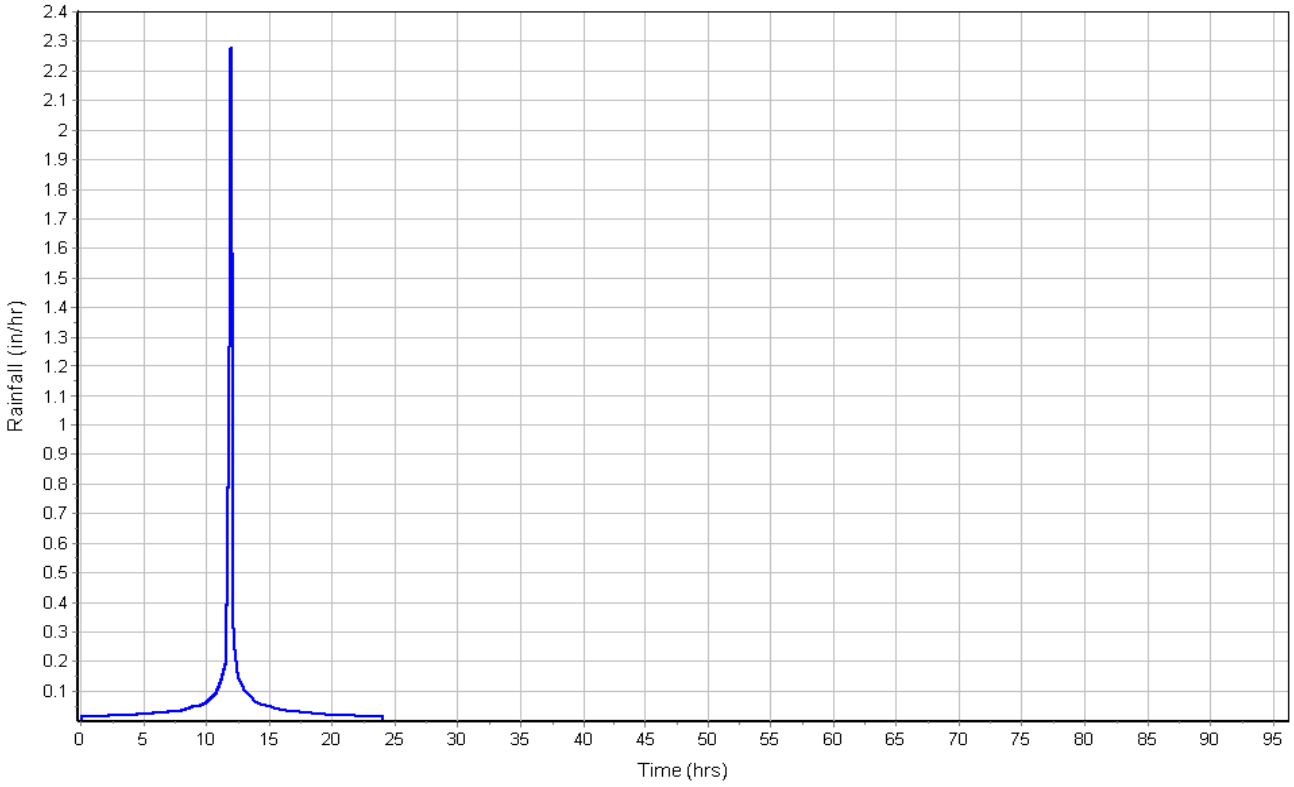
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

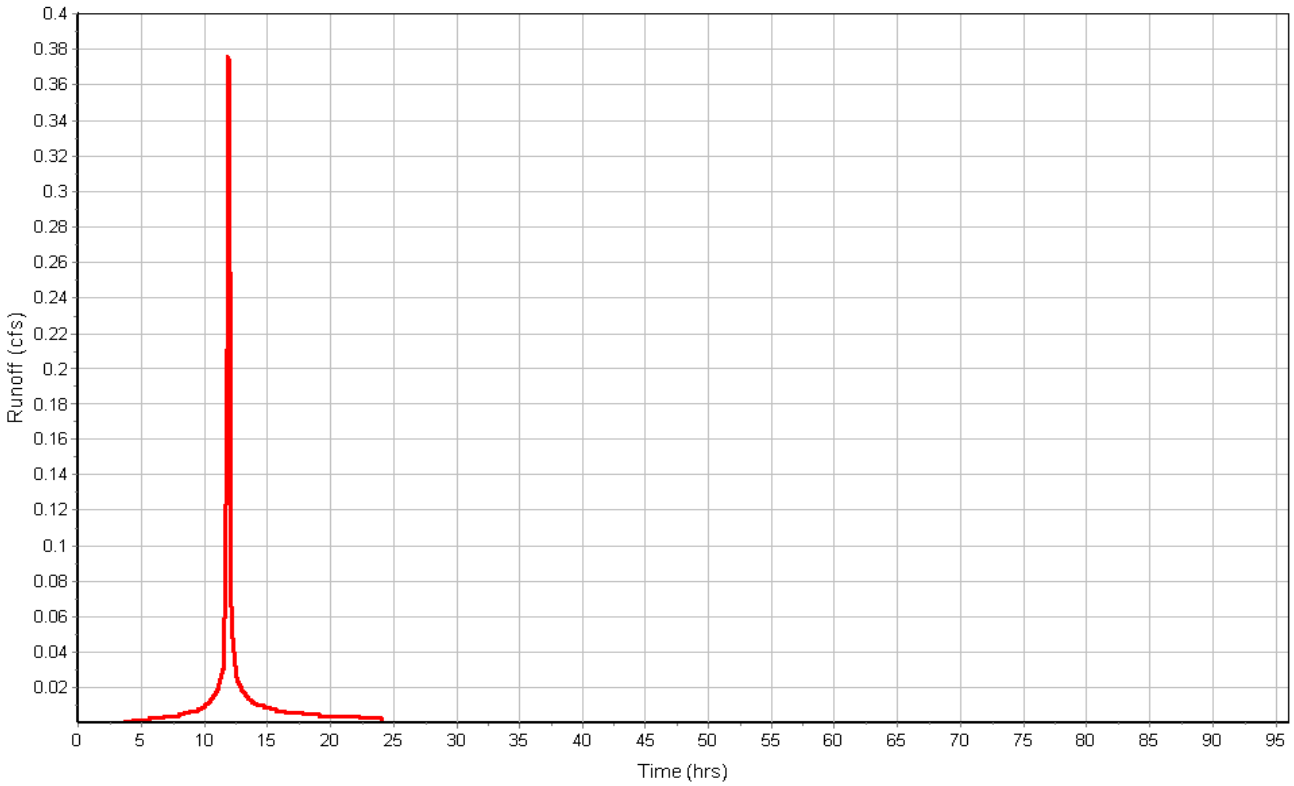
Total Rainfall (in)	1.66
Total Runoff (in)	1.43
Peak Runoff (cfs)	0.38
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_2_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_2_VACANT

Input Data

Area (ac) 0.46
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.46	B	58.00
Composite Area & Weighted CN	0.46		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	259	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	56.90	0.00	0.00

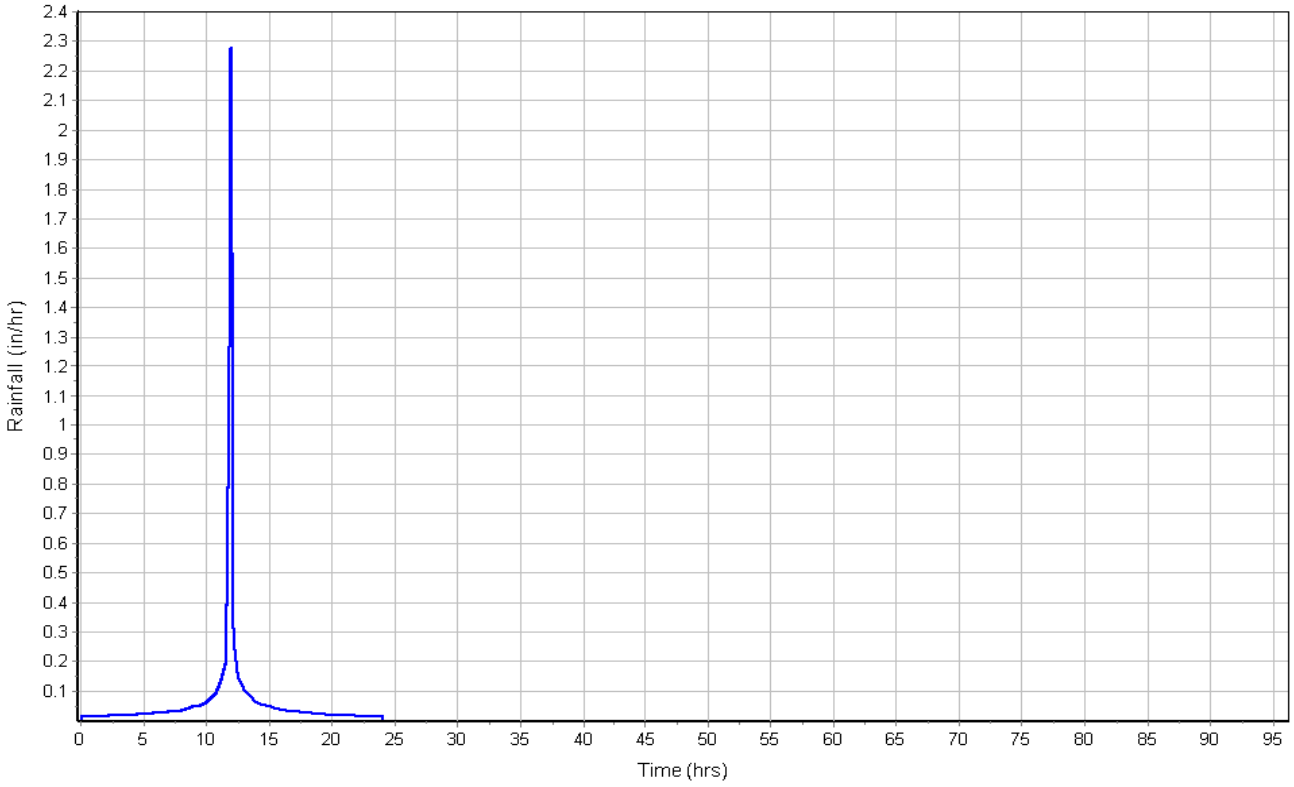
Total TOC (min) 56.90

Subbasin Runoff Results

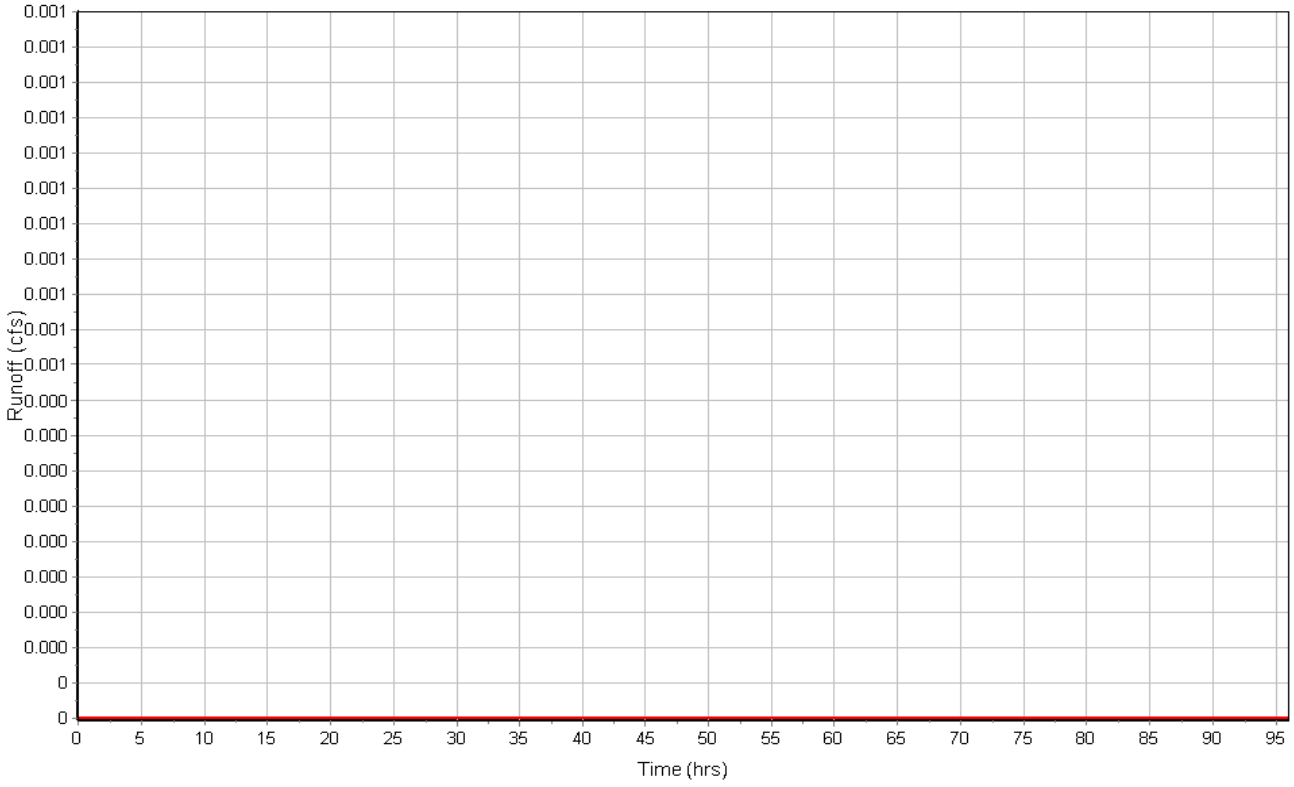
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:56:54

Subbasin : BASIN_2_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_20_ROW

Input Data

Area (ac)	0.12
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.12	B	98.00
Composite Area & Weighted CN	0.12		98.00

Time of Concentration

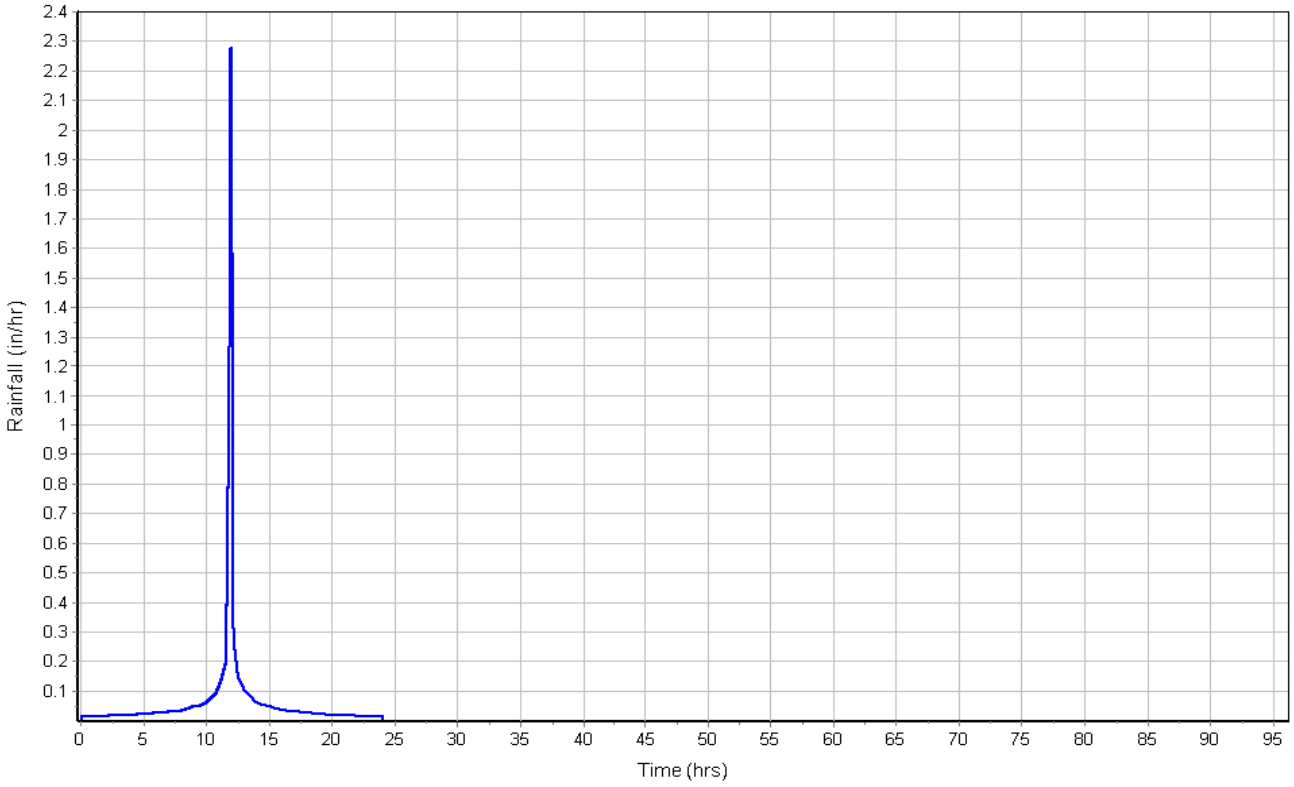
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

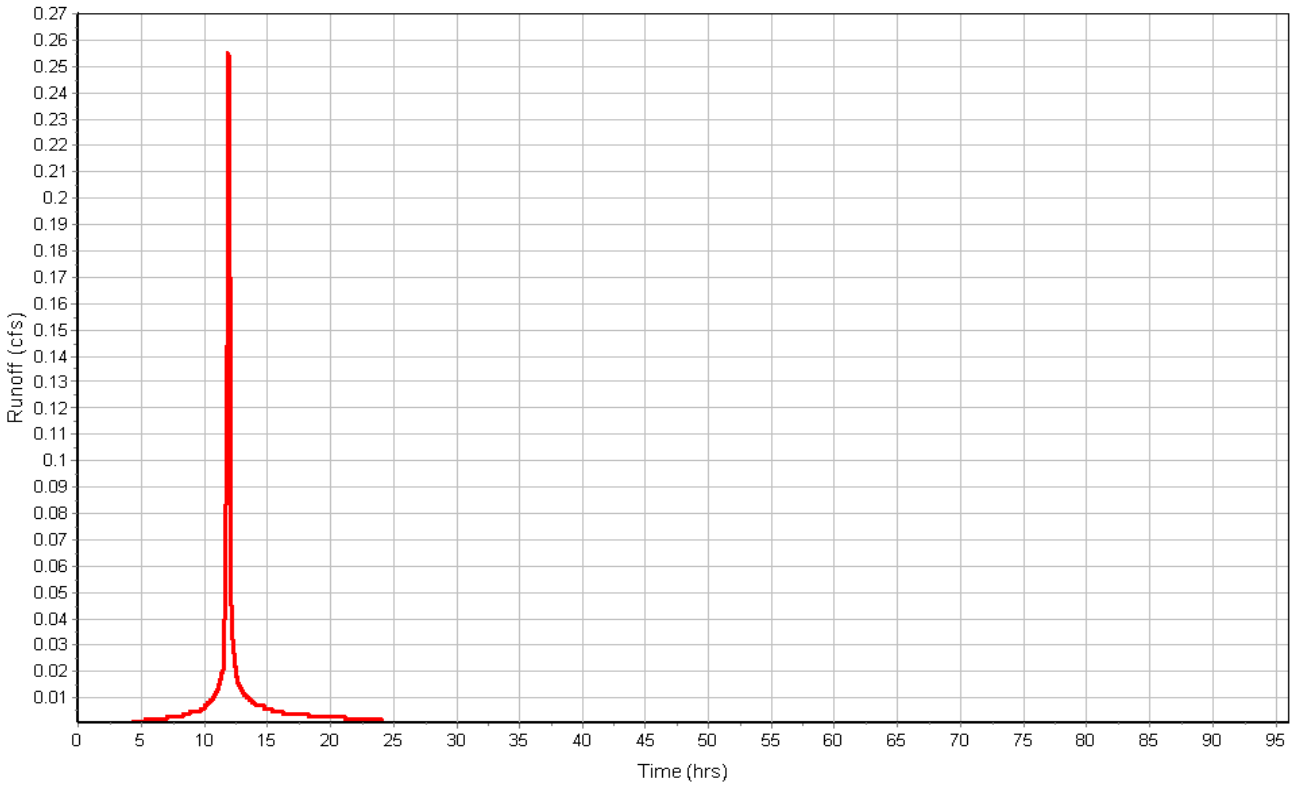
Total Rainfall (in)	1.66
Total Runoff (in)	1.43
Peak Runoff (cfs)	0.25
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_20_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_20_VACANT

Input Data

Area (ac) 0.38
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.38	B	58.00
Composite Area & Weighted CN	0.38		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	279	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	60.39	0.00	0.00

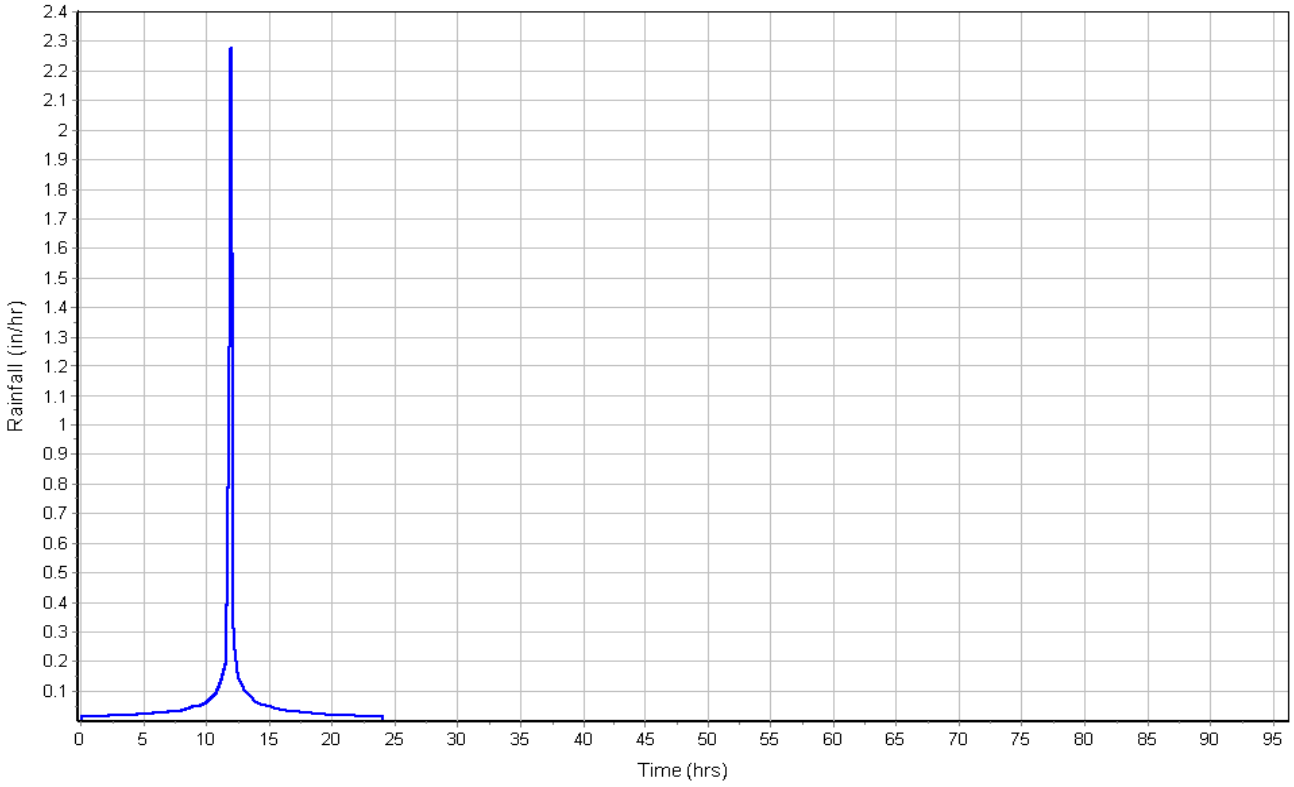
Total TOC (min) 60.39

Subbasin Runoff Results

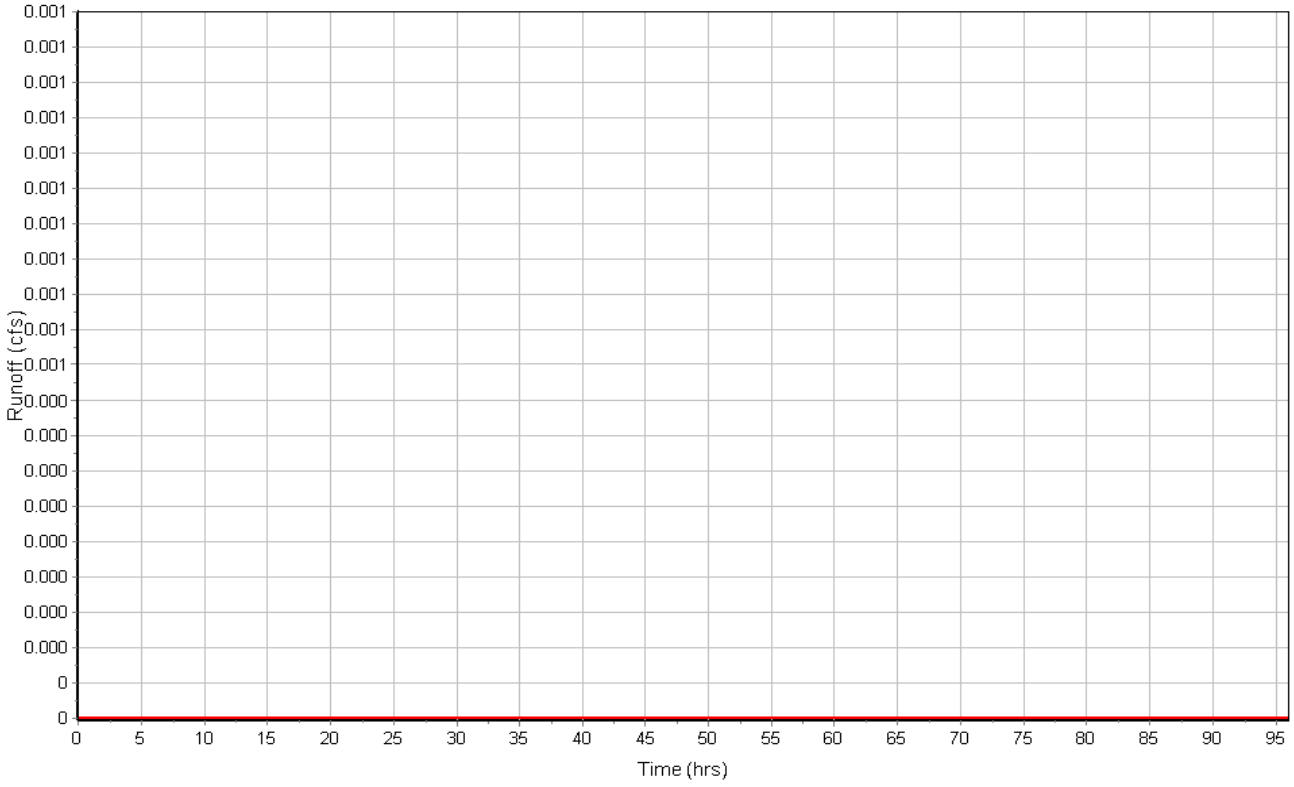
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 01:00:23

Subbasin : BASIN_20_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_21_ROW

Input Data

Area (ac)	0.12
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.12	B	98.00
Composite Area & Weighted CN	0.12		98.00

Time of Concentration

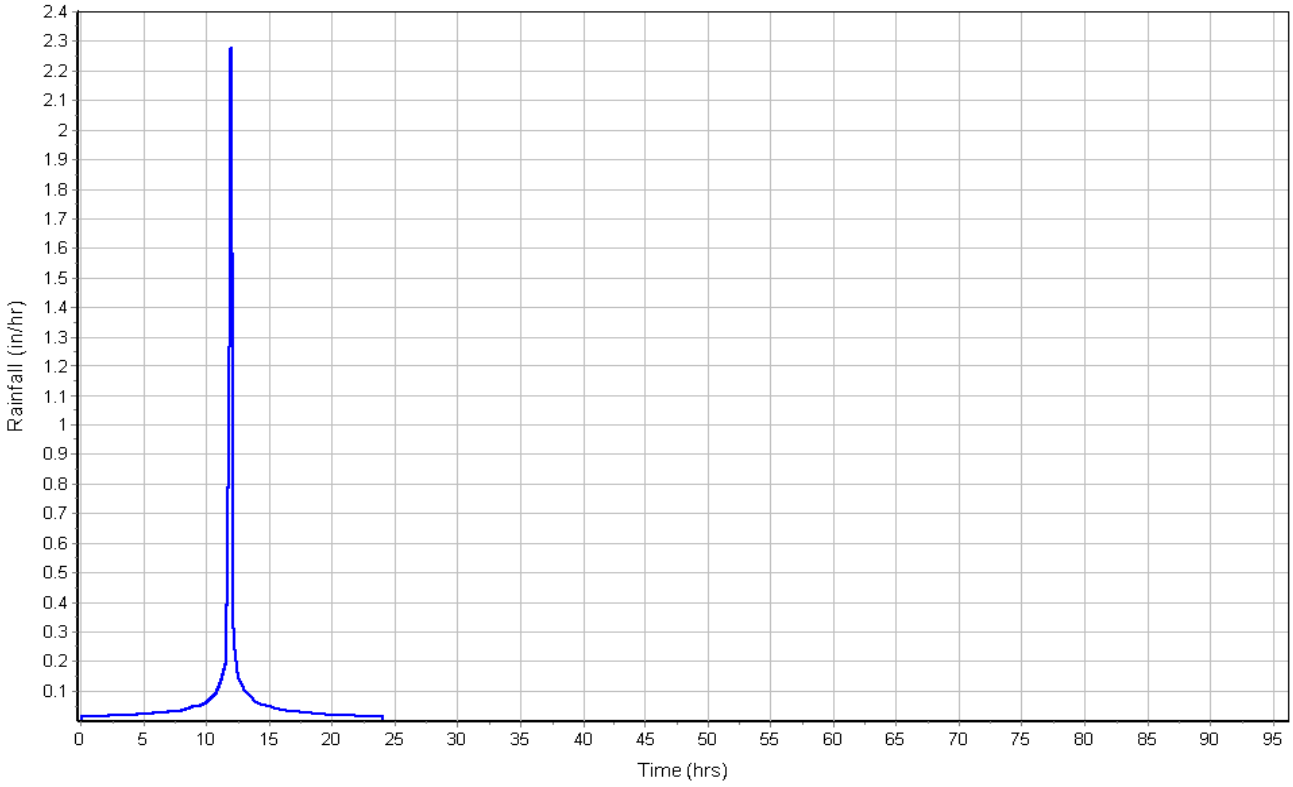
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

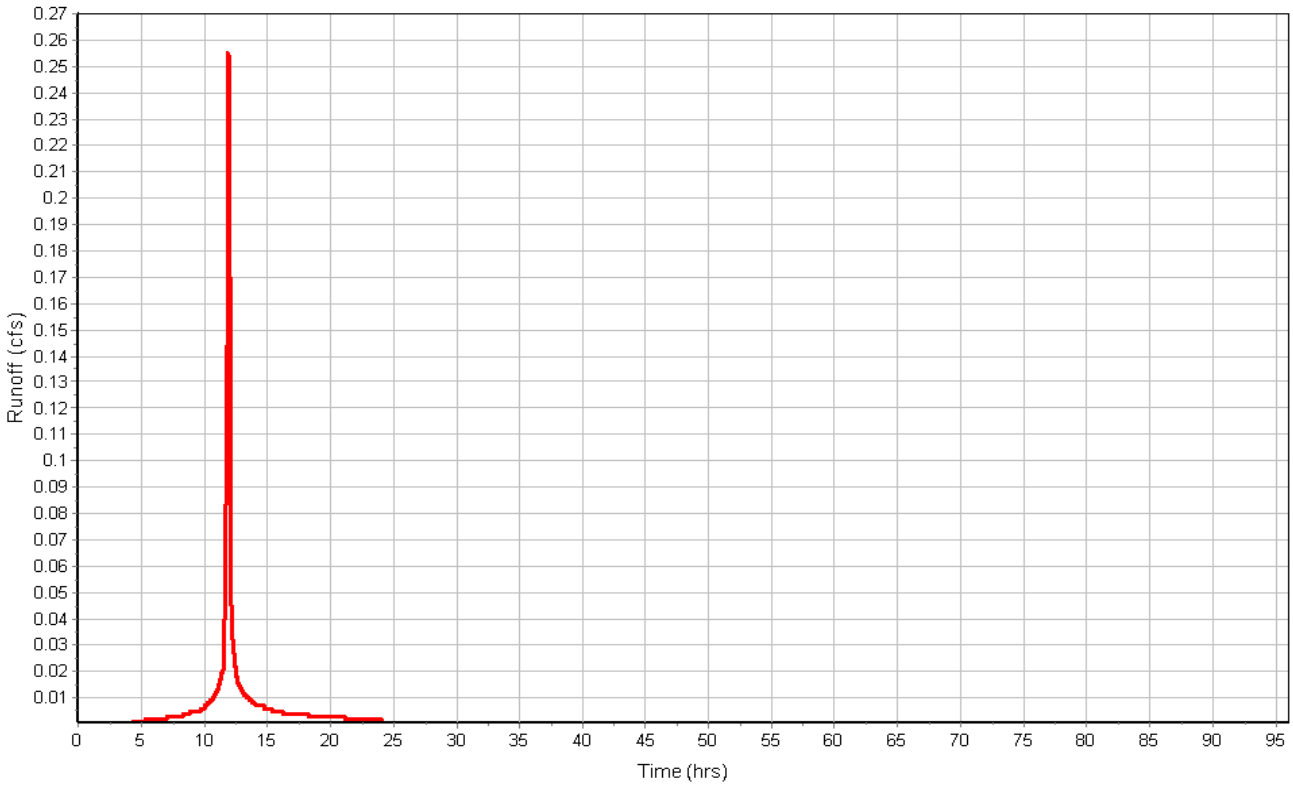
Total Rainfall (in)	1.66
Total Runoff (in)	1.43
Peak Runoff (cfs)	0.25
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_21_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_21_VACANT

Input Data

Area (ac) 0.44
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.44	B	58.00
Composite Area & Weighted CN	0.44		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	298	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	63.66	0.00	0.00

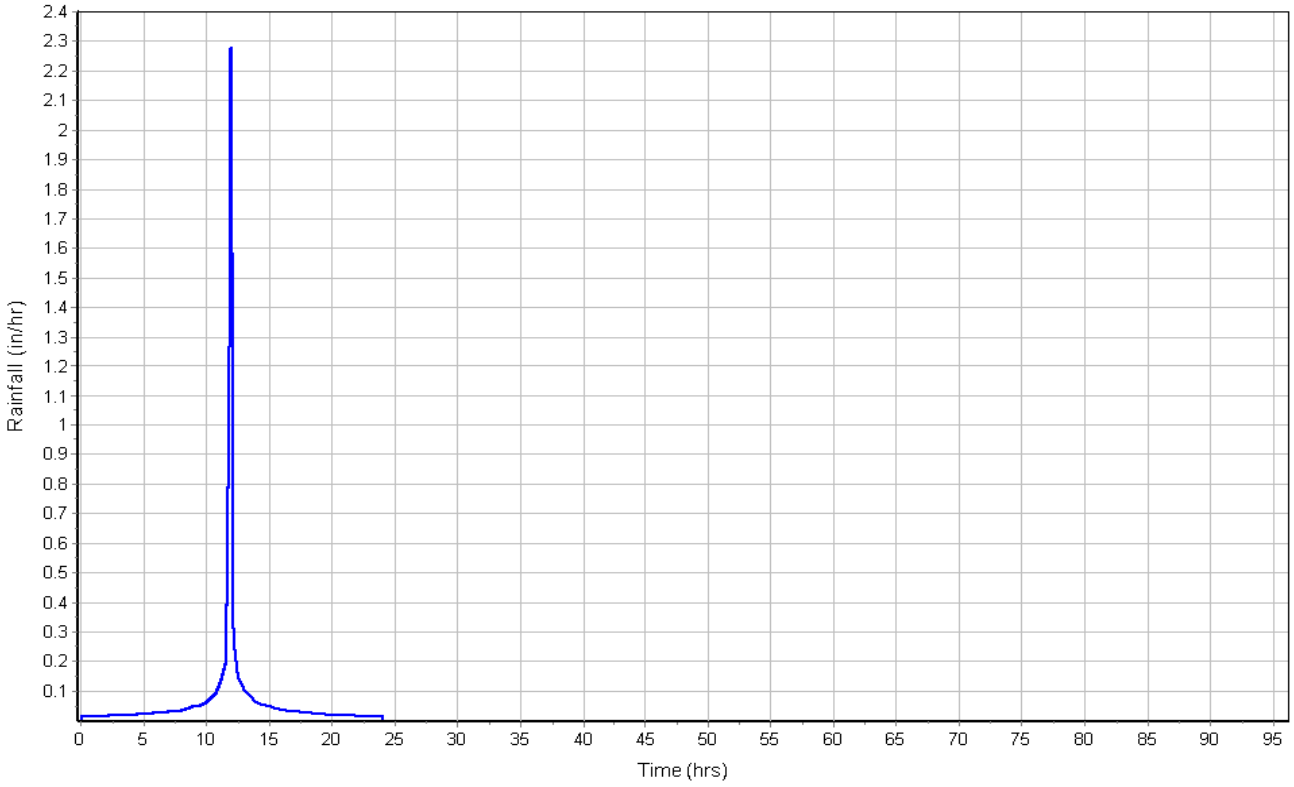
Total TOC (min) 63.66

Subbasin Runoff Results

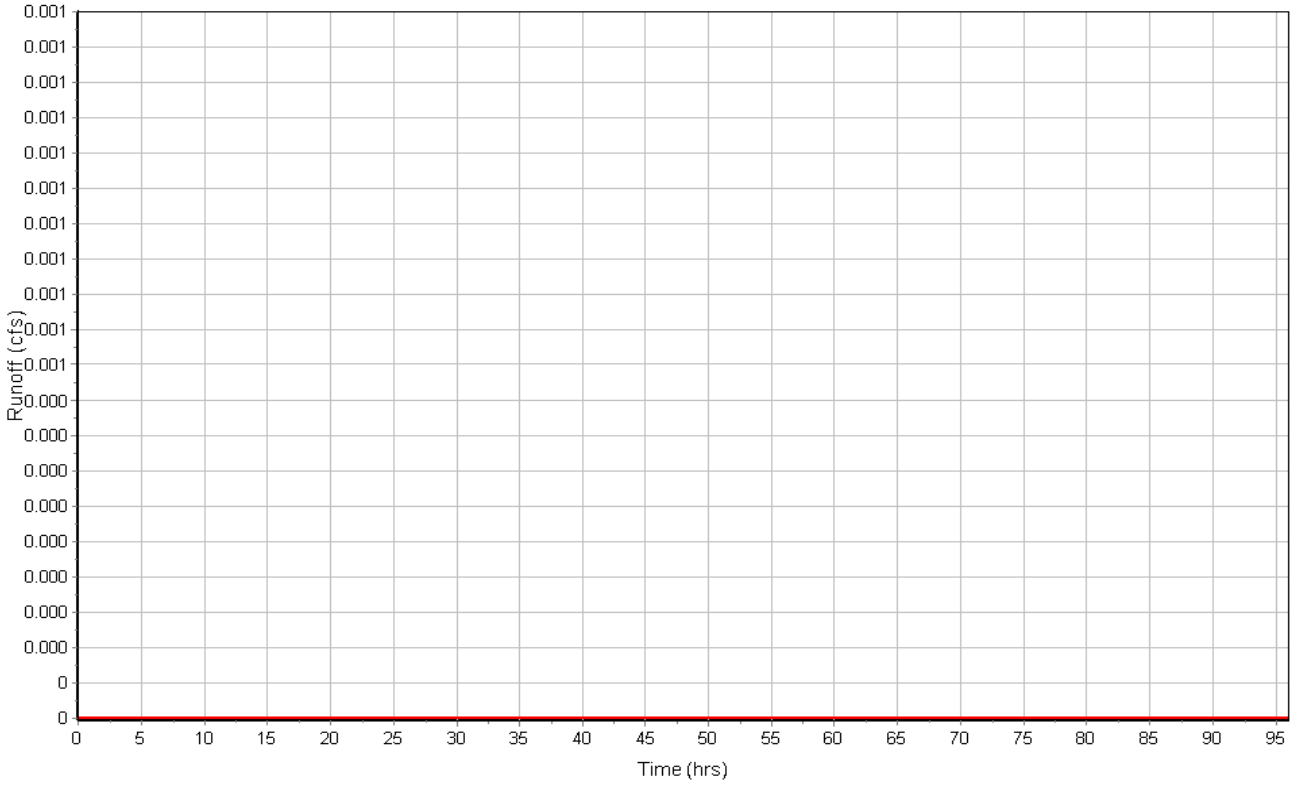
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 01:03:40

Subbasin : BASIN_21_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_22_ROW

Input Data

Area (ac) 0.14
Peak Rate Factor 484.00
Weighted Curve Number 98.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.14	B	98.00
Composite Area & Weighted CN	0.14		98.00

Time of Concentration

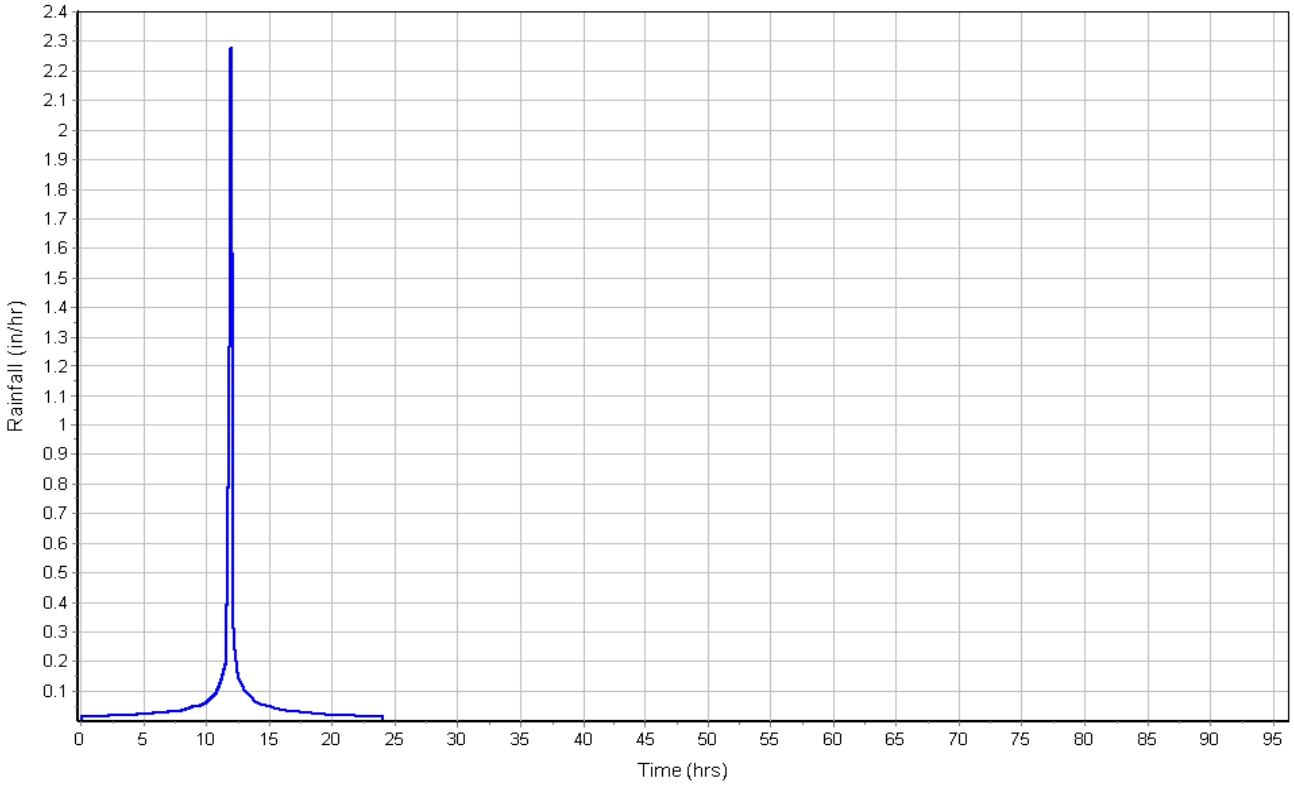
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

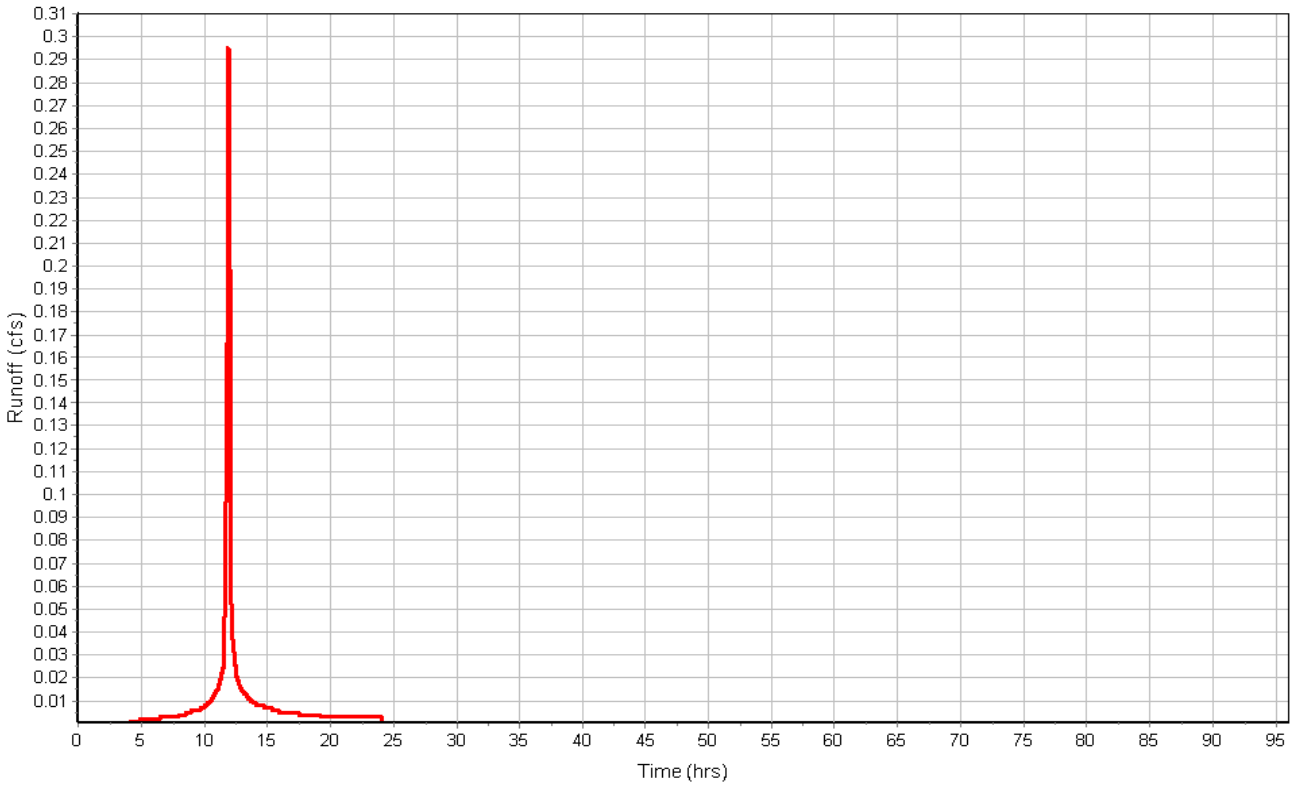
Total Rainfall (in) 1.66
Total Runoff (in) 1.43
Peak Runoff (cfs) 0.30
Weighted Curve Number 98.00
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : BASIN_22_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_22_VACANT

Input Data

Area (ac) 0.71
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.71	B	58.00
Composite Area & Weighted CN	0.71		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	226	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	51.02	0.00	0.00

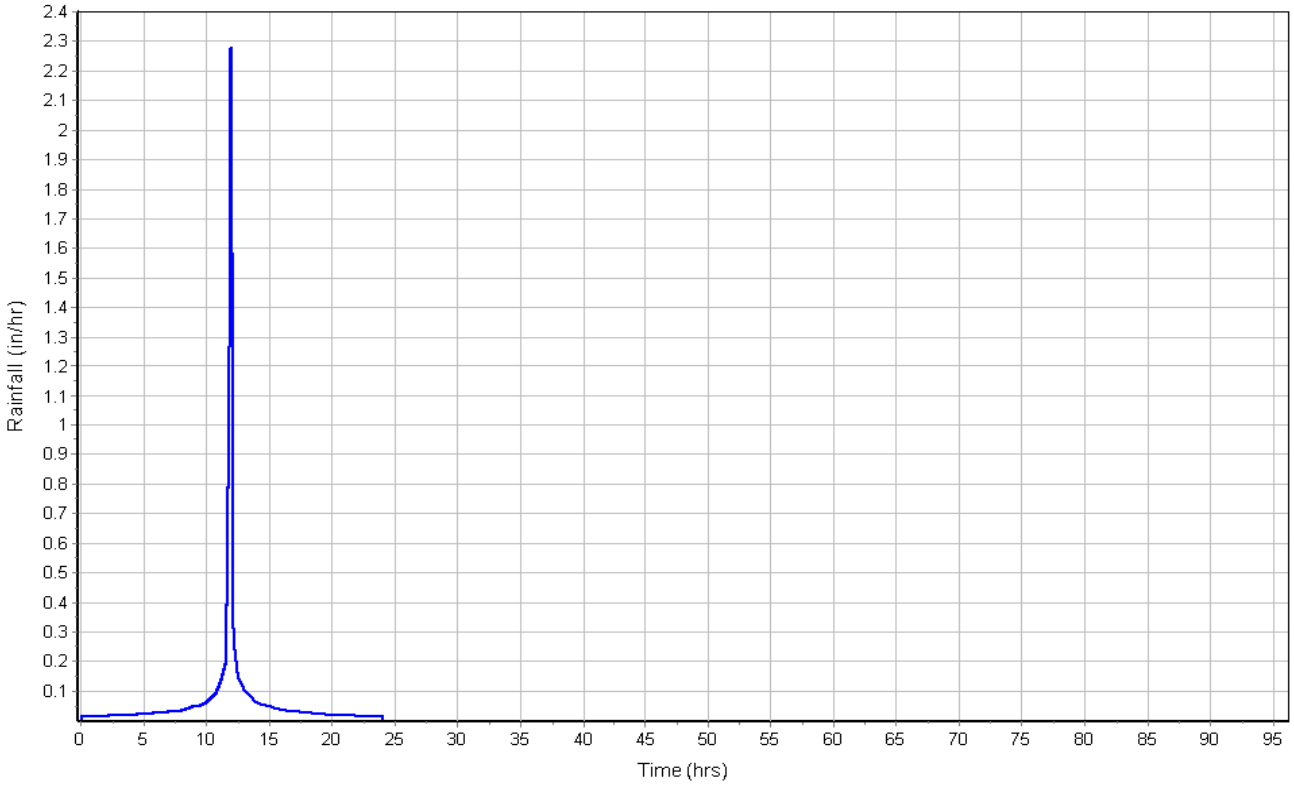
Total TOC (min) 51.02

Subbasin Runoff Results

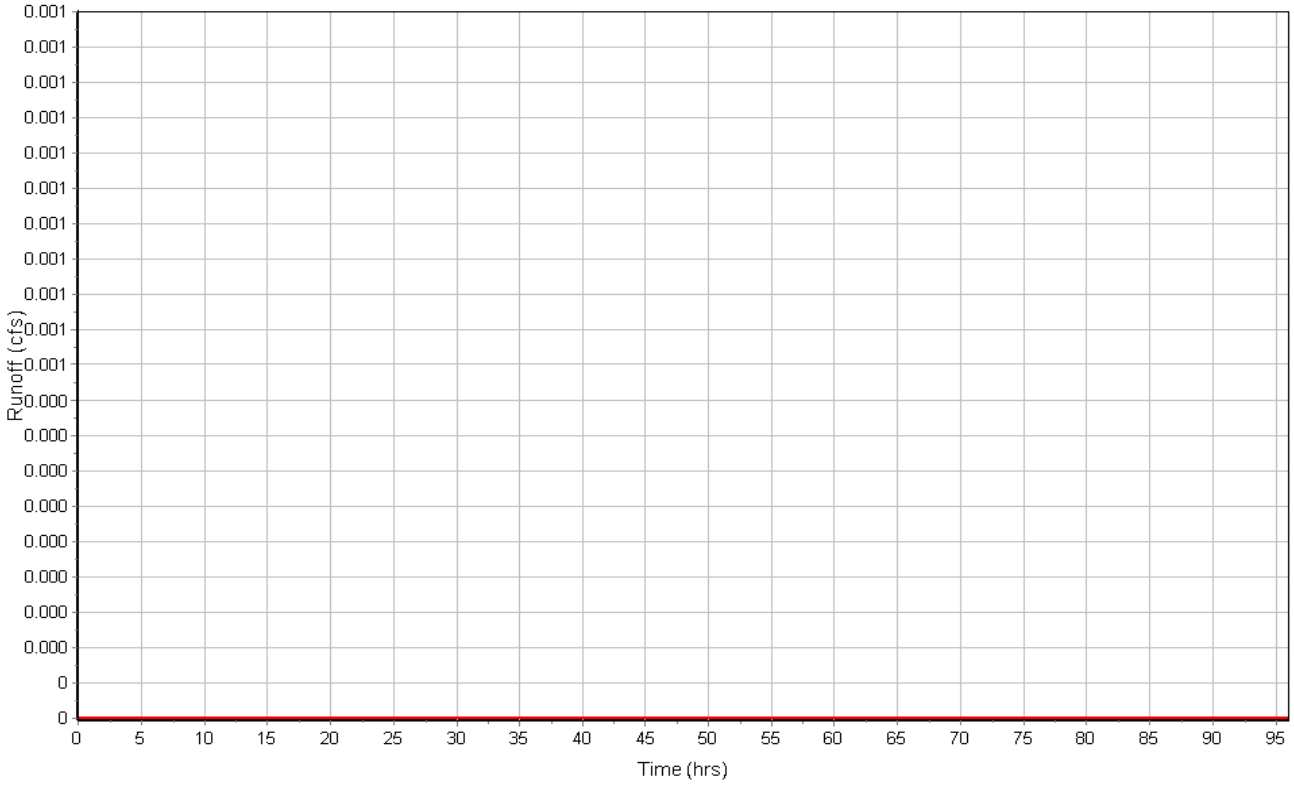
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:51:01

Subbasin : BASIN_22_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_23_ROW

Input Data

Area (ac)	0.14
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.14	B	98.00
Composite Area & Weighted CN	0.14		98.00

Time of Concentration

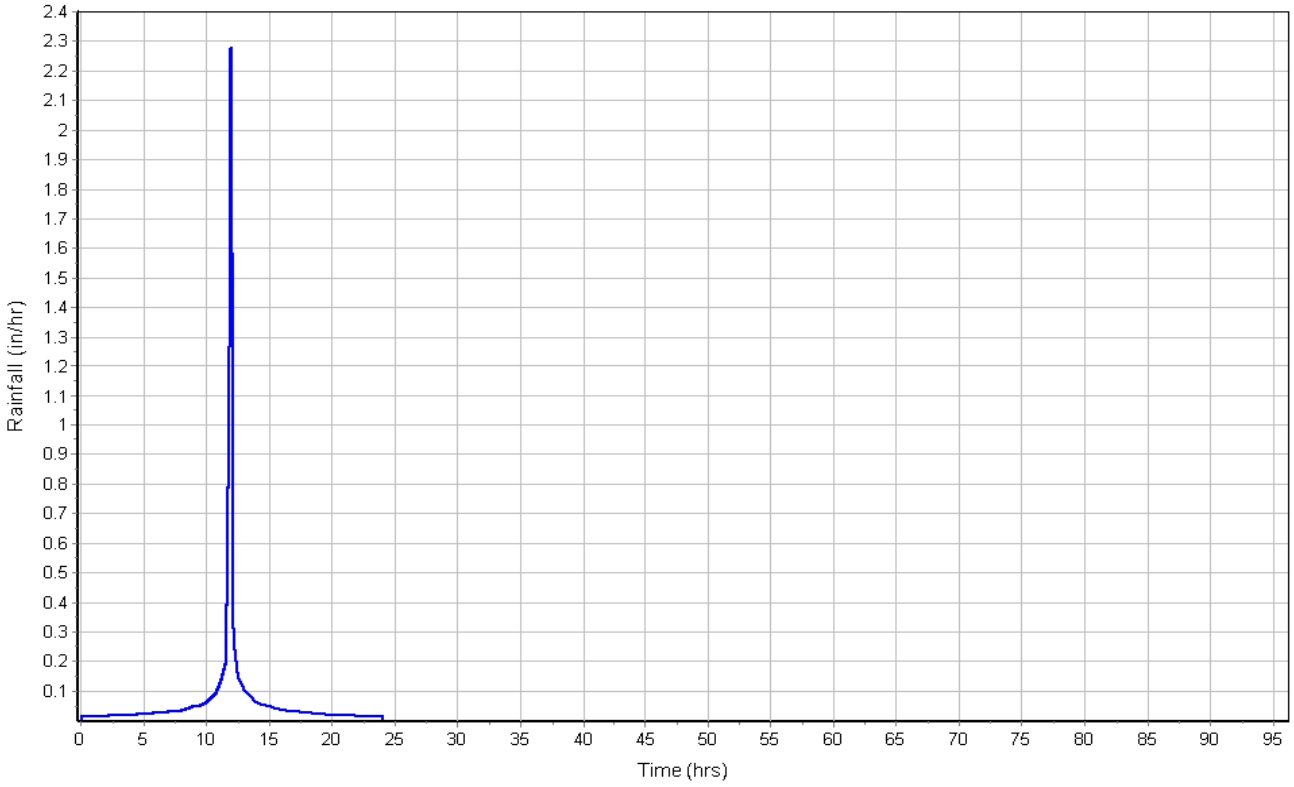
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

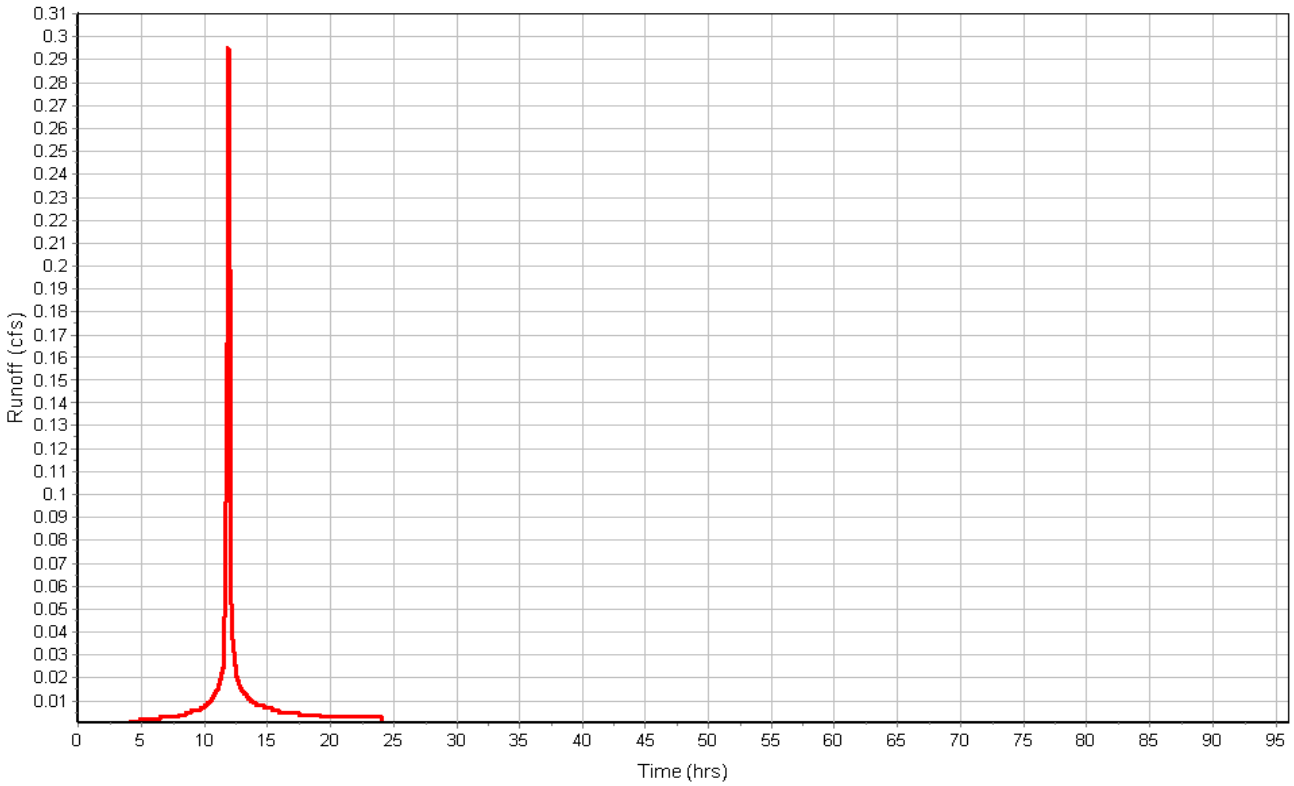
Total Rainfall (in)	1.66
Total Runoff (in)	1.43
Peak Runoff (cfs)	0.30
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_23_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_23_VACANT

Input Data

Area (ac) 0.63
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.63	B	58.00
Composite Area & Weighted CN	0.63		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	209	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	47.93	0.00	0.00

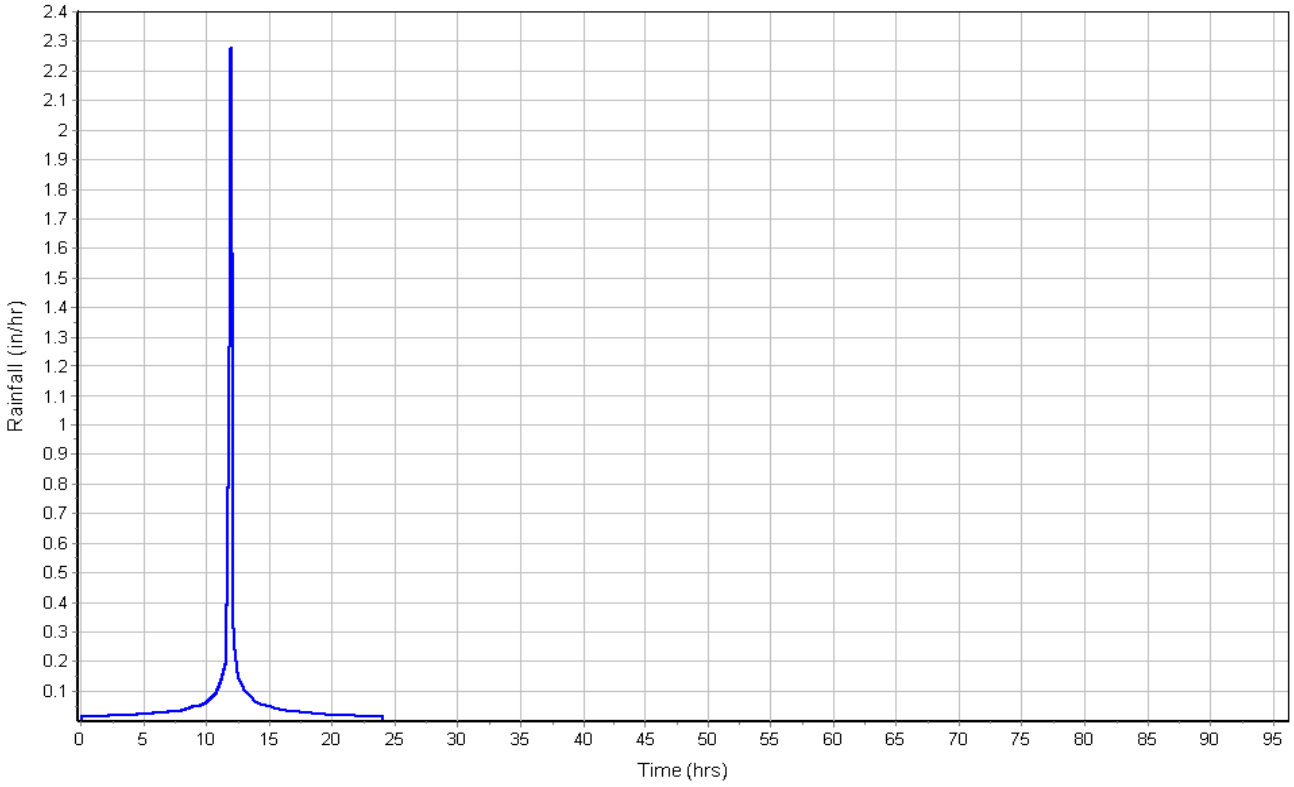
Total TOC (min) 47.93

Subbasin Runoff Results

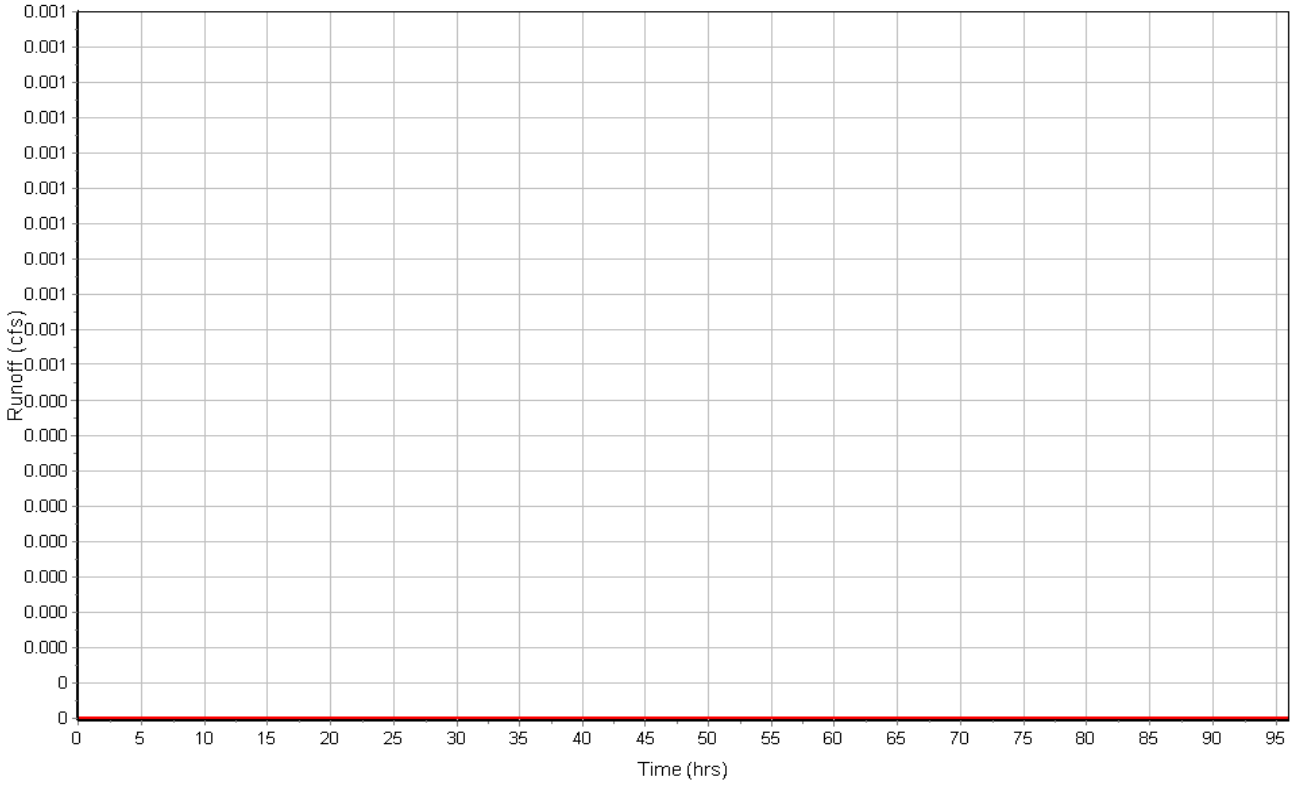
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:47:56

Subbasin : BASIN_23_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_24_ROW

Input Data

Area (ac)	0.11
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.11	B	98.00
Composite Area & Weighted CN	0.11		98.00

Time of Concentration

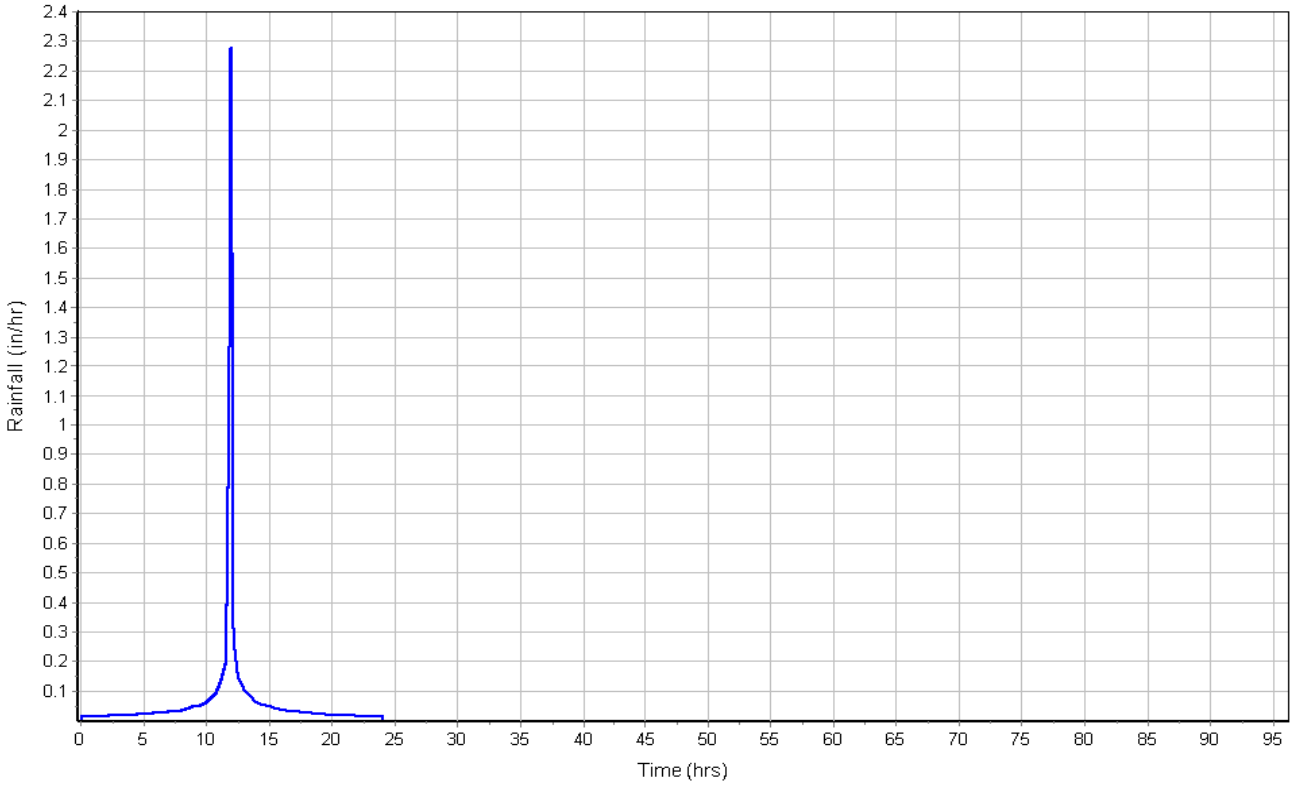
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

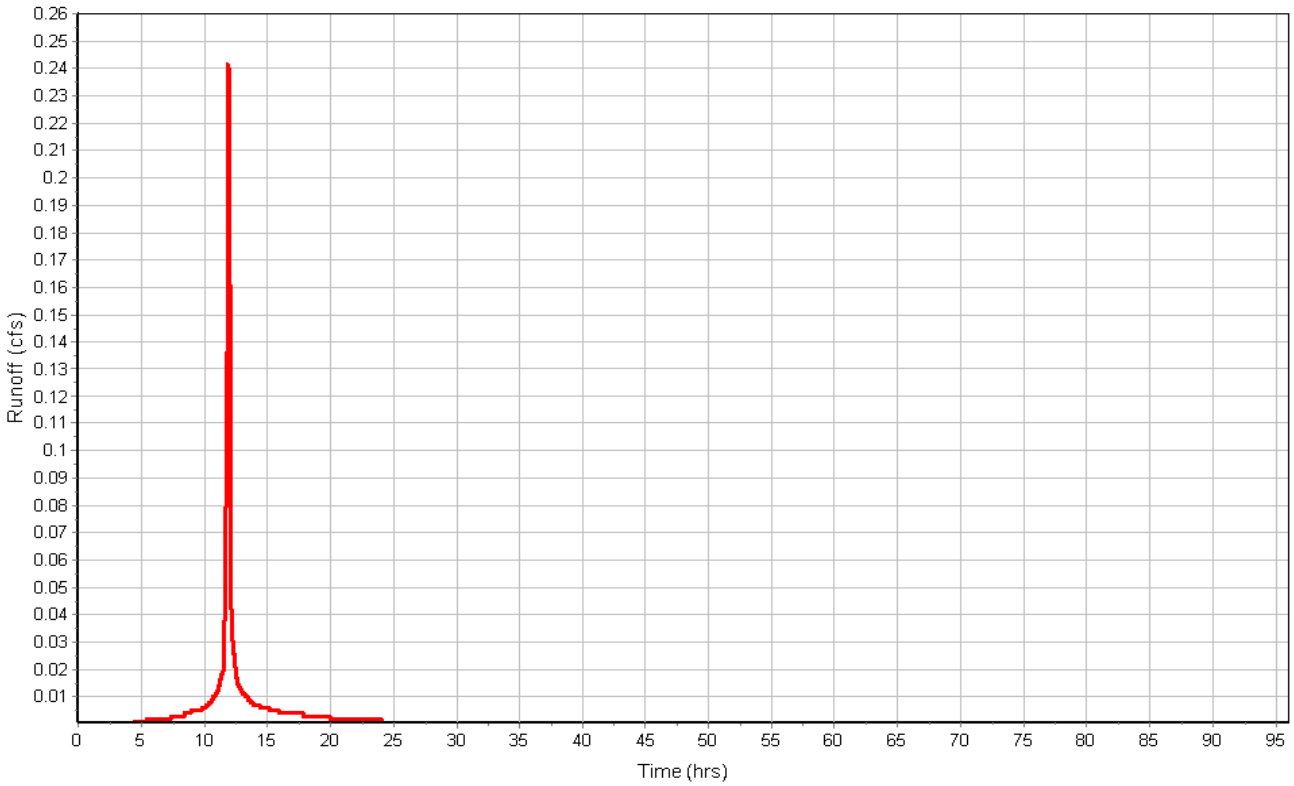
Total Rainfall (in)	1.66
Total Runoff (in)	1.43
Peak Runoff (cfs)	0.24
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_24_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_24_VACANT

Input Data

Area (ac) 0.29
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.29	B	58.00
Composite Area & Weighted CN	0.29		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	257	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	56.55	0.00	0.00

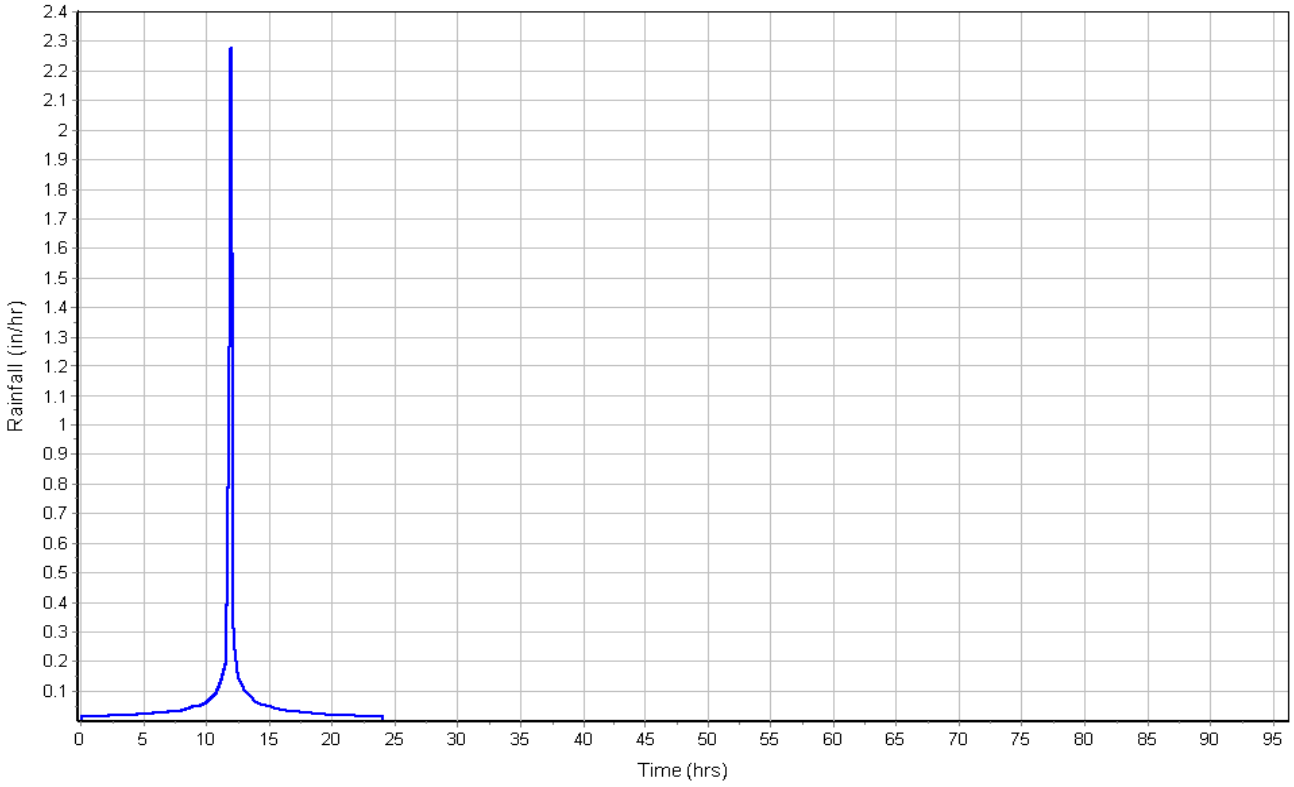
Total TOC (min) 56.55

Subbasin Runoff Results

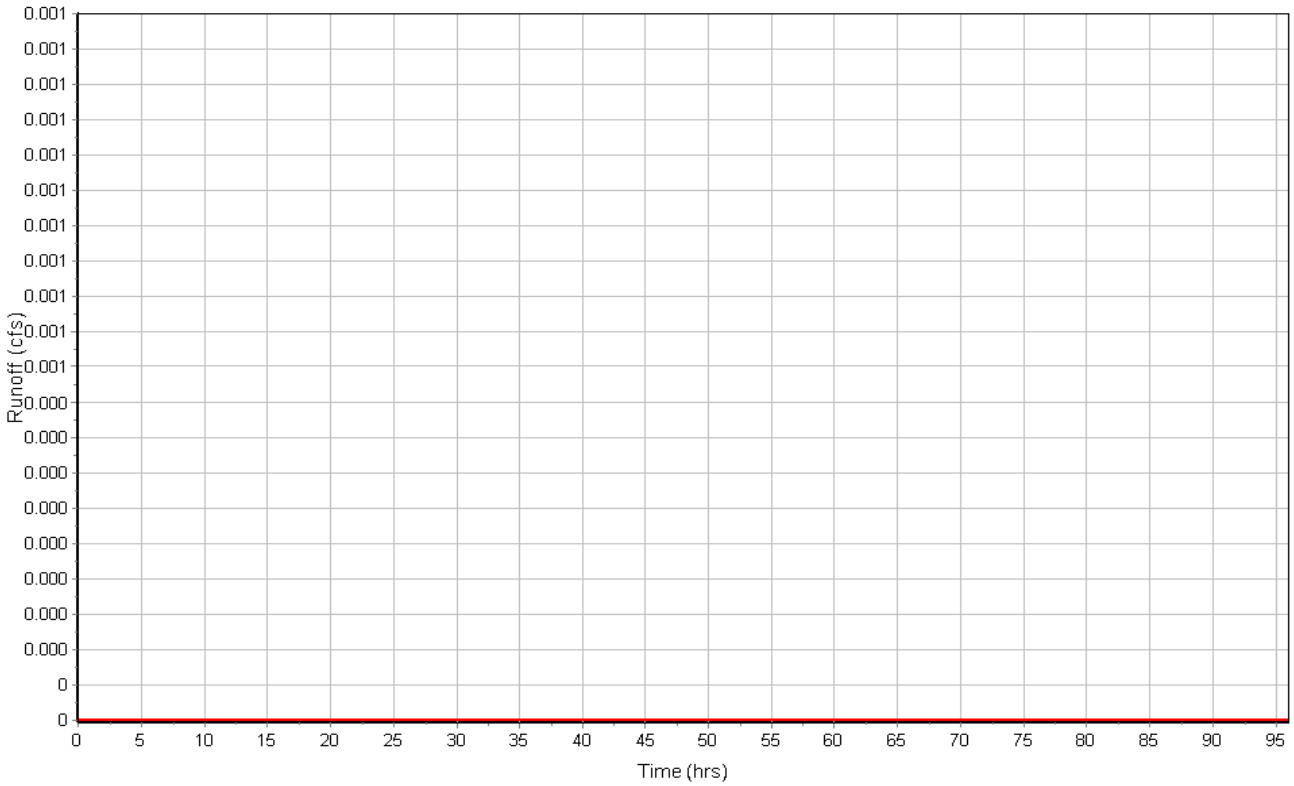
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:56:33

Subbasin : BASIN_24_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_25_ROW

Input Data

Area (ac)	0.13
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.13	B	98.00
Composite Area & Weighted CN	0.13		98.00

Time of Concentration

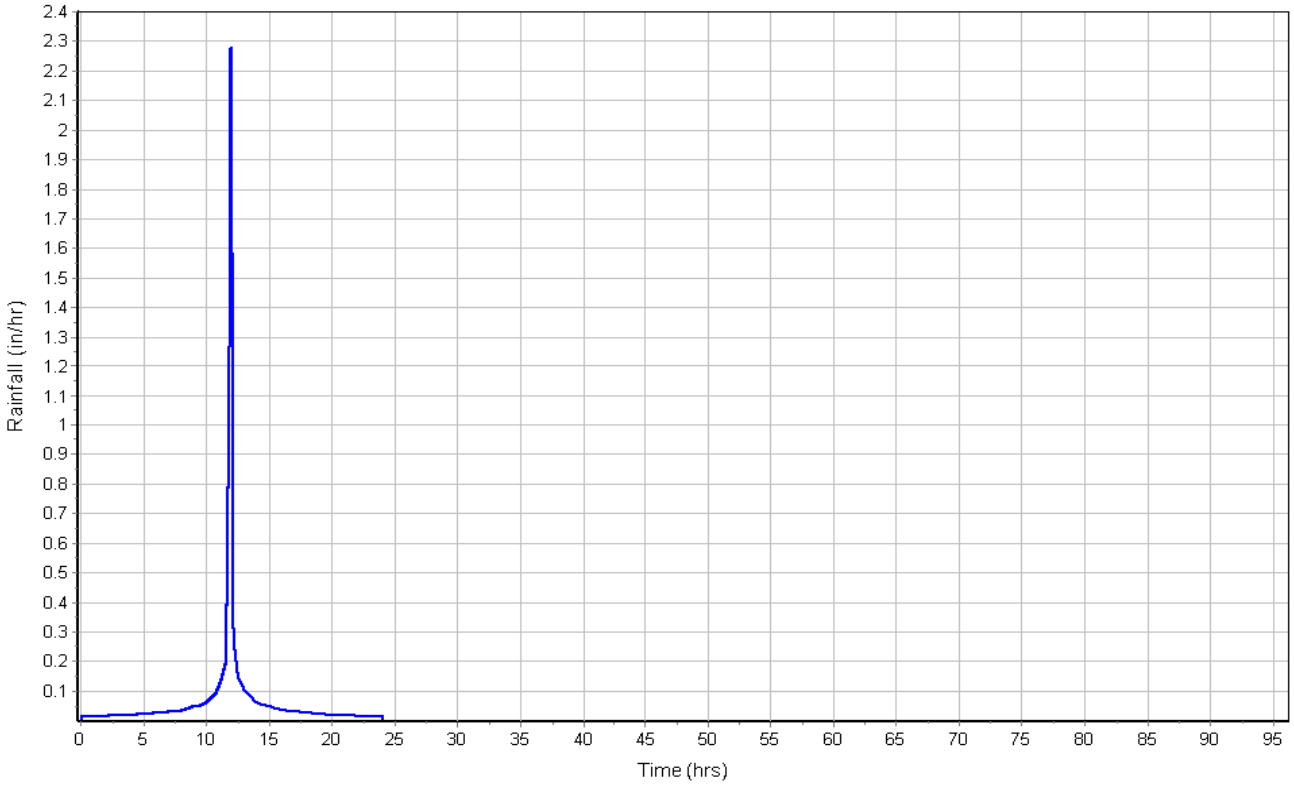
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

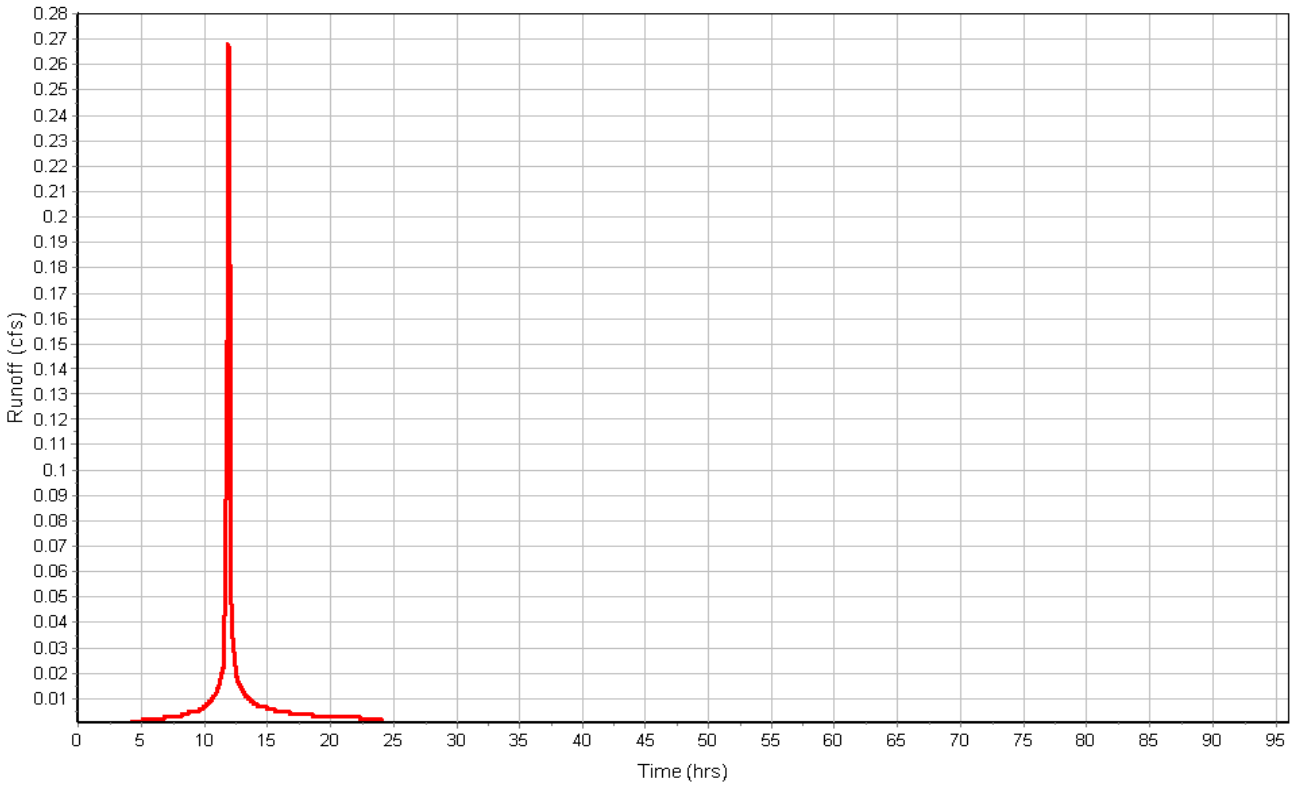
Total Rainfall (in)	1.66
Total Runoff (in)	1.43
Peak Runoff (cfs)	0.27
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_25_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_25_VACANT

Input Data

Area (ac) 0.30
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.30	B	58.00
Composite Area & Weighted CN	0.30		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	238	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	53.18	0.00	0.00

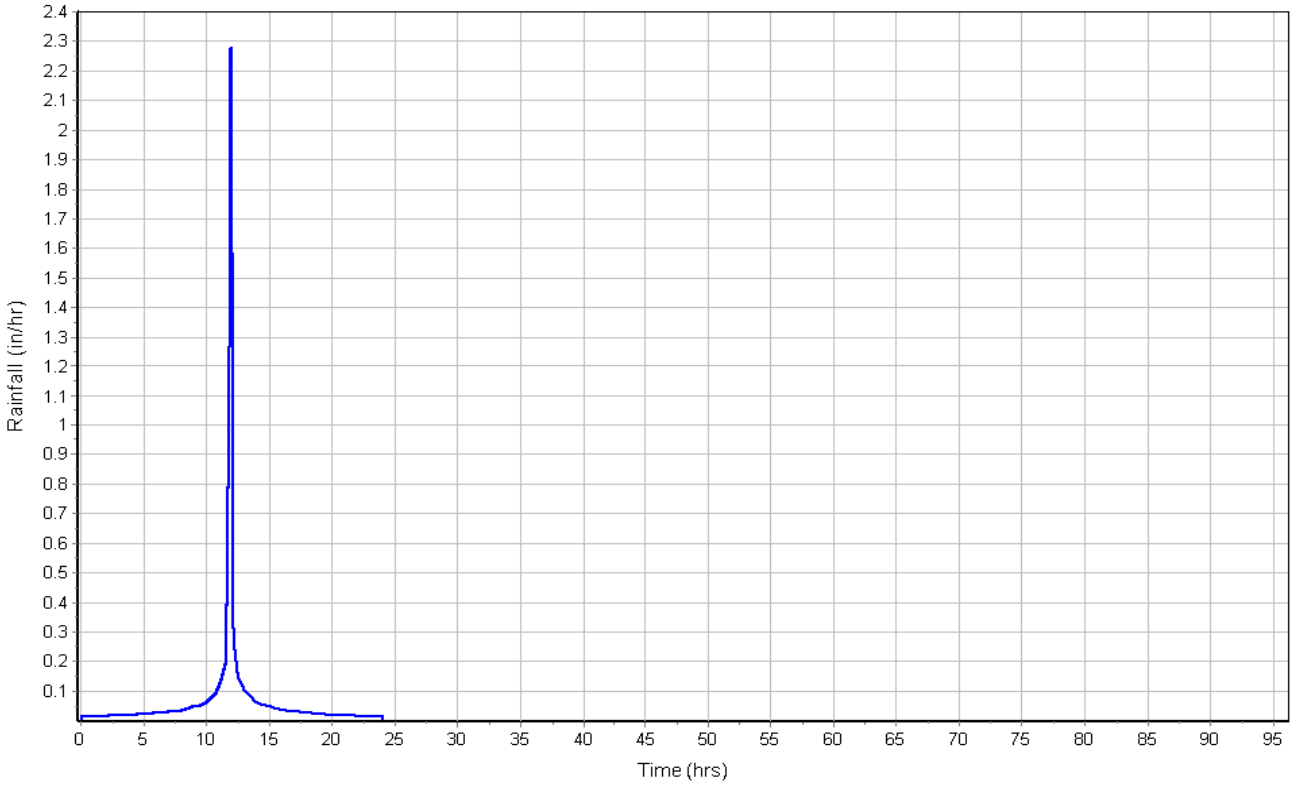
Total TOC (min) 53.18

Subbasin Runoff Results

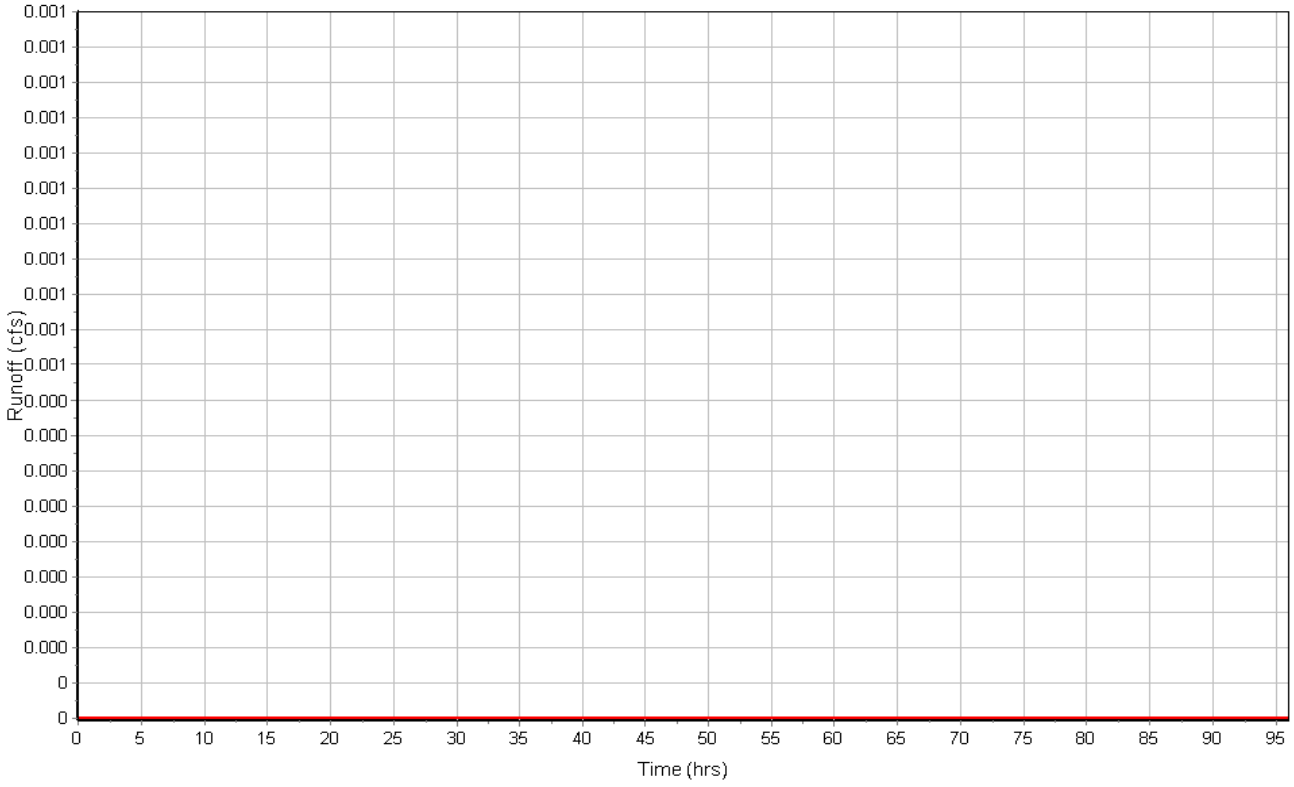
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:53:11

Subbasin : BASIN_25_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_26_ROW

Input Data

Area (ac)	0.17
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.17	B	98.00
Composite Area & Weighted CN	0.17		98.00

Time of Concentration

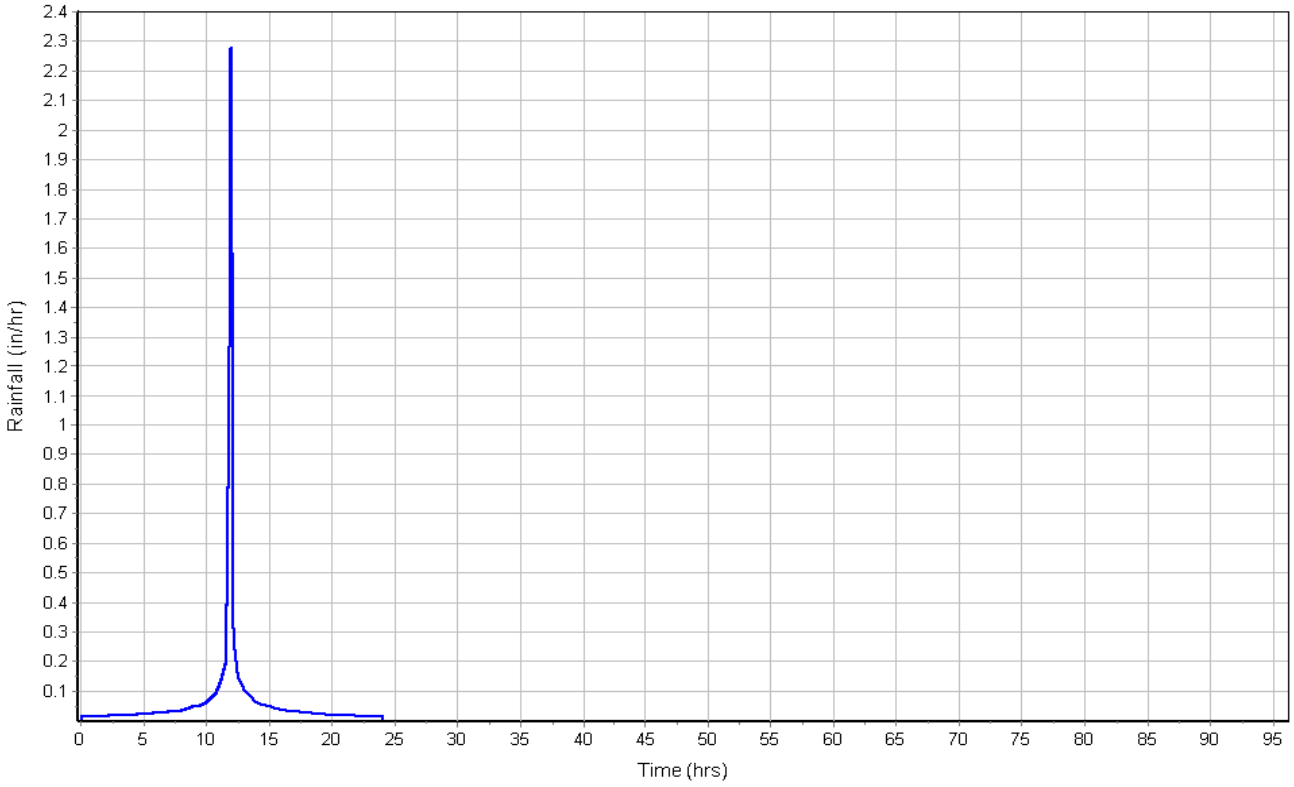
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

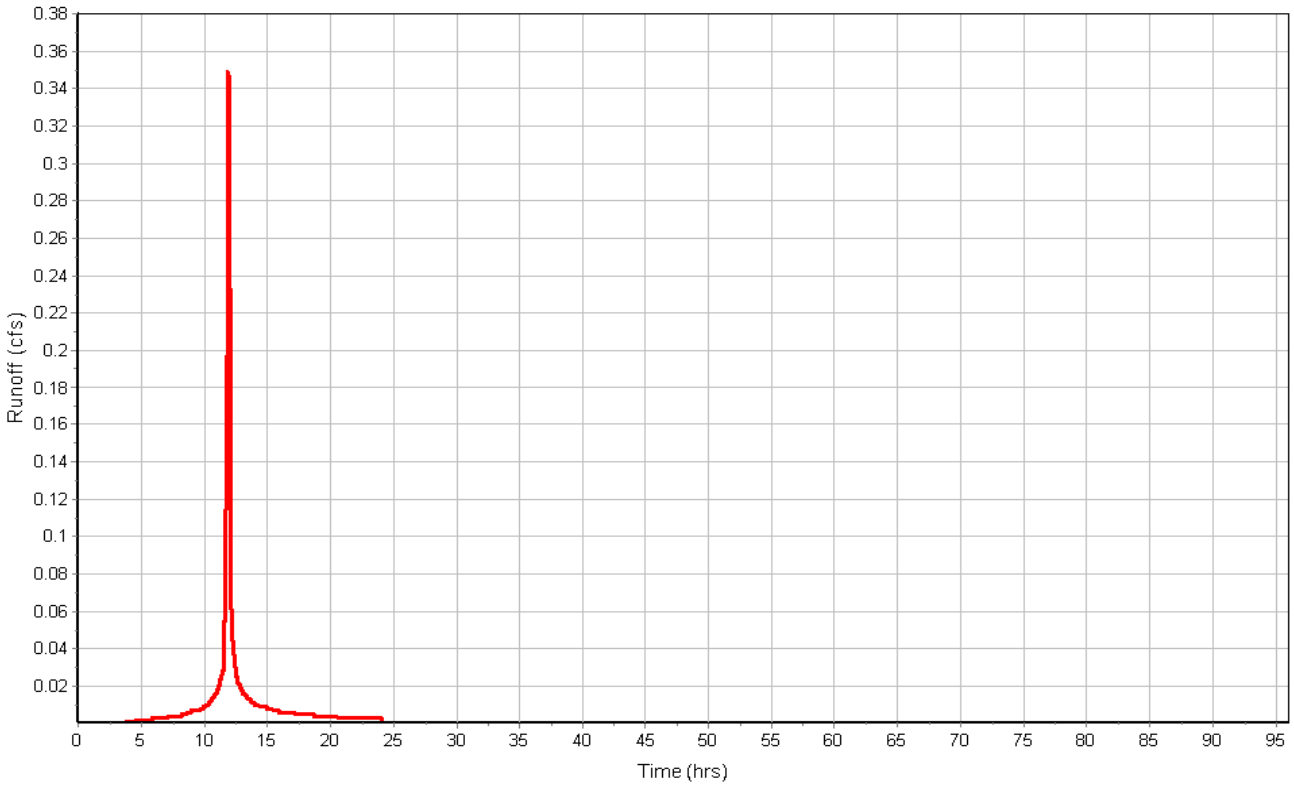
Total Rainfall (in)	1.66
Total Runoff (in)	1.43
Peak Runoff (cfs)	0.35
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_26_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_26_VACANT

Input Data

Area (ac) 0.41
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.41	B	58.00
Composite Area & Weighted CN	0.41		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	236	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	52.82	0.00	0.00

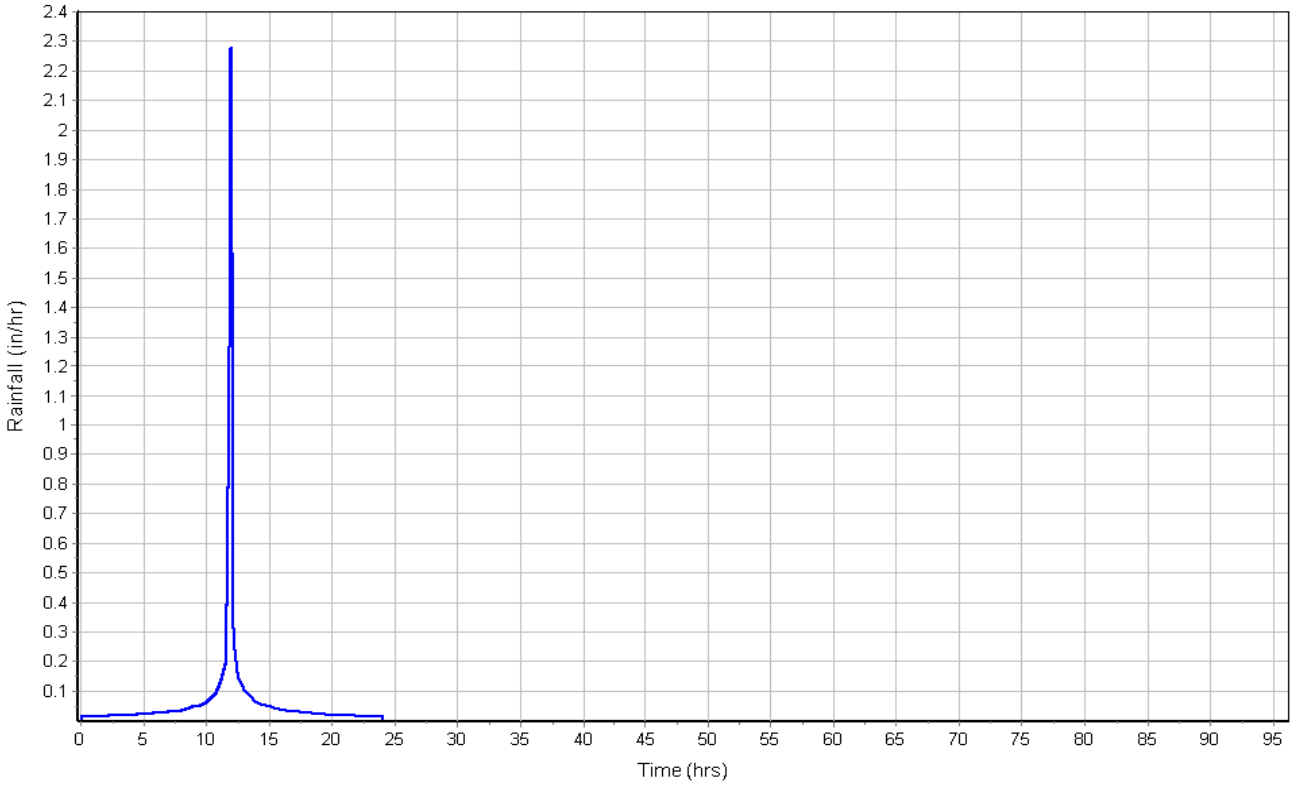
Total TOC (min) 52.82

Subbasin Runoff Results

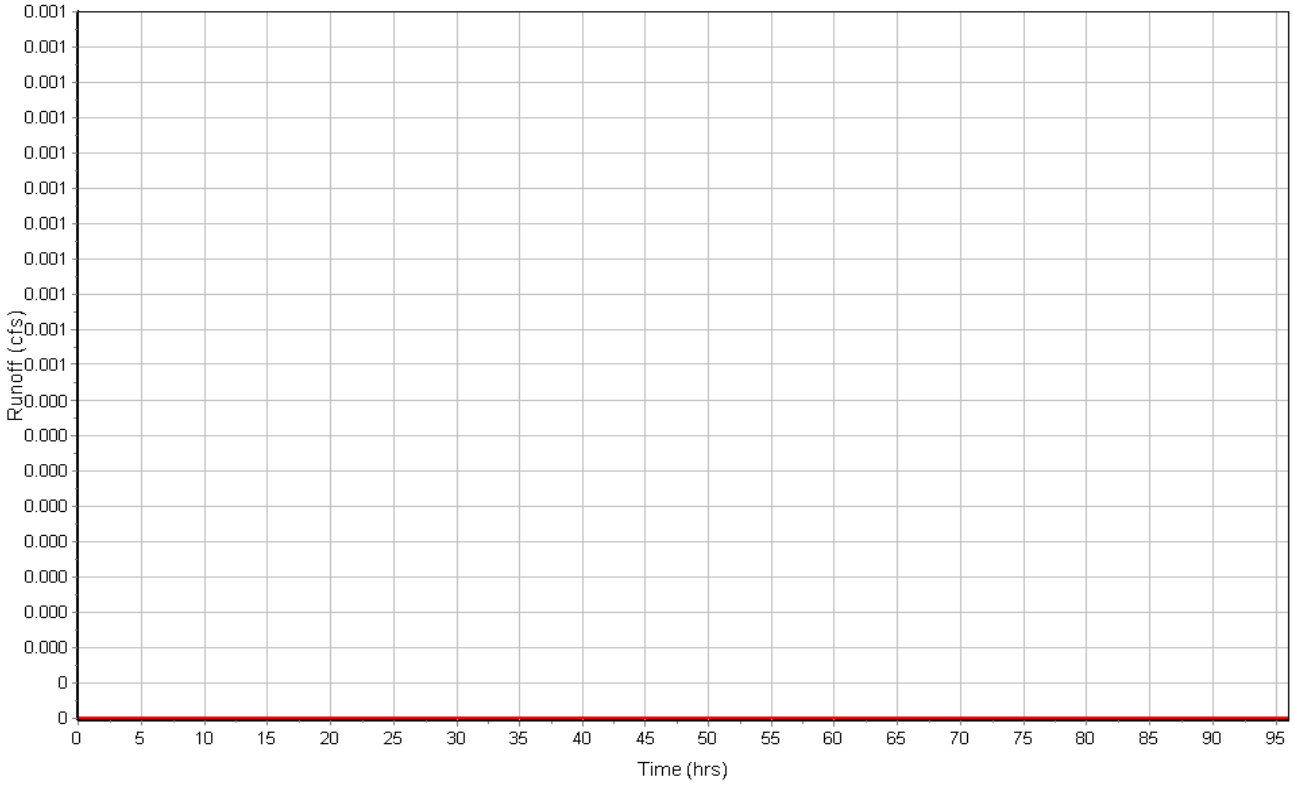
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:52:49

Subbasin : BASIN_26_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_27_ROW

Input Data

Area (ac)	0.05
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.05	B	98.00
Composite Area & Weighted CN	0.05		98.00

Time of Concentration

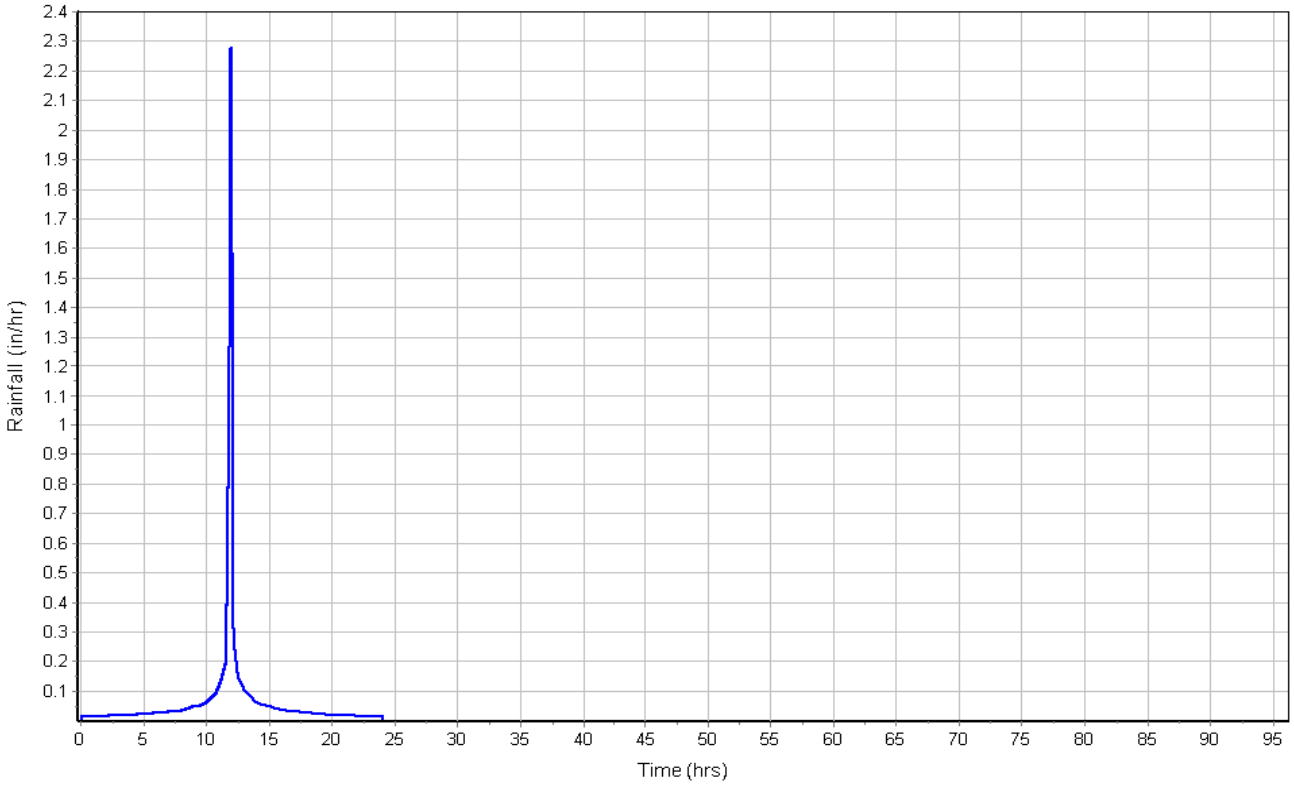
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

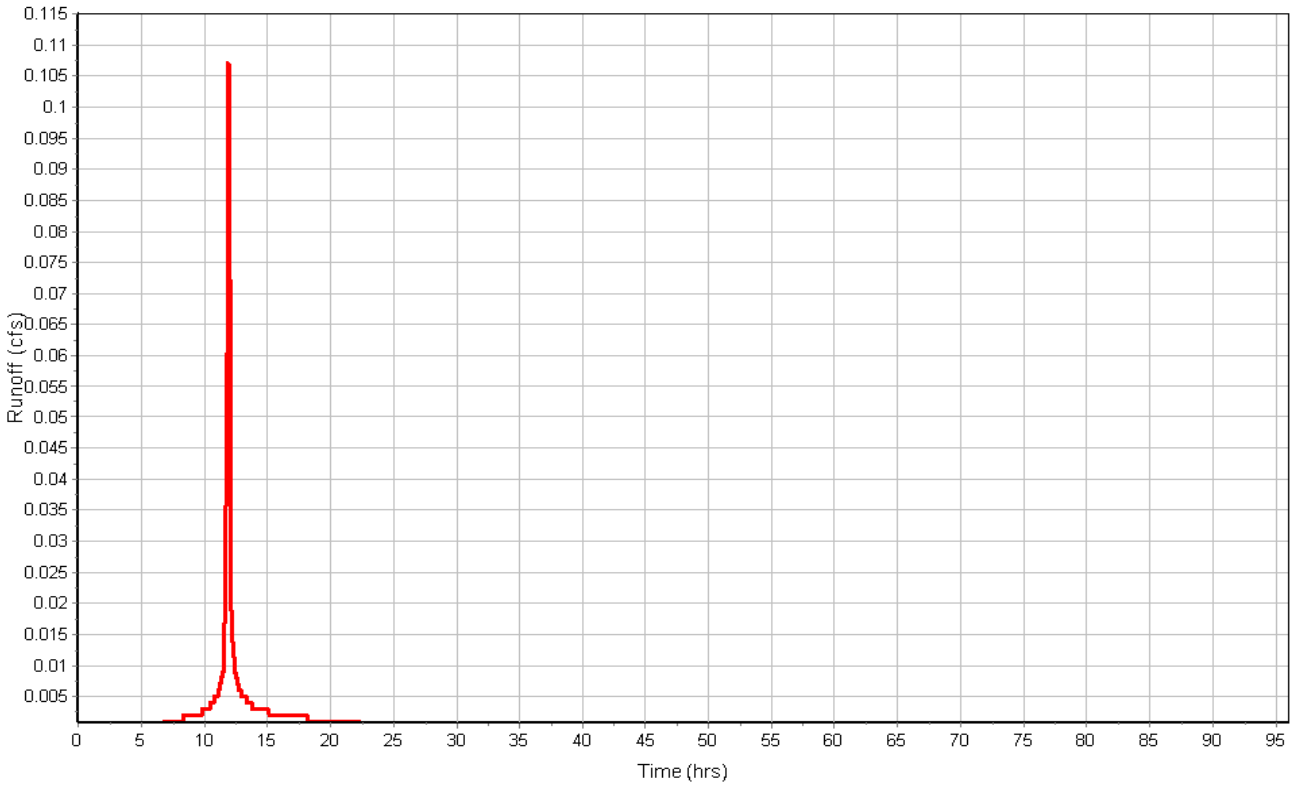
Total Rainfall (in)	1.66
Total Runoff (in)	1.36
Peak Runoff (cfs)	0.11
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_27_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_27_VACANT

Input Data

Area (ac) 0.01
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.01	B	58.00
Composite Area & Weighted CN	0.01		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	27	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.05	0.00	0.00
Computed Flow Time (min) :	9.32	0.00	0.00

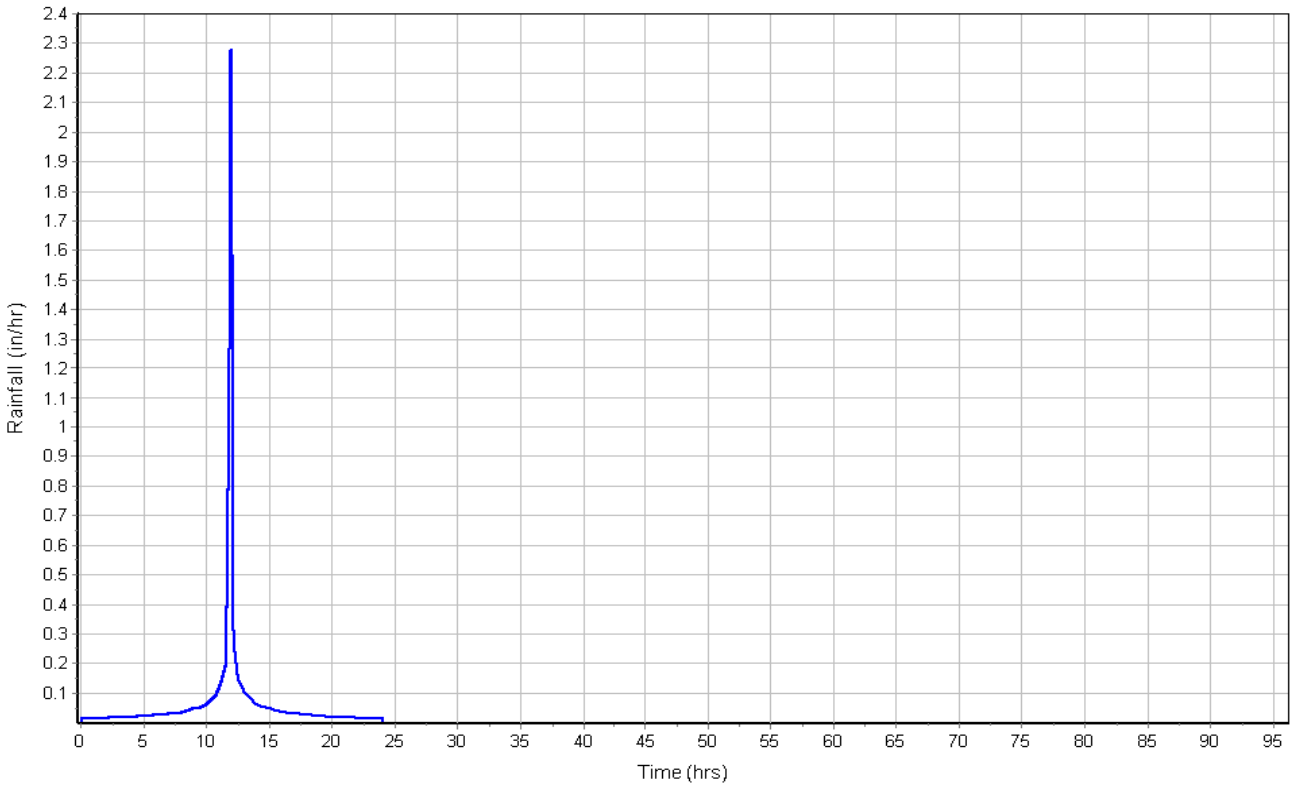
Total TOC (min) 9.32

Subbasin Runoff Results

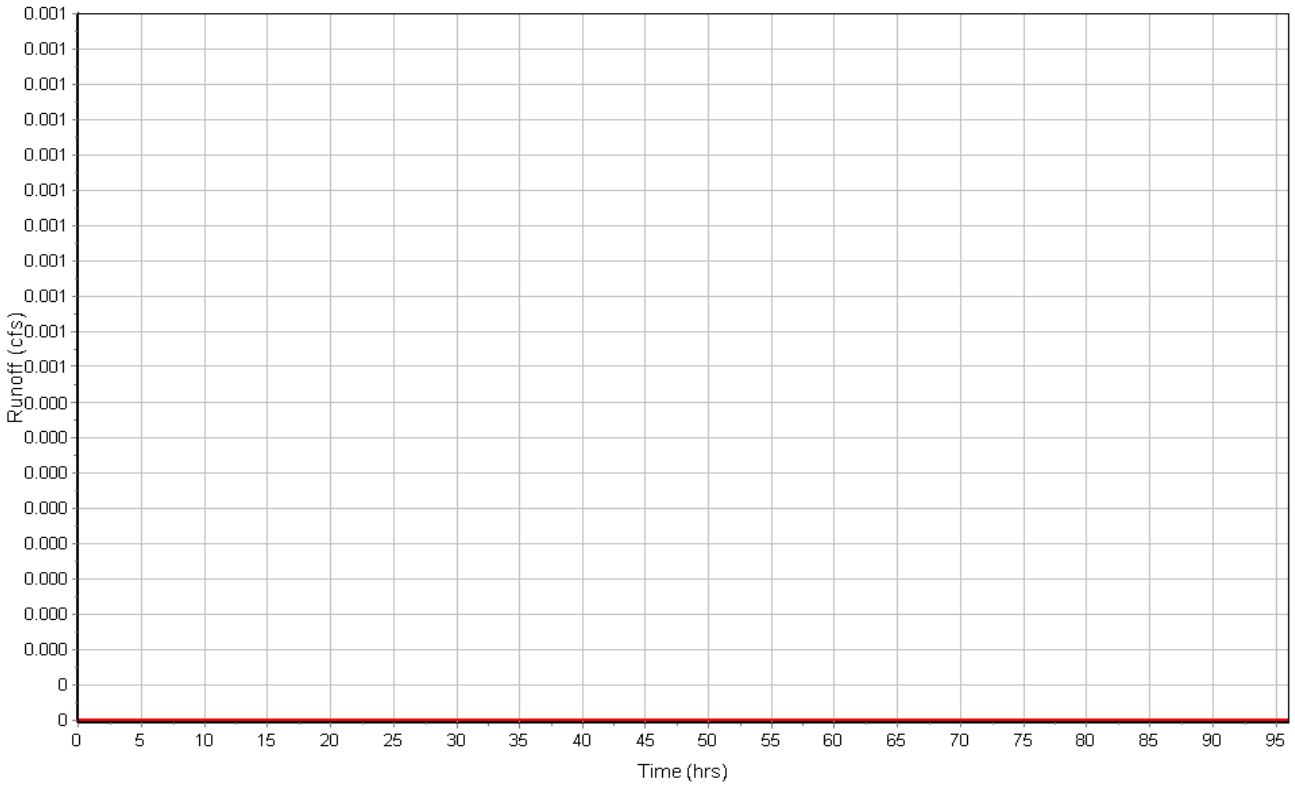
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:09:19

Subbasin : BASIN_27_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_28_ROW

Input Data

Area (ac)	0.12
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.12	B	98.00
Composite Area & Weighted CN	0.12		98.00

Time of Concentration

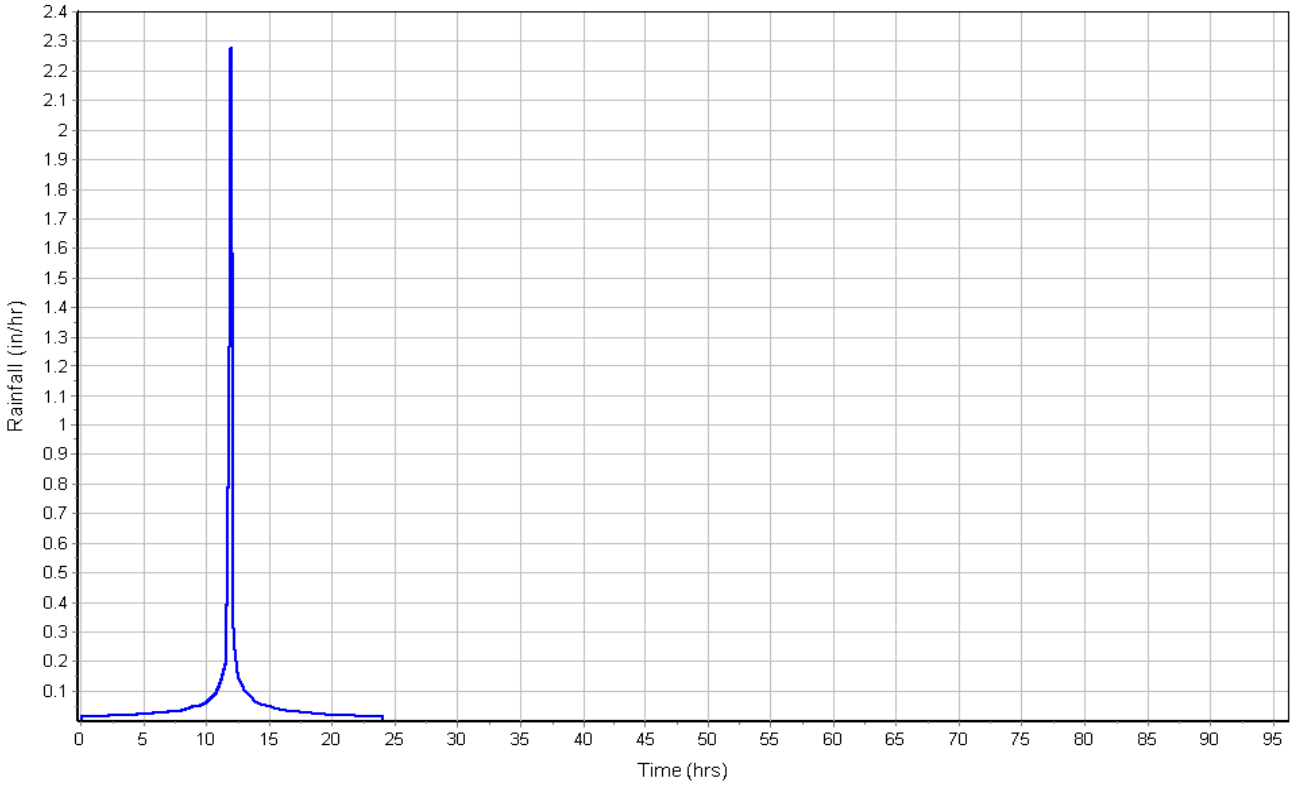
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

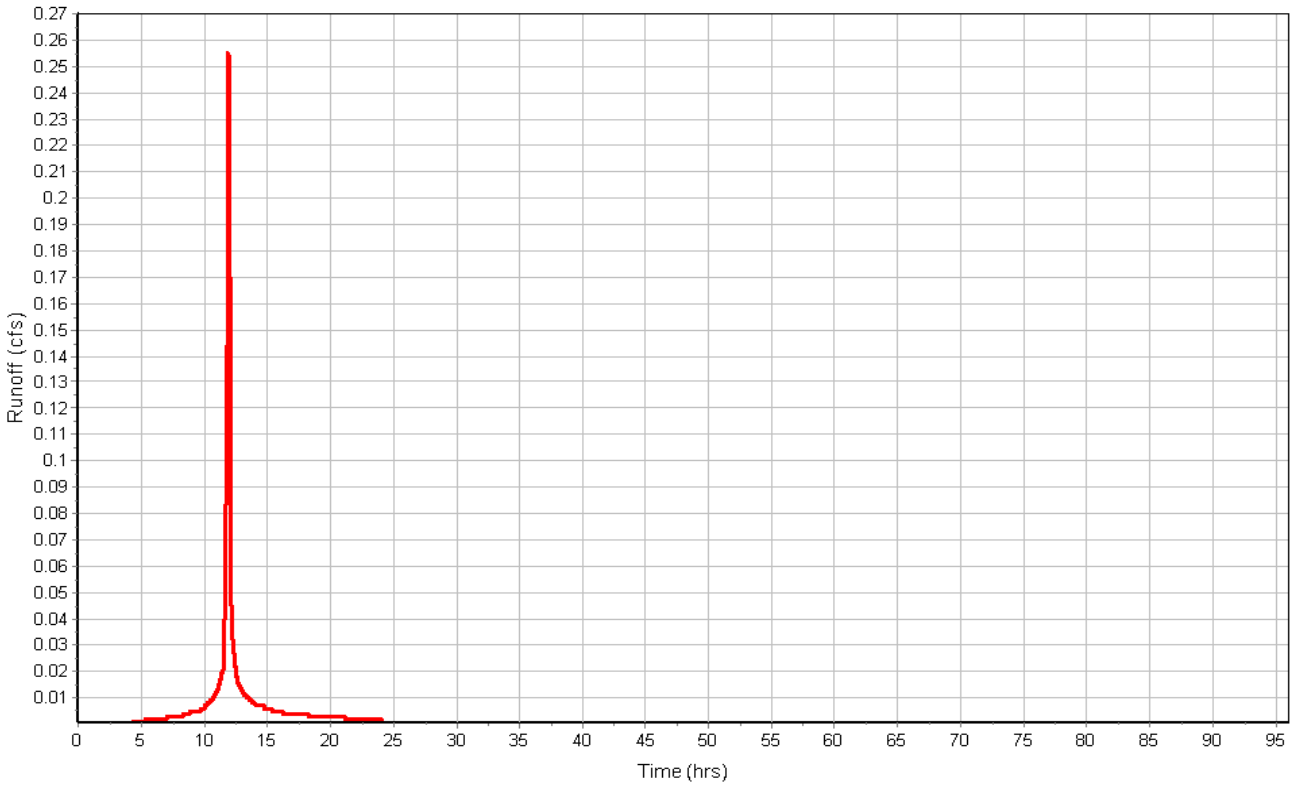
Total Rainfall (in)	1.66
Total Runoff (in)	1.43
Peak Runoff (cfs)	0.25
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_28_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_28_VACANT

Input Data

Area (ac) 0.46
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.46	B	58.00
Composite Area & Weighted CN	0.46		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	225	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	50.84	0.00	0.00

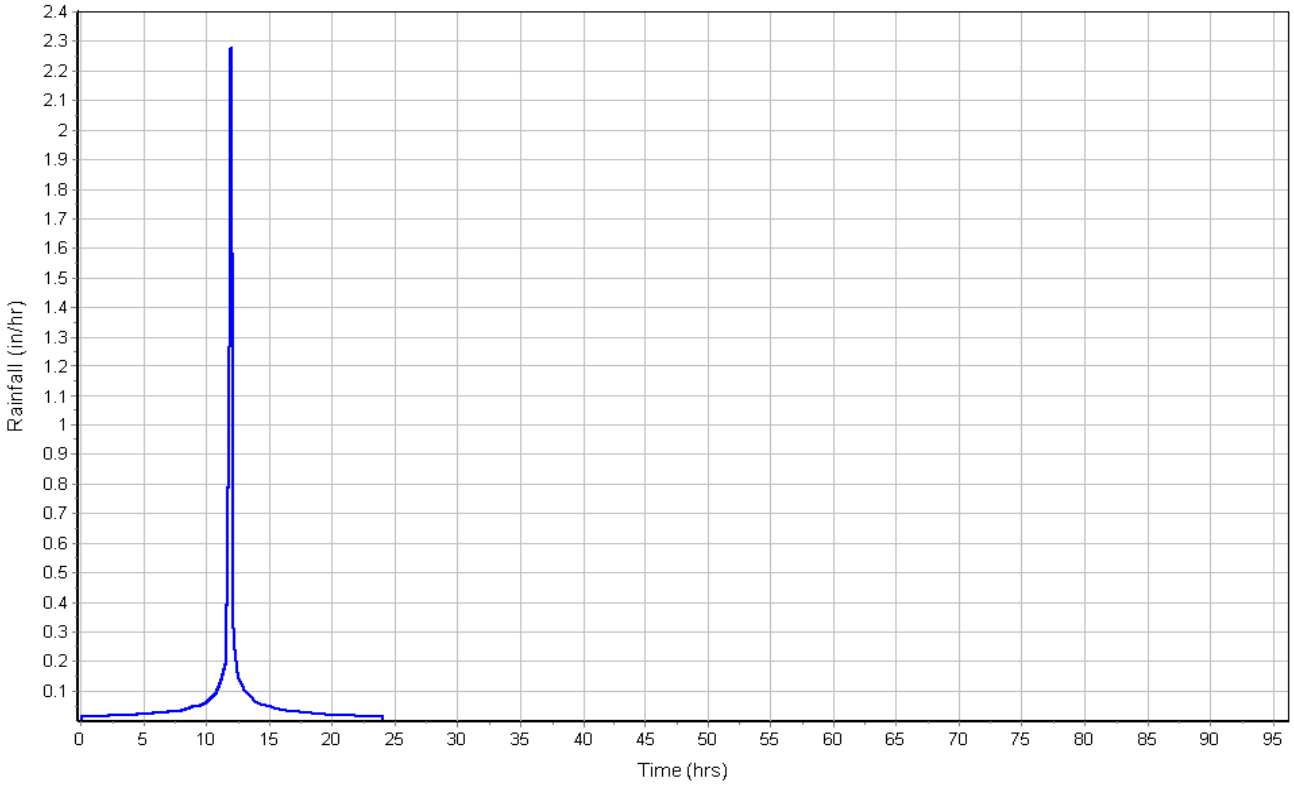
Total TOC (min) 50.84

Subbasin Runoff Results

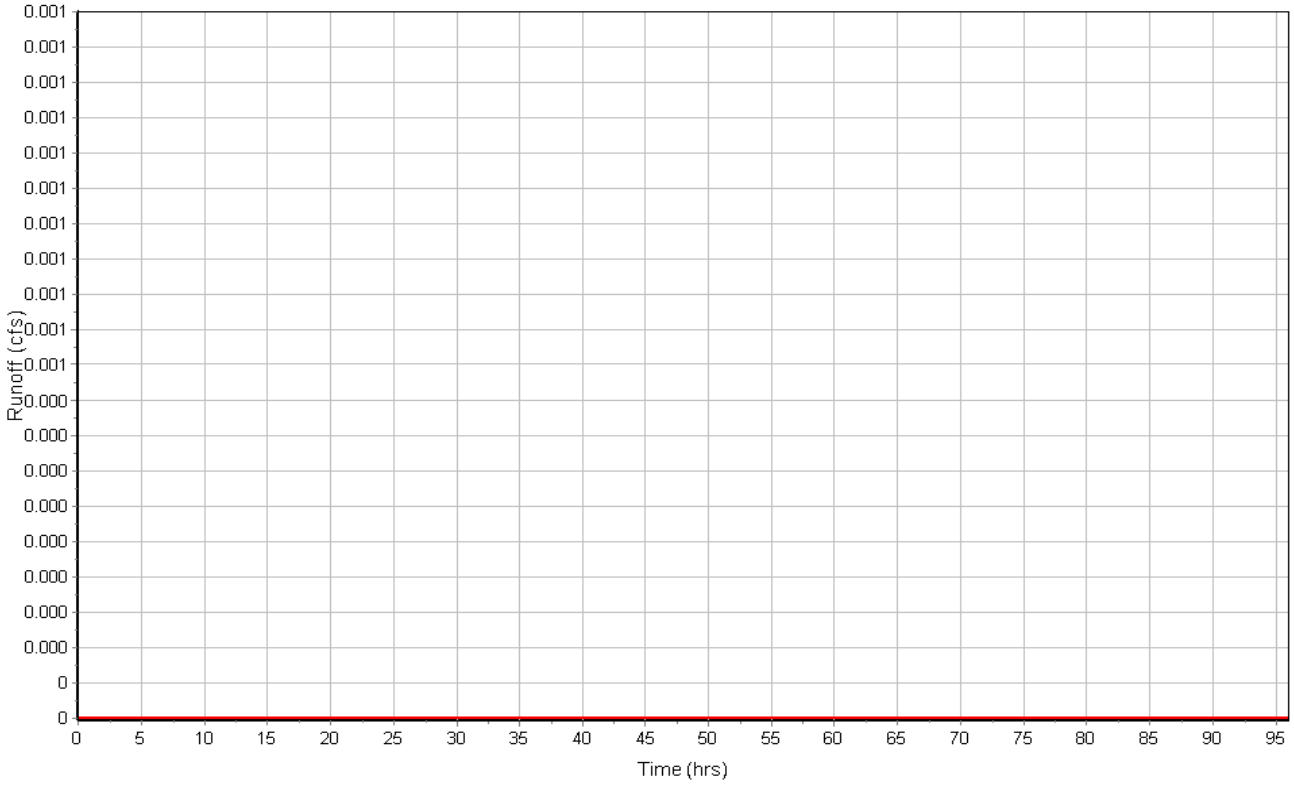
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:50:50

Subbasin : BASIN_28_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_29_ROW

Input Data

Area (ac)	0.12
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.12	B	98.00
Composite Area & Weighted CN	0.12		98.00

Time of Concentration

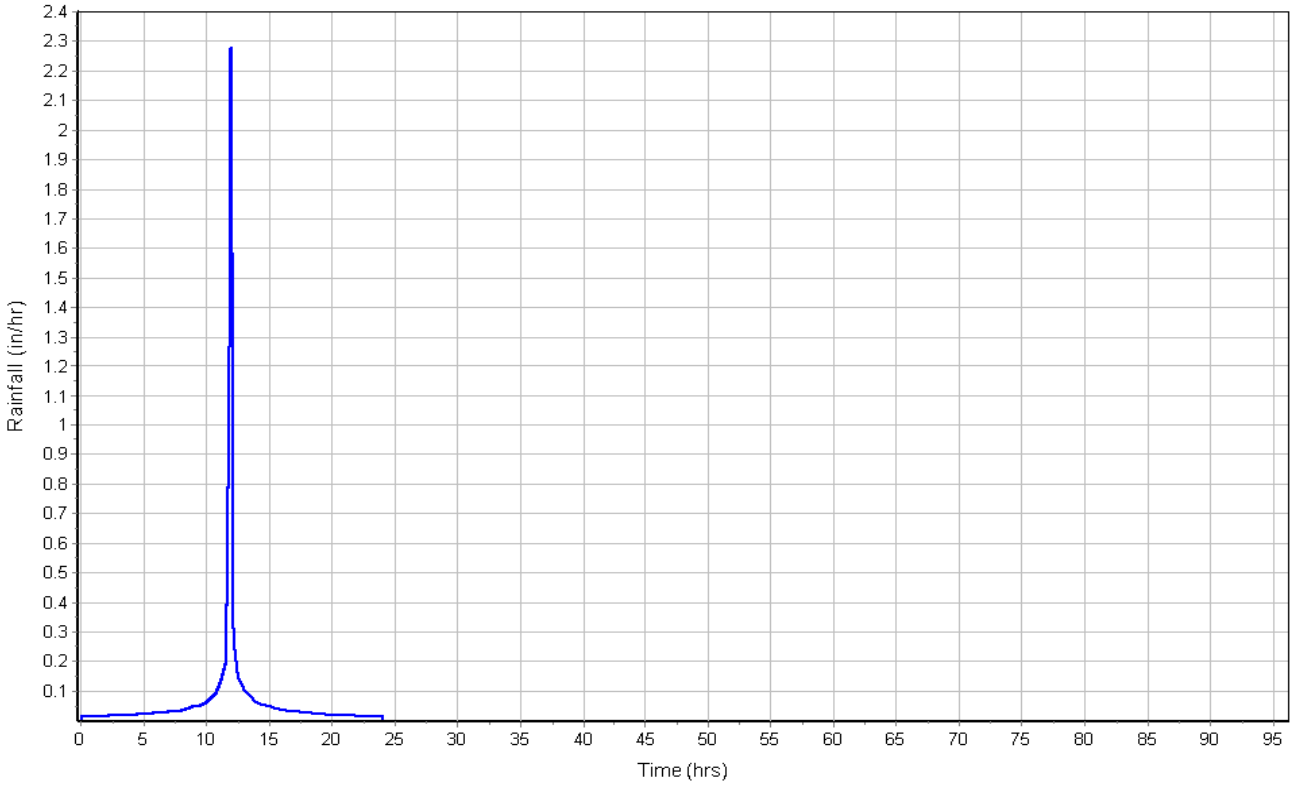
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

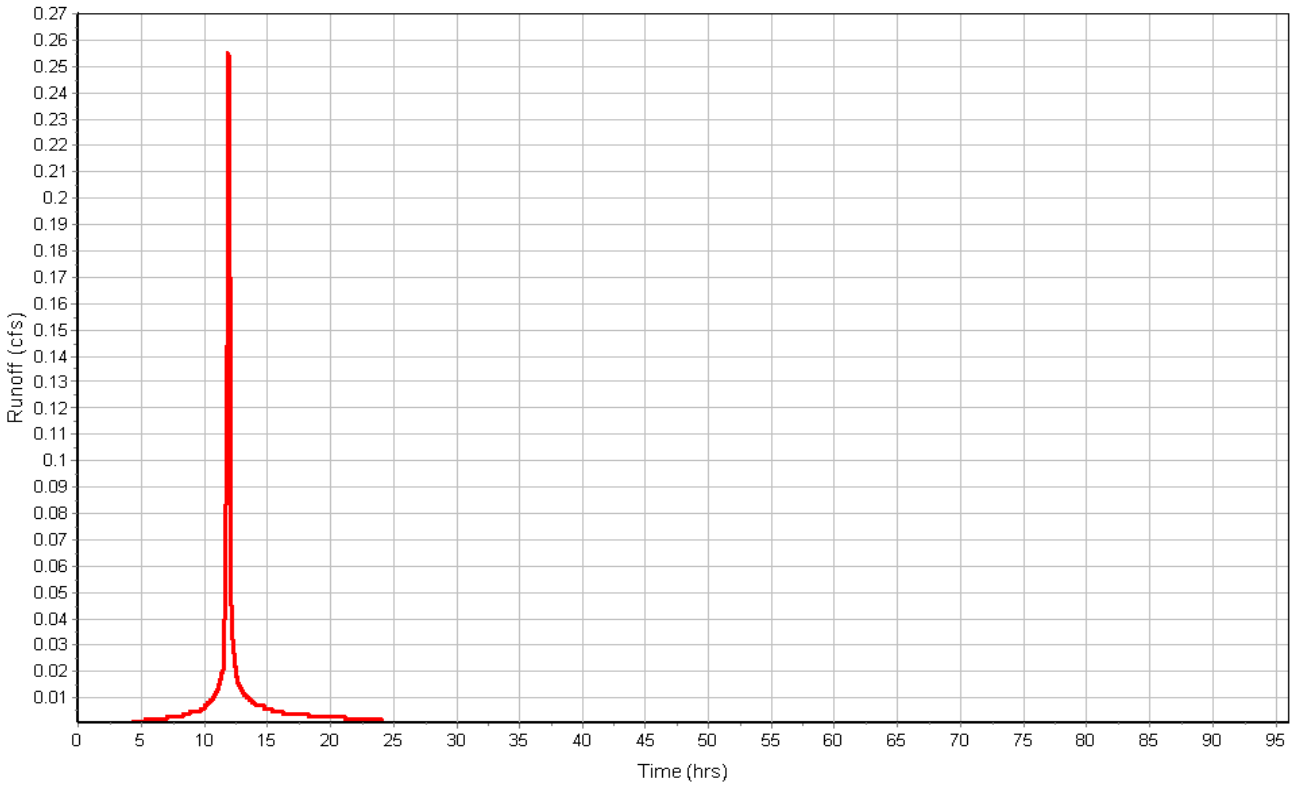
Total Rainfall (in)	1.66
Total Runoff (in)	1.43
Peak Runoff (cfs)	0.25
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_29_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_29_VACANT

Input Data

Area (ac) 0.42
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.42	B	58.00
Composite Area & Weighted CN	0.42		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	208	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	47.75	0.00	0.00

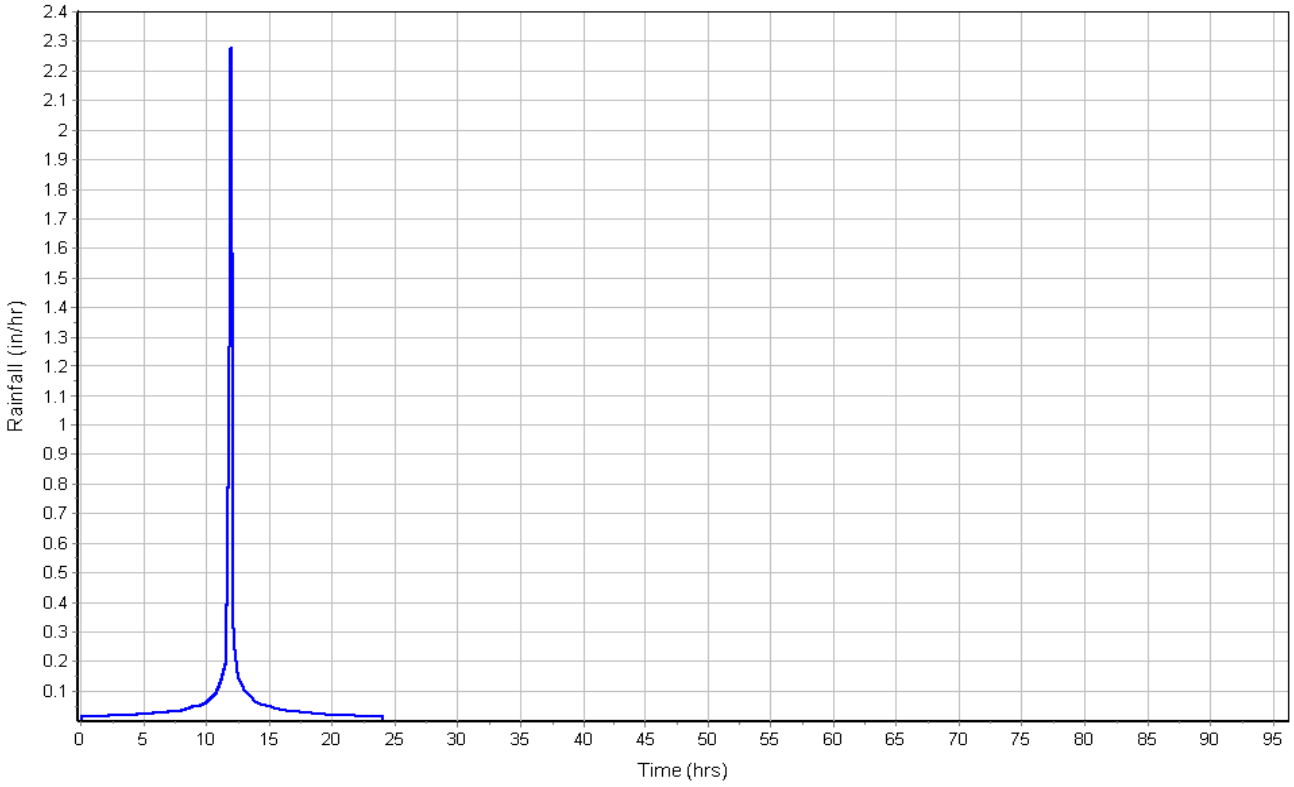
Total TOC (min) 47.75

Subbasin Runoff Results

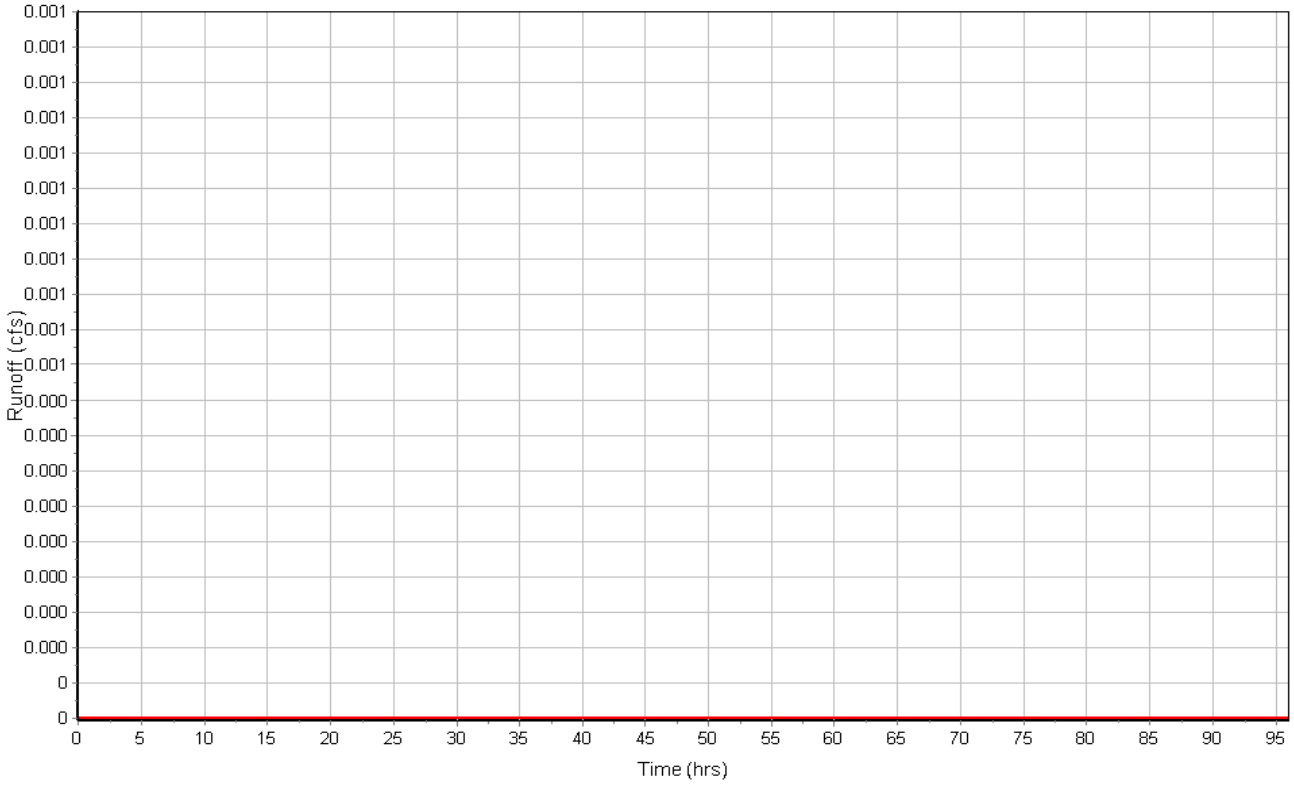
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:47:45

Subbasin : BASIN_29_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_3_ROW

Input Data

Area (ac)	0.15
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.15	B	98.00
Composite Area & Weighted CN	0.15		98.00

Time of Concentration

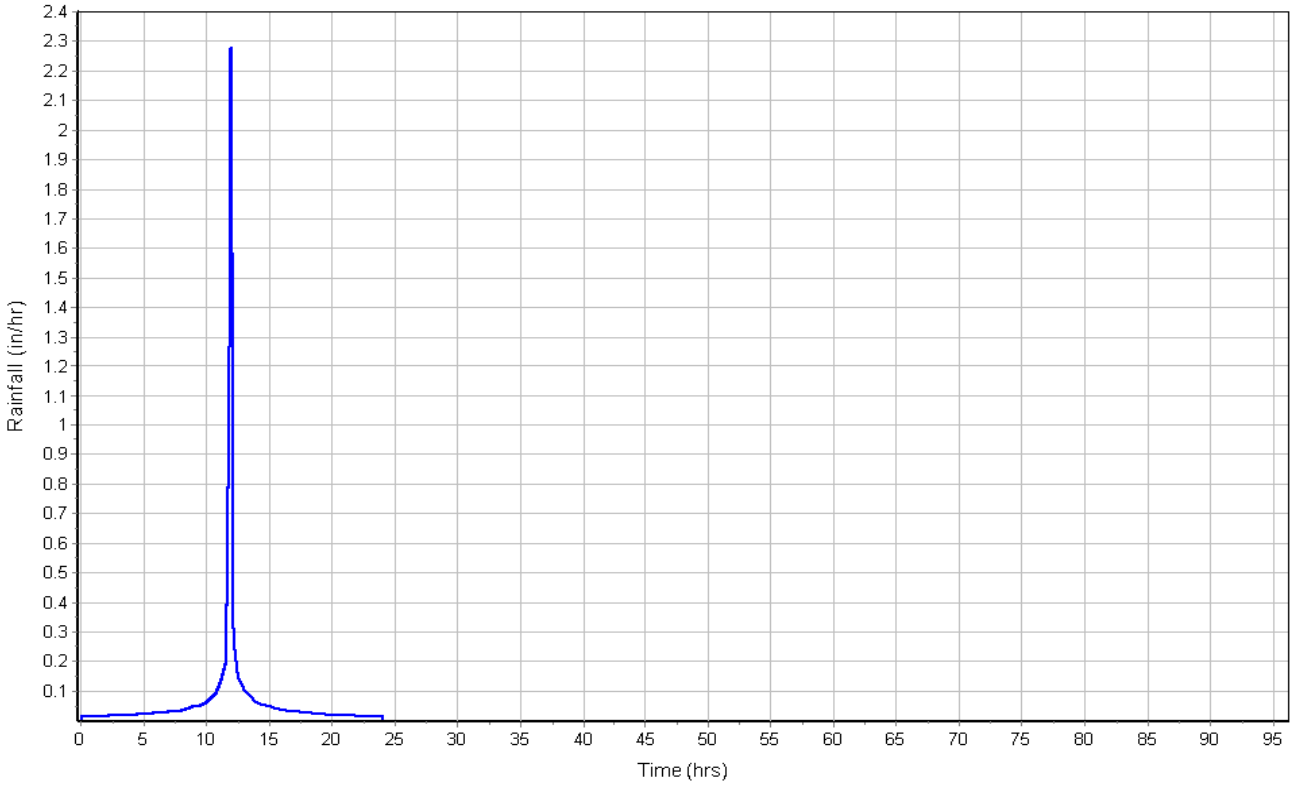
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

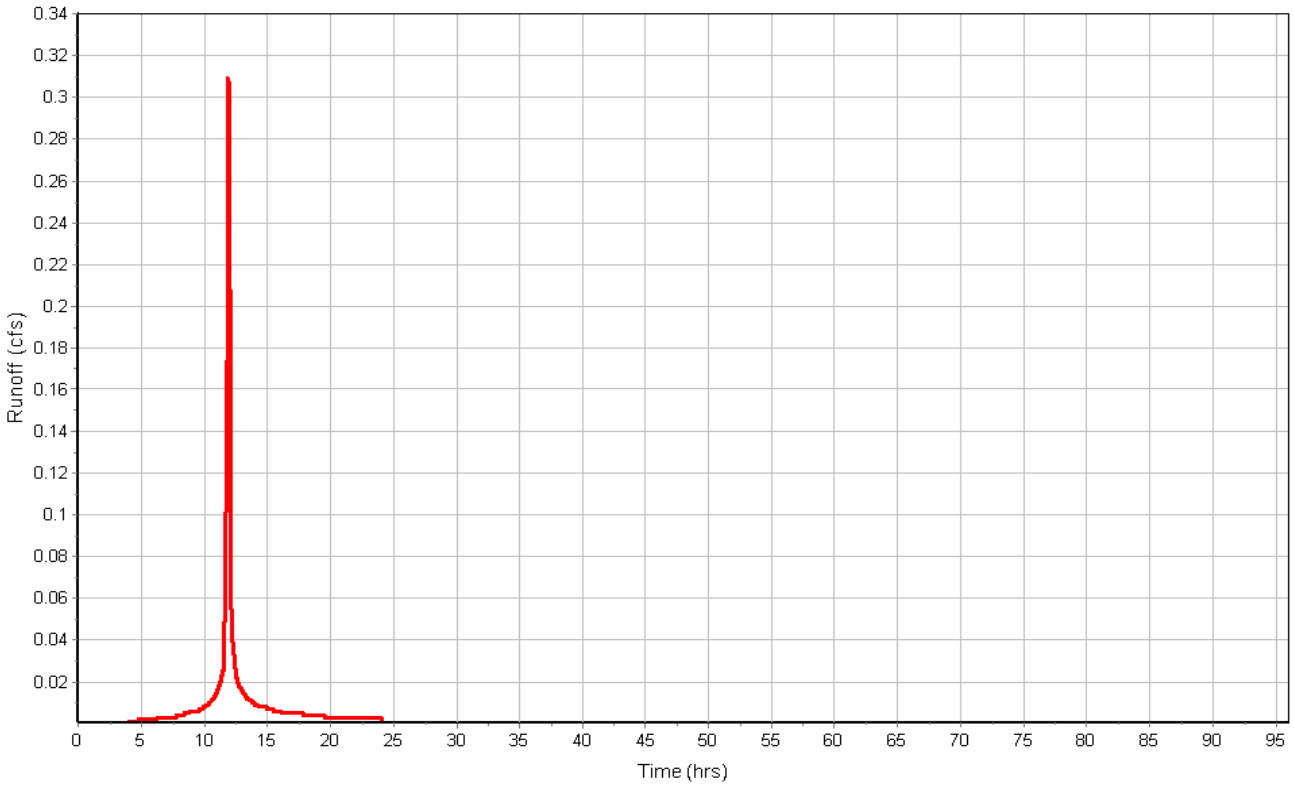
Total Rainfall (in)	1.66
Total Runoff (in)	1.43
Peak Runoff (cfs)	0.31
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_3_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_3_VACANT

Input Data

Area (ac) 0.27
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.27	B	58.00
Composite Area & Weighted CN	0.27		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	259	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	56.90	0.00	0.00

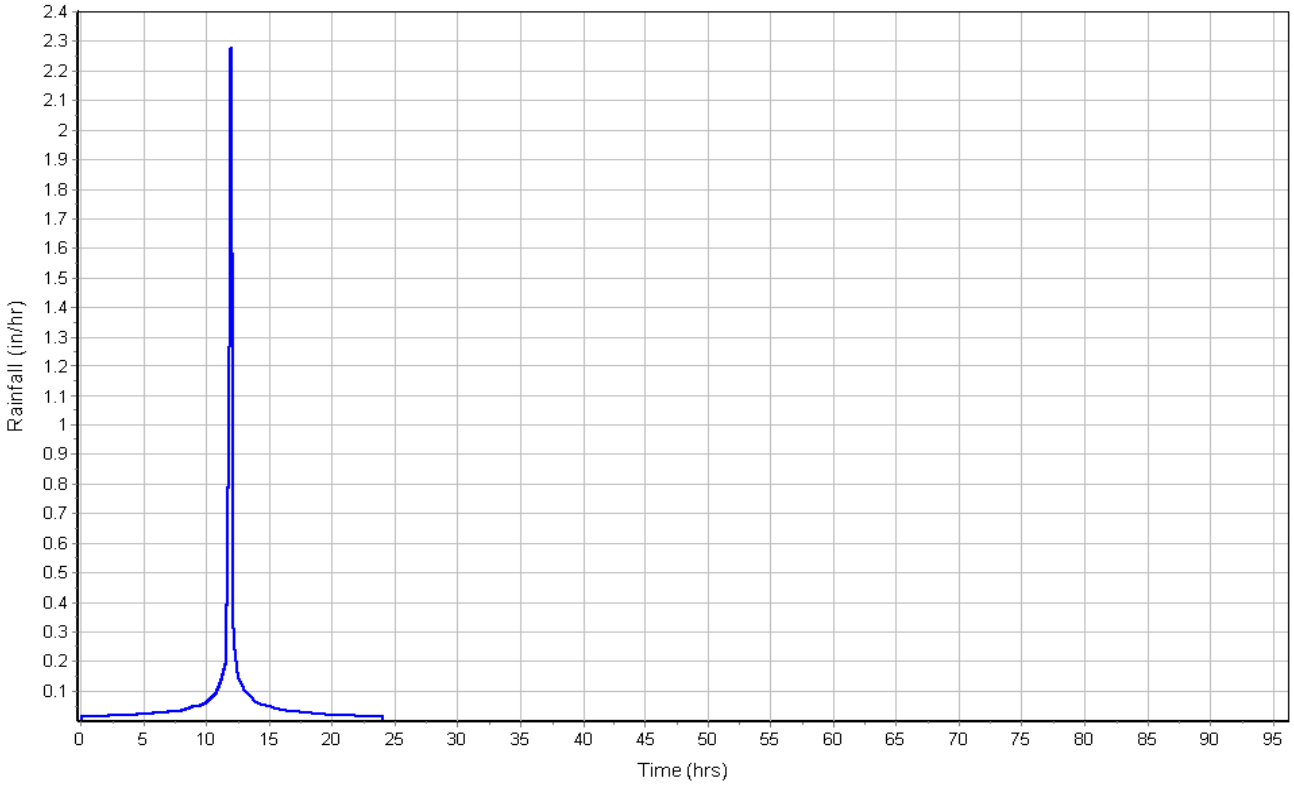
Total TOC (min) 56.90

Subbasin Runoff Results

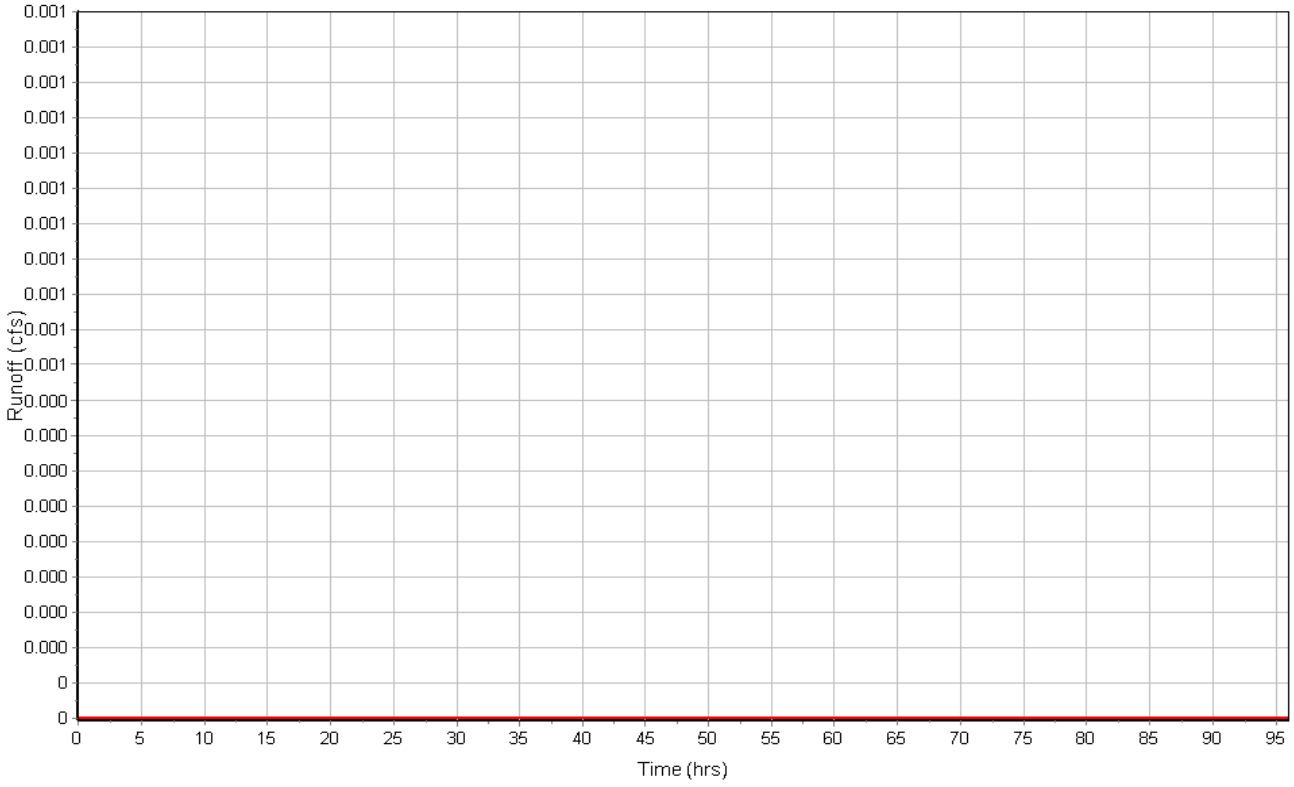
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:56:54

Subbasin : BASIN_3_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_30_ROW

Input Data

Area (ac)	0.15
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.15	B	98.00
Composite Area & Weighted CN	0.15		98.00

Time of Concentration

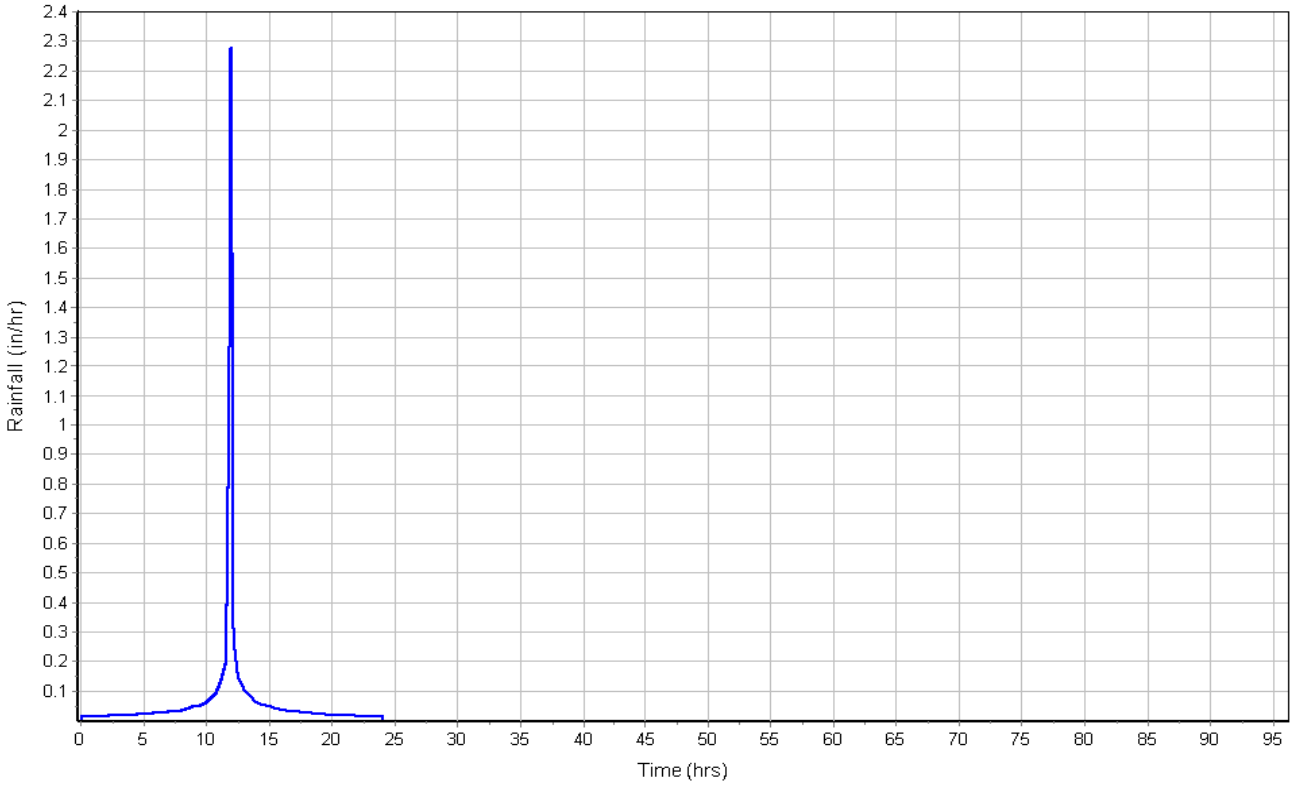
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

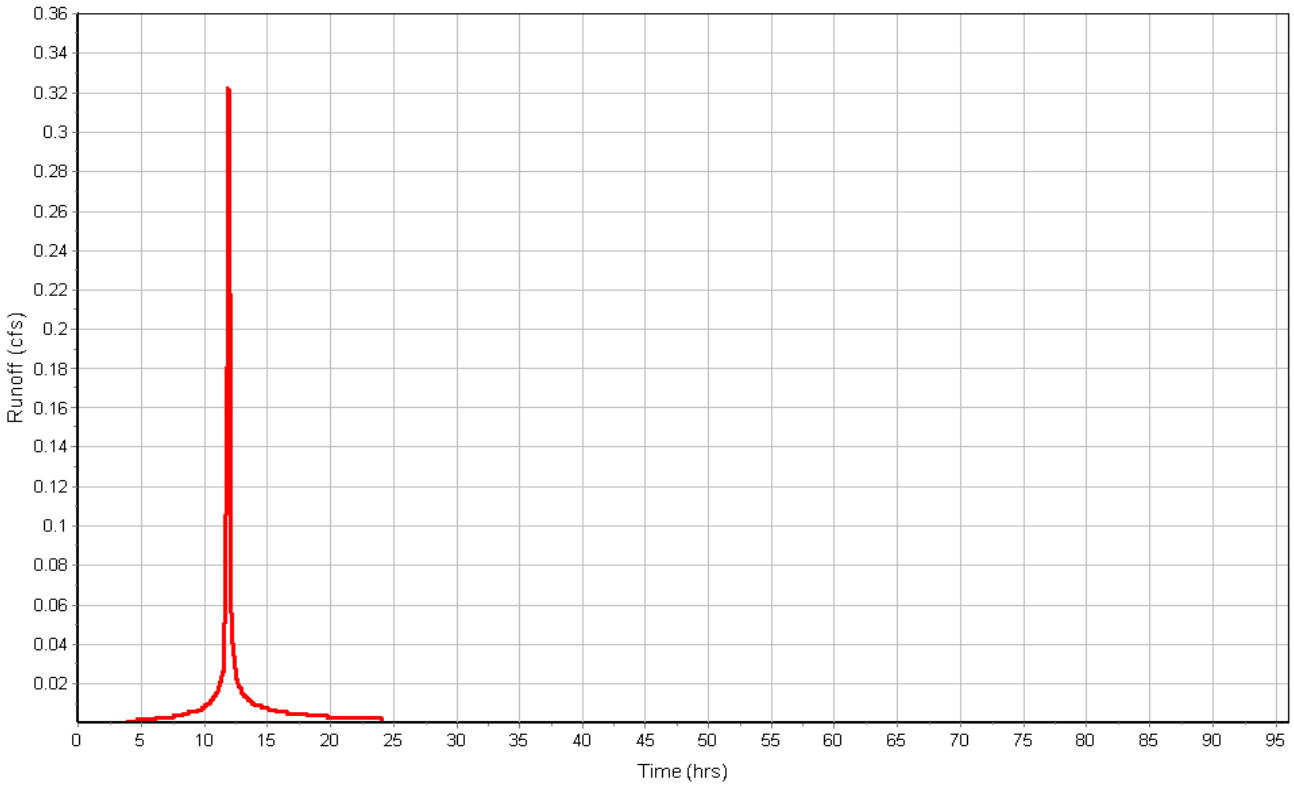
Total Rainfall (in)	1.66
Total Runoff (in)	1.43
Peak Runoff (cfs)	0.32
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_30_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_30_VACANT

Input Data

Area (ac) 0.63
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.63	B	58.00
Composite Area & Weighted CN	0.63		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	300	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	64.00	0.00	0.00

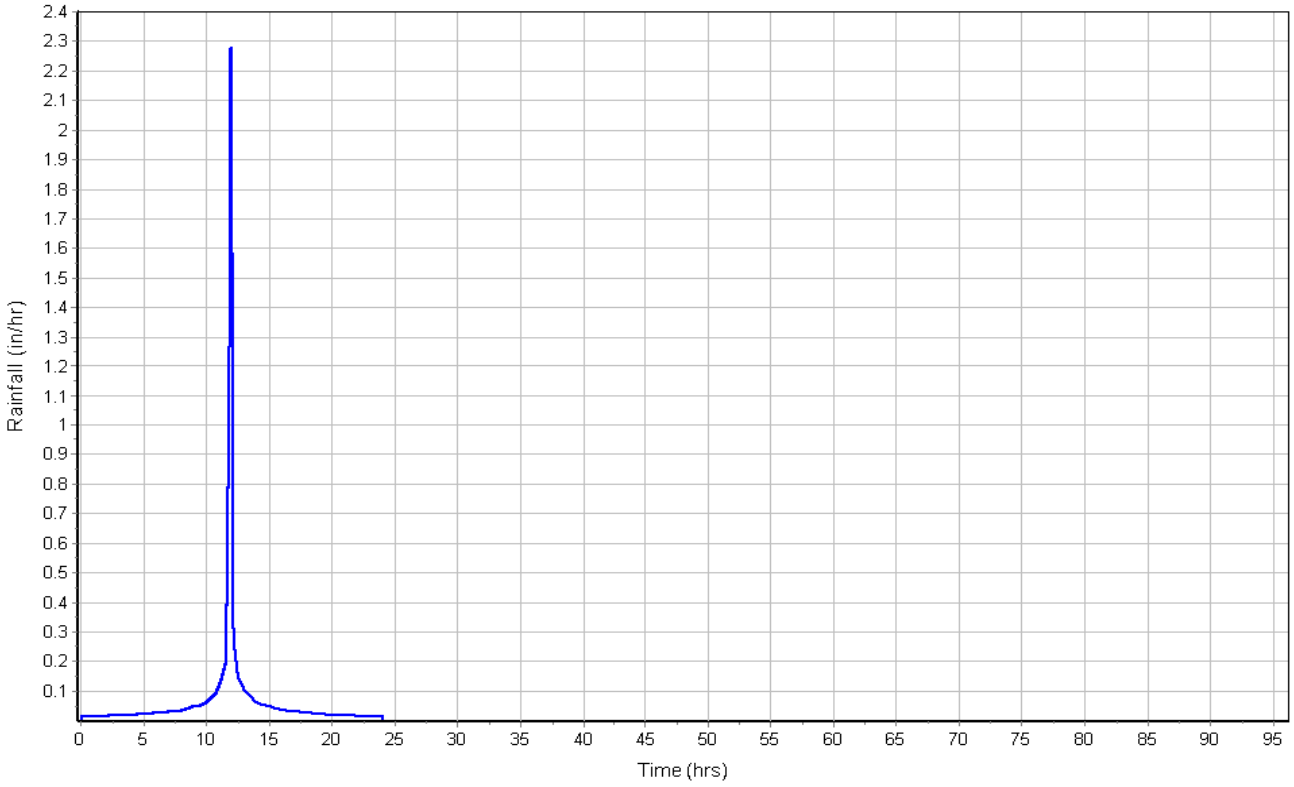
Total TOC (min) 64.00

Subbasin Runoff Results

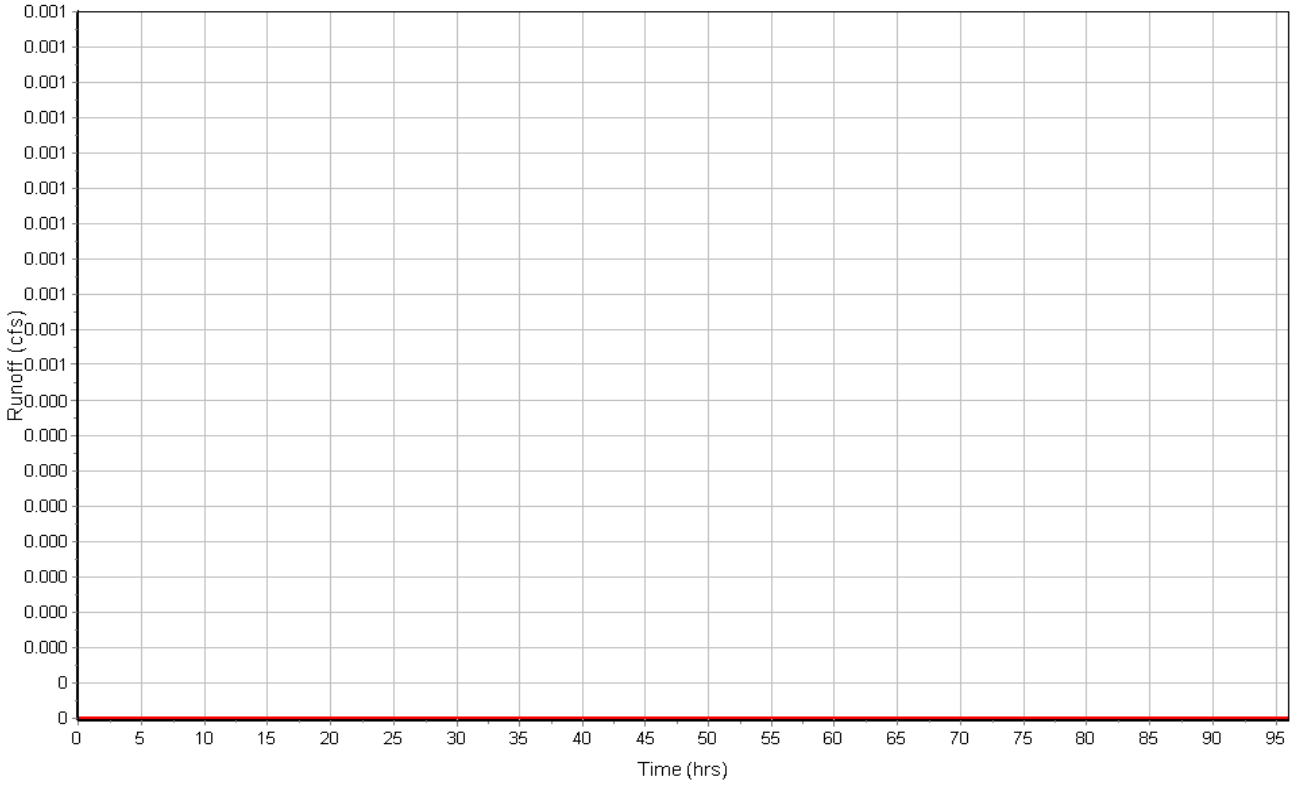
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 01:04:00

Subbasin : BASIN_30_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_31_ROW

Input Data

Area (ac)	0.15
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.15	B	98.00
Composite Area & Weighted CN	0.15		98.00

Time of Concentration

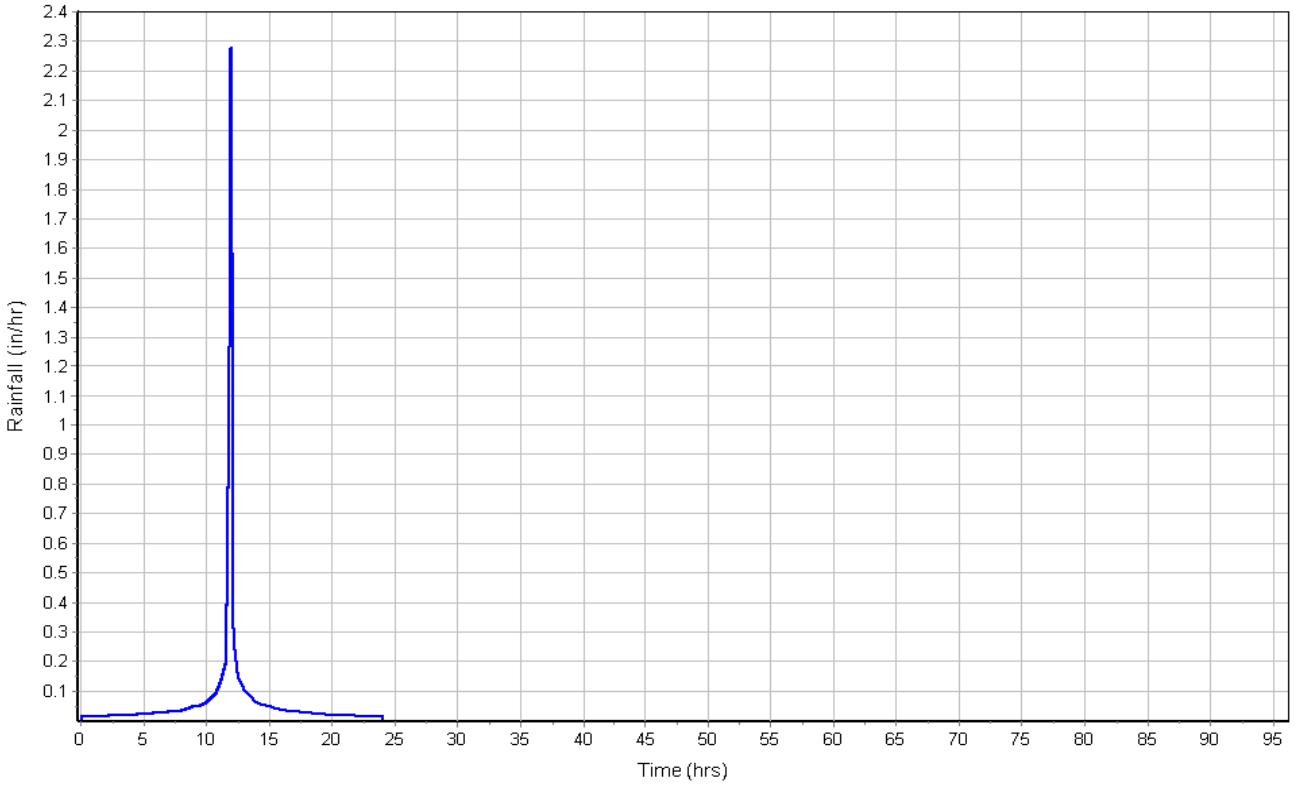
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

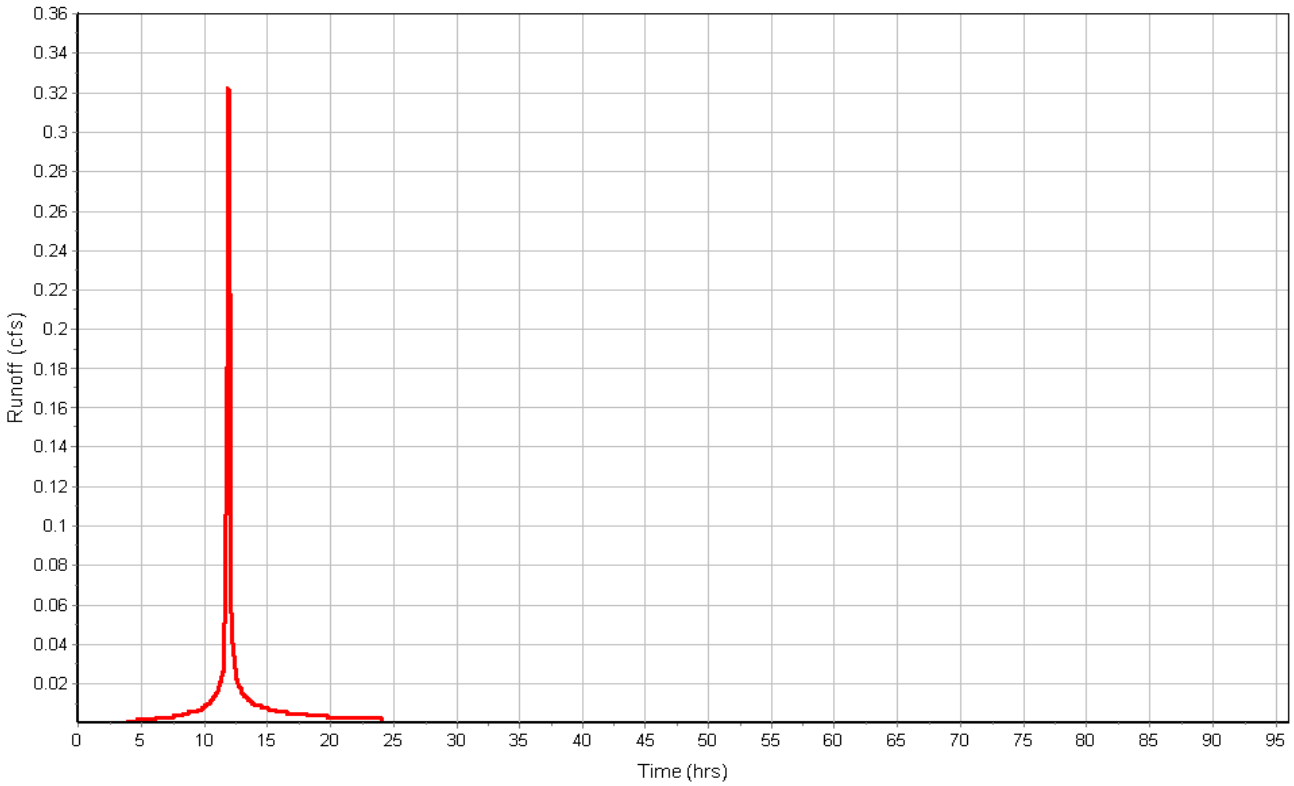
Total Rainfall (in)	1.66
Total Runoff (in)	1.43
Peak Runoff (cfs)	0.32
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_31_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_31_VACANT

Input Data

Area (ac) 0.71
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.71	B	58.00
Composite Area & Weighted CN	0.71		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	274	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	59.52	0.00	0.00

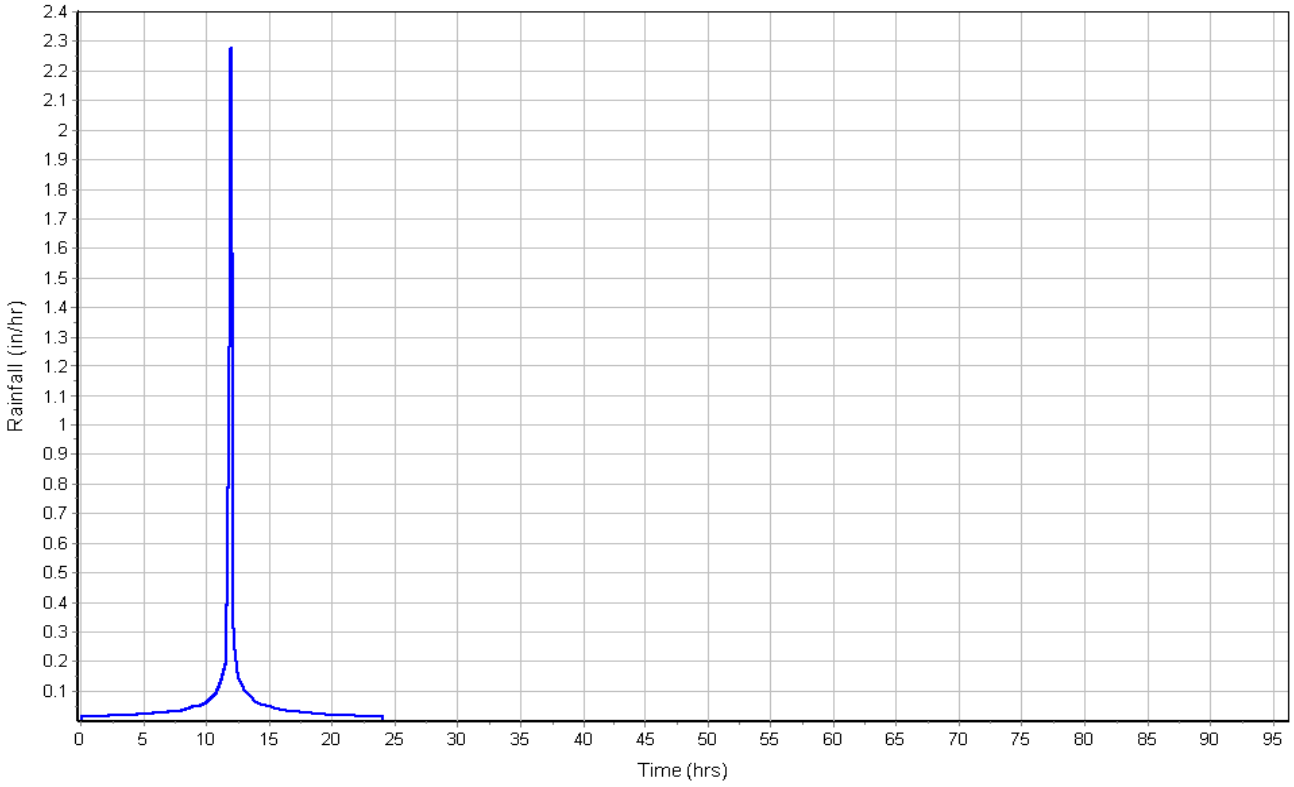
Total TOC (min) 59.52

Subbasin Runoff Results

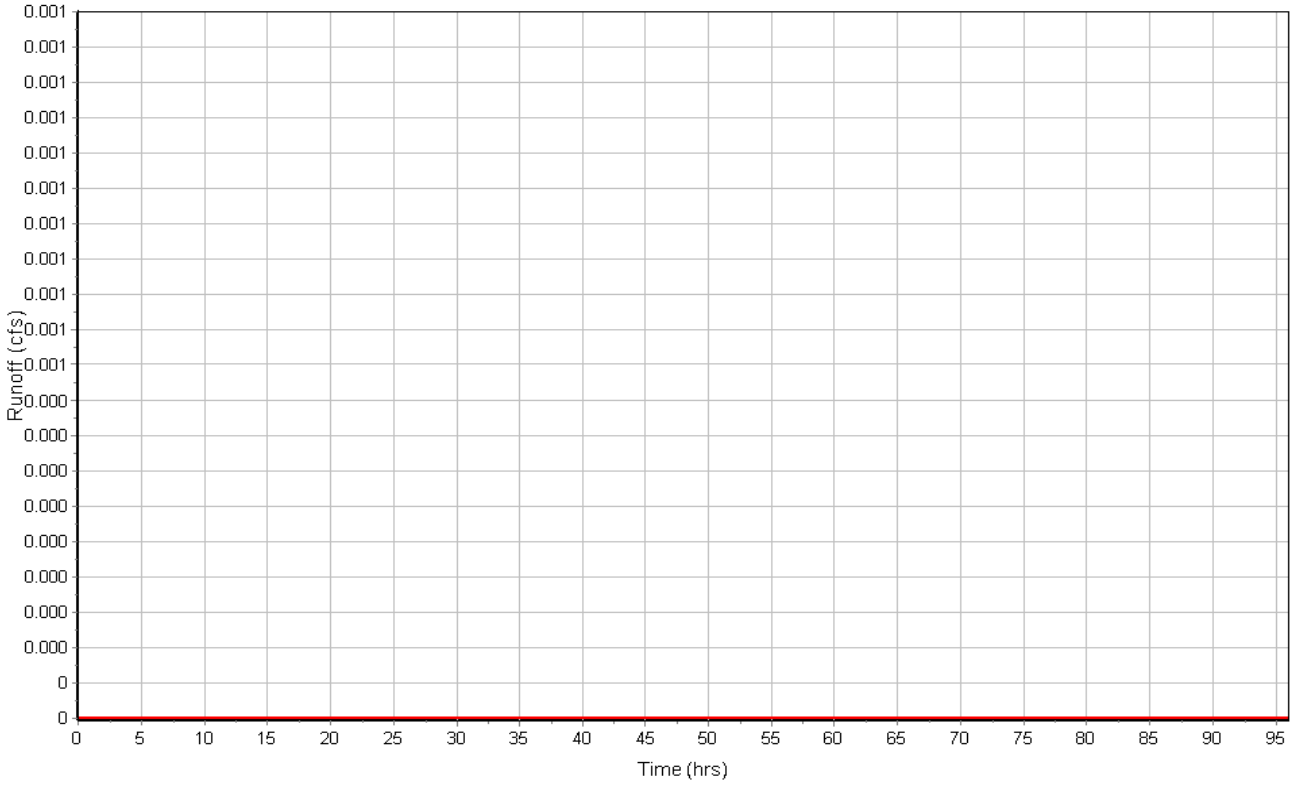
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:59:31

Subbasin : BASIN_31_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_32_ROW

Input Data

Area (ac)	0.12
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.12	B	98.00
Composite Area & Weighted CN	0.12		98.00

Time of Concentration

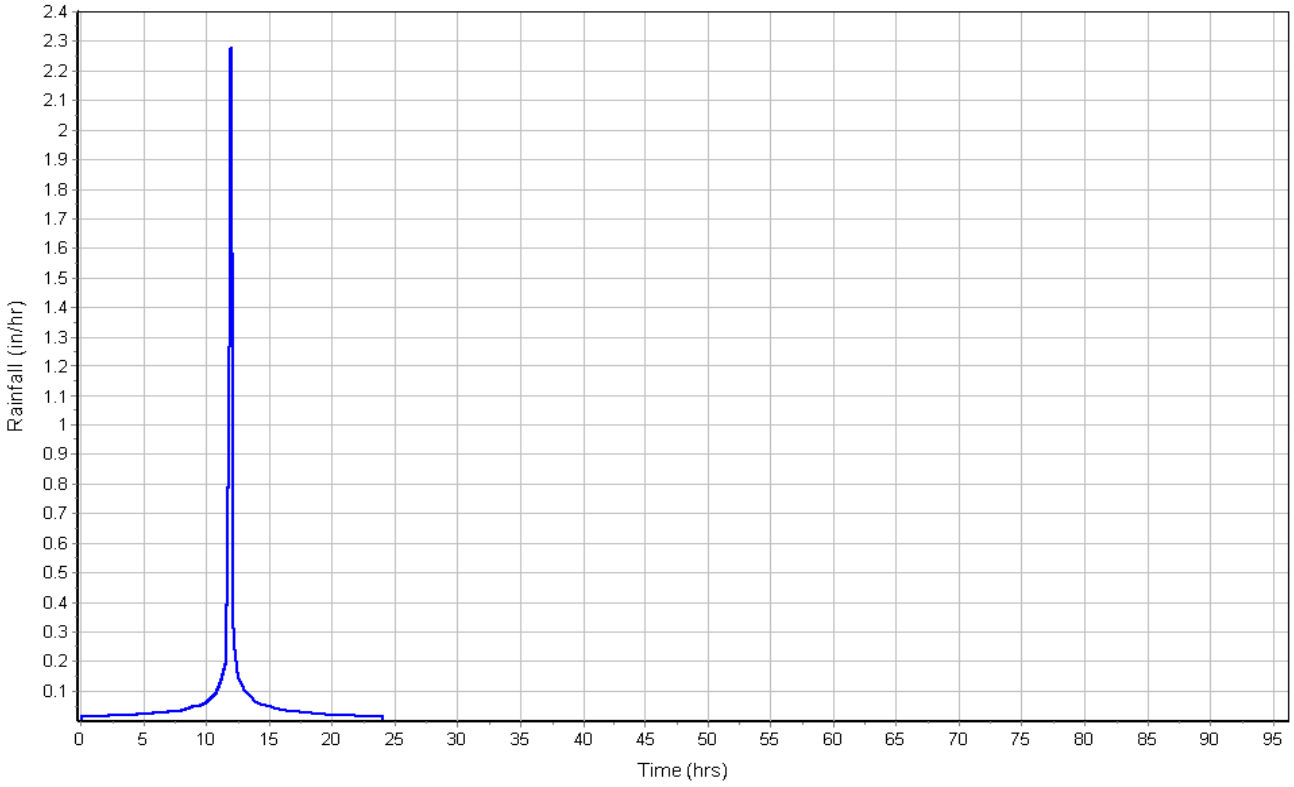
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

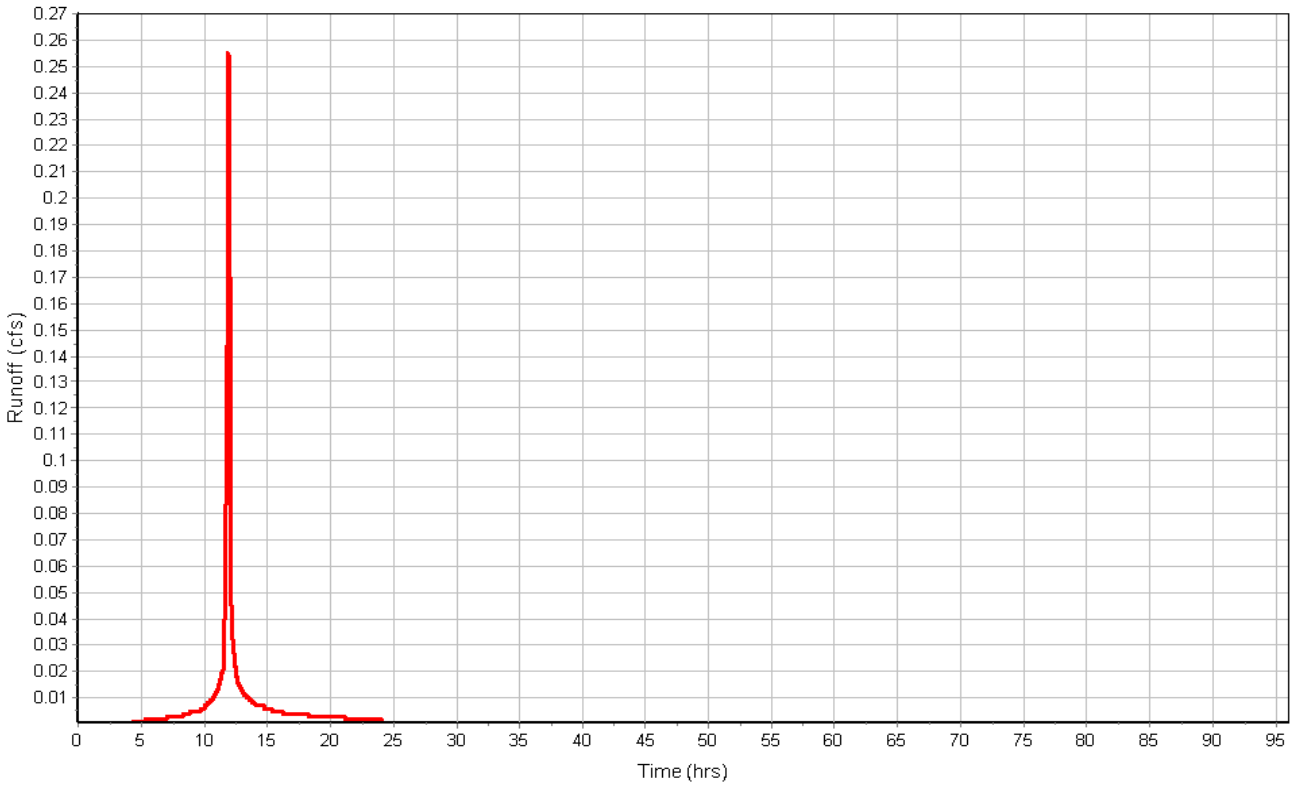
Total Rainfall (in)	1.66
Total Runoff (in)	1.43
Peak Runoff (cfs)	0.25
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_32_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_32_VACANT

Input Data

Area (ac) 0.52
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.52	B	58.00
Composite Area & Weighted CN	0.52		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	246	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	54.60	0.00	0.00

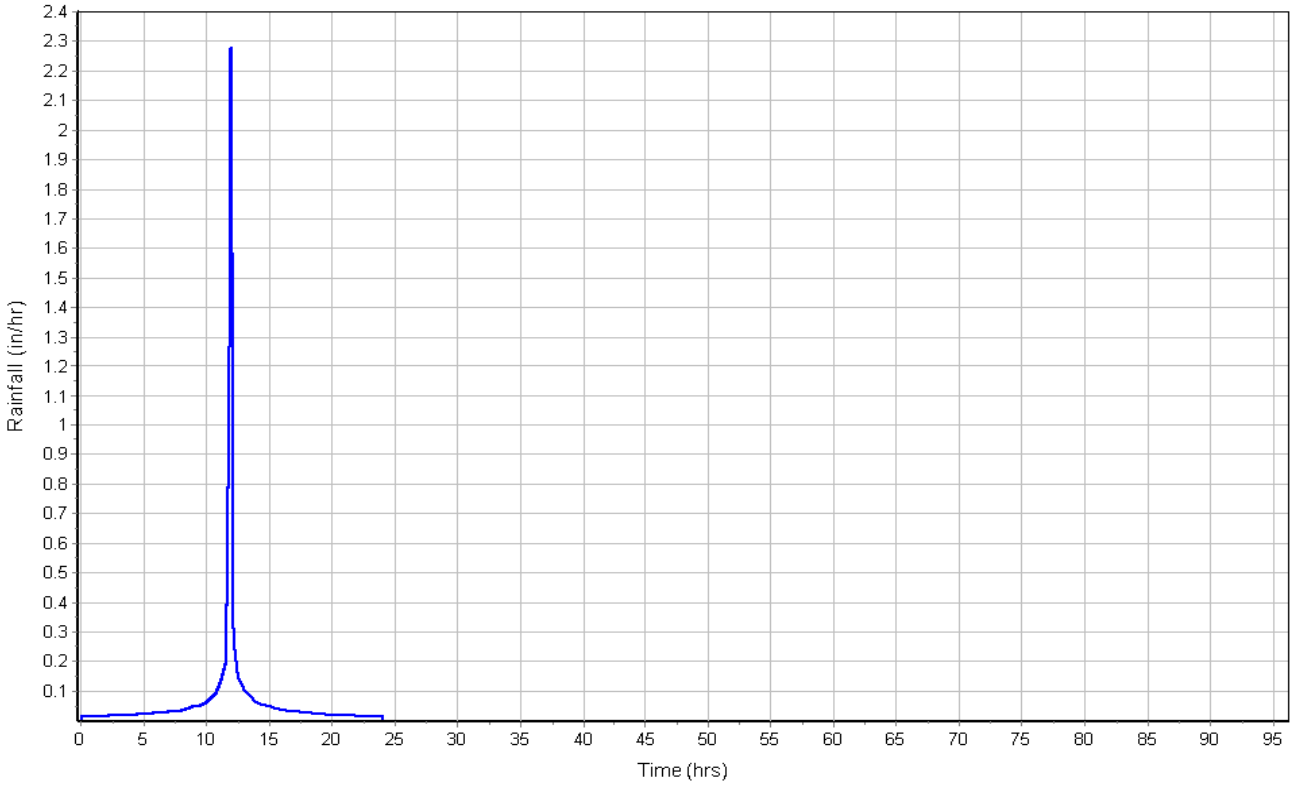
Total TOC (min) 54.60

Subbasin Runoff Results

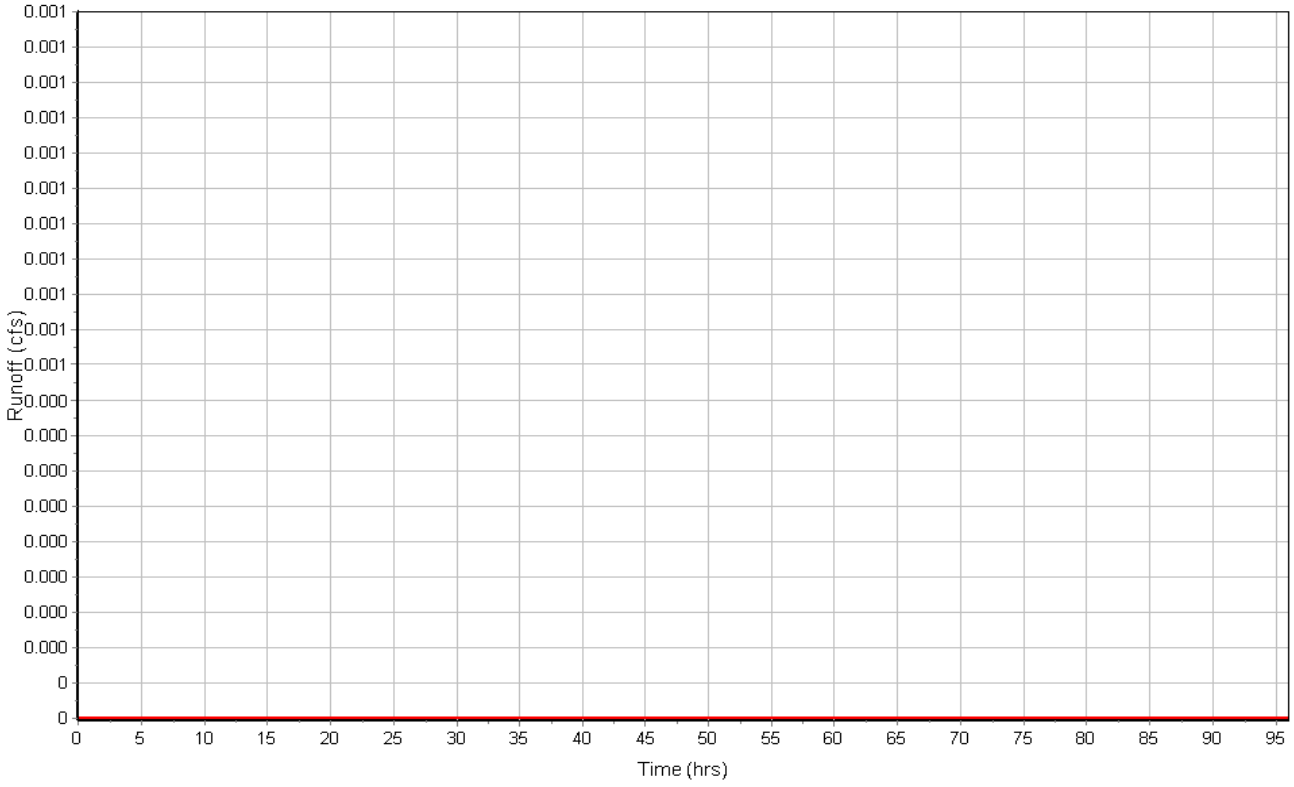
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:54:36

Subbasin : BASIN_32_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_33_ROW

Input Data

Area (ac)	0.12
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.12	B	98.00
Composite Area & Weighted CN	0.12		98.00

Time of Concentration

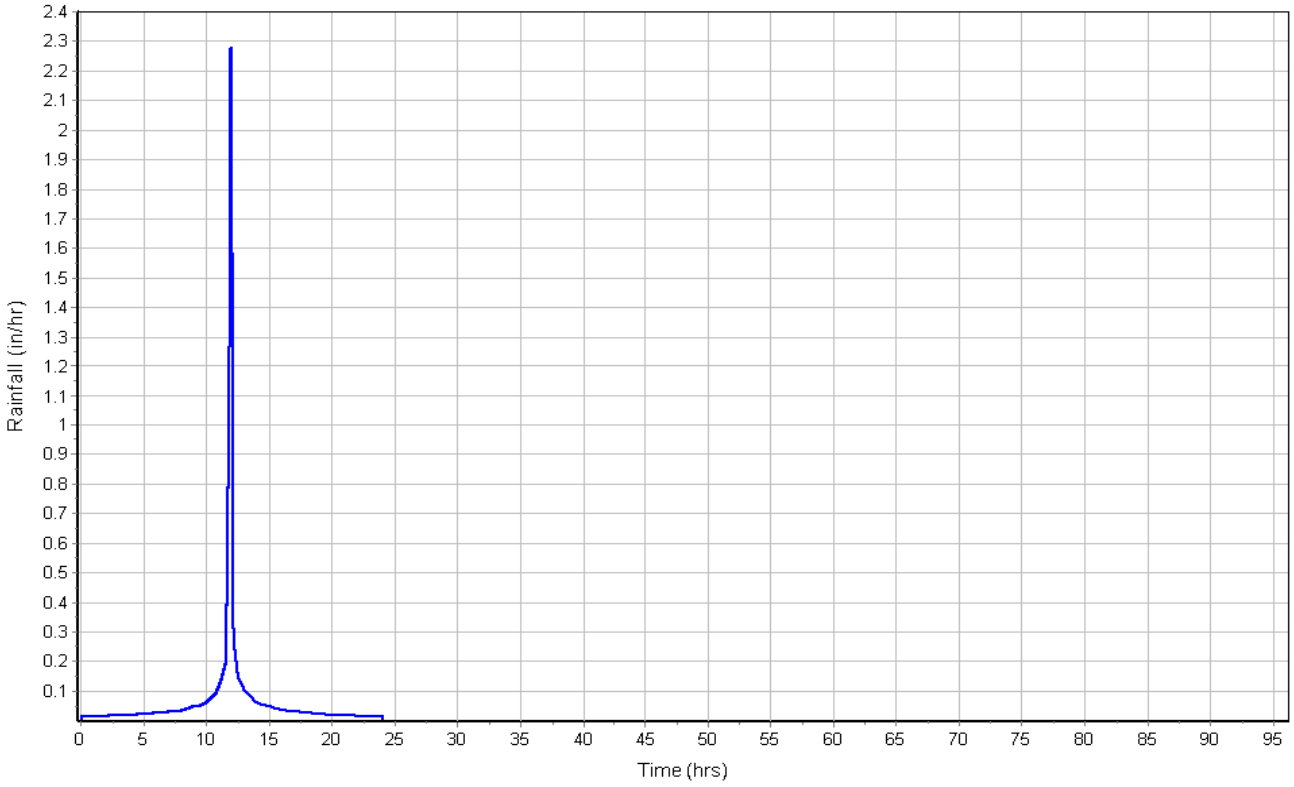
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

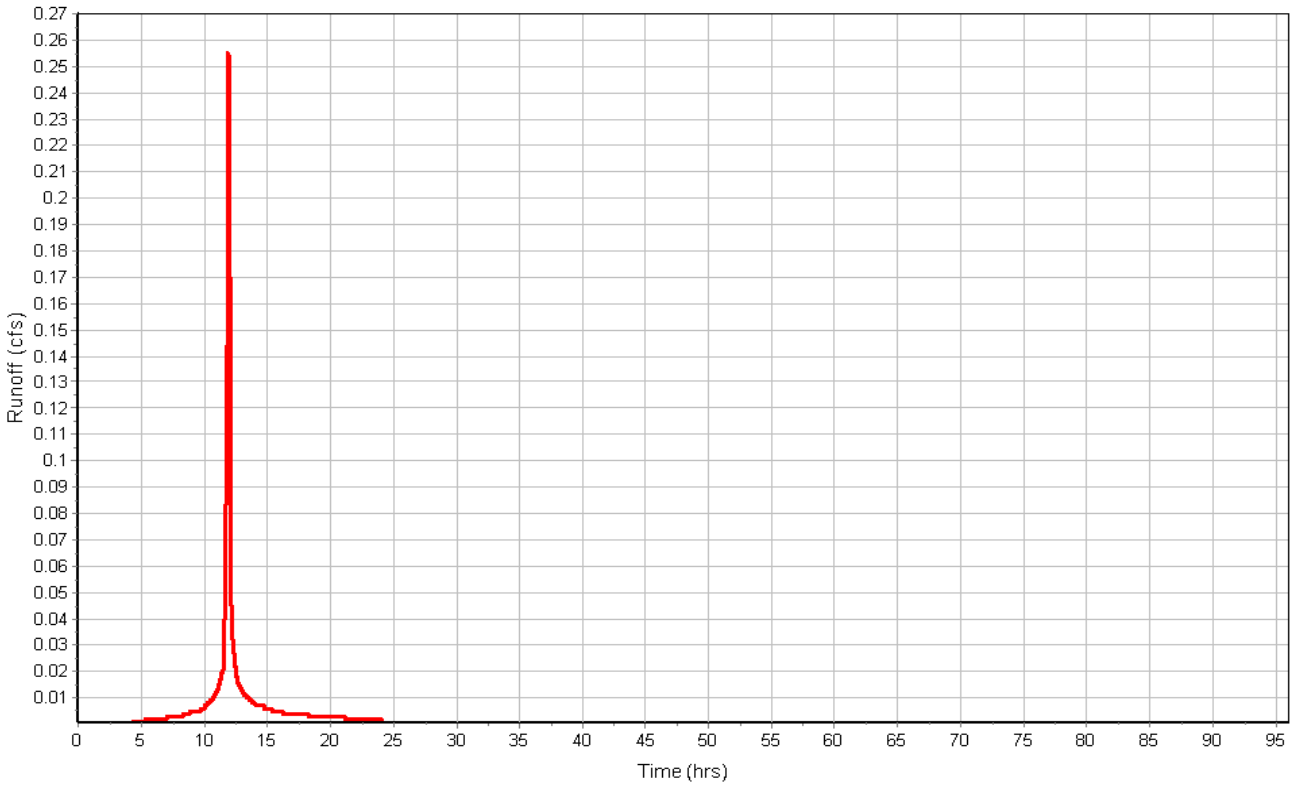
Total Rainfall (in)	1.66
Total Runoff (in)	1.43
Peak Runoff (cfs)	0.25
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_33_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_33_VACANT

Input Data

Area (ac) 0.54
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.54	B	58.00
Composite Area & Weighted CN	0.54		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	256	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	56.37	0.00	0.00

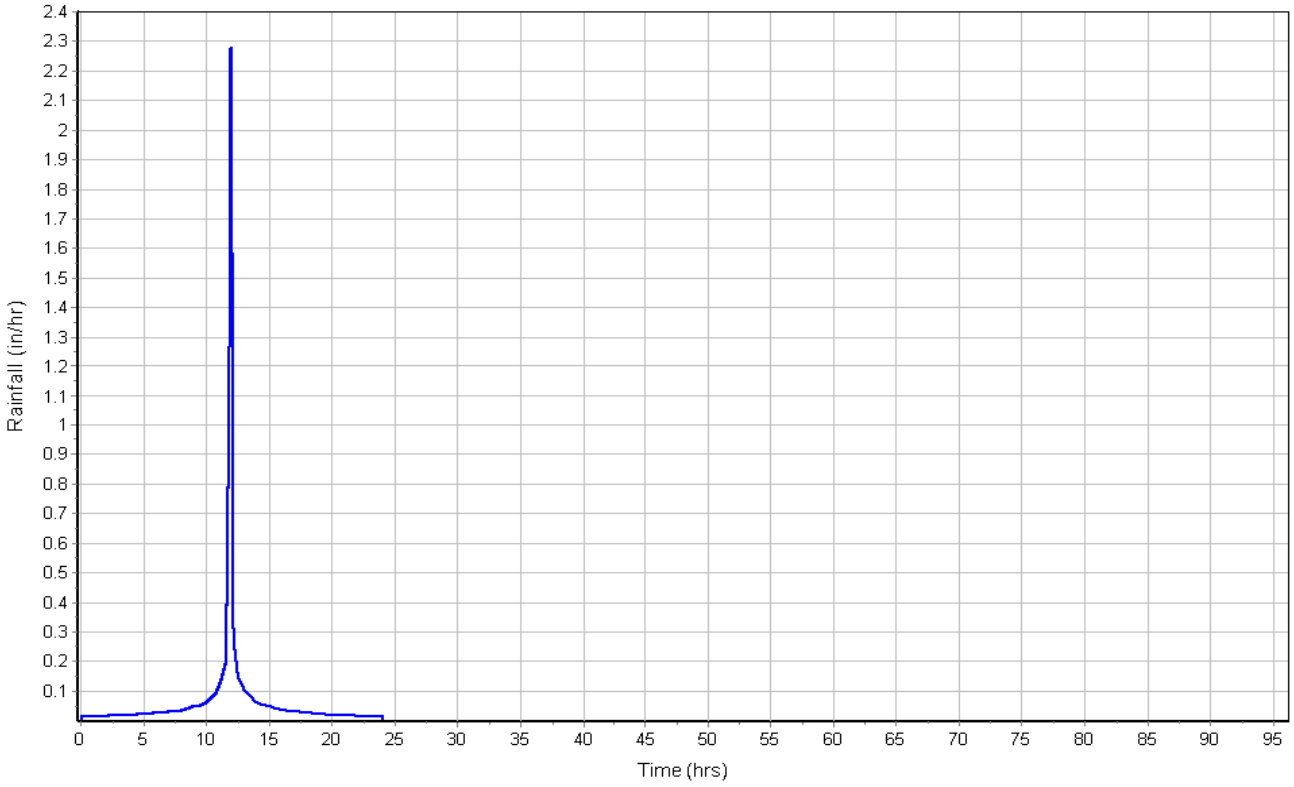
Total TOC (min) 56.37

Subbasin Runoff Results

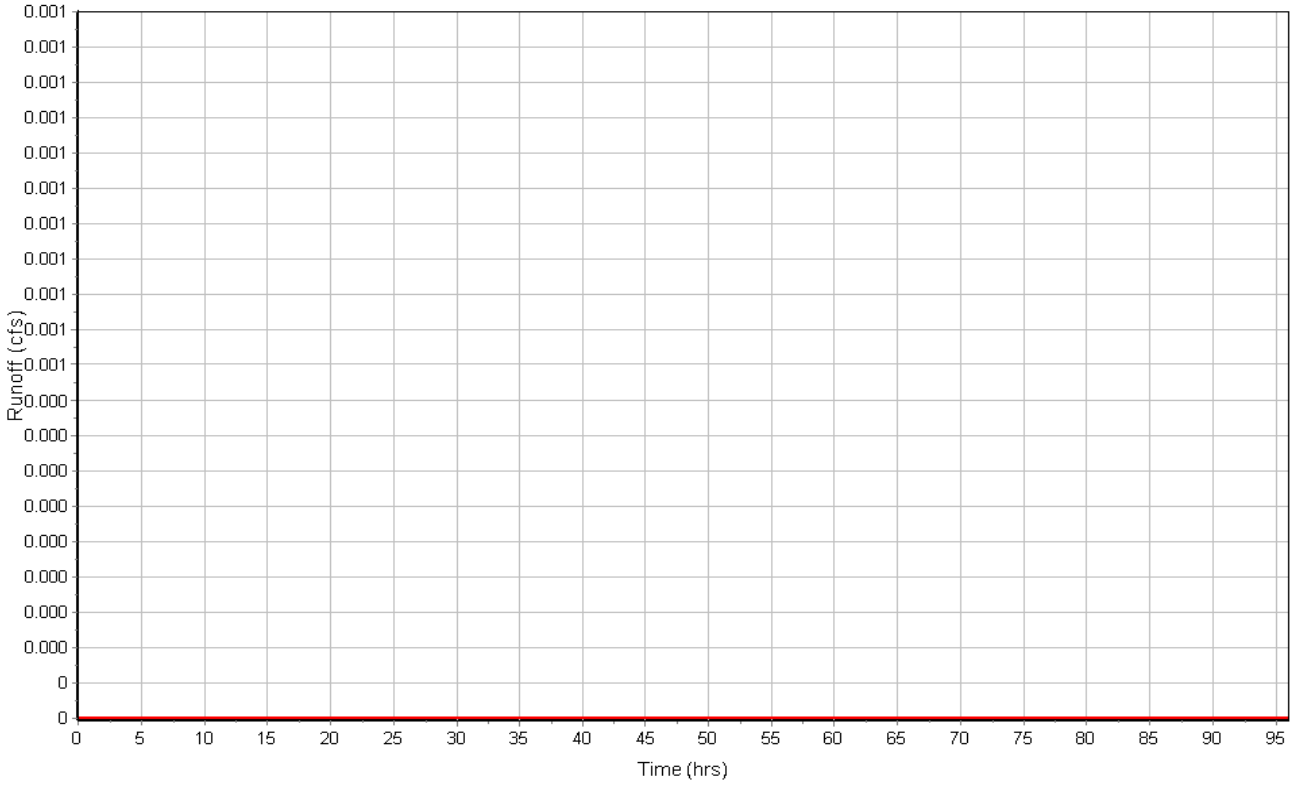
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:56:22

Subbasin : BASIN_33_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_34_ROW

Input Data

Area (ac)	0.07
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.07	B	98.00
Composite Area & Weighted CN	0.07		98.00

Time of Concentration

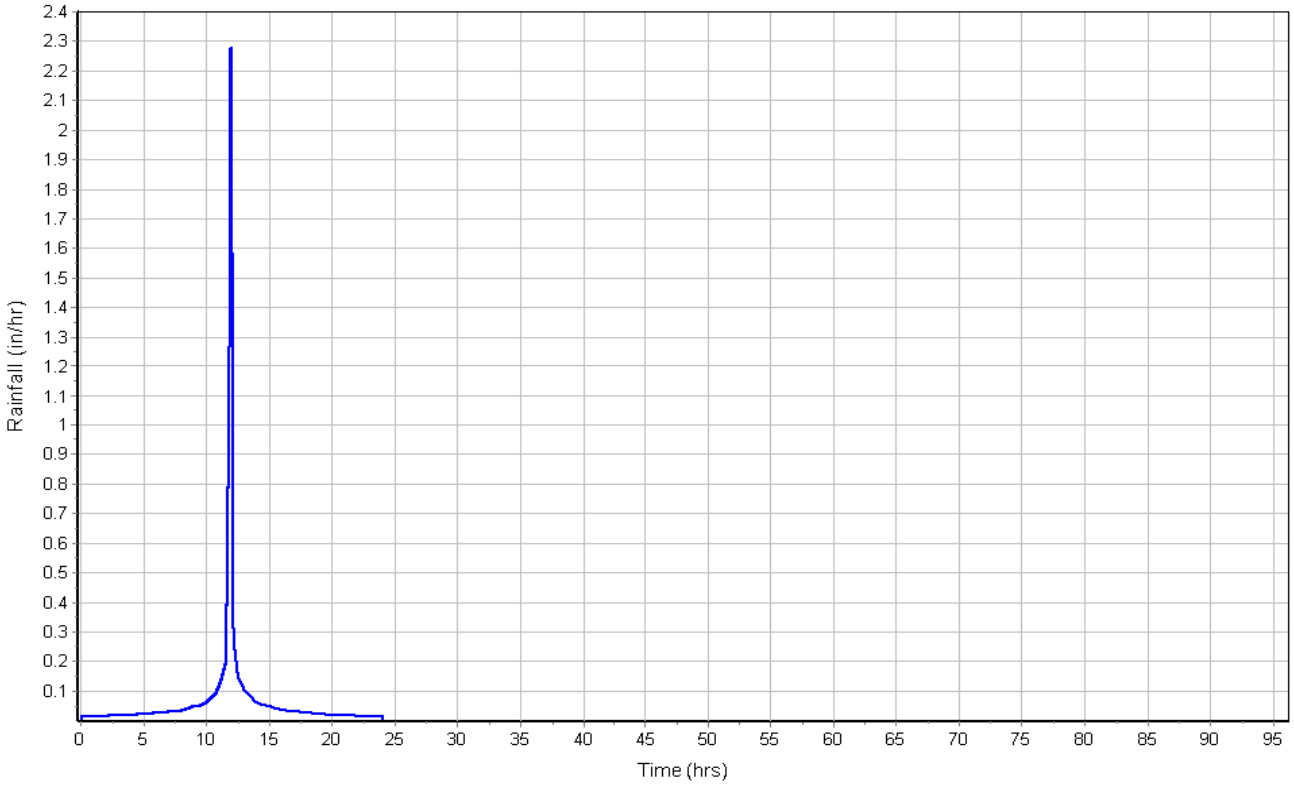
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

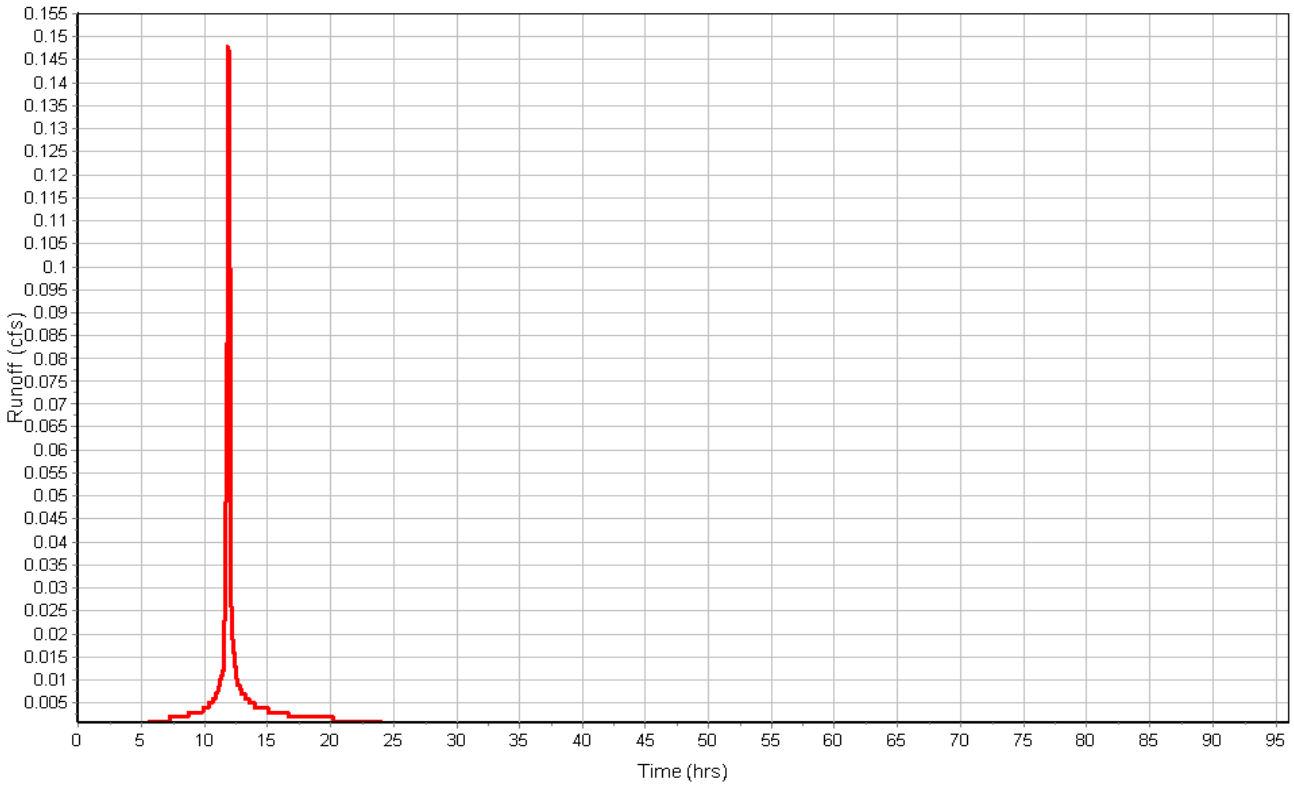
Total Rainfall (in)	1.66
Total Runoff (in)	1.41
Peak Runoff (cfs)	0.15
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_34_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_34_VACANT

Input Data

Area (ac) 0.51
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.51	B	58.00
Composite Area & Weighted CN	0.51		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	198	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	45.90	0.00	0.00

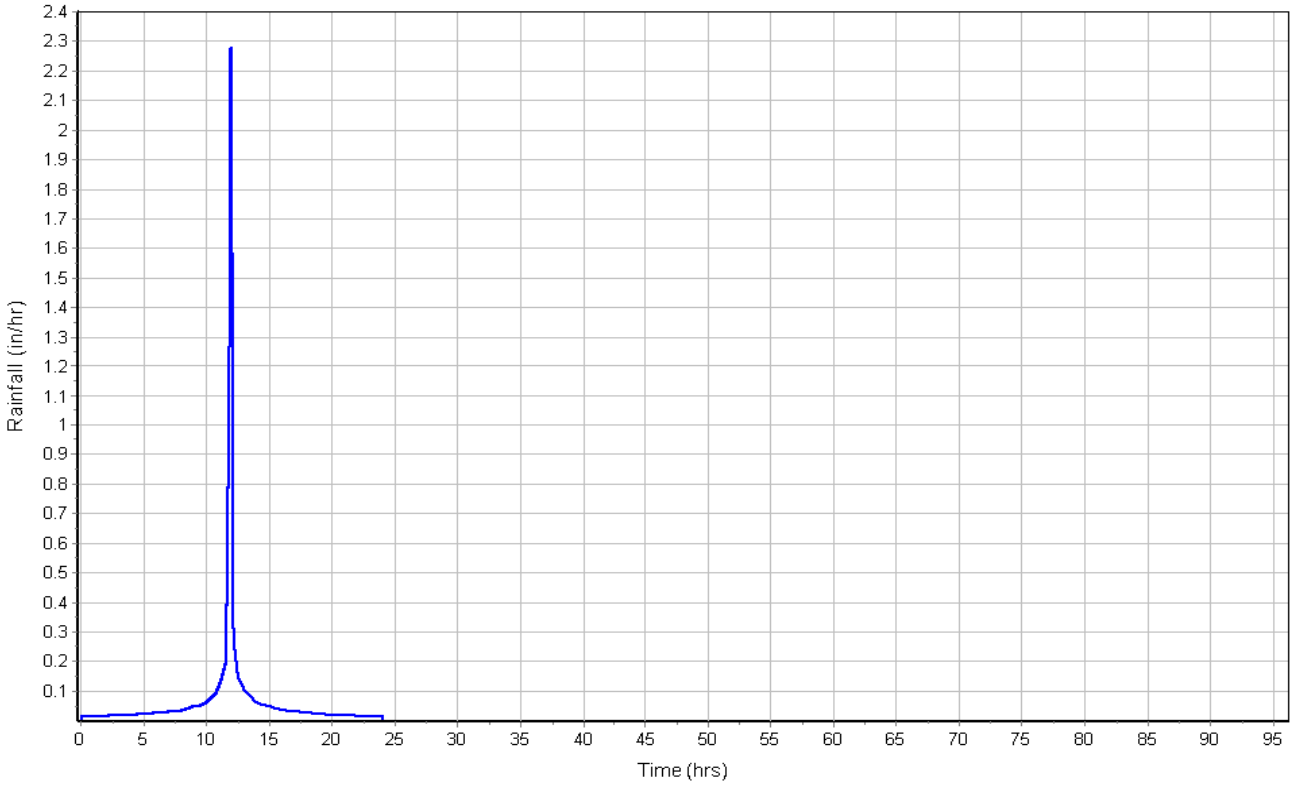
Total TOC (min) 45.90

Subbasin Runoff Results

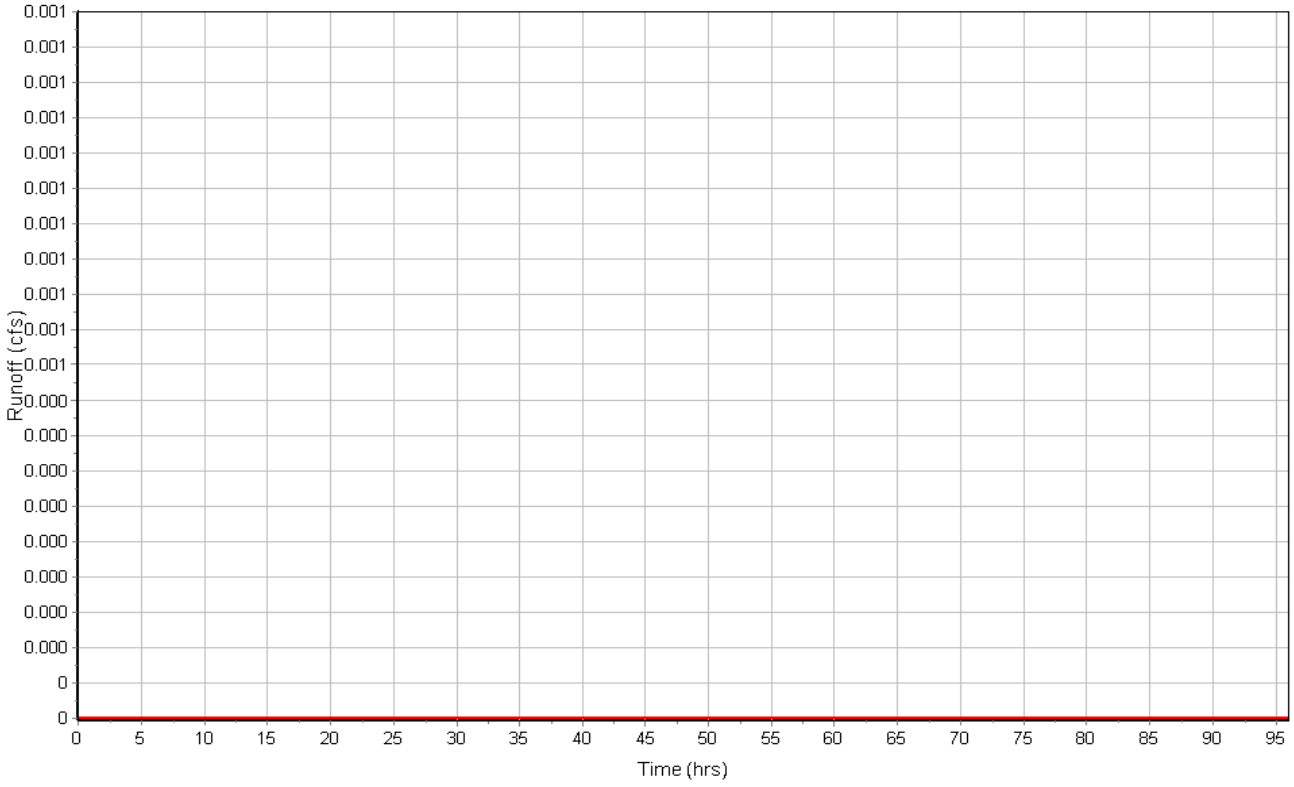
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:45:54

Subbasin : BASIN_34_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_35_ROW

Input Data

Area (ac)	0.07
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.07	B	98.00
Composite Area & Weighted CN	0.07		98.00

Time of Concentration

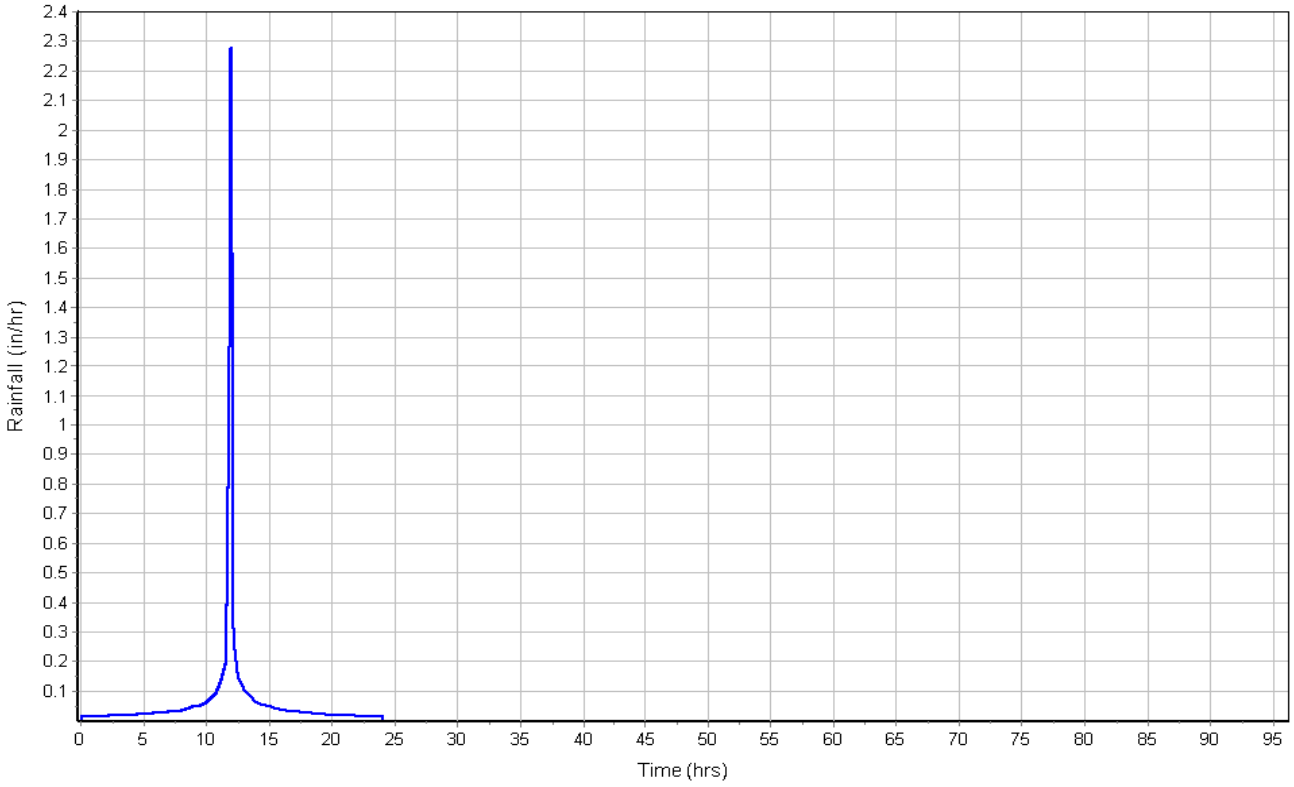
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

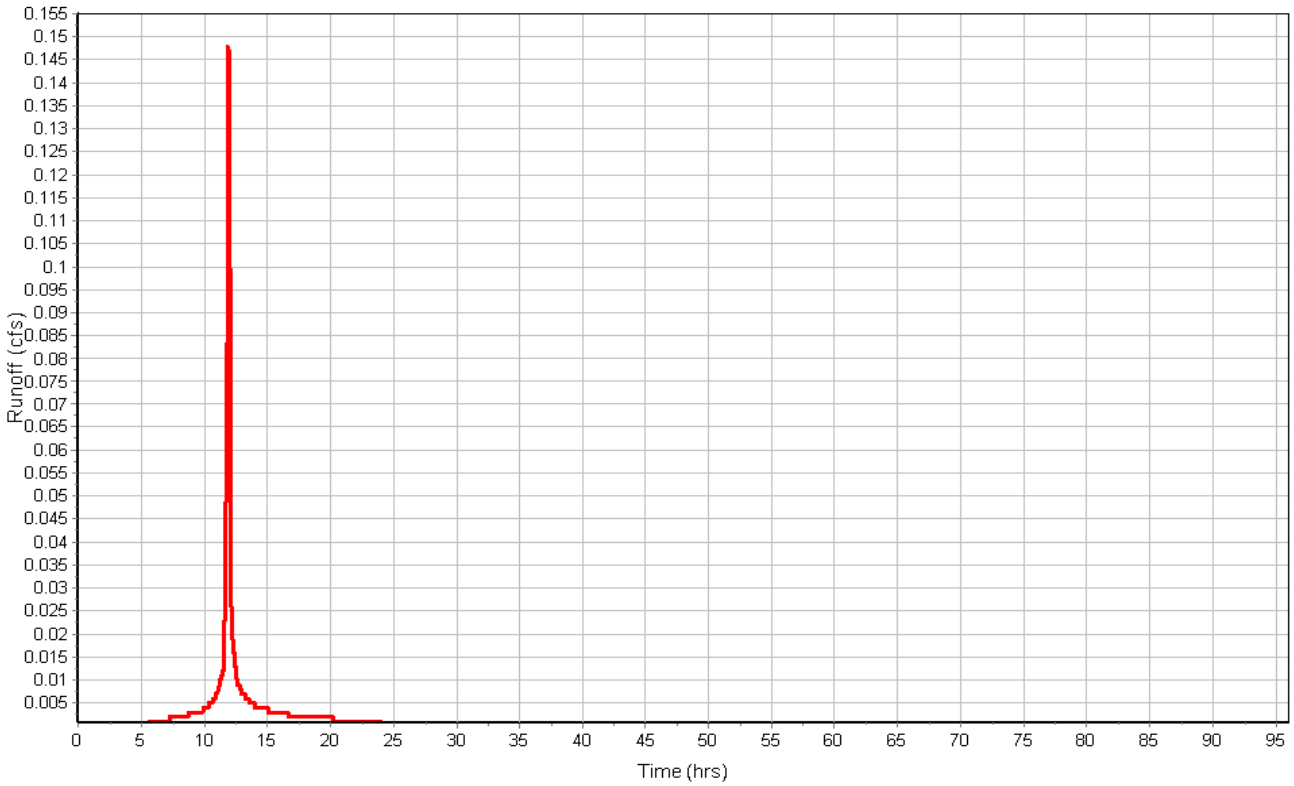
Total Rainfall (in)	1.66
Total Runoff (in)	1.41
Peak Runoff (cfs)	0.15
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_35_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_35_VACANT

Input Data

Area (ac) 0.34
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.34	B	58.00
Composite Area & Weighted CN	0.34		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	184	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	43.28	0.00	0.00

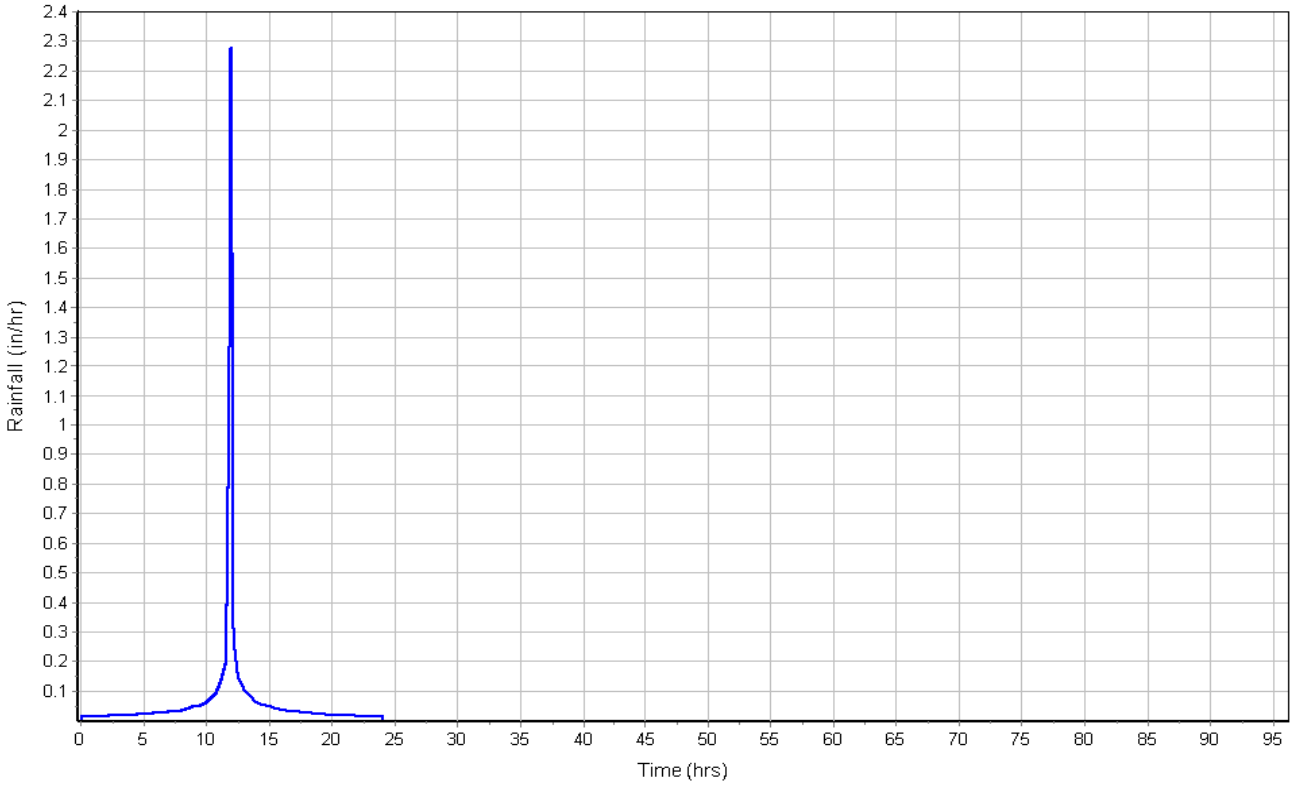
Total TOC (min) 43.28

Subbasin Runoff Results

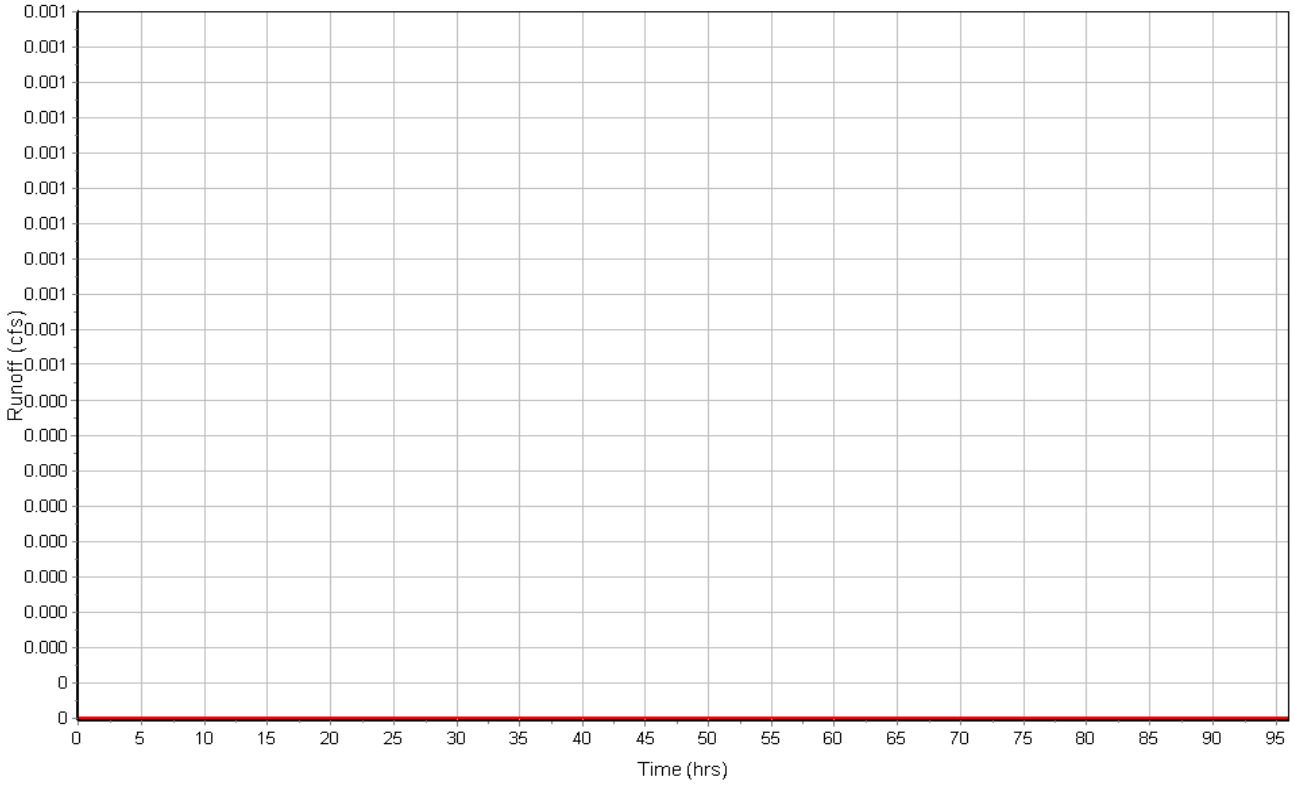
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:43:17

Subbasin : BASIN_35_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_36_ROW

Input Data

Area (ac)	0.13
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.13	B	98.00
Composite Area & Weighted CN	0.13		98.00

Time of Concentration

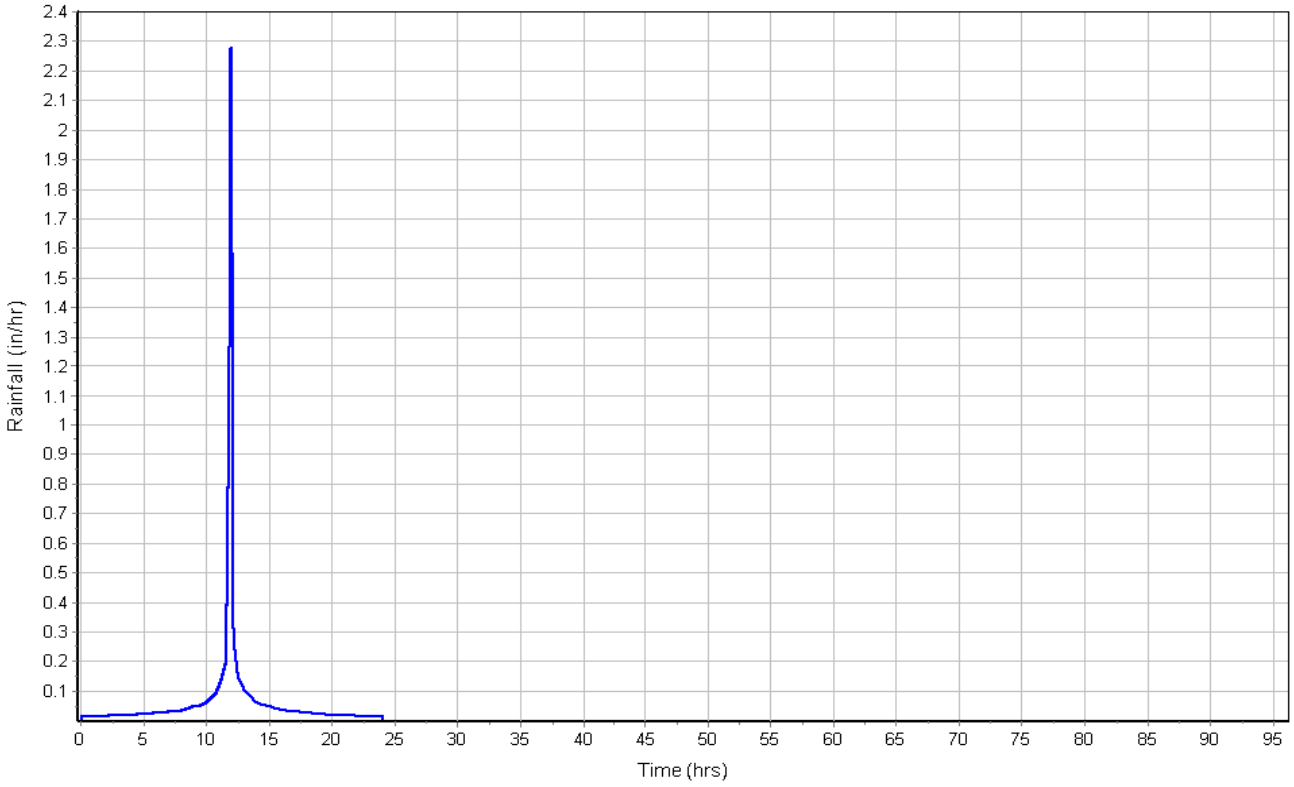
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

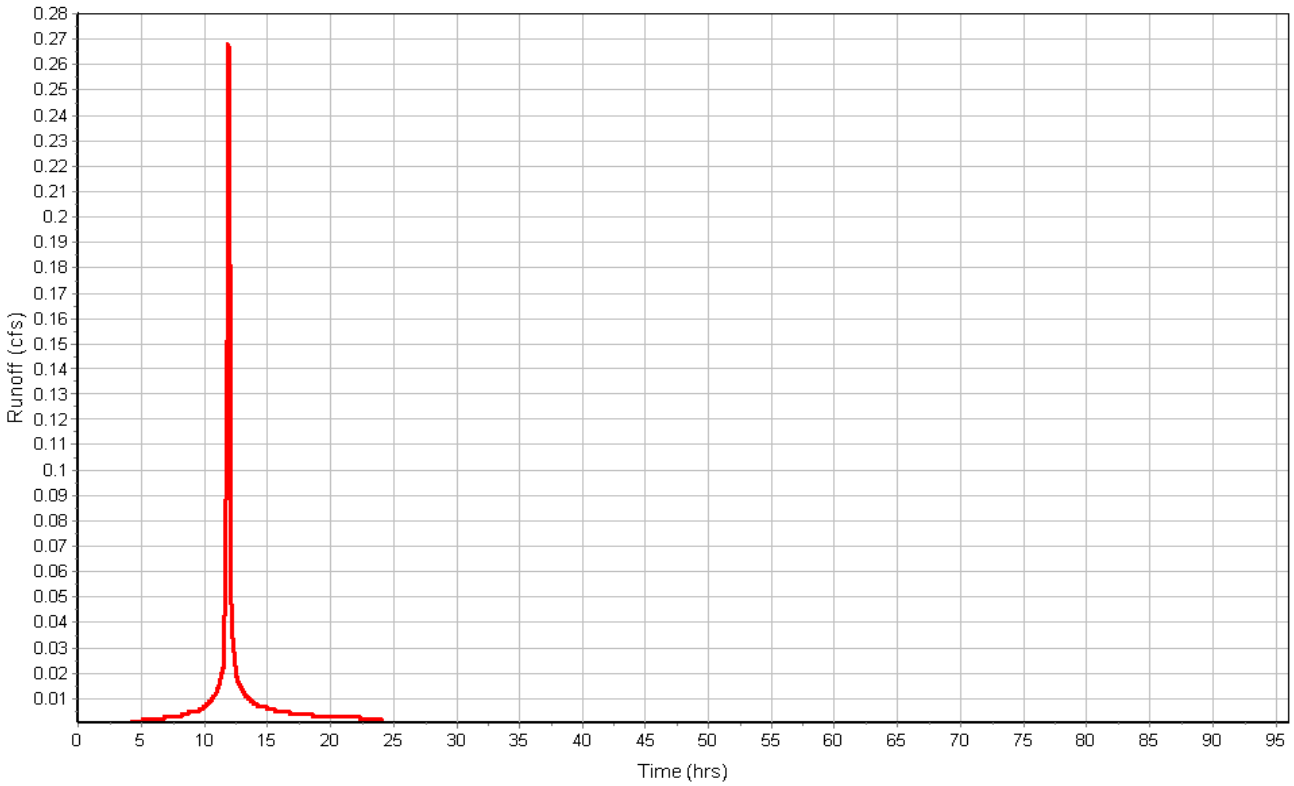
Total Rainfall (in)	1.66
Total Runoff (in)	1.43
Peak Runoff (cfs)	0.27
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_36_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_36_VACANT

Input Data

Area (ac) 0.35
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.35	B	58.00
Composite Area & Weighted CN	0.35		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	190	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	44.41	0.00	0.00

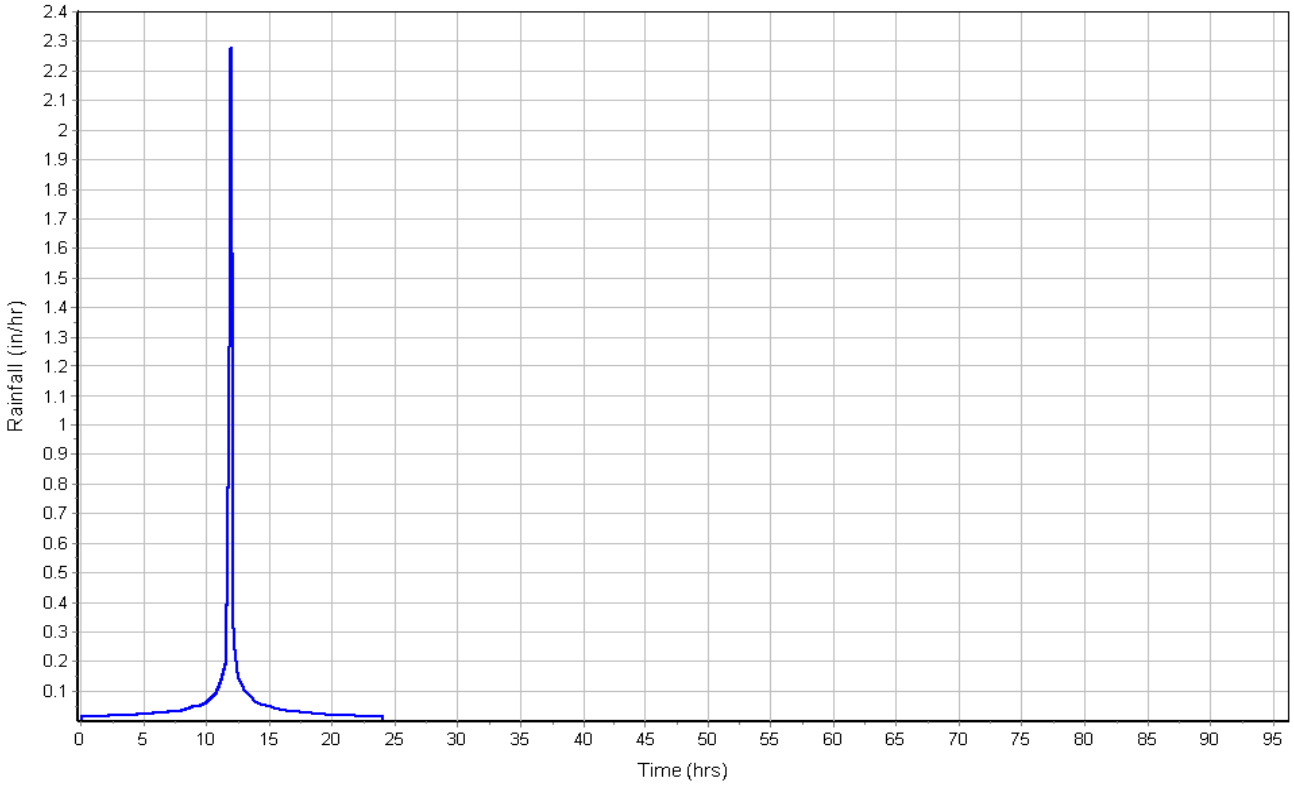
Total TOC (min) 44.41

Subbasin Runoff Results

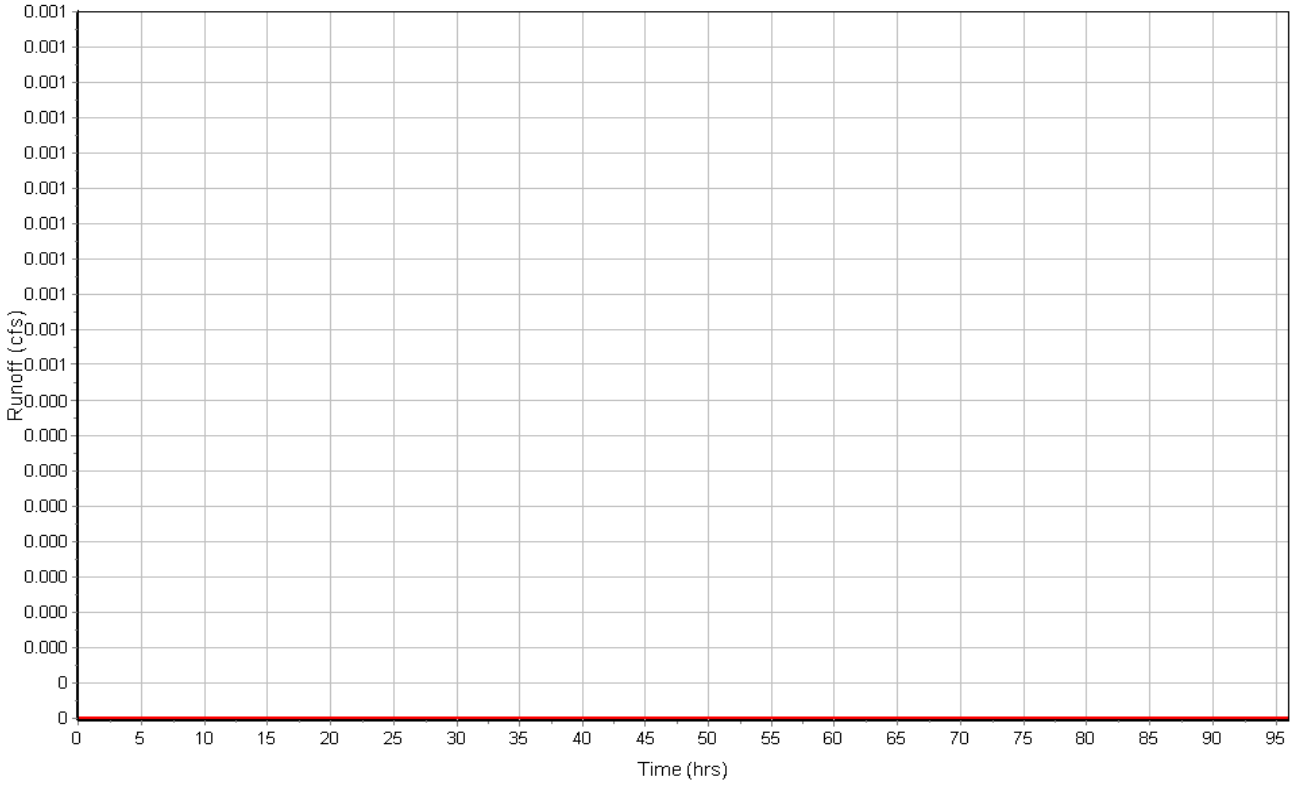
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:44:25

Subbasin : BASIN_36_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_37_ROW

Input Data

Area (ac)	0.12
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.12	B	98.00
Composite Area & Weighted CN	0.12		98.00

Time of Concentration

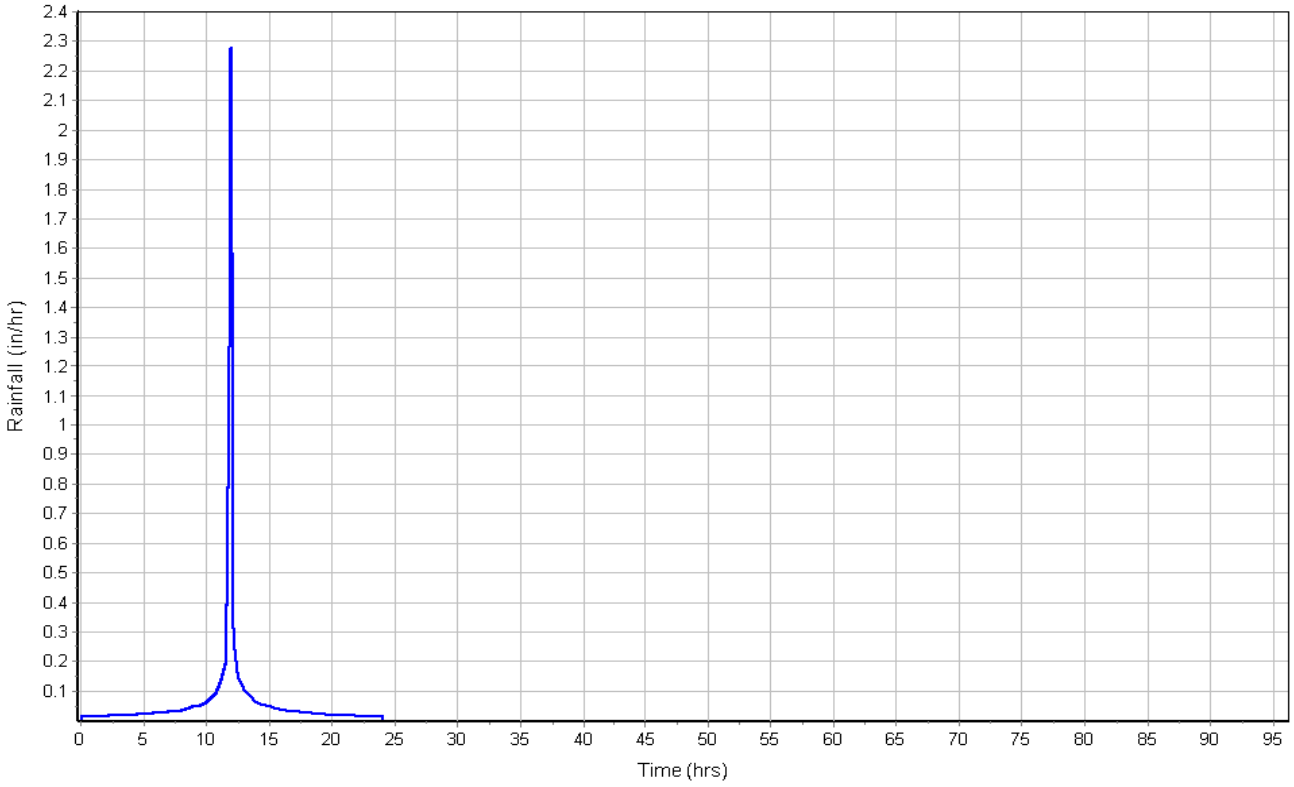
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

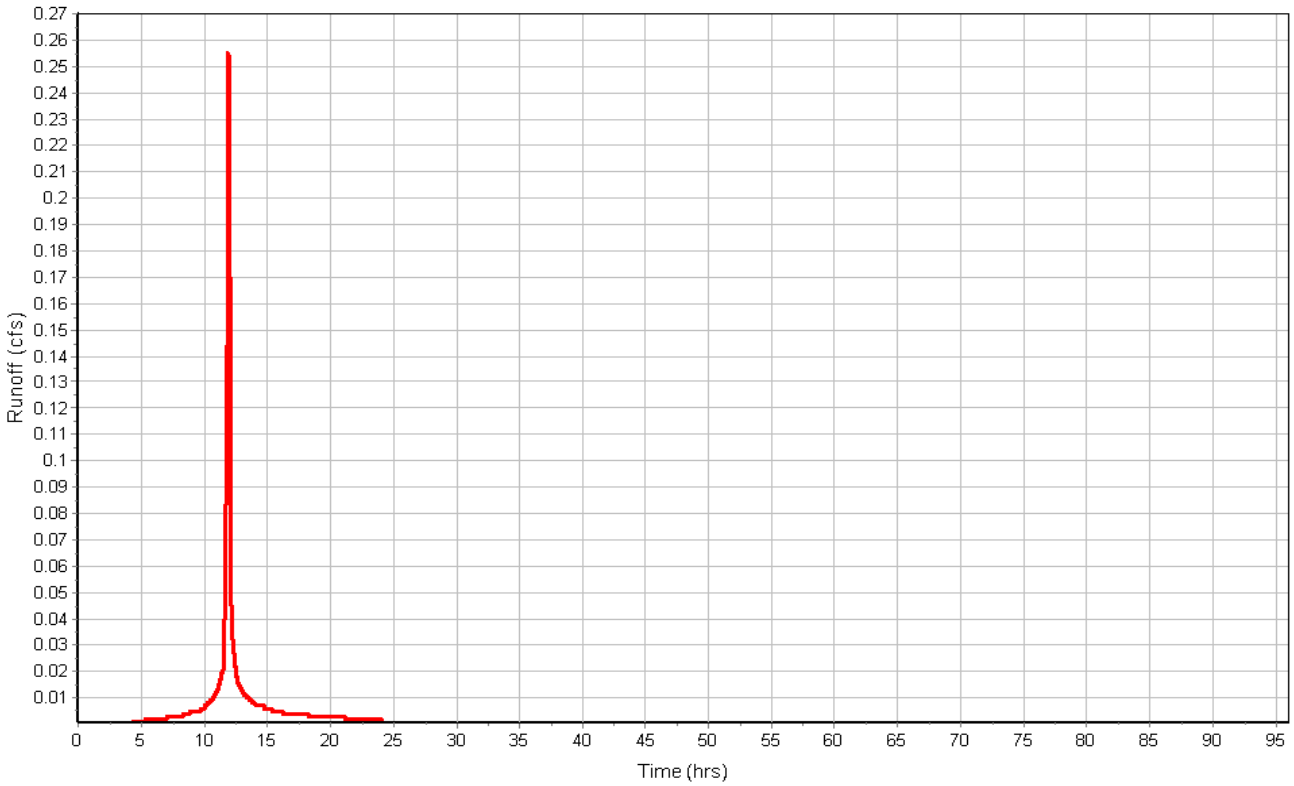
Total Rainfall (in)	1.66
Total Runoff (in)	1.43
Peak Runoff (cfs)	0.25
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_37_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_37_VACANT

Input Data

Area (ac) 0.44
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.44	B	58.00
Composite Area & Weighted CN	0.44		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	195	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	45.34	0.00	0.00

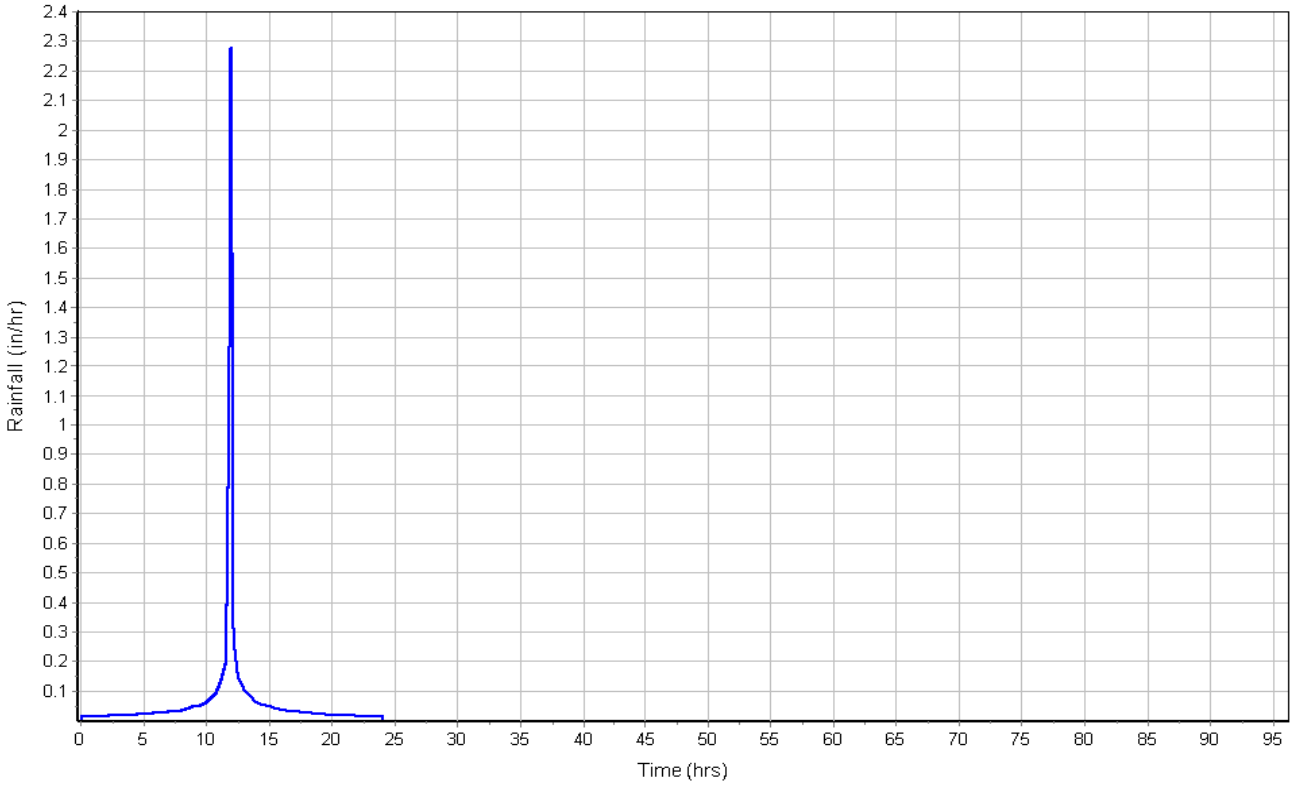
Total TOC (min) 45.34

Subbasin Runoff Results

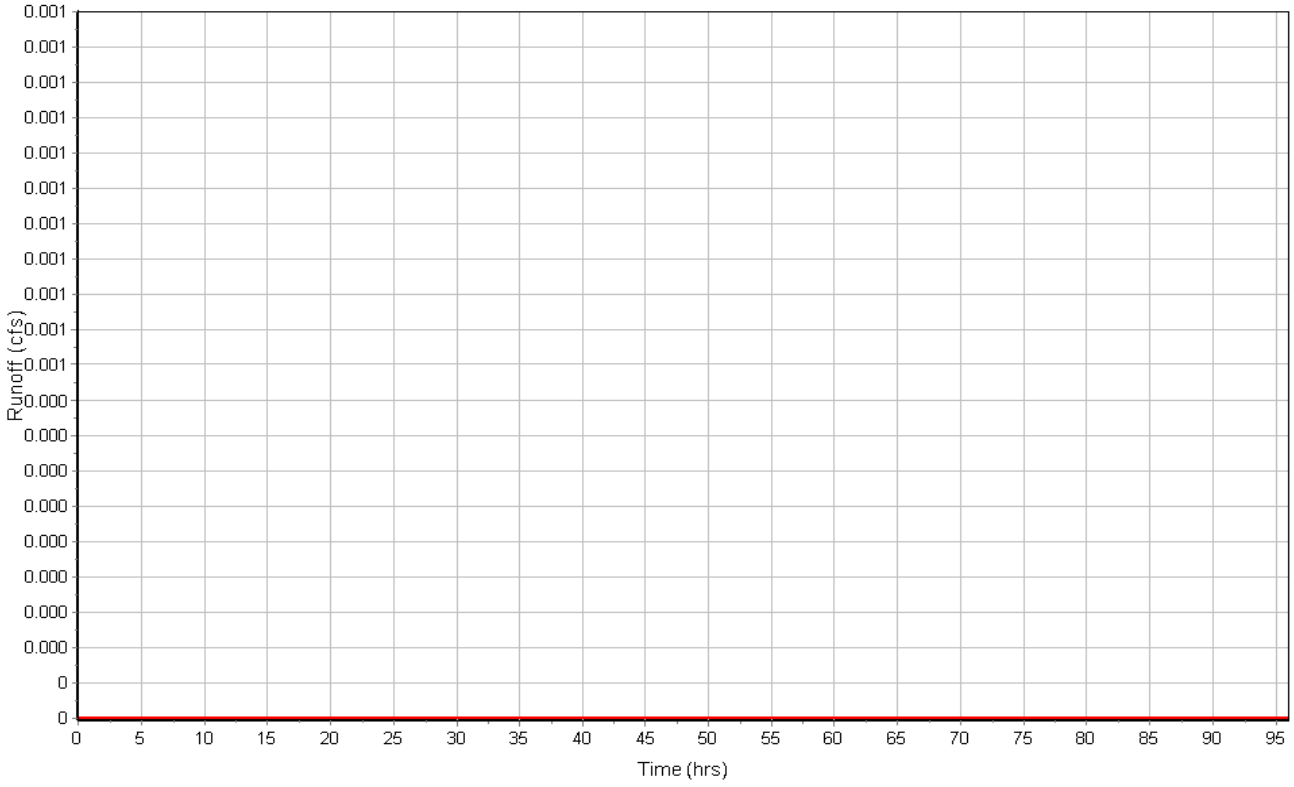
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:45:20

Subbasin : BASIN_37_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_38_ROW

Input Data

Area (ac)	0.09
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.09	B	98.00
Composite Area & Weighted CN	0.09		98.00

Time of Concentration

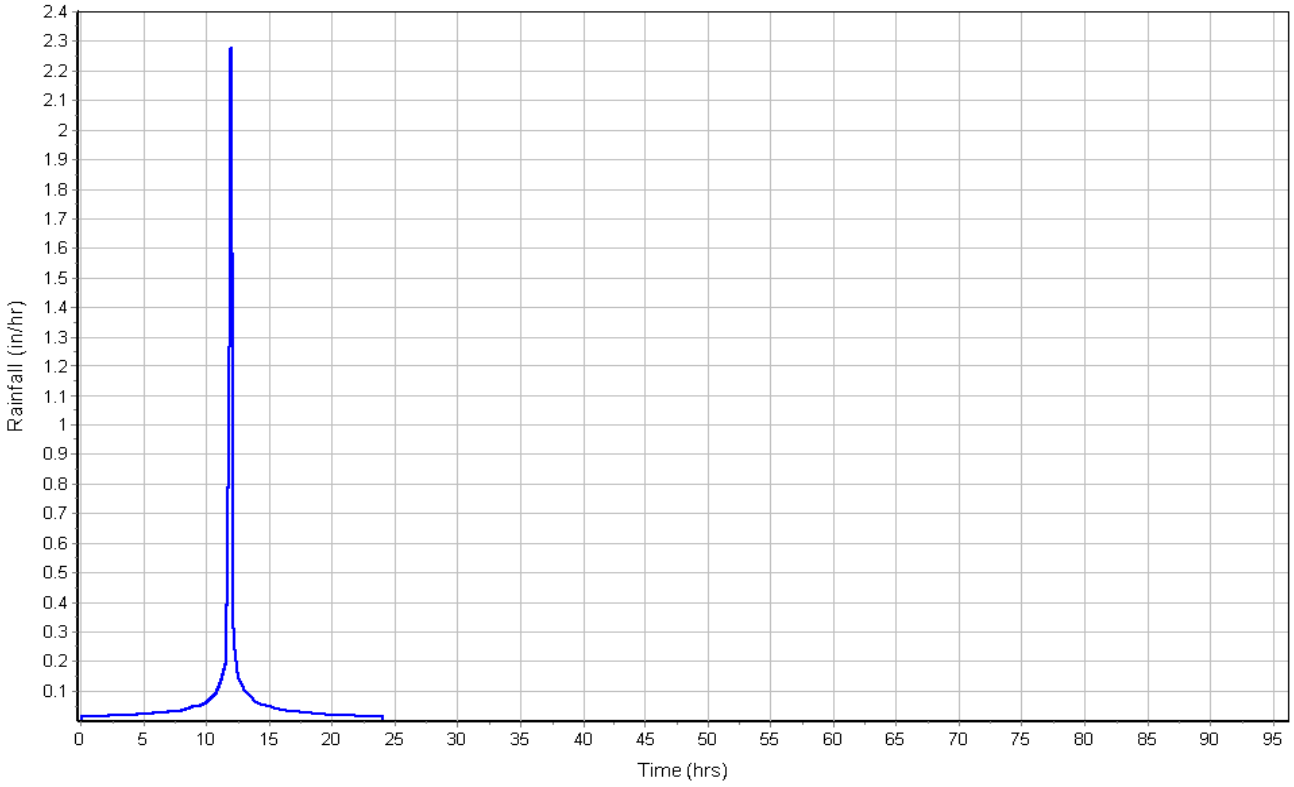
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

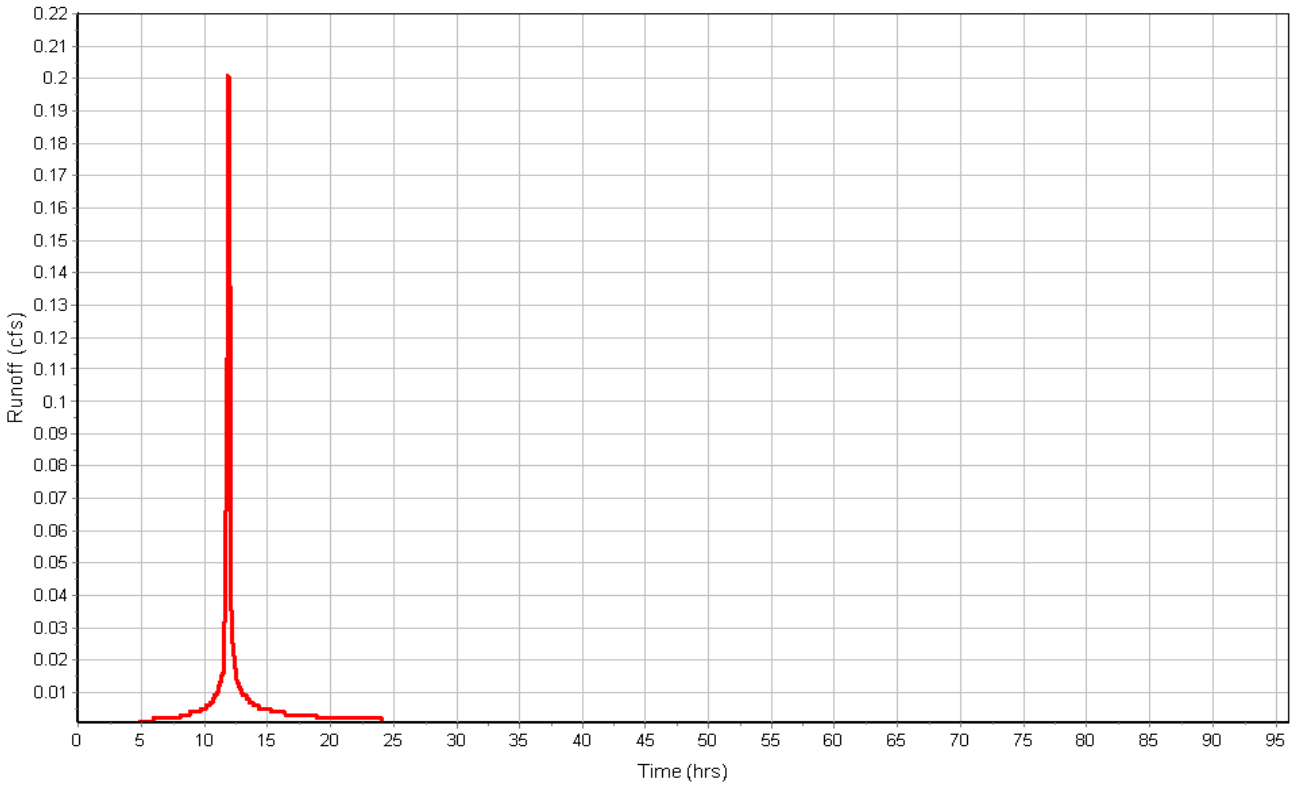
Total Rainfall (in)	1.66
Total Runoff (in)	1.42
Peak Runoff (cfs)	0.20
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_38_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_38_VACANT

Input Data

Area (ac) 0.25
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.25	B	58.00
Composite Area & Weighted CN	0.25		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	230	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	51.74	0.00	0.00

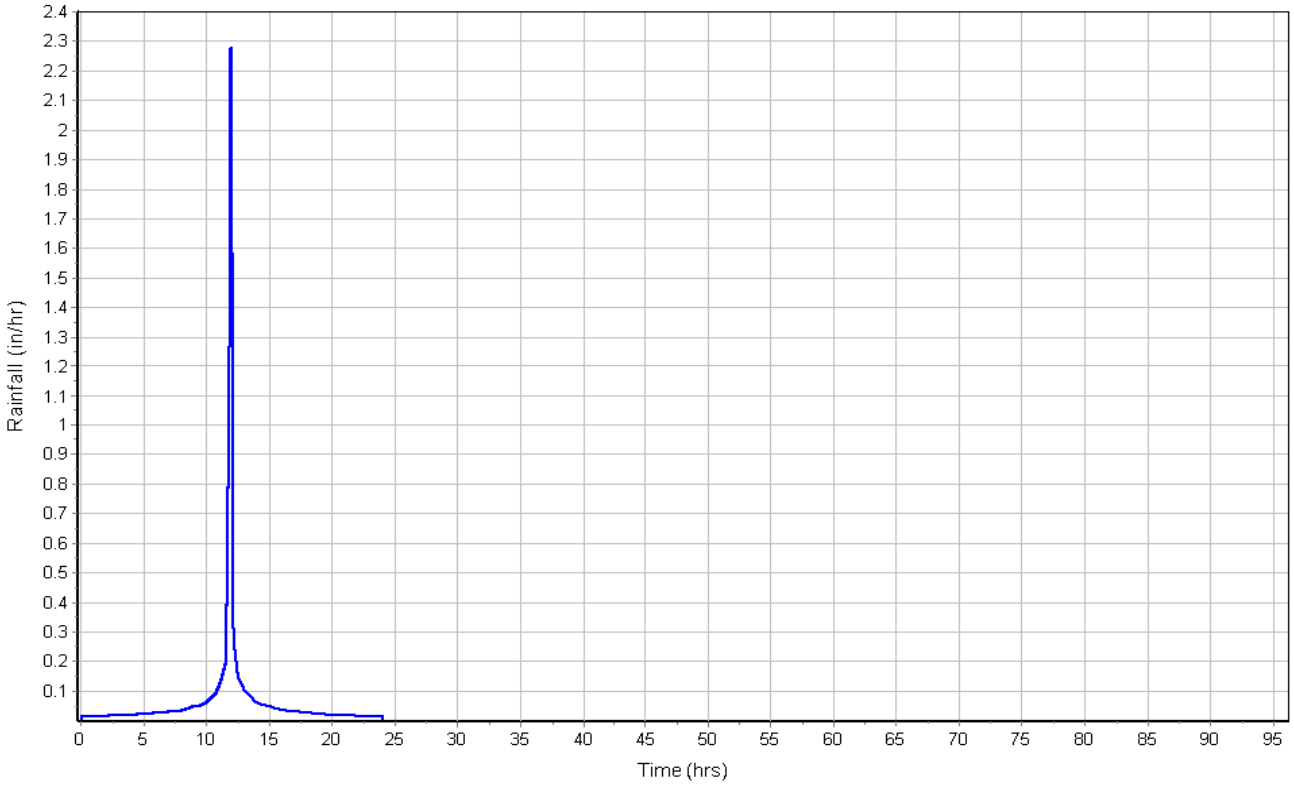
Total TOC (min) 51.74

Subbasin Runoff Results

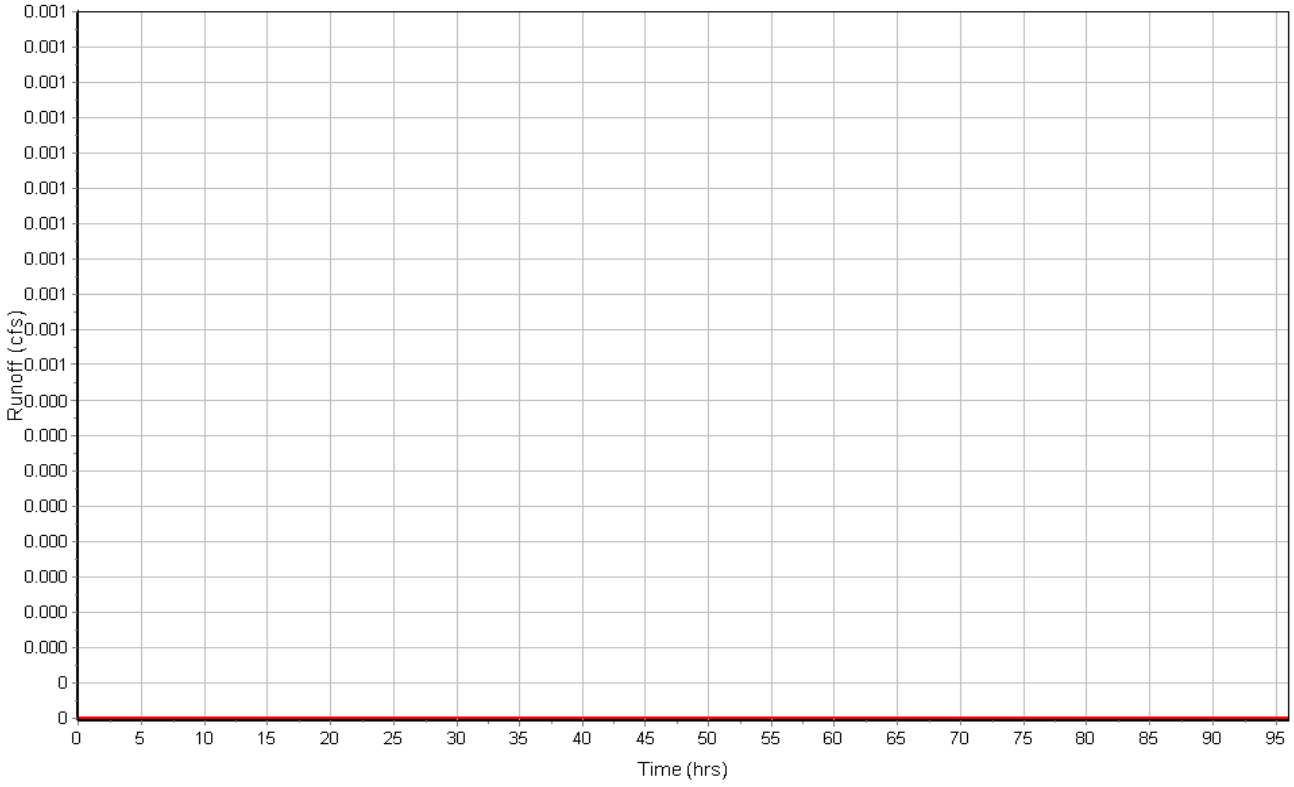
Total Rainfall (in) 1.66
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:51:44

Subbasin : BASIN_38_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_4_ROW

Input Data

Area (ac)	0.06
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.06	B	98.00
Composite Area & Weighted CN	0.06		98.00

Time of Concentration

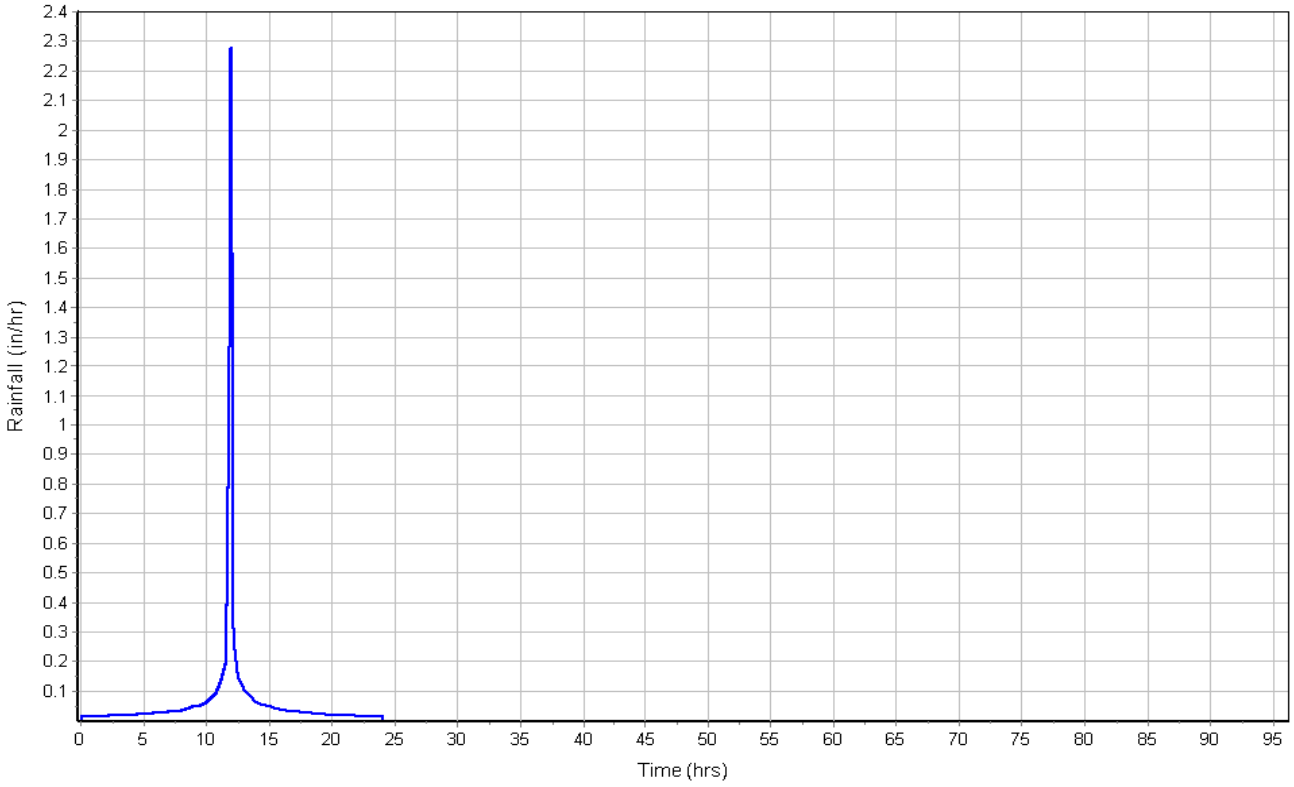
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

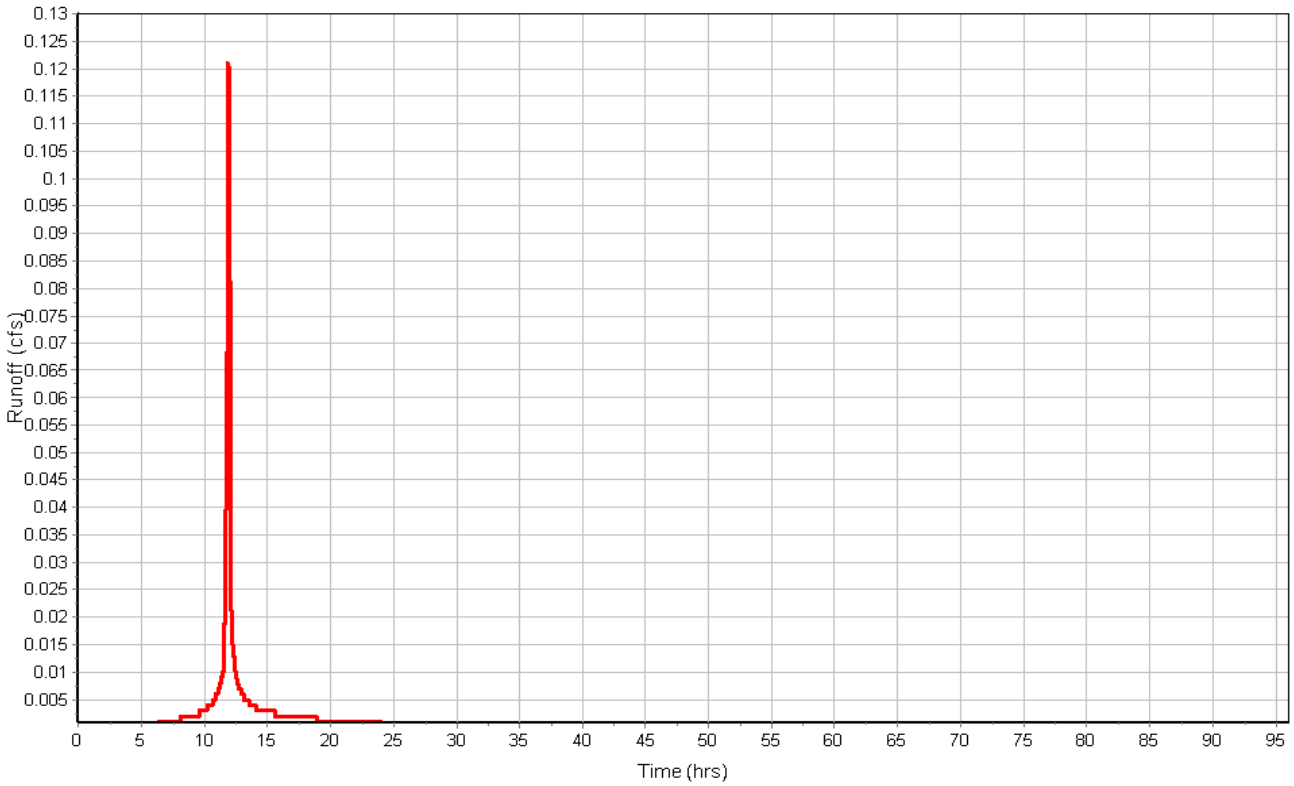
Total Rainfall (in)	1.66
Total Runoff (in)	1.40
Peak Runoff (cfs)	0.12
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_4_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_4_VACANT

Input Data

Area (ac)	0.04
Peak Rate Factor	484.00
Weighted Curve Number	58.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.04	B	58.00
Composite Area & Weighted CN	0.04		58.00

Time of Concentration

Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft²)	Minimum Pipe Cover (in)
1	Jun-02	3151.24	3155.50	4.26	3151.24	0.00	3155.50	0.00	0.00	0.00

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Jun-02	0.36	0.00	3152.51	1.27	0.00	3.06	3151.47	0.23	0 21:25	0 00:00	0.00	0.00

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	Link-01	29.78	3154.22	10.00	3154.00	3154.00	0.22	0.7500	CIRCULAR	18.000	18.000	0.0150	0.5000	0.5000	0.0000	0.00	No
2	Link-02	140.60	3151.24	0.00	3150.37	3.86	0.87	0.6200	CIRCULAR	18.000	18.000	0.0110	0.5000	0.5000	0.0000	0.00	No
3	SDP 2	250.54	3150.27	3.76	3148.71	3.21	1.55	0.6200	CIRCULAR	18.000	18.000	0.0120	0.5000	0.5000	0.0000	0.00	No
4	SDP 3	45.01	3148.62	3.12	3148.34	2.84	0.28	0.6200	CIRCULAR	18.000	18.000	0.0120	0.5000	0.5000	0.0000	0.00	No
5	SDP 4	78.23	3148.14	2.64	3147.65	2.70	0.49	0.6200	CIRCULAR	18.000	18.000	0.0120	0.5000	0.5000	0.0000	0.00	No

No. of Barrels
1
1
1
1
1

Pipe Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	Link-01	0.00	0 00:00	7.87	0.00	0.00		0.00	0.00	0.00		Calculated
2	Link-02	0.32	0 13:43	9.76	0.03	0.79	2.97	1.39	0.92	0.00		Calculated
3	SDP 2	0.18	0 13:50	8.96	0.02	0.14	29.83	1.50	1.00	1113.00		SURCHARGED
4	SDP 3	0.30	0 11:57	8.96	0.03	1.74	0.43	1.50	1.00	3221.00		SURCHARGED
5	SDP 4	0.26	0 11:46	8.96	0.03	1.68	0.78	1.50	1.00	3655.00		SURCHARGED

Storage Nodes

Storage Node : EX-POND

Input Data

Invert Elevation (ft) 3150.40
Max (Rim) Elevation (ft) 3155.50
Max (Rim) Offset (ft) 5.10
Initial Water Elevation (ft) 3150.40
Initial Water Depth (ft) 0.00
Ponded Area (ft²) 10000.00
Evaporation Loss 0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs) 0.2800

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	L1-1	Side	CIRCULAR	No	4.50			3151.74	0.60
2	L1-2	Side	CIRCULAR	No	4.50			3151.74	0.60
3	L2-1	Side	CIRCULAR	No	4.50			3152.65	0.60
4	L2-2	Side	CIRCULAR	No	4.50			3152.65	0.60
5	L2-3	Side	CIRCULAR	No	4.50			3152.65	0.60
6	L2-4	Side	CIRCULAR	No	4.50			3152.65	0.60
7	L3	Side	CIRCULAR	No	4.50			3152.99	0.60

Output Summary Results

Peak Inflow (cfs) 6.11
Peak Lateral Inflow (cfs) 6.11
Peak Outflow (cfs) 0.36
Peak Exfiltration Flow Rate (cfm) 16.80
Max HGL Elevation Attained (ft) 3152.51
Max HGL Depth Attained (ft) 2.11
Average HGL Elevation Attained (ft) 3150.89
Average HGL Depth Attained (ft) 0.49
Time of Max HGL Occurrence (days hh:mm) 0 21:20
Total Exfiltration Volume (1000-ft³) 34.844
Total Flooded Volume (ac-in) 0
Total Time Flooded (min) 0
Total Retention Time (sec) 0.00

Storage Node : Out-1SDP 4

Input Data

Invert Elevation (ft)	3144.95
Max (Rim) Elevation (ft)	3154.95
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.95
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0023

Output Summary Results

Peak Inflow (cfs)	0.32
Peak Lateral Inflow (cfs)	0.12
Peak Outflow (cfs)	0.18
Peak Exfiltration Flow Rate (cfm)	0.14
Max HGL Elevation Attained (ft)	3152.51
Max HGL Depth Attained (ft)	7.56
Average HGL Elevation Attained (ft)	3149.91
Average HGL Depth Attained (ft)	4.96
Time of Max HGL Occurrence (days hh:mm)	0 21:28
Total Exfiltration Volume (1000-ft³)	0.732
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 1

Input Data

Invert Elevation (ft)	3146.51
Max (Rim) Elevation (ft)	3156.51
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3146.51
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0012

Output Summary Results

Peak Inflow (cfs)	0.32
Peak Lateral Inflow (cfs)	0.00
Peak Outflow (cfs)	0.18
Peak Exfiltration Flow Rate (cfm)	0.07
Max HGL Elevation Attained (ft)	3152.51
Max HGL Depth Attained (ft)	6
Average HGL Elevation Attained (ft)	3149.76
Average HGL Depth Attained (ft)	3.25
Time of Max HGL Occurrence (days hh:mm)	0 21:21
Total Exfiltration Volume (1000-ft³)	0.343
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 10

Input Data

Invert Elevation (ft)	3144.15
Max (Rim) Elevation (ft)	3154.15
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.15
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0019

Output Summary Results

Peak Inflow (cfs)	0.20
Peak Lateral Inflow (cfs)	0.20
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.11
Max HGL Elevation Attained (ft)	3151.12
Max HGL Depth Attained (ft)	6.97
Average HGL Elevation Attained (ft)	3147.29
Average HGL Depth Attained (ft)	3.14
Time of Max HGL Occurrence (days hh:mm)	1 00:02
Total Exfiltration Volume (1000-ft³)	0.497
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 11

Input Data

Invert Elevation (ft)	3144.06
Max (Rim) Elevation (ft)	3154.06
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.06
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0068

Output Summary Results

Peak Inflow (cfs)	0.31
Peak Lateral Inflow (cfs)	0.31
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.41
Max HGL Elevation Attained (ft)	3149.47
Max HGL Depth Attained (ft)	5.41
Average HGL Elevation Attained (ft)	3145.19
Average HGL Depth Attained (ft)	1.13
Time of Max HGL Occurrence (days hh:mm)	0 15:32
Total Exfiltration Volume (1000-ft³)	0.766
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 12

Input Data

Invert Elevation (ft)	3144.06
Max (Rim) Elevation (ft)	3154.06
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.06
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0019

Output Summary Results

Peak Inflow (cfs)	0.19
Peak Lateral Inflow (cfs)	0.19
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.11
Max HGL Elevation Attained (ft)	3150.54
Max HGL Depth Attained (ft)	6.48
Average HGL Elevation Attained (ft)	3146.83
Average HGL Depth Attained (ft)	2.77
Time of Max HGL Occurrence (days hh:mm)	1 00:02
Total Exfiltration Volume (1000-ft³)	0.465
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 13

Input Data

Invert Elevation (ft)	3145.41
Max (Rim) Elevation (ft)	3155.41
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.41
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0033

Output Summary Results

Peak Inflow (cfs)	0.28
Peak Lateral Inflow (cfs)	0.28
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.20
Max HGL Elevation Attained (ft)	3151.23
Max HGL Depth Attained (ft)	5.82
Average HGL Elevation Attained (ft)	3147.70
Average HGL Depth Attained (ft)	2.29
Time of Max HGL Occurrence (days hh:mm)	0 18:57
Total Exfiltration Volume (1000-ft³)	0.701
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 14

Input Data

Invert Elevation (ft)	3145.41
Max (Rim) Elevation (ft)	3155.41
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.41
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0068

Output Summary Results

Peak Inflow (cfs)	0.32
Peak Lateral Inflow (cfs)	0.32
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.41
Max HGL Elevation Attained (ft)	3151.03
Max HGL Depth Attained (ft)	5.62
Average HGL Elevation Attained (ft)	3146.62
Average HGL Depth Attained (ft)	1.21
Time of Max HGL Occurrence (days hh:mm)	0 15:40
Total Exfiltration Volume (1000-ft³)	0.797
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 15

Input Data

Invert Elevation (ft)	3145.06
Max (Rim) Elevation (ft)	3155.06
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.06
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.27
Peak Lateral Inflow (cfs)	0.27
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3150.93
Max HGL Depth Attained (ft)	5.87
Average HGL Elevation Attained (ft)	3146.39
Average HGL Depth Attained (ft)	1.33
Time of Max HGL Occurrence (days hh:mm)	0 15:38
Total Exfiltration Volume (1000-ft³)	0.665
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 16

Input Data

Invert Elevation (ft)	3145.06
Max (Rim) Elevation (ft)	3155.06
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.06
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.27
Peak Lateral Inflow (cfs)	0.27
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3150.93
Max HGL Depth Attained (ft)	5.87
Average HGL Elevation Attained (ft)	3146.39
Average HGL Depth Attained (ft)	1.33
Time of Max HGL Occurrence (days hh:mm)	0 15:38
Total Exfiltration Volume (1000-ft³)	0.665
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 17

Input Data

Invert Elevation (ft)	3144.38
Max (Rim) Elevation (ft)	3154.38
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.38
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.25
Peak Lateral Inflow (cfs)	0.25
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3149.96
Max HGL Depth Attained (ft)	5.58
Average HGL Elevation Attained (ft)	3145.58
Average HGL Depth Attained (ft)	1.2
Time of Max HGL Occurrence (days hh:mm)	0 15:26
Total Exfiltration Volume (1000-ft³)	0.629
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 18

Input Data

Invert Elevation (ft)	3144.37
Max (Rim) Elevation (ft)	3154.37
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.37
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0038

Output Summary Results

Peak Inflow (cfs)	0.23
Peak Lateral Inflow (cfs)	0.23
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.23
Max HGL Elevation Attained (ft)	3151.11
Max HGL Depth Attained (ft)	6.74
Average HGL Elevation Attained (ft)	3146.10
Average HGL Depth Attained (ft)	1.73
Time of Max HGL Occurrence (days hh:mm)	0 17:27
Total Exfiltration Volume (1000-ft³)	0.561
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 19

Input Data

Invert Elevation (ft)	3144.52
Max (Rim) Elevation (ft)	3154.52
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.52
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0012

Output Summary Results

Peak Inflow (cfs)	0.16
Peak Lateral Inflow (cfs)	0.16
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.07
Max HGL Elevation Attained (ft)	3153.39
Max HGL Depth Attained (ft)	8.87
Average HGL Elevation Attained (ft)	3149.15
Average HGL Depth Attained (ft)	4.63
Time of Max HGL Occurrence (days hh:mm)	0 22:23
Total Exfiltration Volume (1000-ft³)	0.390
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 2

Input Data

Invert Elevation (ft)	3145.50
Max (Rim) Elevation (ft)	3155.50
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.50
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0023

Output Summary Results

Peak Inflow (cfs)	0.66
Peak Lateral Inflow (cfs)	0.38
Peak Outflow (cfs)	0.18
Peak Exfiltration Flow Rate (cfm)	0.14
Max HGL Elevation Attained (ft)	3152.51
Max HGL Depth Attained (ft)	7.01
Average HGL Elevation Attained (ft)	3149.99
Average HGL Depth Attained (ft)	4.49
Time of Max HGL Occurrence (days hh:mm)	0 21:28
Total Exfiltration Volume (1000-ft³)	0.760
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 20

Input Data

Invert Elevation (ft)	3144.64
Max (Rim) Elevation (ft)	3154.64
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.64
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0026

Output Summary Results

Peak Inflow (cfs)	0.25
Peak Lateral Inflow (cfs)	0.25
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.16
Max HGL Elevation Attained (ft)	3151.24
Max HGL Depth Attained (ft)	6.6
Average HGL Elevation Attained (ft)	3147.47
Average HGL Depth Attained (ft)	2.83
Time of Max HGL Occurrence (days hh:mm)	0 21:10
Total Exfiltration Volume (1000-ft³)	0.629
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 21

Input Data

Invert Elevation (ft)	3144.66
Max (Rim) Elevation (ft)	3154.66
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.66
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.25
Peak Lateral Inflow (cfs)	0.25
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3150.24
Max HGL Depth Attained (ft)	5.58
Average HGL Elevation Attained (ft)	3145.86
Average HGL Depth Attained (ft)	1.2
Time of Max HGL Occurrence (days hh:mm)	0 15:26
Total Exfiltration Volume (1000-ft³)	0.629
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 22

Input Data

Invert Elevation (ft)	3146.75
Max (Rim) Elevation (ft)	3156.75
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3146.75
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0068

Output Summary Results

Peak Inflow (cfs)	0.29
Peak Lateral Inflow (cfs)	0.29
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.41
Max HGL Elevation Attained (ft)	3151.95
Max HGL Depth Attained (ft)	5.2
Average HGL Elevation Attained (ft)	3147.79
Average HGL Depth Attained (ft)	1.04
Time of Max HGL Occurrence (days hh:mm)	0 15:21
Total Exfiltration Volume (1000-ft³)	0.734
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 23

Input Data

Invert Elevation (ft)	3146.75
Max (Rim) Elevation (ft)	3156.75
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3146.75
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0068

Output Summary Results

Peak Inflow (cfs)	0.29
Peak Lateral Inflow (cfs)	0.29
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.41
Max HGL Elevation Attained (ft)	3151.95
Max HGL Depth Attained (ft)	5.2
Average HGL Elevation Attained (ft)	3147.79
Average HGL Depth Attained (ft)	1.04
Time of Max HGL Occurrence (days hh:mm)	0 15:21
Total Exfiltration Volume (1000-ft³)	0.734
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 24

Input Data

Invert Elevation (ft)	3145.70
Max (Rim) Elevation (ft)	3155.70
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.70
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0038

Output Summary Results

Peak Inflow (cfs)	0.24
Peak Lateral Inflow (cfs)	0.24
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.23
Max HGL Elevation Attained (ft)	3152.91
Max HGL Depth Attained (ft)	7.21
Average HGL Elevation Attained (ft)	3147.64
Average HGL Depth Attained (ft)	1.94
Time of Max HGL Occurrence (days hh:mm)	0 17:53
Total Exfiltration Volume (1000-ft³)	0.594
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 25

Input Data

Invert Elevation (ft)	3145.96
Max (Rim) Elevation (ft)	3155.96
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.96
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.27
Peak Lateral Inflow (cfs)	0.27
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3151.83
Max HGL Depth Attained (ft)	5.87
Average HGL Elevation Attained (ft)	3147.29
Average HGL Depth Attained (ft)	1.33
Time of Max HGL Occurrence (days hh:mm)	0 15:38
Total Exfiltration Volume (1000-ft³)	0.665
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 26

Input Data

Invert Elevation (ft)	3145.93
Max (Rim) Elevation (ft)	3155.93
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.93
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0068

Output Summary Results

Peak Inflow (cfs)	0.35
Peak Lateral Inflow (cfs)	0.35
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.41
Max HGL Elevation Attained (ft)	3152.02
Max HGL Depth Attained (ft)	6.09
Average HGL Elevation Attained (ft)	3147.34
Average HGL Depth Attained (ft)	1.41
Time of Max HGL Occurrence (days hh:mm)	0 15:57
Total Exfiltration Volume (1000-ft³)	0.864
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 27

Input Data

Invert Elevation (ft)	3145.69
Max (Rim) Elevation (ft)	3155.69
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.69
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0023

Output Summary Results

Peak Inflow (cfs)	0.11
Peak Lateral Inflow (cfs)	0.11
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.14
Max HGL Elevation Attained (ft)	3150.38
Max HGL Depth Attained (ft)	4.69
Average HGL Elevation Attained (ft)	3146.55
Average HGL Depth Attained (ft)	0.86
Time of Max HGL Occurrence (days hh:mm)	0 15:08
Total Exfiltration Volume (1000-ft³)	0.252
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 28

Input Data

Invert Elevation (ft)	3146.31
Max (Rim) Elevation (ft)	3156.31
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3146.31
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.25
Peak Lateral Inflow (cfs)	0.25
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3151.89
Max HGL Depth Attained (ft)	5.58
Average HGL Elevation Attained (ft)	3147.51
Average HGL Depth Attained (ft)	1.2
Time of Max HGL Occurrence (days hh:mm)	0 15:26
Total Exfiltration Volume (1000-ft³)	0.629
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 29

Input Data

Invert Elevation (ft)	3146.31
Max (Rim) Elevation (ft)	3156.31
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3146.31
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.25
Peak Lateral Inflow (cfs)	0.25
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3151.89
Max HGL Depth Attained (ft)	5.58
Average HGL Elevation Attained (ft)	3147.51
Average HGL Depth Attained (ft)	1.2
Time of Max HGL Occurrence (days hh:mm)	0 15:26
Total Exfiltration Volume (1000-ft³)	0.629
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 3

Input Data

Invert Elevation (ft)	3145.50
Max (Rim) Elevation (ft)	3155.50
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.50
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0023

Output Summary Results

Peak Inflow (cfs)	0.49
Peak Lateral Inflow (cfs)	0.31
Peak Outflow (cfs)	0.36
Peak Exfiltration Flow Rate (cfm)	0.14
Max HGL Elevation Attained (ft)	3152.51
Max HGL Depth Attained (ft)	7.01
Average HGL Elevation Attained (ft)	3150.01
Average HGL Depth Attained (ft)	4.51
Time of Max HGL Occurrence (days hh:mm)	0 21:28
Total Exfiltration Volume (1000-ft³)	0.756
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 30

Input Data

Invert Elevation (ft)	3145.07
Max (Rim) Elevation (ft)	3155.07
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.07
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0068

Output Summary Results

Peak Inflow (cfs)	0.32
Peak Lateral Inflow (cfs)	0.32
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.41
Max HGL Elevation Attained (ft)	3150.70
Max HGL Depth Attained (ft)	5.63
Average HGL Elevation Attained (ft)	3146.28
Average HGL Depth Attained (ft)	1.21
Time of Max HGL Occurrence (days hh:mm)	0 15:40
Total Exfiltration Volume (1000-ft³)	0.797
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 31

Input Data

Invert Elevation (ft)	3145.07
Max (Rim) Elevation (ft)	3155.07
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.07
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0068

Output Summary Results

Peak Inflow (cfs)	0.32
Peak Lateral Inflow (cfs)	0.32
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.41
Max HGL Elevation Attained (ft)	3150.70
Max HGL Depth Attained (ft)	5.63
Average HGL Elevation Attained (ft)	3146.28
Average HGL Depth Attained (ft)	1.21
Time of Max HGL Occurrence (days hh:mm)	0 15:40
Total Exfiltration Volume (1000-ft³)	0.797
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 32

Input Data

Invert Elevation (ft)	3145.81
Max (Rim) Elevation (ft)	3155.81
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.81
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0033

Output Summary Results

Peak Inflow (cfs)	0.25
Peak Lateral Inflow (cfs)	0.25
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.20
Max HGL Elevation Attained (ft)	3151.12
Max HGL Depth Attained (ft)	5.31
Average HGL Elevation Attained (ft)	3147.71
Average HGL Depth Attained (ft)	1.9
Time of Max HGL Occurrence (days hh:mm)	0 18:17
Total Exfiltration Volume (1000-ft³)	0.629
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 33

Input Data

Invert Elevation (ft)	3145.81
Max (Rim) Elevation (ft)	3155.81
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.81
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0033

Output Summary Results

Peak Inflow (cfs)	0.25
Peak Lateral Inflow (cfs)	0.25
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.20
Max HGL Elevation Attained (ft)	3151.12
Max HGL Depth Attained (ft)	5.31
Average HGL Elevation Attained (ft)	3147.71
Average HGL Depth Attained (ft)	1.9
Time of Max HGL Occurrence (days hh:mm)	0 18:17
Total Exfiltration Volume (1000-ft³)	0.629
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 34

Input Data

Invert Elevation (ft)	3145.71
Max (Rim) Elevation (ft)	3155.71
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.71
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0019

Output Summary Results

Peak Inflow (cfs)	0.15
Peak Lateral Inflow (cfs)	0.15
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.11
Max HGL Elevation Attained (ft)	3150.81
Max HGL Depth Attained (ft)	5.1
Average HGL Elevation Attained (ft)	3147.42
Average HGL Depth Attained (ft)	1.71
Time of Max HGL Occurrence (days hh:mm)	0 20:12
Total Exfiltration Volume (1000-ft³)	0.357
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 35

Input Data

Invert Elevation (ft)	3145.69
Max (Rim) Elevation (ft)	3155.69
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.69
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0019

Output Summary Results

Peak Inflow (cfs)	0.15
Peak Lateral Inflow (cfs)	0.15
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.11
Max HGL Elevation Attained (ft)	3150.79
Max HGL Depth Attained (ft)	5.1
Average HGL Elevation Attained (ft)	3147.40
Average HGL Depth Attained (ft)	1.71
Time of Max HGL Occurrence (days hh:mm)	0 20:12
Total Exfiltration Volume (1000-ft³)	0.357
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 36

Input Data

Invert Elevation (ft)	3145.61
Max (Rim) Elevation (ft)	3155.61
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.61
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.27
Peak Lateral Inflow (cfs)	0.27
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3151.48
Max HGL Depth Attained (ft)	5.87
Average HGL Elevation Attained (ft)	3146.94
Average HGL Depth Attained (ft)	1.33
Time of Max HGL Occurrence (days hh:mm)	0 15:38
Total Exfiltration Volume (1000-ft³)	0.665
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 37

Input Data

Invert Elevation (ft)	3145.61
Max (Rim) Elevation (ft)	3155.61
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.61
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.25
Peak Lateral Inflow (cfs)	0.25
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3151.19
Max HGL Depth Attained (ft)	5.58
Average HGL Elevation Attained (ft)	3146.81
Average HGL Depth Attained (ft)	1.2
Time of Max HGL Occurrence (days hh:mm)	0 15:26
Total Exfiltration Volume (1000-ft³)	0.629
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 5

Input Data

Invert Elevation (ft)	3144.22
Max (Rim) Elevation (ft)	3154.22
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.22
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0038

Output Summary Results

Peak Inflow (cfs)	0.31
Peak Lateral Inflow (cfs)	0.31
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.23
Max HGL Elevation Attained (ft)	3154.22
Max HGL Depth Attained (ft)	10
Average HGL Elevation Attained (ft)	3147.57
Average HGL Depth Attained (ft)	3.35
Time of Max HGL Occurrence (days hh:mm)	0 19:31
Total Exfiltration Volume (1000-ft³)	0.773
Total Flooded Volume (ac-in)	0.00
Total Time Flooded (min)	112
Total Retention Time (sec)	0.00

Storage Node : SDS 6

Input Data

Invert Elevation (ft)	3144.22
Max (Rim) Elevation (ft)	3154.22
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.22
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.27
Peak Lateral Inflow (cfs)	0.27
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3150.09
Max HGL Depth Attained (ft)	5.87
Average HGL Elevation Attained (ft)	3145.55
Average HGL Depth Attained (ft)	1.33
Time of Max HGL Occurrence (days hh:mm)	0 15:38
Total Exfiltration Volume (1000-ft³)	0.665
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 7

Input Data

Invert Elevation (ft)	3144.19
Max (Rim) Elevation (ft)	3154.19
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.19
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0023

Output Summary Results

Peak Inflow (cfs)	0.15
Peak Lateral Inflow (cfs)	0.15
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.14
Max HGL Elevation Attained (ft)	3150.84
Max HGL Depth Attained (ft)	6.65
Average HGL Elevation Attained (ft)	3145.91
Average HGL Depth Attained (ft)	1.72
Time of Max HGL Occurrence (days hh:mm)	0 16:39
Total Exfiltration Volume (1000-ft³)	0.357
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 8

Input Data

Invert Elevation (ft)	3144.19
Max (Rim) Elevation (ft)	3154.19
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.19
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0038

Output Summary Results

Peak Inflow (cfs)	0.21
Peak Lateral Inflow (cfs)	0.21
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.23
Max HGL Elevation Attained (ft)	3150.49
Max HGL Depth Attained (ft)	6.3
Average HGL Elevation Attained (ft)	3145.72
Average HGL Depth Attained (ft)	1.53
Time of Max HGL Occurrence (days hh:mm)	0 16:57
Total Exfiltration Volume (1000-ft³)	0.529
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 9

Input Data

Invert Elevation (ft)	3144.20
Max (Rim) Elevation (ft)	3154.20
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.20
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0038

Output Summary Results

Peak Inflow (cfs)	0.20
Peak Lateral Inflow (cfs)	0.20
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.23
Max HGL Elevation Attained (ft)	3150.09
Max HGL Depth Attained (ft)	5.89
Average HGL Elevation Attained (ft)	3145.56
Average HGL Depth Attained (ft)	1.36
Time of Max HGL Occurrence (days hh:mm)	0 16:25
Total Exfiltration Volume (1000-ft³)	0.497
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS_38

Input Data

Invert Elevation (ft)	3145.96
Max (Rim) Elevation (ft)	3155.96
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.96
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0038

Output Summary Results

Peak Inflow (cfs)	0.20
Peak Lateral Inflow (cfs)	0.20
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.23
Max HGL Elevation Attained (ft)	3151.85
Max HGL Depth Attained (ft)	5.89
Average HGL Elevation Attained (ft)	3147.32
Average HGL Depth Attained (ft)	1.36
Time of Max HGL Occurrence (days hh:mm)	0 16:25
Total Exfiltration Volume (1000-ft³)	0.497
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Project Description

File Name ..... 1931 - SWMM V4.SPF

Project Options

Flow Units ..... CFS
Elevation Type ..... Elevation
Hydrology Method ..... SCS TR-55
Time of Concentration (TOC) Method ..... SCS TR-55
Link Routing Method ..... Hydrodynamic
Enable Overflow Ponding at Nodes ..... YES
Skip Steady State Analysis Time Periods ..... YES

Analysis Options

Start Analysis On ..... Oct 01, 2020 00:00:00
End Analysis On ..... Oct 05, 2020 00:00:00
Start Reporting On ..... Oct 01, 2020 00:00:00
Antecedent Dry Days ..... 0 days
Runoff (Dry Weather) Time Step ..... 0 01:00:00 days hh:mm:ss
Runoff (Wet Weather) Time Step ..... 0 00:05:00 days hh:mm:ss
Reporting Time Step ..... 0 00:00:30 days hh:mm:ss
Routing Time Step ..... 2 seconds

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1		Time Series	MSLA 100YR/24HR	Intensity	inches	Montana	Missoula	100	2.28	SCS Type II 24-hr

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	BASIN_10_ROW	0.10	484.00	98.00	2.28	2.04	0.20	0.28	0 00:05:00
2	BASIN_10_VACANT	0.26	484.00	58.00	2.28	0.08	0.02	0.00	0 00:53:53
3	BASIN_11_ROW	0.15	484.00	98.00	2.28	2.05	0.30	0.43	0 00:05:00
4	BASIN_11_VACANT	0.72	484.00	58.00	2.28	0.09	0.06	0.01	0 01:04:00
5	BASIN_12_ROW	0.09	484.00	98.00	2.28	2.04	0.18	0.26	0 00:05:00
6	BASIN_12_VACANT	0.40	484.00	58.00	2.28	0.09	0.03	0.01	0 00:42:09
7	BASIN_13_ROW	0.14	484.00	98.00	2.28	2.05	0.28	0.39	0 00:05:00
8	BASIN_13_VACANT	0.39	484.00	58.00	2.28	0.09	0.03	0.01	0 00:47:00
9	BASIN_14_ROW	0.15	484.00	98.00	2.28	2.05	0.31	0.45	0 00:05:00
10	BASIN_14_VACANT	0.76	484.00	58.00	2.28	0.09	0.06	0.01	0 01:04:00
11	BASIN_15_ROW	0.13	484.00	98.00	2.28	2.05	0.27	0.38	0 00:05:00
12	BASIN_15_VACANT	0.45	484.00	58.00	2.28	0.09	0.04	0.01	0 00:43:39
13	BASIN_16_ROW	0.13	484.00	98.00	2.28	2.05	0.27	0.38	0 00:05:00
14	BASIN_16_VACANT	0.48	484.00	58.00	2.28	0.09	0.04	0.01	0 00:43:39
15	BASIN_17_ROW	0.12	484.00	98.00	2.28	2.05	0.25	0.36	0 00:05:00
16	BASIN_17_VACANT	0.34	484.00	58.00	2.28	0.08	0.03	0.00	0 00:57:57
17	BASIN_18_ROW	0.11	484.00	98.00	2.28	2.05	0.22	0.32	0 00:05:00
18	BASIN_18_VACANT	0.31	484.00	58.00	2.28	0.08	0.03	0.00	0 00:59:00
19	BASIN_19_ROW	0.08	484.00	98.00	2.28	2.04	0.16	0.23	0 00:05:00
20	BASIN_19_VACANT	0.06	484.00	58.00	2.28	0.00	0.00	0.00	0 00:23:59
21	BASIN_2_ROW	0.18	484.00	98.00	2.28	2.05	0.37	0.53	0 00:05:00
22	BASIN_2_VACANT	0.46	484.00	58.00	2.28	0.09	0.04	0.01	0 00:56:54
23	BASIN_20_ROW	0.12	484.00	98.00	2.28	2.05	0.25	0.36	0 00:05:00
24	BASIN_20_VACANT	0.38	484.00	58.00	2.28	0.08	0.03	0.00	0 01:00:23
25	BASIN_21_ROW	0.12	484.00	98.00	2.28	2.05	0.25	0.36	0 00:05:00
26	BASIN_21_VACANT	0.44	484.00	58.00	2.28	0.09	0.04	0.01	0 01:03:39
27	BASIN_22_ROW	0.14	484.00	98.00	2.28	2.05	0.29	0.41	0 00:05:00
28	BASIN_22_VACANT	0.71	484.00	58.00	2.28	0.09	0.06	0.01	0 00:51:01
29	BASIN_23_ROW	0.14	484.00	98.00	2.28	2.05	0.29	0.41	0 00:05:00
30	BASIN_23_VACANT	0.63	484.00	58.00	2.28	0.09	0.05	0.01	0 00:47:55
31	BASIN_24_ROW	0.11	484.00	98.00	2.28	2.05	0.23	0.34	0 00:05:00
32	BASIN_24_VACANT	0.29	484.00	58.00	2.28	0.08	0.02	0.00	0 00:56:33
33	BASIN_25_ROW	0.13	484.00	98.00	2.28	2.05	0.26	0.38	0 00:05:00
34	BASIN_25_VACANT	0.30	484.00	58.00	2.28	0.08	0.03	0.00	0 00:53:10
35	BASIN_26_ROW	0.17	484.00	98.00	2.28	2.05	0.34	0.49	0 00:05:00
36	BASIN_26_VACANT	0.41	484.00	58.00	2.28	0.09	0.03	0.01	0 00:52:49
37	BASIN_27_ROW	0.05	484.00	98.00	2.28	2.02	0.10	0.15	0 00:05:00
38	BASIN_27_VACANT	0.01	484.00	58.00	2.28	0.00	0.00	0.00	0 00:09:19
39	BASIN_28_ROW	0.12	484.00	98.00	2.28	2.05	0.25	0.36	0 00:05:00
40	BASIN_28_VACANT	0.46	484.00	58.00	2.28	0.09	0.04	0.01	0 00:50:50
41	BASIN_29_ROW	0.12	484.00	98.00	2.28	2.05	0.25	0.36	0 00:05:00
42	BASIN_29_VACANT	0.42	484.00	58.00	2.28	0.09	0.04	0.01	0 00:47:45
43	BASIN_3_ROW	0.15	484.00	98.00	2.28	2.05	0.30	0.43	0 00:05:00
44	BASIN_3_VACANT	0.27	484.00	58.00	2.28	0.08	0.02	0.00	0 00:56:54
45	BASIN_30_ROW	0.15	484.00	98.00	2.28	2.05	0.31	0.45	0 00:05:00
46	BASIN_30_VACANT	0.63	484.00	58.00	2.28	0.09	0.05	0.01	0 01:04:00
47	BASIN_31_ROW	0.15	484.00	98.00	2.28	2.05	0.31	0.45	0 00:05:00
48	BASIN_31_VACANT	0.71	484.00	58.00	2.28	0.09	0.06	0.01	0 00:59:31
49	BASIN_32_ROW	0.12	484.00	98.00	2.28	2.05	0.25	0.36	0 00:05:00
50	BASIN_32_VACANT	0.52	484.00	58.00	2.28	0.09	0.04	0.01	0 00:54:36
51	BASIN_33_ROW	0.12	484.00	98.00	2.28	2.05	0.25	0.36	0 00:05:00
52	BASIN_33_VACANT	0.54	484.00	58.00	2.28	0.09	0.05	0.01	0 00:56:22
53	BASIN_34_ROW	0.07	484.00	98.00	2.28	2.03	0.14	0.21	0 00:05:00
54	BASIN_34_VACANT	0.51	484.00	58.00	2.28	0.09	0.04	0.01	0 00:45:54
55	BASIN_35_ROW	0.07	484.00	98.00	2.28	2.03	0.14	0.21	0 00:05:00
56	BASIN_35_VACANT	0.34	484.00	58.00	2.28	0.09	0.03	0.00	0 00:43:16
57	BASIN_36_ROW	0.13	484.00	98.00	2.28	2.05	0.26	0.38	0 00:05:00
58	BASIN_36_VACANT	0.35	484.00	58.00	2.28	0.09	0.03	0.00	0 00:44:24
59	BASIN_37_ROW	0.12	484.00	98.00	2.28	2.05	0.25	0.36	0 00:05:00
60	BASIN_37_VACANT	0.44	484.00	58.00	2.28	0.09	0.04	0.01	0 00:45:20
61	BASIN_38_ROW	0.09	484.00	98.00	2.28	2.04	0.19	0.28	0 00:05:00
62	BASIN_38_VACANT	0.25	484.00	58.00	2.28	0.08	0.02	0.00	0 00:51:44
63	BASIN_4_ROW	0.06	484.00	98.00	2.28	2.03	0.12	0.17	0 00:05:00
64	BASIN_4_VACANT	0.04	484.00	58.00	2.28	0.00	0.00	0.00	0 00:23:46
65	BASIN_5_ROW	0.15	484.00	98.00	2.28	2.05	0.31	0.43	0 00:05:00
66	BASIN_5_VACANT	1.12	484.00	58.00	2.28	0.09	0.09	0.01	0 00:57:36
67	BASIN_6_ROW	0.13	484.00	98.00	2.28	2.05	0.27	0.38	0 00:05:00
68	BASIN_6_VACANT	0.44	484.00	58.00	2.28	0.09	0.04	0.01	0 00:47:00
69	BASIN_7_ROW	0.07	484.00	98.00	2.28	2.03	0.14	0.21	0 00:05:00
70	BASIN_7_VACANT	0.33	484.00	58.00	2.28	0.09	0.03	0.00	0 00:39:17
71	BASIN_8_ROW	0.10	484.00	98.00	2.28	2.04	0.21	0.30	0 00:05:00
72	BASIN_8_VACANT	0.26	484.00	58.00	2.28	0.08	0.02	0.00	0 00:50:28
73	BASIN_9_ROW	0.10	484.00	98.00	2.28	2.04	0.20	0.28	0 00:05:00
74	BASIN_9_VACANT	0.25	484.00	58.00	2.28	0.08	0.02	0.00	0 00:53:53
75	FLYNNRANCH	24.35	484.00	81.06	2.28	0.79	19.29	13.32	0 00:40:00

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Jun-02	Junction	3151.24	3155.50	3151.24	3155.50	0.00	1.89	3154.98	0.00	0.60	0 00:00	0.00	0.00
2	Out-02	Outfall	0.00					0.00	0.00					
3	OUTFALL	Outfall	0.00					0.04	0.00					
4	EX-POND	Storage Node	3150.40	3155.50	3150.40		10000.00	13.32	3154.97				0.00	0.00
5	Out-1SDP 4	Storage Node	3144.95	3154.95	3144.95		0.00	0.44	3154.95				1.63	415.00
6	SDS 1	Storage Node	3146.51	3156.51	3146.51		0.00	0.87	3154.96				0.00	0.00
7	SDS 10	Storage Node	3144.15	3154.15	3144.15		1000.00	0.28	3154.27				0.03	1675.00
8	SDS 11	Storage Node	3144.06	3154.06	3144.06		1000.00	0.43	3153.90				0.00	0.00
9	SDS 12	Storage Node	3144.06	3154.06	3144.06		1000.00	0.26	3154.18				0.03	1622.00
10	SDS 13	Storage Node	3145.41	3155.41	3145.41		1000.00	0.39	3155.42				0.00	159.00
11	SDS 14	Storage Node	3145.41	3155.41	3145.41		1000.00	0.45	3155.45				0.01	464.00
12	SDS 15	Storage Node	3145.06	3155.06	3145.06		1000.00	0.37	3155.09				0.01	487.00
13	SDS 16	Storage Node	3145.06	3155.06	3145.06		1000.00	0.37	3155.10				0.01	538.00
14	SDS 17	Storage Node	3144.38	3154.38	3144.38		1000.00	0.36	3153.64				0.00	0.00
15	SDS 18	Storage Node	3144.37	3154.37	3144.37		1000.00	0.32	3154.48				0.03	1125.00
16	SDS 19	Storage Node	3144.52	3154.52	3144.52		1000.00	0.22	3154.64				0.03	2434.00
17	SDS 2	Storage Node	3145.50	3155.50	3145.50		0.00	0.99	3154.96				0.00	0.00
18	SDS 20	Storage Node	3144.64	3154.64	3144.64		1000.00	0.36	3154.77				0.04	1372.00
19	SDS 21	Storage Node	3144.66	3154.66	3144.66		1000.00	0.36	3154.30				0.00	0.00
20	SDS 22	Storage Node	3146.75	3156.75	3146.75		1000.00	0.41	3156.05				0.00	0.00
21	SDS 23	Storage Node	3146.75	3156.75	3146.75		1000.00	0.41	3155.67				0.00	0.00
22	SDS 24	Storage Node	3145.70	3155.70	3145.70		1000.00	0.34	3155.84				0.04	1302.00
23	SDS 25	Storage Node	3145.96	3155.96	3145.96		1000.00	0.37	3155.82				0.00	0.00
24	SDS 26	Storage Node	3145.93	3155.93	3145.93		1000.00	0.49	3155.96				0.01	514.00
25	SDS 27	Storage Node	3145.69	3155.69	3145.69		1000.00	0.15	3152.52				0.00	0.00
26	SDS 28	Storage Node	3146.31	3156.31	3146.31		1000.00	0.36	3156.04				0.00	0.00
27	SDS 29	Storage Node	3146.31	3156.31	3146.31		1000.00	0.36	3155.94				0.00	0.00
28	SDS 3	Storage Node	3145.50	3155.50	3145.50		0.00	0.56	3154.96				0.00	0.00
29	SDS 30	Storage Node	3145.07	3155.07	3145.07		0.00	0.45	3155.07				0.00	110.00
30	SDS 31	Storage Node	3145.07	3155.07	3145.07		0.00	0.45	3155.07				0.01	316.00
31	SDS 32	Storage Node	3145.81	3155.81	3145.81		0.00	0.36	3155.26				0.00	0.00
32	SDS 33	Storage Node	3145.81	3155.81	3145.81		0.00	0.36	3155.30				0.00	0.00
33	SDS 34	Storage Node	3145.71	3155.71	3145.71		1000.00	0.21	3155.73				0.01	329.00
34	SDS 35	Storage Node	3145.69	3155.69	3145.69		1000.00	0.21	3154.92				0.00	0.00
35	SDS 36	Storage Node	3145.61	3155.61	3145.61		1000.00	0.37	3155.61				0.00	170.00
36	SDS 37	Storage Node	3145.61	3155.61	3145.61		1000.00	0.36	3155.30				0.00	0.00
37	SDS 5	Storage Node	3144.22	3154.22	3144.22		1000.00	0.43	3154.30				0.02	850.00
38	SDS 6	Storage Node	3144.22	3154.22	3144.22		1000.00	0.37	3154.25				0.01	471.00
39	SDS 7	Storage Node	3144.19	3154.19	3144.19		1000.00	0.21	3154.30				0.03	1427.00
40	SDS 8	Storage Node	3144.19	3154.19	3144.19		1000.00	0.30	3154.24				0.01	750.00
41	SDS 9	Storage Node	3144.20	3154.20	3144.20		1000.00	0.28	3154.20				0.00	289.00
42	SDS_38	Storage Node	3145.96	3155.96	3145.96		1000.00	0.28	3155.97				0.00	329.00

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	Link-01	Pipe	SDS 5	OUTFALL	29.78	3154.22	3154.00	0.7500	18.000	0.0150	0.04	7.87	0.00	1.19	0.07	0.05	0.00	Calculated
2	Link-02	Pipe	Jun-02	SDS 1	140.60	3151.24	3150.37	0.6200	18.000	0.0110	0.71	9.76	0.07	0.68	1.50	1.00	2229.00	SURCHARGED
3	SDP 2	Pipe	SDS 1	SDS 2	250.54	3150.27	3148.71	0.6200	18.000	0.0120	0.87	8.96	0.10	0.77	1.50	1.00	2874.00	SURCHARGED
4	SDP 3	Pipe	SDS 2	SDS 3	45.01	3148.62	3148.34	0.6200	18.000	0.0120	0.51	8.96	0.06	1.15	1.50	1.00	4906.00	SURCHARGED
5	SDP 4	Pipe	SDS 3	Out-1SDP 4	78.23	3148.14	3147.65	0.6200	18.000	0.0120	0.43	8.96	0.05	1.25	1.50	1.00	5050.00	SURCHARGED
6	L1-1	Orifice	EX-POND	Jun-02		3150.40	3151.24		4.500		0.41							
7	L1-2	Orifice	EX-POND	Jun-02		3150.40	3151.24		4.500		0.41							
8	L2-1	Orifice	EX-POND	Jun-02		3150.40	3151.24		4.500		0.11							
9	L2-2	Orifice	EX-POND	Jun-02		3150.40	3151.24		4.500		0.11							
10	L2-3	Orifice	EX-POND	Jun-02		3150.40	3151.24		4.500		0.11							
11	L2-4	Orifice	EX-POND	Jun-02		3150.40	3151.24		4.500		0.11							
12	L3	Orifice	EX-POND	Jun-02		3150.40	3151.24		4.500		0.05							
13	Orifice-10	Outlet	EX-POND	Jun-02		3150.40	3151.24				1.64							

Subbasin Hydrology

Subbasin : BASIN_10_ROW

Input Data

Area (ac) 0.10
Peak Rate Factor 484.00
Weighted Curve Number 98.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.10	B	98.00
Composite Area & Weighted CN	0.10		98.00

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

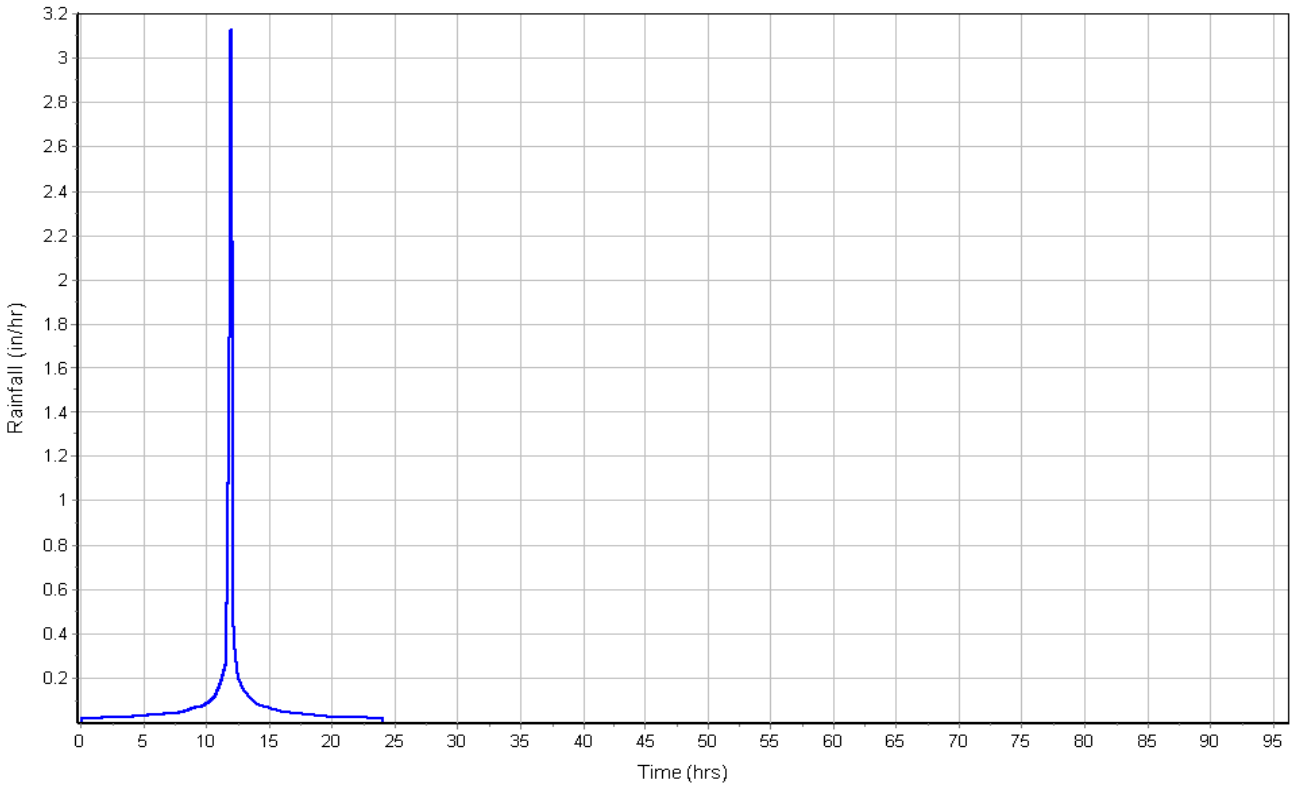
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

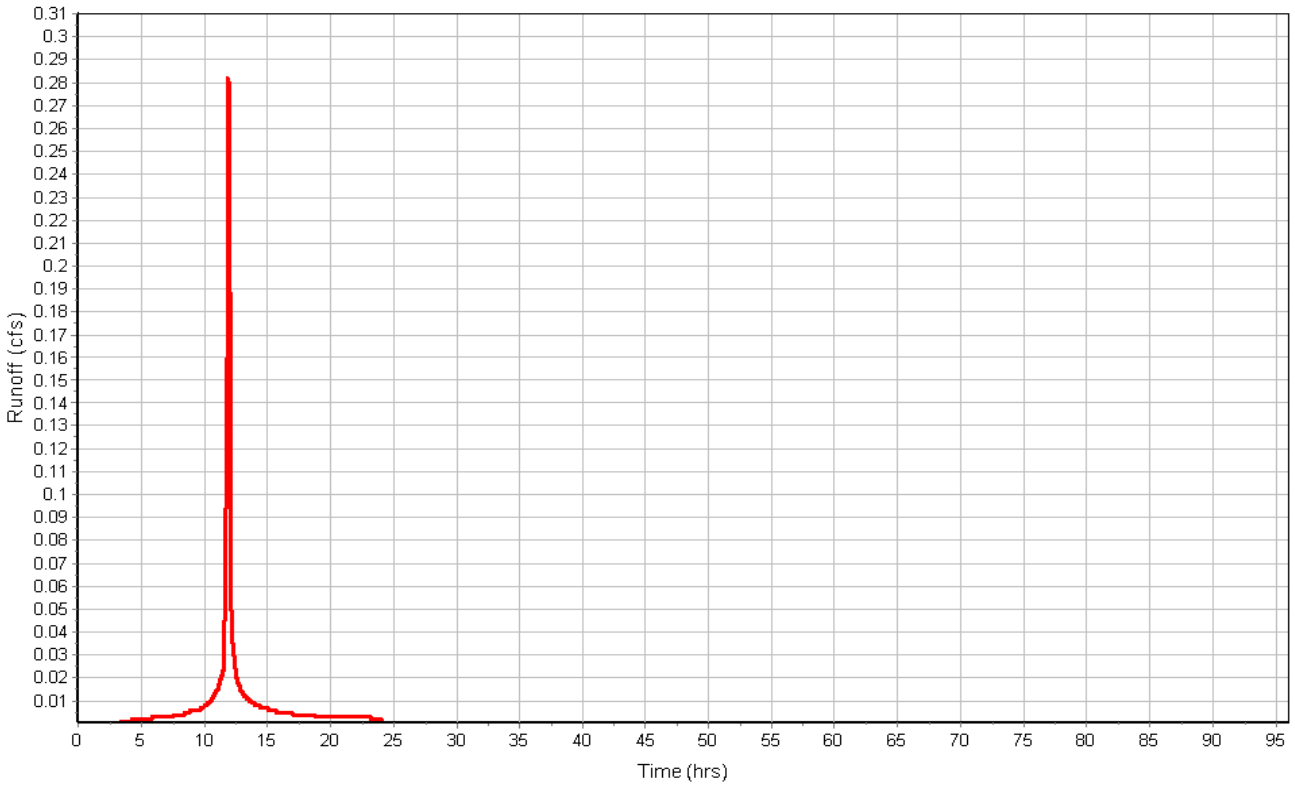
Total Rainfall (in) 2.28
Total Runoff (in) 2.04
Peak Runoff (cfs) 0.28
Weighted Curve Number 98.00
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : BASIN_10_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_10_VACANT

Input Data

Area (ac) 0.26
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.26	B	58.00
Composite Area & Weighted CN	0.26		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	242	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	53.89	0.00	0.00

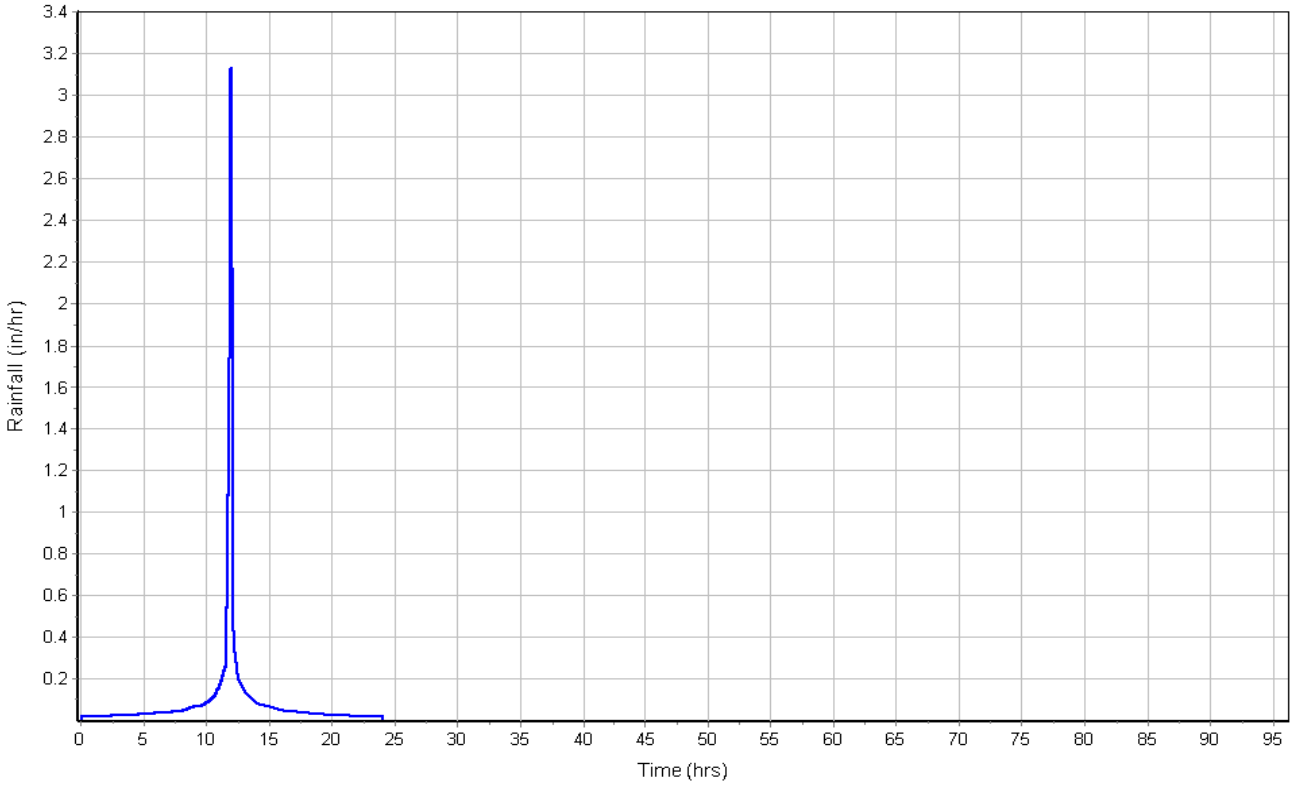
Total TOC (min) 53.89

Subbasin Runoff Results

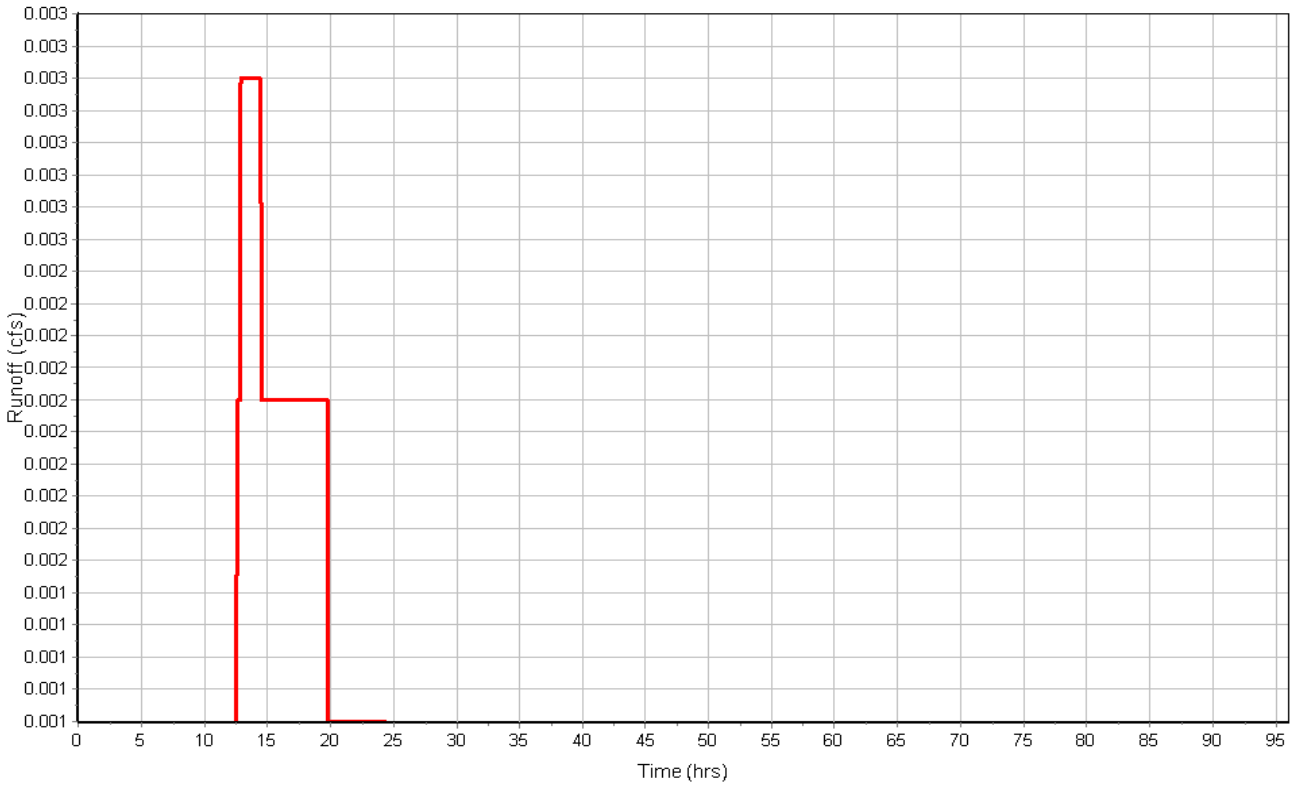
Total Rainfall (in) 2.28
Total Runoff (in) 0.08
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:53:53

Subbasin : BASIN_10_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_11_ROW

Input Data

Area (ac)	0.15
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.15	B	98.00
Composite Area & Weighted CN	0.15		98.00

Time of Concentration

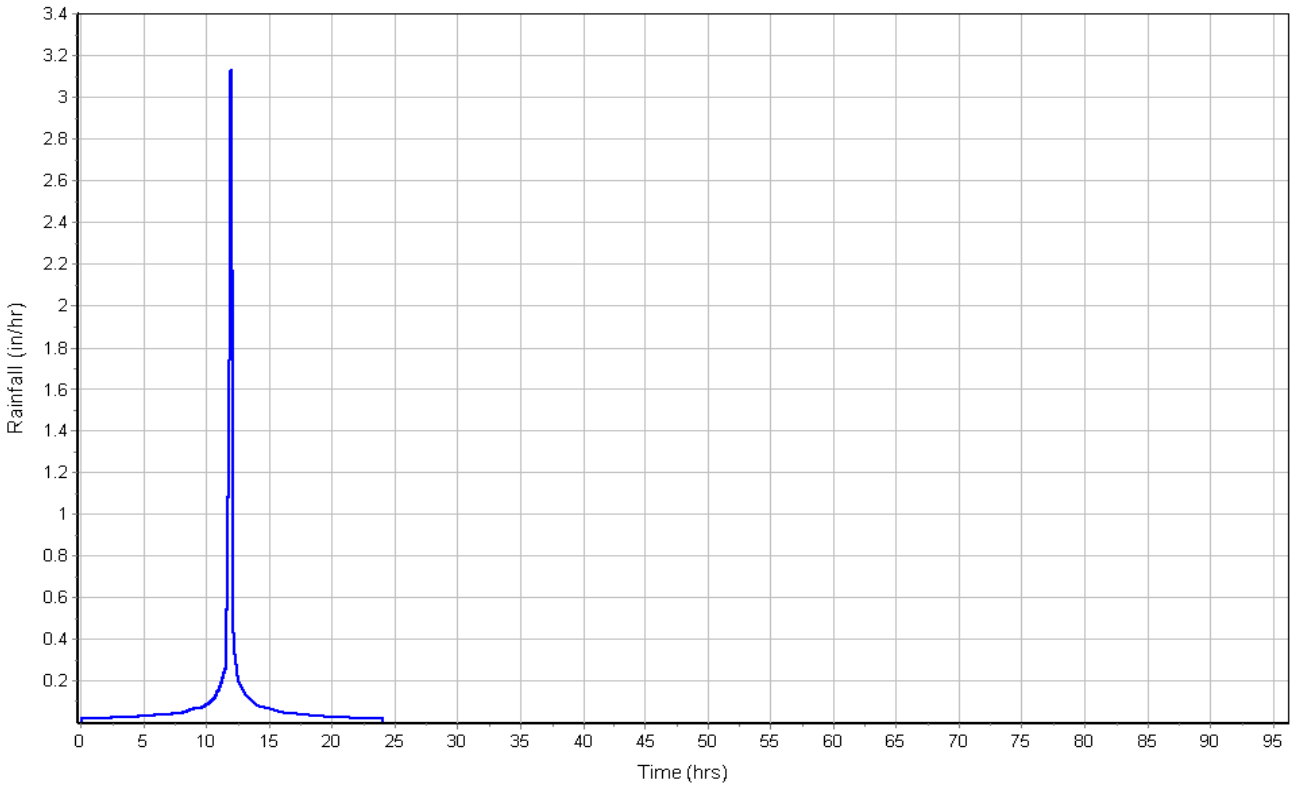
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

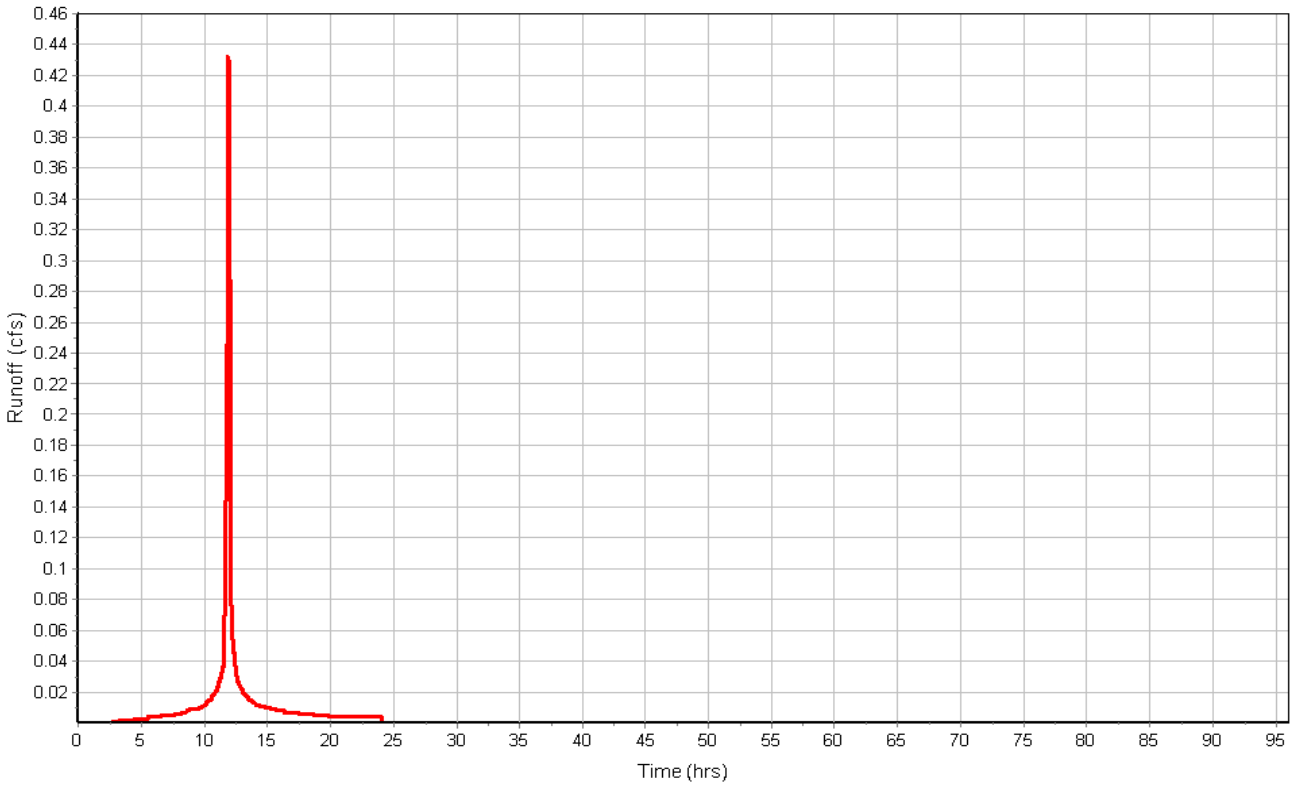
Total Rainfall (in)	2.28
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.43
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_11_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_11_VACANT

Input Data

Area (ac) 0.72
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.72	B	58.00
Composite Area & Weighted CN	0.72		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	300	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	64.00	0.00	0.00

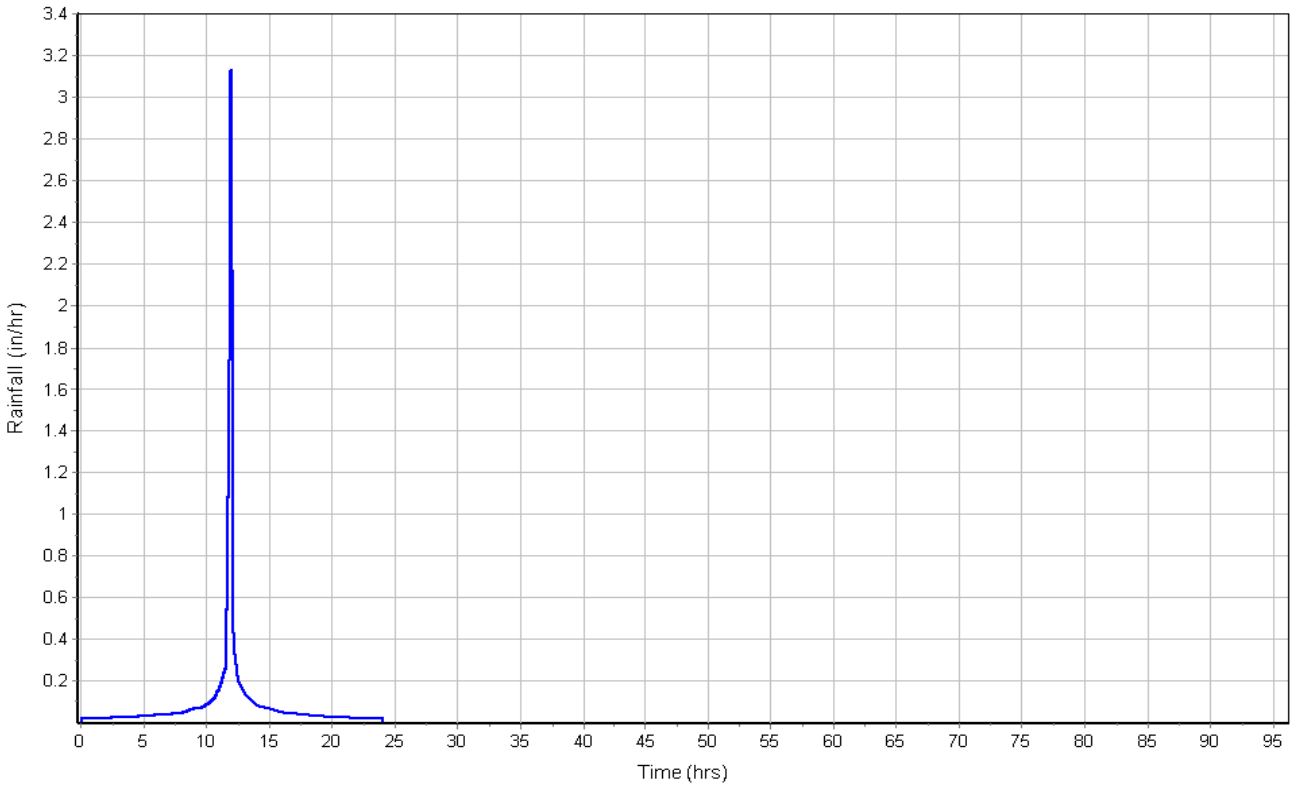
Total TOC (min) 64.00

Subbasin Runoff Results

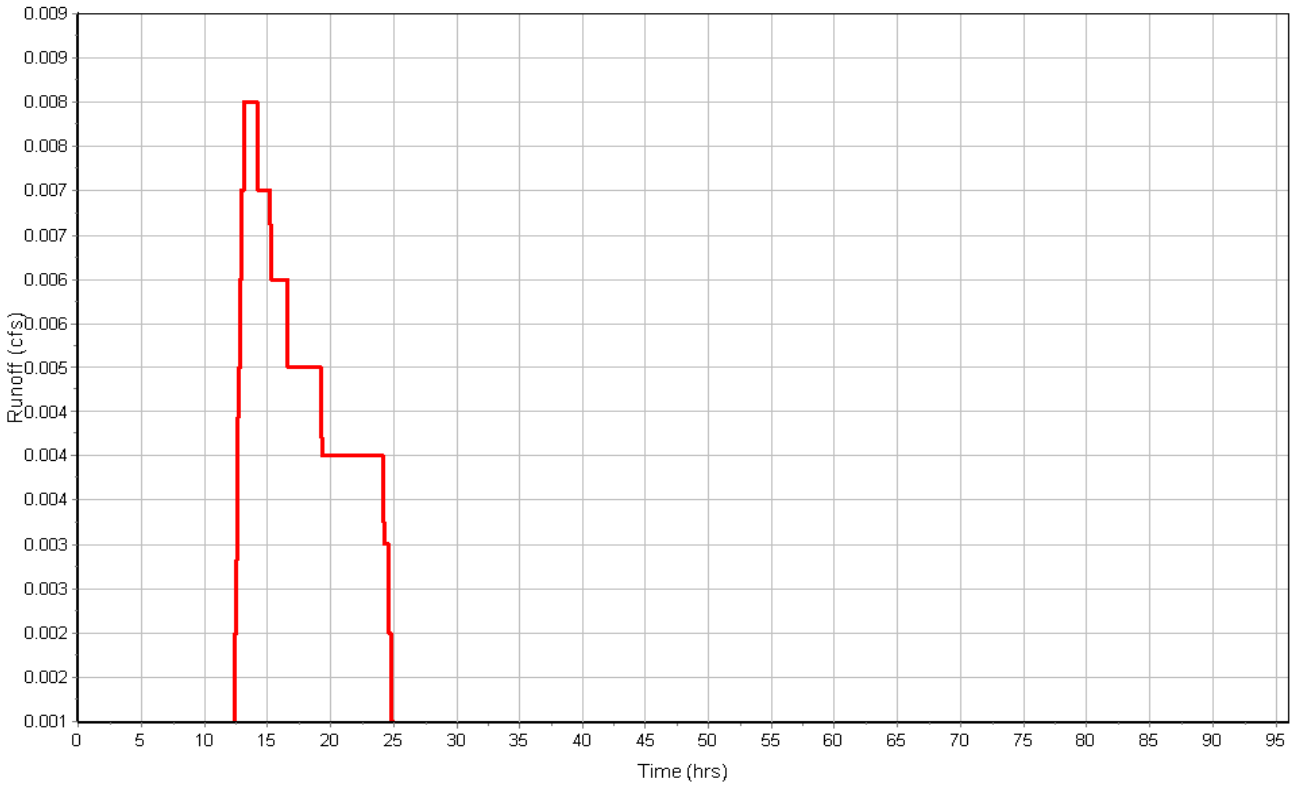
Total Rainfall (in) 2.28
Total Runoff (in) 0.09
Peak Runoff (cfs) 0.01
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 01:04:00

Subbasin : BASIN_11_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_12_ROW

Input Data

Area (ac)	0.09
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.09	B	98.00
Composite Area & Weighted CN	0.09		98.00

Time of Concentration

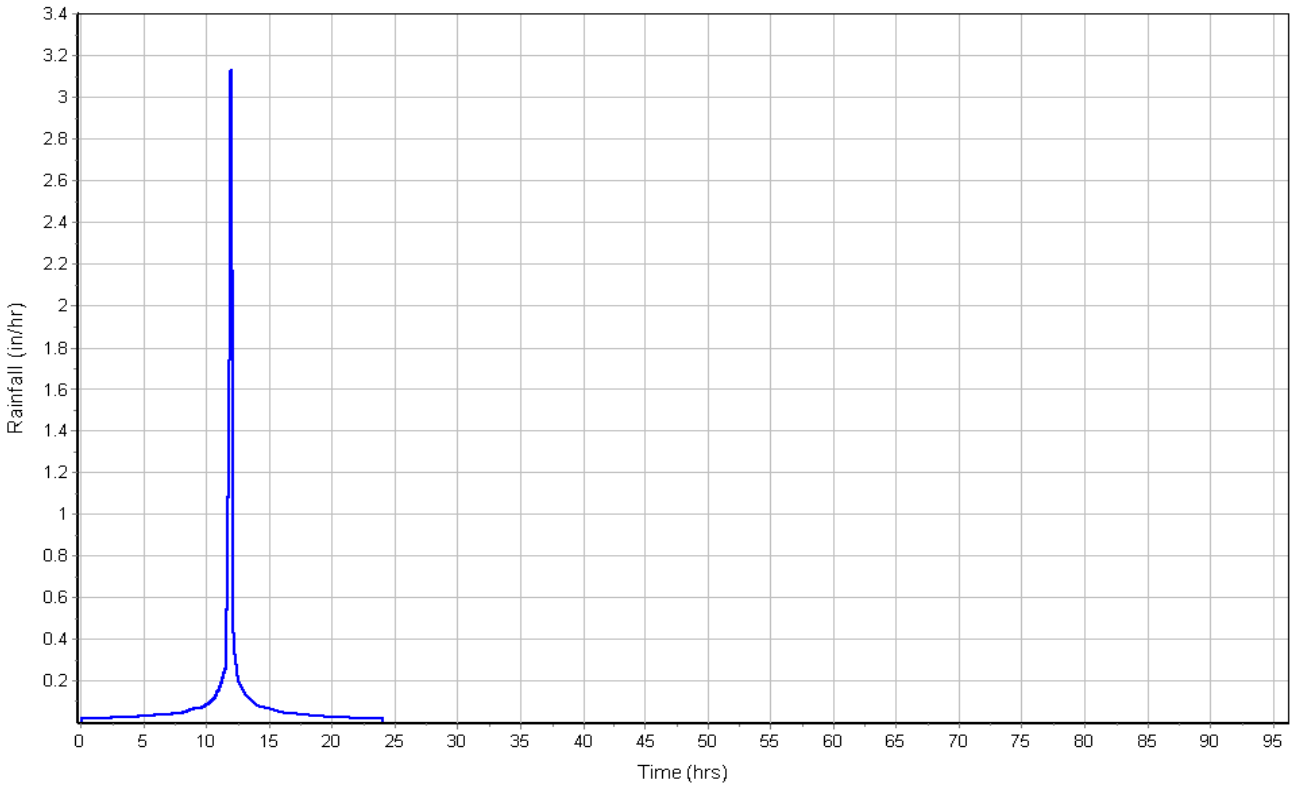
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

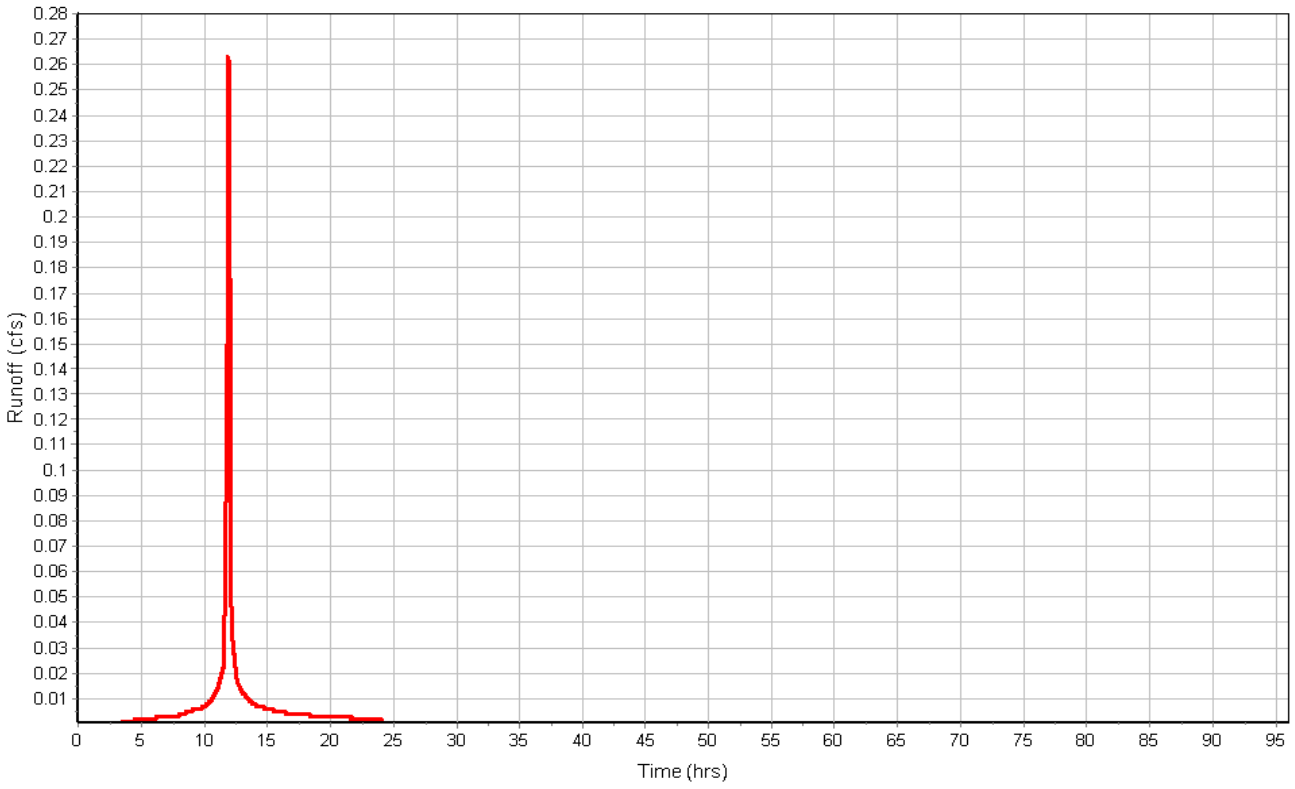
Total Rainfall (in)	2.28
Total Runoff (in)	2.04
Peak Runoff (cfs)	0.26
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_12_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_12_VACANT

Input Data

Area (ac) 0.40
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.40	B	58.00
Composite Area & Weighted CN	0.40		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	178	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	42.15	0.00	0.00

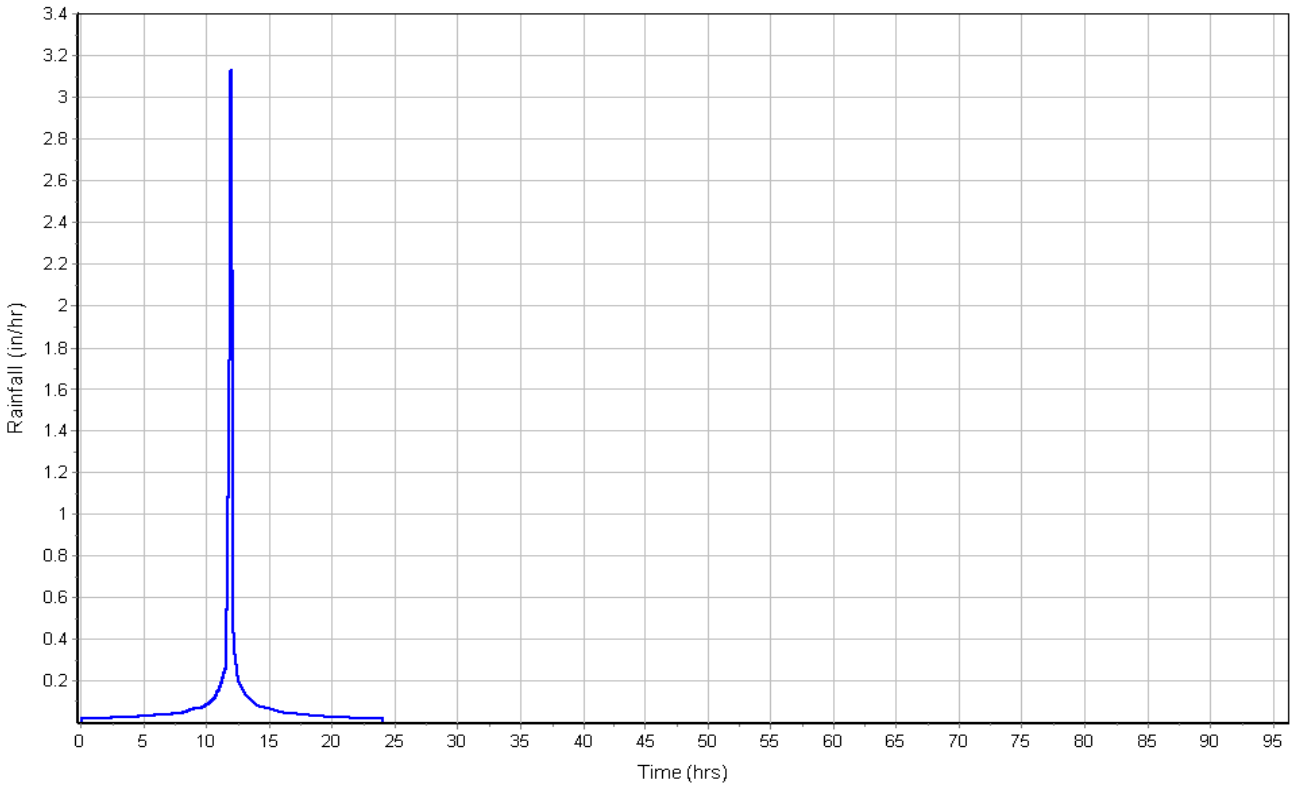
Total TOC (min) 42.15

Subbasin Runoff Results

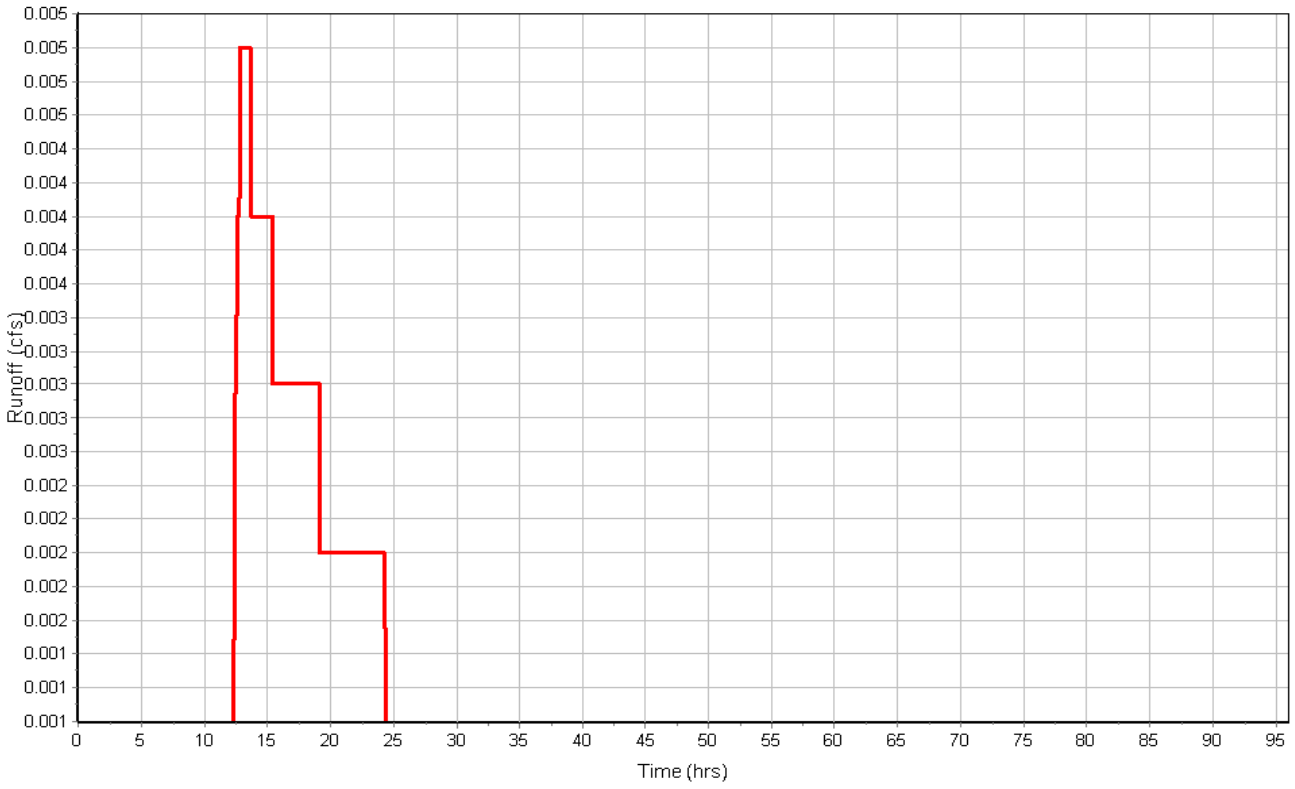
Total Rainfall (in) 2.28
Total Runoff (in) 0.09
Peak Runoff (cfs) 0.01
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:42:09

Subbasin : BASIN_12_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_13_ROW

Input Data

Area (ac)	0.14
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.14	B	98.00
Composite Area & Weighted CN	0.14		98.00

Time of Concentration

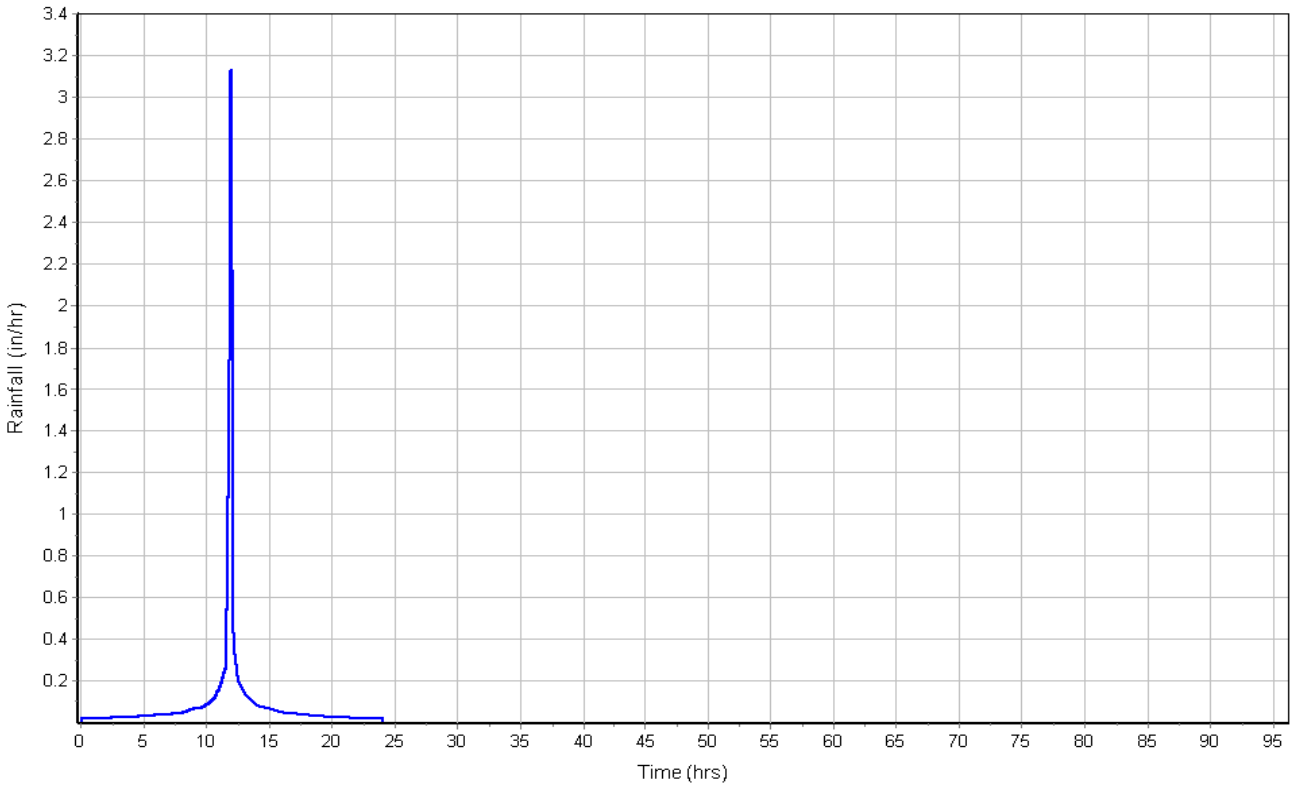
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

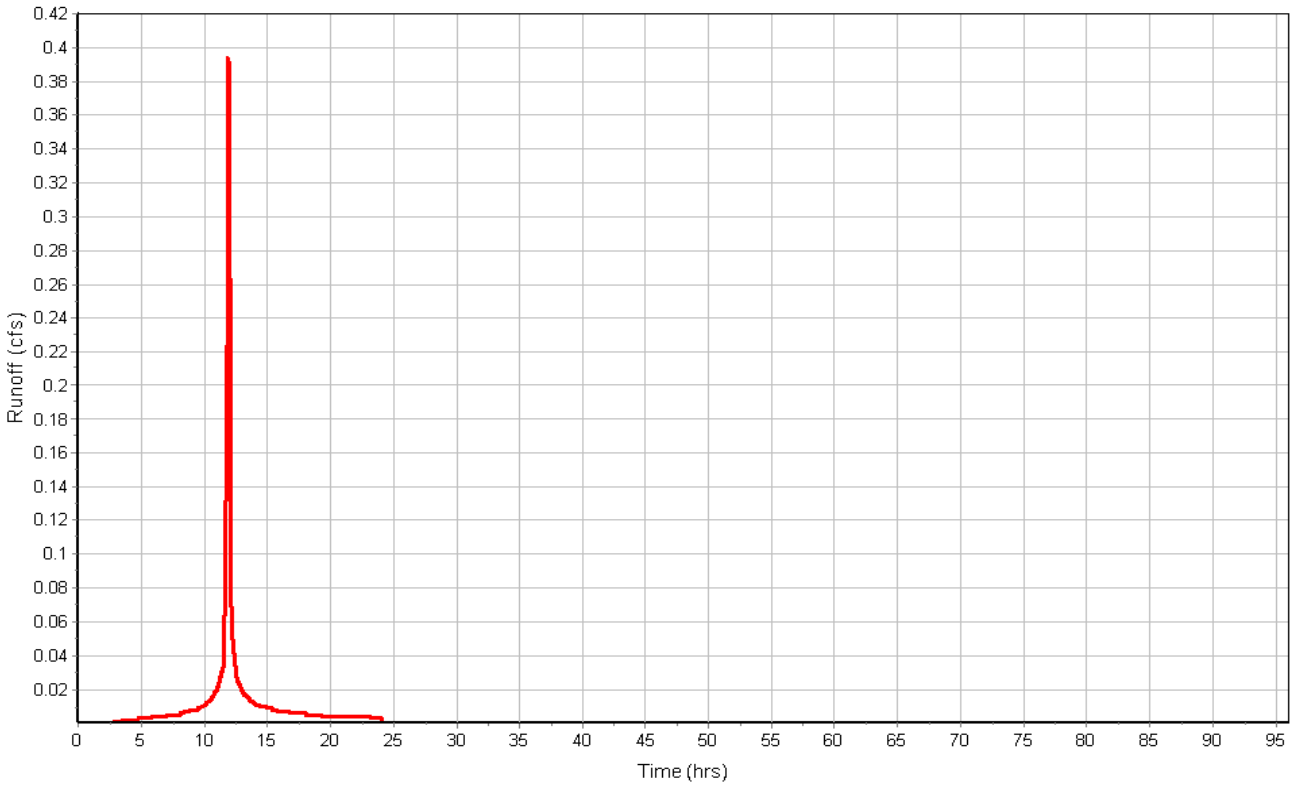
Total Rainfall (in)	2.28
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.39
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_13_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_13_VACANT

Input Data

Area (ac) 0.39
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.39	B	58.00
Composite Area & Weighted CN	0.39		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	204	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	47.01	0.00	0.00

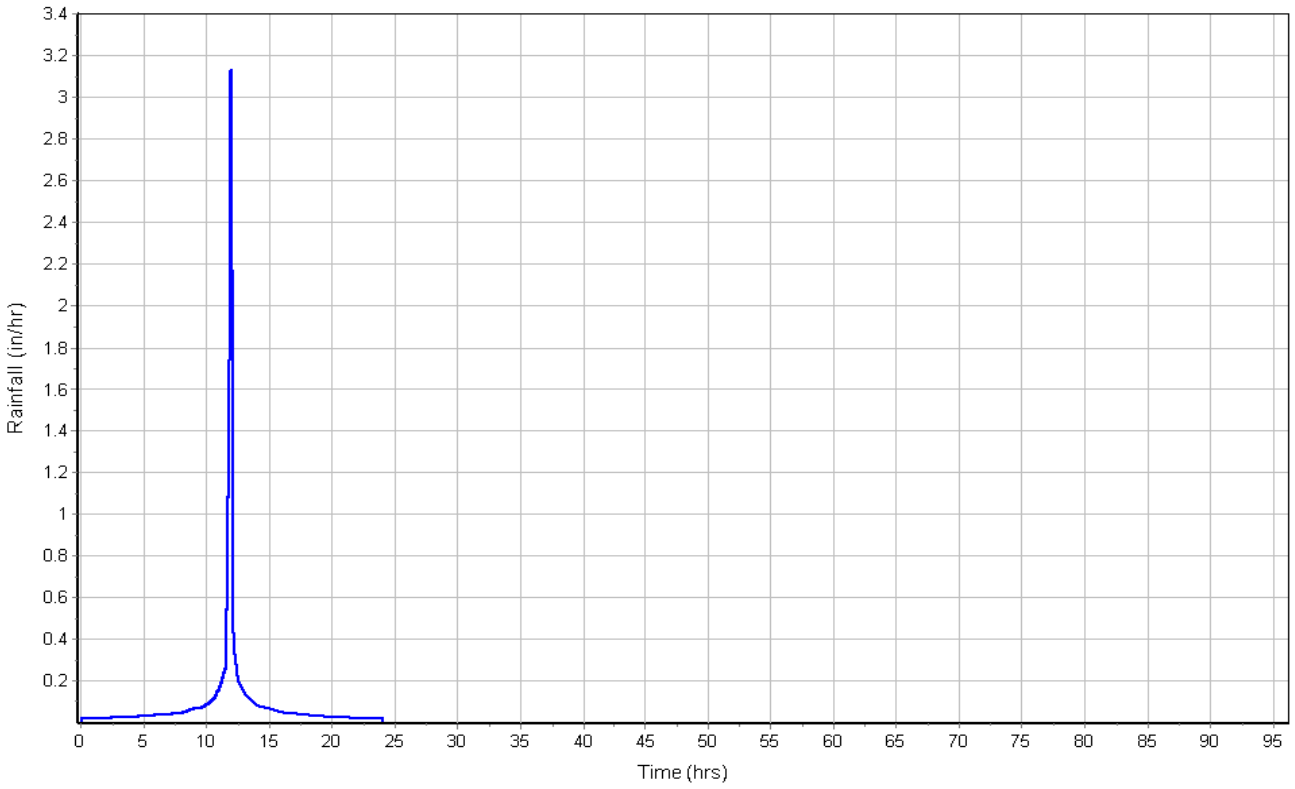
Total TOC (min) 47.01

Subbasin Runoff Results

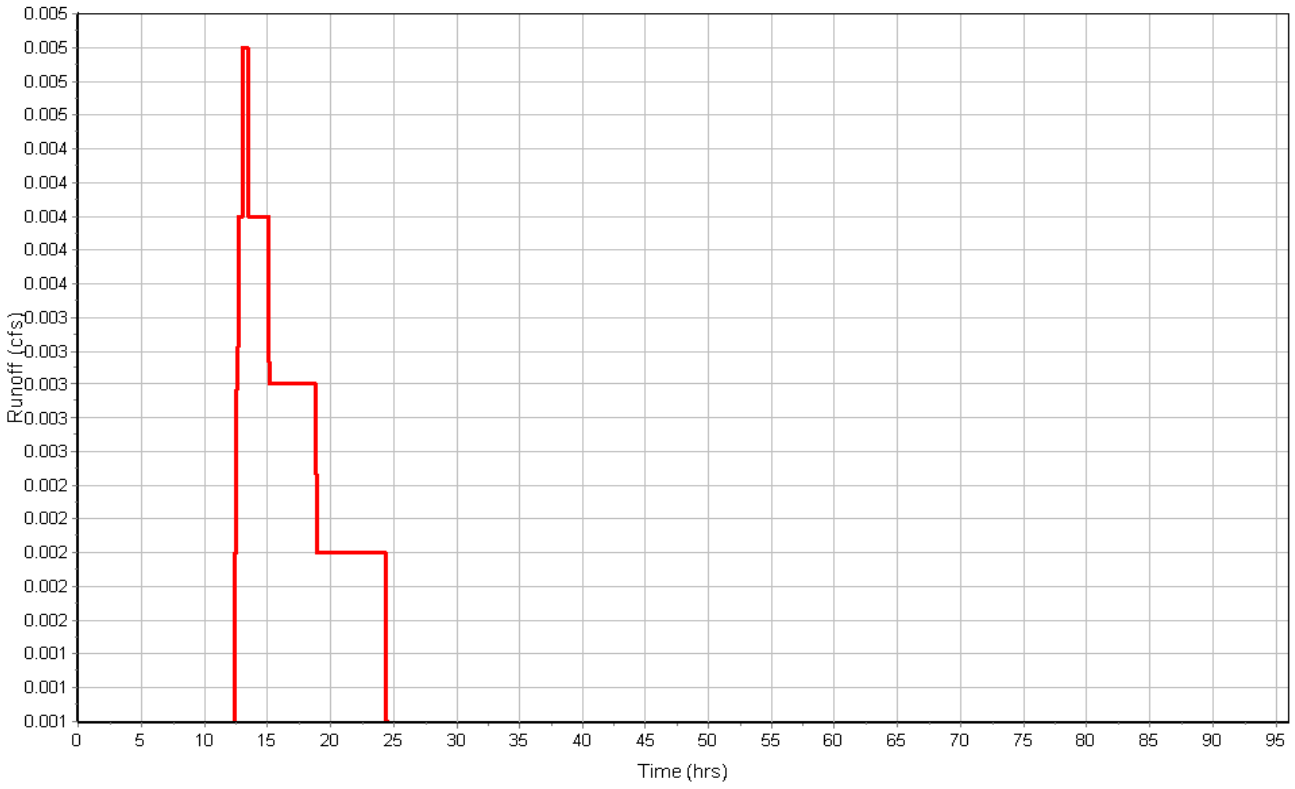
Total Rainfall (in) 2.28
Total Runoff (in) 0.09
Peak Runoff (cfs) 0.01
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:47:01

Subbasin : BASIN_13_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_14_ROW

Input Data

Area (ac)	0.15
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.15	B	98.00
Composite Area & Weighted CN	0.15		98.00

Time of Concentration

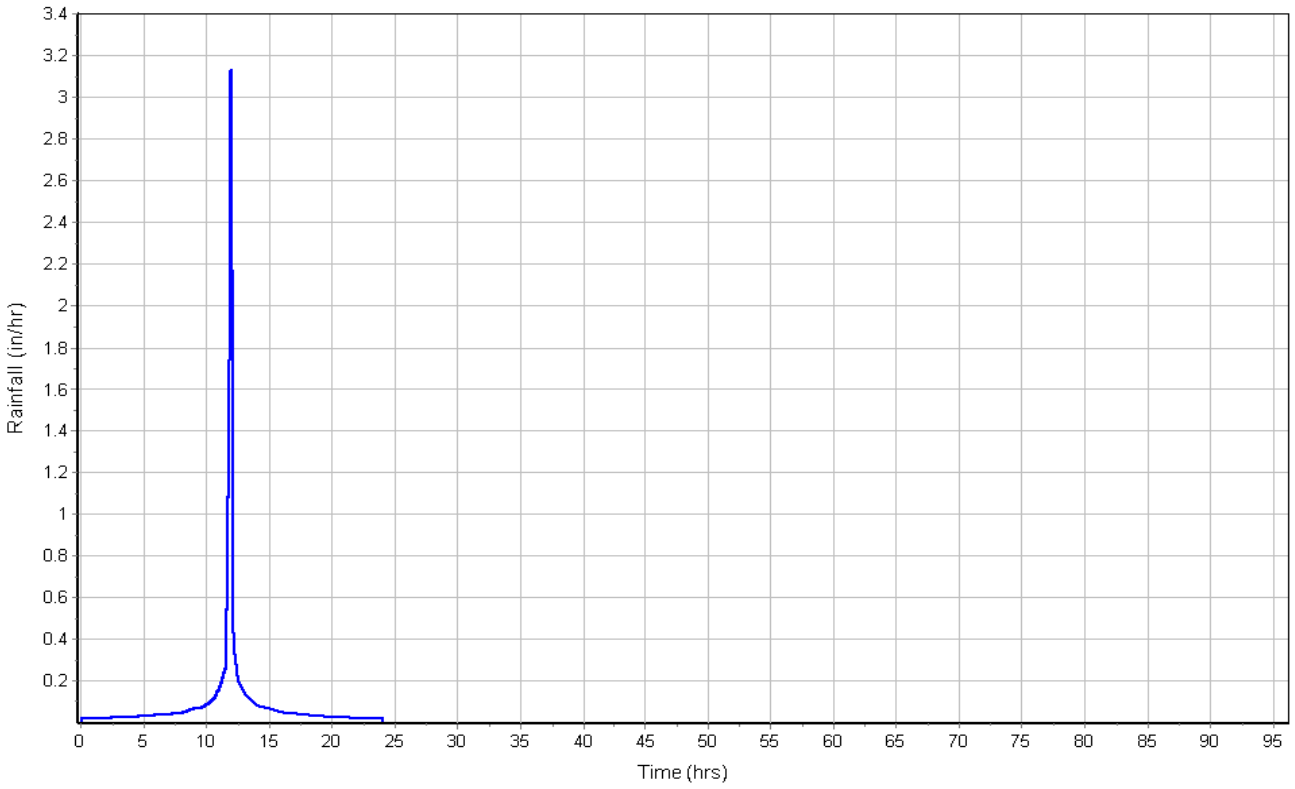
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

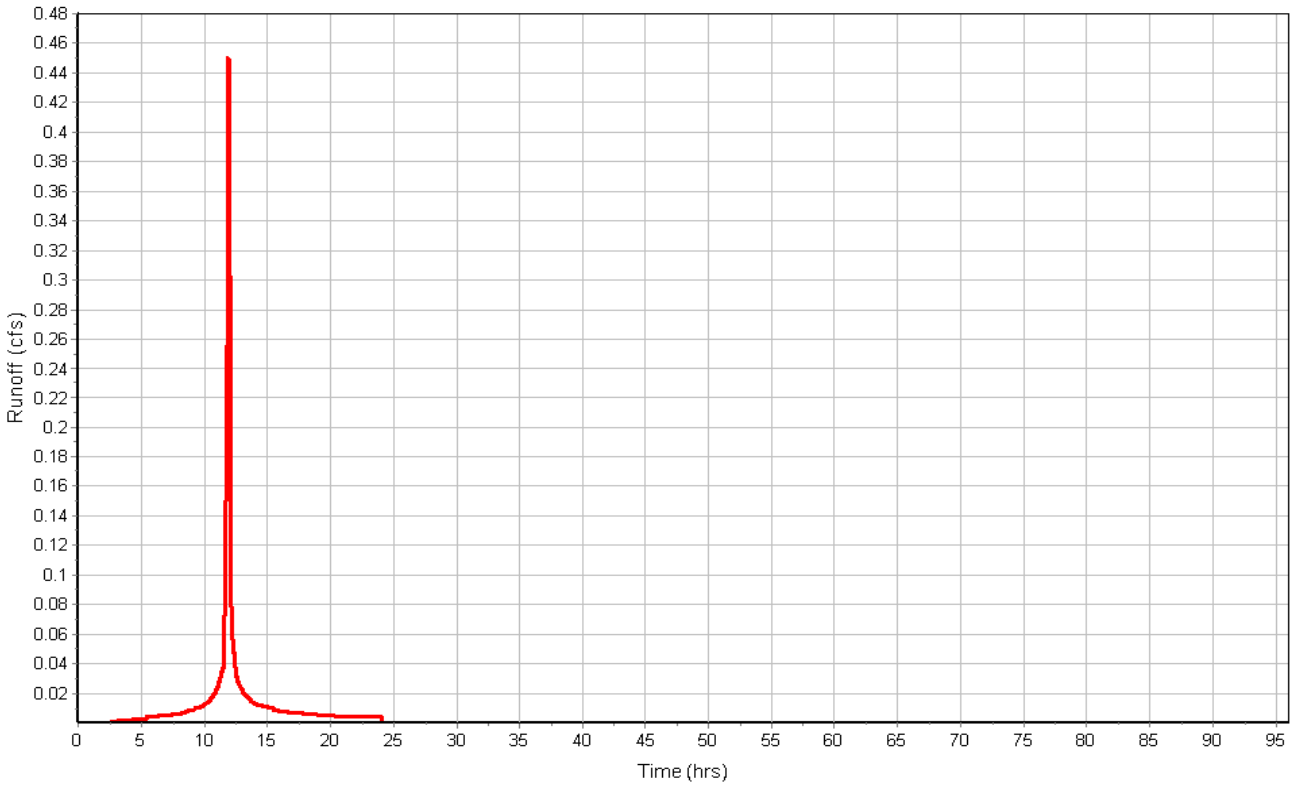
Total Rainfall (in)	2.28
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.45
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_14_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_14_VACANT

Input Data

Area (ac) 0.76
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.76	B	58.00
Composite Area & Weighted CN	0.76		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	300	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	64.00	0.00	0.00

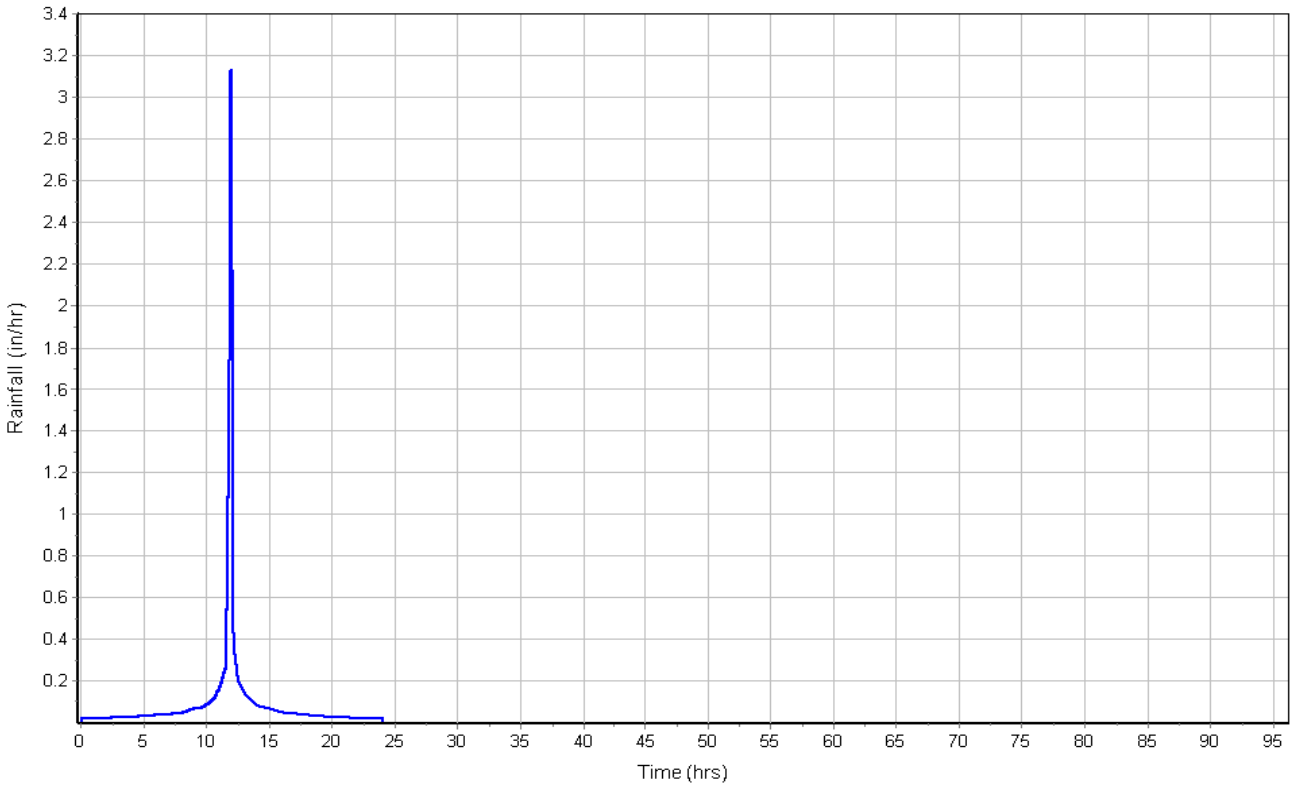
Total TOC (min) 64.00

Subbasin Runoff Results

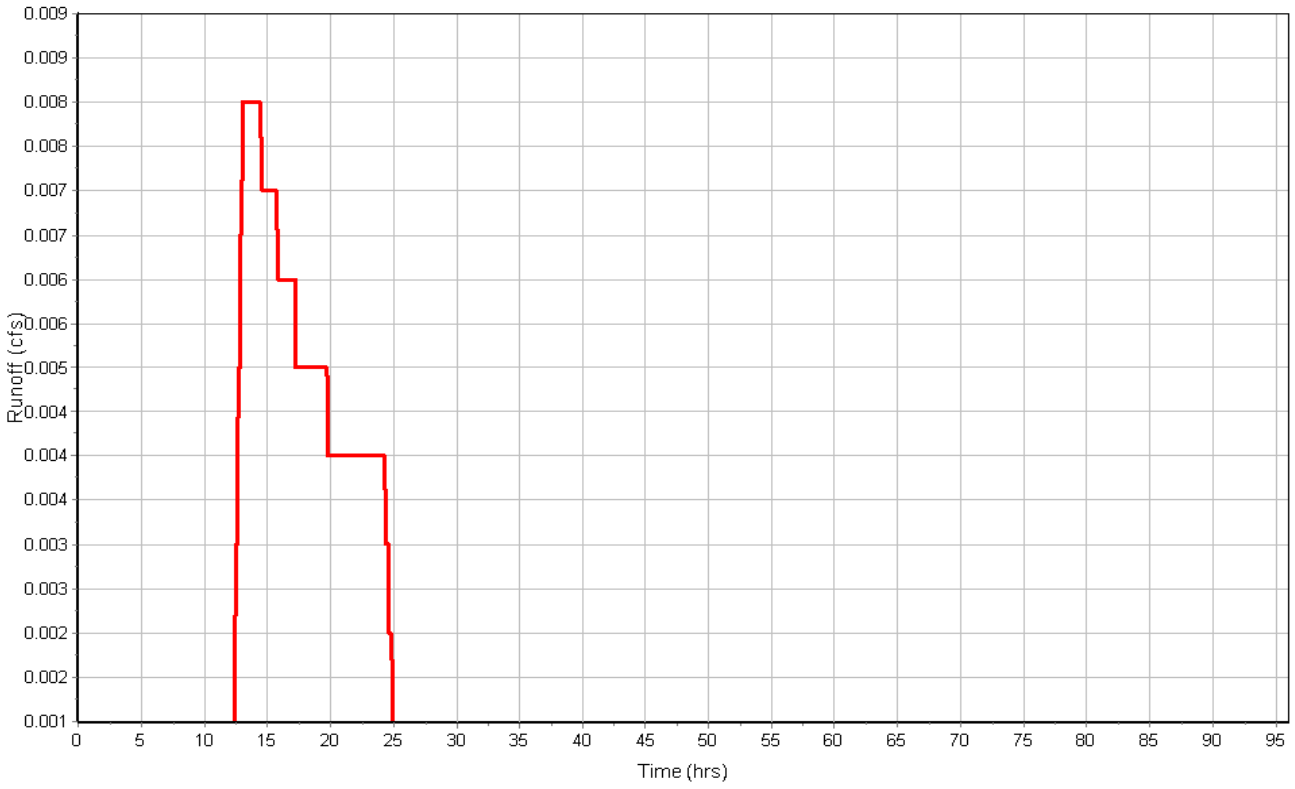
Total Rainfall (in) 2.28
Total Runoff (in) 0.09
Peak Runoff (cfs) 0.01
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 01:04:00

Subbasin : BASIN_14_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_15_ROW

Input Data

Area (ac)	0.13
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.13	B	98.00
Composite Area & Weighted CN	0.13		98.00

Time of Concentration

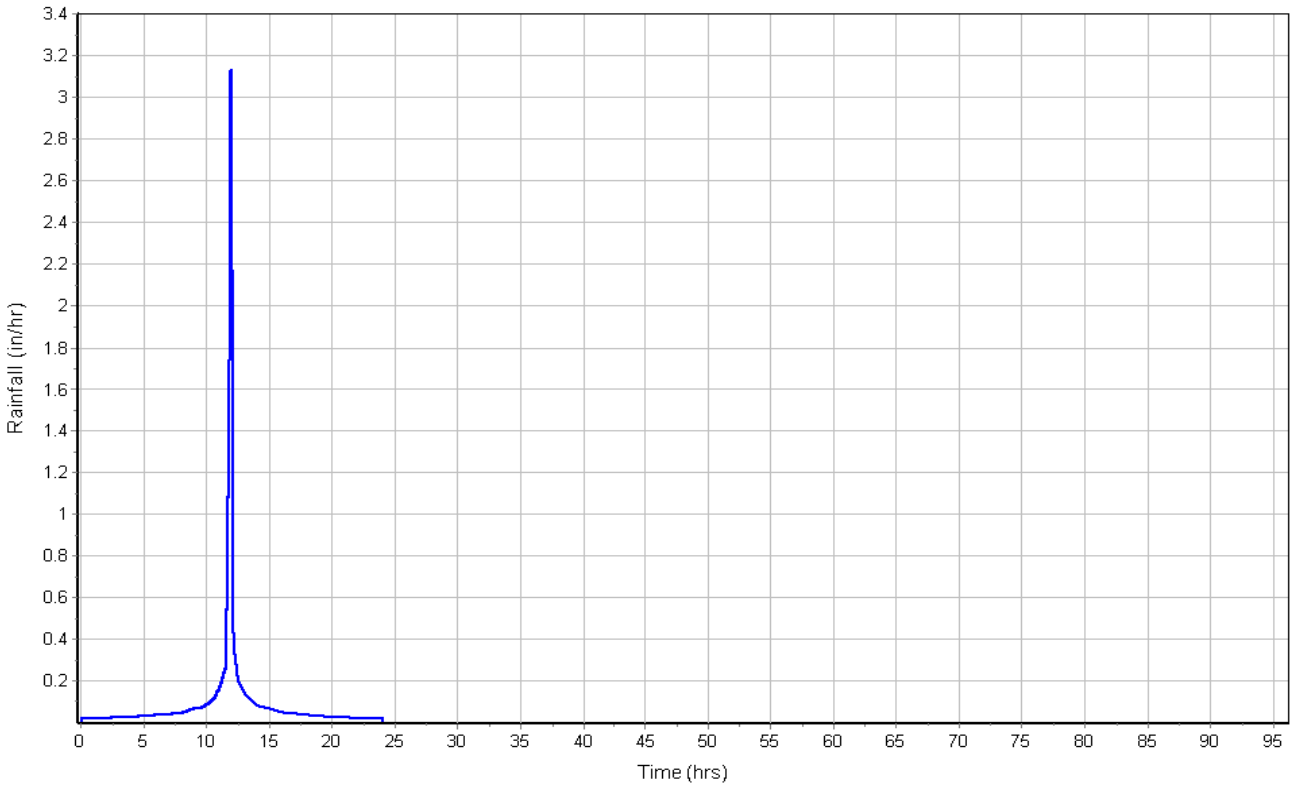
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

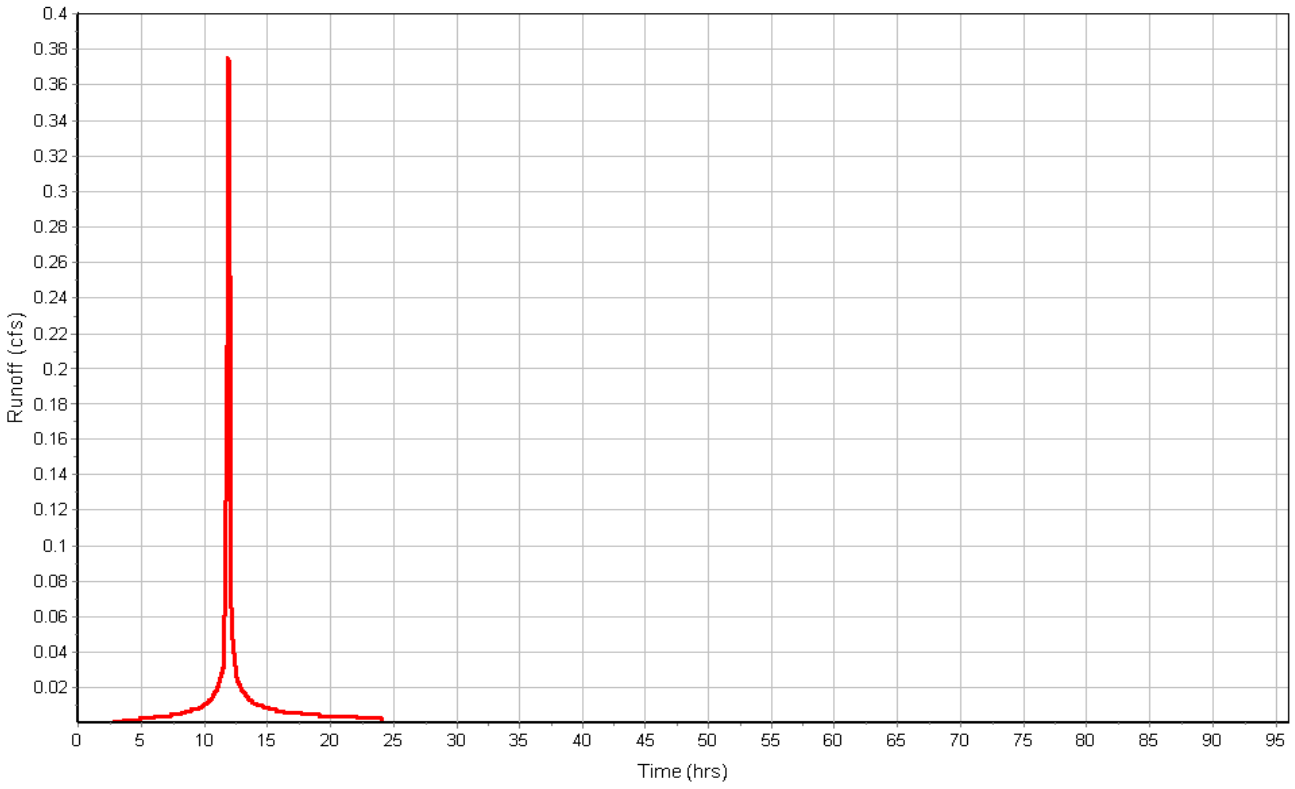
Total Rainfall (in)	2.28
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.38
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_15_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_15_VACANT

Input Data

Area (ac)	0.45
Peak Rate Factor	484.00
Weighted Curve Number	58.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.45	B	58.00
Composite Area & Weighted CN	0.45		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	186	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	43.66	0.00	0.00

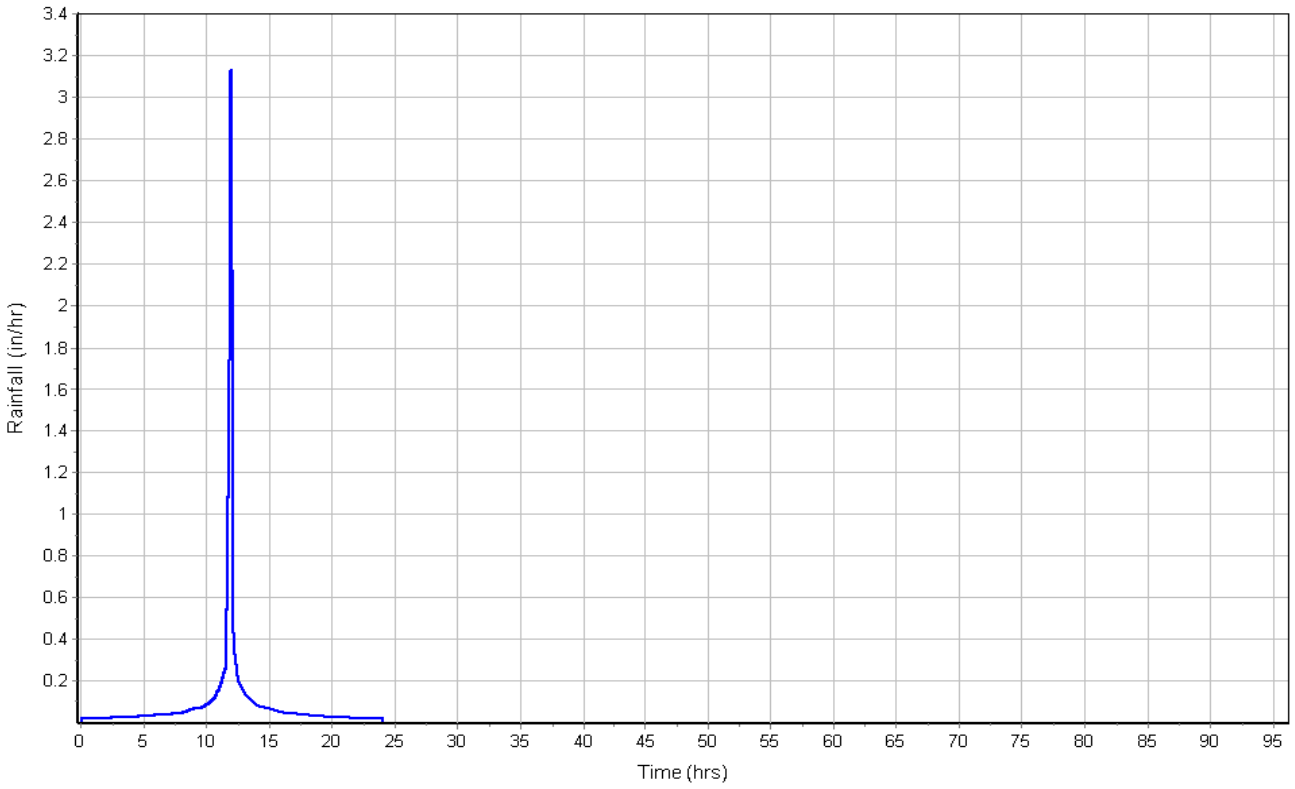
Total TOC (min) 43.66

Subbasin Runoff Results

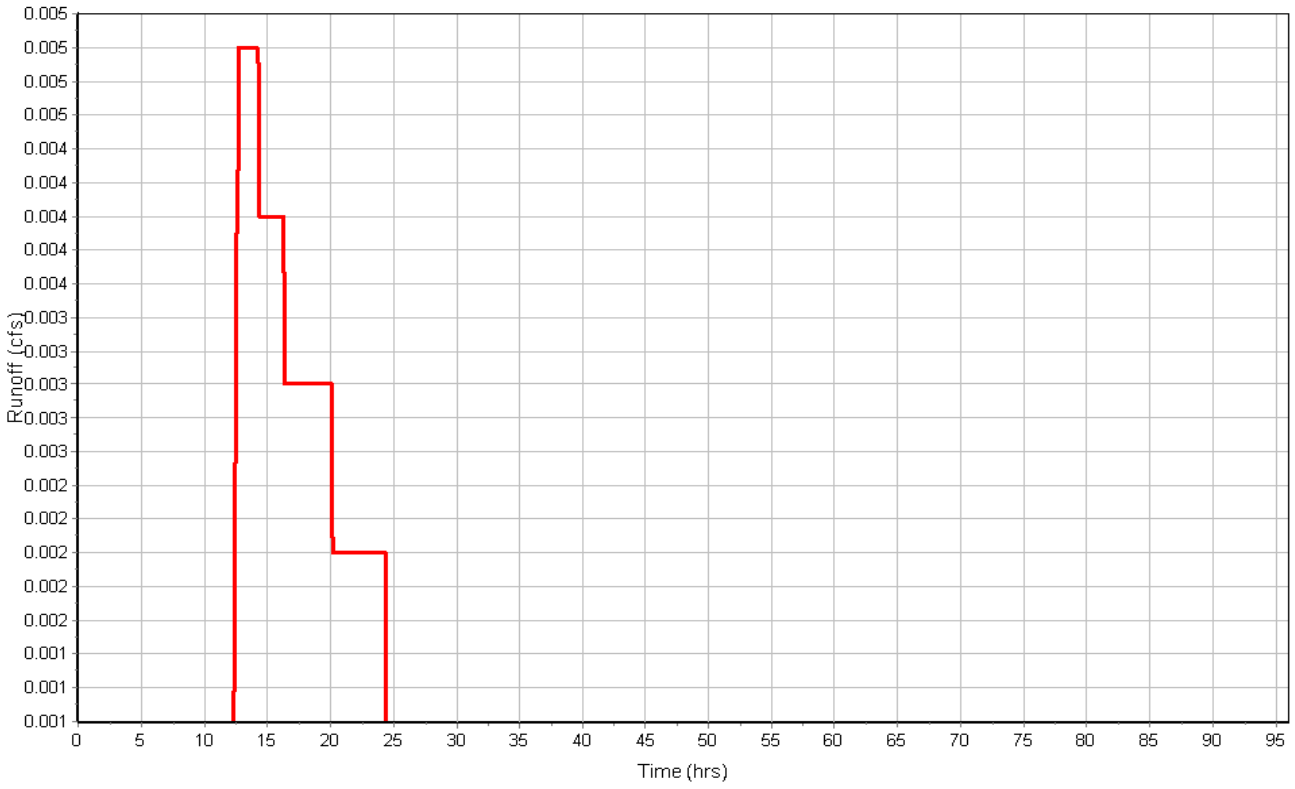
Total Rainfall (in)	2.28
Total Runoff (in)	0.09
Peak Runoff (cfs)	0.01
Weighted Curve Number	58.00
Time of Concentration (days hh:mm:ss)	0 00:43:40

Subbasin : BASIN_15_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_16_ROW

Input Data

Area (ac)	0.13
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.13	B	98.00
Composite Area & Weighted CN	0.13		98.00

Time of Concentration

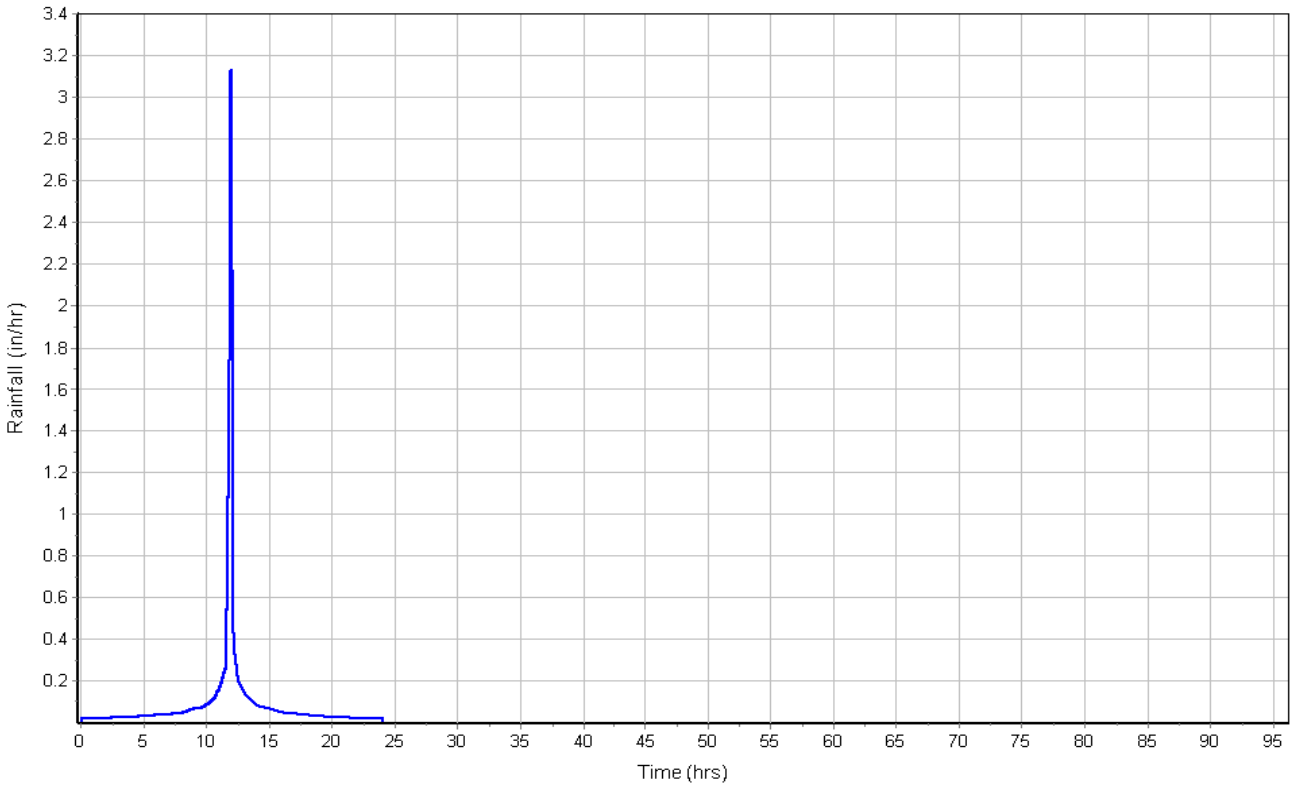
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

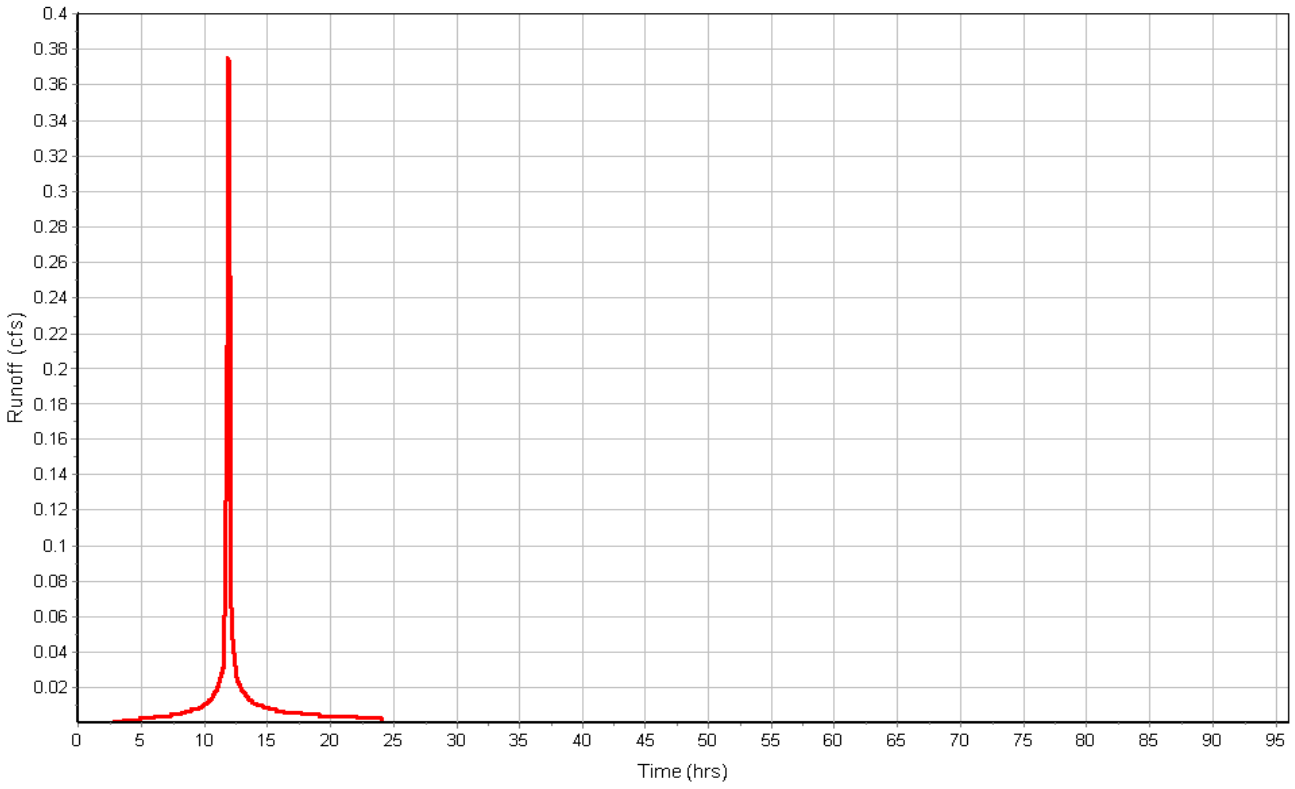
Total Rainfall (in)	2.28
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.38
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_16_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_16_VACANT

Input Data

Area (ac) 0.48
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.48	B	58.00
Composite Area & Weighted CN	0.48		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	186	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	43.66	0.00	0.00

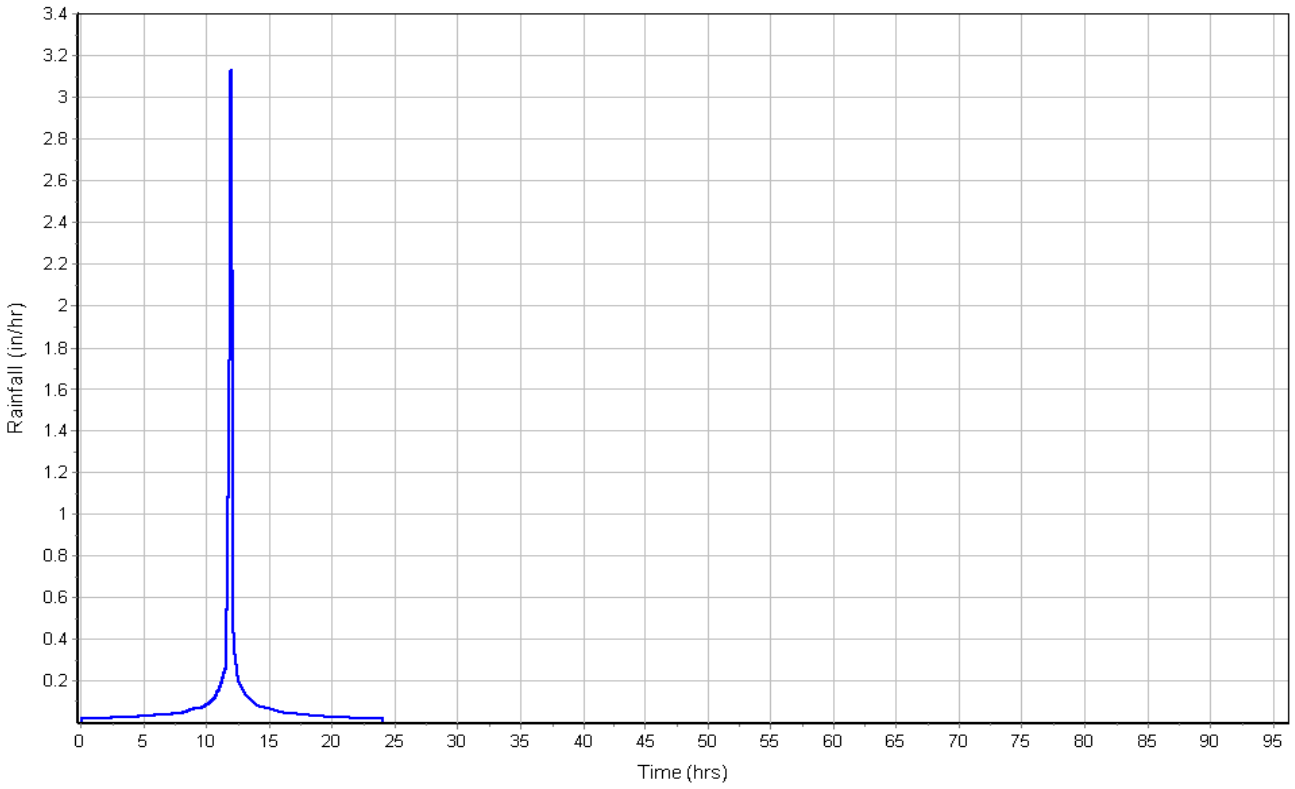
Total TOC (min) 43.66

Subbasin Runoff Results

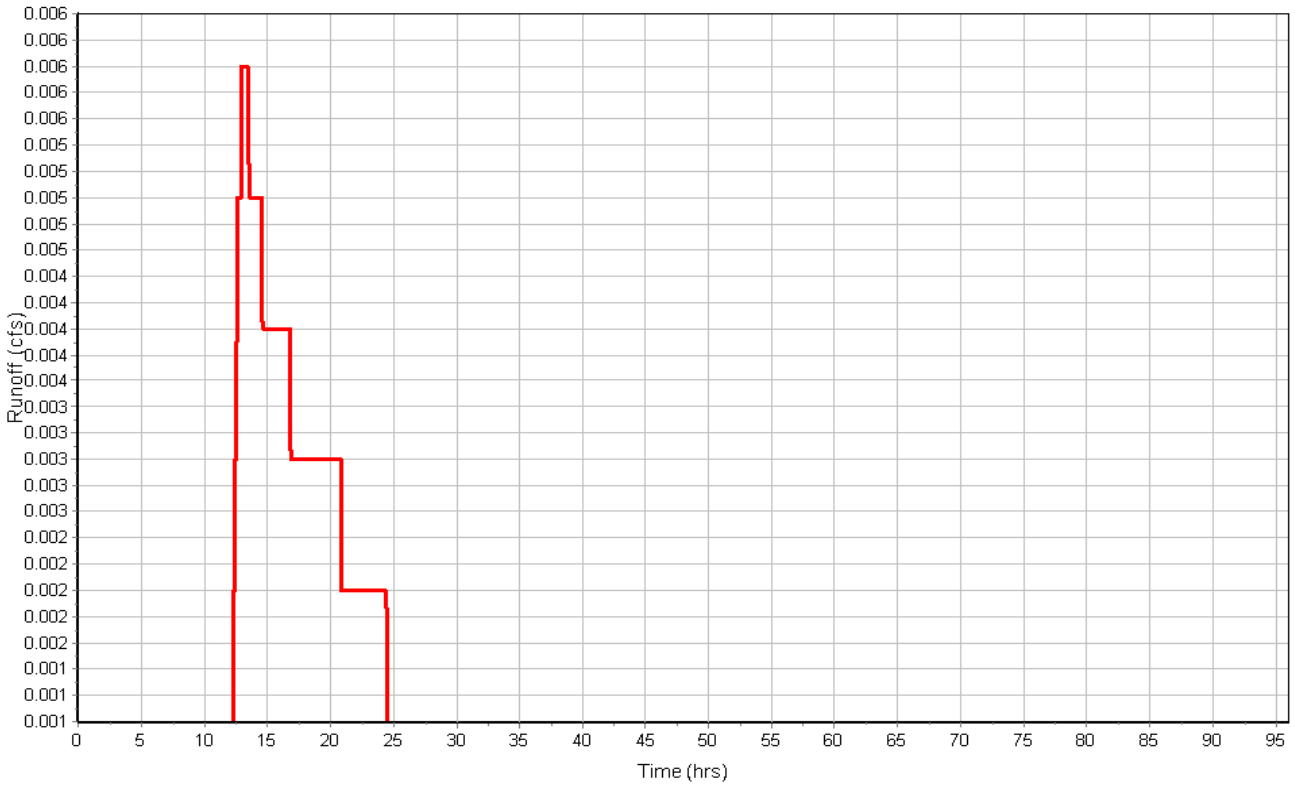
Total Rainfall (in) 2.28
Total Runoff (in) 0.09
Peak Runoff (cfs) 0.01
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:43:40

Subbasin : BASIN_16_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_17_ROW

Input Data

Area (ac)	0.12
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.12	B	98.00
Composite Area & Weighted CN	0.12		98.00

Time of Concentration

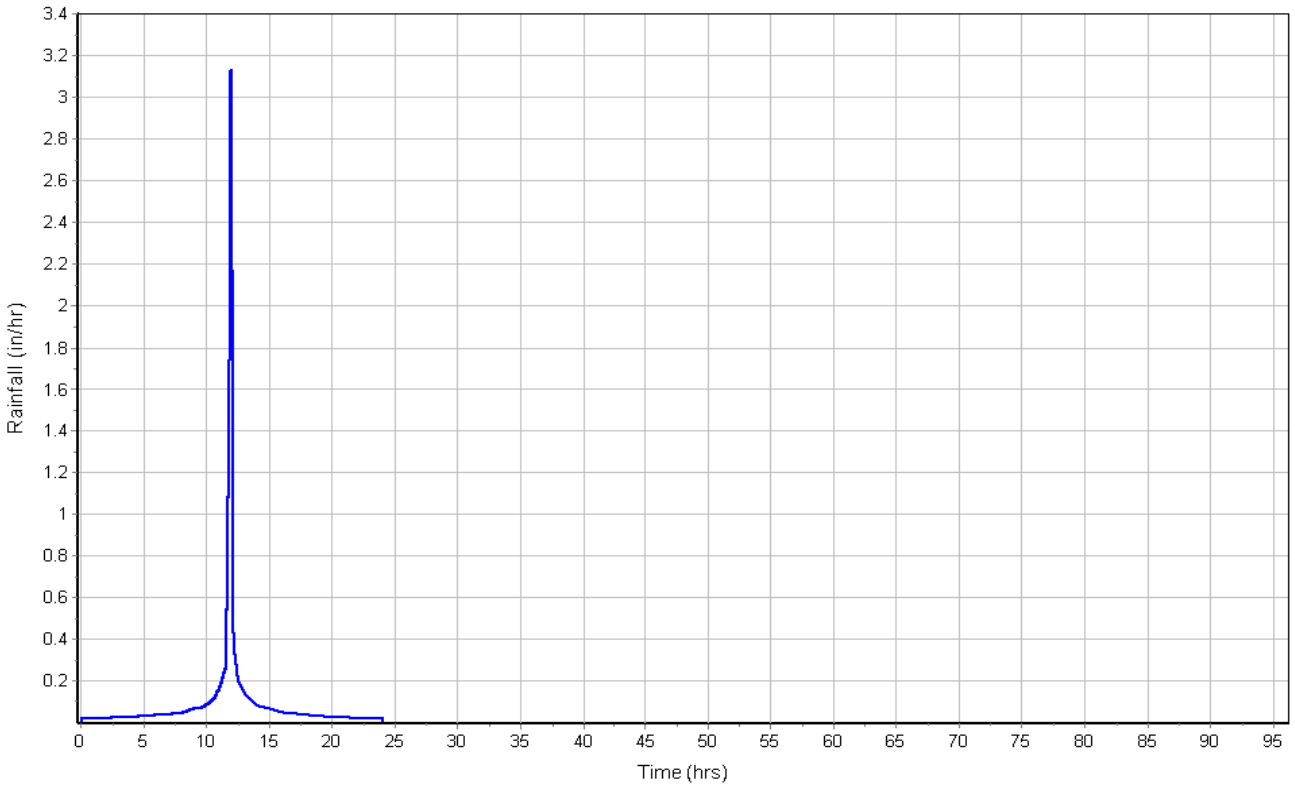
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

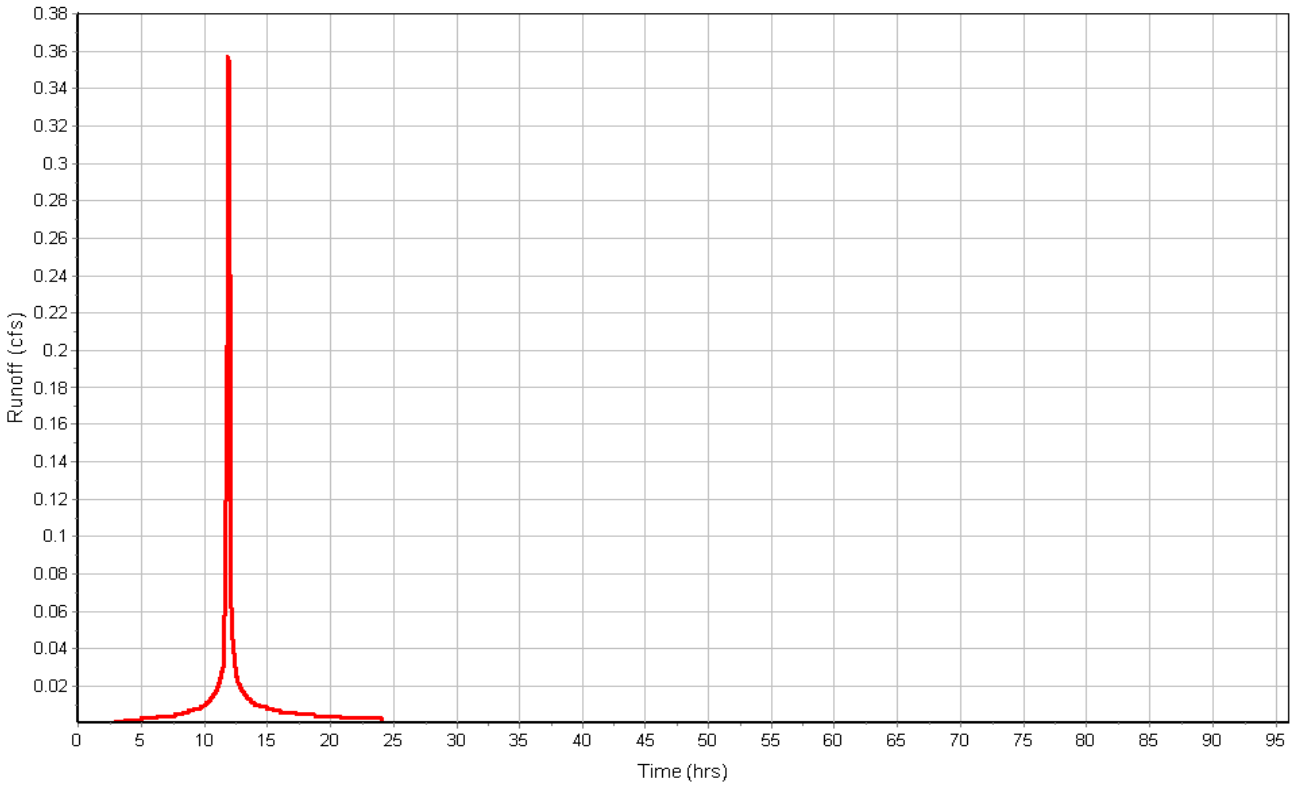
Total Rainfall (in)	2.28
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.36
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_17_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_17_VACANT

Input Data

Area (ac) 0.34
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.34	B	58.00
Composite Area & Weighted CN	0.34		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	265	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	57.95	0.00	0.00

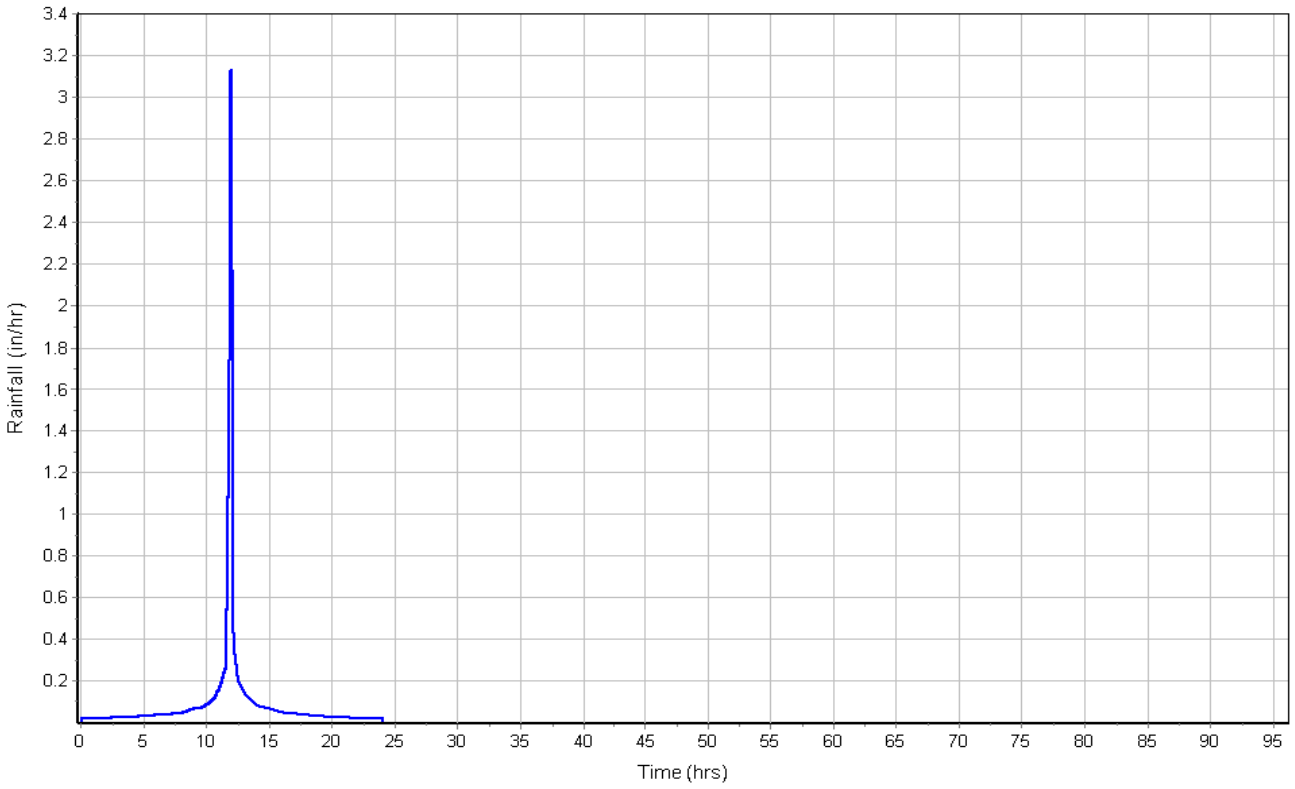
Total TOC (min) 57.95

Subbasin Runoff Results

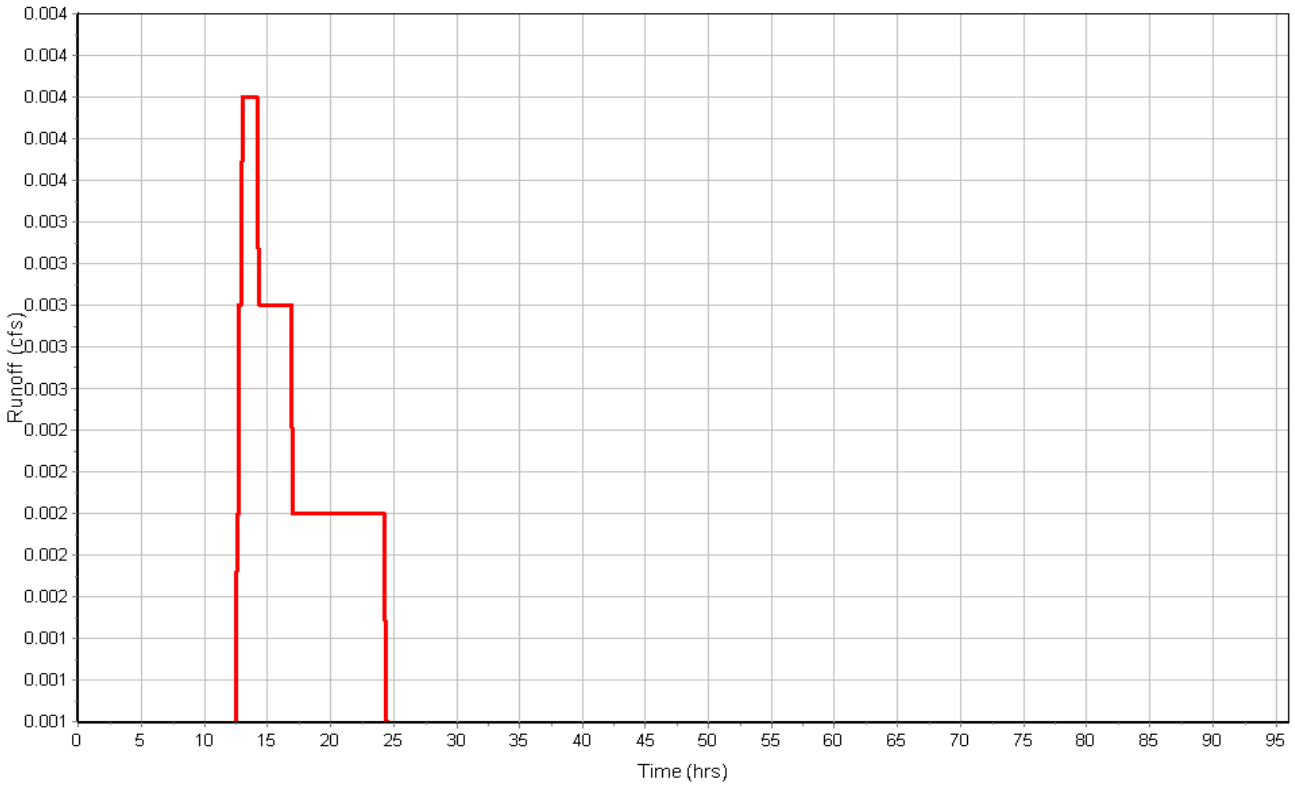
Total Rainfall (in) 2.28
Total Runoff (in) 0.08
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:57:57

Subbasin : BASIN_17_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_18_ROW

Input Data

Area (ac)	0.11
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.11	B	98.00
Composite Area & Weighted CN	0.11		98.00

Time of Concentration

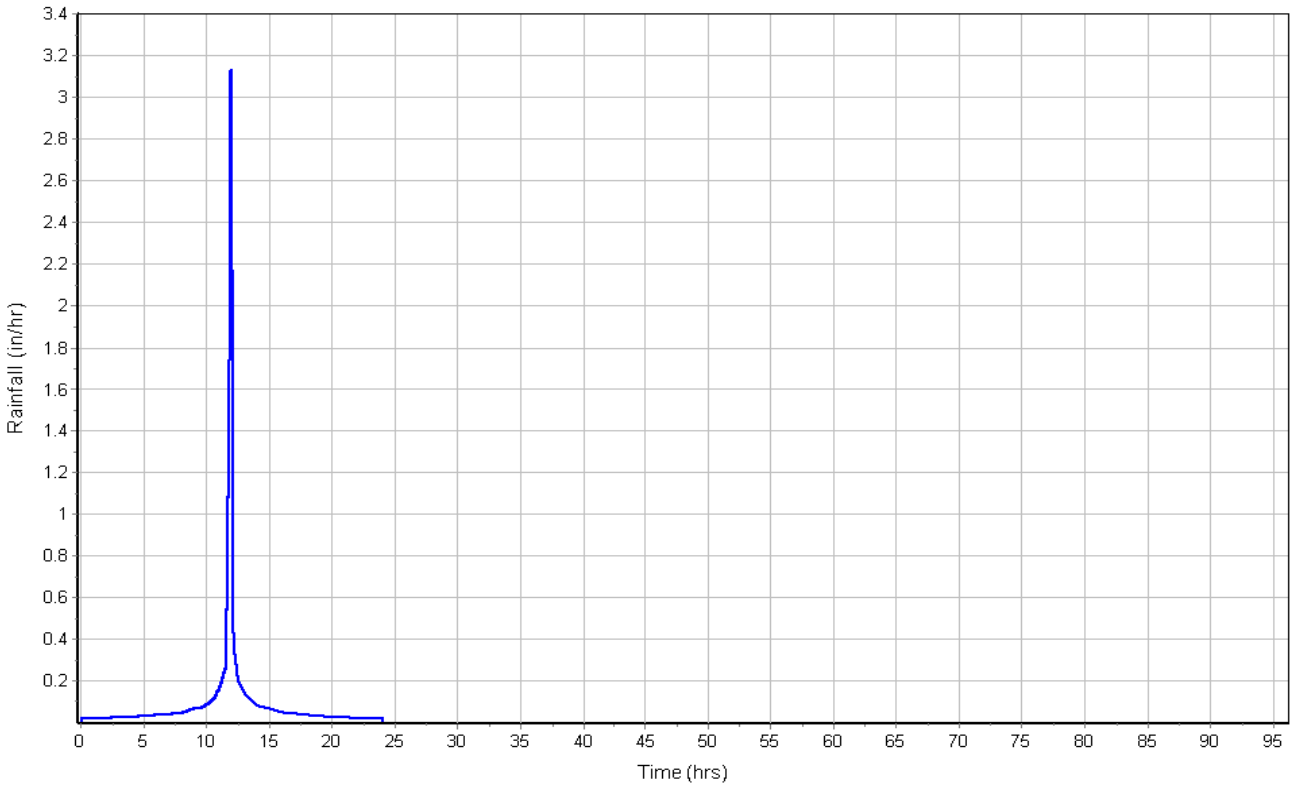
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

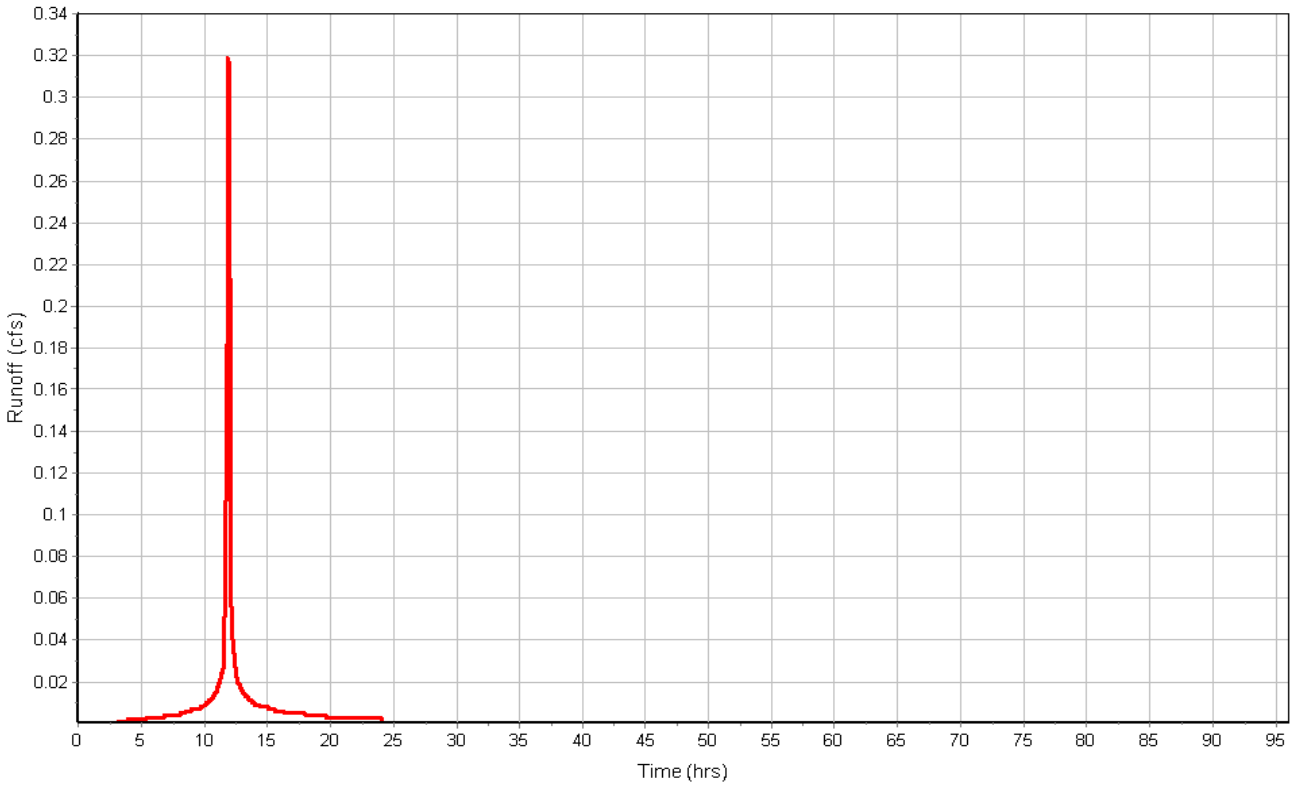
Total Rainfall (in)	2.28
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.32
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_18_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_18_VACANT

Input Data

Area (ac)	0.31
Peak Rate Factor	484.00
Weighted Curve Number	58.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.31	B	58.00
Composite Area & Weighted CN	0.31		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	271	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	59.00	0.00	0.00

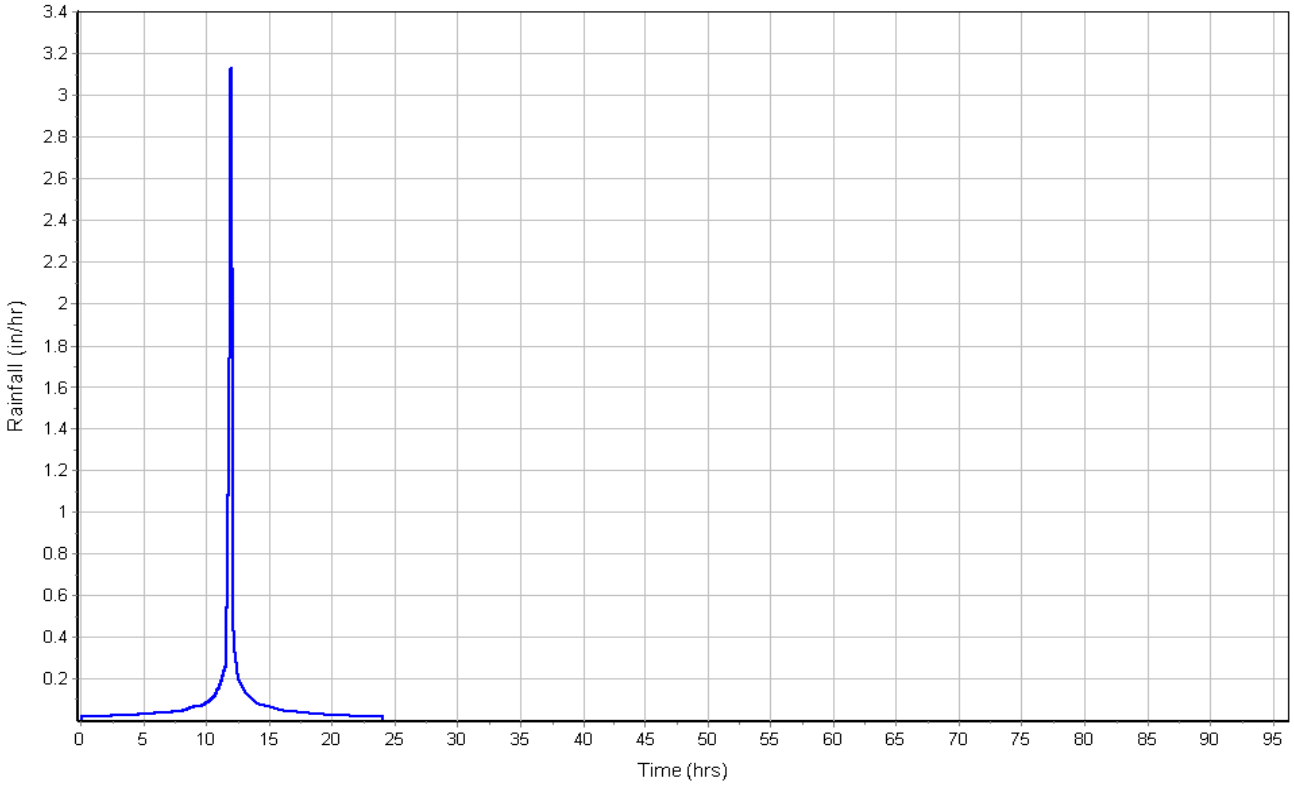
Total TOC (min) 59.00

Subbasin Runoff Results

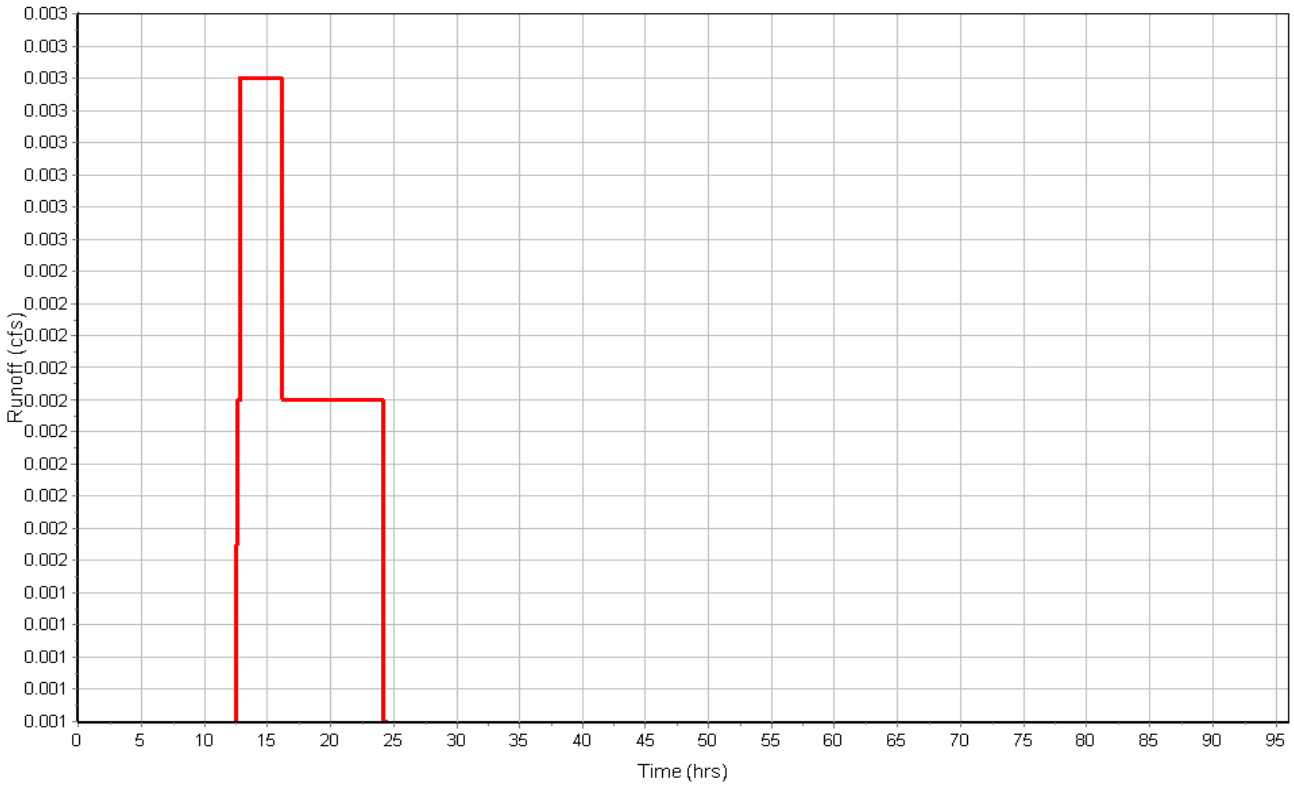
Total Rainfall (in)	2.28
Total Runoff (in)	0.08
Peak Runoff (cfs)	0.00
Weighted Curve Number	58.00
Time of Concentration (days hh:mm:ss)	0 00:59:00

Subbasin : BASIN_18_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_19_ROW

Input Data

Area (ac)	0.08
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.08	B	98.00
Composite Area & Weighted CN	0.08		98.00

Time of Concentration

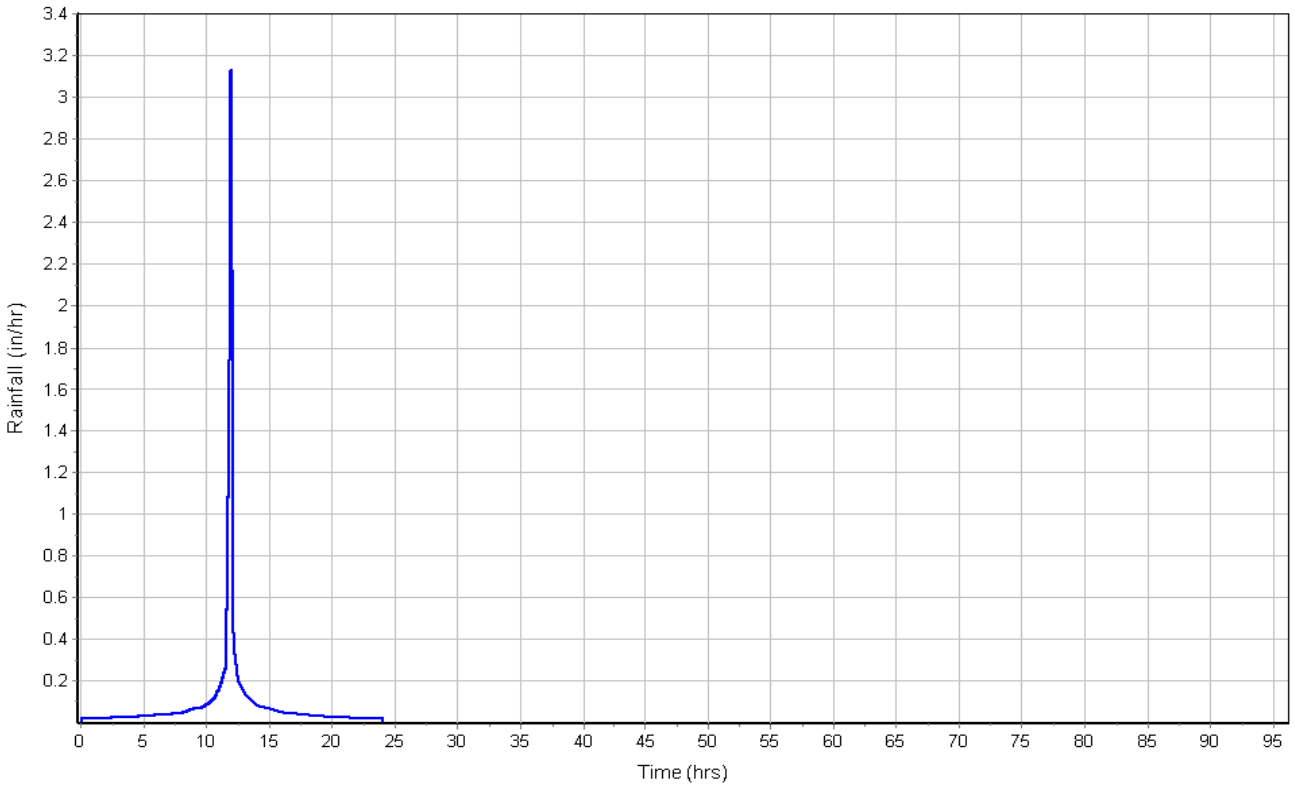
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

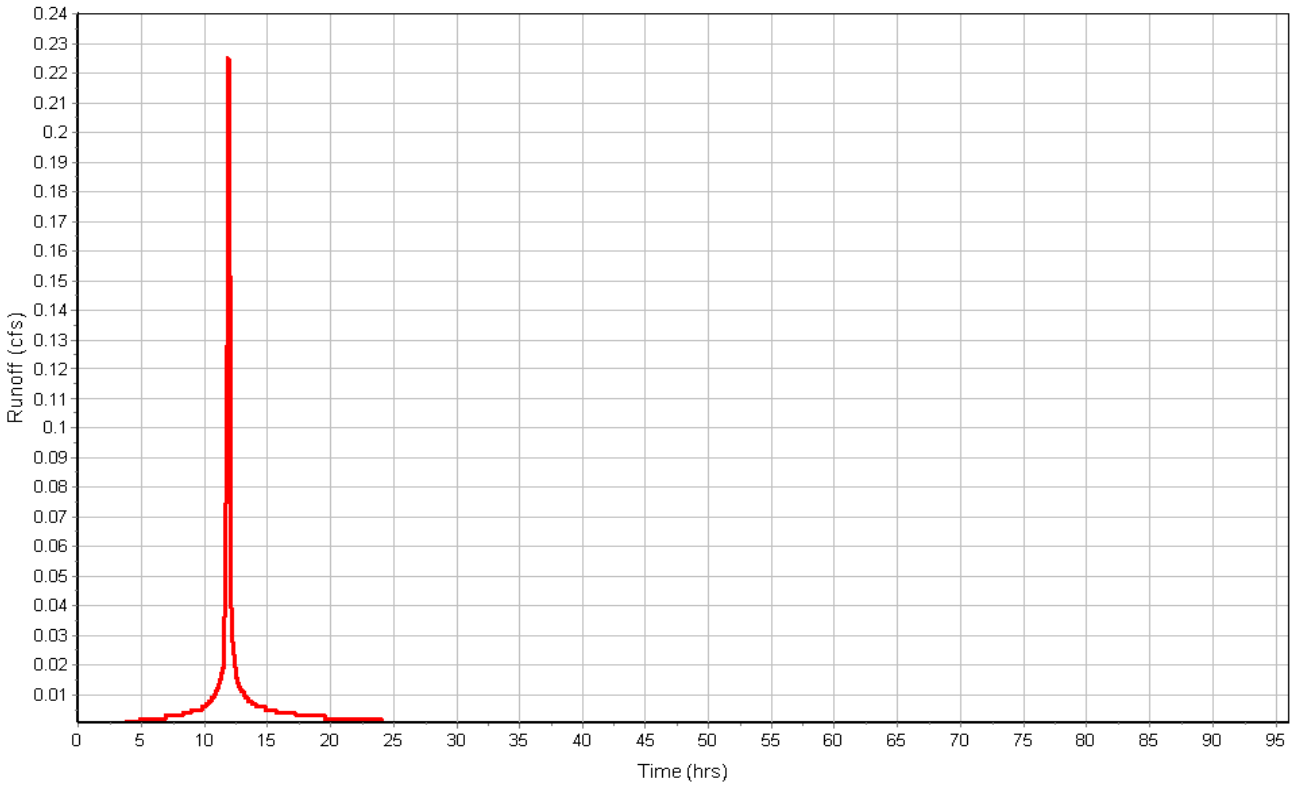
Total Rainfall (in)	2.28
Total Runoff (in)	2.04
Peak Runoff (cfs)	0.23
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_19_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_19_VACANT

Input Data

Area (ac) 0.06
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.06	B	58.00
Composite Area & Weighted CN	0.06		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	88	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.06	0.00	0.00
Computed Flow Time (min) :	23.99	0.00	0.00

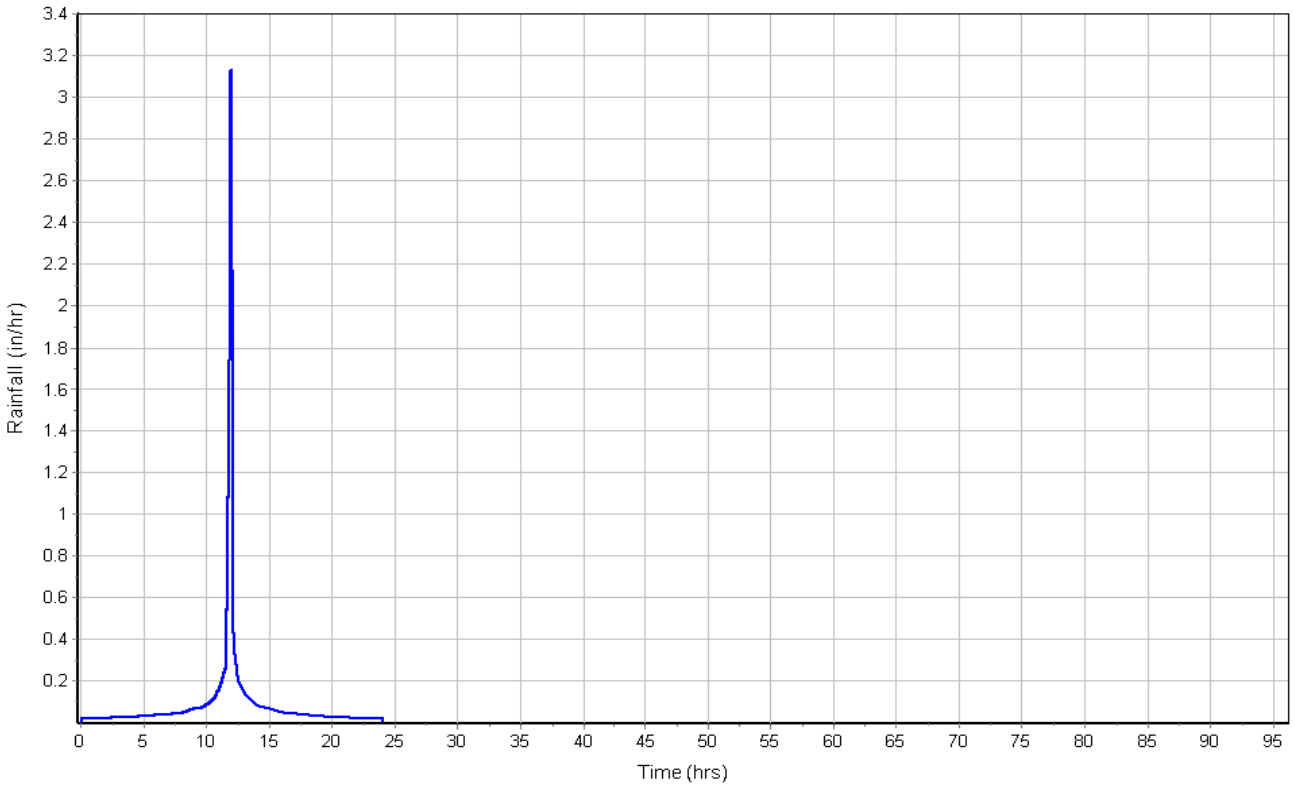
Total TOC (min) 23.99

Subbasin Runoff Results

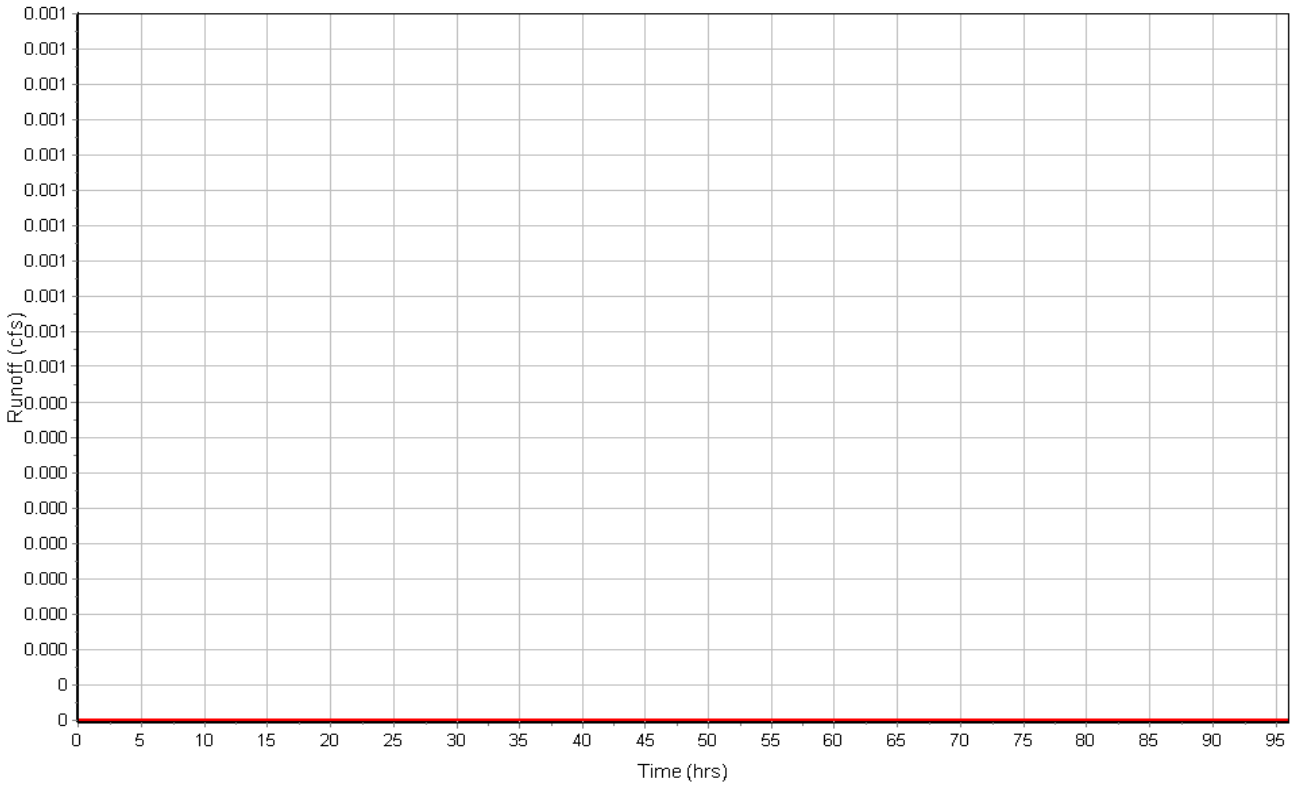
Total Rainfall (in) 2.28
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:23:59

Subbasin : BASIN_19_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_2_ROW

Input Data

Area (ac)	0.18
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.18	B	98.00
Composite Area & Weighted CN	0.18		98.00

Time of Concentration

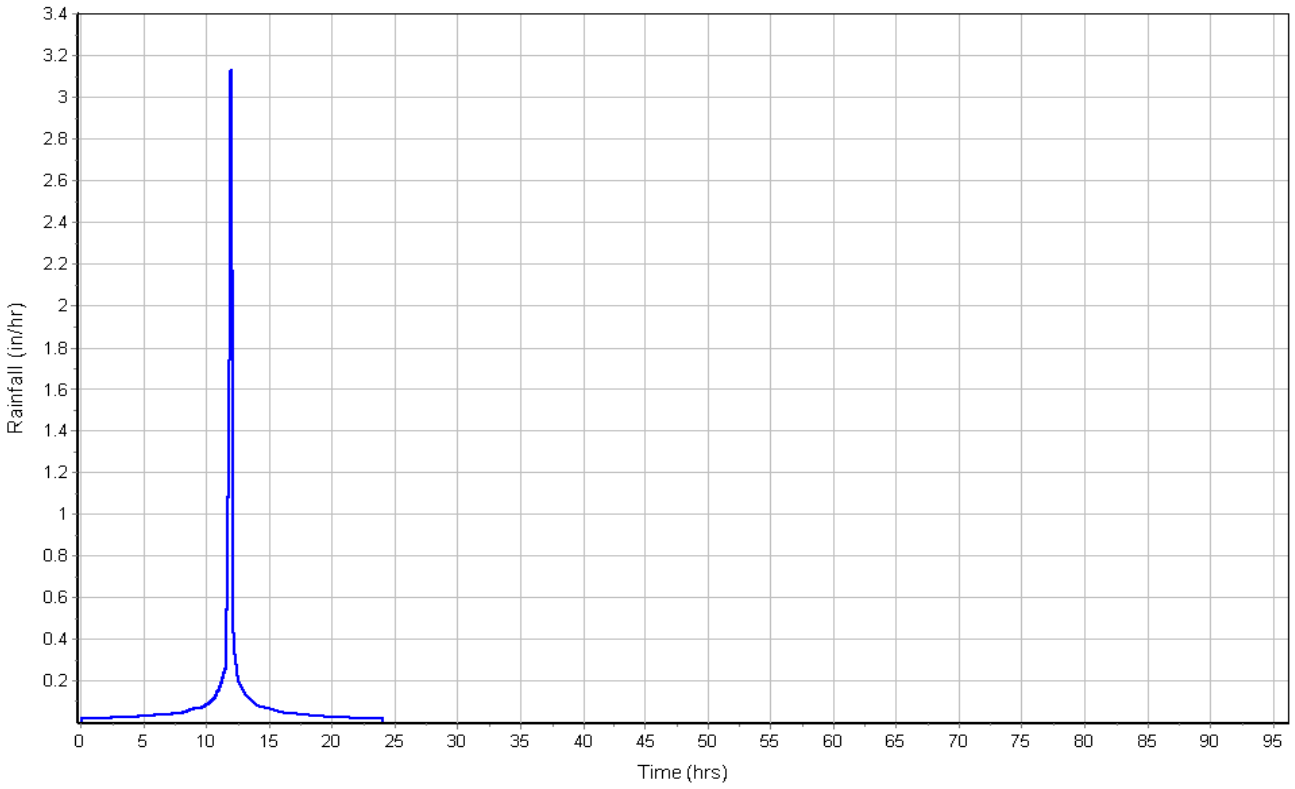
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

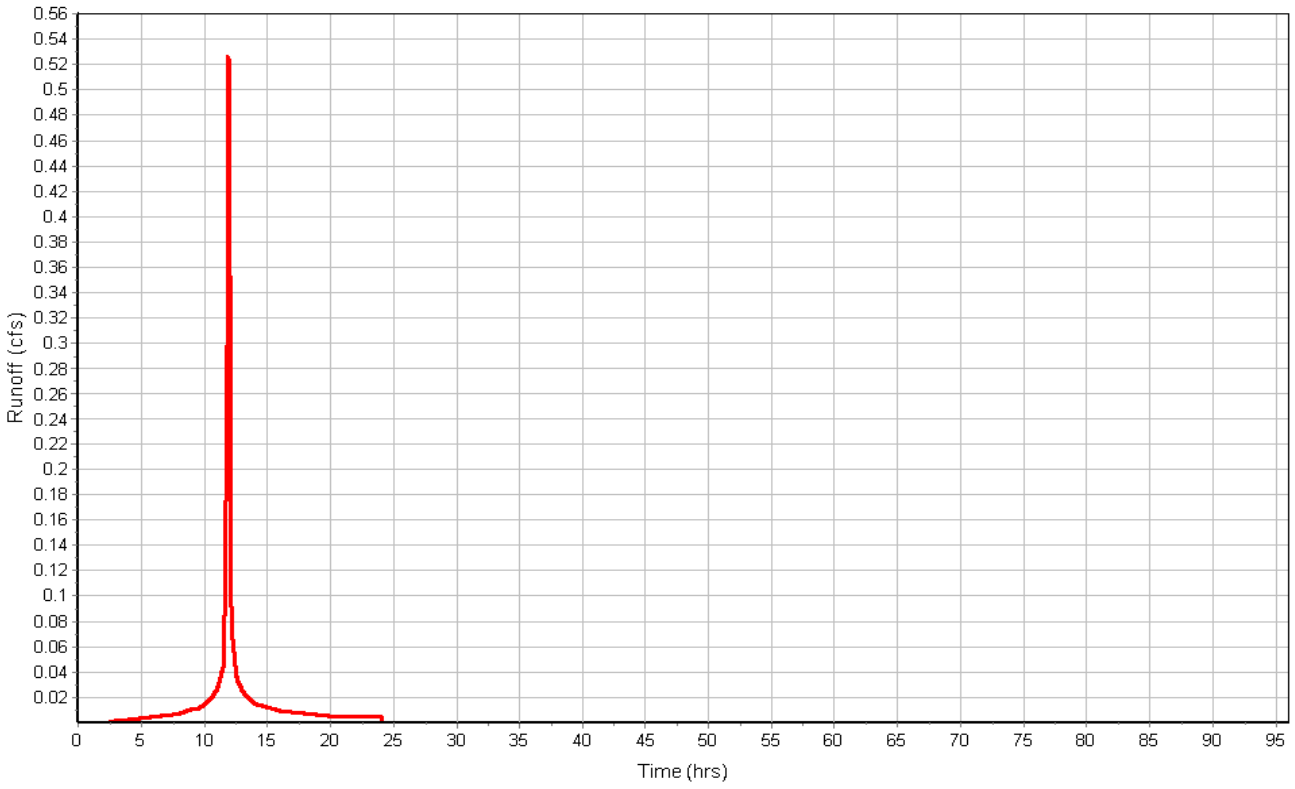
Total Rainfall (in)	2.28
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.53
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_2_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_2_VACANT

Input Data

Area (ac) 0.46
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.46	B	58.00
Composite Area & Weighted CN	0.46		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	259	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	56.90	0.00	0.00

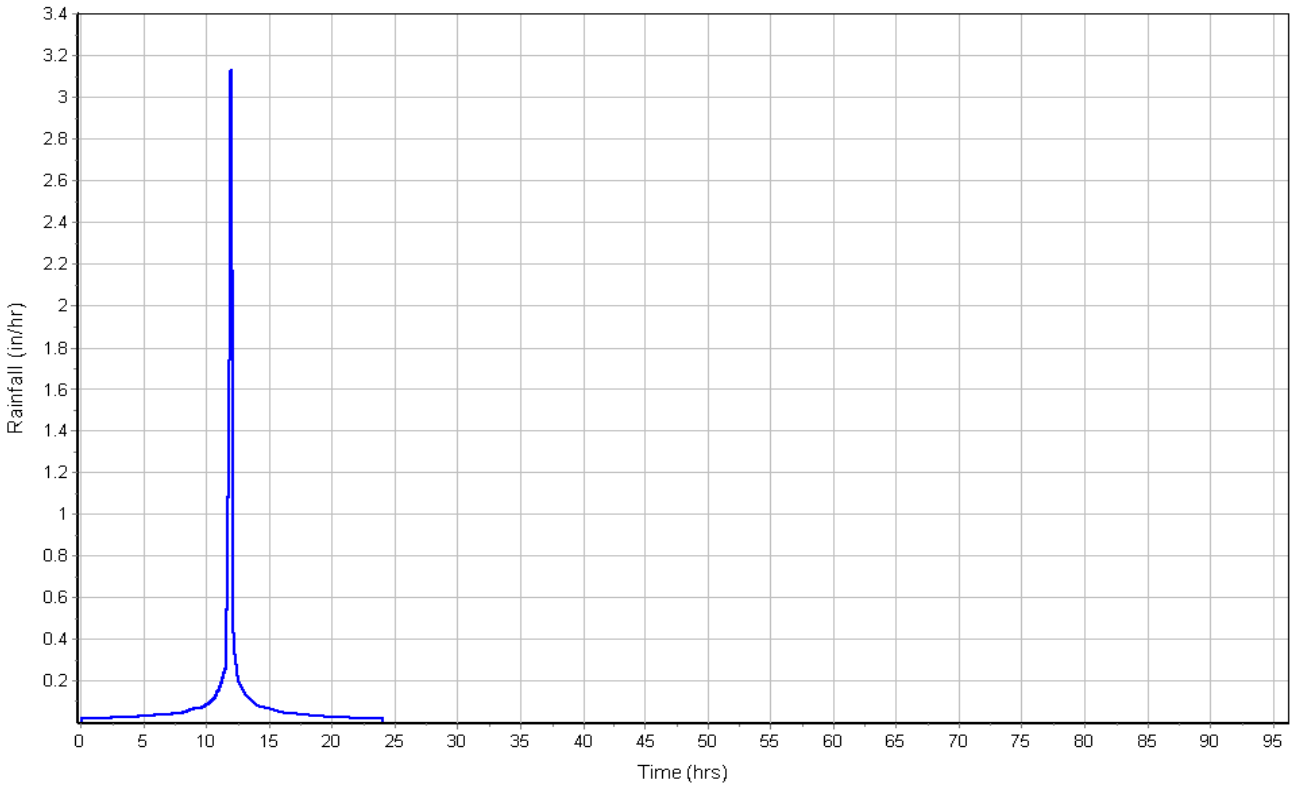
Total TOC (min) 56.90

Subbasin Runoff Results

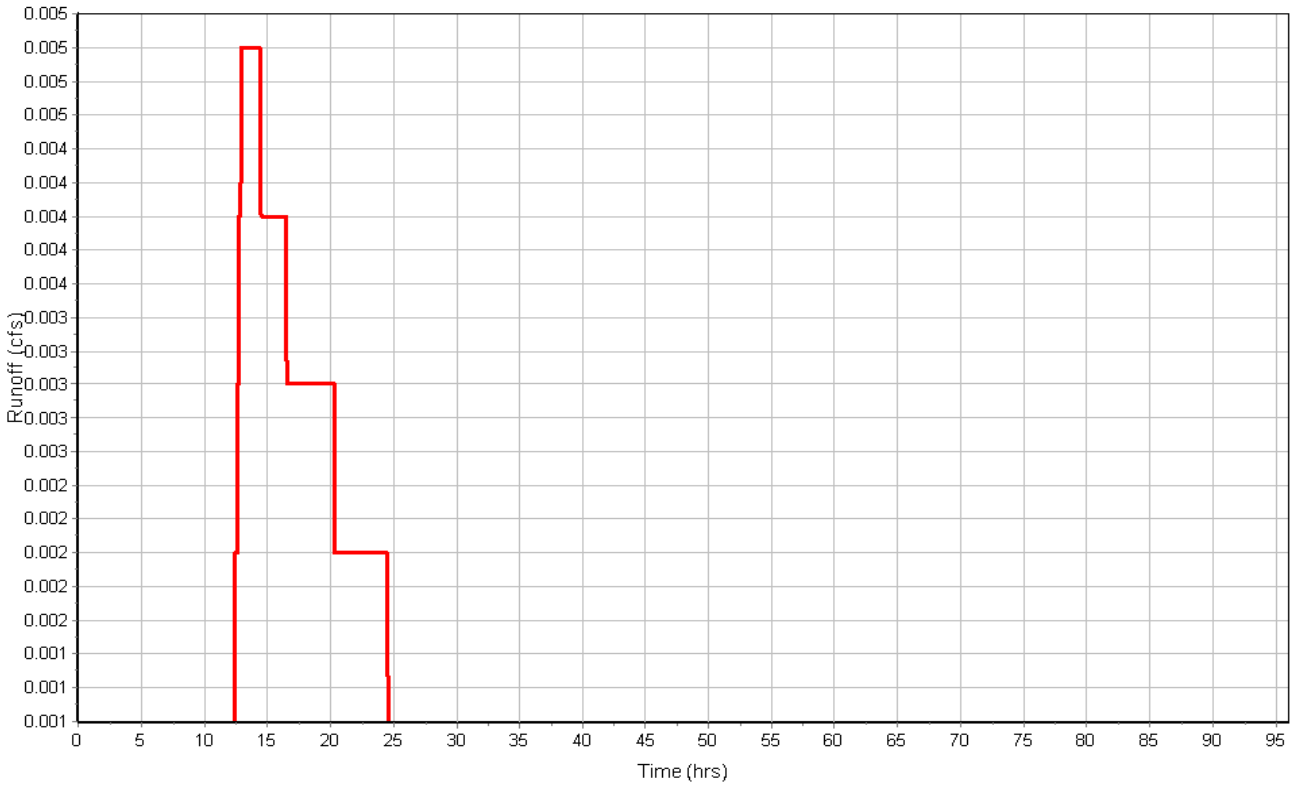
Total Rainfall (in) 2.28
Total Runoff (in) 0.09
Peak Runoff (cfs) 0.01
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:56:54

Subbasin : BASIN_2_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_20_ROW

Input Data

Area (ac)	0.12
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.12	B	98.00
Composite Area & Weighted CN	0.12		98.00

Time of Concentration

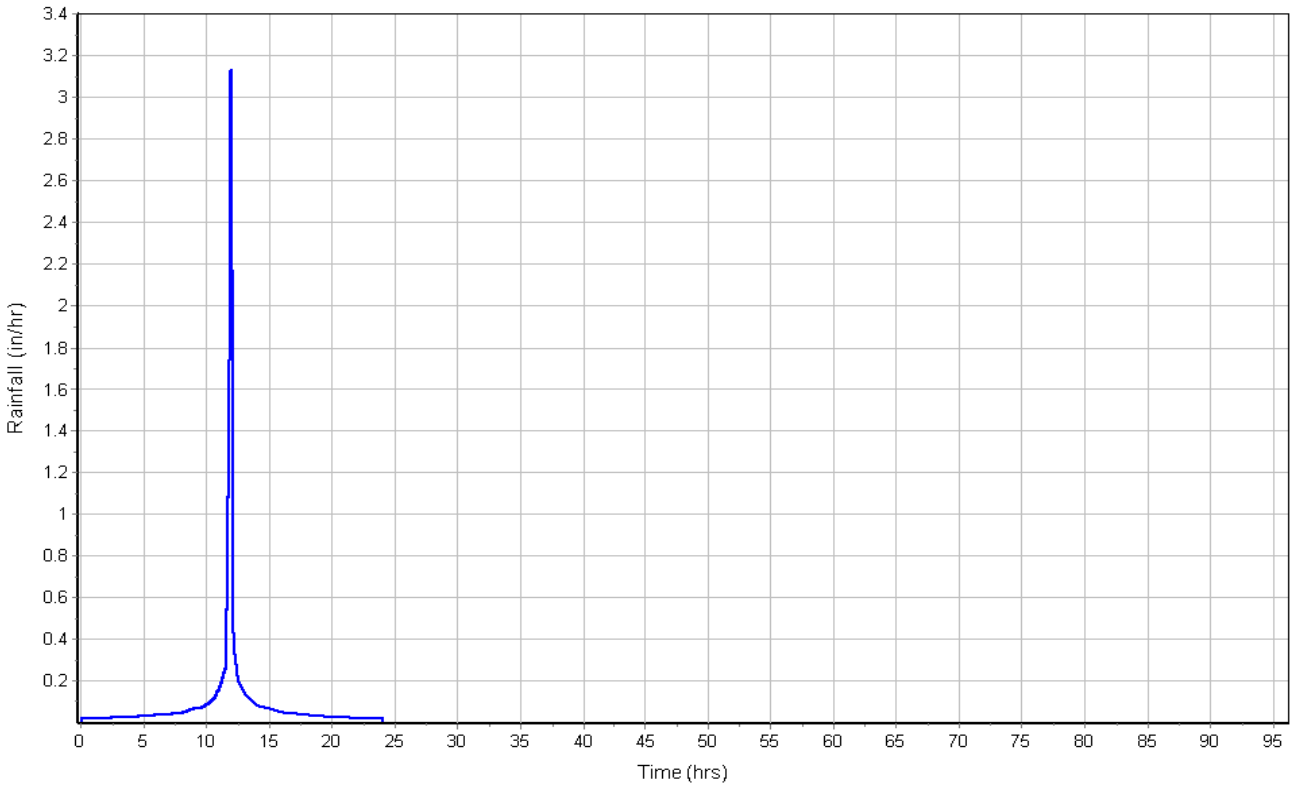
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

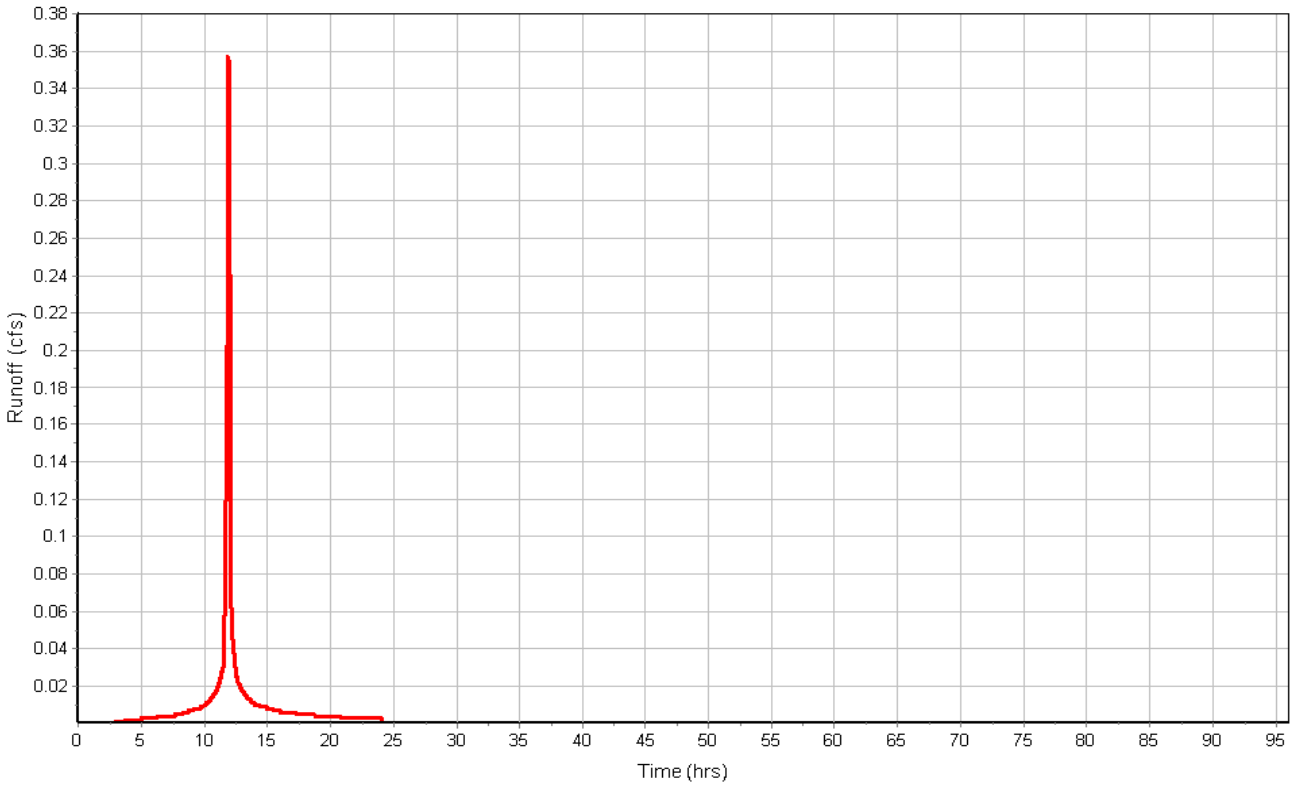
Total Rainfall (in)	2.28
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.36
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_20_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_20_VACANT

Input Data

Area (ac) 0.38
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.38	B	58.00
Composite Area & Weighted CN	0.38		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	279	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	60.39	0.00	0.00

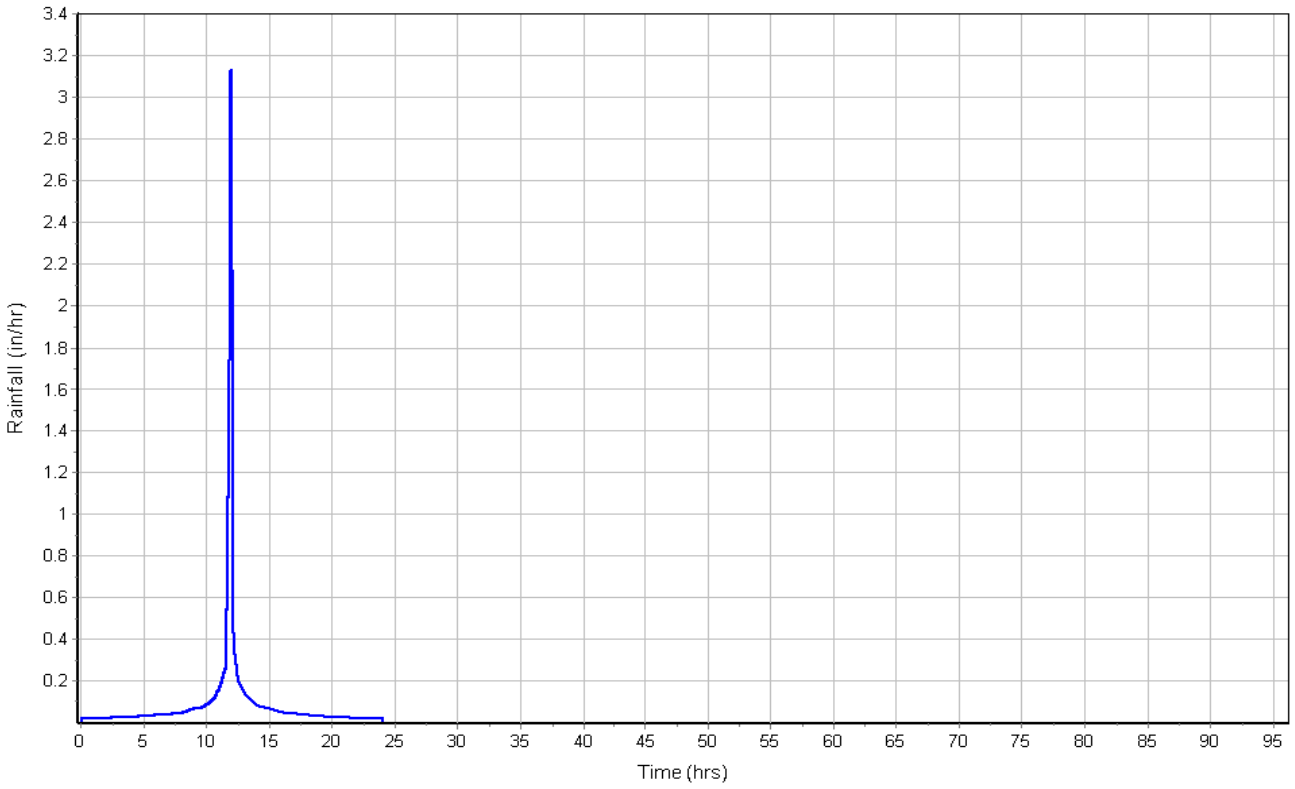
Total TOC (min) 60.39

Subbasin Runoff Results

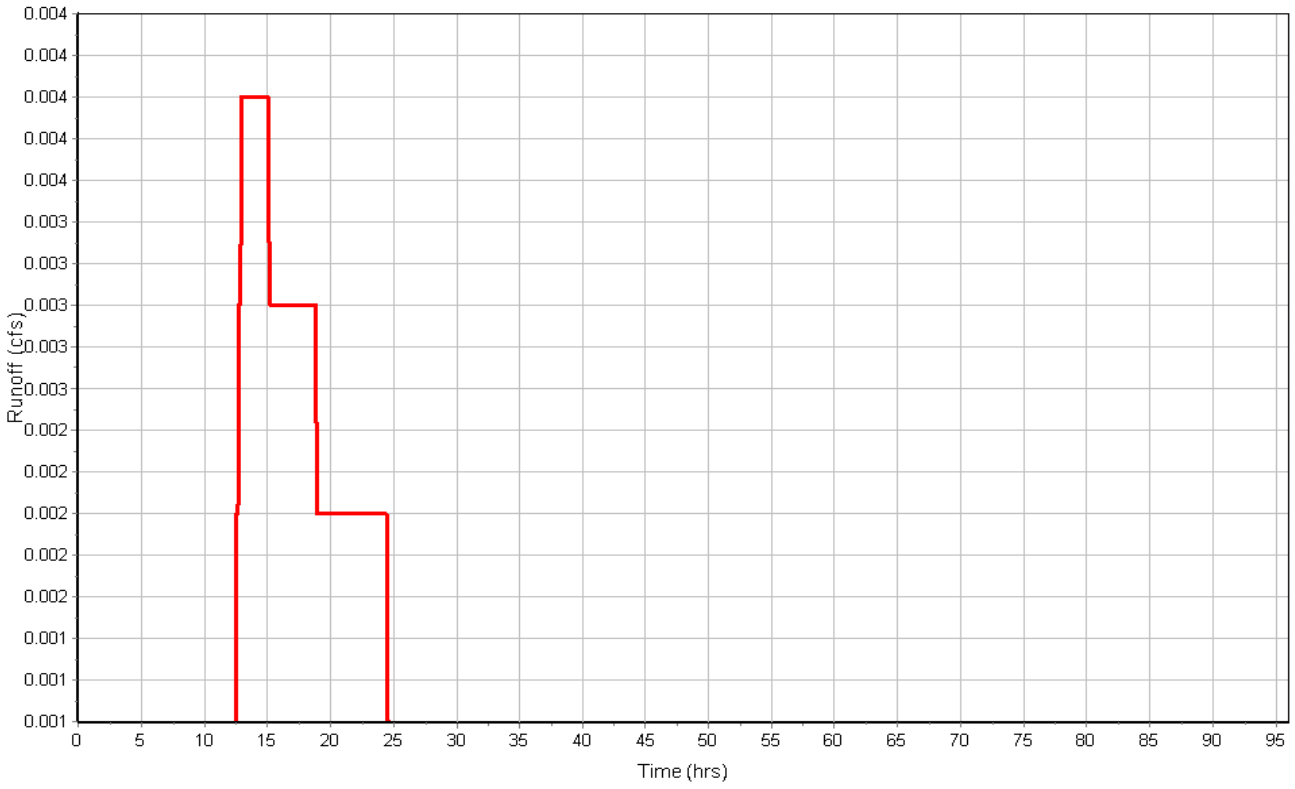
Total Rainfall (in) 2.28
Total Runoff (in) 0.08
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 01:00:23

Subbasin : BASIN_20_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_21_ROW

Input Data

Area (ac)	0.12
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.12	B	98.00
Composite Area & Weighted CN	0.12		98.00

Time of Concentration

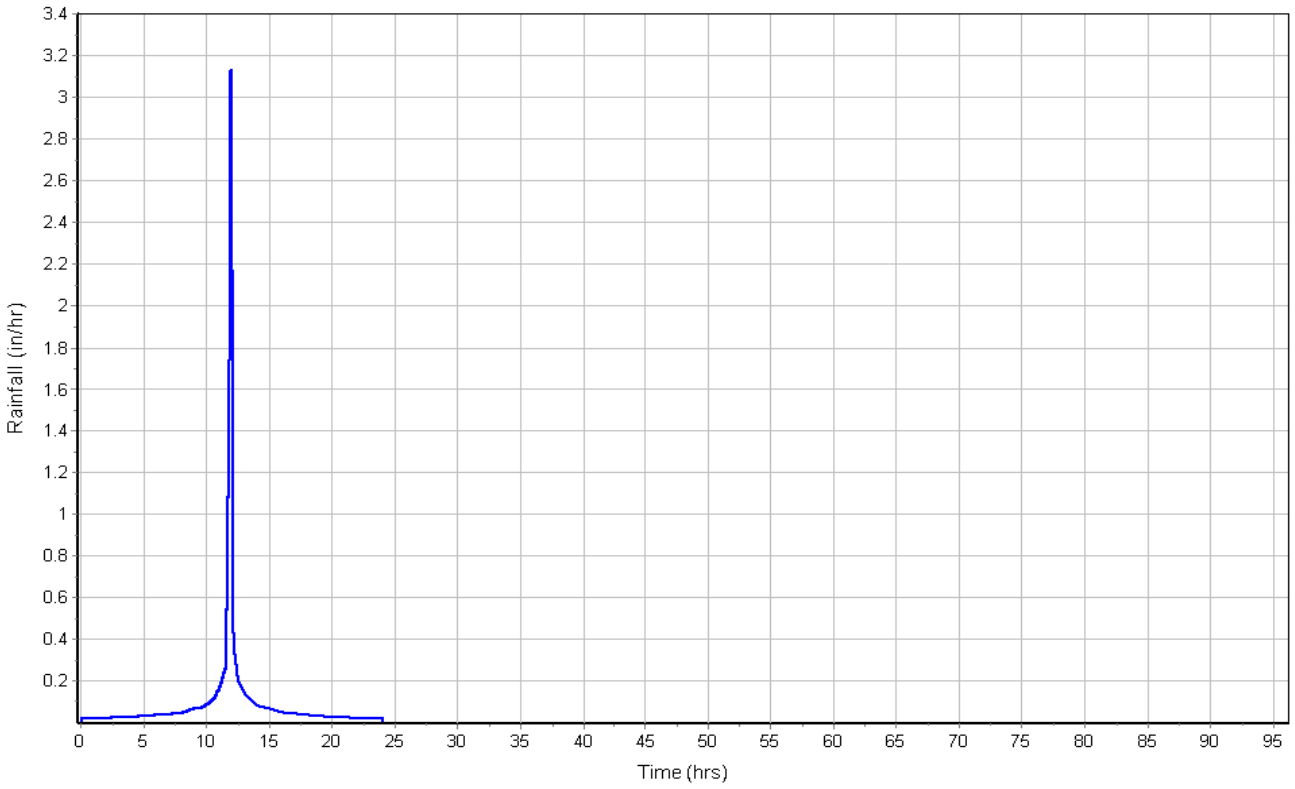
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

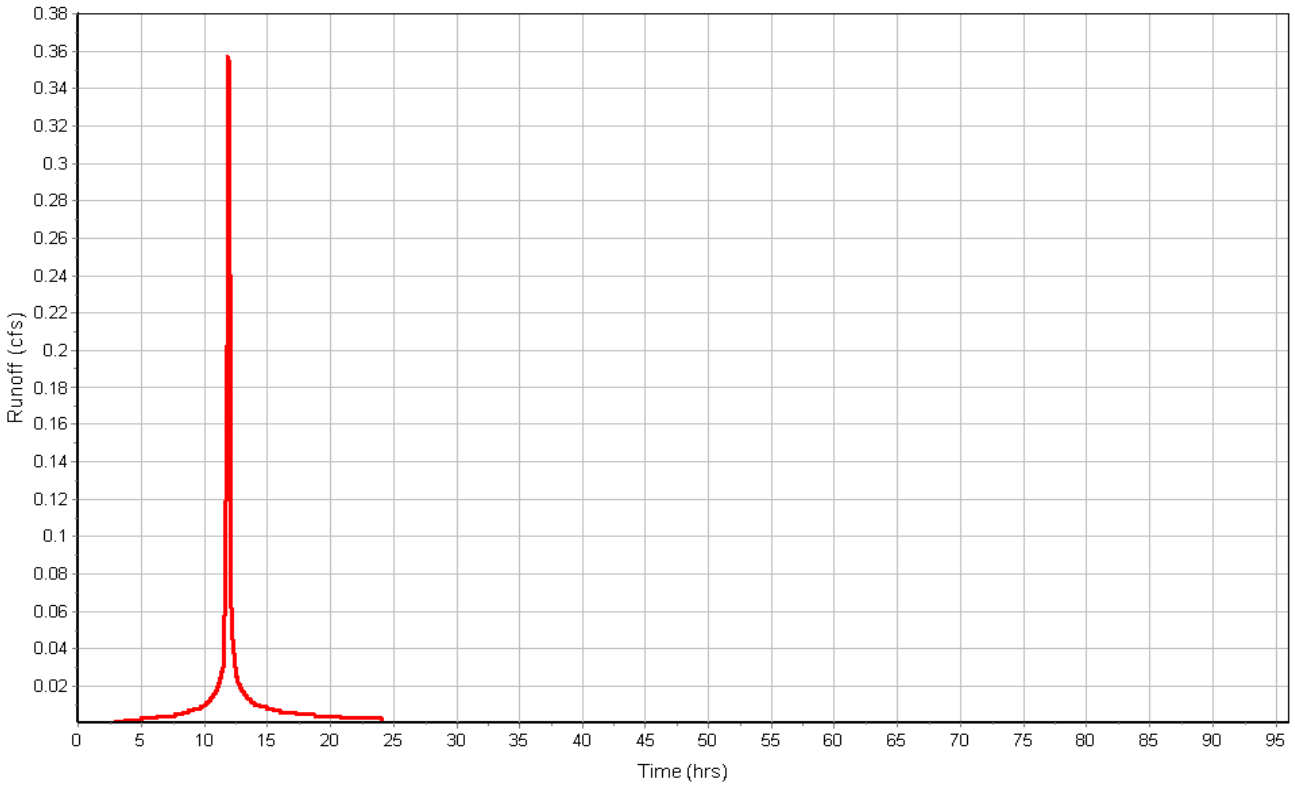
Total Rainfall (in)	2.28
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.36
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_21_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_21_VACANT

Input Data

Area (ac) 0.44
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.44	B	58.00
Composite Area & Weighted CN	0.44		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	298	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	63.66	0.00	0.00

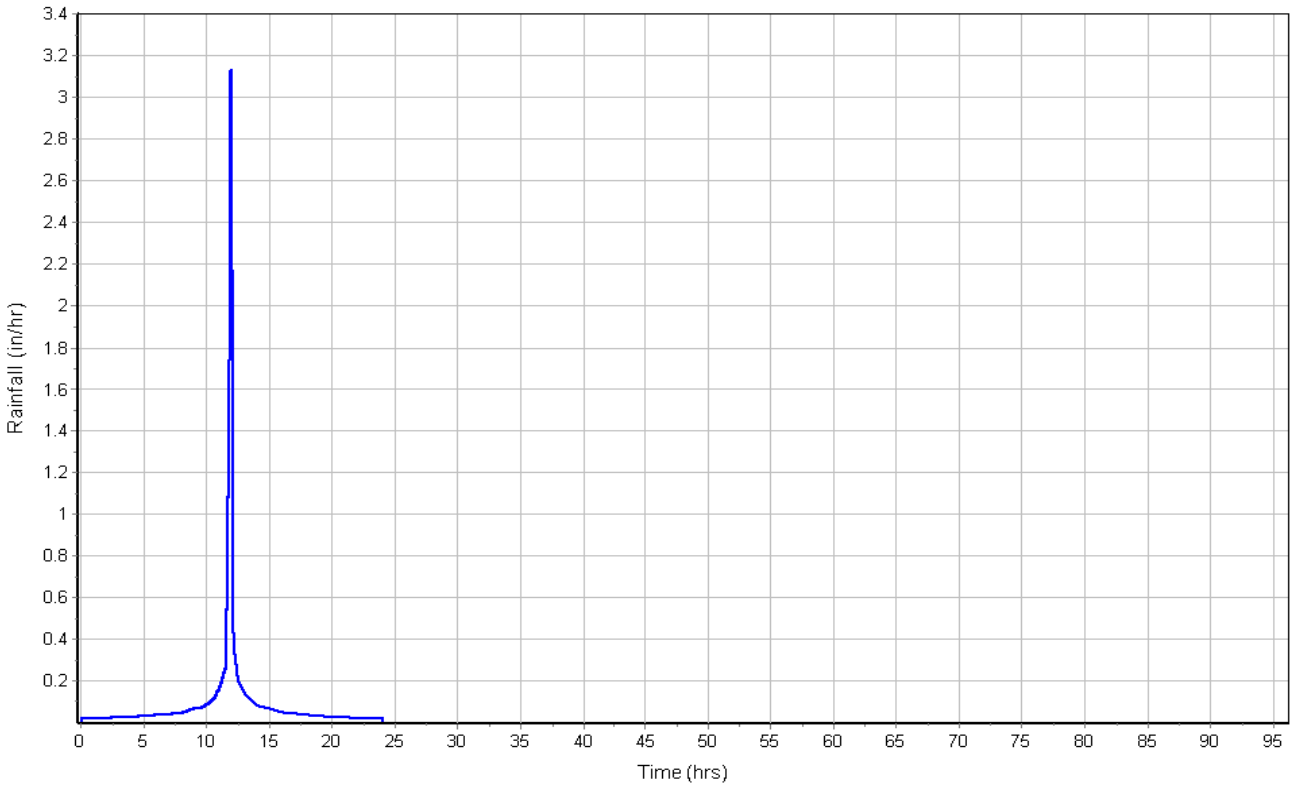
Total TOC (min) 63.66

Subbasin Runoff Results

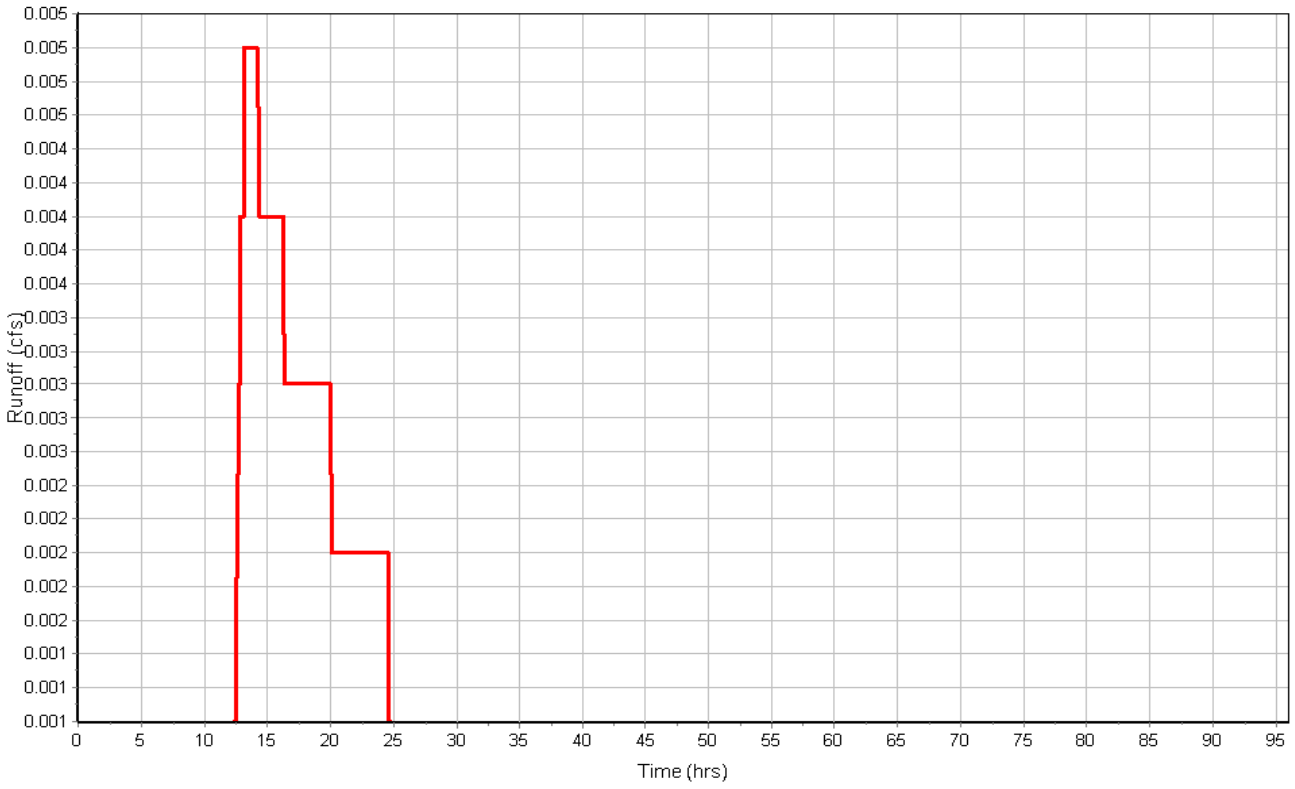
Total Rainfall (in) 2.28
Total Runoff (in) 0.09
Peak Runoff (cfs) 0.01
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 01:03:40

Subbasin : BASIN_21_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_22_ROW

Input Data

Area (ac)	0.14
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.14	B	98.00
Composite Area & Weighted CN	0.14		98.00

Time of Concentration

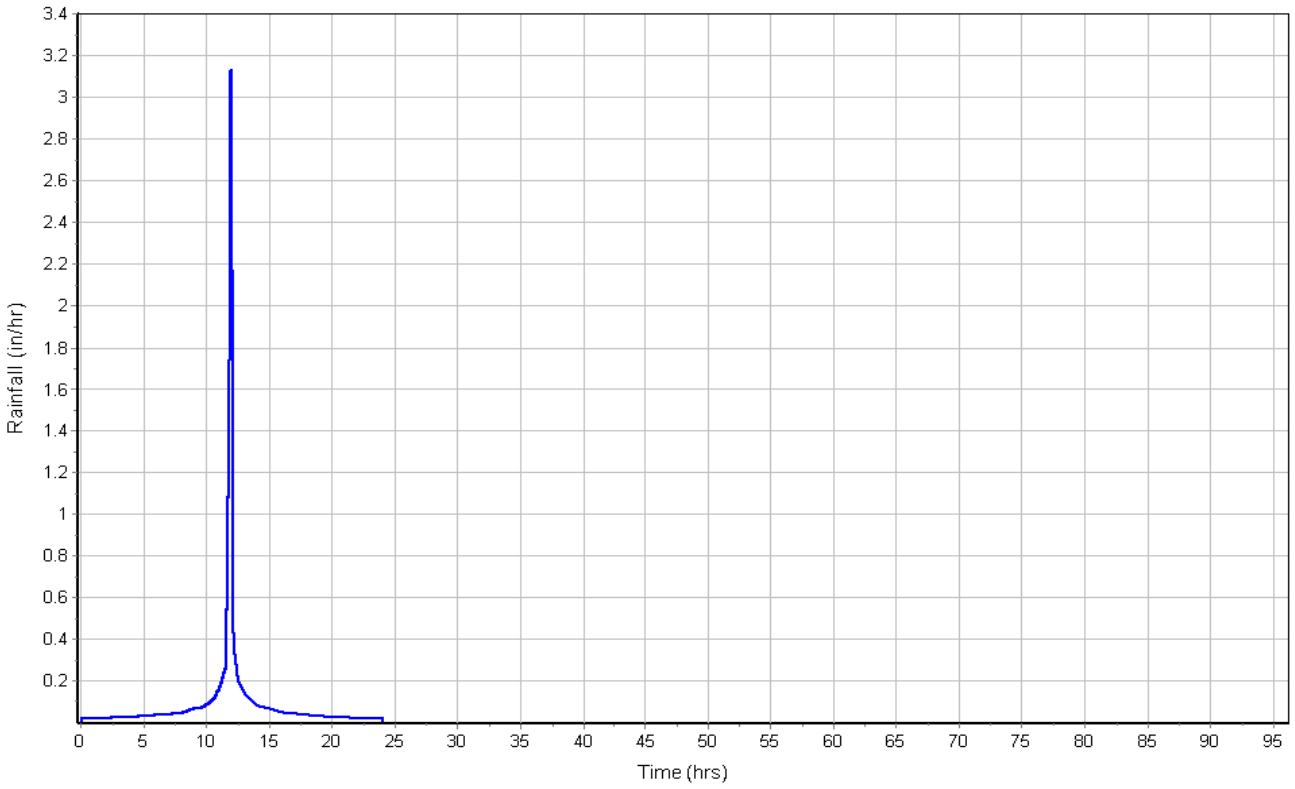
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

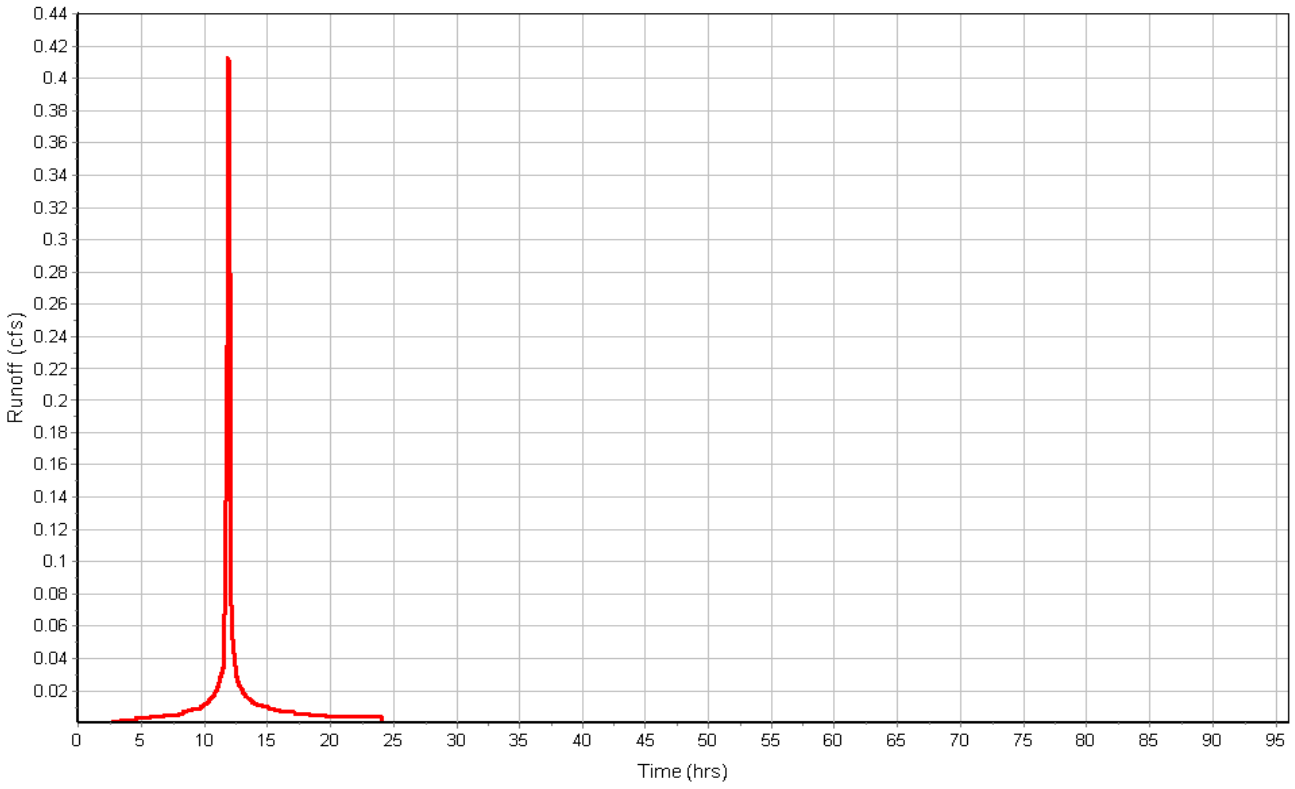
Total Rainfall (in)	2.28
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.41
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_22_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_22_VACANT

Input Data

Area (ac) 0.71
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.71	B	58.00
Composite Area & Weighted CN	0.71		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	226	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	51.02	0.00	0.00

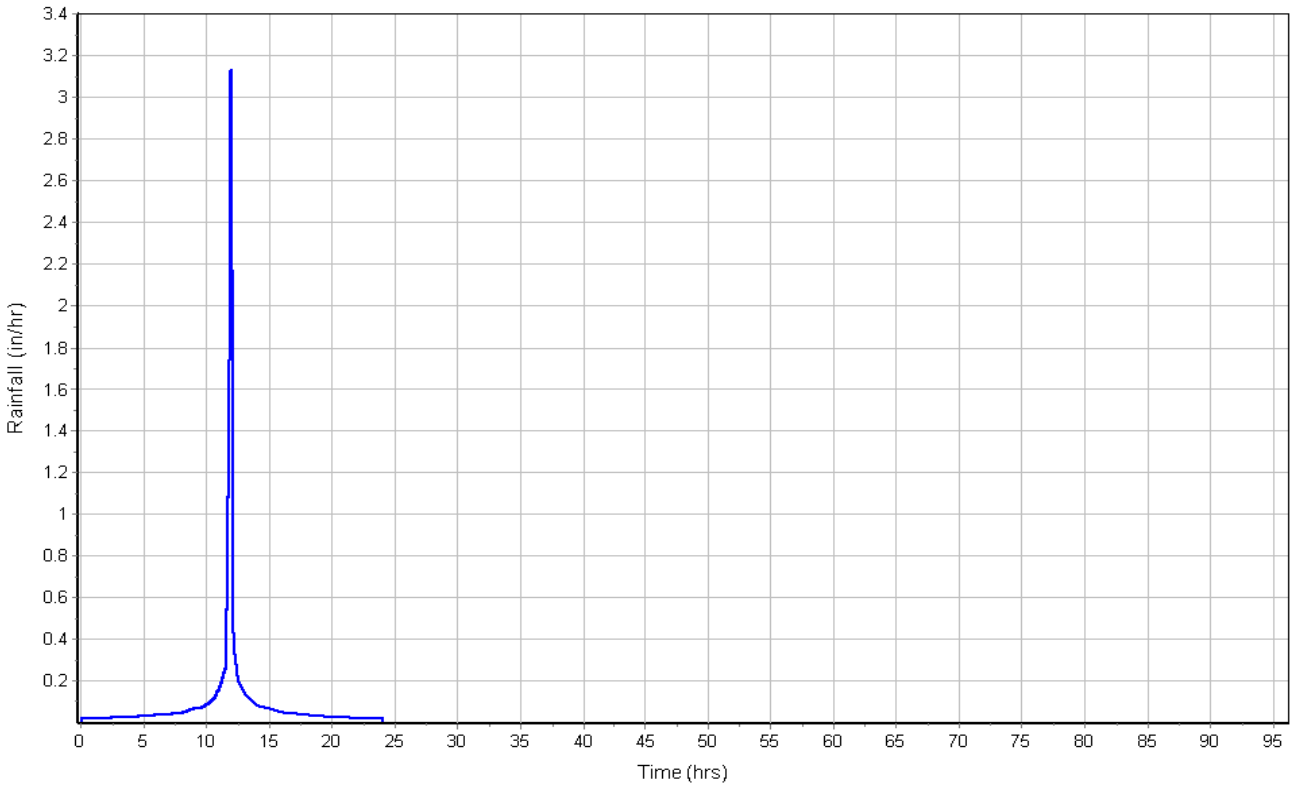
Total TOC (min) 51.02

Subbasin Runoff Results

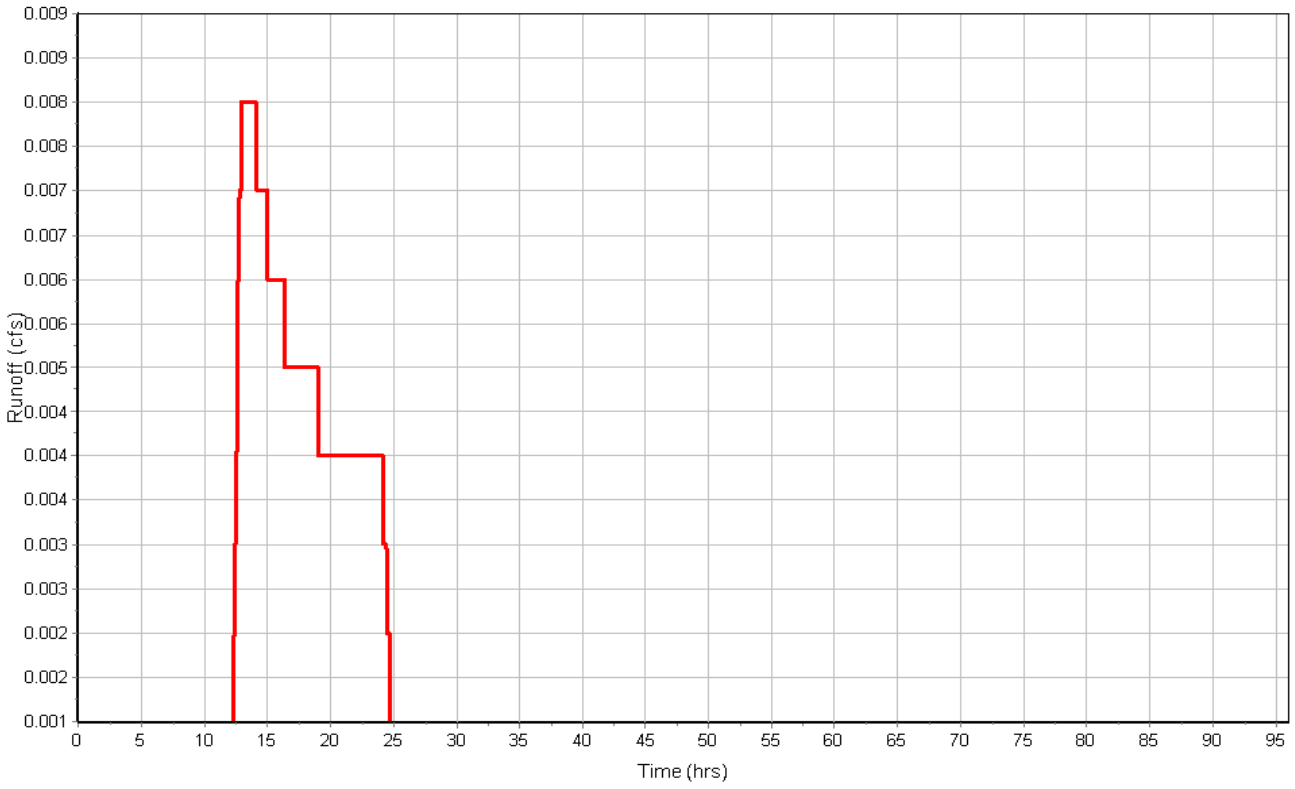
Total Rainfall (in) 2.28
Total Runoff (in) 0.09
Peak Runoff (cfs) 0.01
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:51:01

Subbasin : BASIN_22_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_23_ROW

Input Data

Area (ac)	0.14
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.14	B	98.00
Composite Area & Weighted CN	0.14		98.00

Time of Concentration

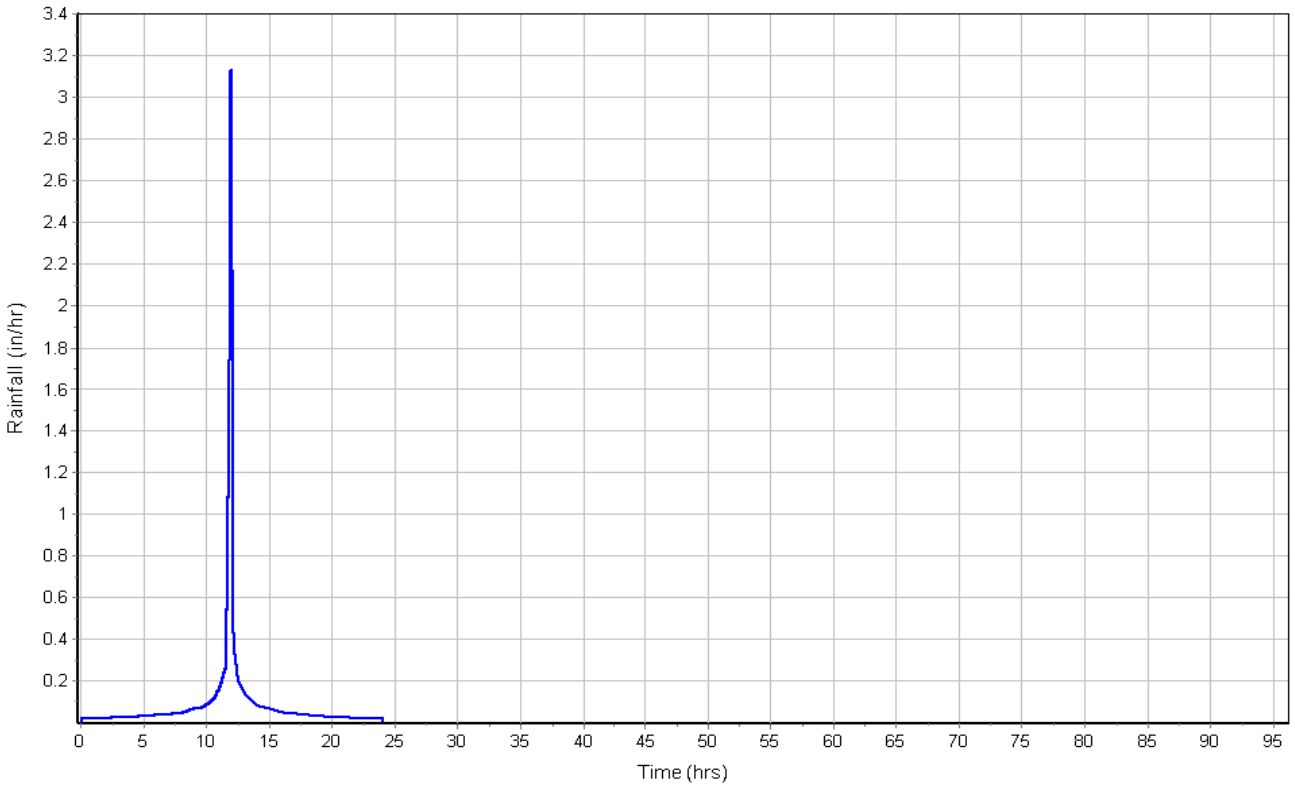
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

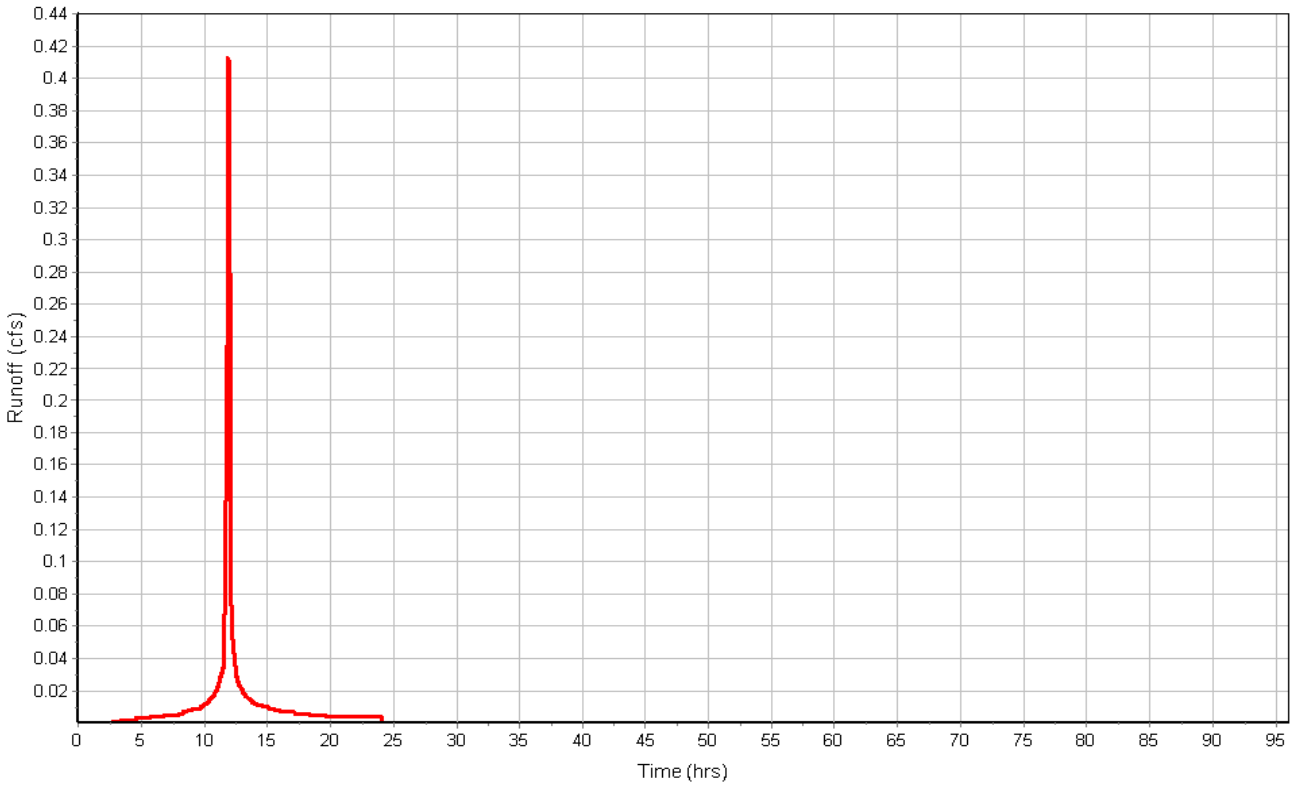
Total Rainfall (in)	2.28
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.41
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_23_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_23_VACANT

Input Data

Area (ac) 0.63
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.63	B	58.00
Composite Area & Weighted CN	0.63		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	209	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	47.93	0.00	0.00

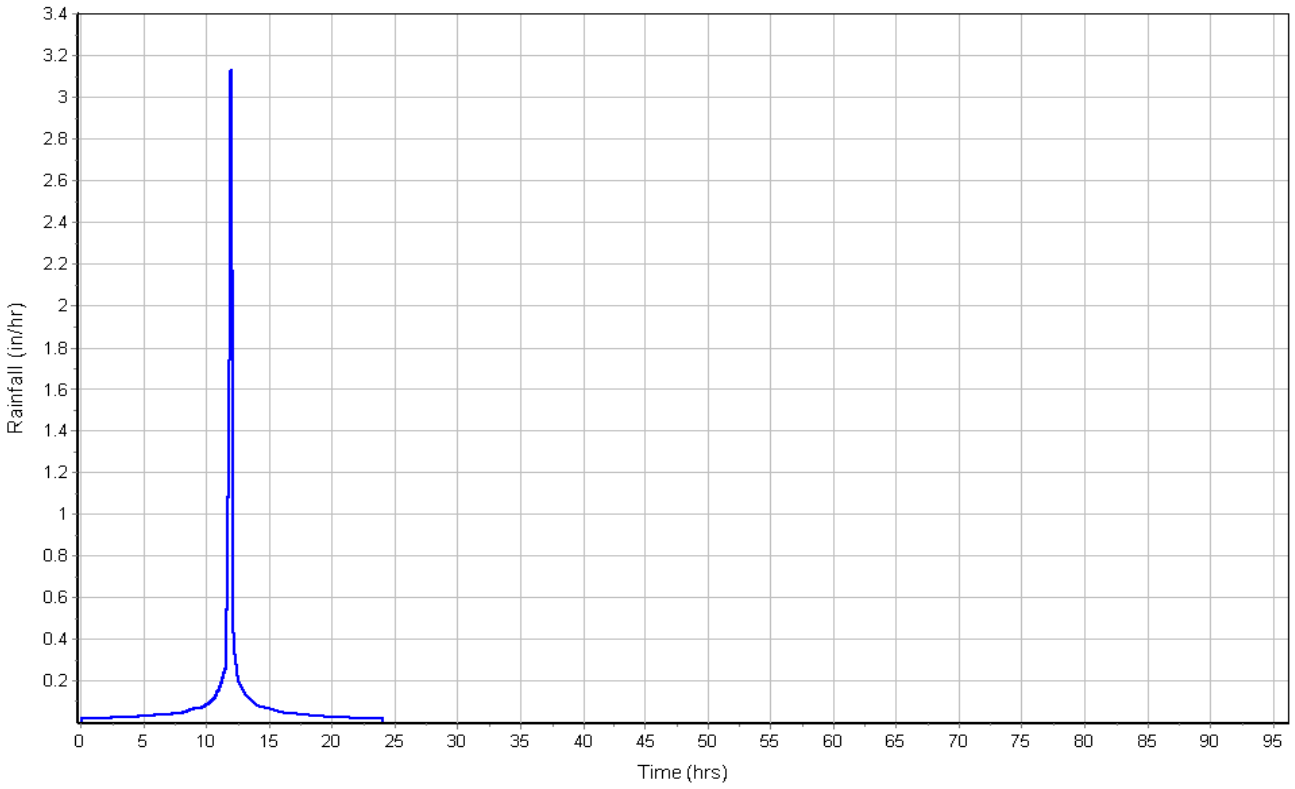
Total TOC (min) 47.93

Subbasin Runoff Results

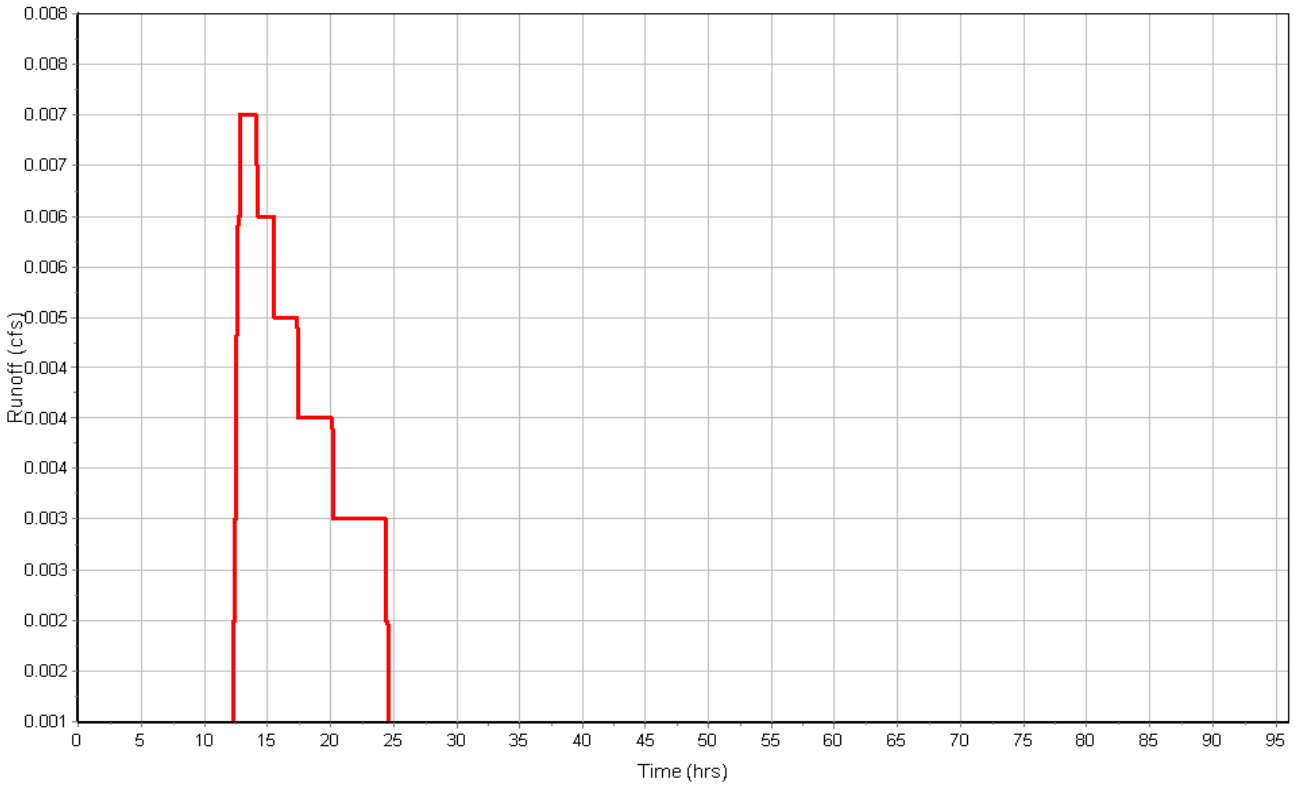
Total Rainfall (in) 2.28
Total Runoff (in) 0.09
Peak Runoff (cfs) 0.01
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:47:56

Subbasin : BASIN_23_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_24_ROW

Input Data

Area (ac)	0.11
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.11	B	98.00
Composite Area & Weighted CN	0.11		98.00

Time of Concentration

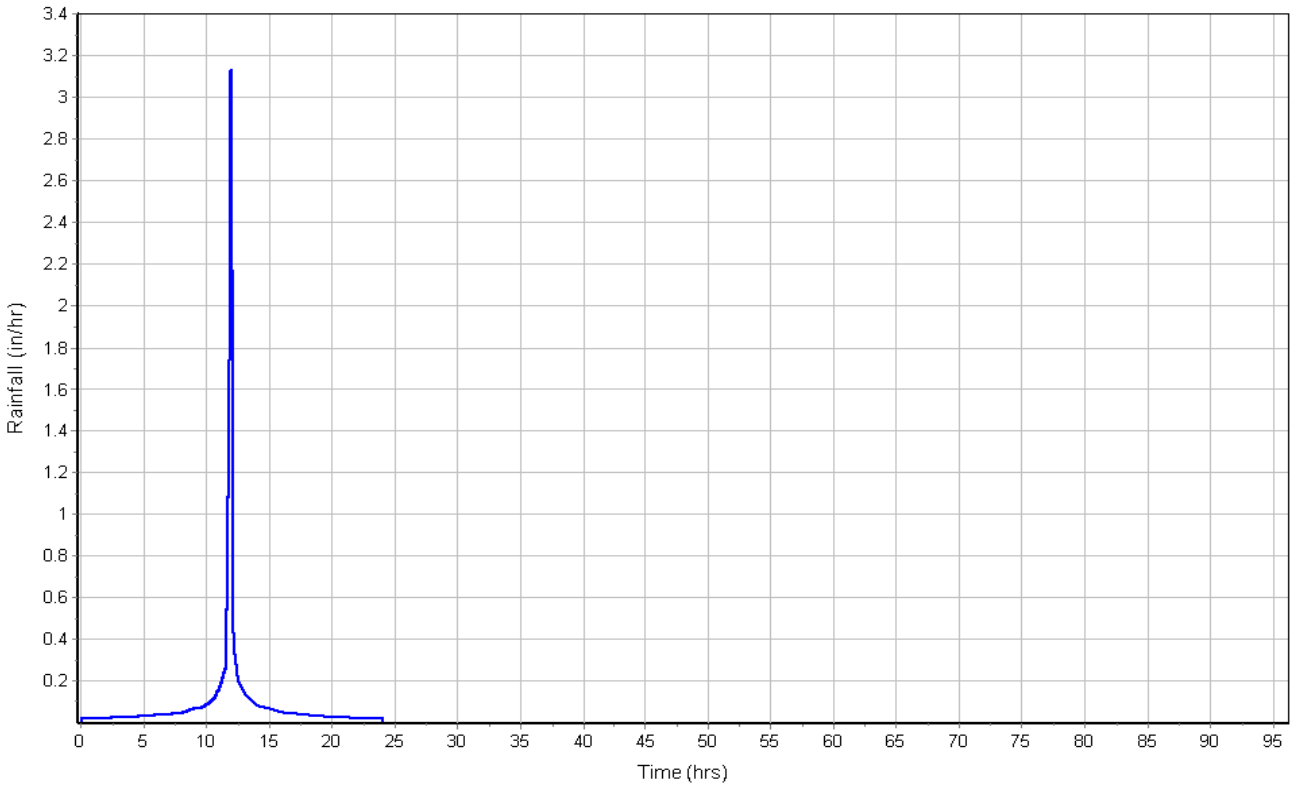
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

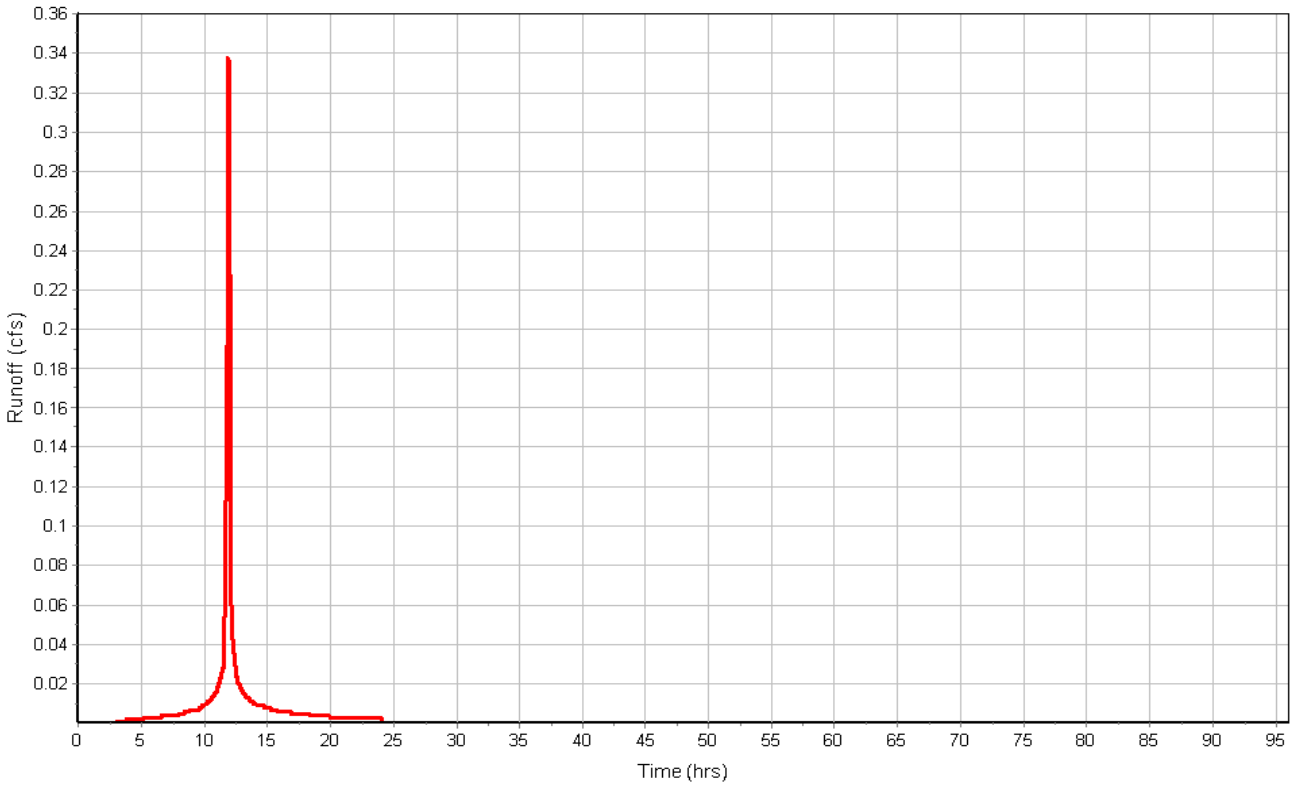
Total Rainfall (in)	2.28
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.34
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_24_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_24_VACANT

Input Data

Area (ac) 0.29
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.29	B	58.00
Composite Area & Weighted CN	0.29		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	257	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	56.55	0.00	0.00

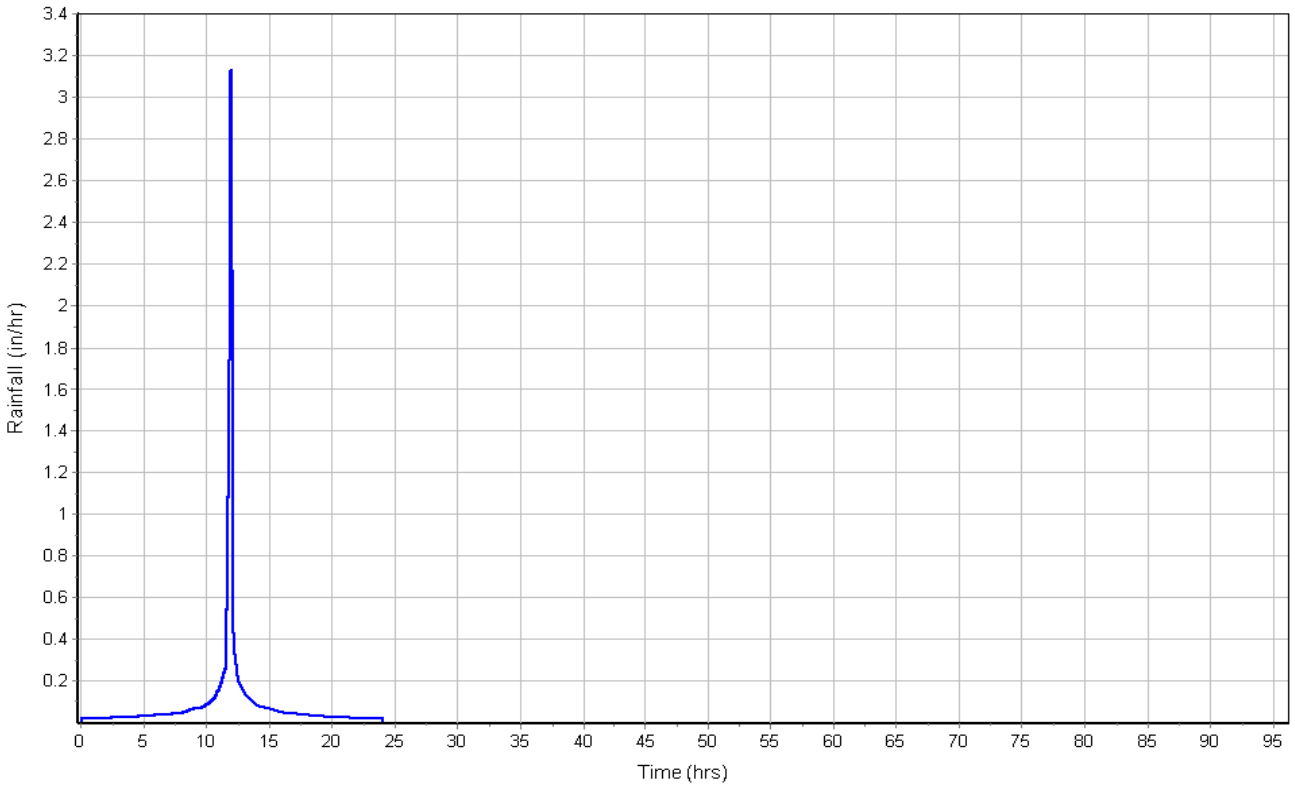
Total TOC (min) 56.55

Subbasin Runoff Results

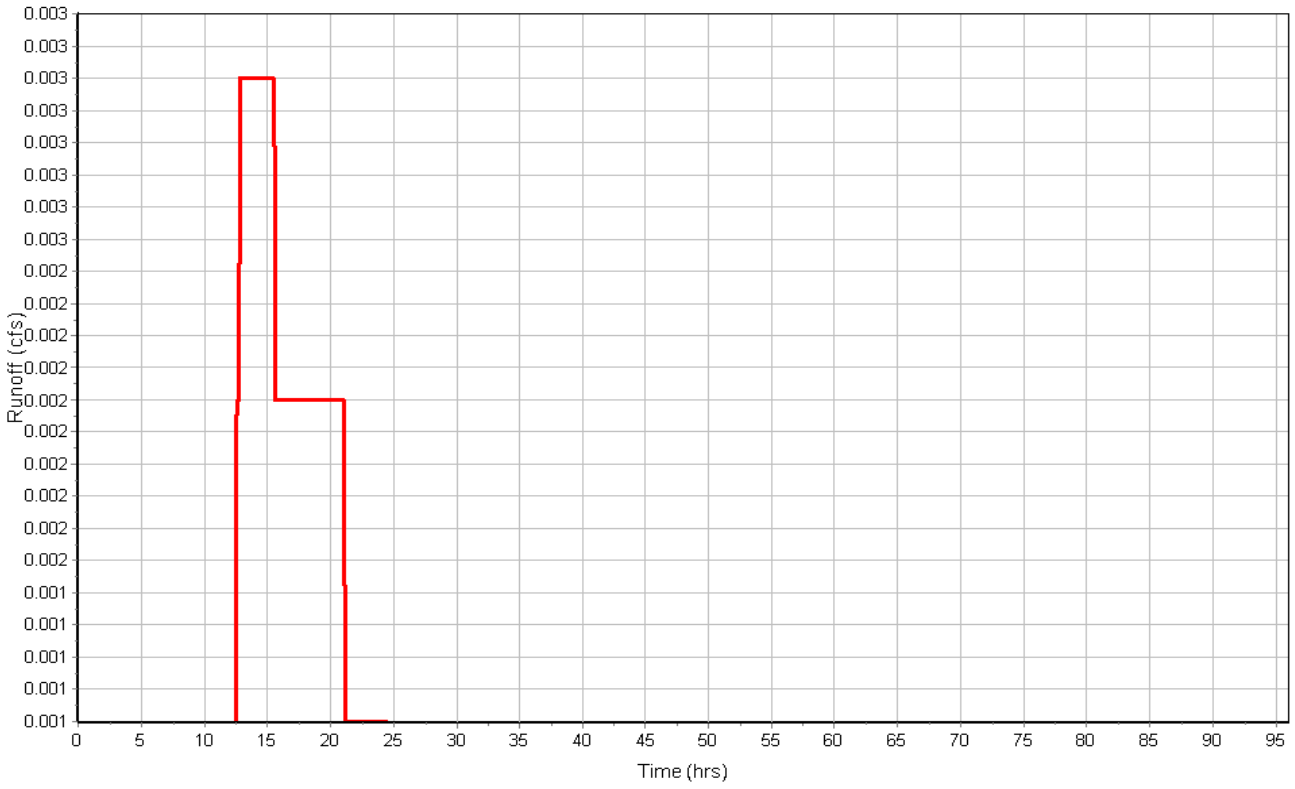
Total Rainfall (in) 2.28
Total Runoff (in) 0.08
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:56:33

Subbasin : BASIN_24_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_25_ROW

Input Data

Area (ac)	0.13
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.13	B	98.00
Composite Area & Weighted CN	0.13		98.00

Time of Concentration

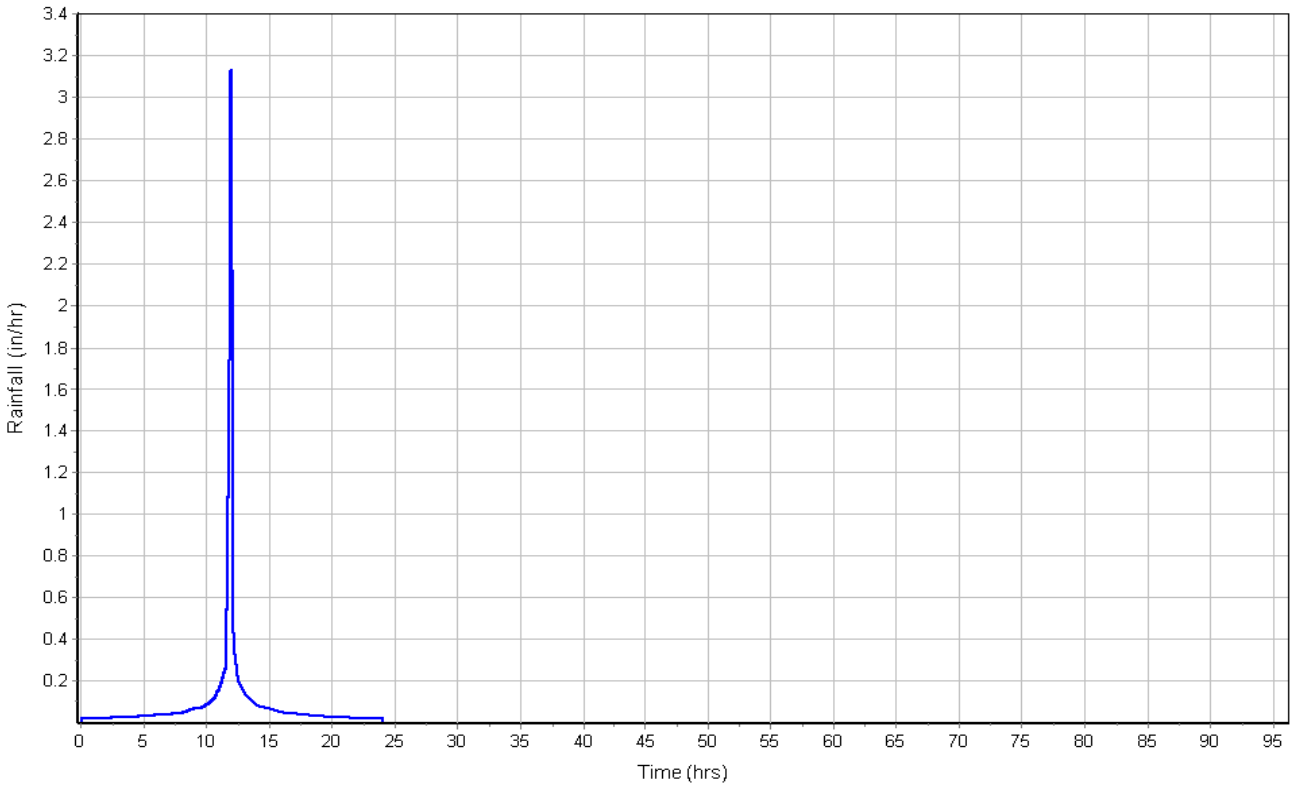
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

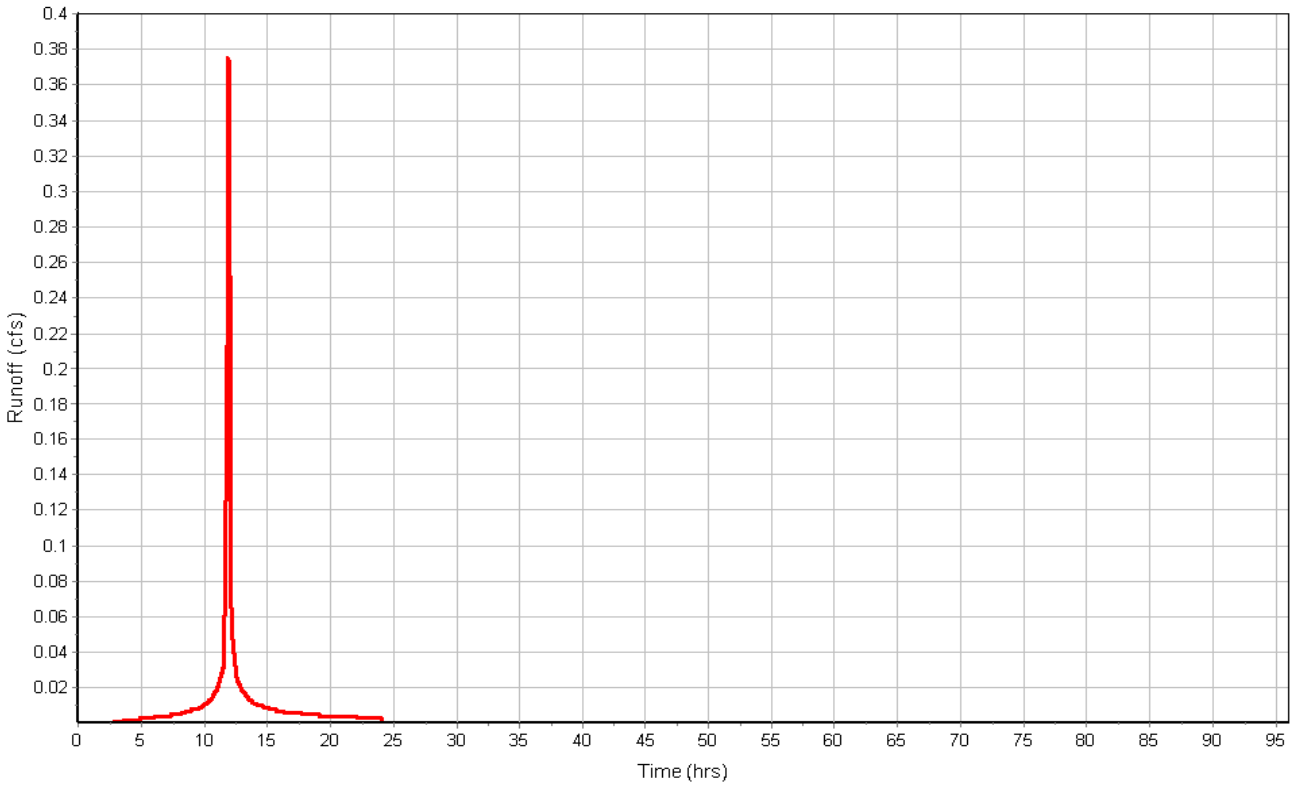
Total Rainfall (in)	2.28
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.38
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_25_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_25_VACANT

Input Data

Area (ac) 0.30
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.30	B	58.00
Composite Area & Weighted CN	0.30		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	238	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	53.18	0.00	0.00

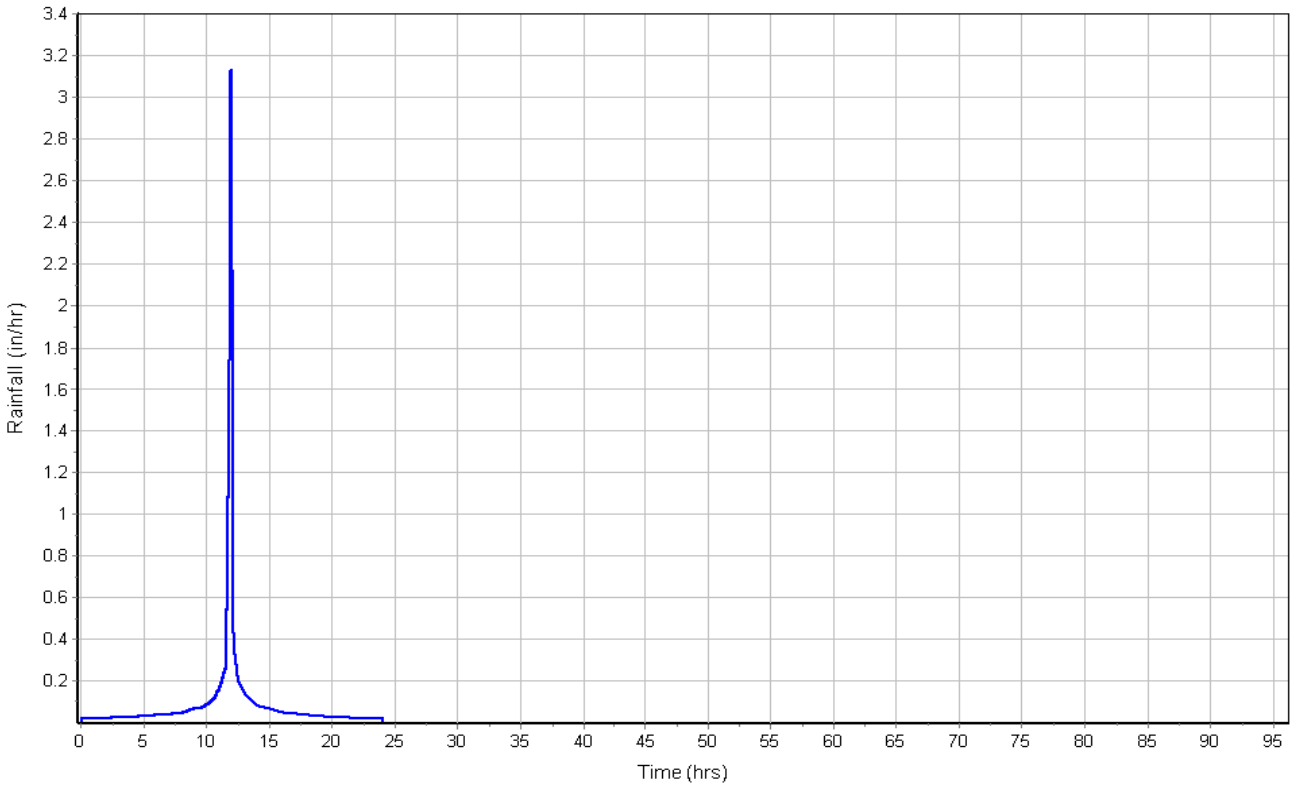
Total TOC (min) 53.18

Subbasin Runoff Results

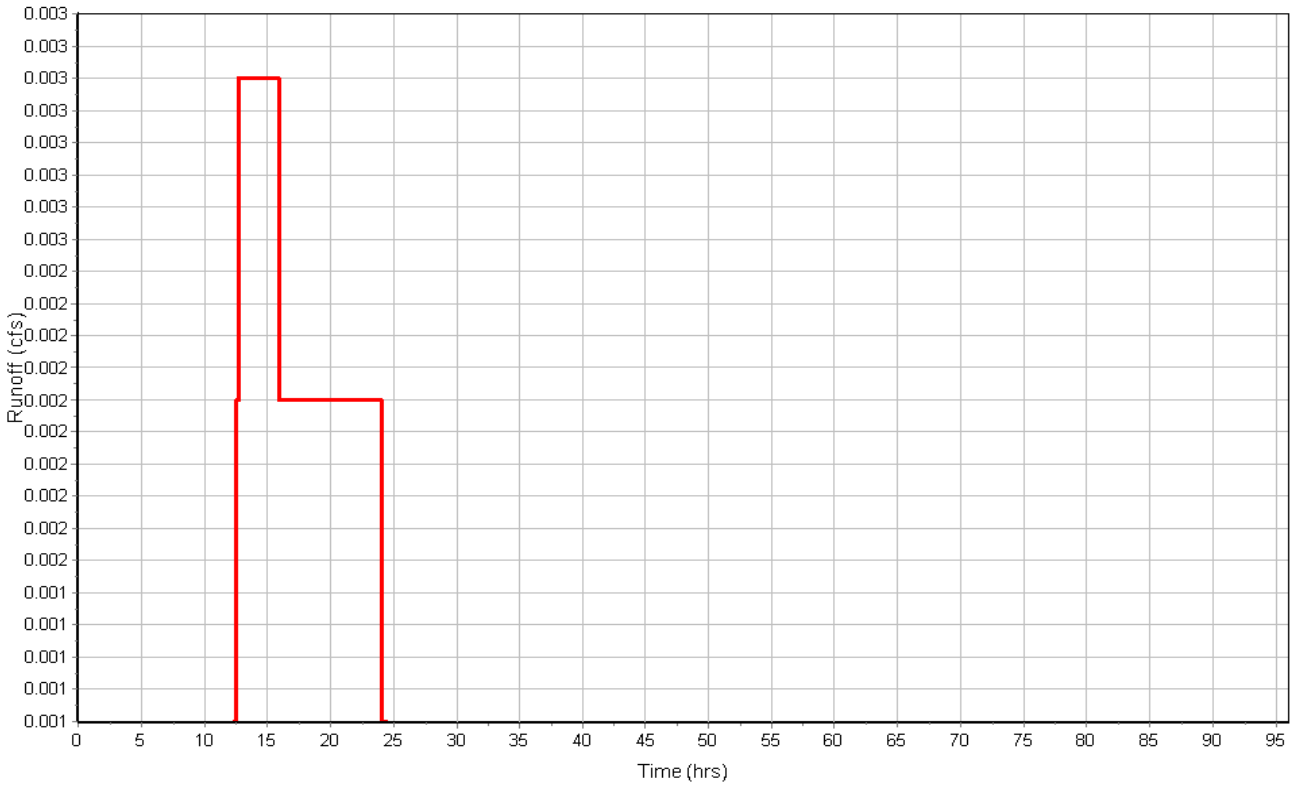
Total Rainfall (in) 2.28
Total Runoff (in) 0.08
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:53:11

Subbasin : BASIN_25_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_26_ROW

Input Data

Area (ac)	0.17
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.17	B	98.00
Composite Area & Weighted CN	0.17		98.00

Time of Concentration

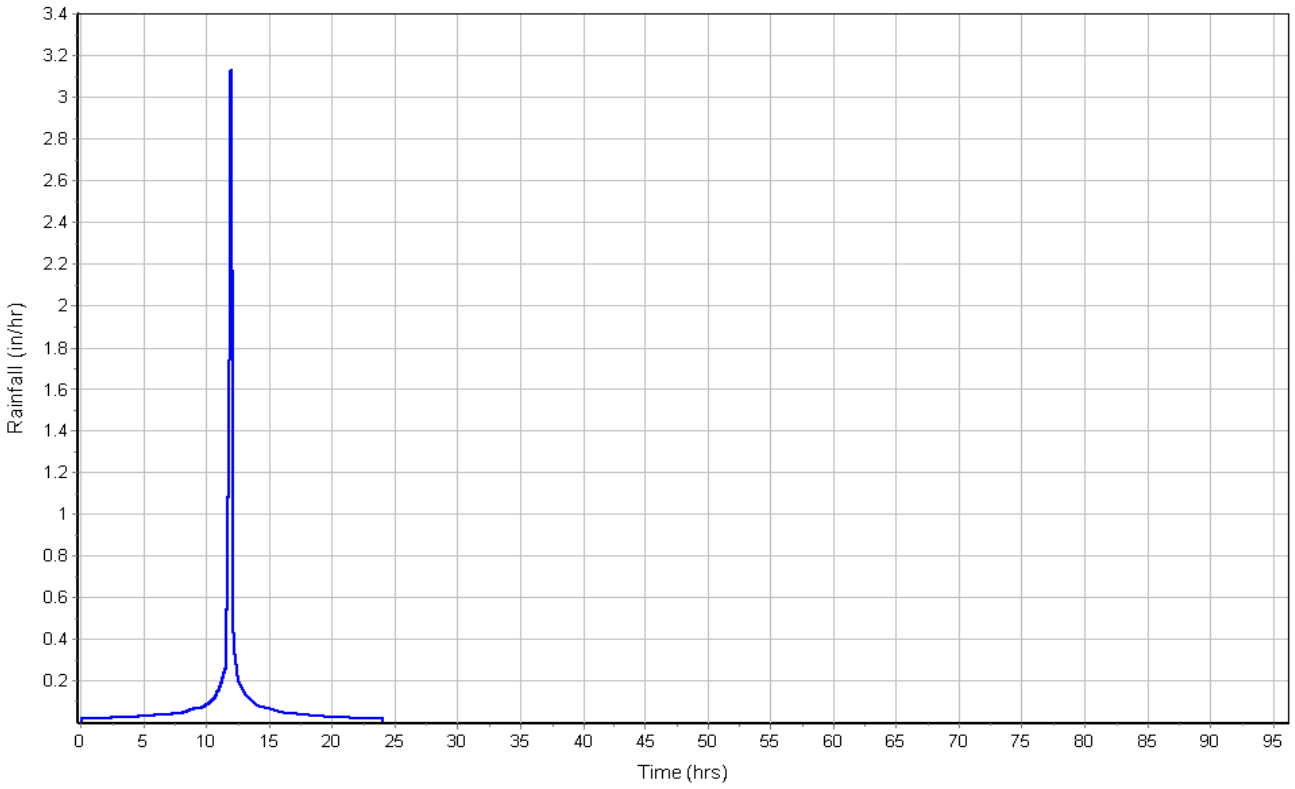
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

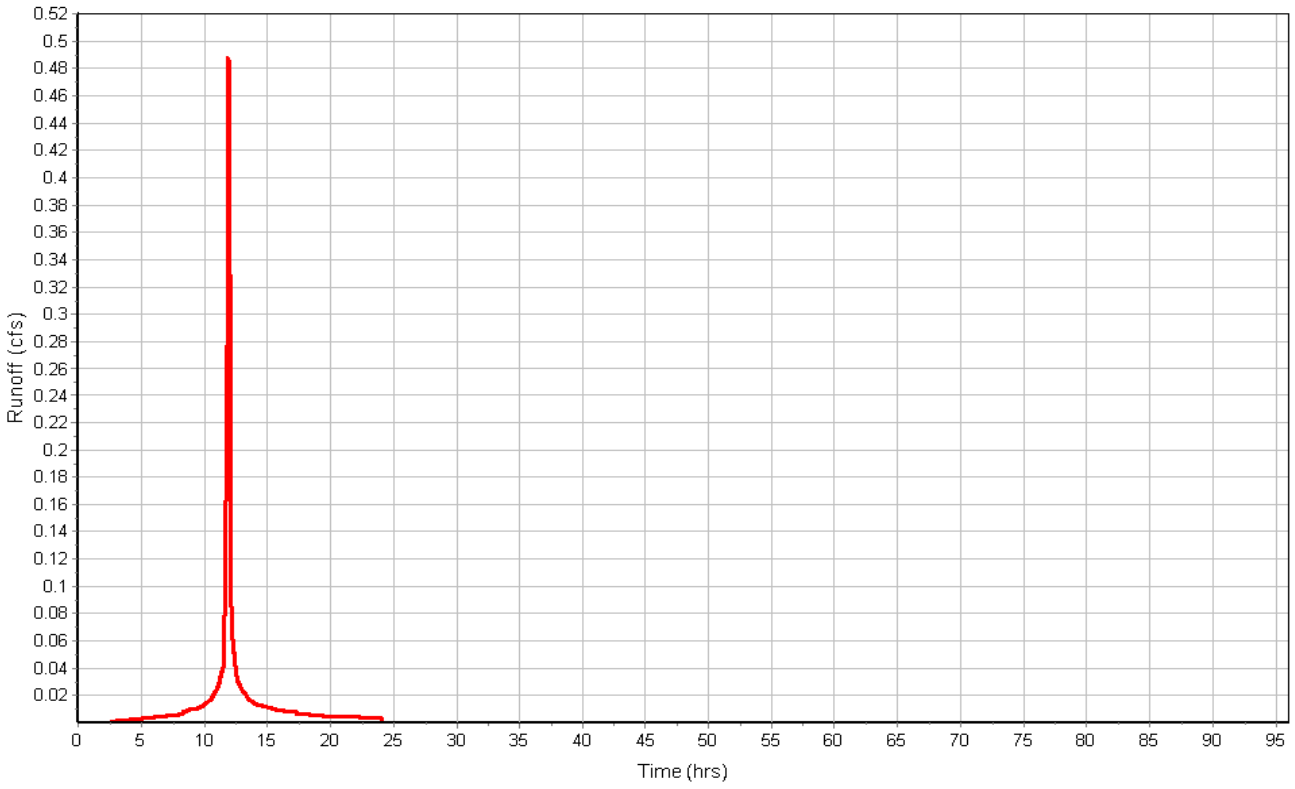
Total Rainfall (in)	2.28
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.49
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_26_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_26_VACANT

Input Data

Area (ac) 0.41
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.41	B	58.00
Composite Area & Weighted CN	0.41		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	236	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	52.82	0.00	0.00

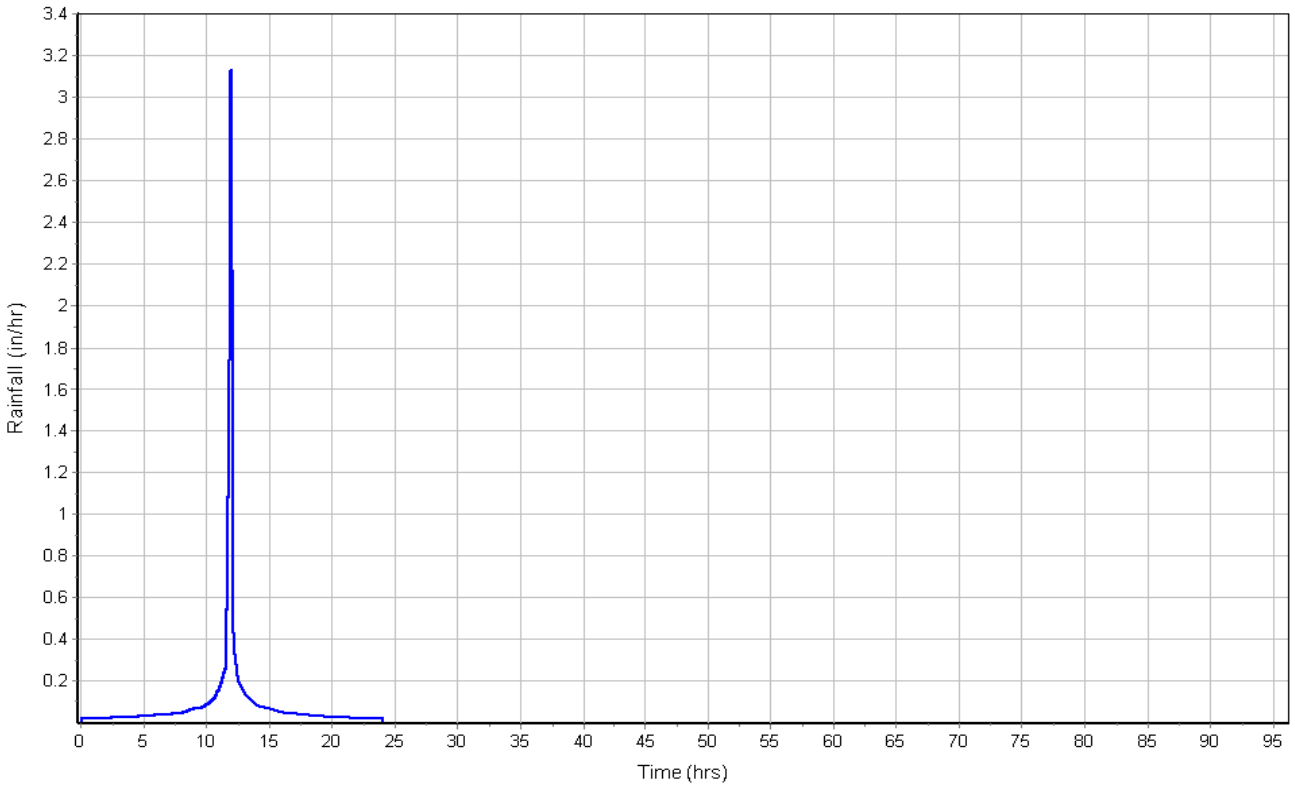
Total TOC (min) 52.82

Subbasin Runoff Results

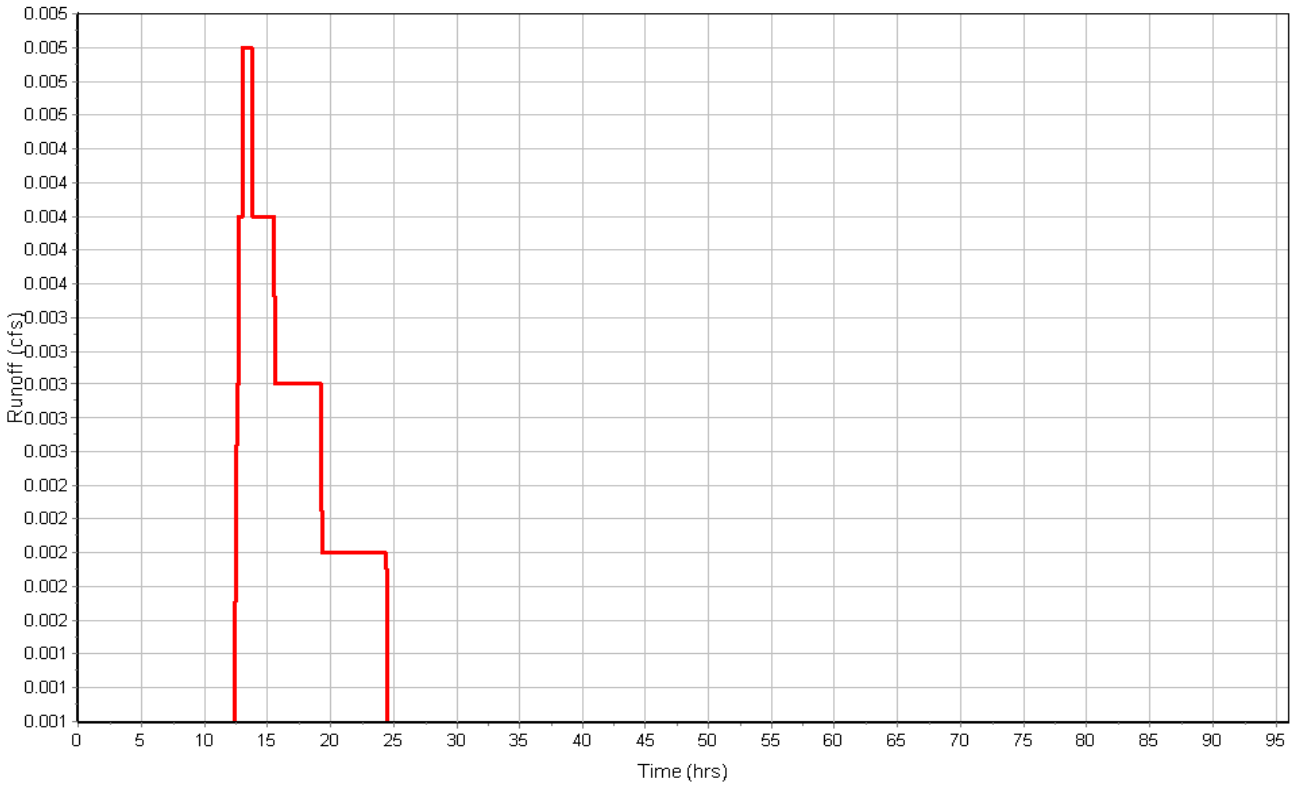
Total Rainfall (in) 2.28
Total Runoff (in) 0.09
Peak Runoff (cfs) 0.01
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:52:49

Subbasin : BASIN_26_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_27_ROW

Input Data

Area (ac)	0.05
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.05	B	98.00
Composite Area & Weighted CN	0.05		98.00

Time of Concentration

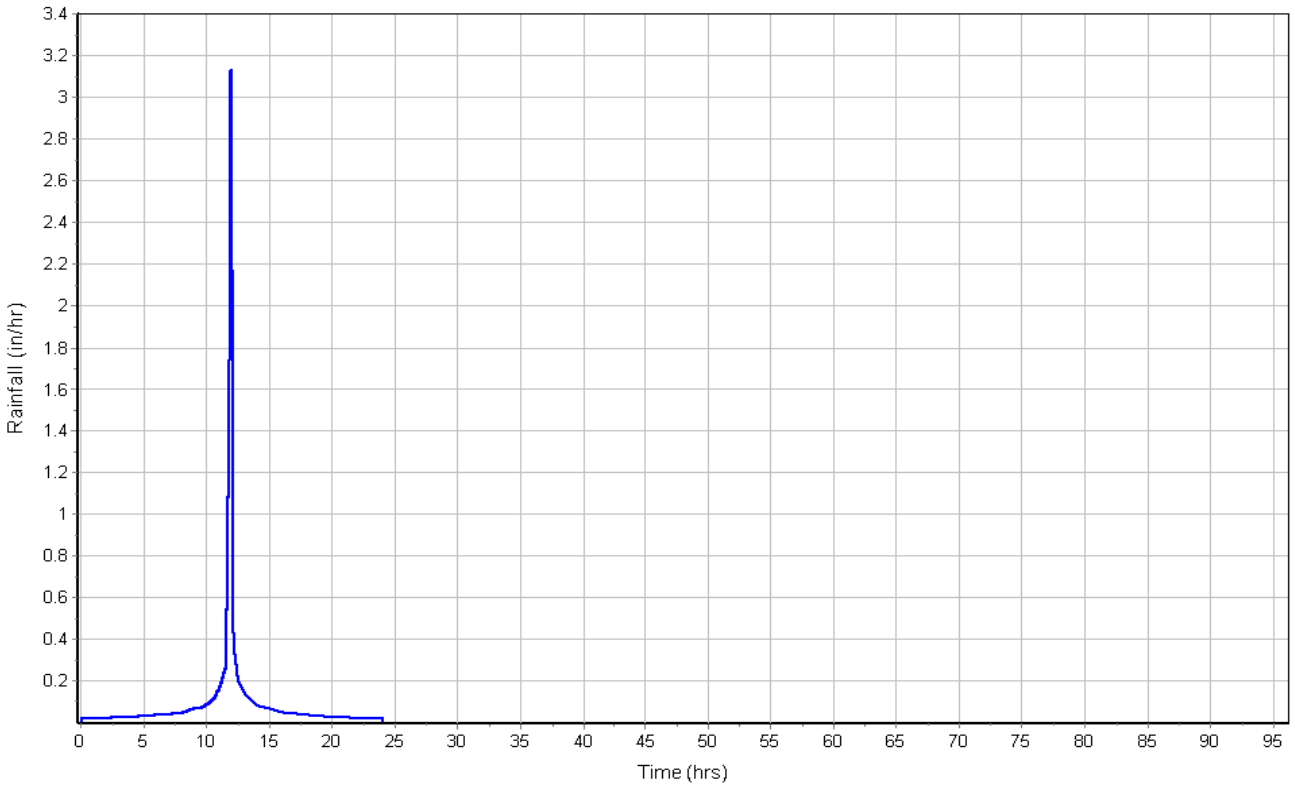
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

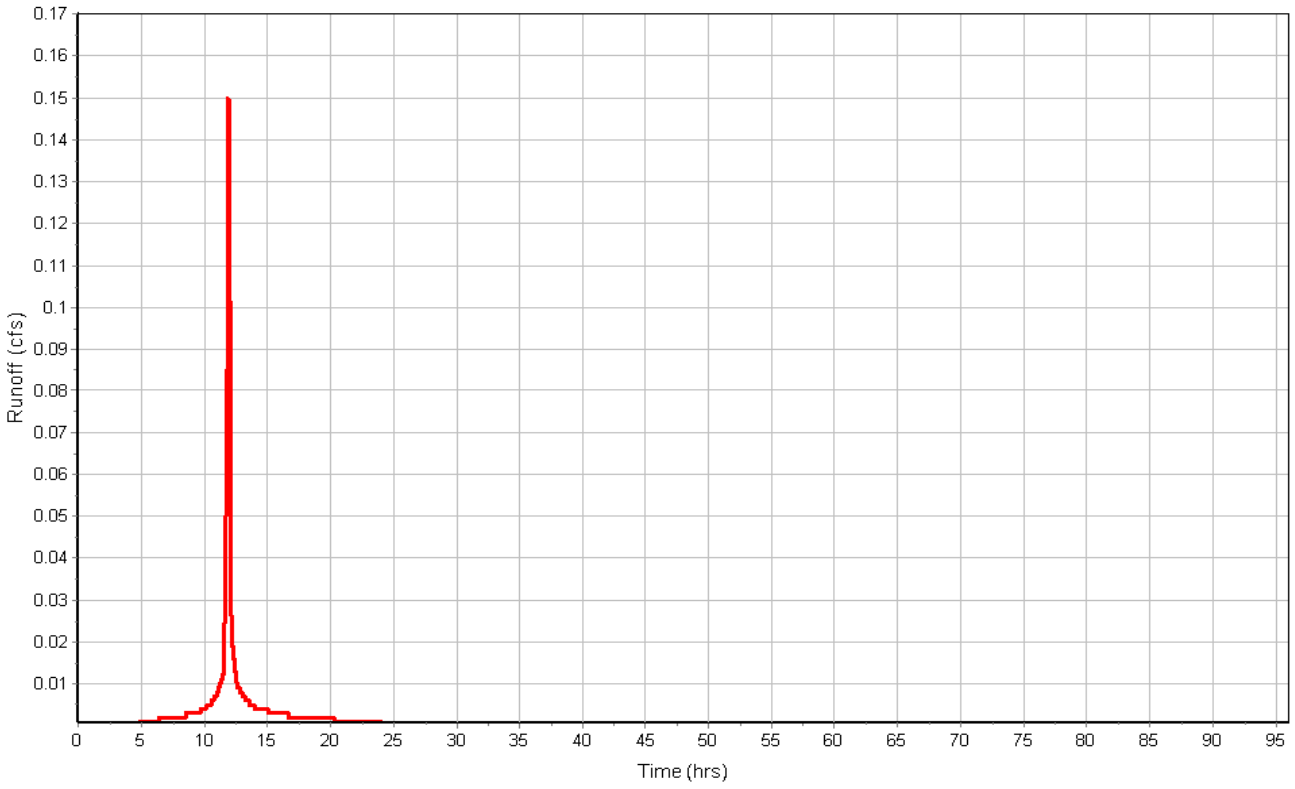
Total Rainfall (in)	2.28
Total Runoff (in)	2.02
Peak Runoff (cfs)	0.15
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_27_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_27_VACANT

Input Data

Area (ac) 0.01
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.01	B	58.00
Composite Area & Weighted CN	0.01		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	27	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.05	0.00	0.00
Computed Flow Time (min) :	9.32	0.00	0.00

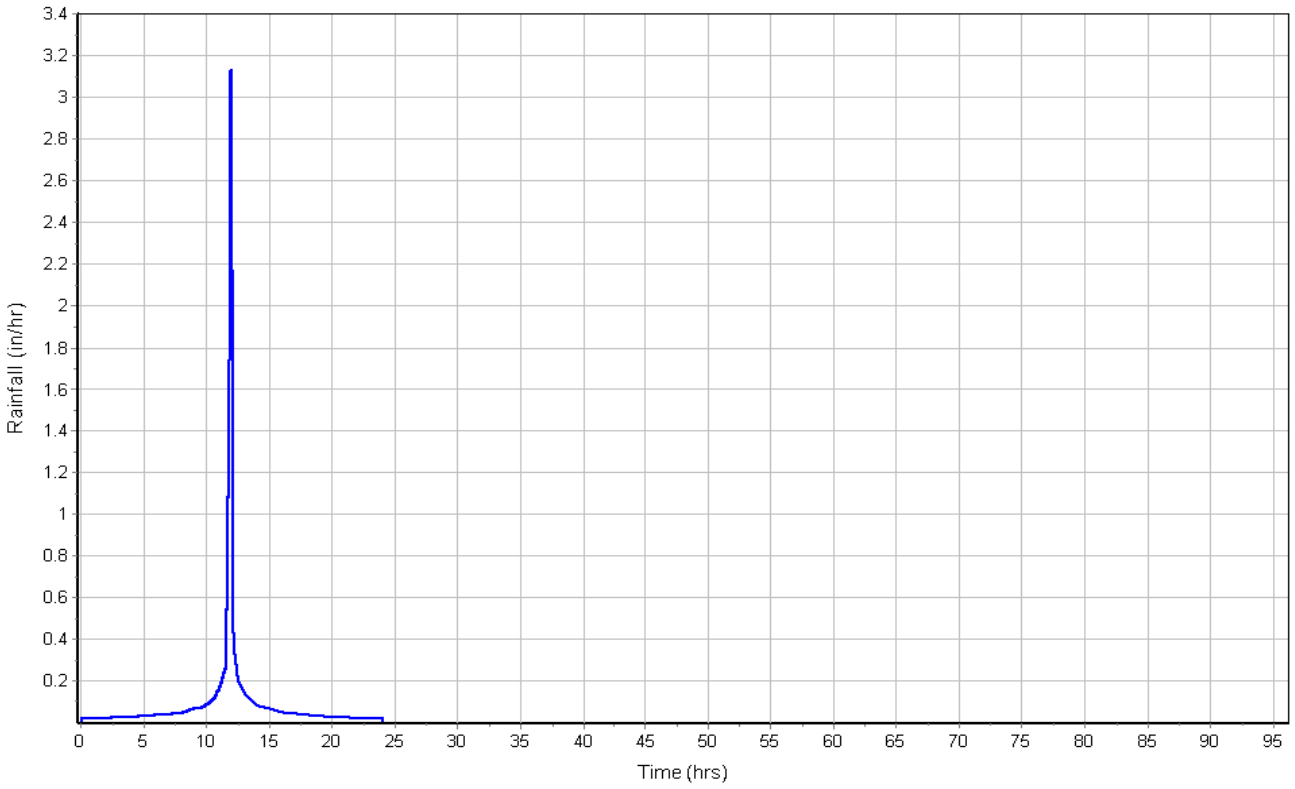
Total TOC (min) 9.32

Subbasin Runoff Results

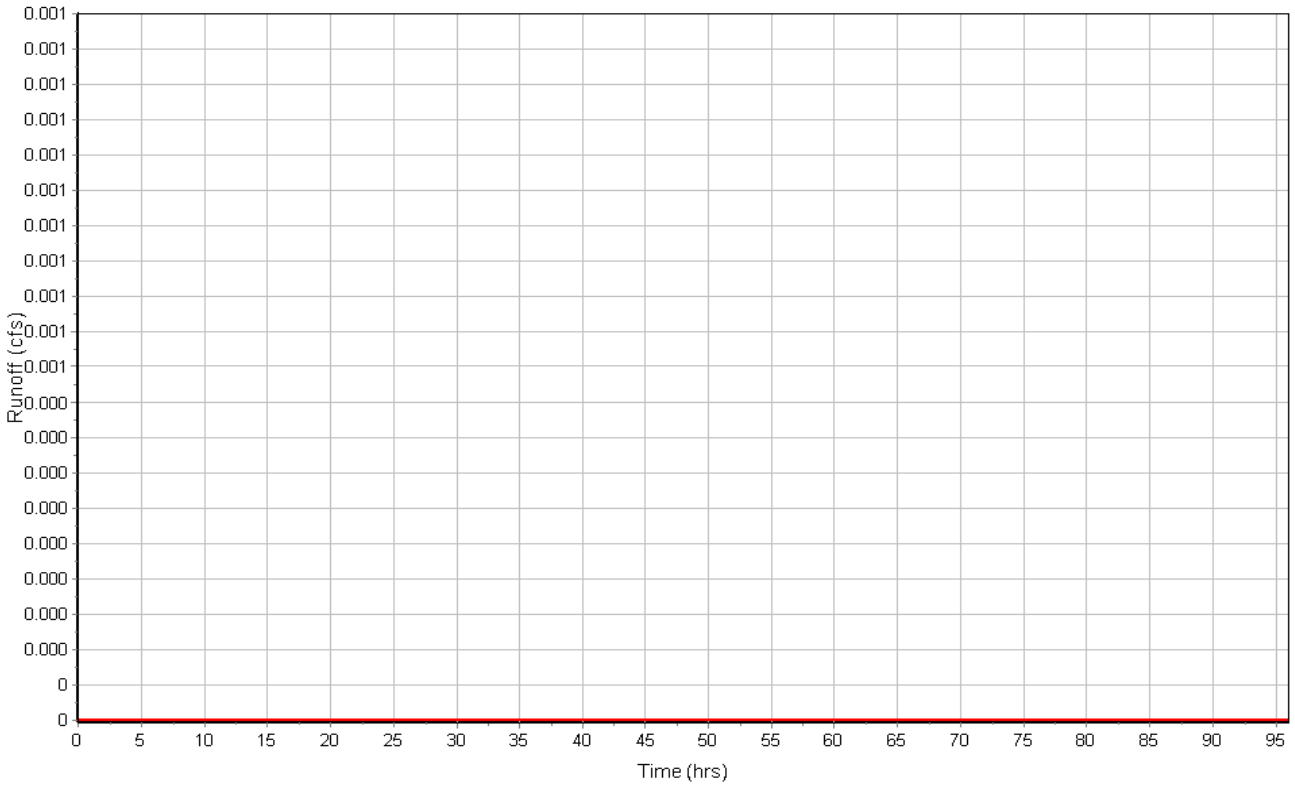
Total Rainfall (in) 2.28
Total Runoff (in) 0.00
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:09:19

Subbasin : BASIN_27_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_28_ROW

Input Data

Area (ac)	0.12
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.12	B	98.00
Composite Area & Weighted CN	0.12		98.00

Time of Concentration

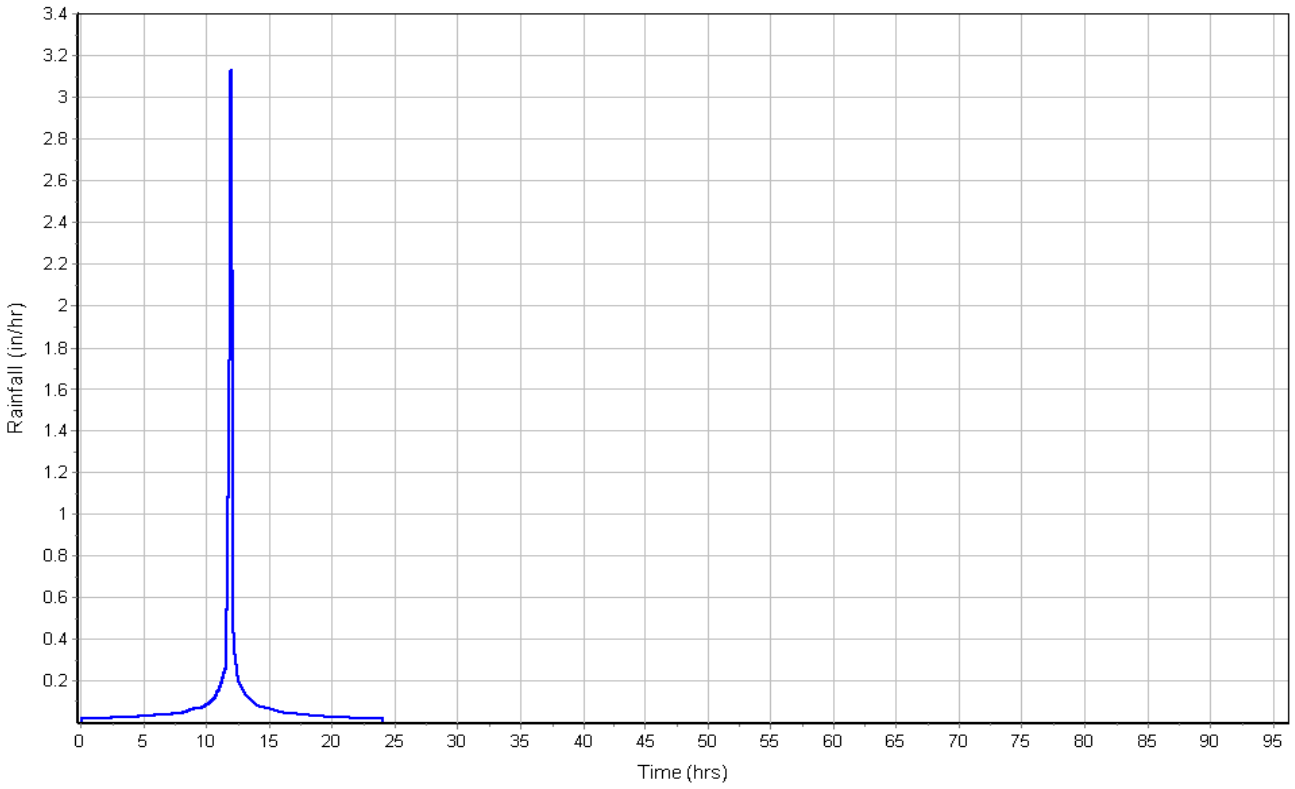
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

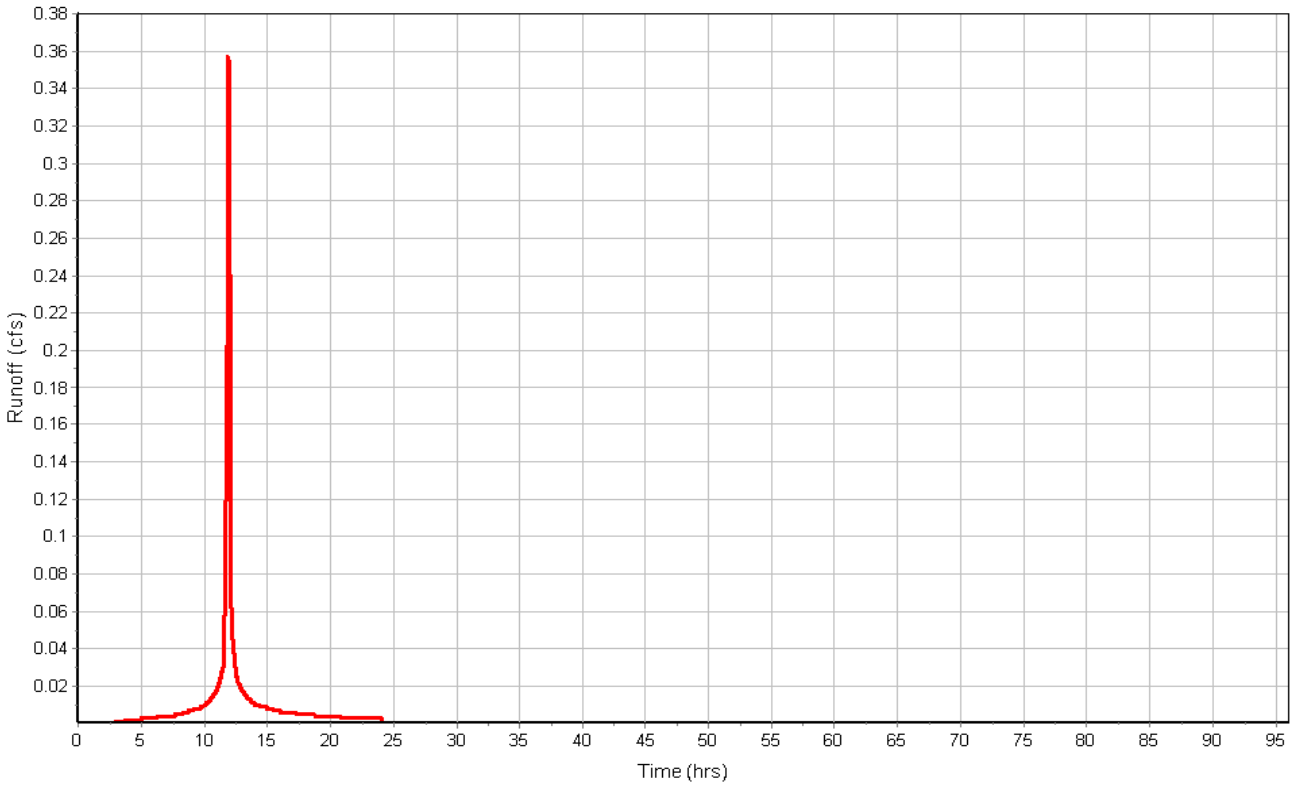
Total Rainfall (in)	2.28
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.36
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_28_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_28_VACANT

Input Data

Area (ac) 0.46
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.46	B	58.00
Composite Area & Weighted CN	0.46		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	225	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	50.84	0.00	0.00

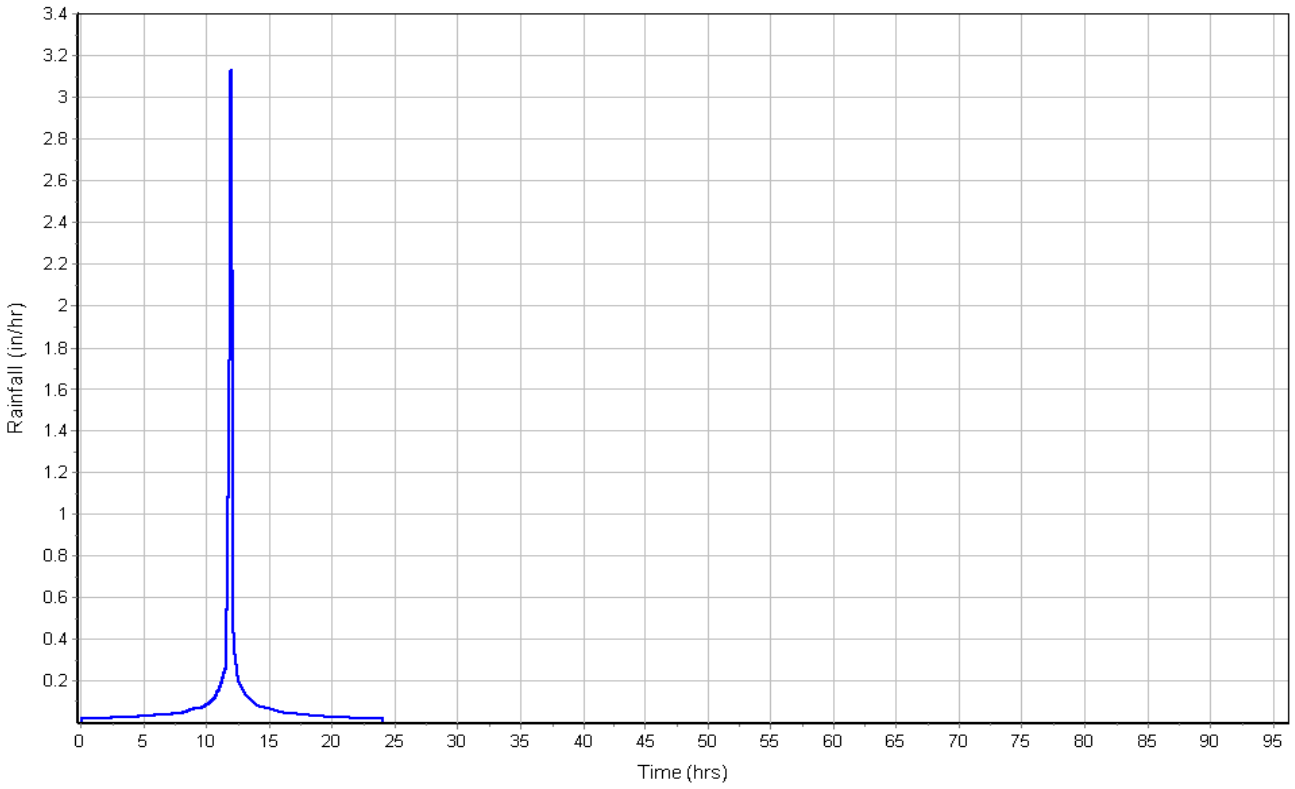
Total TOC (min) 50.84

Subbasin Runoff Results

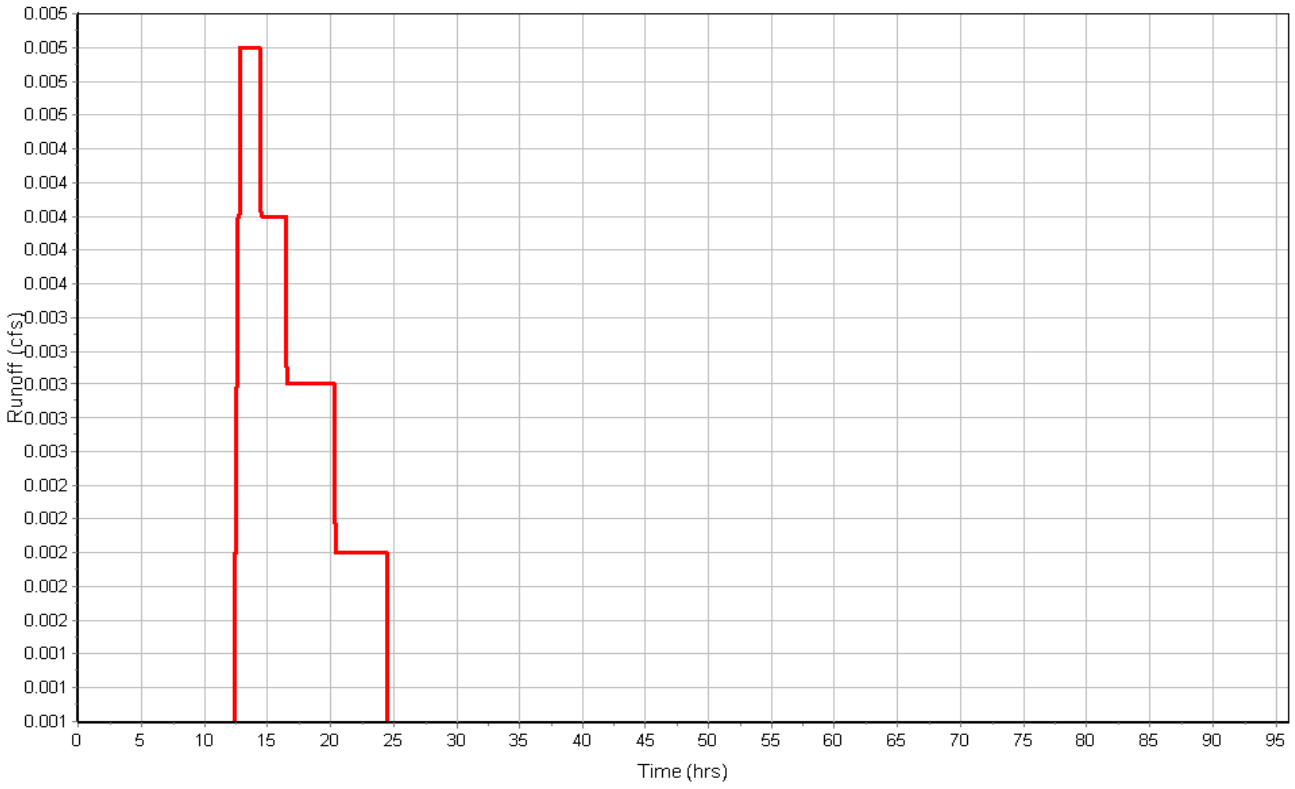
Total Rainfall (in) 2.28
Total Runoff (in) 0.09
Peak Runoff (cfs) 0.01
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:50:50

Subbasin : BASIN_28_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_29_ROW

Input Data

Area (ac)	0.12
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.12	B	98.00
Composite Area & Weighted CN	0.12		98.00

Time of Concentration

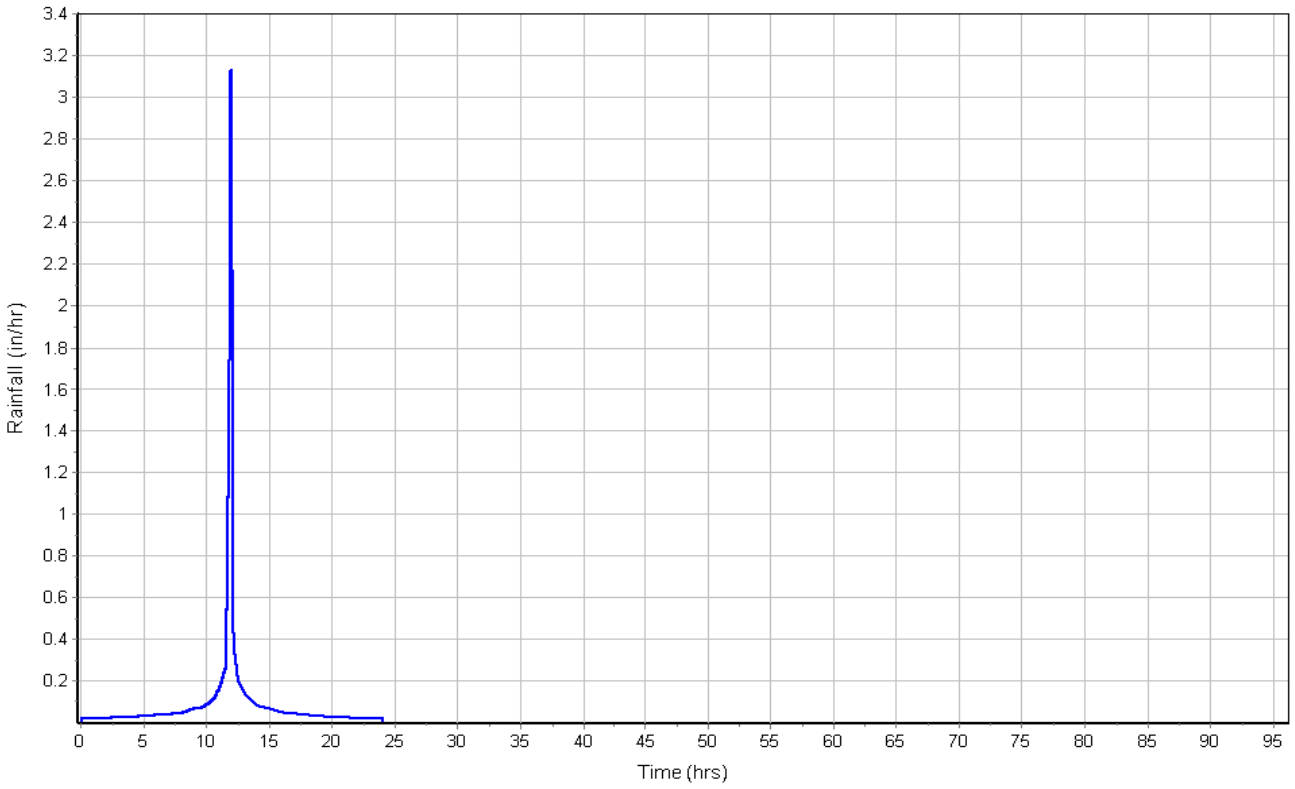
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

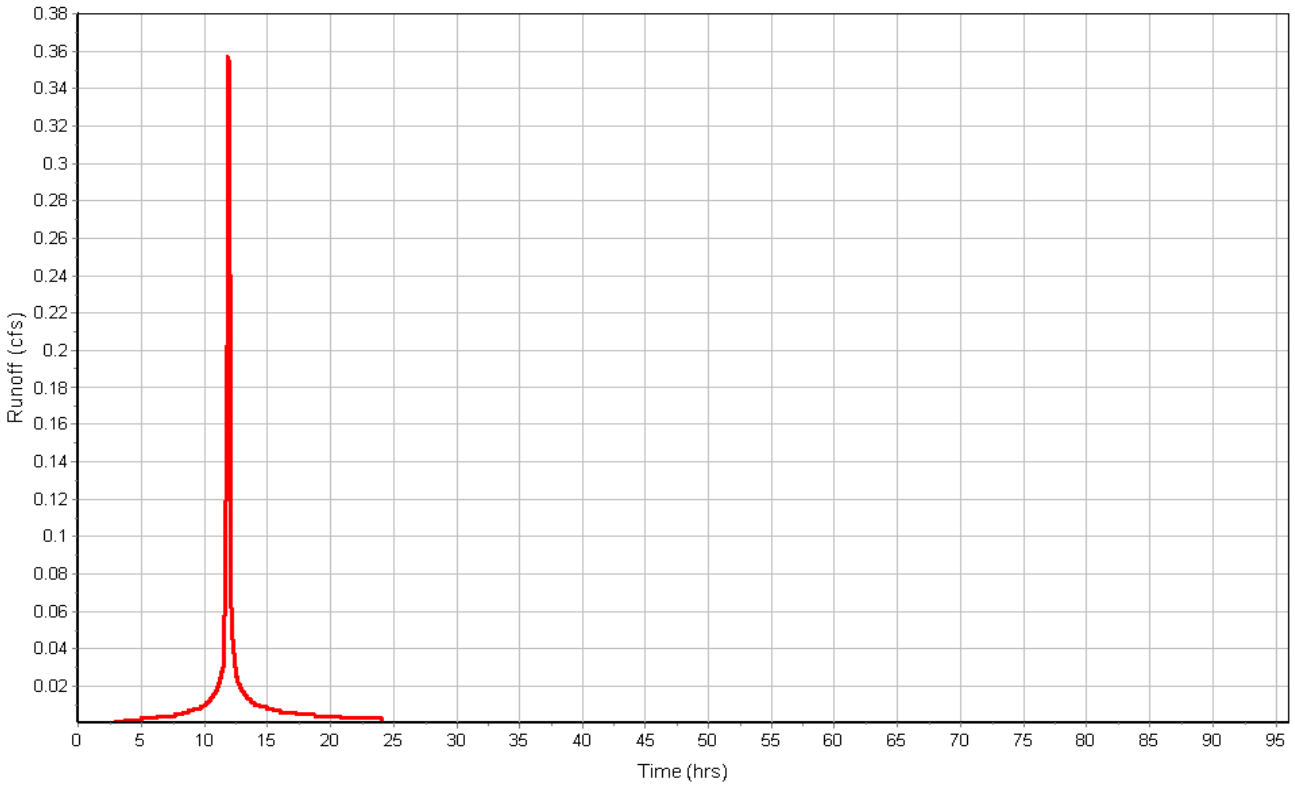
Total Rainfall (in)	2.28
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.36
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_29_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_29_VACANT

Input Data

Area (ac) 0.42
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.42	B	58.00
Composite Area & Weighted CN	0.42		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	208	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	47.75	0.00	0.00

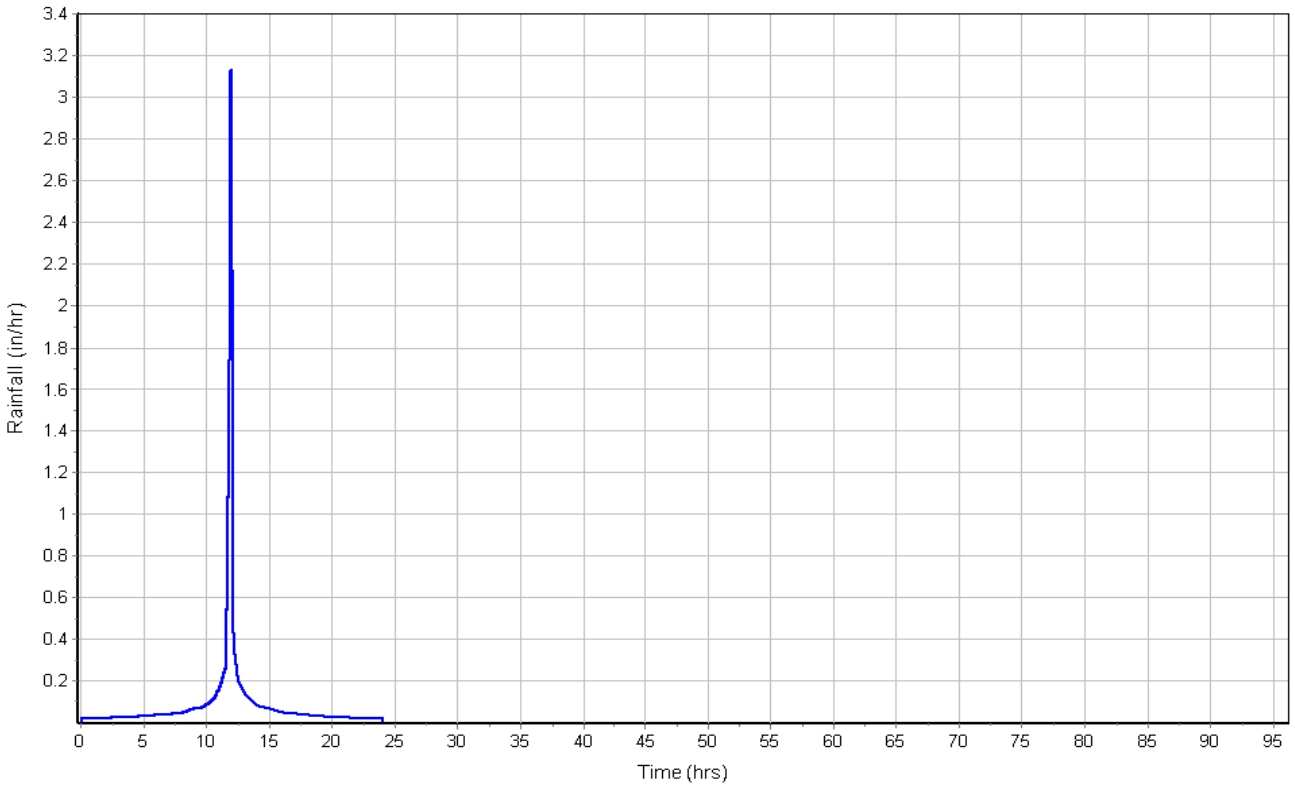
Total TOC (min) 47.75

Subbasin Runoff Results

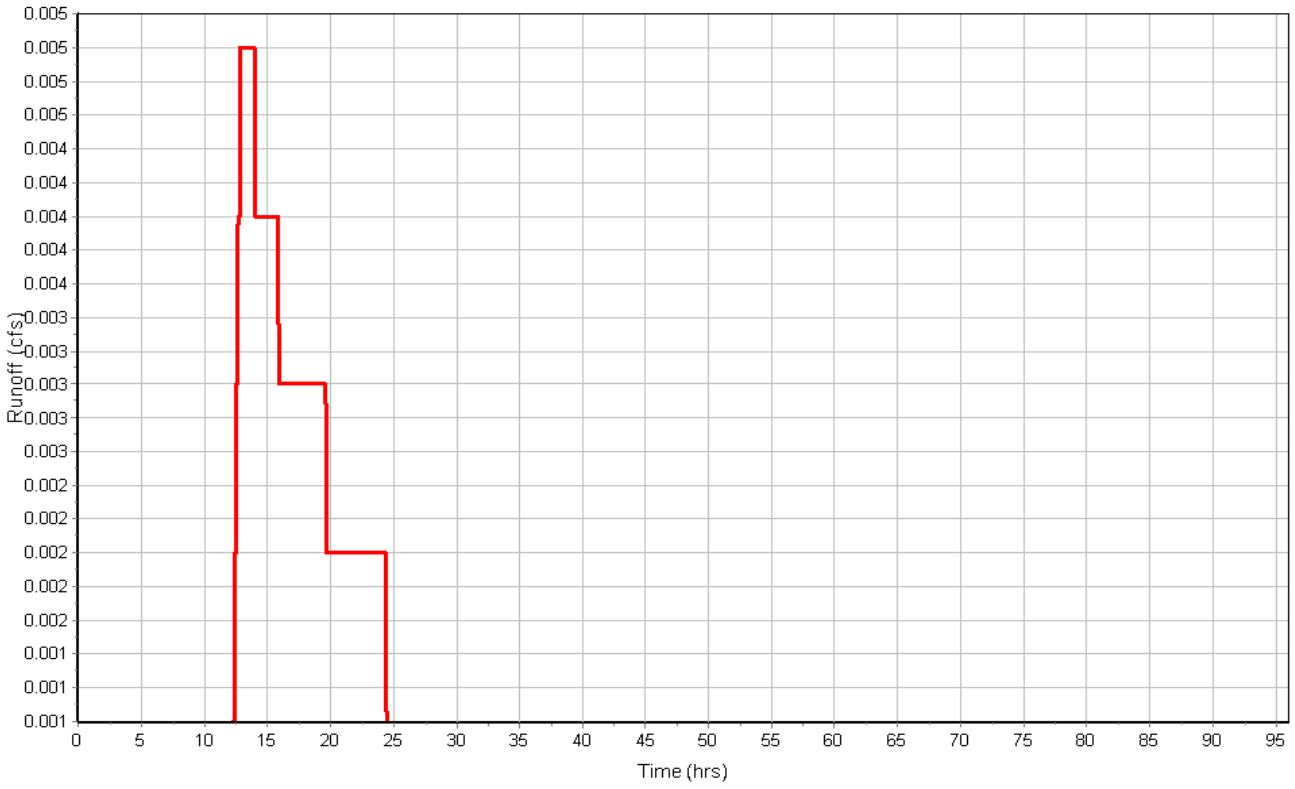
Total Rainfall (in) 2.28
Total Runoff (in) 0.09
Peak Runoff (cfs) 0.01
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:47:45

Subbasin : BASIN_29_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_3_ROW

Input Data

Area (ac)	0.15
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.15	B	98.00
Composite Area & Weighted CN	0.15		98.00

Time of Concentration

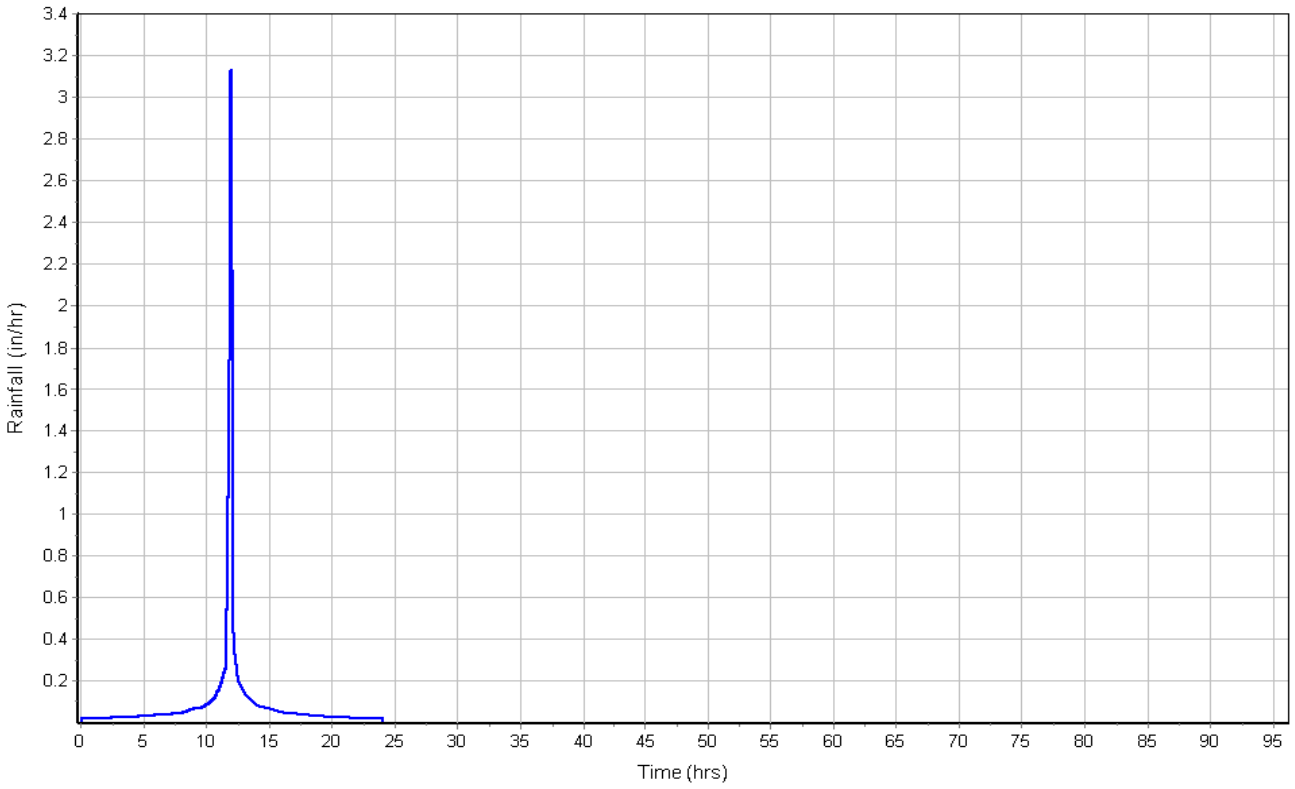
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

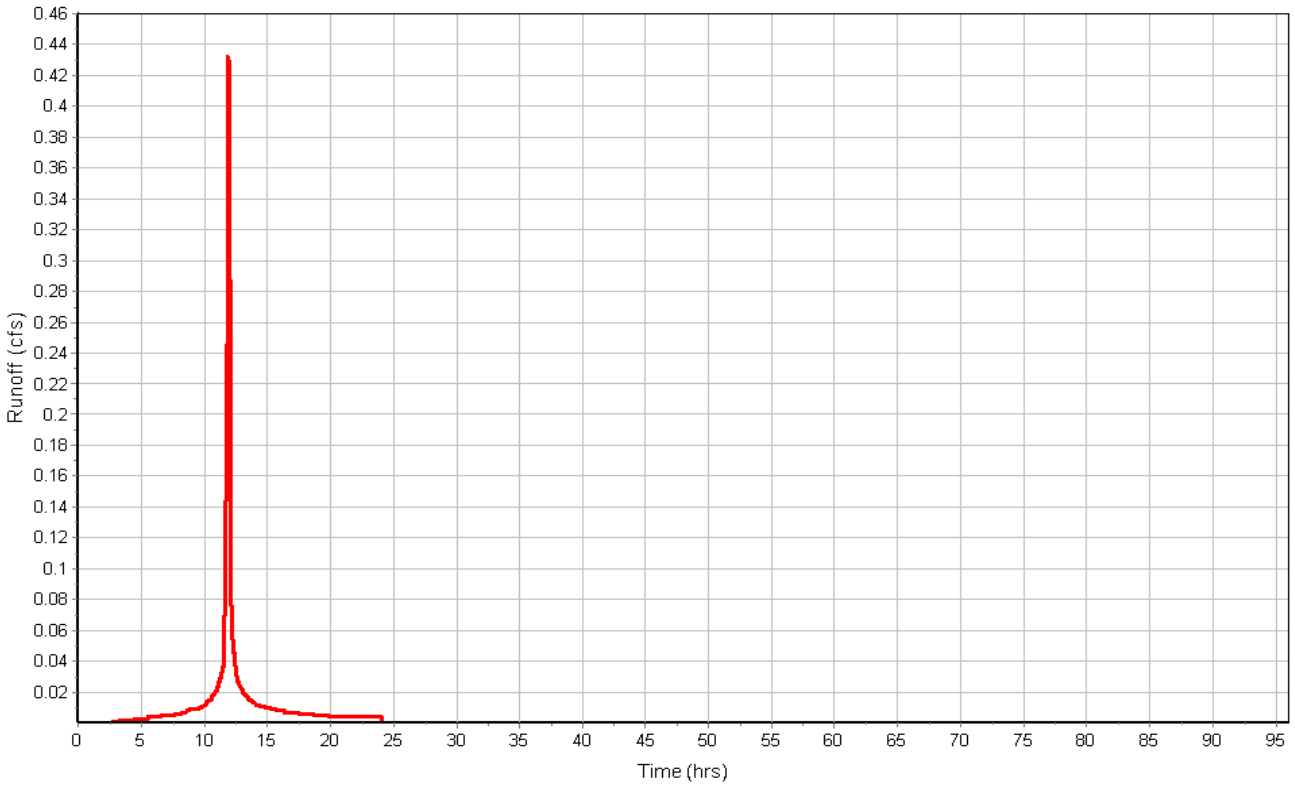
Total Rainfall (in)	2.28
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.43
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_3_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_3_VACANT

Input Data

Area (ac) 0.27
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.27	B	58.00
Composite Area & Weighted CN	0.27		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	259	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	56.90	0.00	0.00

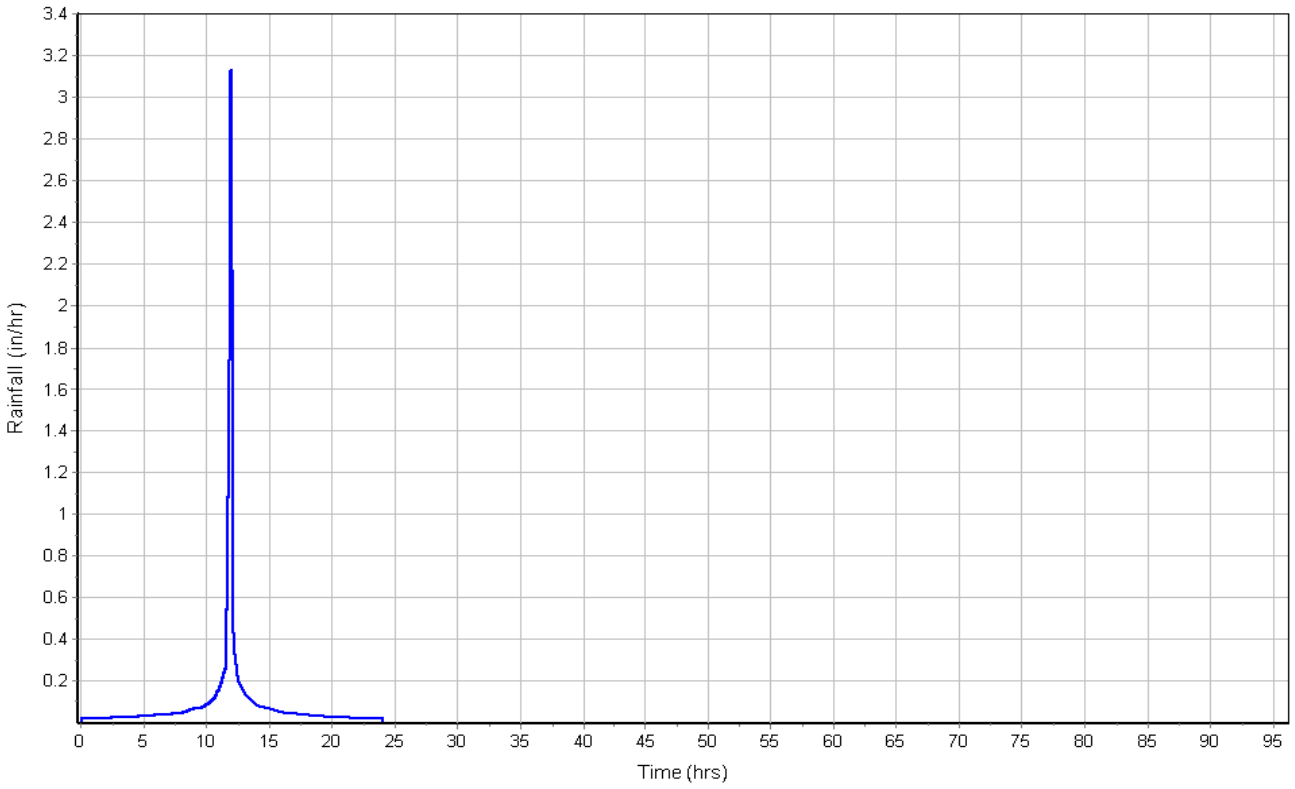
Total TOC (min) 56.90

Subbasin Runoff Results

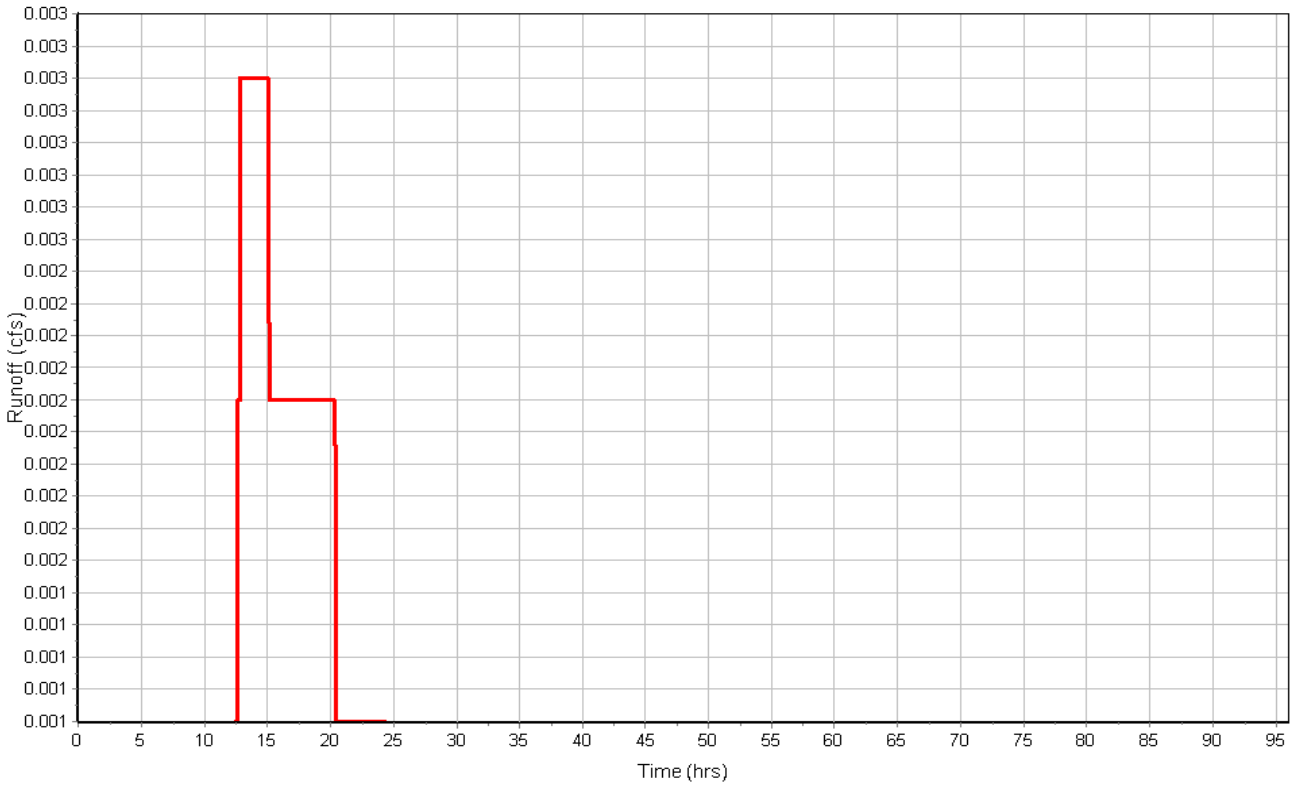
Total Rainfall (in) 2.28
Total Runoff (in) 0.08
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:56:54

Subbasin : BASIN_3_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_30_ROW

Input Data

Area (ac)	0.15
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.15	B	98.00
Composite Area & Weighted CN	0.15		98.00

Time of Concentration

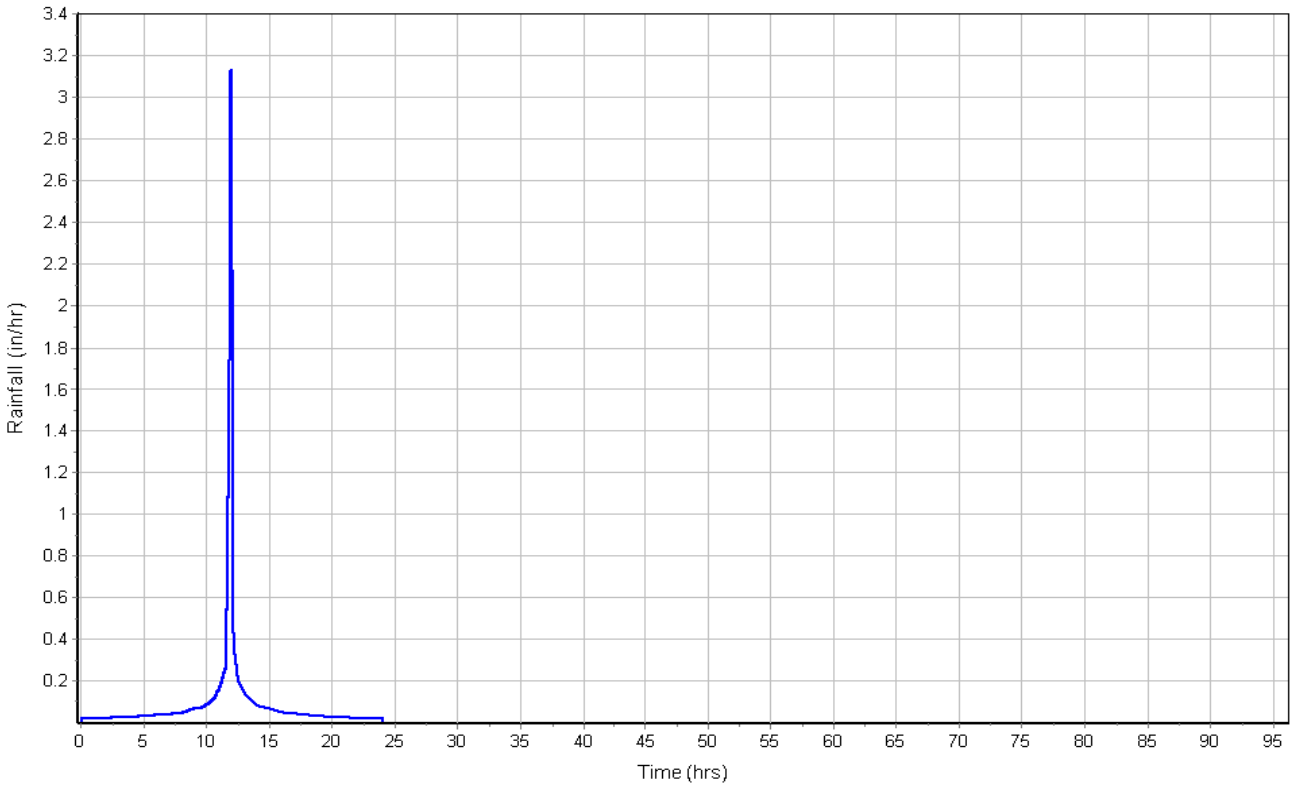
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

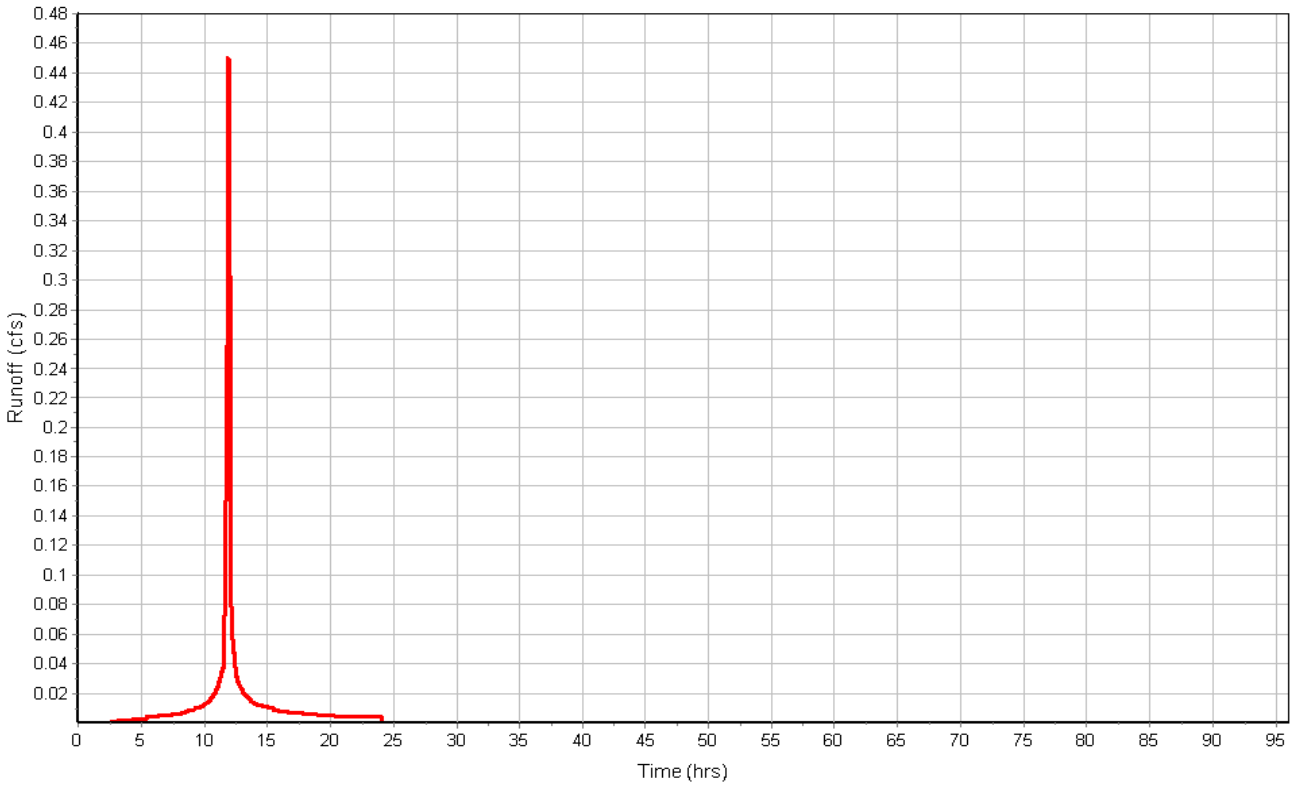
Total Rainfall (in)	2.28
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.45
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_30_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_30_VACANT

Input Data

Area (ac) 0.63
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.63	B	58.00
Composite Area & Weighted CN	0.63		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	300	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	64.00	0.00	0.00

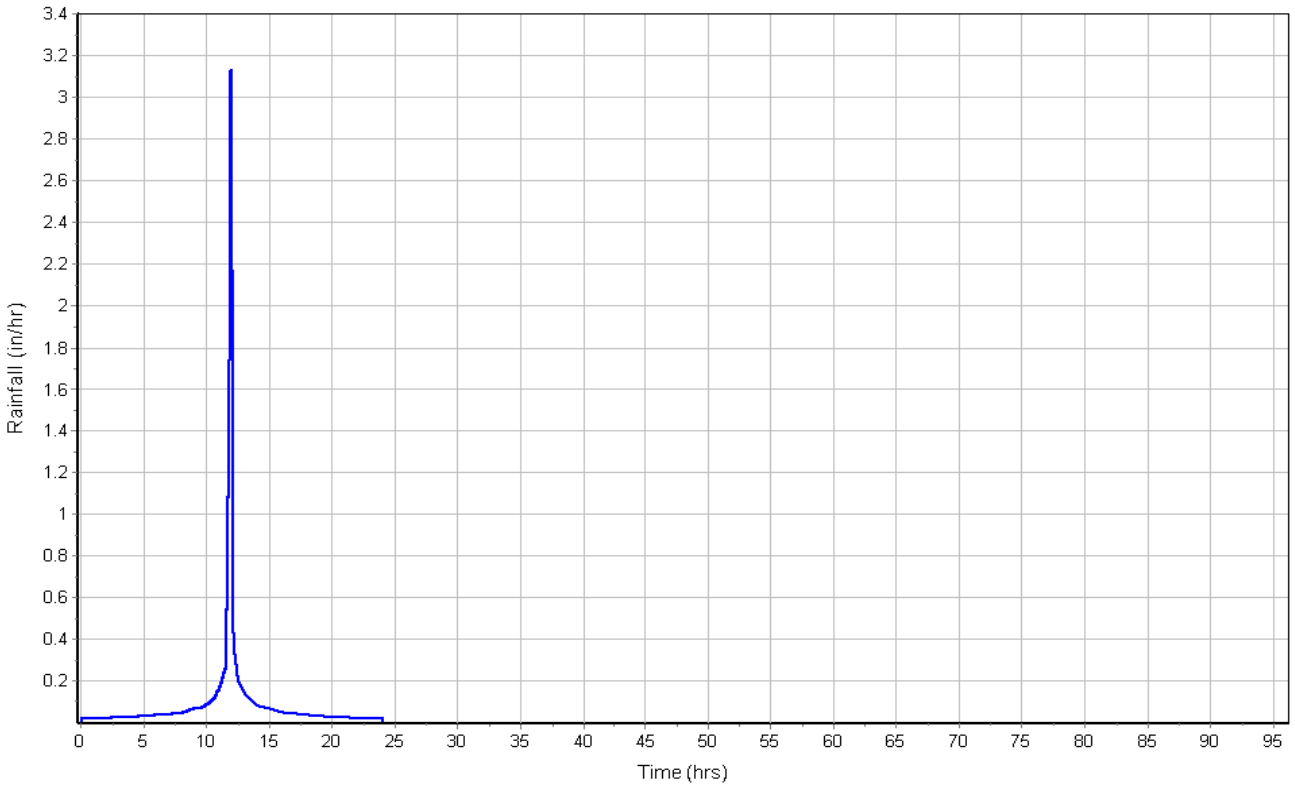
Total TOC (min) 64.00

Subbasin Runoff Results

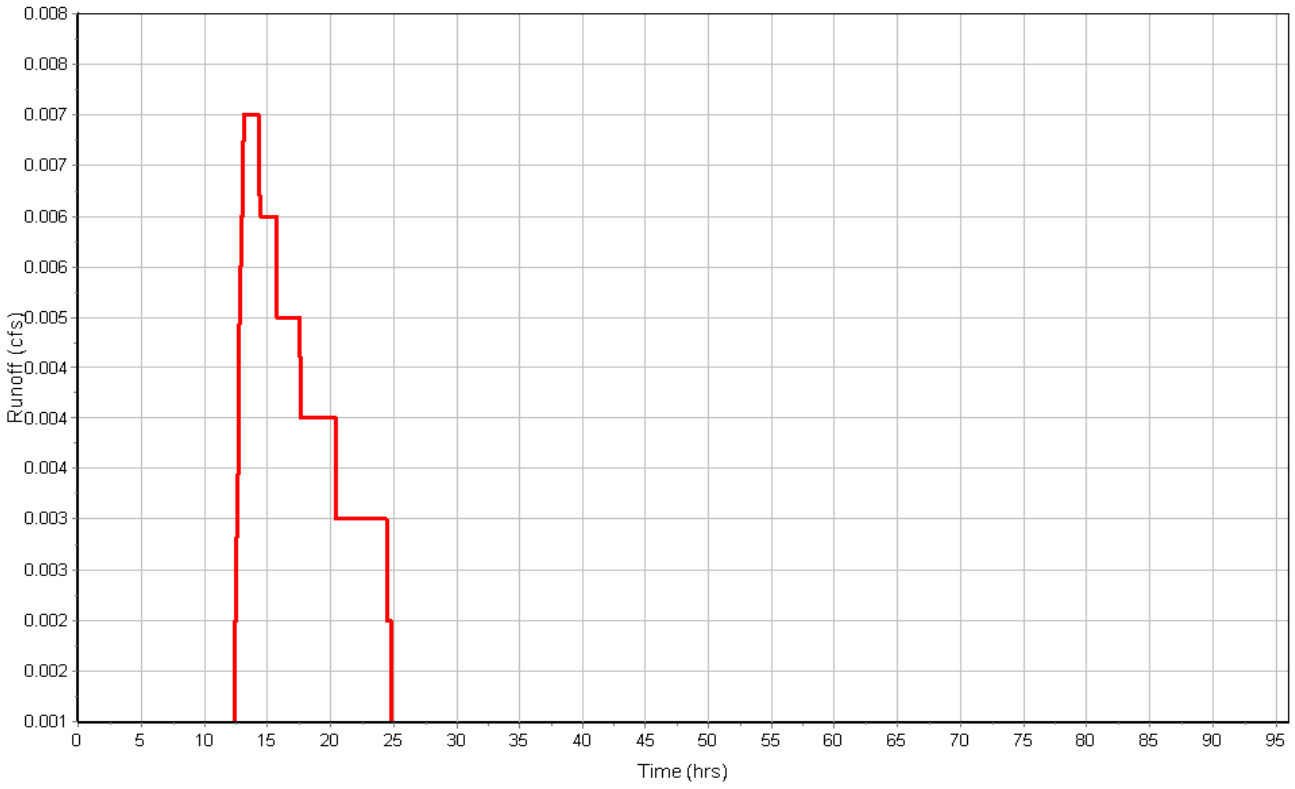
Total Rainfall (in) 2.28
Total Runoff (in) 0.09
Peak Runoff (cfs) 0.01
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 01:04:00

Subbasin : BASIN_30_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_31_ROW

Input Data

Area (ac)	0.15
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.15	B	98.00
Composite Area & Weighted CN	0.15		98.00

Time of Concentration

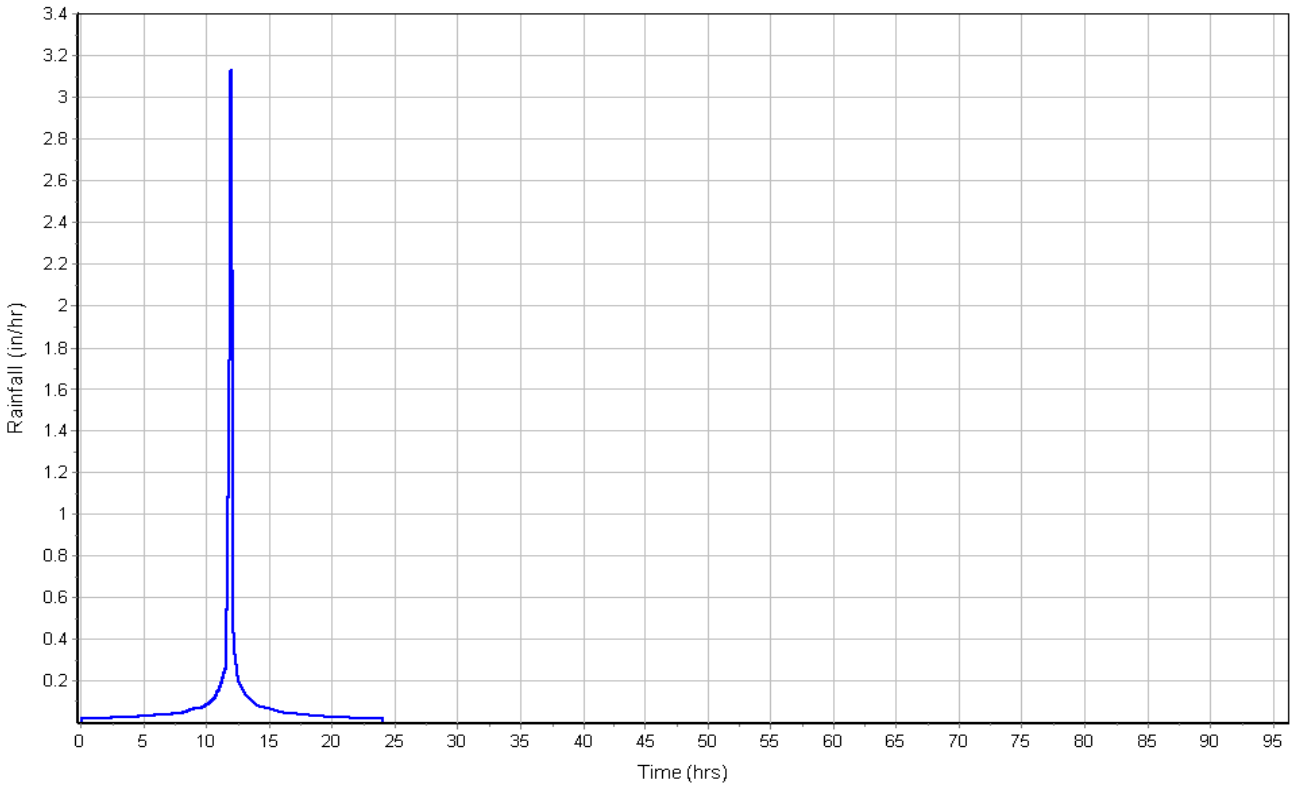
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

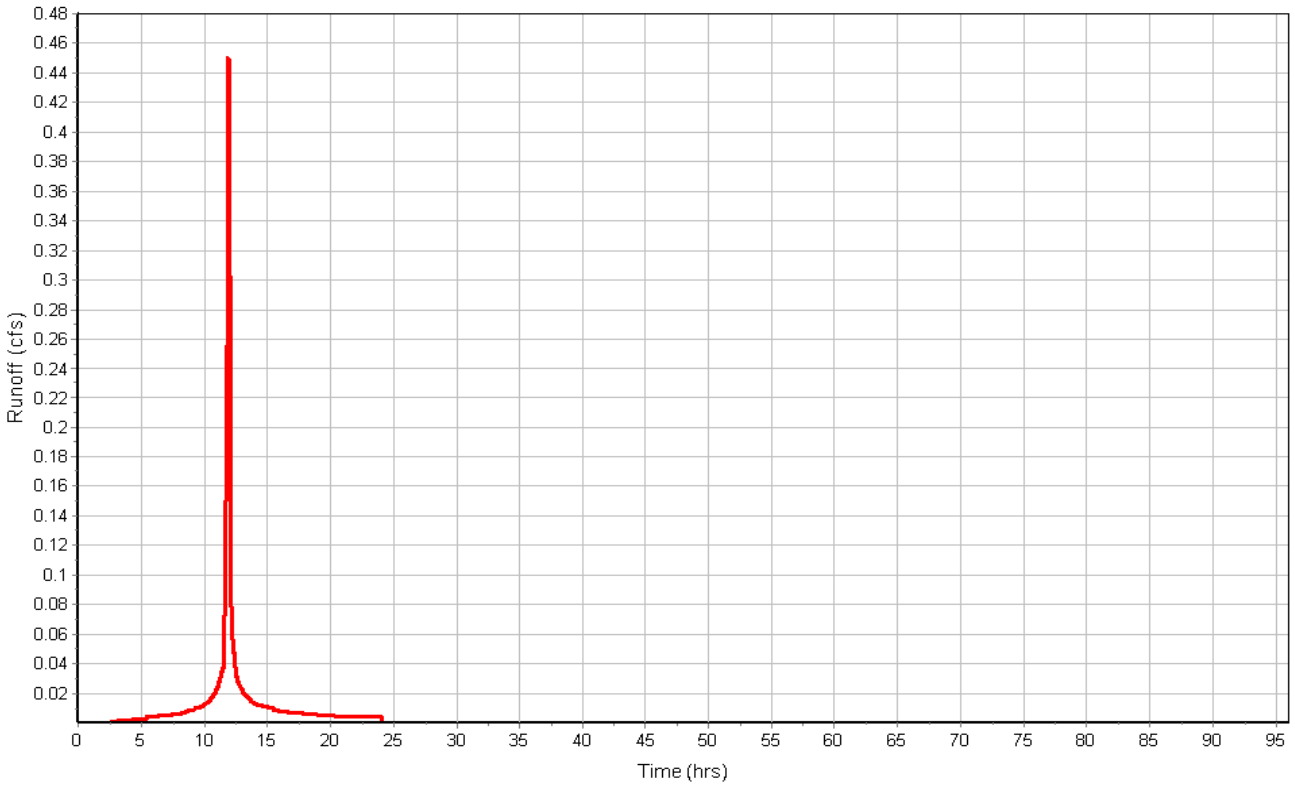
Total Rainfall (in)	2.28
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.45
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_31_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_31_VACANT

Input Data

Area (ac) 0.71
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.71	B	58.00
Composite Area & Weighted CN	0.71		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	274	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	59.52	0.00	0.00

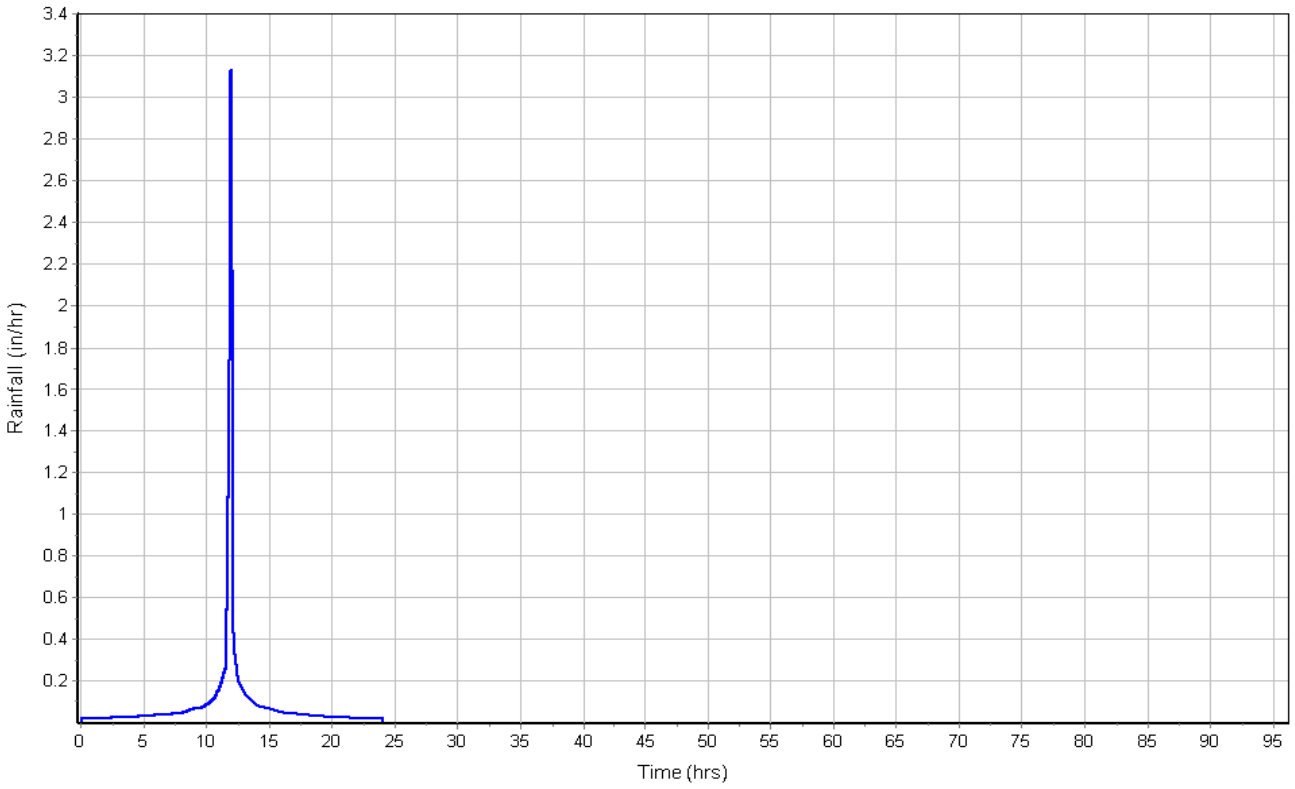
Total TOC (min) 59.52

Subbasin Runoff Results

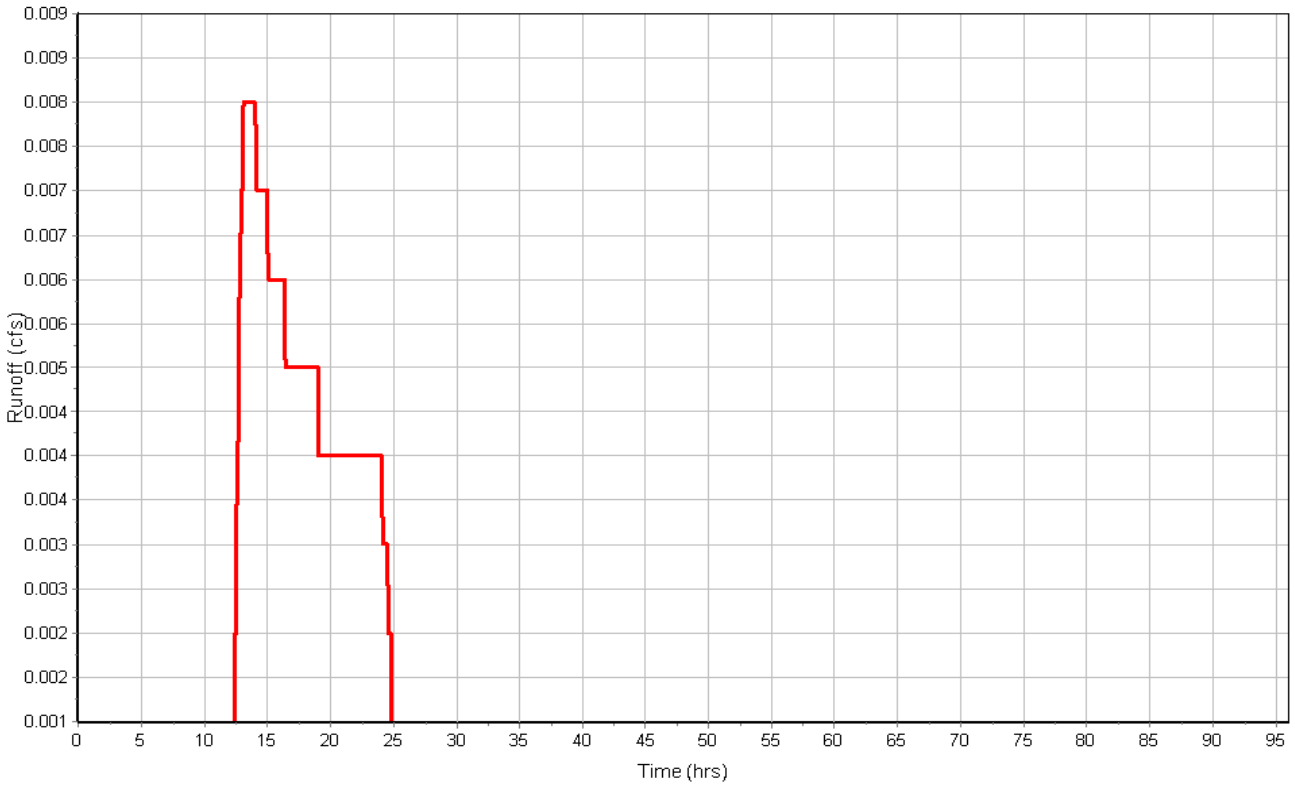
Total Rainfall (in) 2.28
Total Runoff (in) 0.09
Peak Runoff (cfs) 0.01
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:59:31

Subbasin : BASIN_31_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_32_ROW

Input Data

Area (ac)	0.12
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.12	B	98.00
Composite Area & Weighted CN	0.12		98.00

Time of Concentration

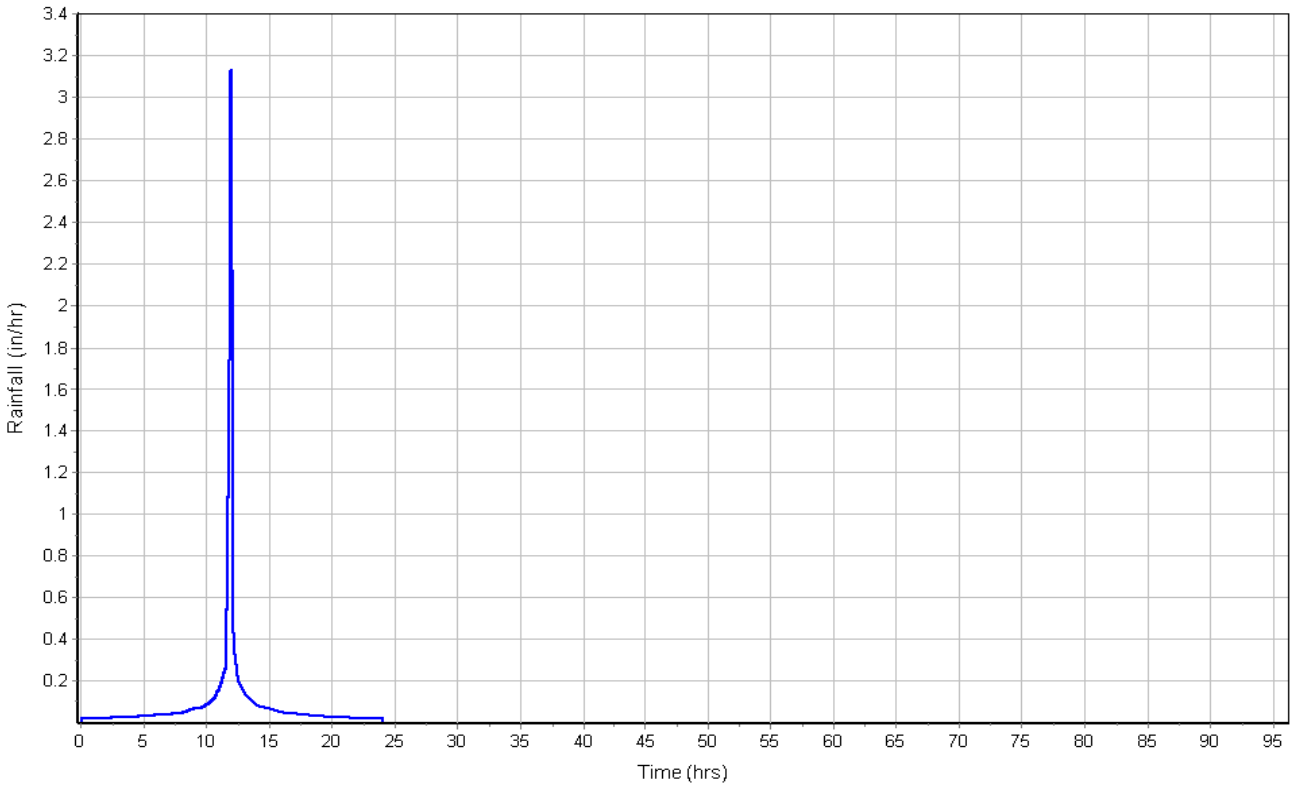
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

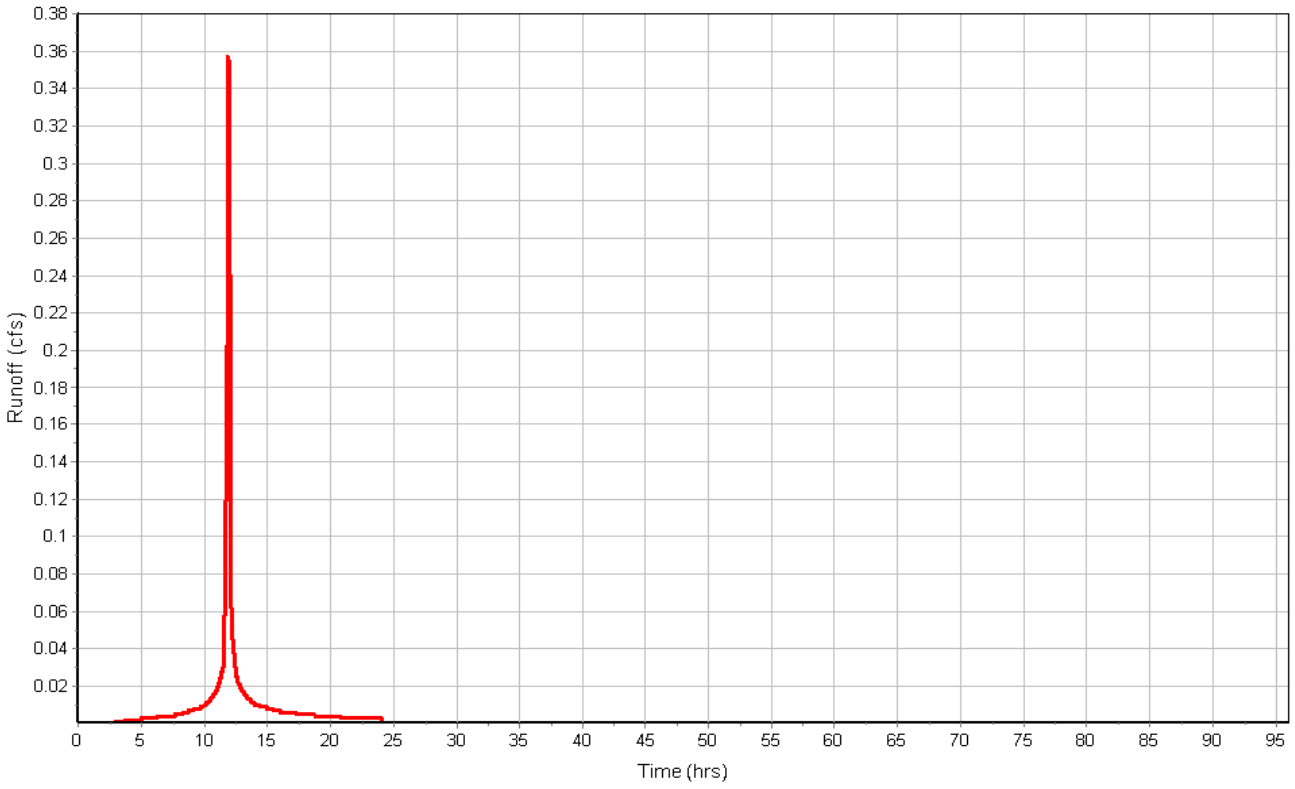
Total Rainfall (in)	2.28
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.36
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_32_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_32_VACANT

Input Data

Area (ac) 0.52
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.52	B	58.00
Composite Area & Weighted CN	0.52		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	246	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	54.60	0.00	0.00

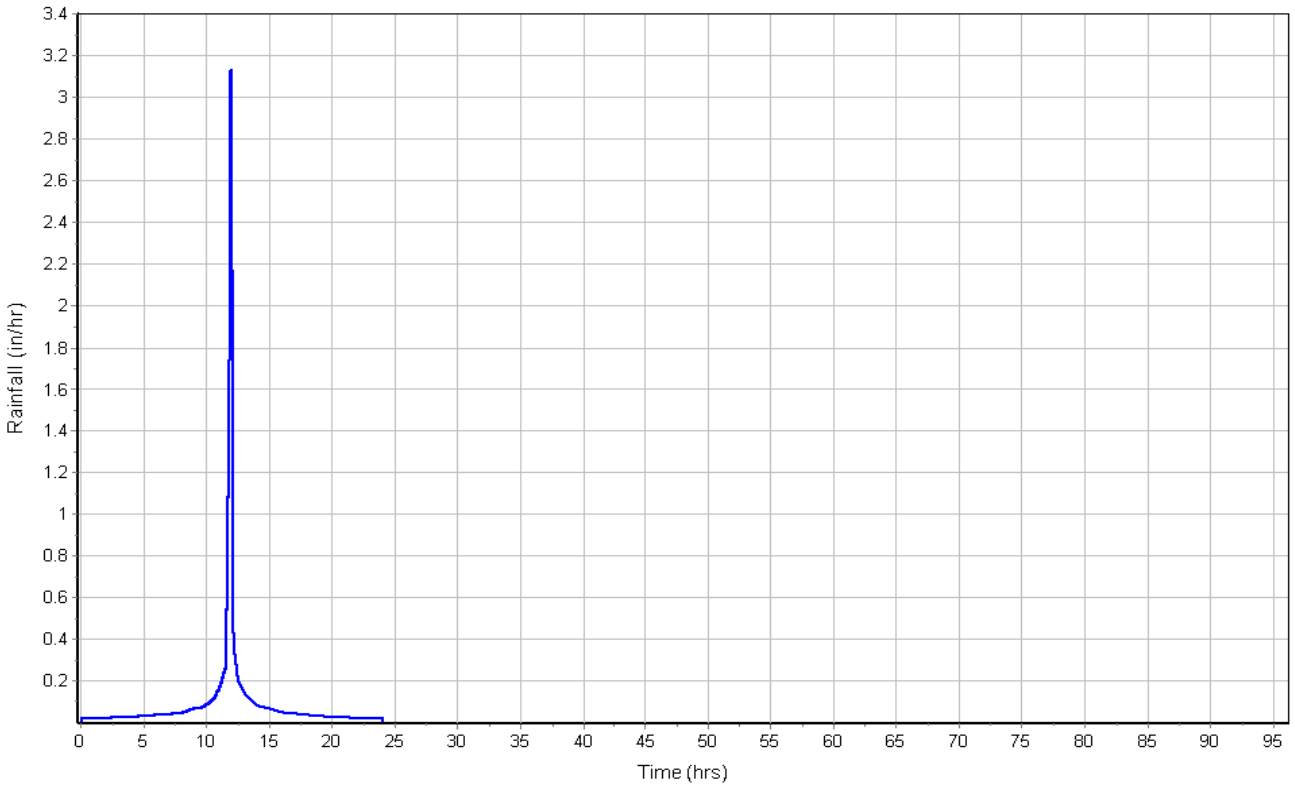
Total TOC (min) 54.60

Subbasin Runoff Results

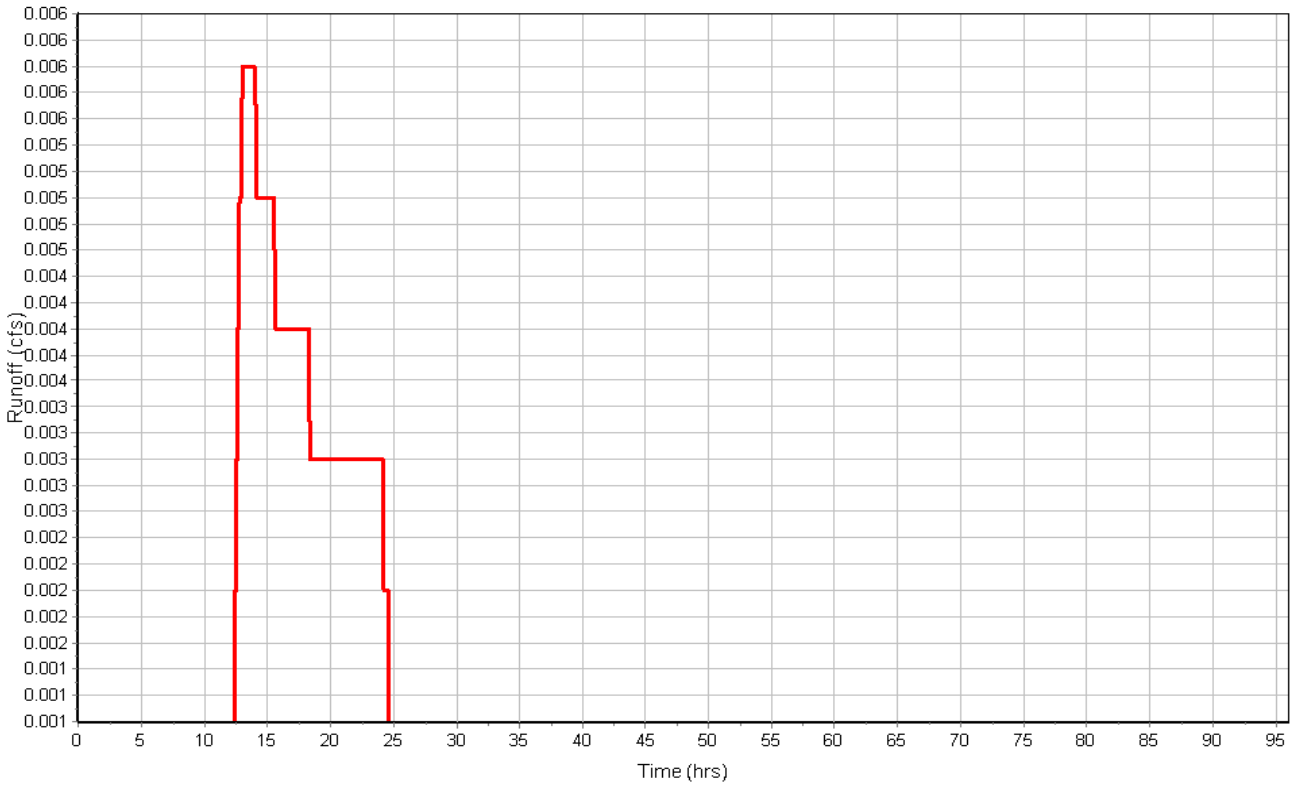
Total Rainfall (in) 2.28
Total Runoff (in) 0.09
Peak Runoff (cfs) 0.01
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:54:36

Subbasin : BASIN_32_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_33_ROW

Input Data

Area (ac)	0.12
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.12	B	98.00
Composite Area & Weighted CN	0.12		98.00

Time of Concentration

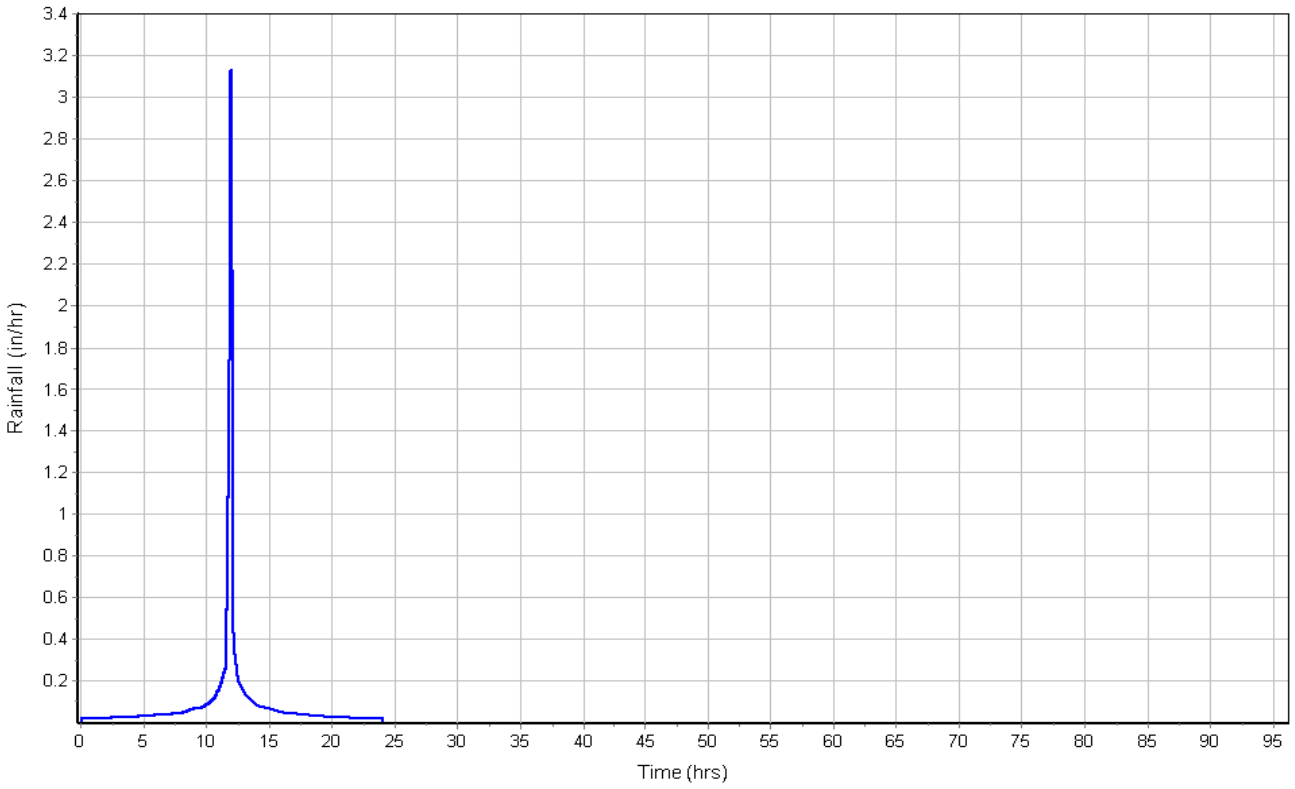
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

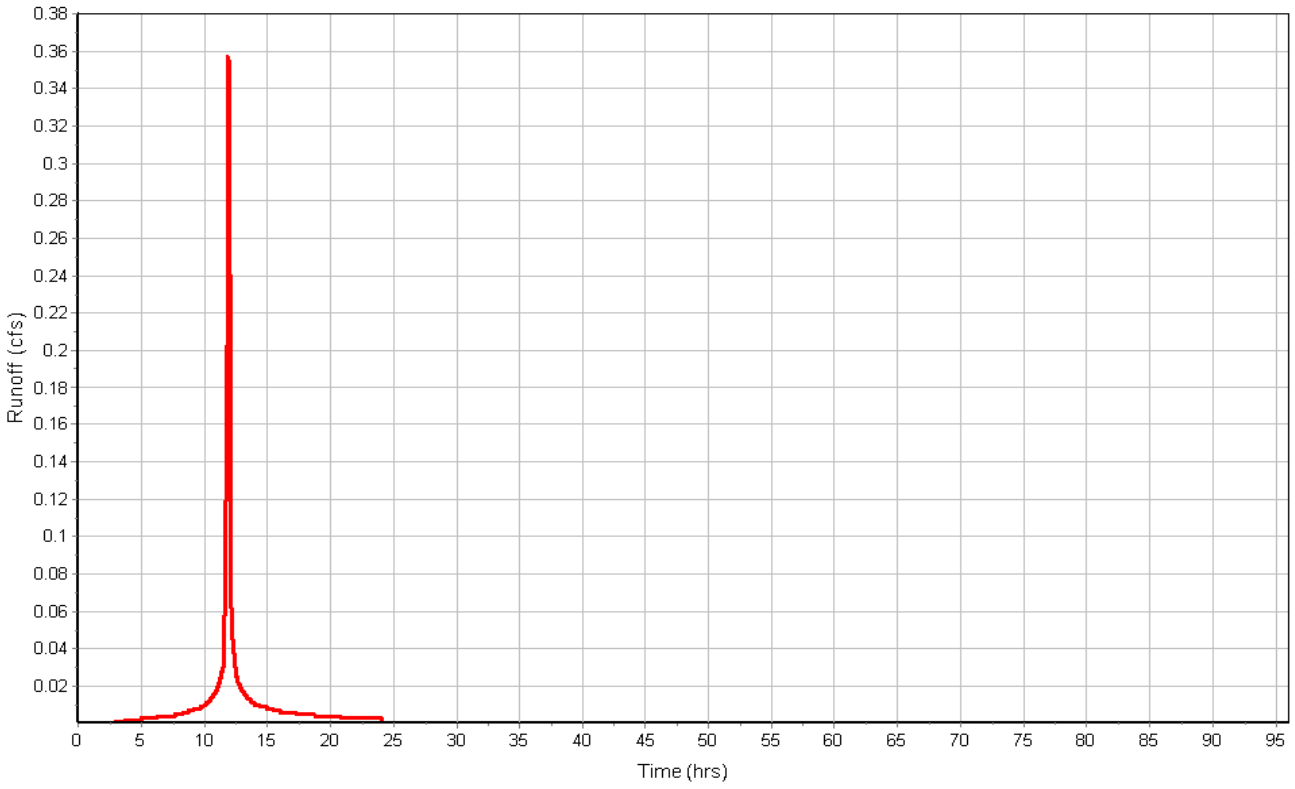
Total Rainfall (in)	2.28
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.36
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_33_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_33_VACANT

Input Data

Area (ac) 0.54
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.54	B	58.00
Composite Area & Weighted CN	0.54		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	256	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.08	0.00	0.00
Computed Flow Time (min) :	56.37	0.00	0.00

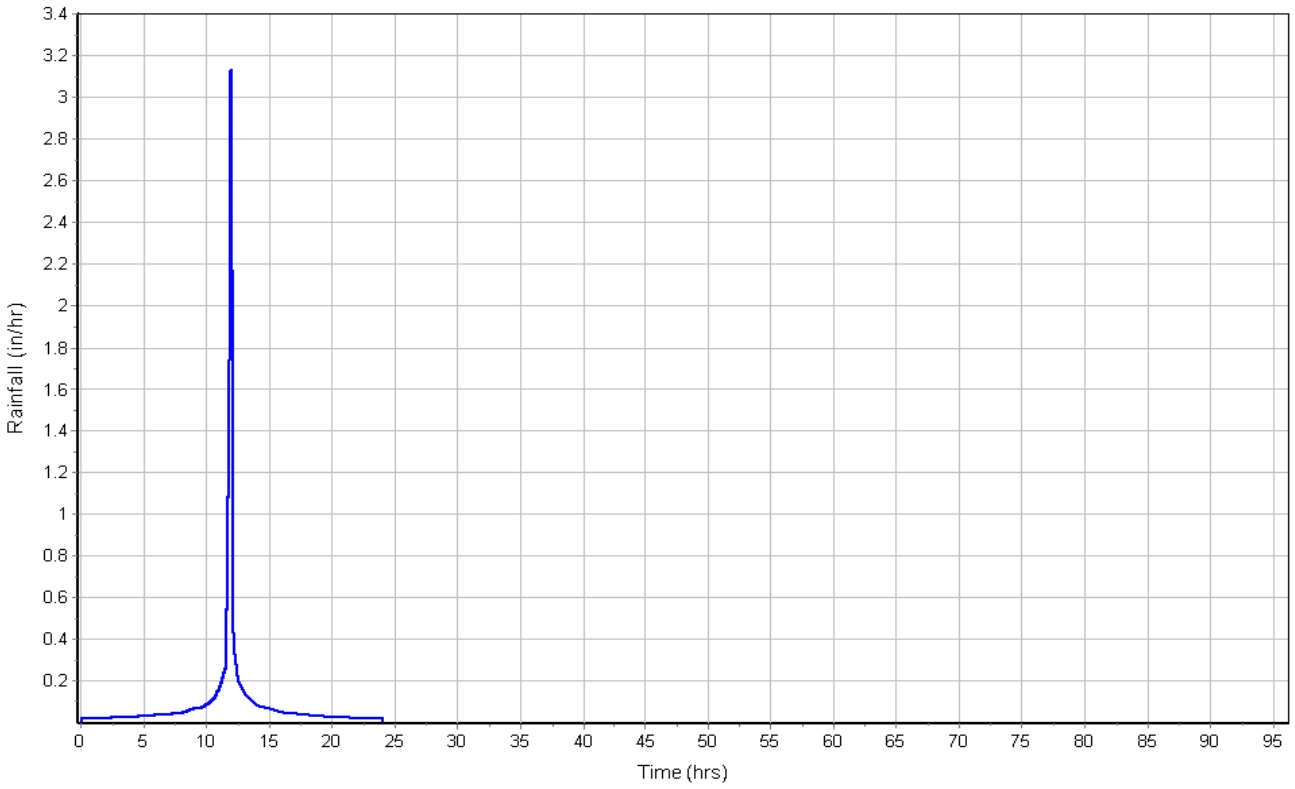
Total TOC (min) 56.37

Subbasin Runoff Results

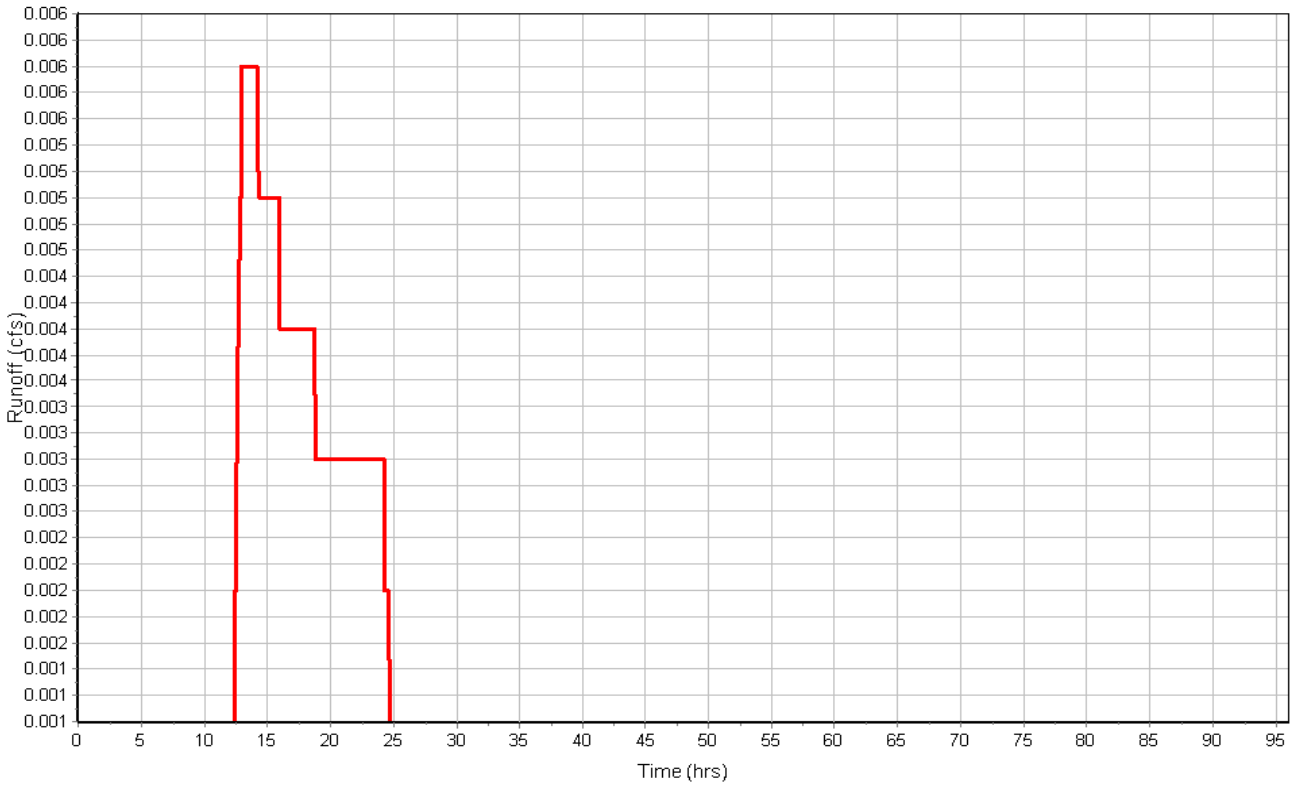
Total Rainfall (in) 2.28
Total Runoff (in) 0.09
Peak Runoff (cfs) 0.01
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:56:22

Subbasin : BASIN_33_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_34_ROW

Input Data

Area (ac)	0.07
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.07	B	98.00
Composite Area & Weighted CN	0.07		98.00

Time of Concentration

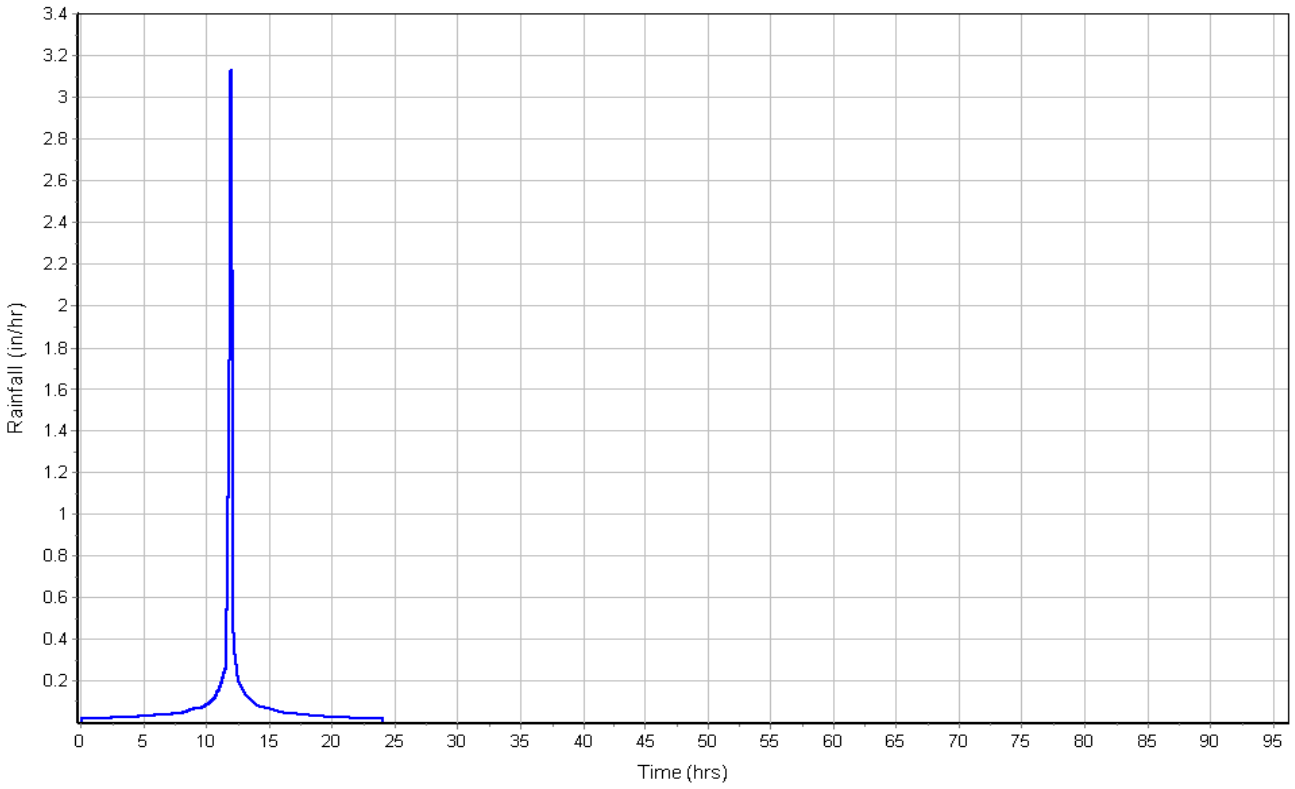
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

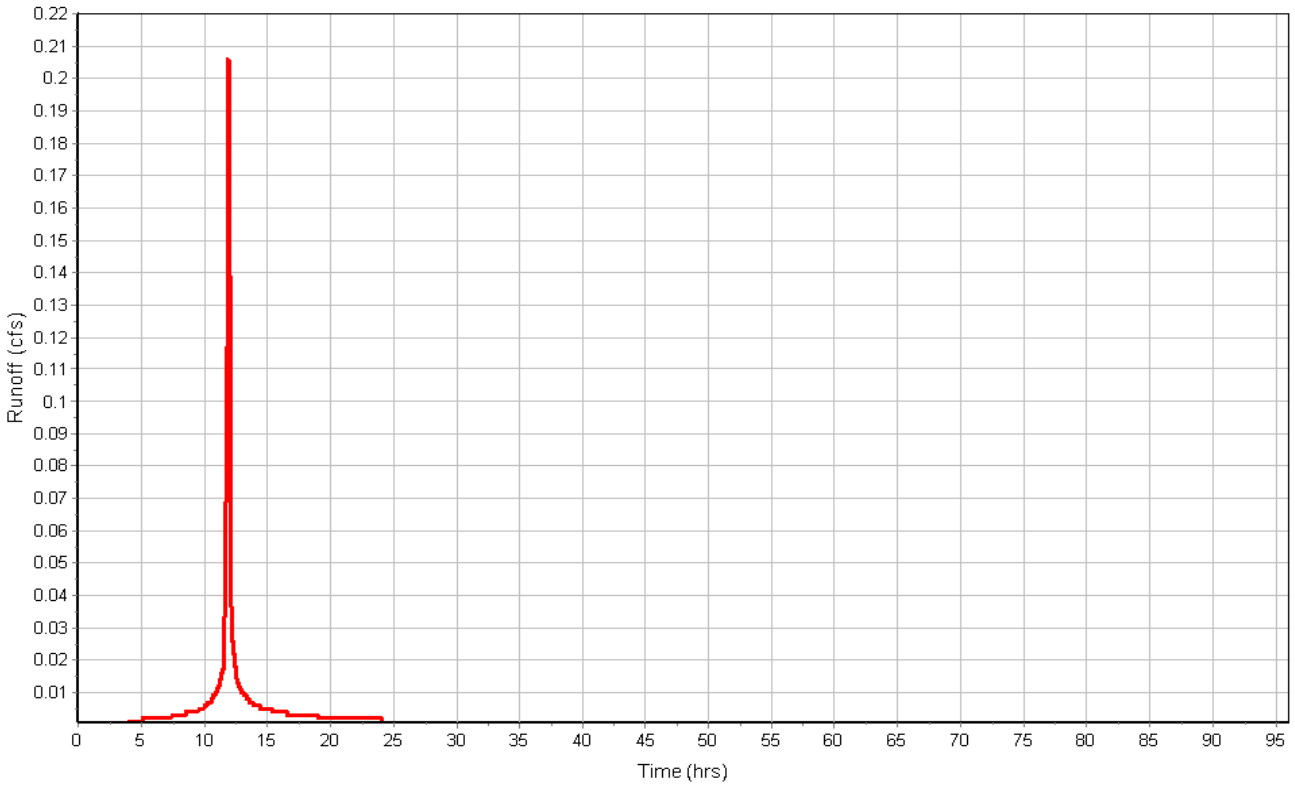
Total Rainfall (in)	2.28
Total Runoff (in)	2.03
Peak Runoff (cfs)	0.21
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_34_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_34_VACANT

Input Data

Area (ac) 0.51
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.51	B	58.00
Composite Area & Weighted CN	0.51		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	198	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	45.90	0.00	0.00

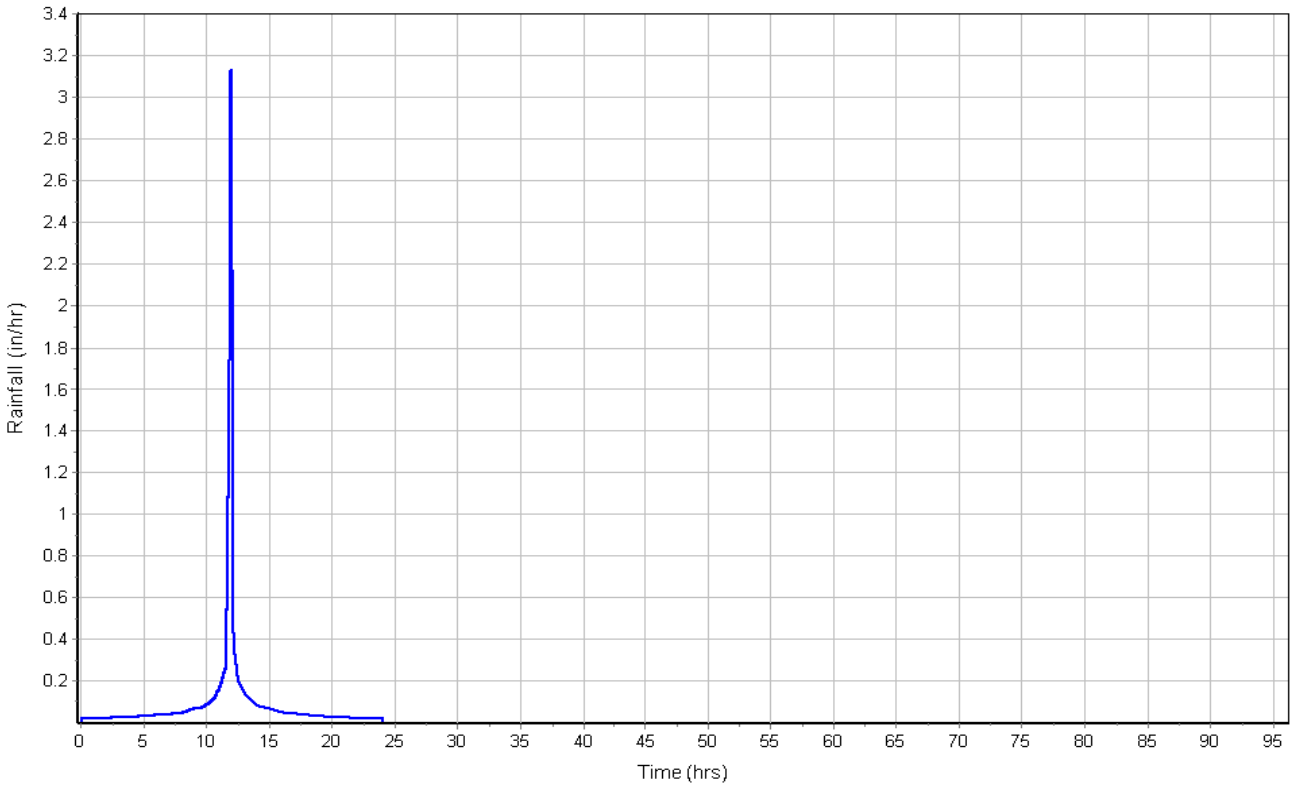
Total TOC (min) 45.90

Subbasin Runoff Results

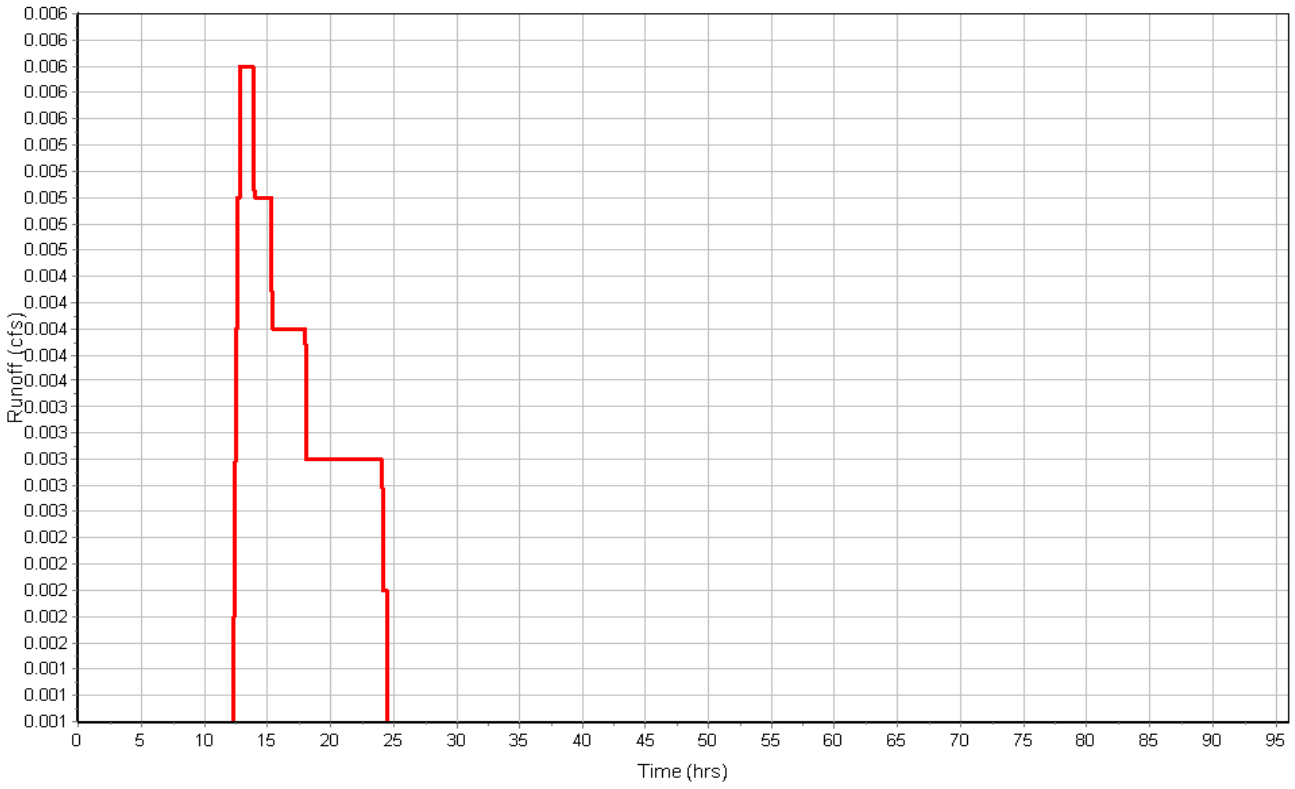
Total Rainfall (in) 2.28
Total Runoff (in) 0.09
Peak Runoff (cfs) 0.01
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:45:54

Subbasin : BASIN_34_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_35_ROW

Input Data

Area (ac)	0.07
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.07	B	98.00
Composite Area & Weighted CN	0.07		98.00

Time of Concentration

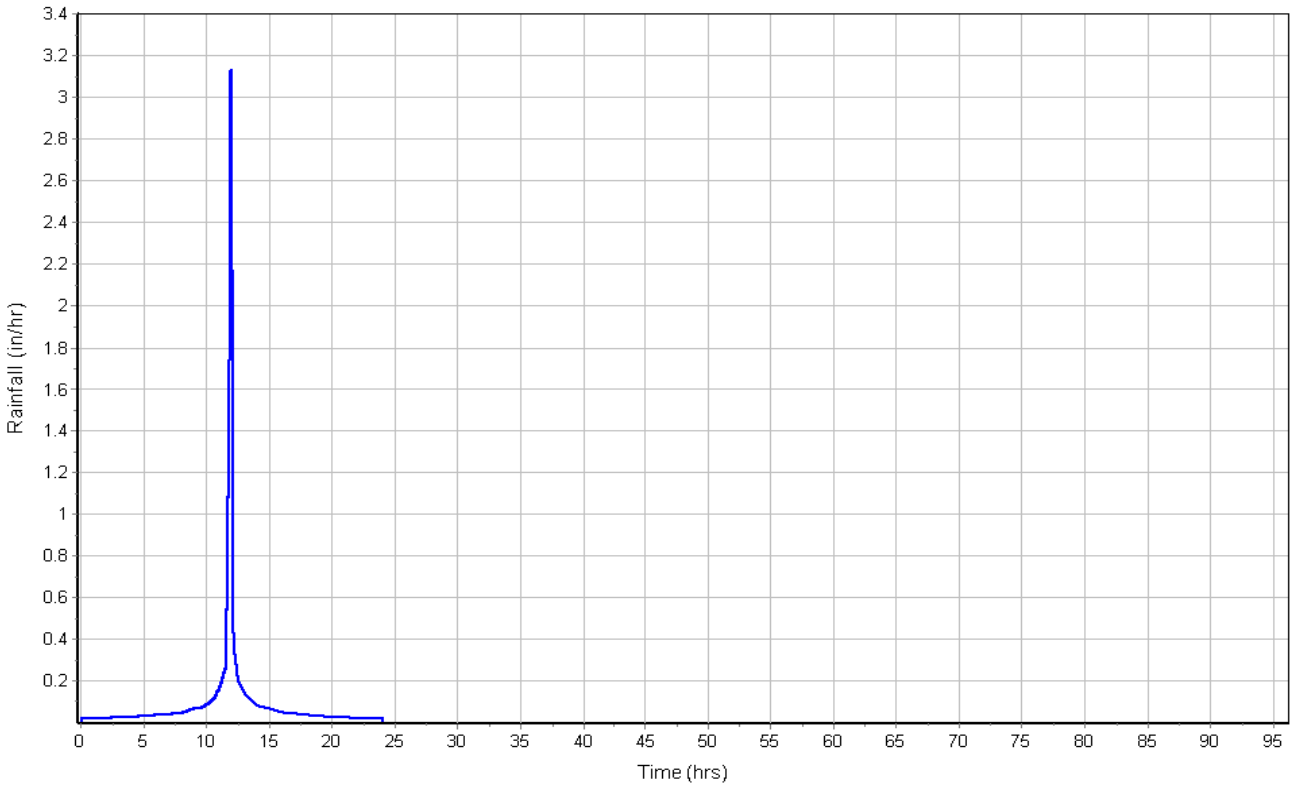
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

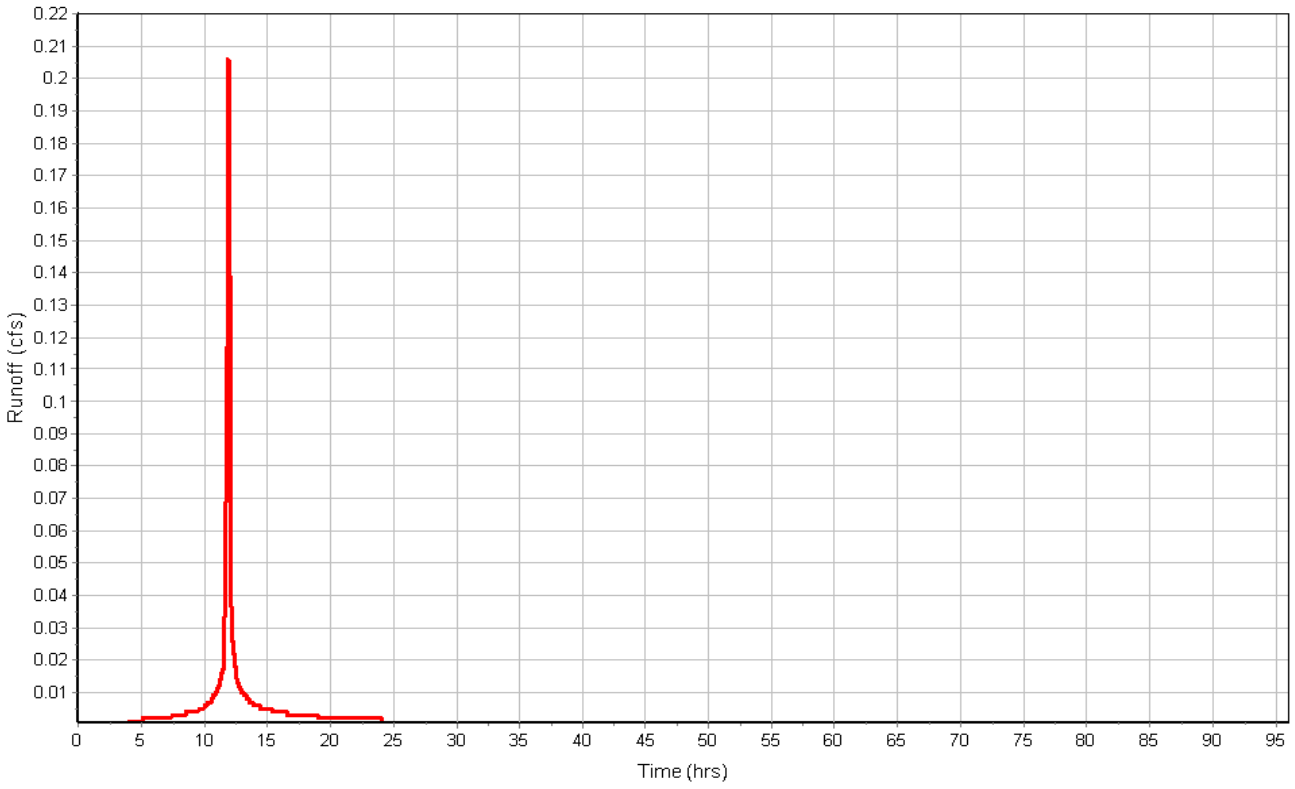
Total Rainfall (in)	2.28
Total Runoff (in)	2.03
Peak Runoff (cfs)	0.21
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_35_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_35_VACANT

Input Data

Area (ac) 0.34
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.34	B	58.00
Composite Area & Weighted CN	0.34		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	184	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	43.28	0.00	0.00

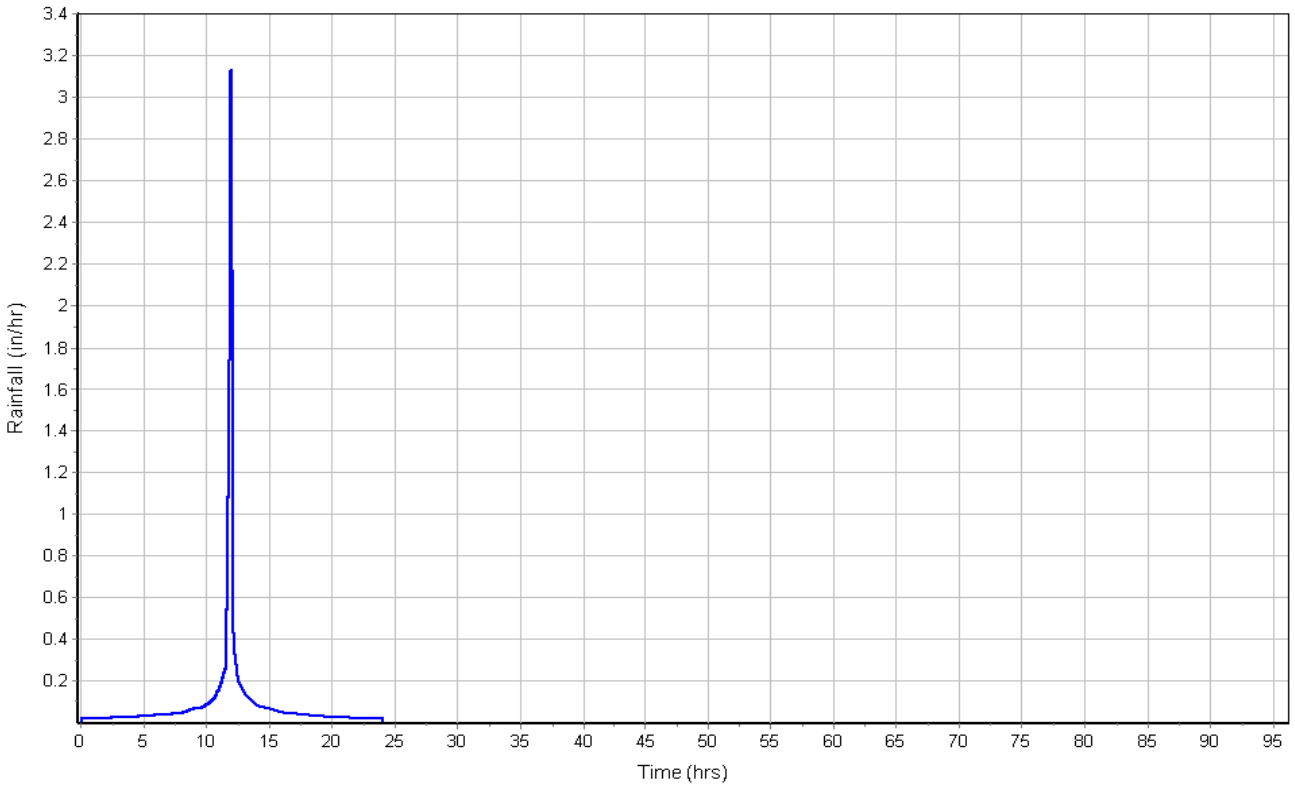
Total TOC (min) 43.28

Subbasin Runoff Results

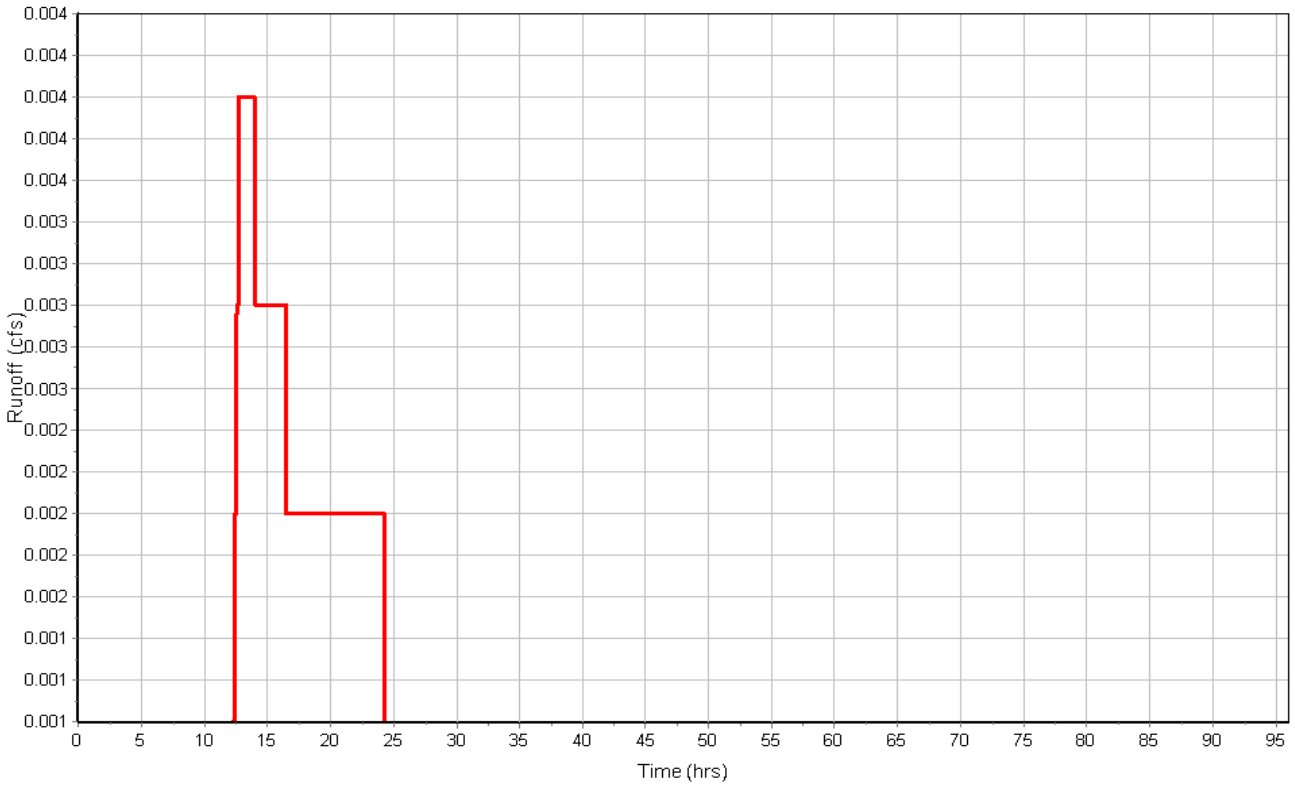
Total Rainfall (in) 2.28
Total Runoff (in) 0.09
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:43:17

Subbasin : BASIN_35_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_36_ROW

Input Data

Area (ac)	0.13
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.13	B	98.00
Composite Area & Weighted CN	0.13		98.00

Time of Concentration

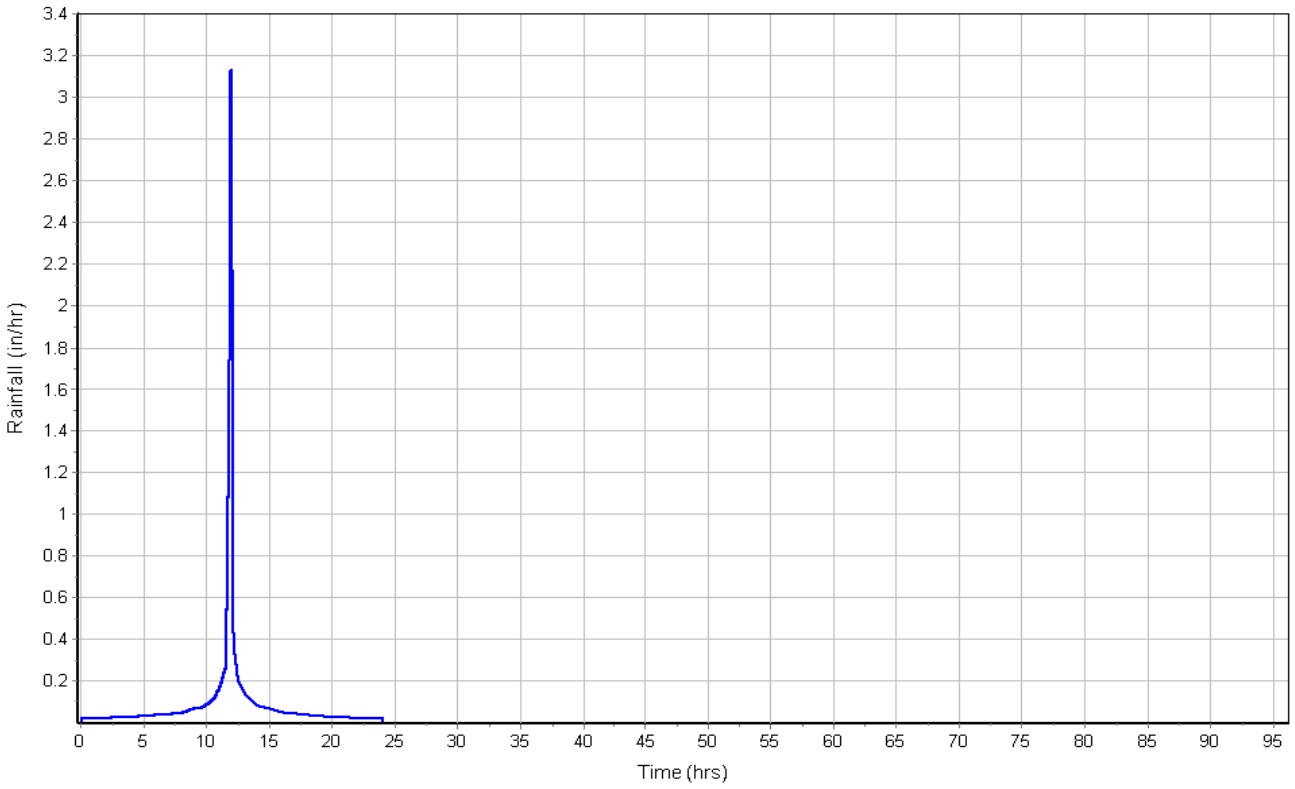
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

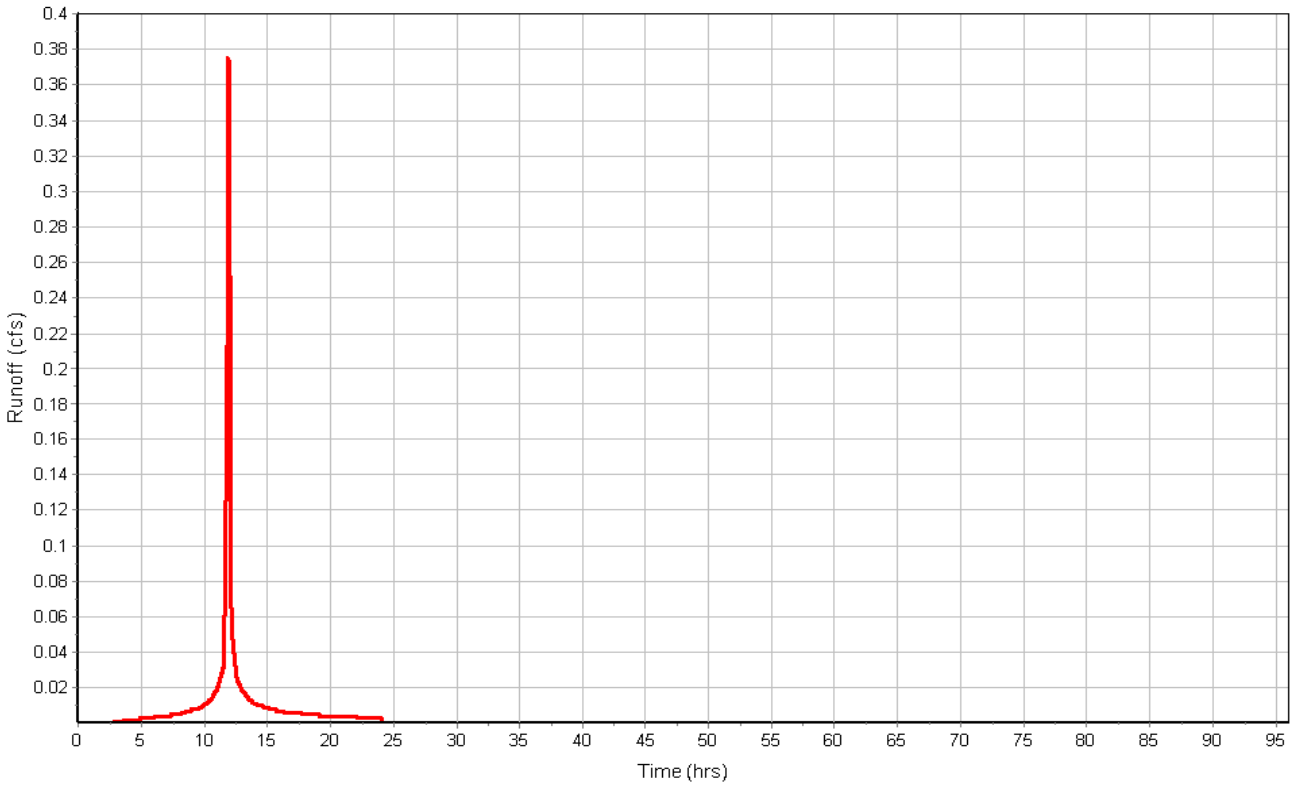
Total Rainfall (in)	2.28
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.38
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_36_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_36_VACANT

Input Data

Area (ac) 0.35
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.35	B	58.00
Composite Area & Weighted CN	0.35		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	190	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	44.41	0.00	0.00

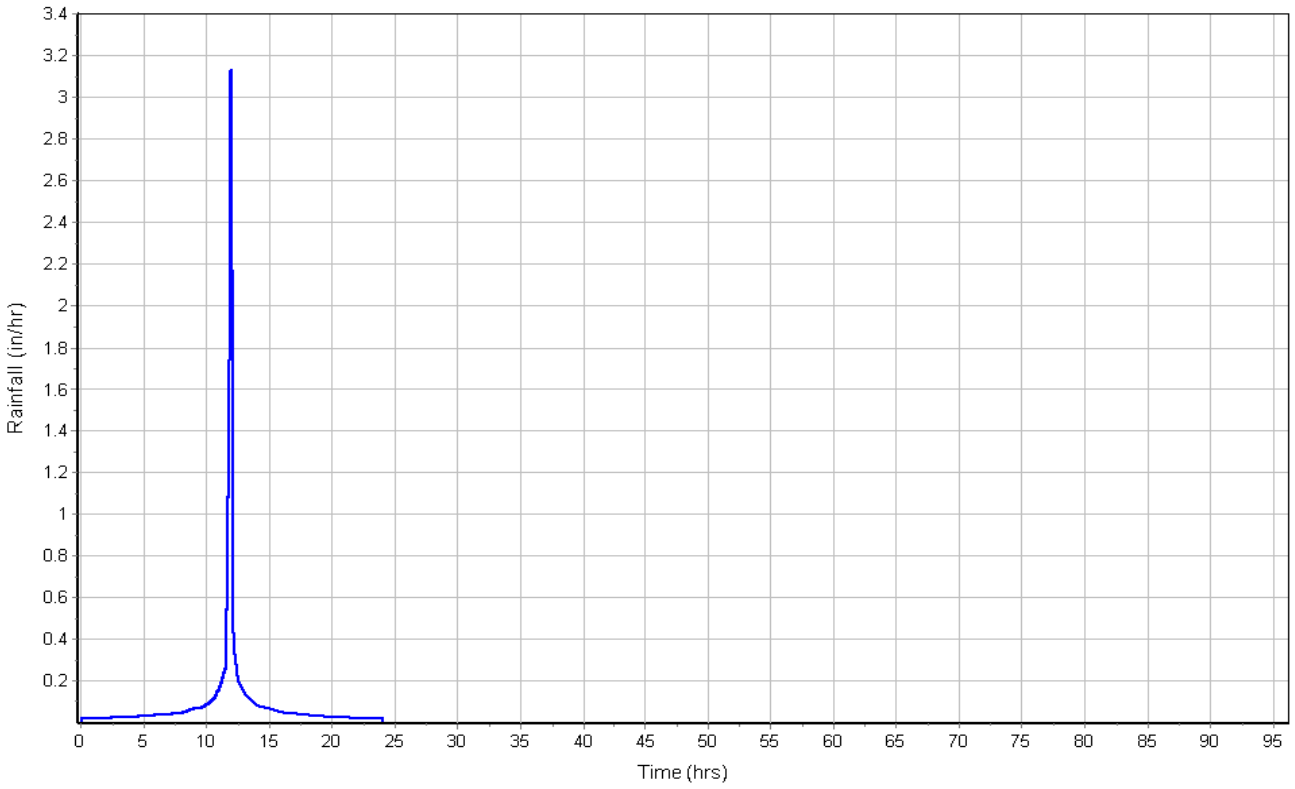
Total TOC (min) 44.41

Subbasin Runoff Results

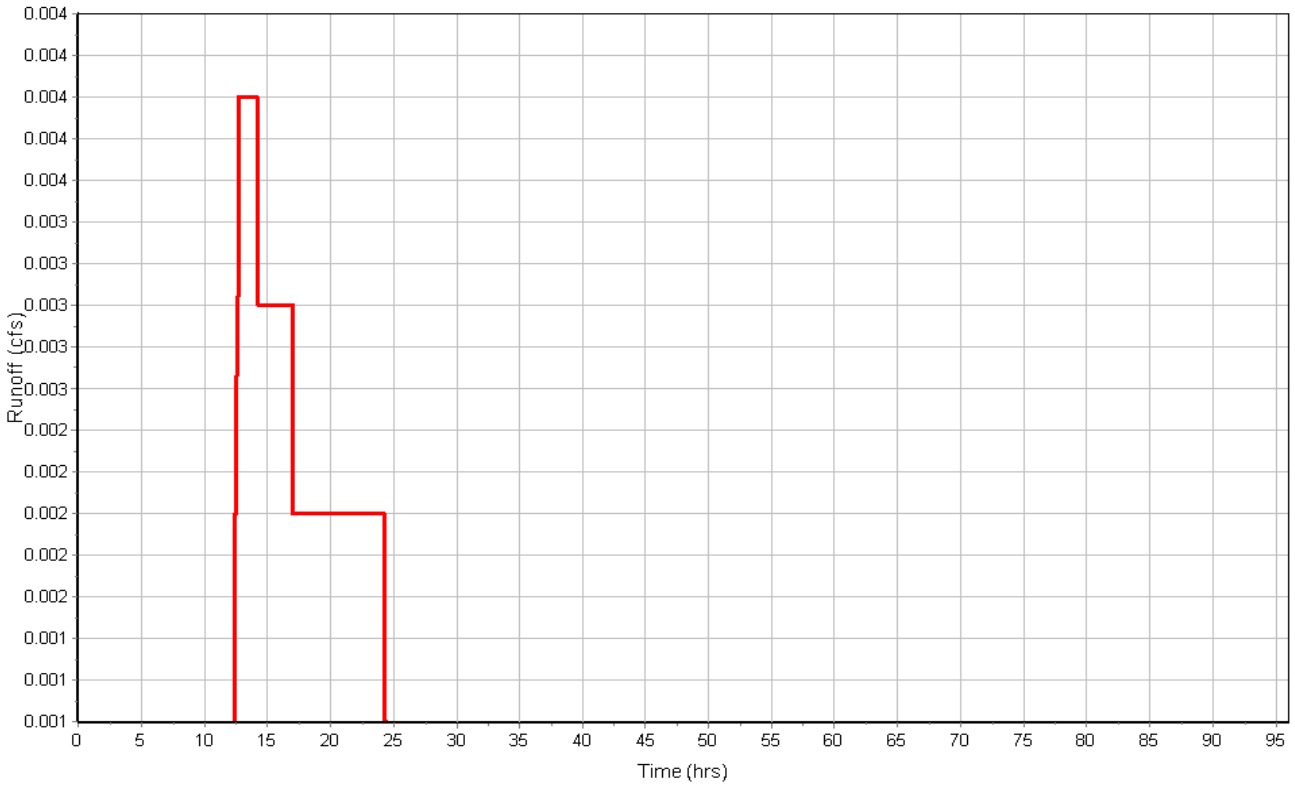
Total Rainfall (in) 2.28
Total Runoff (in) 0.09
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:44:25

Subbasin : BASIN_36_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_37_ROW

Input Data

Area (ac)	0.12
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.12	B	98.00
Composite Area & Weighted CN	0.12		98.00

Time of Concentration

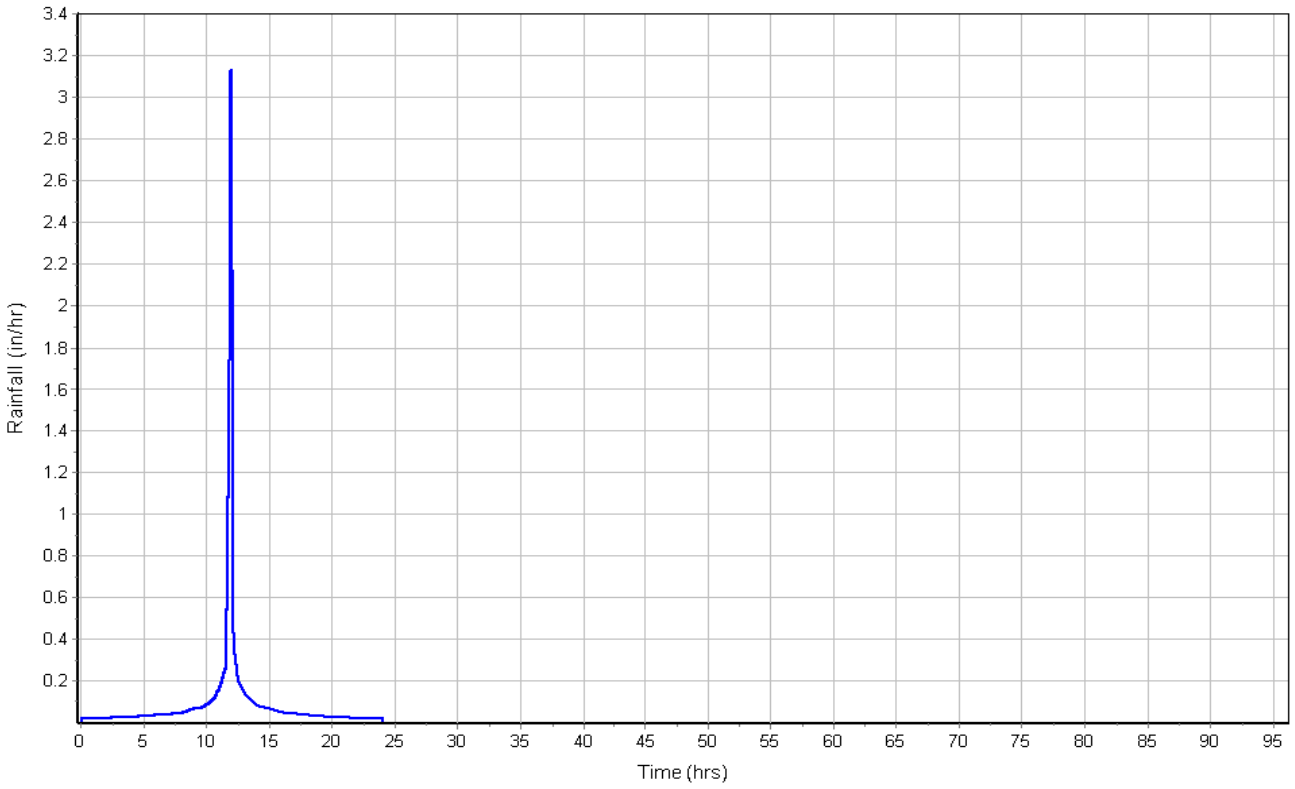
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

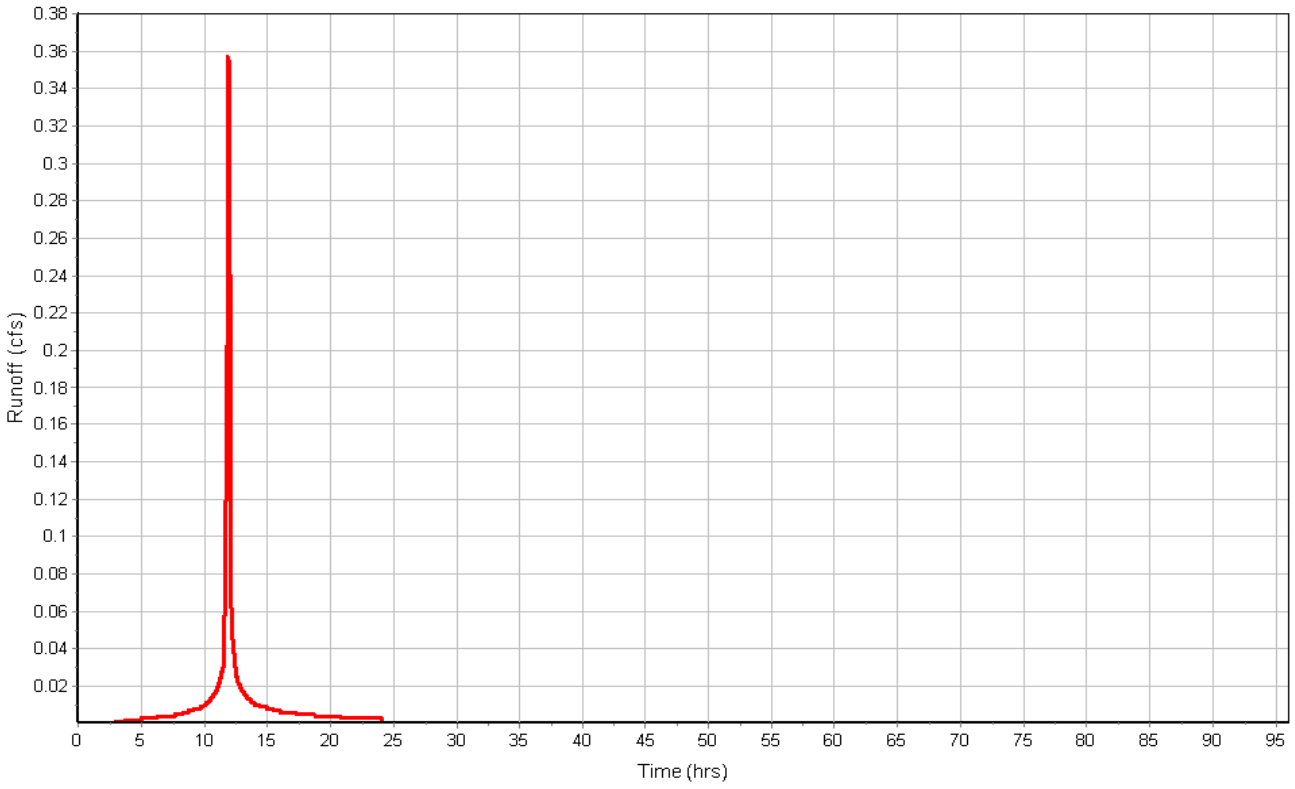
Total Rainfall (in)	2.28
Total Runoff (in)	2.05
Peak Runoff (cfs)	0.36
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_37_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_37_VACANT

Input Data

Area (ac) 0.44
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.44	B	58.00
Composite Area & Weighted CN	0.44		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	195	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	45.34	0.00	0.00

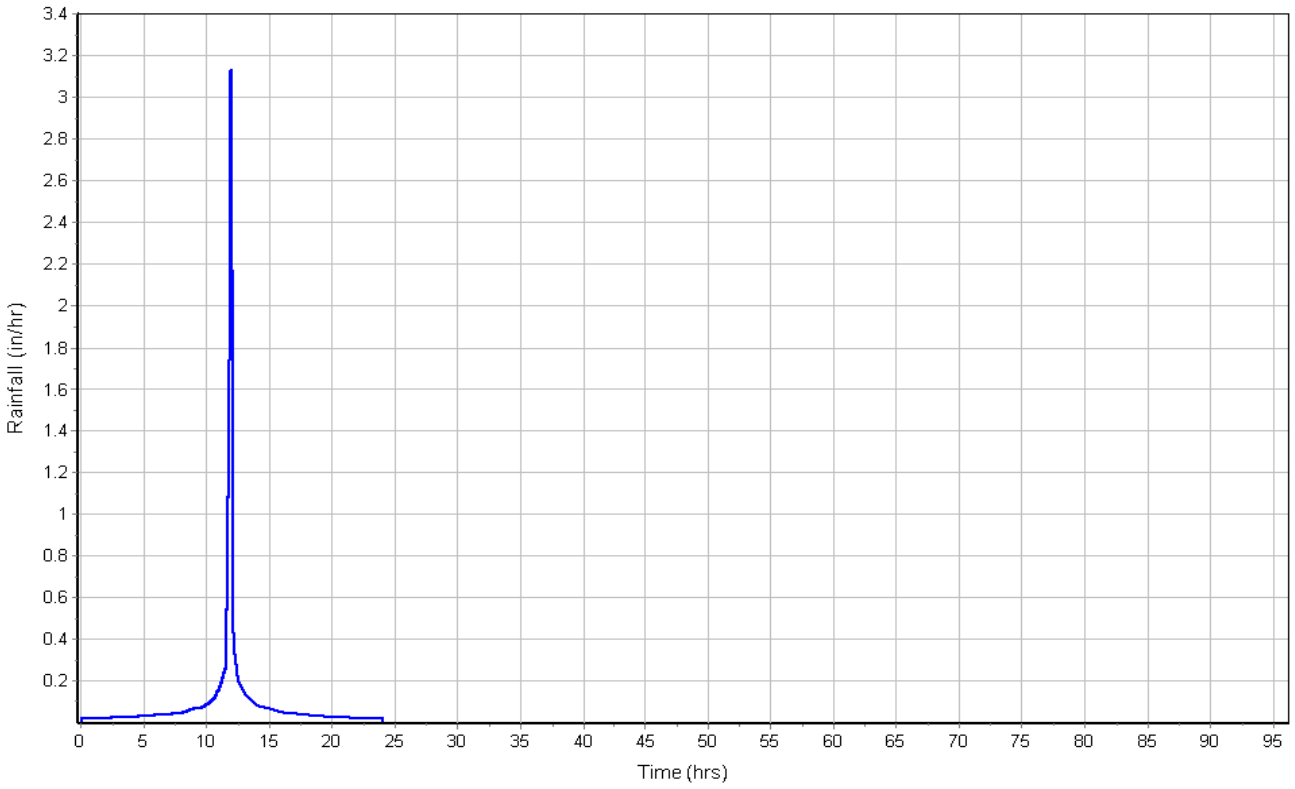
Total TOC (min) 45.34

Subbasin Runoff Results

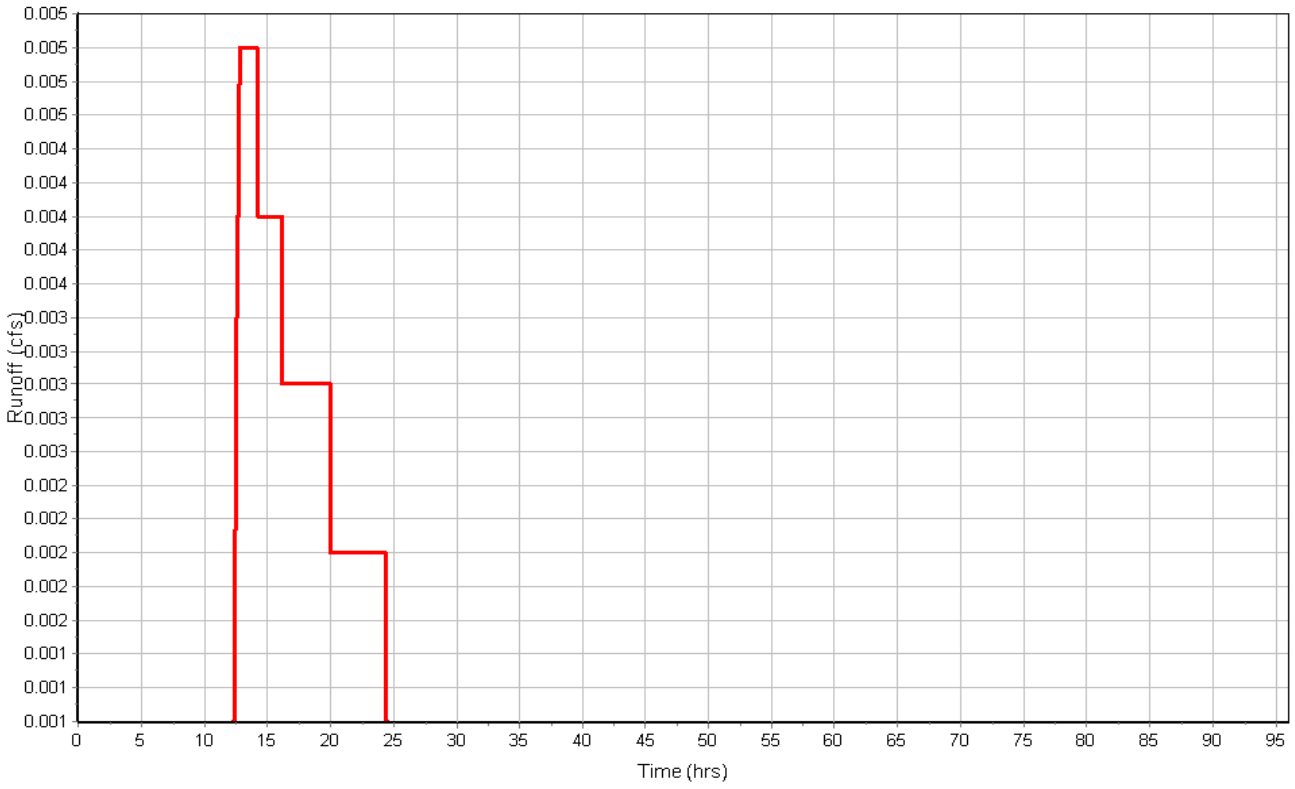
Total Rainfall (in) 2.28
Total Runoff (in) 0.09
Peak Runoff (cfs) 0.01
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:45:20

Subbasin : BASIN_37_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_38_ROW

Input Data

Area (ac)	0.09
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.09	B	98.00
Composite Area & Weighted CN	0.09		98.00

Time of Concentration

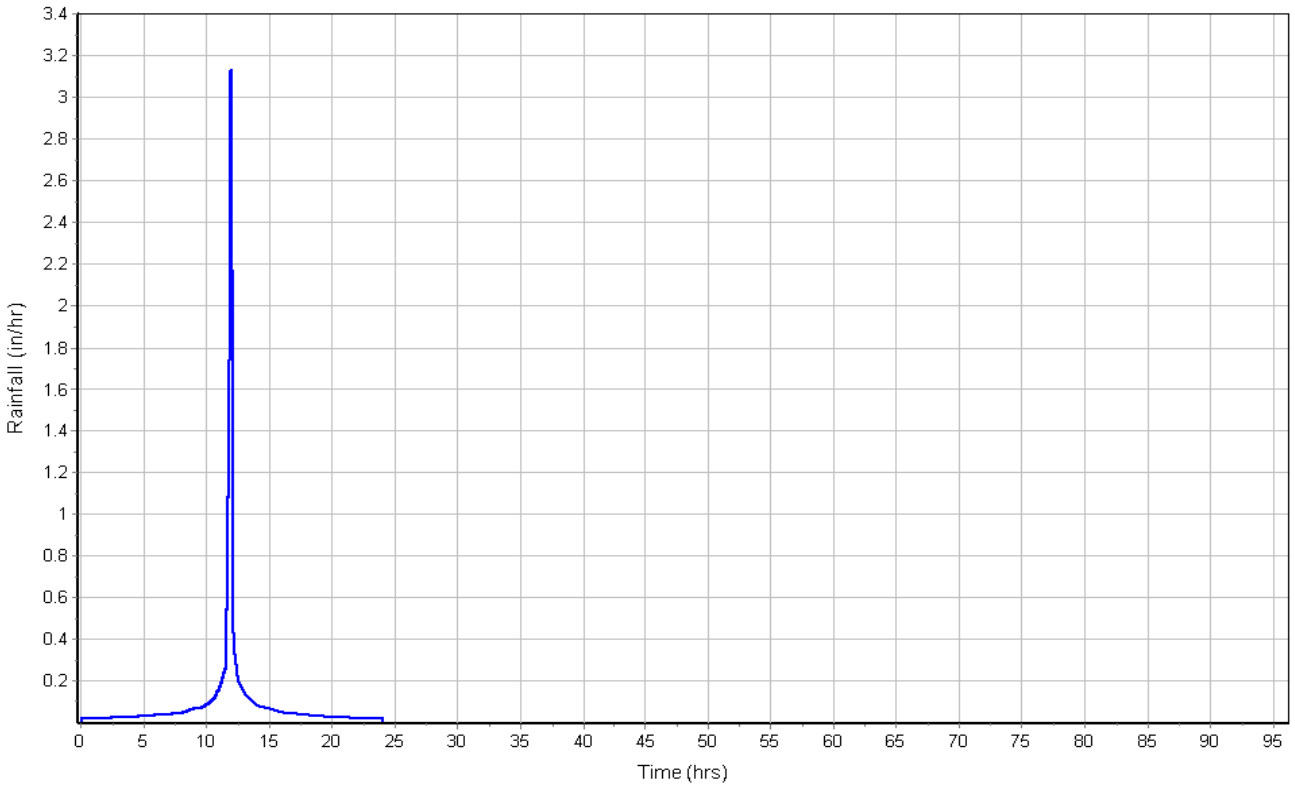
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

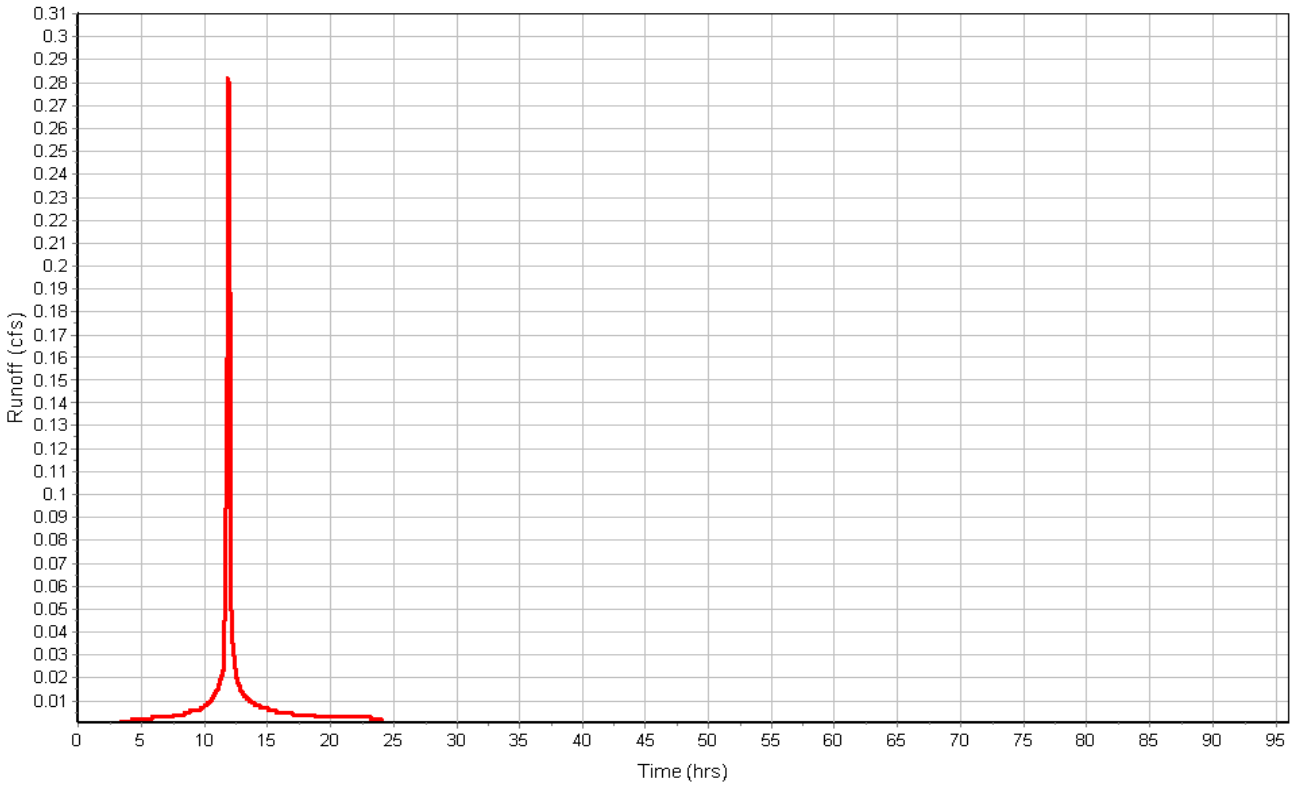
Total Rainfall (in)	2.28
Total Runoff (in)	2.04
Peak Runoff (cfs)	0.28
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_38_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_38_VACANT

Input Data

Area (ac) 0.25
Peak Rate Factor 484.00
Weighted Curve Number 58.00
Rain Gage ID ..... DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.25	B	58.00
Composite Area & Weighted CN	0.25		58.00

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0.00	0.00
Flow Length (ft) :	230	0.00	0.00
Slope (%) :	1	0.00	0.00
2 yr, 24 hr Rainfall (in) :	1.20	0.00	0.00
Velocity (ft/sec) :	0.07	0.00	0.00
Computed Flow Time (min) :	51.74	0.00	0.00

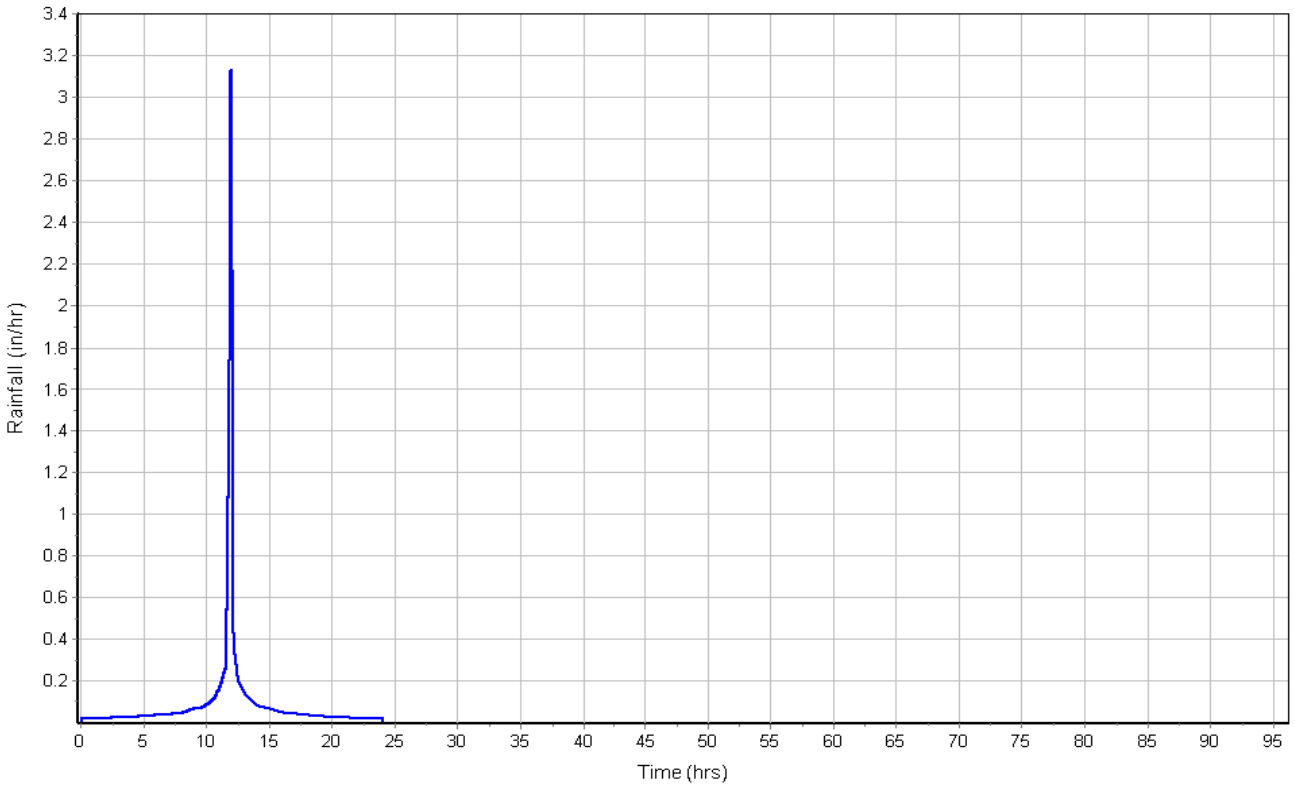
Total TOC (min) 51.74

Subbasin Runoff Results

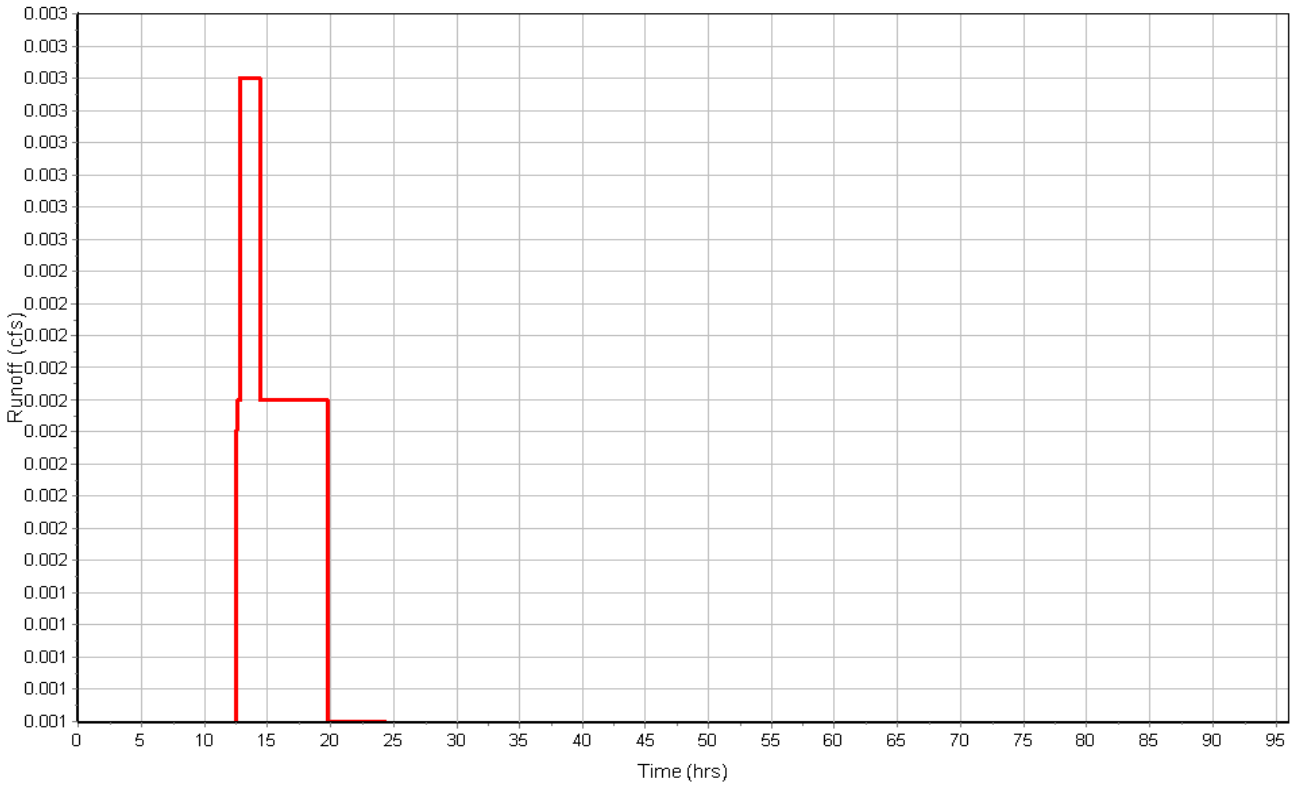
Total Rainfall (in) 2.28
Total Runoff (in) 0.08
Peak Runoff (cfs) 0.00
Weighted Curve Number 58.00
Time of Concentration (days hh:mm:ss) 0 00:51:44

Subbasin : BASIN_38_VACANT

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_4_ROW

Input Data

Area (ac)	0.06
Peak Rate Factor	484.00
Weighted Curve Number	98.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.06	B	98.00
Composite Area & Weighted CN	0.06		98.00

Time of Concentration

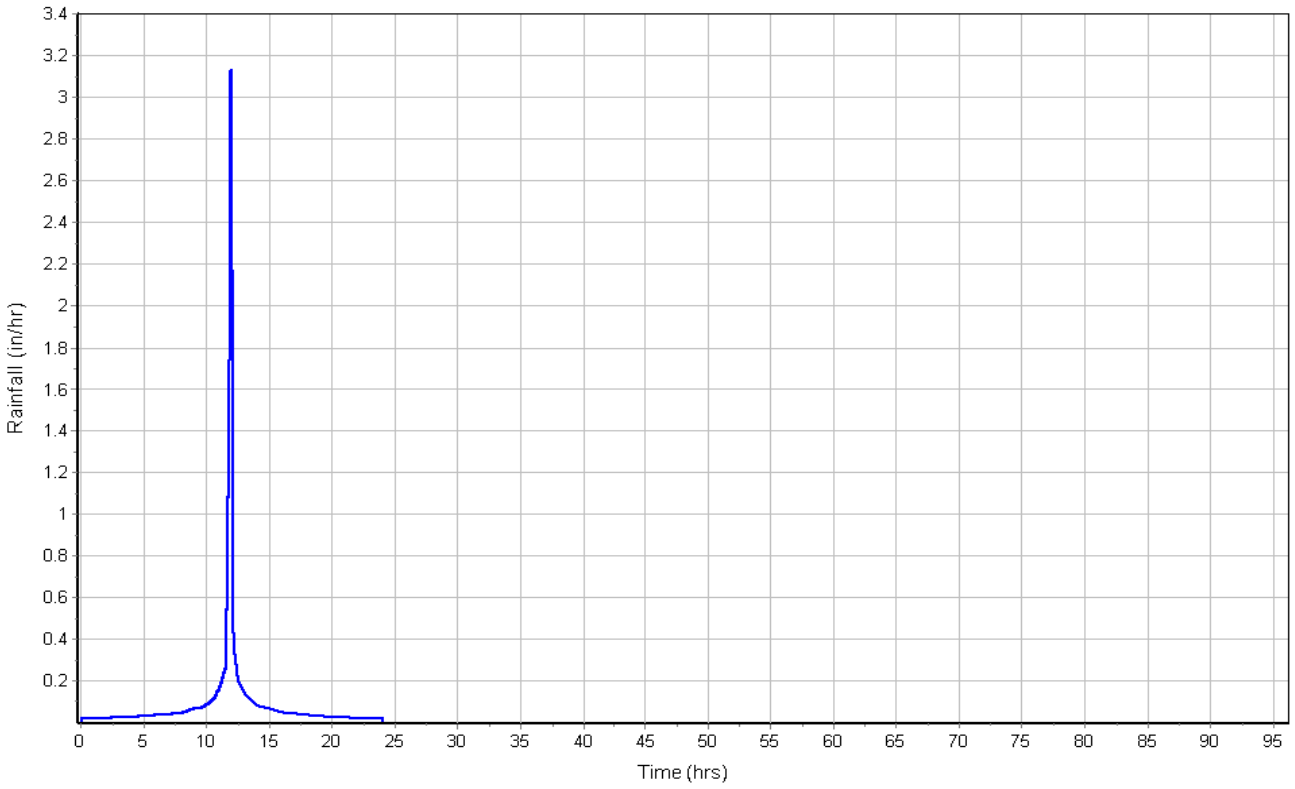
User-Defined TOC override (minutes): 5

Subbasin Runoff Results

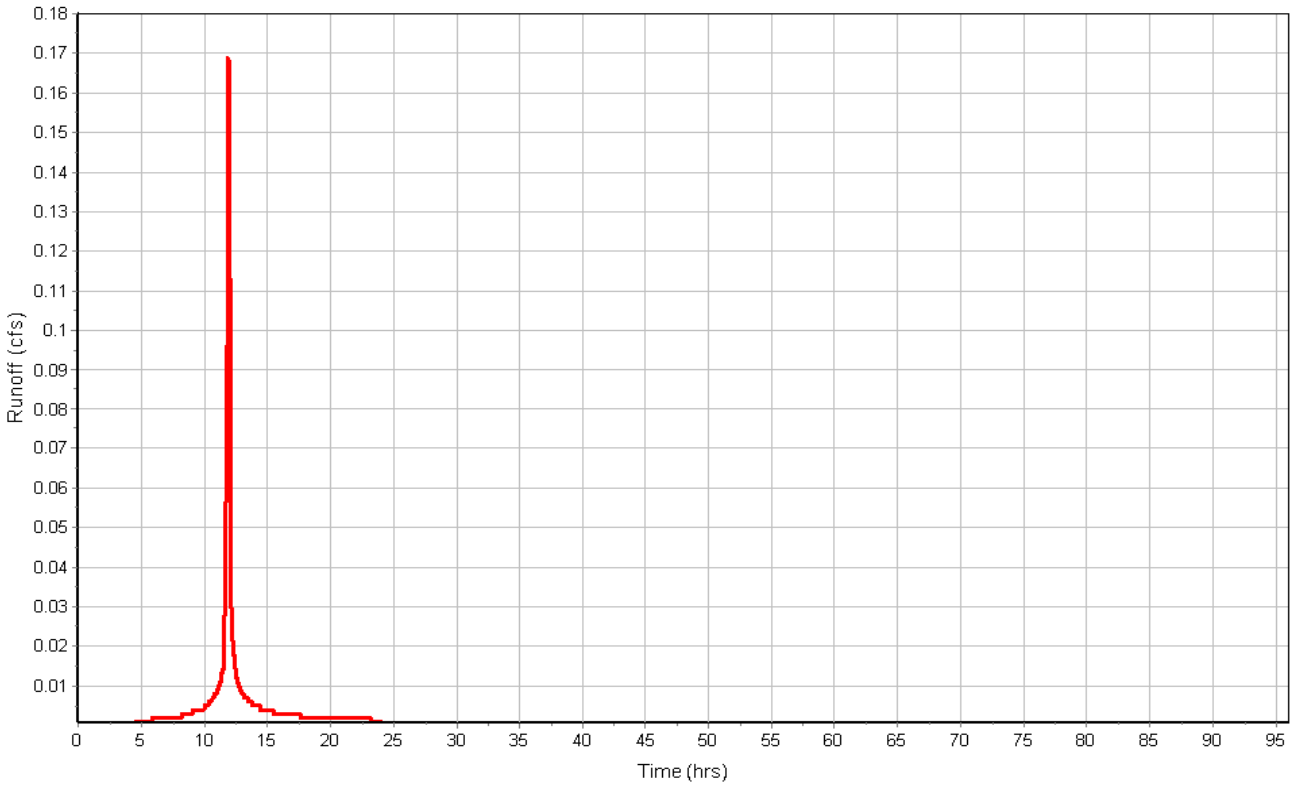
Total Rainfall (in)	2.28
Total Runoff (in)	2.03
Peak Runoff (cfs)	0.17
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : BASIN_4_ROW

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : BASIN_4_VACANT

Input Data

Area (ac)	0.04
Peak Rate Factor	484.00
Weighted Curve Number	58.00
Rain Gage ID	DESIGN-STORM

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Meadow, non-grazed	0.04	B	58.00
Composite Area & Weighted CN	0.04		58.00

Time of Concentration

Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft²)	Minimum Pipe Cover (in)
1	Jun-02	3151.24	3155.50	4.26	3151.24	0.00	3155.50	0.00	0.00	0.00

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Jun-02	1.89	0.00	3154.98	3.74	0.00	0.60	3152.50	1.26	0 17:52	0 00:00	0.00	0.00

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	Link-01	29.78	3154.22	10.00	3154.00	3154.00	0.22	0.7500	CIRCULAR	18.000	18.000	0.0150	0.5000	0.5000	0.0000	0.00	No
2	Link-02	140.60	3151.24	0.00	3150.37	3.86	0.87	0.6200	CIRCULAR	18.000	18.000	0.0110	0.5000	0.5000	0.0000	0.00	No
3	SDP 2	250.54	3150.27	3.76	3148.71	3.21	1.55	0.6200	CIRCULAR	18.000	18.000	0.0120	0.5000	0.5000	0.0000	0.00	No
4	SDP 3	45.01	3148.62	3.12	3148.34	2.84	0.28	0.6200	CIRCULAR	18.000	18.000	0.0120	0.5000	0.5000	0.0000	0.00	No
5	SDP 4	78.23	3148.14	2.64	3147.65	2.70	0.49	0.6200	CIRCULAR	18.000	18.000	0.0120	0.5000	0.5000	0.0000	0.00	No

No. of Barrels
1
1
1
1
1

Pipe Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	Link-01	0.04	0 12:27	7.87	0.00	1.19	0.42	0.07	0.05	0.00		Calculated
2	Link-02	0.71	0 12:39	9.76	0.07	0.68	3.45	1.50	1.00	2229.00		SURCHARGED
3	SDP 2	0.87	0 11:59	8.96	0.10	0.77	5.42	1.50	1.00	2874.00		SURCHARGED
4	SDP 3	0.51	0 11:58	8.96	0.06	1.15	0.65	1.50	1.00	4906.00		SURCHARGED
5	SDP 4	0.43	0 18:27	8.96	0.05	1.25	1.04	1.50	1.00	5050.00		SURCHARGED

Storage Nodes

Storage Node : EX-POND

Input Data

Invert Elevation (ft)	3150.40
Max (Rim) Elevation (ft)	3155.50
Max (Rim) Offset (ft)	5.10
Initial Water Elevation (ft)	3150.40
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	10000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.2800

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	L1-1	Side	CIRCULAR	No	4.50			3151.74	0.60
2	L1-2	Side	CIRCULAR	No	4.50			3151.74	0.60
3	L2-1	Side	CIRCULAR	No	4.50			3152.65	0.60
4	L2-2	Side	CIRCULAR	No	4.50			3152.65	0.60
5	L2-3	Side	CIRCULAR	No	4.50			3152.65	0.60
6	L2-4	Side	CIRCULAR	No	4.50			3152.65	0.60
7	L3	Side	CIRCULAR	No	4.50			3152.99	0.60

Output Summary Results

Peak Inflow (cfs)	13.32
Peak Lateral Inflow (cfs)	13.32
Peak Outflow (cfs)	1.89
Peak Exfiltration Flow Rate (cfm)	16.80
Max HGL Elevation Attained (ft)	3154.97
Max HGL Depth Attained (ft)	4.57
Average HGL Elevation Attained (ft)	3152.16
Average HGL Depth Attained (ft)	1.76
Time of Max HGL Occurrence (days hh:mm)	0 18:11
Total Exfiltration Volume (1000-ft³)	63.532
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : Out-1SDP 4

Input Data

Invert Elevation (ft)	3144.95
Max (Rim) Elevation (ft)	3154.95
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.95
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0023

Output Summary Results

Peak Inflow (cfs)	0.44
Peak Lateral Inflow (cfs)	0.17
Peak Outflow (cfs)	0.17
Peak Exfiltration Flow Rate (cfm)	0.14
Max HGL Elevation Attained (ft)	3154.95
Max HGL Depth Attained (ft)	10
Average HGL Elevation Attained (ft)	3151.63
Average HGL Depth Attained (ft)	6.68
Time of Max HGL Occurrence (days hh:mm)	0 17:37
Total Exfiltration Volume (1000-ft³)	0.748
Total Flooded Volume (ac-in)	1.63
Total Time Flooded (min)	415
Total Retention Time (sec)	0.00

Storage Node : SDS 1

Input Data

Invert Elevation (ft)	3146.51
Max (Rim) Elevation (ft)	3156.51
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3146.51
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0012

Output Summary Results

Peak Inflow (cfs)	0.87
Peak Lateral Inflow (cfs)	0.00
Peak Outflow (cfs)	0.43
Peak Exfiltration Flow Rate (cfm)	0.07
Max HGL Elevation Attained (ft)	3154.96
Max HGL Depth Attained (ft)	8.45
Average HGL Elevation Attained (ft)	3151.76
Average HGL Depth Attained (ft)	5.25
Time of Max HGL Occurrence (days hh:mm)	0 17:49
Total Exfiltration Volume (1000-ft³)	0.363
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 10

Input Data

Invert Elevation (ft)	3144.15
Max (Rim) Elevation (ft)	3154.15
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.15
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0019

Output Summary Results

Peak Inflow (cfs)	0.28
Peak Lateral Inflow (cfs)	0.28
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.11
Max HGL Elevation Attained (ft)	3154.27
Max HGL Depth Attained (ft)	10.12
Average HGL Elevation Attained (ft)	3151.09
Average HGL Depth Attained (ft)	6.94
Time of Max HGL Occurrence (days hh:mm)	1 00:04
Total Exfiltration Volume (1000-ft³)	0.630
Total Flooded Volume (ac-in)	0.03
Total Time Flooded (min)	1675
Total Retention Time (sec)	0.00

Storage Node : SDS 11

Input Data

Invert Elevation (ft)	3144.06
Max (Rim) Elevation (ft)	3154.06
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.06
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0068

Output Summary Results

Peak Inflow (cfs)	0.43
Peak Lateral Inflow (cfs)	0.43
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.41
Max HGL Elevation Attained (ft)	3153.90
Max HGL Depth Attained (ft)	9.84
Average HGL Elevation Attained (ft)	3147.23
Average HGL Depth Attained (ft)	3.17
Time of Max HGL Occurrence (days hh:mm)	1 00:03
Total Exfiltration Volume (1000-ft³)	1.318
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 12

Input Data

Invert Elevation (ft)	3144.06
Max (Rim) Elevation (ft)	3154.06
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.06
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0019

Output Summary Results

Peak Inflow (cfs)	0.26
Peak Lateral Inflow (cfs)	0.26
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.11
Max HGL Elevation Attained (ft)	3154.18
Max HGL Depth Attained (ft)	10.12
Average HGL Elevation Attained (ft)	3150.97
Average HGL Depth Attained (ft)	6.91
Time of Max HGL Occurrence (days hh:mm)	1 00:19
Total Exfiltration Volume (1000-ft³)	0.630
Total Flooded Volume (ac-in)	0.03
Total Time Flooded (min)	1622
Total Retention Time (sec)	0.00

Storage Node : SDS 13

Input Data

Invert Elevation (ft)	3145.41
Max (Rim) Elevation (ft)	3155.41
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.41
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0033

Output Summary Results

Peak Inflow (cfs)	0.39
Peak Lateral Inflow (cfs)	0.39
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.20
Max HGL Elevation Attained (ft)	3155.42
Max HGL Depth Attained (ft)	10.01
Average HGL Elevation Attained (ft)	3150.87
Average HGL Depth Attained (ft)	5.46
Time of Max HGL Occurrence (days hh:mm)	1 00:04
Total Exfiltration Volume (1000-ft³)	1.094
Total Flooded Volume (ac-in)	0.00
Total Time Flooded (min)	159
Total Retention Time (sec)	0.00

Storage Node : SDS 14

Input Data

Invert Elevation (ft)	3145.41
Max (Rim) Elevation (ft)	3155.41
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.41
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0068

Output Summary Results

Peak Inflow (cfs)	0.45
Peak Lateral Inflow (cfs)	0.45
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.41
Max HGL Elevation Attained (ft)	3155.45
Max HGL Depth Attained (ft)	10.04
Average HGL Elevation Attained (ft)	3148.85
Average HGL Depth Attained (ft)	3.44
Time of Max HGL Occurrence (days hh:mm)	1 00:03
Total Exfiltration Volume (1000-ft³)	1.374
Total Flooded Volume (ac-in)	0.01
Total Time Flooded (min)	464
Total Retention Time (sec)	0.00

Storage Node : SDS 15

Input Data

Invert Elevation (ft)	3145.06
Max (Rim) Elevation (ft)	3155.06
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.06
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.37
Peak Lateral Inflow (cfs)	0.37
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3155.09
Max HGL Depth Attained (ft)	10.03
Average HGL Elevation Attained (ft)	3148.52
Average HGL Depth Attained (ft)	3.46
Time of Max HGL Occurrence (days hh:mm)	0 22:09
Total Exfiltration Volume (1000-ft³)	1.086
Total Flooded Volume (ac-in)	0.01
Total Time Flooded (min)	487
Total Retention Time (sec)	0.00

Storage Node : SDS 16

Input Data

Invert Elevation (ft)	3145.06
Max (Rim) Elevation (ft)	3155.06
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.06
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.37
Peak Lateral Inflow (cfs)	0.37
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3155.10
Max HGL Depth Attained (ft)	10.04
Average HGL Elevation Attained (ft)	3148.56
Average HGL Depth Attained (ft)	3.5
Time of Max HGL Occurrence (days hh:mm)	0 22:09
Total Exfiltration Volume (1000-ft³)	1.094
Total Flooded Volume (ac-in)	0.01
Total Time Flooded (min)	538
Total Retention Time (sec)	0.00

Storage Node : SDS 17

Input Data

Invert Elevation (ft)	3144.38
Max (Rim) Elevation (ft)	3154.38
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.38
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.36
Peak Lateral Inflow (cfs)	0.36
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3153.64
Max HGL Depth Attained (ft)	9.26
Average HGL Elevation Attained (ft)	3147.34
Average HGL Depth Attained (ft)	2.96
Time of Max HGL Occurrence (days hh:mm)	0 20:51
Total Exfiltration Volume (1000-ft³)	1.008
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 18

Input Data

Invert Elevation (ft)	3144.37
Max (Rim) Elevation (ft)	3154.37
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.37
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0038

Output Summary Results

Peak Inflow (cfs)	0.32
Peak Lateral Inflow (cfs)	0.32
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.23
Max HGL Elevation Attained (ft)	3154.48
Max HGL Depth Attained (ft)	10.11
Average HGL Elevation Attained (ft)	3148.68
Average HGL Depth Attained (ft)	4.31
Time of Max HGL Occurrence (days hh:mm)	1 00:03
Total Exfiltration Volume (1000-ft³)	0.905
Total Flooded Volume (ac-in)	0.03
Total Time Flooded (min)	1125
Total Retention Time (sec)	0.00

Storage Node : SDS 19

Input Data

Invert Elevation (ft)	3144.52
Max (Rim) Elevation (ft)	3154.52
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.52
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0012

Output Summary Results

Peak Inflow (cfs)	0.22
Peak Lateral Inflow (cfs)	0.22
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.07
Max HGL Elevation Attained (ft)	3154.64
Max HGL Depth Attained (ft)	10.12
Average HGL Elevation Attained (ft)	3152.21
Average HGL Depth Attained (ft)	7.69
Time of Max HGL Occurrence (days hh:mm)	1 00:03
Total Exfiltration Volume (1000-ft³)	0.397
Total Flooded Volume (ac-in)	0.03
Total Time Flooded (min)	2434
Total Retention Time (sec)	0.00

Storage Node : SDS 2

Input Data

Invert Elevation (ft)	3145.50
Max (Rim) Elevation (ft)	3155.50
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.50
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0023

Output Summary Results

Peak Inflow (cfs)	0.99
Peak Lateral Inflow (cfs)	0.53
Peak Outflow (cfs)	0.87
Peak Exfiltration Flow Rate (cfm)	0.14
Max HGL Elevation Attained (ft)	3154.96
Max HGL Depth Attained (ft)	9.46
Average HGL Elevation Attained (ft)	3151.77
Average HGL Depth Attained (ft)	6.27
Time of Max HGL Occurrence (days hh:mm)	0 17:43
Total Exfiltration Volume (1000-ft³)	0.770
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 20

Input Data

Invert Elevation (ft)	3144.64
Max (Rim) Elevation (ft)	3154.64
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.64
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0026

Output Summary Results

Peak Inflow (cfs)	0.36
Peak Lateral Inflow (cfs)	0.36
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.16
Max HGL Elevation Attained (ft)	3154.77
Max HGL Depth Attained (ft)	10.13
Average HGL Elevation Attained (ft)	3151.26
Average HGL Depth Attained (ft)	6.62
Time of Max HGL Occurrence (days hh:mm)	1 00:04
Total Exfiltration Volume (1000-ft³)	0.863
Total Flooded Volume (ac-in)	0.04
Total Time Flooded (min)	1372
Total Retention Time (sec)	0.00

Storage Node : SDS 21

Input Data

Invert Elevation (ft)	3144.66
Max (Rim) Elevation (ft)	3154.66
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.66
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.36
Peak Lateral Inflow (cfs)	0.36
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3154.30
Max HGL Depth Attained (ft)	9.64
Average HGL Elevation Attained (ft)	3147.78
Average HGL Depth Attained (ft)	3.12
Time of Max HGL Occurrence (days hh:mm)	0 20:51
Total Exfiltration Volume (1000-ft³)	1.033
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 22

Input Data

Invert Elevation (ft)	3146.75
Max (Rim) Elevation (ft)	3156.75
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3146.75
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0068

Output Summary Results

Peak Inflow (cfs)	0.41
Peak Lateral Inflow (cfs)	0.41
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.41
Max HGL Elevation Attained (ft)	3156.05
Max HGL Depth Attained (ft)	9.3
Average HGL Elevation Attained (ft)	3149.68
Average HGL Depth Attained (ft)	2.93
Time of Max HGL Occurrence (days hh:mm)	1 00:03
Total Exfiltration Volume (1000-ft³)	1.272
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 23

Input Data

Invert Elevation (ft)	3146.75
Max (Rim) Elevation (ft)	3156.75
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3146.75
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0068

Output Summary Results

Peak Inflow (cfs)	0.41
Peak Lateral Inflow (cfs)	0.41
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.41
Max HGL Elevation Attained (ft)	3155.67
Max HGL Depth Attained (ft)	8.92
Average HGL Elevation Attained (ft)	3149.54
Average HGL Depth Attained (ft)	2.79
Time of Max HGL Occurrence (days hh:mm)	1 00:00
Total Exfiltration Volume (1000-ft³)	1.241
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 24

Input Data

Invert Elevation (ft)	3145.70
Max (Rim) Elevation (ft)	3155.70
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.70
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0038

Output Summary Results

Peak Inflow (cfs)	0.34
Peak Lateral Inflow (cfs)	0.34
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.23
Max HGL Elevation Attained (ft)	3155.84
Max HGL Depth Attained (ft)	10.14
Average HGL Elevation Attained (ft)	3150.27
Average HGL Depth Attained (ft)	4.57
Time of Max HGL Occurrence (days hh:mm)	1 00:02
Total Exfiltration Volume (1000-ft³)	0.938
Total Flooded Volume (ac-in)	0.04
Total Time Flooded (min)	1302
Total Retention Time (sec)	0.00

Storage Node : SDS 25

Input Data

Invert Elevation (ft)	3145.96
Max (Rim) Elevation (ft)	3155.96
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.96
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.37
Peak Lateral Inflow (cfs)	0.37
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3155.82
Max HGL Depth Attained (ft)	9.86
Average HGL Elevation Attained (ft)	3149.18
Average HGL Depth Attained (ft)	3.22
Time of Max HGL Occurrence (days hh:mm)	0 22:09
Total Exfiltration Volume (1000-ft³)	1.047
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 26

Input Data

Invert Elevation (ft)	3145.93
Max (Rim) Elevation (ft)	3155.93
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.93
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0068

Output Summary Results

Peak Inflow (cfs)	0.49
Peak Lateral Inflow (cfs)	0.49
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.41
Max HGL Elevation Attained (ft)	3155.96
Max HGL Depth Attained (ft)	10.03
Average HGL Elevation Attained (ft)	3149.33
Average HGL Depth Attained (ft)	3.4
Time of Max HGL Occurrence (days hh:mm)	0 22:21
Total Exfiltration Volume (1000-ft³)	1.361
Total Flooded Volume (ac-in)	0.01
Total Time Flooded (min)	514
Total Retention Time (sec)	0.00

Storage Node : SDS 27

Input Data

Invert Elevation (ft)	3145.69
Max (Rim) Elevation (ft)	3155.69
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.69
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0023

Output Summary Results

Peak Inflow (cfs)	0.15
Peak Lateral Inflow (cfs)	0.15
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.14
Max HGL Elevation Attained (ft)	3152.52
Max HGL Depth Attained (ft)	6.83
Average HGL Elevation Attained (ft)	3147.50
Average HGL Depth Attained (ft)	1.81
Time of Max HGL Occurrence (days hh:mm)	0 16:43
Total Exfiltration Volume (1000-ft³)	0.371
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 28

Input Data

Invert Elevation (ft)	3146.31
Max (Rim) Elevation (ft)	3156.31
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3146.31
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.36
Peak Lateral Inflow (cfs)	0.36
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3156.04
Max HGL Depth Attained (ft)	9.73
Average HGL Elevation Attained (ft)	3149.46
Average HGL Depth Attained (ft)	3.15
Time of Max HGL Occurrence (days hh:mm)	0 20:51
Total Exfiltration Volume (1000-ft³)	1.037
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 29

Input Data

Invert Elevation (ft)	3146.31
Max (Rim) Elevation (ft)	3156.31
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3146.31
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.36
Peak Lateral Inflow (cfs)	0.36
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3155.94
Max HGL Depth Attained (ft)	9.63
Average HGL Elevation Attained (ft)	3149.42
Average HGL Depth Attained (ft)	3.11
Time of Max HGL Occurrence (days hh:mm)	0 20:51
Total Exfiltration Volume (1000-ft³)	1.030
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 3

Input Data

Invert Elevation (ft)	3145.50
Max (Rim) Elevation (ft)	3155.50
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.50
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0023

Output Summary Results

Peak Inflow (cfs)	0.56
Peak Lateral Inflow (cfs)	0.43
Peak Outflow (cfs)	0.51
Peak Exfiltration Flow Rate (cfm)	0.14
Max HGL Elevation Attained (ft)	3154.96
Max HGL Depth Attained (ft)	9.46
Average HGL Elevation Attained (ft)	3151.74
Average HGL Depth Attained (ft)	6.24
Time of Max HGL Occurrence (days hh:mm)	0 17:43
Total Exfiltration Volume (1000-ft³)	0.768
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 30

Input Data

Invert Elevation (ft)	3145.07
Max (Rim) Elevation (ft)	3155.07
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.07
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0068

Output Summary Results

Peak Inflow (cfs)	0.45
Peak Lateral Inflow (cfs)	0.45
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.41
Max HGL Elevation Attained (ft)	3155.07
Max HGL Depth Attained (ft)	10
Average HGL Elevation Attained (ft)	3148.32
Average HGL Depth Attained (ft)	3.25
Time of Max HGL Occurrence (days hh:mm)	0 22:11
Total Exfiltration Volume (1000-ft³)	1.332
Total Flooded Volume (ac-in)	0.00
Total Time Flooded (min)	110
Total Retention Time (sec)	0.00

Storage Node : SDS 31

Input Data

Invert Elevation (ft)	3145.07
Max (Rim) Elevation (ft)	3155.07
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.07
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0068

Output Summary Results

Peak Inflow (cfs)	0.45
Peak Lateral Inflow (cfs)	0.45
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.41
Max HGL Elevation Attained (ft)	3155.07
Max HGL Depth Attained (ft)	10
Average HGL Elevation Attained (ft)	3148.33
Average HGL Depth Attained (ft)	3.26
Time of Max HGL Occurrence (days hh:mm)	0 18:47
Total Exfiltration Volume (1000-ft³)	1.333
Total Flooded Volume (ac-in)	0.01
Total Time Flooded (min)	316
Total Retention Time (sec)	0.00

Storage Node : SDS 32

Input Data

Invert Elevation (ft)	3145.81
Max (Rim) Elevation (ft)	3155.81
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.81
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0033

Output Summary Results

Peak Inflow (cfs)	0.36
Peak Lateral Inflow (cfs)	0.36
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.20
Max HGL Elevation Attained (ft)	3155.26
Max HGL Depth Attained (ft)	9.45
Average HGL Elevation Attained (ft)	3150.75
Average HGL Depth Attained (ft)	4.94
Time of Max HGL Occurrence (days hh:mm)	1 00:04
Total Exfiltration Volume (1000-ft³)	1.067
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 33

Input Data

Invert Elevation (ft)	3145.81
Max (Rim) Elevation (ft)	3155.81
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.81
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0033

Output Summary Results

Peak Inflow (cfs)	0.36
Peak Lateral Inflow (cfs)	0.36
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.20
Max HGL Elevation Attained (ft)	3155.30
Max HGL Depth Attained (ft)	9.49
Average HGL Elevation Attained (ft)	3150.79
Average HGL Depth Attained (ft)	4.98
Time of Max HGL Occurrence (days hh:mm)	1 00:04
Total Exfiltration Volume (1000-ft³)	1.071
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 34

Input Data

Invert Elevation (ft)	3145.71
Max (Rim) Elevation (ft)	3155.71
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.71
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0019

Output Summary Results

Peak Inflow (cfs)	0.21
Peak Lateral Inflow (cfs)	0.21
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.11
Max HGL Elevation Attained (ft)	3155.73
Max HGL Depth Attained (ft)	10.02
Average HGL Elevation Attained (ft)	3151.38
Average HGL Depth Attained (ft)	5.67
Time of Max HGL Occurrence (days hh:mm)	1 00:26
Total Exfiltration Volume (1000-ft³)	0.625
Total Flooded Volume (ac-in)	0.01
Total Time Flooded (min)	329
Total Retention Time (sec)	0.00

Storage Node : SDS 35

Input Data

Invert Elevation (ft)	3145.69
Max (Rim) Elevation (ft)	3155.69
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.69
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0019

Output Summary Results

Peak Inflow (cfs)	0.21
Peak Lateral Inflow (cfs)	0.21
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.11
Max HGL Elevation Attained (ft)	3154.92
Max HGL Depth Attained (ft)	9.23
Average HGL Elevation Attained (ft)	3150.51
Average HGL Depth Attained (ft)	4.82
Time of Max HGL Occurrence (days hh:mm)	1 00:14
Total Exfiltration Volume (1000-ft³)	0.625
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 36

Input Data

Invert Elevation (ft)	3145.61
Max (Rim) Elevation (ft)	3155.61
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.61
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.37
Peak Lateral Inflow (cfs)	0.37
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3155.61
Max HGL Depth Attained (ft)	10
Average HGL Elevation Attained (ft)	3148.91
Average HGL Depth Attained (ft)	3.3
Time of Max HGL Occurrence (days hh:mm)	0 22:09
Total Exfiltration Volume (1000-ft³)	1.059
Total Flooded Volume (ac-in)	0.00
Total Time Flooded (min)	170
Total Retention Time (sec)	0.00

Storage Node : SDS 37

Input Data

Invert Elevation (ft)	3145.61
Max (Rim) Elevation (ft)	3155.61
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.61
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.36
Peak Lateral Inflow (cfs)	0.36
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3155.30
Max HGL Depth Attained (ft)	9.69
Average HGL Elevation Attained (ft)	3148.74
Average HGL Depth Attained (ft)	3.13
Time of Max HGL Occurrence (days hh:mm)	0 20:51
Total Exfiltration Volume (1000-ft³)	1.034
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : SDS 5

Input Data

Invert Elevation (ft)	3144.22
Max (Rim) Elevation (ft)	3154.22
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.22
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0038

Output Summary Results

Peak Inflow (cfs)	0.43
Peak Lateral Inflow (cfs)	0.43
Peak Outflow (cfs)	0.04
Peak Exfiltration Flow Rate (cfm)	0.23
Max HGL Elevation Attained (ft)	3154.30
Max HGL Depth Attained (ft)	10.08
Average HGL Elevation Attained (ft)	3147.95
Average HGL Depth Attained (ft)	3.73
Time of Max HGL Occurrence (days hh:mm)	0 12:27
Total Exfiltration Volume (1000-ft³)	0.833
Total Flooded Volume (ac-in)	0.02
Total Time Flooded (min)	850
Total Retention Time (sec)	0.00

Storage Node : SDS 6

Input Data

Invert Elevation (ft)	3144.22
Max (Rim) Elevation (ft)	3154.22
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.22
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0053

Output Summary Results

Peak Inflow (cfs)	0.37
Peak Lateral Inflow (cfs)	0.37
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.32
Max HGL Elevation Attained (ft)	3154.25
Max HGL Depth Attained (ft)	10.03
Average HGL Elevation Attained (ft)	3147.66
Average HGL Depth Attained (ft)	3.44
Time of Max HGL Occurrence (days hh:mm)	0 22:09
Total Exfiltration Volume (1000-ft³)	1.083
Total Flooded Volume (ac-in)	0.01
Total Time Flooded (min)	471
Total Retention Time (sec)	0.00

Storage Node : SDS 7

Input Data

Invert Elevation (ft)	3144.19
Max (Rim) Elevation (ft)	3154.19
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.19
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0023

Output Summary Results

Peak Inflow (cfs)	0.21
Peak Lateral Inflow (cfs)	0.21
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.14
Max HGL Elevation Attained (ft)	3154.30
Max HGL Depth Attained (ft)	10.11
Average HGL Elevation Attained (ft)	3149.20
Average HGL Depth Attained (ft)	5.01
Time of Max HGL Occurrence (days hh:mm)	1 00:03
Total Exfiltration Volume (1000-ft³)	0.625
Total Flooded Volume (ac-in)	0.03
Total Time Flooded (min)	1427
Total Retention Time (sec)	0.00

Storage Node : SDS 8

Input Data

Invert Elevation (ft)	3144.19
Max (Rim) Elevation (ft)	3154.19
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.19
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0038

Output Summary Results

Peak Inflow (cfs)	0.30
Peak Lateral Inflow (cfs)	0.30
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.23
Max HGL Elevation Attained (ft)	3154.24
Max HGL Depth Attained (ft)	10.05
Average HGL Elevation Attained (ft)	3147.97
Average HGL Depth Attained (ft)	3.78
Time of Max HGL Occurrence (days hh:mm)	1 00:01
Total Exfiltration Volume (1000-ft³)	0.837
Total Flooded Volume (ac-in)	0.01
Total Time Flooded (min)	750
Total Retention Time (sec)	0.00

Storage Node : SDS 9

Input Data

Invert Elevation (ft)	3144.20
Max (Rim) Elevation (ft)	3154.20
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3144.20
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0038

Output Summary Results

Peak Inflow (cfs)	0.28
Peak Lateral Inflow (cfs)	0.28
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.23
Max HGL Elevation Attained (ft)	3154.20
Max HGL Depth Attained (ft)	10
Average HGL Elevation Attained (ft)	3147.57
Average HGL Depth Attained (ft)	3.37
Time of Max HGL Occurrence (days hh:mm)	0 23:13
Total Exfiltration Volume (1000-ft³)	0.786
Total Flooded Volume (ac-in)	0.00
Total Time Flooded (min)	289
Total Retention Time (sec)	0.00

Storage Node : SDS_38

Input Data

Invert Elevation (ft)	3145.96
Max (Rim) Elevation (ft)	3155.96
Max (Rim) Offset (ft)	10.00
Initial Water Elevation (ft)	3145.96
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	1000.00
Evaporation Loss	0.00

Infiltration/Exfiltration

Constant Flow Rate (cfs)	0.0038

Output Summary Results

Peak Inflow (cfs)	0.28
Peak Lateral Inflow (cfs)	0.28
Peak Outflow (cfs)	0.00
Peak Exfiltration Flow Rate (cfm)	0.23
Max HGL Elevation Attained (ft)	3155.97
Max HGL Depth Attained (ft)	10.01
Average HGL Elevation Attained (ft)	3149.36
Average HGL Depth Attained (ft)	3.4
Time of Max HGL Occurrence (days hh:mm)	0 23:13
Total Exfiltration Volume (1000-ft³)	0.789
Total Flooded Volume (ac-in)	0.00
Total Time Flooded (min)	329
Total Retention Time (sec)	0.00