

**LAKE POINT CITY COUNCIL
RESOLUTION NO: 2025-11
ADOPTING A STORMWATER MASTER PLAN**

WHEREAS Lake Point is granted certain enumerated powers as a municipality of the State of Utah pursuant to the Utah Code Ann., Title 10, the Utah Municipal Code (“Code”);

WHEREAS the Lake Point City Council (“Council”) is authorized to carry out the powers of the responsibilities of the city, including those to adopt a Stormwater Master Plan to study identifying flood risks, and proposing preliminary alternatives to mitigate flooding for watersheds draining in and around Lake Point.

WHEREAS the purpose of the Stormwater Master Plan is to determine the increase in runoff caused by the urbanization of Lake Point and to determine Lake Point’s ability to manage runoff from off-site drainages. The Stormwater Master Plan also proposes solutions to any deficiencies found during this study. This report is to be used as a reference to correct current drainage deficiencies and plan for the future as the area experience growth.

WHEREAS the Council has received reports, presentations, and supporting information from Jones & DeMille Engineering culminating in a document entitled the “Lake Point City Stormwater Master Plan Study Final Report” dated May 8, 2025.

WHEREAS the Council understands the Stormwater Master Plan to be a guiding document in making future decisions covered by the Stormwater Master Plan.

WHEREAS the Council desires to approve the plan and finds that approving the plan is in the best interest of Lake Point and its residents.

NOW THEREFORE, BE IT RESOLVED by the Lake Point City Council as follows:

1. The Council hereby authorizes and approves the Stormwater Master Plan in substantially the form presented to this meeting of the Lake Point City Council, attached as **Exhibit A**.
2. The appropriate officials and staff are hereby authorized and directed to carry out the necessary actions in substantially the form presented to this meeting of the Commission.
3. If any section, clause, or portion of this Resolution is declared invalid by a court of competent jurisdiction, the remainder shall not be affected thereby and shall remain in full force and effect.
4. This resolution shall be effective immediately upon passage.

PASSED, APPROVED, AND ADOPTED on the 25 day of June, 2025

Lake Point

By Alexis Wheeler
Chair

ATTEST:

Janell
City Recorder

SEAL

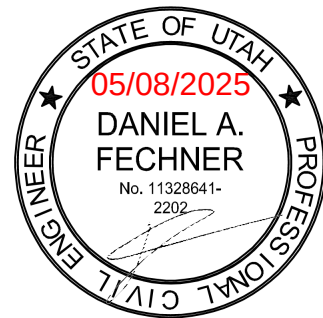
Voting:

Alexis Wheeler	Yea___	Nay <u>X</u>	Absent ___
Jonathan Garrard	Yea___	Nay <u>X</u>	Absent ___
Kirk Pearson	Yea <u>X</u>	Nay___	Absent ___
Kathleen VonHatten	Yea <u>X</u>	Nay___	Absent ___
Ryan Zumwalt	Yea <u>X</u>	Nay___	Absent ___

2025 06.25
EXHIBIT A

LAKE POINT CITY STORMWATER MASTER PLAN STUDY

FINAL REPORT



May 8, 2025

Project #: 2311-048



Prepared by:



**Jones & DeMille
Engineering**

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1. INTRODUCTION

1.1. PURPOSE AND SCOPE

Lake Point (the City) contracted Jones and DeMille Engineering (JDE) to complete a stormwater masterplan study identifying flood risks and proposing preliminary alternatives to mitigate flooding for watersheds draining in and around Lake Point. The purpose of this study is to determine the increase in runoff caused by the urbanization of Lake Point and to determine Lake Point's ability to manage runoff from off-site drainages. This report will also propose solutions to any deficiencies found during this study. This report is to be used as a reference to correct current drainage deficiencies and plan for the future as the area experiences growth.

The primary tasks and objectives of this report are to:

- Develop a database cataloging existing stormwater conveyance infrastructure.
- Evaluate existing conditions and future development hydrology and hydraulics.
- Identify existing deficiencies (flooding potential).
- Propose alternatives to mitigate future flooding.
- Provide high level cost estimates and benefits to aid in project prioritization and determine future fundability of proposed projects.

For the purposes of this study, the flooding in Lake Point will be broken down into two categories, major and minor flooding. Major flooding issues are generally larger scale flooding caused by watersheds outside the City limits while minor flooding issues are localized and originating inside Lake Point. While major flooding may originate outside the City, in-town flooding can result as this runoff is conveyed through the City. This two-part breakdown will help to clarify the effect that the urbanization of Lake Point has had on stormwater runoff. The two-part breakdown will also help to clarify potential funding sources available. The major flooding issues are generally fundable through FEMA and NRCS programs while the minor flooding will need to be funded through programs available to Lake Point such as the Utah Community Impact Board.

1.2. STUDY AREA

The City of Lake Point is a small community of approximately 2,599 residents located in Tooele County, Utah. The City is located on the south shore of the Great Salt Lake and the northeastern end of Tooele County in the foothills of the Oquirrh Mountain Range. Lake Point was originally a Pioneer community, settled in 1854 as E.T. City. It was renamed Lake Point in 1923 and incorporated into a city in 2022. The City is rapidly growing but continues to pride itself in preserving a rural lifestyle and heritage. A few of the newer subdivisions have piped storm water conveyance, but the majority of the system is roadside swales and ditches that convey water through the City even in the newer areas. This study includes all drainage basins running into and throughout the City boundaries.

1.3. HISTORICAL FLOODING

Minor flooding Issues in Lake Point are generally minor roadway overtopping causing sediment and debris issues. Lake Point is concerned with the City's liability due to its urbanization potentially increasing downstream runoff as well as the large drainages to the east of the city that drain through it. Appendix A – Map 1 includes a map showing areas that have historically had problems with flooding as identified by city staff.

Large mountain drainages east of the City have high potential to cause major flooding during large storms. The railroad on the east side concentrates this runoff to a few crossings where it is conveyed under the tracks and into the City. Several of these crossings do not appear to have adequate downstream conveyance facilities; the conveyance facilities were likely removed as the city was developed.

2. EXISTING STORM DRAINAGE

2.1. STORM DRAINAGE SYSTEM OVERVIEW

There is little existing drainage infrastructure in Lake Point. Where drainage infrastructure does exist, it mainly consists of roadside gravel swales and a piped drainage system in newer areas of the City. Several large ditches have been constructed strategically to capture and direct the runoff. These larger ditches and piped storm drain systems are located primarily in the more recently developed areas of the City, with the older areas having little to no storm infrastructure. Several natural gullies and manmade structures traverse the railroad above Lake Point. These gullies channelize the runoff to the several crossings under the railroad tracks. In the north half of the City there are several small local retention basins scattered throughout and one large regional basin. While there are a few smaller local basins in newer subdivisions, they are sized to only manage the runoff from the respective subdivisions. There are no large detention or retention facilities in the south half of the City.

2.2. MAPPING, SURVEYING, AND DATA COLLECTION

A web map was provided where city staff marked historic flooding or other drainage problem areas that they were aware of (see Appendix A – Map 1). Additionally, information on the existing stormwater infrastructure was provided in the form of as-built drawings. Site visits were conducted as part of this study for further data collection where additional details or information was necessary. The data collected by the as-built drawings and site visits were added to the map shown in Appendix A – Map 4. This existing infrastructure mapping includes only the general location and sizing. No survey was completed as part of this mapping.

The collected data, consisting of locations and brief descriptions, were added to a GIS database for the City. The database is intended to be maintained by the City to enable management of the stormwater infrastructure as the area continues to develop.

Additional data referenced in this study includes soil type, historic precipitation data, land use and cover types, and digital elevation models (DEM). This data was used for hydrologic calculations and modeling.

3. HYDROLOGIC AND HYDRAULIC MODEL SETUP

3.1. METHODOLOGY & DESIGN CRITERIA

3.1.1. HYDROLOGY

Hydrologic analyses were performed for the watersheds in and around Lake Point in two separate evaluations. One analysis with the mountainous watersheds and a second analysis with the watersheds within the City. The mountainous watersheds were evaluated using a common method called the *Soil Conservation Service (SCS) Technical Release 55 – Urban Hydrology for Small Watersheds*, commonly referred to as TR-55. The hydrologic scenarios were then modeled using a software called the *U.S. Army Corps (USACE) Hydrologic Engineering Center's Hydrologic Modeling System (HEC-HMS)*. This analysis provided graphs which relate how water flow changes over time called hydrographs for each mountain watershed (Appendix B).

For the City watersheds a different modeling approach was taken, using Autodesk's Storm and Sanitary Analysis (SSA) to estimate watershed runoff and more accurately analyze the capacity of the existing drainage system. The SSA model used the same SCS method as the mountain watersheds for the majority of the analysis. However, a different time of concentration calculation was used. See Section 3.2.8 for more information on the time of concentration calculations.

3.1.2. HYDRAULICS

The hydraulics of stormwater conveyance structures (e.g., pipes, culverts, open channels, detention basins) were modeled using SSA software. The SSA model used the HEC-HMS output hydrographs resulting from the mountain watersheds as inflow hydrographs applied to the upstream end of each of the culverts under the railroad. Data required to analyze the hydraulics of some conveyance structures, such as invert elevations, sizing measurements, and cross-sections, were approximated based off topography (DEM) and aerial imagery. The larger culverts conveying water under the railroad were visually inspected and measured (Appendix C). Pipe entrance and exit loss coefficients as well as pipe and open channel roughness coefficients (Manning's *n* values) were estimated based on field notes, pictures, and aerial imagery.

3.2. DESIGN STORM

3.2.1. FREQUENCY

Design storm events are typically categorized by the recurrence interval or storm frequency and are reported in years ranging from a 2-year storm event to a 100-year storm event. The storm frequency represents the probability of how often a given storm will occur. For example, a 100-year storm event

has the probability of occurring once every 100 years. However, it is possible to have more or less than one of these storms in a 100-year period as this is a probability of occurrence.

The design storm frequency is selected based on the level of acceptable risk, mitigation cost versus benefit, and the type of conveyance being designed. For example, culverts under small local streets are typically designed for a smaller storm event such as a 10-year storm, whereas culverts under larger county roads or highways, or along main drainage corridors are designed for a larger storm event such as a 100-year storm. If the local street is flooded, the damage will be less severe and the effects on the community more concentrated. Whereas if a larger county road or highway is flooded, repairs will be more costly and the impact on the community more widely spread.

Conveyance designed for a smaller storm event (10-year) is typically referred to as the minor drainage system, and conveyance designed for a larger storm event (100-year) is the major drainage system. The major drainage system components are highlighted in a map in Appendix A – Map 4.

3.2.2. RAINFALL

National Oceanic and Atmospheric Administration (NOAA) is a federal agency that studies and predicts weather patterns. Precipitation depths were taken from a gridded precipitation dataset downloaded from the NOAA Atlas 14 Point Precipitation Frequency Data Server. The centroid of each mountain watershed was used to determine a precipitation value for that watershed. The watersheds inside the City used a single precipitation value for the centroid of the City.

3.2.3. DISTRIBUTION

A rainfall distribution refers to how much rain falls over a 24-hour period, showing the intensity of rainfall at different time intervals throughout the timeframe. A SCS Type II 24-hour rainfall distribution was used in the hydrology models of this report. The temporal pattern is derived from historical storms of the rainfall depth over each increment of time and standardizing the two axes and was used directly with the precipitation-frequency from NOAA Atlas 14.

The NOAA Atlas 14 Second Quartile 50% 24-hour rainfall distribution was also used in the hydrology models of this report. The temporal pattern is derived from historical storms of the rainfall depth over each increment of time, with the majority of the rain falls in the second quarter of the storm. NOAA Atlas 14 provides information on the 10th through the 90th percentile distributions for each quartile (1st, 2nd, 3rd, 4th).

After analysis, it was determined that the Second Quartile 24-hour rainfall distribution provided results closer to anticipated values. The SCS Type II 24-hour rainfall distribution overinflated the peak discharge while both methods produced very similar runoff volumes. The Second Quartile 24-hour rainfall distribution results were used for the remainder of the modeling.

3.2.4. DRAINAGE BASIN DELINEATIONS

A drainage basin, also referred to as a watershed or catchment, is an area where all rainfall collects and discharges to a single point. Drainage basins were delineated based on existing streams, overland flow paths, existing and proposed storm conveyance structures, aerial imagery, topography using the DEM, and manual delineations using topographic maps.

The watersheds above Lake Point start high in the mountains and drain down to the valley where they spread out over an alluvial fan. A total of six mountain watersheds were delineated based on the six major culverts under the railroad. Within the City and developed areas, watersheds were delineated using contours in Esri's ArcGIS Pro and known existing infrastructure. A total of 6 mountainous watersheds and 34 City watersheds were delineated. The delineated watersheds are shown in Appendix A – Map 3.

3.2.5. SOILS AND HYDROLOGIC SOIL GROUPS

The hydrologic soil group (HSG) is a general indication of a soil's relative rate of infiltration. The NRCS via TR-55 classifies soils into hydrologic soil groups for hydrologic modeling. These soil groups are designated as A, B, C, and D. Soil group A results in the highest infiltration rate and thus the least amount of runoff, and D results in the lowest infiltration rate and thus the most amount of runoff.

Spatial soils data for the area around Lake Point was downloaded through the NRCS Web Soil Survey (see Appendix A – Map 2). The data shows soil ratings from B to D surrounding the City. The most common soil group within Lake Point is group C. The area closer to the Great Salt Lake is a mix of group B and D. The mountain drainages above Lake Point are predominantly group C with some group B and D mixed in.

3.2.6. LAND COVER AND IMPERVIOUSNESS

Land cover and imperviousness have a significant effect on runoff. Impervious surfaces, such as rooftops, paved parking lots, driveways, and paved roads significantly increase runoff peak flows and volumes. Depending on the natural land cover, as an area is developed and the land cover is altered, an increase in runoff can occur. For example, if the natural land cover is well vegetated and development results in a decrease in vegetative cover and an increase in imperviousness, a decrease in infiltration and vegetative interception will occur resulting in an increase in runoff.

The landcover in Lake Point is mainly low density residential and grassland with some agricultural lands. The area above Lake Point is almost entirely herbaceous and grassland area. Based on field visits and aerial imagery, the groundcover was estimated to range from poor to good condition.

The percent impervious cover for Lake Point was determined using lot size, aerial imagery, and the average percent impervious values found in TR-55 for land cover types. Lake Point is zoned for 1-2 acre lots in the older areas with ½ and ¼ acre lots in the newer areas.

3.2.7. DESIGN CURVE NUMBERS

When using the SCS methodology, infiltration is estimated using Curve Numbers (CN). A drainage basin's CN value defines the relationship between precipitation, infiltration, and runoff. Curve numbers are based on land cover type, land cover hydrologic condition, and the soil type. Larger CN values result in more runoff relative to lower CN values. Tables 2-2a, 2-2b, 2-2c, and 2-2d in TR-55 were used to find CN values for Lake Point. These values are presented along with other pertinent drainage basin characteristics in the modeling result in Appendix B. The CN values applicable to this study are presented in Table 3-1.

Table 3-1. Summary of SCS curve numbers applicable to this study.

Lake Point Curve Numbers				
Zoning	Soil Type			
	A	B	C	D
Herbaceous – Good Hydrologic Condition				
Non-Developed	-	62	74	85
Herbaceous – Fair Hydrologic Condition				
Non-Developed	-	71	81	89
Herbaceous - Poor Hydrologic Condition				
Non-Developed	-	80	87	93
Straight Row Legumes – Good Hydrologic Condition				
Non-Developed	58	72	81	85
Residential ½ Acre				
Developed	54	70	80	85
Residential 1 Acre				
Developed	51	68	79	84
Commercial-Business				
Developed	89	92	94	95
Open Space				
Grassy Areas	39	61	74	80
Pasture - Fair Hydrologic Condition				
Non-Developed	49	69	79	84

The listed curve numbers in the above table are then used to calculate a weighted curve number average for each basin from a curve number raster. The table in Appendix B presents the average curve number values for each watershed.

3.2.8. TIME OF CONCENTRATION

The time of concentration represents the time for rainfall to travel from the most hydraulically remote location within a drainage basin to the drainage basin discharge point. Time of concentration for the mountain watersheds was estimated using TR-55 methodology (Velocity Method). The Velocity Method

is calculated based on the following flow conditions: sheet flow, shallow concentrated flow, and open channel flow. The travel time for each flow condition is dependent on distance, slope, and ground cover type. Sheet flow was generally assumed to occur over the most upstream 300 feet of a drainage basin. Shallow concentrated flow conditions occur in the transition between sheet flow and open channel flow conditions. Open channel flow occurs when the runoff is fully channelized such as in canyons, ditches, or swales. Chapter 3 of the TR-55 design criteria manual can provide further explanation as well as the equations used for this calculation. The total time of concentration is then calculated by summing the travel time in each of these flow conditions.

The Velocity Method is generally considered the most accurate method for estimating time of concentration. However, it is time consuming and requires multiple inputs for each watershed. Due to the high number of watersheds within the City, the Velocity Method was determined to be too time-consuming to perform for each individual watershed. Comparisons of several methods for estimating time of concentration were performed for selected city watersheds. The comparison showed the Kirpich equation produced results comparable to the Velocity Method for the selected watersheds. Time of Concentration for watersheds within the City were therefore estimated using the Kirpich Equation in the SSA model.

The times of concentration for all watersheds can be found in Appendix B.

3.2.9. DRAINAGE BASIN SUMMARY

As a part of this study, 40 basins were delineated and analyzed, 6 in the mountains and 34 in the city. The basins and their characteristics are included in Appendix B. It should be noted that the listed curve numbers are a weighted average for each basin calculated from a CN raster as described in previous sections. The table in Appendix B presents the average curve number values.

4. STORMWATER MODELING RESULTS

4.1. HYDROLOGIC MODEL RESULTS

Two different model conditions were created in SSA, a model for existing conditions and a model for future build out. Scenarios were run for the 10-year and 100-year storm event to identify deficiencies and size proposed improvements for minor and major conveyance, respectively, as required by Lake Point's *Storm Water Design Standards*. The runoff increases from existing to future buildout for the 100-year storm are shown in Appendix B.

As expected, the existing urbanization and development of Lake Point has increased the amount of stormwater runoff in all watersheds. This increase in the runoff is relatively small however, in comparison to the overall runoff during a given storm event. This is due to the large size of the mountain watersheds in relation to the city watersheds. The mountain watersheds include 7,746 acres, while the city watersheds include 2,765 acres.

The undetained nature of these mountain watersheds produce far greater runoff than the city areas. This is in part due to the limited storm drain infrastructure within the city. It is recommended that any future development in the city follow Lake Point's *Storm Water Design Standards*. This includes detention or retention of runoff for development areas and restricting the runoff release flows to pre-development conditions. This will mitigate any increases to runoff being discharged from the future city development areas.

Due to the city areas' relatively small percentage of runoff contribution, the future buildout of Lake Point is unlikely to cause a significant increase in flooding risks at any of the drainages over existing conditions. Any mitigation measures designed for the offsite watersheds that pass through the city could be sized to accommodate the future buildout of the City.

4.1.1. DETENTION BASINS

Preliminary detention basin sizing was performed using HEC-HMS to determine the detention required to attenuate flow of the mountain watersheds. The detention basins were sized to reduce the flow of each watershed to manageable levels for a 100-year storm, as required by Lake Point's *Storm Water Design Standards*.

Using detention to reduce flows through the city, five of the mountain watersheds require a detention basin to attenuate the flow. However, it is important to note that only four basins are being proposed; the smallest two watersheds (Watershed 3 and 4) are proposed as one combined basin. The existing basin in the center of town would also need to be made deeper and an outlet installed to appropriately attenuate flows. Detaining the runoff in the mountain watersheds would reduce the size of the conveyance infrastructure needed through the city. This will be discussed in the following sections in more detail.

The Main City Basin is an existing basin that requires more storage capacity. Its storage capacity is limited by its current footprint and a high-water table. The mountain watershed basins were not sized at a particular location but were simply created to show the amount of storage that would be required for each basin. The estimated detention basin sizes are shown in Table 4-1. The basin calculations can be found with the HEC-HMS model results in Appendix B.

Table 4-1. Storage Volume Needed to Reduce Lake Point Watersheds for the 100-year Storm

Basin	100-Yr Peak Inflow (cfs)	100-Yr Basin Area(acre)	100-Yr Basin Depth (ft)	100-Yr Basin Outlet Size (in)	100-Yr Peak Outflow (cfs)
Upgrade to Existing Main City Basin	59.9	31.75	4	30	11.4
Upper Basin* (Watershed 1)	44.7	3.42	9	30	17.8
Middle A Basin* (Watershed 2)	121.5	11.59	9	30	18.1
Middle B Basin* (Watershed 3 and 4)	121.9	9.29	9	30	28.5
Lower Basin* (Watershed 5)	327.4	24.41	9	60	89.3

*Each of the mountain basins can be considered optional as conveyance options were sized for scenarios with and without the basins (see Section 5).

4.1.1.1. EXISTING MAIN CITY BASIN

The existing basin on the northern end of the city occupies a large empty area of almost 32 acres. Many of the major drainages in the city terminate in this basin. However, the basin doesn't have much storage capacity or an outlet. Based on geotechnical reports from areas around the basin, the groundwater is only about eight feet below grade to the north and a maximum of 14 feet to the east. This reduces the depth the basin can be further excavated. Currently the basin is under construction by the developer of the adjacent subdivision. For modeling and estimates associated with this report, the designed storage volume of the basin was used as if it existed. The design drawings specify the provided volume would be 51 ac-ft.

A four-foot-deep basin within the existing footprint (approximately two-feet deeper than the current conditions) would provide approximately 128 ac-ft of storage in the center of the city. A 48" outlet would also need to be installed on the western side of the basin. This outlet will connect to existing 30" storm drain piping to the west and discharge on the other side of I-80 (see Appendix A- Map 6 and 7). This existing piping would need to be upgraded to 48".

4.2. HYDRAULIC MODEL RESULTS

Two SSA models were created for the 10-year and 100-year storm event to show where flow travels throughout the City and size conveyances to mitigate flooding risk. To help identify areas of interest, each storm event has a scenario for existing conditions and another scenario for future full build out conditions. These models were used to identify existing and future deficiencies in the storm drain infrastructure. The results and findings from these models will be discussed in the following sections.

4.2.1. EXISTING CULVERT CAPACITIES

Numerous culverts of varying sizes and types are currently installed throughout Lake Point. Surveying the slope and length of all culverts was above the scope of this study. However, sizes and pipe types for some of the culverts were available. Site visits with a visual inspection estimated the size and pipe type for other known locations of culvert. Capacities for generic culverts were calculated for pipe sizes found throughout the City using the two most common materials. Actual culvert flow capacities will vary slightly but will be close to those listed in Table 4-2.

Table 4-2. Culvert Capacities Based on Size.

Culvert Diameter	Culvert Types	Culvert Capacity (CFS)
18	ADS	16.1
18	CMP	8.1
24	ADS	34.5
24	CMP	17.2
36	ADS	101.6
36	CMP	50.84
42	ADS	153.4
42	CMP	76.68
48	ADS	218.9
48	CMP	109.5
60	ADS	397.1
60	CMP	198.5

The flow capacities shown above were used for modeling purposes. Actual flow capacities of existing undersized culverts will need to be verified in the future with the design of any deficiency improvement drawings. Based on the modeling results, all the existing culverts under SR-36 and I-80 are undersized for the anticipated flows. This will lead to backups and flooding on the east side of both of these roadways. Detailed survey and analysis will need to be completed for each of these crossings with future improvement plans to ensure any new or improved culverts provide the required capacities.

4.3. DEFICIENCIES AND OTHER CONSIDERATIONS

Many areas in the city have no existing storm water infrastructure for the local drainages, and development has interrupted the natural drainages for the offsite flows. Many of the natural drainages through Lake Point have roads or homes constructed across them. In areas where no infrastructure exists, water is generally directed to the roads. Lake Point's recently established and adopted *Storm Water Design Standards* require roadside swales to convey the local runoff. In the older portions of the city, many of the swales are filled in or are non-existent. This increases the flooding potential.

The mountains to the east of Lake Point create significant runoff that is difficult to convey through the city due to topography and the city location. The city is built on a delta with a high-water table and is

locked between the railroad and two major highways. As the city has been developed, the natural drainages have been filled in through much of the city.

The City identified eight locations throughout the city which have historically had flooding (see Appendix A – Map 1). These locations are summarized in Table 4-3 below.

Table 4-3. Lake Point Areas of Concern

Map ID	City Comment
1	Pooled water
2	Floods in spring
3	Floods in spring
4	Floods during most storms, especially the lower lots
5	Water entry point during flooding in the 80's
6	High runoff area resulting in flooding of commercial buildings
7	High runoff from 1200 dirt road
8	No existing stormwater infrastructure

The storm modeling confirmed the problem areas as identified by the city. Location seven and eight did not show any flooding in the model. This is due to the roadside swales that are shown on the plans for this area that was provided by the city. These swales were input into the model. Currently, these swales have not been installed, which is the reason the city has experienced flooding in this area. Once the swales are installed it is anticipated that the flooding in this area will be resolved.

4.4. PROPOSED DRAINAGE SYSTEM IMPROVEMENTS

Proposed improvements for Lake Point have been developed based on results from the Hydrologic and Hydraulic modeling of the system. Many of the existing major drainage features are undersized to meet these criteria. Large mountain flows need to be conveyed or attenuated and conveyed through the City to safely route the runoff. The City is located on a delta and locked between the railroad and two major highways; this creates a more challenging task to convey large amounts of water. The use of detention/retention basins above the city would allow for smaller conveyance measures and flows to pass through the city. The existing basin in the center of town would also need to be deepened and an outlet installed to appropriately convey flows.

4.5. PROPOSED IMPROVEMENTS

The following proposed drainage system improvements include upsizing several existing culverts, channels, and stormwater piping. Several new culverts, channels, and piping are also proposed. Onsite drainage infrastructure has been sized to pass the 10-year storm and offsite drainage infrastructure has been sized to pass the 100-year storm, as required by Lake Point's *Storm Water Design Standards*. Offsite drainage infrastructure has been sized WITH and WITHOUT basins in the mountains to provide some options for the City. The City may choose to implement any combination of the two options. A preferred alternative as identified by JDE is included in Section 4.5.2.

Several Channel types were developed as a part of the proposed improvements, all channels were assumed to be unlined with a 2:1 side slope. These channel types are summarized in Table 4-4.

Table 4-4. Proposed Channel Types.

Type	Channel Bottom (ft)	Channel Depth (ft)
1	2	1.5
2	2	2
3	4	2
4	3	2.5
5	4	2.5
6	5	2.5
7	4	3
8	6	3
9	6	3.5
10	8	3.5
11	10	4
12	12	5
13	12	6

4.5.1. ONSITE (MINOR) DRAINAGE

Improvements for the identified areas of historic flooding, along with other minor drainage deficiencies identified from the storm water models, are addressed by the proposed improvements contained in this section. Each of these areas will be discussed below.

Pooled water at Location 1 will be resolved with the outlet to the Main City Basin and associated improvements as addressed in the Offsite (Major) Drainage section (see Section 4.5.2.1, ID 2-11 or 3-9). Water entry into the City at Location 5 will be resolved with Watershed 5 Conveyance as addressed in the Offsite (Major) Drainage section (See Section 4.5.2.1, ID 2-7 or 3-5 and 3-13). Location 7 and 8 reference no existing infrastructure and high runoff down the dirt road. Design drawings for Lake Point Vistas indicate roadside swales throughout the subdivision on both sides of the road. These swales were installed through most of the subdivision with the exception of the portion between points 7 and 8. Model results show that the existing designs, if implemented, will resolve flooding in these locations. This swale section is included as item 1-7 in the proposed minor drainage improvements.

All other items are addressed in Section 4.5.1.1 below.

4.5.1.1. STORMWATER CONVEYANCE

Stormwater conveyance for the minor drainages passing through Lake Point City was sized for the 10-year 24-hour storm event. All improvements within this section are considered minor drainage features within the City. All channels were sized to have 1-foot of freeboard above the peak water surface. The resulting 10-year conveyance sizing can be found in Table 4-5, which corresponds with Map 5 in Appendix A.

Spring flooding in Location 2 will be resolved through the upsizing of the existing drainage piping that crosses under I-80 and drains to the west. The area is currently drained by pipes and detention basins throughout the commercial subdivision, but the existing culvert under I-80 will need to be upsized to have adequate capacity.

Spring flooding in Location 3 will be resolved through the addition of drainage conveyance which will drain to the west. There are existing channels along the sides of the roads that direct the runoff to several retention basins. Currently there are no overflow routes for these basins and the soils infiltrate slowly. When there is larger storm events these basins can be overwhelmed. The overflow channels will route the runoff to the SR-36 culvert.

The subdivision at Location 4 floods during most storm events similar to Location 3. This area will need to have a swale installed to route the runoff west to the SR-36 crossing. The culvert under SR-36 will need to be upsized to accommodate the flows from this area as well as Location 3.

Location 6 is a high runoff area, resulting in flooding to the surrounding commercial businesses. This will be resolved through onsite grading and piping to drain the water to the south. A new culvert will need to be installed under Canyon Road and a connection added to the existing culvert that runs water under Highway 36. This culvert will also need to be upsized to have adequate capacity.

Table 4-5. Onsite Stormwater Conveyance Sizing for a 10-Year Storm Event.

Map ID	Existing Pipe Size	Proposed Pipe Size	Proposed Channel
1-1	See Major Drainage		
1-2	15	30" CMP or ADS	NA
1-3	NA	24" CMP or ADS	Type 10
1-4	NA	24" CMP or ADS	Type 10
1-5	See Major Drainage		
1-6	NA	NA	Type 2
1-7	NA	AS SHOWN IN CONSTRUCTION DRAWINGS	

4.5.2. OFFSITE (MAJOR) DRAINAGE

4.5.2.1. STORMWATER CONVEYANCE

Stormwater conveyance for the mountain drainages passing through Lake Point were sized for a 100-year 24-hour storm event. All improvements within this section are considered major drainage features within the City. All channels were sized to have 1 foot of freeboard above the peak flow water surface. Stormwater piping was only sized for drainages that allow for realistic pipe sizing.

Each of the drainage segments were sized WITHOUT and WITH detention/retention basins in the mountain watersheds to provide options for improvements. Using detention/retention basins to attenuate the flow allows for the conveyance system components to be much smaller, however, it does come at the cost of constructing the detention basin. All options require the proposed improvements to

the existing Main City Basin. The resulting 100-year conveyance sizing can be found in Table 4-6 and Table 4-7. Exhibits of these alternatives can be found in Appendix A – Maps 6 and 7.

Table 4-6. Offsite Stormwater Conveyance Sizing for a 100-year Storm Event – Conveyance WITHOUT Basins.

Map ID	Drainage Section	Peak Flow (cfs)	Channel Type	Culvert Size
2-1	Watershed 1 to 9000 North	45	5	42
2-2	Watershed 2 to 9000 North	125	7	60" CMP or 54" ADS
2-3	Watersheds 1 and 2 to Main City Basin	170	9	8x4 Box
2-4	Watershed 3 past Lake Shore Drive	10	1	24" ADS or CMP
2-5	Watershed 4 to 8350 Lakeshore Drive	115	8	6x4 Box
2-6	Watersheds 3 and 4 to Main City Basin	125	8	6x4 Box
2-7	Watershed 5 Along Canyon Road	330	NA*	10x4 Box
2-8	Watershed 5 Canyon Road to Hwy 36	330	11	8x5 Box
2-9	Watershed 6 Conveyance	365	12	12x4 Box
2-10	Watershed 5 and 6 Conveyance	695	12	12x5 Box
2-11	Main City Basin Outlet	11.4	48" CMP or ADS	48" CMP or ADS

*Fully developed area with no room in the ROW for the channel needed to convey the flow.

Table 4-7. Offsite Stormwater Conveyance Sizing for a 100-year Storm Event – Conveyance WITH Basins.

Map ID	Drainage Section	Peak Flow (cfs)	Channel Type	Culvert Size
3-1	Watershed 1 to 9000 North	20	3	30" CMP or 24" ADS
3-2	Watershed 2 to 9000 North	20	2	30" CMP or 24" ADS
3-3	Watersheds 1 and 2 to Main City Basin	40	4	36" CMP or 30" ADS
3-4	Watersheds 3 and 4 to Main City Basin	30	4	36" CMP or 30" ADS
3-5	Watershed 5 Along Canyon Road	90	48" CMP or ADS	48" CMP or ADS
3-6	Watershed 5 Canyon Road to Hwy 36	90	10	48" CMP or ADS
3-7	Watershed 6 Conveyance	365	11	12x4 Box
3-8	Watershed 5 and 6 Conveyance	455	12	12x5 Box
3-9	Main City Basin Outlet	11.4	48" CMP or ADS	48" CMP or ADS
3-10	Upper Basin Outlet	17.8	2	30" CMP or 24" ADS
3-11	Middle Basin A Outlet	18.1	2	30" CMP or 24" ADS
3-12	Middle Basin B Outlet	28.5	3	30" CMP or 24" ADS
3-13	Lower Basin Outlet	89.3	5	30" CMP or 24" ADS

4.5.2.2. DETENTION BASINS

Preliminary detention basin sizing was performed using HEC-HMS to determine the detention required to attenuate flow of the mountain watersheds. The detention basins were sized to reduce the flow of each watershed to manageable levels for a 100-year storm, as required by Lake Point's *Storm Water Design Standards*. If attenuating flows to allow for smaller conveyance systems is desired, five of the mountain watersheds would require a detention basin. Regardless of if the mountain watershed basins

are constructed or not, the existing basin in the center of town would also need to be made deeper and an outlet installed to appropriately attenuate flows leaving the town.

The mountain watershed basins were not sized at a particular location but were simply created to show the amount of storage that would be required for each basin. The estimated detention basin sizes are shown in Table 4-8. The basin calculations can be found with the HEC-HMS model results in Appendix B.

Table 4-8. Storage Volume Needed to Reduce Lake Point Watersheds for the 100-year Storm

Basin	100-Yr Peak Inflow (cfs)	100-Yr Basin Area(acre)	100-Yr Basin Depth (ft)	100-Yr Peak Outflow (cfs)
Upgrade to Existing Main City Basin	59.9	31.75	4	11.4
Upper Basin (Watershed 1)	44.7	3.42	9	17.8
Middle A Basin (Watershed 2)	121.5	11.59	9	18.1
Middle B Basin (Watershed 3 and 4)	121.9	9.29	9	28.5
Lower Basin (Watershed 5)	327.4	24.41	9	89.3

4.5.3. OFFSITE (MAJOR) DRAINAGE PREFERRED ALTERNATIVE

After collaboration with the City, a preferred alternative was selected by JDE which took into account both cost and public safety. The preferred alternative is a combination of the Major drainage alternatives presented above, see Table 4-9 and Table 4-10. An exhibit of this alternative is included in Appendix A – Map 8. Each of the above alternatives will need to be analyzed in detail with final designs. Actual slopes may lead to reductions or increases in required culvert sizes based on final design constraints.

Table 4-9. Offsite Stormwater Conveyance Sizing for a 100-year Storm Event – Preferred Alternative.

Map ID	Drainage Section	Peak Flow (cfs)	Channel Type	Culvert Size
4-1	Watershed 1 to 9000 North	45	5	42
4-2	Watershed 2 to 9000 North	125	7	60" CMP or 54" ADS
4-3	Watersheds 1 and 2 to Main City Basin	170	9	8x4 Box
4-4	Watersheds 3 and 4 to Main City Basin	125	8	6x4 Box
4-5	Middle Basin B Outlet	28.5	3	30" CMP or 24" ADS
4-6	Watershed 5 Along Canyon Road	90	48" CMP or ADS	48" CMP or ADS
4-7	Watershed 5 Canyon Road to Hwy 36	90	10	48" CMP or ADS
4-8	Watershed 6 Conveyance	365	11	12x4 Box
4-9	Watershed 5 and 6 Conveyance	455	12	12x5 Box
4-10	Main City Basin Outlet	11.4	48" CMP or ADS	48" CMP or ADS
4-11	Lower Basin Outlet	89.3	5	30" CMP or 24" ADS

Each of the above alternatives will need to be analyzed in detail with final designs. Actual slopes may lead to reductions or increases in required culvert sizes based on final design constraints.

Table 4-10. Storage Volume Needed to Reduce Lake Point Watersheds for the 100-year Storm – Preferred Alternative.

Basin	100-Yr Peak Inflow (cfs)	100-Yr Basin Area(acre)	100-Yr Basin Depth (ft)	100-Yr Peak Outflow (cfs)
Upgrade to Existing Main City Basin	59.9	31.75	4	11.4
Middle B Basin (Watershed 3 and 4)	121.9	9.29	9	28.5
Lower Basin (Watershed 5)	327.4	24.41	9	89.3

As was previously mentioned, the existing main city basin has an assumed depth of two-feet deep. With final design this basin will need to be surveyed in detail and enough depth provided to detain the volume shown above.

4.5.4. RECOMMENDED IMPROVEMENT PHASING

Based on the above-described preferred alternative, the following phasing for these improvements are proposed. This list is provided for guidance and to allow for future financial planning. The list can be altered by city staff as deemed necessary and as funding allows.

Table 4-11. Recommended improvement phasing.

Priority	Year	Proposed Improvement	Approximate Cost
1	2026	Minor Drainage Improvements	\$113,380.17
2	2028	4-10	\$3,887,799.54
3	2029	4-1 & 4-2	\$119,067.32
4	2030	4-3	\$514,678.96
5	2031	4-4	\$99,598.40
6	2034	4-5	\$4,234,526.25
7	2036	4-6	\$3,363,275.32
8	2040	4-11	\$10,975,563.39
9	2041	4-7	\$38,308.83
10	2042	4-9	\$101,455.42
11	2043	4-8	\$1,155,232.02

The approximate costs shown above are based on the estimated construction costs that are detailed in section 4.6 below. It should be noted that the project costs shown above are based on 2025 dollars. No inflation was accounted for in these estimates.

Several of the lower cost items may be able to be funded by the city, but it is likely that funding assistance will be needed for the larger cost items. Funding availability may necessitate updates to the schedule and ordering shown above. Some potential funding sources will be discussed later in this report.

4.5.5. PROGRAM IMPROVEMENT RECOMMENDATIONS

4.5.5.1. STORMWATER UTILITY

More than 70 cities in Utah have adopted a stormwater utility to provide a dedicated stormwater funding source used to maintain and/or install city-owned stormwater infrastructure. An ongoing survey conducted by Western Kentucky University (WKU) shows that Utah cities with a population of less than 15,000 have an average monthly household stormwater fee of \$5.23, however, the costs reported in the study may be outdated. A 2023 Spanish Fork City report shows stormwater fees are higher than the WKU study. The WKU survey still contains valuable information about stormwater utilities and is included in Appendix D for reference. Based on the average Utah County monthly fee of \$9.47 reported by Spanish Fork, and approximately 700 households in Lake Point, a stormwater utility could generate approximately \$80,000 per year for the City for storm water improvements.

As part of this study, a detailed stormwater utility fee analysis was completed by EFG Consultants. This report should be reviewed by the Council, and it is recommended that an appropriate stormwater utility fee be adopted. The monies collected from this fee can be used for maintenance of the existing system and as a partial funding source for the required future improvements.

4.5.5.2. STORMWATER IMPACT FEES

Another potential source of stormwater funding could come from impact fees for new construction. This would allow for public storm infrastructure upgrades to accommodate new growth. The stormwater impact fee for several other communities in Utah County averages \$2,737 with a high of \$6,690 and a low of \$770. This would be a one-time fee required for new construction and would go towards future storm drain infrastructure improvements required to accommodate the new growth. To determine a reasonable impact fee for the City, a detailed impact fee analysis would need to be completed prior to implementing this program.

4.5.5.3. STORMWATER INSPECTION AND MAINTENANCE PLAN

To track and complete required maintenance, the City could adopt a plan to inspect the stormwater conveyance systems at regular intervals. The stormwater conveyance systems could be inspected over a four-year period, focusing on one quadrant of the City each year. Inspection of any inlets should be done on a more frequent basis, for example quarterly or after large rainfall events. As inspections occur, the inventory of city-owned infrastructure can be updated and mapped. As maintenance or replacement projects are discovered, they can be added to a work order list or a Capital Improvement Projects (CIP) list. Having an updated inventory, work order list, and CIP list will facilitate building a long-term plan for the stormwater program, enable plan progress to be objectively measured, and allow similar projects to be conducted or bid together which can reduce material or mobilization costs. Funding an inspection and maintenance plan can be done through a stormwater utility as described in Section 4.5.5.1.

Additionally, it is recommended that the City update the Stormwater Master plan every 5 years.

4.6. ESTIMATED CONSTRUCTION COST

Based on the recommendations in Section 4.5, preliminary estimates have been prepared for each of the recommended improvements for onsite and offsite conveyance along with the preferred alternative. This was done to provide the City with some guidance on potential future costs to budget for. These are summarized below in Table 4-11 through Table 4-13.

Table 4-11. Estimated Cost – Onsite Drainage.

Map ID	Recommended Improvement	Estimated Cost
1-2	Historic Flooding Location 2	\$ 49,385.95
1-3	Historic Flooding Location 3	\$ 18,211.29
1-4	Historic Flooding Location 4	\$ 22,243.58
1-6	Historic Flooding Location 6	\$ 23,539.35
1-7	Historic Flooding Location 7	Refer to Lake Point Vista Plans
1-8	Historic Flooding Location 8	Refer to Lake Point Vista Plans
Total		\$ 113,380.17

Table 4-12. Estimated Cost – Offsite Drainage WITHOUT Basin.

Map ID	Recommended Improvement	Estimated Cost
2-1	Watershed 1 to 9000 North	\$ 114,846.51
2-2	Watershed 2 to 9000 North	\$ 4,220.81
2-3	Watersheds 1 and 2 to Main City Basin	\$ 516,707.44
2-4	Watershed 3 past Lake Shore Drive	\$ 489,313.00
2-5	Watershed 4 to 8350 Lakeshore Drive	\$ 12,362.11
2-6	Watersheds 3 and 4 to Main City Basin	\$ 178,982.59
2-7	Watershed 5 Along Canyon Road	\$ 16,509,860.88
2-8	Watershed 5 Canyon Road to Hwy 36	\$ 134,971.67
2-9	Watershed 6 Conveyance	\$ 1,155,232.02
2-10	Watershed 5 and 6 Conveyance	\$ 101,455.42
2-11	Main City Basin and Outfall Conveyance	\$ 3,887,799.54
Total		\$ 23,105,751.99

Table 4-13. Estimated Cost – Offsite Drainage WITH Basins.

Map ID	Recommended Improvement	Estimated Cost
3-1	Watershed 1 to 9000 North	\$ 111,061.10
3-2	Watershed 2 to 9000 North	\$ 1,272.93
3-3	Watersheds 1 and 2 to Main City Basin	\$ 115,790.52
3-4	Watersheds 3 and 4 to Main City Basin	\$ 99,598.40
3-5	Watershed 5 Along Canyon Road	\$ 3,559,206.67
3-6	Watershed 5 Canyon Road to Hwy 36	\$ 38,308.83
3-7	Watershed 6 Conveyance	\$ 1,155,232.02
3-8	Watershed 5 and 6 Conveyance	\$ 101,455.42
3-9	Main City Basin and Outfall Conveyance	\$ 3,887,799.54
3-10	Upper Basin and Outfall Conveyance	\$ 1,429,283.15
3-11	Middle A Basin and Outfall Conveyance	\$ 5,112,228.77
3-12	Middle B Basin and Outfall Conveyance	\$ 4,234,526.25
3-13	Lower Basin and Outfall Conveyance	\$ 10,975,563.39
Total		\$ 30,821,327.00

Copies of the estimate breakdowns are included in Appendix E for reference.

A preferred alternative was selected and includes all the minor onsite drainage improvements along with a combination of the major offsite drainage options. The potential future cost for the preferred alternative is shown in Table 4-14.

Table 4-14. Estimated Cost – Offsite Drainage Preferred Alternative.

Map ID	Recommended Improvement	Estimated Cost
4-1	Watershed 1 to 9000 North	\$ 114,847.00
4-2	Watershed 2 to 9000 North	\$ 4,220.81
4-3	Watersheds 1 and 2 to Main City Basin	\$ 514,678.96
4-4	Watersheds 3 and 4 to Main City Basin	\$ 99,598.40
4-5	Middle Basin B and Outfall Conveyance	\$ 4,234,526.25
4-6	Watershed 5 Along Canyon Road	\$ 3,363,275.32
4-7	Watershed 5 Canyon Road to Hwy 36	\$ 38,308.83
4-8	Watershed 6 Conveyance	\$ 1,155,232.02
4-9	Watershed 5 and 6 Conveyance	\$ 101,455.42
4-10	Main City Basin and Outfall Conveyance	\$ 3,887,799.54
4-11	Lower Basin and Outfall Conveyance	\$ 10,975,563.39
Total		\$ 24,489,505.94

To accommodate the smaller, more frequent storm events, it is recommended that the onsite drainage improvements be completed first before the larger offsite drainage improvements. Priority on the offsite drainage improvements are detailed below.

Using the above projects, the city can be separated into the north and south portions. From the estimates, the total improvements to mitigate the chance for flooding for the north portion of the city would be \$8,855,671, and the south portion would total \$15,633,835. The areas in the north of the city

are generally newer homes and more densely populated. In addition, there seems to be more current development being completed in the north of the city. The south is less densely populated and contains older, more established neighborhoods.

Based on population densities, it is recommended that the improvements to the north portion of the city be completed. This could start with the main city basin and outfall (Item 4-10), then expand to the other north drainage areas (Items 4-1 to 4-5).

For the south portion of the city, it is recommended that Item 4-6 be completed first, then Item 4-11 to reduce the offsite flows into the city, then the conveyance features within the city (Items 4-7 to 4-9) could be completed.

For additional information on timing, refer to the proposed priority list provided in Section 4.5.4. A detailed cost benefit analysis will need to be completed for each item listed which is beyond the scope of this report. As was previously mentioned there are various potential funding sources that may be available for both the major and minor drainages. Once the city establishes its priority list, potential funding sources can be investigated and applications made. Much of the funding requires a match by the city. For that reason, it is imperative that the city start collecting funds for the upkeep and improvement of the storm drain infrastructure as discussed in Section 4.5.5.1.

5. POTENTIAL FUNDING SOURCES

Due to the lack of a full stormwater system in Lake Point, and the high potential for flood damage, larger projects could be required to reduce flood risk. These projects will have costs which are difficult for the City to fund on its own. Several federal funding opportunities were identified to assist Lake Point. The federal funding opportunities require a benefit-cost analysis of the impacts to the area to determine the fundability of the projects. The funding opportunities are summarized below.

5.1. NRCS PL-566 FUNDING

The National Resources Conservation Service (NRCS) provides flood protection funding through the Watershed Protection and Flood Prevention Act (PL-566). NRCS PL-566 projects are required to benefit rural communities and have varying cost-share requirements. For flood control projects, the NRCS PL-566 program will fund 100 percent of construction excluding culverts, roadway crossings, and any property rights (e.g., land purchase, easements, or water rights). Like BRIC projects, NRCS PL-566 projects are multi-stage. Funding through NRCS PL-566 requires a Preliminary Investigation and Feasibility Study (PIFR), an Environmental Assessment or Environmental Impact Statement (EA or EIS, depending on project cost), and a design and construction phase. This process spans 3-5 years to reach construction and requires reapplication and acceptance before each phase. The design and planning costs are covered under NRCS PL-566 and only applicant involvement is required. Application requires the submittal of a simple letter outlining the project's needs to the Utah NRCS.

The PL-566 program has restrictions and BCA methodology to determine project feasibility. The in-town storm conveyance projects are unlikely to be fundable through the PL-566 program while any larger off-site drainage issues may qualify.

5.2. COMMUNITY IMPACT FUND BOARD (CIB)

The Utah Permanent Community Impact Fund Board (CIB) provides loans and grants to counties, cities and towns that are impacted by mineral resource development on federal lands. Since Lake Point City has no mineral producing federal lands, it may be difficult to receive CIB funding for Lake Point City projects. In addition, stormwater projects are generally not funded through CIB on their own. However, road improvements with a stormwater component may be fundable.

6. FUTURE DEVELOPMENT

Typically, as an area experiences growth, government entities require developers to not increase peak flows discharged from their developments. This is accomplished by installing the necessary detention or retention systems to attenuate post-development peak flows to pre-development peak flows. This is done to ensure the existing drainage conveyance does not become inadequate, as a stormwater system is typically sized for the existing conditions. The current Lake Point *Storm Water Design Standards* require all new developments to provide a maximum release rate of 0.20 cfs per acre.

The current Lake Point *Storm Water Design Standards* have been reviewed, and some suggested changes and additions have been added. These include implementing low impact development standards (LID) for new developments. A copy of the current Lake Point *Storm Water Design Standards* with suggested changes in red are included in Appendix F.

It is recommended that the hydrologic model developed as part of this study be updated as new development and stormwater conveyance is built so it can be a valuable up-to-date reference for the city.

7. CONCLUSIONS AND RECOMENDATIONS

Lake Point, a growing city in Tooele County, Utah, preserves its rural charm while addressing challenges from urbanization, including potential flooding issues due to inadequate drainage facilities and runoff from large mountain drainages. Incorporated in 2022, this small community is mindful of its historic roots and proactive in managing infrastructure to mitigate risks.

This report was prepared to identify the natural drainages through Lake Point City, and to estimate the stormwater runoff that will be conveyed by these channels to downstream areas. The City has limited existing drainage infrastructure, with newer areas using roadside gravel swales and piped systems, while older regions lack stormwater facilities. Large ditches and gullies channel runoff, but the south part of the city has no major retention basins, prompting efforts to manage stormwater as development continues.

Hydrologic analyses for Lake Point involved separate evaluations of mountainous and city watersheds using the TR-55 hydrology method and HEC-HMS modeling. Hydraulic analysis was performed for the area using Autodesk's Storm and Sanitary Analysis (SSA). These models assessed runoff, drainage capacity, and conveyance structures, with data sourced from topography, aerial imagery, and field inspections to manage stormwater effectively.

Design storm events, based on storm frequency and recurrence intervals, guide infrastructure design to mitigate flooding risks, with smaller storms (e.g., 10-year) catered to local streets and larger storms (e.g., 100-year) for major roads. For this study, 40 watersheds were delineated and analyzed using hydrologic models and data on precipitation, soils, land cover, and time of concentration, supporting effective stormwater management planning.

Two model scenarios—existing conditions and future buildout—were developed in SSA to analyze stormwater runoff for 10-year and 100-year storms, identifying drainage deficiencies and planning improvements. Detention basins are recommended to reduce runoff from large mountain watersheds, which significantly exceed city runoff due to their size and lack of detention.

Recommended improvements were organized into onsite (minor) and offsite (major) drainage deficiencies and improvements. Onsite drainage improvements, in areas within the city to reduce historical flooding issues, were designed for the 10-year storm. Proposed minor improvements focus on addressing upsizing and adding culverts, channels, and stormwater piping, along with resolving specific flooding issues at key locations through infrastructure upgrades or additions.

Offsite drainage improvements, in areas needed to route the larger mountain flows through the City, were designed for the 100-year storm. These major drainage improvements include channels, culverts, and piping designed to accommodate peak flows with a 1-foot freeboard. Detention basins in mountain watersheds are recommended to reduce flow and infrastructure size, while the existing Main City Basin would need deepening and an outlet to effectively manage runoff.

Over 70 Utah cities use stormwater utilities to fund infrastructure, with this being a potential route for Lake Point to fund the recommended improvements. Regular inspections, updates to infrastructure inventories, and maintenance plans can ensure efficient stormwater management, complemented by a recommended Stormwater Master Plan update every five years. The city should prioritize storm drain improvements based on its budget and available funds, then investigate and apply for potential funding sources. Since most funding requires a city match, it's crucial to start collecting funds for the upkeep and improvement of the storm drain infrastructure.

As areas grow, developers are required to manage peak flows by installing detention or retention systems to match pre-development levels, ensuring existing drainage systems remain adequate. The current Lake Point *Storm Water Design Standards* mandate a maximum release rate of 0.20 cfs per acre for new developments, with suggested changes including low impact development standards. It's recommended to update the hydrologic model as new developments and stormwater conveyance are built to keep it a valuable reference for the city.

APPENDIX A. MAPS

Lake Point Areas of Concern	
Map ID	City Comment
1	Pooled water
2	Floods in the spring
3	Floods in the spring
4	Floods during most storms, especially the lower lots
5	Water entry point during flooding in 80's
6	High runoff area resultings in flooding of commercial buildings
7	High runoff from 1200 dirt road
8	No existing stormwater infrastructure



Areas Of Concern

City Boundary

Jones & DeMille

Engineering

Lake Point City

Stormwater Master Plan
Historical Flooding

Map Name: H:\UD\Proj\2407-046\GIS\Projects\2407-046_Stormwater\2407-046_Stormwater.aprx - 1. Lake Point - Stormwater Master Plan - Historical Flooding 11x17P
Project Number: 2407-046

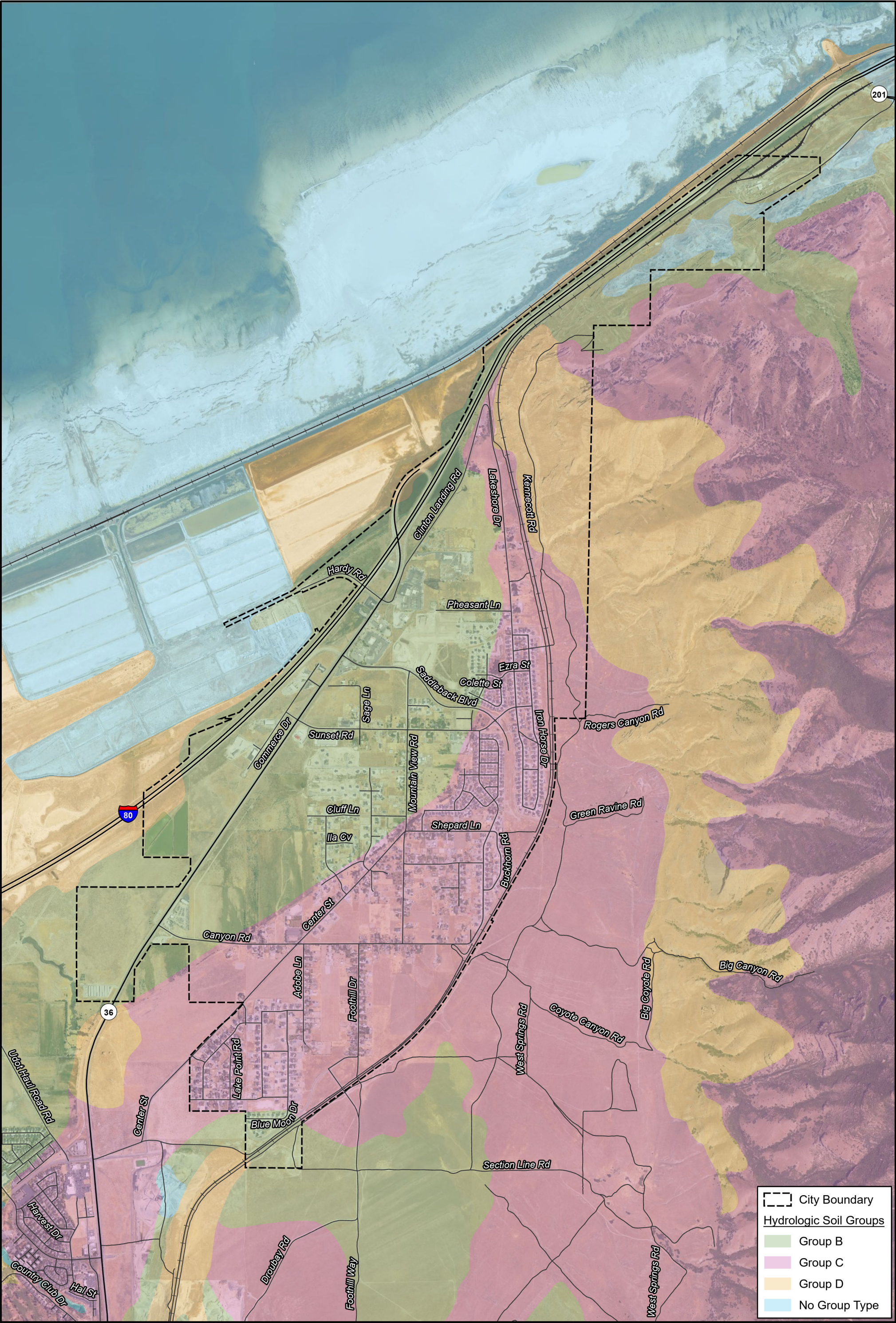
Drawn by: JEM 01-25

Last Edit: 01/15/2025

Tooele County,
Utah

Scale: 1" = 800'

1



City Boundary

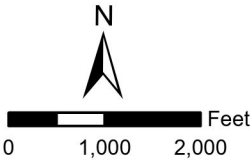
Hydrologic Soil Groups

Group B

Group C

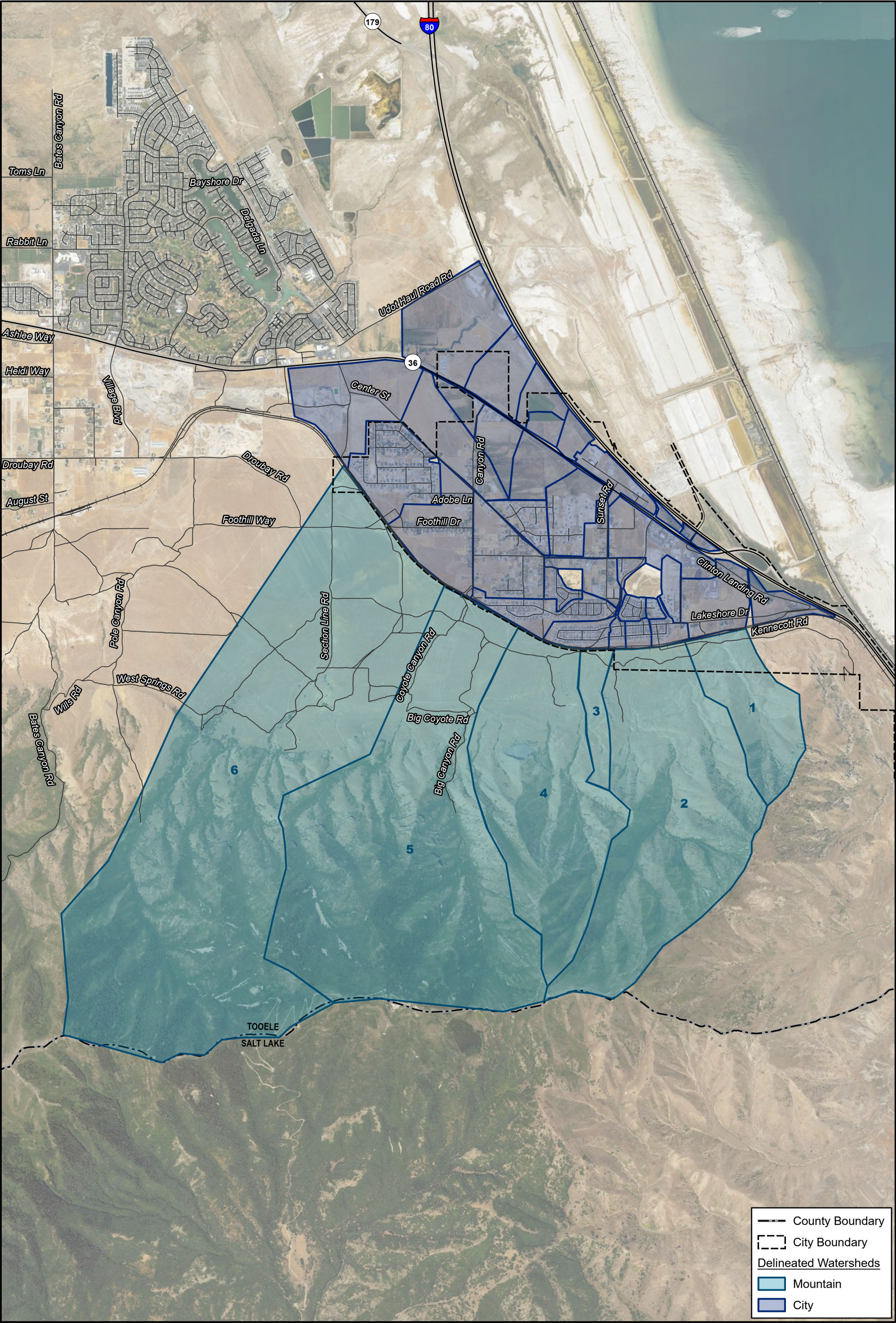
Group D

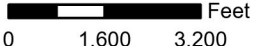
No Group Type



Jones & DeMille
Engineering

Lake Point City		Tooele County, Utah
Stormwater Master Plan Hydrologic Soil Groups		Scale: 1" = 2,000'
Map Name: H:\JD\Proj\2407-046\GIS\Projects\2407-046_Stormwater.aprx - 2. Lake Point - Stormwater Master Plan - Hydrologic Soil Groups 11x17 Project Number: 2407-046		2
Drawn by: JEM 01-25		Last Edit: 01/16/2025



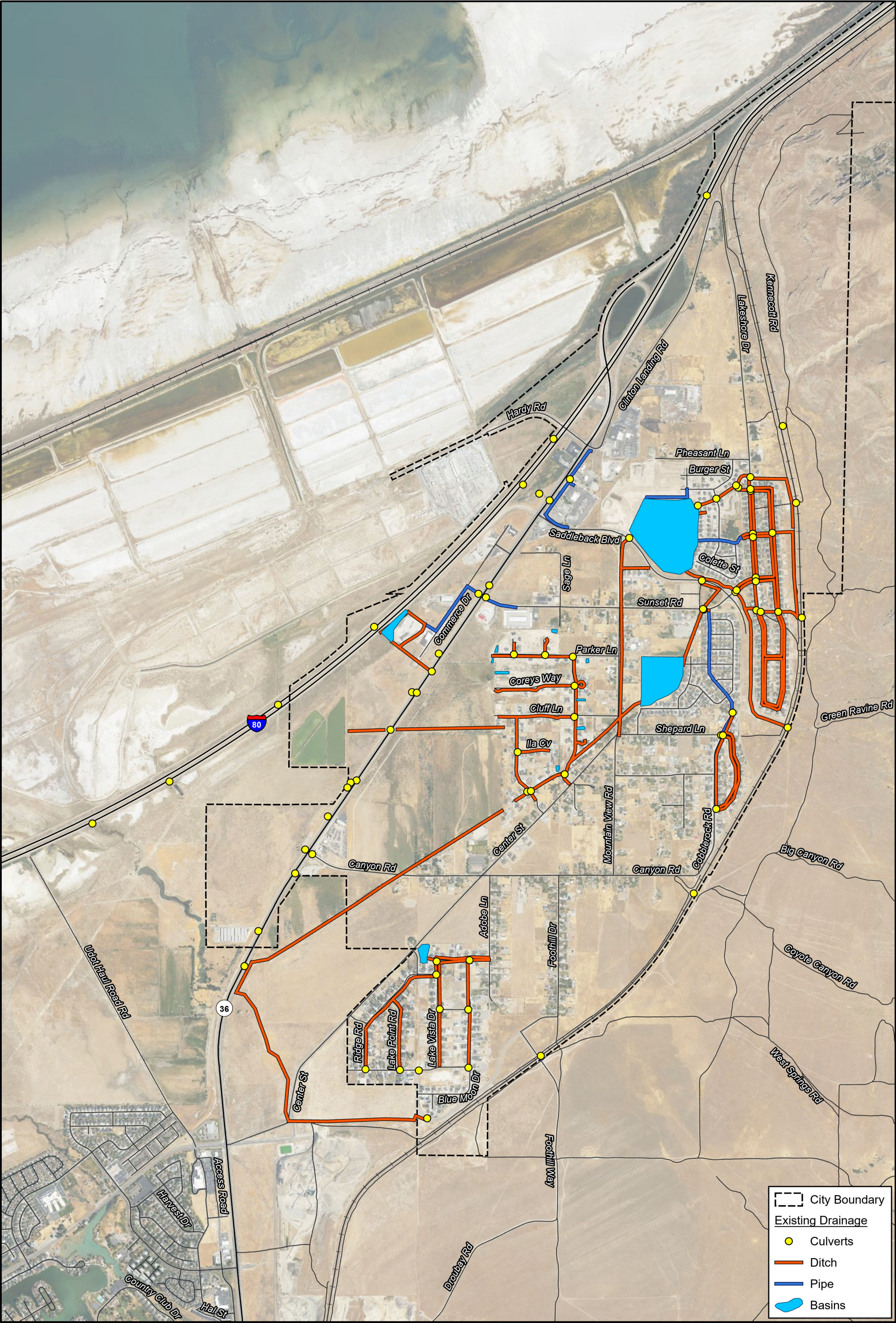


0 1,600 3,200 Feet



**Jones & DeMille
Engineering**

Lake Point City		
Stormwater Master Plan Delineated Watersheds		
Map Name: H:\JD\Proj\2407-046\GIS\Projects\2407-046_Stormwater\2407-046_Stormwater.aprx - 3. Lake Point - Stormwater Master Plan - Delineated Watersheds 11x17P		
Project Number: 2407-046	Drawn by: JEM 01-25	Last Edit: 01/23/2025

Tooele County, Utah
Scale: 1" = 3,200'
3



City Boundary

Existing Drainage

Culverts

Ditch

Pipe

Basins

**Jones & DeMille
Engineering**

Lake Point City

**Stormwater Master Plan
Major Drainage - Existing**

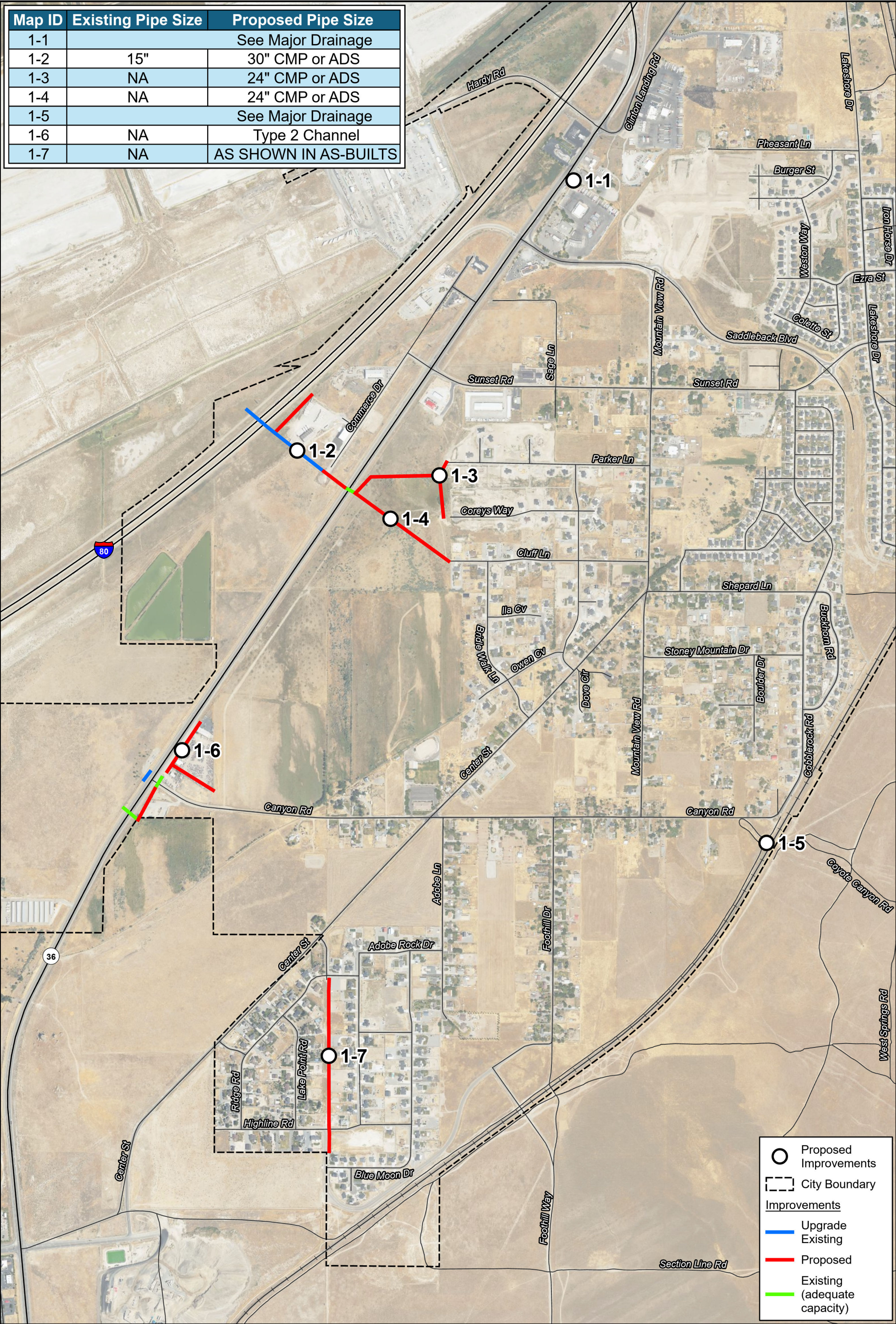
Map Name: H:\JD\Proj\2407-046\GIS\Projects\2407-046_Stormwater\2407-046_Stormwater.aprx - 4. Lake Point - Stormwater Master Plan - Existing Major Drainage 11x17P
Project Number: 2407-046 Drawn by: JEM 01-25 Last Edit: 04/02/2025

**Tooele County,
Utah**

Scale: 1" = 1,600'

4

Map ID	Existing Pipe Size	Proposed Pipe Size
1-1	See Major Drainage	
1-2	15"	30" CMP or ADS
1-3	NA	24" CMP or ADS
1-4	NA	24" CMP or ADS
1-5	See Major Drainage	
1-6	NA	Type 2 Channel
1-7	NA	AS SHOWN IN AS-BUILTS



Proposed Improvements

City Boundary

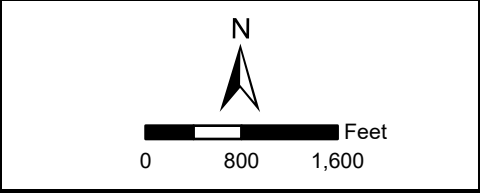
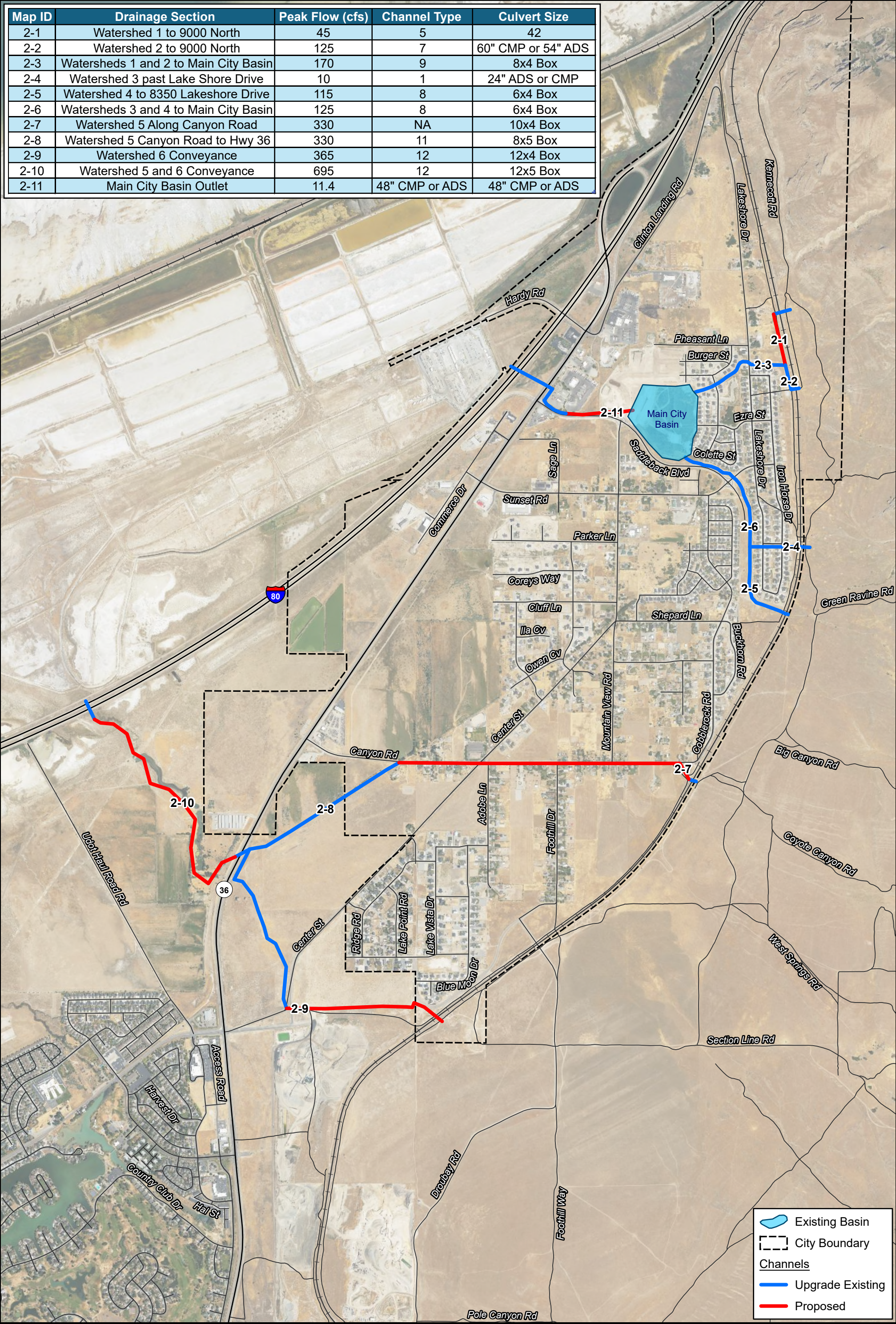
Improvements

Upgrade Existing

Proposed

Existing (adequate capacity)

Map ID	Drainage Section	Peak Flow (cfs)	Channel Type	Culvert Size
2-1	Watershed 1 to 9000 North	45	5	42
2-2	Watershed 2 to 9000 North	125	7	60" CMP or 54" ADS
2-3	Watersheds 1 and 2 to Main City Basin	170	9	8x4 Box
2-4	Watershed 3 past Lake Shore Drive	10	1	24" ADS or CMP
2-5	Watershed 4 to 8350 Lakeshore Drive	115	8	6x4 Box
2-6	Watersheds 3 and 4 to Main City Basin	125	8	6x4 Box
2-7	Watershed 5 Along Canyon Road	330	NA	10x4 Box
2-8	Watershed 5 Canyon Road to Hwy 36	330	11	8x5 Box
2-9	Watershed 6 Conveyance	365	12	12x4 Box
2-10	Watershed 5 and 6 Conveyance	695	12	12x5 Box
2-11	Main City Basin Outlet	11.4	48" CMP or ADS	48" CMP or ADS





**Jones & DeMille
Engineering**

Lake Point City

Stormwater Master Plan
Proposed Improvements - Major Drainage WITHOUT Basins

Map Name: H:\JD\Proj\2407-046\GIS\Projects\2407-046_Stormwater.aprx - 6. Lake Point - Stormwater Master Plan - Proposed Drainage - No New Basins 11x17P

Project Number: 2407-046

Drawn by: JEM 01-25

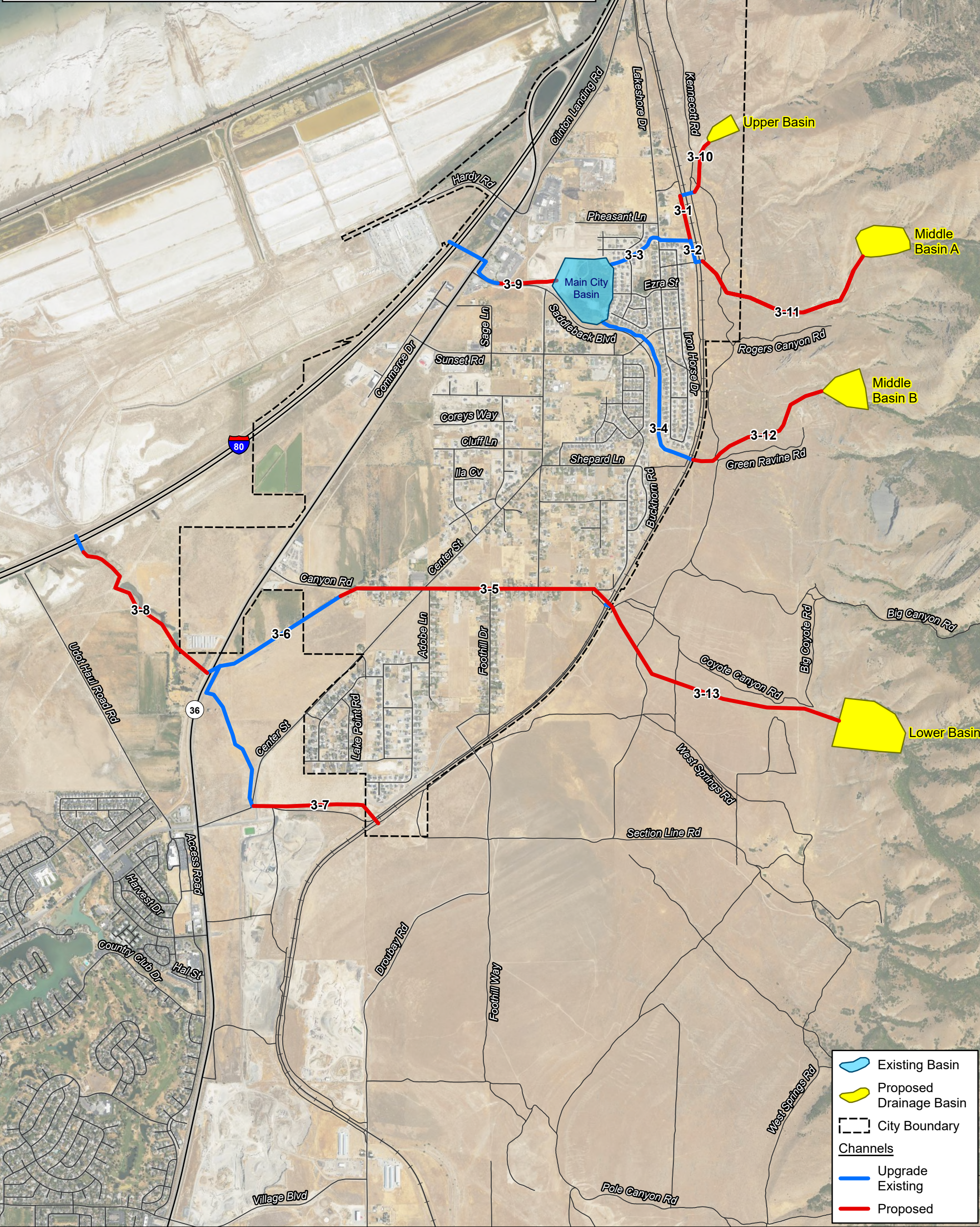
Last Edit: 02/24/2025

Tooele County,
Utah

Scale: 1" = 1,600'

6

Map ID	Drainage Section	Peak Flow (cfs)	Channel Type	Culvert Size
3-1	Watershed 1 to 9000 North	20	3	30" CMP or 24" ADS
3-2	Watershed 2 to 9000 North	20	2	30" CMP or 24" ADS
3-3	Watersheds 1 and 2 to Main City Basin	40	4	36" CMP or 30" ADS
3-4	Watersheds 3 and 4 to Main City Basin	30	4	36" CMP or 30" ADS
3-5	Watershed 5 Along Canyon Road	90	48" CMP or ADS	48" CMP or ADS
3-6	Watershed 5 Canyon Road to Hwy 36	90	10	48" CMP or ADS
3-7	Watershed 6 Conveyance	365	11	12x4 Box
3-8	Watershed 5 and 6 Conveyance	455	12	12x5 Box
3-9	Main City Basin Outlet	11.4	48" CMP or ADS	48" CMP or ADS
3-10	Upper Basin Outlet	17.8	2	30" CMP or 24" ADS
3-11	Middle Basin A Outlet	18.1	2	30" CMP or 24" ADS
3-12	Middle Basin B Outlet	28.5	3	30" CMP or 24" ADS
3-13	Lower Basin Outlet	89.3	5	30" CMP or 24" ADS



 Existing Basin

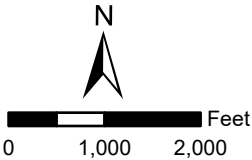
 Proposed Drainage Basin

 City Boundary

Channels

 Upgrade Existing

 Proposed



Jones & DeMille
Engineering

Lake Point City

Stormwater Master Plan
Proposed Improvements - Major Drainage WITH Basins

Map Name: H:\JD\Proj\2407-046\GIS\Projects\2407-046_Stormwater\2407-046_Stormwater.aprx - 7. Lake Point - Stormwater Master Plan - Proposed Drainage - New Basin 11x17P
Project Number: 2407-046

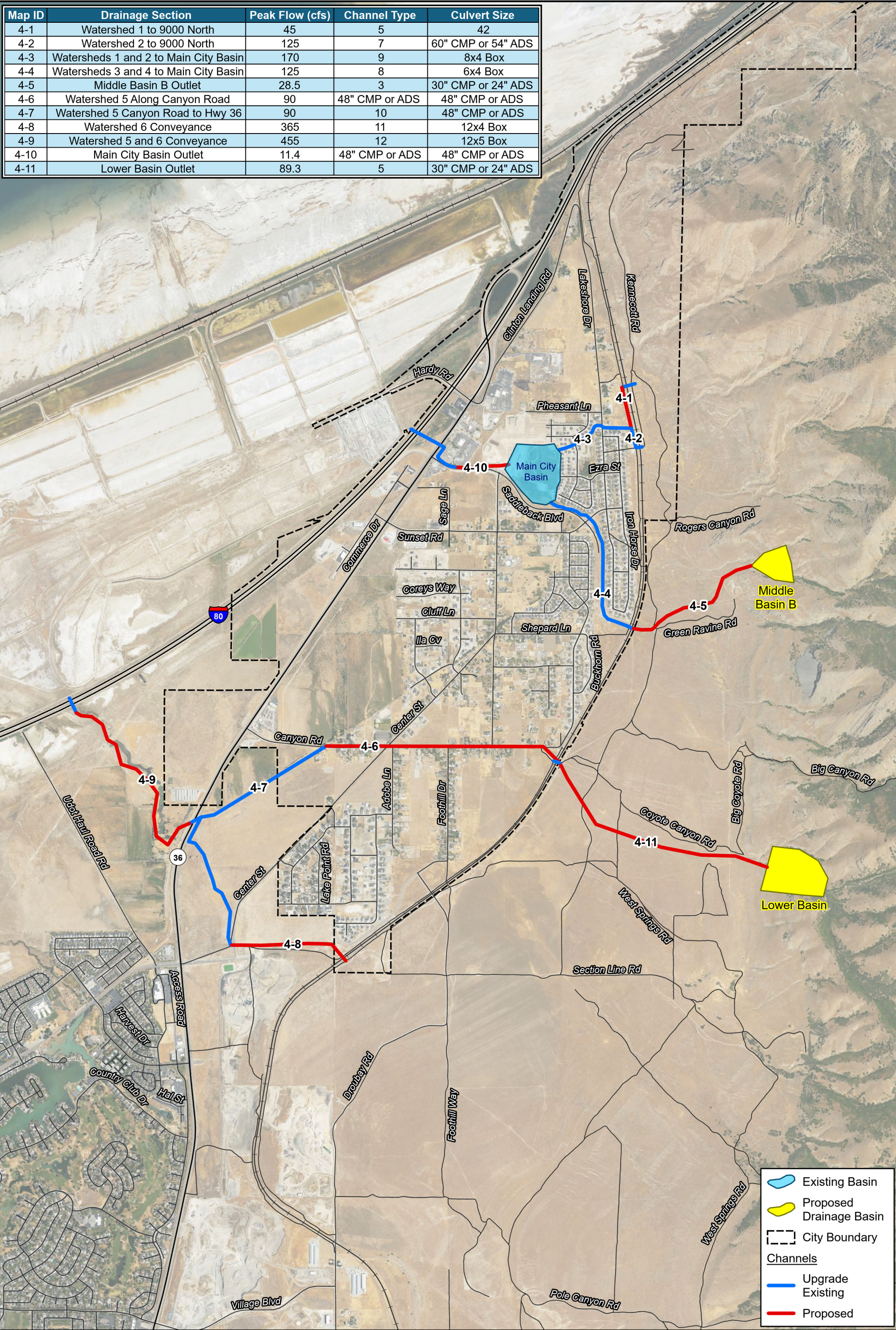
Drawn by: JEM 01-25

Last Edit: 02/24/2025

Tooele County,
Utah

Scale: 1" = 2,000'

Map ID	Drainage Section	Peak Flow (cfs)	Channel Type	Culvert Size
4-1	Watershed 1 to 9000 North	45	5	42
4-2	Watershed 2 to 9000 North	125	7	60" CMP or 54" ADS
4-3	Watersheds 1 and 2 to Main City Basin	170	9	8x4 Box
4-4	Watersheds 3 and 4 to Main City Basin	125	8	6x4 Box
4-5	Middle Basin B Outlet	28.5	3	30" CMP or 24" ADS
4-6	Watershed 5 Along Canyon Road	90	48" CMP or ADS	48" CMP or ADS
4-7	Watershed 5 Canyon Road to Hwy 36	90	10	48" CMP or ADS
4-8	Watershed 6 Conveyance	365	11	12x4 Box
4-9	Watershed 5 and 6 Conveyance	455	12	12x5 Box
4-10	Main City Basin Outlet	11.4	48" CMP or ADS	48" CMP or ADS
4-11	Lower Basin Outlet	89.3	5	30" CMP or 24" ADS



 Existing Basin

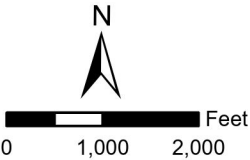
 Proposed Drainage Basin

 City Boundary

Channels

 Upgrade Existing

 Proposed



**Jones & DeMille
Engineering**

Lake Point City

**Stormwater Master Plan
Proposed Improvements - Major Drainage Preferred Alternative**

Map Name: H:\JD\Proj\2407-046\GIS\Projects\2407-046_Stormwater\2407-046_Stormwater.aprx - 8 Lake Point - Stormwater Master Plan - Proposed Drainage - Preferred Alternatives 11x17P
Project Number: 2407-046

Drawn by: JEM 02-25

Last Edit: 03/14/2025

**Tooele County,
Utah**

Scale: 1" = 2,000'

APPENDIX B. HYDROLOGY MODEL RESULTS

Paste Note: Land Cover, Condition and Soil Type must be pasted in the format indicated on the Curve Number Table Sheet, Column O

Weighted Curve Number Calculation

Sub-Basin	Watershed Name	Land Cover, Condition, and Soil Type	Area (acres)	Curve Number	CN * Area
Subbasin1	Subbasin1	Open Space - Fair - C	2.22	79	175.38
Subbasin1	Subbasin1	Residential - 1/2 Acre - C	0.6	80	48
Subbasin1	Subbasin1	Pinyon-Juniper - Fair - C	21.19	73	1546.87
Subbasin1	Subbasin1	Pinyon-Juniper - Fair - D	0.66	80	52.8
Subbasin1	Subbasin1	Desert Shrub - Fair - C	62.95	81	5098.95
Subbasin1	Subbasin1	Desert Shrub - Fair - D	156.05	86	13420.3
Subbasin1	Subbasin1	Sage-Grass - Fair - C	6.05	63	381.15
Subbasin1	Subbasin1	Sage-Grass - Fair - D	86.09	70	6026.3
Subbasin2	Subbasin2	Open Space - Fair - C	6.18	79	488.22
Subbasin2	Subbasin2	Open Space - Fair - D	0.02	84	1.68
Subbasin2	Subbasin2	Residential - 1/2 Acre - C	3.36	80	268.8
Subbasin2	Subbasin2	Oak-Aspen - Fair - C	27.44	57	1564.08
Subbasin2	Subbasin2	Pinyon-Juniper - Fair - C	48.04	73	3506.92
Subbasin2	Subbasin2	Desert Shrub - Fair - C	71.22	81	5768.82
Subbasin2	Subbasin2	Desert Shrub - Fair - D	15.53	86	1335.58
Subbasin2	Subbasin2	Sage-Grass - Fair - C	729.24	63	45942.12
Subbasin2	Subbasin2	Sage-Grass - Fair - D	410.28	70	28719.6
Subbasin2	Subbasin2	Herbaceous - Fair - C	1.11	81	89.91
Subbasin3	Subbasin3	Open Space - Fair - C	2.8	79	221.2
Subbasin3	Subbasin3	Residential - 1/2 Acre - C	1.63	80	130.4
Subbasin3	Subbasin3	Desert Shrub - Fair - C	0.87	81	70.47
Subbasin3	Subbasin3	Desert Shrub - Fair - D	1.09	86	93.74
Subbasin3	Subbasin3	Sage-Grass - Fair - C	50.87	63	3204.81
Subbasin3	Subbasin3	Sage-Grass - Fair - D	70.51	70	4935.7
Subbasin4	Subbasin4	Open Space - Fair - C	6.51	79	514.29
Subbasin4	Subbasin4	Residential - 1/2 Acre - C	3.26	80	260.8
Subbasin4	Subbasin4	Oak-Aspen - Fair - C	8.88	57	506.16
Subbasin4	Subbasin4	Pinyon-Juniper - Fair - C	36.47	73	2662.31
Subbasin4	Subbasin4	Woods - Fair - C	2	73	146
Subbasin4	Subbasin4	Desert Shrub - Fair - C	273.46	81	22150.26
Subbasin4	Subbasin4	Desert Shrub - Fair - D	61.37	86	5277.82
Subbasin4	Subbasin4	Sage-Grass - Fair - C	474.41	63	29887.83
Subbasin4	Subbasin4	Sage-Grass - Fair - D	155.49	70	10884.3
Subbasin5	Subbasin5	Open Space - Fair - C	14.66	79	1158.14
Subbasin5	Subbasin5	Residential - 1/2 Acre - C	2.92	80	233.6
Subbasin5	Subbasin5	Residential - 1/4 Acre - C	0.01	83	0.83
Subbasin5	Subbasin5	Residential - 1/4 Acre - D	0.38	87	33.06
Subbasin5	Subbasin5	Residential - 1/8 Acre - C	0.01	90	0.9
Subbasin5	Subbasin5	Pinyon-Juniper - Fair - B	1.58	58	91.64
Subbasin5	Subbasin5	Pinyon-Juniper - Fair - C	356.71	73	26039.83
Subbasin5	Subbasin5	Pinyon-Juniper - Fair - D	0.07	80	5.6
Subbasin5	Subbasin5	Oak-Aspen - Fair - B	0.4	48	19.2
Subbasin5	Subbasin5	Oak-Aspen - Fair - C	153.3	57	8738.1
Subbasin5	Subbasin5	Woods - Fair - C	3.11	73	227.03
Subbasin5	Subbasin5	Desert Shrub - Fair - B	1.35	72	97.2
Subbasin5	Subbasin5	Desert Shrub - Fair - C	1274.46	81	103231.26
Subbasin5	Subbasin5	Desert Shrub - Fair - D	17.34	86	1491.24
Subbasin5	Subbasin5	Sage-Grass - Fair - C	177.16	63	11161.08
Subbasin5	Subbasin5	Sage-Grass - Fair - D	30.33	70	2123.1
Subbasin5	Subbasin5	Herbaceous - Fair - C	3.7	81	299.7
Subbasin5	Subbasin5	Herbaceous - Fair - D	1.19	89	105.91
Subbasin6	Subbasin6	Open Space - Fair - B	16.33	69	1126.77
Subbasin6	Subbasin6	Open Space - Fair - C	15.84	79	1251.36
Subbasin6	Subbasin6	Open Space - Fair - D	0.5	84	42
Subbasin6	Subbasin6	Residential - 1/2 Acre - B	3.7	70	259
Subbasin6	Subbasin6	Residential - 1/2 Acre - C	1.99	80	159.2
Subbasin6	Subbasin6	Residential - 1/4 Acre - B	0.72	75	54
Subbasin6	Subbasin6	Residential - 1/4 Acre - C	0.09	83	7.47
Subbasin6	Subbasin6	Residential - 1/4 Acre - D	0.01	87	0.87
Subbasin6	Subbasin6	Oak-Aspen - Fair - B	0.61	48	29.28
Subbasin6	Subbasin6	Oak-Aspen - Fair - C	198.91	57	11337.87
Subbasin6	Subbasin6	Oak-Aspen - Fair - D	0.05	63	3.15
Subbasin6	Subbasin6	Pinyon-Juniper - Fair - B	0.69	58	40.02
Subbasin6	Subbasin6	Pinyon-Juniper - Fair - C	217.93	73	15908.89
Subbasin6	Subbasin6	Pinyon-Juniper - Fair - D	1.27	80	101.6
Subbasin6	Subbasin6	Woods - Fair - B	0.13	60	7.8
Subbasin6	Subbasin6	Woods - Fair - C	6.38	73	465.74
Subbasin6	Subbasin6	Desert Shrub - Fair - B	267.3	72	19245.6
Subbasin6	Subbasin6	Desert Shrub - Fair - C	1524.3	81	123468.3
Subbasin6	Subbasin6	Desert Shrub - Fair - D	38.21	86	3286.06
Subbasin6	Subbasin6	Sage-Grass - Fair - B	199.42	51	10170.42
Subbasin6	Subbasin6	Sage-Grass - Fair - C	391.56	63	24668.28
Subbasin6	Subbasin6	Sage-Grass - Fair - D	11.25	70	787.5
Subbasin6	Subbasin6	Pasture - Fair - C	6.23	79	492.17
Subbasin6	Subbasin6	Herbaceous - Fair - C	6	81	486

Results

Number	Sub-Basin	Total Area	Sum of CN*Area	Weighted Curve Number
1	Subbasin1	335.810	26749.750	79.66
2	Subbasin2	1312.420	87685.730	66.81
3	Subbasin3	127.770	8656.320	67.75
4	Subbasin4	1021.850	72289.770	70.74
5	Subbasin5	2038.680	155057.420	76.06
6	Subbasin6	2909.420	213399.350	73.35
7	#N/A	0.000	0.000	#DIV/0!
8	#N/A	0.000	0.000	#DIV/0!
9	#N/A	0.000	0.000	#DIV/0!
10	#N/A	0.000	0.000	#DIV/0!
11	#N/A	0.000	0.000	#DIV/0!
12	#N/A	0.000	0.000	#DIV/0!
13	#N/A	0.000	0.000	#DIV/0!
14	#N/A	0.000	0.000	#DIV/0!
15				
16				
17				
18				
19				

SCS Velocity Method

Manning's Sheet Flow	
Smooth surface (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated soils: Residue cover = 20%	0.06
Cultivated soils: Residue cover > 20%	0.17
Grass: Short-grass prairie	0.15
Grass: Dense grasses	0.24
Grass: Bermudagrass	0.41
Range (natural)	0.13
Woods: Light underbrush	0.4
Woods: Dense underbrush	0.8

Sheet Flow								
ID	Elev 1	Elev 2	Length	So	P2 (2yr24hr)	Cover Type	Manning's n	T _{SF}
-	ft	ft	ft	ft/ft	in	-	-	min
Subbasin1	7250.47	7193	100	0.5747	2.07	Range (natural)	0.13	2.83
Subbasin2	8742	8728.74	100	0.1326	1.84	Cultivated soils: Re	0.17	6.70
Subbasin3	6002.8	5951	100	0.5180	2.01	Grass: Bermudagra	0.41	7.53
Subbasin4	8729	8713	100	0.1600	2.09	Grass: Bermudagra	0.41	11.80
Subbasin5	8844.9	8792.8	100	0.5210	2.10	Woods: Light under	0.4	7.20
Subbasin6	8855.46	8849	100	0.0646	1.82	Woods: Light under	0.4	17.81
0	0	0	0	#DIV/0!	1.86	Smooth surface (co	0.011	#DIV/0!
0	0	0	0	#DIV/0!	2.03	Smooth surface (co	0.011	#DIV/0!
0	0	0	0	#DIV/0!	1.98	Smooth surface (co	0.011	#DIV/0!
0	0	0	0	#DIV/0!	2.03	Smooth surface (co	0.011	#DIV/0!
0	0	0	0	#DIV/0!	0.00	Smooth surface (co	0.011	#DIV/0!
0	0	0	0	#DIV/0!	0.00	Smooth surface (co	0.011	#DIV/0!

<u>Shallow Concentrated Equ. Coef.</u>	
Paved (TR-55)	20.365
Pavement and small upland gullies	20.328
Grassed waterways (unpaved TR-55)	16.135
Nearly bare and untilled	9.965
Cultivated straight row crops	8.762
Short-grass pasture	6.962
Minimum tillage cultivation, contour or strip-cropped, and woodlands	5.032
Forest with heavy ground litter and hay meadows	2.516

[illegible]

Manning's Open Channel	
as, smooth earth	0.021
Earth, smooth	0.018
channel - clean	0.022
channel - gravelly	0.025
channel - weedy	0.03
- stony, cobbles	0.035

https://www.engineeringtoolbox.com/mannings-roughness-d_799.html

Manning's Open Channel	
as, smooth earth	0.021
Earth, smooth	0.018
channel - clean	0.022
channel - gravelly	0.025
channel - weedy	0.03
- stony, cobbles	0.035

https://www.engineeringtoolbox.com/mannings-roughness-d_799.html

[illegible]

R55

[illegible]

Project: Mountain Watersheds

Simulation Run: 100-Yr 24-Hr NOAA

Simulation Start: 31 December 1999, 24:00

Simulation End: 7 January 2000, 24:00

HMS Version: 4.12

Executed: 14 March 2025, 21:08

Global Parameter Summary - Subbasin

Location		
Element Name	Longitude Degrees	Latitude Degrees
Subbasin - 6	-112.24	40.65
Subbasin - 2	-112.23	40.69
Subbasin - 4	-112.23	40.67
Subbasin - 1	-112.24	40.7
Subbasin - 3	-112.24	40.68
Subbasin - 5	-112.22	40.66

Area (MI ²)	
Element Name	Area (MI ²)
Subbasin - 6	4.54
Subbasin - 2	2.05
Subbasin - 4	1.6
Subbasin - 1	0.52
Subbasin - 3	0.2
Subbasin - 5	3.19

Loss Rate: Scs		
Element Name	Percent Impervious Area	Curve Number
Subbasin - 6	0	73.3
Subbasin - 2	0	66.8
Subbasin - 4	0	70.7
Subbasin - 1	0	79.7
Subbasin - 3	0	67.7
Subbasin - 5	0	76.1

Transform: SCS

Element Name	Lag	Unitgraph Type
Subbasin - 6	69.29	Standard
Subbasin - 2	24.04	Standard
Subbasin - 4	22.97	Standard
Subbasin - 1	12.56	Standard
Subbasin - 3	20.01	Standard
Subbasin - 5	32.22	Standard

Global Results Summary

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Subbasin - 6	4.54	361.81	01Jan2000, 12:36	1.21
Subbasin - 2	2.05	121.54	01Jan2000, 12:06	0.81
Subbasin - 4	1.6	111.91	01Jan2000, 12:06	0.97
Subbasin - 1	0.52	44.69	01Jan2000, 12:00	1.22
Subbasin - 3	0.2	9.98	01Jan2000, 12:06	0.68
Junction - 1	4.37	287.37	01Jan2000, 12:06	0.91
Subbasin - 5	3.19	327.39	01Jan2000, 12:06	1.51

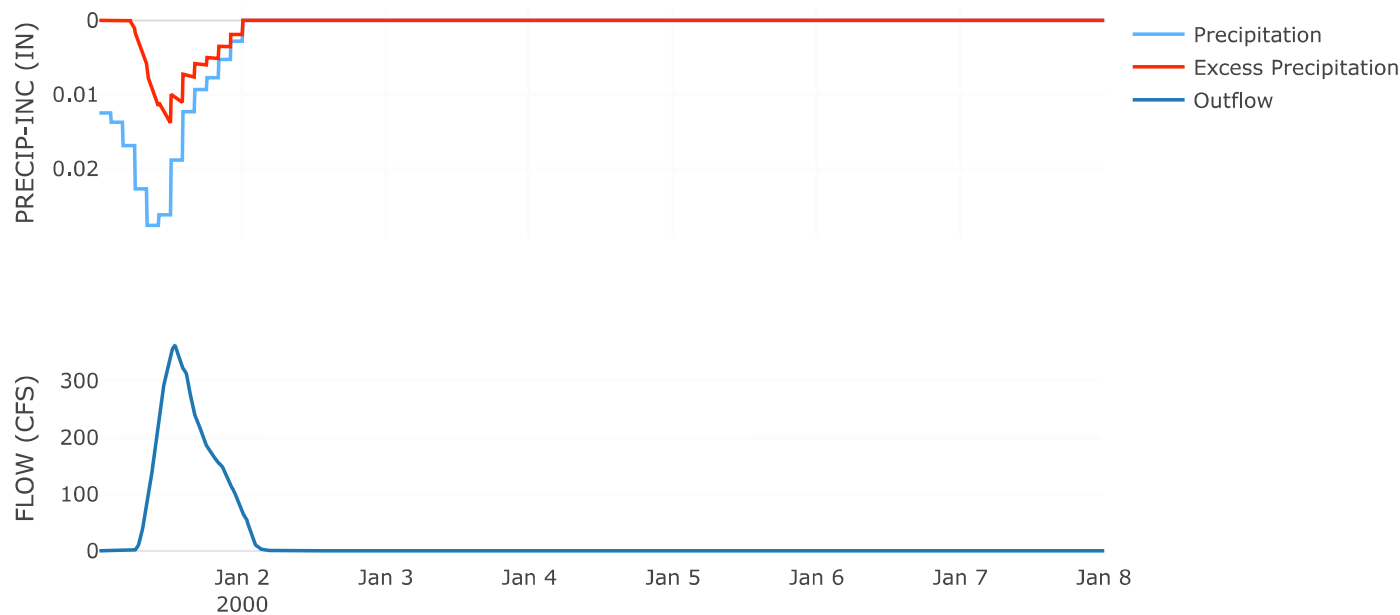
Subbasin: Subbasin-6

Area (MI²) : 4.54

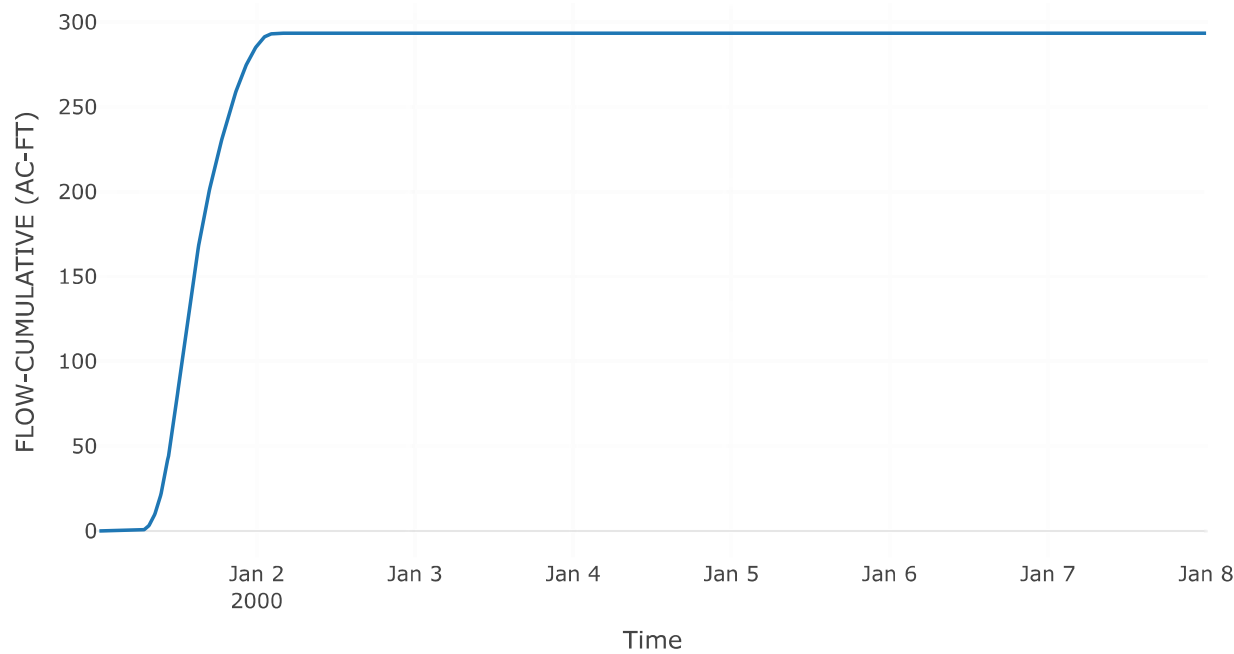
Transform: Scs	
Lag	69.29
Unitgraph Type	Standard

Results: Subbasin-6	
Peak Discharge (CFS)	361.81
Time of Peak Discharge	01Jan2000, 12:36
Volume (IN)	1.21
Precipitation Volume (AC - FT)	853.25
Loss Volume (AC - FT)	559.67
Excess Volume (AC - FT)	293.58
Direct Runoff Volume (AC - FT)	293.58
Baseflow Volume (AC - FT)	0

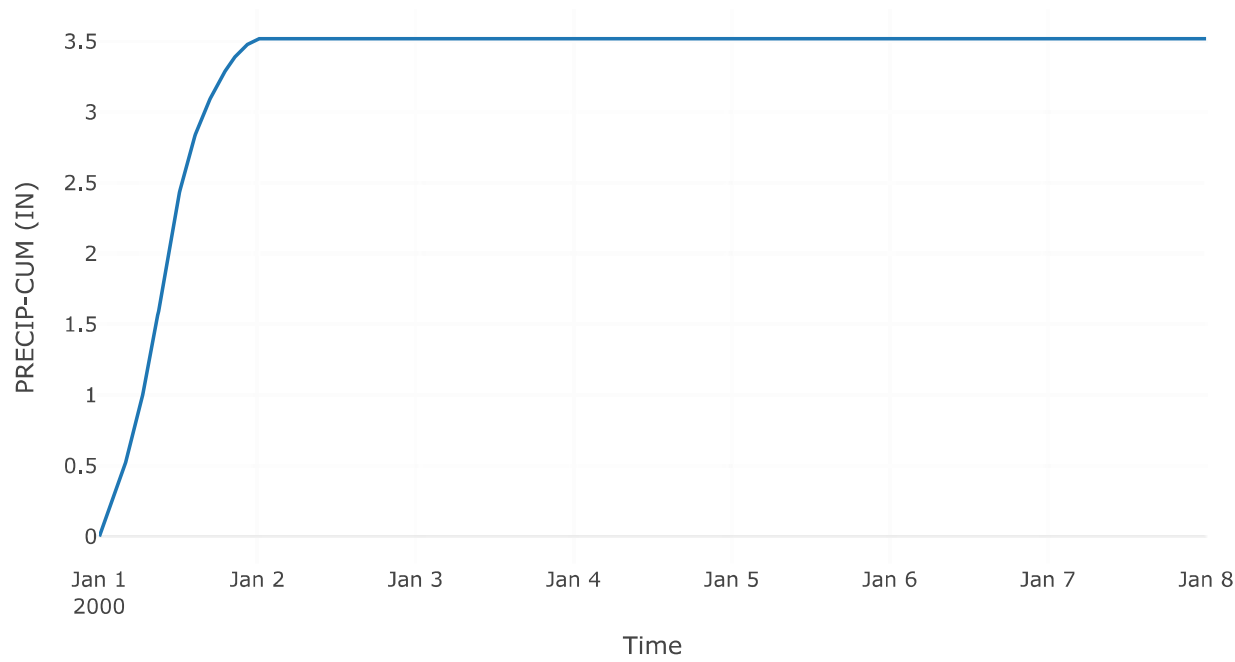
Precipitation and Outflow



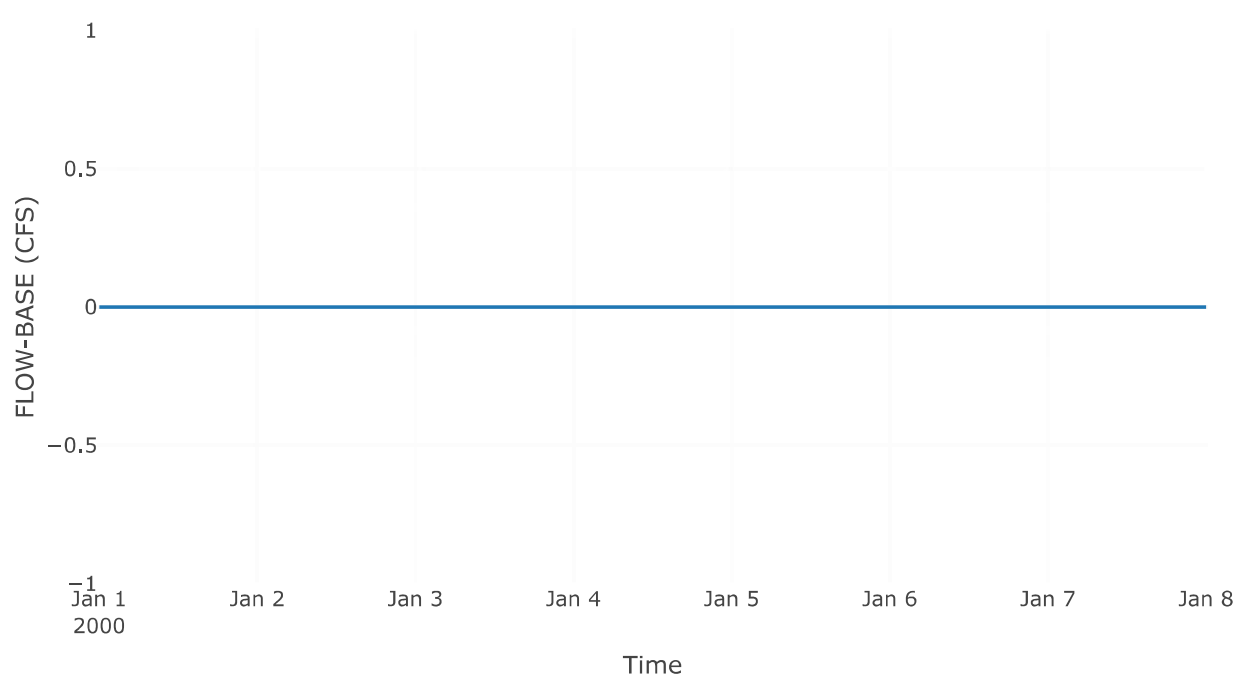
Cumulative Outflow



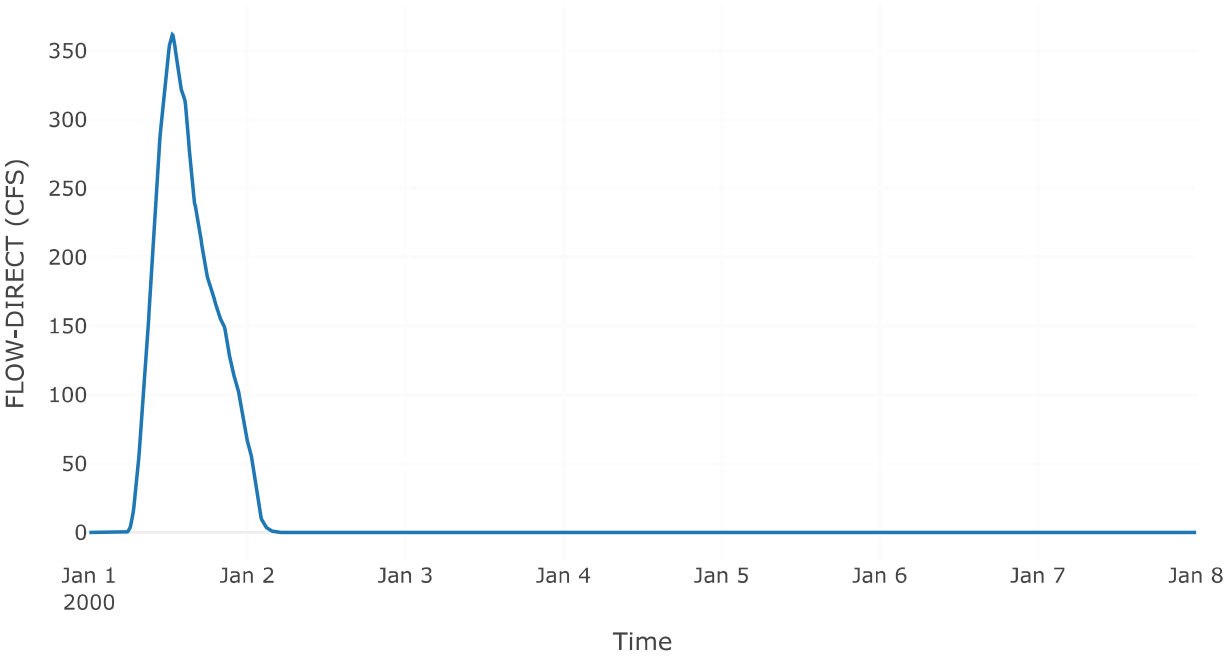
Cumulative Precipitation



Baseflow



Direct Runoff



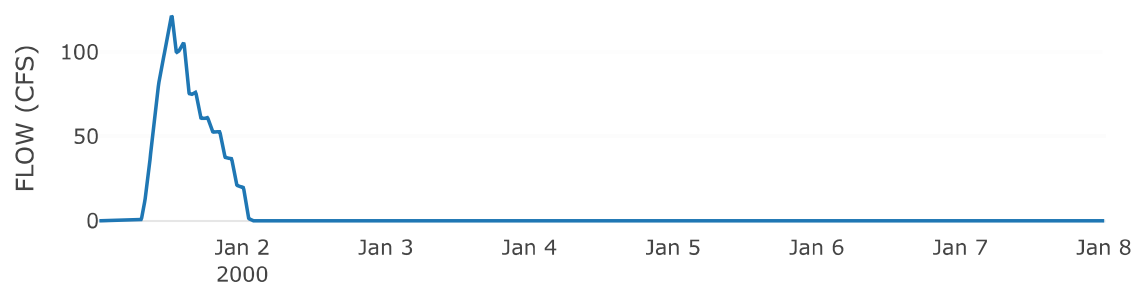
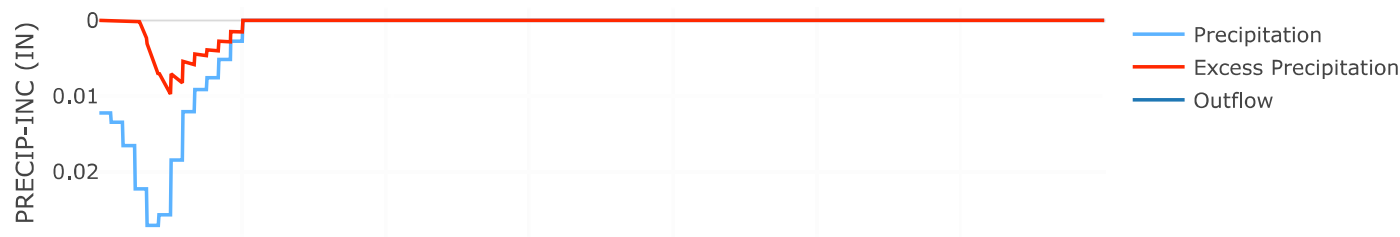
Subbasin: Subbasin-2

Area (MI²) : 2.05

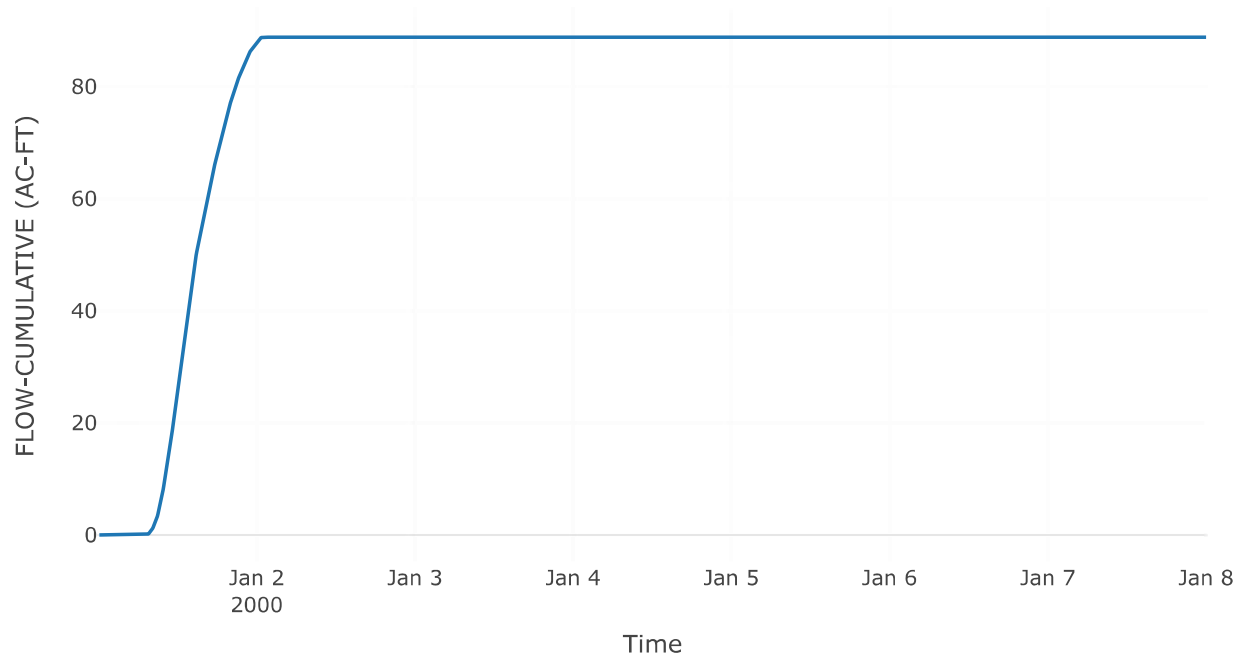
Transform: Scs	
Lag	24.04
Unitgraph Type	Standard

Results: Subbasin-2	
Peak Discharge (CFS)	121.54
Time of Peak Discharge	01Jan2000, 12:06
Volume (IN)	0.81
Precipitation Volume (AC - FT)	377.38
Loss Volume (AC - FT)	288.53
Excess Volume (AC - FT)	88.85
Direct Runoff Volume (AC - FT)	88.85
Baseflow Volume (AC - FT)	0

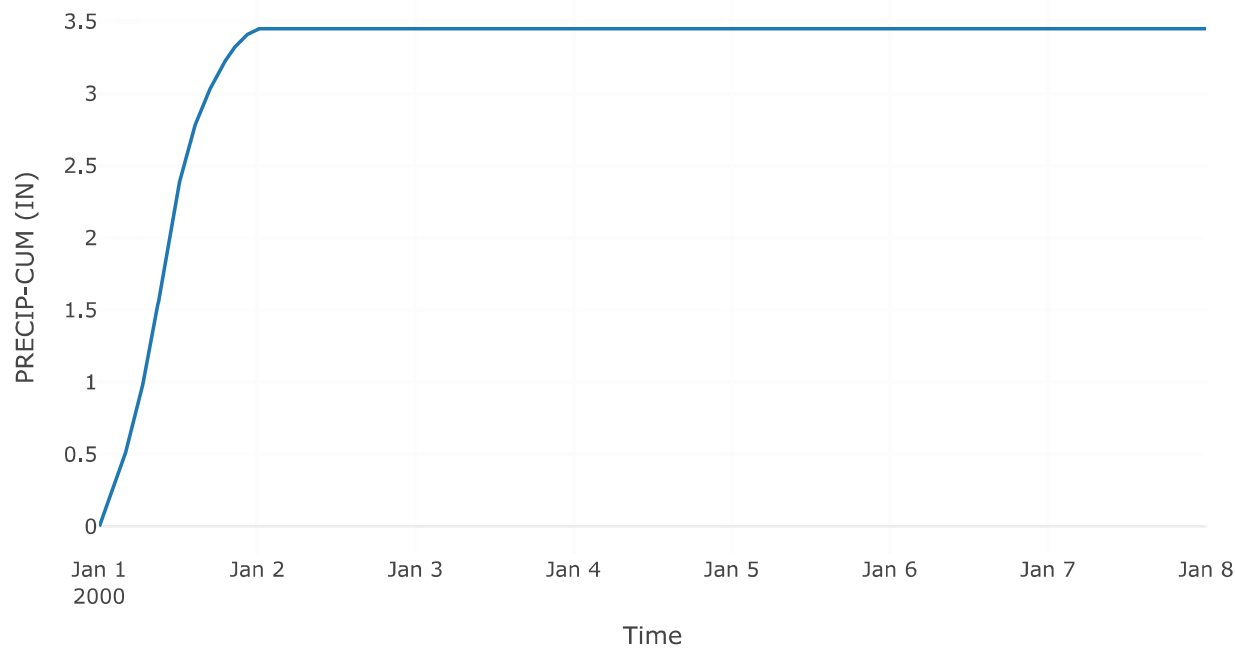
Precipitation and Outflow



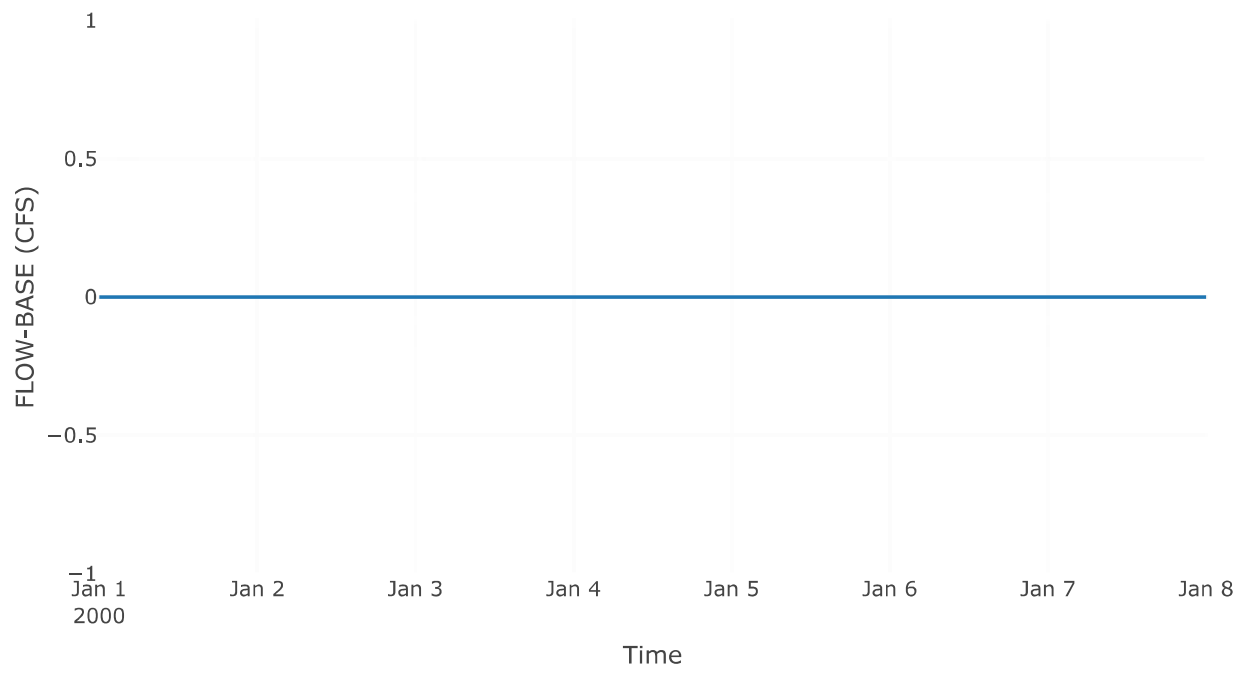
Cumulative Outflow



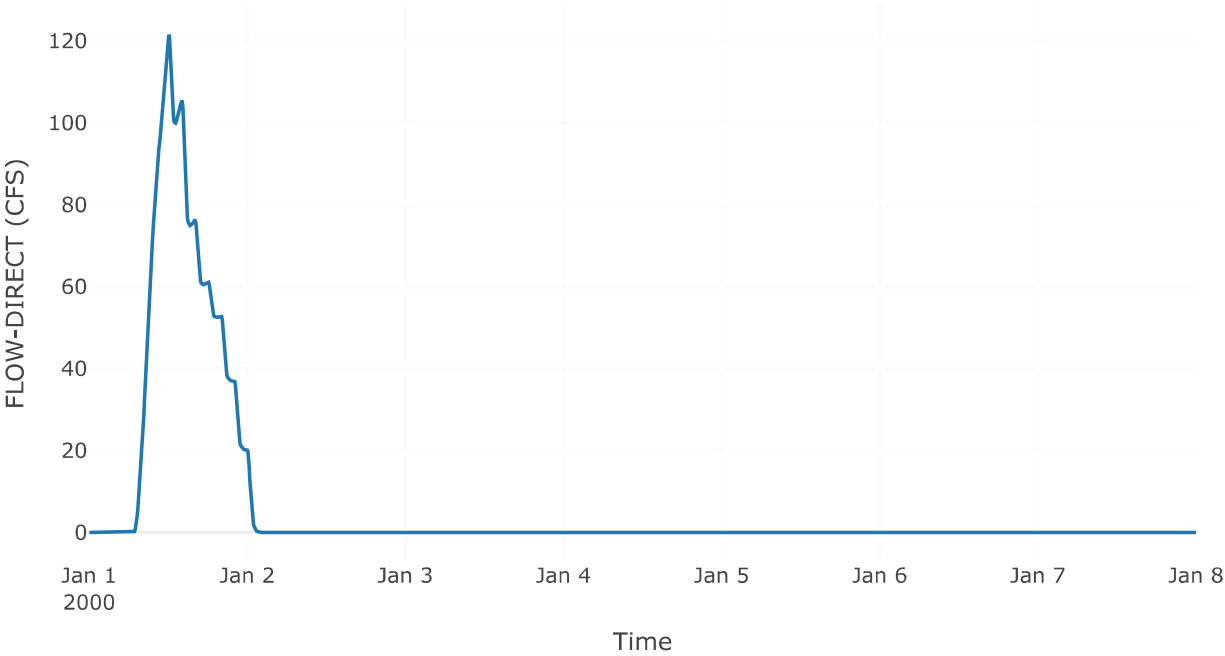
Cumulative Precipitation



Baseflow



Direct Runoff



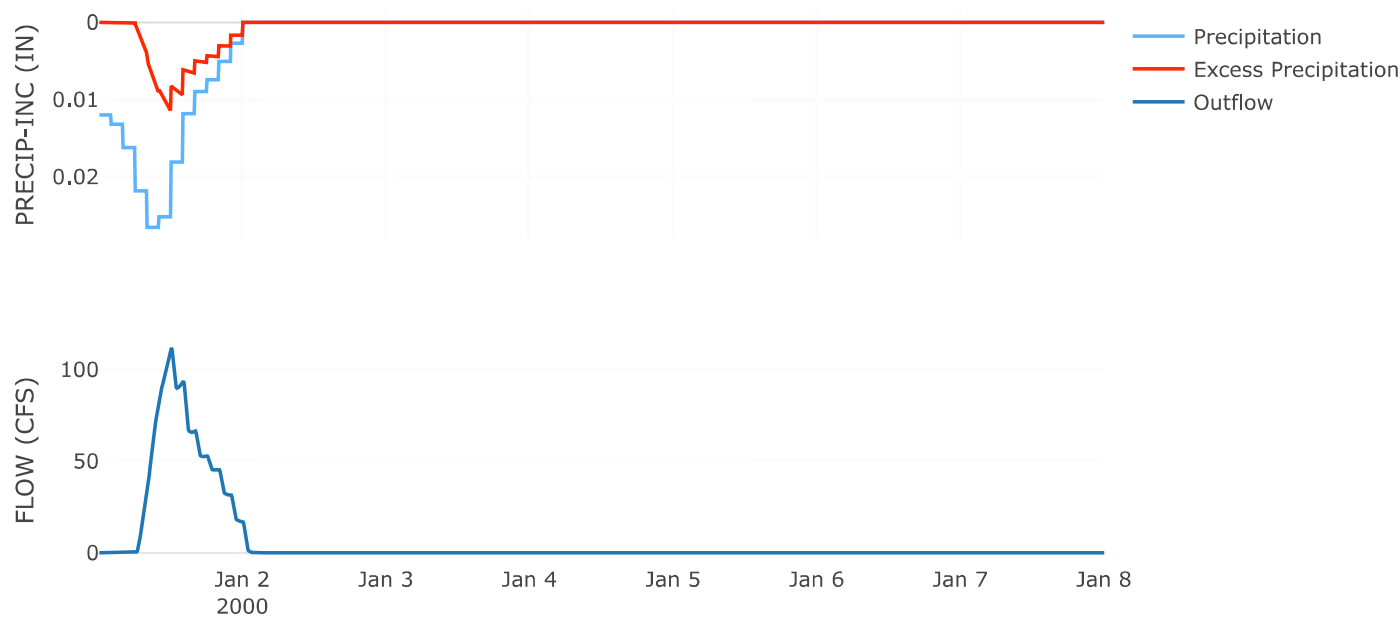
Subbasin: Subbasin-4

Area (MI²) : 1.6

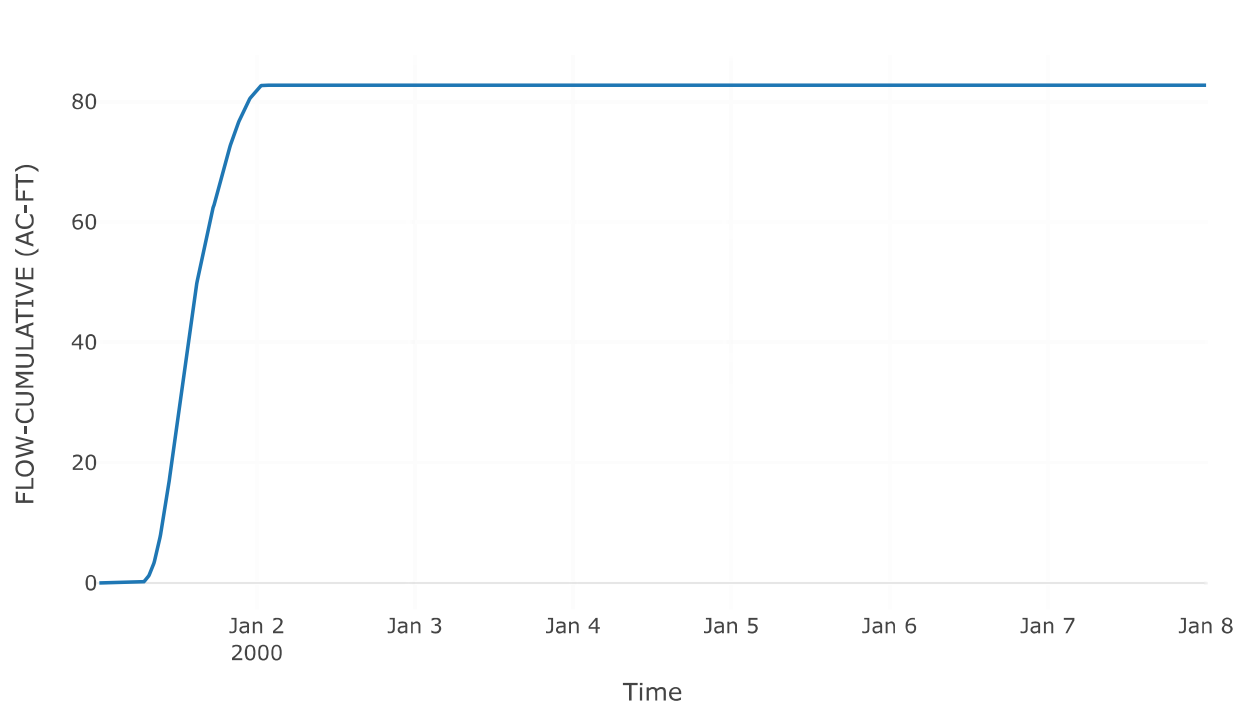
Transform: Scs	
Lag	22.97
Unitgraph Type	Standard

Results: Subbasin-4	
Peak Discharge (CFS)	111.91
Time of Peak Discharge	01Jan2000, 12:06
Volume (IN)	0.97
Precipitation Volume (AC - FT)	287.81
Loss Volume (AC - FT)	205.04
Excess Volume (AC - FT)	82.77
Direct Runoff Volume (AC - FT)	82.77
Baseflow Volume (AC - FT)	0

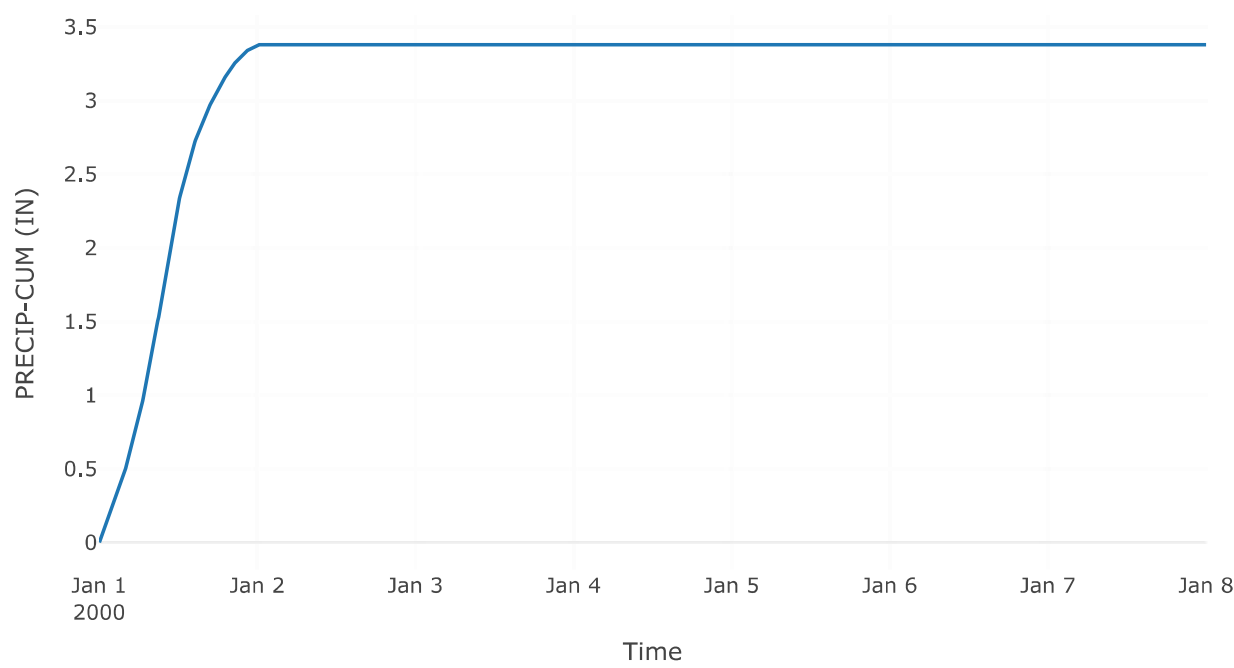
Precipitation and Outflow



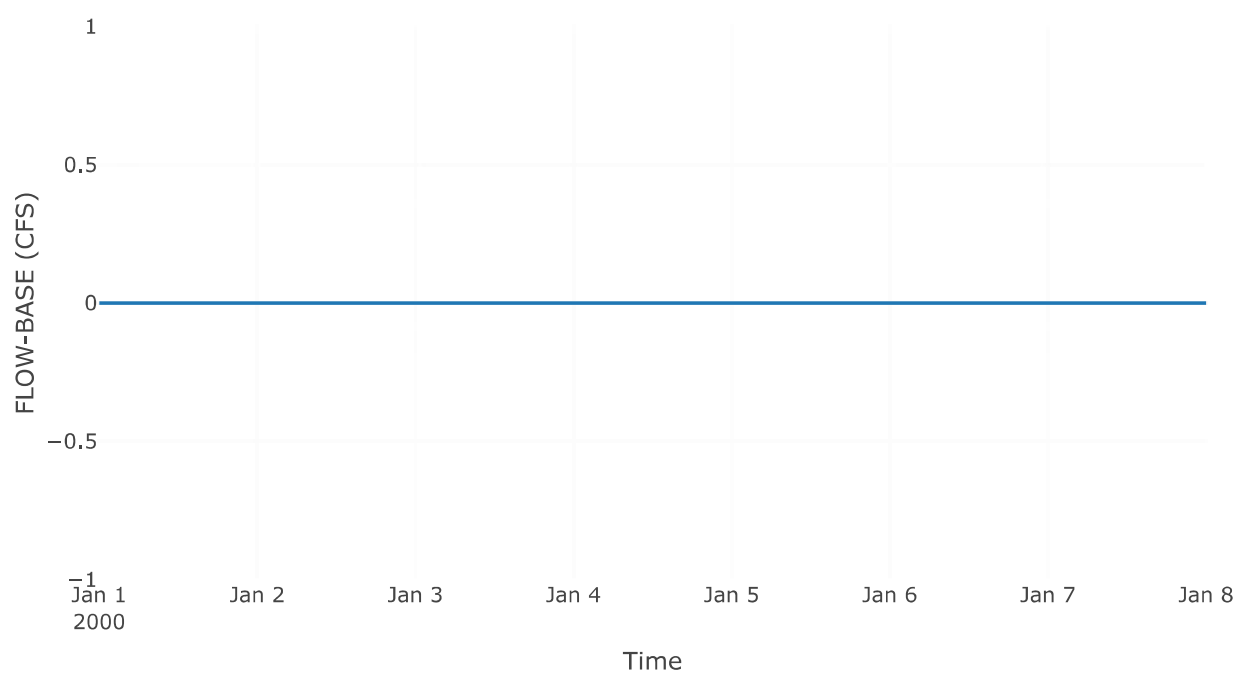
Cumulative Outflow



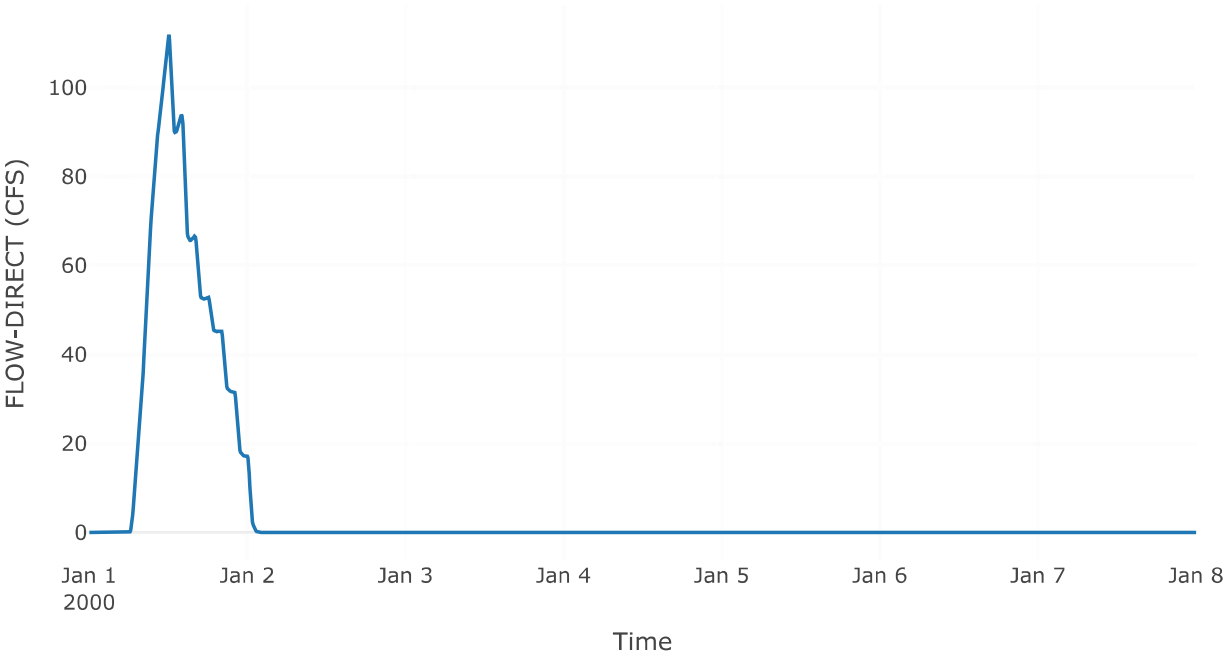
Cumulative Precipitation



Baseflow



Direct Runoff



Subbasin: Subbasin-1

Area (MI²) : 0.52

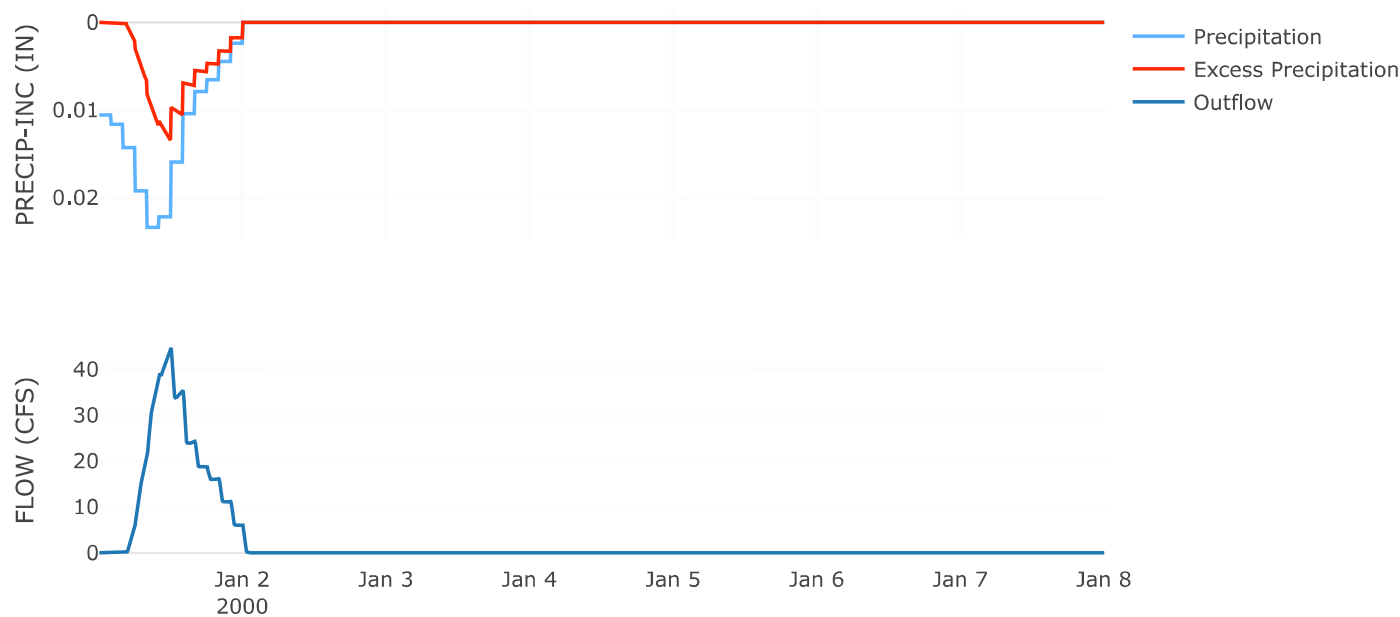
Transform: SCS

Lag	12.56
Unitgraph Type	Standard

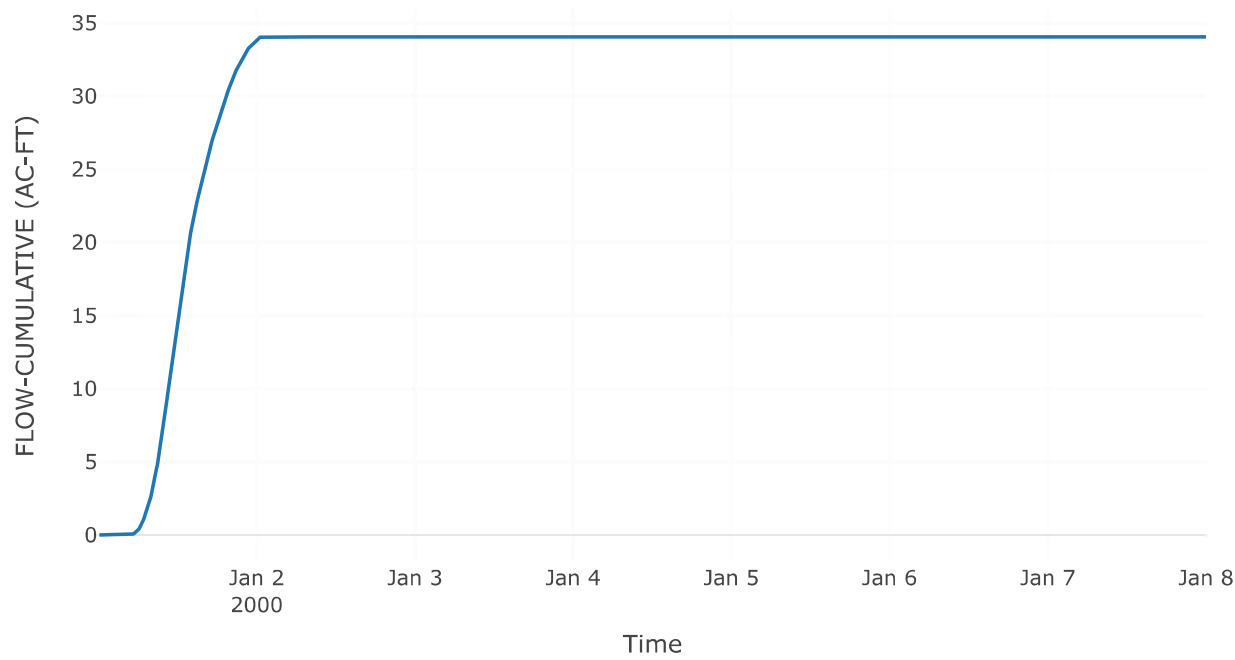
Results: Subbasin-1

Peak Discharge (CFS)	44.69
Time of Peak Discharge	01Jan2000, 12:00
Volume (IN)	1.22
Precipitation Volume (AC - FT)	83.39
Loss Volume (AC - FT)	49.35
Excess Volume (AC - FT)	34.04
Direct Runoff Volume (AC - FT)	34.04
Baseflow Volume (AC - FT)	0

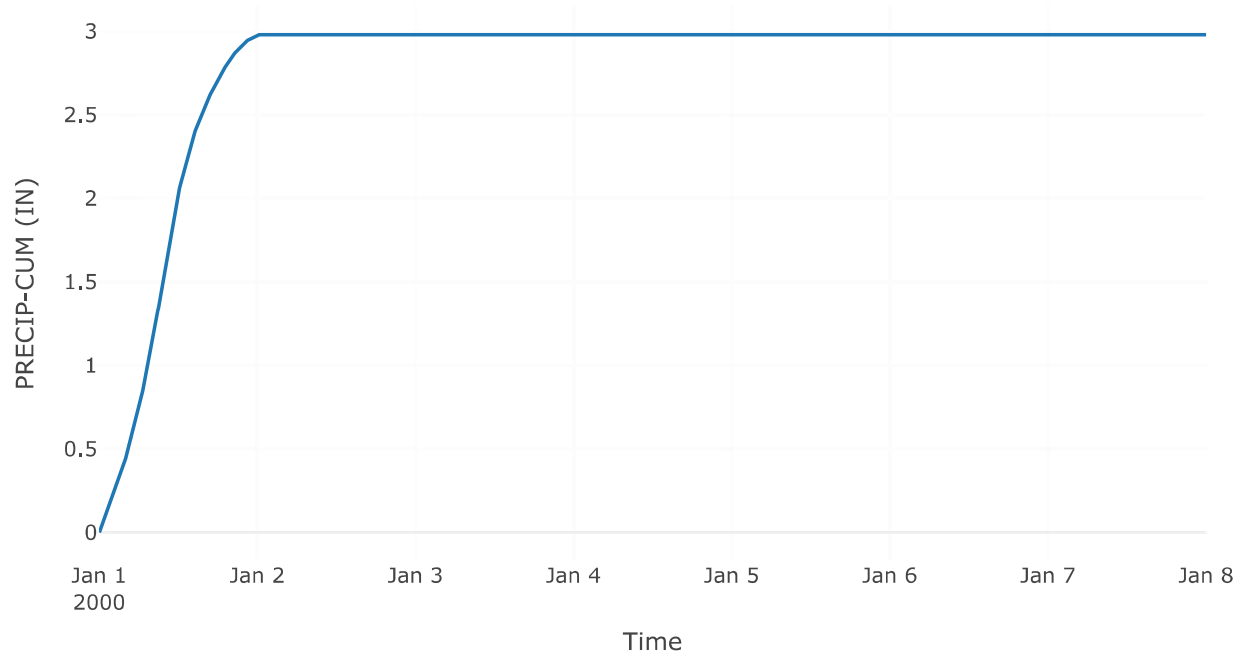
Precipitation and Outflow



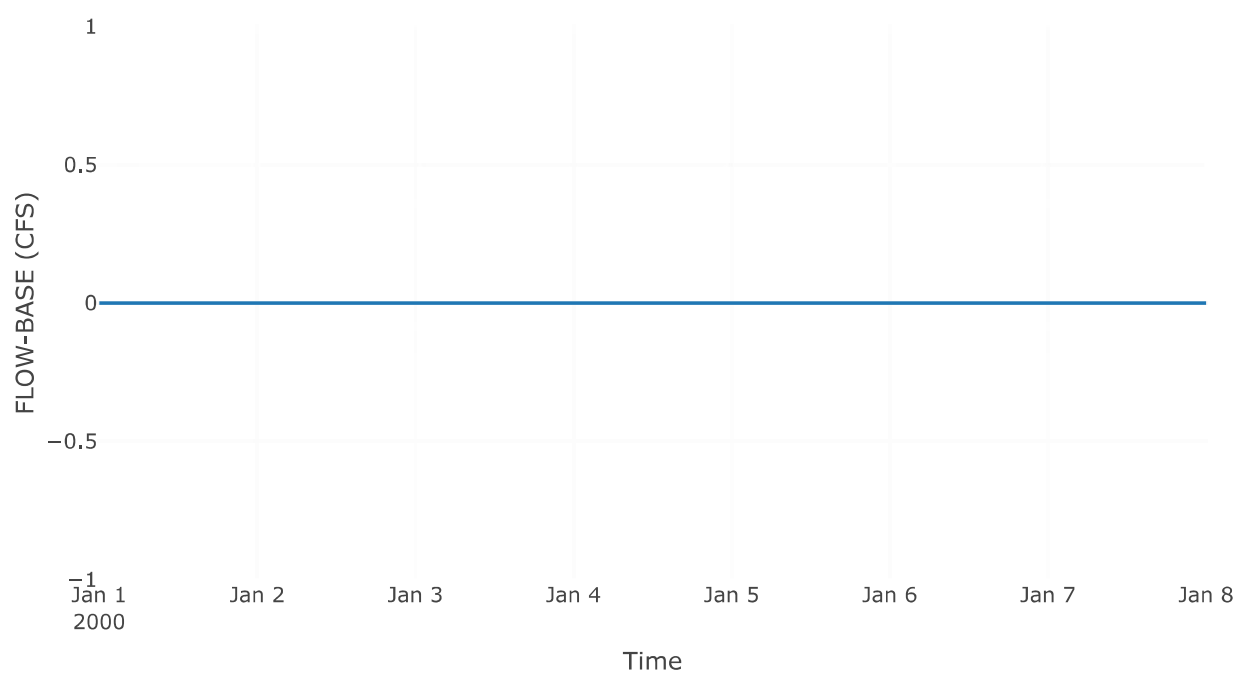
Cumulative Outflow



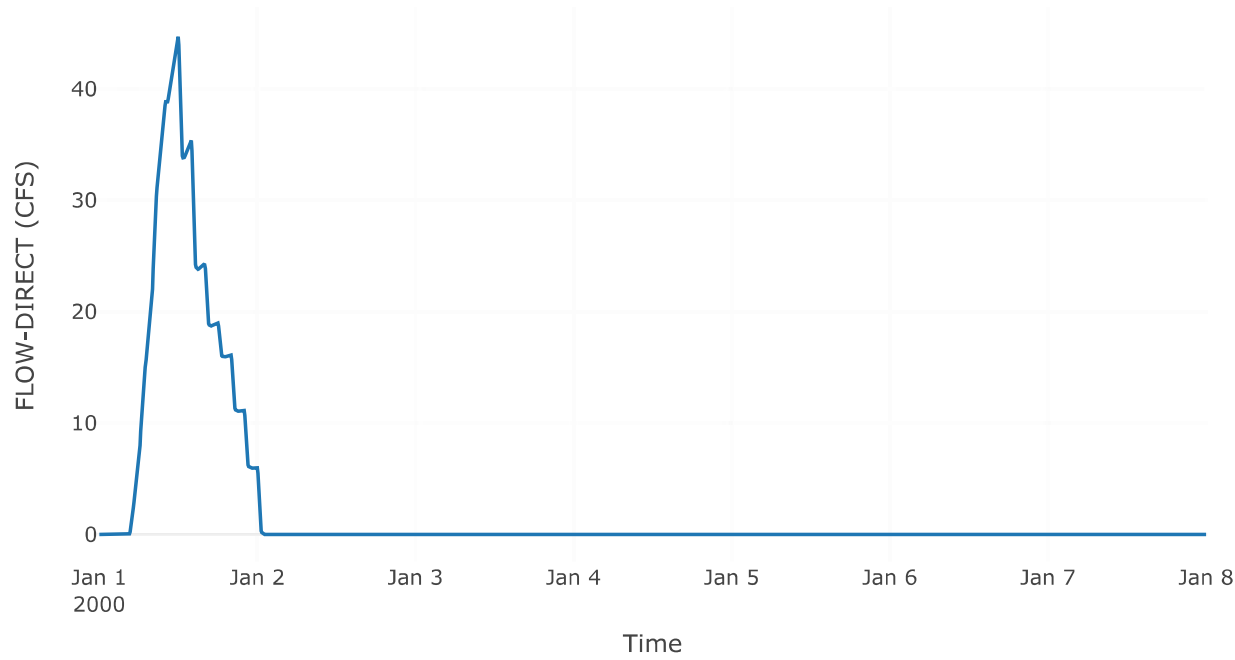
Cumulative Precipitation



Baseflow



Direct Runoff



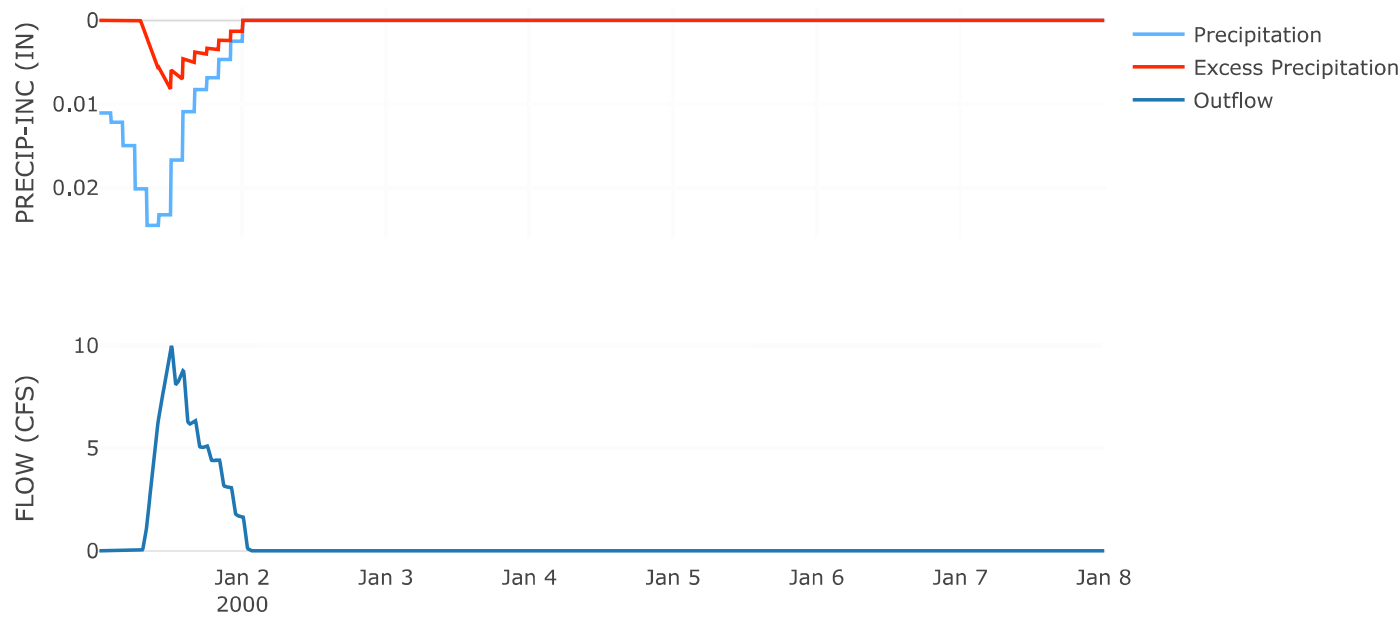
Subbasin: Subbasin-3

Area (MI²) : 0.2

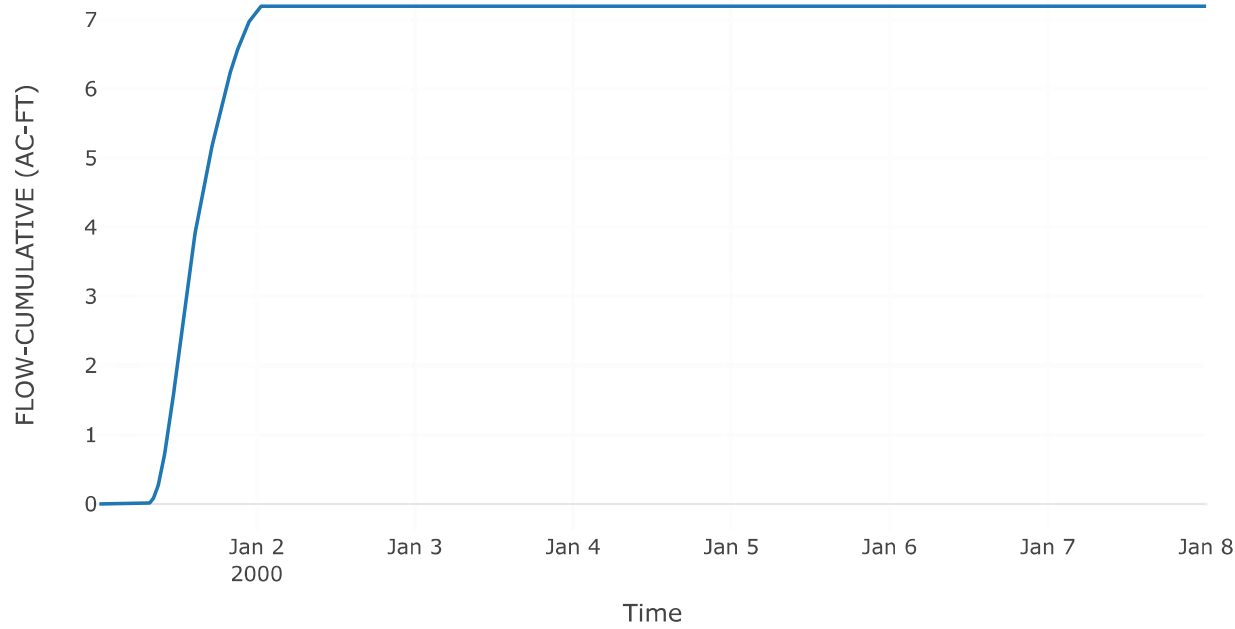
Transform: SCS	
Lag	20.01
Unitgraph Type	Standard

Results: Subbasin-3	
Peak Discharge (CFS)	9.98
Time of Peak Discharge	01Jan2000, 12:06
Volume (IN)	0.68
Precipitation Volume (AC - FT)	33.21
Loss Volume (AC - FT)	26.02
Excess Volume (AC - FT)	7.2
Direct Runoff Volume (AC - FT)	7.2
Baseflow Volume (AC - FT)	0

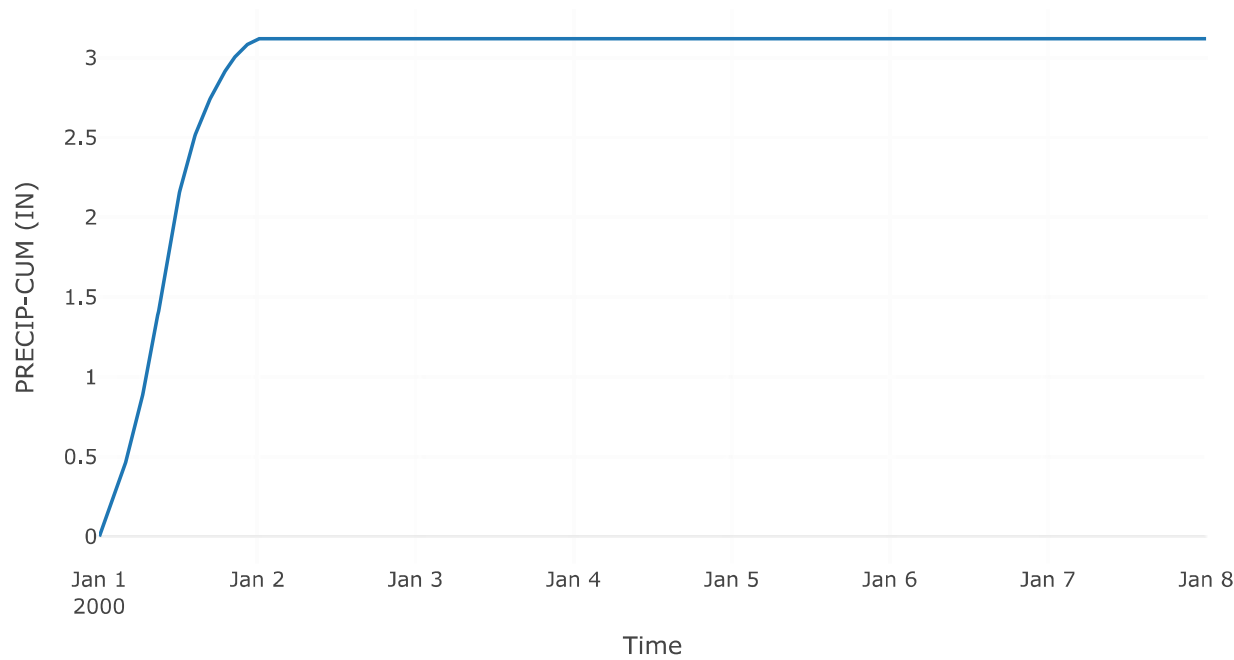
Precipitation and Outflow



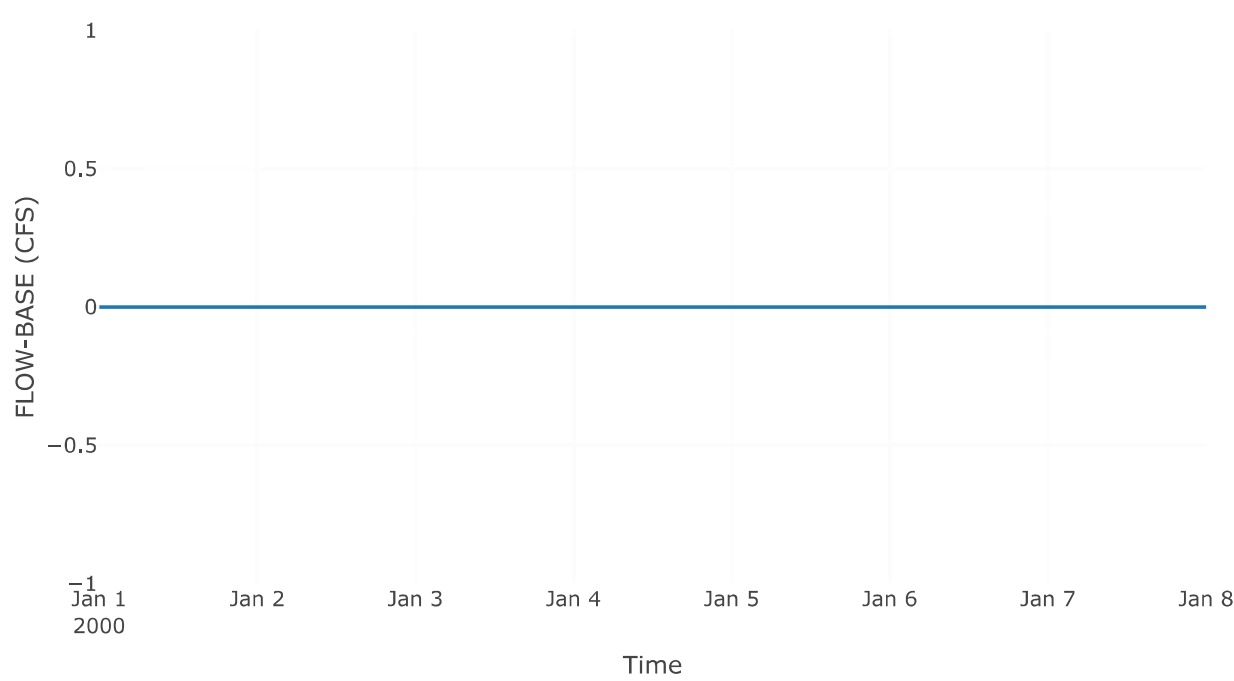
Cumulative Outflow



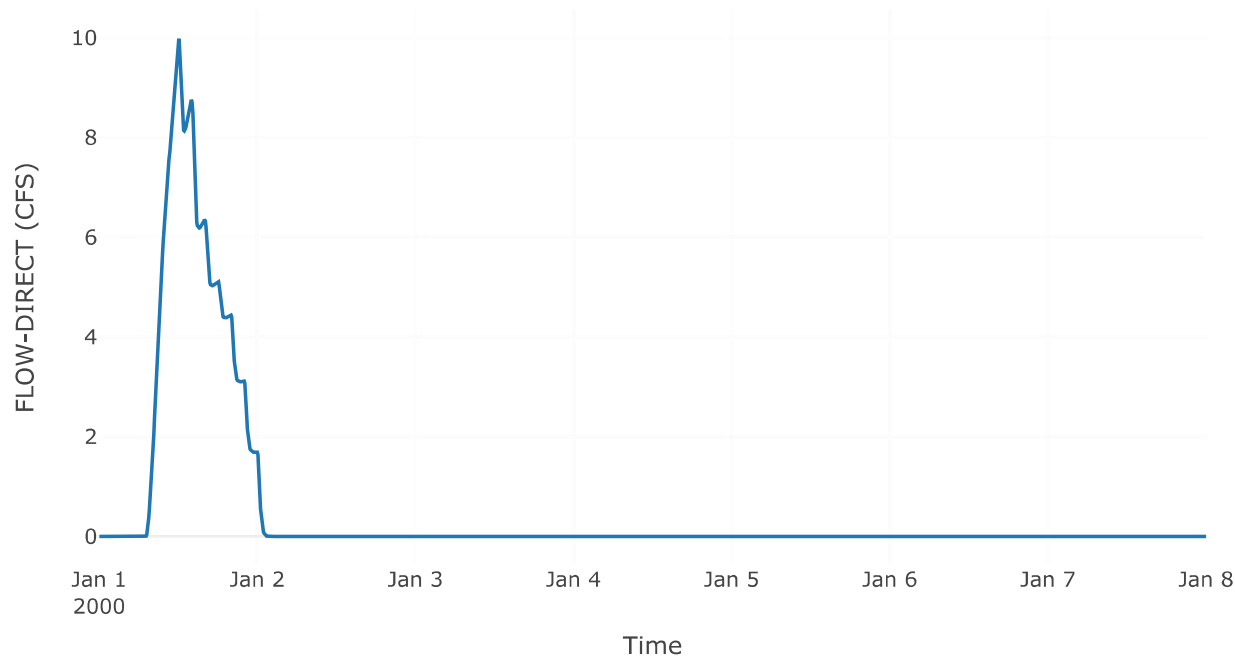
Cumulative Precipitation



Baseflow



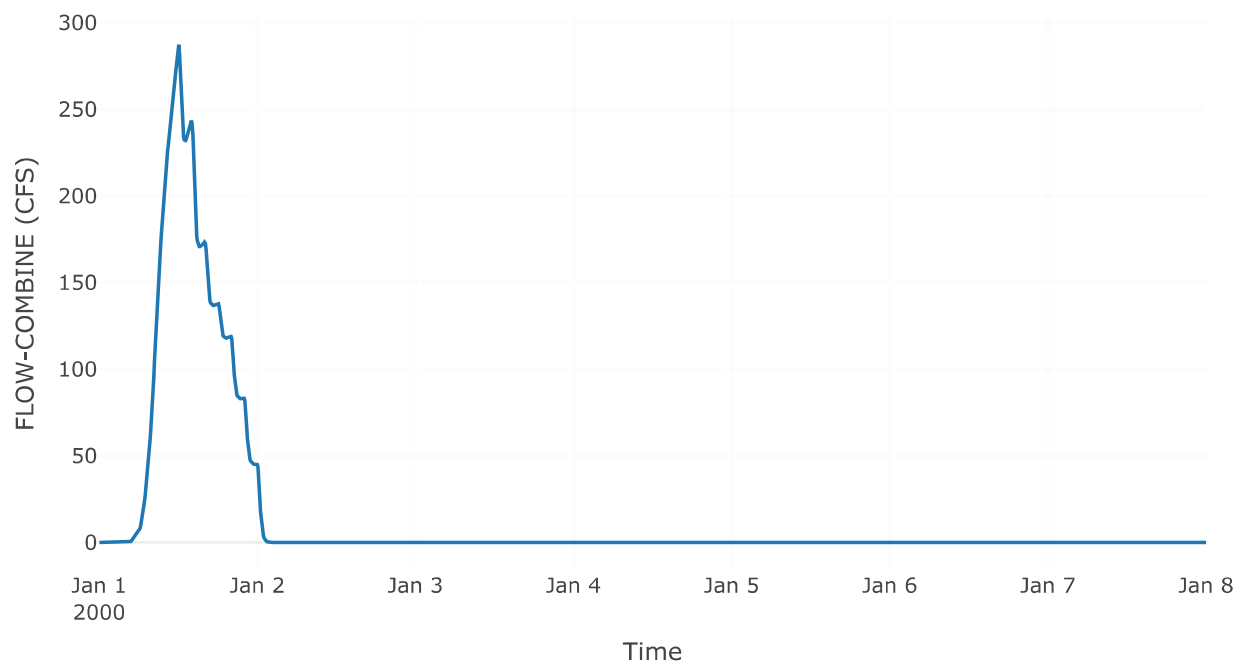
Direct Runoff



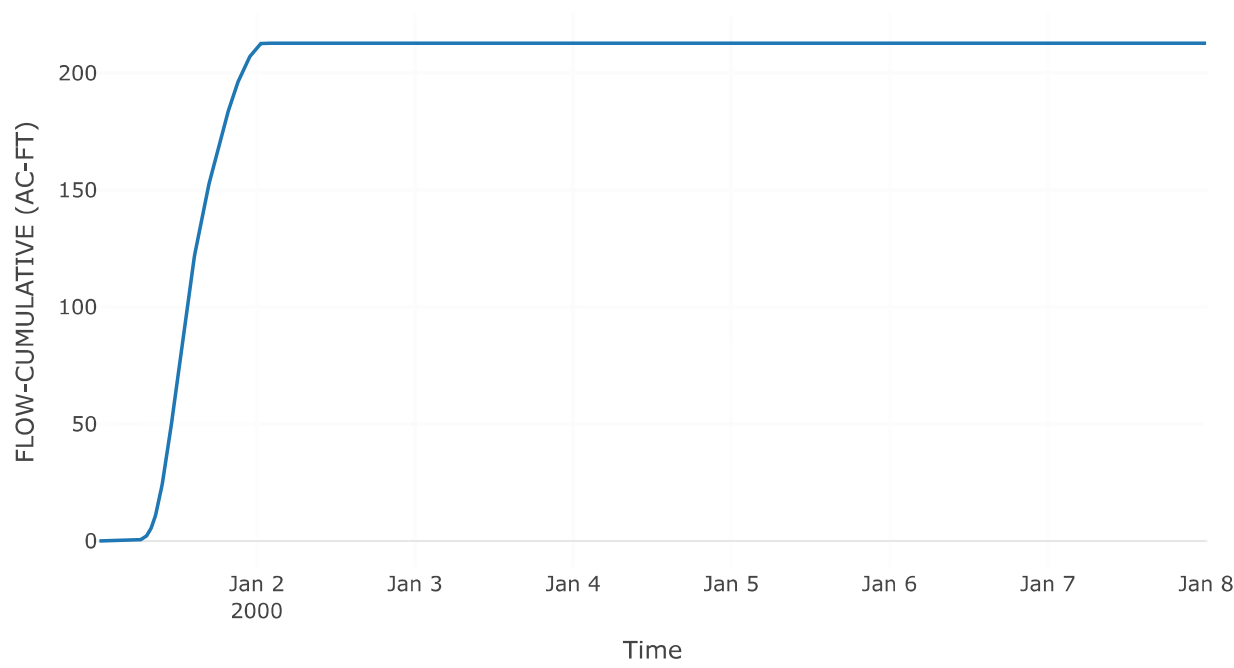
Junction: Junction-1

Results: Junction-1	
Peak Discharge (CFS)	287.37
Time of Peak Discharge	01Jan2000, 12:06
Volume (IN)	0.91

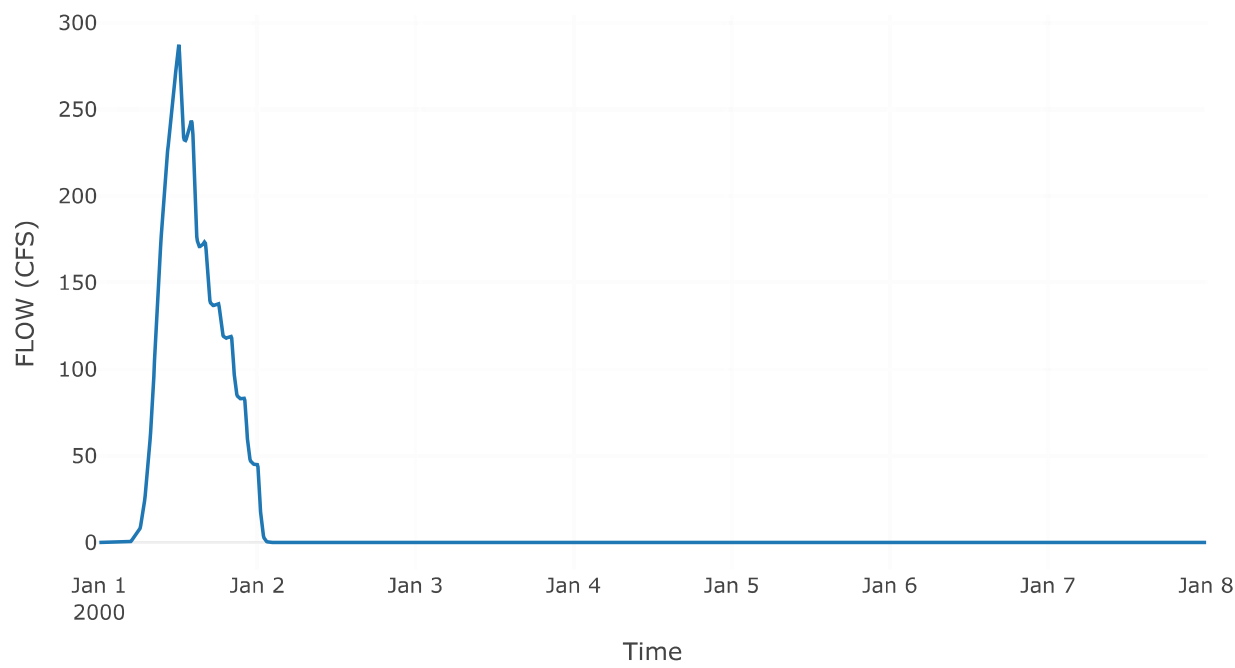
Combined Inflow



Cumulative Outflow



Outflow



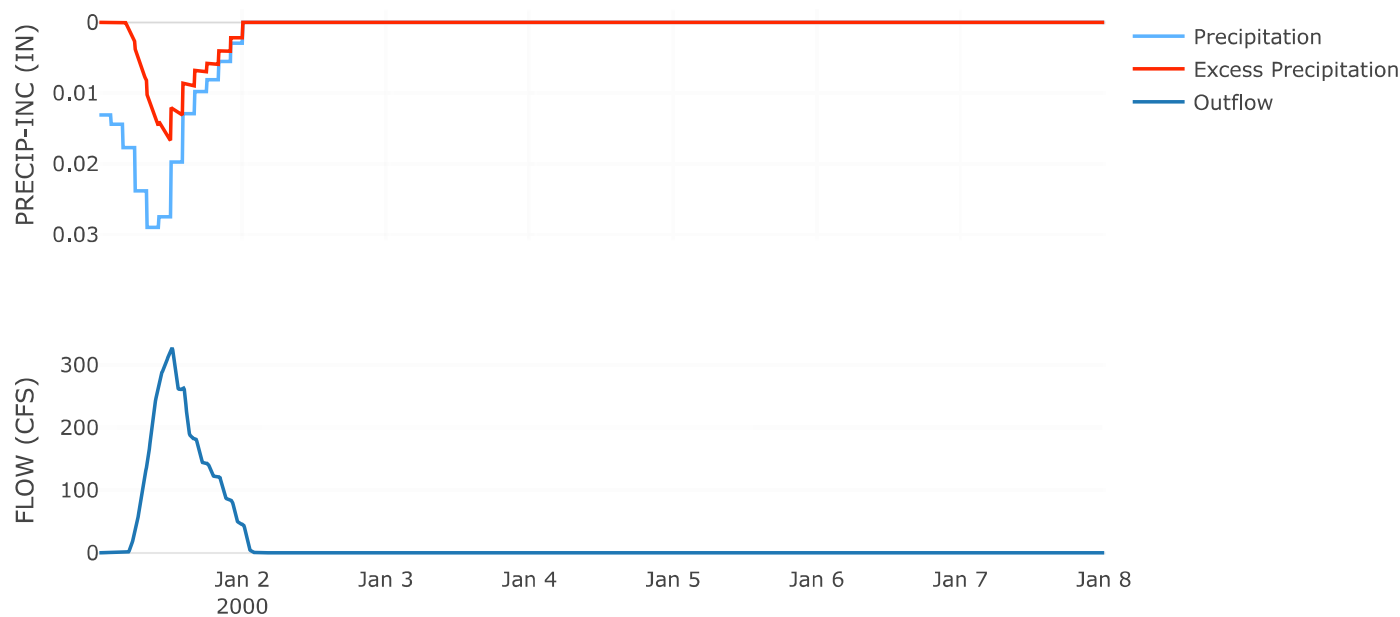
Subbasin: Subbasin-5

Area (MI²) : 3.19

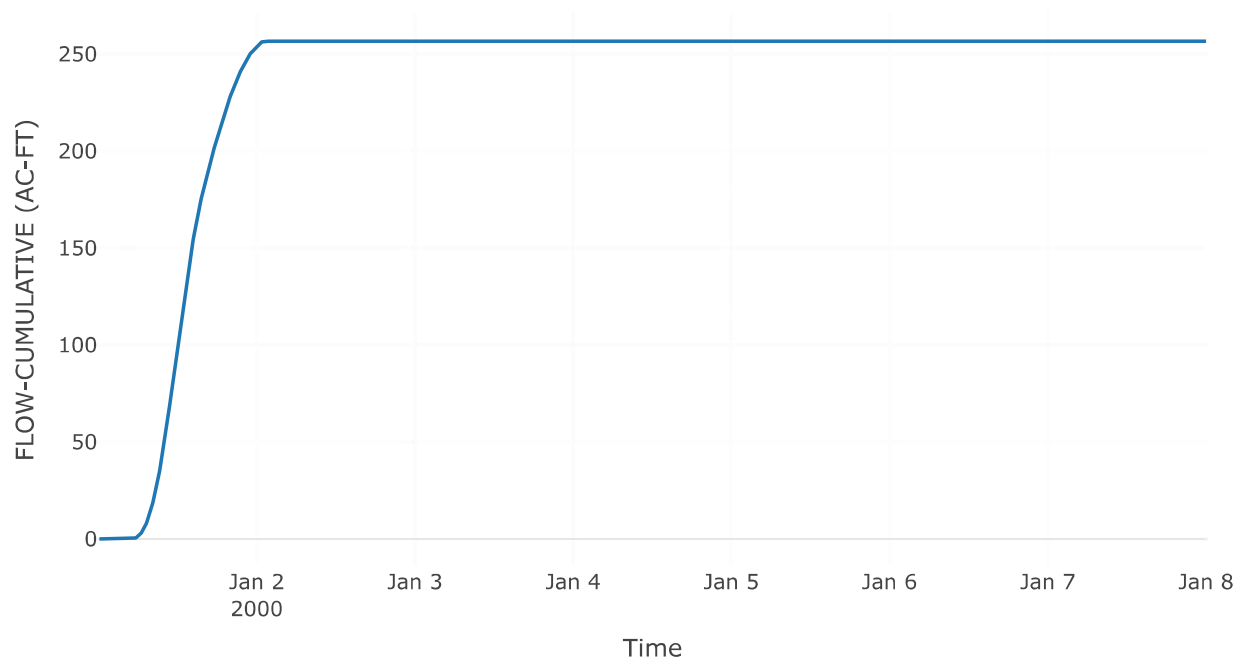
Transform: Scs	
Lag	32.22
Unitgraph Type	Standard

Results: Subbasin-5	
Peak Discharge (CFS)	327.39
Time of Peak Discharge	01Jan2000, 12:06
Volume (IN)	1.51
Precipitation Volume (AC - FT)	626.89
Loss Volume (AC - FT)	370.1
Excess Volume (AC - FT)	256.79
Direct Runoff Volume (AC - FT)	256.79
Baseflow Volume (AC - FT)	0

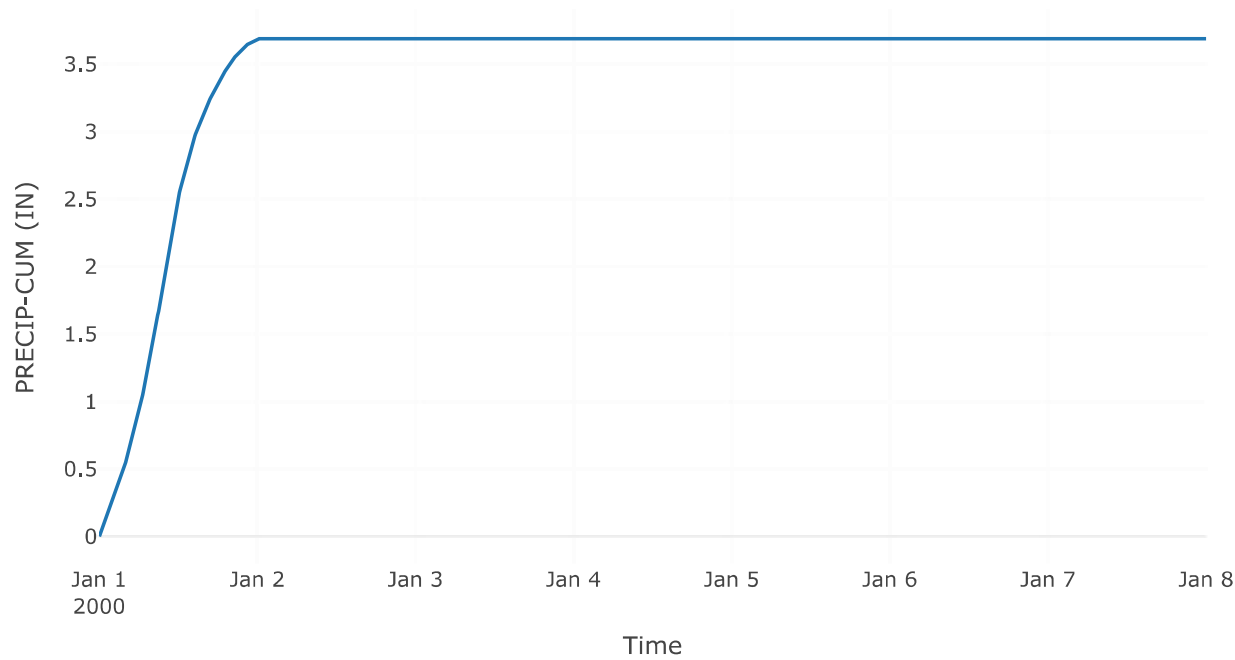
Precipitation and Outflow



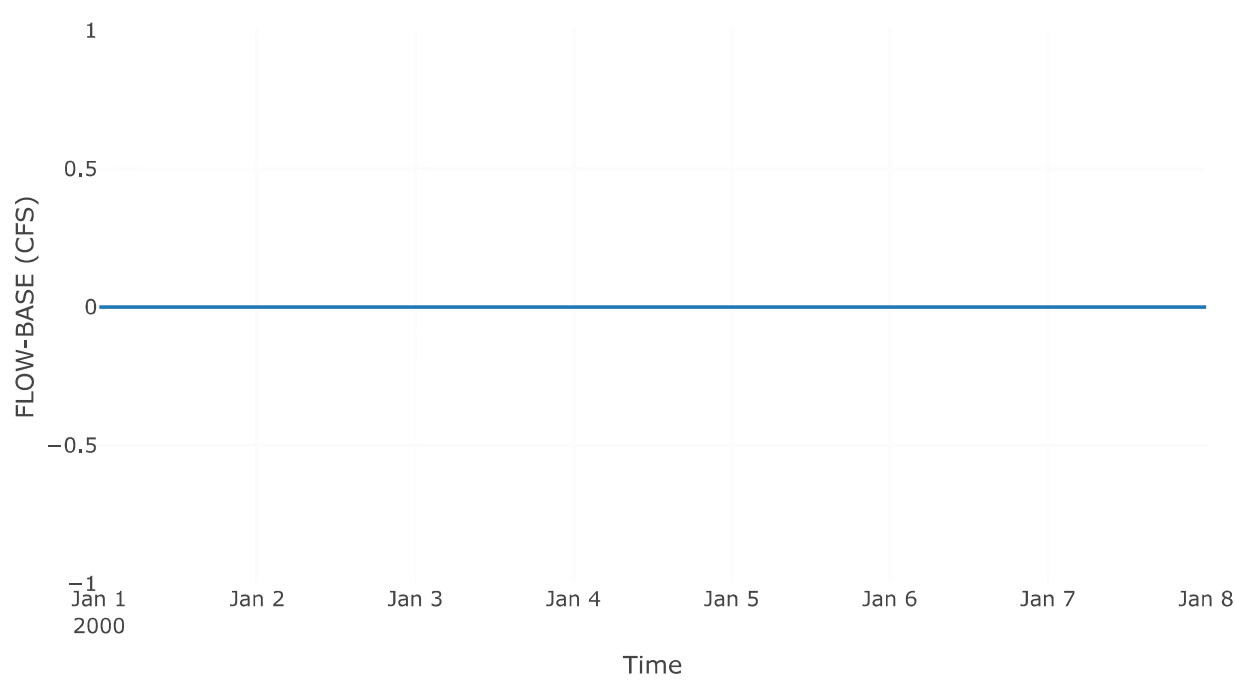
Cumulative Outflow



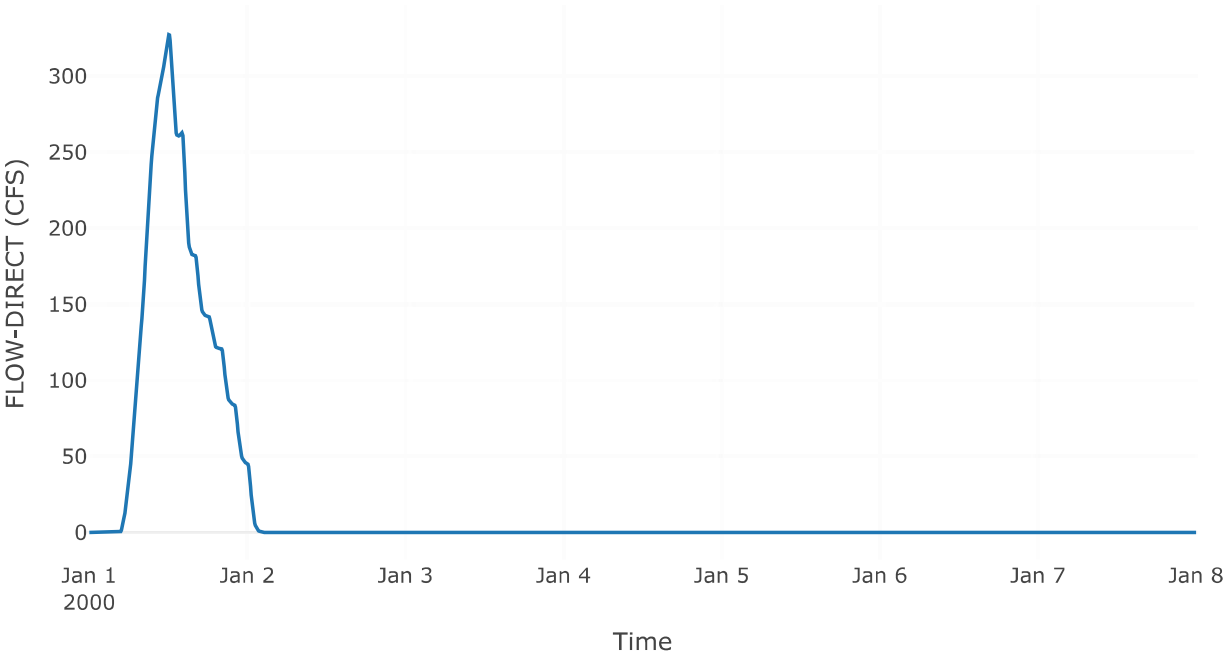
Cumulative Precipitation



Baseflow



Direct Runoff



Project: Mountain Watersheds

Simulation Run: 100-Yr 24-HrNOAA w/detention

Simulation Start: 31 December 1999, 24:00

Simulation End: 7 January 2000, 24:00

HMS Version: 4.12

Executed: 14 March 2025, 21:09

Global Parameter Summary - Subbasin

Area (MI ²)	
Element Name	Area (MI ²)
Subbasin - 6	4.54
Subbasin - 5	3.19
Subbasin - 1	0.52
Subbasin - 2	2.05
Subbasin - 4	1.6
Subbasin - 3	0.2

Global Results Summary

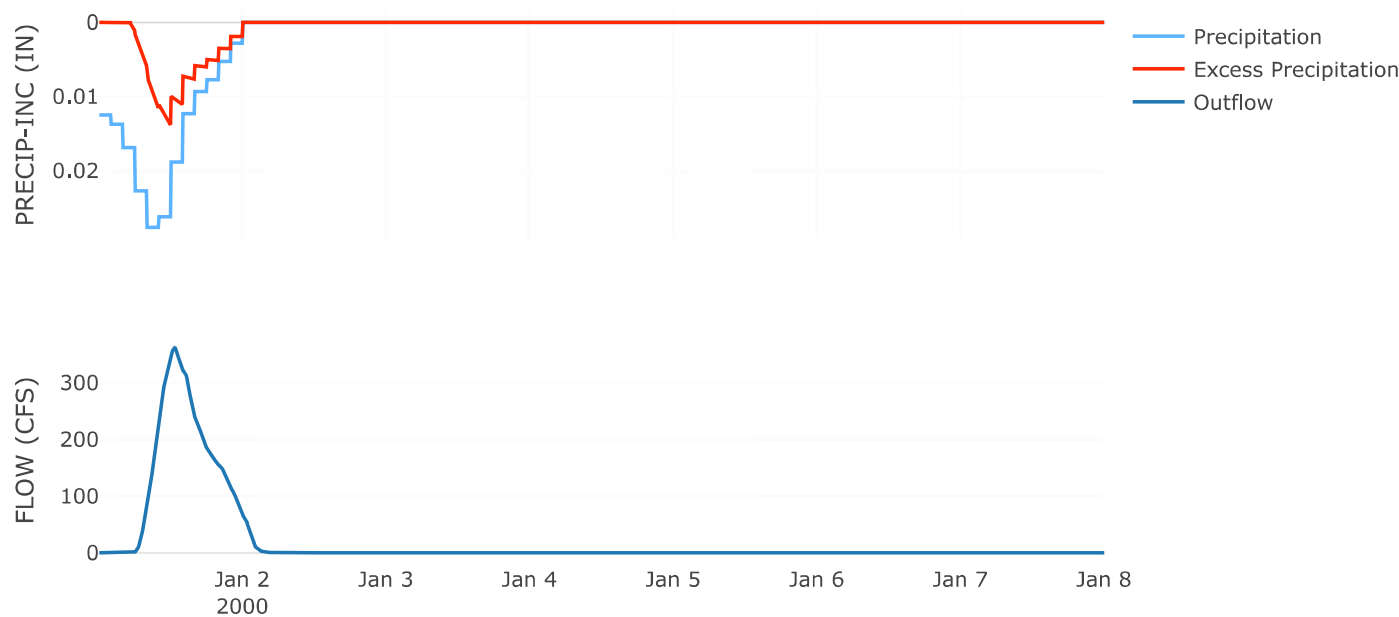
Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Subbasin - 6	4.54	361.81	01Jan2000, 12:36	1.21
Subbasin - 5	3.19	327.39	01Jan2000, 12:06	1.51
Subbasin - 1	0.52	44.69	01Jan2000, 12:00	1.22
Subbasin - 2	2.05	121.54	01Jan2000, 12:06	0.81
Middle A Reservoir	2.05	18.05	02Jan2000, 00:12	0.28
Subbasin - 4	1.6	111.91	01Jan2000, 12:06	0.97
Subbasin - 3	0.2	9.98	01Jan2000, 12:06	0.68
Middle B Reservoir	1.8	28.53	01Jan2000, 22:24	0.46
Upper Reservoir	0.52	17.79	01Jan2000, 18:12	0.65
City Reservoir	4.37	11.37	02Jan2000, 16:18	0.3
Lower Reservoir	3.19	89.27	01Jan2000, 21:06	0.88

Subbasin: Subbasin-6

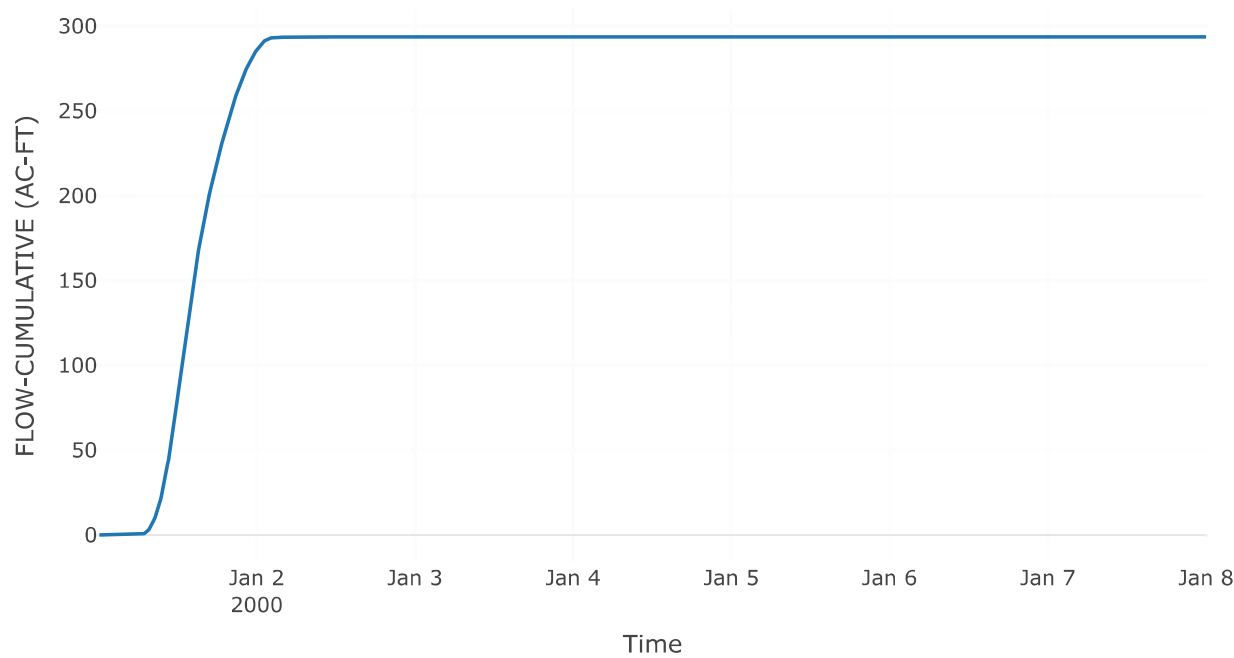
Area (MI²) : 4.54

Results: Subbasin-6	
Peak Discharge (CFS)	361.81
Time of Peak Discharge	01Jan2000, 12:36
Volume (IN)	1.21
Precipitation Volume (AC - FT)	853.25
Loss Volume (AC - FT)	559.67
Excess Volume (AC - FT)	293.58
Direct Runoff Volume (AC - FT)	293.58
Baseflow Volume (AC - FT)	0

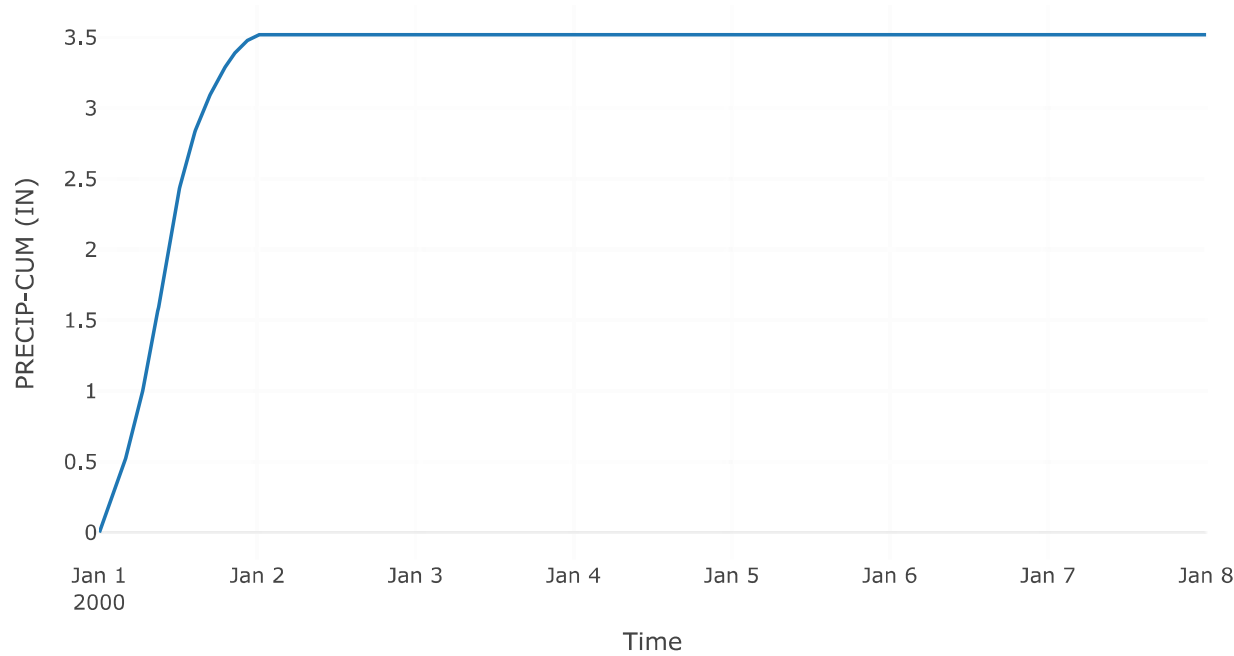
Precipitation and Outflow



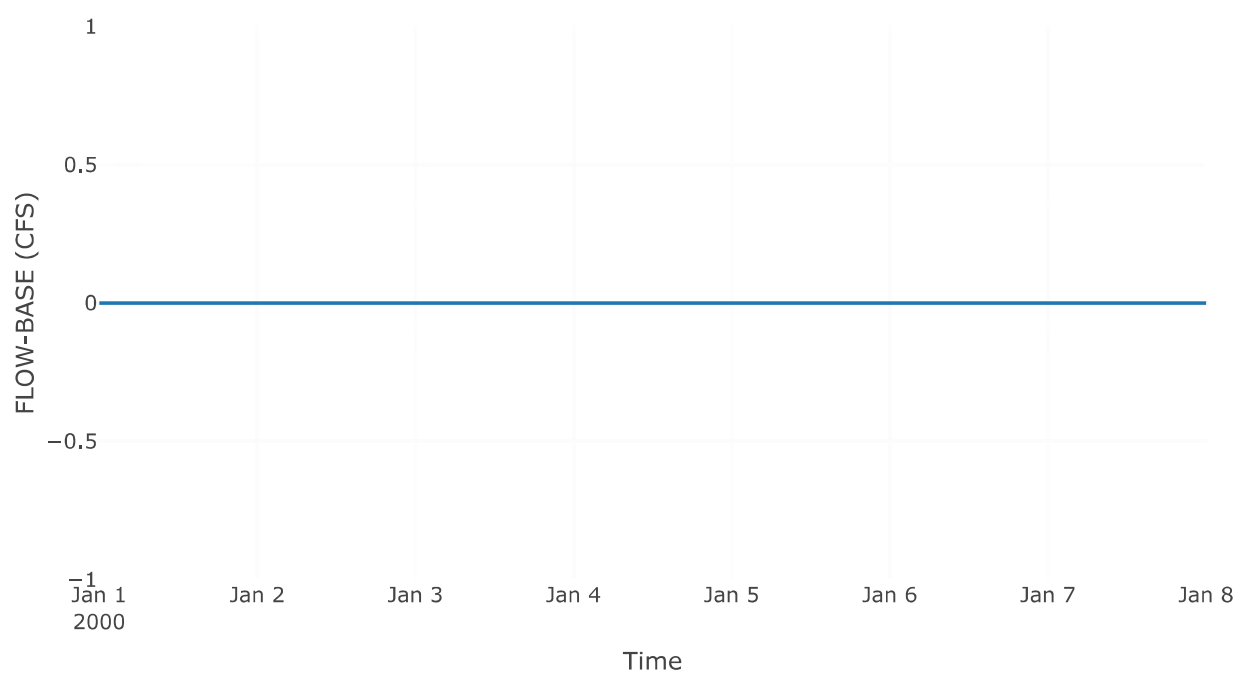
Cumulative Outflow



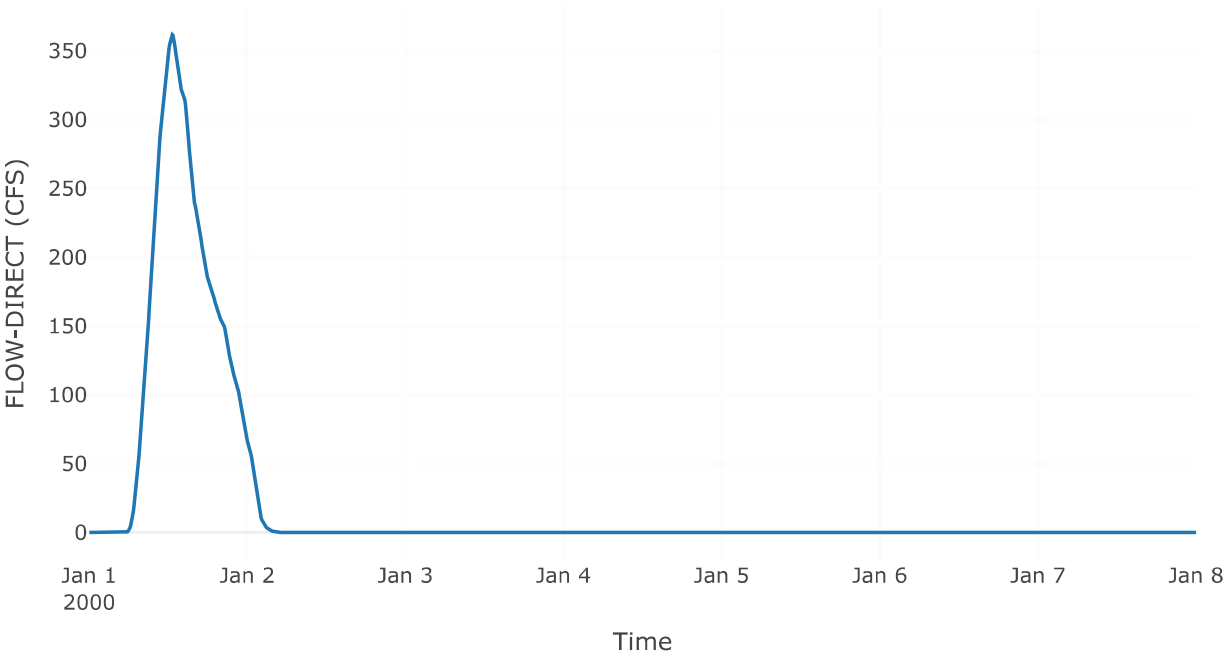
Cumulative Precipitation



Baseflow



Direct Runoff

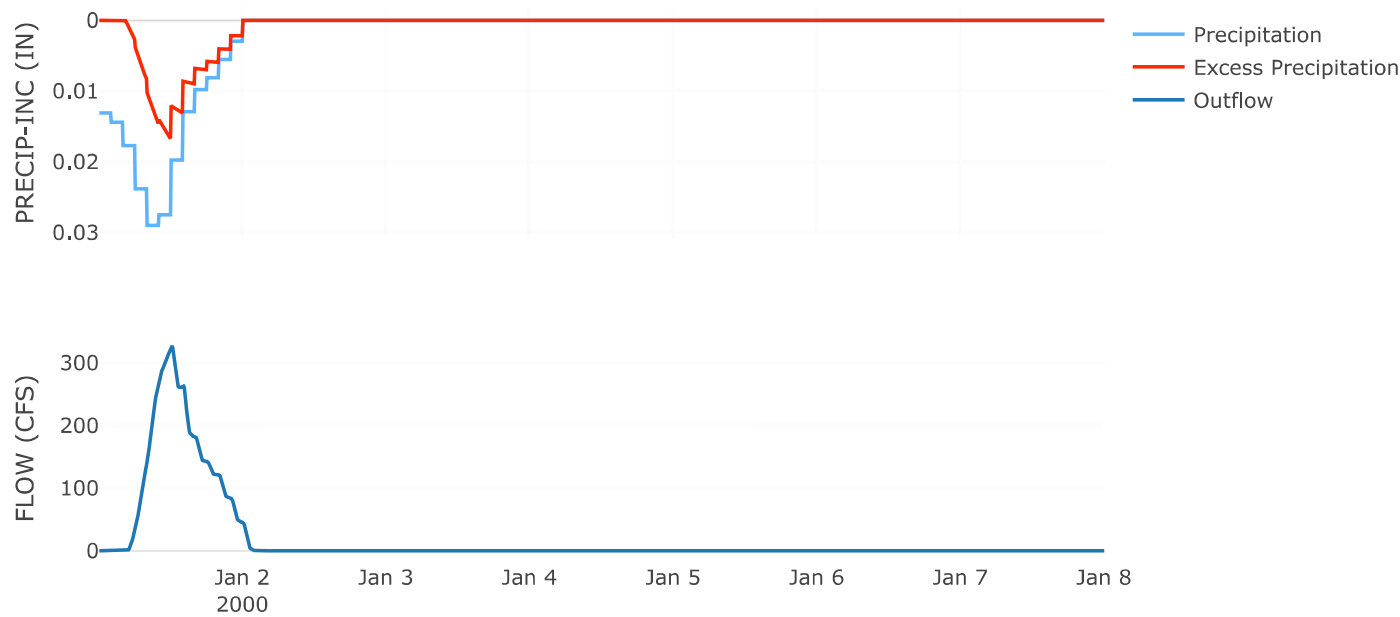


Subbasin: Subbasin-5

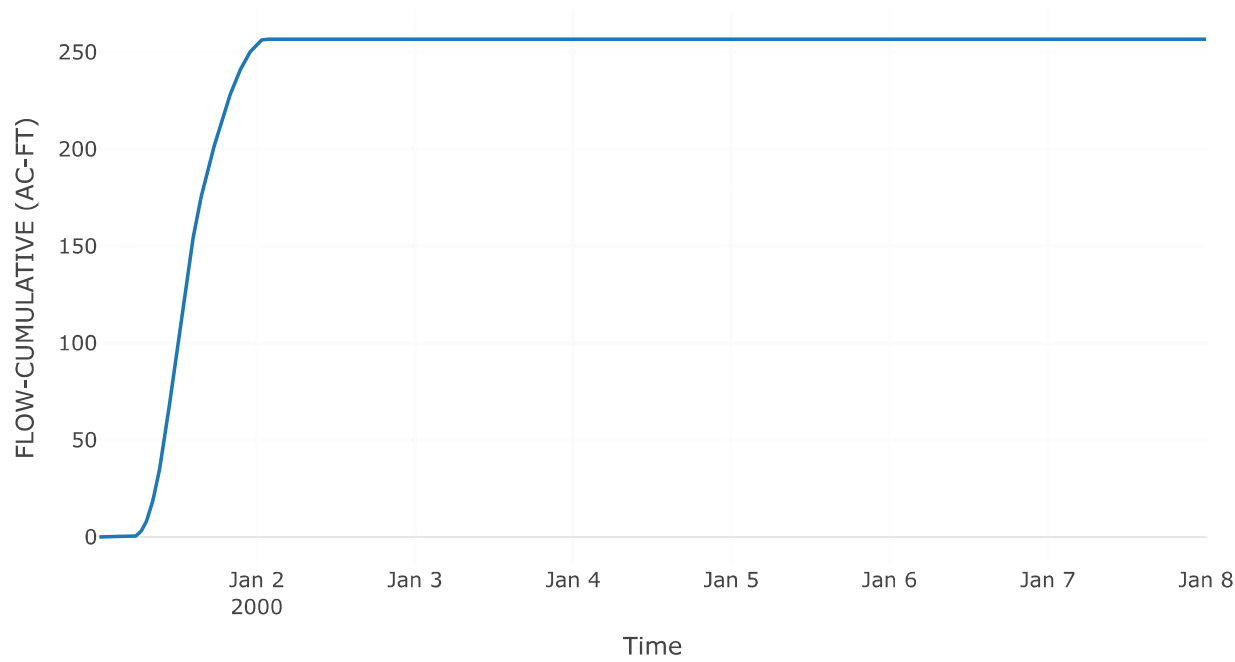
Area (MI²) : 3.19

Results: Subbasin-5	
Peak Discharge (CFS)	327.39
Time of Peak Discharge	01Jan2000, 12:06
Volume (IN)	1.51
Precipitation Volume (AC - FT)	626.89
Loss Volume (AC - FT)	370.1
Excess Volume (AC - FT)	256.79
Direct Runoff Volume (AC - FT)	256.79
Baseflow Volume (AC - FT)	0

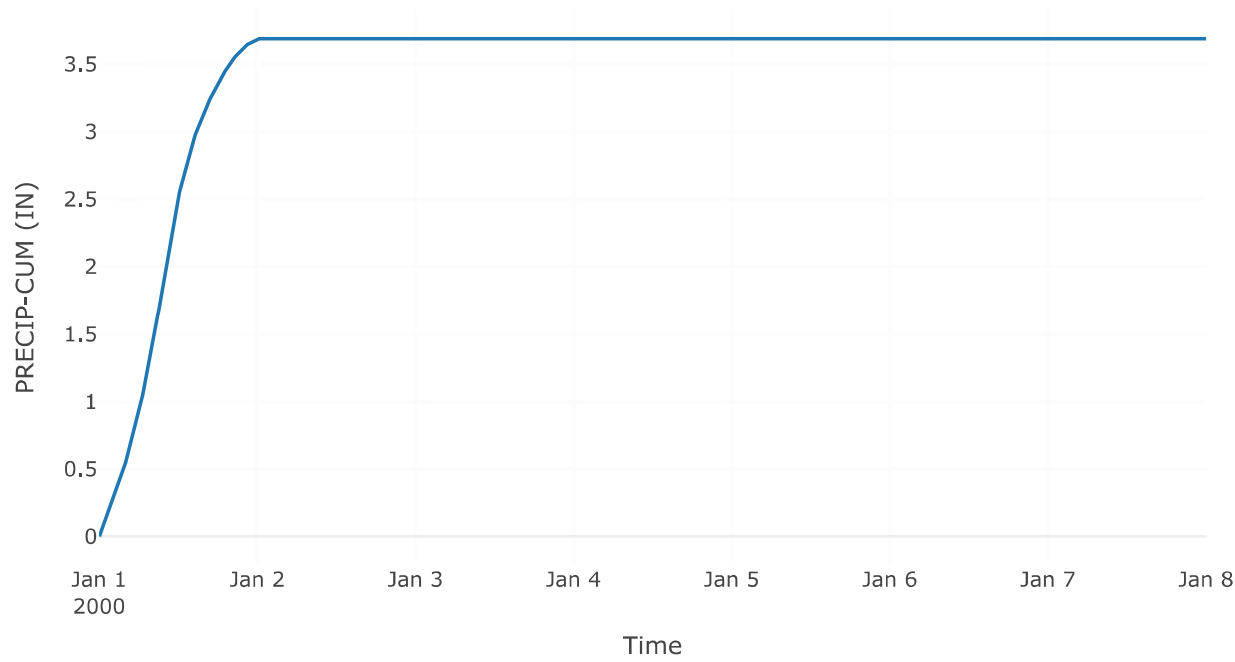
Precipitation and Outflow



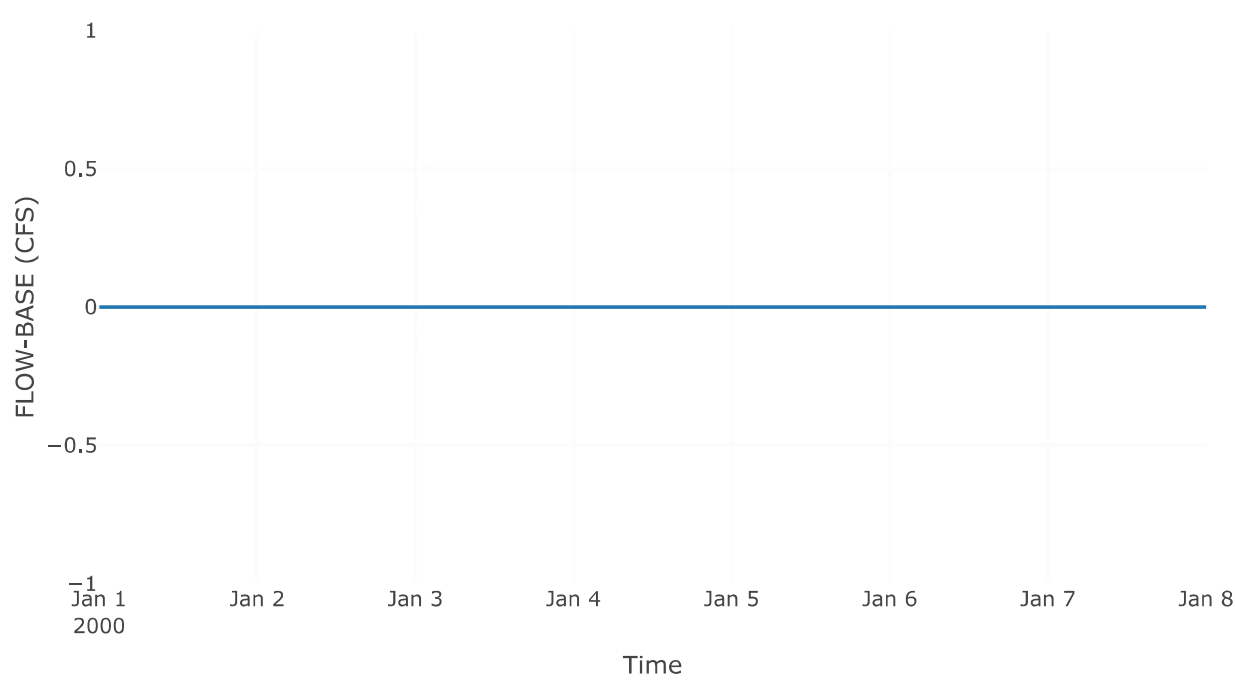
Cumulative Outflow



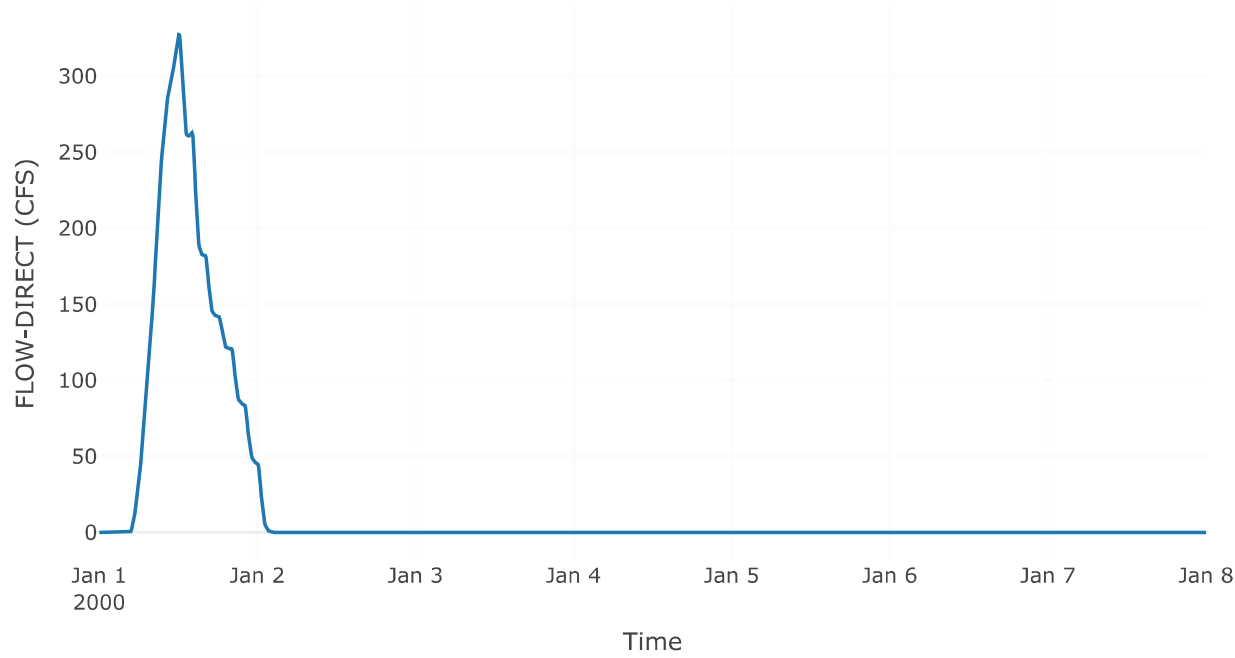
Cumulative Precipitation



Baseflow



Direct Runoff

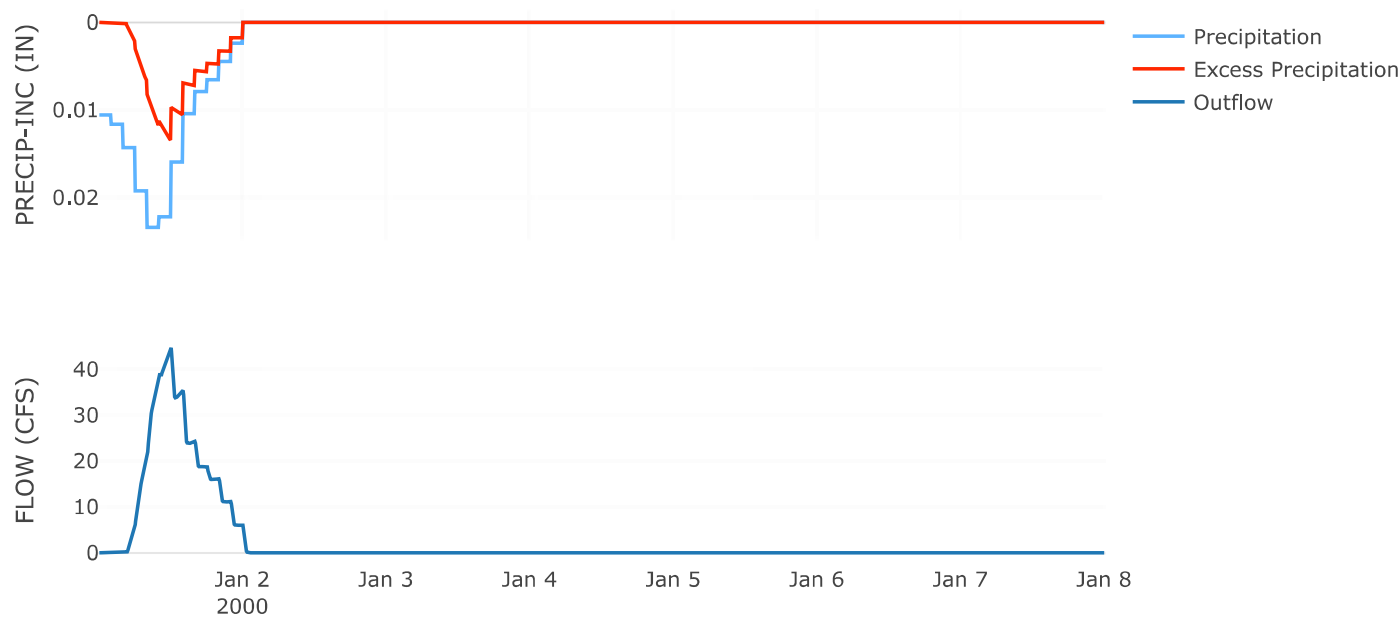


Subbasin: Subbasin-1

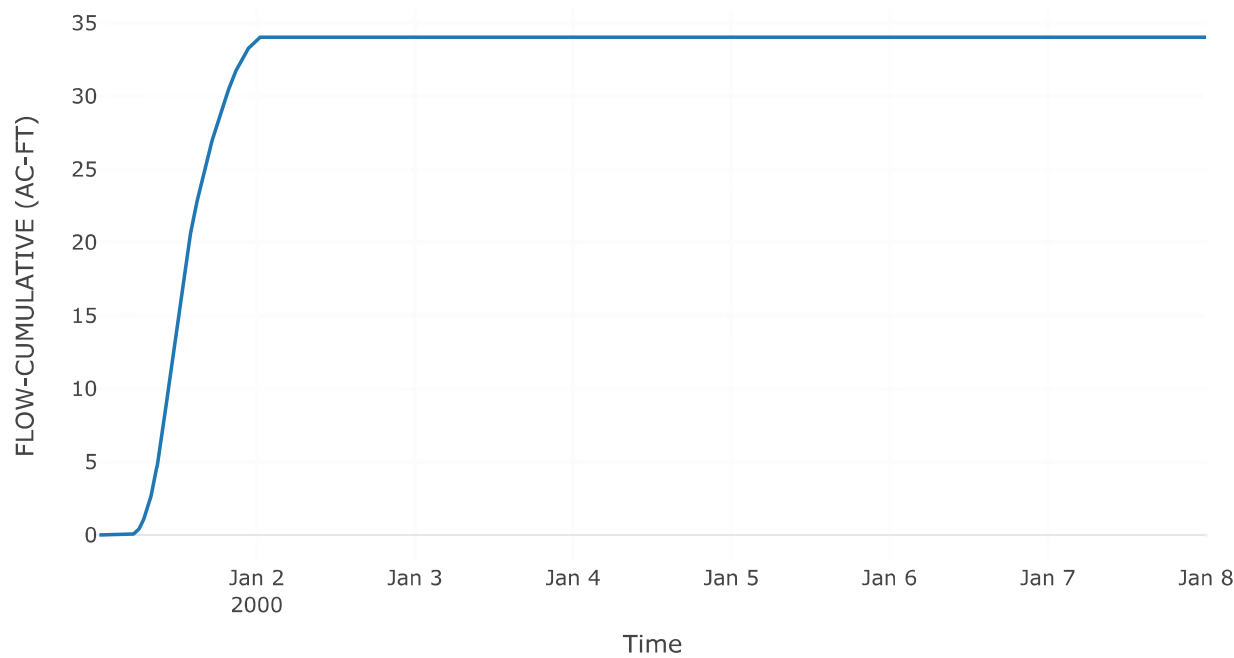
Area (MI²) : 0.52

Results: Subbasin-1	
Peak Discharge (CFS)	44.69
Time of Peak Discharge	01Jan2000, 12:00
Volume (IN)	1.22
Precipitation Volume (AC - FT)	83.39
Loss Volume (AC - FT)	49.35
Excess Volume (AC - FT)	34.04
Direct Runoff Volume (AC - FT)	34.04
Baseflow Volume (AC - FT)	0

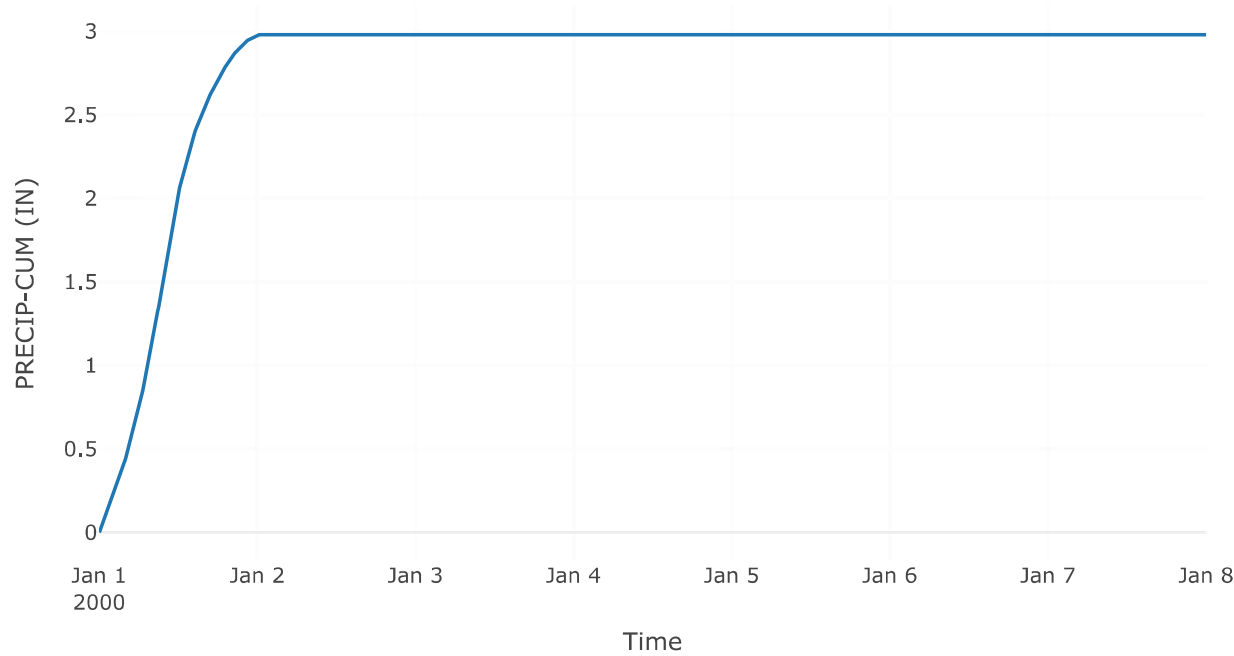
Precipitation and Outflow



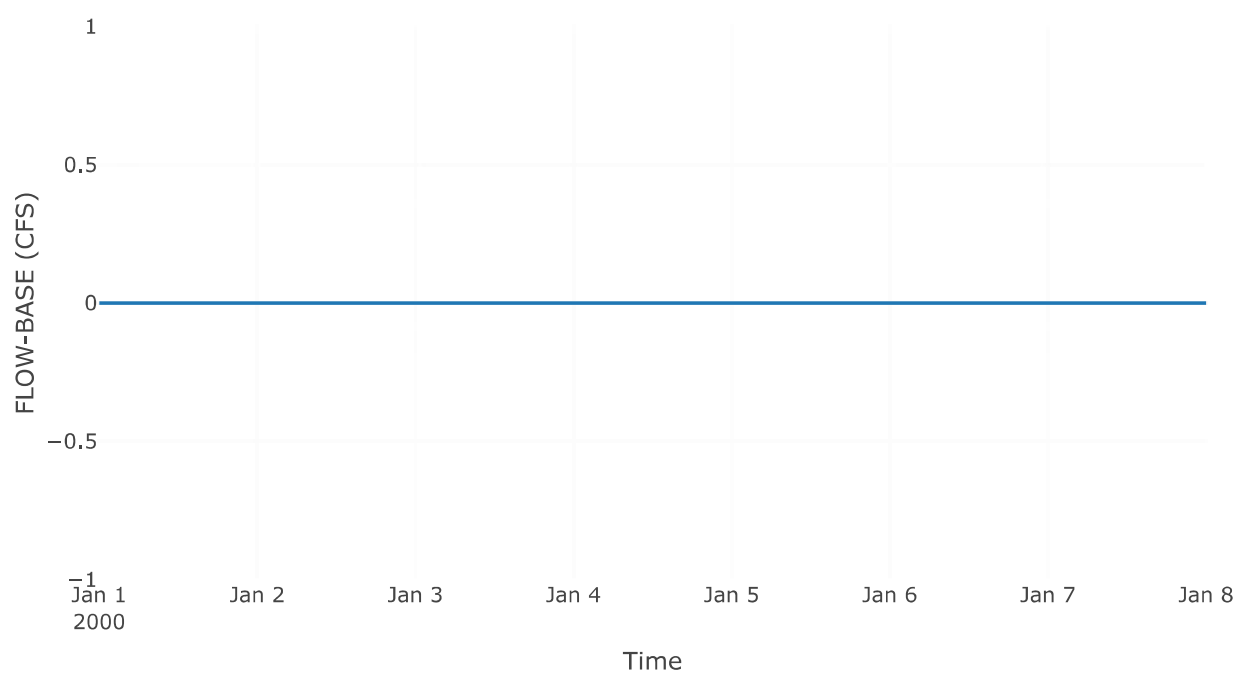
Cumulative Outflow



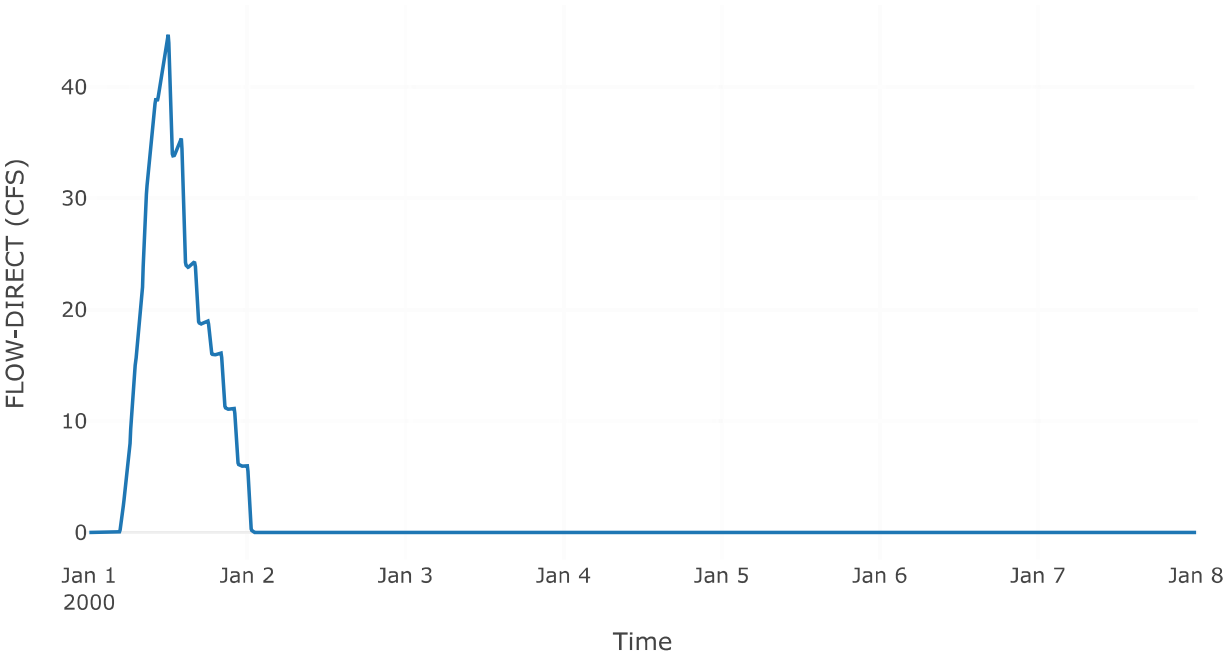
Cumulative Precipitation



Baseflow



Direct Runoff

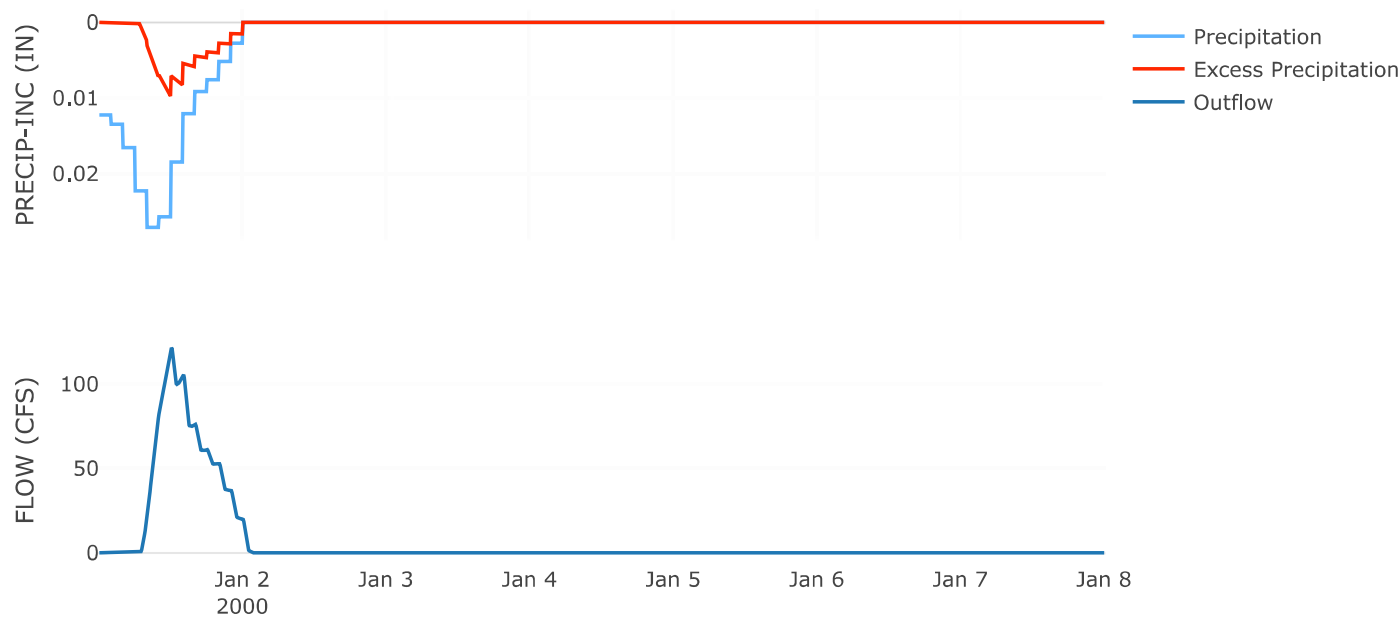


Subbasin: Subbasin-2

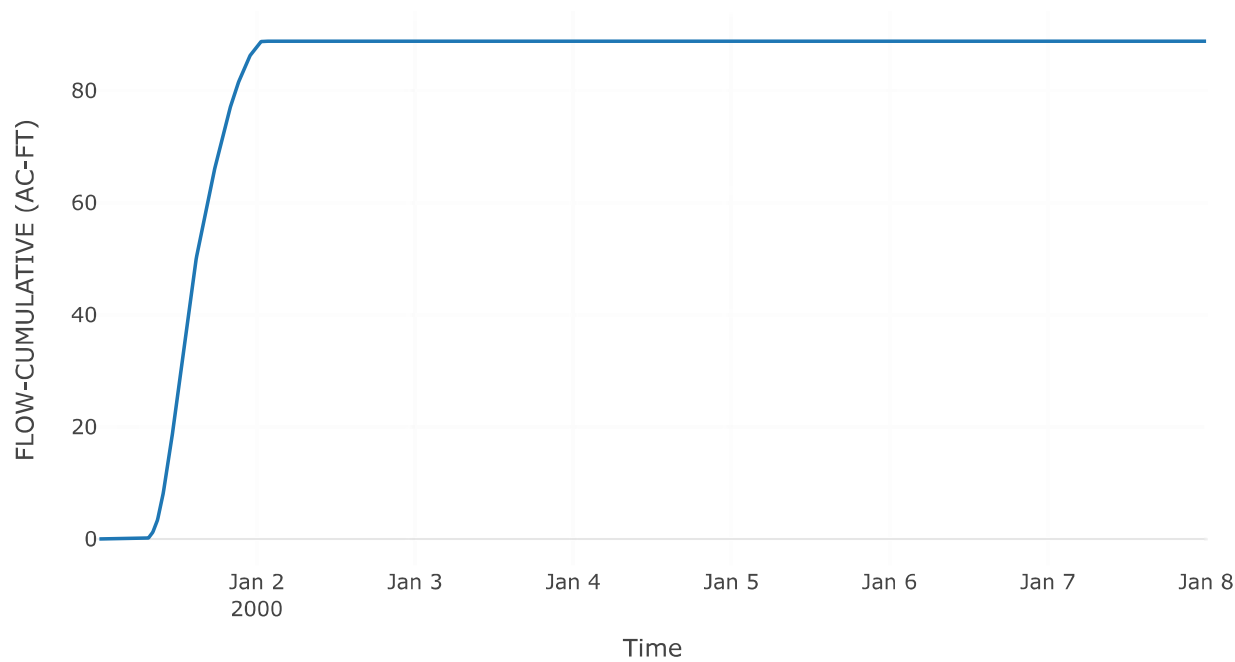
Area (MI²) : 2.05

Results: Subbasin-2	
Peak Discharge (CFS)	121.54
Time of Peak Discharge	01Jan2000, 12:06
Volume (IN)	0.81
Precipitation Volume (AC - FT)	377.38
Loss Volume (AC - FT)	288.53
Excess Volume (AC - FT)	88.85
Direct Runoff Volume (AC - FT)	88.85
Baseflow Volume (AC - FT)	0

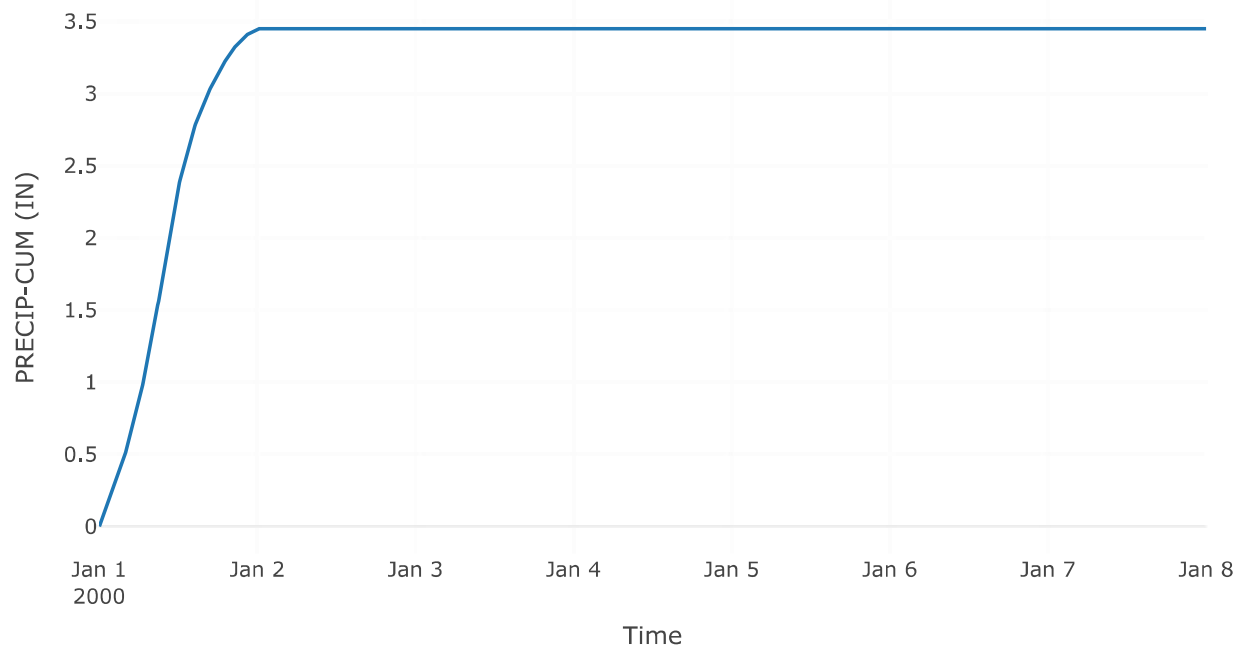
Precipitation and Outflow



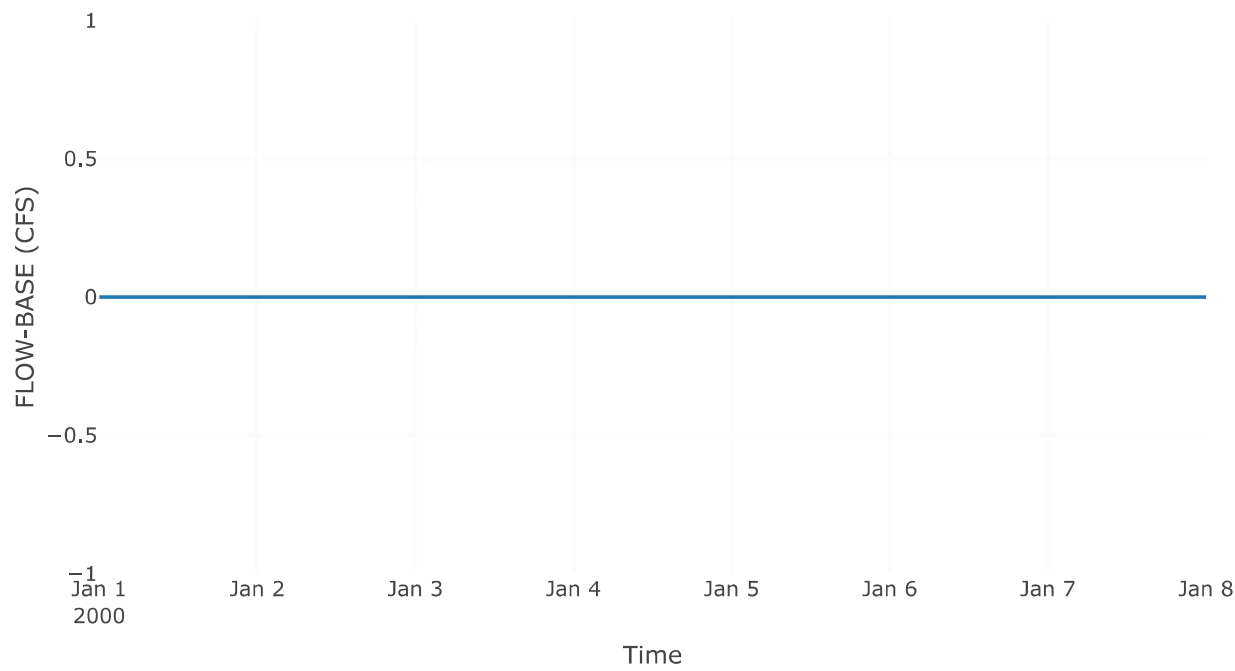
Cumulative Outflow



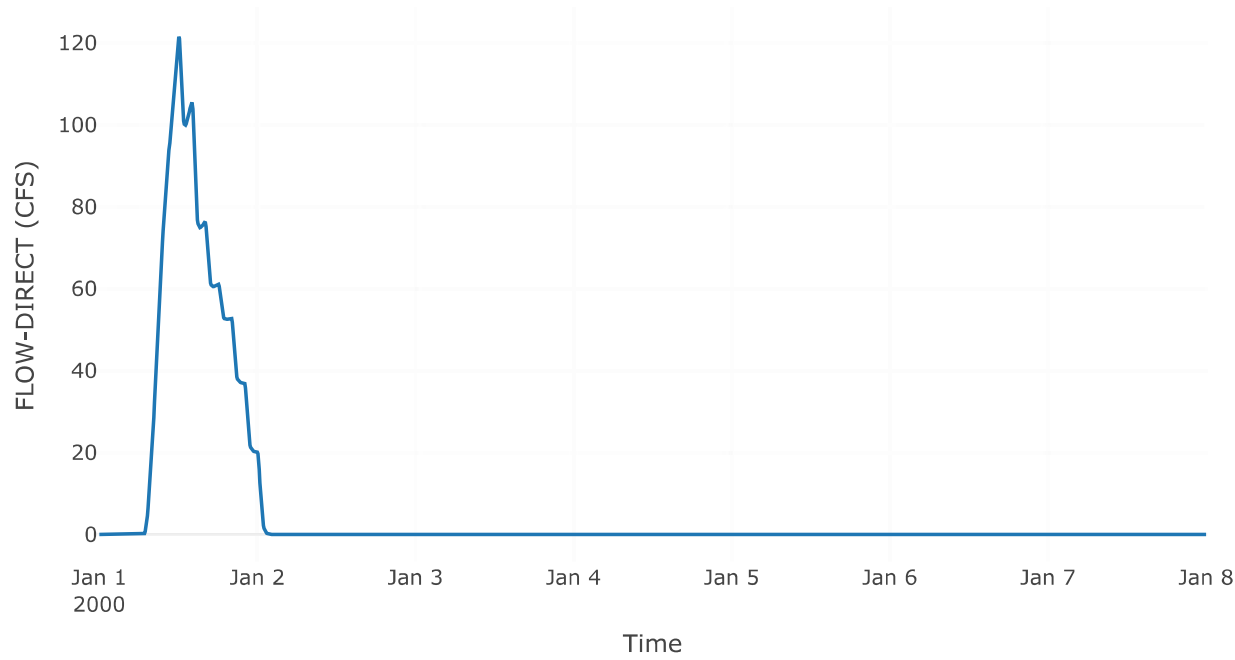
Cumulative Precipitation



Baseflow



Direct Runoff



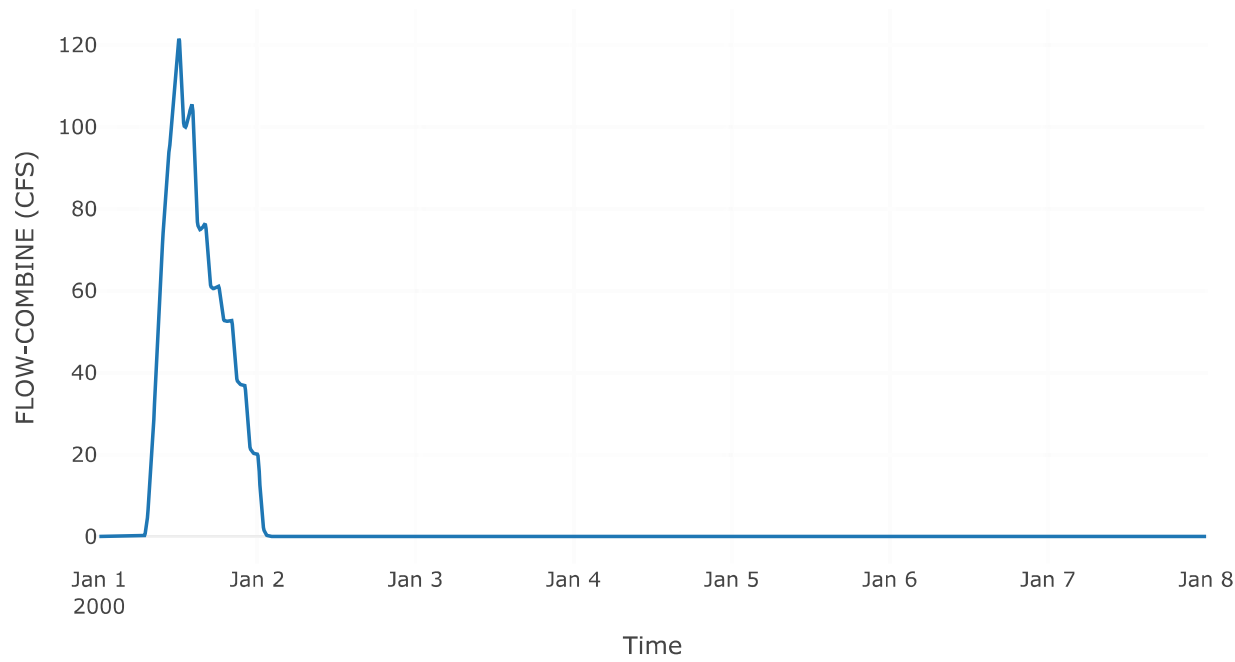
Reservoir: Middle A Reservoir

Downstream : City Reservoir

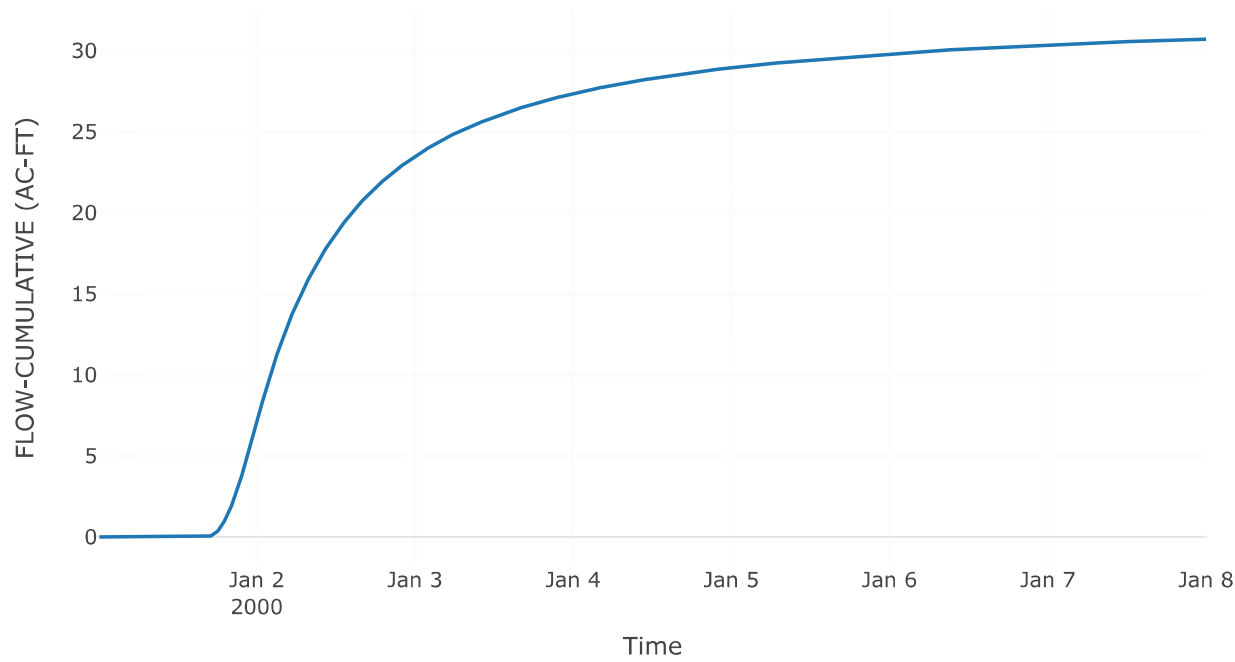
Results: Middle A Reservoir

Peak Discharge (CFS)	18.05
Time of Peak Discharge	02Jan2000, 00:12
Volume (IN)	0.28
Peak Inflow (CFS)	121.54
Time of Peak Inflow	01Jan2000, 12:06
Inflow Volume (AC - FT)	88.85
Maximum Storage (AC - FT)	80.9
Peak Elevation (FT)	7.41
Discharge Volume (AC - FT)	30.72

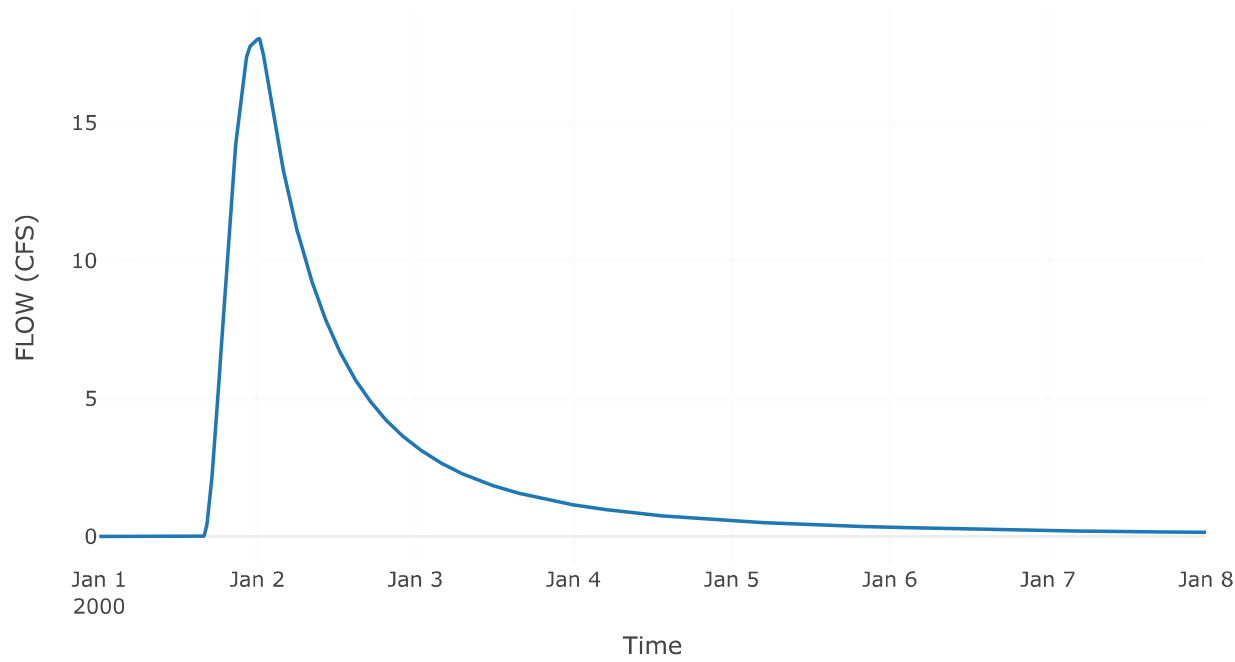
Combined Inflow



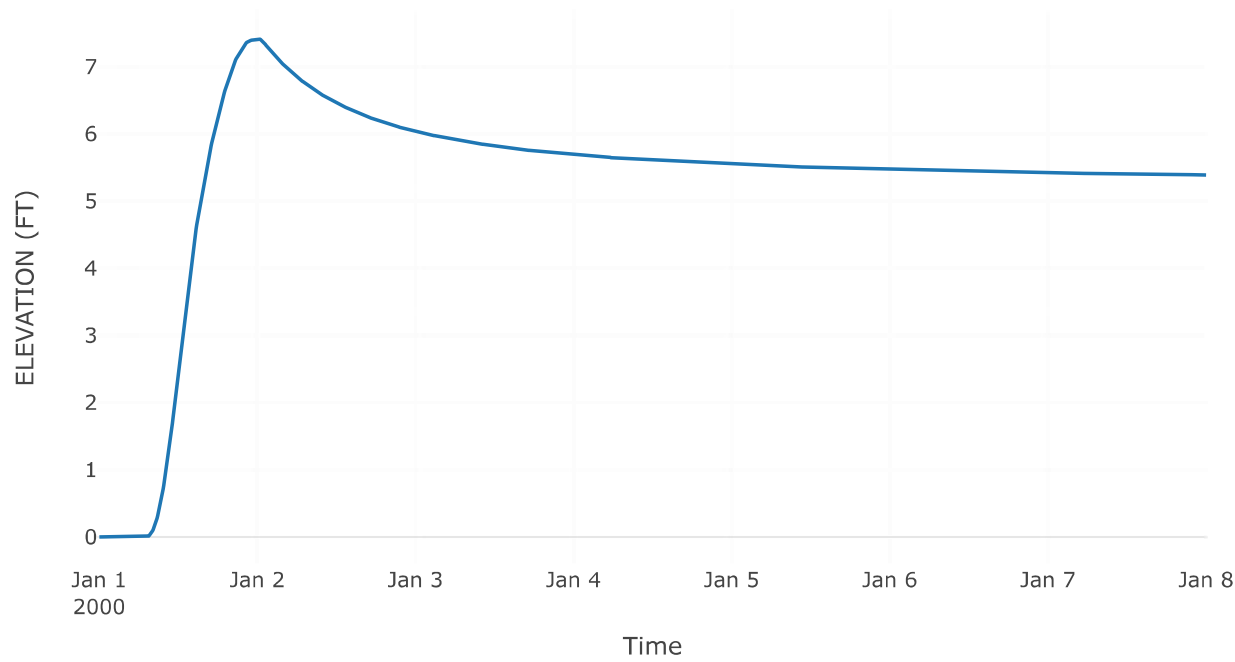
Cumulative Outflow



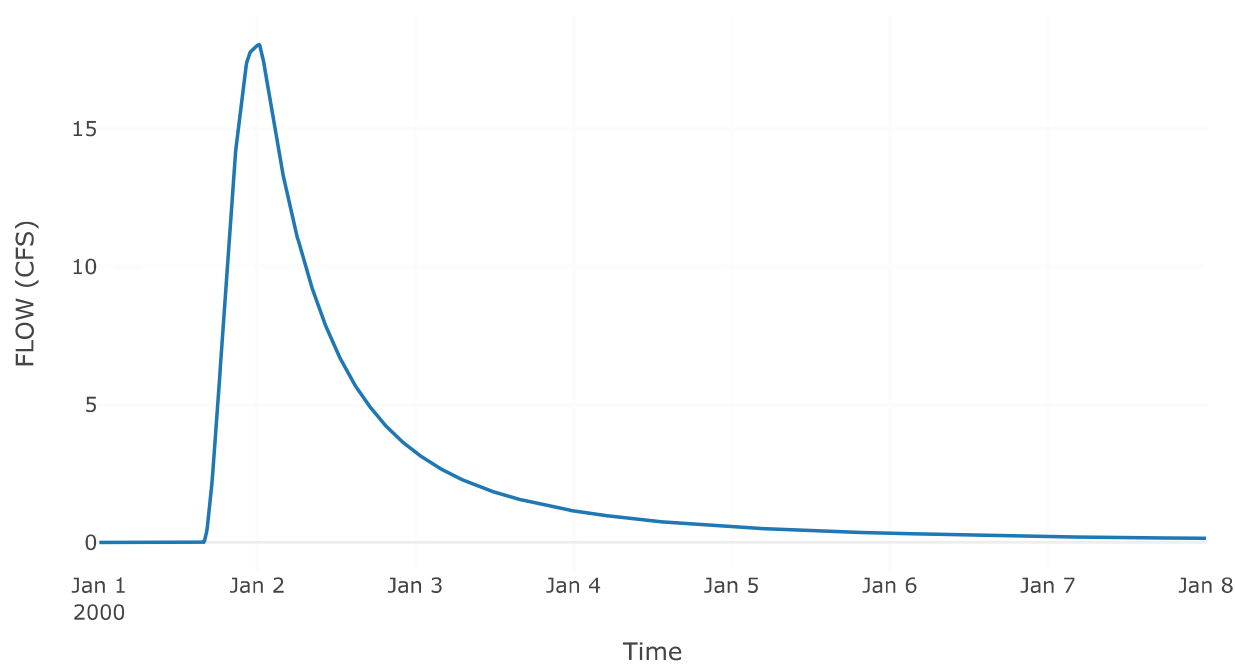
Outlet 1



Pool Elevation



Outflow

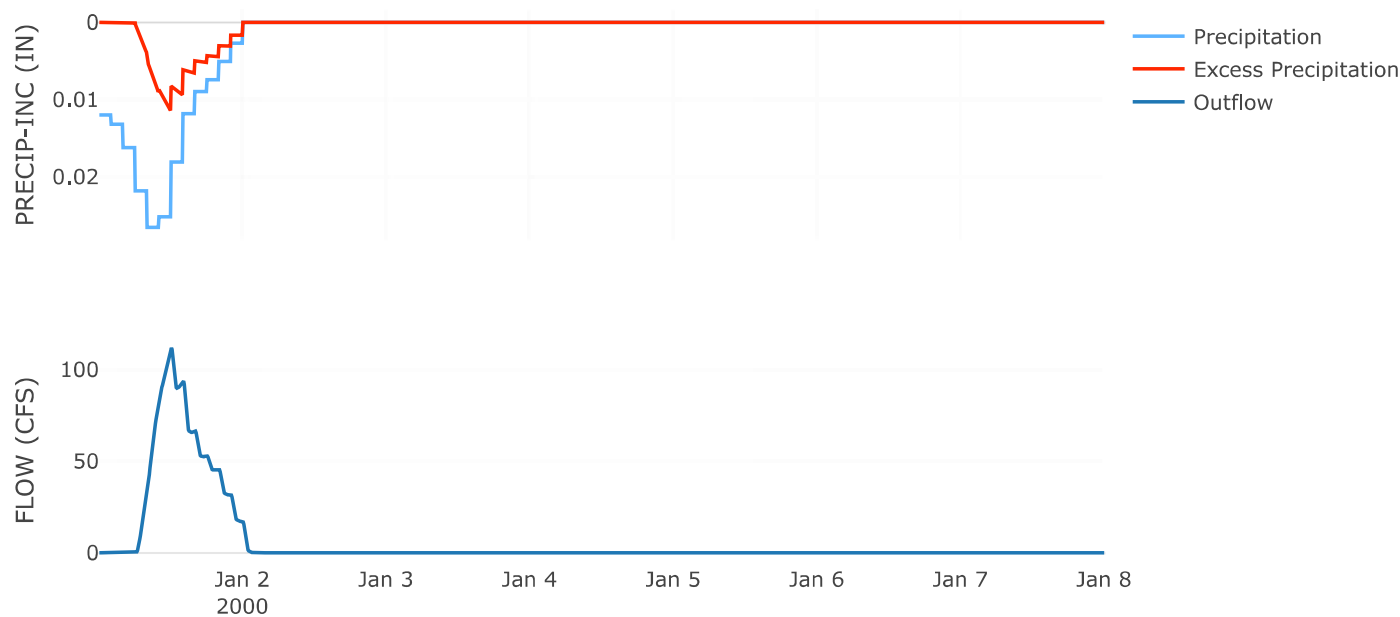


Subbasin: Subbasin-4

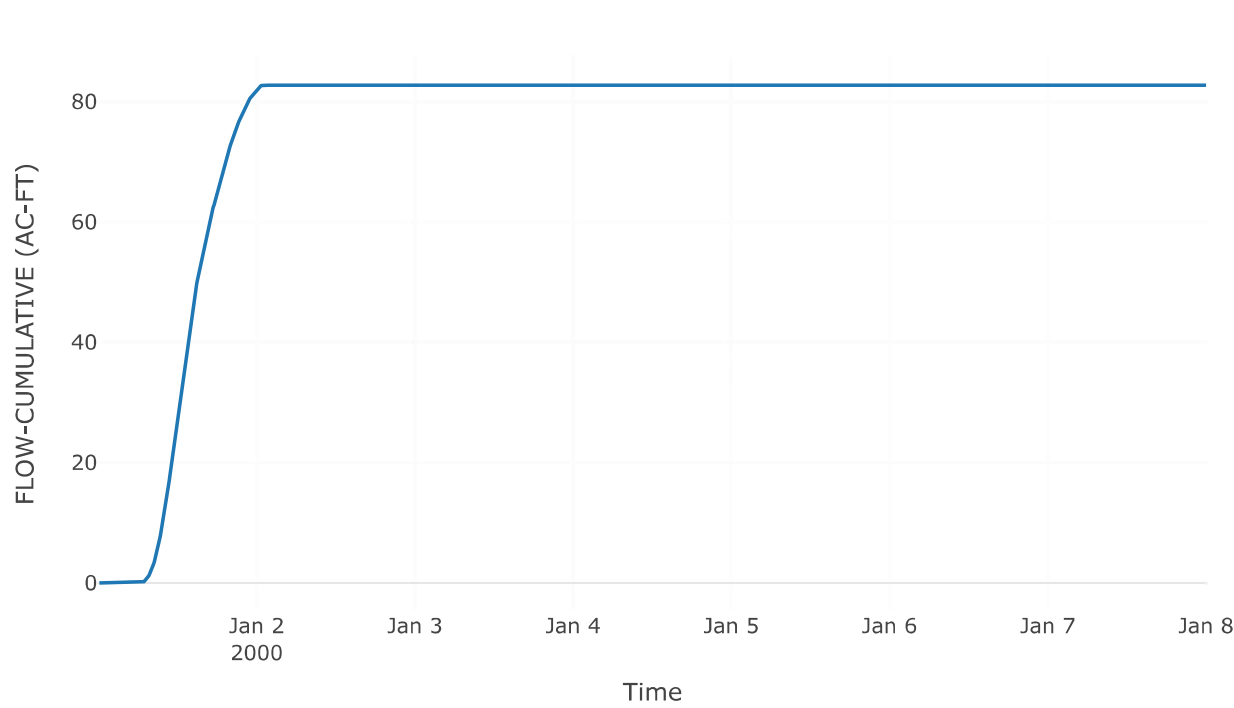
Area (MI²) : 1.6

Results: Subbasin-4	
Peak Discharge (CFS)	111.91
Time of Peak Discharge	01Jan2000, 12:06
Volume (IN)	0.97
Precipitation Volume (AC - FT)	287.81
Loss Volume (AC - FT)	205.04
Excess Volume (AC - FT)	82.77
Direct Runoff Volume (AC - FT)	82.77
Baseflow Volume (AC - FT)	0

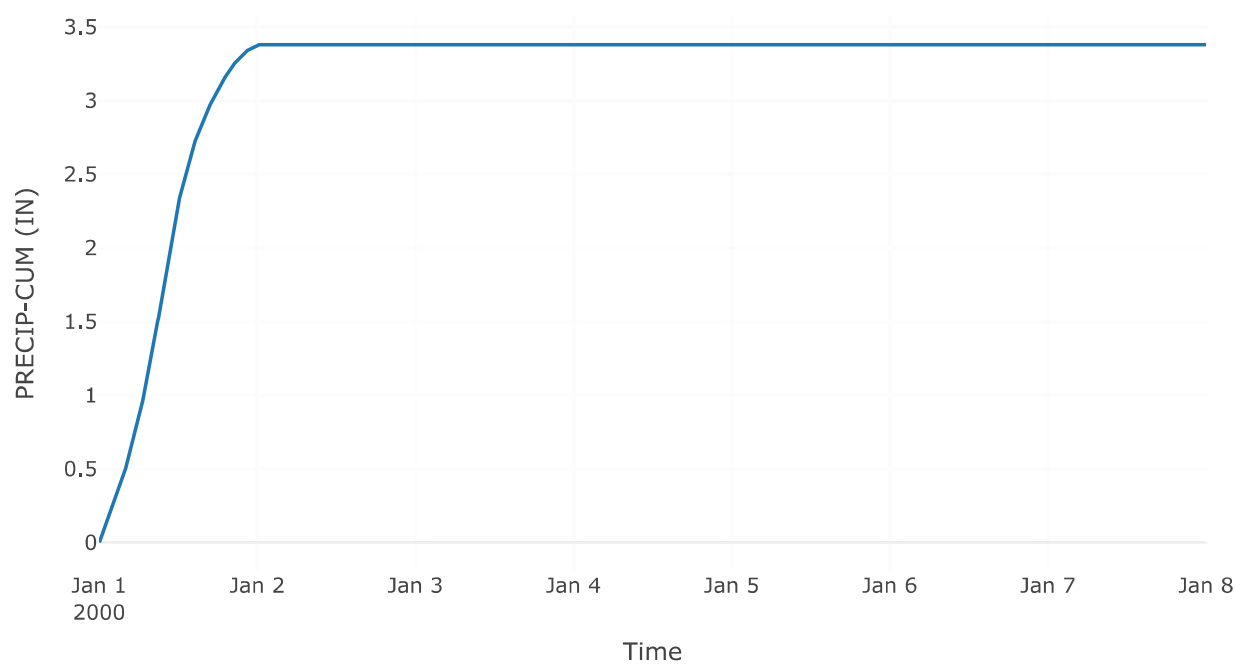
Precipitation and Outflow



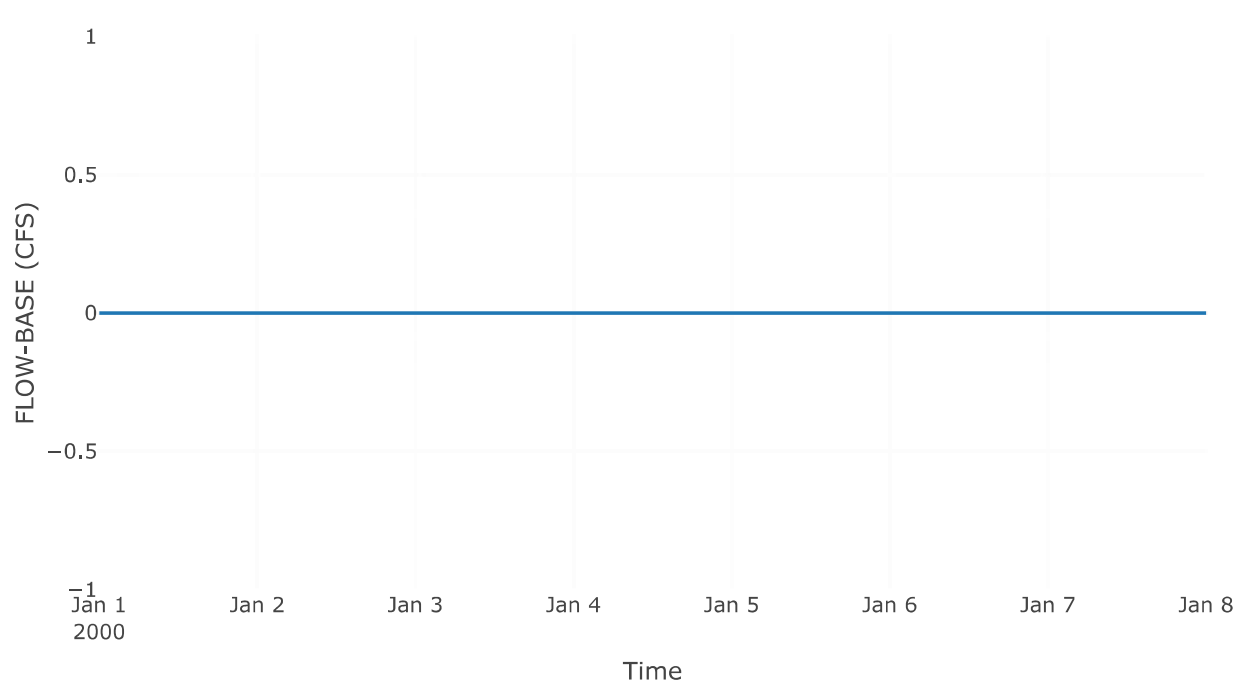
Cumulative Outflow



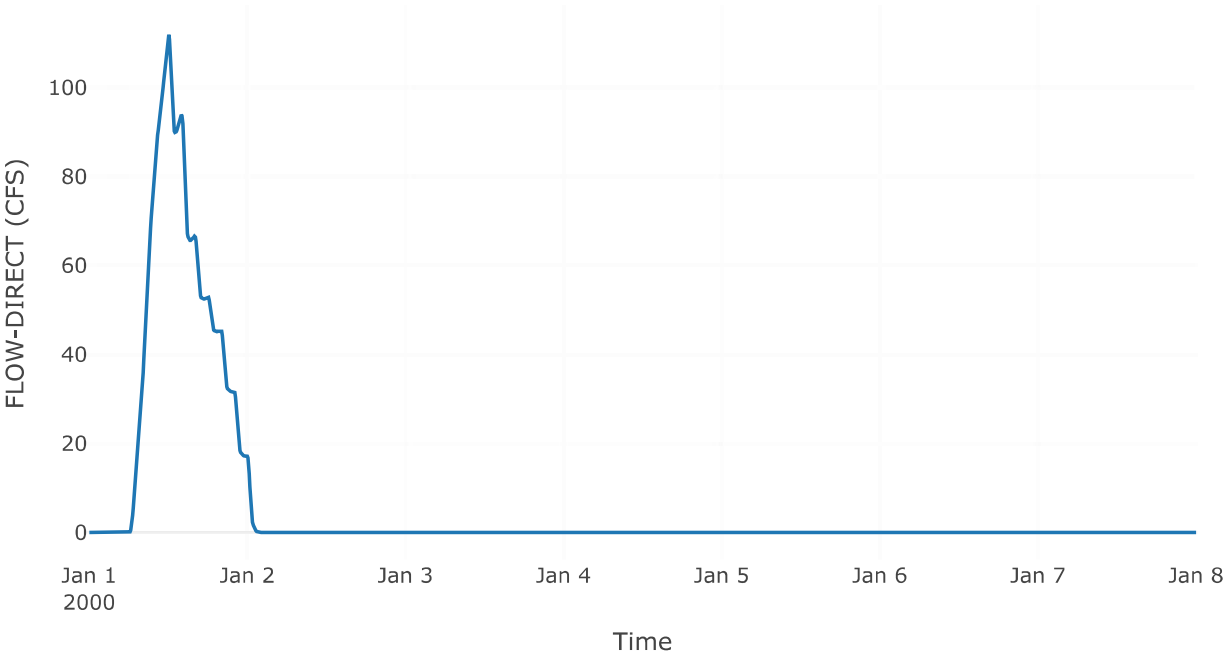
Cumulative Precipitation



Baseflow



Direct Runoff

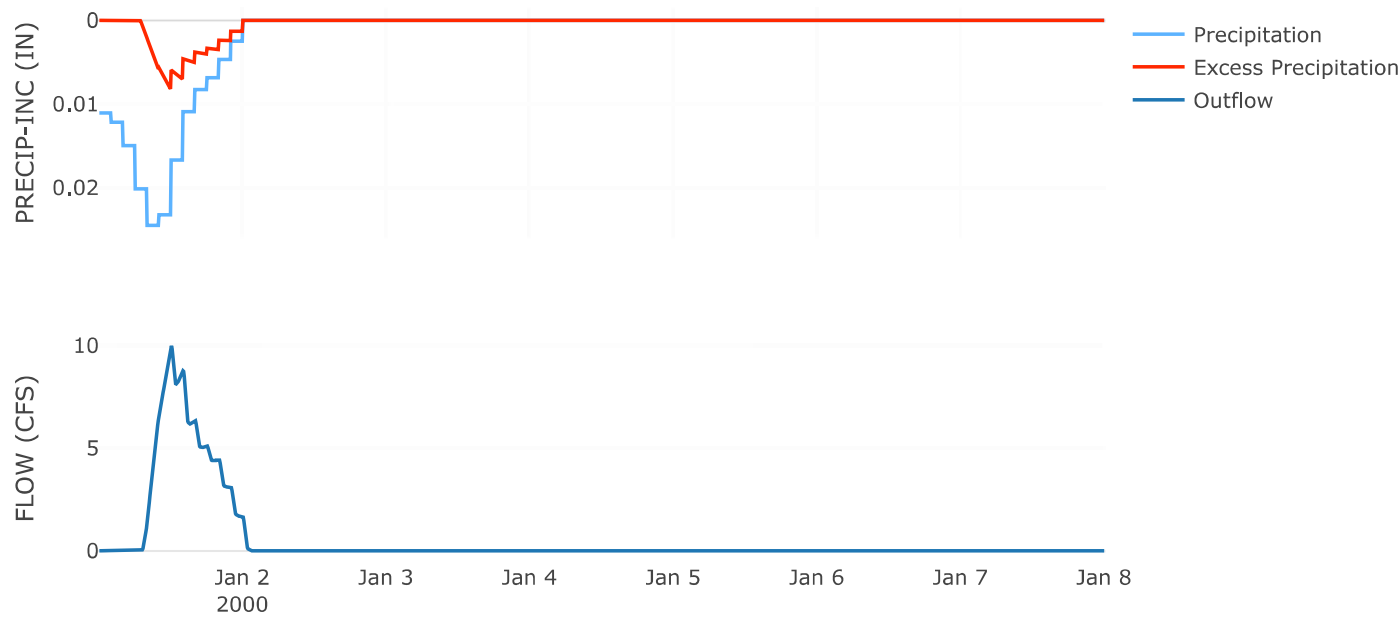


Subbasin: Subbasin-3

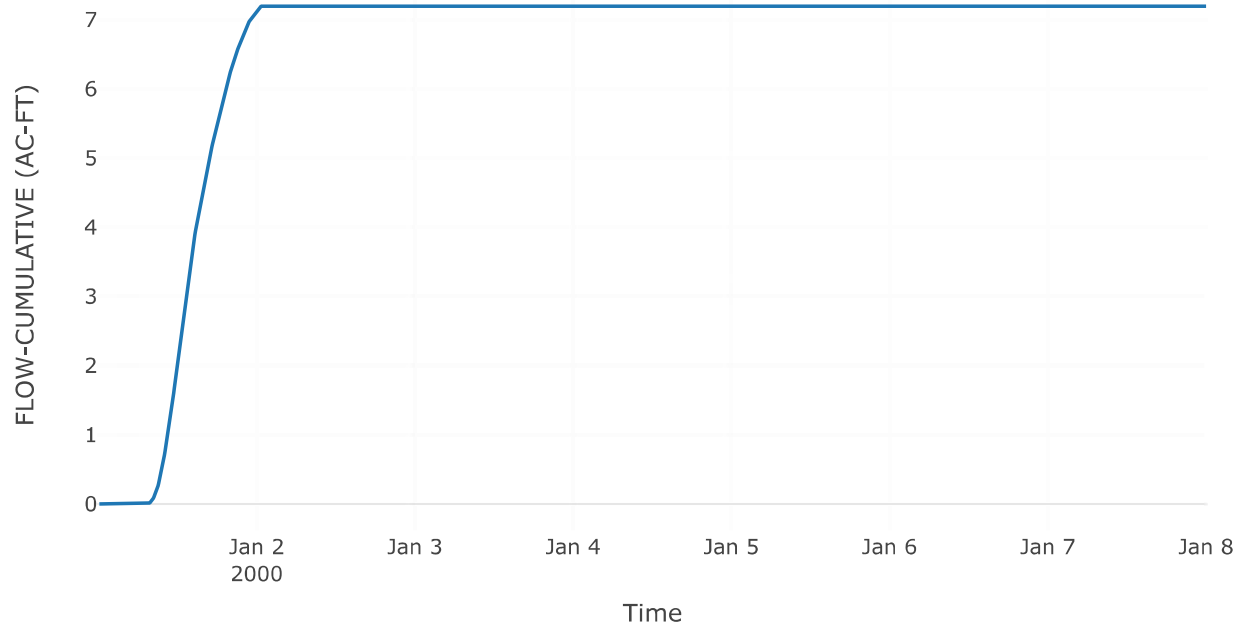
Area (MI²) : 0.2

Results: Subbasin-3	
Peak Discharge (CFS)	9.98
Time of Peak Discharge	01Jan2000, 12:06
Volume (IN)	0.68
Precipitation Volume (AC - FT)	33.21
Loss Volume (AC - FT)	26.02
Excess Volume (AC - FT)	7.2
Direct Runoff Volume (AC - FT)	7.2
Baseflow Volume (AC - FT)	0

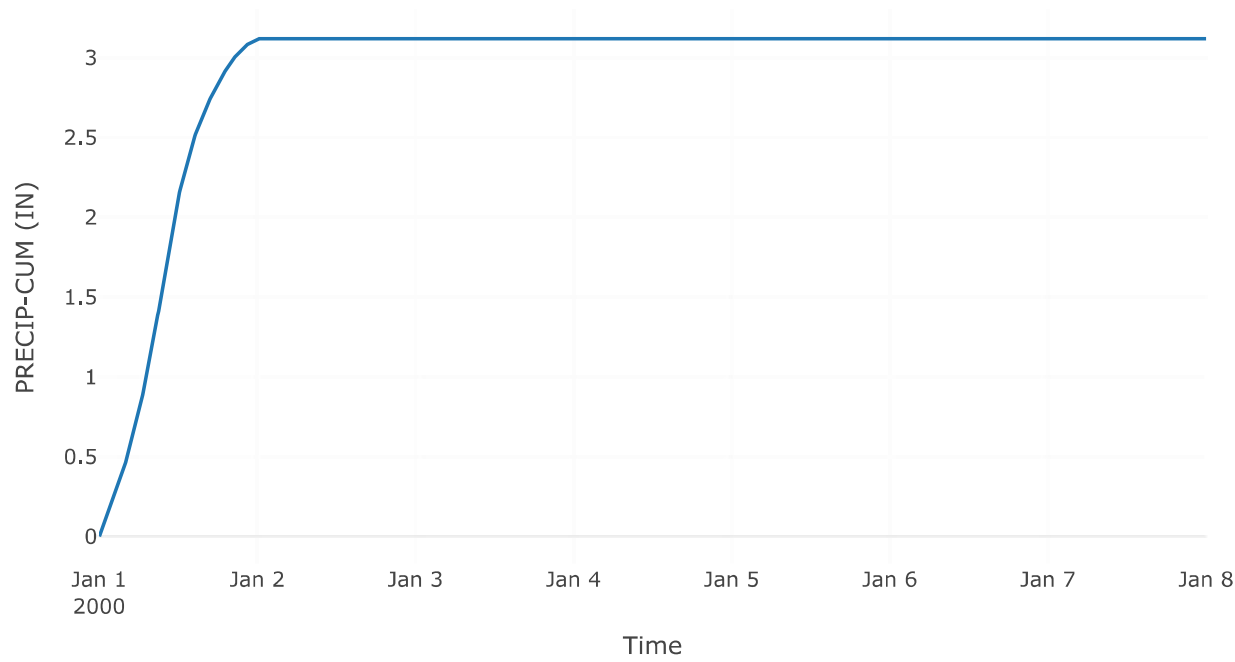
Precipitation and Outflow



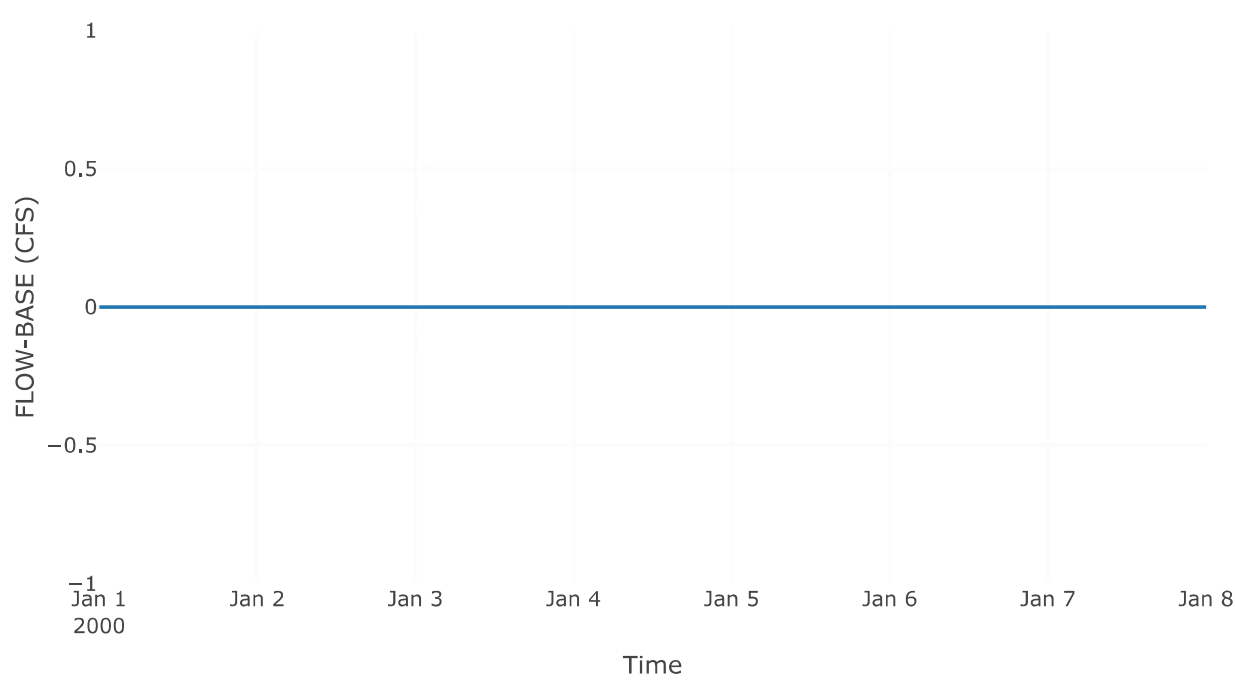
Cumulative Outflow



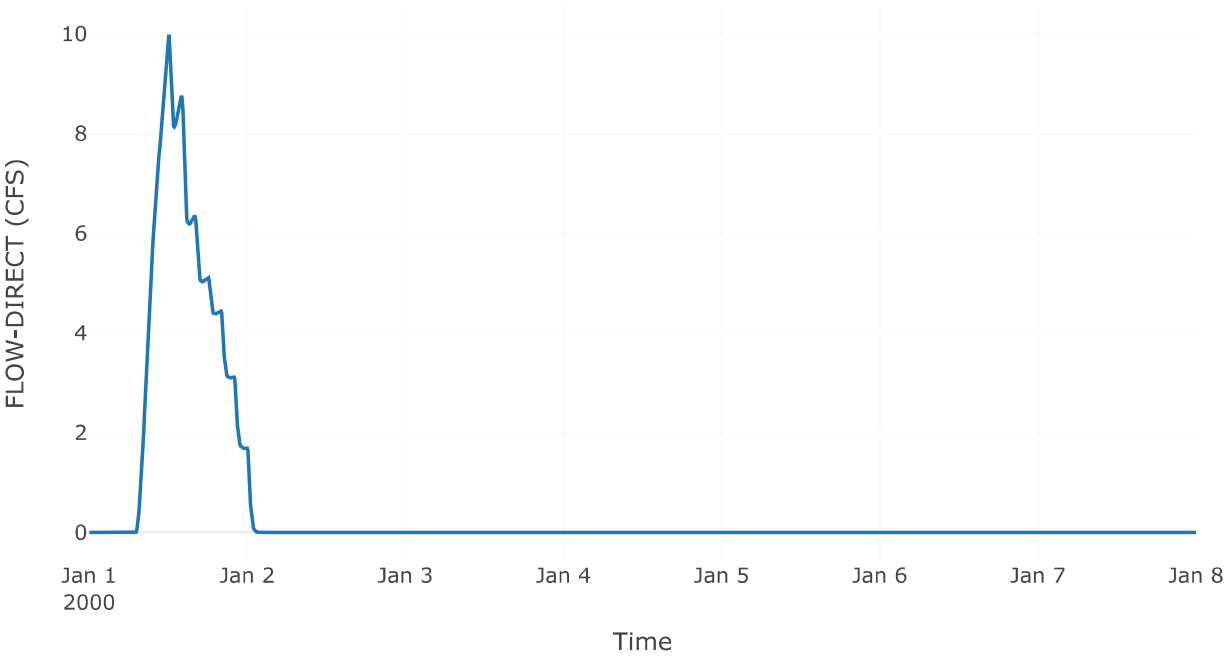
Cumulative Precipitation



Baseflow



Direct Runoff

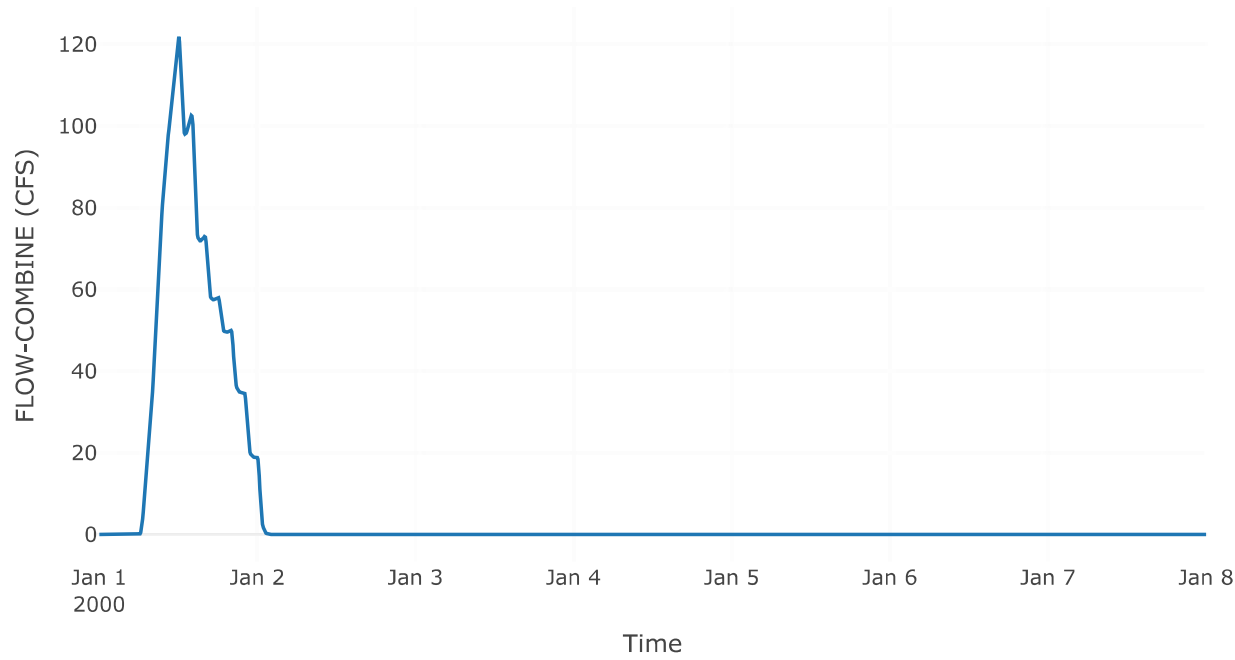


Reservoir: Middle B Reservoir

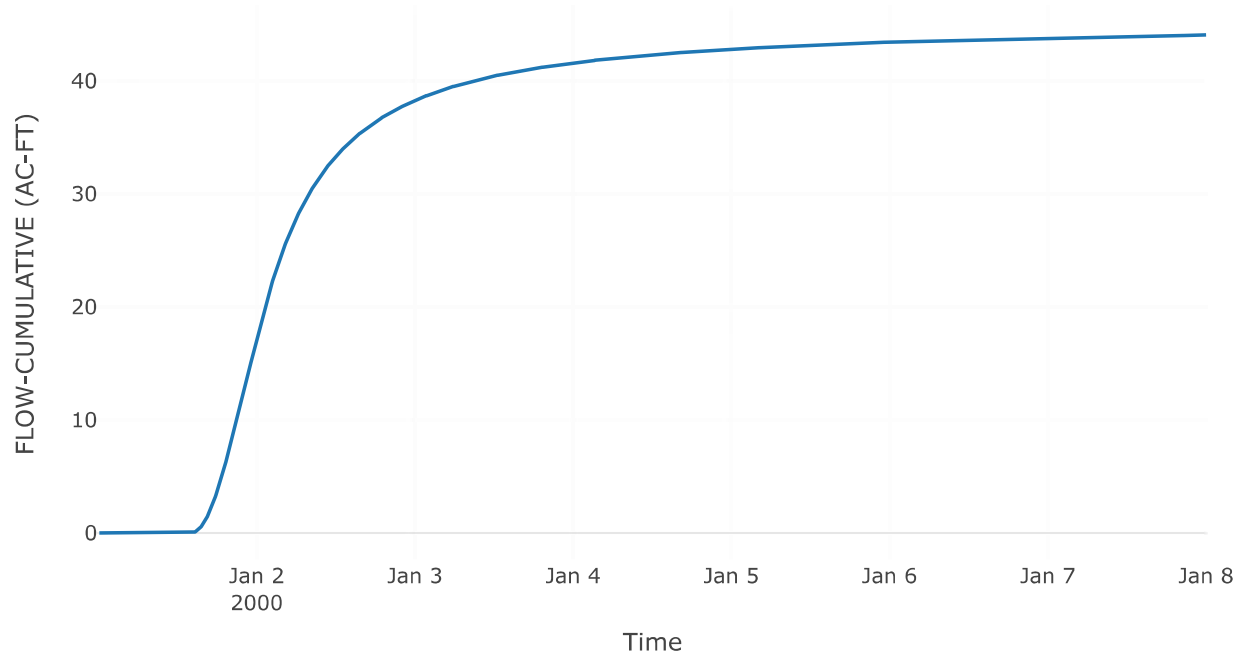
Downstream : City Reservoir

Results: Middle B Reservoir	
Peak Discharge (CFS)	28.53
Time of Peak Discharge	01Jan2000, 22:24
Volume (IN)	0.46
Peak Inflow (CFS)	121.9
Time of Peak Inflow	01Jan2000, 12:06
Inflow Volume (AC - FT)	89.97
Maximum Storage (AC - FT)	73.05
Peak Elevation (FT)	8.36
Discharge Volume (AC - FT)	44.06

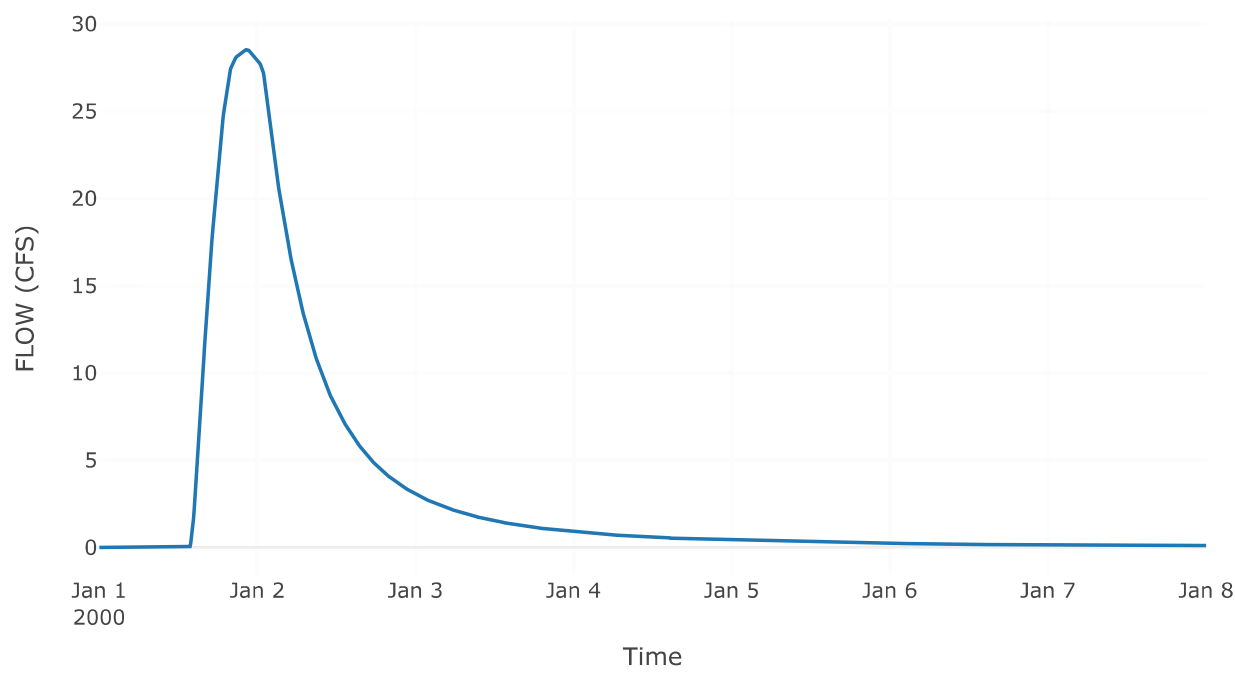
Combined Inflow



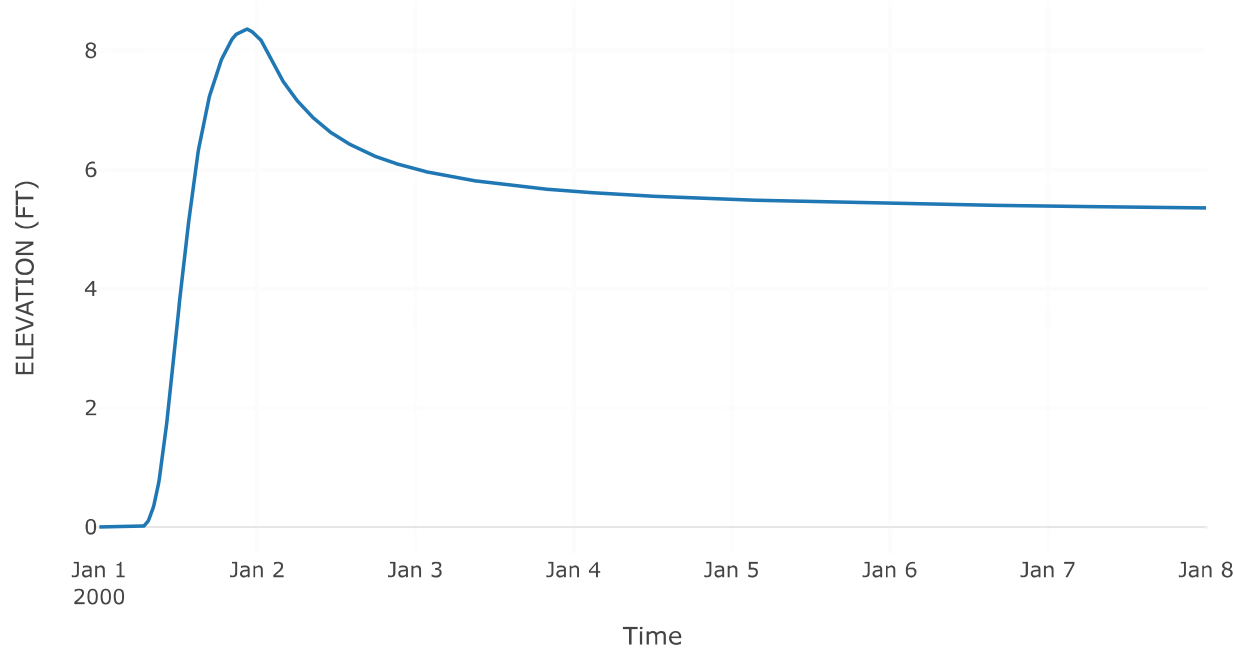
Cumulative Outflow



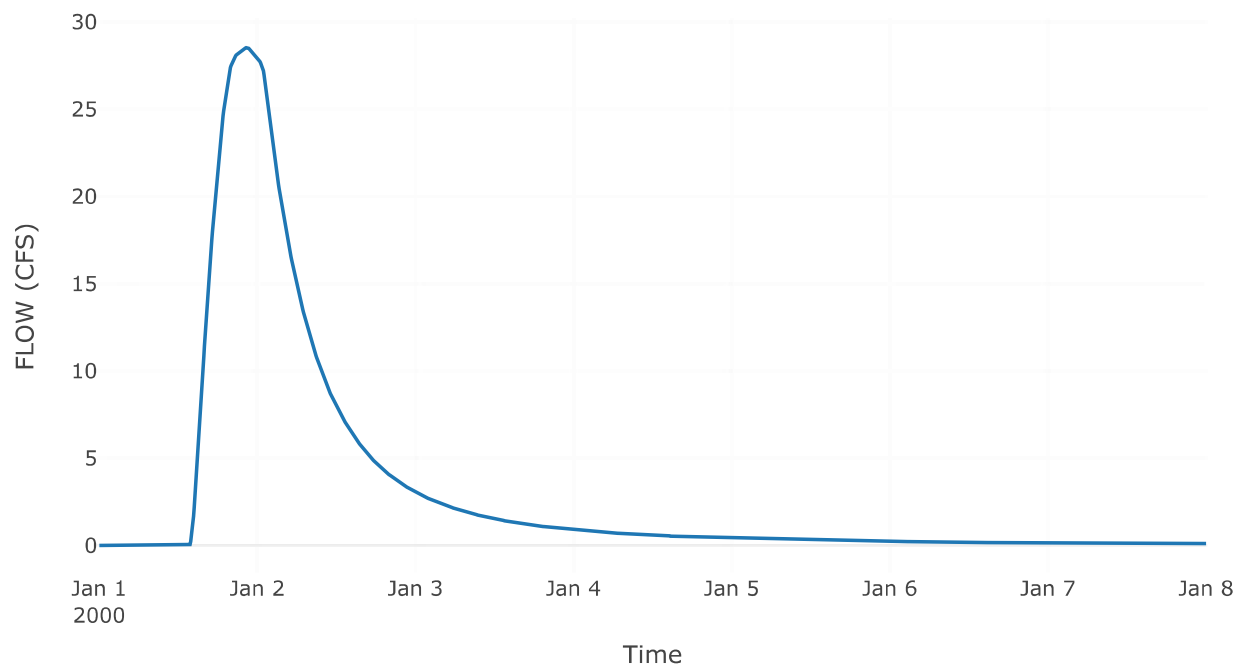
Outlet 1



Pool Elevation



Outflow



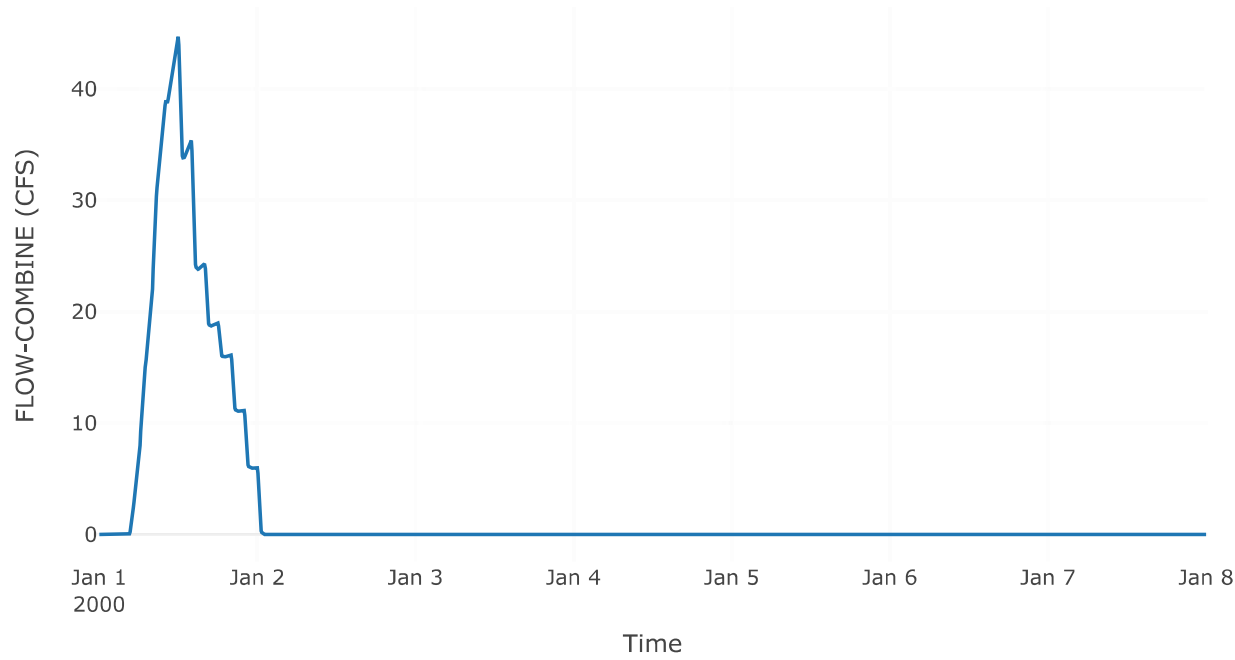
Reservoir: Upper Reservoir

Downstream : City Reservoir

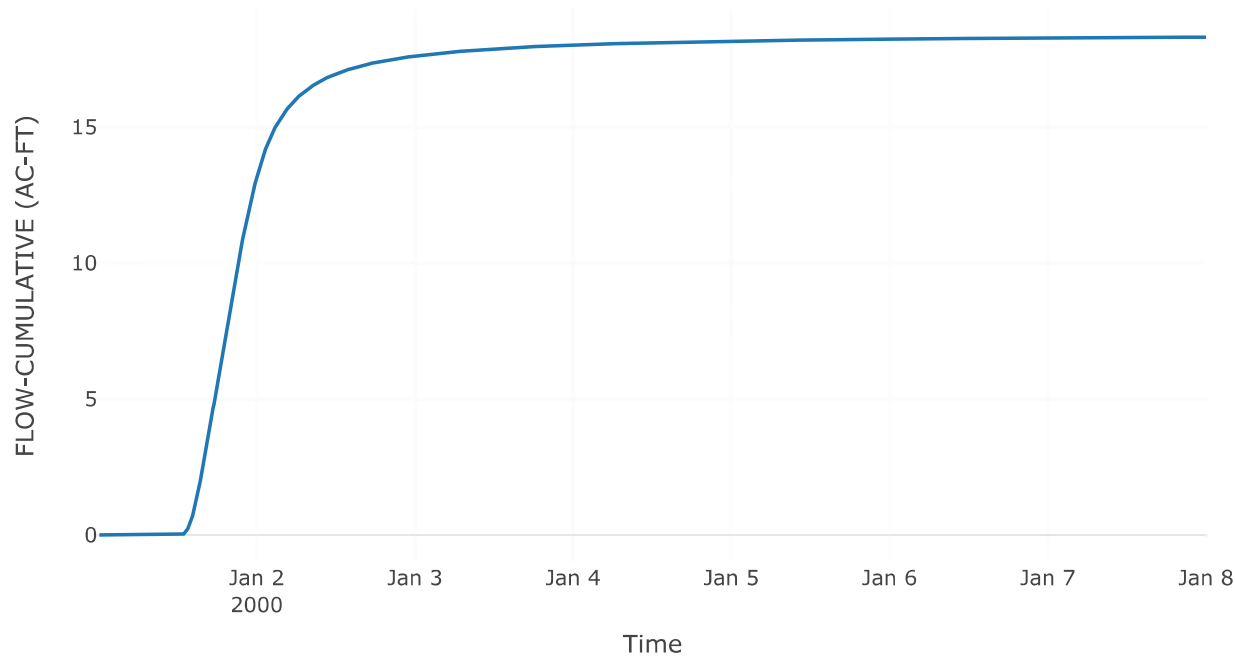
Results: Upper Reservoir

Peak Discharge (CFS)	17.79
Time of Peak Discharge	01Jan2000, 18:12
Volume (IN)	0.65
Peak Inflow (CFS)	44.69
Time of Peak Inflow	01Jan2000, 12:00
Inflow Volume (AC - FT)	34.04
Maximum Storage (AC - FT)	22.6
Peak Elevation (FT)	7.39
Discharge Volume (AC - FT)	18.31

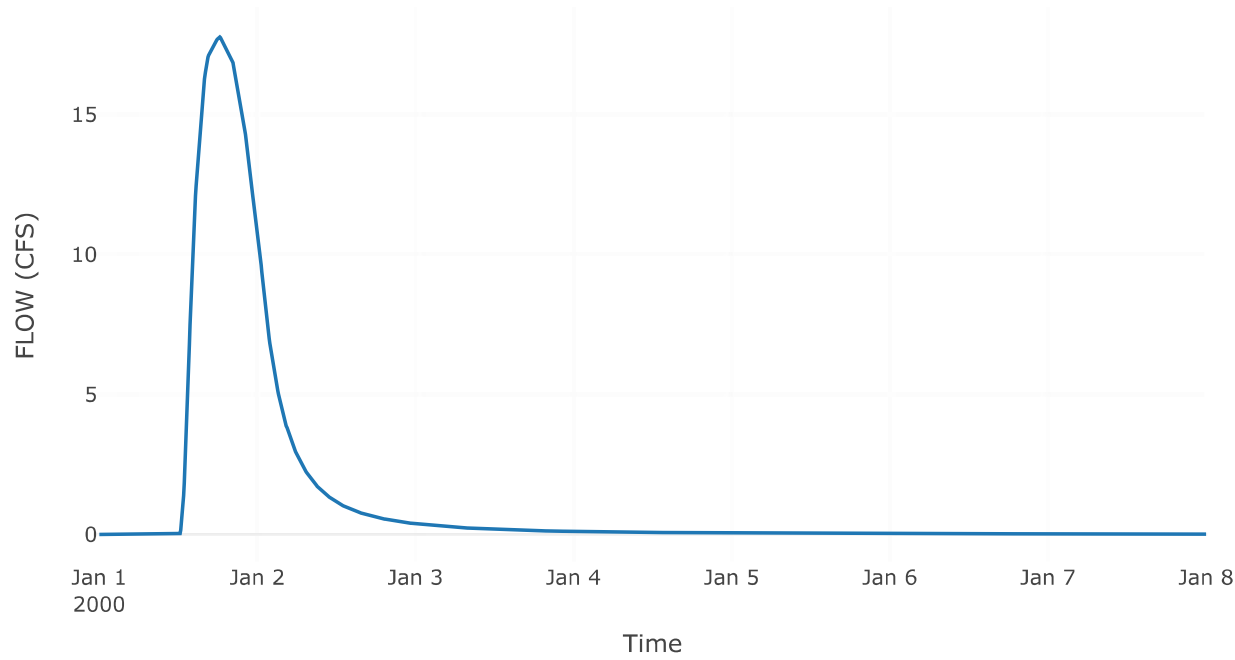
Combined Inflow



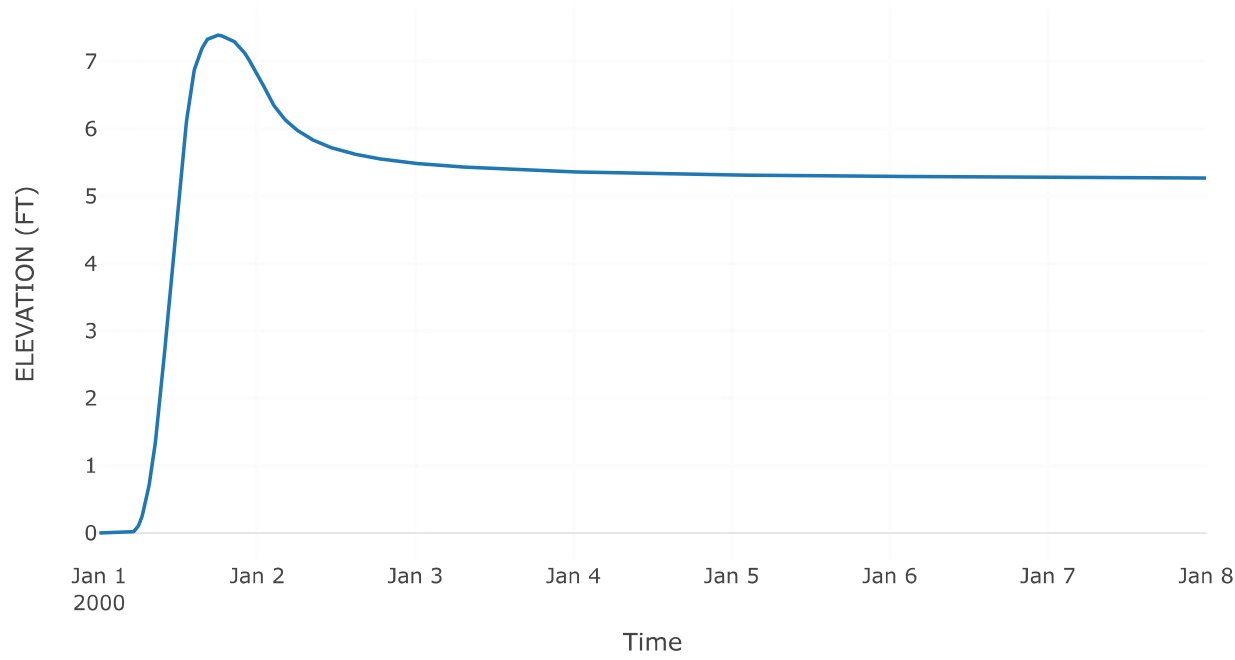
Cumulative Outflow



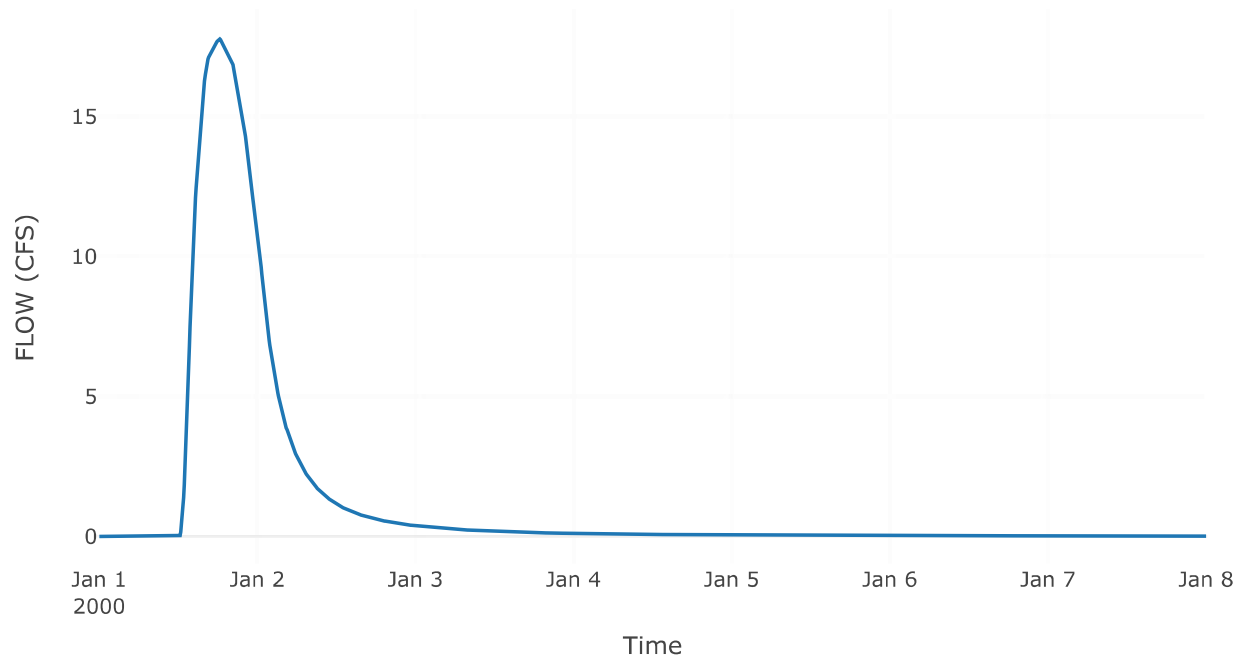
Outlet 1



Pool Elevation



Outflow

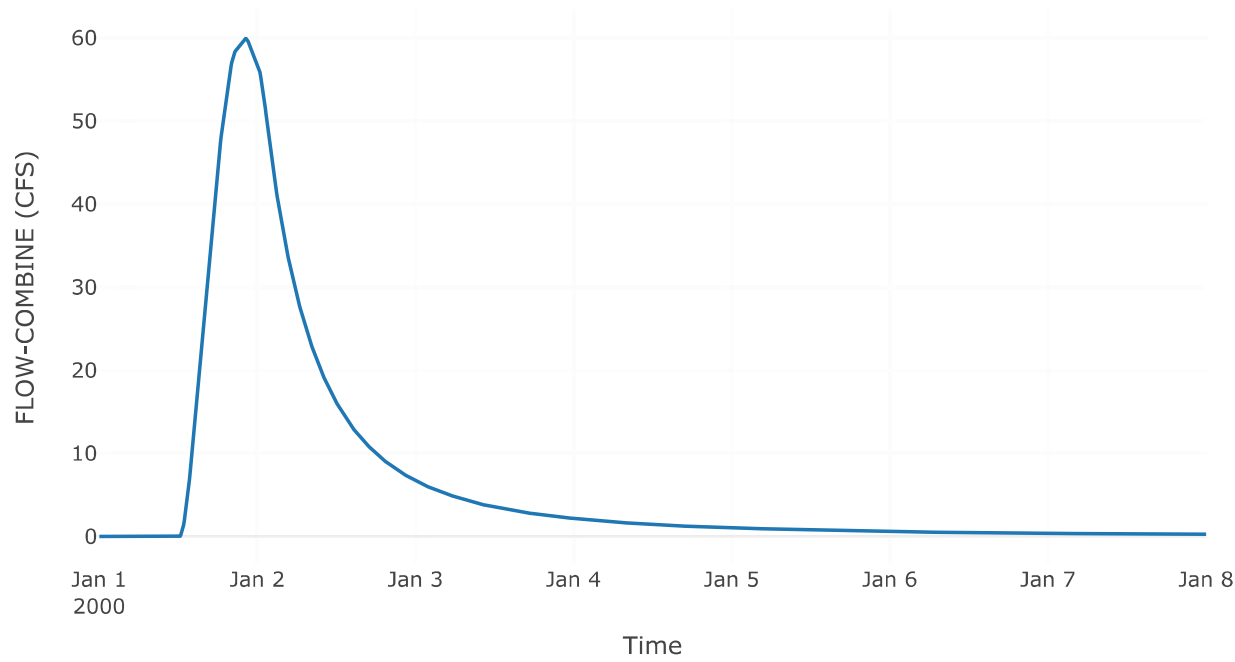


Reservoir: City Reservoir

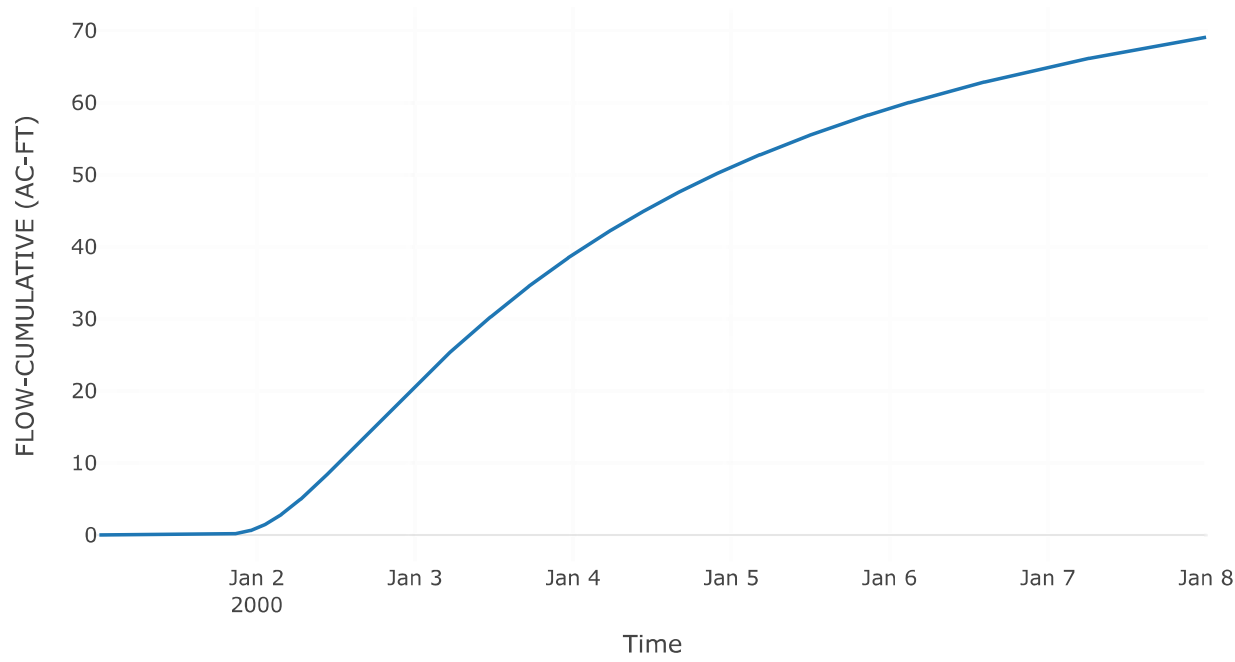
Results: City Reservoir

Peak Discharge (CFS)	11.37
Time of Peak Discharge	02Jan2000, 16:18
Volume (IN)	0.3
Peak Inflow (CFS)	59.92
Time of Peak Inflow	01Jan2000, 22:18
Inflow Volume (AC - FT)	93.09
Maximum Storage (AC - FT)	60.2
Peak Elevation (FT)	1.94
Discharge Volume (AC - FT)	69.11

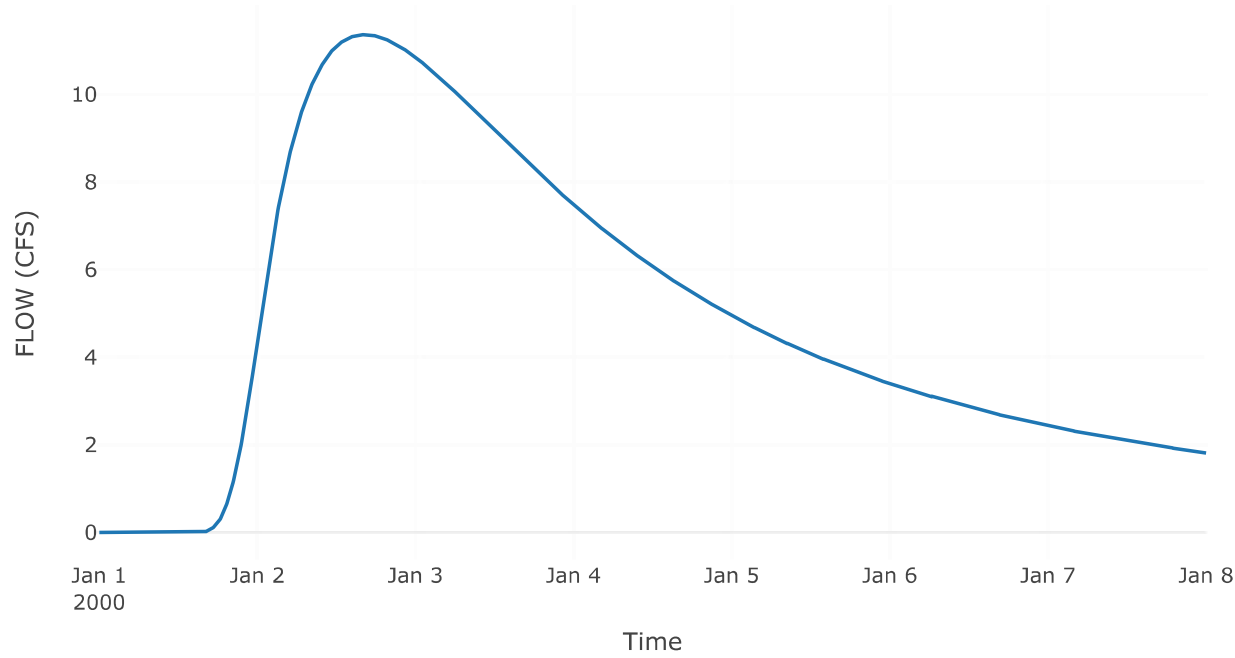
Combined Inflow



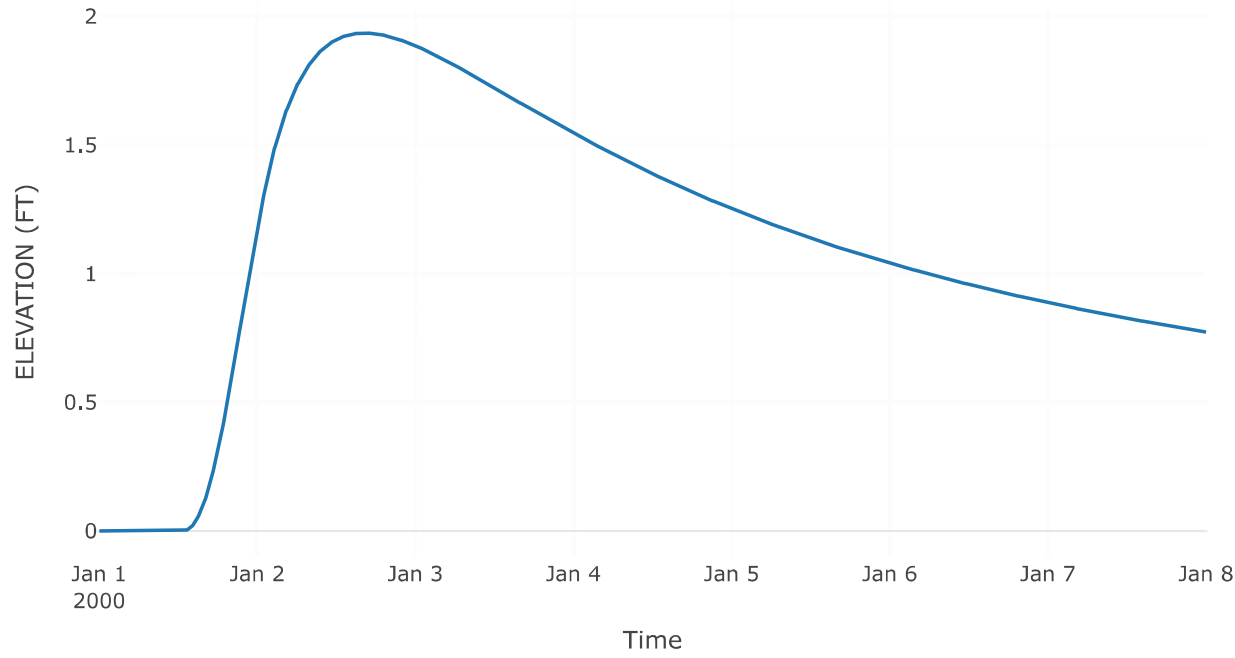
Cumulative Outflow



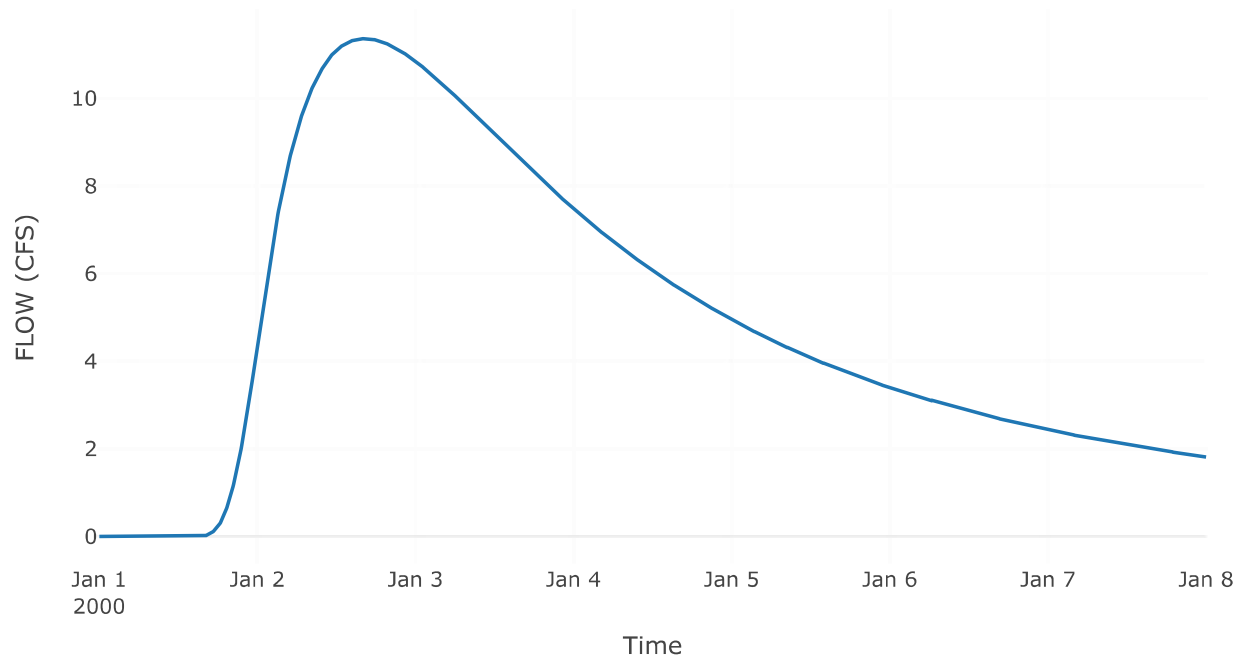
Outlet 1



Pool Elevation



Outflow

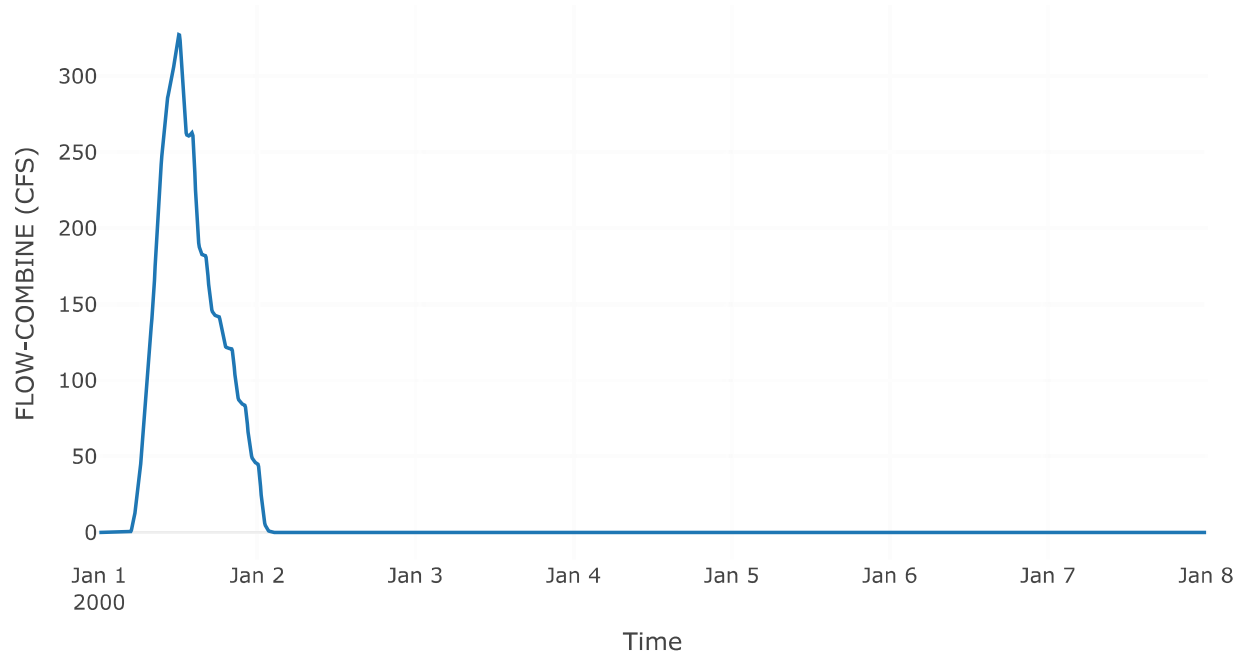


Reservoir: Lower Reservoir

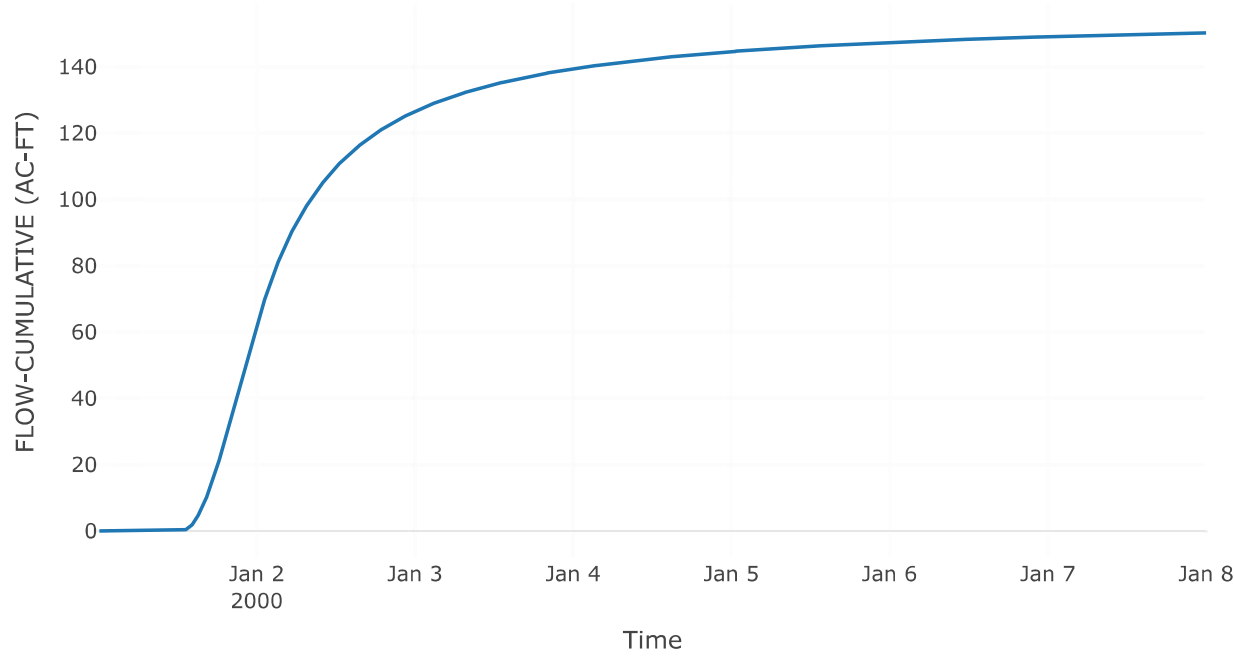
Results: Lower Reservoir

Peak Discharge (CFS)	89.27
Time of Peak Discharge	01Jan2000, 21:06
Volume (IN)	0.88
Peak Inflow (CFS)	327.39
Time of Peak Inflow	01Jan2000, 12:06
Inflow Volume (AC - FT)	256.79
Maximum Storage (AC - FT)	196.99
Peak Elevation (FT)	8.38
Discharge Volume (AC - FT)	150.18

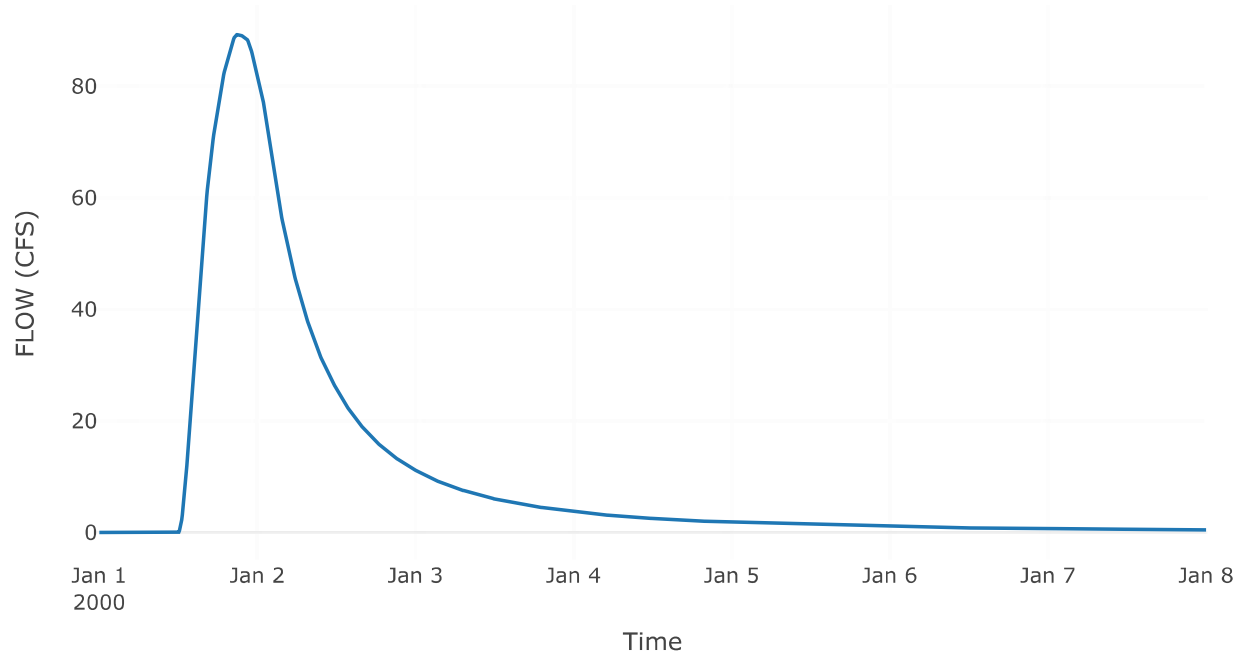
Combined Inflow



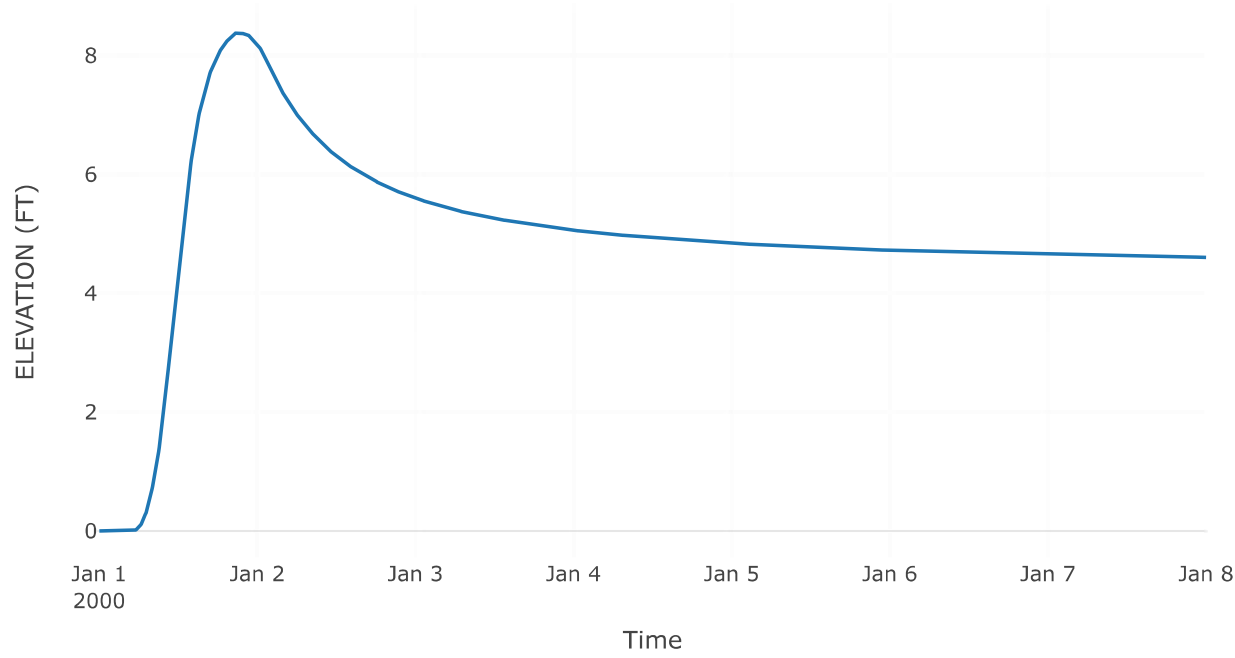
Cumulative Outflow



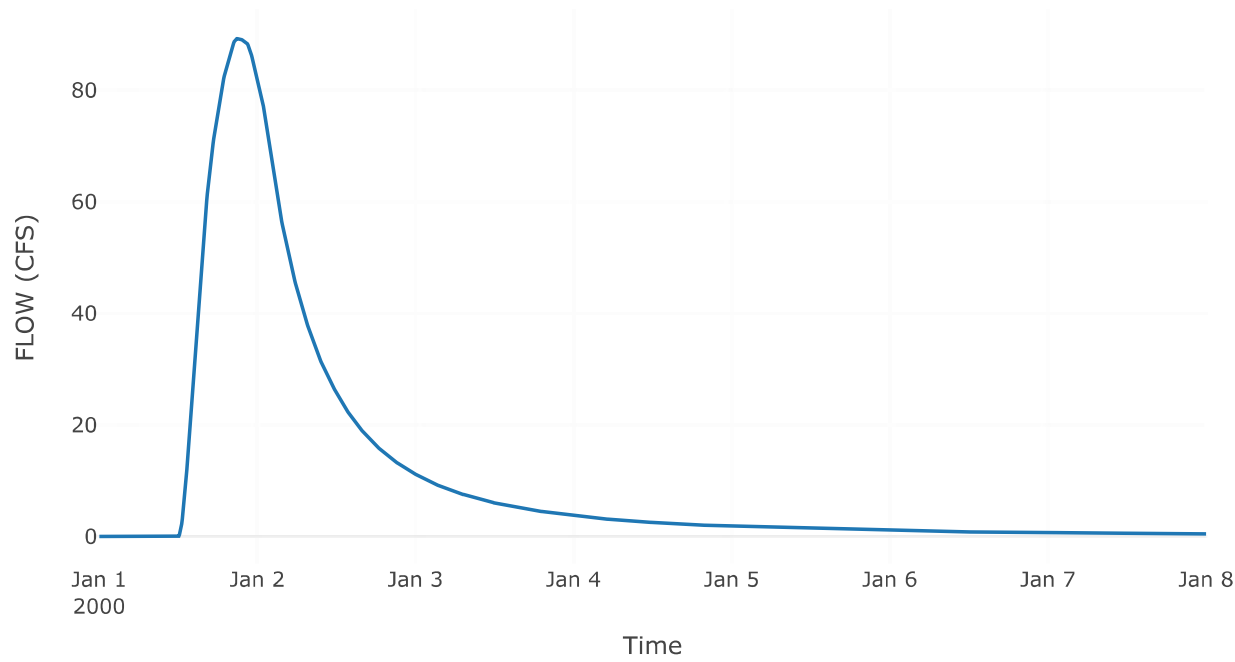
Outlet 1



Pool Elevation



Outflow



Project: Mountain Watersheds

Simulation Run: Run I - Middle B

Simulation Start: 31 December 1999, 24:00

Simulation End: 7 January 2000, 24:00

HMS Version: 4.12

Executed: 14 March 2025, 21:11

Global Parameter Summary - Subbasin

Element Name	Area (MI ²)
	Area (MI ²)
Subbasin - 6	4.54
Subbasin - 5	3.19
Subbasin - 2	2.05
Subbasin - 4	1.6
Subbasin - 3	0.2
Subbasin - 1	0.52

Global Results Summary

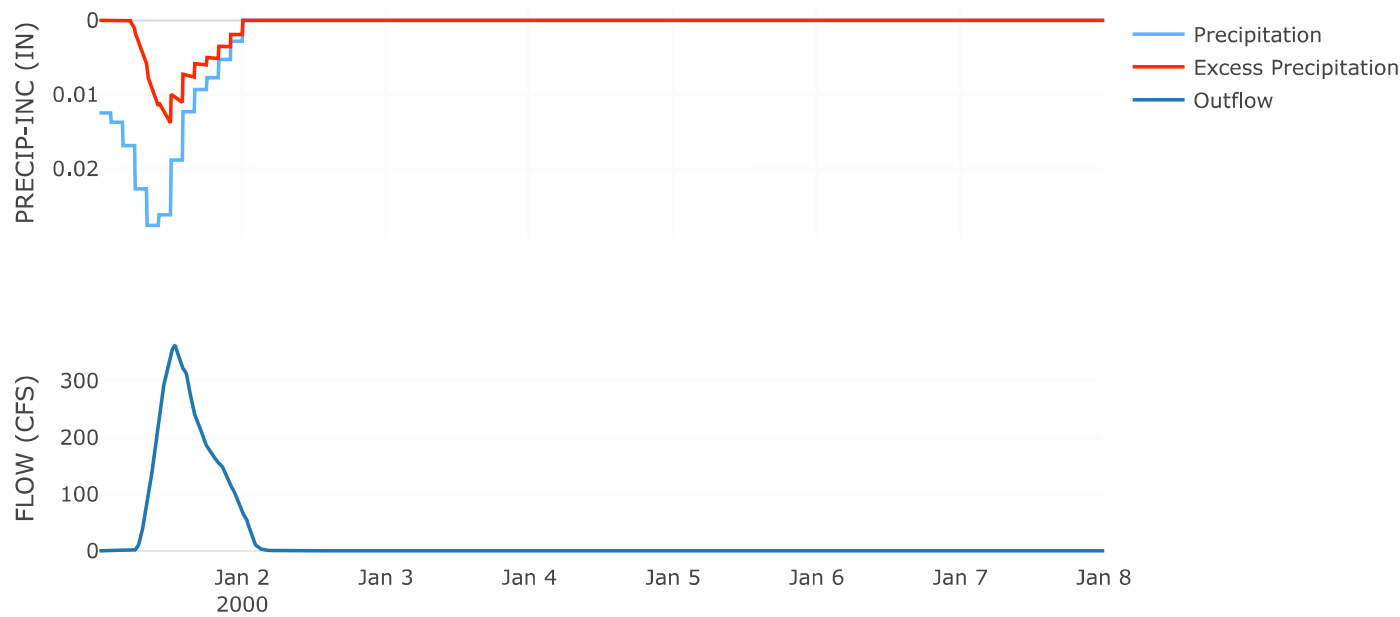
Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Subbasin - 6	4.54	361.81	01Jan2000, 12:36	1.21
Subbasin - 5	3.19	327.39	01Jan2000, 12:06	1.51
Subbasin - 2	2.05	121.54	01Jan2000, 12:06	0.81
Subbasin - 4	1.6	111.91	01Jan2000, 12:06	0.97
Subbasin - 3	0.2	9.98	01Jan2000, 12:06	0.68
Middle B Reservoir	1.8	28.53	01Jan2000, 22:24	0.46
Subbasin - 1	0.52	44.69	01Jan2000, 12:00	1.22
City Reservoir	4.37	46.75	02Jan2000, 00:18	0.64
Lower Reservoir	3.19	89.27	01Jan2000, 21:06	0.88

Subbasin: Subbasin-6

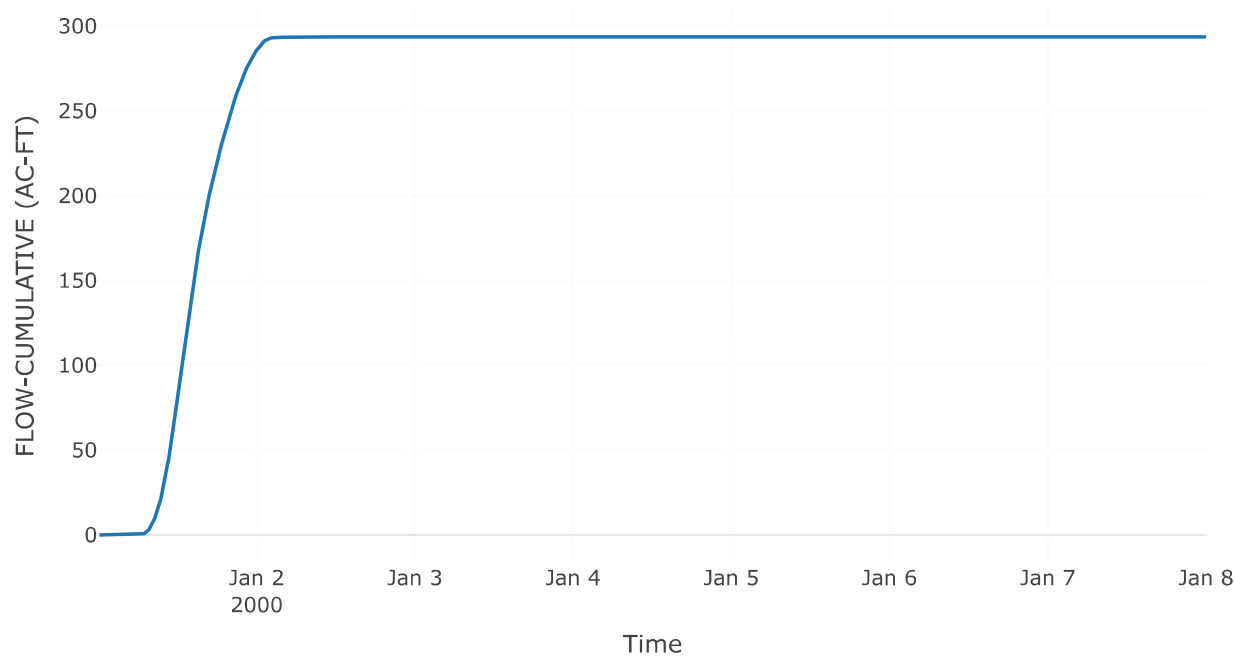
Area (MI²) : 4.54

Results: Subbasin-6	
Peak Discharge (CFS)	361.81
Time of Peak Discharge	01Jan2000, 12:36
Volume (IN)	1.21
Precipitation Volume (AC - FT)	853.25
Loss Volume (AC - FT)	559.67
Excess Volume (AC - FT)	293.58
Direct Runoff Volume (AC - FT)	293.58
Baseflow Volume (AC - FT)	0

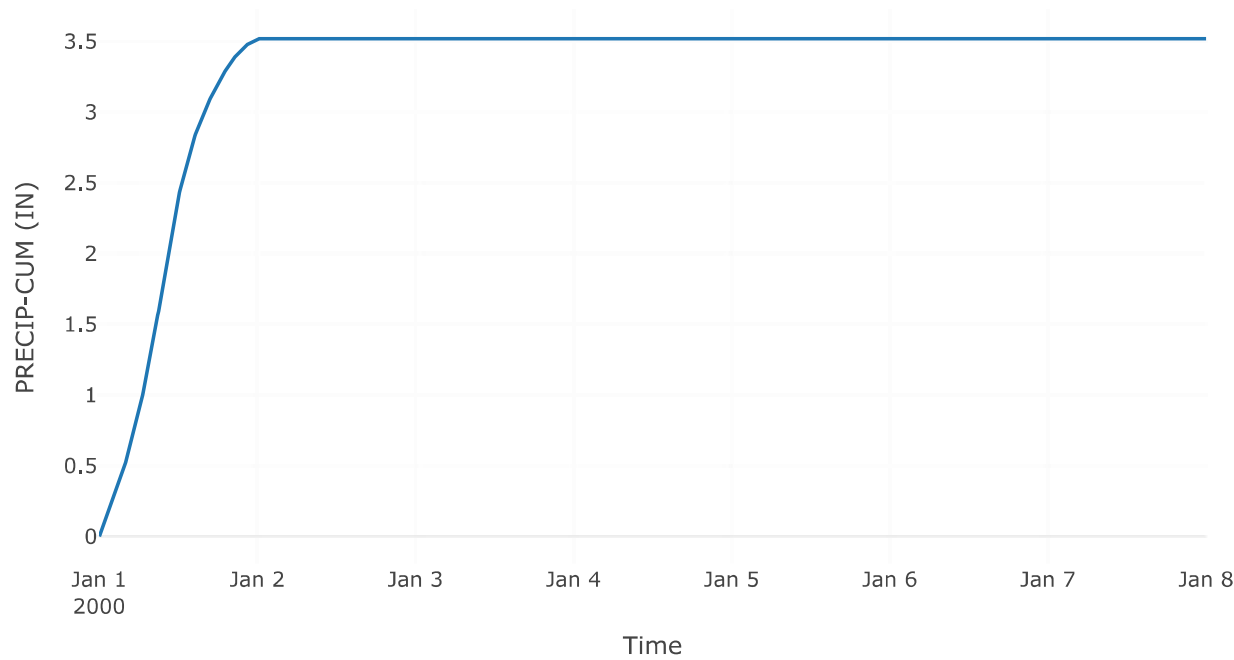
Precipitation and Outflow



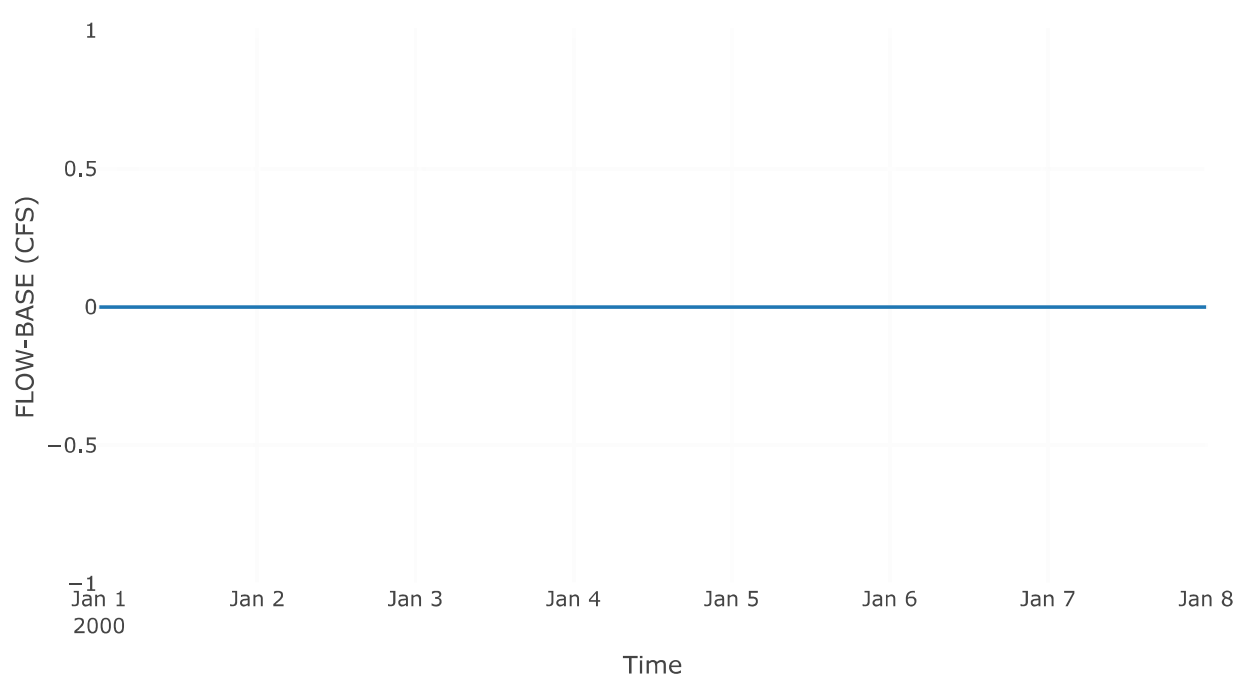
Cumulative Outflow



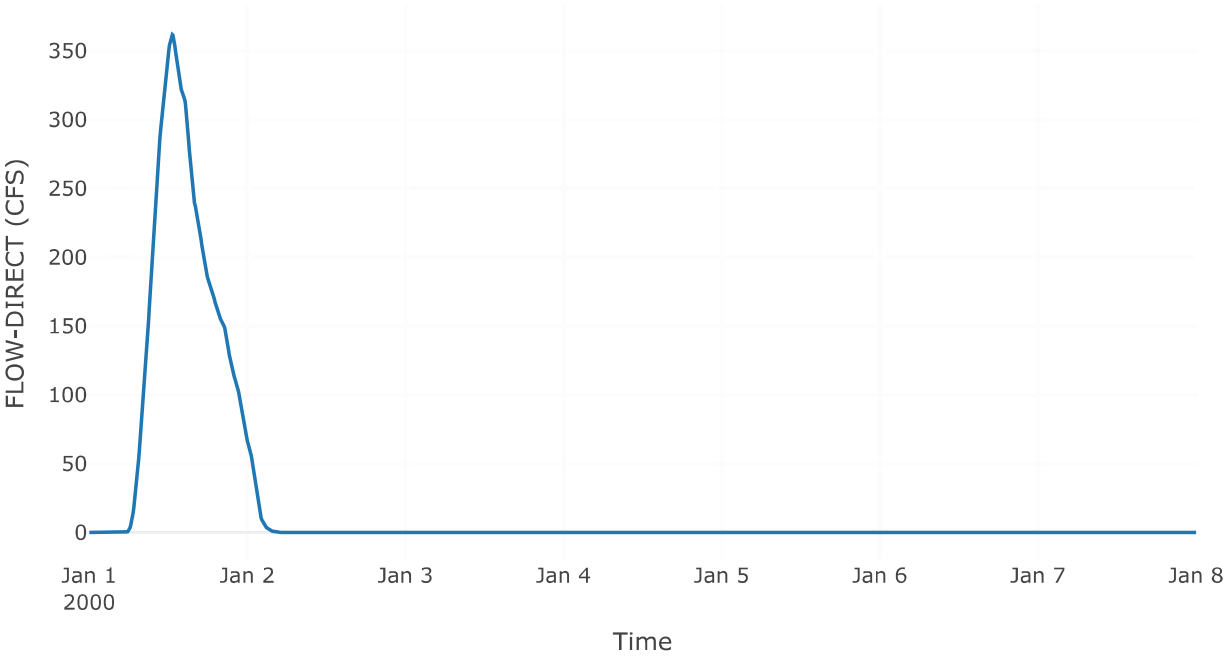
Cumulative Precipitation



Baseflow



Direct Runoff

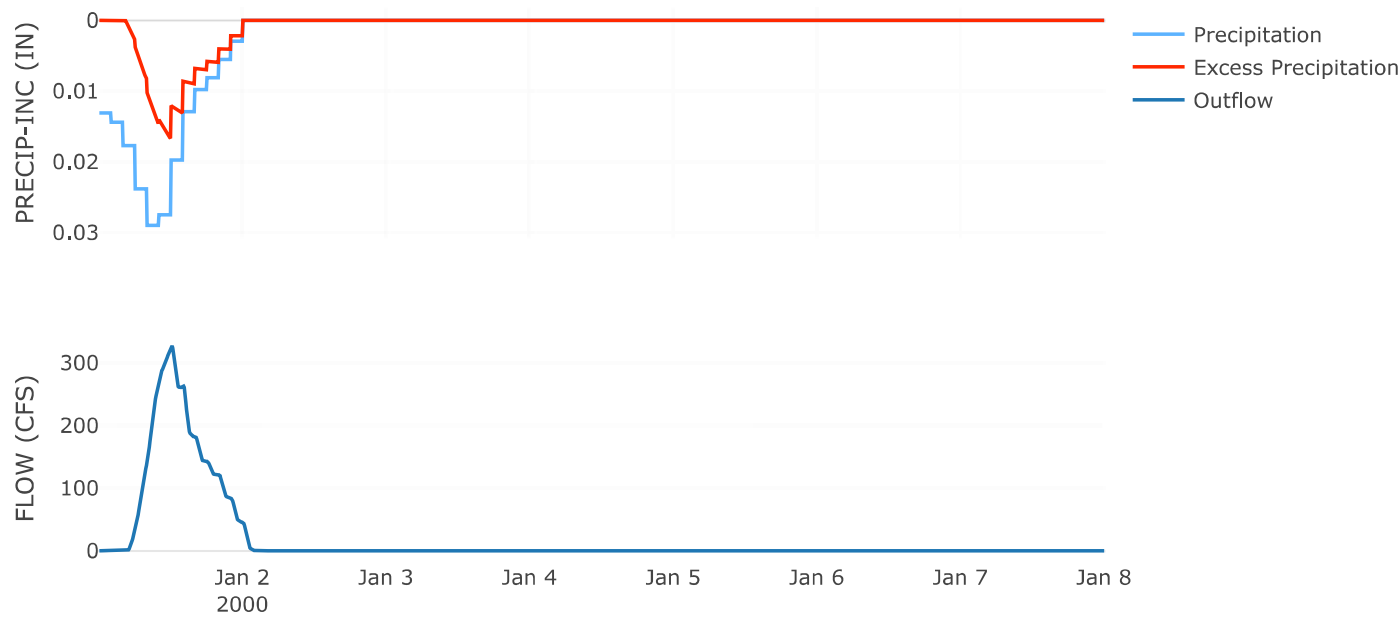


Subbasin: Subbasin-5

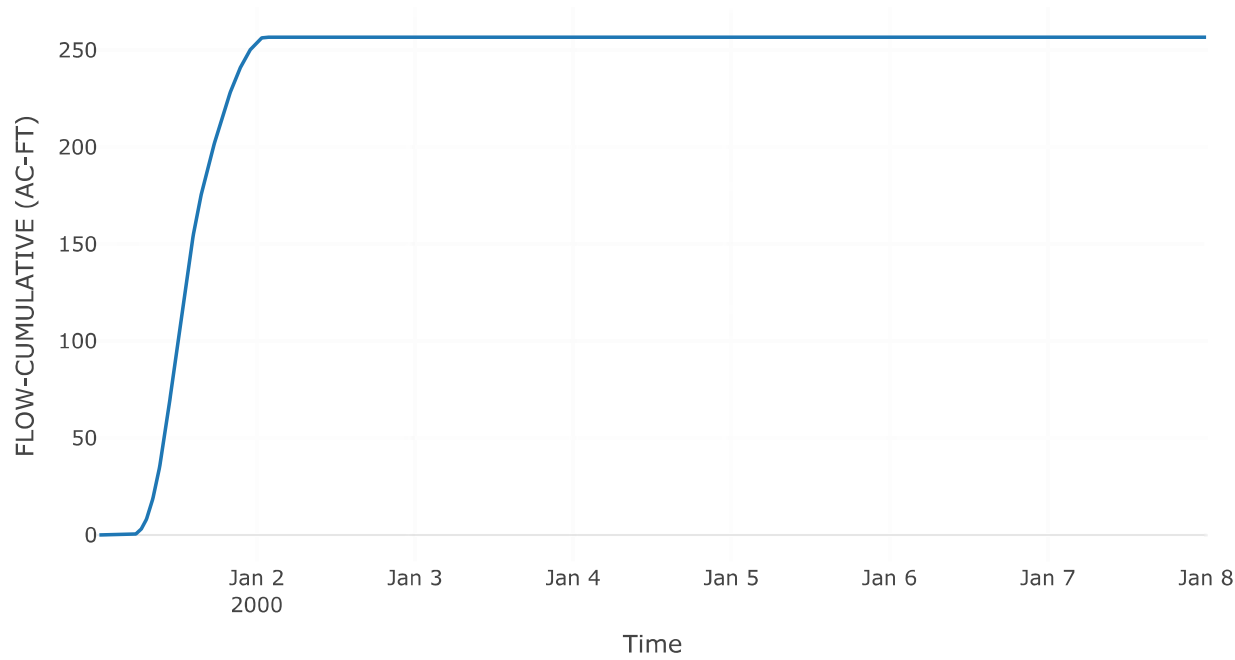
Area (MI²) : 3.19

Results: Subbasin-5	
Peak Discharge (CFS)	327.39
Time of Peak Discharge	01Jan2000, 12:06
Volume (IN)	1.51
Precipitation Volume (AC - FT)	626.89
Loss Volume (AC - FT)	370.1
Excess Volume (AC - FT)	256.79
Direct Runoff Volume (AC - FT)	256.79
Baseflow Volume (AC - FT)	0

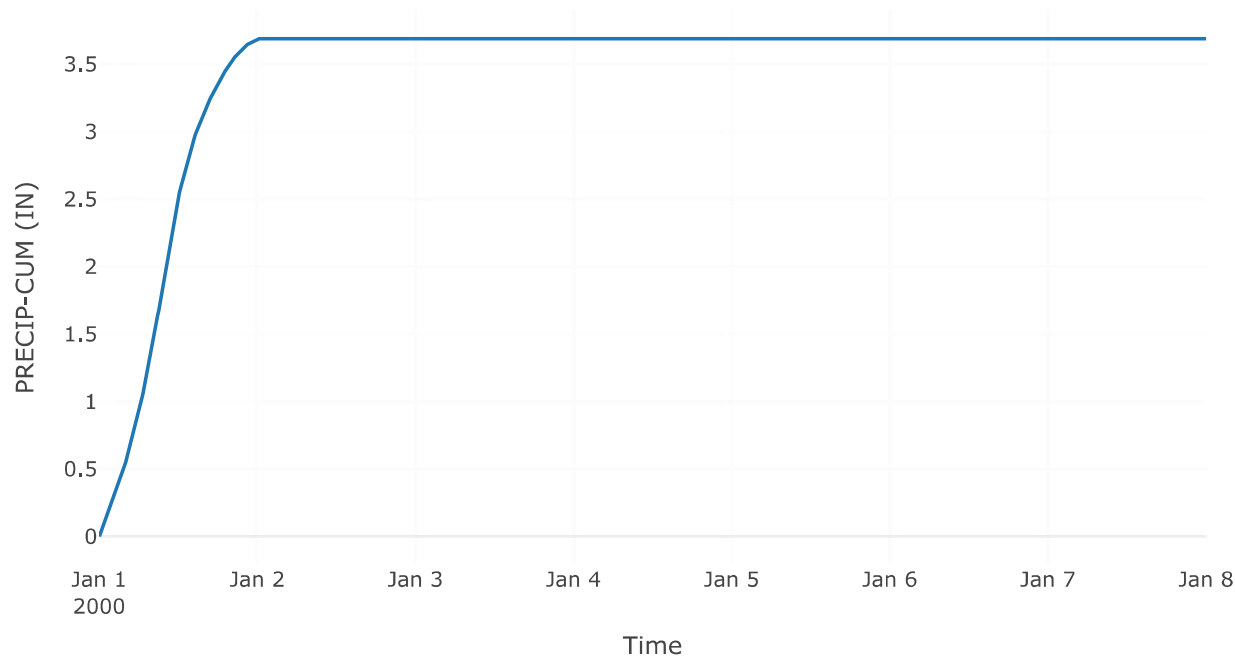
Precipitation and Outflow



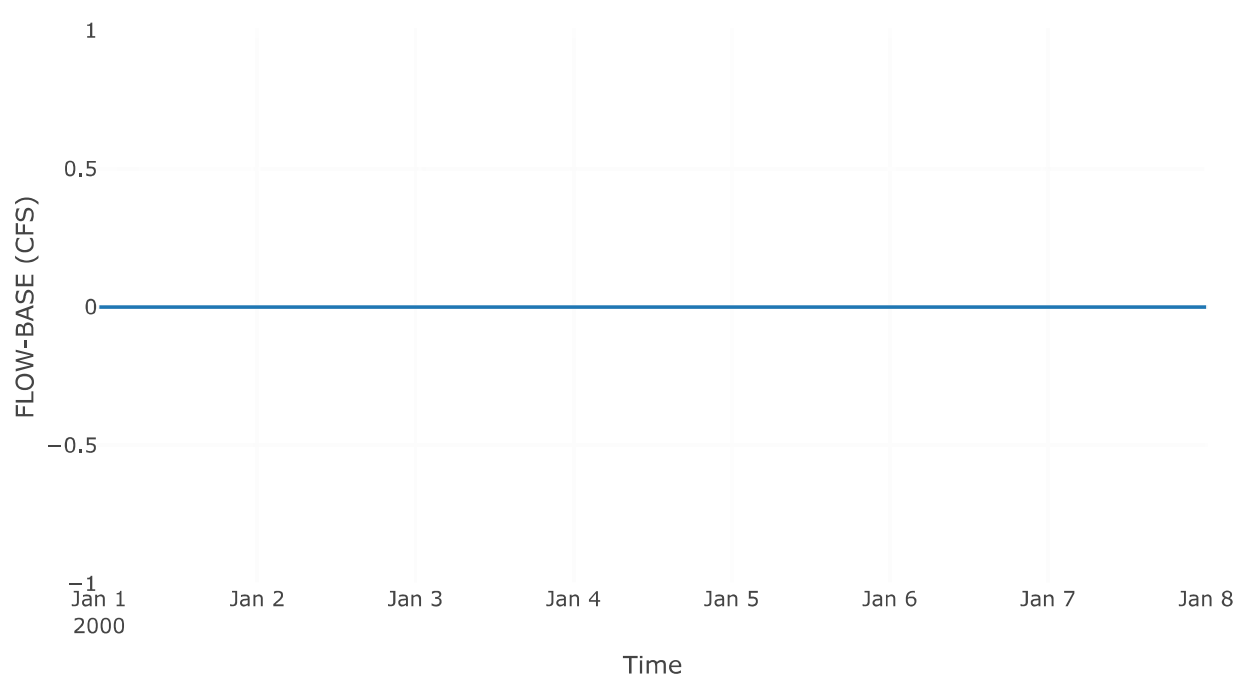
Cumulative Outflow



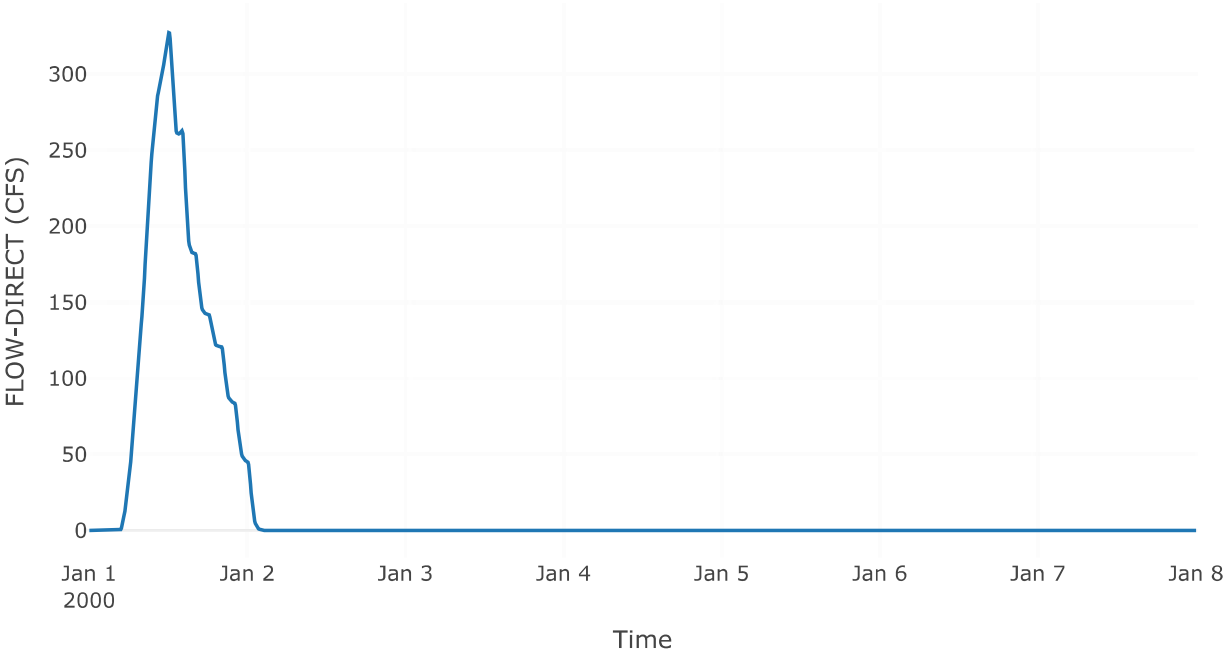
Cumulative Precipitation



Baseflow



Direct Runoff

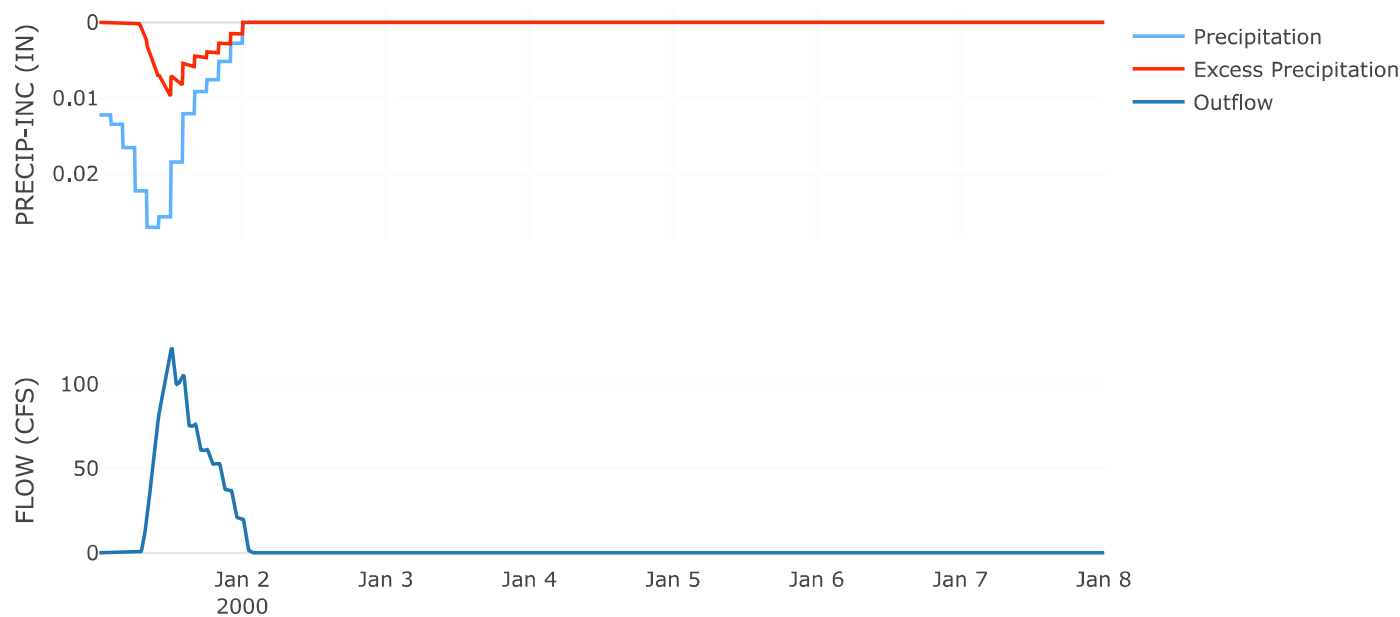


Subbasin: Subbasin-2

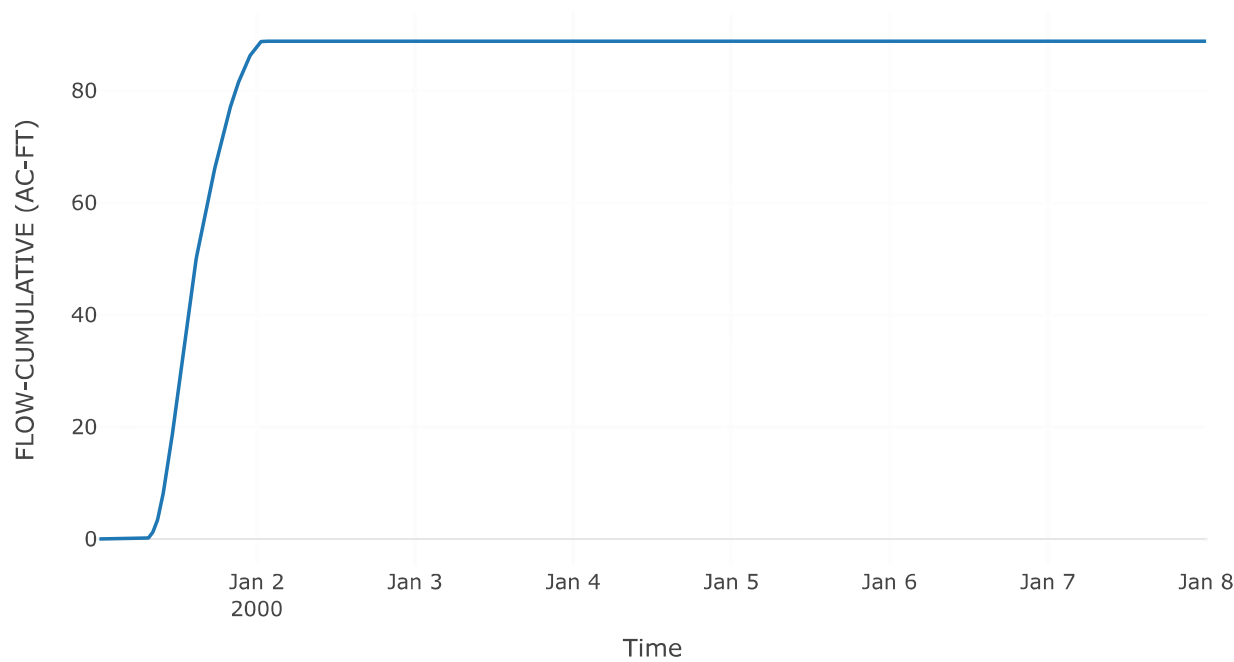
Area (MI²) : 2.05

Results: Subbasin-2	
Peak Discharge (CFS)	121.54
Time of Peak Discharge	01Jan2000, 12:06
Volume (IN)	0.81
Precipitation Volume (AC - FT)	377.38
Loss Volume (AC - FT)	288.53
Excess Volume (AC - FT)	88.85
Direct Runoff Volume (AC - FT)	88.85
Baseflow Volume (AC - FT)	0

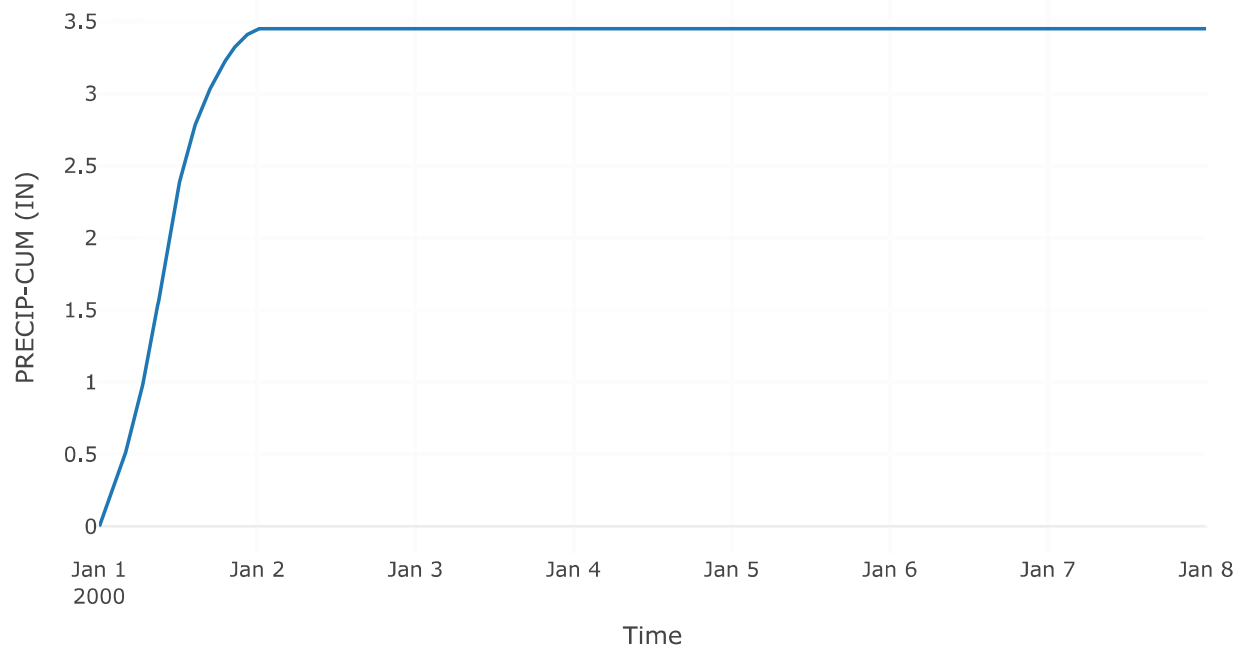
Precipitation and Outflow



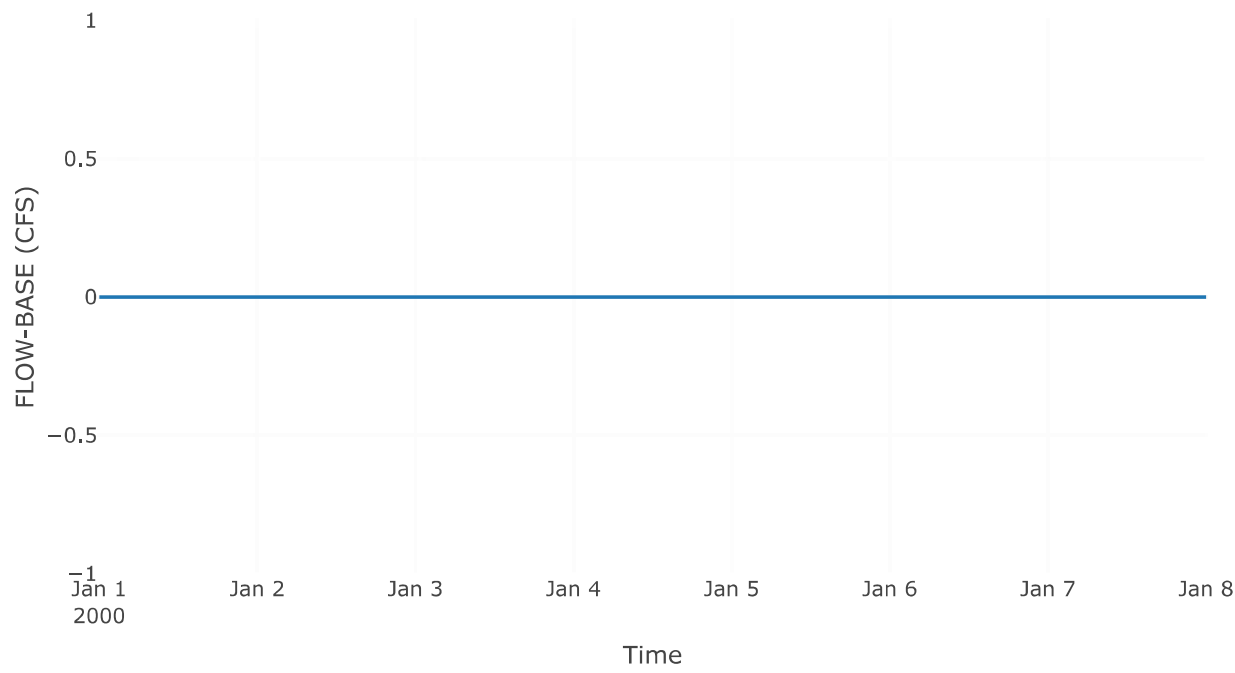
Cumulative Outflow



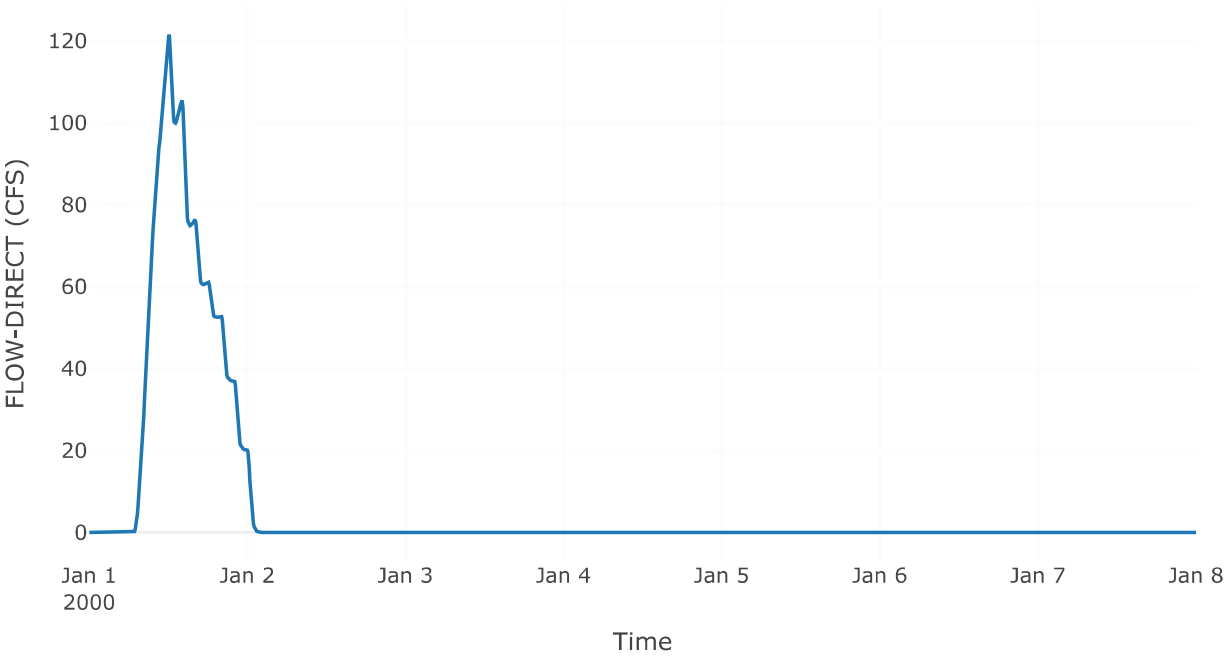
Cumulative Precipitation



Baseflow



Direct Runoff

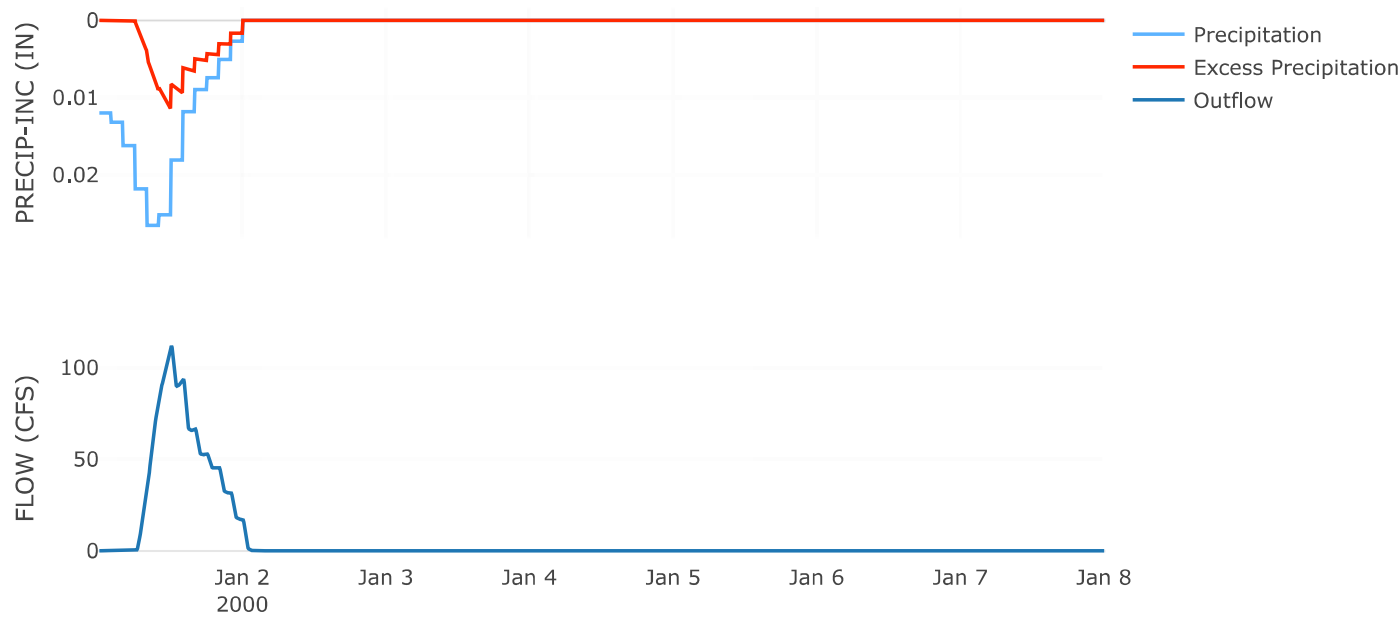


Subbasin: Subbasin-4

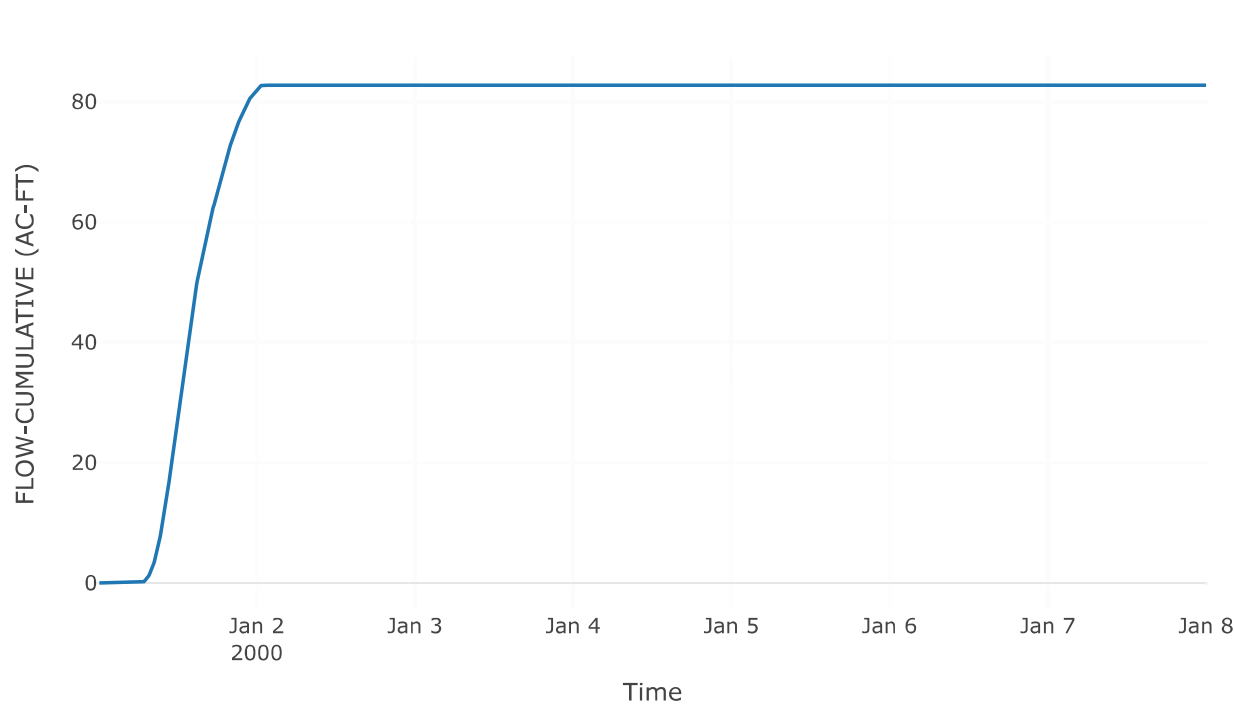
Area (MI²) : 1.6

Results: Subbasin-4	
Peak Discharge (CFS)	111.91
Time of Peak Discharge	01Jan2000, 12:06
Volume (IN)	0.97
Precipitation Volume (AC - FT)	287.81
Loss Volume (AC - FT)	205.04
Excess Volume (AC - FT)	82.77
Direct Runoff Volume (AC - FT)	82.77
Baseflow Volume (AC - FT)	0

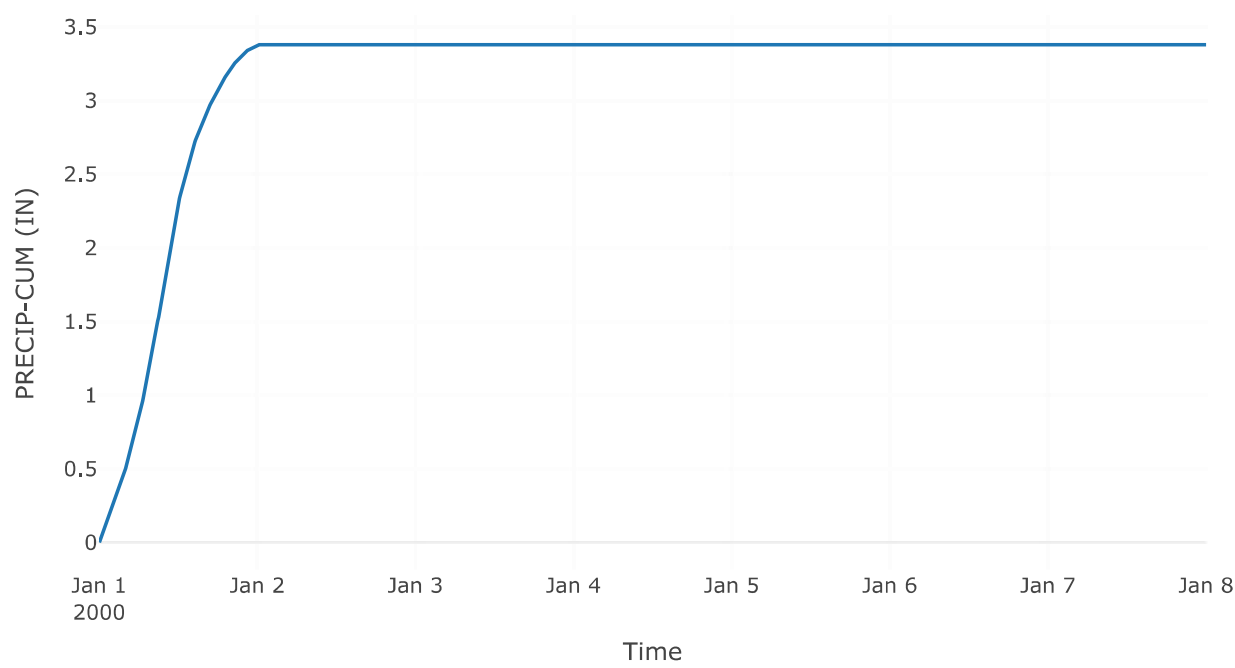
Precipitation and Outflow



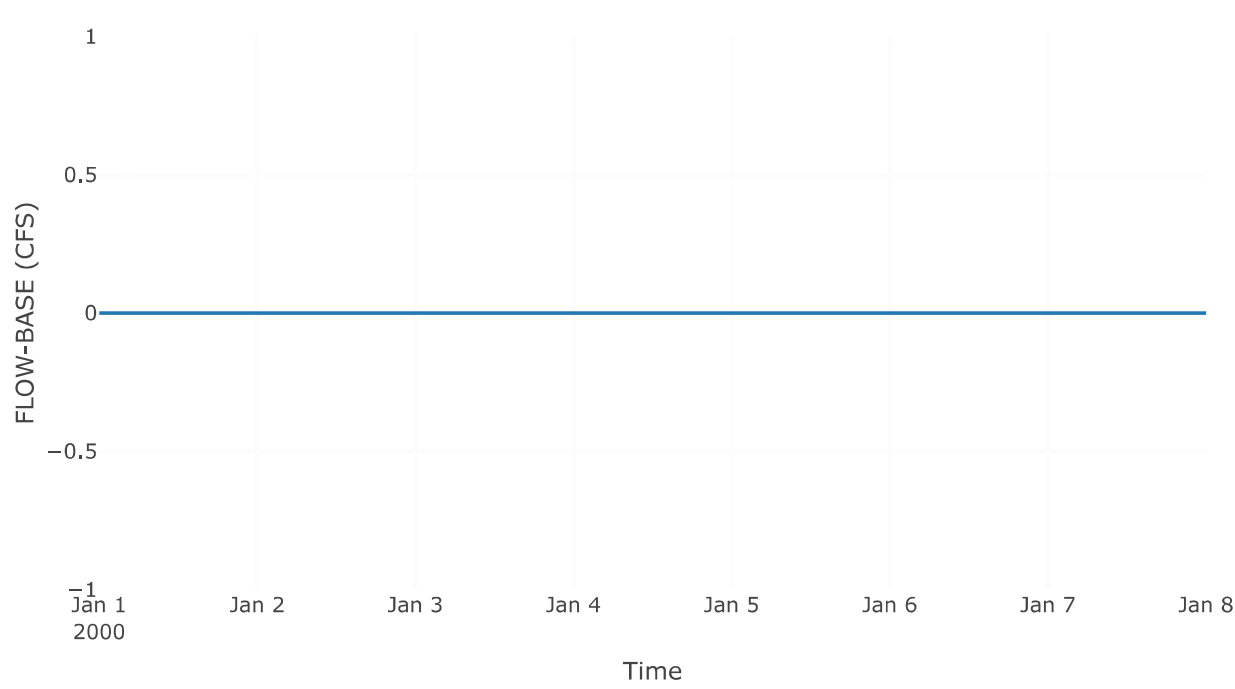
Cumulative Outflow



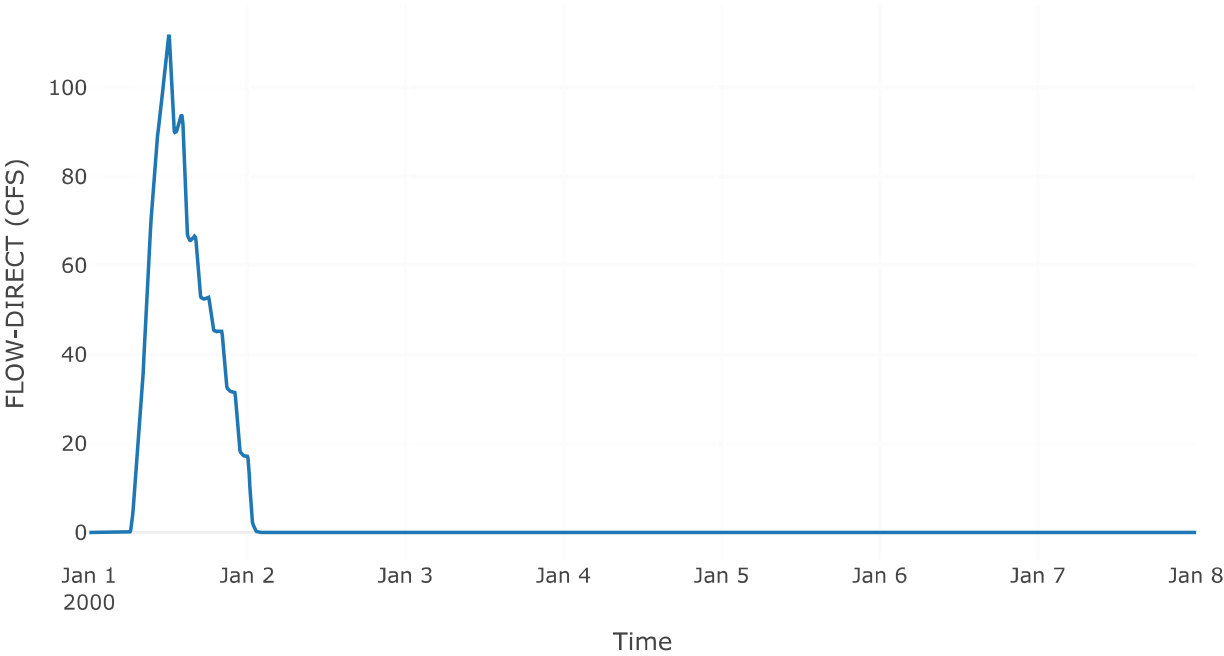
Cumulative Precipitation



Baseflow



Direct Runoff

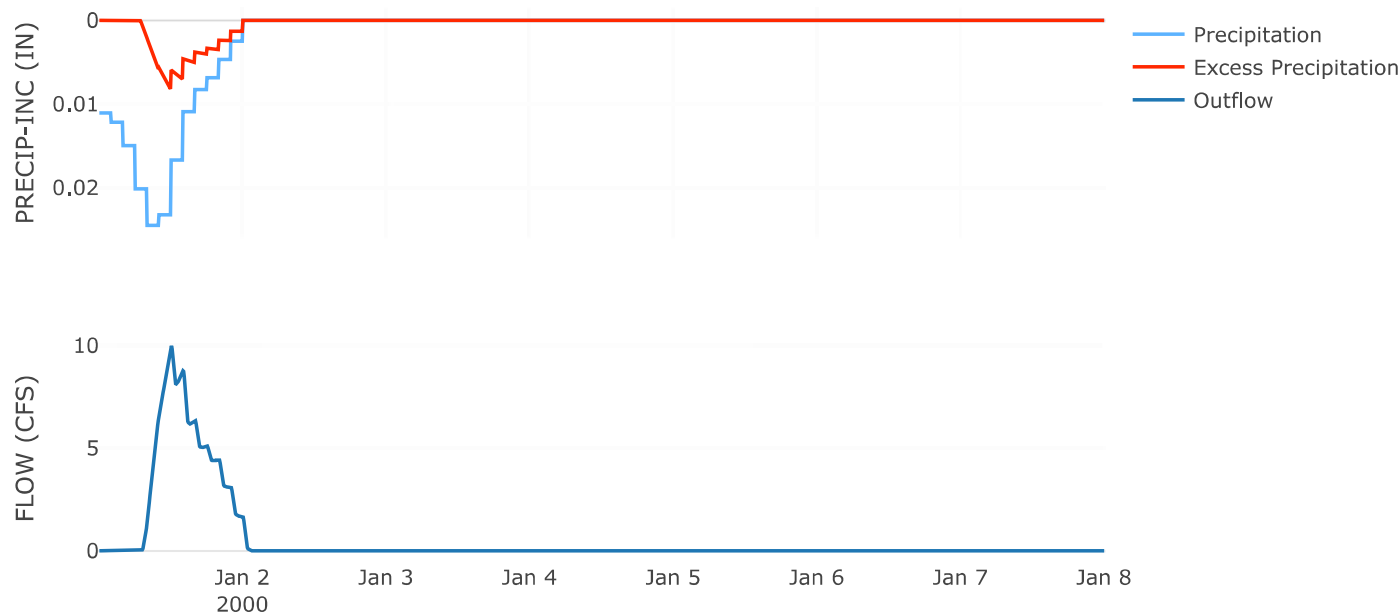


Subbasin: Subbasin-3

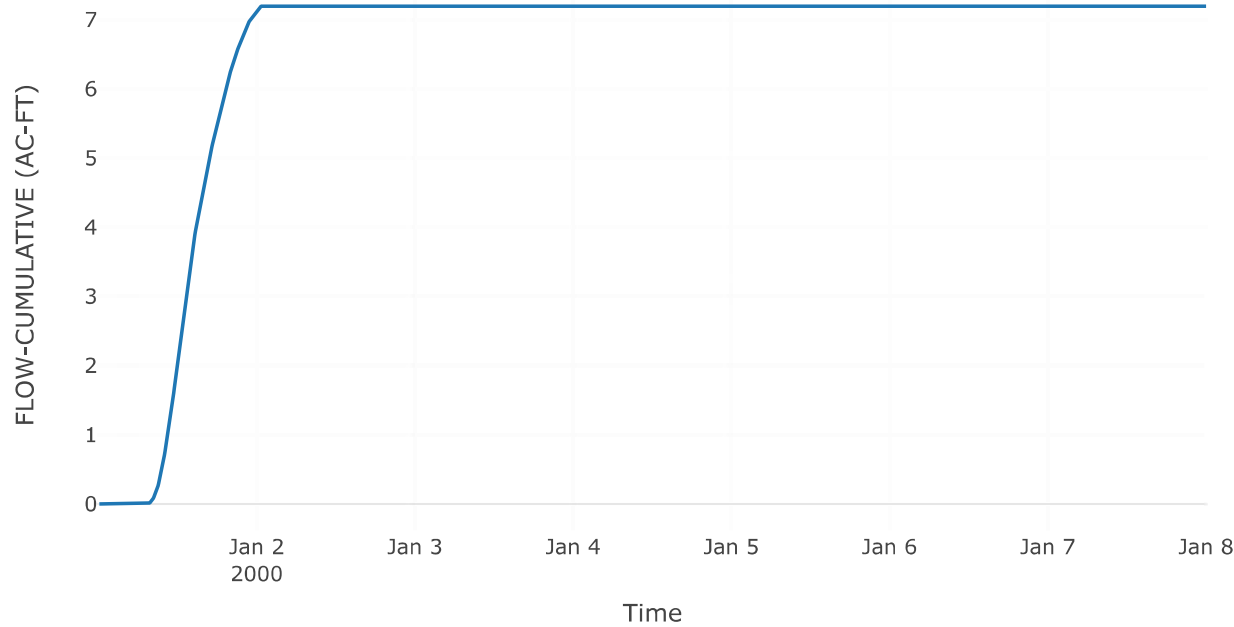
Area (MI²) : 0.2

Results: Subbasin-3	
Peak Discharge (CFS)	9.98
Time of Peak Discharge	01Jan2000, 12:06
Volume (IN)	0.68
Precipitation Volume (AC - FT)	33.21
Loss Volume (AC - FT)	26.02
Excess Volume (AC - FT)	7.2
Direct Runoff Volume (AC - FT)	7.2
Baseflow Volume (AC - FT)	0

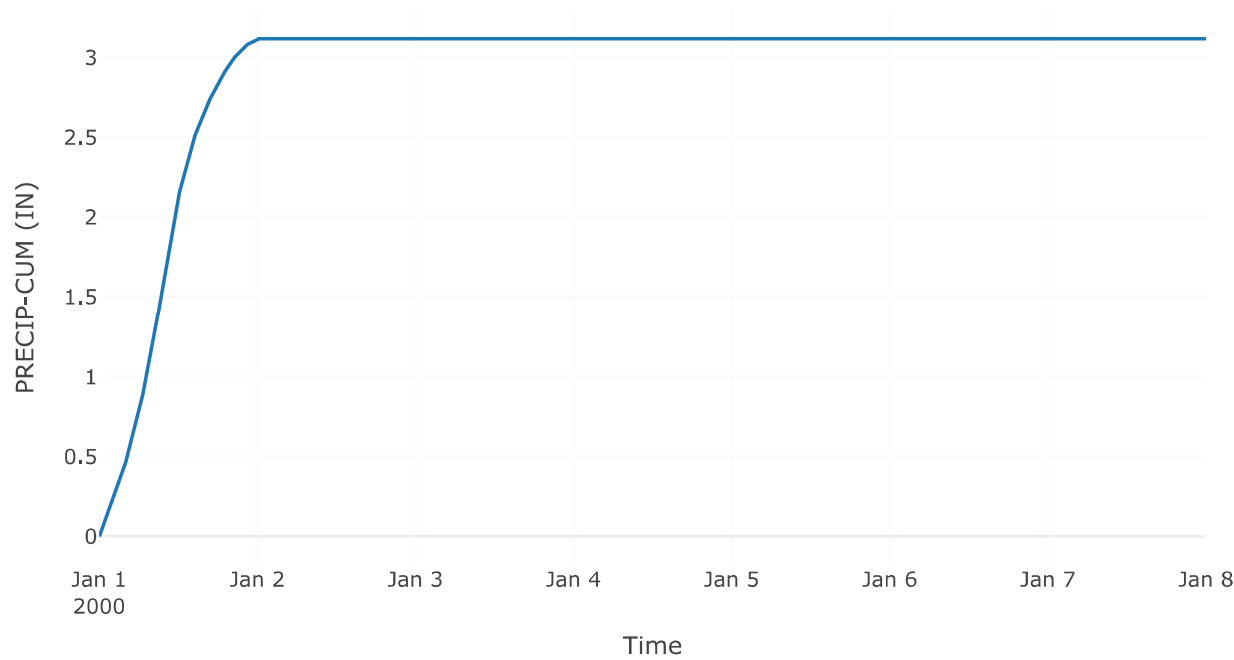
Precipitation and Outflow



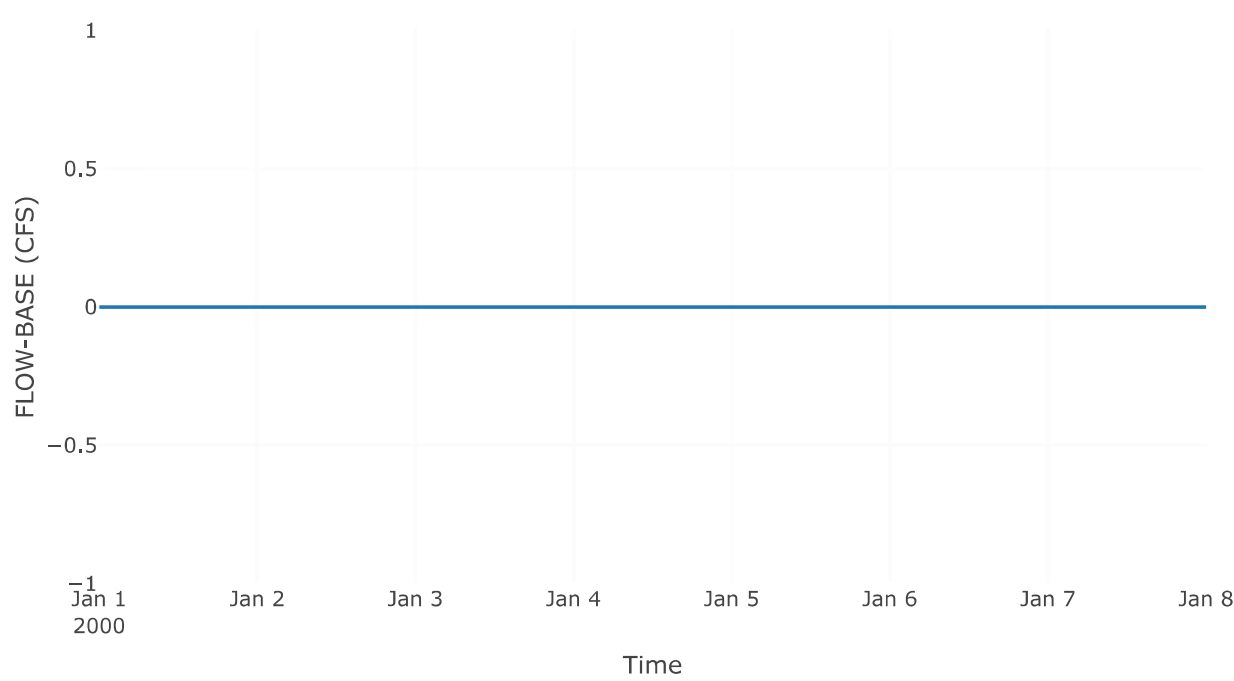
Cumulative Outflow



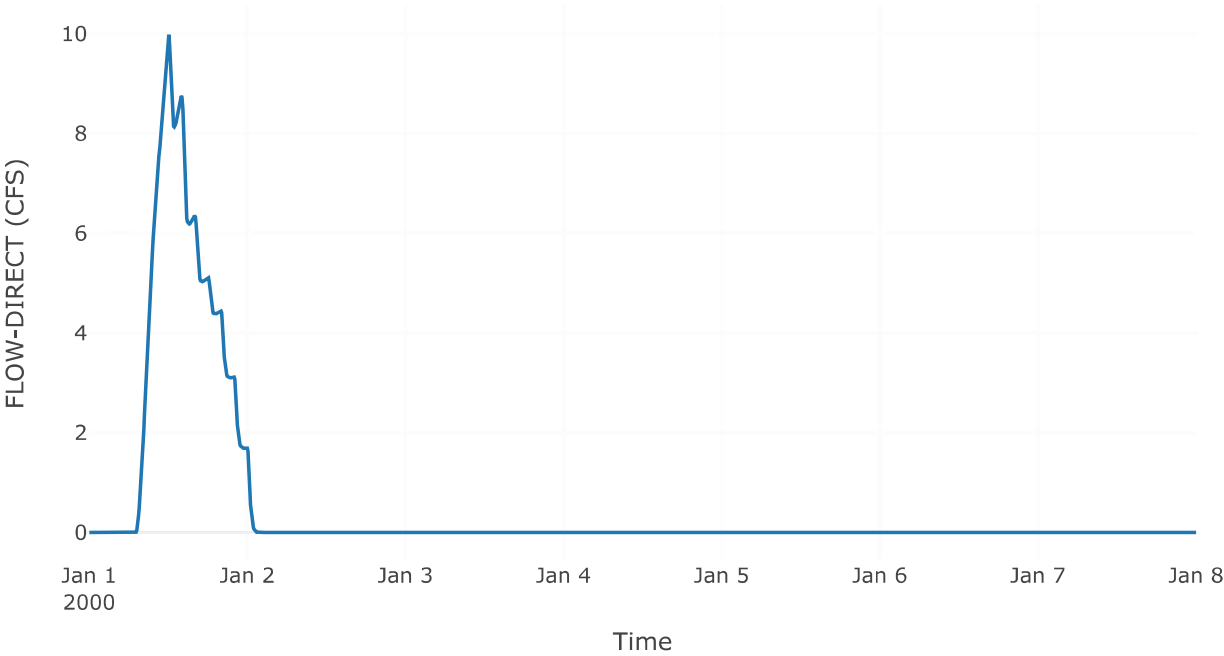
Cumulative Precipitation



Baseflow



Direct Runoff



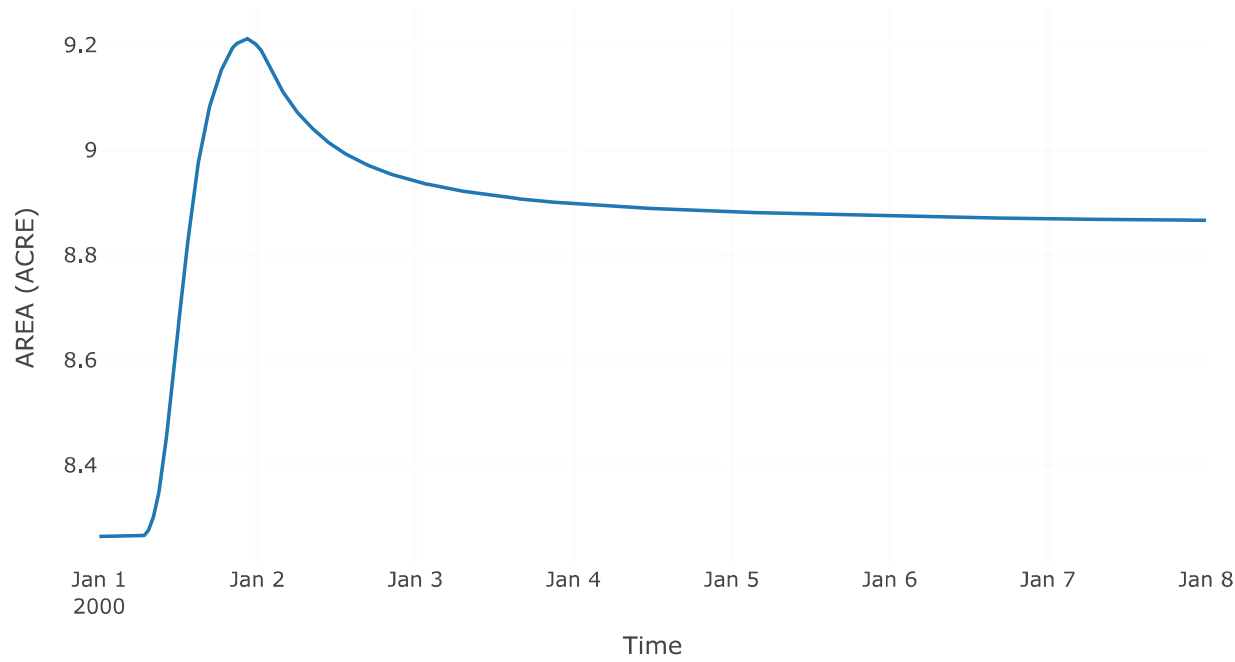
Reservoir: Middle B Reservoir

Downstream : City Reservoir

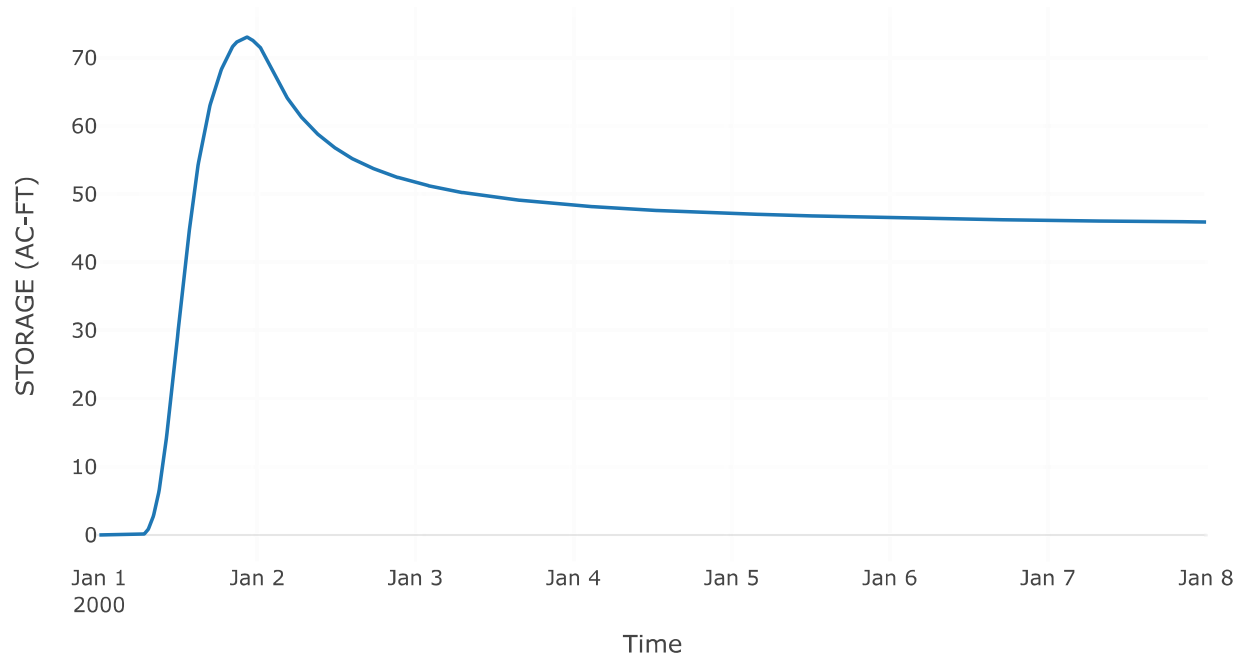
Results: Middle B Reservoir

Peak Discharge (CFS)	28.53
Time of Peak Discharge	01Jan2000, 22:24
Volume (IN)	0.46
Peak Inflow (CFS)	121.9
Time of Peak Inflow	01Jan2000, 12:06
Inflow Volume (AC - FT)	89.97
Maximum Storage (AC - FT)	73.05
Peak Elevation (FT)	8.36
Discharge Volume (AC - FT)	44.06

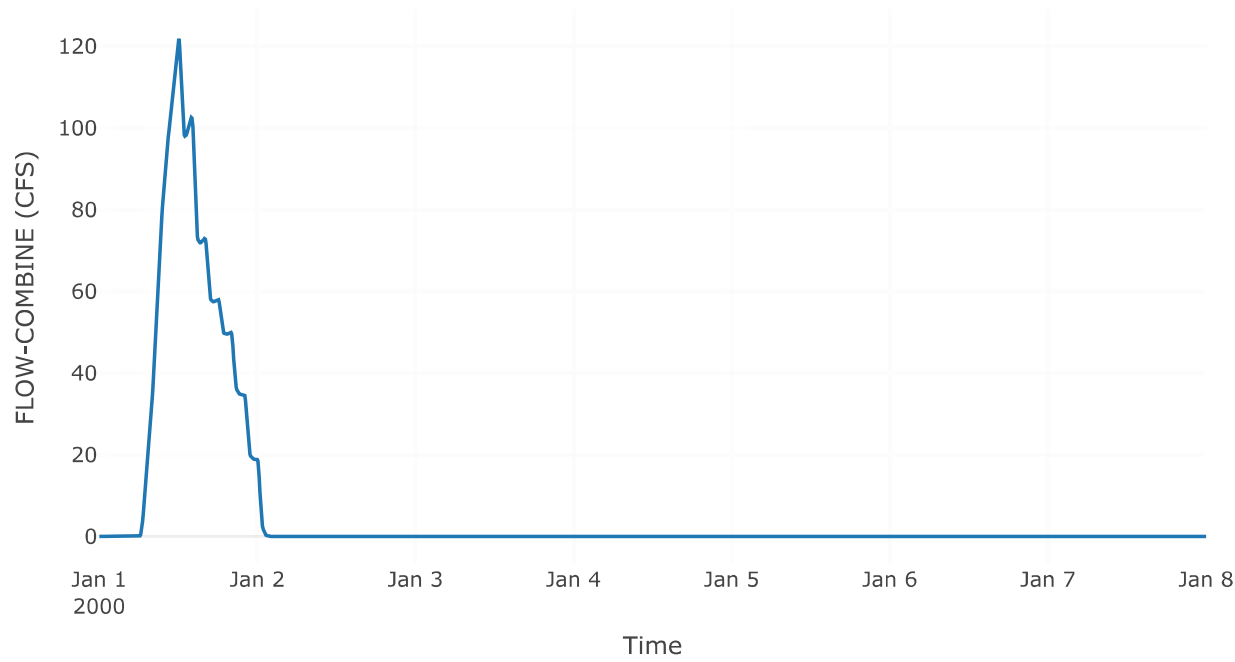
Reservoir Area



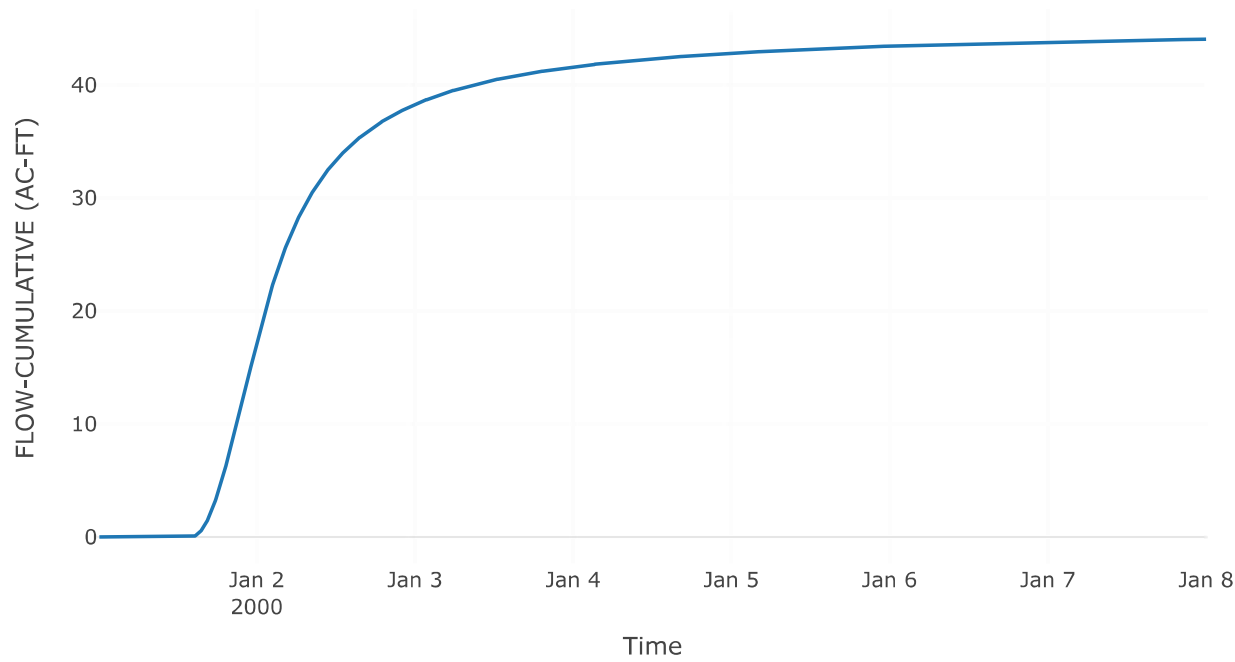
Storage



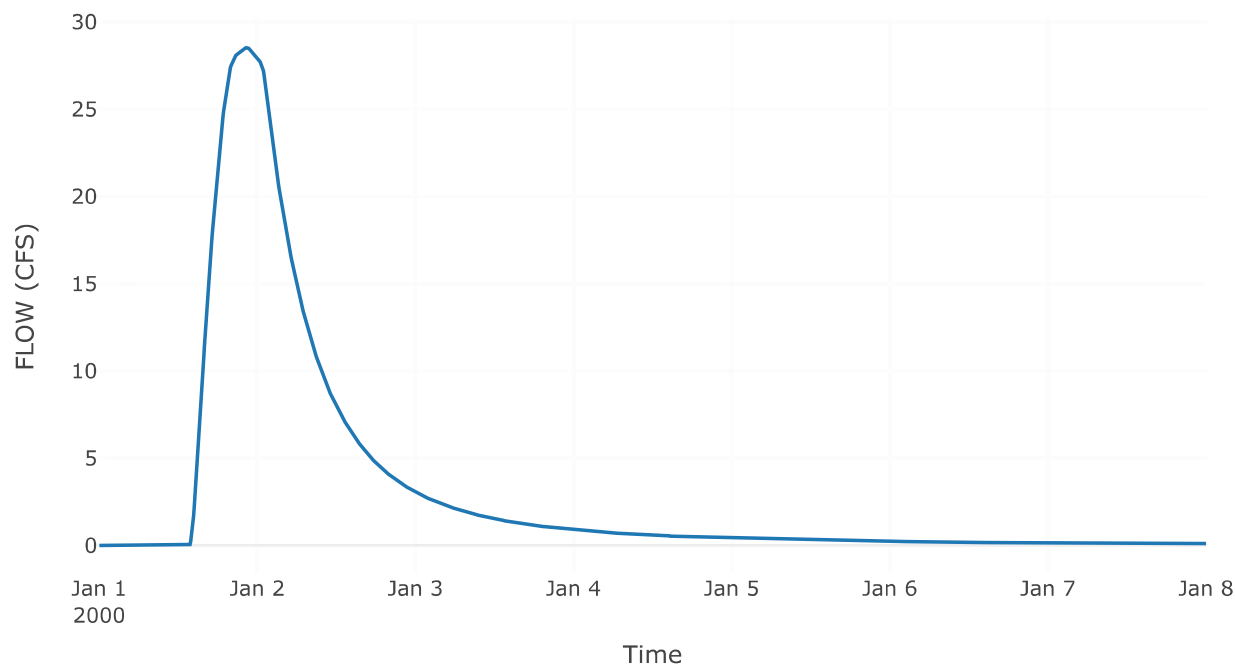
Combined Inflow



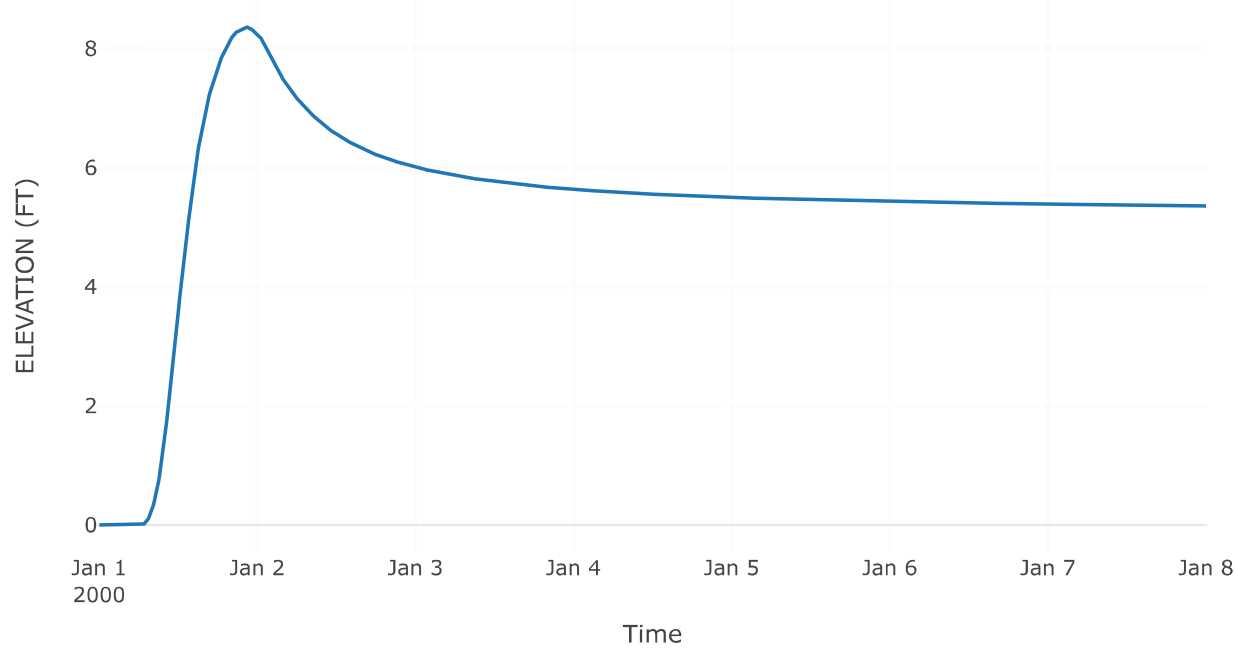
Cumulative Outflow



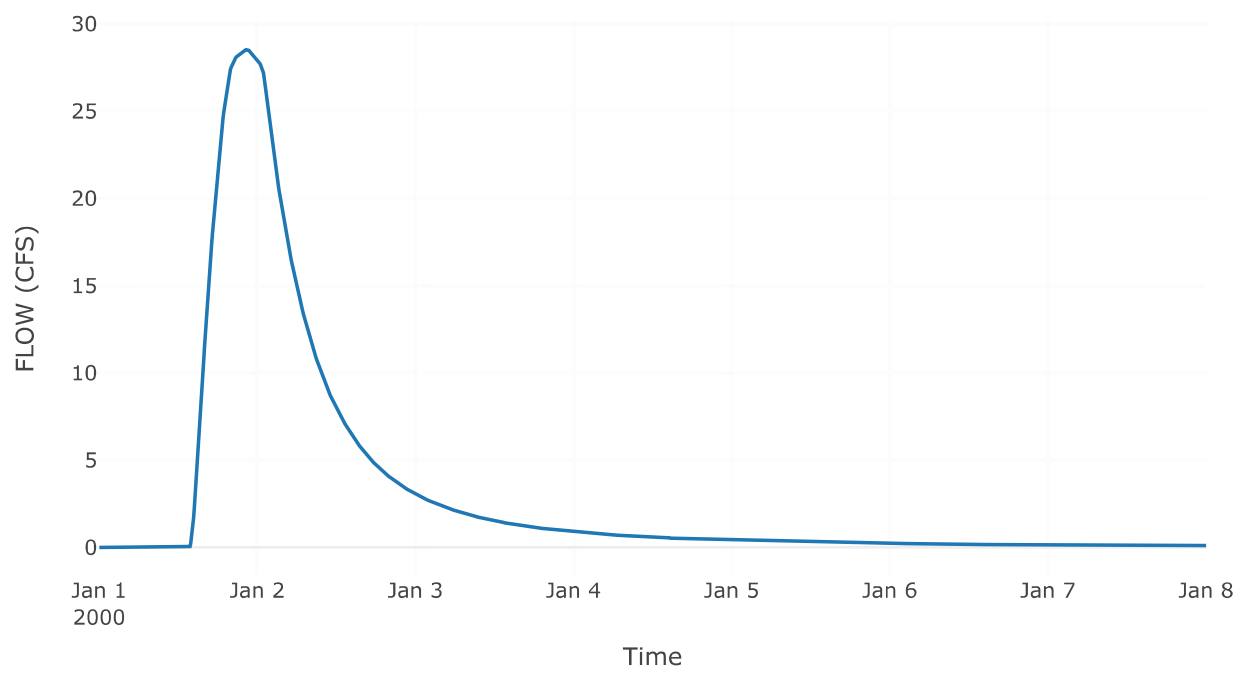
Outlet 1



Pool Elevation



Outflow

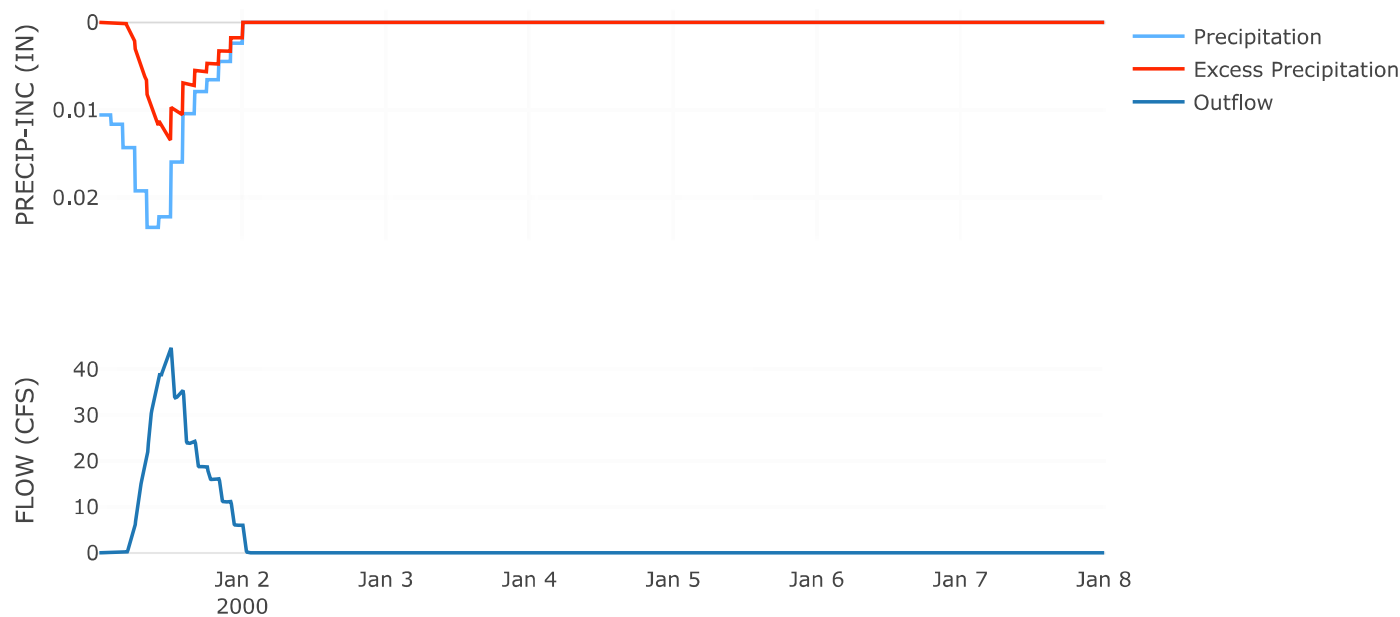


Subbasin: Subbasin-1

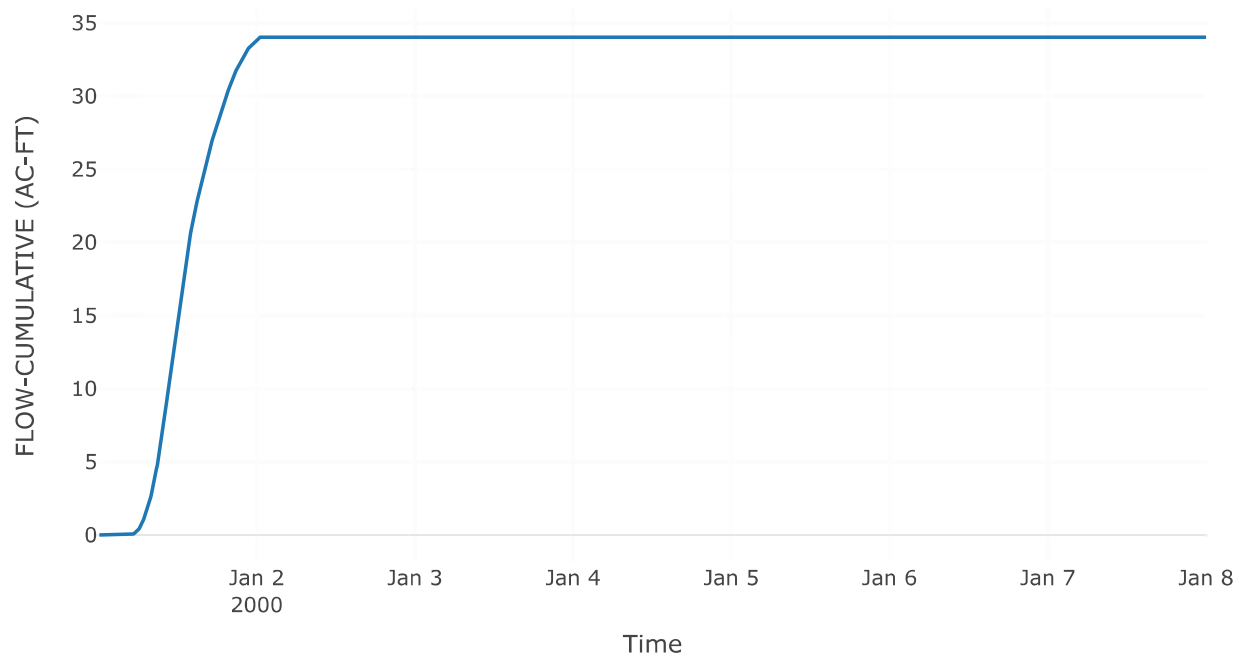
Area (MI²) : 0.52

Results: Subbasin-1	
Peak Discharge (CFS)	44.69
Time of Peak Discharge	01Jan2000, 12:00
Volume (IN)	1.22
Precipitation Volume (AC - FT)	83.39
Loss Volume (AC - FT)	49.35
Excess Volume (AC - FT)	34.04
Direct Runoff Volume (AC - FT)	34.04
Baseflow Volume (AC - FT)	0

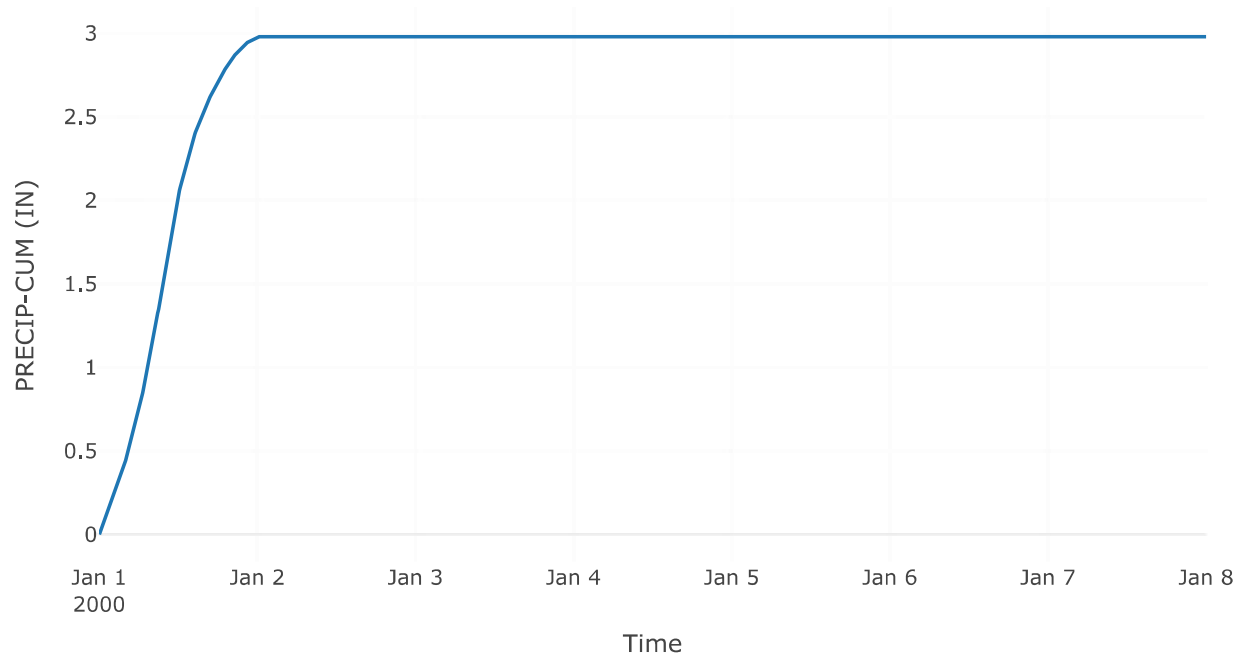
Precipitation and Outflow



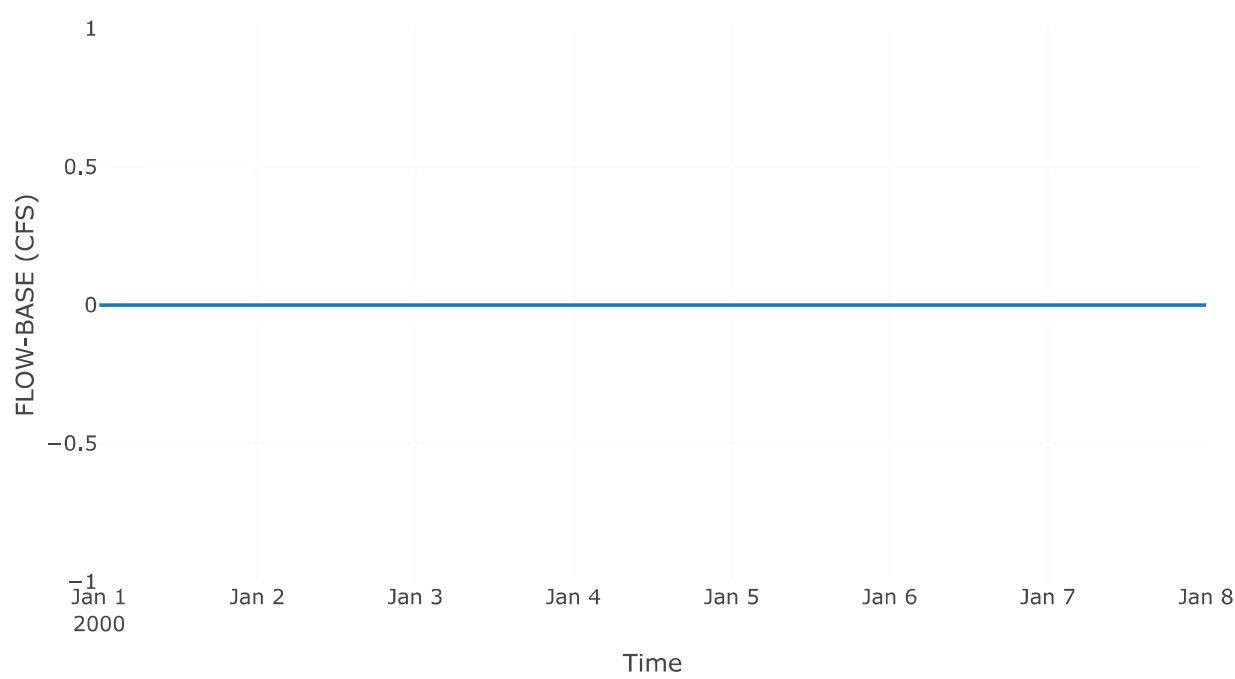
Cumulative Outflow



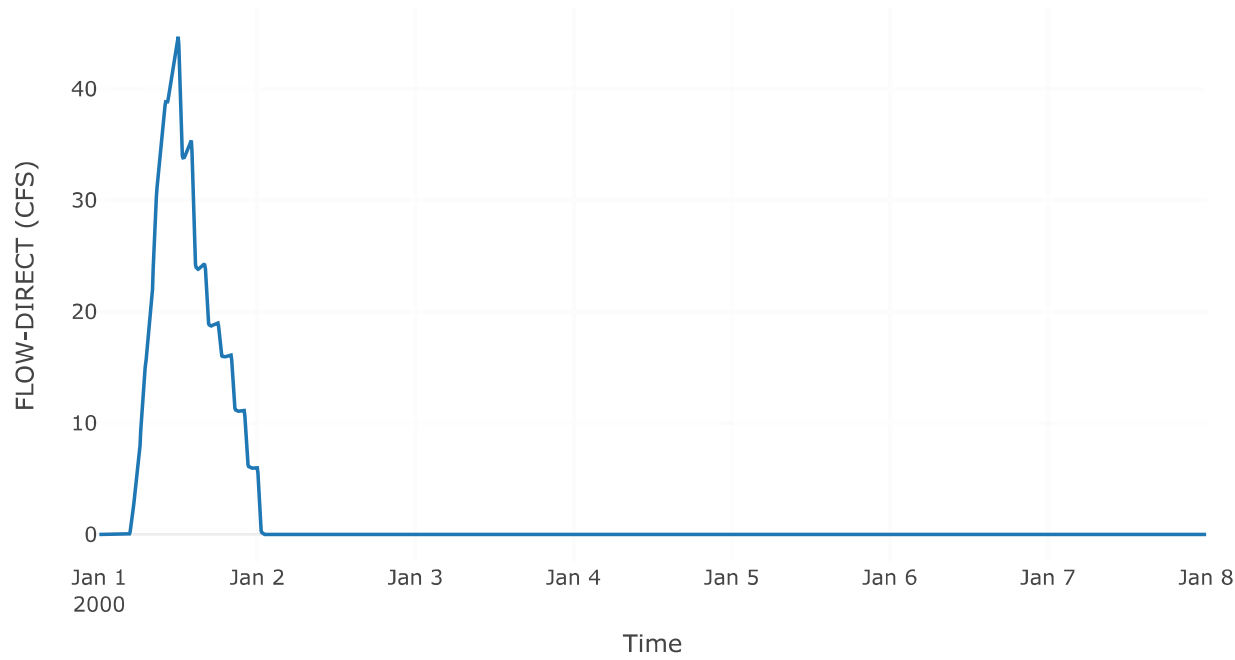
Cumulative Precipitation



Baseflow



Direct Runoff

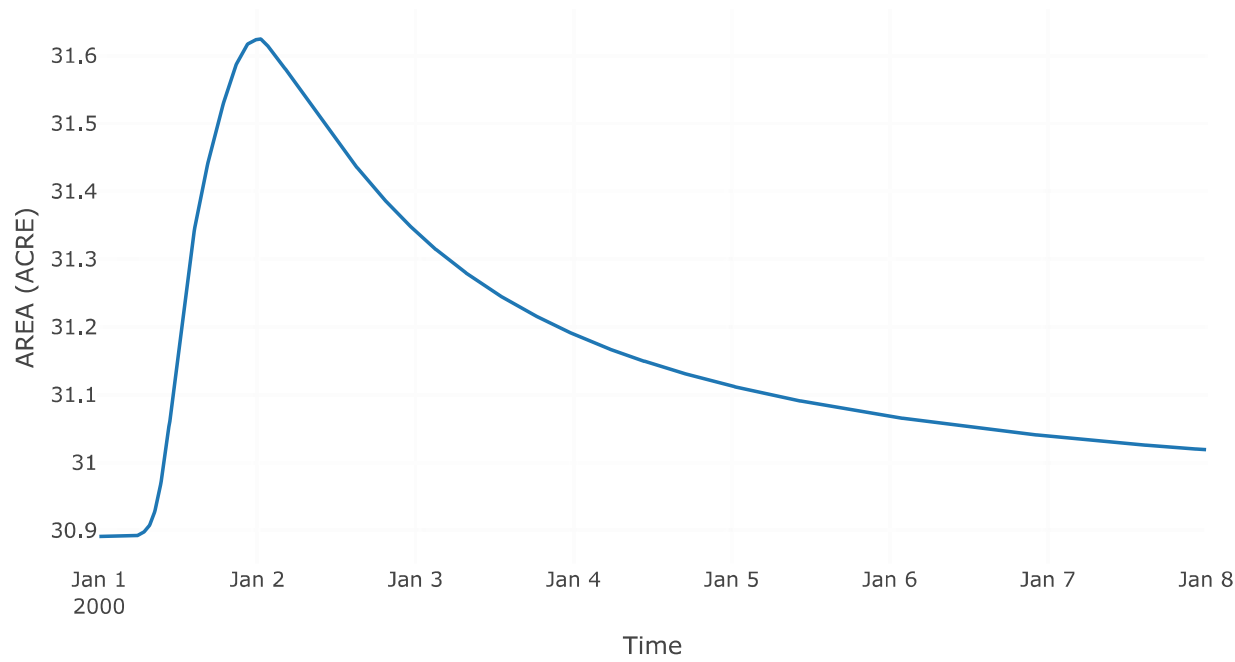


Reservoir: City Reservoir

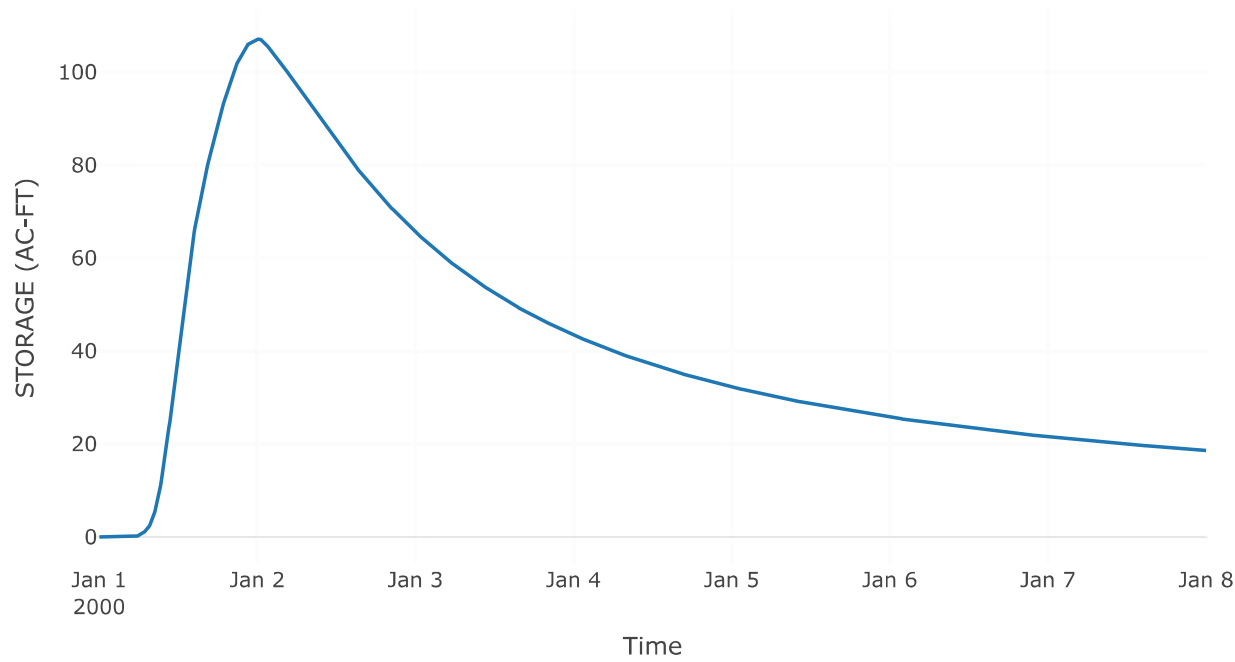
Results: City Reservoir

Peak Discharge (CFS)	46.75
Time of Peak Discharge	02Jan2000, 00:18
Volume (IN)	0.64
Peak Inflow (CFS)	165.48
Time of Peak Inflow	01Jan2000, 12:06
Inflow Volume (AC - FT)	166.96
Maximum Storage (AC - FT)	107.12
Peak Elevation (FT)	3.43
Discharge Volume (AC - FT)	148.35

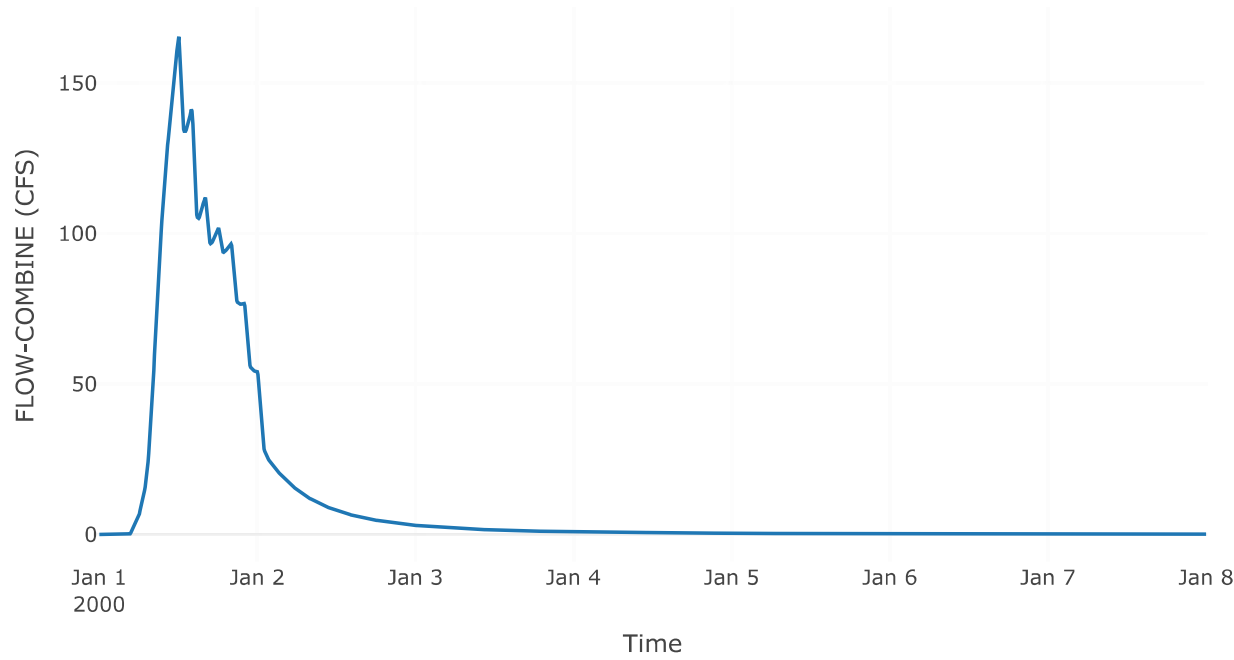
Reservoir Area



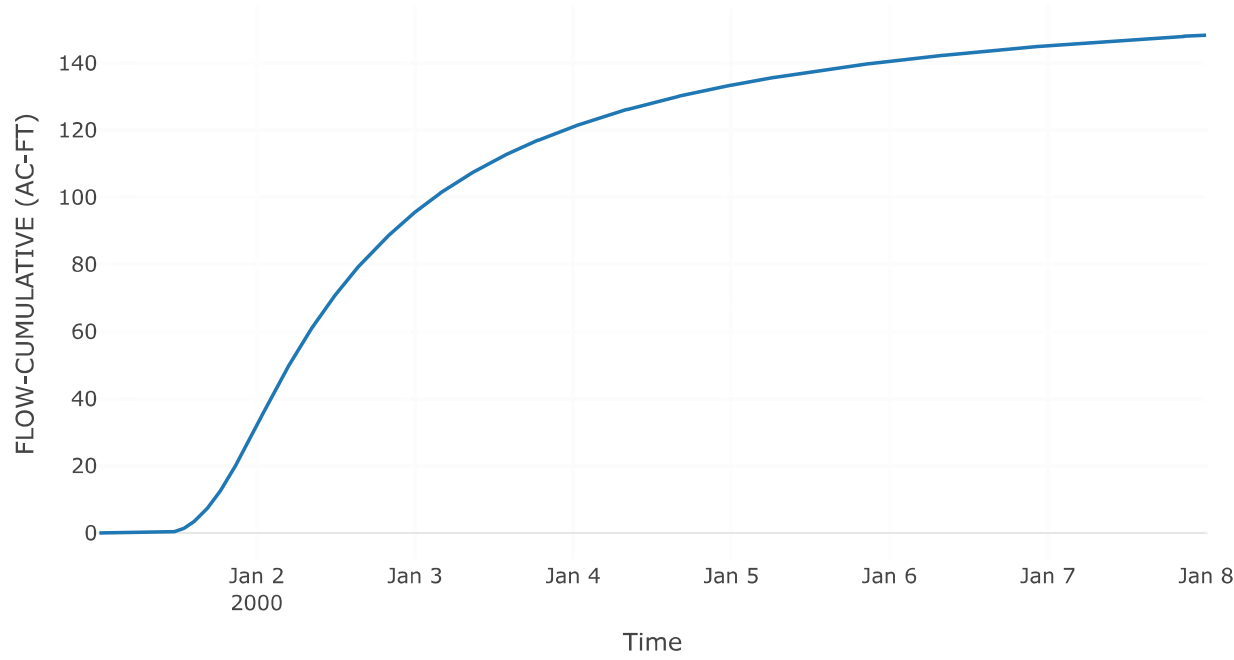
Storage



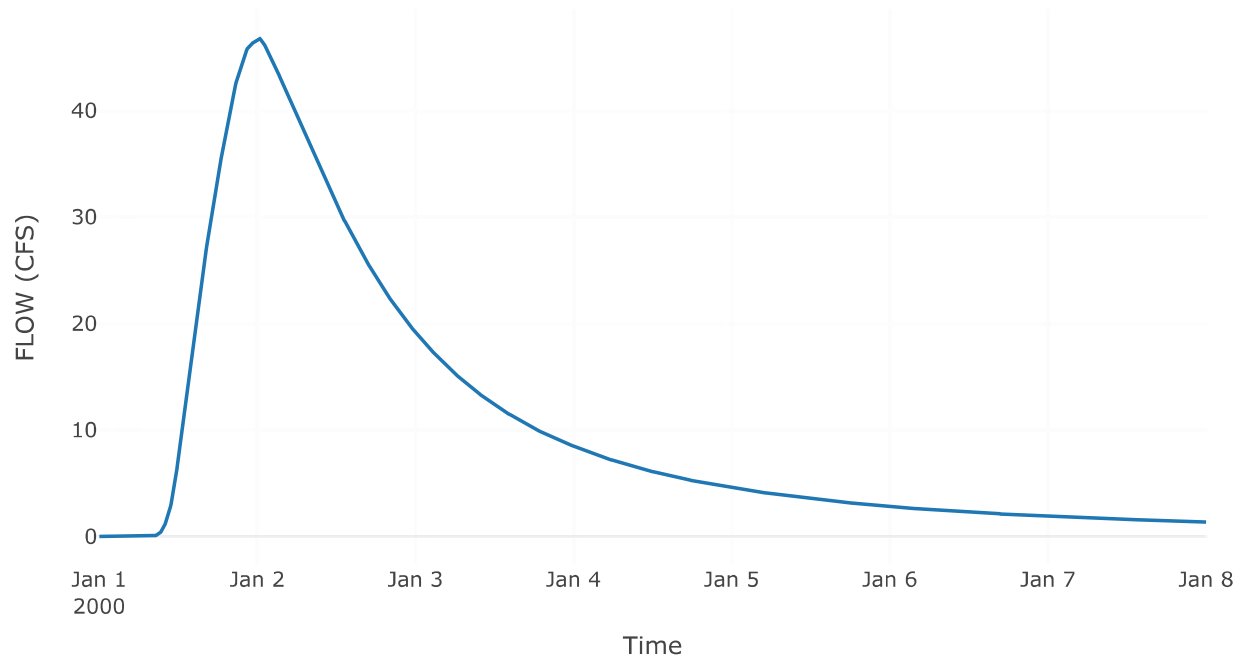
Combined Inflow



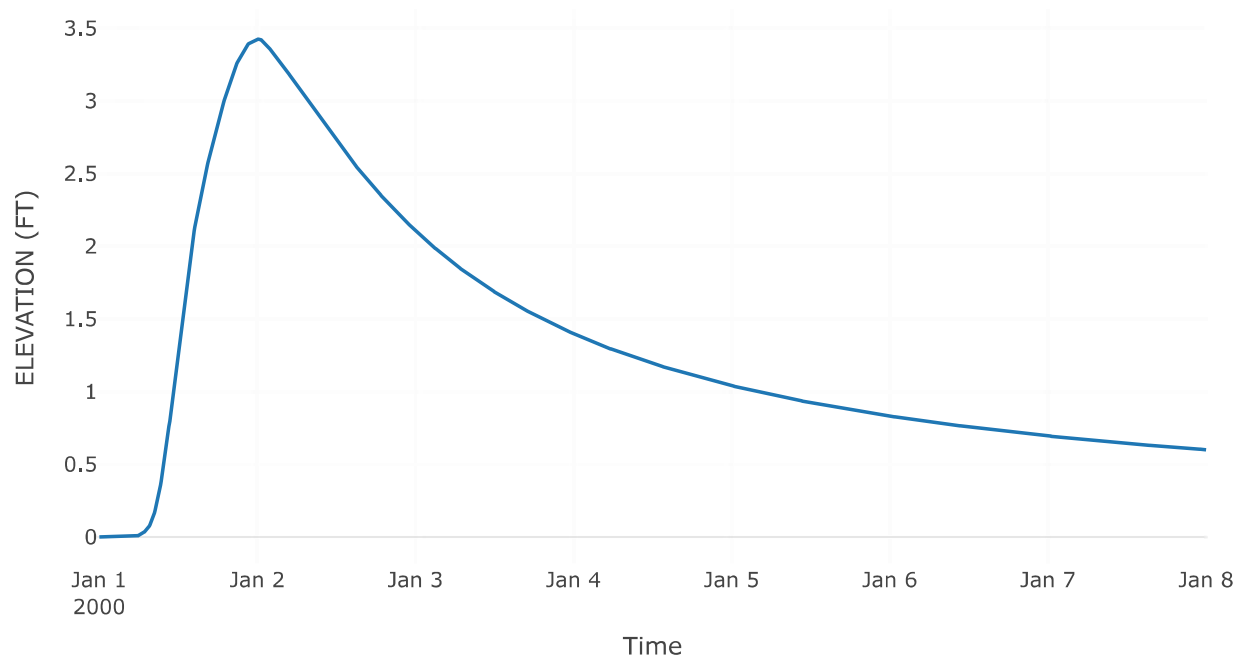
Cumulative Outflow

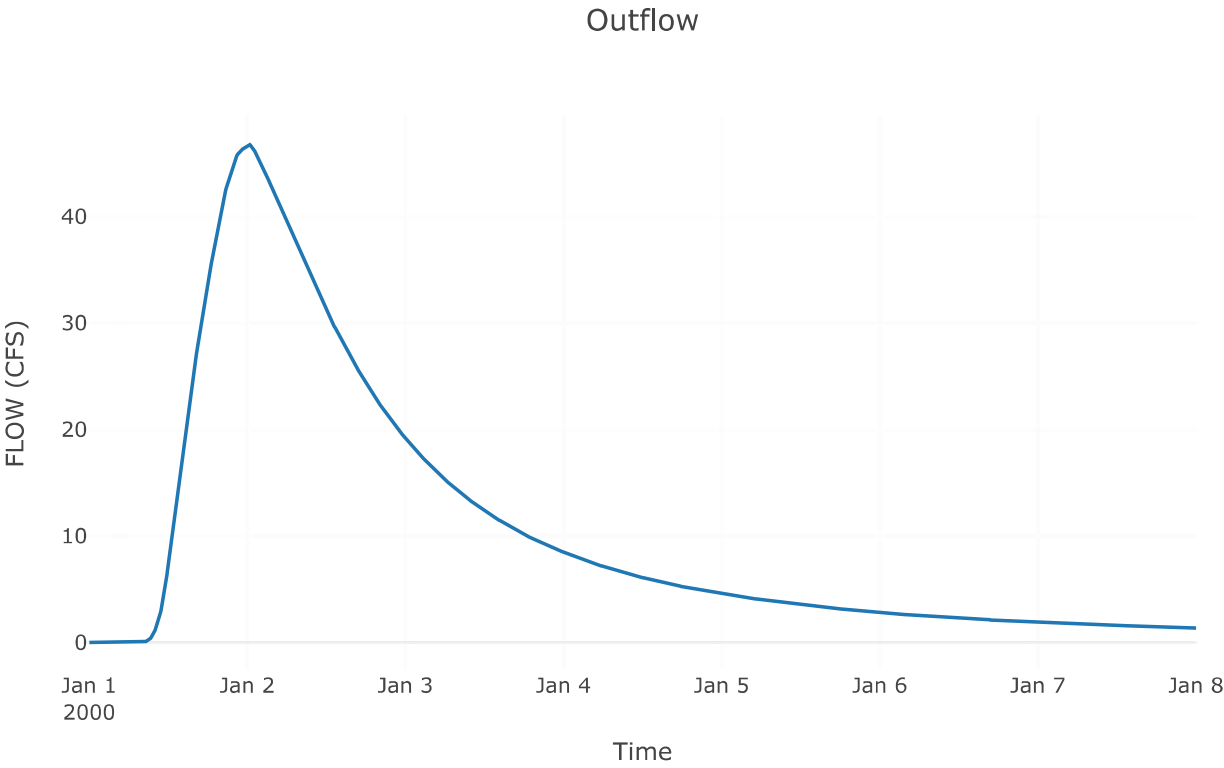


Outlet 1



Pool Elevation



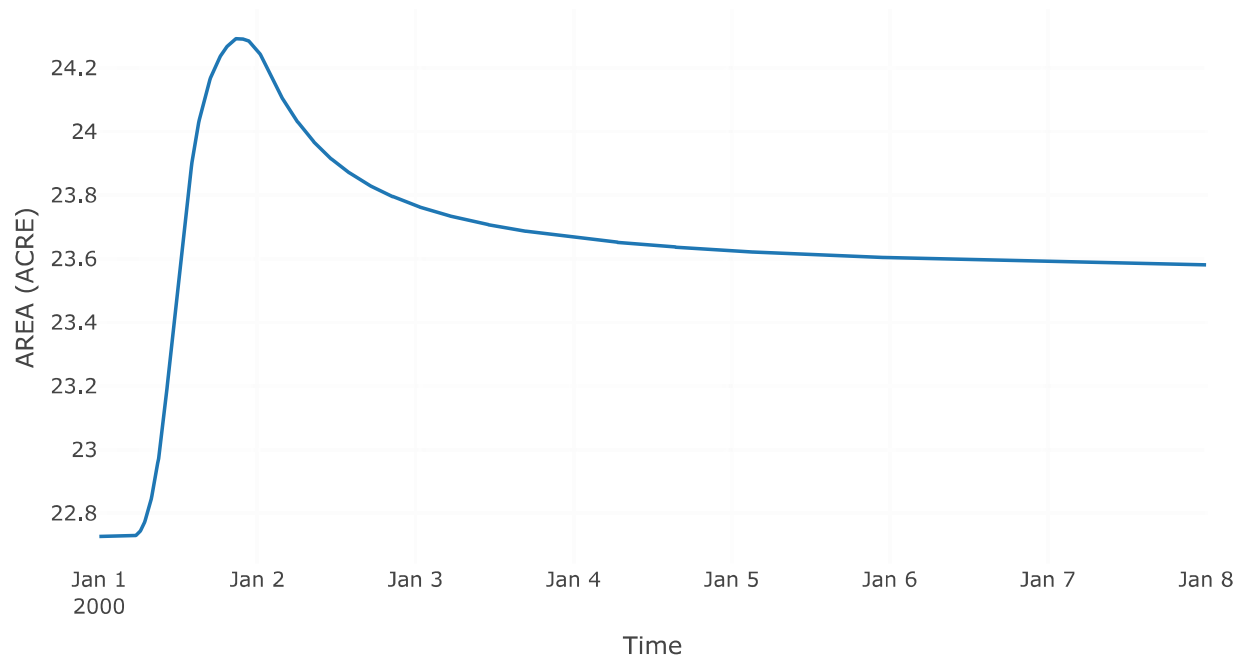


Reservoir: Lower Reservoir

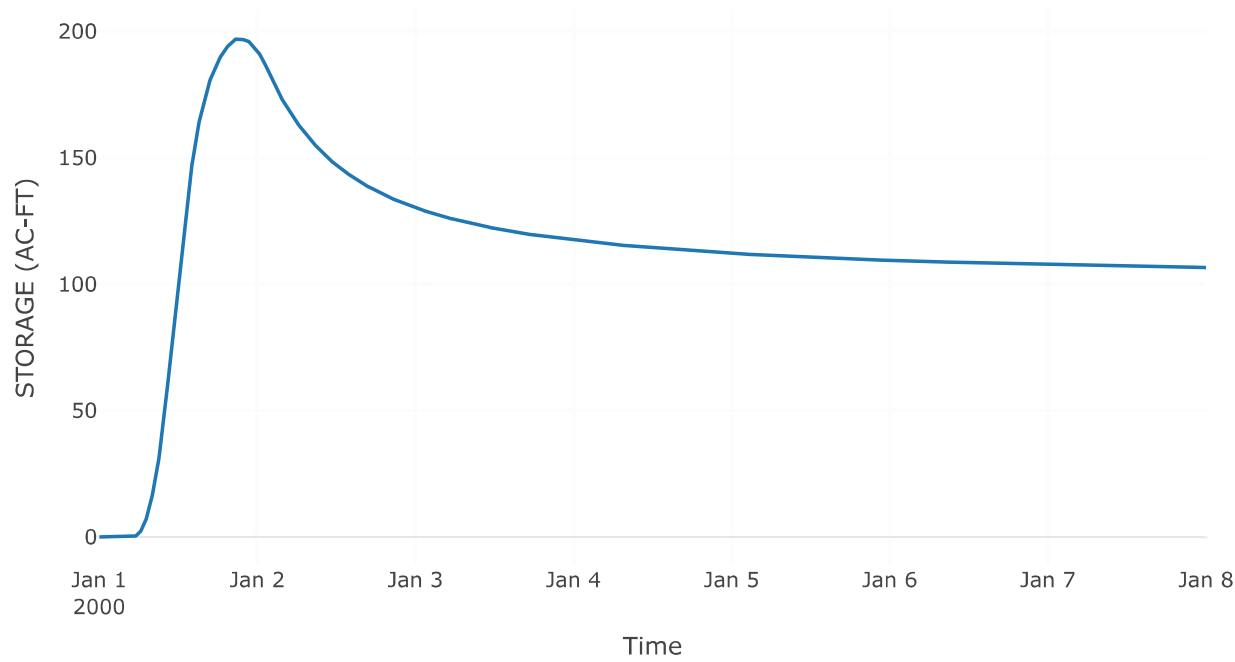
Results: Lower Reservoir

Peak Discharge (CFS)	89.27
Time of Peak Discharge	01Jan2000, 21:06
Volume (IN)	0.88
Peak Inflow (CFS)	327.39
Time of Peak Inflow	01Jan2000, 12:06
Inflow Volume (AC - FT)	256.79
Maximum Storage (AC - FT)	196.99
Peak Elevation (FT)	8.38
Discharge Volume (AC - FT)	150.18

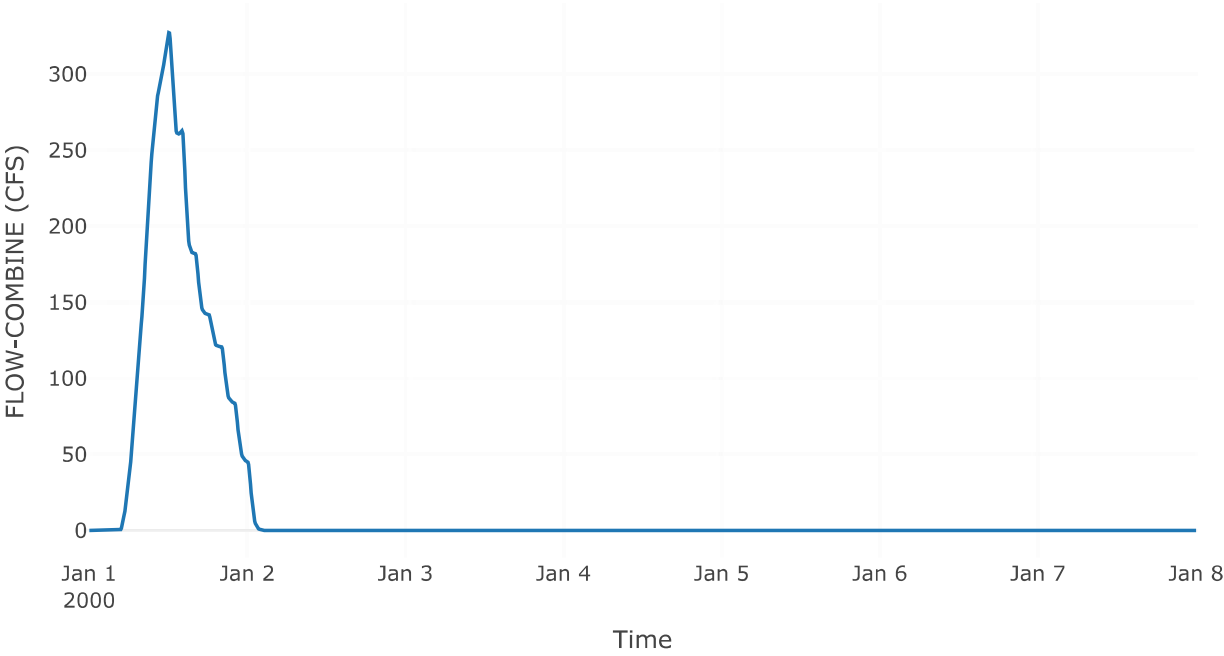
Reservoir Area



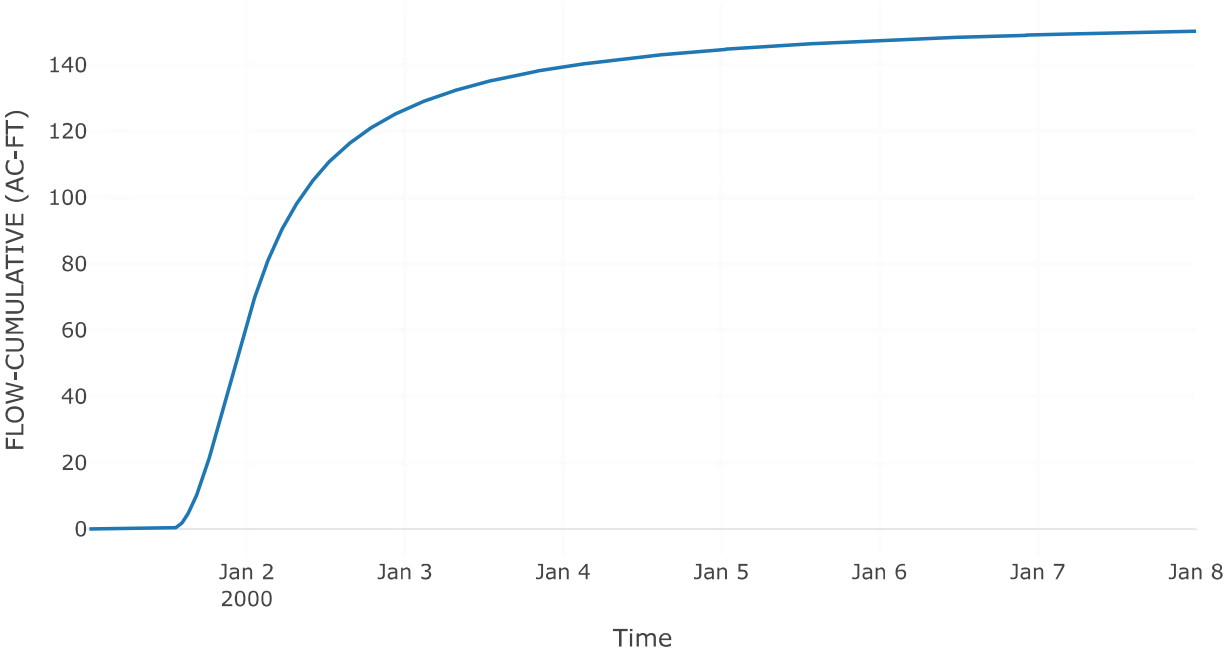
Storage



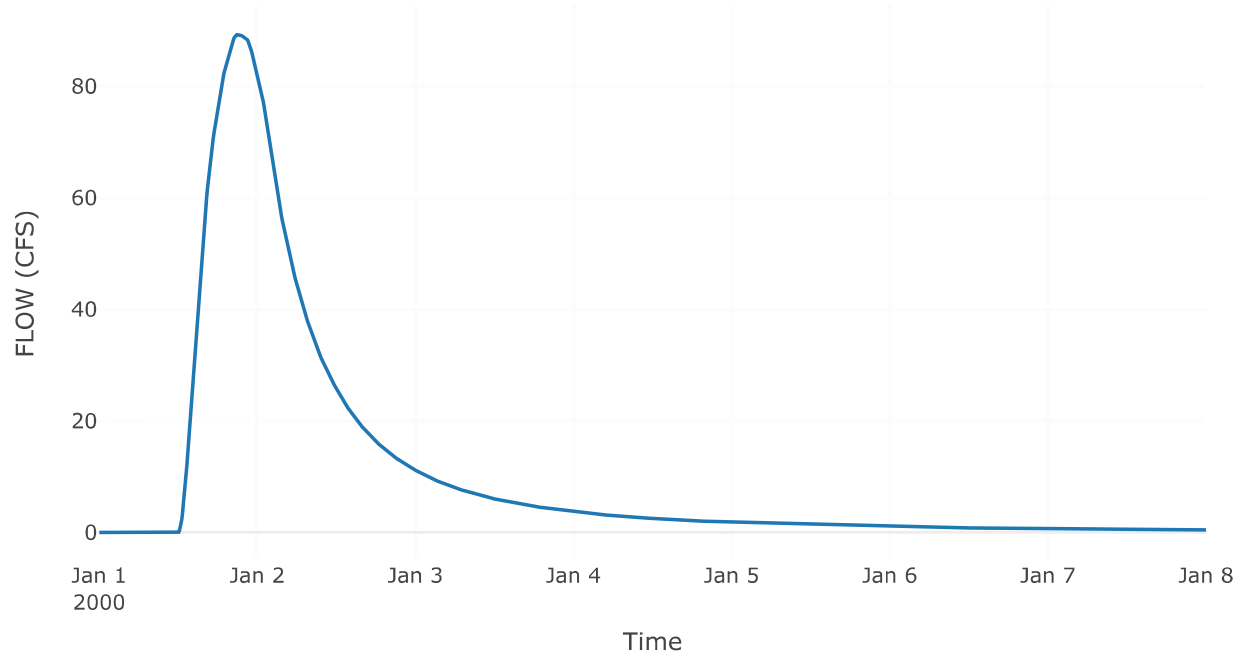
Combined Inflow



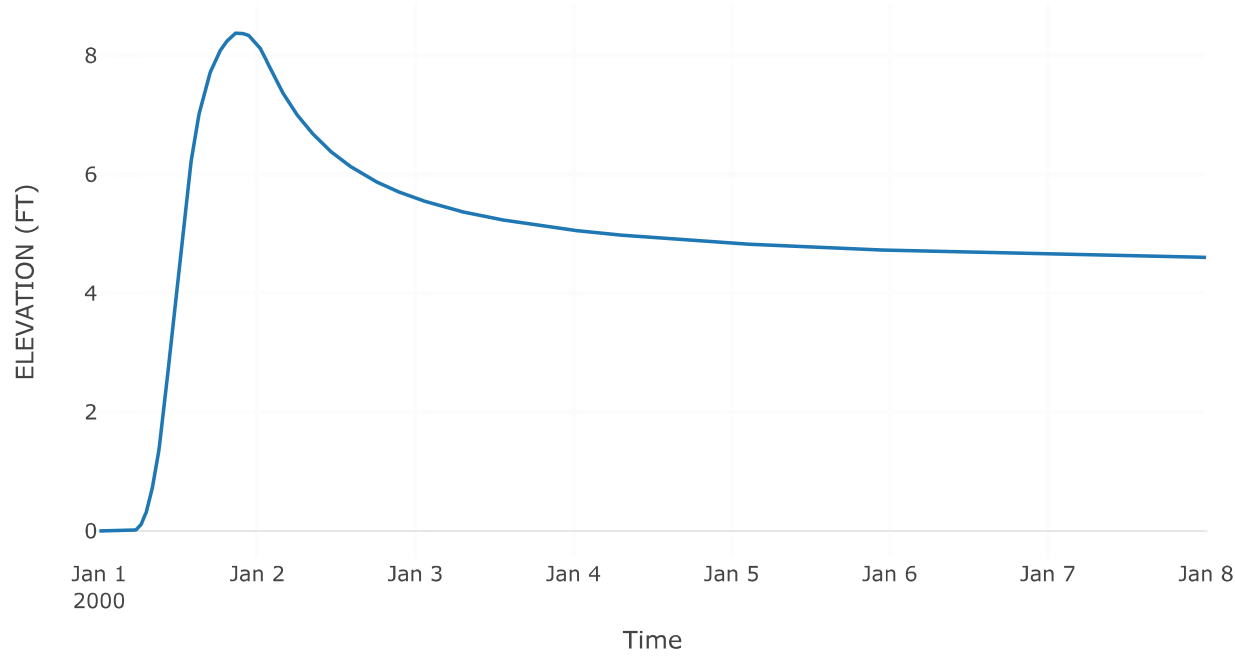
Cumulative Outflow



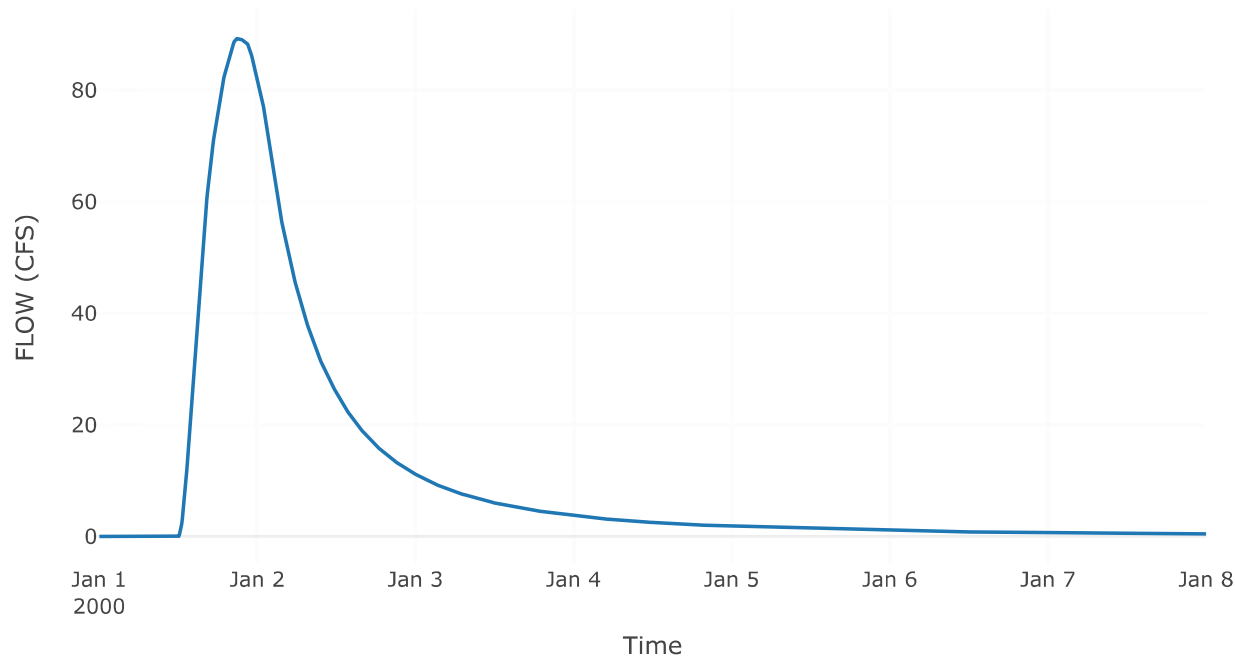
Outlet 1



Pool Elevation



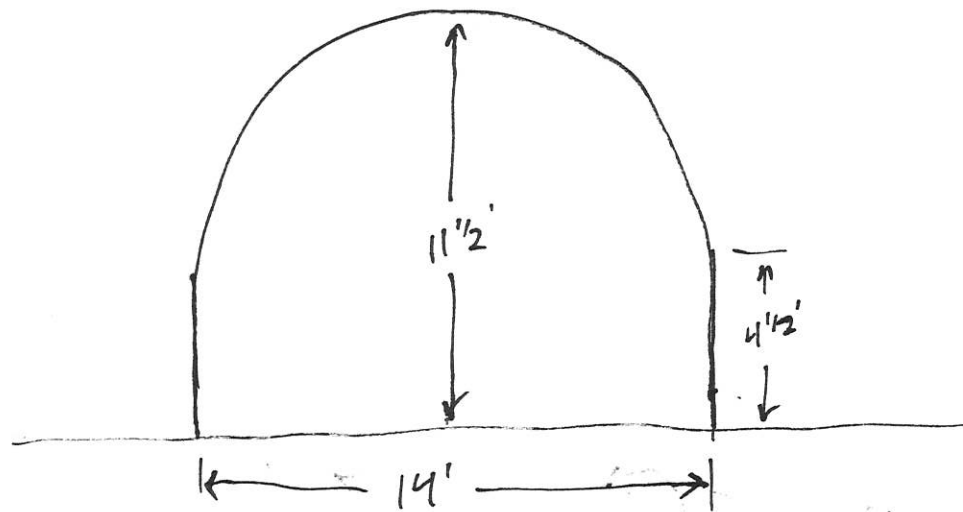
Outflow



APPENDIX C. HYDRAULIC MODEL RESULTS

①

#2797-2799



Looking East

(2)

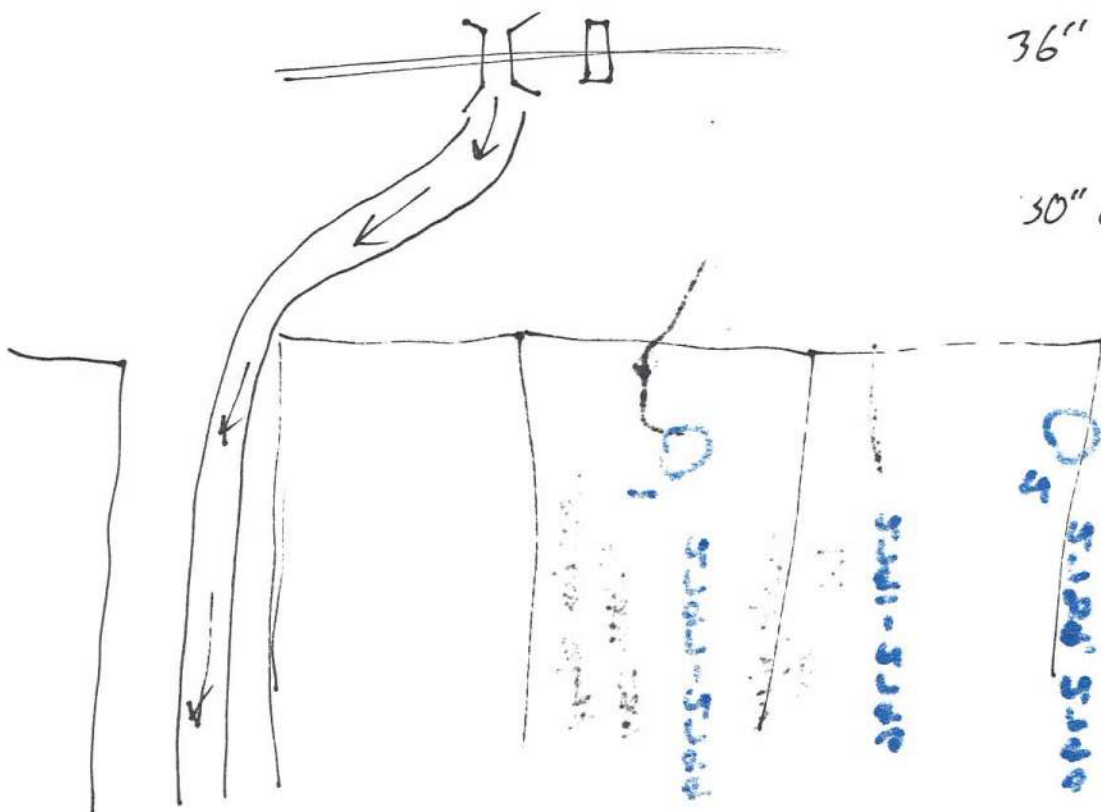
#2791 - 2796

~~AP~~ - 5'x8' box

inlet + outlet are ~25% plugged w/ Rock
50%

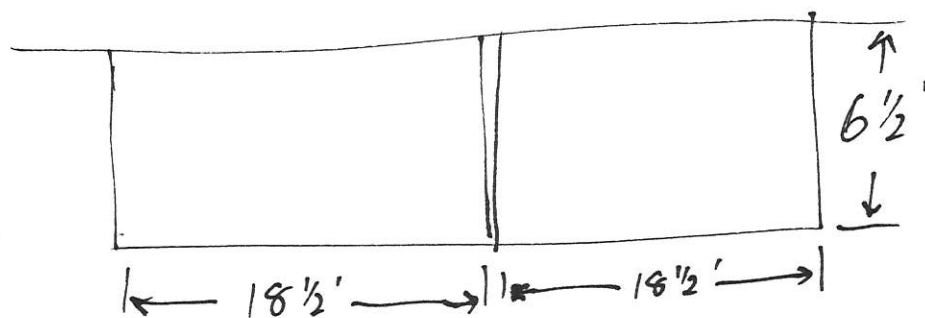
36" culvert 10' to the south of box

30" culvert at road crossing



3

2789, 2790

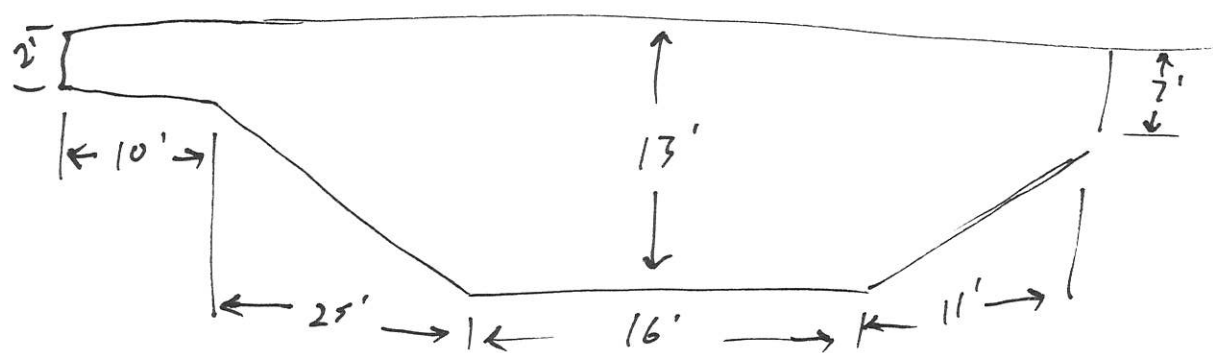


Looking East

44

4

#2788



looking East

W





























Watersheds 1 and 2 to Main City Basin



Type: **Trapezoidal** ▼

Define...

Side Slope 1 (Z1): H : 1V

Side Slope 2 (Z2): H : 1V

Channel Width (B): (ft)

Pipe Diameter (D): (ft)

Longitudinal Slope: (ft/ft)

Manning's Roughness:

☒ Enter Flow: (cfs)

☐ Enter Depth: (ft)

Calculate

Plot...

Compute Curves...

Parameter	Value	Units
Flow	170.000	cfs
Depth	2.608	ft
Area of Flow	29.245	sq ft
Wetted Perimeter	17.661	ft
Hydraulic Radius	1.656	ft
Average Velocity	5.813	fps
Top Width (T)	16.430	ft
Froude Number	0.768	
Critical Depth	2.263	ft
Critical Velocity	7.138	fps
Critical Slope	0.01404	ft/ft
Critical Top Width	15.051	ft
Max Shear Stress	1.302	lb/ft^2
Avg Shear Stress	0.827	lb/ft^2

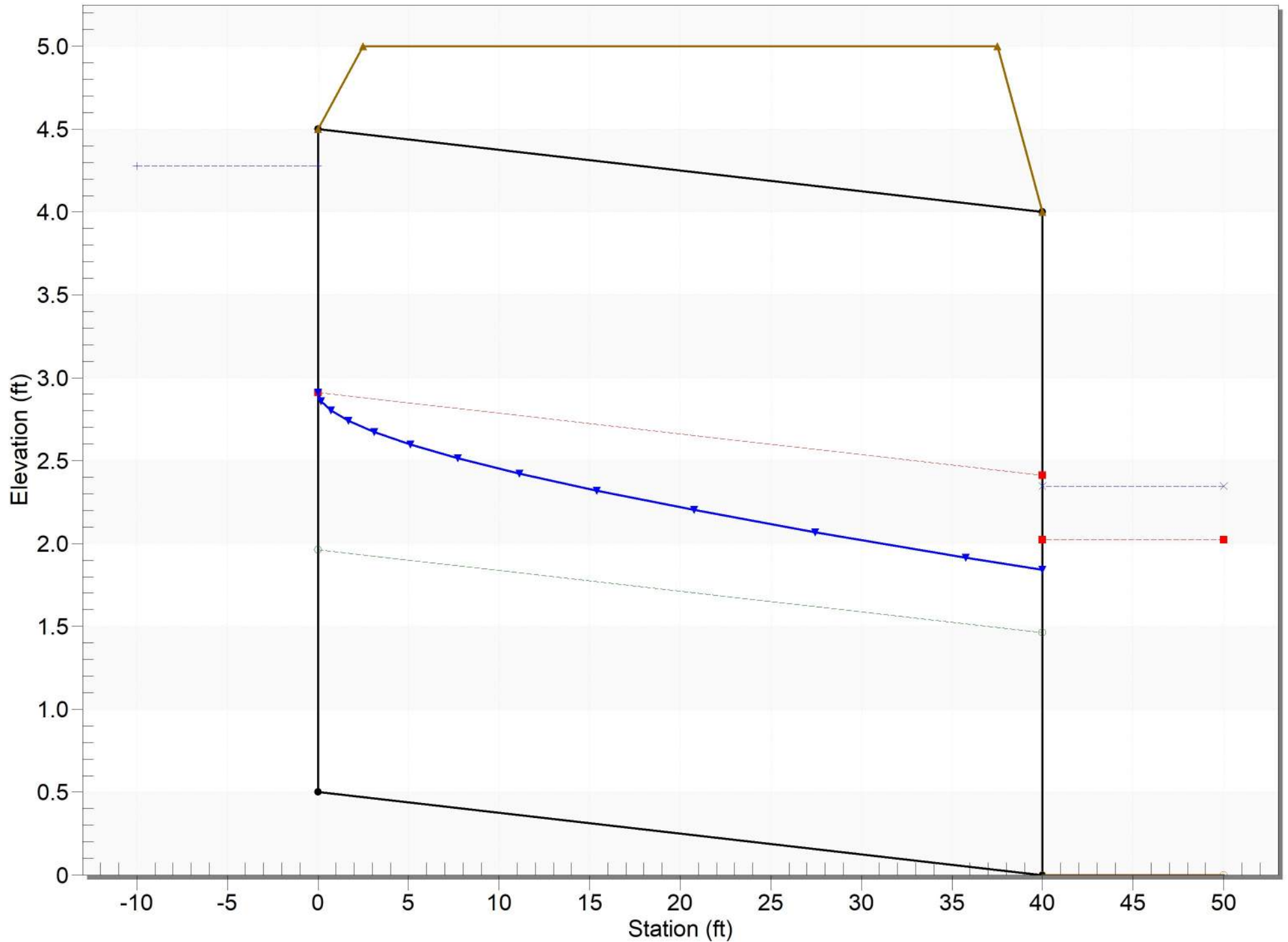
OK

Cancel

Map using the map v

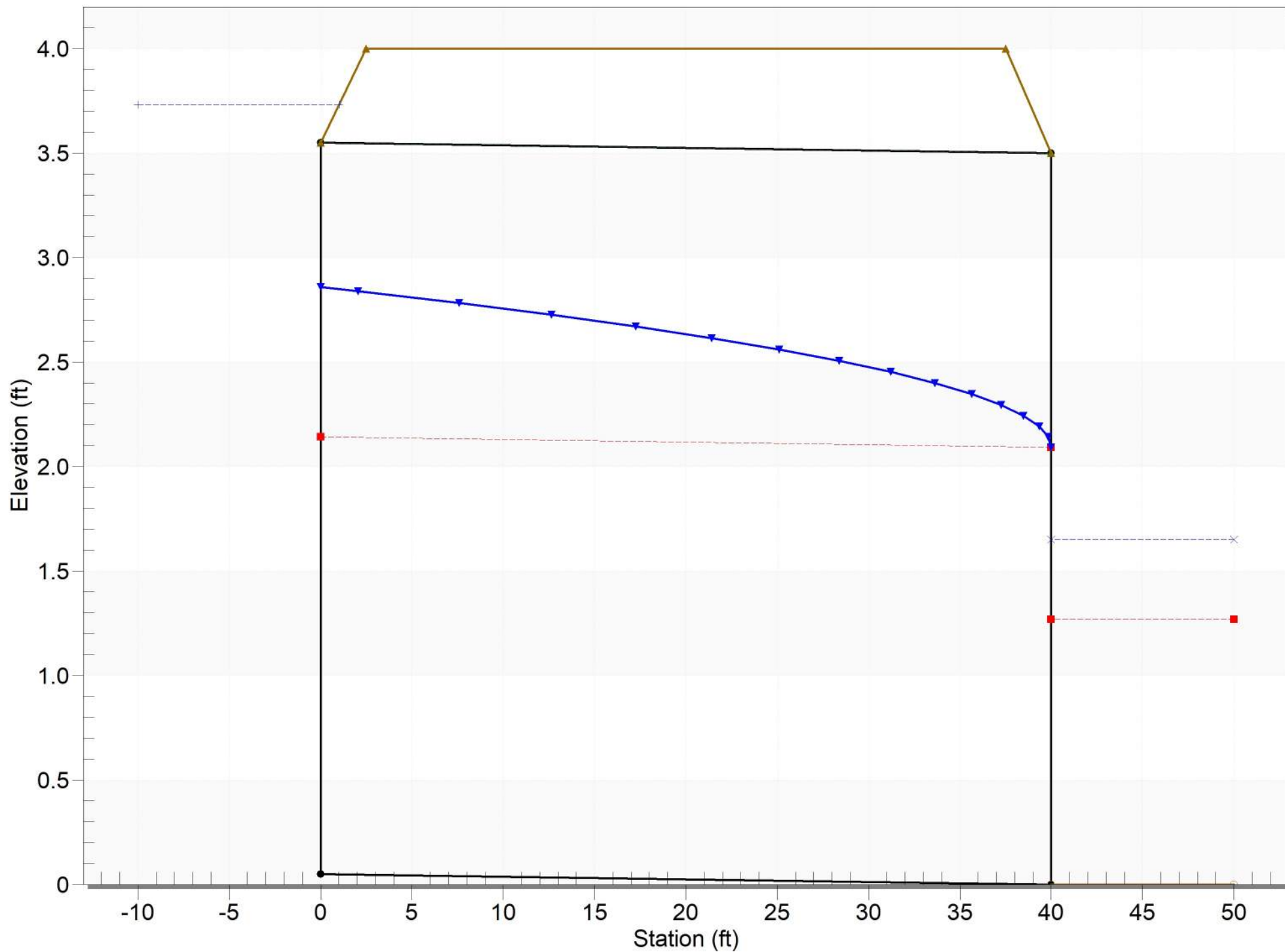
Crossing - Watersheds 1 and 2 to Main Basin, Design Discharge - 170.0 cfs

Culvert - Culvert 1, Culvert Discharge - 170.0 cfs



Crossing - Watershed 1 to 9000 North, Design Discharge - 45.0 cfs

Culvert - Culvert 1, Culvert Discharge - 45.0 cfs



Watershed 1 to 9000 North Ditch



Type: Trapezoidal

Define...

Side Slope 1 (Z1): 2.0 H : 1V

Side Slope 2 (Z2): 2.0 H : 1V

Channel Width (B): 4.0 (ft)

Pipe Diameter (D): 0.0 (ft)

Longitudinal Slope: 0.006 (ft/ft)

Manning's Roughness: 0.0320

☒ Enter Flow: 45.000 (cfs)☐ Enter Depth: 1.650 (ft)

Calculate

Plot...

Compute Curves...

Parameter	Value	Units
Flow	45.000	cfs
Depth	1.650	ft
Area of Flow	12.045	sq ft
Wetted Perimeter	11.379	ft
Hydraulic Radius	1.059	ft
Average Velocity	3.736	fps
Top Width (T)	10.600	ft
Froude Number	0.618	
Critical Depth	1.269	ft
Critical Velocity	5.425	fps
Critical Slope	0.01675	ft/ft
Critical Top Width	9.075	ft
Max Shear Stress	0.618	lb/ft ²
Avg Shear Stress	0.396	lb/ft ²

OK

Cancel

Watershed 1 to 9000 North Pipe



Type:

Circular

Define...

Side Slope 1 (Z1):

2.0

H : 1V

Side Slope 2 (Z2):

2.0

H : 1V

Channel Width (B):

4.0

(ft)

Pipe Diameter (D):

3.0

(ft)

Longitudinal Slope:

0.006

(ft/ft)

Manning's Roughness:

0.0130

☒ Enter Flow:

45.000

(cfs)

☐ Enter Depth:

2.166

(ft)

Calculate

Plot...

Compute Curves...

OK

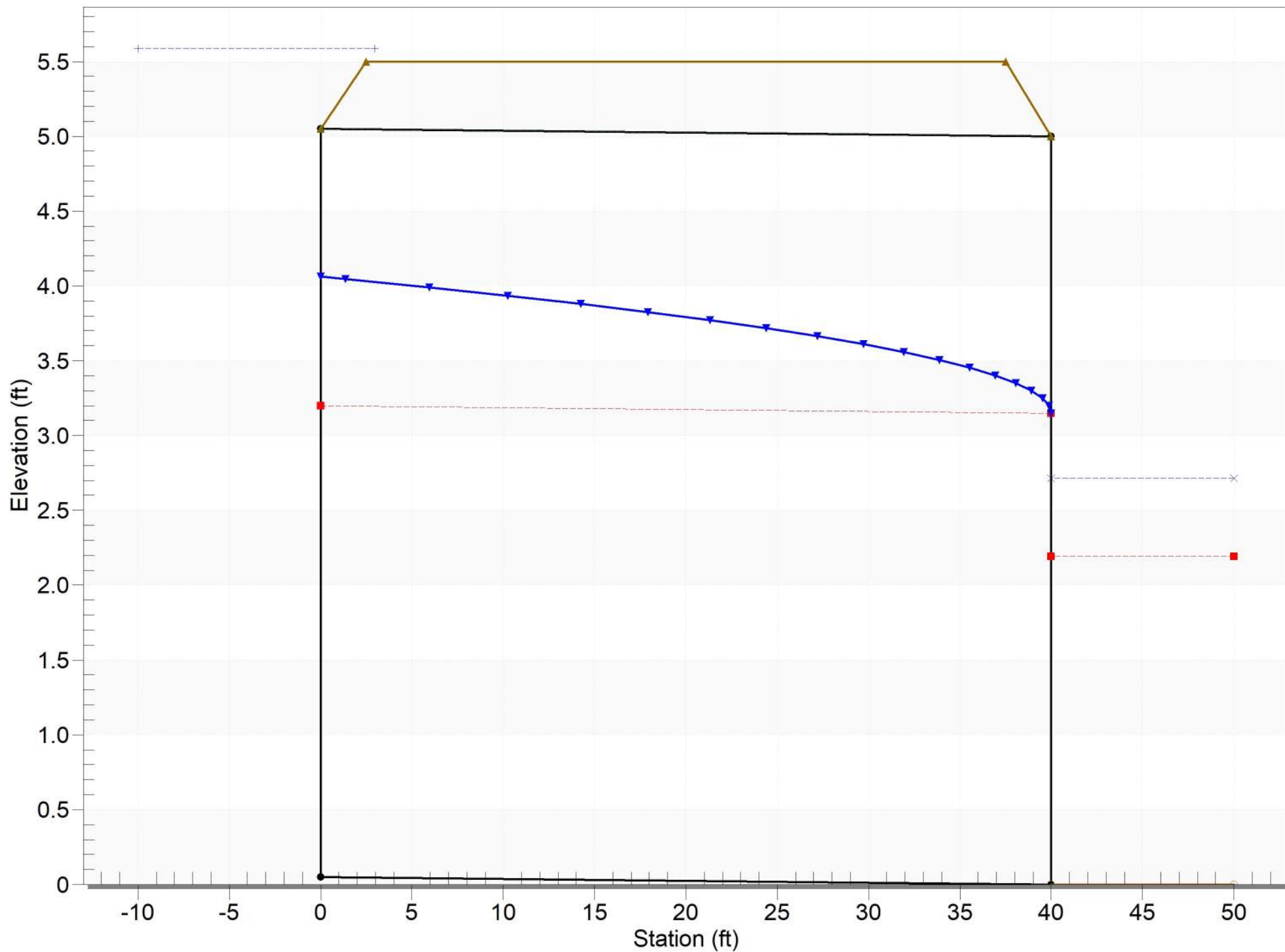
Cancel

Parameter	Value	Units
Flow	45.000	cfs
Depth	2.166	ft
Area of Flow	5.464	sq ft
Wetted Perimeter	6.092	ft
Hydraulic Radius	0.897	ft
Average Velocity	8.235	fps
Top Width (T)	2.688	ft
Froude Number	1.018	
Critical Depth	2.186	ft
Critical Velocity	8.157	fps
Critical Slope	0.00587	ft/ft
Critical Top Width	2.668	ft
Max Shear Stress	0.811	lb/ft^2
Avg Shear Stress	0.336	lb/ft^2

the map view

Crossing - Watershed 2 to 9000 North, Design Discharge - 125.0 cfs

Culvert - Culvert 1, Culvert Discharge - 121.3 cfs



Watershed 2 to 9000 North Ditch



Type: **Trapezoidal**

Define...

Side Slope 1 (Z1): H : 1V

Side Slope 2 (Z2): H : 1V

Channel Width (B): (ft)

Pipe Diameter (D): (ft)

Longitudinal Slope: (ft/ft)

Manning's Roughness:

☒ Enter Flow: (cfs)

☐ Enter Depth: (ft)

Calculate

Plot...

Compute Curves...

Parameter	Value	Units
Flow	125.000	cfs
Depth	1.924	ft
Area of Flow	15.096	sq ft
Wetted Perimeter	12.603	ft
Hydraulic Radius	1.198	ft
Average Velocity	8.281	fps
Top Width (T)	11.695	ft
Froude Number	1.284	
Critical Depth	2.191	ft
Critical Velocity	6.806	fps
Critical Slope	0.01467	ft/ft
Critical Top Width	12.764	ft
Max Shear Stress	3.001	lb/ft ²
Avg Shear Stress	1.869	lb/ft ²

OK

Cancel

Watershed 2 to 9000 North Pipe



Type: **Circular**

Define...

Side Slope 1 (Z1): H : 1V

Side Slope 2 (Z2): H : 1V

Channel Width (B): (ft)

Pipe Diameter (D): (ft)

Longitudinal Slope: (ft/ft)

Manning's Roughness:

☒ Enter Flow: (cfs)

☐ Enter Depth: (ft)

Calculate

Plot...

Compute Curves...

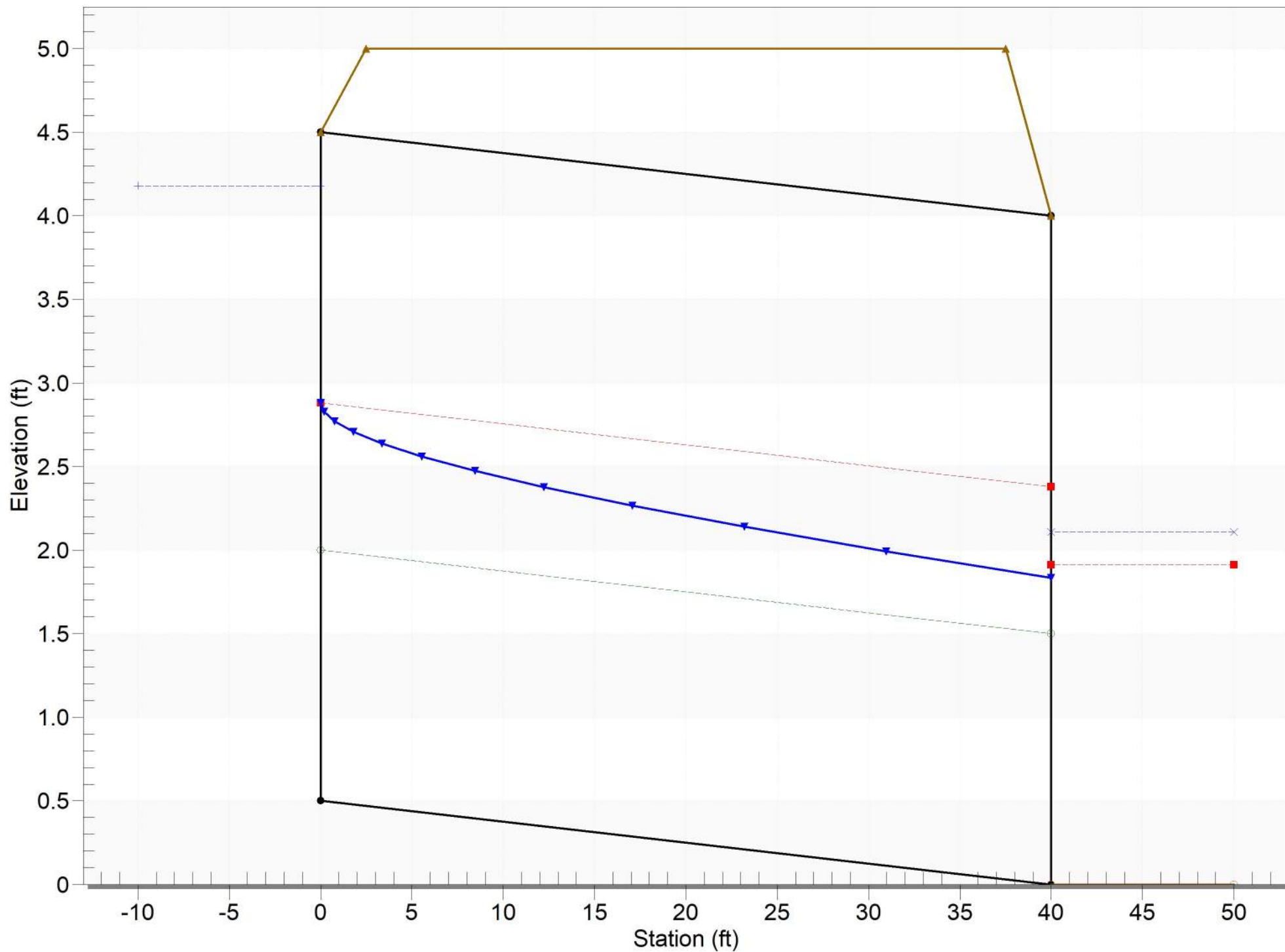
Parameter	Value	Units
Flow	125.000	cfs
Depth	2.337	ft
Area of Flow	6.827	sq ft
Wetted Perimeter	6.696	ft
Hydraulic Radius	1.020	ft
Average Velocity	18.309	fps
Top Width (T)	3.297	ft
Froude Number	2.242	
Critical Depth	3.281	ft
Critical Velocity	13.339	fps
Critical Slope	0.01334	ft/ft
Critical Top Width	1.694	ft
Max Shear Stress	3.646	lb/ft ²
Avg Shear Stress	1.591	lb/ft ²

OK

Cancel

Crossing - Watersheds 3 and 4 to Main City Basin, Design Discharge - 125.0 cfs

Culvert - Culvert 1, Culvert Discharge - 125.0 cfs



Watershed 3 and 4 to Main City Basin Ditch



Type: **Trapezoidal** ▼

Define...

Side Slope 1 (Z1): H : 1V

Side Slope 2 (Z2): H : 1V

Channel Width (B): (ft)

Pipe Diameter (D): (ft)

Longitudinal Slope: (ft/ft)

Manning's Roughness:

☒ Enter Flow: (cfs)

☐ Enter Depth: (ft)

Calculate

Plot...

Compute Curves...

Parameter	Value	Units
Flow	125.000	cfs
Depth	2.109	ft
Area of Flow	21.546	sq ft
Wetted Perimeter	15.431	ft
Hydraulic Radius	1.396	ft
Average Velocity	5.801	fps
Top Width (T)	14.435	ft
Froude Number	0.837	
Critical Depth	1.912	ft
Critical Velocity	6.656	fps
Critical Slope	0.01462	ft/ft
Critical Top Width	13.647	ft
Max Shear Stress	1.316	lb/ft ²
Avg Shear Stress	0.871	lb/ft ²

OK

Cancel

Watershed 3 and 4 to Main City Basin Pipe



Type:

Circular

Define...

Side Slope 1 (Z1): 2.0 H : 1V

Side Slope 2 (Z2): 2.0 H : 1V

Channel Width (B): 6.0 (ft)

Pipe Diameter (D): 5.0 (ft)

Longitudinal Slope: 0.01 (ft/ft)

Manning's Roughness: 0.0320

☐ Enter Flow: 111.803 (cfs)

☒ Enter Depth: 4.900 (ft)

Calculate

Plot...

Compute Curves...

Parameter	Value	Units
Flow	111.803	cfs
Depth	4.900	ft
Area of Flow	19.541	sq ft
Wetted Perimeter	14.289	ft
Hydraulic Radius	1.368	ft
Average Velocity	5.721	fps
Top Width (T)	1.400	ft
Froude Number	0.270	
Critical Depth	3.018	ft
Critical Velocity	9.026	fps
Critical Slope	0.02430	ft/ft
Critical Top Width	4.892	ft
Max Shear Stress	3.058	lb/ft ²
Avg Shear Stress	0.853	lb/ft ²

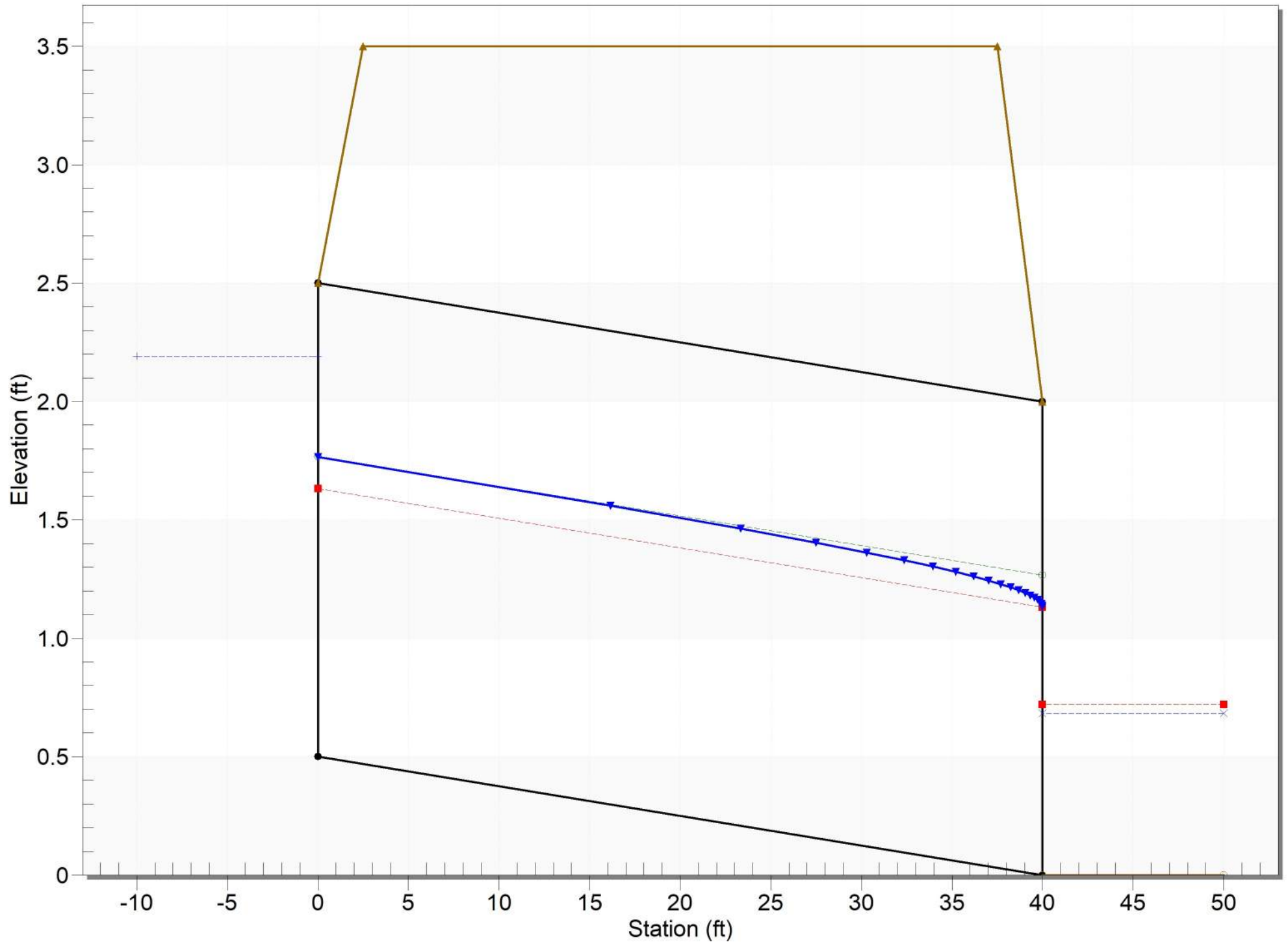
OK

Cancel

p viewer

Crossing - Watershed 3 Past Lake Shore Drive, Design Discharge - 10.0 cfs

Culvert - Culvert 1, Culvert Discharge - 10.0 cfs



Watershed 3 Past Lake Shore Drive Ditch



Type: Trapezoidal

Define...

Side Slope 1 (Z1): 2.0 H : 1V

Side Slope 2 (Z2): 2.0 H : 1V

Channel Width (B): 2.0 (ft)

Pipe Diameter (D): 0.0 (ft)

Longitudinal Slope: 0.025 (ft/ft)

Manning's Roughness: 0.0320

☒ Enter Flow: 10.000 (cfs)☐ Enter Depth: 0.684 (ft)

Calculate

Plot...

Compute Curves...

Parameter	Value	Units
Flow	10.000	cfs
Depth	0.684	ft
Area of Flow	2.302	sq ft
Wetted Perimeter	5.057	ft
Hydraulic Radius	0.455	ft
Average Velocity	4.345	fps
Top Width (T)	4.734	ft
Froude Number	1.098	
Critical Depth	0.720	ft
Critical Velocity	4.041	fps
Critical Slope	0.02048	ft/ft
Critical Top Width	4.878	ft
Max Shear Stress	1.066	lb/ft^2
Avg Shear Stress	0.710	lb/ft^2

OK

Cancel

or define a map u

Watershed 3 Past Lake Shore Drive Pipe



Type: **Circular**

Define...

Side Slope 1 (Z1): 2.0 H : 1V

Side Slope 2 (Z2): 2.0 H : 1V

Channel Width (B): 4.0 (ft)

Pipe Diameter (D): 2.0 (ft)

Longitudinal Slope: 0.006 (ft/ft)

Manning's Roughness: 0.0130

☒ Enter Flow: 10.000 (cfs)

☐ Enter Depth: 1.083 (ft)

Calculate

Plot...

Compute Curves...

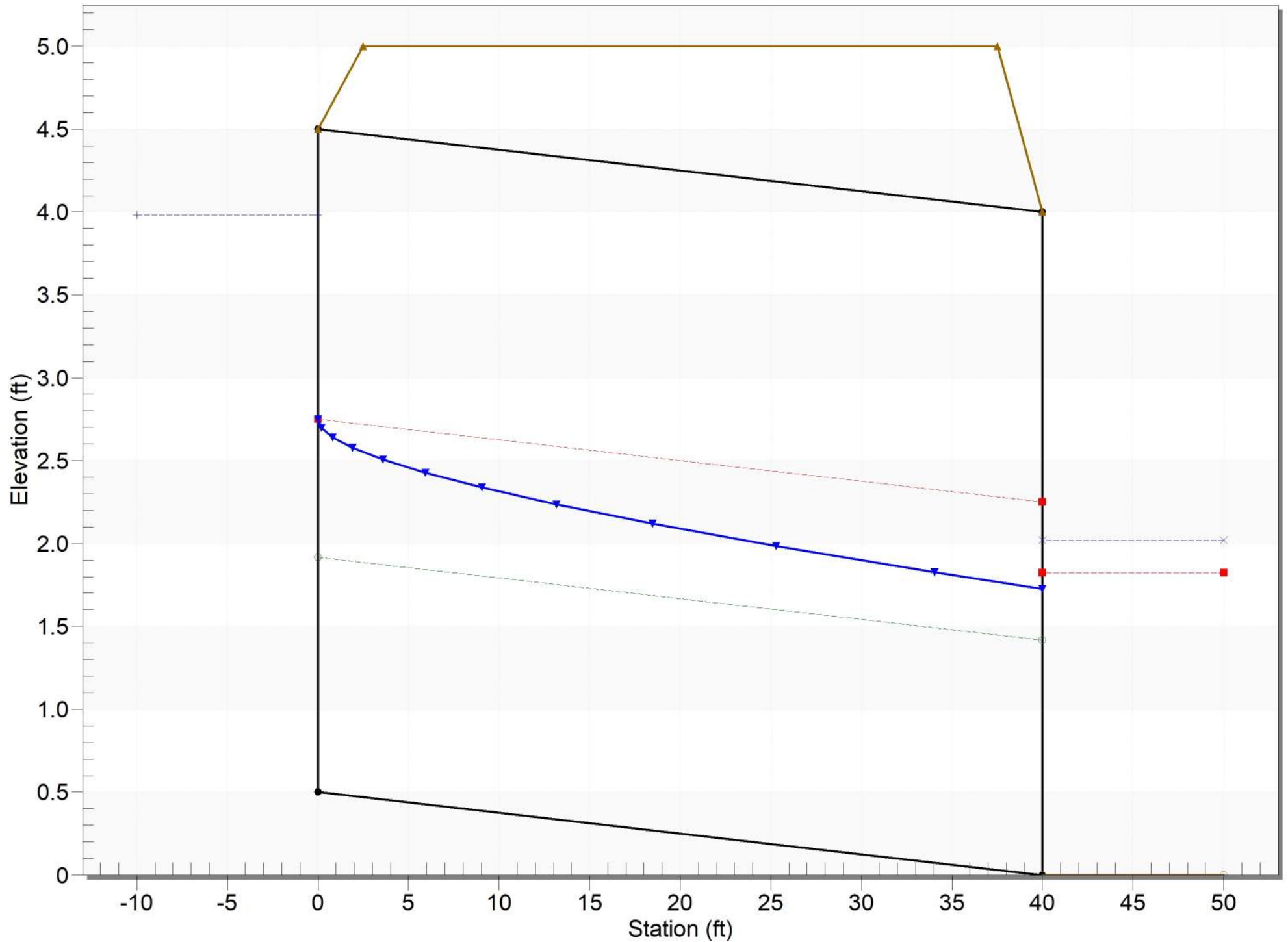
Parameter	Value	Units
Flow	10.000	cfs
Depth	1.083	ft
Area of Flow	1.736	sq ft
Wetted Perimeter	3.307	ft
Hydraulic Radius	0.525	ft
Average Velocity	5.761	fps
Top Width (T)	1.993	ft
Froude Number	1.088	
Critical Depth	1.131	ft
Critical Velocity	5.459	fps
Critical Slope	0.00521	ft/ft
Critical Top Width	1.983	ft
Max Shear Stress	0.405	lb/ft ²
Avg Shear Stress	0.197	lb/ft ²

OK

Cancel

Crossing - Watershed 4 to 8350 Lakeshore Drive, Design Discharge - 115.0 cfs

Culvert - Culvert 1, Culvert Discharge - 115.0 cfs



Watershed 4 to 8350 Lakeshore Drive Ditch



Type: **Trapezoidal** Define...

Side Slope 1 (Z1): 2.0 H : 1V

Side Slope 2 (Z2): 2.0 H : 1V

Channel Width (B): 6.0 (ft)

Pipe Diameter (D): 0.0 (ft)

Longitudinal Slope: 0.01 (ft/ft)

Manning's Roughness: 0.0320

☒ Enter Flow: 115.000 (cfs)

☐ Enter Depth: 2.020 (ft)

Calculate

Plot...

Compute Curves...

Parameter	Value	Units
Flow	115.000	cfs
Depth	2.020	ft
Area of Flow	20.283	sq ft
Wetted Perimeter	15.034	ft
Hydraulic Radius	1.349	ft
Average Velocity	5.670	fps
Top Width (T)	14.081	ft
Froude Number	0.833	
Critical Depth	1.825	ft
Critical Velocity	6.530	fps
Critical Slope	0.01478	ft/ft
Critical Top Width	13.300	ft
Max Shear Stress	1.261	lb/ft ²
Avg Shear Stress	0.842	lb/ft ²

OK

Cancel

Watershed 4 to 8350 Lakeshore Drive Pipe



Type: **Circular**

Define...

Side Slope 1 (Z1): 2.0 H : 1V

Side Slope 2 (Z2): 2.0 H : 1V

Channel Width (B): 4.0 (ft)

Pipe Diameter (D): 4.0 (ft)

Longitudinal Slope: 0.01 (ft/ft)

Manning's Roughness: 0.0130

☒ Enter Flow: 115.000 (cfs)

☐ Enter Depth: 2.708 (ft)

Calculate

Plot...

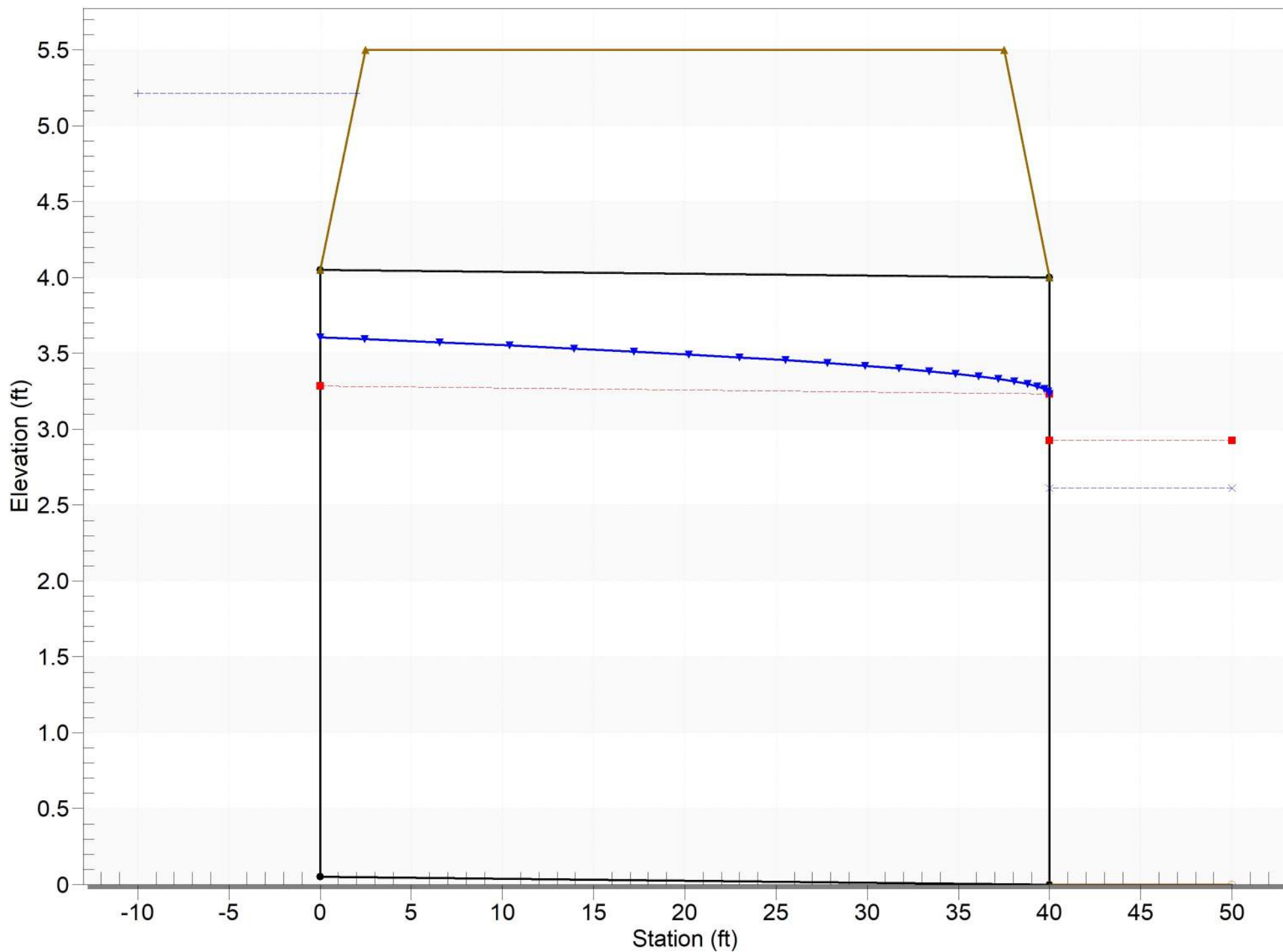
Compute Curves...

Parameter	Value	Units
Flow	115.000	cfs
Depth	2.708	ft
Area of Flow	9.054	sq ft
Wetted Perimeter	7.730	ft
Hydraulic Radius	1.171	ft
Average Velocity	12.701	fps
Top Width (T)	3.741	ft
Froude Number	1.439	
Critical Depth	3.234	ft
Critical Velocity	10.564	fps
Critical Slope	0.00657	ft/ft
Critical Top Width	3.147	ft
Max Shear Stress	1.690	lb/ft^2
Avg Shear Stress	0.731	lb/ft^2

OK

Cancel

Culvert - Culvert 1, Culvert Discharge - 330.0 cfs



Watershed 5 along Canyon Road



Type: **Trapezoidal**

Define...

Side Slope 1 (Z1): H : 1V

Side Slope 2 (Z2): H : 1V

Channel Width (B): (ft)

Pipe Diameter (D): (ft)

Longitudinal Slope: (ft/ft)

Manning's Roughness:

☒ Enter Flow: (cfs)

☐ Enter Depth: (ft)

Calculate

Plot...

Compute Curves...

Parameter	Value	Units
Flow	330.000	cfs
Depth	2.612	ft
Area of Flow	34.538	sq ft
Wetted Perimeter	19.680	ft
Hydraulic Radius	1.755	ft
Average Velocity	9.555	fps
Top Width (T)	18.447	ft
Froude Number	1.231	
Critical Depth	2.927	ft
Critical Velocity	8.139	fps
Critical Slope	0.01285	ft/ft
Critical Top Width	19.707	ft
Max Shear Stress	3.260	lb/ft^2
Avg Shear Stress	2.190	lb/ft^2

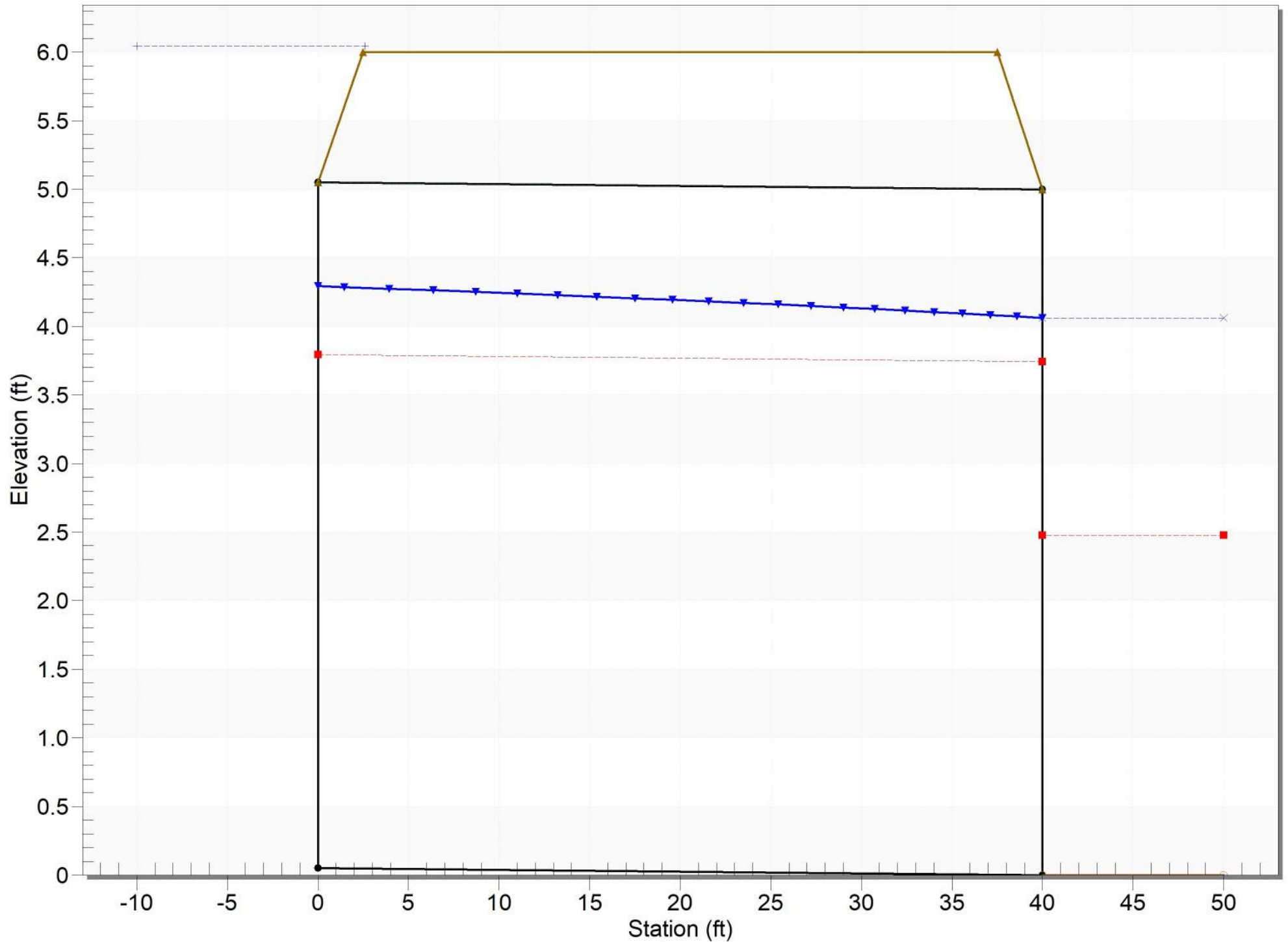
OK

Cancel

map view

Crossing - Watershed 5 Canyon Road to Hwy 36, Design Discharge - 330.0 cfs

Culvert - Culvert 1, Culvert Discharge - 328.7 cfs



Watershed 5 Canyon Road to Hwy 36



Type: **Trapezoidal**

Define...

Side Slope 1 (Z1): 2.0 H : 1V

Side Slope 2 (Z2): 2.0 H : 1V

Channel Width (B): 12.0 (ft)

Pipe Diameter (D): 0.0 (ft)

Longitudinal Slope: 0.002 (ft/ft)

Manning's Roughness: 0.0320

☒ Enter Flow: 330.000 (cfs)

☐ Enter Depth: 4.062 (ft)

Calculate

Plot...

Compute Curves...

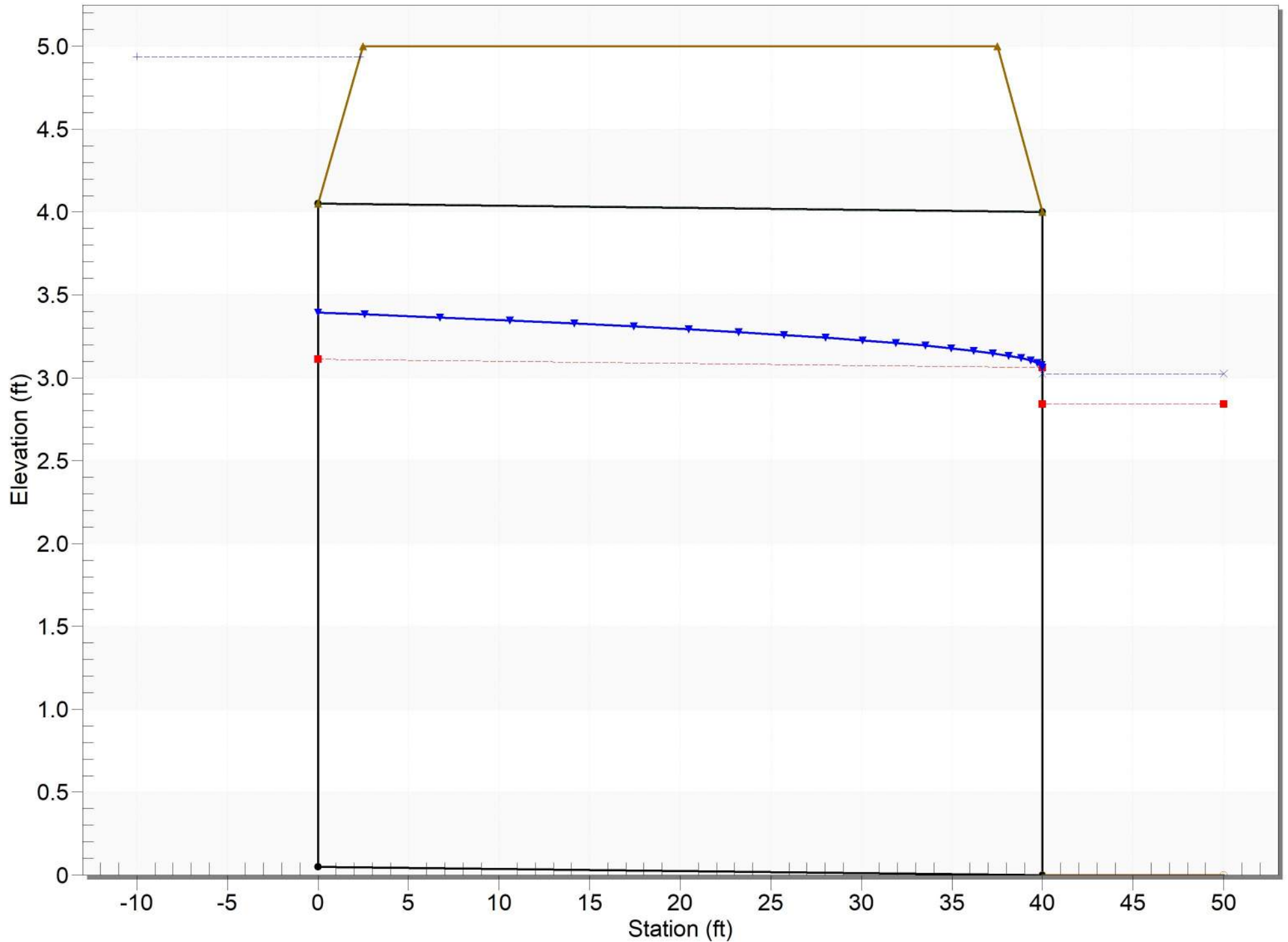
Parameter	Value	Units
Flow	330.000	cfs
Depth	4.062	ft
Area of Flow	81.751	sq ft
Wetted Perimeter	30.167	ft
Hydraulic Radius	2.710	ft
Average Velocity	4.037	fps
Top Width (T)	28.249	ft
Froude Number	0.418	
Critical Depth	2.477	ft
Critical Velocity	7.857	fps
Critical Slope	0.01288	ft/ft
Critical Top Width	21.909	ft
Max Shear Stress	0.507	lb/ft ²
Avg Shear Stress	0.338	lb/ft ²

OK

Cancel

Crossing - Watershed 6, Design Discharge - 365.0 cfs

Culvert - Culvert 1, Culvert Discharge - 365.0 cfs



Watershed 6



Type: Trapezoidal

Define...

Side Slope 1 (Z1): 2.0 H : 1V

Side Slope 2 (Z2): 2.0 H : 1V

Channel Width (B): 10.0 (ft)

Pipe Diameter (D): 0.0 (ft)

Longitudinal Slope: 0.01 (ft/ft)

Manning's Roughness: 0.0320

☒ Enter Flow: 365.000 (cfs)☐ Enter Depth: 3.023 (ft)

Calculate

Plot...

Compute Curves...

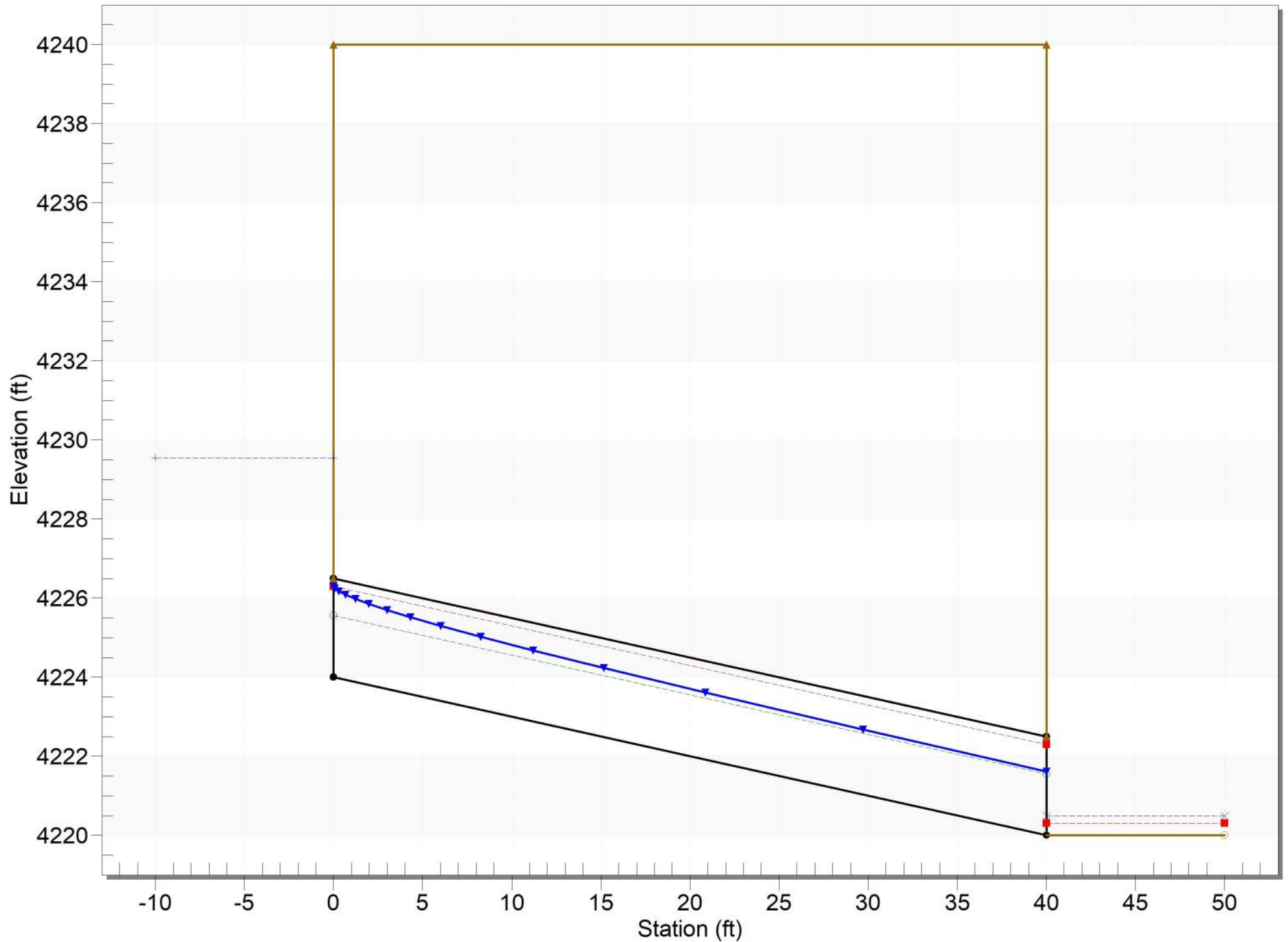
Parameter	Value	Units
Flow	365.000	cfs
Depth	3.023	ft
Area of Flow	48.510	sq ft
Wetted Perimeter	23.520	ft
Hydraulic Radius	2.062	ft
Average Velocity	7.524	fps
Top Width (T)	22.092	ft
Froude Number	0.895	
Critical Depth	2.841	ft
Critical Velocity	8.194	fps
Critical Slope	0.01267	ft/ft
Critical Top Width	21.363	ft
Max Shear Stress	1.886	lb/ft^2
Avg Shear Stress	1.287	lb/ft^2

OK

Cancel

Crossing - I-80 - Location 2, Design Discharge - 50.0 cfs

Culvert - Culvert 1, Culvert Discharge - 50.0 cfs



Lower Basin Outlet



Type:

Trapezoidal

Define...

Side Slope 1 (Z1): 2.0 H : 1V

Side Slope 2 (Z2): 2.0 H : 1V

Channel Width (B): 4.0 (ft)

Pipe Diameter (D): 0.0 (ft)

Longitudinal Slope: 0.11 (ft/ft)

Manning's Roughness: 0.0150

☒ Enter Flow: 89.200 (cfs)☐ Enter Depth: 0.737 (ft)

Calculate

Plot...

Compute Curves...

Parameter	Value	Units
Flow	89.200	cfs
Depth	0.737	ft
Area of Flow	4.031	sq ft
Wetted Perimeter	7.294	ft
Hydraulic Radius	0.553	ft
Average Velocity	22.128	fps
Top Width (T)	6.946	ft
Froude Number	5.119	
Critical Depth	1.838	ft
Critical Velocity	6.325	fps
Critical Slope	0.00337	ft/ft
Critical Top Width	11.350	ft
Max Shear Stress	5.056	lb/ft^2
Avg Shear Stress	3.794	lb/ft^2

OK

Cancel

Middle Basin A Outlet



Type: Trapezoidal

Define...

Side Slope 1 (Z1): 2.0 H : 1V

Side Slope 2 (Z2): 2.0 H : 1V

Channel Width (B): 2.0 (ft)

Pipe Diameter (D): 0.0 (ft)

Longitudinal Slope: 0.145 (ft/ft)

Manning's Roughness: 0.0150

☒ Enter Flow: 18.200 (cfs)☐ Enter Depth: 0.393 (ft)

Calculate

Plot...

Compute Curves...

Parameter	Value	Units
Flow	18.200	cfs
Depth	0.393	ft
Area of Flow	1.097	sq ft
Wetted Perimeter	3.760	ft
Hydraulic Radius	0.292	ft
Average Velocity	16.596	fps
Top Width (T)	3.574	ft
Froude Number	5.280	
Critical Depth	0.991	ft
Critical Velocity	4.615	fps
Critical Slope	0.00416	ft/ft
Critical Top Width	5.962	ft
Max Shear Stress	3.560	lb/ft ²
Avg Shear Stress	2.639	lb/ft ²

OK

Cancel

Middle Basin B Outlet



Type: Trapezoidal

Define...

Side Slope 1 (Z1): 2.0 H : 1V

Side Slope 2 (Z2): 2.0 H : 1V

Channel Width (B): 4.0 (ft)

Pipe Diameter (D): 0.0 (ft)

Longitudinal Slope: 0.05 (ft/ft)

Manning's Roughness: 0.0150

☒ Enter Flow: 28.000 (cfs)☐ Enter Depth: 0.480 (ft)

Calculate

Plot...

Compute Curves...

Parameter	Value	Units
Flow	28.000	cfs
Depth	0.480	ft
Area of Flow	2.379	sq ft
Wetted Perimeter	6.145	ft
Hydraulic Radius	0.387	ft
Average Velocity	11.769	fps
Top Width (T)	5.919	ft
Froude Number	3.271	
Critical Depth	0.971	ft
Critical Velocity	4.854	fps
Critical Slope	0.00393	ft/ft
Critical Top Width	7.883	ft
Max Shear Stress	1.497	lb/ft ²
Avg Shear Stress	1.208	lb/ft ²

OK

Cancel

Upper Basin Outlet



Type: Trapezoidal

Define...

Side Slope 1 (Z1): 2.0 H : 1V

Side Slope 2 (Z2): 2.0 H : 1V

Channel Width (B): 4.0 (ft)

Pipe Diameter (D): 0.0 (ft)

Longitudinal Slope: 0.14 (ft/ft)

Manning's Roughness: 0.0150

☒ Enter Flow: 17.000 (cfs)☐ Enter Depth: 0.267 (ft)

Calculate

Plot...

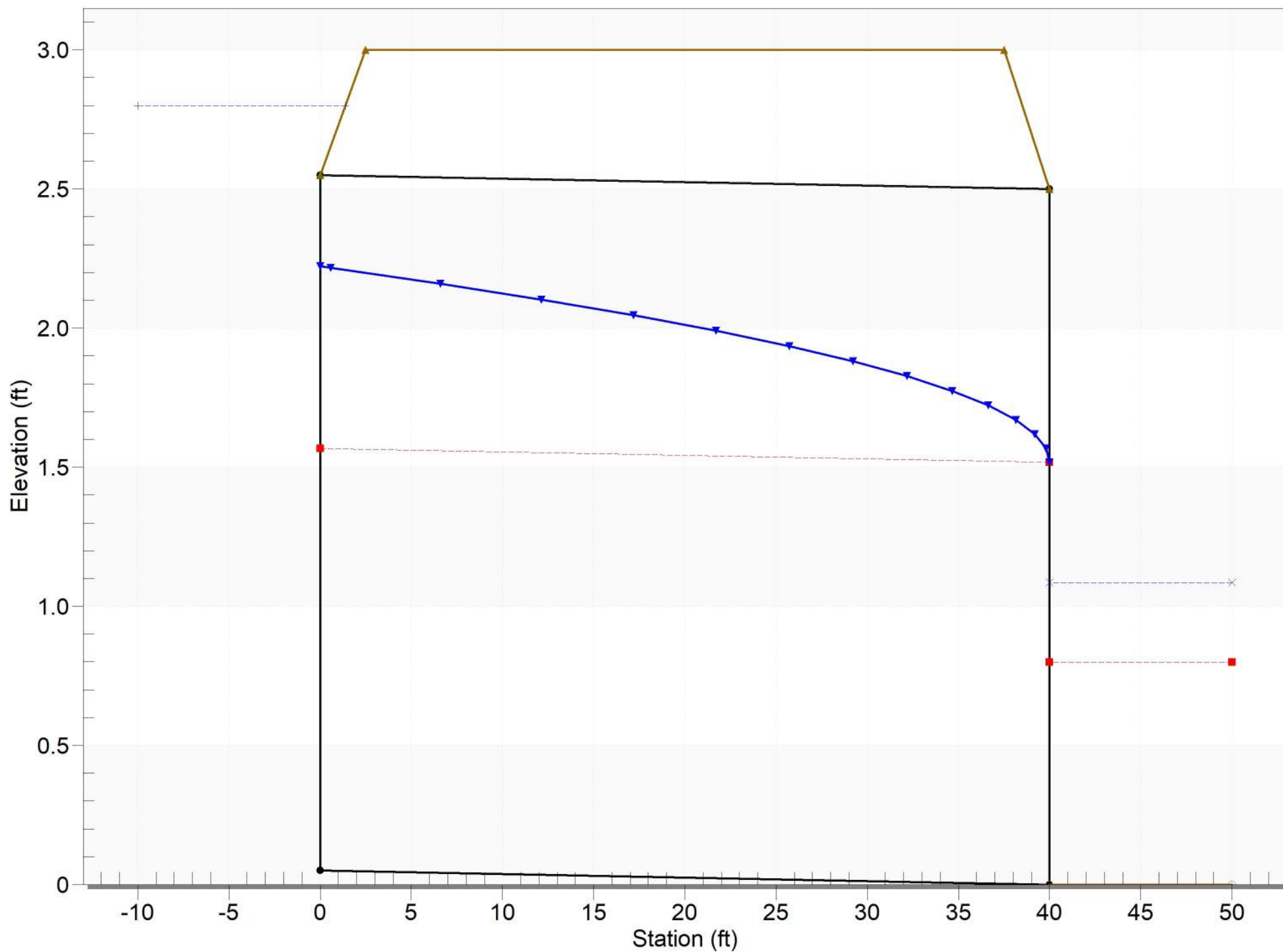
Compute Curves...

Parameter	Value	Units
Flow	17.000	cfs
Depth	0.267	ft
Area of Flow	1.211	sq ft
Wetted Perimeter	5.195	ft
Hydraulic Radius	0.233	ft
Average Velocity	14.037	fps
Top Width (T)	5.068	ft
Froude Number	5.060	
Critical Depth	0.726	ft
Critical Velocity	4.296	fps
Critical Slope	0.00421	ft/ft
Critical Top Width	6.903	ft
Max Shear Stress	2.333	lb/ft^2
Avg Shear Stress	2.037	lb/ft^2

OK

Cancel

Culvert - Culvert 1, Culvert Discharge - 20.0 cfs



Watershed 1 to 9000 North Ditch



Type: Trapezoidal

Define...

Side Slope 1 (Z1): 2.0 H : 1V

Side Slope 2 (Z2): 2.0 H : 1V

Channel Width (B): 4.0 (ft)

Pipe Diameter (D): 0.0 (ft)

Longitudinal Slope: 0.006 (ft/ft)

Manning's Roughness: 0.0320

☒ Enter Flow: 18.000 (cfs)☐ Enter Depth: 1.026 (ft)

Calculate

Plot...

Compute Curves...

Parameter	Value	Units
Flow	18.000	cfs
Depth	1.026	ft
Area of Flow	6.211	sq ft
Wetted Perimeter	8.589	ft
Hydraulic Radius	0.723	ft
Average Velocity	2.898	fps
Top Width (T)	8.105	ft
Froude Number	0.583	
Critical Depth	0.751	ft
Critical Velocity	4.358	fps
Critical Slope	0.01902	ft/ft
Critical Top Width	7.003	ft
Max Shear Stress	0.384	lb/ft ²
Avg Shear Stress	0.271	lb/ft ²

OK

Cancel

click

Watershed 1 to 9000 North Pipe



Type: **Circular** ▼

Define...

Side Slope 1 (Z1): H : 1V

Side Slope 2 (Z2): H : 1V

Channel Width (B): (ft)

Pipe Diameter (D): (ft)

Longitudinal Slope: (ft/ft)

Manning's Roughness:

☒ Enter Flow: (cfs)

☐ Enter Depth: (ft)

Calculate

Plot...

Compute Curves...

Parameter	Value	Units
Flow	18.000	cfs
Depth	1.693	ft
Area of Flow	2.836	sq ft
Wetted Perimeter	4.673	ft
Hydraulic Radius	0.607	ft
Average Velocity	6.347	fps
Top Width (T)	1.442	ft
Froude Number	0.798	
Critical Depth	1.528	ft
Critical Velocity	6.988	fps
Critical Slope	0.00730	ft/ft
Critical Top Width	1.698	ft
Max Shear Stress	0.634	lb/ft ²
Avg Shear Stress	0.227	lb/ft ²

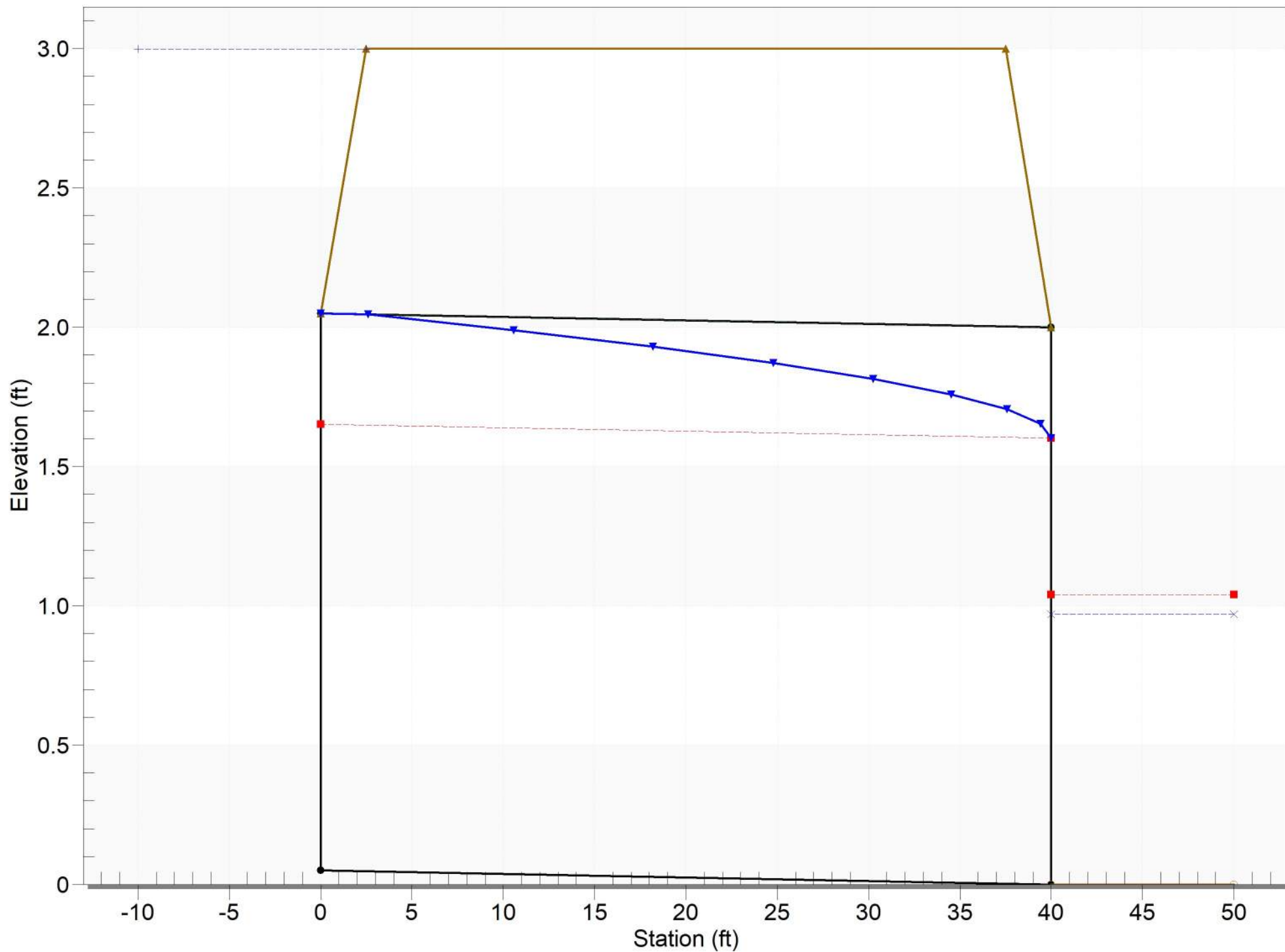
OK

Cancel

using the map

Crossing - Watershed 2 to 9000 North, Design Discharge - 20.0 cfs

Culvert - Culvert 1, Culvert Discharge - 19.9 cfs



Watershed 2 to 9000 North Ditch



Type: **Trapezoidal** ▼

Define...

Side Slope 1 (Z1): H : 1V

Side Slope 2 (Z2): H : 1V

Channel Width (B): (ft)

Pipe Diameter (D): (ft)

Longitudinal Slope: (ft/ft)

Manning's Roughness:

☒ Enter Flow: (cfs)

☐ Enter Depth: (ft)

Calculate

Plot...

Compute Curves...

Parameter	Value	Units
Flow	18.000	cfs
Depth	0.920	ft
Area of Flow	3.533	sq ft
Wetted Perimeter	6.115	ft
Hydraulic Radius	0.578	ft
Average Velocity	5.094	fps
Top Width (T)	5.680	ft
Froude Number	1.138	
Critical Depth	0.985	ft
Critical Velocity	4.604	fps
Critical Slope	0.01898	ft/ft
Critical Top Width	5.939	ft
Max Shear Stress	1.435	lb/ft^2
Avg Shear Stress	0.901	lb/ft^2

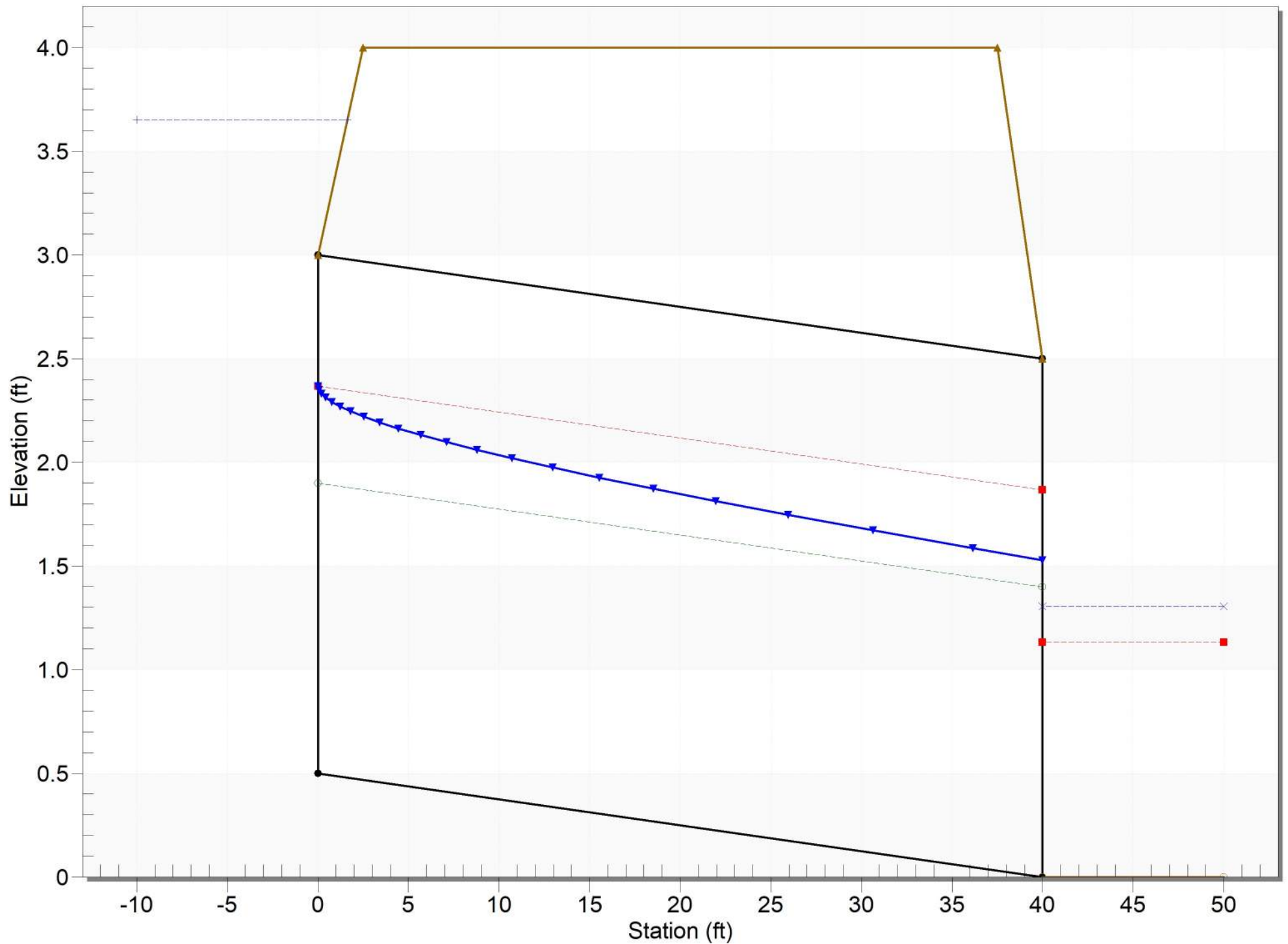
OK

Cancel

age or def

Crossing - Watersheds 3 and 4 to Main City Basin, Design Discharge - 30.0 cfs

Culvert - Culvert 1, Culvert Discharge - 30.0 cfs



Watershed 3 and 4 to Main City Basin Ditch



Type: Trapezoidal

Define...

Side Slope 1 (Z1): 2.0 H : 1V

Side Slope 2 (Z2): 2.0 H : 1V

Channel Width (B): 3.0 (ft)

Pipe Diameter (D): 0.0 (ft)

Longitudinal Slope: 0.01 (ft/ft)

Manning's Roughness: 0.0320

☒ Enter Flow: 30.000 (cfs)

☐ Enter Depth: 1.305 (ft)

Calculate

Plot...

Compute Curves...

Parameter	Value	Units
Flow	30.000	cfs
Depth	1.305	ft
Area of Flow	7.323	sq ft
Wetted Perimeter	8.837	ft
Hydraulic Radius	0.829	ft
Average Velocity	4.097	fps
Top Width (T)	8.221	ft
Froude Number	0.765	
Critical Depth	1.130	ft
Critical Velocity	5.045	fps
Critical Slope	0.01769	ft/ft
Critical Top Width	7.521	ft
Max Shear Stress	0.814	lb/ft ²
Avg Shear Stress	0.517	lb/ft ²

OK

Cancel

using t

Watershed 3 and 4 to Main City Basin Pipe



Type:

Circular

Define...

Side Slope 1 (Z1):

2.0

H : 1V

Side Slope 2 (Z2):

2.0

H : 1V

Channel Width (B):

6.0

(ft)

Pipe Diameter (D):

2.5

(ft)

Longitudinal Slope:

0.01

(ft/ft)

Manning's Roughness:

0.0130



Enter Flow:

30.000

(cfs)



Enter Depth:

1.588

(ft)

Calculate

Plot...

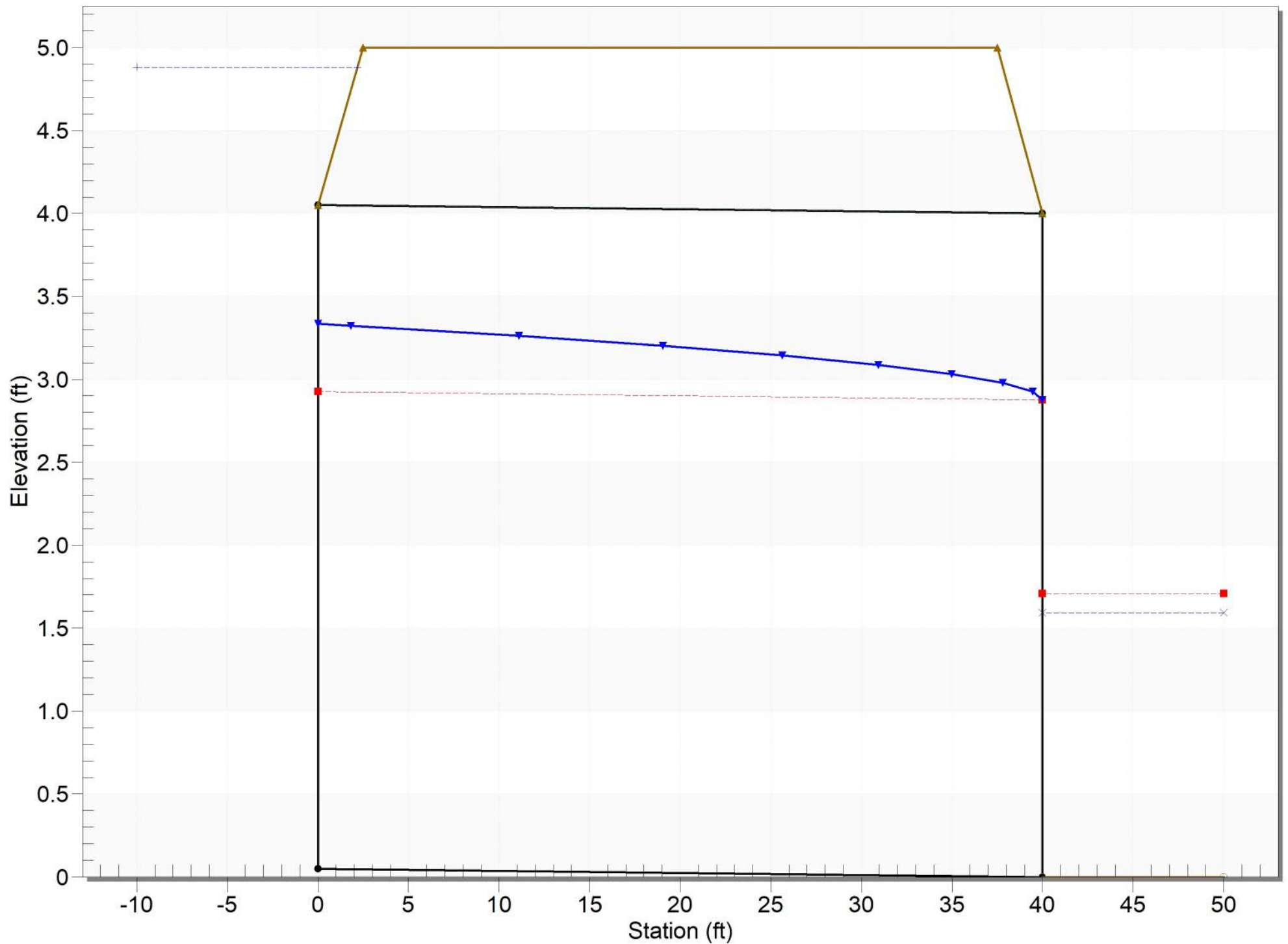
Compute Curves...

Parameter	Value	Units
Flow	30.000	cfs
Depth	1.588	ft
Area of Flow	3.288	sq ft
Wetted Perimeter	4.611	ft
Hydraulic Radius	0.713	ft
Average Velocity	9.124	fps
Top Width (T)	2.407	ft
Froude Number	1.376	
Critical Depth	1.868	ft
Critical Velocity	7.627	fps
Critical Slope	0.00649	ft/ft
Critical Top Width	2.173	ft
Max Shear Stress	0.991	lb/ft^2
Avg Shear Stress	0.445	lb/ft^2

OK

Cancel

Culvert - Culvert 1, Culvert Discharge - 90.0 cfs



Watershed 5 Along Canyon Road Pipe



Type: **Circular**

Define...

Side Slope 1 (Z1): 2.0 H : 1V

Side Slope 2 (Z2): 2.0 H : 1V

Channel Width (B): 5.0 (ft)

Pipe Diameter (D): 3.0 (ft)

Longitudinal Slope: 0.02 (ft/ft)

Manning's Roughness: 0.0130

☒ Enter Flow: 90.000 (cfs)

☐ Enter Depth: 2.344 (ft)

Calculate

Plot...

Compute Curves...

Parameter	Value	Units
Flow	90.000	cfs
Depth	2.344	ft
Area of Flow	5.925	sq ft
Wetted Perimeter	6.505	ft
Hydraulic Radius	0.911	ft
Average Velocity	15.190	fps
Top Width (T)	2.480	ft
Froude Number	1.732	
Critical Depth	2.846	ft
Critical Velocity	12.984	fps
Critical Slope	0.01576	ft/ft
Critical Top Width	1.323	ft
Max Shear Stress	2.925	lb/ft ²
Avg Shear Stress	1.137	lb/ft ²

OK

Cancel

Watershed 5 along Canyon Road Ditch



Type: **Trapezoidal**

Define...

Side Slope 1 (Z1): H : 1V

Side Slope 2 (Z2): H : 1V

Channel Width (B): (ft)

Pipe Diameter (D): (ft)

Longitudinal Slope: (ft/ft)

Manning's Roughness:

☒ Enter Flow: (cfs)

☐ Enter Depth: (ft)

Calculate

Plot...

Compute Curves...

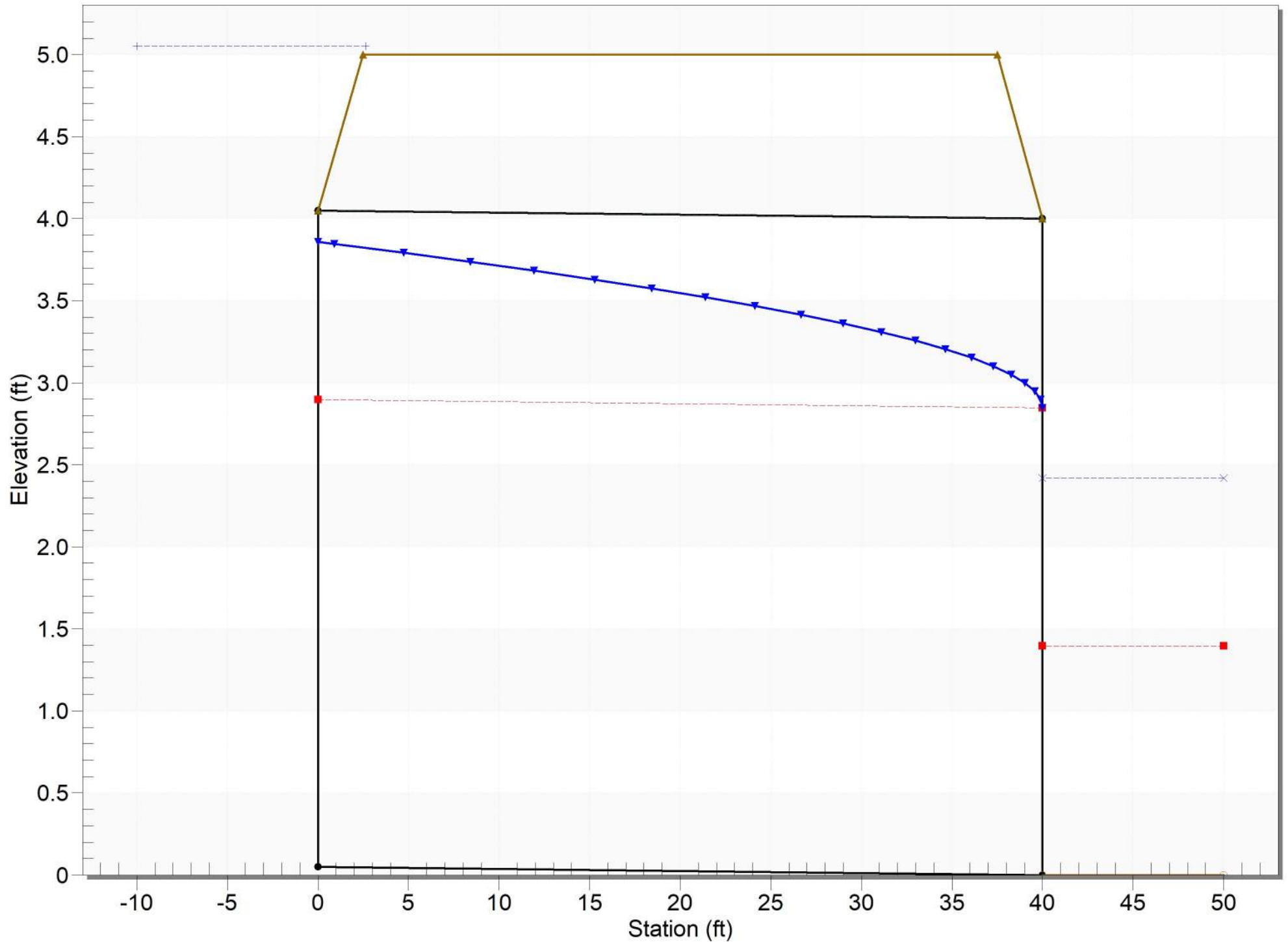
Parameter	Value	Units
Flow	90.000	cfs
Depth	1.594	ft
Area of Flow	13.051	sq ft
Wetted Perimeter	12.128	ft
Hydraulic Radius	1.076	ft
Average Velocity	6.896	fps
Top Width (T)	11.376	ft
Froude Number	1.135	
Critical Depth	1.709	ft
Critical Velocity	6.256	fps
Critical Slope	0.01528	ft/ft
Critical Top Width	11.836	ft
Max Shear Stress	1.989	lb/ft^2
Avg Shear Stress	1.343	lb/ft^2

OK

Cancel

Crossing - Watershed 5 Canyon Road to Hwy 36, Design Discharge - 90.0 cfs

Culvert - Culvert 1, Culvert Discharge - 88.3 cfs



Watershed 5 Canyon Road to Hwy 36 Ditch



Type:

Trapezoidal

Define...

Side Slope 1 (Z1): 2.0 H : 1V

Side Slope 2 (Z2): 2.0 H : 1V

Channel Width (B): 8.0 (ft)

Pipe Diameter (D): 0.0 (ft)

Longitudinal Slope: 0.002 (ft/ft)

Manning's Roughness: 0.0320

☒ Enter Flow: 90.000 (cfs)

☐ Enter Depth: 2.418 (ft)

Calculate

Plot...

Compute Curves...

Parameter	Value	Units
Flow	90.000	cfs
Depth	2.418	ft
Area of Flow	31.040	sq ft
Wetted Perimeter	18.814	ft
Hydraulic Radius	1.650	ft
Average Velocity	2.899	fps
Top Width (T)	17.673	ft
Froude Number	0.386	
Critical Depth	1.396	ft
Critical Velocity	5.975	fps
Critical Slope	0.01537	ft/ft
Critical Top Width	13.583	ft
Max Shear Stress	0.302	lb/ft^2
Avg Shear Stress	0.206	lb/ft^2

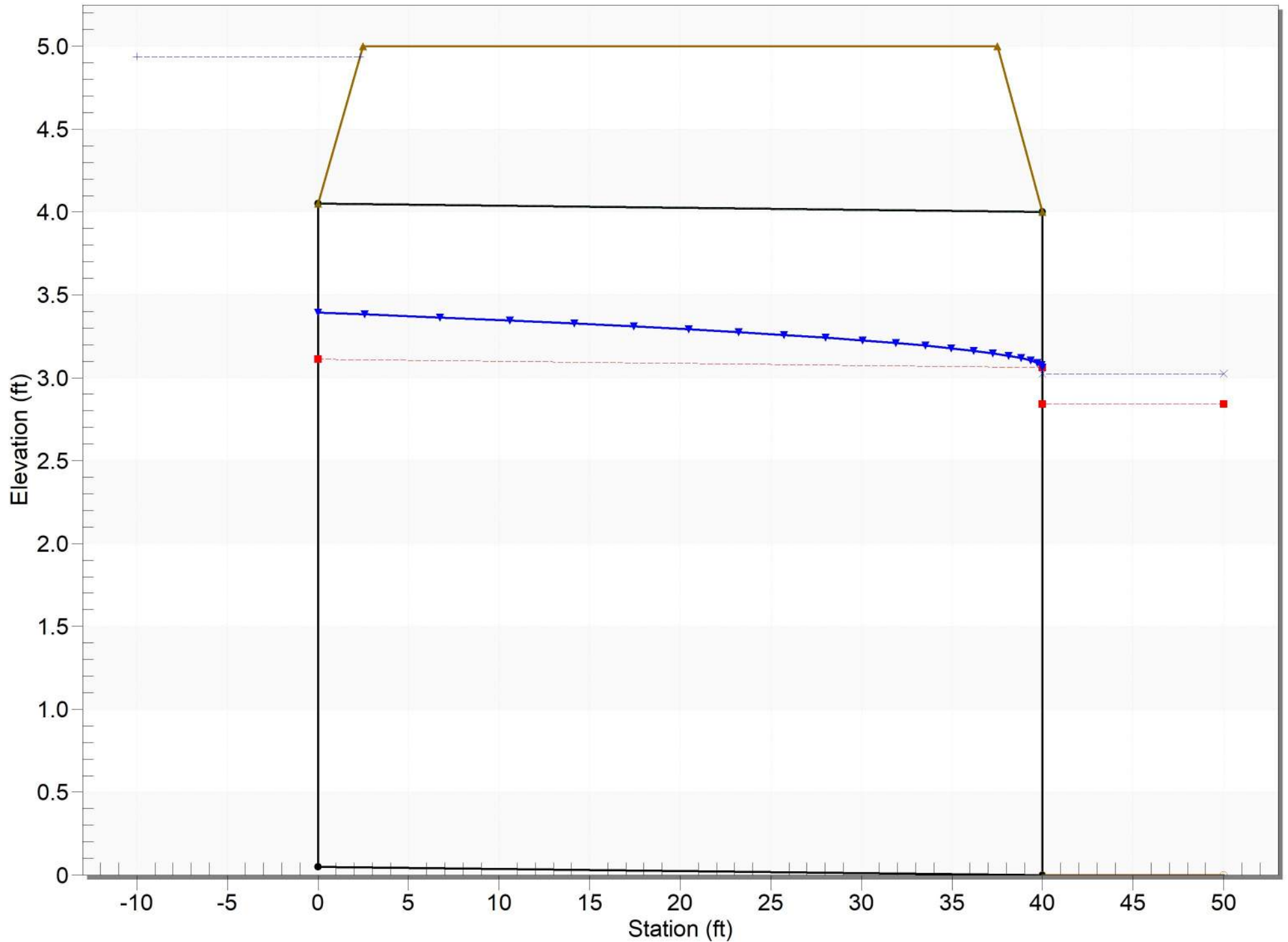
OK

Cancel

using the

Crossing - Watershed 6, Design Discharge - 365.0 cfs

Culvert - Culvert 1, Culvert Discharge - 365.0 cfs



Watershed 6



Type:

Trapezoidal

Define...

Side Slope 1 (Z1): 2.0 H : 1V

Side Slope 2 (Z2): 2.0 H : 1V

Channel Width (B): 10.0 (ft)

Pipe Diameter (D): 0.0 (ft)

Longitudinal Slope: 0.01 (ft/ft)

Manning's Roughness: 0.0320

☒ Enter Flow: 365.000 (cfs)

☐ Enter Depth: 3.023 (ft)

Calculate

Plot...

Compute Curves...

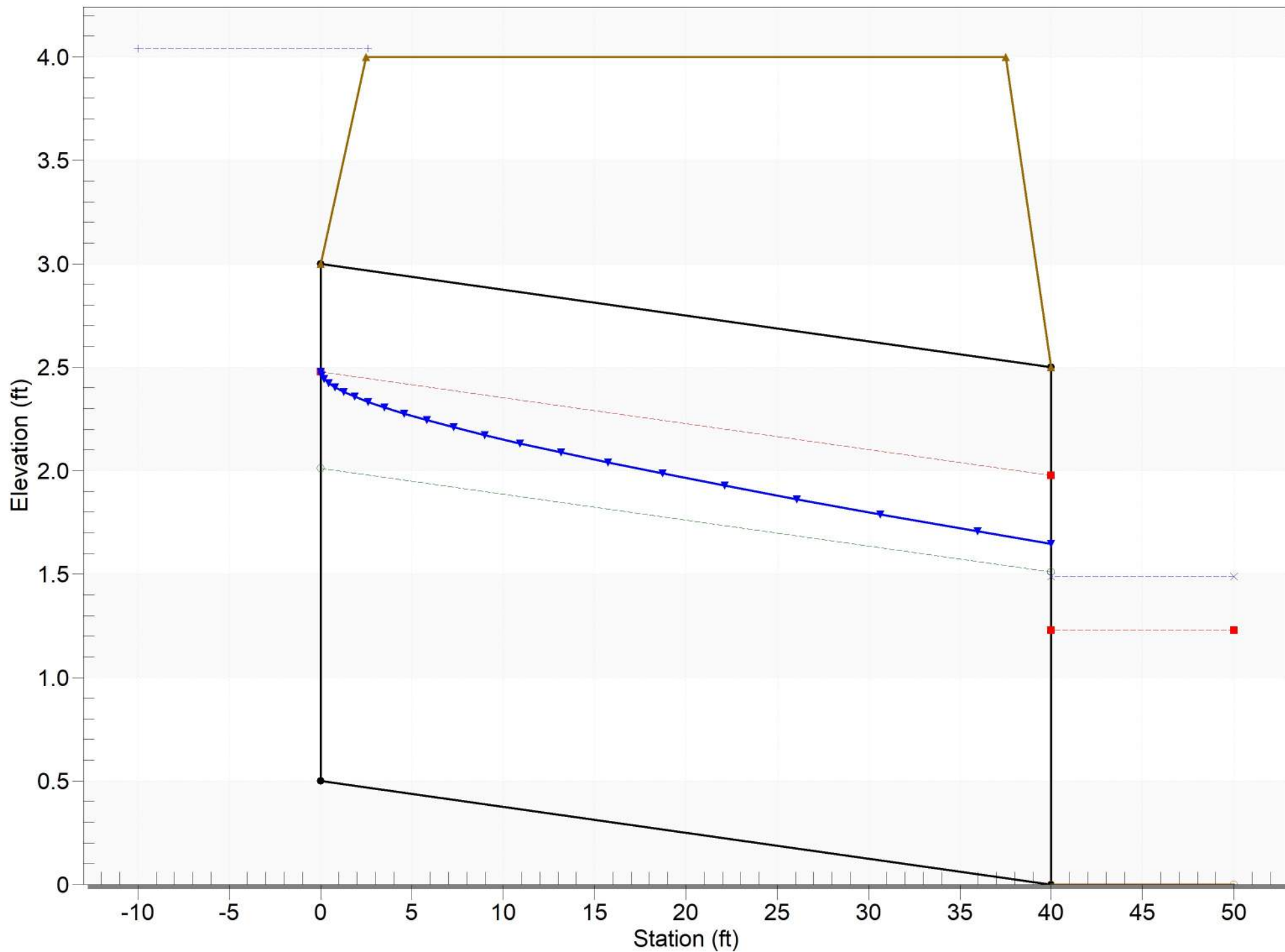
Parameter	Value	Units
Flow	365.000	cfs
Depth	3.023	ft
Area of Flow	48.510	sq ft
Wetted Perimeter	23.520	ft
Hydraulic Radius	2.062	ft
Average Velocity	7.524	fps
Top Width (T)	22.092	ft
Froude Number	0.895	
Critical Depth	2.841	ft
Critical Velocity	8.194	fps
Critical Slope	0.01267	ft/ft
Critical Top Width	21.363	ft
Max Shear Stress	1.886	lb/ft^2
Avg Shear Stress	1.287	lb/ft^2

OK

Cancel

Crossing - Watersheds 1 and 2 to Main Basin, Design Discharge - 35.0 cfs

Culvert - Culvert 1, Culvert Discharge - 33.8 cfs



Watersheds 1 and 2 to Main City Basin Ditch



Type: Trapezoidal

Define...

Side Slope 1 (Z1): 2.0 H : 1V

Side Slope 2 (Z2): 2.0 H : 1V

Channel Width (B): 3.0 (ft)

Pipe Diameter (D): 0.0 (ft)

Longitudinal Slope: 0.008 (ft/ft)

Manning's Roughness: 0.0320

☒ Enter Flow: 36.000 (cfs)

☐ Enter Depth: 1.510 (ft)

Calculate

Plot...

Compute Curves...

Parameter	Value	Units
Flow	36.000	cfs
Depth	1.510	ft
Area of Flow	9.086	sq ft
Wetted Perimeter	9.751	ft
Hydraulic Radius	0.932	ft
Average Velocity	3.962	fps
Top Width (T)	9.038	ft
Froude Number	0.696	
Critical Depth	1.247	ft
Critical Velocity	5.255	fps
Critical Slope	0.01728	ft/ft
Critical Top Width	7.988	ft
Max Shear Stress	0.754	lb/ft^2
Avg Shear Stress	0.465	lb/ft^2

OK

Cancel

defin

Watersheds 1 and 2 to Main City Basin Pipe



Type: Circular

Define...

Side Slope 1 (Z1): 2.0 H : 1V

Side Slope 2 (Z2): 2.0 H : 1V

Channel Width (B): 3.0 (ft)

Pipe Diameter (D): 2.5 (ft)

Longitudinal Slope: 0.008 (ft/ft)

Manning's Roughness: 0.0130

☒ Enter Flow: 36.000 (cfs)

☐ Enter Depth: 2.008 (ft)

Calculate

Plot...

Compute Curves...

Parameter	Value	Units
Flow	36.000	cfs
Depth	2.008	ft
Area of Flow	4.226	sq ft
Wetted Perimeter	5.556	ft
Hydraulic Radius	0.761	ft
Average Velocity	8.519	fps
Top Width (T)	1.988	ft
Froude Number	1.030	
Critical Depth	2.035	ft
Critical Velocity	8.414	fps
Critical Slope	0.00780	ft/ft
Critical Top Width	1.946	ft
Max Shear Stress	1.002	lb/ft^2
Avg Shear Stress	0.380	lb/ft^2

OK

Cancel

Project Description

File Name Lake Point Existing 10-Year_SPF

Project Options

Flow Units CFS
Elevation Type Elevation
Hydrology Method SCS TR-55
Time of Concentration (TOC) Method Kirpich
Link Routing Method Hydrodynamic
Enable Overflow Ponding at Nodes YES
Skip Steady State Analysis Time Periods NO

Analysis Options

Start Analysis On 00:00:00 0:00:00
End Analysis On 00:00:00 0:00:00
Start Reporting On 00:00:00 0:00:00
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 00:05:00 days hh:mm:ss
Routing Time Step 30 seconds

Number of Elements

Qty
Rain Gages 2
Subbasins..... 34
Nodes..... 164
 Junctions 148
 Outfalls 10
 Flow Diversions 0
 Inlets 0
 Storage Nodes 6
Links..... 145
 Channels 56
 Pipes 89
 Pumps 0
 Orifices 0
 Weirs 0
 Outlets 0
Pollutants 0
Land Uses 0

Rainfall Details

SN	Rain Gage	Data	Data Source	Rainfall	Rain	State	County	Return	Rainfall	Rainfall
	ID	Source	ID	Type	Units			Period	Depth	Distribution
								(years)	(inches)	

Subbasin Summary

Subbasin ID	Area	Peak Rate Factor	Weighted Curve Number	Average Slope	Flow Length	Total Rainfall	Total Runoff	Total Runoff Volume	Peak Runoff	Time of Concentration
	(ac)			(%)	(ft)	(in)	(in)	(ac-in)	(cfs)	(days hh:mm:ss)
Sub-01	36.33	0.00	67.91	7.6700	1806.00	1.90	0.16	5.85	5.20	0 00:06:45
Sub-02	10.35	0.00	73.69	5.8000	849.00	1.90	0.30	3.06	4.01	0 00:05:00
Sub-03	19.64	0.00	71.89	9.7000	1248.00	1.90	0.25	4.89	6.11	0 00:05:00
Sub-04	31.59	0.00	73.69	11.4000	1659.00	1.90	0.30	9.35	12.11	0 00:05:25
Sub-05	23.00	0.00	76.28	12.5500	1371.00	1.90	0.37	8.56	11.65	0 00:05:00
Sub-06	14.99	0.00	75.63	12.5500	4090.00	1.90	0.35	5.28	6.29	0 00:10:28
Sub-07	55.50	0.00	76.52	11.0800	2327.00	1.90	0.38	21.09	27.82	0 00:07:07
Sub-08	103.26	0.00	77.71	11.0800	3377.00	1.90	0.42	43.27	55.63	0 00:09:28
Sub-09	27.76	0.00	77.58	3.0000	1535.00	1.90	0.42	11.52	15.07	0 00:08:32
Sub-10	15.89	0.00	72.48	10.0000	1099.00	1.90	0.26	4.18	5.33	0 00:05:00
Sub-11	200.91	0.00	75.16	3.0000	5034.00	1.90	0.34	67.91	56.59	0 00:21:19
Sub-12	203.25	0.00	78.37	9.9200	5070.00	1.90	0.44	89.84	105.05	0 00:13:31
Sub-13	65.02	0.00	77.98	10.0000	2558.00	1.90	0.43	27.89	37.10	0 00:07:57
Sub-14	137.26	0.00	65.26	10.0000	4006.00	1.90	0.11	15.51	6.42	0 00:11:15
Sub-15	199.89	0.00	71.11	17.3300	5019.00	1.90	0.23	45.97	44.13	0 00:10:49
Sub-16	206.85	0.00	72.72	6.8200	5123.00	1.90	0.27	55.85	49.13	0 00:15:45
Sub-17	270.69	0.00	76.01	19.5900	6020.00	1.90	0.36	98.53	113.74	0 00:11:52
Sub-18	184.46	0.00	79.37	21.8000	3787.00	1.90	0.48	88.36	119.72	0 00:07:58
Sub-19	36.42	0.00	69.67	15.3100	2056.00	1.90	0.20	7.17	7.88	0 00:05:42
Sub-20	65.33	0.00	72.52	7.9000	2477.00	1.90	0.27	17.31	19.65	0 00:08:30
Sub-21	102.50	0.00	73.57	6.1800	3632.00	1.90	0.29	29.93	30.94	0 00:12:33
Sub-22	60.51	0.00	67.70	7.2000	2450.00	1.90	0.16	9.44	7.31	0 00:08:44
Sub-23	38.80	0.00	68.69	8.2500	1877.00	1.90	0.18	6.83	6.60	0 00:06:45
Sub-24	167.95	0.00	77.73	8.0000	4521.00	1.90	0.42	70.54	81.40	0 00:13:27
Sub-25	32.94	0.00	85.30	6.6300	1701.00	1.90	0.74	24.31	35.96	0 00:06:48
Sub-26	29.12	0.00	92.35	10.0000	1580.00	1.90	1.17	34.19	53.20	0 00:05:30
Sub-27	35.04	0.00	88.40	5.0900	1765.00	1.90	0.91	31.85	46.55	0 00:07:45
Sub-28	100.31	0.00	61.80	5.5000	3319.00	1.90	0.06	6.42	0.91	0 00:12:15
Sub-29	304.22	0.00	69.63	16.1200	6458.00	1.90	0.20	59.63	45.23	0 00:13:31
Sub-30	7.88	0.00	66.10	10.0000	721.00	1.90	0.13	1.00	0.79	0 00:05:00
Sub-31	17.60	0.00	81.93	10.0000	1168.00	1.90	0.58	10.23	15.51	0 00:05:00
Sub-38	61.52	0.00	72.00	0.5000	500.00	1.90	0.25	15.44	18.01	0 00:07:10
Sub-39	4.88	0.00	81.93	0.5000	500.00	1.90	0.58	2.84	4.02	0 00:07:10
Sub-40	60.45	0.00	72.00	0.5000	500.00	1.90	0.25	15.17	17.70	0 00:07:10

Subbasin Hydrology

Subbasin : Sub-01

Input Data

Area (ac)	36.33
Peak Rate Factor	0
Weighted Curve Number	67.91
Average Slope (%)	7.67
Flow Length (ft)	1806
Rain Gage ID	Rain Gage-14

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	36.33	-	67.91
Composite Area & Weighted CN	36.33		67.91

Time of Concentration

TOC Method : Kirpich

Sheet Flow Equation :

$T_c = (0.0078 * ((L_f^{0.77}) * (S_f^{-0.385})))$

Where :

- Tc = Time of Concentration (min)
- Lf = Flow Length (ft)
- Sf = Slope (ft/ft)

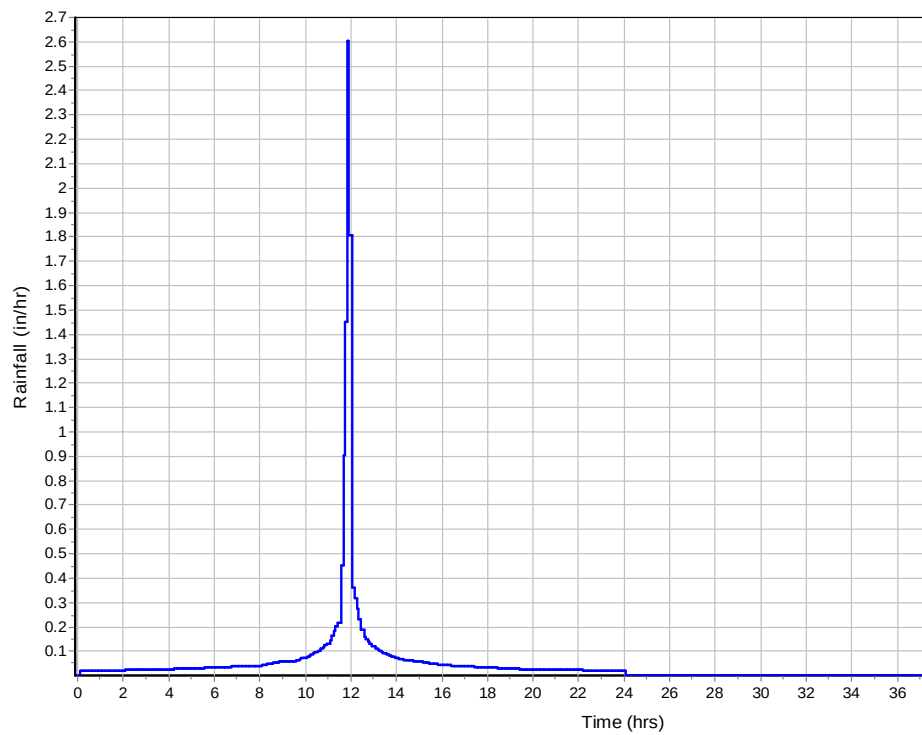
Flow Length (ft)	1806
Slope (%)	7.67
Computed TOC (min)	6.75

Subbasin Runoff Results

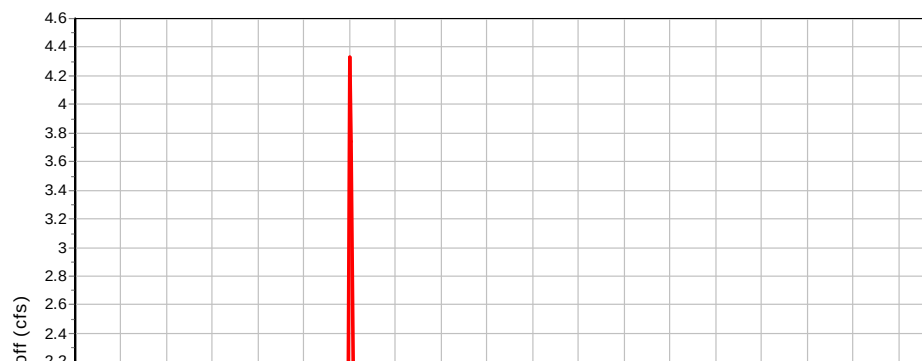
Total Rainfall (in)	1.9
Total Runoff (in)	0.16
Peak Runoff (cfs)	5.2
Weighted Curve Number	67.91
Time of Concentration (days hh:mm:ss)	0 00:06:45

Subbasin : Sub-01

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-02

Input Data

Area (ac)	10.35
Peak Rate Factor	0
Weighted Curve Number	73.69
Average Slope (%)	5.8
Flow Length (ft)	849
Rain Gage ID	Rain Gage-14

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	10.35	-	73.69
Composite Area & Weighted CN	10.35		73.69

Time of Concentration

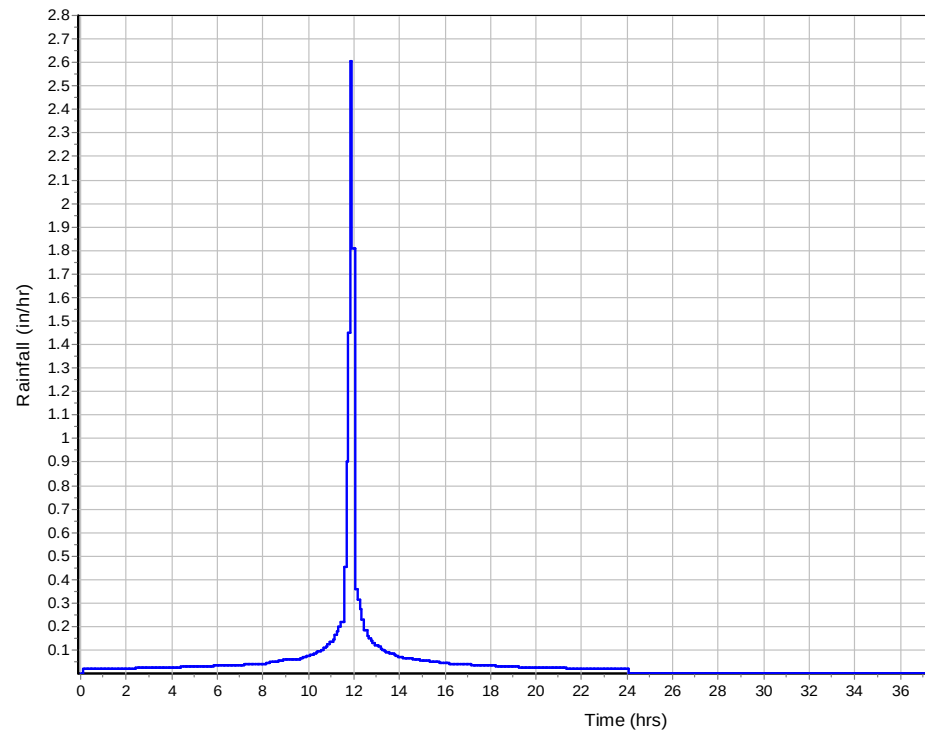
Flow Length (ft)	849
Slope (%)	5.8
Computed TOC (min)	4.2

Subbasin Runoff Results

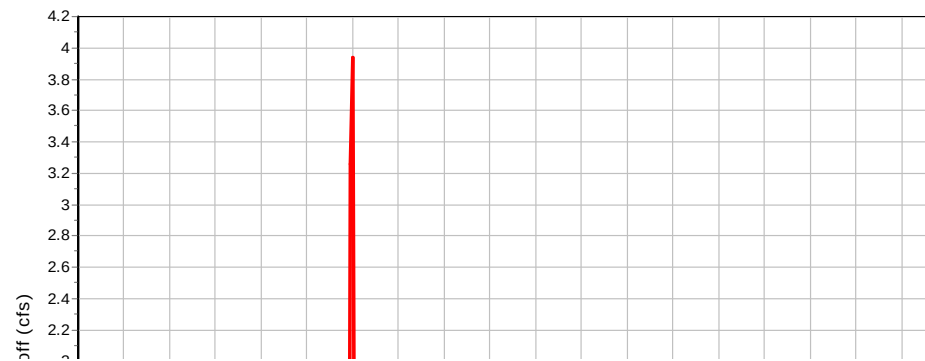
Total Rainfall (in)	1.9
Total Runoff (in)	0.3
Peak Runoff (cfs)	4.01
Weighted Curve Number	73.69
Time of Concentration (days hh:mm:ss)	0 00:04:12

Subbasin : Sub-02

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-03

Input Data

Area (ac)	19.64
Peak Rate Factor	0
Weighted Curve Number	71.89
Average Slope (%)	9.7
Flow Length (ft)	1248
Rain Gage ID	Rain Gage-14

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	19.64	-	71.89
Composite Area & Weighted CN	19.64		71.89

Time of Concentration

Flow Length (ft)	1248
Slope (%)	9.7
Computed TOC (min)	4.64

Subbasin Runoff Results

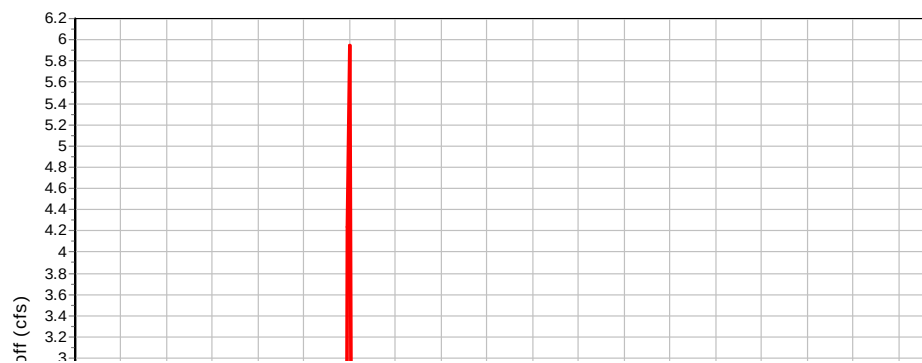
Total Rainfall (in)	1.9
Total Runoff (in)	0.25
Peak Runoff (cfs)	6.11
Weighted Curve Number	71.89
Time of Concentration (days hh:mm:ss)	0 00:04:38

Subbasin : Sub-03

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-04

Input Data

Area (ac)	31.59
Peak Rate Factor	0
Weighted Curve Number	73.69
Average Slope (%)	11.4
Flow Length (ft)	1659
Rain Gage ID	Rain Gage-14

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	31.59	-	73.69
Composite Area & Weighted CN	31.59		73.69

Time of Concentration

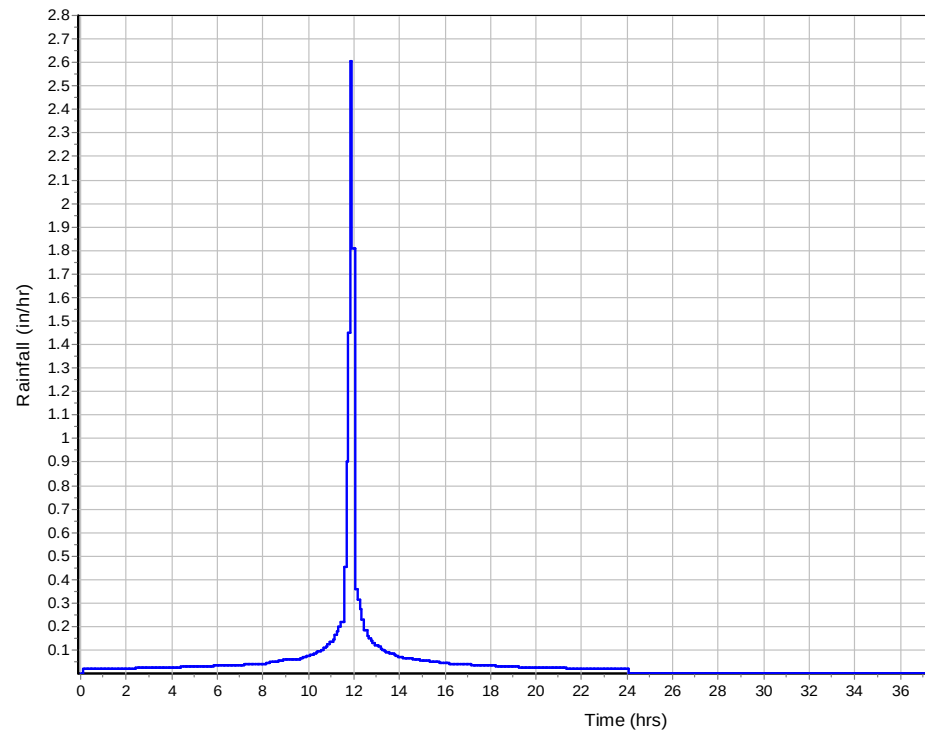
Flow Length (ft)	1659
Slope (%)	11.4
Computed TOC (min)	5.43

Subbasin Runoff Results

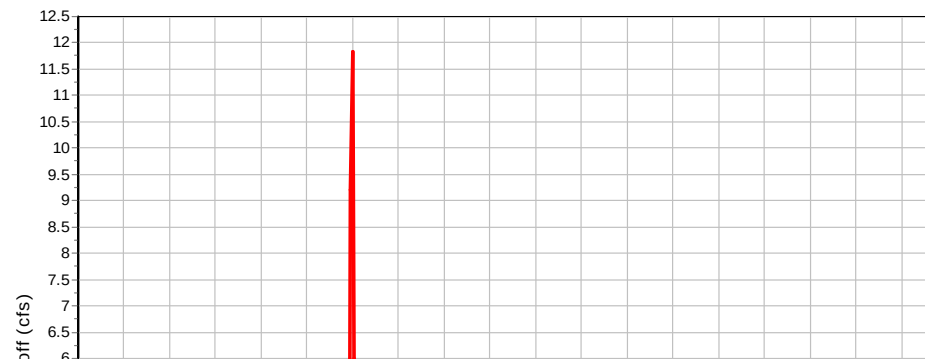
Total Rainfall (in)	1.9
Total Runoff (in)	0.3
Peak Runoff (cfs)	12.11
Weighted Curve Number	73.69
Time of Concentration (days hh:mm:ss)	0 00:05:26

Subbasin : Sub-04

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-05

Input Data

Area (ac)	23
Peak Rate Factor	0
Weighted Curve Number	76.28
Average Slope (%)	12.55
Flow Length (ft)	1371
Rain Gage ID	Rain Gage-14

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	23	-	76.28
Composite Area & Weighted CN	23		76.28

Time of Concentration

Flow Length (ft)	1371
Slope (%)	12.55
Computed TOC (min)	4.51

Subbasin Runoff Results

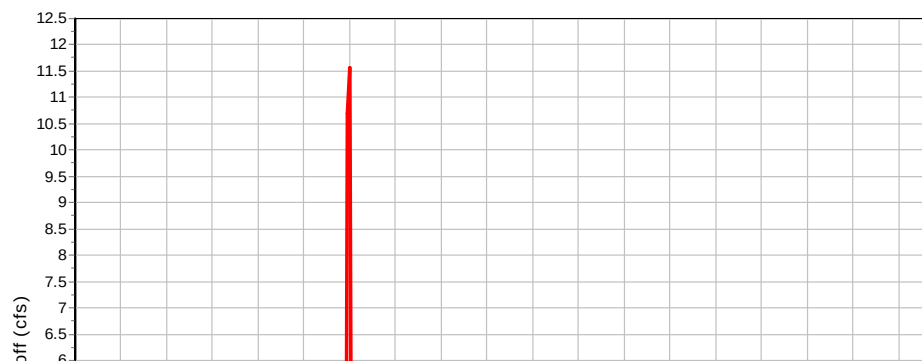
Total Rainfall (in)	1.9
Total Runoff (in)	0.37
Peak Runoff (cfs)	11.65
Weighted Curve Number	76.28
Time of Concentration (days hh:mm:ss)	0 00:04:31

Subbasin : Sub-05

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-06

Input Data

Area (ac)	14.99
Peak Rate Factor	0
Weighted Curve Number	75.63
Average Slope (%)	12.55
Flow Length (ft)	4090
Rain Gage ID	Rain Gage-14

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	14.99	-	75.63
Composite Area & Weighted CN	14.99		75.63

Time of Concentration

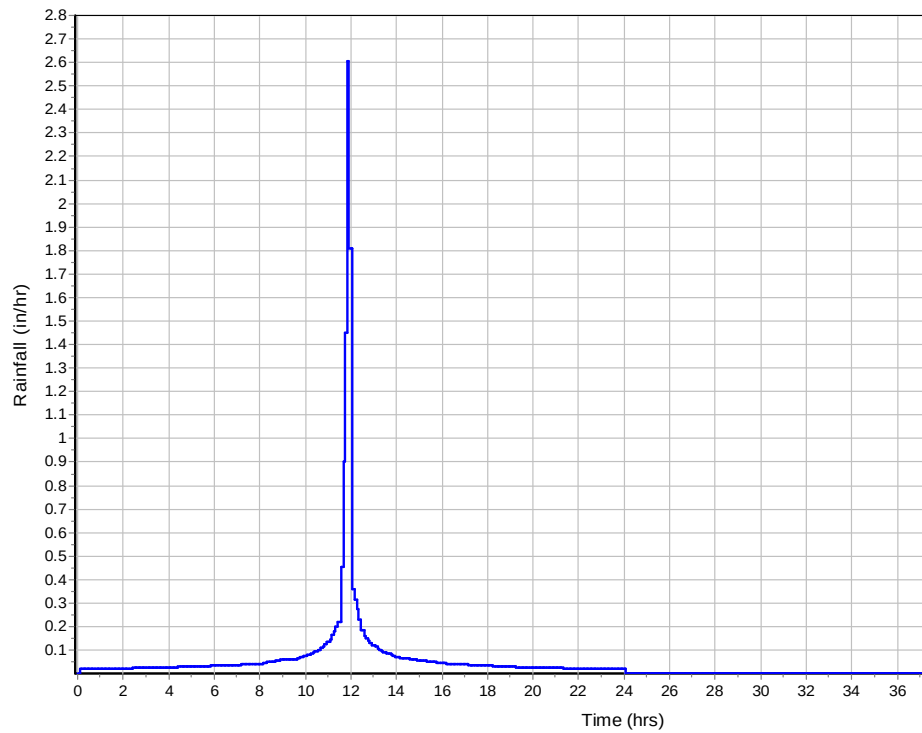
Flow Length (ft)	4090
Slope (%)	12.55
Computed TOC (min)	10.47

Subbasin Runoff Results

Total Rainfall (in)	1.9
Total Runoff (in)	0.35
Peak Runoff (cfs)	6.29
Weighted Curve Number	75.63
Time of Concentration (days hh:mm:ss)	0 00:10:28

Subbasin : Sub-06

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-07

Input Data

Area (ac)	55.5
Peak Rate Factor	0
Weighted Curve Number	76.52
Average Slope (%)	11.08
Flow Length (ft)	2327
Rain Gage ID	Rain Gage-14

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	55.5	-	76.52
Composite Area & Weighted CN	55.5		76.52

Time of Concentration

Flow Length (ft)	2327
Slope (%)	11.08
Computed TOC (min)	7.12

Subbasin Runoff Results

Total Rainfall (in)	1.9
Total Runoff (in)	0.38
Peak Runoff (cfs)	27.82
Weighted Curve Number	76.52
Time of Concentration (days hh:mm:ss)	0 00:07:07

Subbasin : Sub-07

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-08

Input Data

Area (ac)	103.26
Peak Rate Factor	0
Weighted Curve Number	77.71
Average Slope (%)	11.08
Flow Length (ft)	3377
Rain Gage ID	Rain Gage-14

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	103.26	-	77.71
Composite Area & Weighted CN	103.26		77.71

Time of Concentration

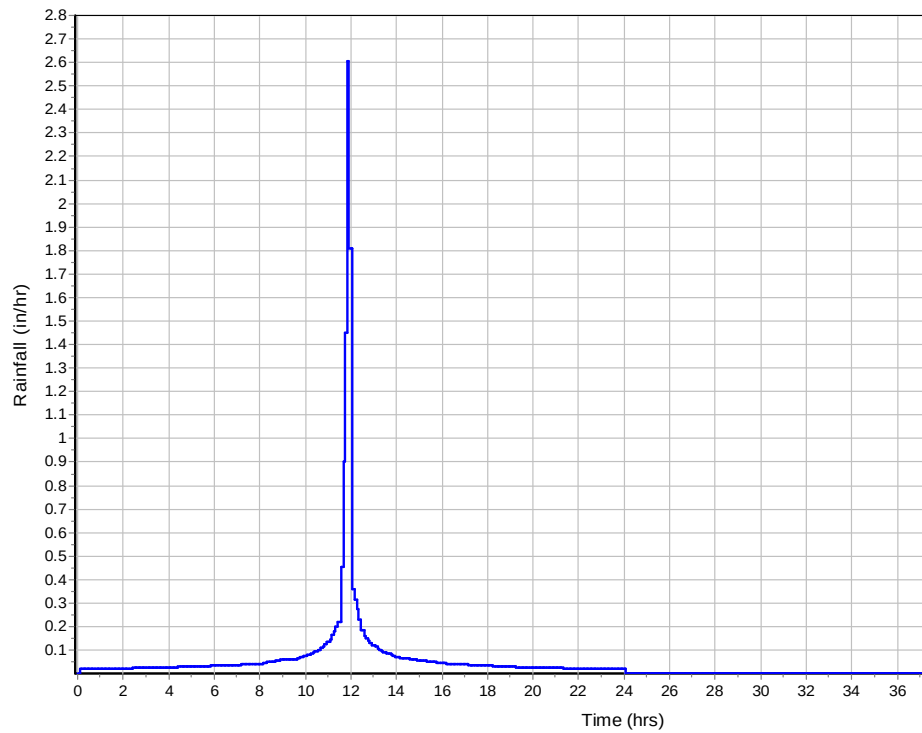
Flow Length (ft)	3377
Slope (%)	11.08
Computed TOC (min)	9.48

Subbasin Runoff Results

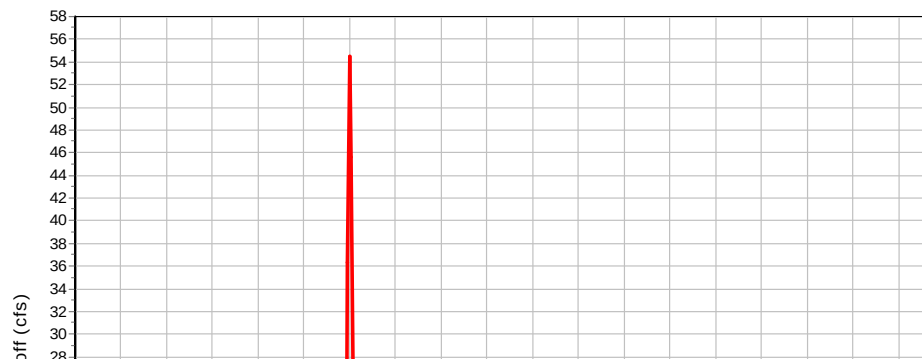
Total Rainfall (in)	1.9
Total Runoff (in)	0.42
Peak Runoff (cfs)	55.63
Weighted Curve Number	77.71
Time of Concentration (days hh:mm:ss)	0 00:09:29

Subbasin : Sub-08

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-09

Input Data

Area (ac)	27.76
Peak Rate Factor	0
Weighted Curve Number	77.58
Average Slope (%)	3
Flow Length (ft)	1535
Rain Gage ID	Rain Gage-14

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	27.76	-	77.58
Composite Area & Weighted CN	27.76		77.58

Time of Concentration

Flow Length (ft)	1535
Slope (%)	3
Computed TOC (min)	8.54

Subbasin Runoff Results

Total Rainfall (in)	1.9
Total Runoff (in)	0.42
Peak Runoff (cfs)	15.07
Weighted Curve Number	77.58
Time of Concentration (days hh:mm:ss)	0 00:08:32

Subbasin : Sub-09

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-10

Input Data

Area (ac)	15.89
Peak Rate Factor	0
Weighted Curve Number	72.48
Average Slope (%)	10
Flow Length (ft)	1099
Rain Gage ID	Rain Gage-14

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	15.89	-	72.48
Composite Area & Weighted CN	15.89		72.48

Time of Concentration

Flow Length (ft)	1099
Slope (%)	10
Computed TOC (min)	4.16

Subbasin Runoff Results

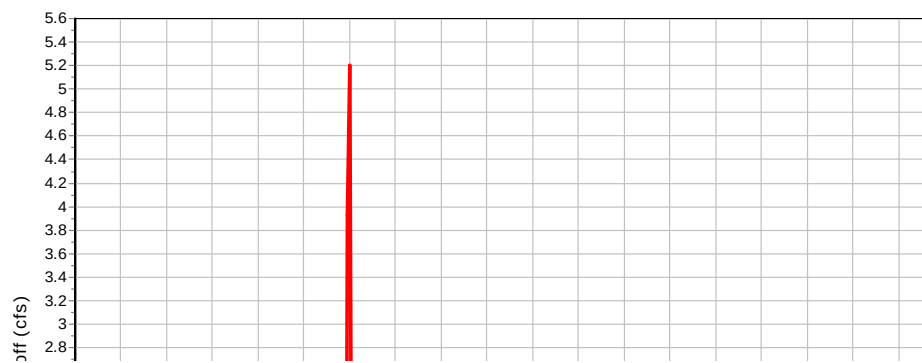
Total Rainfall (in)	1.9
Total Runoff (in)	0.26
Peak Runoff (cfs)	5.33
Weighted Curve Number	72.48
Time of Concentration (days hh:mm:ss)	0 00:04:10

Subbasin : Sub-10

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-11

Input Data

Area (ac)	200.91
Peak Rate Factor	0
Weighted Curve Number	75.16
Average Slope (%)	3
Flow Length (ft)	5034
Rain Gage ID	Rain Gage-14

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		200.91	-	75.16
Composite Area & Weighted CN		200.91		75.16

Time of Concentration

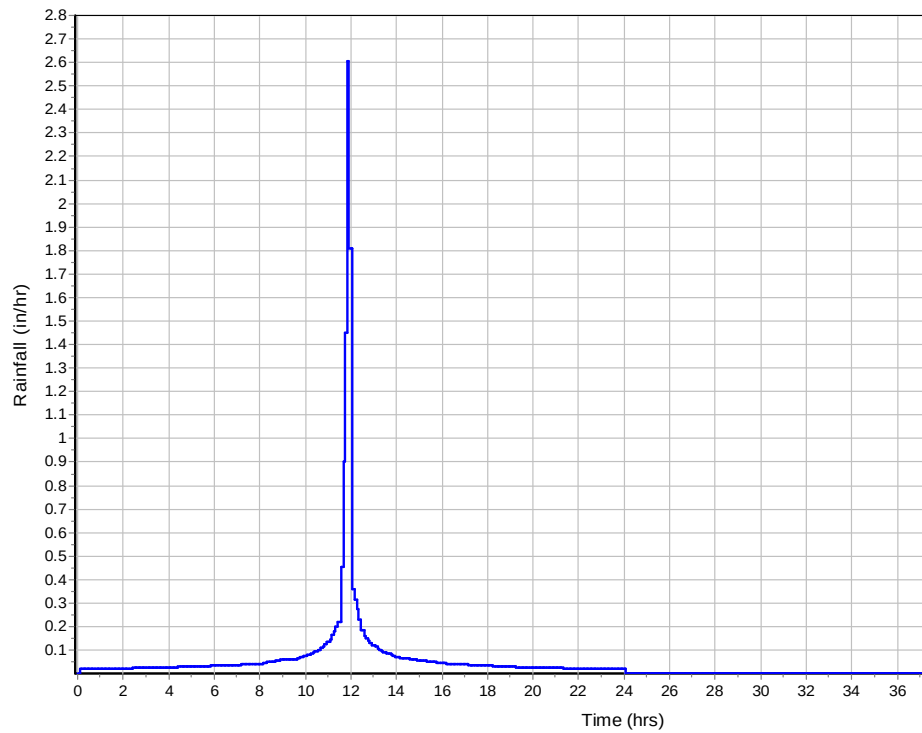
Flow Length (ft)	5034
Slope (%)	3
Computed TOC (min)	21.32

Subbasin Runoff Results

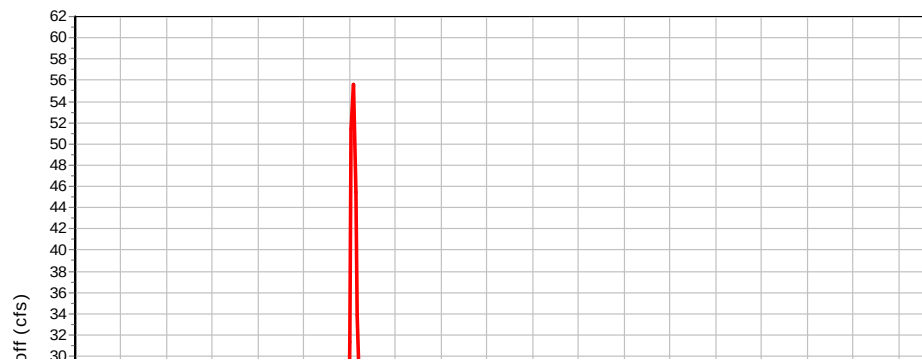
Total Rainfall (in)	1.9
Total Runoff (in)	0.34
Peak Runoff (cfs)	56.59
Weighted Curve Number	75.16
Time of Concentration (days hh:mm:ss)	0 00:21:19

Subbasin : Sub-11

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-12

Input Data

Area (ac)	203.25
Peak Rate Factor	0
Weighted Curve Number	78.37
Average Slope (%)	9.92
Flow Length (ft)	5070
Rain Gage ID	Rain Gage-14

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		203.25	-	78.37
Composite Area & Weighted CN		203.25		78.37

Time of Concentration

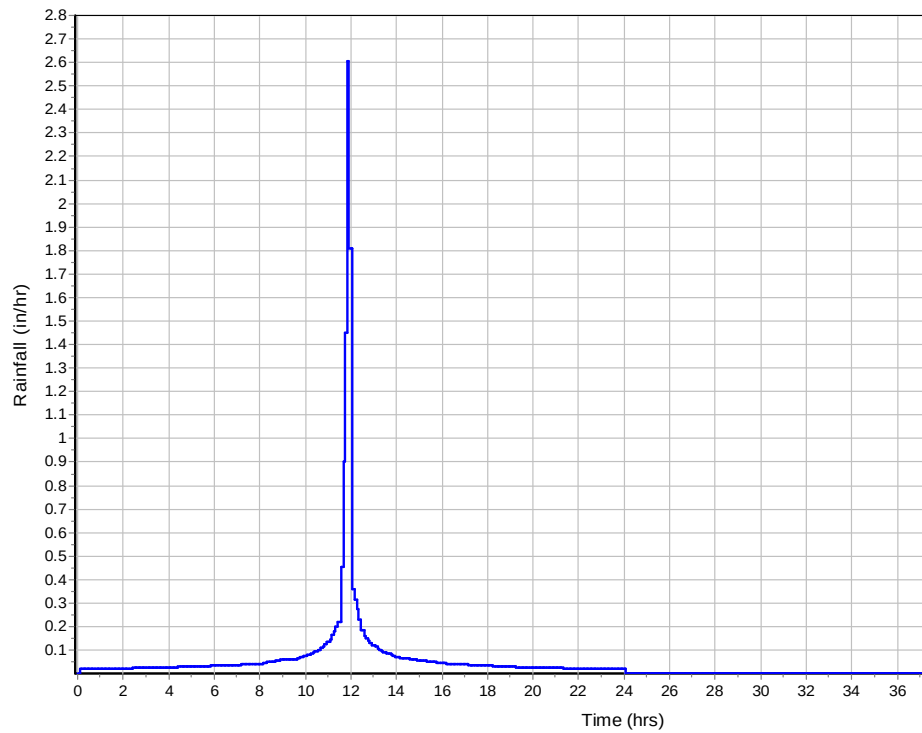
Flow Length (ft)	5070
Slope (%)	9.92
Computed TOC (min)	13.53

Subbasin Runoff Results

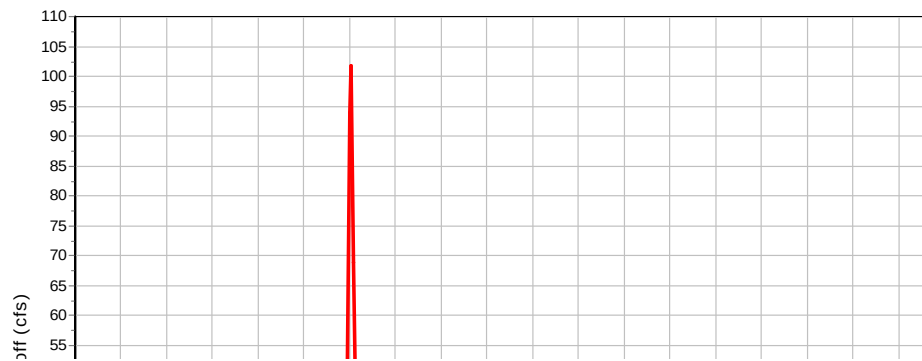
Total Rainfall (in)	1.9
Total Runoff (in)	0.44
Peak Runoff (cfs)	105.05
Weighted Curve Number	78.37
Time of Concentration (days hh:mm:ss)	0 00:13:32

Subbasin : Sub-12

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-13

Input Data

Area (ac)	65.02
Peak Rate Factor	0
Weighted Curve Number	77.98
Average Slope (%)	10
Flow Length (ft)	2558
Rain Gage ID	Rain Gage-14

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		65.02	-	77.98
Composite Area & Weighted CN		65.02		77.98

Time of Concentration

Flow Length (ft)	2558
Slope (%)	10
Computed TOC (min)	7.96

Subbasin Runoff Results

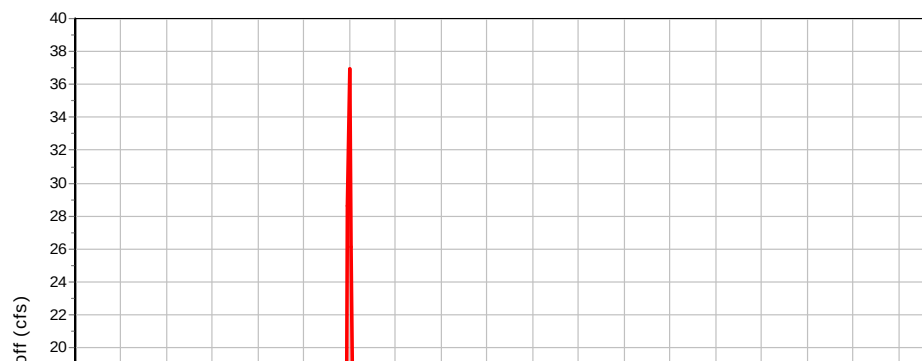
Total Rainfall (in)	1.9
Total Runoff (in)	0.43
Peak Runoff (cfs)	37.1
Weighted Curve Number	77.98
Time of Concentration (days hh:mm:ss)	0 00:07:58

Subbasin : Sub-13

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-14

Input Data

Area (ac)	137.26
Peak Rate Factor	0
Weighted Curve Number	65.26
Average Slope (%)	10
Flow Length (ft)	4006
Rain Gage ID	Rain Gage-14

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		137.26	-	65.26
Composite Area & Weighted CN		137.26		65.26

Time of Concentration

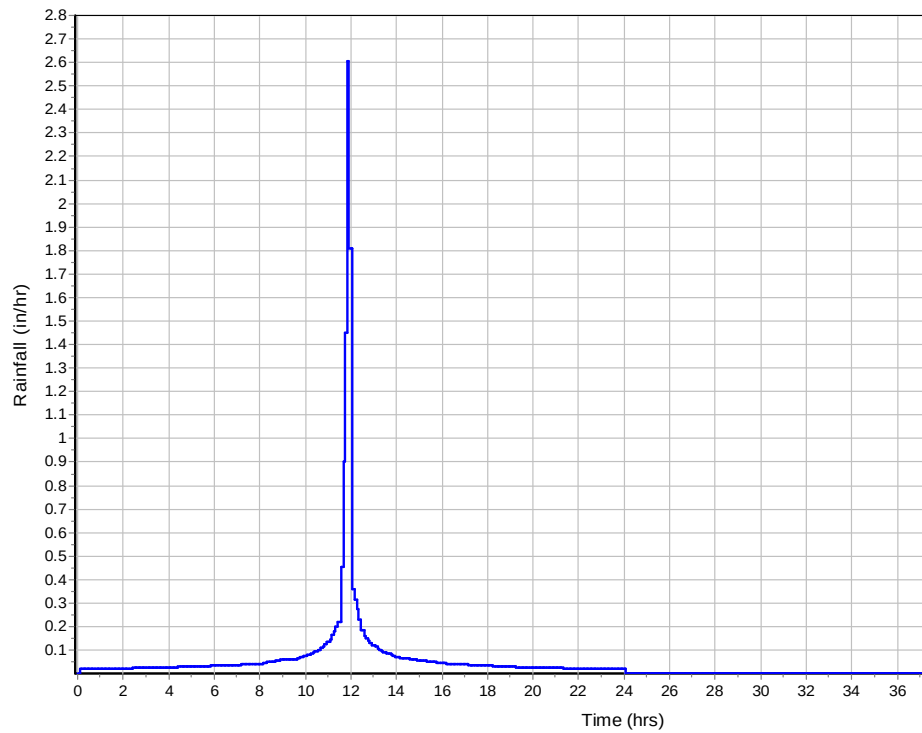
Flow Length (ft)	4006
Slope (%)	10
Computed TOC (min)	11.25

Subbasin Runoff Results

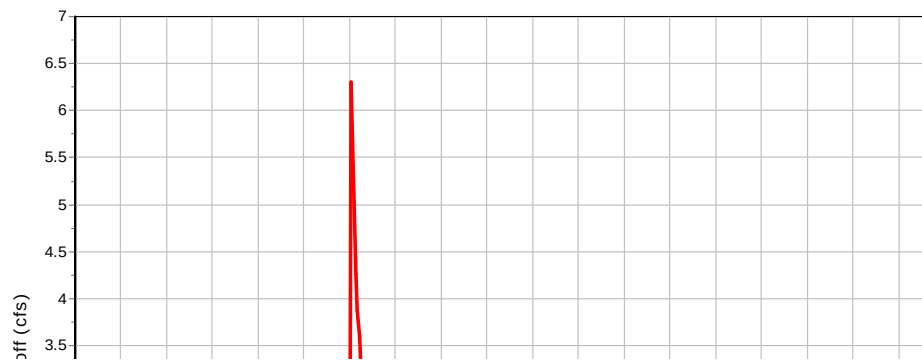
Total Rainfall (in)	1.9
Total Runoff (in)	0.11
Peak Runoff (cfs)	6.42
Weighted Curve Number	65.26
Time of Concentration (days hh:mm:ss)	0 00:11:15

Subbasin : Sub-14

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-15

Input Data

Area (ac)	199.89
Peak Rate Factor	0
Weighted Curve Number	71.11
Average Slope (%)	17.33
Flow Length (ft)	5019
Rain Gage ID	Rain Gage-14

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		199.89	-	71.11
Composite Area & Weighted CN		199.89		71.11

Time of Concentration

Flow Length (ft)	5019
Slope (%)	17.33
Computed TOC (min)	10.83

Subbasin Runoff Results

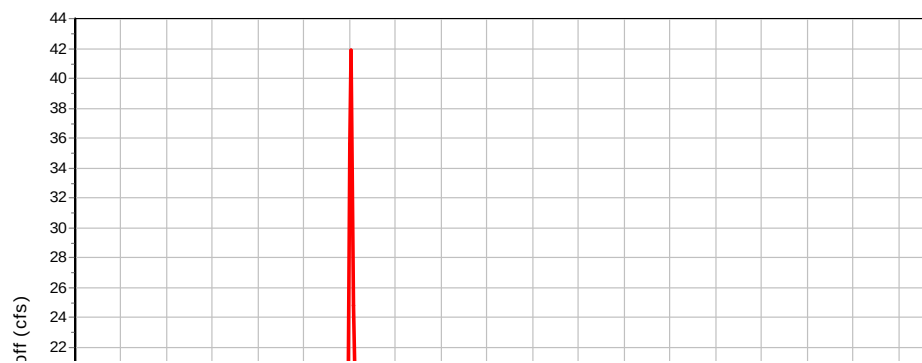
Total Rainfall (in)	1.9
Total Runoff (in)	0.23
Peak Runoff (cfs)	44.13
Weighted Curve Number	71.11
Time of Concentration (days hh:mm:ss)	0 00:10:50

Subbasin : Sub-15

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-16

Input Data

Area (ac)	206.85
Peak Rate Factor	0
Weighted Curve Number	72.72
Average Slope (%)	6.82
Flow Length (ft)	5123
Rain Gage ID	Rain Gage-14

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		206.85	-	72.72
Composite Area & Weighted CN		206.85		72.72

Time of Concentration

Flow Length (ft)	5123
Slope (%)	6.82
Computed TOC (min)	15.75

Subbasin Runoff Results

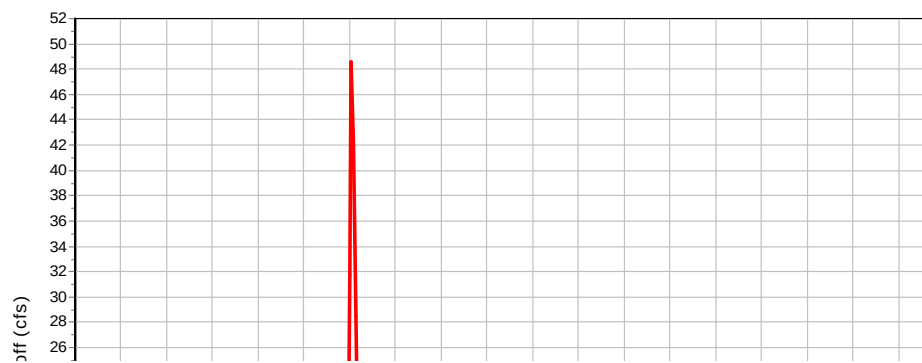
Total Rainfall (in)	1.9
Total Runoff (in)	0.27
Peak Runoff (cfs)	49.13
Weighted Curve Number	72.72
Time of Concentration (days hh:mm:ss)	0 00:15:45

Subbasin : Sub-16

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-17

Input Data

Area (ac)	270.69
Peak Rate Factor	0
Weighted Curve Number	76.01
Average Slope (%)	19.59
Flow Length (ft)	6020
Rain Gage ID	Rain Gage-14

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		270.69	-	76.01
Composite Area & Weighted CN		270.69		76.01

Time of Concentration

Flow Length (ft)	6020
Slope (%)	19.59
Computed TOC (min)	11.88

Subbasin Runoff Results

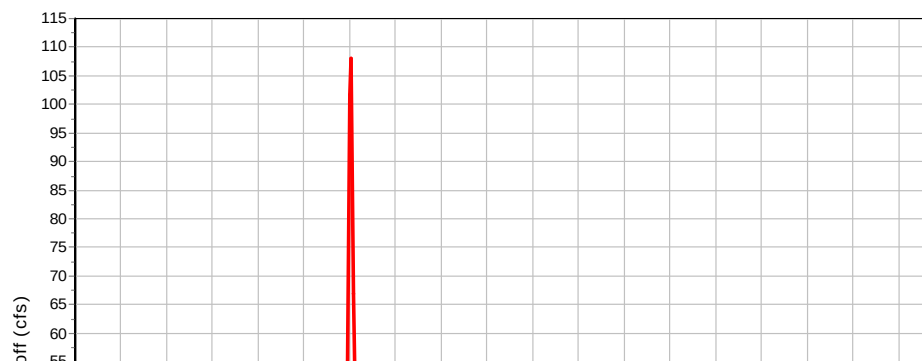
Total Rainfall (in)	1.9
Total Runoff (in)	0.36
Peak Runoff (cfs)	113.74
Weighted Curve Number	76.01
Time of Concentration (days hh:mm:ss)	0 00:11:53

Subbasin : Sub-17

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-18

Input Data

Area (ac)	184.46
Peak Rate Factor	0
Weighted Curve Number	79.37
Average Slope (%)	21.8
Flow Length (ft)	3787
Rain Gage ID	Rain Gage-14

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		184.46	-	79.37
Composite Area & Weighted CN		184.46		79.37

Time of Concentration

Flow Length (ft)	3787
Slope (%)	21.8
Computed TOC (min)	7.98

Subbasin Runoff Results

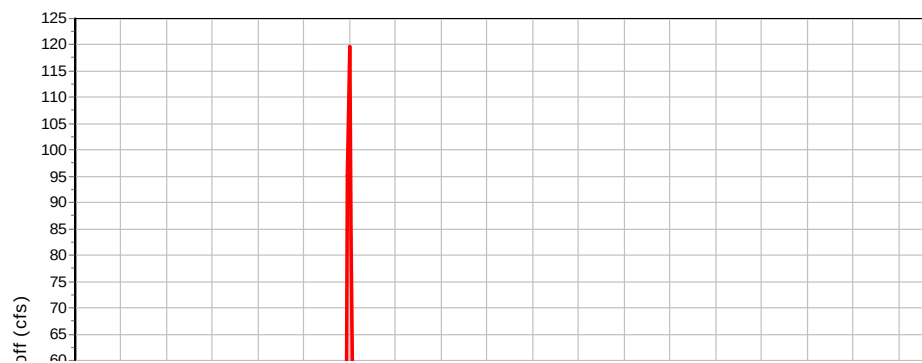
Total Rainfall (in)	1.9
Total Runoff (in)	0.48
Peak Runoff (cfs)	119.72
Weighted Curve Number	79.37
Time of Concentration (days hh:mm:ss)	0 00:07:59

Subbasin : Sub-18

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-19

Input Data

Area (ac)	36.42
Peak Rate Factor	0
Weighted Curve Number	69.67
Average Slope (%)	15.31
Flow Length (ft)	2056
Rain Gage ID	Rain Gage-14

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		45.17	-	69.67
Composite Area & Weighted CN		45.17		69.67

Time of Concentration

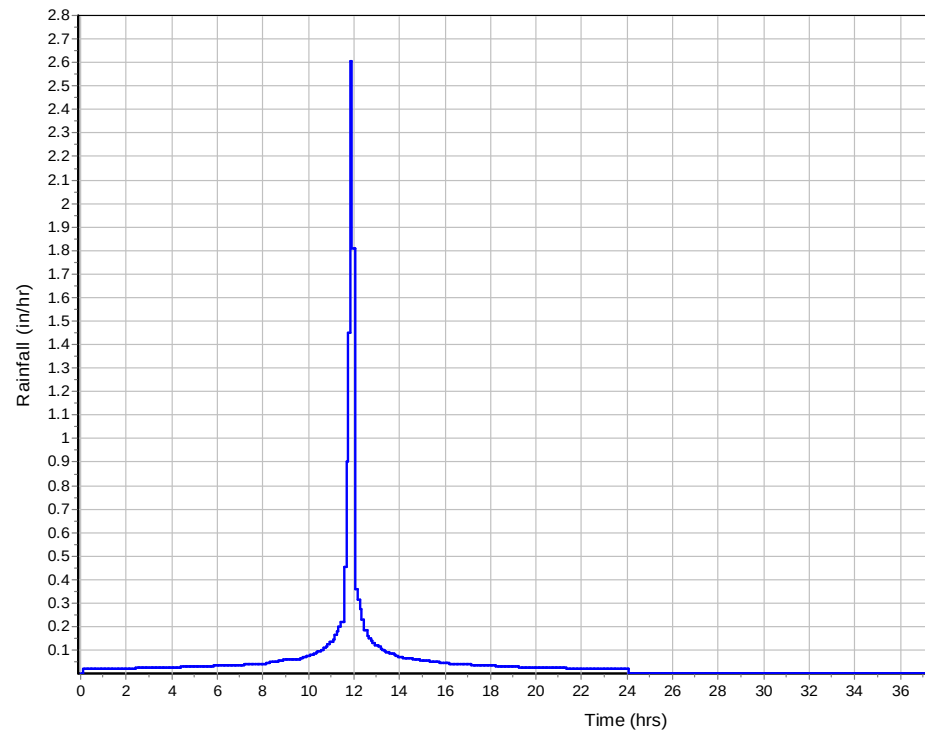
Flow Length (ft)	2056
Slope (%)	15.31
Computed TOC (min)	5.71

Subbasin Runoff Results

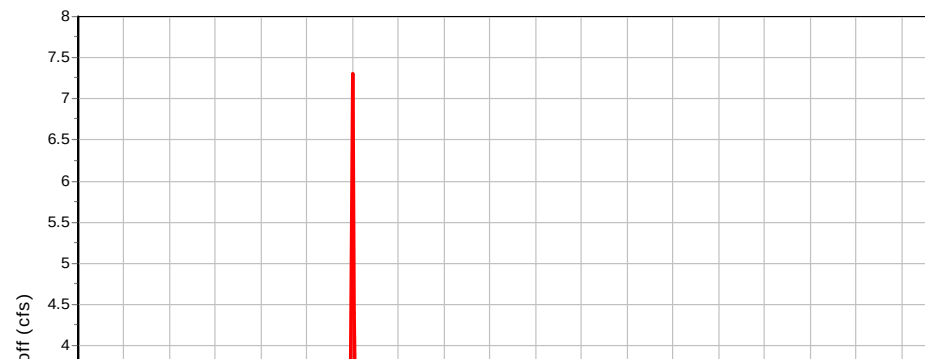
Total Rainfall (in)	1.9
Total Runoff (in)	0.2
Peak Runoff (cfs)	7.88
Weighted Curve Number	69.67
Time of Concentration (days hh:mm:ss)	0 00:05:43

Subbasin : Sub-19

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-20

Input Data

Area (ac)	65.33
Peak Rate Factor	0
Weighted Curve Number	72.52
Average Slope (%)	7.9
Flow Length (ft)	2477
Rain Gage ID	Rain Gage-14

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		65.33	-	72.52
Composite Area & Weighted CN		65.33		72.52

Time of Concentration

Flow Length (ft)	2477
Slope (%)	7.9
Computed TOC (min)	8.51

Subbasin Runoff Results

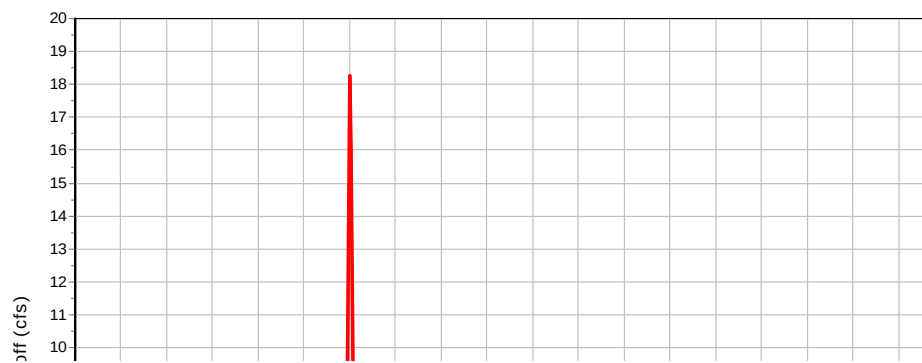
Total Rainfall (in)	1.9
Total Runoff (in)	0.27
Peak Runoff (cfs)	19.65
Weighted Curve Number	72.52
Time of Concentration (days hh:mm:ss)	0 00:08:31

Subbasin : Sub-20

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-21

Input Data

Area (ac)	102.5
Peak Rate Factor	0
Weighted Curve Number	73.57
Average Slope (%)	6.18
Flow Length (ft)	3632
Rain Gage ID	Rain Gage-14

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		102.5	-	73.57
Composite Area & Weighted CN		102.5		73.57

Time of Concentration

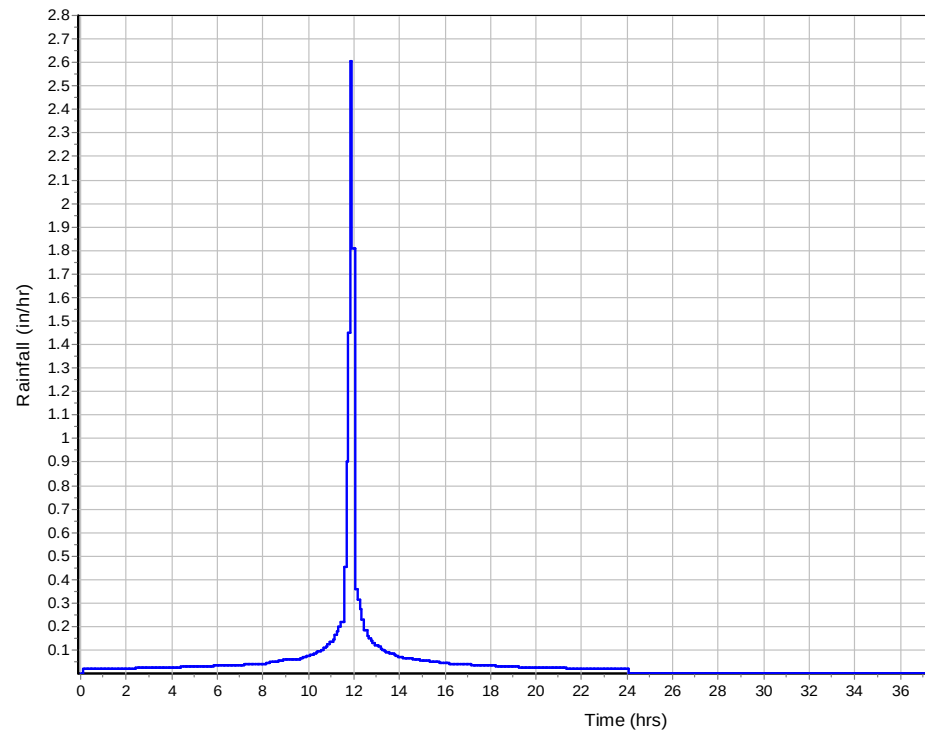
Flow Length (ft)	3632
Slope (%)	6.18
Computed TOC (min)	12.56

Subbasin Runoff Results

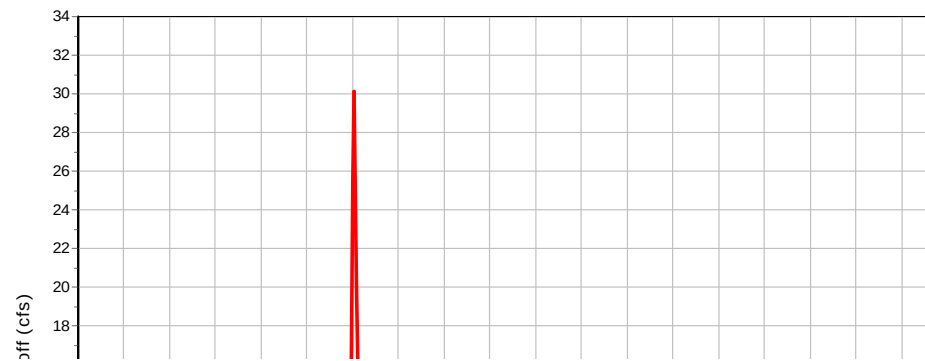
Total Rainfall (in)	1.9
Total Runoff (in)	0.29
Peak Runoff (cfs)	30.94
Weighted Curve Number	73.57
Time of Concentration (days hh:mm:ss)	0 00:12:34

Subbasin : Sub-21

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-22

Input Data

Area (ac)	60.51
Peak Rate Factor	0
Weighted Curve Number	67.7
Average Slope (%)	7.2
Flow Length (ft)	2450
Rain Gage ID	Rain Gage-14

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		60.51	-	67.7
Composite Area & Weighted CN		60.51		67.7

Time of Concentration

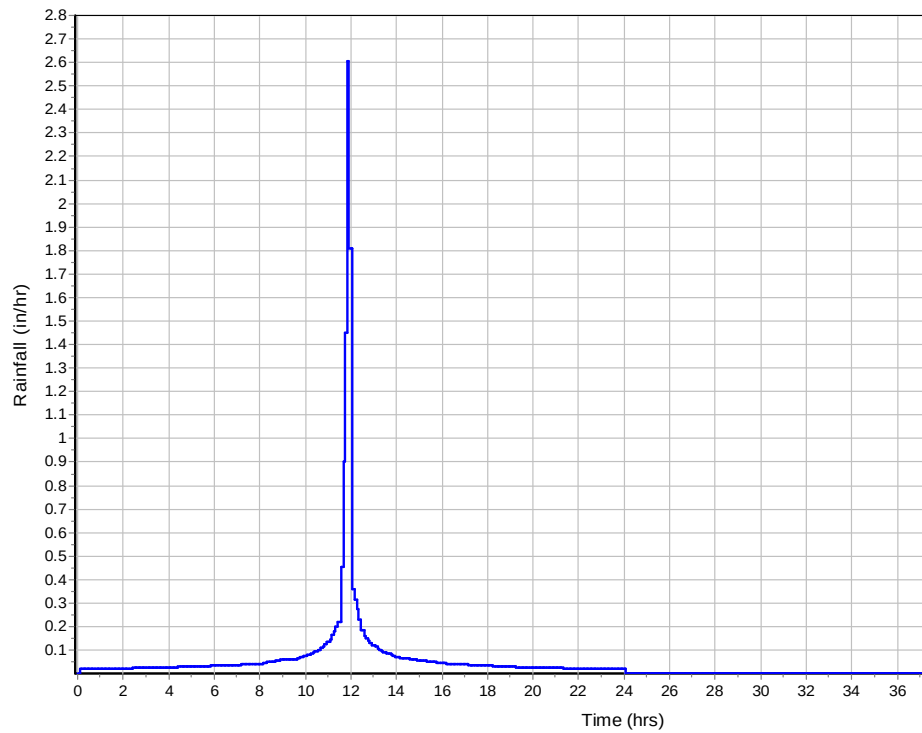
Flow Length (ft)	2450
Slope (%)	7.2
Computed TOC (min)	8.74

Subbasin Runoff Results

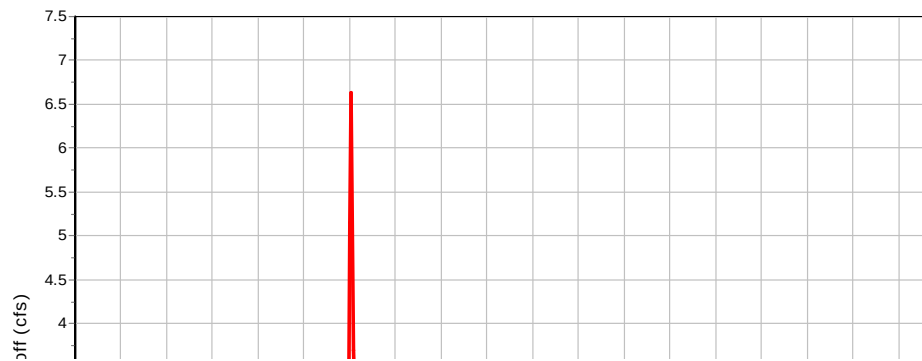
Total Rainfall (in)	1.9
Total Runoff (in)	0.16
Peak Runoff (cfs)	7.31
Weighted Curve Number	67.7
Time of Concentration (days hh:mm:ss)	0 00:08:44

Subbasin : Sub-22

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-23

Input Data

Area (ac)	38.8
Peak Rate Factor	0
Weighted Curve Number	68.69
Average Slope (%)	8.25
Flow Length (ft)	1877
Rain Gage ID	Rain Gage-14

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		38.8	-	68.69
Composite Area & Weighted CN		38.8		68.69

Time of Concentration

Flow Length (ft)	1877
Slope (%)	8.25
Computed TOC (min)	6.76

Subbasin Runoff Results

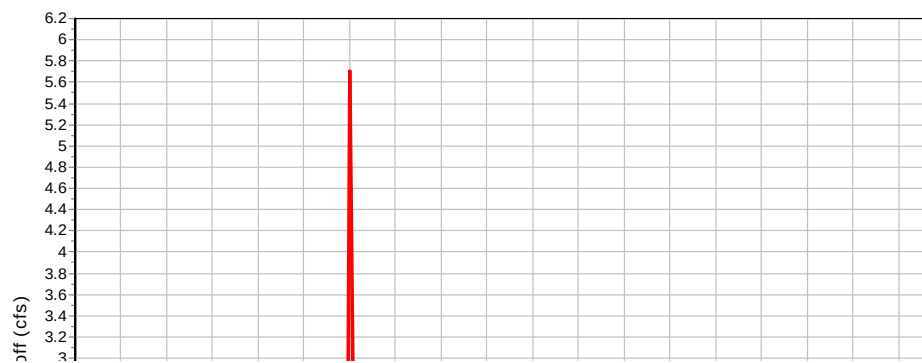
Total Rainfall (in)	1.9
Total Runoff (in)	0.18
Peak Runoff (cfs)	6.6
Weighted Curve Number	68.69
Time of Concentration (days hh:mm:ss)	0 00:06:46

Subbasin : Sub-23

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-24

Input Data

Area (ac)	167.95
Peak Rate Factor	0
Weighted Curve Number	77.73
Average Slope (%)	8
Flow Length (ft)	4521
Rain Gage ID	Rain Gage-14

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		167.95	-	77.73
Composite Area & Weighted CN		167.95		77.73

Time of Concentration

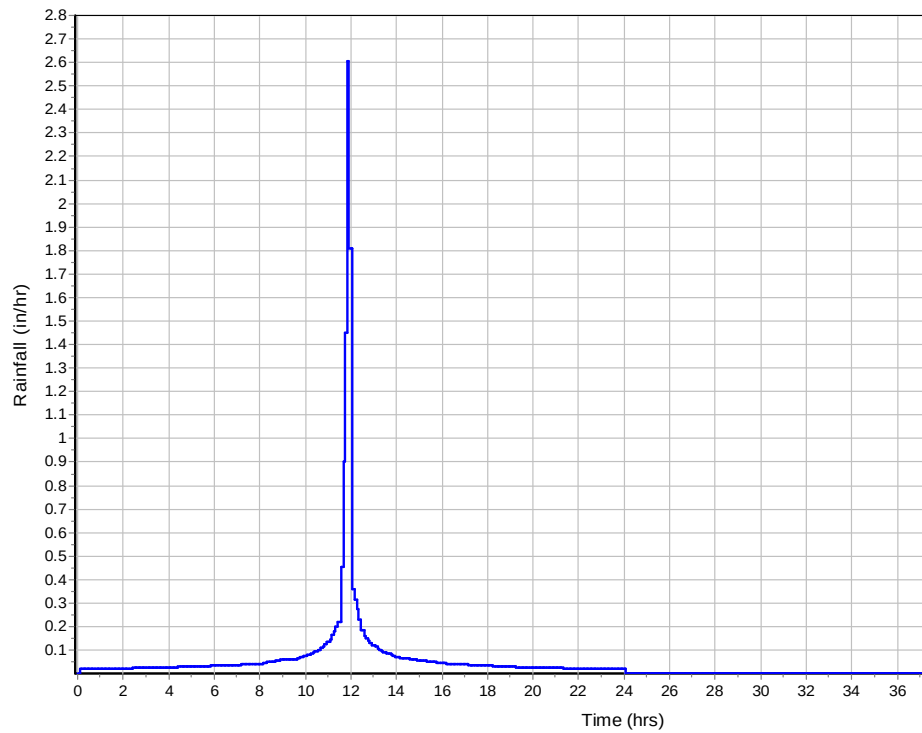
Flow Length (ft)	4521
Slope (%)	8
Computed TOC (min)	13.46

Subbasin Runoff Results

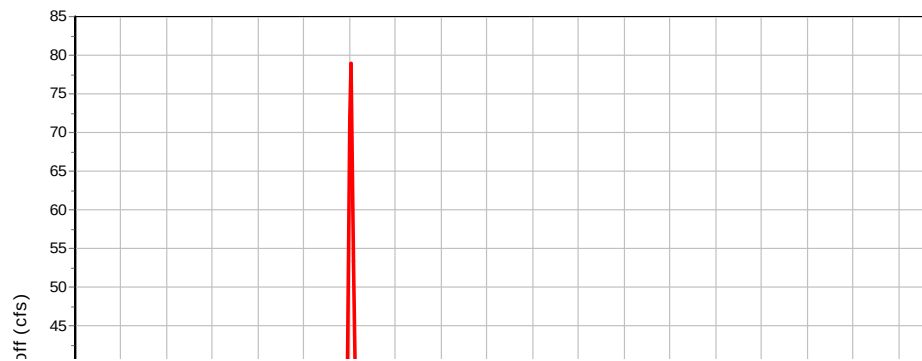
Total Rainfall (in)	1.9
Total Runoff (in)	0.42
Peak Runoff (cfs)	81.4
Weighted Curve Number	77.73
Time of Concentration (days hh:mm:ss)	0 00:13:28

Subbasin : Sub-24

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-25

Input Data

Area (ac)	32.94
Peak Rate Factor	0
Weighted Curve Number	85.3
Average Slope (%)	6.63
Flow Length (ft)	1701
Rain Gage ID	Rain Gage-14

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		32.94	-	85.3
Composite Area & Weighted CN		32.94		85.3

Time of Concentration

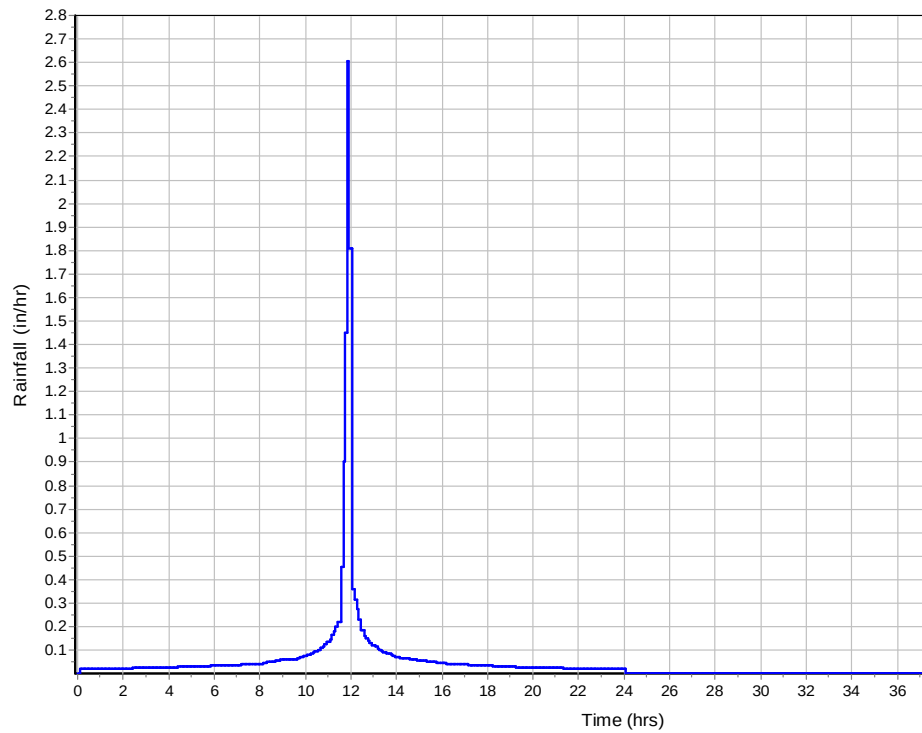
Flow Length (ft)	1701
Slope (%)	6.63
Computed TOC (min)	6.81

Subbasin Runoff Results

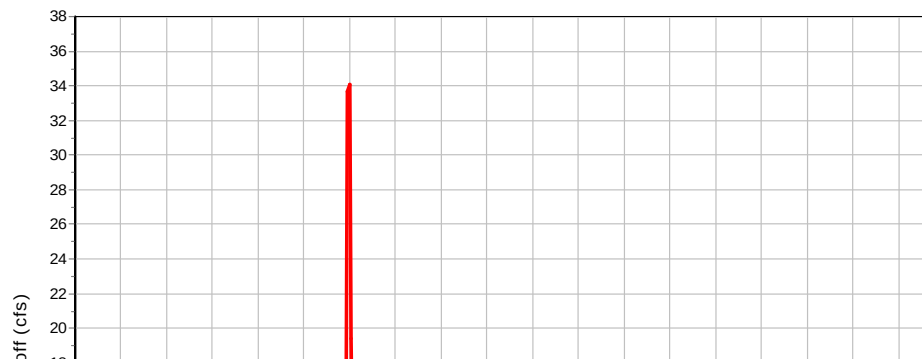
Total Rainfall (in)	1.9
Total Runoff (in)	0.74
Peak Runoff (cfs)	35.96
Weighted Curve Number	85.3
Time of Concentration (days hh:mm:ss)	0 00:06:49

Subbasin : Sub-25

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-26

Input Data

Area (ac)	29.12
Peak Rate Factor	0
Weighted Curve Number	92.35
Average Slope (%)	10
Flow Length (ft)	1580
Rain Gage ID	Rain Gage-14

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		29.12	-	92.35
Composite Area & Weighted CN		29.12		92.35

Time of Concentration

Flow Length (ft)	1580
Slope (%)	10
Computed TOC (min)	5.5

Subbasin Runoff Results

Total Rainfall (in)	1.9
Total Runoff (in)	1.17
Peak Runoff (cfs)	53.2
Weighted Curve Number	92.35
Time of Concentration (days hh:mm:ss)	0 00:05:30

Subbasin : Sub-26

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-27

Input Data

Area (ac)	35.04
Peak Rate Factor	0
Weighted Curve Number	88.4
Average Slope (%)	5.09
Flow Length (ft)	1765
Rain Gage ID	Rain Gage-14

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		35.04	-	88.4
Composite Area & Weighted CN		35.04		88.4

Time of Concentration

Flow Length (ft)	1765
Slope (%)	5.09
Computed TOC (min)	7.76

Subbasin Runoff Results

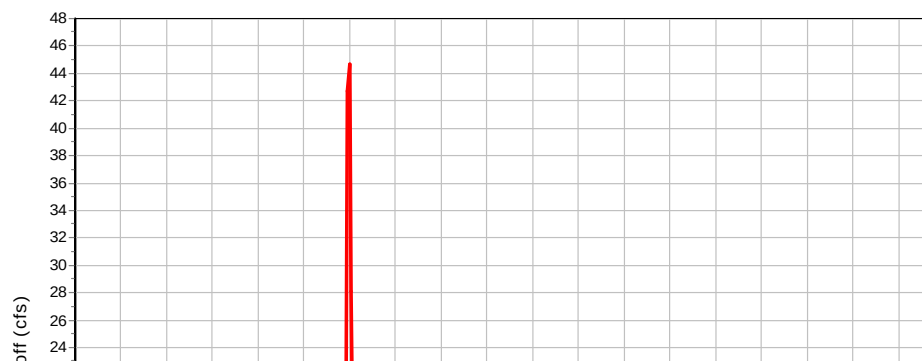
Total Rainfall (in)	1.9
Total Runoff (in)	0.91
Peak Runoff (cfs)	46.55
Weighted Curve Number	88.4
Time of Concentration (days hh:mm:ss)	0 00:07:46

Subbasin : Sub-27

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-28

Input Data

Area (ac)	100.31
Peak Rate Factor	0
Weighted Curve Number	61.8
Average Slope (%)	5.5
Flow Length (ft)	3319
Rain Gage ID	Rain Gage-14

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		100.31	-	61.8
Composite Area & Weighted CN		100.31		61.8

Time of Concentration

Flow Length (ft)	3319
Slope (%)	5.5
Computed TOC (min)	12.25

Subbasin Runoff Results

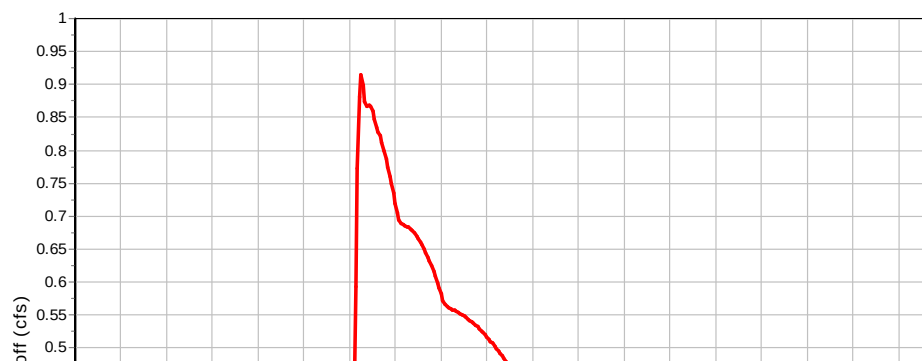
Total Rainfall (in)	1.9
Total Runoff (in)	0.06
Peak Runoff (cfs)	0.91
Weighted Curve Number	61.8
Time of Concentration (days hh:mm:ss)	0 00:12:15

Subbasin : Sub-28

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-29

Input Data

Area (ac)	304.22
Peak Rate Factor	0
Weighted Curve Number	69.63
Average Slope (%)	16.12
Flow Length (ft)	6458
Rain Gage ID	Rain Gage-14

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		304.22	-	69.63
Composite Area & Weighted CN		304.22		69.63

Time of Concentration

Flow Length (ft)	6458
Slope (%)	16.12
Computed TOC (min)	13.52

Subbasin Runoff Results

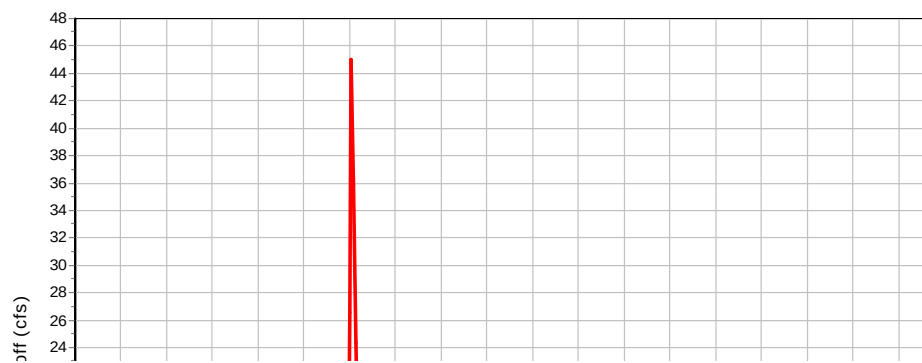
Total Rainfall (in)	1.9
Total Runoff (in)	0.2
Peak Runoff (cfs)	45.23
Weighted Curve Number	69.63
Time of Concentration (days hh:mm:ss)	0 00:13:31

Subbasin : Sub-29

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-30

Input Data

Area (ac)	7.88
Peak Rate Factor	0
Weighted Curve Number	66.1
Average Slope (%)	10
Flow Length (ft)	721
Rain Gage ID	Rain Gage-14

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		7.88	-	66.1
Composite Area & Weighted CN		7.88		66.1

Time of Concentration

Flow Length (ft)	721
Slope (%)	10
Computed TOC (min)	3

Subbasin Runoff Results

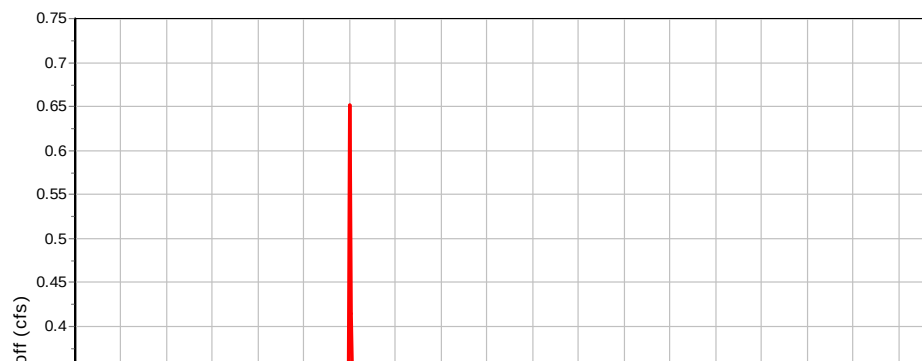
Total Rainfall (in)	1.9
Total Runoff (in)	0.13
Peak Runoff (cfs)	0.79
Weighted Curve Number	66.1
Time of Concentration (days hh:mm:ss)	0 00:03:00

Subbasin : Sub-30

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-31

Input Data

Area (ac)	17.6
Peak Rate Factor	0
Weighted Curve Number	81.93
Average Slope (%)	10
Flow Length (ft)	1168
Rain Gage ID	Rain Gage-14

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		17.6	-	81.93
Composite Area & Weighted CN		17.6		81.93

Time of Concentration

Flow Length (ft)	1168
Slope (%)	10
Computed TOC (min)	4.36

Subbasin Runoff Results

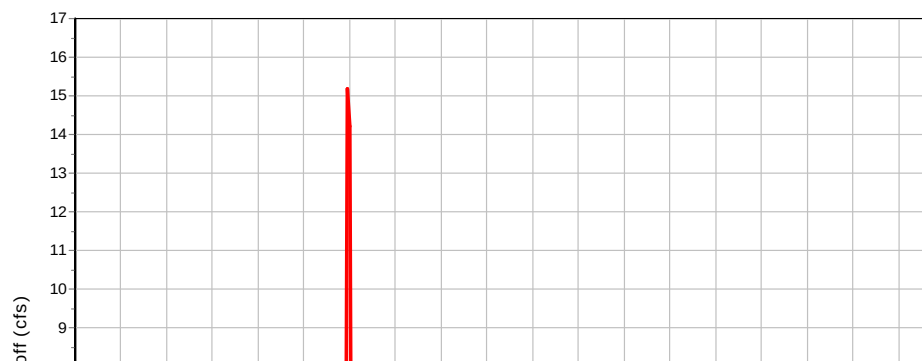
Total Rainfall (in)	1.9
Total Runoff (in)	0.58
Peak Runoff (cfs)	15.51
Weighted Curve Number	81.93
Time of Concentration (days hh:mm:ss)	0 00:04:22

Subbasin : Sub-31

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-38

Input Data

Area (ac)	61.52
Peak Rate Factor	0
Weighted Curve Number	72
Average Slope (%)	0.5
Flow Length (ft)	500
Rain Gage ID	Rain Gage-14

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		61.52	-	72
Composite Area & Weighted CN		61.52		72

Time of Concentration

Flow Length (ft)	500
Slope (%)	0.5
Computed TOC (min)	7.18

Subbasin Runoff Results

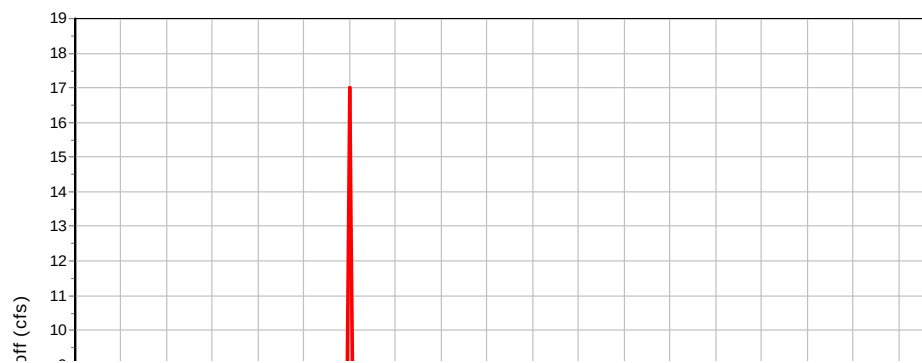
Total Rainfall (in)	1.9
Total Runoff (in)	0.25
Peak Runoff (cfs)	18.01
Weighted Curve Number	72
Time of Concentration (days hh:mm:ss)	0 00:07:11

Subbasin : Sub-38

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-39

Input Data

Area (ac)	4.88
Peak Rate Factor	0
Weighted Curve Number	81.93
Average Slope (%)	0.5
Flow Length (ft)	500
Rain Gage ID	Rain Gage-14

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		4.88	-	81.93
Composite Area & Weighted CN		4.88		81.93

Time of Concentration

Flow Length (ft)	500
Slope (%)	0.5
Computed TOC (min)	7.18

Subbasin Runoff Results

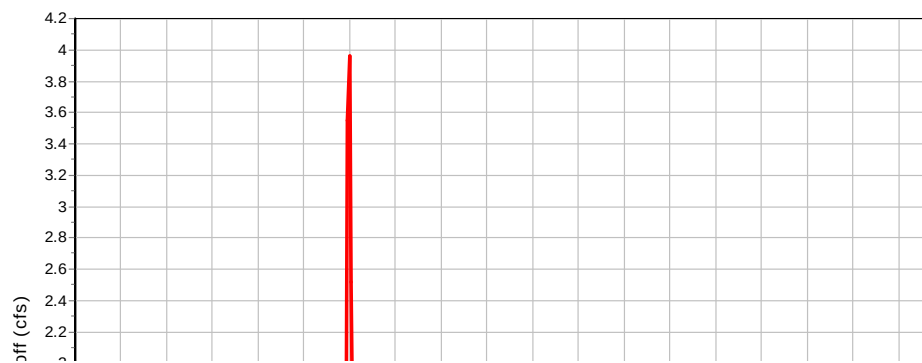
Total Rainfall (in)	1.9
Total Runoff (in)	0.58
Peak Runoff (cfs)	4.02
Weighted Curve Number	81.93
Time of Concentration (days hh:mm:ss)	0 00:07:11

Subbasin : Sub-39

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-40

Input Data

Area (ac)	60.45
Peak Rate Factor	0
Weighted Curve Number	72
Average Slope (%)	0.5
Flow Length (ft)	500
Rain Gage ID	Rain Gage-14

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		60.45	-	72
Composite Area & Weighted CN		60.45		72

Time of Concentration

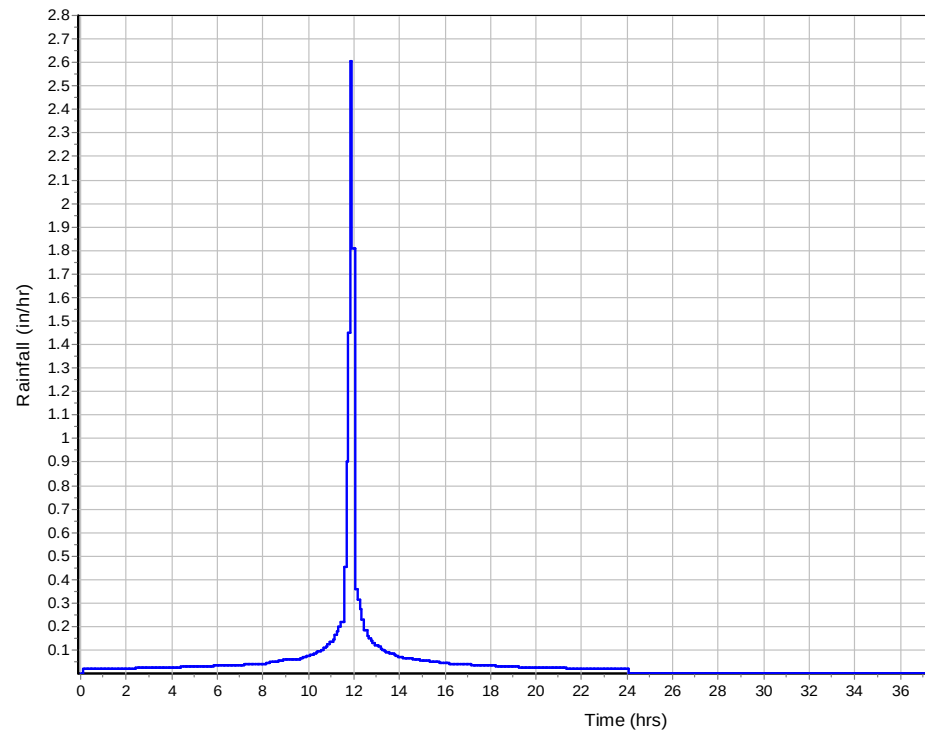
Flow Length (ft)	500
Slope (%)	0.5
Computed TOC (min)	7.18

Subbasin Runoff Results

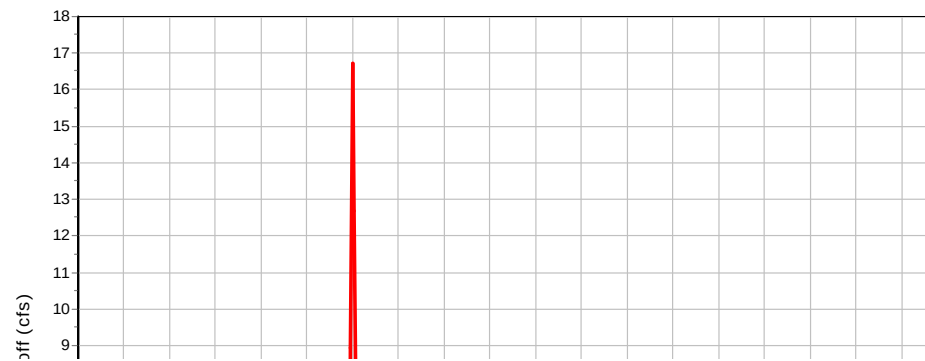
Total Rainfall (in)	1.9
Total Runoff (in)	0.25
Peak Runoff (cfs)	17.7
Weighted Curve Number	72
Time of Concentration (days hh:mm:ss)	0 00:07:11

Subbasin : Sub-40

Rainfall Intensity Graph



Runoff Hydrograph



Junction Input

Element ID	Invert Elevation	Ground/Rim (Max) Elevation	Surcharge Elevation	Surcharge Depth
	(ft)	(ft)	(ft)	(ft)
1	4260.98	4266.98	4266.98	0.00
2	4259.88	4265.88	4265.88	0.00
3	4257.74	4263.74	4263.74	0.00
4	4254.93	4260.93	4260.93	0.00
5	4254.63	4260.63	4260.63	0.00
6	4252.78	4258.78	4258.78	0.00
7	4253.11	4259.11	4259.11	0.00
8	4245.81	4251.81	4251.81	0.00
9	4243.77	4249.77	4249.77	0.00
10	4254.91	4260.91	4260.91	0.00
11	4241.07	4247.07	4247.07	0.00
12	4241.47	4247.47	4247.47	0.00
14	4243.42	4249.42	4249.42	0.00
15	4239.31	4245.31	4245.31	0.00
16	4237.31	4243.31	4243.31	0.00
17	4232.56	4238.56	4238.56	0.00
18	4243.38	4249.38	4249.38	0.00
20	4256.70	4262.70	4262.70	0.00
21	4258.45	4264.45	4264.45	0.00
23	4264.62	4270.62	4270.62	0.00
26	4265.76	4271.76	4271.76	0.00
27	4285.43	4291.43	4291.43	0.00
28	4284.30	4290.30	4290.30	0.00
29	4321.09	4327.09	4327.09	0.00
30	4308.33	4314.33	4314.33	0.00
31	4320.20	4326.00	4326.20	0.20
36	4273.57	4279.57	4279.57	0.00
37	4271.52	4277.52	4277.52	0.00
38	4294.11	4300.11	4300.11	0.00
39	4261.41	4267.41	4267.41	0.00
40	4259.38	4265.38	4265.38	0.00
41	4260.21	4266.21	4266.21	0.00
42	4253.17	4259.17	4259.17	0.00
43	4246.76	4252.76	4252.76	0.00
44	4243.38	4249.38	4249.38	0.00
45	4253.80	4259.80	4259.80	0.00
46	4250.85	4256.85	4256.85	0.00
47	4252.93	4258.93	4258.93	0.00
48	4253.16	4259.16	4259.16	0.00
49	4254.49	4260.49	4260.49	0.00
50	4252.66	4258.66	4258.66	0.00
54	4249.99	4255.99	4255.99	0.00
56	4259.64	4265.64	4265.64	0.00
57	4288.20	4294.20	4294.20	0.00
58	4289.96	4295.96	4295.96	0.00

Junction Input

Element ID	Invert Elevation	Ground/Rim (Max) Elevation	Surcharge Elevation	Surcharge Depth
	(ft)	(ft)	(ft)	(ft)
99	4344.55	4350.55	4350.55	0.00
100	4351.25	4357.25	4357.25	0.00
101	4351.61	4357.61	4357.61	0.00
102	4367.46	4373.46	4373.46	0.00
103	4369.87	4375.87	4375.87	0.00
104	4370.10	4376.10	4376.10	0.00
105	4385.22	4391.22	4391.22	0.00
106	4387.70	4393.70	4393.70	0.00
107	4376.77	4382.77	4382.77	0.00
108	4382.09	4388.09	4388.09	0.00
109	4364.29	4370.29	4370.29	0.00
110	4365.62	4371.62	4371.62	0.00
111	4391.77	4397.77	4397.77	0.00
112	4391.61	4397.61	4397.61	0.00
113	4403.41	4409.41	4409.41	0.00
115	4358.55	4364.55	4364.55	0.00
116	4357.50	4363.50	4363.50	0.00
117	4320.74	4326.74	4326.74	0.00
125	4220.89	4226.89	4226.89	0.00
126	4222.98	4228.98	4228.98	0.00
127	4227.38	4233.38	4233.38	0.00
128	4225.04	4231.04	4231.04	0.00
129	4233.00	4239.00	4239.00	0.00
131	4224.26	4230.26	4230.26	0.00
132	4229.07	4235.07	4235.07	0.00
133	4228.44	4234.44	4234.44	0.00
134	4224.79	4230.79	4230.79	0.00
137	4235.01	4241.01	4241.01	0.00
138	4231.65	4237.65	4237.65	0.00
139	4224.29	4230.29	4230.29	0.00
141	4236.25	4242.25	4242.25	0.00
142	4229.93	4235.93	4235.93	0.00
148	4237.06	4243.06	4243.06	0.00
149	4235.93	4241.93	4241.93	0.00
152	4233.11	4239.11	4239.11	0.00
153	4233.32	4239.32	4239.32	0.00
154	4232.66	4238.66	4238.66	0.00
155	4231.89	4237.89	4237.89	0.00
156	4234.20	4240.20	4240.20	0.00
157	4236.52	4242.52	4242.52	0.00
158	4240.41	4246.41	4246.41	0.00
163	4242.81	4248.81	4248.81	0.00
164	4233.00	4239.00	4239.00	0.00
165	4244.65	4250.65	4250.65	0.00
172	4245.97	4251.97	4251.97	0.00

Junction Input

Element ID	Invert Elevation	Ground/Rim (Max) Elevation	Surcharge Elevation	Surcharge Depth
	(ft)	(ft)	(ft)	(ft)
16-Jun	4240.00	4244.00	4244.00	0.00
18-Jun	4238.00	4242.00	4242.00	0.00
22-Jun	4238.00	4242.00	4242.00	0.00
23-Jun	4326.00	4332.00	4332.00	0.00
24-Jun	4328.00	4334.00	4334.00	0.00
25-Jun	4318.00	4324.00	4324.00	0.00

Junction Results

Element ID	Peak Inflow	Peak Lateral Inflow	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained
	(cfs)	(cfs)	(ft)	(ft)	(ft)
1	0.00	0.00	6.00	4260.98	0.00
2	0.00	0.00	6.00	4259.88	0.00
3	0.63	0.00	5.52	4257.86	0.12
4	3.07	0.00	2.70	4256.74	1.81
5	20.95	0.00	2.40	4256.68	2.05
6	116.48	0.00	0.00	4256.93	4.15
7	20.55	0.00	5.37	4253.54	0.43
8	20.51	0.00	4.30	4247.02	1.21
9	21.49	0.00	4.68	4244.45	0.68
10	115.93	0.00	2.07	4257.04	2.13
11	21.24	11.82	5.86	4241.14	0.07
12	20.51	0.00	2.39	4243.55	2.08
14	0.00	0.00	6.00	4243.42	0.00
15	3.94	3.94	6.00	4239.31	0.00
16	0.00	0.00	6.00	4237.31	0.00
17	4.33	4.33	6.00	4232.56	0.00
18	17.12	5.94	5.97	4243.40	0.02
20	11.57	11.57	4.56	4256.99	0.29
21	0.42	0.00	5.84	4258.59	0.14
23	1.01	0.00	0.00	4269.71	5.09
26	0.59	0.00	1.06	4269.86	4.10
27	0.65	0.00	0.92	4289.62	4.19
28	0.64	0.00	0.00	4289.55	5.25
29	57.58	0.00	0.00	4324.87	3.78
30	121.06	0.00	7.86	4308.57	0.24
31	71.02	0.00	0.00	4324.87	4.67
36	5.86	0.00	4.61	4273.81	0.24
37	5.62	0.00	5.63	4271.57	0.05
38	5.90	5.90	5.70	4294.15	0.04
39	5.59	0.00	4.85	4261.65	0.24
40	69.15	0.00	5.07	4260.06	0.68
41	315.83	0.00	0.00	4264.32	4.11
42	68.96	0.00	4.95	4253.94	0.77
43	72.33	0.00	4.63	4247.81	1.05
44	71.81	0.00	5.98	4243.39	0.01
45	4.14	0.00	5.80	4253.93	0.13
46	155.91	0.00	0.00	4254.72	3.87
47	92.41	0.00	2.60	4254.88	1.95
48	58.44	0.00	0.00	4254.88	1.72
49	23.00	0.00	0.00	4255.41	0.92
50	15.06	14.91	2.33	4254.87	2.21
54	36.83	0.00	5.99	4250.00	0.01
56	11.67	0.00	0.00	4262.59	2.95
57	11.69	0.00	5.14	4288.49	0.29

Junction Results

Element ID	Peak Inflow	Peak Lateral Inflow	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained
	(cfs)	(cfs)	(ft)	(ft)	(ft)
98	0.00	0.00	6.00	4343.15	0.00
99	0.00	0.00	6.00	4344.55	0.00
100	0.00	0.00	6.00	4351.25	0.00
101	0.00	0.00	6.00	4351.61	0.00
102	0.00	0.00	6.00	4367.46	0.00
103	0.00	0.00	6.00	4369.87	0.00
104	0.00	0.00	6.00	4370.10	0.00
105	0.00	0.00	6.00	4385.22	0.00
106	0.00	0.00	6.00	4387.70	0.00
107	0.00	0.00	6.00	4376.77	0.00
108	0.00	0.00	6.00	4382.09	0.00
109	0.00	0.00	6.00	4364.29	0.00
110	0.00	0.00	6.00	4365.62	0.00
111	5.14	0.00	0.00	4397.44	5.67
112	67.00	0.00	0.00	4397.43	5.82
113	107.99	107.99	5.08	4403.53	0.12
115	0.00	0.00	6.00	4358.55	0.00
116	0.00	0.00	6.00	4357.50	0.00
117	0.00	0.00	6.00	4320.74	0.00
125	0.38	0.00	5.49	4221.40	0.51
126	0.83	0.00	5.74	4222.98	0.00
127	0.00	0.00	6.00	4227.38	0.00
128	4.61	0.00	5.69	4225.04	0.00
129	0.00	0.00	5.00	4233.00	0.00
131	11.24	0.00	4.99	4225.21	0.95
132	0.00	0.00	6.00	4229.07	0.00
133	0.00	0.00	6.00	4228.44	0.00
134	1.77	0.00	5.55	4225.21	0.42
137	5.71	5.71	0.00	4235.38	0.37
138	3.42	0.00	5.81	4231.70	0.05
139	2.29	0.00	6.00	4224.29	0.00
141	0.00	0.00	6.00	4236.25	0.00
142	0.73	0.00	4.57	4230.90	0.97
148	62.29	30.10	3.10	4238.98	1.92
149	41.76	0.00	2.68	4238.86	2.93
152	0.00	0.00	6.00	4233.11	0.00
153	0.00	0.00	6.00	4233.32	0.00
154	0.00	0.00	6.00	4232.66	0.00
155	0.00	0.00	6.00	4231.89	0.00
156	0.00	0.00	6.00	4234.20	0.00
157	0.00	0.00	6.00	4236.52	0.00
158	18.27	0.00	0.00	4246.23	5.82
163	18.26	18.26	0.46	4246.30	3.49
164	53.09	0.00	0.00	4238.73	5.73

Junction Results

Element ID	Peak Inflow	Peak Lateral Inflow	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained
	(cfs)	(cfs)	(ft)	(ft)	(ft)
13-Jun	17.00	17.00	4.02	4255.62	0.62
14-Jun	422.40	422.40	10.44	4428.06	1.06
16-Jun	44.98	44.98	0.00	4240.84	0.84
18-Jun	0.91	0.91	3.74	4238.15	0.15
22-Jun	95.34	95.34	0.00	4238.55	0.55
23-Jun	3.96	3.96	5.14	4326.15	0.15
24-Jun	16.71	16.71	3.44	4328.40	0.40
25-Jun	0.00	0.00	6.00	4318.00	0.00

Channel Input

Element ID	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Shape	Height	Width	Manning's Roughness
	(ft)	(ft)	(ft)	(%)		(ft)	(ft)	
Link-100	130.92	4257.74	4254.93	2.1500	Rectangular	1.000	4.000	0.0320
Link-102	511.88	4238.02	4236.07	0.3800	Trapezoidal	2.000	12.000	0.0320
Link-103	545.39	4236.07	4234.71	0.2500	Trapezoidal	2.000	12.000	0.0320
Link-104	323.62	4266.77	4260.21	2.0300	Trapezoidal	6.000	40.000	0.0320
Link-105	198.63	4273.67	4266.77	3.4700	Rectangular	1.000	4.000	0.0320
Link-106	989.28	4278.30	4266.77	1.1700	Trapezoidal	6.000	40.000	0.0320
Link-107	1563.70	4342.86	4278.30	4.1300	Trapezoidal	6.000	40.000	0.0320
Link-108	182.43	4324.88	4314.83	5.5100	Rectangular	1.000	4.000	0.0320
Link-113	76.67	4254.49	4253.16	1.7300	Triangular	1.000	2.000	0.0320
Link-114	384.54	4231.65	4224.29	1.9100	Rectangular	2.000	8.000	0.0320
Link-116	669.92	4231.65	4229.93	0.2600	Rectangular	2.000	8.000	0.0320
Link-120	188.77	4314.83	4300.59	7.5400	Rectangular	1.000	4.000	0.0320
Link-121	237.97	4301.69	4285.53	6.7900	Rectangular	1.000	4.000	0.0320
Link-125	831.47	4321.09	4320.20	0.1100	Rectangular	4.000	16.000	0.0320
Link-126	777.66	4324.88	4320.20	0.6000	Rectangular	4.000	16.000	0.0320
Link-127	137.43	4306.94	4300.27	4.8500	Trapezoidal	1.500	4.750	0.0320
Link-128	325.92	4319.63	4313.24	1.9600	Trapezoidal	1.500	4.750	0.0320
Link-129	534.68	4317.95	4306.99	2.0500	Trapezoidal	1.500	6.250	0.0320
Link-130	1049.21	4324.80	4306.94	1.7000	Trapezoidal	1.500	4.750	0.0320
Link-131	248.61	4317.51	4306.94	4.2500	Trapezoidal	1.500	4.750	0.0320
Link-133	894.32	4351.25	4317.95	3.7200	Trapezoidal	1.500	4.750	0.0320
Link-134	332.99	4326.66	4316.98	2.9100	Trapezoidal	1.500	4.750	0.0320
Link-136	1013.21	4370.10	4344.55	2.5200	Trapezoidal	1.500	6.250	0.0320
Link-139	341.18	4257.65	4255.00	0.7800	Trapezoidal	2.000	12.000	0.0320
Link-141	315.45	4254.91	4252.78	0.6800	Trapezoidal	6.000	42.000	0.0320
Link-142	361.26	4253.11	4245.81	2.0200	Trapezoidal	6.000	42.000	0.0320
Link-143	275.20	4243.77	4241.47	0.8400	Trapezoidal	6.000	42.000	0.0320
Link-144	1367.14	4364.29	4320.74	3.1900	Trapezoidal	1.500	4.750	0.0320
Link-155	1989.83	4244.65	4237.06	0.3800	Rectangular	4.000	16.000	0.0320
Link-156	706.40	4235.93	4233.00	0.4100	Rectangular	4.000	16.000	0.0320
Link-167	639.08	4272.20	4253.83	2.8700	Rectangular	4.000	16.000	0.0320
Link-168	5237.65	4403.41	4272.20	2.5100	Rectangular	2.000	8.000	0.0320
Link-172	5516.13	4254.95	4253.83	0.0200	Rectangular	4.000	16.000	0.0320
Link-173	156.21	4236.27	4236.07	0.1300	Trapezoidal	2.000	12.000	0.0320
Link-174	46.09	4236.47	4236.27	0.4300	Trapezoidal	2.000	12.000	0.0320
Link-175	146.36	4237.62	4236.47	0.7900	Trapezoidal	2.000	12.000	0.0320
Link-177	205.30	4376.77	4369.87	3.3600	Trapezoidal	1.500	4.750	0.0320
Link-178	257.45	4259.38	4253.17	2.4100	Trapezoidal	6.000	40.000	0.0320
Link-179	404.20	4253.17	4246.76	1.5900	Trapezoidal	6.000	40.000	0.0320
Link-180	321.82	4246.76	4243.38	1.0500	Trapezoidal	6.000	40.000	0.0320
Link-181	103.73	4348.99	4342.86	5.9100	Trapezoidal	6.000	40.000	0.0320
Link-184	206.42	4403.41	4391.61	5.7200	Rectangular	2.000	8.000	0.0320
Link-188	1066.88	4252.66	4250.93	0.1600	Trapezoidal	6.000	40.000	0.0320
Link-191	1488.20	4357.50	4320.74	2.4700	Trapezoidal	1.500	4.750	0.0320
Link-192	668.07	4320.74	4313.24	1.1200	Trapezoidal	1.000	4.000	0.0320

Channel Results

Element ID	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	Froude Number	Reported Condition
	(cfs)	(cfs)		(ft/sec)	(ft)		(min)		
Link-100	0.63	20.77	0.03	0.28	0.73	0.74	0.00		
Link-102	6.93	52.82	0.13	1.04	1.52	0.76	0.00		
Link-103	35.83	42.73	0.84	2.56	2.00	1.00	27.00		
Link-104	315.83	2305.79	0.14	3.77	4.12	0.69	0.00		
Link-105	26.74	26.42	1.01	6.71	1.00	1.00	109.00		
Link-106	289.43	1748.40	0.17	7.62	2.38	0.40	0.00		
Link-107	287.88	3290.72	0.09	8.76	2.14	0.36	0.00		
Link-108	34.09	33.27	1.02	8.74	0.97	0.98	0.00		
Link-113	23.00	3.06	7.52	32.49	1.00	1.00	1020.00		
Link-114	2.29	124.52	0.02	2.96	0.10	0.05	0.00		
Link-116	0.73	45.61	0.02	0.63	0.72	0.36	0.00		
Link-120	34.08	38.93	0.88	8.73	0.97	0.98	0.00		
Link-121	34.14	36.94	0.92	8.64	0.99	0.99	0.00		
Link-125	57.58	186.98	0.31	2.14	4.00	1.00	674.00		
Link-126	71.02	443.36	0.16	1.58	2.78	0.71	0.00		
Link-127	0.00	35.28	0.00	0.00	0.75	0.50	0.00		
Link-128	0.00	22.42	0.00	0.00	0.00	0.00	0.00		
Link-129	0.00	30.38	0.00	0.00	0.00	0.00	0.00		
Link-130	0.00	20.89	0.00	0.00	0.00	0.00	0.00		
Link-131	0.00	33.02	0.00	0.00	0.00	0.00	0.00		
Link-133	0.00	30.90	0.00	0.00	0.00	0.00	0.00		
Link-134	0.00	27.30	0.00	0.00	0.00	0.00	0.00		
Link-136	0.00	33.70	0.00	0.00	0.00	0.00	0.00		
Link-139	78.82	75.42	1.05	5.89	1.79	0.90	0.00		
Link-141	116.48	1212.20	0.10	1.83	4.95	0.83	0.00		
Link-142	20.51	2097.02	0.01	2.87	1.16	0.19	0.00		
Link-143	20.51	1348.62	0.02	2.38	2.46	0.41	0.00		
Link-144	0.00	28.58	0.00	0.00	0.00	0.00	0.00		
Link-155	40.25	352.97	0.11	1.78	1.83	0.46	0.00		
Link-156	53.09	368.08	0.14	2.19	3.66	0.92	0.00		
Link-167	32.10	968.96	0.03	1.55	2.11	0.53	0.00		
Link-168	37.67	142.46	0.26	7.18	0.65	0.33	0.00		
Link-172	32.05	81.44	0.39	0.95	4.00	1.00	2081.00		
Link-173	40.85	30.62	1.33	2.78	2.00	1.00	26.00		
Link-174	40.93	56.37	0.73	2.57	2.00	1.00	25.00		
Link-175	41.23	75.86	0.54	3.28	1.87	0.93	0.00		
Link-177	0.00	29.36	0.00	0.00	0.00	0.00	0.00		
Link-178	68.96	2515.27	0.03	5.63	0.99	0.16	0.00		
Link-179	68.92	2039.47	0.03	4.39	1.21	0.20	0.00		
Link-180	71.81	1659.73	0.04	8.83	0.69	0.12	0.00		
Link-181	287.90	3936.98	0.07	12.00	1.69	0.28	0.00		
Link-184	67.00	215.20	0.31	5.74	1.46	0.73	0.00		
Link-188	15.77	257.64	0.06	0.76	3.49	0.58	0.00		
Link-191	0.00	25.17	0.00	0.00	0.00	0.00	0.00		

Pipe Input

Element ID	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	No. of Barrels
Link-01	73.49	4259.88	4259.01	1.1800	CIRCULAR	18.000	18.000	0.0150	1
Link-02	57.56	4265.76	4264.62	1.9800	CIRCULAR	18.000	18.000	0.0120	1
Link-04	57.99	4285.43	4284.30	1.9500	CIRCULAR	18.000	18.000	0.0120	1
Link-06	62.36	4273.57	4271.52	3.2900	CIRCULAR	18.000	18.000	0.0150	1
Link-08	70.65	4275.40	4273.67	2.4500	CIRCULAR	24.000	24.000	0.0150	1
Link-09	61.77	4301.69	4300.59	1.7800	CIRCULAR	30.000	30.000	0.0150	1
Link-10	94.56	4260.21	4259.38	0.8800	CIRCULAR	24.000	24.000	0.0150	2
Link-101	117.25	4254.93	4252.63	1.9600	CIRCULAR	24.000	24.000	0.0150	1
Link-11	76.08	4391.77	4391.61	0.2100	CIRCULAR	18.000	18.000	0.0150	1
Link-118	362.79	4243.42	4239.31	1.1300	CIRCULAR	5.040	5.040	0.0250	1
Link-12	58.38	4387.70	4385.22	4.2500	CIRCULAR	18.000	18.000	0.0120	1
Link-122	353.18	4323.09	4284.30	10.9800	CIRCULAR	5.040	5.040	0.0250	1
Link-13	93.05	4369.87	4367.46	2.5900	CIRCULAR	18.000	18.000	0.0150	1
Link-132	830.12	4345.15	4306.99	4.6000	CIRCULAR	5.040	5.040	0.0250	1
Link-135	1040.61	4385.22	4351.61	3.2300	CIRCULAR	5.040	5.040	0.0250	1
Link-137	1573.65	4367.46	4319.38	3.0600	CIRCULAR	5.040	5.040	0.0250	1
Link-14	45.62	4365.62	4364.29	2.9200	CIRCULAR	18.000	18.000	0.0150	1
Link-16	308.62	4262.88	4253.83	2.9300	CIRCULAR	54.000	54.000	0.0150	1
Link-18	149.37	4312.04	4306.33	3.8200	Arch	105.000	169.080	0.0150	1
Link-19	55.55	4352.27	4348.99	5.9000	Rectangular	78.000	222.000	0.0150	2
Link-197	591.18	4232.84	4231.07	0.3000	Dummy	0.000	0.000	0.0150	1
Link-198	576.46	4232.56	4231.07	0.2600	Dummy	0.000	0.000	0.0150	1
Link-199	488.43	4239.31	4231.07	1.6900	Dummy	0.000	0.000	0.0150	1
Link-20	52.53	4373.93	4373.08	1.6200	Rectangular	156.000	483.960	0.0150	1
Link-201	622.26	4249.99	4245.99	0.6400	Dummy	0.000	0.000	0.0150	1
Link-202	951.90	4243.38	4241.07	0.2400	Dummy	0.000	0.000	0.0150	1
Link-203	88.02	4257.63	4254.91	3.0900	Rectangular	72.000	36.000	0.0150	1
Link-206	641.76	4224.29	4220.72	0.5600	Dummy	0.000	0.000	0.0150	1
Link-208	145.66	4237.00	4236.25	0.5100	CIRCULAR	18.000	18.000	0.0150	1
Link-21	159.10	4337.85	4324.88	8.1500	Rectangular	30.000	48.000	0.0150	2
Link-210	737.37	4241.07	4239.07	0.2700	Dummy	0.000	0.000	0.0150	1
Link-213	435.76	4253.80	4250.85	0.6800	CIRCULAR	18.000	18.000	0.0150	1
Link-214	702.85	4243.38	4241.07	0.3300	Dummy	0.000	0.000	0.0150	1
Link-216	322.19	4300.00	4293.00	2.1700	CIRCULAR	18.000	18.000	0.0150	1
Link-217	187.21	4234.00	4233.00	0.5300	CIRCULAR	24.000	24.000	0.0150	1
Link-218	276.75	4228.00	4227.00	0.3600	Dummy	0.000	0.000	0.0150	1
Link-225	309.97	4427.00	4422.00	1.6100	Rectangular	156.000	483.960	0.0150	1
Link-226	381.58	4240.00	4238.00	0.5200	CIRCULAR	24.000	24.000	0.0150	1
Link-229	271.20	4238.00	4236.00	0.7400	CIRCULAR	36.000	36.000	0.0150	2
Link-232	434.16	4238.00	4236.00	0.4600	CIRCULAR	36.000	36.000	0.0150	1
Link-233	325.26	4220.72	4220.00	0.2200	CIRCULAR	24.000	24.000	0.0150	1
Link-234	430.94	4231.00	4230.00	0.2300	CIRCULAR	24.000	24.000	0.0150	1
Link-235	181.34	4326.00	4323.00	1.6500	CIRCULAR	24.000	24.000	0.0150	1
Link-236	342.37	4328.00	4326.00	0.5800	CIRCULAR	24.000	24.000	0.0150	1
Link-239	241.85	4290.66	4289.96	0.2900	CIRCULAR	18.000	18.000	0.0150	1

Pipe Input

Element ID	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	No. of Barrels
Link-66	17.51	4252.78	4252.63	0.8600	CIRCULAR	15.000	15.000	0.0150	2
Link-67	18.86	4254.63	4253.11	8.0600	CIRCULAR	15.000	15.000	0.0150	2
Link-68	609.49	4222.98	4220.89	0.3400	CIRCULAR	18.000	18.000	0.0120	1
Link-69	265.21	4227.32	4224.26	1.1500	CIRCULAR	30.000	30.000	0.0120	1
Link-71	306.97	4228.44	4224.79	1.1900	CIRCULAR	30.000	30.000	0.0120	1
Link-72	79.63	4224.79	4224.26	0.6700	CIRCULAR	30.000	30.000	0.0120	1
Link-74	1055.32	4288.20	4259.64	2.7100	CIRCULAR	18.000	18.000	0.0120	1
Link-77	2284.11	4235.01	4231.65	0.1500	CIRCULAR	15.000	15.000	0.0120	1
Link-81	981.52	4237.31	4232.56	0.4800	CIRCULAR	18.000	18.000	0.0120	1
Link-82	140.41	4319.38	4313.24	4.3700	CIRCULAR	18.000	18.000	0.0120	1
Link-83	152.71	4382.09	4376.77	3.4800	CIRCULAR	18.000	18.000	0.0120	1
Link-84	101.06	4227.38	4225.04	2.3200	CIRCULAR	24.000	24.000	0.0120	1
Link-85	474.27	4233.00	4225.04	1.6800	CIRCULAR	24.000	24.000	0.0120	1
Link-86	66.12	4258.45	4256.70	2.6500	CIRCULAR	18.000	18.000	0.0120	1
Link-87	862.25	4256.70	4243.38	1.5400	CIRCULAR	18.000	18.000	0.0120	1
Link-88	106.03	4229.07	4228.44	0.5900	CIRCULAR	30.000	30.000	0.0120	1
Link-92	161.85	4264.62	4258.45	3.8100	CIRCULAR	5.040	5.040	0.0250	1
Link-93	311.25	4285.43	4265.76	6.3200	CIRCULAR	5.040	5.040	0.0250	1

Pipe Results

Element ID	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	Froude Number	Reported Condition
	(cfs)	(cfs)		(ft/sec)	(ft)		(min)		
Link-01	0.00	9.91	0.00	0.00	0.00	0.00	0.00		Calculated
Link-02	1.01	16.01	0.06	3.35	1.50	1.00	1404.00		SURCHARGED
Link-04	0.65	15.89	0.04	0.64	1.50	1.00	1390.00		SURCHARGED
Link-06	5.62	16.51	0.34	5.33	0.88	0.59	0.00		Calculated
Link-08	34.92	30.68	1.14	13.33	2.00	1.00	100.00		SURCHARGED
Link-09	34.08	47.44	0.72	9.36	1.74	0.70	0.00		Calculated
Link-10	68.05	36.74	1.85	13.83	1.46	0.73	0.00		> CAPACITY
Link-101	3.07	9.92	0.31	2.29	2.00	1.00	359.00		SURCHARGED
Link-11	5.14	4.17	1.23	2.91	1.50	1.00	2161.00		SURCHARGED
Link-118	0.00	0.19	0.00	0.00	0.00	0.00	0.00		Calculated
Link-12	0.00	23.45	0.00	0.00	0.00	0.00	0.00		Calculated
Link-122	0.64	0.59	1.08	5.08	0.42	1.00	1283.00		SURCHARGED
Link-13	0.00	14.65	0.00	0.00	0.00	0.00	0.00		Calculated
Link-132	0.00	0.38	0.00	0.00	0.00	0.00	0.00		Calculated
Link-135	0.00	0.32	0.00	0.00	0.00	0.00	0.00		Calculated
Link-137	0.00	0.31	0.00	0.00	0.00	0.00	0.00		Calculated
Link-14	0.00	15.54	0.00	0.00	0.00	0.00	0.00		Calculated
Link-16	0.00	291.85	0.00	0.00	2.25	0.50	0.00		Calculated
Link-18	121.06	2879.79	0.04	8.17	1.51	0.17	0.00		Calculated
Link-19	287.90	10392.36	0.03	4.48	1.73	0.27	0.00		Calculated
Link-197	26.99	0.00	0.00	0.00	0.00	0.00	0.00		Calculated
Link-198	4.33	0.00	0.00	0.00	0.00	0.00	0.00		Calculated
Link-199	3.94	0.00	0.00	0.00	0.00	0.00	0.00		Calculated
Link-20	411.21	19102.63	0.02	7.20	1.42	0.11	0.00		Calculated
Link-201	36.83	0.00	0.02	0.00	1.42	0.11	0.00		Calculated
Link-202	71.81	0.00	0.02	0.00	1.42	0.11	0.00		Calculated
Link-203	115.93	313.47	0.37	7.82	4.94	0.82	0.00		Calculated
Link-206	2.29	0.00	0.00	0.00	0.72	0.36	0.00		Calculated
Link-208	0.00	6.53	0.00	0.00	0.00	0.00	0.00		Calculated
Link-21	99.20	474.93	0.21	6.11	2.03	0.84	0.00		Calculated
Link-210	21.24	0.00	0.21	0.00	2.03	0.84	0.00		Calculated
Link-213	4.14	7.49	0.55	4.04	0.85	0.57	0.00		Calculated
Link-214	17.12	0.00	0.55	0.00	0.85	0.57	0.00		Calculated
Link-216	32.67	13.42	2.43	18.49	1.50	1.00	294.00		SURCHARGED
Link-217	0.00	14.33	0.00	0.00	0.00	0.00	0.00		Calculated
Link-218	6.30	0.00	0.00	0.00	0.00	0.00	0.00		Calculated
Link-225	422.30	19072.72	0.02	6.03	1.74	0.13	0.00		Calculated
Link-226	20.07	14.19	1.41	6.39	2.00	1.00	34.00		SURCHARGED
Link-229	0.91	99.28	0.01	1.82	0.23	0.08	0.00		Calculated
Link-232	48.05	39.23	1.22	6.80	3.00	1.00	20.00		SURCHARGED
Link-233	17.86	9.22	1.94	5.68	2.00	1.00	231.00		SURCHARGED
Link-234	0.72	9.44	0.08	1.50	0.42	0.21	0.00		Calculated
Link-235	3.93	25.22	0.16	4.11	0.70	0.35	0.00		Calculated
Link-236	16.71	14.99	1.12	5.32	2.00	1.00	3.00		SURCHARGED

Pipe Results

Element ID	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	Froude Number	Reported Condition
	(cfs)	(cfs)		(ft/sec)	(ft)		(min)		
Link-63	155.91	89.47	1.74	33.13	2.50	1.00	624.00		SURCHARGED
Link-66	20.95	36.40	0.58	8.54	1.25	1.00	717.00		SURCHARGED
Link-67	20.55	31.79	0.65	10.39	0.94	0.75	0.00		Calculated
Link-68	0.38	6.66	0.06	4.00	0.26	0.17	0.00		Calculated
Link-69	11.24	80.67	0.14	8.50	0.48	0.31	0.00		Calculated
Link-71	0.00	48.45	0.00	0.00	0.21	0.09	0.00		Calculated
Link-72	1.77	36.25	0.05	1.90	0.68	0.27	0.00		Calculated
Link-74	11.67	18.72	0.62	8.32	1.18	0.79	0.00		Calculated
Link-77	3.42	2.68	1.27	4.86	0.72	0.58	0.00		> CAPACITY
Link-81	0.00	7.92	0.00	0.00	0.00	0.00	0.00		Calculated
Link-82	0.00	23.80	0.00	0.00	0.00	0.00	0.00		Calculated
Link-83	0.00	21.24	0.00	0.00	0.00	0.00	0.00		Calculated
Link-84	0.00	37.29	0.00	0.00	0.05	0.08	0.00		Calculated
Link-85	4.61	31.75	0.15	10.05	0.07	0.25	0.00		Calculated
Link-86	0.42	18.51	0.02	3.31	0.72	0.48	0.00		Calculated
Link-87	11.19	14.14	0.79	14.49	0.73	0.49	0.00		Calculated
Link-88	0.00	34.25	0.00	0.00	0.00	0.00	0.00		Calculated
Link-92	0.42	0.35	1.19	4.22	0.29	0.69	0.00		> CAPACITY
Link-93	0.52	0.45	1.15	4.53	0.42	1.00	1400.00		SURCHARGED

Storage Nodes

Storage Node : 93

Input Data

Invert Elevation (ft)	4300.27
Max (Rim) Elevation (ft)	4306.27
Max (Rim) Offset (ft)	6.00
Initial Water Elevation (ft)	4300.27
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Output Summary Results

Peak Inflow (cfs)	55.62
Peak Lateral Inflow (cfs)	55.62
Peak Outflow (cfs)	0
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	4305.44
Max HGL Depth Attained (ft)	5.17
Average HGL Elevation Attained (ft)	4304.19
Average HGL Depth Attained (ft)	3.92
Time of Max HGL Occurrence (days hh:mm)	1 01:10
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Storage Node : 140

Input Data

Invert Elevation (ft)	4220.72
Max (Rim) Elevation (ft)	4226.72
Max (Rim) Offset (ft)	6.00
Initial Water Elevation (ft)	4224.72
Initial Water Depth (ft)	4.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Output Summary Results

Peak Inflow (cfs)	71.15
Peak Lateral Inflow (cfs)	70.95
Peak Outflow (cfs)	17.86
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	4224.72
Max HGL Depth Attained (ft)	4
Average HGL Elevation Attained (ft)	4221.64
Average HGL Depth Attained (ft)	0.92
Time of Max HGL Occurrence (days hh:mm)	0 00:00
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Storage Node : Stor-01

Input Data

Invert Elevation (ft)	4241.07
Max (Rim) Elevation (ft)	4247.07
Max (Rim) Offset (ft)	6.00
Initial Water Elevation (ft)	4241.07
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Output Summary Results

Peak Inflow (cfs)	118.46
Peak Lateral Inflow (cfs)	0
Peak Outflow (cfs)	0
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	4243.99
Max HGL Depth Attained (ft)	2.92
Average HGL Elevation Attained (ft)	4242.68
Average HGL Depth Attained (ft)	1.61
Time of Max HGL Occurrence (days hh:mm)	2 00:00
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Storage Node : Stor-02

Input Data

Invert Elevation (ft)	4255.99
Max (Rim) Elevation (ft)	4261.99
Max (Rim) Offset (ft)	6.00
Initial Water Elevation (ft)	4255.99
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Output Summary Results

Peak Inflow (cfs)	36.83
Peak Lateral Inflow (cfs)	0
Peak Outflow (cfs)	0
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	4256.23
Max HGL Depth Attained (ft)	0.24
Average HGL Elevation Attained (ft)	4256.17
Average HGL Depth Attained (ft)	0.18
Time of Max HGL Occurrence (days hh:mm)	2 00:00
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Storage Node : Stor-03

Input Data

Invert Elevation (ft)	4226.72
Max (Rim) Elevation (ft)	4229.00
Max (Rim) Offset (ft)	2.28
Initial Water Elevation (ft)	4226.72
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Output Summary Results

Peak Inflow (cfs)	0.65
Peak Lateral Inflow (cfs)	0.65
Peak Outflow (cfs)	0
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	4226.74
Max HGL Depth Attained (ft)	0.02
Average HGL Elevation Attained (ft)	4226.73
Average HGL Depth Attained (ft)	0.01
Time of Max HGL Occurrence (days hh:mm)	1 00:15
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Storage Node : Stor-04

Input Data

Invert Elevation (ft)	4231.00
Max (Rim) Elevation (ft)	4235.00
Max (Rim) Offset (ft)	4.00
Initial Water Elevation (ft)	4231.00
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Output Summary Results

Peak Inflow (cfs)	16.1
Peak Lateral Inflow (cfs)	15.18
Peak Outflow (cfs)	0.72
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	4231.46
Max HGL Depth Attained (ft)	0.46
Average HGL Elevation Attained (ft)	4231.35
Average HGL Depth Attained (ft)	0.35
Time of Max HGL Occurrence (days hh:mm)	1 00:08
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Project Description

File Name Lake Point Existing 100-Year.SPF

Project Options

Flow Units CFS
Elevation Type Elevation
Hydrology Method SCS TR-55
Time of Concentration (TOC) Method Kirpich
Link Routing Method Hydrodynamic
Enable Overflow Ponding at Nodes YES
Skip Steady State Analysis Time Periods NO

Analysis Options

Start Analysis On 00:00:00 0:00:00
End Analysis On 00:00:00 0:00:00
Start Reporting On 00:00:00 0:00:00
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 00:05:00 days hh:mm:ss
Routing Time Step 30 seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins.....	34
Nodes.....	164
<i>Junctions</i>	148
<i>Outfalls</i>	10
<i>Flow Diversions</i>	0
<i>Inlets</i>	0
<i>Storage Nodes</i>	6
Links.....	145
<i>Channels</i>	56
<i>Pipes</i>	89
<i>Pumps</i>	0
<i>Orifices</i>	0
<i>Weirs</i>	0
<i>Outlets</i>	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage	Data	Data Source	Rainfall	Rain	State	County	Return	Rainfall	Rainfall
	ID	Source	ID	Type	Units			Period	Depth	Distribution
								(years)	(inches)	

Subbasin Summary

Subbasin ID	Area	Peak Rate Factor	Weighted Curve Number	Average Slope	Flow Length	Total Rainfall	Total Runoff	Total Runoff Volume	Peak Runoff	Time of Concentration
	(ac)			(%)	(ft)	(in)	(in)	(ac-in)	(cfs)	(days hh:mm:ss)
Sub-01	36.33	0.00	67.91	7.6700	1806.00	2.72	0.49	17.62	22.83	0 00:06:45
Sub-02	10.35	0.00	73.69	5.8000	849.00	2.72	0.72	7.47	11.00	0 00:05:00
Sub-03	19.64	0.00	71.89	9.7000	1248.00	2.72	0.64	12.61	18.00	0 00:05:00
Sub-04	31.59	0.00	73.69	11.4000	1659.00	2.72	0.72	22.81	33.07	0 00:05:25
Sub-05	23.00	0.00	76.28	12.5500	1371.00	2.72	0.85	19.44	29.59	0 00:05:00
Sub-06	14.99	0.00	75.63	12.5500	4090.00	2.72	0.81	12.19	16.17	0 00:10:28
Sub-07	55.50	0.00	76.52	11.0800	2327.00	2.72	0.86	47.56	67.91	0 00:07:07
Sub-08	103.26	0.00	77.71	11.0800	3377.00	2.72	0.92	94.90	130.19	0 00:09:28
Sub-09	27.76	0.00	77.58	3.0000	1535.00	2.72	0.91	25.32	35.29	0 00:08:32
Sub-10	15.89	0.00	72.48	10.0000	1099.00	2.72	0.67	10.61	15.32	0 00:05:00
Sub-11	200.91	0.00	75.16	3.0000	5034.00	2.72	0.79	158.72	157.78	0 00:21:19
Sub-12	203.25	0.00	78.37	9.9200	5070.00	2.72	0.95	193.90	244.08	0 00:13:31
Sub-13	65.02	0.00	77.98	10.0000	2558.00	2.72	0.93	60.66	85.83	0 00:07:57
Sub-14	137.26	0.00	65.26	10.0000	4006.00	2.72	0.39	53.94	56.48	0 00:11:15
Sub-15	199.89	0.00	71.11	17.3300	5019.00	2.72	0.61	121.73	151.94	0 00:10:49
Sub-16	206.85	0.00	72.72	6.8200	5123.00	2.72	0.68	140.24	156.46	0 00:15:45
Sub-17	270.69	0.00	76.01	19.5900	6020.00	2.72	0.83	225.21	290.12	0 00:11:52
Sub-18	184.46	0.00	79.37	21.8000	3787.00	2.72	1.01	186.12	265.42	0 00:07:58
Sub-19	36.42	0.00	69.67	15.3100	2056.00	2.72	0.55	20.07	27.16	0 00:05:42
Sub-20	65.33	0.00	72.52	7.9000	2477.00	2.72	0.67	43.71	58.56	0 00:08:30
Sub-21	102.50	0.00	73.57	6.1800	3632.00	2.72	0.72	73.39	90.59	0 00:12:33
Sub-22	60.51	0.00	67.70	7.2000	2450.00	2.72	0.48	28.86	35.48	0 00:08:44
Sub-23	38.80	0.00	68.69	8.2500	1877.00	2.72	0.51	19.94	26.17	0 00:06:45
Sub-24	167.95	0.00	77.73	8.0000	4521.00	2.72	0.92	154.51	193.91	0 00:13:27
Sub-25	32.94	0.00	85.30	6.6300	1701.00	2.72	1.38	45.36	68.23	0 00:06:48
Sub-26	29.12	0.00	92.35	10.0000	1580.00	2.72	1.93	56.17	85.88	0 00:05:30
Sub-27	35.04	0.00	88.40	5.0900	1765.00	2.72	1.60	56.13	82.03	0 00:07:45
Sub-28	100.31	0.00	61.80	5.5000	3319.00	2.72	0.29	28.79	23.58	0 00:12:15
Sub-29	304.22	0.00	69.63	16.1200	6458.00	2.72	0.55	167.32	187.20	0 00:13:31
Sub-30	7.88	0.00	66.10	10.0000	721.00	2.72	0.42	3.32	4.34	0 00:05:00
Sub-31	17.60	0.00	81.93	10.0000	1168.00	2.72	1.16	20.38	32.22	0 00:05:00
Sub-38	61.52	0.00	72.00	0.5000	500.00	2.72	0.65	39.80	54.00	0 00:07:10
Sub-39	4.88	0.00	81.93	0.5000	500.00	2.72	1.16	5.65	8.35	0 00:07:10
Sub-40	60.45	0.00	72.00	0.5000	500.00	2.72	0.65	39.11	53.07	0 00:07:10

Subbasin Hydrology

Subbasin : Sub-01

Input Data

Area (ac)	36.33
Peak Rate Factor	0
Weighted Curve Number	67.91
Average Slope (%)	7.67
Flow Length (ft)	1806
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	36.33	-	67.91
Composite Area & Weighted CN	36.33		67.91

Time of Concentration

TOC Method : Kirpich

Sheet Flow Equation :

$T_c = (0.0078 * ((L_f^{0.77}) * (S_f^{-0.385})))$

Where :

- Tc = Time of Concentration (min)
- Lf = Flow Length (ft)
- Sf = Slope (ft/ft)

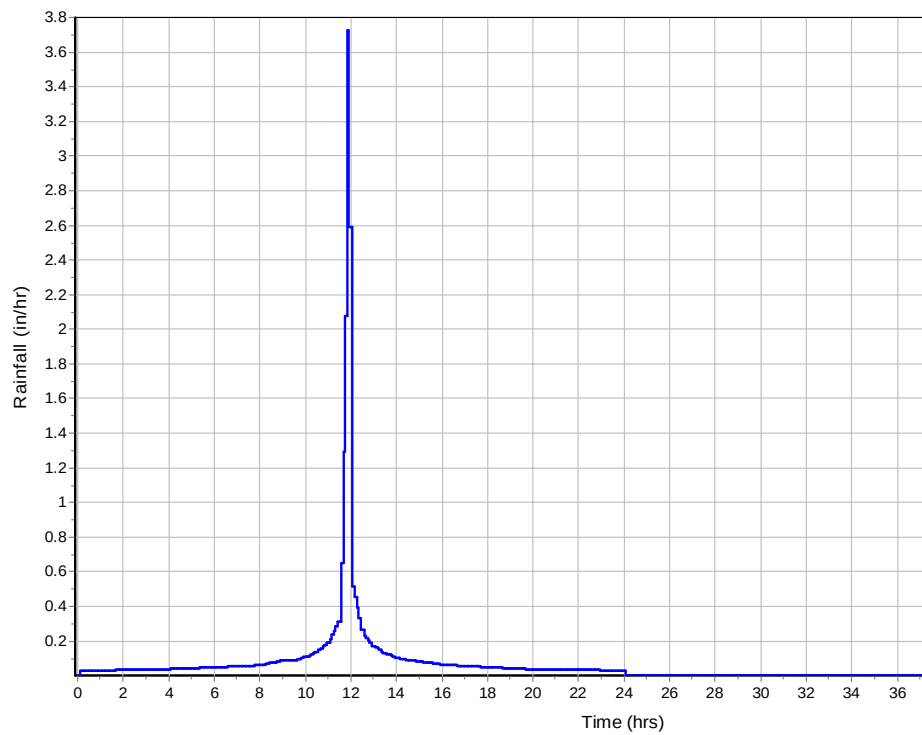
Flow Length (ft)	1806
Slope (%)	7.67
Computed TOC (min)	6.75

Subbasin Runoff Results

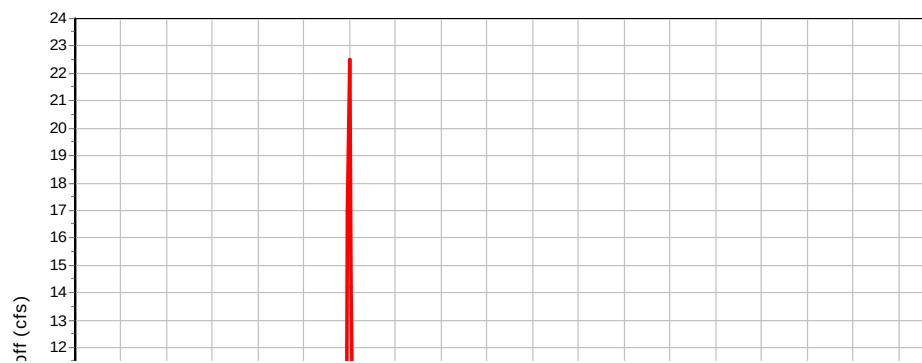
Total Rainfall (in)	2.72
Total Runoff (in)	0.49
Peak Runoff (cfs)	22.83
Weighted Curve Number	67.91
Time of Concentration (days hh:mm:ss)	0 00:06:45

Subbasin : Sub-01

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-02

Input Data

Area (ac)	10.35
Peak Rate Factor	0
Weighted Curve Number	73.69
Average Slope (%)	5.8
Flow Length (ft)	849
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	10.35	-	73.69
Composite Area & Weighted CN	10.35		73.69

Time of Concentration

Flow Length (ft)	849
Slope (%)	5.8
Computed TOC (min)	4.2

Subbasin Runoff Results

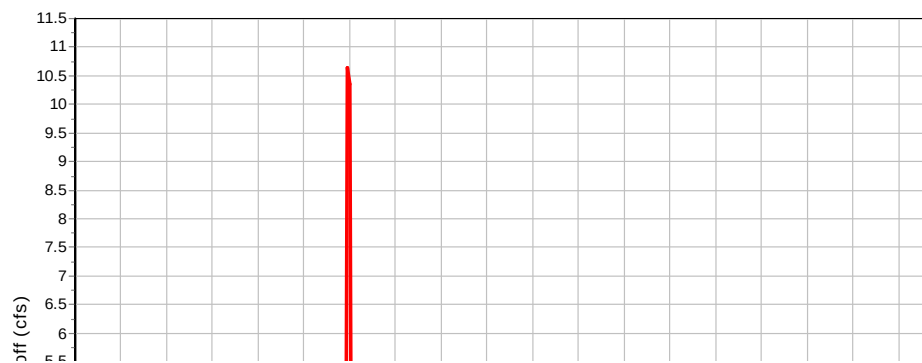
Total Rainfall (in)	2.72
Total Runoff (in)	0.72
Peak Runoff (cfs)	11
Weighted Curve Number	73.69
Time of Concentration (days hh:mm:ss)	0 00:04:12

Subbasin : Sub-02

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-03

Input Data

Area (ac)	19.64
Peak Rate Factor	0
Weighted Curve Number	71.89
Average Slope (%)	9.7
Flow Length (ft)	1248
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	19.64	-	71.89
Composite Area & Weighted CN	19.64		71.89

Time of Concentration

Flow Length (ft)	1248
Slope (%)	9.7
Computed TOC (min)	4.64

Subbasin Runoff Results

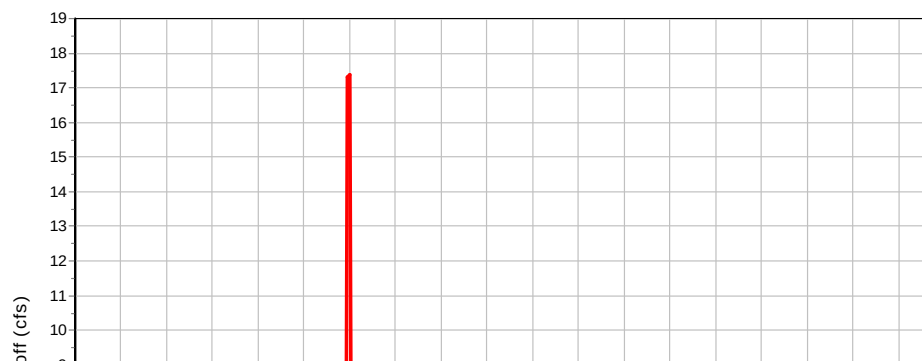
Total Rainfall (in)	2.72
Total Runoff (in)	0.64
Peak Runoff (cfs)	18
Weighted Curve Number	71.89
Time of Concentration (days hh:mm:ss)	0 00:04:38

Subbasin : Sub-03

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-04

Input Data

Area (ac)	31.59
Peak Rate Factor	0
Weighted Curve Number	73.69
Average Slope (%)	11.4
Flow Length (ft)	1659
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	31.59	-	73.69
Composite Area & Weighted CN	31.59		73.69

Time of Concentration

Flow Length (ft)	1659
Slope (%)	11.4
Computed TOC (min)	5.43

Subbasin Runoff Results

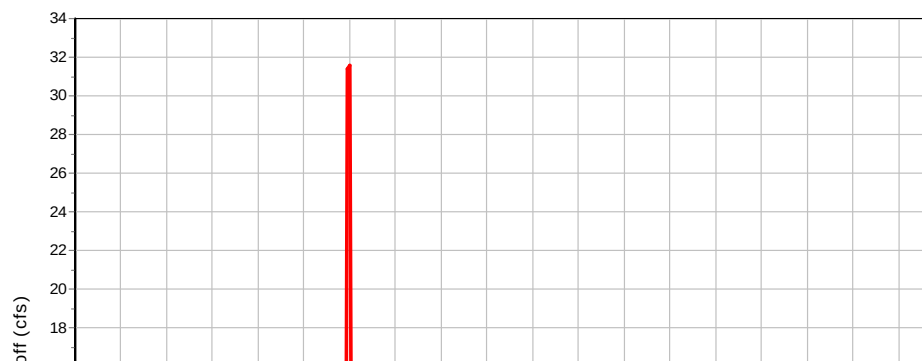
Total Rainfall (in)	2.72
Total Runoff (in)	0.72
Peak Runoff (cfs)	33.07
Weighted Curve Number	73.69
Time of Concentration (days hh:mm:ss)	0 00:05:26

Subbasin : Sub-04

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-05

Input Data

Area (ac) 23
Peak Rate Factor 0
Weighted Curve Number 76.28
Average Slope (%) 12.55
Flow Length (ft) 1371
Rain Gage ID Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	23	-	76.28
Composite Area & Weighted CN	23		76.28

Time of Concentration

Flow Length (ft) 1371
Slope (%) 12.55
Computed TOC (min) 4.51

Subbasin Runoff Results

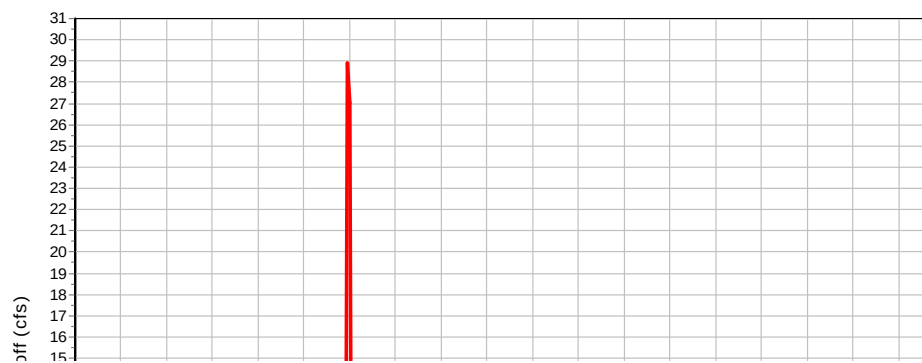
Total Rainfall (in) 2.72
Total Runoff (in) 0.85
Peak Runoff (cfs) 29.59
Weighted Curve Number 76.28
Time of Concentration (days hh:mm:ss) 0 00:04:31

Subbasin : Sub-05

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-06

Input Data

Area (ac)	14.99
Peak Rate Factor	0
Weighted Curve Number	75.63
Average Slope (%)	12.55
Flow Length (ft)	4090
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	14.99	-	75.63
Composite Area & Weighted CN	14.99		75.63

Time of Concentration

Flow Length (ft)	4090
Slope (%)	12.55
Computed TOC (min)	10.47

Subbasin Runoff Results

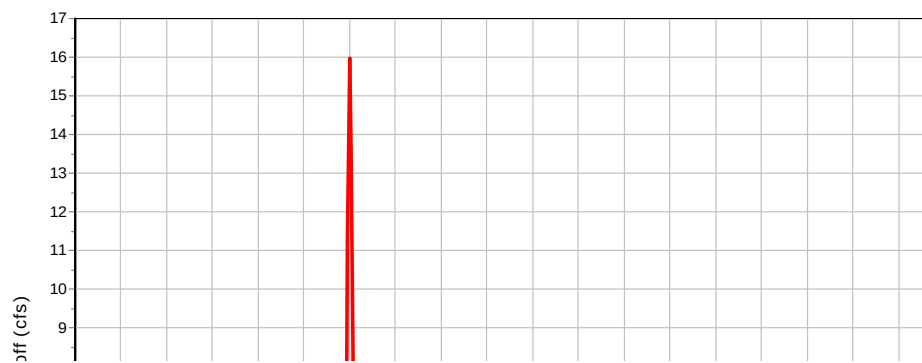
Total Rainfall (in)	2.72
Total Runoff (in)	0.81
Peak Runoff (cfs)	16.17
Weighted Curve Number	75.63
Time of Concentration (days hh:mm:ss)	0 00:10:28

Subbasin : Sub-06

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-07

Input Data

Area (ac)	55.5
Peak Rate Factor	0
Weighted Curve Number	76.52
Average Slope (%)	11.08
Flow Length (ft)	2327
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	55.5	-	76.52
Composite Area & Weighted CN	55.5		76.52

Time of Concentration

Flow Length (ft)	2327
Slope (%)	11.08
Computed TOC (min)	7.12

Subbasin Runoff Results

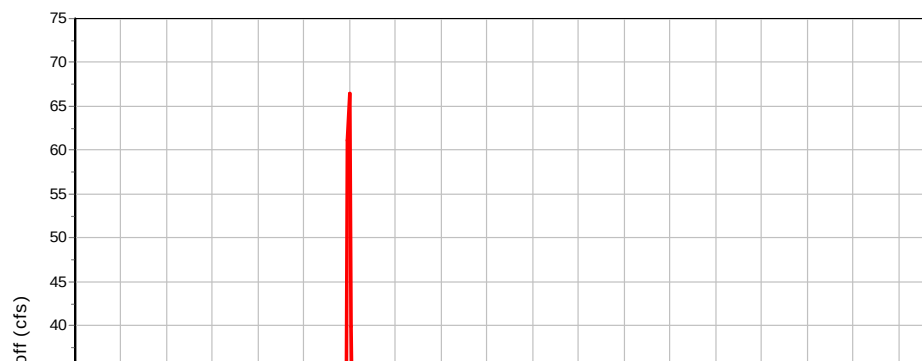
Total Rainfall (in)	2.72
Total Runoff (in)	0.86
Peak Runoff (cfs)	67.91
Weighted Curve Number	76.52
Time of Concentration (days hh:mm:ss)	0 00:07:07

Subbasin : Sub-07

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-08

Input Data

Area (ac)	103.26
Peak Rate Factor	0
Weighted Curve Number	77.71
Average Slope (%)	11.08
Flow Length (ft)	3377
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	103.26	-	77.71
Composite Area & Weighted CN	103.26		77.71

Time of Concentration

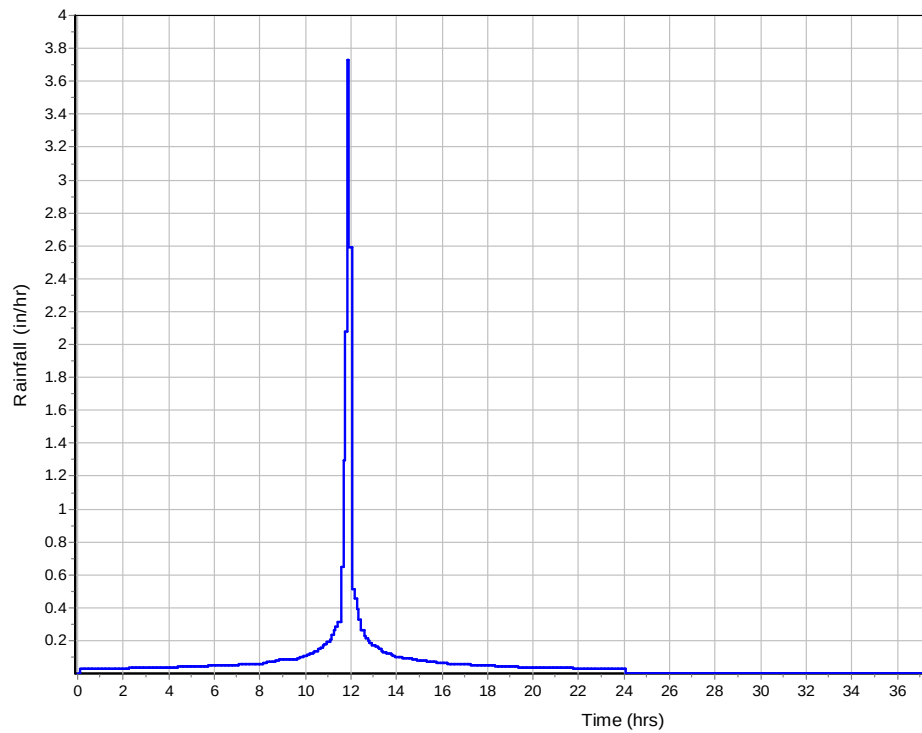
Flow Length (ft)	3377
Slope (%)	11.08
Computed TOC (min)	9.48

Subbasin Runoff Results

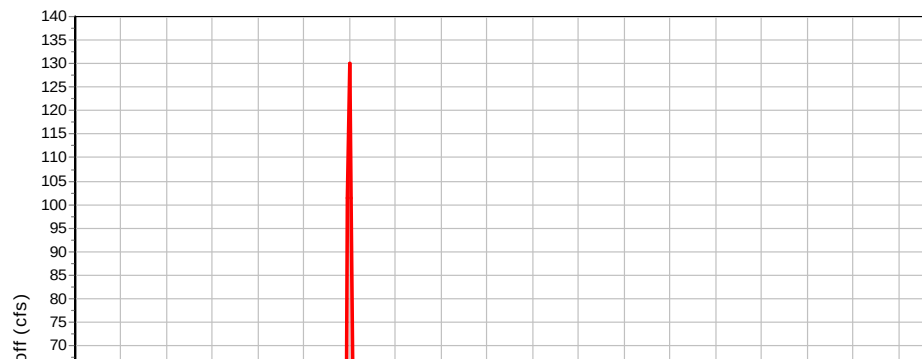
Total Rainfall (in)	2.72
Total Runoff (in)	0.92
Peak Runoff (cfs)	130.19
Weighted Curve Number	77.71
Time of Concentration (days hh:mm:ss)	0 00:09:29

Subbasin : Sub-08

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-09

Input Data

Area (ac)	27.76
Peak Rate Factor	0
Weighted Curve Number	77.58
Average Slope (%)	3
Flow Length (ft)	1535
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	27.76	-	77.58
Composite Area & Weighted CN	27.76		77.58

Time of Concentration

Flow Length (ft)	1535
Slope (%)	3
Computed TOC (min)	8.54

Subbasin Runoff Results

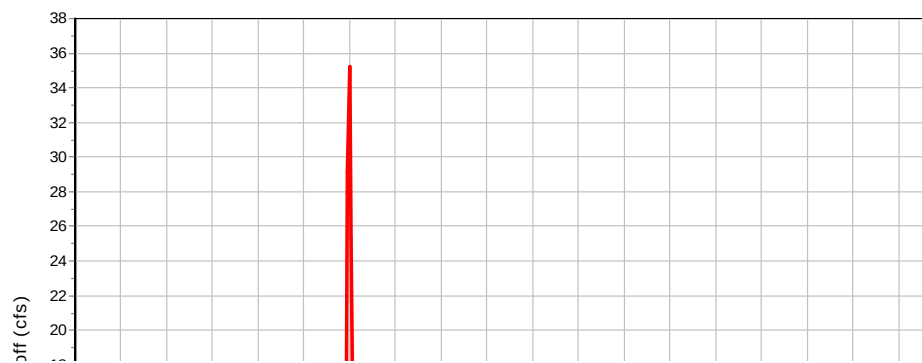
Total Rainfall (in)	2.72
Total Runoff (in)	0.91
Peak Runoff (cfs)	35.29
Weighted Curve Number	77.58
Time of Concentration (days hh:mm:ss)	0 00:08:32

Subbasin : Sub-09

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-10

Input Data

Area (ac)	15.89
Peak Rate Factor	0
Weighted Curve Number	72.48
Average Slope (%)	10
Flow Length (ft)	1099
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	15.89	-	72.48
Composite Area & Weighted CN	15.89		72.48

Time of Concentration

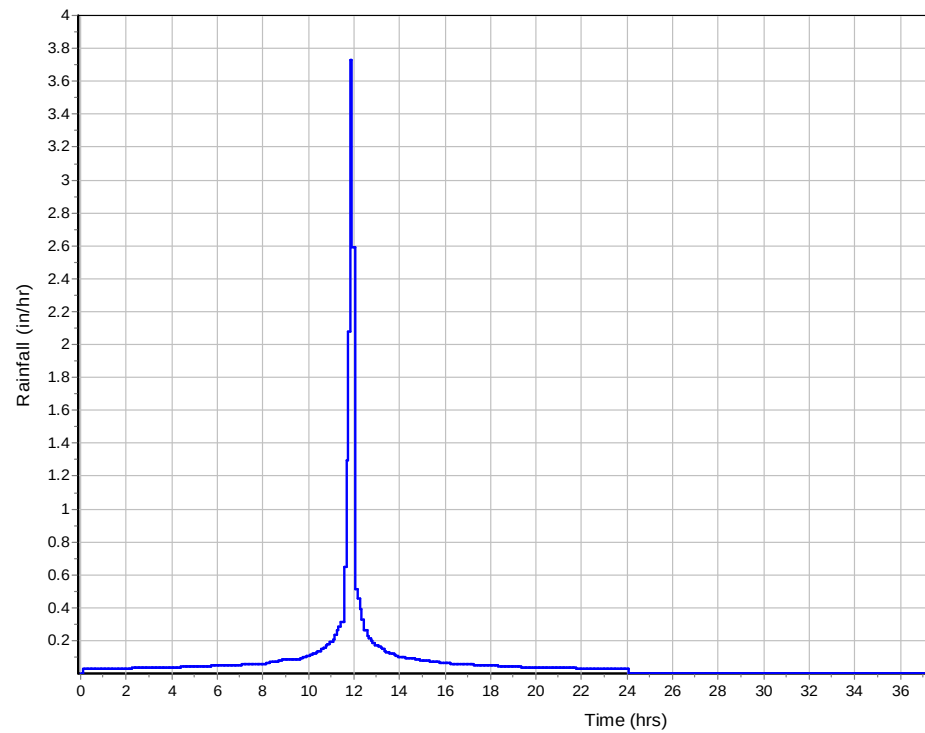
Flow Length (ft)	1099
Slope (%)	10
Computed TOC (min)	4.16

Subbasin Runoff Results

Total Rainfall (in)	2.72
Total Runoff (in)	0.67
Peak Runoff (cfs)	15.32
Weighted Curve Number	72.48
Time of Concentration (days hh:mm:ss)	0 00:04:10

Subbasin : Sub-10

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-11

Input Data

Area (ac)	200.91
Peak Rate Factor	0
Weighted Curve Number	75.16
Average Slope (%)	3
Flow Length (ft)	5034
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		200.91	-	75.16
Composite Area & Weighted CN		200.91		75.16

Time of Concentration

Flow Length (ft)	5034
Slope (%)	3
Computed TOC (min)	21.32

Subbasin Runoff Results

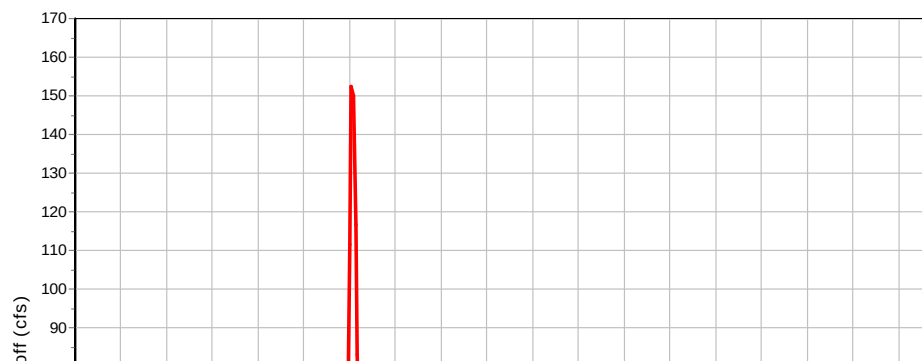
Total Rainfall (in)	2.72
Total Runoff (in)	0.79
Peak Runoff (cfs)	157.78
Weighted Curve Number	75.16
Time of Concentration (days hh:mm:ss)	0 00:21:19

Subbasin : Sub-11

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-12

Input Data

Area (ac)	203.25
Peak Rate Factor	0
Weighted Curve Number	78.37
Average Slope (%)	9.92
Flow Length (ft)	5070
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		203.25	-	78.37
Composite Area & Weighted CN		203.25		78.37

Time of Concentration

Flow Length (ft)	5070
Slope (%)	9.92
Computed TOC (min)	13.53

Subbasin Runoff Results

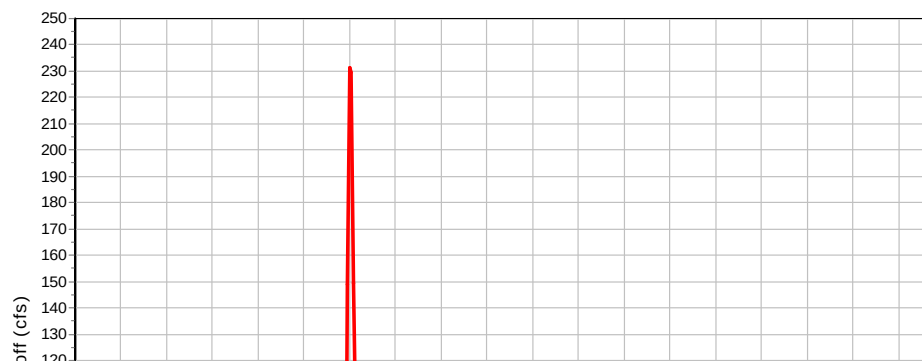
Total Rainfall (in)	2.72
Total Runoff (in)	0.95
Peak Runoff (cfs)	244.08
Weighted Curve Number	78.37
Time of Concentration (days hh:mm:ss)	0 00:13:32

Subbasin : Sub-12

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-13

Input Data

Area (ac)	65.02
Peak Rate Factor	0
Weighted Curve Number	77.98
Average Slope (%)	10
Flow Length (ft)	2558
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		65.02	-	77.98
Composite Area & Weighted CN		65.02		77.98

Time of Concentration

Flow Length (ft)	2558
Slope (%)	10
Computed TOC (min)	7.96

Subbasin Runoff Results

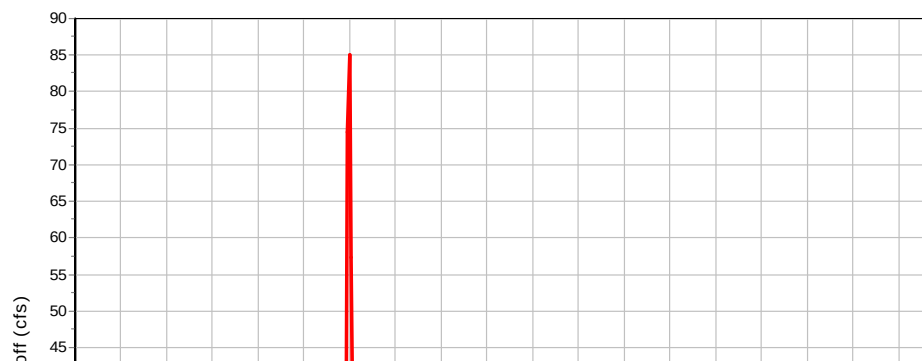
Total Rainfall (in)	2.72
Total Runoff (in)	0.93
Peak Runoff (cfs)	85.83
Weighted Curve Number	77.98
Time of Concentration (days hh:mm:ss)	0 00:07:58

Subbasin : Sub-13

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-14

Input Data

Area (ac)	137.26
Peak Rate Factor	0
Weighted Curve Number	65.26
Average Slope (%)	10
Flow Length (ft)	4006
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		137.26	-	65.26
Composite Area & Weighted CN		137.26		65.26

Time of Concentration

Flow Length (ft)	4006
Slope (%)	10
Computed TOC (min)	11.25

Subbasin Runoff Results

Total Rainfall (in)	2.72
Total Runoff (in)	0.39
Peak Runoff (cfs)	56.48
Weighted Curve Number	65.26
Time of Concentration (days hh:mm:ss)	0 00:11:15

Subbasin : Sub-14

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-15

Input Data

Area (ac)	199.89
Peak Rate Factor	0
Weighted Curve Number	71.11
Average Slope (%)	17.33
Flow Length (ft)	5019
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		199.89	-	71.11
Composite Area & Weighted CN		199.89		71.11

Time of Concentration

Flow Length (ft)	5019
Slope (%)	17.33
Computed TOC (min)	10.83

Subbasin Runoff Results

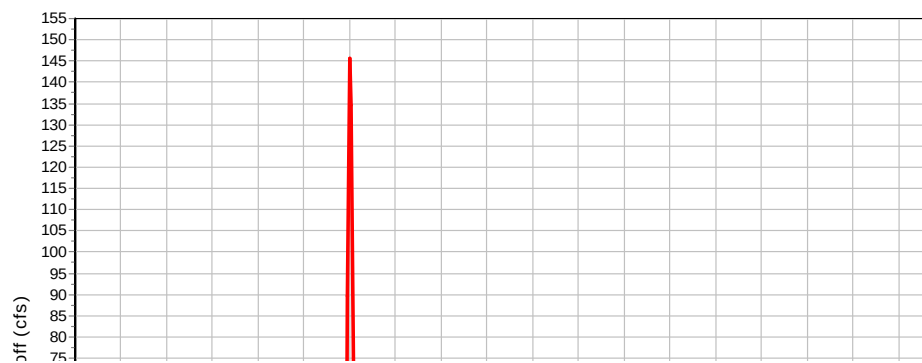
Total Rainfall (in)	2.72
Total Runoff (in)	0.61
Peak Runoff (cfs)	151.94
Weighted Curve Number	71.11
Time of Concentration (days hh:mm:ss)	0 00:10:50

Subbasin : Sub-15

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-16

Input Data

Area (ac)	206.85
Peak Rate Factor	0
Weighted Curve Number	72.72
Average Slope (%)	6.82
Flow Length (ft)	5123
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		206.85	-	72.72
Composite Area & Weighted CN		206.85		72.72

Time of Concentration

Flow Length (ft)	5123
Slope (%)	6.82
Computed TOC (min)	15.75

Subbasin Runoff Results

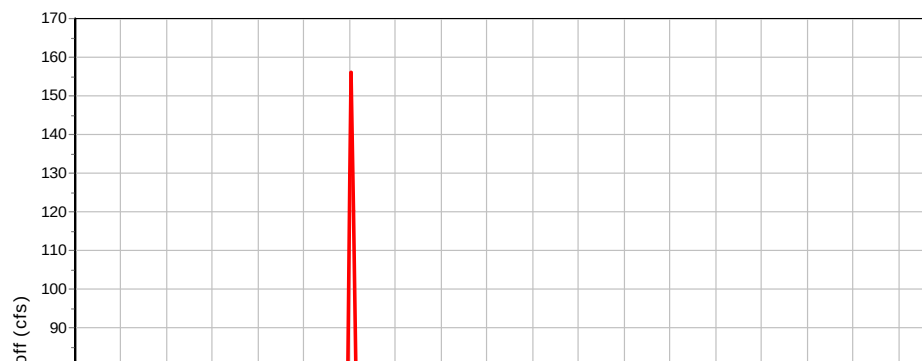
Total Rainfall (in)	2.72
Total Runoff (in)	0.68
Peak Runoff (cfs)	156.46
Weighted Curve Number	72.72
Time of Concentration (days hh:mm:ss)	0 00:15:45

Subbasin : Sub-16

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-17

Input Data

Area (ac)	270.69
Peak Rate Factor	0
Weighted Curve Number	76.01
Average Slope (%)	19.59
Flow Length (ft)	6020
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		270.69	-	76.01
Composite Area & Weighted CN		270.69		76.01

Time of Concentration

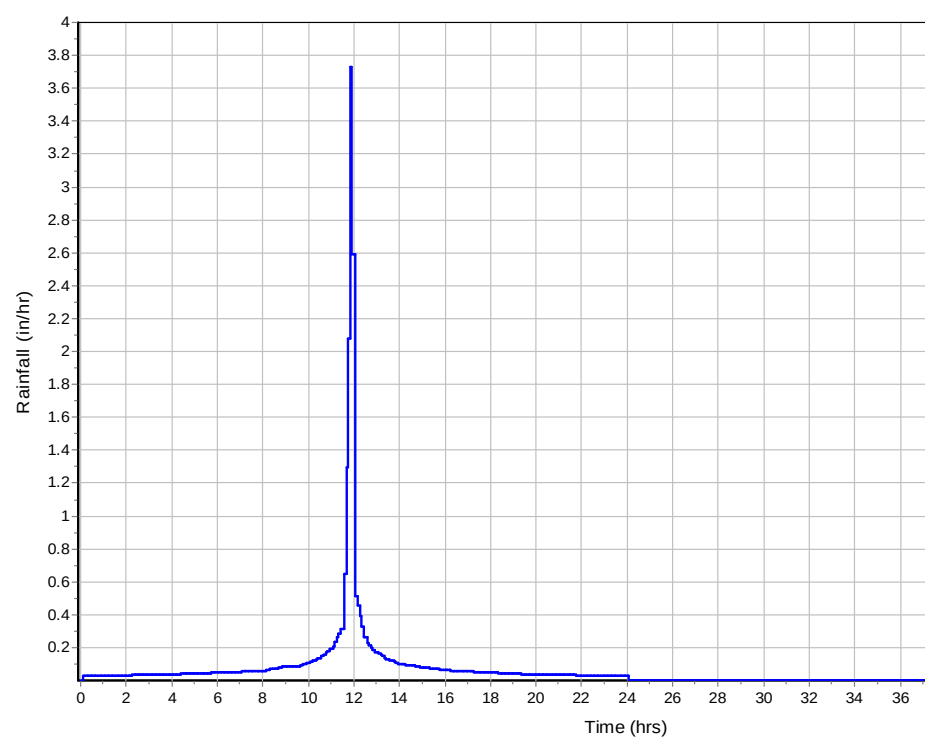
Flow Length (ft)	6020
Slope (%)	19.59
Computed TOC (min)	11.88

Subbasin Runoff Results

Total Rainfall (in)	2.72
Total Runoff (in)	0.83
Peak Runoff (cfs)	290.12
Weighted Curve Number	76.01
Time of Concentration (days hh:mm:ss)	0 00:11:53

Subbasin : Sub-17

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-18

Input Data

Area (ac)	184.46
Peak Rate Factor	0
Weighted Curve Number	79.37
Average Slope (%)	21.8
Flow Length (ft)	3787
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		184.46	-	79.37
Composite Area & Weighted CN		184.46		79.37

Time of Concentration

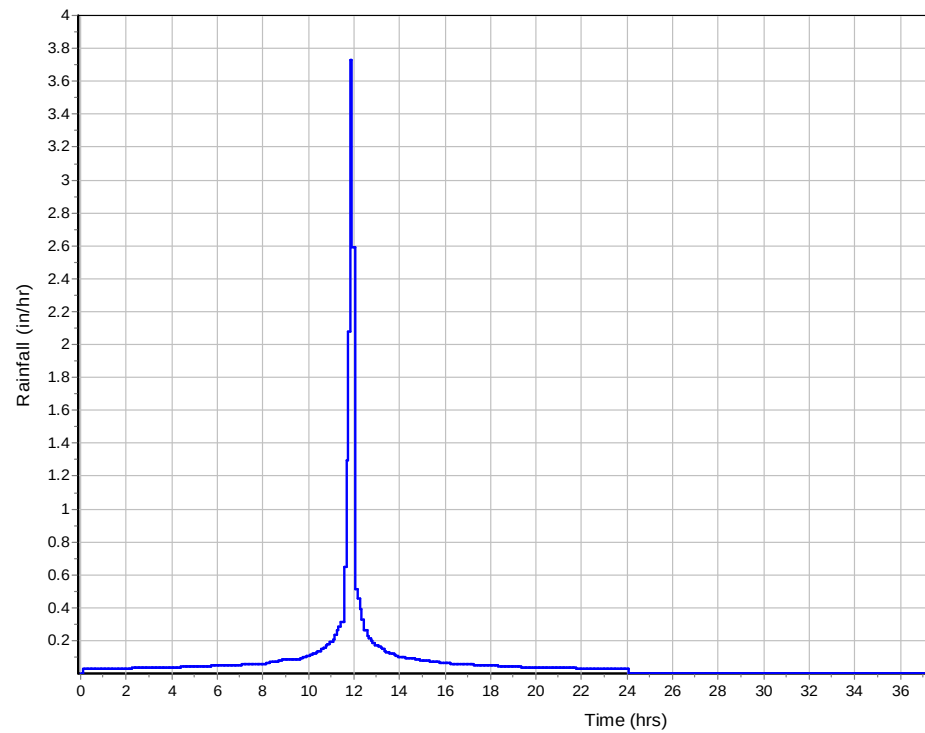
Flow Length (ft)	3787
Slope (%)	21.8
Computed TOC (min)	7.98

Subbasin Runoff Results

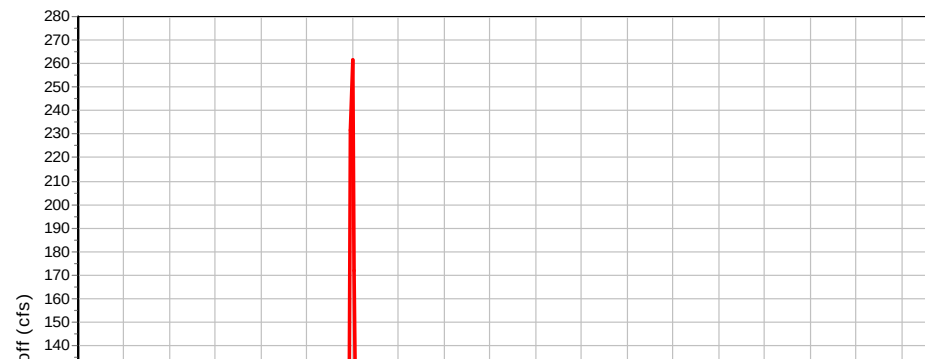
Total Rainfall (in)	2.72
Total Runoff (in)	1.01
Peak Runoff (cfs)	265.42
Weighted Curve Number	79.37
Time of Concentration (days hh:mm:ss)	0 00:07:59

Subbasin : Sub-18

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-19

Input Data

Area (ac)	36.42
Peak Rate Factor	0
Weighted Curve Number	69.67
Average Slope (%)	15.31
Flow Length (ft)	2056
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		45.17	-	69.67
Composite Area & Weighted CN		45.17		69.67

Time of Concentration

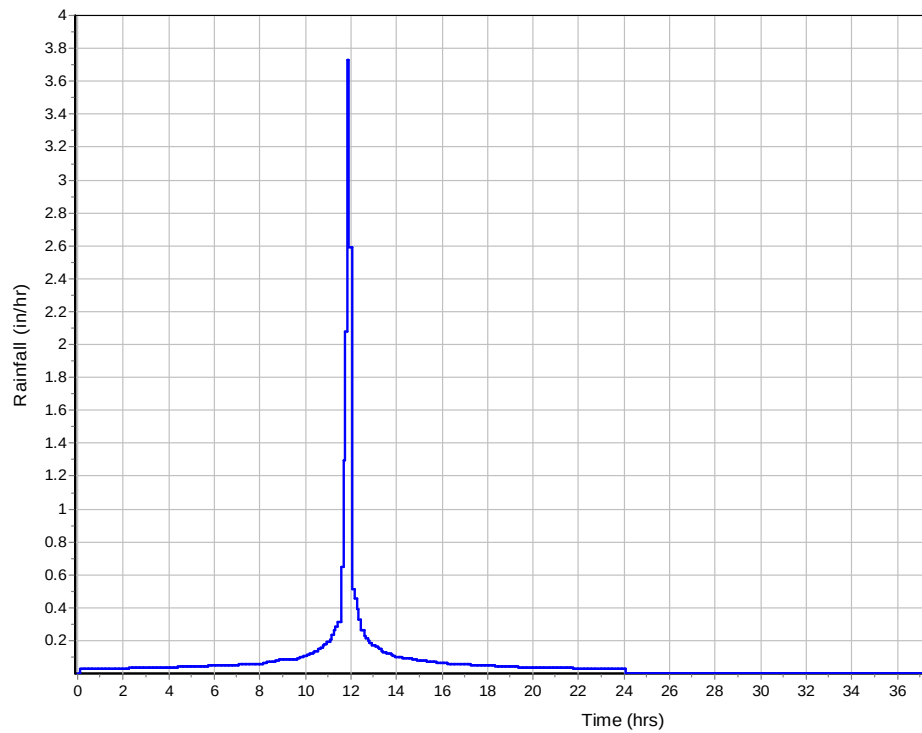
Flow Length (ft)	2056
Slope (%)	15.31
Computed TOC (min)	5.71

Subbasin Runoff Results

Total Rainfall (in)	2.72
Total Runoff (in)	0.55
Peak Runoff (cfs)	27.16
Weighted Curve Number	69.67
Time of Concentration (days hh:mm:ss)	0 00:05:43

Subbasin : Sub-19

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-20

Input Data

Area (ac)	65.33
Peak Rate Factor	0
Weighted Curve Number	72.52
Average Slope (%)	7.9
Flow Length (ft)	2477
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		65.33	-	72.52
Composite Area & Weighted CN		65.33		72.52

Time of Concentration

Flow Length (ft)	2477
Slope (%)	7.9
Computed TOC (min)	8.51

Subbasin Runoff Results

Total Rainfall (in)	2.72
Total Runoff (in)	0.67
Peak Runoff (cfs)	58.56
Weighted Curve Number	72.52
Time of Concentration (days hh:mm:ss)	0 00:08:31

Subbasin : Sub-20

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-21

Input Data

Area (ac)	102.5
Peak Rate Factor	0
Weighted Curve Number	73.57
Average Slope (%)	6.18
Flow Length (ft)	3632
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		102.5	-	73.57
Composite Area & Weighted CN		102.5		73.57

Time of Concentration

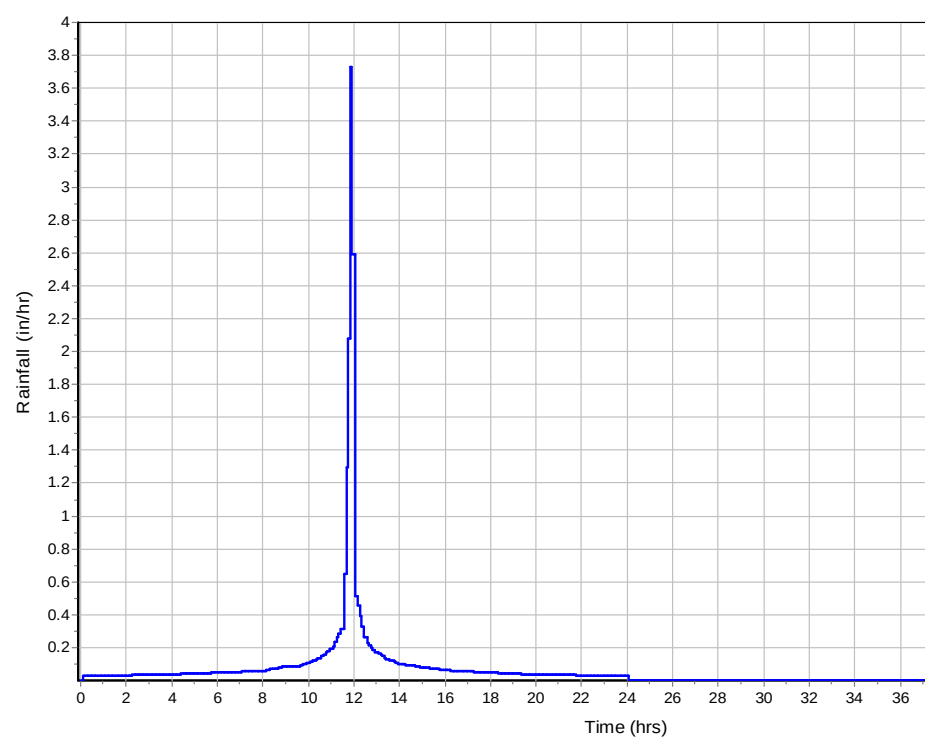
Flow Length (ft)	3632
Slope (%)	6.18
Computed TOC (min)	12.56

Subbasin Runoff Results

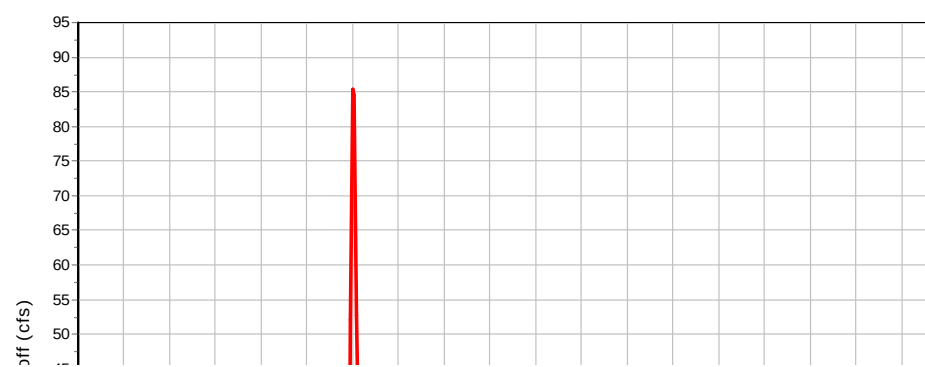
Total Rainfall (in)	2.72
Total Runoff (in)	0.72
Peak Runoff (cfs)	90.59
Weighted Curve Number	73.57
Time of Concentration (days hh:mm:ss)	0 00:12:34

Subbasin : Sub-21

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-22

Input Data

Area (ac)	60.51
Peak Rate Factor	0
Weighted Curve Number	67.7
Average Slope (%)	7.2
Flow Length (ft)	2450
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		60.51	-	67.7
Composite Area & Weighted CN		60.51		67.7

Time of Concentration

Flow Length (ft)	2450
Slope (%)	7.2
Computed TOC (min)	8.74

Subbasin Runoff Results

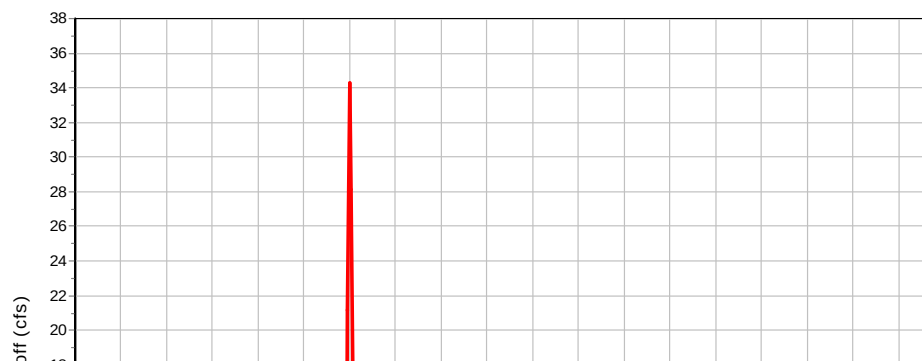
Total Rainfall (in)	2.72
Total Runoff (in)	0.48
Peak Runoff (cfs)	35.48
Weighted Curve Number	67.7
Time of Concentration (days hh:mm:ss)	0 00:08:44

Subbasin : Sub-22

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-23

Input Data

Area (ac)	38.8
Peak Rate Factor	0
Weighted Curve Number	68.69
Average Slope (%)	8.25
Flow Length (ft)	1877
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		38.8	-	68.69
Composite Area & Weighted CN		38.8		68.69

Time of Concentration

Flow Length (ft)	1877
Slope (%)	8.25
Computed TOC (min)	6.76

Subbasin Runoff Results

Total Rainfall (in)	2.72
Total Runoff (in)	0.51
Peak Runoff (cfs)	26.17
Weighted Curve Number	68.69
Time of Concentration (days hh:mm:ss)	0 00:06:46

Subbasin : Sub-23

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-24

Input Data

Area (ac)	167.95
Peak Rate Factor	0
Weighted Curve Number	77.73
Average Slope (%)	8
Flow Length (ft)	4521
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		167.95	-	77.73
Composite Area & Weighted CN		167.95		77.73

Time of Concentration

Flow Length (ft)	4521
Slope (%)	8
Computed TOC (min)	13.46

Subbasin Runoff Results

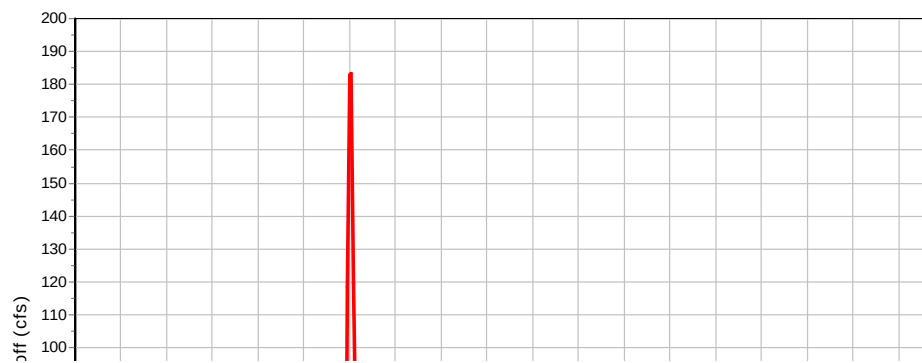
Total Rainfall (in)	2.72
Total Runoff (in)	0.92
Peak Runoff (cfs)	193.91
Weighted Curve Number	77.73
Time of Concentration (days hh:mm:ss)	0 00:13:28

Subbasin : Sub-24

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-25

Input Data

Area (ac)	32.94
Peak Rate Factor	0
Weighted Curve Number	85.3
Average Slope (%)	6.63
Flow Length (ft)	1701
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		32.94	-	85.3
Composite Area & Weighted CN		32.94		85.3

Time of Concentration

Flow Length (ft)	1701
Slope (%)	6.63
Computed TOC (min)	6.81

Subbasin Runoff Results

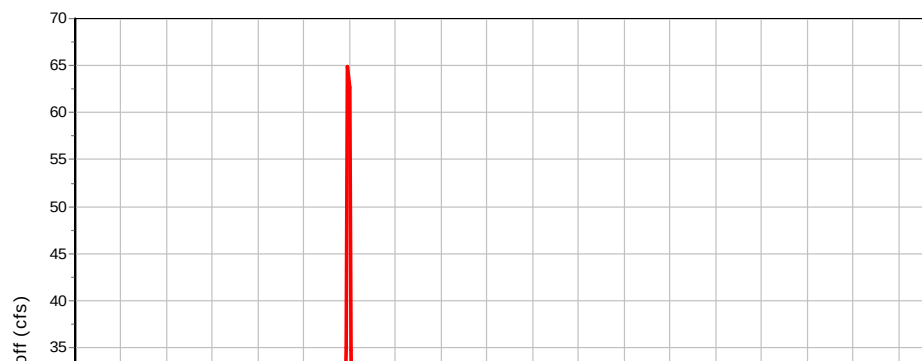
Total Rainfall (in)	2.72
Total Runoff (in)	1.38
Peak Runoff (cfs)	68.23
Weighted Curve Number	85.3
Time of Concentration (days hh:mm:ss)	0 00:06:49

Subbasin : Sub-25

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-26

Input Data

Area (ac)	29.12
Peak Rate Factor	0
Weighted Curve Number	92.35
Average Slope (%)	10
Flow Length (ft)	1580
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		29.12	-	92.35
Composite Area & Weighted CN		29.12		92.35

Time of Concentration

Flow Length (ft)	1580
Slope (%)	10
Computed TOC (min)	5.5

Subbasin Runoff Results

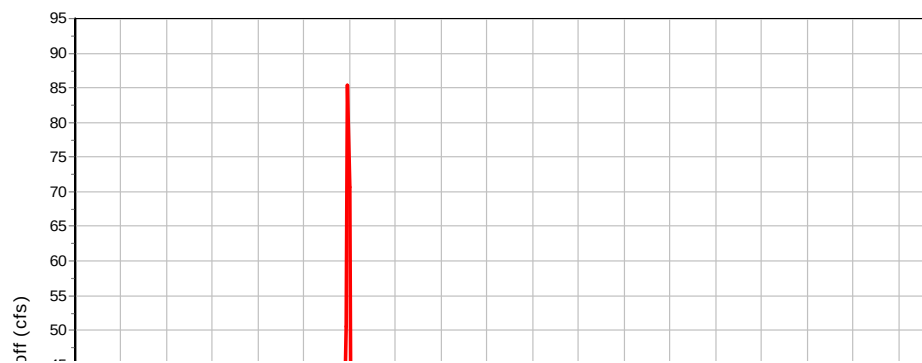
Total Rainfall (in)	2.72
Total Runoff (in)	1.93
Peak Runoff (cfs)	85.88
Weighted Curve Number	92.35
Time of Concentration (days hh:mm:ss)	0 00:05:30

Subbasin : Sub-26

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-27

Input Data

Area (ac)	35.04
Peak Rate Factor	0
Weighted Curve Number	88.4
Average Slope (%)	5.09
Flow Length (ft)	1765
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		35.04	-	88.4
Composite Area & Weighted CN		35.04		88.4

Time of Concentration

Flow Length (ft)	1765
Slope (%)	5.09
Computed TOC (min)	7.76

Subbasin Runoff Results

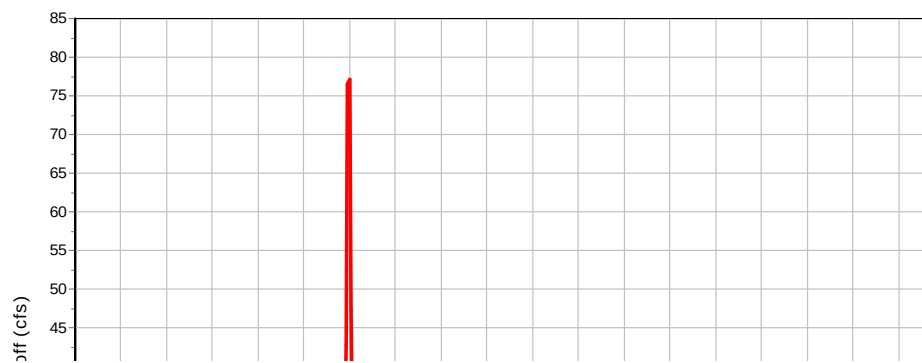
Total Rainfall (in)	2.72
Total Runoff (in)	1.6
Peak Runoff (cfs)	82.03
Weighted Curve Number	88.4
Time of Concentration (days hh:mm:ss)	0 00:07:46

Subbasin : Sub-27

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-28

Input Data

Area (ac)	100.31
Peak Rate Factor	0
Weighted Curve Number	61.8
Average Slope (%)	5.5
Flow Length (ft)	3319
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		100.31	-	61.8
Composite Area & Weighted CN		100.31		61.8

Time of Concentration

Flow Length (ft)	3319
Slope (%)	5.5
Computed TOC (min)	12.25

Subbasin Runoff Results

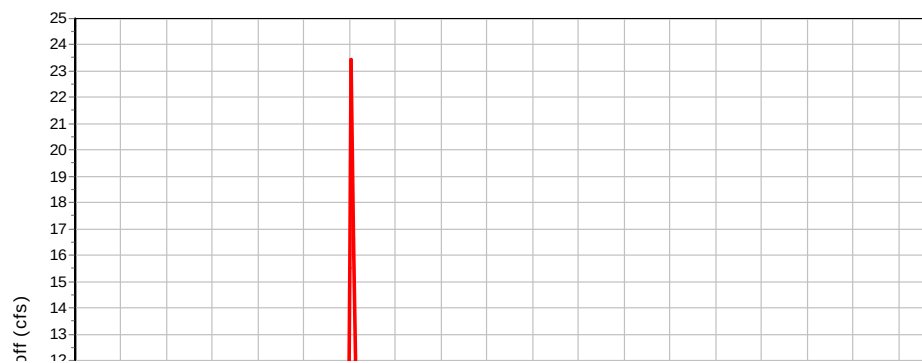
Total Rainfall (in)	2.72
Total Runoff (in)	0.29
Peak Runoff (cfs)	23.58
Weighted Curve Number	61.8
Time of Concentration (days hh:mm:ss)	0 00:12:15

Subbasin : Sub-28

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-29

Input Data

Area (ac)	304.22
Peak Rate Factor	0
Weighted Curve Number	69.63
Average Slope (%)	16.12
Flow Length (ft)	6458
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		304.22	-	69.63
Composite Area & Weighted CN		304.22		69.63

Time of Concentration

Flow Length (ft)	6458
Slope (%)	16.12
Computed TOC (min)	13.52

Subbasin Runoff Results

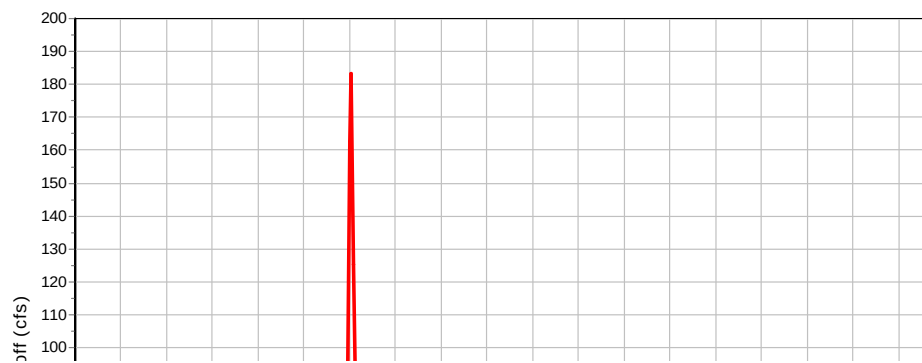
Total Rainfall (in)	2.72
Total Runoff (in)	0.55
Peak Runoff (cfs)	187.2
Weighted Curve Number	69.63
Time of Concentration (days hh:mm:ss)	0 00:13:31

Subbasin : Sub-29

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-30

Input Data

Area (ac)	7.88
Peak Rate Factor	0
Weighted Curve Number	66.1
Average Slope (%)	10
Flow Length (ft)	721
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		7.88	-	66.1
Composite Area & Weighted CN		7.88		66.1

Time of Concentration

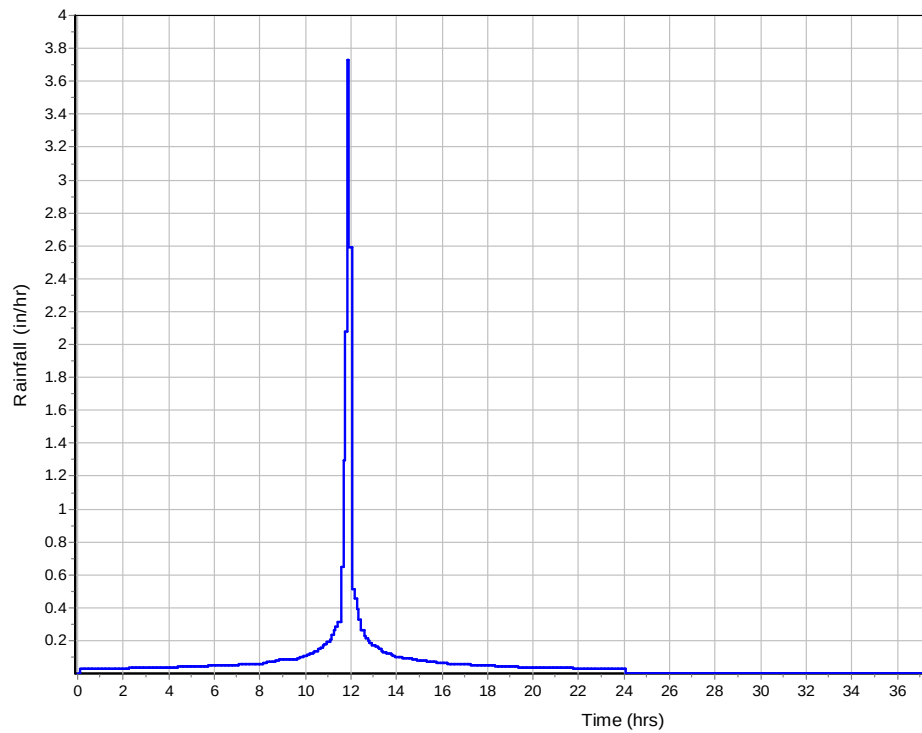
Flow Length (ft)	721
Slope (%)	10
Computed TOC (min)	3

Subbasin Runoff Results

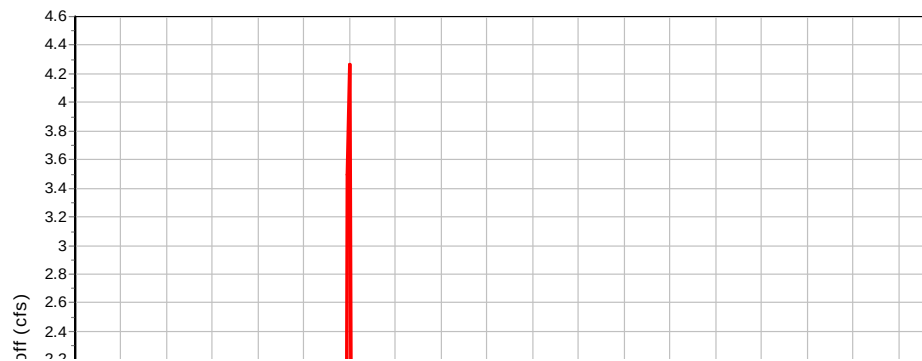
Total Rainfall (in)	2.72
Total Runoff (in)	0.42
Peak Runoff (cfs)	4.34
Weighted Curve Number	66.1
Time of Concentration (days hh:mm:ss)	0 00:03:00

Subbasin : Sub-30

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-31

Input Data

Area (ac)	17.6
Peak Rate Factor	0
Weighted Curve Number	81.93
Average Slope (%)	10
Flow Length (ft)	1168
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		17.6	-	81.93
Composite Area & Weighted CN		17.6		81.93

Time of Concentration

Flow Length (ft)	1168
Slope (%)	10
Computed TOC (min)	4.36

Subbasin Runoff Results

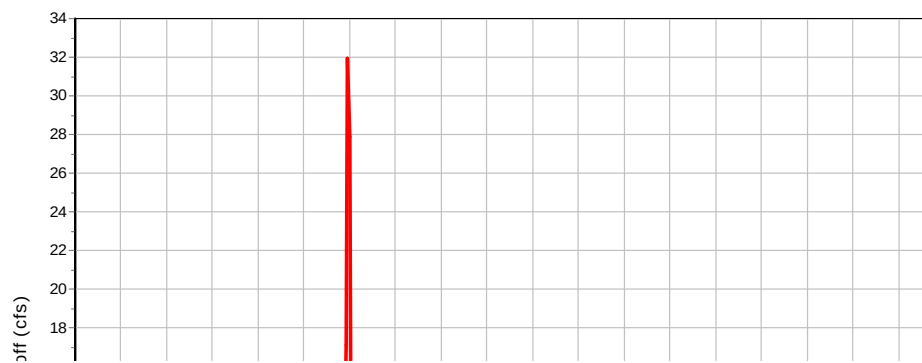
Total Rainfall (in)	2.72
Total Runoff (in)	1.16
Peak Runoff (cfs)	32.22
Weighted Curve Number	81.93
Time of Concentration (days hh:mm:ss)	0 00:04:22

Subbasin : Sub-31

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-38

Input Data

Area (ac)	61.52
Peak Rate Factor	0
Weighted Curve Number	72
Average Slope (%)	0.5
Flow Length (ft)	500
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		61.52	-	72
Composite Area & Weighted CN		61.52		72

Time of Concentration

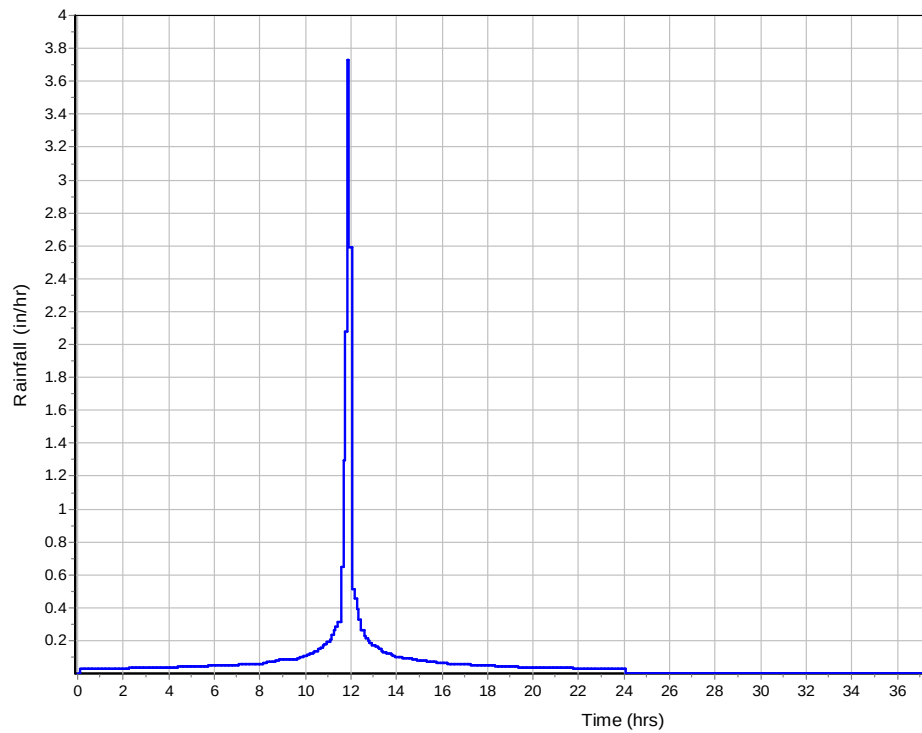
Flow Length (ft)	500
Slope (%)	0.5
Computed TOC (min)	7.18

Subbasin Runoff Results

Total Rainfall (in)	2.72
Total Runoff (in)	0.65
Peak Runoff (cfs)	54
Weighted Curve Number	72
Time of Concentration (days hh:mm:ss)	0 00:07:11

Subbasin : Sub-38

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-39

Input Data

Area (ac)	4.88
Peak Rate Factor	0
Weighted Curve Number	81.93
Average Slope (%)	0.5
Flow Length (ft)	500
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		4.88	-	81.93
Composite Area & Weighted CN		4.88		81.93

Time of Concentration

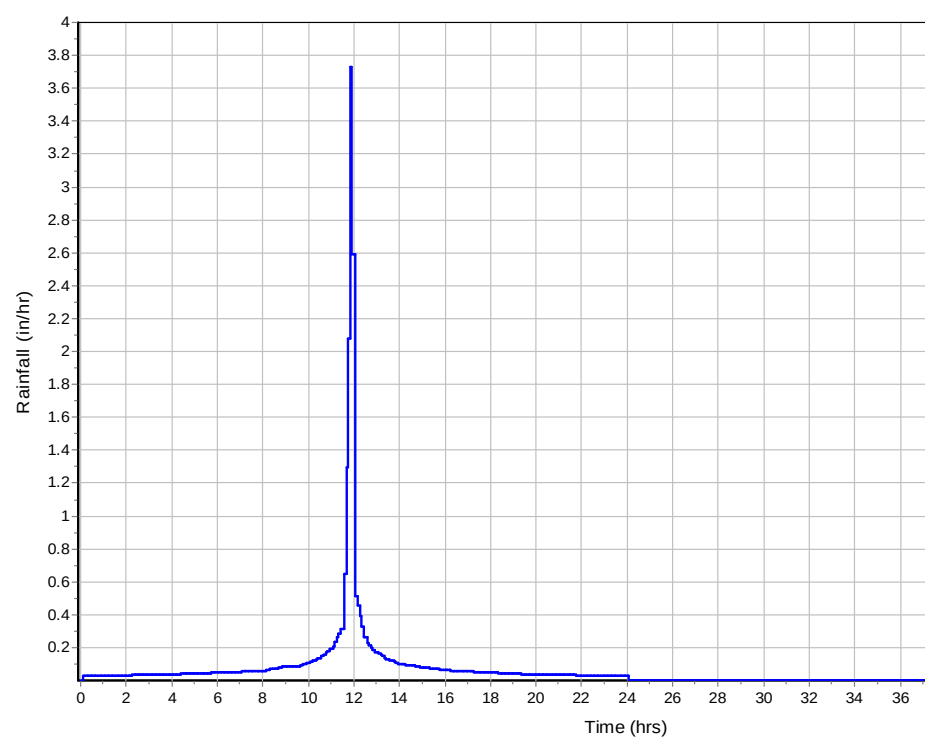
Flow Length (ft)	500
Slope (%)	0.5
Computed TOC (min)	7.18

Subbasin Runoff Results

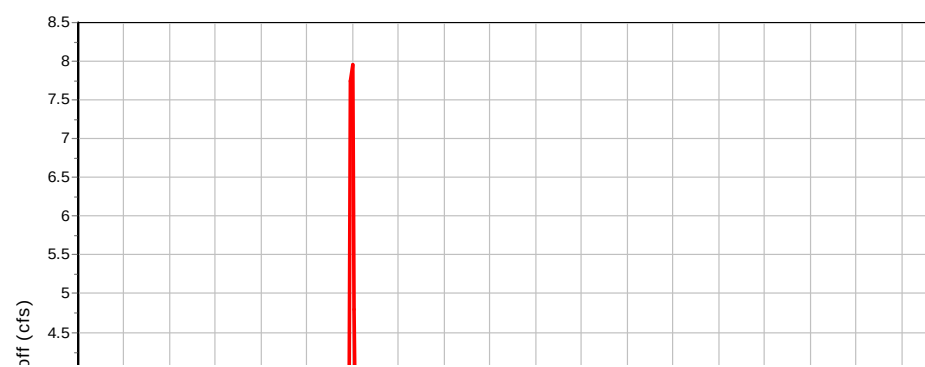
Total Rainfall (in)	2.72
Total Runoff (in)	1.16
Peak Runoff (cfs)	8.35
Weighted Curve Number	81.93
Time of Concentration (days hh:mm:ss)	0 00:07:11

Subbasin : Sub-39

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-40

Input Data

Area (ac)	60.45
Peak Rate Factor	0
Weighted Curve Number	72
Average Slope (%)	0.5
Flow Length (ft)	500
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		60.45	-	72
Composite Area & Weighted CN		60.45		72

Time of Concentration

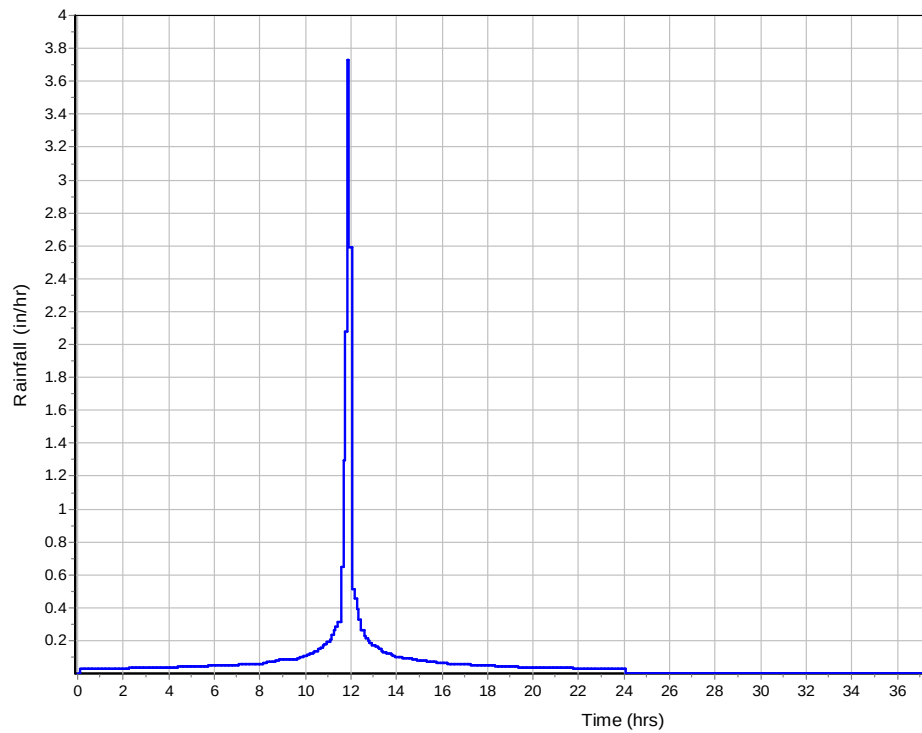
Flow Length (ft)	500
Slope (%)	0.5
Computed TOC (min)	7.18

Subbasin Runoff Results

Total Rainfall (in)	2.72
Total Runoff (in)	0.65
Peak Runoff (cfs)	53.07
Weighted Curve Number	72
Time of Concentration (days hh:mm:ss)	0 00:07:11

Subbasin : Sub-40

Rainfall Intensity Graph



Runoff Hydrograph



Junction Input

Element ID	Invert Elevation	Ground/Rim (Max) Elevation	Surcharge Elevation
	(ft)	(ft)	(ft)
1	4260.98	4266.98	4266.98
2	4259.88	4265.88	4265.88
3	4257.74	4263.74	4263.74
4	4254.93	4260.93	4260.93
5	4254.63	4260.63	4260.63
6	4252.78	4258.78	4258.78
7	4253.11	4259.11	4259.11
8	4245.81	4251.81	4251.81
9	4243.77	4249.77	4249.77
10	4254.91	4260.91	4260.91
11	4241.07	4247.07	4247.07
12	4241.47	4247.47	4247.47
14	4243.42	4249.42	4249.42
15	4239.31	4245.31	4245.31
16	4237.31	4243.31	4243.31
17	4232.56	4238.56	4238.56
18	4243.38	4249.38	4249.38
20	4256.70	4262.70	4262.70
21	4258.45	4264.45	4264.45
23	4264.62	4270.62	4270.62
26	4265.76	4271.76	4271.76
27	4285.43	4291.43	4291.43
28	4284.30	4290.30	4290.30
29	4321.09	4327.09	4327.09
30	4308.33	4314.33	4314.33
31	4320.20	4326.00	4326.20
36	4273.57	4279.57	4279.57
37	4271.52	4277.52	4277.52
38	4294.11	4300.11	4300.11
39	4261.41	4267.41	4267.41
40	4259.38	4265.38	4265.38
41	4260.21	4266.21	4266.21
42	4253.17	4259.17	4259.17
43	4246.76	4252.76	4252.76
44	4243.38	4249.38	4249.38
45	4253.80	4259.80	4259.80
46	4250.85	4256.85	4256.85
47	4252.93	4258.93	4258.93
48	4253.16	4259.16	4259.16
49	4254.49	4260.49	4260.49
50	4252.66	4258.66	4258.66
54	4249.99	4255.99	4255.99
56	4259.64	4265.64	4265.64
57	4288.20	4294.20	4294.20
58	4289.96	4295.96	4295.96

Junction Input

Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Surcharge Elevation (ft)
99	4344.55	4350.55	4350.55
100	4351.25	4357.25	4357.25
101	4351.61	4357.61	4357.61
102	4367.46	4373.46	4373.46
103	4369.87	4375.87	4375.87
104	4370.10	4376.10	4376.10
105	4385.22	4391.22	4391.22
106	4387.70	4393.70	4393.70
107	4376.77	4382.77	4382.77
108	4382.09	4388.09	4388.09
109	4364.29	4370.29	4370.29
110	4365.62	4371.62	4371.62
111	4391.77	4397.77	4397.77
112	4391.61	4397.61	4397.61
113	4403.41	4409.41	4409.41
115	4358.55	4364.55	4364.55
116	4357.50	4363.50	4363.50
117	4320.74	4326.74	4326.74
125	4220.89	4226.89	4226.89
126	4222.98	4228.98	4228.98
127	4227.38	4233.38	4233.38
128	4225.04	4231.04	4231.04
129	4233.00	4239.00	4239.00
131	4224.26	4230.26	4230.26
132	4229.07	4235.07	4235.07
133	4228.44	4234.44	4234.44
134	4224.79	4230.79	4230.79
137	4235.01	4241.01	4241.01
138	4231.65	4237.65	4237.65
139	4224.29	4230.29	4230.29
141	4236.25	4242.25	4242.25
142	4229.93	4235.93	4235.93
148	4237.06	4243.06	4243.06
149	4235.93	4241.93	4241.93
152	4233.11	4239.11	4239.11
153	4233.32	4239.32	4239.32
154	4232.66	4238.66	4238.66
155	4231.89	4237.89	4237.89
156	4234.20	4240.20	4240.20
157	4236.52	4242.52	4242.52
158	4240.41	4246.41	4246.41
163	4242.81	4248.81	4248.81
164	4233.00	4239.00	4239.00
165	4244.65	4250.65	4250.65
172	4245.97	4251.97	4251.97

Junction Input

Element ID	Invert Elevation	Ground/Rim (Max) Elevation	Surcharge Elevation
	(ft)	(ft)	(ft)
16-Jun	4240.00	4244.00	4244.00
18-Jun	4238.00	4242.00	4242.00
22-Jun	4238.00	4242.00	4242.00
23-Jun	4326.00	4332.00	4332.00
24-Jun	4328.00	4334.00	4334.00
25-Jun	4318.00	4324.00	4324.00

Junction Results

Element ID	Peak Inflow	Peak Lateral Inflow	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained
	(cfs)	(cfs)	(ft)	(ft)	(ft)
1	0.00	0.00	6.00	4260.98	0.00
2	0.00	0.00	6.00	4259.88	0.00
3	1.82	0.00	5.47	4257.91	0.17
4	5.44	0.00	2.12	4257.02	2.09
5	21.99	0.00	2.39	4256.97	2.34
6	139.96	0.00	0.00	4257.26	4.48
7	20.60	0.00	5.37	4253.57	0.46
8	20.53	0.00	4.30	4247.10	1.29
9	21.49	0.00	4.68	4244.55	0.78
10	115.93	0.00	1.98	4257.38	2.47
11	31.58	31.58	5.87	4241.13	0.06
12	20.51	0.00	2.39	4243.83	2.36
14	0.00	0.00	6.00	4243.42	0.00
15	10.64	10.64	6.00	4239.31	0.00
16	0.00	0.00	6.00	4237.31	0.00
17	22.51	22.51	6.00	4232.56	0.00
18	29.54	17.39	5.98	4243.40	0.02
20	28.91	28.91	0.00	4257.11	0.41
21	3.65	0.00	0.05	4258.63	0.18
23	0.97	0.00	0.00	4269.65	5.03
26	0.56	0.00	1.07	4269.81	4.05
27	1.17	0.00	0.92	4289.57	4.14
28	0.64	0.00	0.00	4289.49	5.19
29	58.78	0.00	0.00	4324.84	3.75
30	121.06	0.00	7.86	4308.57	0.24
31	71.01	0.00	0.00	4324.84	4.64
36	15.85	0.00	1.80	4273.93	0.36
37	15.85	0.00	5.27	4271.61	0.09
38	15.97	15.97	5.43	4294.18	0.07
39	15.74	0.00	3.66	4261.76	0.35
40	70.26	0.00	5.06	4260.08	0.70
41	317.39	0.00	0.00	4264.42	4.21
42	70.19	0.00	4.94	4253.96	0.79
43	97.39	0.00	4.39	4247.86	1.10
44	96.82	0.00	5.99	4243.39	0.01
45	4.18	0.00	5.80	4253.96	0.16
46	117.65	0.00	0.00	4255.36	4.51
47	91.72	0.00	2.63	4255.49	2.56
48	42.47	0.00	0.00	4255.49	2.33
49	22.48	0.00	0.00	4255.90	1.41
50	35.25	35.25	2.37	4255.49	2.83
54	60.96	0.00	5.98	4250.01	0.02
56	11.67	0.00	0.00	4264.41	4.77
57	11.69	0.00	5.14	4288.60	0.40

Junction Results

Element ID	Peak Inflow	Peak Lateral Inflow	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained
	(cfs)	(cfs)	(ft)	(ft)	(ft)
98	0.00	0.00	6.00	4343.15	0.00
99	0.00	0.00	6.00	4344.55	0.00
100	0.00	0.00	6.00	4351.25	0.00
101	0.00	0.00	6.00	4351.61	0.00
102	0.00	0.00	6.00	4367.46	0.00
103	0.00	0.00	6.00	4369.87	0.00
104	0.00	0.00	6.00	4370.10	0.00
105	0.00	0.00	6.00	4385.22	0.00
106	0.00	0.00	6.00	4387.70	0.00
107	0.00	0.00	6.00	4376.77	0.00
108	0.00	0.00	6.00	4382.09	0.00
109	0.00	0.00	6.00	4364.29	0.00
110	0.00	0.00	6.00	4365.62	0.00
111	1.79	0.00	0.00	4397.44	5.67
112	158.70	0.00	0.00	4397.44	5.83
113	279.76	279.76	4.14	4403.62	0.21
115	0.00	0.00	6.00	4358.55	0.00
116	0.00	0.00	6.00	4357.50	0.00
117	0.00	0.00	6.00	4320.74	0.00
125	0.38	0.00	5.49	4221.40	0.51
126	0.83	0.00	5.74	4222.98	0.00
127	0.00	0.00	6.00	4227.38	0.00
128	4.61	0.00	5.69	4225.04	0.00
129	0.00	0.00	5.00	4233.00	0.00
131	11.24	0.00	4.99	4225.21	0.95
132	0.00	0.00	6.00	4229.07	0.00
133	0.00	0.00	6.00	4228.44	0.00
134	1.77	0.00	5.55	4225.21	0.42
137	25.90	25.90	0.00	4235.90	0.89
138	3.45	0.00	5.79	4231.74	0.09
139	2.71	0.00	6.00	4224.29	0.00
141	0.00	0.00	6.00	4236.25	0.00
142	1.22	0.00	4.16	4231.46	1.53
148	221.82	85.43	0.00	4239.20	2.14
149	75.06	0.00	2.37	4238.88	2.95
152	0.00	0.00	6.00	4233.11	0.00
153	0.00	0.00	6.00	4233.32	0.00
154	0.00	0.00	6.00	4232.66	0.00
155	0.00	0.00	6.00	4231.89	0.00
156	0.00	0.00	6.00	4234.20	0.00
157	0.00	0.00	6.00	4236.52	0.00
158	42.78	0.00	0.00	4246.22	5.81
163	58.33	58.33	0.00	4246.33	3.52
164	104.80	0.00	0.00	4238.75	5.75

Junction Results

Element ID	Peak Inflow	Peak Lateral Inflow	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained
	(cfs)	(cfs)	(ft)	(ft)	(ft)
13-Jun	53.94	53.94	0.00	4255.91	0.91
14-Jun	422.40	422.40	10.44	4428.05	1.05
16-Jun	183.20	183.20	0.00	4241.42	1.42
18-Jun	23.44	23.44	2.46	4238.33	0.33
22-Jun	161.82	161.82	0.00	4238.75	0.75
23-Jun	7.96	7.96	4.56	4326.22	0.22
24-Jun	53.01	53.01	0.00	4328.62	0.62
25-Jun	0.00	0.00	6.00	4318.00	0.00

Channel Input

Element ID	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Shape	Height	Width	Manning's Roughness
	(ft)	(ft)	(ft)	(%)		(ft)	(ft)	
Link-100	130.92	4257.74	4254.93	2.1500	Rectangular	1.000	4.000	0.0320
Link-102	511.88	4238.02	4236.07	0.3800	Trapezoidal	2.000	12.000	0.0320
Link-103	545.39	4236.07	4234.71	0.2500	Trapezoidal	2.000	12.000	0.0320
Link-104	323.62	4266.77	4260.21	2.0300	Trapezoidal	6.000	40.000	0.0320
Link-105	198.63	4273.67	4266.77	3.4700	Rectangular	1.000	4.000	0.0320
Link-106	989.28	4278.30	4266.77	1.1700	Trapezoidal	6.000	40.000	0.0320
Link-107	1563.70	4342.86	4278.30	4.1300	Trapezoidal	6.000	40.000	0.0320
Link-108	182.43	4324.88	4314.83	5.5100	Rectangular	1.000	4.000	0.0320
Link-113	76.67	4254.49	4253.16	1.7300	Triangular	1.000	2.000	0.0320
Link-114	384.54	4231.65	4224.29	1.9100	Rectangular	2.000	8.000	0.0320
Link-116	669.92	4231.65	4229.93	0.2600	Rectangular	2.000	8.000	0.0320
Link-120	188.77	4314.83	4300.59	7.5400	Rectangular	1.000	4.000	0.0320
Link-121	237.97	4301.69	4285.53	6.7900	Rectangular	1.000	4.000	0.0320
Link-125	831.47	4321.09	4320.20	0.1100	Rectangular	4.000	16.000	0.0320
Link-126	777.66	4324.88	4320.20	0.6000	Rectangular	4.000	16.000	0.0320
Link-127	137.43	4306.94	4300.27	4.8500	Trapezoidal	1.500	4.750	0.0320
Link-128	325.92	4319.63	4313.24	1.9600	Trapezoidal	1.500	4.750	0.0320
Link-129	534.68	4317.95	4306.99	2.0500	Trapezoidal	1.500	6.250	0.0320
Link-130	1049.21	4324.80	4306.94	1.7000	Trapezoidal	1.500	4.750	0.0320
Link-131	248.61	4317.51	4306.94	4.2500	Trapezoidal	1.500	4.750	0.0320
Link-133	894.32	4351.25	4317.95	3.7200	Trapezoidal	1.500	4.750	0.0320
Link-134	332.99	4326.66	4316.98	2.9100	Trapezoidal	1.500	4.750	0.0320
Link-136	1013.21	4370.10	4344.55	2.5200	Trapezoidal	1.500	6.250	0.0320
Link-139	341.18	4257.65	4255.00	0.7800	Trapezoidal	2.000	12.000	0.0320
Link-141	315.45	4254.91	4252.78	0.6800	Trapezoidal	6.000	42.000	0.0320
Link-142	361.26	4253.11	4245.81	2.0200	Trapezoidal	6.000	42.000	0.0320
Link-143	275.20	4243.77	4241.47	0.8400	Trapezoidal	6.000	42.000	0.0320
Link-144	1367.14	4364.29	4320.74	3.1900	Trapezoidal	1.500	4.750	0.0320
Link-155	1989.83	4244.65	4237.06	0.3800	Rectangular	4.000	16.000	0.0320
Link-156	706.40	4235.93	4233.00	0.4100	Rectangular	4.000	16.000	0.0320
Link-167	639.08	4272.20	4253.83	2.8700	Rectangular	4.000	16.000	0.0320
Link-168	5237.65	4403.41	4272.20	2.5100	Rectangular	2.000	8.000	0.0320
Link-172	5516.13	4254.95	4253.83	0.0200	Rectangular	4.000	16.000	0.0320
Link-173	156.21	4236.27	4236.07	0.1300	Trapezoidal	2.000	12.000	0.0320
Link-174	46.09	4236.47	4236.27	0.4300	Trapezoidal	2.000	12.000	0.0320
Link-175	146.36	4237.62	4236.47	0.7900	Trapezoidal	2.000	12.000	0.0320
Link-177	205.30	4376.77	4369.87	3.3600	Trapezoidal	1.500	4.750	0.0320
Link-178	257.45	4259.38	4253.17	2.4100	Trapezoidal	6.000	40.000	0.0320
Link-179	404.20	4253.17	4246.76	1.5900	Trapezoidal	6.000	40.000	0.0320
Link-180	321.82	4246.76	4243.38	1.0500	Trapezoidal	6.000	40.000	0.0320
Link-181	103.73	4348.99	4342.86	5.9100	Trapezoidal	6.000	40.000	0.0320
Link-184	206.42	4403.41	4391.61	5.7200	Rectangular	2.000	8.000	0.0320
Link-188	1066.88	4252.66	4250.93	0.1600	Trapezoidal	6.000	40.000	0.0320
Link-191	1488.20	4357.50	4320.74	2.4700	Trapezoidal	1.500	4.750	0.0320
Link-192	668.07	4320.74	4313.24	1.1200	Trapezoidal	1.000	4.000	0.0320

Channel Results

Element ID	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	Froude Number	Reported Condition
	(cfs)	(cfs)		(ft/sec)	(ft)		(min)		
Link-100	1.82	20.77	0.09	0.72	0.76	0.76	0.00		
Link-102	6.94	52.82	0.13	1.07	2.00	1.00	22.00		
Link-103	41.88	42.73	0.98	2.66	2.00	1.00	67.00		
Link-104	317.39	2305.79	0.14	3.79	4.13	0.69	0.00		
Link-105	26.42	26.42	1.00	6.61	1.00	1.00	110.00		
Link-106	290.99	1748.40	0.17	7.63	2.39	0.40	0.00		
Link-107	287.88	3290.72	0.09	8.74	2.15	0.36	0.00		
Link-108	34.09	33.27	1.02	8.74	0.97	0.98	0.00		
Link-113	22.48	3.06	7.35	22.48	1.00	1.00	1780.00		
Link-114	2.71	124.52	0.02	3.16	0.11	0.05	0.00		
Link-116	1.22	45.61	0.03	0.77	0.98	0.49	0.00		
Link-120	34.08	38.93	0.88	8.73	0.97	0.98	0.00		
Link-121	34.17	36.94	0.93	8.64	0.99	0.99	0.00		
Link-125	58.78	186.98	0.31	2.14	4.00	1.00	674.00		
Link-126	71.01	443.36	0.16	1.58	2.78	0.71	0.00		
Link-127	0.00	35.28	0.00	0.00	0.75	0.50	0.00		
Link-128	0.00	22.42	0.00	0.00	0.00	0.00	0.00		
Link-129	0.00	30.38	0.00	0.00	0.00	0.00	0.00		
Link-130	0.00	20.89	0.00	0.00	0.00	0.00	0.00		
Link-131	0.00	33.02	0.00	0.00	0.00	0.00	0.00		
Link-133	0.00	30.90	0.00	0.00	0.00	0.00	0.00		
Link-134	0.00	27.30	0.00	0.00	0.00	0.00	0.00		
Link-136	0.00	33.70	0.00	0.00	0.00	0.00	0.00		
Link-139	119.31	75.42	1.58	7.78	2.00	1.00	1.00		
Link-141	139.96	1212.20	0.12	1.72	4.95	0.83	0.00		
Link-142	20.53	2097.02	0.01	3.32	1.16	0.19	0.00		
Link-143	20.51	1348.62	0.02	2.60	2.46	0.41	0.00		
Link-144	0.00	28.58	0.00	0.00	0.00	0.00	0.00		
Link-155	143.03	352.97	0.41	2.89	3.06	0.77	0.00		
Link-156	104.80	368.08	0.28	2.77	3.77	0.95	0.00		
Link-167	105.76	968.96	0.11	2.68	2.46	0.62	0.00		
Link-168	110.61	142.46	0.78	10.09	1.39	0.69	0.00		
Link-172	81.44	81.44	1.00	1.27	4.00	1.00	2154.00		
Link-173	55.02	30.62	1.80	3.48	2.00	1.00	66.00		
Link-174	56.37	56.37	1.00	3.52	2.00	1.00	67.00		
Link-175	64.57	75.86	0.85	4.04	2.00	1.00	44.00		
Link-177	0.00	29.36	0.00	0.00	0.00	0.00	0.00		
Link-178	70.19	2515.27	0.03	5.66	1.00	0.17	0.00		
Link-179	70.08	2039.47	0.03	4.34	1.31	0.22	0.00		
Link-180	96.82	1659.73	0.06	9.96	0.80	0.13	0.00		
Link-181	287.90	3936.98	0.07	12.00	1.69	0.28	0.00		
Link-184	158.70	215.20	0.74	10.29	1.92	0.96	0.00		
Link-188	22.06	257.64	0.09	0.90	3.47	0.58	0.00		
Link-191	0.00	25.17	0.00	0.00	0.00	0.00	0.00		

Pipe Input

Element ID	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	No. of Barrels
Link-01	73.49	4259.88	4259.01	1.1800	CIRCULAR	18.000	18.000	0.0150	1
Link-02	57.56	4265.76	4264.62	1.9800	CIRCULAR	18.000	18.000	0.0120	1
Link-04	57.99	4285.43	4284.30	1.9500	CIRCULAR	18.000	18.000	0.0120	1
Link-06	62.36	4273.57	4271.52	3.2900	CIRCULAR	18.000	18.000	0.0150	1
Link-08	70.65	4275.40	4273.67	2.4500	CIRCULAR	24.000	24.000	0.0150	1
Link-09	61.77	4301.69	4300.59	1.7800	CIRCULAR	30.000	30.000	0.0150	1
Link-10	94.56	4260.21	4259.38	0.8800	CIRCULAR	24.000	24.000	0.0150	2
Link-101	117.25	4254.93	4252.63	1.9600	CIRCULAR	24.000	24.000	0.0150	1
Link-11	76.08	4391.77	4391.61	0.2100	CIRCULAR	18.000	18.000	0.0150	1
Link-118	362.79	4243.42	4239.31	1.1300	CIRCULAR	5.040	5.040	0.0250	1
Link-12	58.38	4387.70	4385.22	4.2500	CIRCULAR	18.000	18.000	0.0120	1
Link-122	353.18	4323.09	4284.30	10.9800	CIRCULAR	5.040	5.040	0.0250	1
Link-13	93.05	4369.87	4367.46	2.5900	CIRCULAR	18.000	18.000	0.0150	1
Link-132	830.12	4345.15	4306.99	4.6000	CIRCULAR	5.040	5.040	0.0250	1
Link-135	1040.61	4385.22	4351.61	3.2300	CIRCULAR	5.040	5.040	0.0250	1
Link-137	1573.65	4367.46	4319.38	3.0600	CIRCULAR	5.040	5.040	0.0250	1
Link-14	45.62	4365.62	4364.29	2.9200	CIRCULAR	18.000	18.000	0.0150	1
Link-16	308.62	4262.88	4253.83	2.9300	CIRCULAR	54.000	54.000	0.0150	1
Link-18	149.37	4312.04	4306.33	3.8200	Arch	105.000	169.080	0.0150	1
Link-19	55.55	4352.27	4348.99	5.9000	Rectangular	78.000	222.000	0.0150	2
Link-197	591.18	4232.84	4231.07	0.3000	Dummy	0.000	0.000	0.0150	1
Link-198	576.46	4232.56	4231.07	0.2600	Dummy	0.000	0.000	0.0150	1
Link-199	488.43	4239.31	4231.07	1.6900	Dummy	0.000	0.000	0.0150	1
Link-20	52.53	4373.93	4373.08	1.6200	Rectangular	156.000	483.960	0.0150	1
Link-201	622.26	4249.99	4245.99	0.6400	Dummy	0.000	0.000	0.0150	1
Link-202	951.90	4243.38	4241.07	0.2400	Dummy	0.000	0.000	0.0150	1
Link-203	88.02	4257.63	4254.91	3.0900	Rectangular	72.000	36.000	0.0150	1
Link-206	641.76	4224.29	4220.72	0.5600	Dummy	0.000	0.000	0.0150	1
Link-208	145.66	4237.00	4236.25	0.5100	CIRCULAR	18.000	18.000	0.0150	1
Link-21	159.10	4337.85	4324.88	8.1500	Rectangular	30.000	48.000	0.0150	2
Link-210	737.37	4241.07	4239.07	0.2700	Dummy	0.000	0.000	0.0150	1
Link-213	435.76	4253.80	4250.85	0.6800	CIRCULAR	18.000	18.000	0.0150	1
Link-214	702.85	4243.38	4241.07	0.3300	Dummy	0.000	0.000	0.0150	1
Link-216	322.19	4300.00	4293.00	2.1700	CIRCULAR	18.000	18.000	0.0150	1
Link-217	187.21	4234.00	4233.00	0.5300	CIRCULAR	24.000	24.000	0.0150	1
Link-218	276.75	4228.00	4227.00	0.3600	Dummy	0.000	0.000	0.0150	1
Link-225	309.97	4427.00	4422.00	1.6100	Rectangular	156.000	483.960	0.0150	1
Link-226	381.58	4240.00	4238.00	0.5200	CIRCULAR	24.000	24.000	0.0150	1
Link-229	271.20	4238.00	4236.00	0.7400	CIRCULAR	36.000	36.000	0.0150	2
Link-232	434.16	4238.00	4236.00	0.4600	CIRCULAR	36.000	36.000	0.0150	1
Link-233	325.26	4220.72	4220.00	0.2200	CIRCULAR	24.000	24.000	0.0150	1
Link-234	430.94	4231.00	4230.00	0.2300	CIRCULAR	24.000	24.000	0.0150	1
Link-235	181.34	4326.00	4323.00	1.6500	CIRCULAR	24.000	24.000	0.0150	1
Link-236	342.37	4328.00	4326.00	0.5800	CIRCULAR	24.000	24.000	0.0150	1
Link-239	241.85	4290.66	4289.96	0.2900	CIRCULAR	18.000	18.000	0.0150	1

Pipe Input

Element ID	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	No. of Barrels
Link-66	17.51	4252.78	4252.63	0.8600	CIRCULAR	15.000	15.000	0.0150	2
Link-67	18.86	4254.63	4253.11	8.0600	CIRCULAR	15.000	15.000	0.0150	2
Link-68	609.49	4222.98	4220.89	0.3400	CIRCULAR	18.000	18.000	0.0120	1
Link-69	265.21	4227.32	4224.26	1.1500	CIRCULAR	30.000	30.000	0.0120	1
Link-71	306.97	4228.44	4224.79	1.1900	CIRCULAR	30.000	30.000	0.0120	1
Link-72	79.63	4224.79	4224.26	0.6700	CIRCULAR	30.000	30.000	0.0120	1
Link-74	1055.32	4288.20	4259.64	2.7100	CIRCULAR	18.000	18.000	0.0120	1
Link-77	2284.11	4235.01	4231.65	0.1500	CIRCULAR	15.000	15.000	0.0120	1
Link-81	981.52	4237.31	4232.56	0.4800	CIRCULAR	18.000	18.000	0.0120	1
Link-82	140.41	4319.38	4313.24	4.3700	CIRCULAR	18.000	18.000	0.0120	1
Link-83	152.71	4382.09	4376.77	3.4800	CIRCULAR	18.000	18.000	0.0120	1
Link-84	101.06	4227.38	4225.04	2.3200	CIRCULAR	24.000	24.000	0.0120	1
Link-85	474.27	4233.00	4225.04	1.6800	CIRCULAR	24.000	24.000	0.0120	1
Link-86	66.12	4258.45	4256.70	2.6500	CIRCULAR	18.000	18.000	0.0120	1
Link-87	862.25	4256.70	4243.38	1.5400	CIRCULAR	18.000	18.000	0.0120	1
Link-88	106.03	4229.07	4228.44	0.5900	CIRCULAR	30.000	30.000	0.0120	1
Link-92	161.85	4264.62	4258.45	3.8100	CIRCULAR	5.040	5.040	0.0250	1
Link-93	311.25	4285.43	4265.76	6.3200	CIRCULAR	5.040	5.040	0.0250	1

Pipe Results

Element ID	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	Froude Number	Reported Condition
	(cfs)	(cfs)		(ft/sec)	(ft)		(min)		
Link-01	0.00	9.91	0.00	0.00	0.00	0.00	0.00		Calculated
Link-02	0.97	16.01	0.06	3.34	1.50	1.00	1408.00		SURCHARGED
Link-04	1.17	15.89	0.07	0.66	1.50	1.00	1392.00		SURCHARGED
Link-06	15.85	16.51	0.96	11.27	1.11	0.74	0.00		Calculated
Link-08	34.66	30.68	1.13	13.32	2.00	1.00	100.00		SURCHARGED
Link-09	34.08	47.44	0.72	9.35	1.74	0.70	0.00		Calculated
Link-10	68.05	36.74	1.85	13.82	1.47	0.73	0.00		> CAPACITY
Link-101	5.44	9.92	0.55	2.90	2.00	1.00	516.00		SURCHARGED
Link-11	1.79	4.17	0.43	1.01	1.50	1.00	2178.00		SURCHARGED
Link-118	0.00	0.19	0.00	0.00	0.00	0.00	0.00		Calculated
Link-12	0.00	23.45	0.00	0.00	0.00	0.00	0.00		Calculated
Link-122	0.64	0.59	1.08	5.08	0.42	1.00	1281.00		SURCHARGED
Link-13	0.00	14.65	0.00	0.00	0.00	0.00	0.00		Calculated
Link-132	0.00	0.38	0.00	0.00	0.00	0.00	0.00		Calculated
Link-135	0.00	0.32	0.00	0.00	0.00	0.00	0.00		Calculated
Link-137	0.00	0.31	0.00	0.00	0.00	0.00	0.00		Calculated
Link-14	0.00	15.54	0.00	0.00	0.00	0.00	0.00		Calculated
Link-16	0.00	291.85	0.00	0.00	2.25	0.50	0.00		Calculated
Link-18	121.06	2879.79	0.04	8.17	1.51	0.17	0.00		Calculated
Link-19	287.90	10392.36	0.03	4.48	1.73	0.27	0.00		Calculated
Link-197	36.11	0.00	0.00	0.00	0.00	0.00	0.00		Calculated
Link-198	22.51	0.00	0.00	0.00	0.00	0.00	0.00		Calculated
Link-199	10.64	0.00	0.00	0.00	0.00	0.00	0.00		Calculated
Link-20	411.21	19102.63	0.02	7.20	1.42	0.11	0.00		Calculated
Link-201	60.96	0.00	0.02	0.00	1.42	0.11	0.00		Calculated
Link-202	96.82	0.00	0.02	0.00	1.42	0.11	0.00		Calculated
Link-203	115.93	313.47	0.37	7.89	4.94	0.83	0.00		Calculated
Link-206	2.71	0.00	0.00	0.00	0.92	0.46	0.00		Calculated
Link-208	0.00	6.53	0.00	0.00	0.00	0.00	0.00		Calculated
Link-21	99.20	474.93	0.21	6.11	2.03	0.84	0.00		Calculated
Link-210	31.58	0.00	0.21	0.00	2.03	0.84	0.00		Calculated
Link-213	4.18	7.49	0.56	4.07	0.85	0.56	0.00		Calculated
Link-214	29.54	0.00	0.56	0.00	0.85	0.56	0.00		Calculated
Link-216	32.67	13.42	2.43	18.49	1.50	1.00	296.00		SURCHARGED
Link-217	0.00	14.33	0.00	0.00	0.00	0.00	0.00		Calculated
Link-218	53.64	0.00	0.00	0.00	0.00	0.00	0.00		Calculated
Link-225	422.30	19072.72	0.02	6.03	1.74	0.13	0.00		Calculated
Link-226	20.07	14.19	1.41	6.39	2.00	1.00	131.00		SURCHARGED
Link-229	22.90	99.28	0.23	4.05	1.25	0.42	0.00		Calculated
Link-232	48.05	39.23	1.22	6.80	3.00	1.00	28.00		SURCHARGED
Link-233	17.86	9.22	1.94	5.68	2.00	1.00	516.00		SURCHARGED
Link-234	4.16	9.44	0.44	2.91	0.93	0.46	0.00		Calculated
Link-235	7.95	25.22	0.32	4.45	1.11	0.55	0.00		Calculated
Link-236	25.95	14.99	1.73	8.26	2.00	1.00	21.00		SURCHARGED

Pipe Results

Element ID	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	Froude Number	Reported Condition
	(cfs)	(cfs)		(ft/sec)	(ft)		(min)		
Link-63	117.65	89.47	1.31	32.29	2.50	1.00	670.00		SURCHARGED
Link-66	21.99	36.40	0.60	8.96	1.25	1.00	738.00		SURCHARGED
Link-67	20.60	31.79	0.65	10.42	0.94	0.75	0.00		Calculated
Link-68	0.38	6.66	0.06	4.00	0.26	0.17	0.00		Calculated
Link-69	11.24	80.67	0.14	8.50	0.48	0.31	0.00		Calculated
Link-71	0.00	48.45	0.00	0.00	0.21	0.09	0.00		Calculated
Link-72	1.77	36.25	0.05	1.90	0.68	0.27	0.00		Calculated
Link-74	11.67	18.72	0.62	7.84	1.18	0.79	0.00		Calculated
Link-77	3.45	2.68	1.29	4.91	0.73	0.59	0.00		> CAPACITY
Link-81	0.00	7.92	0.00	0.00	0.00	0.00	0.00		Calculated
Link-82	0.00	23.80	0.00	0.00	0.00	0.00	0.00		Calculated
Link-83	0.00	21.24	0.00	0.00	0.00	0.00	0.00		Calculated
Link-84	0.00	37.29	0.00	0.00	0.05	0.08	0.00		Calculated
Link-85	4.61	31.75	0.15	10.05	0.07	0.25	0.00		Calculated
Link-86	3.65	18.51	0.20	3.29	1.50	1.00	15.00		SURCHARGED
Link-87	12.14	14.14	0.86	14.57	0.76	0.51	0.00		Calculated
Link-88	0.00	34.25	0.00	0.00	0.00	0.00	0.00		Calculated
Link-92	0.42	0.35	1.19	4.22	0.29	0.69	0.00		> CAPACITY
Link-93	0.52	0.45	1.15	4.52	0.42	1.00	1403.00		SURCHARGED

Storage Nodes

Storage Node : 93

Input Data

Invert Elevation (ft)	4300.27
Max (Rim) Elevation (ft)	4306.27
Max (Rim) Offset (ft)	6.00
Initial Water Elevation (ft)	4300.27
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Output Summary Results

Peak Inflow (cfs)	152.36
Peak Lateral Inflow (cfs)	152.36
Peak Outflow (cfs)	0
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	4306.27
Max HGL Depth Attained (ft)	6
Average HGL Elevation Attained (ft)	4305.95
Average HGL Depth Attained (ft)	5.68
Time of Max HGL Occurrence (days hh:mm)	0 12:56
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	79.97
Total Time Flooded (min)	734
Total Retention Time (sec)	0

Storage Node : 140

Input Data

Invert Elevation (ft)	4220.72
Max (Rim) Elevation (ft)	4226.72
Max (Rim) Offset (ft)	6.00
Initial Water Elevation (ft)	4224.72
Initial Water Depth (ft)	4.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Output Summary Results

Peak Inflow (cfs)	150.07
Peak Lateral Inflow (cfs)	147.62
Peak Outflow (cfs)	17.86
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	4224.72
Max HGL Depth Attained (ft)	4
Average HGL Elevation Attained (ft)	4222.3
Average HGL Depth Attained (ft)	1.58
Time of Max HGL Occurrence (days hh:mm)	0 00:00
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Storage Node : Stor-01

Input Data

Invert Elevation (ft)	4241.07
Max (Rim) Elevation (ft)	4247.07
Max (Rim) Offset (ft)	6.00
Initial Water Elevation (ft)	4241.07
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Output Summary Results

Peak Inflow (cfs)	199.65
Peak Lateral Inflow (cfs)	0
Peak Outflow (cfs)	0
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	4244.44
Max HGL Depth Attained (ft)	3.37
Average HGL Elevation Attained (ft)	4242.97
Average HGL Depth Attained (ft)	1.9
Time of Max HGL Occurrence (days hh:mm)	2 00:00
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Storage Node : Stor-02

Input Data

Invert Elevation (ft)	4255.99
Max (Rim) Elevation (ft)	4261.99
Max (Rim) Offset (ft)	6.00
Initial Water Elevation (ft)	4255.99
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Output Summary Results

Peak Inflow (cfs)	60.96
Peak Lateral Inflow (cfs)	0
Peak Outflow (cfs)	0
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	4256.49
Max HGL Depth Attained (ft)	0.5
Average HGL Elevation Attained (ft)	4256.39
Average HGL Depth Attained (ft)	0.4
Time of Max HGL Occurrence (days hh:mm)	2 00:00
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Storage Node : Stor-03

Input Data

Invert Elevation (ft)	4226.72
Max (Rim) Elevation (ft)	4229.00
Max (Rim) Offset (ft)	2.28
Initial Water Elevation (ft)	4226.72
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Output Summary Results

Peak Inflow (cfs)	4.27
Peak Lateral Inflow (cfs)	4.27
Peak Outflow (cfs)	0
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	4226.79
Max HGL Depth Attained (ft)	0.07
Average HGL Elevation Attained (ft)	4226.77
Average HGL Depth Attained (ft)	0.05
Time of Max HGL Occurrence (days hh:mm)	1 00:20
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Storage Node : Stor-04

Input Data

Invert Elevation (ft)	4231.00
Max (Rim) Elevation (ft)	4235.00
Max (Rim) Offset (ft)	4.00
Initial Water Elevation (ft)	4231.00
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Output Summary Results

Peak Inflow (cfs)	75.74
Peak Lateral Inflow (cfs)	31.92
Peak Outflow (cfs)	4.16
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	4231.93
Max HGL Depth Attained (ft)	0.93
Average HGL Elevation Attained (ft)	4231.77
Average HGL Depth Attained (ft)	0.77
Time of Max HGL Occurrence (days hh:mm)	0 15:59
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Project Description

File Name Lake Point Proposed 100-Year_mountain drainage only..SPF

Project Options

Flow Units CFS
Elevation Type Elevation
Hydrology Method SCS TR-55
Time of Concentration (TOC) Method Kirpich
Link Routing Method Hydrodynamic
Enable Overflow Ponding at Nodes YES
Skip Steady State Analysis Time Periods NO

Analysis Options

Start Analysis On 00:00:00 0:00:00
End Analysis On 00:00:00 0:00:00
Start Reporting On 00:00:00 0:00:00
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 00:05:00 days hh:mm:ss
Routing Time Step 30 seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins.....	22
Nodes.....	50
<i>Junctions</i>	46
<i>Outfalls</i>	2
<i>Flow Diversions</i>	0
<i>Inlets</i>	0
<i>Storage Nodes</i>	2
Links.....	46
<i>Channels</i>	21
<i>Pipes</i>	25
<i>Pumps</i>	0
<i>Orifices</i>	0
<i>Weirs</i>	0
<i>Outlets</i>	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage	Data	Data Source	Rainfall	Rain	State	County	Return	Rainfall	Rainfall
	ID	Source	ID	Type	Units			Period	Depth	Distribution
								(years)	(inches)	

Subbasin Summary

Subbasin ID	Area	Peak Rate Factor	Weighted Curve Number	Average Slope	Flow Length	Total Rainfall	Total Runoff	Total Runoff Volume	Peak Runoff	Time of Concentration
	(ac)			(%)	(ft)	(in)	(in)	(ac-in)	(cfs)	(days hh:mm:ss)
Sub-01	36.33	0.00	67.91	7.6700	1806.00	2.72	0.49	17.62	22.83	0 00:06:45
Sub-02	10.35	0.00	73.69	5.8000	849.00	2.72	0.72	7.47	11.00	0 00:05:00
Sub-03	19.64	0.00	71.89	9.7000	1248.00	2.72	0.64	12.61	18.00	0 00:05:00
Sub-04	31.59	0.00	73.69	11.4000	1659.00	2.72	0.72	22.81	33.07	0 00:05:25
Sub-05	23.00	0.00	76.28	12.5500	1371.00	2.72	0.85	19.44	29.59	0 00:05:00
Sub-06	14.99	0.00	75.63	12.5500	4090.00	2.72	0.81	12.19	16.17	0 00:10:28
Sub-07	55.50	0.00	76.52	11.0800	2327.00	2.72	0.86	47.56	67.91	0 00:07:07
Sub-08	103.26	0.00	77.71	11.0800	3377.00	2.72	0.92	94.90	130.19	0 00:09:28
Sub-09	27.76	0.00	77.58	3.0000	1535.00	2.72	0.91	25.32	35.29	0 00:08:32
Sub-10	15.89	0.00	72.48	10.0000	1099.00	2.72	0.67	10.61	15.32	0 00:05:00
Sub-11	200.91	0.00	75.16	3.0000	5034.00	2.72	0.79	158.72	157.78	0 00:21:19
Sub-12	203.25	0.00	78.37	9.9200	5070.00	2.72	0.95	193.90	244.08	0 00:13:31
Sub-14	137.26	0.00	65.26	10.0000	4006.00	2.72	0.39	53.94	56.48	0 00:11:15
Sub-15	199.89	0.00	71.11	17.3300	5019.00	2.72	0.61	121.73	151.94	0 00:10:49
Sub-17	270.69	0.00	76.01	19.5900	6020.00	2.72	0.83	225.21	290.12	0 00:11:52
Sub-18	184.46	0.00	79.37	21.8000	3787.00	2.72	1.01	186.12	265.42	0 00:07:58
Sub-19	36.42	0.00	69.67	15.3100	2056.00	2.72	0.55	20.07	27.16	0 00:05:42
Sub-22	60.51	0.00	67.70	7.2000	2450.00	2.72	0.48	28.86	35.48	0 00:08:44
Sub-28	100.31	0.00	61.80	5.5000	3319.00	2.72	0.29	28.79	23.58	0 00:12:15
Sub-29	304.22	0.00	69.63	16.1200	6458.00	2.72	0.55	167.32	187.20	0 00:13:31
Sub-31	17.60	0.00	81.93	10.0000	1168.00	2.72	1.16	20.38	32.22	0 00:05:00
Sub-41	64.14	0.00	75.60	0.5000	500.00	2.72	0.81	52.08	73.52	0 00:07:10

Subbasin Hydrology

Subbasin : Sub-01

Input Data

Area (ac)	36.33
Peak Rate Factor	0
Weighted Curve Number	67.91
Average Slope (%)	7.67
Flow Length (ft)	1806
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	36.33	-	67.91
Composite Area & Weighted CN	36.33		67.91

Time of Concentration

TOC Method : Kirpich

Sheet Flow Equation :

$T_c = (0.0078 * ((L_f^{0.77}) * (S_f^{-0.385})))$

Where :

- Tc = Time of Concentration (min)
- Lf = Flow Length (ft)
- Sf = Slope (ft/ft)

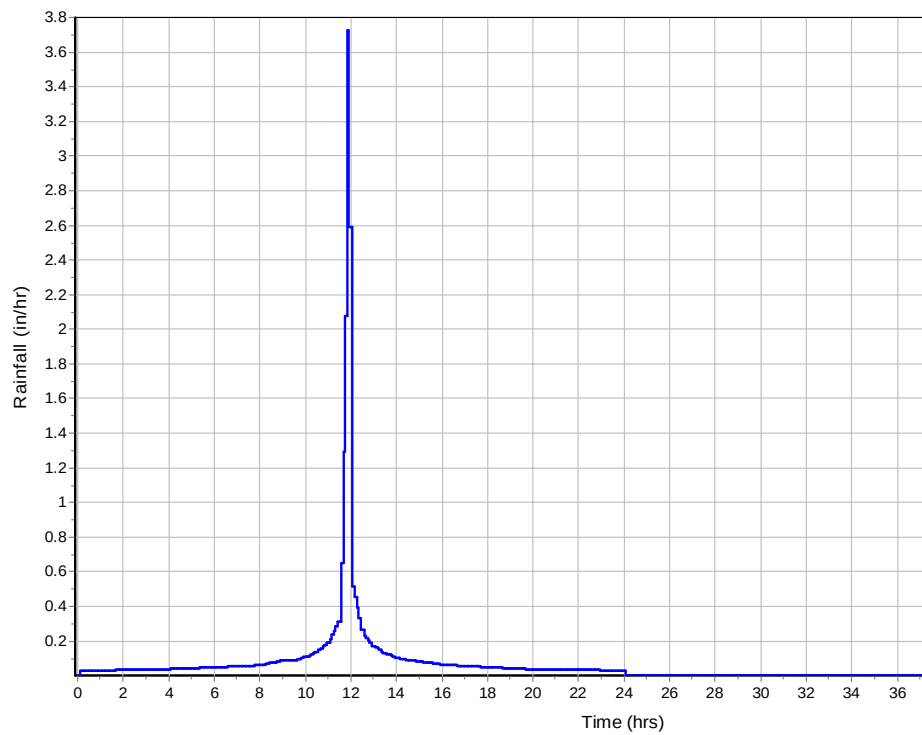
Flow Length (ft)	1806
Slope (%)	7.67
Computed TOC (min)	6.75

Subbasin Runoff Results

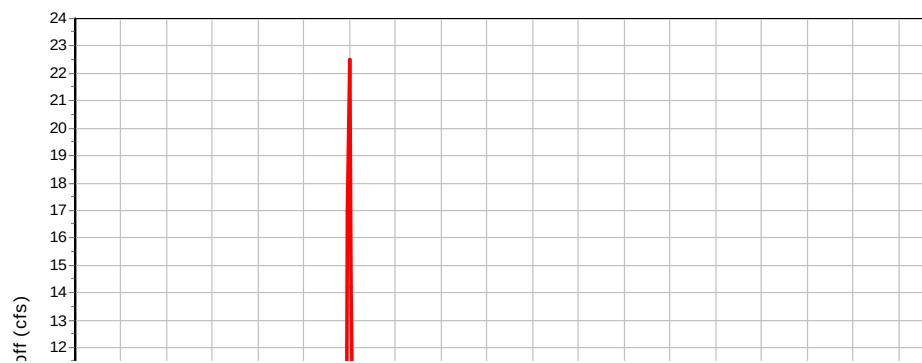
Total Rainfall (in)	2.72
Total Runoff (in)	0.49
Peak Runoff (cfs)	22.83
Weighted Curve Number	67.91
Time of Concentration (days hh:mm:ss)	0 00:06:45

Subbasin : Sub-01

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-02

Input Data

Area (ac)	10.35
Peak Rate Factor	0
Weighted Curve Number	73.69
Average Slope (%)	5.8
Flow Length (ft)	849
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	10.35	-	73.69
Composite Area & Weighted CN	10.35		73.69

Time of Concentration

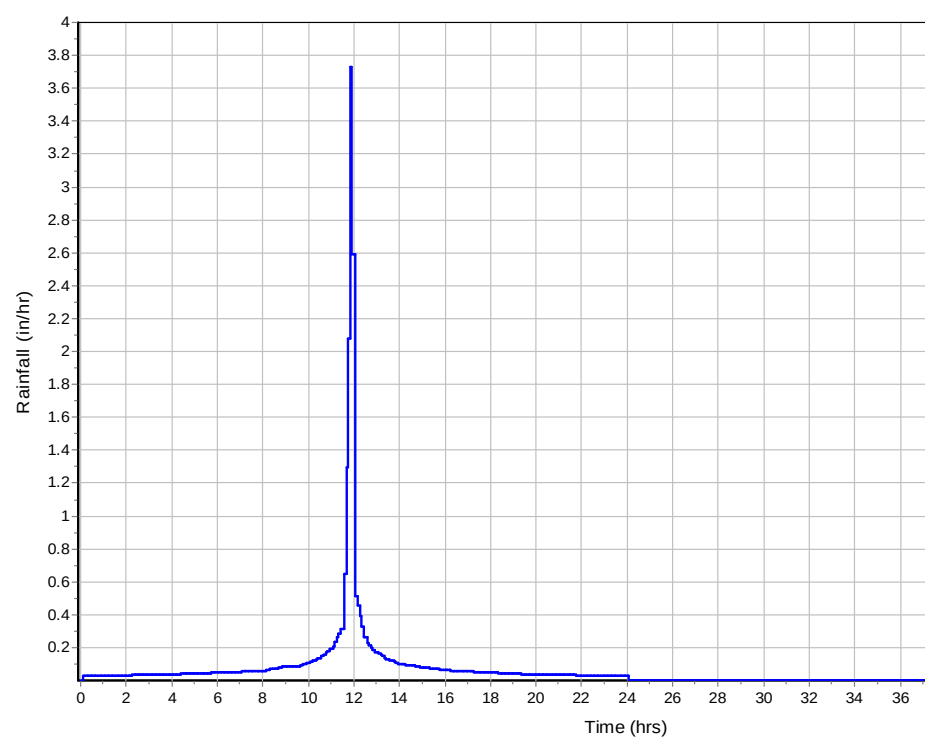
Flow Length (ft)	849
Slope (%)	5.8
Computed TOC (min)	4.2

Subbasin Runoff Results

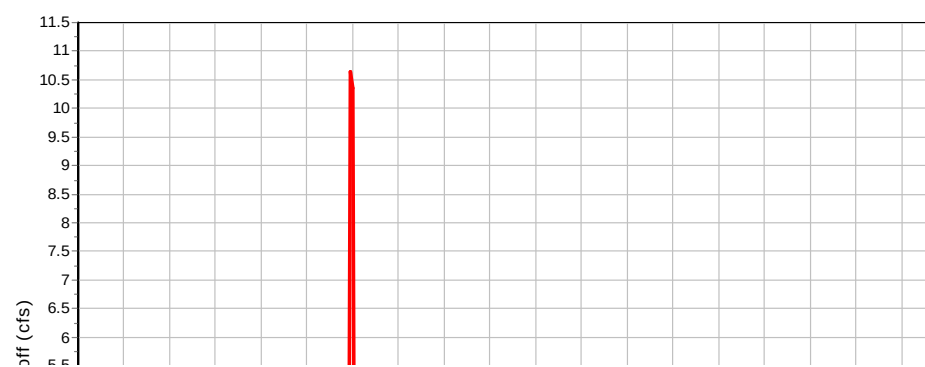
Total Rainfall (in)	2.72
Total Runoff (in)	0.72
Peak Runoff (cfs)	11
Weighted Curve Number	73.69
Time of Concentration (days hh:mm:ss)	0 00:04:12

Subbasin : Sub-02

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-03

Input Data

Area (ac)	19.64
Peak Rate Factor	0
Weighted Curve Number	71.89
Average Slope (%)	9.7
Flow Length (ft)	1248
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	19.64	-	71.89
Composite Area & Weighted CN	19.64		71.89

Time of Concentration

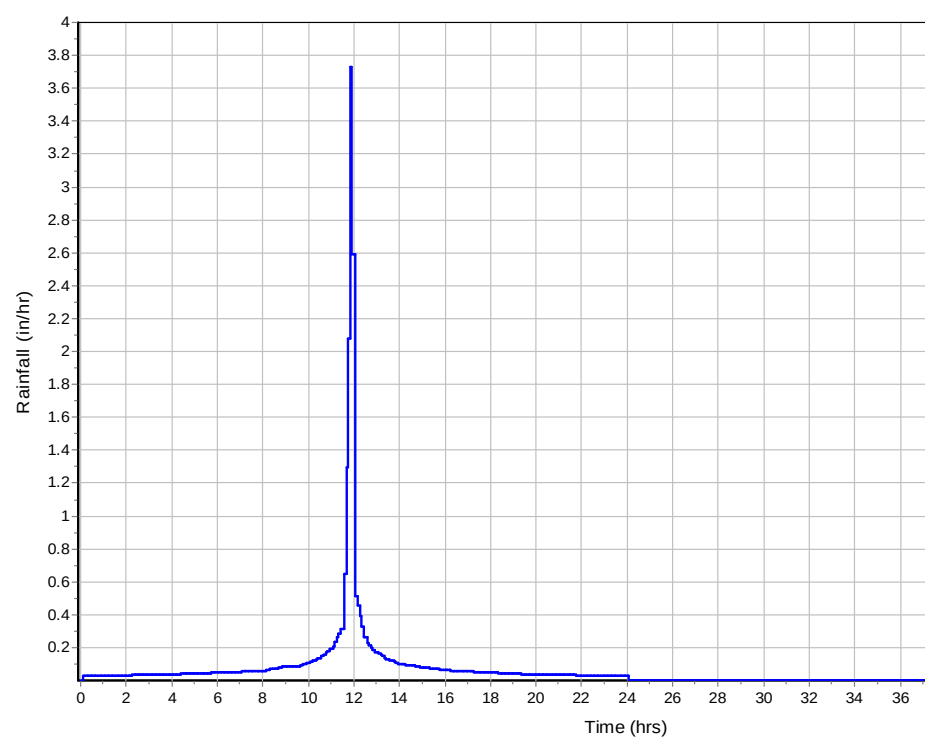
Flow Length (ft)	1248
Slope (%)	9.7
Computed TOC (min)	4.64

Subbasin Runoff Results

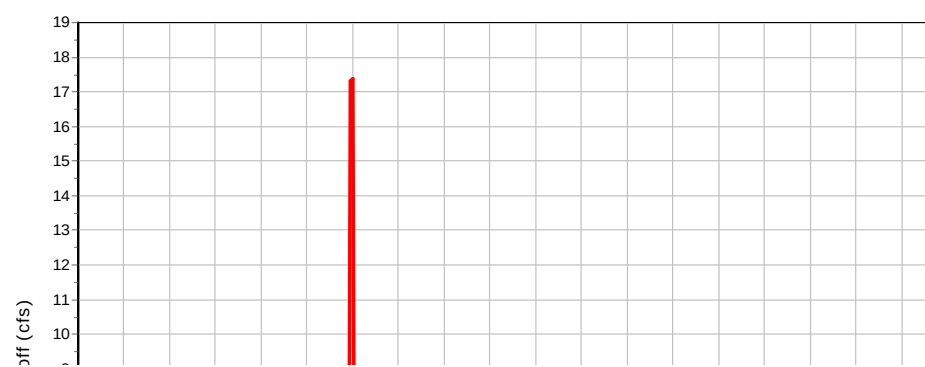
Total Rainfall (in)	2.72
Total Runoff (in)	0.64
Peak Runoff (cfs)	18
Weighted Curve Number	71.89
Time of Concentration (days hh:mm:ss)	0 00:04:38

Subbasin : Sub-03

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-04

Input Data

Area (ac)	31.59
Peak Rate Factor	0
Weighted Curve Number	73.69
Average Slope (%)	11.4
Flow Length (ft)	1659
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	31.59	-	73.69
Composite Area & Weighted CN	31.59		73.69

Time of Concentration

Flow Length (ft)	1659
Slope (%)	11.4
Computed TOC (min)	5.43

Subbasin Runoff Results

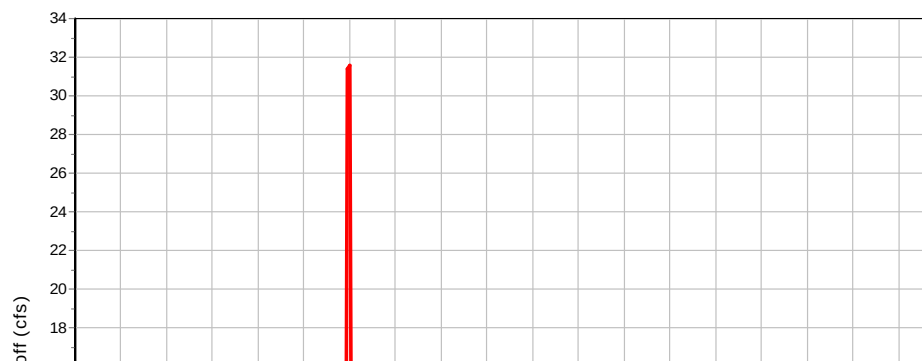
Total Rainfall (in)	2.72
Total Runoff (in)	0.72
Peak Runoff (cfs)	33.07
Weighted Curve Number	73.69
Time of Concentration (days hh:mm:ss)	0 00:05:26

Subbasin : Sub-04

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-05

Input Data

Area (ac)	23
Peak Rate Factor	0
Weighted Curve Number	76.28
Average Slope (%)	12.55
Flow Length (ft)	1371
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	23	-	76.28
Composite Area & Weighted CN	23		76.28

Time of Concentration

Flow Length (ft)	1371
Slope (%)	12.55
Computed TOC (min)	4.51

Subbasin Runoff Results

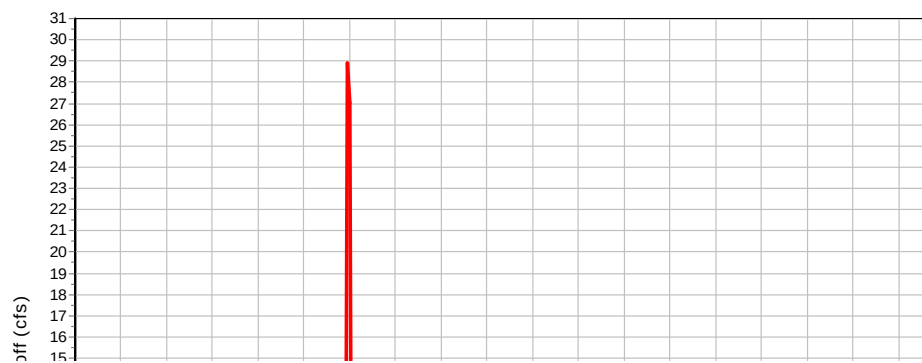
Total Rainfall (in)	2.72
Total Runoff (in)	0.85
Peak Runoff (cfs)	29.59
Weighted Curve Number	76.28
Time of Concentration (days hh:mm:ss)	0 00:04:31

Subbasin : Sub-05

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-06

Input Data

Area (ac)	14.99
Peak Rate Factor	0
Weighted Curve Number	75.63
Average Slope (%)	12.55
Flow Length (ft)	4090
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	14.99	-	75.63
Composite Area & Weighted CN	14.99		75.63

Time of Concentration

Flow Length (ft)	4090
Slope (%)	12.55
Computed TOC (min)	10.47

Subbasin Runoff Results

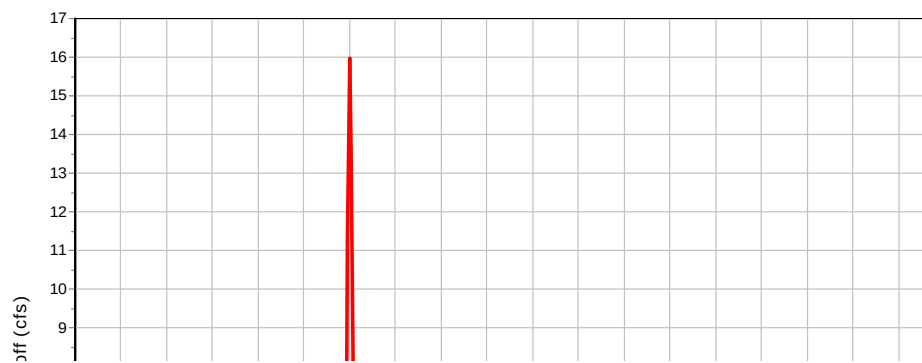
Total Rainfall (in)	2.72
Total Runoff (in)	0.81
Peak Runoff (cfs)	16.17
Weighted Curve Number	75.63
Time of Concentration (days hh:mm:ss)	0 00:10:28

Subbasin : Sub-06

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-07

Input Data

Area (ac)	55.5
Peak Rate Factor	0
Weighted Curve Number	76.52
Average Slope (%)	11.08
Flow Length (ft)	2327
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	55.5	-	76.52
Composite Area & Weighted CN	55.5		76.52

Time of Concentration

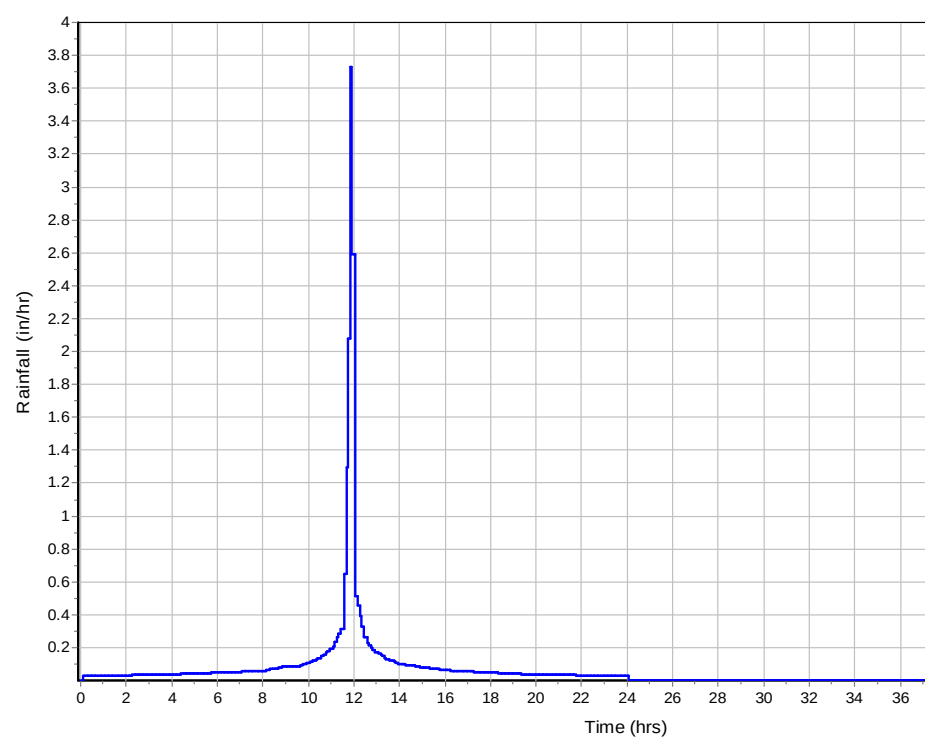
Flow Length (ft)	2327
Slope (%)	11.08
Computed TOC (min)	7.12

Subbasin Runoff Results

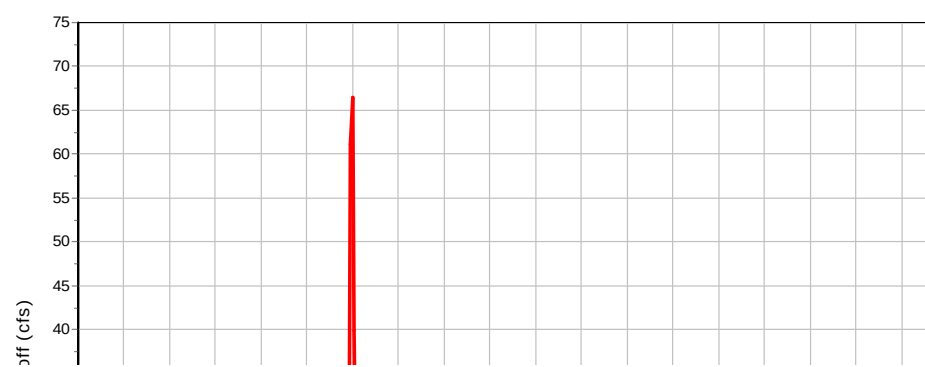
Total Rainfall (in)	2.72
Total Runoff (in)	0.86
Peak Runoff (cfs)	67.91
Weighted Curve Number	76.52
Time of Concentration (days hh:mm:ss)	0 00:07:07

Subbasin : Sub-07

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-08

Input Data

Area (ac)	103.26
Peak Rate Factor	0
Weighted Curve Number	77.71
Average Slope (%)	11.08
Flow Length (ft)	3377
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	103.26	-	77.71
Composite Area & Weighted CN	103.26		77.71

Time of Concentration

Flow Length (ft)	3377
Slope (%)	11.08
Computed TOC (min)	9.48

Subbasin Runoff Results

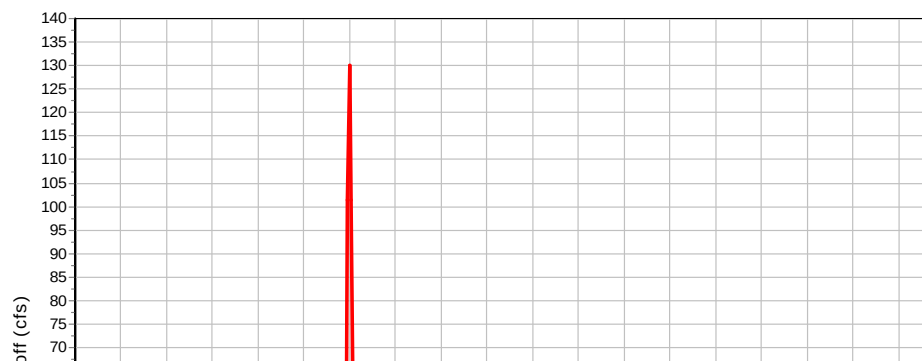
Total Rainfall (in)	2.72
Total Runoff (in)	0.92
Peak Runoff (cfs)	130.19
Weighted Curve Number	77.71
Time of Concentration (days hh:mm:ss)	0 00:09:29

Subbasin : Sub-08

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-09

Input Data

Area (ac)	27.76
Peak Rate Factor	0
Weighted Curve Number	77.58
Average Slope (%)	3
Flow Length (ft)	1535
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	27.76	-	77.58
Composite Area & Weighted CN	27.76		77.58

Time of Concentration

Flow Length (ft)	1535
Slope (%)	3
Computed TOC (min)	8.54

Subbasin Runoff Results

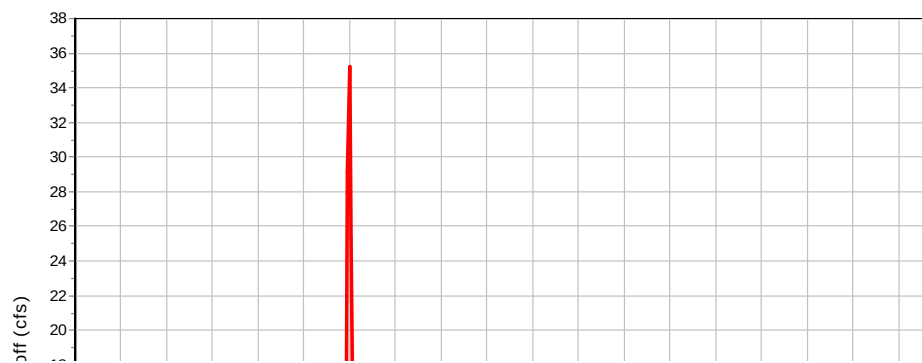
Total Rainfall (in)	2.72
Total Runoff (in)	0.91
Peak Runoff (cfs)	35.29
Weighted Curve Number	77.58
Time of Concentration (days hh:mm:ss)	0 00:08:32

Subbasin : Sub-09

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-10

Input Data

Area (ac)	15.89
Peak Rate Factor	0
Weighted Curve Number	72.48
Average Slope (%)	10
Flow Length (ft)	1099
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	15.89	-	72.48
Composite Area & Weighted CN	15.89		72.48

Time of Concentration

Flow Length (ft)	1099
Slope (%)	10
Computed TOC (min)	4.16

Subbasin Runoff Results

Total Rainfall (in)	2.72
Total Runoff (in)	0.67
Peak Runoff (cfs)	15.32
Weighted Curve Number	72.48
Time of Concentration (days hh:mm:ss)	0 00:04:10

Subbasin : Sub-10

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-11

Input Data

Area (ac)	200.91
Peak Rate Factor	0
Weighted Curve Number	75.16
Average Slope (%)	3
Flow Length (ft)	5034
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		200.91	-	75.16
Composite Area & Weighted CN		200.91		75.16

Time of Concentration

Flow Length (ft)	5034
Slope (%)	3
Computed TOC (min)	21.32

Subbasin Runoff Results

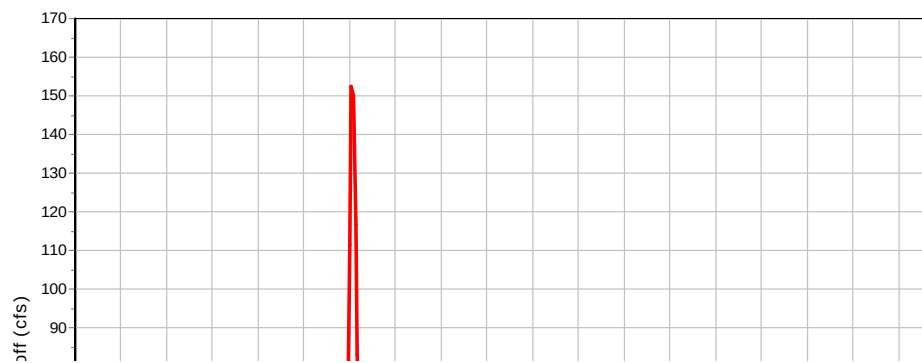
Total Rainfall (in)	2.72
Total Runoff (in)	0.79
Peak Runoff (cfs)	157.78
Weighted Curve Number	75.16
Time of Concentration (days hh:mm:ss)	0 00:21:19

Subbasin : Sub-11

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-12

Input Data

Area (ac)	203.25
Peak Rate Factor	0
Weighted Curve Number	78.37
Average Slope (%)	9.92
Flow Length (ft)	5070
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		203.25	-	78.37
Composite Area & Weighted CN		203.25		78.37

Time of Concentration

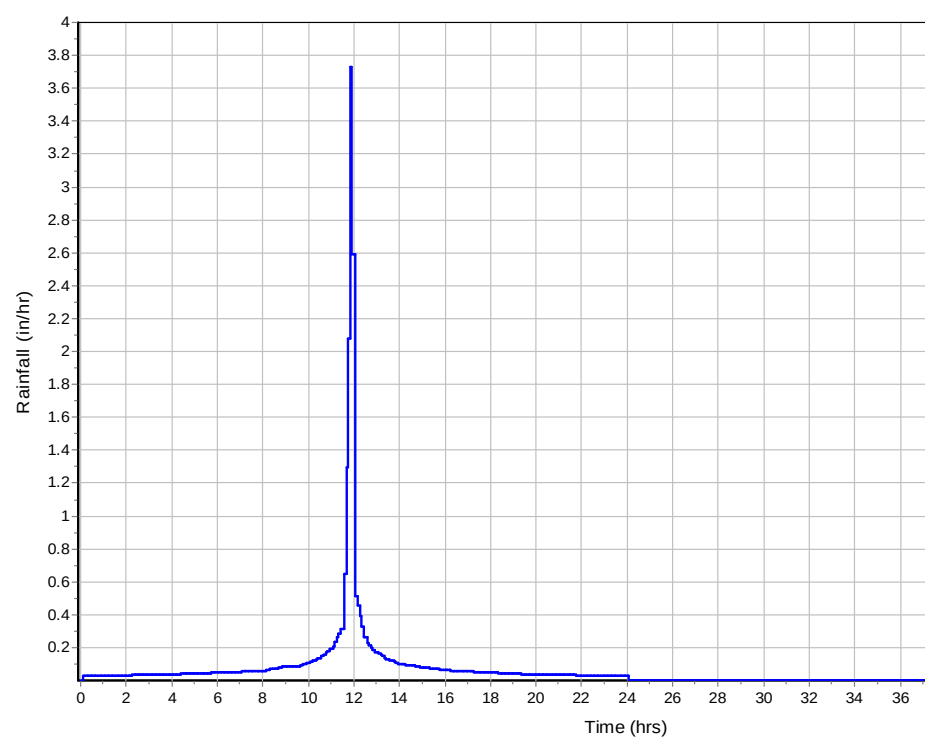
Flow Length (ft)	5070
Slope (%)	9.92
Computed TOC (min)	13.53

Subbasin Runoff Results

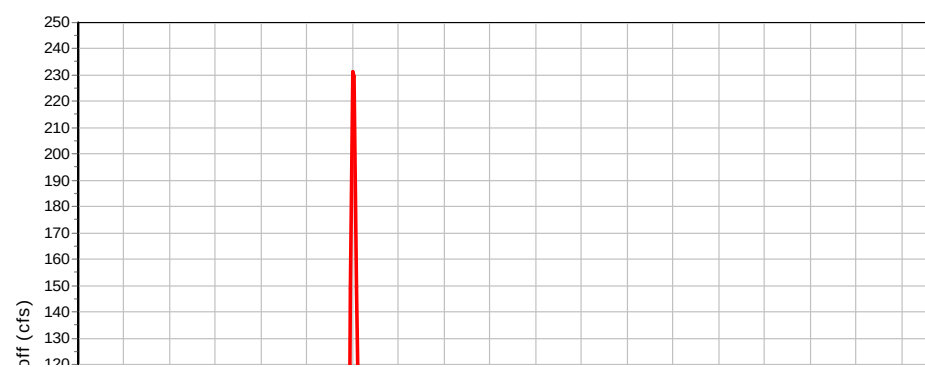
Total Rainfall (in)	2.72
Total Runoff (in)	0.95
Peak Runoff (cfs)	244.08
Weighted Curve Number	78.37
Time of Concentration (days hh:mm:ss)	0 00:13:32

Subbasin : Sub-12

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-14

Input Data

Area (ac)	137.26
Peak Rate Factor	0
Weighted Curve Number	65.26
Average Slope (%)	10
Flow Length (ft)	4006
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		137.26	-	65.26
Composite Area & Weighted CN		137.26		65.26

Time of Concentration

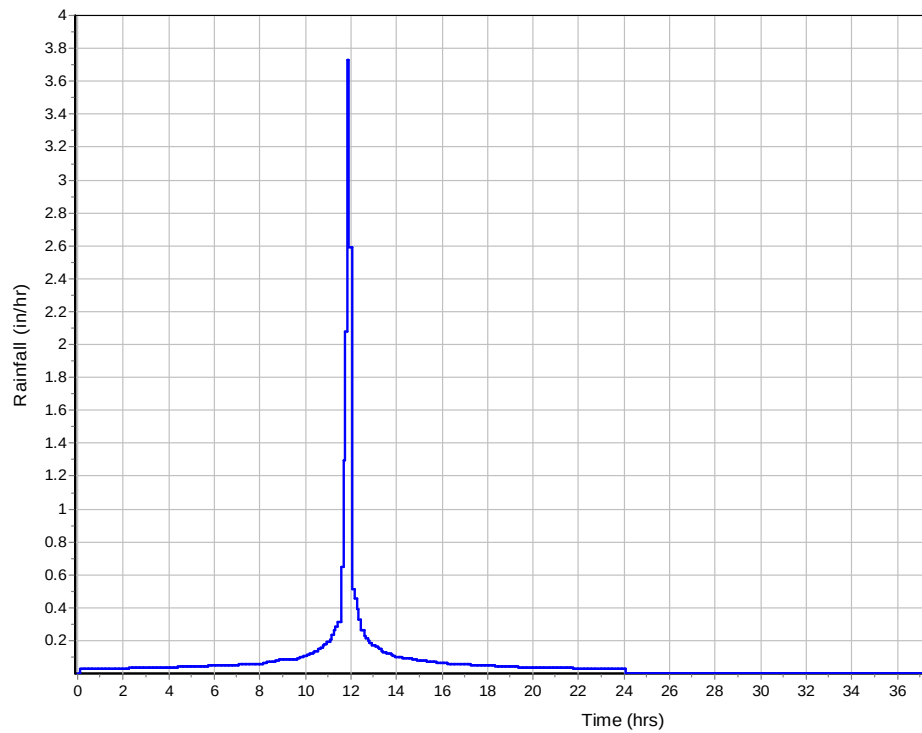
Flow Length (ft)	4006
Slope (%)	10
Computed TOC (min)	11.25

Subbasin Runoff Results

Total Rainfall (in)	2.72
Total Runoff (in)	0.39
Peak Runoff (cfs)	56.48
Weighted Curve Number	65.26
Time of Concentration (days hh:mm:ss)	0 00:11:15

Subbasin : Sub-14

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-15

Input Data

Area (ac)	199.89
Peak Rate Factor	0
Weighted Curve Number	71.11
Average Slope (%)	17.33
Flow Length (ft)	5019
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		199.89	-	71.11
Composite Area & Weighted CN		199.89		71.11

Time of Concentration

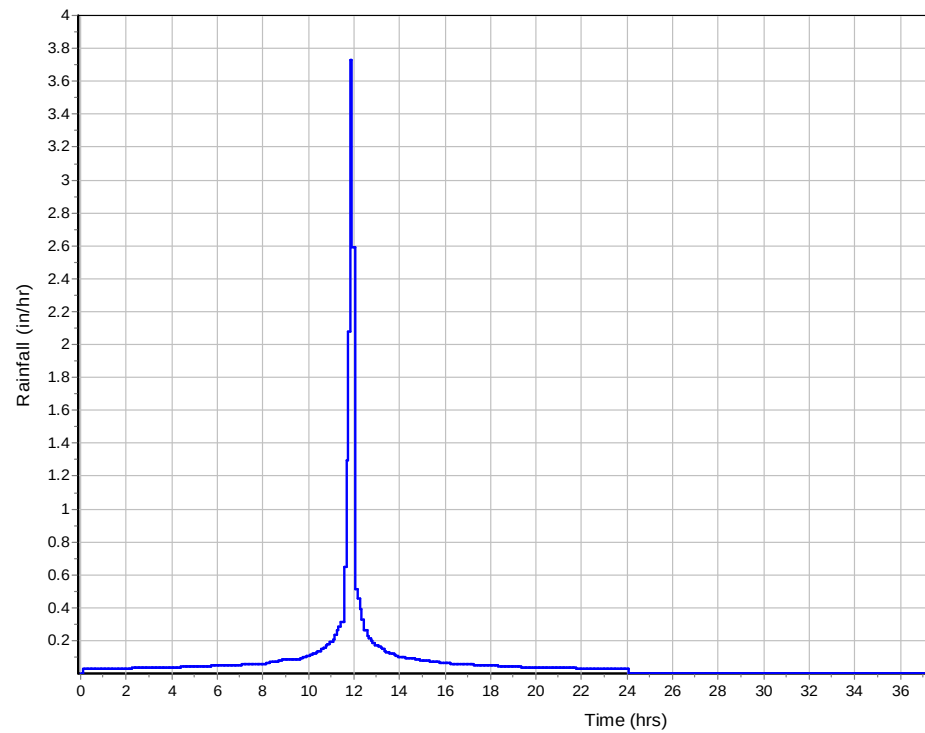
Flow Length (ft)	5019
Slope (%)	17.33
Computed TOC (min)	10.83

Subbasin Runoff Results

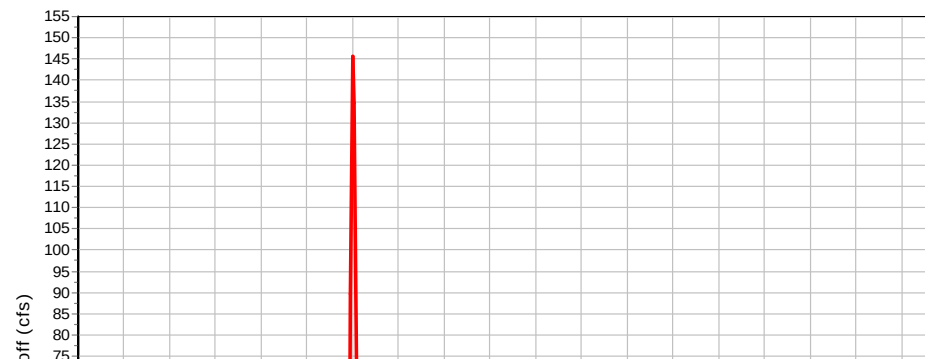
Total Rainfall (in)	2.72
Total Runoff (in)	0.61
Peak Runoff (cfs)	151.94
Weighted Curve Number	71.11
Time of Concentration (days hh:mm:ss)	0 00:10:50

Subbasin : Sub-15

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-17

Input Data

Area (ac)	270.69
Peak Rate Factor	0
Weighted Curve Number	76.01
Average Slope (%)	19.59
Flow Length (ft)	6020
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		270.69	-	76.01
Composite Area & Weighted CN		270.69		76.01

Time of Concentration

Flow Length (ft)	6020
Slope (%)	19.59
Computed TOC (min)	11.88

Subbasin Runoff Results

Total Rainfall (in)	2.72
Total Runoff (in)	0.83
Peak Runoff (cfs)	290.12
Weighted Curve Number	76.01
Time of Concentration (days hh:mm:ss)	0 00:11:53

Subbasin : Sub-17

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-18

Input Data

Area (ac)	184.46
Peak Rate Factor	0
Weighted Curve Number	79.37
Average Slope (%)	21.8
Flow Length (ft)	3787
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		184.46	-	79.37
Composite Area & Weighted CN		184.46		79.37

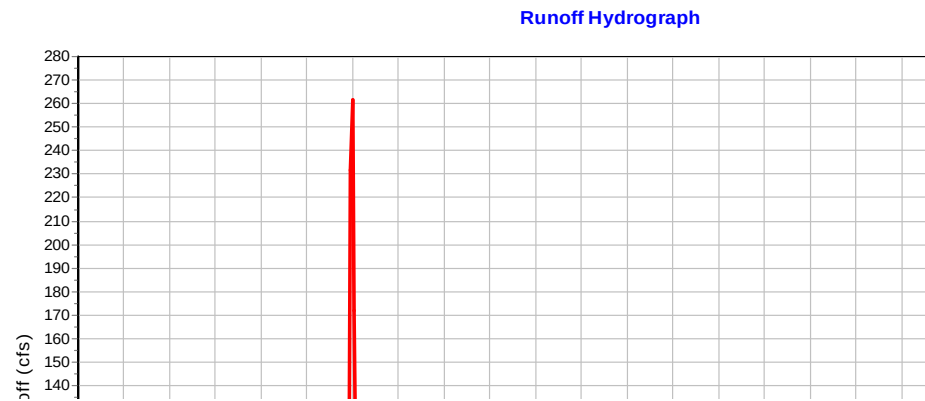
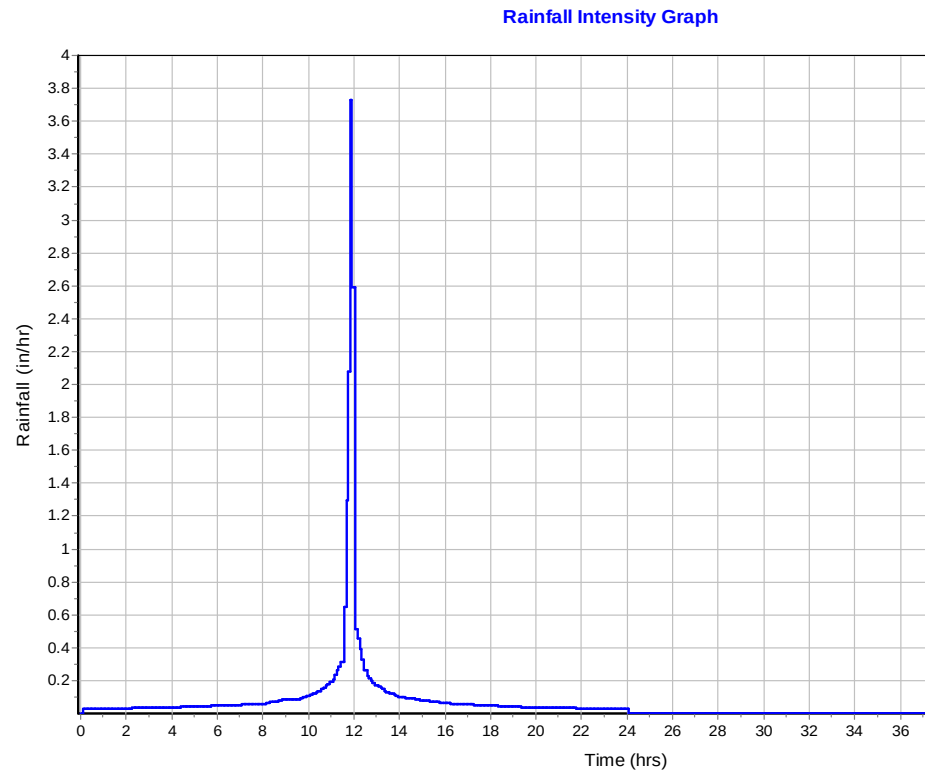
Time of Concentration

Flow Length (ft)	3787
Slope (%)	21.8
Computed TOC (min)	7.98

Subbasin Runoff Results

Total Rainfall (in)	2.72
Total Runoff (in)	1.01
Peak Runoff (cfs)	265.42
Weighted Curve Number	79.37
Time of Concentration (days hh:mm:ss)	0 00:07:59

Subbasin : Sub-18



Subbasin : Sub-19

Input Data

Area (ac)	36.42
Peak Rate Factor	0
Weighted Curve Number	69.67
Average Slope (%)	15.31
Flow Length (ft)	2056
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		45.17	-	69.67
Composite Area & Weighted CN		45.17		69.67

Time of Concentration

Flow Length (ft)	2056
Slope (%)	15.31
Computed TOC (min)	5.71

Subbasin Runoff Results

Total Rainfall (in)	2.72
Total Runoff (in)	0.55
Peak Runoff (cfs)	27.16
Weighted Curve Number	69.67
Time of Concentration (days hh:mm:ss)	0 00:05:43

Subbasin : Sub-19

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-22

Input Data

Area (ac)	60.51
Peak Rate Factor	0
Weighted Curve Number	67.7
Average Slope (%)	7.2
Flow Length (ft)	2450
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		60.51	-	67.7
Composite Area & Weighted CN		60.51		67.7

Time of Concentration

Flow Length (ft)	2450
Slope (%)	7.2
Computed TOC (min)	8.74

Subbasin Runoff Results

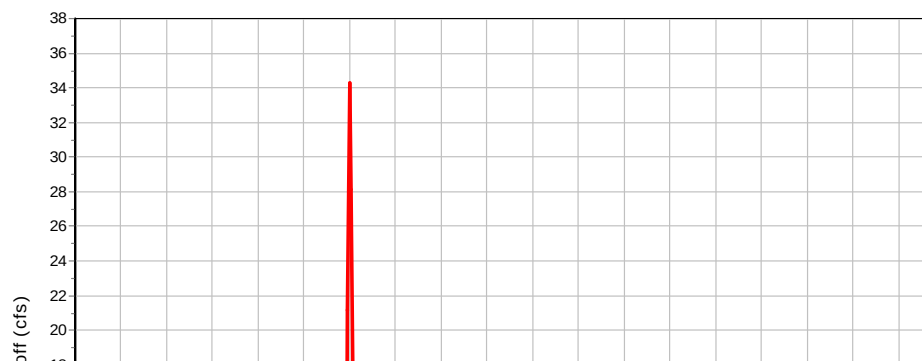
Total Rainfall (in)	2.72
Total Runoff (in)	0.48
Peak Runoff (cfs)	35.48
Weighted Curve Number	67.7
Time of Concentration (days hh:mm:ss)	0 00:08:44

Subbasin : Sub-22

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-28

Input Data

Area (ac)	100.31
Peak Rate Factor	0
Weighted Curve Number	61.8
Average Slope (%)	5.5
Flow Length (ft)	3319
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		100.31	-	61.8
Composite Area & Weighted CN		100.31		61.8

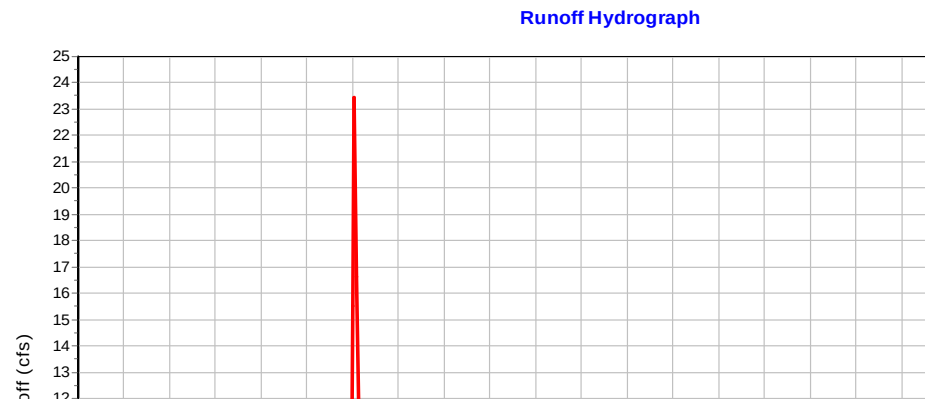
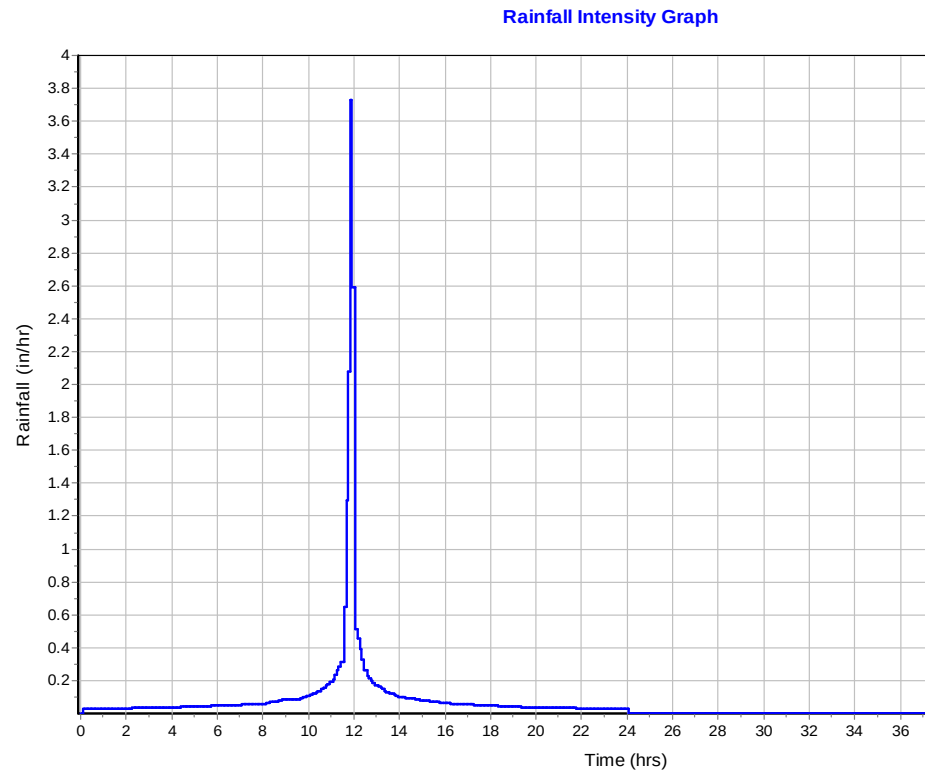
Time of Concentration

Flow Length (ft)	3319
Slope (%)	5.5
Computed TOC (min)	12.25

Subbasin Runoff Results

Total Rainfall (in)	2.72
Total Runoff (in)	0.29
Peak Runoff (cfs)	23.58
Weighted Curve Number	61.8
Time of Concentration (days hh:mm:ss)	0 00:12:15

Subbasin : Sub-28



Subbasin : Sub-29

Input Data

Area (ac)	304.22
Peak Rate Factor	0
Weighted Curve Number	69.63
Average Slope (%)	16.12
Flow Length (ft)	6458
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		304.22	-	69.63
Composite Area & Weighted CN		304.22		69.63

Time of Concentration

Flow Length (ft)	6458
Slope (%)	16.12
Computed TOC (min)	13.52

Subbasin Runoff Results

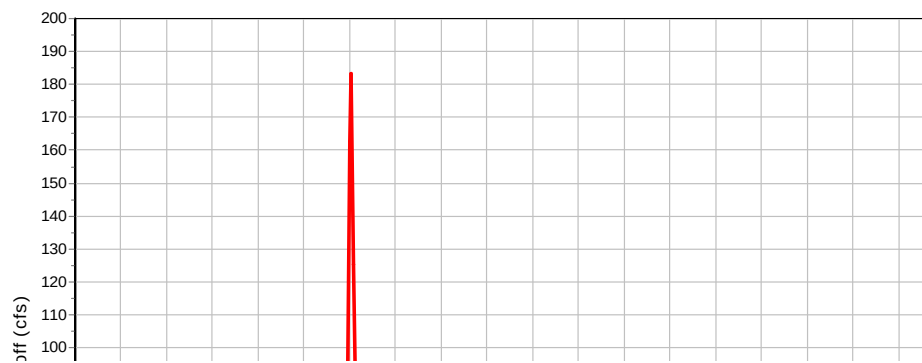
Total Rainfall (in)	2.72
Total Runoff (in)	0.55
Peak Runoff (cfs)	187.2
Weighted Curve Number	69.63
Time of Concentration (days hh:mm:ss)	0 00:13:31

Subbasin : Sub-29

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-31

Input Data

Area (ac)	17.6
Peak Rate Factor	0
Weighted Curve Number	81.93
Average Slope (%)	10
Flow Length (ft)	1168
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		17.6	-	81.93
Composite Area & Weighted CN		17.6		81.93

Time of Concentration

Flow Length (ft)	1168
Slope (%)	10
Computed TOC (min)	4.36

Subbasin Runoff Results

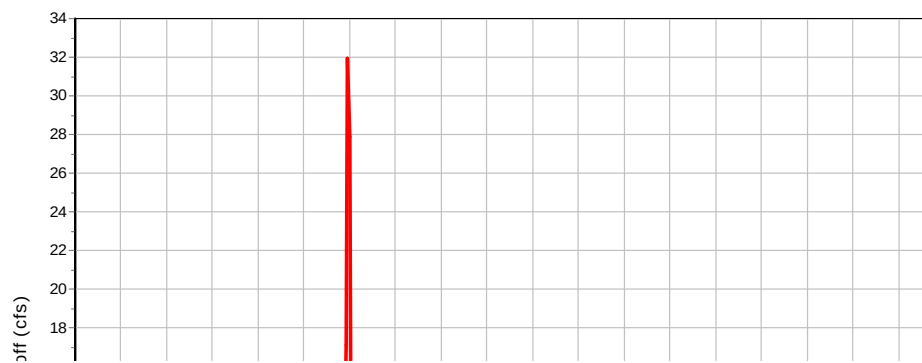
Total Rainfall (in)	2.72
Total Runoff (in)	1.16
Peak Runoff (cfs)	32.22
Weighted Curve Number	81.93
Time of Concentration (days hh:mm:ss)	0 00:04:22

Subbasin : Sub-31

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-41

Input Data

Area (ac)	64.14
Peak Rate Factor	0
Weighted Curve Number	75.6
Average Slope (%)	0.5
Flow Length (ft)	500
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		64.14	-	75.6
Composite Area & Weighted CN		64.14		75.6

Time of Concentration

Flow Length (ft)	500
Slope (%)	0.5
Computed TOC (min)	7.18

Subbasin Runoff Results

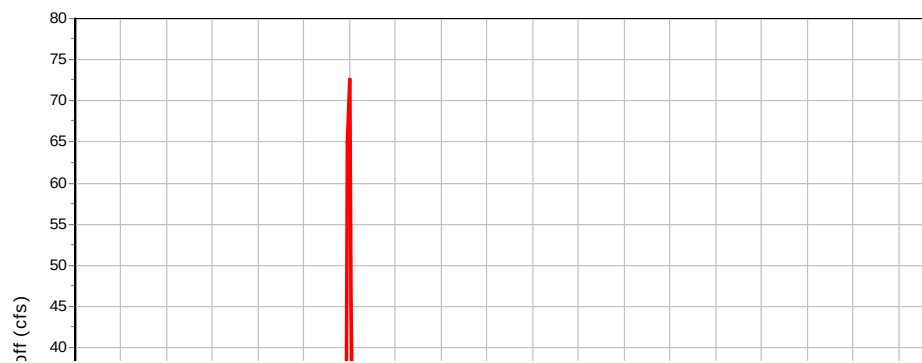
Total Rainfall (in)	2.72
Total Runoff (in)	0.81
Peak Runoff (cfs)	73.52
Weighted Curve Number	75.6
Time of Concentration (days hh:mm:ss)	0 00:07:11

Subbasin : Sub-41

Rainfall Intensity Graph



Runoff Hydrograph



Junction Input

Element ID	Invert Elevation	Ground/Rim (Max) Elevation	Surcharge Elevation	Surcharge Depth
	(ft)	(ft)	(ft)	(ft)
6	4255.78	4261.78	4261.78	0.00
7	4253.11	4259.11	4259.11	0.00
8	4245.81	4251.81	4251.81	0.00
9	4243.77	4249.77	4249.77	0.00
10	4256.91	4262.91	4262.91	0.00
11	4241.07	4247.07	4247.07	0.00
12	4241.47	4247.47	4247.47	0.00
30	4308.33	4314.33	4314.33	0.00
40	4259.38	4265.38	4265.38	0.00
41	4260.21	4266.21	4266.21	0.00
42	4253.17	4259.17	4259.17	0.00
43	4246.76	4252.76	4252.76	0.00
44	4243.38	4249.38	4249.38	0.00
68	4352.27	4358.27	4358.27	0.00
69	4348.99	4354.99	4354.99	0.00
70	4342.86	4348.86	4348.86	0.00
71	4278.30	4284.30	4284.30	0.00
72	4266.77	4272.77	4272.77	0.00
82	4375.08	4381.08	4381.08	0.00
83	4373.93	4379.93	4379.93	0.00
113	4393.41	4399.41	4399.41	0.00
129	4223.00	4229.00	4229.00	0.00
131	4224.26	4230.26	4230.26	0.00
132	4229.07	4235.07	4235.07	0.00
133	4228.44	4234.44	4234.44	0.00
134	4224.79	4230.79	4230.79	0.00
176	4253.83	4259.83	4259.83	0.00
177	4272.20	4278.20	4278.20	0.00
179	4248.00	4254.00	4254.00	0.00
196	4312.04	4318.04	4318.04	0.00
200	4259.00	4263.63	4263.63	0.00
8-Jun	4300.00	4307.00	4307.00	0.00
9-Jun	4293.00	4299.00	4299.00	0.00
10-Jun	4222.00	4229.00	4229.00	0.00
14-Jun	4427.00	4433.00	4433.00	0.00
15-Jun	4422.00	4428.00	4428.00	0.00
16-Jun	4240.00	4244.00	4244.00	0.00
26-Jun	4287.00	4293.00	4293.00	0.00
27-Jun	4259.00	4265.00	4265.00	0.00
29-Jun	4235.07	4243.07	4243.70	0.63
30-Jun	4220.00	4223.00	4223.00	0.00
Jun-31	4397.00	4403.00	4403.00	0.00
Jun-32	4348.99	4354.99	4354.99	0.00
Jun-33	4352.27	4358.27	4358.27	0.00
Jun-34	4285.00	4291.00	4291.00	0.00

Junction Results

Element ID	Peak Inflow	Peak Lateral Inflow	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained
	(cfs)	(cfs)	(ft)	(ft)	(ft)
6	207.00	0.00	1.46	4257.57	1.79
7	207.00	0.00	3.61	4254.22	1.11
8	207.00	0.00	1.35	4247.66	1.85
9	207.00	0.00	3.10	4245.13	1.36
10	207.00	0.00	2.20	4258.59	1.68
11	236.49	31.58	5.42	4241.21	0.14
12	207.00	0.00	1.34	4243.33	1.86
30	121.70	0.00	6.93	4309.22	0.89
40	255.32	15.96	3.77	4260.16	0.78
41	241.79	0.00	2.09	4261.40	1.19
42	255.27	0.00	3.54	4254.04	0.87
43	254.93	0.00	3.03	4247.86	1.10
44	299.96	66.51	5.96	4243.41	0.03
68	111.90	111.90	5.51	4352.71	0.44
69	111.89	0.00	5.32	4349.55	0.56
70	111.89	0.00	4.71	4343.48	0.62
71	251.53	130.00	3.36	4279.26	0.96
72	243.18	0.00	3.74	4267.58	0.81
82	327.40	327.40	10.87	4376.02	0.94
83	327.39	0.00	10.62	4375.11	1.18
113	361.57	0.00	3.59	4394.63	1.22
129	52.38	0.00	2.75	4223.83	0.83
131	52.53	0.00	3.59	4224.83	0.57
132	53.64	53.64	1.52	4229.68	0.61
133	53.64	0.00	2.34	4228.95	0.51
134	52.68	0.00	3.80	4225.32	0.53
176	1381.84	399.92	0.00	4257.28	3.45
177	623.46	279.76	3.01	4273.37	1.17
179	455.09	0.00	1.37	4250.82	2.82
196	121.50	121.50	6.61	4313.10	1.06
200	311.02	145.50	0.00	4260.84	1.84
8-Jun	44.70	44.70	4.11	4301.31	1.31
9-Jun	44.68	0.00	4.01	4293.99	0.99
10-Jun	52.24	0.00	3.96	4223.35	1.35
14-Jun	361.80	361.80	10.70	4428.07	1.07
15-Jun	361.77	0.00	9.91	4423.57	1.57
16-Jun	661.73	206.64	0.00	4243.12	3.12
26-Jun	165.69	0.00	4.34	4287.79	0.79
27-Jun	431.92	72.60	1.66	4261.01	2.01
29-Jun	11.40	11.40	6.77	4235.53	0.46
30-Jun	63.59	31.93	0.34	4220.90	0.90
Jun-31	361.65	0.00	3.16	4398.41	1.41
Jun-32	10.00	0.00	0.41	4353.95	4.96
Jun-33	10.00	10.00	3.69	4354.09	1.82

Channel Input

Element ID	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Shape	Height	Width	Manning's Roughness
	(ft)	(ft)	(ft)	(%)		(ft)	(ft)	
Link-104	323.62	4266.77	4260.21	2.0300	Trapezoidal	3.000	24.000	0.0320
Link-106	989.28	4278.30	4266.77	1.1700	Trapezoidal	3.000	24.000	0.0320
Link-107	1563.70	4342.86	4278.30	4.1300	Trapezoidal	3.000	24.000	0.0320
Link-141	315.45	4256.91	4255.78	0.3600	Trapezoidal	6.000	39.500	0.0320
Link-142	361.26	4253.11	4245.81	2.0200	Trapezoidal	6.000	39.500	0.0320
Link-143	275.20	4243.77	4241.47	0.8400	Trapezoidal	6.000	39.500	0.0320
Link-167	639.08	4272.20	4253.83	2.8700	Trapezoidal	4.000	26.000	0.0320
Link-168	5237.65	4393.41	4272.20	2.3100	Trapezoidal	4.000	26.000	0.0320
Link-178	257.45	4259.38	4253.17	2.4100	Trapezoidal	3.000	24.000	0.0320
Link-179	404.20	4253.17	4246.76	1.5900	Trapezoidal	3.000	24.000	0.0320
Link-180	321.82	4246.76	4243.38	1.0500	Trapezoidal	3.000	24.000	0.0320
Link-181	103.73	4348.99	4342.86	5.9100	Trapezoidal	3.000	24.000	0.0320
Link-243	640.58	4287.00	4259.00	4.3700	Trapezoidal	3.500	20.000	0.0320
Link-244	980.62	4293.00	4287.00	0.6100	Trapezoidal	4.000	18.500	0.0320
Link-246	2992.37	4259.00	4253.83	0.1700	Trapezoidal	6.000	48.000	0.0320
Link-247	4047.56	4373.93	4289.00	2.1000	Trapezoidal	3.500	29.000	0.0320
Link-255	4969.82	4248.00	4240.00	0.1600	Trapezoidal	5.000	42.000	0.0320
Link-263	2602.95	4422.00	4397.00	0.9600	Trapezoidal	4.000	26.000	0.0320
Link-264	208.76	4397.00	4393.41	1.7200	Trapezoidal	4.000	26.000	0.0320
Link-269	1470.27	4285.00	4259.00	1.7700	Trapezoidal	3.500	29.000	0.0320
Link-94	473.27	4306.33	4287.00	4.0800	Trapezoidal	4.000	19.000	0.0320

Channel Results

Element ID	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	Froude Number	Reported Condition
	(cfs)	(cfs)		(ft/sec)	(ft)		(min)		
Link-104	241.79	440.56	0.55	6.62	2.62	0.88	0.00		
Link-106	243.18	334.06	0.73	7.46	2.41	0.82	0.00		
Link-107	111.80	628.74	0.18	6.36	1.95	0.65	0.00		
Link-141	207.00	764.30	0.27	3.35	4.17	0.70	0.00		
Link-142	207.00	1815.26	0.11	4.37	3.52	0.59	0.00		
Link-143	207.00	1167.42	0.18	3.80	3.78	0.63	0.00		
Link-167	607.31	1066.80	0.57	10.22	3.50	0.87	0.00		
Link-168	361.31	957.21	0.38	10.18	2.67	0.67	0.00		
Link-178	255.27	480.58	0.53	8.38	2.34	0.78	0.00		
Link-179	254.93	389.67	0.65	6.64	2.72	0.91	0.00		
Link-180	254.53	317.12	0.80	16.02	1.51	0.50	0.00		
Link-181	111.89	752.22	0.15	9.37	1.23	0.41	0.00		
Link-243	165.64	724.73	0.23	5.75	2.58	0.74	0.00		
Link-244	44.67	246.99	0.18	4.17	1.82	0.46	0.00		
Link-246	412.51	816.68	0.51	2.90	5.17	0.86	0.00		
Link-247	327.11	725.24	0.45	6.61	2.94	0.84	0.00		
Link-255	455.09	534.14	0.85	3.57	4.82	0.96	0.00		
Link-263	361.65	616.66	0.59	7.65	2.97	0.74	0.00		
Link-264	361.57	825.14	0.44	9.03	2.63	0.66	0.00		
Link-269	359.32	665.78	0.54	6.86	3.05	0.87	0.00		
Link-94	121.46	712.79	0.17	10.80	1.74	0.43	0.00		

Pipe Input

Element ID	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	No. of Barrels
Link-10	94.56	4260.21	4259.38	0.8800	Rectangular	48.000	72.000	0.0150	2
Link-16	308.62	4253.83	4248.00	1.8900	Rectangular	60.000	144.000	0.0150	1
Link-18	149.37	4312.04	4306.33	3.8200	Arch	105.000	169.080	0.0150	1
Link-19	55.55	4352.27	4348.99	5.9000	Rectangular	78.000	222.000	0.0150	2
Link-20	52.53	4375.08	4373.93	2.1900	Rectangular	156.000	483.960	0.0150	1
Link-216	322.19	4300.00	4293.00	2.1700	CIRCULAR	48.000	48.000	0.0150	1
Link-217	187.21	4223.00	4222.00	0.5300	CIRCULAR	48.000	48.000	0.0150	1
Link-225	309.97	4427.00	4422.00	1.6100	Rectangular	156.000	483.960	0.0150	1
Link-226	381.58	4240.00	4238.00	0.5200	Rectangular	48.000	144.000	0.0150	1
Link-256	1261.72	4235.00	4229.07	0.4700	CIRCULAR	30.000	30.000	0.0150	1
Link-258	737.36	4241.07	4235.07	0.8100	Dummy	0.000	0.000	0.0150	1
Link-259	951.90	4243.38	4235.07	0.8700	Dummy	0.000	0.000	0.0150	1
Link-260	459.56	4223.00	4220.00	0.6500	CIRCULAR	48.000	48.000	0.0150	1
Link-261	240.10	4220.00	4217.00	1.2500	CIRCULAR	48.000	48.000	0.0150	1
Link-262	36.37	4255.78	4253.11	7.3400	Rectangular	48.000	96.000	0.0240	1
Link-266	201.92	4352.27	4348.99	1.6200	Rectangular	78.000	222.000	0.0150	1
Link-267	922.68	4353.49	4278.30	8.1500	CIRCULAR	24.000	24.000	0.0150	1
Link-268	88.02	4259.00	4256.91	2.3700	Rectangular	48.000	96.000	0.0130	1
Link-270	199.39	4289.00	4285.00	2.0100	Rectangular	48.000	120.000	0.0150	1
Link-54	136.41	4245.81	4243.77	1.5000	Rectangular	48.000	96.000	0.0150	1
Link-55	55.62	4241.47	4241.07	0.7200	Rectangular	48.000	96.000	0.0150	1
Link-69	265.21	4224.26	4223.00	0.4800	CIRCULAR	42.000	42.000	0.0120	1
Link-71	306.97	4228.44	4224.79	1.1900	CIRCULAR	30.000	30.000	0.0120	1
Link-72	79.63	4224.79	4224.26	0.6700	CIRCULAR	42.000	42.000	0.0120	1
Link-88	106.03	4229.07	4228.44	0.5900	CIRCULAR	30.000	30.000	0.0120	1

Pipe Results

Element ID	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	Froude Number	Reported Condition
	(cfs)	(cfs)		(ft/sec)	(ft)		(min)		
Link-10	241.06	503.09	0.48	6.55	3.06	0.77	0.00		Calculated
Link-16	455.09	1193.02	0.38	7.96	4.82	0.96	0.00		Calculated
Link-18	121.70	2879.79	0.04	5.71	1.97	0.23	0.00		Calculated
Link-19	111.89	10392.36	0.01	2.79	1.08	0.17	0.00		Calculated
Link-20	327.39	22219.42	0.01	3.60	2.25	0.17	0.00		Calculated
Link-216	44.68	183.50	0.24	5.56	2.44	0.61	0.00		Calculated
Link-217	52.24	90.99	0.57	5.04	3.13	0.79	0.00		Calculated
Link-225	361.77	19072.72	0.02	3.33	2.70	0.21	0.00		Calculated
Link-226	342.00	451.11	0.76	8.57	3.32	0.83	0.00		Calculated
Link-256	11.40	24.51	0.47	5.40	1.25	0.50	0.00		Calculated
Link-258	236.49	0.00	0.47	0.00	1.25	0.50	0.00		Calculated
Link-259	299.95	0.00	0.47	0.00	1.25	0.50	0.00		Calculated
Link-260	52.08	100.58	0.52	5.45	2.83	0.71	0.00		Calculated
Link-261	63.40	139.16	0.46	6.81	2.76	0.69	0.00		Calculated
Link-262	207.00	650.33	0.32	8.10	3.19	0.80	0.00		Calculated
Link-266	10.00	2725.44	0.00	0.61	4.45	0.69	0.00		Calculated
Link-267	9.92	55.97	0.18	3.33	1.80	0.90	0.00		Calculated
Link-268	207.00	682.81	0.30	6.79	3.90	0.97	0.00		Calculated
Link-270	359.32	711.92	0.50	10.92	3.30	0.83	0.00		Calculated
Link-54	207.00	469.64	0.44	7.50	3.45	0.86	0.00		Calculated
Link-55	207.00	325.68	0.64	11.95	2.17	0.54	0.00		Calculated
Link-69	52.38	75.13	0.70	6.56	2.82	0.81	0.00		Calculated
Link-71	52.68	48.45	1.09	11.35	2.33	0.94	0.00		> CAPACITY
Link-72	52.53	88.92	0.59	8.09	2.30	0.66	0.00		Calculated
Link-88	53.64	34.25	1.57	10.95	2.48	1.00	1.00		SURCHARGED

Storage Nodes

Storage Node : Stor-01

Input Data

Invert Elevation (ft)	4235.07
Max (Rim) Elevation (ft)	4243.07
Max (Rim) Offset (ft)	8.00
Initial Water Elevation (ft)	4235.07
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Output Summary Results

Peak Inflow (cfs)	620.82
Peak Lateral Inflow (cfs)	91.96
Peak Outflow (cfs)	0
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	4242.5
Max HGL Depth Attained (ft)	7.43
Average HGL Elevation Attained (ft)	4240.1
Average HGL Depth Attained (ft)	5.03
Time of Max HGL Occurrence (days hh:mm)	2 00:00
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Storage Node : Stor-02

Input Data

Invert Elevation (ft)	4255.99
Max (Rim) Elevation (ft)	4261.99
Max (Rim) Offset (ft)	6.00
Initial Water Elevation (ft)	4255.99
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Output Summary Results

Peak Inflow (cfs)	69.52
Peak Lateral Inflow (cfs)	69.52
Peak Outflow (cfs)	0
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	4256.36
Max HGL Depth Attained (ft)	0.37
Average HGL Elevation Attained (ft)	4256.24
Average HGL Depth Attained (ft)	0.25
Time of Max HGL Occurrence (days hh:mm)	1 00:30
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Project Description

File Name Lake Point Proposed 100-Year_mountain drainage only_withbasins.SPF

Project Options

Flow Units CFS
Elevation Type Elevation
Hydrology Method SCS TR-55
Time of Concentration (TOC) Method Kirpich
Link Routing Method Hydrodynamic
Enable Overflow Ponding at Nodes YES
Skip Steady State Analysis Time Periods NO

Analysis Options

Start Analysis On 00:00:00 0:00:00
End Analysis On 00:00:00 0:00:00
Start Reporting On 00:00:00 0:00:00
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 00:05:00 days hh:mm:ss
Routing Time Step 30 seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins.....	21
Nodes.....	46
<i>Junctions</i>	42
<i>Outfalls</i>	2
<i>Flow Diversions</i>	0
<i>Inlets</i>	0
<i>Storage Nodes</i>	2
Links.....	42
<i>Channels</i>	20
<i>Pipes</i>	22
<i>Pumps</i>	0
<i>Orifices</i>	0
<i>Weirs</i>	0
<i>Outlets</i>	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage	Data	Data Source	Rainfall	Rain	State	County	Return	Rainfall	Rainfall
	ID	Source	ID	Type	Units			Period	Depth	Distribution
								(years)	(inches)	

Subbasin Summary

Subbasin ID	Area	Peak Rate Factor	Weighted Curve Number	Average Slope	Flow Length	Total Rainfall	Total Runoff	Total Runoff Volume	Peak Runoff	Time of Concentration
	(ac)			(%)	(ft)	(in)	(in)	(ac-in)	(cfs)	(days hh:mm:ss)
Sub-01	36.33	0.00	67.91	7.6700	1806.00	2.72	0.49	17.62	22.83	0 00:06:45
Sub-02	10.35	0.00	73.69	5.8000	849.00	2.72	0.72	7.47	11.00	0 00:05:00
Sub-03	19.64	0.00	71.89	9.7000	1248.00	2.72	0.64	12.61	18.00	0 00:05:00
Sub-04	31.59	0.00	73.69	11.4000	1659.00	2.72	0.72	22.81	33.07	0 00:05:25
Sub-05	23.00	0.00	76.28	12.5500	1371.00	2.72	0.85	19.44	29.59	0 00:05:00
Sub-06	14.99	0.00	75.63	12.5500	4090.00	2.72	0.81	12.19	16.17	0 00:10:28
Sub-07	55.50	0.00	76.52	11.0800	2327.00	2.72	0.86	47.56	67.91	0 00:07:07
Sub-08	103.26	0.00	77.71	11.0800	3377.00	2.72	0.92	94.90	130.19	0 00:09:28
Sub-09	27.76	0.00	77.58	3.0000	1535.00	2.72	0.91	25.32	35.29	0 00:08:32
Sub-10	15.89	0.00	72.48	10.0000	1099.00	2.72	0.67	10.61	15.32	0 00:05:00
Sub-11	200.91	0.00	75.16	3.0000	5034.00	2.72	0.79	158.72	157.78	0 00:21:19
Sub-12	203.25	0.00	78.37	9.9200	5070.00	2.72	0.95	193.90	244.08	0 00:13:31
Sub-14	137.26	0.00	65.26	10.0000	4006.00	2.72	0.39	53.94	56.48	0 00:11:15
Sub-15	199.89	0.00	71.11	17.3300	5019.00	2.72	0.61	121.73	151.94	0 00:10:49
Sub-17	270.69	0.00	76.01	19.5900	6020.00	2.72	0.83	225.21	290.12	0 00:11:52
Sub-18	184.46	0.00	79.37	21.8000	3787.00	2.72	1.01	186.12	265.42	0 00:07:58
Sub-22	60.51	0.00	67.70	7.2000	2450.00	2.72	0.48	28.86	35.48	0 00:08:44
Sub-28	100.31	0.00	61.80	5.5000	3319.00	2.72	0.29	28.79	23.58	0 00:12:15
Sub-29	304.22	0.00	69.63	16.1200	6458.00	2.72	0.55	167.32	187.20	0 00:13:31
Sub-31	17.60	0.00	81.93	10.0000	1168.00	2.72	1.16	20.38	32.22	0 00:05:00
Sub-41	64.14	484.00	75.60	0.5000	500.00	2.72	0.81	52.08	73.50	0 00:07:10

Subbasin Hydrology

Subbasin : Sub-01

Input Data

Area (ac)	36.33
Peak Rate Factor	0
Weighted Curve Number	67.91
Average Slope (%)	7.67
Flow Length (ft)	1806
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	36.33	-	67.91
Composite Area & Weighted CN	36.33		67.91

Time of Concentration

TOC Method : Kirpich

Sheet Flow Equation :

$T_c = (0.0078 * ((L_f^{0.77}) * (S_f^{-0.385})))$

Where :

- Tc = Time of Concentration (min)
- Lf = Flow Length (ft)
- Sf = Slope (ft/ft)

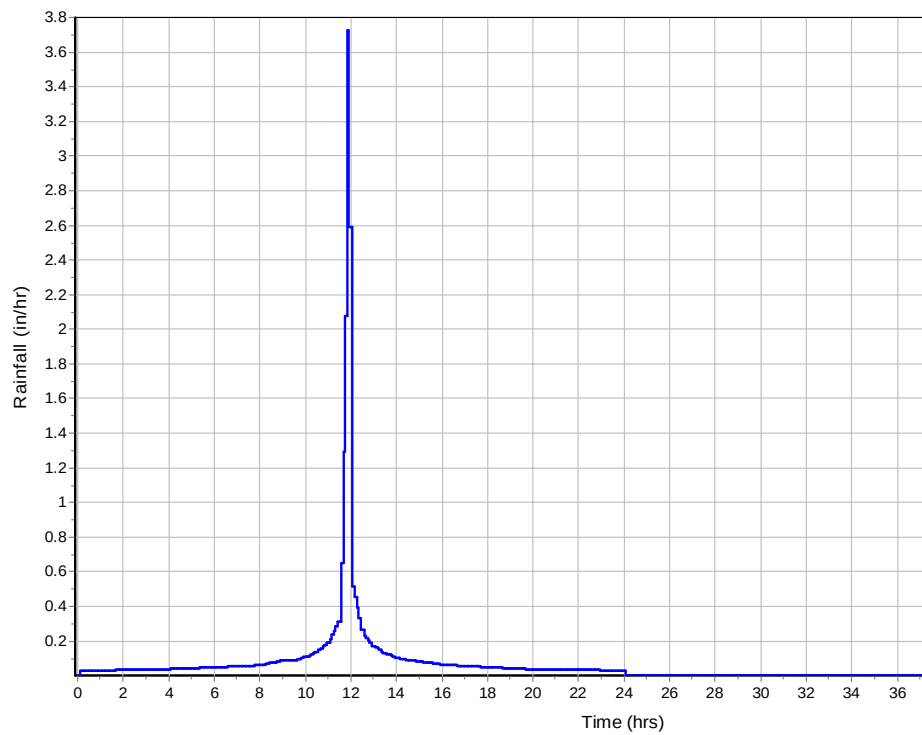
Flow Length (ft)	1806
Slope (%)	7.67
Computed TOC (min)	6.75

Subbasin Runoff Results

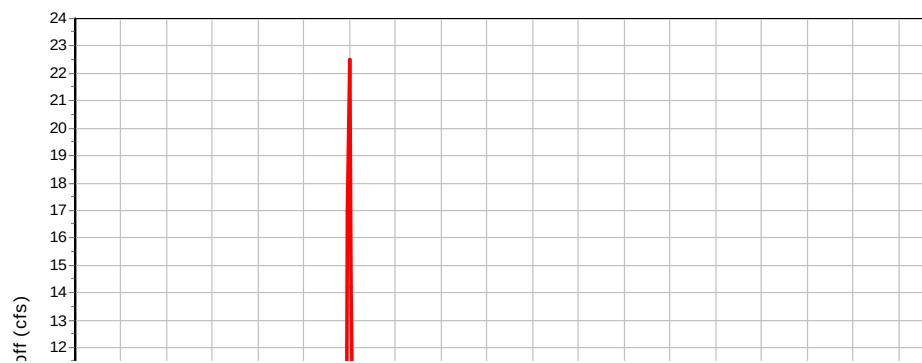
Total Rainfall (in)	2.72
Total Runoff (in)	0.49
Peak Runoff (cfs)	22.83
Weighted Curve Number	67.91
Time of Concentration (days hh:mm:ss)	0 00:06:45

Subbasin : Sub-01

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-02

Input Data

Area (ac)	10.35
Peak Rate Factor	0
Weighted Curve Number	73.69
Average Slope (%)	5.8
Flow Length (ft)	849
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	10.35	-	73.69
Composite Area & Weighted CN	10.35		73.69

Time of Concentration

Flow Length (ft)	849
Slope (%)	5.8
Computed TOC (min)	4.2

Subbasin Runoff Results

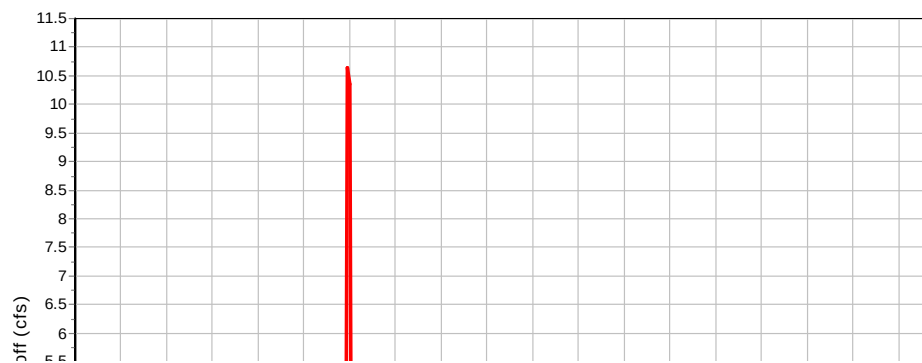
Total Rainfall (in)	2.72
Total Runoff (in)	0.72
Peak Runoff (cfs)	11
Weighted Curve Number	73.69
Time of Concentration (days hh:mm:ss)	0 00:04:12

Subbasin : Sub-02

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-03

Input Data

Area (ac)	19.64
Peak Rate Factor	0
Weighted Curve Number	71.89
Average Slope (%)	9.7
Flow Length (ft)	1248
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	19.64	-	71.89
Composite Area & Weighted CN	19.64		71.89

Time of Concentration

Flow Length (ft)	1248
Slope (%)	9.7
Computed TOC (min)	4.64

Subbasin Runoff Results

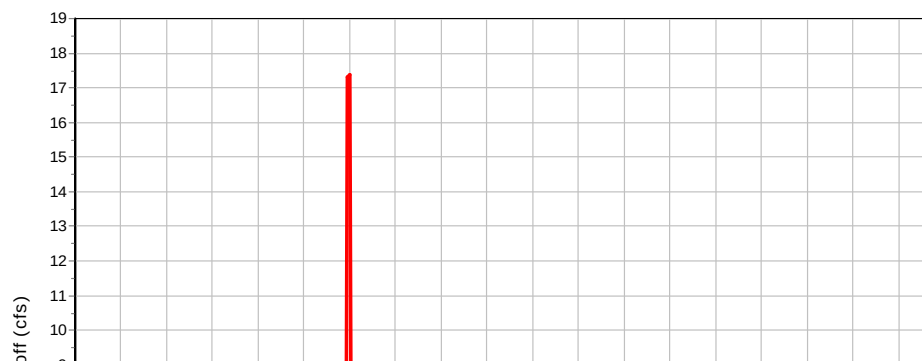
Total Rainfall (in)	2.72
Total Runoff (in)	0.64
Peak Runoff (cfs)	18
Weighted Curve Number	71.89
Time of Concentration (days hh:mm:ss)	0 00:04:38

Subbasin : Sub-03

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-04

Input Data

Area (ac)	31.59
Peak Rate Factor	0
Weighted Curve Number	73.69
Average Slope (%)	11.4
Flow Length (ft)	1659
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	31.59	-	73.69
Composite Area & Weighted CN	31.59		73.69

Time of Concentration

Flow Length (ft)	1659
Slope (%)	11.4
Computed TOC (min)	5.43

Subbasin Runoff Results

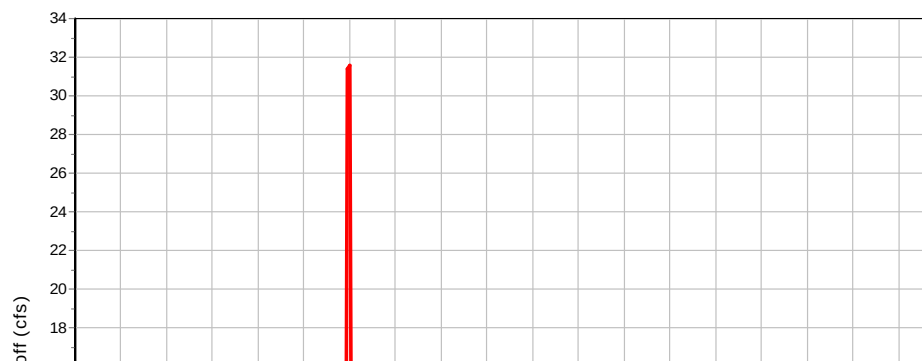
Total Rainfall (in)	2.72
Total Runoff (in)	0.72
Peak Runoff (cfs)	33.07
Weighted Curve Number	73.69
Time of Concentration (days hh:mm:ss)	0 00:05:26

Subbasin : Sub-04

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-05

Input Data

Area (ac)	23
Peak Rate Factor	0
Weighted Curve Number	76.28
Average Slope (%)	12.55
Flow Length (ft)	1371
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	23	-	76.28
Composite Area & Weighted CN	23		76.28

Time of Concentration

Flow Length (ft)	1371
Slope (%)	12.55
Computed TOC (min)	4.51

Subbasin Runoff Results

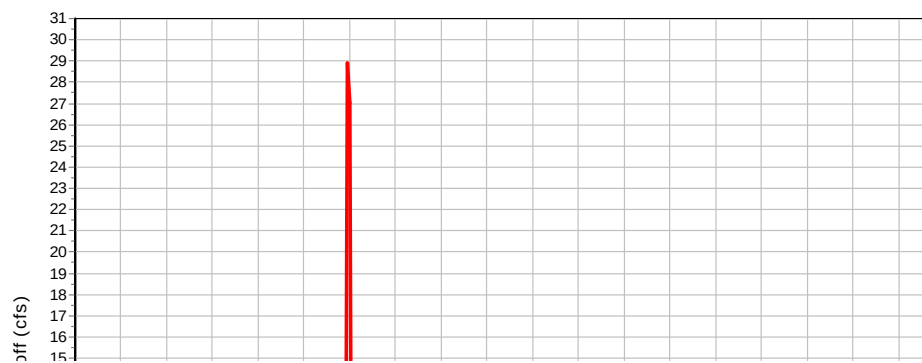
Total Rainfall (in)	2.72
Total Runoff (in)	0.85
Peak Runoff (cfs)	29.59
Weighted Curve Number	76.28
Time of Concentration (days hh:mm:ss)	0 00:04:31

Subbasin : Sub-05

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-06

Input Data

Area (ac)	14.99
Peak Rate Factor	0
Weighted Curve Number	75.63
Average Slope (%)	12.55
Flow Length (ft)	4090
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	14.99	-	75.63
Composite Area & Weighted CN	14.99		75.63

Time of Concentration

Flow Length (ft)	4090
Slope (%)	12.55
Computed TOC (min)	10.47

Subbasin Runoff Results

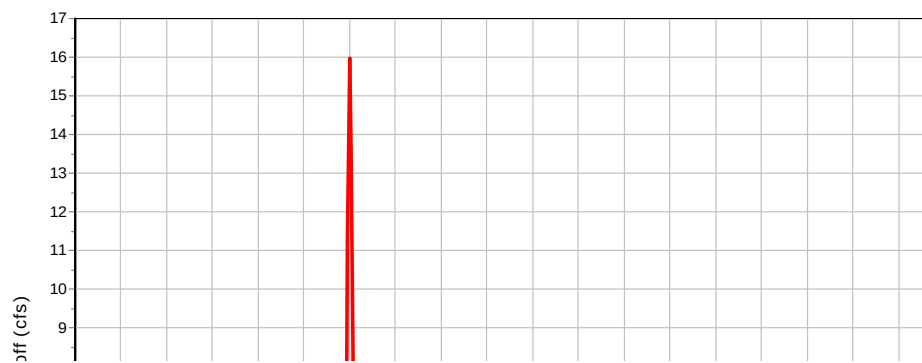
Total Rainfall (in)	2.72
Total Runoff (in)	0.81
Peak Runoff (cfs)	16.17
Weighted Curve Number	75.63
Time of Concentration (days hh:mm:ss)	0 00:10:28

Subbasin : Sub-06

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-07

Input Data

Area (ac)	55.5
Peak Rate Factor	0
Weighted Curve Number	76.52
Average Slope (%)	11.08
Flow Length (ft)	2327
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	55.5	-	76.52
Composite Area & Weighted CN	55.5		76.52

Time of Concentration

Flow Length (ft)	2327
Slope (%)	11.08
Computed TOC (min)	7.12

Subbasin Runoff Results

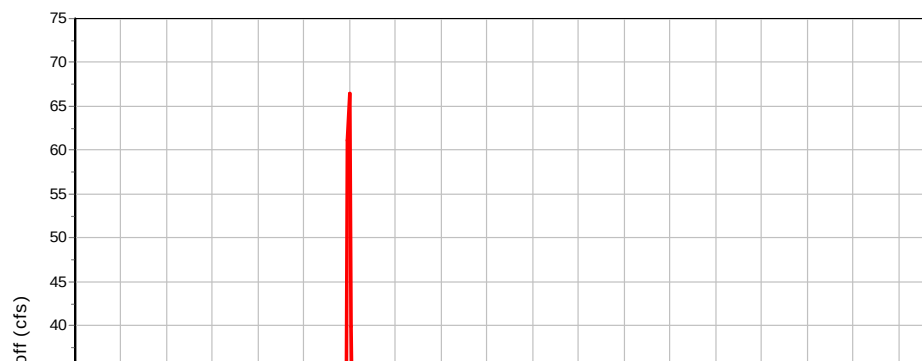
Total Rainfall (in)	2.72
Total Runoff (in)	0.86
Peak Runoff (cfs)	67.91
Weighted Curve Number	76.52
Time of Concentration (days hh:mm:ss)	0 00:07:07

Subbasin : Sub-07

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-08

Input Data

Area (ac)	103.26
Peak Rate Factor	0
Weighted Curve Number	77.71
Average Slope (%)	11.08
Flow Length (ft)	3377
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	103.26	-	77.71
Composite Area & Weighted CN	103.26		77.71

Time of Concentration

Flow Length (ft)	3377
Slope (%)	11.08
Computed TOC (min)	9.48

Subbasin Runoff Results

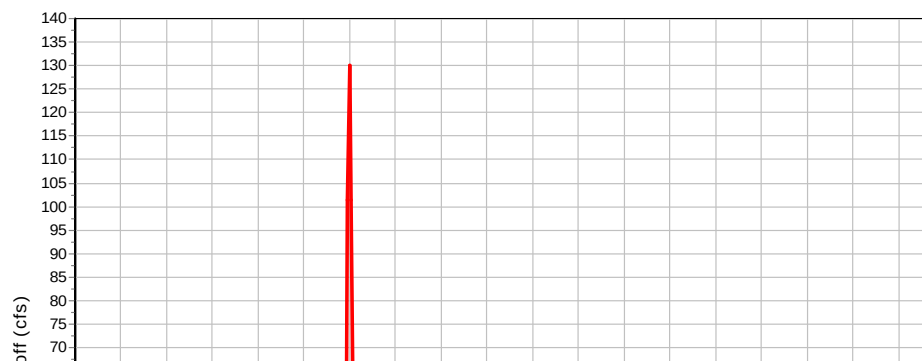
Total Rainfall (in)	2.72
Total Runoff (in)	0.92
Peak Runoff (cfs)	130.19
Weighted Curve Number	77.71
Time of Concentration (days hh:mm:ss)	0 00:09:29

Subbasin : Sub-08

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-09

Input Data

Area (ac)	27.76
Peak Rate Factor	0
Weighted Curve Number	77.58
Average Slope (%)	3
Flow Length (ft)	1535
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	27.76	-	77.58
Composite Area & Weighted CN	27.76		77.58

Time of Concentration

Flow Length (ft)	1535
Slope (%)	3
Computed TOC (min)	8.54

Subbasin Runoff Results

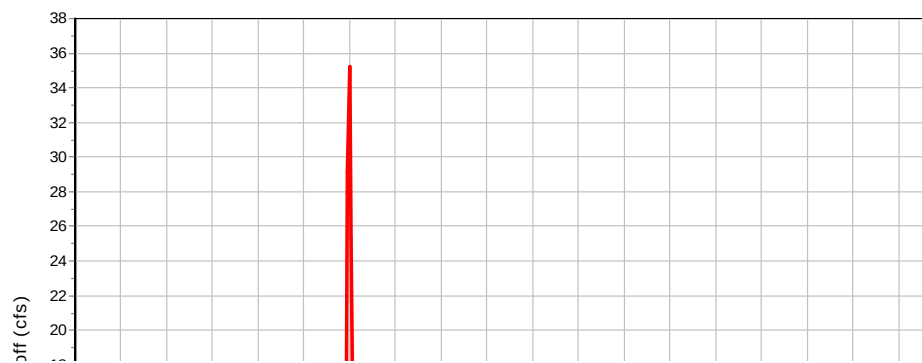
Total Rainfall (in)	2.72
Total Runoff (in)	0.91
Peak Runoff (cfs)	35.29
Weighted Curve Number	77.58
Time of Concentration (days hh:mm:ss)	0 00:08:32

Subbasin : Sub-09

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-10

Input Data

Area (ac)	15.89
Peak Rate Factor	0
Weighted Curve Number	72.48
Average Slope (%)	10
Flow Length (ft)	1099
Rain Gage ID	Rain Gage-01

Composite Curve Number

32	Area	Soil	Curve
Soil/Surface Description	(acres)	Group	Number
-	15.89	-	72.48
Composite Area & Weighted CN	15.89		72.48

Time of Concentration

Flow Length (ft)	1099
Slope (%)	10
Computed TOC (min)	4.16

Subbasin Runoff Results

Total Rainfall (in)	2.72
Total Runoff (in)	0.67
Peak Runoff (cfs)	15.32
Weighted Curve Number	72.48
Time of Concentration (days hh:mm:ss)	0 00:04:10

Subbasin : Sub-10

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-11

Input Data

Area (ac)	200.91
Peak Rate Factor	0
Weighted Curve Number	75.16
Average Slope (%)	3
Flow Length (ft)	5034
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		200.91	-	75.16
Composite Area & Weighted CN		200.91		75.16

Time of Concentration

Flow Length (ft)	5034
Slope (%)	3
Computed TOC (min)	21.32

Subbasin Runoff Results

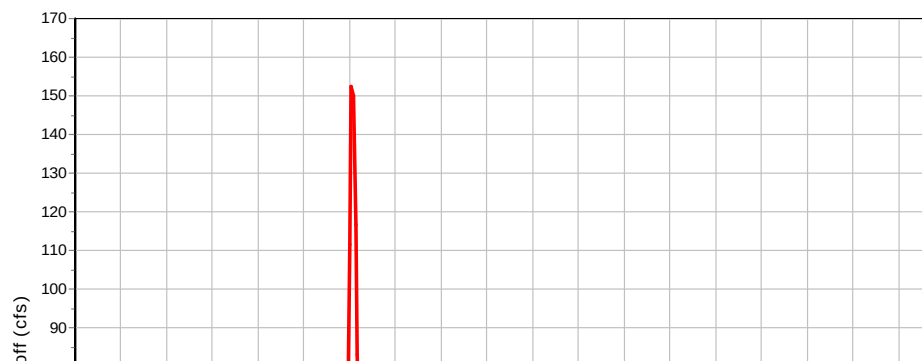
Total Rainfall (in)	2.72
Total Runoff (in)	0.79
Peak Runoff (cfs)	157.78
Weighted Curve Number	75.16
Time of Concentration (days hh:mm:ss)	0 00:21:19

Subbasin : Sub-11

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-12

Input Data

Area (ac)	203.25
Peak Rate Factor	0
Weighted Curve Number	78.37
Average Slope (%)	9.92
Flow Length (ft)	5070
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		203.25	-	78.37
Composite Area & Weighted CN		203.25		78.37

Time of Concentration

Flow Length (ft)	5070
Slope (%)	9.92
Computed TOC (min)	13.53

Subbasin Runoff Results

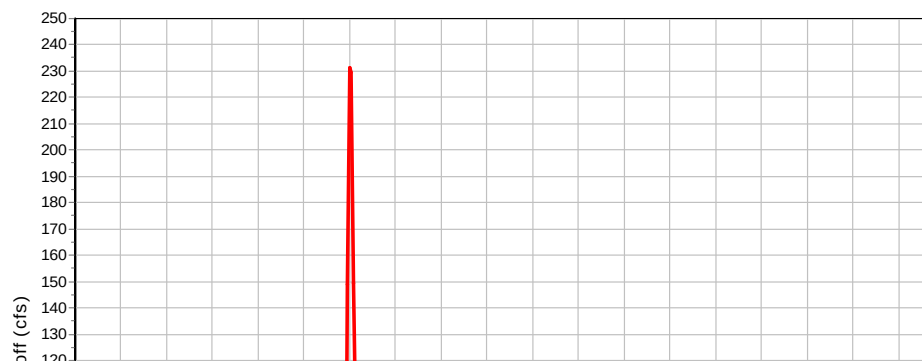
Total Rainfall (in)	2.72
Total Runoff (in)	0.95
Peak Runoff (cfs)	244.08
Weighted Curve Number	78.37
Time of Concentration (days hh:mm:ss)	0 00:13:32

Subbasin : Sub-12

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-14

Input Data

Area (ac)	137.26
Peak Rate Factor	0
Weighted Curve Number	65.26
Average Slope (%)	10
Flow Length (ft)	4006
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		137.26	-	65.26
Composite Area & Weighted CN		137.26		65.26

Time of Concentration

Flow Length (ft)	4006
Slope (%)	10
Computed TOC (min)	11.25

Subbasin Runoff Results

Total Rainfall (in)	2.72
Total Runoff (in)	0.39
Peak Runoff (cfs)	56.48
Weighted Curve Number	65.26
Time of Concentration (days hh:mm:ss)	0 00:11:15

Subbasin : Sub-14

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-15

Input Data

Area (ac)	199.89
Peak Rate Factor	0
Weighted Curve Number	71.11
Average Slope (%)	17.33
Flow Length (ft)	5019
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		199.89	-	71.11
Composite Area & Weighted CN		199.89		71.11

Time of Concentration

Flow Length (ft)	5019
Slope (%)	17.33
Computed TOC (min)	10.83

Subbasin Runoff Results

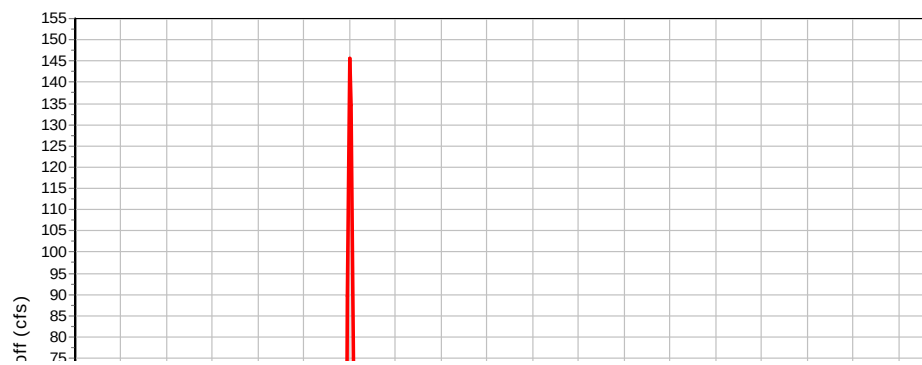
Total Rainfall (in)	2.72
Total Runoff (in)	0.61
Peak Runoff (cfs)	151.94
Weighted Curve Number	71.11
Time of Concentration (days hh:mm:ss)	0 00:10:50

Subbasin : Sub-15

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-17

Input Data

Area (ac)	270.69
Peak Rate Factor	0
Weighted Curve Number	76.01
Average Slope (%)	19.59
Flow Length (ft)	6020
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		270.69	-	76.01
Composite Area & Weighted CN		270.69		76.01

Time of Concentration

Flow Length (ft)	6020
Slope (%)	19.59
Computed TOC (min)	11.88

Subbasin Runoff Results

Total Rainfall (in)	2.72
Total Runoff (in)	0.83
Peak Runoff (cfs)	290.12
Weighted Curve Number	76.01
Time of Concentration (days hh:mm:ss)	0 00:11:53

Subbasin : Sub-17

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-18

Input Data

Area (ac)	184.46
Peak Rate Factor	0
Weighted Curve Number	79.37
Average Slope (%)	21.8
Flow Length (ft)	3787
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		184.46	-	79.37
Composite Area & Weighted CN		184.46		79.37

Time of Concentration

Flow Length (ft)	3787
Slope (%)	21.8
Computed TOC (min)	7.98

Subbasin Runoff Results

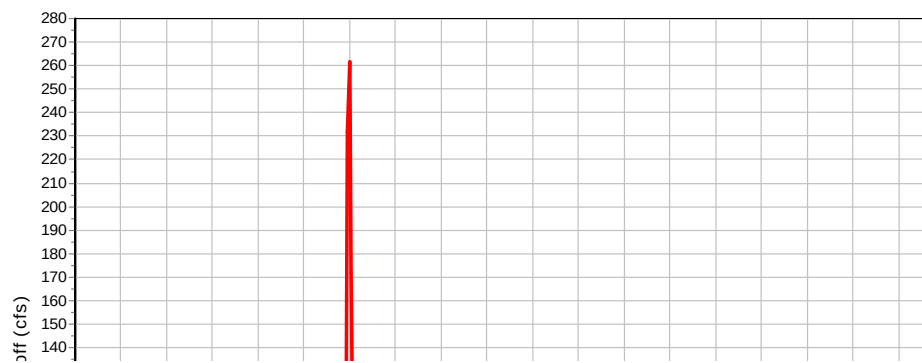
Total Rainfall (in)	2.72
Total Runoff (in)	1.01
Peak Runoff (cfs)	265.42
Weighted Curve Number	79.37
Time of Concentration (days hh:mm:ss)	0 00:07:59

Subbasin : Sub-18

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-22

Input Data

Area (ac)	60.51
Peak Rate Factor	0
Weighted Curve Number	67.7
Average Slope (%)	7.2
Flow Length (ft)	2450
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		60.51	-	67.7
Composite Area & Weighted CN		60.51		67.7

Time of Concentration

Flow Length (ft)	2450
Slope (%)	7.2
Computed TOC (min)	8.74

Subbasin Runoff Results

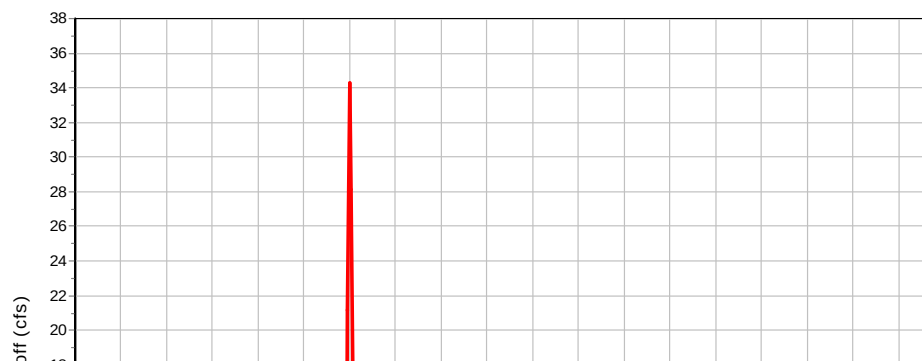
Total Rainfall (in)	2.72
Total Runoff (in)	0.48
Peak Runoff (cfs)	35.48
Weighted Curve Number	67.7
Time of Concentration (days hh:mm:ss)	0 00:08:44

Subbasin : Sub-22

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-28

Input Data

Area (ac)	100.31
Peak Rate Factor	0
Weighted Curve Number	61.8
Average Slope (%)	5.5
Flow Length (ft)	3319
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		100.31	-	61.8
Composite Area & Weighted CN		100.31		61.8

Time of Concentration

Flow Length (ft)	3319
Slope (%)	5.5
Computed TOC (min)	12.25

Subbasin Runoff Results

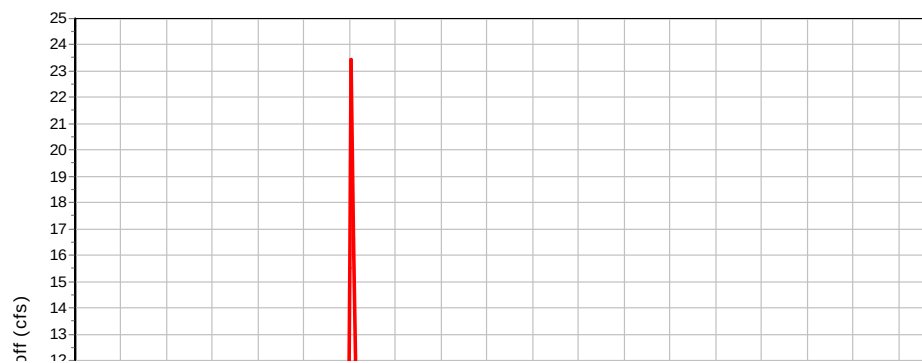
Total Rainfall (in)	2.72
Total Runoff (in)	0.29
Peak Runoff (cfs)	23.58
Weighted Curve Number	61.8
Time of Concentration (days hh:mm:ss)	0 00:12:15

Subbasin : Sub-28

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-29

Input Data

Area (ac)	304.22
Peak Rate Factor	0
Weighted Curve Number	69.63
Average Slope (%)	16.12
Flow Length (ft)	6458
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		304.22	-	69.63
Composite Area & Weighted CN		304.22		69.63

Time of Concentration

Flow Length (ft)	6458
Slope (%)	16.12
Computed TOC (min)	13.52

Subbasin Runoff Results

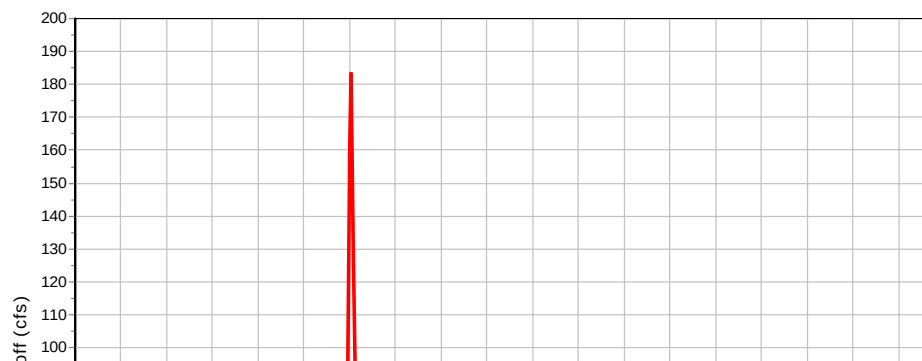
Total Rainfall (in)	2.72
Total Runoff (in)	0.55
Peak Runoff (cfs)	187.2
Weighted Curve Number	69.63
Time of Concentration (days hh:mm:ss)	0 00:13:31

Subbasin : Sub-29

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-31

Input Data

Area (ac)	17.6
Peak Rate Factor	0
Weighted Curve Number	81.93
Average Slope (%)	10
Flow Length (ft)	1168
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		17.6	-	81.93
Composite Area & Weighted CN		17.6		81.93

Time of Concentration

Flow Length (ft)	1168
Slope (%)	10
Computed TOC (min)	4.36

Subbasin Runoff Results

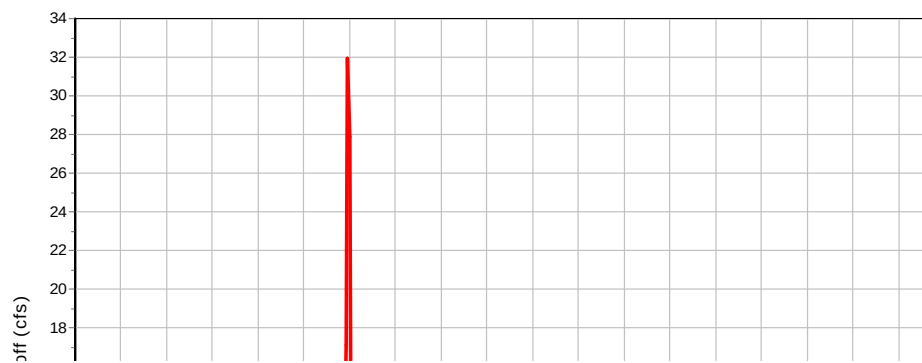
Total Rainfall (in)	2.72
Total Runoff (in)	1.16
Peak Runoff (cfs)	32.22
Weighted Curve Number	81.93
Time of Concentration (days hh:mm:ss)	0 00:04:22

Subbasin : Sub-31

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : Sub-41

Input Data

Area (ac)	64.14
Peak Rate Factor	484
Weighted Curve Number	75.6
Average Slope (%)	0.5
Flow Length (ft)	500
Rain Gage ID	Rain Gage-01

Composite Curve Number

	32	Area	Soil	Curve
Soil/Surface Description		(acres)	Group	Number
-		64.14	-	75.6
Composite Area & Weighted CN		64.14		75.6

Time of Concentration

Flow Length (ft)	500
Slope (%)	0.5
Computed TOC (min)	7.18

Subbasin Runoff Results

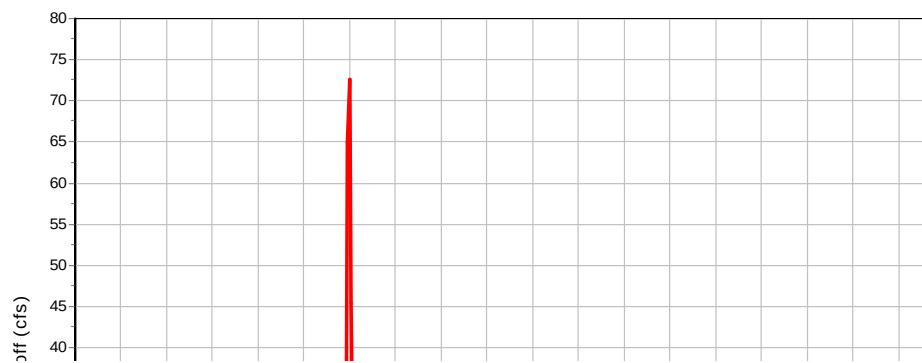
Total Rainfall (in)	2.72
Total Runoff (in)	0.81
Peak Runoff (cfs)	73.5
Weighted Curve Number	75.6
Time of Concentration (days hh:mm:ss)	0 00:07:11

Subbasin : Sub-41

Rainfall Intensity Graph



Runoff Hydrograph



Junction Input

Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Surcharge Elevation (ft)
6	4255.78	4261.78	4261.78
7	4253.11	4259.11	4259.11
8	4245.81	4251.81	4251.81
9	4243.77	4249.77	4249.77
10	4256.91	4262.91	4262.91
11	4241.07	4247.07	4247.07
12	4241.47	4247.47	4247.47
30	4308.33	4314.33	4314.33
40	4259.38	4265.38	4265.38
41	4260.21	4266.21	4266.21
42	4253.17	4259.17	4259.17
43	4246.76	4252.76	4252.76
44	4243.38	4249.38	4249.38
68	4352.27	4358.27	4358.27
69	4348.99	4354.99	4354.99
70	4342.86	4348.86	4348.86
71	4278.30	4284.30	4284.30
72	4266.77	4272.77	4272.77
82	4375.08	4381.08	4381.08
83	4373.93	4379.93	4379.93
113	4393.41	4399.41	4399.41
129	4223.00	4229.00	4229.00
131	4224.26	4230.26	4230.26
132	4229.07	4235.07	4235.07
133	4228.44	4234.44	4234.44
134	4224.79	4230.79	4230.79
176	4253.83	4259.83	4259.83
177	4272.20	4278.20	4278.20
179	4248.88	4254.88	4254.88
196	4312.04	4318.04	4318.04
200	4259.00	4263.63	4263.63
8-Jun	4300.00	4307.00	4307.00
9-Jun	4293.00	4299.00	4299.00
10-Jun	4222.00	4229.00	4229.00
14-Jun	4427.00	4433.00	4433.00
15-Jun	4422.00	4428.00	4428.00
16-Jun	4240.00	4244.00	4244.00
26-Jun	4287.00	4293.00	4293.00
27-Jun	4259.00	4265.00	4265.00
29-Jun	4235.07	4243.07	4235.07
30-Jun	4220.00	4223.00	4223.00
Jun-31	4397.00	4403.00	4403.00

Junction Results

Element ID	Peak Inflow	Peak Lateral Inflow	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained
	(cfs)	(cfs)	(ft)	(ft)	(ft)
6	139.92	0.00	2.56	4257.67	1.89
7	138.59	0.00	4.01	4254.39	1.28
8	138.51	0.00	2.50	4247.78	1.97
9	137.06	0.00	3.58	4245.34	1.57
10	141.32	0.00	3.03	4258.85	1.94
11	147.17	31.58	4.49	4241.69	0.62
12	136.92	0.00	2.50	4243.46	1.99
30	18.10	0.00	7.95	4308.81	0.48
40	137.49	15.96	4.03	4260.07	0.69
41	122.12	0.00	1.08	4261.40	1.19
42	137.39	0.00	3.76	4253.94	0.77
43	134.87	0.00	1.36	4247.76	1.00
44	195.85	66.51	5.92	4243.44	0.06
68	28.50	28.50	6.10	4352.51	0.24
69	28.50	0.00	5.94	4349.35	0.36
70	28.50	0.00	5.18	4343.40	0.54
71	28.50	0.00	4.84	4279.06	0.76
72	130.01	130.01	3.95	4267.49	0.72
82	89.30	89.30	12.16	4375.58	0.50
83	89.30	0.00	11.53	4374.93	1.00
113	361.57	0.00	3.59	4394.22	0.81
129	52.39	0.00	2.75	4223.99	0.99
131	52.53	0.00	3.59	4224.96	0.70
132	53.62	53.62	1.59	4229.82	0.75
133	53.62	0.00	2.41	4229.06	0.62
134	52.63	0.00	3.80	4225.44	0.65
176	1054.96	372.93	0.00	4256.45	2.62
177	623.69	279.74	3.01	4272.99	0.79
179	454.41	0.00	1.72	4251.07	2.19
196	18.10	18.10	8.03	4312.50	0.46
200	145.49	145.49	1.73	4260.79	1.79
8-Jun	89.30	89.30	2.31	4302.93	2.93
9-Jun	89.30	0.00	3.11	4295.10	2.10
10-Jun	52.25	0.00	3.96	4223.63	1.63
14-Jun	361.80	361.80	10.70	4427.67	0.67
15-Jun	361.77	0.00	9.87	4423.05	1.05
16-Jun	657.67	206.58	0.00	4242.65	2.65
26-Jun	105.90	0.00	4.23	4288.22	1.22
27-Jun	303.91	303.91	2.54	4260.83	1.83
29-Jun	11.40	11.40	6.77	4235.78	0.71
30-Jun	63.71	31.93	0.34	4221.02	1.02
Jun-31	361.64	0.00	3.39	4397.87	0.87

Channel Input

Element ID	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Shape	Height	Width	Manning's Roughness
	(ft)	(ft)	(ft)	(%)		(ft)	(ft)	
Link-104	323.62	4266.77	4260.21	2.0300	Trapezoidal	2.500	18.000	0.0320
Link-106	989.28	4278.30	4266.77	1.1700	Trapezoidal	2.500	18.000	0.0320
Link-107	1563.70	4342.86	4278.30	4.1300	Trapezoidal	2.500	18.000	0.0320
Link-141	315.45	4256.91	4255.78	0.3600	Trapezoidal	6.000	39.500	0.0320
Link-142	361.26	4253.11	4245.81	2.0200	Trapezoidal	6.000	39.500	0.0320
Link-143	275.20	4243.77	4241.47	0.8400	Trapezoidal	6.000	39.500	0.0320
Link-167	639.08	4272.20	4253.83	2.8700	Trapezoidal	4.000	26.000	0.0320
Link-168	5237.65	4393.41	4272.20	2.3100	Trapezoidal	4.000	26.000	0.0320
Link-178	257.45	4259.38	4253.17	2.4100	Trapezoidal	2.500	18.000	0.0320
Link-179	404.20	4253.17	4246.76	1.5900	Trapezoidal	2.500	18.000	0.0320
Link-180	321.82	4246.76	4243.38	1.0500	Trapezoidal	2.500	18.000	0.0320
Link-181	103.73	4348.99	4342.86	5.9100	Trapezoidal	3.000	24.000	0.0320
Link-243	640.58	4287.00	4259.00	4.3700	Trapezoidal	3.000	14.500	0.0320
Link-244	980.62	4293.00	4287.00	0.6100	Trapezoidal	4.000	18.000	0.0320
Link-246	2992.37	4259.00	4253.83	0.1700	Trapezoidal	3.500	29.000	0.0320
Link-247	5717.21	4373.93	4259.00	2.0100	Trapezoidal	2.500	20.000	0.0320
Link-263	2602.95	4422.00	4397.00	0.9600	Trapezoidal	4.000	26.000	0.0320
Link-264	208.76	4397.00	4393.41	1.7200	Trapezoidal	4.000	26.000	0.0320
Link-266	3973.53	4248.88	4240.00	0.2200	Trapezoidal	5.000	42.000	0.0320
Link-94	473.27	4306.33	4287.00	4.0800	Trapezoidal	2.000	10.000	0.0320

Channel Results

Element ID	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	Froude Number	Reported Condition
	(cfs)	(cfs)		(ft/sec)	(ft)		(min)		
Link-104	122.12	216.72	0.56	5.45	2.25	0.91	0.00		
Link-106	28.50	164.33	0.17	4.23	1.09	0.44	0.00		
Link-107	28.50	309.30	0.09	4.82	0.99	0.40	0.00		
Link-141	139.92	764.30	0.18	3.58	3.20	0.53	0.00		
Link-142	138.51	1815.26	0.08	4.84	2.73	0.46	0.00		
Link-143	136.92	1167.42	0.12	3.95	2.88	0.49	0.00		
Link-167	607.58	1066.80	0.57	10.22	3.50	0.87	0.00		
Link-168	361.33	957.21	0.38	10.18	2.68	0.67	0.00		
Link-178	137.39	236.41	0.58	7.25	2.04	0.84	0.00		
Link-179	134.87	191.69	0.70	5.67	2.34	0.95	0.00		
Link-180	134.87	156.00	0.86	15.22	1.29	0.52	0.00		
Link-181	28.50	752.22	0.04	5.11	0.69	0.23	0.00		
Link-243	105.90	338.97	0.31	6.76	2.27	0.76	0.00		
Link-244	89.29	231.50	0.39	5.78	2.33	0.58	0.00		
Link-246	146.38	208.11	0.70	2.38	3.47	0.99	0.00		
Link-247	89.27	269.80	0.33	4.28	1.93	0.77	0.00		
Link-263	361.64	616.66	0.59	8.01	2.87	0.72	0.00		
Link-264	361.57	825.14	0.44	9.61	2.51	0.63	0.00		
Link-266	454.41	629.36	0.72	3.78	4.64	0.93	0.00		
Link-94	18.09	125.79	0.14	3.19	1.28	0.64	0.00		

Pipe Input

Element ID	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Pipe Slope	Pipe Shape	Pipe Diameter or Height	Pipe Width	Manning's Roughness	No. of Barrels
	(ft)	(ft)	(ft)	(%)		(in)	(in)		
Link-10	94.56	4260.21	4259.38	0.8800	CIRCULAR	36.000	36.000	0.0150	2
Link-16	308.62	4253.83	4248.88	1.6000	Rectangular	60.000	144.000	0.0150	1
Link-18	149.37	4312.04	4306.33	3.8200	Arch	105.000	169.080	0.0150	1
Link-19	55.55	4352.27	4348.99	5.9000	Rectangular	78.000	222.000	0.0150	2
Link-20	52.53	4375.08	4373.93	2.1900	Rectangular	156.000	483.960	0.0150	1
Link-203	88.02	4259.00	4256.91	2.3700	Rectangular	60.000	120.000	0.0130	1
Link-216	322.19	4300.00	4293.00	2.1700	CIRCULAR	48.000	48.000	0.0150	1
Link-217	187.21	4223.00	4222.00	0.5300	CIRCULAR	48.000	48.000	0.0150	1
Link-225	309.97	4427.00	4422.00	1.6100	Rectangular	156.000	483.960	0.0150	1
Link-226	381.58	4240.00	4238.00	0.5200	Rectangular	48.000	144.000	0.0150	1
Link-256	1261.72	4235.00	4229.07	0.4700	CIRCULAR	30.000	30.000	0.0150	1
Link-258	737.36	4241.07	4235.07	0.8100	Dummy	0.000	0.000	0.0150	1
Link-259	951.90	4243.38	4235.07	0.8700	Dummy	0.000	0.000	0.0150	1
Link-260	459.56	4223.00	4220.00	0.6500	CIRCULAR	48.000	48.000	0.0150	1
Link-261	240.10	4220.00	4217.00	1.2500	CIRCULAR	48.000	48.000	0.0150	1
Link-262	36.37	4255.78	4253.11	7.3400	Rectangular	48.000	96.000	0.0240	1
Link-54	136.41	4245.81	4243.77	1.5000	Rectangular	48.000	96.000	0.0150	1
Link-55	55.62	4241.47	4241.07	0.7200	Rectangular	48.000	96.000	0.0150	1
Link-69	265.21	4224.26	4223.00	0.4800	CIRCULAR	42.000	42.000	0.0120	1
Link-71	306.97	4228.44	4224.79	1.1900	CIRCULAR	30.000	30.000	0.0120	1
Link-72	79.63	4224.79	4224.26	0.6700	CIRCULAR	42.000	42.000	0.0120	1
Link-88	106.03	4229.07	4228.44	0.5900	CIRCULAR	30.000	30.000	0.0120	1

Pipe Results

Element ID	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	Froude Number	Reported Condition
	(cfs)	(cfs)		(ft/sec)	(ft)		(min)		
Link-10	122.18	108.31	1.13	9.76	2.47	0.83	0.00		> CAPACITY
Link-16	454.41	1099.30	0.41	8.47	4.64	0.93	0.00		Calculated
Link-18	18.10	2879.79	0.01	3.25	0.75	0.09	0.00		Calculated
Link-19	28.50	10392.36	0.00	1.61	0.48	0.07	0.00		Calculated
Link-20	89.30	22219.42	0.00	1.91	1.16	0.09	0.00		Calculated
Link-203	141.32	1238.02	0.11	4.55	3.08	0.62	0.00		Calculated
Link-216	89.30	183.50	0.49	7.76	3.45	0.86	0.00		Calculated
Link-217	52.25	90.99	0.57	5.02	3.13	0.79	0.00		Calculated
Link-225	361.77	19072.72	0.02	3.30	2.71	0.21	0.00		Calculated
Link-226	342.00	451.11	0.76	8.57	3.32	0.83	0.00		Calculated
Link-256	11.40	24.51	0.47	5.40	1.25	0.50	0.00		Calculated
Link-258	147.16	0.00	0.47	0.00	1.25	0.50	0.00		Calculated
Link-259	196.10	0.00	0.47	0.00	1.25	0.50	0.00		Calculated
Link-260	52.09	100.58	0.52	5.45	2.83	0.71	0.00		Calculated
Link-261	63.58	139.16	0.46	6.82	2.76	0.70	0.00		Calculated
Link-262	138.59	650.33	0.21	6.38	2.71	0.68	0.00		Calculated
Link-54	137.06	469.64	0.29	5.79	2.94	0.74	0.00		Calculated
Link-55	136.06	325.68	0.42	9.03	1.89	0.47	0.00		Calculated
Link-69	52.39	75.13	0.70	6.57	2.82	0.81	0.00		Calculated
Link-71	52.63	48.45	1.09	11.36	2.33	0.94	0.00		> CAPACITY
Link-72	52.53	88.92	0.59	8.09	2.30	0.66	0.00		Calculated
Link-88	53.62	34.25	1.57	10.95	2.48	1.00	1.00		SURCHARGED

Storage Nodes

Storage Node : Stor-01

Input Data

Invert Elevation (ft)	4235.07
Max (Rim) Elevation (ft)	4243.07
Max (Rim) Offset (ft)	8.00
Initial Water Elevation (ft)	4235.07
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Output Summary Results

Peak Inflow (cfs)	403.57
Peak Lateral Inflow (cfs)	91.96
Peak Outflow (cfs)	0
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	4241.8
Max HGL Depth Attained (ft)	6.73
Average HGL Elevation Attained (ft)	4238.73
Average HGL Depth Attained (ft)	3.66
Time of Max HGL Occurrence (days hh:mm)	2 00:00
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Storage Node : Stor-02

Input Data

Invert Elevation (ft)	4255.99
Max (Rim) Elevation (ft)	4261.99
Max (Rim) Offset (ft)	6.00
Initial Water Elevation (ft)	4255.99
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Output Summary Results

Peak Inflow (cfs)	69.52
Peak Lateral Inflow (cfs)	69.52
Peak Outflow (cfs)	0
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	4256.36
Max HGL Depth Attained (ft)	0.37
Average HGL Elevation Attained (ft)	4256.31
Average HGL Depth Attained (ft)	0.32
Time of Max HGL Occurrence (days hh:mm)	1 00:30
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

APPENDIX D. WESTERN KENTUCKY UNIVERSITY SURVEY

Western Kentucky University

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6-2023

Western Kentucky University Stormwater Utility Survey 2023

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Campbell, C. Warren, and Davis, Emily G. (2023). “Western Kentucky University Stormwater Utility Survey 2022” (2022). https://digitalcommons.wku.edu/seas_faculty_pubs/6 ii Western Kentucky University Stormwater Utility Survey 2023.

Western Kentucky University Stormwater Utility Survey 2023



C. Warren Campbell
Emily G. Davis



Cover

The cover flood picture is taken in Antelope Canyon near Page, Arizona. This slot canyon is prone to flash flooding. On August 12, 1997, 11 people died during an Antelope Canyon flash flood.

Preface to the 2023 Survey

With the addition of the East Baton Rouge stormwater utility, 42 states and the District of Columbia now have stormwater utilities. Nine of those states have more than 100, and two have more than 200. At least 2100 communities have enacted stormwater utilities in the U.S. While this seems like a large number, FEMA lists more than 22,000 communities participating in the National Flood Insurance Program. There appears to be a need for this survey for some years to come.

Most of the data provided in this survey come from scouring community websites and online municipal codes. This means that some of the fees are out of date. Keeping track of more than 2000 utilities is a massive job. For that reason, as always, I appreciate corrections from readers. Please send your information to warren.campbell@wku.edu.

Warren Campbell
Bowling Green, Kentucky
May 26, 2023

Methods

The main goal of this survey is to identify as many U.S. Stormwater Utilities (SWUs) as possible. Because many stormwater professionals do not have the time to respond to questionnaires, our primary method of identification was Internet searches. We searched key terms such as “stormwater utility”, “stormwater fee”, and “drainage fee”. We scoured online municipal codes such as Municode, AmLegal, Sterling, LexisNexis, General Code, and others. We searched through many city web websites to find utilities. We have also had many people contact me to update fees and identify new utilities. However, the data primarily comes from Internet sources and is prone to errors. Some community websites are not very clear on whether the fee given is monthly, bi-monthly, quarterly, or annually. In cases like that, we made the best guess we could. We hope the readers of this document will continue to help us correct mistakes. However, it is difficult to keep up with fee changes in more than 2000 utilities, so if you discover errors in our data please contact me at warren.campbell@wku.edu.

Disclaimer

The opinions expressed in this document are those of the author. They are not official opinions of Western Kentucky University, its administration, or of any other individuals associated in any way with WKU. The author is an engineer so that any opinions expressed should not in any way be construed by any individual or organization as sound legal advice. The use or misuse of any of the data and information provided herein is the sole responsibility of the user and is not the responsibility of Western Kentucky University, its employees, students, or of any organization associated with the University. vi Western Kentucky University Stormwater Utility Survey 2022

ACKNOWLEDGEMENTS

We are indebted to the Wisconsin chapter of the American Public Works Association for their excellent survey of Wisconsin SWUs (Wisconsin APWA [2019]). Thanks to Mike Gregory of Computational Hydraulics International for his updates on Canadian stormwater utilities. For several years, he has been my complete source for Canadian SWUs. Because of his contribution, he really should be a co-author. I offered that, but he declined. In any case, thank you, Mike. Also, the University of North Carolina Environmental Finance Center has identified several SWUs that I have included in this survey. I also want to thank Andy Reese of AMEC (now Wood) for showing me several SWUs as well. Black and Veatch (2021) publishes an excellent stormwater utility survey with more detailed information about the SWUs in their survey. In 2021 73 SWU communities responded to their survey. It is a very worthwhile survey and should be read by anyone interested in stormwater utilities.

The author is grateful to Professor Randel Dymond and his graduate students Kandace Kea and Amanda Dritschel at Virginia Tech for the work they did on past surveys and the database.

Since 2007, many of the SWUs in this survey were identified by our undergraduate students who are listed below. I am very proud of the fact that 66 of my students have passed the Certified Floodplain Manager (CFM) exam. When I came to Kentucky in 2004, I was the 7th CFM in the state. There are 11 states with fewer than 64 CFMs so we are making a contribution to floodplain management.

Student Contributing to the 2021 Survey
Ross Mannel

Students contributing to the 2014 and 2016 surveys were:
Kain Kotoucek, CFM
Cory Smith, CFM
Megan Jones, CFM

Students contributing to the 2013 Survey were:
Jordon Begley
Walker Bruns
Clayton Cook
Aaron Dockery
Gabriel Goncalves de Godoy
Chris Heil
Eathan Johnson
Carson Joyce
Zach Neihof
Ashley Penrod
Tyler Sweetland
Kirk Thomas

Dylan Ward
Rory Watson, CFM
Doug Woodson, CFM
Students participating in the 2012 survey were:

Benjamin Bell, CFM
Jeremy Brown, CFM
Will Spaulding, CFM
Justin Wallace, CFM

Contributors from previous years were:

Daniel Douglas
Allison Gee
Emily Kinslow, CFM
Lacie Lawson
Kendall McClenny, CFM
Kory McDonald
Daniel Skees, CFM
Brian Vincent, CFM
Jason Walker
Russ Whatley, CFM
Alex Krumenacher, CFM
Nick Lawhon, CFM
Austin Shields, CFM
Adam Disselkamp, CFM
Kenneth Marshall
Wesley Poynter, CFM
Tyler Williams, CFM
Brittany Griggs
Lisa Heartsill, CFM
Spenser Noffsinger, CFM
Pat Stevens
Tony Stylianides, CFM
Scott Wolfe, CFM
Darren Back, CFM
Robert Dillingham, CFM
James Edmunds
Scott Embry, CFM
Clint Ervin
Catie Gay Stevens, CFM
Sean O'Bryan, CFM
Casey Pedigo
Broc Porter
Kelly Stolt, CFM
Ben Webster, CFM
Jon Allen

Karla Andrew, CFM
Eric Broomfield, CFM
Kevin Collignon, CFM
Heath Crawford, CFM
Adam Evans
Cody Humble
Steve Hupper, CFM
Christine Morgan, CFM
Jeremy Rodgers, CFM
Matt Stone, CFM
Kyle Turpin, CFM
Kal Vencill, CFM

The authors are grateful to all of these students who have participated in the survey over the past years. They have worked diligently at a somewhat tedious job, but one that should have taught them something about stormwater financing, municipal codes, and websites.

We are also indebted to AMEC for sharing their list of stormwater utilities with us. In 2008, Scott Embry had the foresight to ask them for it and they obliged. We continue to have a good relationship with AMEC and with Andy Reese.

We also wish to thank the Environmental Finance Center of the University of North Carolina which provided data on several North Carolina and Georgia stormwater utilities (Environmental Finance Center, 2013).

Several companies publish municipal and county codes which serve as a source for much of our data. We are particularly indebted to the Municipal Code Corporation, Code Publishing Company, American Legal Publishing Corporation, General Code, Lexis Nexis, and Sterling Codifiers, Inc.

Introduction

We have been able to identify 2109 U.S. stormwater utilities (SWUs) that have formed nationwide, and Mike Gregory found 70 in Canada. There are now 2 states with more than 200 stormwater utilities (SWUs) and nine with 100 or more SWUs. Minnesota leads with 229. Figure 1 shows U.S. stormwater utilities by location.

East Baton Rouge has created a stormwater utility adding the first for Louisiana. This makes 42 states plus DC which have enacted SWUs. One community official once said to me, “We are too small to have a stormwater utility.” The smallest community with a stormwater utility that we have found is Indian Creek Village, Florida with a 2020 census population of 84 (no, this is not a misprint). The largest community is Los Angeles County with a population of over 10,000,000. The average SWU community population is 203,390, and the median is 16,112. These numbers are almost certainly too large because it is difficult to find stormwater utilities in small communities because their web pages often do not provide much information. We were able to find a few communities with populations under 5000 using online code publishers like Municode. The bottom line is that no community is too small or too large to have a stormwater utility.

At some point, this survey will become unnecessary as every community will have some appropriate stormwater funding mechanism. When will this occur? We have identified 2109 SWUs in the U.S. and 70 in Canada, and in June 2019, there were 22,389 communities participating in the National Flood Insurance Program (NFIP) (FEMA’s Community Status Book: <https://www.fema.gov/cis/nation.pdf>). This survey will be necessary for the foreseeable future.

The Data

Part of our raw data is contained in the Table in Appendix A. As this is written, our survey contains data on 2109 stormwater utilities (SWUs) located in 42 states and the District of Columbia (Figure 1). Based on our current find rate, my best guess would be that there are at least 2500 SWUs in the U.S., and quite possibly, 3000. More are being formed all the time, and we are aware of several that will form within the next few months.

Figure 2 shows the number of stormwater utilities by state. Politics does not seem to play a role in stormwater utility formation. If SWUs were electoral votes in 2020, Trump would have won 1227 to 991. It is interesting that conservative states have more stormwater utilities than more liberal states. At least 9 states have more than 100 SWUs. Democratic-leaning Washington, Wisconsin, and Minnesota have more than 100 SWUs, while conservative-leaning Texas, Ohio, Iowa, Indiana, North Carolina, and Florida also have more than 100. Three of those states went for Biden in the 2020 election, and six went for Trump. Of the no-SWU states, 4 went for Biden and 3 for Trump.

Nationwide, the average monthly single-family residential fee was \$6.06, the standard deviation was \$4.72, and the median fee was \$5.00. Most fees go up over time reflecting an increase in the Consumer Price Index (CPI). Some communities tie the monthly fee to the CPI. However, a few communities have reduced their fees. The quartile fees are: 25% - \$3.00 and 75 % - \$7.43 for an interquartile range of \$4.43.

Fees ranged from zero to \$45 per month. Figure 3 shows the spatial distribution of monthly fees. As has been observed in previous surveys, no state has all high fees. Even states with theer fees also have

utilities with much lower fees. The range of fee amounts probably reflects stormwater needs and local political realities.

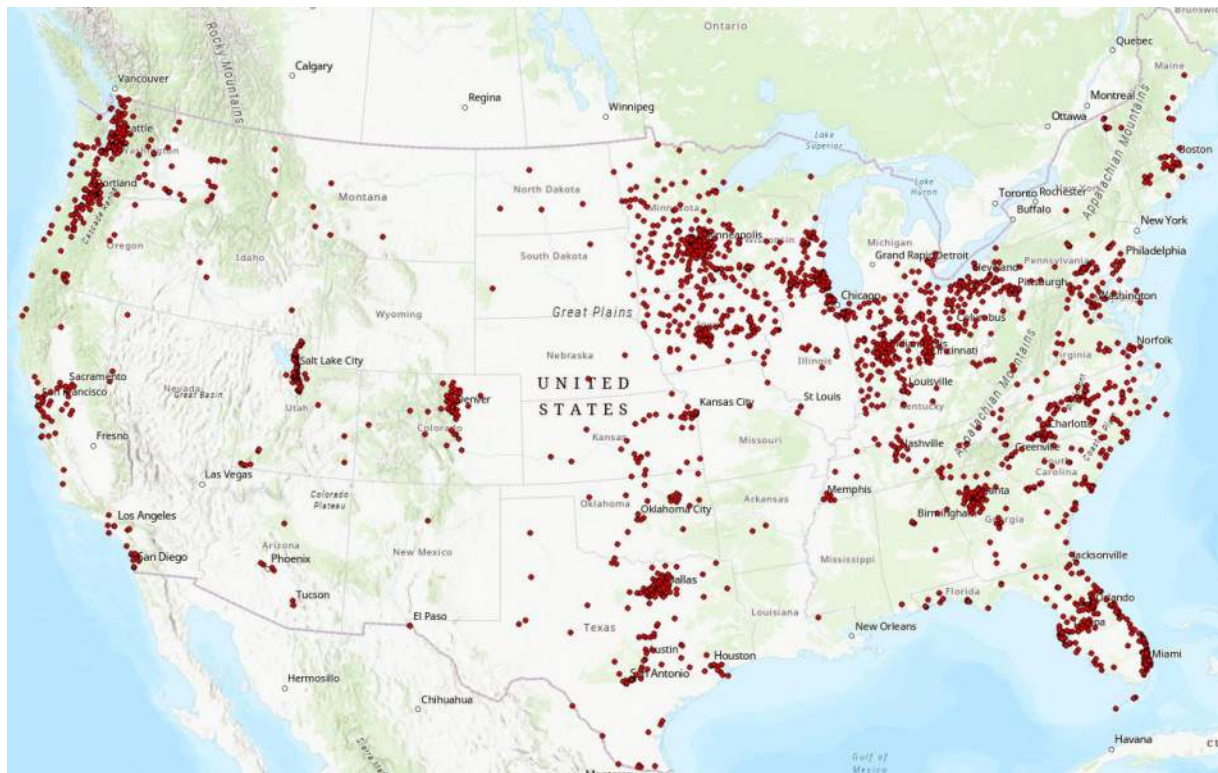


Figure 1. U.S. stormwater utilities (SWUs).

The most widely used method of funding is the ERU system. An Equivalent Residential Unit is usually the average or median impervious area on a single-family residential parcel, although some communities define it as the average of all residential parcels. Fees for non-residential properties are proportional to the ratio of the parcel impervious area to the ERU. For the ERUs identified in our survey, the average was 3123 sq ft of impervious area, the median was 3000 sq ft, and the standard deviation 1417 sq ft. We were able to find ERUs for 1031 utilities which is just under half of the SWUs for which I could identify the fee type. It is important to have a good estimate of the ERU because an inaccurate ERU means that someone is paying a disproportionate amount which could increase legal exposure (Campbell [2010]). The second and third most popular fee systems were the flat fee (252 SWUs) and the tier fee (250 SWUs) systems. Next in popularity was the Residential Equivalent Factor (REF) system, with 151 identified. We were able to identify 120 Dual Fee systems.

A few communities use ERU systems with a cap. For example, I am aware of one community with an ERU system that caps at \$60. In that community, at least one property owner should be paying 10 times that \$60 dollar cap per month. In a community like this, the residential customers will be paying much more than their fair share of the cost of the stormwater program. This increases the legal exposure for the community.

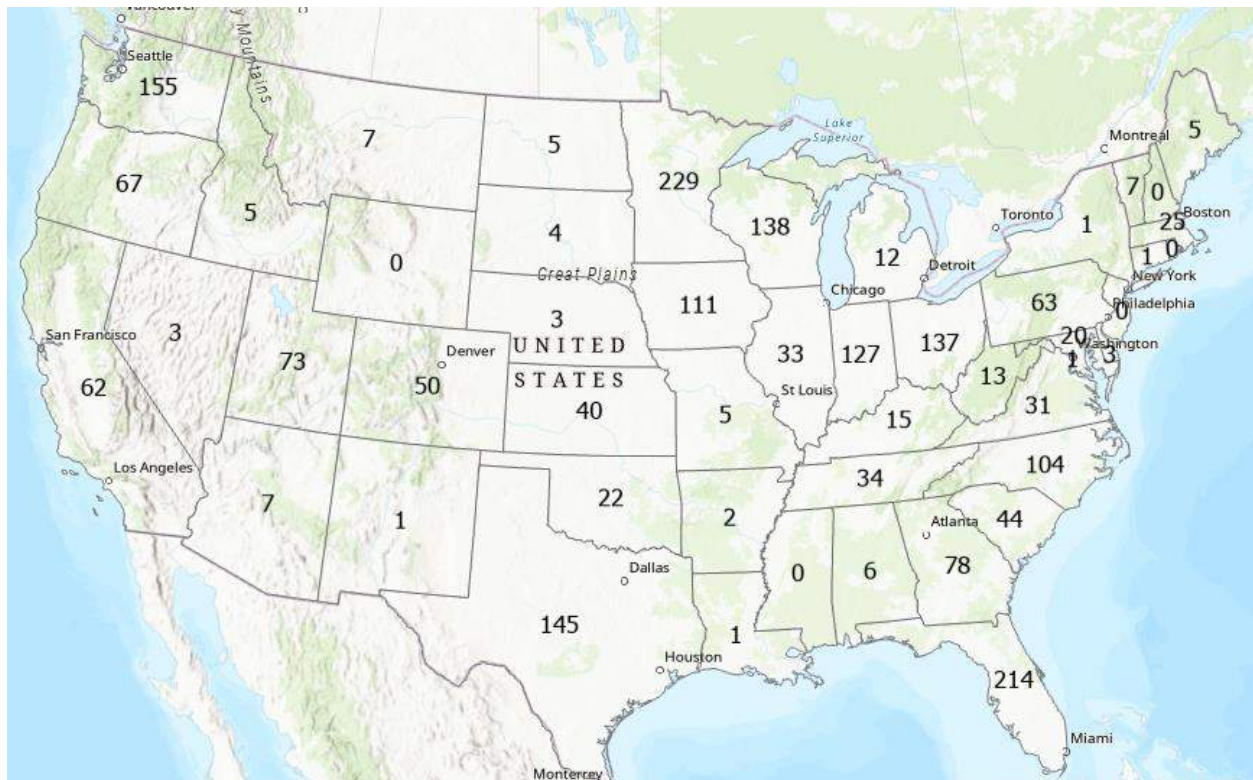


Figure 2. The number of stormwater utilities by state.

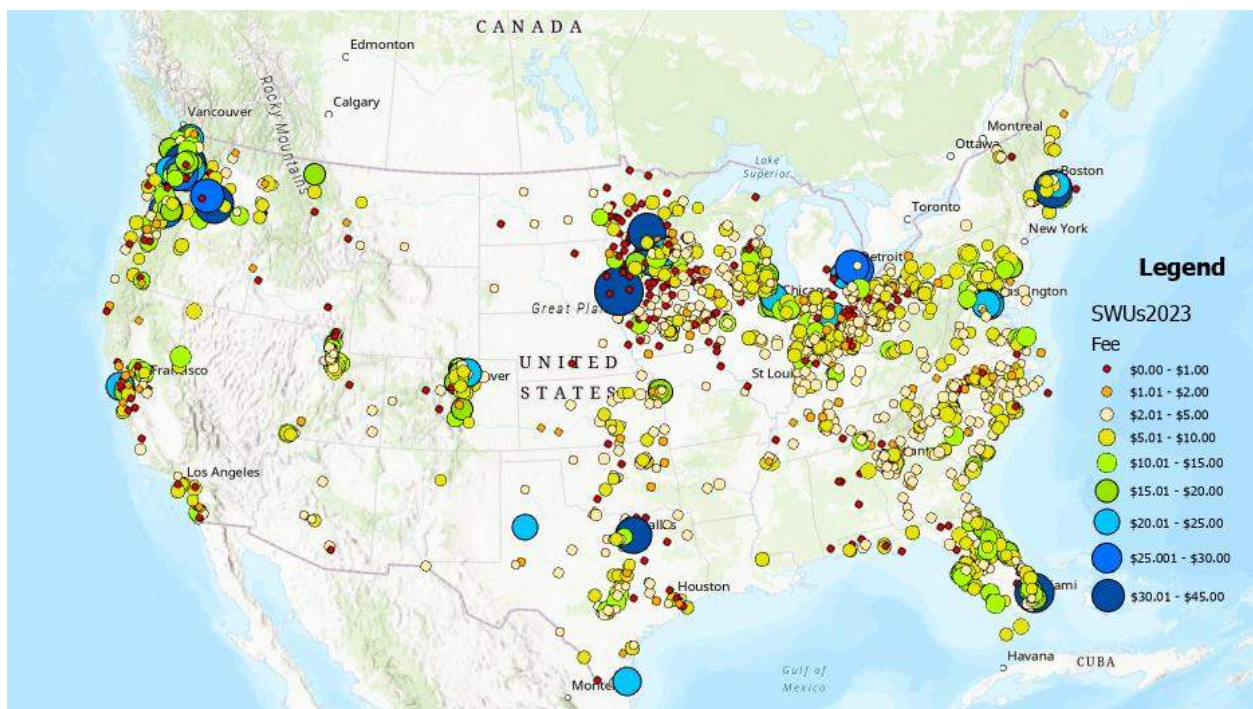


Figure 3. Spatial distribution of monthly stormwater fees.

Canadian Stormwater Utilities

Mike Gregory found 70 Canadian communities with stormwater utilities. From Figure 4, SWUs in Canada seem to cluster mostly in tight groupings near metropolitan areas. The average fee was \$11.07 Canadian, and the median was \$8.57. The median population of a SWU community was 33,800. Comparing U.S. SWUs and Canadian SWUs, we see several differences. The ERU fee was most popular in the U.S. but was much less popular in Canada, where only 3 of 70 used it. The most popular fee there was the flat fee, with 28 of 70 using it, followed by the dual fee, with 15 using it. The median population of a SWU community in Canada was 2.1 times larger than the median population in the U.S.

Figure 5 provides the distribution of Canadian monthly fees in Canadian dollars. All information to create these maps was provided by Mike Gregory, Engineering Director for Computational Hydraulics International.

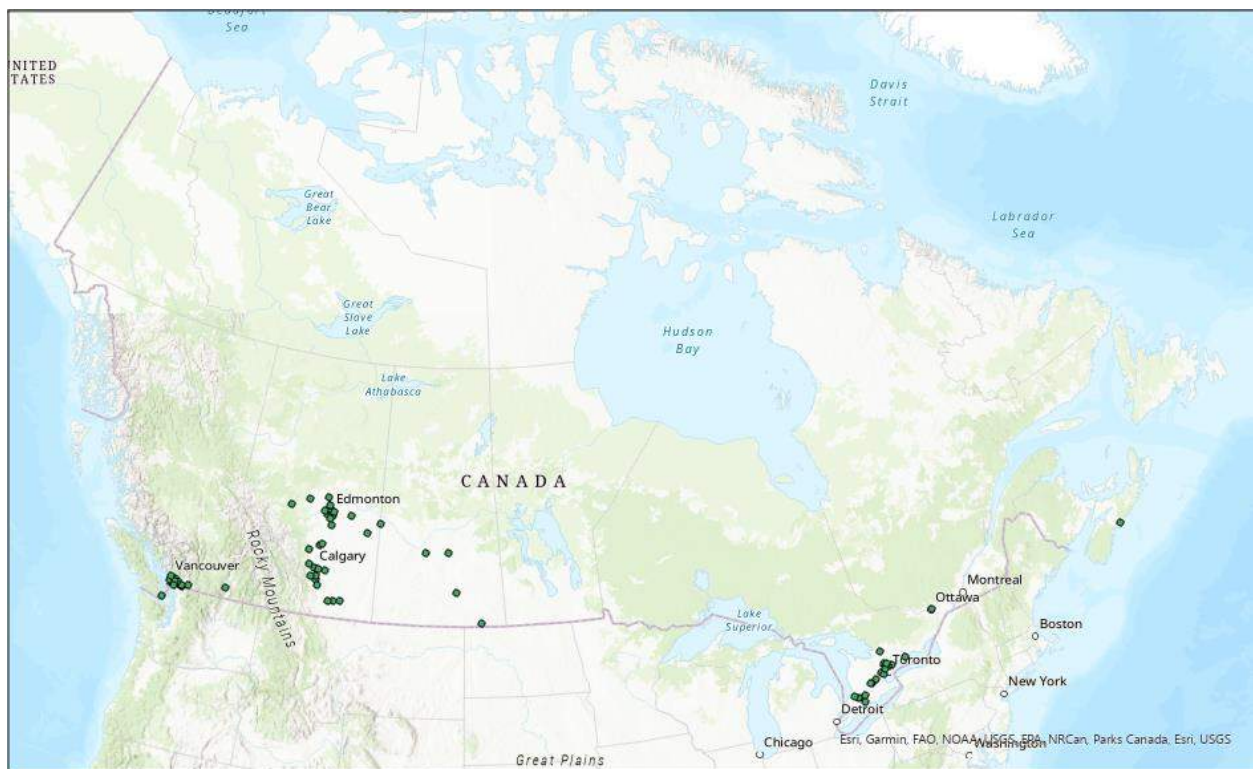


Figure 4. Canadian communities with stormwater utilities.

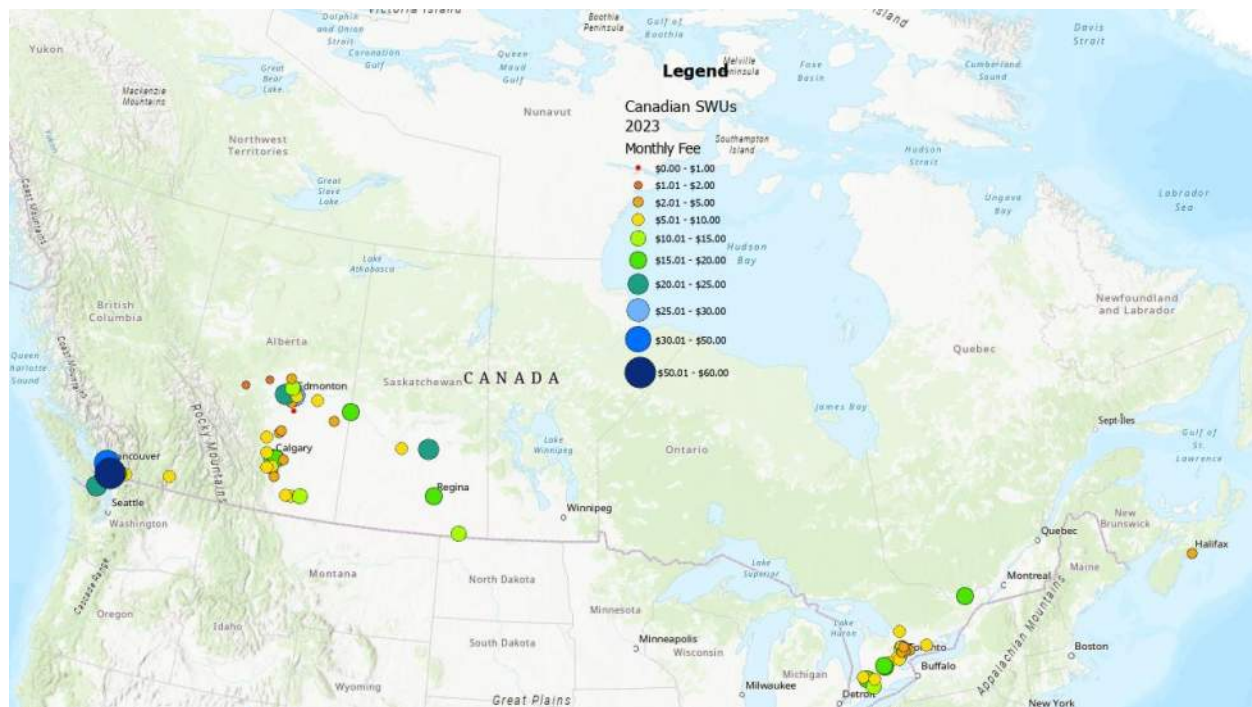


Figure 5. Canadian monthly fees (Canadian \$).

Stormwater Financing

There are many ways to fund stormwater programs, but we strongly support stormwater utilities for reasons that will become clear from this discussion. The most popular method is through a community's general fund. That is, through sales tax, property tax, or income tax. The problem with this type of funding is that stormwater must compete with fixing potholes, putting more police on the street, and other community priorities. Stormwater is the forgotten infrastructure since every drainage system works perfectly when it is not raining. Community officials want to spend taxpayer money on immediate priorities, and until the next flood these priorities do not include stormwater. Voters do not give political support to expenditures they do not perceive as important. Media are all about viewership and readership. "If it bleeds, it leads" is their mantra. When it has been years since the last major flood, media lose interest in flood problems, because their viewers and readers lose interest. Stormwater falls victim to a perfect storm of disinterest.

Another way to fund stormwater is through an addition to the property tax. This is the method used by the Maricopa County, Arizona Flood Control District (outside of Phoenix). The good news is that every year they can adjust the percentage of the property tax that goes to flood control; the bad news is that every year they must beseech their elected officials to give them the financial support they need. Few elected officials are motivated to increase taxes.

Clark County, Nevada (Las Vegas) has another approach. They use an addition to their sales tax. When this was proposed, it passed by a 2 to 1 margin. Why not let visitors to Las Vegas pay for their flood control? This was very politically popular. The problem is that the income for the Flood Control District goes up and down with the local economy. Prior to the bursting of the mortgage bubble, the District received \$90M each year. When the bubble burst, their annual revenue fell to \$60M.

There is a more general problem with the Maricopa and Clark models. They use *ad valorem* assessments. There is no nexus between the fee and the service rendered. This is easiest to illustrate with a property tax example. You might be able to build a 100-story building on a 5-acre parcel for \$1B. On the same parcel, you might be able to build a parking lot for \$1M. If the flood control fee is based on property taxes, the 100-story building owner would be paying 1000 times that of the parking lot owner even though they both produce the same amount of stormwater runoff.

By contrast, a stormwater utility fee can be made fair, though it is not a given. Many fees are based on the amount of impervious area (IA) within the parcel. This includes the building footprint, sidewalks, parking lots, etc. The theory is that the amount of stormwater produced is strongly correlated with the amount of IA. The gold standard for fairness of fees based on IA is Arvada, Colorado and a handful of other communities across the U.S. These communities have estimated the IA on every parcel in town. The fee paid is proportional to the impervious area on the parcel. This system is very fair, but complex to administer because every parcel has a different fee. The community's GIS system must be very sophisticated.

On the other end of the spectrum is the flat fee, that is, every parcel in town pays the same fee. This system is the easiest to administer because every fee is the same, but also the least fair of any SWU system.

The Equivalent Residential Unit (ERU) system is a compromise between the highly complex, highly fair Arvada system, and the flat fee system. An ERU is the average or median impervious area of a single-family residential parcel. Often, every residential property will pay the same fee, and nonresidential properties will pay according to the number of ERUs on the parcel. For example, if the base fee is \$5.00 per month, and the ERU is 3000 square feet, then a store with 30,000 square feet of IA has 10 ERUs. The store owner would pay \$50 per month. Residential parcels may account for 90 percent of the parcels in town, so those parcels may all receive a single fee. The IA for nonresidential parcels will all have a different fee, but the GIS overhead is much less.

In 2022, one of us (Campbell) made a presentation at the Association of State Floodplain Managers (ASFPM) national conference entitled "Stormwater Fees: the Good, the Bad, and the Ugly." After making that presentation, it occurred to us that the designations good, bad, and ugly were very qualitative. We felt that a more quantitative measure was needed to encourage fee best management practices to reduce legal exposure for SWUs. Many SWUs have been challenged in court, and some successfully. Consequently, in 2023 at the ASFPM conference, we made a presentation entitled "An Ugly Index for Stormwater Fees." We considered several indices, but finally settled on the ratio of the total over/under payment of fees to the total revenue collected. We applied several real fee systems to tax assessor data we had for Warren County, Kentucky. We compared over- and under-payments to what would have been charged under the Arvada system applied to Warren County. Since we did not have the impervious area for parcels in Warren County, we applied standard hydrological percentages of the impervious area given in any engineering hydrology book. These percentages are based on work done by the NRCS. The results are given in Table 1.

Table 1. Summary of ugly indices for different fee types.

Fee System	Ugly Index
Flat	126.04%
Dual	122.06%
8N4R Tiers	62.37%
15 Tiers	57.46%
18 Tiers	52.29%
ERU	5.68%
Arvada	0.00%

8N4R refers to 8 nonresidential tiers and 4 residential tiers. The ERU system used had one residential tier. Relative to Arvada, the residential parcels are the only ones that contributed significantly to the ugly index (UI). Significantly because we required that the fees raise the same amount of money annually. To achieve this, the base fee was adjusted. We assumed that Arvada had an ERU of 3825 square feet and a base fee of \$5.00 a month. The ERU is that of the Warren County, Kentucky data used to develop the indices. In the ERU case above, to match annual revenue, the base fee was adjusted to \$4.96, while to calculate the Arvada fee, we used a base fee of \$5.00. This led nonresidential parcels to contribute slightly to the UI. However, less than 6% over/undercharge is less than 1/22 that of the flat fee. The larger the number of tiers, the fairer the fee system. The ERU system is a tier system with an infinite number of tiers.

These indices do not represent any real fee system. The analysis combines data available from Warren County, Kentucky with some real fee systems. Further, we did not have actual IA data for Warren County. Instead, we used typical IA percentages from the Natural Resources Conservation Service, as shown in their runoff curve number tables. Figure 6 emphasizes the point. It shows the 8N4R fee system applied to the Warren County Data. The points that do not quite fall on the tiers are from mobile home parks. The data would have plotted in one case as a residential property with almost 1,000,000 square feet of IA. Rather than plotting it that way and raising questions about the data, we estimated that a mobile home combined with a driveway, and half of a narrow street had 2000 square feet of IA. We divided the parcel impervious area by 2000 and multiplied it by the base fee. The results are points that do not fall on the tiers.

Viewing the figure begs the question, “How can these two fee systems raise the same amount of money?” The data are correct. It is hard to see in the figure, but at the low end of IA there are so many properties that are overcharged, that they compensate for the undercharges on the upper end.

The ugly index developed is only appropriate for fees based strictly on IA. However, even parcels without any IA create runoff. So the Arvada system is not the fairest possible system. It would be possible to convert the Arvada system to a complete runoff system. The ultimately fair system would account for the IA and the soil type or Hydrologic Soil Group (HSG). This is approaching the Residential Equivalent Factor (REF) system. In a REF system, the average runoff from a standard storm is calculated from an acre of average single-family lots, and from nonresidential parcels. A standard storm may be defined as one inch of rainfall, as the 2-yr, 24-hr storm, or other storms. Campbell (2022) pointed out that the choice of the standard storm is critical because a storm with a high rainfall amount favors commercial interests, while a storm with little rainfall favors residential customers. Campbell also points out that the fairest method of applying the REF system is to calculate runoff from years of historical rainfall data and use that to set fees.

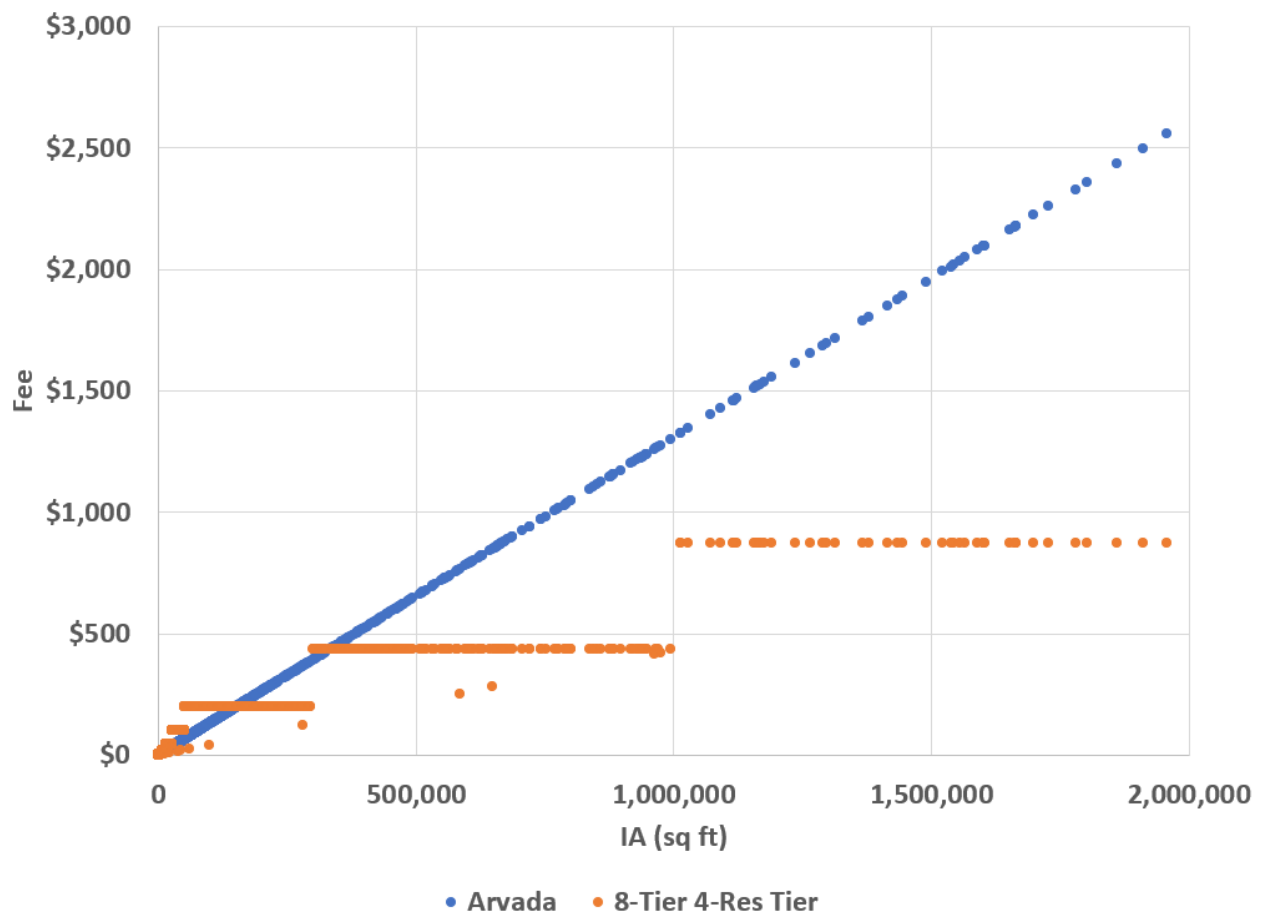


Figure 6. Fees versus impervious area for a nonresidential 8-tier, 4-tier residential fee system.

Hydrologic soil groups fall into the four categories A, B, C, and D. Type A soils are coarse-grained soils that allow significant infiltration so much of the rainfall does not run off the surface. Type D soils are silts and clays with little absorption of rainfall. B and C groups fall in between.

Soil types available from the Natural Resources Conservation Service (NRCS) show that one parcel can have more than one soil type. A fee that accounts for different soil types as well as the IA is possible, but would be at another level of complexity. Also, construction compacts soils, moving them in the direction of type D soils. If a community is predominantly one soil type, say B or C, we could use that type to calculate runoff. Alternatively, we could use GIS to determine the percentage of area underlain by different soil types in a community, and use this community average to calculate runoff. For example, roughly 63% of Warren County is type B soils, 37% type C, and a trace of type D. This information, along with historical rainfall data, could be used to calculate runoff for different land uses.

Summary

Forty-two states and DC have stormwater utilities. Communities in Alaska and Hawaii are also considering stormwater utilities. There are probably at least 2500 SWUs in the U.S., with possibly as many as 3000. At least 70 have been enacted in Canada. A state's political leaning does not seem to be a serious impediment.

Many SWUs are challenged in court or repealed by opportunistic elected officials. Regardless, SWUs are the fairest method of funding flood and water quality programs if the fee systems are set up correctly. Many are not. Any community wanting to set up a SWU should contract with a company that does many of them. At least one company has helped many communities enact stormwater utilities that have never been successfully challenged in court. In this report, we made suggestions for setting up stormwater utilities to reduce legal exposure. It is our hope that communities will take them to heart.

If you are a community official wishing to enhance your flood control or water quality programs, I have the following suggestions for setting up a stormwater utility.

1. Work with a company that sets up many SWUs. They are the experts.
2. Use flat fees only to raise money to hire these experts, then go to a fairer system like the ERU system.
3. Put teeth in your ordinance. Being able to turn off water and power, rather than taking nonpayers to court, will be a more effective strategy if state law allows it.
4. Determine the level of service you want to provide, determine how much it will cost, and set your base fee accordingly.
5. Make your case, and identify the people in town who will be the first beneficiaries. Enlist their support at public meetings.
6. Make a powerful elected official your champion.

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Appendix A. U.S. Stormwater Utilities

The following data tables provide the information collected on 2109 U.S. stormwater utilities and 70 Canadian ones. Note that ERUs in the Canadian SWUs are in square meters impervious. The key for the fee types is given below.

Code	Meaning
IA	Impervious Area
E	ERU
F	Fixed Rate
T	Tier System
R	Residential Equivalence Factor (or similar)
D	Two Level System (Residential/Commercial)
X	No information
S	Fee per Parcel Square Footage
A	Fee per Parcel Acre
-	Repealed
M	Water Meter
W	By Water Usage
AV	Ad valorem fee
LU	Land use-based fee
ID	Intensity of development
Z	Zoning
PT	Parking spaces in tiers
O	Other – does not fit other categories

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
1	Anniston	AL	IA		\$0.83	2014	22,112
2	Birmingham	AL	T		\$0.83		212,157
3	Jefferson County	AL	F				
4	Madison	AL	IA		\$0.83	2014	48,861
5	Mobile	AL	E		\$0.83	2009	195,111
6	Montgomery	AL	IA		\$0.83	2016	199,518
7	Bryant	AR	D		\$5.00	2015	20,194
8	Hot Springs	AR	D		\$4.25	2008	35,680
9	Flagstaff	AZ	T		\$3.74	2003	68,667
10	Mesa	AZ	F		\$7.32	2006	462,821
11	Oro Valley	AZ	E	4000	\$4.50	2008	41,627
12	Peoria	AZ	F		\$1.00	1995	154,065
13	Scottsdale	AZ	F		\$3.10	2016	226,918
14	Surprise	AZ	E	3420	\$2.75	2016	117,517
15	Tuscon	AZ	W		\$1.00	2020	541,482
16	Alameda	CA	E	2000	\$11.18	1992	79,177
17	Albany	CA	F		\$3.47	1992	18,539
18	Arcata	CA	E	2500	\$1.96	2001	17,231
19	Berkeley	CA	R		\$7.28	1991	112,580
20	Burlingame	CA	A		\$10.48	2009	28,806
21	Carlsbad	CA	F		\$1.95	1994	106,000
22	Carmel-by-the-Sea	CA	E	4000	\$8.77	2001	15,677
23	Chino	CA	T		\$8.96	1989	77,983
24	Citrus Heights	CA	R			1997	83,301
25	Contra Costa County	CA	E	5,000	\$2.50	2012	1,041,274
26	Coronado	CA	F		\$3.80	1991	24,417
27	Cupertino	CA	E	4,073	\$4.70	1992	60,170
28	Davis	CA	LU		\$13.10	2012	65,622
29	Del Mar	CA	W		\$12.52	2009	4,161
30	Dixon	CA	F		\$3.77		18,351
31	El Paso de Robles	CA	V				24,297
32	Elk Grove	CA	IA		\$11.68	2004	153,015
33	Escalon	CA	T			1993	7,132
34	Escondido	CA	V		\$2.10	1994	143,911
35	Fairfield-Suisun	CA			\$1.69	2008	147,992
36	Folsom	CA	V			1990	72,203
37	Fortuna	CA	A		\$0.55	1993	11,926
38	Galt	CA	F		\$2.43	2002	23,647
39	Grover Beach	CA	F		\$4.85		13,275

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
40	Healdsburg	CA	IA				11,254
41	Hollister	CA	V				34,928
42	Larkspur	CA	E	3,000	\$1.25	1995	11,926
43	Los Angeles	CA	R		\$8.25	1993	3,792,621
44	Los Angeles County	CA	IA		\$6.25		10,000,000
45	Millbrae	CA	W		\$23.71		20,532
46	Modesto	CA	LU		\$3.23	2004	201,165
47	Monterey	CA	F		\$5.44	1997	27,810
48	Oceanside	CA	F		\$1.00	2002	167,086
49	Ontario	CA	R			2002	163,924
50	Palo Alto	CA	E	2,500	\$15.04	1989	64,403
51	Pinole	CA	F		\$2.92	1979	18,390
52	Poway	CA	V		\$4.36		47,811
53	Rancho Cordova	CA	E	3,500	\$5.54	1996	64,776
54	Rancho Palos Verdes	CA	E	3,804	\$8.06	2005	41,643
55	Redding	CA	T		\$1.32	1993	89,861
56	Richmond	CA	V				103,701
57	Sacramento	CA	D		\$10.78		466,488
58	Sacramento County	CA	F		\$5.84	1995	1,400,949
59	Salinas	CA	V				150,441
60	San Bruno	CA	A		\$4.20	1993	41,114
61	San Carlos	CA	T			1994	28,755
62	San Clemente	CA	T		\$5.10	1993	63,522
63	San Diego	CA	W		\$0.95	1990	1,307,402
64	San Jose	CA	T		\$7.87	1982	945,942
65	San Marcos	CA	F		\$1.77	2001	83,781
66	San Ramon	CA	F		\$1.92	1993	73,333
67	Santa Clara County	CA	V				1,784,642
68	Santa Clarita	CA	E		\$2.12	1994	176,320
69	Santa Cruz	CA	T		\$1.77	1994	59,946
70	Santa Monica	CA	R			1995	89,736
71	Santa Rosa	CA	F		\$1.96	1996	167,815
72	South San Francisco	CA	V			1994	63,632
73	Stockton	CA	E	2,347	\$2.10		291,707
74	Tracy	CA	E	3,140	\$1.20		84,266
75	Vallejo	CA	F		\$1.97		115,942
76	Vista	CA	F		\$1.80		93,834
77	Woodland	CA	T		\$0.48		55,468
78	Adams County	CO	A		\$6.90	2012	469,193
79	Arvada	CO	IA		\$4.26	2002	106,433

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
80	Aurora	CO	E	2,500	\$10.46	2002	345,803
81	Berthoud	CO	F		\$3.50	1989	5,105
82	Boulder	CO	R		\$19.83	1974	310,048
83	Brighton	CO	T		\$5.50	2011	35,719
84	Buena Vista	CO				2017	2,855
85	Canon City	CO	IA		\$11.09	2004	16,318
86	Castle Pines	CO				2022	11,036
87	Castle Rock	CO	E	3,255	\$7.12	2002	48,231
88	Colorado Springs	CO	A		\$8.00	2005	416,427
89	Denver	CO	T		\$12.75	1980	649,495
90	Eagle	CO				2020	6,856
91	Englewood	CO	A		\$1.39		30,255
92	Erie	CO	E	5,300	\$11.98	2003	19,723
93	Evans	CO	A		\$9.43	1998	18,537
94	Federal Heights	CO	IA		\$3.15	2001	11,973
95	Firestone	CO	IA		\$7.00	2009	11,175
96	Fort Collins	CO	R		\$17.00	1980	152,061
97	Fort Lupton	CO	E		\$3.80	2007	7,955
98	Fort Morgan	CO	LU		\$5.00	2021	11,377
99	Fountain	CO	V				25,846
100	Frederick	CO	A		\$7.25	2008	10,196
101	Gilcrest	CO	E	3,738	\$3.50	2006	1,029
102	Golden	CO	IA		\$4.22	1997	19,393
103	Grand Junction	CO	E	2,500	\$3.00	2015	61,881
104	Greeley	CO	A		\$23.34	2002	96,539
105	Idaho Springs	CO	V			2006	1,717
106	Johnstown	CO	E		\$5.00	2020	17,303
107	Lafayette	CO	F		\$9.38	2007	24,453
108	Lakewood	CO	D		\$4.16	1998	147,214
109	Larimer County	CO	T				315,988
110	LaSalle	CO	D		\$4.00	2002	2,359
111	Littleton	CO	A		\$7.80	1986	44,275
112	Longmont	CO	A		\$13.05	1984	89,919
113	Louisville	CO	E	3,500	\$4.71	2007	19,588
114	Loveland	CO	A		\$15.07	1987	71,334
115	Lyons	CO	F		\$10.00	2018	2,148
116	Manitou Springs	CO	F		\$17.00	2010	4,858
117	Milliken	CO	A		\$5.75	2016	8,386
118	Northglenn	CO	A		\$2.00	2004	37,499
119	Parker	CO	E	4,000	\$8.70	1999	48,608

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
120	Pueblo	CO	A		\$5.36	2003	108,249
121	Sheridan	CO	D		\$3.00	2005	5,874
122	Silverthorne	CO	D		\$3.33	2020	4,673
123	Southeast Metro SA	CO	T		\$8.61	2006	715,522
124	Wellington	CO	D		\$5.00	2008	8,516
125	Westminster	CO	T		\$6.00	2001	110,945
126	Windsor	CO	R		\$6.62	2003	20,422
127	Woodland Park	CO	D		\$2.00	1994	7,153
128	New London	CT	T		\$7.50	2018	27,569
129	Washington	DC	T		\$2.67		601,723
130	Lewes	DE	F		\$5.00	2010	2,747
131	Newark	DE	E	1,620	\$3.54	2017	33,398
132	Wilmington	DE	T		\$7.18	2006	71,305
133	Alachua County	FL	V			1996	243,574
134	Altamonte Springs	FL	E	2,492	\$6.75	1989	41,496
135	Anna Maria	FL	E	2,254	\$3.75	2008	1,503
136	Apalachicola	FL	D		\$1.00	2017	2,341
137	Apopka	FL	T		\$15.00	2002	41,542
138	Atlantic Beach	FL	E	1,790	\$8.39	1991	12,655
139	Atlantis	FL	E		\$5.09	2015	2,142
140	Auburndale	FL	F		\$0.75		13,675
141	Aventura	FL	E	1,548	\$2.50	1997	36,610
142	Bartow	FL	E	2,520	\$3.75	2005	17,501
143	Bay County	FL	D		\$3.33	2005	169,856
144	Bay Harbor Islands	FL	E	1,548	\$5.00	1996	5,762
145	Belle Glade	FL	V			1998	17,667
146	Belle Isle	FL	E	4,087	\$4.00	2005	6,111
147	Belleair	FL	E	5,459	\$11.92	2012	4,273
148	Belleair Beach	FL	D		\$15.00	2020	1,560
149	Boca Raton	FL	E	2,837	\$3.11	1993	85,329
150	Bonita Springs	FL	E			2019	53,644
151	Boynton Beach	FL	E	1,937	\$5.00	1993	68,996
152	Bradenton	FL	F		\$4.50	1996	50,193
153	Bradenton Beach	FL	F		\$9.58	2004	1,187
154	Brevard County	FL	E	2,500	\$3.00	1990	543,566
155	Callaway	FL	F		\$1.00	1991	14,493
156	Cape Canaveral	FL	T		\$9.00	2003	9,916
157	Cape Coral	FL	A		\$3.00	2004	157,476
158	Casselberry	FL	E	2,304	\$8.40	1993	26,387
159	Charlotte County	FL	F		\$2.50	1991	160,511

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
160	Citrus County	FL	T		\$4.90	2020	153,843
161	Clearwater	FL	E	1,830	\$14.15	1991	107,784
162	Clermont	FL	E	3,154	\$8.42	1990	29,126
163	Cocoa	FL	E	2,166	\$7.00	1992	17,147
164	Cocoa Beach	FL	E	2,900	\$8.75	2003	11,235
165	Coconut Creek	FL	E	2,070	\$3.87	2004	53,915
166	Collier County	FL	V		\$5.62	1991	328,134
167	Cooper City	FL	E				34,401
168	Coral Gables	FL	E	2,346	\$14.73	1993	47,783
169	Coral Springs	FL	E	5,000	\$9.93		121,096
170	Crestview	FL	E			2020	27,134
171	Cutler Bay	FL	E	1,548	\$4.00	2007	44,300
172	Dade City	FL	E			2014	7,275
173	Daytona Beach	FL	E	1,661	\$8.67	2004	61,028
174	Deerfield Beach	FL	E			2018	86,859
175	DeLand	FL	E	3,100	\$8.69	2009	27,041
176	DeBary	FL	E	2,560	\$7.00	2005	19,324
177	Delray Beach	FL	E	2,502	\$5.33	1990	61,209
178	Deltona	FL	E	3,484	\$6.34	1996	85,219
179	Doral	FL	E	1,548	\$4.00	2005	46,789
180	Dundee	FL	E	4,749	\$1.20	2003	3,764
181	Dunedin	FL	E	1,708	\$11.49	2007	35,354
182	Eagle Lake	FL	D		\$4.00	2007	2,283
183	Eatonville	FL	E	2,011		2000	2,349
184	Edgewater	FL	E	2,027	\$12.00	2004	20,761
185	El Portal	FL	E	1,548	\$3.00		2,380
186	Eustis	FL	D		\$6.00	1997	18,805
187	Fellsmere	FL	F		\$4.00	2013	3,813
188	Fernandina Beach	FL	F		\$4.00	2012	11,705
189	Florida City	FL	E	1,250	\$2.50	2000	11,511
190	Fort Lauderdale	FL	T		\$14.00	1992	168,528
191	Fort Meade	FL	T		\$4.25	1990	5,696
192	Fort Myers	FL	E	500	\$11.52	2009	63,512
193	Fort Myers Beach	FL	E			2019	5,582
194	Fort Pierce	FL	E	2,186	\$4.50	2005	41,993
195	Fort Walton Beach	FL	E	3,200	\$5.00	1990	19,793
196	Frostproof	FL	F		\$3.00	1997	3,030
197	Fruitland Park	FL	F		\$2.00	2005	4,132
198	Gainesville	FL	E	2,300	\$9.45	1988	125,326
199	Golden Beach	FL	E	8,000	\$35.00	1993	940

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
200	Grant-Valkaria	FL	E	2,500	\$3.00	2008	3,851
201	Green Cove Springs	FL	E	3,000	\$10.42	2013	8,313
202	Gulf Breeze	FL	E	4,450	\$5.07	2006	5,870
203	Gulfport	FL	E	2,300	\$3.21	1995	12,041
204	Haines City	FL	T			2002	20,807
205	Hallandale Beach	FL	E	958	\$3.35	1980	37,800
206	Hernando County	FL	-			2003	173,094
207	Hialeah	FL	E	1,664	\$2.50	1998	229,969
208	Hialeah Gardens	FL	E	1,267	\$3.00	1996	19,297
209	Hillsborough County	FL	E		\$3.50	1989	1,267,775
210	Holly Hill	FL	E	2,050	\$7.00	1997	11,663
211	Hollywood	FL	E	2,250	\$3.22	1993	143,357
212	Homestead	FL	E	2,000	\$3.37	1992	61,940
213	Indian Creek Village	FL	E	1,548	\$4.00	1999	84
214	Indian Harbor Beach	FL	E	2,500	\$3.00		8,228
215	Inglis	FL				2003	1,476
216	Jacksonville	FL	E	3,100	\$5.00	2007	827,908
217	Jacksonville Beach	FL	E	1,541	\$5.00	1990	21,523
218	Jupiter	FL	E	2,651	\$5.33	1994	55,911
219	Key Biscayne	FL	E	1,083	\$16.90	1993	12,637
220	Key Colony Beach	FL	E			2013	790
221	Key West	FL	E	1,400	\$7.35	2001	24,909
222	Kissimmee	FL	E	2,404	\$7.38	1989	61,346
223	Lake Alfred	FL	T		\$2.00	1999	5,077
224	Lake City	FL	E	2,019		2017	12,329
225	Lake Mary	FL	E	4,576	\$4.00		13,900
226	Lake Park	FL	E			2008	9,047
227	Lake Worth	FL	E	1,748	\$5.80	1993	35,306
228	Lake Worth Beach	FL	E			2015	42,219
229	Lakeland	FL	E	5,000	\$6.00	1999	98,589
230	Largo	FL	E	2,257	\$6.65	1989	77,723
231	Lauderdale Lakes	FL	E	2,133	\$4.57	1997	33,191
232	Lauderdale-by-the-Sea	FL	E	4,472	\$3.50	2004	6,168
233	Lauderhill	FL	M		\$17.30		68,117
234	Leesburg	FL	E	2,000	\$6.00	1994	20,390
235	Leon County	FL	E	2,723	\$1.67	1991	277,971
236	Lighthouse Point	FL	E			2009	10,486
237	Live Oak	FL	D			2011	6,735
238	Longwood	FL	E	2,898	\$6.00		13,745
239	Lynn Haven	FL			\$6.00	1996	20,948

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
240	Madeira Beach	FL	E	1,249	\$5.00		4,267
241	Maitland	FL	E	2,532	\$9.60	2008	16,076
242	Malabar	FL	E	2,500	\$3.00	1992	2,758
243	Manatee County	FL	V			1991	327,142
244	Marathon	FL	E	4,769	\$10.00	2005	8,387
245	Margate	FL	E	2,382	\$8.25	1993	54,270
246	Marion County	FL	E	2,275	\$1.25		332,529
247	Martin County	FL	E	3,428		2009	147,495
248	Mascotte	FL	E		\$7.00	2012	6,609
249	Medley	FL	E	1,487	\$3.00	1991	857
250	Melbourne	FL	E	2,500	\$3.00	1999	76,095
251	Melbourne Beach	FL	E	2,500	\$3.00	2000	3,102
252	Miami Beach	FL	E	791	\$9.06	1996	89,840
253	Miami Gardens	FL	E	1,800	\$6.00	2006	109,680
254	Miami Lakes	FL	E	2,800	\$8.75	2003	30,467
255	Miami Shores	FL	E	2,466	\$3.75	2000	10,720
256	Miami Springs	FL	F		\$3.67	1993	14,129
257	Miami-Dade County	FL	E	1,548	\$5.00	2004	408,750
258	Milton	FL	V			2008	8,984
259	Minneola	FL	E	3,050	\$4.00	2001	9,531
260	Miramar	FL	F		\$7.00	1998	124,302
261	Mount Dora	FL	E	2,500	\$5.00		12,534
262	Mulberry	FL	E	3,250	\$4.00		3,867
263	Naples	FL	E	1,934	\$13.93	1994	19,939
264	Neptune Beach	FL	E	3,164	\$3.00	2002	7,090
265	New Port Richey	FL	E	2,629	\$6.66	2001	14,961
266	New Smyrna Beach	FL	E	1,818	\$7.00	1995	22,481
267	Niceville	FL	T		\$4.51	2004	12,941
268	North Bay Village	FL	D		\$7.72	1994	7,305
269	North Lauderdale	FL	E	2,138	\$6.00	1995	41,782
270	North Miami	FL	E	1,760	\$6.19	1998	60,143
271	North Miami Beach	FL	E	1,800	\$4.60	1992	42,504
272	North Palm Beach	FL	E	5,550	\$7.78	2021	13,162
273	North Redington Beach	FL	E	1,687			1,418
274	Oakland Park	FL	E	1,507	\$6.00	1989	42,126
275	Ocala	FL	E	1,948	\$6.39	1988	56,517
276	Ocoee	FL	E	2,054	\$7.00		36,320
277	Oldsmar	FL	E	2,550	\$3.00	1998	13,618
278	Opa-Locka	FL	E	1,548	\$6.00		15,579
279	Orange County	FL	V			1996	1,169,107

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
280	Orlando	FL	E	2,000	\$9.99	1989	243,195
281	Ormond Beach	FL	E	3,000	\$7.00	1987	38,153
282	Oviedo	FL	E	2,464	\$7.00	1993	33,528
283	Palm Bay	FL	E	4,602	\$14.76	2010	103,227
284	Palm Coast	FL	E	3,432	\$15.55	2004	76,499
285	Palm Springs	FL				2015	18,928
286	Palmetto	FL	IA		\$14.12	1999	12,774
287	Palmetto Bay	FL	E	1,548	\$5.00	2006	24,439
288	Panama City	FL	V		\$6.66	1991	36,686
289	Pasco County	FL	E	2,890	\$7.92	2007	466,457
290	Pembroke Park	FL	E	1,548	\$2.00	1996	6,214
291	Pensacola	FL	E	2,998	\$6.02	2001	52,197
292	Pinecrest	FL	E	1,548	\$10.00	2002	18,657
293	Pinellas County	FL	E	2,339	\$9.81	2013	929,048
294	Pinellas Park	FL	E	2,000	\$5.78	2006	53,486
295	Plant City	FL	E	2,280	\$5.50	2004	35,817
296	Plantation	FL	E	4,489	\$2.50	2012	86,524
297	Polk City	FL	E	4,030	\$4.53	2012	1,580
298	Polk County	FL	-			2012	609,492
299	Pompano Beach	FL	E	2,880	\$3.00	1997	78,191
300	Port Orange	FL	E	3,050	\$9.58	1993	45,823
301	Port Richey	FL	E			2006	3,052
302	Port Saint Lucie	FL	T			1988	88,769
303	Redington Beach	FL	F		\$7.50		1,539
304	Riviera Beach	FL	E	1,920	\$4.50	2003	29,884
305	Rockledge	FL	E	2,922	\$5.00	2000	20,170
306	Royal Palm Beach	FL	E	2,723	\$5.50	2012	31,864
307	Safety Harbor	FL	E	1,865	\$10.30		16,884
308	Saint Augustine	FL	E	2,752	\$8.00	1993	14,280
309	Saint Cloud	FL	E	2,664	\$6.35	2007	20,074
310	Saint Johns County	FL	E	3,000	\$6.50	1994	123,135
311	Saint Pete Beach	FL	E	3,813	\$3.69		9,391
312	Saint Petersburg	FL	E	2,719	\$11.00	1989	248,232
313	Sanford	FL	E	2,126	\$7.63	1991	38,291
314	Sarasota County	FL	E	3,153	\$7.55	1989	325,957
315	Satellite Beach	FL	E	3,000	\$16.67	1997	10,109
316	Sebastian	FL	E	3,285	\$10.00	2001	20,339
317	South Daytona	FL	E	2,000	\$9.00	1989	13,177
318	South Miami	FL	E	1,865	\$3.00	2000	10,741
319	Springfield	FL	D		\$1.00	2017	8,075

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
320	Stuart	FL	E	3,707	\$4.18	2000	14,633
321	Sunny Isles Beach	FL	E	1,548	\$4.00	1999	15,315
322	Sunrise	FL	E	1,884	\$8.36	1997	85,779
323	Surfside	FL	E	1,040	\$10.70	1998	4,909
324	Sweetwater	FL	E	1,548	\$4.00	2000	14,226
325	Tallahassee	FL	E	1,990	\$8.35	1986	150,624
326	Tamarac	FL	E	1,830	\$10.65	1993	55,588
327	Tampa	FL	E	3,310	\$6.83	2003	303,447
328	Tarpon Springs	FL	E	1,945	\$5.65	1992	21,003
329	Tavares	FL	E	3,000	\$10.00		14,248
330	Tequesta	FL	E	2,507	\$8.23		5,273
331	Titusville	FL	R		\$7.64	1990	40,670
332	Treasure Island	FL	E	1,513	\$12.14	1994	7,450
333	Umatilla	FL	E	3,000	\$4.00	2008	2,896
334	Venice	FL	R		\$6.99	1995	17,764
335	Vero Beach	FL	E	3,972	\$2.38	2021	16,354
336	Volusia County	FL	E	2,775	\$10.50	1992	443,343
337	West Melbourne	FL	E	2,500	\$5.33	1992	9,824
338	West Miami	FL	E	1,400	\$2.50	1996	5,863
339	West Palm Beach	FL	E	2,171	\$8.48		82,103
340	West Park	FL	E	1,351	\$3.50	2012	14,609
341	Wilton Manors	FL	E	3,460	\$5.58	1992	12,697
342	Windermere	FL	E	3,000	\$12.00	2010	3,030
343	Winter Garden	FL	E	4,077	\$5.13	2006	14,351
344	Winter Haven	FL	F		\$3.56	1998	26,487
345	Winter Park	FL	E	2,324	\$13.21		24,090
346	Winter Springs	FL	E	2,123	\$5.50	1992	31,666
347	Albany	GA	E	2,700	\$3.00	2014	77,431
348	Americus	GA	E	3,000	\$4.00	2010	17,103
349	Athens - Clarke County	GA	E	2,628	\$2.10	2004	101,489
350	Atlanta	GA	-				416,474
351	Auburn	GA	T			2011	6,900
352	Augusta	GA	E	2,200	\$6.40	2015	197,872
353	Austell	GA	E	3,100	\$5.00		5,200
354	Avondale Estates	GA	E	2,900	\$15.00	2004	2,995
355	Barrow County	GA	E	3,478	\$1.50	2008	46,144
356	Braselton	GA	E	3,478	\$1.50		1,206
357	Brookhaven	GA	E	3,000	\$7.83	2013	52,444
358	Brunswick	GA	E	2,200	\$3.95	2018	16,287
359	Byron	GA	E	3,850	\$3.50	2017	5,188

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
360	Camilla	GA	E	3,360	\$4.00	2010	5,669
361	Canton	GA	E	2,000	\$2.65		7,709
362	Cartersville	GA	E	3,000	\$3.75		15,925
363	Centerville	GA	E	3,900	\$4.25	2016	7,148
364	Chamblee	GA	E	3,000	\$4.00	2004	9,552
365	Chickamauga	GA				2009	3,101
366	Clarkston	GA	E	1,500	\$5.33	2006	7,554
367	Clayton County	GA	E	2,950	\$3.75	2006	236,517
368	College Park	GA	E	3,523	\$3.00	2007	20,382
369	Columbia County	GA	IA		\$5.33	1999	89,288
370	Conyers	GA	T		\$3.33	2002	10,689
371	Cornelia	GA	E	3,300	\$4.50		4,513
372	Covington	GA	E	2,600	\$3.00	2005	13,226
373	Dahlonega	GA	F		\$1.50	2020	6,773
374	Dalton	GA	F		\$2.00	2018	34,077
375	Decatur	GA	E	4,000	\$17.92	1999	18,147
376	DeKalb County	GA	E	3,000	\$8.00	2003	665,865
377	Doraville	GA	E	3,000	\$4.00	2005	9,862
378	Douglasville-Douglas County	GA	E	2,543	\$4.00	2003	92,174
379	Duluth	GA	E	2,654	\$3.00	2011	22,122
380	Dunwoody	GA	E	3,000	\$5.75	2009	46,267
381	East Point	GA	E	3,200	\$9.15		38,358
382	Evans	GA	E	100	\$0.09		17,727
383	Fairburn	GA	T		\$4.08	2005	5,464
384	Fayette County	GA	E	1,000	\$0.35	2011	107,784
385	Fayetteville	GA	E	3,800	\$2.95	2004	11,148
386	Garden City	GA	E	3,000	\$4.75	2008	11,289
387	Gilmer County	GA	V				23,456
388	Griffin	GA	E	2,200	\$3.56	1997	23,451
389	Grovetown	GA	F		\$4.95	2014	11,216
390	Gwinnett County	GA	E	100	\$6.97	2006	588,448
391	Hapeville	GA	E	2,400	\$3.50	2016	6,373
392	Henry County	GA	E	4,780	\$3.32	2006	119,341
393	Hinesville	GA	E	2,635	\$6.42		30,392
394	Holly Springs	GA	E	2,700	\$4.00	2009	3,195
395	Johns Creek	GA	E	4,000	\$5.80	2021	84,551
396	Kennesaw	GA	D		\$5.00		30,990
397	Lawrenceville	GA	D		\$4.20	2007	29,258
398	Lithonia	GA				2005	1,924

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
399	Locust Grove	GA	E	2,768		2008	2,322
400	Loganville	GA	E	3,000	\$4.00		5,435
401	Macon	GA	E	2,200	\$4.99	2021	153,095
402	McDonough	GA	E	3,000	\$3.30		8,493
403	Milledgeville	GA	E	3,400	\$3.95	2019	18,933
404	Norcross	GA	IA		\$4.13		8,410
405	Peachtree City	GA	E	4,600	\$3.95		31,580
406	Peachtree Corners	GA	IA		\$6.15	2017	43,509
407	Perry	GA	F		\$2.00	2012	14,215
408	Pine Lake	GA					730
409	Powder Springs	GA	E	2,840	\$3.79	2012	13,940
410	Richmond Hill	GA	E	3,300	\$4.75	2015	10,919
411	Rockdale County	GA	E	3,420	\$8.50	2005	70,111
412	Roswell	GA	T		\$4.25	2011	79,334
413	Senoia	GA	E	4,400	\$5.00	2016	3,751
414	Smyrna	GA	E	3,900	\$2.45	2007	40,999
415	Snellville	GA	E	3,800	\$3.10	2008	19,983
416	Statesboro	GA	E	3,200	\$3.95	2015	33,438
417	Stockbridge	GA	E	2,000	\$2.92	2004	9,853
418	Stone Mountain	GA	E	3,000			7,145
419	Sugar Hill	GA	IA		\$4.50	2009	16,725
420	Suwanee	GA	E	3,825	\$7.42	2022	20,786
421	Union City	GA	E	2,800	\$4.00	2013	20,501
422	Valdosta	GA	E	3,704	\$3.50	2006	43,724
423	Warner Robbins	GA	E	3,000	\$4.25	2008	48,804
424	Woodstock	GA	E	2,700	\$4.20	2006	10,050
425	Ackley	IA	F		\$3.00		1,665
426	Adel	IA	E	3,000	\$3.40		4,563
427	Alburnett	IA	F		\$1.50	2012	673
428	Algona	IA	T		\$3.00		5,741
429	Altoona	IA	E	4,000	\$5.00	2010	10,345
430	Ames	IA	T		\$5.20	1994	50,731
431	Ankeny	IA	E	4,000	\$5.50		45,582
432	Asbury	IA	F		\$4.00		4,357
433	Atlantic	IA	E	2000	\$2.85		6,937
434	Aurelia	IA	F		\$1.00		1,036
435	Avoca	IA	E		\$2.50		1,506
436	Belle Plaine	IA	F		\$3.56		2,537
437	Bellevue	IA	F		\$5.00		2,191
438	Belmond	IA	F		\$4.00	2009	2,376

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
439	Bettendorf	IA	E	2,500	\$2.70	2003	32,445
440	Bondurant	IA	E	2,450	\$3.25	2010	3,860
441	Boone	IA	E	3,000	\$2.00		12,633
442	Brooklyn	IA	F		\$2.00		1,468
443	Buffalo	IA	F		\$1.00		1,270
444	Burlington	IA	E	3,360	\$2.58		26,839
445	Carroll	IA	E	2,500	\$3.00		10,103
446	Cedar Falls	IA	F		\$3.00	2006	36,145
447	Cedar Rapids	IA	E	4,356	\$7.16		126,326
448	Centerville	IA	F		\$3.00	2008	5,513
449	Charles City	IA	F		\$5.00	2008	7,812
450	Cherokee	IA	F		\$3.00	2004	5,369
451	Clarinda	IA	F		\$2.00	2006	5,690
452	Clarion	IA	T			2011	2,850
453	Clear Lake	IA	D		\$2.42		8,161
454	Clive	IA	E	3,667	\$7.83	2005	15,000
455	Conrad	IA	F		\$4.00	2008	1,108
456	Coon Rapids	IA	T		\$3.47		1,305
457	Coralville	IA	E	3,440	\$3.00	2005	18,907
458	Creston	IA	V				7,597
459	Dallas Center	IA	F		\$4.00		1,623
460	Davenport	IA	E	2,600	\$2.72	2004	98,359
461	Decorah	IA	T		\$3.00	2016	7,957
462	Deloit	IA	V				264
463	Des Moines	IA	E	2,349	\$12.68	1995	206,599
464	DeWitt	IA	T		\$2.75		5,049
465	Dubuque	IA	E	2,917	\$6.81	2003	57,686
466	Elkhart	IA	D		\$2.21		691
467	Ely	IA	F		\$2.00		1,766
468	Farnhamville	IA	V				420
469	Forest City	IA	F		\$5.00		4,362
470	Fort Dodge	IA	E	2,533	\$3.00	2007	26,309
471	Fort Madison	IA				2005	11,051
472	Garnavillo	IA	T				745
473	Garner	IA	V		\$3.95		2,922
474	Grimes	IA	A		\$5.25	2012	8,378
475	Grinnell	IA	E	3250	\$3.26		9,218
476	Grundy Center	IA	D		\$3.00		2,706
477	Guttenberg	IA	F		\$1.50	2010	1,987
478	Hancock	IA	V				207

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
479	Hiawatha	IA	F		\$1.50	2000	6,694
480	Hills	IA	V				703
481	Hillsboro	IA	V				205
482	Independence	IA			\$4.00	2021	5,966
483	Indianola	IA	E	3,400	\$2.00	2011	12,998
484	Iowa City	IA	D		\$5.00	2004	67,831
485	Johnston	IA	E	4,000	\$7.05	2012	17,278
486	Kalona	IA	F		\$3.00	2010	2,363
487	Kelley	IA	T				304
488	Keokuk	IA	E			2018	10,343
489	Lake City	IA	F		\$1.00	2005	1,727
490	Lake Mills	IA	T		\$3.00		2,100
491	Laurens	IA	T		\$3.25		1,258
492	Le Mars	IA	D		\$7.00	2008	9,826
493	Madrid	IA	A		\$3.00		2,539
494	Mallard	IA	V				298
495	Mapleton	IA	V				1,224
496	Marengo	IA	F		\$1.50		2,535
497	Marion	IA	E	2,791	\$3.50		2,011
498	Marshalltown	IA	F		\$2.16		26,009
499	Mason City	IA	F		\$1.00		29,172
500	McGregor	IA	F		\$8.50		871
501	Milford	IA	F		\$3.00	2012	2,954
502	Nevada	IA	F		\$5.25		6,658
503	North Liberty	IA	F		\$2.00		15,000
504	Norwalk	IA	F		\$7.50		8,821
505	Odebolt	IA	F		\$1.00	2004	1,153
506	Ogden	IA	F		\$3.00		2,044
507	Olin	IA	F		\$1.00		698
508	Oskaloosa	IA	E	2,750	\$2.00	2007	10,938
509	Perry	IA	F		\$3.00	2004	7,633
510	Pleasant Hill	IA	E	3,500	\$3.00		9,082
511	Polk City	IA	E	3,976	\$3.00	2020	4,625
512	Postville	IA	F		\$2.50	2007	2,273
513	Princeton	IA				2015	886
514	Reinbeck	IA	T		\$2.00	2008	1,751
515	Ringsted	IA	V				422
516	Rock Valley	IA	V			2015	3,345
517	Rolfe	IA	D		\$3.00	2012	584
518	Sac City	IA	F		\$3.00		2,368

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
519	Sergeant Bluff	IA	R		\$2.15		4,326
520	Sioux Center	IA	T		\$2.00	2007	6,327
521	Sioux City	IA	F		\$3.50	1990	85,013
522	Slater	IA	D		\$3.00		1,306
523	Solon	IA	F		\$0.50		2,173
524	State Center	IA	T		\$5.08		1,349
525	Storm Lake	IA	E	2,750	\$4.00		10,076
526	Urbandale	IA	E	3,200	\$6.00	2010	40,311
527	Victor	IA	V				952
528	Waterloo	IA	F		\$2.75	2009	68,406
529	Waukee	IA	E	2,973	\$4.25	2006	5,126
530	Wellman	IA	F		\$4.75	2012	1,408
531	West Branch	IA	E	3,500	\$2.25		2,326
532	West Des Moines	IA	E	4,000	\$4.25		46,403
533	Windsor Heights	IA	D		\$5.50		4,805
534	Woodward	IA	F		\$3.00		1,200
535	Wyoming	IA	F		\$1.00		515
536	Coeur D'Alene	ID	E	3,000	\$4.00	2004	34,514
537	Lewiston	ID	-			2008	31,794
538	Moscow	ID				2021	25,319
539	Nampa	ID	-			2010	51,867
540	Pocatello	ID	-				51,466
541	Arlington Heights	IL	T		\$6.25		75,525
542	Aurora	IL	F		\$10.46	1998	170,617
543	Bloomington	IL	T		\$6.39	2004	70,970
544	Buffalo Grove	IL	A		\$5.08	2016	43,212
545	Champaign	IL	T		\$5.24	2012	81,055
546	Decatur	IL	E	4,500	\$3.67	2014	75,407
547	Downer's Grove	IL	E	3,300	\$14.65	2013	48,163
548	East Moline	IL	T		\$2.61	2009	20,333
549	Eureka	IL	E	3,250	\$6.00	2015	5,295
550	Freeport	IL	T				25,638
551	Highland Park	IL	E	2,765	\$8.00		31,614
552	Hoffman Estates	IL	E	3,300	\$2.00	2013	51,895
553	Lake Bluff	IL			\$20.00	2023	5,616
554	Libertyville	IL	E	3,800	\$13.00	2021	20,300
555	Lincolnshire	IL	E	5,000	\$12.88	2021	7,940
556	Matteson	IL	D		\$7.00	2013	19,147
557	Moline	IL	T		\$11.24	2000	42,916
558	Morton	IL	E	3,300	\$4.88	2005	15,757

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
559	Normal	IL	E	3,200	\$4.60	2006	45,386
560	Northbrook	IL	W		\$9.00		33,170
561	Palatine	IL	F		\$6.13	2012	67,908
562	Park Ridge	IL	E	2,800	\$2.75	2016	37,480
563	Peoria	IL	E	2,600	\$7.80	2017	114,265
564	Rantoul	IL	F		\$3.43	2001	12,857
565	Richton Park	IL	D		\$5.97		12,533
566	Rock Island	IL	E	2,800	\$4.63	2002	39,020
567	Rolling Meadows	IL	E	3,604	\$4.76	2001	23,682
568	Tinley Park	IL	W		\$3.72	1983	56,703
569	Urbana	IL	E	3,100	\$4.94	2012	41,250
570	Western Springs	IL	E	3,708	\$17.50	2023	13,629
571	Wheeling	IL	E	3,000	\$2.00	2015	37,648
572	Wilmette	IL	E	3,590	\$17.92	2019	27,418
573	Winetka	IL	E	3,400	\$21.83	2014	12,370
574	Albany	IN	F		\$10.64		2,368
575	Anderson	IN	E	2,500	\$3.50	2002	59,734
576	Andrews	IN	E	2,500		2018	1,048
577	Angola	IN	F		\$2.08		7,344
578	Attica	IN	F		\$3.00	2014	3,147
579	Avon	IN	E		\$6.00	2017	16,960
580	Bargersville	IN	E	2,350	\$9.46	2005	2,120
581	Batesville	IN	T		\$2.00	2005	6,033
582	Battle Ground	IN			\$8.00	2017	1,946
583	Beech Grove	IN	E	2,620		2006	14,192
584	Berne	IN	T		\$24.00		4,114
585	Bloomington	IN	R		\$5.95	1998	69,291
586	Brazil	IN	E	3800	\$5.00	2021	8,380
587	Brooklyn	IN				2005	2,511
588	Brownsburg	IN	E	2,900	\$5.00	2006	14,520
589	Butler	IN	E	2,500		2016	2,635
590	Carmel	IN	E	4,150	\$5.91	2016	85,927
591	Cedar Lake	IN	E	2,903	\$5.00	2006	9,279
592	Centerville	IN	E	3,536	\$8.50	2004	2,624
593	Chandler	IN	F		\$4.00	2004	3,500
594	Chesterton	IN	D		\$6.83		11,139
595	Cicero	IN	V				4,303
596	Clark County	IN	F		\$3.33	2014	
597	Clarksville	IN	E	2,527	\$2.95	2004	21,400
598	Clayton	IN	E	3,000	\$3.00	2015	908

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599	Clinton	IN	F		\$8.30	2017	4,831
600	Cloverdale	IN	E		\$5.00	2014	2,060
601	Connersville	IN	E	2,662	\$5.15		15,411
602	Crawfordsville	IN	D		\$6.00		15,243
603	Crothersville	IN	F		\$3.00	2016	1,591
604	Crown Point	IN	D		\$6.00		19,806
605	Culver	IN	D		\$2.00	2009	1,129
606	Cumberland	IN	F		\$5.20	2007	5,500
607	Daleville	IN	F		\$1.50	2005	1,651
608	Danville	IN	E	3,700			6,418
609	Decatur	IN	E				9,561
610	Delaware County	IN	T		\$0.95		48,682
611	Dyer	IN	E	4,343	\$6.00	1991	13,895
612	Edinburgh	IN	E	3,225	\$3.00	2014	4,435
613	Elkhart	IN	E	3,600		2007	53,923
614	Elkhart County	IN	E	3,600	\$1.25		2,008
615	Ellettsville	IN	E	3,720	\$4.00	2007	6,655
616	Farmersburg	IN	V				1,107
617	Fishers	IN	E	3,318	\$6.65		79,127
618	Floyd County	IN	E	3,700	\$3.25	2007	70,823
619	Fort Wayne	IN	E	2,500	\$5.90		255,824
620	Fortville	IN	D		\$8.00		3,444
621	Frankfort	IN	E	2,860		2006	16,715
622	Franklin	IN	T		\$5.00	2009	23,712
623	Gary	IN	LU		\$5.00	2011	80,294
624	Goshen	IN	E	2,800	\$1.25		29,383
625	Greendale	IN	E	3,000	\$4.39		4,296
626	Greenfield	IN	E	2,250	\$2.00	2005	14,600
627	Greentown	IN					2,369
628	Greenwood	IN	E	2,800	\$5.00	2012	51,584
629	Griffith	IN	E	2,200	\$5.27	2005	17,334
630	Hammond	IN	LU		\$5.00	1999	76,618
631	Highland	IN	T		\$8.69		64,322
632	Howard County	IN	T		\$7.50		84,964
633	Indianapolis/Marion County	IN	IA		\$3.90	2001	791,926
634	Jamestown	IN	LU		\$4.50	2017	942
635	Jasper	IN	E	5,000	\$3.96	2003	12,100
636	Jeffersonville	IN	E	2,500	\$3.50		27,362
637	Kirklin	IN	F		\$5.00	2011	710

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
638	Kokomo	IN	M		\$3.18	2005	57,869
639	Kouts	IN	T		\$8.50	1999	2,028
640	La Porte	IN				2018	21,610
641	Lafayette	IN	E	3,200	\$5.00	2009	56,397
642	Lake County	IN	F		\$3.30		484,564
643	Lake Station	IN	F		\$8.33		12,572
644	Lebanon	IN	E	3,000	\$4.75		15,259
645	Leo Cedarville	IN	V		\$6.30		2,782
646	Linton	IN	F		\$12.50	2017	5,133
647	Logansport	IN	T		\$12.49		19,684
648	Lowell	IN	LU		\$7.00	2012	9,661
649	Marion	IN	E	2,521	\$5.00	2001	31,320
650	McCordsville	IN	E	2,250	\$7.50	2005	1,134
651	Merrillville	IN	LU		\$5.00	2009	32,147
652	Middletown	IN	D		\$8.25		2,357
653	Monroe County	IN	E	5,200	\$2.93	2011	137,974
654	Morgantown	IN	D		\$3.00	2013	1,014
655	Muncie	IN	V		\$9.00	2005	70,087
656	Munster	IN	F		\$14.76		22,346
657	New Albany	IN	E	2,500	\$4.17	2005	37,603
658	New Castle	IN	F		\$6.00		17,780
659	New Haven	IN	E	2,534	\$5.35		12,406
660	North Manchester	IN	E	2,650	\$3.45	1994	5,932
661	North Vernon	IN	W		\$3.75	2008	6,727
662	Oolitic	IN				2015	1,137
663	Ossian	IN	T		\$8.00	2005	2,943
664	Otterbein	IN				2017	1,144
665	Pendleton	IN	E	3,842		2021	4,717
666	Peru	IN	E	3,497	\$4.00		12,994
667	Pittsboro	IN	F		\$3.50		1,588
668	Plainfield	IN	E	3,000	\$8.34		18,396
669	Plymouth	IN	T		\$2.05		9,840
670	Portage	IN	E	3,500	\$12.00	2009	36,828
671	Porter County	IN			\$10.00	2016	164,343
672	Princeton	IN			\$3.00	2021	8,684
673	Richmond	IN	D		\$6.00		39,124
674	Rockville	IN	E	25,000	\$6.00	2009	2,510
675	Seymour	IN	E	2,840	\$4.00		21,569
676	Shelbyville	IN	F		\$6.00		17,951
677	Sheridan	IN	E	3,400	\$5.00	2015	3,106

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
678	Shipshewana	IN	A		\$8.00	1993	839
679	South Bend	IN	D		\$2.00	2019	102,245
680	Southport	IN	E	4,440	\$6.00	2016	1,763
681	Tippecanoe County	IN	E	3,200			199,562
682	Tipton	IN	E	3,000	\$11.85	2006	5,275
683	Trafalgar	IN	D		\$5.00	2014	1,232
684	Troy	IN	E		\$5.00	2013	401
685	Union City	IN	E	4,343		2019	3,454
686	Valparaiso	IN	T		\$12.50	1998	27,428
687	Versailles	IN	D		\$3.25	2017	2,184
688	Vincennes	IN	E	2,800	\$3.00		18,701
689	Wabash	IN	E	3,675			10,666
690	Warrick County	IN	E	3,100	\$5.00	2006	52,383
691	Warsaw	IN	E	3,550	\$2.95		15,804
692	Washington	IN	E	2,558	\$4.25	2004	11,380
693	West Layfayette	IN	E	3,200	\$8.00	2013	30,419
694	West Terre Haute	IN	F		\$7.70	2014	2,157
695	Westfield	IN	T		\$4.16	2008	9,293
696	Whiteland	IN	E	3,704	\$7.50	2010	4,169
697	Winfield	IN	E	4,343	\$6.00	2010	4,530
698	Worthington	IN	E	3,170		2017	1,393
699	Yorktown	IN	E	2,500	\$2.00		4,785
700	Zionsville	IN	E	4,400	\$3.86	2010	24,159
701	Abilene	KS	T		\$3.25	1999	6,844
702	Andover	KS	T		\$2.00	2005	6,698
703	Arkansas City	KS	D		\$3.00	1993	11,963
704	Bonner Springs	KS	D		\$3.00		7,093
705	Caldwell	KS	D		\$1.00		1,043
706	Coffeyville	KS	D		\$7.00	2006	10,387
707	Derby	KS	E	2,233	\$3.00	2012	22,158
708	Dodge City	KS	T		\$1.28	2009	25,176
709	El Dorado	KS	E	2,314	\$3.00	2008	12,057
710	Eudora	KS	F		\$3.25	2007	4,307
711	Fairway	KS	E	3,200	\$5.00		3,952
712	Garden City	KS	T		\$1.50		26,658
713	Hays	KS	E	3,369	\$3.62	2011	20,013
714	Hiawatha	KS	D		\$4.00	2009	3,417
715	Hutchinson	KS	T		\$4.75	2015	40,787
716	Junction City	KS	T		\$5.00		18,886
717	Kansas City	KS	F		\$3.85		146,453

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
718	Lawrence	KS	E	2,366	\$4.50	1997	80,098
719	Leavenworth	KS	T		\$7.00	2018	36,210
720	Lenexa	KS	E	2,750	\$9.08	2000	40,238
721	Manhattan	KS	T		\$5.34	1992	44,831
722	McPherson	KS	E		\$7.00		13,155
723	Mission	KS	E	2,600	\$19.00	2004	9,727
724	Mission Hills	KS	-			2012	3,498
725	Olathe	KS	A		\$5.77		114,662
726	Ottawa	KS	E	2,600	\$4.00	2012	12,620
727	Overland Park	KS	E	2,485	\$2.00	2001	149,080
728	Paola	KS	F		\$3.00		5,602
729	Parsons	KS	D		\$3.50	2008	11,514
730	Pittsburg	KS	E	3,106	\$3.86	2003	19,243
731	Prairie Village	KS	IA		\$10.00	2008	21,447
732	Roeland Park	KS	E		\$6.25	2023	6,871
733	Shawnee	KS	E	2,773	\$6.00	2004	64,680
734	Tonganoxie	KS	D		\$1.50	2018	5,573
735	Topeka	KS	T		\$5.00	1996	122,377
736	Valley Center	KS	T		\$5.50	2008	4,883
737	Wamego	KS	D		\$5.50		4,841
738	Westwood	KS	V		\$6.00	2013	1,658
739	Wichita	KS	E	2,139	\$3.00		344,284
740	Winfield	KS	D		\$2.00	1991	11,900
741	Cold Spring	KY	E		\$4.50		6,481
742	Danville	KY	E	3,813	\$3.36	2007	15,385
743	Franklin	KY	E	3,813	\$2.00	2015	10,176
744	Glasgow	KY	-		\$2.00	2012	14,059
745	Henderson	KY	E	3,000	\$5.00	1998	27,373
746	Hopkinsville	KY	E	3,350	\$3.00	2005	30,089
747	Lexington/Fayette County	KY	E	2,500	\$4.90	2009	260,512
748	Louisville/Jefferson Co.	KY	E	2,500	\$10.58	1987	693,604
749	Murray	KY	E	3,000	\$1.50	2004	14,950
750	Oak Grove	KY			\$2.00	2021	7,332
751	Oldham County	KY	E	6,000	\$3.91	2008	40,502
752	Radcliff	KY	E	2,800	\$5.26	2003	21,961
753	Sanitation District 1	KY	E	2,600	\$4.54	2003	290,000
754	Vine Grove	KY	E		\$5.00	2020	6,310
755	Warren County	KY	D		\$4.00	2007	43,226
756	East Baton Rouge Parish	LA	E	500	\$8.16	2022	456,781

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
757	Ashland	MA	IA		\$2.92		18,832
758	Belchertown	MA	IA		\$2.40		15,350
759	Bellingham	MA	E	3,025	\$8.00	2020	17,182
760	Braintree	MA	E	2,780	\$3.75		8,380
761	Brockton	MA	F		\$2.00	2020	95,777
762	Canton	MA			\$7.00		24,370
763	Chelmsford	MA	T		\$3.33	2017	33,802
764	Chicopee	MA	E	2,000	\$8.33	1998	54,653
765	Dedham	MA	T		\$15.67	2023	25,364
766	East Longmeadow	MA	LU		\$2.08		16,430
767	Fall River	MA	E	2,800	\$14.67	2008	91,938
768	Franklin	MA			\$4.67	2022	33,261
769	Gloucester	MA	F		\$4.42	2011	30,273
770	Hudson	MA				2023	20,092
771	Longmeadow	MA	T	3,400	\$1.48	2017	15,827
772	Millis	MA	T		\$33.00	2017	8,216
773	Milton	MA	T		\$20.33	2016	27,003
774	Newton	MA	T		\$8.33	2006	83,829
775	Northampton	MA	T		\$7.85	2014	28,592
776	Pepperell	MA	F		\$5.00	2019	12,146
777	Reading	MA	D		\$3.33	2006	24,145
778	Shrewsbury	MA	T		\$7.50	2019	37,387
779	Westfield	MA	F		\$2.50	2010	41,094
780	Westford	MA	E	3,500	\$6.25	2019	24,310
781	Yarmouth	MA					23,793
782	Annapolis	MD	T		\$3.33	2003	35,838
783	Anne Arundel County	MD	T			2013	544,403
784	Baltimore	MD	E	1,050	\$5.00	2013	619,493
785	Baltimore County	MD	E	1,050	\$5.00	2013	809,641
786	Berlin	MD	D		\$4.16	2013	4,491
787	Centreville	MD	E	3,200	\$2.50	2013	4,334
788	Charles County	MD	F		\$5.08		120,546
789	Emmitsburg	MD	E	2,932	\$1.67	2022	2,770
790	Frederick	MD	E	1,000	\$5.49	2013	79,588
791	Frederick County	MD	F		\$0.01	2013	236,745
792	Gaithersburg	MD	IA		\$11.22	2015	69,657
793	Hagerstown	MD	IA		\$8.50	2020	43,527
794	Harford County	MD	D		\$7.00	2013	246,849
795	Howard County	MD	E	3,000	\$7.50	2013	293,142
796	Montgomery County	MD	E	2,406	\$8.69	2002	873,341

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
797	Prince George's County	MD	E	2,465	\$3.46	2013	871,233
798	Rockville	MD	E	2,330	\$11.00	2007	47,388
799	Salisbury	MD	E	3,344	\$1.67	2014	31,507
800	Silver Spring	MD	IA		\$12.50		76,540
801	Takoma Park	MD	E	1,228	\$7.67	1996	17,299
802	Augusta	ME	E	2,700	\$7.54		18,560
803	Bangor	ME	E	3,000	\$1.83	2012	33,011
804	Lewiston	ME	D		\$5.00	2006	35,690
805	Long Creek Watershed	ME	D		\$6.89	2010	
806	Portland	ME	E	1,200	\$6.75		68,408
807	Adrian	MI	-			2012	21,122
808	Ann Arbor	MI	T		\$21.54	1980	114,024
809	Berkley	MI	E	2,600	\$5.18	2001	15,531
810	Birmingham	MI	E	4,317	\$16.75	2017	21,007
811	Chelsea	MI	A				5,467
812	Detroit	MI	A		\$29.85	1979	951,270
813	Jackson	MI	-			2011	36,316
814	Lansing	MI	V			1995	119,128
815	Marquette	MI	T				19,661
816	New Baltimore	MI	D		\$2.00	2005	7,405
817	Oak Park	MI	IA		\$29.08	2020	29,560
818	Saint Clair Shores	MI	D		\$2.84	2017	59,635
819	Albert Lea	MN	V			2005	17,967
820	Albertville	MN	V				7,044
821	Alexandria	MN	T		\$4.50	2005	8,820
822	Amboy	MN				2021	535
823	Andover	MN	R			2003	30,222
824	Annandale	MN	D		\$3.25		3,228
825	Anoka	MN	R		\$3.90	2003	18,076
826	Apple Valley	MN	R		\$6.52	1988	45,527
827	Arden Hills	MN	R		\$4.49	1993	9,642
828	Ashby	MN	R			2005	444
829	Austin	MN	A		\$4.00	2003	24,834
830	Barnesville	MN	F		\$2.61		2,563
831	Baudette	MN	R				1,020
832	Baxter	MN	IA		\$2.63	2006	7,642
833	Belle Plaine	MN	F		\$3.56	1999	6,792
834	Bemidji	MN	T		\$6.44		13,657
835	Benson	MN	R			2012	3,091
836	Big Lake	MN	R		\$4.93		10,060

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
837	Bird Island	MN	F		\$5.00	2007	1,027
838	Blaine	MN	R		\$2.67	2007	57,584
839	Blooming Prairie	MN	V				1,996
840	Bloomington	MN	R		\$5.95	1988	84,057
841	Brainerd	MN	R			2002	13,646
842	Brooklyn Center	MN	R		\$5.02	1991	30,529
843	Brooklyn Park	MN	R		\$5.39	2002	76,853
844	Browerville	MN	F		\$6.00		788
845	Buffalo	MN	R			1986	15,665
846	Burnsville	MN	R		\$6.99	2012	60,828
847	Byron	MN	R			2008	6,312
848	Caledonia	MN	E	4,000		2018	2,752
849	Cambridge	MN	R			2000	8,209
850	Canby	MN	V				1,795
851	Cannon Falls	MN	R			2009	4,086
852	Carver	MN	T			2004	3,790
853	Center City	MN	R			2011	664
854	Centerville	MN	A		\$4.33	1997	3,818
855	Champlin	MN	R		\$2.50	2008	23,418
856	Chanhassen	MN	T		\$4.96	2007	23,358
857	Chaska	MN	R		\$10.14		23,770
858	Chokio	MN	V				400
859	Circle Pines	MN	F		\$6.00	2005	4,953
860	Clarks Grove	MN	V				706
861	Clarkfield	MN	R				787
862	Cloquet	MN	E	4,312	\$4.00	2011	12,148
863	Cologne	MN	V			2005	1,519
864	Columbia Heights	MN	R			1999	19,632
865	Coon Rapids	MN	R		\$3.47	2002	61,904
866	Cottage Grove	MN	R		\$5.00	2001	35,052
867	Cottonwood	MN	R				1,236
868	Crosby	MN	R				2,386
869	Crystal	MN	R		\$19.15	1991	22,463
870	Dakota	MN	R				306
871	Dassel	MN	LU		\$2.00	2001	1,467
872	Deephaven	MN	F		\$5.00	1994	3,693
873	Delano	MN	R				5,541
874	Detroit Lakes	MN	R				8,641
875	Duluth	MN	E	1,708	\$6.75	1998	86,227
876	Dundas	MN	R				1,371

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
877	Eagan	MN	R			1990	64,765
878	East Bethel	MN				2019	11,626
879	East Grand Forks	MN	R				8,601
880	Eden Prairie	MN	LU		\$15.10	1993	61,657
881	Edina	MN	R		\$11.60	1985	48,620
882	Elk River	MN	IA		\$3.00	2014	22,974
883	Elko-New Market	MN	R		\$8.97	2000	4,194
884	Excelsior	MN	R		\$38.10	1999	2,219
885	Eyota	MN	F		\$2.00		1,998
886	Fairfax	MN	R		\$12.50	1995	1,218
887	Fairmont	MN	R			1987	10,589
888	Falcon Heights	MN	R		\$7.33	1986	5,381
889	Faribault	MN	E	3,500	\$3.80	2001	23,450
890	Farmington	MN	R		\$7.08	1989	21,267
891	Federal Dam	MN	R				110
892	Fergus Falls	MN	T		\$7.25	1997	13,125
893	Forest Lake	MN	R		\$3.33	2008	18,619
894	Frazee	MN	R			2005	1,360
895	Fridley	MN	R		\$9.86	1985	27,398
896	Gaylord	MN	R				2,275
897	Glencoe	MN	R			1993	5,598
898	Glenwood	MN	R				2,611
899	Glyndon	MN	F		\$9.50	2007	1,413
900	Golden Valley	MN	T		\$8.00	1992	20,655
901	Grand Rapids	MN	T		\$7.50	2004	10,862
902	Grove City	MN	R				619
903	Hamburg	MN	D		\$27.00		513
904	Hanover	MN	R		\$8.50		2,980
905	Harmony	MN	D		\$1.00	2009	1,020
906	Hastings	MN	R		\$6.20	2010	22,359
907	Hawley	MN	R			2009	2,219
908	Hermantown	MN	IA		\$7.00	2019	9,414
909	Hopkins	MN	R		\$5.00	1989	17,837
910	Hutchinson	MN	R			2001	14,093
911	Independence	MN				2012	3,803
912	Inver Grove Heights	MN	R		\$8.03	2007	34,157
913	Isanti	MN	E	3,765	\$7.88	2013	5,721
914	Jordan	MN	R		\$6.16	1995	5,583

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
915	Kandiyohi	MN	R			Title V Chapter 53	481
916	Kasson	MN	R				5,978
917	Kenyon	MN	D		\$3.50		1,817
918	Kiester	MN	R				462
919	Lake City	MN	V				5,063
920	Lake Elmo	MN	T			2003	8,177
921	Lake Park	MN	R			2010	728
922	Lakeville	MN	R		\$4.79	1994	56,443
923	Lamberton	MN	D		\$10.67		824
924	Lauderdale	MN	R			1994	2,408
925	Le Seuer	MN	R		\$9.50	2017	4,058
926	Lexington	MN	D		\$2.50		2,049
927	Lilydale	MN	V				623
928	Lindstrom	MN	V				4,442
929	Lino Lakes	MN	IA		\$4.00	2021	22,119
930	Little Falls	MN	R				8,349
931	Littlefork	MN	R				553
932	Long Lake	MN	R			1999	1,792
933	Loretto	MN	R		\$15.00	2003	658
934	Luverne	MN	R		\$45.00		4,745
935	Madison	MN	R		\$11.25	2002	1,540
936	Mahnomen	MN	R				5,413
937	Mahtomedi	MN	R		\$9.38	2001	7,775
938	Mankato	MN	A		\$4.76		39,528
939	Mantorville	MN	V				1,971
940	Maple Grove	MN	IA		\$5.50	2021	72,622
941	Maple Lake	MN	D		\$1.15		2,088
942	Maple Plain	MN	T		\$2.97	2005	1,792
943	Mapleton	MN	V				1,756
944	Maplewood	MN	R		\$7.48	2003	38,472
945	Marshall	MN	R			2003	13,700
946	Mayer	MN	D		\$4.00	2005	1,780
947	Medina	MN	R		\$2.53	2008	4,963
948	Mendota Heights	MN	A		\$2.42	1992	11,168
949	Milan	MN	R				369
950	Minneapolis	MN	E	1,530	\$13.09	2005	387,753
951	Minnetonka	MN	A		\$7.08	2003	50,435
952	Minnetonka Beach	MN	F		\$5.00	2011	539

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
953	Minnetrista	MN	F		\$8.67	2004	6,474
954	Monticello	MN	IA		\$4.00	2019	13,599
955	Montrose	MN	F		\$4.50	2000	2,887
956	Moorhead	MN	F		\$10.21	2005	38,566
957	Mora	MN	F		\$1.25	2005	3,556
958	Mound	MN	R		\$1.00	2001	9,180
959	Mounds View	MN	T			1993	12,305
960	New Brighton	MN	R		\$4.58	1994	21,715
961	New Hope	MN	D		\$7.96	1991	20,616
962	New Prague	MN	R		\$15.53	1992	7,401
963	Newport	MN	R		\$4.08		3,481
964	North Branch	MN	R			2008	10,131
965	North Mankato	MN	A		\$3.75		13,437
966	North Saint Paul	MN	T		\$10.56	1990	11,601
967	Northfield	MN	R			1986	20,084
968	Norwood Young America	MN	R			2003	3,611
969	Oak Park Heights	MN	T			1999	4,389
970	Oakdale	MN	R		\$2.17	2002	27,743
971	Olivia	MN	T		\$15.67		2,449
972	Orono	MN	R		\$8.11	2001	7,543
973	Ortonville	MN	D		\$2.00		1,916
974	Osakis	MN	T				1,746
975	Osseo	MN	R		\$11.14	2007	2,463
976	Otsego	MN	T			2009	13,761
977	Owatonna	MN	R		\$4.35	1998	25,599
978	Park Rapids	MN	R			2010	3,686
979	Paynesville	MN				2018	2,519
980	Perham	MN	R			2007	3,512
981	Pierz	MN	R		\$32.92		1,394
982	Plymouth	MN	R		\$7.34	2001	71,561
983	Preston	MN	V			2001	1,325
984	Princeton	MN	R		\$1.89	2008	4,676
985	Prior Lake	MN	R		\$15.06	1993	25,282
986	Ramsey	MN	R		\$5.33	2000	18,510
987	Red Wing	MN	R		\$11.50	2008	16,116
988	Redwood Falls	MN	R		\$8.24	2003	5,459
989	Richfield	MN	R		\$6.34	1985	34,439
990	Robbinsdale	MN	R		\$10.80	1985	14,123
991	Rochester	MN	R		\$9.29	2003	85,806

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
992	Rogers	MN	T		\$4.10	2002	3,588
993	Rosemount	MN	T		\$6.12	1992	14,619
994	Roseville	MN	R		\$4.12	1984	33,690
995	Saint Anthony	MN	R		\$21.84	1993	8,226
996	Saint Bonifacius	MN	F		\$6.50	2004	1,873
997	Saint Charles	MN	T			2006	3,735
998	Saint Cloud	MN	R			2003	59,107
999	Saint Joseph	MN	R		\$3.00		6,646
1000	Saint Louis Park	MN	R		\$7.94	2000	44,126
1001	Saint Michael	MN	R			2003	9,099
1002	Saint Paul	MN	R		\$7.89	1986	287,151
1003	Saint Paul Park	MN	R		\$3.00	2007	5,070
1004	Saint Peter	MN	A		\$7.50	2004	9,747
1005	Sandstone	MN	R			2008	2,849
1006	Sartell	MN	D		\$6.00		14,445
1007	Sauk Rapids	MN	R			2010	11,957
1008	Savage	MN	R			1994	27,292
1009	Shafer	MN	R			2003	383
1010	Shakopee	MN	R		\$2.71	1985	20,568
1011	Shoreview	MN	R		\$10.40	1991	25,924
1012	Shorewood	MN	R		\$9.87	1993	7,400
1013	South Saint Paul	MN	R			2010	20,167
1014	South Washington Watershed District	MN	F		\$7.41	2010	
1015	Spring Lake Park	MN	R		\$2.00	2021	6,919
1016	Spring Valley	MN	F		\$5.00		2,479
1017	Stacy	MN	R		\$3.50	2003	1,456
1018	Starbuck	MN	V				1,302
1019	Stewart	MN	V				571
1020	Stewartville	MN	R		\$4.40	2001	5,916
1021	Stillwater	MN	R			1996	15,143
1022	Taylors Falls	MN	R		\$1.50	2003	976
1023	Thief River Falls	MN	R		\$0.86		8,410
1024	Tonka Bay	MN	R		\$3.50	1993	1,547
1025	Truman	MN	V				1,115
1026	Twin Valley	MN	D		\$4.50		821
1027	Two Harbors	MN	E	1,718	\$4.00	1999	3,613
1028	Vadnais Heights	MN	R			1992	12,525

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
1029	Vadnais Lake Water Management Organization	MN	F		\$2.20	2007	
1030	Victoria	MN	R		\$7.67	1997	4,025
1031	Virginia	MN	R				8,423
1032	Waconia	MN	F		\$14.55	1992	6,814
1033	Waite Park	MN	F		\$6.00		7,481
1034	Walker	MN	V				941
1035	Walnut Grove	MN	V				871
1036	Waseca	MN	R		\$7.00	2013	8,865
1037	Watertown	MN	F		\$3.00	1993	3,029
1038	Waverly	MN	D		\$4.00	2003	1,089
1039	Wayzata	MN	R		\$5.55	1991	4,113
1040	West Concord	MN	V				782
1041	West Saint Paul	MN	R		\$3.08	2005	19,405
1042	White Bear Township	MN	E	4,000	\$7.00	1992	11,293
1043	Winnebago	MN	V				1,437
1044	Winona	MN	R			2003	27,069
1045	Woodbury	MN	F		\$6.43	1992	46,463
1046	Worthington	MN	R			2004	11,283
1047	Wyoming	MN	R		\$0.67	1997	7,716
1048	Arnold	MO	E	1,750	\$3.00	2005	21,013
1049	Columbia - Boone County	MO	T		\$2.25	1993	115,276
1050	Hannibal	MO				2017	17,808
1051	Kansas City	MO	E	500	\$2.50	1992	463,202
1052	Saint Louis	MO	A		\$0.24	2008	318,069
1053	Billings	MT	F		\$2.69		89,847
1054	Bozeman	MT	M		\$2.68	2012	38,025
1055	Great Falls	MT	F		\$5.71	1989	56,690
1056	Helena	MT	E	2,222	\$1.48	1988	25,780
1057	Missoula	MT	D		\$0.75	2016	69,122
1058	Polson	MT	F		\$8.00	2009	4,041
1059	Whitefish	MT	E	2,400	\$16.67	2006	5,032
1060	Apex	NC	E	2,700	\$5.00	2022	55,220
1061	Archdale	NC	E	3,163	\$5.00		11,415
1062	Asheville	NC	E	2,442	\$5.10	2004	84,458
1063	Ayden	NC	F		\$3.50		5,141
1064	Atlantic Beach	NC	F		\$4.00		1,495
1065	Beaufort	NC	F		\$4.00		4,452

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
1066	Belmont	NC	E	2,500	\$3.00		10,076
1067	Bessemer City	NC	F		\$2.07		5,398
1068	Black Mountain	NC	LU		\$6.00	2022	8,177
1069	Burgaw	NC	E	2,400	\$2.50	2021	3,088
1070	Burlington	NC	F		\$5.00	2005	44,917
1071	Butner	NC	F		\$2.50		7,598
1072	Camden County	NC	E	4,500		2014	10,187
1073	Carolina Beach	NC	E	2,000	\$9.00	2002	4,701
1074	Carrboro	NC	T	2,800	\$6.25	2017	21,265
1075	Chadbourn	NC	F		\$3.00		1,856
1076	Chapel Hill	NC	T		\$8.04	2004	48,715
1077	Charlotte	NC	T		\$16.40	1994	695,454
1078	Clemmons	NC	E	3,952	\$5.00	1993	13,827
1079	Concord	NC	E	3,120	\$5.16	2005	79,066
1080	Cornelius	NC	T		\$6.58		11,969
1081	Cramerton	NC	T				4,165
1082	Creedmoor	NC	T		\$8.92	2012	4,129
1083	Cumberland County	NC	E	2,266	\$1.00	1995	302,963
1084	Dallas	NC	E	2,500	\$3.10		3,402
1085	Davidson	NC	T		\$6.94		7,139
1086	Dunn	NC	F		\$3.50		9,718
1087	Durham	NC	E	4,300	\$7.76	1997	228,330
1088	Durham County	NC			\$2.00	2020	41,324
1089	Elizabeth City	NC	D		\$3.00	2006	18,683
1090	Elon	NC	F		\$2.00		9,419
1091	Erwin	NC	F		\$2.50		4,405
1092	Fayetteville	NC	E	2,266	\$6.00	2004	200,564
1093	Forsythe County	NC	T		\$5.77	2006	306,067
1094	Gastonia	NC	E	2,650	\$3.25	2001	71,741
1095	Gibsonville	NC	F		\$0.75		6,410
1096	Goldsboro	NC	E	3,000	\$4.50	2017	36,437
1097	Graham	NC	F		\$1.00		14,153
1098	Granville County	NC	T		\$1.50	2012	59,976
1099	Greensboro	NC	E	2,543	\$2.70	1994	269,666
1100	Greenville	NC	T		\$10.70		84,554
1101	Grifton	NC	F		\$3.00		2,682
1102	Haw River	NC	F		\$2.00		2,298
1103	Hendersonville	NC	E	3,000	\$5.00	2018	13,840
1104	High Point	NC	E	2,588	\$4.00		104,371
1105	Hillsborough	NC	T		\$6.25	2016	6,087

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
1106	Holly Springs	NC			\$3.00		24,661
1107	Hope Mills	NC	D		\$4.00	2008	15,176
1108	Huntersville	NC	T		\$6.54		24,960
1109	Indian Trail	NC	T		\$4.43	2007	11,905
1110	Jacksonville	NC	E	2,850	\$5.00	2006	66,715
1111	Kannapolis	NC	T		\$7.25		36,910
1112	Kernersville	NC	E	2,980	\$3.29	2006	23,123
1113	Kings Mountain	NC	E	2,000	\$2.50	2014	10,791
1114	Kinston	NC	E	3,059	\$4.50	2008	22,346
1115	Knightdale	NC			\$6.75		11,401
1116	Kure Beach	NC	F		\$8.71		2,012
1117	Lake Park	NC	T				3,422
1118	Landis	NC	D		\$5.00		3,121
1119	Laurel Park	NC	F		\$5.00		2,180
1120	Lexington	NC	E	2,700	\$3.50	2020	18,933
1121	Lowell	NC	E	2,827	\$6.75	2021	3,526
1122	Lumberton	NC	T		\$4.25	1997	21,542
1123	Matthews	NC	T		\$6.87		22,127
1124	Mecklenburg County	NC	T		\$6.10		695,454
1125	Mint Hill	NC	T		\$6.32		14,922
1126	Monroe	NC	T		\$4.50	2008	32,797
1127	Mooresville	NC	E	2,700	\$3.40	2014	34,887
1128	Morrisville	NC	E	2,800	\$1.92	2012	19,184
1129	Mount Holly	NC	E		\$2.50		13,656
1130	Nags Head	NC	F		\$2.00		2,757
1131	Nashville	NC	F		\$2.50		5,554
1132	New Bern	NC	E	3,100	\$2.10	2012	29,524
1133	New Hanover County	NC	E	4,000	\$1.00	2019	229,018
1134	Oak Island	NC	D		\$1.75		6,783
1135	Oxford	NC	E	2,500	\$2.00		8,338
1136	Person County	NC	T		\$1.00	2013	39,127
1137	Pineville	NC	T		\$6.14		3,449
1138	Plymouth	NC	F		\$3.00		3,878
1139	Raleigh	NC	T		\$7.00	2004	416,468
1140	Randleman	NC	F		\$2.00		4,113
1141	Ranlo	NC	W		\$7.45		3,434
1142	Rocky Mount	NC	E	2,519	\$5.00	2003	57,477
1143	Roxboro	NC			\$1.50		8,362
1144	Salisbury	NC	E	2,500	\$4.00	2012	33,834
1145	Shelby	NC	E	2,600	\$2.50	2014	20,325

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
1146	Spring Lake	NC	D		\$2.75		11,964
1147	Stallings	NC	E	2,060	\$2.12	2007	13,831
1148	Statesville	NC	E	3,050	\$4.70	2019	26,506
1149	Stem	NC	T				463
1150	Swansboro	NC	T		\$3.75	2016	2,993
1151	Tarboro	NC	E	2,000	\$3.00	2018	11,415
1152	Thomasville	NC	F		\$1.00		26,729
1153	Wallace	NC	E	2,400	\$4.85		3,880
1154	Washington	NC	T		\$5.50	2002	9,744
1155	Whitakers	NC	F		\$3.25		744
1156	Whiteville	NC	F		\$6.00		5,394
1157	Williamston	NC	F		\$1.35		5,511
1158	Wilmington	NC	E	2,500	\$8.19	2004	106,476
1159	Wilson	NC	E	2,585	\$4.50	2002	49,167
1160	Winston-Salem	NC	T		\$4.50		185,776
1161	Winterville	NC	E	2,000	\$2.00	2007	9,269
1162	Wrightsville Beach	NC	T				2,593
1163	Zebulon	NC	T		\$2.00		4,433
1164	Bismarck	ND	F		\$2.98		55,532
1165	Dickinson	ND	V				25,167
1166	Grand Forks	ND	F		\$2.90	1988	49,321
1167	Jamestown	ND			\$3.00	2019	15,387
1168	Minot	ND	F		\$2.60	1998	36,567
1169	Columbus	NE	T		\$3.00	2018	23,128
1170	Kearney	NE	D		\$1.00	2016	33,835
1171	Omaha	NE			\$0.84		475,862
1172	Sante Fe	NM	W		\$5.50	2003	62,203
1173	Carson City	NV	F		\$8.79	2003	52,457
1174	Sparks	NV	D		\$14.59		66,346
1175	Washoe County	NV	E		\$9.31	2015	446,903
1176	Ithaca	NY	E		\$4.75	2014	30,014
1177	Ada	OH	T			2004	5,952
1178	Amberley Village	OH	R			2003	3,585
1179	Ashland	OH	E	3,052	\$3.50	2006	20,367
1180	Ashville	OH	E	2530	\$3.00	2006	4,120
1181	Avon	OH	E	4300	\$2.00	2018	21,193
1182	Barberton	OH	E	8,668	\$5.00	2006	26,455
1183	Bellefontaine	OH	E	2,400	\$3.75	2001	13,322
1184	Bellville	OH	E	3,200	\$1.50	2017	1,918
1185	Boardman	OH	E	4,764	\$3.12	2018	35,376

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
1186	Broadview Heights	OH	E	4,000	\$4.00	2007	19,247
1187	Brookville	OH	LU		\$4.50	2019	5,874
1188	Brunswick	OH	E	3,500	\$4.95	2011	34,441
1189	Buckeye Lake	OH	E	2,700	\$4.00	2013	2,703
1190	Bucyrus	OH	E	2,506	\$7.20	2000	12,253
1191	Butler County	OH	E	4,000	\$1.08	2003	369,999
1192	Campbell	OH	T		\$3.00	2007	8,235
1193	Canal Winchester	OH	E	3,001	\$3.00	2010	7,191
1194	Canfield	OH	E	3,050	\$3.12	1992	7,464
1195	Celina	OH	E	3,083	\$2.00	2008	10,406
1196	Cincinnati	OH	T		\$8.28	1984	296,223
1197	Columbus	OH	E	2,000	\$4.68	1994	797,434
1198	Cortland	OH	F		\$1.50	2007	7,069
1199	Coshocton	OH	D		\$0.25	2010	11,231
1200	Crooksville	OH	E		\$2.54		2,491
1201	Cuyahoga Falls	OH	E	3,000	\$5.00	1992	49,473
1202	Dayton	OH	F		\$5.03	1997	142,148
1203	Deerfield Regional Stormwater District	OH	E	3,407	\$1.92	2006	
1204	Delaware	OH	E	2,773	\$2.50	1998	35,541
1205	East Liverpool	OH	E	7,773	\$6.50	2018	10,691
1206	Elida	OH	F		\$3.00	2018	1,803
1207	Elyria	OH	E	2,700	\$2.65	2016	52,656
1208	Findlay	OH	T		\$3.00	1999	41,202
1209	Forest Park	OH	F		\$3.00	1988	19,463
1210	Fostoria	OH	R			2006	13,411
1211	Franklin	OH	E	2,611	\$3.50		11,771
1212	Gahanna	OH	E	3,064	\$4.33	2004	32,636
1213	Galion	OH	E	2,650	\$6.00	2001	10,416
1214	Gambier	OH	T		\$4.00		2,396
1215	Germantown	OH	LU		\$4.00	2003	5,547
1216	Greenville	OH	E	2,800	\$2.95	2007	13,189
1217	Groveport	OH	E	2,760	\$2.00	2008	5,363
1218	Hamilton	OH	E	2,536	\$4.30	2002	62,795
1219	Hamilton County	OH	V				800,362
1220	Harrison	OH	R		\$2.00	2007	9,871
1221	Haskins	OH	F		\$8.00	2020	1,188
1222	Hilliard	OH	E	2,000	\$2.35	2009	28,435
1223	Hillsboro	OH	E	2,899	\$5.00	2019	6,512
1224	Hubbard	OH	T		\$3.00	2007	8,284

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
1225	Huber Heights	OH	E	3,431	\$2.00	2002	38,278
1226	Hudson	OH	-				22,182
1227	Huron	OH	T		\$1.67	2017	7,149
1228	Ironton	OH	W		\$12.42	2005	11,211
1229	Kent	OH	E	1,963	\$4.30	2001	28,935
1230	LaGrange	OH	E	3,865	\$5.00	2014	2,103
1231	Lake County	OH	E	3,050	\$3.50	2003	229,885
1232	Lancaster	OH	E	2,600	\$7.64	2003	39,026
1233	Lebanon	OH	E	2,615	\$3.50	2004	20,242
1234	Lexington	OH	E	5,000	\$1.50	2004	4,784
1235	Lima	OH	E	2,600			38,693
1236	Logan	OH	E	2,300	\$3.00	2014	7,152
1237	London	OH	E	2,766	\$4.00		9,896
1238	Lorain County (unincorporated areas)	OH	E	6,000	\$1.50		
1239	Loudonville	OH	E			1997	2,617
1240	Louisville	OH	T		\$3.50	2005	9,186
1241	Loveland	OH	E	2,500	\$4.50	2003	12,082
1242	Lowellville	OH	F		\$2.00	2007	1,148
1243	Lucas County	OH	E	5,500	\$4.31	2011	440,005
1244	Marion	OH	E	2,778	\$4.16	1997	36,689
1245	Marysville	OH	E	2,700	\$6.00	2004	22,288
1246	Mason	OH	F		\$4.32	2001	31,039
1247	Massillon	OH	T		\$1.00	2010	32,106
1248	Medina	OH	E	2,716	\$2.25	2003	26,822
1249	Middletown	OH	E	2,814	\$4.00	2005	48,962
1250	Milford	OH	E	2,400	\$5.50	2004	6,768
1251	Monroe	OH	D		\$3.00	2003	12,509
1252	Monroeville	OH	E	4,200		2009	1,400
1253	Montpelier	OH	T			1986	4,067
1254	Mount Gilead	OH	E	2,000	\$2.50	2014	3,678
1255	Mount Vernon	OH	E	2,900	\$6.00	2019	16,659
1256	Muskingum Watershed Conservancy District	OH	E	3,300	\$1.00		2,000,000
1257	New Lexington	OH	F		\$2.25	2005	4,689
1258	New London	OH	T		\$4.00	2005	2,455
1259	New Washington	OH				1999	920
1260	Newark	OH	E	2,600	\$6.50	2005	47,790
1261	Newton Falls	OH	LU		\$3.00	2014	4,471
1262	North Baltimore	OH	E	3,000	\$3.00	2007	3,545

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
1263	North Ridgeville	OH	E	3,820	\$3.88	2018	33,436
1264	Northeast Ohio Regional Sewer District	OH	E	3,000	\$5.15	2010	
1265	Northwood	OH	E	2,500	\$3.16	2001	5,265
1266	Norwalk	OH	E	3,800	\$1.35	2011	16,977
1267	Oak Harbor	OH	E	4,200	\$13.00	2007	2,758
1268	Oakwood	OH	E		\$6.00	2013	9,202
1269	Oberlin	OH	E	3,600	\$4.39	2018	8,312
1270	Painesville	OH	E	2,500	\$2.75	2002	19,549
1271	Pemberville	OH	M		\$3.00	2007	1,420
1272	Pickerington	OH	E	2,530	\$4.50	2001	18,408
1273	Piqua	OH	E	5,400	\$6.70	2009	20,592
1274	Poland	OH	E	2,500	\$3.50	2010	2,537
1275	Portage County	OH	E	5,800	\$1.50	2009	162,277
1276	Ravenna	OH	E	2,750	\$3.00	2007	11,739
1277	Reynoldsburg	OH	E	2,530	\$2.00	1996	36,293
1278	Rittman	OH				2015	6,593
1279	Russels Point	OH				2016	1,390
1280	Sebring	OH	D		\$4.50		4,391
1281	Sheffield	OH	E	2,500	\$3.50	2004	3,986
1282	Sheffield Lake	OH	E	2,275	\$4.85	1999	9,145
1283	Sheffield Village	OH	E	2,500	\$3.50	2004	4,135
1284	Sidney	OH	E	2,752	\$1.95	1994	21,178
1285	Silver Lake	OH	F		\$8.00	2003	2,510
1286	South Charleston	OH	F		\$2.00	2014	1,619
1287	Spencerville	OH	V			2008	2,218
1288	Springboro	OH	D		\$3.00	2003	17,588
1289	Springfield	OH	E	1,898	\$2.25	2011	60,333
1290	Stow	OH	E	3,060	\$3.00		34,711
1291	Struthers	OH	E	3,500	\$3.50	2007	10,640
1292	Summit County	OH	F		\$4.00	2017	540,428
1293	Swanton	OH	E	3,460	\$3.00	2005	3,858
1294	Tallmadge	OH	E	3,000	\$2.00		17,473
1295	Toledo	OH	E	2,500	\$3.80	1999	286,038
1296	Trenton	OH	E	3,000	\$0.30	2003	11,931
1297	Trotwood	OH	E	4,020	\$4.00		2,455
1298	Troy	OH	E	3,000	\$4.65	2007	25,143
1299	Trumbell County	OH	-			2016	206,443
1300	Union	OH	LU		\$4.00	1987	6,448
1301	Upper Arlington	OH	F		\$3.75	1991	34,223

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
1302	Urbana	OH	W		\$5.00	2017	14,239
1303	Vandalia	OH	E	4,431	\$2.30	2004	15,317
1304	Vermilion	OH	E	3,923	\$5.50	2016	10,594
1305	Wadsworth	OH	E	3,500	\$4.50	2005	21,683
1306	Wapakoneta	OH	T			1994	9,843
1307	Warren	OH	E	648	\$2.92		41,358
1308	Wellington	OH	E	2,900	\$3.50	2010	4,806
1309	Wilmington	OH	LU		\$6.32	2020	12,392
1310	Wooster	OH	E	3,050	\$5.75	1985	26,139
1311	Wyoming	OH	V		general fund	2011	8,398
1312	Xenia	OH	T		\$2.50		25,925
1313	Zanesville	OH	E	2,300	\$3.00	1987	25,531
1314	Bixby	OK	E	2,650	\$4.00		21,137
1315	Broken Arrow	OK	E	2,650	\$6.86	2002	100,073
1316	Catoosa	OK	D		\$2.50		7,226
1317	Chickasha	OK			\$7.00	2016	16,374
1318	Choctaw	OK	F		\$3.00	2005	11,364
1319	Edmond	OK	E	4,860	\$3.00	1994	82,963
1320	Enid	OK	E	5,000	\$4.79	2009	49,451
1321	Jenks	OK	F		\$2.00	2002	17,130
1322	Lawton	OK	F		\$0.75		98,177
1323	McAlester	OK	E	2,650	\$2.00	2016	18,301
1324	Miami	OK	E		\$2.00		13,577
1325	Midwest City	OK	W		\$2.42		55,427
1326	Muskogee	OK	D		\$2.37	2005	39,231
1327	Oklahoma City	OK	M		\$5.53	1995	591,967
1328	Owasso	OK	E	3,000	\$4.50		29,854
1329	Ponca City	OK	D		\$3.50		25,168
1330	Sand Springs	OK	E	2,650	\$5.80		19,140
1331	Sapulpa	OK	D		\$4.15		20,691
1332	Stillwater	OK	E	5,000	\$1.00	1997	46,048
1333	Tahlequah	OK	D		\$2.00		16,021
1334	Tulsa	OK	E	2,650	\$7.03	1986	396,466
1335	Woodward	OK			\$3.00	2016	12,758
1336	Adair Village	OR	F		\$2.50		843
1337	Albany	OR	E	3,200	\$5.28	2017	53,211
1338	Ashland	OR	T		\$4.90	1994	20,232
1339	Beaverton	OR	E	2,640	\$10.78	1989	91,625
1340	Bend	OR	E	3,800	\$5.62	2007	77,905
1341	Brookings	OR	E	2,500	\$2.60	2008	6,480

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
1342	Cannon Beach	OR	F		\$4.49	1996	1,695
1343	Central Point	OR	E	3,000	\$6.50	2005	17,308
1344	Clackamas County	OR	E	2,500	\$6.95		380,207
1345	Clatskanie	OR	D		\$2.50	1999	1,738
1346	Coburg	OR					1,035
1347	Corvallis	OR	E	2,750	\$9.02	1977	54,674
1348	Cottage Grove	OR	E	2,650	\$5.15	1998	9,734
1349	Dundee	OR	D		\$1.67	1997	3,188
1350	Eagle Point	OR	E	6,024	\$5.00	2009	9,554
1351	Estacada	OR	F		\$6.50	1998	2,725
1352	Eugene	OR	T		\$12.64	1994	156,929
1353	Fairview	OR	IA		\$12.48	1994	8,920
1354	Florence	OR	IA		\$6.49	2005	8,466
1355	Forest Grove	OR	E	2,640	\$7.75	1990	21,083
1356	Gladstone	OR			\$10.00	2017	11,491
1357	Grants Pass	OR	E	3,700	\$7.78		37,579
1358	Gresham	OR	E	2,500	\$12.12	1994	105,594
1359	Halsey	OR	F		\$3.00	2018	962
1360	Harrisburg	OR	O		\$3.67	2004	3,850
1361	Hillsboro	OR	E	2,640	\$9.06		70,186
1362	Hood River	OR	M		\$9.19	2006	7,167
1363	Hubbard	OR	F				3,173
1364	Independence	OR	E	3,250	\$7.41	2011	8,650
1365	Jackson County	OR	E	3,000		2004	181,269
1366	Keizer	OR	E	3,000	\$7.47	2007	32,203
1367	Lake Oswego	OR	E	3,030	\$11.76	1992	35,278
1368	Lebanon	OR	T		\$3.47	2010	12,950
1369	Marion County	OR	E	3,000	\$4.55		330,700
1370	Medford	OR	E	3,730	\$10.25	1994	63,154
1371	Milwaukie	OR	E	2,706	\$25.22	1994	20,490
1372	Molalla	OR	E	2,640	\$3.87	1999	9,218
1373	Monmouth	OR	E	3,542	\$11.88	2021	10,282
1374	Newberg	OR	E	2,877	\$11.23	2003	18,064
1375	Newport	OR	F		\$8.25		9,968
1376	North Bend	OR	E	2,500	\$4.63	2007	10,317
1377	Ontario	OR	F		\$1.16		10,985
1378	Oregon City	OR	T		\$12.54	1993	25,754
1379	Philomath	OR	T		\$2.00	1999	3,838
1380	Portland	OR	E	2,280	\$29.68	1977	593,820
1381	Redmond	OR	F		\$7.87	2013	27,873

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
1382	Reedsport	OR	E	3,000			4,378
1383	Rogue Valley Sewer Services	OR	E	3,000	\$1.00		
1384	Roseburg	OR	E	3,000	\$5.50		21,790
1385	Saint Helens	OR	E	2,500	\$11.71	2003	12,905
1386	Salem	OR	T		\$5.04	2010	156,244
1387	Sandy	OR	E	2,750	\$3.00	2001	9,677
1388	Scappoose	OR	E	2,750	\$3.13		6,599
1389	Sheridan	OR	E	3,000	\$3.50		6,165
1390	Silverton	OR	E		\$7.38		9,222
1391	Springfield	OR	T				59,695
1392	Sweet Home	OR	E	3,200	\$2.40	2007	9,035
1393	Talent	OR	F		\$1.41	2000	6,115
1394	Tigard	OR	E	2,640	\$6.75		49,011
1395	Troutdale	OR	E	2,700	\$6.40		16,244
1396	Tualatin	OR	E	2,640	\$6.96		26,558
1397	Turner	OR	F		\$2.00		2,116
1398	Veneta	OR				2004	5,056
1399	Washington County	OR	E	2,640	\$6.75		540,410
1400	West Linn	OR	E	2,914	\$5.58		25,392
1401	Wilsonville	OR	E	2,750	\$5.25		19,715
1402	Wood Village	OR			\$1.50		3,878
1403	Allentown	PA	E	500	\$10.00	2018	120,207
1404	Annville Township	PA	E	5,227	\$3.33	2018	4,936
1405	Baldwin Borough	PA	E	2,200	\$8.00	2021	19,752
1406	Bethlehem	PA	T		\$8.60	2021	75,461
1407	Borough of Dormont	PA	E		\$9.00	2015	8,593
1408	Borough of Fountain Hill	PA	IA		\$10.00		4,693
1409	Brighton Township	PA	E	4,700	\$5.50	2018	8,369
1410	Carlisle	PA	E	2,410	\$7.00		19,153
1411	Chambersburg	PA	E	2,920	\$5.00	2015	20,508
1412	Chester	PA	E	1,139	\$8.25	2017	33,972
1413	Clarion Borough	PA	T		\$9.00	2019	5,305
1414	Coraopolis	PA	E	1,900	\$7.00	2019	5,530
1415	Cranberry Township	PA	F		\$4.00	2019	31,560
1416	Derry Township	PA	E	3,800	\$6.50	2016	25,074
1417	Duboistown	PA	F		\$15.00	2020	1,163
1418	Easton	PA	E	1,797	\$6.75	2018	27,109
1419	Ebensburg	PA	E	2,830	\$8.00	2014	3,269
1420	Erie	PA	E	2,136	\$2.00	2022	94,831

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
1421	Ferguson Township	PA	E		\$9.92	2021	19,390
1422	Fox Chapel Borough	PA	E	8,400	\$12.50	2019	5,274
1423	Greencastle Borough	PA			\$14.33	2019	4,026
1424	Greenville	PA	IA		\$10.00		5,459
1425	Hampden Township	PA	E	3,534	\$4.42	2015	28,044
1426	Hampton Township	PA	E	3,300	\$9.58	2019	18,235
1427	Hanover Borough	PA	E	2,250	\$5.54	2019	15,607
1428	Harrisburg	PA	T		\$6.15	2019	49,192
1429	Highspire Borough	PA	D		\$7.00	2016	2,399
1430	Jonestown	PA	E	3,100	\$6.67	2012	1,931
1431	Lancaster	PA	E	1,000	\$7.74	2014	59,325
1432	Lebanon	PA	E	1,780	\$5.00		25,902
1433	LeMoyne Borough	PA	T		\$7.70		4,638
1434	Lititz Borough	PA	R		\$5.20	2020	9,381
1435	Lower Allen Township	PA	E	3,115	\$6.33	2019	19,338
1436	Lower Paxton Township	PA	E	3,400	\$10.67	2019	49,050
1437	Lower Swatara Township	PA	E	3,750	\$7.00	2019	8,268
1438	Lycoming County	PA	T	2,480	\$10.00	2020	116,111
1439	Meadville	PA	E	2,660	\$7.50	2012	13,616
1440	Monroeville	PA	E	2,385	\$10.00	2018	28,445
1441	Moon Township	PA	E	3,800	\$5.50	2020	25,580
1442	Mount Lebanon	PA	E	2,400	\$8.00	2011	33,137
1443	New Castle	PA	E	2,500	\$6.00		22,142
1444	New Sewickley Township	PA	E	6,800	\$6.00	2020	7,197
1445	North Fayette Township	PA	E		\$3.50	2018	13,934
1446	North Lebanon Township	PA	E	3,755	\$3.35	2018	11,429
1447	North Middleton Township	PA	E	3,100	\$8.00	2020	11,649
1448	O'Hara Township	PA	E	3,200	\$8.00	2020	8,892
1449	Philadelphia	PA	F		\$15.80		1,536,471
1450	Pittsburgh	PA	E	1,650	\$5.96	2022	301,286
1451	Plum Borough	PA	E	2,500	\$5.00	2015	27,135
1452	Radnor Township	PA	E	1,500	\$4.83		31,531
1453	Silver Spring Township	PA	E	4,000	\$9.00	2019	13,657
1454	South Williamsport	PA	F		\$10.00	2020	6,379
1455	Susquehanna Township	PA	T		\$11.60	2020	25,107
1456	Swatara Township	PA			\$5.00	2018	24,900

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
1457	Upper Allen Township	PA	E	3,800	\$5.00	2018	19,857
1458	Warminster Township	PA	E	3,000	\$10.00	2021	32,460
1459	Waynesborough	PA	E	1,600	\$3.42	2015	10,877
1460	West Chester	PA	T		\$11.73	2016	18,461
1461	White Township	PA	E	3,700	\$2.00	2015	15,821
1462	Whitehall Borough	PA	E	2,800	\$8.00	2014	13,648
1463	Williamsport	PA	E	2,711	\$10.00	2022	27,754
1464	Wrightsville	PA	T		\$7.50	2020	2,045
1465	Wyoming Valley	PA	E	1,000	\$5.10	2018	68,900
1466	Aiken	SC	A		\$7.90	1993	29,828
1467	Aiken County	SC	A		\$5.42		160,682
1468	Anderson	SC	F		\$4.00	2007	26,871
1469	Beaufort	SC	E	4,906	\$11.25		12,534
1470	Beaufort County	SC	E	4,906	\$7.25	2005	164,684
1471	Berkeley County	SC	E	2,760	\$4.00	2014	194,020
1472	Bluffton	SC	E	4,906	\$8.17	2001	12,734
1473	Charleston	SC	E	2,200	\$10.00	1994	122,689
1474	Charleston County	SC	F		\$6.00	2006	235,015
1475	Clemson	SC	D		\$4.00	2015	14,276
1476	Columbia	SC	E	2,454	\$14.15	2002	130,591
1477	Conway	SC	E	2,700	\$5.25	2003	17,513
1478	Dorchester County	SC	E	3,000	\$5.00	2002	140,892
1479	Easley	SC	E	5,000	\$2.00	2003	20,058
1480	Florence	SC	E	2,500	\$3.50	1981	37,326
1481	Folly Beach	SC	E	3,000	\$6.00	2007	2,675
1482	Fort Mill	SC	E	3,473	\$6.00		22,284
1483	Georgetown	SC	M		\$2.00	1993	8,950
1484	Georgetown County	SC	E	3,770	\$4.33	2007	55,797
1485	Goose Creek	SC				2007	45,946
1486	Greenville	SC	E	2,389	\$6.26	1995	56,002
1487	Greenville County	SC	D		\$1.85		402,000
1488	Greer	SC	E	2,500	\$2.08	2002	16,843
1489	Hartsville	SC	F		\$4.00	2008	7,556
1490	Hilton Head Island	SC	E	4,906	\$9.06	2001	33,862
1491	Horry County	SC	E	5,000	\$3.70	2000	196,629
1492	Isle of Palms	SC	R		\$6.00	2007	4,133
1493	James Island	SC	E	3,000	\$4.00	2012	1,808
1494	Lancaster County	SC	F		\$6.25	2017	
1495	Monck's Corner	SC	E		\$3.00	2019	7,885
1496	Mount Pleasant	SC	D		\$5.00		47,609

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
1497	Myrtle Beach	SC	E	5,000	\$6.25	1999	22,759
1498	North Augusta	SC	T		\$5.00	2002	17,574
1499	North Charleston	SC	E	2,900	\$6.00	2003	79,641
1500	North Myrtle Beach	SC	E	3,500	\$8.00	2005	14,118
1501	Port Royal	SC	E	4,906	\$4.17		10,790
1502	Rock Hill	SC	F		\$4.25		67,423
1503	Spartanburg	SC	E	2,000	\$3.50	2010	37,334
1504	Sullivan's Island	SC	E	3,000	\$6.00	2007	1,911
1505	Summerville	SC	F		\$4.00		44,783
1506	Sumter	SC	D		\$2.50	2011	40,526
1507	Sumter County	SC	T		\$1.25	2010	107,460
1508	Surfside Beach	SC			\$6.83	2019	3,837
1509	Tega Cay	SC	E	3,500	\$9.00		7,773
1510	Aberdeen	SD	IA		\$0.86	2005	26,297
1511	Brookings	SD	V			1996	22,228
1512	Rapid City	SD	LU		\$2.50	2013	67,956
1513	Sioux Falls	SD	V			1982	156,592
1514	Alcoa	TN	E	2,696	\$4.00	2008	8,570
1515	Belle Meade	TN	E	12,200	\$7.47	2010	2,881
1516	Bristol	TN	T		\$2.00	2014	26,626
1517	Chattanooga	TN	E		\$12.69	1993	171,279
1518	Cleveland	TN	E	3,830	\$3.25	2015	41,285
1519	Collierville	TN	F		\$2.25		44,324
1520	Dyersburg	TN	E	1,500	\$1.00	2012	17,043
1521	Franklin	TN	E	3,350	\$3.83	2004	66,280
1522	Gallatin	TN	E	3,650	\$5.00	2018	30,278
1523	Germantown	TN	T		\$9.00	2010	39,161
1524	Goodlettsville	TN	D		\$3.67	2012	16,176
1525	Greenbrier	TN				2020	6,839
1526	Hamilton County	TN	D		\$0.75		11,530
1527	Hendersonville	TN	E	3,930	\$6.00	2018	57,050
1528	Johnson City	TN	T		\$3.00	2007	63,815
1529	Kingsport	TN	E	3,794	\$3.50	2011	49,232
1530	La Vergne	TN	E	3,181	\$3.50	2005	33,389
1531	Lakeland	TN	E		\$3.20		12,617
1532	Lebanon	TN	T		\$2.50	2017	31,317
1533	Lenoir City	TN	T		\$3.00	2017	9,106
1534	Maryville	TN	E	2,400	\$3.97	2003	27,646
1535	Memphis	TN	E	3,147	\$6.03	2006	652,050
1536	Millington	TN	E	3,000	\$3.80	2006	10,257

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
1537	Morristown	TN	E	2,400	\$2.50	2008	29,374
1538	Mount Juliet	TN			\$5.40	2023	39,289
1539	Murfreesboro	TN	E	3,470	\$3.25	2007	100,575
1540	Nashville/Davidson County	TN	T		\$6.00	2009	635,475
1541	Portland	TN	T		\$5.00	2016	11,480
1542	Shelby County	TN	D		\$1.50	2009	282,141
1543	Signal Mountain	TN	E	3,960	\$3.30	2002	7,655
1544	Smyrna	TN	E	3,543	\$3.47	2008	25,569
1545	Spring Hill	TN	E	3,412	\$3.50	2009	29,735
1546	Springfield	TN	E	3,465	\$2.00		18,782
1547	Tullahoma	TN	V		\$0.00		17,994
1548	Abilene	TX	T		\$3.25	2003	118,117
1549	Addison	TX	T		\$10.50	2012	13,056
1550	Allen	TX	F		\$3.50	1993	76,600
1551	Alton	TX				1999	12,341
1552	Amarillo	TX	E	2,800	\$2.82	2011	193,675
1553	Anna	TX	E	3,600	\$3.20	2022	16,896
1554	Arlington	TX	E	2,800	\$7.50	1994	373,698
1555	Austin	TX	E	1,763	\$13.57	2003	820,611
1556	Azle	TX	E	1,500	\$3.00	2000	11,170
1557	Baytown	TX	E	1,979	\$3.00	2004	73,322
1558	Bedford	TX	E	2,727	\$4.50	2002	48,043
1559	Belton	TX	T		\$4.00	2007	18,486
1560	Benbrook	TX	E	3,186	\$6.50	2007	21,715
1561	Bexar County	TX	T		\$1.10	2008	145,336
1562	Boerne	TX	E	4,700	\$4.00	2019	16,056
1563	Bonham	TX	E	11,844		2021	10,127
1564	Brenham	TX	E	2,685	\$3.75	2019	16,951
1565	Bryan	TX	F		\$2.80	1997	77,321
1566	Burkburnett	TX	E	3,500	\$1.50	2007	10,740
1567	Castle Hills	TX	T		\$7.19	2014	3,978
1568	Celina	TX	E	5,000	\$7.75	2016	6,744
1569	Cibolo	TX	E	2,889	\$5.00		15,853
1570	Cleburne	TX	A		\$2.75	2004	29,681
1571	College Station	TX	F		\$3.50		95,142
1572	Colleyville	TX	T		\$7.00	1993	23,328
1573	Converse	TX	T		\$2.43	2010	18,643
1574	Coppell	TX	T		\$1.00	2004	39,462
1575	Copperas Cove	TX	A		\$6.00	1991	32,706

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
1576	Corinth	TX	E	3,900	\$6.00		20,662
1577	Corpus Christi	TX	E	3,280	\$7.69	2021	326,332
1578	Crowley	TX	A		\$3.50	2011	13,131
1579	Dallas	TX	IA		\$7.38	1991	1,223,229
1580	De Soto	TX	T		\$6.00	2001	50,045
1581	Deer Park	TX	E	4,250	\$1.45	2012	32,706
1582	Denton	TX	T		\$5.45	2002	117,187
1583	Dickinson	TX	F		\$4.00	2001	18,967
1584	Duncanville	TX	E	4,300	\$3.50	2011	39,364
1585	Eagle Pass	TX	D		\$3.00	2003	26,807
1586	Edgecliff Village	TX	S		\$6.95	2009	2,776
1587	El Paso	TX	T		\$4.25	2008	665,568
1588	Euless	TX	T			1990	52,443
1589	Fairview	TX	F		\$7.75		8,000
1590	Farmers Branch	TX	E	4,000	\$4.50	2014	35,991
1591	Flower Mound	TX	F		\$4.35	2003	65,851
1592	Forest Hill	TX	T			2013	12,355
1593	Fort Worth	TX	E	2,600	\$5.75	2006	686,850
1594	Fredericksburg	TX	F		\$7.00	1992	8,911
1595	Frisco	TX	F		\$4.14	2009	33,714
1596	Gainesville	TX	E	1,895	\$3.79	1993	16,569
1597	Galena Park	TX					10,740
1598	Galveston	TX	D		\$7.00		47,743
1599	Garland	TX	F		\$3.23	1991	224,750
1600	Georgetown	TX	E	2,808	\$6.50		45,342
1601	Glenn Heights	TX	T		\$5.08	2009	11,511
1602	Grand Prairie	TX	A		\$5.43	1993	161,550
1603	Grapevine	TX	F		\$4.00		48,583
1604	Haltom City	TX	D		\$6.81	2004	40,811
1605	Harker Heights	TX	T		\$6.00	2002	26,026
1606	Hewitt	TX	T		\$4.72	2009	13,588
1607	Highland Park	TX	A		\$10.97		8,564
1608	Highland Village	TX	E	4,094	\$5.73	2006	15,738
1609	Houston	TX	IA		\$8.00	2010	1,953,631
1610	Hudson Oaks	TX	E	6,477	\$5.60	2017	1,865
1611	Hurst	TX	IA		\$4.00	2009	36,273
1612	Iowa Park	TX	E	3,500	\$1.50	2013	6,339
1613	Irving	TX	F		\$3.00	2003	205,600
1614	Jacinto City	TX	V			2002	9,870
1615	Kaufman	TX	E	3,500	\$3.00	2015	7,788

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
1616	Keller	TX	E	3,731	\$7.00		37,700
1617	Kennedale	TX	IA		\$3.50	2010	7,284
1618	Killeen	TX	E	3,027	\$5.40	2001	102,003
1619	Kingsville	TX	E	2,425	\$1.25	2012	26,322
1620	Kyle	TX	IA		\$5.00	2016	39,060
1621	Lake Dallas	TX	E	3,220	\$9.50	2022	7,708
1622	La Marque	TX	V			2016	14,194
1623	Lake Worth	TX	E	3,700	\$2.00	2020	4,584
1624	Lancaster	TX	F		\$7.97		36,236
1625	Laredo	TX	T		\$6.50		215,484
1626	Leon Valley	TX	T		\$3.68	2009	11,020
1627	Lewisville	TX	IA		\$4.00	2017	77,737
1628	Little Elm	TX	E	3,687	\$3.35	2011	25,797
1629	Live Oak	TX	E	3,007	\$12.79	2009	12,471
1630	Lockhart	TX	T		\$2.50	2001	14,238
1631	Lubbock	TX	E	5,700	\$21.22	1993	212,365
1632	Mansfield	TX	LU		\$6.50		56,368
1633	Marshall	TX	M		\$3.50	2016	23,561
1634	McAllen	TX	E	2,700	\$1.50	2018	142,212
1635	McKinney	TX	E	2,343	\$4.00		112,000
1636	Mesquite	TX	D		\$4.50		136,750
1637	Mexia	TX	T		\$1.00	2019	7,394
1638	Midland	TX	T		\$2.00	2018	132,950
1639	Mineral Wells	TX	M		\$2.50	2017	14,826
1640	Mission	TX	F		\$2.50		77,058
1641	Mount Vernon	TX	D		\$3.00	2010	2,286
1642	Murphy	TX	D		\$3.80		20,673
1643	New Braunfels	TX	E	2,690	\$4.59	2000	36,494
1644	North Richland Hills	TX	T		\$6.31		64,050
1645	Odessa	TX	T		\$2.15	2009	116,861
1646	Palm Valley	TX	LU		\$24.00	2021	1,304
1647	Pilot Point	TX	D		\$6.00	2020	
1648	Plano	TX	T		\$3.10		255,700
1649	Portland	TX	F		\$3.00		18,500
1650	Princeton	TX	E	3,950	\$4.85	2016	9,405
1651	Prosper	TX	IA		\$5.15	2008	9,613
1652	Red Oak	TX	T		\$4.85	2016	10,769
1653	Richardson	TX	IA		\$4.25	2011	99,223
1654	Richland Hills	TX	D		\$8.00	1993	8,300
1655	River Oaks	TX	A		\$4.00	2012	7,597

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
1656	Roma	TX	E	2,900	\$1.00	2018	9,765
1657	Round Rock	TX	IA		\$4.75	2010	105,000
1658	Rowlett	TX	D		\$5.50	2002	54,869
1659	Sachse	TX	E		\$1.66	2017	20,329
1660	Saginaw	TX	D		\$5.00	2005	18,950
1661	San Angelo	TX	T		\$4.00	2009	91,880
1662	San Antonio	TX	T		\$4.83	1997	1,306,900
1663	San Marcos	TX	E	2,575	\$13.99	1999	53,205
1664	Sansom Park	TX	D		\$2.50	2014	4,686
1665	Schertz	TX	E		\$5.20		32,160
1666	Seagoville	TX	F		\$3.85	2016	16,861
1667	Sealy	TX	F		\$2.00	2004	6,374
1668	Seguin	TX	E	2,500	\$3.00	2022	29,992
1669	Selma	TX	E	3433	\$4.12	2010	5,046
1670	Shenandoah	TX				2009	3,499
1671	Sherman	TX	E	3400	\$1.00	2017	41,567
1672	Smithville	TX				2001	3,922
1673	Southlake	TX	E	1,000	\$8.00	2006	26,224
1674	Stephenville	TX	T		\$3.00	2002	17,050
1675	Sugar Land	TX	E	4,200	\$2.96	2022	111,026
1676	Sunset Valley	TX	E	3,350	\$4.00		919
1677	Taylor	TX	E	2,500	\$3.00	2010	16,106
1678	Temple	TX	T		\$6.00		54,514
1679	Terrell	TX	F		\$1.00	2011	16,112
1680	The Colony	TX	F		\$3.00		40,206
1681	Trophy Club	TX	F		\$6.00		7,832
1682	Troy	TX	F		\$2.00	2004	
1683	Tyler	TX	R				101,106
1684	Universal City	TX	T		\$4.47	2004	16,569
1685	University Park	TX	T		\$31.44		24,182
1686	Waco	TX	E	2633	\$5.41	2021	138,486
1687	Watauga	TX	F		\$11.00		24,150
1688	Weatherford	TX	E	3300	\$4.50		25,557
1689	Webster	TX	IA		\$1.24	2009	10,613
1690	White Settlement	TX	F		\$4.62	2005	16,116
1691	Wichita Falls	TX	E	3,500	\$5.00	2000	104,197
1692	Willow Park	TX	IA		\$7.33	2021	5,365
1693	Alpine	UT	F		\$5.00		9,821
1694	American Fork	UT	E		\$6.00	1997	32,519
1695	Blanding	UT	E	3,000	\$4.00	2009	3,633

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
1696	Bluffdale	UT	D		\$5.00		14,699
1697	Bountiful City	UT	E	3,828	\$7.00		41,301
1698	Cedar City	UT	E				33,404
1699	Cedar Hills	UT	E	2,900	\$11.18	1998	10,066
1700	Centerville	UT	E	3,600	\$4.00	2007	14,585
1701	Clearfield	UT	E	2,700	\$7.27	2008	31,364
1702	Clinton	UT	F		\$4.50		22,191
1703	Cottonwood Heights	UT	E	4,000	\$7.50	2021	33,865
1704	Draper City	UT	E	3,000	\$9.00	2001	25,220
1705	Eagle Mountain	UT	E	2,500	\$5.00	2010	2,157
1706	Elk Ridge	UT	F		\$3.00		1,838
1707	Enoch	UT	D		\$2.00		5,803
1708	Farmington	UT	E	4,083	\$7.00	2003	12,081
1709	Heber	UT	F		\$10.56		17,082
1710	Herriman	UT	E	4,000	\$7.00	2019	44,877
1711	Holladay	UT	E	5,200	\$6.50	2020	30,636
1712	Hurricane	UT	F		\$4.00		20,036
1713	Hyrum	UT	E	2,700	\$4.00	2016	7,609
1714	Ivins	UT			\$12.86		8,931
1715	Kaysville	UT	E	4,000	\$8.00	Title 9 Sec. 9- 3a-6	27,368
1716	Layton	UT	T		\$6.60	1997	58,474
1717	Lehi	UT	IA		\$3.00	1999	47,407
1718	Lindon	UT	F		\$5.47		8,363
1719	Logan	UT	E	3,000	\$5.50	2005	42,670
1720	Midvale	UT	E	3,000	\$8.00	2004	27,029
1721	Millcreek	UT	E	4,000		2020	60,731
1722	Moab	UT	E	3,000	\$4.00	2008	4,779
1723	Murray	UT	E	3,400	\$6.30	2006	46,558
1724	Nibley City	UT	F		\$7.25		2,045
1725	North Logan	UT	E	4,700	\$4.00	2007	6,163
1726	North Ogden	UT	E		\$12.10	1987	15,026
1727	North Salt Lake	UT	E	3,900			20,721
1728	Ogden	UT	E	1,500	\$7.85		77,226
1729	Orem	UT	E	2,700	\$7.10	1996	84,324
1730	Park City	UT	E	2,000	\$6.10	2016	7,873
1731	Payson	UT	E	2,700	\$5.43		16,748
1732	Perry	UT	E	2,800	\$4.00	2020	5,248
1733	Plain City	UT	E	3,000		2003	7,669

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
1734	Pleasant Grove	UT	E	4,400	\$14.41		38,474
1735	Pleasant View	UT	E	3,000	\$7.80		10,460
1736	Price	UT	E	3,000		2012	8,332
1737	Providence	UT	M		\$4.00		7,780
1738	Provo	UT	E	3,200	\$9.20		105,166
1739	Richmond	UT	E	3,500		2019	2,803
1740	Riverdale	UT	E	2,600	\$2.20	2005	7,656
1741	Riverton	UT	E	2,744	\$6.00	2010	25,011
1742	Roy	UT	F		\$4.50		38,773
1743	Saint George	UT	F		\$4.50		87,176
1744	Salem	UT	E		\$6.24		8,403
1745	Salt Lake City	UT	E	2,500	\$7.60	1991	181,743
1746	Sandy	UT	E	2,816	\$6.00		88,418
1747	Santa Clara	UT	E	3,500	\$9.25	2004	4,630
1748	Smithfield	UT	E	4,700		2015	9,495
1749	South Jordan	UT	E	4,752	\$7.15	2011	55,934
1750	South Ogden	UT	LU		\$10.71		17,080
1751	South Salt Lake	UT	E	2,700		2018	25,582
1752	South Weber	UT	E	2,800		2007	7,836
1753	Spanish Fork	UT	E	3,956	\$9.82		20,246
1754	Springville	UT	E	3,800	\$5.66	2007	25,998
1755	Sunset City	UT	E	9,000	\$2.00	2012	5,213
1756	Taylorsville	UT	E	3,800	\$4.00	2007	58,620
1757	Tooele	UT	A		\$3.00		35,742
1758	Vineyard	UT	E		\$5.00	2015	12,543
1759	Washington	UT	E		\$6.80	2004	29,174
1760	Wellsville	UT	E			2007	3,941
1761	West Bountiful	UT	E	4,460	\$3.75	2015	5,800
1762	West Jordan	UT	E	10,890	\$5.58	2011	68,336
1763	West Point	UT	E	2,500	\$4.00	2010	6,033
1764	West Valley City	UT	E	2,830	\$4.00	2001	108,869
1765	Woods Cross	UT	E	3,000	\$3.00	2004	6,419
1766	Alexandria	VA	E	2,062	\$24.50	2017	153,511
1767	Arlington County	VA	E	2,762	\$2.17		189,453
1768	Blacksburg	VA	E	3,300	\$6.00	2014	42,620
1769	Charlottesville	VA	T		\$5.86	2013	43,511
1770	Chesapeake	VA	E	2,112	\$11.35	1992	222,209
1771	Chesterfield County	VA	E	2,800	\$2.08	2016	327,745
1772	Christiansburg	VA	E	3,030	\$6.00	2016	21,533
1773	Colonial Heights	VA	E	2,656	\$4.00		16,897

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
1774	Falls Church	VA	IA		\$22.95	2013	12,332
1775	Galax	VA	E	4,700	\$1.50	2016	7,042
1776	Hampton	VA	E	2,429	\$7.83	1994	146,437
1777	Harrisonburg	VA	IA		\$3.00	2015	51,395
1778	Hopewell	VA	E	2,106	\$4.00	2015	22,163
1779	Isle of Wight County	VA	E	3,200	\$4.50	2014	35,656
1780	James City County	VA	E	3,235	\$4.90	2007	48,102
1781	Lynchburg	VA	E	2,672	\$4.00	2012	76,504
1782	Manassas Park	VA	E	2,500	\$2.97	2010	6,734
1783	Newport News	VA	E	1,777	\$11.85	1993	180,150
1784	Norfolk	VA	E	2,000	\$11.71	1996	234,403
1785	Petersburg	VA	E	2,116	\$3.75	2013	32,420
1786	Portsmouth	VA	E	1,877	\$9.25	1995	100,565
1787	Prince George County	VA	T		\$3.28	2014	37,253
1788	Prince William County	VA	T		\$1.55	1994	280,813
1789	Richmond	VA	T		\$6.41	2009	197,790
1790	Roanoke	VA	IA		\$5.40	2013	97,032
1791	Stafford County	VA	V		\$4.17		149,960
1792	Staunton	VA	T		\$3.20		23,853
1793	Suffolk	VA	E	3,200	\$6.00	2006	63,677
1794	Virginia Beach	VA	E	2,269	\$12.99	1993	425,257
1795	Waynesboro	VA	E	1,600	\$3.96	2015	21,263
1796	Winchester	VA				2022	28,120
1797	Burlington	VT	T		\$6.60	2009	38,889
1798	Colchester	VT	E	4,400	\$4.58	2017	17,067
1799	Montpelier	VT				2023	8,074
1800	Saint Albans City	VT	E	3,000	\$2.50	2018	6,795
1801	Saint Albans Town	VT	E	3,500	\$4.17	2021	5,999
1802	South Burlington	VT	T		\$5.94	2005	15,814
1803	Williston	VT	E	4,000	\$4.25	2014	8,698
1804	Aberdeen	WA	F		\$6.69	1999	16,835
1805	Algona	WA	F		\$5.00	2004	2,460
1806	Anacortes	WA	E	3,600	\$10.22	1999	15,941
1807	Arlington	WA	E	6,000	\$6.89	2006	18,154
1808	Asotin	WA	E	3,700		2010	1,204
1809	Asotin County	WA	E	3,700	\$6.00	2010	21,933
1810	Auburn	WA	T			1991	71,517
1811	Bainbridge Island	WA	E	3,000	\$12.23		23,262
1812	Battle Ground	WA	E	3,000	\$12.08	1982	17,893
1813	Bellevue	WA	F		\$6.48	1974	124,798

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
1814	Bellingham	WA	T		\$22.60	2001	81,862
1815	Black Diamond	WA	E	3,000	\$16.00	2008	4,273
1816	Blaine	WA	T		\$5.67	1999	4,684
1817	Bonney Lake	WA	E	2,600	\$14.00	1997	17,579
1818	Bothell	WA	T		\$12.42	1994	34,055
1819	Bremerton	WA	E	2,500	\$17.54	1994	39,051
1820	Brier	WA	E	2,000	\$6.50	1999	6,165
1821	Buckley	WA	E	8,000	\$23.77	1992	4,354
1822	Burien	WA	T		\$11.42	2008	33,977
1823	Burlington	WA	E	2,400	\$6.88	1994	8,474
1824	Camas	WA	E	3,218	\$12.04	1989	19,712
1825	Castle Rock	WA	T				1,982
1826	Centralia	WA	E	3,000	\$8.00	2004	16,432
1827	Chehalis	WA	E	3,000	\$7.95	1992	7,299
1828	Chelan County	WA	E	4,600	\$5.50	2008	73,477
1829	Clark County	WA	E	3,500	\$4.33	1980	433,418
1830	Colfax	WA	A		\$2.10	1992	2,805
1831	College Place	WA	E		\$9.75	2018	9,258
1832	Cosmopolis	WA	D		\$7.00	2021	1,638
1833	Coupeville	WA	T		\$18.63	2016	1,831
1834	Covington	WA				2002	20,777
1835	Cowlitz County	WA	E	4,500		2008	106,910
1836	Des Moines	WA	T		\$22.57	1990	30,258
1837	Douglas County	WA	E	2,750	\$3.75	1998	38,971
1838	DuPont	WA	F		\$25.00		10,151
1839	Duvall	WA	F		\$20.54	1981	6,828
1840	East Wenatchee	WA	E	2,750	\$3.75	1999	13,375
1841	Eatonville	WA	E	3,000	\$9.90	1999	2,845
1842	Edgewood	WA	T		\$13.25	1996	9,499
1843	Edmonds	WA	E	3,000	\$12.35	1998	40,215
1844	Ellensburg	WA	E	3,900	\$9.88	2009	18,468
1845	Enumclaw	WA	E	3,200	\$5.24	2017	11,609
1846	Everett	WA	E	900	\$13.06	2004	104,295
1847	Federal Way	WA	T		\$6.59	1990	91,085
1848	Ferndale	WA	E	10,000	\$11.00	2006	11,564
1849	Fife	WA	T		\$3.78	2004	9,281
1850	Fircrest	WA	IA		\$17.25	2016	7,156
1851	Friday Harbor	WA	E	2,000	\$13.50	1993	1,989
1852	Gig Harbor	WA	E	2,200	\$14.92	1984	7,208
1853	Gold Bar	WA	F		\$12.05	2012	2,403

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
1854	Granite Falls	WA	A		\$6.00	2010	4,234
1855	Hoquiam	WA	E	2,500	\$10.83	2005	8,696
1856	Ilwaco	WA	T		\$8.28	2011	936
1857	Island County	WA	Z		\$2.00	2010	58,645
1858	Issaquah	WA	E	2,000	\$16.47	1988	31,037
1859	Kalama	WA	E	3,500		2018	2,344
1860	Kelso	WA	E	2,500	\$10.23	1993	11,934
1861	Kenmore	WA				2016	20,460
1862	Kennewick	WA	V		\$5.46		76,224
1863	Kent	WA	E	2,500	\$14.76	1992	120,916
1864	King County	WA	T		\$24.08	1986	1,969,722
1865	Kirkland	WA	E	2,600	\$19.34		45,054
1866	Kitsap County	WA	E	4,200	\$8.00	1994	231,969
1867	La Conner	WA	E	2,100	\$15.08	2002	785
1868	Lacey	WA	W		\$12.40	1986	31,226
1869	Lake Forest Park	WA	T		\$18.65	1990	13,142
1870	Lake Stevens	WA	T		\$8.67	1997	6,361
1871	Lake Whatcom	WA			\$12.58	2017	
1872	Langley	WA				1989	1,035
1873	Leavenworth	WA	E	4,000		2013	2,029
1874	Liberty Lake	WA	E	3,160	\$10.00	2003	4,660
1875	Long Beach	WA				1993	1,496
1876	Longview	WA	E	2,500	\$14.50	1999	34,660
1877	Lynden	WA	D		\$8.00		9,020
1878	Lynnwood	WA	E	2,900	\$13.12	1991	33,847
1879	Maple Valley	WA	ID		\$10.46		28,013
1880	Marysville	WA	E	3,200	\$11.95	1999	25,315
1881	Mason County	WA	V		\$0.00	2008	49,405
1882	McCleary	WA	E	3,000	\$14.91	2002	1,997
1883	Mercer Island	WA	E	3,471	\$30.64	1995	22,036
1884	Mill Creek	WA	E	3,000	\$12.50	2001	11,525
1885	Milton	WA	E	2,800	\$15.50		5,795
1886	Monroe	WA	E	2,500	\$12.28	1996	17,304
1887	Montesano	WA	E	3,000	\$4.85	1999	3,312
1888	Moses Lake	WA	T		\$5.91		14,953
1889	Mount Vernon	WA				2009	35,051
1890	Mountlake Terrace	WA	E	2,282	\$11.45	1999	20,362
1891	Mukilteo	WA	E	2,500	\$23.43	1988	18,019
1892	Newcastle	WA	ID		\$23.53		11,823
1893	Normandy Park	WA	E	3,100	\$16.00	2003	6,392

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
1894	North Bend	WA	E	2,920	\$12.36	2001	4,746
1895	Oak Harbor	WA	E	3,300	\$11.95	1997	22,075
1896	Ocean Shores	WA	F		\$3.90	1980	5,569
1897	Olympia	WA	E	2,882	\$17.12	1986	46,478
1898	Omak	WA	T		\$4.28	1984	4,845
1899	Orting	WA	T			1997	6,746
1900	Pacific	WA	E	2,500	\$23.82	1999	6,737
1901	Pasco	WA	PT		\$6.85		59,781
1902	Pierce County	WA	T		\$10.61	1991	807,904
1903	Port Angeles	WA	E	4,000	\$16.87	2003	19,154
1904	Port Orchard	WA	E	3,000	\$14.00	2008	11,144
1905	Port Townsend	WA	E	3,000	\$7.25	1987	9,113
1906	Poulsbo	WA	E	3,000	\$18.08	1999	9,200
1907	Pullman	WA	E	3,500	\$7.00	2009	29,799
1908	Puyallup	WA	E	2,800	\$12.75		37,022
1909	Redmond	WA	R		\$16.56	1988	54,144
1910	Renton	WA	T		\$14.85	1987	92,812
1911	Richland	WA	E	3,000	\$3.85	1998	48,058
1912	Ridgefield	WA	E	3,500		2014	10,319
1913	Roslyn	WA	E	3,900	\$5.68	2016	893
1914	Ruston	WA	F		\$5.00	2005	1,055
1915	Sammamish	WA	E		\$18.75	2012	63,773
1916	San Juan County	WA	T		\$3.85	2005	15,844
1917	Seatac	WA	V		\$11.05	1992	26,909
1918	Seattle	WA	IA		\$38.83	1987	602,778
1919	Sedro-Woolley	WA	E	10,000	\$10.80	2007	10,540
1920	Shelton	WA	T		\$22.70	1995	8,442
1921	Shoreline	WA	T		\$17.87	2009	53,007
1922	Skagit County	WA	T		\$5.00	1994	102,979
1923	Snohomish	WA	E	2,500	\$15.27	2004	9,098
1924	Snoqualmie	WA	E	2,600	\$22.83	1997	1,631
1925	South Bend	WA	W		\$7.08	1999	1,637
1926	Spokane	WA	D		\$4.42	2005	195,629
1927	Spokane County	WA	E	3,160	\$3.33	1993	417,939
1928	Spokane Valley	WA	E	3,160	\$1.75		89,755
1929	Stanwood	WA	T		\$14.20	2015	7,287
1930	Steilacoom	WA	E	2,500	\$19.39	1994	6,049
1931	Sultan	WA	E	4,519	\$10.29		4,183
1932	Sumas	WA	T		\$1.50	2005	1,265
1933	Sumner	WA	E	2,400	\$16.33		8,504

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
1934	Sunnyside	WA	A		\$34.39		13,905
1935	Tacoma	WA	A		\$29.74	1984	193,556
1936	Tonasket	WA	D		\$1.50	2018	1,032
1937	Toppenish	WA	E	2,000	\$1.00	1991	8,949
1938	Thurston County	WA	T		\$4.50	2002	207,355
1939	Toppenish	WA	E	2,000	\$1.00	1991	8,946
1940	Tukwila	WA	T		\$15.42	1989	17,181
1941	Tumwater	WA	E	3,250	\$10.63	1987	12,698
1942	University Place	WA	T		\$15.93	1995	29,933
1943	Vancouver	WA	E	2,500	\$10.13	1994	157,493
1944	Walla Walla	WA	E	5,000	\$12.60	1999	30,945
1945	Walla Walla County	WA	E	5,000	\$3.00	2010	59,844
1946	Washougal	WA	D		\$16.28	2010	15,466
1947	Wenatchee	WA	E	3,000	\$7.86	1995	27,856
1948	West Richland	WA	T		\$7.00	2006	8,358
1949	Wilkeson	WA	E	2,200		1994	499
1950	Winlock	WA				2002	1,472
1951	Woodinville	WA	T		\$17.17	1993	9,194
1952	Woodland	WA	E	4,000	\$4.48	2020	6,358
1953	Woodway	WA	T		\$12.81		1,307
1954	Yacolt	WA	E	3,000	\$6.00	1999	1,566
1955	Yakima	WA	E	3,600	\$29.50	2007	71,845
1956	Yakima County	WA	E	3,600		2007	184,190
1957	Yarrow Point	WA				2011	1,149
1958	Yelm	WA	T		\$10.25	1999	3,289
1959	Allouez	WI	E	3,663	\$7.50	2006	14,126
1960	Altoona	WI	T		\$3.00	2007	6,789
1961	Antigo	WI	E	3,069	\$3.52	2010	8,004
1962	Appleton	WI	E	2,368	\$14.58	1995	73,243
1963	Ashwaubenon	WI	F		\$4.17	2012	16,973
1964	Baraboo	WI	E	2,379	\$4.10	2005	1,828
1965	Barron	WI	E	10,850	\$2.00	2005	3,425
1966	Bayside	WI	E	5,269	\$18.58	2009	4,411
1967	Beaver Dam	WI	E	2,637	\$4.05	2009	16,243
1968	Belleville	WI	E	2,800	\$4.17	2010	2,426
1969	Bellevue	WI	E	3,221	\$4.00	2002	14,742
1970	Beloit	WI	E	3,347	\$3.50	2006	36,913
1971	Brookfield (Town of, not City of)	WI	V		\$6.80		6,390
1972	Brown Deer	WI	E	3,257	\$8.84	2004	12,061

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
1973	Buchanan	WI	E	3,623	\$8.00	2018	5,827
1974	Butler	WI	E	3,032	\$7.18	1999	1,846
1975	Caledonia	WI	E	5,230	\$5.44		24,737
1976	Cambridge	WI	D		\$2.33	2005	1,101
1977	Chetek	WI	F		\$2.25	2005	2,222
1978	Chippewa Falls	WI	F		\$3.47	2005	13,738
1979	Columbus	WI	E	3,600	\$5.00	2022	5,540
1980	Cudahy	WI	E	2,700	\$7.83	2001	18,359
1981	Cumberland	WI	IA				2,170
1982	De Forest	WI	E	2,900	\$5.00	2005	9,085
1983	De Pere	WI	E	3,861	\$6.83	2003	20,560
1984	Delafield	WI	E	1,000	\$2.42	2004	7,100
1985	Denmark	WI	F		\$4.00	2007	2,148
1986	Durand	WI	E	3,300	\$4.00	2010	1,968
1987	Eau Claire	WI	E	3,000	\$7.17	1997	66,623
1988	Elm Grove	WI	E	4,660	\$10.23	2004	5,947
1989	Fitchburg (city)	WI	E	3,700	\$6.50	2002	25,665
1990	Fitchburg (rural)	WI	E	3,700	\$3.24	2002	4,000
1991	Fort Atkinson	WI	E	3,096	\$2.82	2009	12,407
1992	Fox Crossing	WI	E	4,177	\$10.00	2009	10,980
1993	Fox Point	WI	T		\$11.90	2009	6,734
1994	Franklin	WI	E	2,964	\$3.00		35,620
1995	Garner's Creek Watershed	WI	E	3,623	\$9.83	1998	
1996	Glendale	WI	E	3,200	\$4.50	1996	12,935
1997	Grand Chute	WI	E	3,283	\$8.32	1997	18,392
1998	Grantsburg	WI	F		\$2.00	2004	1,397
1999	Green Bay	WI	E	3,000	\$9.84	2004	105,809
2000	Greendale	WI	E	3,941	\$6.63	2004	14,117
2001	Greenfield	WI	E	3,630	\$5.67	2009	36,903
2002	Greenville	WI	E	4,510	\$5.83	1999	6,844
2003	Hales Corners	WI	E	3952	\$1.17	2008	7,730
2004	Harrison	WI	F		\$8.00	1998	5,800
2005	Hobart	WI	E	4,000	\$6.00	2007	6,254
2006	Holmen	WI	E	3,550	\$4.08	2007	9,081
2007	Howard	WI	E	3,301	\$5.16	2005	17,602
2008	Hudson	WI	E	2,890	\$2.50	2012	12,719
2009	Janesville	WI	E	3,200	\$6.22	2003	63,479
2010	Jefferson	WI	E	3,220	\$3.33		7,997
2011	Kaukauna	WI	E	2,944	\$6.00		12,983

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
2012	Kenosha	WI	R		\$7.44	2007	99,738
2013	Kimberly	WI	E	3,350	\$9.17	2006	6,508
2014	La Crosse	WI	E	2,841	\$4.49	2011	51,719
2015	Lake Delton	WI	E	1,685	\$1.50	1993	1,982
2016	Lancaster	WI	E	2,400	\$2.00	2008	3,868
2017	Lawrence	WI	V		\$0.92	2012	3,075
2018	Ledgeview	WI	E	5,800	\$3.33	2010	3,363
2019	Lisbon	WI	E	6,642	\$4.00	2007	1,020
2020	Little Chute	WI	E	2,752	\$8.25	1998	10,514
2021	Madison	WI	R		\$7.75	2001	236,901
2022	Manitowoc	WI	E	3,167	\$6.00	2007	34,053
2023	Marinette	WI	E	3,105	\$4.08	2009	10,943
2024	Marshfield	WI	F		\$5.50	2004	19,220
2025	Mazomanie	WI	E	3,639		2013	1,652
2026	McFarland	WI	E	3,456	\$7.06	2007	7,937
2027	Menasha	WI	E	2,980	\$8.25	2009	17,442
2028	Menomonee Falls	WI	V			2002	35,704
2029	Menomonie	WI	E	3,000	\$3.00	2008	14,937
2030	Middleton	WI	E	2,880	\$3.75		19,660
2031	Milton	WI	E	4,081	\$5.24	2009	5,538
2032	Milwaukee	WI	E	1,610	\$5.65	2006	597,867
2033	Monona	WI	E		\$5.00	2004	7,658
2034	Monroe	WI	E	2,728	\$5.00	2006	10,843
2035	Mount Pleasant	WI	E	3,000	\$4.58	1998	26,601
2036	Mukwonago	WI	E	3,000	\$0.86	2006	8,519
2037	Neenah	WI	E	3,138	\$7.08	2003	25,501
2038	New Berlin	WI	E	4,000	\$5.00	2001	39,584
2039	New Glarus	WI	E	3,000	\$4.85	2009	2,111
2040	New Richmond	WI	E	12,632	\$2.94	2004	8,375
2041	North Fond du Lac	WI	E	3,123	\$4.67	2006	5,014
2042	North Hudson	WI	E	3,500		2010	3,768
2043	Oak Creek	WI	E	2,964	\$2.42		34,451
2044	Oconomowoc-Summit	WI					20,435
2045	Onalaska (City)	WI	E	3,888	\$4.97	2009	17,736
2046	Onalaska (Town)	WI	E	3,709	\$2.00	2005	5,600
2047	Oshkosh	WI	E	2,817	\$12.41	2003	66,083
2048	Outagamie County	WI	E	8,000			177,913
2049	Palmyra	WI	F		\$9.77		2,911
2050	Pewaukee	WI	E	2010	\$10.00	2010	13,195
2051	Pleasant Prairie	WI	E	2,000	\$6.00	2006	19,719

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
2052	Plymouth	WI	E		\$2.50	2019	8,729
2053	Poynette	WI	E	3,550	\$5.00	2006	2,266
2054	Prairie du Sac	WI	E		\$3.62		3,231
2055	Prescott	WI	E		\$3.77	2010	4,276
2056	Pulaski	WI	E	4,100			3,682
2057	Racine	WI	E	2,844	\$8.52	2004	78,860
2058	Raymond	WI	A		\$2.08	2007	3,516
2059	Reedsburg	WI	E	3,024	\$4.30	2008	8,594
2060	Rhineland	WI	E	3,305	\$3.25	2012	7,756
2061	Rice Lake	WI	F		\$4.81	2011	8,438
2062	River Falls	WI	F		\$3.14	1998	14,889
2063	Rochester	WI	E	4000	\$5.27		3,867
2064	Saint Francis	WI	E	2,500	\$4.00	2001	9,365
2065	Salem	WI	E	3,000	\$5.00	2010	9,871
2066	Salem Lakes	WI	E		\$6.67		14,852
2067	Scott	WI	E	4,250	\$3.75		3,712
2068	Sheboygan	WI	E	2,215	\$3.00	2001	50,792
2069	Shorewood Hills	WI	E	2,941	\$9.17	2007	1,732
2070	Silver Lake	WI	E	3,870	\$7.83	2008	2,497
2071	Slinger	WI	E	4,300	\$3.98	2007	5,068
2072	Somers	WI	E	5,000	\$3.58	2018	9,597
2073	South Milwaukee	WI	E	2,964	\$6.00		21,256
2074	Stevens Point	WI	E	3,364	\$4.92		26,748
2075	Stoughton	WI	E	3,105	\$4.30	2012	12,817
2076	Sturtevant	WI	V			2008	6,941
2077	Suamico	WI	E	5,137	\$2.08	2008	12,588
2078	Sun Prairie	WI	E	3,468	\$7.50	2003	29,364
2079	Superior	WI	E	2,933	\$5.90	2004	27,368
2080	Sussex	WI	E	3,897	\$8.76	2005	10,518
2081	Two Rivers	WI	E	3,015	\$5.75	2014	11,716
2082	Union Grove	WI	E	4,000	\$7.28	2009	4,884
2083	Vernon	WI	E	6,904	\$1.08	2006	7,227
2084	Verona	WI	E	2,842	\$4.42	2009	10,619
2085	Washburn	WI	F		\$5.25	2005	2,280
2086	Watertown	WI	E	2,900	\$6.77	2005	22,824
2087	Waupun	WI	E	3,204	\$8.00	2005	11,340
2088	Wauwatosa	WI	E	2,174	\$6.56	1999	47,271
2089	West Allis	WI	E	1,827	\$6.43	1997	61,254
2090	West Milwaukee	WI	E	1,956	\$3.00	2003	4,142
2091	West Salem	WI	E	2,400	\$1.50	2007	4,837

No	Community	Sta	Fee Type	ERU (ft ²)	Monthly Fee	Year Created	Population
2092	Weston	WI	E	3,338	\$4.17	2004	14,904
2093	Whitefish Bay	WI	E	3,045	\$8.33		14,954
2094	Whitewater	WI	E	3,850	\$6.17	2007	14,769
2095	Wind Point	WI	E	3,857	\$2.71	2008	1,717
2096	Wisconsin Rapids	WI	E	2,620	\$2.92	2008	18,217
2097	Beckley	WV	E	3,000	\$3.75	2007	17,606
2098	Bluefield	WV	T		\$3.48	2018	9,658
2099	Ceredo	WV	T		\$7.00	2014	1,273
2100	Fairmont	WV	D		\$5.50	2006	18,737
2101	Huntington	WV	T		\$7.15	2017	49,138
2102	Hurricane	WV	D		\$1.50	2005	6,359
2103	Martinsburg	WV	E	2,280	\$12.00	2021	17,454
2104	Milton	WV	T		\$4.00	2016	2,498
2105	Morgantown	WV	T		\$5.88	2011	31,000
2106	Moundsville	WV	D		\$5.00	2010	8,887
2107	Oak Hill	WV	D		\$5.00	2003	7,713
2108	Saint Albans	WV	T		\$8.50	2011	10,973
2109	Vienna	WV	F		\$4.00	2010	10,686

Appendix B. Canadian Stormwater Utilities

ERUs are in square meters, and fees are in Canadian dollars.

No.	Community	Province	Fee Type	ERU (m ²)	Fee	Year Created	Population
1	Beaumont	Alberta	F		\$7.41	2022	20,900
2	Calgary	Alberta	O		\$15.63	1994	1,306,800
3	Chestermere	Alberta	F		\$15.05	2020	22,200
4	Coaldale	Alberta	F		\$9.95	2022	8,800
5	Coalhurst	Alberta	F		\$5.57	2020	2,900
6	Cochrane	Alberta	F		\$5.95	2016	32,200
7	Devon	Alberta	F		\$8.00	2018	6,500
8	Edmonton	Alberta	ID		\$25.91	2003	1,010,900
9	Edson	Alberta	F		\$2.00	2021	8,400
10	High River	Alberta	F		\$2.93	2014	14,300
11	Innisfail	Alberta	D		\$3.00	2021	8,000
12	Leduc	Alberta	F		\$5.00	2021	34,100
13	Mayerthorpe	Alberta	LU		\$1.98	2017	1,300
14	Morinville	Alberta	D		\$10.00	2018	10,400
15	Nanton	Alberta	F		\$2.13	2021	2,200
16	Okotoks	Alberta	F		\$8.33	2020	30,400
17	Penhold	Alberta	F		\$4.25	2018	3,500
18	Spruce Grove	Alberta	M		\$14.55	2020	37,600
19	St. Albert	Alberta	D		\$16.18	2003	68,200
20	Stony Plain	Alberta	D		\$23.25	2020	18,000
21	Strathcona County	Alberta	F		\$8.05	2007	99,200
22	Strathmore	Alberta	F		\$3.95	2020	14,300
23	Sturgeon County	Alberta	F		\$15.00	2019	20,100
24	Sundre	Alberta	F		\$5.25	2022	2,700
25	Taber	Alberta	D		\$11.42	2021	8,900
26	Turner Valley	Alberta	F		\$5.03	2020	2,600
27	Vegreville	Alberta	F		\$6.00	2020	5,700
28	Wainwright	Alberta	D		\$5.00	2019	6,600
29	Westlock	Alberta	F		\$3.00	2021	4,900
30	Wetaskiwin	Alberta	F		\$0.70	2023	12,600
31	Lloydminster	AB/SK	T		\$16.13	2017	31,600
32	Abbotsford	British Columbia	AV		\$8.64	2001	153,500
33	Chilliwack	British Columbia	AV		\$9.05		93,200
34	Delta	British Columbia	AV		\$9.57		108,500
35	Langley Township	British Columbia	AV		\$9.11	2003	132,600
36	Mission	British Columbia	AV		\$13.88		41,500

No.	Community	Province	Fee Type	ERU (m ²)	Fee	Year Created	Population
37	North Vancouver	British Columbia	AV		\$9.12		58,100
38	Penticton	British Columbia	F		\$6.78	2019	36,900
39	Pitt Meadows	British Columbia	AV		\$8.50	2009	19,100
40	Port Moody	British Columbia	AV		\$12.50		33,500
41	Richmond	British Columbia	F		\$18.67	2006	209,900
42	Surrey	British Columbia	D		\$20.21	2002	568,300
43	Victoria	British Columbia	IA		\$24.15	2016	91,900
44	West Vancouver	British Columbia	F		\$48.88	2008	44,100
45	White Rock	British Columbia	ID		\$53.48	2004	21,900
46	Halifax	Nova Scotia	T		\$3.17	2013	439,800
47	Ajax	Ontario	F		\$4.00	2023	126,700
48	Aurora	Ontario	D		\$13.41	1998	62,100
49	Brampton	Ontario	E	234	\$7.42	2020	656,500
50	Cobourg	Ontario	F		\$6.03	2023	20,500
51	Guelph	Ontario	E	188	\$7.60	2018	143,700
52	Kitchener	Ontario	T		\$18.76	2011	256,900
53	London	Ontario	D		\$18.48	1996	422,300
54	Markham	Ontario	D		\$4.42	2015	338,500
55	Middlesex Centre	Ontario	D		\$16.15	2017	18,900
56	Mississauga	Ontario	T		\$9.73	2016	718,000
57	Newmarket	Ontario	ID		\$7.96	2017	87,900
58	North Middlesex	Ontario	F		\$5.69	2021	6,300
59	Orillia	Ontario	D		\$8.40	2017	33,400
60	Ottawa	Ontario	D		\$15.62	2017	1,017,400
61	Richmond Hill	Ontario	S		\$6.84	2013	202,000
62	St. Thomas	Ontario	D		\$12.29	2000	42,800
63	Thames Centre	Ontario	F		\$5.68	2019	14,000
64	Vaughan	Ontario	T		\$4.89	2017	323,100
65	Waterloo	Ontario	T		\$15.39	2011	121,400
66	Whitchurch-Stouffville	Ontario	D		\$2.92	2019	49,900
67	Estevan	Saskatchewan	F		\$10.53	2020	10,900
68	Humboldt	Saskatchewan	M		\$22.00	2012	6,000
69	Regina	Saskatchewan	A		\$19.77	2001	226,400
70	Saskatoon	Saskatchewan	E	264	\$8.90	2002	266,100

APPENDIX E. COST ESTIMATES

Owner: Lake Point
Project: Lake Point City Storm Water Master Plan
Project #: 2407-046
PM: Dan Fechner
Date: 4/16/2025



ENGINEER'S OPINION OF PROBABLE COST					
Minor Drainage					
Item No.	Item Description	Unit	Estimated Quantity	Unit Price	Price
1-2	Historic Flooding Location 2	L.S.	1	\$ 49,385.95	\$ 49,385.95
1-3	Historic Flooding Location 3	L.S.	1	\$ 18,211.29	\$ 18,211.29
1-4	Historic Flooding Location 4	L.S.	1	\$ 22,243.58	\$ 22,243.58
1-6	Historic Flooding Location 6	L.S.	1	\$ 23,539.35	\$ 23,539.35
Base Bid / Schedule 1 - Subtotal					\$ 113,380.17
Major Drainage WITHOUT Basins					
2-1	Watershed 1 to 9000 North	L.S.	1	\$ 114,846.51	\$ 114,846.51
2-2	Watershed 2 to 9000 North	L.S.	1	\$ 4,220.81	\$ 4,220.81
2-3	Watersheds 1 and 2 to Main City Basin	L.S.	1	\$ 516,707.44	\$ 516,707.44
2-4	Watershed 3 past Lake Shore Drive	L.S.	1	\$ 489,313.00	\$ 489,313.00
2-5	Watershed 4 to 8350 Lakeshore Drive	L.S.	1	\$ 12,362.11	\$ 12,362.11
2-6	Watersheds 3 and 4 to Main City Basin	L.S.	1	\$ 178,982.59	\$ 178,982.59
2-7	Watershed 5 Along Canyon Road	L.S.	1	\$ 16,509,860.88	\$ 16,509,860.88
2-8	Watershed 5 Canyon Road to Hwy 36	L.S.	1	\$ 134,971.67	\$ 134,971.67
2-9	Watershed 6 Conveyance	L.S.	1	\$ 1,155,232.02	\$ 1,155,232.02
2-10	Watershed 5 and 6 Conveyance	L.S.	1	\$ 101,455.42	\$ 101,455.42
2-11	Main City Basin and Outfall Conveyance	L.S.	1	\$ 3,887,799.54	\$ 3,887,799.54
Base Bid / Schedule 2 - Subtotal					\$ 23,105,751.99
Major Drainage WITH Basins					
3-1	Watershed 1 to 9000 North	L.S.	1	\$ 111,061.10	\$ 111,061.10
3-2	Watershed 2 to 9000 North	L.S.	1	\$ 1,272.93	\$ 1,272.93
3-3	Watersheds 1 and 2 to Main City Basin	L.S.	1	\$ 115,790.52	\$ 115,790.52
3-4	Watersheds 3 and 4 to Main City Basin	L.S.	1	\$ 99,598.40	\$ 99,598.40
3-5	Watershed 5 Along Canyon Road	L.S.	1	\$ 3,559,206.67	\$ 3,559,206.67
3-6	Watershed 5 Canyon Road to Hwy 36	L.S.	1	\$ 38,308.83	\$ 38,308.83
3-7	Watershed 6 Conveyance	L.S.	1	\$ 1,155,232.02	\$ 1,155,232.02
3-8	Watershed 5 and 6 Conveyance	L.S.	1	\$ 101,455.42	\$ 101,455.42
3-9	Main City Basin and Outfall Conveyance	L.S.	1	\$ 3,887,799.54	\$ 3,887,799.54
3-10	Upper Basin and Outfall Conveyance	L.S.	1	\$ 1,429,283.15	\$ 1,429,283.15
3-11	Middle A Basin and Outfall Conveyance	L.S.	1	\$ 5,112,228.77	\$ 5,112,228.77
3-12	Middle B Basin and Outfall Conveyance	L.S.	1	\$ 4,234,526.25	\$ 4,234,526.25
3-13	Lower Basin and Outfall Conveyance	L.S.	1	\$ 10,975,563.39	\$ 10,975,563.39
Base Bid / Schedule 3 - Subtotal					\$ 30,821,327.00
Major Drainage Preferred Alternative					
4-1	Watershed 1 to 9000 North	L.S.	1	\$ 114,847.00	\$ 114,847.00
4-2	Watershed 2 to 9000 North	L.S.	1	\$ 4,220.81	\$ 4,220.81
4-3	Watersheds 1 and 2 to Main City Basin	L.S.	1	\$ 514,678.96	\$ 514,678.96
4-4	Watersheds 3 and 4 to Main City Basin	L.S.	1	\$ 99,598.40	\$ 99,598.40
4-5	Middle Basin B and Outfall Conveyance	L.S.	1	\$ 4,234,526.25	\$ 4,234,526.25
4-6	Watershed 5 Along Canyon Road	L.S.	1	\$ 3,363,275.32	\$ 3,363,275.32
4-7	Watershed 5 Canyon Road to Hwy 36	L.S.	1	\$ 38,308.83	\$ 38,308.83
4-8	Watershed 6 Conveyance	L.S.	1	\$ 1,155,232.02	\$ 1,155,232.02
4-9	Watershed 5 and 6 Conveyance	L.S.	1	\$ 101,455.42	\$ 101,455.42
4-10	Main City Basin and Outfall Conveyance	L.S.	1	\$ 3,887,799.54	\$ 3,887,799.54
4-11	Lower Basin and Outfall Conveyance	L.S.	1	\$ 10,975,563.39	\$ 10,975,563.39
Base Bid / Schedule 3 - Subtotal					\$ 24,489,505.95
Total Probable Construction Cost - Alt 1					\$ 23,219,132.16
Total Probable Construction Cost - Alt 2					\$ 30,934,707.17
Total Probable Construction Cost - Alt 3					\$ 24,602,886.12

In providing estimates of probable construction cost, the Client understands that the Consultant has no control over the cost or availability of labor, equipment or materials, or over market conditions or the Contractor's method of pricing, and that the Consultant's estimates of probable construction costs are made on the basis of the consultant's professional judgement and experience. The Consultant makes no warranty, express or implied, that the bids or negotiated costs of the Work will not vary from the Consultant's estimate of probable construction cost.

Owner: Lake Point City
Project: Lake Point Stormwater Master Plan
Project #: 2407-046
PM: Dan Fechner
Date: 4/16/2025



1-800-748-5275
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ENGINEER'S OPINION OF PROBABLE COST - Minor Drainage					
Item No.	Item Description	Unit	Estimated Quantity	Unit Price	Price
Historic Flooding Location 2					
1-1	Mobilization	L.S.	9%	\$ 3,056.78	\$ 3,056.78
1-2	Traffic Control	L.S.	7%	\$ 2,221.96	\$ 2,221.96
1-3	Type 4 Stormwater Channel Excavation	C.Y.	1,324	\$ 6.00	\$ 7,942.22
1-4	30-Inch ADS Drain Pipe Culvert (Under I-80)	L.F.	80	\$ 235.00	\$ 18,800.00
1-5	Temporary Construction Easement	Acre	2	\$ 2,500.00	\$ 5,000.00
Construction Contingency			15%	\$ 5,553.14	\$ 5,553.14
Total Probable Construction Cost					\$ 42,574.10
1-6	Design Engineering	L.S.	7%	\$ 2,980.19	\$ 2,980.19
1-7	Construction Engineering	L.S.	8%	\$ 3,405.93	\$ 3,405.93
1-8	Final Environmental Permitting	L.S.	1%	\$ 425.74	\$ 425.74
Schedule 1 Total Bid Price					\$ 49,385.95
Historic Flooding Location 3					
2-1	Mobilization	L.S.	9%	\$ 1,127.20	\$ 1,127.20
2-2	Type 4 Stormwater Channel Excavation	L.F.	1,254	\$ 6.00	\$ 7,524.44
2-3	Temporary Construction Easement	Acre	2	\$ 2,500.00	\$ 5,000.00
Construction Contingency			15%	\$ 2,047.75	\$ 2,047.75
Total Probable Construction Cost					\$ 15,699.39
2-4	Design Engineering	L.F.	7%	\$ 1,098.96	\$ 1,098.96
2-5	Construction Engineering	C.Y.	8%	\$ 1,255.95	\$ 1,255.95
2-6	Final Environmental Permitting	C.Y.	1%	\$ 156.99	\$ 156.99
Schedule 2 Total Bid Price					\$ 18,211.29
Historic Flooding Location 4					
3-1	Mobilization	L.S.	9%	\$ 1,028.87	\$ 1,028.87
3-2	Temporary Construction Easement	Acre	2	\$ 2,500.00	\$ 5,000.00
3-3	Type 4 Stormwater Channel Excavation	C.Y.	1,039	\$ 6.00	\$ 6,235.56
3-4	Spoils Removal	C.Y.	1,039	\$ 5.00	\$ 5,196.30
Construction Contingency			15%	\$ 1,714.78	\$ 1,714.78
Total Probable Construction Cost					\$ 19,175.50
3-5	Design Engineering	L.S.	7%	\$ 1,342.28	\$ 1,342.28
3-6	Construction Engineering	L.S.	8%	\$ 1,534.04	\$ 1,534.04
3-7	Final Environmental Permitting	L.S.	1%	\$ 191.75	\$ 191.75
Schedule 3 Total Bid Price					\$ 22,243.58
Historic Flooding Location 6					
4-1	Mobilization	L.S.	9%	\$ 1,456.98	\$ 1,456.98
3-2	Traffic Control	L.S.	7%	\$ 1,059.07	\$ 1,059.07
3-3	Type 4 Stormwater Channel Excavation	C.Y.	1,148	\$ 6.00	\$ 6,888.89
3-5	Spoils Removal	C.Y.	1,148	\$ 5.00	\$ 5,740.74
4-11	Temporary Construction Easement	Acre	1	\$ 2,500.00	\$ 2,500.00
Construction Contingency			15%	\$ 2,646.85	\$ 2,646.85
Total Probable Construction Cost					\$ 20,292.54
4-12	Design Engineering	L.S.	7%	\$ 1,420.48	\$ 1,420.48
4-13	Construction Engineering	L.S.	8%	\$ 1,623.40	\$ 1,623.40
4-15	Final Environmental Permitting	L.S.	1%	\$ 202.93	\$ 202.93
Schedule 4 Total Bid Price					\$ 23,539.35
Total Project Price					\$ 113,380.17

Length 1787
 Volume 1323.7037

Length 1693 pipe
 Volume 1254.07407

full channel to be excavated
 Length 1403
 Volume 1039.25926

Length 1550
 Volume 1148.14815

In providing estimates of probable construction cost, the Client understands that the Consultant has no control over the cost or availability of labor, equipment or materials, or over market conditions or the Contractor's method of pricing, and that the Consultant's estimates of probable construction costs are made on the basis of the consultant's professional judgement and experience. The Consultant makes no warranty, express or

Owner: Lake Point City
Project: Lake Point Stormwater Master Plan
Project #: 2407-046
PM: Dan Fechner
Date: 4/16/2025



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ENGINEER'S OPINION OF PROBABLE COST - Major Drainage WITHOUT basins					
Item No.	Item Description	Unit	Estimated Quantity	Unit Price	Price
Watershed 1 to 9000 North					
1-1	Mobilization	L.S.	9%	\$ 7,108.50	\$ 7,108.50
1-2	Type 5 Stormwater Channel Excavation	C.Y.	817	\$ 6.00	\$ 4,900.00
1-3	Spoils Removal	C.Y.	817	\$ 5.00	\$ 4,083.33
1-4	Property Acquisition (permanent ROW)	Acre	2	\$ 35,000.00	\$ 70,000.00
Construction Contingency			15%	\$ 12,913.78	\$ 12,913.78
Total Probable Construction Cost					\$ 99,005.61
1-5	Design Engineering	L.S.	7%	\$ 6,930.39	\$ 6,930.39
1-6	Construction Engineering	L.S.	8%	\$ 7,920.45	\$ 7,920.45
1-7	Final Environmental Permitting	L.S.	1%	\$ 990.06	\$ 990.06
Schedule 1 Total Bid Price					\$ 114,846.51
Watershed 2 to 9000 North					
2-1	Mobilization	L.S.	9%	\$ 261.25	\$ 261.25
2-2	Type 7 Stormwater Channel Excavation	C.Y.	264	\$ 6.00	\$ 1,583.33
2-3	Spoils Removal	C.Y.	264	\$ 5.00	\$ 1,319.44
Construction Contingency			15%	\$ 474.60	\$ 474.60
Total Probable Construction Cost					\$ 3,638.63
2-4	Design Engineering	L.F.	7%	\$ 254.70	\$ 254.70
2-5	Construction Engineering	C.Y.	8%	\$ 291.09	\$ 291.09
2-6	Final Environmental Permitting	C.Y.	1%	\$ 36.39	\$ 36.39
Schedule 2 Total Bid Price					\$ 4,220.81
Watersheds 1 and 2 to Main City Basin					
3-1	Mobilization	L.S.	9%	\$ 32,588.03	\$ 32,588.03
3-2	Traffic Control	L.S.	7%	\$ 23,688.08	\$ 23,688.08
3-3	Type 9 Stormwater Channel Excavation	C.Y.	266	\$ 6.00	\$ 1,594.19
3-4	Spoils Removal	C.Y.	266	\$ 10.00	\$ 2,656.98
3-5	4'x8' Box Culvert	L.F.	80	\$ 1,100.00	\$ 88,000.00
3-6	4'x8' Box Culvert	L.F.	80	\$ 1,100.00	\$ 88,000.00
3-7	4'x8' Box Culvert	L.F.	60	\$ 1,100.00	\$ 66,000.00
3-8	Asphalt Removal	S.Y.	970	\$ 20.00	\$ 19,400.00
3-9	Asphalt Repair	S.Y.	970	\$ 75.00	\$ 72,750.00
Construction Contingency			15%	\$ 50,760.17	\$ 50,760.17
Total Probable Construction Cost					\$ 445,437.45
3-10	Design Engineering	L.S.	7%	\$ 31,180.62	\$ 31,180.62
3-11	Construction Engineering	L.S.	8%	\$ 35,635.00	\$ 35,635.00
3-12	Final Environmental Permitting	L.S.	1%	\$ 4,454.37	\$ 4,454.37
Schedule 3 Total Bid Price					\$ 516,707.44
Watershed 3 past Lake Shore Drive					
4-1	Mobilization	L.S.	9%	\$ 30,286.35	\$ 30,286.35
4-2	Traffic Control	L.S.	7%	\$ 22,015.00	\$ 22,015.00
4-3	24" ADS Drain Pipe	L.F.	922	\$ 180.00	\$ 165,960.00
4-4	Storm Drain Manhole	Each	2	\$ 5,000.00	\$ 11,525.00
4-5	24-Inch ADS Drain Pipe Culvert	L.F.	60	\$ 180.00	\$ 10,800.00
4-6	24-Inch ADS Drain Pipe Culvert	L.F.	60	\$ 180.00	\$ 10,800.00
4-7	Asphalt Removal	S.Y.	1,157	\$ 20.00	\$ 23,140.00
4-8	Asphalt Repair	S.Y.	1,157	\$ 75.00	\$ 86,775.00
4-9	Curb Repair	L.F.	60	\$ 50.00	\$ 3,000.00
4-10	Temporary Construction Easement	Acre	1	\$ 2,500.00	\$ 2,500.00
Construction Contingency			15%	\$ 55,020.20	\$ 55,020.20
Total Probable Construction Cost					\$ 421,821.55
4-11	Design Engineering	L.S.	7%	\$ 29,527.51	\$ 29,527.51
4-12	Construction Engineering	L.S.	8%	\$ 33,745.72	\$ 33,745.72
4-13	Final Environmental Permitting	L.S.	1%	\$ 4,218.22	\$ 4,218.22
Schedule 4 Total Bid Price					\$ 489,313.00
Watershed 4 to 8350 Lakeshore Drive					
5-1	Mobilization	L.S.	9%	\$ 732.16	\$ 732.16
5-2	Traffic Control	L.S.	7%	\$ 569.46	\$ 569.46
5-3	Type 8 Stormwater Channel Excavation	C.Y.	740	\$ 6.00	\$ 4,437.33

Length 980
 Volume 816.6667

1/2 channel area is already existing
 Length 475
 Volume 527.7778

2/3 volume of channel already excavated
 Length 473
 Volume 797.0926

Length 922
 Volume 247.5741

10,420 1,157.78

2/3 of channel existing

5-4	Spoils Removal	C.Y.	740	\$ 5.00	\$ 3,697.78	Length Volume	1664 2218.667
Construction Contingency			15%	\$ 1,220.27	\$ 1,220.27		
Total Probable Construction Cost					\$ 10,657.00		
5-5	Design Engineering	L.S.	7%	\$ 745.99	\$ 745.99		
5-6	Construction Engineering	L.S.	8%	\$ 852.56	\$ 852.56		
5-7	Final Environmental Permitting	L.S.	1%	\$ 106.57	\$ 106.57		
Schedule 5 Total Bid Price					\$ 12,362.11		
Watersheds 3 and 4 to Main City Basin							
6-1	Mobilization	L.S.	9%	\$ 11,078.25	\$ 11,078.25		
6-2	Traffic Control	L.S.	7%	\$ 8,052.72	\$ 8,052.72		
6-3	Type 8 Stormwater Channel Excavation	C.Y.	2,044	\$ 6.00	\$ 12,266.67	1/3 of channel existing Length Volume	2300 3066.667
6-4	Spoils Removal	C.Y.	2,044	\$ 5.00	\$ 10,222.22		
6-5	4'x6' Box Culvert	L.F.	80	\$ 800.00	\$ 64,000.00		
6-6	Asphalt Removal	S.Y.	90	\$ 20.00	\$ 1,800.00		
6-7	Asphalt Repair	S.Y.	90	\$ 75.00	\$ 6,750.00	800	88.89
6-8	Utility Crossings	Each	4	\$ 5,000.00	\$ 20,000.00		
Construction Contingency			15%	\$ 20,125.48	\$ 20,125.48		
Total Probable Construction Cost					\$ 154,295.33		
6-9	Design Engineering	L.S.	7%	\$ 10,800.67	\$ 10,800.67		
6-10	Construction Engineering	L.S.	8%	\$ 12,343.63	\$ 12,343.63		
6-11	Final Environmental Permitting	L.S.	1%	\$ 1,542.95	\$ 1,542.95		
Schedule 6 Total Bid Price					\$ 178,982.59		
Watershed 5 Along Canyon Road							
7-1	Mobilization	L.S.	9%	\$ 960,223.00	\$ 960,223.00		
7-2	Traffic Control	L.S.	7%	\$ 746,840.11	\$ 746,840.11		
7-3	4'x10' Box Culvert	L.F.	5,597	\$ 1,800.00	\$ 10,074,600.00	Length	5597
7-4	Asphalt Removal	S.Y.	6,219	\$ 20.00	\$ 124,377.78		
7-5	Asphalt Repair	S.Y.	6,219	\$ 75.00	\$ 466,416.67		
7-6	Temporary Construction Easement	Acre	2	\$ 2,500.00	\$ 3,750.00	55,970	6,218.89
Construction Contingency			15%	\$ 1,856,431.13	\$ 1,856,431.13		
Total Probable Construction Cost					\$ 14,232,638.69		
7-7	Design Engineering	L.S.	7%	\$ 996,284.71	\$ 996,284.71		
7-8	Construction Engineering	L.S.	8%	\$ 1,138,611.10	\$ 1,138,611.10		
7-9	Final Environmental Permitting	L.S.	1%	\$ 142,326.39	\$ 142,326.39		
Schedule 7 Total Bid Price					\$ 16,509,860.88		
Watershed 5 Canyon Road to Hwy 36							
8-1	Mobilization	L.S.	9%	\$ 8,354.16	\$ 8,354.16		
8-2	Type 13 Stormwater Channel Excavation	C.Y.	7,984	\$ 6.00	\$ 47,904.00	1/2 of channel existing Length Volume	2994 15968
8-3	Spoils Removal	C.Y.	7,984	\$ 5.00	\$ 39,920.00		
8-4	Temporary Construction Easement	Acre	2	\$ 2,500.00	\$ 5,000.00		
Construction Contingency			15%	\$ 15,176.72	\$ 15,176.72		
Total Probable Construction Cost					\$ 116,354.88		
8-5	Design Engineering	L.S.	7%	\$ 8,144.84	\$ 8,144.84		
8-6	Construction Engineering	L.S.	8%	\$ 9,308.39	\$ 9,308.39		
8-7	Final Environmental Permitting	L.S.	1%	\$ 1,163.55	\$ 1,163.55		
Schedule 8 Total Bid Price					\$ 134,971.67		
Watershed 6 Conveyance							
9-1	Mobilization	L.S.	9%	\$ 69,120.38	\$ 69,120.38		
9-2	Traffic Control	L.S.	7%	\$ 50,243.27	\$ 50,243.27		
9-3	4'x10' Box Culvert (Under Railroad)	L.F.	120	\$ 1,800.00	\$ 216,000.00	1/2 of channel existing Length Volume	5876 7834.667
9-4	Type 11 Stormwater Channel Excavation	C.Y.	14,776	\$ 6.00	\$ 88,656.00		
9-5	Spoils Removal	C.Y.	14,776	\$ 5.00	\$ 73,880.00		
9-6	Temporary Construction Easement	Acre	3	\$ 2,500.00	\$ 7,500.00		
9-7	Railroad Easement	Acre	1	\$ 10,000.00	\$ 10,000.00		
9-8	4'x10' Box Culvert (Under HW 36)	L.F.	80	\$ 1,800.00	\$ 144,000.00	new channel Length Volume	2603 6941.333
9-9	4'x10' Box Culvert (Under I-80)	L.F.	80	\$ 1,800.00	\$ 144,000.00		
9-10	Asphalt Removal	S.Y.	355	\$ 20.00	\$ 7,100.00		
9-11	Asphalt Repair	S.Y.	355	\$ 75.00	\$ 26,625.00		
Construction Contingency			15%	\$ 125,568.70	\$ 125,568.70		
Total Probable Construction Cost					\$ 962,693.35		
9-12	Design Engineering	L.S.	7%	\$ 67,388.53	\$ 67,388.53		
9-13	Construction Engineering	L.S.	8%	\$ 77,015.47	\$ 77,015.47		
9-14	Final Environmental Permitting	L.S.	5%	\$ 48,134.67	\$ 48,134.67		
Schedule 9 Total Bid Price					\$ 1,155,232.02		
Watershed 5 and 6 Conveyance							
10-1	Mobilization	L.S.	9%	\$ 6,136.42	\$ 6,136.42		
10-2	Type 12 Stormwater Channel Excavation	C.Y.	5,062	\$ 6.00	\$ 30,372.22	1/2 of channel existing Length Volume	4970 10124.07
10-3	Spoils Removal	C.Y.	5,062	\$ 5.00	\$ 25,310.19		
10-4	Temporary Construction Easement	Acre	5	\$ 2,500.00	\$ 12,500.00		
Construction Contingency			15%	\$ 10,227.36	\$ 10,227.36		

Total Probable Construction Cost					\$ 84,546.19
10-5	Design Engineering	L.S.	7%	\$ 5,918.23	\$ 5,918.23
10-6	Construction Engineering	L.S.	8%	\$ 6,763.69	\$ 6,763.69
10-7	Final Environmental Permitting	L.S.	5%	\$ 4,227.31	\$ 4,227.31
Schedule 10 Total Bid Price					\$ 101,455.42
Main City Basin Outlet					
11-1	Mobilization	L.S.	9%	\$ 276,733.60	\$ 276,733.60
11-2	Traffic Control	L.S.	7%	\$ 201,156.30	\$ 201,156.30
11-3	Exploratory Excavation	L.S.	3%	\$ 73,059.19	\$ 73,059.19
11-4	Main City Stormwater Basin Excavation	C.Y.	122,936	\$ 6.00	\$ 737,614.80
11-5	Spoils Removal	C.Y.	122,936	\$ 5.00	\$ 614,679.00
11-6	Outlet Structure	Each	1	\$ 50,000.00	\$ 50,000.00
11-7	Geotechnical Report	L.S.	1	\$ 15,000.00	\$ 15,000.00
11-8	48-Inch ADS Drain Pipe	L.F.	2,385	\$ 280.00	\$ 667,800.00
11-9	48-Inch ADS Drain Pipe Culvert (Under HW 36)	L.F.	80	\$ 280.00	\$ 22,400.00
11-10	48-Inch ADS Drain Pipe Culvert (Under I-80)	L.F.	80	\$ 280.00	\$ 22,400.00
11-11	Storm Drain Manhole	Each	6	\$ 9,000.00	\$ 53,662.50
11-12	Asphalt Removal	S.Y.	2,650	\$ 20.00	\$ 53,000.00
11-13	Asphalt Repair	S.Y.	2,650	\$ 75.00	\$ 198,750.00
Construction Contingency			15%	\$ 365,295.95	\$ 365,295.95
Total Probable Construction Cost					\$ 3,351,551.33
11-14	Design Engineering	L.S.	7%	\$ 234,608.59	\$ 234,608.59
11-15	Construction Engineering	L.S.	8%	\$ 268,124.11	\$ 268,124.11
11-16	Final Environmental Permitting	L.S.	1%	\$ 33,515.51	\$ 33,515.51
Schedule 11 Total Bid Price					\$ 3,887,799.54

assume 51 ac-ft f is already excavated.
volume 204893 CY 122935.8
127.026 acre-ft 76.02604

Length 2385

23,850 2,650.00

Total Project Price					\$ 23,105,751.99
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Owner: Lake Point City
Project: Lake Point Stormwater Master Plan
Project #: 2407-046
PM: Dan Fechner
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ENGINEER'S OPINION OF PROBABLE COST - Major Drainage WITH basins					
Item No.	Item Description	Unit	Estimated Quantity	Unit Price	Price
Watershed 1 to 9000 North					
1-1	Mobilization	L.S.	9%	\$ 6,874.20	\$ 6,874.20
1-2	Type 3 Stormwater Channel Excavation	C.Y.	580	\$ 6.00	\$ 3,480.00
1-4	Spoils Removal	C.Y.	580	\$ 5.00	\$ 2,900.00
1-5	Property Acquisition (permanent ROW)	Acre	2	\$ 35,000.00	\$ 70,000.00
Construction Contingency			15%	\$ 12,488.13	\$ 12,488.13
Total Probable Construction Cost					\$ 95,742.33
1-6	Design Engineering	L.S.	7%	\$ 6,701.96	\$ 6,701.96
1-7	Construction Engineering	L.S.	8%	\$ 7,659.39	\$ 7,659.39
1-8	Final Environmental Permitting	L.S.	1%	\$ 957.42	\$ 957.42
Schedule 1 Total Bid Price					\$ 111,061.10
Watershed 2 to 9000 North					
2-1	Mobilization	L.S.	9%	\$ 57.00	\$ 57.00
2-2	Type 2 Stormwater Channel Excavation	C.Y.	106	\$ 6.00	\$ 633.33
2-4	Spoils Removal	C.Y.	53	\$ 5.00	\$ 263.89
Construction Contingency			15%	\$ 143.13	\$ 143.13
Total Probable Construction Cost					\$ 1,097.36
2-5	Design Engineering	L.F.	7%	\$ 76.81	\$ 76.81
2-6	Construction Engineering	C.Y.	8%	\$ 87.79	\$ 87.79
2-7	Final Environmental Permitting	C.Y.	1%	\$ 10.97	\$ 10.97
Schedule 2 Total Bid Price					\$ 1,272.93
Watersheds 1 and 2 to Main City Basin					
3-1	Mobilization	L.S.	9%	\$ 6,857.82	\$ 6,857.82
3-2	Traffic Control	L.S.	7%	\$ 5,333.86	\$ 5,333.86
3-3	Type 4 Stormwater Channel Excavation	C.Y.	117	\$ 6.00	\$ 700.74
3-5	Spoils Removal	C.Y.	117	\$ 5.00	\$ 583.95
3-6	30-Inch ADS Drain Pipe Culvert	L.F.	80	\$ 235.00	\$ 18,800.00
3-7	30-Inch ADS Drain Pipe Culvert	L.F.	80	\$ 235.00	\$ 18,800.00
3-8	30-Inch ADS Drain Pipe Culvert	L.F.	60	\$ 235.00	\$ 14,100.00
3-9	Asphalt Removal	S.Y.	244	\$ 20.00	\$ 4,880.00
3-10	Asphalt Repair	S.Y.	244	\$ 75.00	\$ 18,333.33
Construction Contingency			15%	\$ 11,429.70	\$ 11,429.70
Total Probable Construction Cost					\$ 99,819.41
3-11	Design Engineering	L.S.	7%	\$ 6,987.36	\$ 6,987.36
3-12	Construction Engineering	L.S.	8%	\$ 7,985.55	\$ 7,985.55
3-14	Final Environmental Permitting	L.S.	1%	\$ 998.19	\$ 998.19
Schedule 3 Total Bid Price					\$ 115,790.52
Watersheds 3 and 4 to Main City Basin					
4-1	Mobilization	L.S.	9%	\$ 5,792.70	\$ 5,792.70
4-2	Traffic Control	L.S.	7%	\$ 4,505.43	\$ 4,505.43
4-3	Type 4 Stormwater Channel Excavation	C.Y.	1,547	\$ 6.00	\$ 9,280.00
4-4	Spoils Removal	C.Y.	1,547	\$ 5.00	\$ 7,733.33
4-5	30-Inch ADS Drain Pipe Culvert	L.F.	80	\$ 235.00	\$ 18,800.00
4-6	Asphalt Removal	S.Y.	90	\$ 20.00	\$ 1,800.00
4-7	Asphalt Repair	S.Y.	90	\$ 75.00	\$ 6,750.00
4-8	Utility Crossings	Each	4	\$ 5,000.00	\$ 20,000.00
Construction Contingency			15%	\$ 11,199.22	\$ 11,199.22
Total Probable Construction Cost					\$ 85,860.69
4-9	Design Engineering	L.S.	7%	\$ 6,010.25	\$ 6,010.25
4-10	Construction Engineering	L.S.	8%	\$ 6,868.85	\$ 6,868.85
4-11	Final Environmental Permitting	L.S.	1%	\$ 858.61	\$ 858.61
Schedule 4 Total Bid Price					\$ 99,598.40
Watershed 5 Along Canyon Road					
5-1	Mobilization	L.S.	9%	\$ 220,299.44	\$ 220,299.44
5-2	Traffic Control	L.S.	7%	\$ 160,134.59	\$ 160,134.59
5-3	48-Inch ADS Drain Pipe	L.F.	5,597	\$ 280.00	\$ 1,567,160.00
5-4	Storm Drain Manhole	Each	14	\$ 9,000.00	\$ 125,932.50
5-5	Asphalt Removal	S.Y.	6,219	\$ 20.00	\$ 124,377.78

Length 980
 Volume 580.7407

1/2 channel area is already existing
 Length 475
 Volume 211.1111

2/3 volume of channel already excavated
 Length 473
 Volume 350.3704

2,200 244.44

2/3 of channel existing
 Length 1664
 Volume 410.8642

1/3 of channel existing
 Length 2300
 Volume 1135.802

800 88.89

Length 5597

5-6	Asphalt Repair	S.Y.	6,219	\$ 75.00	\$ 466,416.67	55,970	6,218.89
5-7	Temporary Construction Easement	Acre	2	\$ 2,500.00	\$ 3,750.00		
Construction Contingency			15%	\$ 400,210.65	\$ 400,210.65		
Total Probable Construction Cost				\$ 3,068,281.61			
5-8	Design Engineering	L.S.	7%	\$ 214,779.71	\$ 214,779.71		
5-9	Construction Engineering	L.S.	8%	\$ 245,462.53	\$ 245,462.53		
5-10	Final Environmental Permitting	L.S.	1%	\$ 30,682.82	\$ 30,682.82		
Schedule 5 Total Bid Price				\$ 3,559,206.67			
Watershed 5 Canyon Road to Hwy 36							
6-1	Mobilization	L.S.	9%	\$ 2,371.15	\$ 2,371.15		
6-2	Type 10 Stormwater Channel Excavation	C.Y.	1,941	\$ 6.00	\$ 11,643.33	2/3 of channel existing	
6-3	Spoils Removal	C.Y.	1,941	\$ 5.00	\$ 9,702.78	Length	2994
6-4	Temporary Construction Easement	Acre	2	\$ 2,500.00	\$ 5,000.00	Volume	5821.667
Construction Contingency			15%	\$ 4,307.59	\$ 4,307.59		
Total Probable Construction Cost				\$ 33,024.85			
6-5	Design Engineering	L.S.	7%	\$ 2,311.74	\$ 2,311.74		
6-6	Construction Engineering	L.S.	8%	\$ 2,641.99	\$ 2,641.99		
6-7	Final Environmental Permitting	L.S.	1%	\$ 330.25	\$ 330.25		
Schedule 6 Total Bid Price				\$ 38,308.83			
Watershed 6 Conveyance							
7-1	Mobilization	L.S.	9%	\$ 69,120.38	\$ 69,120.38		
7-2	Traffic Control	L.S.	7%	\$ 50,243.27	\$ 50,243.27	1/2 of channel existing	
7-3	4'x10' Box Culvert (Under Railroad)	L.F.	120	\$ 1,800.00	\$ 216,000.00		
7-4	Type 11 Stormwater Channel Excavation	C.Y.	14,776	\$ 6.00	\$ 88,656.00	Length	5876
7-5	Spoils Removal	C.Y.	14,776	\$ 5.00	\$ 73,880.00	Volume	7834.667
7-6	Temporary Construction Easement	Acre	3	\$ 2,500.00	\$ 7,500.00		
7-7	Railroad Easement	Acre	1	\$ 10,000.00	\$ 10,000.00		
7-8	4'x10' Box Culvert (Under HW 36)	L.F.	80	\$ 1,800.00	\$ 144,000.00	new channel	
7-9	4'x10' Box Culvert (Under I-80)	L.F.	80	\$ 1,800.00	\$ 144,000.00	Length	2603
7-10	Asphalt Removal	S.Y.	355	\$ 20.00	\$ 7,100.00	Volume	6941.333
7-11	Asphalt Repair	S.Y.	355	\$ 75.00	\$ 26,625.00		
Construction Contingency			15%	\$ 125,568.70	\$ 125,568.70		
Total Probable Construction Cost				\$ 962,693.35			
7-11	Design Engineering	L.S.	7%	\$ 67,388.53	\$ 67,388.53		
7-12	Construction Engineering	L.S.	8%	\$ 77,015.47	\$ 77,015.47		
7-14	Final Environmental Permitting	L.S.	5%	\$ 48,134.67	\$ 48,134.67		
Schedule 7 Total Bid Price				\$ 1,155,232.02			
Watershed 5 and 6 Conveyance							
8-1	Mobilization	L.S.	9%	\$ 6,136.42	\$ 6,136.42		
8-2	Type 12 Stormwater Channel Excavation	C.Y.	5,062	\$ 6.00	\$ 30,372.22	1/2 of channel existing	
8-3	Spoils Removal	C.Y.	5,062	\$ 5.00	\$ 25,310.19	Length	4970
8-4	Temporary Construction Easement	Acre	5	\$ 2,500.00	\$ 12,500.00	Volume	10124.07
Construction Contingency			15%	\$ 10,227.36	\$ 10,227.36		
Total Probable Construction Cost				\$ 84,546.19			
8-5	Design Engineering	L.S.	7%	\$ 5,918.23	\$ 5,918.23		
8-6	Construction Engineering	L.S.	8%	\$ 6,763.69	\$ 6,763.69		
8-8	Final Environmental Permitting	L.S.	5%	\$ 4,227.31	\$ 4,227.31		
Schedule 8 Total Bid Price				\$ 101,455.42			
Main City Basin							
9-1	Mobilization	L.S.	9%	\$ 276,733.60	\$ 276,733.60		
9-2	Traffic Control	L.S.	7%	\$ 201,156.30	\$ 201,156.30		
9-3	Exploratory Excavation	L.S.	3%	\$ 73,059.19	\$ 73,059.19	assume 51 ac-ft f is already excavated.	
9-4	Main City Stormwater Basin Excavation	C.Y.	122,936	\$ 6.00	\$ 737,614.80	volume	204893 CY 122935.8
9-5	Spoils Removal	C.Y.	122,936	\$ 5.00	\$ 614,679.00	127.026 acre-ft	76.02604
9-6	Outlet Structure	Each	1	\$ 50,000.00	\$ 50,000.00		
9-7	Geotechnical Report	L.S.	1	\$ 15,000.00	\$ 15,000.00		
9-8	48-Inch ADS Drain Pipe	L.F.	2,385	\$ 280.00	\$ 667,800.00	Length	2385
9-9	48-Inch ADS Drain Pipe Culvert (Under HW 36)	L.F.	80	\$ 280.00	\$ 22,400.00		
9-10	48-Inch ADS Drain Pipe Culvert (Under I-80)	L.F.	80	\$ 280.00	\$ 22,400.00		
9-11	Storm Drain Manhole	Each	6	\$ 9,000.00	\$ 53,662.50	23,850	2,650.00
9-12	Asphalt Removal	S.Y.	2,650	\$ 20.00	\$ 53,000.00		
9-13	Asphalt Repair	S.Y.	2,650	\$ 75.00	\$ 198,750.00		
Construction Contingency			15%	\$ 365,295.95	\$ 365,295.95		
Total Probable Construction Cost				\$ 3,351,551.33			
9-14	Design Engineering	L.S.	7%	\$ 234,608.59	\$ 234,608.59		
9-15	Construction Engineering	L.S.	8%	\$ 268,124.11	\$ 268,124.11		
9-16	Final Environmental Permitting	L.S.	1%	\$ 33,515.51	\$ 33,515.51		
Schedule 9 Total Bid Price				\$ 3,887,799.54			
Upper Basin and Outfall Conveyance							
10-1	Mobilization	L.S.	9%	\$ 65,344.59	\$ 65,344.59		

10-2	Exploratory Excavation	L.S.	7%	\$ 47,264.90	\$ 47,264.90	basin	49648 CY	54612.8
10-3	Upper Stormwater Basin Excavation	C.Y.	54,613	\$ 6.00	\$ 327,676.80		30.77991 acre-ft	
10-4	Upper Stormwater Basin Compacted Embankment	C.Y.	49,648	\$ 7.00	\$ 347,536.00			
10-5	Type 2 Channel Excavation	C.Y.	596	\$ 6.00	\$ 3,573.33	length	1340	
10-6	Spoils Removal	C.Y.	50,244	\$ 5.00	\$ 251,217.78	volume	595.5556	
10-7	Outlet Structure (30" Outlet)	Each	1	\$ 50,000.00	\$ 50,000.00			
10-8	Geotechnical Report	L.S.	1	\$ 15,000.00	\$ 15,000.00			
Construction Contingency			15%	\$ 118,709.34	\$ 17,806.40			
Total Probable Construction Cost					\$ 1,125,419.80			
10-9	Design Engineering	L.S.	11%	\$ 123,796.18	\$ 123,796.18			
10-10	Construction Engineering	L.S.	11%	\$ 123,796.18	\$ 123,796.18			
10-11	Final Environmental Permitting	L.S.	5%	\$ 56,270.99	\$ 56,270.99			
Schedule 10 Total Bid Price					\$ 1,429,283.15			
Middle A Basin and Outfall Conveyance								
11-1	Mobilization	L.S.	9%	\$ 213,292.02	\$ 213,292.02			
11-2	Exploratory Excavation	L.S.	3%	\$ 68,646.82	\$ 68,646.82	basin	168252 CY	185077.2
11-3	Upper Stormwater Basin Excavation	C.Y.	185,077	\$ 6.00	\$ 1,110,463.20		104.31 acre-ft	
11-4	Middle A Stormwater Basin Compacted Embankment	C.Y.	168,252	\$ 7.00	\$ 1,177,764.00			
11-5	Type 2 Channel Excavation	C.Y.	2,173	\$ 6.00	\$ 13,037.33	length	4889	
11-6	Spoils Removal	C.Y.	170,425	\$ 5.00	\$ 852,124.44	volume	2172.889	
11-7	Outlet Structure (30" Outlet)	Each	1	\$ 50,000.00	\$ 50,000.00			
11-8	Geotechnical Report	L.S.	1	\$ 15,000.00	\$ 15,000.00			
Construction Contingency			15%	\$ 525,049.17	\$ 525,049.17			
Total Probable Construction Cost					\$ 4,025,376.99			
11-9	Design Engineering	L.S.	11%	\$ 442,791.47	\$ 442,791.47			
11-10	Construction Engineering	L.S.	11%	\$ 442,791.47	\$ 442,791.47			
11-11	Final Environmental Permitting	L.S.	5%	\$ 201,268.85	\$ 201,268.85			
Schedule 11 Total Bid Price					\$ 5,112,228.77			
Middle B Basin and Outfall Conveyance								
12-1	Mobilization	L.S.	9%	\$ 177,605.28	\$ 177,605.28			
12-2	Exploratory Excavation	L.S.	7%	\$ 128,389.51	\$ 128,389.51	basin	134862.9 CY	148349.2
12-3	Upper Stormwater Basin Excavation	C.Y.	148,349	\$ 6.00	\$ 890,095.34		83.61 acre-ft	
12-4	Middle B Stormwater Basin Compacted Embankment	C.Y.	134,863	\$ 7.00	\$ 944,040.51			
12-5	Type 3 Channel Excavation	C.Y.	1,811	\$ 6.00	\$ 10,866.67	length	3260	
12-6	Spoils Removal	C.Y.	136,674	\$ 5.00	\$ 683,370.21	volume	1811.111	
12-7	Outlet Structure (30" Outlet)	Each	1	\$ 50,000.00	\$ 50,000.00			
12-8	Geotechnical Report	L.S.	1	\$ 15,000.00	\$ 15,000.00			
Construction Contingency			15%	\$ 434,905.13	\$ 434,905.13			
Total Probable Construction Cost					\$ 3,334,272.64			
12-9	Design Engineering	L.S.	11%	\$ 366,769.99	\$ 366,769.99			
12-10	Construction Engineering	L.S.	11%	\$ 366,769.99	\$ 366,769.99			
12-11	Final Environmental Permitting	L.S.	5%	\$ 166,713.63	\$ 166,713.63			
Schedule 12 Total Bid Price					\$ 4,234,526.25			
Lower Basin and Outfall Conveyance								
13-1	Mobilization	L.S.	9%	\$ 466,783.40	\$ 466,783.40			
13-2	Exploratory Excavation	L.S.	7%	\$ 337,349.77	\$ 337,349.77	basin	354359 CY	389794.9
13-3	Upper Stormwater Basin Excavation	C.Y.	389,795	\$ 6.00	\$ 2,338,769.40		219.6894 acre-ft	
13-4	Middle B Stormwater Basin Compacted Embankment	C.Y.	354,359	\$ 7.00	\$ 2,480,513.00			
13-5	Type 5 Channel Excavation	C.Y.	4,975	\$ 6.00	\$ 29,850.00	length	5970	
13-6	Spoils Removal	C.Y.	359,334	\$ 5.00	\$ 1,796,670.00	volume	4975	
13-7	Outlet Structure (30" Outlet)	Each	1	\$ 50,000.00	\$ 50,000.00			
13-8	Geotechnical Report	L.S.	1	\$ 15,000.00	\$ 15,000.00			
Construction Contingency			15%	\$ 1,127,240.33	\$ 1,127,240.33			
Total Probable Construction Cost					\$ 8,642,175.90			
13-9	Design Engineering	L.S.	11%	\$ 950,639.35	\$ 950,639.35			
13-10	Construction Engineering	L.S.	11%	\$ 950,639.35	\$ 950,639.35			
13-12	Final Environmental Permitting	L.S.	5%	\$ 432,108.79	\$ 432,108.79			
Schedule 13 Total Bid Price					\$ 10,975,563.39			
Total Project Price					\$ 30,821,327.00			

In providing estimates of probable construction cost, the Client understands that the Consultant has no control over the cost or availability of labor, equipment or materials, or over market conditions or the Contractor's method of pricing, and that the Consultant's estimates of probable construction costs are made on the basis of the consultant's professional judgement and experience. The Consultant makes no warranty, express or

Owner: Lake Point City
Project: Lake Point Stormwater Master Plan
Project #: 2407-046
PM: Dan Fechner
Date: 4/16/2025



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ENGINEER'S OPINION OF PROBABLE COST - Major Drainage Preferred Alternative					
Item No.	Item Description	Unit	Estimated Quantity	Unit Price	Price
Watershed 1 to 9000 North					
1-1	Mobilization	L.S.	9%	\$ 7,108.50	\$ 7,108.50
1-2	Type 5 Stormwater Channel Excavation	C.Y.	817	\$ 6.00	\$ 4,900.00
1-3	Spoils Removal	C.Y.	817	\$ 5.00	\$ 4,083.33
1-4	Property Acquisition (permanent ROW)	Acre	2	\$ 35,000.00	\$ 70,000.00
Construction Contingency			15%	\$ 12,913.78	\$ 12,913.78
Total Probable Construction Cost					\$ 99,005.61
1-5	Design Engineering	L.S.	7%	\$ 6,930.39	\$ 6,930.39
1-6	Construction Engineering	L.S.	8%	\$ 7,920.45	\$ 7,920.45
1-7	Final Environmental Permitting	L.S.	1%	\$ 990.06	\$ 990.06
Schedule 1 Total Bid Price					\$ 114,847.00
Watershed 2 to 9000 North					
2-1	Mobilization	L.S.	9%	\$ 261.25	\$ 261.25
2-2	Type 7 Stormwater Channel Excavation	C.Y.	264	\$ 6.00	\$ 1,583.33
2-3	Spoils Removal	C.Y.	264	\$ 5.00	\$ 1,319.44
Construction Contingency			15%	\$ 474.60	\$ 474.60
Total Probable Construction Cost					\$ 3,638.63
2-4	Design Engineering	L.F.	7%	\$ 254.70	\$ 254.70
2-5	Construction Engineering	C.Y.	8%	\$ 291.09	\$ 291.09
2-6	Final Environmental Permitting	C.Y.	1%	\$ 36.39	\$ 36.39
Schedule 2 Total Bid Price					\$ 4,220.81
Watersheds 1 and 2 to Main City Basin					
3-1	Mobilization	L.S.	9%	\$ 32,460.10	\$ 32,460.10
3-2	Traffic Control	L.S.	7%	\$ 23,595.09	\$ 23,595.09
3-3	Type 9 Stormwater Channel Excavation	C.Y.	266	\$ 6.00	\$ 1,594.19
3-4	Spoils Removal	C.Y.	266	\$ 5.00	\$ 1,328.49
3-5	4'x8' Box Culvert	L.F.	80	\$ 1,100.00	\$ 88,000.00
3-6	4'x8' Box Culvert	L.F.	80	\$ 1,100.00	\$ 88,000.00
3-7	4'x8' Box Culvert	L.F.	60	\$ 1,100.00	\$ 66,000.00
3-8	Asphalt Removal	S.Y.	970	\$ 20.00	\$ 19,400.00
3-9	Asphalt Repair	S.Y.	970	\$ 75.00	\$ 72,750.00
Construction Contingency			15%	\$ 50,560.90	\$ 50,560.90
Total Probable Construction Cost					\$ 443,688.76
3-10	Design Engineering	L.S.	7%	\$ 31,058.21	\$ 31,058.21
3-11	Construction Engineering	L.S.	8%	\$ 35,495.10	\$ 35,495.10
3-12	Final Environmental Permitting	L.S.	1%	\$ 4,436.89	\$ 4,436.89
Schedule 3 Total Bid Price					\$ 514,678.96
Watersheds 3 and 4 to Main City Basin					
4-1	Mobilization	L.S.	9%	\$ 5,792.70	\$ 5,792.70
4-2	Traffic Control	L.S.	7%	\$ 4,505.43	\$ 4,505.43
4-3	Type 4 Stormwater Channel Excavation	C.Y.	1,547	\$ 6.00	\$ 9,280.00
4-4	Spoils Removal	C.Y.	1,547	\$ 5.00	\$ 7,733.33
4-5	30-Inch ADS Drain Pipe Culvert	L.F.	80	\$ 235.00	\$ 18,800.00
4-6	Asphalt Removal	S.Y.	90	\$ 20.00	\$ 1,800.00
4-7	Asphalt Repair	S.Y.	90	\$ 75.00	\$ 6,750.00
4-8	Utility Crossings	Each	4	\$ 5,000.00	\$ 20,000.00
Construction Contingency			15%	\$ 11,199.22	\$ 11,199.22
Total Probable Construction Cost					\$ 85,860.69
4-9	Design Engineering	L.S.	7%	\$ 6,010.25	\$ 6,010.25
4-10	Construction Engineering	L.S.	8%	\$ 6,868.85	\$ 6,868.85
4-11	Final Environmental Permitting	L.S.	1%	\$ 858.61	\$ 858.61
Schedule 4 Total Bid Price					\$ 99,598.40
Middle B Basin and Outfall Conveyance					
5-1	Mobilization	L.S.	9%	\$ 177,605.28	\$ 177,605.28
5-2	Exploratory Excavation	L.S.	7%	\$ 128,389.51	\$ 128,389.51
5-3	Upper Stormwater Basin Excavation	C.Y.	148,349	\$ 6.00	\$ 890,095.34
5-4	Middle B Stormwater Basin Compacted Embankment	C.Y.	134,863	\$ 7.00	\$ 944,040.51
5-5	Type 3 Channel Excavation	C.Y.	1,811	\$ 6.00	\$ 10,866.67

Length 980
 Volume 816.6667

1/2 channel area is already existing
 Length 475
 Volume 527.7778

2/3 volume of channel already excavated
 Length 473
 Volume 797.0926

2/3 of channel existing
 Length 1664
 Volume 410.8642
 1/3 of channel existing
 Length 2300
 Volume 1135.802
 800 88.89

basin 134862.9 CY 148349.2
 83.61 acre-ft
 length 3260

5-6	Spoils Removal	C.Y.	136,674	\$ 5.00	\$ 683,370.21	volume 1811.111
5-7	Outlet Structure (30" Outlet)	Each	1	\$ 50,000.00	\$ 50,000.00	
5-8	Geotechnical Report	L.S.	1	\$ 15,000.00	\$ 15,000.00	
Construction Contingency			15%	\$ 434,905.13	\$ 434,905.13	
Total Probable Construction Cost				\$ 3,334,272.64		
5-9	Design Engineering	L.S.	11%	\$ 366,769.99	\$ 366,769.99	
5-10	Construction Engineering	L.S.	11%	\$ 366,769.99	\$ 366,769.99	
5-11	Final Environmental Permitting	L.S.	5%	\$ 166,713.63	\$ 166,713.63	
Schedule 12 Total Bid Price				\$ 4,234,526.25		
Watershed 5 Along Canyon Road						
6-1	Mobilization	L.S.	9%	\$ 208,172.14	\$ 208,172.14	Length 5597 55,970 6,218.89
6-2	Traffic Control	L.S.	7%	\$ 151,319.31	\$ 151,319.31	
6-3	48-Inch ADS Drain Pipe	L.F.	5,597	\$ 280.00	\$ 1,567,160.00	
6-4	Asphalt Removal	S.Y.	6,219	\$ 20.00	\$ 124,377.78	
6-5	Asphalt Repair	S.Y.	6,219	\$ 75.00	\$ 466,416.67	
6-6	Temporary Construction Easement	Acre	2	\$ 2,500.00	\$ 3,750.00	
Construction Contingency			15%	\$ 378,179.38	\$ 378,179.38	
Total Probable Construction Cost				\$ 2,899,375.28		
6-7	Design Engineering	L.S.	7%	\$ 202,956.27	\$ 202,956.27	
6-8	Construction Engineering	L.S.	8%	\$ 231,950.02	\$ 231,950.02	
6-9	Final Environmental Permitting	L.S.	1%	\$ 28,993.75	\$ 28,993.75	
Schedule 5 Total Bid Price				\$ 3,363,275.32		
Watershed 5 Canyon Road to Hwy 36						
7-1	Mobilization	L.S.	9%	\$ 2,371.15	\$ 2,371.15	2/3 of channel existing Length 2994 Volume 5821.667
7-2	Type 10 Stormwater Channel Excavation	C.Y.	1,941	\$ 6.00	\$ 11,643.33	
7-3	Spoils Removal	C.Y.	1,941	\$ 5.00	\$ 9,702.78	
7-4	Temporary Construction Easement	Acre	2	\$ 2,500.00	\$ 5,000.00	
Construction Contingency			15%	\$ 4,307.59	\$ 4,307.59	
Total Probable Construction Cost				\$ 33,024.85		
7-5	Design Engineering	L.S.	7%	\$ 2,311.74	\$ 2,311.74	
7-6	Construction Engineering	L.S.	8%	\$ 2,641.99	\$ 2,641.99	
7-7	Final Environmental Permitting	L.S.	1%	\$ 330.25	\$ 330.25	
Schedule 6 Total Bid Price				\$ 38,308.83		
Watershed 6 Conveyance						
8-1	Mobilization	L.S.	9%	\$ 69,120.38	\$ 69,120.38	1/2 of channel existing Length 5876 Volume 7834.667
8-2	Traffic Control	L.S.	7%	\$ 50,243.27	\$ 50,243.27	
8-3	4'x10' Box Culvert (Under Railroad)	L.F.	120	\$ 1,800.00	\$ 216,000.00	
8-4	Type 11 Stormwater Channel Excavation	C.Y.	14,776	\$ 6.00	\$ 88,656.00	
8-5	Spoils Removal	C.Y.	14,776	\$ 5.00	\$ 73,880.00	
8-6	Temporary Construction Easement	Acre	3	\$ 2,500.00	\$ 7,500.00	
8-7	Railroad Easement	Acre	1	\$ 10,000.00	\$ 10,000.00	
8-8	4'x10' Box Culvert (Under HW 36)	L.F.	80	\$ 1,800.00	\$ 144,000.00	
8-9	4'x10' Box Culvert (Under I-80)	L.F.	80	\$ 1,800.00	\$ 144,000.00	
8-10	Asphalt Removal	S.Y.	355	\$ 20.00	\$ 7,100.00	
8-11	Asphalt Repair	S.Y.	355	\$ 75.00	\$ 26,625.00	
Construction Contingency			15%	\$ 125,568.70	\$ 125,568.70	
Total Probable Construction Cost				\$ 962,693.35		
8-12	Design Engineering	L.S.	7%	\$ 67,388.53	\$ 67,388.53	
8-13	Construction Engineering	L.S.	8%	\$ 77,015.47	\$ 77,015.47	
8-14	Final Environmental Permitting	L.S.	5%	\$ 48,134.67	\$ 48,134.67	
Schedule 7 Total Bid Price				\$ 1,155,232.02		
Watershed 5 and 6 Conveyance						
9-1	Mobilization	L.S.	9%	\$ 6,136.42	\$ 6,136.42	1/2 of channel existing Length 4970 Volume 10124.07
9-2	Type 12 Stormwater Channel Excavation	C.Y.	5,062	\$ 6.00	\$ 30,372.22	
9-3	Spoils Removal	C.Y.	5,062	\$ 5.00	\$ 25,310.19	
9-4	Temporary Construction Easement	Acre	5	\$ 2,500.00	\$ 12,500.00	
Construction Contingency			15%	\$ 10,227.36	\$ 10,227.36	
Total Probable Construction Cost				\$ 84,546.19		
9-5	Design Engineering	L.S.	7%	\$ 5,918.23	\$ 5,918.23	
9-6	Construction Engineering	L.S.	8%	\$ 6,763.69	\$ 6,763.69	
9-7	Final Environmental Permitting	L.S.	5%	\$ 4,227.31	\$ 4,227.31	
Schedule 8 Total Bid Price				\$ 101,455.42		
Main City Basin						
10-1	Mobilization	L.S.	9%	\$ 276,733.60	\$ 276,733.60	assume 51 ac-ft f is already excavated. volume 204893 CY 122935.8 127.026 acre-ft 76.02604
10-2	Traffic Control	L.S.	7%	\$ 201,156.30	\$ 201,156.30	
10-3	Exploraty Excavation	L.S.	3%	\$ 73,059.19	\$ 73,059.19	
10-4	Main City Stormwater Basin Excavation	C.Y.	122,936	\$ 6.00	\$ 737,614.80	
10-5	Spoils Removal	C.Y.	122,936	\$ 5.00	\$ 614,679.00	
10-6	Outlet Structure	Each	1	\$ 50,000.00	\$ 50,000.00	
10-7	Geotechnical Report	L.S.	1	\$ 15,000.00	\$ 15,000.00	

10-8	48-Inch ADS Drain Pipe	L.F.	2,385	\$	280.00	\$	667,800.00	Length	2385	
10-9	48-Inch ADS Drain Pipe Culvert (Under HW 36)	L.F.	80	\$	280.00	\$	22,400.00			
10-10	48-Inch ADS Drain Pipe Culvert (Under I-80)	L.F.	80	\$	280.00	\$	22,400.00			
10-11	Storm Drain Manhole	Each	6	\$	9,000.00	\$	53,662.50			
10-12	Asphalt Removal	S.Y.	2,650	\$	20.00	\$	53,000.00			
10-13	Asphalt Repair	S.Y.	2,650	\$	75.00	\$	198,750.00	23,850	2,650.00	
Construction Contingency			15%		\$	365,295.95	\$			365,295.95
			Total Probable Construction Cost			\$	3,351,551.33			
10-14	Design Engineering	L.S.	7%	\$	234,608.59	\$	234,608.59			
10-15	Construction Engineering	L.S.	8%	\$	268,124.11	\$	268,124.11			
10-16	Final Environmental Permitting	L.S.	1%	\$	33,515.51	\$	33,515.51			
				Schedule 9 Total Bid Price		\$	3,887,799.54			
Lower Basin										
11-1	Mobilization	L.S.	9%	\$	466,783.40	\$	466,783.40	basin	354359 CY	
11-2	Exploratory Excavation	L.S.	7%	\$	337,349.77	\$	337,349.77			
11-3	Upper Stormwater Basin Excavation	C.Y.	389,795	\$	6.00	\$	2,338,769.40			
11-4	Middle B Stormwater Basin Compacted Embankment	C.Y.	354,359	\$	7.00	\$	2,480,513.00			
11-5	Type 5 Channel Excavation	C.Y.	4,975	\$	6.00	\$	29,850.00			
11-6	Spoils Removal	C.Y.	359,334	\$	5.00	\$	1,796,670.00	length volume	5970 4975	
11-7	Outlet Structure (30" Outlet)	Each	1	\$	50,000.00	\$	50,000.00			
11-8	Geotechnical Report	L.S.	1	\$	15,000.00	\$	15,000.00			
Construction Contingency			15%		\$	1,127,240.33	\$			1,127,240.33
			Total Probable Construction Cost			\$	8,642,175.90			
11-9	Design Engineering	L.S.	11%	\$	950,639.35	\$	950,639.35			
11-10	Construction Engineering	L.S.	11%	\$	950,639.35	\$	950,639.35			
11-11	Final Environmental Permitting	L.S.	5%	\$	432,108.79	\$	432,108.79			
				Schedule 13 Total Bid Price		\$	10,975,563.39			
				Total Project Price		\$	24,489,505.95			

In providing estimates of probable construction cost, the Client understands that the Consultant has no control over the cost or availability of labor, equipment or materials, or over market conditions or the Contractor's method of pricing, and that the Consultant's estimates of probable construction costs are made on the basis of the consultant's professional judgement and experience. The Consultant makes no warranty, express or

APPENDIX F. LAKE POINT STORM WATER DESIGN STANDARD RECOMENDATIONS



Jones & DeMille
Engineering

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The following memorandum contains the subdivision ordinance that was adopted by Lake Point City January 10, 2024. This has been reviewed in connection with the storm drain masterplan. Suggested changes are shown in red.

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Richfield, UT 84701
435.896.8266

50 South Main, Suite 4
Manti, UT 84642
435.835.4540

38 West 100 North
Vernal, UT 84078
435.781.1988

1675 South Highway 10
Price, UT 84501
435.637.8266

520 West Highway 40
Roosevelt, UT 84066
435.722.8267

775 West 1200 North
Suite 200A
Springville, UT 84663
801.692.0219

1664 South Dixie Drive
Building G
St. George, UT 84770
435.986.3622

7 South Main Street
Suite 107/109
Tooele, UT 84074
435.268.8089

696 North Main Street
PO Box 577
Monticello, UT 84535
435.587.9100

545 East Cheyenne Drive
Suite C
Evanston, WY 82930
307.288.2005



**Jones & DeMille
Engineering**

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MEMORANDUM

DATE: January 9, 2024
TO: Lake Point City
FROM: Jones and DeMille Engineering
PROJECT: Lake Point Stormwater Drainage Design Criteria
PROJECT NO: 2301-058
RE: Stormwater Drainage Design Criteria

Introduction

The following design standards apply to the design of all stormwater and floodplain improvements for areas within Lake Point City (the City). All hydrologic and hydraulic evaluations and designs for a proposed commercial or industrial site or multi-house development shall be performed in accordance with sound and accepted engineering practices by a professional engineer, licensed in the State of Utah and qualified to perform such work. The overarching objective of this guidance is to:

- Eliminate increased peak runoff which naturally occurs with development due to an increase in impervious surfaces (i.e., do not increase downstream flows from pre-development or existing/natural conditions).
- Implement site-specific solutions for conveyance and detention/retention as required to maintain pre-development flows, thus not creating downstream flooding issues.
- Formalize the process for the design and review of stormwater calculations, designs, etc. between developers and the City.

To this end, the stormwater system design guidelines are provided as outlined below:

1. General Design Criteria
2. Methodology
3. **Low Impact Development Guidelines**
4. Conveyance Facilities
5. Storage Facilities
6. Other Related Permits
7. Drainage Report

1. General Design Criteria

- The overall storm drainage system must be designed to ensure the downstream total peak flowrate does not increase with additional runoff created by the proposed site or development; or in other words, the downstream post-development peak flowrate must be equal to or less

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than the downstream pre-development peak flowrate for the 10-year 24-hour and 100-year 24-hour storm events.

- The capacity of downstream infrastructure should be considered. If the downstream conveyance capacity is insufficient, the developer should work with the City to develop a design that reduces flows sufficient to meet downstream capacities (possibly reducing flows less than the pre-development conditions).
- The stormwater drainage analysis and proposed system should consider on-site and off-site flows. This includes drainage areas upstream of the project site, which drain onto and through the project site. Conveyance and/or storage facilities should be sized to accommodate predicted site drainage as well as historic off-site drainage. Storage facilities do not need to store or retain off-site drainage but must be able to safely pass off-site drainage without affecting the storage of on-site drainage.
- Components of the storm drainage system shall be sized based on the design frequency in the table below:

Facility Type	Design Storm	Description
Minor Conveyance	10-year	Facilities which convey on-site flows only, such as culverts, drainage swales, pipelines, channels. Minor conveyance facilities drain to major conveyance and storage facilities.
Major Conveyance	100-year	Facilities which convey off-site and on-site flows (mixed water) including culverts, pipelines, and channels.
Storage Facilities	100-year	All storage facilities are to be designed for the 100-year storm even if they only store on-site flows. Storage facilities are not required to store or retain off-site drainage as long as the storage facility discharge does not exceed pre-development levels.

- Existing commercial, industrial or residential properties may be evaluated on an individual basis if improvements required by these guidelines would adversely impacting neighboring properties.

2. Methodology

- Hydrology calculations which require the peak flowrate and volume shall follow the SCS method as outlined in the NRCS National Engineering Handbook.
- The rational method can be used if only the peak flowrate is needed (only conveyance features are required such as culverts and channels).
- Precipitation data shall be obtained from NOAA Atlas 14.
- A minimum time of concentration of 5 minutes shall be used.



3. Low Impact Development Guidelines

Typical storm drain design consists of collect and convey systems to route runoff through and away from developed areas. Low Impact Development (LID) practices utilize storm drain infrastructure to collect, clean, and infiltrate runoff. There are many benefits to LID practices including reducing downstream discharge, groundwater recharge, reduced pollutants, and infrastructure cost savings.

All new developments implement LID design practices to the greatest extent possible, where feasible. “A Guide to Low Impact Development within Utah” which was published by the Utah Department of Environmental Quality should be used as a resource to design LID techniques within new development areas. This manual as well as other LID design resources can be downloaded from the following website.

<https://deq.utah.gov/water-quality/low-impact-development>

All site and subdivision designs shall control the peak flow rates of storm water discharge associated with design storms specified in this chapter and reduce the generation of post-construction storm water runoff volumes and water quality to pre-construction levels. These practices should seek to utilize pervious areas for storm water treatment and to infiltrate storm water runoff from driveways, sidewalks, rooftops, parking lots, and landscaped areas to the maximum extent practical to provide treatment for both water quality and quantity. Other LID methods are also encouraged.

The 80th percentile storm volume shall be retained on site. Areas with high groundwater or poor soil may be exempt from this requirement due to poor infiltration rates. Evidence supporting claims of poor infiltration such as soils testing or infiltration testing shall be submitted for developments where retention of the 80th percentile storm is unfeasible.

Field testing with a single ring infiltrometer is required to confirm adequate infiltration in all basins where infiltration will be used. A supporting report shall be stamped by a licensed geotechnical engineer and submitted as part of the drainage report.

4. Conveyance Facilities

All conveyance facilities should be designed to carry the design storms listed in the General Design Criteria section. Special criteria for conveyance facilities are as follows:

- The minimum size of all culverts and storm drainage pipe diameter is 18 inches to allow for maintenance such as cleaning. This includes driveway culverts.
- All culverts are to be constructed with an intake apron, for City maintained culverts (under city roadways) a trash grate is required.
- Main drain lines connecting manholes are to be reinforced concrete pipe class III.
- Conveyance systems should be evaluated for scour and erosion.
- **Piped** conveyance systems should be designed to maintain **minimum** velocities ~~between of 2 and 5~~ feet per second, ~~if possible~~, to allow for flushing of debris and sediment ~~and avoid scour~~



~~and erosion.~~ Open channel conveyance systems should be designed to not exceed a peak velocity of 5 feet per second to avoid scour and erosion. Special cases not meeting this requirement must be approved by the city.

- Manholes are required every 400 feet for storm drainage pipelines, and at changes in grade or direction.
- ~~Minimum manhole interior diameter is four (4) foot for manholes with one inlet and one outlet pipe. Manholes with two or more inlet pipes and one outlet pipe shall be a minimum of five (5) foot in diameter~~
- Minimum manhole diameters shall follow the following minimum requirements:
 - Four (4) foot minimum manhole diameter for main lines less than 18 inches in diameter
 - Five (5) foot minimum manhole diameter for main lines 18" to 30" in diameter.
 - Six (6) foot minimum manhole diameter for main lines greater than 30" in diameter
 - The minimum structural leg width (6" minimum) between pipe core holes must be maintained when multiple pipes intersect a manhole.
- Use of curb and gutter is prohibited unless approved by the City. Drainage swales within street right-of-way are required for roadside drainage. Swales must be sized to convey the site conditions, having a minimum of 18-inch depth with max side slope of 2:1 (See Lake Point Standard Detail SD-02 – Swale Detail).
- Preserve and protect natural flood water conveyance corridors and channels in easements dedicated to the City and with improvements where necessary.
- Drainage ways that allow infiltration in minor storm events are encouraged.

5. Storage Facilities

All storage facilities should be designed based on the design storms listed in the General Design Criteria section. Storage facilities can be either retention (stores 100% of flow with no release) or detention (temporarily stores flows and releases at controlled rate) facilities. Special criteria for storage facilities are as follows:

- Post-developed discharge rates shall not exceed pre-developed discharge rates for the 10-year and 100-year storms. Check both storms and design/size detention pond outlet structures accordingly. ~~In no case shall the storm drain discharge from a development or site exceed 0.20 cfs/acre for on-site runoff. LID practices as described in Section 3 above shall be implemented.~~
- Retention ponds must be sized to capture and contain the entire 100-year event.
- For detention basins, the entire 100-year storm shall be routed through the principal outlet without activating the emergency spillway. This is typically accomplished with a grate at the top of the outlet structure. The routed 100-year water surface is typically set at the emergency spillway crest elevation.
- All storage facilities shall be designed to completely drain within 3 days of the end of a storm event (retention facilities must be designed to infiltrate in this time, field testing with a single ring infiltrometer is required to confirm adequate infiltration).
- Detention basin principal outlet pipes shall be at least 18-inches in diameter to minimize the chance of clogging and to facilitate cleaning. Orifice plates are to be used on the upstream end



of the principal outlet pipe to reduce the maximum release flowrate and must be inside a storm drain box to facilitate cleaning.

- Emergency spillways shall be designed to safely pass the 100-year storm, without endangering life or property downstream, assuming the principal spillway outlet is not functioning.
- A minimum of 1 foot of freeboard above the emergency spillway design water surface elevation is required (routed 100-year storm assuming principal spillway outlet is clogged).
- The invert or lowest point of a storage basin must be 12-inches above groundwater levels.
- All storage facility slopes shall have a maximum slope of 3:1 and must be stabilized with rock or planted vegetation to prevent erosion.
- No part of the bottom of the basin shall have a slope of less than 3% sloped toward the outlet. Within 10-feet of the outlet, the slope of the basin bottom must not be flatter than 5% unless a concrete apron is constructed around the outlet. **In this case, the minimum slope for the concrete apron shall be 0.50%.**
- Storage basins should be designed with a maximum water depth of 3 feet. Deeper basin may be permitted as approved by the city but will require at minimum a two-rail perimeter fence.
- Underground systems are not allowed in drinking water source protection zones.
- Underground systems shall provide adequate access for cleaning and maintenance.
- If the detention basin is classified as a dam, the facility shall also comply with prevailing dam safety standards as outlined by the Utah State Dam Safety and the Utah Division of Water Rights. See applicable design standards to determine if the pond should be classified as a dam.

6. Other Related Permits

Other permits may be required for the proposed development. These permits should be considered as part of the proposed drainage system and be referenced in the documentation. Applicable permits may include:

- Stream Alteration Permit
- Floodplain Development Permit (if in FEMA designated floodplain)
- Small Dam Application (assuming pond is classified as a dam per Utah Dam Safety)

This list is not exhaustive. Additional permitting may be identified and required during the approval process.

7. Drainage Report

All proposed developments are required to submit a drainage report for the Cities review and approval. The report is to include enough detail to provide assurance that the development will control stormwater drainage in a safe manner, and not pose a flood risk to residents downstream or within the development. The following information is required at a minimum:

- Drainage Report Outline
 - Introduction



- References
- General property description
 - Include known flooding issues
- Off-site and on-site drainage description
 - Include relevant downstream conveyance facilities
- Design runoff computations
 - Map of drainage basins delineated
 - Precipitation
 - Land cover and soil conditions
 - Runoff curve number and/or rational method coefficient
 - Time of concentration
 - Hydrology model results for all drainage basins comparing pre-development and post-development peak flows and volumes, considering on-site and off-site areas
- Design of drainage facilities
 - All hydraulic and hydrologic calculations used to design conveyance facilities
 - All hydraulic and hydrologic calculations used to design storage facilities
 - Operation and maintenance considerations
 - LID design summary and/or limiting factors including retention basin drain times
- Other related permits
 - Indicate implications to streams, wetlands, FEMA designated floodplains, if ponds should be classified as a dam, etc. – and indicate if permitting is needed (e.g., stream alteration permit, Floodplain Development Permit, Small Dam Application, etc.)
- Statement of compliance
 - Include stamp by professional engineer
- Appendix
 - Modeling results, hydrographs, tables, etc.
 - Maps of drainage basin characteristics, existing and proposed contours, including drainage basin delineation, land cover, soils, drainage paths, etc.
 - FEMA floodplain maps, if applicable

