LEE'S SUMMIT DOWNTOWN MARKET PRELIMINARY DEVLEOPMENT PLAN DRAINAGE STUDY

Lee's Summit, Missouri

Prepared for:

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Submitted August 2023
Revised September 2023

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1. GENERAL INFORMATION

The Lee's Summit Downtown Market is a proposed commercial development on approximately 6 acres. The project is located in the downtown area of Lee's Summit, MO located east of City Hall. The project lies in the southwest 1/4 of Section 5, Township 47N, Range 31W, in Lee's Summit, Jackson County, Missouri.

1.1. Project Location

The Lee's Summit Downtown Market development is located entirely in the city of Lee's Summit, Missouri. The area to be developed is bounded by City Hall and Douglas Street to the West, SE 2nd St to the North, SE Johnson Street to the East, SE 3rd Street to the South. The site discharges stormwater to the northeast, through public storm sewer, into a drainage ditch, ultimately discharging into Lake Jacomo.

Figure 1. Lee's Summit Downtown Market Location Map.

1.2. Federal Emergency Management Agency Floodplain Classification

FEMA Flood Boundary and Floodway Map Community Panel Number 29095C0436G classifies the Lee's Summit Downtown Market property as a "Zone X Unshaded" Area. This is the FEMA flood insurance rate zone that corresponds to areas outside the 0.2% annual chance floodplain. No Base Flood Elevations or depths are shown within this zone. Refer to Appendix E for the FIRM Map.

1.3. Soil Classifications

Soil maps published on the Natural Resources Conservation Service (NRCS) Web Soil Survey categorize soils on the Lee's Summit Downtown Market as shown in Table 1. Refer to Appendix D for a map of soils on the property.

Table 1. Soil Classifications

HSG	Symbol	Name	Slope
C	10082	Arisburg-Urban land complex	1-5%
D	10128	Sharpsburg-Urban land complex	2-5%
C	10180	Udarents-Urban land-Sampsel complex	2-5%
C	10181	Udarents-Urban land-Sampsel complex	5-9%
D	99012	Urban land	5-9%

2. METHODOLOGY

The storm drainage study will be analyzed in accordance with the February 15, 2006 edition of the Kansas City Metropolitan Chapter, American Public Works Association, (KCAPWA) Construction and Material Specifications, Section 5601.5.A.4.

The Existing Conditions hydrology will be evaluated in Section 3, and Proposed Conditions hydrology will be computed in Section 4. The Proposed Conditions discharge data for each stage of development will be compared to the Existing Conditions results; variations in quantity and rate of stormwater discharge between these models will represent the hydrologic impact generated by the proposed development. The overall stormwater management plan will be designed utilizing this information. Section 3 assumes current land use within the tributary sub-watersheds, and pre-development conditions within the project boundary. Section 4 assumes completion of the entire development. The program used is Autodesk Storm & Sanitary Analysis 2022 (SSA).

The following methods were used in this study to model Existing, Proposed (Micro) and Future (Macro) Conditions in for stormwater runoff:

- NRCS TR-55 Unit Hydrograph Method
- 1-,10-, and 100-year Return Frequency, 24-hr. Storm Precip. Depths (TP-40)
- ARC Type II Soil Moisture Conditions
- 24-Hour NRCS Type II Rainfall Distribution
- Runoff Curve Numbers per NRCS TR-55 (Tables 2-2a - 2-2c) and KCAPWA Section 5602.3
- NRCS TR-55 Methods for determination of Time of Concentration and Travel Time.
  NOTE: SSA models use "Time of Concentration" rather than "Lag Time" for computing subarea hydrology.

City code follows the February 16, 2011 version of APWA 5600, requiring comprehensive control to reduce flows to maximum allowable release rates. However, after conversations with the city, reaching maximum allowable release rates will cause an undue burden on the project, and a goal has been set of reducing post-development flows to pre-development rates.

Stormwater runoff models were created for the 1%, 10%, and 100% design storm events. The precipitation depths used in the analyses have been interpolated from the NOAA Atlas 14, Volume 8, Ver. The following Table 2 summarizes the rainfall depths used in this analysis:

Table 2. Precipitation Depths.

Return Period	24-Hour Precipitation Depth (in.)
Water Quality Volume	1.37
1-Year (100% Storm)	3.10
2-Year (50% Storm)	3.71
10-Year (10% Storm)	5.67
100-Year (1% Storm)	9.25

3. EXISTING CONDITIONS

To quantify the effects of development of this project, the following area and point of interest has been used for Existing and Proposed Conditions analyses. See Exhibit 301 in Appendix A, Existing Conditions Drainage Area Map.

Watershed A is the watershed from the entire site. The Downtown Market site has an existing box culvert travelling through the site that receives water from the entire watershed area, approximately 133 acres. 100% of the site discharges into the box culvert. The entirety of the watershed was analyzed in a previous storm study. For the purpose of this study, only the on-site area will be analyzed for impacts from proposed developments. The entire site flows into multiple inlets, which ultimately discharge into the storm box culvert. Thus, a single point is chosen as the outfall, which is location where all flows from the site have discharged into the box.

The following table summarizes the results of the Existing Conditions analysis. The Proposed Conditions data will be compared to these results in Section 4 of this report. Refer to Appendix C for output from and a schematic of the Existing Conditions model.

Curve Numbers (CN) were assumed as follows:

Cover Type	Soil Type	CN Value
Single-Family Residential	C	83
	D	87
Urban Commercial	C	94
	D	95
Multi-Family Residential	C	90
Impervious Pavement	Any	98
Turf	D	84

Table 3-1. Lee's Summit Downtown Market – Existing Conditions Subarea

The following tables summarize the results of the Existing Conditions analysis. With the prevalence of public storm sewer inlets around the site along with the majority of the site being impervious, a time of concentration (Tc) of 5 minutes is chosen.

Table 3-2. Lee's Summit Downtown Market – Existing Conditions Subarea

Subarea	Area (acres)	T_C (minutes)	Weighted Curve Number
A	6.43	5	93.49

Table 3-3 Lee's Summit Downtown Market – Existing Conditions Subarea Results

Subarea	Q_1 (cfs)	V_{R-1} (ac-ft)	Q_2 (cfs)	V_{R-2} (ac-ft)	Q_{10} (cfs)	V_{R-10} (ac-ft)	Q_{100} (cfs)	V_{R-100} (ac-ft)
A-1	23.44	1.285	28.86	1.602	46.07	2.633	77.03	4.537

* cfs – cubic feet per second

4. PROPOSED CONDITIONS

This section of analysis assumes completion of the Lee's Summit Downtown Market site. The mixed-use site includes construction of a multi-story apartment complex, open-air market area, commercial buildings, and associated parking and utilities.

4.1. PROPOSED CONDITIONS

The proposed development will result in no changes in overall tributary areas on the site. The development to occur on the site will increase the amount of impervious surface on the site. As a result of the increase in impervious surfaces, the CN value is increased, and thus the peak flows onsite are increased. To mitigate the increase in flows, detention must be installed on site. Due to the small site area and the lack of open space, an above ground detention basin will be infeasible, and underground detention in the form of isolator rows are proposed. To accurately model this, the area has been divided into three subareas, labeled **A_Detained** and **A_Undetained** in Proposed Drainage Area Map EX-302 (See Appendix A.) **A_Undetained** represents the area that will not enter the isolator row system, while **Canopy and Pad Site 2** represents the area that will be picked up by roof drains from the canopy and Pad Site 2, while **Farmer's Market** represents the area that will be picked up by roof drains on the Farmer's Market building. **Canopy and Pad Site 2** and **Farmer's Market** areas will both be treated by Isolator Rows.

The following tables summarize the results of the Proposed Conditions analysis for the revised subareas within Watershed A. Tables 4-2 and 4-3 assume no detention is provided, to demonstrate the effects of development in this watershed. Refer to Appendix C for outputs from the Proposed Conditions SSA model.

Table 4-1. Lee's Summit Downtown Market –Proposed Conditions Subarea Data

Subarea	Area (acres)	T_C (minutes)	Weighted Curve Number
A_Undetained	5.72	5	95.26
Farmers Market	0.306	5	98
Canopy and Pad Site 2	0.40	5	98

Table 4-2 Lee's Summit Downtown Market –Proposed (No Detention) Conditions Subarea Results

Subarea	Q_1 (cfs)	V_{R-1} (ac-ft)	Q_2 (cfs)	V_{R-2} (ac-ft)	Q_{10} (cfs)	V_{R-10} (ac-ft)	Q_{100} (cfs)	V_{R-100} (ac-ft)
A_Undetained	21.87	1.227	36.63	1.513	41.76	2.438	69.08	4.138
Farmer's Market	1.24	0.069	1.49	0.088	2.29	0.139	3.74	0.231
Canopy and Pad Site 2	1.62	0.091	1.95	0.117	3.00	0.182	4.91	0.303

Table 4-3 Lee's Summit Downtown Market –Proposed (No Detention) Conditions Outfall Results

Outfall	Q_1 (cfs)	V_{R-1} (ac-ft)	Q_2 (cfs)	V_{R-2} (ac-ft)	Q_{10} (cfs)	V_{R-10} (ac-ft)	Q_{100} (cfs)	V_{R-100} (ac-ft)
A	24.69	1.398	30.02	1.720	46.99	2.76	77.69	4.672

The following table compares the results of the Proposed Conditions analysis to the Existing Conditions from Section 3 at Outfall A. Positive values indicate an increase from Existing to Proposed conditions, while negative values indicate a decrease.

Table 4-4. Lee's Summit Downtown Market –Proposed (No Detention) vs. Existing Conditions Point of Interest Comparison

Point of Interest	Q_1 (cfs)	V_{R-1} (ac-ft)	Q_2 (cfs)	V_{R-2} (ac-ft)	Q_{10} (cfs)	V_{R-10} (ac-ft)	Q_{100} (cfs)	V_{R-100} (ac-ft)
Outfall A	+1.25	+1.113	+1.16	+1.118	+0.92	+0.127	+0.66	+0.135

As can be seen in the previous table, the flows increase with no detention. To mitigate the increases shown in the previous table, detention will be provided within the previously undeveloped area, to be constructed as part of the private development. Detention is intended to be constructed via underground isolator rows that will treat flows from the proposed developed site. Drainage areas for the proposed isolator rows can be found in Exhibit EX-302. To account for the increased flows on site, two systems of ADS MC3500 chambers are proposed to reduce the increase of stormwater flow to pre-development levels. The chambers will be restricted by a weir plate set in a junction box to restrict flows into the chamber system.

The table below shows results for the proposed isolator rows.

Table 4-5. Lee's Summit Downtown Market – Proposed Conditions Detention Flow and Volume Results

Storm Event	Peak Q In (cfs)	TP In (hr)	Peak Q Out (cfs)	TP Out (hr)	Peak W.S.E. (ft)	Stored Volume (ac-ft)
Farmer's Market System (10 Chambers)						
1-Year	1.24	11.93	0.86	11.98	1003.05	0.005
2-Year	1.49	11.93	0.99	11.98	1003.32	0.019
10-Year	2.28	11.93	1.38	11.98	1004.37	0.029
100-Year	3.74	11.93	3.39	111.97	1005.99	0.040
Canopy and Pad Site 2 (6 Chambers)						
1-Year	1.62	11.93	0.78	11.98	1005.59	0.003
2-Year	1.95	11.93	0.79	11.98	1005.68	0.022
10-Year	3.00	11.93	3.00	11.94	1005.80	0.023
100-Year	4.96	11.93	4.93	11.94	1005.96	0.024

The following table shows the results of the points of interest that are impacted by the constructed detention chambers.

Table 4-6. Lee's Summit Downtown Market –Proposed (With Detention) Conditions Point of Interest Results

Outfall	Q_1 (cfs)	V_{R-1} (ac-ft)	Q_2 (cfs)	V_{R-2} (ac-ft)	Q_{10} (cfs)	V_{R-10} (ac-ft)	Q_{100} (cfs)	V_{R-100} (ac-ft)
A	23.23	1.381	28.18	1.703	42.01	2.743	75.54	4.655

The following table compares the results of the Proposed Conditions analysis with the detention described above to the Existing Conditions from Section 3.

Table 4-7. Lee's Summit Downtown Market –Proposed (With Detention) vs. Existing Conditions Point Data

Subarea	Q_1 (cfs)	V_{R-1} (ac-ft)	Q_2 (cfs)	V_{R-10} (ac-ft)	Q_{10} (cfs)	V_{R-10} (ac-ft)	Q_{100} (cfs)	V_{R-100} (ac-ft)
Existing	23.44	1.285	28.86	1.602	46.07	2.633	77.03	4.537
Proposed	23.23	1.381	28.18	1.703	45.83	2.743	75.54	4.655
Difference	-0.21	+0.096	-0.68	+0.101	-0.24	+0.110	-1.49	+0.118

As shown in the table above, the proposed underground isolator systems reduce flows in the 1-, 2-, 10- and 100-year storms to below pre-development conditions at Outfall A.

5. RESULTS

As shown in the discussion and tables in the previous sections, the proposed underground detention system adequately reduces the peak stormwater rates and do not negatively impact downstream areas. Table 6-1 below, summarizes the Proposed Conditions results and compares them with Existing conditions.

Table 5-1 Lee's Summit Downtown Market –Points of Interest Discharge Comparison

Outfall	Condition	Q_1 (cfs)	Q_2 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
Outfall A	Existing	23.44	28.86	46.07	77.03
	Proposed	23.23	28.18	45.83	75.54
	Difference	**-0.21**	**-0.68**	**-0.24**	**-1.49**

6. CONCLUSION

This Preliminary Development Plan Stormwater Drainage Study has been prepared for the proposed project to establish a comprehensive stormwater management plan for the site. The results of this analysis demonstrate that the proposed stormwater management plan for the project achieves compliance the stated goal of reducing peak flows for the 1-year, 2-year, 10-year and 100 year storm events to below the existing peak flow rates. As mentioned in Section 2, a waiver is requested to achieve pre-vs-post reduction, without achieving allowable rates, per APWA 2011. Based on information received, Olsson requests that this stormwater drainage report be approved.

APPENDIX A

Exhibits

LAND COVER LEGEND		
	TREATMENT	AREA (AC.)
	OPEN TURF	1.61
	IMPERVIOUS	4.82

N

0’ 50’ 100’
SCALE IN FEET

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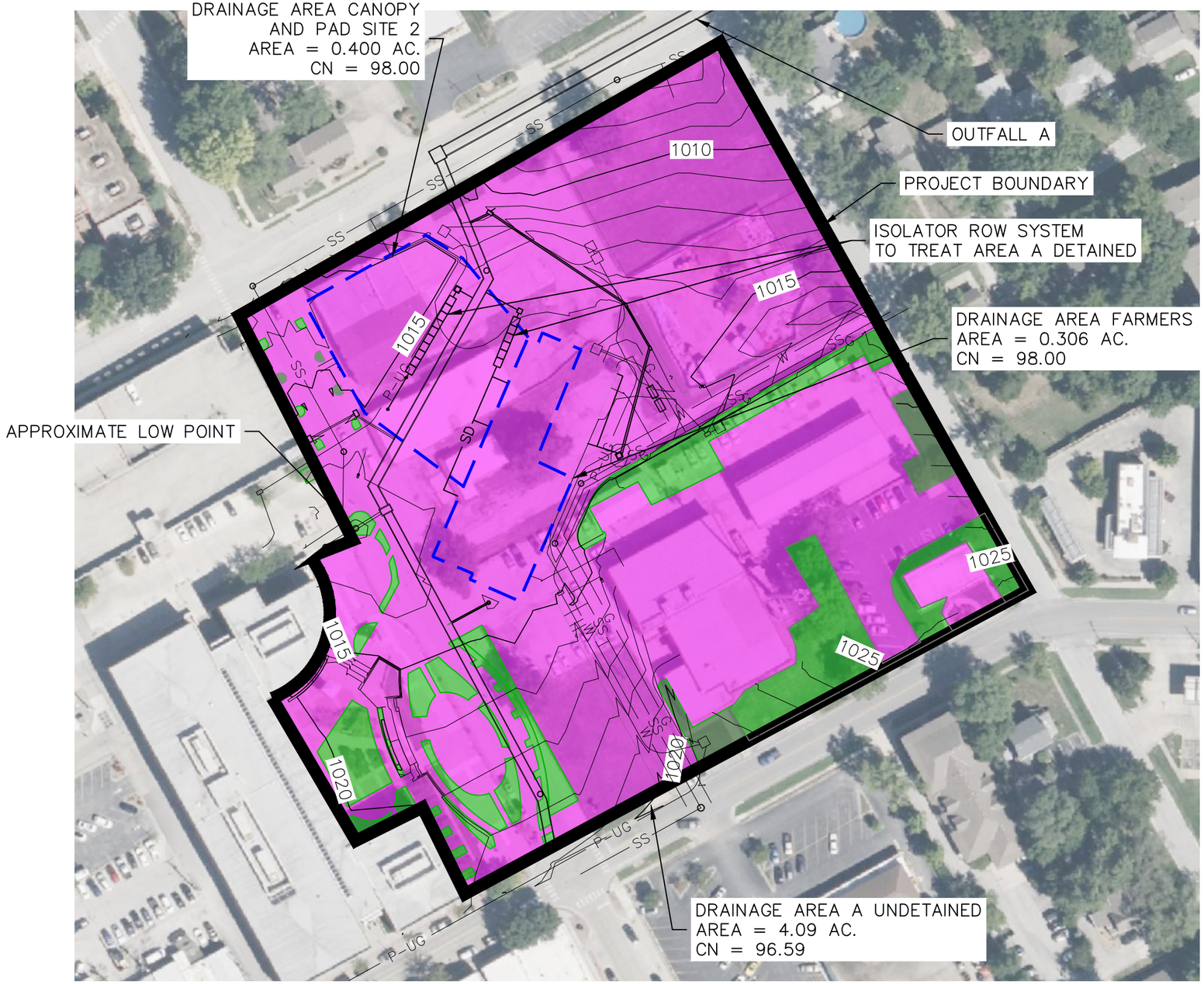
OLSSON - CIVIL ENGINEERING
MISSOURI CERTIFICATE OF AUTHORITY #

PROJECT NO: 022-03930	EXISTING CONDITIONS DRAINAGE AREA MAP	olsson 1301 Burlington Street North Kansas City, MO 64116 TEL 816.361.1177	EXHIBIT EX-301
DRAWN BY: DFG			
DATE: 08/23/2023			



LAND COVER LEGEND		
	TREATMENT	AREA (AC.)
	OPEN TURF	0.87
	IMPERVIOUS	5.56

DENOTES BOUNDARY OF FLOWS TO ISOLATOR ROWS

N

0’ 50’ 100’

SCALE IN FEET

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OLSSON - CIVIL ENGINEERING
MISSOURI CERTIFICATE OF AUTHORITY #

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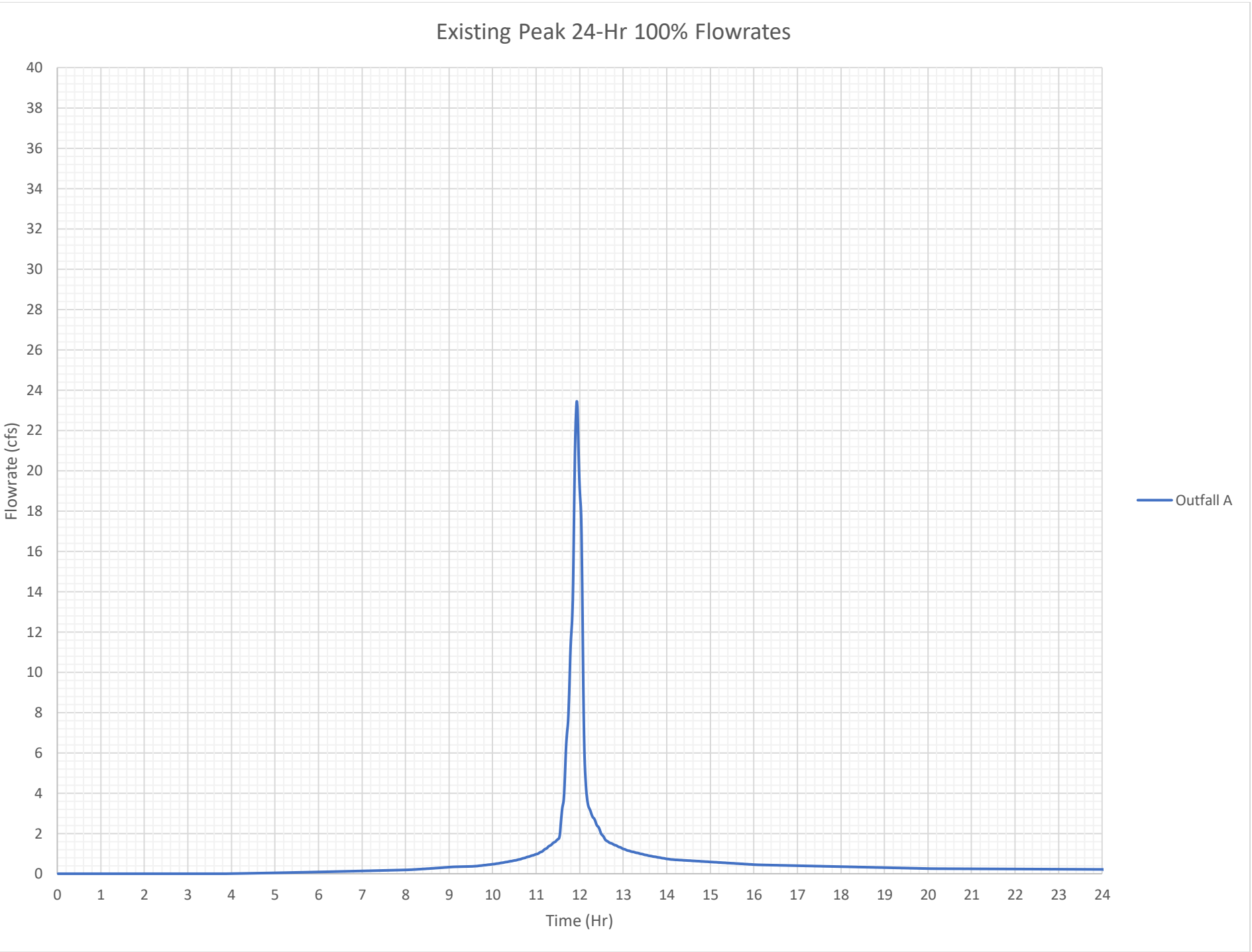
APPENDIX B

Hydrographs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Time (Hr)
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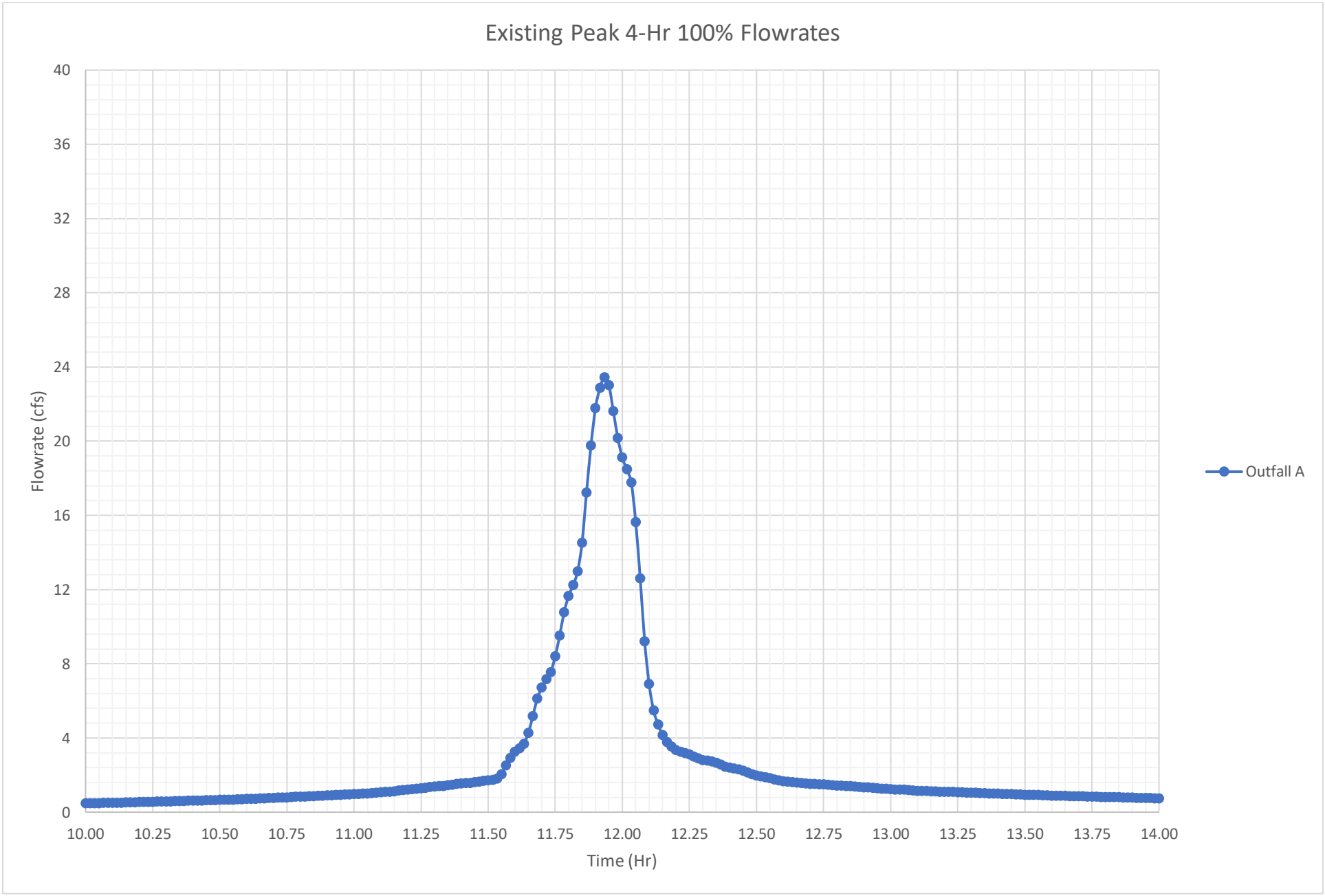
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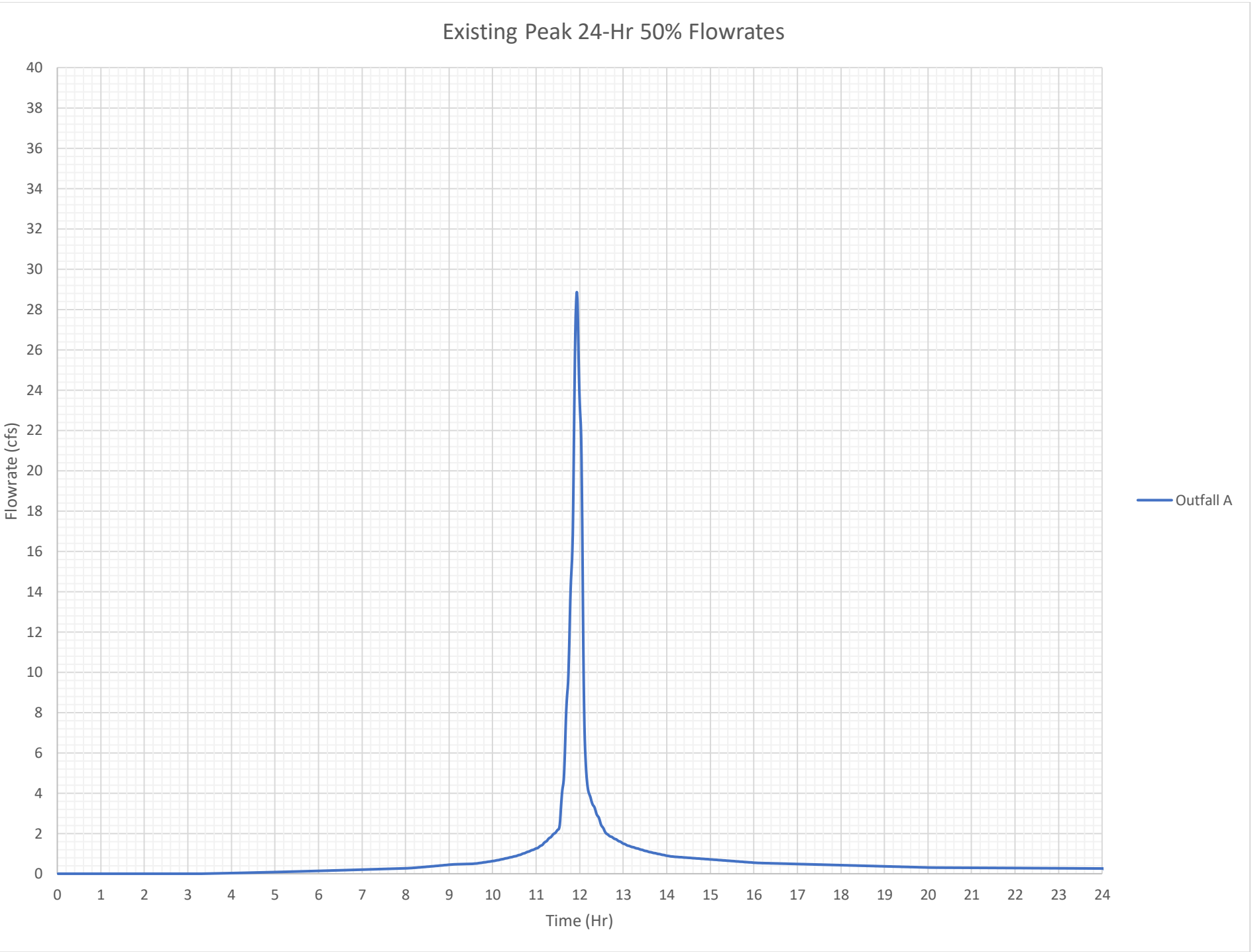
Time (Hr)
Outfall A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Flowrate (cfs)
Time (Hr)
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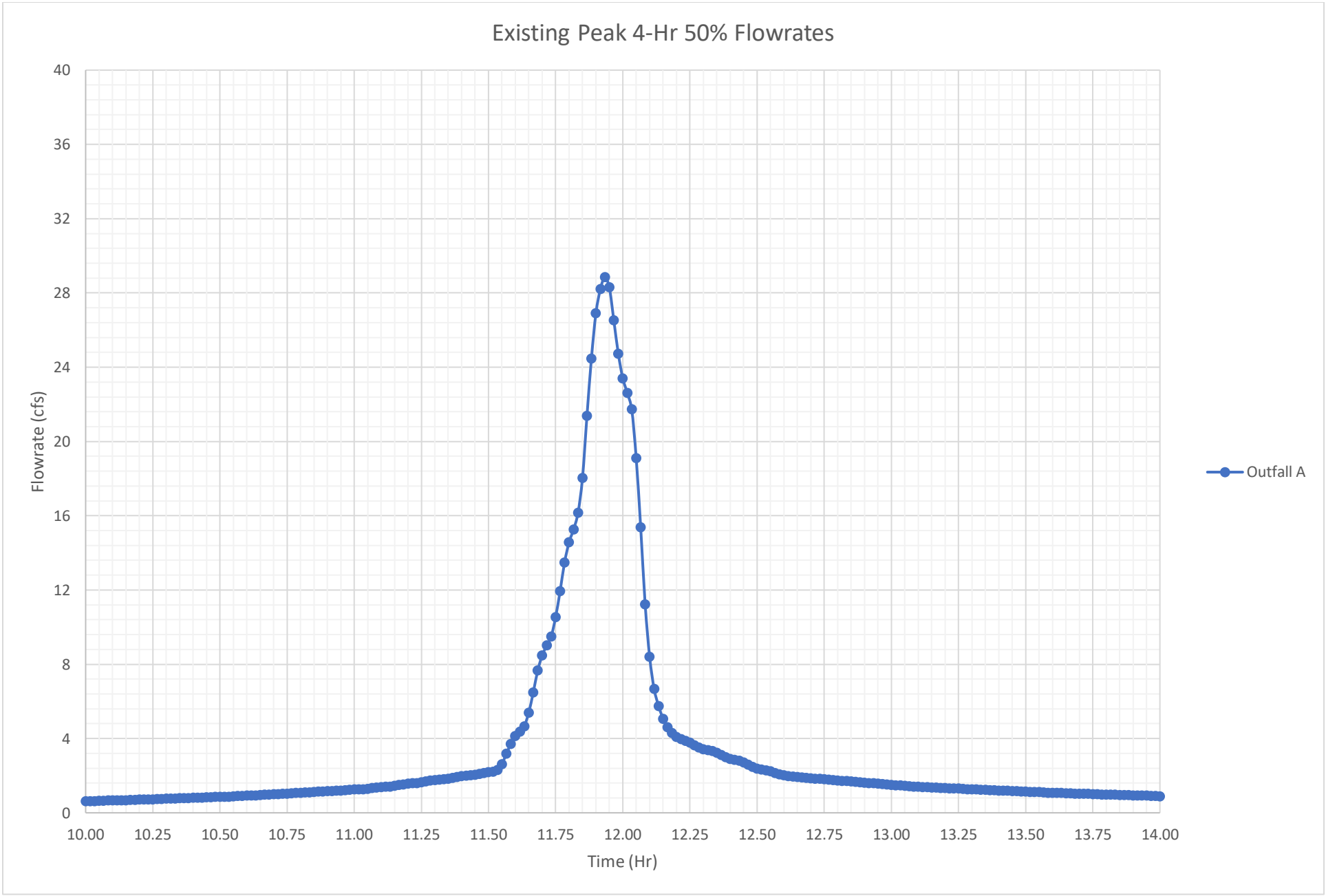
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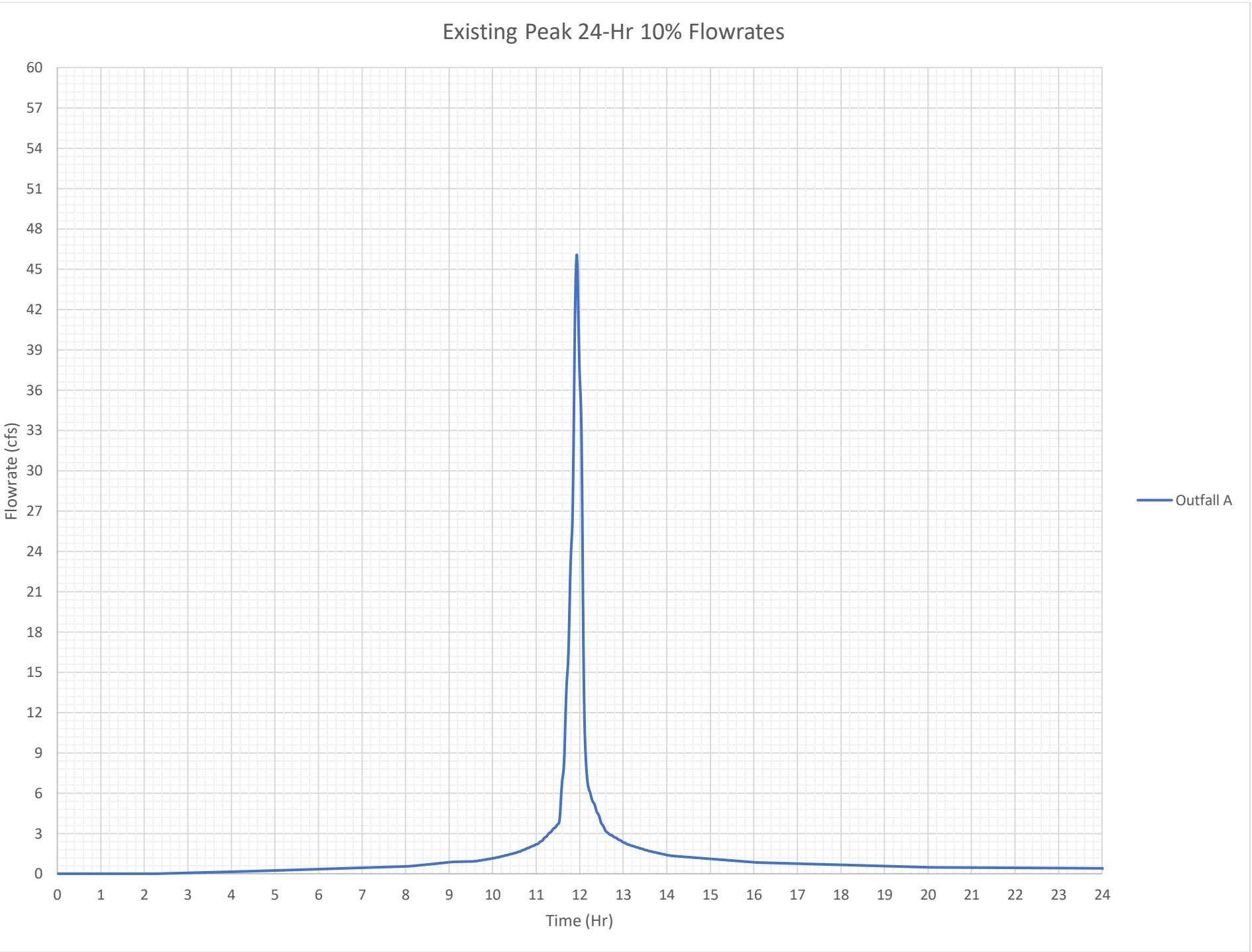
Time (Hr)
Outfall A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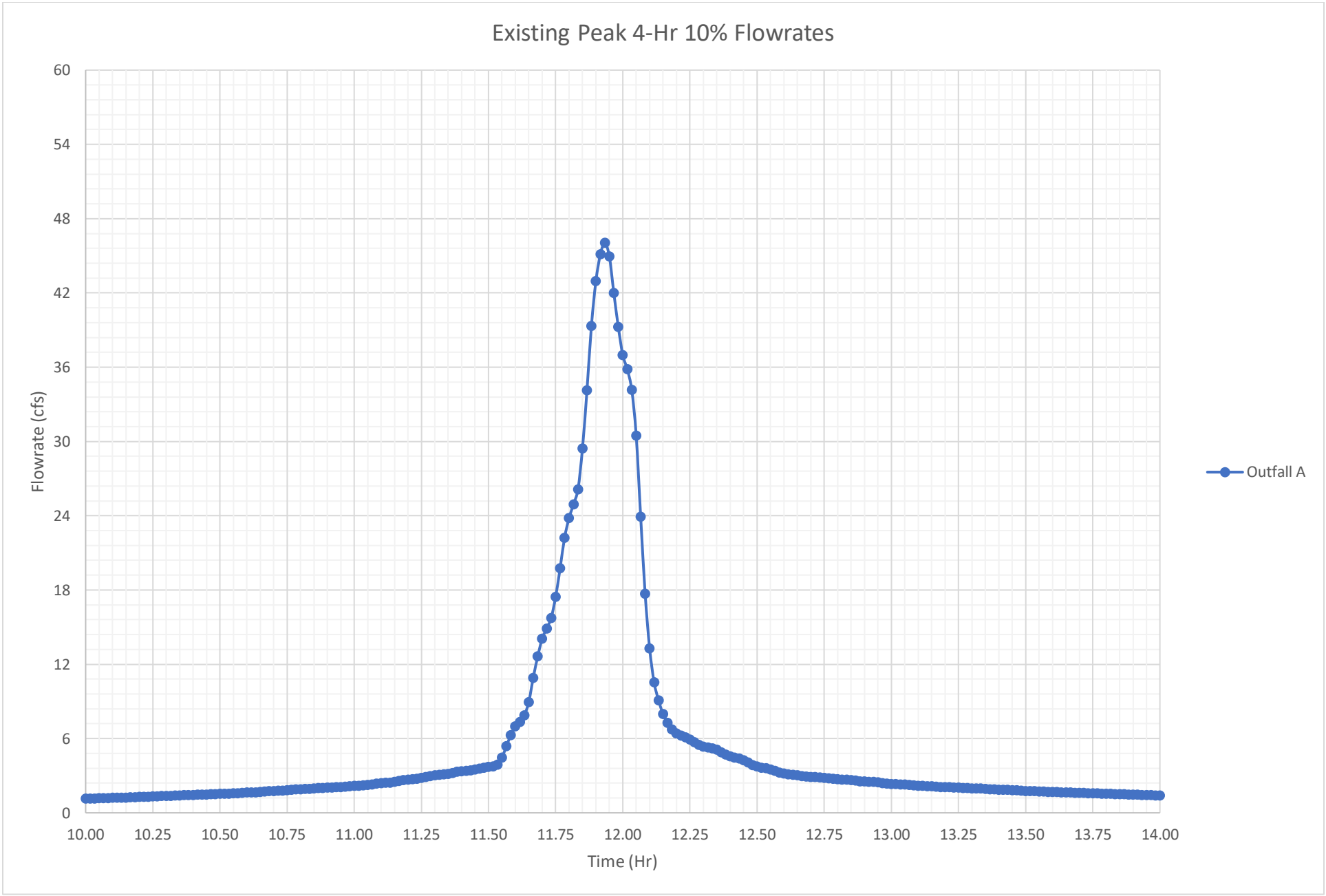
Time (Hr)
Outfall A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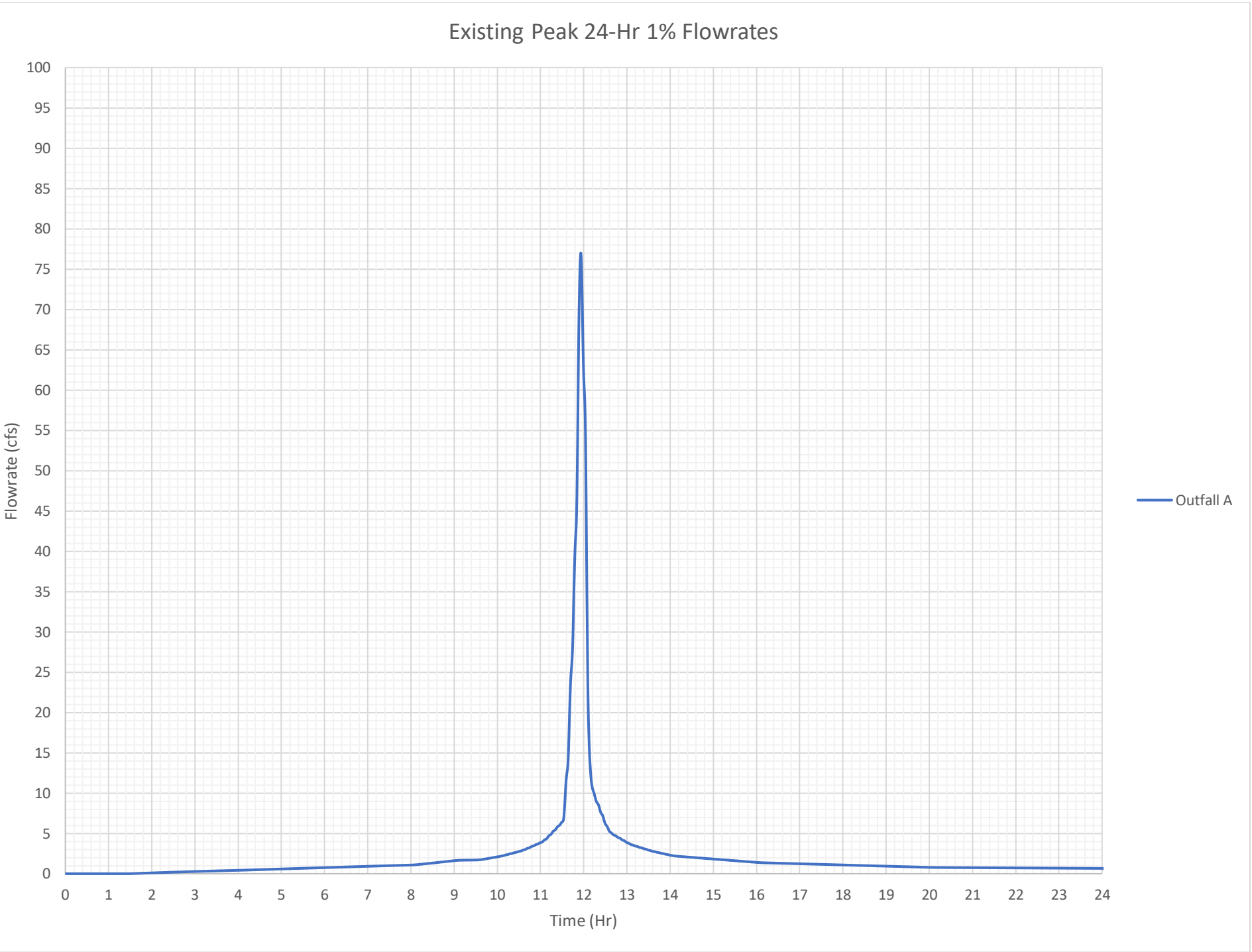
Time (Hr)
Outfall A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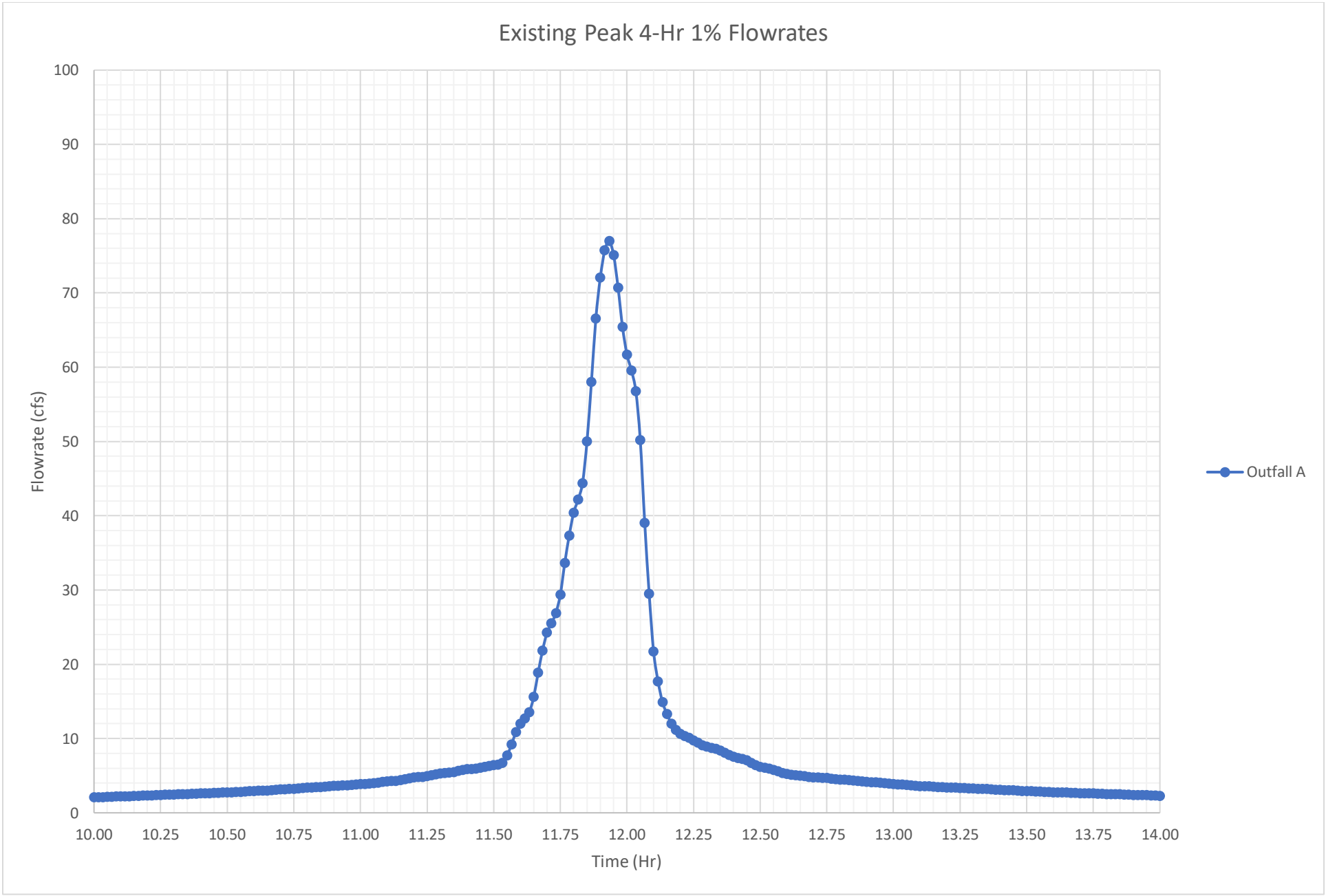
Time (Hr)
Outfall A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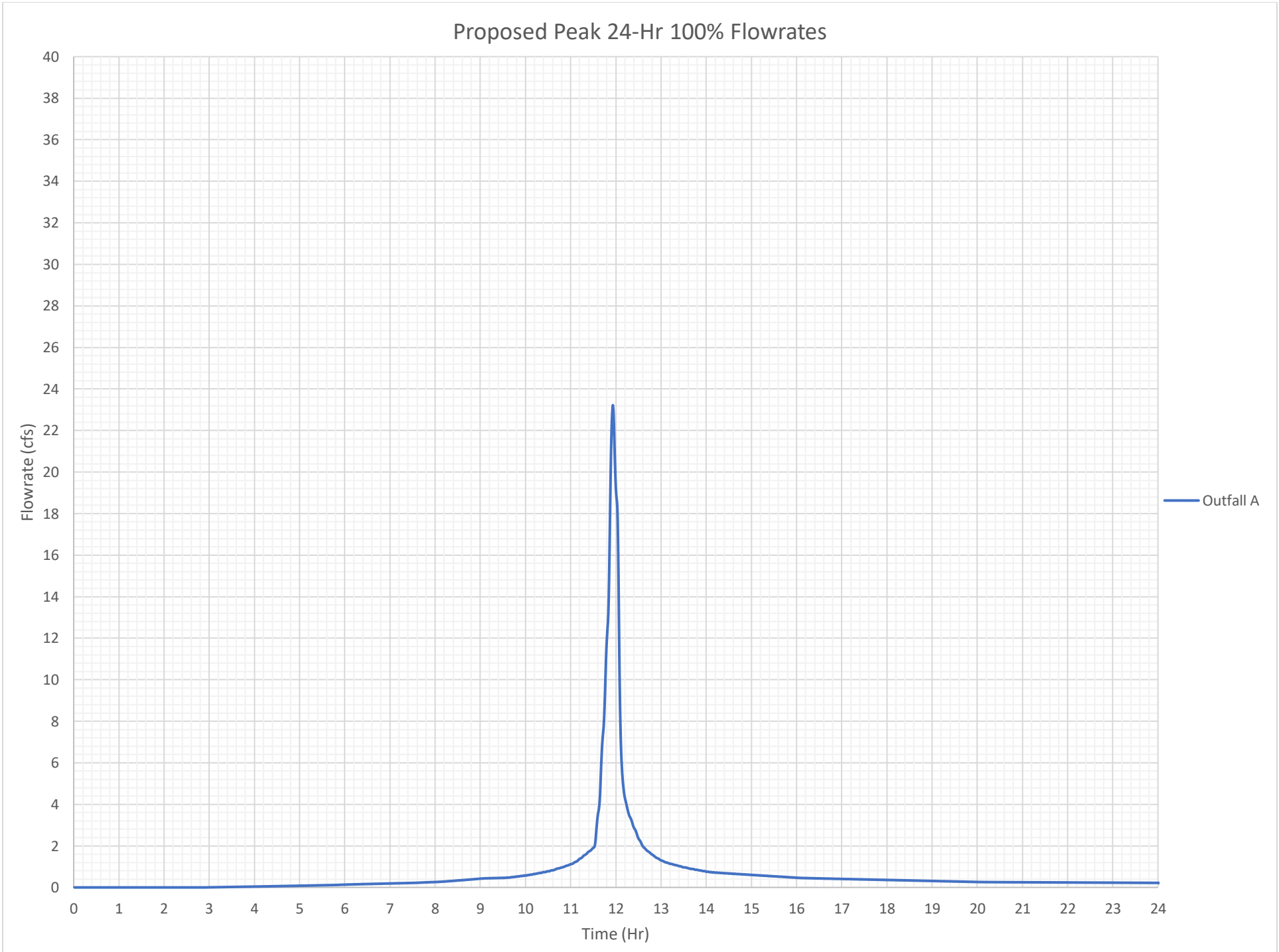
Time (Hr)
Outfall A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Flowrate (cfs)
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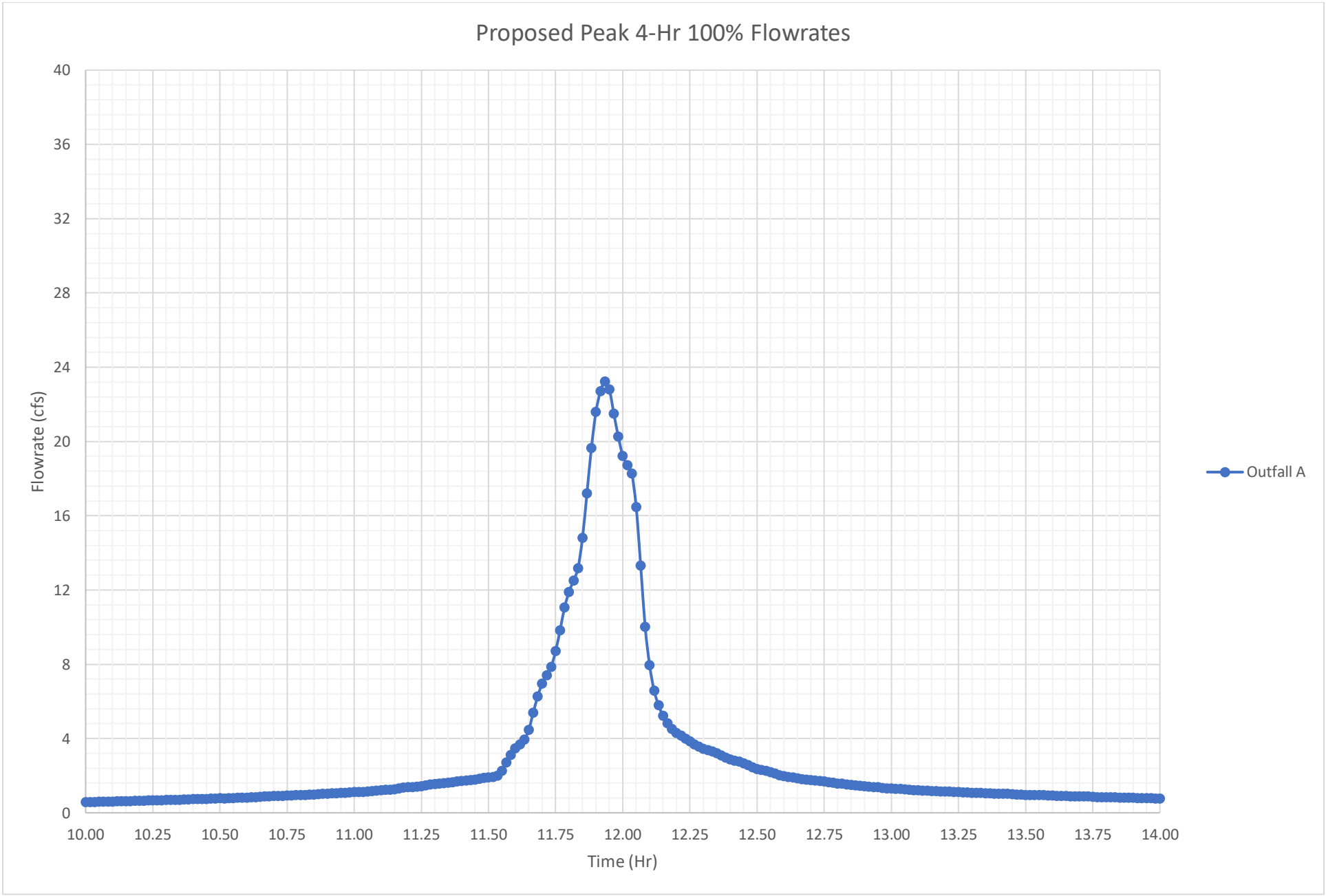
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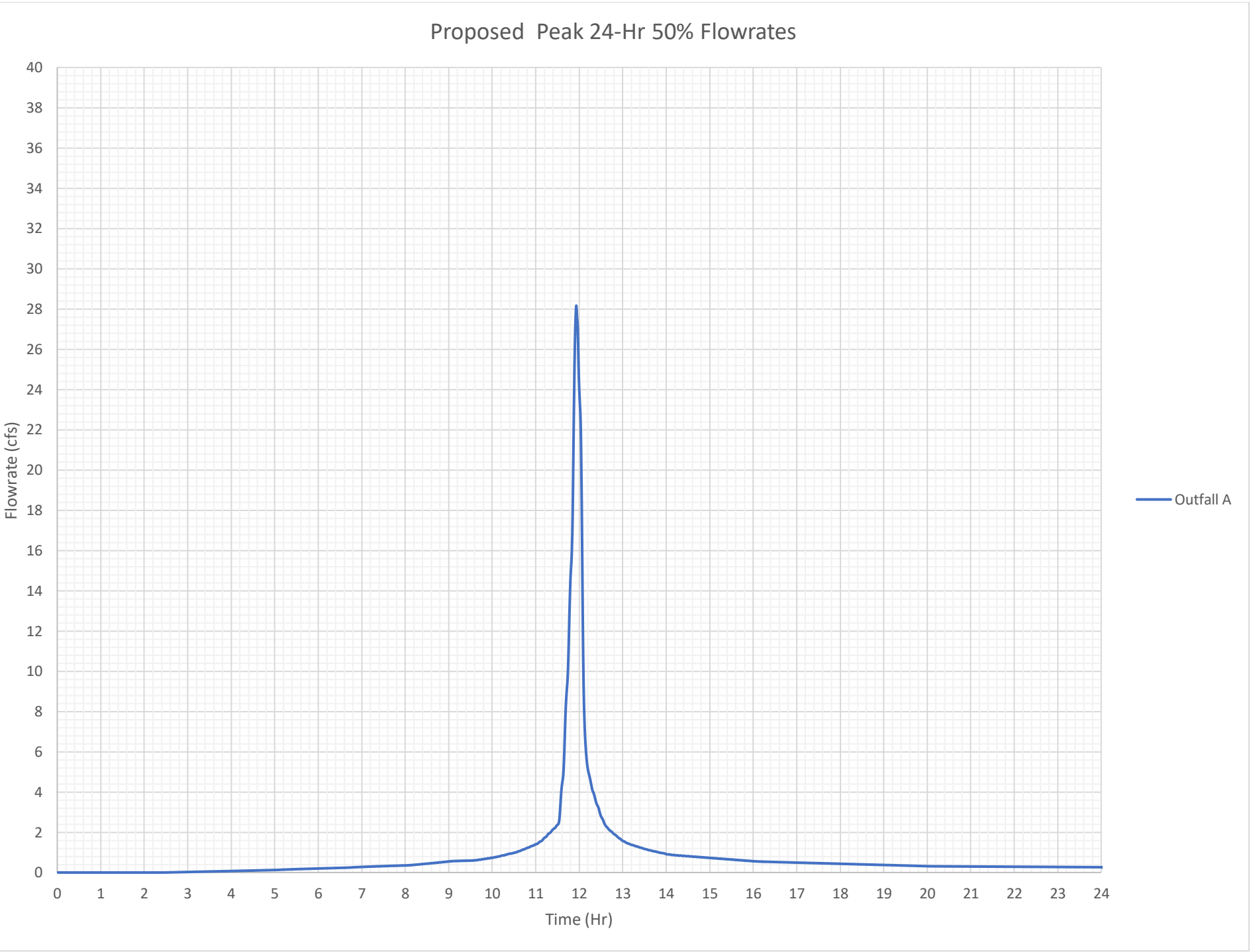
Time (Hr)
Outfall A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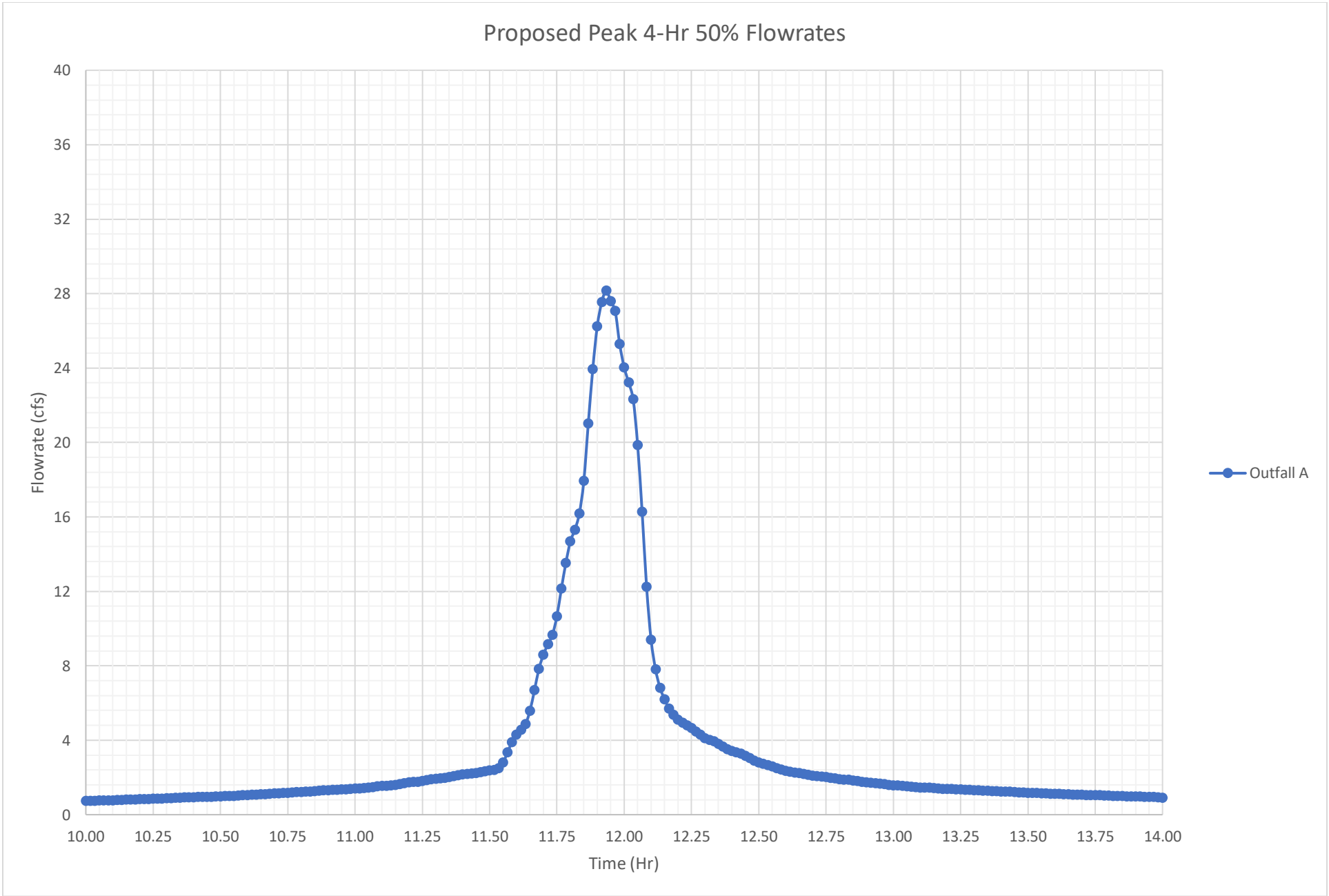
Outfall A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Flowrate (cfs)
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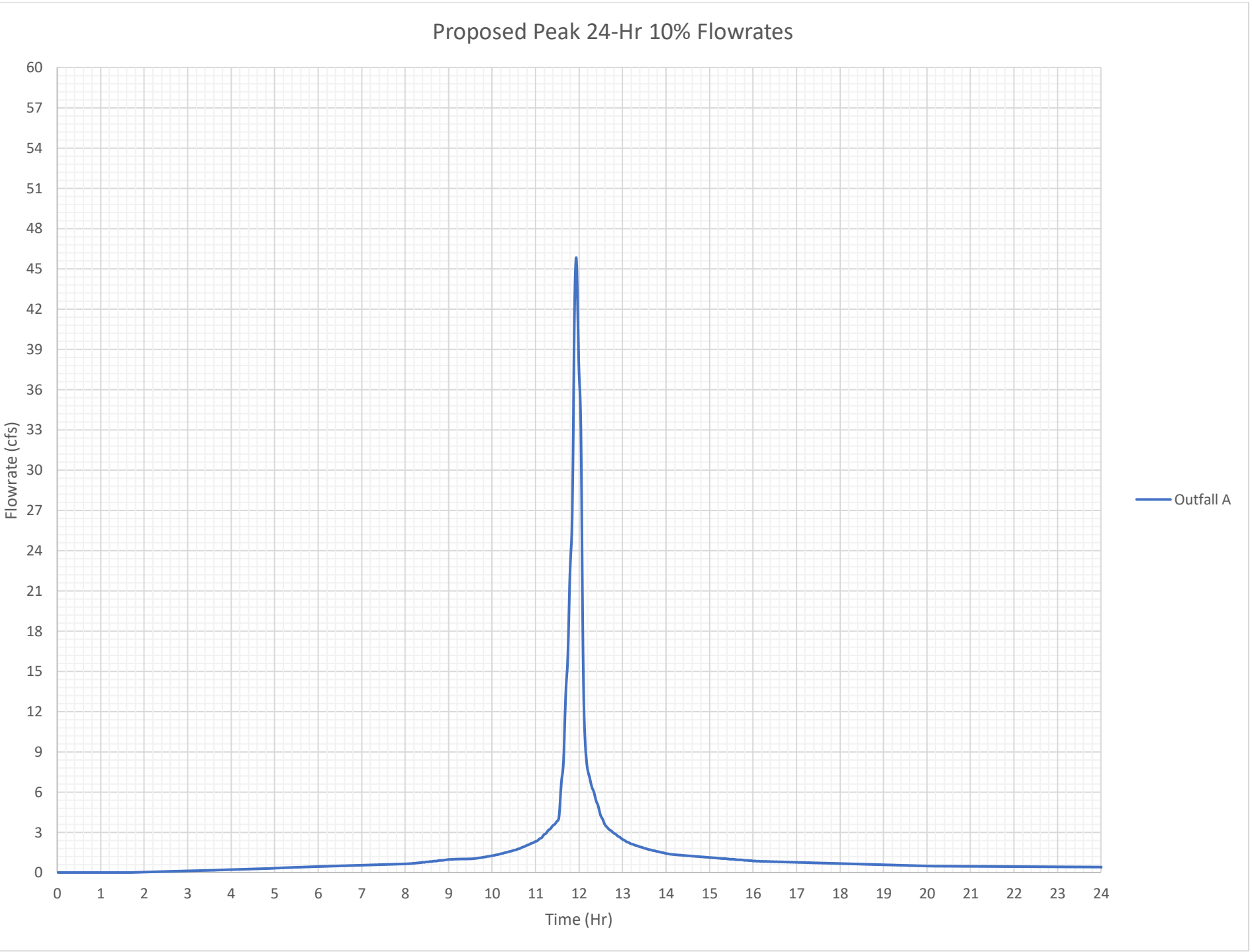
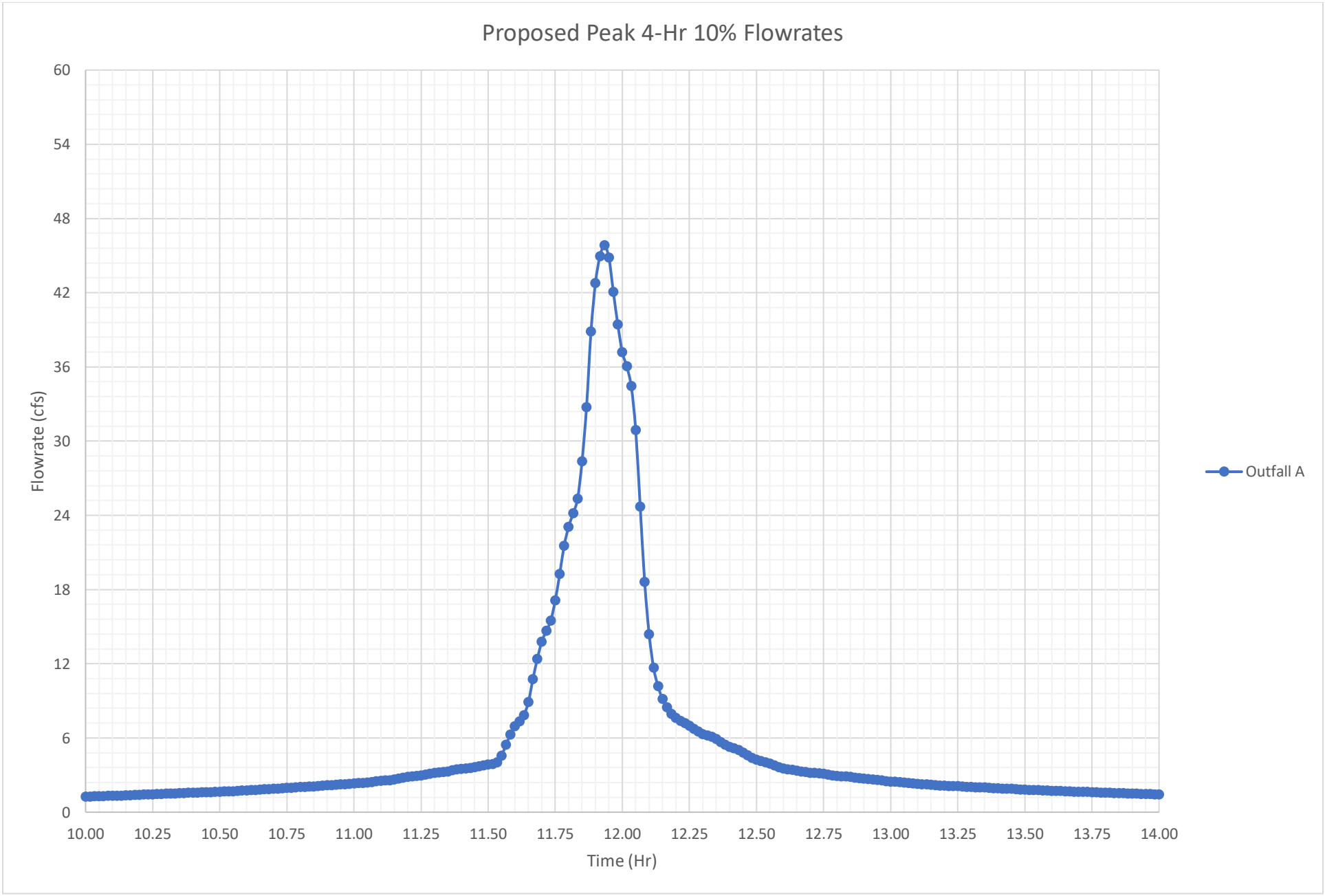
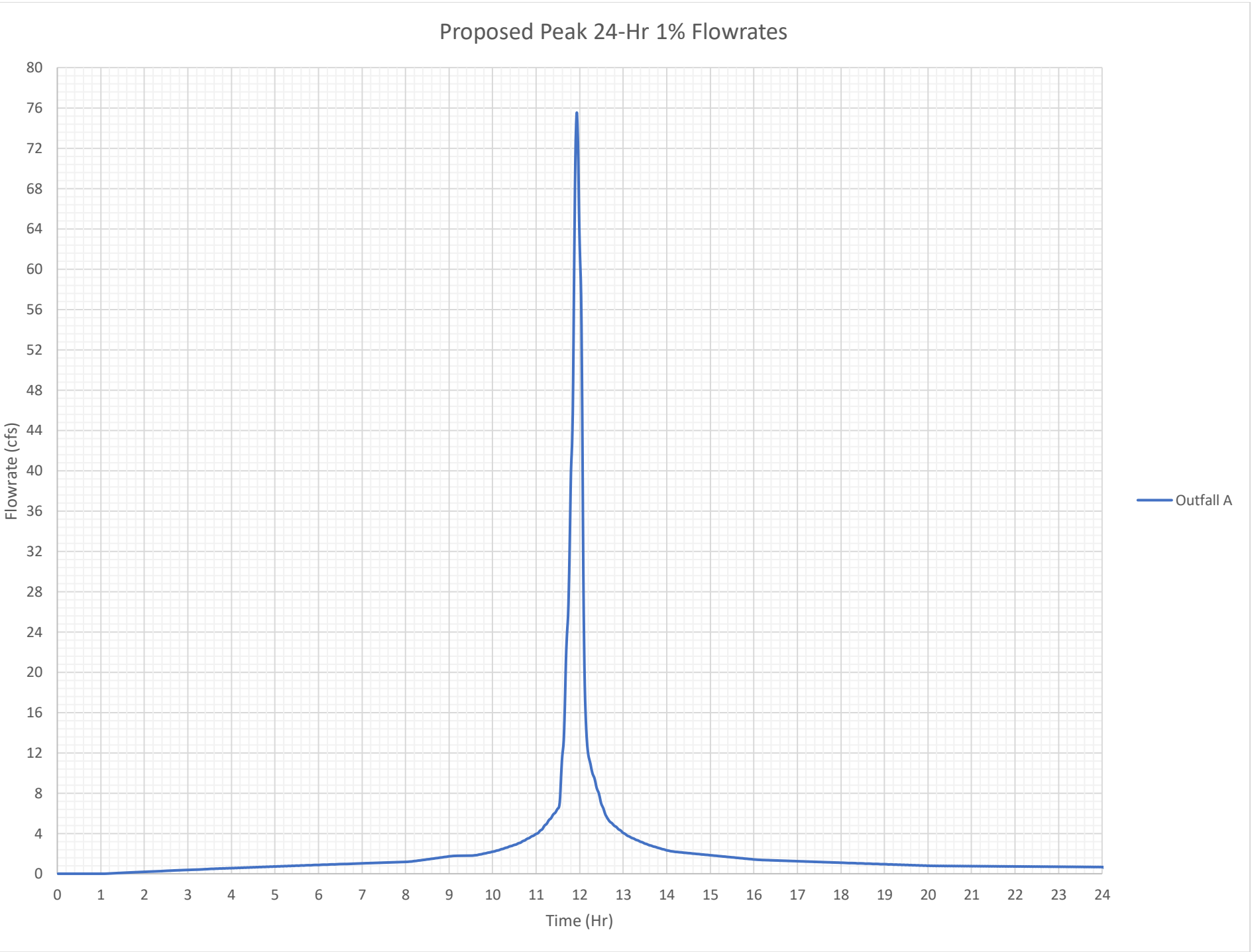
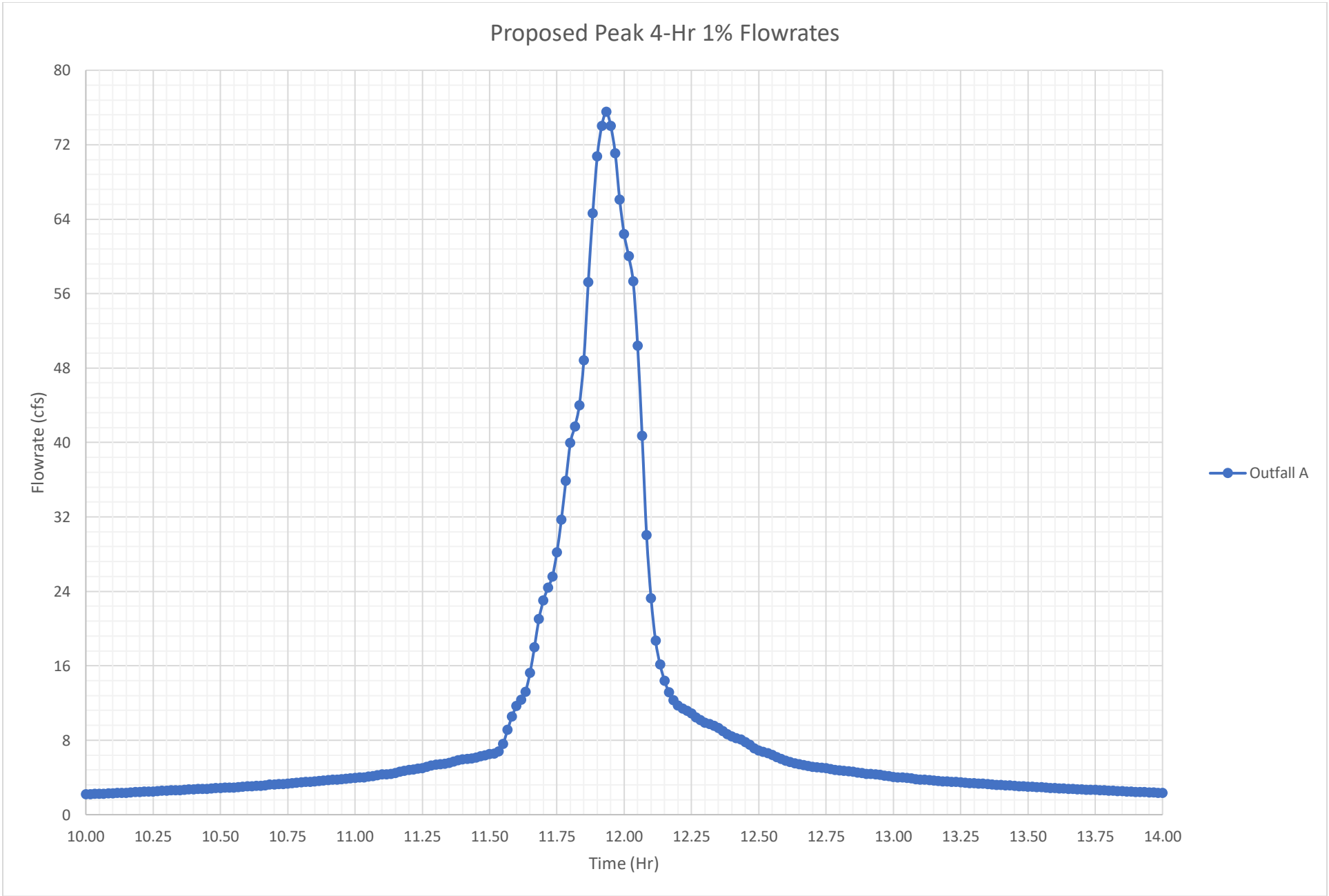
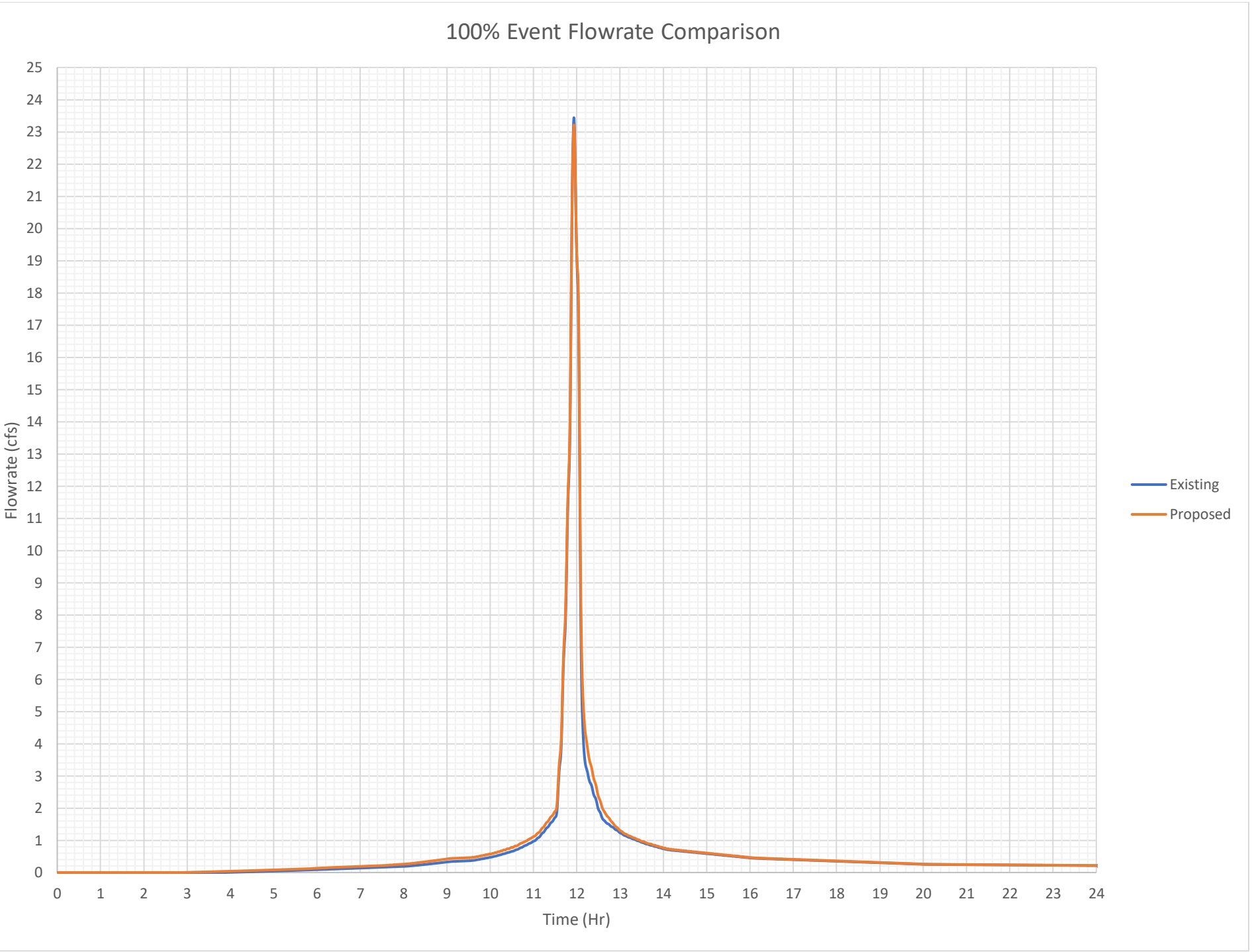
11.00
11.25
11.50
11.75
12.00
12.25
12.50
12.75
13.00
13.25
13.50
13.75
14.00
Time (Hr)
Outfall A

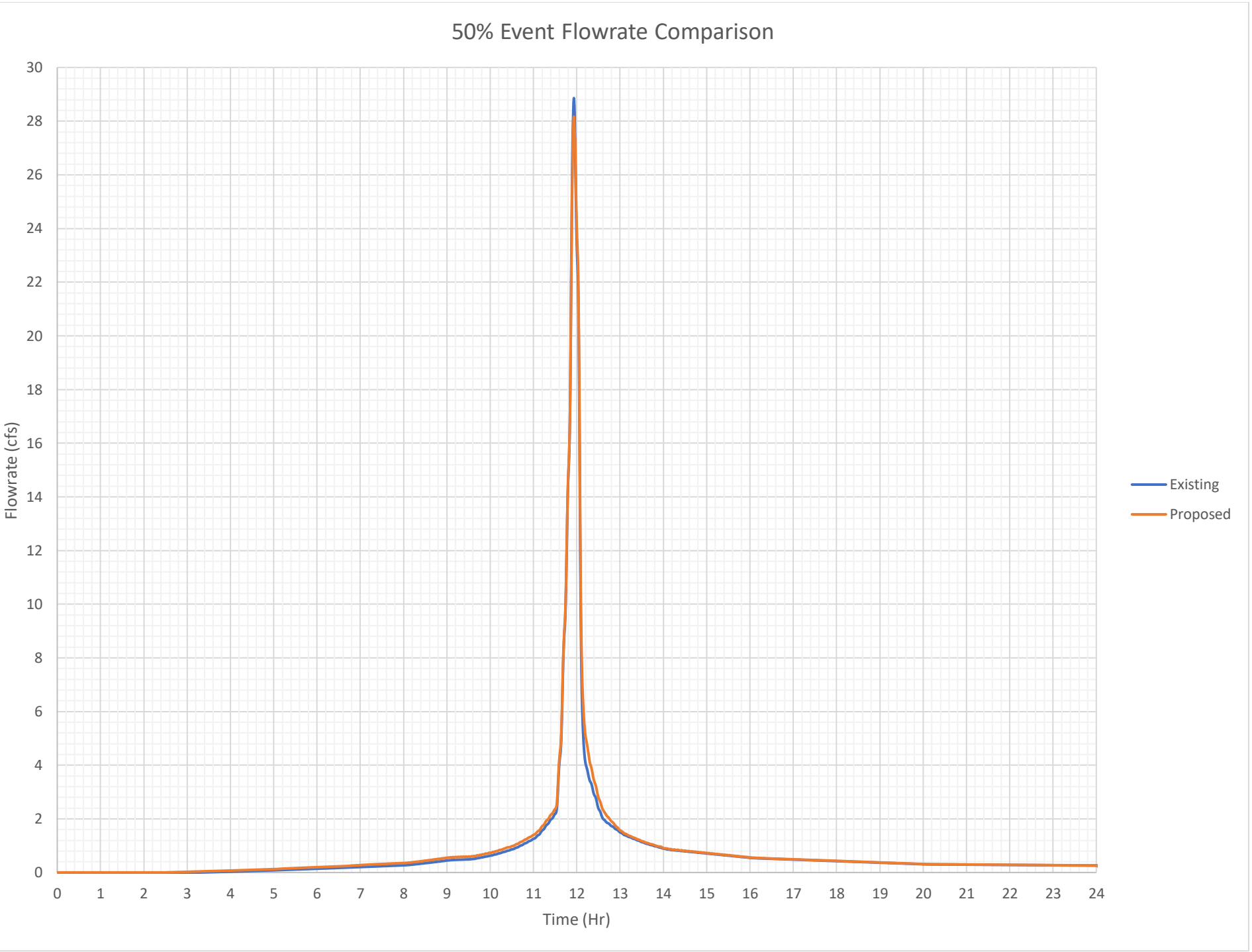

Proposed Peak 24-Hr 10% Flowrates
Flowrate (cfs)
60
57
54
51
48
45
42
39
36
33
30
27
24
21
18
15
12
9
6
3
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time (Hr)
Outfall A

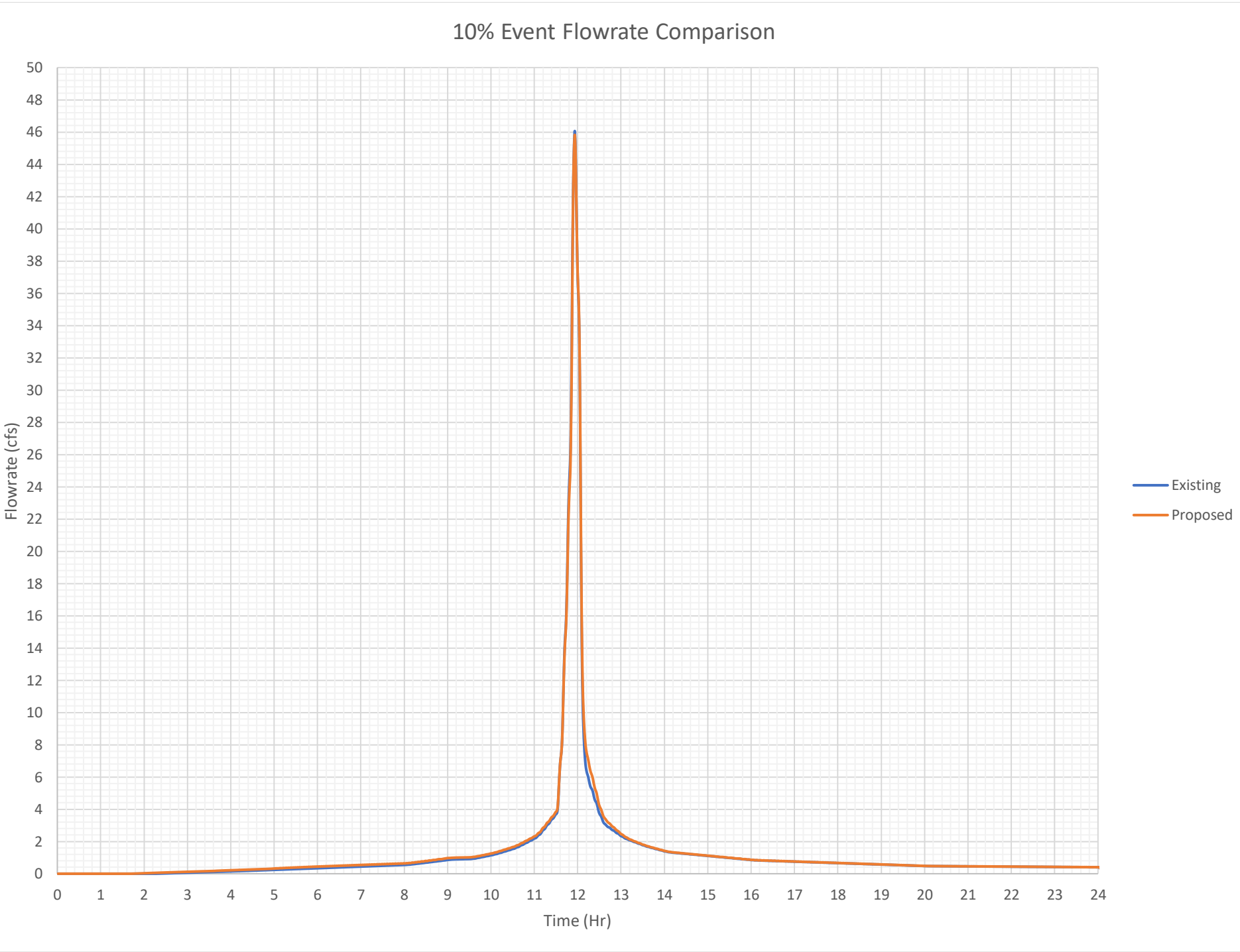

Proposed Peak 4-Hr 10% Flowrates
Flowrate (cfs)
60
54
48
42
36
30
24
18
12
6
0
10.00
10.25
10.50
10.75
11.00
11.25
11.50
11.75
12.00
12.25
12.50
12.75
13.00
13.25
13.50
13.75
14.00
Time (Hr)
Outfall A

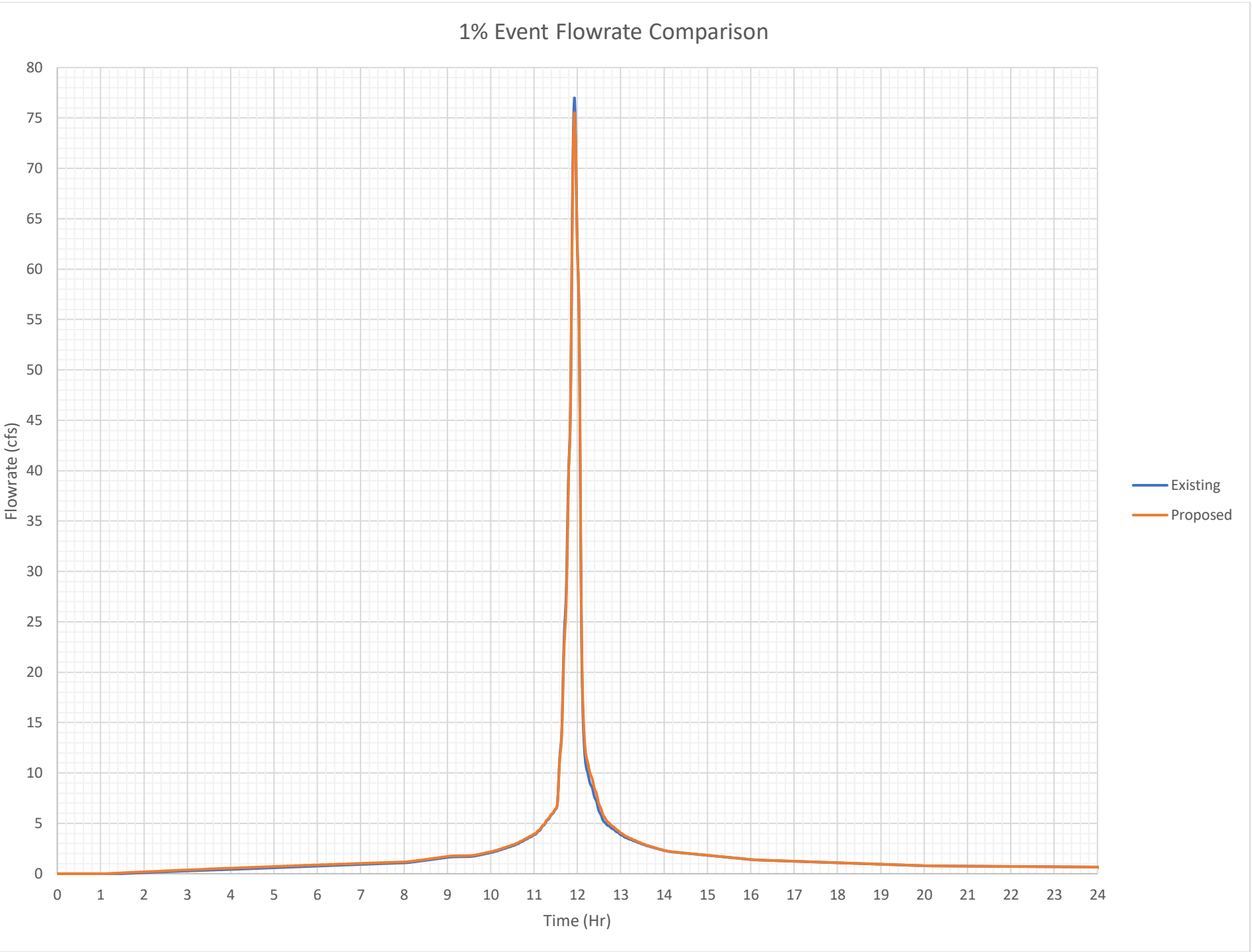

Proposed Peak 24-Hr 1% Flowrates
Flowrate (cfs)
0
4
8
12
16
20
24
28
32
36
40
44
48
52
56
60
64
68
72
76
80
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time (Hr)
Outfall A


Proposed Peak 4-Hr 1% Flowrates
Flowrate (cfs)
80
72
64
56
48
40
32
24
16
8
0
10.00
10.25
10.50
10.75
11.00
11.25
11.50
11.75
12.00
12.25
12.50
12.75
13.00
13.25
13.50
13.75
14.00
Time (Hr)
Outfall A


100% Event Flowrate Comparison
Flowrate (cfs)
Time (Hr)
Existing
Proposed
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25


50% Event Flowrate Comparison
Flowrate (cfs)
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time (Hr)
Existing
Proposed


10% Event Flowrate Comparison
Flowrate (cfs)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
Time (Hr)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
Existing
Proposed


1% Event Flowrate Comparison
Flowrate (cfs)
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time (Hr)
Existing
Proposed

APPENDIX C

Model Results

EXISTING CONDITIONS

1-YEAR EVENT

Project Description

File Name ..... Micro Existing Conditions.SPF

Project Options

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

Analysis Options

Start Analysis On	Feb 15, 2023	00:00:00
End Analysis On	Feb 18, 2023	00:00:00
Start Reporting On	Feb 15, 2023	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:01:00	days hh:mm:ss
Routing Time Step	5	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins	1
Nodes	1
Junctions	0
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	0
Links	0
Channels	0
Pipes	0
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1		Time Series	1 Year	Cumulative	inches	Missouri	Jackson	1	3.10	SCS Type II 24-hr

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	A-1	6.43	484.00	93.49	3.10	2.40	15.41	23.44	0 00:05:00

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft^2)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Out-01	Outfall	0.00					0.00	0.00					

Subbasin Hydrology

Subbasin : A-1

Input Data

Area (ac) 6.43
Peak Rate Factor 484.00
Weighted Curve Number 93.49
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	4.82	D	98.00
> 75% grass cover, Good	1.61	D	80.00
Composite Area & Weighted CN	6.43		93.49

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

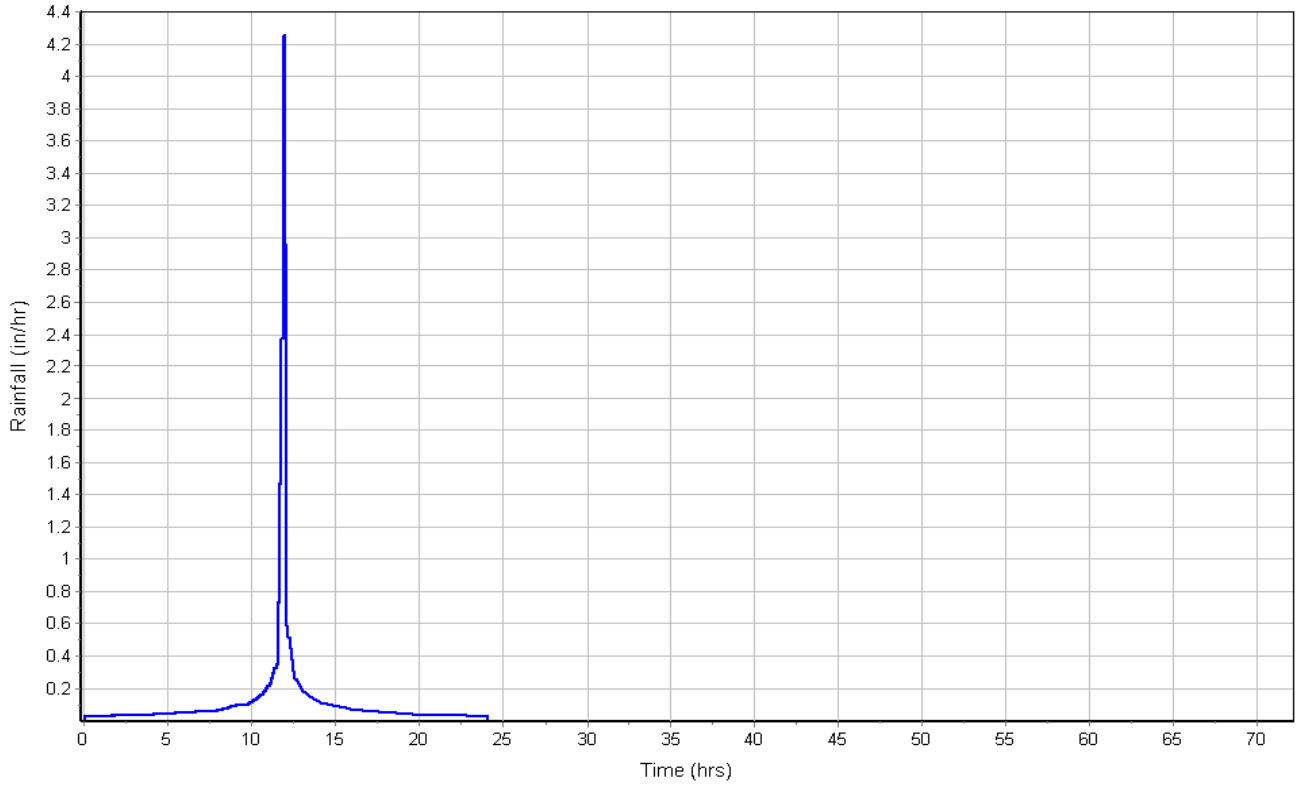
User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

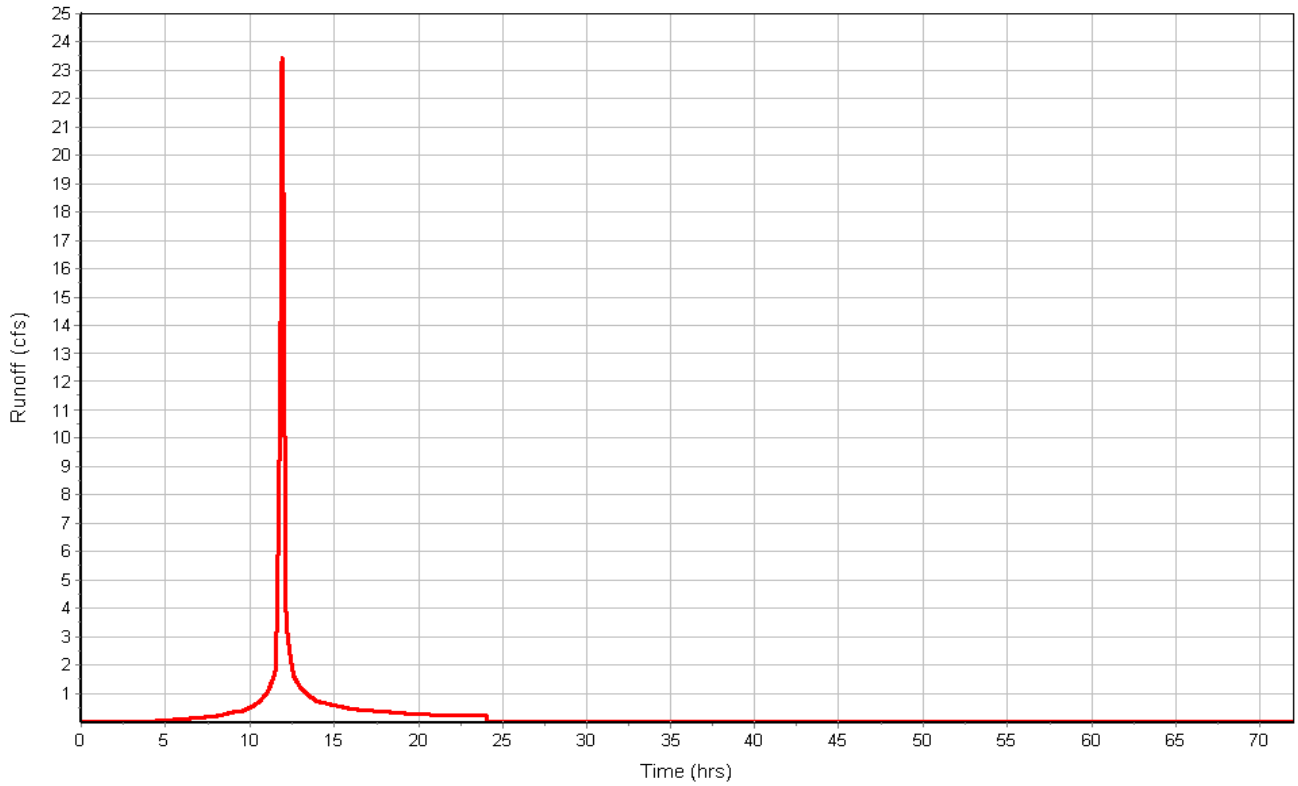
Total Rainfall (in) 3.10
Total Runoff (in) 2.40
Peak Runoff (cfs) 23.44
Weighted Curve Number 93.49
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : A-1

Rainfall Intensity Graph



Runoff Hydrograph



2-YEAR EVENT

Project Description

File Name ..... Micro Existing Conditions.SPF

Project Options

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

Analysis Options

Start Analysis On	Feb 15, 2023	00:00:00
End Analysis On	Feb 18, 2023	00:00:00
Start Reporting On	Feb 15, 2023	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:01:00	days hh:mm:ss
Routing Time Step	5	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins	1
Nodes	1
Junctions	0
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	0
Links	0
Channels	0
Pipes	0
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1		Time Series	2-Year	Cumulative	inches	Missouri	Jackson	2	3.71	SCS Type II 24-hr

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	A-1	6.43	484.00	93.49	3.71	2.99	19.21	28.86	0 00:05:00

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft^2)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Out-01	Outfall	0.00					0.00	0.00					

Subbasin Hydrology

Subbasin : A-1

Input Data

Area (ac) 6.43
Peak Rate Factor 484.00
Weighted Curve Number 93.49
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	4.82	D	98.00
> 75% grass cover, Good	1.61	D	80.00
Composite Area & Weighted CN	6.43		93.49

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

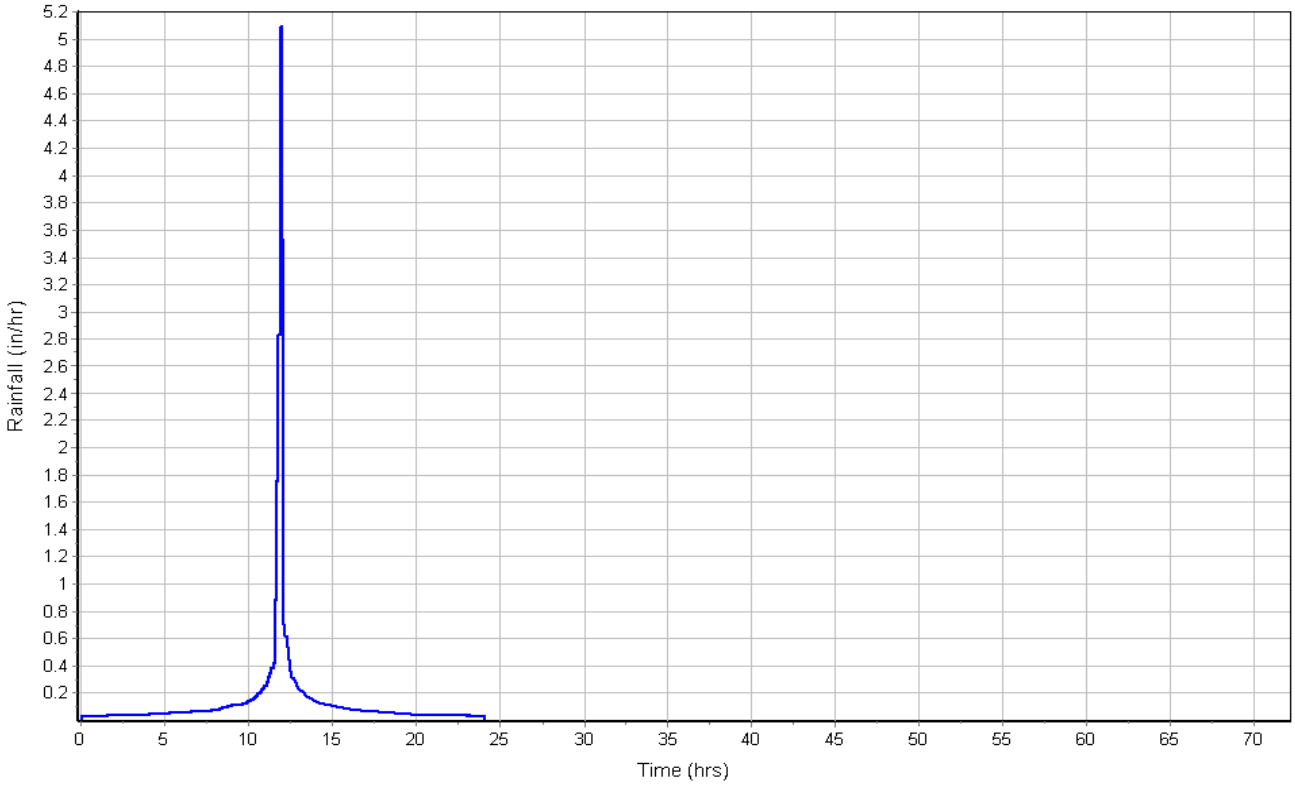
User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

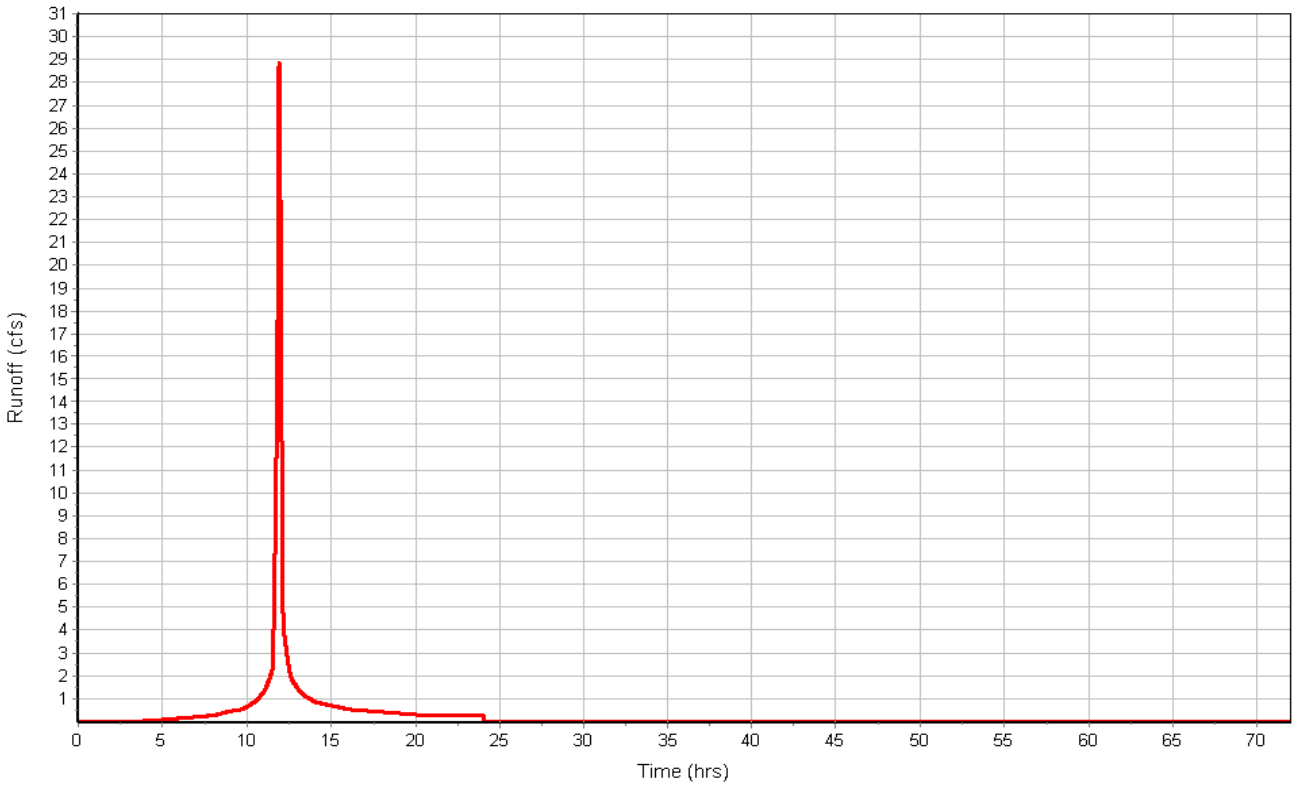
Total Rainfall (in) 3.71
Total Runoff (in) 2.99
Peak Runoff (cfs) 28.86
Weighted Curve Number 93.49
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : A-1

Rainfall Intensity Graph



Runoff Hydrograph



10-YEAR EVENT

Project Description

File Name ..... Micro Existing Conditions.SPF

Project Options

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

Analysis Options

Start Analysis On	Feb 15, 2023	00:00:00
End Analysis On	Feb 18, 2023	00:00:00
Start Reporting On	Feb 15, 2023	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:01:00	days hh:mm:ss
Routing Time Step	5	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins	1
Nodes	1
Junctions	0
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	0
Links	0
Channels	0
Pipes	0
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1		Time Series	10 Year	Cumulative	inches	Missouri	Jackson	10	5.67	SCS Type II 24-hr

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	A-1	6.43	484.00	93.49	5.67	4.91	31.58	46.07	0 00:05:00

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft^2)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Out-01	Outfall	0.00					0.00	0.00					

Subbasin Hydrology

Subbasin : A-1

Input Data

Area (ac) 6.43
Peak Rate Factor 484.00
Weighted Curve Number 93.49
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	4.82	D	98.00
> 75% grass cover, Good	1.61	D	80.00
Composite Area & Weighted CN	6.43		93.49

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

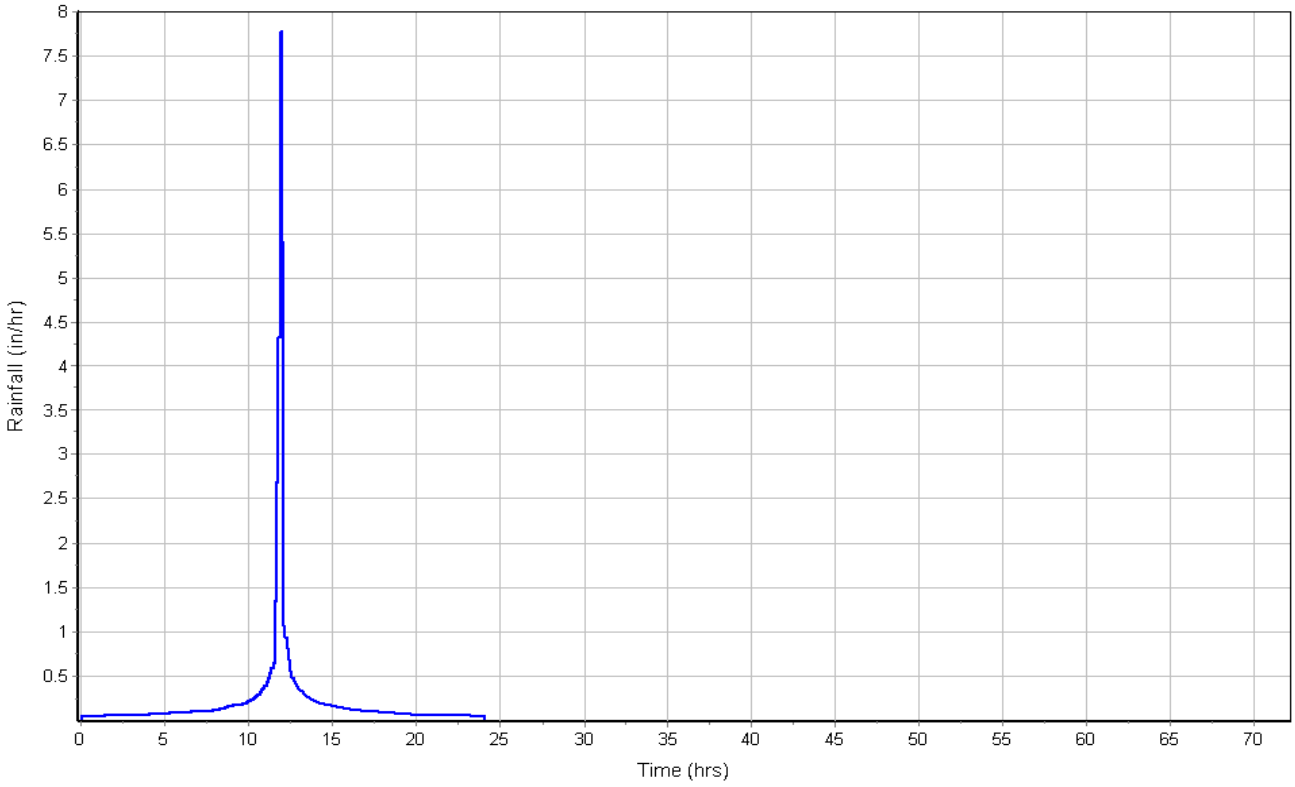
User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

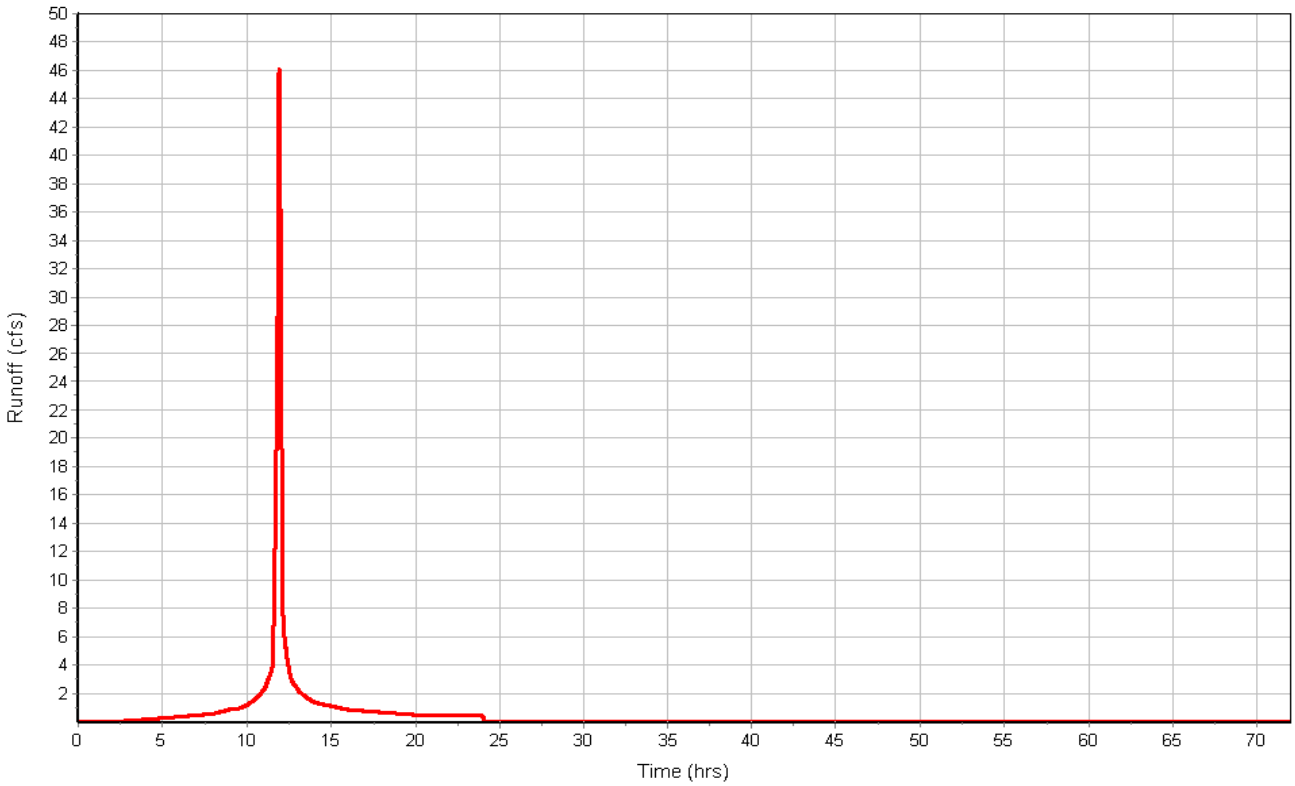
Total Rainfall (in) 5.67
Total Runoff (in) 4.91
Peak Runoff (cfs) 46.07
Weighted Curve Number 93.49
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : A-1

Rainfall Intensity Graph



Runoff Hydrograph



100-YEAR EVENT

Project Description

File Name ..... Micro Existing Conditions.SPF

Project Options

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

Analysis Options

Start Analysis On	Feb 15, 2023	00:00:00
End Analysis On	Feb 18, 2023	00:00:00
Start Reporting On	Feb 15, 2023	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:01:00	days hh:mm:ss
Routing Time Step	5	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins	1
Nodes	1
Junctions	0
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	0
Links	0
Channels	0
Pipes	0
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1		Time Series	100 Year	Cumulative	inches	Missouri	Jackson	100	9.25	SCS Type II 24-hr

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	A-1	6.43	484.00	93.49	9.25	8.46	54.42	77.03	0 00:05:00

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft^2)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Out-01	Outfall	0.00					0.00	0.00					

Subbasin Hydrology

Subbasin : A-1

Input Data

Area (ac) 6.43
Peak Rate Factor 484.00
Weighted Curve Number 93.49
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	4.82	D	98.00
> 75% grass cover, Good	1.61	D	80.00
Composite Area & Weighted CN	6.43		93.49

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

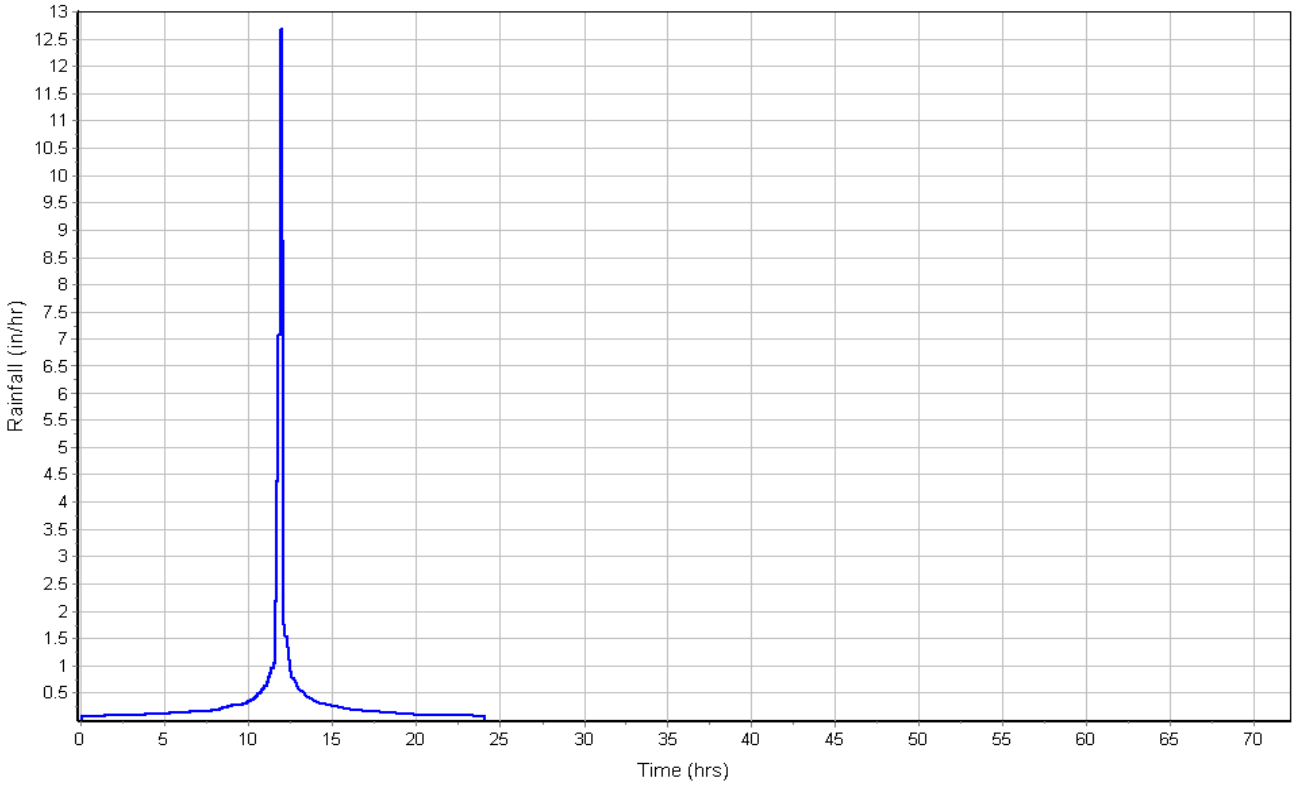
User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

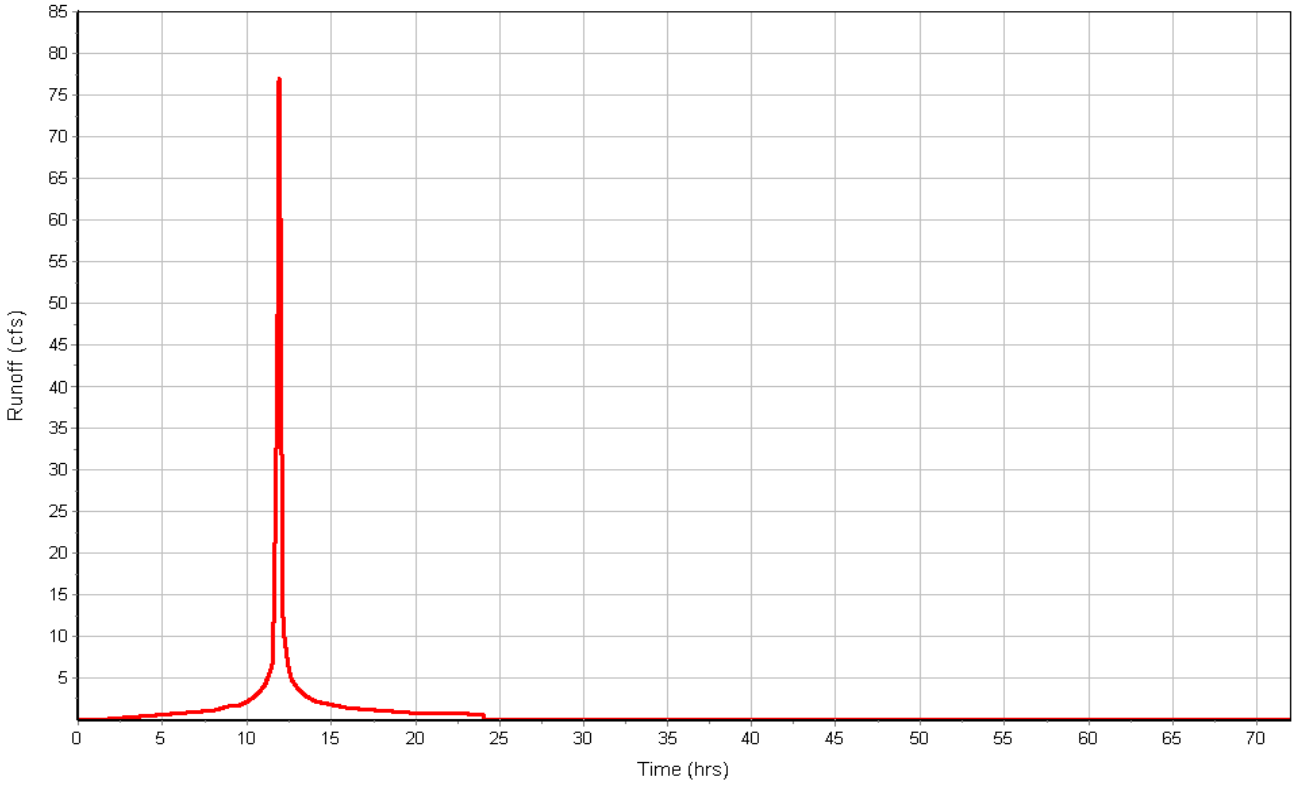
Total Rainfall (in) 9.25
Total Runoff (in) 8.46
Peak Runoff (cfs) 77.03
Weighted Curve Number 93.49
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : A-1

Rainfall Intensity Graph



Runoff Hydrograph



PROPOSED CONDITIONS

1-YEAR EVENT

Project Description

File Name	Revisions.SPF

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	SCS TR-55
Time of Concentration (TOC) Method	SCS TR-55
Link Routing Method	Hydrodynamic
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	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 00:01:00	days hh:mm:ss
Routing Time Step	5	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins	3
Nodes	5
Junctions	2
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	2
Links	6
Channels	0
Pipes	2
Pumps	0
Orifices	2
Weirs	2
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
49		Time Series	1 Year	Cumulative	inches	Missouri	Jackson	1.00	3.10	SCS Type II 24-hr

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	A_Undetained	5.72	484.00	95.26	3.10	2.57	14.73	21.87	0 00:05:00
2	Canopy and Pad Site 2	0.40	484.00	98.00	3.10	2.87	1.15	1.62	0 00:05:00
3	Farmers Market	0.31	484.00	98.00	3.10	2.87	0.88	1.24	0 00:05:00

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	1-Jun	Junction	1001.90	1007.00	0.00	0.00	0.00	2.03	1002.26	0.00	7.39	0 00:00	0.00	0.00
2	2-Jun	Junction	1002.00	1007.00	0.00	0.00	0.00	1.17	1002.36	0.00	5.14	0 00:00	0.00	0.00
3	Out-01	Outfall	995.00					23.22	995.26					
4	Stor-01	Storage Node	1001.00	1007.00	0.00		0.00	1.24	1003.05				0.00	0.00
5	Stor-02	Storage Node	1001.00	1007.00	0.00		0.00	1.62	1005.60				0.00	0.00

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	Link-01	Pipe	1-Jun	Out-01	200.00	1002.00	995.00	3.5000	36.000	0.0120	2.02	135.18	0.01	6.77	0.26	0.09	0.00	Calculated
2	Link-02	Pipe	2-Jun	1-Jun	1.00	1002.00	1001.90	10.0000	36.000	0.0150	1.17	182.80	0.01	2.43	0.36	0.12	0.00	Calculated
3	Orifice-01	Orifice	Stor-01	1-Jun		1001.00	1001.90		6.000		0.86							
4	Orifice-02	Orifice	Stor-02	2-Jun		1001.00	1002.00		4.000		0.77							
5	Weir-01	Weir	Stor-01	1-Jun		1001.00	1001.90				0.00							
6	Weir-02	Weir	Stor-02	2-Jun		1001.00	1002.00				0.39							

Subbasin Hydrology

Subbasin : A_Undetained

Input Data

Area (ac) 5.72
Peak Rate Factor 484
Weighted Curve Number 95.26
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	4.85	D	98
> 75% grass cover, Good	0.87	D	80
Composite Area & Weighted CN	5.72		95.26

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft^2)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

Total Rainfall (in) 3.1
Total Runoff (in) 2.57
Peak Runoff (cfs) 21.87

Weighted Curve Number	95.26
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : Canopy and Pad Site 2

Input Data

Area (ac)	0.4
Peak Rate Factor	484
Weighted Curve Number	98
Rain Gage ID	Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved parking & roofs	0.52	D	98
Composite Area & Weighted CN	0.52		98

Time of Concentration

User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

Total Rainfall (in)	3.1
Total Runoff (in)	2.87
Peak Runoff (cfs)	1.62
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : Farmers Market

Input Data

Area (ac)	0.31
Peak Rate Factor	484
Weighted Curve Number	98
Rain Gage ID	Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved parking & roofs	0.31	D	98
Composite Area & Weighted CN	0.31		98

Time of Concentration

User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

Total Rainfall (in)	3.1
Total Runoff (in)	2.87
Peak Runoff (cfs)	1.24
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:05:00

Storage Nodes

Storage Node : Stor-01

Input Data

Invert Elevation (ft) 1001
Max (Rim) Elevation (ft) 1007
Max (Rim) Offset (ft) 6
Initial Water Elevation (ft) 0
Initial Water Depth (ft) ..... -1001
Ponded Area (ft²) 0
Evaporation Loss 0

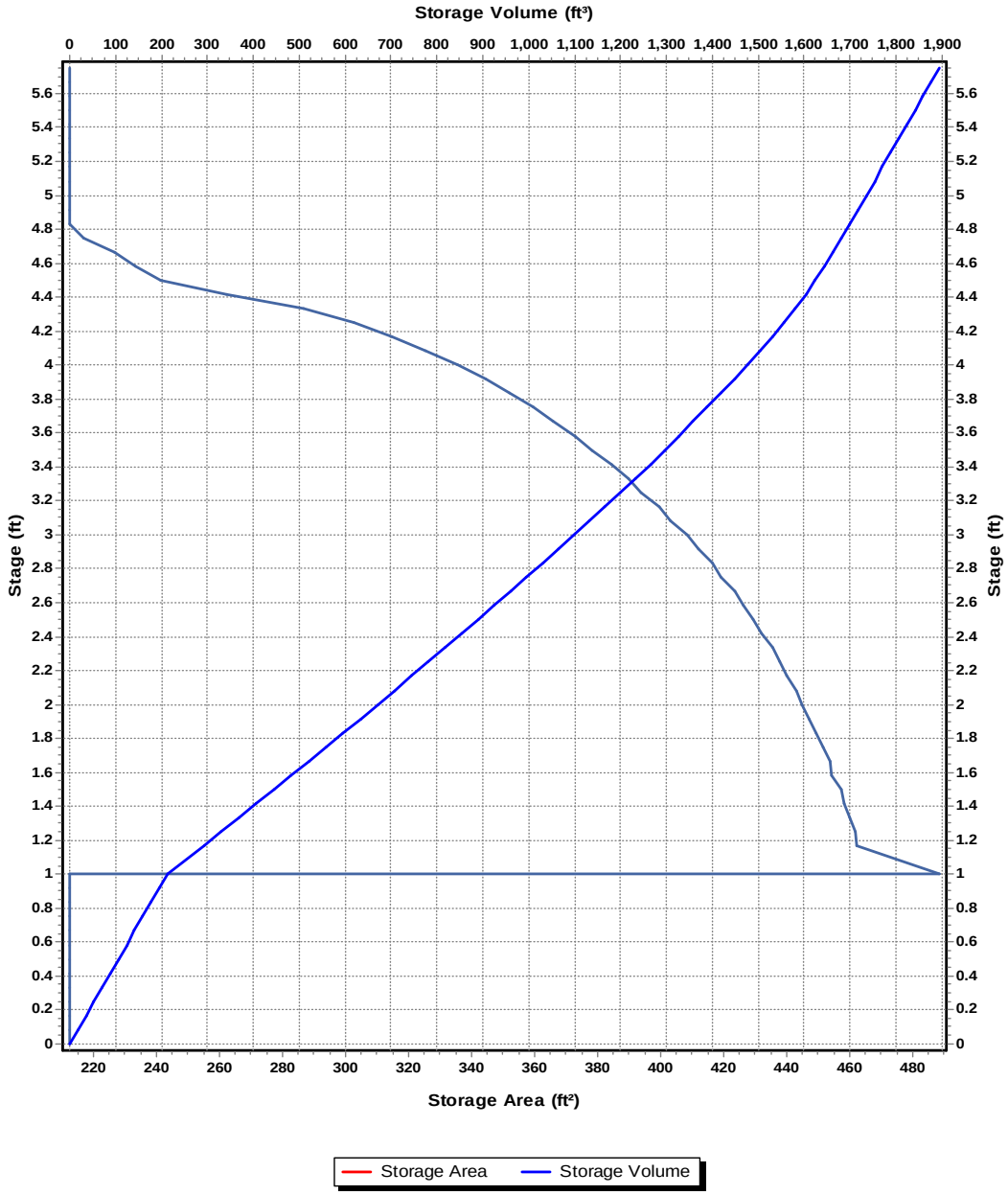
Storage Area Volume Curves

Storage Curve : Undeground Storage

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	212.6667	0
0.083	212.6667	17.65
0.167	212.6667	35.51
0.25	212.6667	53.16
0.333	212.6667	70.81
0.417	212.6667	88.67
0.5	212.6667	106.32
0.583	212.6667	123.97
0.667	212.6667	141.83
0.75	212.6667	159.48
0.833	212.6667	177.13
0.917	212.6667	194.99
1	212.667	212.64
1.001	488.6067	212.99
1.167	462.5067	291.93
1.25	461.7867	330.29
1.333	460.3467	368.56
1.417	458.1867	407.14
1.5	457.4667	445.14
1.583	454.5867	482.99
1.667	453.8667	521.15
1.75	451.7067	558.73
1.833	449.5467	596.13
1.917	447.3867	633.8
2	445.2267	670.84
2.083	443.0667	707.7
2.167	440.1867	744.8
2.25	438.0267	781.25
2.333	435.8667	817.52
2.417	432.2667	853.98
2.5	429.3867	889.74
2.583	426.5067	925.26
2.667	423.6267	960.97
2.75	419.3067	995.95
2.833	416.4267	1030.63
2.917	412.1067	1065.43
3	408.5067	1099.49
3.083	403.4667	1133.19
3.167	399.8667	1166.93
3.25	394.1067	1199.88
3.333	389.7867	1232.41
3.417	384.7467	1264.94
3.5	378.2667	1296.61
3.583	373.2267	1327.8
3.667	366.0267	1358.85
3.75	359.5467	1388.96
3.833	352.3467	1418.5
3.917	344.4267	1447.76
4	335.7867	1475.99
4.083	325.7067	1503.44
4.167	314.9067	1530.35
4.25	302.6667	1555.98
4.333	286.8267	1580.44
4.417	262.3467	1603.51
4.5	241.4667	1624.42
4.583	233.5467	1644.13
4.667	227.0667	1663.48
4.75	216.9867	1681.91

4.833	212.6667	1699.74
4.917	212.6667	1717.6
5	212.6667	1735.25
5.083	212.6667	1752.9
5.167	212.6667	1770.76
5.25	212.6667	1788.41
5.333	212.6667	1806.06
5.417	212.6667	1823.92
5.5	212.6667	1841.57
5.583	212.6667	1859.22
5.667	212.6667	1877.08
5.75	212.6667	1894.73

Storage Area Volume Curves



Storage Node : Stor-01 (continued)

Outflow Weirs

SN	Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Weir Total Height (ft)	Discharge Coefficient
1	Weir-01	Rectangular	No	1005.75	4.75	4.00	3.00	3.33

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	Orifice-01	Side	CIRCULAR	No	6.00			1002.00	0.61

Output Summary Results

Peak Inflow (cfs)	1.24
Peak Lateral Inflow (cfs)	1.24
Peak Outflow (cfs)	0.86
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	1003.05
Max HGL Depth Attained (ft)	2.05
Average HGL Elevation Attained (ft)	1001.95
Average HGL Depth Attained (ft)	0.95
Time of Max HGL Occurrence (days hh:mm)	0 12:02
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)	1001
Max (Rim) Elevation (ft)	1007
Max (Rim) Offset (ft)	6
Initial Water Elevation (ft)	0
Initial Water Depth (ft)	-1001
Ponded Area (ft²)	0
Evaporation Loss	0

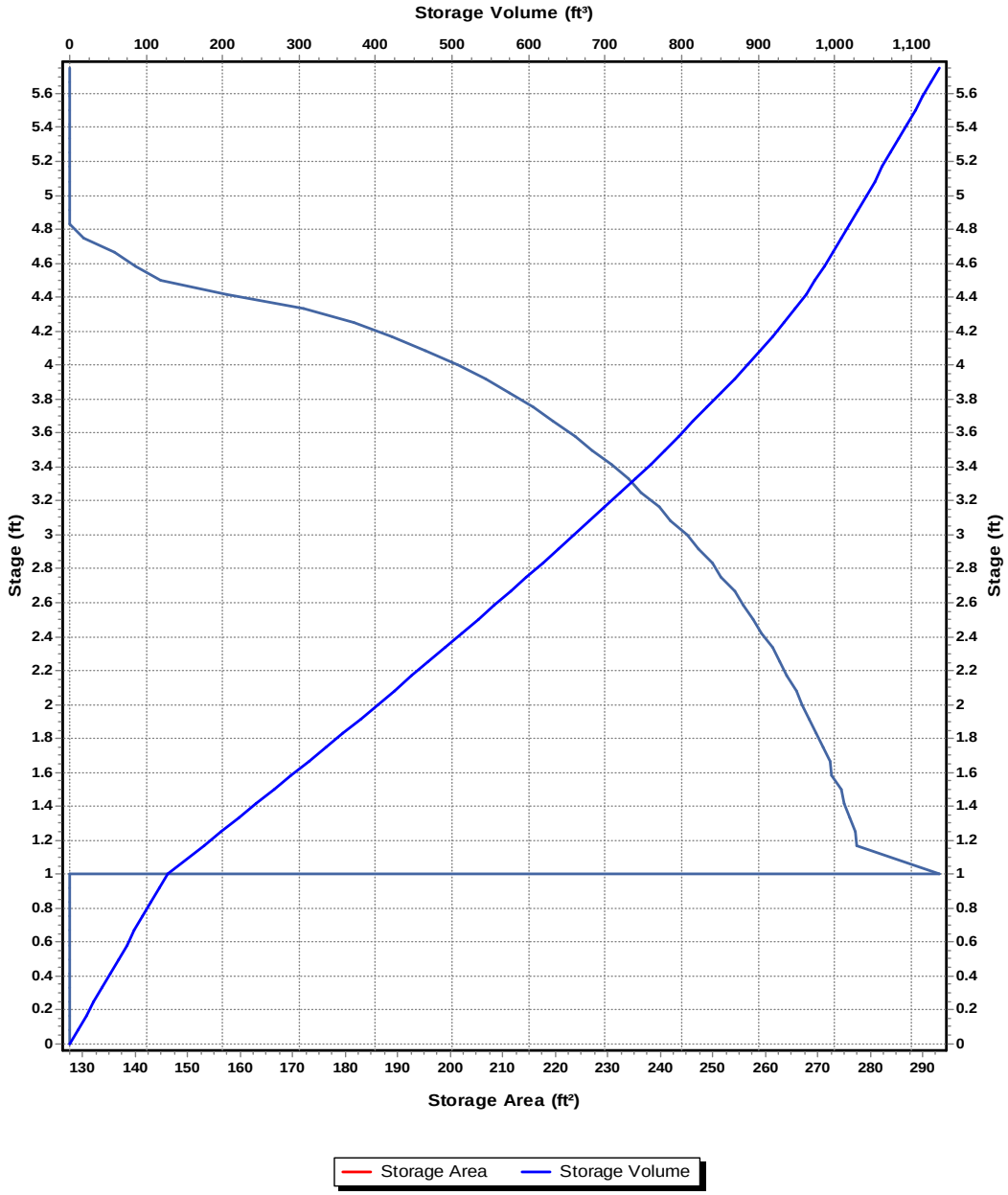
Storage Area Volume Curves

Storage Curve : 2 Underground Storage

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	127.6	0
0.083	127.6	10.59
0.167	127.6	21.31
0.25	127.6	31.9
0.333	127.6	42.49
0.417	127.6	53.21
0.5	127.6	63.8
0.583	127.6	74.39
0.667	127.6	85.11
0.75	127.6	95.7
0.833	127.6	106.29
0.917	127.6	117.01
1	127.6	127.6
1.001	293.164	127.81
1.167	277.504	175.18
1.25	277.072	198.19
1.333	276.208	221.15
1.417	274.912	244.3
1.5	274.48	267.1
1.583	272.752	289.81
1.667	272.32	312.7
1.75	271.024	335.25
1.833	269.728	357.69
1.917	268.432	380.29
2	267.136	402.52
2.083	265.84	424.64
2.167	264.112	446.9
2.25	262.816	468.77
2.333	261.52	490.53
2.417	259.36	512.41
2.5	257.632	533.87
2.583	255.904	555.18
2.667	254.176	576.6
2.75	251.584	597.59
2.833	249.856	618.4
2.917	247.264	639.28
3	245.104	659.71
3.083	242.08	679.93
3.167	239.92	700.17
3.25	236.464	719.94
3.333	233.872	739.46
3.417	230.848	758.98
3.5	226.96	777.98
3.583	223.936	796.69
3.667	219.616	815.32
3.75	215.728	833.39
3.833	211.408	851.12
3.917	206.656	868.68
4	201.472	885.62
4.083	195.424	902.09
4.167	188.944	918.23
4.25	181.6	933.61
4.333	172.096	948.29
4.417	157.408	962.13
4.5	144.88	974.67
4.583	140.128	986.5
4.667	136.24	998.11
4.75	130.192	1009.17
4.833	127.6	1019.87
4.917	127.6	1030.59
5	127.6	1041.18
5.083	127.6	1051.77

5.167	127.6	1062.49
5.25	127.6	1073.08
5.333	127.6	1083.67
5.417	127.6	1094.39
5.5	127.6	1104.98
5.583	127.6	1115.57
5.667	127.6	1126.29
5.75	127.6	1136.88

Storage Area Volume Curves



Storage Node : Stor-02 (continued)

Outflow Weirs

SN	Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Weir Total Height (ft)	Discharge Coefficient
1	Weir-02	Rectangular	No	1005.50	4.50	4.00	1.00	3.33

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	Orifice-02	Side	CIRCULAR	No	4.00			1002.00	0.61

Output Summary Results

Peak Inflow (cfs)	1.62
Peak Lateral Inflow (cfs)	1.62
Peak Outflow (cfs)	1.17
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	1005.6
Max HGL Depth Attained (ft)	4.6
Average HGL Elevation Attained (ft)	1002
Average HGL Depth Attained (ft)	1
Time of Max HGL Occurrence (days hh:mm)	0 12:02
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

2-YEAR EVENT

Project Description

File Name	Revisions.SPF

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	SCS TR-55
Time of Concentration (TOC) Method	SCS TR-55
Link Routing Method	Hydrodynamic
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	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 00:01:00	days hh:mm:ss
Routing Time Step	5	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins	3
Nodes	5
Junctions	2
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	2
Links	6
Channels	0
Pipes	2
Pumps	0
Orifices	2
Weirs	2
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
49		Time Series	2-Year	Cumulative	inches	Missouri	Jackson	2.00	3.71	SCS Type II 24-hr

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	A_Undetained	5.72	484.00	95.26	3.71	3.17	18.16	26.63	0 00:05:00
2	Canopy and Pad Site 2	0.40	484.00	98.00	3.71	3.48	1.39	1.95	0 00:05:00
3	Farmers Market	0.31	484.00	98.00	3.71	3.48	1.06	1.49	0 00:05:00

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	1-Jun	Junction	1001.90	1007.00	0.00	0.00	0.00	2.73	1002.30	0.00	7.35	0 00:00	0.00	0.00
2	2-Jun	Junction	1002.00	1007.00	0.00	0.00	0.00	1.78	1002.44	0.00	5.06	0 00:00	0.00	0.00
3	Out-01	Outfall	995.00					28.17	995.30					
4	Stor-01	Storage Node	1001.00	1007.00	0.00		0.00	1.49	1003.32				0.00	0.00
5	Stor-02	Storage Node	1001.00	1007.00	0.00		0.00	1.95	1005.68				0.00	0.00

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	Link-01	Pipe	1-Jun	Out-01	200.00	1002.00	995.00	3.5000	36.000	0.0120	2.70	135.18	0.02	7.26	0.30	0.10	0.00	Calculated
2	Link-02	Pipe	2-Jun	1-Jun	1.00	1002.00	1001.90	10.0000	36.000	0.0150	1.82	182.80	0.01	3.00	0.42	0.14	0.00	Calculated
3	Orifice-01	Orifice	Stor-01	1-Jun		1001.00	1001.90		6.000		0.99							
4	Orifice-02	Orifice	Stor-02	2-Jun		1001.00	1002.00		4.000		0.78							
5	Weir-01	Weir	Stor-01	1-Jun		1001.00	1001.90				0.00							
6	Weir-02	Weir	Stor-02	2-Jun		1001.00	1002.00				1.01							

Subbasin Hydrology

Subbasin : A_Undetained

Input Data

Area (ac) 5.72
Peak Rate Factor 484
Weighted Curve Number 95.26
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	4.85	D	98
> 75% grass cover, Good	0.87	D	80
Composite Area & Weighted CN	5.72		95.26

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft^2)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

Total Rainfall (in) 3.71
Total Runoff (in) 3.17
Peak Runoff (cfs) 26.63

Weighted Curve Number	95.26
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : Canopy and Pad Site 2

Input Data

Area (ac)	0.4
Peak Rate Factor	484
Weighted Curve Number	98
Rain Gage ID	Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved parking & roofs	0.52	D	98
Composite Area & Weighted CN	0.52		98

Time of Concentration

User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

Total Rainfall (in)	3.71
Total Runoff (in)	3.48
Peak Runoff (cfs)	1.95
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : Farmers Market

Input Data

Area (ac)	0.31
Peak Rate Factor	484
Weighted Curve Number	98
Rain Gage ID	Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved parking & roofs	0.31	D	98
Composite Area & Weighted CN	0.31		98

Time of Concentration

User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

Total Rainfall (in)	3.71
Total Runoff (in)	3.48
Peak Runoff (cfs)	1.49
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:05:00

Storage Nodes

Storage Node : Stor-01

Input Data

Invert Elevation (ft) 1001
Max (Rim) Elevation (ft) 1007
Max (Rim) Offset (ft) 6
Initial Water Elevation (ft) 0
Initial Water Depth (ft) ..... -1001
Ponded Area (ft²) 0
Evaporation Loss 0

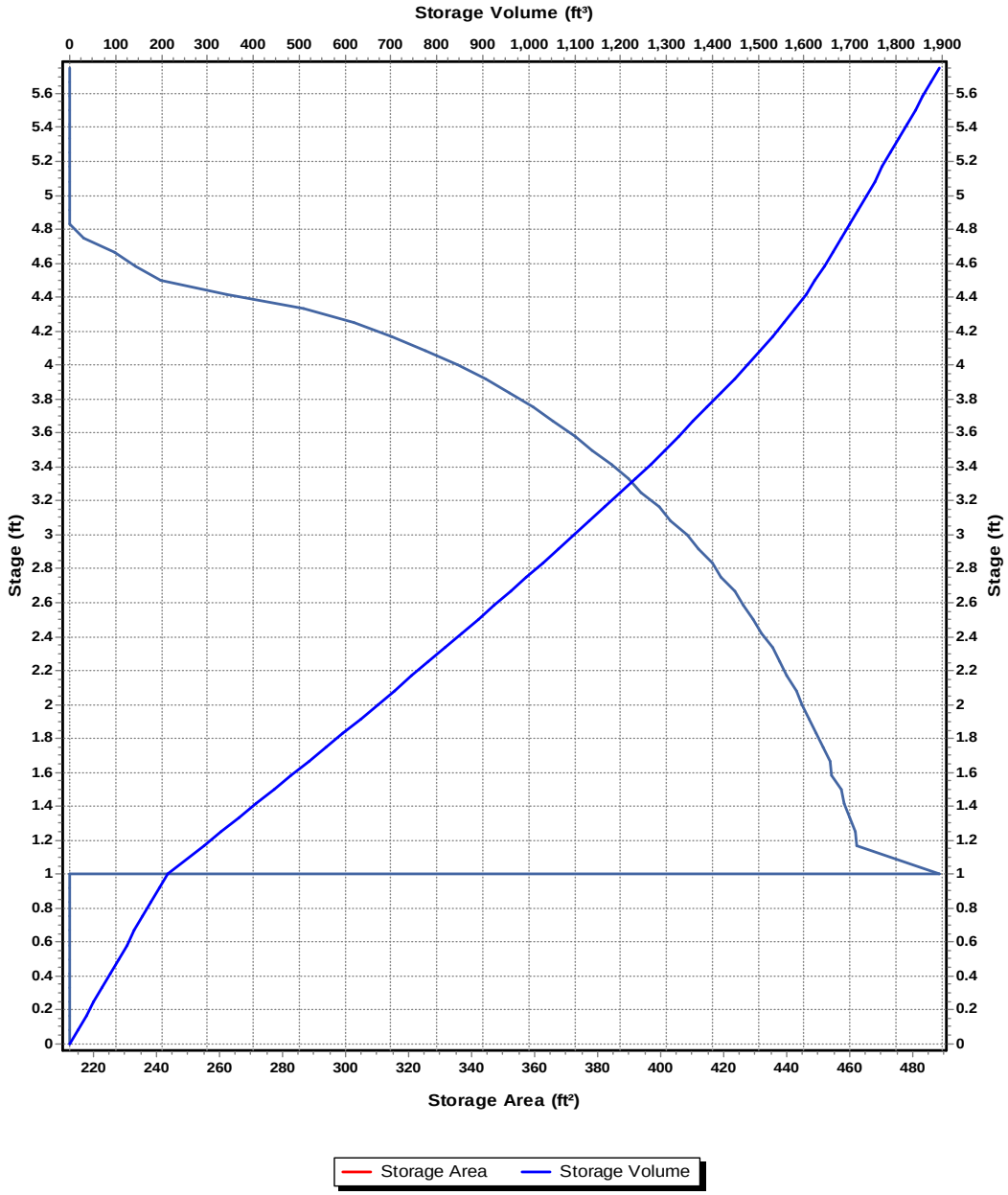
Storage Area Volume Curves

Storage Curve : Undeground Storage

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	212.6667	0
0.083	212.6667	17.65
0.167	212.6667	35.51
0.25	212.6667	53.16
0.333	212.6667	70.81
0.417	212.6667	88.67
0.5	212.6667	106.32
0.583	212.6667	123.97
0.667	212.6667	141.83
0.75	212.6667	159.48
0.833	212.6667	177.13
0.917	212.6667	194.99
1	212.667	212.64
1.001	488.6067	212.99
1.167	462.5067	291.93
1.25	461.7867	330.29
1.333	460.3467	368.56
1.417	458.1867	407.14
1.5	457.4667	445.14
1.583	454.5867	482.99
1.667	453.8667	521.15
1.75	451.7067	558.73
1.833	449.5467	596.13
1.917	447.3867	633.8
2	445.2267	670.84
2.083	443.0667	707.7
2.167	440.1867	744.8
2.25	438.0267	781.25
2.333	435.8667	817.52
2.417	432.2667	853.98
2.5	429.3867	889.74
2.583	426.5067	925.26
2.667	423.6267	960.97
2.75	419.3067	995.95
2.833	416.4267	1030.63
2.917	412.1067	1065.43
3	408.5067	1099.49
3.083	403.4667	1133.19
3.167	399.8667	1166.93
3.25	394.1067	1199.88
3.333	389.7867	1232.41
3.417	384.7467	1264.94
3.5	378.2667	1296.61
3.583	373.2267	1327.8
3.667	366.0267	1358.85
3.75	359.5467	1388.96
3.833	352.3467	1418.5
3.917	344.4267	1447.76
4	335.7867	1475.99
4.083	325.7067	1503.44
4.167	314.9067	1530.35
4.25	302.6667	1555.98
4.333	286.8267	1580.44
4.417	262.3467	1603.51
4.5	241.4667	1624.42
4.583	233.5467	1644.13
4.667	227.0667	1663.48
4.75	216.9867	1681.91

4.833	212.6667	1699.74
4.917	212.6667	1717.6
5	212.6667	1735.25
5.083	212.6667	1752.9
5.167	212.6667	1770.76
5.25	212.6667	1788.41
5.333	212.6667	1806.06
5.417	212.6667	1823.92
5.5	212.6667	1841.57
5.583	212.6667	1859.22
5.667	212.6667	1877.08
5.75	212.6667	1894.73

Storage Area Volume Curves



Storage Node : Stor-01 (continued)

Outflow Weirs

SN	Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Weir Total Height (ft)	Discharge Coefficient
1	Weir-01	Rectangular	No	1005.75	4.75	4.00	3.00	3.33

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	Orifice-01	Side	CIRCULAR	No	6.00			1002.00	0.61

Output Summary Results

Peak Inflow (cfs)	1.49
Peak Lateral Inflow (cfs)	1.49
Peak Outflow (cfs)	0.99
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	1003.32
Max HGL Depth Attained (ft)	2.32
Average HGL Elevation Attained (ft)	1001.96
Average HGL Depth Attained (ft)	0.96
Time of Max HGL Occurrence (days hh:mm)	0 12:02
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)	1001
Max (Rim) Elevation (ft)	1007
Max (Rim) Offset (ft)	6
Initial Water Elevation (ft)	0
Initial Water Depth (ft)	-1001
Ponded Area (ft²)	0
Evaporation Loss	0

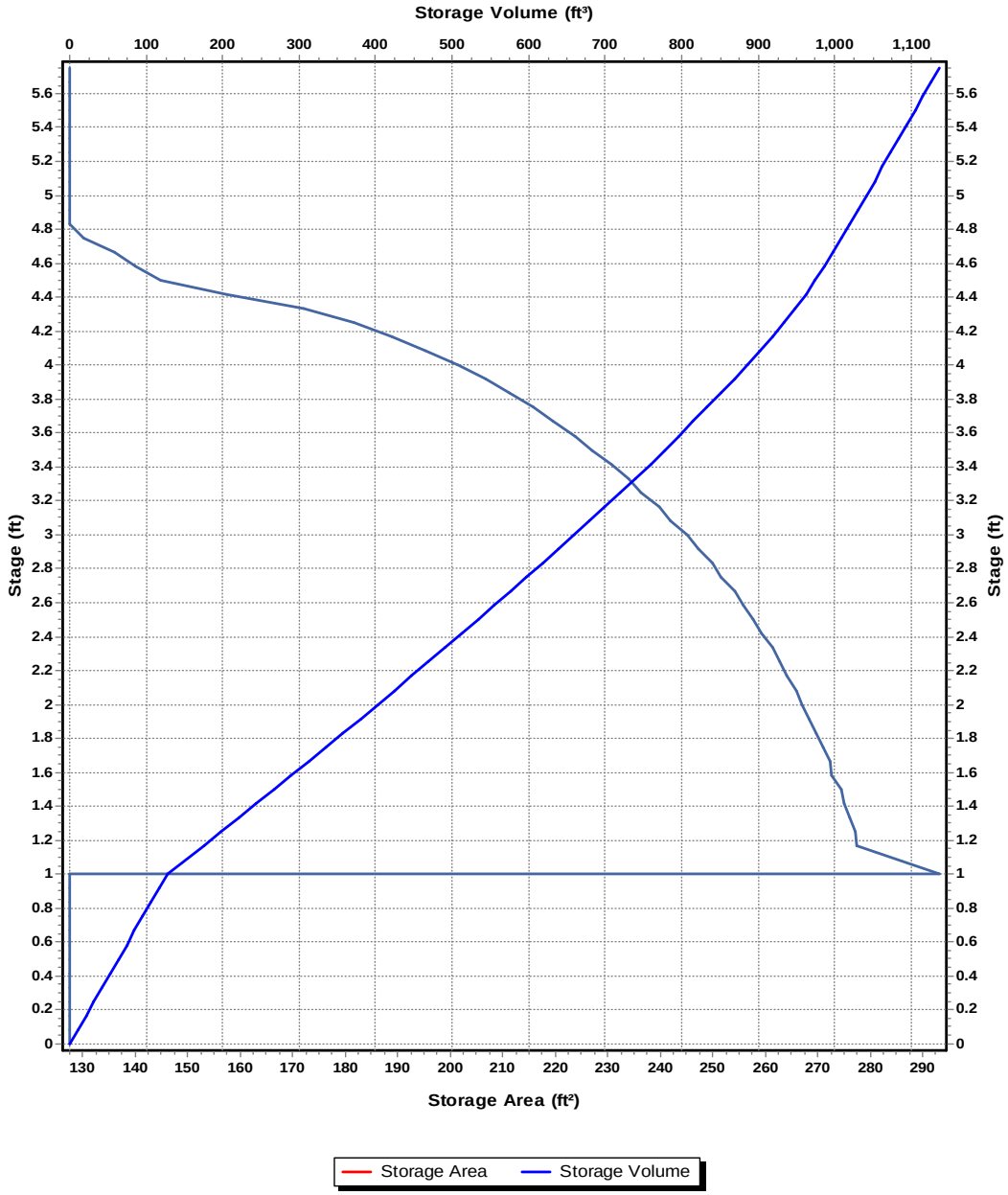
Storage Area Volume Curves

Storage Curve : 2 Underground Storage

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	127.6	0
0.083	127.6	10.59
0.167	127.6	21.31
0.25	127.6	31.9
0.333	127.6	42.49
0.417	127.6	53.21
0.5	127.6	63.8
0.583	127.6	74.39
0.667	127.6	85.11
0.75	127.6	95.7
0.833	127.6	106.29
0.917	127.6	117.01
1	127.6	127.6
1.001	293.164	127.81
1.167	277.504	175.18
1.25	277.072	198.19
1.333	276.208	221.15
1.417	274.912	244.3
1.5	274.48	267.1
1.583	272.752	289.81
1.667	272.32	312.7
1.75	271.024	335.25
1.833	269.728	357.69
1.917	268.432	380.29
2	267.136	402.52
2.083	265.84	424.64
2.167	264.112	446.9
2.25	262.816	468.77
2.333	261.52	490.53
2.417	259.36	512.41
2.5	257.632	533.87
2.583	255.904	555.18
2.667	254.176	576.6
2.75	251.584	597.59
2.833	249.856	618.4
2.917	247.264	639.28
3	245.104	659.71
3.083	242.08	679.93
3.167	239.92	700.17
3.25	236.464	719.94
3.333	233.872	739.46
3.417	230.848	758.98
3.5	226.96	777.98
3.583	223.936	796.69
3.667	219.616	815.32
3.75	215.728	833.39
3.833	211.408	851.12
3.917	206.656	868.68
4	201.472	885.62
4.083	195.424	902.09
4.167	188.944	918.23
4.25	181.6	933.61
4.333	172.096	948.29
4.417	157.408	962.13
4.5	144.88	974.67
4.583	140.128	986.5
4.667	136.24	998.11
4.75	130.192	1009.17
4.833	127.6	1019.87
4.917	127.6	1030.59
5	127.6	1041.18
5.083	127.6	1051.77

5.167	127.6	1062.49
5.25	127.6	1073.08
5.333	127.6	1083.67
5.417	127.6	1094.39
5.5	127.6	1104.98
5.583	127.6	1115.57
5.667	127.6	1126.29
5.75	127.6	1136.88

Storage Area Volume Curves



Storage Node : Stor-02 (continued)

Outflow Weirs

SN	Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Weir Total Height (ft)	Discharge Coefficient
1	Weir-02	Rectangular	No	1005.50	4.50	4.00	1.00	3.33

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	Orifice-02	Side	CIRCULAR	No	4.00			1002.00	0.61

Output Summary Results

Peak Inflow (cfs)	1.95
Peak Lateral Inflow (cfs)	1.95
Peak Outflow (cfs)	1.78
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	1005.68
Max HGL Depth Attained (ft)	4.68
Average HGL Elevation Attained (ft)	1002.01
Average HGL Depth Attained (ft)	1.01
Time of Max HGL Occurrence (days hh:mm)	0 11:58
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

10-YEAR EVENT

Project Description

File Name	Revisions.SPF

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	SCS TR-55
Time of Concentration (TOC) Method	SCS TR-55
Link Routing Method	Hydrodynamic
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	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 00:01:00	days hh:mm:ss
Routing Time Step	5	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins	3
Nodes	5
Junctions	2
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	2
Links	6
Channels	0
Pipes	2
Pumps	0
Orifices	2
Weirs	2
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
49		Time Series	10 Year	Cumulative	inches	Missouri	Jackson	10.00	5.67	SCS Type II 24-hr

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	A_Undetained	5.72	484.00	95.26	5.67	5.11	29.26	41.76	0 00:05:00
2	Canopy and Pad Site 2	0.40	484.00	98.00	5.67	5.43	2.17	3.00	0 00:05:00
3	Farmers Market	0.31	484.00	98.00	5.67	5.43	1.66	2.29	0 00:05:00

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft^2)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	1-Jun	Junction	1001.90	1007.00	0.00	0.00	0.00	4.18	1002.38	0.00	7.27	0 00:00	0.00	0.00
2	2-Jun	Junction	1002.00	1007.00	0.00	0.00	0.00	2.99	1002.57	0.00	4.93	0 00:00	0.00	0.00
3	Out-01	Outfall	995.00					45.83	995.36					
4	Stor-01	Storage Node	1001.00	1007.00	0.00		0.00	2.28	1004.37				0.00	0.00
5	Stor-02	Storage Node	1001.00	1007.00	0.00		0.00	3.00	1005.80				0.00	0.00

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	Link-01	Pipe	1-Jun	Out-01	200.00	1002.00	995.00	3.5000	36.000	0.0120	4.12	135.18	0.03	8.33	0.37	0.12	0.00	Calculated
2	Link-02	Pipe	2-Jun	1-Jun	1.00	1002.00	1001.90	10.0000	36.000	0.0150	3.03	182.80	0.02	3.69	0.52	0.17	0.00	Calculated
3	Orifice-01	Orifice	Stor-01	1-Jun		1001.00	1001.90		6.000		1.38							
4	Orifice-02	Orifice	Stor-02	2-Jun		1001.00	1002.00		4.000		0.78							
5	Weir-01	Weir	Stor-01	1-Jun		1001.00	1001.90				0.00							
6	Weir-02	Weir	Stor-02	2-Jun		1001.00	1002.00				2.22							

Subbasin Hydrology

Subbasin : A_Undetained

Input Data

Area (ac) 5.72
Peak Rate Factor 484
Weighted Curve Number 95.26
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	4.85	D	98
> 75% grass cover, Good	0.87	D	80
Composite Area & Weighted CN	5.72		95.26

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft^2)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

Total Rainfall (in) 5.67
Total Runoff (in) 5.11
Peak Runoff (cfs) 41.76

Weighted Curve Number	95.26
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : Canopy and Pad Site 2

Input Data

Area (ac)	0.4
Peak Rate Factor	484
Weighted Curve Number	98
Rain Gage ID	Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved parking & roofs	0.52	D	98
Composite Area & Weighted CN	0.52		98

Time of Concentration

User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

Total Rainfall (in)	5.67
Total Runoff (in)	5.43
Peak Runoff (cfs)	3
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : Farmers Market

Input Data

Area (ac)	0.31
Peak Rate Factor	484
Weighted Curve Number	98
Rain Gage ID	Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved parking & roofs	0.31	D	98
Composite Area & Weighted CN	0.31		98

Time of Concentration

User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

Total Rainfall (in)	5.67
Total Runoff (in)	5.43
Peak Runoff (cfs)	2.29
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:05:00

Storage Nodes

Storage Node : Stor-01

Input Data

Invert Elevation (ft) 1001
Max (Rim) Elevation (ft) 1007
Max (Rim) Offset (ft) 6
Initial Water Elevation (ft) 0
Initial Water Depth (ft) ..... -1001
Ponded Area (ft²) 0
Evaporation Loss 0

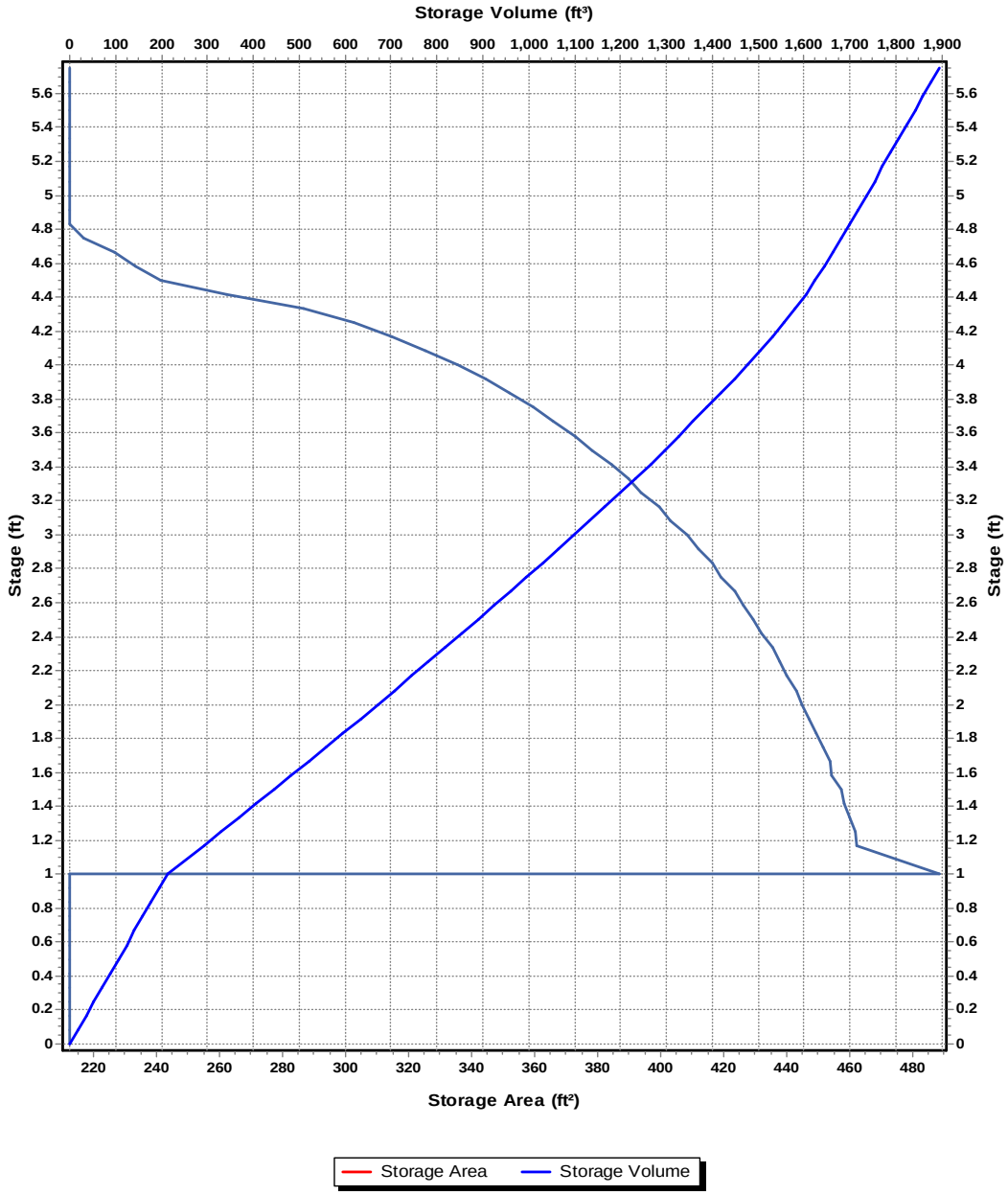
Storage Area Volume Curves

Storage Curve : Undeground Storage

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	212.6667	0
0.083	212.6667	17.65
0.167	212.6667	35.51
0.25	212.6667	53.16
0.333	212.6667	70.81
0.417	212.6667	88.67
0.5	212.6667	106.32
0.583	212.6667	123.97
0.667	212.6667	141.83
0.75	212.6667	159.48
0.833	212.6667	177.13
0.917	212.6667	194.99
1	212.667	212.64
1.001	488.6067	212.99
1.167	462.5067	291.93
1.25	461.7867	330.29
1.333	460.3467	368.56
1.417	458.1867	407.14
1.5	457.4667	445.14
1.583	454.5867	482.99
1.667	453.8667	521.15
1.75	451.7067	558.73
1.833	449.5467	596.13
1.917	447.3867	633.8
2	445.2267	670.84
2.083	443.0667	707.7
2.167	440.1867	744.8
2.25	438.0267	781.25
2.333	435.8667	817.52
2.417	432.2667	853.98
2.5	429.3867	889.74
2.583	426.5067	925.26
2.667	423.6267	960.97
2.75	419.3067	995.95
2.833	416.4267	1030.63
2.917	412.1067	1065.43
3	408.5067	1099.49
3.083	403.4667	1133.19
3.167	399.8667	1166.93
3.25	394.1067	1199.88
3.333	389.7867	1232.41
3.417	384.7467	1264.94
3.5	378.2667	1296.61
3.583	373.2267	1327.8
3.667	366.0267	1358.85
3.75	359.5467	1388.96
3.833	352.3467	1418.5
3.917	344.4267	1447.76
4	335.7867	1475.99
4.083	325.7067	1503.44
4.167	314.9067	1530.35
4.25	302.6667	1555.98
4.333	286.8267	1580.44
4.417	262.3467	1603.51
4.5	241.4667	1624.42
4.583	233.5467	1644.13
4.667	227.0667	1663.48
4.75	216.9867	1681.91

4.833	212.6667	1699.74
4.917	212.6667	1717.6
5	212.6667	1735.25
5.083	212.6667	1752.9
5.167	212.6667	1770.76
5.25	212.6667	1788.41
5.333	212.6667	1806.06
5.417	212.6667	1823.92
5.5	212.6667	1841.57
5.583	212.6667	1859.22
5.667	212.6667	1877.08
5.75	212.6667	1894.73

Storage Area Volume Curves



Storage Node : Stor-01 (continued)

Outflow Weirs

SN	Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Weir Total Height (ft)	Discharge Coefficient
1	Weir-01	Rectangular	No	1005.75	4.75	4.00	3.00	3.33

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	Orifice-01	Side	CIRCULAR	No	6.00			1002.00	0.61

Output Summary Results

Peak Inflow (cfs)	2.28
Peak Lateral Inflow (cfs)	2.28
Peak Outflow (cfs)	1.38
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	1004.37
Max HGL Depth Attained (ft)	3.37
Average HGL Elevation Attained (ft)	1002
Average HGL Depth Attained (ft)	1
Time of Max HGL Occurrence (days hh:mm)	0 12:03
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)	1001
Max (Rim) Elevation (ft)	1007
Max (Rim) Offset (ft)	6
Initial Water Elevation (ft)	0
Initial Water Depth (ft)	-1001
Ponded Area (ft²)	0
Evaporation Loss	0

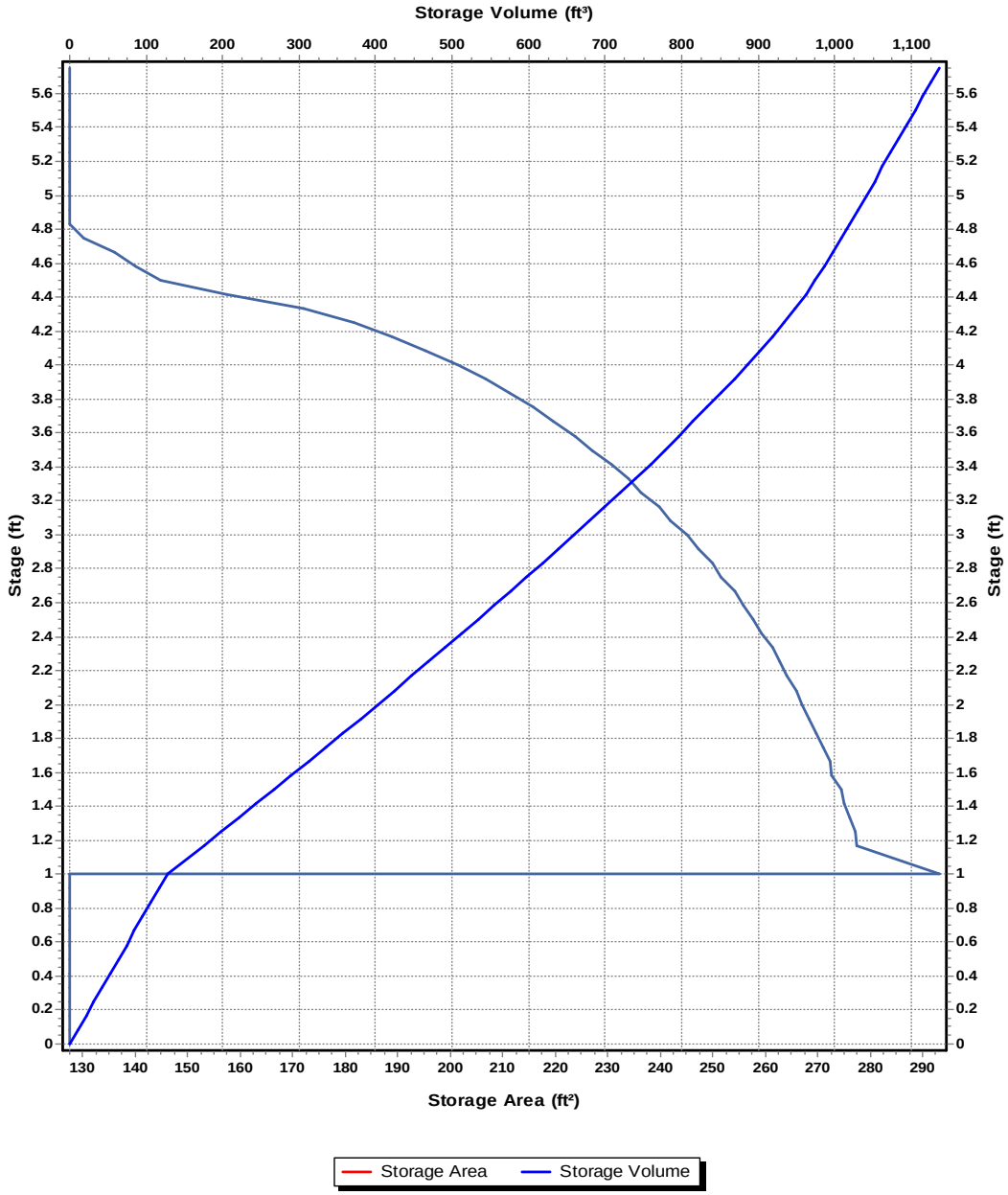
Storage Area Volume Curves

Storage Curve : 2 Underground Storage

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	127.6	0
0.083	127.6	10.59
0.167	127.6	21.31
0.25	127.6	31.9
0.333	127.6	42.49
0.417	127.6	53.21
0.5	127.6	63.8
0.583	127.6	74.39
0.667	127.6	85.11
0.75	127.6	95.7
0.833	127.6	106.29
0.917	127.6	117.01
1	127.6	127.6
1.001	293.164	127.81
1.167	277.504	175.18
1.25	277.072	198.19
1.333	276.208	221.15
1.417	274.912	244.3
1.5	274.48	267.1
1.583	272.752	289.81
1.667	272.32	312.7
1.75	271.024	335.25
1.833	269.728	357.69
1.917	268.432	380.29
2	267.136	402.52
2.083	265.84	424.64
2.167	264.112	446.9
2.25	262.816	468.77
2.333	261.52	490.53
2.417	259.36	512.41
2.5	257.632	533.87
2.583	255.904	555.18
2.667	254.176	576.6
2.75	251.584	597.59
2.833	249.856	618.4
2.917	247.264	639.28
3	245.104	659.71
3.083	242.08	679.93
3.167	239.92	700.17
3.25	236.464	719.94
3.333	233.872	739.46
3.417	230.848	758.98
3.5	226.96	777.98
3.583	223.936	796.69
3.667	219.616	815.32
3.75	215.728	833.39
3.833	211.408	851.12
3.917	206.656	868.68
4	201.472	885.62
4.083	195.424	902.09
4.167	188.944	918.23
4.25	181.6	933.61
4.333	172.096	948.29
4.417	157.408	962.13
4.5	144.88	974.67
4.583	140.128	986.5
4.667	136.24	998.11
4.75	130.192	1009.17
4.833	127.6	1019.87
4.917	127.6	1030.59
5	127.6	1041.18
5.083	127.6	1051.77

5.167	127.6	1062.49
5.25	127.6	1073.08
5.333	127.6	1083.67
5.417	127.6	1094.39
5.5	127.6	1104.98
5.583	127.6	1115.57
5.667	127.6	1126.29
5.75	127.6	1136.88

Storage Area Volume Curves



Storage Node : Stor-02 (continued)

Outflow Weirs

SN	Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Weir Total Height (ft)	Discharge Coefficient
1	Weir-02	Rectangular	No	1005.50	4.50	4.00	1.00	3.33

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	Orifice-02	Side	CIRCULAR	No	4.00			1002.00	0.61

Output Summary Results

Peak Inflow (cfs)	3
Peak Lateral Inflow (cfs)	3
Peak Outflow (cfs)	2.99
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	1005.8
Max HGL Depth Attained (ft)	4.8
Average HGL Elevation Attained (ft)	1002.05
Average HGL Depth Attained (ft)	1.05
Time of Max HGL Occurrence (days hh:mm)	0 11:56
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

100-YEAR EVENT

Project Description

File Name	Revisions.SPF

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	SCS TR-55
Time of Concentration (TOC) Method	SCS TR-55
Link Routing Method	Hydrodynamic
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	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 00:01:00	days hh:mm:ss
Routing Time Step	5	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins	3
Nodes	5
Junctions	2
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	2
Links	6
Channels	0
Pipes	2
Pumps	0
Orifices	2
Weirs	2
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
49		Time Series	100 Year	Cumulative	inches	Missouri	Jackson	100.00	9.25	SCS Type II 24-hr

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	A_Undetained	5.72	484.00	95.26	9.25	8.68	49.66	69.08	0 00:05:00
2	Canopy and Pad Site 2	0.40	484.00	98.00	9.25	9.01	3.60	4.91	0 00:05:00
3	Farmers Market	0.31	484.00	98.00	9.25	9.01	2.76	3.74	0 00:05:00

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	1-Jun	Junction	1001.90	1007.00	0.00	0.00	0.00	7.92	1002.53	0.00	7.12	0 00:00	0.00	0.00
2	2-Jun	Junction	1002.00	1007.00	0.00	0.00	0.00	4.90	1002.74	0.00	4.76	0 00:00	0.00	0.00
3	Out-01	Outfall	995.00					75.54	995.49					
4	Stor-01	Storage Node	1001.00	1007.00	0.00		0.00	3.74	1005.99				0.00	0.00
5	Stor-02	Storage Node	1001.00	1007.00	0.00		0.00	4.91	1005.96				0.00	0.00

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	Link-01	Pipe	1-Jun	Out-01	200.00	1002.00	995.00	3.5000	36.000	0.0120	7.94	135.18	0.06	9.93	0.51	0.17	0.00	Calculated
2	Link-02	Pipe	2-Jun	1-Jun	1.00	1002.00	1001.90	10.0000	36.000	0.0150	4.93	182.80	0.03	4.32	0.68	0.23	0.00	Calculated
3	Orifice-01	Orifice	Stor-01	1-Jun		1001.00	1001.90		6.000		1.80							
4	Orifice-02	Orifice	Stor-02	2-Jun		1001.00	1002.00		4.000		0.78							
5	Weir-01	Weir	Stor-01	1-Jun		1001.00	1001.90				1.59							
6	Weir-02	Weir	Stor-02	2-Jun		1001.00	1002.00				4.12							

Subbasin Hydrology

Subbasin : A_Undetained

Input Data

Area (ac) 5.72
Peak Rate Factor 484
Weighted Curve Number 95.26
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32

Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved roads with curbs & sewers	4.85	D	98
> 75% grass cover, Good	0.87	D	80
Composite Area & Weighted CN	5.72		95.26

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft^2)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

Total Rainfall (in) 9.25
Total Runoff (in) 8.68
Peak Runoff (cfs) 69.08

Weighted Curve Number	95.26
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : Canopy and Pad Site 2

Input Data

Area (ac)	0.4
Peak Rate Factor	484
Weighted Curve Number	98
Rain Gage ID	Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved parking & roofs	0.52	D	98
Composite Area & Weighted CN	0.52		98

Time of Concentration

User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

Total Rainfall (in)	9.25
Total Runoff (in)	9.01
Peak Runoff (cfs)	4.91
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:05:00

Subbasin : Farmers Market

Input Data

Area (ac)	0.31
Peak Rate Factor	484
Weighted Curve Number	98
Rain Gage ID	Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Paved parking & roofs	0.31	D	98
Composite Area & Weighted CN	0.31		98

Time of Concentration

User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

Total Rainfall (in)	9.25
Total Runoff (in)	9.01
Peak Runoff (cfs)	3.74
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:05:00

Storage Nodes

Storage Node : Stor-01

Input Data

Invert Elevation (ft) 1001
Max (Rim) Elevation (ft) 1007
Max (Rim) Offset (ft) 6
Initial Water Elevation (ft) 0
Initial Water Depth (ft) ..... -1001
Ponded Area (ft²) 0
Evaporation Loss 0

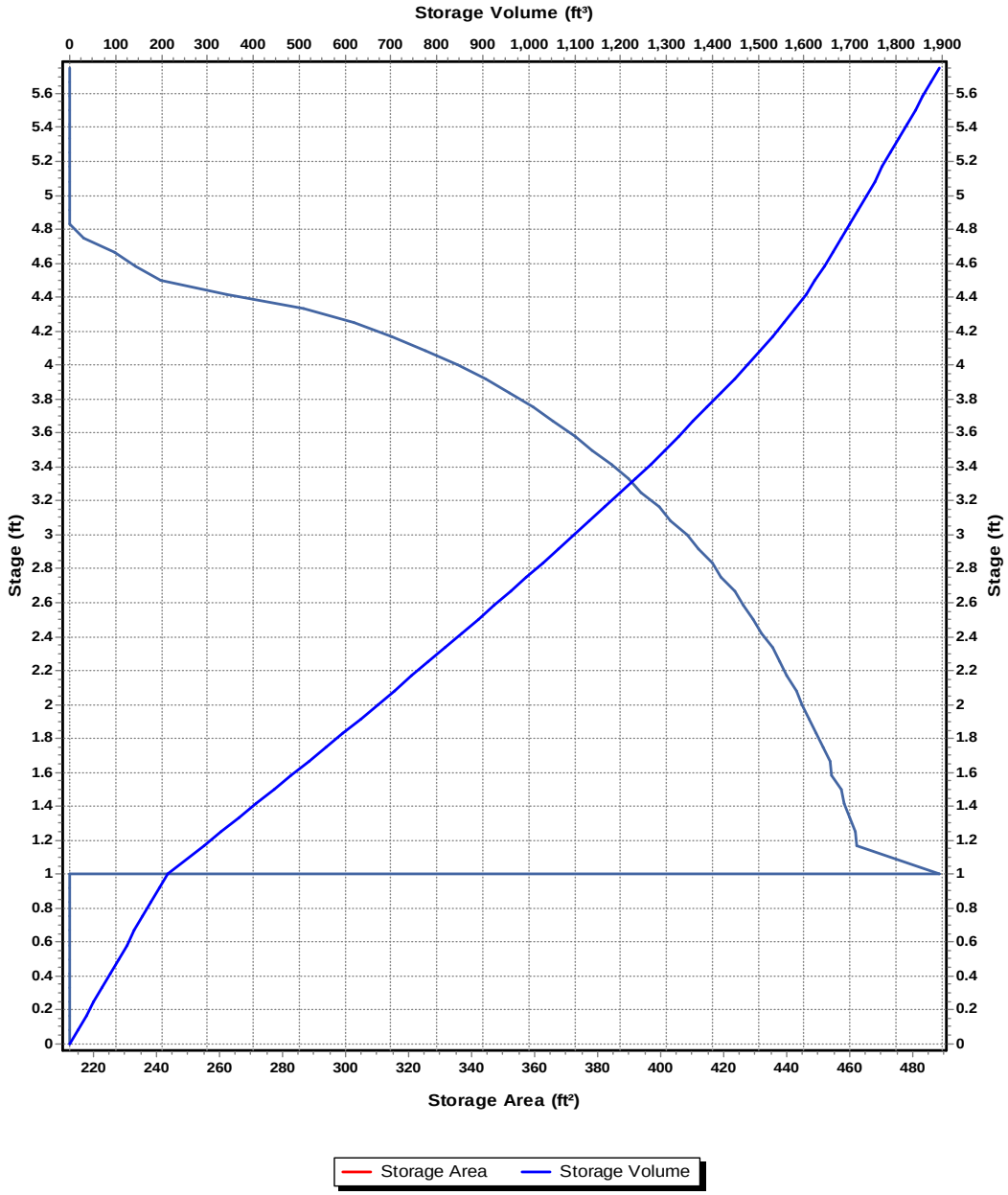
Storage Area Volume Curves

Storage Curve : Undeground Storage

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	212.6667	0
0.083	212.6667	17.65
0.167	212.6667	35.51
0.25	212.6667	53.16
0.333	212.6667	70.81
0.417	212.6667	88.67
0.5	212.6667	106.32
0.583	212.6667	123.97
0.667	212.6667	141.83
0.75	212.6667	159.48
0.833	212.6667	177.13
0.917	212.6667	194.99
1	212.667	212.64
1.001	488.6067	212.99
1.167	462.5067	291.93
1.25	461.7867	330.29
1.333	460.3467	368.56
1.417	458.1867	407.14
1.5	457.4667	445.14
1.583	454.5867	482.99
1.667	453.8667	521.15
1.75	451.7067	558.73
1.833	449.5467	596.13
1.917	447.3867	633.8
2	445.2267	670.84
2.083	443.0667	707.7
2.167	440.1867	744.8
2.25	438.0267	781.25
2.333	435.8667	817.52
2.417	432.2667	853.98
2.5	429.3867	889.74
2.583	426.5067	925.26
2.667	423.6267	960.97
2.75	419.3067	995.95
2.833	416.4267	1030.63
2.917	412.1067	1065.43
3	408.5067	1099.49
3.083	403.4667	1133.19
3.167	399.8667	1166.93
3.25	394.1067	1199.88
3.333	389.7867	1232.41
3.417	384.7467	1264.94
3.5	378.2667	1296.61
3.583	373.2267	1327.8
3.667	366.0267	1358.85
3.75	359.5467	1388.96
3.833	352.3467	1418.5
3.917	344.4267	1447.76
4	335.7867	1475.99
4.083	325.7067	1503.44
4.167	314.9067	1530.35
4.25	302.6667	1555.98
4.333	286.8267	1580.44
4.417	262.3467	1603.51
4.5	241.4667	1624.42
4.583	233.5467	1644.13
4.667	227.0667	1663.48
4.75	216.9867	1681.91

4.833	212.6667	1699.74
4.917	212.6667	1717.6
5	212.6667	1735.25
5.083	212.6667	1752.9
5.167	212.6667	1770.76
5.25	212.6667	1788.41
5.333	212.6667	1806.06
5.417	212.6667	1823.92
5.5	212.6667	1841.57
5.583	212.6667	1859.22
5.667	212.6667	1877.08
5.75	212.6667	1894.73

Storage Area Volume Curves



Storage Node : Stor-01 (continued)

Outflow Weirs

SN	Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Weir Total Height (ft)	Discharge Coefficient
1	Weir-01	Rectangular	No	1005.75	4.75	4.00	3.00	3.33

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	Orifice-01	Side	CIRCULAR	No	6.00			1002.00	0.61

Output Summary Results

Peak Inflow (cfs)	3.74
Peak Lateral Inflow (cfs)	3.74
Peak Outflow (cfs)	3.39
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	1005.99
Max HGL Depth Attained (ft)	4.99
Average HGL Elevation Attained (ft)	1002.04
Average HGL Depth Attained (ft)	1.04
Time of Max HGL Occurrence (days hh:mm)	0 11:58
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)	1001
Max (Rim) Elevation (ft)	1007
Max (Rim) Offset (ft)	6
Initial Water Elevation (ft)	0
Initial Water Depth (ft)	-1001
Ponded Area (ft²)	0
Evaporation Loss	0

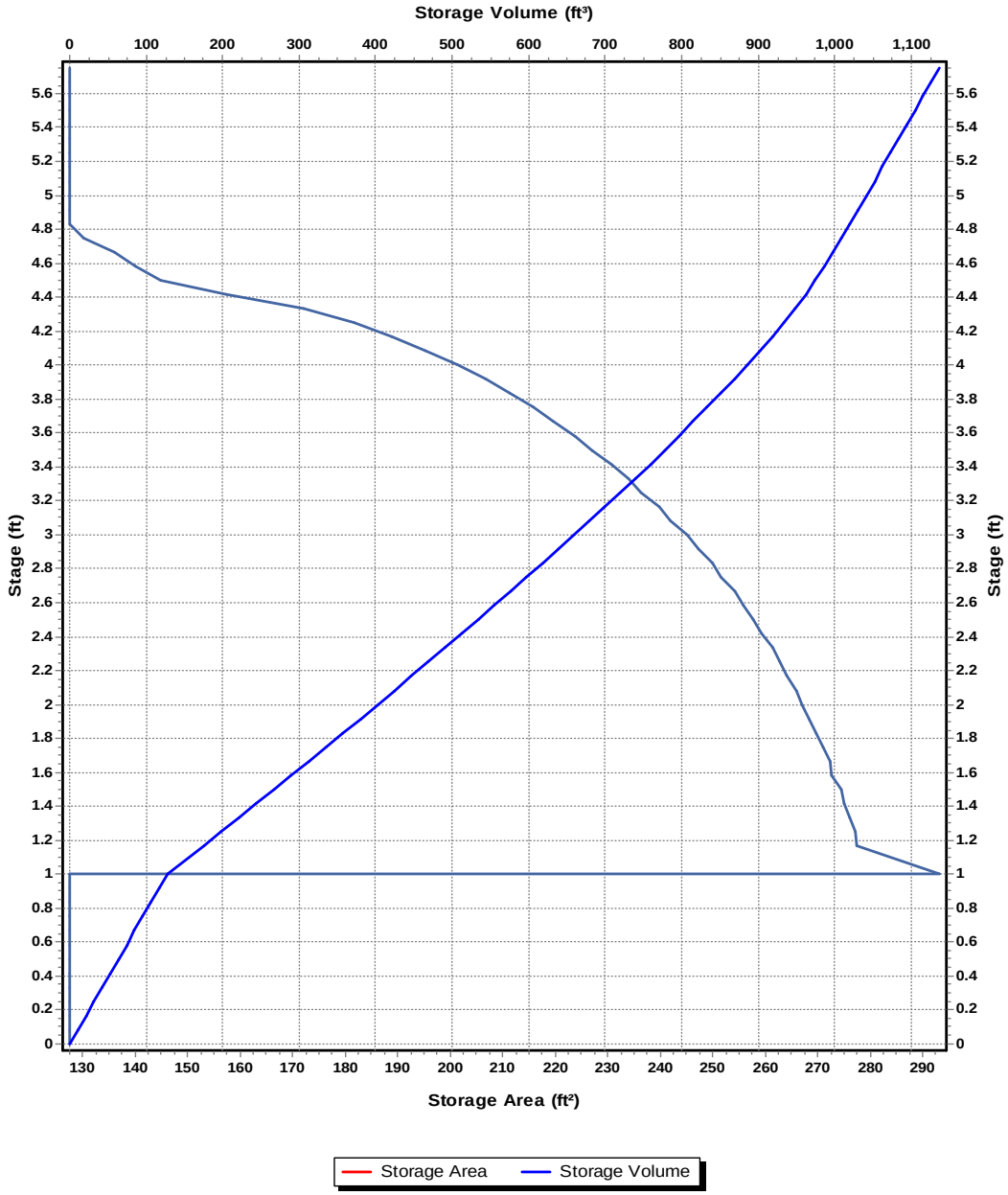
Storage Area Volume Curves

Storage Curve : 2 Underground Storage

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	127.6	0
0.083	127.6	10.59
0.167	127.6	21.31
0.25	127.6	31.9
0.333	127.6	42.49
0.417	127.6	53.21
0.5	127.6	63.8
0.583	127.6	74.39
0.667	127.6	85.11
0.75	127.6	95.7
0.833	127.6	106.29
0.917	127.6	117.01
1	127.6	127.6
1.001	293.164	127.81
1.167	277.504	175.18
1.25	277.072	198.19
1.333	276.208	221.15
1.417	274.912	244.3
1.5	274.48	267.1
1.583	272.752	289.81
1.667	272.32	312.7
1.75	271.024	335.25
1.833	269.728	357.69
1.917	268.432	380.29
2	267.136	402.52
2.083	265.84	424.64
2.167	264.112	446.9
2.25	262.816	468.77
2.333	261.52	490.53
2.417	259.36	512.41
2.5	257.632	533.87
2.583	255.904	555.18
2.667	254.176	576.6
2.75	251.584	597.59
2.833	249.856	618.4
2.917	247.264	639.28
3	245.104	659.71
3.083	242.08	679.93
3.167	239.92	700.17
3.25	236.464	719.94
3.333	233.872	739.46
3.417	230.848	758.98
3.5	226.96	777.98
3.583	223.936	796.69
3.667	219.616	815.32
3.75	215.728	833.39
3.833	211.408	851.12
3.917	206.656	868.68
4	201.472	885.62
4.083	195.424	902.09
4.167	188.944	918.23
4.25	181.6	933.61
4.333	172.096	948.29
4.417	157.408	962.13
4.5	144.88	974.67
4.583	140.128	986.5
4.667	136.24	998.11
4.75	130.192	1009.17
4.833	127.6	1019.87
4.917	127.6	1030.59
5	127.6	1041.18
5.083	127.6	1051.77

5.167	127.6	1062.49
5.25	127.6	1073.08
5.333	127.6	1083.67
5.417	127.6	1094.39
5.5	127.6	1104.98
5.583	127.6	1115.57
5.667	127.6	1126.29
5.75	127.6	1136.88

Storage Area Volume Curves



Storage Node : Stor-02 (continued)

Outflow Weirs

SN	Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Weir Total Height (ft)	Discharge Coefficient
1	Weir-02	Rectangular	No	1005.50	4.50	4.00	1.00	3.33

Outflow Orifices

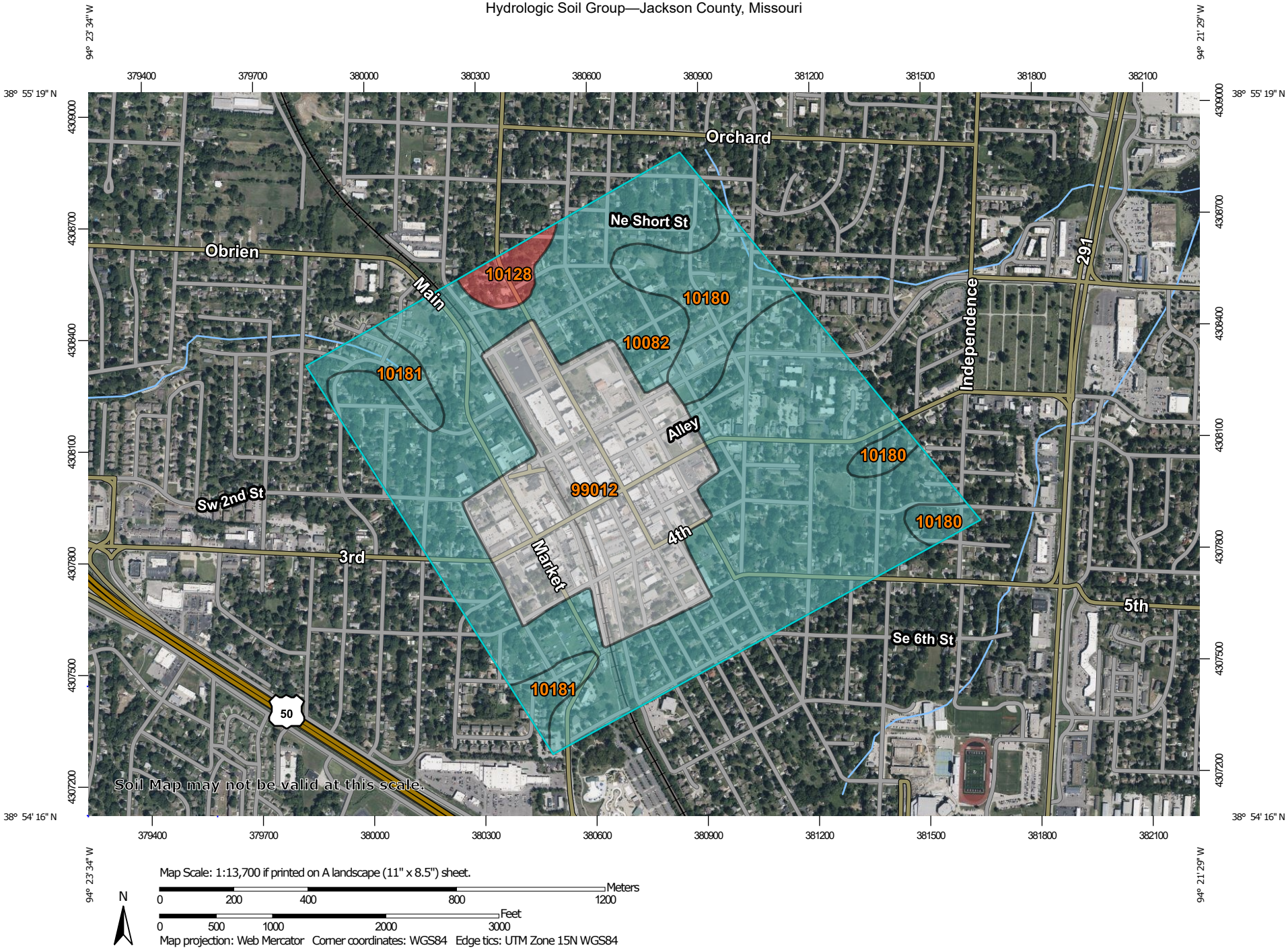
SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	Orifice-02	Side	CIRCULAR	No	4.00			1002.00	0.61

Output Summary Results

Peak Inflow (cfs)	4.91
Peak Lateral Inflow (cfs)	4.91
Peak Outflow (cfs)	4.9
Peak Exfiltration Flow Rate (cfm)	0
Max HGL Elevation Attained (ft)	1005.96
Max HGL Depth Attained (ft)	4.96
Average HGL Elevation Attained (ft)	1002.09
Average HGL Depth Attained (ft)	1.09
Time of Max HGL Occurrence (days hh:mm)	0 11:56
Total Exfiltration Volume (1000-ft³)	0
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

APPENDIX D

Soil Maps



Map Scale: 1:13,700 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 200 400 800 1200

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Jackson County, Missouri
Survey Area Data: Version 24, Aug 31, 2022

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

Date(s) aerial images were photographed: Aug 30, 2022—Sep 8, 2022

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
10082	Arisburg-Urban land complex, 1 to 5 percent slopes	C	232.8	60.9%
10128	Sharpsburg-Urban land complex, 2 to 5 percent slopes	D	6.9	1.8%
10180	Udarents-Urban land-Sampsel complex, 2 to 5 percent slopes	C	33.7	8.8%
10181	Udarents-Urban land-Sampsel complex, 5 to 9 percent slopes	C	15.5	4.0%
99012	Urban land, upland, 5 to 9 percent slopes		93.4	24.4%
Totals for Area of Interest			**382.3**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX E

FEMA

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Missouri State Plane West Zone (FIPS zone 2403). The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from the U.S.D.A Farm Service National Agriculture ImageryProgram (NAIP) dated 2014. Produced at scale of 1:24,000.

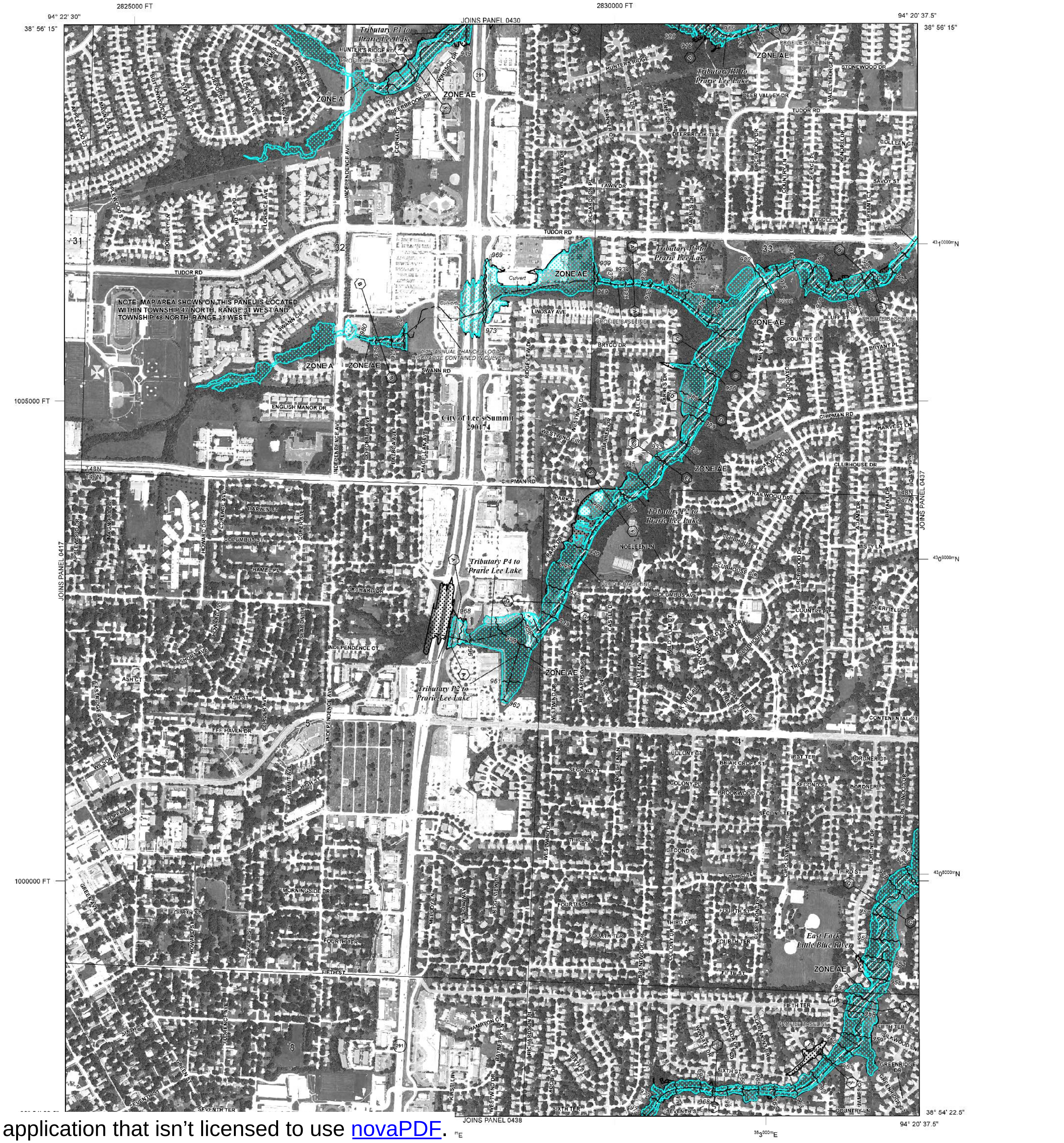
The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on the map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% Annual Chance Floodplain Boundary
	0.2% Annual Chance Floodplain Boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

(A) —— (A)	Cross section line
(23) - - - - (23)	Transect line
	Culvert
	Bridge
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
3100000 FT	5000-foot ticks: Missouri State Plane West Zone (FIPS Zone 2403), Transverse Mercator projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
September 29, 2006

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
January 20, 2017 - to change Special Flood Hazard Areas.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

N

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0436G

FIRM

FLOOD INSURANCE RATE MAP

JACKSON COUNTY, MISSOURI
AND INCORPORATED AREAS

PANEL 436 OF 625
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LEE'S SUMMIT, CITY OF	290174	0436	G

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

U.S. DEPARTMENT OF HOMELAND SECURITY

MAP NUMBER
29095C0436G

MAP REVISED
JANUARY 20, 2017

Federal Emergency Management Agency

LEE'S SUMMIT DOWNTOWN MARKET
PRELIMARY DEVELOPMENT PLAN
DRAINAGE STUDY

Lee's Summit, MO

September 2023

Olsson Project No. 022-00393