

# **LITTLE CAESARS DRAINAGE REPORT**

DATE 7/10/24  
REVISED 7/11/24

PREPARED FOR:  
**CITY OF BRYANT, AR**

PREPARED BY:

THOMAS ENGINEERING COMPANY  
JOHN R POWNALL, P.E.  
3810 LOOKOUT ROAD  
NORTH LITTLE ROCK, AR 72116

CERTIFICATION

I hereby state that this Final Drainage has been prepared by me or under my supervision and meets the standard of care and expertise which is usual and customary in this community of professional engineers. The analysis has been prepared utilizing procedures and practices by the City of Bryant and within the standard accepted practices.

  
John R. Pownall, P.E.  
President



Date: 07/10/24  
REVISED: 07/11/24

## **PROJECT DESCRIPTION**

The proposed project is for the construction of a Little Caesars Restaurant located at Reynolds Road and Brown Lane. The proposed development is for a 1,873 square foot building.

This drainage analysis is to evaluate the predevelopment & post development drainage for the 2YR, 5YR, 10YR, 25YR and 100YR storms. The existing site is grass covered. The developed condition will be covered in approximately 70% impermeable surfaces.

## **PROPOSED DRAINAGE SYSTEM**

The developed site will drain by overland flow to a detention basin on the west side of the site. The detention basin will have a 8" diameter outlet pipe and a 5 foot wide overflow wier. The pre-development and post-development flows are summarized below:

STORM	<u>PRE-DEVELOPMENT</u>	<u>POST-DEVELOPMENT</u>
2	1.10	1.97
5	1.35	2.11
10	1.49	2.22
25	1.71	2.77
100	2.13	3.65

Due to the 8" minimum size of the outlet pipe, the post-development flows are more than the pre-development.

# **APPENDIX**

## Project Description

File Name ..... LITTLE CAESARS BRYANT POST DEV.SPF  
Description .....  
LITTLE CAESARS BRYANT

## Project Options

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

## Analysis Options

Start Analysis On ..... Jun 28, 2024 00:00:00  
End Analysis On ..... Jun 28, 2024 03:00:00  
Start Reporting On ..... Jun 28, 2024 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 00:05:00 days hh:mm:ss  
Routing Time Step ..... 30 seconds

## Number of Elements

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

## Rainfall Details

Return Period..... 2 year(s)

## Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub-01	0.82	0.3400	0.48	0.16	0.13	1.62	0 00:05:00

## Node Summary

SN ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft <sup>2</sup> )	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)
1	Out-01 Outfall	430.30					1.21	430.30	
2	Stor-01 Storage Node	430.50	433.00	430.50		0.00	1.62	431.32	

# Link Summary

SN Element ID	Element Type	From (Inlet Node)	To (Outlet Node)	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)
1	DETENTION-OUTLET	Orifice	Stor-01 Out-01		430.50	430.30		8.000		1.21			
2	DETENTION-SPILLWAY	Weir	Stor-01 Out-01		430.50	430.30				0.00			



# Subbasin Hydrology

## Subbasin : Sub-01

### Input Data

Area (ac) ..... 0.82  
Weighted Runoff Coefficient ..... 0.3400

### Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
Pasture, less than 25 years	0.82	C (2-6%)	0.34
Composite Area & Weighted Runoff Coeff.	0.82		0.34

### Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$$T_c = (0.007 * ((n * L_f)^{0.8}) / ((P^{0.5}) * (S_f^{0.4})))$$

Where :

T<sub>c</sub> = Time of Concentration (hr)  
n = Manning's roughness  
L<sub>f</sub> = Flow Length (ft)  
P = 2 yr, 24 hr Rainfall (inches)  
S<sub>f</sub> = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 \* (S<sub>f</sub><sup>0.5</sup>) (unpaved surface)  
V = 20.3282 \* (S<sub>f</sub><sup>0.5</sup>) (paved surface)  
V = 15.0 \* (S<sub>f</sub><sup>0.5</sup>) (grassed waterway surface)  
V = 10.0 \* (S<sub>f</sub><sup>0.5</sup>) (nearly bare & untilled surface)  
V = 9.0 \* (S<sub>f</sub><sup>0.5</sup>) (cultivated straight rows surface)  
V = 7.0 \* (S<sub>f</sub><sup>0.5</sup>) (short grass pasture surface)  
V = 5.0 \* (S<sub>f</sub><sup>0.5</sup>) (woodland surface)  
V = 2.5 \* (S<sub>f</sub><sup>0.5</sup>) (forest w/heavy litter surface)  
T<sub>c</sub> = (L<sub>f</sub> / V) / (3600 sec/hr)

Where:

T<sub>c</sub> = Time of Concentration (hr)  
L<sub>f</sub> = Flow Length (ft)  
V = Velocity (ft/sec)  
S<sub>f</sub> = Slope (ft/ft)

Channel Flow Equation :

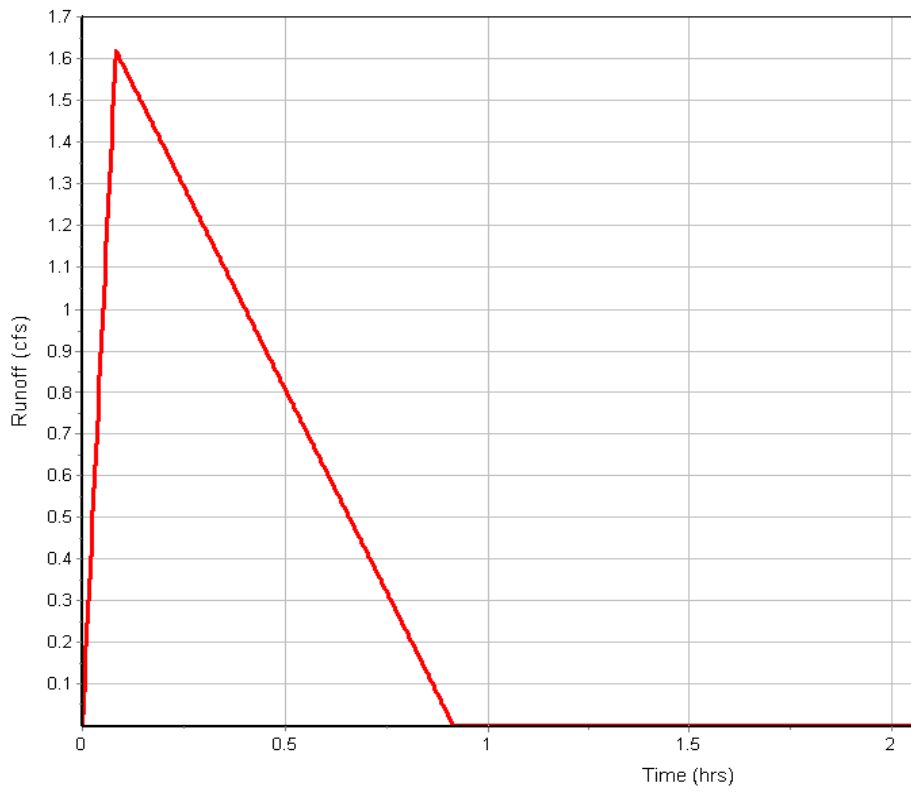
V = (1.49 \* (R<sup>2/3</sup>) \* (S<sub>f</sub><sup>0.5</sup>)) / n  
R = A<sub>q</sub> / W<sub>p</sub>  
T<sub>c</sub> = (L<sub>f</sub> / V) / (3600 sec/hr)

Where :

T<sub>c</sub> = Time of Concentration (hr)  
L<sub>f</sub> = Flow Length (ft)  
R = Hydraulic Radius (ft)

Subbasin : Sub-01

Runoff Hydrograph



# Storage Nodes

## Storage Node : Stor-01

### Input Data

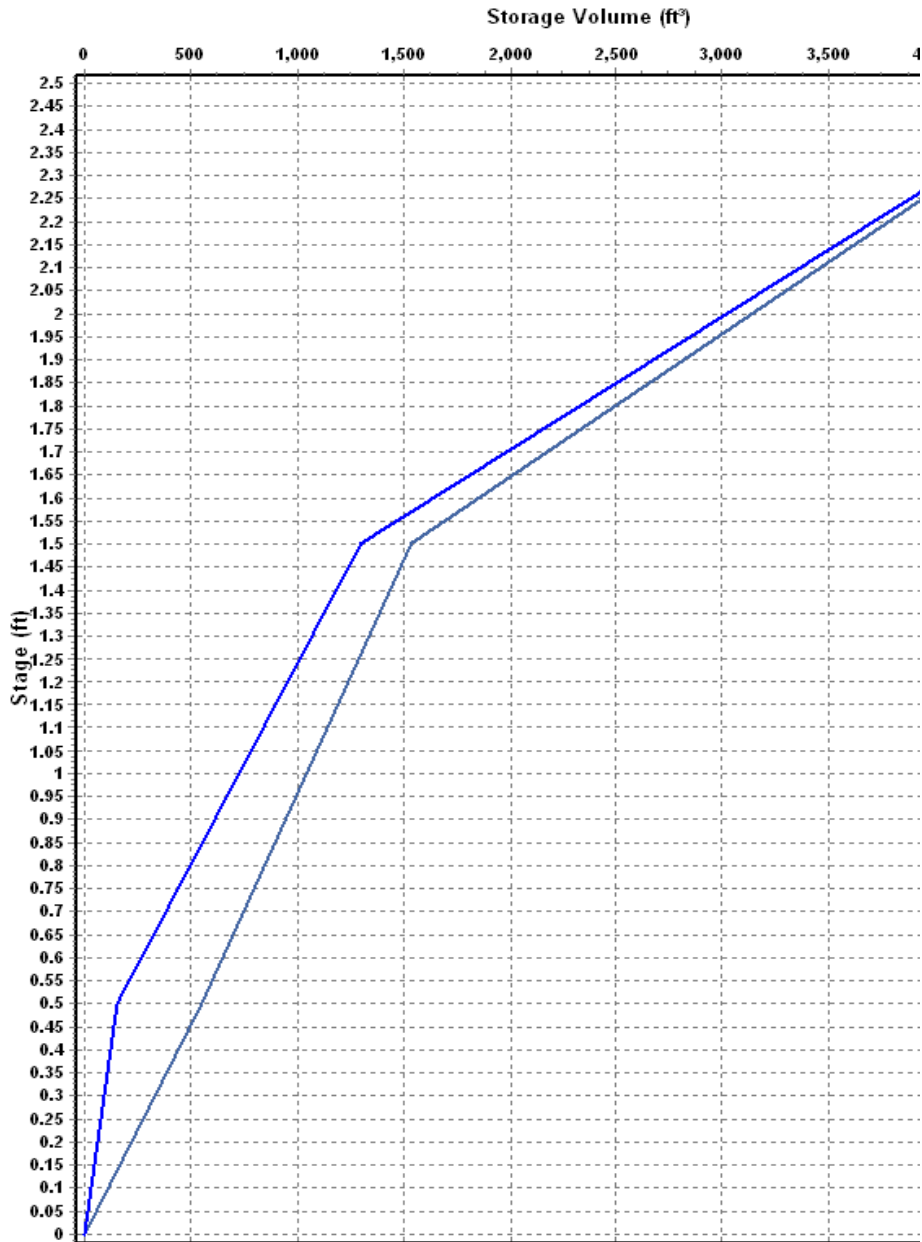
Invert Elevation (ft) ..... 430.50  
Max (Rim) Elevation (ft) ..... 433.00  
Max (Rim) Offset (ft) ..... 2.50  
Initial Water Elevation (ft) ..... 430.50  
Initial Water Depth (ft) ..... 0.00  
Ponded Area (ft<sup>2</sup>) ..... 0.00  
Evaporation Loss ..... 0.00

### Storage Area Volume Curves

Storage Curve : Storage-01

Stage (ft)	Storage Area (ft <sup>2</sup> )	Storage Volume (ft <sup>3</sup> )
0	1	0.000
.5	608	152.25
1.5	1689	1300.75
2.5	5204	4747.25

### 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)
1 DETENTION-SPILLWAY	Rectangular	No	432.50	2.00	5.00

**Outflow Orifices**

SN Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)
1 DETENTION-OUTLET	Side	CIRCULAR	No	8.00	

**Output Summary Results**

Peak Inflow (cfs) .....	1.62
Peak Lateral Inflow (cfs) .....	1.62
Peak Outflow (cfs) .....	1.21
Peak Exfiltration Flow Rate (cfm) .....	0.00
Max HGL Elevation Attained (ft) .....	431.32
Max HGL Depth Attained (ft) .....	0.82
Average HGL Elevation Attained (ft) .....	430.68
Average HGL Depth Attained (ft) .....	0.18
Time of Max HGL Occurrence (days hh:mm) .....	0 00:17
Total Exfiltration Volume (1000-ft³) .....	0.000
Total Flooded Volume (ac-in) .....	0
Total Time Flooded (min) .....	0
Total Retention Time (sec) .....	0.00

## Project Description

File Name ..... LITTLE CAESARS BRYANT POST DEV.SPF  
Description ..... LITTLE CAESARS BRYANT

## Project Options

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

## Analysis Options

Start Analysis On ..... Jun 28, 2024 00:00:00  
End Analysis On ..... Jun 28, 2024 03:00:00  
Start Reporting On ..... Jun 28, 2024 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 00:05:00 days hh:mm:ss  
Routing Time Step ..... 30 seconds

## Number of Elements

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

## Rainfall Details

Return Period..... 5 year(s)

## Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub-01	0.82	0.3400	0.56	0.19	0.16	1.87	0 00:05:00

## Node Summary

SN ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft <sup>2</sup> )	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)
1	Out-01	Outfall	430.30				1.34	430.30	
2	Stor-01	Storage Node	430.50	433.00	430.50	0.00	1.87	431.44	



# Link Summary

SN Element ID	Element Type	From (Inlet Node)	To (Outlet Node)	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)
1	DETENTION-OUTLET	Orifice	Stor-01 Out-01		430.50	430.30		8.000		1.34			
2	DETENTION-SPILLWAY	Weir	Stor-01 Out-01		430.50	430.30				0.00			

# Subbasin Hydrology

## Subbasin : Sub-01

### Input Data

Area (ac) ..... 0.82  
Weighted Runoff Coefficient ..... 0.3400

### Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
Pasture, less than 25 years	0.82	C (2-6%)	0.34
Composite Area & Weighted Runoff Coeff.	0.82		0.34

### Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$$T_c = (0.007 * ((n * L_f)^{0.8}) / ((P^{0.5}) * (S_f^{0.4})))$$

Where :

T<sub>c</sub> = Time of Concentration (hr)  
n = Manning's roughness  
L<sub>f</sub> = Flow Length (ft)  
P = 2 yr, 24 hr Rainfall (inches)  
S<sub>f</sub> = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 \* (S<sub>f</sub><sup>0.5</sup>) (unpaved surface)  
V = 20.3282 \* (S<sub>f</sub><sup>0.5</sup>) (paved surface)  
V = 15.0 \* (S<sub>f</sub><sup>0.5</sup>) (grassed waterway surface)  
V = 10.0 \* (S<sub>f</sub><sup>0.5</sup>) (nearly bare & untilled surface)  
V = 9.0 \* (S<sub>f</sub><sup>0.5</sup>) (cultivated straight rows surface)  
V = 7.0 \* (S<sub>f</sub><sup>0.5</sup>) (short grass pasture surface)  
V = 5.0 \* (S<sub>f</sub><sup>0.5</sup>) (woodland surface)  
V = 2.5 \* (S<sub>f</sub><sup>0.5</sup>) (forest w/heavy litter surface)  
T<sub>c</sub> = (L<sub>f</sub> / V) / (3600 sec/hr)

Where:

T<sub>c</sub> = Time of Concentration (hr)  
L<sub>f</sub> = Flow Length (ft)  
V = Velocity (ft/sec)  
S<sub>f</sub> = Slope (ft/ft)

Channel Flow Equation :

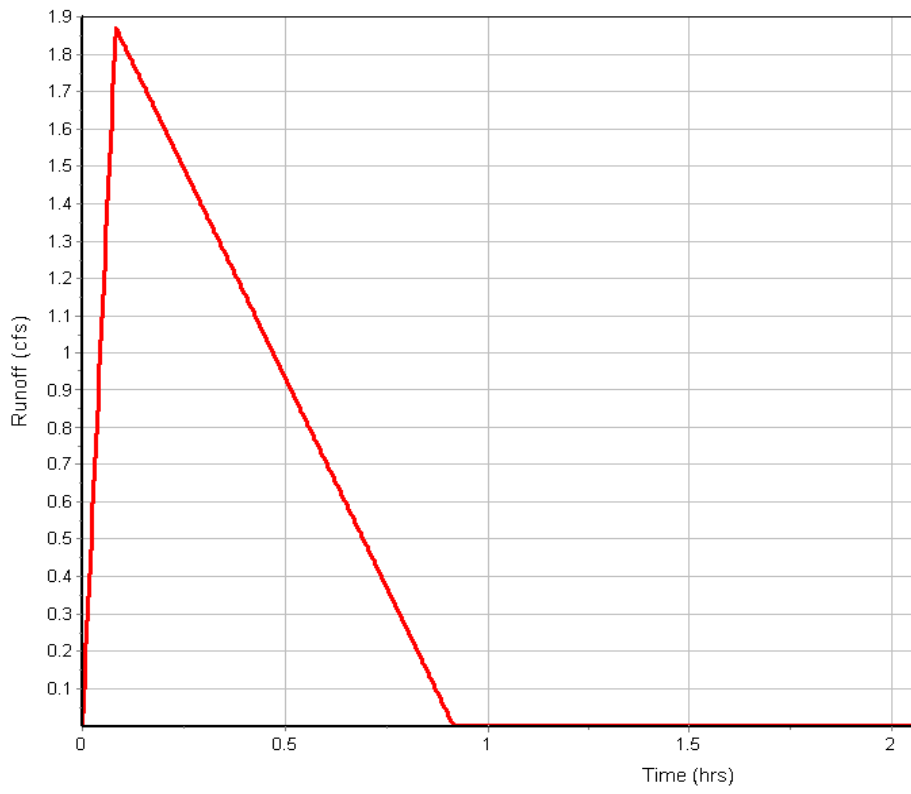
V = (1.49 \* (R<sup>2/3</sup>) \* (S<sub>f</sub><sup>0.5</sup>)) / n  
R = A<sub>q</sub> / W<sub>p</sub>  
T<sub>c</sub> = (L<sub>f</sub> / V) / (3600 sec/hr)

Where :

T<sub>c</sub> = Time of Concentration (hr)  
L<sub>f</sub> = Flow Length (ft)  
R = Hydraulic Radius (ft)

Subbasin : Sub-01

### Runoff Hydrograph



# Storage Nodes

## Storage Node : Stor-01

### Input Data

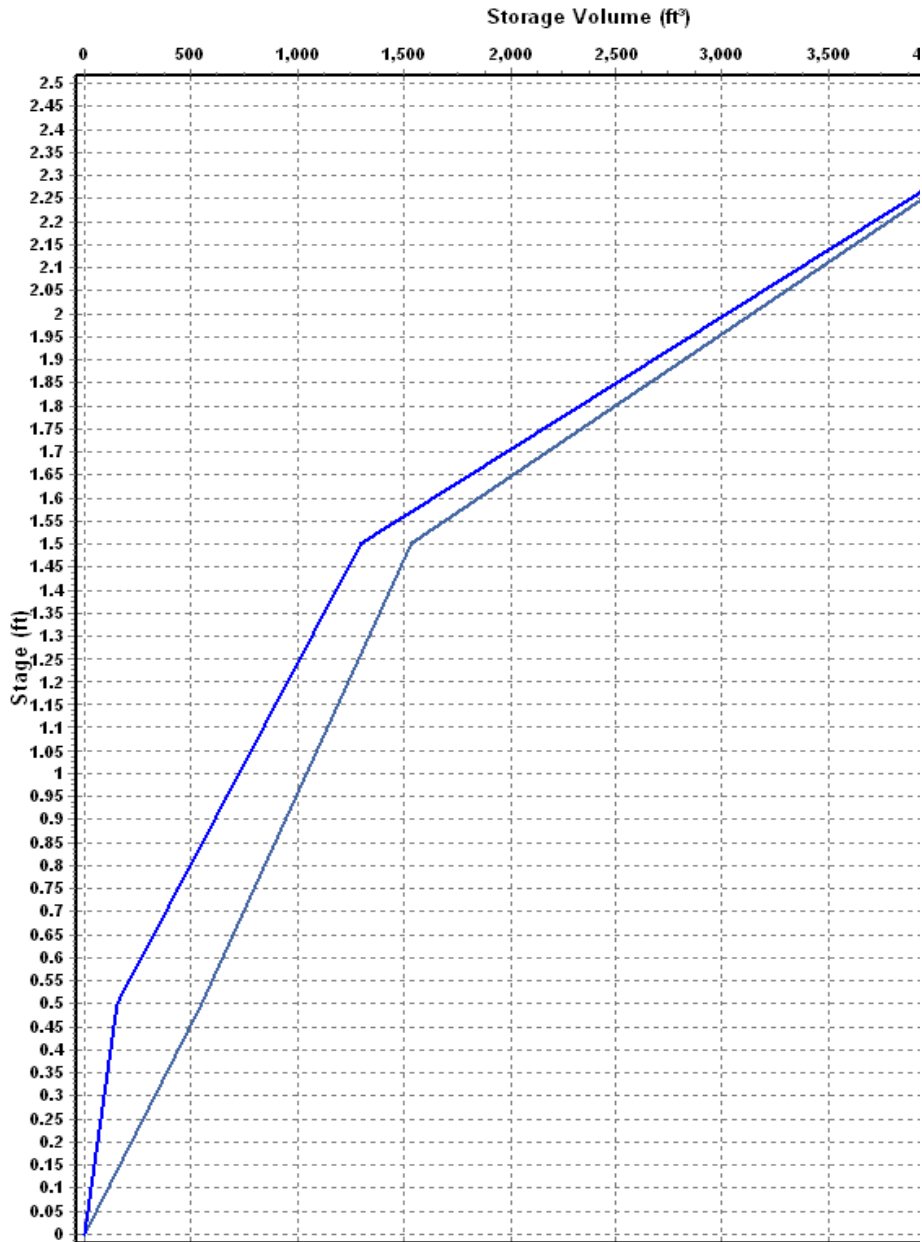
Invert Elevation (ft) ..... 430.50  
Max (Rim) Elevation (ft) ..... 433.00  
Max (Rim) Offset (ft) ..... 2.50  
Initial Water Elevation (ft) ..... 430.50  
Initial Water Depth (ft) ..... 0.00  
Ponded Area (ft<sup>2</sup>) ..... 0.00  
Evaporation Loss ..... 0.00

### Storage Area Volume Curves

Storage Curve : Storage-01

Stage (ft)	Storage Area (ft <sup>2</sup> )	Storage Volume (ft <sup>3</sup> )
0	1	0.000
.5	608	152.25
1.5	1689	1300.75
2.5	5204	4747.25

### 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)
1 DETENTION-SPILLWAY	Rectangular	No	432.50	2.00	5.00

**Outflow Orifices**

SN Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)
1 DETENTION-OUTLET	Side	CIRCULAR	No	8.00	

**Output Summary Results**

Peak Inflow (cfs) .....	1.87
Peak Lateral Inflow (cfs) .....	1.87
Peak Outflow (cfs) .....	1.34
Peak Exfiltration Flow Rate (cfm) .....	0.00
Max HGL Elevation Attained (ft) .....	431.44
Max HGL Depth Attained (ft) .....	0.94
Average HGL Elevation Attained (ft) .....	430.71
Average HGL Depth Attained (ft) .....	0.21
Time of Max HGL Occurrence (days hh:mm) .....	0 00:19
Total Exfiltration Volume (1000-ft³) .....	0.000
Total Flooded Volume (ac-in) .....	0
Total Time Flooded (min) .....	0
Total Retention Time (sec) .....	0.00

## Project Description

File Name ..... LITTLE CAESARS BRYANT POST DEV.SPF  
Description .....  
LITTLE CAESARS BRYANT

## Project Options

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

## Analysis Options

Start Analysis On ..... Jun 28, 2024 00:00:00  
End Analysis On ..... Jun 28, 2024 03:00:00  
Start Reporting On ..... Jun 28, 2024 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 00:05:00 days hh:mm:ss  
Routing Time Step ..... 30 seconds

## Number of Elements

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

## Rainfall Details

Return Period..... 10 year(s)

## Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub-01	0.82	0.3400	0.63	0.22	0.18	2.12	0 00:05:00



## Node Summary

SN ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft <sup>2</sup> )	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)
1	Out-01 Outfall	430.30					1.46	430.30	
2	Stor-01 Storage Node	430.50	433.00	430.50		0.00	2.12	431.55	

# Link Summary

SN Element ID	Element Type	From (Inlet Node)	To (Outlet Node)	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)
1	DETENTION-OUTLET	Orifice	Stor-01 Out-01		430.50	430.30		8.000		1.46			
2	DETENTION-SPILLWAY	Weir	Stor-01 Out-01		430.50	430.30				0.00			

# Subbasin Hydrology

## Subbasin : Sub-01

### Input Data

Area (ac) ..... 0.82  
Weighted Runoff Coefficient ..... 0.3400

### Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
Pasture, less than 25 years	0.82	C (2-6%)	0.34
Composite Area & Weighted Runoff Coeff.	0.82		0.34

### Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$$T_c = (0.007 * ((n * L_f)^{0.8}) / ((P^{0.5}) * (S_f^{0.4})))$$

Where :

T<sub>c</sub> = Time of Concentration (hr)  
n = Manning's roughness  
L<sub>f</sub> = Flow Length (ft)  
P = 2 yr, 24 hr Rainfall (inches)  
S<sub>f</sub> = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 \* (S<sub>f</sub><sup>0.5</sup>) (unpaved surface)  
V = 20.3282 \* (S<sub>f</sub><sup>0.5</sup>) (paved surface)  
V = 15.0 \* (S<sub>f</sub><sup>0.5</sup>) (grassed waterway surface)  
V = 10.0 \* (S<sub>f</sub><sup>0.5</sup>) (nearly bare & untilled surface)  
V = 9.0 \* (S<sub>f</sub><sup>0.5</sup>) (cultivated straight rows surface)  
V = 7.0 \* (S<sub>f</sub><sup>0.5</sup>) (short grass pasture surface)  
V = 5.0 \* (S<sub>f</sub><sup>0.5</sup>) (woodland surface)  
V = 2.5 \* (S<sub>f</sub><sup>0.5</sup>) (forest w/heavy litter surface)  
T<sub>c</sub> = (L<sub>f</sub> / V) / (3600 sec/hr)

Where:

T<sub>c</sub> = Time of Concentration (hr)  
L<sub>f</sub> = Flow Length (ft)  
V = Velocity (ft/sec)  
S<sub>f</sub> = Slope (ft/ft)

Channel Flow Equation :

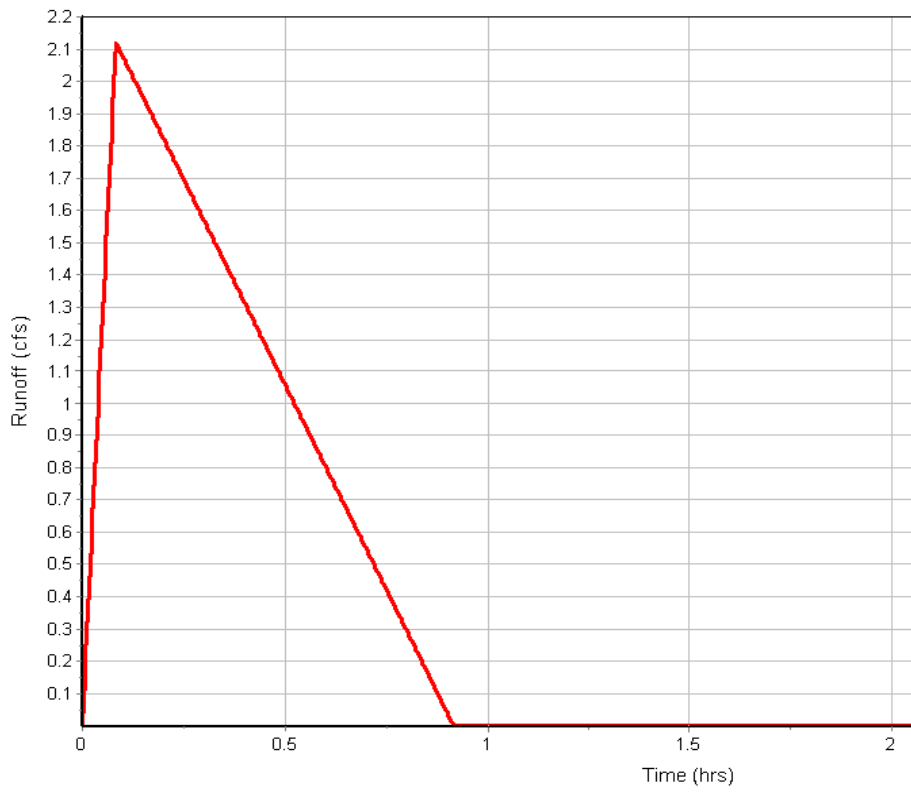
V = (1.49 \* (R<sup>2/3</sup>) \* (S<sub>f</sub><sup>0.5</sup>)) / n  
R = A<sub>q</sub> / W<sub>p</sub>  
T<sub>c</sub> = (L<sub>f</sub> / V) / (3600 sec/hr)

Where :

T<sub>c</sub> = Time of Concentration (hr)  
L<sub>f</sub> = Flow Length (ft)  
R = Hydraulic Radius (ft)

Subbasin : Sub-01

Runoff Hydrograph



# Storage Nodes

## Storage Node : Stor-01

### Input Data

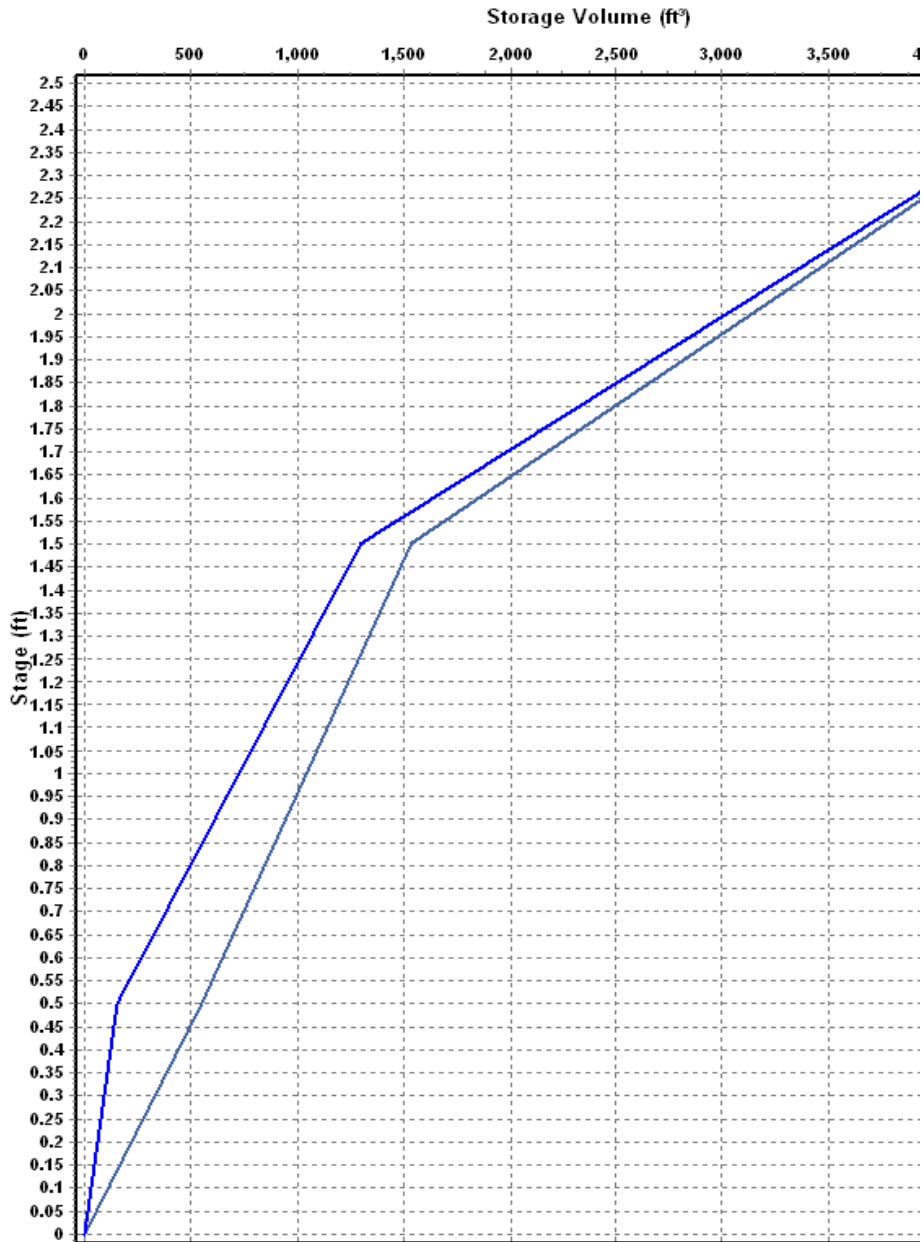
Invert Elevation (ft) ..... 430.50  
Max (Rim) Elevation (ft) ..... 433.00  
Max (Rim) Offset (ft) ..... 2.50  
Initial Water Elevation (ft) ..... 430.50  
Initial Water Depth (ft) ..... 0.00  
Ponded Area (ft<sup>2</sup>) ..... 0.00  
Evaporation Loss ..... 0.00

### Storage Area Volume Curves

Storage Curve : Storage-01

Stage (ft)	Storage Area (ft <sup>2</sup> )	Storage Volume (ft <sup>3</sup> )
0	1	0.000
.5	608	152.25
1.5	1689	1300.75
2.5	5204	4747.25

### 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)
1 DETENTION-SPILLWAY	Rectangular	No	432.50	2.00	5.00

**Outflow Orifices**

SN Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)
1 DETENTION-OUTLET	Side	CIRCULAR	No	8.00	

**Output Summary Results**

Peak Inflow (cfs) .....	2.12
Peak Lateral Inflow (cfs) .....	2.12
Peak Outflow (cfs) .....	1.46
Peak Exfiltration Flow Rate (cfm) .....	0.00
Max HGL Elevation Attained (ft) .....	431.55
Max HGL Depth Attained (ft) .....	1.05
Average HGL Elevation Attained (ft) .....	430.74
Average HGL Depth Attained (ft) .....	0.24
Time of Max HGL Occurrence (days hh:mm) .....	0 00:20
Total Exfiltration Volume (1000-ft³) .....	0.000
Total Flooded Volume (ac-in) .....	0
Total Time Flooded (min) .....	0
Total Retention Time (sec) .....	0.00

## Project Description

File Name ..... LITTLE CAESARS BRYANT POST DEV.SPF  
Description ..... LITTLE CAESARS BRYANT

## Project Options

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

## Analysis Options

Start Analysis On ..... Jun 28, 2024 00:00:00  
End Analysis On ..... Jun 28, 2024 03:00:00  
Start Reporting On ..... Jun 28, 2024 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 00:05:00 days hh:mm:ss  
Routing Time Step ..... 30 seconds

## Number of Elements

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

## Rainfall Details

Return Period..... 25 year(s)



## Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub-01	0.82	0.3400	0.71	0.24	0.20	2.37	0 00:05:00

## Node Summary

SN ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft <sup>2</sup> )	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)
1	Out-01 Outfall	430.30					1.57	430.30	
2	Stor-01 Storage Node	430.50	433.00	430.50		0.00	2.37	431.67	

# Link Summary

SN Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)
1	DETENTION-OUTLET	Orifice	Stor-01 Out-01		430.50	430.30		8.000		1.57			
2	DETENTION-SPILLWAY	Weir	Stor-01 Out-01		430.50	430.30				0.00			

# Subbasin Hydrology

## Subbasin : Sub-01

### Input Data

Area (ac) ..... 0.82  
Weighted Runoff Coefficient ..... 0.3400

### Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
Pasture, less than 25 years	0.82	C (2-6%)	0.34
Composite Area & Weighted Runoff Coeff.	0.82		0.34

### Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$$T_c = (0.007 * ((n * L_f)^{0.8}) / ((P^{0.5}) * (S_f^{0.4})))$$

Where :

T<sub>c</sub> = Time of Concentration (hr)  
n = Manning's roughness  
L<sub>f</sub> = Flow Length (ft)  
P = 2 yr, 24 hr Rainfall (inches)  
S<sub>f</sub> = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 \* (S<sub>f</sub><sup>0.5</sup>) (unpaved surface)  
V = 20.3282 \* (S<sub>f</sub><sup>0.5</sup>) (paved surface)  
V = 15.0 \* (S<sub>f</sub><sup>0.5</sup>) (grassed waterway surface)  
V = 10.0 \* (S<sub>f</sub><sup>0.5</sup>) (nearly bare & untilled surface)  
V = 9.0 \* (S<sub>f</sub><sup>0.5</sup>) (cultivated straight rows surface)  
V = 7.0 \* (S<sub>f</sub><sup>0.5</sup>) (short grass pasture surface)  
V = 5.0 \* (S<sub>f</sub><sup>0.5</sup>) (woodland surface)  
V = 2.5 \* (S<sub>f</sub><sup>0.5</sup>) (forest w/heavy litter surface)  
T<sub>c</sub> = (L<sub>f</sub> / V) / (3600 sec/hr)

Where:

T<sub>c</sub> = Time of Concentration (hr)  
L<sub>f</sub> = Flow Length (ft)  
V = Velocity (ft/sec)  
S<sub>f</sub> = Slope (ft/ft)

Channel Flow Equation :

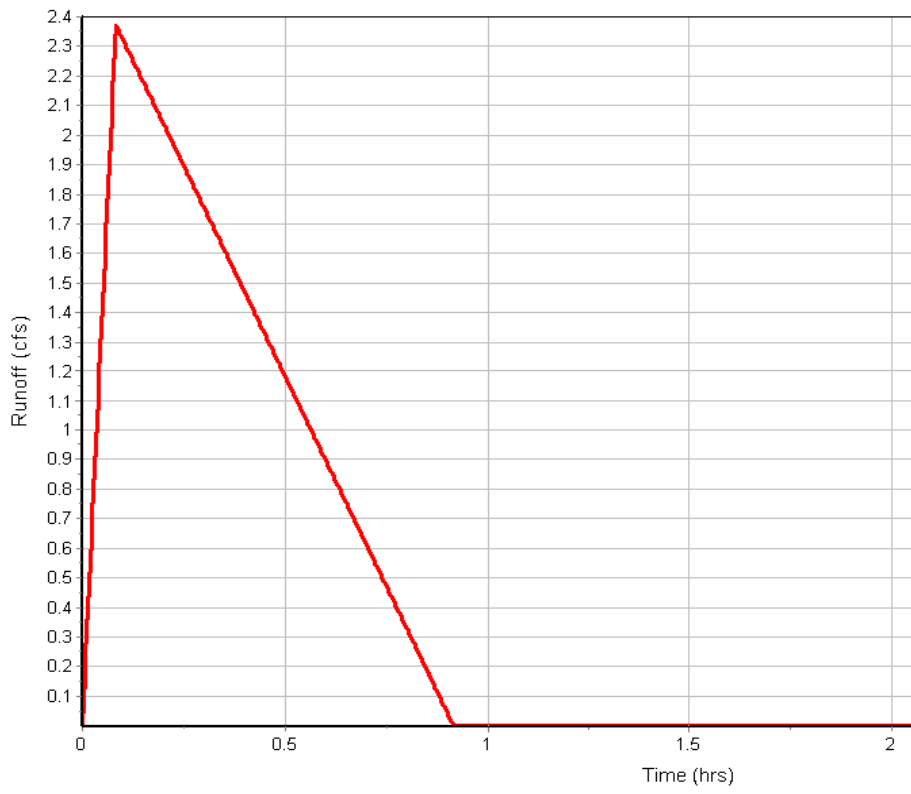
V = (1.49 \* (R<sup>2/3</sup>) \* (S<sub>f</sub><sup>0.5</sup>)) / n  
R = A<sub>q</sub> / W<sub>p</sub>  
T<sub>c</sub> = (L<sub>f</sub> / V) / (3600 sec/hr)

Where :

T<sub>c</sub> = Time of Concentration (hr)  
L<sub>f</sub> = Flow Length (ft)  
R = Hydraulic Radius (ft)

Subbasin : Sub-01

Runoff Hydrograph



# Storage Nodes

## Storage Node : Stor-01

### Input Data

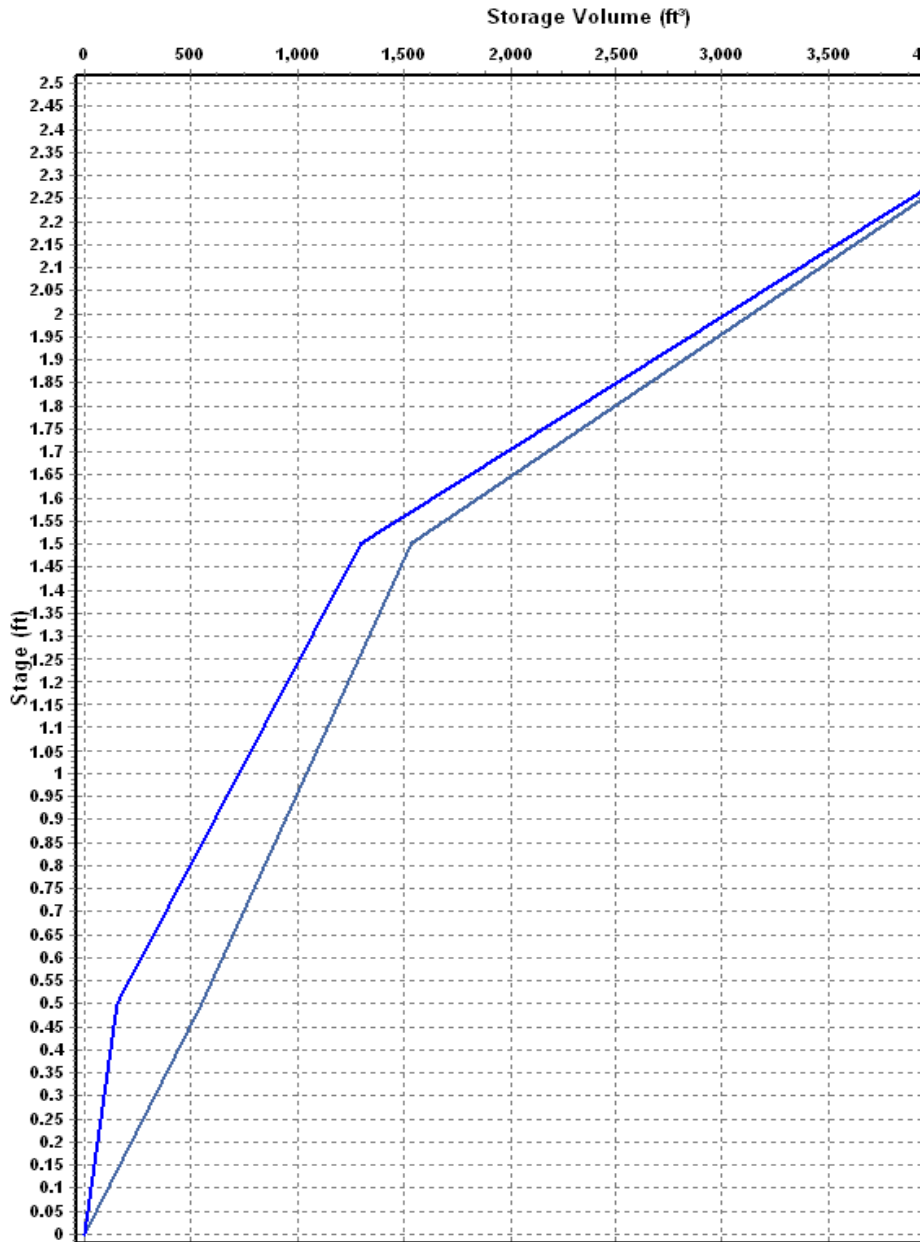
Invert Elevation (ft) ..... 430.50  
Max (Rim) Elevation (ft) ..... 433.00  
Max (Rim) Offset (ft) ..... 2.50  
Initial Water Elevation (ft) ..... 430.50  
Initial Water Depth (ft) ..... 0.00  
Ponded Area (ft<sup>2</sup>) ..... 0.00  
Evaporation Loss ..... 0.00

### Storage Area Volume Curves

Storage Curve : Storage-01

Stage (ft)	Storage Area (ft <sup>2</sup> )	Storage Volume (ft <sup>3</sup> )
0	1	0.000
.5	608	152.25
1.5	1689	1300.75
2.5	5204	4747.25

### 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)
1 DETENTION-SPILLWAY	Rectangular	No	432.50	2.00	5.00

**Outflow Orifices**

SN Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)
1 DETENTION-OUTLET	Side	CIRCULAR	No	8.00	

**Output Summary Results**

Peak Inflow (cfs) .....	2.37
Peak Lateral Inflow (cfs) .....	2.37
Peak Outflow (cfs) .....	1.57
Peak Exfiltration Flow Rate (cfm) .....	0.00
Max HGL Elevation Attained (ft) .....	431.67
Max HGL Depth Attained (ft) .....	1.17
Average HGL Elevation Attained (ft) .....	430.77
Average HGL Depth Attained (ft) .....	0.27
Time of Max HGL Occurrence (days hh:mm) .....	0 00:22
Total Exfiltration Volume (1000-ft³) .....	0.000
Total Flooded Volume (ac-in) .....	0
Total Time Flooded (min) .....	0
Total Retention Time (sec) .....	0.00



## Project Description

File Name ..... LITTLE CAESARS BRYANT POST DEV.SPF  
Description .....  
LITTLE CAESARS BRYANT

## Project Options

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

## Analysis Options

Start Analysis On ..... Jun 28, 2024 00:00:00  
End Analysis On ..... Jun 28, 2024 03:00:00  
Start Reporting On ..... Jun 28, 2024 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 00:05:00 days hh:mm:ss  
Routing Time Step ..... 30 seconds

## Number of Elements

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

## Rainfall Details

Return Period..... 100 year(s)

## Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub-01	0.82	0.3400	0.83	0.28	0.23	2.79	0 00:05:00

## Node Summary

SN ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft <sup>2</sup> )	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)
1	Out-01 Outfall	430.30					1.74	430.30	
2	Stor-01 Storage Node	430.50	433.00	430.50		0.00	2.79	431.86	

# Link Summary

SN Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)
1	DETENTION-OUTLET	Orifice	Stor-01	Out-01	430.50	430.30		8.000		1.74			
2	DETENTION-SPILLWAY	Weir	Stor-01	Out-01	430.50	430.30				0.00			

# Subbasin Hydrology

## Subbasin : Sub-01

### Input Data

Area (ac) ..... 0.82  
Weighted Runoff Coefficient ..... 0.3400

### Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
Pasture, less than 25 years	0.82	C (2-6%)	0.34
Composite Area & Weighted Runoff Coeff.	0.82		0.34

### Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$$T_c = (0.007 * ((n * L_f)^{0.8}) / ((P^{0.5}) * (S_f^{0.4})))$$

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<sup>0.5</sup>) (unpaved surface)  
V = 20.3282 \* (Sf<sup>0.5</sup>) (paved surface)  
V = 15.0 \* (Sf<sup>0.5</sup>) (grassed waterway surface)  
V = 10.0 \* (Sf<sup>0.5</sup>) (nearly bare & untilled surface)  
V = 9.0 \* (Sf<sup>0.5</sup>) (cultivated straight rows surface)  
V = 7.0 \* (Sf<sup>0.5</sup>) (short grass pasture surface)  
V = 5.0 \* (Sf<sup>0.5</sup>) (woodland surface)  
V = 2.5 \* (Sf<sup>0.5</sup>) (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 :

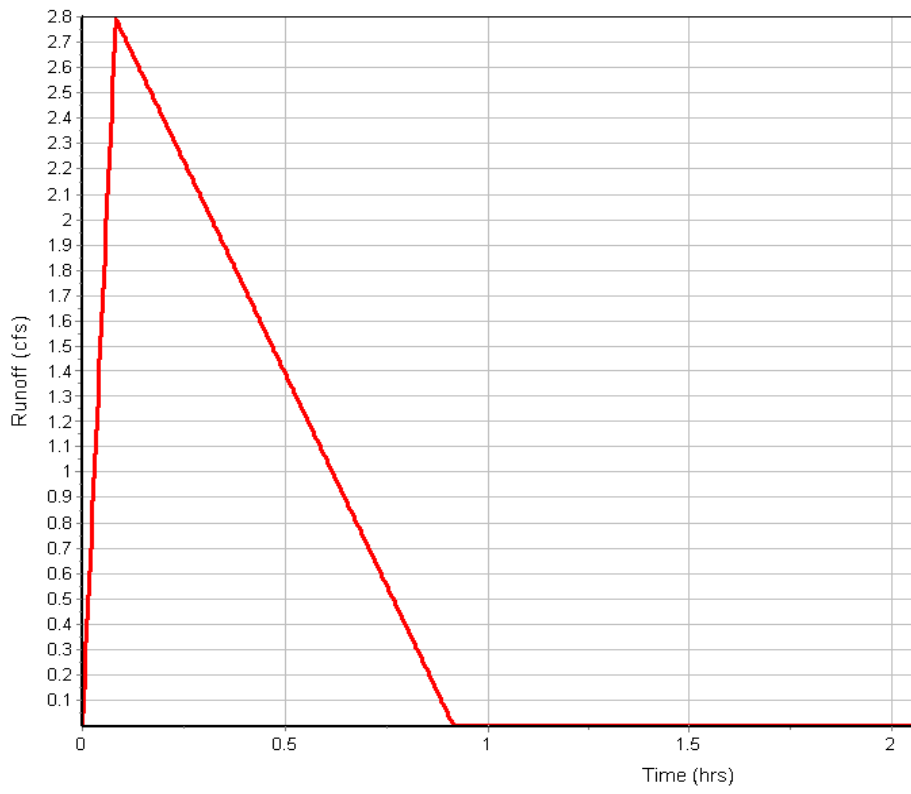
V = (1.49 \* (R<sup>2/3</sup>) \* (Sf<sup>0.5</sup>)) / n  
R = Aq / Wp  
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)  
Lf = Flow Length (ft)  
R = Hydraulic Radius (ft)

Subbasin : Sub-01

### Runoff Hydrograph



# Storage Nodes

## Storage Node : Stor-01

### Input Data

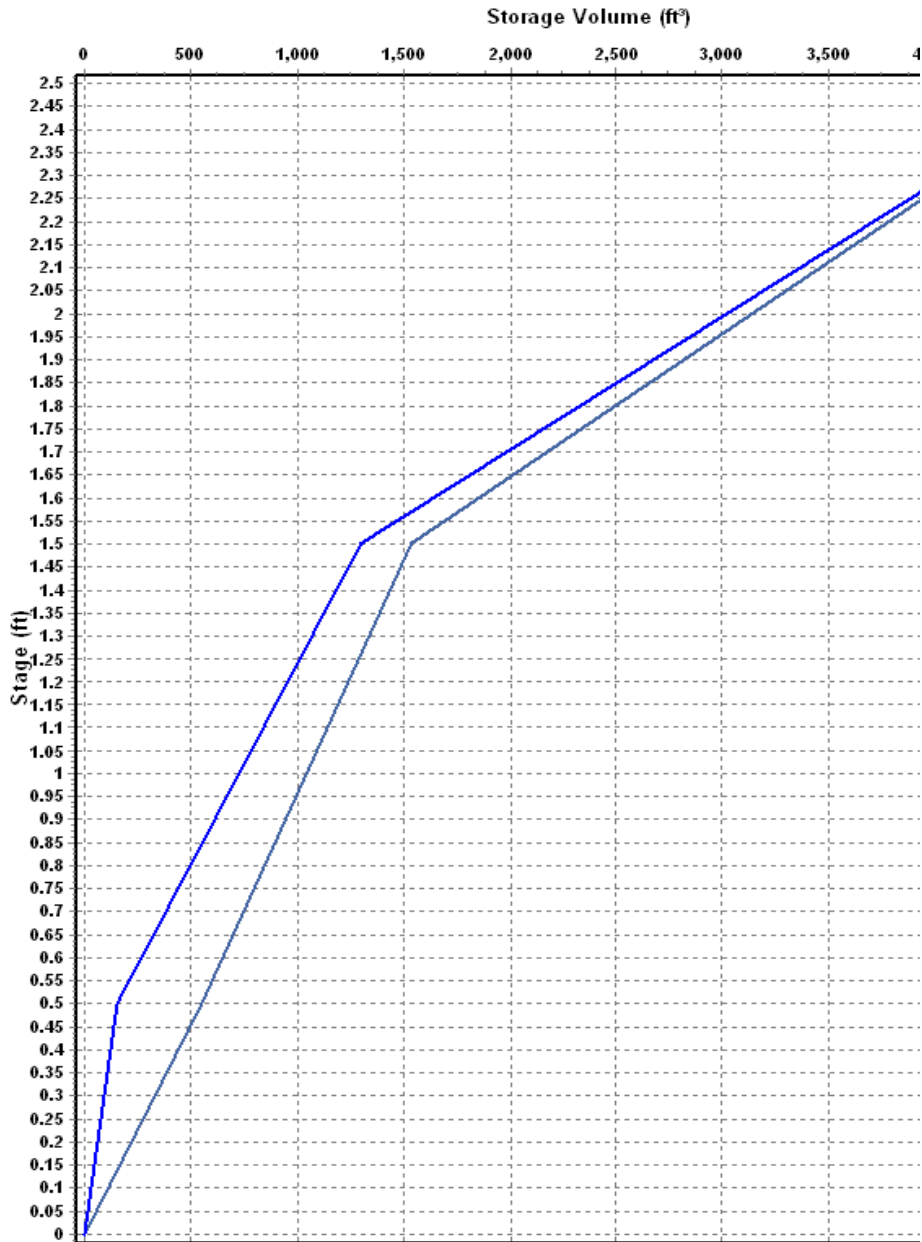
Invert Elevation (ft) ..... 430.50  
Max (Rim) Elevation (ft) ..... 433.00  
Max (Rim) Offset (ft) ..... 2.50  
Initial Water Elevation (ft) ..... 430.50  
Initial Water Depth (ft) ..... 0.00  
Ponded Area (ft<sup>2</sup>) ..... 0.00  
Evaporation Loss ..... 0.00

### Storage Area Volume Curves

Storage Curve : Storage-01

Stage (ft)	Storage Area (ft <sup>2</sup> )	Storage Volume (ft <sup>3</sup> )
0	1	0.000
.5	608	152.25
1.5	1689	1300.75
2.5	5204	4747.25

### 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)
1 DETENTION-SPILLWAY	Rectangular	No	432.50	2.00	5.00

**Outflow Orifices**

SN Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)
1 DETENTION-OUTLET	Side	CIRCULAR	No	8.00	

**Output Summary Results**

Peak Inflow (cfs) .....	2.79
Peak Lateral Inflow (cfs) .....	2.79
Peak Outflow (cfs) .....	1.74
Peak Exfiltration Flow Rate (cfm) .....	0.00
Max HGL Elevation Attained (ft) .....	431.86
Max HGL Depth Attained (ft) .....	1.36
Average HGL Elevation Attained (ft) .....	430.82
Average HGL Depth Attained (ft) .....	0.32
Time of Max HGL Occurrence (days hh:mm) .....	0 00:23
Total Exfiltration Volume (1000-ft³) .....	0.000
Total Flooded Volume (ac-in) .....	0
Total Time Flooded (min) .....	0
Total Retention Time (sec) .....	0.00

## Project Description

File Name ..... LITTLE CAESARS BRYANT PREDEV.SPF  
Description ..... LITTLE CAESARS BRYANT

## Project Options

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

## Analysis Options

Start Analysis On ..... Jun 28, 2024 00:00:00  
End Analysis On ..... Jun 28, 2024 03:00:00  
Start Reporting On ..... Jun 28, 2024 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 00:05:00 days hh:mm:ss  
Routing Time Step ..... 30 seconds

## Number of Elements

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

## Rainfall Details

Return Period..... 2 year(s)

## Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub-01	0.82	0.3400	1.01	0.34	0.28	1.10	0 00:15:17

## Node Summary

SN ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft <sup>2</sup> )	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Freeboard Attain
1	Out-01	Outfall	430.20				0.00	0.00		

# Subbasin Hydrology

## Subbasin : Sub-01

### Input Data

Area (ac) ..... 0.82  
Weighted Runoff Coefficient ..... 0.3400

### Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
Pasture, less than 25 years	0.82	C (2-6%)	0.34
Composite Area & Weighted Runoff Coeff.	0.82		0.34

### Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$$T_c = (0.007 * ((n * L_f)^{0.8}) / ((P^{0.5}) * (S_f^{0.4})))$$

Where :

T<sub>c</sub> = Time of Concentration (hr)  
n = Manning's roughness  
L<sub>f</sub> = Flow Length (ft)  
P = 2 yr, 24 hr Rainfall (inches)  
S<sub>f</sub> = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 \* (S<sub>f</sub><sup>0.5</sup>) (unpaved surface)  
V = 20.3282 \* (S<sub>f</sub><sup>0.5</sup>) (paved surface)  
V = 15.0 \* (S<sub>f</sub><sup>0.5</sup>) (grassed waterway surface)  
V = 10.0 \* (S<sub>f</sub><sup>0.5</sup>) (nearly bare & untilled surface)  
V = 9.0 \* (S<sub>f</sub><sup>0.5</sup>) (cultivated straight rows surface)  
V = 7.0 \* (S<sub>f</sub><sup>0.5</sup>) (short grass pasture surface)  
V = 5.0 \* (S<sub>f</sub><sup>0.5</sup>) (woodland surface)  
V = 2.5 \* (S<sub>f</sub><sup>0.5</sup>) (forest w/heavy litter surface)  
T<sub>c</sub> = (L<sub>f</sub> / V) / (3600 sec/hr)

Where:

T<sub>c</sub> = Time of Concentration (hr)  
L<sub>f</sub> = Flow Length (ft)  
V = Velocity (ft/sec)  
S<sub>f</sub> = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 \* (R<sup>2/3</sup>) \* (S<sub>f</sub><sup>0.5</sup>)) / n  
R = A<sub>q</sub> / W<sub>p</sub>  
T<sub>c</sub> = (L<sub>f</sub> / V) / (3600 sec/hr)

Where :

T<sub>c</sub> = Time of Concentration (hr)  
L<sub>f</sub> = Flow Length (ft)  
R = Hydraulic Radius (ft)

Sheet Flow Computations	Subarea	Subarea	Subarea
	A	B	C
Manning's Roughness :	.3	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	2.2	0.00	0.00
2 yr, 24 hr Rainfall (in) :	4.13	0.00	0.00
Velocity (ft/sec) :	0.12	0.00	0.00
Computed Flow Time (min) :	14.45	0.00	0.00

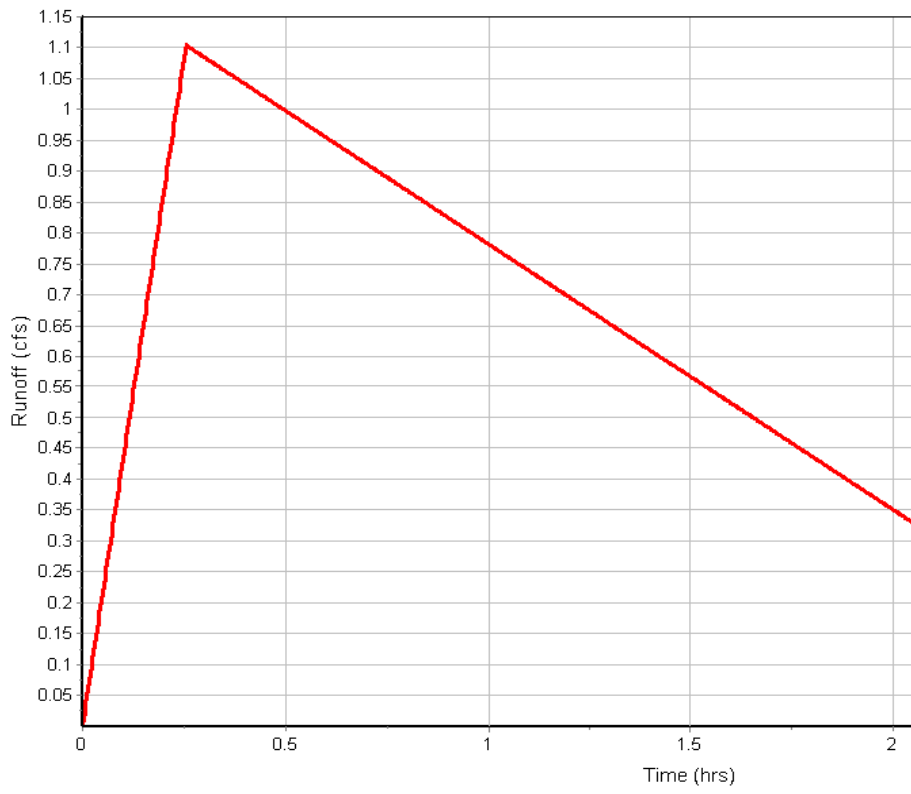
Shallow Concentrated Flow Computations	Subarea	Subarea	Subarea
	A	B	C
Flow Length (ft) :	120	0.00	0.00
Slope (%) :	2.2	0.00	0.00
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.39	0.00	0.00
Computed Flow Time (min) :	0.84	0.00	0.00
Total TOC (min) .....	15.29		

**Subbasin Runoff Results**

Total Rainfall (in) .....	1.01
Total Runoff (in) .....	0.34
Peak Runoff (cfs) .....	1.10
Rainfall Intensity .....	3.961
Weighted Runoff Coefficient .....	0.3400
Time of Concentration (days hh:mm:ss) .....	0 00:15:17

Subbasin : Sub-01

Runoff Hydrograph



## Project Description

File Name ..... LITTLE CAESARS BRYANT PREDEV.SPF  
Description .....  
LITTLE CAESARS BRYANT

## Project Options

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

## Analysis Options

Start Analysis On ..... Jun 28, 2024 00:00:00  
End Analysis On ..... Jun 28, 2024 03:00:00  
Start Reporting On ..... Jun 28, 2024 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 00:05:00 days hh:mm:ss  
Routing Time Step ..... 30 seconds

## Number of Elements

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

## Rainfall Details

Return Period..... 5 year(s)



## Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub-01	0.82	0.3400	1.24	0.42	0.35	1.35	0 00:15:17

## Node Summary

SN ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft <sup>2</sup> )	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Freeboard Attain
1	Out-01	Outfall	430.20				0.00	0.00		

# Subbasin Hydrology

## Subbasin : Sub-01

### Input Data

Area (ac) ..... 0.82  
Weighted Runoff Coefficient ..... 0.3400

### Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
Pasture, less than 25 years	0.82	C (2-6%)	0.34
Composite Area & Weighted Runoff Coeff.	0.82		0.34

### Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$$T_c = (0.007 * ((n * L_f)^{0.8}) / ((P^{0.5}) * (S_f^{0.4})))$$

Where :

T<sub>c</sub> = Time of Concentration (hr)  
n = Manning's roughness  
L<sub>f</sub> = Flow Length (ft)  
P = 2 yr, 24 hr Rainfall (inches)  
S<sub>f</sub> = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 \* (S<sub>f</sub><sup>0.5</sup>) (unpaved surface)  
V = 20.3282 \* (S<sub>f</sub><sup>0.5</sup>) (paved surface)  
V = 15.0 \* (S<sub>f</sub><sup>0.5</sup>) (grassed waterway surface)  
V = 10.0 \* (S<sub>f</sub><sup>0.5</sup>) (nearly bare & untilled surface)  
V = 9.0 \* (S<sub>f</sub><sup>0.5</sup>) (cultivated straight rows surface)  
V = 7.0 \* (S<sub>f</sub><sup>0.5</sup>) (short grass pasture surface)  
V = 5.0 \* (S<sub>f</sub><sup>0.5</sup>) (woodland surface)  
V = 2.5 \* (S<sub>f</sub><sup>0.5</sup>) (forest w/heavy litter surface)  
T<sub>c</sub> = (L<sub>f</sub> / V) / (3600 sec/hr)

Where:

T<sub>c</sub> = Time of Concentration (hr)  
L<sub>f</sub> = Flow Length (ft)  
V = Velocity (ft/sec)  
S<sub>f</sub> = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 \* (R<sup>2/3</sup>) \* (S<sub>f</sub><sup>0.5</sup>)) / n  
R = A<sub>q</sub> / W<sub>p</sub>  
T<sub>c</sub> = (L<sub>f</sub> / V) / (3600 sec/hr)

Where :

T<sub>c</sub> = Time of Concentration (hr)  
L<sub>f</sub> = Flow Length (ft)  
R = Hydraulic Radius (ft)

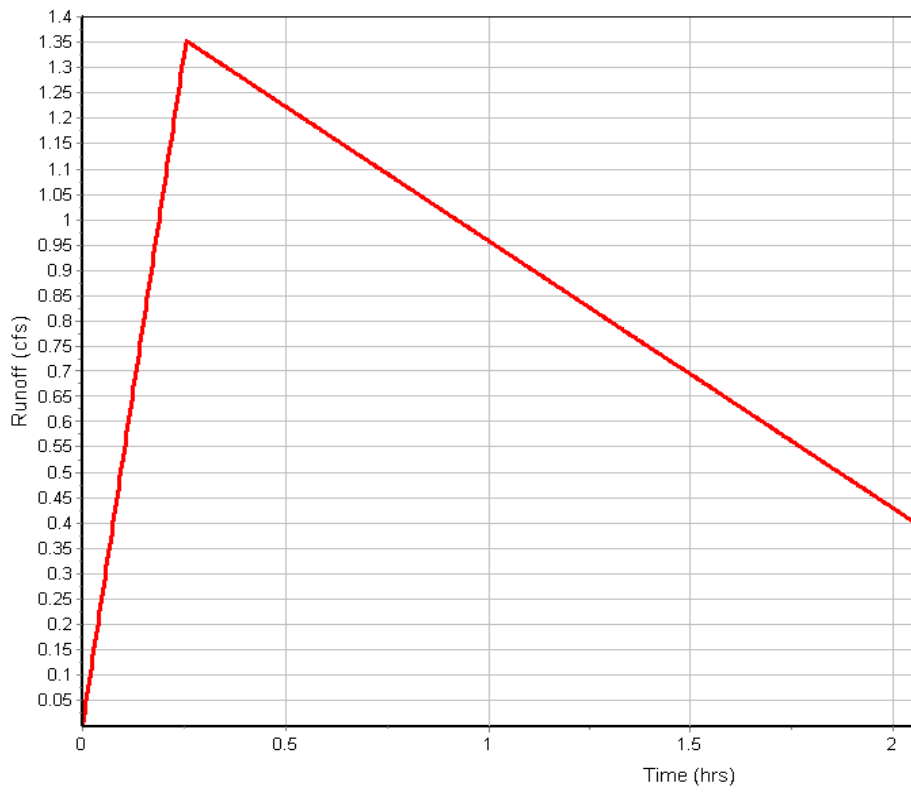
	Subarea A	Subarea B	Subarea C
Sheet Flow Computations			
Manning's Roughness :	.3	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	2.2	0.00	0.00
2 yr, 24 hr Rainfall (in) :	4.13	0.00	0.00
Velocity (ft/sec) :	0.12	0.00	0.00
Computed Flow Time (min) :	14.45	0.00	0.00
	Subarea A	Subarea B	Subarea C
Shallow Concentrated Flow Computations			
Flow Length (ft) :	120	0.00	0.00
Slope (%) :	2.2	0.00	0.00
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.39	0.00	0.00
Computed Flow Time (min) :	0.84	0.00	0.00
Total TOC (min) .....	15.29		

### Subbasin Runoff Results

Total Rainfall (in) .....	1.24
Total Runoff (in) .....	0.42
Peak Runoff (cfs) .....	1.35
Rainfall Intensity .....	4.855
Weighted Runoff Coefficient .....	0.3400
Time of Concentration (days hh:mm:ss) .....	0 00:15:17

Subbasin : Sub-01

### Runoff Hydrograph



## Project Description

File Name ..... LITTLE CAESARS BRYANT PREDEV.SPF  
Description ..... LITTLE CAESARS BRYANT

## Project Options

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

## Analysis Options

Start Analysis On ..... Jun 28, 2024 00:00:00  
End Analysis On ..... Jun 28, 2024 03:00:00  
Start Reporting On ..... Jun 28, 2024 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 00:05:00 days hh:mm:ss  
Routing Time Step ..... 30 seconds

## Number of Elements

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

## Rainfall Details

Return Period..... 10 year(s)

## Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub-01	0.82	0.3400	1.37	0.47	0.38	1.49	0 00:15:17

## Node Summary

SN ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft <sup>2</sup> )	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Freeboard Attain
1	Out-01	Outfall	430.20				0.00	0.00		



# Subbasin Hydrology

## Subbasin : Sub-01

### Input Data

Area (ac) ..... 0.82  
Weighted Runoff Coefficient ..... 0.3400

### Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
Pasture, less than 25 years	0.82	C (2-6%)	0.34
Composite Area & Weighted Runoff Coeff.	0.82		0.34

### Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$$T_c = (0.007 * ((n * L_f)^{0.8}) / ((P^{0.5}) * (S_f^{0.4})))$$

Where :

T<sub>c</sub> = Time of Concentration (hr)  
n = Manning's roughness  
L<sub>f</sub> = Flow Length (ft)  
P = 2 yr, 24 hr Rainfall (inches)  
S<sub>f</sub> = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 \* (S<sub>f</sub><sup>0.5</sup>) (unpaved surface)  
V = 20.3282 \* (S<sub>f</sub><sup>0.5</sup>) (paved surface)  
V = 15.0 \* (S<sub>f</sub><sup>0.5</sup>) (grassed waterway surface)  
V = 10.0 \* (S<sub>f</sub><sup>0.5</sup>) (nearly bare & untilled surface)  
V = 9.0 \* (S<sub>f</sub><sup>0.5</sup>) (cultivated straight rows surface)  
V = 7.0 \* (S<sub>f</sub><sup>0.5</sup>) (short grass pasture surface)  
V = 5.0 \* (S<sub>f</sub><sup>0.5</sup>) (woodland surface)  
V = 2.5 \* (S<sub>f</sub><sup>0.5</sup>) (forest w/heavy litter surface)  
T<sub>c</sub> = (L<sub>f</sub> / V) / (3600 sec/hr)

Where:

T<sub>c</sub> = Time of Concentration (hr)  
L<sub>f</sub> = Flow Length (ft)  
V = Velocity (ft/sec)  
S<sub>f</sub> = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 \* (R<sup>2/3</sup>) \* (S<sub>f</sub><sup>0.5</sup>)) / n  
R = A<sub>q</sub> / W<sub>p</sub>  
T<sub>c</sub> = (L<sub>f</sub> / V) / (3600 sec/hr)

Where :

T<sub>c</sub> = Time of Concentration (hr)  
L<sub>f</sub> = Flow Length (ft)  
R = Hydraulic Radius (ft)

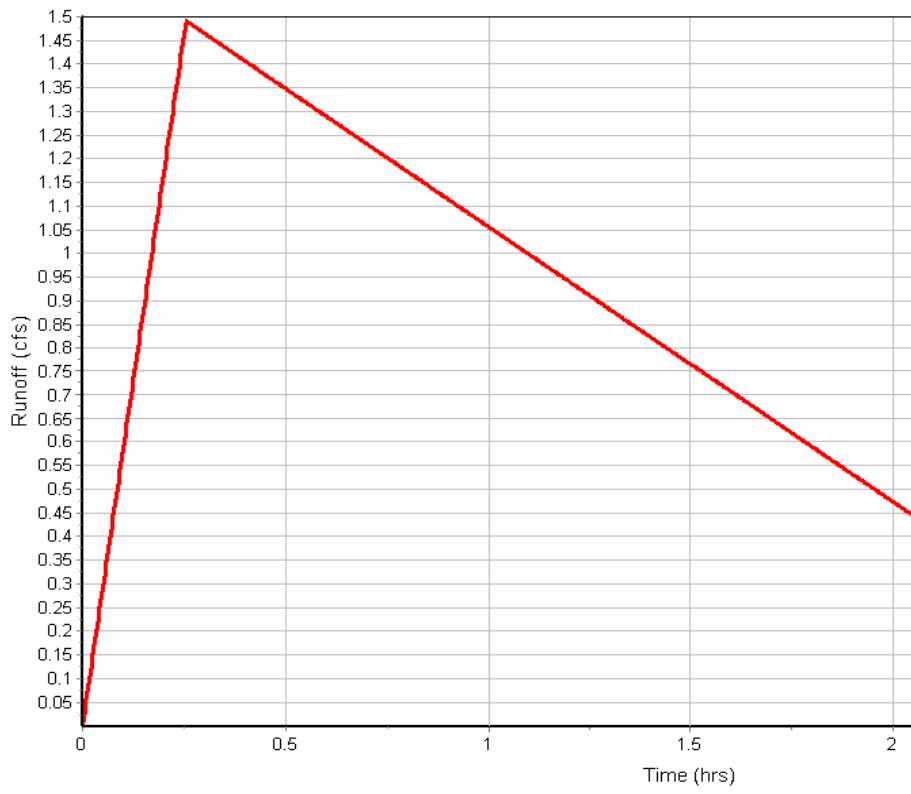
	Subarea A	Subarea B	Subarea C
Sheet Flow Computations			
Manning's Roughness :	.3	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	2.2	0.00	0.00
2 yr, 24 hr Rainfall (in) :	4.13	0.00	0.00
Velocity (ft/sec) :	0.12	0.00	0.00
Computed Flow Time (min) :	14.45	0.00	0.00
	Subarea A	Subarea B	Subarea C
Shallow Concentrated Flow Computations			
Flow Length (ft) :	120	0.00	0.00
Slope (%) :	2.2	0.00	0.00
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.39	0.00	0.00
Computed Flow Time (min) :	0.84	0.00	0.00
Total TOC (min) .....	15.29		

### Subbasin Runoff Results

Total Rainfall (in) .....	1.37
Total Runoff (in) .....	0.47
Peak Runoff (cfs) .....	1.49
Rainfall Intensity .....	5.352
Weighted Runoff Coefficient .....	0.3400
Time of Concentration (days hh:mm:ss) .....	0 00:15:17

Subbasin : Sub-01

Runoff Hydrograph



## Project Description

File Name ..... LITTLE CAESARS BRYANT PREDEV.SPF  
Description ..... LITTLE CAESARS BRYANT

## Project Options

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

## Analysis Options

Start Analysis On ..... Jun 28, 2024 00:00:00  
End Analysis On ..... Jun 28, 2024 03:00:00  
Start Reporting On ..... Jun 28, 2024 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 00:05:00 days hh:mm:ss  
Routing Time Step ..... 30 seconds

## Number of Elements

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

## Rainfall Details

Return Period..... 25 year(s)

## Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub-01	0.82	0.3400	1.57	0.53	0.44	1.71	0 00:15:17

## Node Summary

SN ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft <sup>2</sup> )	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Freeboard Attain
1	Out-01	Outfall	430.20				0.00	0.00		

# Subbasin Hydrology

## Subbasin : Sub-01

### Input Data

Area (ac) ..... 0.82  
Weighted Runoff Coefficient ..... 0.3400

### Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
Pasture, less than 25 years	0.82	C (2-6%)	0.34
Composite Area & Weighted Runoff Coeff.	0.82		0.34

### Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$$T_c = (0.007 * ((n * L_f)^{0.8}) / ((P^{0.5}) * (S_f^{0.4})))$$

Where :

T<sub>c</sub> = Time of Concentration (hr)  
n = Manning's roughness  
L<sub>f</sub> = Flow Length (ft)  
P = 2 yr, 24 hr Rainfall (inches)  
S<sub>f</sub> = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 \* (S<sub>f</sub><sup>0.5</sup>) (unpaved surface)  
V = 20.3282 \* (S<sub>f</sub><sup>0.5</sup>) (paved surface)  
V = 15.0 \* (S<sub>f</sub><sup>0.5</sup>) (grassed waterway surface)  
V = 10.0 \* (S<sub>f</sub><sup>0.5</sup>) (nearly bare & untilled surface)  
V = 9.0 \* (S<sub>f</sub><sup>0.5</sup>) (cultivated straight rows surface)  
V = 7.0 \* (S<sub>f</sub><sup>0.5</sup>) (short grass pasture surface)  
V = 5.0 \* (S<sub>f</sub><sup>0.5</sup>) (woodland surface)  
V = 2.5 \* (S<sub>f</sub><sup>0.5</sup>) (forest w/heavy litter surface)  
T<sub>c</sub> = (L<sub>f</sub> / V) / (3600 sec/hr)

Where:

T<sub>c</sub> = Time of Concentration (hr)  
L<sub>f</sub> = Flow Length (ft)  
V = Velocity (ft/sec)  
S<sub>f</sub> = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 \* (R<sup>2/3</sup>) \* (S<sub>f</sub><sup>0.5</sup>)) / n  
R = A<sub>q</sub> / W<sub>p</sub>  
T<sub>c</sub> = (L<sub>f</sub> / V) / (3600 sec/hr)

Where :

T<sub>c</sub> = Time of Concentration (hr)  
L<sub>f</sub> = Flow Length (ft)  
R = Hydraulic Radius (ft)

Sheet Flow Computations	Subarea	Subarea	Subarea
	A	B	C
Manning's Roughness :	.3	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	2.2	0.00	0.00
2 yr, 24 hr Rainfall (in) :	4.13	0.00	0.00
Velocity (ft/sec) :	0.12	0.00	0.00
Computed Flow Time (min) :	14.45	0.00	0.00

Shallow Concentrated Flow Computations	Subarea	Subarea	Subarea
	A	B	C
Flow Length (ft) :	120	0.00	0.00
Slope (%) :	2.2	0.00	0.00
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.39	0.00	0.00
Computed Flow Time (min) :	0.84	0.00	0.00
Total TOC (min) .....	15.29		

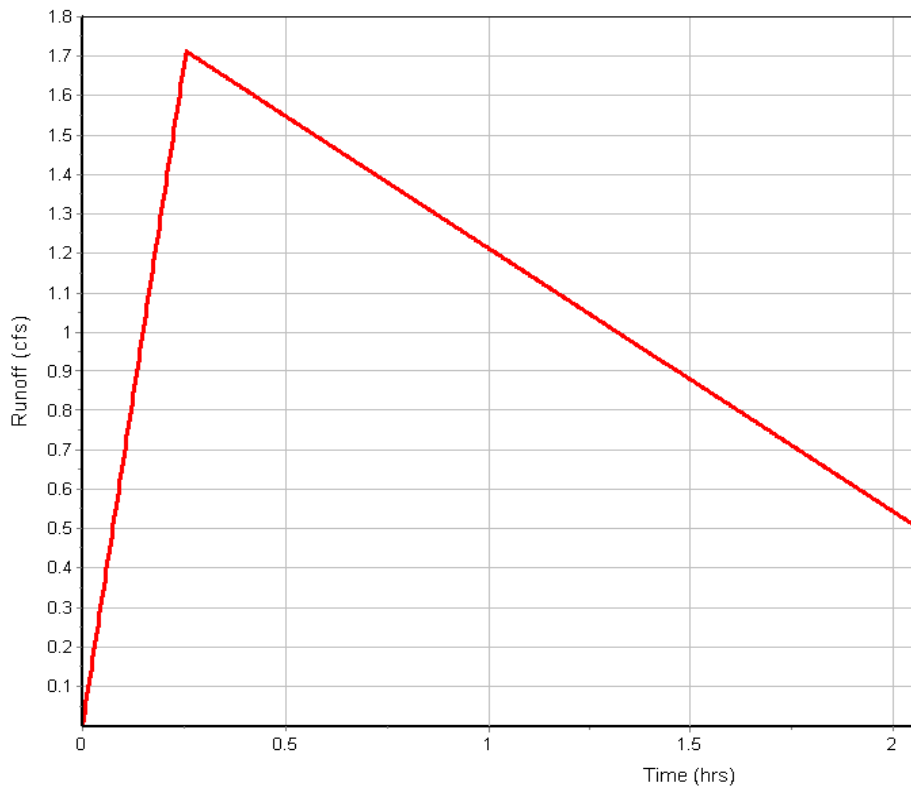
**Subbasin Runoff Results**

Total Rainfall (in) .....	1.57
Total Runoff (in) .....	0.53
Peak Runoff (cfs) .....	1.71
Rainfall Intensity .....	6.145
Weighted Runoff Coefficient .....	0.3400
Time of Concentration (days hh:mm:ss) .....	0 00:15:17



Subbasin : Sub-01

Runoff Hydrograph



## Project Description

File Name ..... LITTLE CAESARS BRYANT PREDEV.SPF  
Description ..... LITTLE CAESARS BRYANT

## Project Options

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

## Analysis Options

Start Analysis On ..... Jun 28, 2024 00:00:00  
End Analysis On ..... Jun 28, 2024 03:00:00  
Start Reporting On ..... Jun 28, 2024 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 00:05:00 days hh:mm:ss  
Routing Time Step ..... 30 seconds

## Number of Elements

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

## Rainfall Details

Return Period..... 100 year(s)

## Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub-01	0.82	0.3400	1.95	0.66	0.54	2.13	0 00:15:17

## Node Summary

SN ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft <sup>2</sup> )	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Freeboard Attain
1	Out-01 Outfall	430.20					0.00	0.00		

# Subbasin Hydrology

## Subbasin : Sub-01

### Input Data

Area (ac) ..... 0.82  
Weighted Runoff Coefficient ..... 0.3400

### Runoff Coefficient

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
Pasture, less than 25 years	0.82	C (2-6%)	0.34
Composite Area & Weighted Runoff Coeff.	0.82		0.34

### Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$$T_c = (0.007 * ((n * L_f)^{0.8}) / ((P^{0.5}) * (S_f^{0.4})))$$

Where :

T<sub>c</sub> = Time of Concentration (hr)  
n = Manning's roughness  
L<sub>f</sub> = Flow Length (ft)  
P = 2 yr, 24 hr Rainfall (inches)  
S<sub>f</sub> = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 \* (S<sub>f</sub><sup>0.5</sup>) (unpaved surface)  
V = 20.3282 \* (S<sub>f</sub><sup>0.5</sup>) (paved surface)  
V = 15.0 \* (S<sub>f</sub><sup>0.5</sup>) (grassed waterway surface)  
V = 10.0 \* (S<sub>f</sub><sup>0.5</sup>) (nearly bare & untilled surface)  
V = 9.0 \* (S<sub>f</sub><sup>0.5</sup>) (cultivated straight rows surface)  
V = 7.0 \* (S<sub>f</sub><sup>0.5</sup>) (short grass pasture surface)  
V = 5.0 \* (S<sub>f</sub><sup>0.5</sup>) (woodland surface)  
V = 2.5 \* (S<sub>f</sub><sup>0.5</sup>) (forest w/heavy litter surface)  
T<sub>c</sub> = (L<sub>f</sub> / V) / (3600 sec/hr)

Where:

T<sub>c</sub> = Time of Concentration (hr)  
L<sub>f</sub> = Flow Length (ft)  
V = Velocity (ft/sec)  
S<sub>f</sub> = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 \* (R<sup>2/3</sup>) \* (S<sub>f</sub><sup>0.5</sup>)) / n  
R = A<sub>q</sub> / W<sub>p</sub>  
T<sub>c</sub> = (L<sub>f</sub> / V) / (3600 sec/hr)

Where :

T<sub>c</sub> = Time of Concentration (hr)  
L<sub>f</sub> = Flow Length (ft)  
R = Hydraulic Radius (ft)

	Subarea	Subarea	Subarea
	A	B	C
Sheet Flow Computations			
Manning's Roughness :	.3	0.00	0.00
Flow Length (ft) :	100	0.00	0.00
Slope (%) :	2.2	0.00	0.00
2 yr, 24 hr Rainfall (in) :	4.13	0.00	0.00
Velocity (ft/sec) :	0.12	0.00	0.00
Computed Flow Time (min) :	14.45	0.00	0.00
	Subarea	Subarea	Subarea
	A	B	C
Shallow Concentrated Flow Computations			
Flow Length (ft) :	120	0.00	0.00
Slope (%) :	2.2	0.00	0.00
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.39	0.00	0.00
Computed Flow Time (min) :	0.84	0.00	0.00
Total TOC (min) .....	15.29		

**Subbasin Runoff Results**

Total Rainfall (in) .....	1.95
Total Runoff (in) .....	0.66
Peak Runoff (cfs) .....	2.13
Rainfall Intensity .....	7.636
Weighted Runoff Coefficient .....	0.3400
Time of Concentration (days hh:mm:ss) .....	0 00:15:17

Subbasin : Sub-01

Runoff Hydrograph

