STORM WATER DRAINAGE REPORT

705 SE HIGH STREET

LOT 9A, LOT 11A, LOT 13A

BLOCK 5, LOWES ADDITION

LEE'S SUMMIT, MISSOURI

PREPARED FOR

705 HIGH STREET LLC

PREPARED BY

HG CONSULT, INC.

December 29, 2021

12/29/21

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3. Project Overview

The proposed project is a 3 lot, 0.49 acre residential redevelopment in central part of Lee's Summit, Jackson County, Missouri. This is a subdivision with existing development on all four sides. The existing storm water flows to this site from the west to the east. Existing Drainage Area 1 drains to the east. This existing drainage area will be divided partly to discharge to High Street on the north side of drainage area and partly to the south to an off-site field inlet.

4. Drainage Assessment of the Project Site

After development this site will be diverting storm water from the ridge of each duplex to the north and to the south. The drainage to the north will drain directly to the street and the drainage to the south will drain through a surface swale to a proposed field inlet. This drainage will be piped by a series of HDPE pipes to the public storm sewer system on the north side of 3rd Street.

Existing Condition Curve Number Calculations

Type	Area (ac)	CN
DA-1	0.51	77

The existing drainage area is 0.51 acres and flows to the east and north to High Street.

Discharge rates for Existing Condition

Drainage Area	Area (ac)	Q10 (cfs)	Q100 (cfs)
DA-1	0.51	2.61	4.44
Total	0.51	2.61	4.44

The post development drainage area drains to the north (High Street DA-2) and to the south to a proposed field inlet (DA-1)

Proposed Condition Curve Number Calculations

Type	Area (ac)	CN
DA-1	0.24	78
DA-2	0.27	88

Discharge rates for Proposed Conditions

Drainage Area	Area (ac)	Q10 (cfs)	Q100 (cfs)
DA-1	0.24	1.25	2.10
DA-2	0.27	1.82	2.81
Total	0.51	3.07	4.91

Curve Numbers are based on the SCS/NRSCS TR-55 Chart for various site conditions. Time of concentration was considered using TR-55; however, due to the small size of the drainage basin and the amount of impervious area on the site that will just be conveying sheet flow, a time of concentration of 5 minutes was assumed. This is the minimum time of concentration per APWA 5600.

5. Temporary Erosion and Sediment Control

During construction, it will be necessary to control erosion and sediment from the site during storms within the construction timeframe. To ensure that sediment does not enter the existing storm system, perimeter containment is controlled by silt fence installation and inlet protection. These erosion control devices, and their maintenance throughout the construction timeframe, are required by ordinance and the details for them are referenced by the City's Design and Construction Manual.

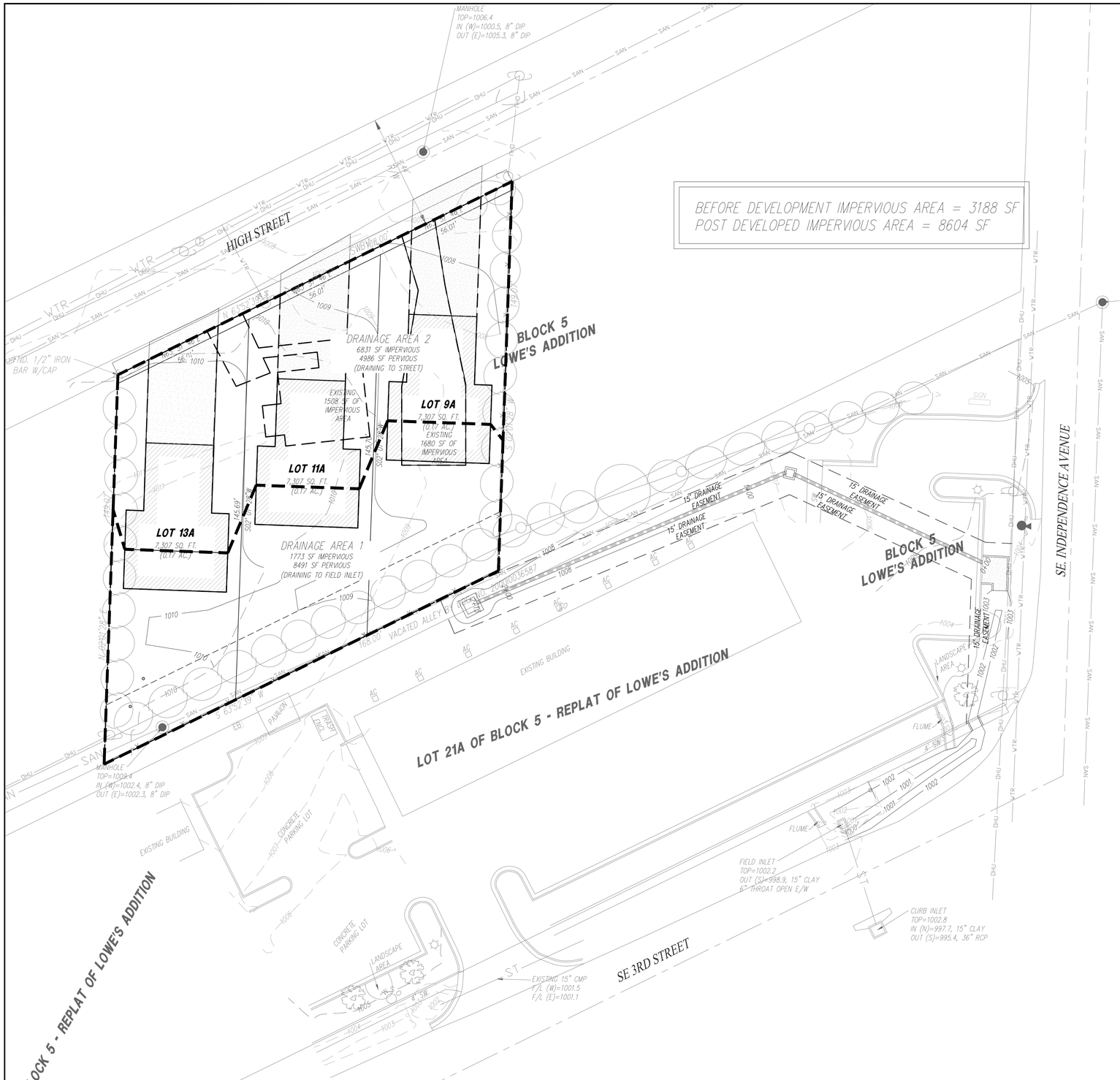
6. Conclusion

The proposed project is a redevelopment, infill project in a previously developed area of the city. The report has been prepared to evaluate the storm water discharge. Even though there is an increase in impervious coverage due to the 3 (three) proposed houses, it has been shown that with the addition of the field inlet on the south side of property, there will be very minimal impact or increase in sheet flow to the downstream areas.

A waiver is requested, to the City of Lee's Summit, MO City Engineer, that no detention shall be required since the amount of additional storm water is negligible and the flood protection for the 1% storm is not reasonably attainable due to the location of damageable improvements with respect to the drainage system.

7. Design Calculations

See the attached for drainage area calculations and flows.



KEY

PROPOSED		EXISTING
979	Grades	960
→	100 Year Overflow	
- - -	Drainage Area	

**All storm sewer piping is designed to carry the 10 year storm event. Storm events that are not carried by storm sewer piping is routed overland in parking lot until the overland flow reaches the south west corner of lot.

PROJECT BENCHMARK:

#1 Top of Sanitary Manhole lid in street on north side of project.
N: 1000974.6290
E: 2826739.8680
TOP ELEV. 1006.44

NO.	DATE	REVISION	BY	CK/APP

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Consult engineers Inc planners
CORPORATE LICENSE No. E2010005873
R. KEVIN STERRETT, MO E-26440

DRAINAGE AREA MAP

705 SE HIGH STREET DUPLEXES
LEE'S SUMMIT - JACKSON COUNTY - MISSOURI

X-REF NO. 211188
DRAWING NO. 21085
DATE OCTOBER 7, 2021
JOB NO. 21085

Hydrologic Soil Group—Jackson County, Missouri
(HIGH STREET)

Map Scale: 1:378 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 5 10 20 30

Feet: 0 15 30 60 90

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 23, Sep 1, 2021

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

Date(s) aerial images were photographed: Sep 6, 2019—Nov 16, 2019

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	0.4	100.0%
Totals for Area of Interest			**0.4**	**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.

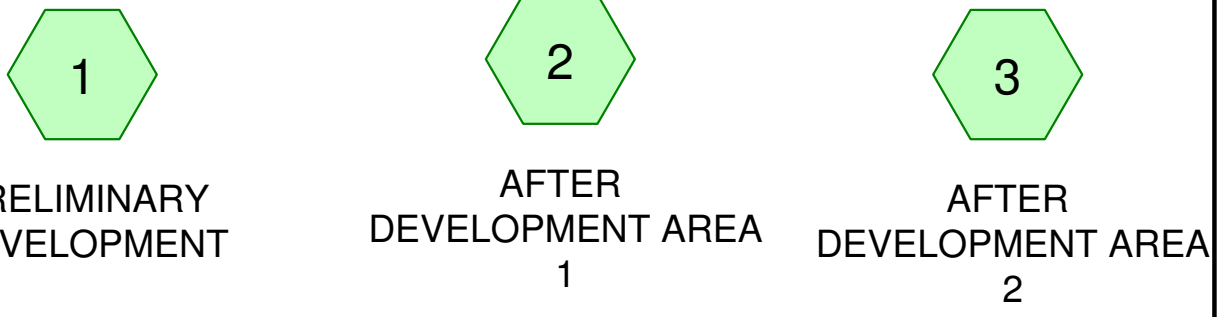
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



Subcat Reach Pond Link

Routing Diagram for 21085 PRE
Prepared by HG Consult, Printed 12/29/2021

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 5447 MO Jackson

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	10-Year	Type II 24-hr		Default	24.00	1	5.30	2
2	100-Year	Type II 24-hr		Default	24.00	1	7.70	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.743	74	>75% Grass cover, Good, HSG C (1, 2, 3)
0.230	98	Paved parking, HSG C (1, 3)
0.041	98	Roofs, HSG C (2)
1.014	**80**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
1.014	HSG C	1, 2, 3
0.000	HSG D	
0.000	Other	
1.014		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.743	0.000	0.000	0.743	>75% Grass cover, Good	1, 2, 3
0.000	0.000	0.230	0.000	0.000	0.230	Paved parking	1, 3
0.000	0.000	0.041	0.000	0.000	0.041	Roofs	2
0.000	**0.000**	**1.014**	**0.000**	**0.000**	**1.014**	**TOTAL AREA**	

Time span=0.50-40.00 hrs, dt=0.05 hrs, 791 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: PRELIMINARY Runoff Area=22,082 sf 14.40% Impervious Runoff Depth=2.88"
Tc=5.0 min CN=77 Runoff=2.61 cfs 0.121 af

Subcatchment 2: AFTER DEVELOPMENT Runoff Area=10,264 sf 17.27% Impervious Runoff Depth=2.97"
Tc=5.0 min CN=78 Runoff=1.25 cfs 0.058 af

Subcatchment 3: AFTER DEVELOPMENT Runoff Area=11,817 sf 57.81% Impervious Runoff Depth=3.95"
Tc=5.0 min CN=88 Runoff=1.82 cfs 0.089 af

Total Runoff Area = 1.014 ac Runoff Volume = 0.269 af Average Runoff Depth = 3.19"
73.32% Pervious = 0.743 ac 26.68% Impervious = 0.271 ac

Summary for Subcatchment 1: PRELIMINARY DEVELOPMENT

[49] Hint: Tc<2dt may require smaller dt

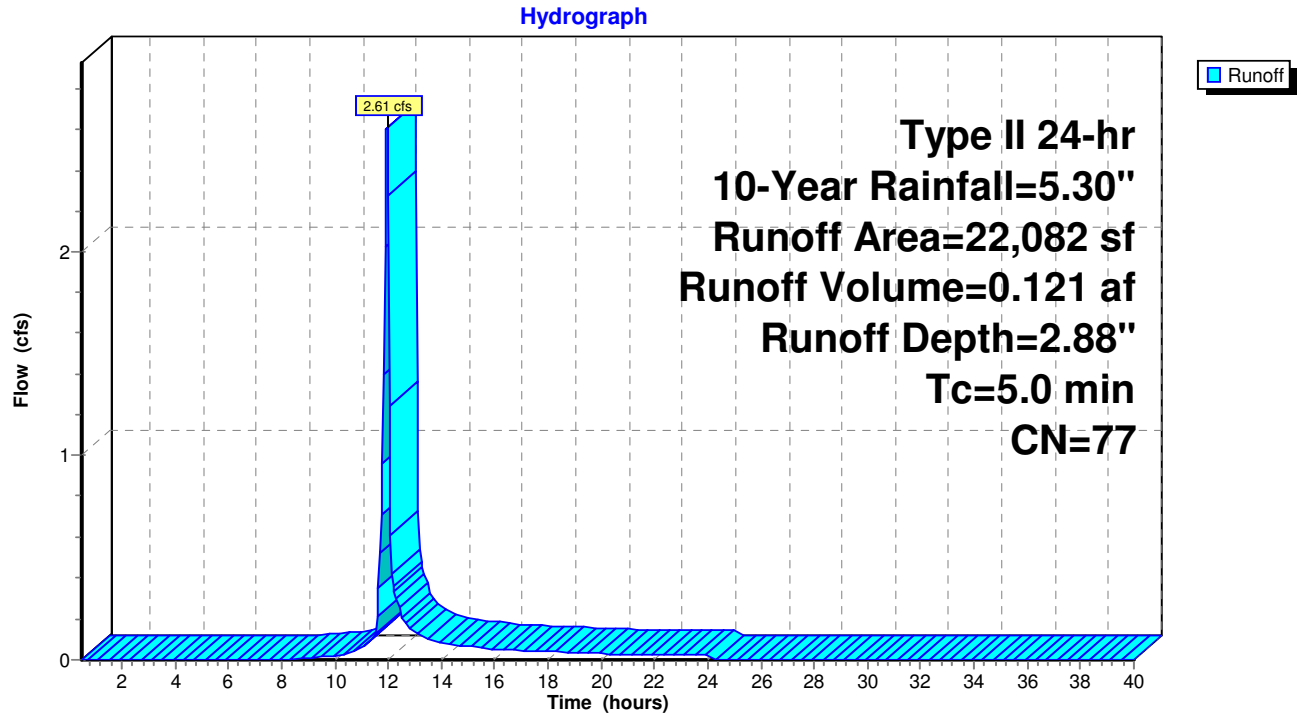
Runoff = 2.61 cfs @ 11.96 hrs, Volume= 0.121 af, Depth= 2.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-40.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=5.30"

Area (sf)	CN	Description
3,180	98	Paved parking, HSG C
18,902	74	>75% Grass cover, Good, HSG C
22,082	77	Weighted Average
18,902		85.60% Pervious Area
3,180		14.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1: PRELIMINARY DEVELOPMENT



Summary for Subcatchment 2: AFTER DEVELOPMENT AREA 1

[49] Hint: Tc<2dt may require smaller dt

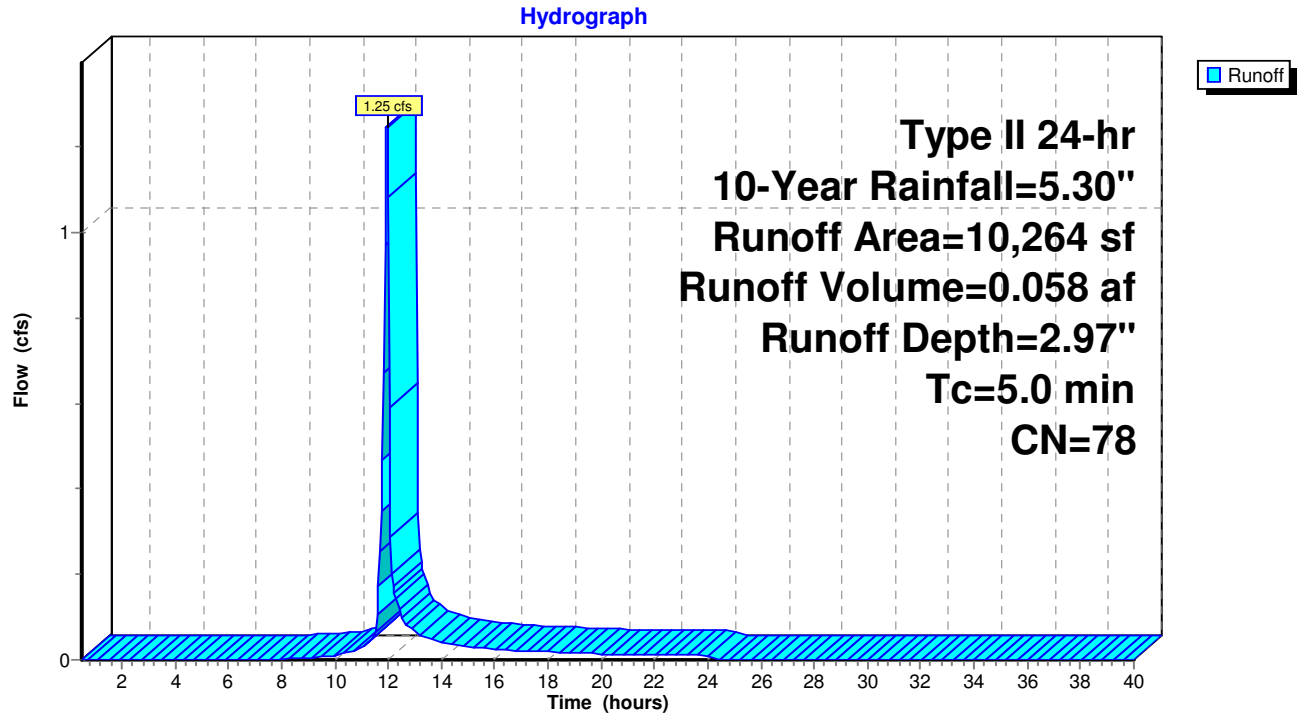
Runoff = 1.25 cfs @ 11.96 hrs, Volume= 0.058 af, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-40.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=5.30"

Area (sf)	CN	Description
1,773	98	Roofs, HSG C
8,491	74	>75% Grass cover, Good, HSG C
10,264	78	Weighted Average
8,491		82.73% Pervious Area
1,773		17.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2: AFTER DEVELOPMENT AREA 1



Summary for Subcatchment 3: AFTER DEVELOPMENT AREA 2

[49] Hint: Tc<2dt may require smaller dt

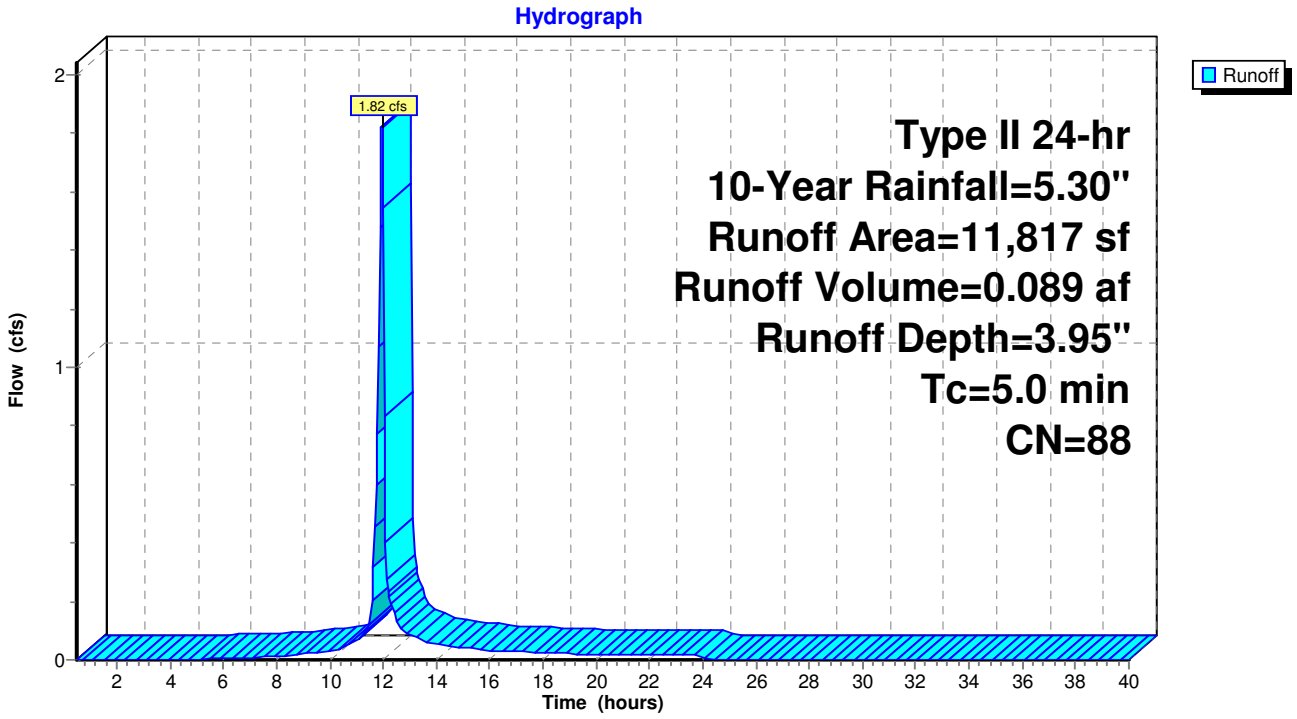
Runoff = 1.82 cfs @ 11.95 hrs, Volume= 0.089 af, Depth= 3.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-40.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=5.30"

Area (sf)	CN	Description
6,831	98	Paved parking, HSG C
4,986	74	>75% Grass cover, Good, HSG C
11,817	88	Weighted Average
4,986		42.19% Pervious Area
6,831		57.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3: AFTER DEVELOPMENT AREA 2



Time span=0.50-40.00 hrs, dt=0.05 hrs, 791 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: PRELIMINARY Runoff Area=22,082 sf 14.40% Impervious Runoff Depth=5.00"
Tc=5.0 min CN=77 Runoff=4.44 cfs 0.211 af

Subcatchment 2: AFTER DEVELOPMENT Runoff Area=10,264 sf 17.27% Impervious Runoff Depth=5.11"
Tc=5.0 min CN=78 Runoff=2.10 cfs 0.100 af

Subcatchment 3: AFTER DEVELOPMENT Runoff Area=11,817 sf 57.81% Impervious Runoff Depth=6.28"
Tc=5.0 min CN=88 Runoff=2.81 cfs 0.142 af

Total Runoff Area = 1.014 ac Runoff Volume = 0.454 af Average Runoff Depth = 5.37"
73.32% Pervious = 0.743 ac 26.68% Impervious = 0.271 ac

Summary for Subcatchment 1: PRELIMINARY DEVELOPMENT

[49] Hint: Tc<2dt may require smaller dt

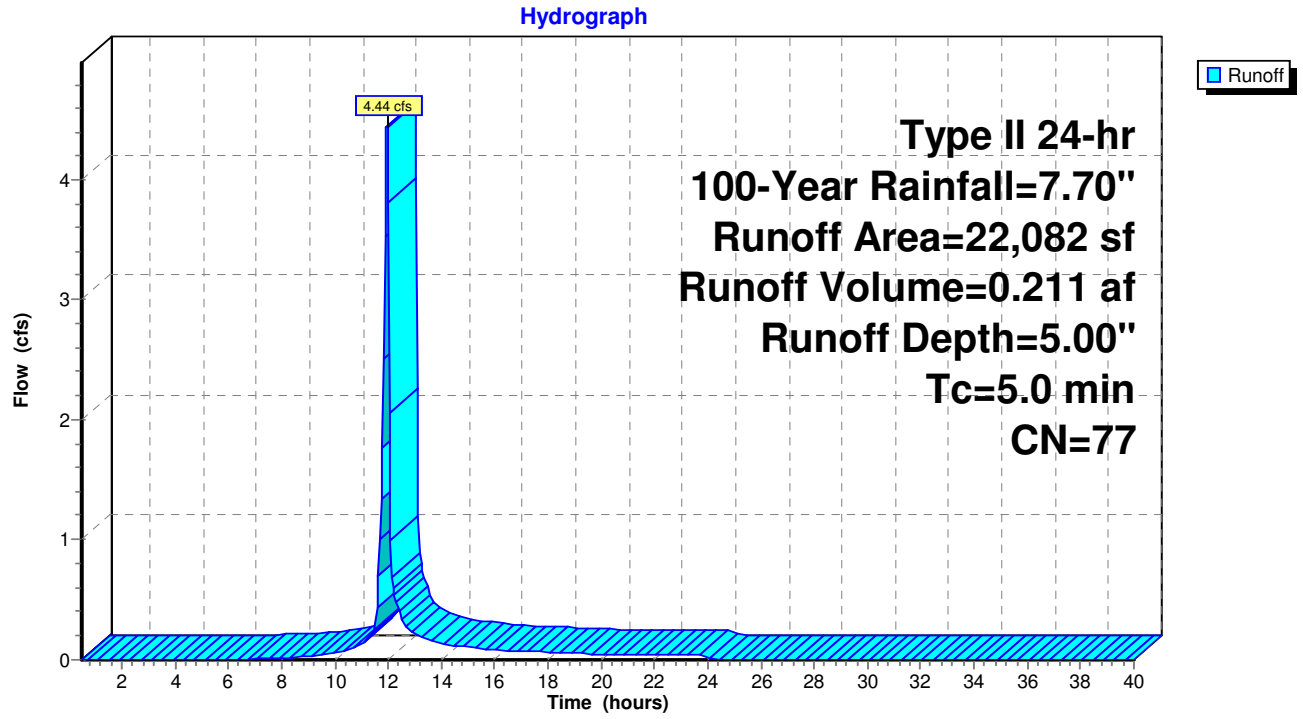
Runoff = 4.44 cfs @ 11.95 hrs, Volume= 0.211 af, Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-40.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.70"

Area (sf)	CN	Description
3,180	98	Paved parking, HSG C
18,902	74	>75% Grass cover, Good, HSG C
22,082	77	Weighted Average
18,902		85.60% Pervious Area
3,180		14.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1: PRELIMINARY DEVELOPMENT



Summary for Subcatchment 2: AFTER DEVELOPMENT AREA 1

[49] Hint: Tc<2dt may require smaller dt

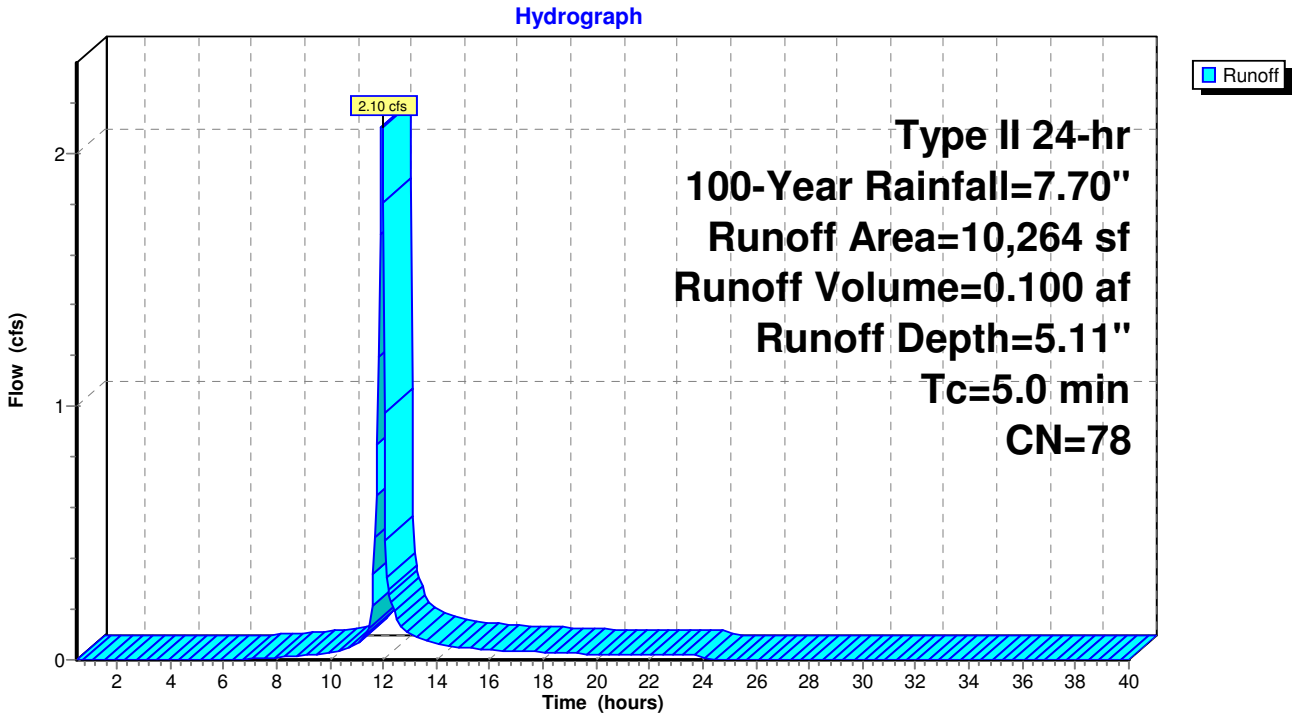
Runoff = 2.10 cfs @ 11.95 hrs, Volume= 0.100 af, Depth= 5.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-40.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.70"

Area (sf)	CN	Description
1,773	98	Roofs, HSG C
8,491	74	>75% Grass cover, Good, HSG C
10,264	78	Weighted Average
8,491		82.73% Pervious Area
1,773		17.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2: AFTER DEVELOPMENT AREA 1



Summary for Subcatchment 3: AFTER DEVELOPMENT AREA 2

[49] Hint: Tc<2dt may require smaller dt

Runoff = 2.81 cfs @ 11.95 hrs, Volume= 0.142 af, Depth= 6.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-40.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.70"

Area (sf)	CN	Description
6,831	98	Paved parking, HSG C
4,986	74	>75% Grass cover, Good, HSG C
11,817	88	Weighted Average
4,986		42.19% Pervious Area
6,831		57.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3: AFTER DEVELOPMENT AREA 2