Drainage Report

Project:

SMITH VALLEY ROAD RETAIL

Smith Valley Road & Morgantown Road

Greenwood, Indiana 46142

Prepared For:

ECHO GREENWOOD, LLC

560 Epsilon Drive

Pittsburgh, PA 15238

Prepared By:

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.

Indianapolis, Indiana

Civil Engineer:

Nicholas Justice, PE

CEC Project 322-045

AUGUST 2022

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APPENDICES

1.0 REPORT OVERVIEW

This report establishes the stormwater requirements for the proposed Smith Valley Road Retail project located at the northwest corner of Smith Valley Road and Morgantown Road in Greenwood, IN, Johnson County. The existing site is part of Section 2 of the Wakefield Commercial master planned subdivision. The proposed project area is 10.41 acres and consists of a new grocery store, retail building, and 3 outparcel lots. The existing pond system has been designed to detain and provide water quality treatment for the proposed site.

2.0 PROJECT BACKGROUND

2.1 EXISTING CONDITIONS

Located within Section 2 of the master planned Wakefield Commercial subdivisions, the area of interest for the project is +/- 10.41-acres. The project site is at the northwest corner of Smith Valley Road and Morgantown Road. The existing site is an undeveloped vacant lot consisting of grass and woods. The project site drains from south to north to an existing ditch. The existing drainage map *Figure C-1* can be found in **Appendix C.**

2.1.1 FEMA Map

The project site is located within the FEMA Community Panel Map # 18081C0105D dated August 2, 2007 which indicates the site is located within the Flood Designation 'Zone X, Area of Minimal Flood Hazard (No Shading)'. The FEMA Map is included in **Appendix A**.

2.1.2 Watershed Description

The project site is located within the Honey Creek-Turkey Pen Creek watershed, as provided on the IndianaMap GIS system and identified with a 14-digit Hydrologic Unit Code (HUC) of 05120201140010.

2.1.3 Soils Map

The approximate limits of each soil type are depicted in the Soils Map provided in **Appendix B**.

3.0 STORMWATER DESIGN

3.1 PROPOSED CONDITIONS

The proposed project consists of a new grocery store, retail building, and 3 outparcel lots. The project will disturb approximately 9.595 acres. See proposed conditions on *Figure C-2* in **Appendix C**.

Stormwater runoff from the site will be collected into the proposed storm sewer network. The proposed storm sewer network is sized to convey the 10-year rainfall event. Calculations for pipe sizing can be found in **Appendix D**.

Runoff from the site will be detained in the existing detention pond north of the site before outletting into the existing ditch north of the site. Refer to the proposed drainage maps *Figures C-2 & C-3* in **Appendix C**.

3.2 STORMWATER MANAGEMENT

3.2.1 Hydraulic Performance

Stormwater runoff from the site pre- and post-construction are presented below in *Table 1*.

Table 1: Peak Runoff Rates

Runoff Rate (cfs)			
Condition	**2-Year**	**10-Year**	**100-Year**
Existing	0.34	1.66	6.14
Proposed	8.41	17.37	33.90

The existing and proposed HydroCAD reports can be found in **Appendices E & F**, respectively.

3.2.2 Utilized Computer Software

The hydrology and pipe sizing calculations were performed using HydroCAD v10.00 (by HydroCAD Software Solutions LLC) and Hydraflow Storm Sewers Extension v12 (By Autodesk, Inc.). Indy Huff Quartile Rainfall Distributions were used for 1-, 2-, 3-, 6-, 12-, and 24-hour storm durations.

3.2.3 Runoff Curve Number (CN) Determination

For impervious areas such as buildings and pavement, a CN value of 98 was used. Areas with exposed subgrade and grass cover were modeled using a CN of 61 because the site is classified as "B" soils (see **Appendix B**). These values were chosen based on the 320-VI-TR-55 reference table.

3.2.4 Storm Sewer Piping

Sized for a 10-year rainfall event, a series of catch basin inlets and piping will convey rainfall runoff to the proposed detention system. The minimum flow velocity of each pipe achieves the velocity requirement (Section 6-102-5.C.2.d). All of the most-upstream full-flow pipe velocities are at least 2.0 ft/s, and all exceed 2.5 ft/s when flowing full. Refer to storm sewer calculations in **Appendix D**.

For the sewer calculations, a Composite "C" value of 0.90 was used for roof area, whereas 0.85 and 0.20 were used for pavement and pervious lawn, respectively. The time of concentration was assumed to be a minimum allowable of 5 minutes for paved inlets. Storm pipes were assigned a Manning's coefficient "n" value of 0.013.

3.2.5 Water Quality Treatment

The Smith Valley Road Retail project will utilize a mechanical BMP structure for the site. The peak discharge during the 1-inch storm event from the site was determined to be 5.98 cfs to the proposed storm drainage network. To accommodate the flow, an Aqua-Swirl Xcelerator XC-9 in-line unit will treat the site. The unit is sized to allow for 8.29 cfs of water quality treatment. The water quality sizing calculations are shown in **Appendix H.**

4.0 CONCLUSION

The Smith Valley Road Retail project will be served with adequate detention and water quality facilities in accordance with the Johnson County Subdivision Ordinance. With proper construction of the described stormwater features, no adverse impacts are expected for upstream or downstream property owners.

5.0 REFERENCES

5.1.1 Databases and Manuals

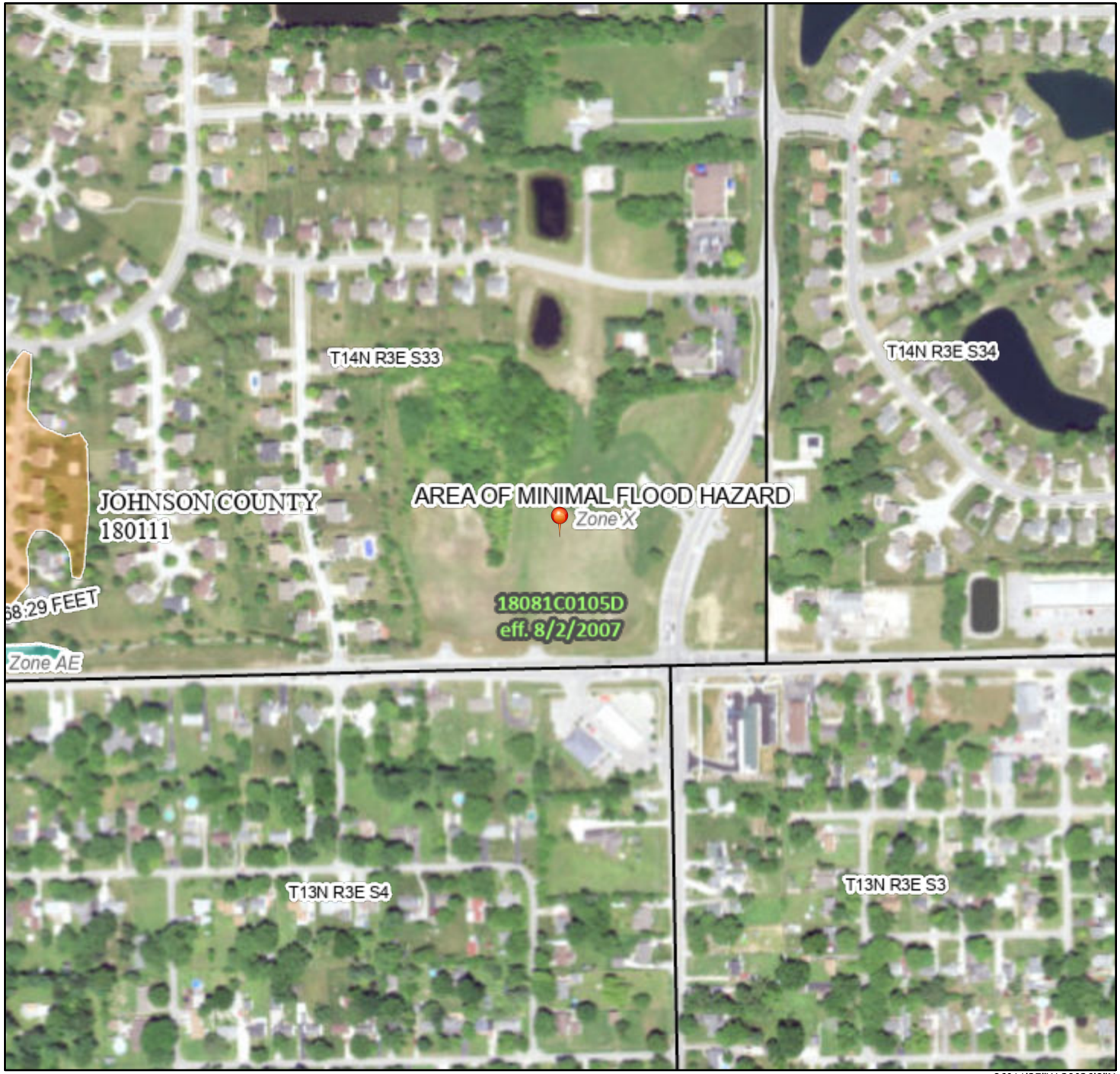
1. USDA NRCS Web Soil Survey
2. U.S. Geological Survey, IndianaMap website
3. FEMA Flood Insurance Rate Maps, FEMA website
4. Johnson County Subdivision Ordinance, adopted February 19, 2002

APPENDIX A
FEMA FIRM

National Flood Hazard Layer FIRMette

FEMA

86°12'13"W 39°36'36"N



0 250 500 1,000 1,500 2,000 Feet

1:6,000

86°11'35"W 39°36'8"N

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 — Cross Sections with 1% Annual Chance
- 17.5 — Water Surface Elevation
- Coastal Transect
- 513 — Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 8/6/2022 at 11:12 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX B
SOILS MAP

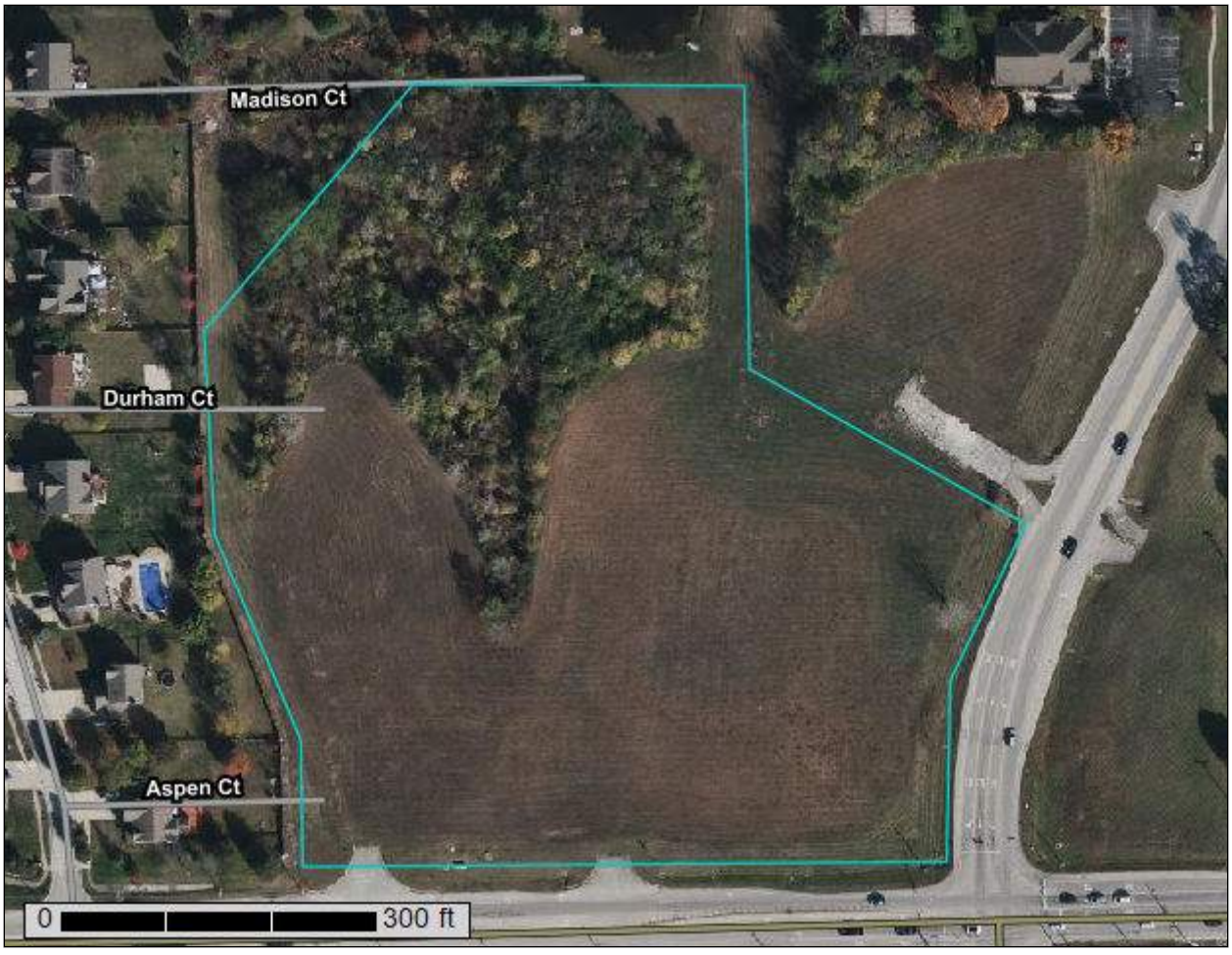
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Johnson County, Indiana



August 6, 2022

Custom Soil Resource Report
Soil Map

Map Scale: 1:1,920 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
YfhC2	Fox-Urban land complex, 6 to 12 percent slopes, eroded	3.2	32.5%
YflB2	Fox loam-Urban land complex, 2 to 6 percent slopes, eroded	3.8	39.3%
YobB2	Ockley loam-Urban land complex, 2 to 6 percent slopes, eroded	2.8	28.3%
Totals for Area of Interest		**9.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

Johnson County, Indiana

YfhC2—Fox-Urban land complex, 6 to 12 percent slopes, eroded

Map Unit Setting

National map unit symbol: 2y8lr
Elevation: 680 to 1,040 feet
Mean annual precipitation: 36 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 145 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

Fox, eroded, and similar soils: 60 percent
Urban land: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fox, Eroded

Setting

Landform: Stream terraces, outwash plains
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy outwash over sandy and gravelly outwash

Typical profile

H1 - 0 to 8 inches: loam
H2 - 8 to 34 inches: gravelly sandy clay loam
H3 - 34 to 60 inches: sand

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: 20 to 40 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 55 percent
Available water supply, 0 to 60 inches: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: F111AY015IN - Dry Outwash Upland
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Minor Components

Fox, severely eroded

Percent of map unit: 10 percent
Landform: Stream terraces, outwash plains
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: F111AY015IN - Dry Outwash Upland
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

YflB2—Fox loam-Urban land complex, 2 to 6 percent slopes, eroded

Map Unit Setting

National map unit symbol: 2w57r
Elevation: 700 to 1,040 feet
Mean annual precipitation: 37 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 145 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Fox, eroded, and similar soils: 55 percent
Urban land: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fox, Eroded

Setting

Landform: Stream terraces, till plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Convex, linear
Across-slope shape: Linear
Parent material: Loamy outwash over sandy and gravelly outwash

Typical profile

Ap - 0 to 8 inches: loam
Bt1 - 8 to 18 inches: loam
Bt2 - 18 to 25 inches: sandy loam
Bt3 - 25 to 36 inches: gravelly sandy loam
2C - 36 to 79 inches: stratified very gravelly loamy coarse sand to gravelly sand to sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 32 to 39 inches to strongly contrasting textural stratification

Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 45 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F111AY015IN - Dry Outwash Upland
Hydric soil rating: No

Minor Components

Ockley

Percent of map unit: 5 percent
Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F111AY015IN - Dry Outwash Upland
Hydric soil rating: No

Westland, drained

Percent of map unit: 3 percent
Landform: Depressions on stream terraces, swales on stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave, linear, convex
Across-slope shape: Concave, linear
Ecological site: R111AY016IN - Outwash Mollisol
Hydric soil rating: Yes

Fox, till substratum

Percent of map unit: 2 percent
Landform: Stream terraces on till plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear, convex
Across-slope shape: Linear
Ecological site: F111AY015IN - Dry Outwash Upland
Hydric soil rating: No

YobB2—Ockley loam-Urban land complex, 2 to 6 percent slopes, eroded

Map Unit Setting

National map unit symbol: 2xf73
Elevation: 680 to 1,040 feet
Mean annual precipitation: 36 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 145 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

Ockley, eroded, and similar soils: 70 percent
Urban land: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ockley, Eroded

Setting

Landform: Outwash plains, stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy outwash over sandy and gravelly outwash

Typical profile

H1 - 0 to 11 inches: loam
H2 - 11 to 22 inches: clay loam
H3 - 22 to 50 inches: gravelly sandy clay loam
H4 - 50 to 60 inches: stratified gravelly sand to fine sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 20 to 60 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 55 percent
Available water supply, 0 to 60 inches: Moderate (about 8.2 inches)

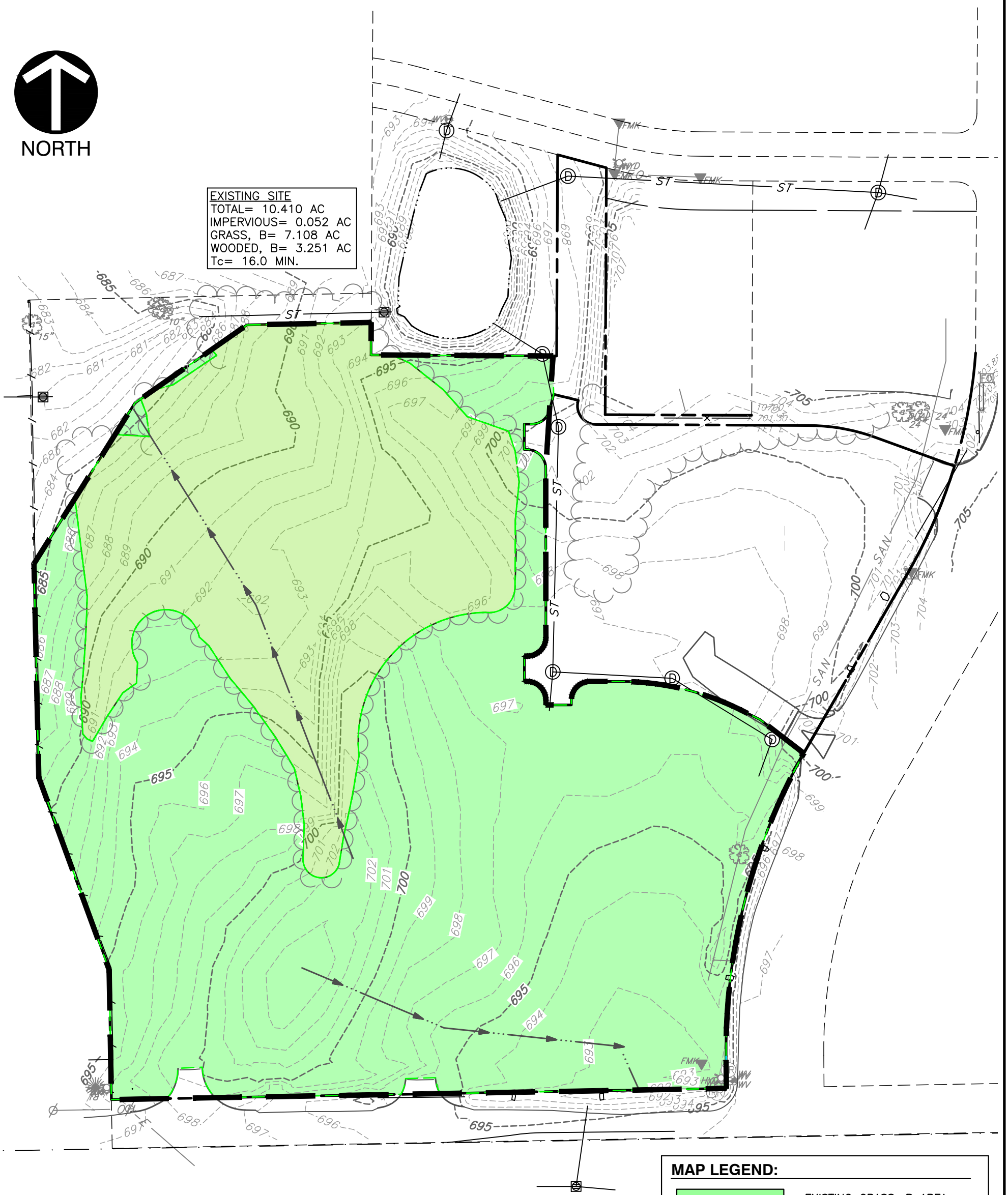
Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F111AY015IN - Dry Outwash Upland
Other vegetative classification: Trees/Timber (Woody Vegetation)

APPENDIX C
EXISTING & PROPOSED WATERSHED MAPS

NORTH

EXISTING SITE
TOTAL= 10.410 AC
IMPERVIOUS= 0.052 AC
GRASS, B= 7.108 AC
WOODED, B= 3.251 AC
Tc= 16.0 MIN.



MAP LEGEND:

- EXISTING GRASS, B AREA
- EXISTING WOODED, B AREA
- EXISTING IMPERVIOUS AREA
- PROJECT SITE BOUNDARY

SCALE IN FEET
0 100' 200'

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www.cecinc.com

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SMITH VALLEY & MORGANTOWN ROAD
GREENWOOD, IN

EXISTING DRAINAGE MAP

DRAWN BY:	RT	CHECKED BY:	NPJ	APPROVED BY:		FIGURE NO.:	C-1
DATE:	AUGUST 2022	DWG SCALE:	1"=100'	PROJECT NO:	322-045		

P:\320-000\322-045\-CADD\Dwg\XRef\322045XR-CV01-HYD-Pre.dwg[C-1] LS:(8/8/2022 - njustice) - LP: 8/9/2022 10:01 AM (njustice)

NORTH

PROPOSED SITE
TOTAL= 10.410 AC
IMPERVIOUS= 7.770 AC
GRASS, B= 2.640 AC
Tc= 9.9 MIN.

ST
RD
FMK
SAN
OH

MAP LEGEND:

- PROPOSED GRASS, B AREA
- PROPOSED IMPERVIOUS AREA
- PROJECT SITE BOUNDARY

SCALE IN FEET
0 100' 200'

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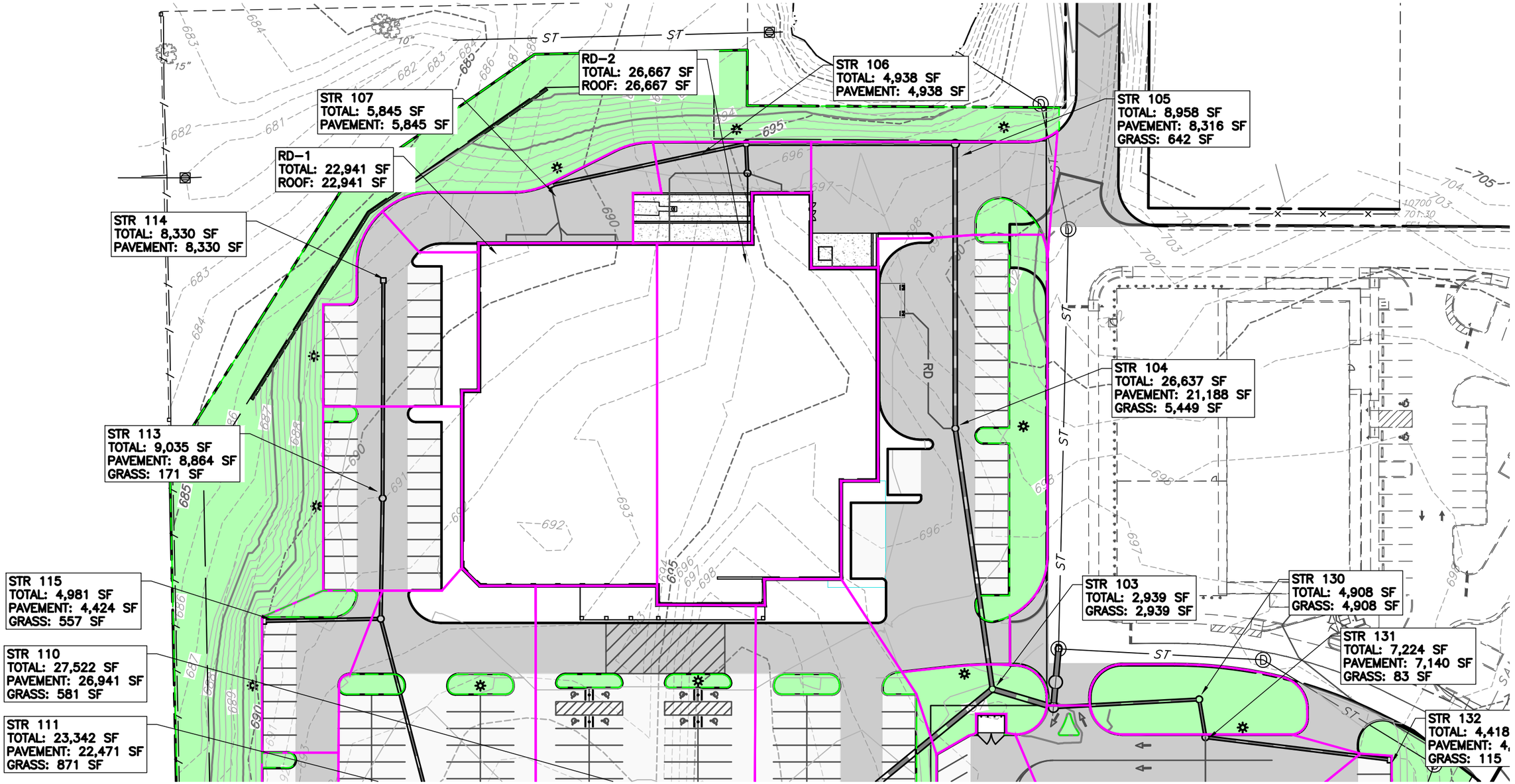
ECHO REALTY
SMITH VALLEY ROAD RETAIL
SMITH VALLEY & MORGANTOWN ROAD
GREENWOOD, IN

PROPOSED DRAINAGE MAP

DRAWN BY:	RT	CHECKED BY:	NPJ	APPROVED BY:		FIGURE NO.:
DATE:	AUGUST 2022	DWG SCALE:	1"=100'	PROJECT NO:	322-045	C-2



NORTH

SCALE IN FEET

0 60' 120'

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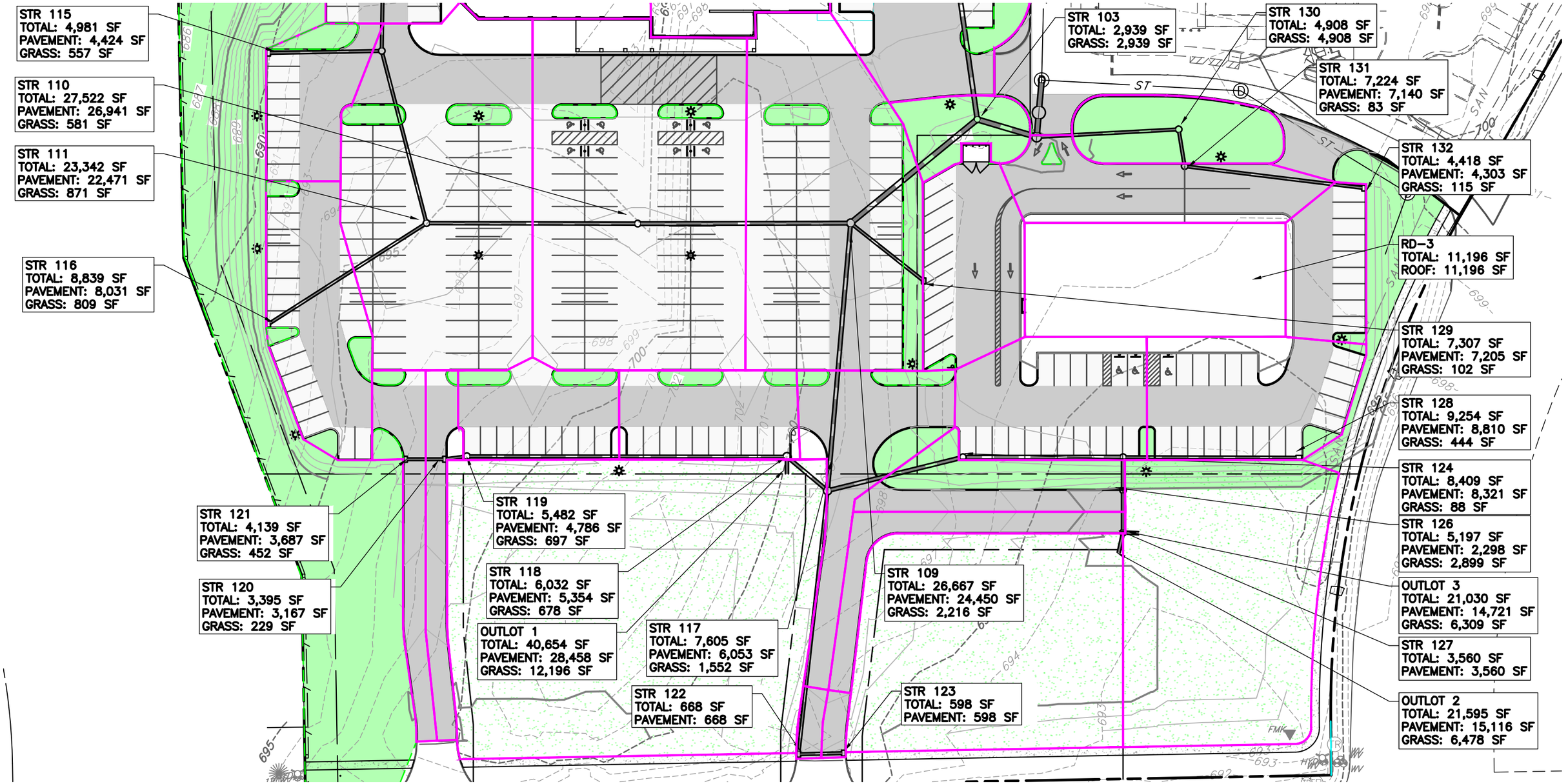
GREENWOOD, IN

PROPOSED DRAINAGE MAP

DRAWN BY:	RT	CHECKED BY:	NPJ	APPROVED BY:		FIGURE NO.:
DATE:	AUGUST 2022	DWG SCALE:	1"=60'	PROJECT NO:	322-045	C-3



NORTH

SCALE IN FEET

0 60' 120'

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GREENWOOD, IN

PROPOSED DRAINAGE MAP

DRAWN BY:	RT	CHECKED BY:	NPJ	APPROVED BY:		FIGURE NO.:	C-4
DATE:	AUGUST 2022	DWG SCALE:	1"=60'	PROJECT NO:	322-045		

APPENDIX D
STORM SEWER SIZING CALCULATIONS

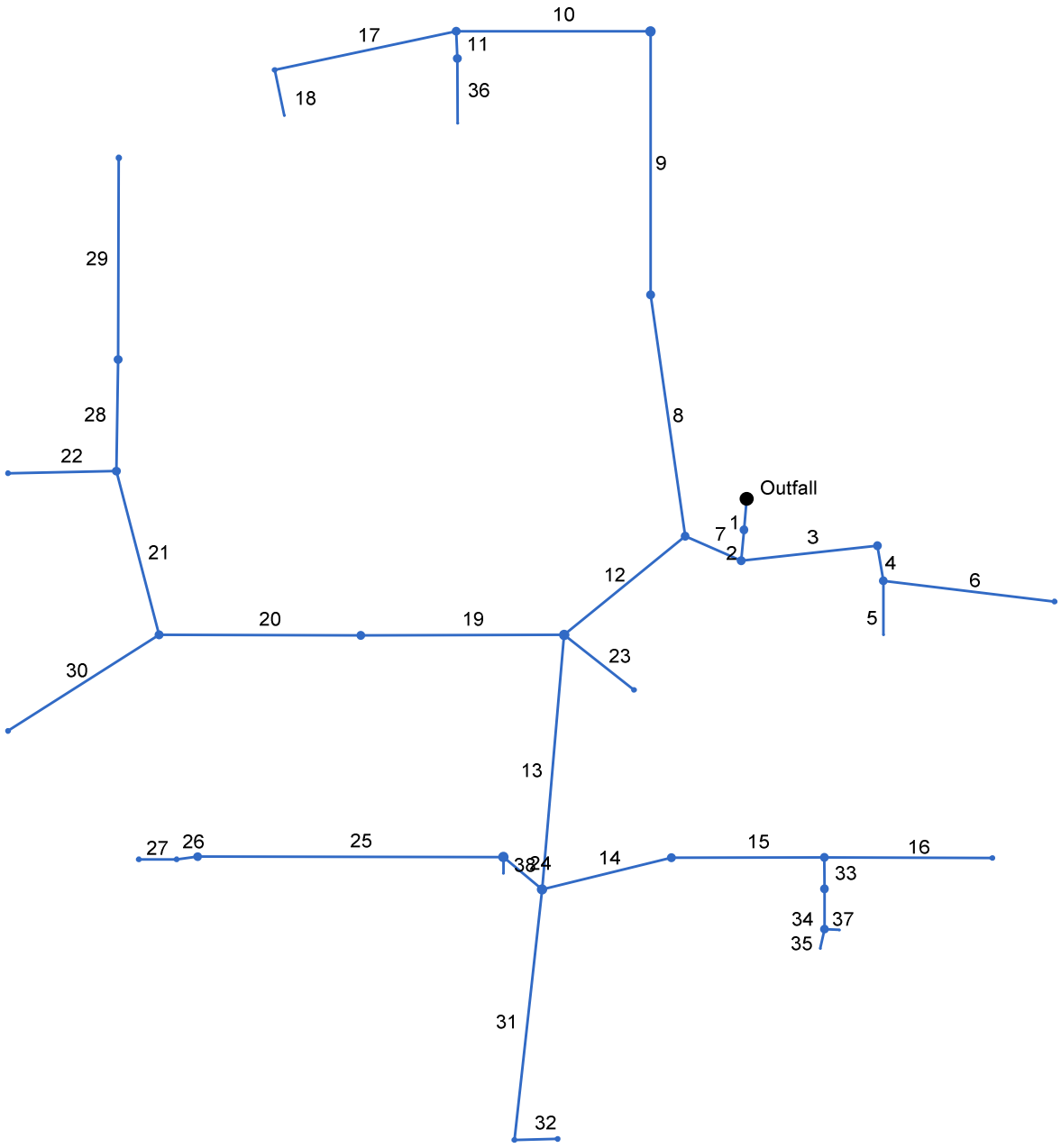
Civil & Environmental Consultants, Inc.						
				By:	NPJ	
Project Name:	The Plant			Date:	8/2022	
CEC Project No.:	318-195			Checked By:		
Description:	Composite C Calculations			Date:		
Runoff Coefficient						
Roof Surfaces=		0.90				
Pavement=		0.85				
Pervious=		0.20				
BASINS						
STR 103						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	0	2,939	2,939	0.07	0.20	
STR 104						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	21,188	5,449	26,637	0.61	0.72	
STR 105						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	8,316	642	8,958	0.21	0.80	
STR 106						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	4,938	0	4,938	0.11	0.85	
STR 107						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	5,845	0	5,845	0.13	0.85	
STR 109						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	24,450	2,216	26,666	0.61	0.80	
STR 110						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	26,941	581	27,522	0.63	0.84	
STR 111						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	22,471	871	23,342	0.54	0.83	
STR 113						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	8,864	171	9,035	0.21	0.84	
STR 114						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	8,330	0	8,330	0.19	0.85	

Civil & Environmental Consultants, Inc.						
				By:	NPJ	
Project Name:	The Plant			Date:	8/2022	
CEC Project No.:	318-195			Checked By:		
Description:	Composite C Calculations			Date:		
Runoff Coefficient						
Roof Surfaces=		0.90				
Pavement=		0.85				
Pervious=		0.20				
BASINS						
STR 115						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	4,424	557	4,981	0.11	0.78	
STR 116						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	8,031	809	8,840	0.20	0.79	
STR 117						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	6,053	1,552	7,605	0.17	0.72	
STR 118						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	5,354	678	6,032	0.14	0.78	
STR 119						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	4,786	697	5,483	0.13	0.77	
STR 120						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	3,167	229	3,396	0.08	0.81	
STR 121						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	3,687	452	4,139	0.10	0.78	
STR 122						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	668	0	668	0.02	0.85	
STR 123						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	598	0	598	0.01	0.85	

Civil & Environmental Consultants, Inc.						
				By:	NPJ	
Project Name:	The Plant			Date:	8/2022	
CEC Project No.:	318-195			Checked By:		
Description:	Composite C Calculations			Date:		
Runoff Coefficient						
Roof Surfaces=		0.90				
Pavement=		0.85				
Pervious=		0.20				
BASINS						
STR 124						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	8,321	88	8,409	0.19	0.84	
STR 126						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	2,298	2,899	5,197	0.12	0.49	
STR 127						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	3,560	0	3,560	0.08	0.85	
STR 128						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	8,810	444	9,254	0.21	0.82	
STR 129						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	7,205	102	7,307	0.17	0.84	
STR 130						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	0	4,908	4,908	0.11	0.20	
STR 131						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	7,140	83	7,223	0.17	0.84	
STR 132						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	4,303	115	4,418	0.10	0.83	
RD-1						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
22,941	0	0	22,941	0.53	0.90	

Civil & Environmental Consultants, Inc.						
				By:	NPJ	
Project Name:	The Plant			Date:	8/2022	
CEC Project No.:	318-195			Checked By:		
Description:	Composite C Calculations			Date:		
Runoff Coefficient						
	Roof Surfaces=	0.90				
	Pavement=	0.85				
	Pervious=	0.20				
BASINS						
RD-2						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
26,667	0	0	26,667	0.61	0.90	
RD-3						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
11,196	0	0	11,196	0.26	0.90	
OUTLOT 1						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	28,458	12,196	40,654	0.93	0.66	
OUTLOT 2						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	15,116	6,478	21,594	0.50	0.66	
OUTLOT 3						
Roof	Pavement	Lawn	Total	Total	Composite	
(ft^2)	(ft^2)	(ft^2)	(ft^2)	(Acres)	"C"	
0	14,721	6,309	21,030	0.48	0.66	

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: New.stm	Number of lines: 38	Date: 8/9/2022

MyReport

Line No.	Line ID	Line Length (ft)	Drng Area (ac)	Total Area (ac)	Runoff Coeff (C)	Incr CxA	Total CxA	n-val Pipe	Tc (min)	i Sys (in/hr)	Flow Rate (cfs)	Capac Full (cfs)	Vel Up (ft/s)	Line Size (in)	Line Slope (%)	Invert Dn (ft)	Invert Up (ft)	HGL Dn (ft)	HGL Up (ft)	Incr Q (cfs)
1	101	20.000	0.00	8.73	0.00	0.00	6.74	0.013	9.9	5.50	37.08	38.91	8.57	30	0.90	688.11	688.29	690.17	690.35	0.00
2	102	20.000	0.00	8.73	0.00	0.00	6.74	0.013	9.9	5.51	37.17	38.91	8.58	30	0.90	688.29	688.47	690.35	690.53	0.00
3	130	88.039	0.11	0.64	0.20	0.02	0.48	0.013	7.3	6.20	2.99	4.57	3.96	15	0.50	694.80	695.24	695.54	695.98	0.15
4	131	22.898	0.17	0.53	0.84	0.14	0.46	0.013	7.2	6.23	2.87	4.48	3.39	15	0.48	695.34	695.45	696.22	696.26	1.00
5	RD-3	34.783	0.26	0.26	0.90	0.23	0.23	0.012	5.0	6.99	1.64	2.70	3.59	12	0.49	696.00	696.17	696.56	696.73	1.64
6	132	110.835	0.10	0.10	0.83	0.08	0.08	0.013	5.0	6.99	0.58	3.52	1.05	15	0.30	695.55	695.88	696.44	696.46	0.58
7	103	39.335	0.07	8.09	0.20	0.01	6.26	0.013	9.8	5.54	34.66	36.41	8.24	30	0.79	688.61	688.92	690.56	690.92	0.10
8	104	157.310	0.61	2.20	0.72	0.44	1.84	0.013	6.7	6.38	11.73	12.36	4.13	24	0.30	689.11	689.58	690.92	691.28	3.07
9	105	170.043	0.21	1.59	0.80	0.17	1.40	0.013	6.0	6.62	9.26	12.39	3.92	24	0.30	689.68	690.19	691.32	691.60	1.17
10	106	124.862	0.11	1.38	0.85	0.09	1.23	0.013	5.6	6.77	8.32	9.11	5.29	18	0.75	690.33	691.27	691.84	692.52	0.65
11	108	17.658	0.00	0.61	0.00	0.00	0.55	0.013	5.1	6.93	3.81	4.61	3.10	15	0.51	691.37	691.46	692.96	693.02	0.00
12	109	100.433	0.61	5.82	0.80	0.49	4.41	0.013	9.4	5.61	24.75	25.88	6.00	30	0.40	689.02	689.42	690.98	691.38	3.41
13	117	164.805	0.17	3.16	0.72	0.12	2.22	0.013	7.5	6.14	13.63	10.02	5.67	21	0.40	689.42	690.08	691.94	693.16	0.86
14	124	85.568	0.19	1.58	0.84	0.16	1.11	0.013	6.1	6.60	7.29	9.99	3.03	21	0.40	690.08	690.42	693.66	693.84	1.12
15	125	98.249	0.00	1.39	0.00	0.00	0.95	0.013	5.6	6.75	6.39	10.11	2.66	21	0.41	690.42	690.82	693.88	694.04	0.00
16	128	107.902	0.21	0.21	0.82	0.17	0.17	0.013	5.0	6.99	1.20	4.08	2.89	15	0.40	695.07	695.50	695.54	695.97	1.20
17	107	119.251	0.13	0.66	0.85	0.11	0.59	0.013	5.1	6.95	4.08	4.54	4.19	15	0.49	694.29	694.88	695.22	695.81	0.77
18	RD-1	30.067	0.53	0.53	0.90	0.48	0.48	0.012	5.0	6.99	3.33	3.92	5.07	12	1.03	695.10	695.41	696.08	696.19 j	3.33
19	110	130.674	0.63	1.88	0.84	0.53	1.56	0.013	9.0	5.72	8.92	11.17	5.17	21	0.50	691.41	692.06	692.59	693.24	3.70
20	111	129.587	0.54	1.25	0.83	0.45	1.03	0.013	8.5	5.84	6.02	7.44	4.83	18	0.50	692.16	692.81	693.30	693.81	3.13
21	112	109.180	0.00	0.51	0.00	0.00	0.42	0.013	7.9	6.01	2.55	4.58	3.65	15	0.50	693.12	693.67	694.16	694.36	0.00
22	115	69.613	0.11	0.11	0.78	0.09	0.09	0.013	5.0	6.99	0.60	4.10	2.53	15	0.40	694.22	694.50	694.57	694.81	0.60
23	129	57.147	0.17	0.17	0.84	0.14	0.14	0.013	5.0	6.99	1.00	4.60	3.00	15	0.51	694.02	694.31	694.42	694.71	1.00

Project File: New.stm | Number of lines: 38 | Date: 8/9/2022

NOTES: Intensity = 56.97 / (Inlet time + 9.00) ^ 0.80 -- Return period = 10 Yrs. ; ** Critical depth

MyReport

Line No.	Line ID	Line Length (ft)	Drng Area (ac)	Total Area (ac)	Runoff Coeff (C)	Incr CxA	Total CxA	n-val Pipe	Tc (min)	i Sys (in/hr)	Flow Rate (cfs)	Capac Full (cfs)	Vel Up (ft/s)	Line Size (in)	Line Slope (%)	Invert Dn (ft)	Invert Up (ft)	HGL Dn (ft)	HGL Up (ft)	Incr Q (cfs)	
24	118	32.500	0.14	1.38	0.78	0.11	0.97	0.013	6.2	6.54	6.32	7.37	3.58	18	0.49	690.41	690.57	693.66	693.78	0.76	
25	119	196.414	0.13	0.31	0.77	0.10	0.24	0.013	5.3	6.89	1.67	4.56	2.92	15	0.50	692.68	693.66	693.98	694.25	0.70	
26	120	13.621	0.08	0.18	0.81	0.06	0.14	0.013	5.2	6.92	0.99	4.63	2.49	15	0.51	693.76	693.83	694.28	694.28	0.45	
27	121	24.333	0.10	0.10	0.78	0.08	0.08	0.013	5.0	6.99	0.55	4.53	2.52	15	0.49	693.93	694.05	694.29	694.34 j	0.55	
28	113	72.019	0.21	0.40	0.84	0.18	0.34	0.013	7.2	6.22	2.10	4.57	1.71	15	0.50	692.52	692.88	694.57	694.64	1.23	
29	114	130.116	0.19	0.19	0.85	0.16	0.16	0.013	5.0	6.99	1.13	4.56	1.02	15	0.50	692.98	693.63	694.65	694.68	1.13	
30	116	115.173	0.20	0.20	0.79	0.16	0.16	0.013	5.0	6.99	1.10	4.13	1.31	15	0.41	692.91	693.38	694.16	694.19	1.10	
31	122	162.639	0.02	0.03	0.85	0.02	0.03	0.013	5.4	6.82	0.17	3.54	0.14	15	0.30	691.92	692.41	693.66	693.66	0.12	
32	123	27.790	0.01	0.01	0.85	0.01	0.01	0.013	5.0	6.99	0.06	3.47	0.05	15	0.29	692.51	692.59	693.66	693.66	0.06	
33	126	20.248	0.12	1.18	0.49	0.06	0.77	0.013	5.3	6.88	5.32	6.60	3.01	18	0.40	690.82	690.90	694.15	694.20	0.41	
34	127	26.000	0.08	1.06	0.85	0.07	0.71	0.013	5.1	6.93	4.96	6.51	2.80	18	0.38	690.90	691.00	694.22	694.28	0.48	
35	OUTLOT 2	12.579	0.50	0.50	0.66	0.33	0.33	0.013	5.0	6.99	2.31	6.62	1.31	18	0.40	691.10	691.15	694.40	694.41	2.31	
36	RD-2	41.735	0.61	0.61	0.90	0.55	0.55	0.012	5.0	6.99	3.84	3.87	4.89	12	1.01	691.35	691.77	693.04	693.45	3.84	
37	OUTLOT 3	9.563	0.48	0.48	0.66	0.32	0.32	0.013	5.0	6.99	2.21	6.79	1.25	18	0.42	691.10	691.14	694.40	694.41	2.21	
38	OUTLOT 1	10.576	0.93	0.93	0.66	0.61	0.61	0.013	5.0	6.99	4.29	7.91	2.43	18	0.57	690.67	690.73	693.98	693.99	4.29	

Project File: New.stm | Number of lines: 38 | Date: 8/9/2022

NOTES: Intensity = 56.97 / (Inlet time + 9.00) ^ 0.80 -- Return period = 10 Yrs. ; ** Critical depth

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	30	37.08	688.11	690.17	2.06	4.33	8.57	1.14	691.31	0.000	20.000	688.29	690.35	2.06**	4.33	8.57	1.14	691.49	0.000	0.000	n/a	0.15	0.17
2	30	37.17	688.29	690.35	2.06	4.33	8.59	1.14	691.50	0.000	20.000	688.47	690.53	2.06**	4.33	8.58	1.14	691.68	0.000	0.000	n/a	1.00	1.14
3	15	2.99	694.80	695.54	0.74*	0.75	3.96	0.24	695.78	0.499	88.039	695.24	695.98	0.74	0.75	3.96	0.24	696.22	0.499	0.499	0.439	1.00	0.24
4	15	2.87	695.34	696.22	0.88	0.93	3.10	0.15	696.37	0.276	22.898	695.45	696.26	0.81	0.85	3.39	0.18	696.44	0.343	0.309	0.071	0.97	0.17
5	12	1.64	696.00	696.56	0.56*	0.45	3.60	0.20	696.76	0.488	34.783	696.17	696.73	0.56	0.46	3.59	0.20	696.93	0.487	0.488	0.170	1.00	0.20
6	15	0.58	695.55	696.44	0.89	0.93	0.62	0.01	696.44	0.011	110.835	695.88	696.46	0.58	0.55	1.05	0.02	696.47	0.043	0.027	0.030	1.00	0.02
7	30	34.66	688.61	690.56	1.95*	4.11	8.44	1.06	691.61	0.788	39.335	688.92	690.92	2.00**	4.21	8.24	1.06	691.97	0.785	0.786	n/a	0.91	0.96
8	24	11.73	689.11	690.92	1.81	2.99	3.92	0.24	691.16	0.236	157.310	689.58	691.28	1.70	2.84	4.13	0.26	691.54	0.254	0.245	0.385	0.17	0.05
9	24	9.26	689.68	691.32	1.64	2.76	3.36	0.18	691.50	0.167	170.043	690.19	691.60	1.41	2.37	3.92	0.24	691.84	0.235	0.201	0.342	1.00	0.24
10	18	8.32	690.33	691.84	1.50	1.77	4.71	0.35	692.18	0.629	124.862	691.27	692.52	1.25	1.57	5.29	0.43	692.96	0.610	0.619	0.773	1.00	0.43
11	15	3.81	691.37	692.96	1.25	1.23	3.10	0.15	693.10	0.348	17.658	691.46	693.02	1.25	1.23	3.10	0.15	693.17	0.348	0.348	0.061	0.15	0.02
12	30	24.75	689.02	690.98	1.96*	4.12	6.00	0.56	691.54	0.398	100.433	689.42	691.38	1.96	4.13	6.00	0.56	691.94	0.398	0.398	0.400	1.00	0.56
13	21	13.63	689.42	691.94	1.75	2.40	5.67	0.50	692.44	0.741	164.805	690.08	693.16	1.75	2.41	5.67	0.50	693.66	0.741	0.741	1.221	1.00	0.50
14	21	7.29	690.08	693.66	1.75	2.40	3.03	0.14	693.80	0.212	85.568	690.42	693.84	1.75	2.41	3.03	0.14	693.98	0.212	0.212	0.181	0.28	0.04
15	21	6.39	690.42	693.88	1.75	2.40	2.66	0.11	693.99	0.163	98.249	690.82	694.04	1.75	2.41	2.66	0.11	694.15	0.163	0.163	0.160	1.00	0.11
16	15	1.20	695.07	695.54	0.47*	0.42	2.89	0.13	695.67	0.398	107.902	695.50	695.97	0.47	0.42	2.89	0.13	696.10	0.399	0.398	0.430	1.00	0.13
17	15	4.08	694.29	695.22	0.93*	0.97	4.19	0.27	695.49	0.495	119.251	694.88	695.81	0.93	0.97	4.19	0.27	696.08	0.495	0.495	0.590	1.00	0.27
18	12	3.33	695.10	696.08	0.98	0.66	4.27	0.40	696.48	0.000	30.067	695.41	696.19 j	0.78**	0.66	5.07	0.40	696.59	0.000	0.000	n/a	1.00	n/a
19	21	8.92	691.41	692.59	1.18*	1.73	5.16	0.41	693.01	0.497	130.674	692.06	693.24	1.18	1.72	5.17	0.42	693.66	0.500	0.499	0.651	0.15	0.06
20	18	6.02	692.16	693.30	1.14	1.44	4.17	0.27	693.57	0.382	129.587	692.81	693.81	1.00	1.25	4.83	0.36	694.17	0.539	0.460	0.597	0.97	0.35
21	15	2.55	693.12	694.16	1.04	1.09	2.34	0.08	694.24	0.152	109.180	693.67	694.36	0.69	0.70	3.65	0.21	694.57	0.445	0.298	0.326	0.98	0.20
22	15	0.60	694.22	694.57	0.35	0.23	2.18	0.07	694.64	0.311	69.613	694.50	694.81	0.31**	0.24	2.53	0.10	694.91	0.475	0.393	0.274	1.00	0.10

Project File: New.stm | Number of lines: 38 | Run Date: 8/9/2022

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
	(in)	(cfs)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	(ft)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)	(K)	(ft)
23	15	1.00	694.02	694.42	0.40*	0.33	2.99	0.14	694.56	0.507	57.147	694.31	694.71	0.40**	0.33	3.00	0.14	694.85	0.508	0.508	0.290	1.00	0.14
24	18	6.32	690.41	693.66	1.50	1.77	3.58	0.20	693.86	0.362	32.500	690.57	693.78	1.50	1.77	3.58	0.20	693.98	0.362	0.362	0.118	1.00	0.20
25	15	1.67	692.68	693.98	1.25	1.23	1.36	0.03	694.00	0.067	196.414	693.66	694.25	0.59	0.57	2.92	0.13	694.39	0.321	0.194	0.381	0.17	0.02
26	15	0.99	693.76	694.28	0.52	0.48	2.07	0.07	694.34	0.184	13.621	693.83	694.28	0.45	0.40	2.49	0.10	694.38	0.307	0.245	0.033	0.16	0.02
27	15	0.55	693.93	694.29	0.36	0.21	1.83	0.05	694.35	0.207	24.333	694.05	694.34 j	0.29**	0.22	2.52	0.10	694.44	0.510	0.359	0.087	1.00	0.10
28	15	2.10	692.52	694.57	1.25	1.23	1.71	0.05	694.61	0.106	72.019	692.88	694.64	1.25	1.23	1.71	0.05	694.69	0.106	0.106	0.076	0.15	0.01
29	15	1.13	692.98	694.65	1.25	1.23	0.92	0.01	694.66	0.031	130.116	693.63	694.68	1.05	1.10	1.02	0.02	694.70	0.029	0.030	0.039	1.00	0.02
30	15	1.10	692.91	694.16	1.25	1.23	0.90	0.01	694.17	0.028	115.173	693.38	694.19	0.81	0.84	1.31	0.03	694.22	0.052	0.040	0.046	1.00	0.03
31	15	0.17	691.92	693.66	1.25	1.23	0.14	0.00	693.66	0.001	162.639	692.41	693.66	1.25	1.23	0.14	0.00	693.66	0.001	0.001	0.001	1.00	0.00
32	15	0.06	692.51	693.66	1.15	1.18	0.05	0.00	693.66	0.000	27.790	692.59	693.66	1.07	1.12	0.05	0.00	693.66	0.000	0.000	0.000	1.00	0.00
33	18	5.32	690.82	694.15	1.50	1.77	3.01	0.14	694.29	0.257	20.248	690.90	694.20	1.50	1.77	3.01	0.14	694.34	0.257	0.257	0.052	0.15	0.02
34	18	4.96	690.90	694.22	1.50	1.77	2.80	0.12	694.35	0.223	26.000	691.00	694.28	1.50	1.77	2.80	0.12	694.40	0.223	0.223	0.058	1.00	0.12
35	18	2.31	691.10	694.40	1.50	1.77	1.31	0.03	694.43	0.048	12.579	691.15	694.41	1.50	1.77	1.31	0.03	694.44	0.048	0.048	0.006	1.00	0.03
36	12	3.84	691.35	693.04	1.00	0.79	4.89	0.37	693.41	0.990	41.735	691.77	693.45	1.00	0.79	4.89	0.37	693.82	0.990	0.990	0.413	1.00	0.37
37	18	2.21	691.10	694.40	1.50	1.77	1.25	0.02	694.43	0.044	9.563	691.14	694.41	1.50	1.77	1.25	0.02	694.43	0.044	0.044	0.004	1.00	0.02
38	18	4.29	690.67	693.98	1.50	1.77	2.43	0.09	694.07	0.167	10.576	690.73	693.99	1.50	1.77	2.43	0.09	694.09	0.167	0.167	0.018	1.00	0.09

Project File: New.stm | Number of lines: 38 | Run Date: 8/9/2022

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Civil & Environmental Consultants, Inc.

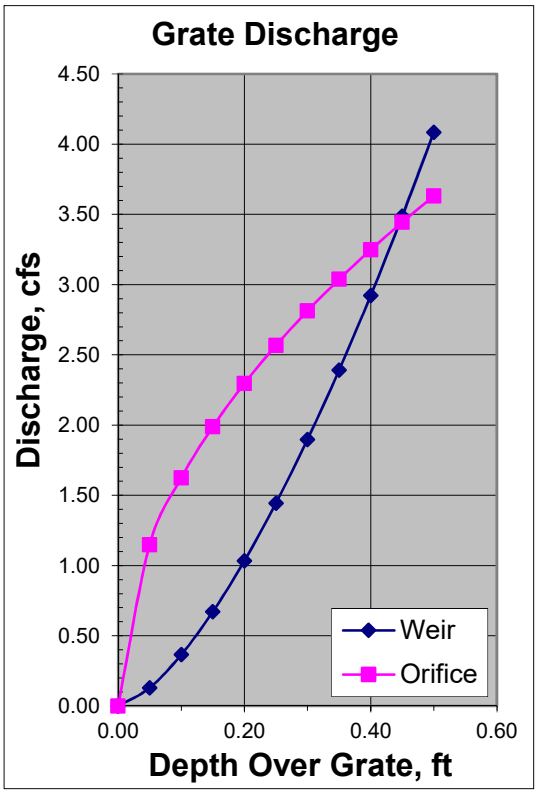
Project: Smith Valley Road Retail
CEC No.: 322-045

By: NPJ
Date: 8/2022
Checked By:
Date:

Sump Grates Ponding Depth Calculation

Structure Number		128
Casting	Neenah	R-3287-10V
Area	2.1	ft^2
Perimeter	5.5	ft
P	3.85	ft
A	1.05	ft^2
Q=3.0*P*D^1.5		(Weir)
Q=4.89*A*D^0.5		(Orifice)

Depth	Weir	Orifice
0.00	0.00	0.00
0.05	0.13	1.15
0.10	0.37	1.62
0.15	0.67	1.99
0.20	1.03	2.30
0.25	1.44	2.57
0.30	1.90	2.81
0.35	2.39	3.04
0.40	2.92	3.25
0.45	3.49	3.44
0.50	4.08	3.63
GRATE FLOW IN CFS		

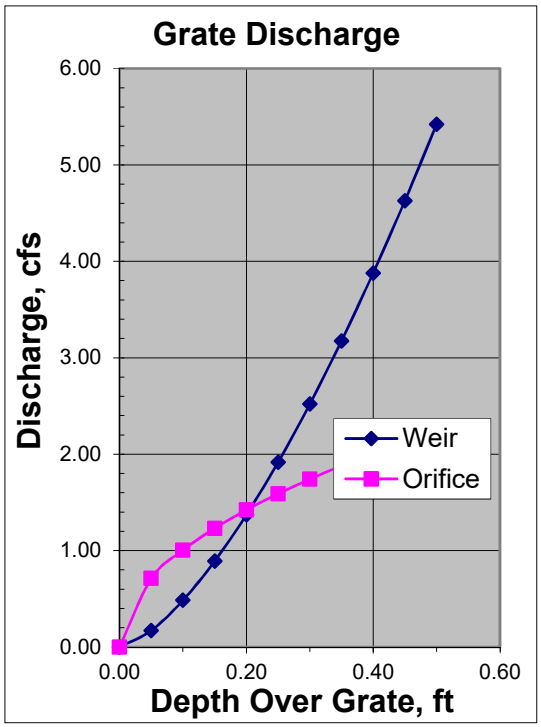


Q=CiA (cfs)

105 = 1.17
106 = 0.65
107 = 0.77
115 = 0.60
116 = 1.10
118 = 0.76
119 = 0.70
120 = 0.45
121 = 0.55
122 = 0.12
123 = 0.06
124 = 1.12
126 = 0.41
127 = 0.48
128 = 1.20
129 = 1.00
131 = 1.00
132 = 0.58

Structure Number		110
Casting	Neenah	3472
Area	1.3	ft^2
Perimeter	7.3	ft
P	5.11	ft
A	0.65	ft^2
Q=3.0*P*D^1.5		(Weir)
Q=4.89*A*D^0.5		(Orifice)

Depth	Weir	Orifice
0.00	0.00	0.00
0.05	0.17	0.71
0.10	0.48	1.01
0.15	0.89	1.23
0.20	1.37	1.42
0.25	1.92	1.59
0.30	2.52	1.74
0.35	3.17	1.88
0.40	3.88	2.01
0.45	4.63	2.13
0.50	5.42	2.25
GRATE FLOW IN CFS		



Q=CiA (cfs)

104 = 3.07
109 = 3.41
110 = 3.70
111 = 3.13
113 = 1.23
114 = 1.13

Sump Grates Ponding Depth Calculation

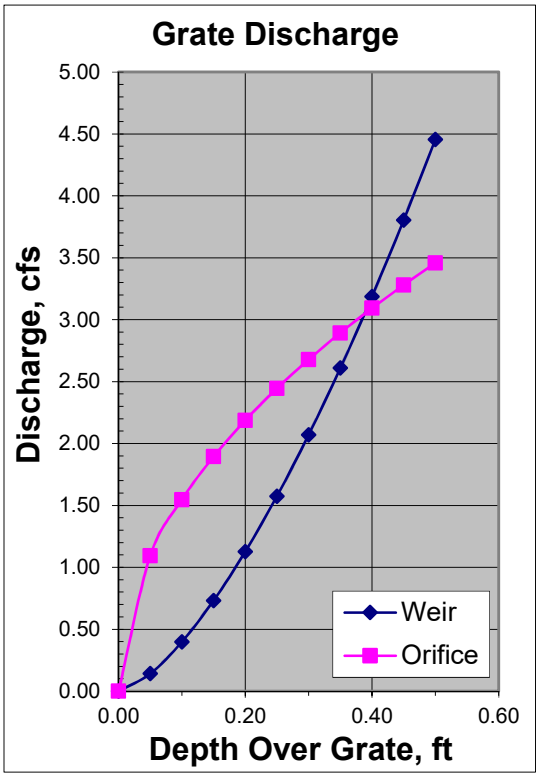
Structure Number		130
Casting	Neenah	R-4342
Area	2	ft^2
Perimeter	6	ft
P	4.2	ft
A	1	ft^2
Q=3.0*P*D^1.5		(Weir)
Q=4.89*A*D^0.5		(Orifice)

Q=CiA (cfs)

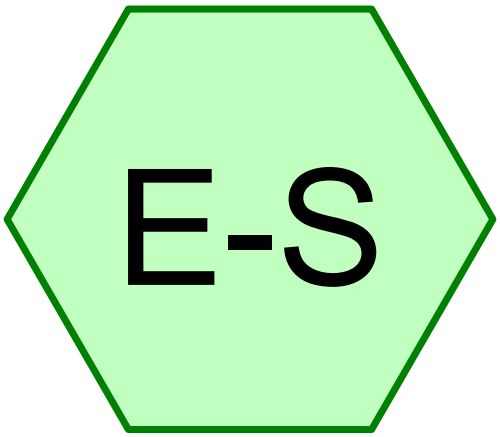
103 = 0.10

130 = 0.15

Depth	Weir	Orifice
0.00	0.00	0.00
0.05	0.14	1.09
0.10	0.40	1.55
0.15	0.73	1.89
0.20	1.13	2.19
0.25	1.58	2.45
0.30	2.07	2.68
0.35	2.61	2.89
0.40	3.19	3.09
0.45	3.80	3.28
0.50	4.45	3.46
GRATE FLOW IN CFS		



APPENDIX E
EXISTING HYDROCAD OUTPUT



E-Site

Subcat Reach Pond Link

Routing Diagram for 322-045 - E-Site
Prepared by CEC, Printed 8/9/2022

Events for Subcatchment E-S: E-Site

Event	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
2-Year, 01 Hour	0.04	0.001	0.00
2-Year, 02 Hour	0.31	0.012	0.01
2-Year, 03 Hour	0.32	0.021	0.02
2-Year, 06 Hour	0.34	0.064	0.07
2-Year, 12 Hour	0.33	0.144	0.17
2-Year, 24 Hour	0.48	0.265	0.31
10-Year, 01 Hour	1.66	0.059	0.07
10-Year, 02 Hour	1.66	0.130	0.15
10-Year, 03 Hour	1.38	0.168	0.19
10-Year, 06 Hour	1.12	0.308	0.36
10-Year, 12 Hour	1.03	0.484	0.56
10-Year, 24 Hour	1.21	0.700	0.81
100-Year, 01 Hour	**6.14**	0.305	0.35
100-Year, 02 Hour	5.05	0.538	0.62
100-Year, 03 Hour	4.00	0.657	0.76
100-Year, 06 Hour	3.00	1.034	1.19
100-Year, 12 Hour	2.91	1.342	1.55
100-Year, 24 Hour	2.59	**1.605**	**1.85**

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
7.108	61	Grass, B (E-S)
0.052	98	Impervious (E-S)
3.251	58	Woods/grass, B (E-S)
10.411	**60**	**TOTAL AREA**

Summary for Subcatchment E-S: E-Site

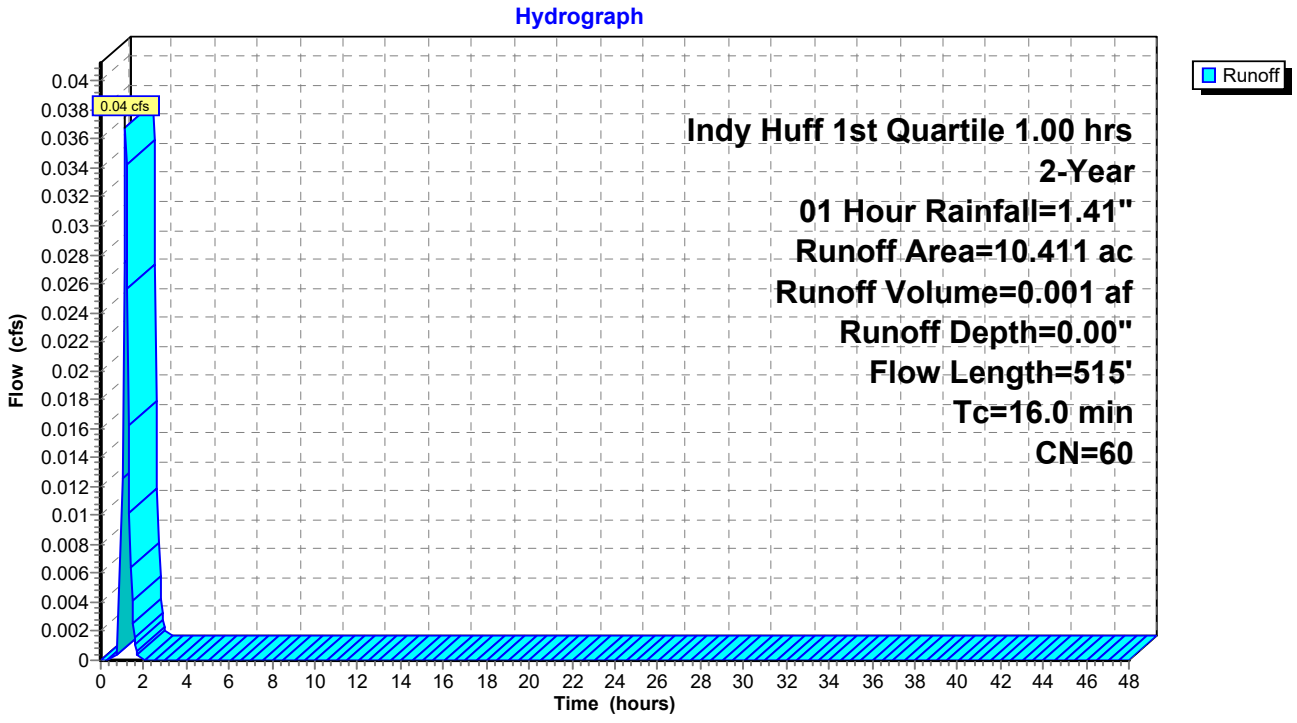
Runoff = 0.04 cfs @ 1.17 hrs, Volume= 0.001 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 1st Quartile 1.00 hrs 2-Year, 01 Hour Rainfall=1.41"

	Area (ac)	CN	Description
*	0.052	98	Impervious
*	7.108	61	Grass, B
*	3.251	58	Woods/grass, B
	10.411	60	Weighted Average
	10.359		99.50% Pervious Area
	0.052		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	100	0.0732	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.92"
2.6	415	0.0268	2.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	515	Total			

Subcatchment E-S: E-Site



Summary for Subcatchment E-S: E-Site

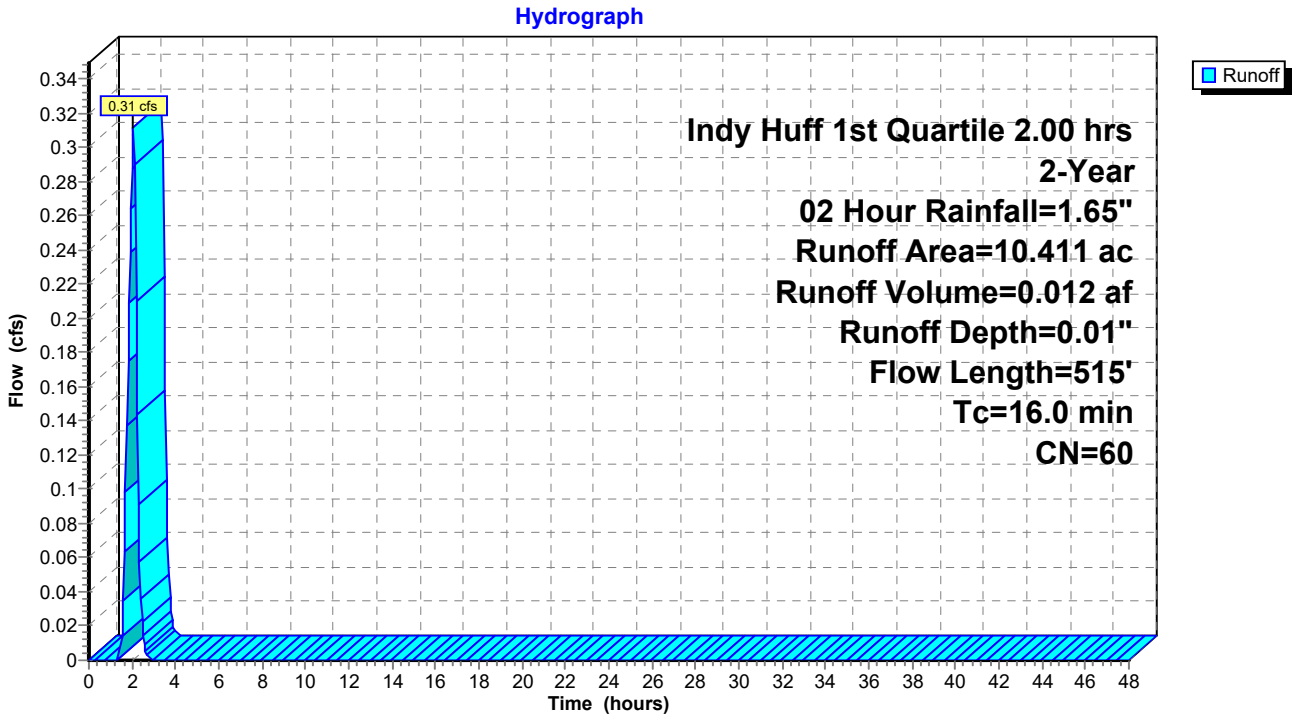
Runoff = 0.31 cfs @ 2.08 hrs, Volume= 0.012 af, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 1st Quartile 2.00 hrs 2-Year, 02 Hour Rainfall=1.65"

	Area (ac)	CN	Description
*	0.052	98	Impervious
*	7.108	61	Grass, B
*	3.251	58	Woods/grass, B
	10.411	60	Weighted Average
	10.359		99.50% Pervious Area
	0.052		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	100	0.0732	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.92"
2.6	415	0.0268	2.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	515	Total			

Subcatchment E-S: E-Site



Summary for Subcatchment E-S: E-Site

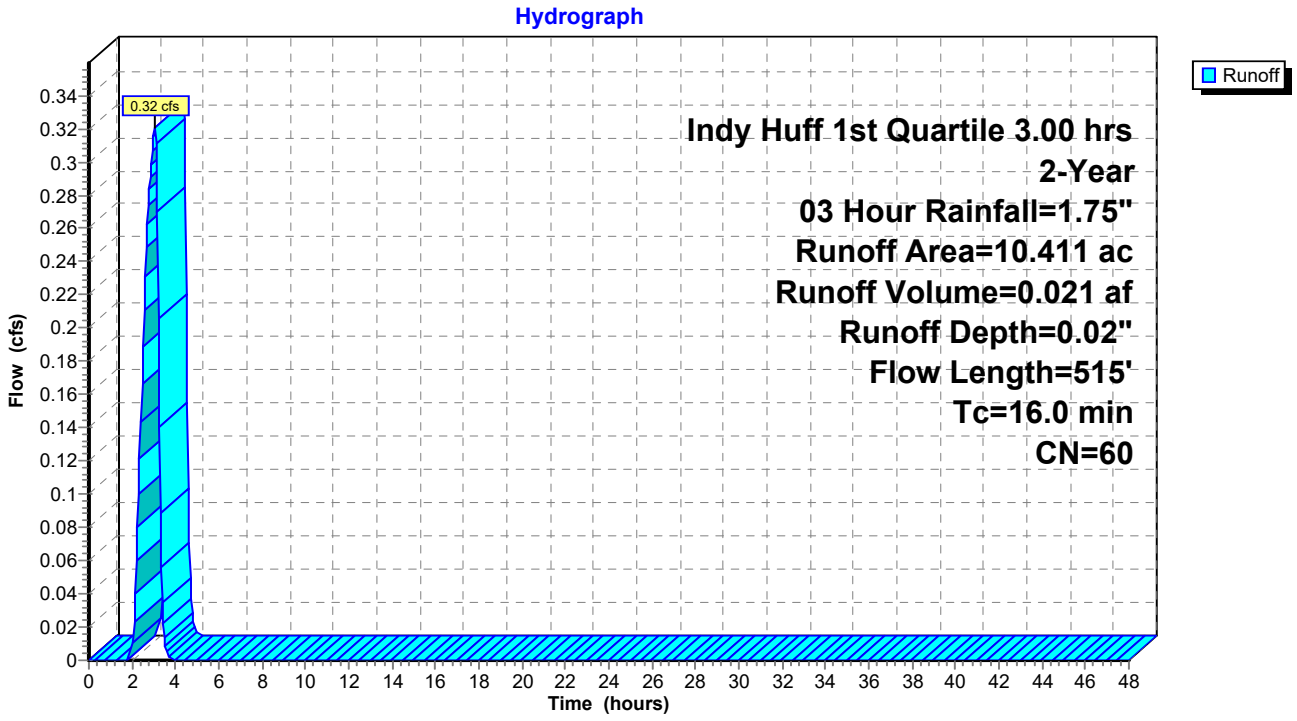
Runoff = 0.32 cfs @ 3.04 hrs, Volume= 0.021 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 1st Quartile 3.00 hrs 2-Year, 03 Hour Rainfall=1.75"

	Area (ac)	CN	Description
*	0.052	98	Impervious
*	7.108	61	Grass, B
*	3.251	58	Woods/grass, B
	10.411	60	Weighted Average
	10.359		99.50% Pervious Area
	0.052		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	100	0.0732	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.92"
2.6	415	0.0268	2.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	515	Total			

Subcatchment E-S: E-Site



Summary for Subcatchment E-S: E-Site

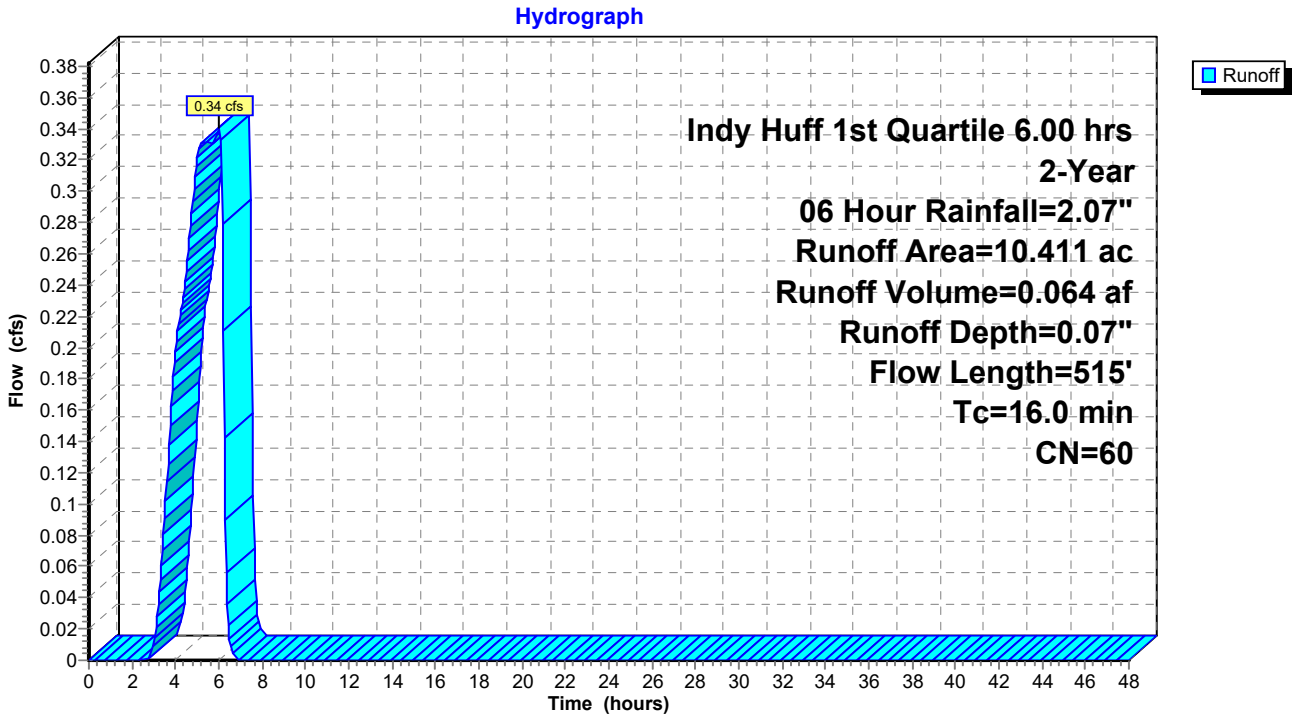
Runoff = 0.34 cfs @ 6.01 hrs, Volume= 0.064 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 1st Quartile 6.00 hrs 2-Year, 06 Hour Rainfall=2.07"

	Area (ac)	CN	Description
*	0.052	98	Impervious
*	7.108	61	Grass, B
*	3.251	58	Woods/grass, B
	10.411	60	Weighted Average
	10.359		99.50% Pervious Area
	0.052		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	100	0.0732	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.92"
2.6	415	0.0268	2.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	515	Total			

Subcatchment E-S: E-Site



Summary for Subcatchment E-S: E-Site

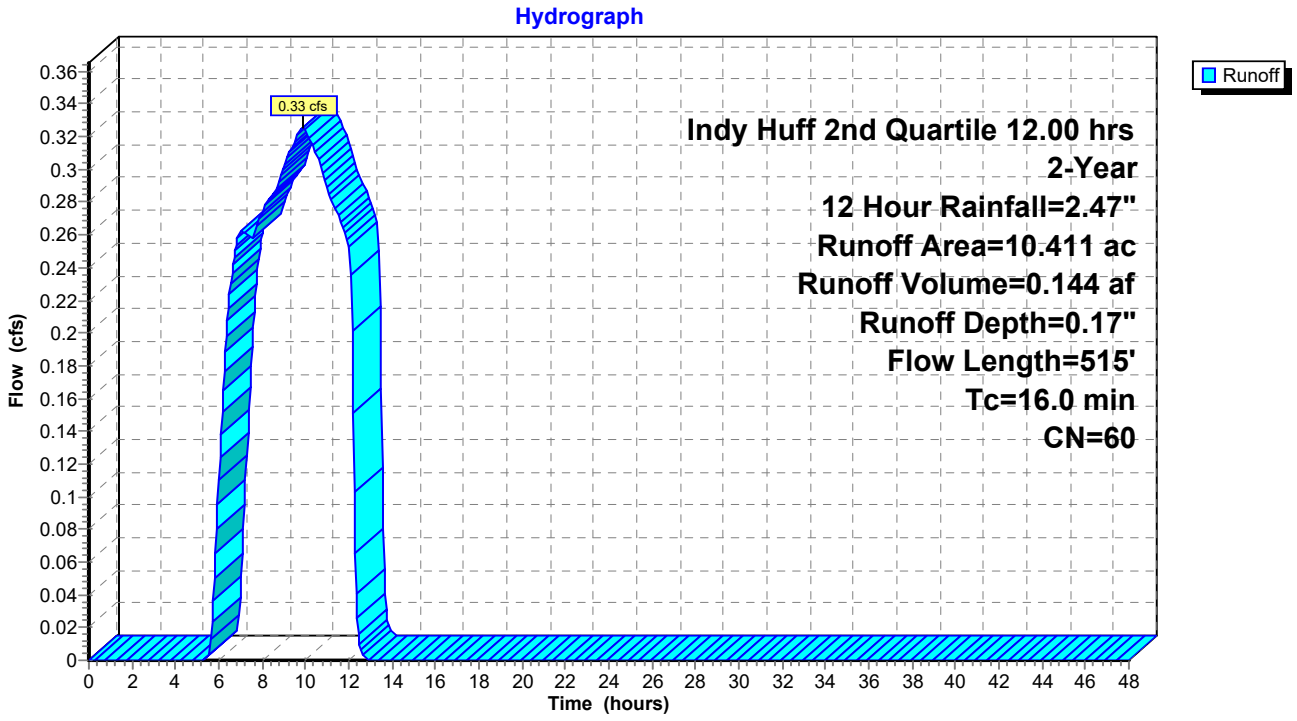
Runoff = 0.33 cfs @ 9.85 hrs, Volume= 0.144 af, Depth= 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 2nd Quartile 12.00 hrs 2-Year, 12 Hour Rainfall=2.47"

	Area (ac)	CN	Description
*	0.052	98	Impervious
*	7.108	61	Grass, B
*	3.251	58	Woods/grass, B
	10.411	60	Weighted Average
	10.359		99.50% Pervious Area
	0.052		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	100	0.0732	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.92"
2.6	415	0.0268	2.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	515	Total			

Subcatchment E-S: E-Site



Summary for Subcatchment E-S: E-Site

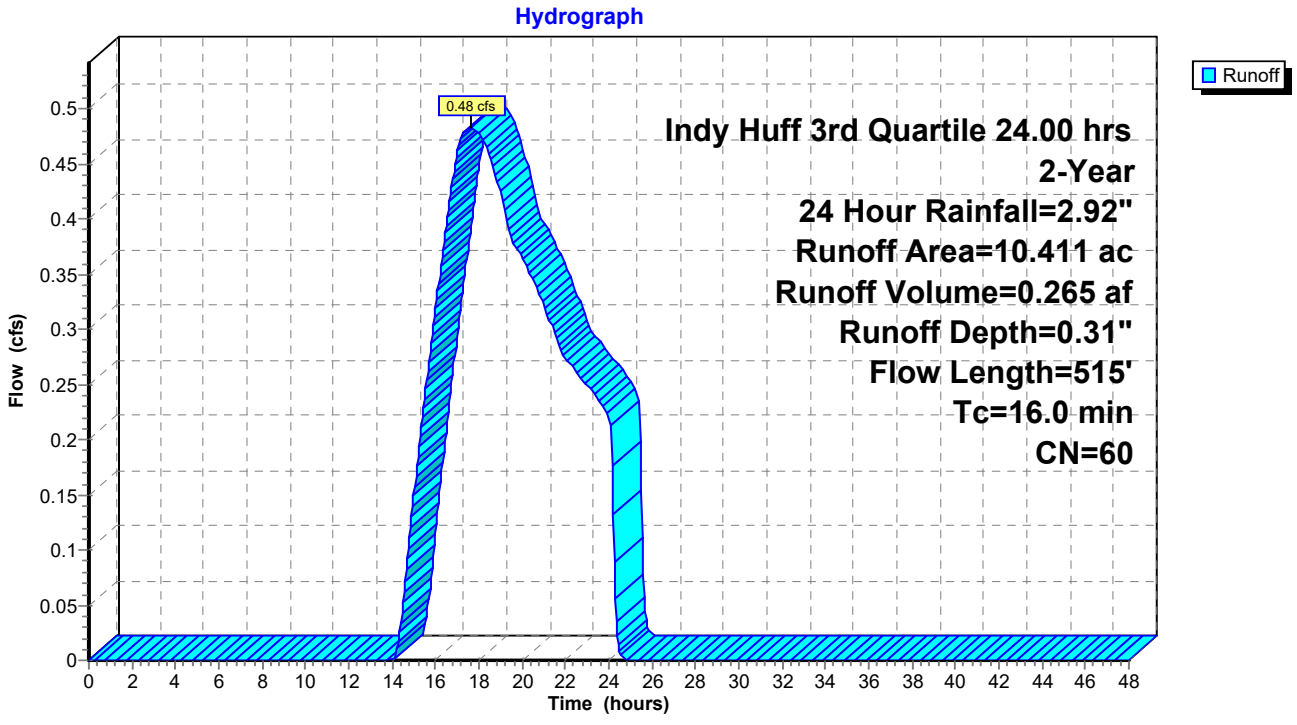
Runoff = 0.48 cfs @ 17.62 hrs, Volume= 0.265 af, Depth= 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 3rd Quartile 24.00 hrs 2-Year, 24 Hour Rainfall=2.92"

	Area (ac)	CN	Description
*	0.052	98	Impervious
*	7.108	61	Grass, B
*	3.251	58	Woods/grass, B
	10.411	60	Weighted Average
	10.359		99.50% Pervious Area
	0.052		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	100	0.0732	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.92"
2.6	415	0.0268	2.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	515	Total			

Subcatchment E-S: E-Site



Summary for Subcatchment E-S: E-Site

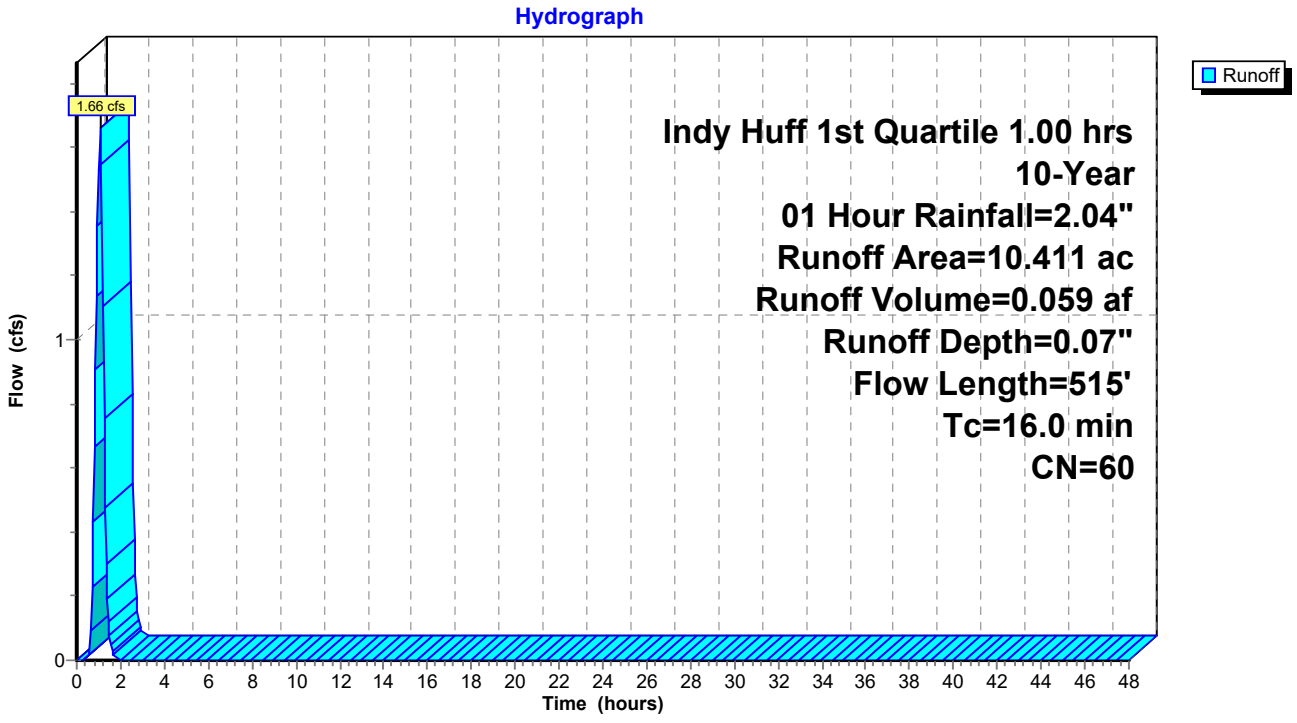
Runoff = 1.66 cfs @ 1.07 hrs, Volume= 0.059 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 1st Quartile 1.00 hrs 10-Year, 01 Hour Rainfall=2.04"

	Area (ac)	CN	Description
*	0.052	98	Impervious
*	7.108	61	Grass, B
*	3.251	58	Woods/grass, B
	10.411	60	Weighted Average
	10.359		99.50% Pervious Area
	0.052		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	100	0.0732	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.92"
2.6	415	0.0268	2.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	515	Total			

Subcatchment E-S: E-Site



Summary for Subcatchment E-S: E-Site

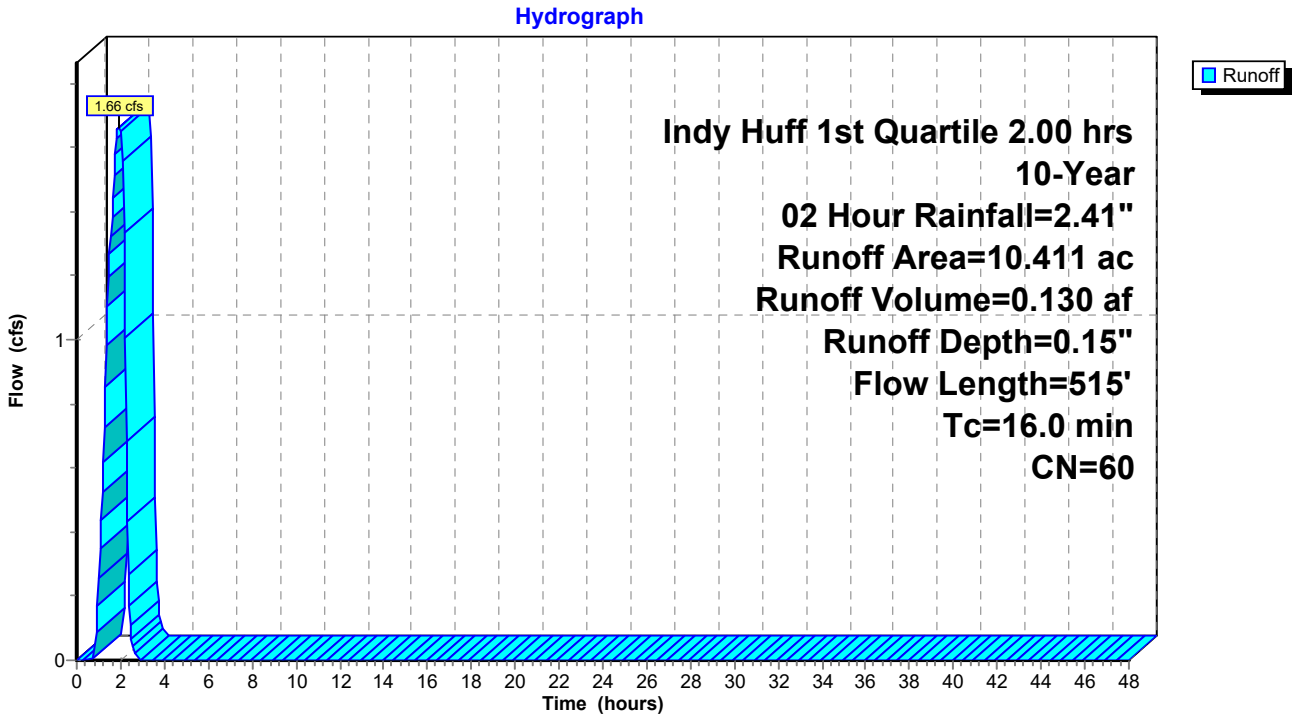
Runoff = 1.66 cfs @ 1.90 hrs, Volume= 0.130 af, Depth= 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 1st Quartile 2.00 hrs 10-Year, 02 Hour Rainfall=2.41"

	Area (ac)	CN	Description
*	0.052	98	Impervious
*	7.108	61	Grass, B
*	3.251	58	Woods/grass, B
	10.411	60	Weighted Average
	10.359		99.50% Pervious Area
	0.052		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	100	0.0732	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.92"
2.6	415	0.0268	2.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	515	Total			

Subcatchment E-S: E-Site



Summary for Subcatchment E-S: E-Site

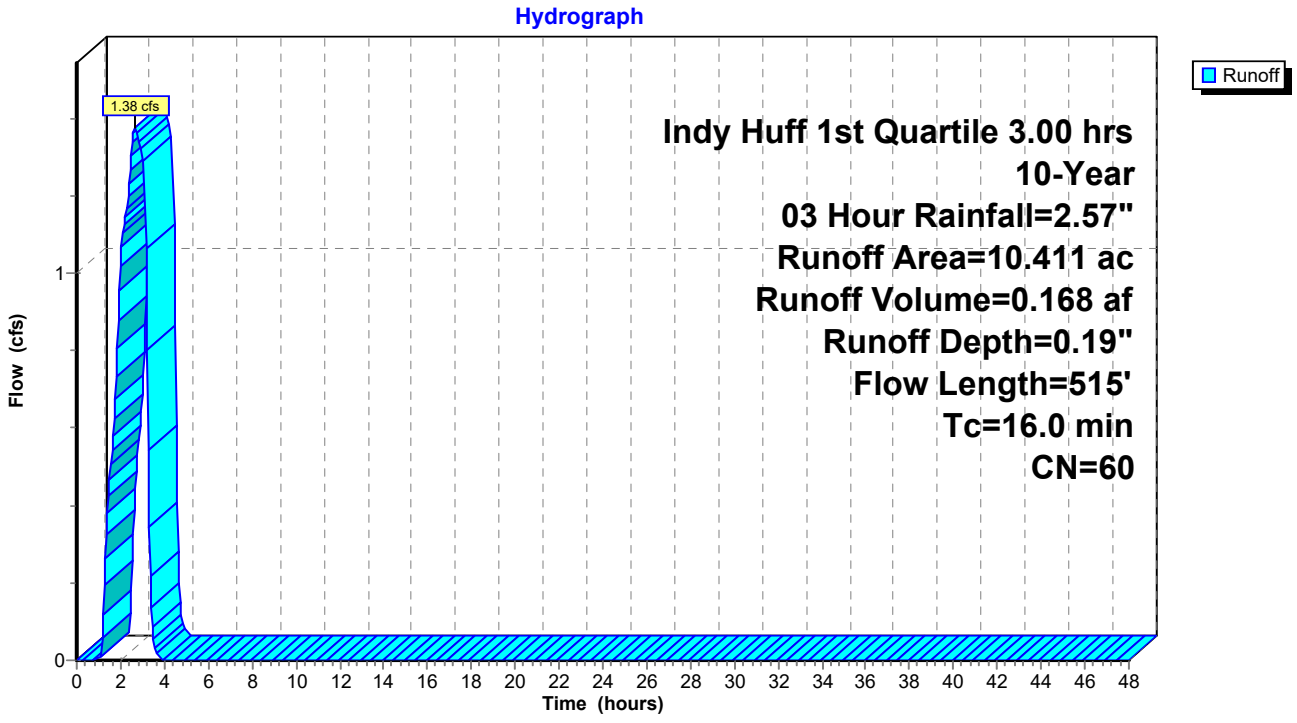
Runoff = 1.38 cfs @ 2.68 hrs, Volume= 0.168 af, Depth= 0.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 1st Quartile 3.00 hrs 10-Year, 03 Hour Rainfall=2.57"

	Area (ac)	CN	Description
*	0.052	98	Impervious
*	7.108	61	Grass, B
*	3.251	58	Woods/grass, B
	10.411	60	Weighted Average
	10.359		99.50% Pervious Area
	0.052		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	100	0.0732	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.92"
2.6	415	0.0268	2.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	515	Total			

Subcatchment E-S: E-Site



Summary for Subcatchment E-S: E-Site

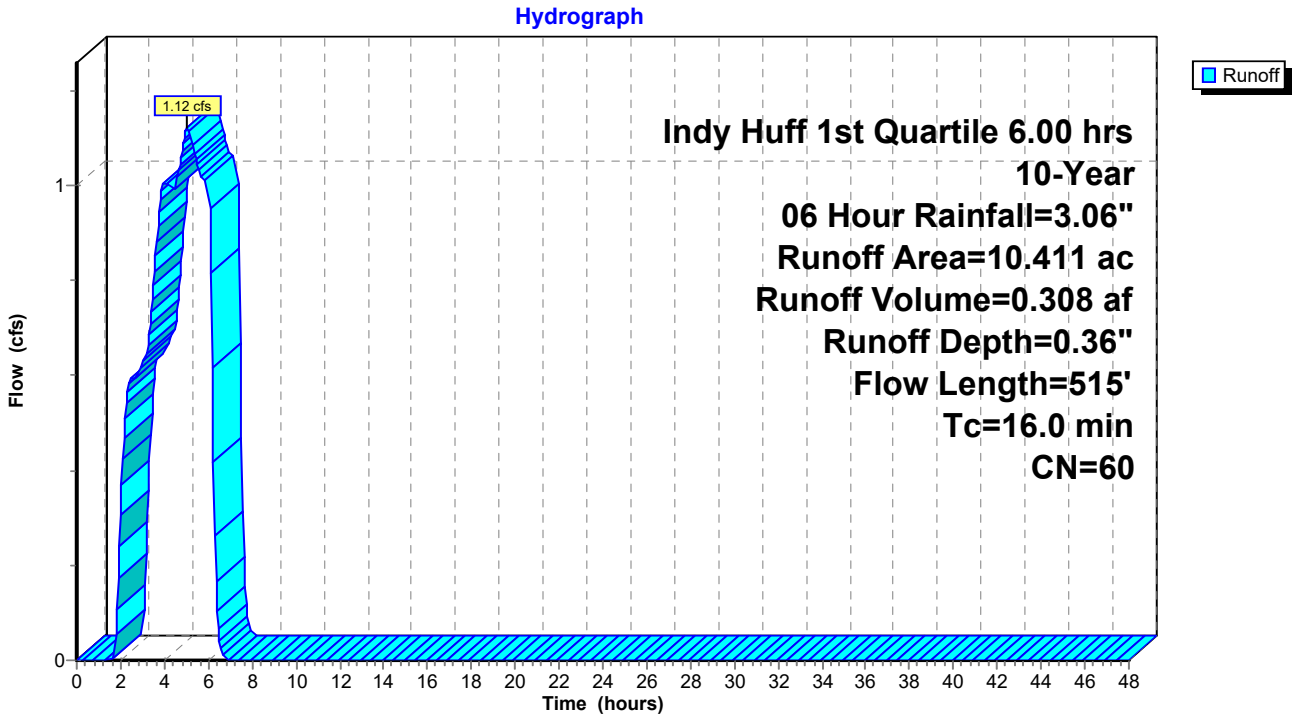
Runoff = 1.12 cfs @ 5.06 hrs, Volume= 0.308 af, Depth= 0.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 1st Quartile 6.00 hrs 10-Year, 06 Hour Rainfall=3.06"

	Area (ac)	CN	Description
*	0.052	98	Impervious
*	7.108	61	Grass, B
*	3.251	58	Woods/grass, B
	10.411	60	Weighted Average
	10.359		99.50% Pervious Area
	0.052		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	100	0.0732	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.92"
2.6	415	0.0268	2.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	515	Total			

Subcatchment E-S: E-Site



Summary for Subcatchment E-S: E-Site

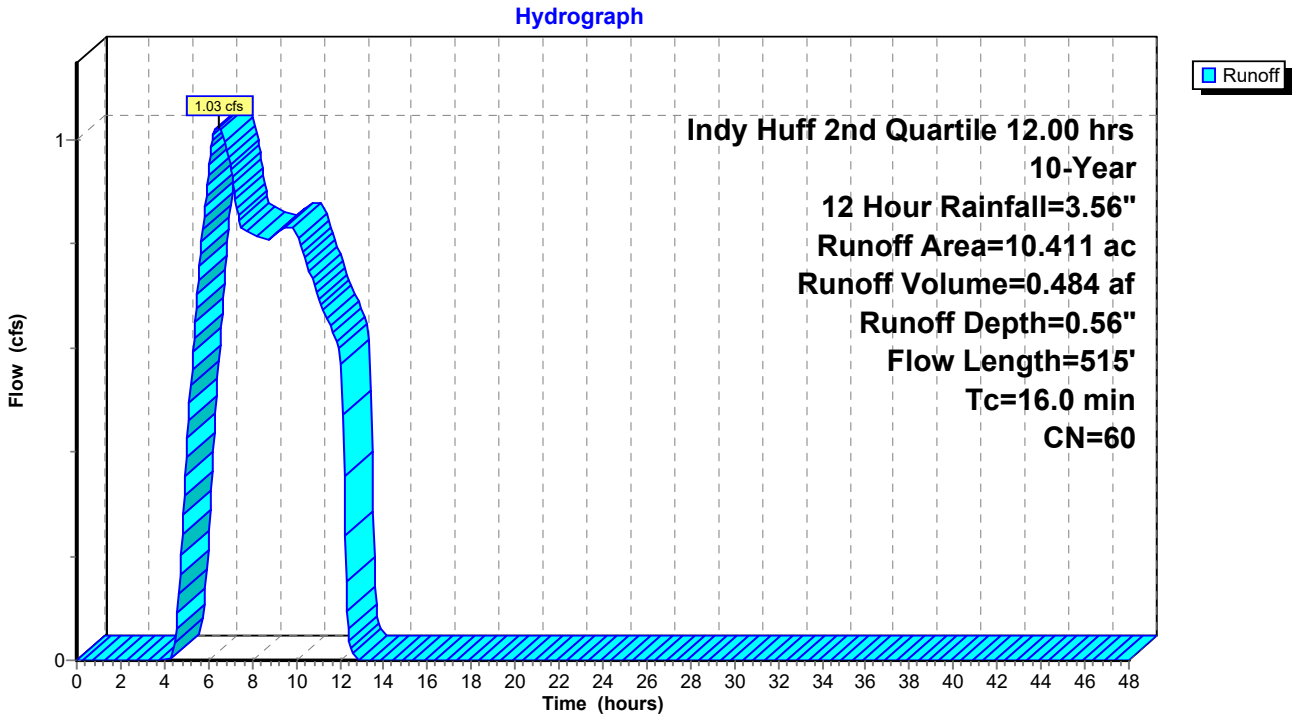
Runoff = 1.03 cfs @ 6.45 hrs, Volume= 0.484 af, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 2nd Quartile 12.00 hrs 10-Year, 12 Hour Rainfall=3.56"

	Area (ac)	CN	Description
*	0.052	98	Impervious
*	7.108	61	Grass, B
*	3.251	58	Woods/grass, B
	10.411	60	Weighted Average
	10.359		99.50% Pervious Area
	0.052		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	100	0.0732	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.92"
2.6	415	0.0268	2.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	515	Total			

Subcatchment E-S: E-Site



Summary for Subcatchment E-S: E-Site

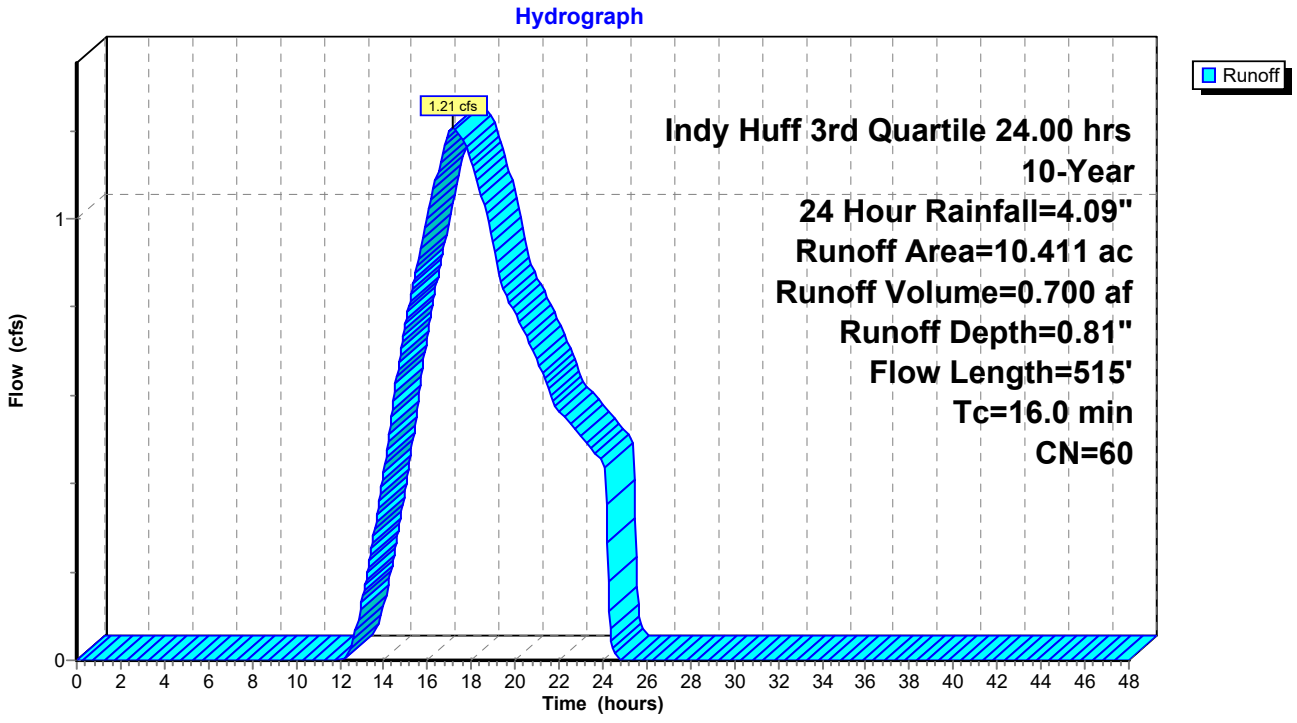
Runoff = 1.21 cfs @ 17.12 hrs, Volume= 0.700 af, Depth= 0.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 3rd Quartile 24.00 hrs 10-Year, 24 Hour Rainfall=4.09"

	Area (ac)	CN	Description
*	0.052	98	Impervious
*	7.108	61	Grass, B
*	3.251	58	Woods/grass, B
	10.411	60	Weighted Average
	10.359		99.50% Pervious Area
	0.052		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	100	0.0732	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.92"
2.6	415	0.0268	2.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	515	Total			

Subcatchment E-S: E-Site



Summary for Subcatchment E-S: E-Site

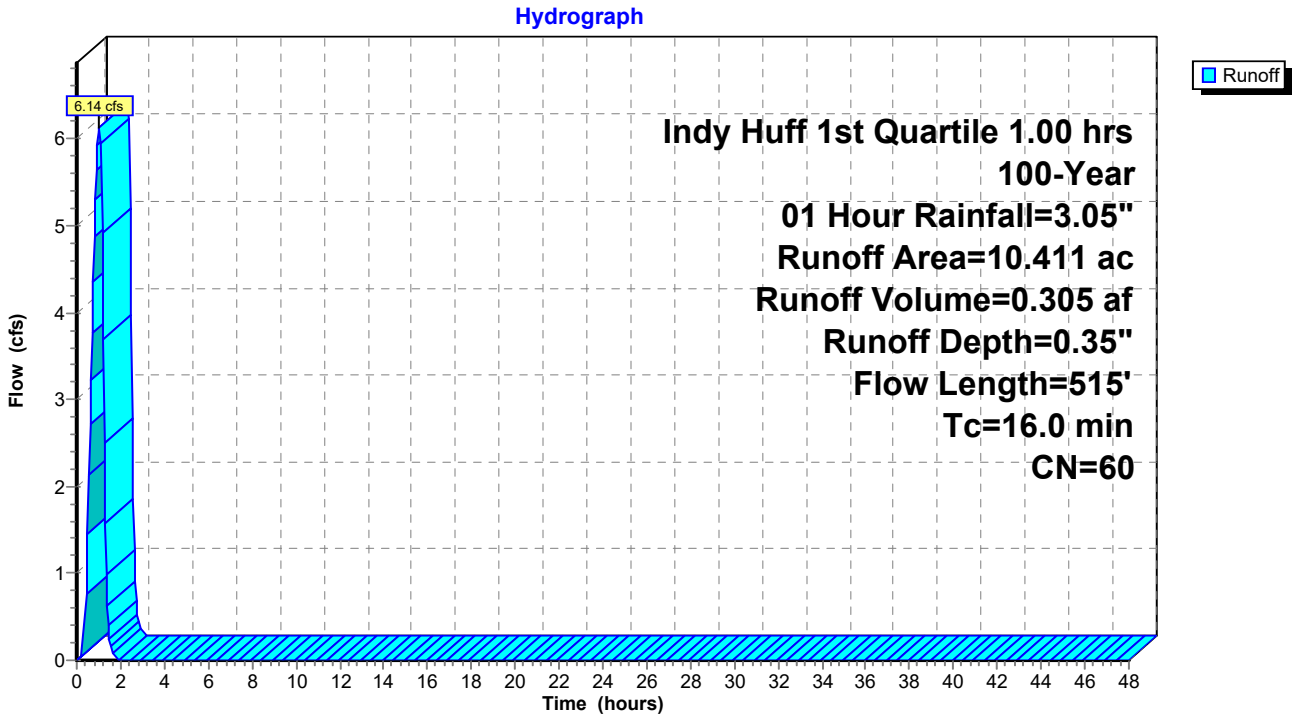
Runoff = 6.14 cfs @ 1.03 hrs, Volume= 0.305 af, Depth= 0.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 1st Quartile 1.00 hrs 100-Year, 01 Hour Rainfall=3.05"

	Area (ac)	CN	Description
*	0.052	98	Impervious
*	7.108	61	Grass, B
*	3.251	58	Woods/grass, B
	10.411	60	Weighted Average
	10.359		99.50% Pervious Area
	0.052		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	100	0.0732	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.92"
2.6	415	0.0268	2.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	515	Total			

Subcatchment E-S: E-Site



Summary for Subcatchment E-S: E-Site

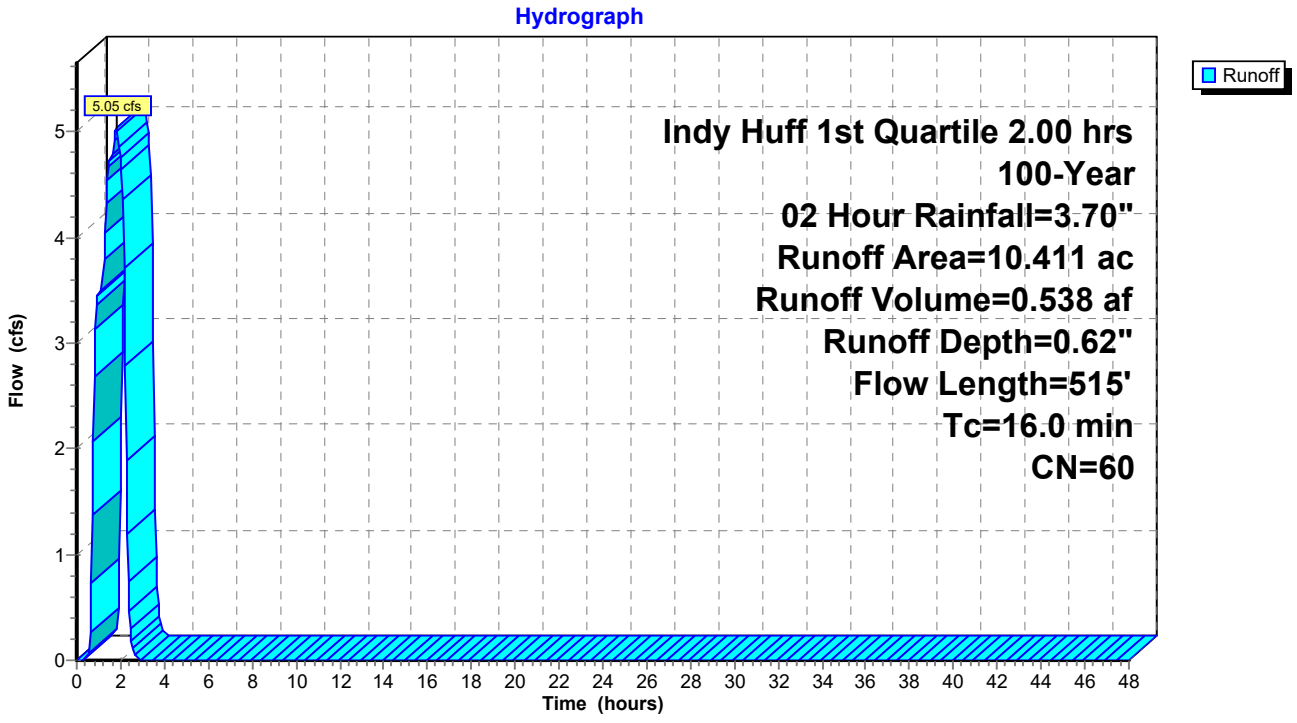
Runoff = 5.05 cfs @ 1.81 hrs, Volume= 0.538 af, Depth= 0.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 1st Quartile 2.00 hrs 100-Year, 02 Hour Rainfall=3.70"

	Area (ac)	CN	Description
*	0.052	98	Impervious
*	7.108	61	Grass, B
*	3.251	58	Woods/grass, B
	10.411	60	Weighted Average
	10.359		99.50% Pervious Area
	0.052		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	100	0.0732	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.92"
2.6	415	0.0268	2.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	515	Total			

Subcatchment E-S: E-Site



Summary for Subcatchment E-S: E-Site

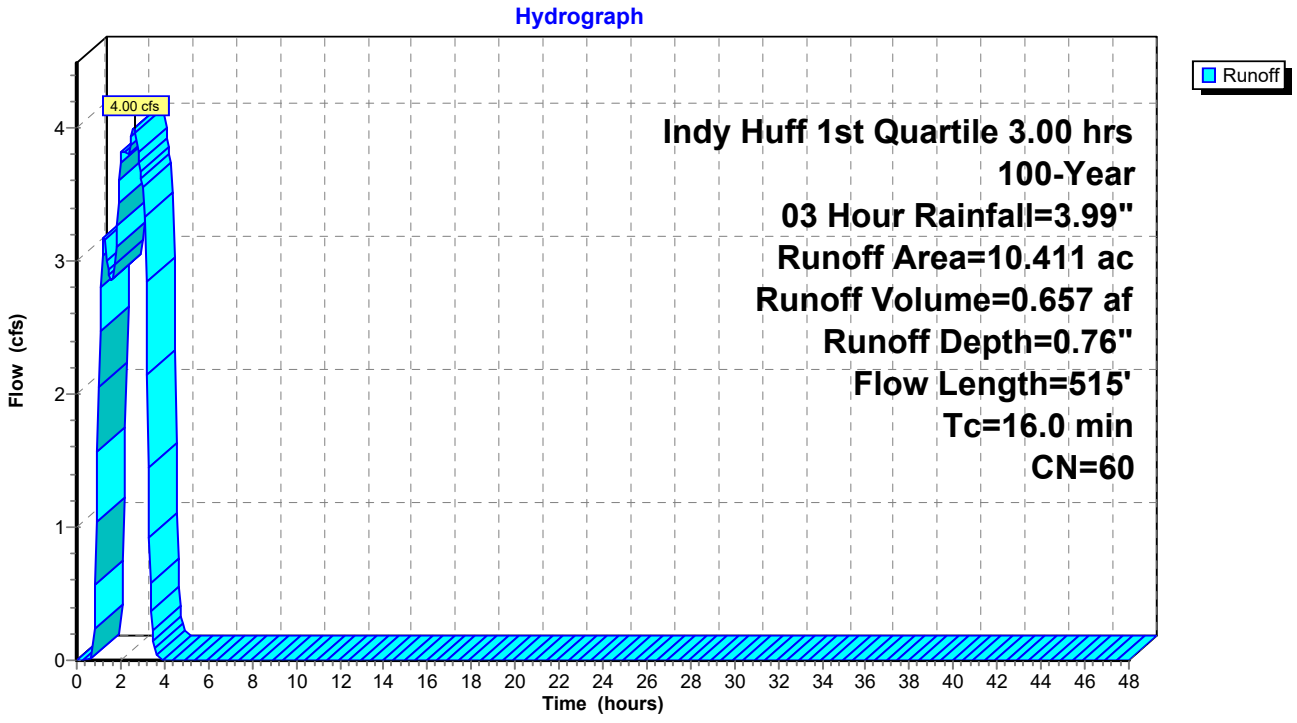
Runoff = 4.00 cfs @ 2.61 hrs, Volume= 0.657 af, Depth= 0.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 1st Quartile 3.00 hrs 100-Year, 03 Hour Rainfall=3.99"

	Area (ac)	CN	Description
*	0.052	98	Impervious
*	7.108	61	Grass, B
*	3.251	58	Woods/grass, B
	10.411	60	Weighted Average
	10.359		99.50% Pervious Area
	0.052		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	100	0.0732	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.92"
2.6	415	0.0268	2.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	515	Total			

Subcatchment E-S: E-Site



Summary for Subcatchment E-S: E-Site

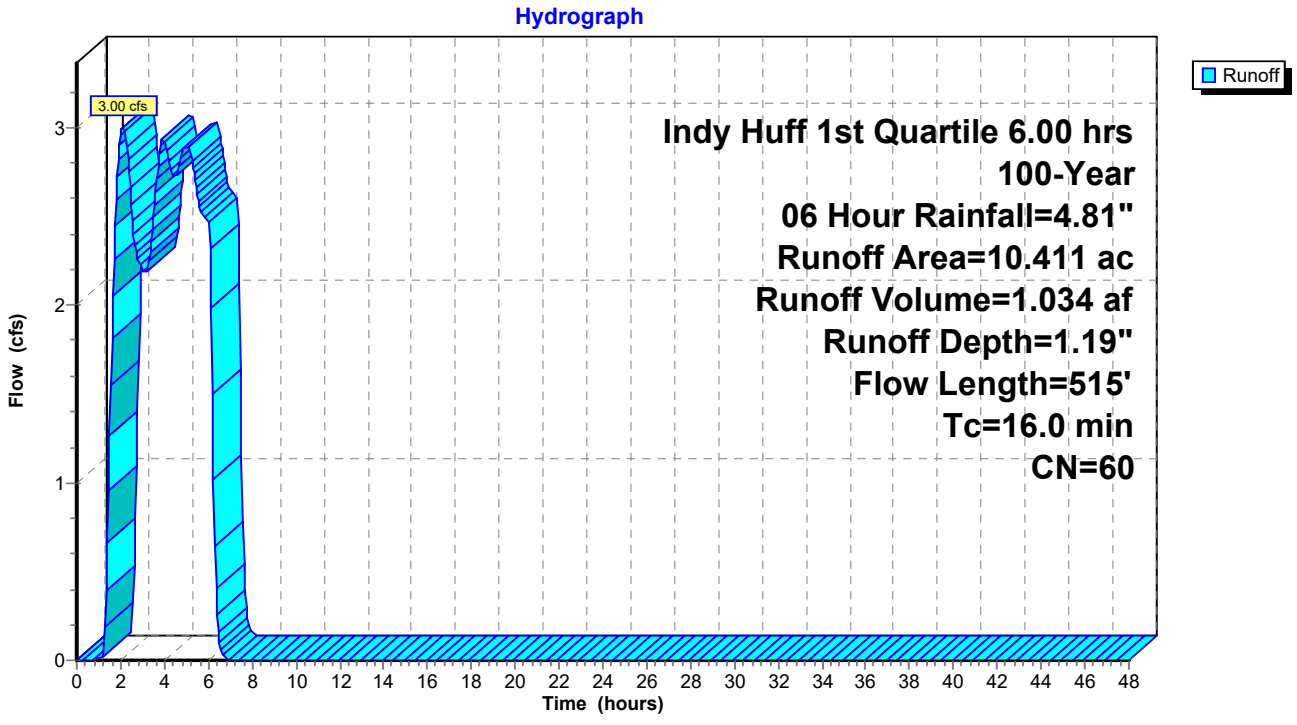
Runoff = 3.00 cfs @ 2.11 hrs, Volume= 1.034 af, Depth= 1.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 1st Quartile 6.00 hrs 100-Year, 06 Hour Rainfall=4.81"

	Area (ac)	CN	Description
*	0.052	98	Impervious
*	7.108	61	Grass, B
*	3.251	58	Woods/grass, B
	10.411	60	Weighted Average
	10.359		99.50% Pervious Area
	0.052		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	100	0.0732	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.92"
2.6	415	0.0268	2.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	515	Total			

Subcatchment E-S: E-Site



Summary for Subcatchment E-S: E-Site

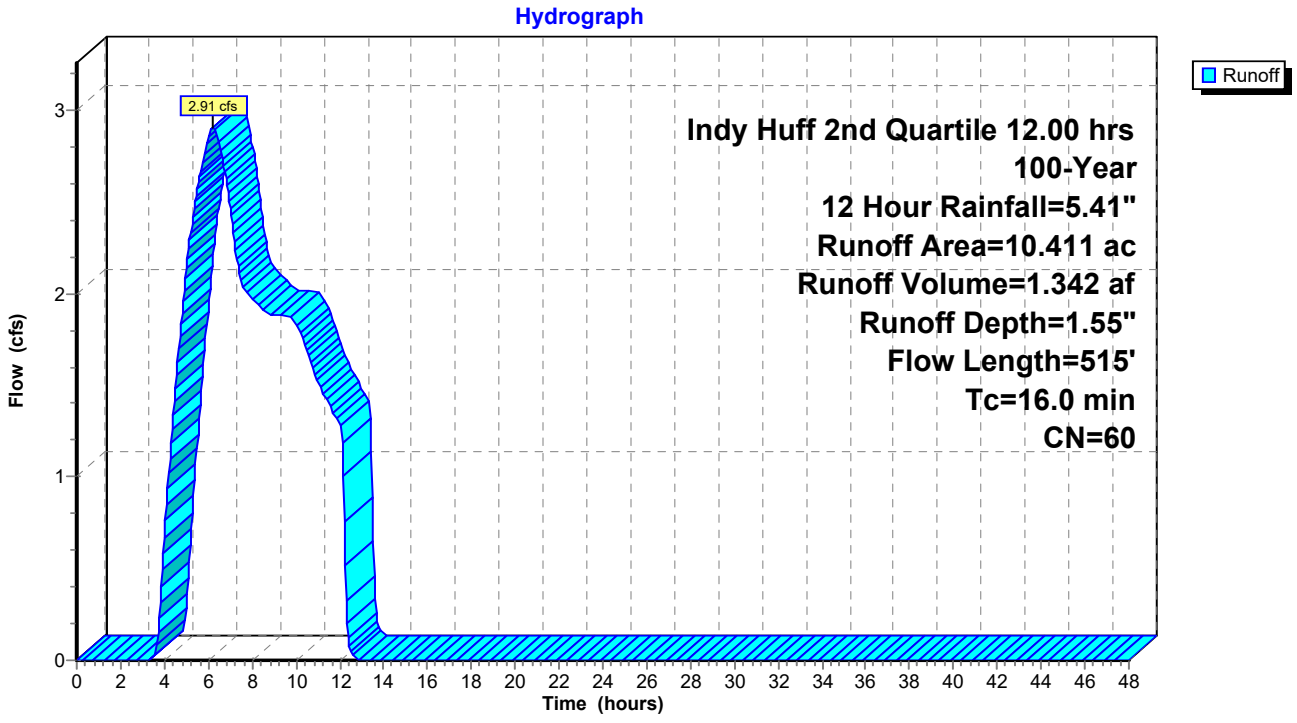
Runoff = 2.91 cfs @ 6.22 hrs, Volume= 1.342 af, Depth= 1.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 2nd Quartile 12.00 hrs 100-Year, 12 Hour Rainfall=5.41"

	Area (ac)	CN	Description
*	0.052	98	Impervious
*	7.108	61	Grass, B
*	3.251	58	Woods/grass, B
	10.411	60	Weighted Average
	10.359		99.50% Pervious Area
	0.052		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	100	0.0732	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.92"
2.6	415	0.0268	2.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	515	Total			

Subcatchment E-S: E-Site



Summary for Subcatchment E-S: E-Site

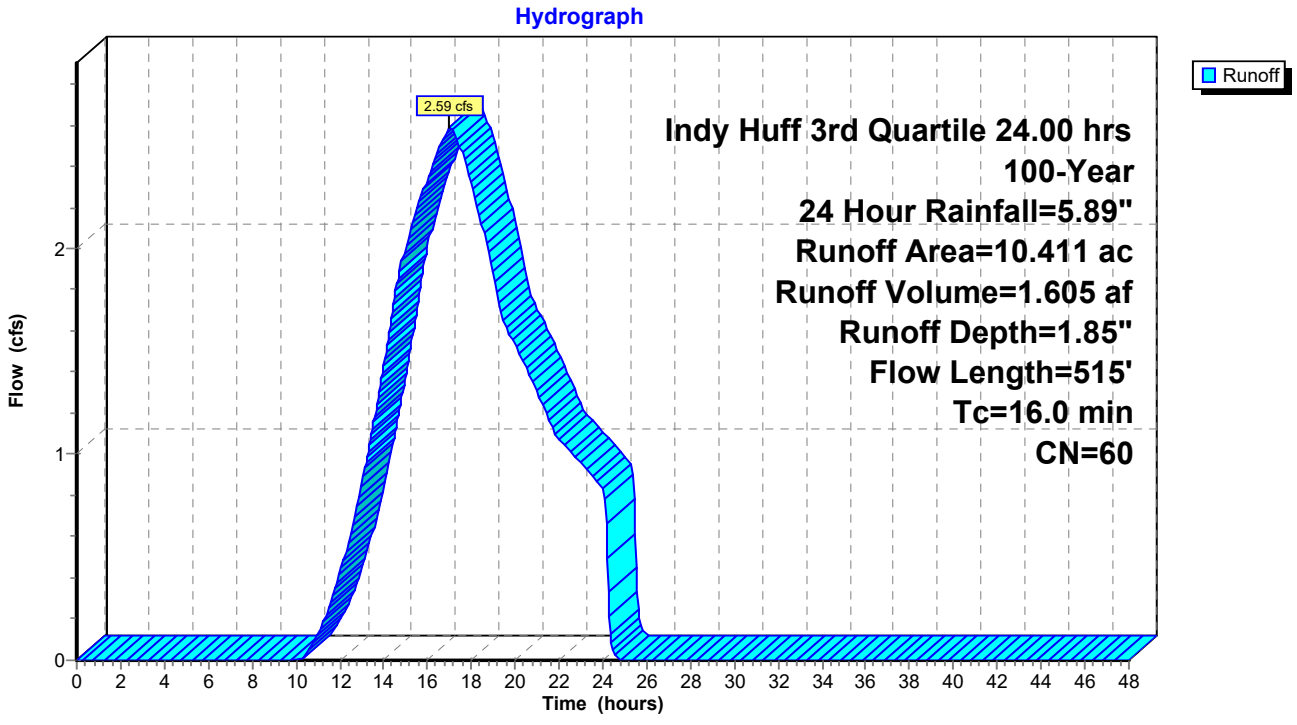
Runoff = 2.59 cfs @ 17.02 hrs, Volume= 1.605 af, Depth= 1.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 3rd Quartile 24.00 hrs 100-Year, 24 Hour Rainfall=5.89"

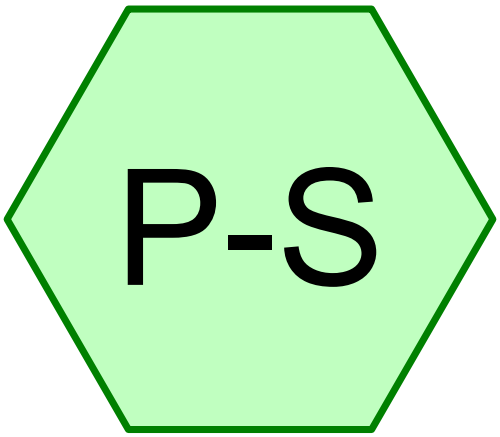
	Area (ac)	CN	Description
*	0.052	98	Impervious
*	7.108	61	Grass, B
*	3.251	58	Woods/grass, B
	10.411	60	Weighted Average
	10.359		99.50% Pervious Area
	0.052		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	100	0.0732	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.92"
2.6	415	0.0268	2.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	515	Total			

Subcatchment E-S: E-Site



APPENDIX F
PROPOSED HYDROCAD OUTPUT



P-Site

Subcat Reach Pond Link

Routing Diagram for 322-045 P-HydroCAD
Prepared by CEC, Printed 8/9/2022

Events for Subcatchment P-S: P-Site

Event	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
2-Year, 01 Hour	8.41	0.489	0.56
2-Year, 02 Hour	6.60	0.647	0.75
2-Year, 03 Hour	5.09	0.715	0.82
2-Year, 06 Hour	3.54	0.942	1.09
2-Year, 12 Hour	2.53	1.239	1.43
2-Year, 24 Hour	2.14	1.585	1.83
10-Year, 01 Hour	17.37	0.921	1.06
10-Year, 02 Hour	13.13	1.194	1.38
10-Year, 03 Hour	10.07	1.315	1.52
10-Year, 06 Hour	6.82	1.695	1.95
10-Year, 12 Hour	4.21	2.093	2.41
10-Year, 24 Hour	3.23	2.522	2.91
100-Year, 01 Hour	**33.90**	1.687	1.95
100-Year, 02 Hour	25.80	2.206	2.54
100-Year, 03 Hour	19.89	2.441	2.81
100-Year, 06 Hour	13.29	3.115	3.59
100-Year, 12 Hour	7.18	3.614	4.17
100-Year, 24 Hour	4.91	**4.016**	**4.63**

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.640	61	Grass, B (P-S)
7.770	98	Impervious (P-S)
10.410	**89**	**TOTAL AREA**

Summary for Subcatchment P-S: P-Site

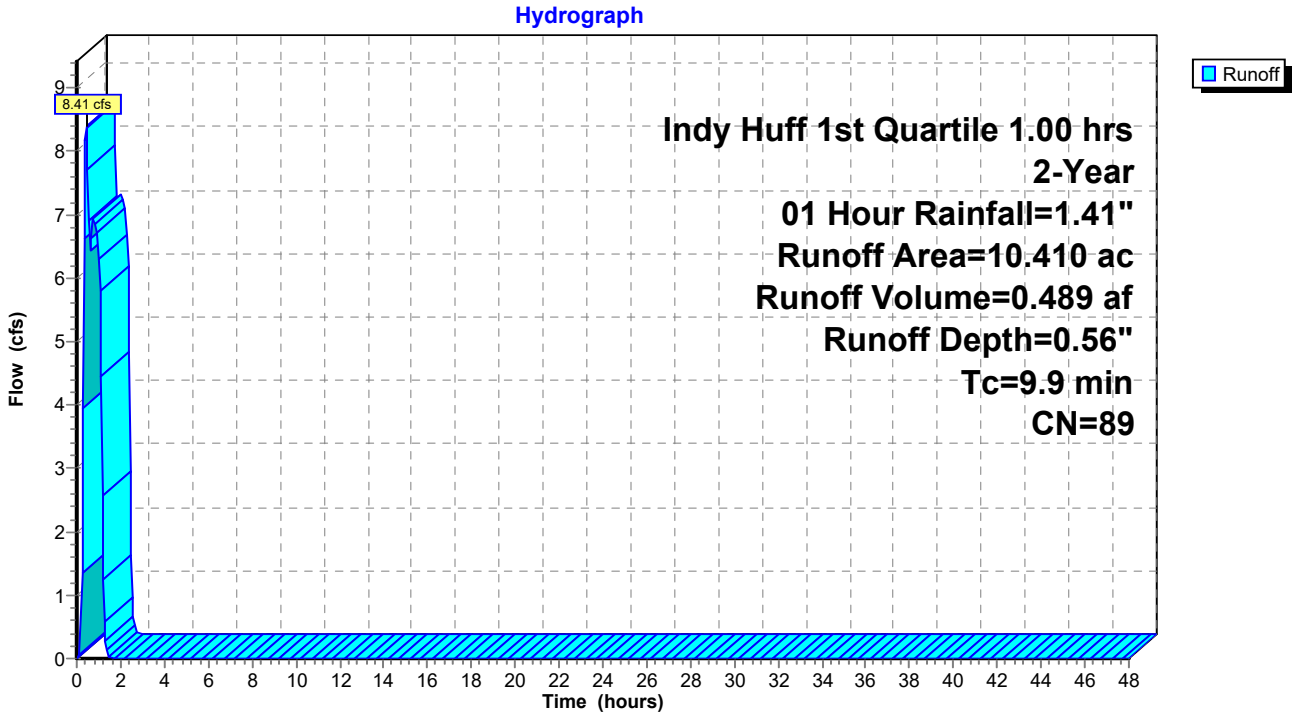
Runoff = 8.41 cfs @ 0.44 hrs, Volume= 0.489 af, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 1st Quartile 1.00 hrs 2-Year, 01 Hour Rainfall=1.41"

	Area (ac)	CN	Description
*	7.770	98	Impervious
*	2.640	61	Grass, B
	10.410	89	Weighted Average
	2.640		25.36% Pervious Area
	7.770		74.64% Impervious Area

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

Subcatchment P-S: P-Site



Summary for Subcatchment P-S: P-Site

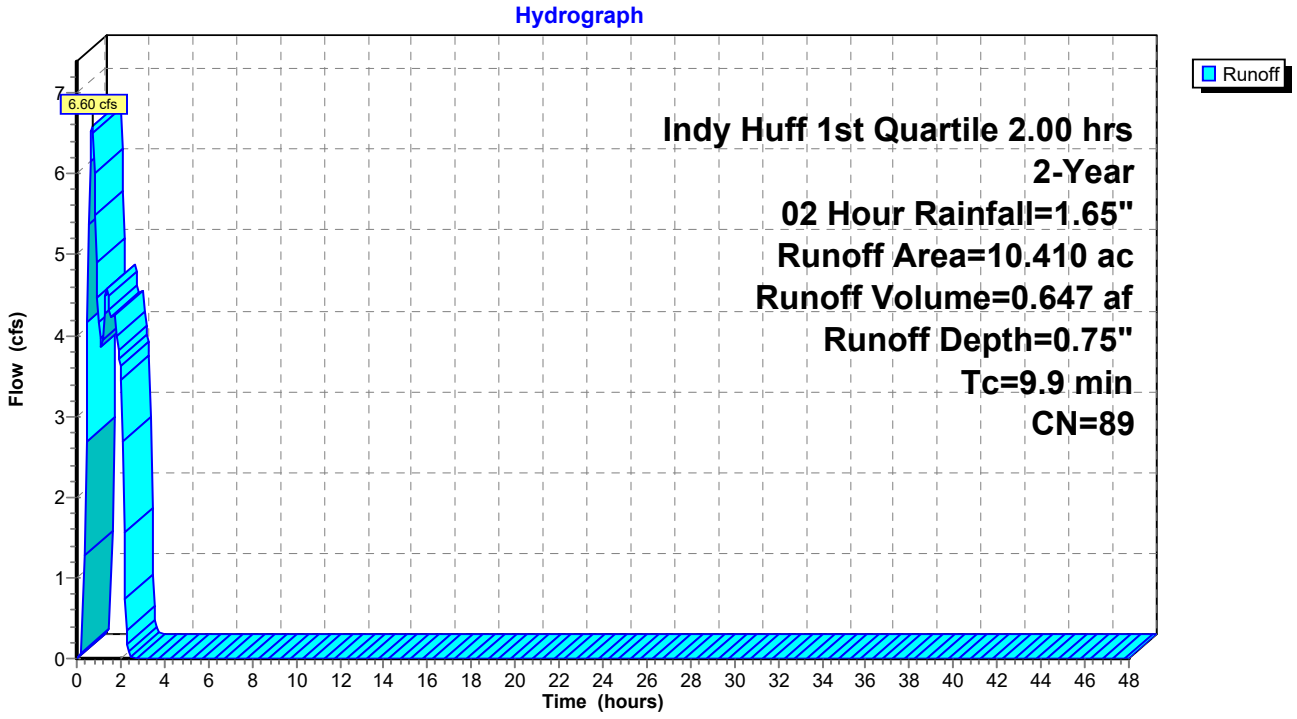
Runoff = 6.60 cfs @ 0.69 hrs, Volume= 0.647 af, Depth= 0.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 1st Quartile 2.00 hrs 2-Year, 02 Hour Rainfall=1.65"

	Area (ac)	CN	Description
*	7.770	98	Impervious
*	2.640	61	Grass, B
	10.410	89	Weighted Average
	2.640		25.36% Pervious Area
	7.770		74.64% Impervious Area

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

Subcatchment P-S: P-Site



Summary for Subcatchment P-S: P-Site

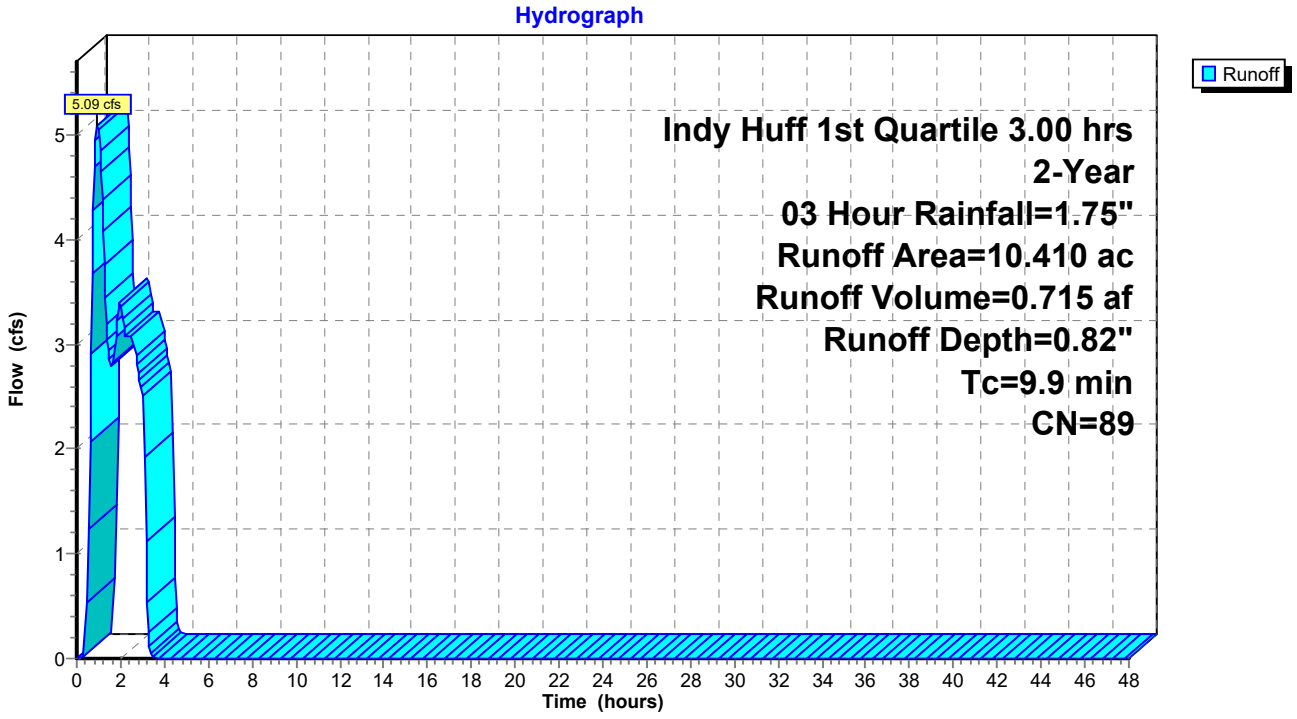
Runoff = 5.09 cfs @ 0.93 hrs, Volume= 0.715 af, Depth= 0.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 1st Quartile 3.00 hrs 2-Year, 03 Hour Rainfall=1.75"

	Area (ac)	CN	Description
*	7.770	98	Impervious
*	2.640	61	Grass, B
	10.410	89	Weighted Average
	2.640		25.36% Pervious Area
	7.770		74.64% Impervious Area

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

Subcatchment P-S: P-Site



Summary for Subcatchment P-S: P-Site

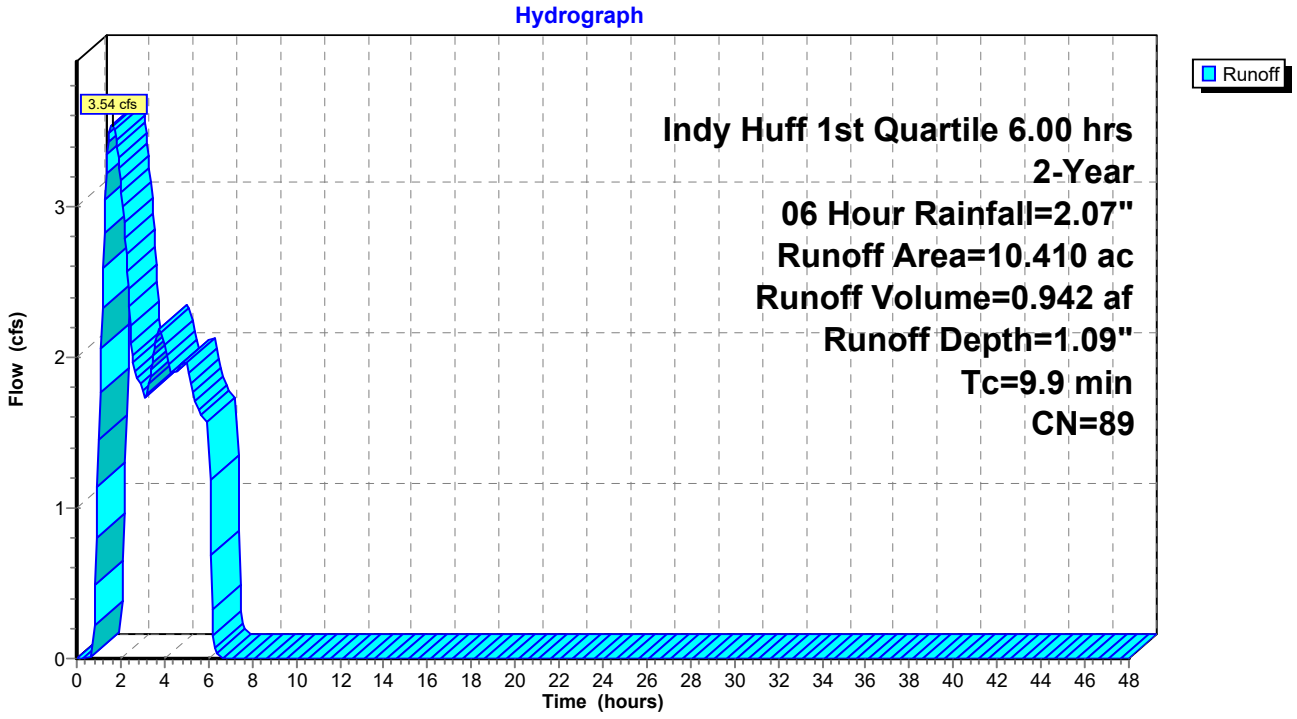
Runoff = 3.54 cfs @ 1.62 hrs, Volume= 0.942 af, Depth= 1.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 1st Quartile 6.00 hrs 2-Year, 06 Hour Rainfall=2.07"

	Area (ac)	CN	Description
*	7.770	98	Impervious
*	2.640	61	Grass, B
	10.410	89	Weighted Average
	2.640		25.36% Pervious Area
	7.770		74.64% Impervious Area

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

Subcatchment P-S: P-Site



Summary for Subcatchment P-S: P-Site

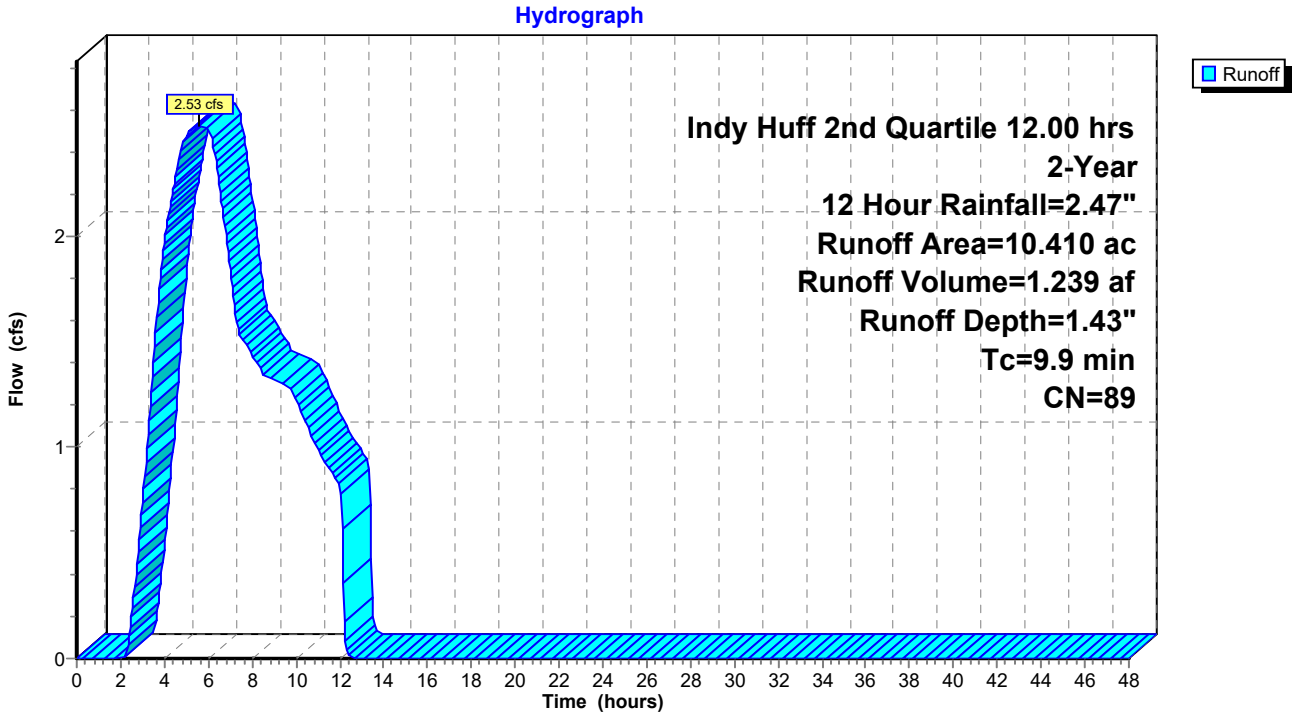
Runoff = 2.53 cfs @ 5.59 hrs, Volume= 1.239 af, Depth= 1.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 2nd Quartile 12.00 hrs 2-Year, 12 Hour Rainfall=2.47"

	Area (ac)	CN	Description
*	7.770	98	Impervious
*	2.640	61	Grass, B
	10.410	89	Weighted Average
	2.640		25.36% Pervious Area
	7.770		74.64% Impervious Area

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

Subcatchment P-S: P-Site



Summary for Subcatchment P-S: P-Site

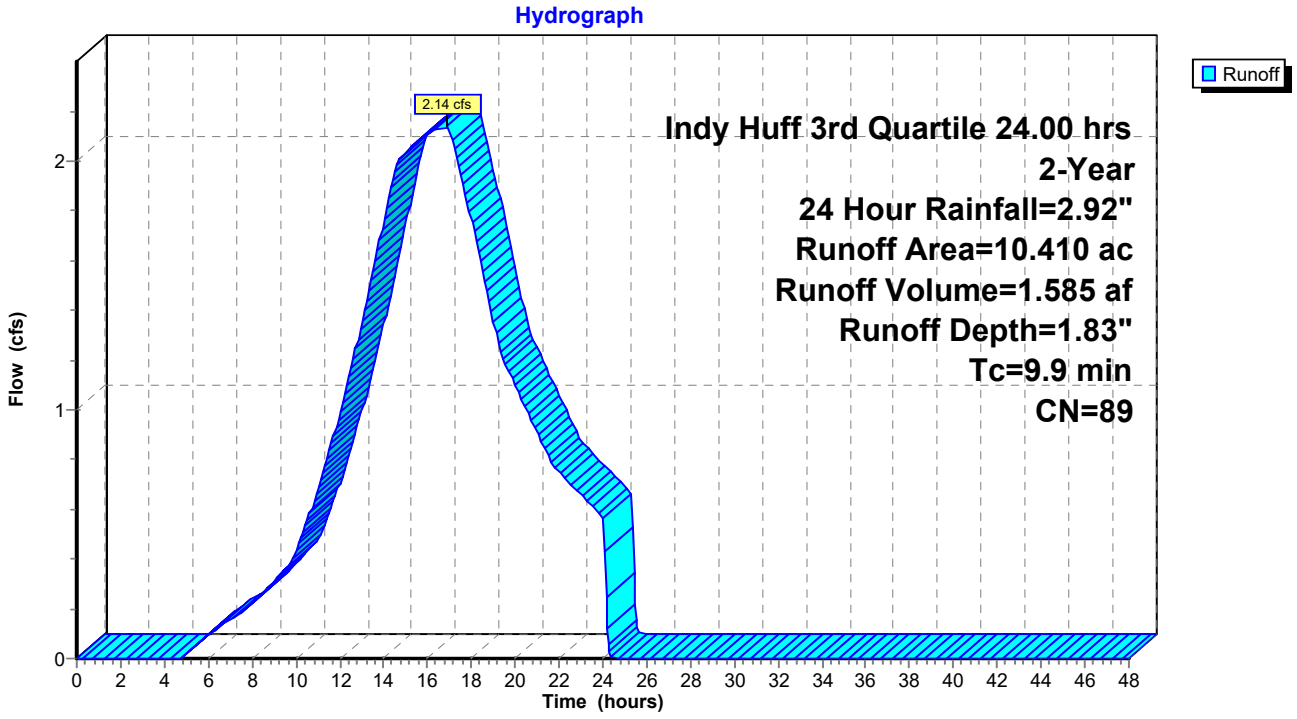
Runoff = 2.14 cfs @ 16.86 hrs, Volume= 1.585 af, Depth= 1.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 3rd Quartile 24.00 hrs 2-Year, 24 Hour Rainfall=2.92"

	Area (ac)	CN	Description
*	7.770	98	Impervious
*	2.640	61	Grass, B
	10.410	89	Weighted Average
	2.640		25.36% Pervious Area
	7.770		74.64% Impervious Area

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

Subcatchment P-S: P-Site



Summary for Subcatchment P-S: P-Site

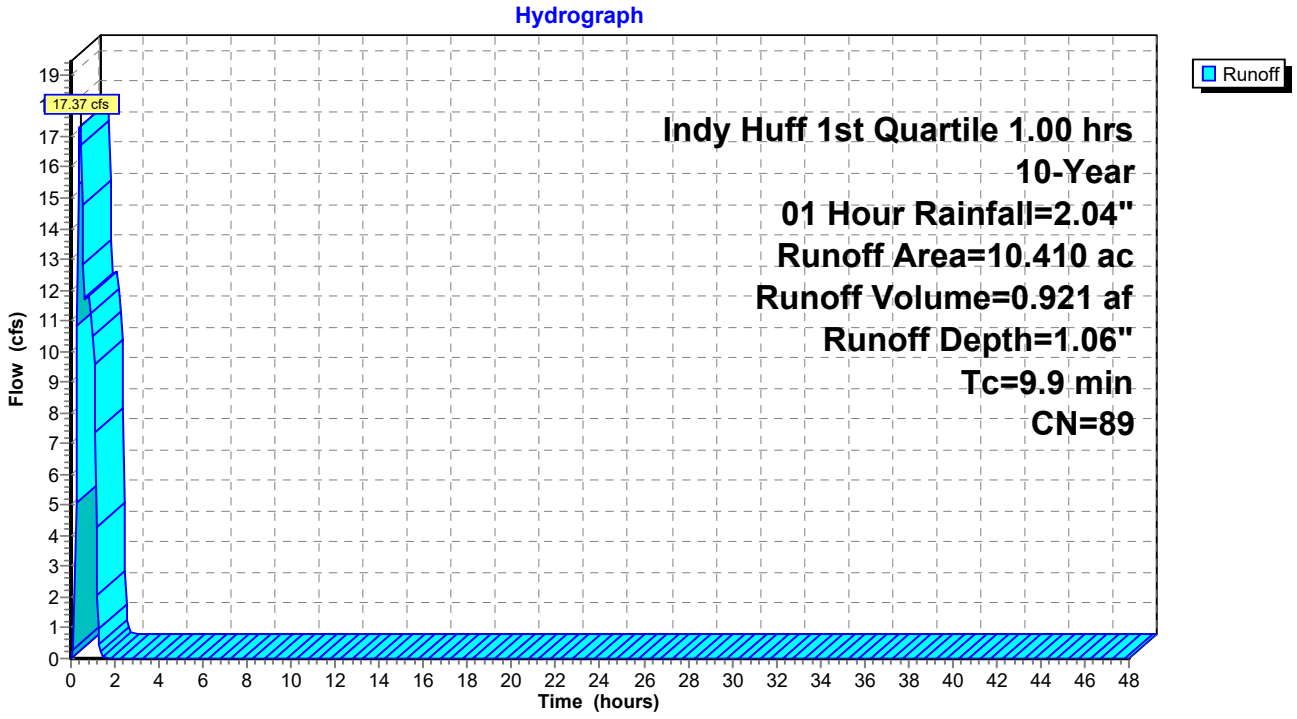
Runoff = 17.37 cfs @ 0.41 hrs, Volume= 0.921 af, Depth= 1.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 1st Quartile 1.00 hrs 10-Year, 01 Hour Rainfall=2.04"

	Area (ac)	CN	Description
*	7.770	98	Impervious
*	2.640	61	Grass, B
	10.410	89	Weighted Average
	2.640		25.36% Pervious Area
	7.770		74.64% Impervious Area

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

Subcatchment P-S: P-Site



Summary for Subcatchment P-S: P-Site

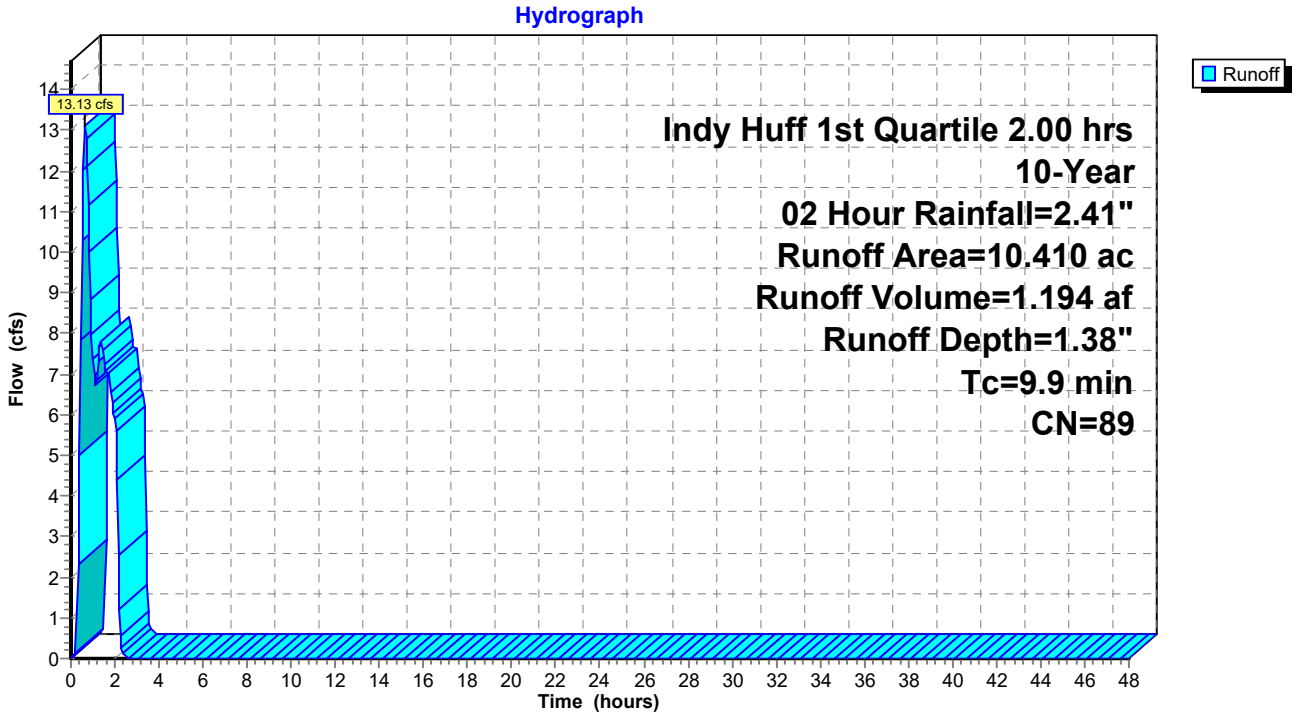
Runoff = 13.13 cfs @ 0.64 hrs, Volume= 1.194 af, Depth= 1.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 1st Quartile 2.00 hrs 10-Year, 02 Hour Rainfall=2.41"

	Area (ac)	CN	Description
*	7.770	98	Impervious
*	2.640	61	Grass, B
	10.410	89	Weighted Average
	2.640		25.36% Pervious Area
	7.770		74.64% Impervious Area

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

Subcatchment P-S: P-Site



Summary for Subcatchment P-S: P-Site

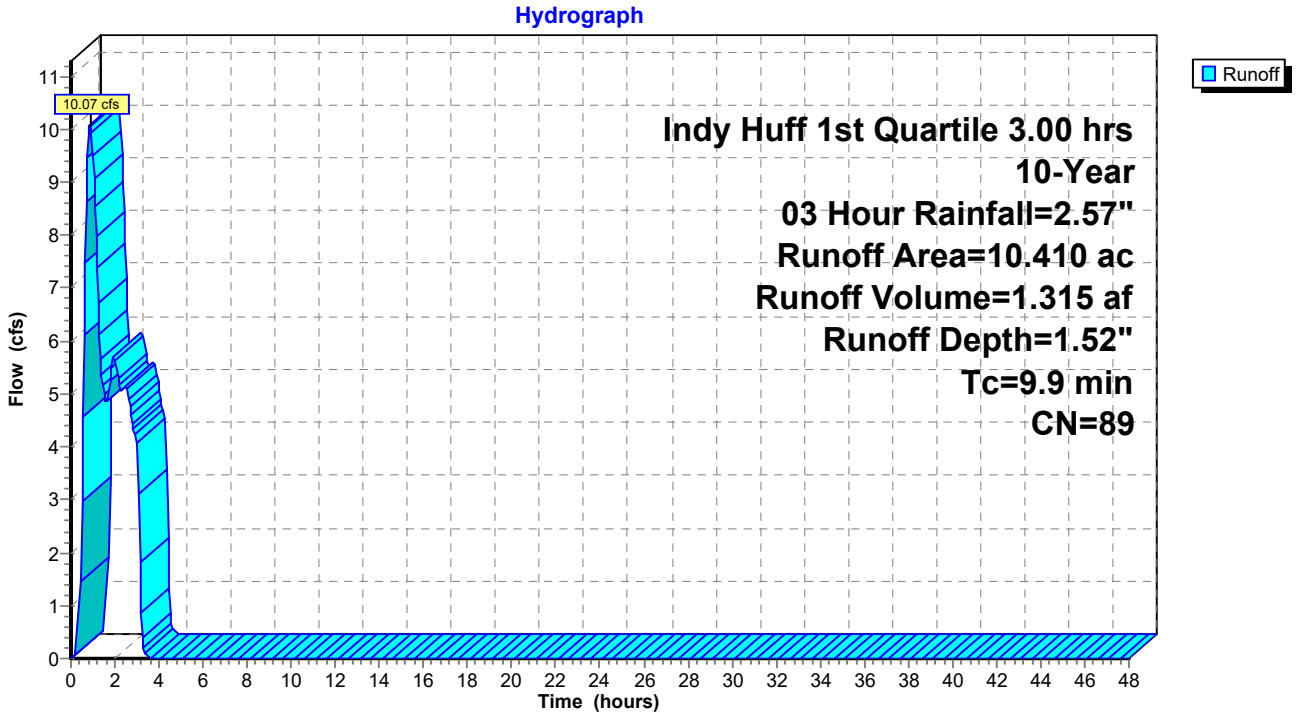
Runoff = 10.07 cfs @ 0.86 hrs, Volume= 1.315 af, Depth= 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 1st Quartile 3.00 hrs 10-Year, 03 Hour Rainfall=2.57"

	Area (ac)	CN	Description
*	7.770	98	Impervious
*	2.640	61	Grass, B
	10.410	89	Weighted Average
	2.640		25.36% Pervious Area
	7.770		74.64% Impervious Area

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

Subcatchment P-S: P-Site



Summary for Subcatchment P-S: P-Site

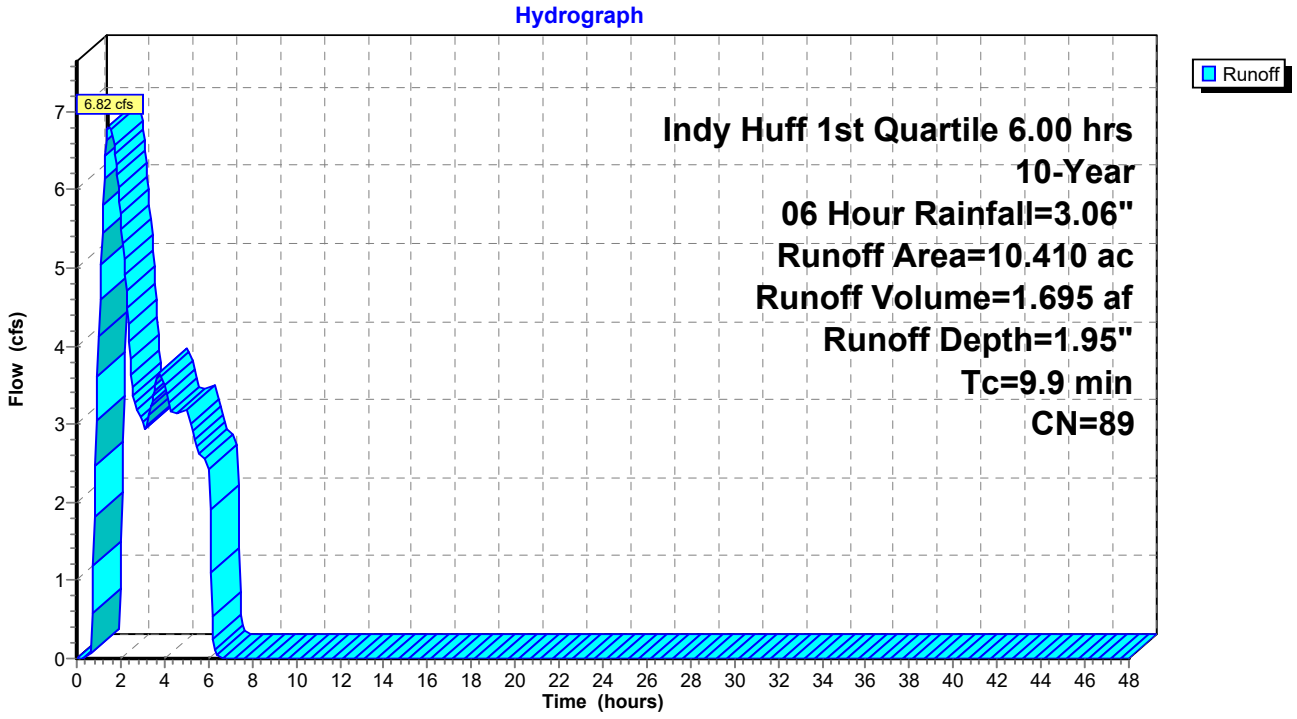
Runoff = 6.82 cfs @ 1.49 hrs, Volume= 1.695 af, Depth= 1.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 1st Quartile 6.00 hrs 10-Year, 06 Hour Rainfall=3.06"

	Area (ac)	CN	Description
*	7.770	98	Impervious
*	2.640	61	Grass, B
	10.410	89	Weighted Average
	2.640		25.36% Pervious Area
	7.770		74.64% Impervious Area

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

Subcatchment P-S: P-Site



Summary for Subcatchment P-S: P-Site

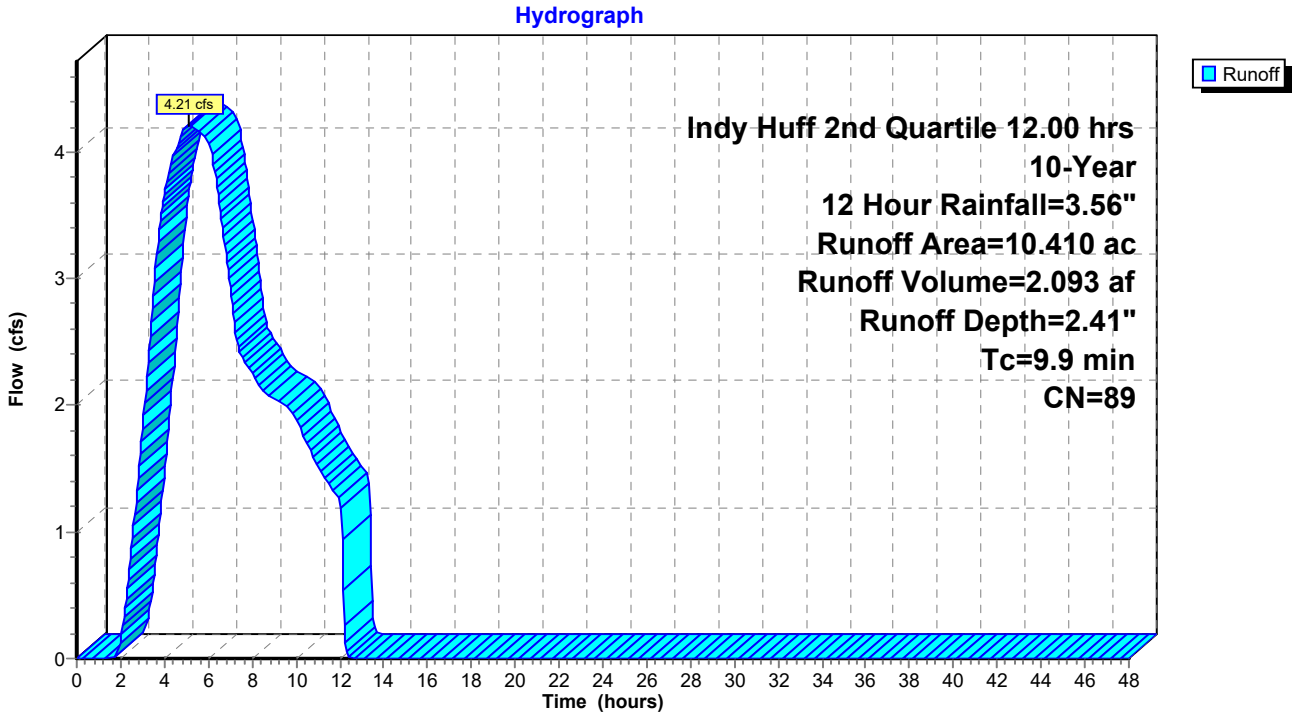
Runoff = 4.21 cfs @ 5.09 hrs, Volume= 2.093 af, Depth= 2.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 2nd Quartile 12.00 hrs 10-Year, 12 Hour Rainfall=3.56"

	Area (ac)	CN	Description
*	7.770	98	Impervious
*	2.640	61	Grass, B
	10.410	89	Weighted Average
	2.640		25.36% Pervious Area
	7.770		74.64% Impervious Area

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

Subcatchment P-S: P-Site



Summary for Subcatchment P-S: P-Site

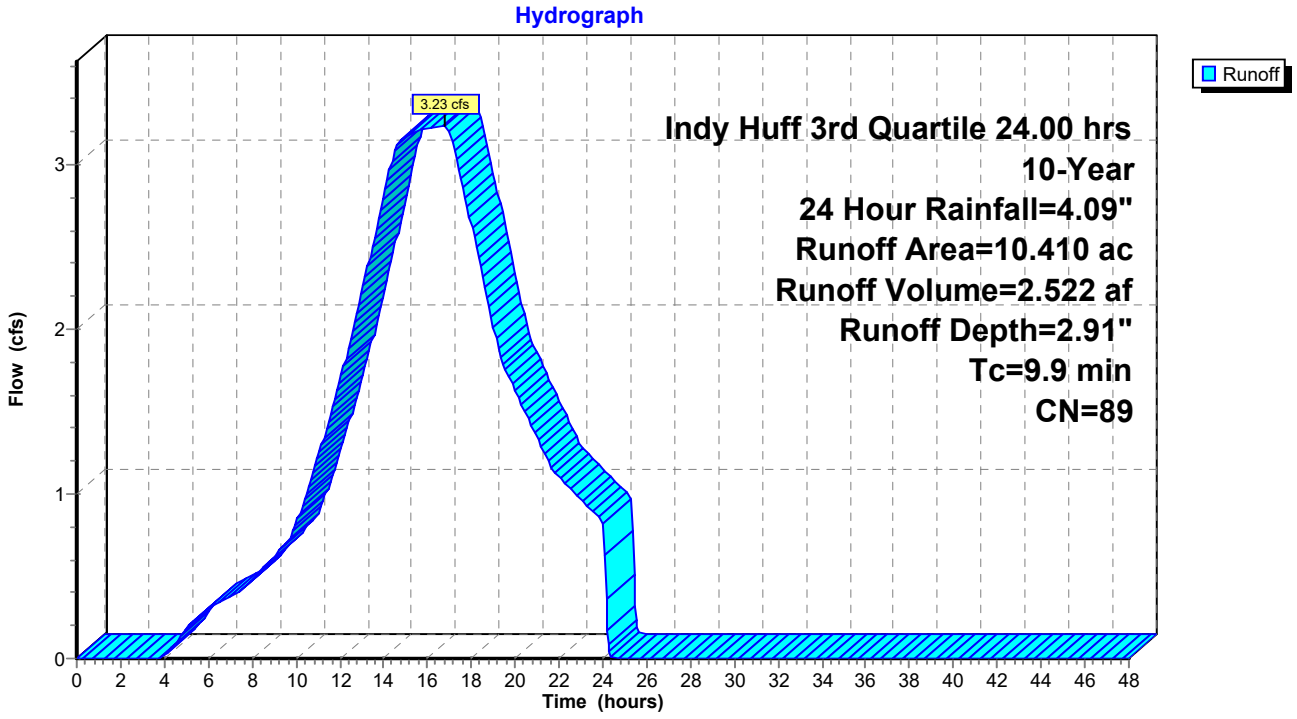
Runoff = 3.23 cfs @ 16.82 hrs, Volume= 2.522 af, Depth= 2.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 3rd Quartile 24.00 hrs 10-Year, 24 Hour Rainfall=4.09"

	Area (ac)	CN	Description
*	7.770	98	Impervious
*	2.640	61	Grass, B
	10.410	89	Weighted Average
	2.640		25.36% Pervious Area
	7.770		74.64% Impervious Area

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

Subcatchment P-S: P-Site



Summary for Subcatchment P-S: P-Site

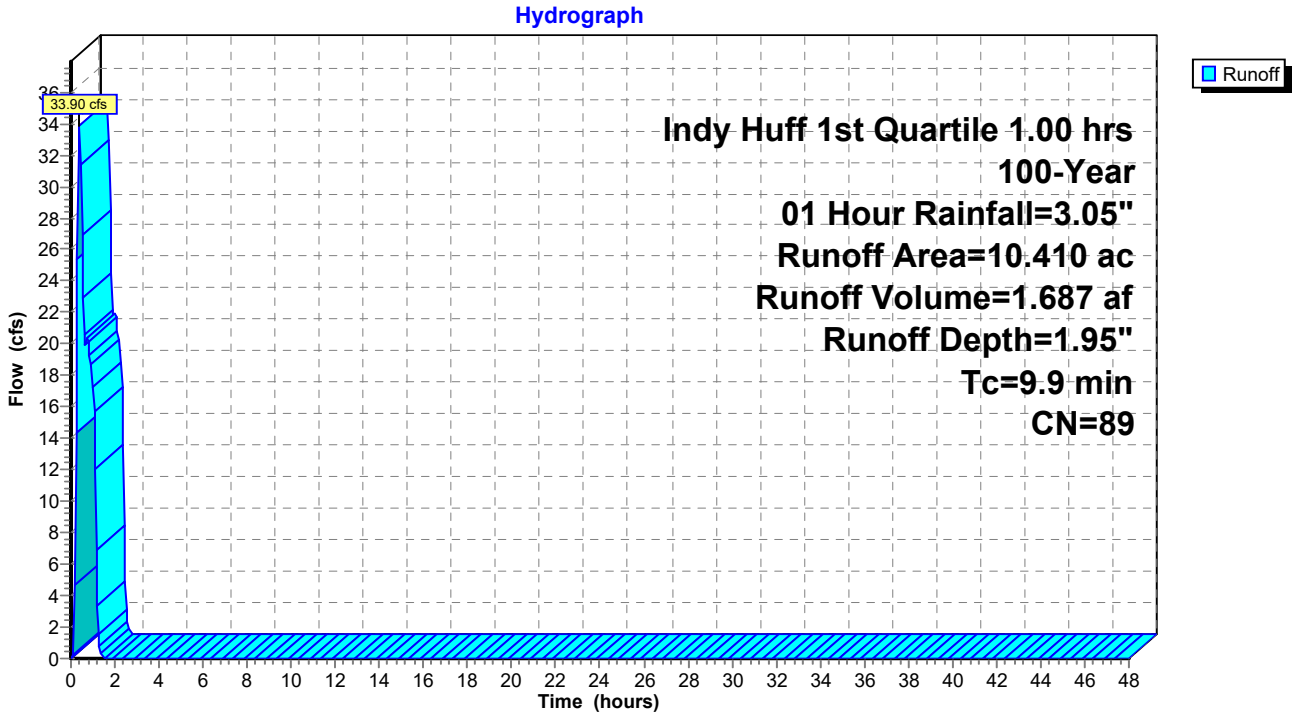
Runoff = 33.90 cfs @ 0.39 hrs, Volume= 1.687 af, Depth= 1.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 1st Quartile 1.00 hrs 100-Year, 01 Hour Rainfall=3.05"

	Area (ac)	CN	Description
*	7.770	98	Impervious
*	2.640	61	Grass, B
	10.410	89	Weighted Average
	2.640		25.36% Pervious Area
	7.770		74.64% Impervious Area

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

Subcatchment P-S: P-Site



Summary for Subcatchment P-S: P-Site

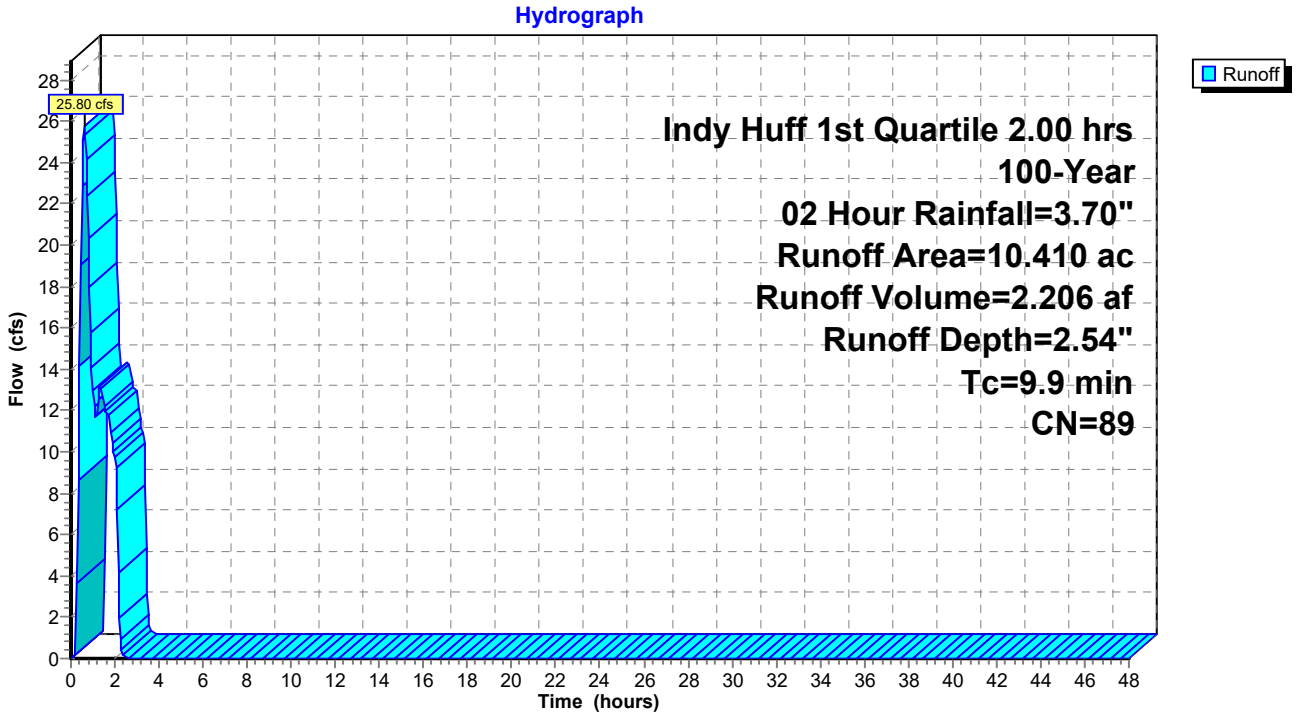
Runoff = 25.80 cfs @ 0.60 hrs, Volume= 2.206 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 1st Quartile 2.00 hrs 100-Year, 02 Hour Rainfall=3.70"

	Area (ac)	CN	Description
*	7.770	98	Impervious
*	2.640	61	Grass, B
	10.410	89	Weighted Average
	2.640		25.36% Pervious Area
	7.770		74.64% Impervious Area

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

Subcatchment P-S: P-Site



Summary for Subcatchment P-S: P-Site

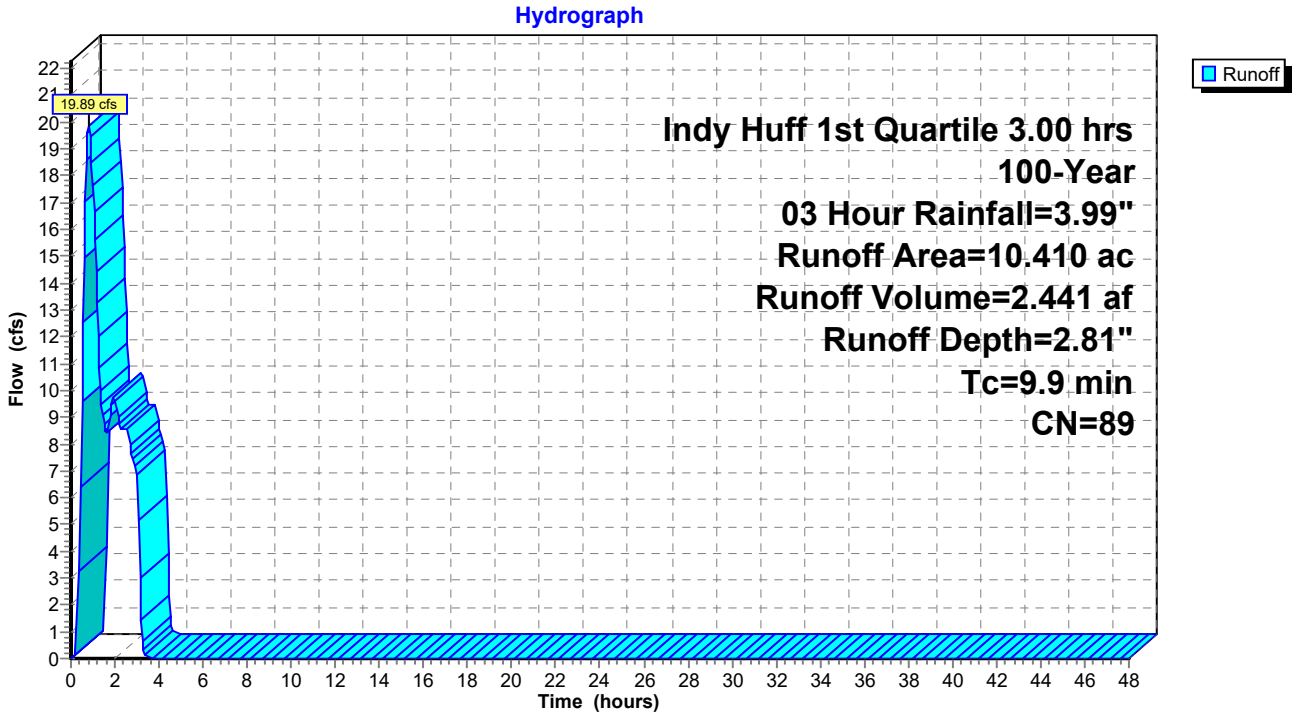
Runoff = 19.89 cfs @ 0.81 hrs, Volume= 2.441 af, Depth= 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 1st Quartile 3.00 hrs 100-Year, 03 Hour Rainfall=3.99"

	Area (ac)	CN	Description
*	7.770	98	Impervious
*	2.640	61	Grass, B
	10.410	89	Weighted Average
	2.640		25.36% Pervious Area
	7.770		74.64% Impervious Area

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

Subcatchment P-S: P-Site



Summary for Subcatchment P-S: P-Site

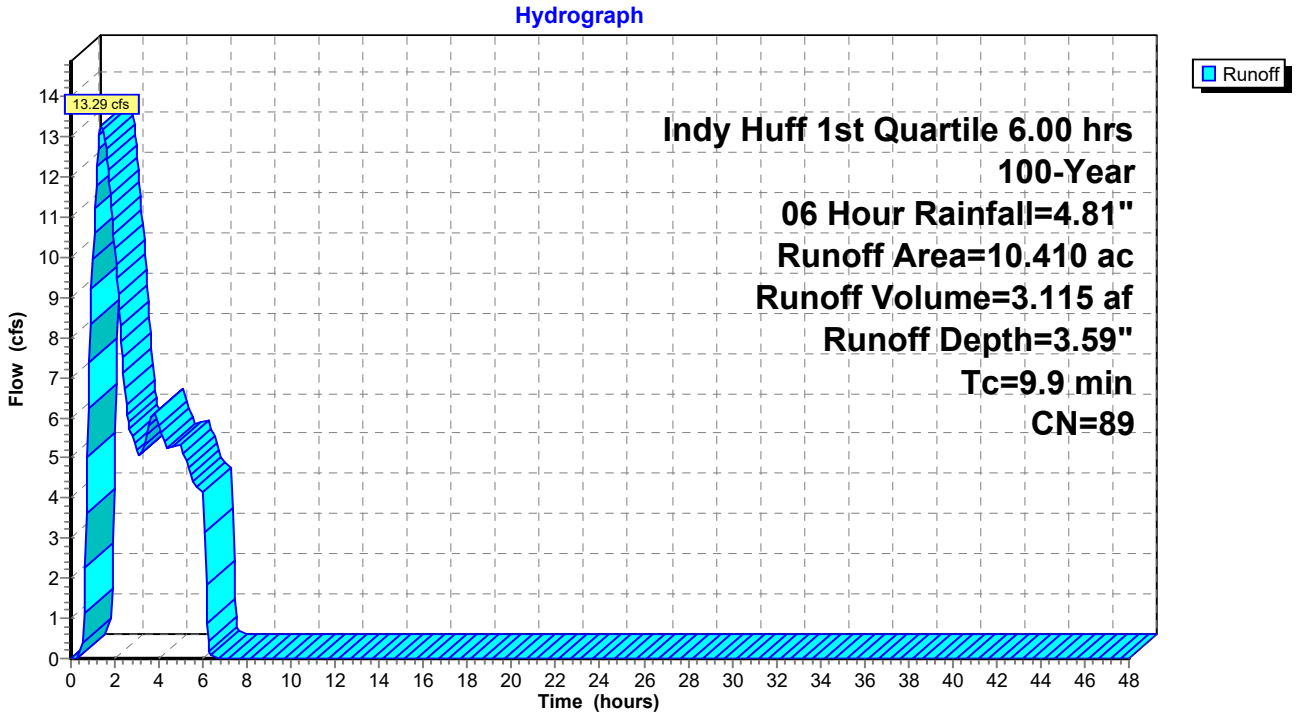
Runoff = 13.29 cfs @ 1.40 hrs, Volume= 3.115 af, Depth= 3.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 1st Quartile 6.00 hrs 100-Year, 06 Hour Rainfall=4.81"

	Area (ac)	CN	Description
*	7.770	98	Impervious
*	2.640	61	Grass, B
	10.410	89	Weighted Average
	2.640		25.36% Pervious Area
	7.770		74.64% Impervious Area

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

Subcatchment P-S: P-Site



Summary for Subcatchment P-S: P-Site

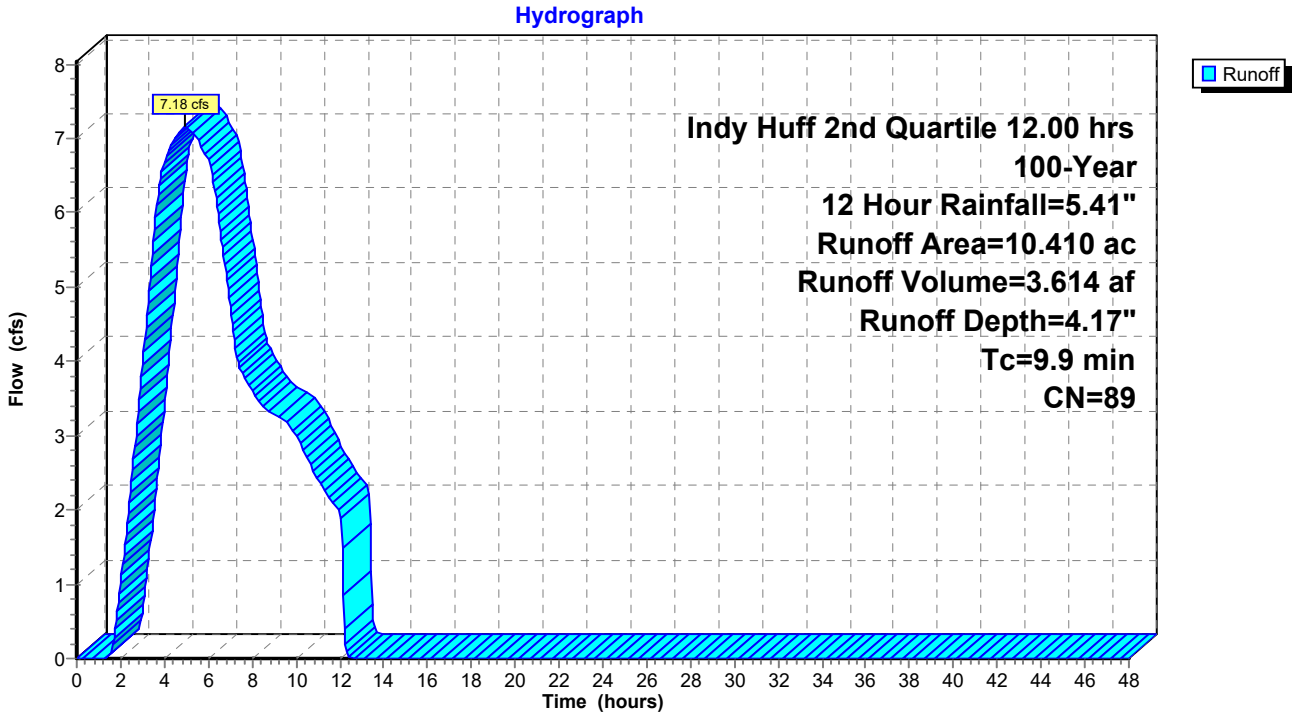
Runoff = 7.18 cfs @ 4.94 hrs, Volume= 3.614 af, Depth= 4.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 2nd Quartile 12.00 hrs 100-Year, 12 Hour Rainfall=5.41"

	Area (ac)	CN	Description
*	7.770	98	Impervious
*	2.640	61	Grass, B
	10.410	89	Weighted Average
	2.640		25.36% Pervious Area
	7.770		74.64% Impervious Area

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

Subcatchment P-S: P-Site



Summary for Subcatchment P-S: P-Site

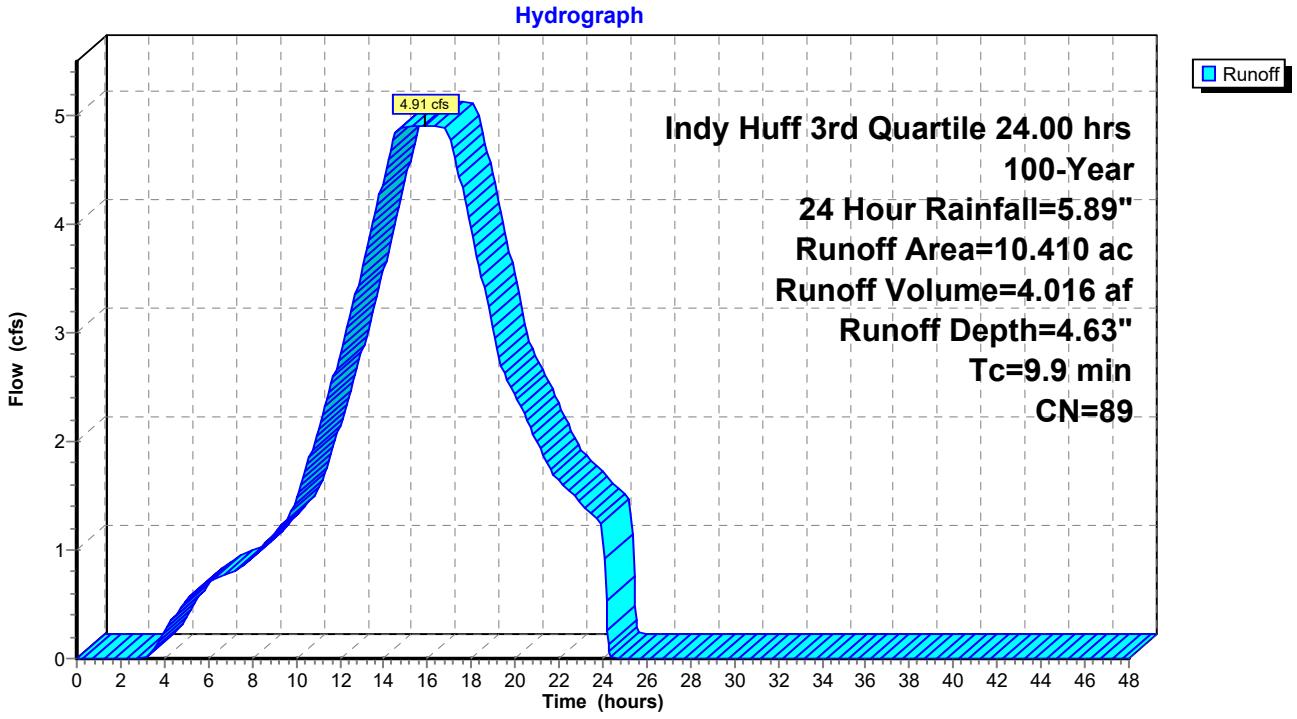
Runoff = 4.91 cfs @ 15.86 hrs, Volume= 4.016 af, Depth= 4.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Indy Huff 3rd Quartile 24.00 hrs 100-Year, 24 Hour Rainfall=5.89"

	Area (ac)	CN	Description
*	7.770	98	Impervious
*	2.640	61	Grass, B
	10.410	89	Weighted Average
	2.640		25.36% Pervious Area
	7.770		74.64% Impervious Area

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

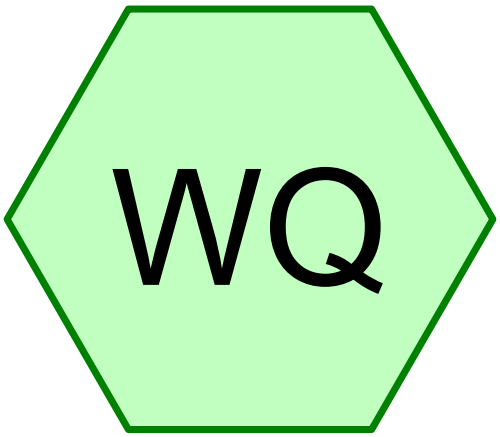
Subcatchment P-S: P-Site



APPENDIX G
WATER QUALITY HYDROCAD OUTPUT

City of Indianapolis Stormwater Quality Unit (SQU) Selection Guide

Manufactured SQU	SQU System Model	Max Treatment Flow (cfs)	Max 10-yr On-Line Flow Rate (cfs)	Cleanout Depth (Inches)
Hydro International First Defense High Capacity	3-ft	0.85	1.84	9
	4-ft	1.5	3.24	9
	5-ft	2.35	5.08	9
	6-ft	3.38	7.30	9
	7-ft	4.60	9.94	9
	8-ft	6.00	12.96	9
HydroStorm by Hydroworks, LLC	HS-3	0.50	1.00	6
	HS-4	0.88	1.76	6
	HS-5	1.37	2.74	6
	HS-6	1.98	3.96	6
	HS-7	2.69	5.38	6
	HS-8	3.52	7.04	6
	HS-9	4.45	8.9	6
	HS-10	5.49	10.98	6
	HS-11	6.65	13.3	6
	HS-12	7.91	15.82	6
AquaShield Aqua-Swirl Xcelerator[1]	XC-2	0.57	1.16	6
	XC-3	1.13	2.30	6
	XC-4	1.86	3.79	6
	XC-5	2.78	5.66	6
	XC-6	3.88	7.90	6
	XC-7	5.17	10.52	6
	XC-8	6.64	13.51	6
	XC-9	8.29	16.87	6
	XC-10	10.13	20.62	6
	XC-11	12.15	24.73	6
	XC-12	14.35	29.20	6
	XC-13	15.53	31.60	6
Contech Cascade Separator	CS-3	1.02	2.27	9
	CS-4	1.80	4.03	9
	CS-5	2.81	6.29	9
	CS-6	4.05	9.07	9
	CS-8	7.20	16.1	9
	CS-10	11.3	25.3	9
	CS-12	16.2	36.3	9



P-Site to WQ

Subcat Reach Pond Link

Routing Diagram for 322-045 WQ
Prepared by CEC, Printed 8/9/2022

Events for Subcatchment WQ: P-Site to WQ

Event	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
WQ	**5.98**	**0.328**	**0.45**

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.181	61	Grass, B (WQ)
7.549	98	Impervious (WQ)
8.731	**93**	**TOTAL AREA**

Summary for Subcatchment WQ: P-Site to WQ

Runoff = 5.98 cfs @ 12.02 hrs, Volume= 0.328 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr WQ Rainfall=1.00"

	Area (sf)	CN	Description
*	328,847	98	Impervious
*	51,465	61	Grass, B
	380,312	93	Weighted Average
	51,465		13.53% Pervious Area
	328,847		86.47% Impervious Area

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

Subcatchment WQ: P-Site to WQ