

STORMWATER MANAGEMENT, GROUNDWATER RECHARGE AND WATER QUALITY ANALYSIS

Prepared for:

WINDSOR 1 DEVELOPERS, LLC

**Proposed Wawa Food Market & Fueling Station and Hotel
U.S. Route 1 (Brunswick Pike) & Emmons Drive
Block 7, Lot 59
Township of West Windsor
Mercer County, New Jersey**

Prepared by:



1904 Main Street
Lake Como, NJ 07719
(732) 974-0198



Matthew Sharo, PE, PP
NJ Professional Engineer License #52989

January 2020
Last Revised April 2020
DEC #1478-99-043

TABLE OF CONTENTS

I.	Site Description.....	3
II.	Design Overview.....	3
III.	Existing Site Conditions	4
IV.	Proposed Site Conditions	5
V.	Design Methodology.....	6
VI.	Runoff Rates	7
VII.	Water Quality	7
VIII.	Groundwater Recharge	8
IX.	Conclusion.....	8

APPENDIX

- NRCS Web Soil Survey
- Runoff Curve Number (CN) Calculations – Existing and Proposed Conditions
- Hydrograph Summary Reports – Existing and Proposed Conditions 2yr, 10yr, 25yr & 100yr
- Hydrograph Summary Reports – Water Quality Storm
- Manufactured Treatment Device NJDEP Certification/Sizing Table
- DRCC Water Quality Calculations
- DRCC NSPS Spreadsheet
- Stormwater Collection System Calculations (Pipe Sizing)
- Scour Hole Sizing
- Drainage Area Maps

I. SITE DESCRIPTION

The subject site is located at the intersection of US Route 1 (Brunswick Pike) & Emmons Drive, in the Township of West Windsor, Mercer County, New Jersey. The site is identified as Block 7, Lot 59 on the Township of West Windsor Tax Map Sheet #13.02. The subject site currently consists of an existing hotel development. The existing ground cover is primarily impervious surfaces with open space and wooded areas on the northwestern portion of the site. The existing conditions of the subject site have been verified by the ALTA/NSPS Land Title Survey as prepared by Dynamic Survey, LLC.

The proposed redevelopment consists of subdividing the property into two (2) lots and constructing a 4-story Hyatt Hotel and a 5,585 SF Wawa Food Market with a Fueling Station consisting of sixteen (16) filling stations. Additional site improvements include constructing new driveways, parking areas, landscaping, lighting and other associated improvements.

II. DESIGN OVERVIEW

This analysis has been prepared to define and analyze the stormwater drainage conditions that would occur as a result of the redevelopment of the subject site into a proposed Hyatt Hotel and a Wawa Food Market and Fueling Station on Block 7, Lot 59 in the Township of West Windsor, Mercer County, New Jersey.

The scope of the study includes the proposed Hyatt Hotel and Wawa Food Market and Fueling Station, associated driveways, parking areas, landscaping and other related site improvements as shown on the accompanying engineering drawings.

Based upon the fact that the proposed redevelopment will result in more than one (1) acre of land disturbance, this project is classified as a “major development”. Therefore, the subject site has been designed to meet the stormwater runoff quantity, quality and groundwater recharge standards, set forth by the Township of West Windsor Land Use Ordinance and NJAC 7:8. However, it is important to note that the proposed redevelopment will reduce the amount of impervious coverage on-site, therefore, the stormwater runoff quality standards, set forth by NJAC 7:8, do not apply to this project.

Accordingly, the following items are addressed within this report:

- Erosion Control, groundwater recharge and runoff quantity standards (7:8-5.4)
- Stormwater runoff quality standards (7:8-5.5)
- Calculation of stormwater runoff and groundwater recharge (7:8-5.6)
- Standards for structural stormwater management measures (7:8-5.7)

A hydrological evaluation is provided for the 2, 10, 25 and 100-year storm events utilizing the Urban Hydrology for Small Watershed TR55 method.

The Township of West Windsor and NJAC 7:8 flow reduction requirements for a redevelopment site that results in a reduction of impervious coverage are as follows:

2-year:	Do not exceed existing flow at any time
10-year:	Do not exceed existing flow at any time
25-year:	Do not exceed existing flow at any time
100-year:	Do not exceed existing flow at any time

It is the intention of the design of this facility to comply with the Stormwater Best Management Practices Manual.

III. EXISTING SITE CONDITIONS

The subject site consists of 5.51 acres. The area on-site to be redeveloped consists of 3.82± acres and is primarily composed of impervious coverage with a minor portion of open space areas. Currently, the stormwater runoff generated by the site flows towards two (2) separate points of analysis; the existing stormwater conveyance within US Route 1 and towards the west through the use of the site's existing stormwater conveyance system, which discharges through an existing headwall, and overland flow.

The subject site has been evaluated with the following drainage sub-watershed areas as depicted on the Existing Drainage Area Map included within the Appendix of this report:

Study Area Route 1: This area consists of existing impervious and open space areas. Under existing conditions, stormwater runoff generated by this area is ultimately tributary to the existing stormwater conveyance system within US Route 1. A minimum time of concentration of ten (10) minutes has been utilized for this drainage area.

Study Area West Headwall: This area consists of existing impervious and open space areas. Under existing conditions, stormwater runoff generated by this area flows towards the west via the site's existing stormwater conveyance system and discharges through an existing headwall. A minimum time of concentration of ten (10) minutes has been utilized for this drainage area.

Study Area West Overland: This area consists of existing impervious and open space areas. Under existing conditions, stormwater runoff generated by this area flows towards the west via overland flow. A minimum time of concentration of ten (10) minutes has been utilized for this drainage area.

Based upon the Mercer County Soil Survey, the soil types native to the site include:

SOIL TYPE	SOIL TYPE NAME	HYDROLOGIC SOIL GROUP
OthA	Othello silt loams, 0 to 2 percent slopes, northern coastal plain	C

IV. PROPOSED SITE CONDITIONS

The proposed redevelopment includes the construction of a 4-story Hyatt Hotel and a Wawa Food Market and Fueling Station with associated driveways, parking areas and other associated site improvements. The area on-site to be redeveloped is 3.82± acres, however, the redevelopment of the site will reduce the impervious coverage by 0.29± acres.

The proposed site conditions have been evaluated using the following drainage sub-watershed areas as depicted on the Proposed Drainage Area Map included within the Appendix of this report:

Study Area Route 1: This area consists of the proposed Wawa Food Market and Fueling Station, proposed parking area and open space areas. Stormwater runoff generated by this area is tributary to the existing stormwater conveyance system within US Route 1 through the proposed stormwater conveyance system on site. A minimum time of concentration of ten (10) minutes has been utilized for this drainage area.

Study Area Route 1 - Untreated: This area consists of a portion of the proposed driveway and open space areas. Stormwater runoff generated by this area is tributary to the existing stormwater conveyance system within US Route 1 through overland flow. A minimum time of concentration of ten (10) minutes has been utilized for this drainage area.

Study Area West Headwall: This area consists of the proposed Emmons Drive driveways, parking area and open space areas. Stormwater runoff generated by this area discharges towards the west through the use of the existing headwall/conveyance system. A minimum time of concentration of ten (10) minutes has been utilized for this drainage area.

Study Area West Overland: This area consists of the proposed Hyatt Hotel, impervious and open space areas. Stormwater runoff generated by the proposed Hyatt Hotel discharges to the west through the use of the proposed roof leader conveyance system and preformed scour hole. The remaining stormwater runoff generated by this

area flows towards the west through overland flow. A minimum time of concentration of ten (10) minutes has been utilized for this drainage area.

V. DESIGN METHODOLOGY

The intention of the design of the proposed stormwater management facilities for this project is to provide measures as required to address applicable aspects of the Township of West Windsor Land Use Ordinance and NJAC 7:8. In order to prepare the stormwater management design for the subject project, extensive initial investigation of the property and topography was performed. On-site review of the tract was performed by Dynamic Engineering Consultants, PC to verify existing site conditions and land cover characteristics. Dynamic Survey, LLC was contracted to prepare the ALTA/NSPS Land Title Survey with topography to depict the existing site conditions.

Based on our review of the existing site conditions and survey, the Drainage Area Maps for the existing and proposed site conditions as defined within this report were established. A grading plan was developed for the proposed site redevelopment with consideration to the existing drainage patterns. The plan was designed to ensure runoff from the proposed redevelopment could be directed to the required stormwater management facilities in order to address the applicable sections of the Township of West Windsor Land Use Ordinance and NJAC 7:8.

The rainfall data utilized for the analysis of the existing and proposed site conditions is based upon the New Jersey 24 Hour Rainfall Frequency Data for Mercer County as published by the USDA NRCS utilizing a Type III rainfall distribution.

The proposed redevelopment will reduce the amount of impervious area on site, therefore, the project is exempt from the water quality aspect of NJAC 7:8. However, proposed water quality manufactured treatment devices have been provided for the development to prevent the outflow of oil generated by the fueling station use, as well as address the applicable Delaware and Raritan Canal Commission water quality treatment requirements.

In addition, the proposed redevelopment satisfies the groundwater recharge criteria set forth by NJAC 7:8 by reducing the amount of impervious area on site, which will increase the average annual groundwater recharge volume for the site.

The overall stormwater management design for the subject site has been evaluated by Dynamic Engineering Consultants to ensure that the overall development satisfies the stormwater criteria set forth by the Township of West Windsor Land Use Ordinance and NJAC 7:8.

VI. RUNOFF RATES

The following is a comparison of the existing and proposed condition runoff rates:

Existing and Proposed Conditions Peak Runoff Results Summary – Study Area Route 1				
	Existing Runoff Rate	NJAC 7:8 Required Reduction	NJAC 7:8 Allowable Runoff	Proposed Runoff Rate
2 Year	3.542 cfs	Do not exceed existing	3.542 cfs	3.430 cfs
10 Year	5.544 cfs	Do not exceed existing	5.544 cfs	5.392 cfs
25 Year	6.945 cfs	Do not exceed existing	6.945 cfs	6.767 cfs
100 Year	9.496 cfs	Do not exceed existing	9.496 cfs	9.274 cfs

Existing and Proposed Conditions Peak Runoff Results Summary – Study Area West (Total)				
	Existing Runoff Rate	NJAC 7:8 Required Reduction	NJAC 7:8 Allowable Runoff	Proposed Runoff Rate
2 Year	4.665 cfs	Do not exceed existing	4.665 cfs	4.352 cfs
10 Year	7.274 cfs	Do not exceed existing	7.274 cfs	6.969 cfs
25 Year	9.097 cfs	Do not exceed existing	9.097 cfs	8.816 cfs
100 Year	12.41 cfs	Do not exceed existing	12.41 cfs	12.19 cfs

The proposed redevelopment will reduce the amount of impervious coverage on-site, therefore, the stormwater runoff peak rate and volume from the redevelopment will be reduced for the 2, 10, 25 and 100-year storm events. As shown above and in the Hydrograph Summary Reports included within the appendix of this report, the post-construction runoff hydrographs for each point of analysis do not exceed at any point in time, the pre-construction runoff hydrographs for the 2, 10, 25, and 100-year storm events. Therefore, the proposed redevelopment satisfies the applicable stormwater runoff quantity standards set forth in the Township of West Windsor Land Use Ordinance and NJAC 7:8.

VII. WATER QUALITY

As noted previously in this report, the proposed redevelopment will reduce the amount of impervious coverage on-site, therefore, the stormwater runoff quality standards, set forth by NJAC 7:8, do not apply to this project. However, proposed water quality manufactured treatment devices have been provided for the development to prevent the outflow of oil generated by the fueling station use, as well as address the applicable Delaware and Raritan Canal Commission water quality treatment requirements. The proposed manufactured treatment devices consist of one (1) First Defense MTD and one (1) Downstream Defender MTD as manufactured by

Hydro International. Each of the proposed MTDs have been certified by the NJDEP to provide a TSS removal rate of 50%. The NJDEP certifications and water quality calculations are included in the Appendix of this report to confirm the development complies with the Delaware and Raritan Canal Commission water quality treatment requirements.

VIII. GROUNDWATER RECHARGE

The proposed redevelopment satisfies the groundwater recharge criteria set forth by NJAC 7:8 by reducing the amount of impervious area on site, which will increase the average annual groundwater recharge volume for the site.

IX. CONCLUSION

The proposed development has been designed with provisions for the safe and efficient control of stormwater runoff in a manner that will not adversely impact the existing drainage patterns of the site.

In addition, this project satisfies the runoff quantity, quality and groundwater recharge requirements set forth by NJAC 7:8 and the Township of West Windsor by reducing the amount of impervious coverage on-site and maintaining the average annual pre-construction groundwater recharge volume for the site. With this stated, it is evident that the proposed development will not have a negative impact on the existing drainage pattern, water quality, or groundwater recharge on site or within the vicinity of the subject parcel.

APPENDIX

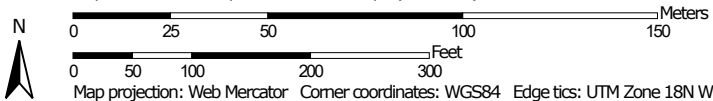
NRCS WEB SOIL SURVEY

Hydrologic Soil Group—Mercer County, New Jersey



Soil Map may not be valid at this scale.

Map Scale: 1:1,940 if printed on A landscape (11" x 8.5") sheet.



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: Mercer County, New Jersey
 Survey Area Data: Version 14, Sep 15, 2018

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

Date(s) aerial images were photographed: Aug 14, 2015—Apr 2, 2017

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
OthA	Othello silt loams, 0 to 2 percent slopes, northern coastal plain	C/D	5.7	100.0%
Totals for Area of Interest			5.7	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

**RUNOFF CURVE NUMBER (CN) CALCULATIONS –
EXISTING AND PROPOSED CONDITIONS**



DYNAMIC ENGINEERING

EXISTING DRAINAGE AREA SUMMARY AND AVERAGE CURVE NUMBER(CN) CALCULATIONS

Project: Paramount Realty

Job #: 1478-99-043

Location: Township of West Windsor, Mercer County, NJ

Computed By: RM

Checked By: KK

Date: 1/6/2020

Drainage Area	Impervious Area (acre)	Impervious Area (sf)	Curve Number (CN) Used	HSG C - Open Space Area (acre)	HSG C - Open Space Area (sf)	Curve Number (CN) Used	Avg. Perv. Curve Number	Total Pervious Area (acres)	Total Area (acres)	TC (Min.)
Ex SA Route 1	1.43	62,225	98	0.23	10,121	74	74	0.23	1.66	10.0
Ex SA West Headwall	1.14	49,472	98	0.16	7,070	74	74	0.16	1.30	10.0
Ex SA West Overland	0.76	33,121	98	0.10	4,436	74	74	0.10	0.86	10.0
Total	3.32	144,818		0.50	21,627			0.50	3.82	

Per Mercer County Soil Survey -	OthA	HSG	C	Soil	Othello silt loams
---------------------------------	------	-----	---	------	--------------------

Description	Runoff Curve Number (CN) (HSG C)
Impervious Surface	98
Open Space (lawn) (good)	74
Woods (good)	70



DYNAMIC ENGINEERING

PROPOSED DRAINAGE AREA SUMMARY AND AVERAGE CURVE NUMBER(CN) CALCULATIONS

Project: Paramount Realty

Job #: 1478-99-043

Location: Township of West Windsor, Mercer County, NJ

Computed By: RM

Checked By: KK

Date: 4/20/2020

Drainage Area	Impervious Area (acre)	Impervious Area (sf)	Curve Number (CN) Used	HSG C - Open Space Area (acre)	HSG C - Open Space Area (sf)	Curve Number (CN) Used	Avg. Perv. Curve Number	Total Pervious Area (acres)	Total Area (acres)	TC (Min.)
Prop SA Route 1	1.26	54,935	98	0.05	2,027	74	74	0.05	1.31	10.0
Prop SA Route 1 - Untreated	0.11	4,825	98	0.21	9,378	74	74	0.21	0.32	10.0
Prop SA West Headwall	1.13	49,077	98	0.16	6,760	74	74	0.16	1.29	10.0
Prop SA West Overland	0.53	23,143	98	0.37	16,300	74	74	0.37	0.90	10.0
Total	3.03	131,980		0.79	34,465			0.79	3.82	

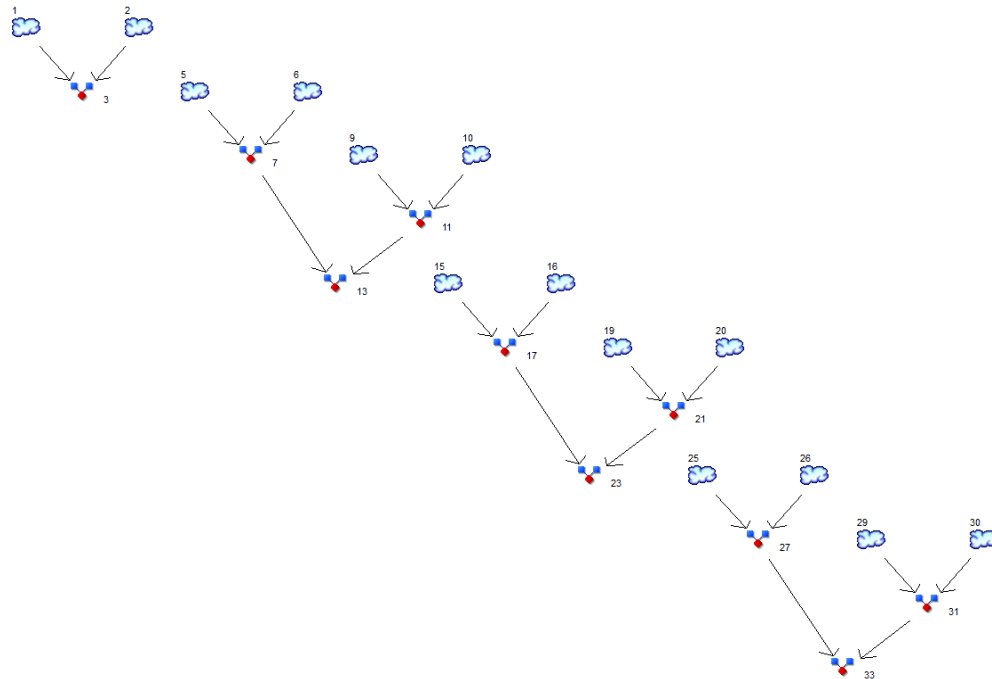
Per Mercer County Soil Survey -	OthA	HSG	C	Soil	Othello silt loams
---------------------------------	------	-----	---	------	--------------------

Description	Runoff Curve Number (CN) (HSG C)
Impervious Surface	98
Open Space (lawn) (good)	74
Woods (good)	70

**HYDROGRAPH SUMMARY REPORTS –
EXISTING AND PROPOSED CONDITIONS 2YR, 10YR, 25YR &
100YR**

Watershed Model Schematic

Hydraflow Hydrographs by Intelisolve v9.1



Legend

Hyd.	Origin	Description
1	SCS Runoff	Ex SA Route 1 - imp.
2	SCS Runoff	Ex SA Route 1 - perv.
3	Combine	Ex SA Route 1 - Total
5	SCS Runoff	Ex SA West Headwall - imp.
6	SCS Runoff	Ex SA West Headwall - perv.
7	Combine	Ex SA West Headwall - Total
9	SCS Runoff	Ex SA West Overland - imp.
10	SCS Runoff	Ex SA West Overland - perv.
11	Combine	Ex SA West Overland - Total
13	Combine	Ex SA West - Total
15	SCS Runoff	Prop SA Route 1 - imp.
16	SCS Runoff	Prop SA Route 1 - perv.
17	Combine	Prop SA Route 1 - Total
19	SCS Runoff	Prop SA Route 1 - Untreated - imp.
20	SCS Runoff	Prop SA Route 1 - Untreated - perv.
21	Combine	Prop SA Route 1 - Untreated - Total
23	Combine	Prop Route 1 - Total
25	SCS Runoff	Prop SA West Headwall - imp.
26	SCS Runoff	Prop SA West Headwall - perv.
27	Combine	Prop SA West Headwall - Total
29	SCS Runoff	Prop SA West Overland - imp.
30	SCS Runoff	Prop SA West Overland - perv.
31	Combine	Prop SA West Overland - Total
33	Combine	Prop West - Total

Watershed Model Schematic	1
Hydrograph Return Period Recap	2
2 - Year	
Summary Report	3
Hydrograph Reports	4
Hydrograph No. 1, SCS Runoff, Ex SA Route 1 - imp.	4
Hydrograph No. 2, SCS Runoff, Ex SA Route 1 - perv.	5
Hydrograph No. 3, Combine, Ex SA Route 1 - Total	6
Hydrograph No. 5, SCS Runoff, Ex SA West Headwall - imp.	7
Hydrograph No. 6, SCS Runoff, Ex SA West Headwall - perv.	8
Hydrograph No. 7, Combine, Ex SA West Headwall - Total	9
Hydrograph No. 9, SCS Runoff, Ex SA West Overland - imp.	10
Hydrograph No. 10, SCS Runoff, Ex SA West Overland - perv.	11
Hydrograph No. 11, Combine, Ex SA West Overland - Total	12
Hydrograph No. 13, Combine, Ex SA West - Total	13
Hydrograph No. 15, SCS Runoff, Prop SA Route 1 - imp.	14
Hydrograph No. 16, SCS Runoff, Prop SA Route 1 - perv.	15
Hydrograph No. 17, Combine, Prop SA Route 1 - Total	16
Hydrograph No. 19, SCS Runoff, Prop SA Route 1 - Untreated - imp.	17
Hydrograph No. 20, SCS Runoff, Prop SA Route 1 - Untreated - perv.	18
Hydrograph No. 21, Combine, Prop SA Route 1 - Untreated - Total	19
Hydrograph No. 23, Combine, Prop Route 1 - Total	20
Hydrograph No. 25, SCS Runoff, Prop SA West Headwall - imp.	21
Hydrograph No. 26, SCS Runoff, Prop SA West Headwall - perv.	22
Hydrograph No. 27, Combine, Prop SA West Headwall - Total	23
Hydrograph No. 29, SCS Runoff, Prop SA West Overland - imp.	24
Hydrograph No. 30, SCS Runoff, Prop SA West Overland - perv.	25
Hydrograph No. 31, Combine, Prop SA West Overland - Total	26
Hydrograph No. 33, Combine, Prop West - Total	27
10 - Year	
Summary Report	28
Hydrograph Reports	29
Hydrograph No. 1, SCS Runoff, Ex SA Route 1 - imp.	29
Hydrograph No. 2, SCS Runoff, Ex SA Route 1 - perv.	30
Hydrograph No. 3, Combine, Ex SA Route 1 - Total	31
Hydrograph No. 5, SCS Runoff, Ex SA West Headwall - imp.	32
Hydrograph No. 6, SCS Runoff, Ex SA West Headwall - perv.	33
Hydrograph No. 7, Combine, Ex SA West Headwall - Total	34
Hydrograph No. 9, SCS Runoff, Ex SA West Overland - imp.	35
Hydrograph No. 10, SCS Runoff, Ex SA West Overland - perv.	36
Hydrograph No. 11, Combine, Ex SA West Overland - Total	37
Hydrograph No. 13, Combine, Ex SA West - Total	38
Hydrograph No. 15, SCS Runoff, Prop SA Route 1 - imp.	39
Hydrograph No. 16, SCS Runoff, Prop SA Route 1 - perv.	40
Hydrograph No. 17, Combine, Prop SA Route 1 - Total	41
Hydrograph No. 19, SCS Runoff, Prop SA Route 1 - Untreated - imp.	42

Hydrograph No. 20, SCS Runoff, Prop SA Route 1 - Untreated - perv.	43
Hydrograph No. 21, Combine, Prop SA Route 1 - Untreated - Total	44
Hydrograph No. 23, Combine, Prop Route 1 - Total	45
Hydrograph No. 25, SCS Runoff, Prop SA West Headwall - imp.	46
Hydrograph No. 26, SCS Runoff, Prop SA West Headwall - perv.	47
Hydrograph No. 27, Combine, Prop SA West Headwall - Total	48
Hydrograph No. 29, SCS Runoff, Prop SA West Overland - imp.	49
Hydrograph No. 30, SCS Runoff, Prop SA West Overland - perv.	50
Hydrograph No. 31, Combine, Prop SA West Overland - Total	51
Hydrograph No. 33, Combine, Prop West - Total	52

25 - Year

Summary Report	53
Hydrograph Reports	54
Hydrograph No. 1, SCS Runoff, Ex SA Route 1 - imp.	54
Hydrograph No. 2, SCS Runoff, Ex SA Route 1 - perv.	55
Hydrograph No. 3, Combine, Ex SA Route 1 - Total	56
Hydrograph No. 5, SCS Runoff, Ex SA West Headwall - imp.	57
Hydrograph No. 6, SCS Runoff, Ex SA West Headwall - perv.	58
Hydrograph No. 7, Combine, Ex SA West Headwall - Total	59
Hydrograph No. 9, SCS Runoff, Ex SA West Overland - imp.	60
Hydrograph No. 10, SCS Runoff, Ex SA West Overland - perv.	61
Hydrograph No. 11, Combine, Ex SA West Overland - Total	62
Hydrograph No. 13, Combine, Ex SA West - Total	63
Hydrograph No. 15, SCS Runoff, Prop SA Route 1 - imp.	64
Hydrograph No. 16, SCS Runoff, Prop SA Route 1 - perv.	65
Hydrograph No. 17, Combine, Prop SA Route 1 - Total	66
Hydrograph No. 19, SCS Runoff, Prop SA Route 1 - Untreated - imp.	67
Hydrograph No. 20, SCS Runoff, Prop SA Route 1 - Untreated - perv.	68
Hydrograph No. 21, Combine, Prop SA Route 1 - Untreated - Total	69
Hydrograph No. 23, Combine, Prop Route 1 - Total	70
Hydrograph No. 25, SCS Runoff, Prop SA West Headwall - imp.	71
Hydrograph No. 26, SCS Runoff, Prop SA West Headwall - perv.	72
Hydrograph No. 27, Combine, Prop SA West Headwall - Total	73
Hydrograph No. 29, SCS Runoff, Prop SA West Overland - imp.	74
Hydrograph No. 30, SCS Runoff, Prop SA West Overland - perv.	75
Hydrograph No. 31, Combine, Prop SA West Overland - Total	76
Hydrograph No. 33, Combine, Prop West - Total	77

100 - Year

Summary Report	78
Hydrograph Reports	79
Hydrograph No. 1, SCS Runoff, Ex SA Route 1 - imp.	79
Hydrograph No. 2, SCS Runoff, Ex SA Route 1 - perv.	80
Hydrograph No. 3, Combine, Ex SA Route 1 - Total	81
Hydrograph No. 5, SCS Runoff, Ex SA West Headwall - imp.	82
Hydrograph No. 6, SCS Runoff, Ex SA West Headwall - perv.	83
Hydrograph No. 7, Combine, Ex SA West Headwall - Total	84
Hydrograph No. 9, SCS Runoff, Ex SA West Overland - imp.	85
Hydrograph No. 10, SCS Runoff, Ex SA West Overland - perv.	86
Hydrograph No. 11, Combine, Ex SA West Overland - Total	87
Hydrograph No. 13, Combine, Ex SA West - Total	88

Hydrograph No. 15, SCS Runoff, Prop SA Route 1 - imp.	89
Hydrograph No. 16, SCS Runoff, Prop SA Route 1 - perv.	90
Hydrograph No. 17, Combine, Prop SA Route 1 - Total	91
Hydrograph No. 19, SCS Runoff, Prop SA Route 1 - Untreated - imp.	92
Hydrograph No. 20, SCS Runoff, Prop SA Route 1 - Untreated - perv.	93
Hydrograph No. 21, Combine, Prop SA Route 1 - Untreated - Total	94
Hydrograph No. 23, Combine, Prop Route 1 - Total	95
Hydrograph No. 25, SCS Runoff, Prop SA West Headwall - imp.	96
Hydrograph No. 26, SCS Runoff, Prop SA West Headwall - perv.	97
Hydrograph No. 27, Combine, Prop SA West Headwall - Total	98
Hydrograph No. 29, SCS Runoff, Prop SA West Overland - imp.	99
Hydrograph No. 30, SCS Runoff, Prop SA West Overland - perv.	100
Hydrograph No. 31, Combine, Prop SA West Overland - Total	101
Hydrograph No. 33, Combine, Prop West - Total	102
 IDF Report	 103

Hydrograph Return Period Recap

Hydroflow Hydrographs by Intellisolve v9.1

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)						Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	
1	SCS Runoff	-----	3.332	5.078	6.286	8.473	Ex SA Route 1 - imp.		
2	SCS Runoff	-----	0.210	0.466	0.659	1.023	Ex SA Route 1 - perv.		
3	Combine	1, 2	3.542	5.544	6.945	9.496	Ex SA Route 1 - Total		
5	SCS Runoff	-----	2.656	4.048	5.011	6.755	Ex SA West Headwall - imp.		
6	SCS Runoff	-----	0.146	0.324	0.459	0.711	Ex SA West Headwall - perv.		
7	Combine	5, 6	2.802	4.372	5.470	7.466	Ex SA West Headwall - Total		
9	SCS Runoff	-----	1.771	2.699	3.341	4.503	Ex SA West Overland - imp.		
10	SCS Runoff	-----	0.091	0.203	0.287	0.445	Ex SA West Overland - perv.		
11	Combine	9, 10	1.862	2.901	3.627	4.948	Ex SA West Overland - Total		
13	Combine	7, 11	4.665	7.274	9.097	12.41	Ex SA West - Total		
15	SCS Runoff	-----	2.936	4.474	5.539	7.466	Prop SA Route 1 - imp.		
16	SCS Runoff	-----	0.046	0.101	0.143	0.222	Prop SA Route 1 - perv.		
17	Combine	15, 16	2.982	4.575	5.682	7.688	Prop SA Route 1 - Total		
19	SCS Runoff	-----	0.256	0.391	0.484	0.652	Prop SA Route 1 - Untreated - imp.		
20	SCS Runoff	-----	0.192	0.426	0.602	0.934	Prop SA Route 1 - Untreated - perv.		
21	Combine	19, 20	0.448	0.816	1.085	1.586	Prop SA Route 1 - Untreated - Total		
23	Combine	17, 21	3.430	5.392	6.767	9.274	Prop Route 1 - Total		
25	SCS Runoff	-----	2.633	4.013	4.967	6.696	Prop SA West Headwall - imp.		
26	SCS Runoff	-----	0.146	0.324	0.459	0.711	Prop SA West Headwall - perv.		
27	Combine	25, 26	2.779	4.337	5.426	7.407	Prop SA West Headwall - Total		
29	SCS Runoff	-----	1.235	1.882	2.330	3.141	Prop SA West Overland - imp.		
30	SCS Runoff	-----	0.338	0.750	1.061	1.645	Prop SA West Overland - perv.		
31	Combine	29, 30	1.573	2.632	3.390	4.786	Prop SA West Overland - Total		
33	Combine	27, 31	4.352	6.969	8.816	12.19	Prop West - Total		

Proj. file: Ex & Prop - 2, 10, 25, 100 yr.gpw

Thursday, Apr 30, 2020

Hydrograph Summary Report

Hydroflow Hydrographs by Intellisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strgs used (cuft)	Hydrograph description
1	SCS Runoff	3.332	5	730	14,975	-----	-----	-----	Ex SA Route 1 - imp.
2	SCS Runoff	0.210	5	730	869	-----	-----	-----	Ex SA Route 1 - perv.
3	Combine	3.542	5	730	15,944	1, 2	-----	-----	Ex SA Route 1 - Total
5	SCS Runoff	2.656	5	730	11,938	-----	-----	-----	Ex SA West Headwall - imp.
6	SCS Runoff	0.146	5	730	605	-----	-----	-----	Ex SA West Headwall - perv.
7	Combine	2.802	5	730	12,543	5, 6	-----	-----	Ex SA West Headwall - Total
9	SCS Runoff	1.771	5	730	7,959	-----	-----	-----	Ex SA West Overland - imp.
10	SCS Runoff	0.091	5	730	378	-----	-----	-----	Ex SA West Overland - perv.
11	Combine	1.862	5	730	8,336	9, 10	-----	-----	Ex SA West Overland - Total
13	Combine	4.665	5	730	20,879	7, 11	-----	-----	Ex SA West - Total
15	SCS Runoff	2.936	5	730	13,194	-----	-----	-----	Prop SA Route 1 - imp.
16	SCS Runoff	0.046	5	730	189	-----	-----	-----	Prop SA Route 1 - perv.
17	Combine	2.982	5	730	13,383	15, 16	-----	-----	Prop SA Route 1 - Total
19	SCS Runoff	0.256	5	730	1,152	-----	-----	-----	Prop SA Route 1 - Untreated - imp.
20	SCS Runoff	0.192	5	730	794	-----	-----	-----	Prop SA Route 1 - Untreated - perv.
21	Combine	0.448	5	730	1,946	19, 20	-----	-----	Prop SA Route 1 - Untreated - Total
23	Combine	3.430	5	730	15,329	17, 21	-----	-----	Prop Route 1 - Total
25	SCS Runoff	2.633	5	730	11,833	-----	-----	-----	Prop SA West Headwall - imp.
26	SCS Runoff	0.146	5	730	605	-----	-----	-----	Prop SA West Headwall - perv.
27	Combine	2.779	5	730	12,438	25, 26	-----	-----	Prop SA West Headwall - Total
29	SCS Runoff	1.235	5	730	5,550	-----	-----	-----	Prop SA West Overland - imp.
30	SCS Runoff	0.338	5	730	1,398	-----	-----	-----	Prop SA West Overland - perv.
31	Combine	1.573	5	730	6,948	29, 30	-----	-----	Prop SA West Overland - Total
33	Combine	4.352	5	730	19,386	27, 31	-----	-----	Prop West - Total

Ex & Prop - 2, 10, 25, 100 yr.gpw

Return Period: 2 Year

Thursday, Apr 30, 2020

Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 1

Ex SA Route 1 - imp.

Hydrograph type = SCS Runoff
 Storm frequency = 2 yrs
 Time interval = 5 min
 Drainage area = 1.430 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 3.31 in
 Storm duration = 24 hrs

Peak discharge = 3.332 cfs
 Time to peak = 730 min
 Hyd. volume = 14,975 cuft
 Curve number = 98
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484

Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 2

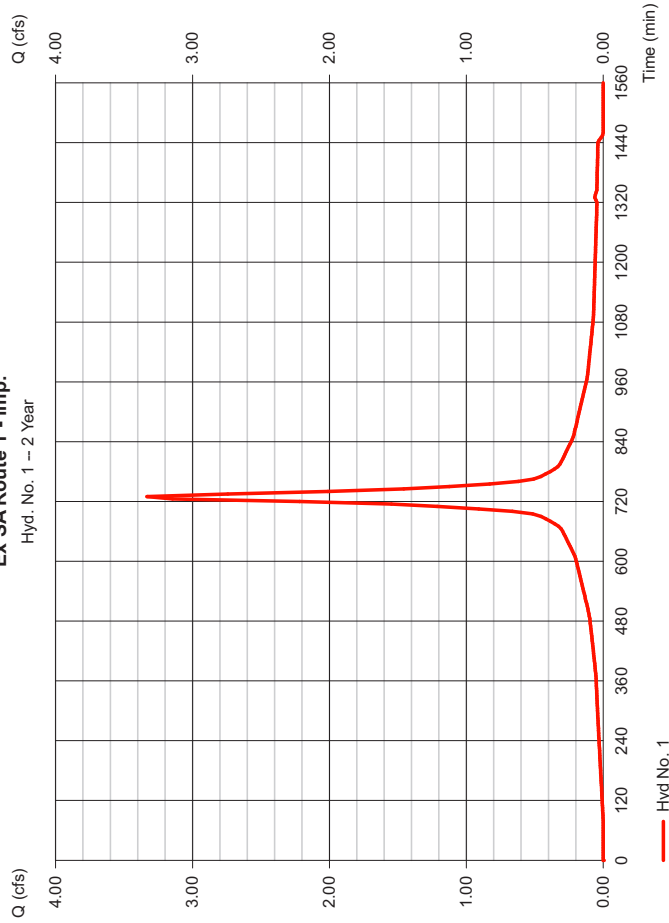
Ex SA Route 1 - perv.

Hydrograph type = SCS Runoff
 Storm frequency = 2 yrs
 Time interval = 5 min
 Drainage area = 0.230 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 3.31 in
 Storm duration = 24 hrs

Peak discharge = 0.210 cfs
 Time to peak = 730 min
 Hyd. volume = 869 cuft
 Curve number = 74
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484

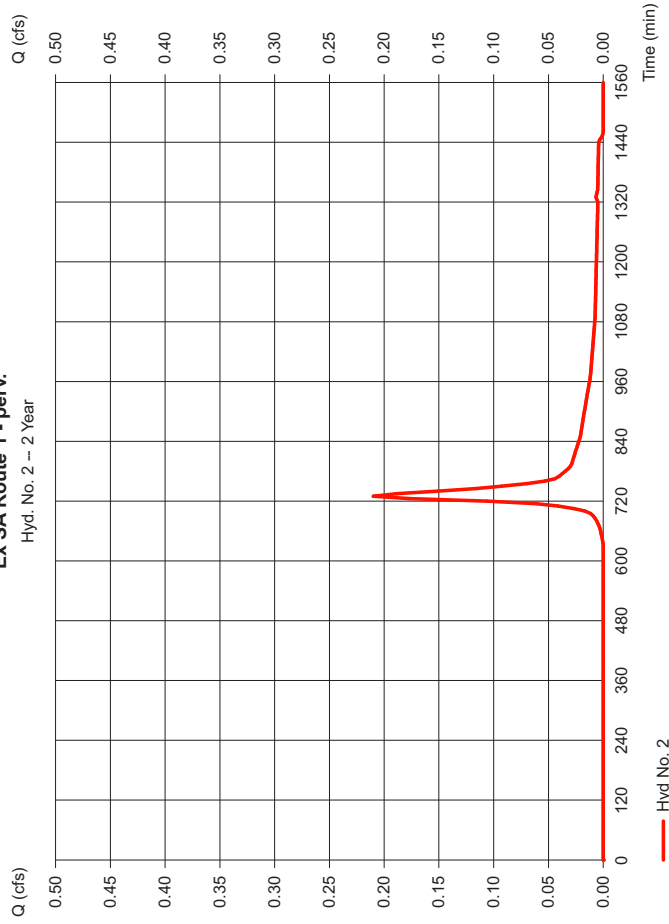
Ex SA Route 1 - imp.

Hyd. No. 1 -- 2 Year



Ex SA Route 1 - perv.

Hyd. No. 2 -- 2 Year



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 3

Ex SA Route 1 - Total

Hydrograph type = Combine
 Storm frequency = 2 yrs
 Time interval = 5 min
 Inflow hyds. = 1, 2

Peak discharge = 3.542 cfs
 Time to peak = 730 min
 Hyd. volume = 15,844 cuft
 Contrib. drain. area = 1.660 ac

Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 5

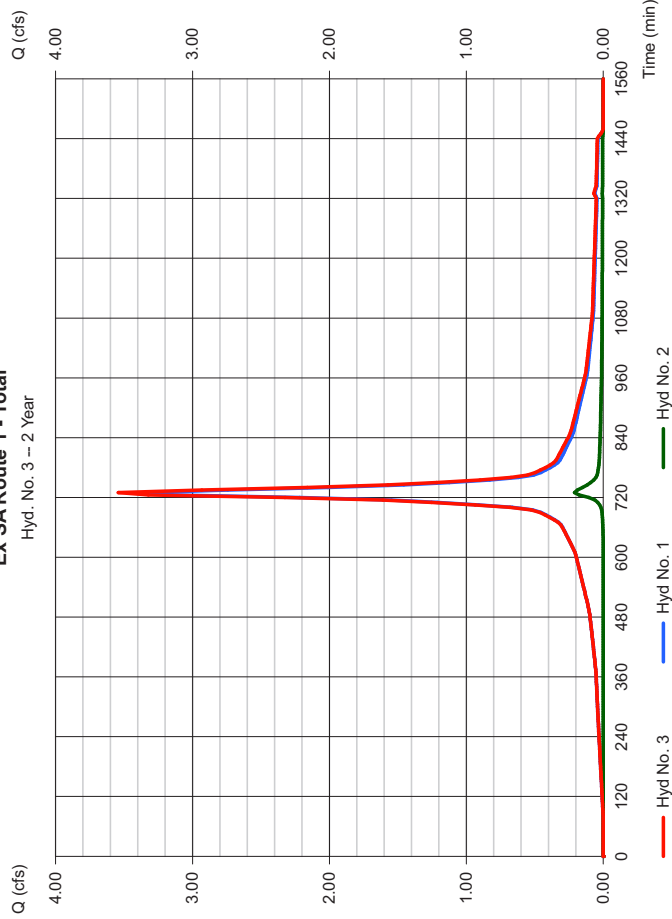
Ex SA West Headwall - imp.

Hydrograph type = SCS Runoff
 Storm frequency = 2 yrs
 Time interval = 5 min
 Drainage area = 1.140 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 3.31 in
 Storm duration = 24 hrs

Peak discharge = 2.656 cfs
 Time to peak = 730 min
 Hyd. volume = 11,938 cuft
 Curve number = 98
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484

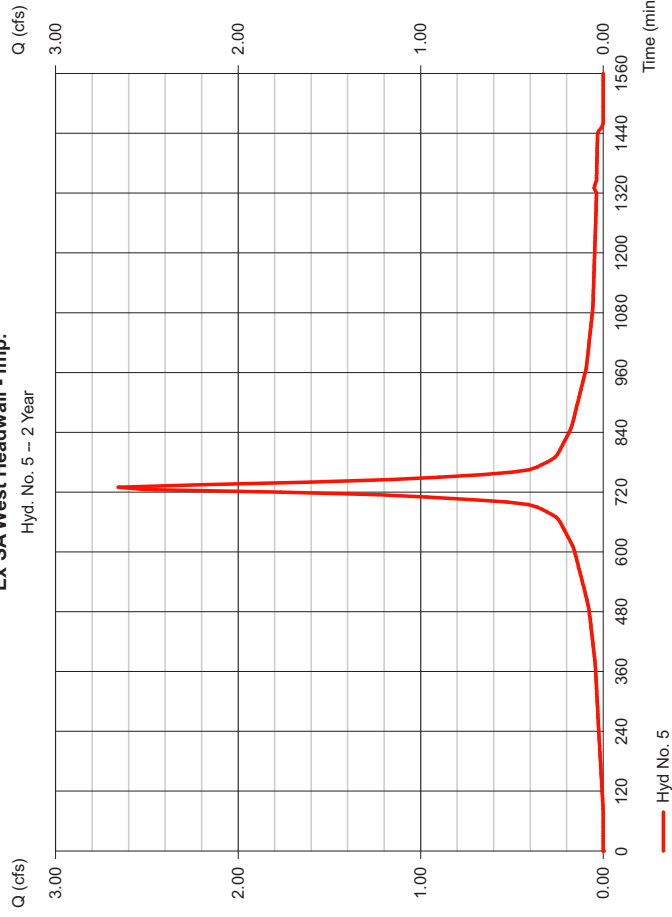
Ex SA Route 1 - Total

Hyd. No. 3 -- 2 Year



Ex SA West Headwall - imp.

Hyd. No. 5 -- 2 Year



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

8

Thursday, Apr 30, 2020

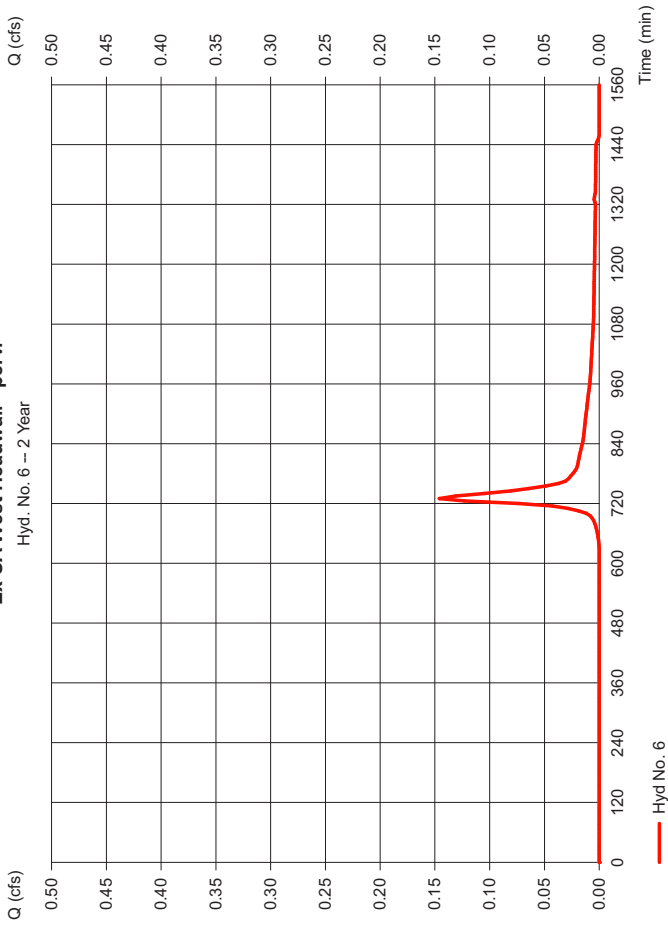
Hyd. No. 6

Ex SA West Headwall - perv.

Hydrograph type = SCS Runoff
 Storm frequency = 2 yrs
 Time interval = 5 min
 Drainage area = 0.160 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 3.31 in
 Storm duration = 24 hrs

Peak discharge = 0.146 cfs
 Time to peak = 730 min
 Hyd. volume = 605 cuft
 Curve number = 74
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484

Ex SA West Headwall - perv.



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

9

Thursday, Apr 30, 2020

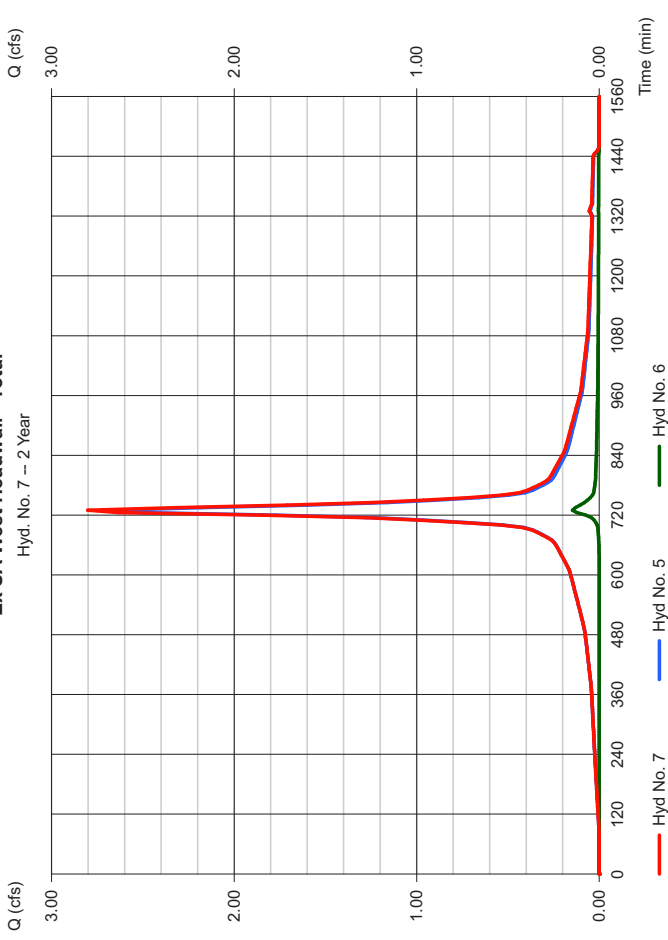
Hyd. No. 7

Ex SA West Headwall - Total

Hydrograph type = Combine
 Storm frequency = 2 yrs
 Time interval = 5 min
 Inflow hyds. = 5, 6

Peak discharge = 2.802 cfs
 Time to peak = 730 min
 Hyd. volume = 12,543 cuft
 Contrib. drain. area = 1,300 ac

Ex SA West Headwall - Total



Hydrograph Report

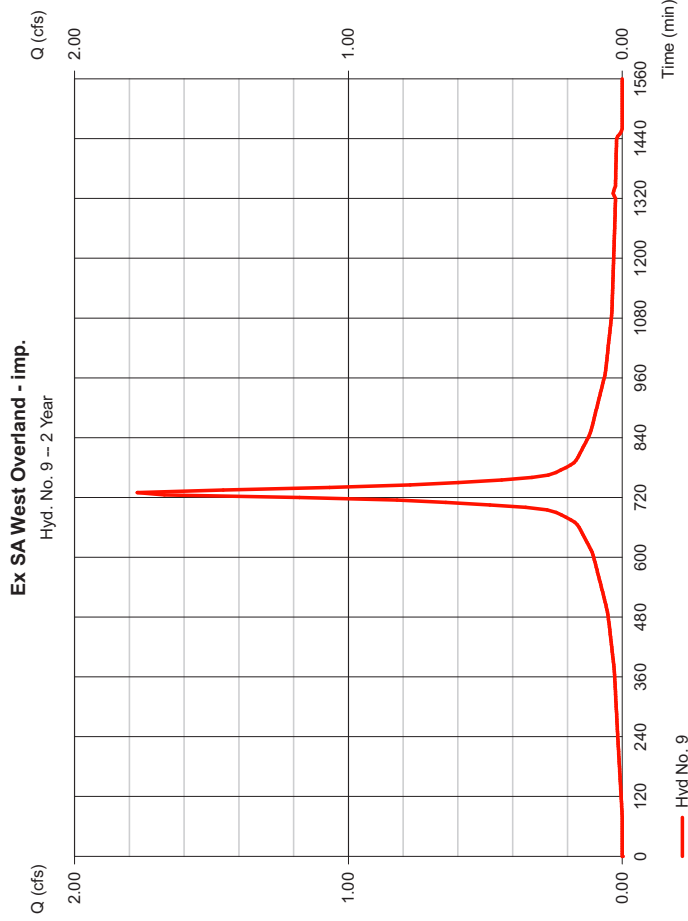
Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 9

Ex SA West Overland - imp.

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.771 cfs
Storm frequency	=	2 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	7.959 cuft
Drainage area	=	0.760 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.31 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Report

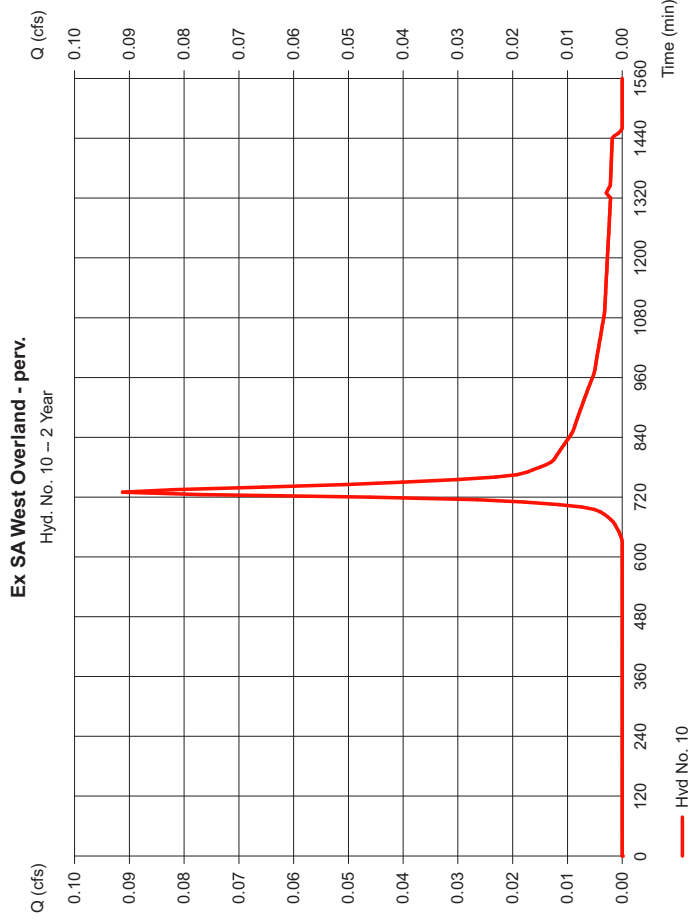
Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 10

Ex SA West Overland - perv.

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.091 cfs
Storm frequency	=	2 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	378 cuft
Drainage area	=	0.100 ac	Curve number	=	74
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.31 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

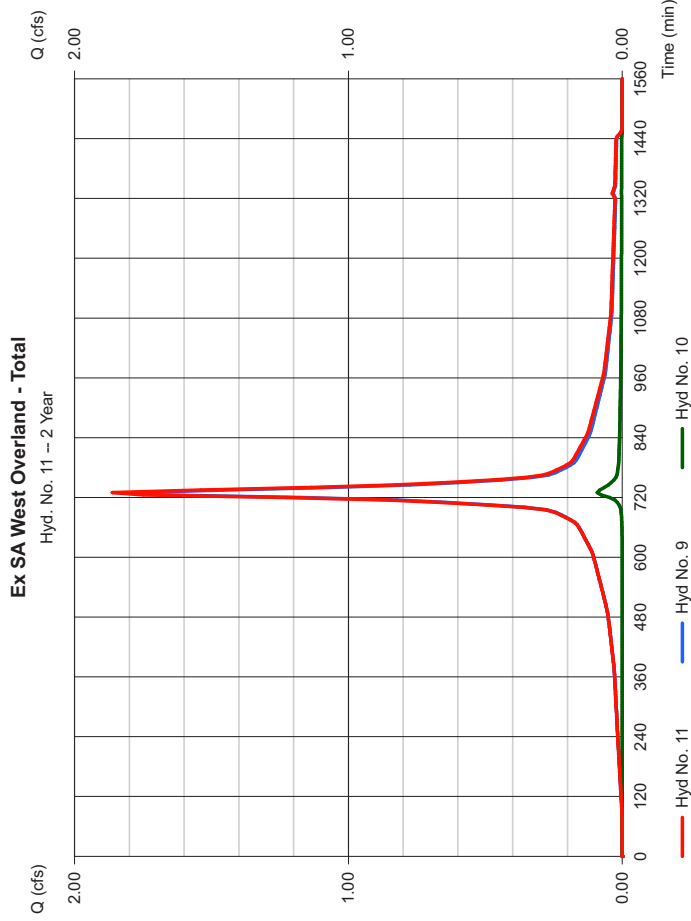
Thursday, Apr 30, 2020

Hyd. No. 11

Ex SA West Overland - Total

Hydrograph type = Combine
 Storm frequency = 2 yrs
 Time interval = 5 min
 Inflow hyds. = 9, 10

Peak discharge = 1.862 cfs
 Time to peak = 730 min
 Hyd. volume = 8,336 cuft
 Contrib. drain. area = 0.860 ac



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

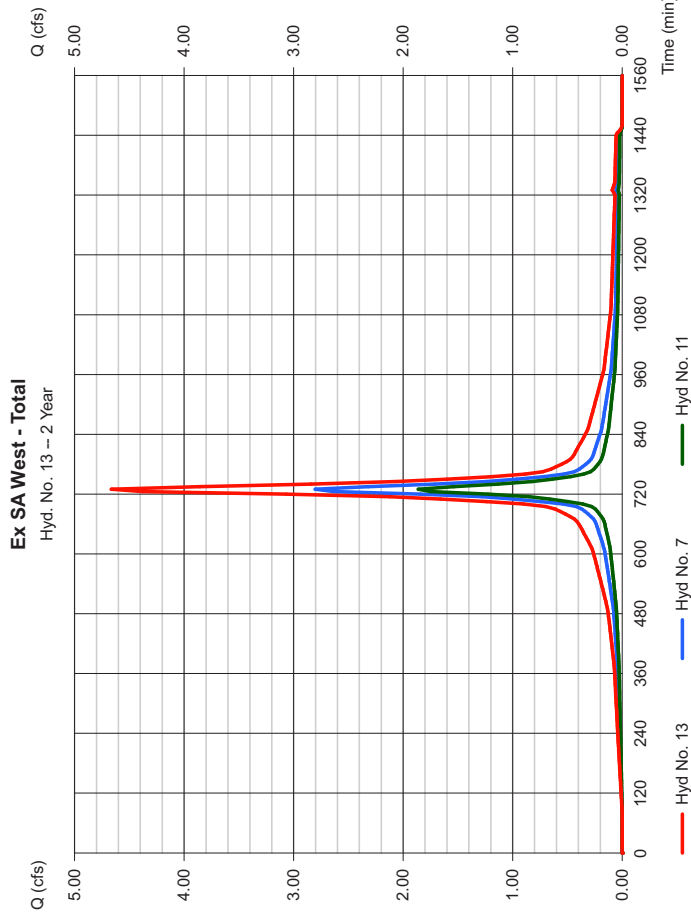
Thursday, Apr 30, 2020

Hyd. No. 13

Ex SA West - Total

Hydrograph type = Combine
 Storm frequency = 2 yrs
 Time interval = 5 min
 Inflow hyds. = 7, 11

Peak discharge = 4.665 cfs
 Time to peak = 730 min
 Hyd. volume = 20,879 cuft
 Contrib. drain. area = 0.000 ac



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

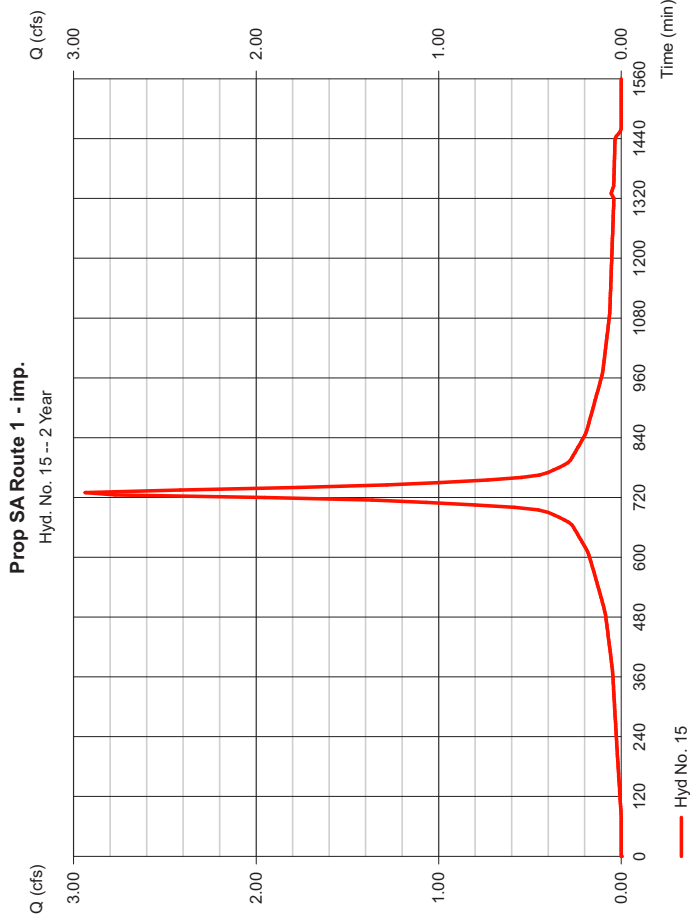
Thursday, Apr 30, 2020

Hyd. No. 15

Prop SA Route 1 - imp.

Hydrograph type = SCS Runoff
 Storm frequency = 2 yrs
 Time interval = 5 min
 Drainage area = 1.260 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 3.31 in
 Storm duration = 24 hrs

Peak discharge = 2.936 cfs
 Time to peak = 730 min
 Hyd. volume = 13,194 cuft
 Curve number = 98
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

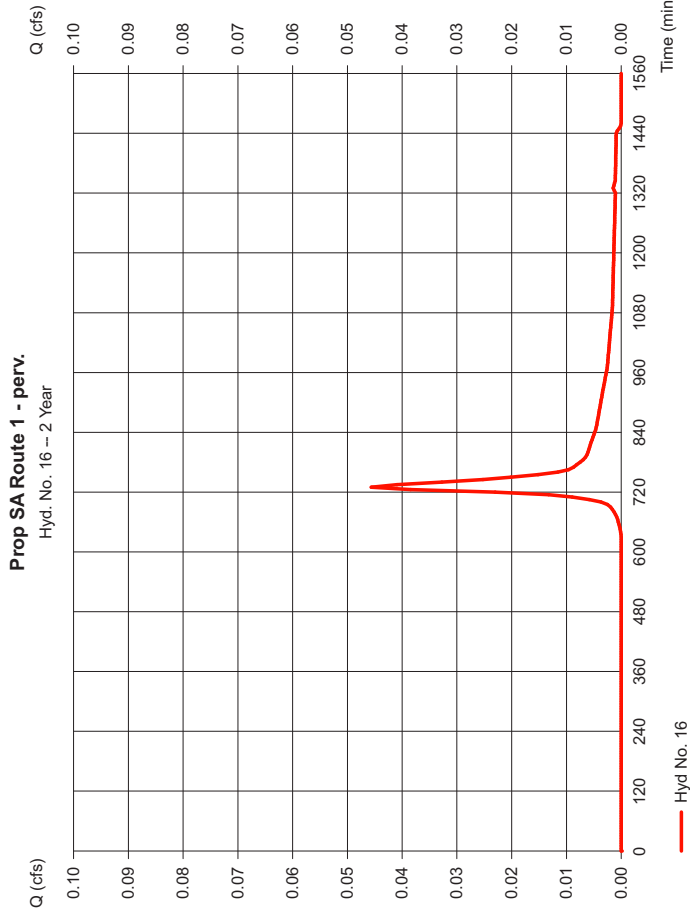
Thursday, Apr 30, 2020

Hyd. No. 16

Prop SA Route 1 - perv.

Hydrograph type = SCS Runoff
 Storm frequency = 2 yrs
 Time interval = 5 min
 Drainage area = 0.050 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 3.31 in
 Storm duration = 24 hrs

Peak discharge = 0.046 cfs
 Time to peak = 730 min
 Hyd. volume = 189 cuft
 Curve number = 74
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 17

Prop SA Route 1 - Total

Hydrograph type = Combine
 Storm frequency = 2 yrs
 Time interval = 5 min
 Inflow hyds. = 15, 16

Peak discharge = 2.982 cfs
 Time to peak = 730 min
 Hyd. volume = 13,383 cuft
 Contrib. drain. area = 1.310 ac

Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

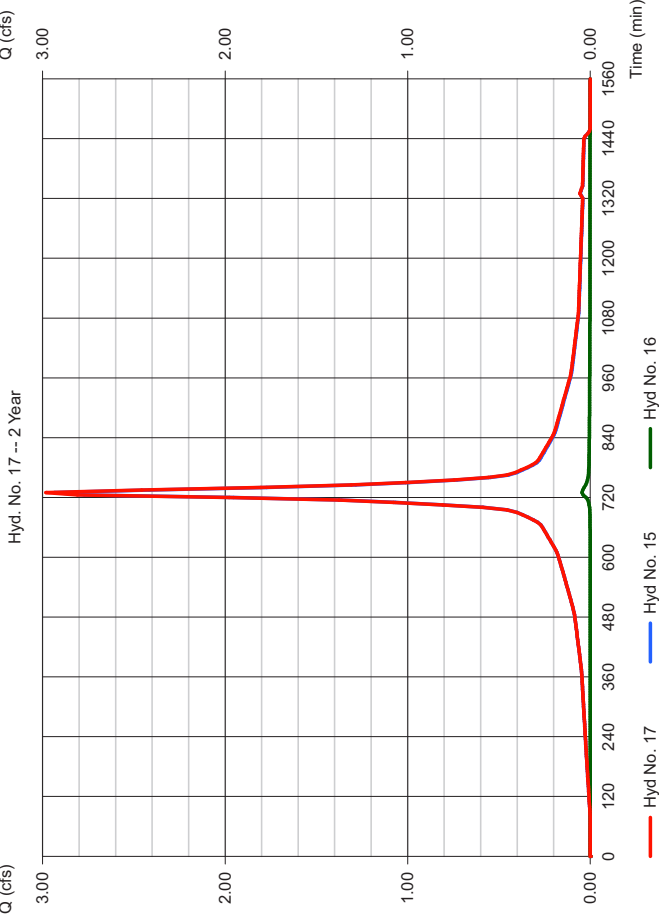
Hyd. No. 19

Prop SA Route 1 - Untreated - imp.

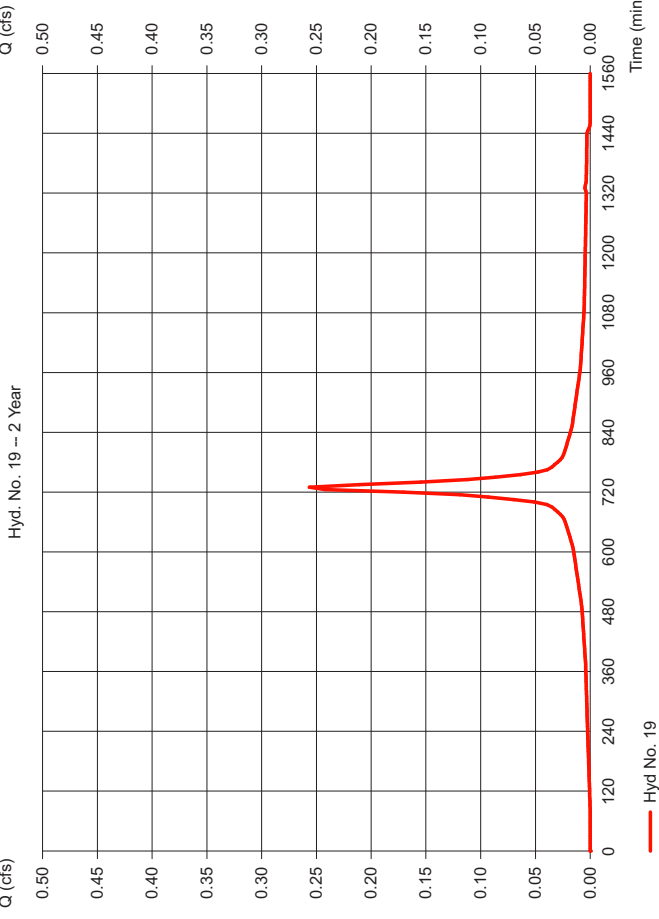
Hydrograph type = SCS Runoff
 Storm frequency = 2 yrs
 Time interval = 5 min
 Drainage area = 0.110 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 3.31 in
 Storm duration = 24 hrs

Peak discharge = 0.256 cfs
 Time to peak = 730 min
 Hyd. volume = 1,152 cuft
 Curve number = 98
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484

Prop SA Route 1 - Total



Prop SA Route 1 - Untreated - imp.



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

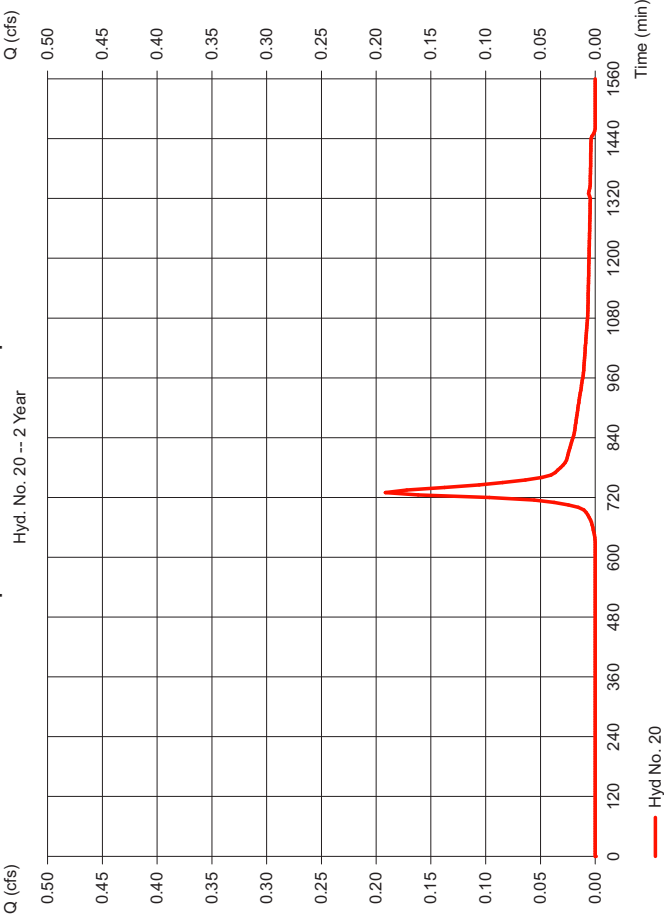
Thursday, Apr 30, 2020

Hyd. No. 20

Prop SA Route 1 - Untreated - perv.

Hydrograph type	= SCS Runoff	Peak discharge	= 0.192 cfs
Storm frequency	= 2 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 794 cuft
Drainage area	= 0.210 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.31 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Prop SA Route 1 - Untreated - perv.



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

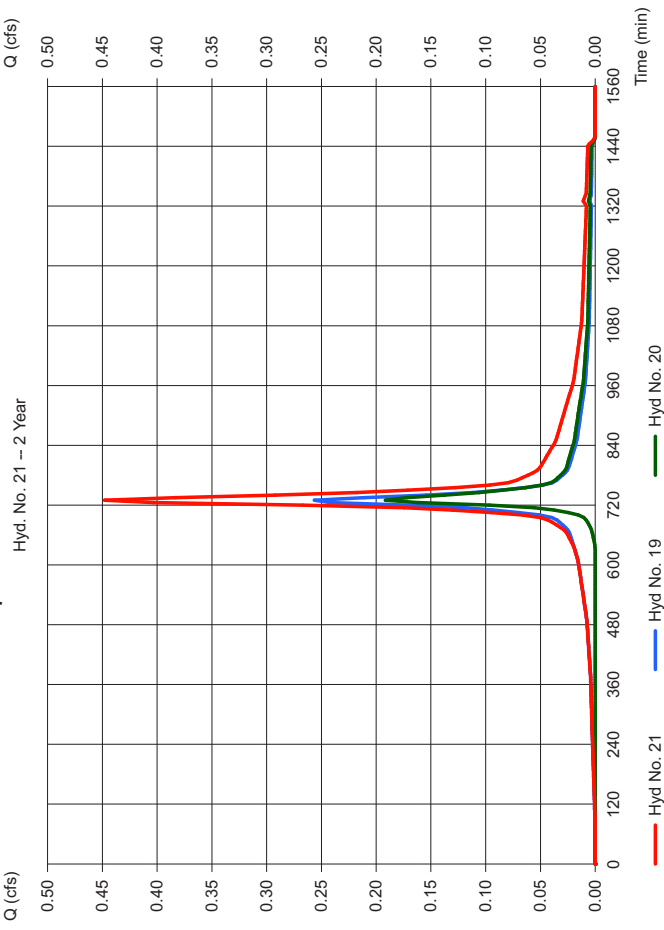
Thursday, Apr 30, 2020

Hyd. No. 21

Prop SA Route 1 - Untreated - Total

Hydrograph type	= Combine	Peak discharge	= 0.448 cfs
Storm frequency	= 2 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 1,946 cuft
Inflow hyds.	= 19, 20	Contrib. drain. area	= 0.320 ac

Prop SA Route 1 - Untreated - Total



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 23

Prop Route 1 - Total

Hydrograph type = Combine
 Storm frequency = 2 yrs
 Time interval = 5 min
 Inflow hyds. = 17, 21

Peak discharge = 3,430 cfs
 Time to peak = 730 min
 Hyd. volume = 15,329 cuft
 Contrib. drain. area = 0,000 ac

Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

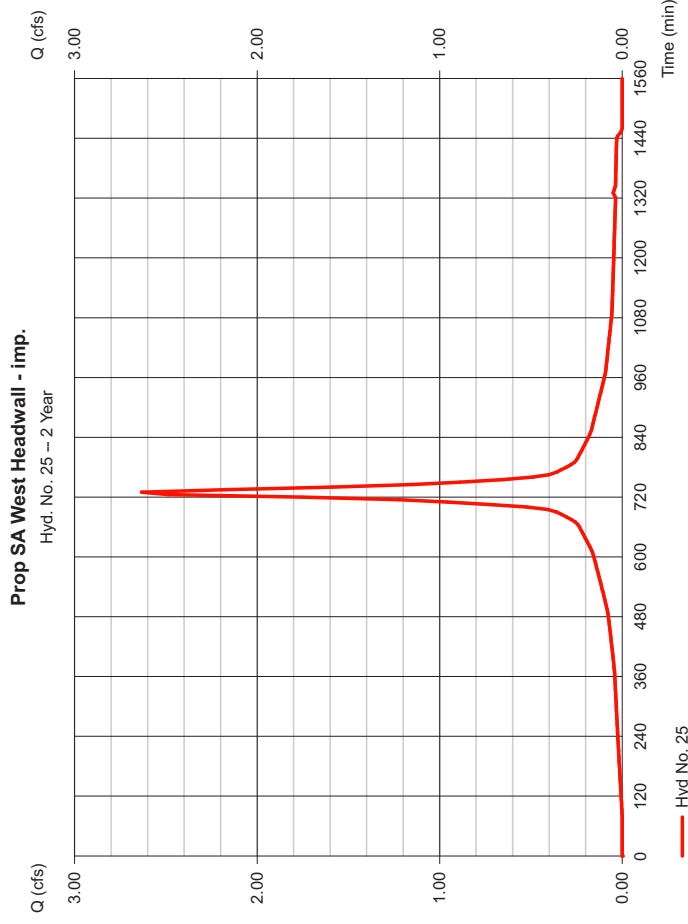
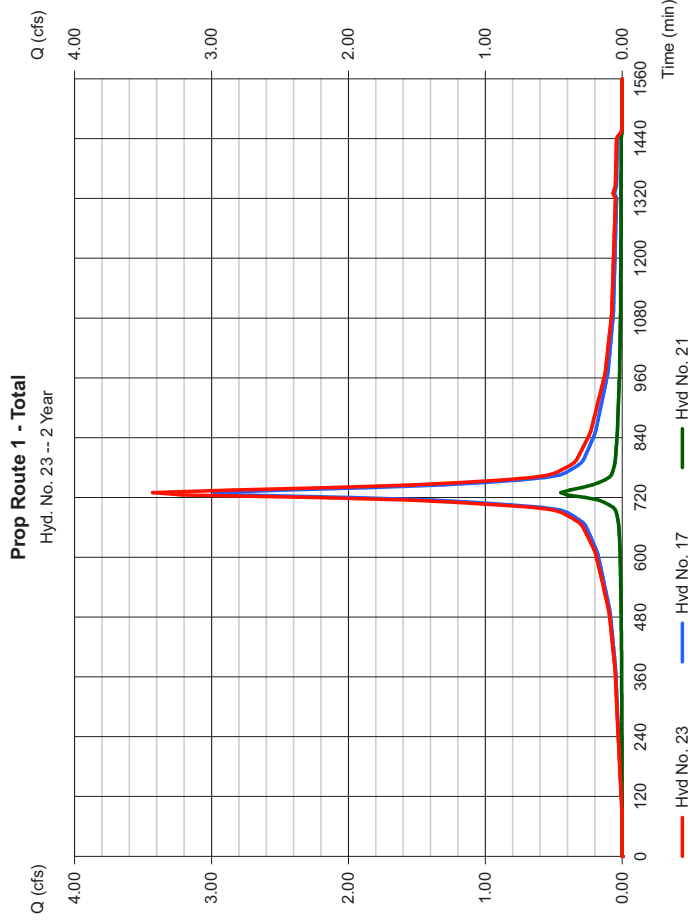
Thursday, Apr 30, 2020

Hyd. No. 25

Prop SA West Headwall - imp.

Hydrograph type = SCS Runoff
 Storm frequency = 2 yrs
 Time interval = 5 min
 Drainage area = 1,130 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 3.31 in
 Storm duration = 24 hrs

Peak discharge = 2,633 cfs
 Time to peak = 730 min
 Hyd. volume = 11,833 cuft
 Curve number = 98
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

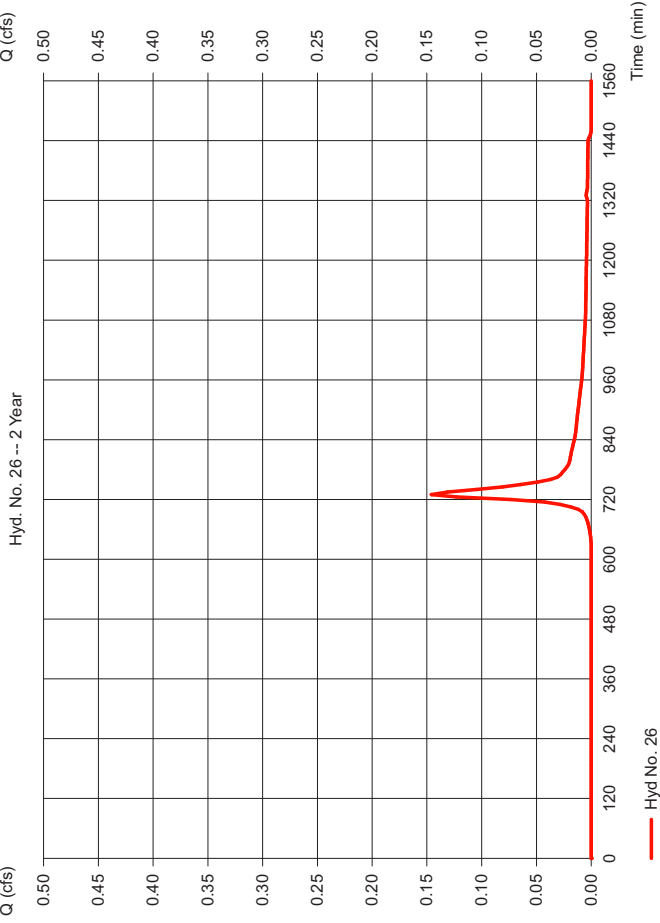
Thursday, Apr 30, 2020

Hyd. No. 26

Prop SA West Headwall - perv.

Hydrograph type	= SCS Runoff	Peak discharge	= 0.146 cfs
Storm frequency	= 2 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 605 cuft
Drainage area	= 0.160 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.31 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Prop SA West Headwall - perv.



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

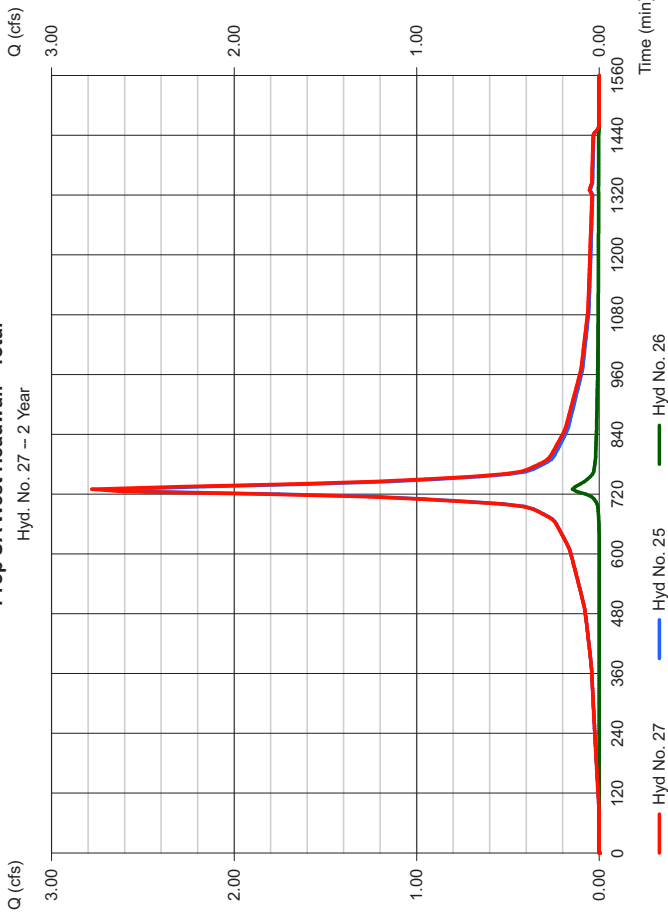
Thursday, Apr 30, 2020

Hyd. No. 27

Prop SA West Headwall - Total

Hydrograph type	= Combine	Peak discharge	= 2.779 cfs
Storm frequency	= 2 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 12,438 cuft
Inflow hyds.	= 25, 26	Contrib. drain. area	= 1,290 ac

Prop SA West Headwall - Total



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

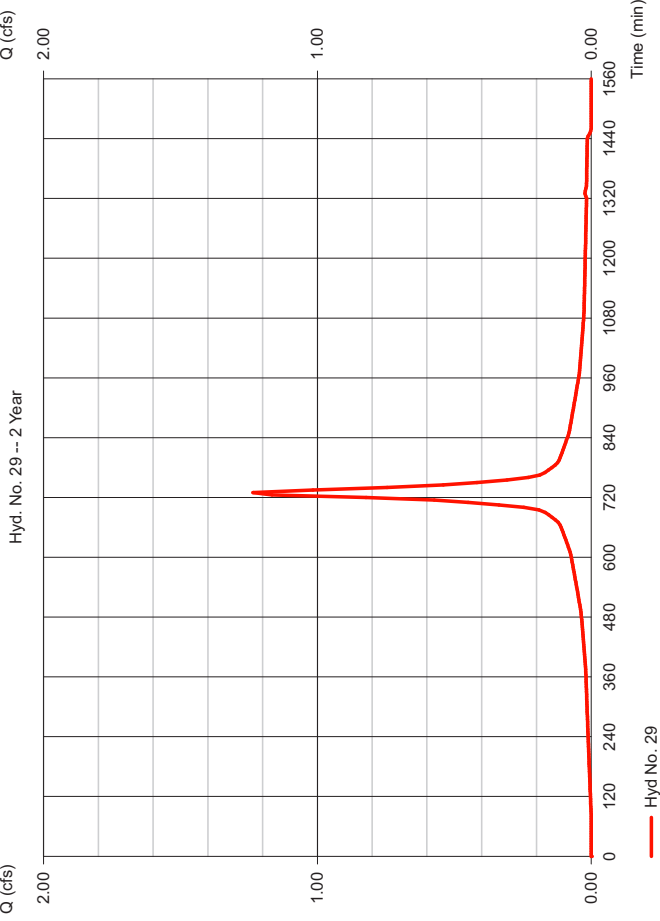
Thursday, Apr 30, 2020

Hyd. No. 29

Prop SA West Overland - imp.

Hydrograph type	=	SCS Runoff	Peak discharge	=	1,235 cfs
Storm frequency	=	2 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	5,550 cuft
Drainage area	=	0.530 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.31 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

Prop SA West Overland - imp.



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

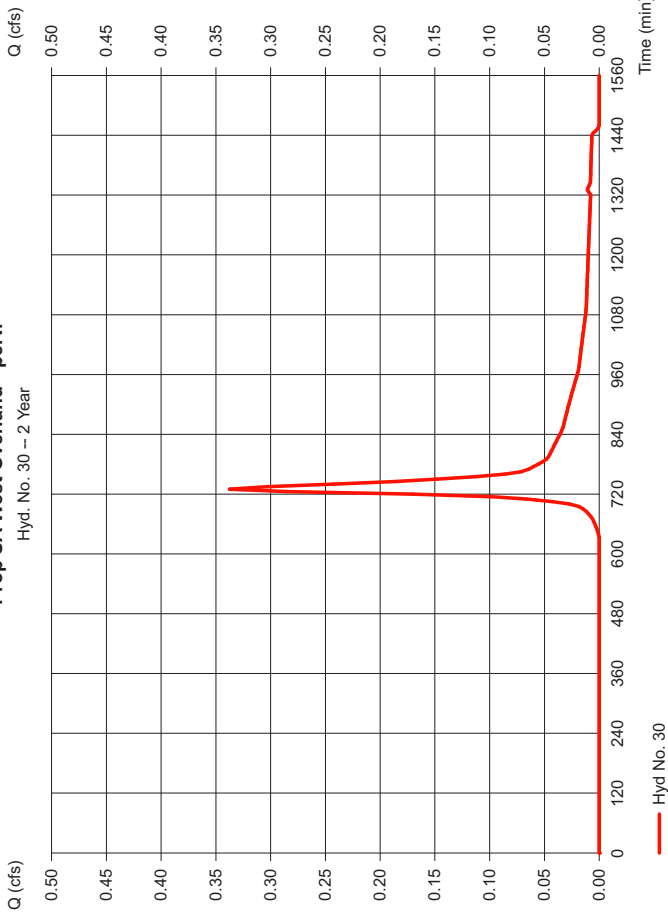
Thursday, Apr 30, 2020

Hyd. No. 30

Prop SA West Overland - perv.

Hydrograph type	=	SCS Runoff	Peak discharge	=	0,338 cfs
Storm frequency	=	2 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	1,398 cuft
Drainage area	=	0.370 ac	Curve number	=	74
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.31 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

Prop SA West Overland - perv.



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

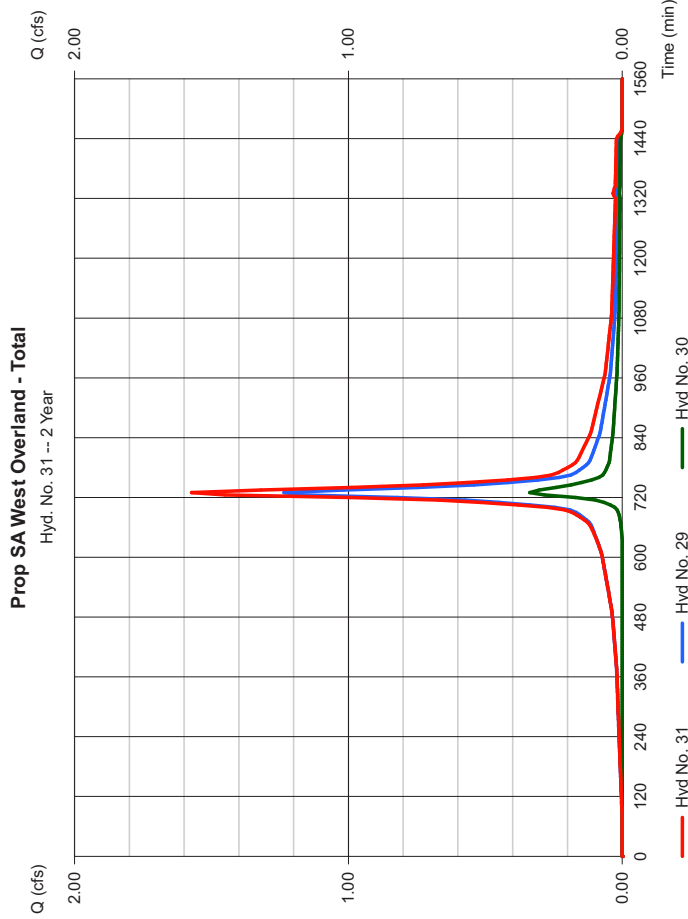
Thursday, Apr 30, 2020

Hyd. No. 31

Prop SA West Overland - Total

Hydrograph type = Combine
 Storm frequency = 2 yrs
 Time interval = 5 min
 Inflow hyds. = 29, 30

Peak discharge = 1.573 cfs
 Time to peak = 730 min
 Hyd. volume = 6,948 cuft
 Contrib. drain. area = 0.900 ac



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

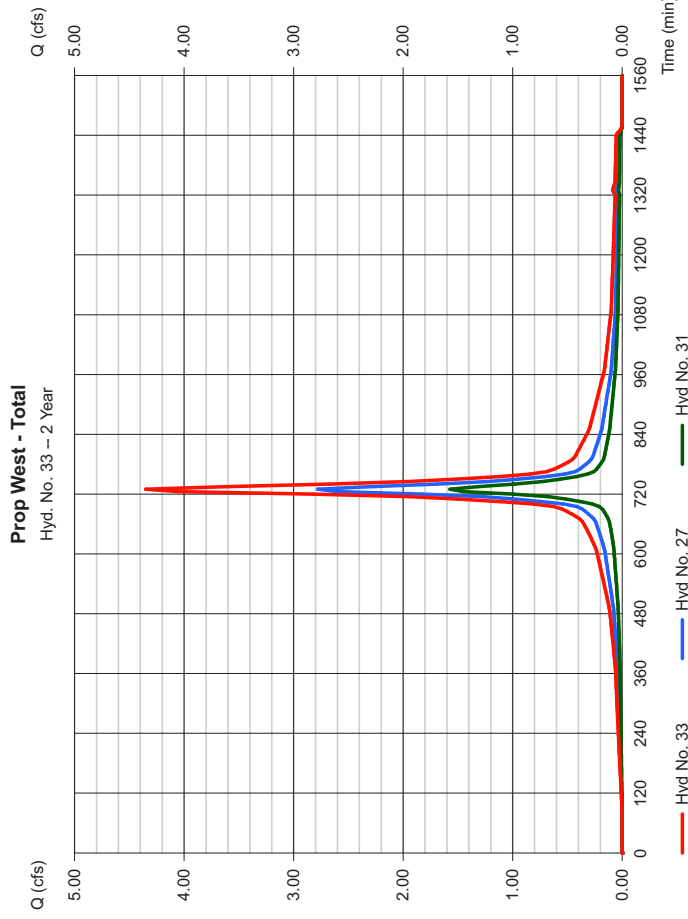
Thursday, Apr 30, 2020

Hyd. No. 33

Prop West - Total

Hydrograph type = Combine
 Storm frequency = 2 yrs
 Time interval = 5 min
 Inflow hyds. = 27, 31

Peak discharge = 4.352 cfs
 Time to peak = 730 min
 Hyd. volume = 19,386 cuft
 Contrib. drain. area = 0.000 ac



Hydrograph Summary Report

Hydratflow Hydrographs by Intellisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strgs used (cuft)	Hydrograph description
1	SCS Runoff	5.078	5	730	23,228	----	----	----	Ex SA Route 1 - imp.
2	SCS Runoff	0.466	5	730	1,857	----	----	----	Ex SA Route 1 - perv.
3	Combine	5.544	5	730	25,085	1, 2	----	----	Ex SA Route 1 - Total
5	SCS Runoff	4.048	5	730	18,518	----	----	----	Ex SA West Headwall - imp.
6	SCS Runoff	0.324	5	730	1,292	----	----	----	Ex SA West Headwall - perv.
7	Combine	4.372	5	730	19,809	5, 6	----	----	Ex SA West Headwall - Total
9	SCS Runoff	2.699	5	730	12,345	----	----	----	Ex SA West Overland - imp.
10	SCS Runoff	0.203	5	730	807	----	----	----	Ex SA West Overland - perv.
11	Combine	2.901	5	730	13,152	9, 10	----	----	Ex SA West Overland - Total
13	Combine	7.274	5	730	32,962	7, 11,	----	----	Ex SA West - Total
15	SCS Runoff	4.474	5	730	20,467	----	----	----	Prop SA Route 1 - imp.
16	SCS Runoff	0.101	5	730	404	----	----	----	Prop SA Route 1 - perv.
17	Combine	4.575	5	730	20,871	15, 16	----	----	Prop SA Route 1 - Total
19	SCS Runoff	0.391	5	730	1,787	----	----	----	Prop SA Route 1 - Untreated - imp.
20	SCS Runoff	0.426	5	730	1,695	----	----	----	Prop SA Route 1 - Untreated - perv.
21	Combine	0.816	5	730	3,482	19, 20	----	----	Prop SA Route 1 - Untreated - Total
23	Combine	5.392	5	730	24,353	17, 21,	----	----	Prop Route 1 - Total
25	SCS Runoff	4.013	5	730	18,355	----	----	----	Prop SA West Headwall - imp.
26	SCS Runoff	0.324	5	730	1,292	----	----	----	Prop SA West Headwall - perv.
27	Combine	4.337	5	730	19,647	25, 26	----	----	Prop SA West Headwall - Total
29	SCS Runoff	1.882	5	730	8,609	----	----	----	Prop SA West Overland - imp.
30	SCS Runoff	0.750	5	730	2,987	----	----	----	Prop SA West Overland - perv.
31	Combine	2.632	5	730	11,596	29, 30	----	----	Prop SA West Overland - Total
33	Combine	6.969	5	730	31,243	27, 31,	----	----	Prop West - Total
Ex & Prop - 2,10,25,100 yr:gpw									Return Period: 10 Year
									Thursday, Apr 30, 2020

Hydrograph Report

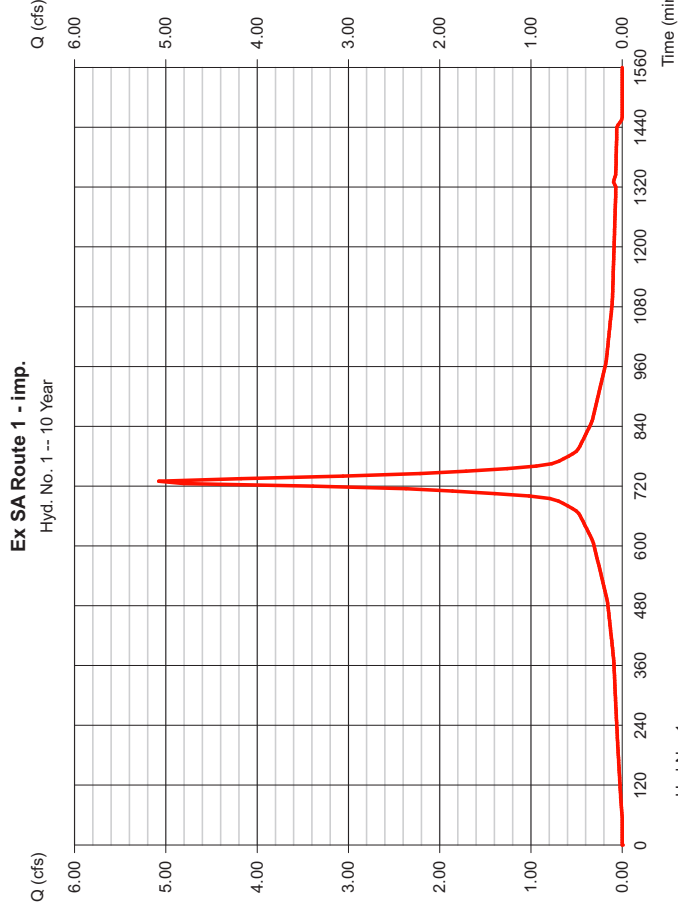
Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 1

Ex SA Route 1 - imp.

Hydrograph type	= SCS Runoff	Peak discharge	= 5.078 cfs
Storm frequency	= 10 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 23,228 cuft
Drainage area	= 1.430 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.01 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

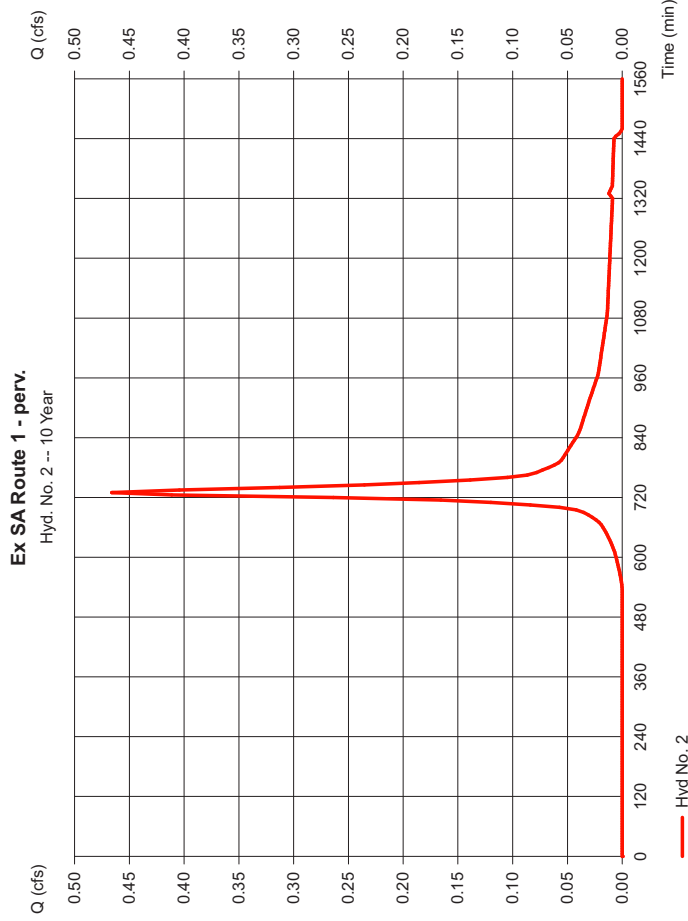
Thursday, Apr 30, 2020

Hyd. No. 2

Ex SA Route 1 - perv.

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 5 min
 Drainage area = 0.230 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 5.01 in
 Storm duration = 24 hrs

Peak discharge = 0.466 cfs
 Time to peak = 730 min
 Hyd. volume = 1,857 cuft
 Curve number = 74
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

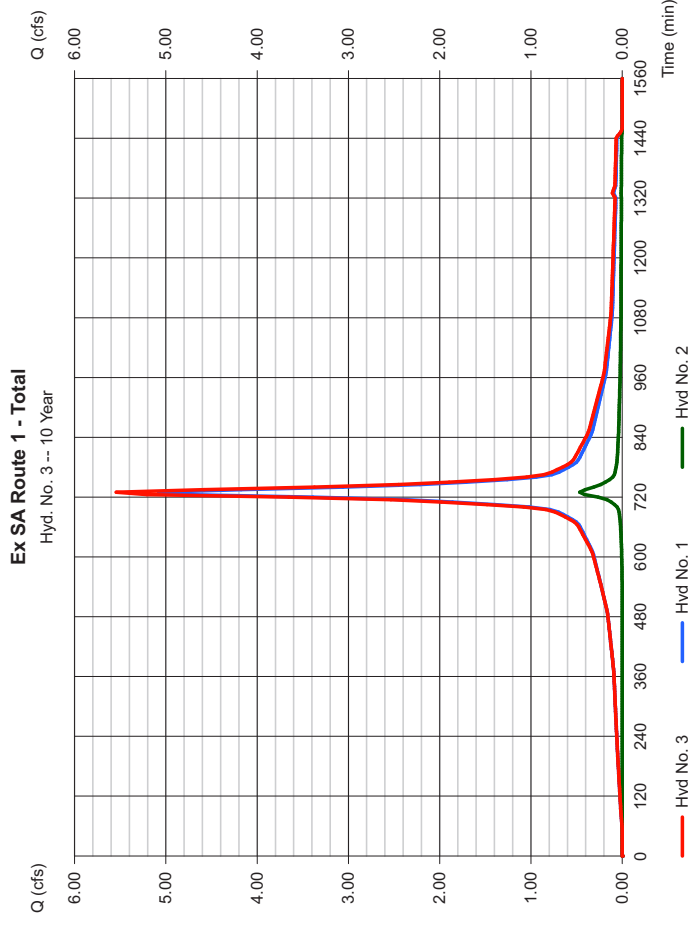
Thursday, Apr 30, 2020

Hyd. No. 3

Ex SA Route 1 - Total

Hydrograph type = Combine
 Storm frequency = 10 yrs
 Time interval = 5 min
 Inflow hyds. = 1, 2

Peak discharge = 5.544 cfs
 Time to peak = 730 min
 Hyd. volume = 25,085 cuft
 Contrib. drain. area = 1.660 ac



Hydrograph Report

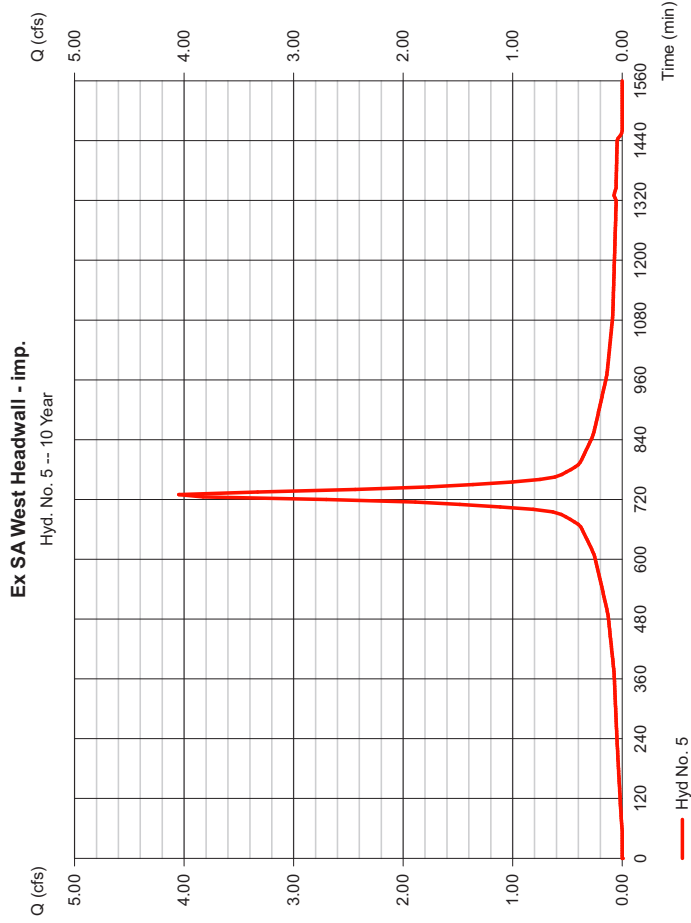
Hydratlow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 5

Ex SA West Headwall - imp.

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.048 cfs
Storm frequency	=	10 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	18,518 cuft
Drainage area	=	1.140 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.01 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Report

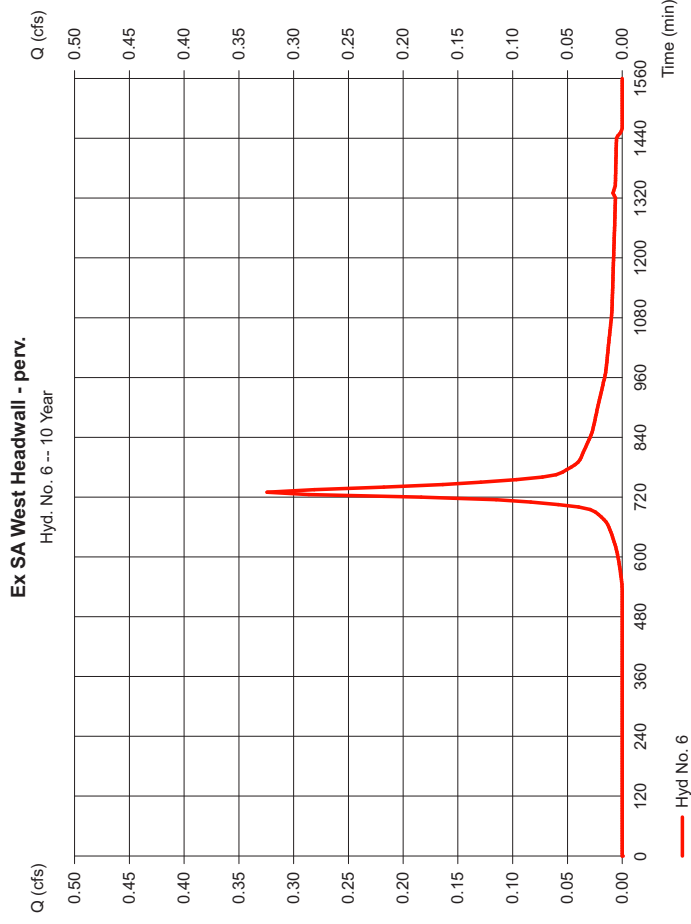
Hydratlow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 6

Ex SA West Headwall - perv.

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.324 cfs
Storm frequency	=	10 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	1,292 cuft
Drainage area	=	0.160 ac	Curve number	=	74
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.01 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 7

Ex SA West Headwall - Total

Hydrograph type = Combine
 Storm frequency = 10 yrs
 Time interval = 5 min
 Inflow hyds. = 5, 6

Peak discharge = 4.372 cfs
 Time to peak = 730 min
 Hyd. volume = 19,809 cuft
 Contrib. drain. area = 1,300 ac

Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

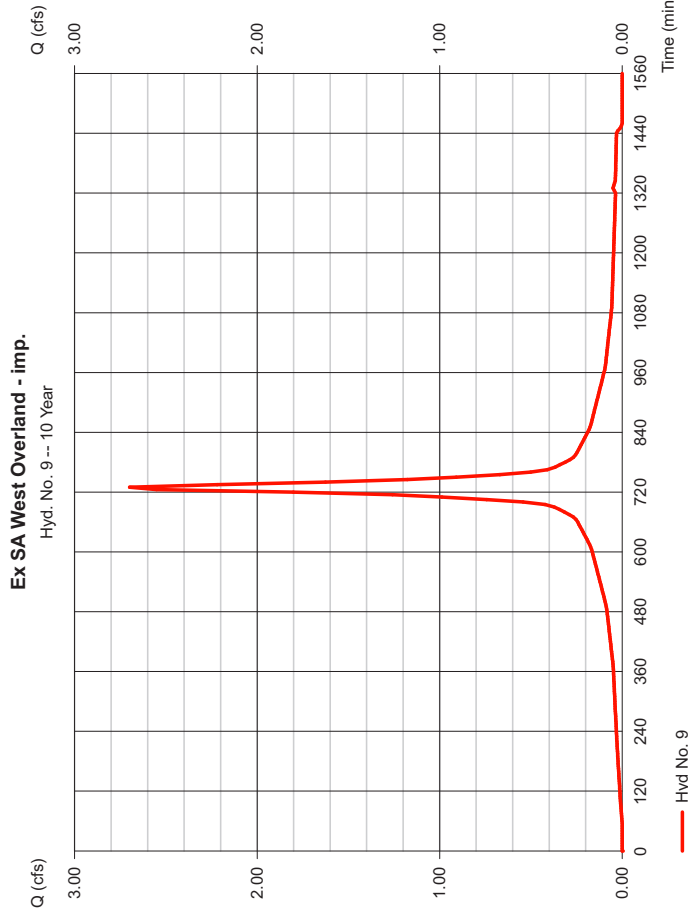
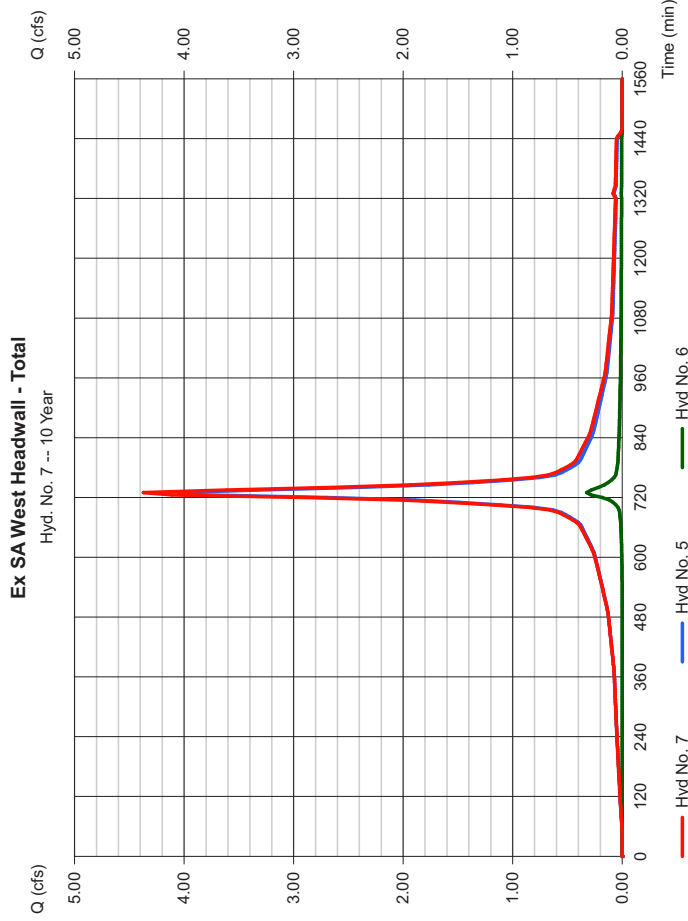
Thursday, Apr 30, 2020

Hyd. No. 9

Ex SA West Overland - imp.

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 5 min
 Drainage area = 0.760 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 5.01 in
 Storm duration = 24 hrs

Peak discharge = 2.699 cfs
 Time to peak = 730 min
 Hyd. volume = 12,345 cuft
 Curve number = 98
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

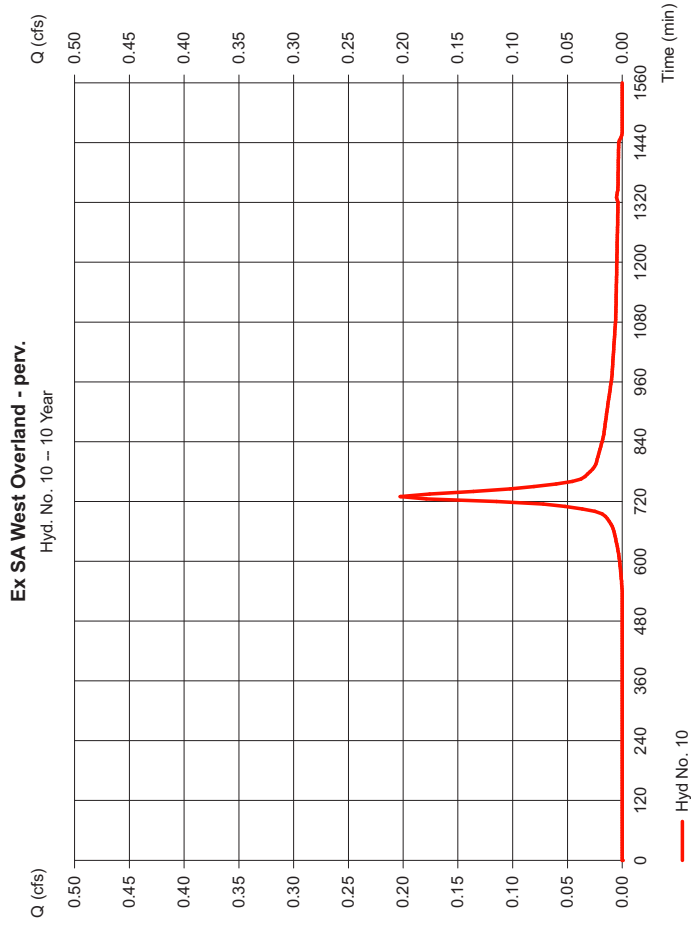
Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 10

Ex SA West Overland - perv.

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.203 cfs
Storm frequency	=	10 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	807 cuft
Drainage area	=	0.100 ac	Curve number	=	74
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.01 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Report

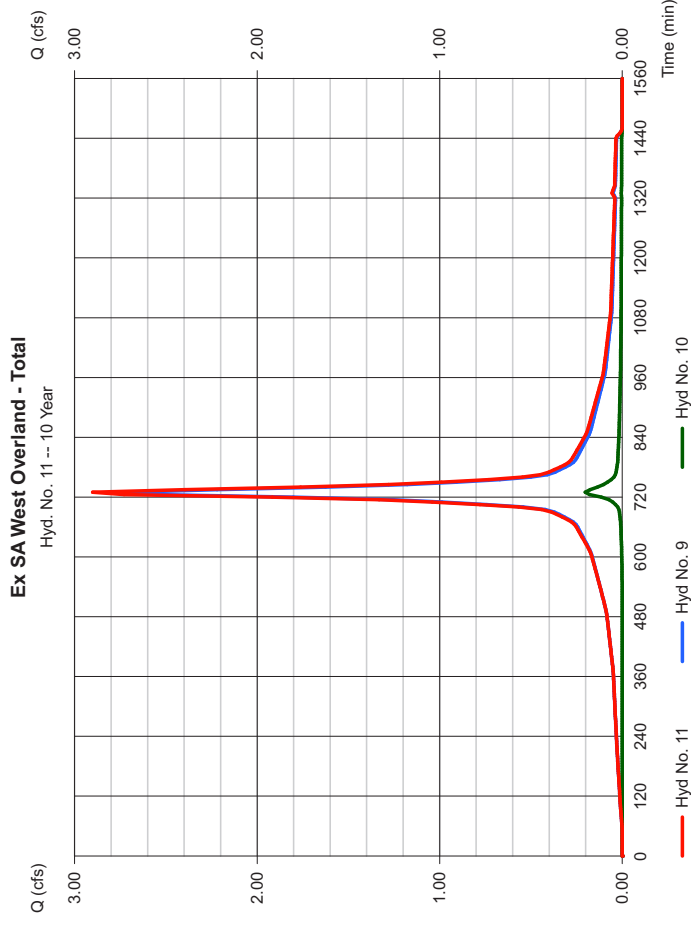
Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 11

Ex SA West Overland - Total

Hydrograph type	=	Combine	Peak discharge	=	2.901 cfs
Storm frequency	=	10 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	13,152 cuft
Inflow hyds.	=	9, 10	Contrib. drain. area	=	0.860 ac



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 13

Ex SA West - Total

Hydrograph type = Combine
 Storm frequency = 10 yrs
 Time interval = 5 min
 Inflow hyds. = 7, 11

Peak discharge = 7.274 cfs
 Time to peak = 730 min
 Hyd. volume = 32,962 cuft
 Contrib. drain. area = 0.000 ac

Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

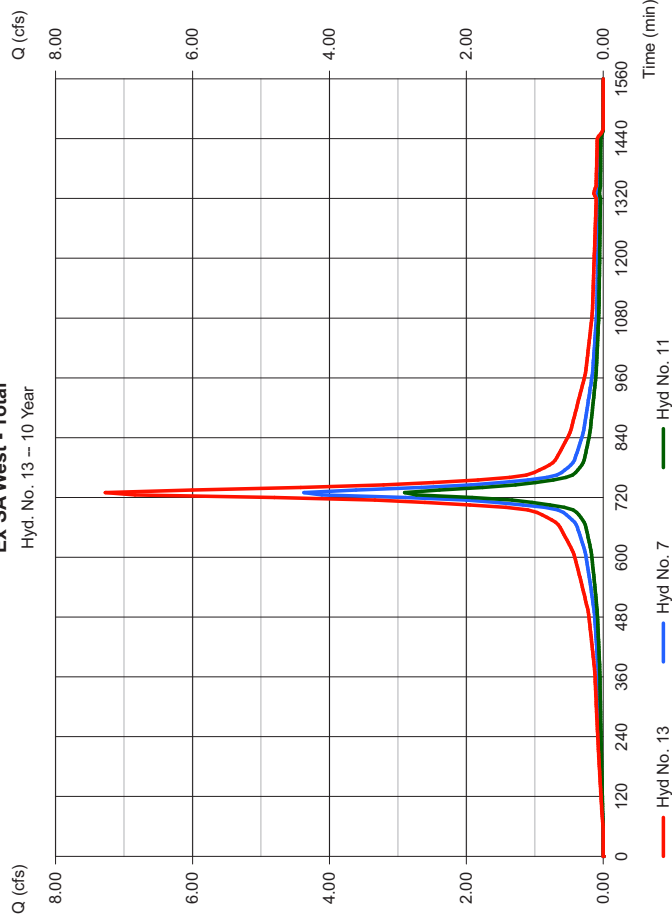
Hyd. No. 15

Prop SA Route 1 - imp.

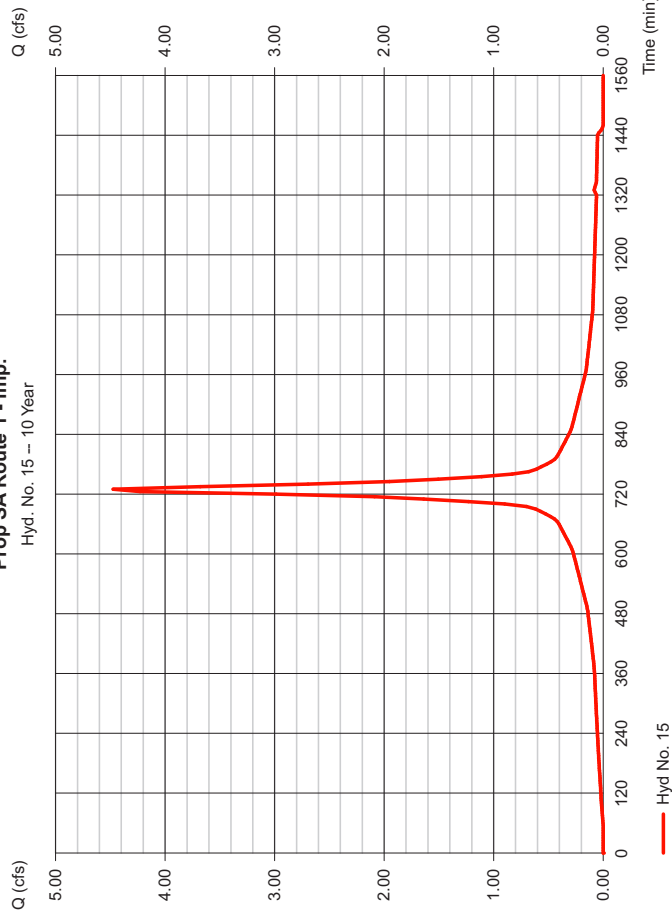
Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 5 min
 Drainage area = 1.260 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 5.01 in
 Storm duration = 24 hrs

Peak discharge = 4.474 cfs
 Time to peak = 730 min
 Hyd. volume = 20,467 cuft
 Curve number = 98
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484

Ex SA West - Total
Hyd. No. 13 -- 10 Year



Prop SA Route 1 - imp.
Hyd. No. 15 -- 10 Year



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

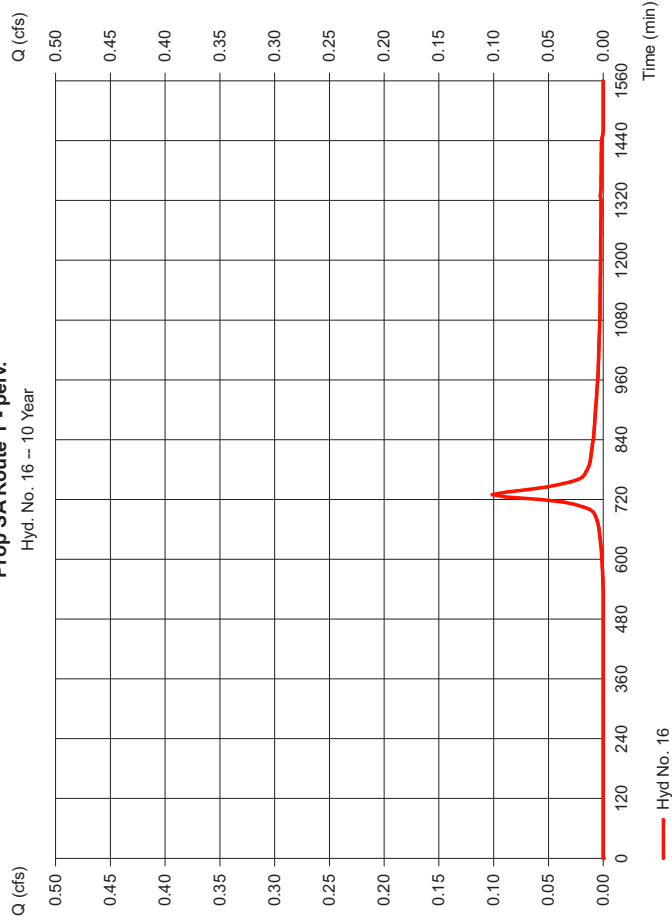
Hyd. No. 16

Prop SA Route 1 - perv.

Hydrograph type	= SCS Runoff	Peak discharge	= 0.101 cfs
Storm frequency	= 10 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 404 cuft
Drainage area	= 0.050 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.01 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Prop SA Route 1 - perv.

Hyd. No. 16 -- 10 Year



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

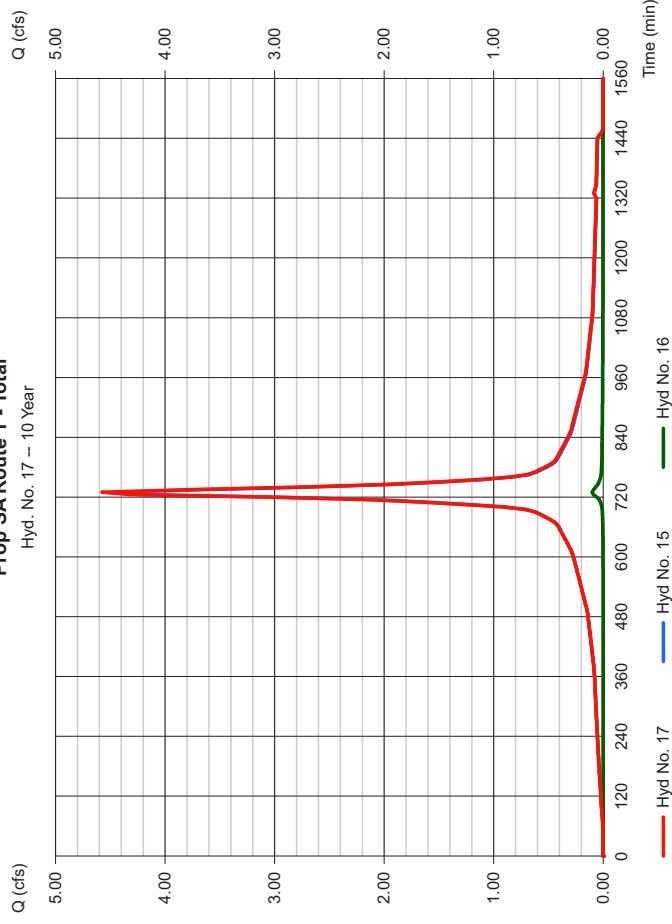
Hyd. No. 17

Prop SA Route 1 - Total

Hydrograph type	= Combine	Peak discharge	= 4.575 cfs
Storm frequency	= 10 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 20,871 cuft
Inflow hyds.	= 15, 16	Contrib. drain. area	= 1.310 ac

Prop SA Route 1 - Total

Hyd. No. 17 -- 10 Year



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

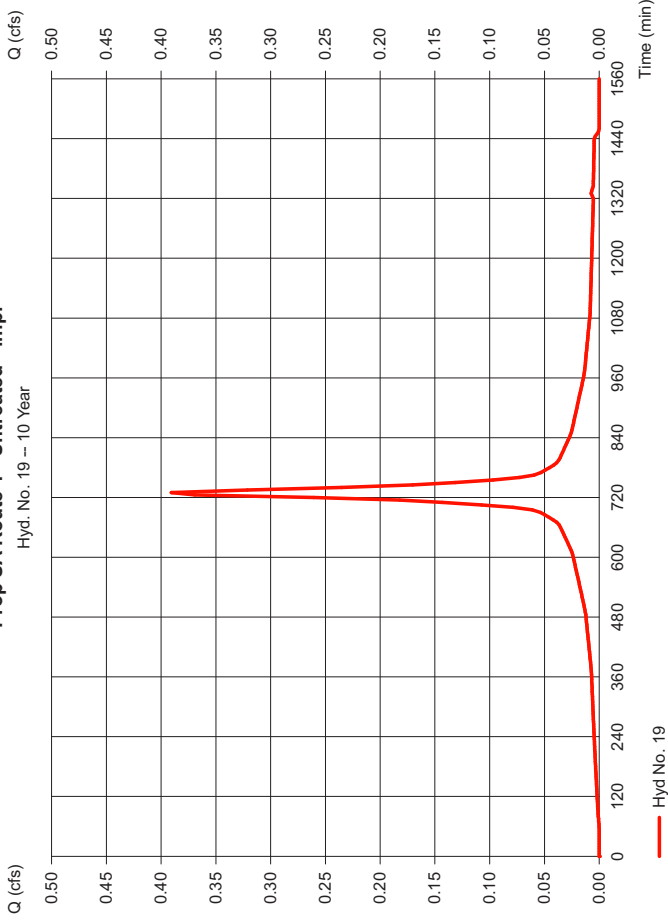
Thursday, Apr 30, 2020

Hyd. No. 19

Prop SA Route 1 - Untreated - imp.

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.391 cfs
Storm frequency	=	10 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	1,787 cuft
Drainage area	=	0.110 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.01 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

Prop SA Route 1 - Untreated - imp.



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

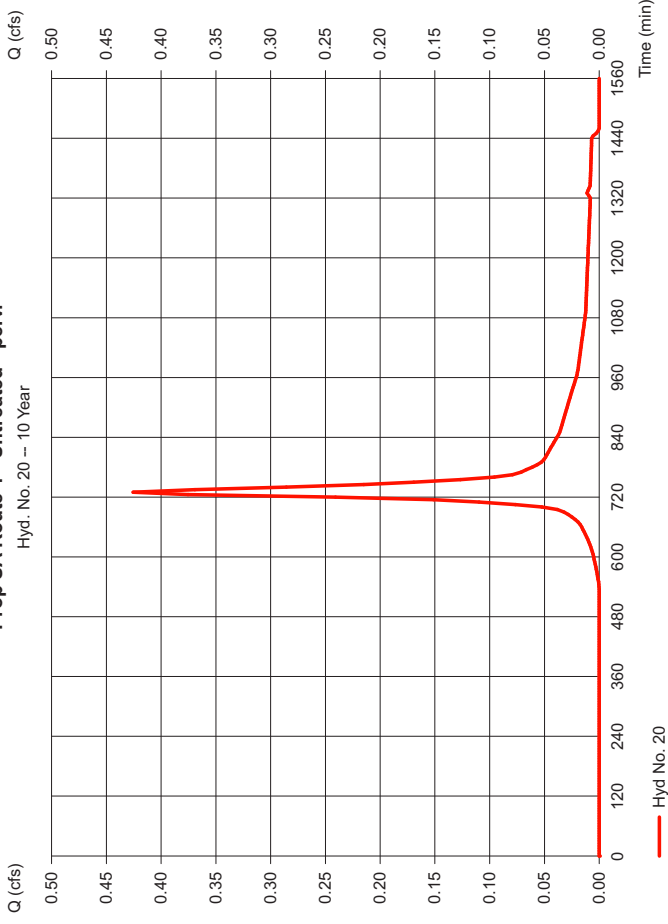
Thursday, Apr 30, 2020

Hyd. No. 20

Prop SA Route 1 - Untreated - perv.

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.426 cfs
Storm frequency	=	10 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	1,695 cuft
Drainage area	=	0.210 ac	Curve number	=	74
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.01 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

Prop SA Route 1 - Untreated - perv.



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

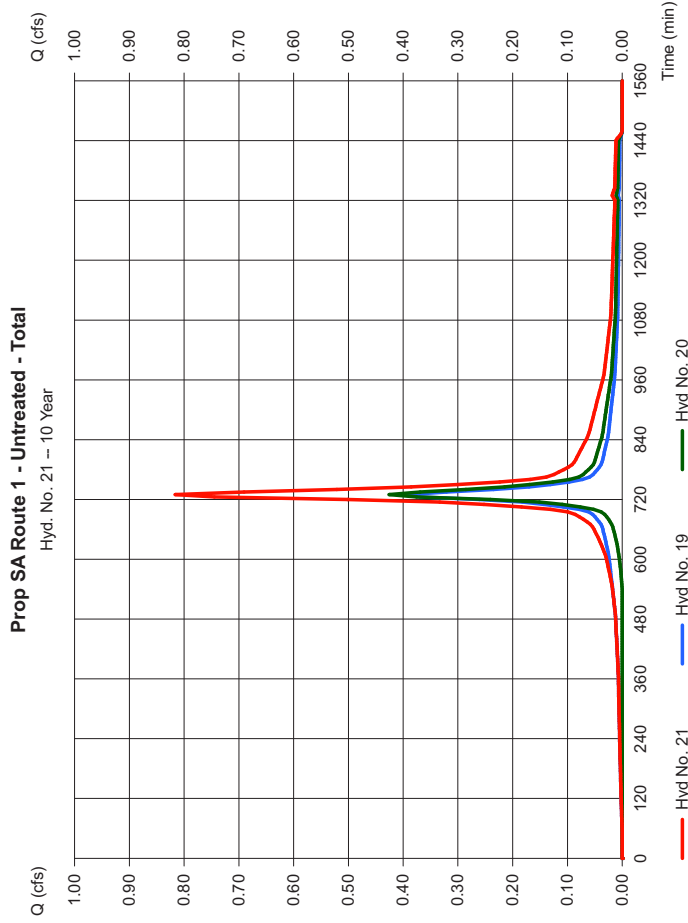
Thursday, Apr 30, 2020

Hyd. No. 21

Prop SA Route 1 - Untreated - Total

Hydrograph type = Combine
 Storm frequency = 10 yrs
 Time interval = 5 min
 Inflow hyds. = 19, 20

Peak discharge = 0.816 cfs
 Time to peak = 730 min
 Hyd. volume = 3,482 cuft
 Contrib. drain. area = 0.320 ac



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

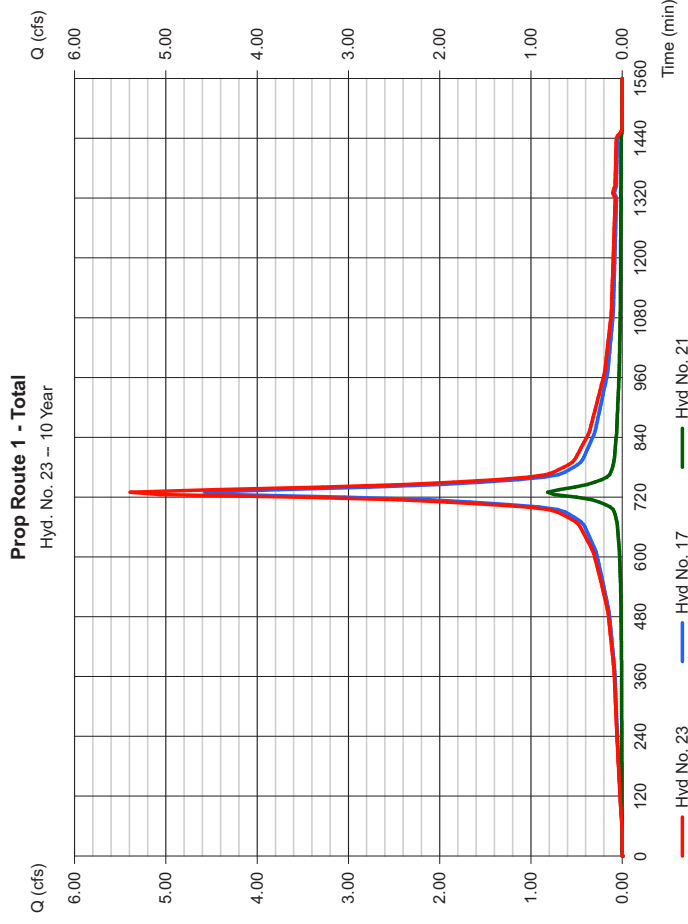
Thursday, Apr 30, 2020

Hyd. No. 23

Prop Route 1 - Total

Hydrograph type = Combine
 Storm frequency = 10 yrs
 Time interval = 5 min
 Inflow hyds. = 17, 21

Peak discharge = 5.392 cfs
 Time to peak = 730 min
 Hyd. volume = 24,353 cuft
 Contrib. drain. area = 0.000 ac



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

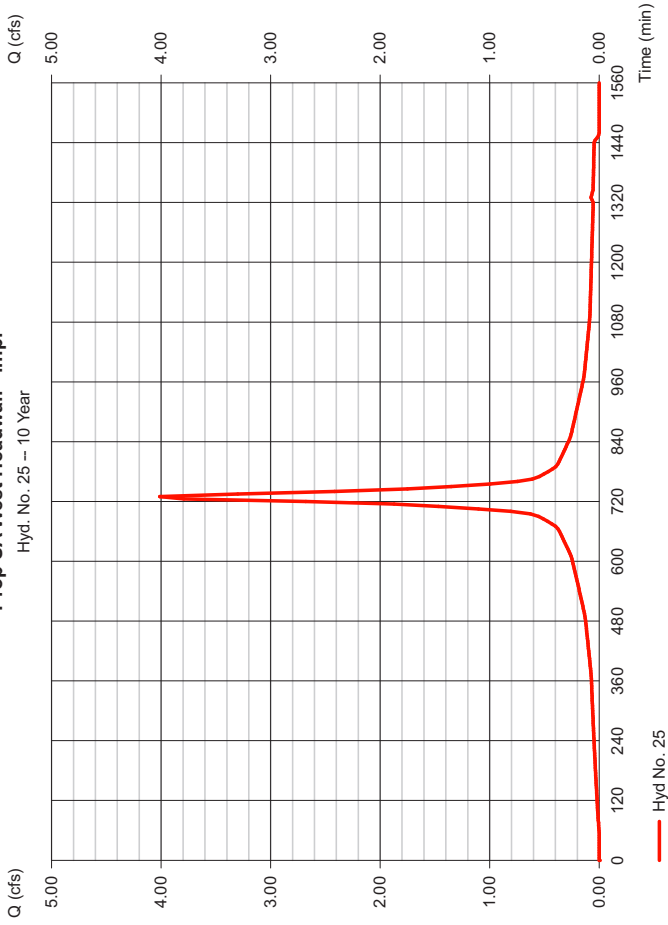
Hyd. No. 25

Prop SA West Headwall - imp.

Hydrograph type	=	SCS Runoff	=	4.013 cfs
Storm frequency	=	10 yrs	=	730 min
Time interval	=	5 min	=	18,355 cuft
Drainage area	=	1.130 ac	=	98
Basin Slope	=	0.0 %	=	0 ft
Tc method	=	USER	=	10.00 min
Total precip.	=	5.01 in	=	Type III
Storm duration	=	24 hrs	=	484

Peak discharge	=	4.013 cfs
Time to peak	=	730 min
Hyd. volume	=	18,355 cuft
Curve number	=	98
Hydraulic length	=	0 ft
Time of conc. (Tc)	=	10.00 min
Distribution	=	Type III
Shape factor	=	484

Prop SA West Headwall - imp.



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

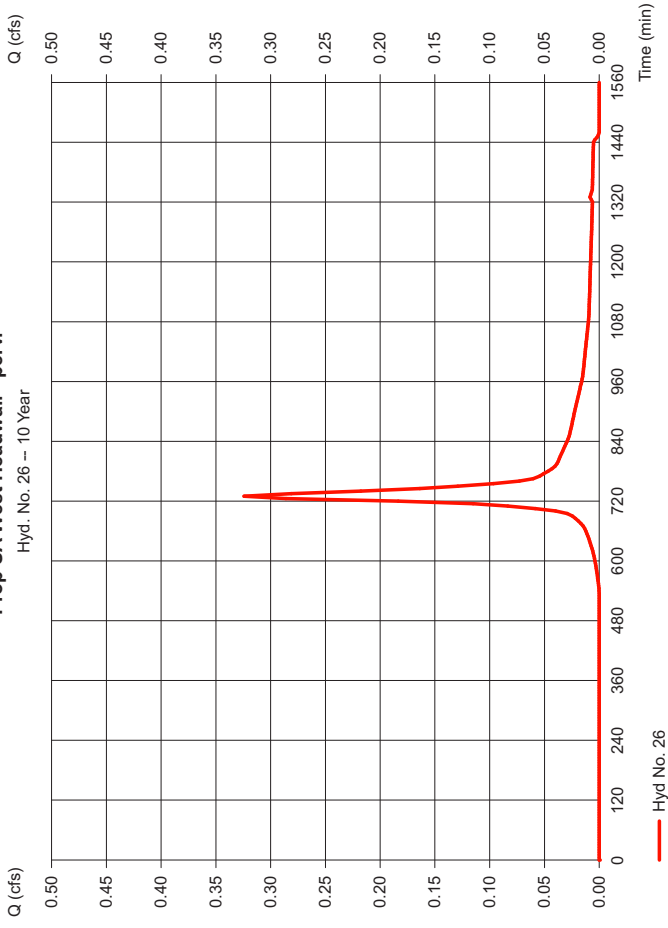
Hyd. No. 26

Prop SA West Headwall - perv.

Hydrograph type	=	SCS Runoff	=	0.324 cfs
Storm frequency	=	10 yrs	=	730 min
Time interval	=	5 min	=	1,292 cuft
Drainage area	=	0.160 ac	=	74
Basin Slope	=	0.0 %	=	0 ft
Tc method	=	USER	=	10.00 min
Total precip.	=	5.01 in	=	Type III
Storm duration	=	24 hrs	=	484

Peak discharge	=	0.324 cfs
Time to peak	=	730 min
Hyd. volume	=	1,292 cuft
Curve number	=	74
Hydraulic length	=	0 ft
Time of conc. (Tc)	=	10.00 min
Distribution	=	Type III
Shape factor	=	484

Prop SA West Headwall - perv.



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 27

Prop SA West Headwall - Total

Hydrograph type = Combine
 Storm frequency = 10 yrs
 Time interval = 5 min
 Inflow hyds. = 25, 26

Peak discharge = 4.337 cfs
 Time to peak = 730 min
 Hyd. volume = 19,647 cuft
 Contrib. drain. area = 1,290 ac

Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

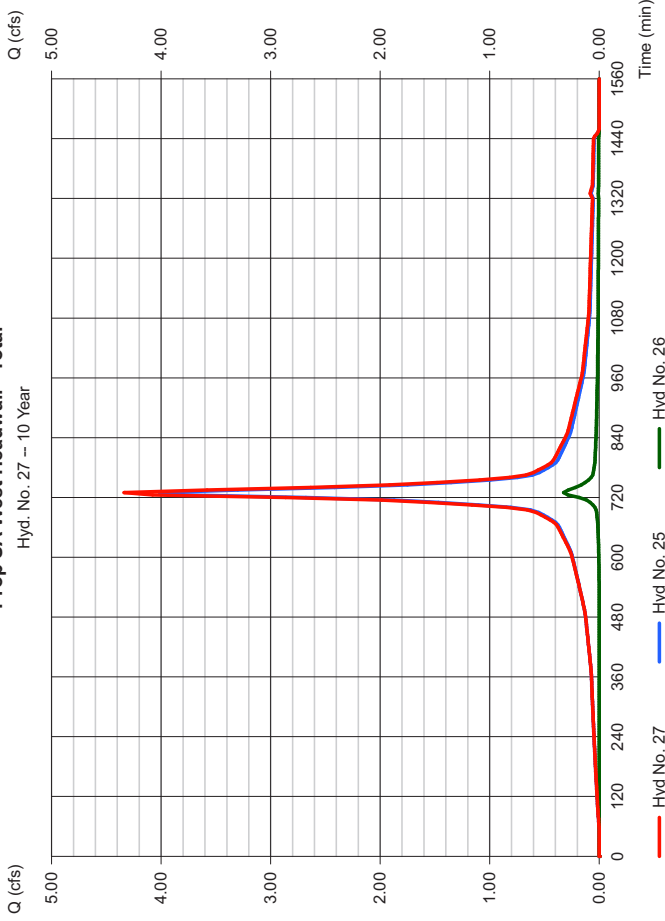
Hyd. No. 29

Prop SA West Overland - imp.

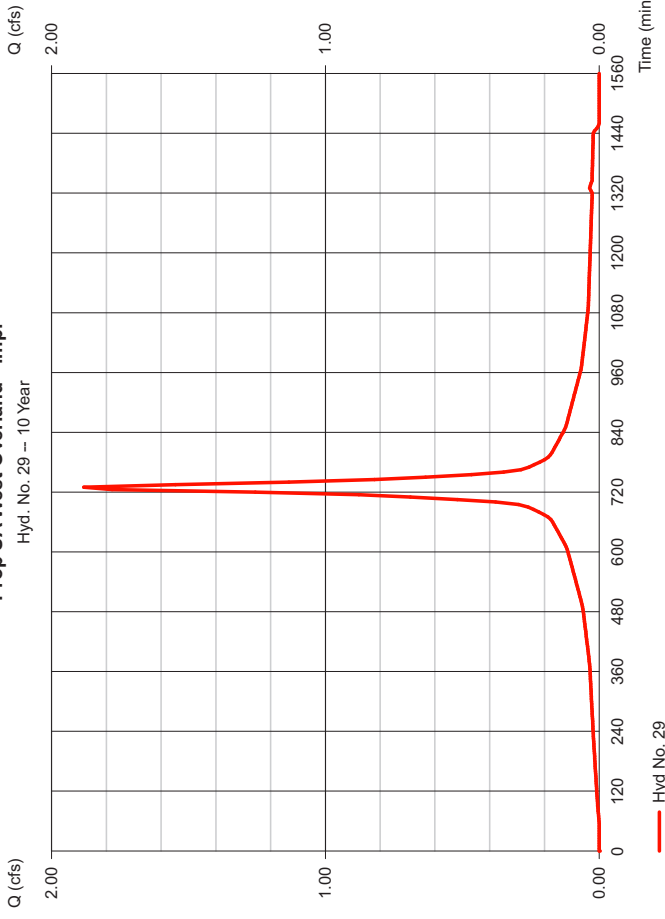
Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 5 min
 Drainage area = 0.530 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 5.01 in
 Storm duration = 24 hrs

Peak discharge = 1.882 cfs
 Time to peak = 730 min
 Hyd. volume = 8,609 cuft
 Curve number = 98
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484

Prop SA West Headwall - Total



Prop SA West Overland - imp.



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

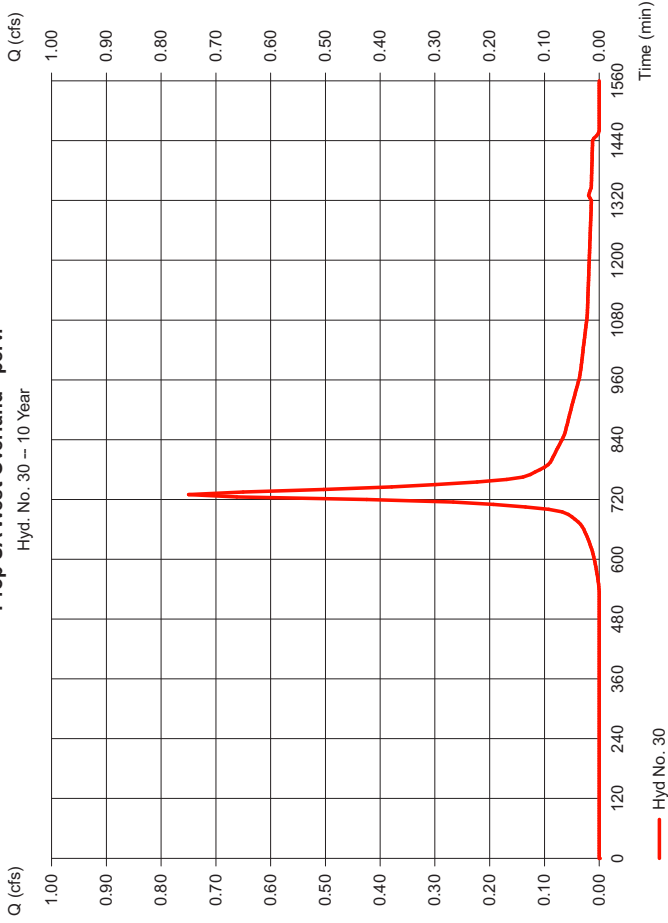
Thursday, Apr 30, 2020

Hyd. No. 30

Prop SA West Overland - perv.

Hydrograph type	= SCS Runoff	Peak discharge	= 0.750 cfs
Storm frequency	= 10 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 2,987 cuft
Drainage area	= 0.370 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.01 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Prop SA West Overland - perv.



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

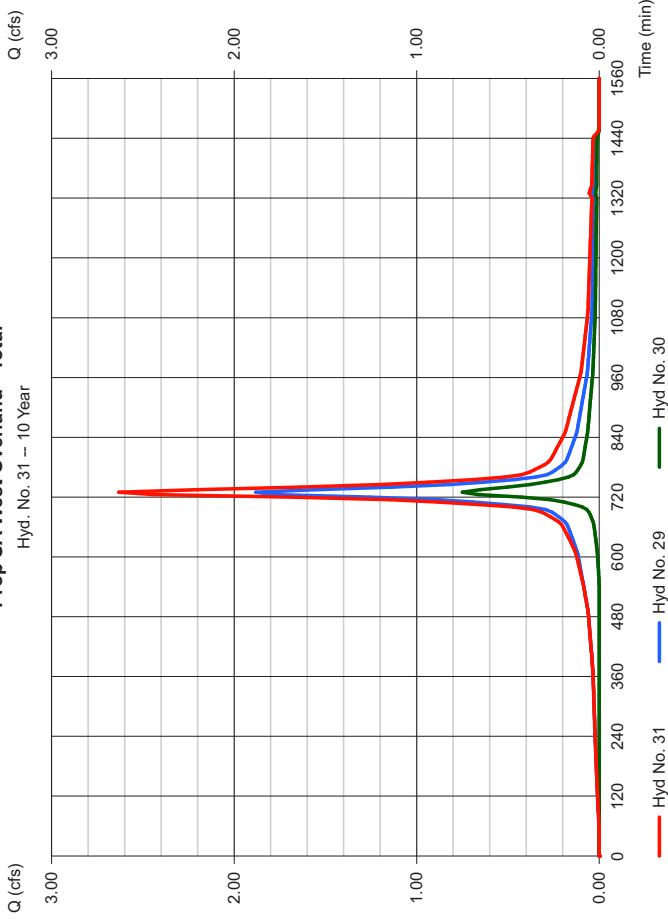
Thursday, Apr 30, 2020

Hyd. No. 31

Prop SA West Overland - Total

Hydrograph type	= Combine	Peak discharge	= 2.632 cfs
Storm frequency	= 10 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 11,596 cuft
Inflow hyds.	= 29, 30	Contrib. drain. area	= 0.900 ac

Prop SA West Overland - Total



Hydrograph Report

Hydratlow Hydrographs by Intelsolve v9.1

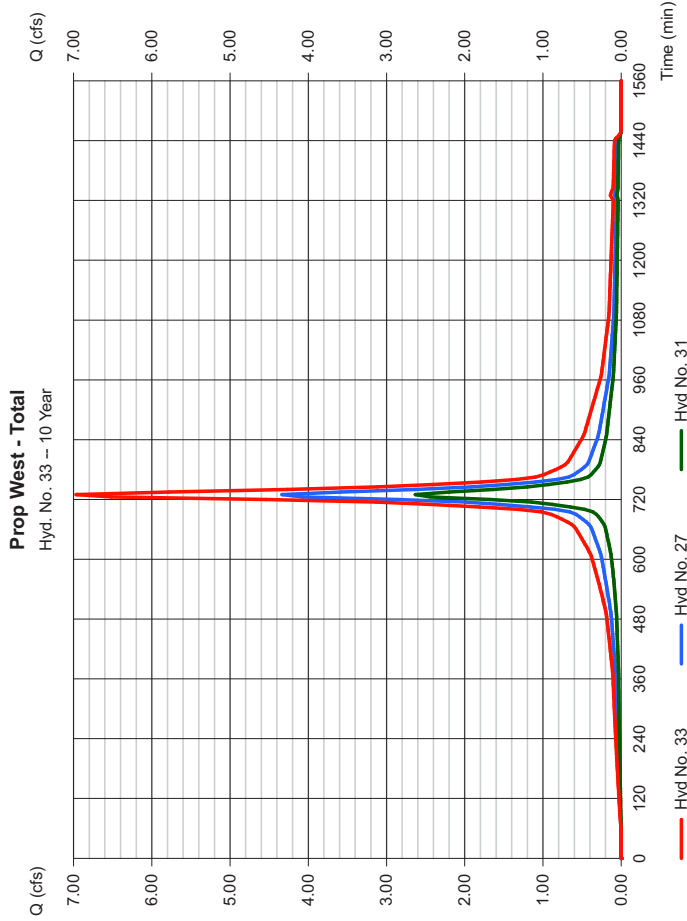
Thursday, Apr 30, 2020

Hyd. No. 33

Prop West - Total

Hydrograph type = Combine
 Storm frequency = 10 yrs
 Time interval = 5 min
 Inflow hyds. = 27, 31

Peak discharge = 6.969 cfs
 Time to peak = 730 min
 Hyd. volume = 31,243 cuft
 Contrib. drain. area = 0.000 ac



Hydrograph Summary Report

Hydratlow Hydrographs by Intelsolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strgs used (cuft)	Hydrograph description
1	SCS Runoff	6.286	5	730	28,964	-----	-----	-----	Ex SA Route 1 - imp.
2	SCS Runoff	0.659	5	730	2,618	-----	-----	-----	Ex SA Route 1 - perv.
3	Combine	6.945	5	730	31,582	1, 2	-----	-----	Ex SA Route 1 - Total
5	SCS Runoff	5.011	5	730	23,090	-----	-----	-----	Ex SA West Headwall - imp.
6	SCS Runoff	0.459	5	730	1,822	-----	-----	-----	Ex SA West Headwall - perv.
7	Combine	5.470	5	730	24,911	5, 6	-----	-----	Ex SA West Headwall - Total
9	SCS Runoff	3.341	5	730	15,393	-----	-----	-----	Ex SA West Overland - imp.
10	SCS Runoff	0.287	5	730	1,138	-----	-----	-----	Ex SA West Overland - perv.
11	Combine	3.627	5	730	16,532	9, 10	-----	-----	Ex SA West Overland - Total
13	Combine	9.097	5	730	41,443	7, 11	-----	-----	Ex SA West - Total
15	SCS Runoff	5.539	5	730	25,520	-----	-----	-----	Prop SA Route 1 - imp.
16	SCS Runoff	0.143	5	730	569	-----	-----	-----	Prop SA Route 1 - perv.
17	Combine	5.682	5	730	26,090	15, 16	-----	-----	Prop SA Route 1 - Total
19	SCS Runoff	0.484	5	730	2,228	-----	-----	-----	Prop SA Route 1 - Untreated - imp.
20	SCS Runoff	0.602	5	730	2,391	-----	-----	-----	Prop SA Route 1 - Untreated - perv.
21	Combine	1.085	5	730	4,619	19, 20	-----	-----	Prop SA Route 1 - Untreated - Total
23	Combine	6.767	5	730	30,708	17, 21	-----	-----	Prop Route 1 - Total
25	SCS Runoff	4.967	5	730	22,887	-----	-----	-----	Prop SA West Headwall - imp.
26	SCS Runoff	0.459	5	730	1,822	-----	-----	-----	Prop SA West Headwall - perv.
27	Combine	5.426	5	730	24,709	25, 26	-----	-----	Prop SA West Headwall - Total
29	SCS Runoff	2.330	5	730	10,735	-----	-----	-----	Prop SA West Overland - imp.
30	SCS Runoff	1.061	5	730	4,212	-----	-----	-----	Prop SA West Overland - perv.
31	Combine	3.390	5	730	14,947	29, 30	-----	-----	Prop SA West Overland - Total
33	Combine	8.816	5	730	39,666	27, 31	-----	-----	Prop West - Total

Ex & Prop - 2,10,25,100 yr.gpw

Return Period: 25 Year

Thursday, Apr 30, 2020

Hydrograph Report

Hydratlow Hydrographs by Intellisolve v9.1

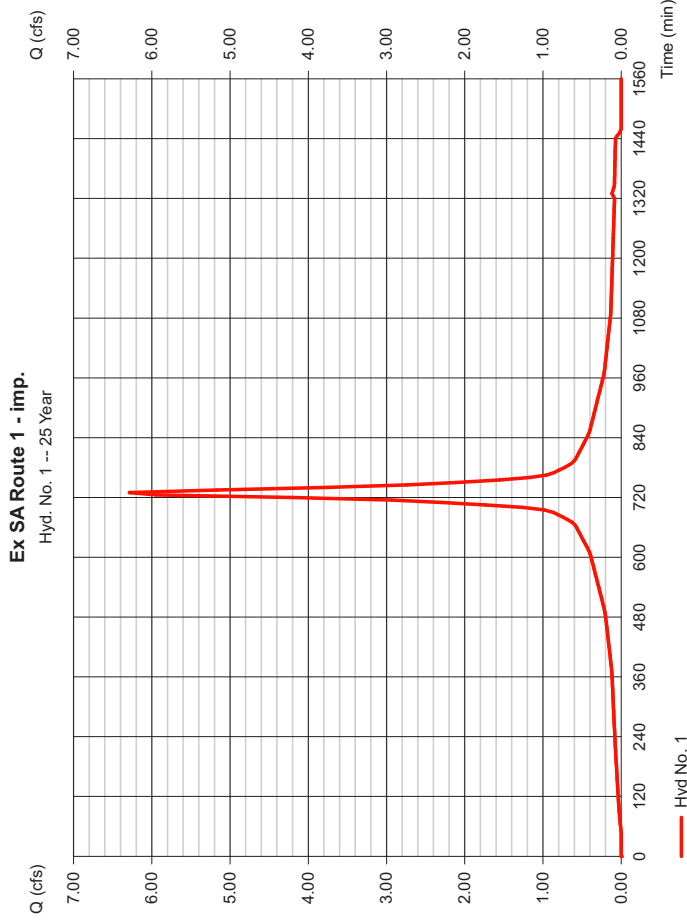
Thursday, Apr 30, 2020

Hyd. No. 1

Ex SA Route 1 - imp.

Hydrograph type = SCS Runoff
 Storm frequency = 25 yrs
 Time interval = 5 min
 Drainage area = 1.430 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 6.19 in
 Storm duration = 24 hrs

Peak discharge = 6.286 cfs
 Time to peak = 730 min
 Hyd. volume = 28,964 cuft
 Curve number = 98
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hydratlow Hydrographs by Intellisolve v9.1

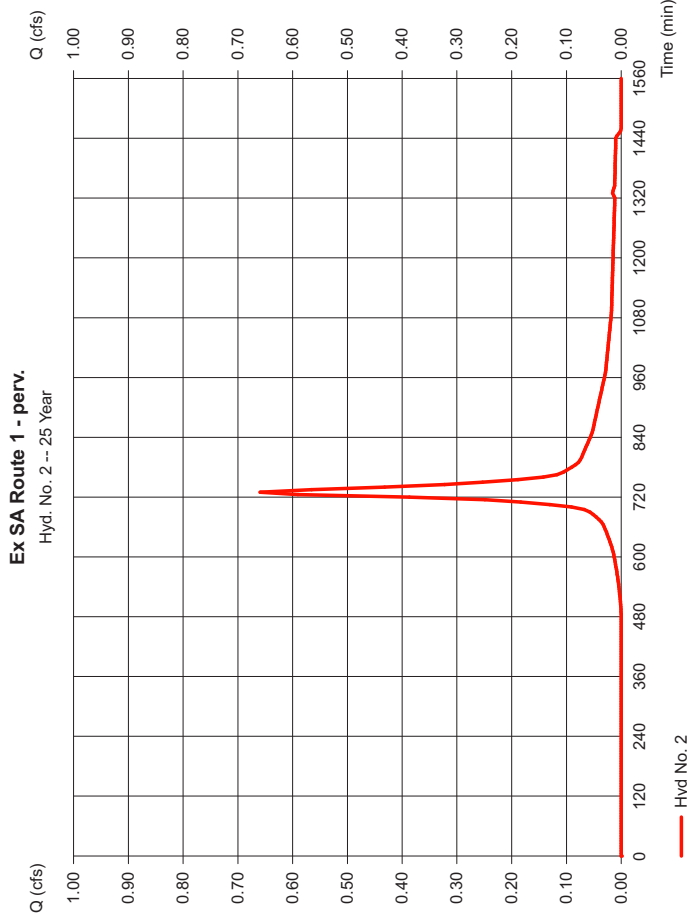
Thursday, Apr 30, 2020

Hyd. No. 2

Ex SA Route 1 - perv.

Hydrograph type = SCS Runoff
 Storm frequency = 25 yrs
 Time interval = 5 min
 Drainage area = 0.230 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 6.19 in
 Storm duration = 24 hrs

Peak discharge = 0.659 cfs
 Time to peak = 730 min
 Hyd. volume = 2,618 cuft
 Curve number = 74
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 3

Ex SA Route 1 - Total

Hydrograph type = Combine
 Storm frequency = 25 yrs
 Time interval = 5 min
 Inflow hyds. = 1, 2

Peak discharge = 6.945 cfs
 Time to peak = 730 min
 Hyd. volume = 31,582 cuft
 Contrib. drain. area = 1.660 ac

Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

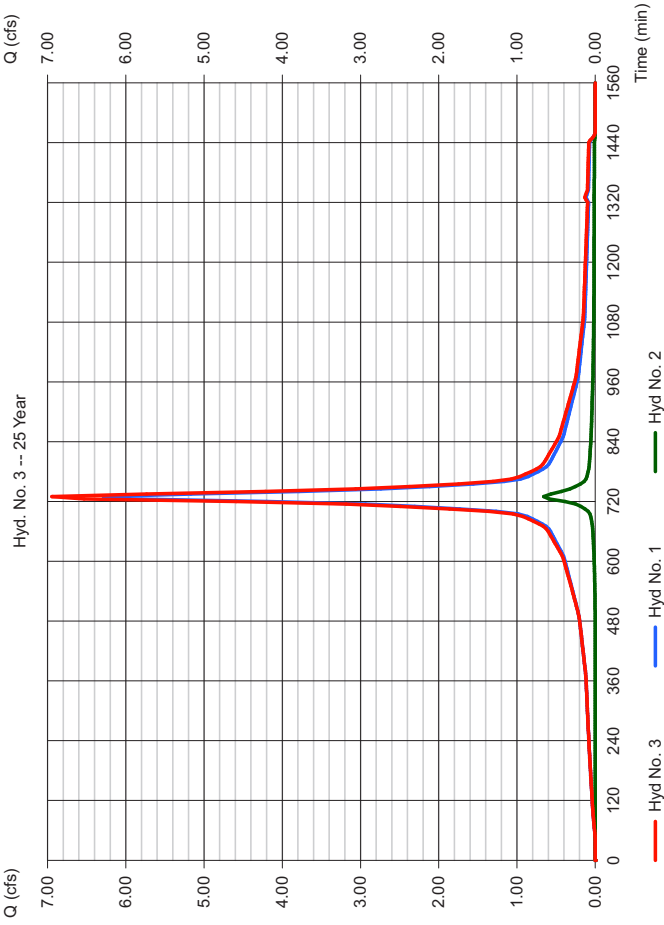
Hyd. No. 5

Ex SA West Headwall - imp.

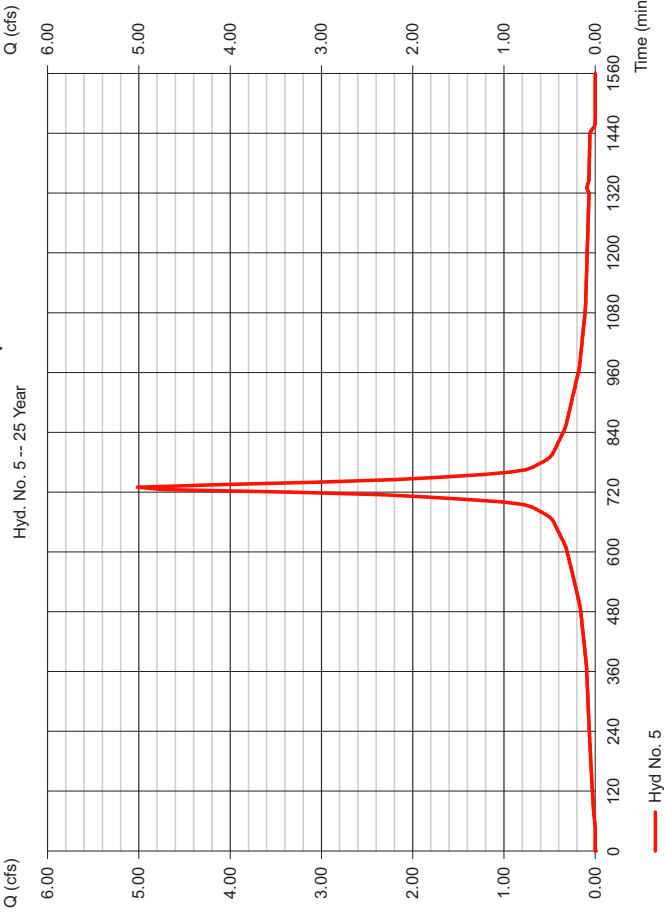
Hydrograph type = SCS Runoff
 Storm frequency = 25 yrs
 Time interval = 5 min
 Drainage area = 1.140 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 6.19 in
 Storm duration = 24 hrs

Peak discharge = 5.011 cfs
 Time to peak = 730 min
 Hyd. volume = 23,090 cuft
 Curve number = 98
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484

Ex SA Route 1 - Total



Ex SA West Headwall - imp.



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

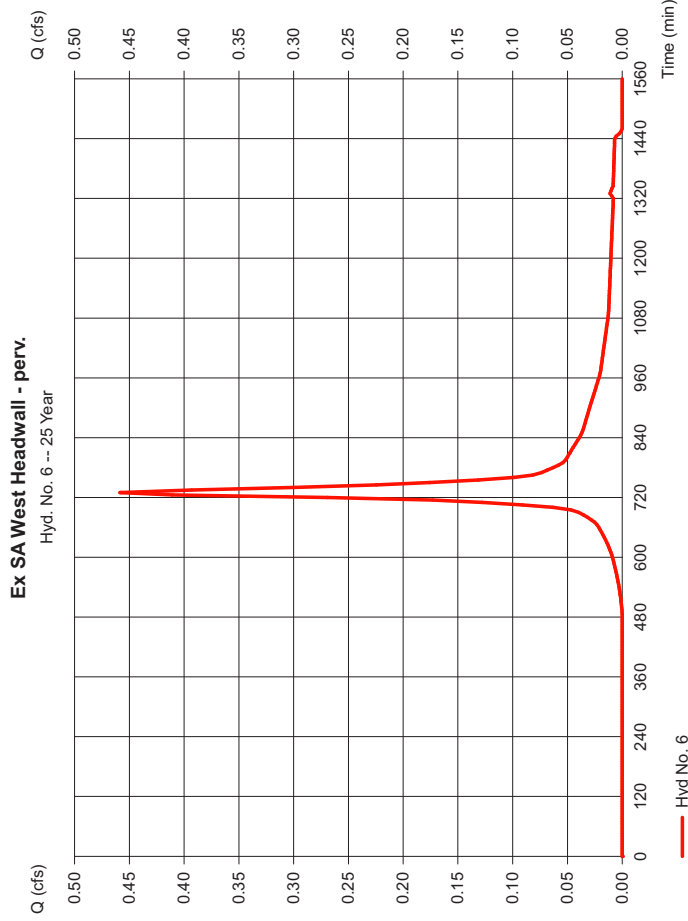
Thursday, Apr 30, 2020

Hyd. No. 6

Ex SA West Headwall - perv.

Hydrograph type = SCS Runoff
 Storm frequency = 25 yrs
 Time interval = 5 min
 Drainage area = 0.160 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 6.19 in
 Storm duration = 24 hrs

Peak discharge = 0.459 cfs
 Time to peak = 730 min
 Hyd. volume = 1,822 cuft
 Curve number = 74
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

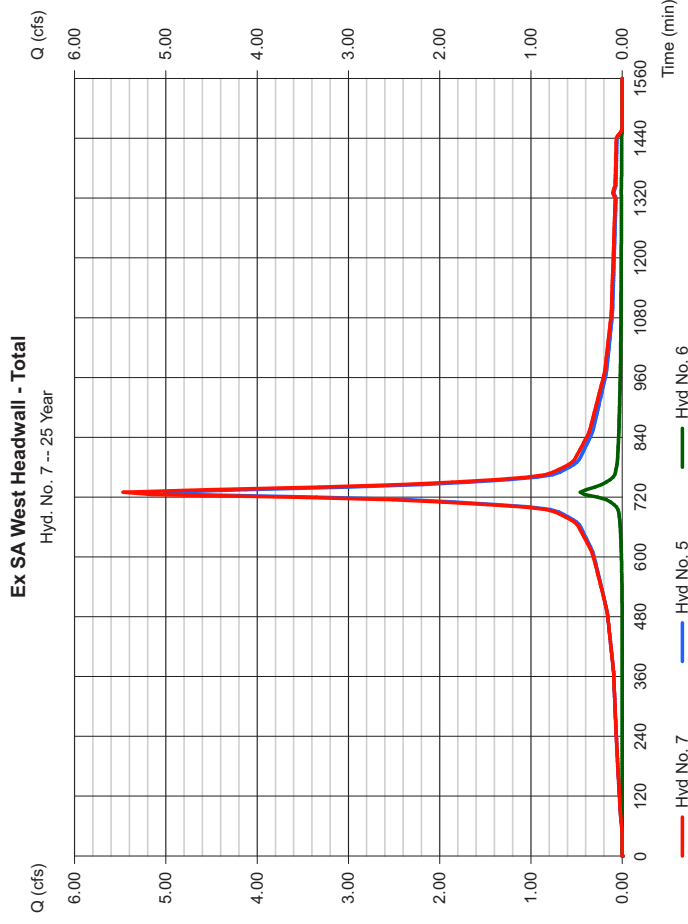
Thursday, Apr 30, 2020

Hyd. No. 7

Ex SA West Headwall - Total

Hydrograph type = Combine
 Storm frequency = 25 yrs
 Time interval = 5 min
 Inflow hyds. = 5, 6

Peak discharge = 5.470 cfs
 Time to peak = 730 min
 Hyd. volume = 24,911 cuft
 Contrib. drain. area = 1,300 ac



Hydrograph Report

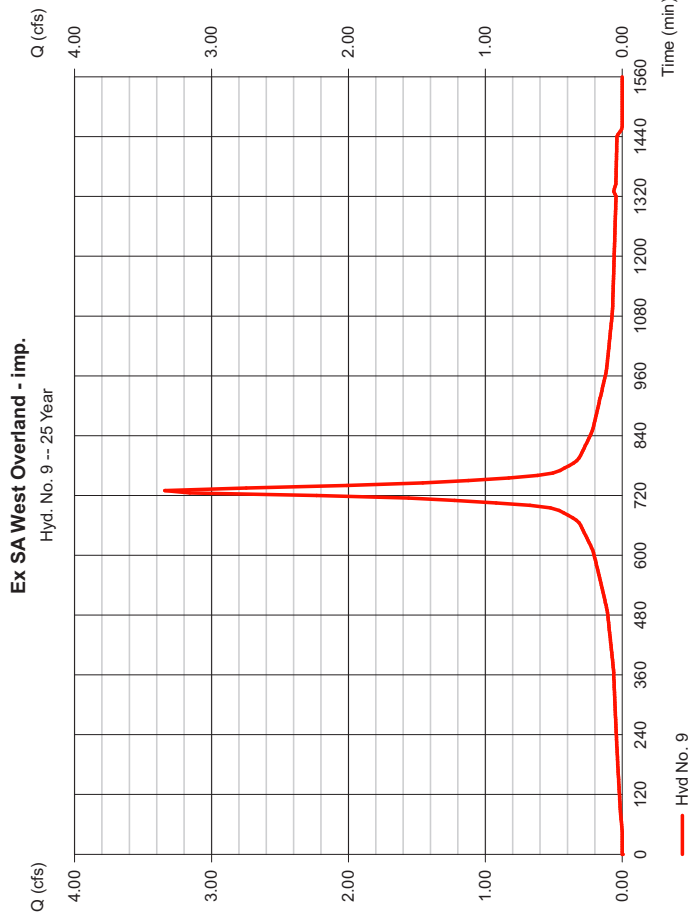
Hydratlow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 9

Ex SA West Overland - imp.

Hydrograph type	=	SCS Runoff	Peak discharge	=	3,341 cfs
Storm frequency	=	25 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	15,393 cuft
Drainage area	=	0.760 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	6.19 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Report

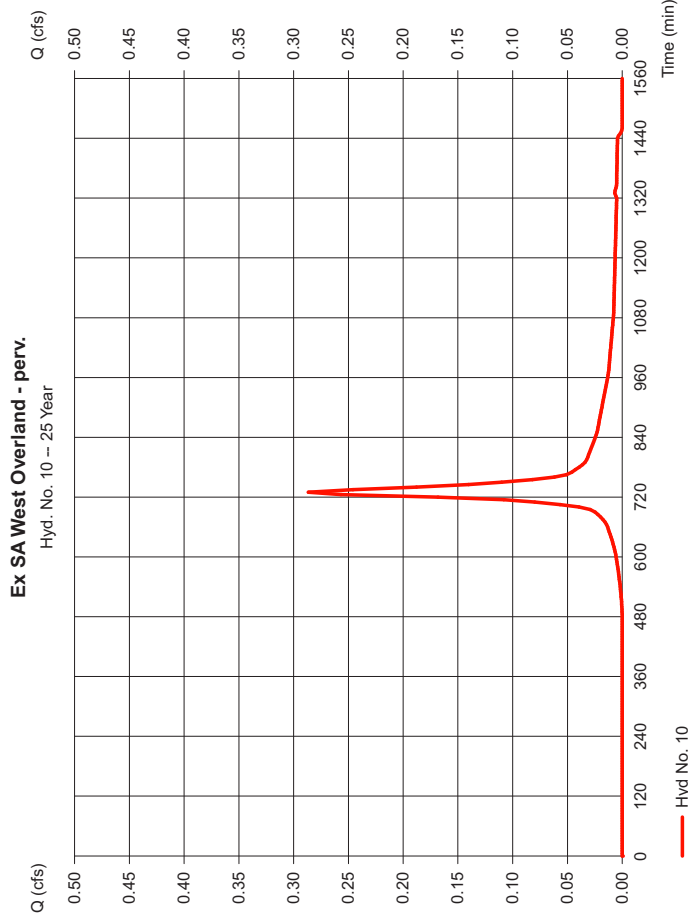
Hydratlow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 10

Ex SA West Overland - perv.

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.287 cfs
Storm frequency	=	25 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	1,138 cuft
Drainage area	=	0.100 ac	Curve number	=	74
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	6.19 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

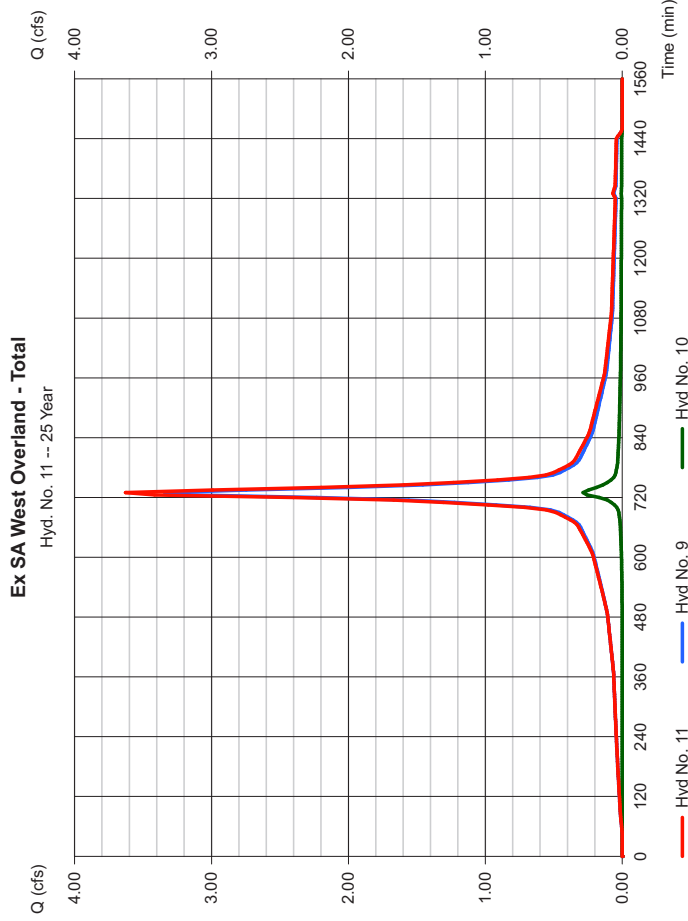
Thursday, Apr 30, 2020

Hyd. No. 11

Ex SA West Overland - Total

Hydrograph type = Combine
 Storm frequency = 25 yrs
 Time interval = 5 min
 Inflow hyds. = 9, 10

Peak discharge = 3.627 cfs
 Time to peak = 730 min
 Hyd. volume = 16.532 cuft
 Contrib. drain. area = 0.860 ac



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

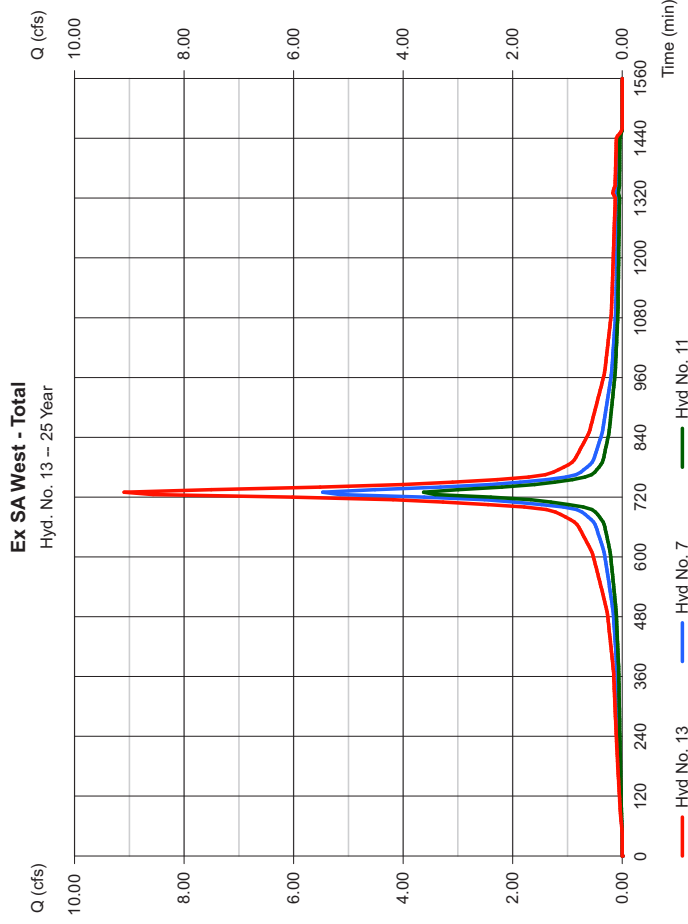
Thursday, Apr 30, 2020

Hyd. No. 13

Ex SA West - Total

Hydrograph type = Combine
 Storm frequency = 25 yrs
 Time interval = 5 min
 Inflow hyds. = 7, 11

Peak discharge = 9.097 cfs
 Time to peak = 730 min
 Hyd. volume = 41.443 cuft
 Contrib. drain. area = 0.000 ac



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

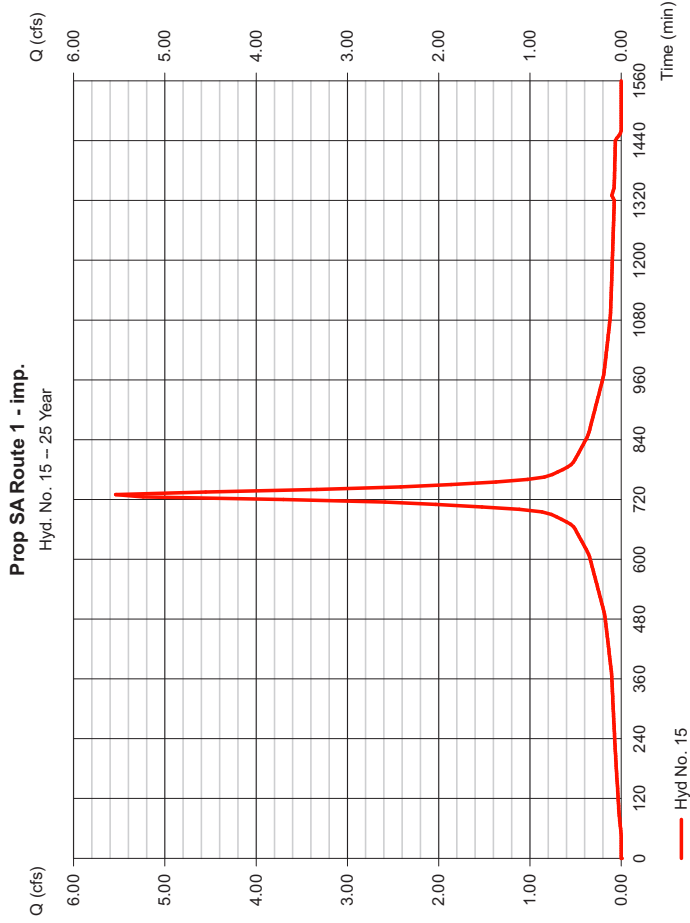
Thursday, Apr 30, 2020

Hyd. No. 15

Prop SA Route 1 - imp.

Hydrograph type = SCS Runoff
 Storm frequency = 25 yrs
 Time interval = 5 min
 Drainage area = 1.260 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 6.19 in
 Storm duration = 24 hrs

Peak discharge = 5.539 cfs
 Time to peak = 730 min
 Hyd. volume = 25.520 cuft
 Curve number = 98
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

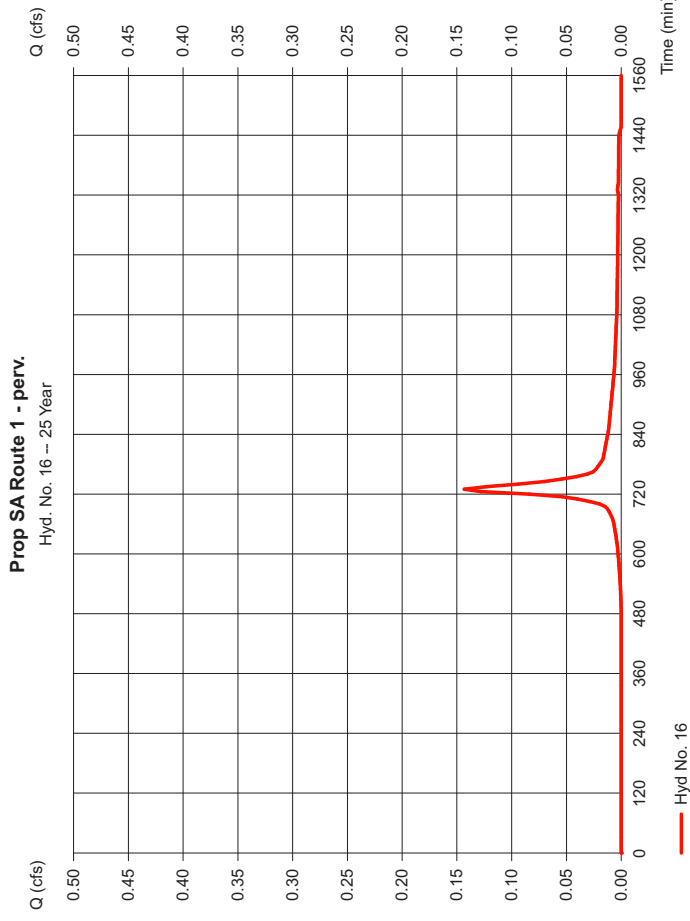
Thursday, Apr 30, 2020

Hyd. No. 16

Prop SA Route 1 - perv.

Hydrograph type = SCS Runoff
 Storm frequency = 25 yrs
 Time interval = 5 min
 Drainage area = 0.050 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 6.19 in
 Storm duration = 24 hrs

Peak discharge = 0.143 cfs
 Time to peak = 730 min
 Hyd. volume = 569 cuft
 Curve number = 74
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 17

Prop SA Route 1 - Total

Hydrograph type = Combine
 Storm frequency = 25 yrs
 Time interval = 5 min
 Inflow hyds. = 15, 16

Peak discharge = 5.682 cfs
 Time to peak = 730 min
 Hyd. volume = 26,090 cuft
 Contrib. drain. area = 1.310 ac

Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

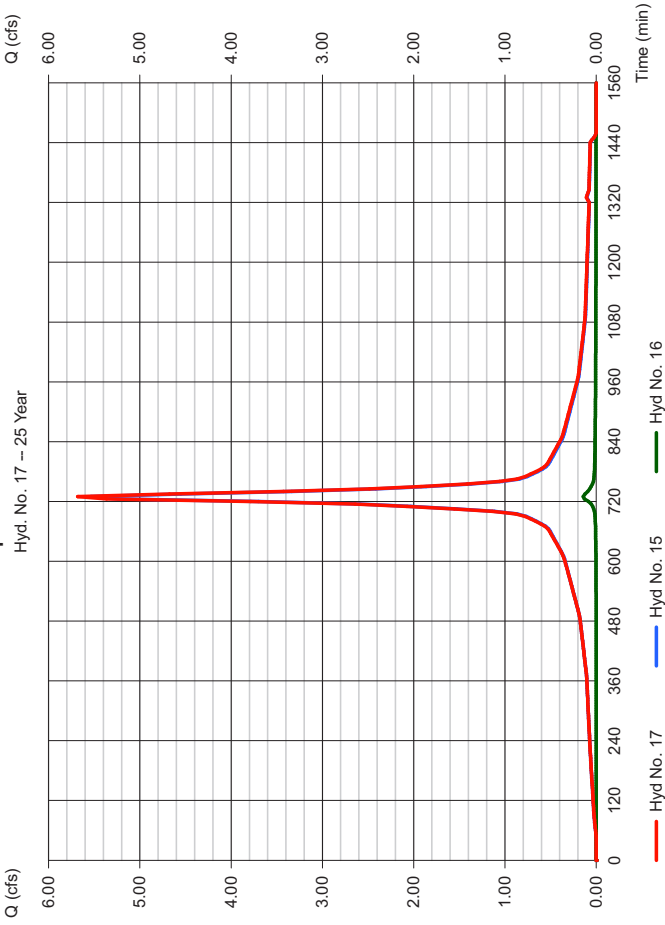
Hyd. No. 19

Prop SA Route 1 - Untreated - imp.

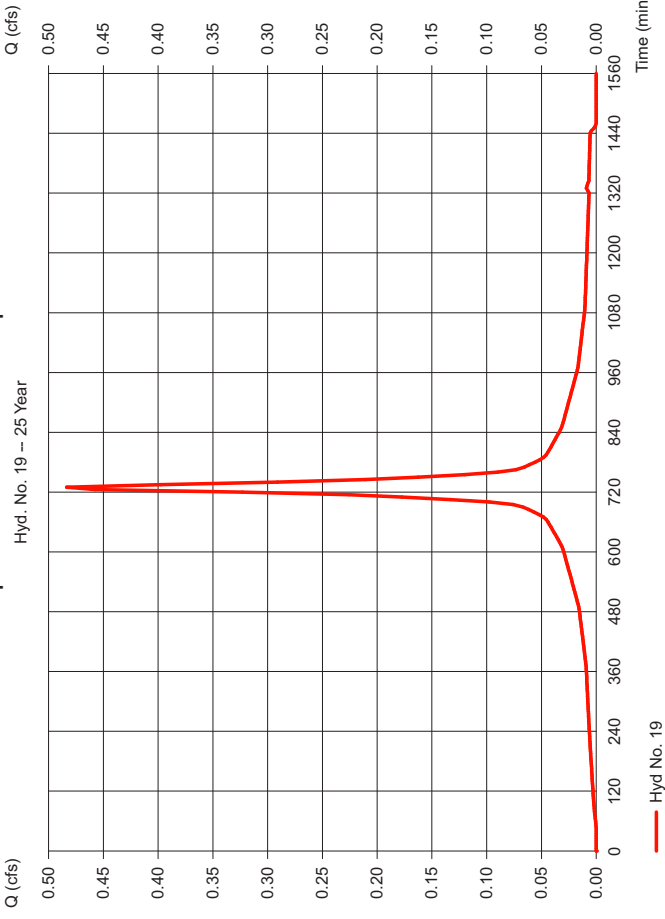
Hydrograph type = SCS Runoff
 Storm frequency = 25 yrs
 Time interval = 5 min
 Drainage area = 0.110 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 6.19 in
 Storm duration = 24 hrs

Peak discharge = 0.484 cfs
 Time to peak = 730 min
 Hyd. volume = 2,228 cuft
 Curve number = 98
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484

Prop SA Route 1 - Total



Prop SA Route 1 - Untreated - imp.



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

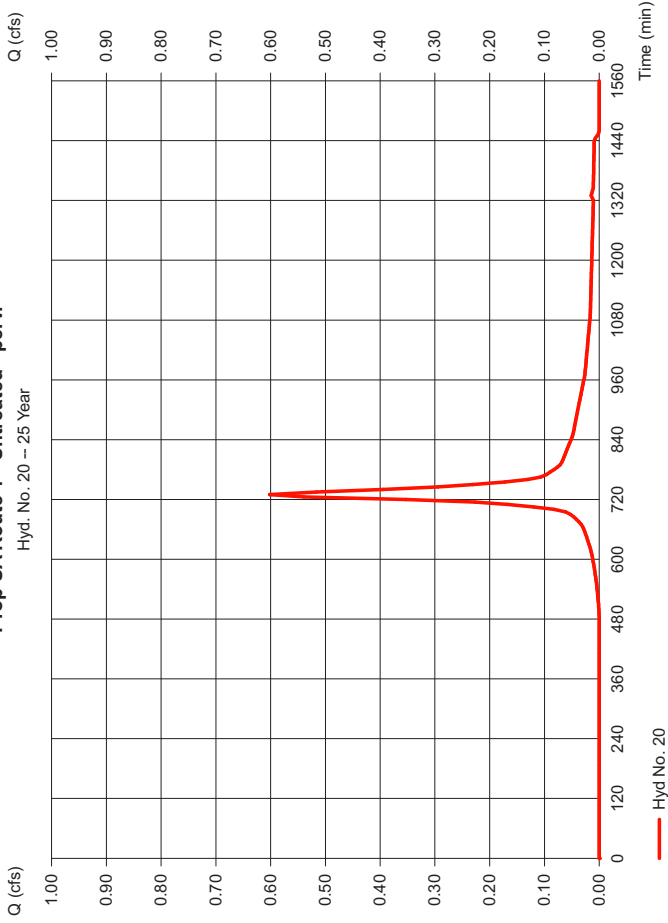
Thursday, Apr 30, 2020

Hyd. No. 20

Prop SA Route 1 - Untreated - perv.

Hydrograph type	= SCS Runoff	Peak discharge	= 0.602 cfs
Storm frequency	= 25 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 2,391 cuft
Drainage area	= 0.210 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 6.19 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Prop SA Route 1 - Untreated - perv.



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

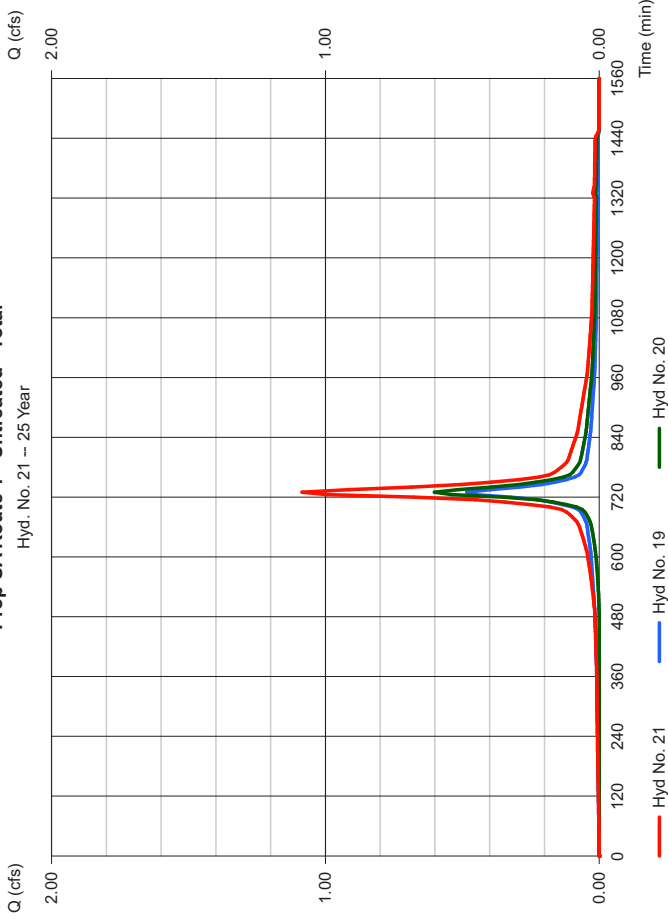
Thursday, Apr 30, 2020

Hyd. No. 21

Prop SA Route 1 - Untreated - Total

Hydrograph type	= Combine	Peak discharge	= 1.085 cfs
Storm frequency	= 25 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 4,619 cuft
Inflow hyds.	= 19, 20	Contrib. drain. area	= 0.320 ac

Prop SA Route 1 - Untreated - Total



Hydrograph Report

Hydratlow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 23

Prop Route 1 - Total

Hydrograph type = Combine
 Storm frequency = 25 yrs
 Time interval = 5 min
 Inflow hyds. = 17, 21

Peak discharge = 6.767 cfs
 Time to peak = 730 min
 Hyd. volume = 30,708 cuft
 Contrib. drain. area = 0.000 ac

Hydrograph Report

Hydratlow Hydrographs by Intellisolve v9.1

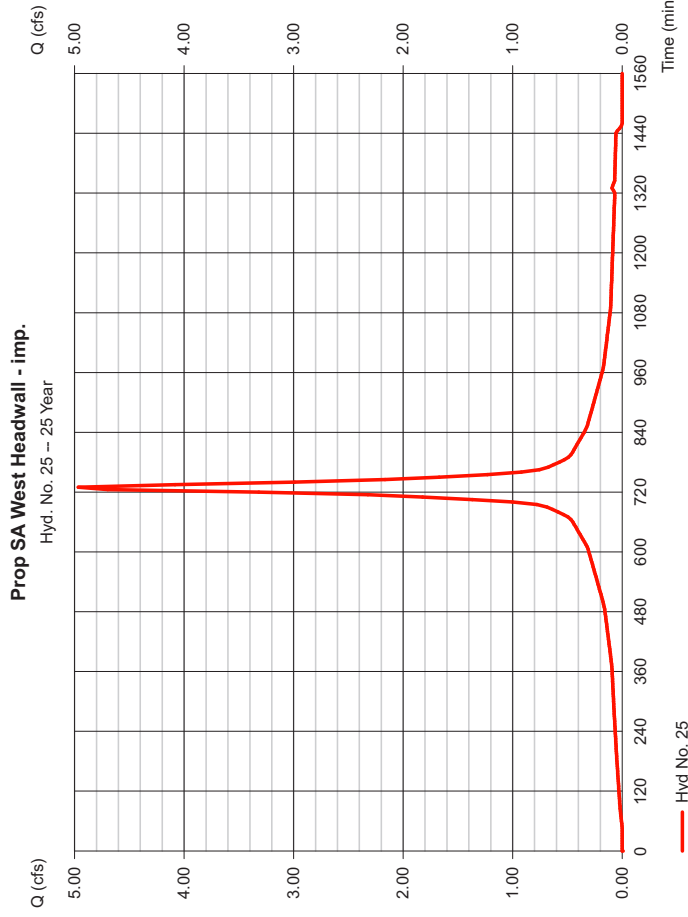
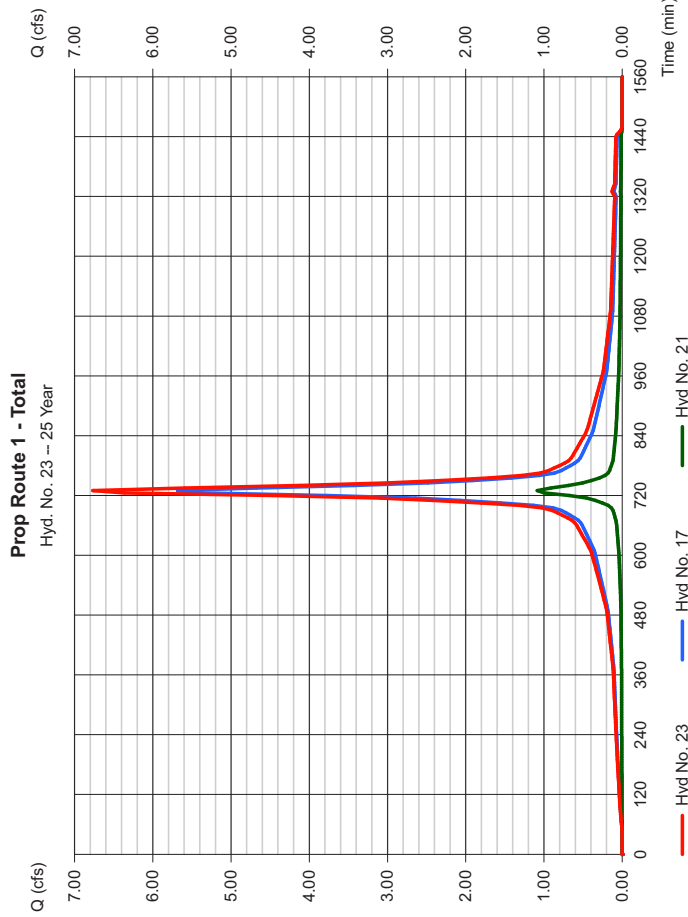
Thursday, Apr 30, 2020

Hyd. No. 25

Prop SA West Headwall - imp.

Hydrograph type = SCS Runoff
 Storm frequency = 25 yrs
 Time interval = 5 min
 Drainage area = 1.130 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 6.19 in
 Storm duration = 24 hrs

Peak discharge = 4.967 cfs
 Time to peak = 730 min
 Hyd. volume = 22,887 cuft
 Curve number = 98
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

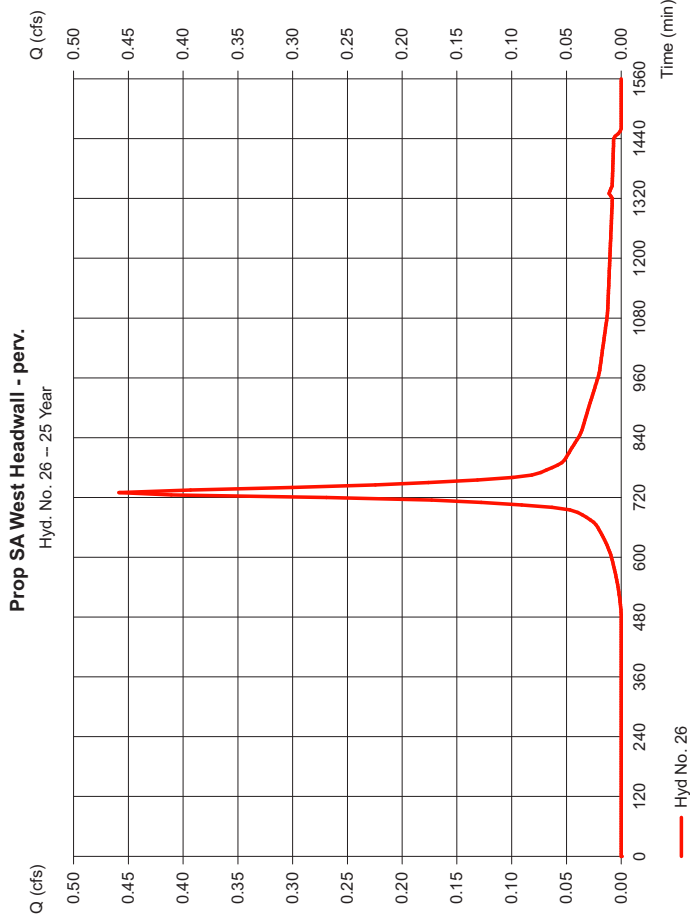
Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 26

Prop SA West Headwall - perv.

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.459 cfs
Storm frequency	=	25 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	1,822 cuft
Drainage area	=	0.160 ac	Curve number	=	74
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	6.19 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Report

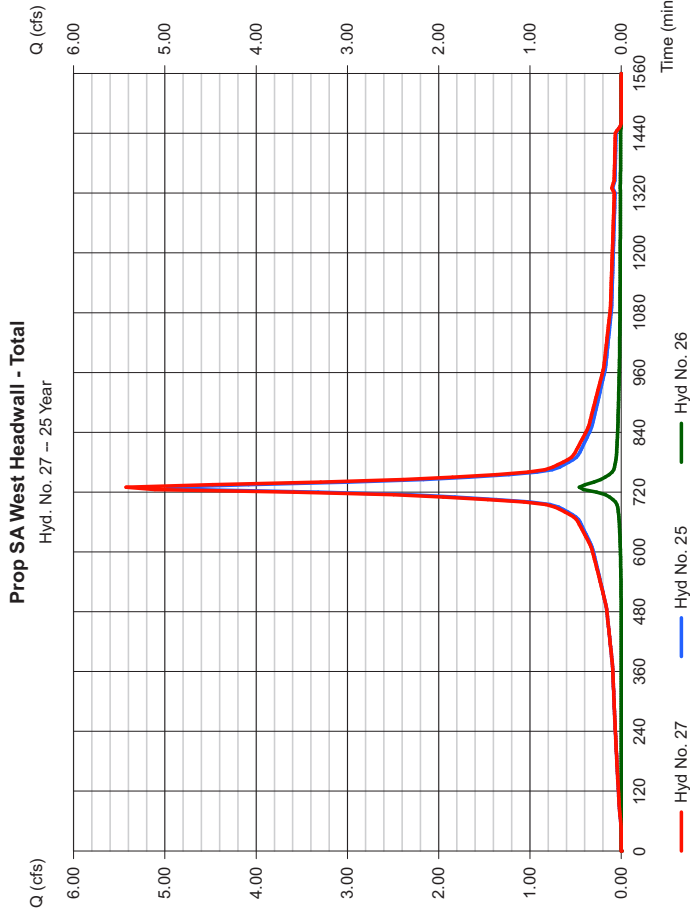
Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 27

Prop SA West Headwall - Total

Hydrograph type	=	Combine	Peak discharge	=	5.426 cfs
Storm frequency	=	25 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	24,709 cuft
Inflow hyds.	=	25, 26	Contrib. drain. area	=	1,290 ac



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

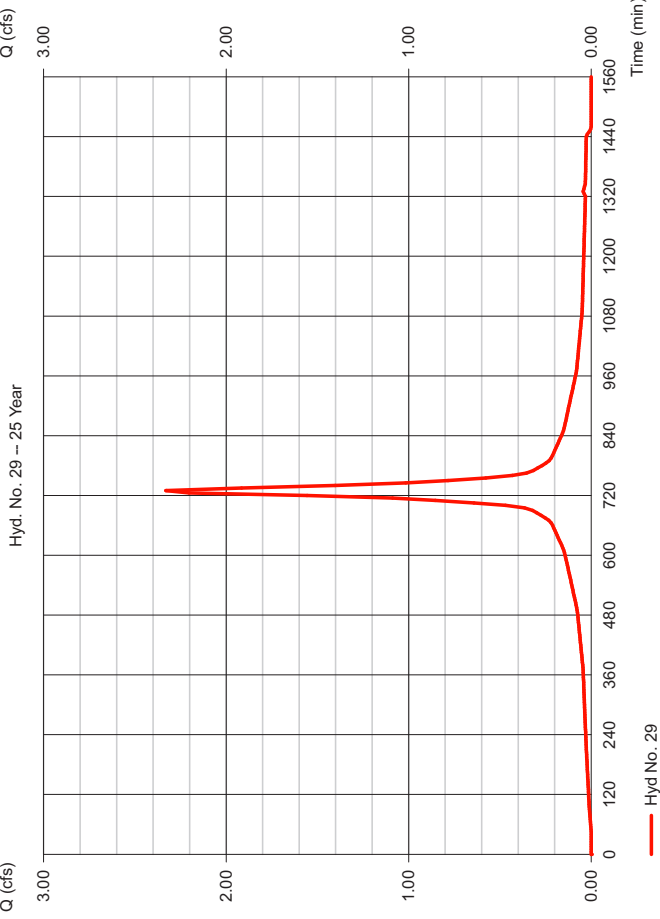
Thursday, Apr 30, 2020

Hyd. No. 29

Prop SA West Overland - imp.

Hydrograph type	=	SCS Runoff	Peak discharge	=	2,330 cfs
Storm frequency	=	25 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	10,735 cuft
Drainage area	=	0.530 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	6.19 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

Prop SA West Overland - imp.



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

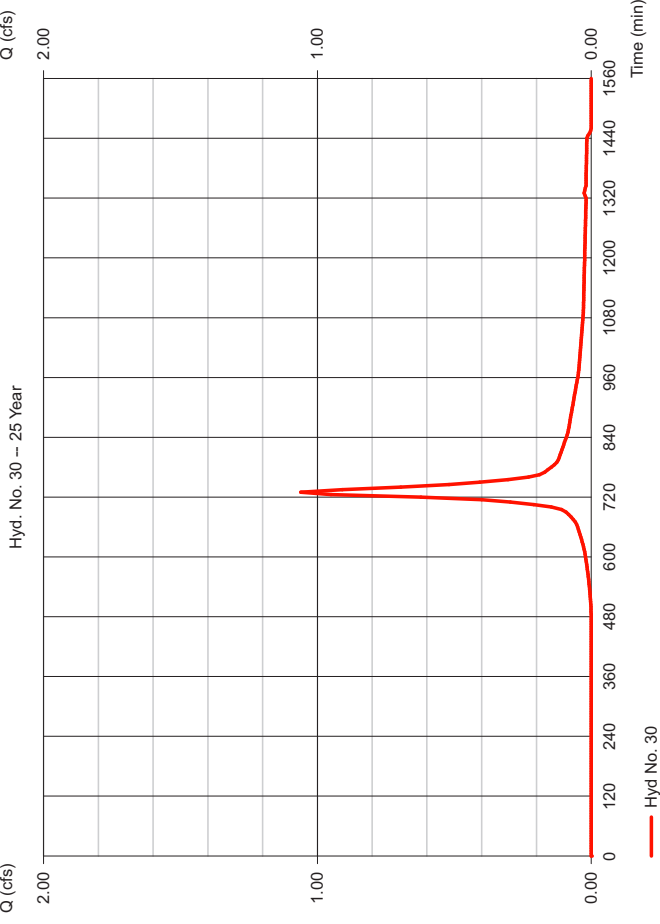
Thursday, Apr 30, 2020

Hyd. No. 30

Prop SA West Overland - perv.

Hydrograph type	=	SCS Runoff	Peak discharge	=	1,061 cfs
Storm frequency	=	25 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	4,212 cuft
Drainage area	=	0.370 ac	Curve number	=	74
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	6.19 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

Prop SA West Overland - perv.



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

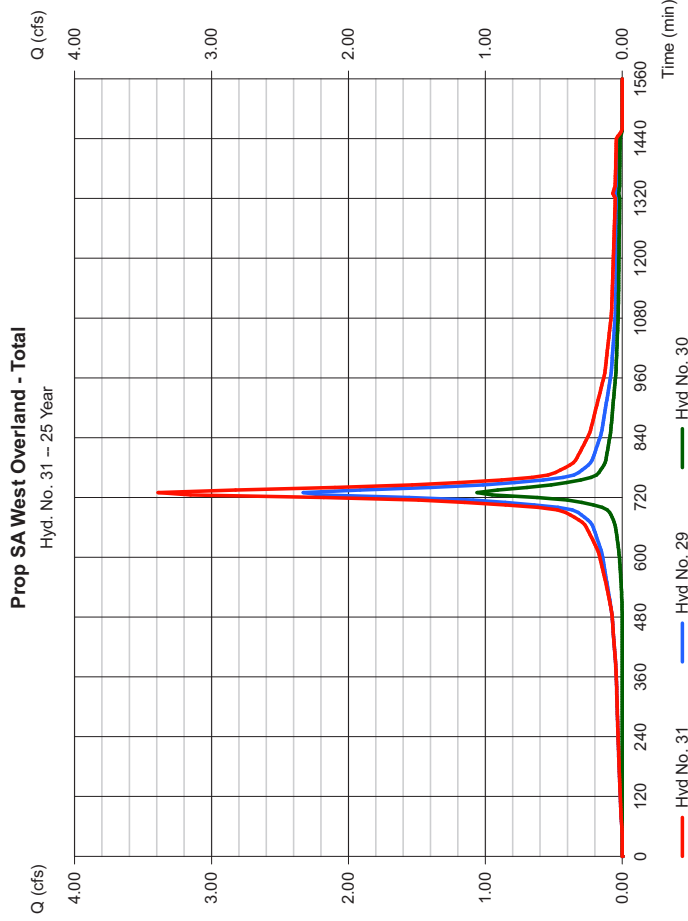
Thursday, Apr 30, 2020

Hyd. No. 31

Prop SA West Overland - Total

Hydrograph type = Combine
 Storm frequency = 25 yrs
 Time interval = 5 min
 Inflow hyds. = 29, 30

Peak discharge = 3.390 cfs
 Time to peak = 730 min
 Hyd. volume = 14,947 cuft
 Contrib. drain. area = 0.900 ac



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

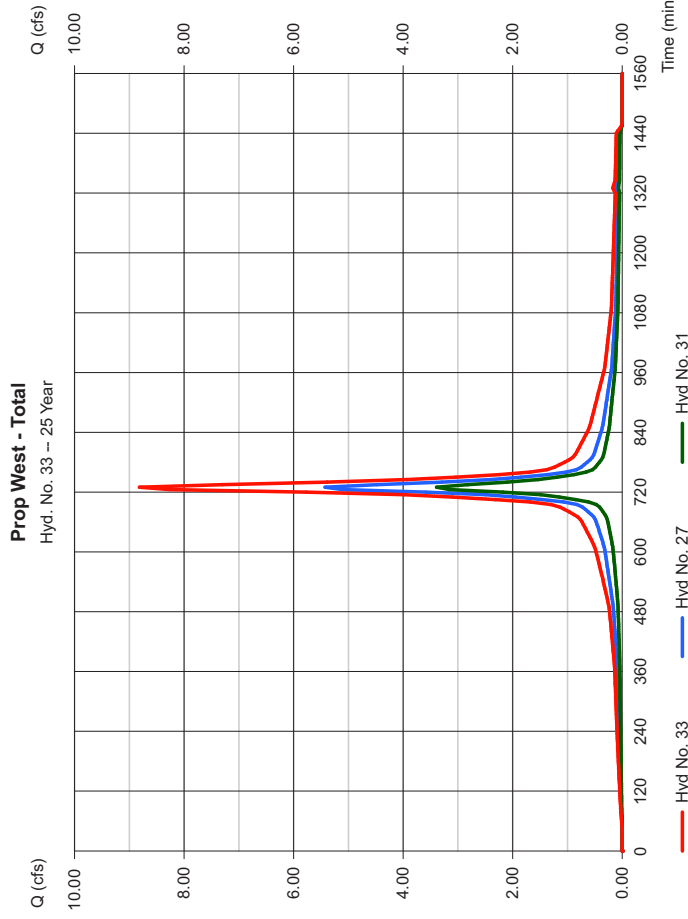
Thursday, Apr 30, 2020

Hyd. No. 33

Prop West - Total

Hydrograph type = Combine
 Storm frequency = 25 yrs
 Time interval = 5 min
 Inflow hyds. = 27, 31

Peak discharge = 8.816 cfs
 Time to peak = 730 min
 Hyd. volume = 39,666 cuft
 Contrib. drain. area = 0.000 ac



Hydrograph Summary Report

Hydratflow Hydrographs by Intellisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strgs used (cuft)	Hydrograph description
1	SCS Runoff	8.473	5	730	39,370	----	----	----	Ex SA Route 1 - imp.
2	SCS Runoff	1.023	5	730	4,087	----	----	----	Ex SA Route 1 - perv.
3	Combine	9.496	5	730	43,457	1, 2	----	----	Ex SA Route 1 - Total
5	SCS Runoff	6.755	5	730	31,386	----	----	----	Ex SA West Headwall - imp.
6	SCS Runoff	0.711	5	730	2,843	----	----	----	Ex SA West Headwall - perv.
7	Combine	7.466	5	730	34,229	5, 6	----	----	Ex SA West Headwall - Total
9	SCS Runoff	4.503	5	730	20,924	----	----	----	Ex SA West Overland - imp.
10	SCS Runoff	0.445	5	730	1,777	----	----	----	Ex SA West Overland - perv.
11	Combine	4.948	5	730	22,701	9, 10	----	----	Ex SA West Overland - Total
13	Combine	12.41	5	730	56,930	7, 11,	----	----	Ex SA West - Total
15	SCS Runoff	7.466	5	730	34,689	----	----	----	Prop SA Route 1 - imp.
16	SCS Runoff	0.222	5	730	889	----	----	----	Prop SA Route 1 - perv.
17	Combine	7.688	5	730	35,578	15, 16	----	----	Prop SA Route 1 - Total
19	SCS Runoff	0.652	5	730	3,028	----	----	----	Prop SA Route 1 - Untreated - imp.
20	SCS Runoff	0.934	5	730	3,732	----	----	----	Prop SA Route 1 - Untreated - perv.
21	Combine	1.586	5	730	6,760	19, 20	----	----	Prop SA Route 1 - Untreated - Total
23	Combine	9.274	5	730	42,338	17, 21,	----	----	Prop Route 1 - Total
25	SCS Runoff	6.896	5	730	31,110	----	----	----	Prop SA West Headwall - imp.
26	SCS Runoff	0.711	5	730	2,843	----	----	----	Prop SA West Headwall - perv.
27	Combine	7.407	5	730	33,954	25, 26	----	----	Prop SA West Headwall - Total
29	SCS Runoff	3.141	5	730	14,592	----	----	----	Prop SA West Overland - imp.
30	SCS Runoff	1.645	5	730	6,575	----	----	----	Prop SA West Overland - perv.
31	Combine	4.786	5	730	21,167	29, 30	----	----	Prop SA West Overland - Total
33	Combine	12.19	5	730	55,120	27, 31,	----	----	Prop West - Total

Ex & Prop - 2,10,25,100 yr:gpw

Return Period: 100 Year

Thursday, Apr 30, 2020

Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

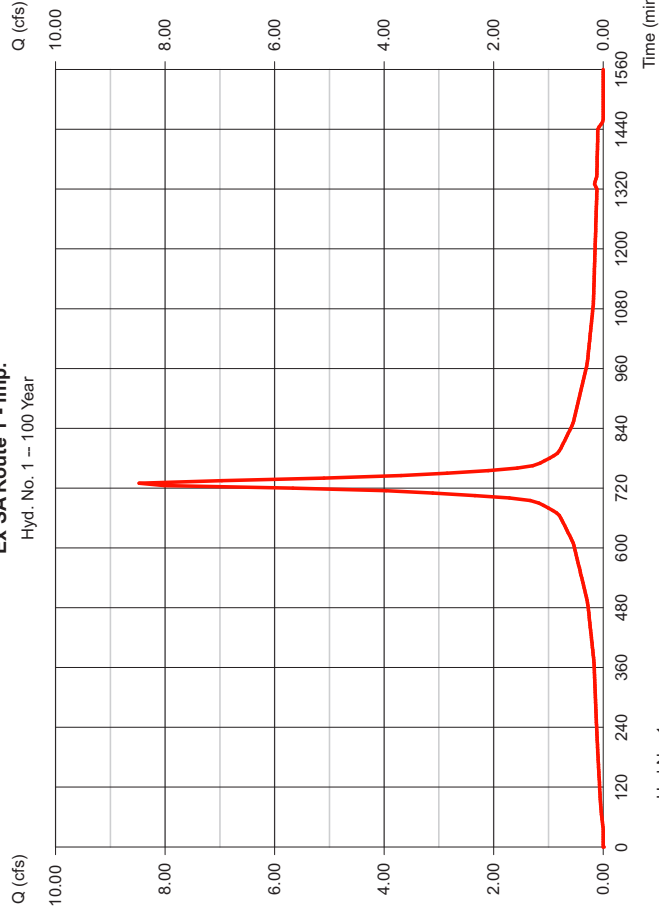
Hyd. No. 1

Ex SA Route 1 - imp.

Hydrograph type	= SCS Runoff	Peak discharge	= 8.473 cfs
Storm frequency	= 100 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 39,370 cuft
Drainage area	= 1.430 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 8.33 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Ex SA Route 1 - imp.

Hyd. No. 1 -- 100 Year



Hydrograph Report

Hydratlow Hydrographs by Intellisolve v9.1

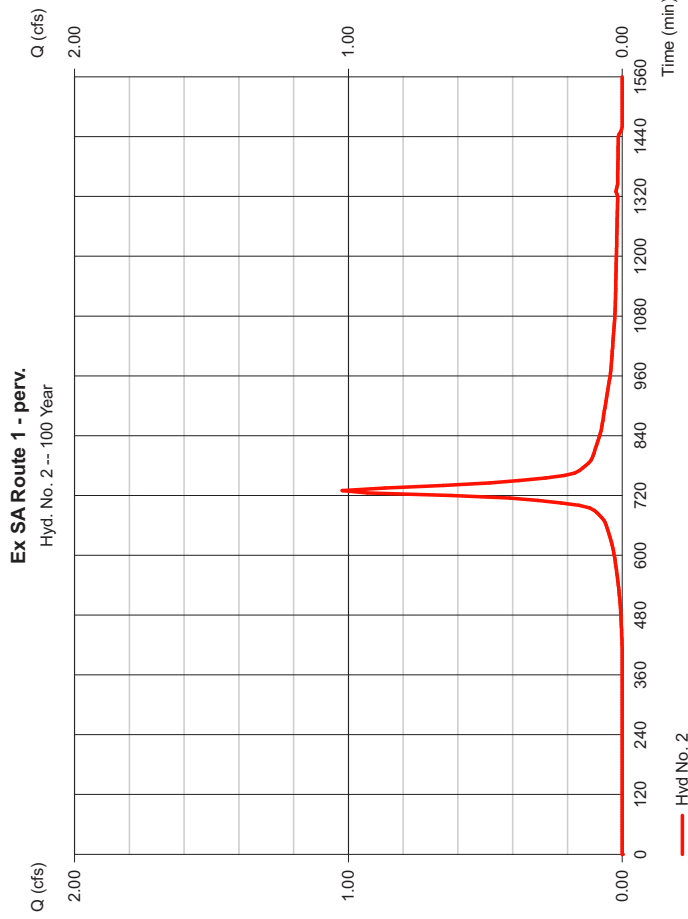
Thursday, Apr 30, 2020

Hyd. No. 2

Ex SA Route 1 - perv.

Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 5 min
 Drainage area = 0.230 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 8.33 in
 Storm duration = 24 hrs

Peak discharge = 1.023 cfs
 Time to peak = 730 min
 Hyd. volume = 4,087 cuft
 Curve number = 74
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hydratlow Hydrographs by Intellisolve v9.1

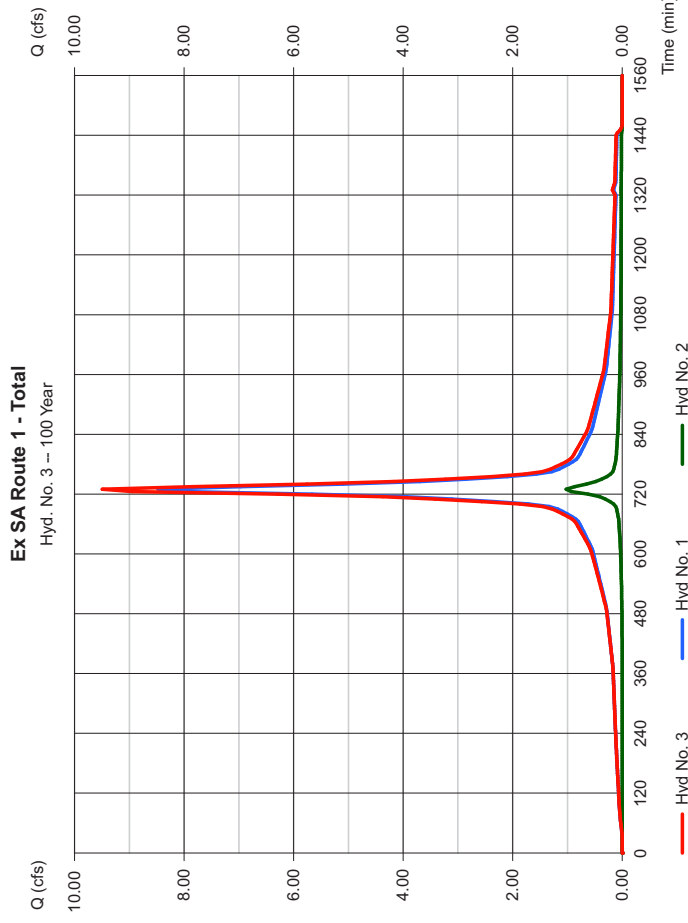
Thursday, Apr 30, 2020

Hyd. No. 3

Ex SA Route 1 - Total

Hydrograph type = Combine
 Storm frequency = 100 yrs
 Time interval = 5 min
 Inflow hyds. = 1, 2

Peak discharge = 9.496 cfs
 Time to peak = 730 min
 Hyd. volume = 43,457 cuft
 Contrib. drain. area = 1.660 ac



Hydrograph Report

Hydratlow Hydrographs by Intellisolve v9.1

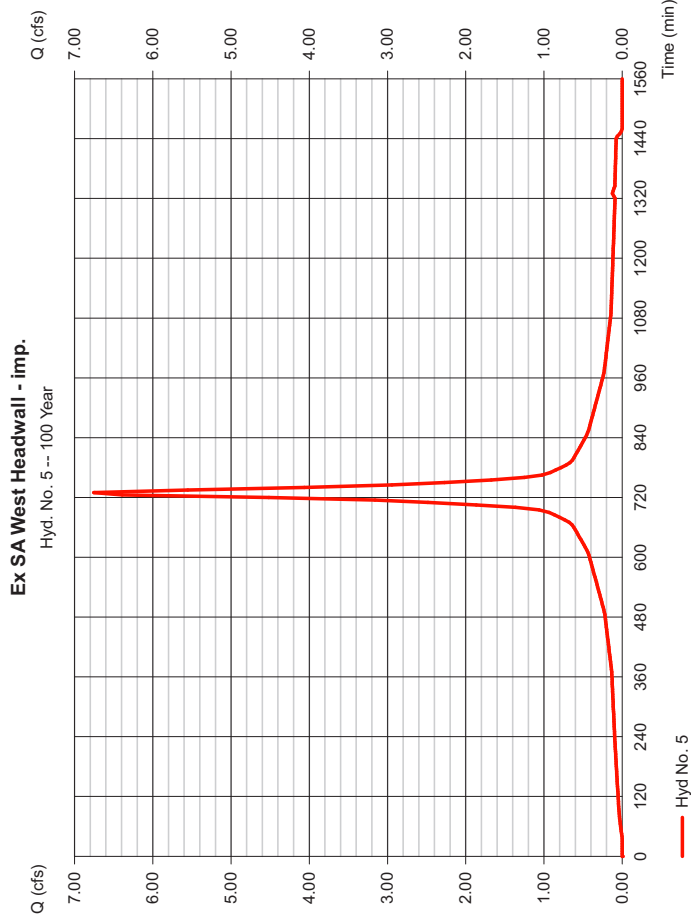
Thursday, Apr 30, 2020

Hyd. No. 5

Ex SA West Headwall - imp.

Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 5 min
 Drainage area = 1.140 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 8.33 in
 Storm duration = 24 hrs

Peak discharge = 6.755 cfs
 Time to peak = 730 min
 Hyd. volume = 31,386 cuft
 Curve number = 98
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hydratlow Hydrographs by Intellisolve v9.1

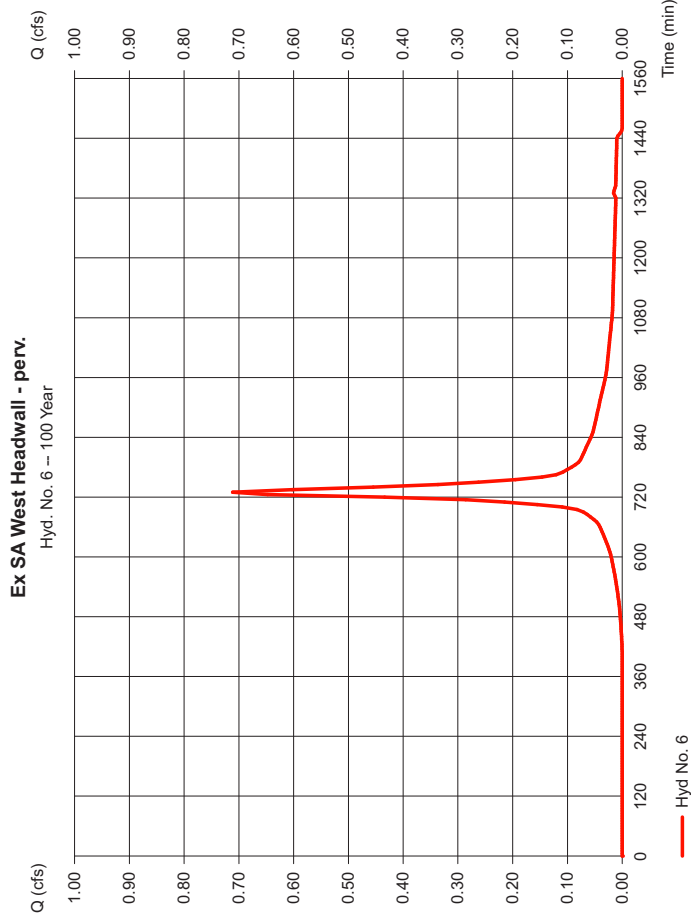
Thursday, Apr 30, 2020

Hyd. No. 6

Ex SA West Headwall - perv.

Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 5 min
 Drainage area = 0.160 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 8.33 in
 Storm duration = 24 hrs

Peak discharge = 0.711 cfs
 Time to peak = 730 min
 Hyd. volume = 2,843 cuft
 Curve number = 74
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 7

Ex SA West Headwall - Total

Hydrograph type = Combine
 Storm frequency = 100 yrs
 Time interval = 5 min
 Inflow hyds. = 5, 6

Peak discharge = 7.466 cfs
 Time to peak = 730 min
 Hyd. volume = 34,229 cuft
 Contrib. drain. area = 1,300 ac

Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

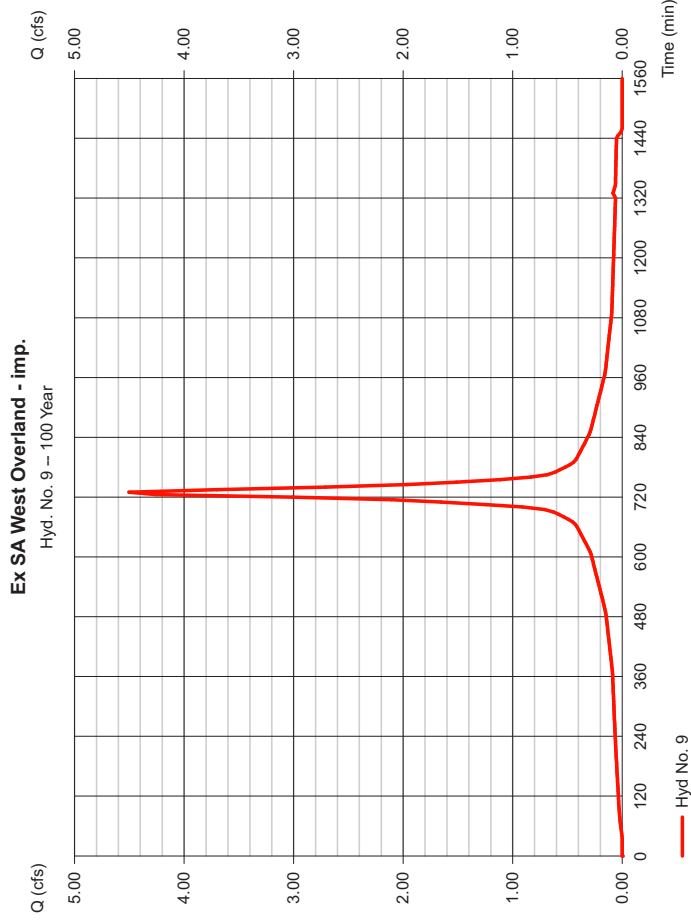
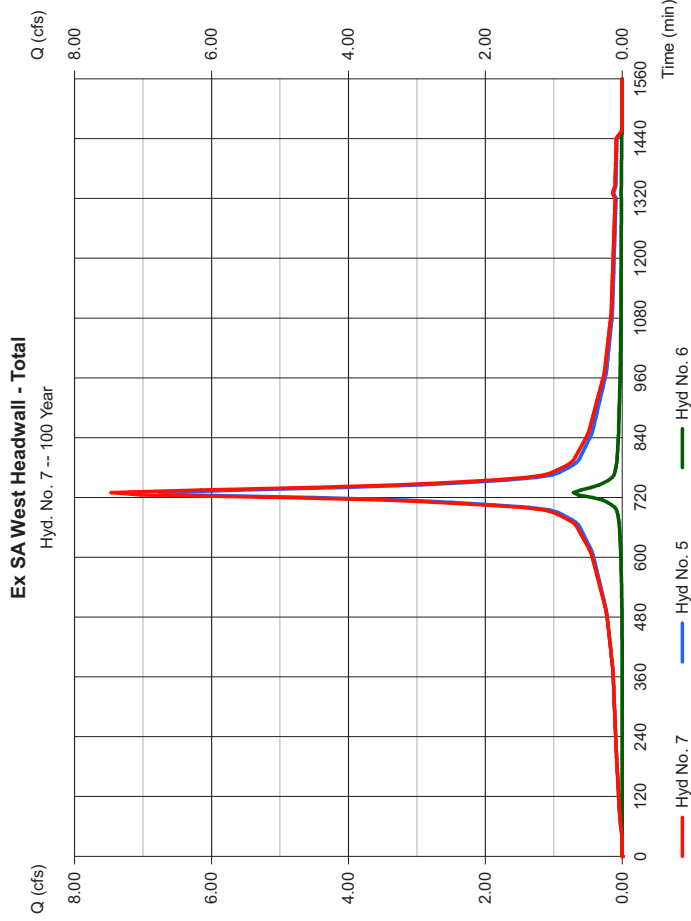
Thursday, Apr 30, 2020

Hyd. No. 9

Ex SA West Overland - imp.

Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 5 min
 Drainage area = 0.760 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 8.33 in
 Storm duration = 24 hrs

Peak discharge = 4.503 cfs
 Time to peak = 730 min
 Hyd. volume = 20,924 cuft
 Curve number = 98
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

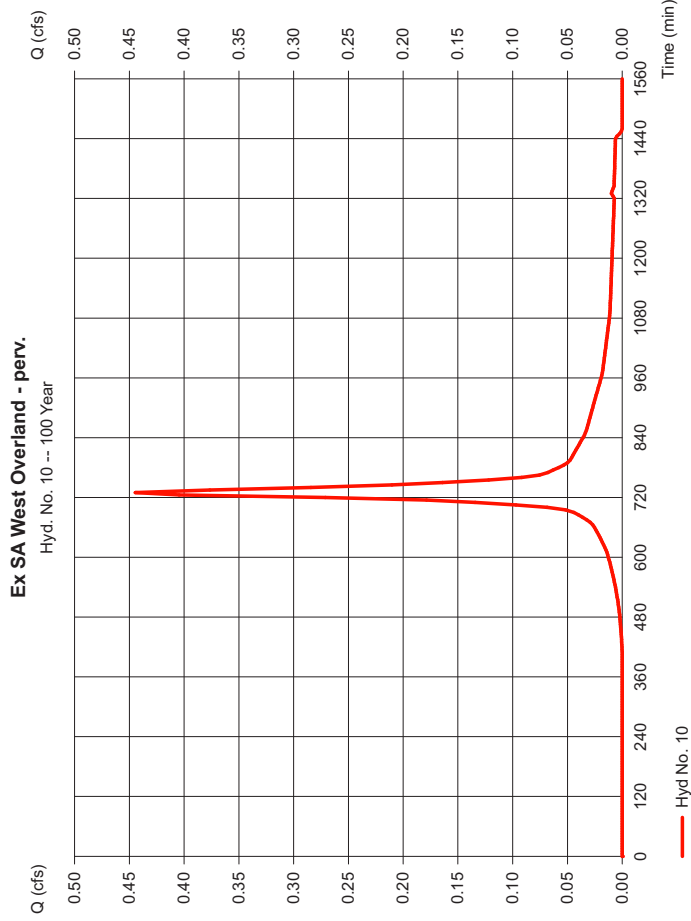
Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 10

Ex SA West Overland - perv.

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.445 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	1,777 cuft
Drainage area	=	0.100 ac	Curve number	=	74
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.33 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Report

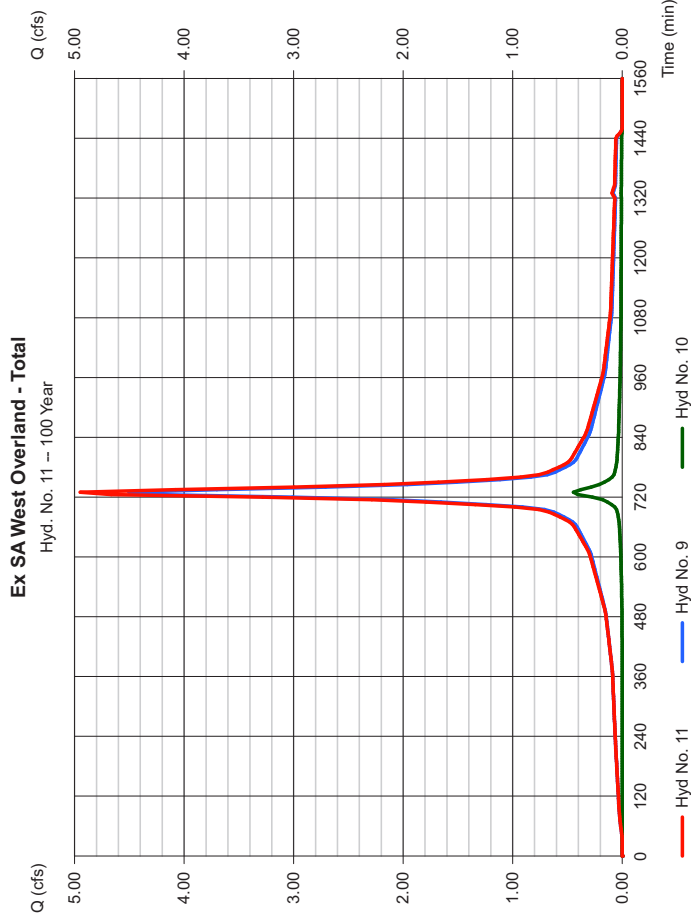
Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 11

Ex SA West Overland - Total

Hydrograph type	=	Combine	Peak discharge	=	4.948 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	22,701 cuft
Inflow hyds.	=	9, 10	Contrib. drain. area	=	0.860 ac



Hydrograph Report

Hydratlow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 13

Ex SA West - Total

Hydrograph type = Combine
 Storm frequency = 100 yrs
 Time interval = 5 min
 Inflow hyds. = 7, 11

Peak discharge = 12.41 cfs
 Time to peak = 730 min
 Hyd. volume = 56,930 cuft
 Contrib. drain. area = 0.000 ac

Hydrograph Report

Hydratlow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

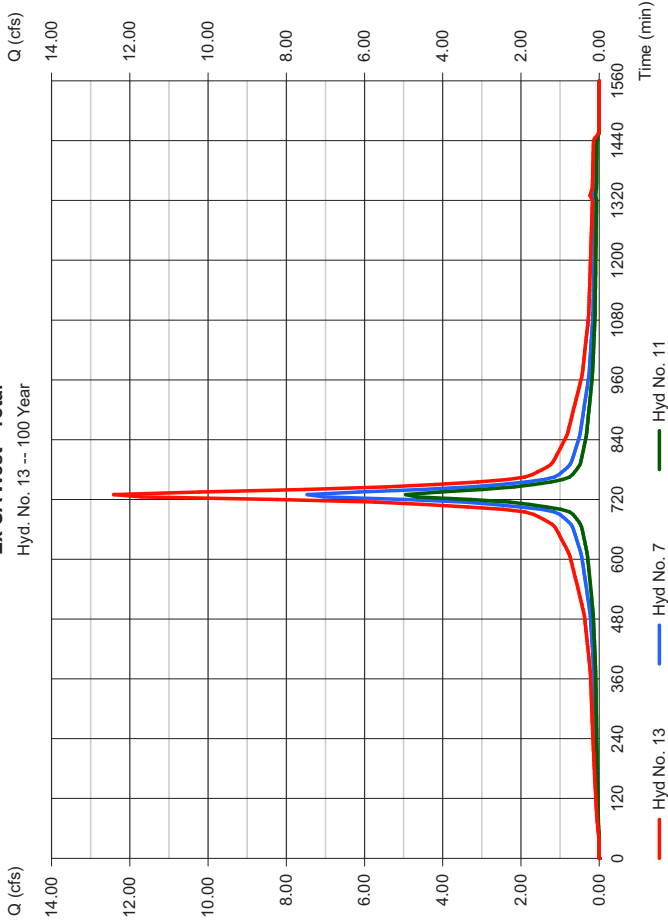
Hyd. No. 15

Prop SA Route 1 - imp.

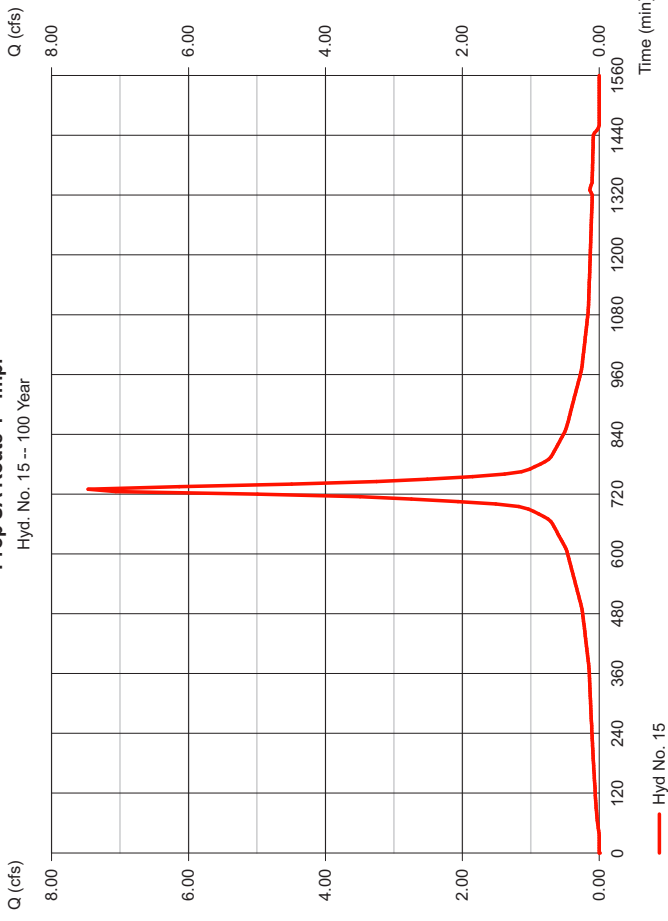
Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 5 min
 Drainage area = 1.260 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 8.33 in
 Storm duration = 24 hrs

Peak discharge = 7.466 cfs
 Time to peak = 730 min
 Hyd. volume = 34,689 cuft
 Curve number = 98
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484

Ex SA West - Total



Prop SA Route 1 - imp.



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

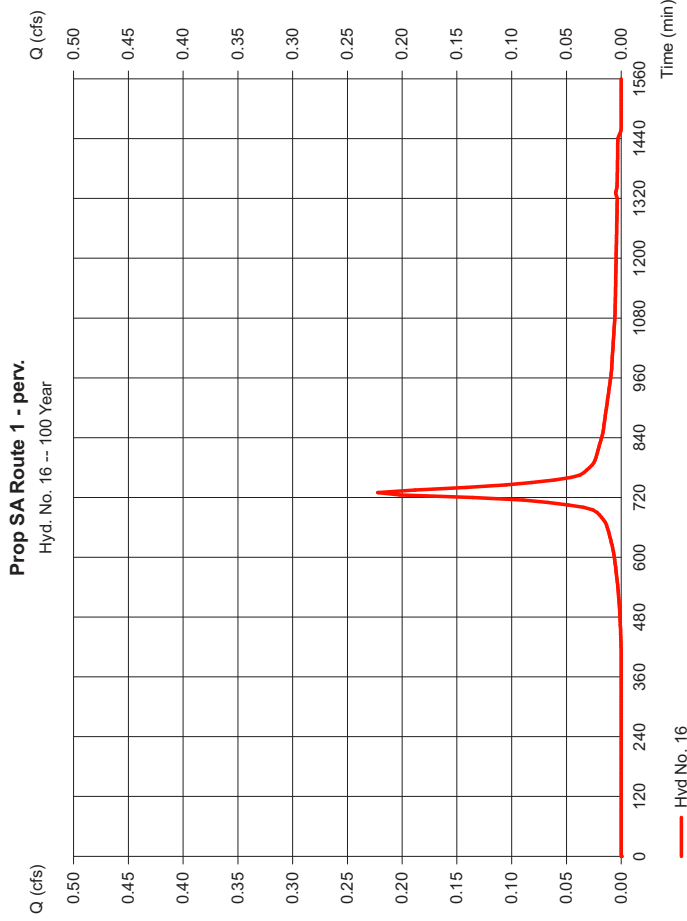
Thursday, Apr 30, 2020

Hyd. No. 16

Prop SA Route 1 - perv.

Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 5 min
 Drainage area = 0.050 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 8.33 in
 Storm duration = 24 hrs

Peak discharge = 0.222 cfs
 Time to peak = 730 min
 Hyd. volume = 889 cuft
 Curve number = 74
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

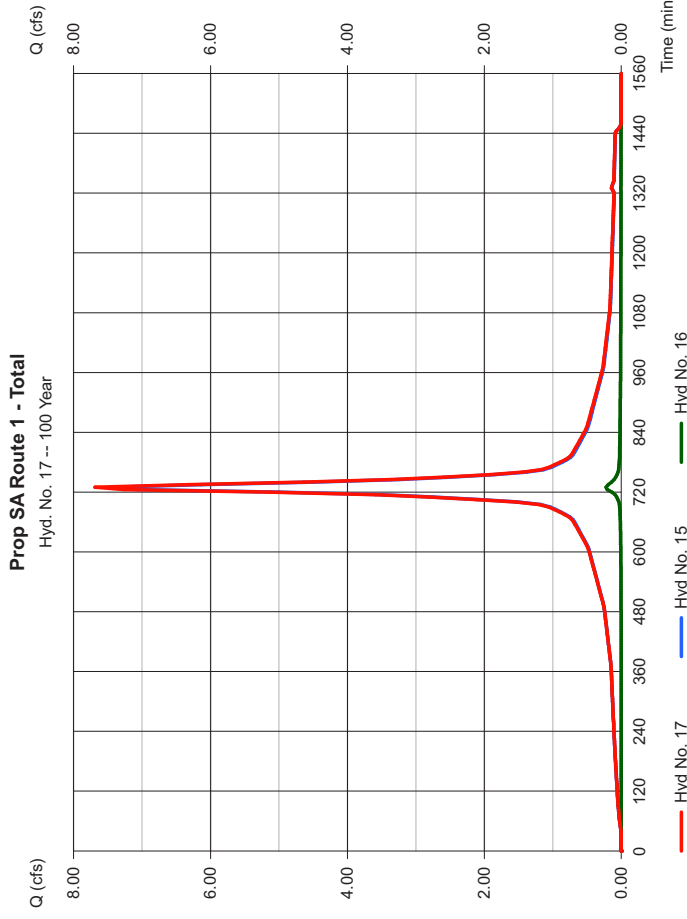
Thursday, Apr 30, 2020

Hyd. No. 17

Prop SA Route 1 - Total

Hydrograph type = Combine
 Storm frequency = 100 yrs
 Time interval = 5 min
 Inflow hyds. = 15, 16

Peak discharge = 7.688 cfs
 Time to peak = 730 min
 Hyd. volume = 35,578 cuft
 Contrib. drain. area = 1.310 ac



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

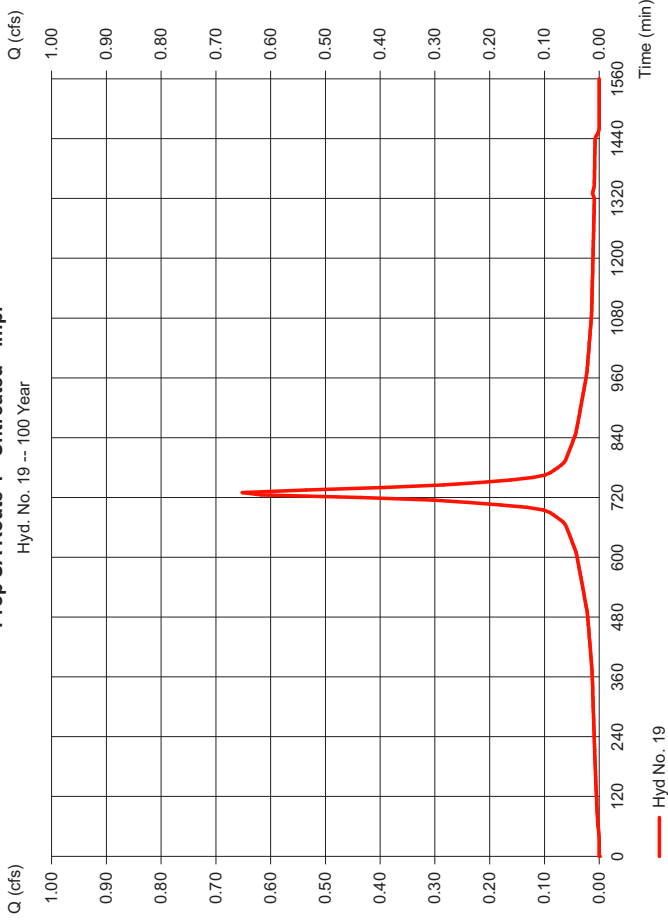
Thursday, Apr 30, 2020

Hyd. No. 19

Prop SA Route 1 - Untreated - imp.

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.652 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	3,028 cuft
Drainage area	=	0.110 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.33 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

Prop SA Route 1 - Untreated - imp.



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

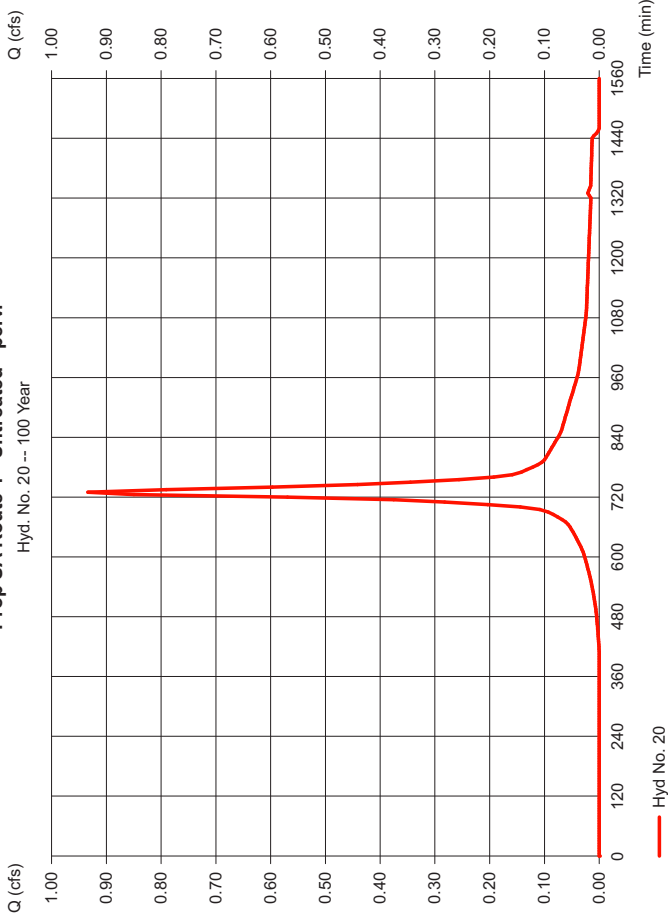
Thursday, Apr 30, 2020

Hyd. No. 20

Prop SA Route 1 - Untreated - perv.

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.934 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	3,732 cuft
Drainage area	=	0.210 ac	Curve number	=	74
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.33 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

Prop SA Route 1 - Untreated - perv.



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

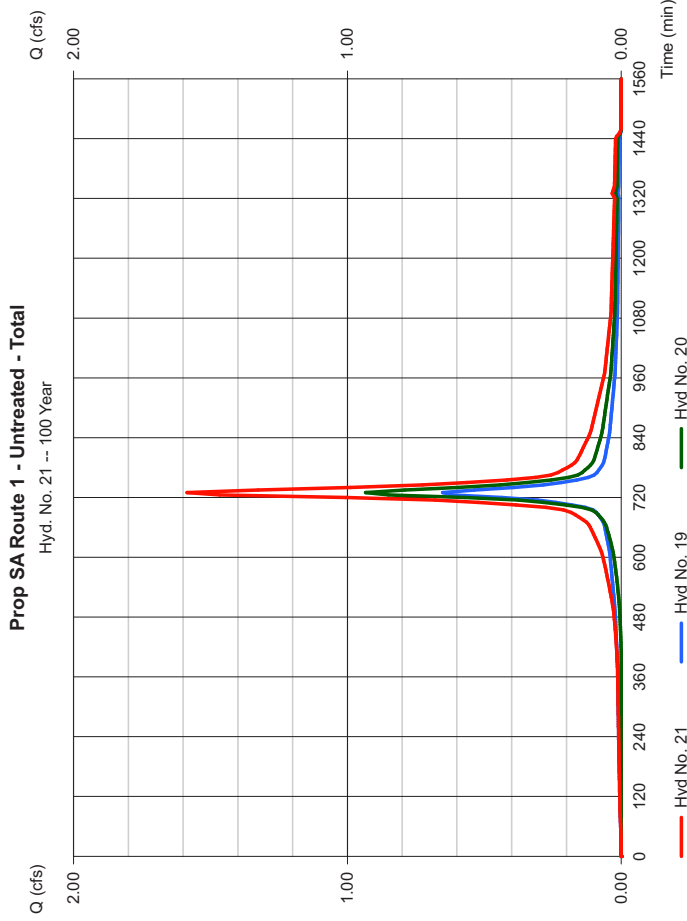
Thursday, Apr 30, 2020

Hyd. No. 21

Prop SA Route 1 - Untreated - Total

Hydrograph type = Combine
 Storm frequency = 100 yrs
 Time interval = 5 min
 Inflow hyds. = 19, 20

Peak discharge = 1.586 cfs
 Time to peak = 730 min
 Hyd. volume = 6,760 cuft
 Contrib. drain. area = 0.320 ac



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

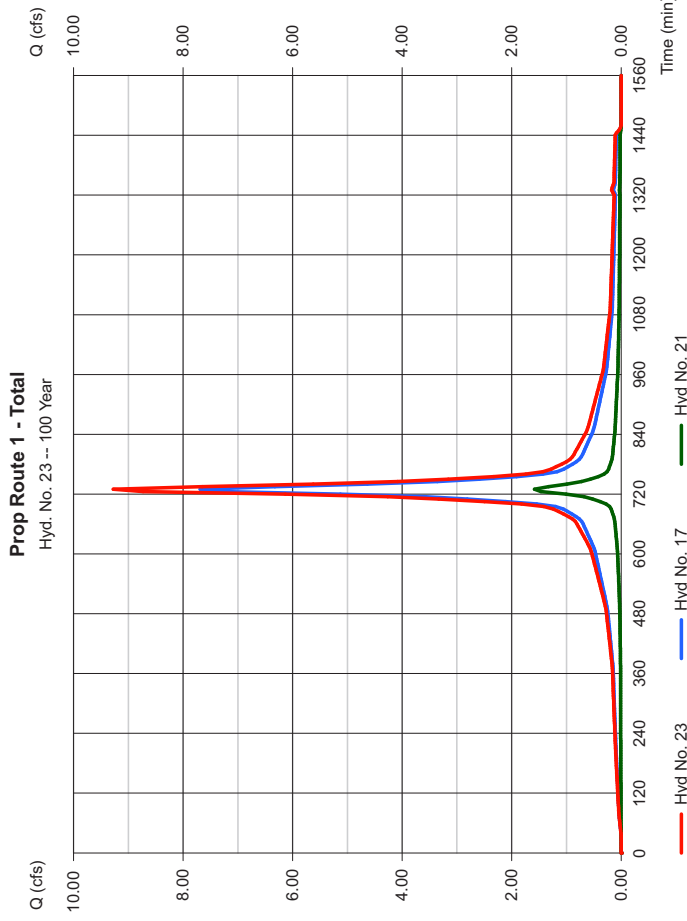
Thursday, Apr 30, 2020

Hyd. No. 23

Prop Route 1 - Total

Hydrograph type = Combine
 Storm frequency = 100 yrs
 Time interval = 5 min
 Inflow hyds. = 17, 21

Peak discharge = 9.274 cfs
 Time to peak = 730 min
 Hyd. volume = 42,338 cuft
 Contrib. drain. area = 0.000 ac



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

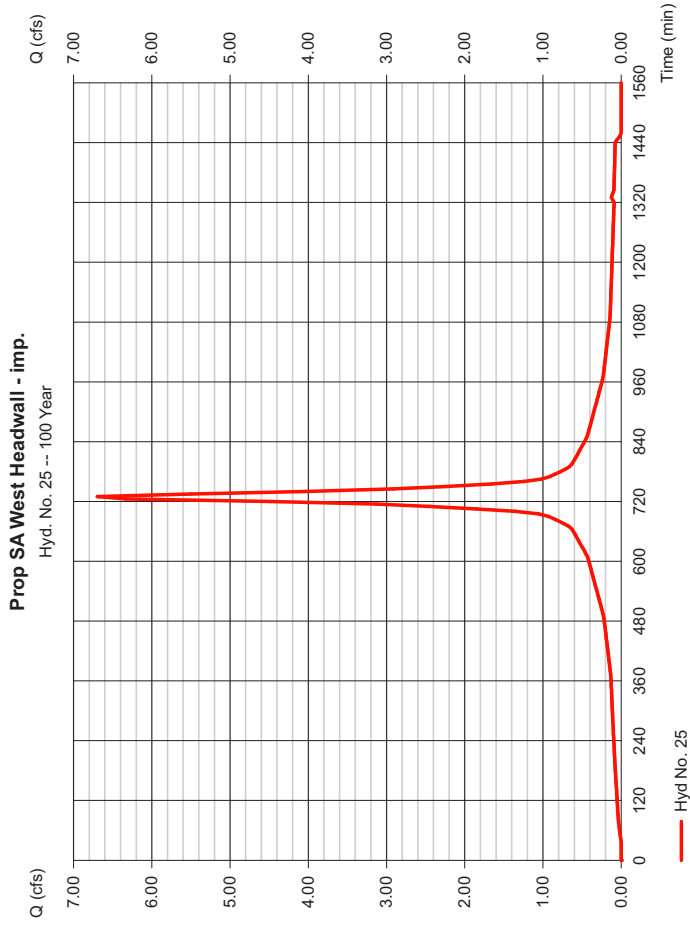
Thursday, Apr 30, 2020

Hyd. No. 25

Prop SA West Headwall - imp.

Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 5 min
 Drainage area = 1.130 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 8.33 in
 Storm duration = 24 hrs

Peak discharge = 6.696 cfs
 Time to peak = 730 min
 Hyd. volume = 31,110 cuft
 Curve number = 98
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

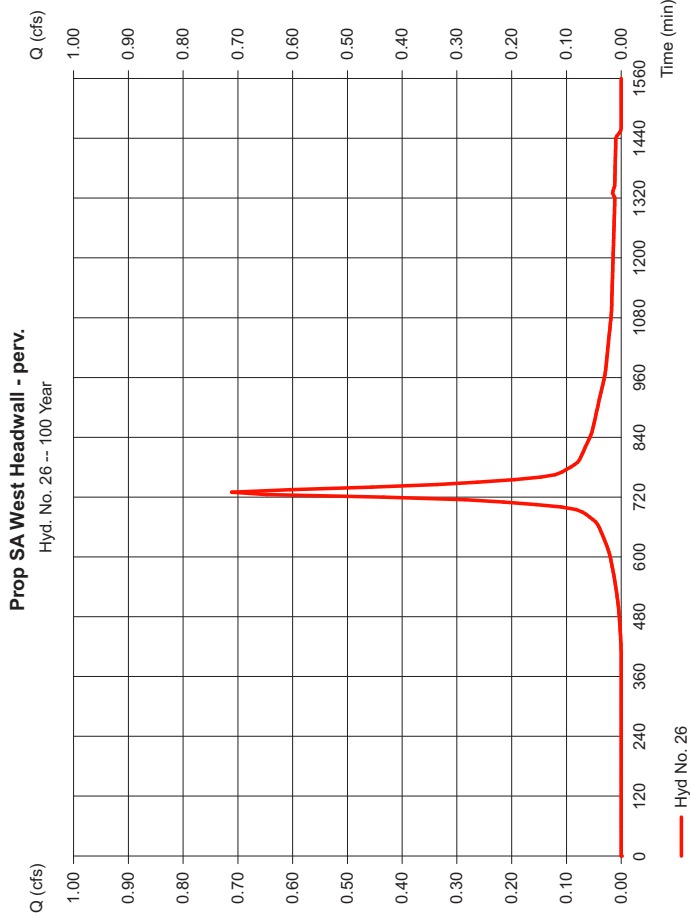
Thursday, Apr 30, 2020

Hyd. No. 26

Prop SA West Headwall - perv.

Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 5 min
 Drainage area = 0.160 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 8.33 in
 Storm duration = 24 hrs

Peak discharge = 0.711 cfs
 Time to peak = 730 min
 Hyd. volume = 2,843 cuft
 Curve number = 74
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 27

Prop SA West Headwall - Total

Hydrograph type = Combine
 Storm frequency = 100 yrs
 Time interval = 5 min
 Inflow hyds. = 25, 26

Peak discharge = 7.407 cfs
 Time to peak = 730 min
 Hyd. volume = 33,954 cuft
 Contrib. drain. area = 1,290 ac

Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

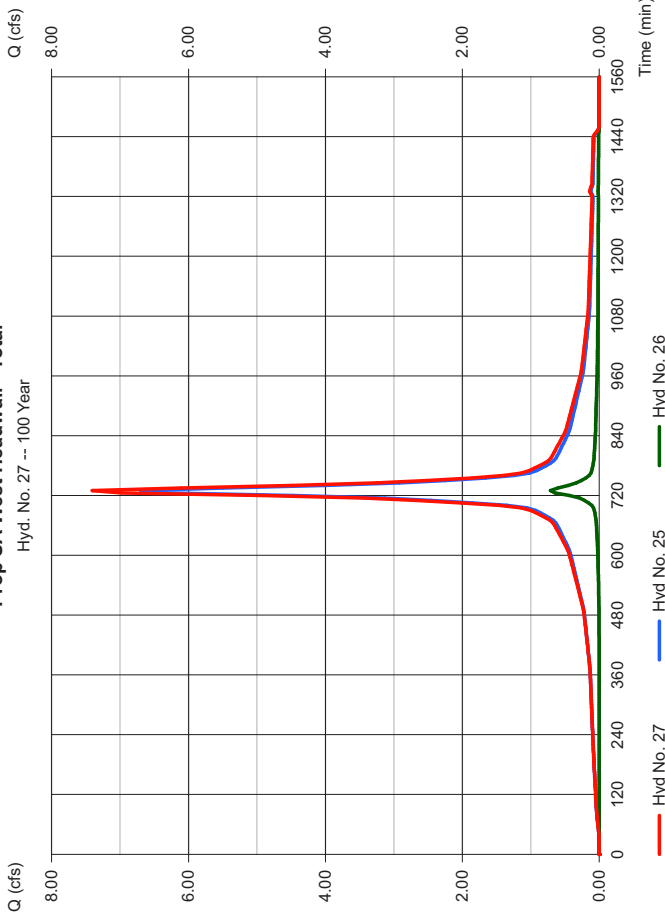
Hyd. No. 29

Prop SA West Overland - imp.

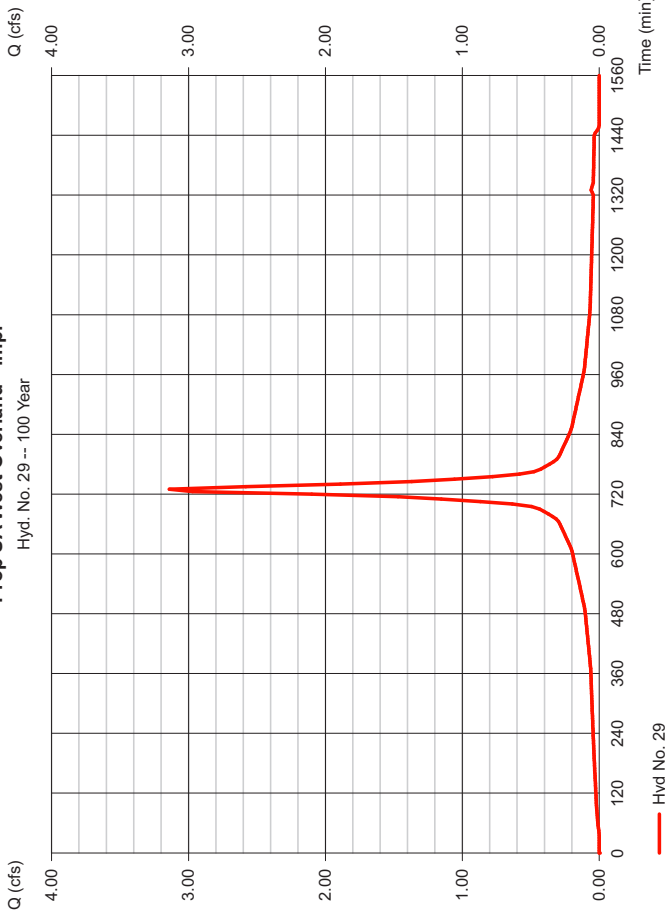
Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 5 min
 Drainage area = 0.530 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 8.33 in
 Storm duration = 24 hrs

Peak discharge = 3.141 cfs
 Time to peak = 730 min
 Hyd. volume = 14,592 cuft
 Curve number = 98
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type III
 Shape factor = 484

Prop SA West Headwall - Total



Prop SA West Overland - imp.



Hydrograph Report

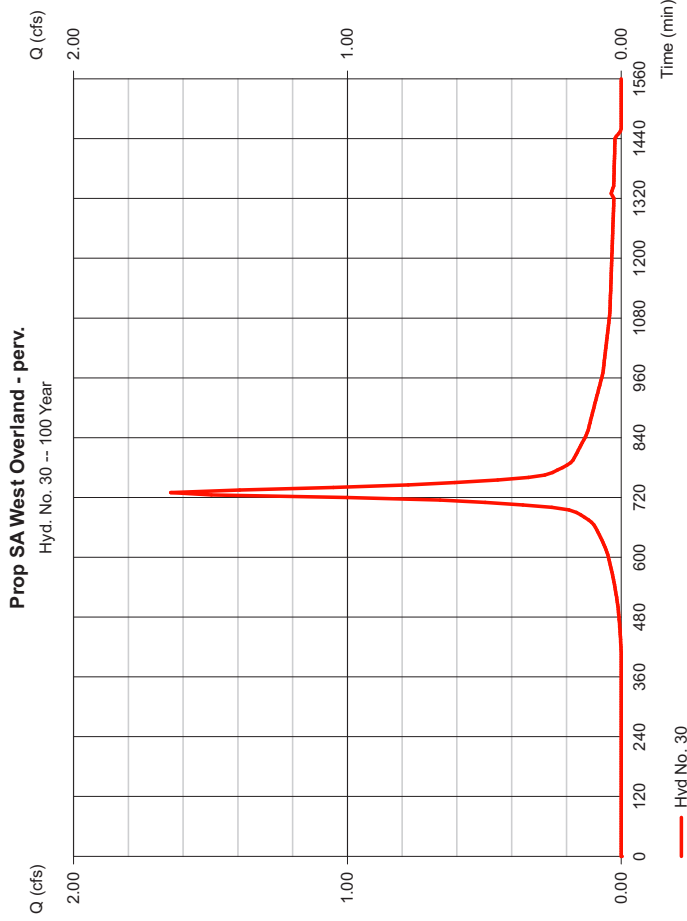
Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 30

Prop SA West Overland - perv.

Hydrograph type	= SCS Runoff	Peak discharge	= 1.645 cfs
Storm frequency	= 100 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 6,575 cuft
Drainage area	= 0.370 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 8.33 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

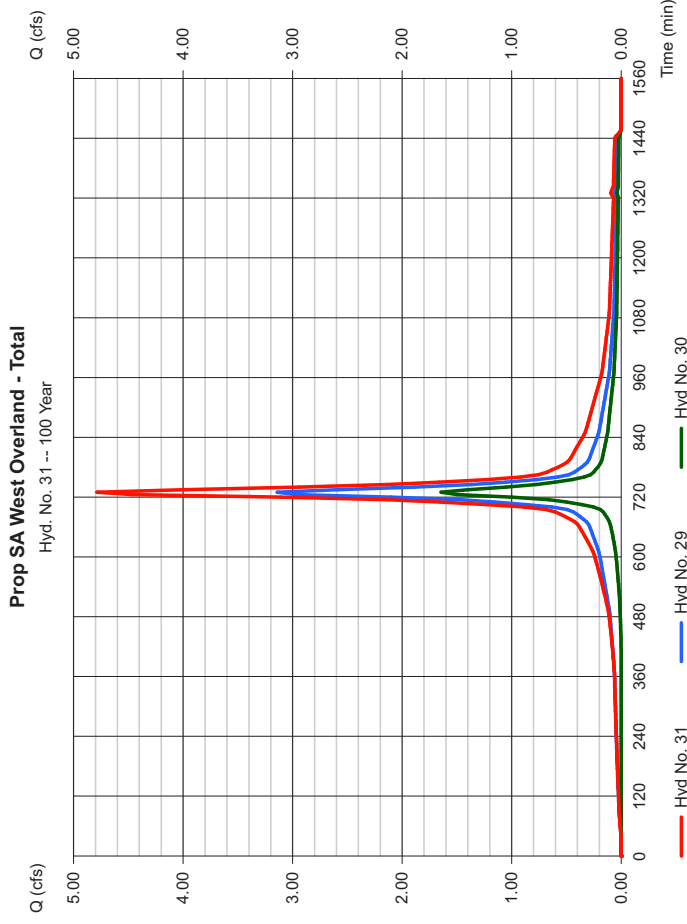
Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 31

Prop SA West Overland - Total

Hydrograph type	= Combine	Peak discharge	= 4.786 cfs
Storm frequency	= 100 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 21,167 cuft
Inflow hyds.	= 29, 30	Contrib. drain. area	= 0.900 ac



Hydrograph Report

Hydroflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 33

Prop West - Total

Hydrograph type = Combine
 Storm frequency = 100 yrs
 Time interval = 5 min
 Inflow hyd. = 27, 31

Peak discharge = 12.19 cfs
 Time to peak = 730 min
 Hyd. volume = 55,120 cuft
 Contrib. drain. area = 0.000 ac

Hydroflow Rainfall Report

Hydroflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	39.0824	9.5000	0.8528	
2	45.6943	10.7000	0.8185	
3	0.0000	0.0000	0.0000	
5	99.7061	14.8000	0.9304	
10	249.7597	21.8001	1.0961	
25	115.7547	14.9000	0.8980	
50	7.3699	0.1000	0.2544	
100	403.8513	25.1001	1.1108	

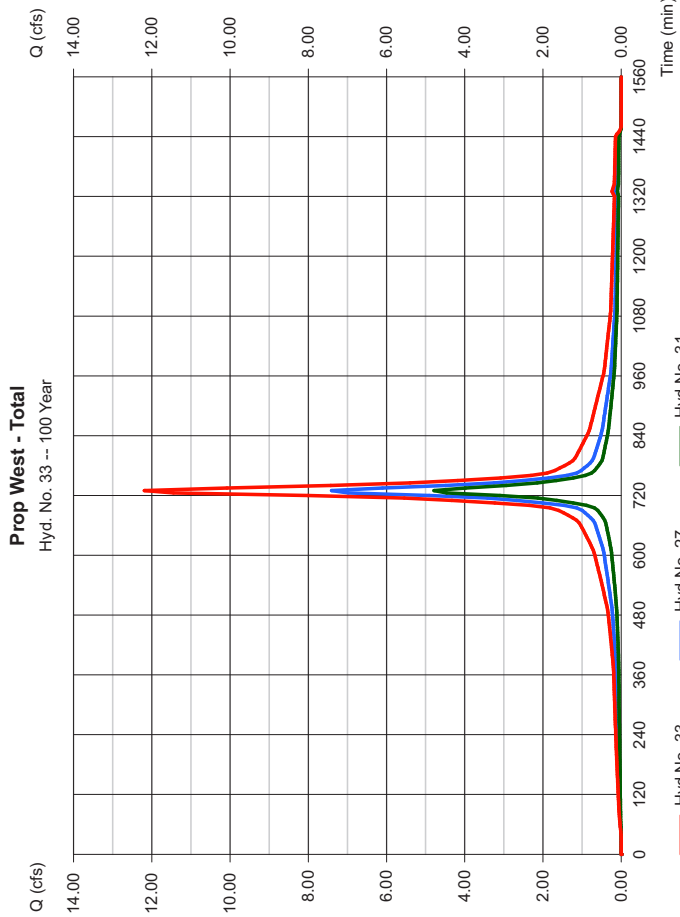
File name: TRENTON.lidf

Intensity = B / (Tc + D)^A

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	4.00	3.10	2.55	2.18	1.91	1.70	1.54	1.40	1.29	1.20	1.12	1.05
2	4.80	3.83	3.21	2.77	2.45	2.20	2.00	1.84	1.70	1.59	1.49	1.40
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.20	5.03	4.24	3.67	3.24	2.90	2.63	2.40	2.22	2.06	1.92	1.80
10	6.80	5.63	4.80	4.17	3.69	3.30	2.98	2.72	2.50	2.31	2.14	2.00
25	7.89	6.45	5.47	4.76	4.23	3.80	3.46	3.17	2.93	2.73	2.55	2.40
50	4.87	4.09	3.69	3.44	3.25	3.10	2.98	2.88	2.80	2.72	2.66	2.60
100	9.20	7.76	6.69	5.87	5.22	4.70	4.27	3.91	3.60	3.33	3.10	2.90

Tc = time in minutes. Values may exceed 60.

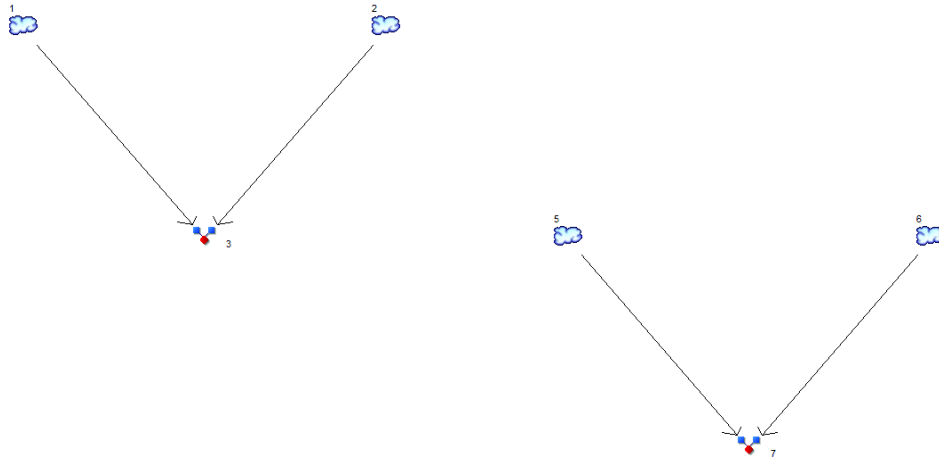
Storm Distribution	Rainfall Precipitation Table (in)									
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr		
SCS 24-hour	0.00	3.31	0.00	0.00	5.01	6.19	0.00	8.33		
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Custom	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00		



**HYDROGRAPH SUMMARY REPORTS –
WATER QUALITY STORM**

Watershed Model Schematic

Hydraflow Hydrographs by Intelisolve v9.1



Legend

<u>Hyd. Origin</u>	<u>Description</u>
1	SCS Runoff Prop SA Route 1 - imp.
2	SCS Runoff Prop SA Route 1 - perv.
3	Combine Prop SA Route 1 - Total
5	SCS Runoff Prop SA West Headwall - imp.
6	SCS Runoff Prop SA West Headwall - perv.
7	Combine Prop SA West Headwall - Total

Watershed Model Schematic	1
Hydrograph Return Period Recap	2
1 - Year	
Summary Report	3
Hydrograph Reports	4
Hydrograph No. 1, SCS Runoff, Prop SA Route 1 - imp.	4
Hydrograph No. 2, SCS Runoff, Prop SA Route 1 - perv.	5
Hydrograph No. 3, Combine, Prop SA Route 1 - Total	6
Hydrograph No. 5, SCS Runoff, Prop SA West Headwall - imp.	7
Hydrograph No. 6, SCS Runoff, Prop SA West Headwall - perv.	8
Hydrograph No. 7, Combine, Prop SA West Headwall - Total	9
IDF Report	10

Hydrograph Return Period Recap

Hydraflow Hydrographs by Intellisolve v9.1

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)							Hydrograph description	
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr		100-Yr
1	SCS Runoff	-----	2,793	-----	-----	-----	-----	-----	-----	-----	Prop SA Route 1 - imp.
2	SCS Runoff	-----	0.005	-----	-----	-----	-----	-----	-----	-----	Prop SA Route 1 - perv.
3	Combine	1, 2	2,796	-----	-----	-----	-----	-----	-----	-----	Prop SA Route 1 - Total
5	SCS Runoff	-----	2,505	-----	-----	-----	-----	-----	-----	-----	Prop SA West Headwall - imp.
6	SCS Runoff	-----	0.017	-----	-----	-----	-----	-----	-----	-----	Prop SA West Headwall - perv.
7	Combine	5, 6	2,515	-----	-----	-----	-----	-----	-----	-----	Prop SA West Headwall - Total
Proj. file: WQS.gpw										Thursday, Apr 30, 2020	

Hydrograph Summary Report

Hydraflow Hydrographs by Intellisolve v9.1

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total storage used (cuft)	Hydrograph description
1	SCS Runoff	2,793	5	70	4,434	-----	-----	-----	Prop SA Route 1 - imp.
2	SCS Runoff	0.005	5	80	12	-----	-----	-----	Prop SA Route 1 - perv.
3	Combine	2,796	5	70	4,447	1, 2	-----	-----	Prop SA Route 1 - Total
5	SCS Runoff	2,505	5	70	3,977	-----	-----	-----	Prop SA West Headwall - imp.
6	SCS Runoff	0.017	5	80	39	-----	-----	-----	Prop SA West Headwall - perv.
7	Combine	2,515	5	70	4,016	5, 6	-----	-----	Prop SA West Headwall - Total
WQS.gpw									Return Period: 1 Year
									Thursday, Apr 30, 2020

Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

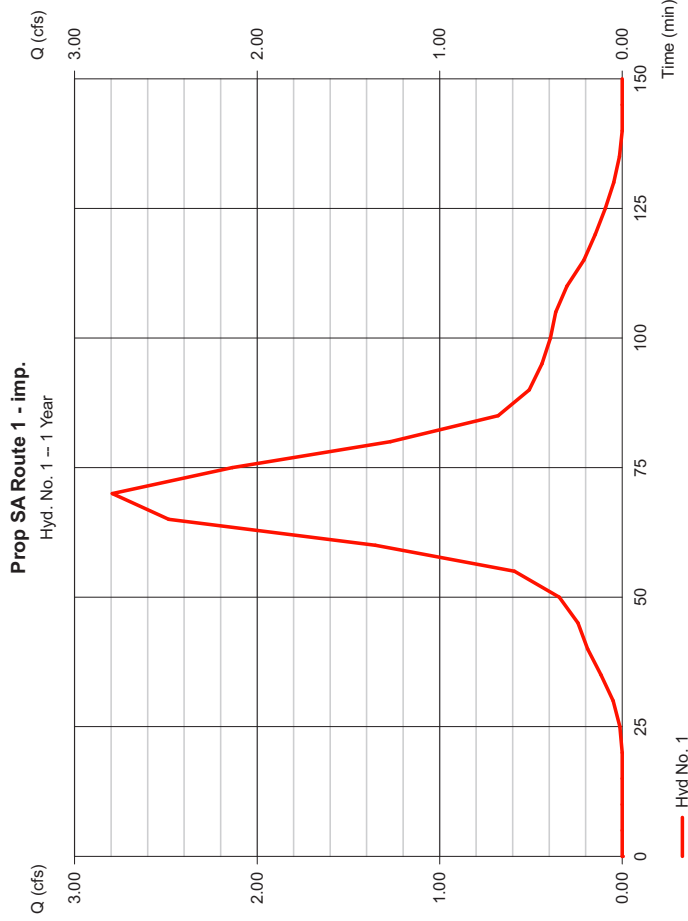
Thursday, Apr 30, 2020

Hyd. No. 1

Prop SA Route 1 - imp.

Hydrograph type = SCS Runoff
 Storm frequency = 1 yrs
 Time interval = 5 min
 Drainage area = 1.260 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 1.25 in
 Storm duration = Water Quality Storm.cds

Peak discharge = 2,793 cfs
 Time to peak = 70 min
 Hyd. volume = 4,434 cuft
 Curve number = 98
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Custom
 Shape factor = 484



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

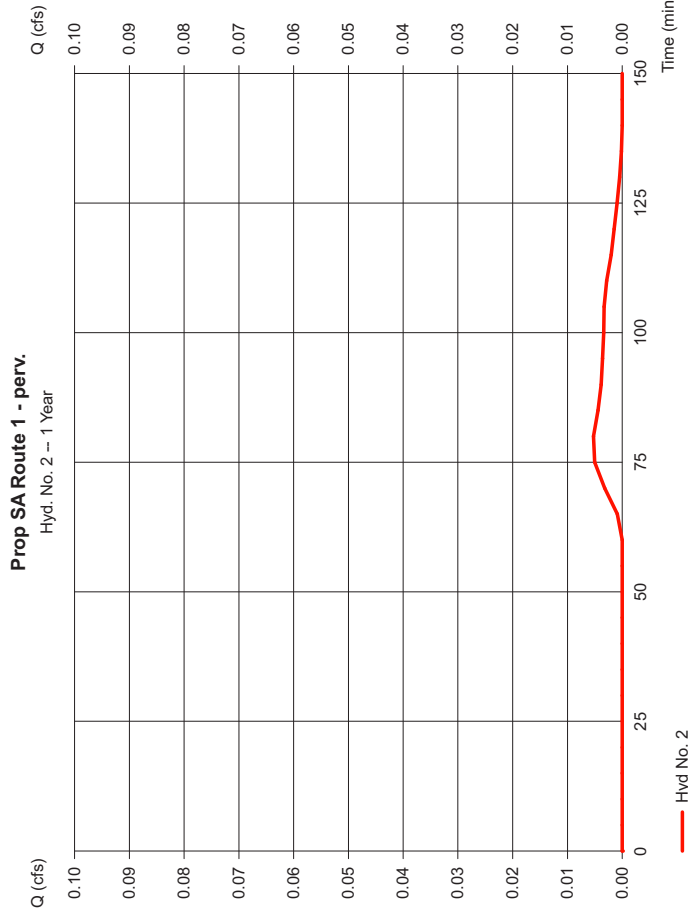
Thursday, Apr 30, 2020

Hyd. No. 2

Prop SA Route 1 - perv.

Hydrograph type = SCS Runoff
 Storm frequency = 1 yrs
 Time interval = 5 min
 Drainage area = 0.050 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 1.25 in
 Storm duration = Water Quality Storm.cds

Peak discharge = 0.005 cfs
 Time to peak = 80 min
 Hyd. volume = 12 cuft
 Curve number = 74
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Custom
 Shape factor = 484



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 3

Prop SA Route 1 - Total

Hydrograph type = Combine
 Storm frequency = 1 yrs
 Time interval = 5 min
 Inflow hyds. = 1, 2

Peak discharge = 2,796 cfs
 Time to peak = 70 min
 Hyd. volume = 4,447 cuft
 Contrib. drain. area = 1,310 ac

Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Hyd. No. 5

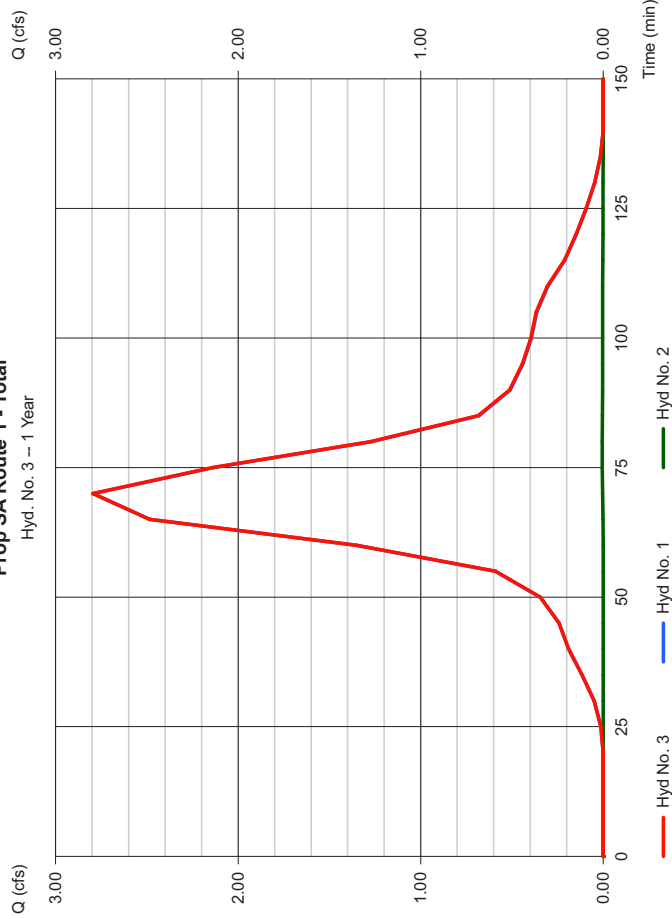
Prop SA West Headwall - imp.

Hydrograph type = SCS Runoff
 Storm frequency = 1 yrs
 Time interval = 5 min
 Drainage area = 1,130 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 1.25 in
 Storm duration = Water Quality Storm.cds

Peak discharge = 2,505 cfs
 Time to peak = 70 min
 Hyd. volume = 3,977 cuft
 Curve number = 98
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Custom
 Shape factor = 484

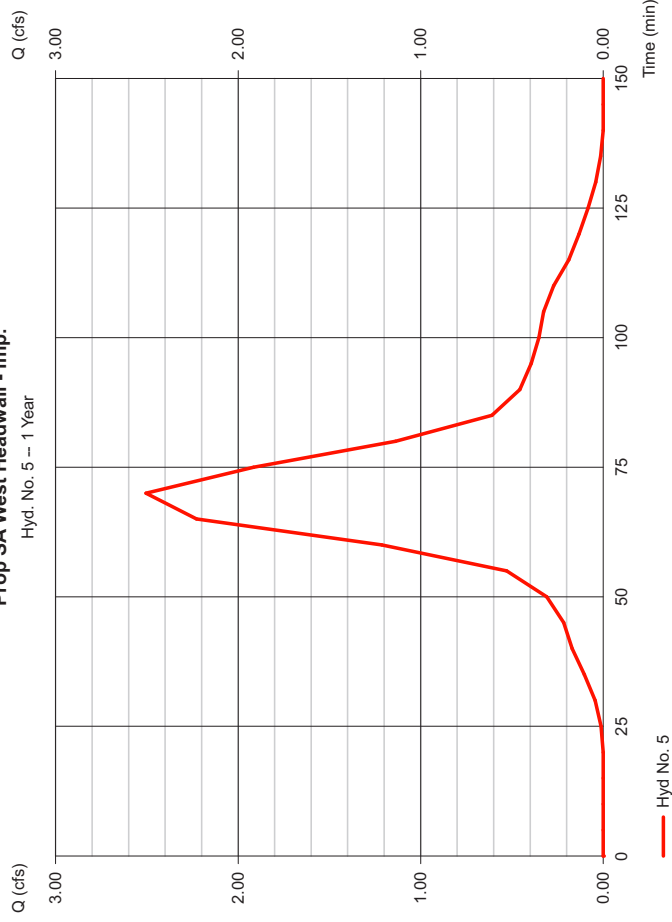
Prop SA Route 1 - Total

Hyd. No. 3 -- 1 Year



Prop SA West Headwall - imp.

Hyd. No. 5 -- 1 Year



Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Hyd. No. 6

Prop SA West Headwall - perv.

Hydrograph type = SCS Runoff
 Storm frequency = 1 yrs
 Time interval = 5 min
 Drainage area = 0.160 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 1.25 in
 Storm duration = Water Quality Storm.cds

Peak discharge = 0.017 cfs
 Time to peak = 80 min
 Hyd. volume = 39 cuft
 Curve number = 74
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Custom
 Shape factor = 484

Thursday, Apr 30, 2020

Hydrograph Report

Hydratflow Hydrographs by Intellisolve v9.1

Hyd. No. 7

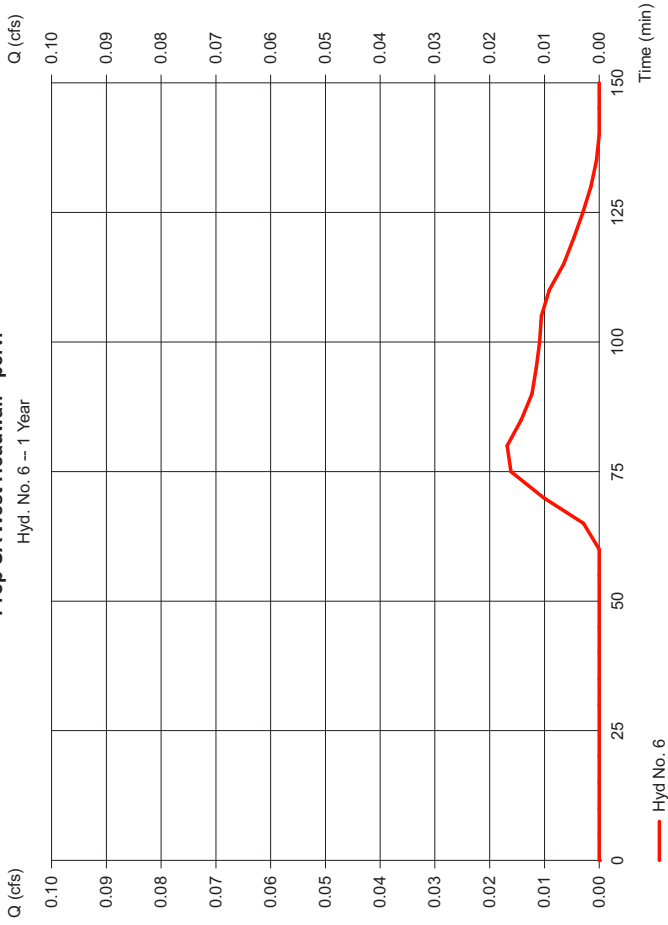
Prop SA West Headwall - Total

Hydrograph type = Combine
 Storm frequency = 1 yrs
 Time interval = 5 min
 Inflow hyds. = 5, 6

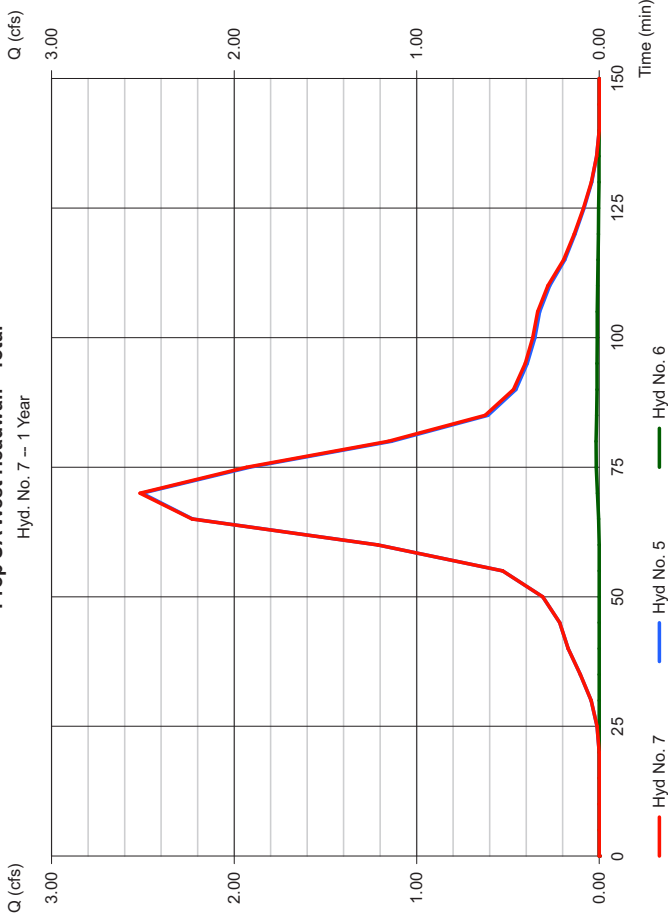
Peak discharge = 2.515 cfs
 Time to peak = 70 min
 Hyd. volume = 4.016 cuft
 Contrib. drain. area = 1.290 ac

Thursday, Apr 30, 2020

Prop SA West Headwall - perv.



Prop SA West Headwall - Total



Hydraflow Rainfall Report

Hydraflow Hydrographs by Intellisolve v9.1

Thursday, Apr 30, 2020

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)				
	B	D	E	(N/A)	
1	39.0824	9.5000	0.8528	-----	
2	45.6943	10.7000	0.8185	-----	
3	0.0000	0.0000	0.0000	-----	
5	99.7061	14.8000	0.9304	-----	
10	249.7597	21.8001	1.0961	-----	
25	115.7547	14.9000	0.8980	-----	
50	7.3699	0.1000	0.2544	-----	
100	403.8513	25.1001	1.1108	-----	

File name: TRENTON.lid

Intensity = B / (Tc + D)^E

Return Period (Yrs)	5 min	Intensity Values (in/hr)										
		10	15	20	25	30	35	40	45	50	55	60
1	4.00	3.10	2.55	2.18	1.91	1.70	1.54	1.40	1.29	1.20	1.12	1.05
2	4.80	3.83	3.21	2.77	2.45	2.20	2.00	1.84	1.70	1.59	1.49	1.40
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.20	5.03	4.24	3.67	3.24	2.90	2.63	2.40	2.22	2.06	1.92	1.80
10	6.80	5.63	4.80	4.17	3.69	3.30	2.98	2.72	2.50	2.31	2.14	2.00
25	7.89	6.45	5.47	4.76	4.23	3.80	3.46	3.17	2.93	2.73	2.55	2.40
50	4.87	4.09	3.69	3.44	3.25	3.10	2.98	2.88	2.80	2.72	2.66	2.60
100	9.20	7.76	6.69	5.87	5.22	4.70	4.27	3.91	3.60	3.33	3.10	2.90

Tc = time in minutes. Values may exceed 60.

Storm Distribution	Rainfall Precipitation Table (in)									
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr		
SCS 24-hour	0.00	3.31	0.00	0.00	5.01	6.19	0.00	8.33		
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Custom	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

Precip... file name: Mercer County.pcp

**MANUFACTURED TREATMENT DEVICE NJDEP
CERTIFICATION/SIZING TABLE**



State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of Nonpoint Pollution Control

Division of Water Quality

401-02B

Post Office Box 420

Trenton, New Jersey 08625-0420

609-633-7021 Fax: 609-777-0432

http://www.state.nj.us/dep/dwq/bnpc_home.htm

CHRIS CHRISTIE

Governor

KIM GUADAGNO

Lt. Governor

BOB MARTIN

Commissioner

March 9, 2017

Mr. Dave Scott
Technical Product Manager
Hydro International
94 Hutchins Drive
Portland, ME 04102

Re: MTD Lab Certification
First Defense® HC (FDHC) Stormwater Treatment Device by Hydro International
On-line Installation

TSS Removal Rate 50%

Dear Mr. Scott:

This revised certification letter supersedes the Department's prior certification dated April 4, 2016. This revision was completed to reflect the updated Manufactured Treatment Device (MTD) scaling methodology as agreed upon by the manufacturers' working group on September 19, 2016. In part, the updated scaling for hydrodynamic MTDs is based on the depth of the reference (tested) MTD from the top of the false floor utilized during removal efficiency testing, not from the physical bottom of the unit. Based on the above decision, Table A-2 of the NJCAT Technology Verification report located at <http://www.njcat.org/uploads/newDocs/FDHCVerificationReportFinal.pdf> has been revised, and Table 1 noted below has been updated as well.

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7 (c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Hydro International has requested an MTD Laboratory Certification for the First Defense® HC Stormwater Treatment Device.

The project falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advance Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Laboratory Testing Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device" dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report dated February 2016 (Revised

January 2017) with the Verification Appendix for this device is published online at <http://www.njcat.org/verification-process/technology-verification-database.html>.

The NJDEP certifies the use of the First Defense® HC Stormwater Treatment Device by Hydro International at a TSS removal rate of 50% when designed, operated and maintained in accordance with the information provided in the Verification Appendix and the following conditions:

1. The maximum treatment flow rate (MTFR) for the manufactured treatment device (MTD) is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs) in N.J.A.C. 7:8-5.5.
2. The First Defense® HC Stormwater Treatment Device shall be installed using the same configuration reviewed by NJCAT and shall be sized in accordance with the criteria specified in item 6 below.
3. This First Defense® HC Stormwater Treatment Device cannot be used in series with another MTD or a media filter (such as a sand filter), to achieve an enhance removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.
4. Additional design criteria for MTDs can be found in Chapter 9.6 of the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual which can be found on-line at www.njstormwater.org.
5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the First Defense® HC Stormwater Treatment Device, which is attached to this document. However, it is recommended to review the maintenance manual at <http://a2795.actonsoftware.com/acton/attachment/2795/f-0132/1/-/-/-/Hydro-International-First-Defense-Treatment-System.pdf> for any changes to the maintenance requirements.
6. Sizing Requirements:

The example below demonstrates the sizing procedure for the First Defense® HC Stormwater Treatment Device:

Example: A 0.25-acre impervious site is to be treated to 50% TSS removal using a First Defense® HC Stormwater Treatment Device. The impervious site runoff (Q) based on the New Jersey Water Quality Design Storm was determined to be 0.79 cfs.

Maximum Treatment Flow Rate (MTFR) Evaluation:

The site runoff (Q) was based on the following:

time of concentration = 10 minutes
i=3.2 in/hr (page 5-8, Fig. 5-3 of the NJ Stormwater BMP Manual)
c=0.99 (curve number for impervious)
 $Q=ciA=0.99 \times 3.2 \times 0.25=0.79$ cfs

Given the site runoff is 0.79 cfs and based on Table 1 below, the First Defense® HC Model 3-ft with a MTFR of 0.85 cfs would be the smallest model approved that could be used for this site that could remove 50% of the TSS from the impervious area without exceeding the MTFR.

The sizing table corresponding to the available system models is noted below. Additional specifications regarding each model can be found in the Verification Appendix under Table A-1 and Table A-2.

Table 1 First Defense® HC Models

First Defense® Model	Manhole Diameter (ft)	Maximum Treatment Flowrate, MTFR (cfs)
3-ft	3	0.85
4-ft	4	1.5
5-ft	5	2.35
6-ft	6	3.38
7-ft	7	4.60
8-ft	8	6.00

Be advised a detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management Rules, N.J.A.C. 7:8. The plan must include all the items identified in the Stormwater Management Rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of inspection and maintenance equipment and tools, specific corrective and preventative maintenance tasks, indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance and Retrofit of Stormwater Management Measures.

If you have any questions regarding the above information, please contact Mr. Shashi Nayak of my office at (609) 633-7021.

Sincerely,



James J. Murphy, Chief
Bureau of Nonpoint Pollution Control

Attachment: Maintenance Plan

C: Chron File
Richard Magee, NJCAT
Vince Mazzei, NJDEP - DLUR
Ravi Patraju, NJDEP - BES
Gabriel Mahon, NJDEP - BNPC
Shashi Nayak, NJDEP - BNPC



State of New Jersey

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of Nonpoint Pollution Control
Division of Water Quality

401-02B

Post Office Box 420

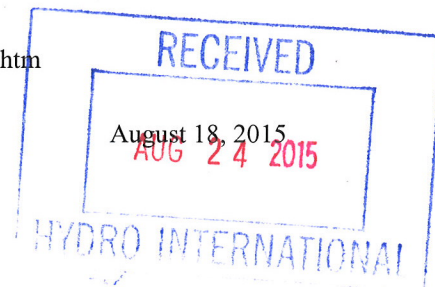
Trenton, New Jersey 08625-0420

609-633-7021 Fax: 609-777-0432

http://www.state.nj.us/dep/dwq/bnpc_home.htm

BOB MARTIN
Commissioner

Lisa Lemont, CPSWQ
Business Development Manager
Hydro International (Stormwater)
94 Hutchins Drive
Portland, ME 04102



Re: Revised MTD Lab Certification for the Downstream Defender Stormwater Treatment Device
By Hydro International

TSS Removal Rate 50%

Dear Ms. Lemont:

This letter supersedes the previous certification letter dated January 21, 2015. Hydro International requested a new verification for the Downstream Defender Stormwater Treatment Device from the New Jersey Corporation for Advanced Technology (NJCAT) based on enhanced Maximum Treatment Flow Rate (MTRF).

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7(c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Hydro International has requested a Laboratory Certification for the Downstream Defender Stormwater Treatment Device.

The projects falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advance Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Laboratory Testing Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device" dated January 25, 2013.

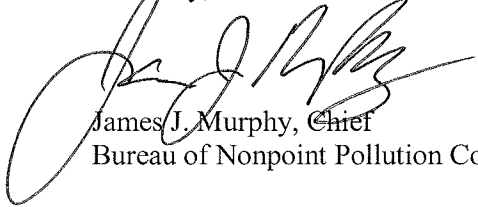
NJCAT verification documents submitted to the NJDEP indicate that the requirements of the aforementioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix for this device is published online at <http://www.njcat.org/verification-process/technology-verification-database.html>.

The NJDEP certifies the use of the Downstream Defender Stormwater Treatment Device by Hydro International at a TSS removal rate of 50% when designed, operated and maintained in accordance with the information provided in the Verification Appendix.

Be advised a detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management Rules, N.J.A.C. 7:8. The plan must include all of the items identified in the Stormwater Management Rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of inspection and maintenance equipment and tools, specific corrective and preventative maintenance tasks, indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance of the New Jersey Stormwater Best Management Practices Manual.

If you have any questions regarding the above information, please contact Mr. Titus Magnanao of my office at (609) 633-7021.

Sincerely,

A handwritten signature in black ink, appearing to read 'James J. Murphy', is written over the typed name and title.

James J. Murphy, Chief
Bureau of Nonpoint Pollution Control

C: Chron File
Richard Magee, NJCAT
Madhu Guru, DLUR
Ravi Patraju, NJDEP
Titus Magnanao, BNPC

Table A-1 MTFRs and Required Sediment Removal Intervals for Downstream Defender Models

Downstream Defender Model	Manhole Diameter (ft)	NJDEP 50% TSS Maximum Treatment Flow Rate (cfs)	Treatment Area (ft²)	Hydraulic Loading Rate (gpm/ft²)	50% Max Sediment Storage Volume (ft³)	Required Sediment Removal Interval¹ (Months)
4-ft	4-ft	1.12	12.6	40.0	9.45	60
6-ft	6-ft	2.52	28.3	40.0	28.35	80
8-ft	8-ft	4.49	50.3	40.0	62.78	99
10-ft	10-ft	7.00	78.5	40.0	117.45	119
12-ft	12-ft	10.08	113.1	40.0	198.45	140

¹ Required sediment removal interval was calculated using the equation specified in Appendix B Part B of the NJDEP Laboratory Protocol for HDS MTDs:

$$\text{Sediment Removal Interval (months)} = \frac{(50\% \text{ HDS MTD Max Sediment Storage Volume} * 3.57)}{(\text{MTFR} * \text{TSS Removal Efficiency})}$$

Table A-2 Standard Dimensions for Downstream Defender Models

Downstream Defender Model and Manhole Diameter (ft)	Treatment Chamber Depth (ft)	Treatment Chamber Wet Volume (ft³)	Total Wet Volume (ft³)	Aspect Ratio Depth:Dia	Detention Time at MTRF (sec)	Maximum Pipe Diameter (in)	Sediment Sump Depth (ft)	50% Max Sediment Storage Volume (ft³)
4-ft	1.71	21.6	51.5	0.43	46	12	1.5	9.45
6-ft	2.74	77.5	167.1	0.46	66	18	2.0	28.35
8-ft	3.73	187.6	385.6	0.47	86	24	2.5	62.78
10-ft	4.71	369.7	740.8	0.47	106	30	3.0	117.45
12-ft	5.85	661.6	1264.7	0.49	125	36	3.5	198.45

DRCC WATER QUALITY CALCULATIONS

Delaware and Raritan Canal Commission – Water Quality Calculations

Coverage Calculation:

Existing pavement to be converted to grass/roof areas = **43,713 SF or 1.00 Acres**

Total proposed pavement area = **84,982 SF or 1.95 acres**

Proposed pavement area to US Route 1/Downstream Defender MTD = **41,377 SF or 0.95 Acres**

Proposed pavement area to West/First Defense MTD = **41,767 SF or 0.96 Acres**

Proposed pavement area to US Route 1 Untreated = **1,838 SF or 0.04 Acres**

(see enclosed Existing and Proposed Pavement Coverage Exhibit for reference)

Effective TSS Removal Rate Calculation:

100% TSS Removal x 1.00 Acres = **1.00**

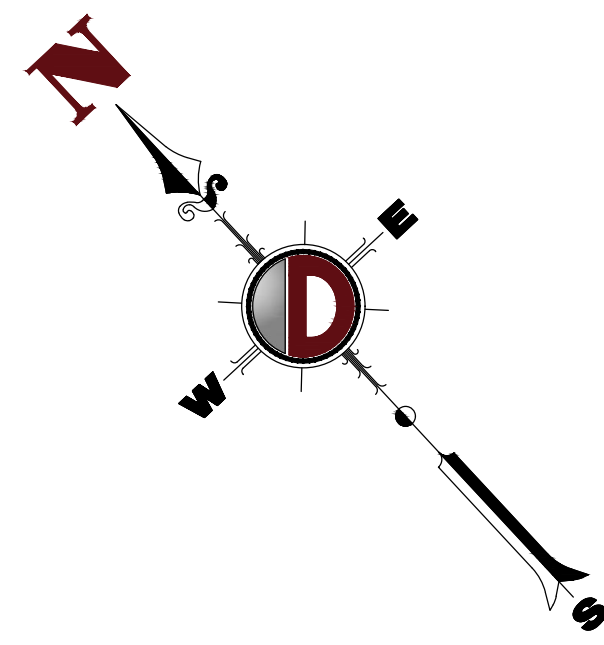
50% TSS Removal (Downstream Defender MTD) x 0.95 Acres = **0.475**

50% TSS Removal (First Defense MTD) x 0.96 Acres = **0.48**

0% TSS Removal x 0.04 Acres = **0.00**

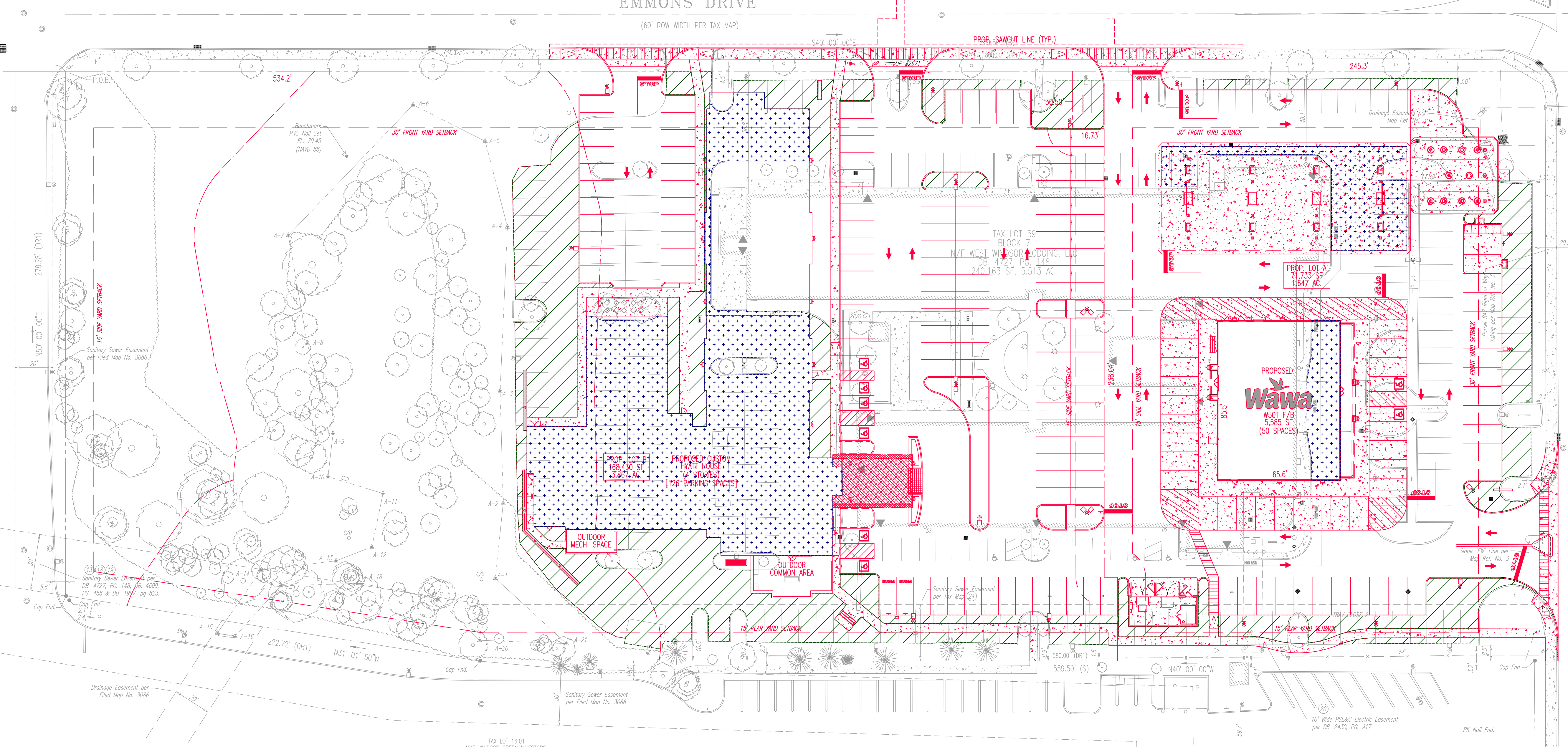
Effective TSS Removal Rate = $1.00 + 0.475 + 0.48 + 0.00 = 1.955/1.95 = \mathbf{100.2\%}$

100.2% TSS Removal Rate > 95% TSS Removal Rate (COMPLIES)



EMMONS DRIVE
(60' ROW WIDTH PER TAX MAP)

U.S. ROUTE 1
(AKA BRUNSWICK PIKE)
(VARIABLE ROW WIDTH PER TAX MAP)

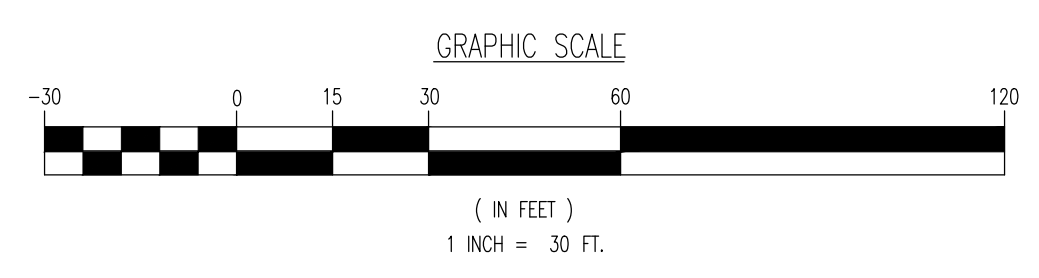


Plotted: 04/16/20 2:29 PM, By: mcoanelli, Product Ver: 23.0s (LMS Tech)
 File: P:\BECPC PROJECTS\0034 Wawa Inc\99-460 - West Windsor\DWG\Exhibits (Misc)\2019-10-18 Survey Overlay D3498460ESD.dwg, ---> EXISTING PAVEMENT COVERAGE EXHIBIT

LEGEND

- EXISTING PAVEMENT TO BE CONVERTED TO GRASS AREAS
(AREA = 22,693 SF OR 0.52 AC)
- EXISTING PAVEMENT TO BE CONVERTED TO ROOF AREAS
(AREA = 21,020 SF OR 0.48 AC)

TOTAL EXISTING PAVEMENT TO GRASS/ROOF AREAS =
43,713 SF OR 1.00 AC



THIS PLAN SET IS FOR PERMITTING PURPOSES ONLY AND MAY NOT BE USED FOR CONSTRUCTION

DYNAMIC ENGINEERING
 LAND DEVELOPMENT CONSULTING • PERMITTING • GEOTECHNICAL • ENVIRONMENTAL • SURVEY • PLANNING & ZONING
 1904 Main Street, Lake Como, NJ 07719
 T: 732.974.0198 F: 732.974.5521 www.dynamiceng.com

TITLE: EXISTING PAVEMENT COVERAGE EXHIBIT

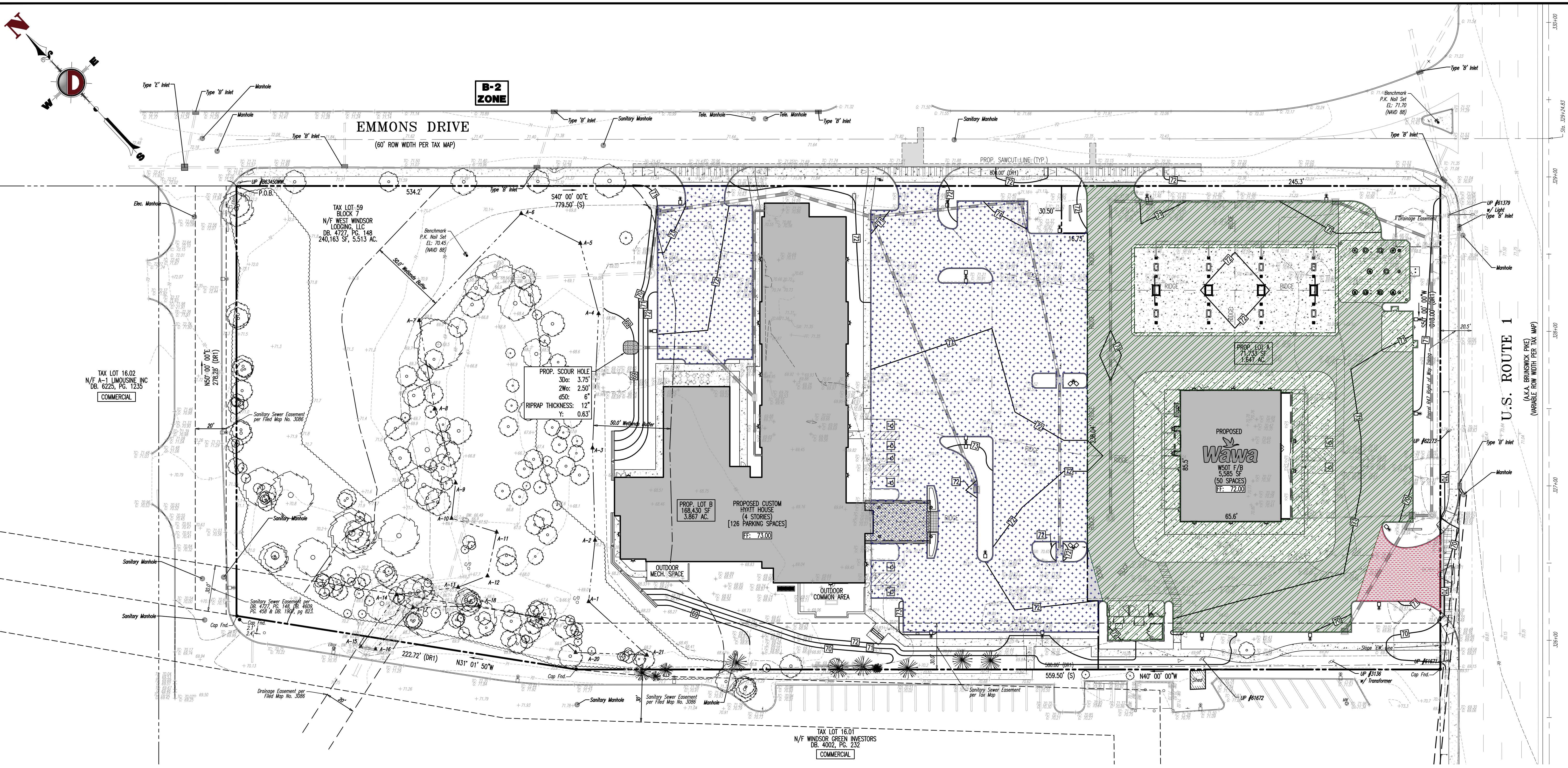
PROJECT: WINDSOR 1 DEVELOPERS, LLC
PROPOSED WAWA FOOD MARKET & FUELING STATION AND HOTEL
 BLOCK 7, LOT 59
 U.S. ROUTE 1 (BRUNSWICK PIKE) & EMMONS DRIVE
 TOWNSHIP OF WEST WINDSOR, MERCER COUNTY, NEW JERSEY

MATTHEW SHARO PROFESSIONAL ENGINEER
 NEW JERSEY LICENSE No. 52989

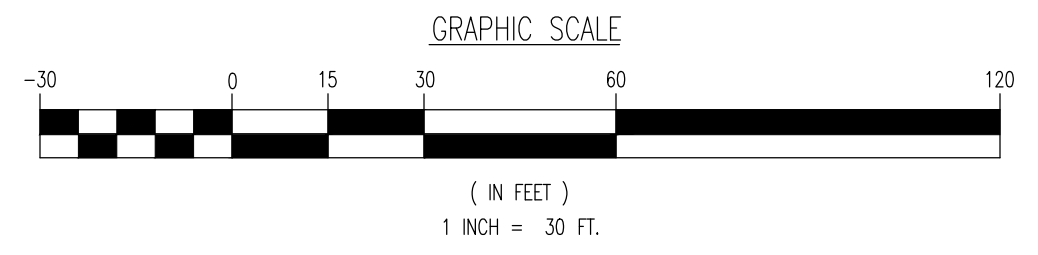
MARK A. WHITAKER PROFESSIONAL ENGINEER
 NEW JERSEY LICENSE No. 41417

PROTECT YOURSELF
 ALL STATES REQUIRE VERIFICATION OF
 ENGINEER'S SIGNATURE. IF ANY DISCREPANCY
 IS FOUND, PLEASE CONTACT THE STATE'S
 PROFESSIONAL ENGINEERING BOARD.
 FOR STATE SPECIFIC DIRECT PHONE NUMBERS VISIT:
 WWW.CALL1811.COM

1
OF 1



Plotted: 04/30/20 3:49 PM, By: rmacneill, Product Ver: 23.0a (LMS Tech)
 File: P:\BECPC PROJECTS\1478 Peromont Realty\99-043 West Windsor\DWG\Exhibits (Misc)\DRCC Exhibit\147899043DRCC.dwg, ---> 02 PROPOSED DRAINAGE AREA MAP



LEGEND

- PROPOSED PAVEMENT AREA TO US ROUTE 1/DOWNSTREAM DEFENDER MTD (AREA = 41,377 SF OR 0.95 AC)
- PROPOSED PAVEMENT AREA TO WEST/FIRST DEFENSE MTD (AREA = 41,767 SF OR 0.96 AC)
- PROPOSED PAVEMENT AREA TO US ROUTE 1 UNTREATED (AREA = 1,838 SF OR 0.04 AC)

TOTAL PROPOSED PAVEMENT AREA = 84,982 SF OR 1.95 AC

THIS PLAN SET IS FOR PERMITTING PURPOSES ONLY AND MAY NOT BE USED FOR CONSTRUCTION

DYNAMIC ENGINEERING
 LAND DEVELOPMENT CONSULTING • PERMITTING • GEOTECHNICAL • ENVIRONMENTAL • SURVEY • PLANNING & ZONING

1904 Main Street, Lake Como, NJ 07719
 T: 732.974.0198 F: 732.974.3521
 www.dynamiceng.com

TITLE: PROPOSED PAVEMENT COVERAGE EXHIBIT

PROJECT: **WINDSOR 1 DEVELOPERS, LLC**
PROPOSED Wawa FOOD MARKET & FUELING STATION AND HOTEL
 BLOCK 7, LOT 59
 U.S. ROUTE 1 (BRUNSWICK PIKE) & EMMONS DRIVE
 TOWNSHIP OF WEST WINDSOR, MERCER COUNTY, NEW JERSEY

JOB No: 1478-99-043 DATE: 04/16/2020
 DRAWN BY: RJM SCALE: (H) 1"=30' (V)
 DESIGNED BY: RJM SHEET No:
 CHECKED BY: MS
 CHECKED BY: -

MATTHEW SHARO
 PROFESSIONAL ENGINEER
 NEW JERSEY LICENSE No. 52989

MARK A. WHITAKER
 PROFESSIONAL ENGINEER
 NEW JERSEY LICENSE No. 41417

811 PROTECT YOURSELF
 ALL UTILITIES REQUIRE NOTIFICATION OF
 EXISTING UTILITIES. IF ANY UTILITY
 PREPARING TO EXCAVE THE SERVICE
 SERVICE AREAS, CALL 811.
 FOR STATE SPECIFIC DIRECT PHONE NUMBERS VISIT
 WWW.CALL811.COM

DRCC NSPS SPREADSHEET

NJDEP Nonstructural Strategies Points System (NSPS)

Version: January 31, 2006

Note: Input Values in Yellow Cells Only

Project:

Date:

User:

Notes:

Step 1 - Provide Basic Major Development Site Information

A. Specify Total Area in Acres of Development Site Described in Steps 2 and 3 = Acres

B. Specify by Percent the Various Planning Areas Located within the Development Site:

State Plan Planning Area:	PA-1	PA-2	PA-3	PA-4	PA-4B	PA-5	Total % Area
Percent of Each Planning Area within Site:	<input type="text"/>	<input type="text" value="100.0%"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text" value="100.0%"/>

Note: See User's Guide for Equivalent Zones within Designated Centers and the NJ Meadowlands, Pinelands, and Highlands Districts

Step 2 - Describe Existing or Pre-Developed Site Conditions

A. Specify Existing Land Use/Land Cover Descriptions and Areas:

Site Segment	Land Use/Land Cover Description	Specify Land Use/Land Cover in Acres for Each HSG				Use/Cover Subtotals	Points
		HSG A	HSG B	HSG C	HSG D		
1	Wetlands and Undisturbed Stream Buffers					0.0	0
2	Lawn and Open Space			0.5		0.5	30
3	Brush and Shrub					0.0	0
4	Meadow, Pasture, Grassland, or Range					0.0	0
5	Row Crop					0.0	0
6	Small Grain and Legumes					0.0	0
7	Woods - Indigenous					0.0	0
8	Woods - Planted					0.0	0
9	Woods and Grass Combination					0.0	0
10	Ponds, Lakes, and Other Open Water					0.0	0
11	Gravel and Dirt					0.0	0
12	Porous and Permeable Paving					0.0	0
13	Directly Connected Impervious			3.3		3.3	0
14	Unconnected Impervious with Small D/S Pervious					0.0	0
15	Unconnected Impervious with Large D/S Pervious					0.0	0
HSG Subtotals (Acres):		0.0	0.0	3.8	0.0		Total Area: 3.8
HSG Subtotals (%):		0.0%	0.0%	100.0%	0.0%		Total % Area: 100.0%
							Points Subtotal: 30
							Total Existing Site Points: 30

Step 3 - Describe Proposed or Post-Developed Site Conditions

A. Specify Proposed Land Use/Land Cover Descriptions and Areas:

Site Segment	Land Use/Land Cover Description	Specify Land Use/Land Cover in Acres for Each HSG				Use/Cover Subtotals	Points
		HSG A	HSG B	HSG C	HSG D		
1	Wetlands and Undisturbed Stream Buffers					0.0	0
2	Lawn and Open Space			0.8		0.8	48
3	Brush and Shrub					0.0	0
4	Meadow, Pasture, Grassland, or Range					0.0	0
5	Row Crop					0.0	0
6	Small Grain and Legumes					0.0	0
7	Woods - Indigenous					0.0	0
8	Woods - Planted					0.0	0
9	Woods and Grass Combination					0.0	0
10	Ponds, Lakes, and Other Open Water					0.0	0
11	Gravel and Dirt					0.0	0
12	Porous and Permeable Paving					0.0	0
13	Directly Connected Impervious			3.0		3.0	0
14	Unconnected Impervious with Small D/S Pervious					0.0	0
15	Unconnected Impervious with Large D/S Pervious					0.0	0
HSG Subtotals (Acres):		0.0	0.0	3.8	0.0		
HSG Subtotals (%):		0.0%	0.0%	100.0%	0.0%		
						Total Area:	3.8
						Total % Area:	100.0%
						Points Subtotal:	48

B. Compare Proposed Impervious Coverage with Maximum Allowable Impervious Coverage:

Total Directly Connected Impervious Coverage = % of Site
 Total Unconnected Impervious Coverage with Small D/S Pervious = % of Site
 Total Unconnected Impervious Coverage with Large D/S Pervious = % of Site
 Total Site Impervious Coverage = % of Site
 Effective Site Impervious Coverage = % of Site

Specify Source of Maximum Allowable Impervious Coverage: (None or Table)

Allowable Site Impervious Cover from Maximum Impervious Cover Table:
 Note: See Maximum Impervious Cover Table Worksheet for Details

Points Subtotal:

C. Compare Proposed Site Disturbance with Maximum Allowable Site Disturbance:

Total Proposed Site Disturbance = % of Site
 Maximum Allowable Site Disturbance by Municipal Ordinance = % of Site

Points Subtotal:

D. Describe Proposed Runoff Conveyance System:

Total Length of Runoff Conveyance System = Feet
 Length of Vegetated Runoff Conveyance System = Feet
 % of Total Runoff Conveyance System That is Vegetated =

Points Subtotal:

E. Residential Lot Clustering:

Percent of Total Site Area that will be Clustered = % of Site
 Minimum Standard Lot Size as Per Zoning (Note: 1/2 Acre or Greater) = Acres
 Maximum Proposed Cluster Lot Size (Note: 1/4 Acre or Less) = Acres
 Percent of Clustered Portion of Site to be Preserved as Vegetated Open Space = % of Clustered Site Portion

Points Subtotal:

F. Will the Following be Utilized to Minimize Soil Compaction?

Proposed Lawn Areas will be Graded with Lightweight Construction Equipment:
Percent of Proposed Lawn Areas to be Graded with Such Equipment:

No	(Yes or No)
	% of Lawn Areas

Points Subtotal: **0**

G. Are Any of the Following Stormwater Management Standards Met Using Only Nonstructural Strategies and Measures?

Groundwater Recharge Standards (NJAC 7:8-5.4-a-2):
Stormwater Runoff Quality Standards (NJAC 7:8-5.5):
Stormwater Runoff Quantity Standards (NJAC 7:8-5.4-a-3):

Yes	(Yes or No)
Yes	(Yes or No)
Yes	(Yes or No)

Points Subtotal: **26**

Note: If the Answers to All Three Questions at G Above are "Yes", Adequate Nonstructural Measures have been Utilized.

Total Proposed Site Points: 77

Ratio of Proposed to Existing Site Points: 255%

Required Site Points Ratio: 87%

Nonstructural Point System Results:

Proposed Nonstructural Measures are Adequate

**STORMWATER COLLECTION SYSTEM CALCULATIONS
(PIPE SIZING)**



Inlet Area Summary and Average Coefficient (C) Calculations

Project: Paramount Realty

Computed By: RM

Job #: 1478-99-043

Checked By: KK

Location: Township of West Windsor, Mercer County, NJ

Date: 04/20/2020

Drainage Area	Impervious Area (sf)	Coefficient (C) Used	Open Space (SF)	Coefficient (C) Used	Average Coefficient (C) Used	Total Area (SF)	Total Area (acres)
IA #6	9477.0	0.95	241.1	0.35	0.94	9718.1	0.22
IA #7	12834.0	0.95	0.0	0.35	0.95	12834.0	0.29
IA #9	4156.1	0.95	0.0	0.35	0.95	4156.1	0.10
IA #10	6634.0	0.95	0.0	0.35	0.95	6634.0	0.15
IA #11	3907.1	0.95	600.8	0.35	0.87	4507.9	0.10
IA #12	4443.9	0.95	1185.0	0.35	0.82	5628.9	0.13
IA #14	456.6	0.95	949.9	0.35	0.54	1406.5	0.03
IA #16	12152.3	0.95	882.6	0.35	0.91	13034.9	0.30
IA #17	6211.3	0.95	300.2	0.35	0.92	6511.5	0.15
IA #18	3374.9	0.95	1860.1	0.35	0.74	5235.0	0.12
IA #19	11154.0	0.95	1628.4	0.35	0.87	12782.4	0.29
IA #21	7864.7	0.95	0.0	0.35	0.95	7864.7	0.18
IA #71	4302.3	0.95	1344.7	0.35	0.81	5647.0	0.13
HOTEL	21660.0	0.95	0.0	0.35	0.95	21660.0	0.50
WAWA	5585.0	0.95	0.0	0.35	0.95	5585.0	0.13
CANOPY	7898.0	0.95	0	0.35	0.95	7898.0	0.18



DYNAMIC ENGINEERING

Stormwater Collection System Calculations

Project: Paramount Realty

Job #: 1478-99-043

Location: Township of West Windsor, Mercer County, NJ

Design Storm: 25 Year

Computed By: RM

Checked By: KK

Date: 4/20/2020

NOTES:

1) Design method used is Rational Method, unless otherwise noted.

2) Refer to Weighted Runoff Coefficient table for calculation of incremental areas and C values

PIPE SECTION		SUBCATCHMENT AREA Area (Acres)	INCREMENTAL		CUMULATIVE A x C (acres)	TIME OF CONCENTRATION			I (In/Hr)	PEAK RUNOFF		PIPING INPUT			PIPING DATA		
FROM	TO		"C"	A x C Ac		Tc to Inlet (min)	Tc in Pipe (min.)	Final Tc (min)		Q to Inlet (CFS)	Q cum. for Pipe (CFS)	Dia. (In)	Length (Ft)	Man. "n"	Slope (ft/ft)	Pipe Capacity (cfs)	Pipe Velocity (fps)
IN #6	IN #7	0.22	0.94	0.21	0.21	10.00	0.39	10.00	6.80	1.43	1.43	15	87.0	0.013	0.0050	4.57	3.73
1/2 WAWA (1)	IN #7	0.07	0.95	0.06	0.06	10.00	0.58	10.00	6.80	0.41	0.41	8	156.0	0.010	0.0100	1.57	4.50
IN #7	DMH #70	0.29	0.95	0.28	0.55	10.00	0.05	10.58	6.68	1.87	3.67	15	12.0	0.013	0.0050	4.57	3.73
DMH #70	DMH to DOT	0.00	0.00	0.00	0.55	0.00	0.43	10.63	6.68	0.00	3.67	15	179.0	0.013	0.0173	8.49	6.92
IN #9	IN #10	0.10	0.95	0.10	0.10	10.00	0.47	10.00	6.80	0.68	0.68	15	105.0	0.013	0.0050	4.57	3.73
1/2 WAWA (2)	IN #10	0.07	0.95	0.06	0.06	10.00	0.44	10.00	6.80	0.41	0.41	8	120.0	0.010	0.0100	1.57	4.50
IN #10	DMH #72	0.15	0.95	0.14	0.30	10.00	0.45	10.47	6.80	0.95	2.04	15	100.0	0.013	0.0050	4.57	3.73
DMH #72	IN #11	0.00	0.00	0.00	0.30	0.00	0.11	10.92	6.68	0.00	2.00	15	25.0	0.013	0.0050	4.57	3.73
IN #11	IN #12	0.10	0.87	0.09	0.39	10.00	0.54	11.03	6.56	0.59	2.56	15	121.0	0.013	0.0050	4.57	3.73
CANOPY	IN #12	0.18	0.95	0.17	0.17	10.00	0.51	10.00	6.80	1.16	1.16	8	139.0	0.010	0.0100	1.57	4.50
IN #12	DMH to DOT	0.13	0.82	0.11	0.67	10.00	0.11	11.57	6.44	0.71	4.31	15	67.0	0.013	0.0381	12.60	10.27
IN #16	IN #17	0.30	0.91	0.27	0.27	10.00	0.64	10.00	6.80	1.84	1.84	15	111.0	0.013	0.0030	3.54	2.89
IN #17	IN #18	0.15	0.92	0.14	0.41	10.00	0.53	10.64	6.68	0.94	2.74	15	119.0	0.013	0.0050	4.57	3.73
IN #18	IN #19	0.12	0.74	0.09	0.50	10.00	0.44	11.17	6.56	0.59	3.28	15	98.0	0.013	0.0050	4.57	3.73
IN #71	IN #19	0.13	0.81	0.11	0.11	10.00	0.27	10.00	6.80	0.75	0.75	15	189.0	0.013	0.0500	14.44	11.77
IN #19	DMH #20	0.29	0.87	0.25	0.86	10.00	0.21	11.61	6.44	1.61	5.54	18	54.0	0.013	0.0050	7.43	4.21
DMH #20	IN #21	0.00	0.00	0.00	0.86	0.00	0.34	11.82	6.44	0.00	5.54	18	87.0	0.013	0.0050	7.43	4.21
IN #21	DMH to West	0.18	0.95	0.17	1.03	10.00	0.16	12.16	6.32	1.07	6.51	18	40.0	0.013	0.0050	7.43	4.21
HOTEL	IN #14	0.50	0.95	0.48	0.48	10.00	0.50	10.00	6.80	3.26	3.26	12	125.0	0.010	0.0050	3.27	4.17
IN #14	DMH #15	0.03	0.54	0.02	0.50	10.00	0.21	10.50	6.68	0.13	3.34	15	46.0	0.013	0.0050	4.57	3.73
DMH #15	FES to West	0.00	0.00	0.00	0.50	0.00	0.19	10.71	6.68	0.00	3.34	15	43.0	0.013	0.0050	4.57	3.73

SCOUR HOLE SIZING



SCOUR HOLE DESIGN

Project: Paramount Realty
 Job #: 1478-99-043
 Location: Township of West Windsor
 Design Storm: 25-year
 Computed By: RM
 Checked By: KK
 Date: 4/20/2020

Discharge not in Basin, Therefore Tailwater is less than 0.5 x Do

Discharge Point	FES #13
Q (25-yr storm cfs)	3.34
Inside Height of Outlet Culvert, Do (in)	15
Inside Height of Outlet Culvert, Do (ft)	1.25
Tailwater (ft), Tw	0.25
Length of Apron, L (ft)	3.75
Width of Culvert, Wo(in)	15
Width of Culvert, Wo(ft)	1.25
Width of Apron, W(ft)	2.50
Where Y = 1/2 Do, Y(ft)	0.625
Median Stone Diameter, D50 (ft)	0.18
Where Y = Do, Y(ft)	1.250
Median Stone Diameter, D50 (ft)	0.12

Note: Use D50 of 6 inches minimum

Equations used:

$L=3*Do$

$W=2*Wo$

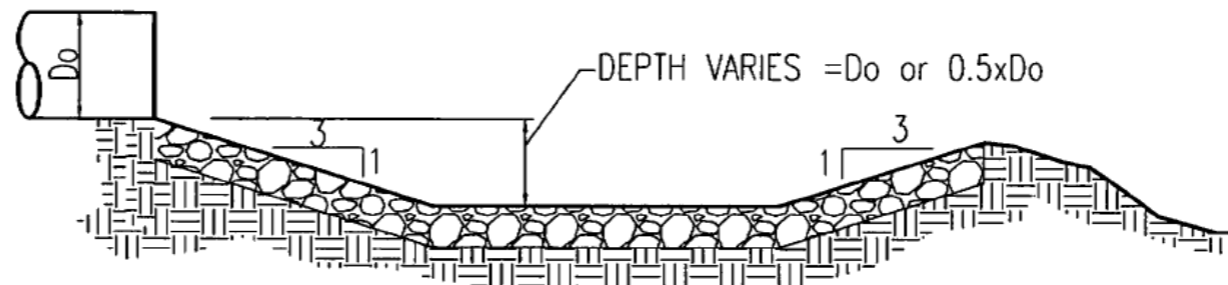
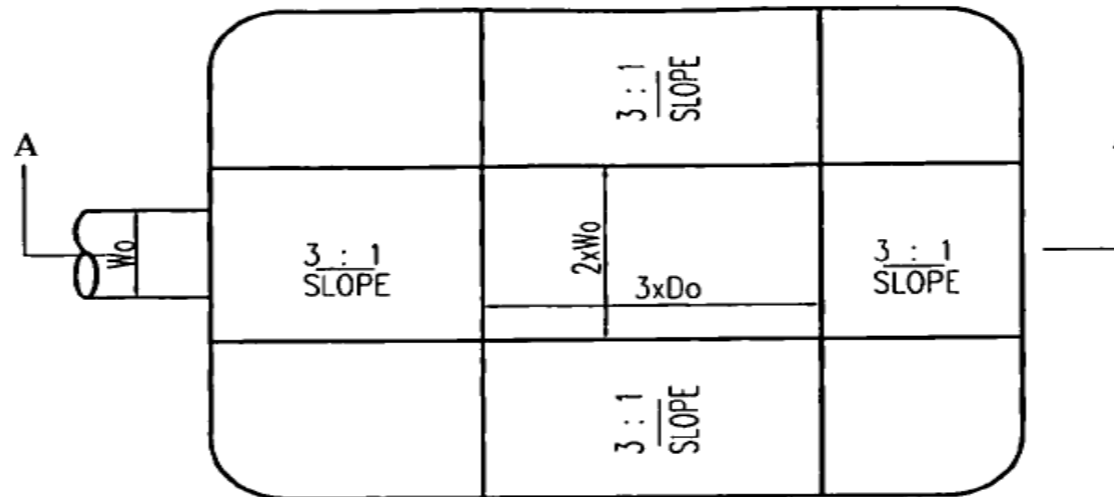
$Tw=0.2*Do$ (If Tw cannot be computed)

Where $Y=1/2 Do$

$D50=(0.0125/Tw)*(q^{1.33})$

Where $Y=Do$

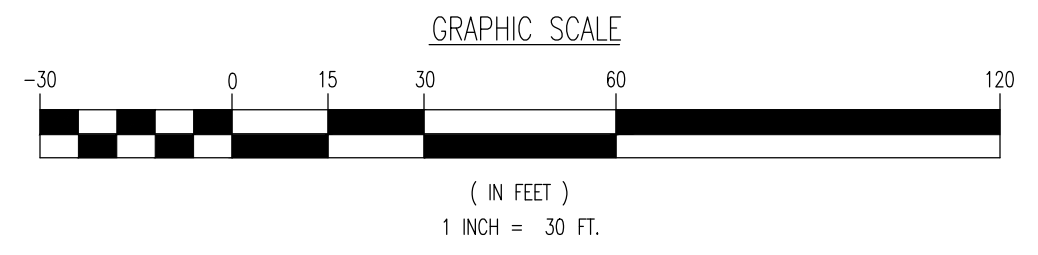
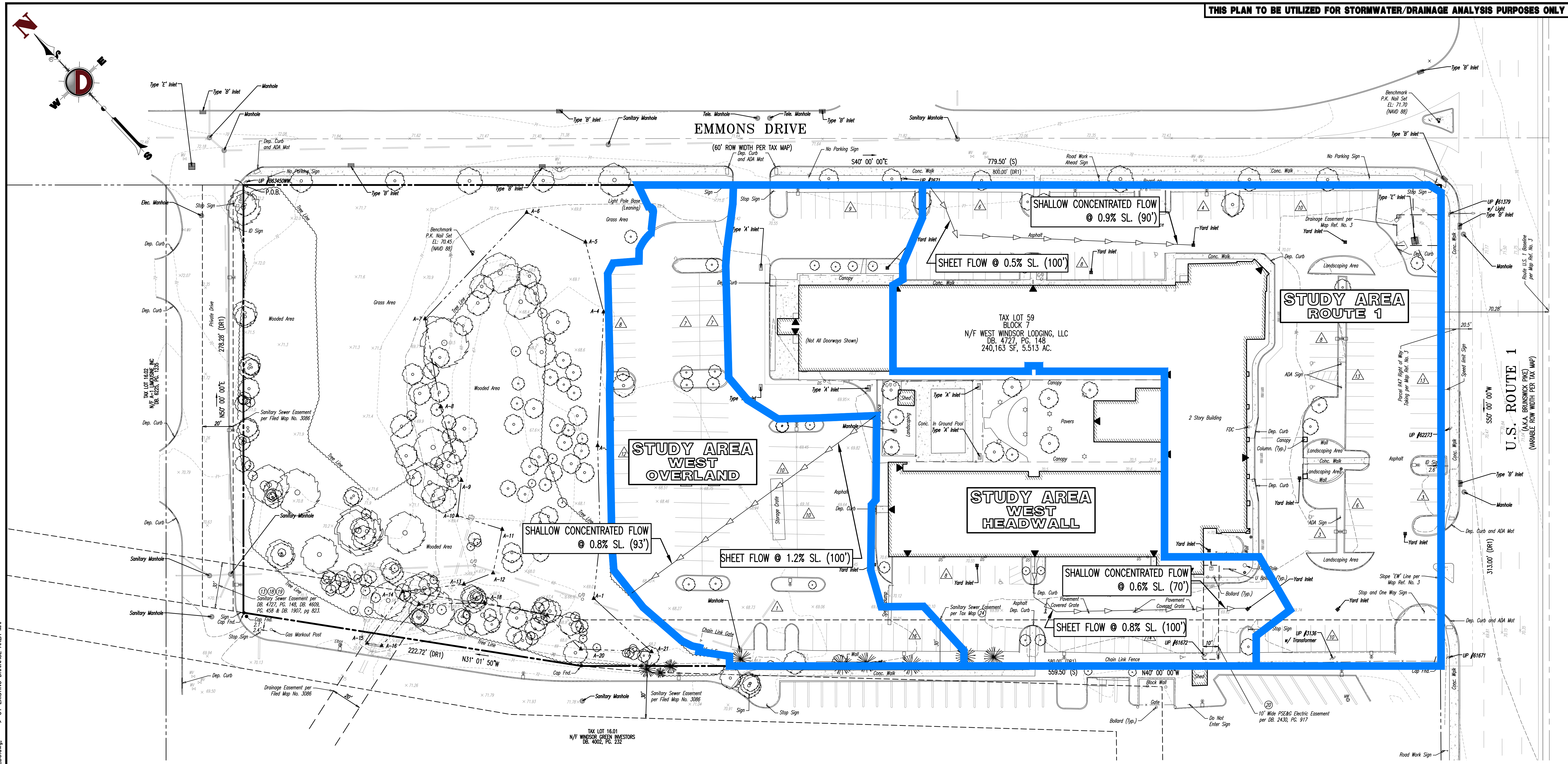
$D50=(0.0082/Tw)*(q^{1.33})$



Notes:

1. The use of scour holes shall comply with county or local ordinances which would restrict the use of such devices due to the possible problems with mosquito breeding.
2. No bends or curves at the intersection of the conduit and apron or scour hole will be permitted.
3. There shall be no over fall from the end of the apron to the receiving material.
4. The thickness of the riprap lining, filter, and quality shall meet the requirements in the Riprap Standard Section of the Standards for Soil Erosion Control in New Jersey.

DRAINAGE AREA MAPS



Plotted: 04/30/20 2:51 PM, By: rmacneill, Product Ver: 23.0a (LMS Tech)
 File: P:\BECPC PROJECTS\1478 Ferromont Realty\99-043 West Windsor\DWG\VA Main\017899043ED0.dwg, ---> 01 EXISTING DRAINAGE AREA MAP

Rev.	Date	By	Comments
1	04/20/20	RAM	REV. PER DRCC & SCD REVIEW COMMENTS

THIS PLAN SET IS FOR PERMITTING PURPOSES ONLY AND MAY NOT BE USED FOR CONSTRUCTION

DYNAMIC ENGINEERING
 LAND DEVELOPMENT CONSULTING • PERMITTING • GEOTECHNICAL • ENVIRONMENTAL • SURVEY • PLANNING & ZONING

1904 Main Street
 Lake Como, NJ 07719
 T: 732.974.0198
 F: 732.974.3521
 www.dynamicoc.com

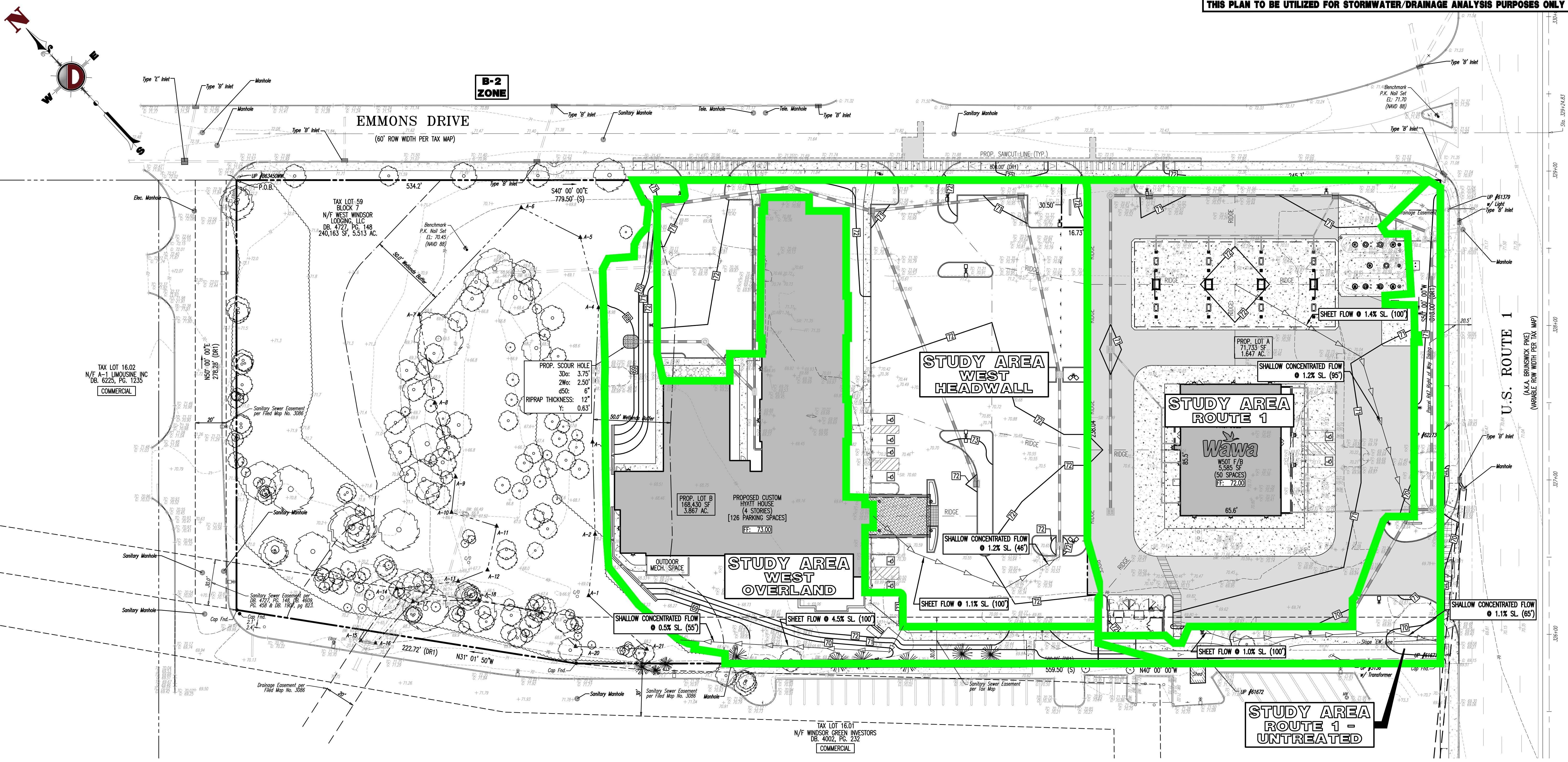
TITLE: **EXISTING DRAINAGE AREA MAP**
 PROJECT: **WINDSOR 1 DEVELOPERS, LLC**
 PROPOSED **WAMA FOOD MARKET & FUELING STATION AND HOTEL**
 BLOCK 7, LOT 59
 U.S. ROUTE 1 (BRUNSWICK PIKE) & EMMONS DRIVE
 TOWNSHIP OF WEST WINDSOR, MERCER COUNTY, NEW JERSEY

JOB No: 1478-99-043
 DATE: 01/06/2020
 DRAWN BY: KAK
 SCALE: (H) 1"=30'
 (V)
 DESIGNED BY: RJM
 SHEET No:
 CHECKED BY: MS
 CHECKED BY:

MATTHEW SHARO PROFESSIONAL ENGINEER
 NEW JERSEY LICENSE No. 52989

MARK A. WHITAKER PROFESSIONAL ENGINEER
 NEW JERSEY LICENSE No. 41417

1
 OF 3



Plotted: 04/30/20 - 2:54 PM, By: rmacneill, Product Ver: 23.0a (LMS Tech)
 File: P:\BECPC PROJECTS\1478 Paramount Realty\99-043 West Windsor\DWG\A Wawa\017899043PPO.dwg, ----> 02 PROPOSED DRAINAGE AREA MAP

THIS PLAN SET IS FOR PERMITTING PURPOSES ONLY AND MAY NOT BE USED FOR CONSTRUCTION

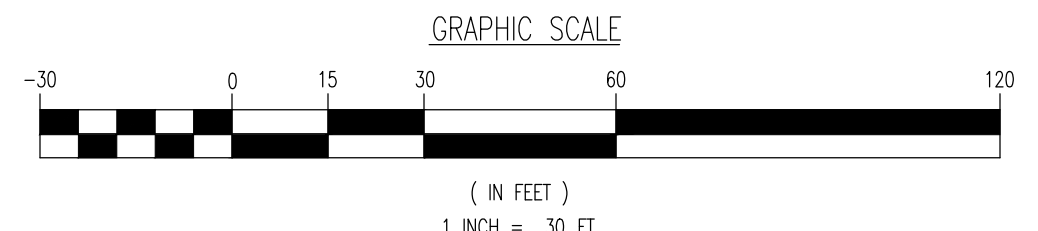
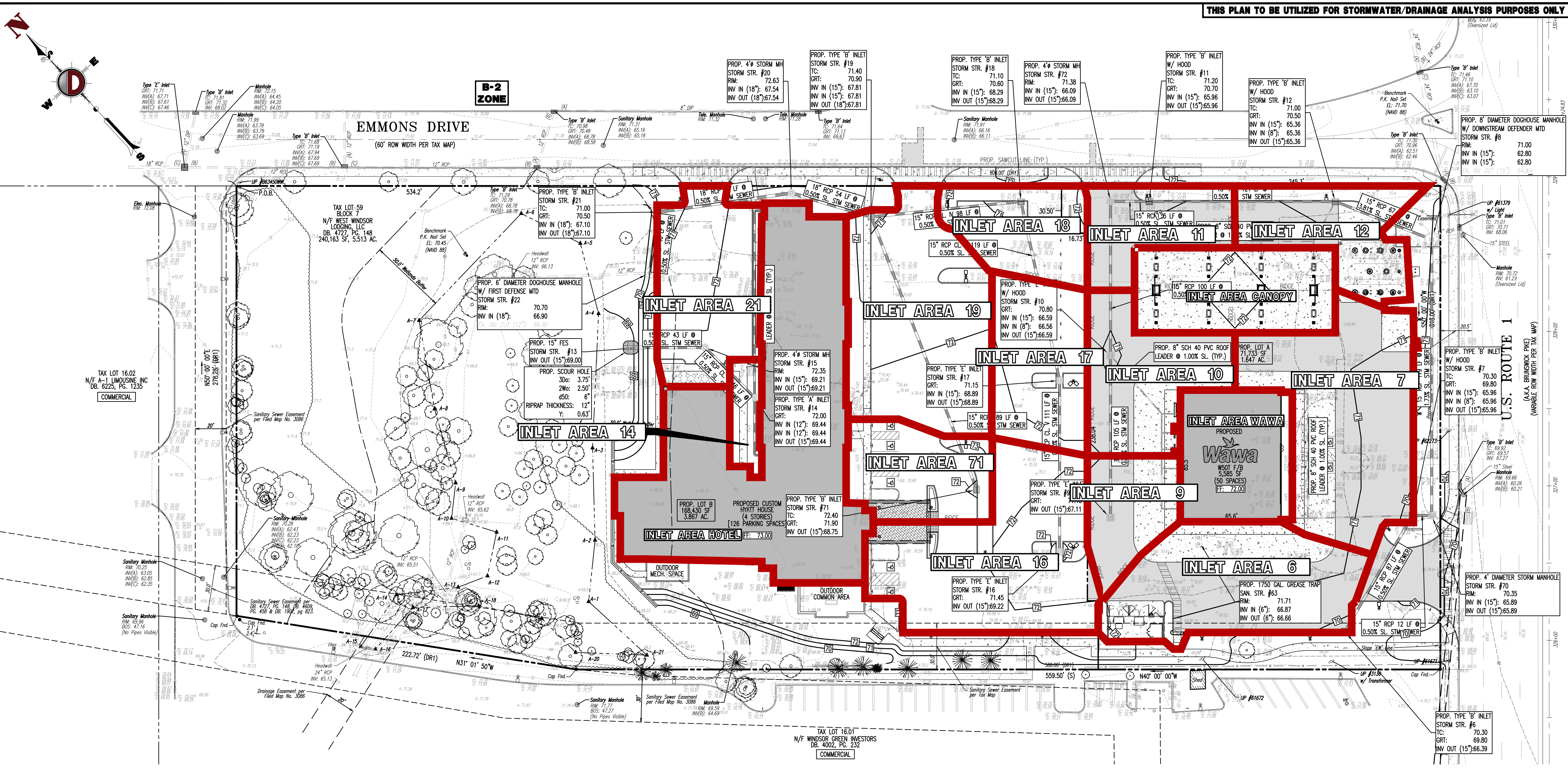
DYNAMIC ENGINEERING
 LAND DEVELOPMENT CONSULTING • PERMITTING • GEOTECHNICAL • ENVIRONMENTAL • SURVEY • PLANNING & ZONING

1904 Main Street
 Lake Como, NJ 07719
 T: 973.974.0198
 F: 973.974.3521
 www.dynamicoc.com

TITLE: PROPOSED DRAINAGE AREA MAP	
PROJECT: WINDSOR 1 DEVELOPERS, LLC PROPOSED WAWA FOOD MARKET & FUELING STATION AND HOTEL	JOB No: 1478-99-043 DATE: 01/06/2020
BLOCK 7, LOT 59 U.S. ROUTE 1 (BRUNSWICK PIKE) & EMMONS DRIVE TOWNSHIP OF WEST WINDSOR, MERCER COUNTY, NEW JERSEY	DRAWN BY: KAK DESIGNED BY: RJM CHECKED BY: MS
DRAWN BY: MATTHEW SHARO PROFESSIONAL ENGINEER NEW JERSEY LICENSE No. 52989	CHECKED BY: MARK A. WHITAKER PROFESSIONAL ENGINEER NEW JERSEY LICENSE No. 41417

2
OF 3

811 PROTECT YOURSELF
 ALL UTILITIES REQUIRE NOTIFICATION BY HOMEOWNERS BEFORE ANY EXCAVATION OR OTHER WORK BEGINS TO AVOID DAMAGE TO UTILITIES AND PERSONAL INJURY.
 FOR STATE SPECIFIC DIRECT PHONE NUMBERS VISIT: www.call811.com



THIS PLAN SET IS FOR PERMITTING PURPOSES ONLY AND MAY NOT BE USED FOR CONSTRUCTION

DYNAMIC ENGINEERING
LAND DEVELOPMENT CONSULTING • PERMITTING • GEOTECHNICAL • ENVIRONMENTAL • SURVEY • PLANNING & ZONING

1964 Main Street
Lake Como, NJ 07719
T: 973.974.0198
F: 973.974.3521
www.dynamicoc.com

TITLE: INLET AREA MAP	
PROJECT: WINDSOR 1 DEVELOPERS, LLC PROPOSED WAWA FOOD MARKET & FUELING STATION AND HOTEL	DATE: 01/06/2020
DESIGNED BY: KAK	SCALE: (H) 1"=30' (V)
CHECKED BY: MS	SHEET No:
MATTHEW SHARO	MARK A. WHITAKER
PROFESSIONAL ENGINEER NEW JERSEY LICENSE NO. 52989	PROFESSIONAL ENGINEER NEW JERSEY LICENSE NO. 41417

PROTECT YOURSELF
ALL UTILITIES REQUIRE NOTIFICATION OF
OWNERS BEFORE ANY EXCAVATION OR
DRILLING TO AVOID DAMAGE TO UTILITIES.
FOR STATE SPECIFIC DIALING NUMBERS VISIT:
WWW.CALL811.COM

Plotted: 04/30/20 2:25 PM, By: rmacneill, Product Ver: 23.0a (LMS Tech)
 File: P:\BECPC PROJECTS\1478 Peromont Realty\99-043 West Windsor\DWG\VA Wawa\01789904300.dwg, ---> 03 INLET AREA MAP