THIEL ENGINEERING CONSULTANTS

LDP 05-05502

FINAL DRAINAGE STUDY
FOR
McCAULEY RANCH ESTATES

CIVIL ENGINEERING • WATER RESOURCES • WATER RIGHTS
SURVEYING • LAND USE PLANNING

231

LDP 05-05502

FINAL DRAINAGE STUDY
FOR
McCAULEY RANCH ESTATES

CITY OF RENO PUBLIC WORKS

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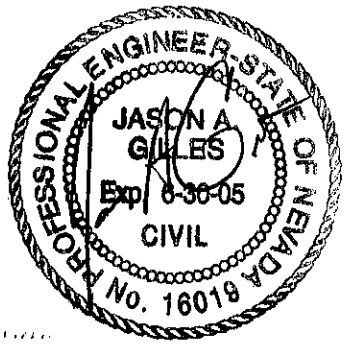

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REFERENCES

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Ref 2: SCS TR-55 Manual, June 1986

Ref 3: SCS Soil Survey of Washoe County, Nevada, South Part, August 1983

Ref 4: Storm Drainage Master Plan, March 2005

Ref 5: McCauley Ranch Estates - Preliminary Hydrology Report, January 2004

Ref 6: Preliminary Geotechnical Investigation-McCauley Ranch, September 2002

Ref 7: Washoe County Hydrologic Criteria & Drainage Design Manual, Dec 1996

Ref 8: "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14, Vol. 1

1. INTRODUCTION

The following report represents the final drainage analysis for McCauley Ranch Estates, a development by Syncon Homes. The project consists of 159 single-family residential dwellings located on three parcels totaling 81.01 acres (APN# 016-390-01, 016-390-02 and 140-020-16). The project is located in Southeast Reno in the southwest ¼ of Section 14, T. 18 N., R. 20E., M.D.M., in Washoe County, Nevada (Figure 1: *Vicinity Map*). McCauley Ranch Estates borders future Golden Hills Subdivision to the north, future Palisades Subdivision to the east, and existing Damonte Ranch High School to the west. This report has been prepared in accordance with City of Reno Design Criteria and is to accompany the civil improvement plans for McCauley Ranch Estates.

The site, in its current undeveloped state, consists of gravel / boulder covered alluvial fan with sagebrush and cheatgrass in "poor condition." The geotechnical report for McCauley Ranch Residential Subdivision, completed by Black Eagle Consulting Inc., January 2005, has revealed the site primarily consists of silty gravel with sand containing less than 20 percent non- to low-plastic fines. The Soil Conservation Services (SCS) Soil Survey of Washoe County, Nevada, South Part (see Figure 2) lists the soils as being in hydrologic soils groups "C" and "D".

The drainage is primarily conveyed across the site as sheet flow in a southeast to northwest direction, ultimately flowing into a large trapezoidal drainage channel that flows from south to north along the eastern boundary of Damonte Ranch High School. The site has a slope of 5% to 30% in a southeast to northwest direction.

Wood Rodgers Inc. has prepared a Master Storm Drainage Plan (March 2005) encompassing the entire Damonte Foothills area (three residential subdivisions: Golden Hills, McCauley Ranch Estates and Palisades). This report is specific to McCauley Ranch Estates and should be considered in addition to the previously mentioned Master Storm Drainage Plan

2. FEMA FLOODPLAIN DISCUSSION

FEMA floodplain designation for this property was confirmed to ensure no detrimental effects would result from the proposed construction. Based on FEMA FIRM panel 32031C3187 E (effective date September 30, 1994), the subject site area is in an unshaded Zone 'X' (area that is determined to be outside the 100- and 500-year floodplains). An excerpt from this FEMA FIRM panel is included as Figure 3.

3. ANALYSIS METHODOLOGY

SCS TR-55 (UNIT HYDROGRAPH METHOD)

The SCS TR-55 Method was used to determine the runoff generated during storm events. Based on each basin's proposed ground cover and hydrologic soils group, the runoff

curve number (CN) was taken from the SCS TR-55 Manual Tables 2-2a and 2-2d (Figure 4) for the post- and pre-developed conditions, respectively (Reference 2). For the pre-developed condition, CN value was chosen for undeveloped land covered primarily with sagebrush in "poor condition" (*SCS TR-55 Manual, Table 2-2d*). For the post-developed condition, CN values were chosen for natural desert landscaping urban areas and for average residential lot size of ¼-acre (lots sizes range from 8,250 sq-ft to 16,842 sq-ft; *SCS TR-55 Manual, Table 2-2a*).

The Time of Concentration (T_c) for each sub-basin was determined using the SCS TR-55 sheet flow and shallow concentrated flow methods. In analyzing the Time of Concentration of the drainage basins, the maximum flow distance running through each basin was used. The time of travel for the sheet (overland) flow was calculated as:

$$T_t = \frac{0.007\,(nL)^{0.8} * 60}{P_2^{0.5}\, s^{0.4}}$$

For the shallow concentrated flows, the velocities were determined from the SCS TR-55 Manual *Shallow Concentrated Flow Chart* based on the watercourse slopes and the paved surface area condition (see Figure 5). Based on the length and velocity of each shallow flow sub-segment, the time of travel was calculated as:

$$T_t = \left(\frac{L}{60V} \right)$$

The Time of Concentration of each drainage area was calculated as the summation of the time of travel of each flow regime within the drainage basin as shown below:

$$T_c = T_{t1} + T_{t2} \ldots + T_{tm}$$

where:

n = Manning's roughness coefficient,
L = Flow length (feet),
P_2 = 2-year, 24-Hour rainfall (inches),
s = Slope of hydraulic grade line (land slope, ft/ft),
V = Average velocity (ft/sec),
T_t = Time of travel (minutes), and
T_c = Time of Concentration (minutes).

T_c was taken as the City of Reno minimum, 10 minutes. Calculations for the T_c are enclosed in Appendix 3. Point precipitation values of 1.89-inches and 3.47-inches for the required 5-year and 100-year, 24-hour storm events were obtained from NOAA Atlas 14, respectively (see Appendix 3).

4. DRAINAGE CONDITIONS

A. EXISTING DRAINAGE CONDITIONS

To determine the historic storm flows affecting the proposed McCauley Ranch Estates, one major basin, PRE-1 was analyzed as a combination of the offsite and onsite drainages (see Exhibit 1: *Pre-Developed Global Drainage Basin Map*). The historic flows were calculated to determine the need for detention facilities.

The pre-developed drainage basin, PRE-1, is an open space area encompassing approximately 193.5 acres. Elevations range from 4,486± feet to 5,840± feet. Flow length through the basin was found to be 6,739± feet. Slope of the basin was calculated to be 20± percent. Soils types are in hydrologic soil groups "C" and "D". Based on the soil composition and undeveloped condition, an average runoff CN of 83 was derived. T_c was calculated to be 46 minutes. Peak runoff rates for the 5-year, 24-hour and 100-year, 24-hour storm events are 71.0 cfs and 225.4 cfs respectively. The historic drainage pattern of storm flows within the basin (PRE-1) is primarily sheet flow conveyed in a southeast to northwest direction, ultimately discharging into the existing trapezoidal drainage channel along the eastern boundary of Damonte Ranch High School. A summary of the existing conditions can be seen below in Table 1. Hereinafter, the drainage channel along the eastern boundary of Damonte Ranch High School will be referred to as the "school drainage channel".

Table 1: Existing Basins Parameters and Flow Rates

Basin	Area (acres)	CN_{ave}	T_c (minutes)	5-yr flow (cfs)	100-yr flow (cfs)
PRE-1	193.5	83	46.0	70.99	225.42

B. PROPOSED DRAINAGE CONDITIONS

Thirty-three drainage basins were established and analyzed as a combination of onsite and offsite basins (see Exhibit 2: *Post-Developed Drainage Plan*). The basins were modeled and analyzed using the SCS TR-55 (Unit Hydrograph Method) as discussed above. All Pond Pack models and results can be seen in the enclosed Appendix 3.

Storm flows will typically be conveyed away from the project site using a combination of curb-and-gutters, interceptor ditches, drainage inlets, landscaping, culverts, riprap lined channels and underground storm drain piping. As part of the drainage analysis and civil improvement design for McCauley Ranch Estates, a total of 22 drainage inlets, six interceptor ditches, four culverts and two trapezoidal channels were designed and analyzed for effectiveness. The previously mentioned drainage infrastructure was designed for the 5-year, 24-hour storm event, however, capacities were verified for the 100-year, 24-hour storm event. The onsite drainage system has been designed to direct offsite encroaching flows as well as onsite generated flows in the westerly direction to the existing school channel. As a result of onsite development, an increase in flow of 152 cfs will need to be detained either onsite, or in a downstream detention area with sufficient

capacity. After analyzing the downstream detention area capacity (located in Damonte Ranch) and storm drain infrastructure, it has been determined the additional flow (152 cfs) can and will be conveyed to said detention area. A summary of the developed conditions can be seen below in Table 2.

Table 2: Post-Developed Basins Parameters and Flow Rates

Basin No.	Area (ac.)	T_c (minutes)	CN	5-yr flow (cfs)	100-yr flow (cfs)
DEV-1	3.15	10.00	83	2.62	7.91
DEV-2	1.78	10.00	83	1.48	4.47
DEV-3	1.01	10.00	83	0.84	2.54
DEV-4	2.21	10.00	83	1.83	5.55
DEV-5	0.71	10.00	83	0.59	1.78
DEV-6	3.52	10.00	84	3.17	9.20
DEV-7	0.93	10.00	83	0.77	2.34
DEV-8	0.48	10.00	83	0.40	1.21
DEV-9	1.26	10.00	83	1.05	3.17
DEV-10	2.98	10.00	83	2.47	7.49
DEV-11	3.17	10.00	85	3.08	8.61
DEV-12	3.54	11.26	83	2.84	8.59
DEV-13	1.71	12.58	83	1.29	3.95
DEV-14	1.24	10.00	83	1.03	3.12
DEV-15	0.26	10.00	83	0.22	0.65
DEV-16	5.85	12.71	85	5.32	14.88
DEV-17	4.88	16.32	83	3.41	10.44
DEV-18	1.65	10.52	83	1.35	4.09
DEV-19	4.47	10.00	83	3.71	11.23
DEV-20	0.50	10.00	84	0.45	1.30
DEV-21	3.49	10.00	85	3.39	9.48
DEV-22	3.67	11.25	83	2.95	8.98
DEV-23	3.92	11.92	83	3.10	9.40
DEV-24	0.94	10.00	84	0.85	2.46
DEV-25	1.57	10.00	85	1.53	4.26
DEV-26	0.49	10.00	98	1.01	1.91
DEV-27	0.58	10.00	98	1.20	2.26
OPEN-1	5.86	10.00	85	5.69	15.92
OPEN-2	5.09	10.00	85	4.94	13.82

Table 2: Post-Developed Basins Parameters and Flow Rates Cont'd

Basin No.	Area (ac.)	T_c (minutes)	CN	5-yr flow (cfs)	100-yr flow (cfs)
OPEN-3	6.13	10.00	85	5.96	16.65
OPEN-4	1.51	10.00	85	1.47	4.10
OPEN-5	0.60	10.00	85	0.58	1.63

In determining pipe sizes based on design flow, pipe capacities were calculated at various slopes. At a design velocity of 3 fps or greater, the flow capacities of an 18-inch diameter reinforced concrete storm drain pipe range from 6.64 cfs @ slope of 0.40% to 31.51 cfs @ slope of 9.0%. For a 24-inch diameter reinforced concrete storm drain pipe, flow capacities range from 16.00 cfs @ slope of 0.50% to 55.83 cfs @ slope of 6.3%. For a 30-inch diameter reinforced concrete storm drain pipe, flow capacities range from 29.00 cfs @ slope of 0.50% to 100.47 cfs @ slope of 6.0%. For a detailed explanation of the calculations and results mentioned above, please reference Appendix 3. Summary of the Hydrograph Peak Flows for drainage inlets and outlets can be seen below in Table 3.

Table 3: Post-Developed Drainage Inlets and Outlets Flow Data

Inlet No.	Pipe Size	Approximate Location	Grade (%)	5-year (cfs)	Capacity (cfs)
1	18"	Sta. 8+18.42 - David Alexander Drive	0.50	3.39	7.43
2	24"	Sta. 7+07.23 - John Patrick Way	0.50	5.96	16.00
3	18"	Sta. 7+19.99 - McCauley Ranch Blvd.	0.50	3.08	7.43
4	24"	Sta. 4+29.77 - John Patrick Way	0.50	4.94	16.00
Outlet No.	Pipe Size	Approximate Location	Grade (%)	5-year (cfs)	Capacity (cfs)
1	24"	Sta. 12+74.05 - David Alexander Drive	1.23	5.88	25.09
2	30"	Sta. 19+32.49 - John Bohach Lane	0.50	9.43	29.00
3	24"	Sta. 2+38.87 - McCauley Ranch Blvd.	4.41	26.72	47.51
4	30"	Sta. 1+94.96 - John Bohach Lane	4.20	36.80	84.06

C. BOX CULVERTS AND CHANNELS ANALYSIS

Exhibit 2 outlines the various box culverts and drainage channels required to effectively convey onsite and offsite drainage runoff. Haestad Methods FlowMaster modeling software was used to size the open channels and determine depths of flow and velocities, using the previously computed 100-year storm runoff. Two trapezoidal drainage channels, along with four reinforced concrete box culverts, were designed to convey the 100-year onsite and offsite flows across the site in an east to west direction, ultimately flowing into the school channel. A summary of the culverts parameters and flow rates can be seen below in Table 4.

Table 4: Proposed Culverts Parameters and Flow Rates

Culvert No.	Size (ft)	Grade (%)	5-year flow (cfs)	100-year flow (cfs)
1	2 x 4	6.00	71.10	205.36
2	2 x 4	16.30	77.43	224.41
3	2 x 4	12.00	78.28	226.87
4	3 x 4	1.50	79.81	231.13

The two previously mentioned trapezoidal drainage channels were designed to effectively convey onsite and offsite flows through the site in a direction similar to the natural pre-developed drainage course (southeast to northwest). The "South Channel," located at the south end of the site, has a bottom width of 10 ft., 3:1 side slopes and a maximum depth of 3 ft. In analyzing the effectiveness of the drainage channel, the 100-year storm flow of 258.96 cfs combined with a minimum slope of 0.50%, reveal a depth of flow of 2.86 ft. and channel velocity of 4.87 fps.

The "North Channel," located in the northwest portion of the site, has a bottom width of 3 feet, 3:1 side slopes and a maximum depth of 2 ft. In analyzing the effectiveness of the drainage channel, the 100-year storm flow of 118.15 cfs combined with a slope of 7.0%, reveal a depth of flow of 1.46 ft. and channel velocity of 10.95 fps. Based on the velocities outlined in Table 5, the drainage channels will be riprap lined for protection in accordance with the City of Reno Design Criteria. A summary of the respective channel parameters and flow rates can be seen below in Table 5. For a detailed explanation of the calculations used to derive the results mentioned above, please reference Appendix 3.

Table 5: Proposed Channels Parameters and Flow Rates

Channel ID	Bottom Width (ft)	Max. Depth (ft)	Side Slope	100-year flow (cfs)
South	10.0	3.0	3H:1V	258.96
North	3.0	2.0	3H:1V	118.15

Channel ID	Slope (%)	Depth of Flow (ft)	Velocity (fps)	100-year flow (cfs)
South	6.00	1.39	11.39	224.41
	16.30	1.06	16.11	224.41
	19.40	1.01	17.17	226.87
	12.00	1.16	14.55	226.87
	5.00	1.48	10.77	231.13
	1.50	2.17	7.25	258.96
	0.50	2.86	4.87	258.96
North	7.72	1.27	10.65	92.39
	4.20	1.57	8.83	106.92
	7.00	1.46	10.95	118.15

D. STREET FLOWS

5-Year, 24-Hour Storm

The 5-year, 24 hour storm event was used in designing the allowable drainage conveyed in the street sections, strategic placement of drainage inlets and underground storm drain piping system. The underground storm drain system has been designed to convey flows in an east to west direction, discharging at various points along the north and south drainage channels that ultimately flow into the school channel. To demonstrate adequate street flow capacity, Manning's equation for open channel flow was utilized to determine depth of flow in worst-case scenarios.

Calculations for the various roadway sections were based on worst-case flow rate scenarios (see Figures 6, 7 & 8). For the 44-foot right of way section, the highest flow rate was found to be within Basin DEV-17 (3.41 cfs). The water surface elevation within the street was calculated to be 0.33 ft., allowing for a 5.5 ft. dry lane on each side of the centerline. The corresponding roadway slope is 0.60%. For the 46-foot right of way section, the highest flow rate was found to be within Basin DEV-22 (2.95 cfs). The water surface elevation within the street was calculated to be 0.25 ft., allowing for a 9.5 ft. dry lane on each side of the centerline. The corresponding roadway slope is 5.0%. For the 50-foot right of way section, the highest flow rate was found to be within Basin DEV-12 (2.84 cfs). The water surface elevation within the street was calculated to 0.23 ft., allowing for a 10.1 ft. dry lane on each side of the centerline. The corresponding roadway slope is 6.0%. It should be noted that in all cases, the maximum design flow for each of the basin was used to evaluate this criteria and actual flow within the individual lanes will likely be lower.

For the design of drainage inlets, the depth of flow was calculated and used to analyze the inlet inflow capacity. Any overflow was applied to the design flow for the next downstream inlet. In a case where the inlet is located in a sump area, maximum depth of ponding was calculated based on manufacturer-supplied data. In the sump condition, maximum allowable head was set at 0.75 ft., which would translate to the water surface elevation at the top of curb. Maximum capacity of the standard Type 4-R inlet under sump condition was found to be 8.8 cfs.

100-Year, 24-Hour Storm

Calculations for the various roadway sections were based on worst-case flow rate scenarios (see Figures 6, 7 & 8). The highest flow rates for the 44 ft., 46 ft. and 50 ft. right of way sections were found to be within Basins DEV-17, 23, and 12 (10.44 cfs, 8.98 cfs, and 8.59 cfs), respectively. The corresponding water surface elevations were calculated to be 0.46 ft., 0.33 ft. and 0.31 ft. respectively. An inlet capacity spreadsheet containing additional information has been included in Appendix 3. In all cases, it was determined that the proposed catch basin inlets are capable of capturing and conveying the 100-tear, 24-hour storm flows. A summary of the storm drain infrastructure can be seen below in Table 6.

Table 6: Drainage Facility Summary

Drainage Structure (as shown on plan)	5-year Design / Capacity / Depth	100-year Design / Capacity / Depth	Notes
Inlet CB-1	3.34 cfs / 1.48 cfs	15.38 cfs / 3.84 cfs	On-Grade
Inlet CB-2	3.17 cfs / 1.44 cfs	10.33 cfs / 2.99 cfs	On-Grade
Inlet CB-3	5.03 cfs / 1.91 cfs	19.14 cfs / 4.41 cfs	On-Grade
Inlet CB-4	1.05 cfs / 0.72 cfs	3.17 cfs / 1.44 cfs	On-Grade
Inlet CB-5	1.03 cfs / 0.61 cfs	3.12 cfs / 1.23 cfs	On-Grade
Inlet CB-6	1.29 cfs / 0.71 cfs	3.95 cfs / 1.43 cfs	On Grade
Inlet CB-7	2.40 cfs / 0.84 cfs	8.93 cfs / 1.68 cfs	On-Grade
Inlet CB-8	0.77 cfs / 0.57 cfs	2.34 cfs / 1.14 cfs	On-Grade
Inlet CB-9	3.17 cfs / 1.37 cfs	9.20 cfs / 2.68 cfs	On-Grade
Inlet CB-10	0.59 cfs / 0.10'	1.78 cfs / 0.20'	Sump
Inlet CB-11	1.83 cfs / 0.21'	5.55 cfs / 0.49'	Sump
Inlet CB-12	1.48 cfs / 0.89 cfs	4.47 cfs / 1.78 cfs	On-Grade
Inlet CB-13	3.22 cfs / 1.45 cfs	10.60 cfs / 3.05 cfs	On-Grade
Inlet CB-14	0.84 cfs / 0.63 cfs	2.54 cfs / 1.25 cfs	On-Grade
Inlet CB-15	4.72 cfs / 1.77 cfs	16.53 cfs / 3.87 cfs	On-Grade
Inlet CB-16	3.31 cfs / 0.31'	10.70 cfs / 0.75'	Sump
Inlet CB-17	1.35 cfs / 0.73 cfs	4.09 cfs / 1.46 cfs	On-Grade
Inlet CB-18	3.41 cfs / 0.32'	21.98 cfs / 0.75'	Sump

Pipe Size	Max. 5-yr (cfs) / 100-yr flow (cfs)		Capacity (cfs)	Notes
18-inch	3.17	9.20	12.38	1.39%
18-inch	1.29	3.95	12.47	1.41%
18-inch	0.59	1.78	12.82	1.49%
18-inch	1.05	3.17	14.86	2.00%
18-inch	0.22	0.65	15.97	2.31%
18-inch	0.40	1.21	18.19	3.00%
18-inch	2.47	7.49	19.74	3.53%
18-inch	3.08	8.61	24.38	5.84%
18-inch	3.39	9.48	26.78	6.50%
18-inch	3.39	9.48	31.51	9.00%
24-inch	5.88	17.75	25.09	1.23%
24-inch	26.72	77.51	47.51	4.41%
30-inch	9.43	27.83	29.00	0.50%
30-inch	36.80	106.92	84.06	4.20%

*Reference Appendix 3 for detailed calculations of the inlet and pipe capacities.

5. CONCLUSION

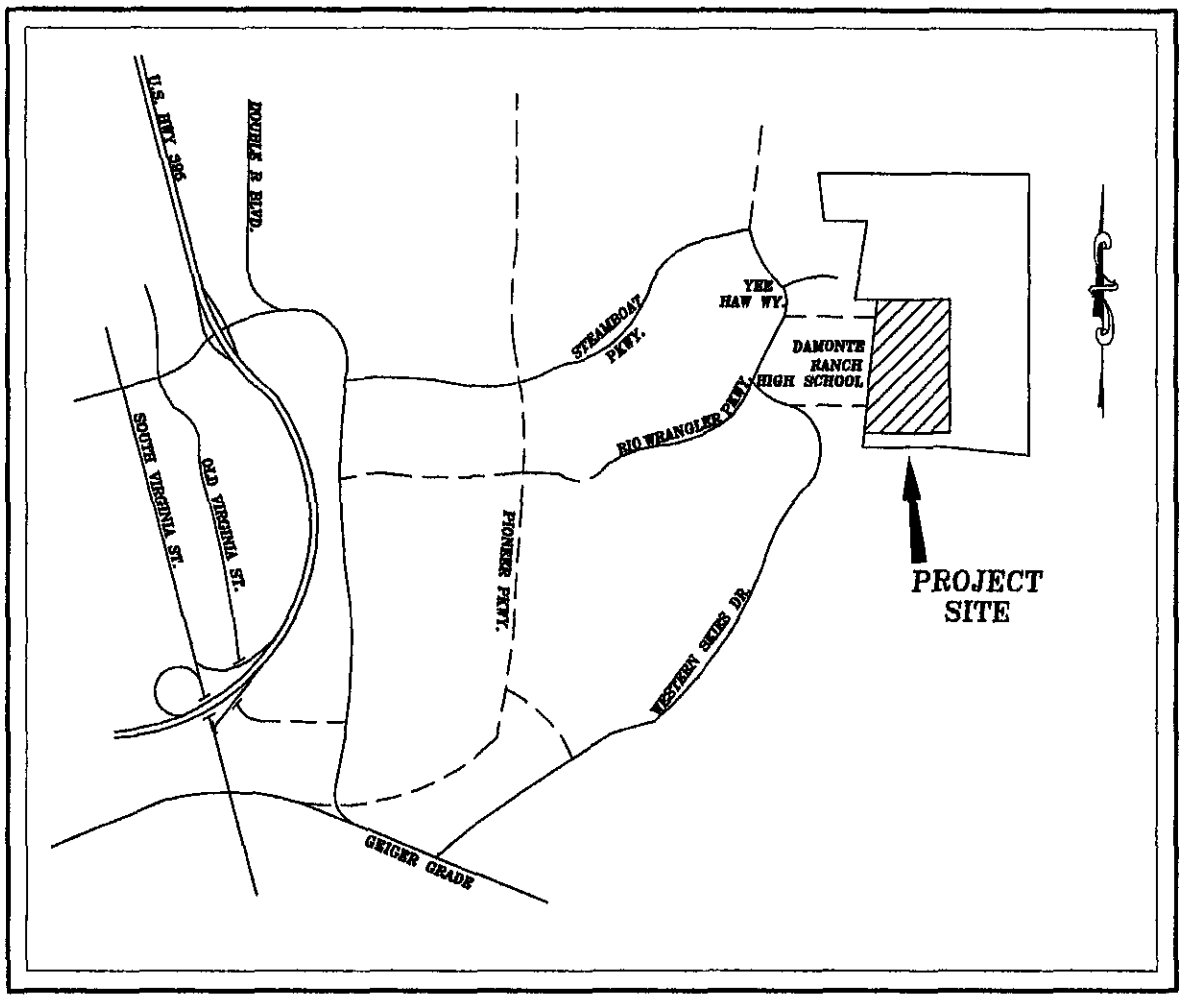
The proposed McCauley Ranch Estates will in no way negatively impact adjacent and/or downstream areas. The drainage improvements specified in this report, and the accompanying Civil Improvement Plans prepared by TEC Civil Engineering Consultants (2005), will effectively convey the 5-year and 100-year, 24-hour storm events and provide for safe collection and discharge of the storm water from the project site. As a result of onsite development, the expected increase in flow of 152 cfs will effectively be conveyed offsite via the school drainage channel to the large downstream detention area located in Damonte Ranch. The additional flow (152 cfs) will have no detrimental impact on the downstream drainage infrastructure and/or downstream detention area. The analysis and preparation of this report has been completed in accordance with *City of Reno Public Works Design Manual*.

APPENDICES

APPENDIX 1

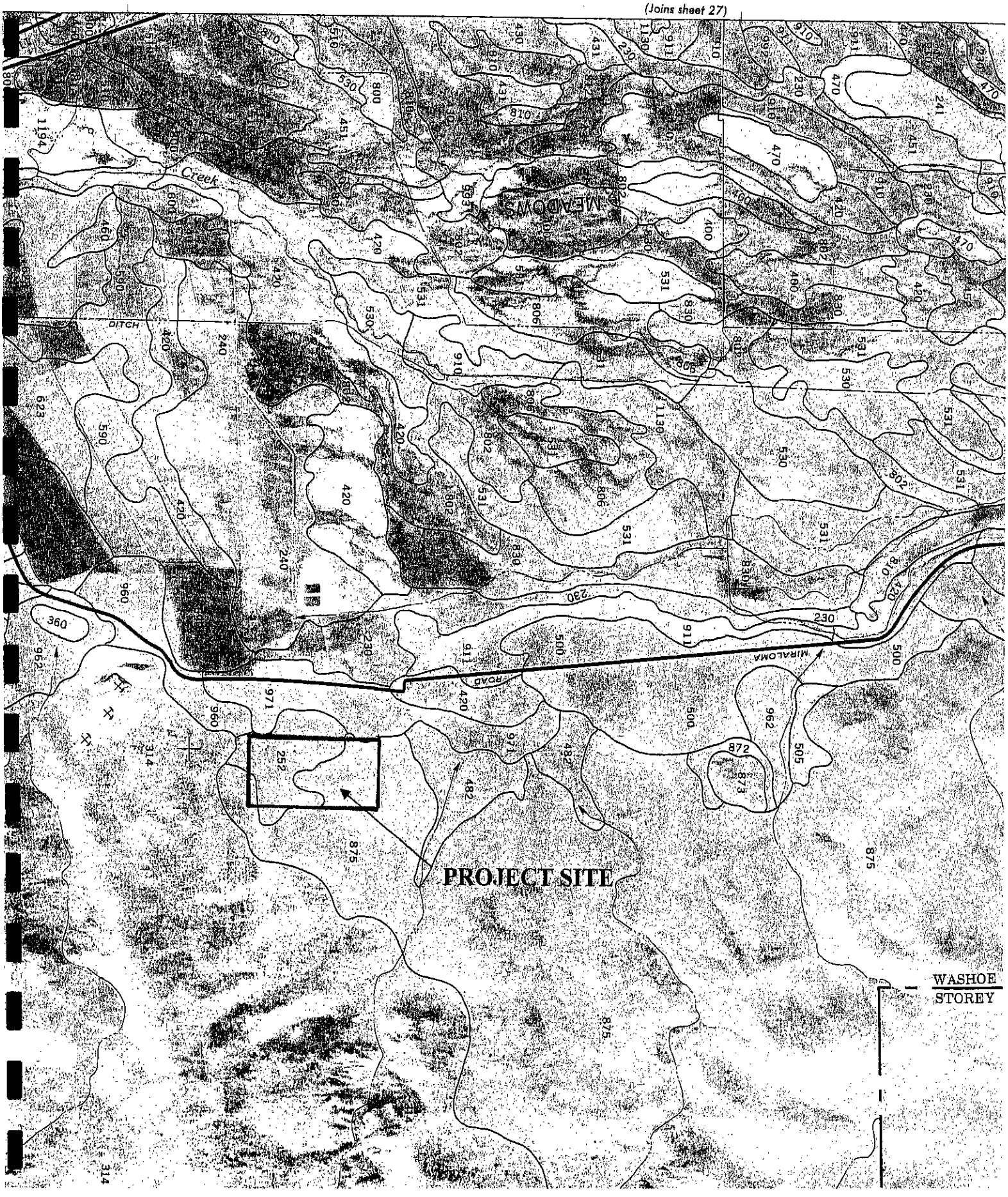
Figures

Figure 1



VICINITY MAP

Figure 2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MEADOWS
Creek
DITCH
MIRALOMA
ROAD
PROJECT SITE
WASHOE
STOREY

Figure 2

TABLE 15.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
240---------- Updike	D	None----------	---	---	5.0-6.0	Apparent	Feb-May
241---------- Updike	D	Rare----------	---	---	4.0-6.0	Apparent	Mar-Aug
250, 251, 252---------- Cassiro	C	None----------	---	---	>6.0	---	---
260*: Acrelane----------	C	None----------	---	---	>6.0	---	---
Rock outcrop.							
262---------- Acrelane	C	None----------	---	---	>6.0	---	---
280, 281, 282---------- Wedekind	D	None----------	---	---	>6.0	---	---
290, 291---------- Verdico Variant	D	None----------	---	---	>6.0	---	---
300---------- Surgem	C	None----------	---	---	>6.0	---	---
301*, 302*: Surgem----------	C	None----------	---	---	>6.0	---	---
Rock outcrop.							
310*, 311*: Risley----------	D	None----------	---	---	>6.0	---	---
Rock outcrop.							
312, 313---------- Risley	D	None----------	---	---	>6.0	---	---
314*: Risley----------	D	None----------	---	---	>6.0	---	---
Xman----------	D	None----------	---	---	>6.0	---	---
Rock outcrop.							
341---------- Yuko	D	None----------	---	---	>6.0	---	---
342*: Yuko----------	D	None----------	---	---	>6.0	---	---
Reywat----------	D	None----------	---	---	>6.0	---	---
Rock outcrop.							
350---------- Mizel	D	None----------	---	---	>6.0	---	---
351*: Mizel----------	D	None----------	---	---	>6.0	---	---
Skedaddle----------	D	None----------	---	---	>6.0	---	---
Rock outcrop.							

See footnote at end of table.

TABLE 15.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
871, 872---------- Xman	D	None----------	---	---	>6.0	---	---
873*: Xman----------	D	None----------	---	---	>6.0	---	---
Rock outcrop.							
875*: Xman----------	D	None----------	---	---	>6.0	---	---
875*: Zephan----------	C	None----------	---	---	>6.0	---	---
Mizel----------	D	None----------	---	---	>6.0	---	---
876*: Xman----------	D	None----------	---	---	>6.0	---	---
Oppio----------	D	None----------	---	---	>6.0	---	---
Old Camp----------	D	None----------	---	---	>6.0	---	---
877*: Xman----------	D	None----------	---	---	>6.0	---	---
Frodo----------	D	None----------	---	---	>6.0	---	---
Mizel----------	D	None----------	---	---	>6.0	---	---
880*: Zephan----------	C	None----------	---	---	>6.0	---	---
Rock outcrop.							
Smallcone----------	D	None----------	---	---	>6.0	---	---
881, 882---------- Zephan	C	None----------	---	---	>6.0	---	---
890, 891---------- Indiano	C	None----------	---	---	>6.0	---	---
892*: Indiano----------	C	None----------	---	---	>6.0	---	---
Koontz----------	D	None----------	---	---	>6.0	---	---
Flex----------	D	None----------	---	---	>6.0	---	---
893*: Indiano----------	C	None----------	---	---	>6.0	---	---
Duco----------	D	None----------	---	---	>6.0	---	---
Cagle----------	D	None----------	---	---	>6.0	---	---
894*: Indiano----------	C	None----------	---	---	>6.0	---	---
Duco----------	D	None----------	---	---	>6.0	---	---
Skedaddle----------	D	None----------	---	---	>6.0	---	---

See footnote at end of table.

Figure 3

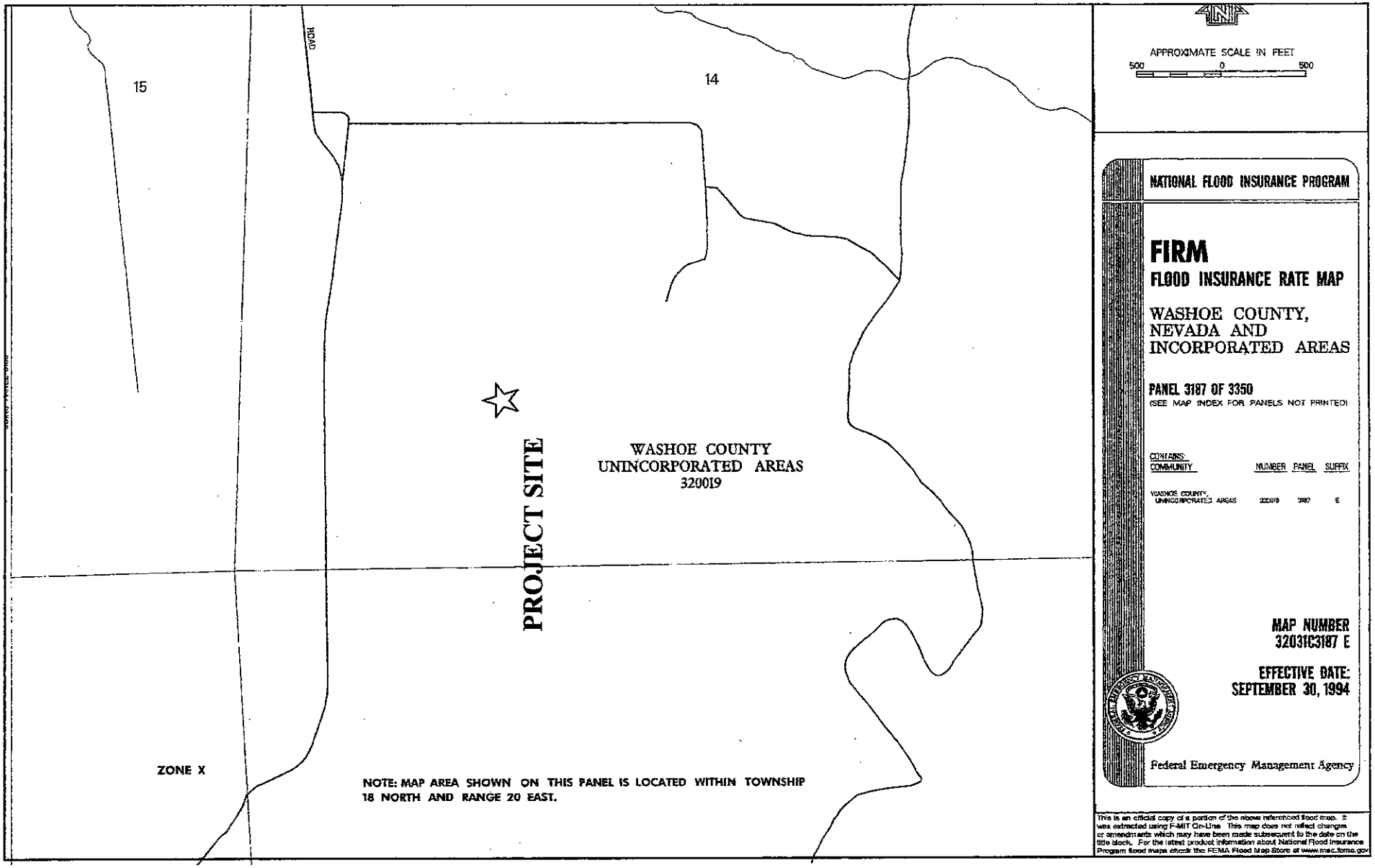

15
14
HOAD
PROJECT SITE
WASHOE COUNTY
UNINCORPORATED AREAS
320019
ZONE X
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 18 NORTH AND RANGE 20 EAST.
APPROXIMATE SCALE IN FEET
500 0 500
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
WASHOE COUNTY, NEVADA AND INCORPORATED AREAS
PANEL 3187 OF 3350
(SEE MAP INDEX FOR PANELS NOT PRINTED)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
WASHOE COUNTY, UNINCORPORATED AREAS 320019 3187 E
MAP NUMBER
32031C3187 E
EFFECTIVE DATE:
SEPTEMBER 30, 1994
Federal Emergency Management Agency
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Figure 4

Table 2-2a.—Runoff curve numbers for urban areas[1]

Cover description		Curve numbers for hydrologic soil group—			
Cover type and hydrologic condition	Average percent impervious area[2]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.)[3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only)[4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation)[5]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

[1]Average runoff condition, and $I_a = 0.2S$.
[2]The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.
[3]CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.
[4]Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.
[5]Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4, based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Figure 4

Table 2-2d.—Runoff curve numbers for arid and semiarid rangelands[1]

Cover description		Curve numbers for hydrologic soil group—			
Cover type	Hydrologic condition[2]	A[3]	B	C	D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

[1]Average runoff condition, and $I_a = 0.2S$. For range in humid regions, use table 2-2c.

[2]*Poor:* <30% ground cover (litter, grass, and brush overstory).
Fair: 30 to 70% ground cover.
Good: >70% ground cover.

[3]Curve numbers for group A have been developed only for desert shrub.

Figure 5

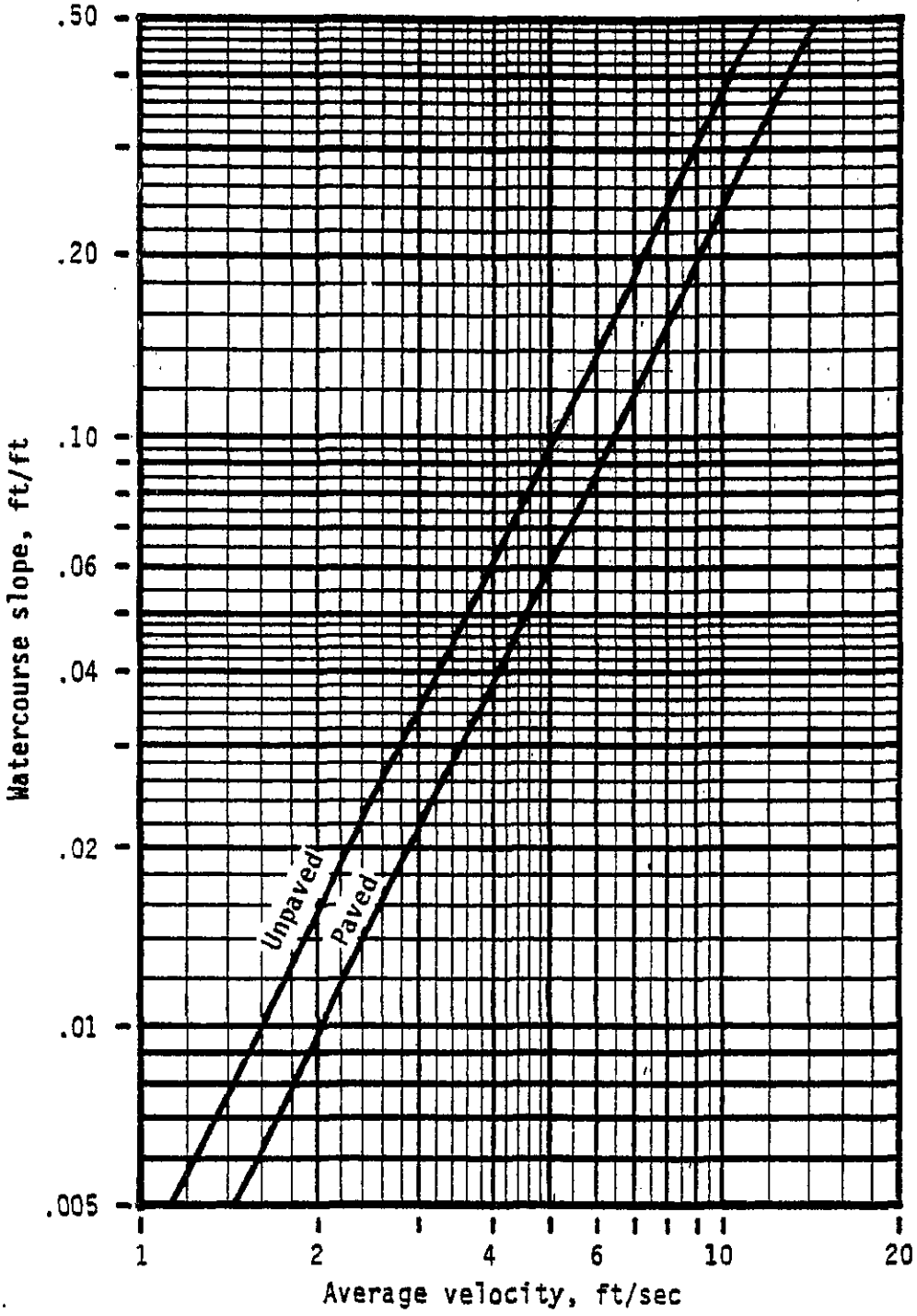


Figure 3-1.—Average velocities for estimating travel time for shallow concentrated flow.

Worksheet for 44' ROADWAY SECTION - 5-YEAR FLOW RATE

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	
Input Data		
Channel Slope:	0.60000	%
Discharge:	3.41	ft³/s
Options		
Current Roughness Weighted Metho	ImprovedLotters	
Open Channel Weighted Roughness	ImprovedLotters	
Closed Channel Weighted Roughnes	Hortons	
Results		
Roughness Coefficient:	0.011	
Water Surface Elevation:	0.33	ft
Elevation Range:	0.00 to 0.50 ft	
Flow Area:	1.40	ft²
Wetted Perimeter:	11.84	ft
Top Width:	11.55	ft
Normal Depth:	0.33	ft
Critical Depth:	0.35	ft
Critical Slope:	0.00385	ft/ft
Velocity:	2.44	ft/s
Velocity Head:	0.09	ft
Specific Energy:	0.42	ft
Froude Number:	1.23	
Flow Type:	Supercritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 0.44)	(0+16, 0.13)	0.013
(0+16, 0.13)	(0+18, 0.50)	0.011

Section Geometry

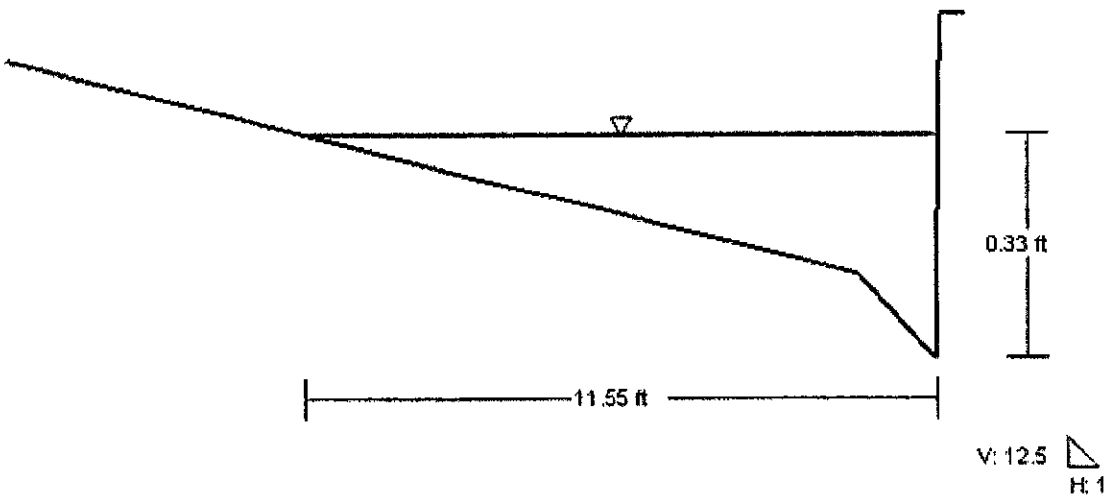
Station	Elevation
0+00	0.44

Worksheet for 44' ROADWAY SECTION - 5-YEAR FLOW RATE

Station	Elevation
0+16	0.13
0+17	0.00
0+17	0.50
0+18	0.50

FIGURE 6
Cross Section for 44' ROADWAY SECTION - 5-YEAR FLOW RATE

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	
Section Data		
Roughness Coefficient:	0.011	
Channel Slope:	0.60000	%
Normal Depth:	0.33	ft
Elevation Range:	0.00 to 0.50 ft	
Discharge:	3.41	ft³/s



Worksheet for 44' ROADWAY SECTION - 100-YEAR FLOW RATE

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	
Input Data		
Channel Slope:	0.60000	%
Discharge:	10.44	ft^3/s
Options		
Current Roughness Weighted Metho	ImprovedLotters	
Open Channel Weighted Roughness	ImprovedLotters	
Closed Channel Weighted Roughnes	Hortons	
Results		
Roughness Coefficient:	0.012	
Water Surface Elevation:	0.46	ft
Elevation Range:	0.00 to 0.50 ft	
Flow Area:	3.33	ft^2
Wetted Perimeter:	17.41	ft
Top Width:	16.99	ft
Normal Depth:	0.46	ft
Critical Depth:	0.49	ft
Critical Slope:	0.00368	ft/ft
Velocity:	3.14	ft/s
Velocity Head:	0.15	ft
Specific Energy:	0.61	ft
Froude Number:	1.25	
Flow Type:	Supercritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 0.44)	(0+16, 0.13)	0.013
(0+16, 0.13)	(0+18, 0.50)	0.011

Section Geometry

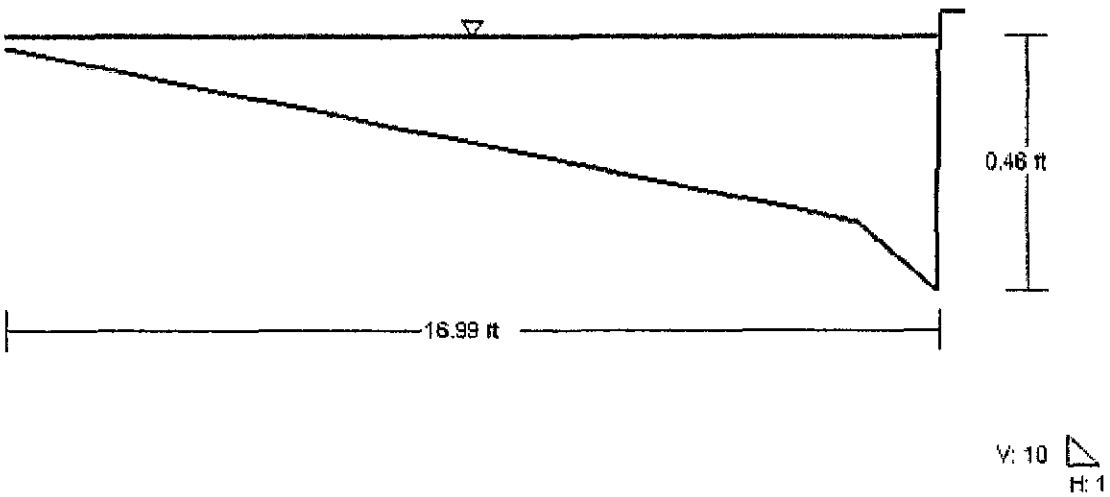
Station	Elevation
0+00	0.44

Worksheet for 44' ROADWAY SECTION - 100-YEAR FLOW RATE

Station	Elevation
0+16	0.13
0+17	0.00
0+17	0.50
0+18	0.50

FIGURE 6
Cross Section for 44' ROADWAY SECTION - 100-YEAR FLOW RATE

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	
Section Data		
Roughness Coefficient:	0.012	
Channel Slope:	0.60000	%
Normal Depth:	0.46	ft
Elevation Range:	0.00 to 0.50 ft	
Discharge:	10.44	ft³/s



Worksheet for 46' ROADWAY SECTION - 5-YEAR FLOW RATE

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	
Input Data		
Channel Slope:	5.00	%
Discharge:	2.95	ft^3/s
Options		
Current Roughness Weighted Metho	ImprovedLotters	
Open Channel Weighted Roughness	ImprovedLotters	
Closed Channel Weighted Roughnes	Hortons	
Results		
Roughness Coefficient:	0.013	
Water Surface Elevation:	0.25	ft
Elevation Range:	0.00 to 0.50 ft	
Flow Area:	0.59	ft^2
Wetted Perimeter:	7.55	ft
Top Width:	7.47	ft
Normal Depth:	0.25	ft
Critical Depth:	0.34	ft
Critical Slope:	0.00479	ft/ft
Velocity:	5.01	ft/s
Velocity Head:	0.39	ft
Specific Energy:	0.64	ft
Froude Number:	3.15	
Flow Type:	Supercritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 0.46)	(0+17, 0.13)	0.013
(0+17, 0.13)	(0+19, 0.50)	0.011

Section Geometry

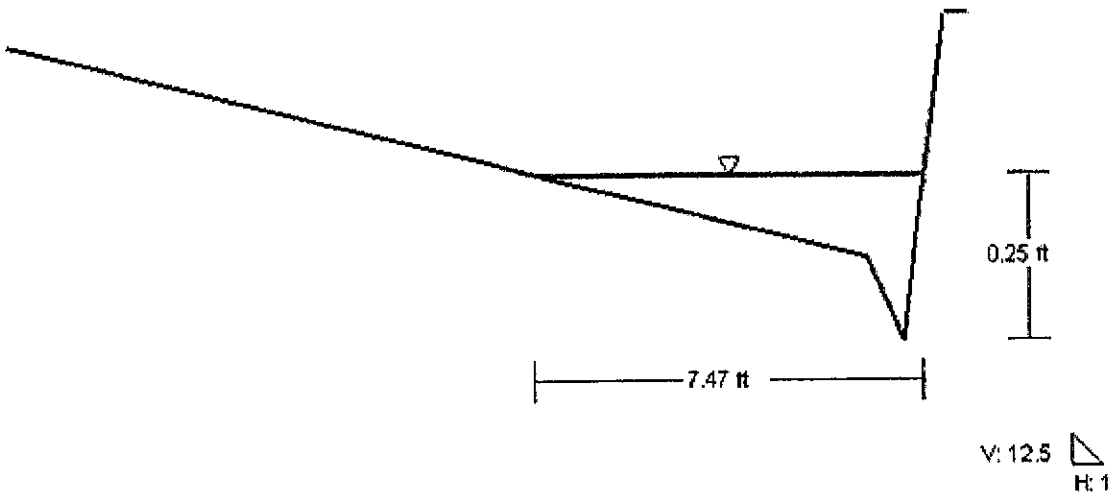
Station	Elevation
0+00	0.46

Worksheet for 46' ROADWAY SECTION - 5-YEAR FLOW RATE

Station	Elevation
0+17	0.13
0+17	0.00
0+18	0.50
0+19	0.50

FIGURE 7
Cross Section for 46' ROADWAY SECTION - 5-YEAR FLOW RATE

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	
Section Data		
Roughness Coefficient:	0.013	
Channel Slope:	5.00	%
Normal Depth:	0.25	ft
Elevation Range:	0.00 to 0.50 ft	
Discharge:	2.95	ft^3/s



Worksheet for 46' ROADWAY SECTION - 100-YEAR FLOW RATE

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	
Input Data		
Channel Slope:	5.00	%
Discharge:	8.98	ft^3/s
Options		
Current Roughness Weighted Metho	ImprovedLotters	
Open Channel Weighted Roughness	ImprovedLotters	
Closed Channel Weighted Roughnes	Hortons	
Results		
Roughness Coefficient:	0.012	
Water Surface Elevation:	0.33	ft
Elevation Range:	0.00 to 0.50 ft	
Flow Area:	1.35	ft^2
Wetted Perimeter:	11.70	ft
Top Width:	11.59	ft
Normal Depth:	0.33	ft
Critical Depth:	0.48	ft
Critical Slope:	0.00355	ft/ft
Velocity:	6.66	ft/s
Velocity Head:	0.69	ft
Specific Energy:	1.02	ft
Froude Number:	3.44	
Flow Type:	Supercritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 0.46)	(0+17, 0.13)	0.013
(0+17, 0.13)	(0+19, 0.50)	0.011

Section Geometry

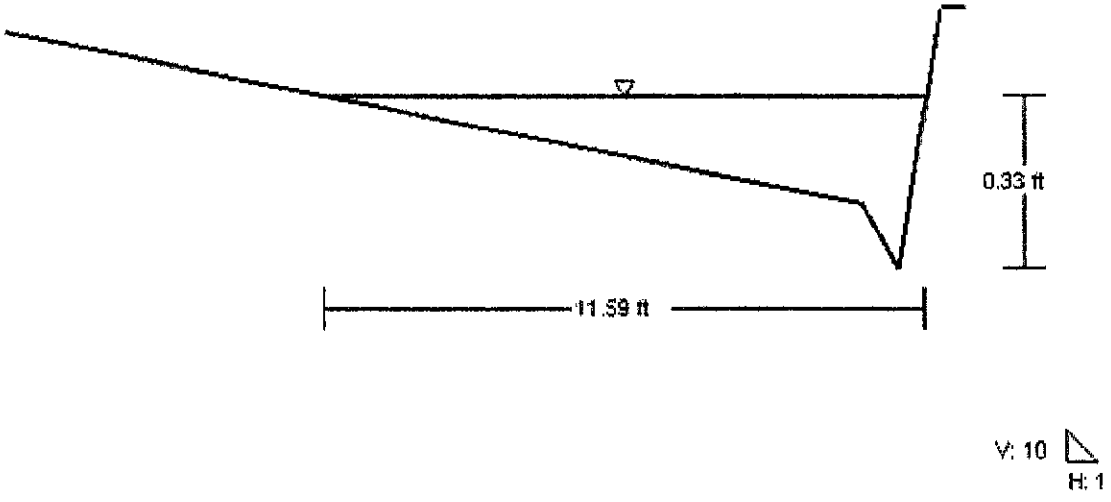
Station	Elevation
0+00	0.46

Worksheet for 46' ROADWAY SECTION - 100-YEAR FLOW RATE

Station	Elevation
0+17	0.13
0+17	0.00
0+18	0.50
0+19	0.50

FIGURE 7
Cross Section for 46' ROADWAY SECTION - 100-YEAR FLOW RATE

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	
Section Data		
Roughness Coefficient:	0.012	
Channel Slope:	5.00	%
Normal Depth:	0.33	ft
Elevation Range:	0.00 to 0.50 ft	
Discharge:	8.98	ft³/s



Worksheet for 50' ROADWAY SECTION - 5-YEAR FLOW RATE

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	
Input Data		
Channel Slope:	6.00	%
Discharge:	2.84	ft^3/s
Options		
Current Roughness Weighted Metho	ImprovedLotters	
Open Channel Weighted Roughness	ImprovedLotters	
Closed Channel Weighted Roughnes	Hortons	
Results		
Roughness Coefficient:	0.013	
Water Surface Elevation:	0.23	ft
Elevation Range:	0.00 to 0.50 ft	
Flow Area:	0.54	ft^2
Wetted Perimeter:	7.09	ft
Top Width:	6.89	ft
Normal Depth:	0.23	ft
Critical Depth:	0.33	ft
Critical Slope:	0.00477	ft/ft
Velocity:	5.24	ft/s
Velocity Head:	0.43	ft
Specific Energy:	0.66	ft
Froude Number:	3.29	
Flow Type:	Supercritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 0.50)	(0+19, 0.13)	0.013
(0+19, 0.13)	(0+21, 0.50)	0.011

Section Geometry

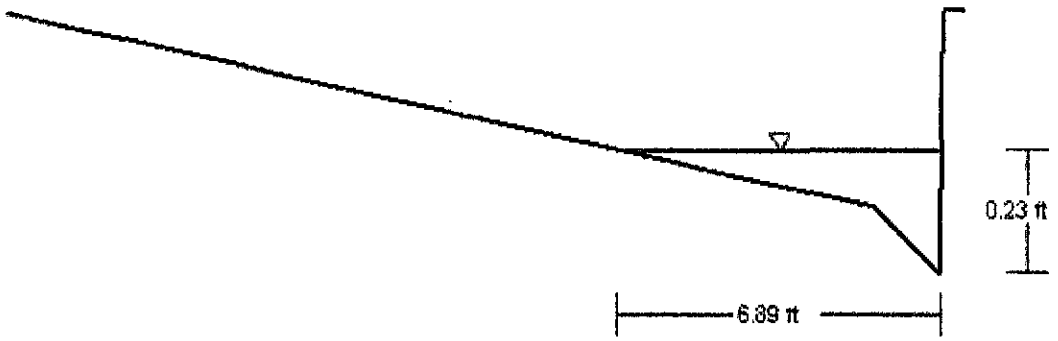
Station	Elevation
0+00	0.50

Worksheet for 50' ROADWAY SECTION - 5-YEAR FLOW RATE

Station	Elevation
0+19	0.13
0+20	0.00
0+20	0.50
0+21	0.50

FIGURE 8
Cross Section for 50' ROADWAY SECTION - 5-YEAR FLOW RATE

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	
Section Data		
Roughness Coefficient:	0.013	
Channel Slope:	6.00	%
Normal Depth:	0.23	ft
Elevation Range:	0.00 to 0.50 ft	
Discharge:	2.84	ft³/s



V: 11.11111
H: 1

Worksheet for 50' ROADWAY SECTION - 100-YEAR FLOW RATE

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	
Input Data		
Channel Slope:	6.00	%
Discharge:	8.59	ft^3/s
Options		
Current Roughness Weighted Metho	ImprovedLotters	
Open Channel Weighted Roughness	ImprovedLotters	
Closed Channel Weighted Roughnes	Hortons	
Results		
Roughness Coefficient:	0.011	
Water Surface Elevation:	0.31	ft
Elevation Range:	0.00 to 0.50 ft	
Flow Area:	1.17	ft^2
Wetted Perimeter:	10.76	ft
Top Width:	10.49	ft
Normal Depth:	0.31	ft
Critical Depth:	0.47	ft
Critical Slope:	0.00329	ft/ft
Velocity:	7.37	ft/s
Velocity Head:	0.84	ft
Specific Energy:	1.15	ft
Froude Number:	3.89	
Flow Type:	Supercritical	

Segment Roughness

Start Station	End Station	Roughness Coefficient
(0+00, 0.50)	(0+19, 0.13)	0.013
(0+19, 0.13)	(0+21, 0.50)	0.011

Section Geometry

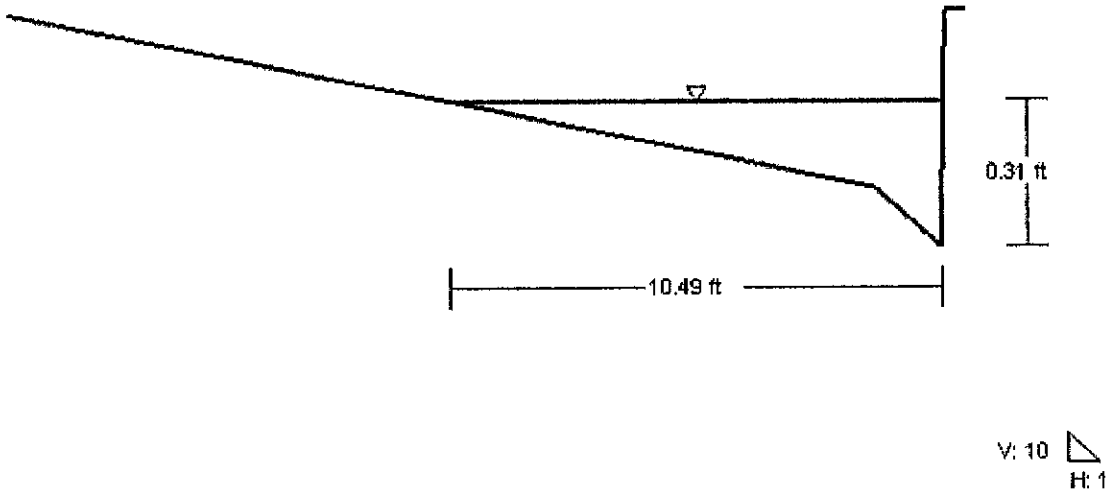
Station	Elevation
0+00	0.50

Worksheet for 50' ROADWAY SECTION - 100-YEAR FLOW RATE

Station	Elevation
0+19	0.13
0+20	0.00
0+20	0.50
0+21	0.50

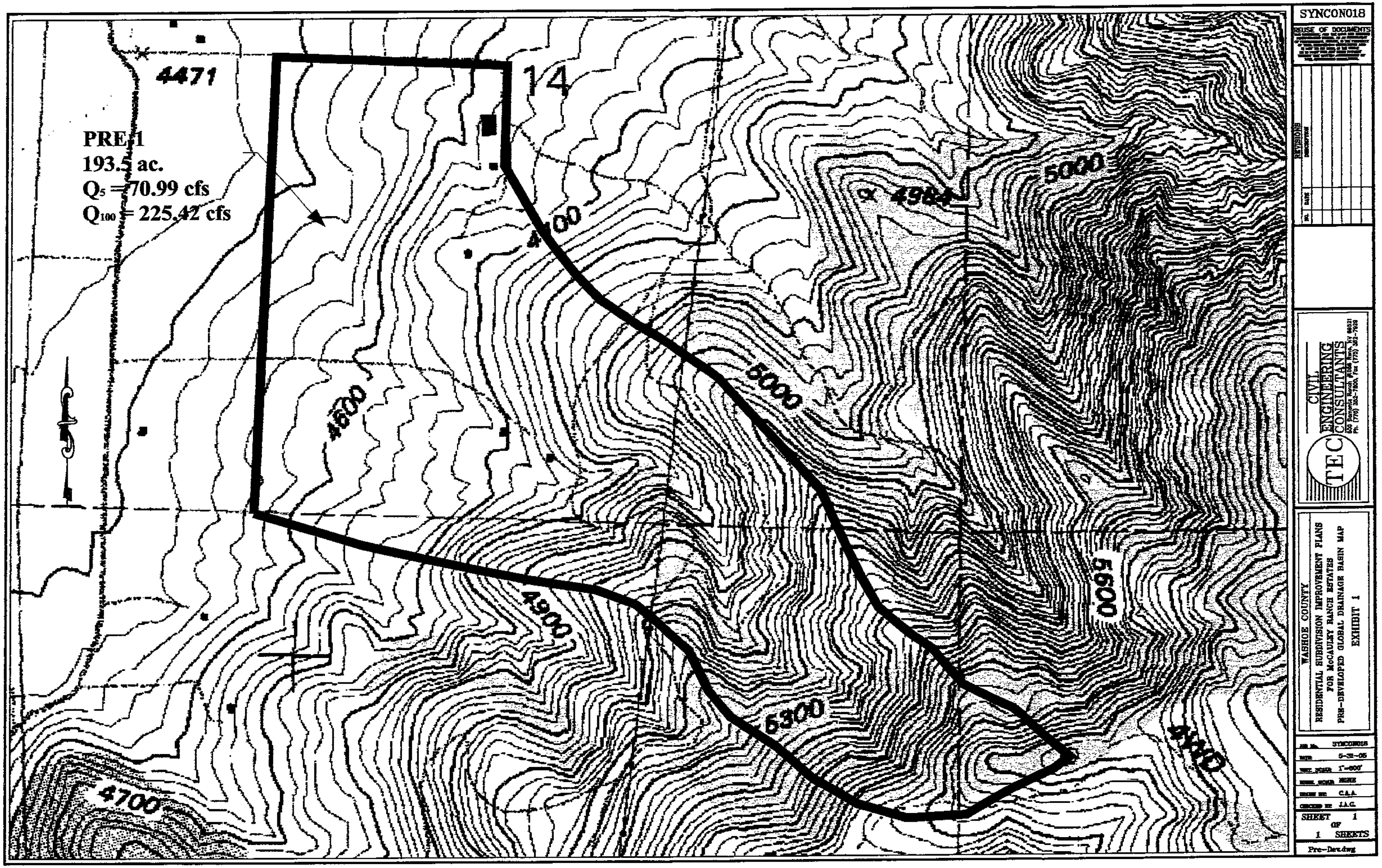
FIGURE 8
Cross Section for 50' ROADWAY SECTION - 100-YEAR FLOW RATE

Project Description		
Flow Element:	Irregular Section	
Friction Method:	Manning Formula	
Solve For:	Normal Depth	
Section Data		
Roughness Coefficient:	0.011	
Channel Slope:	6.00	%
Normal Depth:	0.31	ft
Elevation Range:	0.00 to 0.50 ft	
Discharge:	8.59	ft³/s



APPENDIX 2

Exhibits



SYNCON018
4471
14
PRE-1
193.5 ac.
Q5 = 70.99 cfs
Q100 = 225.42 cfs
5000
4984
5000
5600
4900
6300
4700
TEC
CIVIL
ENGINEERING
CONSULTANTS
WASHOE COUNTY
RESIDENTIAL SUBDIVISION IMPROVEMENT PLANS
FOR McCAULEY RANCH ESTATES
PRE-DEVELOPED GLOBAL DRAINAGE BASIN MAP
EXHIBIT 1
C.A.A.
J.A.G.
SHEET 1 OF 1 SHEETS
Pre-Dev.dwg

Large Plans scanned separately

Post-Developed Drainage Basin Map

APPENDIX 3

Support Data and Calculations

DRAINAGE CHANNELS CALCULATIONS

NORTH DRAINAGE CHANNEL- SLOPE @ 7.72%

CHANNEL CALCULATOR

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	92.3900 cfs
Slope	0.0772 ft/ft
Manning's n	0.0330
Height	24.0000 in
Bottom width	36.0000 in
Left slope	0.3333 ft/ft (V/H)
Right slope	0.3333 ft/ft (V/H)

Computed Results:

Depth	15.2701 in
Velocity	10.6491 fps
Full Flowrate	247.2493 cfs
Flow area	8.6759 ft2
Flow perimeter	132.5854 in
Hydraulic radius	9.4228 in
Top width	127.6299 in
Area	18.0012 ft2
Perimeter	187.8030 in
Percent full	63.6255 %

NORTH DRAINAGE CHANNEL- SLOPE @ 4.20%

CHANNEL CALCULATOR

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	106.9200 cfs
Slope	0.0420 ft/ft
Manning's n	0.0330
Height	24.0000 in
Bottom width	36.0000 in
Left slope	0.3333 ft/ft (V/H)
Right slope	0.3333 ft/ft (V/H)

Computed Results:

Depth	18.8407 in
Velocity	8.8318 fps
Full Flowrate	182.3690 cfs
Flow area	12.1062 ft2
Flow perimeter	155.1701 in
Hydraulic radius	11.2347 in
Top width	149.0558 in
Area	18.0012 ft2
Perimeter	187.8030 in
Percent full	78.5031 %

NORTH DRAINAGE CHANNEL- SLOPE @ 7.00%

CHANNEL CALCULATOR

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	118.1500 cfs
Slope	0.0700 ft/ft
Manning's n	0.0330
Height	24.0000 in
Bottom width	36.0000 in
Left slope	0.3333 ft/ft (V/H)
Right slope	0.3333 ft/ft (V/H)

Computed Results:

Depth	17.5334 in
Velocity	10.9514 fps
Full Flowrate	235.4374 cfs
Flow area	10.7886 ft2
Flow perimeter	146.9012 in
Hydraulic radius	10.5755 in
Top width	141.2111 in
Area	18.0012 ft2
Perimeter	187.8030 in
Percent full	73.0560 %

SOUTH DRAINAGE CHANNEL- SLOPE @ 6.00%

CHANNEL CALCULATOR

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	224.4100 cfs
Slope	0.0600 ft/ft
Manning's n	0.0330
Height	36.0000 in
Bottom width	120.0000 in
Left slope	0.3333 ft/ft (V/H)
Right slope	0.3333 ft/ft (V/H)

Computed Results:

Depth	16.6893 in
Velocity	11.3850 fps
Full Flowrate	987.1584 cfs
Flow area	19.7111 ft2
Flow perimeter	225.5619 in
Hydraulic radius	12.5837 in
Top width	220.1458 in
Area	57.0027 ft2
Perimeter	347.7045 in
Percent full	46.3592 %

SOUTH DRAINAGE CHANNEL- SLOPE @ 16.30%

CHANNEL CALCULATOR

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	224.4100 cfs
Slope	0.1630 ft/ft
Manning's n	0.0330
Height	36.0000 in
Bottom width	120.0000 in
Left slope	0.3333 ft/ft (V/H)
Right slope	0.3333 ft/ft (V/H)

Computed Results:

Depth	12.6867 in
Velocity	16.1148 fps
Full Flowrate	1627.0654 cfs
Flow area	13.9257 ft2
Flow perimeter	200.2449 in
Hydraulic radius	10.0143 in
Top width	196.1277 in
Area	57.0027 ft2
Perimeter	347.7045 in
Percent full	35.2408 %

SOUTH DRAINAGE CHANNEL- SLOPE @ 19.40%

CHANNEL CALCULATOR

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	226.8700 cfs
Slope	0.1940 ft/ft
Manning's n	0.0330
Height	36.0000 in
Bottom width	120.0000 in
Left slope	0.3333 ft/ft (V/H)
Right slope	0.3333 ft/ft (V/H)

Computed Results:

Depth	12.1605 in
Velocity	17.1678 fps
Full Flowrate	1775.0561 cfs
Flow area	13.2149 ft2
Flow perimeter	196.9169 in
Hydraulic radius	9.6637 in
Top width	192.9705 in
Area	57.0027 ft2
Perimeter	347.7045 in
Percent full	33.7793 %

SOUTH DRAINAGE CHANNEL- SLOPE @ 12.00%

CHANNEL CALCULATOR

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	226.8700 cfs
Slope	0.1200 ft/ft
Manning's n	0.0330
Height	36.0000 in
Bottom width	120.0000 in
Left slope	0.3333 ft/ft (V/H)
Right slope	0.3333 ft/ft (V/H)

Computed Results:

Depth	13.8918 in
Velocity	14.5454 fps
Full Flowrate	1396.0528 cfs
Flow area	15.5974 ft2
Flow perimeter	207.8673 in
Hydraulic radius	10.8051 in
Top width	203.3591 in
Area	57.0027 ft2
Perimeter	347.7045 in
Percent full	38.5883 %

SOUTH DRAINAGE CHANNEL- SLOPE @ 5.00%

CHANNEL CALCULATOR

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	231.1300 cfs
Slope	0.0500 ft/ft
Manning's n	0.0330
Height	36.0000 in
Bottom width	120.0000 in
Left slope	0.3333 ft/ft (V/H)
Right slope	0.3333 ft/ft (V/H)

Computed Results:

Depth	17.8133 in
Velocity	10.7724 fps
Full Flowrate	901.1482 cfs
Flow area	21.4558 ft2
Flow perimeter	232.6714 in
Hydraulic radius	13.2790 in
Top width	226.8905 in
Area	57.0027 ft2
Perimeter	347.7045 in
Percent full	49.4814 %

SOUTH DRAINAGE CHANNEL- SLOPE @ 1.50%

CHANNEL CALCULATOR

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	258.9600 cfs
Slope	0.0150 ft/ft
Manning's n	0.0330
Height	36.0000 in
Bottom width	120.0000 in
Left slope	0.3333 ft/ft (V/H)
Right slope	0.3333 ft/ft (V/H)

Computed Results:

Depth	25.9819 in
Velocity	7.2504 fps
Full Flowrate	493.5792 cfs
Flow area	35.7167 ft2
Flow perimeter	284.3386 in
Hydraulic radius	18.0883 in
Top width	275.9069 in
Area	57.0027 ft2
Perimeter	347.7045 in
Percent full	72.1719 %

SOUTH DRAINAGE CHANNEL- SLOPE @ 0.50%

CHANNEL CALCULATOR

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	258.9600 cfs
Slope	0.0050 ft/ft
Manning's n	0.0330
Height	36.0000 in
Bottom width	120.0000 in
Left slope	0.3333 ft/ft (V/H)
Right slope	0.3333 ft/ft (V/H)

Computed Results:

Depth	34.3288 in
Velocity	4.8712 fps
Full Flowrate	284.9681 cfs
Flow area	53.1611 ft2
Flow perimeter	337.1338 in
Hydraulic radius	22.7067 in
Top width	325.9932 in
Area	57.0027 ft2
Perimeter	347.7045 in
Percent full	95.3577 %

MANNING PIPE CALCULATIONS

INLET #1 - 18-INCH RCP @ 0.50% (5-YEAR FLOW RATE)

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Depth of Flow
Diameter	1.5000 ft
Flowrate	3.3900 cfs
Slope	0.0050 ft/ft
Manning's n	0.0130

Computed Results:

Depth	0.7112 ft
Area	1.7671 ft2
Wetted Area	0.8254 ft2
Wetted Perimeter	2.2785 ft
Perimeter	4.7124 ft
Velocity	4.1073 fps
Hydraulic Radius	0.3622 ft
Percent Full	47.4116 %
Full flow Flowrate	7.4277 cfs
Full flow velocity	4.2032 fps

Critical Information

Critical depth	0.7020 ft
Critical slope	0.0052 ft/ft
Critical velocity	4.1767 fps
Critical area	0.8116 ft2
Critical perimeter	2.2602 ft
Critical hydraulic radius	0.3591 ft
Critical top width	1.4969 ft
Specific energy	0.9733 ft
Minimum energy	1.0530 ft
Froude number	0.9755
Flow condition	Subcritical

INLET #1 - 18-INCH RCP @ 0.50% (FLOW CAPACITY)

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	1.5000 ft
Depth	1.5000 ft
Slope	0.0050 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	7.4277 cfs
Area	1.7671 ft2
Wetted Area	1.7671 ft2
Wetted Perimeter	4.7124 ft
Perimeter	4.7124 ft
Velocity	4.2032 fps
Hydraulic Radius	0.3750 ft
Percent Full	100.0000 %
Full flow Flowrate	7.4277 cfs
Full flow velocity	4.2032 fps

Critical Information

Critical depth	1.3122 ft
Critical slope	0.0072 ft/ft
Critical velocity	6.0861 fps
Critical area	1.7269 ft2
Critical perimeter	3.4806 ft
Critical hydraulic radius	0.4961 ft
Critical top width	1.5000 ft
Specific energy	1.9255 ft
Minimum energy	1.9683 ft
Froude number	0.7972
Flow condition	Subcritical

INLET #2 - 24-INCH RCP @ 0.50% (5-YEAR FLOW RATE)

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Depth of Flow
Diameter	2.0000 ft
Flowrate	5.9600 cfs
Slope	0.0050 ft/ft
Manning's n	0.0130

Computed Results:

Depth	0.8455 ft
Area	3.1416 ft2
Wetted Area	1.2630 ft2
Wetted Perimeter	2.8313 ft
Perimeter	6.2832 ft
Velocity	4.7189 fps
Hydraulic Radius	0.4461 ft
Percent Full	42.2746 %
Full flow Flowrate	15.9965 cfs
Full flow velocity	5.0918 fps

Critical Information

Critical depth	0.8632 ft
Critical slope	0.0046 ft/ft
Critical velocity	4.5914 fps
Critical area	1.2981 ft2
Critical perimeter	2.8672 ft
Critical hydraulic radius	0.4527 ft
Critical top width	1.9812 ft
Specific energy	1.1915 ft
Minimum energy	1.2948 ft
Froude number	1.0406
Flow condition	Supercritical

INLET #2 - 24-INCH RCP @ 0.50% (FLOW CAPACITY)

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	2.0000 ft
Depth	2.0000 ft
Slope	0.0050 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	15.9965 cfs
Area	3.1416 ft2
Wetted Area	3.1416 ft2
Wetted Perimeter	6.2832 ft
Perimeter	6.2832 ft
Velocity	5.0918 fps
Hydraulic Radius	0.5000 ft
Percent Full	100.0000 %
Full flow Flowrate	15.9965 cfs
Full flow velocity	5.0918 fps

Critical Information

Critical depth	1.7995 ft
Critical slope	0.0067 ft/ft
Critical velocity	7.1408 fps
Critical area	3.1697 ft2
Critical perimeter	4.7405 ft
Critical hydraulic radius	0.6686 ft
Critical top width	2.0000 ft
Specific energy	2.6244 ft
Minimum energy	2.6992 ft
Froude number	0.8363
Flow condition	Subcritical

INLET #3 - 18-INCH RCP @ 0.50% (5-YEAR FLOW RATE)

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Depth of Flow
Diameter	1.5000 ft
Flowrate	3.0800 cfs
Slope	0.0050 ft/ft
Manning's n	0.0130

Computed Results:

Depth	0.6733 ft
Area	1.7671 ft2
Wetted Area	0.7687 ft2
Wetted Perimeter	2.2025 ft
Perimeter	4.7124 ft
Velocity	4.0067 fps
Hydraulic Radius	0.3490 ft
Percent Full	44.8859 %
Full flow Flowrate	7.4277 cfs
Full flow velocity	4.2032 fps

Critical Information

Critical depth	0.6677 ft
Critical slope	0.0052 ft/ft
Critical velocity	4.0507 fps
Critical area	0.7604 ft2
Critical perimeter	2.1912 ft
Critical hydraulic radius	0.3470 ft
Critical top width	1.4909 ft
Specific energy	0.9228 ft
Minimum energy	1.0015 ft
Froude number	0.9841
Flow condition	Subcritical

INLET #3 - 18-INCH RCP @ 0.50% (FLOW CAPACITY)

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	1.5000 ft
Depth	1.5000 ft
Slope	0.0050 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	7.4277 cfs
Area	1.7671 ft2
Wetted Area	1.7671 ft2
Wetted Perimeter	4.7124 ft
Perimeter	4.7124 ft
Velocity	4.2032 fps
Hydraulic Radius	0.3750 ft
Percent Full	100.0000 %
Full flow Flowrate	7.4277 cfs
Full flow velocity	4.2032 fps

Critical Information

Critical depth	1.3122 ft
Critical slope	0.0072 ft/ft
Critical velocity	6.0861 fps
Critical area	1.7269 ft2
Critical perimeter	3.4806 ft
Critical hydraulic radius	0.4961 ft
Critical top width	1.5000 ft
Specific energy	1.9255 ft
Minimum energy	1.9683 ft
Froude number	0.7972
Flow condition	Subcritical

INLET #4 - 24-INCH RCP @ 0.50% (5-YEAR FLOW RATE)

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Depth of Flow
Diameter	2.0000 ft
Flowrate	4.9400 cfs
Slope	0.0050 ft/ft
Manning's n	0.0130

Computed Results:

Depth	0.7629 ft
Area	3.1416 ft2
Wetted Area	1.1011 ft2
Wetted Perimeter	2.6629 ft
Perimeter	6.2832 ft
Velocity	4.4863 fps
Hydraulic Radius	0.4135 ft
Percent Full	38.1465 %
Full flow Flowrate	15.9965 cfs
Full flow velocity	5.0918 fps

Critical Information

Critical depth	0.7828 ft
Critical slope	0.0045 ft/ft
Critical velocity	4.3341 fps
Critical area	1.1398 ft2
Critical perimeter	2.7037 ft
Critical hydraulic radius	0.4216 ft
Critical top width	1.9522 ft
Specific energy	1.0757 ft
Minimum energy	1.1742 ft
Froude number	1.0506
Flow condition	Supercritical

INLET #4 - 24-INCH RCP @ 0.50% (FLOW CAPACITY)

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	2.0000 ft
Depth	2.0000 ft
Slope	0.0050 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	15.9965 cfs
Area	3.1416 ft2
Wetted Area	3.1416 ft2
Wetted Perimeter	6.2832 ft
Perimeter	6.2832 ft
Velocity	5.0918 fps
Hydraulic Radius	0.5000 ft
Percent Full	100.0000 %
Full flow Flowrate	15.9965 cfs
Full flow velocity	5.0918 fps

Critical Information

Critical depth	1.7995 ft
Critical slope	0.0067 ft/ft
Critical velocity	7.1408 fps
Critical area	3.1697 ft2
Critical perimeter	4.7405 ft
Critical hydraulic radius	0.6686 ft
Critical top width	2.0000 ft
Specific energy	2.6244 ft
Minimum energy	2.6992 ft
Froude number	0.8363
Flow condition	Subcritical

OUTLET #1 - 24-INCH RCP @ 1.23% (5-YEAR FLOW RATE)

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Depth of Flow
Diameter	2.0000 ft
Flowrate	5.8800 cfs
Slope	0.0123 ft/ft
Manning's n	0.0130

Computed Results:

Depth	0.6588 ft
Area	3.1416 ft2
Wetted Area	0.9018 ft2
Wetted Perimeter	2.4452 ft
Perimeter	6.2832 ft
Velocity	6.5199 fps
Hydraulic Radius	0.3688 ft
Percent Full	32.9392 %
Full flow Flowrate	25.0895 cfs
Full flow velocity	7.9862 fps

Critical Information

Critical depth	0.8572 ft
Critical slope	0.0046 ft/ft
Critical velocity	4.5720 fps
Critical area	1.2861 ft2
Critical perimeter	2.8549 ft
Critical hydraulic radius	0.4505 ft
Critical top width	1.9795 ft
Specific energy	1.3194 ft
Minimum energy	1.2857 ft
Froude number	1.6596
Flow condition	Supercritical

OUTLET #1 - 24-INCH RCP @ 1.23% (FLOW CAPACITY)

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	2.0000 ft
Depth	2.0000 ft
Slope	0.0123 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	25.0895 cfs
Area	3.1416 ft2
Wetted Area	3.1416 ft2
Wetted Perimeter	6.2832 ft
Perimeter	6.2832 ft
Velocity	7.9862 fps
Hydraulic Radius	0.5000 ft
Percent Full	100.0000 %
Full flow Flowrate	25.0895 cfs
Full flow velocity	7.9862 fps

OUTLET #2 - 30-INCH RCP @ 0.50% (5-YEAR FLOW RATE)

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Depth of Flow
Diameter	2.5000 ft
Flowrate	9.4300 cfs
Slope	0.0050 ft/ft
Manning's n	0.0130

Computed Results:

Depth	0.9807 ft
Area	4.9087 ft2
Wetted Area	1.7863 ft2
Wetted Perimeter	3.3841 ft
Perimeter	7.8540 ft
Velocity	5.2792 fps
Hydraulic Radius	0.5278 ft
Percent Full	39.2263 %
Full flow Flowrate	29.0035 cfs
Full flow velocity	5.9085 fps

Critical Information

Critical depth	1.0247 ft
Critical slope	0.0043 ft/ft
Critical velocity	4.9783 fps
Critical area	1.8942 ft2
Critical perimeter	3.4739 ft
Critical hydraulic radius	0.5453 ft
Critical top width	2.4591 ft
Specific energy	1.4138 ft
Minimum energy	1.5371 ft
Froude number	1.0881
Flow condition	Supercritical

OUTLET #2 - 30-INCH RCP @ 0.50% (FLOW CAPACITY)

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	2.5000 ft
Depth	2.5000 ft
Slope	0.0050 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	29.0035 cfs
Area	4.9087 ft2
Wetted Area	4.9087 ft2
Wetted Perimeter	7.8540 ft
Perimeter	7.8540 ft
Velocity	5.9085 fps
Hydraulic Radius	0.6250 ft
Percent Full	100.0000 %
Full flow Flowrate	29.0035 cfs
Full flow velocity	5.9085 fps

Critical Information

Critical depth	2.2991 ft
Critical slope	0.0063 ft/ft
Critical velocity	8.0833 fps
Critical area	5.0770 ft2
Critical perimeter	6.0251 ft
Critical hydraulic radius	0.8426 ft
Critical top width	2.5000 ft
Specific energy	3.3408 ft
Minimum energy	3.4486 ft
Froude number	0.8680
Flow condition	Subcritical

OUTLET #3 - 24-INCH RCP @ 4.41% (5-YEAR FLOW RATE)

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Depth of Flow
Diameter	2.0000 ft
Flowrate	26.7200 cfs
Slope	0.0441 ft/ft
Manning's n	0.0130

Computed Results:

Depth	1.0730 ft
Area	3.1416 ft2
Wetted Area	1.7167 ft2
Wetted Perimeter	3.2877 ft
Perimeter	6.2832 ft
Velocity	15.5652 fps
Hydraulic Radius	0.5221 ft
Percent Full	53.6496 %
Full flow Flowrate	47.5070 cfs
Full flow velocity	15.1220 fps

Critical Information

Critical depth	1.9849 ft
Critical slope	0.0071 ft/ft
Critical velocity	7.5469 fps
Critical area	3.5405 ft2
Critical perimeter	5.1113 ft
Critical hydraulic radius	0.6927 ft
Critical top width	2.0000 ft
Specific energy	4.8383 ft
Minimum energy	2.9773 ft
Froude number	2.9621
Flow condition	Supercritical

OUTLET #3 - 24-INCH RCP @ 4.41% (FLOW CAPACITY)

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	2.0000 ft
Depth	2.0000 ft
Slope	0.0441 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	47.5070 cfs
Area	3.1416 ft2
Wetted Area	3.1416 ft2
Wetted Perimeter	6.2832 ft
Perimeter	6.2832 ft
Velocity	15.1220 fps
Hydraulic Radius	0.5000 ft
Percent Full	100.0000 %
Full flow Flowrate	47.5070 cfs
Full flow velocity	15.1220 fps

OUTLET #4 - 30-INCH RCP @ 4.20% (5-YEAR FLOW RATE)

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Depth of Flow
Diameter	2.5000 ft
Flowrate	36.8000 cfs
Slope	0.0420 ft/ft
Manning's n	0.0130

Computed Results:

Depth	1.1573 ft
Area	4.9087 ft2
Wetted Area	2.2228 ft2
Wetted Perimeter	3.7414 ft
Perimeter	7.8540 ft
Velocity	16.5556 fps
Hydraulic Radius	0.5941 ft
Percent Full	46.2917 %
Full flow Flowrate	84.0601 cfs
Full flow velocity	17.1246 fps

Critical Information

Critical depth	2.1567 ft
Critical slope	0.0060 ft/ft
Critical velocity	7.7948 fps
Critical area	4.7211 ft2
Critical perimeter	5.7404 ft
Critical hydraulic radius	0.8224 ft
Critical top width	2.5000 ft
Specific energy	5.4168 ft
Minimum energy	3.2350 ft
Froude number	3.0911
Flow condition	Supercritical

OUTLET #4 - 30-INCH RCP @ 4.20% (FLOW CAPACITY)

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	2.5000 ft
Depth	2.5000 ft
Slope	0.0420 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	84.0601 cfs
Area	4.9087 ft2
Wetted Area	4.9087 ft2
Wetted Perimeter	7.8540 ft
Perimeter	7.8540 ft
Velocity	17.1246 fps
Hydraulic Radius	0.6250 ft
Percent Full	100.0000 %
Full flow Flowrate	84.0601 cfs
Full flow velocity	17.1246 fps

18-INCH PIPE @ 0.40%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	18.0000 in
Depth	18.0000 in
Slope	0.0040 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	6.6435 cfs
Area	1.7671 ft2
Wetted Area	1.7671 ft2
Wetted Perimeter	56.5487 in
Perimeter	56.5487 in
Velocity	3.7595 fps
Hydraulic Radius	4.5000 in
Percent Full	100.0000 %
Full flow Flowrate	6.6435 cfs
Full flow velocity	3.7595 fps

Critical Information

Critical depth	14.7562 in
Critical slope	0.0069 ft/ft
Critical velocity	5.8639 fps
Critical area	1.6031 ft2
Critical perimeter	39.7867 in
Critical hydraulic radius	5.8021 in
Critical top width	18.0000 in
Specific energy	1.8404 ft
Minimum energy	1.8445 ft
Froude number	0.7130
Flow condition	Subcritical

18-INCH PIPE @ 0.50%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	18.0000 in
Depth	18.0000 in
Slope	0.0050 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	7.4277 cfs
Area	1.7671 ft2
Wetted Area	1.7671 ft2
Wetted Perimeter	56.5487 in
Perimeter	56.5487 in
Velocity	4.2032 fps
Hydraulic Radius	4.5000 in
Percent Full	100.0000 %
Full flow Flowrate	7.4277 cfs
Full flow velocity	4.2032 fps

Critical Information

Critical depth	15.7465 in
Critical slope	0.0072 ft/ft
Critical velocity	6.0861 fps
Critical area	1.7269 ft2
Critical perimeter	41.7673 in
Critical hydraulic radius	5.9537 in
Critical top width	18.0000 in
Specific energy	1.9255 ft
Minimum energy	1.9683 ft
Froude number	0.7972
Flow condition	Subcritical

18-INCH PIPE @ 1.00%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	18.0000 in
Depth	18.0000 in
Slope	0.0100 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	10.5043 cfs
Area	1.7671 ft2
Wetted Area	1.7671 ft2
Wetted Perimeter	56.5487 in
Perimeter	56.5487 in
Velocity	5.9442 fps
Hydraulic Radius	4.5000 in
Percent Full	100.0000 %
Full flow Flowrate	10.5043 cfs
Full flow velocity	5.9442 fps

18-INCH PIPE @ 1.39%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	18.0000 in
Depth	18.0000 in
Slope	0.0139 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	12.3844 cfs
Area	1.7671 ft2
Wetted Area	1.7671 ft2
Wetted Perimeter	56.5487 in
Perimeter	56.5487 in
Velocity	7.0082 fps
Hydraulic Radius	4.5000 in
Percent Full	100.0000 %
Full flow Flowrate	12.3844 cfs
Full flow velocity	7.0082 fps

18-INCH PIPE @ 1.41%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	18.0000 in
Depth	18.0000 in
Slope	0.0141 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	12.4732 cfs
Area	1.7671 ft2
Wetted Area	1.7671 ft2
Wetted Perimeter	56.5487 in
Perimeter	56.5487 in
Velocity	7.0584 fps
Hydraulic Radius	4.5000 in
Percent Full	100.0000 %
Full flow Flowrate	12.4732 cfs
Full flow velocity	7.0584 fps

18-INCH RCP @ 1.49%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	1.5000 ft
Depth	1.5000 ft
Slope	0.0149 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	12.8222 cfs
Area	1.7671 ft2
Wetted Area	1.7671 ft2
Wetted Perimeter	4.7124 ft
Perimeter	4.7124 ft
Velocity	7.2559 fps
Hydraulic Radius	0.3750 ft
Percent Full	100.0000 %
Full flow Flowrate	12.8222 cfs
Full flow velocity	7.2559 fps

18-INCH RCP @ 2.00%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	18.0000 in
Depth	18.0000 in
Slope	0.0200 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	14.8554 cfs
Area	1.7671 ft2
Wetted Area	1.7671 ft2
Wetted Perimeter	56.5487 in
Perimeter	56.5487 in
Velocity	8.4064 fps
Hydraulic Radius	4.5000 in
Percent Full	100.0000 %
Full flow Flowrate	14.8554 cfs
Full flow velocity	8.4064 fps

18-INCH PIPE @ 2.31%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	18.0000 in
Depth	18.0000 in
Slope	0.0231 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	15.9652 cfs
Area	1.7671 ft2
Wetted Area	1.7671 ft2
Wetted Perimeter	56.5487 in
Perimeter	56.5487 in
Velocity	9.0345 fps
Hydraulic Radius	4.5000 in
Percent Full	100.0000 %
Full flow Flowrate	15.9652 cfs
Full flow velocity	9.0345 fps

18-INCH RCP @ 3.00%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	18.0000 in
Depth	18.0000 in
Slope	0.0300 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	18.1940 cfs
Area	1.7671 ft2
Wetted Area	1.7671 ft2
Wetted Perimeter	56.5487 in
Perimeter	56.5487 in
Velocity	10.2957 fps
Hydraulic Radius	4.5000 in
Percent Full	100.0000 %
Full flow Flowrate	18.1940 cfs
Full flow velocity	10.2957 fps

18-INCH PIPE @ 3.53%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	18.0000 in
Depth	18.0000 in
Slope	0.0353 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	19.7359 cfs
Area	1.7671 ft2
Wetted Area	1.7671 ft2
Wetted Perimeter	56.5487 in
Perimeter	56.5487 in
Velocity	11.1682 fps
Hydraulic Radius	4.5000 in
Percent Full	100.0000 %
Full flow Flowrate	19.7359 cfs
Full flow velocity	11.1682 fps

18-INCH RCP @ 4.00%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	18.0000 in
Depth	18.0000 in
Slope	0.0400 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	21.0087 cfs
Area	1.7671 ft2
Wetted Area	1.7671 ft2
Wetted Perimeter	56.5487 in
Perimeter	56.5487 in
Velocity	11.8885 fps
Hydraulic Radius	4.5000 in
Percent Full	100.0000 %
Full flow Flowrate	21.0087 cfs
Full flow velocity	11.8885 fps

18-INCH PIPE @ 5.00%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	18.0000 in
Depth	18.0000 in
Slope	0.0500 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	23.4884 cfs
Area	1.7671 ft2
Wetted Area	1.7671 ft2
Wetted Perimeter	56.5487 in
Perimeter	56.5487 in
Velocity	13.2917 fps
Hydraulic Radius	4.5000 in
Percent Full	100.0000 %
Full flow Flowrate	23.4884 cfs
Full flow velocity	13.2917 fps

18-INCH PIPE @ 5.84%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	18.0000 in
Depth	18.0000 in
Slope	0.0584 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	25.3849 cfs
Area	1.7671 ft2
Wetted Area	1.7671 ft2
Wetted Perimeter	56.5487 in
Perimeter	56.5487 in
Velocity	14.3649 fps
Hydraulic Radius	4.5000 in
Percent Full	100.0000 %
Full flow Flowrate	25.3849 cfs
Full flow velocity	14.3649 fps

18-INCH RCP @ 6.00%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	18.0000 in
Depth	18.0000 in
Slope	0.0600 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	25.7303 cfs
Area	1.7671 ft2
Wetted Area	1.7671 ft2
Wetted Perimeter	56.5487 in
Perimeter	56.5487 in
Velocity	14.5604 fps
Hydraulic Radius	4.5000 in
Percent Full	100.0000 %
Full flow Flowrate	25.7303 cfs
Full flow velocity	14.5604 fps

18-INCH PIPE @ 6.48%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	18.0000 in
Depth	18.0000 in
Slope	0.0648 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	26.7397 cfs
Area	1.7671 ft2
Wetted Area	1.7671 ft2
Wetted Perimeter	56.5487 in
Perimeter	56.5487 in
Velocity	15.1316 fps
Hydraulic Radius	4.5000 in
Percent Full	100.0000 %
Full flow Flowrate	26.7397 cfs
Full flow velocity	15.1316 fps

18-INCH PIPE @ 6.50%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	18.0000 in
Depth	18.0000 in
Slope	0.0650 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	26.7809 cfs
Area	1.7671 ft2
Wetted Area	1.7671 ft2
Wetted Perimeter	56.5487 in
Perimeter	56.5487 in
Velocity	15.1549 fps
Hydraulic Radius	4.5000 in
Percent Full	100.0000 %
Full flow Flowrate	26.7809 cfs
Full flow velocity	15.1549 fps

18-INCH PIPE @ 7.50%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	18.0000 in
Depth	18.0000 in
Slope	0.0750 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	28.7673 cfs
Area	1.7671 ft2
Wetted Area	1.7671 ft2
Wetted Perimeter	56.5487 in
Perimeter	56.5487 in
Velocity	16.2790 fps
Hydraulic Radius	4.5000 in
Percent Full	100.0000 %
Full flow Flowrate	28.7673 cfs
Full flow velocity	16.2790 fps

18-INCH PIPE @ 8.00%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	18.0000 in
Depth	18.0000 in
Slope	0.0800 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	29.7108 cfs
Area	1.7671 ft2
Wetted Area	1.7671 ft2
Wetted Perimeter	56.5487 in
Perimeter	56.5487 in
Velocity	16.8128 fps
Hydraulic Radius	4.5000 in
Percent Full	100.0000 %
Full flow Flowrate	29.7108 cfs
Full flow velocity	16.8128 fps

18-INCH PIPE @ 8.80%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	18.0000 in
Depth	18.0000 in
Slope	0.0880 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	31.1609 cfs
Area	1.7671 ft2
Wetted Area	1.7671 ft2
Wetted Perimeter	56.5487 in
Perimeter	56.5487 in
Velocity	17.6335 fps
Hydraulic Radius	4.5000 in
Percent Full	100.0000 %
Full flow Flowrate	31.1609 cfs
Full flow velocity	17.6335 fps

18-INCH PIPE @ 9.00%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	18.0000 in
Depth	18.0000 in
Slope	0.0900 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	31.5130 cfs
Area	1.7671 ft2
Wetted Area	1.7671 ft2
Wetted Perimeter	56.5487 in
Perimeter	56.5487 in
Velocity	17.8327 fps
Hydraulic Radius	4.5000 in
Percent Full	100.0000 %
Full flow Flowrate	31.5130 cfs
Full flow velocity	17.8327 fps

18-INCH RCP @ 1.00% FOR 100-YEAR FLOW

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Depth of Flow
Diameter	1.5000 ft
Flowrate	8.5900 cfs
Slope	0.0100 ft/ft
Manning's n	0.0130

Computed Results:

Depth	1.0315 ft
Area	1.7671 ft2
Wetted Area	1.2957 ft2
Wetted Perimeter	2.9333 ft
Perimeter	4.7124 ft
Velocity	6.6298 fps
Hydraulic Radius	0.4417 ft
Percent Full	68.7656 %
Full flow Flowrate	10.5043 cfs
Full flow velocity	5.9442 fps

Critical Information

Critical depth	1.1673 ft
Critical slope	0.0067 ft/ft
Critical velocity	5.6903 fps
Critical area	1.5096 ft2
Critical perimeter	3.1909 ft
Critical hydraulic radius	0.4731 ft
Critical top width	1.5000 ft
Specific energy	1.7103 ft
Minimum energy	1.7510 ft
Froude number	1.2670
Flow condition	Supercritical

24-INCH RCP @ 0.50%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	24.0000 in
Depth	24.0000 in
Slope	0.0050 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	15.9965 cfs
Area	3.1416 ft2
Wetted Area	3.1416 ft2
Wetted Perimeter	75.3982 in
Perimeter	75.3982 in
Velocity	5.0918 fps
Hydraulic Radius	6.0000 in
Percent Full	100.0000 %
Full flow Flowrate	15.9965 cfs
Full flow velocity	5.0918 fps

Critical Information

Critical depth	21.5936 in
Critical slope	0.0067 ft/ft
Critical velocity	7.1408 fps
Critical area	3.1697 ft2
Critical perimeter	56.8863 in
Critical hydraulic radius	8.0237 in
Critical top width	24.0000 in
Specific energy	2.6244 ft
Minimum energy	2.6992 ft
Froude number	0.8363
Flow condition	Subcritical

24-INCH RCP @ 0.80%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	2.0000 ft
Depth	2.0000 ft
Slope	0.0080 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	20.2341 cfs
Area	3.1416 ft2
Wetted Area	3.1416 ft2
Wetted Perimeter	6.2832 ft
Perimeter	6.2832 ft
Velocity	6.4407 fps
Hydraulic Radius	0.5000 ft
Percent Full	100.0000 %
Full flow Flowrate	20.2341 cfs
Full flow velocity	6.4407 fps

24-INCH RCP @ 1.00%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	24.0000 in
Depth	24.0000 in
Slope	0.0100 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	22.6224 cfs
Area	3.1416 ft2
Wetted Area	3.1416 ft2
Wetted Perimeter	75.3982 in
Perimeter	75.3982 in
Velocity	7.2009 fps
Hydraulic Radius	6.0000 in
Percent Full	100.0000 %
Full flow Flowrate	22.6224 cfs
Full flow velocity	7.2009 fps

24-INCH RCP @ 1.23%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	2.0000 ft
Depth	2.0000 ft
Slope	0.0123 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	25.0895 cfs
Area	3.1416 ft2
Wetted Area	3.1416 ft2
Wetted Perimeter	6.2832 ft
Perimeter	6.2832 ft
Velocity	7.9862 fps
Hydraulic Radius	0.5000 ft
Percent Full	100.0000 %
Full flow Flowrate	25.0895 cfs
Full flow velocity	7.9862 fps

24-INCH RCP @ 2.00%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	24.0000 in
Depth	24.0000 in
Slope	0.0200 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	31.9929 cfs
Area	3.1416 ft2
Wetted Area	3.1416 ft2
Wetted Perimeter	75.3982 in
Perimeter	75.3982 in
Velocity	10.1837 fps
Hydraulic Radius	6.0000 in
Percent Full	100.0000 %
Full flow Flowrate	31.9929 cfs
Full flow velocity	10.1837 fps

24-INCH RCP @ 3.00%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	24.0000 in
Depth	24.0000 in
Slope	0.0300 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	39.1831 cfs
Area	3.1416 ft2
Wetted Area	3.1416 ft2
Wetted Perimeter	75.3982 in
Perimeter	75.3982 in
Velocity	12.4724 fps
Hydraulic Radius	6.0000 in
Percent Full	100.0000 %
Full flow Flowrate	39.1831 cfs
Full flow velocity	12.4724 fps

24-INCH RCP @ 4.00%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	24.0000 in
Depth	24.0000 in
Slope	0.0400 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	45.2448 cfs
Area	3.1416 ft2
Wetted Area	3.1416 ft2
Wetted Perimeter	75.3982 in
Perimeter	75.3982 in
Velocity	14.4019 fps
Hydraulic Radius	6.0000 in
Percent Full	100.0000 %
Full flow Flowrate	45.2448 cfs
Full flow velocity	14.4019 fps

24-INCH RCP @ 4.41%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	24.0000 in
Depth	24.0000 in
Slope	0.0441 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	47.5070 cfs
Area	3.1416 ft2
Wetted Area	3.1416 ft2
Wetted Perimeter	75.3982 in
Perimeter	75.3982 in
Velocity	15.1220 fps
Hydraulic Radius	6.0000 in
Percent Full	100.0000 %
Full flow Flowrate	47.5070 cfs
Full flow velocity	15.1220 fps

24-INCH RCP @ 5.00%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	24.0000 in
Depth	24.0000 in
Slope	0.0500 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	50.5852 cfs
Area	3.1416 ft2
Wetted Area	3.1416 ft2
Wetted Perimeter	75.3982 in
Perimeter	75.3982 in
Velocity	16.1018 fps
Hydraulic Radius	6.0000 in
Percent Full	100.0000 %
Full flow Flowrate	50.5852 cfs
Full flow velocity	16.1018 fps

24-INCH RCP @ 6.00%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	24.0000 in
Depth	24.0000 in
Slope	0.0600 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	55.4133 cfs
Area	3.1416 ft2
Wetted Area	3.1416 ft2
Wetted Perimeter	75.3982 in
Perimeter	75.3982 in
Velocity	17.6386 fps
Hydraulic Radius	6.0000 in
Percent Full	100.0000 %
Full flow Flowrate	55.4133 cfs
Full flow velocity	17.6386 fps

24-INCH RCP @ 6.09%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	24.0000 in
Depth	24.0000 in
Slope	0.0609 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	55.8274 cfs
Area	3.1416 ft2
Wetted Area	3.1416 ft2
Wetted Perimeter	75.3982 in
Perimeter	75.3982 in
Velocity	17.7704 fps
Hydraulic Radius	6.0000 in
Percent Full	100.0000 %
Full flow Flowrate	55.8274 cfs
Full flow velocity	17.7704 fps

24-INCH RCP @ 6.63%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	24.0000 in
Depth	24.0000 in
Slope	0.0663 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	58.2499 cfs
Area	3.1416 ft2
Wetted Area	3.1416 ft2
Wetted Perimeter	75.3982 in
Perimeter	75.3982 in
Velocity	18.5415 fps
Hydraulic Radius	6.0000 in
Percent Full	100.0000 %
Full flow Flowrate	58.2499 cfs
Full flow velocity	18.5415 fps

30-INCH RCP @ 0.40%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	2.5000 ft
Depth	2.5000 ft
Slope	0.0040 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	25.9415 cfs
Area	4.9087 ft2
Wetted Area	4.9087 ft2
Wetted Perimeter	7.8540 ft
Perimeter	7.8540 ft
Velocity	5.2848 fps
Hydraulic Radius	0.6250 ft
Percent Full	100.0000 %
Full flow Flowrate	25.9415 cfs
Full flow velocity	5.2848 fps

Critical Information

Critical depth	2.1535 ft
Critical slope	0.0060 ft/ft
Critical velocity	7.7882 fps
Critical area	4.7131 ft2
Critical perimeter	5.7340 ft
Critical hydraulic radius	0.8220 ft
Critical top width	2.5000 ft
Specific energy	3.1726 ft
Minimum energy	3.2302 ft
Froude number	0.7764
Flow condition	Subcritical

30-INCH RCP @ 0.50%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	30.0000 in
Depth	30.0000 in
Slope	0.0050 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	29.0035 cfs
Area	4.9087 ft2
Wetted Area	4.9087 ft2
Wetted Perimeter	94.2478 in
Perimeter	94.2478 in
Velocity	5.9085 fps
Hydraulic Radius	7.5000 in
Percent Full	100.0000 %
Full flow Flowrate	29.0035 cfs
Full flow velocity	5.9085 fps

Critical Information

Critical depth	27.5888 in
Critical slope	0.0063 ft/ft
Critical velocity	8.0833 fps
Critical area	5.0770 ft2
Critical perimeter	72.3014 in
Critical hydraulic radius	10.1117 in
Critical top width	30.0000 in
Specific energy	3.3408 ft
Minimum energy	3.4486 ft
Froude number	0.8680
Flow condition	Subcritical

30-INCH RCP @ 1.00%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	30.0000 in
Depth	30.0000 in
Slope	0.0100 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	41.0171 cfs
Area	4.9087 ft2
Wetted Area	4.9087 ft2
Wetted Perimeter	94.2478 in
Perimeter	94.2478 in
Velocity	8.3559 fps
Hydraulic Radius	7.5000 in
Percent Full	100.0000 %
Full flow Flowrate	41.0171 cfs
Full flow velocity	8.3559 fps

30-INCH RCP @ 1.15%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	30.0000 in
Depth	30.0000 in
Slope	0.0115 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	43.9860 cfs
Area	4.9087 ft2
Wetted Area	4.9087 ft2
Wetted Perimeter	94.2478 in
Perimeter	94.2478 in
Velocity	8.9608 fps
Hydraulic Radius	7.5000 in
Percent Full	100.0000 %
Full flow Flowrate	43.9860 cfs
Full flow velocity	8.9608 fps

30-INCH RCP @ 2.00%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	30.0000 in
Depth	30.0000 in
Slope	0.0200 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	58.0070 cfs
Area	4.9087 ft2
Wetted Area	4.9087 ft2
Wetted Perimeter	94.2478 in
Perimeter	94.2478 in
Velocity	11.8171 fps
Hydraulic Radius	7.5000 in
Percent Full	100.0000 %
Full flow Flowrate	58.0070 cfs
Full flow velocity	11.8171 fps

30-INCH RCP @ 3.00%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	30.0000 in
Depth	30.0000 in
Slope	0.0300 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	71.0438 cfs
Area	4.9087 ft2
Wetted Area	4.9087 ft2
Wetted Perimeter	94.2478 in
Perimeter	94.2478 in
Velocity	14.4729 fps
Hydraulic Radius	7.5000 in
Percent Full	100.0000 %
Full flow Flowrate	71.0438 cfs
Full flow velocity	14.4729 fps

30-INCH RCP @ 4.00%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	30.0000 in
Depth	30.0000 in
Slope	0.0400 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	82.0343 cfs
Area	4.9087 ft2
Wetted Area	4.9087 ft2
Wetted Perimeter	94.2478 in
Perimeter	94.2478 in
Velocity	16.7119 fps
Hydraulic Radius	7.5000 in
Percent Full	100.0000 %
Full flow Flowrate	82.0343 cfs
Full flow velocity	16.7119 fps

30-INCH RCP @ 4.20%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	30.0000 in
Depth	30.0000 in
Slope	0.0420 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	84.0601 cfs
Area	4.9087 ft2
Wetted Area	4.9087 ft2
Wetted Perimeter	94.2478 in
Perimeter	94.2478 in
Velocity	17.1246 fps
Hydraulic Radius	7.5000 in
Percent Full	100.0000 %
Full flow Flowrate	84.0601 cfs
Full flow velocity	17.1246 fps

30-INCH RCP @ 5.00%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	30.0000 in
Depth	30.0000 in
Slope	0.0500 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	91.7171 cfs
Area	4.9087 ft2
Wetted Area	4.9087 ft2
Wetted Perimeter	94.2478 in
Perimeter	94.2478 in
Velocity	18.6845 fps
Hydraulic Radius	7.5000 in
Percent Full	100.0000 %
Full flow Flowrate	91.7171 cfs
Full flow velocity	18.6845 fps

30-INCH RCP @ 6.00%

MANNING PIPE CALCULATOR

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	30.0000 in
Depth	30.0000 in
Slope	0.0600 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	100.4711 cfs
Area	4.9087 ft2
Wetted Area	4.9087 ft2
Wetted Perimeter	94.2478 in
Perimeter	94.2478 in
Velocity	20.4678 fps
Hydraulic Radius	7.5000 in
Percent Full	100.0000 %
Full flow Flowrate	100.4711 cfs
Full flow velocity	20.4678 fps

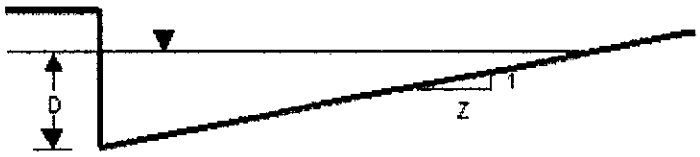
DRAINAGE FACILITY SUMMARY

McCauley Ranch Estates

Catch Basin Inlets Summary

CB No.	CB Type	Design Flow		Design Flow + Overflow		Capacity / Depth		Overflows into		
		5-yr	100-yr	5-yr	100-yr	5-yr	100-yr	5-yr	100-yr	CB No.
1	On-Grade	0.22	0.65	3.34	15.38	1.48	3.84	1.86	11.54	18
2	On-Grade	2.84	8.59	3.17	10.33	1.44	2.99	1.74	7.34	N/A
3	On-Grade	2.47	7.49	5.03	19.14	1.91	4.41	3.12	14.73	1
4	On-Grade	1.05	3.17	1.05	3.17	0.72	1.44	0.33	1.74	2
5	On-Grade	1.03	3.12	1.03	3.12	0.61	1.23	0.42	1.89	3
6	On-Grade	1.29	3.95	1.29	3.95	0.71	1.43	0.58	2.52	3
7	On-Grade	0.40	1.21	2.40	8.93	0.84	1.68	1.56	7.24	3
8	On-Grade	0.77	2.34	0.77	2.34	0.57	1.14	0.20	1.20	7
9	On-Grade	3.17	9.20	3.17	9.20	1.37	2.68	1.80	6.52	7
10	Sump	0.59	1.78	0.59	1.78	0.10'	0.20'	N/A	N/A	N/A
11	Sump	1.83	5.55	1.83	5.55	0.21'	0.49'	N/A	N/A	N/A
12	On-Grade	1.48	4.47	1.48	4.47	0.89	1.78	0.60	2.69	13
13	On-Grade	2.62	7.91	3.22	10.60	1.45	3.05	1.77	7.55	15
14	On-Grade	0.84	2.54	0.84	2.54	0.63	1.25	0.21	1.30	16
15	On-Grade	2.95	8.98	4.72	16.53	1.77	3.87	2.94	12.66	DEV-26
16	Sump	3.10	9.40	3.31	10.70	0.31'	0.75'	N/A	N/A	N/A
17	On-Grade	1.35	4.09	1.35	4.09	0.73	1.46	0.62	2.63	N/A
18	Sump	3.41	10.44	3.41	21.98	0.32'	0.75'	N/A	N/A	N/A

On Grade Flow in Triangular Gutter Sections



$$Q = \frac{0.56}{N} Z D^{8/3} S^{1/2}$$

(Modified Manning Equation)

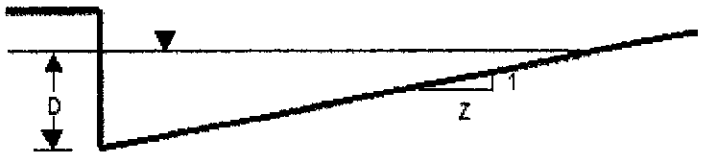
Where...
Q = Channel flow in CFS (calculated)
Z = Reciprocal of transverse slope ($1/S_T$)
D = Depth in feet
S = Longitudinal slope
N = Roughness coefficient at constant 0.016 (value for concrete and asphalt)

CB-1

	5-Year	100-Year	
Depth of flow in feet (D):	0.162	0.287	
Transverse Slope in ft./ft. (S_T):	0.020	0.020	
Longitudinal Slope in ft./ft. (S_L):	0.060	0.060	
Roughness coefficient (N):	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)
Total flow in cfs (Q):	3.34	15.38	
Spread of flow in feet:	8.10	14.35	
Catalog numbers and grate types that have K-charts:	3295		
Grate Coefficient from K-chart (K):	30.75	30.75	
Grate capacity in cfs:	1.48	3.84	
	(Flow captured)	(Flow captured)	(Flow captured)

For additional information regarding Neenah Inlet Grate Capacities, please contact our Product Engineer, Steve Akkala, at 920-725-7000 or at sakkala@nfco.com.

On Grade Flow in Triangular Gutter Sections



$$Q = \frac{0.56}{N} Z D^{8/3} S^{1/2}$$

(Modified Manning Equation)

Where...
Q = Channel flow in CFS (calculated)
Z = Reciprocal of transverse slope ($1/S_T$)
D = Depth in feet
S = Longitudinal slope
N = Roughness coefficient at constant 0.016 (value for concrete and asphalt)

CB-2

	5-Year	100-Year	
Depth of flow in feet (D):	0.159	0.247	
Transverse Slope in ft./ft. (S_T):	0.020	0.020	
Longitudinal Slope in ft./ft. (S_L):	0.060	0.060	
Roughness coefficient (N):	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)
Total flow in cfs (Q):	3.17	10.33	
Spread of flow in feet:	7.95	12.35	
Catalog numbers and grate types that have K-charts:	3295		
Grate Coefficient from K-chart (K):	30.75	30.75	
Grate capacity in cfs:	1.435	2.990	
	(Flow captured)	(Flow captured)	(Flow captured)

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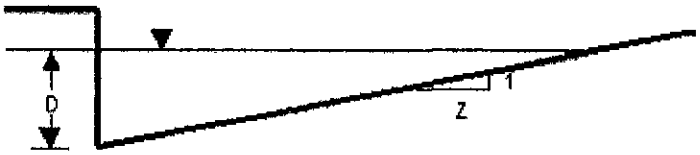
On Grade Flow in Triangular Gutter Sections



$$Q = \frac{0.56}{N} Z D^{8/3} S^{1/2}$$

(Modified Manning Equation)

Where...
Q = Channel flow in CFS (calculated)
Z = Reciprocal of transverse slope ($1/S_T$)
D = Depth in feet
S = Longitudinal slope
N = Roughness coefficient at constant 0.016 (value for concrete and asphalt)

CB-3

	5-Year	100-Year	
Depth of flow in feet (D):	0.189	0.312	
Transverse Slope in ft./ft. (S_T):	0.020	0.020	
Longitudinal Slope in ft./ft. (S_L):	0.060	0.060	
Roughness coefficient (N):	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)
Total flow in cfs (Q):	5.03	19.14	
Spread of flow in feet:	9.45	15.60	

Catalog numbers and grate types that have K-charts: 3295

Grate Coefficient from K-chart (K):	30.75	30.75	
Grate capacity in cfs:	1.914	4.413	
	(Flow captured)	(Flow captured)	(Flow captured)

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On Grade Flow in Triangular Gutter Sections

$$Q = \frac{0.56}{N} Z D^{8/3} S^{1/2}$$

(Modified Manning Equation)

Where...
- **Q** = Channel flow in CFS (calculated)
- **Z** = Reciprocal of transverse slope ($1/S_T$)
- **D** = Depth in feet
- **S** = Longitudinal slope
- **N** = Roughness coefficient at constant 0.016 (value for concrete and asphalt)

CB-4

	5-Year	100-Year	
Depth of flow in feet (D):	0.105	0.159	
Transverse Slope in ft./ft. (S_T):	0.020	0.020	
Longitudinal Slope in ft./ft. (S_L):	0.060	0.060	
Roughness coefficient (N):	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)
Total flow in cfs (Q):	1.05	3.17	
Spread of flow in feet:	5.25	7.95	

Catalog numbers and grate types that have K-charts: 3295

Grate Coefficient from K-chart (K):	30.75	30.75	
Grate capacity in cfs:	0.719	1.435	
	(Flow captured)	(Flow captured)	(Flow captured)

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On Grade Flow in Triangular Gutter Sections

$$Q = \frac{0.56}{N} Z D^{8/3} S^{1/2}$$

(Modified Manning Equation)

Where...
Q = Channel flow in CFS (calculated)
Z = Reciprocal of transverse slope ($1/S_T$)
D = Depth in feet
S = Longitudinal slope
N = Roughness coefficient at constant 0.016 (value for concrete and asphalt)

CB-5

	5-Year	100-Year	
Depth of flow in feet (D):	0.160	0.243	
Transverse Slope in ft./ft. (S_T):	0.020	0.020	
Longitudinal Slope in ft./ft. (S_L):	0.006	0.006	
Roughness coefficient (N):	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)
Total flow in cfs (Q):	1.03	3.12	
Spread of flow in feet:	8.00	12.15	

Catalog numbers and grate types that have K-charts: 3295

Grate Coefficient from K-chart (K):	13	13	
Grate capacity in cfs:	0.613	1.230	
	(Flow captured)	(Flow captured)	(Flow captured)

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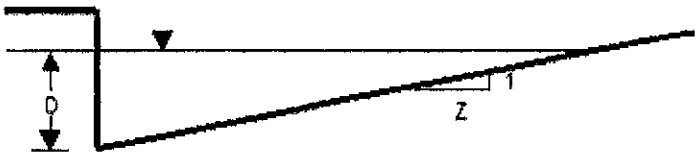
On Grade Flow in Triangular Gutter Sections



$$Q = \frac{0.56}{N} Z D^{8/3} S^{1/2}$$

(Modified Manning Equation)

Where...
Q = Channel flow in CFS (calculated)
Z = Reciprocal of transverse slope ($1/S_T$)
D = Depth in feet
S = Longitudinal slope
N = Roughness coefficient at constant 0.016 (value for concrete and asphalt)

CB-6

	5-Year	100-Year	
Depth of flow in feet (D):	0.175	0.266	
Transverse Slope in ft./ft. (S_T):	0.020	0.020	
Longitudinal Slope in ft./ft. (S_L):	0.006	0.006	
Roughness coefficient (N):	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)
Total flow in cfs (Q):	1.29	3.95	
Spread of flow in feet:	8.75	13.30	

Catalog numbers and grate types that have K-charts: 3295

Grate Coefficient from K-chart (K):	13	13	
Grate capacity in cfs:	0.712	1.430	
	(Flow captured)	(Flow captured)	(Flow captured)

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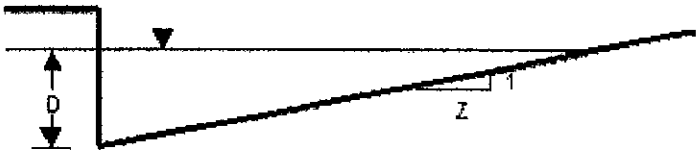
On Grade Flow in Triangular Gutter Sections



$$Q = \frac{0.56}{N} Z D^{8/3} S^{1/2}$$

(Modified Manning Equation)

Where...
Q = Channel flow in CFS (calculated)
Z = Reciprocal of transverse slope ($1/S_T$)
D = Depth in feet
S = Longitudinal slope
N = Roughness coefficient at constant 0.016 (value for concrete and asphalt)

CB-7

	5-Year	100-Year	
Depth of flow in feet (D):	0.115	0.175	
Transverse Slope in ft./ft. (S_T):	0.020	0.020	
Longitudinal Slope in ft./ft. (S_L):	0.060	0.060	
Roughness coefficient (N):	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)
Total flow in cfs (Q):	2.40	8.93	
Spread of flow in feet:	5.75	8.75	

Catalog numbers and grate types that have K-charts: 3295

Grate Coefficient from K-chart (K):	30.75	30.75	
Grate capacity in cfs:	0.836	1.684	
	(Flow captured)	(Flow captured)	(Flow captured)

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On Grade Flow in Triangular Gutter Sections

$$Q = \frac{0.56}{N} Z D^{8/3} S^{1/2}$$

(Modified Manning Equation)

Where...
- **Q** = Channel flow in CFS (calculated)
- **Z** = Reciprocal of transverse slope ($1/S_T$)
- **D** = Depth in feet
- **S** = Longitudinal slope
- **N** = Roughness coefficient at constant 0.016 (value for concrete and asphalt)

CB-8

	5-Year	100-Year	
Depth of flow in feet (D):	0.101	0.153	
Transverse Slope in ft./ft. (S_T):	0.020	0.020	
Longitudinal Slope in ft./ft. (S_L):	0.040	0.040	
Roughness coefficient (N):	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)
Total flow in cfs (Q):	0.77	2.34	
Spread of flow in feet:	5.05	7.65	
Catalog numbers and grate types that have K-charts:	3295		
Grate Coefficient from K-chart (K):	26	26	
Grate capacity in cfs:	0.570	1.138	
	(Flow captured)	(Flow captured)	(Flow captured)

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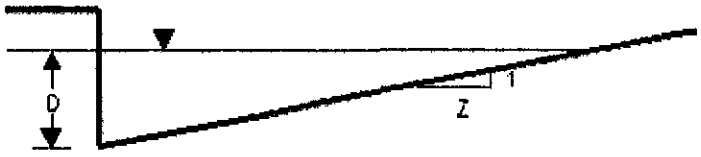
On Grade Flow in Triangular Gutter Sections



$$Q = \frac{0.56}{N} Z D^{8/3} S^{1/2}$$

(Modified Manning Equation)

Where...
- **Q** = Channel flow in CFS (calculated)
- **Z** = Reciprocal of transverse slope ($1/S_T$)
- **D** = Depth in feet
- **S** = Longitudinal slope
- **N** = Roughness coefficient at constant 0.016 (value for concrete and asphalt)

CB-9

	5-Year	100-Year	
Depth of flow in feet (D):	0.171	0.256	
Transverse Slope in ft./ft. (S_T):	0.020	0.020	
Longitudinal Slope in ft./ft. (S_L):	0.040	0.040	
Roughness coefficient (N):	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)
Total flow in cfs (Q):	3.17	9.20	
Spread of flow in feet:	8.55	12.80	

Catalog numbers and grate types that have K-charts: 3295

Grate Coefficient from K-chart (K):	26	26	
Grate capacity in cfs:	1.370	2.684	
	(Flow captured)	(Flow captured)	(Flow captured)

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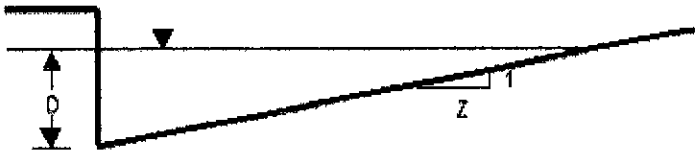
On Grade Flow in Triangular Gutter Sections



$$Q = \frac{0.56}{N} Z D^{8/3} S^{1/2}$$

(Modified Manning Equation)

Where...
Q = Channel flow in CFS (calculated)
Z = Reciprocal of transverse slope ($1/S_T$)
D = Depth in feet
S = Longitudinal slope
N = Roughness coefficient at constant 0.016 (value for concrete and asphalt)

CB-12

	5-Year	100-Year	
Depth of flow in feet (D):	0.119	0.181	
Transverse Slope in ft./ft. (S_T):	0.020	0.020	
Longitudinal Slope in ft./ft. (S_L):	0.060	0.060	
Roughness coefficient (N):	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)
Total flow in cfs (Q):	1.48	4.47	
Spread of flow in feet:	5.95	9.05	
Catalog numbers and grate types that have K-charts:	3295		
Grate Coefficient from K-chart (K):	30.75	30.75	
Grate capacity in cfs:	0.885	1.781	
	(Flow captured)	(Flow captured)	(Flow captured)

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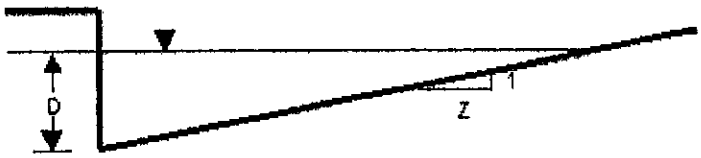
On Grade Flow in Triangular Gutter Sections



$$Q = \frac{0.56}{N} Z D^{8/3} S^{1/2}$$

(Modified Manning Equation)

Where...
- **Q** = Channel flow in CFS (calculated)
- **Z** = Reciprocal of transverse slope ($1/S_T$)
- **D** = Depth in feet
- **S** = Longitudinal slope
- **N** = Roughness coefficient at constant 0.016 (value for concrete and asphalt)

CB-13

	5-Year	100-Year	
Depth of flow in feet (D):	0.160	0.250	
Transverse Slope in ft./ft. (S_T):	0.020	0.020	
Longitudinal Slope in ft./ft. (S_L):	0.060	0.060	
Roughness coefficient (N):	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)
Total flow in cfs (Q):	3.22	10.60	
Spread of flow in feet:	8.00	12.50	

Catalog numbers and grate types that have K-charts: 3295

Grate Coefficient from K-chart (K):	30.75	30.75	
Grate capacity in cfs:	1.450	3.051	
	(Flow captured)	(Flow captured)	(Flow captured)

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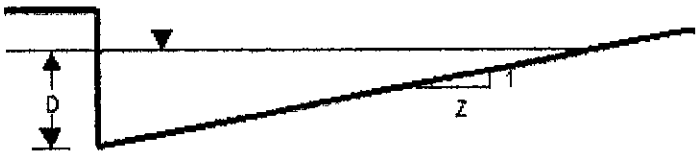
On Grade Flow in Triangular Gutter Sections



$$Q = \frac{0.56}{N} Z D^{8/3} S^{1/2}$$

(Modified Manning Equation)

Where...
Q = Channel flow in CFS (calculated)
Z = Reciprocal of transverse slope ($1/S_T$)
D = Depth in feet
S = Longitudinal slope
N = Roughness coefficient at constant 0.016 (value for concrete and asphalt)

CB-14

	5-Year	100-Year	
Depth of flow in feet (D):	0.097	0.146	
Transverse Slope in ft./ft. (S_T):	0.020	0.020	
Longitudinal Slope in ft./ft. (S_L):	0.060	0.060	
Roughness coefficient (N):	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)
Total flow in cfs (Q):	0.84	2.54	
Spread of flow in feet:	4.85	7.30	

Catalog numbers and grate types that have K-charts: 3295

Grate Coefficient from K-chart (K):	30.75	30.75	
Grate capacity in cfs:	0.630	1.245	
	(Flow captured)	(Flow captured)	(Flow captured)

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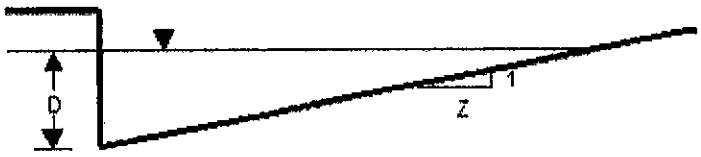
On Grade Flow in Triangular Gutter Sections



$$Q = \frac{0.56}{N} Z D^{8/3} S^{1/2}$$

(Modified Manning Equation)

Where...
- **Q** = Channel flow in CFS (calculated)
- **Z** = Reciprocal of transverse slope ($1/S_T$)
- **D** = Depth in feet
- **S** = Longitudinal slope
- **N** = Roughness coefficient at constant 0.016 (value for concrete and asphalt)

CB-15

	5-Year	100-Year	
Depth of flow in feet (D):	0.191	0.305	
Transverse Slope in ft./ft. (S_T):	0.020	0.020	
Longitudinal Slope in ft./ft. (S_L):	0.050	0.050	
Roughness coefficient (N):	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)
Total flow in cfs (Q):	4.72	16.53	
Spread of flow in feet:	9.55	15.25	
Catalog numbers and grate types that have K-charts:	3295		
Grate Coefficient from K-chart (K):	28	28	
Grate capacity in cfs:	1.774	3.870	
	(Flow captured)	(Flow captured)	(Flow captured)

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On Grade Flow in Triangular Gutter Sections

$$Q = \frac{0.56}{N} Z D^{8/3} S^{1/2}$$

(Modified Manning Equation)

Where...
Q = Channel flow in CFS (calculated)
Z = Reciprocal of transverse slope ($1/S_T$)
D = Depth in feet
S = Longitudinal slope
N = Roughness coefficient at constant 0.016 (value for concrete and asphalt)

CB-17

	5-Year	100-Year	
Depth of flow in feet (D):	0.178	0.269	
Transverse Slope in ft./ft. (S_T):	0.020	0.020	
Longitudinal Slope in ft./ft. (S_L):	0.006	0.006	
Roughness coefficient (N):	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)	0.016 (value for concrete or asphalt)
Total flow in cfs (Q):	1.35	4.09	
Spread of flow in feet:	8.90	13.45	

Catalog numbers and grate types that have K-charts: 3295

Grate Coefficient from K-chart (K):	13	13	
Grate capacity in cfs:	0.732	1.457	
	(Flow captured)	(Flow captured)	(Flow captured)

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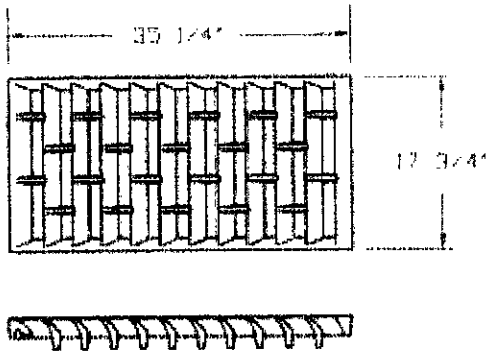
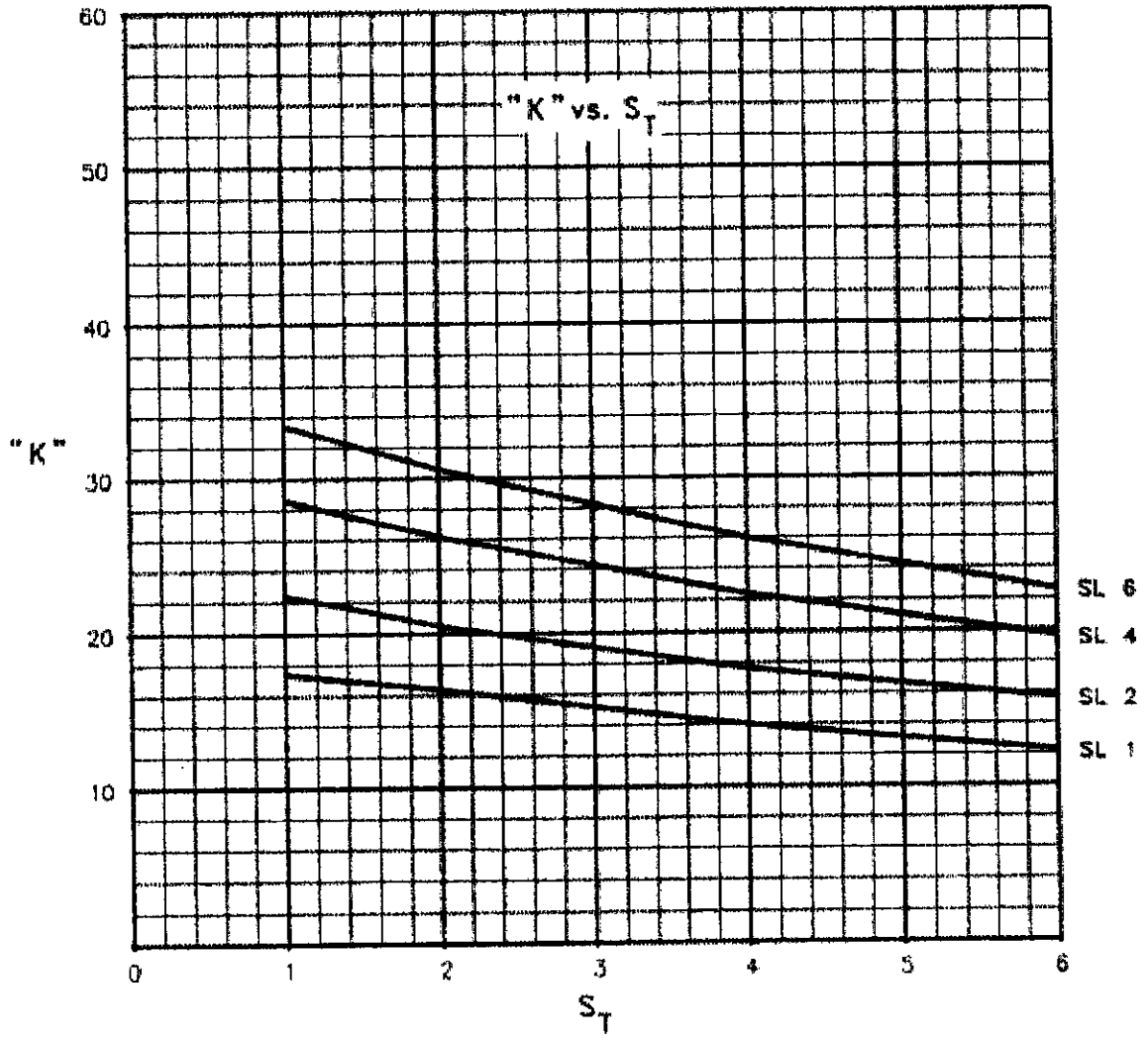
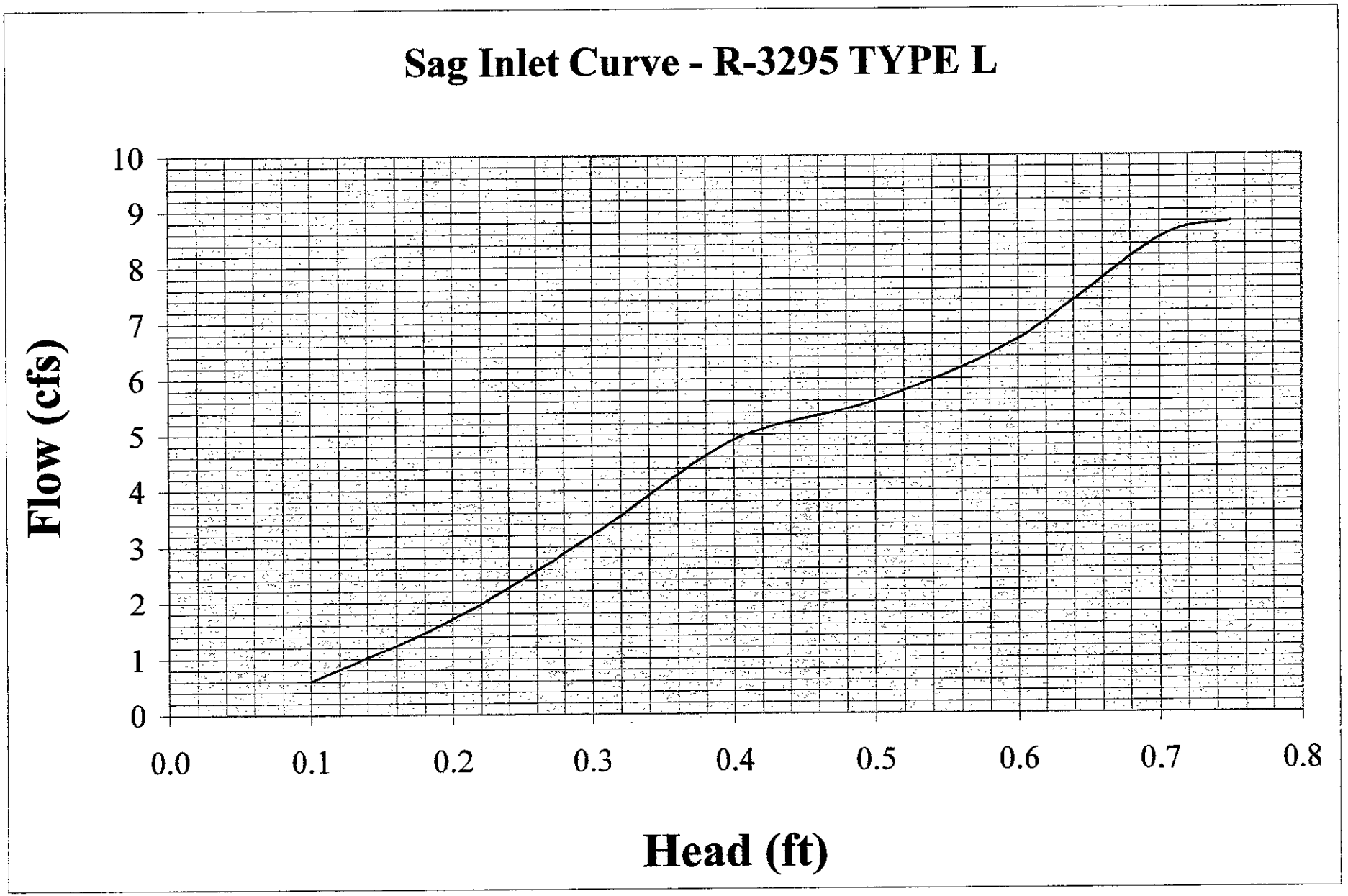
CAT. NO.- R- 3295
DESCRIPTION- TYPE L GRATE






Sag Inlet Curve - R-3295 TYPE L
Flow (cfs)
10
9
8
7
6
5
4
3
2
1
0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
Head (ft)

SCS TR-55 (UNIT HYDROGRAPH METHOD)
POND PACK MODELS AND RESULTS

SCS TR-55 Time of Concentration (T_c) Computation

McCauley Ranch Estates

Pre-Developed Drainage Conditions

Basin PRE-1

Flow Type	Segments
Sheet (overland) Flow	1
Surface Description	open
Manning's roughness coefficient, n	0.03
Flow Length, L (ft)	6739
2-yr 24-hr rainfall, P_2 (in)	1.47
Upper Elevation (ft)	5840
Lower Elevation (ft)	4486
Land slope, s (ft/ft)	0.201
Land slope, s (%)	20.09
$T_t = \frac{0.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ (minutes)	**46.0**

SCS TR-55 Curve Number Computation

McCauley Ranch Estates

Pre-Developed Draiange Conditions

Basin PRE-1

Basins	Area (sq ft)	Area (acres)	Soil Types	CN	Area*CN	$CN_{average}$
Onsite	3554938.9	80.0	C	80	6400.0	
Offsite	4867934.0	113.5	D	85	9643.4	
Total	8426758.2	193.5			16043.4	**83**

McCauley Ranch Estates

SCS TR-55 Time of Concentration Computation

Flow Type	Sheet (overland) Flow					Shallow Concentrated Flow				Time of Concentration	
Basin No.	Flow Length $L \leq 300$ ft (ft)	Land Slope s (ft/ft)	Manning's Roughness Coefficient, n	2-yr 24-Hour Rainfall, P_2 (inches)	Travel Time T_t (minutes)	Flow Length L (ft)	Watercourse Slope, S (%)	Velocity V (fps)	Travel Time T_t (minutes)	Calculated T_c (minutes)	Final T_c (minutes)
	200.01	0.01	0.03	1.75	8.40	128.55	6.00	4.98	0.43		
DEV-1	20.93	0.20	0.03	1.75	0.42					9.25	**10.00**
	157.01	0.01	0.03	1.75	6.92	225.71	6.00	4.98	0.76		
DEV-2	27.42	0.20	0.03	1.75	0.52	565.97	8.00	5.75	1.64	9.83	**10.00**
	45.35	0.06	0.03	1.75	1.27	906.89	6.00	4.98	3.04		
DEV-3						84.38	6.81	5.30	0.27	4.57	**10.00**
	83.48	0.01	0.03	1.75	4.18	647.87	3.17	3.62	2.98		
DEV-4										7.16	**10.00**
	22.22	0.01	0.03	1.75	1.24	684.32	3.17	3.62	3.15		
DEV-5										4.39	**10.00**
	82.16	0.25	0.03	1.75	1.13	70.51	4.00	4.07	0.29		
DEV-6						676.57	7.95	5.73	1.97	3.39	**10.00**
	20.51	0.04	0.03	1.75	0.78	70.51	4.00	4.07	0.29		
DEV-7						676.57	7.95	5.73	1.97	3.04	**10.00**
	125.67	0.16	0.03	1.75	1.93	35.00	6.00	4.98	0.12		
						64.45	6.10	5.02	0.21		
DEV-8						190.00	8.00	5.66	0.56	2.83	**10.00**
	135.00	0.01	0.03	1.75	6.13	113.12	6.00	4.98	0.38		
	19.86	0.10	0.03	1.75	0.52	104.46	7.18	5.45	0.32		
						200.39	8.00	5.75	0.58		
DEV-9						425.13	9.00	6.10	1.16	9.09	**10.00**
	300.00	0.27	0.03	1.75	3.11	89.90	5.85	4.92	0.30		
						63.04	6.00	4.98	0.21		
						208.92	7.18	5.45	0.64		
DEV-10						425.13	9.00	6.10	1.16	5.42	**10.00**
	300.00	0.03	0.03	1.75	7.99	206.78	2.94	2.77	1.25		
DEV-11										9.24	**10.00**
	214.07	0.01	0.03	1.75	8.87	43.99	1.00	2.03	0.36		
						149.41	3.86	3.99	0.62		
						26.71	4.00	4.07	0.11		
						98.82	5.19	4.63	0.36		
DEV-12						282.37	6.00	4.98	0.95	11.26	**11.26**
	115.01	0.01	0.03	1.75	5.40	302.51	0.60	1.57	3.20		
	24.22	0.18	0.03	1.75	0.49	250.00	3.89	4.01	1.04		
						185.29	3.40	3.75	0.82		
DEV-13						517.08	6.71	5.27	1.64	12.58	**12.58**
	18.61	0.04	0.03	1.75	0.72	302.51	0.60	1.57	3.20		
						250.00	3.89	4.01	1.04		
						185.29	3.40	3.75	0.82		
DEV-14						517.08	6.71	5.27	1.64	7.42	**10.00**
	22.98	0.04	0.03	1.75	0.86	271.67	6.00	4.98	0.91		
DEV-15										1.77	**10.00**
	300.00	0.04	0.03	1.75	6.57	1211.86	4.16	3.29	6.14		
DEV-16										12.71	**12.71**

McCauley Ranch Estates

SCS TR-55 Time of Concentration Computation Cont'd

Flow Type	Sheet (overland) Flow					Shallow Concentrated Flow				Time of Concentration	
Basin No.	Flow Length $L \leq 300$ ft (ft)	Land Slope s (ft/ft)	Manning's Roughness Coefficient, n	2-yr 24-Hour Rainfall, P_2 (inches)	Travel Time T_t (minutes)	Flow Length L (ft)	Watercourse Slope, S (%)	Velocity V (fps)	Travel Time T_t (minutes)	Calculated T_c (minutes)	Final T_c (minutes)
	115.00	0.01	0.03	1.75	5.39	780.26	0.60	1.57	8.26		
	27.60	0.02	0.03	1.75	1.29	252.88	3.40	3.75	1.12		
DEV-17						77.33	6.28	5.09	0.25	16.32	**16.32**
	24.56	0.04	0.03	1.75	0.88	780.26	0.60	1.57	8.26		
						252.88	3.40	3.75	1.12		
DEV-18						77.33	6.28	5.09	0.25	10.52	**10.52**
	84.25	0.12	0.03	1.75	1.58						
DEV-19										1.58	**10.00**
	115.00	0.05	0.03	1.75	2.75						
DEV-20										2.75	**10.00**
	139.26	0.11	0.03	1.75	2.39	326.98	10.15	5.14	1.06		
DEV-21										3.45	**10.00**
	170.50	0.01	0.03	1.75	7.39	35.59	4.00	4.07	0.15		
						54.70	5.00	4.55	0.20		
						434.96	6.00	4.98	1.46		
						300.00	7.45	5.55	0.90		
DEV-22						398.01	8.00	5.75	1.15	11.25	**11.25**
	170.50	0.01	0.03	1.75	7.39	35.59	4.00	4.07	0.15		
	21.79	0.14	0.03	1.75	0.50	101.73	5.00	4.55	0.37		
						434.96	6.00	4.98	1.46		
						300.00	7.45	5.55	0.90		
DEV-23						398.01	8.00	5.75	1.15	11.92	**11.92**
						177.42	9.49	4.97	0.59		
DEV-24										0.59	**10.00**
	198.19	0.03	0.03	1.75	5.74						
DEV-25										5.74	**10.00**
						66.50	5.13	4.60	0.24		
DEV-26						896.70	8.00	5.75	2.60	2.84	**10.00**
						120.76	1.00	2.03	0.99		
						182.00	2.33	3.10	0.98		
DEV-27						828.56	8.00	5.75	2.40	4.37	**10.00**
OPEN	300.00	0.06	0.03	1.75	5.50	470.80	6.90	4.24	1.85		
AREA-1										7.35	**10.00**
OPEN						720.97	1.72	2.12	5.68		
AREA-2										5.68	**10.00**
	300.00	0.06	0.03	1.75	5.65	319.00	1.64	2.60	2.04		
OPEN						176.31	3.88	4.00	0.73		
AREA-3						68.73	12.50	5.71	0.20	8.63	**10.00**
OPEN	300.00	0.08	0.03	1.75	4.95	210.79	11.49	5.47	0.64		
AREA-4										5.60	**10.00**

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JOB TITLE
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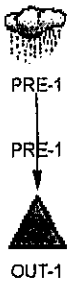
May 24, 2005
TEC Engineering Consultants
McCauley Ranch Estates
Pre-Developed Drainage Conditions


PRE-1
PRE-1
OUT-1

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********** NETWORK SUMMARIES **********

Watershed..... Pre..5
Executive Summary (Nodes) 1.01

Watershed..... Pre100
Executive Summary (Nodes) 1.02

********** DESIGN STORMS SUMMARY **********

McCauley..... Design Storms 2.01

********** RUNOFF HYDROGRAPHS **********

PRE-1..... Pre..5
SCS Unit Hyd. Summary 3.01

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

DEFAULT Design Storm File,ID = MCCAULEY.RNQ McCauley

Storm Tag Name = Pre..5

Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
Storm Frequency = 5 yr
Total Rainfall Depth= 1.8900 in
Duration Multiplier = 1
Resulting Duration = 1440.00 min
Resulting Start Time= .00 min Step= 6.00 min End= 1440.00 min

	Node ID	Type	HYG Vol ac-ft	Trun.	Qpeak min	Qpeak cfs	Max WSEL ft
Outfall	OUT-1	JCT	10.015		742.00	70.99	
	PRE-1	AREA	10.015		742.00	70.99	

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

DEFAULT Design Storm File,ID = MCCAULEY.RNQ McCauley

Storm Tag Name = Pre100

Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
Storm Frequency = 100 yr
Total Rainfall Depth= 3.4700 in
Duration Multiplier = 1
Resulting Duration = 1440.00 min
Resulting Start Time= .00 min Step= 6.00 min End= 1440.00 min

	Node ID	Type	HYG Vol ac-ft	Trun.	Qpeak min	Qpeak cfs	Max WSEL ft
Outfall	OUT-1	JCT	29.564		742.00	225.42	
	PRE-1	AREA	29.564		742.00	225.42	

Type.... Design Storms
Name.... McCauley

File.... C:\HAESTAD\PPKW\RAINFALL\MCCAULEY.RNQ
Title... May 24, 2005
TEC Engineering Consultants
McCauley Ranch Estates
Pre-Developed Drainage Conditions

DESIGN STORMS SUMMARY

Design Storm File,ID = MCCAULEY.RNQ McCauley

Storm Tag Name = Pre100

Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
Storm Frequency = 100 yr
Total Rainfall Depth= 3.4700 in
Duration Multiplier = 1
Resulting Duration = 1440.00 min
Resulting Start Time= .00 min Step= 6.00 min End= 1440.00 min

Storm Tag Name = Pre..5

Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
Storm Frequency = 5 yr
Total Rainfall Depth= 1.8900 in
Duration Multiplier = 1
Resulting Duration = 1440.00 min
Resulting Start Time= .00 min Step= 6.00 min End= 1440.00 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - PRE-1 Pre..5
Tc = 46.00 min
Drainage Area = 193.500 acres Runoff CN= 83

==========

Computational Time Increment	=	6.133 min
Computed Peak Time	=	742.13 min
Computed Peak Flow	=	71.10 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	742.00 min
Peak Flow, Interpolated Output	=	70.99 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 83
Area = 193.500 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

.6211 in
10.015 ac-ft

HYG Volume... 10.015 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 46.000 min (ID: None Selected)
Computational Incr, Tm = 6.133 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	285.97 cfs
Unit peak time	Tp =	30.667 min
Unit receding limb,	Tr =	122.667 min
Total unit time,	Tb =	153.333 min

Index of Starting Page Numbers for ID Names

----- M -----
McCauley... 2.01

----- P -----
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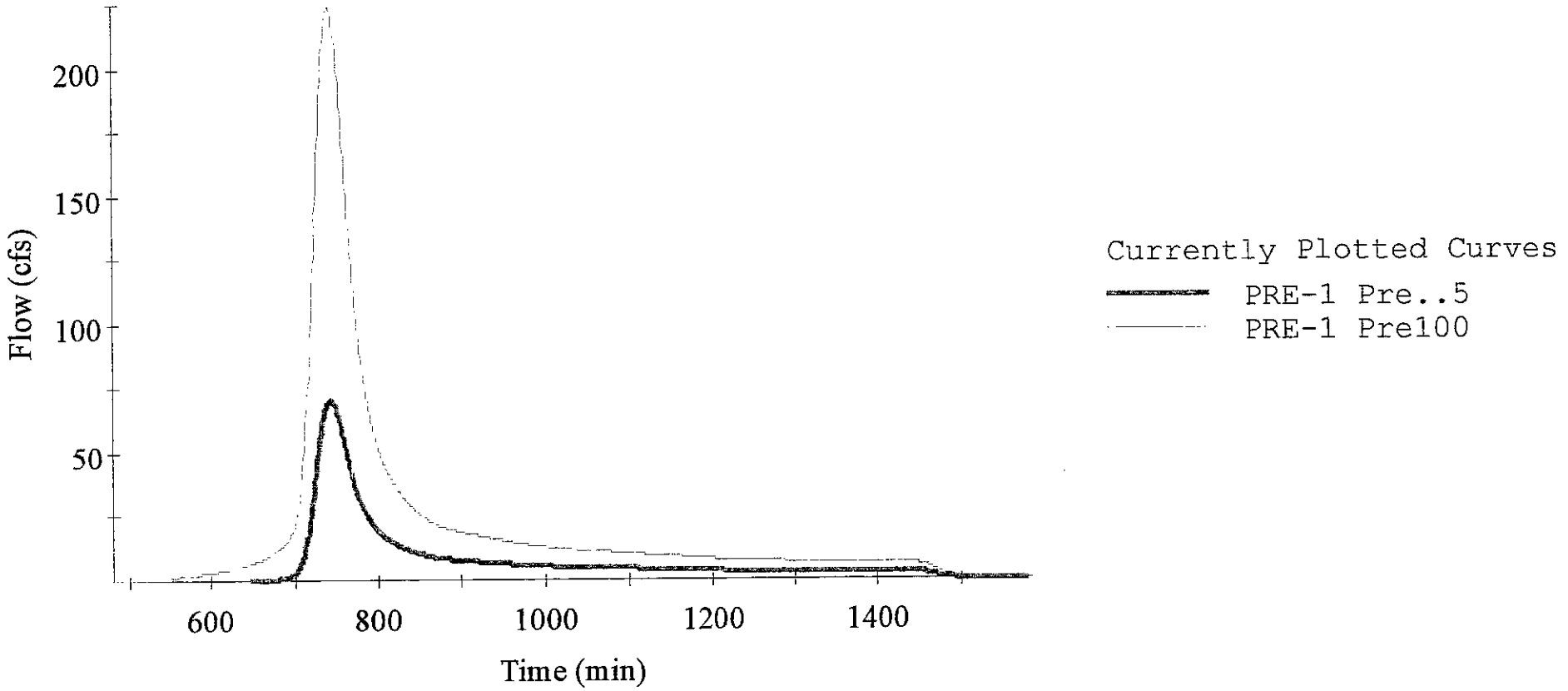
----- W -----
Watershed Pre..5... 1.01, 1.02

Hydrograph
PRE-1



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JOB TITLE
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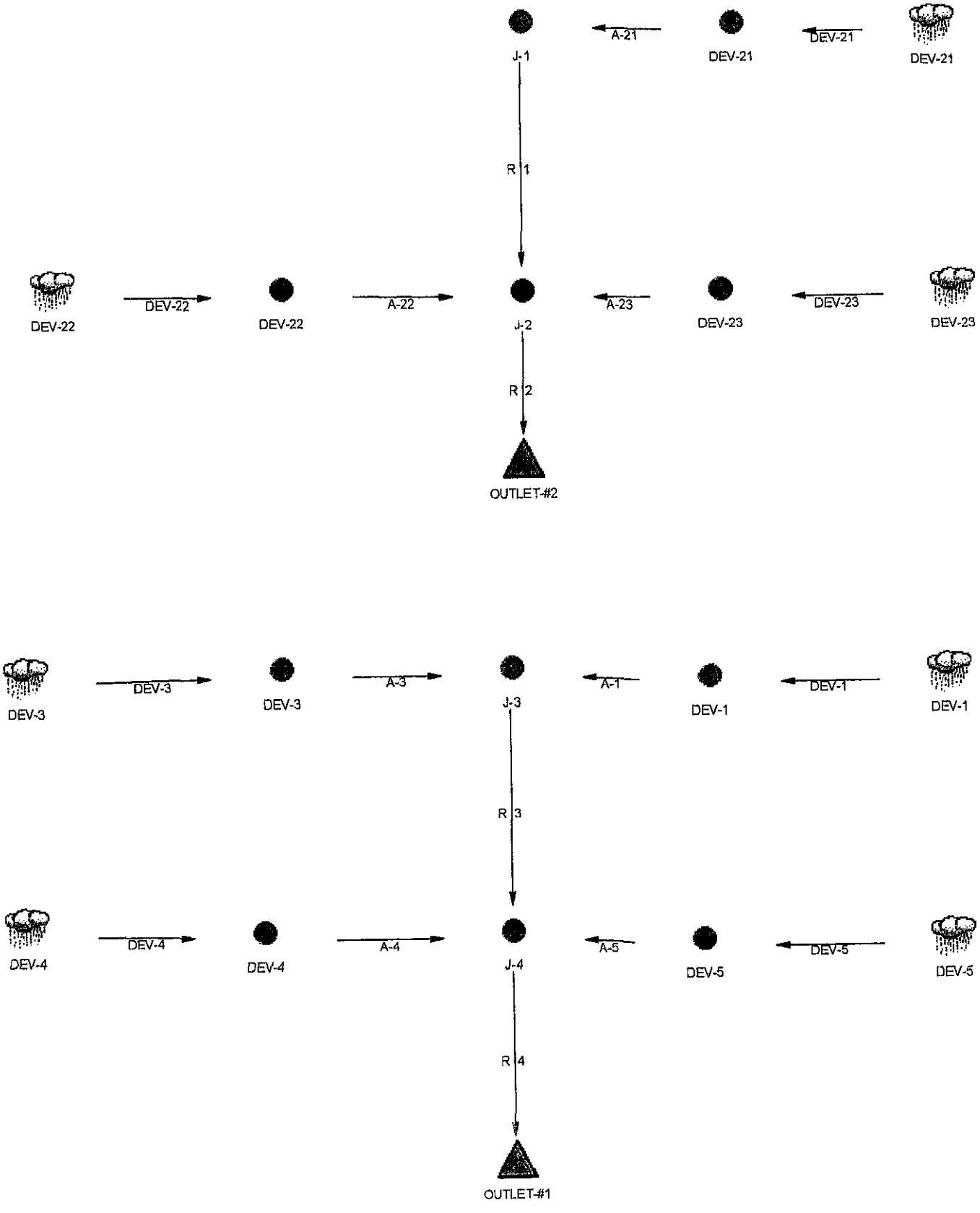
May 24, 2005
TEC Engineering Consultants
McCauley Ranch Estates
Developed Drainage Conditions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R 4
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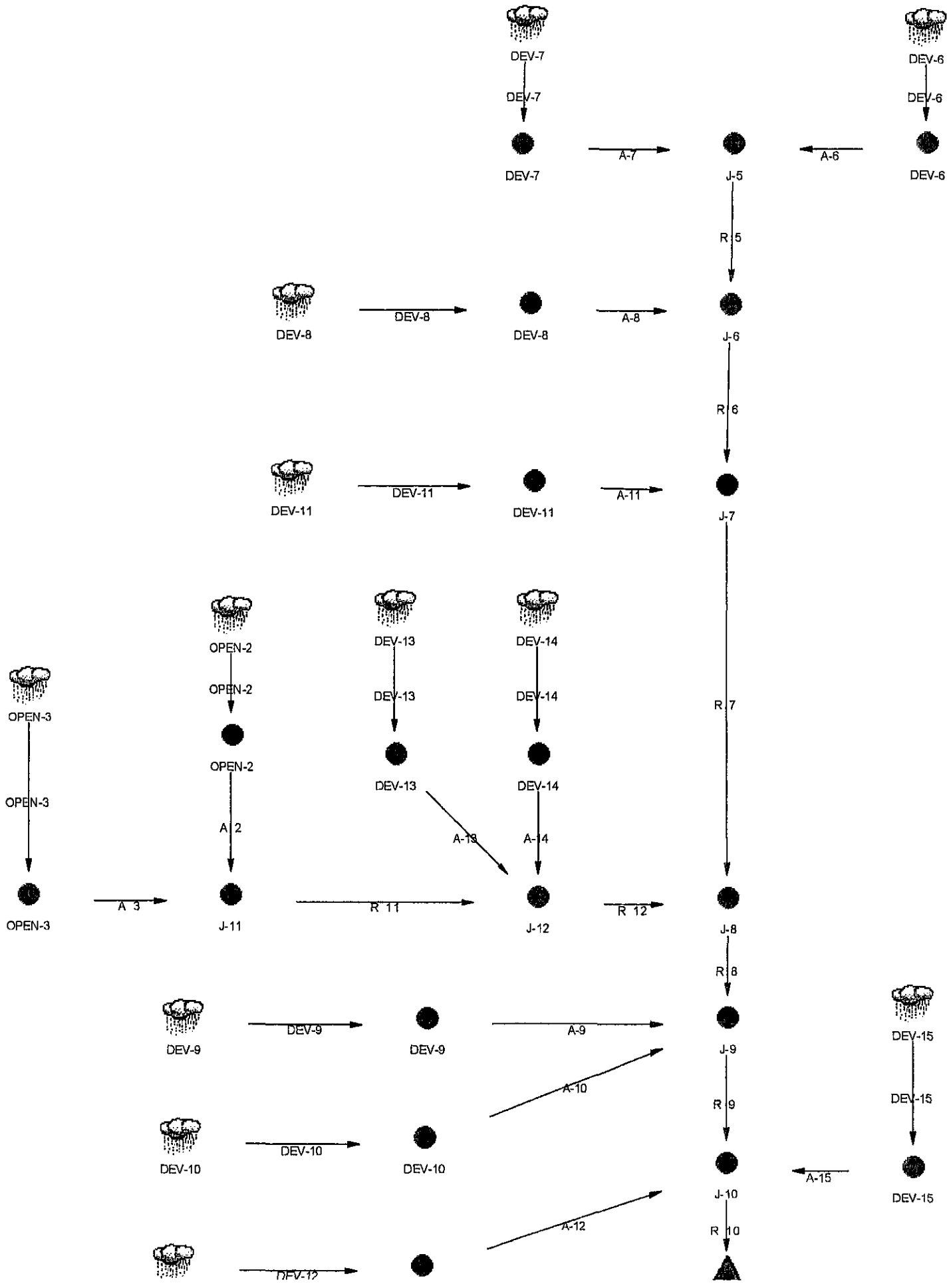
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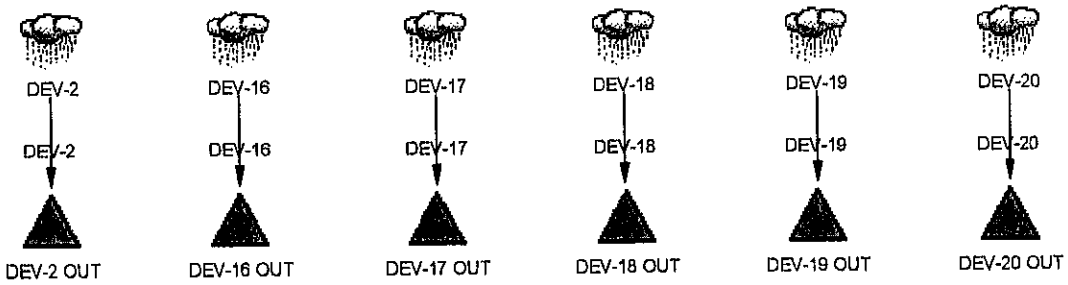
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DEV-2 OUT
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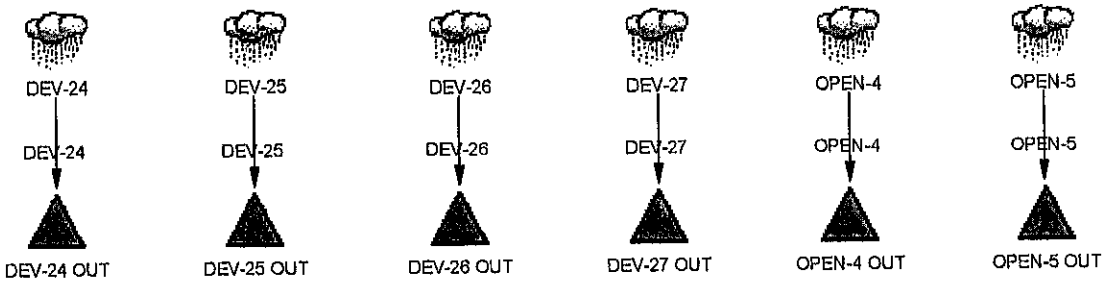
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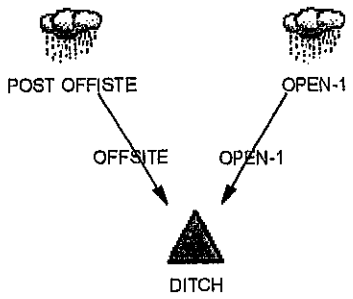
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Watershed..... Dev100
Executive Summary (Nodes) 1.04

********** DESIGN STORMS SUMMARY **********

McCauley..... Design Storms 2.01

********** RUNOFF HYDROGRAPHS **********

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SCS Unit Hyd. Summary 3.01

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SCS Unit Hyd. Summary 3.02

DEV-11..... Dev..5
SCS Unit Hyd. Summary 3.03

DEV-12..... Dev..5
SCS Unit Hyd. Summary 3.04

DEV-13..... Dev..5
SCS Unit Hyd. Summary 3.05

DEV-14..... Dev..5
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DEV-15..... Dev..5
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OPEN-5..... Dev..5
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POST OFFISTE.... Dev..5
SCS Unit Hyd. Summary 3.33

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

DEFAULT Design Storm File,ID = MCCAULEY.RNQ McCauley

Storm Tag Name = Dev..5

Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
Storm Frequency = 5 yr
Total Rainfall Depth= 1.8900 in
Duration Multiplier = 1
Resulting Duration = 1440.00 min
Resulting Start Time= .00 min Step= 6.00 min End= 1440.00 min

Node ID	Type	HYG Vol ac-ft	Trun.	Qpeak min	Qpeak cfs	Max WSEL ft
DEV-1	JCT	.163		721.00	2.62	
DEV-1	AREA	.163		721.00	2.62	
DEV-10	AREA	.154		720.00	2.47	
DEV-10	JCT	.154		720.00	2.47	
DEV-11	AREA	.189		720.00	3.08	
DEV-11	JCT	.189		720.00	3.08	
DEV-12	JCT	.183		721.00	2.84	
DEV-12	AREA	.183		721.00	2.84	
DEV-13	AREA	.088		722.00	1.29	
DEV-13	JCT	.088		722.00	1.29	
DEV-14	JCT	.064		720.00	1.03	
DEV-14	AREA	.064		720.00	1.03	
DEV-15	AREA	.013		720.00	.22	
DEV-15	JCT	.013		720.00	.22	
DEV-16	AREA	.349		722.00	5.32	
Outfall DEV-16 OUT	JCT	.349		722.00	5.32	
DEV-17	AREA	.253		724.00	3.41	
Outfall DEV-17 OUT	JCT	.253		724.00	3.41	
DEV-18	AREA	.085		721.00	1.35	
Outfall DEV-18 OUT	JCT	.085		721.00	1.35	
DEV-19	AREA	.231		721.00	3.71	
Outfall DEV-19 OUT	JCT	.231		721.00	3.71	
DEV-2	AREA	.092		720.00	1.48	
Outfall DEV-2 OUT	JCT	.092		720.00	1.48	
DEV-20	AREA	.028		720.00	.45	
Outfall DEV-20 OUT	JCT	.028		720.00	.45	
DEV-21	AREA	.208		720.00	3.39	
DEV-21	JCT	.208		720.00	3.39	
DEV-22	AREA	.190		721.00	2.95	
DEV-22	JCT	.190		721.00	2.95	
DEV-23	JCT	.203		722.00	3.10	
DEV-23	AREA	.203		722.00	3.10	

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

Node ID	Type	HYG Vol ac-ft	Trun.	Qpeak min	Qpeak cfs	Max WSEL ft
DEV-24	AREA	.052		720.00	.85	
Outfall DEV-24 OUT	JCT	.052		720.00	.85	
DEV-25	AREA	.094		720.00	1.53	
Outfall DEV-25 OUT	JCT	.094		720.00	1.53	
DEV-26	AREA	.068		718.00	1.01	
Outfall DEV-26 OUT	JCT	.068		718.00	1.01	
DEV-27	AREA	.080		718.00	1.20	
Outfall DEV-27 OUT	JCT	.080		718.00	1.20	
DEV-3	JCT	.052		720.00	.84	
DEV-3	AREA	.052		720.00	.84	
DEV-4	AREA	.114		720.00	1.83	
DEV-4	JCT	.114		720.00	1.83	
DEV-5	AREA	.037		720.00	.59	
DEV-5	JCT	.037		720.00	.59	
DEV-6	JCT	.196		720.00	3.17	
DEV-6	AREA	.196		720.00	3.17	
DEV-7	JCT	.048		720.00	.77	
DEV-7	AREA	.048		720.00	.77	
DEV-8	JCT	.025		720.00	.40	
DEV-8	AREA	.025		720.00	.40	
DEV-9	AREA	.065		720.00	1.05	
DEV-9	JCT	.065		720.00	1.05	
Outfall DITCH	JCT	7.016		732.00	65.78	
J-1	JCT	.208		720.00	3.39	
J-10	JCT	1.695		724.00	26.72	
J-11	JCT	.669		720.00	10.90	
J-12	JCT	.822		721.00	13.19	
J-2	JCT	.601		721.00	9.43	
J-3	JCT	.215		721.00	3.46	
J-4	JCT	.366		721.00	5.88	
J-5	JCT	.244		720.00	3.94	
J-6	JCT	.269		721.00	4.34	
J-7	JCT	.458		722.00	7.34	
J-8	JCT	1.279		722.00	20.52	
J-9	JCT	1.499		723.00	23.87	
OPEN-1	AREA	.349		720.00	5.69	
OPEN-2	AREA	.304		720.00	4.94	
OPEN-2	JCT	.304		720.00	4.94	
OPEN-3	AREA	.366		720.00	5.96	
OPEN-3	JCT	.366		720.00	5.96	
OPEN-4	AREA	.090		720.00	1.47	
Outfall OPEN-4 OUT	JCT	.090		720.00	1.47	
OPEN-5	AREA	.036		720.00	.58	

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

Node ID	Type	HYG Vol ac-ft	Trun.	Qpeak min	Qpeak cfs	Max WSEL ft
Outfall OPEN-5 OUT	JCT	.036		720.00	.58	
Outfall OUTLET-#1	JCT	.366		722.00	5.88	
Outfall OUTLET-#2	JCT	.601		722.00	9.43	
Outfall OUTLET-#3	JCT	1.695		725.00	26.72	
POST OFFISTE	AREA	6.666		732.00	63.93	

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

DEFAULT Design Storm File,ID = MCCAULEY.RNQ McCauley

Storm Tag Name = Dev100

Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
Storm Frequency = 100 yr
Total Rainfall Depth= 3.4700 in
Duration Multiplier = 1
Resulting Duration = 1440.00 min
Resulting Start Time= .00 min Step= 6.00 min End= 1440.00 min

Node ID	Type	HYG Vol ac-ft	Trun.	Qpeak min	Qpeak cfs	Max WSEL ft
DEV-1	JCT	.481		720.00	7.91	
DEV-1	AREA	.481		720.00	7.91	
DEV-10	AREA	.455		720.00	7.49	
DEV-10	JCT	.455		720.00	7.49	
DEV-11	AREA	.526		720.00	8.61	
DEV-11	JCT	.526		720.00	8.61	
DEV-12	JCT	.541		720.00	8.59	
DEV-12	AREA	.541		720.00	8.59	
DEV-13	AREA	.261		722.00	3.95	
DEV-13	JCT	.261		722.00	3.95	
DEV-14	JCT	.189		720.00	3.12	
DEV-14	AREA	.189		720.00	3.12	
DEV-15	AREA	.040		719.00	.65	
DEV-15	JCT	.040		719.00	.65	
DEV-16	AREA	.970		721.00	14.88	
Outfall DEV-16 OUT	JCT	.970		721.00	14.88	
DEV-17	AREA	.746		723.00	10.44	
Outfall DEV-17 OUT	JCT	.746		723.00	10.44	
DEV-18	AREA	.252		720.00	4.09	
Outfall DEV-18 OUT	JCT	.252		720.00	4.09	
DEV-19	AREA	.683		720.00	11.23	
Outfall DEV-19 OUT	JCT	.683		720.00	11.23	
DEV-2	AREA	.272		720.00	4.47	
Outfall DEV-2 OUT	JCT	.272		720.00	4.47	
DEV-20	AREA	.080		719.00	1.30	
Outfall DEV-20 OUT	JCT	.080		719.00	1.30	
DEV-21	AREA	.579		720.00	9.48	
DEV-21	JCT	.579		720.00	9.48	
DEV-22	AREA	.561		720.00	8.98	
DEV-22	JCT	.561		720.00	8.98	
DEV-23	JCT	.599		721.00	9.40	
DEV-23	AREA	.599		721.00	9.40	

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

Node ID	Type	HYG Vol ac-ft	Trun.	Qpeak min	Qpeak cfs	Max WSEL ft
DEV-24	AREA	.150		720.00	2.46	
Outfall DEV-24 OUT	JCT	.150		720.00	2.46	
DEV-25	AREA	.260		719.00	4.26	
Outfall DEV-25 OUT	JCT	.260		719.00	4.26	
DEV-26	AREA	.132		718.00	1.91	
Outfall DEV-26 OUT	JCT	.132		718.00	1.91	
DEV-27	AREA	.156		718.00	2.26	
Outfall DEV-27 OUT	JCT	.156		718.00	2.26	
DEV-3	JCT	.154		720.00	2.54	
DEV-3	AREA	.154		720.00	2.54	
DEV-4	AREA	.338		720.00	5.55	
DEV-4	JCT	.338		720.00	5.55	
DEV-5	AREA	.108		720.00	1.78	
DEV-5	JCT	.108		720.00	1.78	
DEV-6	JCT	.561		720.00	9.20	
DEV-6	AREA	.561		720.00	9.20	
DEV-7	JCT	.142		720.00	2.34	
DEV-7	AREA	.142		720.00	2.34	
DEV-8	JCT	.073		720.00	1.21	
DEV-8	AREA	.073		720.00	1.21	
DEV-9	AREA	.192		720.00	3.17	
DEV-9	JCT	.192		720.00	3.17	
Outfall DITCH	JCT	19.514		731.00	189.93	
J-1	JCT	.579		720.00	9.48	
J-10	JCT	4.842		723.00	77.51	
J-11	JCT	1.861		720.00	30.47	
J-12	JCT	2.312		721.00	37.46	
J-2	JCT	1.738		720.00	27.83	
J-3	JCT	.636		720.00	10.45	
J-4	JCT	1.082		720.00	17.75	
J-5	JCT	.703		720.00	11.54	
J-6	JCT	.776		721.00	12.73	
J-7	JCT	1.302		721.00	21.18	
J-8	JCT	3.613		722.00	58.64	
J-9	JCT	4.261		722.00	68.76	
OPEN-1	AREA	.972		720.00	15.92	
OPEN-2	AREA	.844		720.00	13.82	
OPEN-2	JCT	.844		720.00	13.82	
OPEN-3	AREA	1.017		720.00	16.65	
OPEN-3	JCT	1.017		720.00	16.65	
OPEN-4	AREA	.250		719.00	4.10	
Outfall OPEN-4 OUT	JCT	.250		719.00	4.10	
OPEN-5	AREA	.099		719.00	1.63	

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

	Node ID	Type	HYG Vol ac-ft	Trun.	Qpeak min	Qpeak cfs	Max WSEL ft
Outfall	OPEN-5 OUT	JCT	.099		719.00	1.63	
Outfall	OUTLET-#1	JCT	1.082		721.00	17.75	
Outfall	OUTLET-#2	JCT	1.738		721.00	27.83	
Outfall	OUTLET-#3	JCT	4.842		724.00	77.51	
	POST OFFISTE	AREA	18.542		732.00	184.97	

File.... C:\HAESTAD\PPKW\RAINFALL\MCCAULEY.RNQ
Title... May 24, 2005
TEC Engineering Consultants
McCauley Ranch Estates
Developed Drainage Conditions

DESIGN STORMS SUMMARY

Design Storm File,ID = MCCAULEY.RNQ McCauley

Storm Tag Name = Dev100

Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
Storm Frequency = 100 yr
Total Rainfall Depth= 3.4700 in
Duration Multiplier = 1
Resulting Duration = 1440.00 min
Resulting Start Time= .00 min Step= 6.00 min End= 1440.00 min

Storm Tag Name = Dev..5

Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
Storm Frequency = 5 yr
Total Rainfall Depth= 1.8900 in
Duration Multiplier = 1
Resulting Duration = 1440.00 min
Resulting Start Time= .00 min Step= 6.00 min End= 1440.00 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-1 Dev..5
Tc = 10.00 min
Drainage Area = 3.150 acres Runoff CN= 83

==========

Computational Time Increment	=	1.333 min
Computed Peak Time	=	721.33 min
Computed Peak Flow	=	2.62 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	721.00 min
Peak Flow, Interpolated Output	=	2.62 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 83
Area = 3.150 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

.6211 in
.163 ac-ft

HYG Volume... .163 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 10.000 min (ID: None Selected)
Computational Incr, Tm = 1.333 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	21.41 cfs
Unit peak time	Tp =	6.667 min
Unit receding limb,	Tr =	26.667 min
Total unit time,	Tb =	33.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-10 Dev..5
Tc = 10.00 min
Drainage Area = 2.980 acres Runoff CN= 83

==========

Computational Time Increment	=	1.333 min
Computed Peak Time	=	721.33 min
Computed Peak Flow	=	2.48 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	721.00 min
Peak Flow, Interpolated Output	=	2.48 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 83
Area = 2.980 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

.6211 in
.154 ac-ft

HYG Volume... .154 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 10.000 min (ID: None Selected)
Computational Incr, Tm = 1.333 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	20.26 cfs
Unit peak time	Tp =	6.667 min
Unit receding limb,	Tr =	26.667 min
Total unit time,	Tb =	33.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-11 Dev..5
Tc = 10.00 min
Drainage Area = 3.170 acres Runoff CN= 85

==========

Computational Time Increment	=	1.333 min
Computed Peak Time	=	720.00 min
Computed Peak Flow	=	3.08 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	720.00 min
Peak Flow, Interpolated Output	=	3.08 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 85
Area = 3.170 acres
S = 1.7647 in
0.2S = .3529 in

Cumulative Runoff

.7155 in
.189 ac-ft

HYG Volume... .189 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 10.000 min (ID: None Selected)
Computational Incr, Tm = 1.333 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	21.55 cfs
Unit peak time	Tp =	6.667 min
Unit receding limb,	Tr =	26.667 min
Total unit time,	Tb =	33.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-12 Dev..5
Tc = 11.26 min
Drainage Area = 3.540 acres Runoff CN= 83

==========

Computational Time Increment	=	1.501 min
Computed Peak Time	=	720.64 min
Computed Peak Flow	=	2.84 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	721.00 min
Peak Flow, Interpolated Output	=	2.84 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 83
Area = 3.540 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

.6211 in
.183 ac-ft

HYG Volume... .183 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 11.260 min (ID: None Selected)
Computational Incr, Tm = 1.501 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	21.37 cfs
Unit peak time	Tp =	7.507 min
Unit receding limb,	Tr =	30.027 min
Total unit time,	Tb =	37.533 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-13 Dev..5
Tc = 13.54 min
Drainage Area = 1.710 acres Runoff CN= 83

==========

Computational Time Increment	=	1.805 min
Computed Peak Time	=	722.13 min
Computed Peak Flow	=	1.30 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	722.00 min
Peak Flow, Interpolated Output	=	1.29 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 83
Area = 1.710 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

.6211 in
.089 ac-ft

HYG Volume... .088 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 13.540 min (ID: None Selected)
Computational Incr, Tm = 1.805 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	8.59 cfs
Unit peak time	Tp =	9.027 min
Unit receding limb,	Tr =	36.107 min
Total unit time,	Tb =	45.133 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-14 Dev..5
Tc = 10.00 min
Drainage Area = 1.240 acres Runoff CN= 83

==========

Computational Time Increment	=	1.333 min
Computed Peak Time	=	721.33 min
Computed Peak Flow	=	1.03 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	721.00 min
Peak Flow, Interpolated Output	=	1.03 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 83
Area = 1.240 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

.6211 in
.064 ac-ft

HYG Volume... .064 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 10.000 min (ID: None Selected)
Computational Incr, Tm = 1.333 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	8.43 cfs
Unit peak time	Tp =	6.667 min
Unit receding limb,	Tr =	26.667 min
Total unit time,	Tb =	33.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-15 Dev..5
Tc = 10.00 min
Drainage Area = .260 acres Runoff CN= 83

==========

Computational Time Increment	=	1.333 min
Computed Peak Time	=	721.33 min
Computed Peak Flow	=	.22 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	721.00 min
Peak Flow, Interpolated Output	=	.22 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 83
Area = .260 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

.6211 in
.013 ac-ft

HYG Volume... .013 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 10.000 min (ID: None Selected)
Computational Incr, Tm = 1.333 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	1.77 cfs
Unit peak time	Tp =	6.667 min
Unit receding limb,	Tr =	26.667 min
Total unit time,	Tb =	33.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-16 Dev..5
Tc = 12.71 min
Drainage Area = 5.850 acres Runoff CN= 85

==========

Computational Time Increment	=	1.695 min
Computed Peak Time	=	721.93 min
Computed Peak Flow	=	5.32 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	722.00 min
Peak Flow, Interpolated Output	=	5.32 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 85
Area = 5.850 acres
S = 1.7647 in
0.2S = .3529 in

Cumulative Runoff

.7155 in
.349 ac-ft

HYG Volume... .349 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 12.710 min (ID: None Selected)
Computational Incr, Tm = 1.695 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	31.29 cfs
Unit peak time	Tp =	8.473 min
Unit receding limb,	Tr =	33.893 min
Total unit time,	Tb =	42.367 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-17 Dev..5
Tc = 16.32 min
Drainage Area = 4.880 acres Runoff CN= 83

==========

Computational Time Increment	=	2.176 min
Computed Peak Time	=	724.61 min
Computed Peak Flow	=	3.43 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	724.00 min
Peak Flow, Interpolated Output	=	3.41 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 83
Area = 4.880 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

.6211 in
.253 ac-ft

HYG Volume... .253 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 16.320 min (ID: None Selected)
Computational Incr, Tm = 2.176 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	20.33 cfs
Unit peak time	Tp =	10.880 min
Unit receding limb,	Tr =	43.520 min
Total unit time,	Tb =	54.400 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-18 Dev..5
Tc = 10.52 min
Drainage Area = 1.650 acres Runoff CN= 83

==========

Computational Time Increment	=	1.403 min
Computed Peak Time	=	720.97 min
Computed Peak Flow	=	1.35 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	721.00 min
Peak Flow, Interpolated Output	=	1.35 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 83
Area = 1.650 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

.6211 in
.085 ac-ft

HYG Volume... .085 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 10.520 min (ID: None Selected)
Computational Incr, Tm = 1.403 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	10.66 cfs
Unit peak time	Tp =	7.013 min
Unit receding limb,	Tr =	28.053 min
Total unit time,	Tb =	35.067 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-19 Dev..5
Tc = 10.00 min
Drainage Area = 4.470 acres Runoff CN= 83

==========

Computational Time Increment	=	1.333 min
Computed Peak Time	=	721.33 min
Computed Peak Flow	=	3.72 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	721.00 min
Peak Flow, Interpolated Output	=	3.71 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 83
Area = 4.470 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

.6211 in
.231 ac-ft

HYG Volume... .231 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 10.000 min (ID: None Selected)
Computational Incr, Tm = 1.333 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	30.39 cfs
Unit peak time	Tp =	6.667 min
Unit receding limb,	Tr =	26.667 min
Total unit time,	Tb =	33.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-2 Dev..5
Tc = 10.00 min
Drainage Area = 1.780 acres Runoff CN= 83

==========

Computational Time Increment	=	1.333 min
Computed Peak Time	=	721.33 min
Computed Peak Flow	=	1.48 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	721.00 min
Peak Flow, Interpolated Output	=	1.48 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 83
Area = 1.780 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

.6211 in
.092 ac-ft

HYG Volume... .092 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 10.000 min (ID: None Selected)
Computational Incr, Tm = 1.333 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	12.10 cfs
Unit peak time	Tp =	6.667 min
Unit receding limb,	Tr =	26.667 min
Total unit time,	Tb =	33.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-20 Dev..5
Tc = 10.00 min
Drainage Area = .500 acres Runoff CN= 84

==========

Computational Time Increment	=	1.333 min
Computed Peak Time	=	720.00 min
Computed Peak Flow	=	.45 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	720.00 min
Peak Flow, Interpolated Output	=	.45 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 84
Area = .500 acres
S = 1.9048 in
0.2S = .3810 in

Cumulative Runoff

.6671 in
.028 ac-ft

HYG Volume... .028 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 10.000 min (ID: None Selected)
Computational Incr, Tm = 1.333 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	3.40 cfs
Unit peak time	Tp =	6.667 min
Unit receding limb,	Tr =	26.667 min
Total unit time,	Tb =	33.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-21 Dev..5
Tc = 10.00 min
Drainage Area = 3.490 acres Runoff CN= 85

==========

Computational Time Increment	=	1.333 min
Computed Peak Time	=	720.00 min
Computed Peak Flow	=	3.39 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	720.00 min
Peak Flow, Interpolated Output	=	3.39 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 85
Area = 3.490 acres
S = 1.7647 in
0.2S = .3529 in

Cumulative Runoff

.7155 in
.208 ac-ft

HYG Volume... .208 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 10.000 min (ID: None Selected)
Computational Incr, Tm = 1.333 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 23.73 cfs
Unit peak time Tp = 6.667 min
Unit receding limb, Tr = 26.667 min
Total unit time, Tb = 33.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-22 Dev..5
Tc = 11.25 min
Drainage Area = 3.670 acres Runoff CN= 83

==========

Computational Time Increment	=	1.500 min
Computed Peak Time	=	721.50 min
Computed Peak Flow	=	2.97 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	721.00 min
Peak Flow, Interpolated Output	=	2.95 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 83
Area = 3.670 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

.6211 in
.190 ac-ft

HYG Volume... .190 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 11.250 min (ID: None Selected)
Computational Incr, Tm = 1.500 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	22.18 cfs
Unit peak time	Tp =	7.500 min
Unit receding limb,	Tr =	30.000 min
Total unit time,	Tb =	37.500 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-23 Dev..5
Tc = 11.92 min
Drainage Area = 3.920 acres Runoff CN= 83

==========

Computational Time Increment	=	1.589 min
Computed Peak Time	=	721.56 min
Computed Peak Flow	=	3.11 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	722.00 min
Peak Flow, Interpolated Output	=	3.10 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 83
Area = 3.920 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

.6211 in
.203 ac-ft

HYG Volume... .203 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 11.920 min (ID: None Selected)
Computational Incr, Tm = 1.589 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	22.36 cfs
Unit peak time	Tp =	7.947 min
Unit receding limb,	Tr =	31.787 min
Total unit time,	Tb =	39.733 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-24 Dev..5
Tc = 10.00 min
Drainage Area = .940 acres Runoff CN= 84

==========

Computational Time Increment	=	1.333 min
Computed Peak Time	=	720.00 min
Computed Peak Flow	=	.85 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	720.00 min
Peak Flow, Interpolated Output	=	.85 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 84
Area = .940 acres
S = 1.9048 in
0.2S = .3810 in

Cumulative Runoff

.6671 in
.052 ac-ft

HYG Volume... .052 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 10.000 min (ID: None Selected)
Computational Incr, Tm = 1.333 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	6.39 cfs
Unit peak time	Tp =	6.667 min
Unit receding limb,	Tr =	26.667 min
Total unit time,	Tb =	33.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-25 Dev..5
Tc = 10.00 min
Drainage Area = 1.570 acres Runoff CN= 85

==========

Computational Time Increment	=	1.333 min
Computed Peak Time	=	720.00 min
Computed Peak Flow	=	1.53 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	720.00 min
Peak Flow, Interpolated Output	=	1.53 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 85
Area = 1.570 acres
S = 1.7647 in
0.2S = .3529 in

Cumulative Runoff

.7155 in
.094 ac-ft

HYG Volume... .094 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 10.000 min (ID: None Selected)
Computational Incr, Tm = 1.333 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	10.67 cfs
Unit peak time	Tp =	6.667 min
Unit receding limb,	Tr =	26.667 min
Total unit time,	Tb =	33.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-26 Dev..5
Tc = 10.00 min
Drainage Area = .490 acres Runoff CN= 98

==========

Computational Time Increment	=	1.333 min
Computed Peak Time	=	718.67 min
Computed Peak Flow	=	1.02 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	719.00 min
Peak Flow, Interpolated Output	=	1.02 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 98
Area = .490 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

1.6654 in
.068 ac-ft

HYG Volume... .068 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 10.000 min (ID: None Selected)
Computational Incr, Tm = 1.333 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	3.33 cfs
Unit peak time	Tp =	6.667 min
Unit receding limb,	Tr =	26.667 min
Total unit time,	Tb =	33.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-27 Dev..5
Tc = 10.00 min
Drainage Area = .580 acres Runoff CN= 98

==========

Computational Time Increment	=	1.333 min
Computed Peak Time	=	718.67 min
Computed Peak Flow	=	1.21 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	719.00 min
Peak Flow, Interpolated Output	=	1.20 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 98
Area = .580 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

1.6654 in
.080 ac-ft

HYG Volume... .080 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 10.000 min (ID: None Selected)
Computational Incr, Tm = 1.333 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	3.94 cfs
Unit peak time	Tp =	6.667 min
Unit receding limb,	Tr =	26.667 min
Total unit time,	Tb =	33.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-3 Dev..5
Tc = 10.00 min
Drainage Area = 1.010 acres Runoff CN= 83

==========

Computational Time Increment	=	1.333 min
Computed Peak Time	=	721.33 min
Computed Peak Flow	=	.84 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	721.00 min
Peak Flow, Interpolated Output	=	.84 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 83
Area = 1.010 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

.6211 in
.052 ac-ft

HYG Volume... .052 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 10.000 min (ID: None Selected)
Computational Incr, Tm = 1.333 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	6.87 cfs
Unit peak time	Tp =	6.667 min
Unit receding limb,	Tr =	26.667 min
Total unit time,	Tb =	33.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-4 Dev..5
Tc = 10.00 min
Drainage Area = 2.210 acres Runoff CN= 83

==========

Computational Time Increment	=	1.333 min
Computed Peak Time	=	721.33 min
Computed Peak Flow	=	1.84 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	721.00 min
Peak Flow, Interpolated Output	=	1.84 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 83
Area = 2.210 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

.6211 in
.114 ac-ft

HYG Volume... .114 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 10.000 min (ID: None Selected)
Computational Incr, Tm = 1.333 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	15.02 cfs
Unit peak time	Tp =	6.667 min
Unit receding limb,	Tr =	26.667 min
Total unit time,	Tb =	33.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-5 Dev..5
Tc = 10.00 min
Drainage Area = .710 acres Runoff CN= 83

==========
Computational Time Increment = 1.333 min
Computed Peak Time = 721.33 min
Computed Peak Flow = .59 cfs

Time Increment for HYG File = 1.00 min
Peak Time, Interpolated Output = 721.00 min
Peak Flow, Interpolated Output = .59 cfs
==========

DRAINAGE AREA

ID:None Selected
CN = 83
Area = .710 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

.6211 in
.037 ac-ft

HYG Volume... .037 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 10.000 min (ID: None Selected)
Computational Incr, Tm = 1.333 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 4.83 cfs
Unit peak time Tp = 6.667 min
Unit receding limb, Tr = 26.667 min
Total unit time, Tb = 33.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-6 Dev..5
Tc = 10.00 min
Drainage Area = 3.520 acres Runoff CN= 84

==========

Computational Time Increment	=	1.333 min
Computed Peak Time	=	720.00 min
Computed Peak Flow	=	3.17 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	720.00 min
Peak Flow, Interpolated Output	=	3.17 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 84
Area = 3.520 acres
S = 1.9048 in
0.2S = .3810 in

Cumulative Runoff

.6671 in
.196 ac-ft

HYG Volume... .196 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 10.000 min (ID: None Selected)
Computational Incr, Tm = 1.333 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	23.93 cfs
Unit peak time	Tp =	6.667 min
Unit receding limb,	Tr =	26.667 min
Total unit time,	Tb =	33.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-7 Dev..5
Tc = 10.00 min
Drainage Area = .930 acres Runoff CN= 83

==========

Computational Time Increment	=	1.333 min
Computed Peak Time	=	721.33 min
Computed Peak Flow	=	.77 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	721.00 min
Peak Flow, Interpolated Output	=	.77 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 83
Area = .930 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

.6211 in
.048 ac-ft

HYG Volume... .048 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 10.000 min (ID: None Selected)
Computational Incr, Tm = 1.333 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	6.32 cfs
Unit peak time	Tp =	6.667 min
Unit receding limb,	Tr =	26.667 min
Total unit time,	Tb =	33.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-8 Dev..5
Tc = 10.00 min
Drainage Area = .480 acres Runoff CN= 83

==========

Computational Time Increment	=	1.333 min
Computed Peak Time	=	721.33 min
Computed Peak Flow	=	.40 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	721.00 min
Peak Flow, Interpolated Output	=	.40 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 83
Area = .480 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

.6211 in
.025 ac-ft

HYG Volume... .025 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 10.000 min (ID: None Selected)
Computational Incr, Tm = 1.333 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	3.26 cfs
Unit peak time	Tp =	6.667 min
Unit receding limb,	Tr =	26.667 min
Total unit time,	Tb =	33.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - DEV-9 Dev..5
Tc = 10.00 min
Drainage Area = 1.260 acres Runoff CN= 83

==========

Computational Time Increment	=	1.333 min
Computed Peak Time	=	721.33 min
Computed Peak Flow	=	1.05 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	721.00 min
Peak Flow, Interpolated Output	=	1.05 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 83
Area = 1.260 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

.6211 in
.065 ac-ft

HYG Volume... .065 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 10.000 min (ID: None Selected)
Computational Incr, Tm = 1.333 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	8.57 cfs
Unit peak time	Tp =	6.667 min
Unit receding limb,	Tr =	26.667 min
Total unit time,	Tb =	33.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - OPEN-1 Dev..5
Tc = 10.00 min
Drainage Area = 5.860 acres Runoff CN= 85

==========

Computational Time Increment	=	1.333 min
Computed Peak Time	=	720.00 min
Computed Peak Flow	=	5.69 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	720.00 min
Peak Flow, Interpolated Output	=	5.69 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 85
Area = 5.860 acres
S = 1.7647 in
0.2S = .3529 in

Cumulative Runoff

.7155 in
.349 ac-ft

HYG Volume... .349 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 10.000 min (ID: None Selected)
Computational Incr, Tm = 1.333 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	39.84 cfs
Unit peak time	Tp =	6.667 min
Unit receding limb,	Tr =	26.667 min
Total unit time,	Tb =	33.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - OPEN-2 Dev..5
Tc = 10.00 min
Drainage Area = 5.090 acres Runoff CN= 85

==========

Computational Time Increment	=	1.333 min
Computed Peak Time	=	720.00 min
Computed Peak Flow	=	4.94 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	720.00 min
Peak Flow, Interpolated Output	=	4.94 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 85
Area = 5.090 acres
S = 1.7647 in
0.2S = .3529 in

Cumulative Runoff

.7155 in
.304 ac-ft

HYG Volume... .304 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 10.000 min (ID: None Selected)
Computational Incr, Tm = 1.333 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	34.60 cfs
Unit peak time	Tp =	6.667 min
Unit receding limb,	Tr =	26.667 min
Total unit time,	Tb =	33.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - OPEN-3 Dev..5
Tc = 10.00 min
Drainage Area = 6.130 acres Runoff CN= 85

==========

Computational Time Increment	=	1.333 min
Computed Peak Time	=	720.00 min
Computed Peak Flow	=	5.96 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	720.00 min
Peak Flow, Interpolated Output	=	5.96 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 85
Area = 6.130 acres
S = 1.7647 in
0.2S = .3529 in

Cumulative Runoff

.7155 in
.366 ac-ft

HYG Volume... .366 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 10.000 min (ID: None Selected)
Computational Incr, Tm = 1.333 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 41.67 cfs
Unit peak time Tp = 6.667 min
Unit receding limb, Tr = 26.667 min
Total unit time, Tb = 33.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - OPEN-4 Dev..5
Tc = 10.00 min
Drainage Area = 1.510 acres Runoff CN= 85

==========
Computational Time Increment = 1.333 min
Computed Peak Time = 720.00 min
Computed Peak Flow = 1.47 cfs

Time Increment for HYG File = 1.00 min
Peak Time, Interpolated Output = 720.00 min
Peak Flow, Interpolated Output = 1.47 cfs
==========

DRAINAGE AREA

ID:None Selected
CN = 85
Area = 1.510 acres
S = 1.7647 in
0.2S = .3529 in

Cumulative Runoff

.7155 in
.090 ac-ft

HYG Volume... .090 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 10.000 min (ID: None Selected)
Computational Incr, Tm = 1.333 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 10.27 cfs
Unit peak time Tp = 6.667 min
Unit receding limb, Tr = 26.667 min
Total unit time, Tb = 33.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - OPEN-5 Dev..5
Tc = 10.00 min
Drainage Area = .600 acres Runoff CN= 85

==========

Computational Time Increment	=	1.333 min
Computed Peak Time	=	720.00 min
Computed Peak Flow	=	.58 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	720.00 min
Peak Flow, Interpolated Output	=	.58 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 85
Area = .600 acres
S = 1.7647 in
0.2S = .3529 in

Cumulative Runoff

.7155 in
.036 ac-ft

HYG Volume... .036 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 10.000 min (ID: None Selected)
Computational Incr, Tm = 1.333 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	4.08 cfs
Unit peak time	Tp =	6.667 min
Unit receding limb,	Tr =	26.667 min
Total unit time,	Tb =	33.333 min

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 5 year storm
Duration = 1440.00 min Rain Depth = 1.8900 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\MCCAULEY RANCH\
HYG File - ID = - POST OFFISTE Dev..5
Tc = 31.00 min
Drainage Area = 111.800 acres Runoff CN= 85

==========

Computational Time Increment	=	4.133 min
Computed Peak Time	=	731.60 min
Computed Peak Flow	=	64.11 cfs
Time Increment for HYG File	=	1.00 min
Peak Time, Interpolated Output	=	732.00 min
Peak Flow, Interpolated Output	=	63.93 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 85
Area = 111.800 acres
S = 1.7647 in
0.2S = .3529 in

Cumulative Runoff

.7155 in
6.666 ac-ft

HYG Volume... 6.666 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = 31.000 min (ID: None Selected)
Computational Incr, Tm = 4.133 min = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	245.18 cfs
Unit peak time	Tp =	20.667 min
Unit receding limb,	Tr =	82.667 min
Total unit time,	Tb =	103.333 min

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DEV-10 Dev..5... 3.02
DEV-11 Dev..5... 3.03
DEV-12 Dev..5... 3.04
DEV-13 Dev..5... 3.05
DEV-14 Dev..5... 3.06
DEV-15 Dev..5... 3.07
DEV-16 Dev..5... 3.08
DEV-17 Dev..5... 3.09
DEV-18 Dev..5... 3.10
DEV-19 Dev..5... 3.11
DEV-2 Dev..5... 3.12
DEV-20 Dev..5... 3.13
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DEV-23 Dev..5... 3.16
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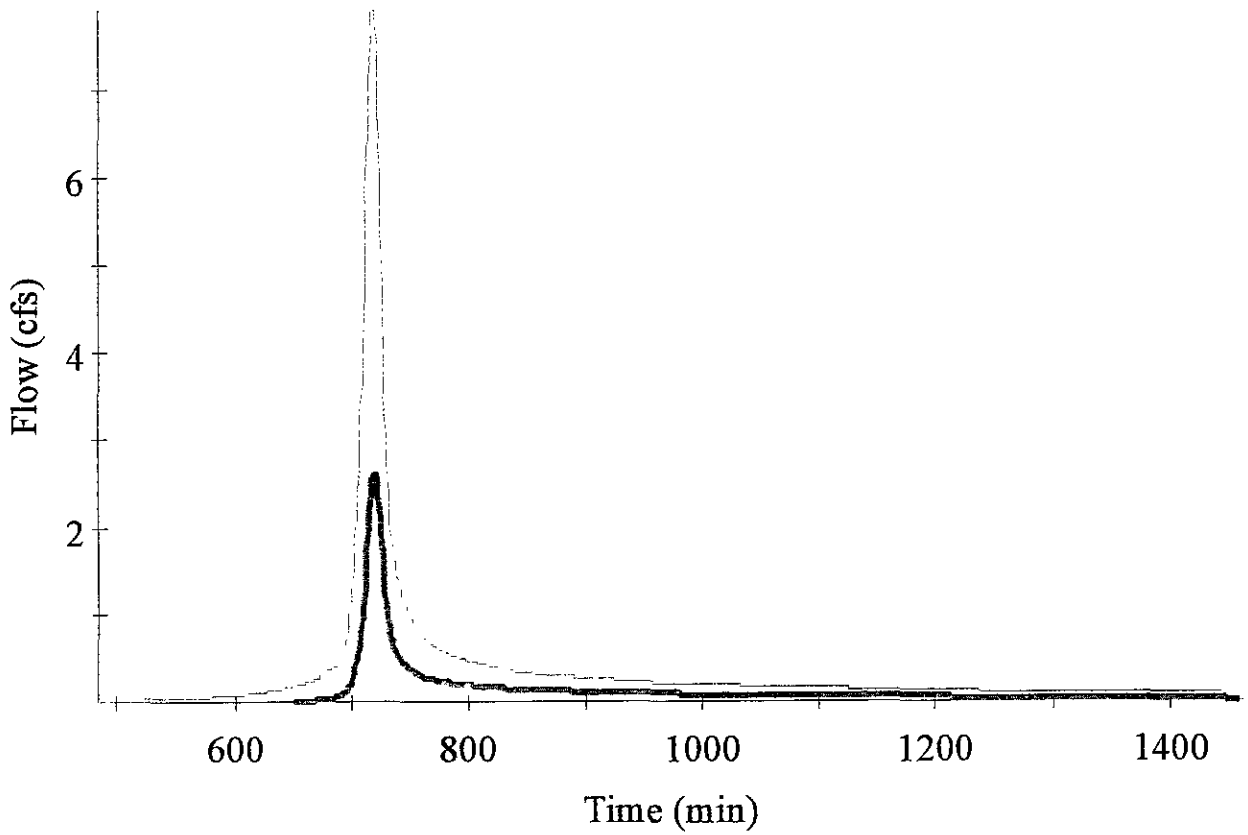
McCauley... 2.01

----- O -----
OPEN-1 Dev..5... 3.28
OPEN-2 Dev..5... 3.29
OPEN-3 Dev..5... 3.30
OPEN-4 Dev..5... 3.31
OPEN-5 Dev..5... 3.32

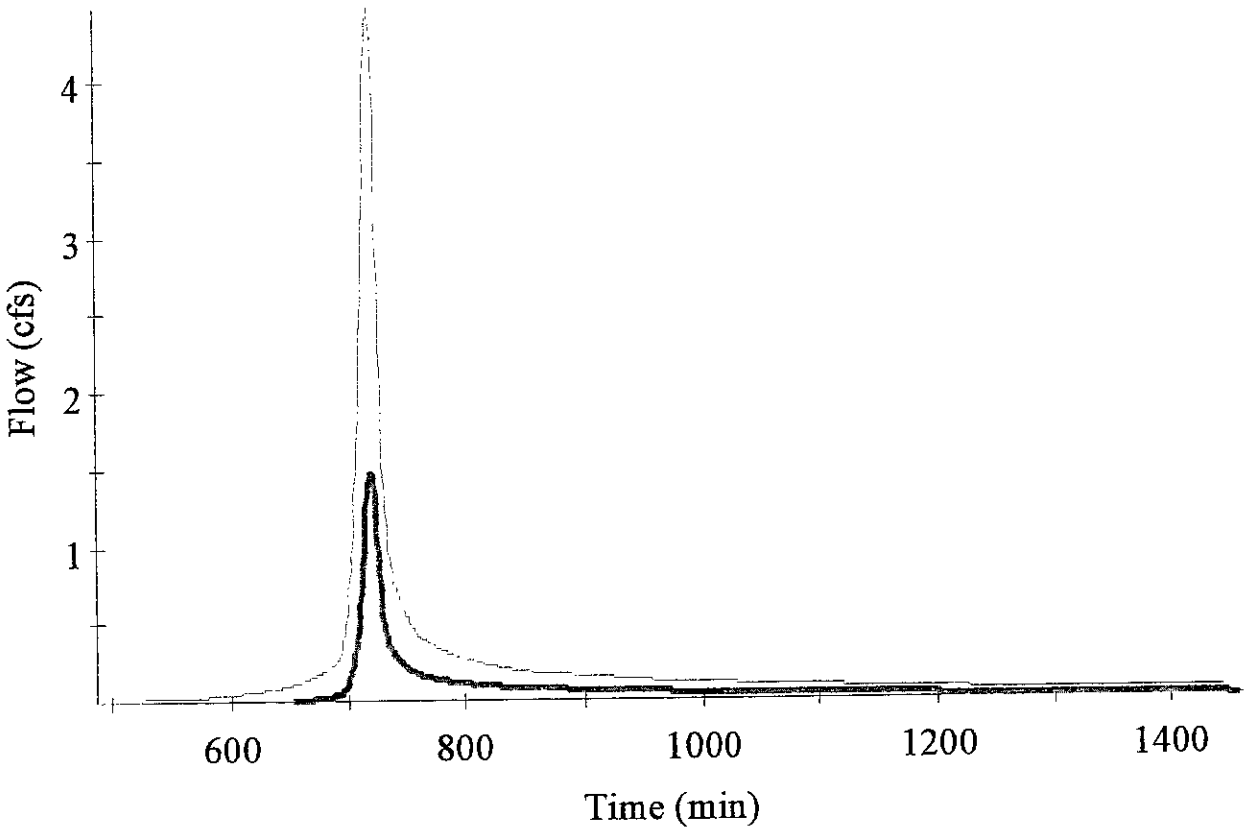
----- P -----
POST OFFISTE Dev..5... 3.33

----- W -----
Watershed Dev..5... 1.01, 1.04

Hydrograph
DEV-1

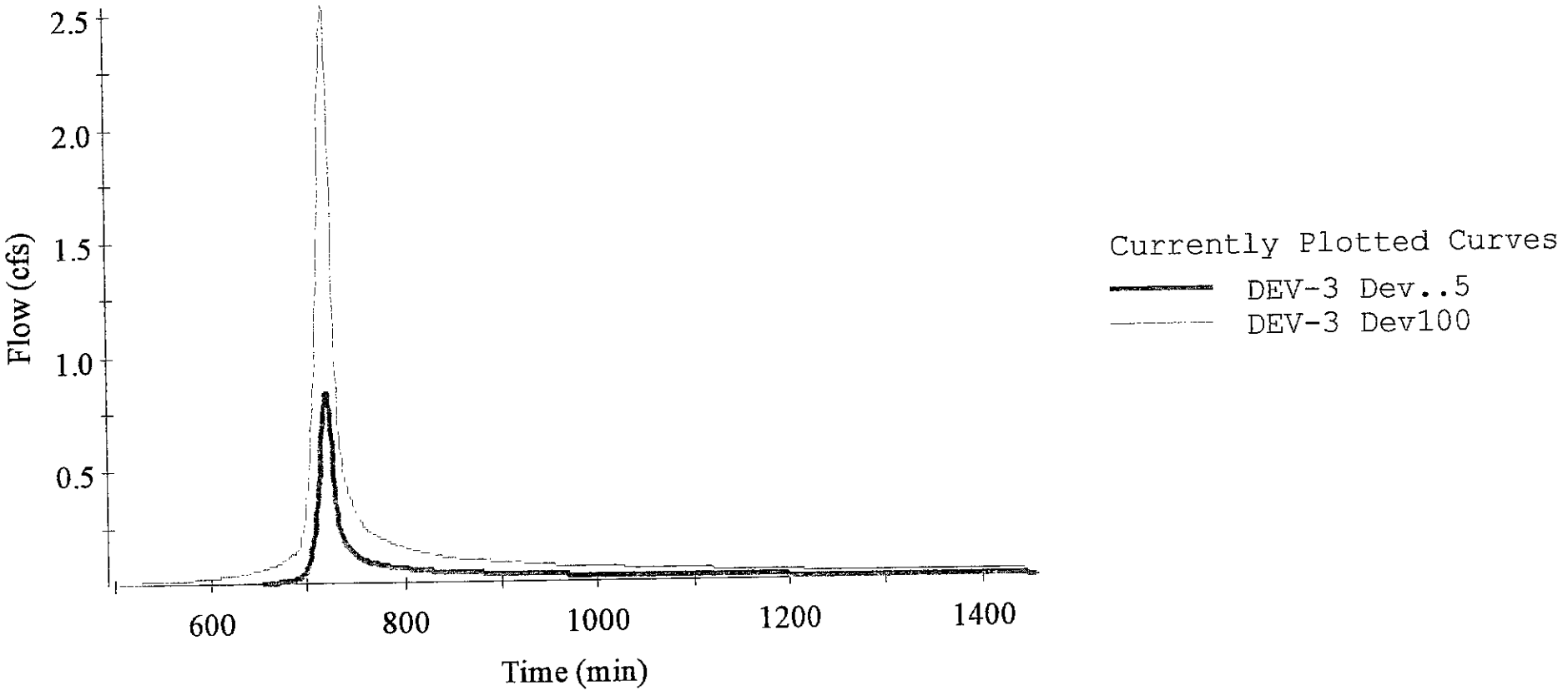


Hydrograph
DEV-2

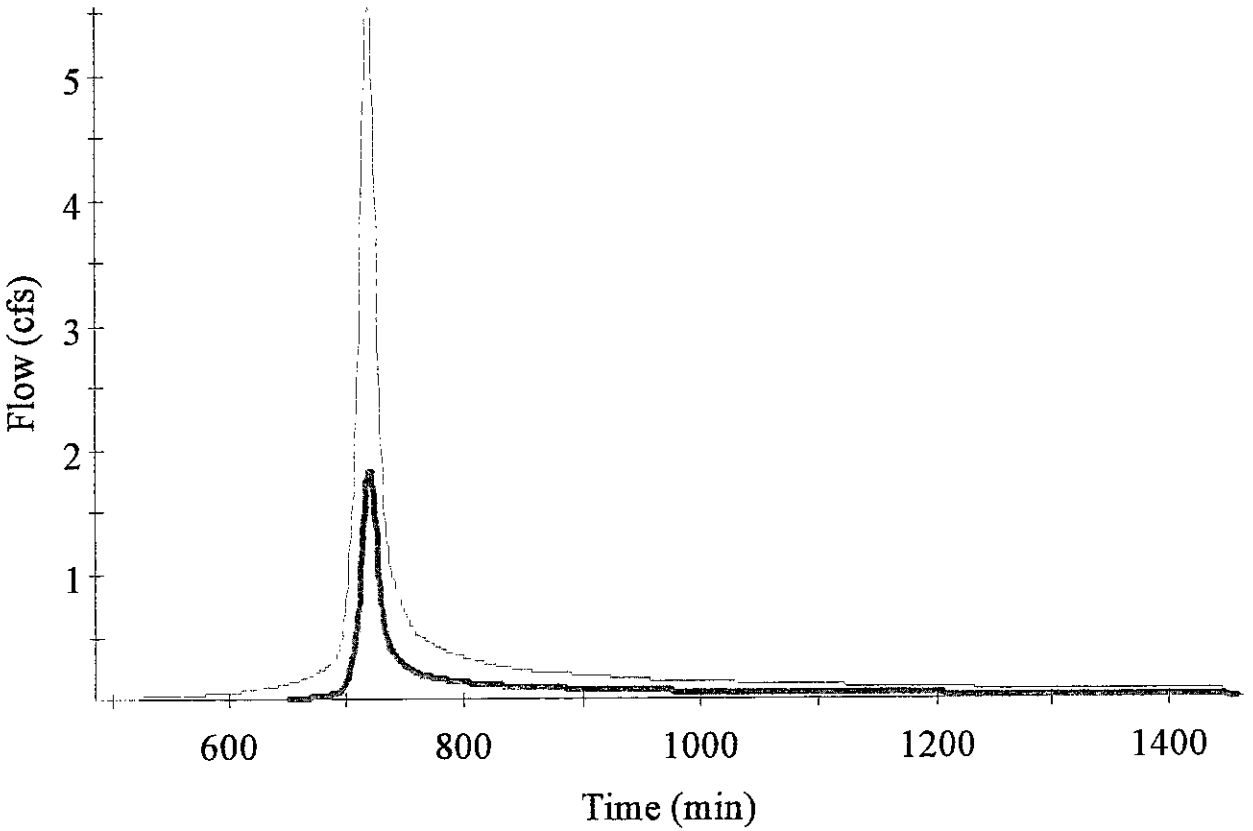


Currently Plotted Curves
DEV-2 Dev..5
DEV-2 Dev100

Hydrograph
DEV-3



Hydrograph
DEV-4

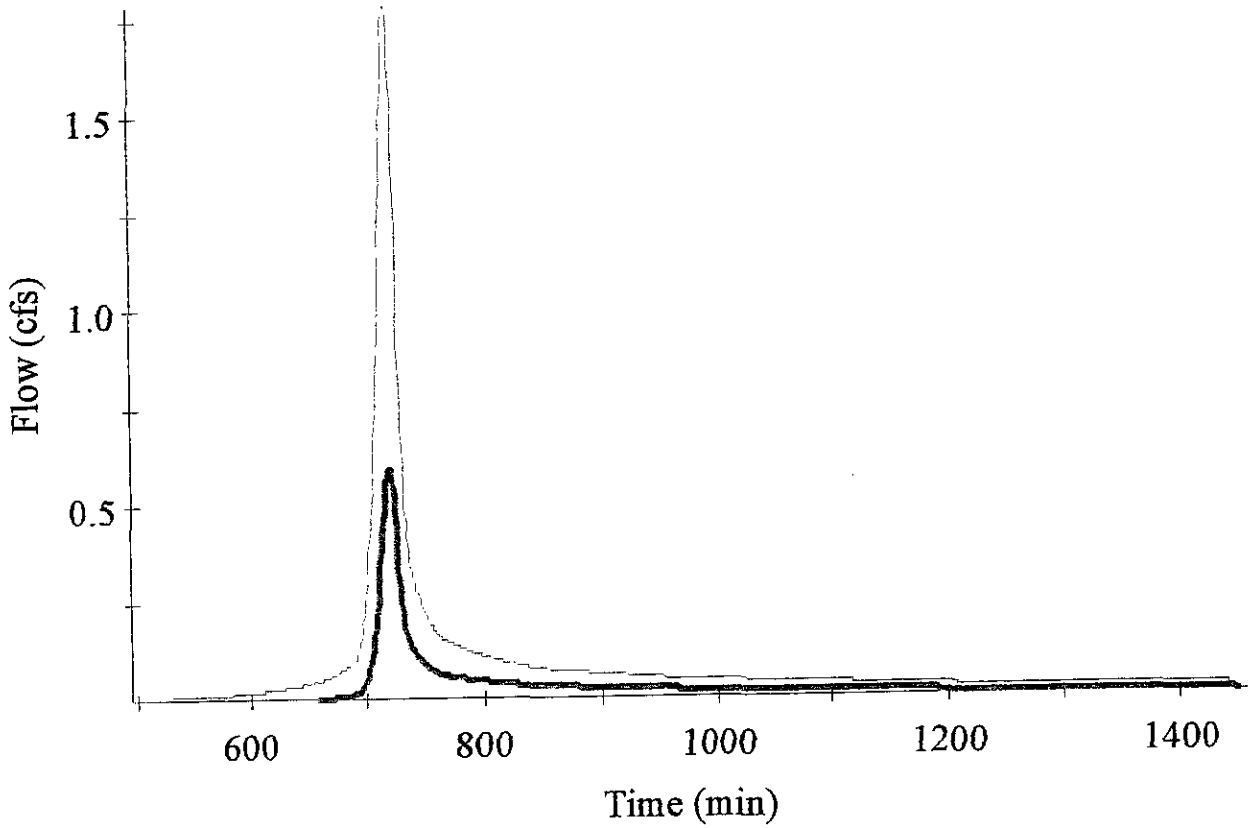


Currently Plotted Curves

DEV-4 Dev..5

DEV-4 Dev100

Hydrograph
DEV-5

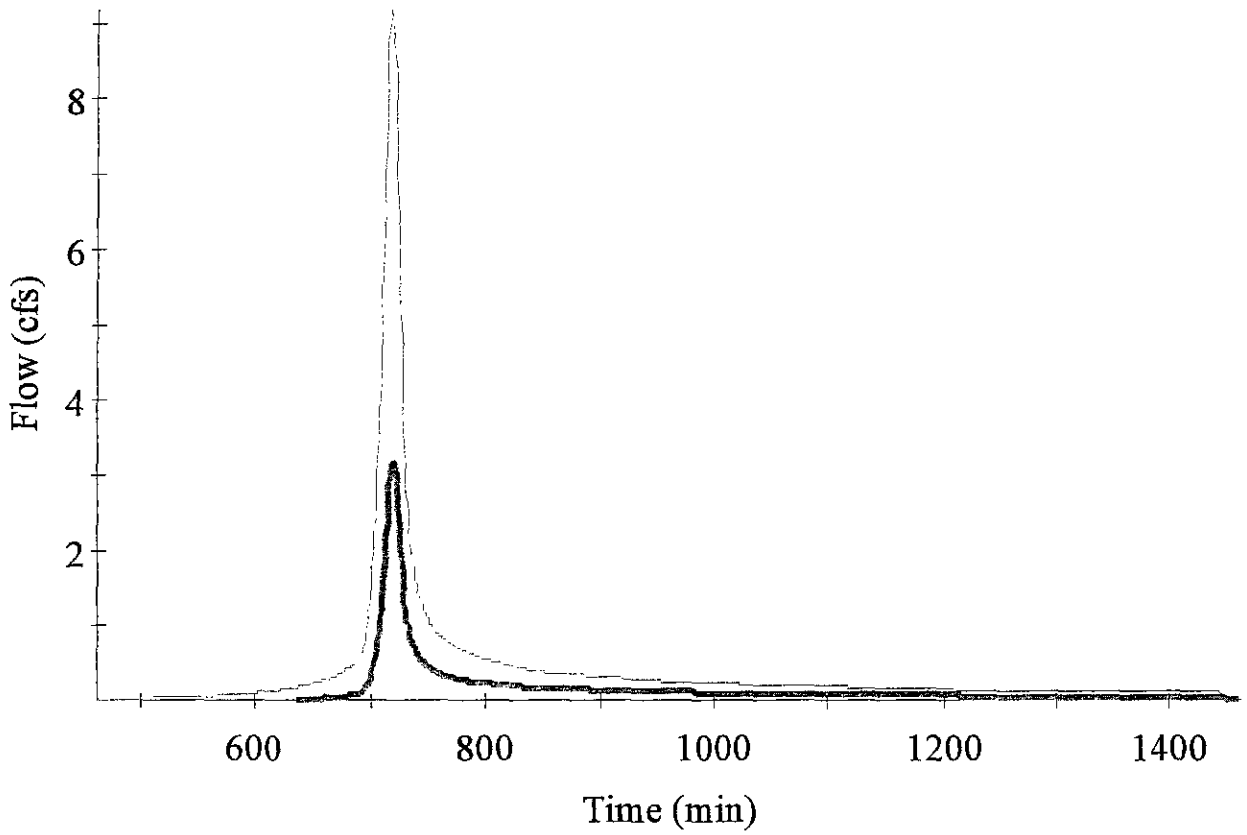


Currently Plotted Curves

DEV-5 Dev..5

DEV-5 Dev100

Hydrograph
DEV-6

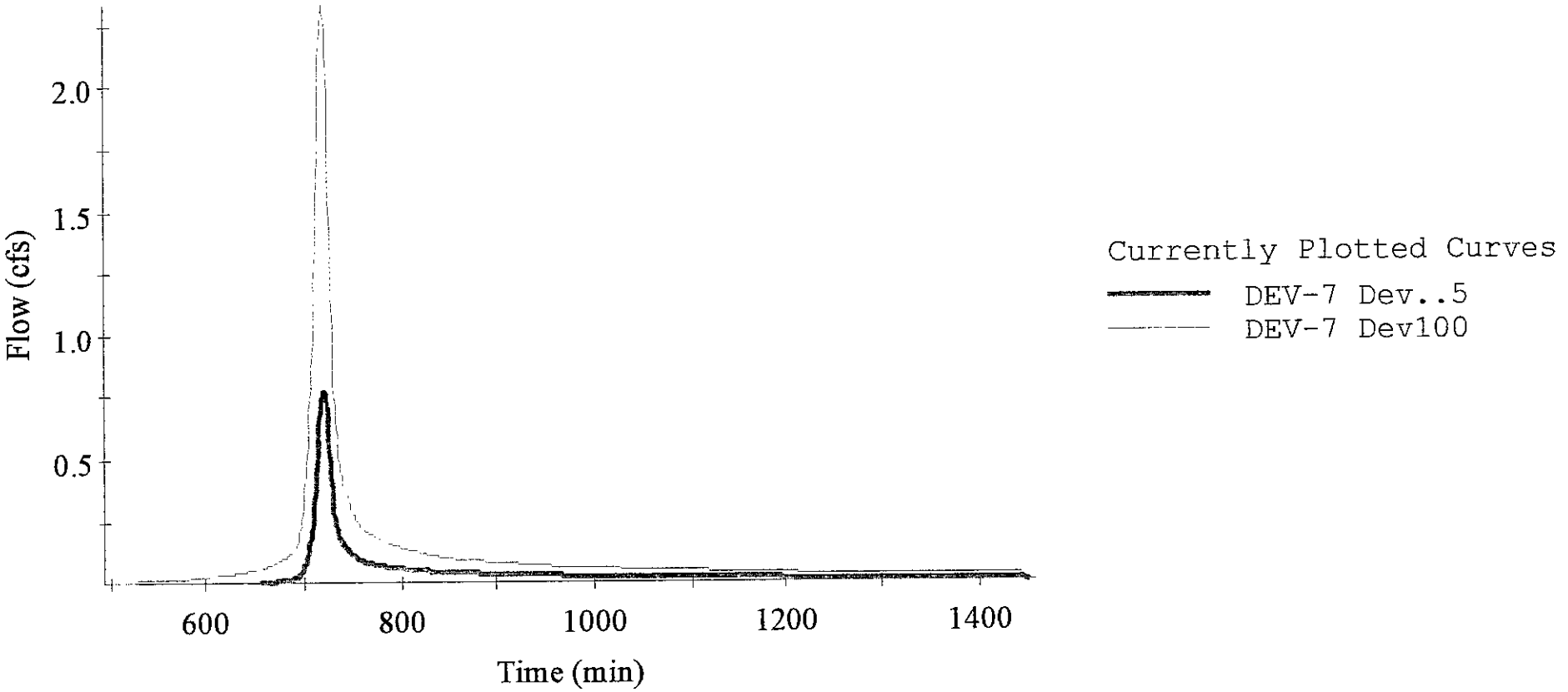


Currently Plotted Curves

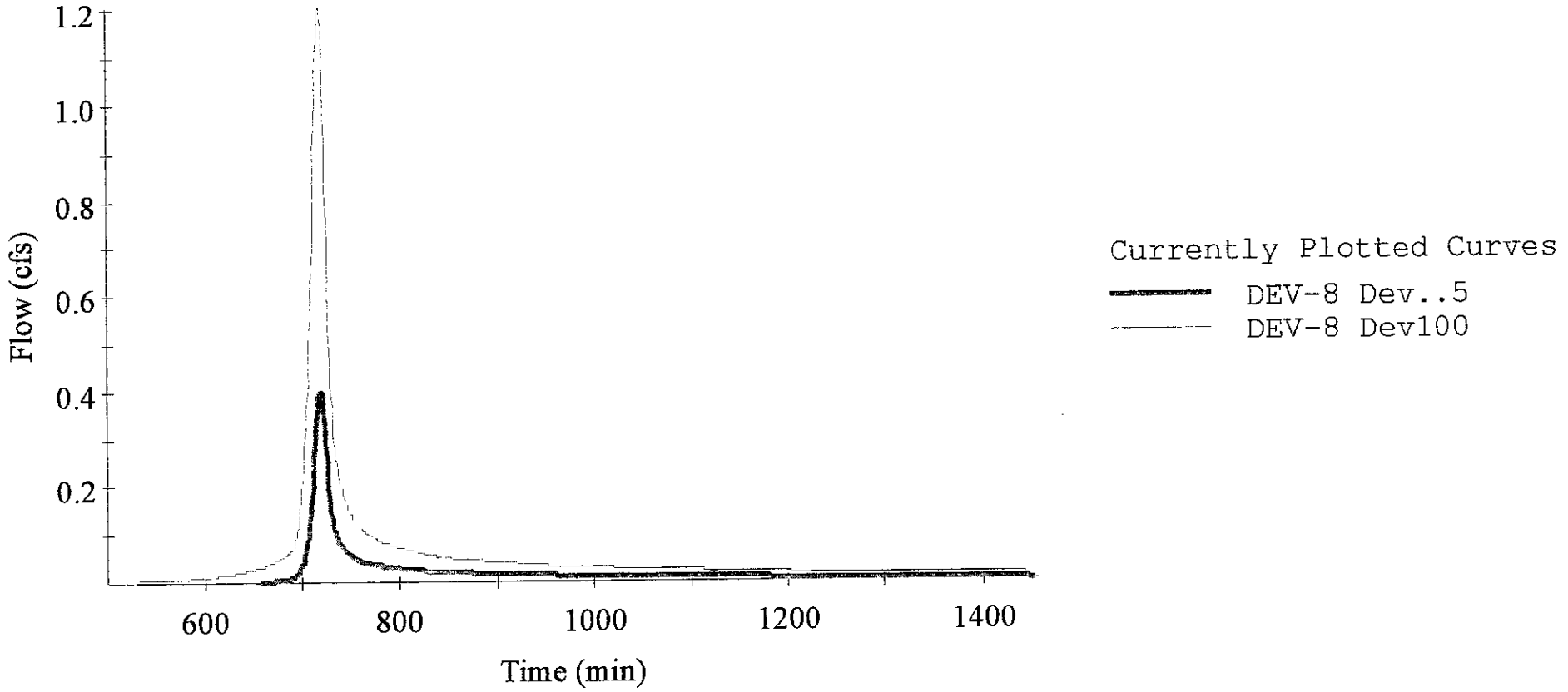
DEV-6 Dev..5

DEV-6 Dev100

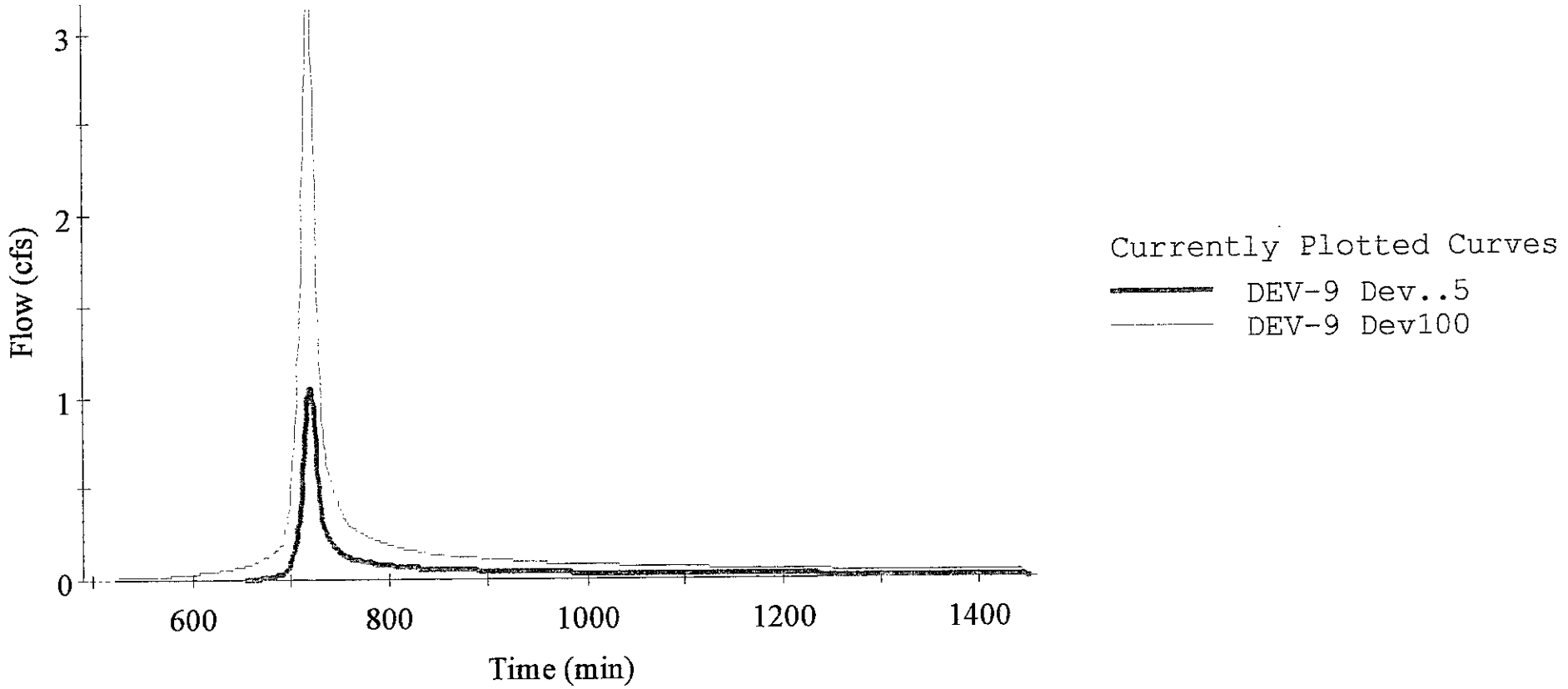
Hydrograph
DEV-7



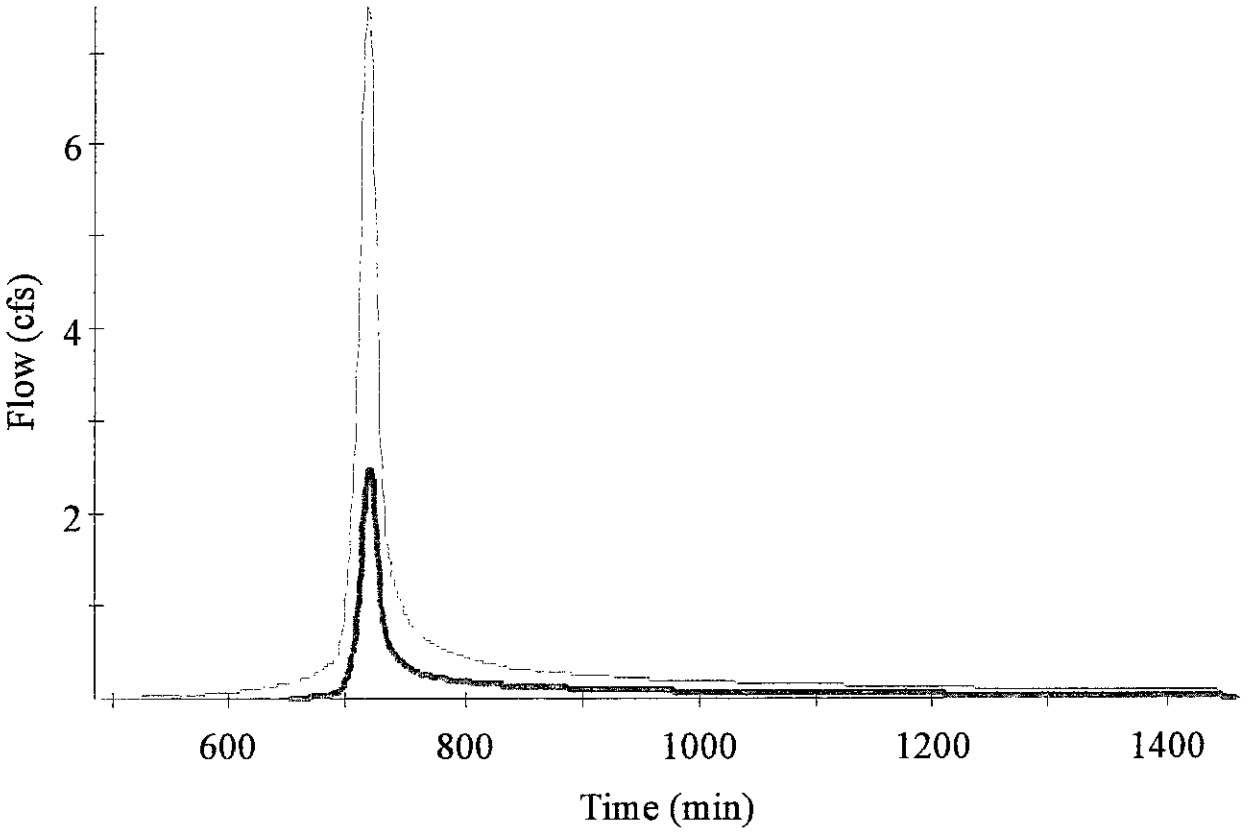
Hydrograph
DEV-8



Hydrograph
DEV-9



Hydrograph
DEV-10

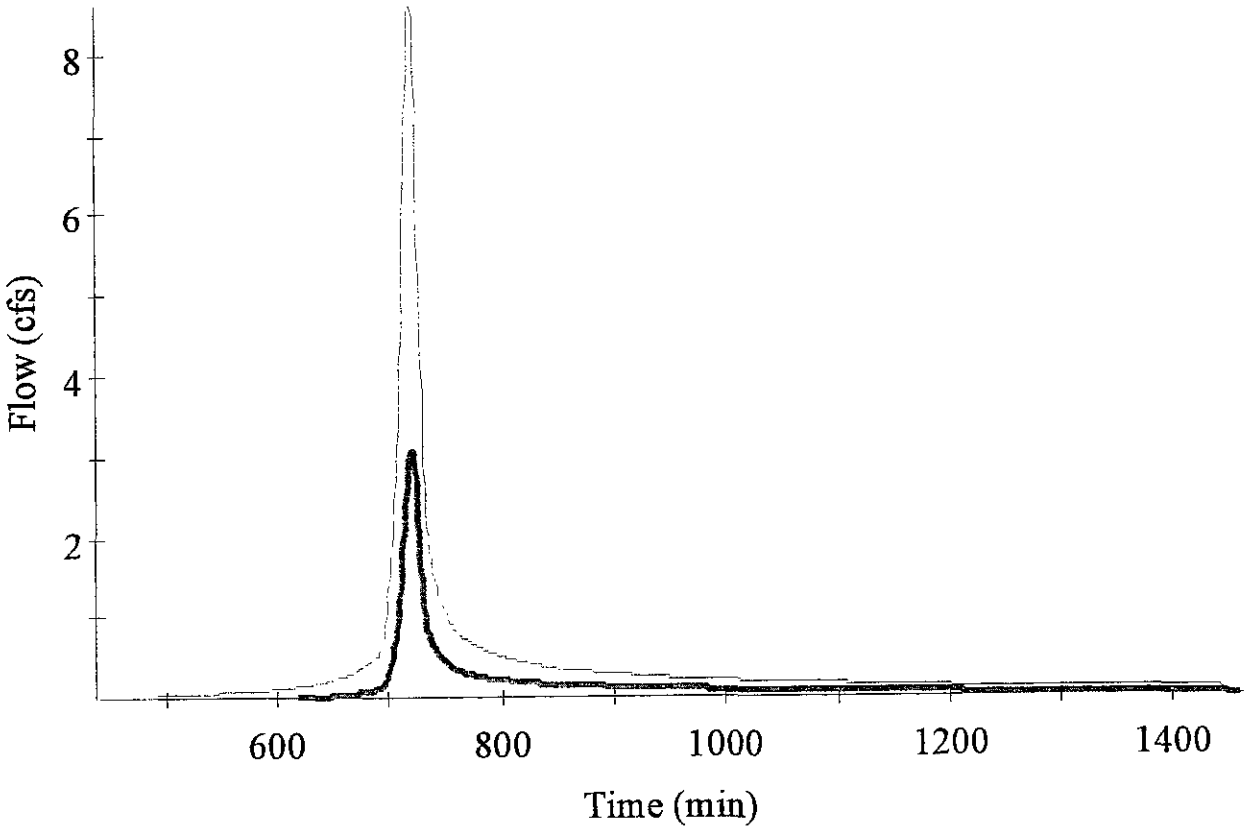


Currently Plotted Curves

DEV-10 Dev..5

DEV-10 Dev100

Hydrograph
DEV-11

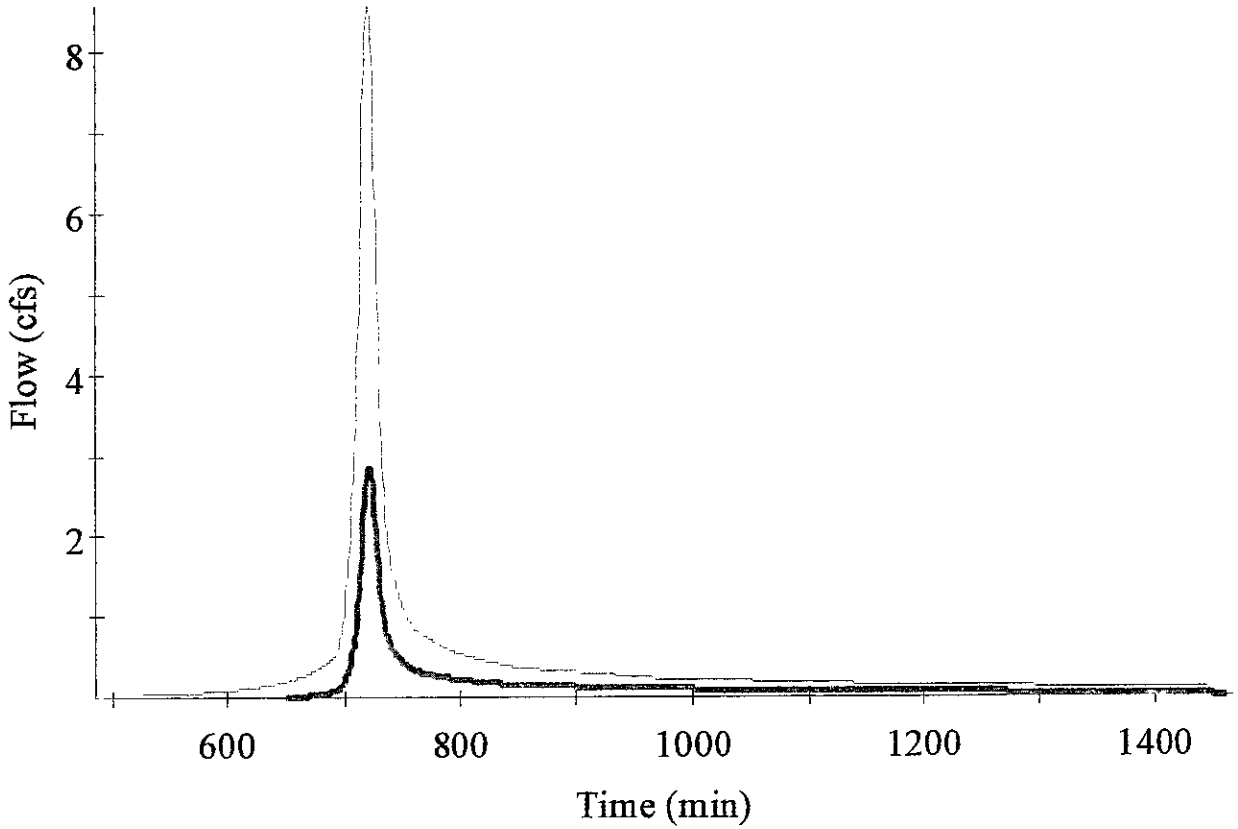


Currently Plotted Curves

DEV-11 Dev..5

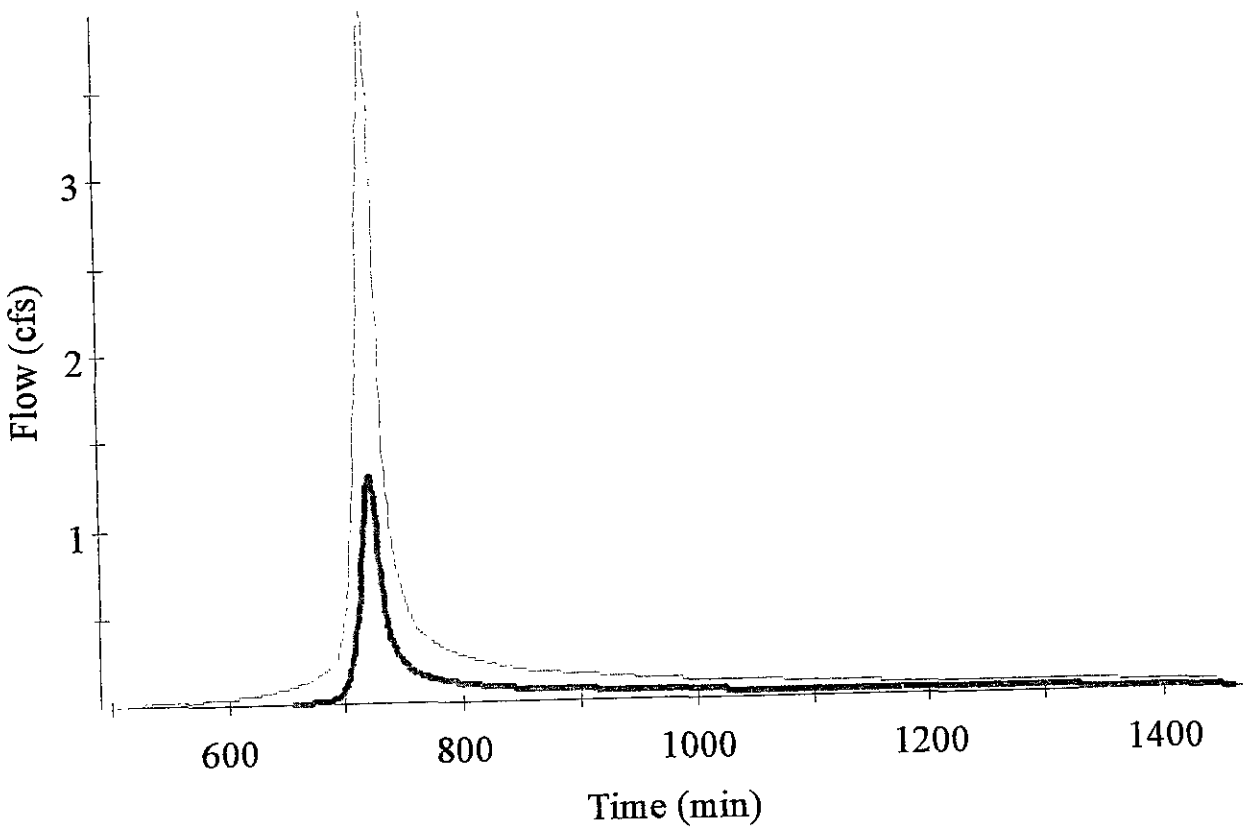
DEV-11 Dev100

Hydrograph
DEV-12



Currently Plotted Curves
DEV-12 Dev..5
DEV-12 Dev100

Hydrograph
DEV-13

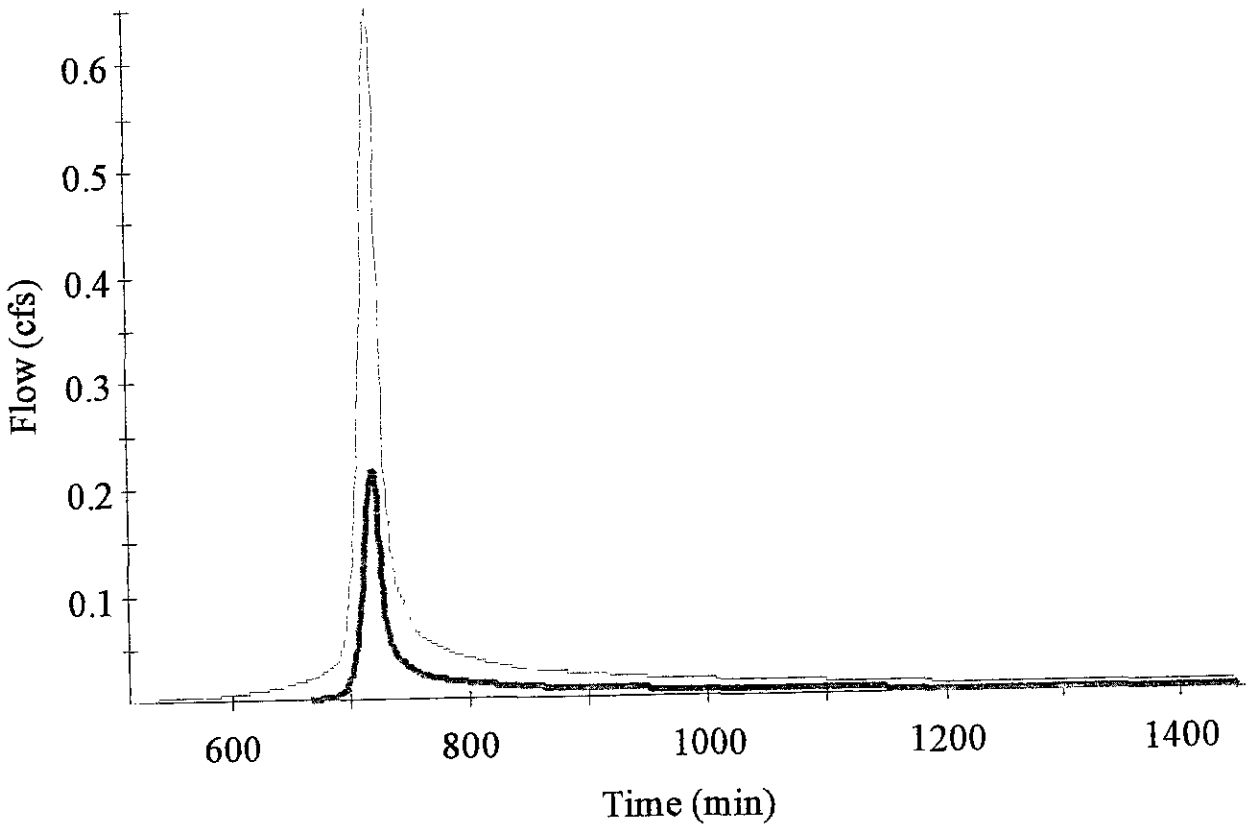


Currently Plotted Curves

DEV-13 Dev..5

DEV-13 Dev100

Hydrograph
DEV-15

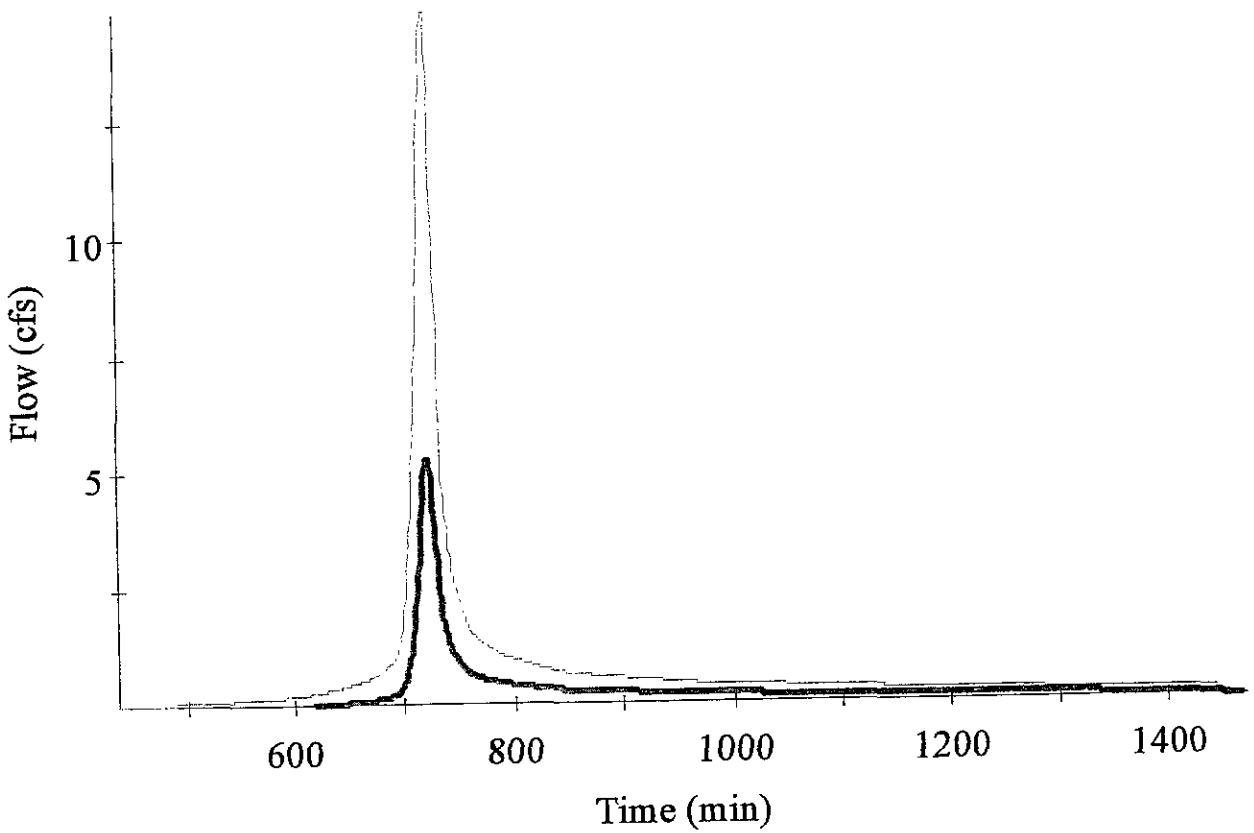


Currently Plotted Curves

DEV-15 Dev..5

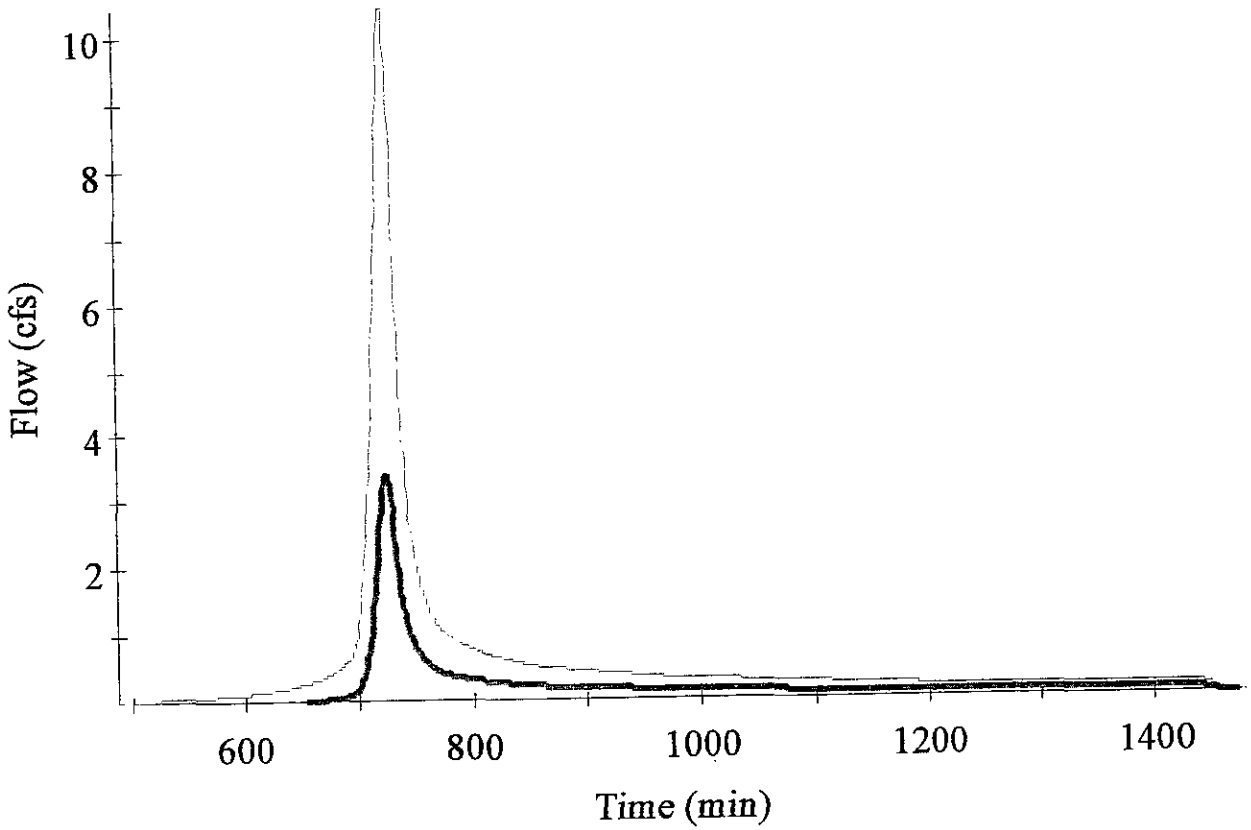
DEV-15 Dev100

Hydrograph
DEV-16



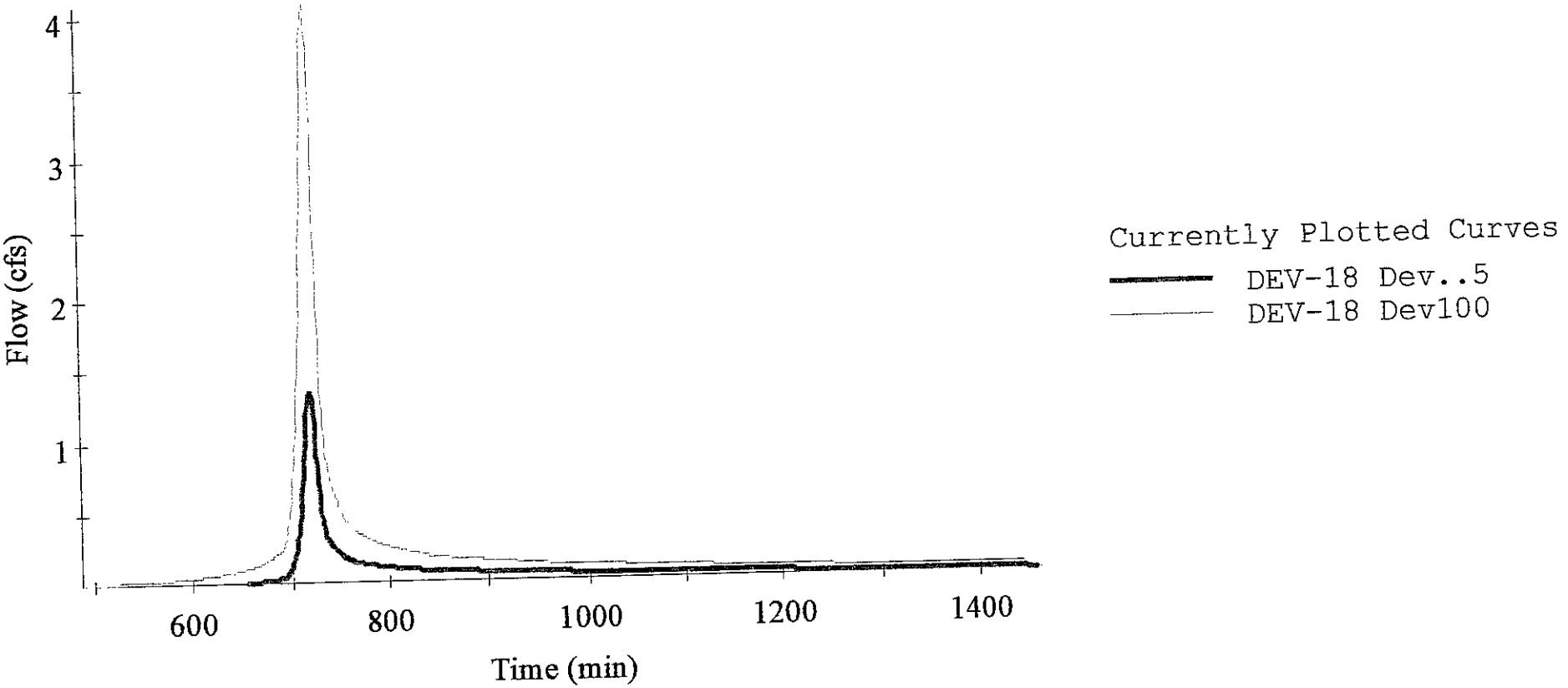
Currently Plotted Curves
DEV-16 Dev..5
DEV-16 Dev100

Hydrograph
DEV-17

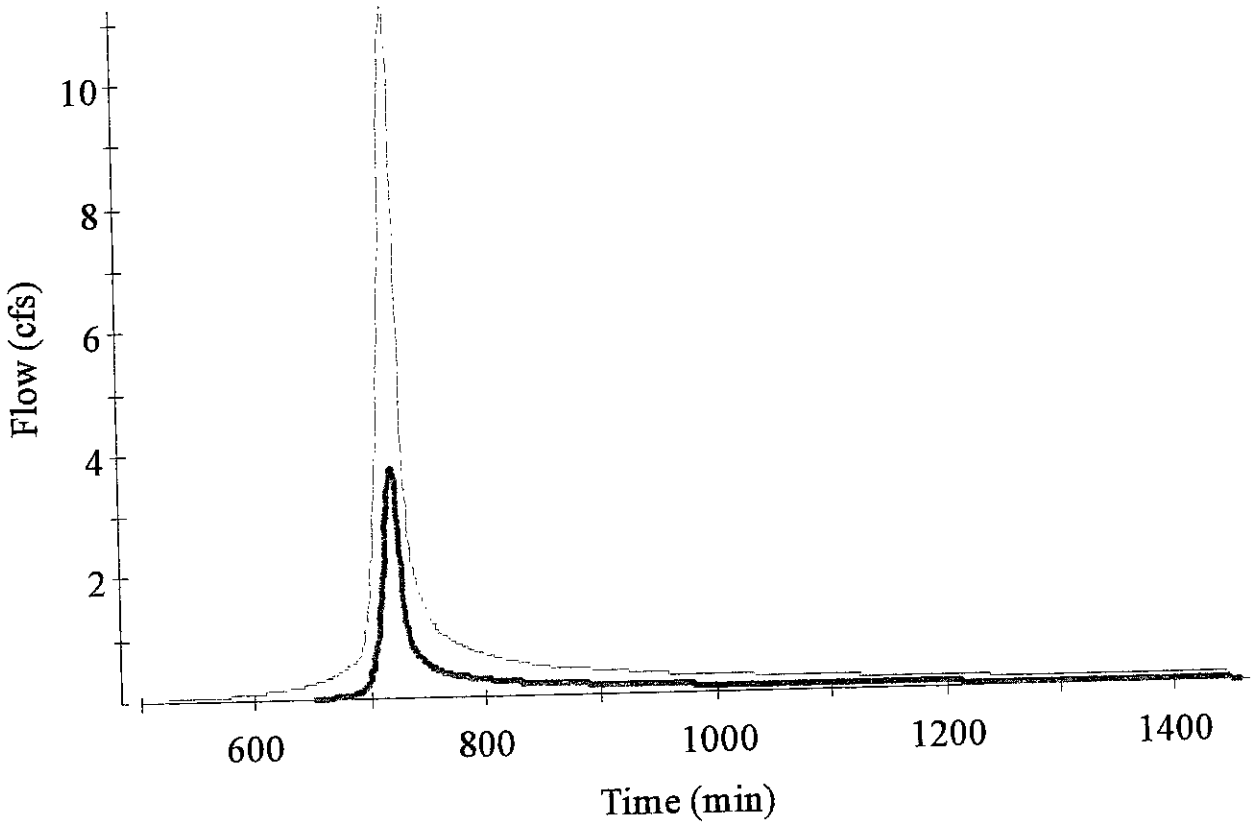


Currently Plotted Curves
DEV-17 Dev..5
DEV-17 Dev100

Hydrograph
DEV-18



Hydrograph
DEV-19

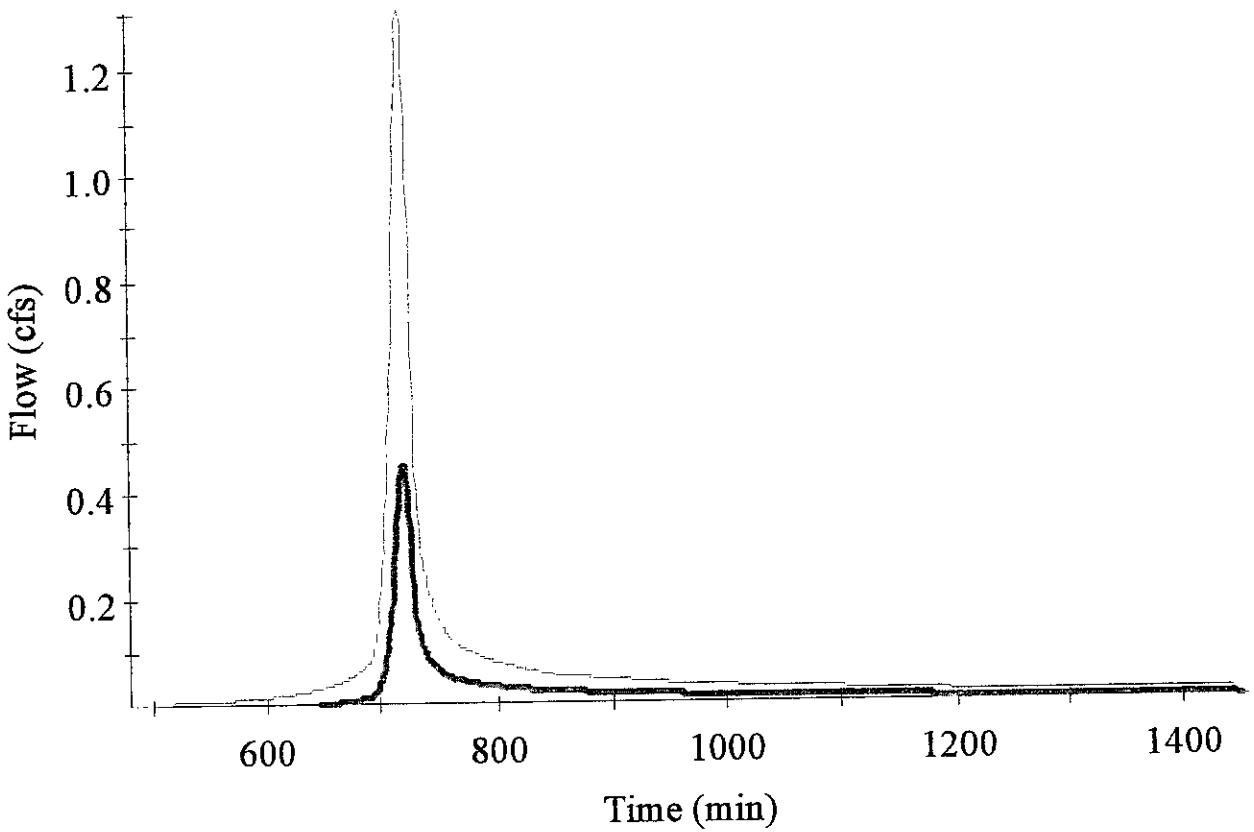


Currently Plotted Curves

DEV-19 Dev..5

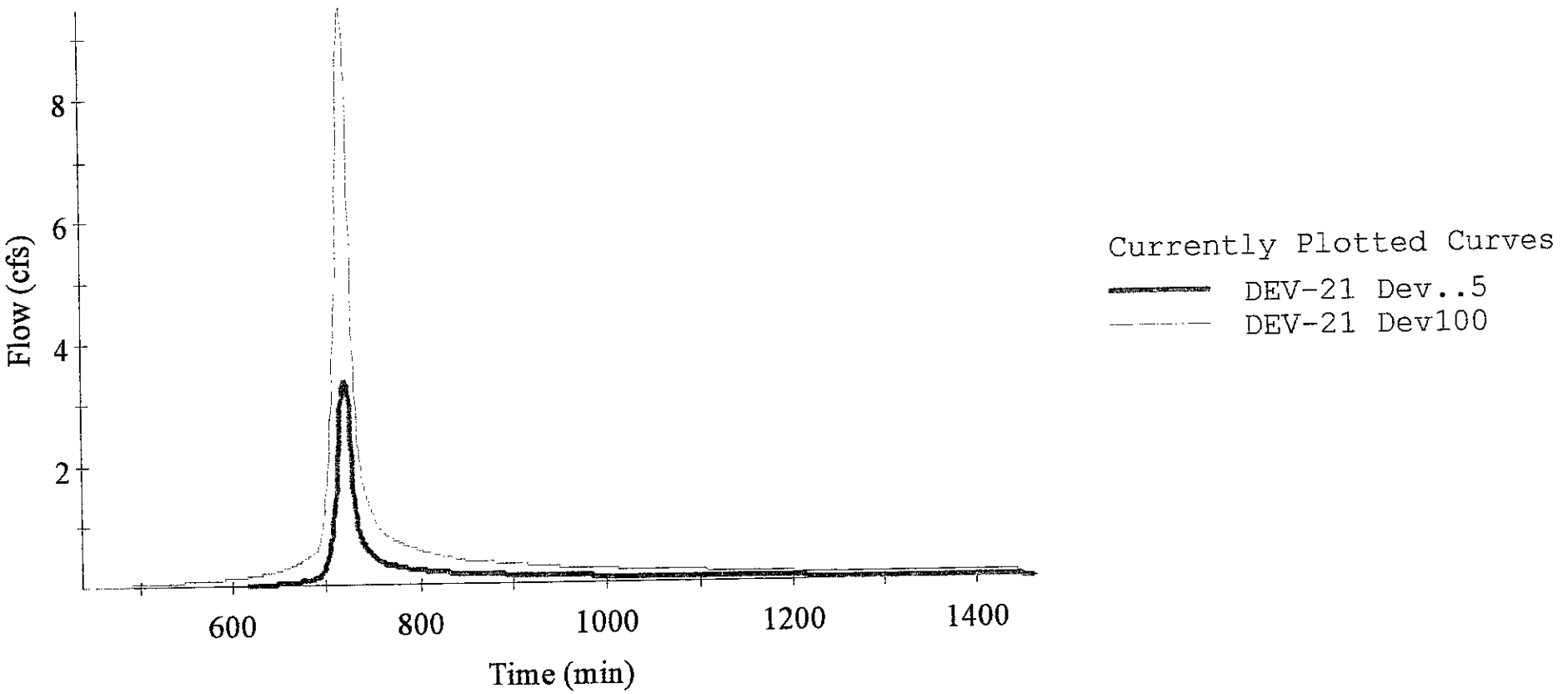
DEV-19 Dev100

Hydrograph
DEV-20

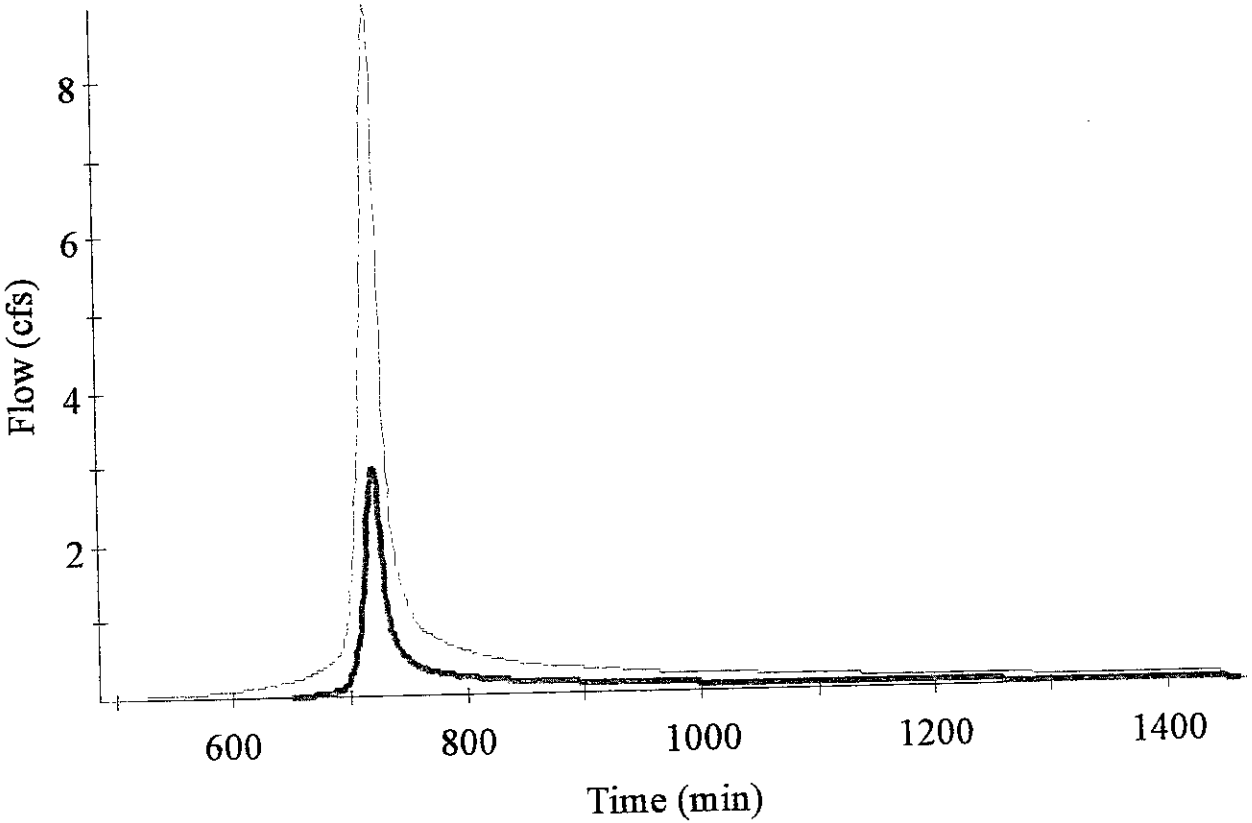


Currently Plotted Curves
DEV-20 Dev..5
DEV-20 Dev100

Hydrograph
DEV-21



Hydrograph
DEV-22

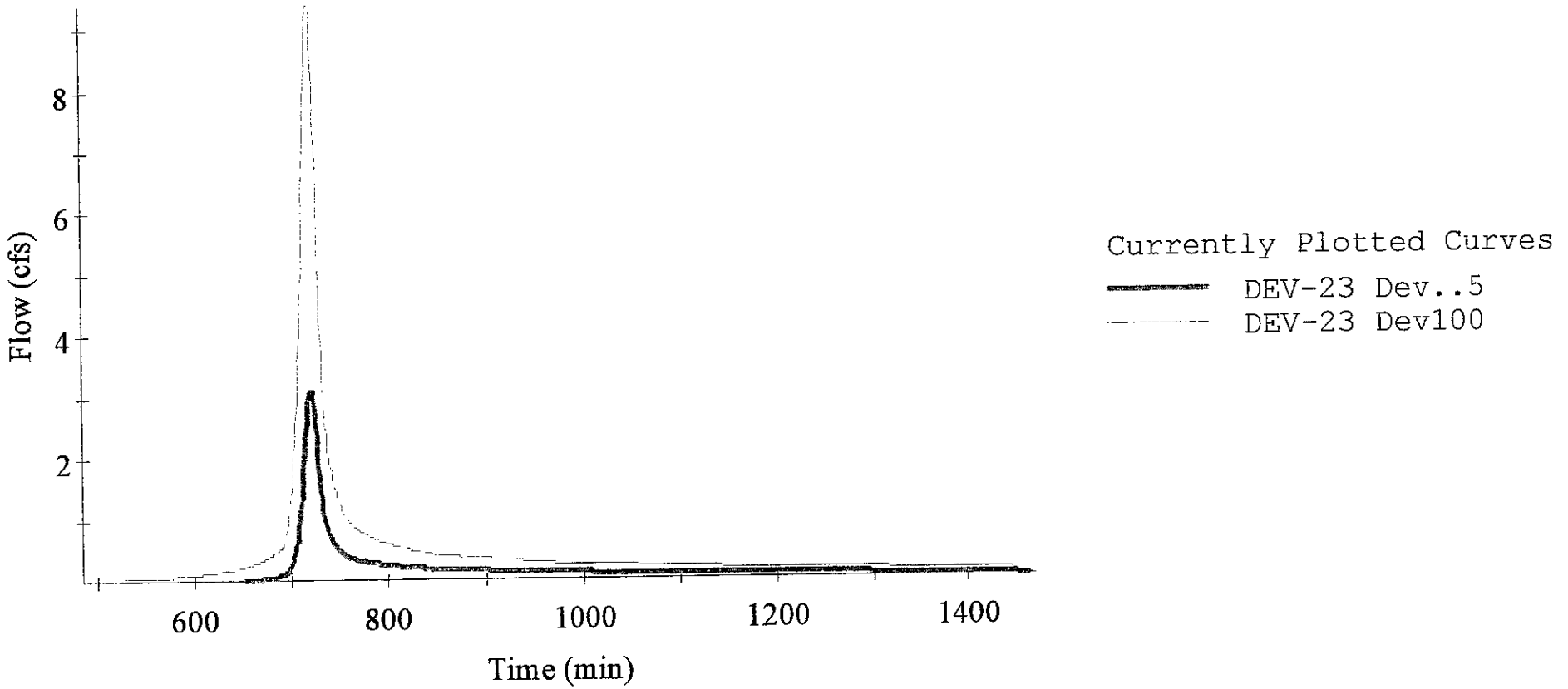


Currently Plotted Curves

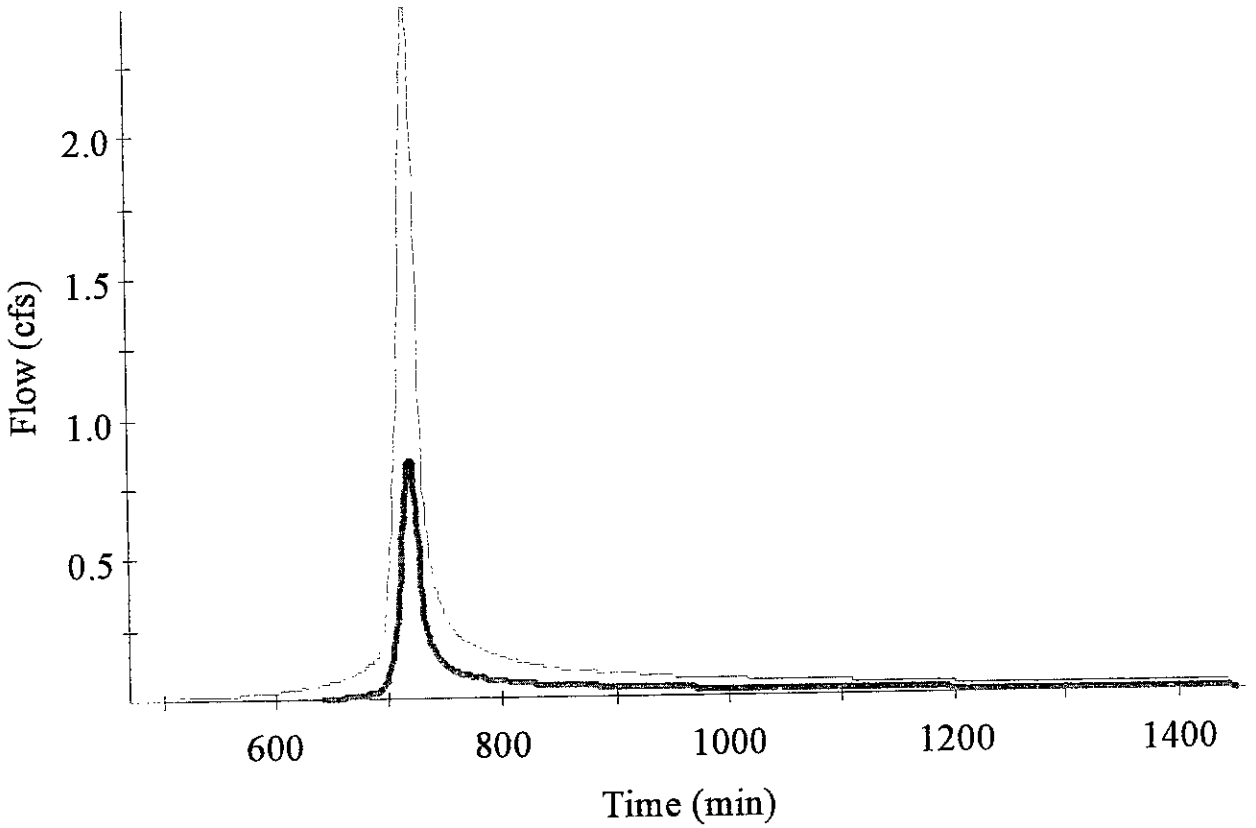
DEV-22 Dev..5

DEV-22 Dev100

Hydrograph
DEV-23

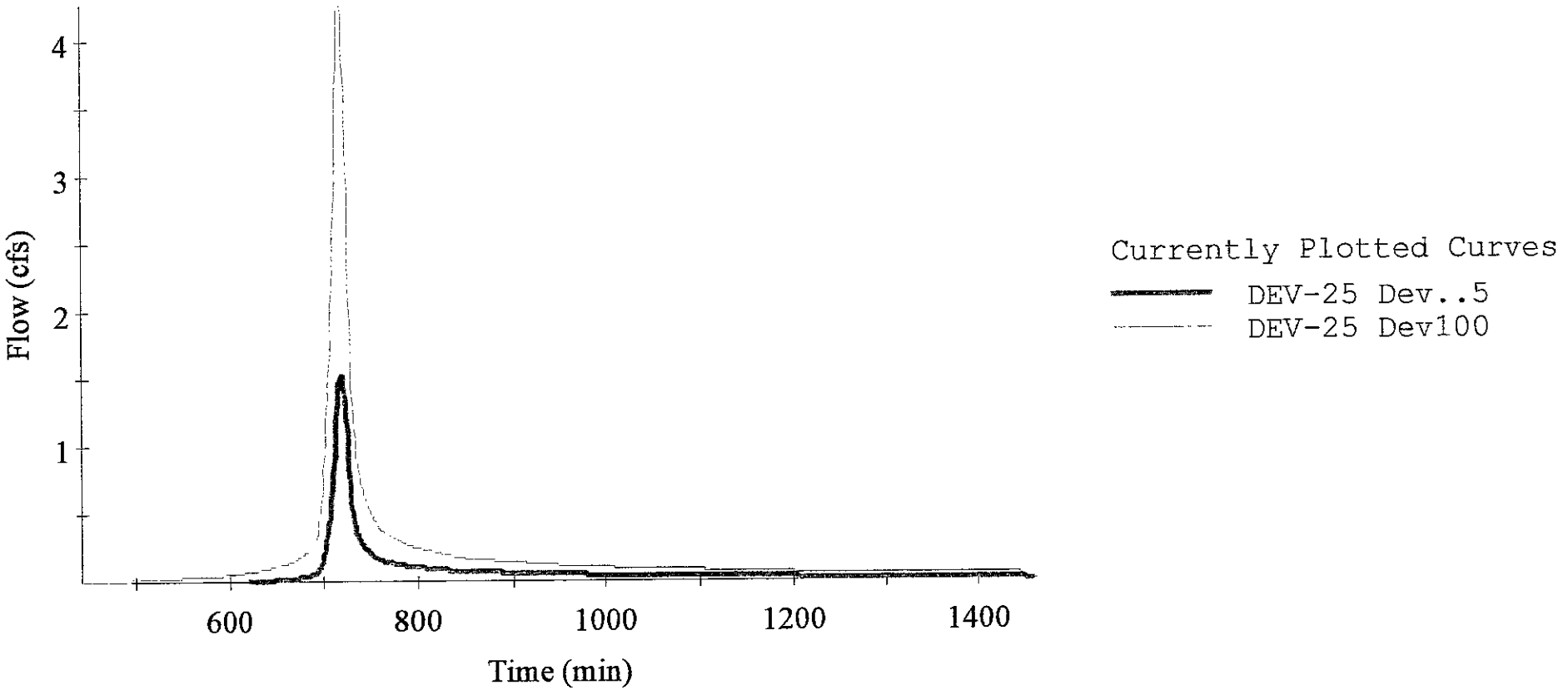


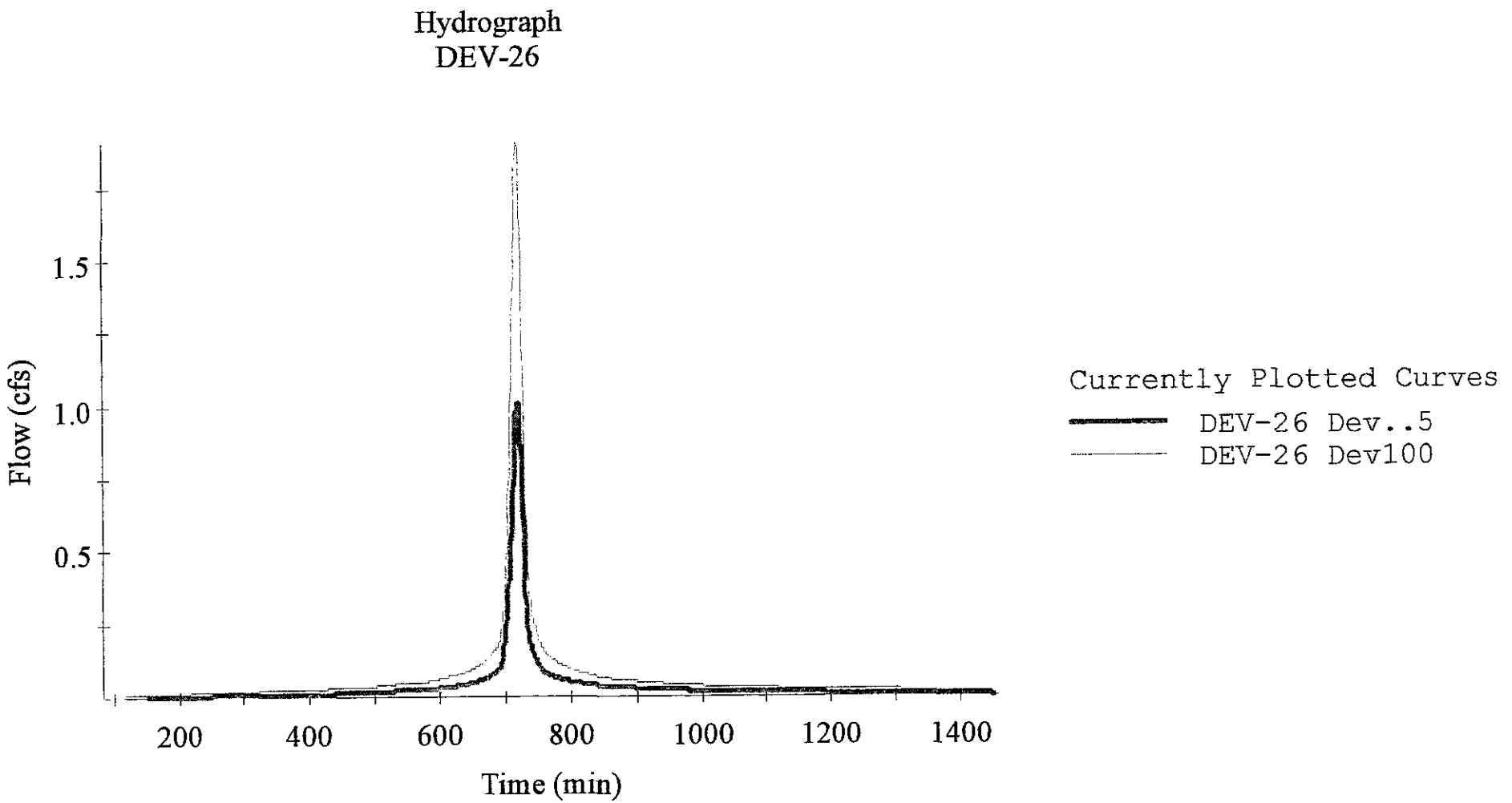
Hydrograph
DEV-24

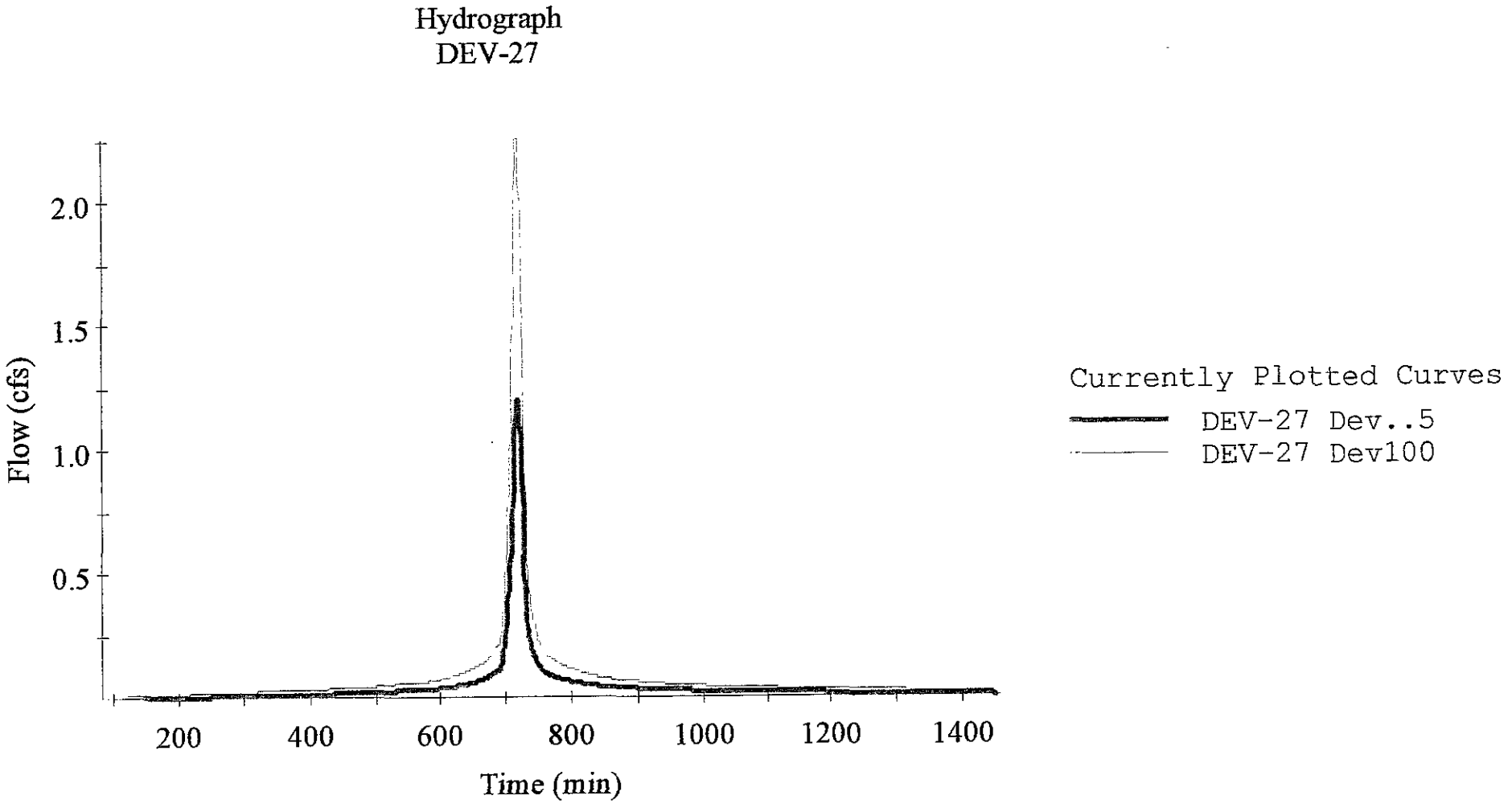


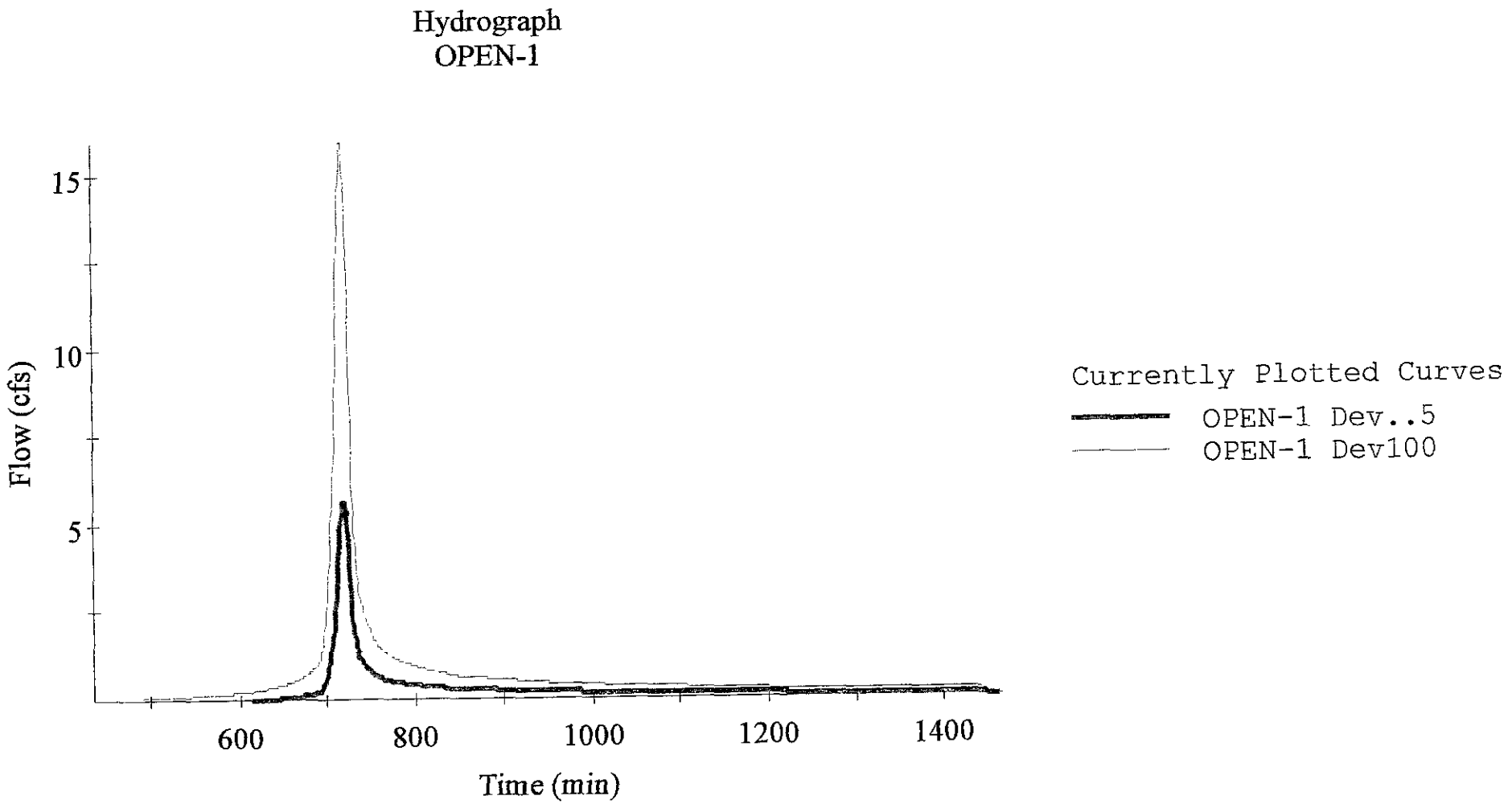
Currently Plotted Curves
DEV-24 Dev..5
DEV-24 Dev100

Hydrograph
DEV-25

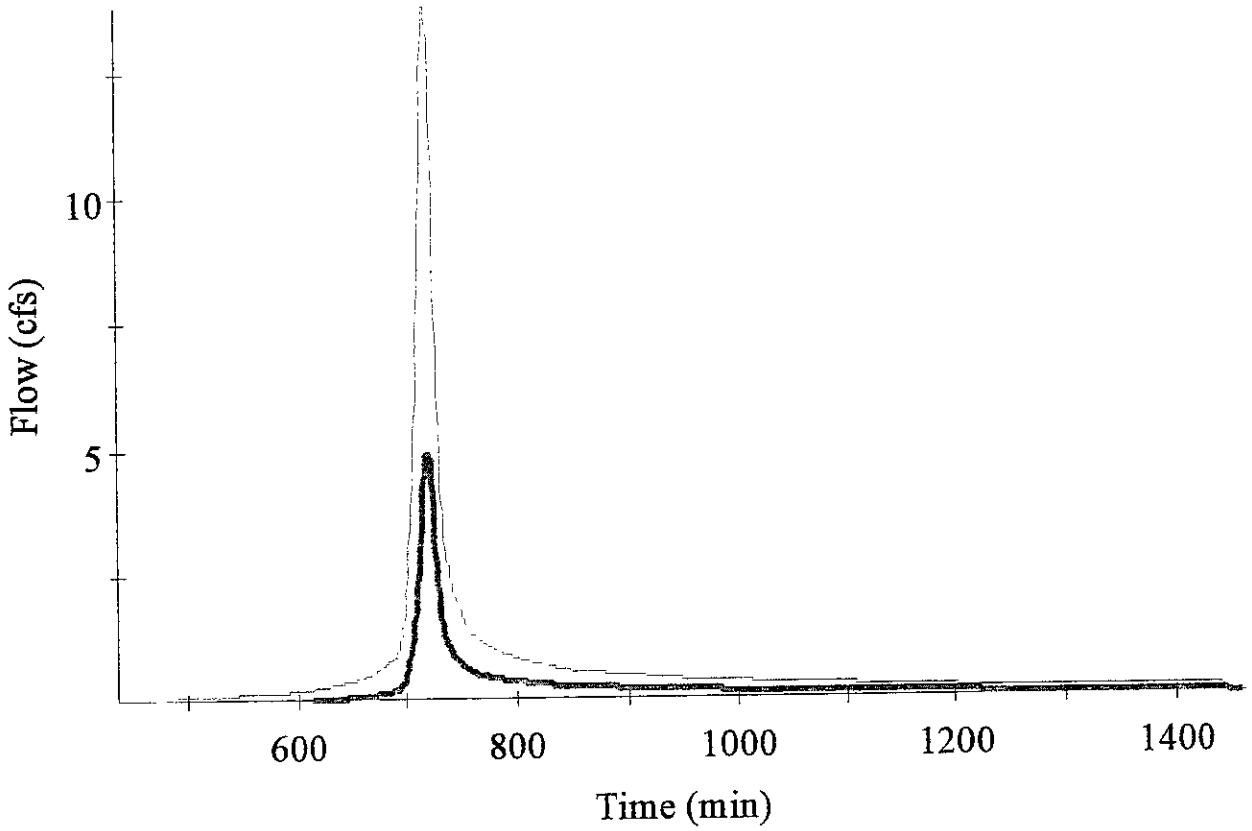



Hydrograph
DEV-26
Flow (cfs)
1.5
1.0
0.5
200
400
600
800
1000
1200
1400
Time (min)
Currently Plotted Curves
DEV-26 Dev..5
DEV-26 Dev100

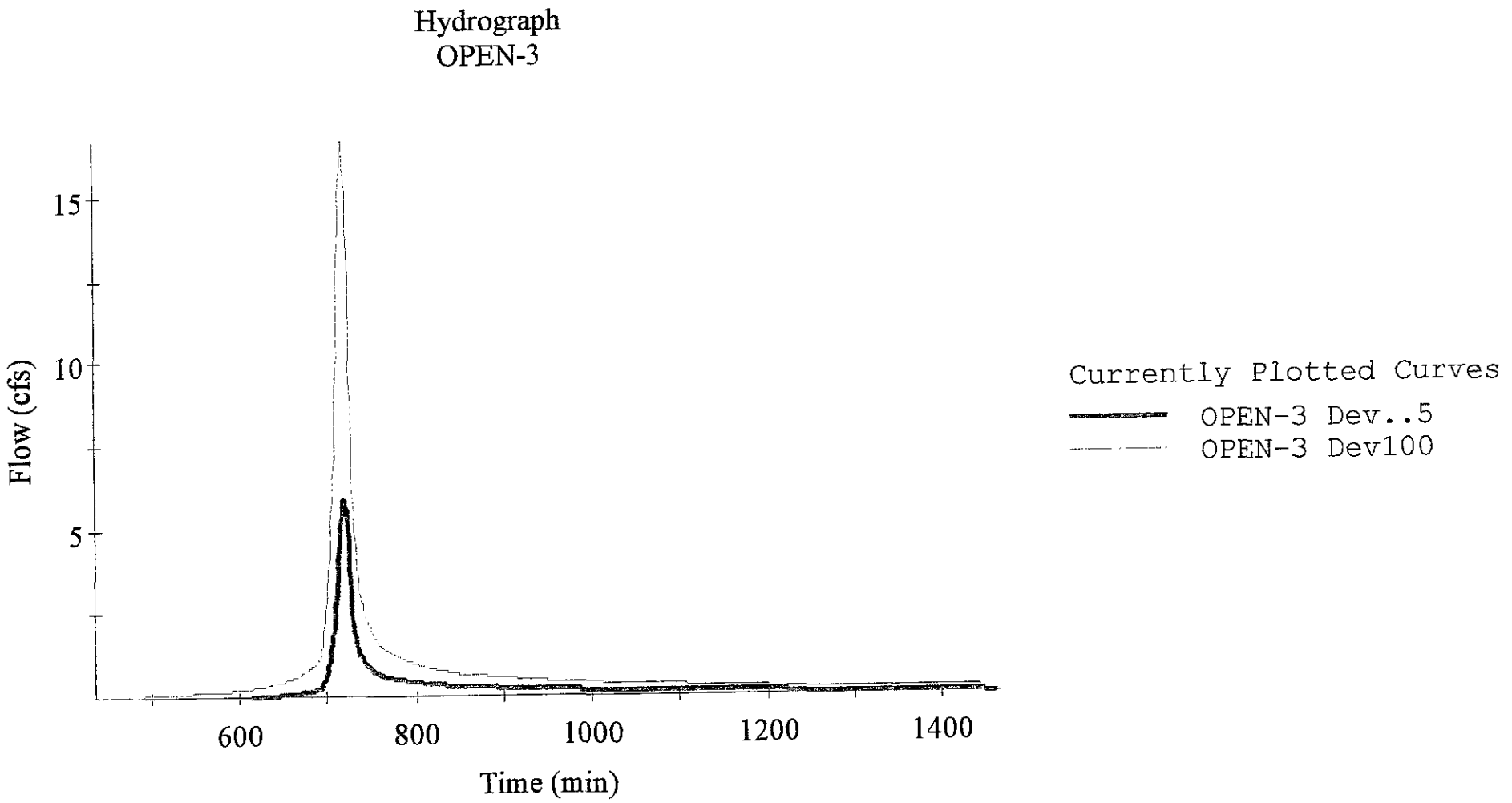

Hydrograph
DEV-27
2.0
1.5
1.0
0.5
Flow (cfs)
200
400
600
800
1000
1200
1400
Time (min)
Currently Plotted Curves
DEV-27 Dev..5
DEV-27 Dev100


Hydrograph
OPEN-1
15
10
5
Flow (cfs)
600
800
1000
1200
1400
Time (min)
Currently Plotted Curves
OPEN-1 Dev..5
OPEN-1 Dev100

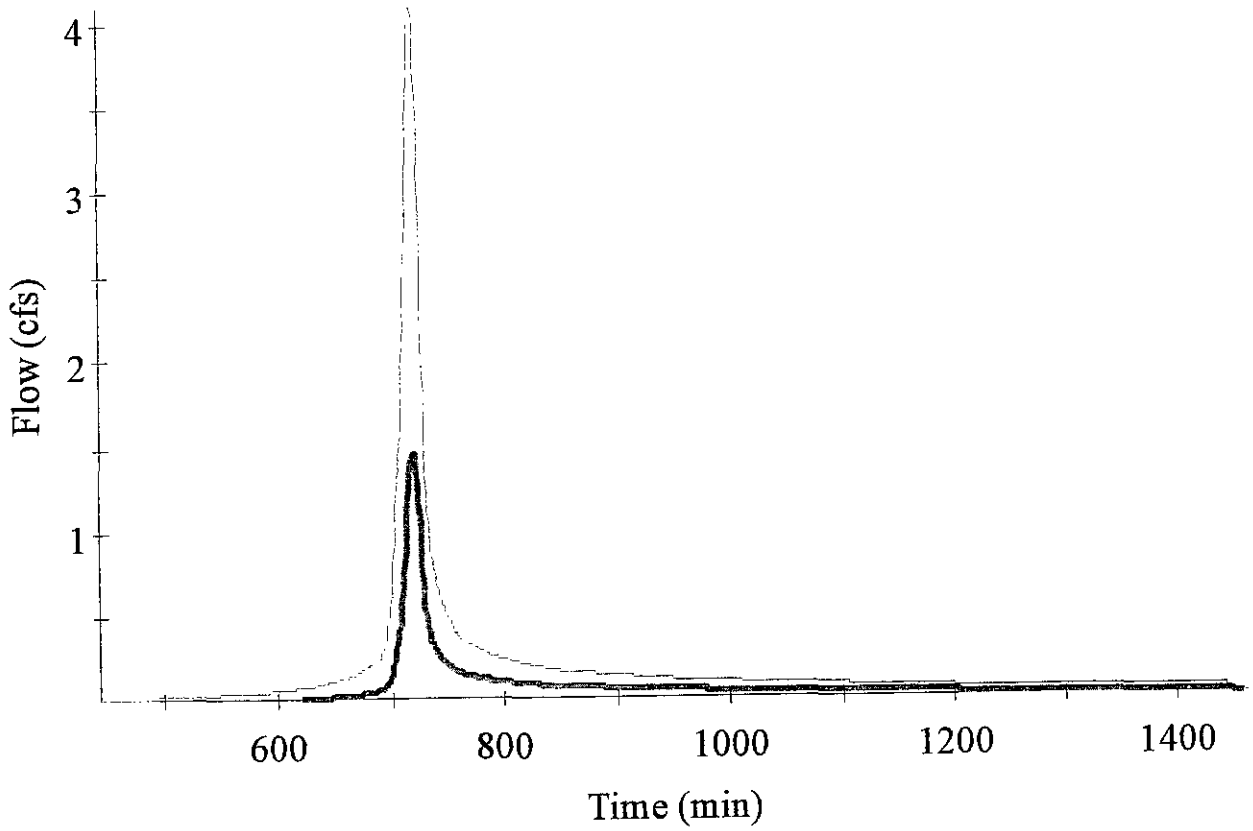
Hydrograph
OPEN-2



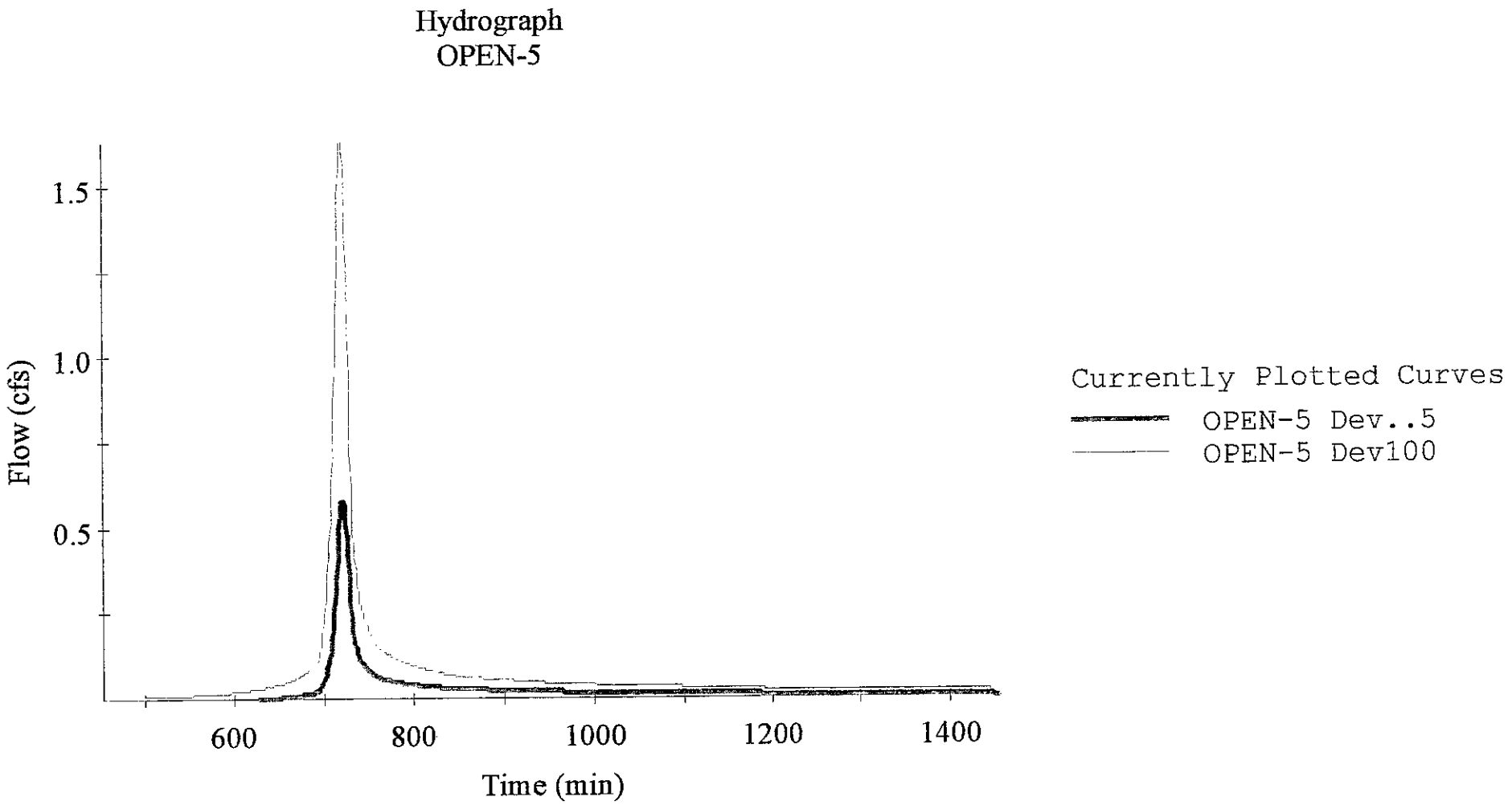
Currently Plotted Curves
OPEN-2 Dev..5
OPEN-2 Dev100


Hydrograph
OPEN-3
15
10
5
Flow (cfs)
600
800
1000
1200
1400
Time (min)
Currently Plotted Curves
OPEN-3 Dev..5
OPEN-3 Dev100

Hydrograph
OPEN-4



Currently Plotted Curves
OPEN-4 Dev..5
OPEN-4 Dev100


Hydrograph
OPEN-5
Flow (cfs)
1.5
1.0
0.5
600
800
1000
1200
1400
Time (min)
Currently Plotted Curves
OPEN-5 Dev..5
OPEN-5 Dev100

POINT PRECIPITATION FREQUENCY ESTIMATES FROM NOAA ATLAS 14

Nevada 39.425694 N 119.707 W 4596 feet

from "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14, Volume 1, Version 3
G.M. Bonnin, D. Todd, B. Lin, T. Parzybok, M.Yekta, and D. Riley
NOAA, National Weather Service, Silver Spring, Maryland, 2003

Extracted: Wed May 18 2005

Confidence Limits Seasonality Location Maps Other Info. Grids Maps Help

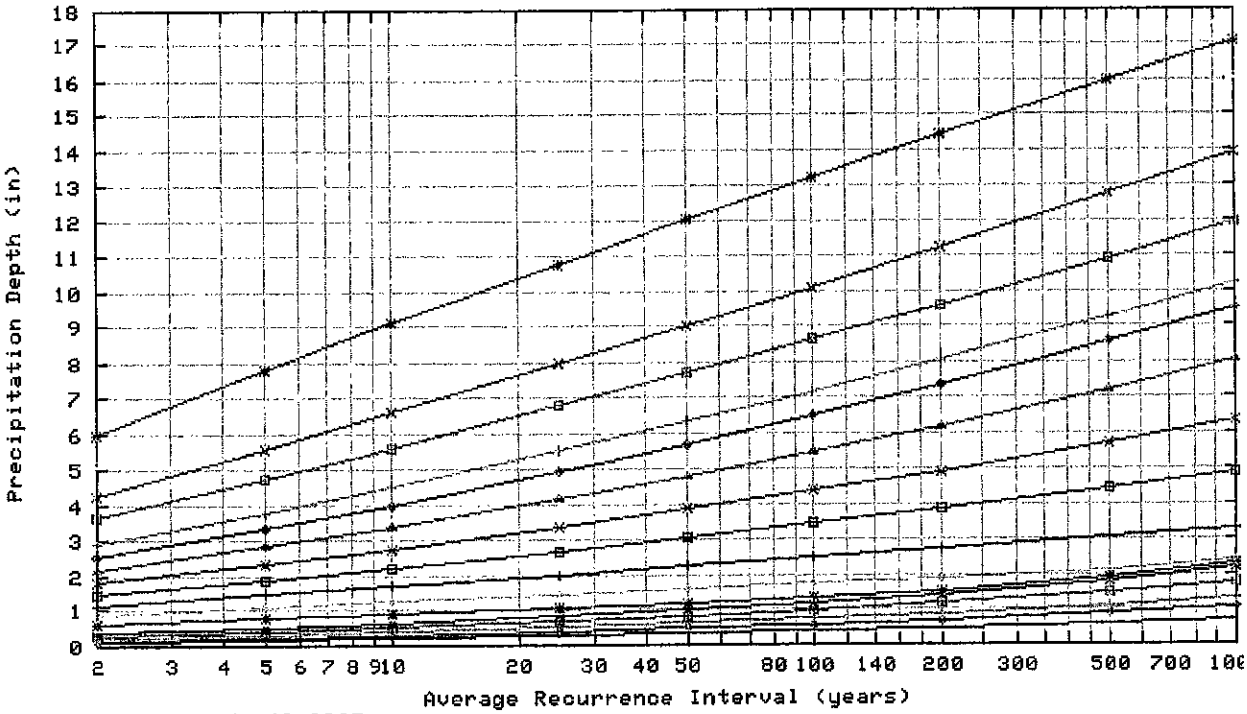
Precipitation Frequency Estimates (inches)

ARI* (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	
2	0.12	0.18	0.23	0.31	0.38	0.51	0.61	0.87	1.16	1.47	1.81	2.19	2.57	2.89	3.64	4.29	5.16	6.
5	0.16	0.25	0.31	0.42	0.52	0.66	0.78	1.08	1.47	1.89	2.33	2.85	3.37	3.80	4.76	5.60	6.72	7.
10	0.20	0.31	0.38	0.51	0.64	0.78	0.90	1.24	1.71	2.23	2.76	3.39	4.03	4.51	5.62	6.61	7.90	9.
25	0.26	0.40	0.50	0.67	0.83	0.97	1.06	1.45	2.03	2.70	3.37	4.17	4.95	5.52	6.79	7.98	9.48	1(
50	0.32	0.49	0.60	0.81	1.01	1.12	1.20	1.60	2.27	3.08	3.86	4.80	5.70	6.32	7.70	9.04	10.69	1:
100	0.39	0.59	0.73	0.98	1.21	1.29	1.36	1.75	2.51	3.47	4.38	5.48	6.50	7.16	8.65	10.14	11.91	1:
200	0.46	0.70	0.87	1.18	1.46	1.50	1.57	1.90	2.75	3.89	4.93	6.20	7.35	8.04	9.60	11.26	13.14	1.
500	0.59	0.90	1.11	1.50	1.86	1.90	1.97	2.10	3.07	4.47	5.70	7.22	8.55	9.26	10.92	12.77	14.80	1:
1000	0.71	1.08	1.34	1.80	2.23	2.27	2.33	2.39	3.31	4.94	6.33	8.06	9.53	10.23	11.94	13.95	16.07	1'

Text version of table

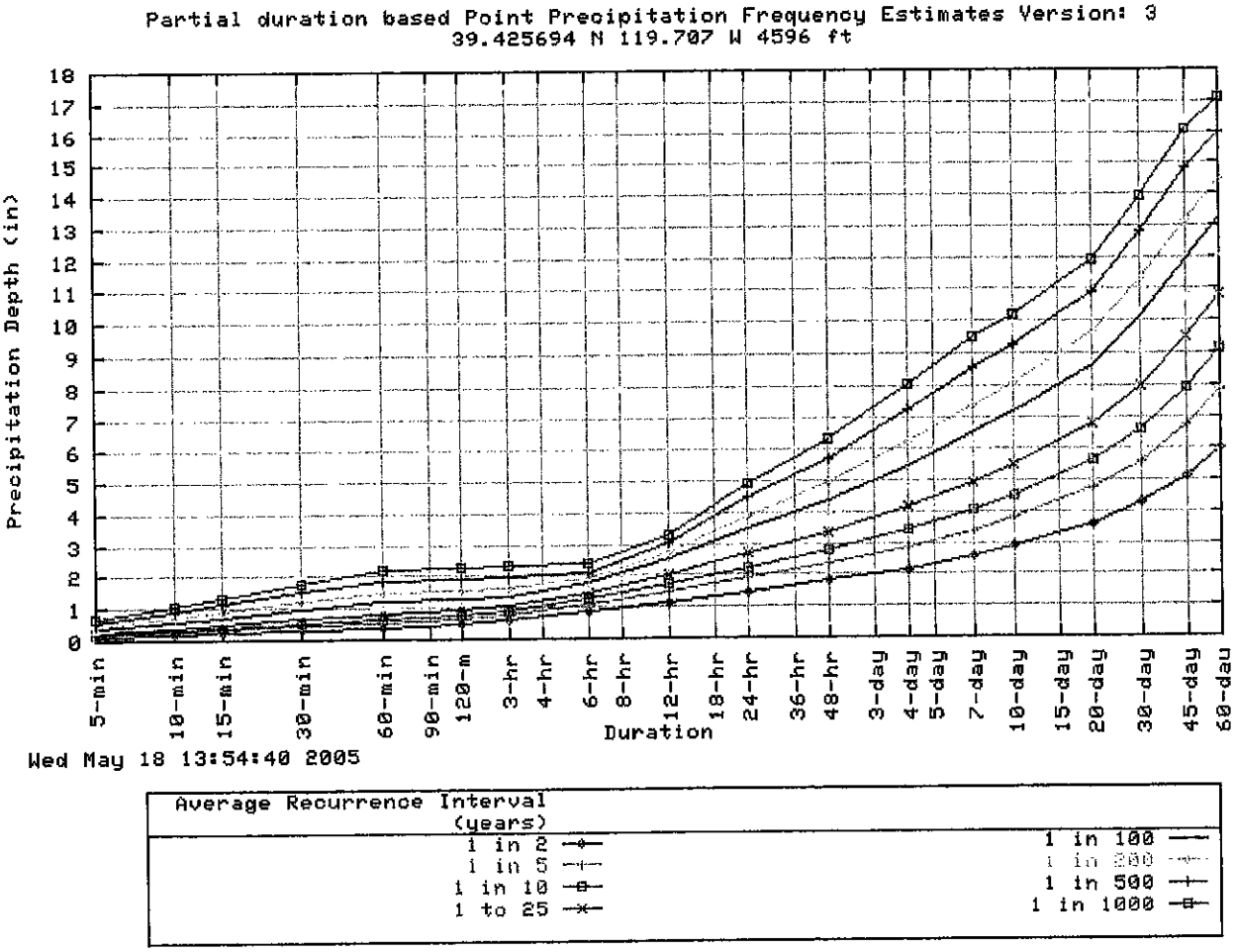
* These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.
Please refer to the documentation for more information. NOTE: Formatting forces estimates near zero to appear as zero.

Partial duration based Point Precipitation Frequency Estimates Version: 3
39.425694 N 119.707 W 4596 ft



Wed May 18 13:54:40 2005

Duration			
5-min		48-hr	30-day
10-min	3-hr	4-day	
15-min	6-hr	7-day	60-day
30-min	12-hr	10-day	
60-min	24-hr	20-day	



Confidence Limits -

*** Upper bound of the 90% confidence interval**
Precipitation Frequency Estimates (inches)

ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	
2	0.14	0.22	0.27	0.36	0.45	0.59	0.69	0.97	1.29	1.64	2.03	2.45	2.91	3.28	4.11	4.85	5.77	6.
5	0.19	0.29	0.37	0.49	0.61	0.76	0.88	1.21	1.65	2.10	2.62	3.20	3.83	4.31	5.36	6.33	7.53	8.
10	0.24	0.36	0.45	0.61	0.75	0.90	1.02	1.39	1.92	2.47	3.10	3.82	4.58	5.13	6.35	7.48	8.85	1(
25	0.32	0.48	0.59	0.80	0.99	1.13	1.22	1.64	2.30	3.02	3.80	4.70	5.64	6.28	7.68	9.05	10.64	1:
50	0.39	0.59	0.73	0.98	1.22	1.34	1.40	1.82	2.60	3.46	4.38	5.42	6.52	7.21	8.73	10.30	12.03	1:
100	0.47	0.72	0.89	1.20	1.49	1.59	1.65	2.02	2.93	3.96	5.00	6.21	7.45	8.19	9.84	11.57	13.45	1.
200	0.58	0.89	1.10	1.49	1.84	1.89	1.95	2.23	3.25	4.49	5.68	7.07	8.47	9.25	10.98	12.92	14.91	1(
500	0.78	1.18	1.46	1.97	2.44	2.49	2.56	2.76	3.74	5.27	6.66	8.33	9.97	10.75	12.62	14.79	16.91	1!
1000	0.96	1.46	1.81	2.44	3.02	3.07	3.13	3.31	4.11	5.92	7.49	9.38	11.21	11.98	13.90	16.29	18.53	1!

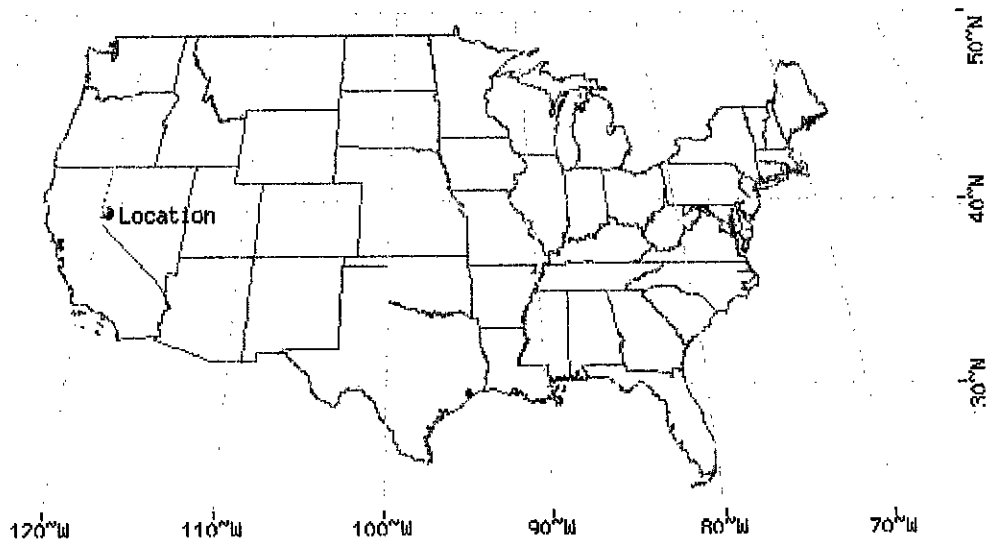
* The upper bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are greater than.
** These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.
Please refer to the documentation for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

* Lower bound of the 90% confidence interval Precipitation Frequency Estimates (inches)																		
ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	
2	0.10	0.16	0.20	0.27	0.33	0.46	0.56	0.78	1.04	1.34	1.62	1.97	2.29	2.57	3.26	3.83	4.60	5.
5	0.14	0.21	0.27	0.36	0.44	0.58	0.70	0.97	1.32	1.71	2.08	2.55	2.99	3.37	4.24	4.97	5.98	6.
10	0.17	0.26	0.32	0.44	0.54	0.68	0.80	1.10	1.52	1.99	2.45	3.03	3.56	3.98	4.99	5.84	7.00	8.
25	0.22	0.33	0.41	0.55	0.68	0.81	0.93	1.26	1.76	2.38	2.96	3.69	4.33	4.82	5.97	7.00	8.35	9.
50	0.25	0.38	0.48	0.64	0.79	0.91	1.02	1.37	1.95	2.67	3.36	4.20	4.94	5.49	6.73	7.87	9.36	1(
100	0.29	0.45	0.55	0.74	0.92	1.02	1.14	1.48	2.11	2.96	3.76	4.74	5.57	6.15	7.49	8.74	10.36	1
200	0.34	0.51	0.63	0.85	1.06	1.14	1.28	1.57	2.26	3.24	4.18	5.29	6.22	6.82	8.24	9.62	11.34	1:
500	0.40	0.60	0.75	1.01	1.25	1.38	1.56	1.69	2.43	3.62	4.74	6.03	7.09	7.71	9.21	10.75	12.62	1:
1000	0.45	0.69	0.85	1.15	1.42	1.58	1.79	1.90	2.56	3.89	5.16	6.61	7.79	8.39	9.94	11.60	13.55	1.

* The lower bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are less than..
** These precipitation frequency estimates are based on a partial duration maxima series. ARI is the Average Recurrence Interval.

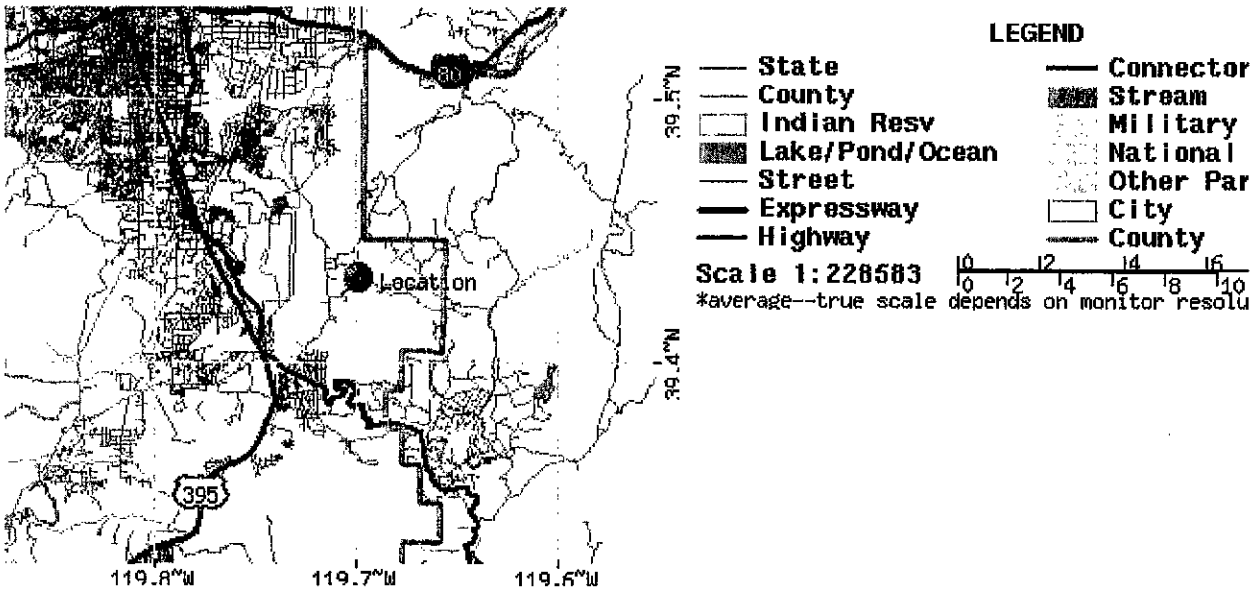
Please refer to the documentation for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

Maps -



These maps were produced using a direct map request from the U.S. Census Bureau Mapping and Cartographic Resources Tiger Map Server.

Please read disclaimer for more information.



Other Maps/Photographs -

View USGS digital orthophoto quadrangle (DOQ) covering this location from TerraServer; **USGS Aerial Photograph** may also be available
from this site. A DOQ is a computer-generated image of an aerial photograph in which image displacement caused by terrain relief and camera tilts has been removed. It combines the image characteristics of a photograph with the geometric qualities of a map. Visit the USGS for more information.

Watershed/Stream Flow Information -

Find the Watershed for this location using the U.S. Environmental Protection Agency's site.

Climate Data Sources -

Precipitation frequency results are based on data from a variety of sources, but largely NCDC. The following links provide general information
about observing sites in the area, regardless of if their data was used in this study. For detailed information about the stations used in this study,
please refer to our documentation.

Using the **National Climatic Data Center's (NCDC)** station search engine, locate other climate stations within:

+/-30 minutes ...OR... +/-1 degree of this location (39.425694/-119.7070). Digital ASCII data can be obtained directly from NCDC.

Find Natural Resources Conservation Service (NRCS) SNOTEL (SNOwpack TELemetry) stations by visiting the **Western Regional Climate Center's state-specific SNOTEL station maps.**

Hydrometeorological Design Studies Center
DOC/NOAA/National Weather Service
1325 East-West Highway
Silver Spring, MD 20910