APPENDIX 6D

Hydrology and Flood Plain Study

HYDROLOGY AND FLOOD PLAIN STUDY FOR MILL CREEK PROMENADE

PLOT PLAN 2017-167
CITY OF MENIFEE
CALIFORNIA

PREPARED FOR:

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DATE PREPARED:
AUGUST 13, 2018
REVISED: JANUARY 17, 2019

This report has been prepared by or under the direction of the following registered civil engineer who attests to the technical information contained herein. The registered civil engineer has also judged the qualifications of any technical specialists providing engineering data upon which recommendations, conclusions, and decisions are based.

	01/19/2019	
Joseph L. Castaneda RCE 59835 Registered Civil Engineer	Date	Seal

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I. INTRODUCTION

The Mill Creek Promenade is a development that proposes to construct townhomes, single family homes, a shopping center and an industrial park. The project site is approximately 59 acres located in the City of Menifee. A watercourse traverses the project site from the south west to the east, in which flows are conveyed under Haun Road. The scope of this report includes:

- Determine the peak 100-year peak flow rates for the ultimate condition for the tributary offsite and onsite areas using the Riverside County Flood Control and Water Conservation District (RCFC & WCD) Unit Hydrograph Method.
- Determine the pre-project and post-project flooding limits upstream, through and downstream of the project site based upon the ultimate condition flow rate.
- Preparation of a preliminary hydrology and flood plain report, which consists of hydrological and analytical results and exhibits.

II. PROJECT SITE AND DRAINAGE OVERVIEW

The Mill Creek Promenade is a project site that consists of townhomes, single family residential homes, a retail shopping center and an industrial park. The project site is roughly bounded by Garbani Road to the north, Sherman Road to the west, Wickered Road to the south and Haun Road to the west. The project site is located in Section 15 of Township 6 South, Range 3 West.

The project site is traversed by a natural stream through the southerly portion of the project site. The stream continues east of Haun Road and ultimately discharges into the Paloma Valley Channel. The stream through the project site will consist of earthen trapezoidal channel, a bridge, and two portions of reinforced concrete box culverts. Currently, an existing triple 24" corrugated metal pipe culvert crosses Haun Road, and will be replaced with a double 4' high by 10' wide reinforced concrete box culvert.

Hydraulic analyses were performed for the pre-project and post-project channel to determine the pre-project and post-project flooding limits.

III. HYDROLOGY ANALYSIS

The RCFC & WCD Hydrology Manual (Reference 1) was used to develop the hydrological parameters for the unit hydrograph analyses. The calculations were performed using the computer program developed by Civil Cadd/Civil Design.

The existing soil types are Soils A, Soil B, Soil C and Soil D, and is shown in Exhibit D. Exhibit D is a Hydrologic Soils Map which was obtained from the United States

Department of Agriculture, Natural Resources Conservation Service (NRCS) WebSoil Survey.

The following rainfall depths (in inches) were utilized in the hydrology analyses, which were obtained from the RCFC & WCD Hydrology Manual's Isohyetal Maps. Since the watershed area is over 700 acres and covers several different isohyetal values, the rainfall values were weighted.

Storm Event	Duration		
	3-hour	6-hour	24-hour
100-Year	2.29	3.05	6.23

The rainfall maps have been included Exhibit F.

The ultimate condition land uses within the watershed were obtained from the City of Menifee General Plan and the County of Riverside Southwest Area Land Use Plan. The area included in the unit hydrograph watershed consists of multiple land uses of varying residential. The following table summarizes the land uses used to calculate the runoff index number and the impervious fraction for the unit hydrograph calculations:

Land Use Designation	Soil A RI	Soil B RI	Soil C RI	Soil D RI	Impervious Fraction
Economic Development Corridor	44	65	77	82	0.90
¼ Acre Residential	32	56	69	75	0.50
½ Acre Residential	32	56	69	75	0.40
1 Acre Residential	32	56	69	75	0.20
2 Acre Residential	39	61	73	79	0.10
10 Acre Residential	46	44	77	83	0.025
Rural Community	46	44	77	83	0.025
Rural Mountain	46	44	77	83	0.025

The land use map has been included as Exhibit E, and a table calculating the runoff index number and impervious fraction has been included in Appendix A.

The unit hydrograph calculations were performed for 761.3 acres of area tributary to Haun Road just south of Garbani Road. The analyses were performed for the 100-year 3-hour, 6-hour and 24-hour storm durations to determine which would result in the highest flow rate. Based upon the results, the 3-hour storm duration resulted in 888 ft^3/s, and was utilized for the HEC-RAS analyses.

The hydrology calculations, runoff index calculations and impervious fraction calculations have been included in Appendix A. The hydrology map has been included as Exhibit A.

IV. HEC-RAS ANALYSES

Pre-Project and Post-Project HEC-RAS Analyses were performed to determine the pre-project and post-project flooding limits.

Pre-Project HEC-RAS

The pre-project condition developed 23 cross sections utilizing 1 foot topographic mapping (as shown on Exhibit B). The following parameters were utilized in the model:

- Manning's "n" Value of 0.035 for the banks and a value of 0.055 for the main channel area
- Expansion and Contraction coefficients of 0.30 and 0.10, respectively
- A flow rate of 890 ft^3/s (888 ft^3/s determined by the unit hydrograph calculations, and rounded up to the nearest tens place)
- Upstream boundary condition equal to normal depth of 0.007
- Downstream boundary condition of a known water surface elevation of 1475.23, which was obtained from a normal depth calculation for the roadway
- Mixed flow regime

The existing triple 24" CMP culvert that traverses Haun Road does not have capacity for the tributary flow rate. Therefore, to be conservative, a normal depth calculation was prepared using an irregular section, and the roadway was modeled with the total flow rate of 890 ft^3/s. The resulting water surface elevation ponded on the roadway is 1475.24, and this was used as the starting water surface elevation for the pre-project condition.

Currently, the flows are contained within the defined natural channel between sections 17+53.19 and 32+36.43. However, once flows reach section 16+69.81, flows begin overtopping the easterly bank, which is Haun Road, and continue to overtop until the low point at the existing CMP culvert. Artificial levees were also

utilized for sections in which flows would not be conveyed to the east or the west of the levee unless the flows overtopped the levee.

The pre-project condition HEC-RAS calculations and the overtopping normal depth calculation has been included in Appendix B, and the pre-project condition HEC-RAS work map has been included as Exhibit B.

Post-Project HEC-RAS

The post-project condition developed 14 cross sections utilizing 1 foot topographic mapping and the post-project site grading (as shown on Exhibit C). The following parameters were utilized in the model:

- Manning's "n" Value of 0.035 for the banks and a value of 0.055 for the main channel area
- Expansion and Contraction coefficients of 0.30 and 0.10, respectively
- A flow rate of 890 ft^3/s (888 ft^3/s determined by the unit hydrograph calculations, and rounded up to the nearest tens place)
- Upstream boundary condition equal to normal depth of 0.007
- Downstream boundary condition of a known water surface elevation of 1480.40, which was obtained from the Line A RCB WSPG Calculations
- Mixed flow regime

The post-project condition HEC-RAS analyses began at station 19+87.13, which is where the proposed RCB storm drain terminates. Flows will be collected from the proposed channel within a double 5' high x 10' wide RCB storm drain defined as Line A and provided as Excerpt C. The proposed channel will transitions into the Line A double 4' high x 12' wide RCB. The Line A system was modeled using the Water Surface Profile Gradient program, using plan view shown in Figure 2 and the plan and profile included as Excerpt C. The starting water surface elevation was set equal to the soffit of the system (1468.50 + 4 feet = 1472.50) and a Manning's "n" value of 0.014 was used. The resulting upstream water surface elevation at the upstream end of the transition from the culvert to the channel is 1480.398 ≈ 1480.40. This was used as the starting water surface elevation for the HEC-RAS model.

The post-project condition HEC-RAS calculations and the WSPG calculations have been included in Appendix C, and the post-project condition HEC-RAS work map has been included as Exhibit C.

V. CONCLUSIONS

Preliminary hydrology and hydraulic analyses were performed for the natural stream traversing the Mill Creek Promenade Project to determine the necessary improvements to flood protect the site. Based upon the analyses, it can be concluded that the proposed Line A storm drain system and channel will provide conveyance for the offsite flow rate of 890 ft^3/s and protect the project site from flooding. During final engineering the following items will be assessed in further detail:

1. The HEC-RAS analysis and the Line A system will require further detail in order to ensure the that the design reflects the final elevations provided in the construction drawings.
2. The project will be required to obtain an easement for Line A storm drain system, shown on Excerpt C, in order to provide access, maintenance and operation of the system. This easement will be obtained from the owner of APN 360-350-007.
3. The final design and construction drawing of the Line A and natural system that traverse the project shall comply with the RCFC&WCD design criteria and policies.

VI. REFERENCES

1. Riverside County Flood Control and Water Conservation District Hydrology Manual, April 1978.

FIGURES

FIGURE 1: VICINITY MAP

MILL CREEK PROMENADE
VICINITY MAP

N

GRAPHIC SCALE
80' 0 40' 80' 160'
1" = 80'

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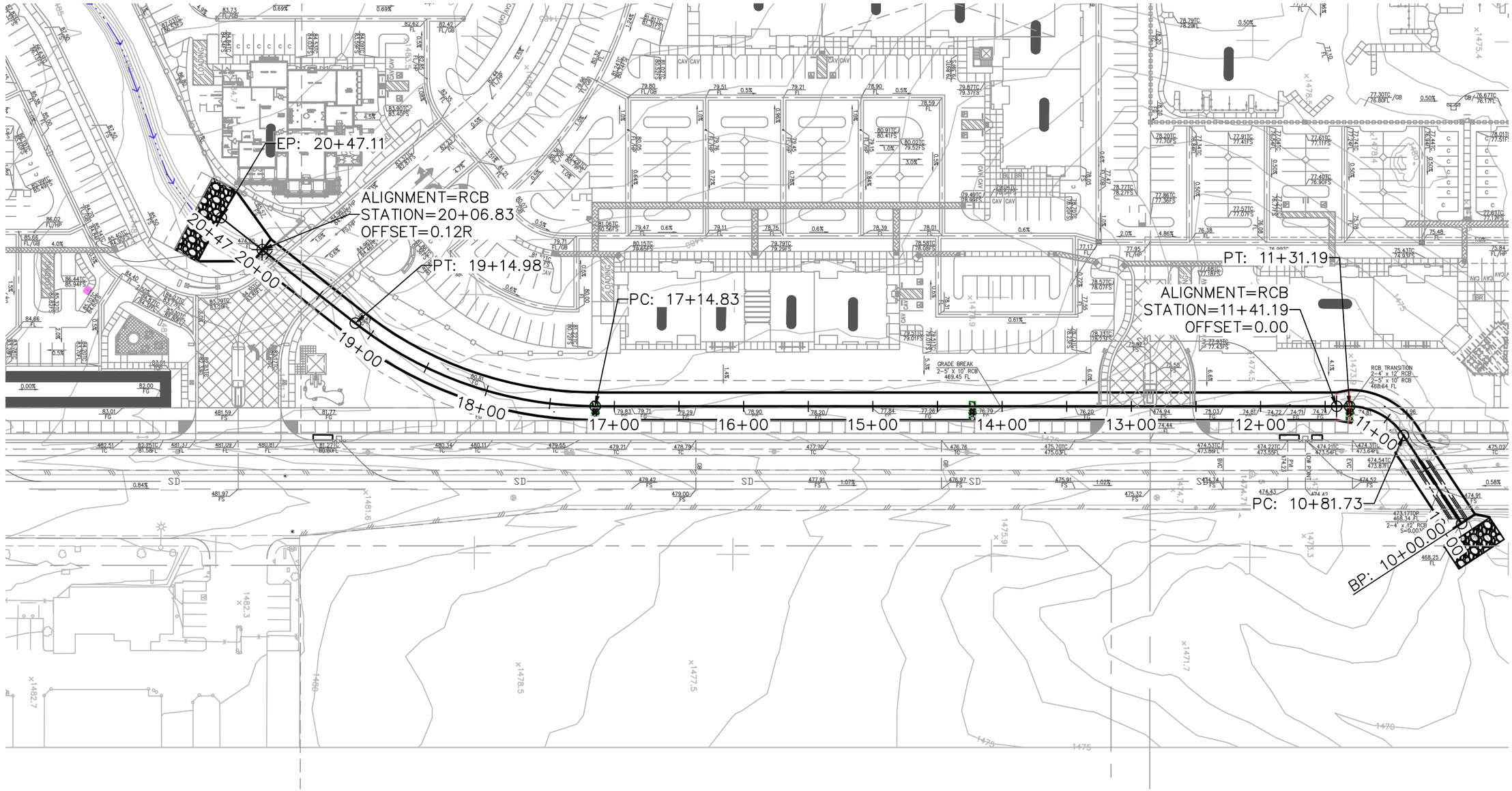
FIGURE 1

Drawing Name: O:\275.01.18\Engineering\Hydrology_Plan\Exhibits\VICINITY MAP.dwg
Last Opened: Aug 14, 2018 - 11:43am by jcarver

FIGURE 2: LINE A PLAN VIEW



MILL CREEK PROMENADE
LINE A PLAN VIEW

N

GRAPHIC SCALE
80' 0 40' 80' 160'
1" = 80'

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FIGURE 2

Drawing Name: O:\275.01.18\Engineering\HEC-RAS\JLC File\WSPG Workmap.dwg
Last Opened: Aug 14, 2018 - 11:02am by jcarver

APPENDICES

APPENDIX A: ULTIMATE CONDITION UNIT HYDROGRAPH HYDROLOGY ANALYSES

APPENDIX A.1: AREA A1 – 100-YEAR, 3-HOUR STORM DURATION

U n i t H y d r o g r a p h A n a l y s i s

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Study date 07/02/18 File: ARAE1003100.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

MILL CREEK ULTIMATE LANDUSE CONDITION
100-YEAR HYDROLOGY ANALYSIS
FILENAME: ARAE100

Drainage Area = 761.30(Ac.) = 1.190 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 761.30(Ac.) = 1.190 Sq. Mi.
Length along longest watercourse = 15950.71(Ft.)
Length along longest watercourse measured to centroid = 10150.71(Ft.)
Length along longest watercourse = 3.021 Mi.
Length along longest watercourse measured to centroid = 1.922 Mi.
Difference in elevation = 768.00(Ft.)
Slope along watercourse = 254.2232 Ft./Mi.
Average Manning's 'N' = 0.025
Lag time = 0.409 Hr.
Lag time = 24.53 Min.
25% of lag time = 6.13 Min.
40% of lag time = 9.81 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
761.30	0.94	715.62

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
761.30	2.29	1743.38

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.940(In)
Area Averaged 100-Year Rainfall = 2.290(In)

Point rain (area averaged) = 2.290(In)
Areal adjustment factor = 99.67 %
Adjusted average point rain = 2.282(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
761.300	76.60	0.248

Total Area Entered = 761.30(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
76.6	76.6	0.284	0.248	0.221	1.000	0.221
					Sum (F) =	0.221

Area averaged mean soil loss (F) (In/Hr) = 0.221
Minimum soil loss rate ((In/Hr)) = 0.110
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.733

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	20.386	1.814	13.920
2	0.167	40.772	5.339	40.961
3	0.250	61.158	9.321	71.511
4	0.333	81.545	13.018	99.879
5	0.417	101.931	14.542	111.575
6	0.500	122.317	12.199	93.593
7	0.583	142.703	8.146	62.502
8	0.667	163.089	5.637	43.253
9	0.750	183.475	3.950	30.307
10	0.833	203.861	3.087	23.683
11	0.917	224.248	2.634	20.208
12	1.000	244.634	2.257	17.319
13	1.083	265.020	1.972	15.134
14	1.167	285.406	1.760	13.503
15	1.250	305.792	1.497	11.486
16	1.333	326.178	1.286	9.866
17	1.417	346.564	1.223	9.385
18	1.500	366.951	1.110	8.520
19	1.583	387.337	0.902	6.918
20	1.667	407.723	0.879	6.747
21	1.750	428.109	0.700	5.367
22	1.833	448.495	0.652	5.005
23	1.917	468.881	0.635	4.871
24	2.000	489.267	0.612	4.693
25	2.083	509.654	0.593	4.552
26	2.167	530.040	0.471	3.614
27	2.250	550.426	0.448	3.441
28	2.333	570.812	0.406	3.115
29	2.417	591.198	0.367	2.815
30	2.500	611.584	0.354	2.714
31	2.583	631.970	0.293	2.248
32	2.667	652.357	0.285	2.186
33	2.750	672.743	0.236	1.809
34	2.833	693.129	0.204	1.564
35	2.917	713.515	0.204	1.564
36	3.000	733.901	0.204	1.564
37	3.083	754.287	0.204	1.564
38	3.167	774.674	0.204	1.564
39	3.250	795.060	0.204	1.564
40	3.333	815.446	0.151	1.161
			Sum = 100.000	Sum= 767.248

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	1.30	0.356	0.221	(0.261)	0.135
2	0.17	1.30	0.356	0.221	(0.261)	0.135

3	0.25	1.10	0.301	0.221	(0.221)		0.080
4	0.33	1.50	0.411	0.221	(0.301)		0.190
5	0.42	1.50	0.411	0.221	(0.301)		0.190
6	0.50	1.80	0.493	0.221	(0.361)		0.272
7	0.58	1.50	0.411	0.221	(0.301)		0.190
8	0.67	1.80	0.493	0.221	(0.361)		0.272
9	0.75	1.80	0.493	0.221	(0.361)		0.272
10	0.83	1.50	0.411	0.221	(0.301)		0.190
11	0.92	1.60	0.438	0.221	(0.321)		0.217
12	1.00	1.80	0.493	0.221	(0.361)		0.272
13	1.08	2.20	0.603	0.221	(0.442)		0.382
14	1.17	2.20	0.603	0.221	(0.442)		0.382
15	1.25	2.20	0.603	0.221	(0.442)		0.382
16	1.33	2.00	0.548	0.221	(0.402)		0.327
17	1.42	2.60	0.712	0.221	(0.522)		0.491
18	1.50	2.70	0.739	0.221	(0.542)		0.519
19	1.58	2.40	0.657	0.221	(0.482)		0.437
20	1.67	2.70	0.739	0.221	(0.542)		0.519
21	1.75	3.30	0.904	0.221	(0.662)		0.683
22	1.83	3.10	0.849	0.221	(0.622)		0.628
23	1.92	2.90	0.794	0.221	(0.582)		0.573
24	2.00	3.00	0.822	0.221	(0.602)		0.601
25	2.08	3.10	0.849	0.221	(0.622)		0.628
26	2.17	4.20	1.150	0.221	(0.843)		0.930
27	2.25	5.00	1.369	0.221	(1.004)		1.149
28	2.33	3.50	0.959	0.221	(0.703)		0.738
29	2.42	6.80	1.862	0.221	(1.365)		1.642
30	2.50	7.30	1.999	0.221	(1.466)		1.779
31	2.58	8.20	2.246	0.221	(1.646)		2.025
32	2.67	5.90	1.616	0.221	(1.184)		1.395
33	2.75	2.00	0.548	0.221	(0.402)		0.327
34	2.83	1.80	0.493	0.221	(0.361)		0.272
35	2.92	1.80	0.493	0.221	(0.361)		0.272
36	3.00	0.60	0.164	(0.221)	0.120		0.044

(Loss Rate Not Used)

Sum = 100.0 Sum = 19.5

Flood volume = Effective rainfall 1.63(In)
times area 761.3(Ac.)/[(In)/(Ft.)] = 103.3(Ac.Ft)
Total soil loss = 0.65(In)
Total soil loss = 41.494(Ac.Ft)
Total rainfall = 2.28(In)
Flood volume = 4499880.3 Cubic Feet
Total soil loss = 1807500.1 Cubic Feet

Peak flow rate of this hydrograph = 887.579(CFS)

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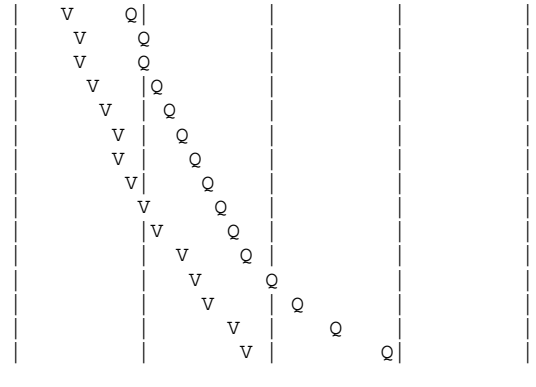
3 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	225.0	450.0	675.0	900.0
0+ 5	0.0130	1.88	Q				
0+10	0.0641	7.43	Q				
0+15	0.1766	16.34	Q				
0+20	0.3773	29.14	VQ				
0+25	0.6859	44.80	VQ				
0+30	1.1058	60.98	V Q				
0+35	1.6326	76.49	V Q				
0+40	2.2738	93.10	V Q				
0+45	3.0295	109.73	|V Q				
0+50	3.8774	123.11	|V Q				
0+55	4.7912	132.67	|V Q				
1+ 0	5.7530	139.67	| V Q				
1+ 5	6.7643	146.83	| V Q				
1+10	7.8385	155.97	| V Q				
1+15	9.0112	170.28	| V Q				
1+20	10.3092	188.47	| V Q |			

1+25	11.7407	207.86	
1+30	13.3026	226.79	
1+35	14.9827	243.95	
1+40	16.7866	261.93	
1+45	18.7403	283.67	
1+50	20.8562	307.23	
1+55	23.1276	329.81	
2+ 0	25.5576	352.83	
2+ 5	28.1347	374.20	
2+10	30.8434	393.30	
2+15	33.7299	419.13	
2+20	36.8554	453.82	
2+25	40.3319	504.79	
2+30	44.3145	578.27	
2+35	48.9318	670.42	
2+40	54.		

APPENDIX A.2: AREA A1 – 100-YEAR, 6-HOUR STORM DURATION

U n i t H y d r o g r a p h A n a l y s i s

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Study date 07/02/18 File: ARAE1006100.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

MILL CREEK ULTIMATE LANDUSE CONDITION
100-YEAR HYDROLOGY ANALYSIS
FILENAME: ARAE100

Drainage Area = 761.30(Ac.) = 1.190 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 761.30(Ac.) = 1.190 Sq. Mi.
Length along longest watercourse = 15950.71(Ft.)
Length along longest watercourse measured to centroid = 10150.71(Ft.)
Length along longest watercourse = 3.021 Mi.
Length along longest watercourse measured to centroid = 1.922 Mi.
Difference in elevation = 768.00(Ft.)
Slope along watercourse = 254.2232 Ft./Mi.
Average Manning's 'N' = 0.025
Lag time = 0.409 Hr.
Lag time = 24.53 Min.
25% of lag time = 6.13 Min.
40% of lag time = 9.81 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
761.30	1.33	1012.53

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
761.30	3.05	2321.96

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.330(In)
Area Averaged 100-Year Rainfall = 3.050(In)

Point rain (area averaged) = 3.050(In)
Areal adjustment factor = 99.74 %
Adjusted average point rain = 3.042(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
761.300	76.60	0.248

Total Area Entered = 761.30(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
76.6	76.6	0.284	0.248	0.221	1.000	0.221
					Sum (F) =	0.221

Area averaged mean soil loss (F) (In/Hr) = 0.221
Minimum soil loss rate ((In/Hr)) = 0.110
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.733

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	20.386	1.814	13.920
2	0.167	40.772	5.339	40.961
3	0.250	61.158	9.321	71.511
4	0.333	81.545	13.018	99.879
5	0.417	101.931	14.542	111.575
6	0.500	122.317	12.199	93.593
7	0.583	142.703	8.146	62.502
8	0.667	163.089	5.637	43.253
9	0.750	183.475	3.950	30.307
10	0.833	203.861	3.087	23.683
11	0.917	224.248	2.634	20.208
12	1.000	244.634	2.257	17.319
13	1.083	265.020	1.972	15.134
14	1.167	285.406	1.760	13.503
15	1.250	305.792	1.497	11.486
16	1.333	326.178	1.286	9.866
17	1.417	346.564	1.223	9.385
18	1.500	366.951	1.110	8.520
19	1.583	387.337	0.902	6.918
20	1.667	407.723	0.879	6.747
21	1.750	428.109	0.700	5.367
22	1.833	448.495	0.652	5.005
23	1.917	468.881	0.635	4.871
24	2.000	489.267	0.612	4.693
25	2.083	509.654	0.593	4.552
26	2.167	530.040	0.471	3.614
27	2.250	550.426	0.448	3.441
28	2.333	570.812	0.406	3.115
29	2.417	591.198	0.367	2.815
30	2.500	611.584	0.354	2.714
31	2.583	631.970	0.293	2.248
32	2.667	652.357	0.285	2.186
33	2.750	672.743	0.236	1.809
34	2.833	693.129	0.204	1.564
35	2.917	713.515	0.204	1.564
36	3.000	733.901	0.204	1.564
37	3.083	754.287	0.204	1.564
38	3.167	774.674	0.204	1.564
39	3.250	795.060	0.204	1.564
40	3.333	815.446	0.151	1.161
			Sum = 100.000	Sum= 767.248

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

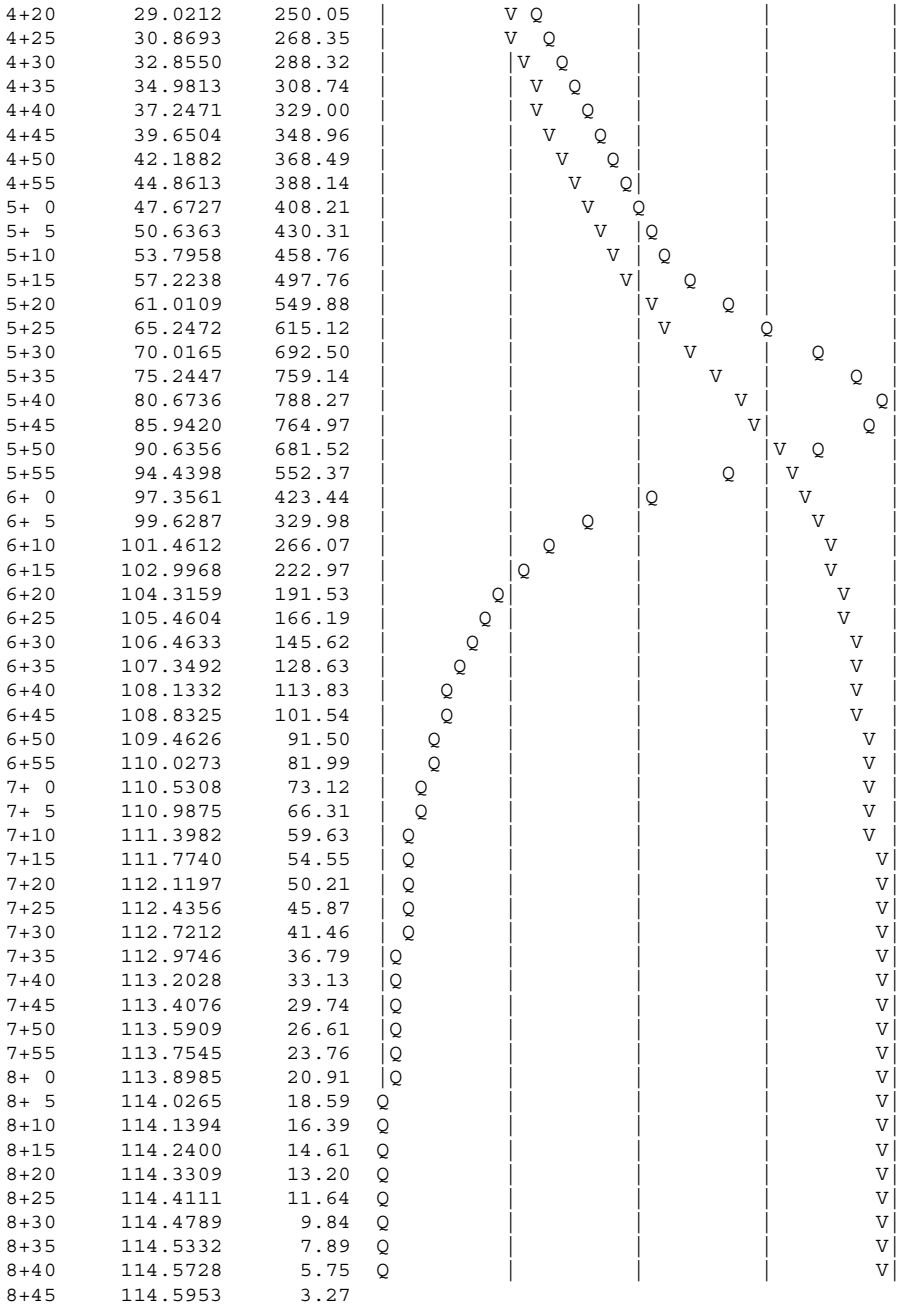
Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.50	0.183	(0.221)	0.134	0.049
2	0.17	0.60	0.219	(0.221)	0.161	0.058

3	0.25	0.60	0.219	(0.221)	0.161	0.058
4	0.33	0.60	0.219	(0.221)	0.161	0.058
5	0.42	0.60	0.219	(0.221)	0.161	0.058
6	0.50	0.70	0.256	(0.221)	0.187	0.068
7	0.58	0.70	0.256	(0.221)	0.187	0.068
8	0.67	0.70	0.256	(0.221)	0.187	0.068
9	0.75	0.70	0.256	(0.221)	0.187	0.068
10	0.83	0.70	0.256	(0.221)	0.187	0.068
11	0.92	0.70	0.256	(0.221)	0.187	0.068
12	1.00	0.80	0.292	(0.221)	0.214	0.078
13	1.08	0.80	0.292	(0.221)	0.214	0.078
14	1.17	0.80	0.292	(0.221)	0.214	0.078
15	1.25	0.80	0.292	(0.221)	0.214	0.078
16	1.33	0.80	0.292	(0.221)	0.214	0.078
17	1.42	0.80	0.292	(0.221)	0.214	0.078
18	1.50	0.80	0.292	(0.221)	0.214	0.078
19	1.58	0.80	0.292	(0.221)	0.214	0.078
20	1.67	0.80	0.292	(0.221)	0.214	0.078
21	1.75	0.80	0.292	(0.221)	0.214	0.078
22	1.83	0.80	0.292	(0.221)	0.214	0.078
23	1.92	0.80	0.292	(0.221)	0.214	0.078
24	2.00	0.90	0.329	0.221	(0.241)	0.108
25	2.08	0.80	0.292	(0.221)	0.214	0.078
26	2.17	0.90	0.329	0.221	(0.241)	0.108
27	2.25	0.90	0.329	0.221	(0.241)	0.108
28	2.33	0.90	0.329	0.221	(0.241)	0.108
29	2.42	0.90	0.329	0.221	(0.241)	0.108
30	2.50	0.90	0.329	0.221	(0.241)	0.108
31	2.58	0.90	0.329	0.221	(0.241)	0.108
32	2.67	0.90	0.329	0.221	(0.241)	0.108
33	2.75	1.00	0.365	0.221	(0.268)	0.144
34	2.83	1.00	0.365	0.221	(0.268)	0.144
35	2.92	1.00	0.365	0.221	(0.268)	0.144
36	3.00	1.00	0.365	0.221	(0.268)	0.144
37	3.08	1.00	0.365	0.221	(0.268)	0.144
38	3.17	1.10	0.402	0.221	(0.294)	0.181
39	3.25	1.10	0.402	0.221	(0.294)	0.181
40	3.33	1.10	0.402	0.221	(0.294)	0.181
41	3.42	1.20	0.438	0.221	(0.321)	0.217
42	3.50	1.30	0.475	0.221	(0.348)	0.254
43	3.58	1.40	0.511	0.221	(0.375)	0.290
44	3.67	1.40	0.511	0.221	(0.375)	0.290
45	3.75	1.50	0.548	0.221	(0.401)	0.327
46	3.83	1.50	0.548	0.221	(0.401)	0.327
47	3.92	1.60	0.584	0.221	(0.428)	0.363
48	4.00	1.60	0.584	0.221	(0.428)	0.363
49	4.08	1.70	0.621	0.221	(0.455)	0.400
50	4.17	1.80	0.657	0.221	(0.482)	0.436
51	4.25	1.90	0.694	0.221	(0.508)	0.473
52	4.33	2.00	0.730	0.221	(0.535)	0.509
53	4.42	2.10	0.767	0.221	(0.562)	0.546
54	4.50	2.10	0.767	0.221	(0.562)	0.546
55	4.58	2.20	0.803	0.221	(0.589)	0.582
56	4.67	2.30	0.840	0.221	(0.615)	0.619
57	4.75	2.40	0.876	0.221	(0.642)	0.655
58	4.83	2.40	0.876	0.221	(0.642)	0.655
59	4.92	2.50	0.913	0.221	(0.669)	0.692
60	5.00	2.60	0.949	0.221	(0.696)	0.728
61	5.08	3.10	1.132	0.221	(0.829)	0.911
62	5.17	3.60	1.314	0.221	(0.963)	1.093
63	5.25	3.90	1.424	0.221	(1.044)	1.203
64	5.33	4.20	1.533	0.221	(1.124)	1.312
65	5.42	4.70	1.716	0.221	(1.258)	1.495
66	5.50	5.60	2.044	0.221	(1.498)	1.823
67	5.58	1.90	0.694	0.221	(0.508)	0.473
68	5.67	0.90	0.329	0.221	(0.241)	0.108
69	5.75	0.60	0.219	(0.221)	0.161	0.058
70	5.83	0.50	0.183	(0.221)	0.134	0.049
71	5.92	0.30	0.110	(0.221)	0.080	0.029
72	6.00	0.20	0.073	(0.221)	0.054	0.019

(Loss Rate Not Used)

```
  Sum =     100.0                                        Sum =    21.7
     Flood volume = Effective rainfall      1.81(In)
      times area     761.3(Ac.)/[(In)/(Ft.)] =     114.6(Ac.Ft)
     Total soil loss =      1.24(In)
     Total soil loss =    78.383(Ac.Ft)
     Total rainfall =      3.04(In)
     Flood volume =     4992302.6 Cubic Feet
     Total soil loss =     3414372.6 Cubic Feet
     ---------------------------------------------------------------------
      Peak flow rate of this hydrograph =    788.270(CFS)
     ---------------------------------------------------------------------
     +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                         6 - H O U R    S T O R M
                    R u n o f f     H y d r o g r a p h
     ---------------------------------------------------------------------
                Hydrograph in   5   Minute intervals ((CFS))

     ---------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0      200.0     400.0     600.0     800.0
-------------------------------------------------------------------------
  0+ 5       0.0047      0.68  Q         |         |         |         |
  0+10       0.0240      2.81  Q         |         |         |         |
  0+15       0.0702      6.70  Q         |         |         |         |
  0+20       0.1546     12.27  Q         |         |         |         |
  0+25       0.2833     18.68  Q         |         |         |         |
  0+30       0.4518     24.47  VQ        |         |         |         |
  0+35       0.6503     28.83  VQ        |         |         |         |
  0+40       0.8724     32.24  VQ        |         |         |         |
  0+45       1.1142     35.12  VQ        |         |         |         |
  0+50       1.3735     37.65  VQ        |         |         |         |
  0+55       1.6475     39.78  VQ        |         |         |         |
  1+ 0       1.9338     41.57  V Q       |         |         |         |
  1+ 5       2.2320     43.30  V Q       |         |         |         |
  1+10       2.5426     45.10  V Q       |         |         |         |
  1+15       2.8662     46.99  |VQ       |         |         |         |
  1+20       3.2028     48.87  |VQ       |         |         |         |
  1+25       3.5506     50.51  |VQ       |         |         |         |
  1+30       3.9072     51.77  |VQ       |         |         |         |
  1+35       4.2704     52.74  |VQ       |         |         |         |
  1+40       4.6392     53.55  |VQ       |         |         |         |
  1+45       5.0125     54.20  |VQ       |         |         |         |
  1+50       5.3899     54.79  |VQ       |         |         |         |
  1+55       5.7709     55.33  | Q       |         |         |         |
  2+ 0       6.1582     56.23  | Q       |         |         |         |
  2+ 5       6.5542     57.50  | Q       |         |         |         |
  2+10       6.9620     59.21  | Q       |         |         |         |
  2+15       7.3864     61.62  | VQ      |         |         |         |
  2+20       7.8301     64.43  | VQ      |         |         |         |
  2+25       8.2926     67.16  | VQ      |         |         |         |
  2+30       8.7735     69.83  |  Q      |         |         |         |
  2+35       9.2713     72.28  |  Q      |         |         |         |
  2+40       9.7808     73.97  |  Q      |         |         |         |
  2+45      10.3025     75.76  |  Q      |         |         |         |
  2+50      10.8412     78.22  |  Q      |         |         |         |
  2+55      11.4033     81.61  |  VQ     |         |         |         |
  3+ 0      11.9953     85.96  |   Q     |         |         |         |
  3+ 5      12.6196     90.65  |   Q     |         |         |         |
  3+10      13.2746     95.11  |   Q     |         |         |         |
  3+15      13.9590     99.38  |   Q     |         |         |         |
  3+20      14.6753    104.01  |    Q    |         |         |         |
  3+25      15.4301    109.60  |    Q    |         |         |         |
  3+30      16.2346    116.81  |    Q    |         |         |         |
  3+35      17.1014    125.87  |    VQ   |         |         |         |
  3+40      18.0431    136.74  |     Q   |         |         |         |
  3+45      19.0757    149.93  |     VQ  |         |         |         |
  3+50      20.2075    164.34  |      VQ |         |         |         |
  3+55      21.4380    178.68  |      VQ |         |         |         |
  4+ 0      22.7628    192.35  |      V Q|         |         |         |
  4+ 5      24.1789    205.62  |       V Q         |         |         |
  4+10      25.6889    219.25  |       V Q         |         |         |
  4+15      27.2991    233.79  |        V|Q        |         |         |
```

4+20	29.0212	250.05	
4+25	30.8693	268.35	
4+30	32.8550	288.32	
4+35	34.9813	308.74	
4+40	37.2471	329.00	
4+45	39.6504	348.96	
4+50	42.1882	368.49	
4+55	44.8613	388.14	
5+ 0	47.6727	408.21	
5+ 5	50.6363	430.31	
5+10	53.7958	458.76	
5+15	57.2238	497.76	
5+20	61.0109	549.88	
5+25	65.2472	615.12	
5+30	70.0165	692.50	
5+35	75.2447	759.14	
5+40	80.6736	788.27	
5+45	85.9420	764.97	
5+50	90.6356	681.52	
5+55	94.4398	552.37	
6+ 0	97.3561	423.44	
6+ 5	99.6287	329.98	
6+10	101.4612	266.07	
6+15	102.9968	222.97	
6+20	104.3159	191.53	
6+25	105.4604	166.19	
6+30	106.4633	145.62	
6+35	107.3492	128.63	
6+40	108.1332	113.83	
6+45	108.8325	101.54	
6+50	109.4626	91.50	
6+55	110.0273	81.99	
7+ 0	110.5308	73.12	
7+ 5	110.9875	66.31	
7+10	111.3982	59.63	
7+15	111.7740	54.55	
7+20	112.1197	50.21	
7+25	112.4356	45.87	
7+30	112.7212	41.46	
7+35	112.9746	36.79	
7+40	113.2028	33.13	
7+45	113.4076	29.74	
7+50	113.5909	26.61	
7+55	113.7545	23.76	
8+ 0	113.8985	20.91	
8+ 5	114.0265	18.59	
8+10	114.1394	16.39	
8+15	114.2400	14.61	
8+20	114.3309	13.20	
8+25	114.4111	11.64	
8+30	114.4789	9.84	
8+35	114.5332	7.89	
8+40	114.5728	5.75	
8+45	114.5953	3.27	

APPENDIX A.3: AREA A1 – 100-YEAR, 24-HOUR STORM DURATION

U n i t H y d r o g r a p h A n a l y s i s

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Study date 07/02/18 File: ARAE10024100.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6279

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

MILL CREEK ULTIMATE LANDUSE CONDITION
100-YEAR HYDROLOGY ANALYSIS
FILENAME: ARAE100

Drainage Area = 761.30(Ac.) = 1.190 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 761.30(Ac.) = 1.190 Sq. Mi.
Length along longest watercourse = 15950.71(Ft.)
Length along longest watercourse measured to centroid = 10150.71(Ft.)
Length along longest watercourse = 3.021 Mi.
Length along longest watercourse measured to centroid = 1.922 Mi.
Difference in elevation = 768.00(Ft.)
Slope along watercourse = 254.2232 Ft./Mi.
Average Manning's 'N' = 0.025
Lag time = 0.409 Hr.
Lag time = 24.53 Min.
25% of lag time = 6.13 Min.
40% of lag time = 9.81 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
761.30	2.37	1804.28

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
761.30	6.23	4742.90

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 2.370(In)
Area Averaged 100-Year Rainfall = 6.230(In)

Point rain (area averaged) = 6.230(In)
Areal adjustment factor = 99.85 %
Adjusted average point rain = 6.221(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
761.300	76.60	0.248

Total Area Entered = 761.30(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
76.6	76.6	0.284	0.248	0.221	1.000	0.221
					Sum (F) =	0.221

Area averaged mean soil loss (F) (In/Hr) = 0.221
Minimum soil loss rate ((In/Hr)) = 0.110
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.733

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	20.386	1.814	13.920
2	0.167	40.772	5.339	40.961
3	0.250	61.158	9.321	71.511
4	0.333	81.545	13.018	99.879
5	0.417	101.931	14.542	111.575
6	0.500	122.317	12.199	93.593
7	0.583	142.703	8.146	62.502
8	0.667	163.089	5.637	43.253
9	0.750	183.475	3.950	30.307
10	0.833	203.861	3.087	23.683
11	0.917	224.248	2.634	20.208
12	1.000	244.634	2.257	17.319
13	1.083	265.020	1.972	15.134
14	1.167	285.406	1.760	13.503
15	1.250	305.792	1.497	11.486
16	1.333	326.178	1.286	9.866
17	1.417	346.564	1.223	9.385
18	1.500	366.951	1.110	8.520
19	1.583	387.337	0.902	6.918
20	1.667	407.723	0.879	6.747
21	1.750	428.109	0.700	5.367
22	1.833	448.495	0.652	5.005
23	1.917	468.881	0.635	4.871
24	2.000	489.267	0.612	4.693
25	2.083	509.654	0.593	4.552
26	2.167	530.040	0.471	3.614
27	2.250	550.426	0.448	3.441
28	2.333	570.812	0.406	3.115
29	2.417	591.198	0.367	2.815
30	2.500	611.584	0.354	2.714
31	2.583	631.970	0.293	2.248
32	2.667	652.357	0.285	2.186
33	2.750	672.743	0.236	1.809
34	2.833	693.129	0.204	1.564
35	2.917	713.515	0.204	1.564
36	3.000	733.901	0.204	1.564
37	3.083	754.287	0.204	1.564
38	3.167	774.674	0.204	1.564
39	3.250	795.060	0.204	1.564
40	3.333	815.446	0.151	1.161
			Sum = 100.000	Sum= 767.248

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.050	(0.391)	0.036	0.013
2	0.17	0.07	0.050	(0.390)	0.036	0.013

3	0.25	0.07	0.050	(0.388)	0.036	0.013
4	0.33	0.10	0.075	(0.387)	0.055	0.020
5	0.42	0.10	0.075	(0.385)	0.055	0.020
6	0.50	0.10	0.075	(0.384)	0.055	0.020
7	0.58	0.10	0.075	(0.382)	0.055	0.020
8	0.67	0.10	0.075	(0.381)	0.055	0.020
9	0.75	0.10	0.075	(0.379)	0.055	0.020
10	0.83	0.13	0.100	(0.378)	0.073	0.027
11	0.92	0.13	0.100	(0.376)	0.073	0.027
12	1.00	0.13	0.100	(0.375)	0.073	0.027
13	1.08	0.10	0.075	(0.373)	0.055	0.020
14	1.17	0.10	0.075	(0.372)	0.055	0.020
15	1.25	0.10	0.075	(0.371)	0.055	0.020
16	1.33	0.10	0.075	(0.369)	0.055	0.020
17	1.42	0.10	0.075	(0.368)	0.055	0.020
18	1.50	0.10	0.075	(0.366)	0.055	0.020
19	1.58	0.10	0.075	(0.365)	0.055	0.020
20	1.67	0.10	0.075	(0.363)	0.055	0.020
21	1.75	0.10	0.075	(0.362)	0.055	0.020
22	1.83	0.13	0.100	(0.360)	0.073	0.027
23	1.92	0.13	0.100	(0.359)	0.073	0.027
24	2.00	0.13	0.100	(0.357)	0.073	0.027
25	2.08	0.13	0.100	(0.356)	0.073	0.027
26	2.17	0.13	0.100	(0.354)	0.073	0.027
27	2.25	0.13	0.100	(0.353)	0.073	0.027
28	2.33	0.13	0.100	(0.352)	0.073	0.027
29	2.42	0.13	0.100	(0.350)	0.073	0.027
30	2.50	0.13	0.100	(0.349)	0.073	0.027
31	2.58	0.17	0.124	(0.347)	0.091	0.033
32	2.67	0.17	0.124	(0.346)	0.091	0.033
33	2.75	0.17	0.124	(0.344)	0.091	0.033
34	2.83	0.17	0.124	(0.343)	0.091	0.033
35	2.92	0.17	0.124	(0.342)	0.091	0.033
36	3.00	0.17	0.124	(0.340)	0.091	0.033
37	3.08	0.17	0.124	(0.339)	0.091	0.033
38	3.17	0.17	0.124	(0.337)	0.091	0.033
39	3.25	0.17	0.124	(0.336)	0.091	0.033
40	3.33	0.17	0.124	(0.335)	0.091	0.033
41	3.42	0.17	0.124	(0.333)	0.091	0.033
42	3.50	0.17	0.124	(0.332)	0.091	0.033
43	3.58	0.17	0.124	(0.330)	0.091	0.033
44	3.67	0.17	0.124	(0.329)	0.091	0.033
45	3.75	0.17	0.124	(0.328)	0.091	0.033
46	3.83	0.20	0.149	(0.326)	0.109	0.040
47	3.92	0.20	0.149	(0.325)	0.109	0.040
48	4.00	0.20	0.149	(0.324)	0.109	0.040
49	4.08	0.20	0.149	(0.322)	0.109	0.040
50	4.17	0.20	0.149	(0.321)	0.109	0.040
51	4.25	0.20	0.149	(0.319)	0.109	0.040
52	4.33	0.23	0.174	(0.318)	0.128	0.047
53	4.42	0.23	0.174	(0.317)	0.128	0.047
54	4.50	0.23	0.174	(0.315)	0.128	0.047
55	4.58	0.23	0.174	(0.314)	0.128	0.047
56	4.67	0.23	0.174	(0.313)	0.128	0.047
57	4.75	0.23	0.174	(0.311)	0.128	0.047
58	4.83	0.27	0.199	(0.310)	0.146	0.053
59	4.92	0.27	0.199	(0.309)	0.146	0.053
60	5.00	0.27	0.199	(0.307)	0.146	0.053
61	5.08	0.20	0.149	(0.306)	0.109	0.040
62	5.17	0.20	0.149	(0.305)	0.109	0.040
63	5.25	0.20	0.149	(0.303)	0.109	0.040
64	5.33	0.23	0.174	(0.302)	0.128	0.047
65	5.42	0.23	0.174	(0.301)	0.128	0.047
66	5.50	0.23	0.174	(0.299)	0.128	0.047
67	5.58	0.27	0.199	(0.298)	0.146	0.053
68	5.67	0.27	0.199	(0.297)	0.146	0.053
69	5.75	0.27	0.199	(0.295)	0.146	0.053
70	5.83	0.27	0.199	(0.294)	0.146	0.053
71	5.92	0.27	0.199	(0.293)	0.146	0.053
72	6.00	0.27	0.199	(0.291)	0.146	0.053
73	6.08	0.30	0.224	(0.290)	0.164	0.060

74	6.17	0.30	0.224	(	0.289)	0.164	0.060
75	6.25	0.30	0.224	(	0.288)	0.164	0.060
76	6.33	0.30	0.224	(	0.286)	0.164	0.060
77	6.42	0.30	0.224	(	0.285)	0.164	0.060
78	6.50	0.30	0.224	(	0.284)	0.164	0.060
79	6.58	0.33	0.249	(	0.282)	0.182	0.066
80	6.67	0.33	0.249	(	0.281)	0.182	0.066
81	6.75	0.33	0.249	(	0.280)	0.182	0.066
82	6.83	0.33	0.249	(	0.279)	0.182	0.066
83	6.92	0.33	0.249	(	0.277)	0.182	0.066
84	7.00	0.33	0.249	(	0.276)	0.182	0.066
85	7.08	0.33	0.249	(	0.275)	0.182	0.066
86	7.17	0.33	0.249	(	0.274)	0.182	0.066
87	7.25	0.33	0.249	(	0.272)	0.182	0.066
88	7.33	0.37	0.274	(	0.271)	0.201	0.073
89	7.42	0.37	0.274	(	0.270)	0.201	0.073
90	7.50	0.37	0.274	(	0.269)	0.201	0.073
91	7.58	0.40	0.299	(	0.267)	0.219	0.080
92	7.67	0.40	0.299	(	0.266)	0.219	0.080
93	7.75	0.40	0.299	(	0.265)	0.219	0.080
94	7.83	0.43	0.323	(	0.264)	0.237	0.086
95	7.92	0.43	0.323	(	0.263)	0.237	0.086
96	8.00	0.43	0.323	(	0.261)	0.237	0.086
97	8.08	0.50	0.373		0.260	(0.274)	0.113
98	8.17	0.50	0.373		0.259	(0.274)	0.114
99	8.25	0.50	0.373		0.258	(0.274)	0.116
100	8.33	0.50	0.373		0.256	(0.274)	0.117
101	8.42	0.50	0.373		0.255	(0.274)	0.118
102	8.50	0.50	0.373		0.254	(0.274)	0.119
103	8.58	0.53	0.398		0.253	(0.292)	0.145
104	8.67	0.53	0.398		0.252	(0.292)	0.146
105	8.75	0.53	0.398		0.251	(0.292)	0.148
106	8.83	0.57	0.423		0.249	(0.310)	0.174
107	8.92	0.57	0.423		0.248	(0.310)	0.175
108	9.00	0.57	0.423		0.247	(0.310)	0.176
109	9.08	0.63	0.473		0.246	(0.347)	0.227
110	9.17	0.63	0.473		0.245	(0.347)	0.228
111	9.25	0.63	0.473		0.243	(0.347)	0.229
112	9.33	0.67	0.498		0.242	(0.365)	0.255
113	9.42	0.67	0.498		0.241	(0.365)	0.256
114	9.50	0.67	0.498		0.240	(0.365)	0.258
115	9.58	0.70	0.523		0.239	(0.383)	0.284
116	9.67	0.70	0.523		0.238	(0.383)	0.285
117	9.75	0.70	0.523		0.237	(0.383)	0.286
118	9.83	0.73	0.547		0.235	(0.401)	0.312
119	9.92	0.73	0.547		0.234	(0.401)	0.313
120	10.00	0.73	0.547		0.233	(0.401)	0.314
121	10.08	0.50	0.373		0.232	(0.274)	0.141
122	10.17	0.50	0.373		0.231	(0.274)	0.142
123	10.25	0.50	0.373		0.230	(0.274)	0.143
124	10.33	0.50	0.373		0.229	(0.274)	0.145
125	10.42	0.50	0.373		0.228	(0.274)	0.146
126	10.50	0.50	0.373		0.226	(0.274)	0.147
127	10.58	0.67	0.498		0.225	(0.365)	0.272
128	10.67	0.67	0.498		0.224	(0.365)	0.273
129	10.75	0.67	0.498		0.223	(0.365)	0.275
130	10.83	0.67	0.498		0.222	(0.365)	0.276
131	10.92	0.67	0.498		0.221	(0.365)	0.277
132	11.00	0.67	0.498		0.220	(0.365)	0.278
133	11.08	0.63	0.473		0.219	(0.347)	0.254
134	11.17	0.63	0.473		0.218	(0.347)	0.255
135	11.25	0.63	0.473		0.217	(0.347)	0.256
136	11.33	0.63	0.473		0.216	(0.347)	0.257
137	11.42	0.63	0.473		0.215	(0.347)	0.258
138	11.50	0.63	0.473		0.213	(0.347)	0.259
139	11.58	0.57	0.423		0.212	(0.310)	0.211
140	11.67	0.57	0.423		0.211	(0.310)	0.212
141	11.75	0.57	0.423		0.210	(0.310)	0.213
142	11.83	0.60	0.448		0.209	(0.328)	0.239
143	11.92	0.60	0.448		0.208	(0.328)	0.240
144	12.00	0.60	0.448		0.207	(0.328)	0.241

145	12.08	0.83	0.622	0.206	(0.456)	0.416
146	12.17	0.83	0.622	0.205	(0.456)	0.417
147	12.25	0.83	0.622	0.204	(0.456)	0.418
148	12.33	0.87	0.647	0.203	(0.474)	0.444
149	12.42	0.87	0.647	0.202	(0.474)	0.445
150	12.50	0.87	0.647	0.201	(0.474)	0.446
151	12.58	0.93	0.697	0.200	(0.511)	0.497
152	12.67	0.93	0.697	0.199	(0.511)	0.498
153	12.75	0.93	0.697	0.198	(0.511)	0.499
154	12.83	0.97	0.722	0.197	(0.529)	0.525
155	12.92	0.97	0.722	0.196	(0.529)	0.526
156	13.00	0.97	0.722	0.195	(0.529)	0.527
157	13.08	1.13	0.846	0.194	(0.620)	0.652
158	13.17	1.13	0.846	0.193	(0.620)	0.653
159	13.25	1.13	0.846	0.192	(0.620)	0.654
160	13.33	1.13	0.846	0.191	(0.620)	0.655
161	13.42	1.13	0.846	0.190	(0.620)	0.656
162	13.50	1.13	0.846	0.189	(0.620)	0.657
163	13.58	0.77	0.572	0.188	(0.420)	0.384
164	13.67	0.77	0.572	0.187	(0.420)	0.385
165	13.75	0.77	0.572	0.186	(0.420)	0.386
166	13.83	0.77	0.572	0.185	(0.420)	0.387
167	13.92	0.77	0.572	0.184	(0.420)	0.388
168	14.00	0.77	0.572	0.183	(0.420)	0.389
169	14.08	0.90	0.672	0.182	(0.492)	0.489
170	14.17	0.90	0.672	0.182	(0.492)	0.490
171	14.25	0.90	0.672	0.181	(0.492)	0.491
172	14.33	0.87	0.647	0.180	(0.474)	0.467
173	14.42	0.87	0.647	0.179	(0.474)	0.468
174	14.50	0.87	0.647	0.178	(0.474)	0.469
175	14.58	0.87	0.647	0.177	(0.474)	0.470
176	14.67	0.87	0.647	0.176	(0.474)	0.471
177	14.75	0.87	0.647	0.175	(0.474)	0.472
178	14.83	0.83	0.622	0.174	(0.456)	0.448
179	14.92	0.83	0.622	0.173	(0.456)	0.449
180	15.00	0.83	0.622	0.172	(0.456)	0.450
181	15.08	0.80	0.597	0.172	(0.438)	0.426
182	15.17	0.80	0.597	0.171	(0.438)	0.426
183	15.25	0.80	0.597	0.170	(0.438)	0.427
184	15.33	0.77	0.572	0.169	(0.420)	0.403
185	15.42	0.77	0.572	0.168	(0.420)	0.404
186	15.50	0.77	0.572	0.167	(0.420)	0.405
187	15.58	0.63	0.473	0.166	(0.347)	0.306
188	15.67	0.63	0.473	0.166	(0.347)	0.307
189	15.75	0.63	0.473	0.165	(0.347)	0.308
190	15.83	0.63	0.473	0.164	(0.347)	0.309
191	15.92	0.63	0.473	0.163	(0.347)	0.310
192	16.00	0.63	0.473	0.162	(0.347)	0.311
193	16.08	0.13	0.100	(0.161)	0.073	0.027
194	16.17	0.13	0.100	(0.160)	0.073	0.027
195	16.25	0.13	0.100	(0.160)	0.073	0.027
196	16.33	0.13	0.100	(0.159)	0.073	0.027
197	16.42	0.13	0.100	(0.158)	0.073	0.027
198	16.50	0.13	0.100	(0.157)	0.073	0.027
199	16.58	0.10	0.075	(0.156)	0.055	0.020
200	16.67	0.10	0.075	(0.156)	0.055	0.020
201	16.75	0.10	0.075	(0.155)	0.055	0.020
202	16.83	0.10	0.075	(0.154)	0.055	0.020
203	16.92	0.10	0.075	(0.153)	0.055	0.020
204	17.00	0.10	0.075	(0.153)	0.055	0.020
205	17.08	0.17	0.124	(0.152)	0.091	0.033
206	17.17	0.17	0.124	(0.151)	0.091	0.033
207	17.25	0.17	0.124	(0.150)	0.091	0.033
208	17.33	0.17	0.124	(0.149)	0.091	0.033
209	17.42	0.17	0.124	(0.149)	0.091	0.033
210	17.50	0.17	0.124	(0.148)	0.091	0.033
211	17.58	0.17	0.124	(0.147)	0.091	0.033
212	17.67	0.17	0.124	(0.147)	0.091	0.033
213	17.75	0.17	0.124	(0.146)	0.091	0.033
214	17.83	0.13	0.100	(0.145)	0.073	0.027
215	17.92	0.13	0.100	(0.144)	0.073	0.027

216	18.00	0.13	0.100	(0.144)	0.073	0.027
217	18.08	0.13	0.100	(0.143)	0.073	0.027
218	18.17	0.13	0.100	(0.142)	0.073	0.027
219	18.25	0.13	0.100	(0.142)	0.073	0.027
220	18.33	0.13	0.100	(0.141)	0.073	0.027
221	18.42	0.13	0.100	(0.140)	0.073	0.027
222	18.50	0.13	0.100	(0.139)	0.073	0.027
223	18.58	0.10	0.075	(0.139)	0.055	0.020
224	18.67	0.10	0.075	(0.138)	0.055	0.020
225	18.75	0.10	0.075	(0.137)	0.055	0.020
226	18.83	0.07	0.050	(0.137)	0.036	0.013
227	18.92	0.07	0.050	(0.136)	0.036	0.013
228	19.00	0.07	0.050	(0.135)	0.036	0.013
229	19.08	0.10	0.075	(0.135)	0.055	0.020
230	19.17	0.10	0.075	(0.134)	0.055	0.020
231	19.25	0.10	0.075	(0.134)	0.055	0.020
232	19.33	0.13	0.100	(0.133)	0.073	0.027
233	19.42	0.13	0.100	(0.132)	0.073	0.027
234	19.50	0.13	0.100	(0.132)	0.073	0.027
235	19.58	0.10	0.075	(0.131)	0.055	0.020
236	19.67	0.10	0.075	(0.131)	0.055	0.020
237	19.75	0.10	0.075	(0.130)	0.055	0.020
238	19.83	0.07	0.050	(0.129)	0.036	0.013
239	19.92	0.07	0.050	(0.129)	0.036	0.013
240	20.00	0.07	0.050	(0.128)	0.036	0.013
241	20.08	0.10	0.075	(0.128)	0.055	0.020
242	20.17	0.10	0.075	(0.127)	0.055	0.020
243	20.25	0.10	0.075	(0.127)	0.055	0.020
244	20.33	0.10	0.075	(0.126)	0.055	0.020
245	20.42	0.10	0.075	(0.125)	0.055	0.020
246	20.50	0.10	0.075	(0.125)	0.055	0.020
247	20.58	0.10	0.075	(0.124)	0.055	0.020
248	20.67	0.10	0.075	(0.124)	0.055	0.020
249	20.75	0.10	0.075	(0.123)	0.055	0.020
250	20.83	0.07	0.050	(0.123)	0.036	0.013
251	20.92	0.07	0.050	(0.122)	0.036	0.013
252	21.00	0.07	0.050	(0.122)	0.036	0.013
253	21.08	0.10	0.075	(0.121)	0.055	0.020
254	21.17	0.10	0.075	(0.121)	0.055	0.020
255	21.25	0.10	0.075	(0.120)	0.055	0.020
256	21.33	0.07	0.050	(0.120)	0.036	0.013
257	21.42	0.07	0.050	(0.120)	0.036	0.013
258	21.50	0.07	0.050	(0.119)	0.036	0.013
259	21.58	0.10	0.075	(0.119)	0.055	0.020
260	21.67	0.10	0.075	(0.118)	0.055	0.020
261	21.75	0.10	0.075	(0.118)	0.055	0.020
262	21.83	0.07	0.050	(0.117)	0.036	0.013
263	21.92	0.07	0.050	(0.117)	0.036	0.013
264	22.00	0.07	0.050	(0.117)	0.036	0.013
265	22.08	0.10	0.075	(0.116)	0.055	0.020
266	22.17	0.10	0.075	(0.116)	0.055	0.020
267	22.25	0.10	0.075	(0.115)	0.055	0.020
268	22.33	0.07	0.050	(0.115)	0.036	0.013
269	22.42	0.07	0.050	(0.115)	0.036	0.013
270	22.50	0.07	0.050	(0.114)	0.036	0.013
271	22.58	0.07	0.050	(0.114)	0.036	0.013
272	22.67	0.07	0.050	(0.114)	0.036	0.013
273	22.75	0.07	0.050	(0.113)	0.036	0.013
274	22.83	0.07	0.050	(0.113)	0.036	0.013
275	22.92	0.07	0.050	(0.113)	0.036	0.013
276	23.00	0.07	0.050	(0.113)	0.036	0.013
277	23.08	0.07	0.050	(0.112)	0.036	0.013
278	23.17	0.07	0.050	(0.112)	0.036	0.013
279	23.25	0.07	0.050	(0.112)	0.036	0.013
280	23.33	0.07	0.050	(0.112)	0.036	0.013
281	23.42	0.07	0.050	(0.111)	0.036	0.013
282	23.50	0.07	0.050	(0.111)	0.036	0.013
283	23.58	0.07	0.050	(0.111)	0.036	0.013
284	23.67	0.07	0.050	(0.111)	0.036	0.013
285	23.75	0.07	0.050	(0.111)	0.036	0.013
286	23.83	0.07	0.050	(0.111)	0.036	0.013

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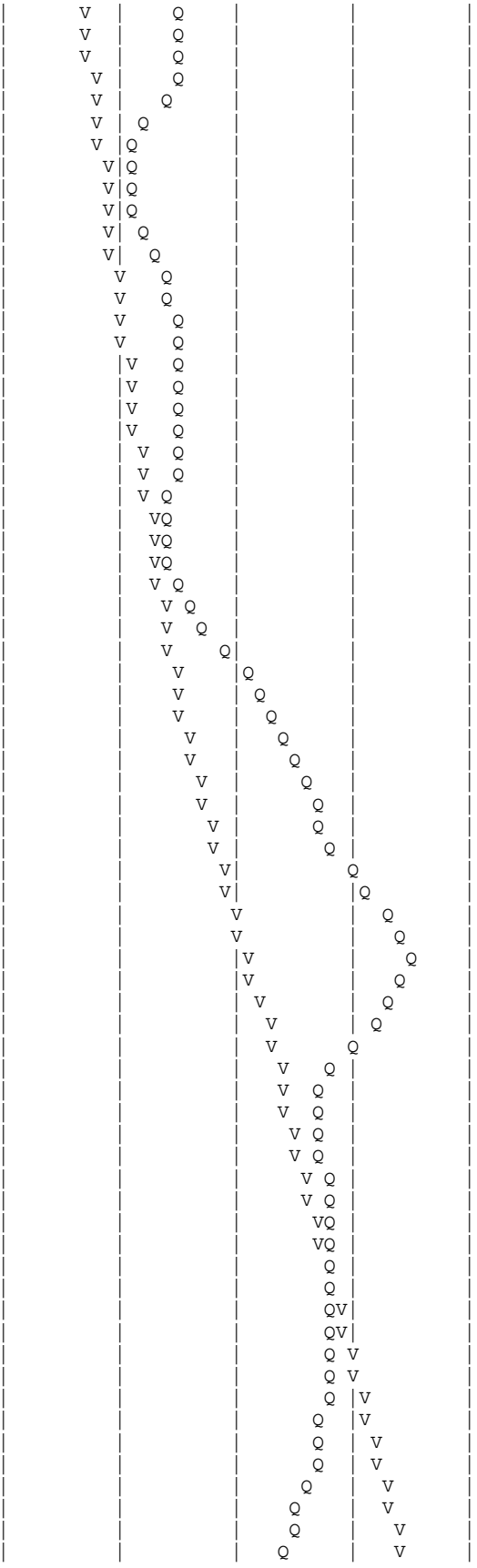
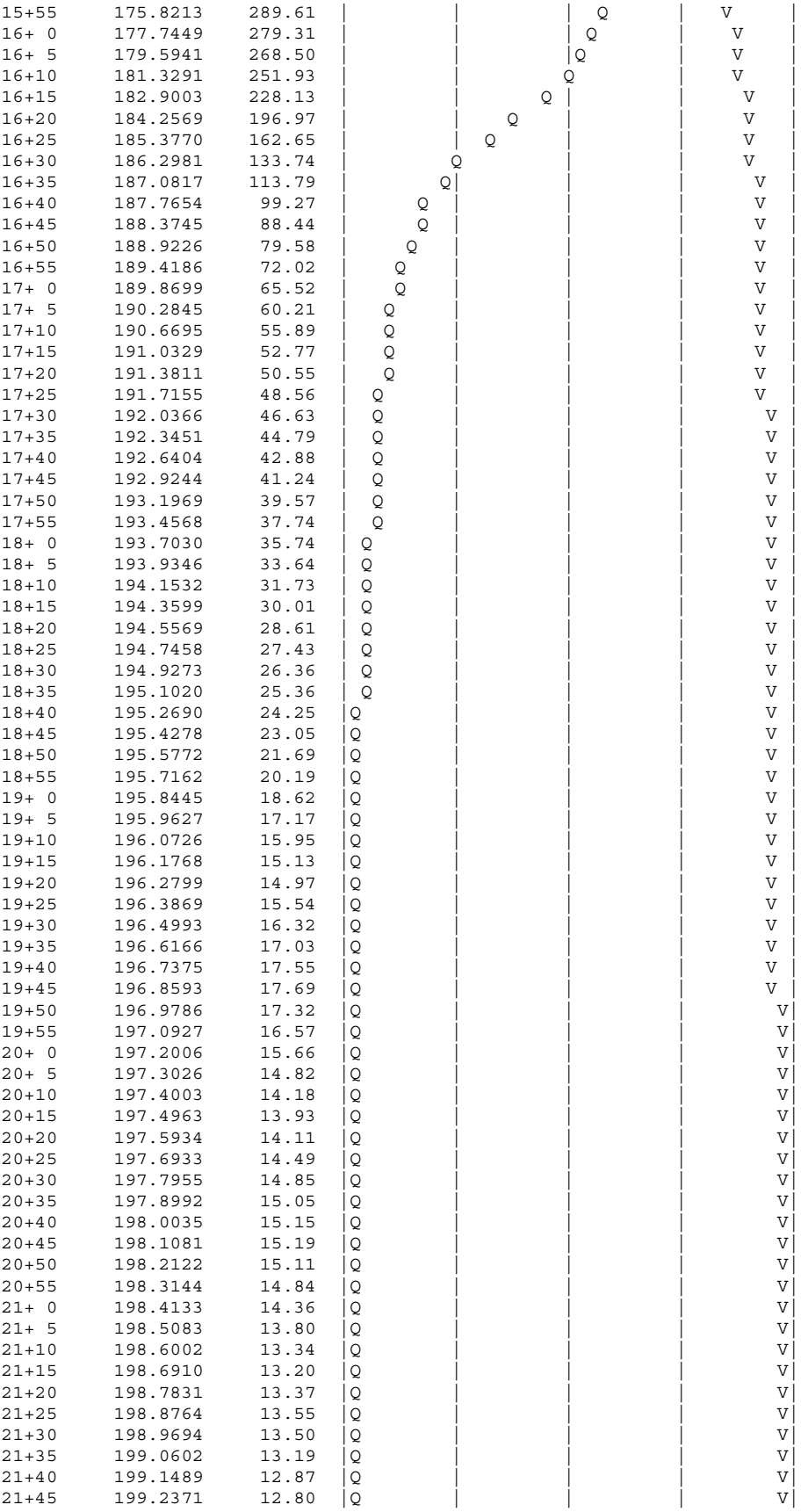
287  23.92     0.07      0.050       (  0.110)       0.036        0.013
288  24.00     0.07      0.050       (  0.110)       0.036        0.013
              (Loss Rate Not Used)
    Sum =     100.0                                   Sum =    38.2
      Flood volume = Effective rainfall      3.18(In)
       times area     761.3(Ac.)/[(In)/(Ft.)] =     201.9(Ac.Ft)
      Total soil loss =      3.04(In)
      Total soil loss =   192.722(Ac.Ft)
      Total rainfall =      6.22(In)
      Flood volume =     8796161.1 Cubic Feet
      Total soil loss =     8394962.4 Cubic Feet
      --------------------------------------------------------------------
       Peak flow rate of this hydrograph =    438.007(CFS)
      --------------------------------------------------------------------
      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                          24 - H O U R    S T O R M
                     R u n o f f      H y d r o g r a p h
      --------------------------------------------------------------------
                  Hydrograph in   5   Minute intervals ((CFS))

      --------------------------------------------------------------------
 Time(h+m) Volume Ac.Ft   Q(CFS)  0      125.0     250.0     375.0     500.0
 ------------------------------------------------------------------------
   0+ 5       0.0013      0.19  Q         |         |         |         |
   0+10       0.0063      0.73  Q         |         |         |         |
   0+15       0.0179      1.68  Q         |         |         |         |
   0+20       0.0392      3.10  Q         |         |         |         |
   0+25       0.0727      4.86  Q         |         |         |         |
   0+30       0.1180      6.58  Q         |         |         |         |
   0+35       0.1735      8.07  Q         |         |         |         |
   0+40       0.2382      9.39  Q         |         |         |         |
   0+45       0.3099     10.41  Q         |         |         |         |
   0+50       0.3873     11.24  Q         |         |         |         |
   0+55       0.4704     12.06  Q         |         |         |         |
   1+ 0       0.5597     12.97  VQ        |         |         |         |
   1+ 5       0.6554     13.90  VQ        |         |         |         |
   1+10       0.7566     14.68  VQ        |         |         |         |
   1+15       0.8605     15.10  VQ        |         |         |         |
   1+20       0.9644     15.08  VQ        |         |         |         |
   1+25       1.0666     14.84  VQ        |         |         |         |
   1+30       1.1673     14.61  VQ        |         |         |         |
   1+35       1.2672     14.51  VQ        |         |         |         |
   1+40       1.3671     14.51  VQ        |         |         |         |
   1+45       1.4673     14.55  VQ        |         |         |         |
   1+50       1.5686     14.70  VQ        |         |         |         |
   1+55       1.6721     15.04  VQ        |         |         |         |
   2+ 0       1.7794     15.57  VQ        |         |         |         |
   2+ 5       1.8916     16.29  VQ        |         |         |         |
   2+10       2.0093     17.09  VQ        |         |         |         |
   2+15       2.1317     17.77  VQ        |         |         |         |
   2+20       2.2573     18.24  VQ        |         |         |         |
   2+25       2.3851     18.57  VQ        |         |         |         |
   2+30       2.5146     18.81  VQ        |         |         |         |
   2+35       2.6462     19.09  VQ        |         |         |         |
   2+40       2.7807     19.54  VQ        |         |         |         |
   2+45       2.9196     20.16  VQ        |         |         |         |
   2+50       3.0639     20.96  VQ        |         |         |         |
   2+55       3.2142     21.82  VQ        |         |         |         |
   3+ 0       3.3695     22.54  VQ        |         |         |         |
   3+ 5       3.5282     23.05  VQ        |         |         |         |
   3+10       3.6895     23.42  VQ        |         |         |         |
   3+15       3.8528     23.71  VQ        |         |         |         |
   3+20       4.0176     23.93  VQ        |         |         |         |
   3+25       4.1836     24.11  VQ        |         |         |         |
   3+30       4.3508     24.27  VQ        |         |         |         |
   3+35       4.5189     24.41  VQ        |         |         |         |
   3+40       4.6878     24.53  VQ        |         |         |         |
   3+45       4.8574     24.63  VQ        |         |         |         |
   3+50       5.0284     24.82  VQ        |         |         |         |
   3+55       5.2018     25.18  |VQ       |         |         |         |
   4+ 0       5.3790     25.73  |VQ       |         |         |         |
```

```
4+ 5       5.5612     26.46  |VQ       |         |         |         |
4+10       5.7489     27.26  |VQ       |         |         |         |
4+15       5.9412     27.92  |VQ       |         |         |         |
4+20       6.1373     28.47  |VQ       |         |         |         |
4+25       6.3375     29.08  |VQ       |         |         |         |
4+30       6.5428     29.80  |VQ       |         |         |         |
4+35       6.7539     30.66  |VQ       |         |         |         |
4+40       6.9713     31.57  |VQ       |         |         |         |
4+45       7.1940     32.34  |VQ       |         |         |         |
4+50       7.4212     32.98  |VQ       |         |         |         |
4+55       7.6530     33.66  |VQ       |         |         |         |
5+ 0       7.8901     34.44  |VQ       |         |         |         |
5+ 5       8.1323     35.16  |VQ       |         |         |         |
5+10       8.3773     35.57  |VQ       |         |         |         |
5+15       8.6213     35.43  |VQ       |         |         |         |
5+20       8.8607     34.76  |VQ       |         |         |         |
5+25       9.0948     33.99  |VQ       |         |         |         |
5+30       9.3258     33.54  |VQ       |         |         |         |
5+35       9.5581     33.73  |VQ       |         |         |         |
5+40       9.7951     34.41  |VQ       |         |         |         |
5+45      10.0383     35.32  |VQ       |         |         |         |
5+50      10.2881     36.27  | Q       |         |         |         |
5+55      10.5442     37.19  | Q       |         |         |         |
6+ 0      10.8054     37.92  | VQ      |         |         |         |
6+ 5      11.0705     38.50  | VQ      |         |         |         |
6+10      11.3400     39.13  | VQ      |         |         |         |
6+15      11.6146     39.87  | VQ      |         |         |         |
6+20      11.8953     40.75  | VQ      |         |         |         |
6+25      12.1823     41.68  | VQ      |         |         |         |
6+30      12.4747     42.45  | VQ      |         |         |         |
6+35      12.7715     43.10  | VQ      |         |         |         |
6+40      13.0730     43.78  | VQ      |         |         |         |
6+45      13.3800     44.58  | VQ      |         |         |         |
6+50      13.6934     45.50  | VQ      |         |         |         |
6+55      14.0134     46.47  | VQ      |         |         |         |
7+ 0      14.3390     47.28  | VQ      |         |         |         |
7+ 5      14.6686     47.85  | VQ      |         |         |         |
7+10      15.0012     48.29  | VQ      |         |         |         |
7+15      15.3360     48.62  |  Q      |         |         |         |
7+20      15.6733     48.98  |  Q      |         |         |         |
7+25      16.0142     49.49  |  Q      |         |         |         |
7+30      16.3598     50.18  |  VQ     |         |         |         |
7+35      16.7119     51.12  |  VQ     |         |         |         |
7+40      17.0720     52.29  |  VQ     |         |         |         |
7+45      17.4407     53.53  |  VQ     |         |         |         |
7+50      17.8183     54.83  |  VQ     |         |         |         |
7+55      18.2057     56.25  |  VQ     |         |         |         |
8+ 0      18.6027     57.65  |  VQ     |         |         |         |
8+ 5      19.0115     59.35  |  VQ     |         |         |         |
8+10      19.4364     61.70  |  VQ     |         |         |         |
8+15      19.8819     64.68  |  V Q    |         |         |         |
8+20      20.3519     68.24  |   VQ    |         |         |         |
8+25      20.8484     72.09  |   VQ    |         |         |         |
8+30      21.3681     75.47  |   V Q   |         |         |         |
8+35      21.9080     78.39  |   V Q   |         |         |         |
8+40      22.4693     81.50  |   V Q   |         |         |         |
8+45      23.0550     85.03  |   V Q   |         |         |         |
8+50      23.6709     89.43  |   V  Q  |         |         |         |
8+55      24.3231     94.70  |   V  Q  |         |         |         |
9+ 0      25.0131    100.20  |   V   Q |         |         |         |
9+ 5      25.7449    106.26  |    V  Q |         |         |         |
9+10      26.5262    113.44  |    V   Q|         |         |         |
9+15      27.3617    121.32  |    V   Q|         |         |         |
9+20      28.2568    129.96  |    V    Q         |         |         |
9+25      29.2160    139.28  |    V    |Q        |         |         |
9+30      30.2356    148.04  |    V    |Q        |         |         |
9+35      31.3103    156.05  |     V   | Q       |         |         |
9+40      32.4393    163.93  |     V   |  Q      |         |         |
9+45      33.6192    171.32  |     V   |  Q      |         |         |
9+50      34.8488    178.54  |     V   |   Q     |         |         |
9+55      36.1299    186.02  |      V  |   Q     |         |         |
```

10+ 0	37.4609	193.26	
10+ 5	38.8221	197.64	
10+10	40.1783	196.92	
10+15	41.4859	189.87	
10+20	42.7032	176.74	
10+25	43.8115	160.93	
10+30	44.8288	147.72	
10+35	45.8018	141.29	
10+40	46.7757	141.40	
10+45	47.7904	147.33	
10+50	48.8770	157.78	
10+55	50.0491	170.19	
11+ 0	51.2939	180.74	
11+ 5	52.5840	187.33	
11+10	53.8998	191.06	
11+15	55.2268	192.68	
11+20	56.5557	192.95	
11+25	57.8815	192.51	
11+30	59.2055	192.24	
11+35	60.5279	192.01	
11+40	61.8413	190.70	
11+45	63.1370	188.15	
11+50	64.4077	184.51	
11+55	65.6539	180.94	
12+ 0	66.8867	179.01	
12+ 5	68.1374	181.59	
12+10	69.4479	190.29	
12+15	70.8556	204.39	
12+20	72.3938	223.36	
12+25	74.0792	244.71	
12+30	75.8940	263.52	
12+35	77.8109	278.33	
12+40	79.8171	291.30	
12+45	81.9051	303.18	
12+50	84.0739	314.91	
12+55	86.3242	326.74	
13+ 0	88.6492	337.59	
13+ 5	91.0510	348.75	
13+10	93.5456	362.22	
13+15	96.1488	377.98	
13+20	98.8751	395.85	
13+25	101.7306	414.62	
13+30	104.6951	430.45	
13+35	107.7116	438.01	
13+40	110.7116	435.60	
13+45	113.6234	422.79	
13+50	116.3859	401.11	
13+55	118.9724	375.56	
14+ 0	121.4132	354.40	
14+ 5	123.7736	342.73	
14+10	126.1057	338.63	
14+15	128.4525	340.75	
14+20	130.8413	346.85	
14+25	133.2812	354.28	
14+30	135.7589	359.75	
14+35	138.2500	361.71	
14+40	140.7419	361.82	
14+45	143.2307	361.38	
14+50	145.7173	361.05	
14+55	148.1987	360.31	
15+ 0	150.6714	359.03	
15+ 5	153.1302	357.02	
15+10	155.5673	353.86	
15+15	157.9818	350.59	
15+20	160.3708	346.89	
15+25	162.7295	342.49	
15+30	165.0580	338.09	
15+35	167.3471	332.38	
15+40	169.5816	324.46	
15+45	171.7456	314.22	
15+50	173.8268	302.19	

15+55	175.8213	289.61	
16+ 0	177.7449	279.31	
16+ 5	179.5941	268.50	
16+10	181.3291	251.93	
16+15	182.9003	228.13	
16+20	184.2569	196.97	
16+25	185.3770	162.65	
16+30	186.2981	133.74	
16+35	187.0817	113.79	
16+40	187.7654	99.27	
16+45	188.3745	88.44	
16+50	188.9226	79.58	
16+55	189.4186	72.02	
17+ 0	189.8699	65.52	
17+ 5	190.2845	60.21	
17+10	190.6695	55.89	
17+15	191.0329	52.77	
17+20	191.3811	50.55	
17+25	191.7155	48.56	
17+30	192.0366	46.63	
17+35	192.3451	44.79	
17+40	192.6404	42.88	
17+45	192.9244	41.24	
17+50	193.1969	39.57	
17+55	193.4568	37.74	
18+ 0	193.7030	35.74	
18+ 5	193.9346	33.64	
18+10	194.1532	31.73	
18+15	194.3599	30.01	
18+20	194.5569	28.61	
18+25	194.7458	27.43	
18+30	194.9273	26.36	
18+35	195.1020	25.36	
18+40	195.2690	24.25	
18+45	195.4278	23.05	
18+50	195.5772	21.69	
18+55	195.7162	20.19	
19+ 0	195.8445	18.62	
19+ 5	195.9627	17.17	
19+10	196.0726	15.95	
19+15	196.1768	15.13	
19+20	196.2799	14.97	
19+25	196.3869	15.54	
19+30	196.4993	16.32	
19+35	196.6166	17.03	
19+40	196.7375	17.55	
19+45	196.8593	17.69	
19+50	196.9786	17.32	
19+55	197.0927	16.57	
20+ 0	197.2006	15.66	
20+ 5	197.3026	14.82	
20+10	197.4003	14.18	
20+15	197.4963	13.93	
20+20	197.5934	14.11	
20+25	197.6933	14.49	
20+30	197.7955	14.85	
20+35	197.8992	15.05	
20+40	198.0035	15.15	
20+45	198.1081	15.19	
20+50	198.2122	15.11	
20+55	198.3144	14.84	
21+ 0	198.4133	14.36	
21+ 5	198.5083	13.80	
21+10	198.6002	13.34	
21+15	198.6910	13.20	
21+20	198.7831	13.37	
21+25	198.8764	13.55	
21+30	198.9694	13.50	
21+35	199.0602	13.19	
21+40	199.1489	12.87	
21+45	199.2371	12.80	

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   21+50     199.3266     13.00  |Q        |         |         |        V|
   21+55     199.4178     13.24  |Q        |         |         |        V|
   22+ 0     199.5088     13.22  |Q        |         |         |        V|
   22+ 5     199.5980     12.95  |Q        |         |         |        V|
   22+10     199.6853     12.67  |Q        |         |         |        V|
   22+15     199.7724     12.65  |Q        |         |         |        V|
   22+20     199.8612     12.89  |Q        |         |         |        V|
   22+25     199.9517     13.14  |Q        |         |         |        V|
   22+30     200.0423     13.15  |Q        |         |         |        V|
   22+35     200.1304     12.80  |Q        |         |         |        V|
   22+40     200.2147     12.24  Q         |         |         |        V|
   22+45     200.2954     11.72  Q         |         |         |        V|
   22+50     200.3738     11.38  Q         |         |         |        V|
   22+55     200.4507     11.16  Q         |         |         |        V|
   23+ 0     200.5266     11.03  Q         |         |         |        V|
   23+ 5     200.6019     10.93  Q         |         |         |        V|
   23+10     200.6766     10.85  Q         |         |         |        V|
   23+15     200.7508     10.77  Q         |         |         |        V|
   23+20     200.8245     10.71  Q         |         |         |        V|
   23+25     200.8979     10.65  Q         |         |         |        V|
   23+30     200.9710     10.61  Q         |         |         |        V|
   23+35     201.0438     10.57  Q         |         |         |        V|
   23+40     201.1163     10.53  Q         |         |         |        V|
   23+45     201.1885     10.48  Q         |         |         |        V|
   23+50     201.2604     10.45  Q         |         |         |        V|
   23+55     201.3322     10.41  Q         |         |         |        V|
   24+ 0     201.4037     10.39  Q         |         |         |        V|
   24+ 5     201.4739     10.19  Q         |         |         |        V|
   24+10     201.5403      9.63  Q         |         |         |        V|
   24+15     201.6000      8.67  Q         |         |         |        V|
   24+20     201.6504      7.33  Q         |         |         |        V|
   24+25     201.6905      5.82  Q         |         |         |        V|
   24+30     201.7219      4.56  Q         |         |         |        V|
   24+35     201.7475      3.72  Q         |         |         |        V|
   24+40     201.7691      3.14  Q         |         |         |        V|
   24+45     201.7879      2.73  Q         |         |         |        V|
   24+50     201.8045      2.41  Q         |         |         |        V|
   24+55     201.8191      2.12  Q         |         |         |        V|
   25+ 0     201.8321      1.88  Q         |         |         |        V|
   25+ 5     201.8436      1.67  Q         |         |         |        V|
   25+10     201.8539      1.49  Q         |         |         |        V|
   25+15     201.8631      1.34  Q         |         |         |        V|
   25+20     201.8714      1.21  Q         |         |         |        V|
   25+25     201.8788      1.07  Q         |         |         |        V|
   25+30     201.8853      0.95  Q         |         |         |        V|
   25+35     201.8911      0.85  Q         |         |         |        V|
   25+40     201.8963      0.76  Q         |         |         |        V|
   25+45     201.9011      0.69  Q         |         |         |        V|
   25+50     201.9053      0.62  Q         |         |         |        V|
   25+55     201.9092      0.55  Q         |         |         |        V|
   26+ 0     201.9125      0.49  Q         |         |         |        V|
   26+ 5     201.9155      0.43  Q         |         |         |        V|
   26+10     201.9182      0.38  Q         |         |         |        V|
   26+15     201.9205      0.34  Q         |         |         |        V|
   26+20     201.9225      0.30  Q         |         |         |        V|
   26+25     201.9243      0.26  Q         |         |         |        V|
   26+30     201.9259      0.22  Q         |         |         |        V|
   26+35     201.9272      0.19  Q         |         |         |        V|
   26+40     201.9283      0.16  Q         |         |         |        V|
   26+45     201.9293      0.14  Q         |         |         |        V|
   26+50     201.9301      0.12  Q         |         |         |        V|
   26+55     201.9308      0.10  Q         |         |         |        V|
   27+ 0     201.9313      0.08  Q         |         |         |        V|
   27+ 5     201.9317      0.06  Q         |         |         |        V|
   27+10     201.9320      0.04  Q         |         |         |        V|
   27+15     201.9321      0.02  Q         |         |         |         V
-------------------------------------------------------------------------
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APPENDIX A.4: AREA A1 RUNOFF INDEX AND IMPERVIOUS FRACTION CALCULATIONS

SOIL TYPE AND LANDUSE BY AREA: Option 1														
SOIL TYPE / LANDUSE	A	B	C	D	RI A	RI B	RI C	RI D	SUM AREA	SUM AREA*RI	SUM AREA*RI/ AREA	% IMPERVIOUS	% IMPERVIOUS*AREA	% IMPERVIOUS*AREA/AREA
EDC	12.48	0	2.76	20.354	44	65	77	82	35.594	2430.668	-	90	3203.46	
0.25 AC	0	0	18.642	45.713	32	56	69	75	64.355	4714.773	-	50	3217.75	
0.5 AC	0	0	0	210.841	32	56	69	75	210.841	15813.075	-	40	8433.64	
1 AC	3.831	0	47.02	39.917	32	56	69	75	90.768	6360.747	-	20	1815.36	
2 AC	1.519	0	26.456	141.28	39	61	73	79	169.255	13151.649	-	10	1692.55	
10 AC	0	0	0	56.832	46	66	77	83	56.832	4717.056	-	2.5	142.08	
Rural Community	0	0	0	60.52	46	66	77	83	60.52	5023.16	-	2.5	151.3	
Rural Mountain	0	0	0	73.13	46	66	77	83	73.13	6069.79	-	2.5	182.825	
SUM									761.295	58280.918	76.6	-	18838.965	24.74594605

APPENDIX B: PRE-PROJECT CONDITION HEC-RAS ANALYSES

APPENDIX B.1: HAUN ROAD OVERTOPPING FLOWS NORMAL DEPTH CALCULATION

Worksheet for Haun Overtopping Flows

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02000	ft/ft
Discharge	890.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	1476.00
1+10	1475.00
1+73	1474.70
2+27	1474.71
2+78	1474.60
3+41	1475.00
4+31	1475.30
5+22	1475.70

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 1476.00)	(5+22, 1475.70)	0.015

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.64	ft
Elevation Range	1474.60 to 1476.00 ft	
Flow Area	122.61	ft²
Wetted Perimeter	329.15	ft
Hydraulic Radius	0.37	ft

Worksheet for Haun Overtopping Flows

Results

Top Width		329.14	ft
Normal Depth		0.64	ft
Critical Depth		0.89	ft
Critical Slope		0.00408	ft/ft
Velocity		7.26	ft/s
Velocity Head		0.82	ft
Specific Energy		1.46	ft
Froude Number		2.10	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

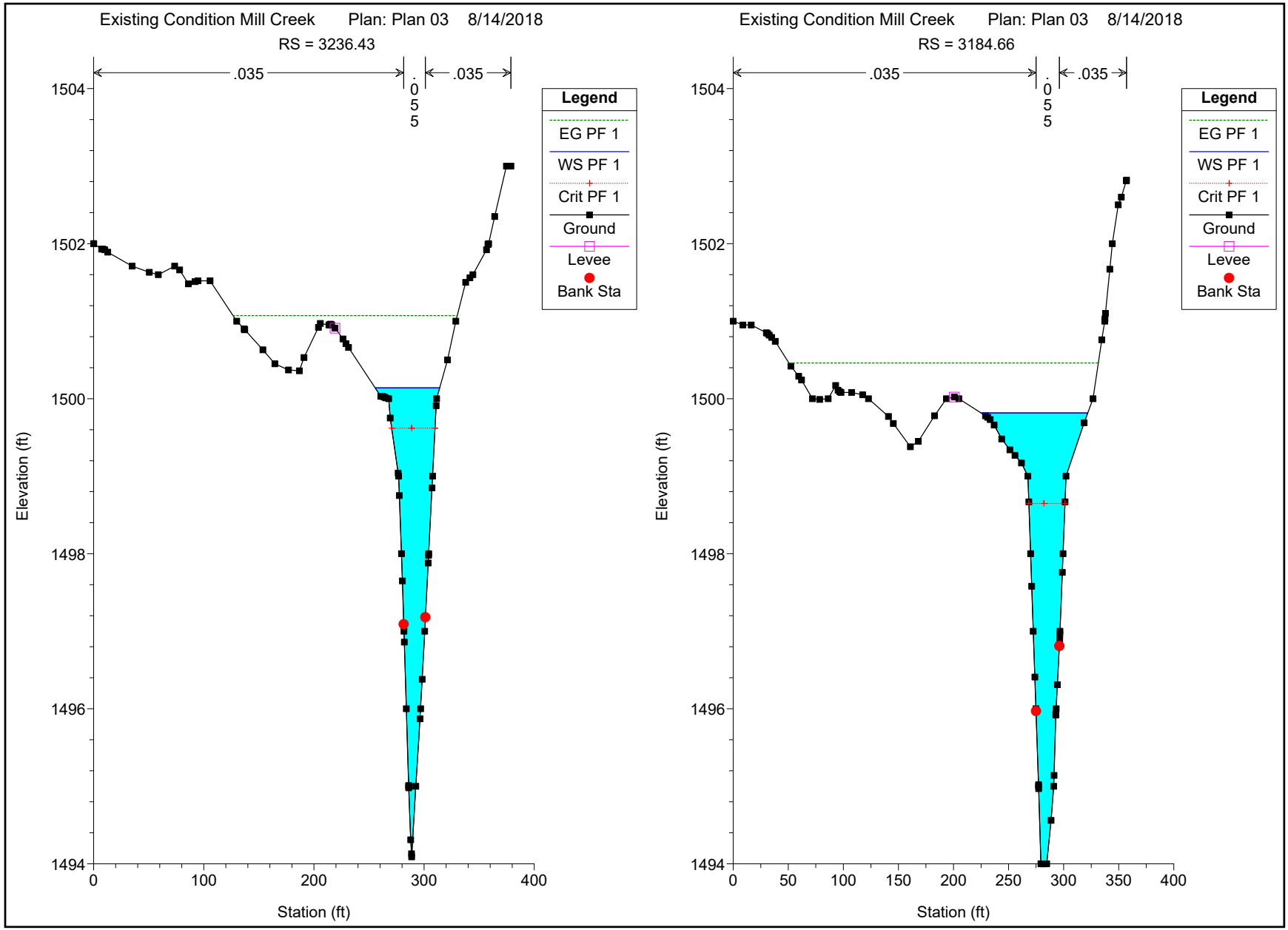
GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.64	ft
Critical Depth	0.89	ft
Channel Slope	0.02000	ft/ft
Critical Slope	0.00408	ft/ft

APPENDIX B.2: PRE-PROJECT CONDITION HEC-RAS

HEC-RAS Plan: Plan 03 River: Mill Creek Reach: Mill_Creek Profile: PF 1

Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Vel Head	Frctn Loss	C & E Loss	Q Left	Q Channel	Q Right	Top Width
			(ft)	(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft)
Mill_Creek	3236.43	PF 1	1501.07	1500.14	0.93	0.53	0.09	60.36	743.33	86.32	58.65
Mill_Creek	3184.66	PF 1	1500.46	1499.82	0.64	0.38	0.09	94.49	733.80	61.71	96.86
Mill_Creek	3136.8	PF 1	1499.99	1499.63	0.36	0.39	0.00	348.04	390.12	151.84	269.49
Mill_Creek	3084.02	PF 1	1499.34	1498.96	0.38	1.37	0.11	387.48	411.33	91.19	233.24
Mill_Creek	2966.14	PF 1	1497.86	1496.37	1.48	0.79	0.40	86.77	762.58	40.65	35.19
Mill_Creek	2848.25	PF 1	1495.76	1495.59	0.16	1.87	0.06	436.14	377.35	76.51	362.57
Mill_Creek	2729.93	PF 1	1494.52	1493.06	1.46	2.22	0.08	55.21	685.37	149.42	64.99
Mill_Creek	2626.56	PF 1	1492.22	1491.03	1.19	1.39	0.26	110.04	682.21	97.75	49.25
Mill_Creek	2511.04	PF 1	1490.56	1490.23	0.33	0.86	0.02	328.90	397.19	163.91	357.89
Mill_Creek	2440.36	PF 1	1489.69	1489.13	0.55	1.37	0.03	391.09	295.78	203.13	429.49
Mill_Creek	2345.39	PF 1	1488.28	1487.84	0.44	1.75	0.02	386.75	385.55	117.69	308.08
Mill_Creek	2224.33	PF 1	1486.52	1485.87	0.65	1.20	0.00	392.96	386.94	110.11	317.48
Mill_Creek	2102.98	PF 1	1485.17	1484.87	0.30	1.25	0.02	518.83	219.83	151.33	416.47
Mill_Creek	1987.13	PF 1	1483.82	1483.59	0.23	1.89	0.01	475.66	171.23	243.11	365.19
Mill_Creek	1837.07	PF 1	1481.92	1481.56	0.36	0.69	0.05	199.24	187.11	503.65	249.02
Mill_Creek	1753.19	PF 1	1481.07	1480.89	0.18	0.58	0.01	385.47	144.09	360.44	202.91
Mill_Creek	1669.81	PF 1	1480.48	1480.19	0.29	0.63	0.02	536.32	205.92	147.76	194.98
Mill_Creek	1588	PF 1	1479.83	1479.62	0.21	0.31	0.00	490.69	225.98	173.33	179.44
Mill_Creek	1532.68	PF 1	1479.52	1479.31	0.20	0.34	0.00	483.47	182.37	224.16	174.53
Mill_Creek	1459.22	PF 1	1479.17	1478.97	0.21	0.37	0.02	366.21	177.17	346.63	163.26
Mill_Creek	1391.24	PF 1	1478.78	1478.36	0.42	0.46	0.02	258.11	203.94	427.95	119.12
Mill_Creek	1315.03	PF 1	1478.30	1477.95	0.35	0.86	0.05	190.06	233.25	466.68	103.31
Mill_Creek	1227.75	PF 1	1477.39	1476.53	0.86			337.96	404.37	147.67	112.38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Legend
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WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
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1502
1500
1498
1496
1494
0
100
200
300
400
Existing Condition Mill Creek Plan: Plan 03 8/14/2018
RS = 3184.66
.035
.055
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
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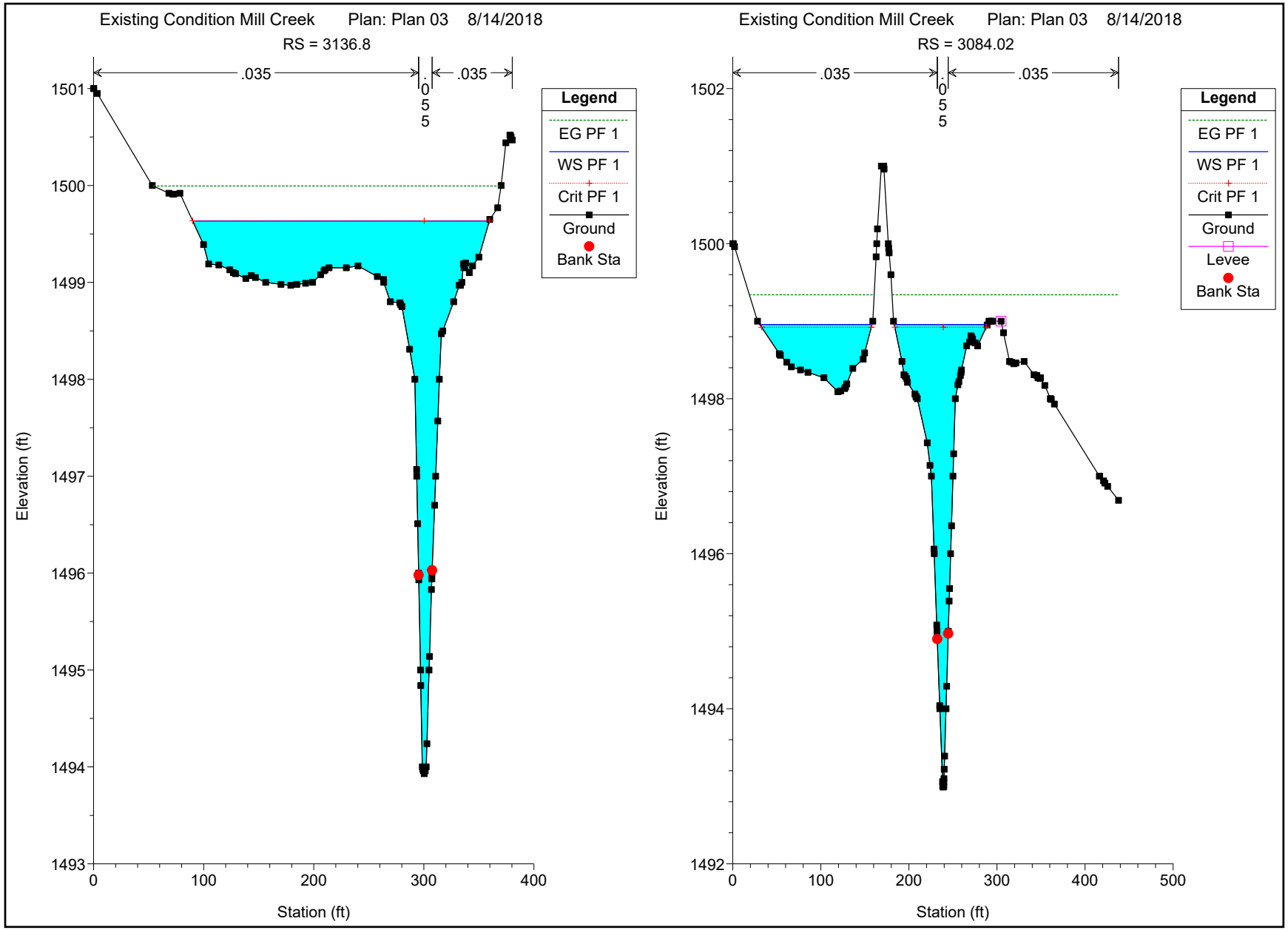
1502
1500
1498
1496
1494
0
50
100
150
200
250
300
350
400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Legend
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Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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1500
1499
1498
1497
1496
1495
1494
1493
0
100
200
300
400
Existing Condition Mill Creek Plan: Plan 03 8/14/2018
RS = 3084.02
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.055
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
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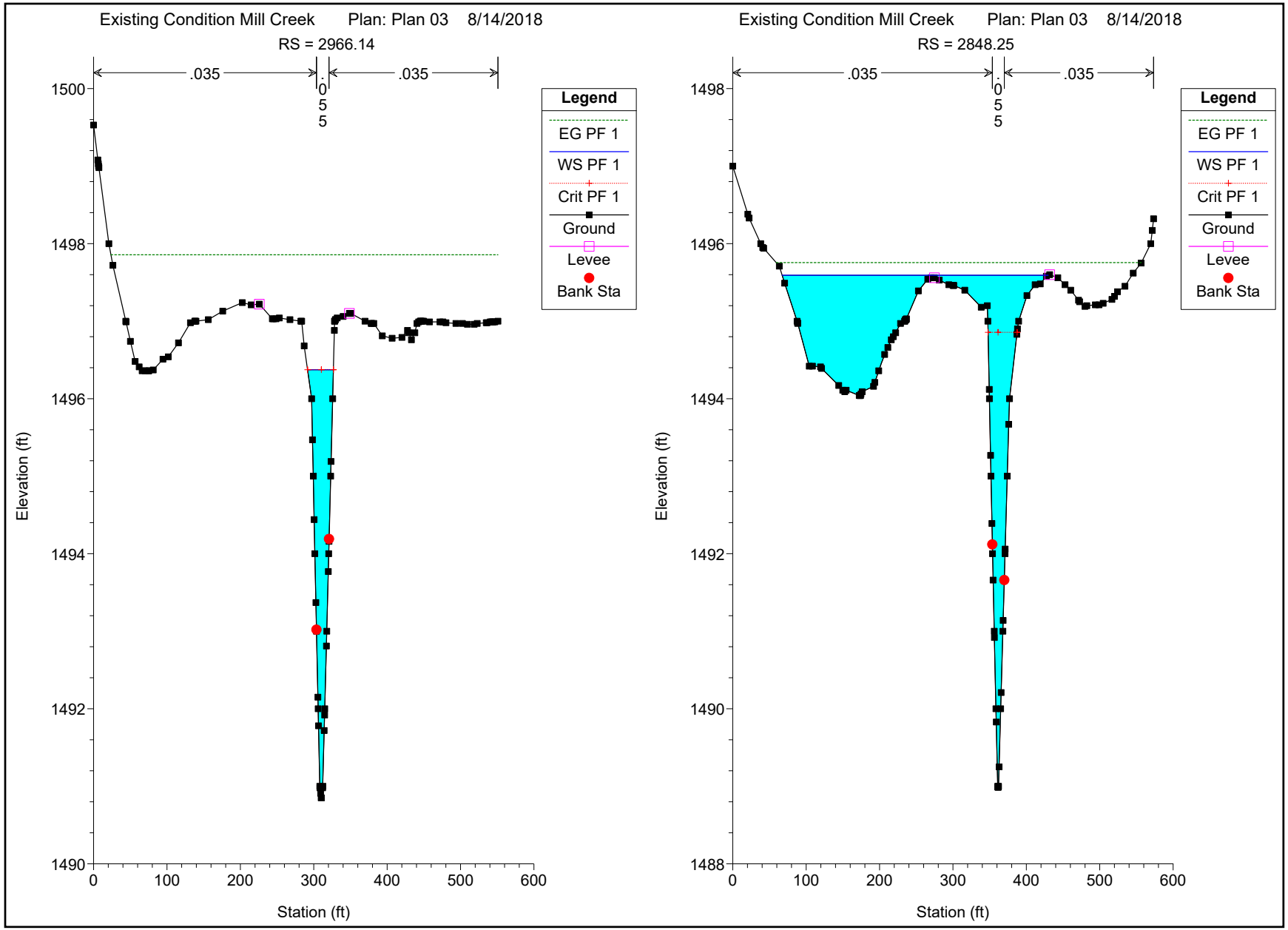
1496
1494
1492
0
100
200
300
400
500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WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
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1498
1496
1494
1492
1490
0
100
200
300
400
500
600
Existing Condition Mill Creek Plan: Plan 03 8/14/2018
RS = 2848.25
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.055
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
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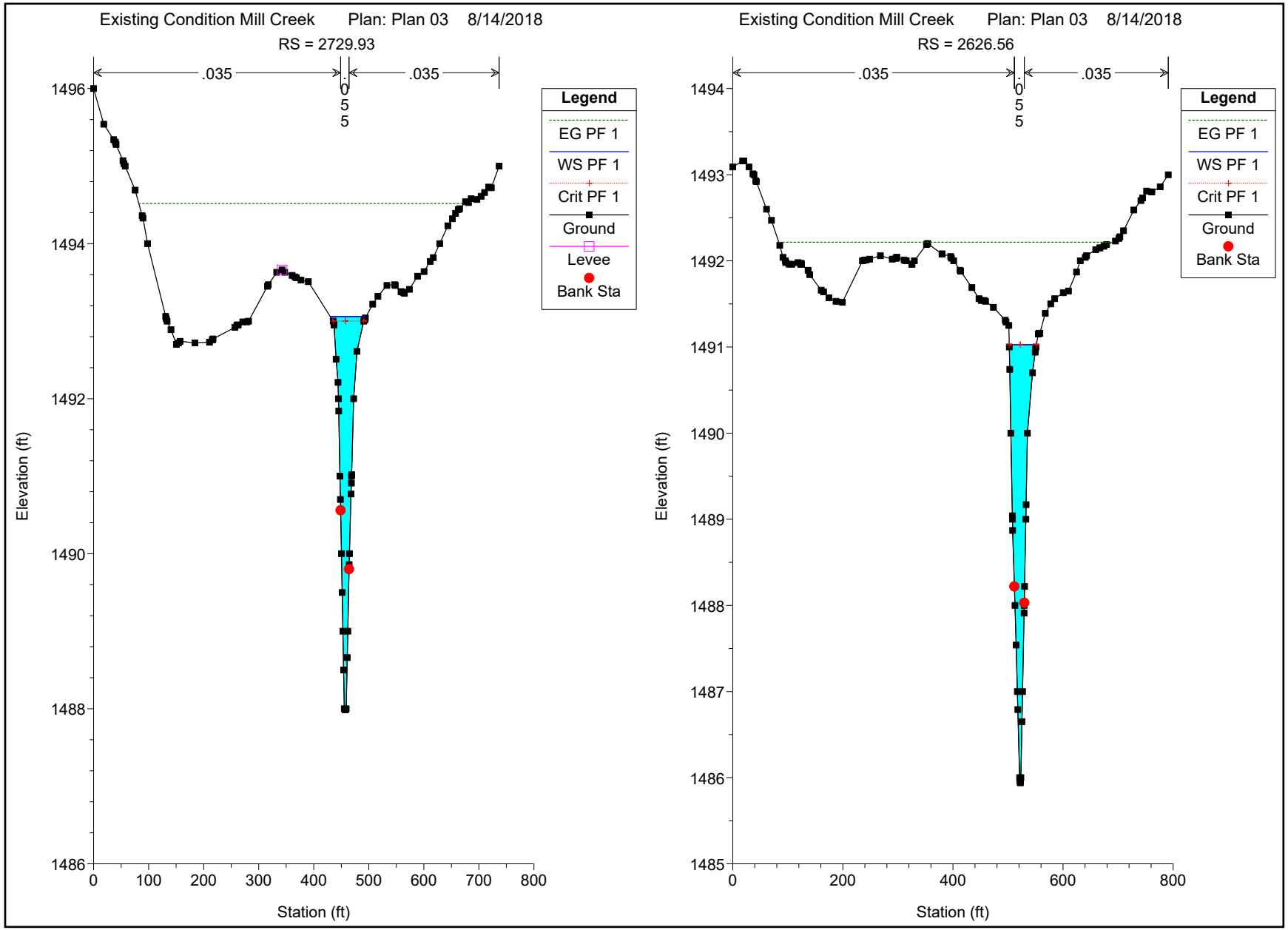
1496
1494
1492
1490
1488
0
100
200
300
400
500
600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WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
1496
1494
1492
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1488
1486
0
100
200
300
400
500
600
700
800
Existing Condition Mill Creek Plan: Plan 03 8/14/2018
RS = 2626.56
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.055
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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1492
1491
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1487
1486
1485
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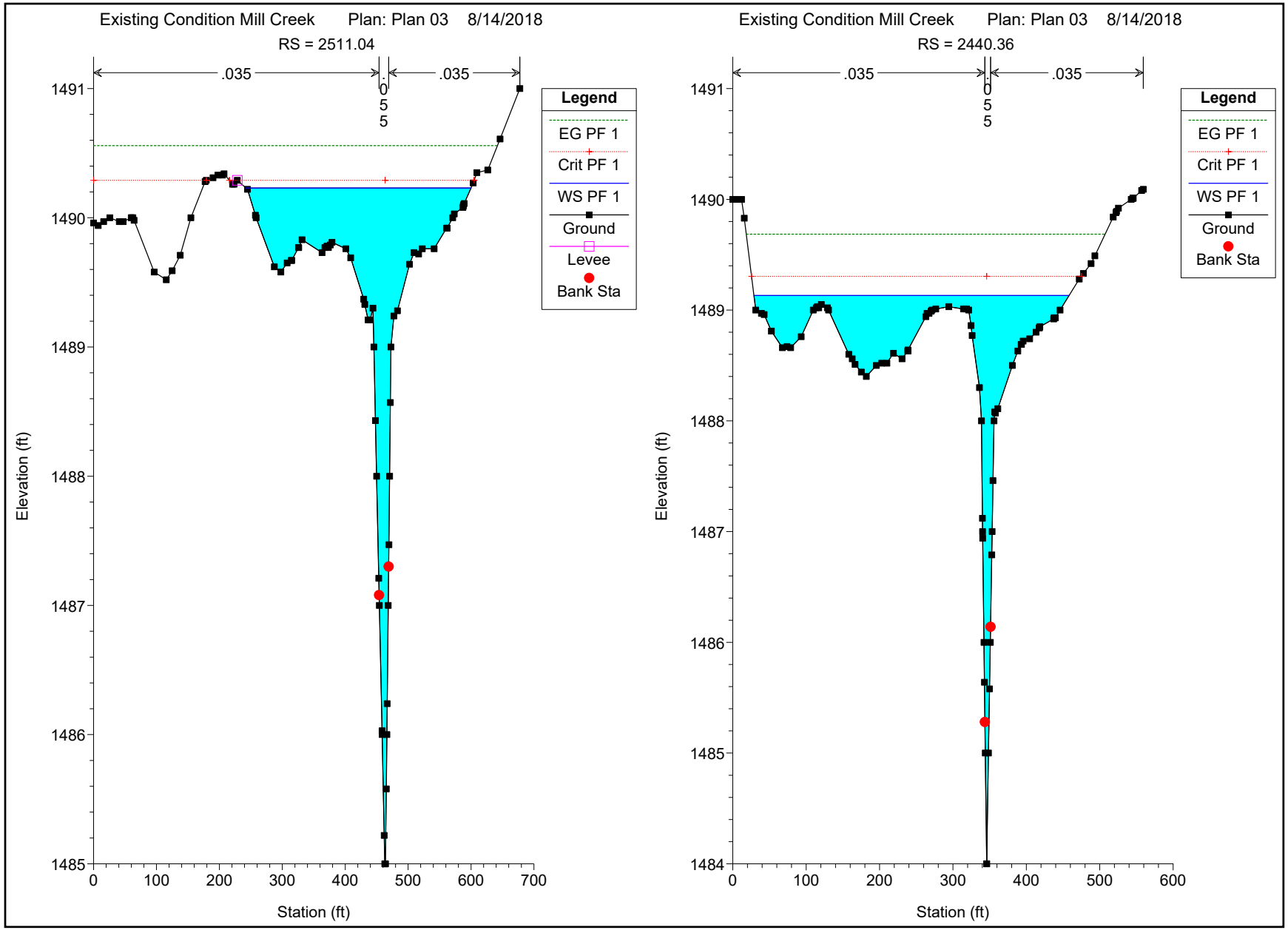
600
800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Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
1491
1490
1489
1488
1487
1486
1485
0
100
200
300
400
500
600
700
Existing Condition Mill Creek Plan: Plan 03 8/14/2018
RS = 2440.36
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.035
.055
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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1490
1489
1488
1487
1486
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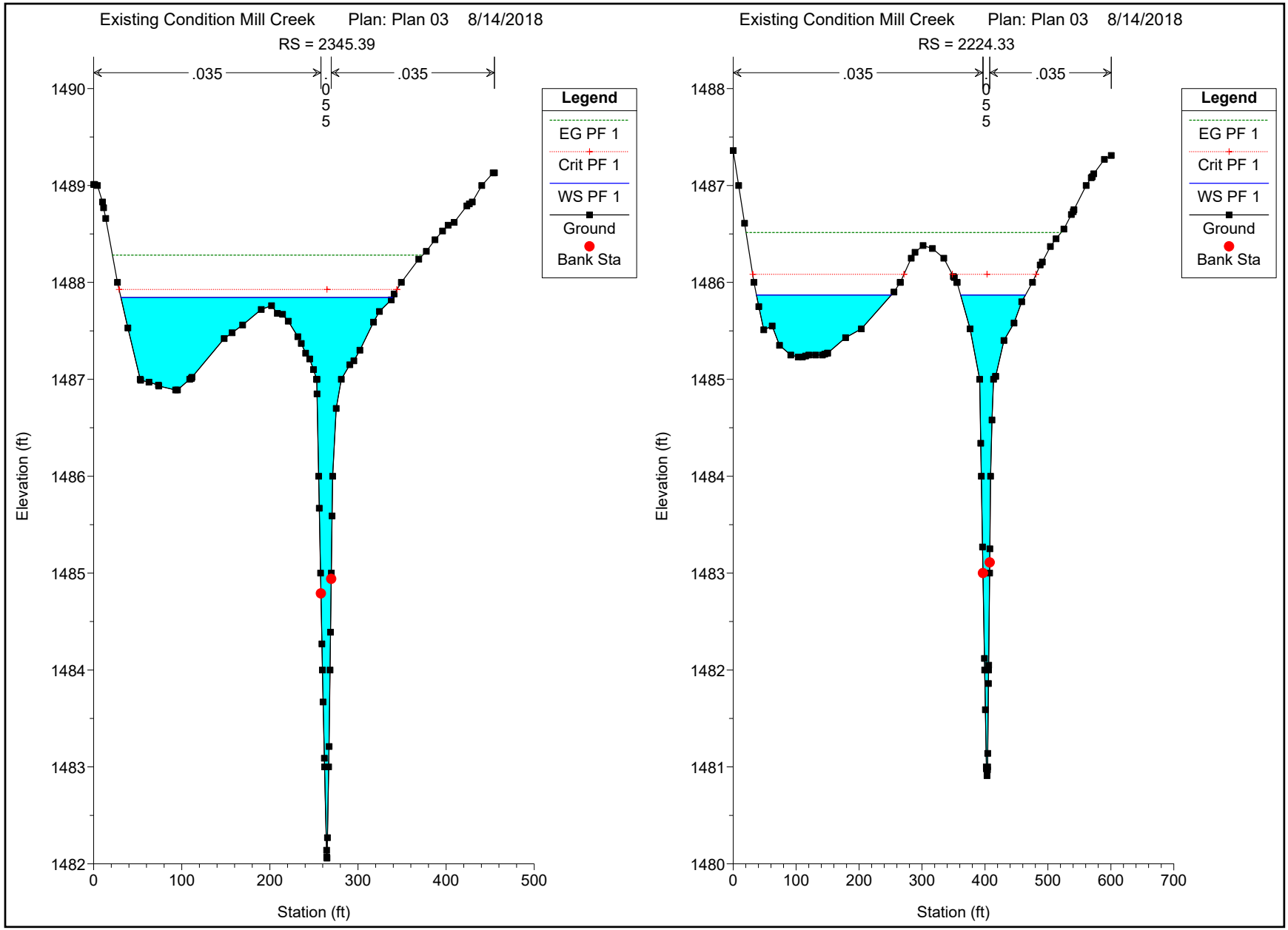
1484
0
100
200
300
400
500
600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Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1490
1489
1488
1487
1486
1485
1484
1483
1482
0
100
200
300
400
500
Existing Condition Mill Creek Plan: Plan 03 8/14/2018
RS = 2224.33
.035
.055
.035
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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1487
1486
1485
1484
1483
1482
1481
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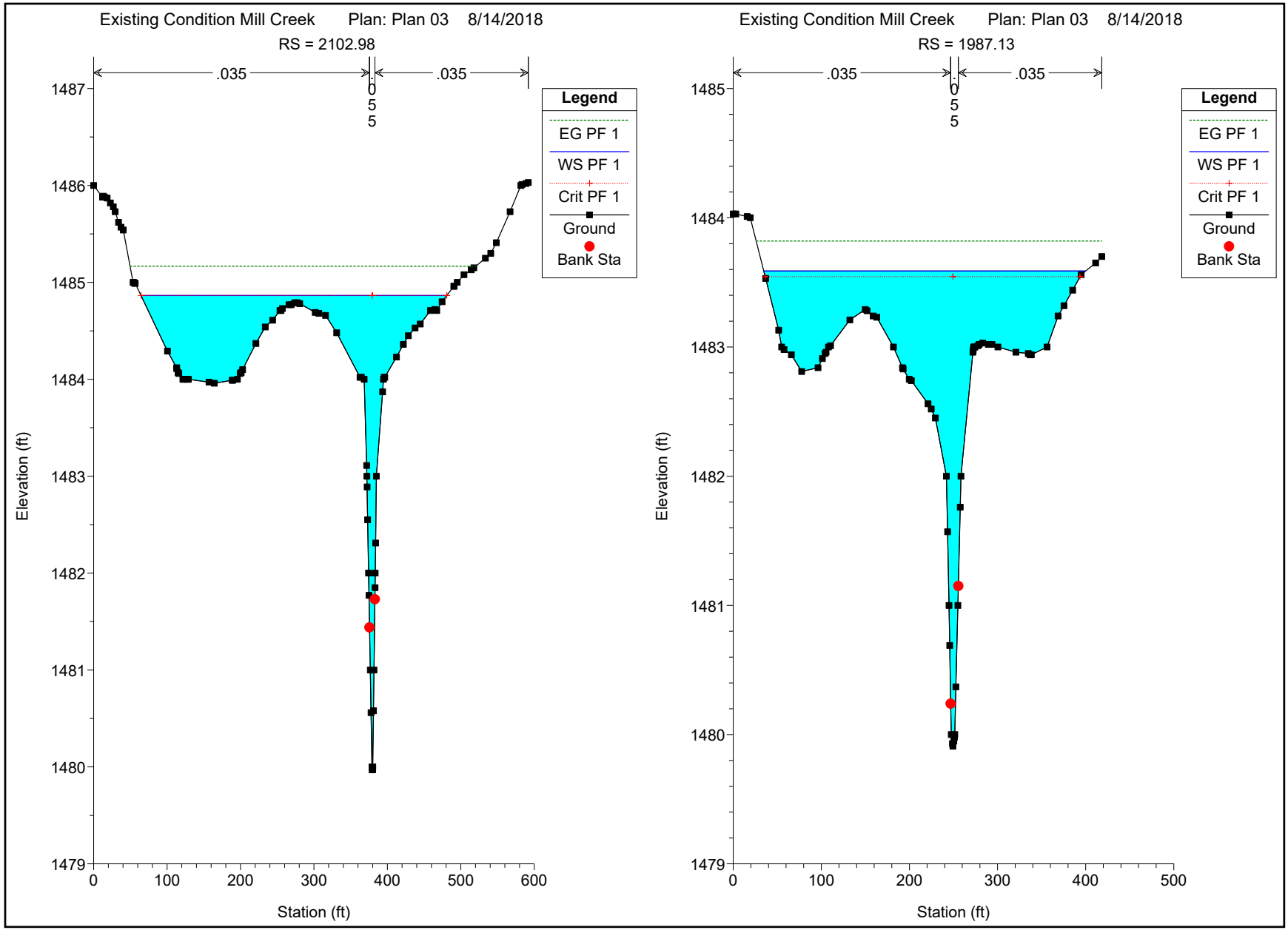
700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0.05
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WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1487
1486
1485
1484
1483
1482
1481
1480
1479
0
100
200
300
400
500
600
Existing Condition Mill Creek Plan: Plan 03 8/14/2018
RS = 1987.13
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.035
0.05
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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1484
1483
1482
1481
1480
1479
0
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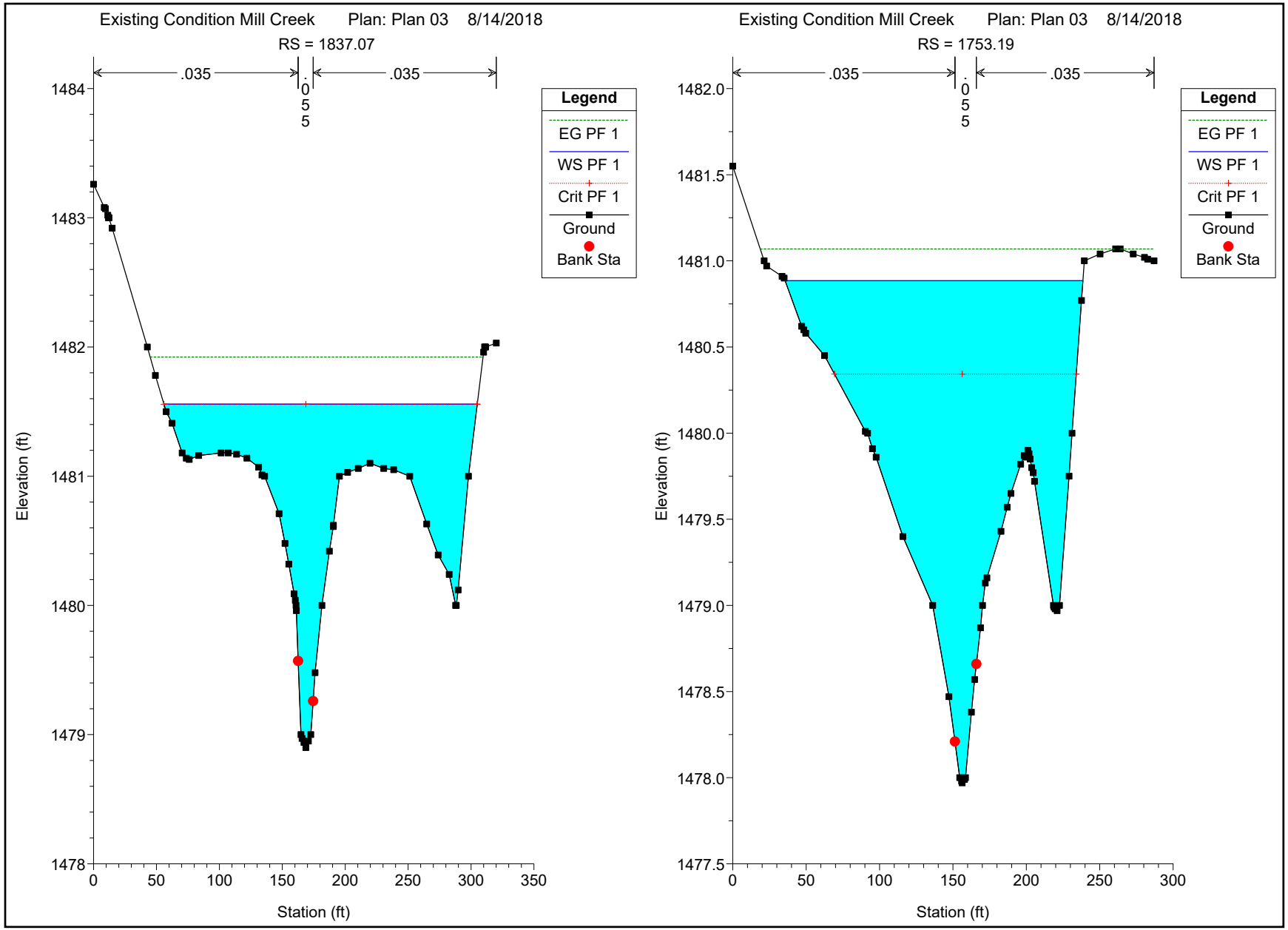
200
300
400
500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Legend
EG PF 1
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Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Existing Condition Mill Creek Plan: Plan 03 8/14/2018
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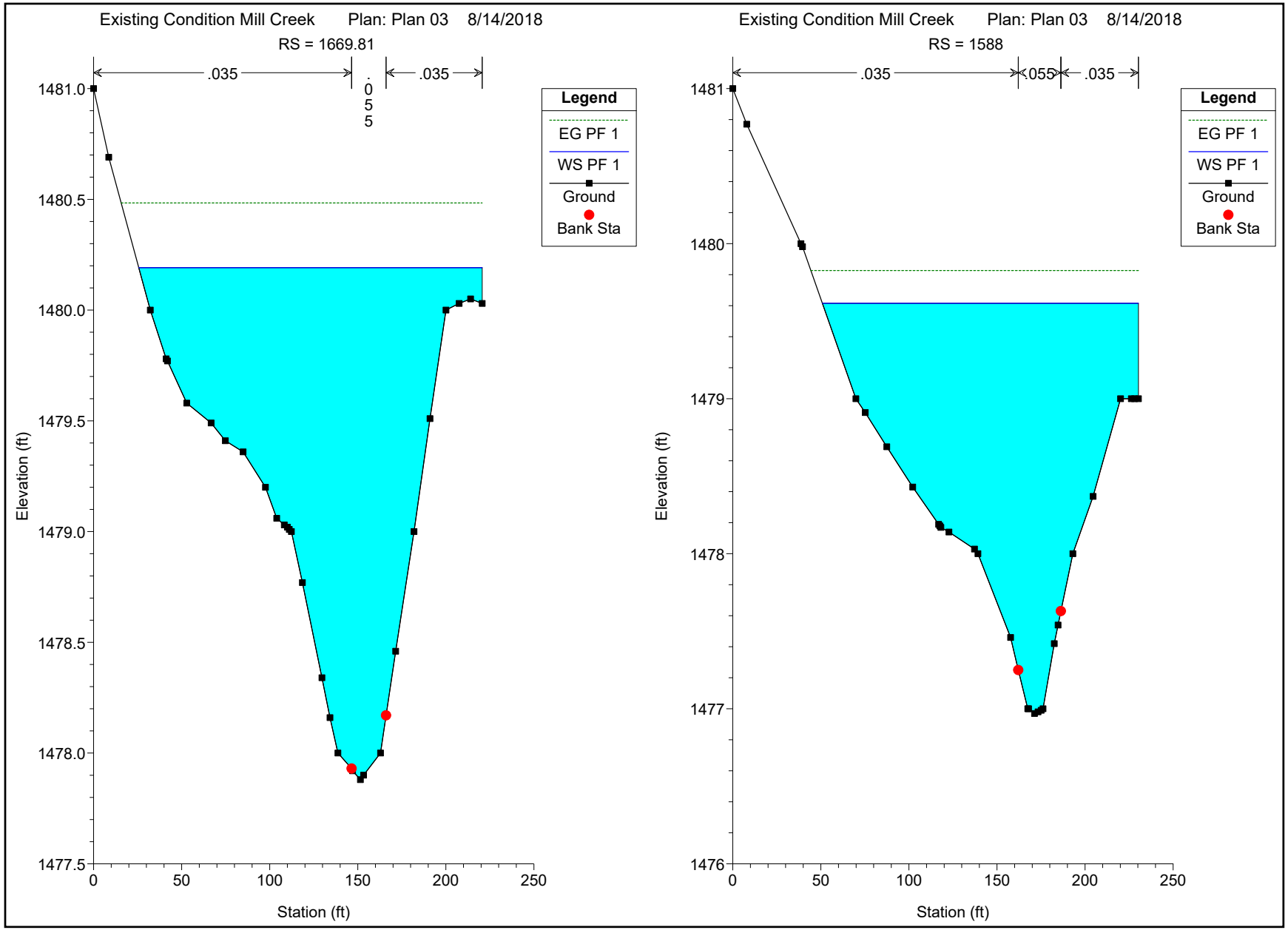
.055
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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RS = 1669.81
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.055
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1481.0
1480.5
1480.0
1479.5
1479.0
1478.5
1478.0
1477.5
0
50
100
150
200
250
Existing Condition Mill Creek Plan: Plan 03 8/14/2018
RS = 1588
.035
.055
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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1480
1479
1478
1477
1476
0
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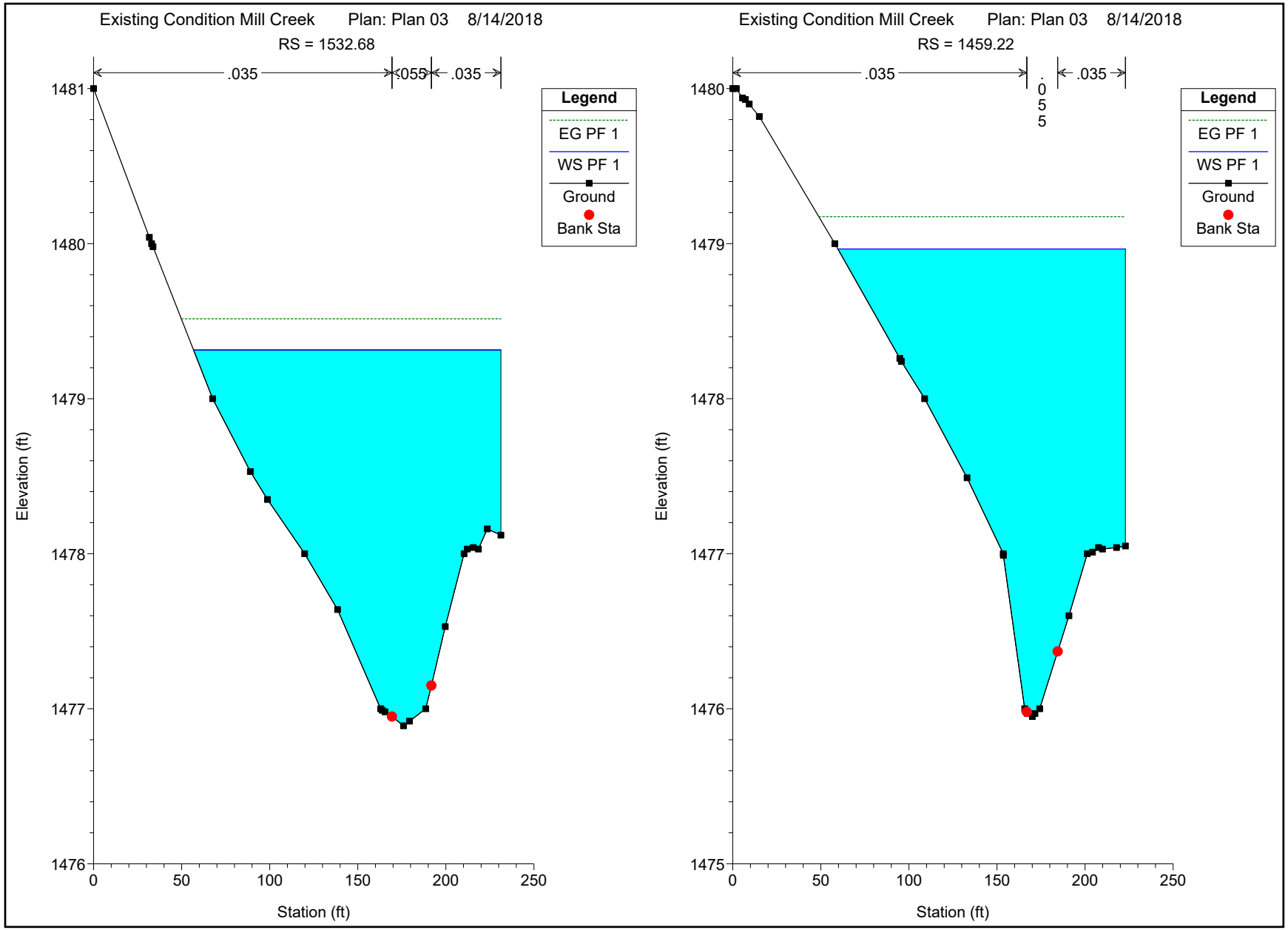
100
150
200
250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Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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1480
1479
1478
1477
1476
0
50
100
150
200
250
Existing Condition Mill Creek Plan: Plan 03 8/14/2018
RS = 1459.22
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.055
.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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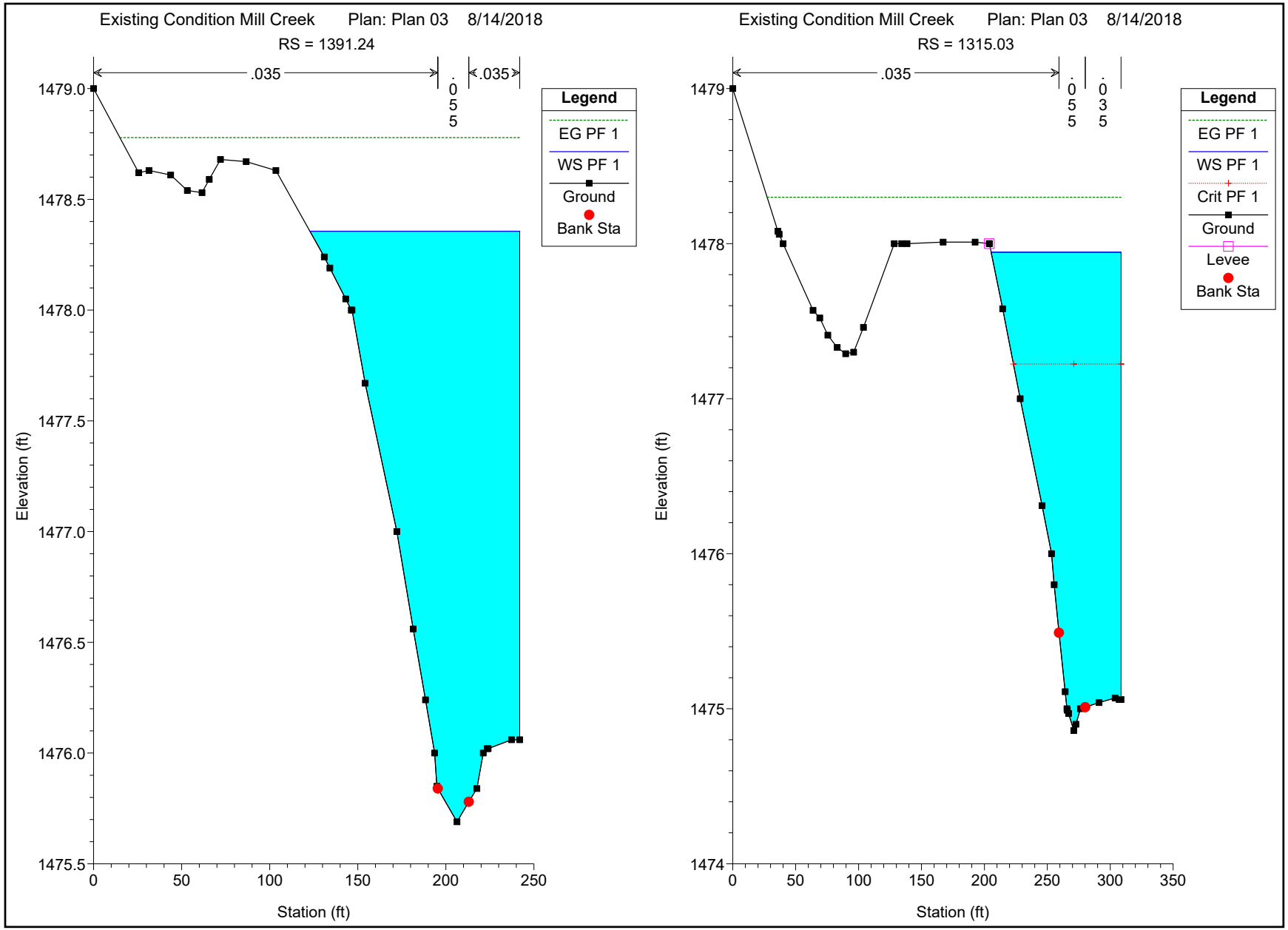
1479
1478
1477
1476
1475
0
50
100
150
200
250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Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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1478.5
1478.0
1477.5
1477.0
1476.5
1476.0
1475.5
0
50
100
150
200
250
Existing Condition Mill Creek Plan: Plan 03 8/14/2018
RS = 1315.03
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.055
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
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1478
1477
1476
1475
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200
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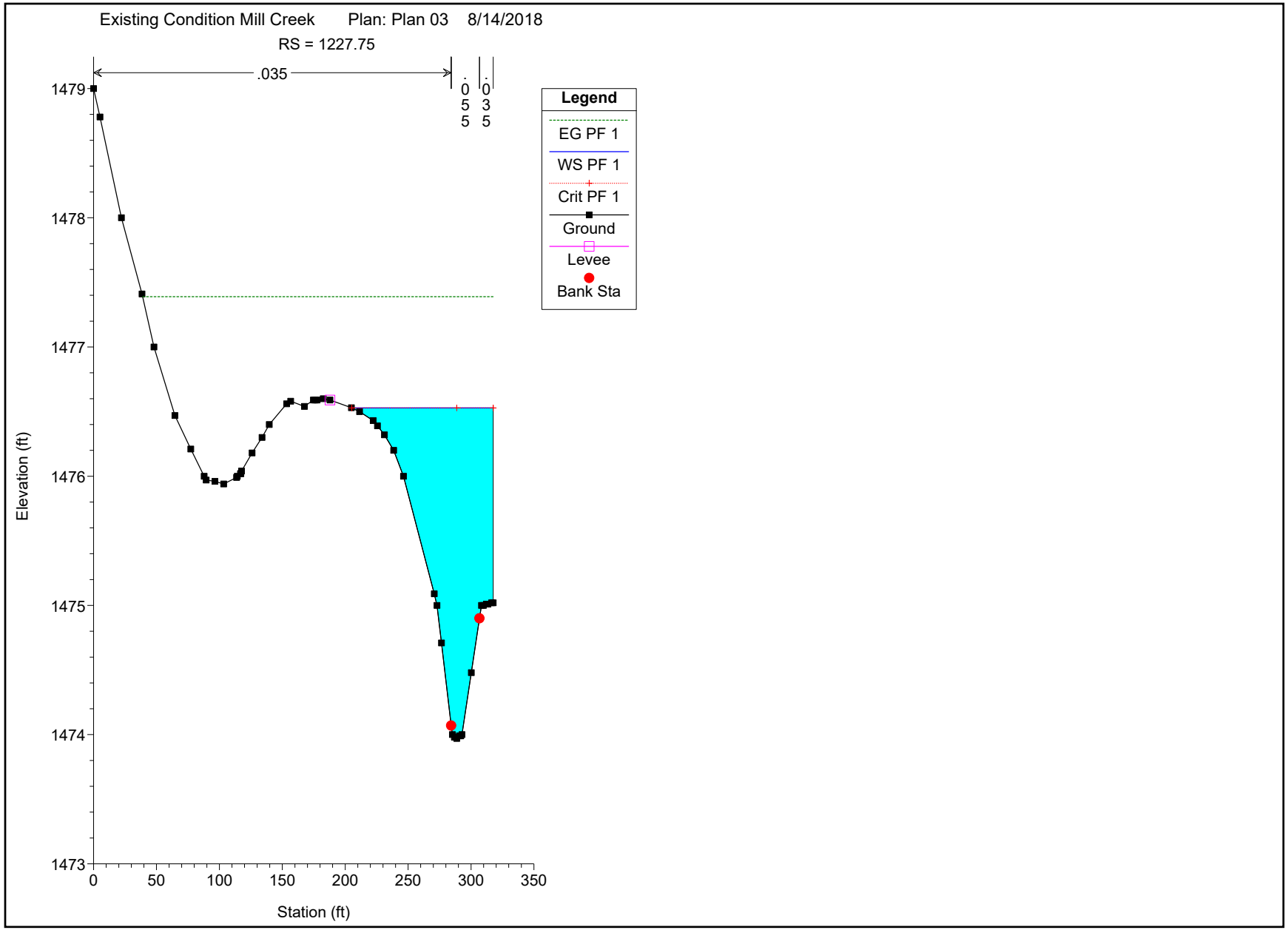
350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RS = 1227.75
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
1479
1478
1477
1476
1475
1474
1473
0
50
100
150
200
250
300
350

HEC-RAS HEC-RAS 5.0.3 September 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
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X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
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PROJECT DATA
Project Title: Existing Condition Mill Creek
Project File : PRE_PROJECT.prj
Run Date and Time: 8/14/2018 9:53:30 AM

Project in English units

Project Description:
HEC-RAS Project and Geometry created by SmartDraft

PLAN DATA

Plan Title: Plan 03
Plan File : o:\275.01.18\Engineering\HEC-RAS\HEC-RAS Models\FINAL MODELS\PRE-PROJECT\PRE_PROJECT.p03

Geometry Title: Existing Condition
Geometry File : o:\275.01.18\Engineering\HEC-RAS\HEC-RAS Models\FINAL MODELS\PRE-PROJECT\PRE_PROJECT.g01

Flow Title : Existing Condition
Flow File : o:\275.01.18\Engineering\HEC-RAS\HEC-RAS Models\FINAL MODELS\PRE-PROJECT\PRE_PROJECT.f03

Plan Summary Information:

Number of:	Cross Sections	= 23	Multiple Openings	=	0
	Culverts	= 0	Inline Structures	=	0
	Bridges	= 0	Lateral Structures	=	0

Computational Information

Water surface calculation tolerance	= 0.01
Critical depth calculation tolerance	= 0.01
Maximum number of iterations	= 20
Maximum difference tolerance	= 0.3
Flow tolerance factor	= 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: Existing Condition
Flow File : o:\275.01.18\Engineering\HEC-RAS\HEC-RAS Models\FINAL MODELS\PRE-PROJECT\PRE_PROJECT.f03

Flow Data (cfs)

River	Reach	RS	PF 1
Mill Creek	Mill_Creek	3236.43	890

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Mill Creek	Mill_Creek	PF 1	Normal S = 0.007	Known WS = 1475.24

GEOMETRY DATA

Geometry Title: Existing Condition
Geometry File : o:\275.01.18\Engineering\HEC-RAS\HEC-RAS Models\FINAL MODELS\PRE-PROJECT\PRE_PROJECT.g01

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 3236.43

INPUT
Description:
Station Elevation Data num= 83

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1502	.11	1502	7.18	1501.93	8.44	1501.93	9.95	1501.92

12.77	1501.89	34.93	1501.71	50.51	1501.63	58.72	1501.6	73.57	1501.71
78.02	1501.66	86.02	1501.48	92.04	1501.51	94.74	1501.52	105.65	1501.52
129.84	1501	136.7	1500.9	136.93	1500.89	137.19	1500.89	153.63	1500.63
164.53	1500.45	176.84	1500.37	186.77	1500.36	190.98	1500.53	204.13	1500.92
205.86	1500.97	213.59	1500.95	214.57	1500.96	215.41	1500.96	216.15	1500.95
219.12	1500.91	226.3	1500.77	229.03	1500.71	231.38	1500.66	260.68	1500.03
262.21	1500.03	263.76	1500.02	265.2	1500.01	267.86	1500	269.25	1499.75
276.49	1499.04	276.89	1499	277.54	1498.75	279.43	1498	280.31	1497.65
281.5	1497.09	281.7	1497	282.01	1496.86	283.85	1496	285.97	1495.01
285.99	1495	286.04	1494.98	287.9	1494.31	288.56	1494.13	288.76	1494.09
292.52	1495	296.37	1495.87	296.86	1496	298.26	1496.38	300.55	1497
301.2	1497.18	303.79	1497.88	304.13	1497.98	304.21	1498	307.21	1498.85
307.73	1499	310.93	1499.91	311.44	1500	321.26	1500.5	328.79	1501
337.76	1501.5	341.62	1501.56	344.31	1501.6	356.67	1501.92	357.92	1501.99
358.19	1501.99	358.56	1502	364.05	1502.35	374.68	1503	376.61	1503
377.33	1503	378.22	1503	378.79	1503				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	281.5	.055	301.2	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
281.5	301.2	51.74	51.78	51.15	.1	.3

Left Levee Station= 219.12 Elevation=

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1501.07	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.93	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1500.14	Reach Len. (ft)	51.74	51.78	51.15
Crit W.S. (ft)	1499.62	Flow Area (sq ft)	16.88	90.59	15.94
E.G. Slope (ft/ft)	0.012878	Area (sq ft)	16.88	90.59	15.94
Q Total (cfs)	890.00	Flow (cfs)	60.36	743.33	86.32
Top Width (ft)	58.65	Top Width (ft)	25.95	19.70	13.00

Vel Total (ft/s)	7.21	Avg. Vel. (ft/s)	3.58	8.21	5.41
Max Chl Dpth (ft)	6.05	Hydr. Depth (ft)	0.65	4.60	1.23
Conv. Total (cfs)	7842.8	Conv. (cfs)	531.9	6550.3	760.6
Length Wtd. (ft)	51.72	Wetted Per. (ft)	26.39	20.69	13.38
Min Ch El (ft)	1494.09	Shear (lb/sq ft)	0.51	3.52	0.96
Alpha	1.15	Stream Power (lb/ft s)	1.84	28.88	5.18
Frctn Loss (ft)	0.53	Cum Volume (acre-ft)	4.69	2.50	2.36
C & E Loss (ft)	0.09	Cum SA (acres)	6.91	0.69	2.94

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 3184.66

INPUT
Description:
Station Elevation Data num= 80

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1501	8.87	1500.95	16.33	1500.95	30.14	1500.85	31.29	1500.84
32.73	1500.82	34.94	1500.79	38.12	1500.74	52.41	1500.42	59.44	1500.29
62.06	1500.24	71.9	1500	78.54	1499.99	86.19	1500	93.04	1500.17
95.16	1500.11	96.7	1500.09	97.83	1500.08	107.54	1500.08	117.48	1500.05
122.81	1500	140.95	1499.77	145.41	1499.68	160.9	1499.38	168.07	1499.45
182.83	1499.78	193.58	1500	200.8	1500.02	204.82	1500	229.06	1499.78
230.97	1499.76	233.32	1499.73	236.86	1499.66	243.72	1499.48	251.18	1499.34
255.83	1499.27	261.73	1499.17	267.56	1499	268.35	1498.67	269.99	1498
271	1497.58	272.41	1497	273.83	1496.41	274.83	1496	274.9	1495.97
277.21	1495.02	277.25	1495	277.31	1494.97	279.35	1494	280.42	1494
281.95	1494	282.46	1494	284.67	1494	288.58	1494.56	290.98	1495

291.27	1495.14	292.9	1495.92	292.93	1495.93	293.19	1496	294.31	1496.31
296.14	1496.81	296.4	1496.88	296.61	1496.96	296.71	1497	298.79	1497.76
299.43	1498	301.24	1498.67	302.14	1499	318.6	1499.69	326.69	1500
334.65	1500.76	337.31	1501	337.53	1501.03	337.98	1501.1	341.9	1501.67
344.23	1502	349.62	1502.5	352.39	1502.6	356.89	1502.81	357.05	1502.82

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	274.9	.055	296.14	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
274.9	296.14	48.69	47.86	50.23	.1	.3

Left Levee Station= 200.8 Elevation=

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1500.46	Element			
Vel Head (ft)	0.64	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1499.82	Reach Len. (ft)	48.69	47.86	50.23
Crit W.S. (ft)	1498.65	Flow Area (sq ft)	32.76	105.56	19.51
E.G. Slope (ft/ft)	0.008213	Area (sq ft)	32.76	105.56	19.51
Q Total (cfs)	890.00	Flow (cfs)	94.49	733.80	61.71
Top Width (ft)	96.86	Top Width (ft)	49.86	21.24	25.76
Vel Total (ft/s)	5.64	Avg. Vel. (ft/s)	2.88	6.95	3.16
Max Chl Dpth (ft)	5.82	Hydr. Depth (ft)	0.66	4.97	0.76
Conv. Total (cfs)	9820.3	Conv. (cfs)	1042.6	8096.8	680.9
Length Wtd. (ft)	48.35	Wetted Per. (ft)	50.47	22.07	26.17
Min Ch El (ft)	1494.00	Shear (lb/sq ft)	0.33	2.45	0.38
Alpha	1.30	Stream Power (lb/ft s)	0.96	17.05	1.21
Frctn Loss (ft)	0.38	Cum Volume (acre-ft)	4.66	2.39	2.34
C & E Loss (ft)	0.09	Cum SA (acres)	6.86	0.66	2.91

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid,

energy was used.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 3136.8

INPUT
Description:
Station Elevation Data num= 84

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1501	.19	1501	3.38	1500.95	53.34	1500	68.43	1499.92
72	1499.91	72.76	1499.91	78.35	1499.92	99.85	1499.39	104.5	1499.19
113.77	1499.18	123.73	1499.13	126.83	1499.1	128.97	1499.09	138.24	1499.04
143.18	1499.07	146.98	1499.05	156.37	1499	170.23	1498.98	179.15	1498.97
184.58	1498.98	192.57	1498.99	198.92	1499	206.25	1499.08	209.34	1499.12
210.19	1499.13	213.83	1499.15	229.52	1499.15	240.25	1499.17	257.75	1499.06
263.49	1499.03	263.56	1499	269.54	1498.8	278.15	1498.79	279.03	1498.77
280.09	1498.75	287.11	1498.31	291.78	1498	293.44	1497.07	293.57	1497
294.45	1496.51	295.29	1496	295.32	1495.98	295.41	1495.93	296.94	1495
297.21	1494.84	298.59	1494	299.02	1493.98	299.44	1493.96	300.37	1493.93
301.34	1493.96	302.15	1494	302.79	1494.24	304.75	1495	305.12	1495.14
306.91	1495.83	307.27	1495.94	307.46	1496	307.55	1496.03	309.81	1496.7
310.8	1497	312.68	1497.57	314.13	1498	315.89	1498.47	317.21	1498.5
327.12	1498.8	332.16	1498.97	333.28	1498.97	334.54	1499	335.93	1499.19
336.44	1499.15	337.96	1499.2	341.34	1499.1	344.25	1499.17	350.02	1499.26
359.84	1499.65	367.12	1499.77	370.23	1500	374.55	1500.44	378.16	1500.52
378.41	1500.52	378.79	1500.51	379.2	1500.5	380.31	1500.47		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	295.32	.055	307.55	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
295.32	307.55	54.65	52.79	52.77	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1499.99	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.36	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1499.63	Reach Len. (ft)	54.65	52.79	52.77
Crit W.S. (ft)	1499.63	Flow Area (sq ft)	128.84	60.22	45.26
E.G. Slope (ft/ft)	0.007567	Area (sq ft)	128.84	60.22	45.26
Q Total (cfs)	890.00	Flow (cfs)	348.04	390.12	151.84
Top Width (ft)	269.49	Top Width (ft)	205.37	12.23	51.89
Vel Total (ft/s)	3.80	Avg. Vel. (ft/s)	2.70	6.48	3.35
Max Chl Dpth (ft)	5.70	Hydr. Depth (ft)	0.63	4.92	0.87
Conv. Total (cfs)	10231.4	Conv. (cfs)	4001.1	4484.8	1745.6
Length Wtd. (ft)	53.56	Wetted Per. (ft)	205.95	13.16	52.27
Min Ch El (ft)	1493.93	Shear (lb/sq ft)	0.30	2.16	0.41
Alpha	1.61	Stream Power (lb/ft s)	0.80	14.01	1.37
Frctn Loss (ft)	0.39	Cum Volume (acre-ft)	4.57	2.30	2.30
C & E Loss (ft)	0.00	Cum SA (acres)	6.72	0.65	2.87

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical
depth for the water surface and continued on with the calculations.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 3084.02

INPUT
Description:
Station Elevation Data num= 117

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1500	.61	1500	1.99	1499.96	28.08	1499	52.78	1498.58
53.41	1498.57	54.05	1498.56	61.29	1498.47	66.57	1498.41	76.92	1498.37
85.39	1498.34	103.51	1498.27	119.35	1498.09	119.61	1498.09	122.59	1498.1
127.08	1498.13	128.05	1498.15	129.41	1498.19	136.28	1498.39	148.17	1498.51
149.76	1498.59	159.01	1499	162.74	1499.83	163.48	1500	164.31	1500.19
168.68	1501	171.39	1501	171.4	1501	171.52	1500.97	171.56	1500.97
171.61	1500.96	176.68	1500	177.07	1499.94	177.51	1499.88	179.63	1499.6
182.56	1499	192.06	1498.48	194.32	1498.31	195.8	1498.29	197.38	1498.26
198.39	1498.21	206.8	1498.06	207.91	1498.03	208.29	1498.02	209.57	1498
220.86	1497.43	223.87	1497.14	225.52	1497	228.52	1496.06	228.7	1496
231.63	1495.08	231.86	1495	231.88	1495	232.22	1494.9	235	1494.04
235.13	1494	238.19	1493.06	238.38	1493	238.43	1493	238.95	1492.99
239.51	1493	239.52	1493	239.53	1493	239.6	1493.05	239.72	1493.1
240.07	1493.22	240.54	1493.39	242.14	1494	242.9	1494.29	244.66	1494.97
244.75	1495	245.74	1495.39	246.17	1495.55	247.35	1496	248.32	1496.36
250.01	1497	250.79	1497.29	252.65	1498	255.6	1498.18	256.69	1498.22
258.53	1498.3	259.26	1498.34	259.71	1498.37	265.61	1498.68	268.87	1498.73
270.47	1498.81	271.41	1498.79	272.29	1498.77	275.3	1498.72	277.96	1498.68
288.78	1498.95	290.9	1499	293.09	1499	295.07	1499	304.65	1499
307.42	1498.85	314.31	1498.48	316.69	1498.47	319.22	1498.45	321.52	1498.46
330.75	1498.48	342.1	1498.31	345.25	1498.3	346.47	1498.27	348.82	1498.26
349.41	1498.27	354.32	1498.17	360.73	1498	360.77	1498	361.66	1497.99
365.2	1497.93	416.2	1497	416.54	1497	420.95	1496.94	422.51	1496.91
425.61	1496.87	438.1	1496.69						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

```
       0    .035  232.22    .055  244.66    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        232.22  244.66           121.24  117.88   117.6             .1       .3
Right Levee     Station=  304.65      Elevation=

CROSS SECTION OUTPUT  Profile #PF 1
```

E.G. Elev (ft)	1499.34	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.38	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1498.96	Reach Len. (ft)	121.24	117.88	117.60
Crit W.S. (ft)	1498.92	Flow Area (sq ft)	124.95	63.21	31.99
E.G. Slope (ft/ft)	0.007112	Area (sq ft)	124.95	63.21	31.99
Q Total (cfs)	890.00	Flow (cfs)	387.48	411.33	91.19
Top Width (ft)	233.24	Top Width (ft)	176.36	12.44	44.44
Vel Total (ft/s)	4.04	Avg. Vel. (ft/s)	3.10	6.51	2.85
Max Chl Dpth (ft)	5.97	Hydr. Depth (ft)	0.71	5.08	0.72
Conv. Total (cfs)	10553.3	Conv. (cfs)	4594.6	4877.5	1081.3
Length Wtd. (ft)	118.75	Wetted Per. (ft)	176.76	13.09	45.02
Min Ch El (ft)	1492.99	Shear (lb/sq ft)	0.31	2.14	0.32
Alpha	1.50	Stream Power (lb/ft s)	0.97	13.95	0.90
Frctn Loss (ft)	1.37	Cum Volume (acre-ft)	4.41	2.22	2.25
C & E Loss (ft)	0.11	Cum SA (acres)	6.48	0.63	2.81

```
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for additional
cross
         sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater
than
         1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This
may indicate
```

the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 2966.14

INPUT
Description:
Station Elevation Data num= 112

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1499.53	5.87	1499.08	6.51	1499.03	6.85	1499	7.22	1498.98
20.76	1498	26.31	1497.72	43.93	1497	44.27	1496.99	50.21	1496.74
56.63	1496.48	62.03	1496.41	66.07	1496.36	70.39	1496.36	74.66	1496.36
75.23	1496.36	81.23	1496.37	94.48	1496.51	101.78	1496.54	115.71	1496.72
131.94	1496.98	137.86	1497	138.21	1497	139.45	1497	156.26	1497.02
175.91	1497.13	202.5	1497.24	214.66	1497.21	225.82	1497.22	243.62	1497.03
245.2	1497.03	248.52	1497.03	253.09	1497.04	267.56	1497.02	282.46	1497
283.5	1497	287.01	1496.68	297.06	1496	298.24	1495.47	299.28	1495
300.52	1494.44	301.5	1494	302.89	1493.37	303.69	1493.02	303.72	1493
305.61	1492.15	305.95	1492	306.43	1491.78	308.17	1491	308.45	1490.98
309.31	1490.91	310.22	1490.85	310.28	1490.85	312.13	1490.98	312.45	1491
314.27	1491.72	314.81	1491.92	315.02	1492	317.19	1492.81	317.7	1493
319.76	1493.77	320.37	1494	320.8	1494.16	320.88	1494.19	323.05	1495
323.55	1495.19	325.73	1496	328.08	1496.88	328.41	1497	328.42	1497
329.48	1497.02	329.65	1497.02	331.86	1497.04	339.93	1497.06	348.47	1497.1
349.64	1497.1	350.53	1497.1	369.85	1497	378.18	1496.97	379.05	1496.97
381.84	1496.97	393.38	1496.81	406.85	1496.78	420.1	1496.79	427.69	1496.88
429.49	1496.85	433.13	1496.76	437.68	1496.85	440.64	1496.97	442.84	1496.99
445.12	1497	445.55	1497	445.91	1497	447.99	1497	449.7	1497
457.68	1496.99	471.98	1496.99	475.91	1496.99	480.23	1496.98	493.75	1496.97

502.55	1496.97	509.42	1496.96	518.5	1496.96	522.82	1496.97	535	1496.98
536.1	1496.98	540.29	1496.99	542.16	1496.99	543.59	1496.99	544.54	1496.99
546.75	1496.99	550.95	1497						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	303.69	.055	320.88	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
303.69	320.88	118.96	117.89	115.96	.1	.3

Left Levee Station= 225.82 Elevation=

Right Levee Station= 348.47 Elevation=

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1497.86	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.48	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1496.37	Reach Len. (ft)	118.96	117.89	115.96
Crit W.S. (ft)	1496.37	Flow Area (sq ft)	13.41	74.62	6.38
E.G. Slope (ft/ft)	0.021831	Area (sq ft)	13.41	74.62	6.38
Q Total (cfs)	890.00	Flow (cfs)	86.77	762.58	40.65
Top Width (ft)	35.19	Top Width (ft)	12.15	17.19	5.85
Vel Total (ft/s)	9.43	Avg. Vel. (ft/s)	6.47	10.22	6.37
Max Chl Dpth (ft)	5.52	Hydr. Depth (ft)	1.10	4.34	1.09
Conv. Total (cfs)	6023.5	Conv. (cfs)	587.3	5161.1	275.1
Length Wtd. (ft)	118.08	Wetted Per. (ft)	12.81	18.22	6.24
Min Ch El (ft)	1490.85	Shear (lb/sq ft)	1.43	5.58	1.39
Alpha	1.07	Stream Power (lb/ft s)	9.24	57.05	8.87
Frctn Loss (ft)	0.79	Cum Volume (acre-ft)	4.22	2.04	2.20
C & E Loss (ft)	0.40	Cum SA (acres)	6.22	0.59	2.74

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical

depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross
sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 2848.25

INPUT
Description:
Station Elevation Data num= 110

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1497	20.49	1496.38	22.3	1496.33	38.07	1496	40.84	1495.95
42.14	1495.94	63.41	1495.71	70.72	1495.49	87.6	1495	88.2	1494.98
88.54	1494.97	104.15	1494.42	108.54	1494.42	119.57	1494.41	120.94	1494.39
144.43	1494.17	149.77	1494.11	152.6	1494.09	154.55	1494.11	172.33	1494.04
173.09	1494.04	173.53	1494.04	173.96	1494.04	174.74	1494.06	176.37	1494.09
191.77	1494.16	193.51	1494.21	198.94	1494.36	206.98	1494.57	211.27	1494.66

215.89	1494.76	218.73	1494.8	221.88	1494.85	228.56	1494.97	234.16	1495
234.29	1495	235.2	1495.02	235.7	1495.02	236.27	1495.02	236.64	1495.03
252.97	1495.39	265.64	1495.54	270.22	1495.56	274.6	1495.56	281.26	1495.53
294.43	1495.47	300.16	1495.46	300.66	1495.46	301.16	1495.46	316.07	1495.4
338.54	1495.18	346.85	1495.2	347.58	1495	349.46	1494.12	349.71	1494
351.25	1493.27	351.83	1493	353.13	1492.39	353.7	1492.12	353.95	1492
354.68	1491.66	356.23	1491	356.43	1490.92	358.59	1490	358.99	1489.83
360.94	1489	361.16	1488.99	361.37	1488.99	361.58	1488.99	361.89	1488.99
362.16	1489	362.88	1489.25	365.08	1490	365.68	1490.21	368	1491
368.41	1491.14	369.94	1491.66	370.92	1492	370.96	1492.02	371.1	1492.06
373.98	1493	376.02	1493.67	377.04	1494	387.03	1494.83	387.93	1494.9
389.45	1495	400.76	1495.33	411.89	1495.47	419.01	1495.48	427.28	1495.58
431.72	1495.6	442.91	1495.56	452.78	1495.47	460.46	1495.4	471.12	1495.27
472.53	1495.25	479.8	1495.19	482.44	1495.2	494.04	1495.21	499.06	1495.21
504.68	1495.23	516.68	1495.28	520.23	1495.32	524.19	1495.38	534.28	1495.45
545.62	1495.62	556.39	1495.75	569.46	1496	571.63	1496.17	573.36	1496.32

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	353.7	.055	369.94	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
353.7	369.94	118.03	118.32	118.08	.1	.3

Left Levee Station= 274.6 Elevation=
Right Levee Station= 431.72 Elevation=

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1495.76	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.16	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1495.59	Reach Len. (ft)	118.03	118.32	118.08
Crit W.S. (ft)	1494.86	Flow Area (sq ft)	218.65	85.52	41.25
E.G. Slope (ft/ft)	0.003174	Area (sq ft)	218.65	85.52	41.25
Q Total (cfs)	890.00	Flow (cfs)	436.14	377.35	76.51

Top Width (ft)	362.57	Top Width (ft)	286.36	16.24	59.97
Vel Total (ft/s)	2.58	Avg. Vel. (ft/s)	1.99	4.41	1.85
Max Chl Dpth (ft)	6.60	Hydr. Depth (ft)	0.76	5.27	0.69
Conv. Total (cfs)	15798.5	Conv. (cfs)	7741.9	6698.4	1358.2
Length Wtd. (ft)	118.26	Wetted Per. (ft)	287.07	17.33	60.39
Min Ch El (ft)	1488.99	Shear (lb/sq ft)	0.15	0.98	0.14
Alpha	1.58	Stream Power (lb/ft s)	0.30	4.31	0.25
Frctn Loss (ft)	1.87	Cum Volume (acre-ft)	3.90	1.82	2.14
C & E Loss (ft)	0.06	Cum SA (acres)	5.81	0.55	2.65

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the
water surface that had the least amount of error between computed and assumed values.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross
sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 2729.93

INPUT
Description:

Station Elevation Data num= 103

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1496	18.47	1495.54	36.57	1495.34	39.49	1495.31	40.93	1495.28
53.37	1495.07	55.3	1495.03	57.51	1495	75.59	1494.69	88.24	1494.36
89.58	1494.33	98.12	1494	131.01	1493.06	132.11	1493.03	133.48	1493
140.7	1492.89	150.63	1492.7	154.18	1492.72	157.24	1492.74	184.13	1492.72
210.62	1492.73	215.76	1492.76	216.07	1492.76	216.97	1492.77	256.82	1492.92
260.47	1492.95	262.81	1492.95	270.97	1492.99	278.45	1492.99	281.42	1493
315.82	1493.45	317.51	1493.47	332.63	1493.63	342.43	1493.66	347.38	1493.63
360.62	1493.59	365.88	1493.57	368.33	1493.56	376.84	1493.53	390.18	1493.51
435.31	1493	436.82	1492.95	440.56	1492.51	444.07	1492.21	444.97	1492
445.39	1491.84	447.61	1491	448.4	1490.7	448.77	1490.56	450.25	1490
451.56	1489.5	452.88	1489	454.21	1488.5	455.52	1488	456.66	1487.99
457.51	1487.99	457.89	1487.99	458.91	1488	460.84	1488.66	461.84	1489
464.17	1489.8	464.36	1489.86	464.89	1490	467.81	1490.77	468.35	1490.91
468.68	1491	468.75	1491.02	472.48	1492	478.57	1492.61	490.71	1493
492.45	1493.02	492.47	1493.02	492.48	1493.02	493.73	1493.04	507.14	1493.22
516.54	1493.32	532.83	1493.46	546.97	1493.47	548.2	1493.46	558.59	1493.38
560.32	1493.38	562.64	1493.37	564.81	1493.36	573.87	1493.41	588.5	1493.58
600.41	1493.64	611.68	1493.77	617.21	1493.82	628.79	1494	643.57	1494.23
651.75	1494.32	657.63	1494.39	662.5	1494.44	664.86	1494.45	675.64	1494.54
681.05	1494.53	686.07	1494.58	696.29	1494.57	704.07	1494.61	710.31	1494.66
717.69	1494.73	722.59	1494.72	736.77	1495				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	448.77	.055	464.17	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
448.77	464.17	102.75	103.37	104.21	.1	.3

Left Levee Station= 342.43 Elevation=

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1494.52	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.46	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1493.06	Reach Len. (ft)	102.75	103.37	104.21
Crit W.S. (ft)	1493.00	Flow Area (sq ft)	11.58	64.55	25.69
E.G. Slope (ft/ft)	0.024381	Area (sq ft)	11.58	64.55	25.69
Q Total (cfs)	890.00	Flow (cfs)	55.21	685.37	149.42
Top Width (ft)	64.99	Top Width (ft)	18.64	15.40	30.94
Vel Total (ft/s)	8.74	Avg. Vel. (ft/s)	4.77	10.62	5.82
Max Chl Dpth (ft)	5.07	Hydr. Depth (ft)	0.62	4.19	0.83
Conv. Total (cfs)	5699.8	Conv. (cfs)	353.6	4389.3	956.9
Length Wtd. (ft)	103.43	Wetted Per. (ft)	18.97	16.17	31.27
Min Ch El (ft)	1487.99	Shear (lb/sq ft)	0.93	6.08	1.25
Alpha	1.23	Stream Power (lb/ft s)	4.43	64.52	7.27
Frctn Loss (ft)	2.22	Cum Volume (acre-ft)	3.59	1.61	2.05
C & E Loss (ft)	0.08	Cum SA (acres)	5.40	0.50	2.53

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 2626.56

INPUT
Description:
Station Elevation Data num= 124

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1493.09	17.8	1493.16	20.03	1493.16	29.42	1493.09	36.6	1493.01

38.4	1493	41.75	1492.93	42.75	1492.92	61.21	1492.6	70.41	1492.47
85.32	1492.18	91.11	1492.04	95.51	1492	96.31	1491.98	102.31	1491.96
107.36	1491.96	118.59	1491.98	123.24	1491.96	124.07	1491.97	124.16	1491.97
124.77	1491.96	136.69	1491.89	139.71	1491.84	160.67	1491.66	164.87	1491.64
174.69	1491.57	187.51	1491.53	199.11	1491.52	235.75	1492	235.93	1492
239.46	1492.01	242.22	1492.01	248.56	1492.02	268.2	1492.06	289.73	1492.02
296.42	1492.03	297.02	1492.03	297.77	1492.04	297.86	1492.04	311.13	1492.01
314.19	1492	315.17	1492	325.26	1491.96	325.58	1491.96	329.84	1492
351.9	1492.19	353.35	1492.2	353.75	1492.2	354.16	1492.2	379.91	1492.08
380.51	1492.08	395.98	1492.05	397.16	1492.03	401.25	1492	413	1491.89
414.02	1491.88	434.51	1491.69	447.24	1491.56	451.4	1491.54	456.87	1491.54
459.1	1491.53	473.63	1491.46	494.95	1491.31	496.34	1491.29	501.61	1491.25
502.4	1491	503.13	1490.74	505.24	1490	507.96	1489.04	508.07	1489
508.45	1488.87	511.6	1488.22	512.65	1488	514.87	1487.54	517.06	1487
517.89	1486.79	521.1	1486	521.66	1485.96	522.29	1485.95	522.34	1485.94
522.39	1485.95	523.36	1486	525.37	1486.65	526.43	1487	529.23	1487.91
529.5	1488	529.61	1488.03	530.18	1488.22	532.42	1489	532.92	1489.17
535.3	1490	544.42	1490.7	549.37	1490.94	549.88	1490.97	550.81	1491
555.11	1491.15	556.43	1491.16	557.83	1491.16	567.67	1491.39	577.66	1491.5
584.8	1491.56	600.36	1491.63	609.82	1491.65	624.5	1491.87	631.32	1492
640.53	1492.04	642.82	1492.06	659.34	1492.13	666.73	1492.15	667.02	1492.15
674.15	1492.17	679.04	1492.19	695.19	1492.23	701.4	1492.26	703.19	1492.28
709.84	1492.35	728.68	1492.59	741.59	1492.7	744.55	1492.73	751.93	1492.81
761.03	1492.8	761.3	1492.8	776.62	1492.86	791.16	1493		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	511.6	.055	529.61	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
511.6	529.61	116.29	115.51	114.99	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1492.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.19	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1491.03	Reach Len. (ft)	116.29	115.51	114.99
Crit W.S. (ft)	1491.03	Flow Area (sq ft)	14.43	73.30	18.74
E.G. Slope (ft/ft)	0.019054	Area (sq ft)	14.43	73.30	18.74
Q Total (cfs)	890.00	Flow (cfs)	110.04	682.21	97.75
Top Width (ft)	49.25	Top Width (ft)	9.28	18.01	21.95
Vel Total (ft/s)	8.36	Avg. Vel. (ft/s)	7.63	9.31	5.22
Max Chl Dpth (ft)	5.09	Hydr. Depth (ft)	1.55	4.07	0.85
Conv. Total (cfs)	6447.6	Conv. (cfs)	797.2	4942.3	708.1
Length Wtd. (ft)	115.63	Wetted Per. (ft)	9.72	18.59	22.32
Min Ch El (ft)	1485.94	Shear (lb/sq ft)	1.77	4.69	1.00
Alpha	1.10	Stream Power (lb/ft s)	13.47	43.64	5.21
Frctn Loss (ft)	1.39	Cum Volume (acre-ft)	3.56	1.45	1.99
C & E Loss (ft)	0.26	Cum SA (acres)	5.36	0.46	2.47

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical
depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross
sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 2511.04

INPUT
Description:
Station Elevation Data num= 93

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1489.96	7.41	1489.94	15.93	1489.97	25.73	1490	40.9	1489.97
47.01	1489.97	59.81	1490	60.23	1490	62.48	1490	64.33	1489.98
96.34	1489.58	115.6	1489.52	124.87	1489.59	137.65	1489.71	154.63	1490
177.22	1490.28	179.23	1490.29	189.93	1490.31	197.52	1490.33	204.9	1490.33
207.41	1490.34	220.92	1490.26	223.28	1490.26	228.45	1490.29	244.57	1490.22
257.2	1490.02	258.43	1490	287.26	1489.62	297.62	1489.58	307.57	1489.65
314.33	1489.67	315.04	1489.67	325.7	1489.77	326.15	1489.77	331.41	1489.83
363.26	1489.73	367.62	1489.77	370.87	1489.78	372.01	1489.78	372.32	1489.78
373.39	1489.77	376.41	1489.79	379.01	1489.81	400.96	1489.76	408.68	1489.69
429.35	1489.37	431.11	1489.33	436.33	1489.21	439.49	1489.21	444.13	1489.3
445.51	1489	448.03	1488.43	449.91	1488	453.38	1487.21	453.95	1487.08
454.3	1487	458.57	1486.03	458.69	1486	461.96	1485.22	462.89	1485
463.34	1485	463.42	1485	463.79	1485	463.9	1485	465.36	1485.58
466.25	1486	466.76	1486.24	468.39	1487	469.03	1487.3	469.4	1487.47
470.53	1488	471.74	1488.57	472.67	1489	477.38	1489.24	483.06	1489.28
502.18	1489.64	509.31	1489.73	516.63	1489.72	522.46	1489.76	541.41	1489.76
561.1	1489.92	562.06	1489.92	570.92	1490	573.38	1490.03	587.02	1490.08
587.65	1490.09	588.04	1490.1	589.23	1490.11	603.54	1490.27	609.33	1490.35
626.69	1490.37	646.13	1490.61	677.52	1491				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	453.95	.055	469.03	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
453.95 469.03 71.54 70.69 70.36 .1 .3
Left Levee Station= 228.45 Elevation=

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1490.56	Element			
Vel Head (ft)	0.33	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1490.23	Reach Len. (ft)	71.54	70.69	70.36
Crit W.S. (ft)	1490.29	Flow Area (sq ft)	122.64	63.76	66.67
E.G. Slope (ft/ft)	0.008284	Area (sq ft)	122.64	63.76	66.67
Q Total (cfs)	890.00	Flow (cfs)	328.90	397.19	163.91
Top Width (ft)	357.89	Top Width (ft)	211.82	15.08	130.98
Vel Total (ft/s)	3.52	Avg. Vel. (ft/s)	2.68	6.23	2.46
Max Chl Dpth (ft)	5.23	Hydr. Depth (ft)	0.58	4.23	0.51
Conv. Total (cfs)	9778.6	Conv. (cfs)	3613.7	4364.0	1801.0
Length Wtd. (ft)	70.97	Wetted Per. (ft)	212.08	15.81	131.37
Min Ch El (ft)	1485.00	Shear (lb/sq ft)	0.30	2.09	0.26
Alpha	1.71	Stream Power (lb/ft s)	0.80	12.99	0.65
Frctn Loss (ft)	0.86	Cum Volume (acre-ft)	3.38	1.27	1.88
C & E Loss (ft)	0.02	Cum SA (acres)	5.07	0.42	2.27

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross
sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Warning: The cross section had to be extended vertically during the critical depth calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.

Note: Program found supercritical flow starting at this cross section.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 2440.36

INPUT
Description:
Station Elevation Data num= 96

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1490	1.82	1490	6.23	1490	11.89	1490	15.64	1489.83
31.31	1489	39.01	1488.97	42.67	1488.96	52.6	1488.81	67.58	1488.66
73.85	1488.67	78.92	1488.66	93.2	1488.76	109.62	1489	113.69	1489.02
115.29	1489.03	117.06	1489.02	120.67	1489.05	128.9	1489.02	130.53	1489
158.02	1488.6	162.82	1488.56	166.67	1488.51	175.23	1488.44	182	1488.4
195.57	1488.5	202.94	1488.52	210	1488.52	218.93	1488.61	230.67	1488.56
238.54	1488.63	238.68	1488.63	238.77	1488.64	263.03	1488.94	264.62	1488.97
267.37	1488.97	270.19	1488.99	271.42	1489	276.69	1489.01	294.33	1489.03
314.31	1489.01	318.47	1489.01	321.41	1489	324.74	1488.86	326.2	1488.77
336.08	1488.3	338.81	1488	340.11	1487.12	340.34	1487	340.45	1486.94
342.22	1486	342.89	1485.64	343.57	1485.28	344.1	1485	345.97	1484
345.98	1484	348.44	1485	349.86	1485.58	350.9	1486	351.24	1486.14
352.83	1486.79	353.36	1487	354.48	1487.46	355.89	1488	356.9	1488.08
357.94	1488.07	361.18	1488.11	380.9	1488.5	388.31	1488.63	392.95	1488.69
393.36	1488.69	395.66	1488.72	404.52	1488.74	413.23	1488.8	417.35	1488.84
417.88	1488.84	418.38	1488.85	437.2	1488.92	437.81	1488.93	439.5	1488.93
446.01	1489	472.1	1489.28	477.75	1489.33	488.25	1489.42	493.37	1489.49
518.33	1489.84	522.06	1489.88	522.94	1489.89	525.56	1489.92	542.84	1490
545.22	1490.01	545.25	1490.01	545.28	1490.01	545.68	1490.01	557.12	1490.08
559.37	1490.09								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	343.57	.055	351.24	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
343.57	351.24	93.95	94.96	94.56	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1489.69	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.55	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1489.13	Reach Len. (ft)	93.95	94.96	94.56
Crit W.S. (ft)	1489.31	Flow Area (sq ft)	123.75	32.20	54.28
E.G. Slope (ft/ft)	0.019304	Area (sq ft)	123.75	32.20	54.28
Q Total (cfs)	890.00	Flow (cfs)	391.09	295.78	203.13
Top Width (ft)	429.49	Top Width (ft)	314.75	7.67	107.06
Vel Total (ft/s)	4.23	Avg. Vel. (ft/s)	3.16	9.19	3.74
Max Chl Dpth (ft)	5.13	Hydr. Depth (ft)	0.39	4.20	0.51
Conv. Total (cfs)	6405.7	Conv. (cfs)	2814.8	2128.8	1462.0
Length Wtd. (ft)	94.45	Wetted Per. (ft)	315.53	8.41	107.43
Min Ch El (ft)	1484.00	Shear (lb/sq ft)	0.47	4.61	0.61
Alpha	1.99	Stream Power (lb/ft s)	1.49	42.39	2.28
Frctn Loss (ft)	1.37	Cum Volume (acre-ft)	3.17	1.19	1.78
C & E Loss (ft)	0.03	Cum SA (acres)	4.63	0.40	2.07

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Warning: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant
method to find critical depth.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 2345.39

INPUT
Description:
Station Elevation Data num= 80

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1489.01	1.22	1489.01	4.3	1489	10.08	1488.83	11.33	1488.77
13.76	1488.66	27.03	1488	38.85	1487.53	52.84	1487	53.38	1486.99
62.82	1486.97	73.48	1486.94	73.95	1486.93	93.01	1486.89	95.1	1486.89
108.98	1487	110.7	1487.01	110.87	1487.01	111.62	1487.02	148.07	1487.42
157.15	1487.48	169.13	1487.56	190.21	1487.72	201.9	1487.76	208.51	1487.68
214.35	1487.67	220.88	1487.6	231.76	1487.44	235.58	1487.37	240.63	1487.27
245.18	1487.21	249.47	1487.1	253.04	1487	253.2	1487	253.23	1487
253.56	1486.85	255.35	1486	256.06	1485.67	257.47	1485	257.91	1484.79
259.02	1484.27	259.59	1484	260.3	1483.67	261.83	1483.09	262.07	1483
264.37	1482.14	264.58	1482.07	264.71	1482.06	264.82	1482.06	265.27	1482.27
266.73	1483	267.14	1483.21	268.3	1484	268.86	1484.39	269.67	1484.94
269.75	1485	270.61	1485.59	271.21	1486	275.23	1486.7	281.09	1487
290.7	1487.15	295.25	1487.19	302.18	1487.3	317.63	1487.59	324.36	1487.7
337.77	1487.82	341.06	1487.88	349.22	1488	368.94	1488.24	377.61	1488.32
387.39	1488.44	395.95	1488.53	402.25	1488.59	409.09	1488.62	423.47	1488.79
426.37	1488.81	429.65	1488.83	440.52	1489	453.3	1489.13	454.82	1489.13

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	257.91	.055	269.67	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
257.91	269.67	122.79	121.06	120.89	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1488.28	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.44	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1487.84	Reach Len. (ft)	122.79	121.06	120.89
Crit W.S. (ft)	1487.93	Flow Area (sq ft)	126.74	52.98	38.69
E.G. Slope (ft/ft)	0.011268	Area (sq ft)	126.74	52.98	38.69
Q Total (cfs)	890.00	Flow (cfs)	386.75	385.55	117.69
Top Width (ft)	308.08	Top Width (ft)	226.94	11.76	69.38
Vel Total (ft/s)	4.07	Avg. Vel. (ft/s)	3.05	7.28	3.04
Max Chl Dpth (ft)	5.78	Hydr. Depth (ft)	0.56	4.50	0.56
Conv. Total (cfs)	8384.3	Conv. (cfs)	3643.5	3632.1	1108.7
Length Wtd. (ft)	121.80	Wetted Per. (ft)	227.46	13.10	69.79
Min Ch El (ft)	1482.06	Shear (lb/sq ft)	0.39	2.84	0.39
Alpha	1.70	Stream Power (lb/ft s)	1.20	20.70	1.19
Frctn Loss (ft)	1.75	Cum Volume (acre-ft)	2.90	1.10	1.68
C & E Loss (ft)	0.02	Cum SA (acres)	4.05	0.38	1.88

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 2224.33

INPUT
Description:
Station Elevation Data num= 78

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1487.36	8.63	1487	18.01	1486.61	33	1486	40.58	1485.75
48.46	1485.51	61.84	1485.55	73.53	1485.35	91.46	1485.25	103.39	1485.23
109.89	1485.23	115.03	1485.24	120.04	1485.25	130.85	1485.25	141.6	1485.25

145.54	1485.26	149.83	1485.27	149.91	1485.27	178.6	1485.43	203.64	1485.52
255.35	1485.9	265.31	1486	265.51	1486	282.86	1486.25	288.9	1486.31
301.63	1486.38	316.54	1486.35	334.49	1486.25	349.89	1486.06	351.32	1486.05
355.44	1486	355.48	1486	355.64	1486	376.3	1485.52	391.55	1485
393.29	1484.34	394.18	1484	396.11	1483.27	396.81	1483	399.13	1482.12
399.44	1482	400.53	1481.59	402.09	1481	402.23	1480.99	402.37	1480.98
403.19	1480.91	403.97	1480.97	404.22	1481	404.44	1481.14	405.56	1481.86
405.78	1482	405.85	1482.05	407.34	1483	407.51	1483.11	407.72	1483.25
408.89	1484	411.18	1484.58	413.58	1485	416.84	1485.03	416.92	1485.03
430.25	1485.4	446.09	1485.58	458.39	1485.8	475.54	1486	487.81	1486.18
491.09	1486.21	503.93	1486.37	512.94	1486.45	525.39	1486.55	537.17	1486.7
540.2	1486.73	541.43	1486.75	560.79	1487	568.86	1487.08	570.46	1487.09
572.83	1487.12	589.79	1487.27	600.68	1487.31				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	396.81	.055	407.51	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
396.81	407.51	121.38	121.35	121.14	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1486.52	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.65	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1485.87	Reach Len. (ft)	121.38	121.35	121.14
Crit W.S. (ft)	1486.08	Flow Area (sq ft)	113.20	43.46	29.43
E.G. Slope (ft/ft)	0.018863	Area (sq ft)	113.20	43.46	29.43
Q Total (cfs)	890.00	Flow (cfs)	392.96	386.94	110.11
Top Width (ft)	317.48	Top Width (ft)	249.90	10.70	56.88
Vel Total (ft/s)	4.78	Avg. Vel. (ft/s)	3.47	8.90	3.74
Max Chl Dpth (ft)	4.96	Hydr. Depth (ft)	0.45	4.06	0.52
Conv. Total (cfs)	6480.2	Conv. (cfs)	2861.1	2817.3	801.7
Length Wtd. (ft)	121.33	Wetted Per. (ft)	250.29	11.69	57.26

Min Ch El (ft)	1480.91	Shear (lb/sq ft)	0.53	4.38	0.61
Alpha	1.82	Stream Power (lb/ft s)	1.85	38.97	2.26
Frctn Loss (ft)	1.20	Cum Volume (acre-ft)	2.56	0.96	1.59
C & E Loss (ft)	0.00	Cum SA (acres)	3.38	0.35	1.71

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 2102.98

INPUT
Description:
Station Elevation Data num= 99

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1486	12.1	1485.88	13.1	1485.89	14.72	1485.88	18.4	1485.87
22.78	1485.82	26.72	1485.78	29.38	1485.73	33.88	1485.62	37.31	1485.57
40.27	1485.54	53.69	1485	54.34	1485	55.82	1484.99	56.59	1484.99
100.5	1484.29	112.84	1484.12	113.22	1484.11	115	1484.07	115.9	1484.06
121.69	1484	121.76	1484	127.03	1484	129.05	1484	157.02	1483.97
164.39	1483.96	188.78	1483.99	189.39	1483.99	195.79	1484	199.47	1484.06
200.97	1484.07	202.85	1484.1	220.96	1484.37	233.67	1484.54	243.73	1484.61
253.76	1484.71	255.21	1484.71	257.03	1484.73	265.92	1484.77	269.07	1484.77
273.73	1484.79	277.34	1484.79	280.65	1484.78	301.78	1484.69	306.56	1484.68
315.86	1484.66	330.92	1484.48	362.81	1484.02	364.68	1484.02	368.45	1484
371.72	1483.11	372.12	1483	372.36	1482.89	373.13	1482.55	374.39	1482
374.92	1481.77	375.68	1481.44	376.7	1481	377.72	1480.56	379.01	1480
379.49	1479.97	379.56	1479.97	379.63	1479.97	379.93	1479.98	380.23	1480

381.17	1480.58	381.85	1481	383.03	1481.73	383.21	1481.85	383.46	1482
383.96	1482.31	385.06	1483	393.58	1483.87	394.68	1484	395.66	1484.02
396.38	1484.02	412.43	1484.23	421.81	1484.36	428.54	1484.45	437.72	1484.53
444.91	1484.57	458.75	1484.71	464.74	1484.72	467.31	1484.71	474.46	1484.8
490.53	1484.96	490.84	1484.96	495.19	1485	504.42	1485.08	514.25	1485.13
517.68	1485.15	533.57	1485.25	540.81	1485.3	548.45	1485.41	567.11	1485.73
581.8	1486	583.32	1486.01	588.78	1486.02	591.87	1486.03		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	375.68	.055	383.03	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
375.68	383.03	114.98	115.86	117.1	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1485.17	Element			
Vel Head (ft)	0.30	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1484.87	Reach Len. (ft)	114.98	115.86	117.10
Crit W.S. (ft)	1484.87	Flow Area (sq ft)	169.80	30.95	51.10
E.G. Slope (ft/ft)	0.011644	Area (sq ft)	169.80	30.95	51.10
Q Total (cfs)	890.00	Flow (cfs)	518.83	219.83	151.33
Top Width (ft)	416.47	Top Width (ft)	311.22	7.35	97.91
Vel Total (ft/s)	3.53	Avg. Vel. (ft/s)	3.06	7.10	2.96
Max Chl Dpth (ft)	4.89	Hydr. Depth (ft)	0.55	4.21	0.52
Conv. Total (cfs)	8247.9	Conv. (cfs)	4808.2	2037.3	1402.5
Length Wtd. (ft)	115.64	Wetted Per. (ft)	311.69	8.14	98.33
Min Ch El (ft)	1479.97	Shear (lb/sq ft)	0.40	2.76	0.38
Alpha	1.55	Stream Power (lb/ft s)	1.21	19.63	1.12
Frctn Loss (ft)	1.25	Cum Volume (acre-ft)	2.17	0.86	1.48
C & E Loss (ft)	0.02	Cum SA (acres)	2.60	0.32	1.49

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical
depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 1987.13

INPUT
Description:
Station Elevation Data num= 67

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1484.03	2.96	1484.03	15.9	1484.01	19.37	1484	36.85	1483.53
51.61	1483.13	54.94	1483	57.6	1482.98	65.94	1482.94	77.68	1482.81
96.2	1482.84	101.21	1482.91	104.34	1482.95	105.37	1482.96	108.05	1483
110.52	1483.01	132.42	1483.21	149.83	1483.29	151.82	1483.28	158.81	1483.24
162.91	1483.23	181.88	1483	192.07	1482.84	192.85	1482.83	199.72	1482.75
202.09	1482.74	221.13	1482.56	224.79	1482.52	229.44	1482.45	241.92	1482
243.34	1481.57	244.83	1481	245.64	1480.69	246.82	1480.24	247.46	1480
248.82	1479.93	249.38	1479.91	250.37	1479.95	251.01	1479.98	251.48	1480
252.69	1480.37	254.94	1481	255.47	1481.15	257.67	1481.76	258.51	1482
272.11	1482.96	272.44	1482.98	272.9	1483	273.81	1483	274.39	1483
277.67	1483.01	279.14	1483.02	283.22	1483.03	289.67	1483.02	293.67	1483.02
300.43	1483	320.87	1482.96	334.84	1482.95	336.7	1482.94	338.27	1482.94

```
  356.15    1483  368.74 1483.24  375.47 1483.32  385.22 1483.44  394.84 1483.56
  411.23 1483.65  418.25  1483.7

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .035  246.82    .055  255.47    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        246.82  255.47             150.1  150.06  153.13             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1483.82    Element                 Left OB    Channel   Right OB
  Vel Head (ft)               0.23    Wt. n-Val.               0.035      0.055     0.035
  W.S. Elev (ft)           1483.59    Reach Len. (ft)         150.10     150.06    153.13
  Crit W.S. (ft)           1483.54    Flow Area (sq ft)       144.52      28.81     82.83
  E.G. Slope (ft/ft)      0.010045    Area (sq ft)            144.52      28.81     82.83
  Q Total (cfs)             890.00    Flow (cfs)              475.66     171.23    243.11
  Top Width (ft)            365.19    Top Width (ft)          212.12       8.65    144.42
  Vel Total (ft/s)            3.47    Avg. Vel. (ft/s)          3.29       5.94      2.94
  Max Chl Dpth (ft)           3.68    Hydr. Depth (ft)          0.68       3.33      0.57
  Conv. Total (cfs)         8879.9    Conv. (cfs)             4745.8     1708.5    2425.6
  Length Wtd. (ft)          151.36    Wetted Per. (ft)        212.45       8.86    144.57
  Min Ch El (ft)           1479.91    Shear (lb/sq ft)          0.43       2.04      0.36
  Alpha                       1.24    Stream Power (lb/ft s)    1.40      12.12      1.05
  Frctn Loss (ft)             1.89    Cum Volume (acre-ft)      1.76       0.78      1.30
  C & E Loss (ft)             0.01    Cum SA (acres)            1.91       0.30      1.17


Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This
may indicate
         the need for additional cross sections.
Note:    Hydraulic jump has occurred between this cross section and the previous upstream section.
```

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 1837.07

INPUT
Description:
Station Elevation Data num= 64

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1483.26	8.51	1483.08	9.39	1483.07	11.25	1483.02	11.85	1483
11.93	1483	12.08	1483	12.17	1483	14.74	1482.92	42.67	1482
49.14	1481.78	57.68	1481.5	62.39	1481.41	70.39	1481.18	73.68	1481.14
76.05	1481.13	83.56	1481.16	101.33	1481.18	107	1481.18	113.61	1481.17
121.87	1481.14	131.15	1481.07	133.79	1481.01	135.91	1481	147.42	1480.71
152.18	1480.48	155.14	1480.32	159.4	1480.09	160.36	1480.04	160.91	1480
161.13	1479.96	162.62	1479.57	164.86	1479	165.72	1478.97	167.23	1478.94
168.71	1478.9	170.79	1478.95	172.64	1479	174.49	1479.26	176.06	1479.48
181.46	1480	187.42	1480.42	190.51	1480.61	190.59	1480.62	195.38	1481
201.94	1481.03	210.4	1481.06	219.73	1481.1	230.65	1481.06	238.48	1481.05
251.31	1481	264.77	1480.63	273.9	1480.39	282.63	1480.24	287.79	1480
288	1480	288.27	1480	289.76	1480.12	297.94	1481	310.03	1481.96
310.76	1482	311.2	1482	311.62	1482	320.1	1482.03		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	162.62	.055	174.49	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
162.62	174.49	83.44	83.88	86.21	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1481.92	Element	Left OB	Channel	Right OB

Vel Head (ft)	0.36	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1481.56	Reach Len. (ft)	83.44	83.88	86.21
Crit W.S. (ft)	1481.56	Flow Area (sq ft)	56.78	29.88	107.37
E.G. Slope (ft/ft)	0.015856	Area (sq ft)	56.78	29.88	107.37
Q Total (cfs)	890.00	Flow (cfs)	199.24	187.11	503.65
Top Width (ft)	249.02	Top Width (ft)	106.69	11.87	130.47
Vel Total (ft/s)	4.59	Avg. Vel. (ft/s)	3.51	6.26	4.69
Max Chl Dpth (ft)	2.66	Hydr. Depth (ft)	0.53	2.52	0.82
Conv. Total (cfs)	7068.0	Conv. (cfs)	1582.3	1485.9	3999.8
Length Wtd. (ft)	84.87	Wetted Per. (ft)	106.77	11.96	130.63
Min Ch El (ft)	1478.90	Shear (lb/sq ft)	0.53	2.47	0.81
Alpha	1.11	Stream Power (lb/ft s)	1.85	15.48	3.82
Frctn Loss (ft)	0.69	Cum Volume (acre-ft)	1.41	0.68	0.96
C & E Loss (ft)	0.05	Cum SA (acres)	1.36	0.27	0.68

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical
depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 1753.19

INPUT
Description:
Station Elevation Data num= 58

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1481.55	21.39	1481	23.07	1480.97	33.57	1480.91	35.02	1480.9
46.92	1480.62	48.36	1480.6	49.7	1480.58	62.49	1480.45	90.29	1480.01
91.86	1480	95.18	1479.91	97.69	1479.86	115.9	1479.4	136.21	1479
147.23	1478.47	151.37	1478.21	154.61	1478	155.86	1477.98	156.28	1477.97
157.16	1477.99	157.88	1477.99	158.55	1478	162.56	1478.38	164.72	1478.57
165.95	1478.66	168.8	1478.87	170.18	1479	171.99	1479.13	173.17	1479.16
182.73	1479.43	186.93	1479.57	189.49	1479.65	196.1	1479.82	198.58	1479.87
199.39	1479.86	201.07	1479.9	201.82	1479.88	202.62	1479.85	203.65	1479.8
204.67	1479.77	205.55	1479.72	218.43	1479	218.84	1478.99	219.58	1478.98
220.98	1478.97	222.61	1479	229.08	1479.75	231.1	1480	237.58	1480.77
239.54	1481	250.26	1481.04	260.78	1481.07	263.98	1481.07	272.79	1481.04
280.52	1481.02	282.69	1481.01	287.05	1481				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	151.37	.055	165.95	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
151.37	165.95	80.72	83.38	86.42	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1481.07	Element			
Vel Head (ft)	0.18	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1480.89	Reach Len. (ft)	80.72	83.38	86.42
Crit W.S. (ft)	1480.34	Flow Area (sq ft)	123.53	39.23	98.55
E.G. Slope (ft/ft)	0.004955	Area (sq ft)	123.53	39.23	98.55
Q Total (cfs)	890.00	Flow (cfs)	385.47	144.09	360.44
Top Width (ft)	202.91	Top Width (ft)	115.72	14.58	72.61
Vel Total (ft/s)	3.41	Avg. Vel. (ft/s)	3.12	3.67	3.66

Max Chl Dpth (ft)	2.92	Hydr. Depth (ft)	1.07	2.69	1.36
Conv. Total (cfs)	12644.1	Conv. (cfs)	5476.3	2047.1	5120.7
Length Wtd. (ft)	82.87	Wetted Per. (ft)	115.76	14.62	72.78
Min Ch El (ft)	1477.97	Shear (lb/sq ft)	0.33	0.83	0.42
Alpha	1.02	Stream Power (lb/ft s)	1.03	3.05	1.53
Frctn Loss (ft)	0.58	Cum Volume (acre-ft)	1.24	0.61	0.76
C & E Loss (ft)	0.01	Cum SA (acres)	1.14	0.24	0.48

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 1669.81

INPUT
Description:
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1481	8.59	1480.69	32.16	1480	41.17	1479.78	41.93	1479.77
52.88	1479.58	66.74	1479.49	74.81	1479.41	84.9	1479.36	97.59	1479.2
103.97	1479.06	108.29	1479.03	110.01	1479.02	111.09	1479.01	112.28	1479
118.55	1478.77	129.62	1478.34	134.24	1478.16	138.74	1478	146.53	1477.93
147.02	1477.92	151.49	1477.88	153.3	1477.9	162.92	1478	166.04	1478.17
171.48	1478.46	181.93	1479	190.98	1479.51	200.1	1480	207.51	1480.03
214.06	1480.05	220.61	1480.03						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	146.53	.055	166.04	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
146.53	166.04	80.88	81.81	83.39	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1480.48	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.29	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1480.19	Reach Len. (ft)	80.88	81.81	83.39
Crit W.S. (ft)		Flow Area (sq ft)	122.60	43.65	41.21
E.G. Slope (ft/ft)	0.010425	Area (sq ft)	122.60	43.65	41.21
Q Total (cfs)	890.00	Flow (cfs)	536.32	205.92	147.76
Top Width (ft)	194.98	Top Width (ft)	120.90	19.51	54.57
Vel Total (ft/s)	4.29	Avg. Vel. (ft/s)	4.37	4.72	3.59
Max Chl Dpth (ft)	2.31	Hydr. Depth (ft)	1.01	2.24	0.76
Conv. Total (cfs)	8716.7	Conv. (cfs)	5252.7	2016.7	1447.2
Length Wtd. (ft)	81.56	Wetted Per. (ft)	120.93	19.52	54.78
Min Ch El (ft)	1477.88	Shear (lb/sq ft)	0.66	1.46	0.49
Alpha	1.02	Stream Power (lb/ft s)	2.89	6.87	1.76
Frctn Loss (ft)	0.63	Cum Volume (acre-ft)	1.01	0.53	0.62
C & E Loss (ft)	0.02	Cum SA (acres)	0.92	0.21	0.36

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 1588

INPUT
Description:
Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1481	7.91	1480.77	38.73	1480	39.56	1479.98	69.9	1479
75.2	1478.91	87.45	1478.69	102.13	1478.43	116.87	1478.19	117.55	1478.18
118.17	1478.17	122.7	1478.14	137.2	1478.03	139.15	1478	157.71	1477.46
162.11	1477.25	167.44	1477	167.91	1477	171.3	1476.97	173.29	1476.98
175.08	1476.99	176.14	1477	182.51	1477.42	184.69	1477.54	186.32	1477.63
193.06	1478	204.58	1478.37	220.19	1479	226.29	1479	228.08	1479
230.3	1479								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	162.11	.055	186.32	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
162.11	186.32	54.63	55.32	56.27	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1479.83	Element			
Vel Head (ft)	0.21	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1479.62	Reach Len. (ft)	54.63	55.32	56.27
Crit W.S. (ft)		Flow Area (sq ft)	132.77	59.44	49.34
E.G. Slope (ft/ft)	0.005988	Area (sq ft)	132.77	59.44	49.34
Q Total (cfs)	890.00	Flow (cfs)	490.69	225.98	173.33
Top Width (ft)	179.44	Top Width (ft)	111.25	24.21	43.98
Vel Total (ft/s)	3.68	Avg. Vel. (ft/s)	3.70	3.80	3.51
Max Chl Dpth (ft)	2.65	Hydr. Depth (ft)	1.19	2.46	1.12
Conv. Total (cfs)	11501.2	Conv. (cfs)	6341.0	2920.3	2239.8
Length Wtd. (ft)	55.15	Wetted Per. (ft)	111.28	24.24	44.62
Min Ch El (ft)	1476.97	Shear (lb/sq ft)	0.45	0.92	0.41
Alpha	1.00	Stream Power (lb/ft s)	1.65	3.49	1.45
Frctn Loss (ft)	0.31	Cum Volume (acre-ft)	0.77	0.44	0.53
C & E Loss (ft)	0.00	Cum SA (acres)	0.71	0.17	0.26

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 1532.68

INPUT
Description:
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1481	31.62	1480.04	32.94	1480	33.75	1479.98	67.61	1479
88.95	1478.53	98.73	1478.35	119.84	1478	138.49	1477.64	162.99	1477
163.92	1476.99	165.46	1476.98	169.41	1476.95	175.97	1476.89	179.4	1476.92
188.57	1477	191.77	1477.15	199.64	1477.53	210.35	1478	212.17	1478.03
215.53	1478.04	218.49	1478.03	223.49	1478.16	231.28	1478.12		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	169.41	.055	191.77	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
169.41	191.77	73.43	73.46	73.53	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1479.52	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.20	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1479.31	Reach Len. (ft)	73.43	73.46	73.53
Crit W.S. (ft)		Flow Area (sq ft)	137.80	52.73	57.83
E.G. Slope (ft/ft)	0.005223	Area (sq ft)	137.80	52.73	57.83
Q Total (cfs)	890.00	Flow (cfs)	483.47	182.37	224.16

Top Width (ft)	174.53	Top Width (ft)	112.66	22.36	39.51
Vel Total (ft/s)	3.58	Avg. Vel. (ft/s)	3.51	3.46	3.88
Max Chl Dpth (ft)	2.42	Hydr. Depth (ft)	1.22	2.36	1.46
Conv. Total (cfs)	12315.1	Conv. (cfs)	6689.8	2523.5	3101.7
Length Wtd. (ft)	73.47	Wetted Per. (ft)	112.69	22.36	40.73
Min Ch El (ft)	1476.89	Shear (lb/sq ft)	0.40	0.77	0.46
Alpha	1.01	Stream Power (lb/ft s)	1.40	2.66	1.79
Frctn Loss (ft)	0.34	Cum Volume (acre-ft)	0.60	0.37	0.46
C & E Loss (ft)	0.00	Cum SA (acres)	0.57	0.14	0.21

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 1459.22

INPUT
Description:
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1480	.26	1480	2.03	1480	5.48	1479.94	7.11	1479.93
9.32	1479.9	15.03	1479.82	57.95	1479	94.84	1478.26	95.69	1478.24
108.92	1478	132.97	1477.49	153.55	1477	153.65	1476.99	165.72	1476
166.93	1475.98	167.35	1475.97	170.1	1475.95	171.54	1475.97	174.27	1476
184.5	1476.37	190.84	1476.6	201.29	1477	204.24	1477.01	207.65	1477.04
209.87	1477.03	217.86	1477.04	222.93	1477.05				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	166.93	.055	184.5	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
166.93	184.5	68.27	67.98	67.91	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1479.17	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.21	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1478.97	Reach Len. (ft)	68.27	67.98	67.91
Crit W.S. (ft)		Flow Area (sq ft)	122.59	50.43	80.21
E.G. Slope (ft/ft)	0.004147	Area (sq ft)	122.59	50.43	80.21
Q Total (cfs)	890.00	Flow (cfs)	366.21	177.17	346.63
Top Width (ft)	163.26	Top Width (ft)	107.26	17.57	38.43
Vel Total (ft/s)	3.51	Avg. Vel. (ft/s)	2.99	3.51	4.32
Max Chl Dpth (ft)	3.02	Hydr. Depth (ft)	1.14	2.87	2.09
Conv. Total (cfs)	13820.4	Conv. (cfs)	5686.7	2751.1	5382.6
Length Wtd. (ft)	68.05	Wetted Per. (ft)	107.33	17.58	40.36
Min Ch El (ft)	1475.95	Shear (lb/sq ft)	0.30	0.74	0.51
Alpha	1.08	Stream Power (lb/ft s)	0.88	2.61	2.22
Frctn Loss (ft)	0.37	Cum Volume (acre-ft)	0.38	0.28	0.35
C & E Loss (ft)	0.02	Cum SA (acres)	0.38	0.10	0.14

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 1391.24

INPUT
Description:
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

0	1479	25.6	1478.62	31.48	1478.63	43.73	1478.61	53.21	1478.54
61.53	1478.53	65.67	1478.59	72.02	1478.68	86.64	1478.67	103.49	1478.63
131.01	1478.24	134.16	1478.19	143.17	1478.05	146.28	1478	146.69	1478
154.17	1477.67	172.21	1477	181.47	1476.56	188.44	1476.24	193.61	1476
194.91	1475.85	195.46	1475.84	206.32	1475.69	213.03	1475.78	217.59	1475.84
221.22	1476	223.51	1476.02	224	1476.02	237.31	1476.06	241.95	1476.06

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	195.46	.055	213.03	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
195.46	213.03	75.73	76.22	76.46	.1 .3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1478.78	Element			
Vel Head (ft)	0.42	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1478.36	Reach Len. (ft)	75.73	76.22	76.46
Crit W.S. (ft)		Flow Area (sq ft)	70.86	45.72	68.45
E.G. Slope (ft/ft)	0.007615	Area (sq ft)	70.86	45.72	68.45
Q Total (cfs)	890.00	Flow (cfs)	258.11	203.94	427.95
Top Width (ft)	119.12	Top Width (ft)	72.63	17.57	28.92
Vel Total (ft/s)	4.81	Avg. Vel. (ft/s)	3.64	4.46	6.25
Max Chl Dpth (ft)	2.67	Hydr. Depth (ft)	0.98	2.60	2.37
Conv. Total (cfs)	10199.0	Conv. (cfs)	2957.8	2337.1	4904.1
Length Wtd. (ft)	76.22	Wetted Per. (ft)	72.69	17.57	31.22
Min Ch El (ft)	1475.69	Shear (lb/sq ft)	0.46	1.24	1.04
Alpha	1.18	Stream Power (lb/ft s)	1.69	5.52	6.52
Frctn Loss (ft)	0.46	Cum Volume (acre-ft)	0.23	0.20	0.23
C & E Loss (ft)	0.02	Cum SA (acres)	0.24	0.08	0.09

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 1315.03

INPUT
Description:
Station Elevation Data num= 36

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1479	35.82	1478.08	36.86	1478.06	40.03	1478	63.83	1477.57
69.19	1477.52	75.52	1477.41	82.95	1477.33	89.8	1477.29	96.06	1477.3
103.86	1477.46	128.35	1478	134.28	1478	138.45	1478	167.17	1478.01
192.55	1478.01	203.92	1478	203.95	1478	214.47	1477.58	228.43	1477
245.83	1476.31	253.4	1476	255.45	1475.8	259.3	1475.49	264.19	1475.11
265.6	1475	265.85	1474.99	266.89	1474.97	271.04	1474.86	272.72	1474.9
276.37	1475	280.19	1475.01	291.08	1475.04	303.92	1475.07	307.08	1475.06
308.64	1475.06								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	259.3	.055	280.19	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
259.3	280.19	86.51	87.28	86.93	.1	.3

Left Levee Station= 203.92 Elevation=

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1478.30	Element			
Vel Head (ft)	0.35	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1477.95	Reach Len. (ft)	86.51	87.28	86.93
Crit W.S. (ft)	1477.22	Flow Area (sq ft)	59.85	60.71	82.50

E.G. Slope (ft/ft)	0.004883	Area (sq ft)	59.85	60.71	82.50
Q Total (cfs)	890.00	Flow (cfs)	190.06	233.25	466.68
Top Width (ft)	103.31	Top Width (ft)	53.97	20.89	28.45
Vel Total (ft/s)	4.38	Avg. Vel. (ft/s)	3.18	3.84	5.66
Max Chl Dpth (ft)	3.08	Hydr. Depth (ft)	1.11	2.91	2.90
Conv. Total (cfs)	12736.7	Conv. (cfs)	2720.0	3338.0	6678.6
Length Wtd. (ft)	86.93	Wetted Per. (ft)	54.03	20.91	31.33
Min Ch El (ft)	1474.86	Shear (lb/sq ft)	0.34	0.88	0.80
Alpha	1.19	Stream Power (lb/ft s)	1.07	3.40	4.54
Frctn Loss (ft)	0.86	Cum Volume (acre-ft)	0.12	0.11	0.10
C & E Loss (ft)	0.05	Cum SA (acres)	0.13	0.04	0.04

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross
sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 1227.75

INPUT
Description:
Station Elevation Data num= 53

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1479	5.06	1478.78	22.09	1478	38.52	1477.41	47.99	1477

64.62	1476.47	77.28	1476.21	87.83	1476	89.52	1475.97	96.44	1475.96
103.39	1475.94	113.69	1475.99	114.26	1476	116.74	1476.02	117.01	1476.02
117.63	1476.04	126	1476.18	133.93	1476.3	139.64	1476.4	153.49	1476.56
156.63	1476.58	167.59	1476.54	174.72	1476.59	176.2	1476.59	177.67	1476.59
182.54	1476.6	187.88	1476.59	204.88	1476.53	211.41	1476.5	222.22	1476.43
225.63	1476.39	231.21	1476.32	238.48	1476.2	246.36	1476	270.74	1475.09
272.97	1475	276.53	1474.71	284.28	1474.07	285.19	1474	286.74	1473.98
288.64	1473.97	290.76	1473.99	291.85	1473.99	292.84	1474	300.19	1474.48
306.74	1474.9	308.36	1475	309.79	1475	312.15	1475.01	312.91	1475.01
313.36	1475.01	316.35	1475.02	317.61	1475.02				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	284.28	.055	306.74	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
284.28	306.74	0	0	0 .1	.3

Left Levee Station= 187.88 Elevation=

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1477.39	Element			
Vel Head (ft)	0.86	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1476.53	Reach Len. (ft)			
Crit W.S. (ft)	1476.53	Flow Area (sq ft)	57.29	50.59	16.60
E.G. Slope (ft/ft)	0.029693	Area (sq ft)	57.29	50.59	16.60
Q Total (cfs)	890.00	Flow (cfs)	337.96	404.37	147.67
Top Width (ft)	112.38	Top Width (ft)	79.05	22.46	10.87
Vel Total (ft/s)	7.15	Avg. Vel. (ft/s)	5.90	7.99	8.90
Max Chl Dpth (ft)	2.56	Hydr. Depth (ft)	0.72	2.25	1.53
Conv. Total (cfs)	5164.9	Conv. (cfs)	1961.3	2346.7	857.0
Length Wtd. (ft)		Wetted Per. (ft)	79.12	22.49	12.38
Min Ch El (ft)	1473.97	Shear (lb/sq ft)	1.34	4.17	2.49
Alpha	1.08	Stream Power (lb/ft s)	7.92	33.33	22.11

Frctn Loss (ft) Cum Volume (acre-ft)
C & E Loss (ft) Cum SA (acres)

Warning: User specified water surface is not possible for the specified flow regime. The program used critical depth as the
starting water surface.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

SUMMARY OF MANNING'S N VALUES

River:Mill Creek

Reach	River Sta.	n1	n2	n3
Mill_Creek	3236.43	.035	.055	.035
Mill_Creek	3184.66	.035	.055	.035
Mill_Creek	3136.8	.035	.055	.035
Mill_Creek	3084.02	.035	.055	.035
Mill_Creek	2966.14	.035	.055	.035
Mill_Creek	2848.25	.035	.055	.035
Mill_Creek	2729.93	.035	.055	.035
Mill_Creek	2626.56	.035	.055	.035
Mill_Creek	2511.04	.035	.055	.035
Mill_Creek	2440.36	.035	.055	.035
Mill_Creek	2345.39	.035	.055	.035
Mill_Creek	2224.33	.035	.055	.035
Mill_Creek	2102.98	.035	.055	.035
Mill_Creek	1987.13	.035	.055	.035
Mill_Creek	1837.07	.035	.055	.035
Mill_Creek	1753.19	.035	.055	.035

Mill_Creek	1669.81	.035	.055	.035
Mill_Creek	1588	.035	.055	.035
Mill_Creek	1532.68	.035	.055	.035
Mill_Creek	1459.22	.035	.055	.035
Mill_Creek	1391.24	.035	.055	.035
Mill_Creek	1315.03	.035	.055	.035
Mill_Creek	1227.75	.035	.055	.035

SUMMARY OF REACH LENGTHS

River: Mill Creek

Reach	River Sta.	Left	Channel	Right
Mill_Creek	3236.43	51.74	51.78	51.15
Mill_Creek	3184.66	48.69	47.86	50.23
Mill_Creek	3136.8	54.65	52.79	52.77
Mill_Creek	3084.02	121.24	117.88	117.6
Mill_Creek	2966.14	118.96	117.89	115.96
Mill_Creek	2848.25	118.03	118.32	118.08
Mill_Creek	2729.93	102.75	103.37	104.21
Mill_Creek	2626.56	116.29	115.51	114.99
Mill_Creek	2511.04	71.54	70.69	70.36
Mill_Creek	2440.36	93.95	94.96	94.56
Mill_Creek	2345.39	122.79	121.06	120.89
Mill_Creek	2224.33	121.38	121.35	121.14
Mill_Creek	2102.98	114.98	115.86	117.1
Mill_Creek	1987.13	150.1	150.06	153.13
Mill_Creek	1837.07	83.44	83.88	86.21
Mill_Creek	1753.19	80.72	83.38	86.42
Mill_Creek	1669.81	80.88	81.81	83.39

Mill_Creek	1588	54.63	55.32	56.27
Mill_Creek	1532.68	73.43	73.46	73.53
Mill_Creek	1459.22	68.27	67.98	67.91
Mill_Creek	1391.24	75.73	76.22	76.46
Mill_Creek	1315.03	86.51	87.28	86.93
Mill_Creek	1227.75	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Mill Creek

Reach	River Sta.	Contr.	Expan.
Mill_Creek	3236.43	.1	.3
Mill_Creek	3184.66	.1	.3
Mill_Creek	3136.8	.1	.3
Mill_Creek	3084.02	.1	.3
Mill_Creek	2966.14	.1	.3
Mill_Creek	2848.25	.1	.3
Mill_Creek	2729.93	.1	.3
Mill_Creek	2626.56	.1	.3
Mill_Creek	2511.04	.1	.3
Mill_Creek	2440.36	.1	.3
Mill_Creek	2345.39	.1	.3
Mill_Creek	2224.33	.1	.3
Mill_Creek	2102.98	.1	.3
Mill_Creek	1987.13	.1	.3
Mill_Creek	1837.07	.1	.3
Mill_Creek	1753.19	.1	.3
Mill_Creek	1669.81	.1	.3
Mill_Creek	1588	.1	.3

Mill_Creek	1532.68	.1	.3
Mill_Creek	1459.22	.1	.3
Mill_Creek	1391.24	.1	.3
Mill_Creek	1315.03	.1	.3
Mill_Creek	1227.75	.1	.3

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Mill_Creek	3236.43	PF 1	890.00	1494.09	1500.14	1499.62	1501.07	0.012878	8.21	123.42	58.65	0.67
Mill_Creek	3184.66	PF 1	890.00	1494.00	1499.82	1498.65	1500.46	0.008213	6.95	157.83	96.86	0.55
Mill_Creek	3136.8	PF 1	890.00	1493.93	1499.63	1499.63	1499.99	0.007567	6.48	234.32	269.49	0.51
Mill_Creek	3084.02	PF 1	890.00	1492.99	1498.96	1498.92	1499.34	0.007112	6.51	220.14	233.24	0.51
Mill_Creek	2966.14	PF 1	890.00	1490.85	1496.37	1496.37	1497.86	0.021831	10.22	94.42	35.19	0.86
Mill_Creek	2848.25	PF 1	890.00	1488.99	1495.59	1494.86	1495.76	0.003174	4.41	345.42	362.57	0.34
Mill_Creek	2729.93	PF 1	890.00	1487.99	1493.06	1493.00	1494.52	0.024381	10.62	101.82	64.99	0.91
Mill_Creek	2626.56	PF 1	890.00	1485.94	1491.03	1491.03	1492.22	0.019054	9.31	106.47	49.25	0.81
Mill_Creek	2511.04	PF 1	890.00	1485.00	1490.23	1490.29	1490.56	0.008284	6.23	253.07	357.89	0.53

Mill_Creek	2440.36	PF 1	890.00	1484.00	1489.13	1489.31	1489.69	0.019304
9.19	210.23	429.49	0.79					
Mill_Creek	2345.39	PF 1	890.00	1482.06	1487.84	1487.93	1488.28	0.011268
7.28	218.41	308.08	0.60					
Mill_Creek	2224.33	PF 1	890.00	1480.91	1485.87	1486.08	1486.52	0.018863
8.90	186.09	317.48	0.78					
Mill_Creek	2102.98	PF 1	890.00	1479.97	1484.87	1484.87	1485.17	0.011644
7.10	251.85	416.47	0.61					
Mill_Creek	1987.13	PF 1	890.00	1479.91	1483.59	1483.54	1483.82	0.010045
5.94	256.16	365.19	0.57					
Mill_Creek	1837.07	PF 1	890.00	1478.90	1481.56	1481.56	1481.92	0.015856
6.26	194.03	249.02	0.70					
Mill_Creek	1753.19	PF 1	890.00	1477.97	1480.89	1480.34	1481.07	0.004955
3.67	261.30	202.91	0.39					
Mill_Creek	1669.81	PF 1	890.00	1477.88	1480.19		1480.48	0.010425
4.72	207.46	194.98	0.56					
Mill_Creek	1588	PF 1	890.00	1476.97	1479.62		1479.83	0.005988
3.80	241.55	179.44	0.43					
Mill_Creek	1532.68	PF 1	890.00	1476.89	1479.31		1479.52	0.005223
3.46	248.36	174.53	0.40					
Mill_Creek	1459.22	PF 1	890.00	1475.95	1478.97		1479.17	0.004147
3.51	253.22	163.26	0.37					
Mill_Creek	1391.24	PF 1	890.00	1475.69	1478.36		1478.78	0.007615
4.46	185.03	119.12	0.49					
Mill_Creek	1315.03	PF 1	890.00	1474.86	1477.95	1477.22	1478.30	0.004883
3.84	203.06	103.31	0.40					
Mill_Creek	1227.75	PF 1	890.00	1473.97	1476.53	1476.53	1477.39	0.029693
7.99	124.49	112.38	0.94					

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Mill_Creek	3236.43	PF 1	1501.07	1500.14	0.93	0.53	0.09	60.36	743.33	86.32	58.65
Mill_Creek	3184.66	PF 1	1500.46	1499.82	0.64	0.38	0.09	94.49	733.80	61.71	96.86
Mill_Creek	3136.8	PF 1	1499.99	1499.63	0.36	0.39	0.00	348.04	390.12	151.84	269.49
Mill_Creek	3084.02	PF 1	1499.34	1498.96	0.38	1.37	0.11	387.48	411.33	91.19	233.24
Mill_Creek	2966.14	PF 1	1497.86	1496.37	1.48	0.79	0.40	86.77	762.58	40.65	35.19
Mill_Creek	2848.25	PF 1	1495.76	1495.59	0.16	1.87	0.06	436.14	377.35	76.51	362.57
Mill_Creek	2729.93	PF 1	1494.52	1493.06	1.46	2.22	0.08	55.21	685.37	149.42	64.99
Mill_Creek	2626.56	PF 1	1492.22	1491.03	1.19	1.39	0.26	110.04	682.21	97.75	49.25
Mill_Creek	2511.04	PF 1	1490.56	1490.23	0.33	0.86	0.02	328.90	397.19	163.91	357.89
Mill_Creek	2440.36	PF 1	1489.69	1489.13	0.55	1.37	0.03	391.09	295.78	203.13	429.49
Mill_Creek	2345.39	PF 1	1488.28	1487.84	0.44	1.75	0.02	386.75	385.55	117.69	308.08
Mill_Creek	2224.33	PF 1	1486.52	1485.87	0.65	1.20	0.00	392.96	386.94	110.11	317.48
Mill_Creek	2102.98	PF 1	1485.17	1484.87	0.30	1.25	0.02	518.83	219.83	151.33	416.47
Mill_Creek	1987.13	PF 1	1483.82	1483.59	0.23	1.89	0.01	475.66	171.23	243.11	365.19

Mill_Creek	1837.07	PF 1	1481.92	1481.56	0.36	0.69	0.05	199.24	187.11	503.65	249.02
Mill_Creek	1753.19	PF 1	1481.07	1480.89	0.18	0.58	0.01	385.47	144.09	360.44	202.91
Mill_Creek	1669.81	PF 1	1480.48	1480.19	0.29	0.63	0.02	536.32	205.92	147.76	194.98
Mill_Creek	1588	PF 1	1479.83	1479.62	0.21	0.31	0.00	490.69	225.98	173.33	179.44
Mill_Creek	1532.68	PF 1	1479.52	1479.31	0.20	0.34	0.00	483.47	182.37	224.16	174.53
Mill_Creek	1459.22	PF 1	1479.17	1478.97	0.21	0.37	0.02	366.21	177.17	346.63	163.26
Mill_Creek	1391.24	PF 1	1478.78	1478.36	0.42	0.46	0.02	258.11	203.94	427.95	119.12
Mill_Creek	1315.03	PF 1	1478.30	1477.95	0.35	0.86	0.05	190.06	233.25	466.68	103.31
Mill_Creek	1227.75	PF 1	1477.39	1476.53	0.86			337.96	404.37	147.67	112.38

APPENDIX C: POST-PROJECT CONDITION HEC-RAS ANALYSES

APPENDIX C.1: LINE A RCB WSPG CALCULATIONS

LINEARCB18.WSW

```
T1 MILL CREEK PROMENADA HYDRAULIC ANALYSES                                  0

T2 LINE A RCB - PEAK 100-YEAR FLOW RATE

T3 FILENAME: LINEARCB

SO   1000.0001468.250  1                          1472.250

R    1081.0601468.490  1      .014                              .000

R    1130.5201468.640  1      .014                           -56.683

TS   1140.5201468.670  2      .014                              .000

R    1400.0001469.450  2      .014                              .000

R    1714.1601472.250  2      .014                              .000

R    1914.3101474.030  2      .014                            38.226

R    2005.4901474.840  2      .014                              .000

TS   2046.1801478.500  3      .014                              .000

SH   2046.1801478.500  3                          1478.500

CD   1  2   1    .670   4.000   24.670  .000  .000   .00

CD   2  2   1    .670   5.000   20.670  .000  .000   .00

CD   3  2   0    .000   4.000   60.000  .000  .000   .00

Q           890.000   .0
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Program Package Serial Number: 7028

WATER SURFACE PROFILE LISTING Date:12-17-2018 Time: 3:37:27

MILL CREEK PROMENADA HYDRAULIC ANALYSES
LINE A RCB - PEAK 100-YEAR FLOW RATE
FILENAME: LINEARCB

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	1468.250	4.000	1472.250	890.00	9.27	1.33	1473.58	.00	3.50	24.67	4.000	24.670	.00	1 .7
30.305	.0030					.0024	.07	4.00	.83	3.70	.014	.00	.00	RECTANG
1030.305	1468.340	3.955	1472.295	890.00	9.38	1.36	1473.66	.00	3.50	24.67	4.000	24.670	.00	1 .7
HYDRAULIC JUMP														
1030.305	1468.340	3.071	1471.411	890.00	12.07	2.26	1473.67	.00	3.50	24.67	4.000	24.670	.00	1 .7
16.160	.0030					.0052	.08	3.07	1.23	3.70	.014	.00	.00	RECTANG
1046.465	1468.388	3.008	1471.396	890.00	12.33	2.36	1473.76	.00	3.50	24.67	4.000	24.670	.00	1 .7
34.595	.0030					.0057	.20	3.01	1.27	3.70	.014	.00	.00	RECTANG
1081.060	1468.490	2.868	1471.358	890.00	12.93	2.60	1473.95	1.25	3.50	24.67	4.000	24.670	.00	1 .7
14.152	.0030					.0063	.09	4.11	1.36	3.67	.014	.00	.00	RECTANG
1095.212	1468.533	2.814	1471.347	890.00	13.18	2.70	1474.04	1.29	3.50	24.67	4.000	24.670	.00	1 .7
35.308	.0030					.0070	.25	4.11	1.40	3.67	.014	.00	.00	RECTANG
1130.520	1468.640	2.683	1471.323	890.00	13.82	2.97	1474.29	.00	3.50	24.67	4.000	24.670	.00	1 .7
TRANS STR	.0030					.0057	.06	2.68	1.51		.014	.00	.00	RECTANG
1140.520	1468.670	3.947	1472.617	890.00	11.27	1.97	1474.59	.00	3.95	20.67	5.000	20.670	.00	1 .7
19.446	.0030					.0037	.07	3.95	1.02	4.35	.014	.00	.00	RECTANG
1159.966	1468.729	4.140	1472.869	890.00	10.75	1.79	1474.66	.00	3.95	20.67	5.000	20.670	.00	1 .7
99.237	.0030					.0033	.33	4.14	.95	4.35	.014	.00	.00	RECTANG

Program Package Serial Number: 7028

WATER SURFACE PROFILE LISTING Date:12-17-2018 Time: 3:37:27

MILL CREEK PROMENADA HYDRAULIC ANALYSES
LINE A RCB - PEAK 100-YEAR FLOW RATE
FILENAME: LINEARCB

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1259.204	1469.027	4.274	1473.300	890.00	10.41	1.68	1474.98	.00	3.95	20.67	5.000	20.670	.00	1 .7
HYDRAULIC JUMP														
1259.204	1469.027	3.637	1472.663	890.00	12.24	2.33	1474.99	.00	3.95	20.67	5.000	20.670	.00	1 .7
12.362	.0030					.0051	.06	3.64	1.15	4.35	.014	.00	.00	RECTANG
1271.566	1469.064	3.563	1472.627	890.00	12.49	2.42	1475.05	.00	3.95	20.67	5.000	20.670	.00	1 .7
29.636	.0030					.0056	.17	3.56	1.19	4.35	.014	.00	.00	RECTANG
1301.202	1469.153	3.397	1472.550	890.00	13.10	2.66	1475.21	.00	3.95	20.67	5.000	20.670	.00	1 .7
32.119	.0030					.0064	.20	3.40	1.27	4.35	.014	.00	.00	RECTANG
1333.321	1469.250	3.239	1472.489	890.00	13.74	2.93	1475.42	.00	3.95	20.67	5.000	20.670	.00	1 .7
33.205	.0030					.0073	.24	3.24	1.37	4.35	.014	.00	.00	RECTANG
1366.526	1469.349	3.089	1472.438	890.00	14.41	3.22	1475.66	.00	3.95	20.67	5.000	20.670	.00	1 .7
33.474	.0030					.0083	.28	3.09	1.47	4.35	.014	.00	.00	RECTANG
1400.000	1469.450	2.945	1472.395	890.00	15.11	3.55	1475.94	.00	3.95	20.67	5.000	20.670	.00	1 .7
314.160	.0089					.0087	2.72	2.94	1.58	2.94	.014	.00	.00	RECTANG
1714.160	1472.250	3.000	1475.250	890.00	14.83	3.42	1478.67	.46	3.95	20.67	5.000	20.670	.00	1 .7
75.897	.0089					.0083	.63	3.46	1.53	2.95	.014	.00	.00	RECTANG
1790.057	1472.925	3.037	1475.962	890.00	14.65	3.33	1479.30	.44	3.95	20.67	5.000	20.670	.00	1 .7
124.253	.0089					.0076	.95	3.48	1.51	2.95	.014	.00	.00	RECTANG

Program Package Serial Number: 7028

WATER SURFACE PROFILE LISTING Date:12-17-2018 Time: 3:37:27

MILL CREEK PROMENADA HYDRAULIC ANALYSES

LINE A RCB - PEAK 100-YEAR FLOW RATE

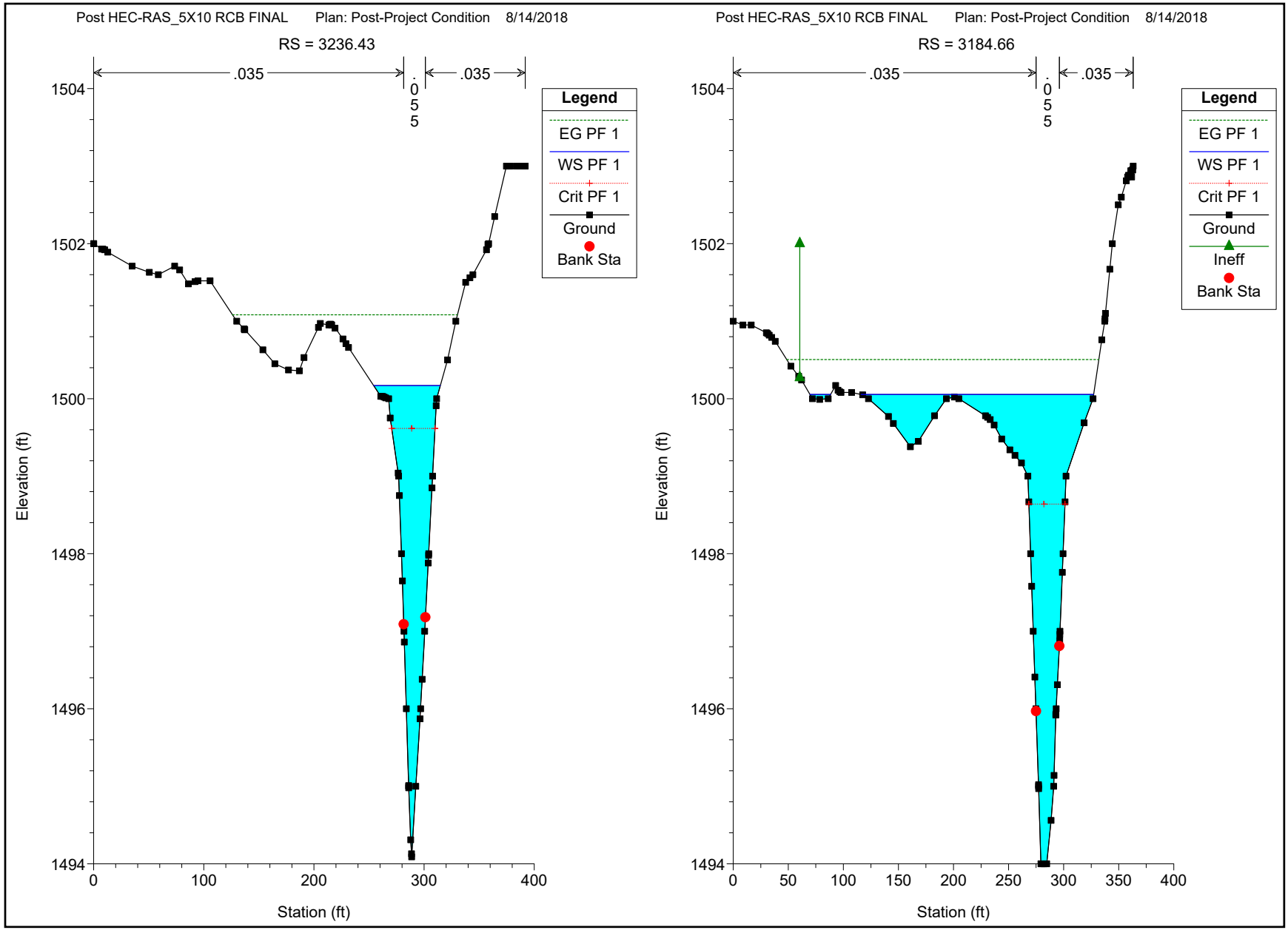
FILENAME: LINEARCB

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1914.310	1474.030	3.185	1477.215	890.00	13.97	3.03	1480.25	.00	3.95	20.67	5.000	20.670	.00	1 .7
26.123	.0089					.0070	.18	3.19	1.40	2.95	.014	.00	.00	RECTANG
1940.433	1474.262	3.244	1477.506	890.00	13.72	2.92	1480.43	.00	3.95	20.67	5.000	20.670	.00	1 .7
42.370	.0089					.0064	.27	3.24	1.36	2.95	.014	.00	.00	RECTANG
1982.803	1474.638	3.402	1478.041	890.00	13.08	2.66	1480.70	.00	3.95	20.67	5.000	20.670	.00	1 .7
22.687	.0089					.0056	.13	3.40	1.27	2.95	.014	.00	.00	RECTANG
2005.490	1474.840	3.568	1478.408	890.00	12.47	2.41	1480.82	.00	3.95	20.67	5.000	20.670	.00	1 .7
TRANS STR	.0899					.0038	.16	3.57	1.18		.014	.00	.00	RECTANG
2046.180	1478.500	1.898	1480.398	890.00	7.82	.95	1481.35	.00	1.90	60.00	4.000	60.000	.00	0 .0

APPENDIX C.2: POST-PROJECT CONDITION HEC-RAS

HEC-RAS Plan: Post Condition River: Mill Creek Reach: Mill_Creek Profile: PF 1

Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Vel Head	Frctn Loss	C & E Loss	Q Left	Q Channel	Q Right	Top Width
			(ft)	(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft)
Mill_Creek	3236.43	PF 1	1501.08	1500.17	0.91	0.44	0.14	62.04	741.71	86.25	60.50
Mill_Creek	3184.66	PF 1	1500.50	1500.05	0.45	0.23	0.08	143.71	670.30	75.99	229.85
Mill_Creek	3136.8	PF 1	1500.19	1500.01	0.19	0.52	0.06	409.06	301.69	179.25	317.21
Mill_Creek	3084.02	PF 1	1499.61	1498.78	0.83	1.55	0.02	252.37	524.65	112.99	267.06
Mill_Creek	2966.14	PF 1	1498.04	1497.03	1.01	1.82	0.03	94.04	741.53	54.43	61.17
Mill_Creek	2848.25	PF 1	1496.19	1494.87	1.32	1.75	0.17	54.30	720.84	114.86	39.72
Mill_Creek	2729.93	PF 1	1494.27	1493.52	0.75	1.27	0.02	106.92	568.24	214.84	81.42
Mill_Creek	2626.56	PF 1	1492.41	1491.48	0.93	1.04	0.14	74.89	675.44	139.68	69.26
Mill_Creek	2511.04	PF 1	1491.23	1490.78	0.46	0.67	0.04	239.10	430.92	219.98	71.25
Mill_Creek	2440.36	PF 1	1490.52	1489.66	0.86	1.37	0.00	215.59	316.93	357.49	66.49
Mill_Creek	2345.39	PF 1	1489.15	1488.24	0.90	1.20	0.11	175.00	501.39	213.61	61.88
Mill_Creek	2224.33	PF 1	1487.48	1486.96	0.52	1.12	0.03	280.23	357.44	252.33	66.27
Mill_Creek	2102.98	PF 1	1486.34	1485.53	0.80	1.64	0.00	271.41	289.67	328.93	58.69
Mill_Creek	1987.13	PF 1	1484.69	1483.87	0.82			409.16	251.10	229.74	74.65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WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1504
1502
1500
1498
1496
1494
0
100
200
300
400
Post HEC-RAS_5X10 RCB FINAL Plan: Post-Project Condition 8/14/2018
RS = 3184.66
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.055
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
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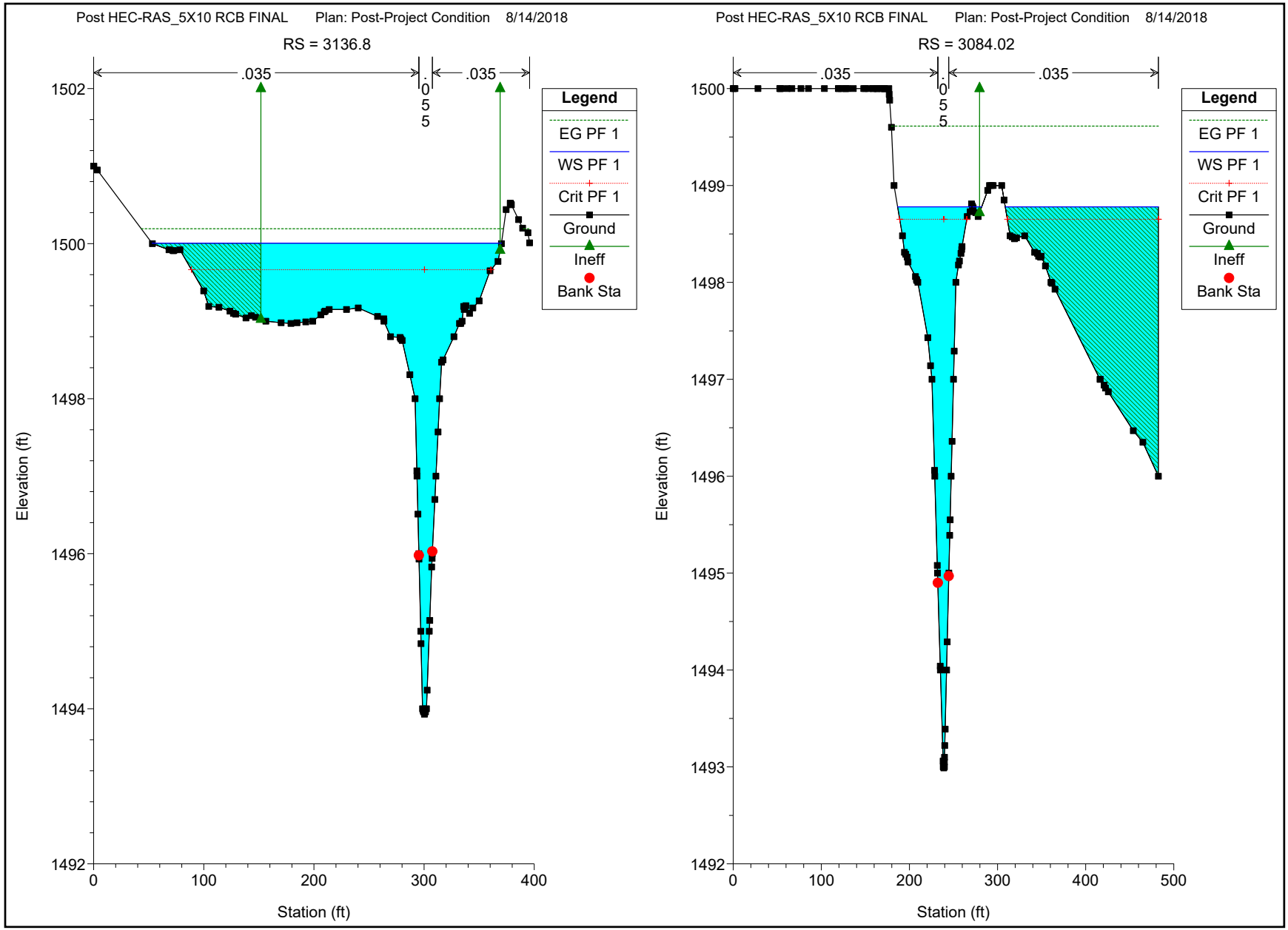
1502
1500
1498
1496
1494
0
50
100
150
200
250
300
350
400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.0555
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
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1500
1498
1496
1494
1492
0
100
200
300
400
Post HEC-RAS_5X10 RCB FINAL Plan: Post-Project Condition 8/14/2018
RS = 3084.02
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.0555
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
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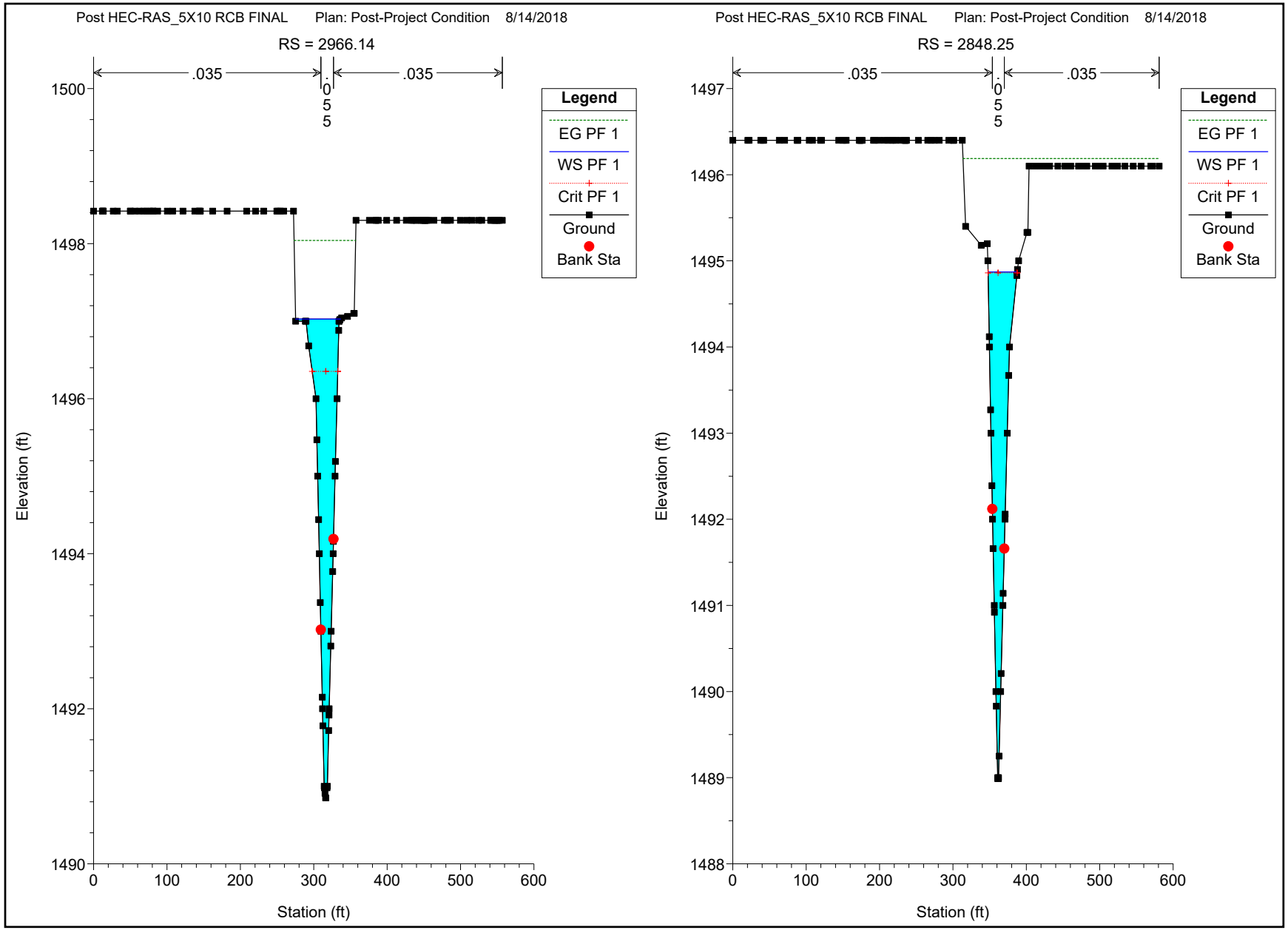
1499
1498
1497
1496
1495
1494
1493
1492
0
100
200
300
400
500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.055
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1500
1498
1496
1494
1492
1490
0
100
200
300
400
500
600
Post HEC-RAS_5X10 RCB FINAL Plan: Post-Project Condition 8/14/2018
RS = 2848.25
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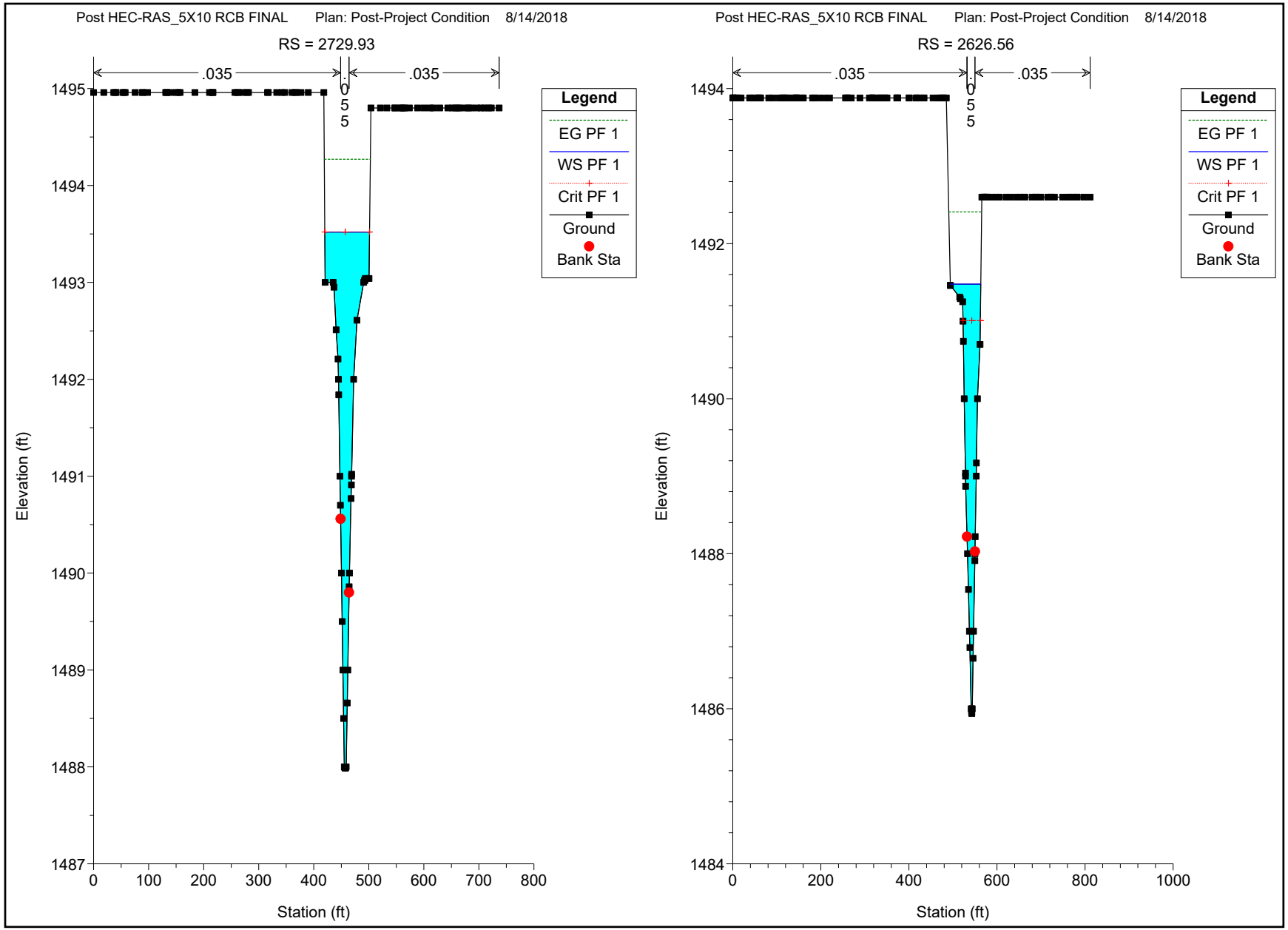
.055
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1497
1496
1495
1494
1493
1492
1491
1490
1489
1488
0
100
200
300
400
500
600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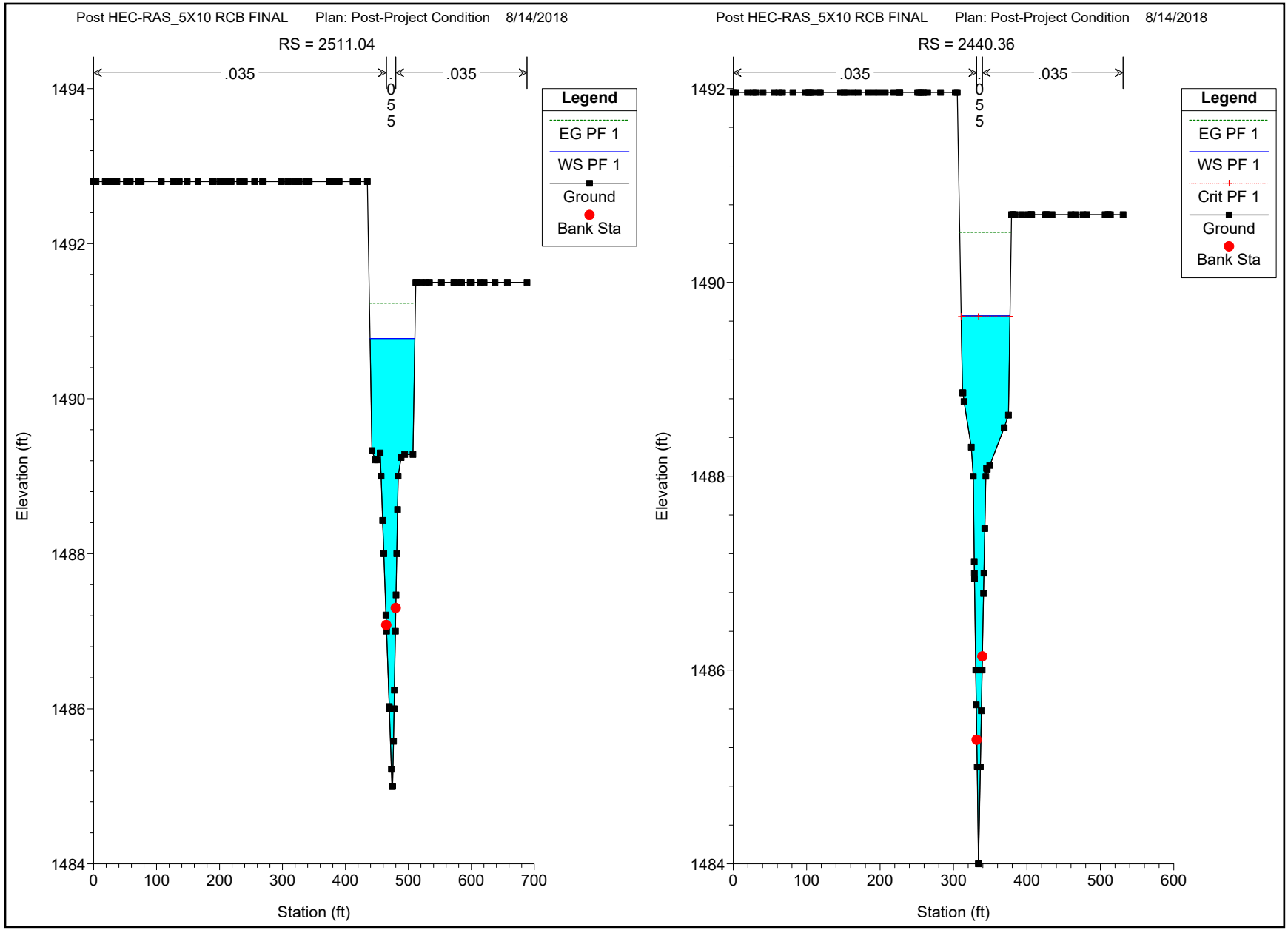
RS = 2729.93
.035
.055
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1495
1494
1493
1492
1491
1490
1489
1488
1487
0
100
200
300
400
500
600
700
800
Post HEC-RAS_5X10 RCB FINAL Plan: Post-Project Condition 8/14/2018
RS = 2626.56
.035
.055
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1494
1492
1490
1488
1486
1484
0
200
400
600
800
1000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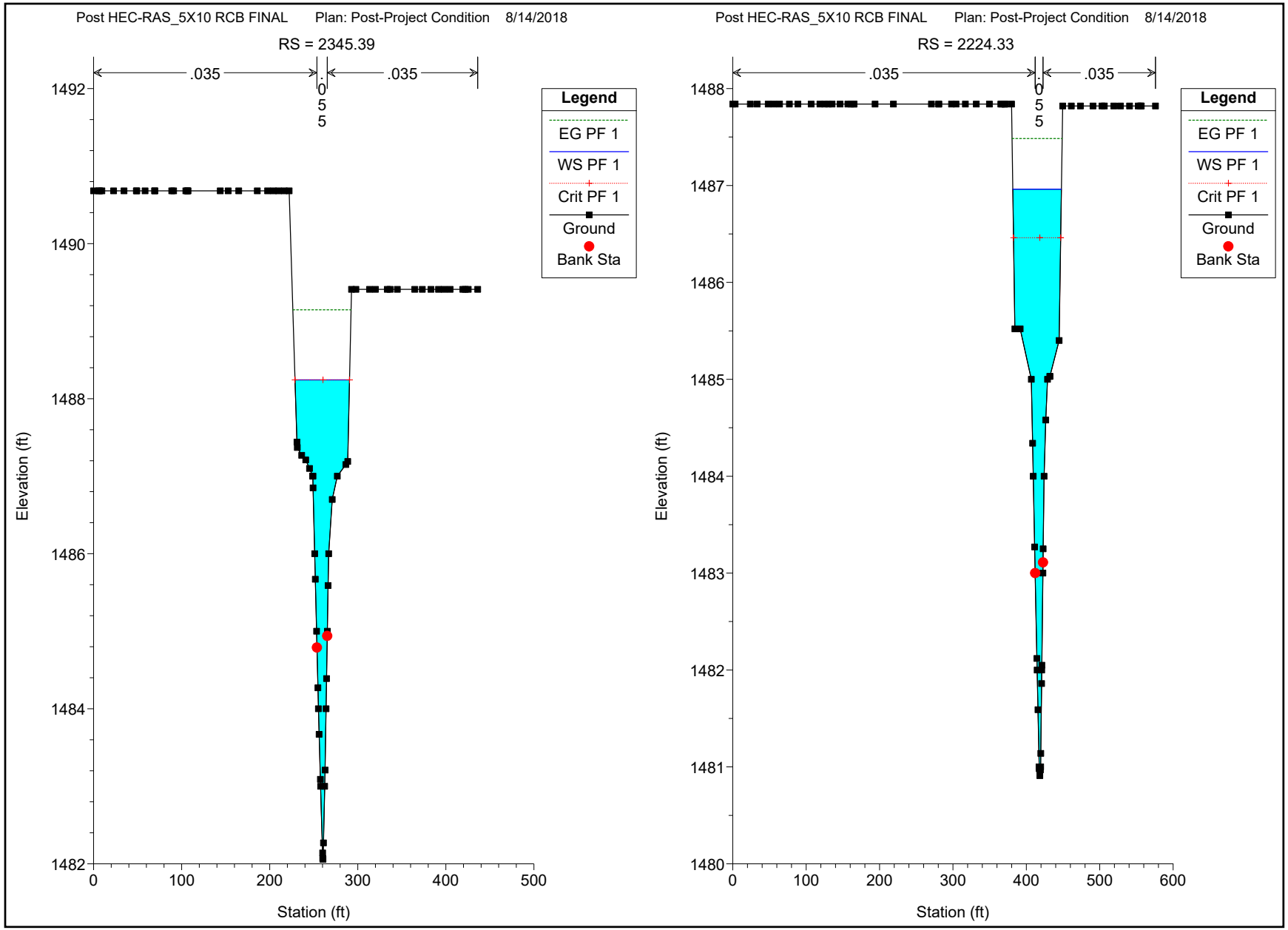
.035
0
5
5
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1494
1492
1490
1488
1486
1484
0
100
200
300
400
500
600
700
Post HEC-RAS_5X10 RCB FINAL Plan: Post-Project Condition 8/14/2018
RS = 2440.36
.035
.035
0
5
5
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1492
1490
1488
1486
1484
0
100
200
300
400
500
600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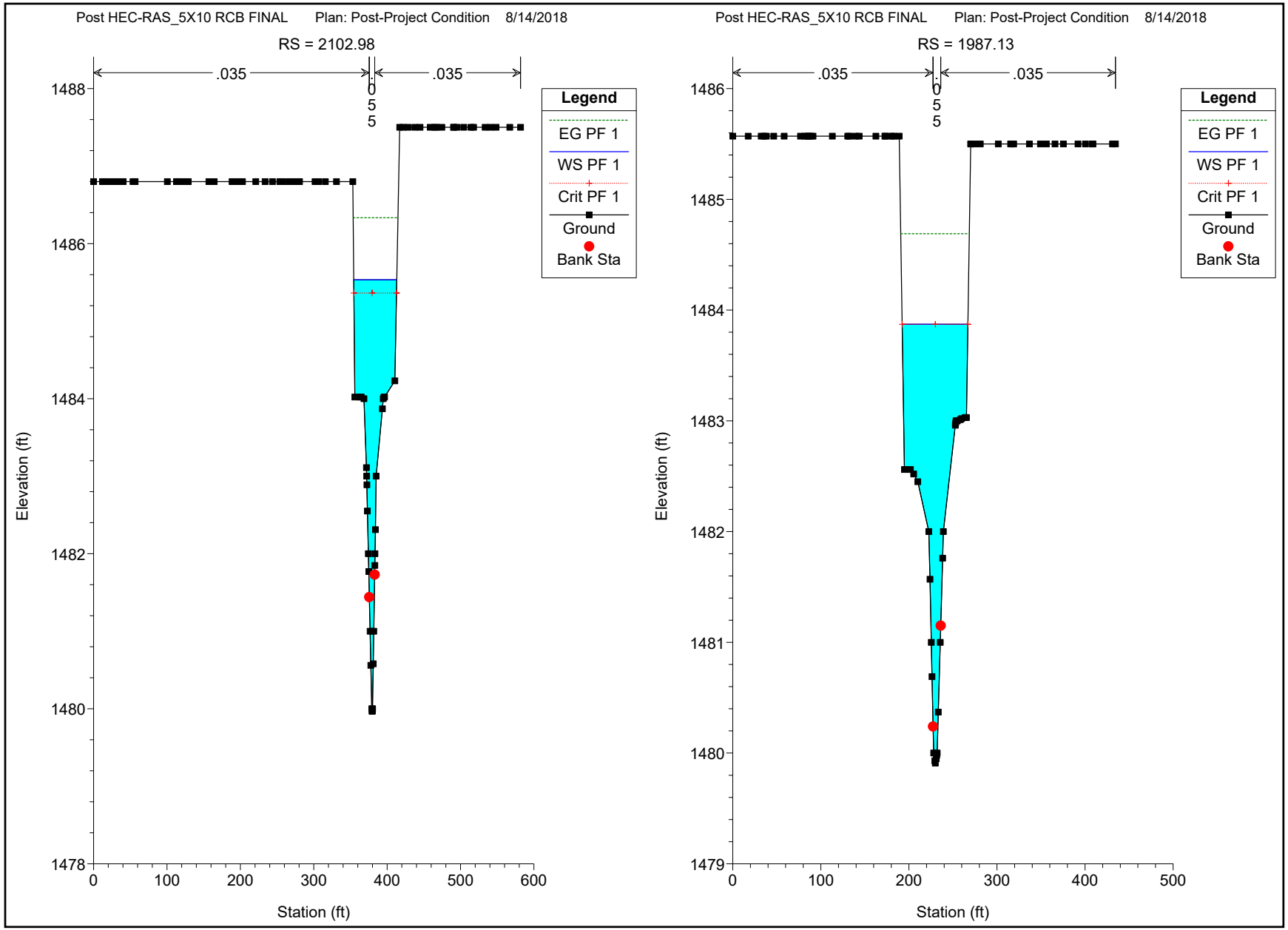
.055
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1492
1490
1488
1486
1484
1482
0
100
200
300
400
500
Post HEC-RAS_5X10 RCB FINAL Plan: Post-Project Condition 8/14/2018
RS = 2224.33
.035
.055
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1488
1487
1486
1485
1484
1483
1482
1481
1480
0
100
200
300
400
500
600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.035
0
5
5
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1488
1486
1484
1482
1480
1478
0
100
200
300
400
500
600
Post HEC-RAS_5X10 RCB FINAL Plan: Post-Project Condition 8/14/2018
RS = 1987.13
.035
.035
0
5
5
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1486
1485
1484
1483
1482
1481
1480
1479
0
100
200
300
400
500

HEC-RAS HEC-RAS 5.0.3 September 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X        X
X     X  X        X    X      X   X    X    X        X
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PROJECT DATA
Project Title: Post HEC-RAS_5X10 RCB FINAL
Project File : POST_PROJECT.prj
Run Date and Time: 8/14/2018 10:40:12 AM

Project in English units

Project Description:
HEC-RAS Project and Geometry created by SmartDraft

PLAN DATA

Plan Title: Post-Project Condition
Plan File : o:\275.01.18\Engineering\HEC-RAS\HEC-RAS Models\FINAL MODELS\POST\POST_PROJECT.p01

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           Geometry Title: Post-Project Condition
           Geometry File : o:\275.01.18\Engineering\HEC-RAS\HEC-RAS Models\FINAL
MODELS\POST\POST_PROJECT.g01

           Flow Title    : Post-Project Condition
           Flow File     : o:\275.01.18\Engineering\HEC-RAS\HEC-RAS Models\FINAL
MODELS\POST\POST_PROJECT.f01

Plan Summary Information:
Number of:  Cross Sections =   14    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    0    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Mixed Flow




FLOW DATA

Flow Title: Post-Project Condition
Flow File : o:\275.01.18\Engineering\HEC-RAS\HEC-RAS Models\FINAL MODELS\POST\POST_PROJECT.f01

Flow Data (cfs)

  River           Reach           RS                    PF 1
```

Mill Creek	Mill_Creek	3236.43	890

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Mill Creek	Mill_Creek	PF 1	Normal S = 0.007	Known WS = 1480.398

GEOMETRY DATA

Geometry Title: Post-Project Condition
Geometry File : o:\275.01.18\Engineering\HEC-RAS\HEC-RAS Models\FINAL MODELS\POST\POST_PROJECT.g01

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 3236.43

INPUT
Description:
Station Elevation Data num= 87

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1502	.11	1502	7.18	1501.93	8.44	1501.93	9.95	1501.92
12.77	1501.89	34.93	1501.71	50.51	1501.63	58.72	1501.6	73.57	1501.71
78.02	1501.66	86.02	1501.48	92.04	1501.51	94.74	1501.52	105.65	1501.52
129.84	1501	136.7	1500.9	136.93	1500.89	137.19	1500.89	153.63	1500.63
164.53	1500.45	176.84	1500.37	186.77	1500.36	190.98	1500.53	204.13	1500.92
205.86	1500.97	213.59	1500.95	214.57	1500.96	215.41	1500.96	216.15	1500.95
219.12	1500.91	226.3	1500.77	229.03	1500.71	231.38	1500.66	260.68	1500.03
262.21	1500.03	263.76	1500.02	265.2	1500.01	267.86	1500	269.25	1499.75
276.49	1499.04	276.89	1499	277.54	1498.75	279.43	1498	280.31	1497.65
281.5	1497.09	281.7	1497	282.01	1496.86	283.85	1496	285.97	1495.01

285.99	1495	286.04	1494.98	287.9	1494.31	288.56	1494.13	288.76	1494.09
292.52	1495	296.37	1495.87	296.86	1496	298.26	1496.38	300.55	1497
301.2	1497.18	303.79	1497.88	304.13	1497.98	304.21	1498	307.21	1498.85
307.73	1499	310.93	1499.91	311.44	1500	321.26	1500.5	328.79	1501
337.76	1501.5	341.62	1501.56	344.31	1501.6	356.67	1501.92	357.92	1501.99
358.19	1501.99	358.56	1502	364.05	1502.35	374.68	1503	376.61	1503
377.33	1503	378.22	1503	383.83	1503	386.29	1503	389.69	1503
391.58	1503	391.78	1503						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	281.5	.055	301.2	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
281.5	301.2	64.28	51.78	48.56	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1501.08	Element			
Vel Head (ft)	0.91	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1500.17	Reach Len. (ft)	64.28	51.78	48.56
Crit W.S. (ft)	1499.62	Flow Area (sq ft)	17.62	91.14	16.31
E.G. Slope (ft/ft)	0.012565	Area (sq ft)	17.62	91.14	16.31
Q Total (cfs)	890.00	Flow (cfs)	62.04	741.71	86.25
Top Width (ft)	60.50	Top Width (ft)	27.25	19.70	13.55
Vel Total (ft/s)	7.12	Avg. Vel. (ft/s)	3.52	8.14	5.29
Max Chl Dpth (ft)	6.08	Hydr. Depth (ft)	0.65	4.63	1.20
Conv. Total (cfs)	7939.7	Conv. (cfs)	553.5	6616.8	769.4
Length Wtd. (ft)	52.93	Wetted Per. (ft)	27.69	20.69	13.93
Min Ch El (ft)	1494.09	Shear (lb/sq ft)	0.50	3.46	0.92
Alpha	1.16	Stream Power (lb/ft s)	1.76	28.12	4.86
Frctn Loss (ft)	0.44	Cum Volume (acre-ft)	1.55	1.85	1.42
C & E Loss (ft)	0.14	Cum SA (acres)	1.62	0.39	1.06

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than

1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 3184.66

INPUT
Description:
Station Elevation Data num= 88

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1501	8.87	1500.95	16.33	1500.95	30.14	1500.85	31.29	1500.84
32.73	1500.82	34.94	1500.79	38.12	1500.74	52.41	1500.42	59.44	1500.29
62.06	1500.24	71.9	1500	78.54	1499.99	86.19	1500	93.04	1500.17
95.16	1500.11	96.7	1500.09	97.83	1500.08	107.54	1500.08	117.48	1500.05
122.81	1500	140.95	1499.77	145.41	1499.68	160.9	1499.38	168.07	1499.45
182.83	1499.78	193.58	1500	200.8	1500.02	204.82	1500	229.06	1499.78
230.97	1499.76	233.32	1499.73	236.86	1499.66	243.72	1499.48	251.18	1499.34
255.83	1499.27	261.73	1499.17	267.56	1499	268.35	1498.67	269.99	1498
271	1497.58	272.41	1497	273.83	1496.41	274.83	1496	274.9	1495.97
277.21	1495.02	277.25	1495	277.31	1494.97	279.35	1494	280.42	1494
281.95	1494	282.46	1494	284.67	1494	288.58	1494.56	290.98	1495
291.27	1495.14	292.9	1495.92	292.93	1495.93	293.19	1496	294.31	1496.31
296.14	1496.81	296.4	1496.88	296.61	1496.96	296.71	1497	298.79	1497.76
299.43	1498	301.24	1498.67	302.14	1499	318.6	1499.69	326.69	1500
334.65	1500.76	337.31	1501	337.53	1501.03	337.98	1501.1	341.9	1501.67
344.23	1502	349.62	1502.5	352.39	1502.6	356.89	1502.81	358.1	1502.86
358.85	1502.88	359.56	1502.88	361.01	1502.94	361.11	1502.93	361.73	1502.86
362.39	1502.95	362.65	1502.95	363.09	1503				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	274.9	.055	296.14	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
274.9	296.14	62.56	47.86	42.23	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	60.4	1502	F

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1500.50	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.45	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1500.05	Reach Len. (ft)	62.56	47.86	42.23
Crit W.S. (ft)	1498.64	Flow Area (sq ft)	74.67	110.61	26.34
E.G. Slope (ft/ft)	0.005865	Area (sq ft)	74.67	110.61	26.34
Q Total (cfs)	890.00	Flow (cfs)	143.71	670.30	75.99
Top Width (ft)	229.85	Top Width (ft)	177.50	21.24	31.12
Vel Total (ft/s)	4.21	Avg. Vel. (ft/s)	1.92	6.06	2.88
Max Chl Dpth (ft)	6.05	Hydr. Depth (ft)	0.42	5.21	0.85
Conv. Total (cfs)	11621.1	Conv. (cfs)	1876.5	8752.4	992.2
Length Wtd. (ft)	51.62	Wetted Per. (ft)	178.12	22.07	31.53
Min Ch El (ft)	1494.00	Shear (lb/sq ft)	0.15	1.84	0.31
Alpha	1.64	Stream Power (lb/ft s)	0.30	11.12	0.88
Frctn Loss (ft)	0.23	Cum Volume (acre-ft)	1.48	1.73	1.39
C & E Loss (ft)	0.08	Cum SA (acres)	1.47	0.36	1.03

Warning: Divided flow computed for this cross-section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 3136.8

INPUT
Description:
Station Elevation Data num= 87

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

```
      0    1501     .19    1501    3.38 1500.95   53.34    1500   68.43 1499.92
     72 1499.91   72.76 1499.91   78.35 1499.92   99.85 1499.39   104.5 1499.19
 113.77 1499.18  123.73 1499.13  126.83  1499.1  128.97 1499.09  138.24 1499.04
 143.18 1499.07  146.98 1499.05  156.37    1499  170.23 1498.98  179.15 1498.97
 184.58 1498.98  192.57 1498.99  198.92    1499  206.25 1499.08  209.34 1499.12
 210.19 1499.13  213.83 1499.15  229.52 1499.15  240.25 1499.17  257.75 1499.06
 263.49 1499.03  263.56    1499  269.54  1498.8  278.15 1498.79  279.03 1498.77
 280.09 1498.75  287.11 1498.31  291.78    1498  293.44 1497.07  293.57    1497
 294.45 1496.51  295.29    1496  295.32 1495.98  295.41 1495.93  296.94    1495
 297.21 1494.84  298.59    1494  299.02 1493.98  299.44 1493.96  300.37 1493.93
 301.34 1493.96  302.15    1494  302.79 1494.24  304.75    1495  305.12 1495.14
 306.91 1495.83  307.27 1495.94  307.46    1496  307.55 1496.03  309.81  1496.7
  310.8    1497  312.68 1497.57  314.13    1498  315.89 1498.47  317.21  1498.5
 327.12  1498.8  332.16 1498.97  333.28 1498.97  334.54    1499  335.93 1499.19
 336.44 1499.15  337.96  1499.2  341.34  1499.1  344.25 1499.17  350.02 1499.26
 359.84 1499.65  367.12 1499.77  370.23    1500  374.55 1500.44  378.16 1500.52
 378.41 1500.52  378.79 1500.51   379.2  1500.5  385.84 1500.31  389.45  1500.2
 394.34 1500.14   395.8 1500.01

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .035  295.32    .055  307.55    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        295.32  307.55           141.06   52.79    44.4             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  151.81    1502       F
  369.07   395.8    1502       F

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1500.19    Element                 Left OB    Channel   Right OB
  Vel Head (ft)               0.19    Wt. n-Val.               0.035      0.055      0.035
  W.S. Elev (ft)           1500.01    Reach Len. (ft)         141.06      52.79      44.40
  Crit W.S. (ft)           1499.66    Flow Area (sq ft)       154.39      64.75      67.13
  E.G. Slope (ft/ft)      0.003552    Area (sq ft)            209.28      64.75      67.18
```

Q Total (cfs)	890.00	Flow (cfs)	409.06	301.69	179.25
Top Width (ft)	317.21	Top Width (ft)	242.25	12.23	62.73
Vel Total (ft/s)	3.11	Avg. Vel. (ft/s)	2.65	4.66	2.67
Max Chl Dpth (ft)	6.08	Hydr. Depth (ft)	1.08	5.29	1.09
Conv. Total (cfs)	14933.8	Conv. (cfs)	6863.8	5062.2	3007.8
Length Wtd. (ft)	84.21	Wetted Per. (ft)	144.08	13.16	61.91
Min Ch El (ft)	1493.93	Shear (lb/sq ft)	0.24	1.09	0.24
Alpha	1.24	Stream Power (lb/ft s)	0.63	5.08	0.64
Frctn Loss (ft)	0.52	Cum Volume (acre-ft)	1.28	1.64	1.35
C & E Loss (ft)	0.06	Cum SA (acres)	1.16	0.34	0.99

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross
sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 3084.02

INPUT
Description:
Station Elevation Data num= 121

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1500	.61	1500	1.99	1500	28.08	1500	52.78	1500
53.41	1500	54.05	1500	61.29	1500	66.57	1500	76.92	1500
85.39	1500	103.51	1500	119.35	1500	119.61	1500	122.59	1500
127.08	1500	128.05	1500	129.41	1500	136.28	1500	148.17	1500
149.76	1500	153.48	1500	158.45	1500	159.01	1500	162.74	1500
163.48	1500	164.31	1500	168.68	1500	171.39	1500	171.4	1500

171.52	1500	171.56	1500	171.61	1500	176.68	1500	177.07	1499.94
177.51	1499.88	179.63	1499.6	182.56	1499	192.06	1498.48	194.32	1498.31
195.8	1498.29	197.38	1498.26	198.39	1498.21	206.8	1498.06	207.91	1498.03
208.29	1498.02	209.57	1498	220.86	1497.43	223.87	1497.14	225.52	1497
228.52	1496.06	228.7	1496	231.63	1495.08	231.86	1495	231.88	1495
232.22	1494.9	235	1494.04	235.13	1494	238.19	1493.06	238.38	1493
238.43	1493	238.95	1492.99	239.51	1493	239.52	1493	239.53	1493
239.6	1493.05	239.72	1493.1	240.07	1493.22	240.54	1493.39	242.14	1494
242.9	1494.29	244.66	1494.97	244.75	1495	245.74	1495.39	246.17	1495.55
247.35	1496	248.32	1496.36	250.01	1497	250.79	1497.29	252.65	1498
255.6	1498.18	256.69	1498.22	258.53	1498.3	259.26	1498.34	259.71	1498.37
265.61	1498.68	268.87	1498.73	270.47	1498.81	271.41	1498.79	272.29	1498.77
275.3	1498.72	277.96	1498.68	288.78	1498.95	290.9	1499	293.09	1499
295.07	1499	304.65	1499	307.42	1498.85	314.31	1498.48	316.69	1498.47
319.22	1498.45	321.52	1498.46	330.75	1498.48	342.1	1498.31	345.25	1498.3
346.47	1498.27	348.82	1498.26	349.41	1498.27	354.32	1498.17	360.73	1498
360.77	1498	361.66	1497.99	365.2	1497.93	416.2	1497	416.54	1497
420.95	1496.94	422.51	1496.91	425.61	1496.87	453.98	1496.47	464.89	1496.35
482.48	1496								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	232.22	.055	244.66	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
232.22	244.66	130.85	117.88	111.28	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
279.57	482.48	1500	F

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1499.61	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.83	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1498.78	Reach Len. (ft)	130.85	117.88	111.28
Crit W.S. (ft)	1498.65	Flow Area (sq ft)	49.55	60.99	24.67
E.G. Slope (ft/ft)	0.013033	Area (sq ft)	49.55	60.99	265.36

Q Total (cfs)	890.00	Flow (cfs)	252.37	524.65	112.99
Top Width (ft)	267.06	Top Width (ft)	45.63	12.44	209.00
Vel Total (ft/s)	6.58	Avg. Vel. (ft/s)	5.09	8.60	4.58
Max Chl Dpth (ft)	5.79	Hydr. Depth (ft)	1.09	4.90	0.75
Conv. Total (cfs)	7796.0	Conv. (cfs)	2210.6	4595.7	989.7
Length Wtd. (ft)	119.78	Wetted Per. (ft)	46.00	13.09	33.46
Min Ch El (ft)	1492.99	Shear (lb/sq ft)	0.88	3.79	0.60
Alpha	1.24	Stream Power (lb/ft s)	4.46	32.60	2.75
Frctn Loss (ft)	1.55	Cum Volume (acre-ft)	0.86	1.56	1.18
C & E Loss (ft)	0.02	Cum SA (acres)	0.70	0.33	0.85

Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 2966.14

INPUT
Description:
Station Elevation Data num= 113

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1498.42	11.89	1498.42	12.53	1498.42	12.87	1498.42	13.24	1498.42
26.78	1498.42	32.33	1498.42	49.95	1498.42	50.28	1498.42	56.23	1498.42
62.65	1498.42	68.05	1498.42	72.09	1498.42	76.4	1498.42	80.68	1498.42
81.24	1498.42	87.24	1498.42	100.5	1498.42	107.79	1498.42	121.72	1498.42
137.96	1498.42	143.88	1498.42	144.23	1498.42	145.46	1498.42	162.28	1498.42
181.93	1498.42	208.52	1498.42	220.68	1498.42	231.84	1498.42	249.64	1498.42
251.22	1498.42	254.54	1498.42	259.1	1498.42	272.4	1498.42	275.39	1497

288.47	1497	289.52	1497	293.02	1496.68	303.08	1496	304.25	1495.47
305.3	1495	306.54	1494.44	307.52	1494	308.91	1493.37	309.7	1493.02
309.74	1493	311.62	1492.15	311.96	1492	312.44	1491.78	314.19	1491
314.47	1490.98	315.33	1490.91	316.23	1490.85	316.29	1490.85	318.14	1490.98
318.47	1491	320.28	1491.72	320.83	1491.92	321.04	1492	323.21	1492.81
323.71	1493	325.78	1493.77	326.39	1494	326.82	1494.16	326.9	1494.19
329.07	1495	329.57	1495.19	331.75	1496	334.09	1496.88	334.42	1497
334.44	1497	335.49	1497.02	335.67	1497.02	337.87	1497.04	345.94	1497.06
354.49	1497.1	355.17	1497.1	357.57	1498.3	375.87	1498.3	384.2	1498.3
385.07	1498.3	387.85	1498.3	399.39	1498.3	412.86	1498.3	426.12	1498.3
433.71	1498.3	435.51	1498.3	439.15	1498.3	443.7	1498.3	446.65	1498.3
448.85	1498.3	451.14	1498.3	451.57	1498.3	451.92	1498.3	454.01	1498.3
455.71	1498.3	463.7	1498.3	477.99	1498.3	481.93	1498.3	486.24	1498.3
499.77	1498.3	508.57	1498.3	515.44	1498.3	524.52	1498.3	528.84	1498.3
541.01	1498.3	542.12	1498.3	546.31	1498.3	548.18	1498.3	549.6	1498.3
550.55	1498.3	552.76	1498.3	556.97	1498.3				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	309.7	.055	326.9	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
309.7	326.9	126.21	117.89	108.03	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1498.04	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.01	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1497.03	Reach Len. (ft)	126.21	117.89	108.03
Crit W.S. (ft)	1496.35	Flow Area (sq ft)	24.65	85.90	10.80
E.G. Slope (ft/ft)	0.012920	Area (sq ft)	24.65	85.90	10.80
Q Total (cfs)	890.00	Flow (cfs)	94.04	741.53	54.43
Top Width (ft)	61.17	Top Width (ft)	34.37	17.20	9.60
Vel Total (ft/s)	7.33	Avg. Vel. (ft/s)	3.82	8.63	5.04
Max Chl Dpth (ft)	6.18	Hydr. Depth (ft)	0.72	4.99	1.12
Conv. Total (cfs)	7830.0	Conv. (cfs)	827.3	6523.8	478.8
Length Wtd. (ft)	117.65	Wetted Per. (ft)	35.05	18.23	10.11

Min Ch El (ft)	1490.85	Shear (lb/sq ft)	0.57	3.80	0.86
Alpha	1.21	Stream Power (lb/ft s)	2.16	32.81	4.34
Frctn Loss (ft)	1.82	Cum Volume (acre-ft)	0.75	1.36	0.82
C & E Loss (ft)	0.03	Cum SA (acres)	0.58	0.29	0.57

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 2848.25

INPUT
Description:
Station Elevation Data num= 113

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1496.4	20.49	1496.4	22.3	1496.4	38.07	1496.4	40.84	1496.4
42.14	1496.4	63.41	1496.4	70.72	1496.4	87.6	1496.4	88.2	1496.4
88.54	1496.4	104.15	1496.4	108.54	1496.4	119.57	1496.4	120.94	1496.4
144.43	1496.4	149.77	1496.4	152.6	1496.4	154.55	1496.4	172.33	1496.4
173.09	1496.4	173.53	1496.4	173.96	1496.4	174.74	1496.4	176.37	1496.4
191.77	1496.4	193.51	1496.4	198.94	1496.4	206.98	1496.4	211.27	1496.4
215.89	1496.4	218.73	1496.4	221.88	1496.4	228.56	1496.4	234.16	1496.4
234.29	1496.4	235.2	1496.4	235.7	1496.4	236.27	1496.4	236.64	1496.4
252.97	1496.4	265.64	1496.4	270.22	1496.4	274.6	1496.4	281.26	1496.4
294.43	1496.4	300.16	1496.4	300.66	1496.4	301.16	1496.4	312.7	1496.4
317.28	1495.4	338.54	1495.18	346.85	1495.2	347.58	1495	349.46	1494.12
349.71	1494	351.25	1493.27	351.83	1493	353.13	1492.39	353.7	1492.12
353.95	1492	354.68	1491.66	356.23	1491	356.43	1490.92	358.59	1490
358.99	1489.83	360.94	1489	361.16	1488.99	361.37	1488.99	361.58	1488.99
361.89	1488.99	362.16	1489	362.88	1489.25	365.08	1490	365.68	1490.21
368	1491	368.41	1491.14	369.94	1491.66	370.92	1492	370.96	1492.02
371.1	1492.06	373.98	1493	376.02	1493.67	377.04	1494	387.03	1494.83

387.93	1494.9	389.45	1495	400.76	1495.33	402.17	1495.33	403.71	1496.1
411.89	1496.1	419.01	1496.1	427.28	1496.1	431.72	1496.1	442.91	1496.1
452.78	1496.1	460.46	1496.1	471.12	1496.1	472.53	1496.1	479.8	1496.1
482.44	1496.1	494.04	1496.1	499.06	1496.1	504.68	1496.1	516.68	1496.1
520.23	1496.1	524.19	1496.1	534.28	1496.1	545.62	1496.1	556.39	1496.1
569.46	1496.1	571.63	1496.1	580.91	1496.1				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	353.7	.055	369.94	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
353.7	369.94	119.66	118.32	118.28	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1496.19	Element			
Vel Head (ft)	1.32	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1494.87	Reach Len. (ft)	119.66	118.32	118.28
Crit W.S. (ft)	1494.86	Flow Area (sq ft)	8.04	73.83	19.01
E.G. Slope (ft/ft)	0.018902	Area (sq ft)	8.04	73.83	19.01
Q Total (cfs)	890.00	Flow (cfs)	54.30	720.84	114.86
Top Width (ft)	39.72	Top Width (ft)	5.85	16.24	17.63
Vel Total (ft/s)	8.82	Avg. Vel. (ft/s)	6.75	9.76	6.04
Max Chl Dpth (ft)	5.88	Hydr. Depth (ft)	1.38	4.55	1.08
Conv. Total (cfs)	6473.4	Conv. (cfs)	395.0	5243.1	835.4
Length Wtd. (ft)	118.43	Wetted Per. (ft)	6.46	17.33	18.04
Min Ch El (ft)	1488.99	Shear (lb/sq ft)	1.47	5.03	1.24
Alpha	1.09	Stream Power (lb/ft s)	9.92	49.09	7.51
Frctn Loss (ft)	1.75	Cum Volume (acre-ft)	0.70	1.15	0.79
C & E Loss (ft)	0.17	Cum SA (acres)	0.52	0.24	0.54

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross
sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.

This may indicate
the need for additional cross sections.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 2729.93

INPUT
Description:
Station Elevation Data num= 106

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1494.96	18.47	1494.96	36.57	1494.96	39.49	1494.96	40.93	1494.96
53.37	1494.96	55.3	1494.96	57.51	1494.96	75.59	1494.96	88.24	1494.96
89.58	1494.96	98.12	1494.96	131.01	1494.96	132.11	1494.96	133.48	1494.96
140.7	1494.96	150.63	1494.96	154.18	1494.96	157.24	1494.96	184.13	1494.96
210.62	1494.96	215.76	1494.96	216.07	1494.96	216.97	1494.96	256.82	1494.96
260.47	1494.96	262.81	1494.96	270.97	1494.96	278.45	1494.96	281.42	1494.96
315.82	1494.96	317.51	1494.96	332.63	1494.96	342.43	1494.96	347.38	1494.96
360.62	1494.96	365.88	1494.96	368.33	1494.96	376.84	1494.96	390.18	1494.96
418.27	1494.96	420.55	1493	435.31	1493	436.82	1492.95	440.56	1492.51
444.07	1492.21	444.97	1492	445.39	1491.84	447.61	1491	448.4	1490.7
448.77	1490.56	450.25	1490	451.56	1489.5	452.88	1489	454.21	1488.5
455.52	1488	456.66	1487.99	457.51	1487.99	457.89	1487.99	458.91	1488
460.84	1488.66	461.84	1489	464.17	1489.8	464.36	1489.86	464.89	1490
467.81	1490.77	468.35	1490.91	468.68	1491	468.75	1491.02	472.48	1492
478.57	1492.61	490.71	1493	492.45	1493.02	492.47	1493.02	492.48	1493.02
493.73	1493.04	500.41	1493.04	503.93	1494.8	521.15	1494.8	532.83	1494.8
546.97	1494.8	548.2	1494.8	558.59	1494.8	560.32	1494.8	562.64	1494.8
564.81	1494.8	573.87	1494.8	588.5	1494.8	600.41	1494.8	611.68	1494.8
617.21	1494.8	628.79	1494.8	643.57	1494.8	651.75	1494.8	657.63	1494.8
662.5	1494.8	664.86	1494.8	675.64	1494.8	681.05	1494.8	686.07	1494.8
696.29	1494.8	704.07	1494.8	710.31	1494.8	717.69	1494.8	722.59	1494.8
736.77	1494.8								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	448.77	.055	464.17	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
448.77	464.17	98.21	103.37	99.97	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1494.27	Element			
Vel Head (ft)	0.75	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1493.52	Reach Len. (ft)	98.21	103.37	99.97
Crit W.S. (ft)	1493.52	Flow Area (sq ft)	25.45	71.65	42.73
E.G. Slope (ft/ft)	0.011838	Area (sq ft)	25.45	71.65	42.73
Q Total (cfs)	890.00	Flow (cfs)	106.92	568.24	214.84
Top Width (ft)	81.42	Top Width (ft)	28.82	15.40	37.20
Vel Total (ft/s)	6.36	Avg. Vel. (ft/s)	4.20	7.93	5.03
Max Chl Dpth (ft)	5.53	Hydr. Depth (ft)	0.88	4.65	1.15
Conv. Total (cfs)	8179.9	Conv. (cfs)	982.7	5222.6	1974.6
Length Wtd. (ft)	102.17	Wetted Per. (ft)	29.34	16.17	37.64
Min Ch El (ft)	1487.99	Shear (lb/sq ft)	0.64	3.28	0.84
Alpha	1.19	Stream Power (lb/ft s)	2.69	25.97	4.22
Frctn Loss (ft)	1.27	Cum Volume (acre-ft)	0.65	0.95	0.70
C & E Loss (ft)	0.02	Cum SA (acres)	0.47	0.20	0.46

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical
depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 2626.56

INPUT
Description:
Station Elevation Data num= 133

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1493.88	.82	1493.88	1.16	1493.88	2.61	1493.88	7.26	1493.88
12.56	1493.88	18.77	1493.88	38.23	1493.88	40.46	1493.88	49.85	1493.88
57.03	1493.88	58.83	1493.88	62.17	1493.88	63.18	1493.88	81.64	1493.88
90.84	1493.88	105.75	1493.88	111.54	1493.88	115.94	1493.88	116.74	1493.88
122.74	1493.88	127.79	1493.88	139.02	1493.88	143.67	1493.88	144.5	1493.88
144.59	1493.88	145.2	1493.88	157.12	1493.88	160.13	1493.88	181.1	1493.88
185.29	1493.88	195.12	1493.88	207.94	1493.88	219.54	1493.88	256.17	1493.88
256.36	1493.88	259.88	1493.88	262.65	1493.88	268.99	1493.88	288.63	1493.88
310.16	1493.88	316.85	1493.88	317.45	1493.88	318.2	1493.88	318.29	1493.88
331.56	1493.88	334.62	1493.88	335.6	1493.88	345.69	1493.88	346.01	1493.88
350.27	1493.88	372.32	1493.88	373.78	1493.88	374.18	1493.88	374.59	1493.88
400.34	1493.88	400.94	1493.88	416.41	1493.88	417.59	1493.88	421.67	1493.88
433.42	1493.88	434.45	1493.88	454.94	1493.88	467.67	1493.88	471.83	1493.88
477.3	1493.88	479.52	1493.88	485.07	1493.88	494.02	1491.46	494.06	1491.46
515.37	1491.31	516.77	1491.29	522.04	1491.25	522.83	1491	523.56	1490.74
525.66	1490	528.39	1489.04	528.5	1489	528.87	1488.87	532.03	1488.22
533.08	1488	535.3	1487.54	537.49	1487	538.32	1486.79	541.53	1486
542.09	1485.96	542.72	1485.95	542.77	1485.94	542.82	1485.95	543.79	1486
545.8	1486.65	546.86	1487	549.65	1487.91	549.93	1488	550.03	1488.03
550.61	1488.22	552.85	1489	553.35	1489.17	555.73	1490	561.66	1490.7
565.46	1492.6	569.8	1492.6	570.31	1492.6	571.24	1492.6	575.54	1492.6
576.86	1492.6	578.26	1492.6	588.1	1492.6	598.09	1492.6	605.23	1492.6
620.79	1492.6	630.25	1492.6	644.93	1492.6	651.75	1492.6	660.96	1492.6
663.25	1492.6	679.77	1492.6	687.16	1492.6	687.45	1492.6	694.58	1492.6
699.46	1492.6	715.62	1492.6	721.83	1492.6	723.62	1492.6	730.26	1492.6
749.1	1492.6	762.02	1492.6	764.98	1492.6	772.36	1492.6	781.46	1492.6
781.73	1492.6	797.04	1492.6	811.59	1492.6				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	532.03	.055	550.03	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
532.03	550.03	116.97	115.51	113.26	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1492.41	Element			
Vel Head (ft)	0.93	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1491.48	Reach Len. (ft)	116.97	115.51	113.26
Crit W.S. (ft)	1491.01	Flow Area (sq ft)	22.21	81.40	21.37
E.G. Slope (ft/ft)	0.013161	Area (sq ft)	22.21	81.40	21.37
Q Total (cfs)	890.00	Flow (cfs)	74.89	675.44	139.68
Top Width (ft)	69.26	Top Width (ft)	38.08	18.00	13.19
Vel Total (ft/s)	7.12	Avg. Vel. (ft/s)	3.37	8.30	6.54
Max Chl Dpth (ft)	5.54	Hydr. Depth (ft)	0.58	4.52	1.62
Conv. Total (cfs)	7757.8	Conv. (cfs)	652.8	5887.6	1217.5
Length Wtd. (ft)	115.31	Wetted Per. (ft)	38.55	18.58	13.74
Min Ch El (ft)	1485.94	Shear (lb/sq ft)	0.47	3.60	1.28
Alpha	1.18	Stream Power (lb/ft s)	1.60	29.86	8.35
Frctn Loss (ft)	1.04	Cum Volume (acre-ft)	0.60	0.77	0.63
C & E Loss (ft)	0.14	Cum SA (acres)	0.40	0.16	0.40

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 2511.04

INPUT
Description:
Station Elevation Data num= 96

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1492.8	3.82	1492.8	18.5	1492.8	27.02	1492.8	36.82	1492.8
51.99	1492.8	58.1	1492.8	70.9	1492.8	71.32	1492.8	73.58	1492.8
75.43	1492.8	107.43	1492.8	126.69	1492.8	135.97	1492.8	148.74	1492.8
165.72	1492.8	188.32	1492.8	190.32	1492.8	201.02	1492.8	208.61	1492.8
215.99	1492.8	218.5	1492.8	232.01	1492.8	234.37	1492.8	239.55	1492.8
255.66	1492.8	268.29	1492.8	269.52	1492.8	298.35	1492.8	308.72	1492.8
318.67	1492.8	325.43	1492.8	326.13	1492.8	336.8	1492.8	337.24	1492.8
342.5	1492.8	374.35	1492.8	378.71	1492.8	381.97	1492.8	383.1	1492.8
383.41	1492.8	384.49	1492.8	387.51	1492.8	390.11	1492.8	412.06	1492.8
419.78	1492.8	434.83	1492.8	442.22	1489.33	447.42	1489.21	450.58	1489.21
455.23	1489.3	456.6	1489	459.12	1488.43	461	1488	464.47	1487.21
465.04	1487.08	465.39	1487	469.66	1486.03	469.79	1486	473.05	1485.22
473.98	1485	474.43	1485	474.51	1485	474.89	1485	474.99	1485
476.45	1485.58	477.34	1486	477.86	1486.24	479.48	1487	480.12	1487.3
480.49	1487.47	481.62	1488	482.83	1488.57	483.76	1489	488.47	1489.24
494.16	1489.28	507.4	1489.28	511.84	1491.5	513.27	1491.5	520.4	1491.5
527.72	1491.5	533.55	1491.5	552.51	1491.5	572.19	1491.5	573.15	1491.5
582.01	1491.5	584.47	1491.5	598.11	1491.5	598.74	1491.5	599.13	1491.5
600.33	1491.5	614.63	1491.5	620.43	1491.5	637.78	1491.5	657.22	1491.5
688.61	1491.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	465.04	.055	480.12	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
465.04	480.12	72.48	70.69	70.93	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1491.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.46	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1490.78	Reach Len. (ft)	72.48	70.69	70.93

Crit W.S. (ft)		Flow Area (sq ft)	47.35	71.97	47.99
E.G. Slope (ft/ft)	0.006513	Area (sq ft)	47.35	71.97	47.99
Q Total (cfs)	890.00	Flow (cfs)	239.10	430.92	219.98
Top Width (ft)	71.25	Top Width (ft)	25.90	15.08	30.27
Vel Total (ft/s)	5.32	Avg. Vel. (ft/s)	5.05	5.99	4.58
Max Chl Dpth (ft)	5.77	Hydr. Depth (ft)	1.83	4.77	1.59
Conv. Total (cfs)	11028.1	Conv. (cfs)	2962.7	5339.6	2725.8
Length Wtd. (ft)	71.23	Wetted Per. (ft)	26.47	15.81	31.01
Min Ch El (ft)	1485.00	Shear (lb/sq ft)	0.73	1.85	0.63
Alpha	1.04	Stream Power (lb/ft s)	3.67	11.08	2.88
Frctn Loss (ft)	0.67	Cum Volume (acre-ft)	0.50	0.56	0.54
C & E Loss (ft)	0.04	Cum SA (acres)	0.31	0.12	0.35

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 2440.36

INPUT
Description:
Station Elevation Data num= 88

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1491.96	3.75	1491.96	19.41	1491.96	27.12	1491.96	30.78	1491.96
40.71	1491.96	55.69	1491.96	61.96	1491.96	67.02	1491.96	81.31	1491.96
97.73	1491.96	101.79	1491.96	103.4	1491.96	105.17	1491.96	108.78	1491.96
117.01	1491.96	118.64	1491.96	146.12	1491.96	150.93	1491.96	154.78	1491.96
163.34	1491.96	170.11	1491.96	183.68	1491.96	191.05	1491.96	198.1	1491.96
207.03	1491.96	218.78	1491.96	226.65	1491.96	226.79	1491.96	226.88	1491.96
251.14	1491.96	252.72	1491.96	255.48	1491.96	258.3	1491.96	259.52	1491.96
264.8	1491.96	282.44	1491.96	302.42	1491.96	305.16	1491.96	312.2	1488.86
312.85	1488.86	314.31	1488.77	324.19	1488.3	326.92	1488	328.22	1487.12

328.44	1487	328.56	1486.94	330.33	1486	331	1485.64	331.68	1485.28
332.21	1485	334.08	1484	334.09	1484	336.54	1485	337.97	1485.58
339.01	1486	339.35	1486.14	340.94	1486.79	341.47	1487	342.59	1487.46
344	1488	345.01	1488.08	346.04	1488.07	349.29	1488.11	369.01	1488.5
374.84	1488.63	378.98	1490.7	381.06	1490.7	381.46	1490.7	383.77	1490.7
392.63	1490.7	401.34	1490.7	405.46	1490.7	405.99	1490.7	406.49	1490.7
425.31	1490.7	425.92	1490.7	427.61	1490.7	434.12	1490.7	460.21	1490.7
465.86	1490.7	476.36	1490.7	481.48	1490.7	506.44	1490.7	510.17	1490.7
511.05	1490.7	513.67	1490.7	530.95	1490.7				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	331.68	.055	339.35	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
331.68	339.35	93.85	94.96	89.96	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1490.52	Element			
Vel Head (ft)	0.86	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1489.66	Reach Len. (ft)	93.85	94.96	89.96
Crit W.S. (ft)	1489.65	Flow Area (sq ft)	32.30	36.20	54.32
E.G. Slope (ft/ft)	0.015000	Area (sq ft)	32.30	36.20	54.32
Q Total (cfs)	890.00	Flow (cfs)	215.59	316.93	357.49
Top Width (ft)	66.49	Top Width (ft)	21.28	7.67	37.54
Vel Total (ft/s)	7.25	Avg. Vel. (ft/s)	6.67	8.76	6.58
Max Chl Dpth (ft)	5.65	Hydr. Depth (ft)	1.52	4.72	1.45
Conv. Total (cfs)	7266.9	Conv. (cfs)	1760.3	2587.7	2918.9
Length Wtd. (ft)	93.11	Wetted Per. (ft)	22.21	8.41	38.15
Min Ch El (ft)	1484.00	Shear (lb/sq ft)	1.36	4.03	1.33
Alpha	1.06	Stream Power (lb/ft s)	9.09	35.29	8.78
Frctn Loss (ft)	1.37	Cum Volume (acre-ft)	0.44	0.48	0.46
C & E Loss (ft)	0.00	Cum SA (acres)	0.27	0.10	0.29

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.

This may indicate
the need for additional cross sections.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 2345.39

INPUT
Description:
Station Elevation Data num= 78

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1490.68	5.78	1490.68	7.03	1490.68	9.46	1490.68	22.73	1490.68
34.55	1490.68	48.54	1490.68	49.08	1490.68	58.52	1490.68	69.18	1490.68
69.65	1490.68	88.71	1490.68	90.8	1490.68	104.68	1490.68	106.4	1490.68
106.57	1490.68	107.32	1490.68	143.77	1490.68	152.85	1490.68	164.83	1490.68
185.91	1490.68	197.6	1490.68	204.21	1490.68	210.05	1490.68	216.58	1490.68
222.05	1490.68	230.86	1487.44	231.28	1487.37	236.33	1487.27	240.88	1487.21
245.17	1487.1	248.75	1487	248.91	1487	248.93	1487	249.26	1486.85
251.05	1486	251.76	1485.67	253.17	1485	253.61	1484.79	254.72	1484.27
255.29	1484	256	1483.67	257.53	1483.09	257.77	1483	260.07	1482.14
260.28	1482.07	260.41	1482.06	260.52	1482.06	260.97	1482.27	262.43	1483
262.84	1483.21	264	1484	264.57	1484.39	265.37	1484.94	265.45	1485
266.31	1485.59	266.91	1486	270.94	1486.7	276.79	1487	286.4	1487.15
288.51	1487.19	292.85	1489.41	297.88	1489.41	313.33	1489.41	320.06	1489.41
333.47	1489.41	336.76	1489.41	344.93	1489.41	364.64	1489.41	373.31	1489.41
383.09	1489.41	391.65	1489.41	397.95	1489.41	404.79	1489.41	419.17	1489.41
422.08	1489.41	425.35	1489.41	436.22	1489.41				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	253.61	.055	265.37	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
253.61	265.37	120.83	121.06	120.17	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1489.15	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.90	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1488.24	Reach Len. (ft)	120.83	121.06	120.17
Crit W.S. (ft)	1488.24	Flow Area (sq ft)	30.55	57.66	34.58
E.G. Slope (ft/ft)	0.014366	Area (sq ft)	30.55	57.66	34.58
Q Total (cfs)	890.00	Flow (cfs)	175.00	501.39	213.61
Top Width (ft)	61.88	Top Width (ft)	24.93	11.76	25.20
Vel Total (ft/s)	7.25	Avg. Vel. (ft/s)	5.73	8.70	6.18
Max Chl Dpth (ft)	6.18	Hydr. Depth (ft)	1.23	4.90	1.37
Conv. Total (cfs)	7425.5	Conv. (cfs)	1460.0	4183.3	1782.2
Length Wtd. (ft)	120.77	Wetted Per. (ft)	25.58	13.10	25.85
Min Ch El (ft)	1482.06	Shear (lb/sq ft)	1.07	3.95	1.20
Alpha	1.11	Stream Power (lb/ft s)	6.14	34.32	7.41
Frctn Loss (ft)	1.20	Cum Volume (acre-ft)	0.37	0.37	0.36
C & E Loss (ft)	0.11	Cum SA (acres)	0.22	0.08	0.23

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical
depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 2224.33

INPUT
Description:
Station Elevation Data num= 78

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1487.84	3.21	1487.84	23.86	1487.84	33.25	1487.84	48.23	1487.84
55.82	1487.84	63.7	1487.84	77.07	1487.84	88.77	1487.84	106.7	1487.84
118.63	1487.84	125.13	1487.84	130.27	1487.84	135.28	1487.84	146.08	1487.84
156.83	1487.84	160.78	1487.84	165.07	1487.84	165.15	1487.84	193.83	1487.84
218.88	1487.84	270.58	1487.84	280.55	1487.84	280.74	1487.84	298.09	1487.84
304.13	1487.84	316.86	1487.84	331.77	1487.84	349.73	1487.84	365.12	1487.84
366.55	1487.84	370.67	1487.84	370.71	1487.84	370.87	1487.84	379.78	1487.84
384.42	1485.52	391.54	1485.52	406.79	1485	408.53	1484.34	409.42	1484
411.35	1483.27	412.04	1483	412.05	1483	414.37	1482.12	414.68	1482
415.76	1481.59	417.32	1481	417.47	1480.99	417.61	1480.98	418.42	1480.91
419.21	1480.97	419.46	1481	419.68	1481.14	420.8	1481.86	421.02	1482
421.09	1482.05	422.57	1483	422.75	1483.11	422.96	1483.25	424.13	1484
426.42	1484.58	428.81	1485	432.07	1485.03	432.15	1485.03	444.68	1485.4
449.52	1487.82	461.33	1487.82	473.63	1487.82	490.78	1487.82	503.04	1487.82
506.33	1487.82	519.17	1487.82	528.17	1487.82	540.63	1487.82	552.41	1487.82
555.44	1487.82	556.67	1487.82	576.02	1487.82				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	412.04	.055	422.75	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
412.04	422.75	121.9	121.35	118.08	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1487.48	Element			
Vel Head (ft)	0.52	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1486.96	Reach Len. (ft)	121.90	121.35	118.08
Crit W.S. (ft)	1486.46	Flow Area (sq ft)	53.84	55.19	46.84
E.G. Slope (ft/ft)	0.007268	Area (sq ft)	53.84	55.19	46.84
Q Total (cfs)	890.00	Flow (cfs)	280.23	357.44	252.33
Top Width (ft)	66.27	Top Width (ft)	30.50	10.71	25.05

Vel Total (ft/s)	5.71	Avg. Vel. (ft/s)	5.20	6.48	5.39
Max Chl Dpth (ft)	6.05	Hydr. Depth (ft)	1.77	5.15	1.87
Conv. Total (cfs)	10439.8	Conv. (cfs)	3287.1	4192.8	2959.8
Length Wtd. (ft)	120.45	Wetted Per. (ft)	31.22	11.70	25.80
Min Ch El (ft)	1480.91	Shear (lb/sq ft)	0.78	2.14	0.82
Alpha	1.03	Stream Power (lb/ft s)	4.07	13.86	4.44
Frctn Loss (ft)	1.12	Cum Volume (acre-ft)	0.25	0.22	0.25
C & E Loss (ft)	0.03	Cum SA (acres)	0.15	0.05	0.16

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 2102.98

INPUT
Description:
Station Elevation Data num= 99

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1486.8	12.1	1486.8	13.1	1486.8	14.72	1486.8	18.4	1486.8
22.78	1486.8	26.72	1486.8	29.38	1486.8	33.88	1486.8	37.31	1486.8
40.27	1486.8	53.69	1486.8	54.34	1486.8	55.82	1486.8	56.59	1486.8
100.5	1486.8	112.84	1486.8	113.22	1486.8	115	1486.8	115.9	1486.8
121.69	1486.8	121.76	1486.8	127.03	1486.8	129.05	1486.8	157.02	1486.8
164.39	1486.8	188.78	1486.8	189.39	1486.8	195.79	1486.8	199.47	1486.8
200.97	1486.8	202.85	1486.8	220.96	1486.8	233.67	1486.8	243.73	1486.8
253.76	1486.8	255.21	1486.8	257.03	1486.8	265.92	1486.8	269.07	1486.8
273.73	1486.8	277.34	1486.8	280.65	1486.8	301.78	1486.8	306.56	1486.8
315.86	1486.8	330.92	1486.8	353.17	1486.8	355.95	1484.02	362.81	1484.02
364.68	1484.02	368.45	1484	371.72	1483.11	372.12	1483	372.36	1482.89
373.13	1482.55	374.39	1482	374.92	1481.77	375.68	1481.44	376.7	1481
377.72	1480.56	379.01	1480	379.49	1479.97	379.56	1479.97	379.63	1479.97

379.93	1479.98	380.23	1480	381.17	1480.58	381.85	1481	383.03	1481.73
383.21	1481.85	383.46	1482	383.96	1482.31	385.06	1483	393.58	1483.87
394.68	1484	395.66	1484.02	396.38	1484.02	410.52	1484.23	417.06	1487.5
421.81	1487.5	428.54	1487.5	437.72	1487.5	444.91	1487.5	458.75	1487.5
464.74	1487.5	467.31	1487.5	474.46	1487.5	490.53	1487.5	490.84	1487.5
495.19	1487.5	504.42	1487.5	514.25	1487.5	517.68	1487.5	533.57	1487.5
540.81	1487.5	548.45	1487.5	567.11	1487.5	581.8	1487.5		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	375.68	.055	383.03	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
375.68	383.03	112.74	115.86	119.85	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1486.34	Element			
Vel Head (ft)	0.80	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1485.53	Reach Len. (ft)	112.74	115.86	119.85
Crit W.S. (ft)	1485.36	Flow Area (sq ft)	39.39	35.88	50.28
E.G. Slope (ft/ft)	0.012363	Area (sq ft)	39.39	35.88	50.28
Q Total (cfs)	890.00	Flow (cfs)	271.41	289.67	328.93
Top Width (ft)	58.69	Top Width (ft)	21.24	7.35	30.10
Vel Total (ft/s)	7.09	Avg. Vel. (ft/s)	6.89	8.07	6.54
Max Chl Dpth (ft)	5.56	Hydr. Depth (ft)	1.85	4.88	1.67
Conv. Total (cfs)	8004.5	Conv. (cfs)	2441.0	2605.2	2958.3
Length Wtd. (ft)	115.92	Wetted Per. (ft)	22.33	8.14	30.82
Min Ch El (ft)	1479.97	Shear (lb/sq ft)	1.36	3.40	1.26
Alpha	1.03	Stream Power (lb/ft s)	9.38	27.46	8.24
Frctn Loss (ft)	1.64	Cum Volume (acre-ft)	0.12	0.09	0.12
C & E Loss (ft)	0.00	Cum SA (acres)	0.07	0.02	0.08

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
This may indicate
the need for additional cross sections.

CROSS SECTION

RIVER: Mill Creek
REACH: Mill_Creek RS: 1987.13

INPUT
Description:
Station Elevation Data num= 72

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1485.57	17.48	1485.57	32.24	1485.57	35.58	1485.57	38.23	1485.57
46.57	1485.57	58.31	1485.57	76.83	1485.57	81.84	1485.57	84.97	1485.57
86	1485.57	88.68	1485.57	91.15	1485.57	113.05	1485.57	130.46	1485.57
132.45	1485.57	139.44	1485.57	143.54	1485.57	162.52	1485.57	172.7	1485.57
173.48	1485.57	180.35	1485.57	182.72	1485.57	188.92	1485.57	194.94	1482.56
201.77	1482.56	205.42	1482.52	210.07	1482.45	222.55	1482	223.97	1481.57
225.46	1481	226.27	1480.69	227.45	1480.24	228.1	1480	229.45	1479.93
230.01	1479.91	231	1479.95	231.64	1479.98	232.12	1480	233.32	1480.37
235.57	1481	236.1	1481.15	238.3	1481.76	239.14	1482	252.75	1482.96
253.07	1482.98	253.53	1483	254.44	1483	255.02	1483	258.3	1483.01
259.77	1483.02	263.85	1483.03	265.28	1483.03	270.22	1485.5	270.3	1485.5
274.3	1485.5	281.06	1485.5	301.5	1485.5	315.47	1485.5	317.33	1485.5
318.9	1485.5	336.78	1485.5	349.37	1485.5	356.1	1485.5	365.85	1485.5
375.47	1485.5	391.87	1485.5	400.36	1485.5	408.02	1485.5	408.97	1485.5
431.12	1485.5	434.56	1485.5						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	227.45	.055	236.1	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
227.45	236.1	714.69	759.39787.2999	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1484.69	Element	Left OB	Channel	Right OB

Vel Head (ft)	0.82	Wt. n-Val.	0.035	0.055	0.035
W.S. Elev (ft)	1483.87	Reach Len. (ft)			
Crit W.S. (ft)	1483.87	Flow Area (sq ft)	55.85	31.27	37.41
E.G. Slope (ft/ft)	0.016435	Area (sq ft)	55.85	31.27	37.41
Q Total (cfs)	890.00	Flow (cfs)	409.16	251.10	229.74
Top Width (ft)	74.65	Top Width (ft)	35.13	8.65	30.86
Vel Total (ft/s)	7.15	Avg. Vel. (ft/s)	7.33	8.03	6.14
Max Chl Dpth (ft)	3.96	Hydr. Depth (ft)	1.59	3.62	1.21
Conv. Total (cfs)	6942.3	Conv. (cfs)	3191.6	1958.7	1792.1
Length Wtd. (ft)		Wetted Per. (ft)	35.76	8.86	31.21
Min Ch El (ft)	1479.91	Shear (lb/sq ft)	1.60	3.62	1.23
Alpha	1.03	Stream Power (lb/ft s)	11.74	29.08	7.55
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

Warning: User specified water surface is not possible for the specified flow regime. The program used critical depth as the
starting water surface.

SUMMARY OF MANNING'S N VALUES

River:Mill Creek

Reach	River Sta.	n1	n2	n3
Mill_Creek	3236.43	.035	.055	.035
Mill_Creek	3184.66	.035	.055	.035
Mill_Creek	3136.8	.035	.055	.035
Mill_Creek	3084.02	.035	.055	.035
Mill_Creek	2966.14	.035	.055	.035
Mill_Creek	2848.25	.035	.055	.035
Mill_Creek	2729.93	.035	.055	.035
Mill_Creek	2626.56	.035	.055	.035
Mill_Creek	2511.04	.035	.055	.035

Mill_Creek	2440.36	.035	.055	.035
Mill_Creek	2345.39	.035	.055	.035
Mill_Creek	2224.33	.035	.055	.035
Mill_Creek	2102.98	.035	.055	.035
Mill_Creek	1987.13	.035	.055	.035

SUMMARY OF REACH LENGTHS

River: Mill Creek

Reach	River Sta.	Left	Channel	Right
Mill_Creek	3236.43	64.28	51.78	48.56
Mill_Creek	3184.66	62.56	47.86	42.23
Mill_Creek	3136.8	141.06	52.79	44.4
Mill_Creek	3084.02	130.85	117.88	111.28
Mill_Creek	2966.14	126.21	117.89	108.03
Mill_Creek	2848.25	119.66	118.32	118.28
Mill_Creek	2729.93	98.21	103.37	99.97
Mill_Creek	2626.56	116.97	115.51	113.26
Mill_Creek	2511.04	72.48	70.69	70.93
Mill_Creek	2440.36	93.85	94.96	89.96
Mill_Creek	2345.39	120.83	121.06	120.17
Mill_Creek	2224.33	121.9	121.35	118.08
Mill_Creek	2102.98	112.74	115.86	119.85
Mill_Creek	1987.13	714.69	759.39	787.2999

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Mill Creek

Reach	River Sta.	Contr.	Expan.
Mill_Creek	3236.43	.1	.3
Mill_Creek	3184.66	.1	.3
Mill_Creek	3136.8	.1	.3
Mill_Creek	3084.02	.1	.3
Mill_Creek	2966.14	.1	.3
Mill_Creek	2848.25	.1	.3
Mill_Creek	2729.93	.1	.3
Mill_Creek	2626.56	.1	.3
Mill_Creek	2511.04	.1	.3
Mill_Creek	2440.36	.1	.3
Mill_Creek	2345.39	.1	.3
Mill_Creek	2224.33	.1	.3
Mill_Creek	2102.98	.1	.3
Mill_Creek	1987.13	.1	.3

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Mill_Creek	3236.43	PF 1	890.00	1494.09	1500.17	1499.62	1501.08	0.012565	8.14	125.08	60.50	0.67
Mill_Creek	3184.66	PF 1	890.00	1494.00	1500.05	1498.64	1500.50	0.005865	6.06	211.62	229.85	0.47
Mill_Creek	3136.8	PF 1	890.00	1493.93	1500.01	1499.66	1500.19	0.003552	4.66	286.27	317.21	0.36
Mill_Creek	3084.02	PF 1	890.00	1492.99	1498.78	1498.65	1499.61	0.013033	8.60	135.21	267.06	0.68
Mill_Creek	2966.14	PF 1	890.00	1490.85	1497.03	1496.35	1498.04	0.012920	8.63	121.35	61.17	0.68

Mill_Creek	2848.25	PF 1	890.00	1488.99	1494.87	1494.86	1496.19		
0.018902	9.76	100.88	39.72	0.81					
Mill_Creek	2729.93	PF 1	890.00	1487.99	1493.52	1493.52	1494.27		
0.011838	7.93	139.84	81.42	0.65					
Mill_Creek	2626.56	PF 1	890.00	1485.94	1491.48	1491.01	1492.41		
0.013161	8.30	124.98	69.26	0.69					
Mill_Creek	2511.04	PF 1	890.00	1485.00	1490.78		1491.23		
0.006513	5.99	167.31	71.25	0.48					
Mill_Creek	2440.36	PF 1	890.00	1484.00	1489.66	1489.65	1490.52		
0.015000	8.76	122.82	66.49	0.71					
Mill_Creek	2345.39	PF 1	890.00	1482.06	1488.24	1488.24	1489.15		
0.014366	8.70	122.79	61.88	0.69					
Mill_Creek	2224.33	PF 1	890.00	1480.91	1486.96	1486.46	1487.48		
0.007268	6.48	155.87	66.27	0.50					
Mill_Creek	2102.98	PF 1	890.00	1479.97	1485.53	1485.36	1486.34		
0.012363	8.07	125.55	58.69	0.64					
Mill_Creek	1987.13	PF 1	890.00	1479.91	1483.87	1483.87	1484.69		
0.016435	8.03	124.53	74.65	0.74					

Profile Output Table - Standard Table 2

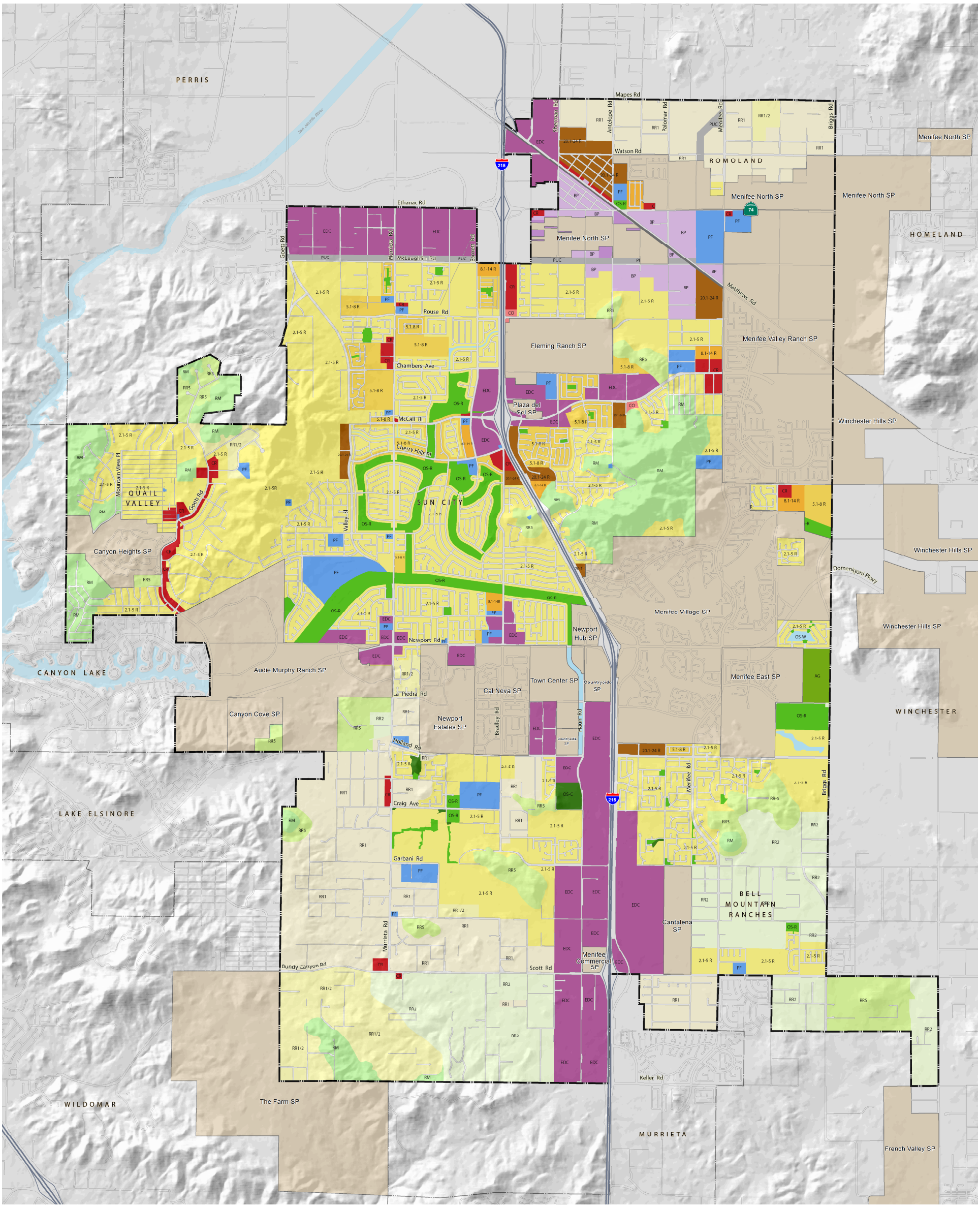
Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Mill_Creek	3236.43	PF 1	1501.08	1500.17	0.91	0.44	0.14	62.04	741.71	86.25	60.50
Mill_Creek	3184.66	PF 1	1500.50	1500.05	0.45	0.23	0.08	143.71	670.30	75.99	229.85
Mill_Creek	3136.8	PF 1	1500.19	1500.01	0.19	0.52	0.06	409.06	301.69	179.25	317.21
Mill_Creek	3084.02	PF 1	1499.61	1498.78	0.83	1.55	0.02				

```
252.37      524.65    112.99      267.06
  Mill_Creek    2966.14       PF 1        1498.04     1497.03       1.01          1.82          0.03
94.04       741.53     54.43       61.17
  Mill_Creek    2848.25       PF 1        1496.19     1494.87       1.32          1.75          0.17
54.30       720.84    114.86       39.72
  Mill_Creek    2729.93       PF 1        1494.27     1493.52       0.75          1.27          0.02
106.92      568.24    214.84       81.42
  Mill_Creek    2626.56       PF 1        1492.41     1491.48       0.93          1.04          0.14
74.89       675.44    139.68       69.26
  Mill_Creek    2511.04       PF 1        1491.23     1490.78       0.46          0.67          0.04
239.10      430.92    219.98       71.25
  Mill_Creek    2440.36       PF 1        1490.52     1489.66       0.86          1.37          0.00
215.59      316.93    357.49       66.49
  Mill_Creek    2345.39       PF 1        1489.15     1488.24       0.90          1.20          0.11
175.00      501.39    213.61       61.88
  Mill_Creek    2224.33       PF 1        1487.48     1486.96       0.52          1.12          0.03
280.23      357.44    252.33       66.27
  Mill_Creek    2102.98       PF 1        1486.34     1485.53       0.80          1.64          0.00
271.41      289.67    328.93       58.69
  Mill_Creek    1987.13       PF 1        1484.69     1483.87       0.82
409.16      251.10    229.74       74.65
```

EXCERPTS

EXCERPT A: CITY OF MENIFEE GENERAL PLAN LAND USE MAP

Exhibit LU-2
Land Use Map



Source: The Planning Center | DC&E, 2013

- Rural Mountainous (RM) 10 ac min
- Rural Residential 5 ac min (RR5)
- Rural Residential 2 ac min (RR2)
- Rural Residential 1 ac min (RR1)
- Rural Residential 1/2 ac min (RR1/2)
- 2.1-5 du/ac Residential (2.1-5R)
- 5.1-8 du/ac Residential (5.1-8R)
- 8.1-14 du/ac Residential (8.1-14R)
- 14.1-20 du/ac Residential (14.1-20R)
- 20.1-24 du/ac Residential (20.1-24R)
- Commercial Retail (CR) 0.20 - 0.35 FAR
- Commercial Office (CO) 0.25 - 1.0 FAR
- Heavy Industrial (HI) 0.15 - 0.50 FAR
- Business Park (BP) 0.25 - 0.60 FAR
- Economic Development Corridor (EDC)
- Agriculture (AG)
- Conservation (OS-C)
- Recreation (OS-R)
- Water (OS-W)
- Public/Quasi Public Facilities (PF)
- Public Utility Corridor (PUC)
- Railroad
- Specific Plan (SP)

MENIFEE GENERAL PLAN

THE PLANNING CENTER DC&E

1/22/2014

0 0.5 1 Mile

Exhibit_LU-2_LandUseMap

EXCERPT B: COUNTY OF RIVERSIDE SOUTHWEST AREA LAND USE PLAN

R5W R4W R3W R2W R1W

T7S

T8S

T5S

Antelope Valley

Santa Rosa Plateau

Sage

HIGHWAY 79 POLICY AREA (Continues on Sun City/Menifee Area Plan)

HIGHWAY 79 POLICY AREA (Continues on Harvest Valley/Winchester Area Plan)

HIGHWAY 79 POLICY AREA (Continues on San Jacinto Valley Area Plan)

SPECIFIC PLAN REQUIRED (See Specific Plans section of Harvest Valley/Winchester Area Plan and Specific Plans section of Southwest Area Plan text for development requirements)

LAKE ELSINORE ENVIRONS POLICY AREA

SCOTT ROAD POLICY AREA

HIGHWAY 79 POLICY AREA

LEON KELLER POLICY AREA

KELLER ROAD SOUTH SIDE POLICY AREA

SECTIONS 36 & 25 POLICY AREA

HIGHWAY 79 POLICY AREA

DIAMOND VALLEY LAKE POLICY AREA

NORTH BENTONER POLICY AREA

SP - 116

SP - 282

SP - 322

SP - 322

SP - 312

SP - 106

SP - 284

SP - 286

SP - 106

SP - 106

SP - 265

SP - 106

SP - 265

SP - 106

SP - 238

SP - 265

SP - 184

SP - 207

SP - 207

SP - 213

SP - 223

SP - 313

SP - 217

SANTA ROSA PLATEAU POLICY AREA

WALKER BASIN POLICY AREA

CITRUS VINEYARD RURAL POLICY AREA

VALLE DE LOS CABALLOS POLICY AREA

VAIL LAKE POLICY AREA

KELLER RD
CLINTON KEITH RD
SCOTT RD
ANTELOPE RD
WHITEWOOD RD
GOLDEN CITY DR
JEAN NICHOLAS RD
THOMPSON RD
BENTON RD
AULD RD
BOREL RD
BUCK RD
EAST BENTON RD
DE PORTOLA RD
LOS CABALLOS RD
NUTMEG ST
JACKSON AVE
CALIFORNIA OAKS RD
GOLDEN TRIANGLE
LOS ALISOS RD
CALLE DEL OSO ORO
MONROE AVE
ALTA MURRIETA DR
MURRIETA HOT SPRINGS RD
CELLAR SPRINGS Dr
TENAJA RD
KALMIA ST
IVY ST
JEFFERSON AVE
ADAMS AVE
MADISON AVE
FIG ST
AVENIDA LA CRESTA
GUAVA ST
WASHINGTON AVE
ELM ST
HAYES AVE
DULCE RD
RANCON CENTER BLV
GATE ST
NICOLAS RD
LEON RD
BUTTERFIELD STAGE RD
WALCOTT LN
LA SERENA Wy
RANCHO CALIFORNIA RD
MARGARITA RD
MURRIETA RD
MEADOWS PKY
RANCHO VISTA RD
YNEZ RD
SANTIAGO RD
ZEVO DR
VAQUERO RD
VIA SANTA ROSA
SANDIA CREEK DR
DE LUZ RD
VIA VAQUERO RD
CALLE DEL ORO
RANCHO CALIFORNIA RD
POLAR ST
JEREMIAH RD
VIA RIO TEMECULA
VAIL RANCH PKY
PALA RD
MARGARITA CANYON RD
MONTE VERDE RD
OLIVE LOOP
JADA RD
DE PORTOLA RD
VALE DR
GLENOAKS RD
LOS OSOS RD
WASHBURN RD
BUCK RD

GENERAL PLAN FOUNDATION COMPONENTS AND LAND USE DESIGNATIONS

COMMUNITY DEVELOPMENT
- Estate Density Residential (2 acre minimum lot size)
- Very Low Density Residential (1 acre minimum lot size)
- Low Density Residential (One-half acre minimum lot size)
- Medium Density Residential (2 - 5 D.U./acre)
- Medium High Density Residential (5 - 8 D.U./acre)
- High Density Residential (8 - 14 D.U./acre)
- Very High Density Residential (14 - 20 D.U./acre)
- Highest Density Residential (20+ D.U./acre)

COMMUNITY DEVELOPMENT (CONT)
- Commercial Retail
- Commercial Tourist
- Commercial Office
- Community Center
- Light Industrial
- Heavy Industrial
- Business Park
- Public Facilities
- Mixed Use Planning Area

RURAL COMMUNITY
- Estate Density Residential (2 acre minimum lot size)
- Very Low Density Residential (1 acre minimum lot size)
- Low Density Residential (One-half acre minimum lot size)

RURAL
- Rural Residential (5 acre minimum lot size)
- Rural Mountainous (10 acre minimum lot size)
- Rural Desert (10 acre minimum lot size)

AGRICULTURE
- Agriculture

OPEN SPACE
- Conservation
- Conservation - Habitat
- Open Space - Recreation
- Open Space - Rural
- Open Space - Water
- Open Space - Mineral Resources

Overlays
- Business Park
- Commercial Retail
- Rural Village and Rural Village Study Area
- Community Center
- Community Development

Definitions:
D.U. - Dwelling Units

- MWD Facilities
- Watercourse
- Supervisorial District Boundary
- Cities
- Sections
- Township/Range
- Areas Subject to Indian Jurisdiction
- Area Plan Boundaries

This map may not represent the most current information available and may be revised without prior notice. The geographic information system and other sources should be queried for the most current information. This map or any information represented on it, shall not be reproduced or transmitted in any form or by any means, electronic or mechanical, including photo copying and recording.

Note: This Map may show designations on lands that have been annexed to cities after 1999.

Source Information: General Plan land uses depicted on this map were developed by The County of Riverside Planning Department. The oldest data shown on this map was created in 1990.

6 Miles

Townships are 36 Sections

3,000 1,500 0 3,000 Feet

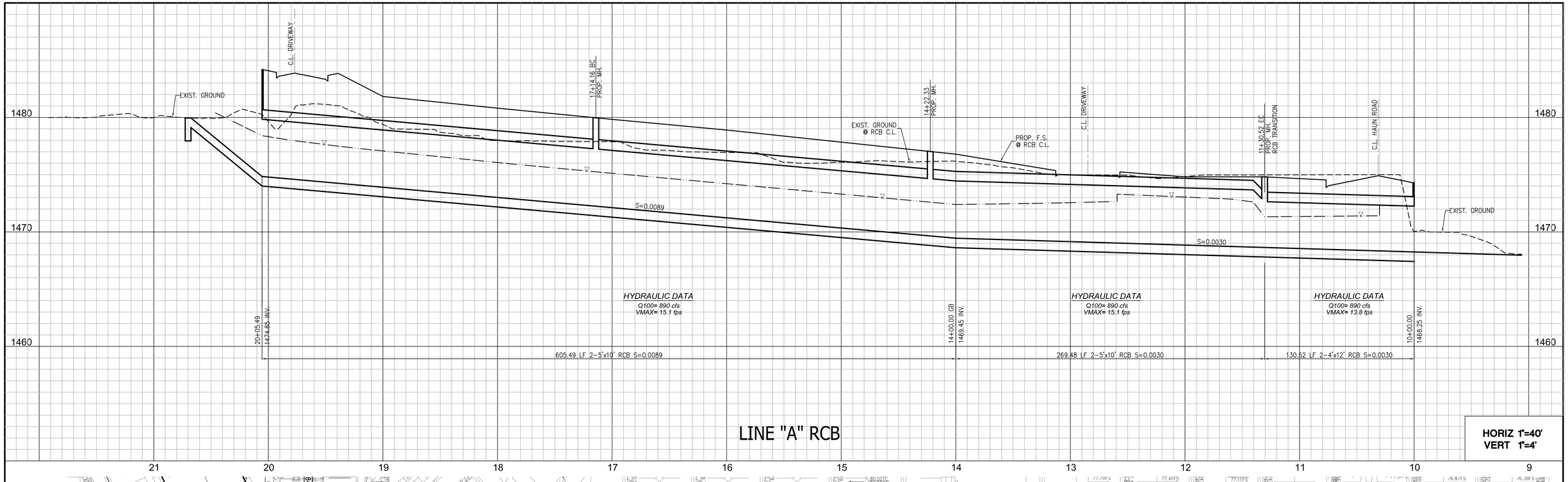
10/7/03

FINAL DRAFT

SOUTHWEST AREA LAND USE PLAN

M:\mdata\10102\99\gis_cop\Plot10_8_9.mxd JM 9/25/03

EXCERPT C: PROPOSED PLAN & PROFILE FOR LINE A RCB



PRELIMINARY

Call before you Dig
Avoid cutting underground utility lines. It's costly.
Call 811
1-800-227-2600

REVISIONS

SHT.	DESCRIPTION	DATE	BY	APRD

ENGINEER LOGO

PACIFIC COAST LAND CONSULTANTS, INC.
Civil Engineering • Land Planning • Land Surveying
25096 Jefferson Avenue, Suite "D", Murrieta, Ca. 92562
Tel: (951) 698-1350 Fax: (951) 698-8657

ENGINEER SEAL
REGISTERED PROFESSIONAL ENGINEER
CHRIS D. HOPPER
No. 34821
Exp. 9/30/19
CIVIL
STATE OF CALIFORNIA

SCALE:	SEE ABOVE
DESIGN:	XXX
DRAWN:	XXX
CHECKED:	XXX
APPROVED:	XXX
DATE:	09/04/2018

CITY OF MENIFEE
ENGINEERING DEPARTMENT

JONATHAN G. SMITH — RCE 61253 — DATE
DIRECTOR OF PUBLIC WORKS/ CITY ENGINEER — EXP. 6/30/20

RECOMMENDED BY: — DATE

CITY OF MENIFEE

DEVELOPMENT PLOT PLAN NO. 2017-167
MILL CREEK PROMENADE
REINFORCED CONCRETE BOX
PLAN & PROFILE

SHEET NO.
1 OF 1
PROJECT NO: ——————

S:\Land Projects 2004\27259 MILL CREEK PROMENADE\DWG\11-STORM\DRAIN\MC-RCB SD.dwg 12-19-18 11:27:54 AM

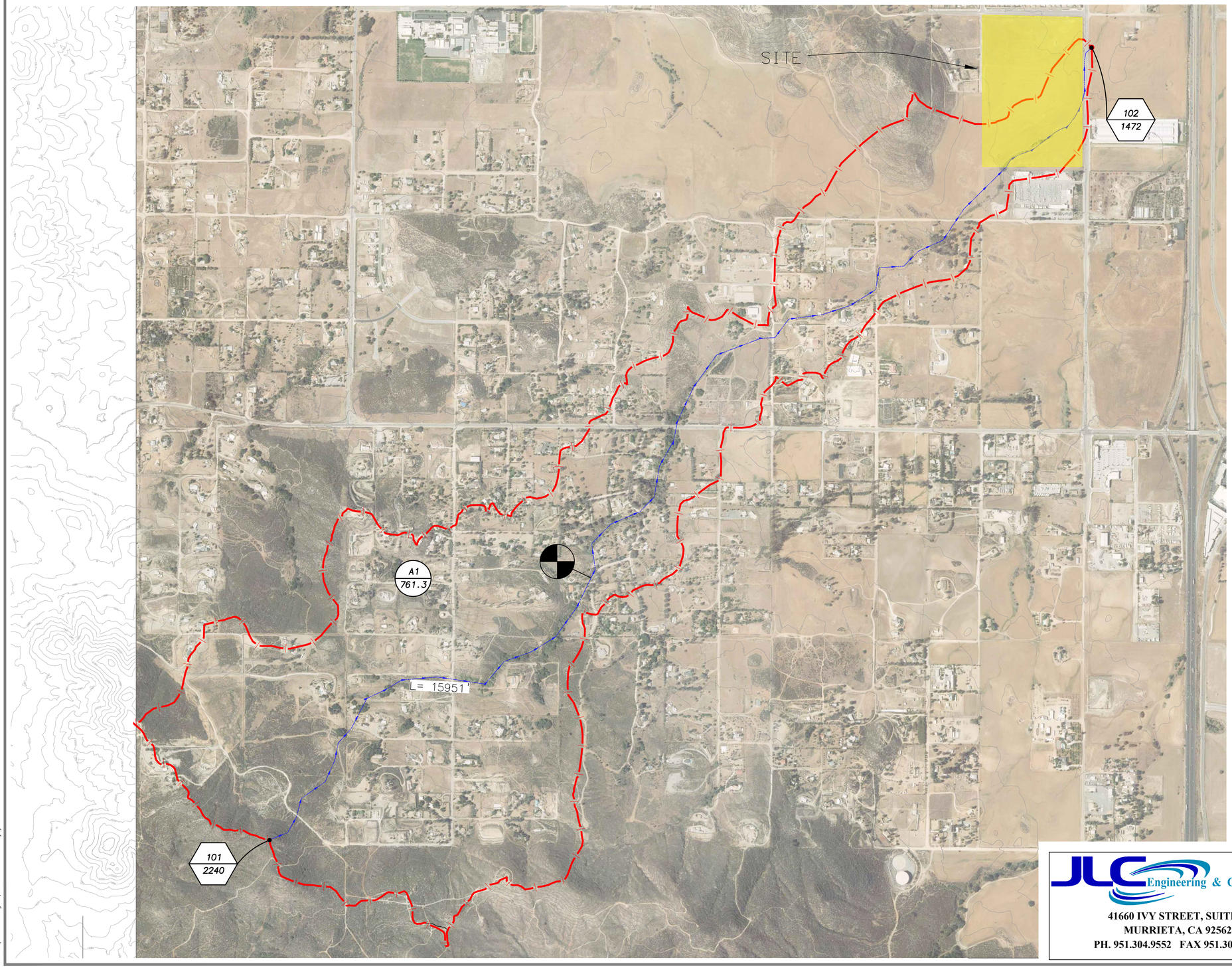
EXHIBITS

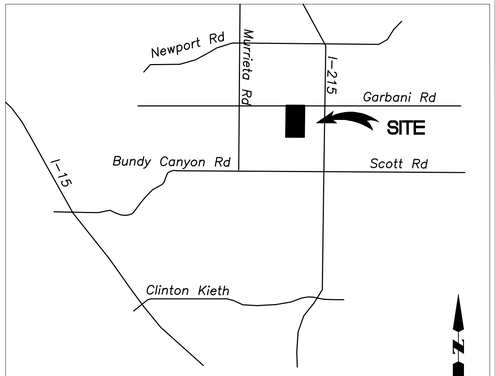
EXHIBIT A: UNIT HYDROGRAPH HYDROLOGY MAP

PLOT PLAN 2017-167

IN THE CITY OF MENIFEE, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

UNIT HYDROGRAPH MAP





VICINITY MAP

N.T.S.

TXN – RXW SECTION X

LEGEND:

XXX.X / XXXX	NODE/CONCENTRATION POINT / FLOWLINE ELEVATION
XXX / X.X	SUB AREA / ACRES
L=XXX'	FLOW DISTANCE
	FLOW PATH
	WATERSHED BOUNDARY

HYDROLOGIC DATA SUMMARY:

AREA	NODE	NODE	LENGTH	Lca	AREA
1	101	102	15,951	10,150	761.3

100 YR FLOWRATE SUMMARY (Q, CFS)	
DURATION (HOURS)	Q (CFS)
3	888
6	788
24	438

N

GRAPHIC SCALE

600' 0 300' 600' 1200'

1" = 600'

JLC Engineering & Consulting, Inc.

41660 IVY STREET, SUITE A
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

EXHIBIT "A"

PP 2017-167

UNIT HYDROGRAPH HYDROLOGY MAP

Drawing Name: G:\725.0118\Engineering\Hydrology_Plan\Exhibits\Hydrology Map.dwg
Last Opened: Aug 14, 2018 - 8:13am by jsarver

EXHIBIT B: PRE-PROJECT CONDITION HEC-RAS WORK MAP

SHEET 1 OF 1

FLOOD PLAIN LIMITS

IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

PRE-PROJECT CONDITION

GARBANI ROAD

HAUN ROAD

XS-12+27.75

XS-13+15.03

XS-13+91.24

XS-14+59.22

XS-15+32.68

XS-15+88.00

XS-16+69.81

XS-17+53.19

XS-18+37.07

XS-19+87.13

XS-21+02.98

XS-22+24.33

XS-23+45.39

XS-24+40.36

XS-25+11.04

XS-26+26.56

XS-27+29.93

XS-28+48.25

XS-29+66.14

XS-30+84.02

XS-31+36.80

XS-31+84.66

XS-32+36.43

N

GRAPHIC SCALE

80' 0 40' 80' 160'

1" = 80'

EXHIBIT "B"

PLOT PLAN 2017-167

PRE-PROJECT CONDITION FLOOD PLAIN MAP

JLC Engineering & Consulting, Inc.

41660 IVY STREET, SUITE A
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

Last Opened: Aug 14, 2018 — 8:28am by jcarver

EXHIBIT C: POST-PROJECT CONDITION HEC-RAS WORK MAP

FLOOD PLAIN LIMITS

IN THE CITY OF MENIFEE, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

POST-PROJECT CONDITION

WSE=1490.78 | XS-25+11.04

WSE=1491.48 | XS-26+26.56

WSE=1493.52 | XS-27+29.93

WSE=1494.87 | XS-28+48.25

WSE=1497.03 | XS-29+66.14

XS-30+84.02
WSE=1498.78

XS-31+36.80
WSE=1500.01

XS-31+84.66
WSE=1500.05

INEFFECTIVE FLOW AREA

WSE=1500.17 | XS-32+36.43

XS-19+87.13 | WSE=1483.87

XS-21+02.98 | WSE=1485.53

XS-22+24.33 | WSE=1486.96

XS-23+45.39 | WSE=1488.24

XS-24+40.36 | WSE=1489.66

N

GRAPHIC SCALE
80' 0 40' 80' 160'
1" = 80'

EXHIBIT "C"

PLOT PLAN 2017-167

POST-PROJECT CONDITION FLOOD PLAIN MAP

JLC Engineering & Consulting, Inc.
41660 IVY STREET, SUITE A
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

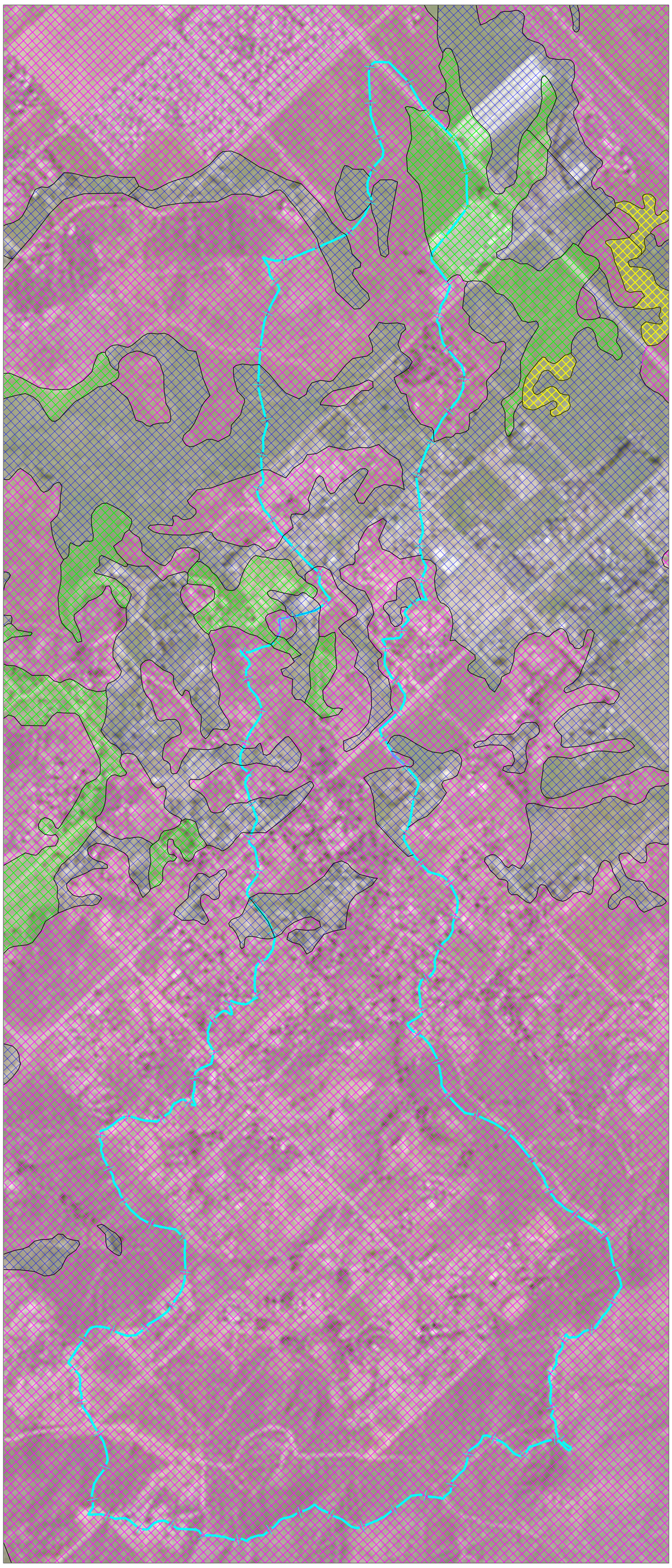
Last Opened: Aug 17, 2018 — 10:02am by joe

EXHIBIT D: HYDROLOGIC SOILS MAP

PLOT PLAN 2017-167

IN THE CITY OF MENIFEE, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

SOILS MAP



LEGEND:

WATERSHED BOUNDARY

SOIL A

SOIL B

SOIL C

SOIL D

GRAPHIC SCALE
600' 0 300' 600' 1200'
1" = 600'

JLC Engineering & Consulting, Inc.
41660 IVY STREET, SUITE A
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

EXHIBIT "D"

PLOT PLAN 2017-167

SOILS MAP

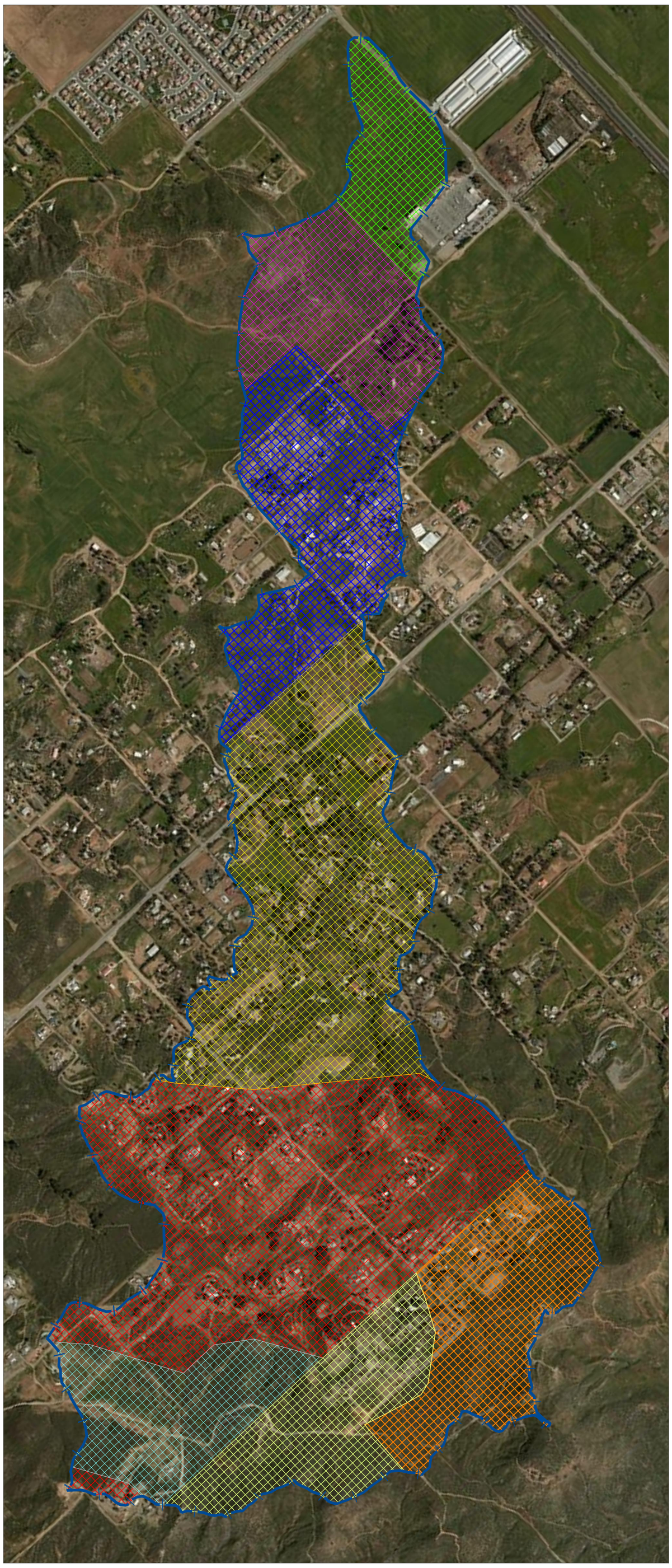
Drawing Name: O:\275.01.18\Engineering\Hydrology_Plan\Exhibits\Soils Map.dwg
Last Opened: Aug 14, 2018 - 8:25am by jcarver

EXHIBIT E: LAND COVER MAP

PLOT PLAN 2017-167

IN THE CITY OF MENIFEE, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

LAND USE MAP



LEGEND:

- WATERSHED BOUNDARY
- ECONOMIC DEVELOPMENT CORRIDOR
- 0.25 AC RESIDENTIAL
- 1 AC RESIDENTIAL
- 2 AC RESIDENTIAL
- 0.50 AC RESIDENTIAL
- RURAL MOUNTAIN 10 AC
- RURAL COMMUNITY
- RURAL MOUNTAIN

N

GRAPHIC SCALE

600' 0 300' 600' 1200'

1" = 600'

Drawing Name: 0:\275.01.18\Engineering\Hydrology_Plan\Exhibits\Land Use Map.dwg
Last Opened: Aug 14, 2018 - 9:31am by jcarver

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PH. 951.304.9552 FAX 951.304.3568

EXHIBIT E

PLOT PLAN 2017-167

LAND USE MAP

EXHIBIT F: RAINFALL MAPS

2 YEAR, 3 HOUR

MILL CREEK PROMENADE
RAINFALL = 0.94

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Notes:
Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973.

RCFC & WCD
Hydrology Manual

RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT

2-YEAR — 3-HOUR
PRECIPITATION

APPROVED CHIEF ENGINEER R.E. NO. 8855	DRAWN BY R.A.S.	SHEET NO
DATE:	PLATE E-5.1	DR. NO
REVISED:		

2 YEAR, 6 HOUR

MILL CREEK PROMENADE
RAINFALL = 1.33

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NOTES
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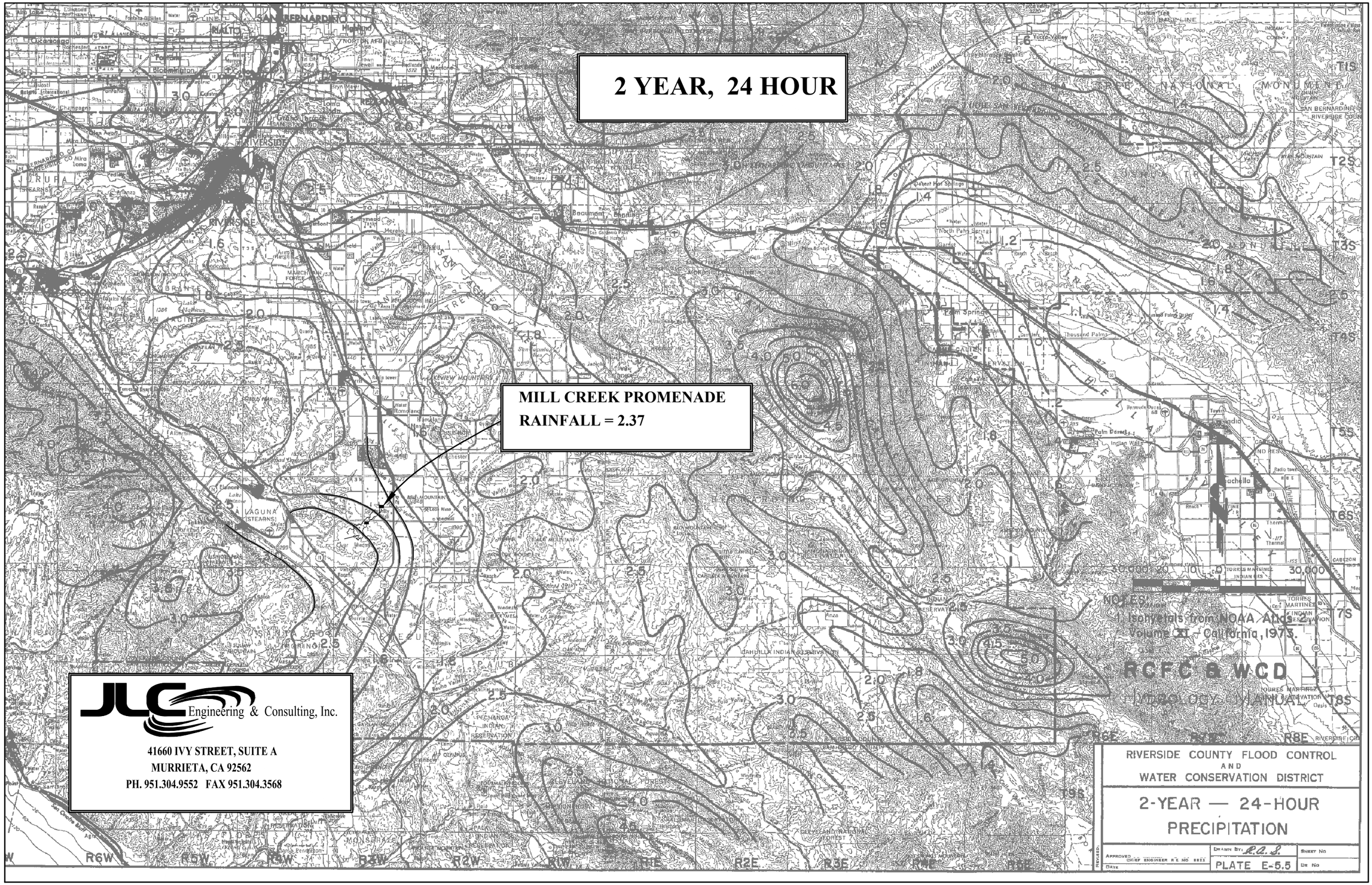
2-YEAR — 6-HOUR
PRECIPITATION

APPROVED: CHIEF ENGINEER R.E. NO. 6822	DRAWN BY:	SHEET NO
DATE:	PLATE E-5.3	DA NO


2 YEAR, 24 HOUR
MILL CREEK PROMENADE
RAINFALL = 2.37
NOTES:
1. Isohyetals from NOAA Atlas 2,
Volume XI - California, 1973.
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AND
WATER CONSERVATION DISTRICT
2-YEAR — 24-HOUR
PRECIPITATION
PLATE E-5.5
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100 YEAR, 3 HOUR

MILL CREEK PROMENADE
RAINFALL = 2.29

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NOTES:
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973

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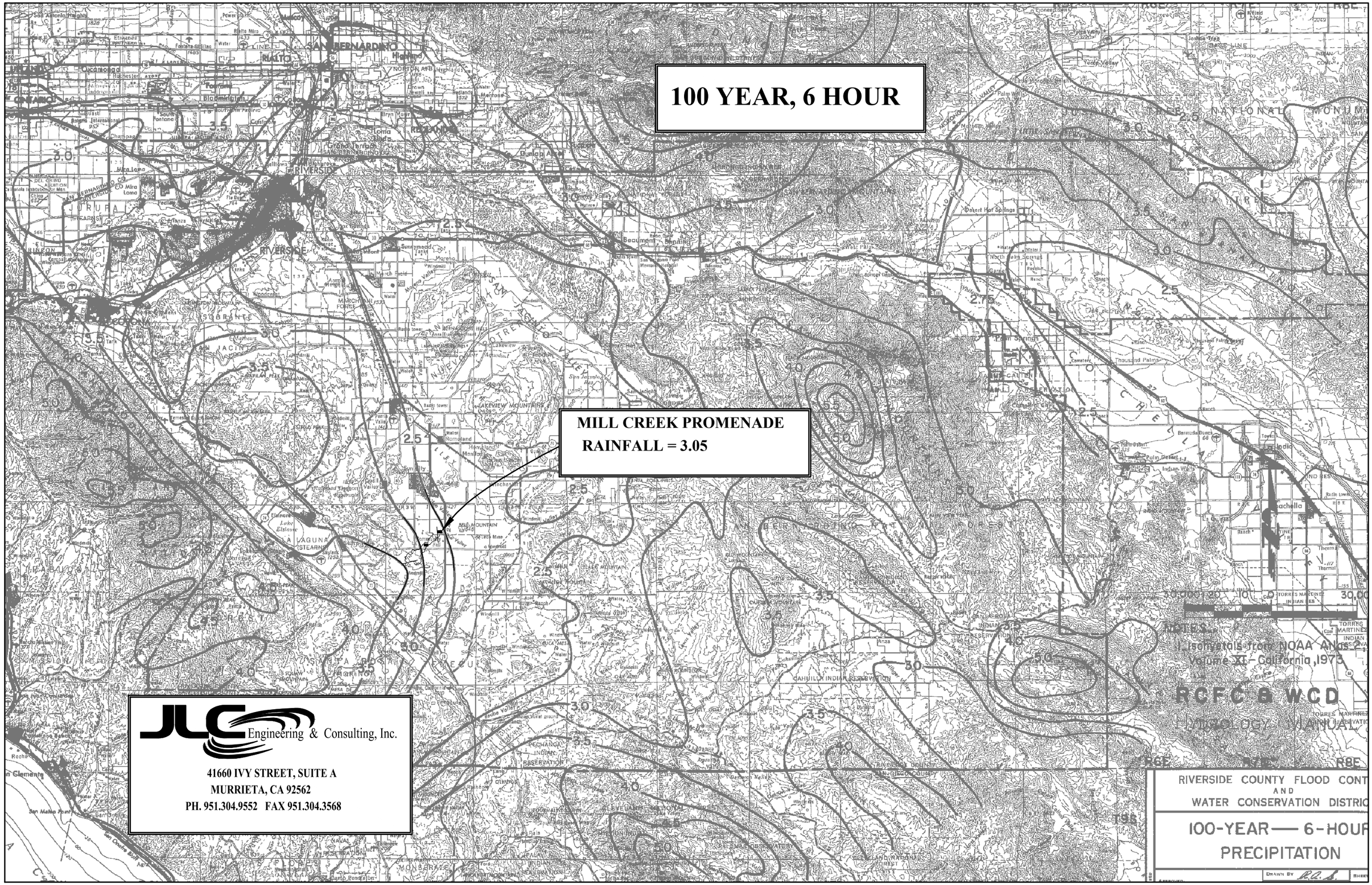
RIVERSIDE COUNTY FLOOD CON
AND
WATER CONSERVATION DISTR

100-YEAR — 3-HOU
PRECIPITATION

DRAWN BY
APPROVED


100 YEAR, 6 HOUR
MILL CREEK PROMENADE
RAINFALL = 3.05
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100-YEAR — 6-HOUR
PRECIPITATION

100 YEAR, 24 HOUR

MILL CREEK PROMENADE
RAINFALL = 6.23

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NOTES:
1. Isohyetals from NOAA Atlas 2, Volume XI - California, 1973.

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AND
WATER CONSERVATION DISTRICT

100-YEAR — 24-HOUR
PRECIPITATION

APPROVED CHIEF ENGINEER R.C.E. NO. 8822	DRAWN BY	SHEET NO
DATE	PLATE E-5.6	DR. NO