Carnevale Subdivision

HEC-RAS Study

Prepared for

County of San Diego

TPM 21133

Environmental Log No. 08-14-015

REGISTERED PROFESSIONAL ENGINEER
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Exp. 6-30-2012
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Date:

November 19, 2010

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DAVID EVANS AND ASSOCIATES INC.

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TABLE OF CONTENTS

VICINITY MAP 3

INTRODUCTION 4

PURPOSE AND SCOPE 4

EXISTING CONDITIONS 5

PROPOSED CONDITIONS 5

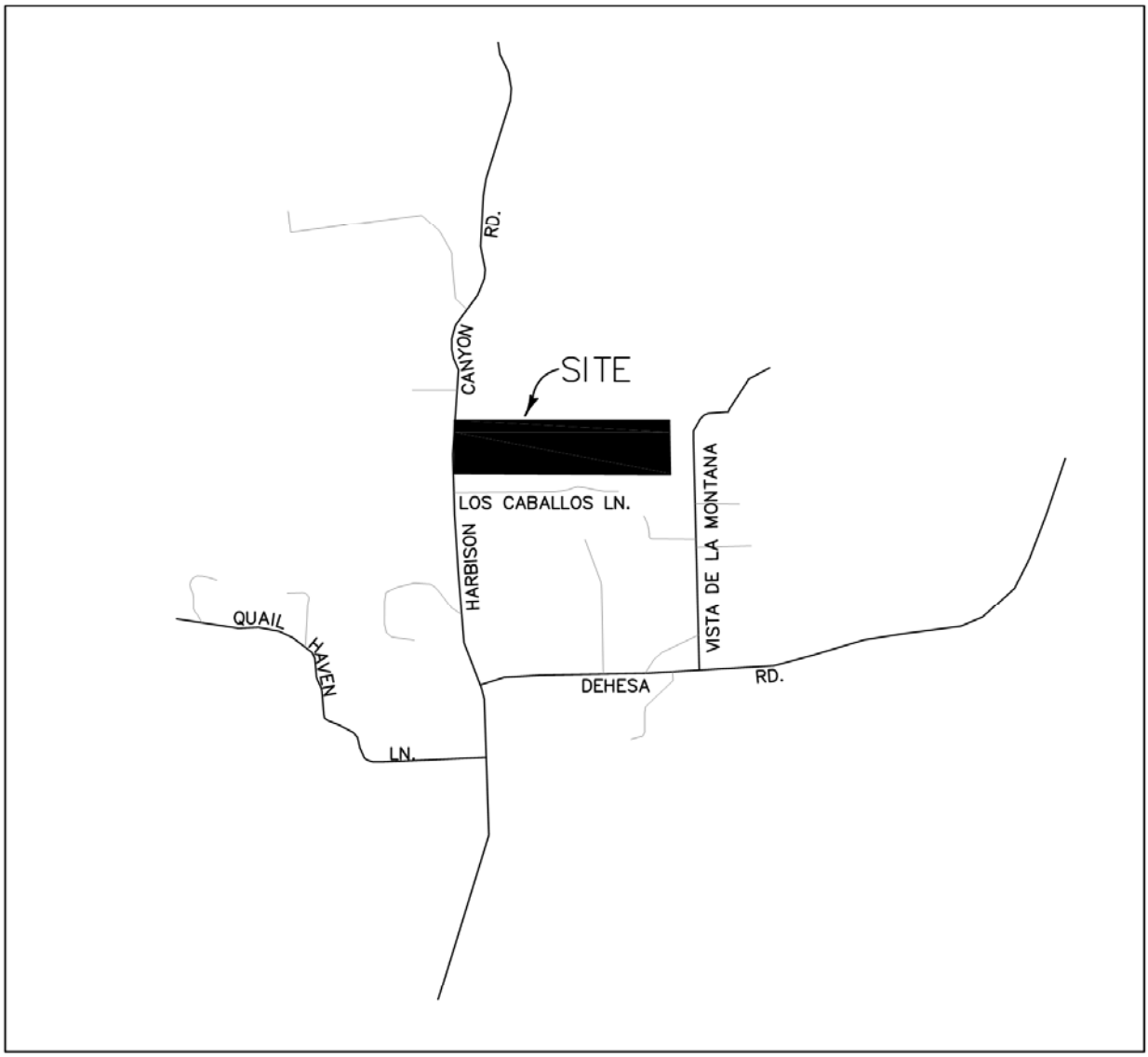
METHODOLOGY AND CALCULATIONS 6

CONCLUSIONS & RECOMMENDATIONS 7

WORKS CITED 10

APPENDIX 11

A. No Rise Certification
B. Existing Hec 2 Study
   I. 10-year and 100-year Analyses
   II. 100-year Floodplain and Floodway Analyses
   III. Existing Topographic Work Map
C. HEC-RAS model of existing Hec 2 Study
   I. 10-year and 100-year Analyses
   II. 100-year Floodplain and Floodway Analyses
D. HEC-RAS model of proposed conditions
   I. 10-year and 100-year Analyses
   II. 100-year Floodplain and Floodway Analyses
   III. Proposed Topographic Work Map
E. Proposed Dip Section Exhibit
F. Existing Dip Section Exhibit



VICINITY MAP

NO SCALE

DAVID EVANS AND ASSOCIATES INC.

Introduction

The project site is located on the east side of Harbison Canyon Road approximately one and one-half miles north of the confluence of Harbison Canyon Creek and Sweetwater River. Harbison Canyon Creek flows through the westerly portion of the project site. The project will subdivide the property into 4 new parcels and one remainder parcel. The remainder parcel is currently developed with one single family home located between the Harbison Canyon Road and the creek. The four new parcels access Harbison Canyon Road via Los Caballos Lane that includes an existing 13 foot wide concrete dip section. The County of San Diego and the San Diego Rural Fire Protection District have requested that the existing dip section be upgraded to provide a minimum width of 24 feet and that it be designed in accordance with the County Standards outlined in DS-14, Private Street Dip Section.

Purpose and Scope

The County of San Diego has requested that the existing dip section crossing at Los Caballos Lane be widened to provide a clear width of 24 feet and revise the vertical alignment to be consistent with DS-14. The dip section crosses Harbison Canyon Creek at cross section E-E as shown on the revised FEMA Flood Insurance Rate Map (FIRM) 06073C1686 F and 06073C1687 F. This study provides a hydraulic model of the creek in support of the “No Rise” Certification. The original hydraulic model prepared in support of the revised FEMA map dated December 8, 1999 was based on a HEC 2 model. HEC-RAS models have since replaced the HEC 2 Models. A new HEC-RAS model was prepared using the original HEC 2 data as a baseline to show the differences between the two models. The proposed improvements to the dip section and the existing ground as shown on the

current topographic survey are reflected in the HECRAS model. The model extends 515 feet downstream of the new improvements and 572 feet upstream of the new improvements to show that no increases are anticipated within these reaches of the creek.

Existing Conditions

The existing dip section crossing Harbison Canyon Creek is 13 feet wide with seven 18-inch culverts. The width of the existing dip section does not meet the fire departments minimum width of 24 feet. The vertical profile is abrupt as shown in section A-A in Appendix F. The 10 year water surface elevation at the dip section is 581.4 and is 3 feet above the existing dip section elevation. A maximum depth between the 10 year water surface elevation and the dip section elevation of 10 inches is allowed by DS-14, therefore the existing condition is 2.2 feet greater the maximum allowed depth. The velocity in the existing 10 year condition is 6.3 feet per second and the flow is 1050 cubic feet per second.

Proposed Conditions

A new dip section has been designed for the crossing in accordance with the criteria outlined in DS-14. The dip section is 24 feet wide. A total of seven 48-inch culverts have been added to allow more flow through the pipes and lessen the flow over the dip section. The water surface elevation at new dip section will be a maximum of 580.1 during a 10 year storm. The details of the new dip section are shown on the preliminary design drawings in Appendix E.

Methodology and Calculations

The original hydraulic model prepared in support of the revised FEMA map dated December 8, 1999 was based on a HEC 2 model. HEC-RAS models have replaced the HEC 2 Model. A new HEC-RAS model was prepared using the original HEC 2 data as a baseline to show the differences between the two models. The existing HEC 2 model is in Appendix B. The section locations are shown on the FEMA map are also located in Appendix B. The baseline HEC-RAS model is shown in Appendix C. The input data and the section locations are consistent with the original HEC 2 model. The HEC-RAS model of the proposed conditions and the current topographic mapping are in Appendix D. The ground conditions within the project reflect the current topographic survey dated April 24, 2006. The proposed changes to the dip section including the addition of seven 48-inch culverts are modeled in accordance with the detailed design drawings in Appendix E.

Conclusions & Recommendations

A baseline HEC-RAS model was prepared in HEC-RAS 4.1.0 using the 1999 HEC 2 Study Data for purposes of comparing results of the two models. Table 1 summarizes the 100 year and 10 year water surface elevations (WSEL) for both models.

Table 1: Existing WSEL Comparison

Station	Flood Year	HEC 2 WSEL	HECRAS WSEL	Δ* (ft)
3 310	10	575.37	575.37	0
	100	578.40	578.40	0
3 710	10	578.43	578.38	-0.05
	100	581.30	581.26	-0.04
3 405	10	580.30	580.23	-0.07
	100	582.80	582.78	-0.02
3 407	10	581.39	581.39	0
	100	583.52	583.52	0
3 410**	10	581.88	581.88	0
	100	583.93	583.93	0
3 460	10	582.84	582.83	-0.01
	100	585.28	585.34	0.06
3 530	10	584.21	584.21	0
	100	587.45	587.42	-0.03

*A positive change in WSEL indicates and increase in WSEL from the HEC2 model to the HEC-RAS model
**Upstream dip section station

The differences vary from a 0.06 foot increase to a decrease of 0.07 feet, and are considered insignificant to the accuracy of the models.

A HEC-RAS model was prepared using the existing ground within the project area as shown on the topographic work map located in Appendix D. The water surface elevations and velocities at the dip section as well as upstream and downstream of the proposed improvements were compared for 100 year and 10 year conditions. Table 2 summarizes the results.

Table 2: Existing vs. Proposed WSEL

Station	Flood Year	Existing WSEL	Proposed WSEL	Δ* (ft)	Existing V (ft/s)	Proposed V (ft/s)	Δ (ft/s)
3 310	10	575.37	575.37	0	7.13	7.13	0
	100	578.40	578.40	0	5.08	5.08	0
3 370	10	578.38	578.38	0	6.89	6.89	0
	100	581.26	581.26	0	8.37	8.37	0
3 405	10	580.23	579.53	-0.70	5.78	4.04	-1.74
	100	582.78	582.71	-0.07	8.04	6.07	-1.97
3 410**	10	581.88	580.74	-1.14	3.38	3.09	-0.29
	100	583.93	583.57	-0.36	6.38	5.46	-0.92
3 460	10	582.83	582.64	-0.19	5.84	5.68	-0.16
	100	585.34	585.02	-0.32	7.82	7.70	-0.12
3 530	10	584.21	584.02	-0.19	6.57	7.04	0.47
	100	587.42	587.42	0	6.32	6.32	0

*A positive change in WSEL indicates and increase in WSEL from the existing HEC 2 model to the proposed HEC-RAS model
**Upstream dip section station

The water surface elevation for both the 100 year and 10 year conditions decreased at the sections immediately upstream of the dip section, as well as at the remaining upstream sections that where modeled. There is also a decrease in the 100 year and 10 year water surface elevation at the downstream edge of the proposed dip section and further downstream there is no change in the water surface elevation. The velocities have all decreased for both the 10 year and 100 year flood, except for an increase of 0.47 feet per second at station 3 530 in the 10 year condition.

Analysis for both the pre and post floodway width and water surface elevation was also completed. The proposed floodway was modeled using the existing floodway widths at the appropriate stations. The results summarized in Table 3 show that there are no increases in the proposed floodway water surface elevation and floodway width.

Table 3: Pre and Post Floodway Width

Station	Flood Year	Existing WSEL	Δ* (ft)	Existing Top Width	Proposed WSEL	Δ* (ft)	Proposed Top Width
3 310	100	578.40			578.40		
	Floodway	578.76	0.36	100.0	578.76	0.36	100.0
3 370	100	581.26			581.26		
	Floodway	581.51	0.25	110.0	581.51	0.25	110.0
3 405	100	582.78			582.71		
	Floodway	583.57	0.79	105.0	583.53	0.83	105.0
3 410**	100	583.93			583.57		
	Floodway	584.97	1.04	110.0	584.83	1.26	110.0
3 460	100	585.34			585.02		
	Floodway	585.89	0.55	88.80	585.69	0.67	88.80
3 530	100	587.42			587.42		
	Floodway	587.60	0.18	65.0	587.36	-0.06	65.0

*A positive change in WSEL indicates and increase in WSEL from the base flood to the floodway condition.
**Upstream dip section station

The proposed model for the 100 year condition shows there are zero increases in the water surface elevations and velocities during a base flood discharge. Similarly, there are zero increases in the floodway water surface elevations and the floodway widths due to the proposed improvements. A “No Rise” certification has been completed for this project and is located in Appendix A.

Works Cited

HEC 2 Study. December 1999.

HEC-RAS Study, November 17, 2010.

County of San Diego. Drainage Design Manual. July 2005.

San Diego County Design Standards. November 2009.

APPENDIX

APPENDIX A

"NO RISE" CERTIFICATION

"NO-RISE" CERTIFICATION

This is to certify that I am a duly qualified registered professional engineer licensed to practice in the State of California.

It is further to certify that the attached technical data supports the fact that the proposed Carnevale Subdivision, TPM 21133, will not impact the 10-year or 100-year flood elevations, floodway elevations, or floodway widths on Harbison Canyon Creek at published sections in the Revised Flood Insurance Rate Map (FIRM), map numbers 06073C1686 F and 06073C1687 F, for the County of San Diego unincorporated areas, dated December 8, 1999 and will not impact the 10-year or 100-year flood elevations, floodway elevations, or floodway widths at unpublished cross-sections in the vicinity of the proposed development.

The following documents located in Appendices B-D of this HEC-RAS Study support my findings:

B. Existing Hec 2 Study
   I. 10-year and 100-year Analyses
   II. 100-year Floodplain and Floodway Analyses
   III. Existing Topographic Work Map
C. HEC-RAS model of existing Hec 2 Study
   I. 10-year and 100-year Analyses
   II. 100-year Floodplain and Floodway Analyses
D. HEC-RAS model of proposed conditions
   I. 10-year and 100-year Analyses
   II. 100-year Floodplain and Floodway Analyses
   III. Proposed Topographic Work Map

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STATE OF CALIFORNIA

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APPENDIX B

EXISTING HEC 2 STUDY

APPENDIX B.I

Harbison Canyon Creek
10-year and 100-year Analyses

DAVID EVANS AND ASSOCIATES INC.

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*****************************************
*  HEC-2 WATER SURFACE PROFILES          *
*                                        *
*  Version   4 6 2,  May 1991            *
*                                        *
*  RUN DATE    09DEC99    TIME   03 59 30 *
*****************************************
```

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**********************************
*  U S  ARMY CORPS OF ENGINEERS
*  HYDROLOGIC ENGINEERING CENTER
*  609 SECOND STREET  SUITE D
*  DAVIS  CALIFORNIA 95616-4687
*          (916) 756-1104
**********************************
```

```
X     X  XXXXXXX   XXXXX              XXXXX
X     X  X        X     X            X     X
X     X  X        X                        X
XXXXXXX  XXXX     X         XXXXX    XXXXX
X     X  X        X                  X
X     X  X        X     X            X
X     X  XXXXXXX   XXXXX             XXXXXXX
```

THIS RUN EXECUTED 09DEC99 03 59 30

```
************************************
HEC 2 WATER SURFACE PROFILES

Version   4 6 2   May 1991
************************************

T1  CLOUD RESIDENCE              DECEMBER 6  1999              J-13606
T2  HARBISON CANYON - LOMR MULTIPROFILE RUN
T3  10-YEAR AND 100-YEAR STORM EVENT                    FN  CLOUD10 HC2

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

      0        2        0        0        0        0        0        0     571 41      0

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

      1        0       -1        0        0        0        0        0        0        0


NC      040      040      035        1        3
QT        2     1050     4700
X1    3 222       21    366 3    439 5
GR    587 8      0 0    577 9     23 4    577 2     50 3    574 6     76 4    573 5    131 1
GR    573 6    200 4    573 4    250 5    574 1    290 8    573 6    366 3    568 6    379 1
GR    568 3    392 4    568 3    410 2    572 0    439 5    573 9    501 9    575 0    564 0
GR    576 7    614 8    579 6    703 2    581 5    770 3    584 4    848 2    585 5    866 8
GR    587 5    893 6

X1     3 31     24 0    505 0    544 6      410      430      420
GR    588 0        0   586 00     13 6   584 00     30 2   582 00     45 8   580 00     97 6
GR    578 0    152 8   578 00    207 8   578 00    229 5   578 00    277 2   578 00    344 7
GR    576 0    456 5   574 00    505 0   572 00    515 0   572 00    527 1   572 00    537 3
GR    574 0    544 6   576 00    562 4   577 00    650 0   578 00    715 2   580 00    804 8
GR    582 0    838 4   584 00    876 8   586 00    915 8   588 00    946 4

NC      035      035      035
X1     3 37     23 0    340 1    408 9      300    295 0    290 0
GR    590 0        0   588 00     31 9   586 00     55 3   584 00     72 3   583 00    112 6
GR    582 0    194 9   580 00    225 3   582 00    242 3   582 00    251 5   580 00    288 4
GR    578 0    340 1   576 00    373 4   574 50    386 8   576 00    401 1   578 00    408 9
GR    580 0    427 3   582 00    478 3   583 00    578 9   583 00    716 2   584 00    806 8
GR    586 0    850 8   588 00    910 4   590 00    939 3
BEGIN CULVERTS

X1    3 405    27 0    255 0      335    210 8    197 3    205 2
GR    594 0        0   592 00       7   590 00       15   588 00       25   586 00       45
GR    584 0       95   584 00     125   584 20      150   584 00      170   584 00    205 0
GR      582      220      580      255      578      270      576      275      575      280
GR      576      290      578      300      580      335      582      395    583 5      530
GR      584      570      584      660      586      730      588      755      590      800
GR      592      840      594      870
```

X1	3 407	24	225	390	10	10	10			
GR	594	0	592	8	590	18	588	28	586	48
GR	584	92	584	125	584 3	150	584	175	584	200
GR	584	210	582	225	580	255	579 5	300	580	330
GR	582	390	583 5	500	584	540	584 2	670	586	735
GR	588	760	590	800	592	830	594	865		

X1	3 41	22 0	256 8	332 7	10	10	10			
GR	594 0	0	592 00	11 4	590 00	23 1	588 00	32 5	586 00	55 3
GR	584 0	119 8	584 00	192 2	584 00	224 5	582 00	238 8	580 00	256 8
GR	578 0	279 3	578 00	289 3	578 00	298 2	580 00	332 7	582 00	398 2
GR	584 0	489 8	585 00	631 5	586 00	741 8	588 00	765 9	590 00	803 2
GR	592 0	839 9	594 00	870 9						

END CULVERTS

NC	035	035	025							
X1	3 46	25 0	467 8	513 1	230 0	205 0	220 0			
GR	600 0	0	596 00	19 7	592 00	39 4	590 00	56 9	588 00	126 0
GR	587 5	224 3	586 00	319 4	584 00	351 1	582 00	408 2	582 00	467 8
GR	580 0	480 3	578 00	488 9	578	495	580 00	500 9	584 00	513 1
GR	586 0	561 8	586 0	724 4	586 00	775 7	588 00	842 0	590 00	871 2
GR	592 0	895 9	594 0	921 9	596 00	961 8	598 00	993 6	600 00	1019 6

CLOUD RESIDENCE LOCATION

↳ now Carnevale Residence

X1	3 53	21 0	613 4	685 6	344 0	372 0	352 0			
GR	594 0	0	593 00	66 1	592 00	121 8	590 00	211 7	588 00	324 6
GR	586 0	422 0	585 60	487 3	586 00	593 0	586 00	593 4	586 00	613 4
GR	582 0	631 1	580 00	651 7	580 00	659 8	580 00	666 5	584 00	675 7
GR	586 0	685 6	588 00	709 6	590 00	722 7	592 00	739 2	594 00	758 8
GR	600 0	789 2								

X1	3 57	13 0	526 2	588 7	214 0	336 0	220 0			
GR	596 0	0	594 00	118 0	592 00	193 7	590 00	318 0	588 00	441 1
GR	584 0	526 2	582 00	536 8	582 00	549 5	582 00	561 2	590 00	579 7
GR	594 0	588 7	596 00	633 4	598 00	664 8				

NC	035	035	035							
X1	3 60	16 0	456 5	506 5	258 2	232 4	247 6			
GR	600 0	0	598 00	153 1	596 00	278 1	594 00	323 4	594 00	348 7
GR	592 0	379 4	590 00	408 0	588 00	456 5	586 00	469 5	586 00	482 5
GR	586 0	497 1	588 00	506 5	590 00	524 3	592 00	568 6	594 00	576 3
GR	600 0	588 9								

NC	025	035	025							
QT	2	1000	4500							
X1	3 621	41	818 4	872 2	245	235	240			
GR	620 9	0 0	610 8	20 1	610 2	41 9	605 1	66 4	605 1	111 2
GR	604 6	168 0	605 4	207 1	605 3	232 7	604 6	264 4	603 9	375 6
GR	604 6	395 8	601 4	406 8	603 5	419 5	603 3	446 5	602 9	468 7
GR	602 8	501 4	602 8	518 1	602 4	538 2	601 6	584 3	600 2	638 3
GR	599 1	671 6	597 2	698 1	598 0	709 7	598 3	731 9	597 6	742 5
GR	595 6	767 2	594 0	786 2	594 1	818 4	590 4	825 0	590 4	835 5
GR	590 4	849 5	594 5	872 2	594 3	903 5	594 7	958 0	594 8	998 6

GR	595 5	1053 6	596 9	1108 8	598 1	1162 0	599 2	1232 4	606 8	1276 5
GR	623 1	1332 8								

X1	3 678	57	298 8	332 4	327	295	313			
GR	603 7	0 0	604 0	24 0	603 0	31 8	602 0	44 5	601 1	47 2
GR	600 1	49 8	600 2	52 9	600 8	67 1	600 5	84 3	599 7	90 6
GR	598 7	93 4	597 8	96 2	596 9	97 7	596 0	100 5	595 0	113 1
GR	594 1	141 7	593 5	155 0	594 3	196 2	594 9	247 9	595 8	298 8
GR	594 9	302 3	593 9	305 4	593 0	307 6	592 0	308 3	591 0	309 6
GR	590 9	310 0	590 9	315 8	590 9	322 1	591 9	323 5	592 8	325 3
GR	593 8	326 2	594 7	328 5	595 6	329 6	596 5	332 4	595 6	338 5
GR	594 6	370 2	604 2	370 6	611 5	391 7	611 5	411 1	596 0	415 5
GR	595 8	461 5	606 6	461 6	607 9	478 2	596 3	478 2	596 3	487 5
GR	609 9	488 5	609 7	528 5	598 2	529 3	597 5	543 6	596 5	552 7
GR	596 3	571 7	597 2	604 2	598 2	625 4	598 7	649 5	599 4	655 3
GR	600 4	665 3	601 3	669 0						

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*PROF 1

CCHV= 100 CEHV= 300

*SECNO 3 222

3 222	3 11	571 41	00	571 41	572 25	84	00	00	573 60
1050 0	0	1050 0	0	0	143 1	0	0	0	572 00
00	00	7 34	00	000	035	000	000	568 30	371 91
010134	0	0	0	0	0	0	00	62 92	434 83

*SECNO 3 310

3 310	3 37	575 37	575 35	00	576 36	99	4 07	05	574 00
1050 0	63 0	964 0	23 0	22 7	116 1	8 3	1 4	7	574 00
01	2 77	8 30	2 76	040	035	040	000	572 00	471 82
009262	410	420	430	5	8	0	00	84 96	556 78

*SECNO 3 370

3 370	3 93	578 43	00	00	579 21	78	2 83	02	578 00
1050 0	3 7	1044 9	1 3	2 4	147 0	9	2 4	1 3	578 00
03	1 55	7 11	1 54	035	035	035	000	574 50	328 94
010282	300	290	295	2	0	0	00	83 94	412 87

*SECNO 3 405

3 405	5 30	580 30	00	00	580 79	49	1 55	03	580 00
1050 0	7	1048 1	1 2	8	186 3	1 3	3 2	1 7	580 00
04	91	5 63	91	035	035	035	000	575 00	249 79
005774	211	205	197	2	0	0	00	94 14	343 93

*SECNO 3 407

3685 20 TRIALS ATTEMPTED WSEL CWSEL

3693 PROBABLE MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

3 407	1 89	581 39	581 39	00	582 01	62	09	04	582 00
1050 0	0	1050 0	0	0	166 5	0	3 2	1 7	582 00
04	00	6 31	00	000	035	000	000	579 50	234 15
017116	10	10	10	20	22	0	00	137 56	371 71

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 3 410

3302 WARNING CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE KRATIO = 3 08

3 410	3 88	581 88	00	00	582 09	21	04	04	580 00
1050 0	27 8	920 6	101 5	16 1	238 2	58 4	3 3	1 8	580 00
04	1 73	3 87	1 74	035	035	035	000	578 00	239 80
001808	10	10	10	2	0	0	00	154 77	394 57

*SECNO 3 460

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3 460	4 84	582 84	582 84	00	583 63	78	57	17	582 00
1050 0	137 2	912 8	0	60 4	120 6	0	4 5	2 5	584 00
05	2 27	7 57	00	035	025	000	000	578 00	384 14
004090	230	220	205	20	15	0	00	125 43	509 57

*SECNO 3 530

3 530	4 21	584 21	00	00	584 88	67	1 24	01	586 00
1050 0	0	1050 0	0	0	159 5	0	5 9	3 2	586 00
06	00	6 58	00	000	025	000	000	580 00	621 34
003082	344	352	372	2	0	0	00	55 38	676 72

*SECNO 3 570
3685 20 TRIALS ATTEMPTED WSEL CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3 570	3 28	585 28	585 28	00	586 40	1 12	90	13	584 00
1050 0	41 2	1008 8	0	17 3	116 5	0	6 6	3 5	594 00
07	2 37	8 66	00	035	025	000	000	582 00	499 03
005695	214	220	336	20	15	0	00	69 74	568 78

*SECNO 3 600
3685 20 TRIALS ATTEMPTED WSEL CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3720 CRITICAL DEPTH ASSUMED

3 600	2 95	588 95	588 95	00	589 93	98	1 90	01	588 00
1050 0	29 1	1010 3	10 6	10 9	124 9	4 0	7 4	3 9	588 00
08	2 68	8 09	2 67	035	035	035	000	586 00	433 55
010804	258	248	232	20	11	0	00	81 38	514 92

*SECNO 3 621

3685 20 TRIALS ATTEMPTED WSEL CWSEL

3693 PROBABLE MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

3 621	3 15	593 55	593 55	00	594 76	1 21	2 09	07	594 10
1000 0	0	1000 0	0	0	113 4	0	8 1	4 3	594 50
08	00	8 82	00	000	025	000	000	590 40	819 39
007127	245	240	235	20	8	0	00	47 54	866 93

*SECNO 3 678

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

3302 WARNING CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE KRATIO = 2 06

3 678	4 68	595 58	00	00	595 81	23	96	10	595 80
1000 0	534 5	449 4	16 1	188 3	92 4	15 3	9 6	5 4	596 50
11	2 84	4 86	1 06	025	025	035	000	590 90	105 79
001672	327	313	295	2	0	0	00	241 62	370 24

T1 CLOUD RESIDENCE
T2 HARBISON CANYON
T3 100-YR

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	3	0	0	0	0	0	0	574 80	0

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	2	0	-1	0	0	0	0	0	0	0

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*PROF 2

CCHV= 100 CEHV= 300

*SECNO 3 222

3720 CRITICAL DEPTH ASSUMED

3 222	6 53	574 83	574 83	574 80	575 70	87	00	00	573 60
4700 0	860 5	3350 3	489 3	315 3	385 8	141 6	0	0	572 00
00	2 73	8 68	3 46	040	035	040	000	568 30	74 11
004657	0	0	0	0	4	0	00	480 21	554 32

*SECNO 3 310

3685 20 TRIALS ATTEMPTED WSEL CWSEL

3693 PROBABLE MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

3 310	6 40	578 40	578 40	00	579 09	70	1 87	02	574 00
4700 0	1478 7	2137 8	1083 5	398 8	236 0	288 4	8 5	5 1	574 00
02	3 71	9 06	3 76	040	035	040	000	572 00	141 88
004281	410	420	430	20	6	0	00	591 04	732 92

*SECNO 3 370

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL CWSEL

3693 PROBABLE MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

3 370	6 80	581 30	581 30	00	582 66	1 36	1 58	20	578 00
4700 0	827 0	3556 2	316 9	154 1	344 0	63 6	13 5	7 9	578 00
03	5 37	10 34	4 98	035	035	035	000	574 50	205 61
006997	300	290	295	20	8	0	00	226 54	460 34

*SECNO 3 405

3 405	7 80	582 80	582 78	00	584 06	1 26	1 40	01	580 00
4700 0	323 6	3776 1	600 3	65 1	385 8	135 7	16 2	9 0	580 00
03	4 97	9 79	4 42	035	035	035	000	575 00	214 06
006620	211	205	197	3	8	0	00	252 21	466 27

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 3 407
3685 20 TRIALS ATTEMPTED WSEL CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3 407	4 02	583 52	583 52	00	584 60	1 08	08	02	582 00
4700 0	29 2	4381 0	289 8	8 7	510 0	85 0	16 3	9 1	582 00
03	3 36	8 59	3 41	035	035	035	000	579 50	213 58
009101	10	10	10	20	11	0	00	288 23	501 81

*SECNO 3 410

3302 WARNING CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE KRATIO = 1 52

3 410	5 93	583 93	00	00	584 69	76	06	03	580 00
4700 0	319 3	3118 8	1261 9	65 9	392 8	276 7	16 5	9 2	580 00
04	4 84	7 94	4 56	035	035	035	000	578 00	225 02
003915	10	10	10	3	0	0	00	261 41	486 44

*SECNO 3 460

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3 460	7 28	585 28	585 28	00	586 74	1 47	95	21	582 00
4700 0	1948 3	2708 6	43 0	338 2	228 8	19 8	19 8	10 3	584 00
04	5 76	11 84	2 17	035	025	035	000	578 00	330 87
004759	230	220	205	20	11	0	00	213 31	544 18

*SECNO 3 530
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3 530	7 45	587 45	587 45	00	588 55	1 10	1 27	04	586 00
4700 0	1080 6	3596 1	23 2	363 4	378 7	12 6	25 2	12 6	586 00
05	2 97	9 50	1 84	035	025	035	000	580 00	351 29
002881	344	352	372	4	5	0	00	351 73	703 02

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 3 570

3685 20 TRIALS ATTEMPTED WSEL CWSEL

3693 PROBABLE MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

3 570	6 93	588 93	588 93	00	590 49	1 57	73	14	584 00
4700 0	1392 5	3307 5	0	275 5	287 3	0	28 5	14 0	594 00
06	5 06	11 51	00	035	025	000	000	582 00	384 08
003903	214	220	336	20	11	0	00	193 14	577 22

*SECNO 3 600

3685 20 TRIALS ATTEMPTED WSEL CWSEL

3693 PROBABLE MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

3 600	5 97	591 97	591 97	00	593 39	1 42	1 27	01	588 00
4700 0	1143 7	3023 8	532 5	171 7	276 0	95 7	31 7	15 1	588 00
07	6 66	10 96	5 56	035	035	035	000	586 00	379 85
006890	258	248	232	20	15	0	00	188 04	567 90

*SECNO 3 621

3685 20 TRIALS ATTEMPTED WSEL CWSEL

3693 PROBABLE MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

3 621	6 12	596 52	596 52	00	597 51	99	1 10	04	594 10
4500 0	659 7	2642 2	1198 1	117 3	270 4	343 6	35 2	16 5	594 50
08	5 62	9 77	3 49	025	025	035	000	590 40	755 87
003243	245	240	235	20	5	0	00	337 86	1093 72

*SECNO 3 678

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

3302 WARNING CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE KRATIO = 1 62

3 678	6 94	597 84	00	00	598 17	33	59	07	595 80
4500 0	2933 0	959 5	607 5	638 3	166 9	278 0	41 7	19 2	596 50
10	4 59	5 75	2 19	025	025	035	000	590 90	96 08
001233	327	313	295	2	0	0	00	411 29	617 75

THIS RUN EXECUTED 09DEC99 03 59 31

****
HEC-2 WATER SURFACE PROFILES

Version 4 6 2 May 1991
****

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

EAR AND 100-YEAR STORM E

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	O
	3 222	00	00	00	568 30	1050 00	571 41	00	572 25	101 34	7 34	143 13	104
*	3 222	00	00	00	568 30	4700 00	574 83	574 83	575 70	46 57	8 68	842 74	688
	3 310	420 00	00	00	572 00	1050 00	575 37	575 35	576 36	92 62	8 30	147 11	109
*	3 310	420 00	00	00	572 00	4700 00	578 40	578 40	579 09	42 81	9 06	923 17	718
	3 370	290 00	00	00	574 50	1050 00	578 43	00	579 21	102 82	7 11	150 26	103
*	3 370	290 00	00	00	574 50	4700 00	581 30	581 30	582 66	69 97	10 34	561 70	561
	BEGIN CULVERTS												
10	3 405	205 20	00	00	575 00	1050 00	580 30	00	580 79	57 74	5 63	188 42	138
100	3 405	205 20	00	00	575 00	4700 00	582 80	582 78	584 06	66 20	9 79	586 65	577
* 10	3 407	10 00	00	00	579 50	1050 00	581 39	581 39	582 01	171 16	6 31	166 50	80
*100	3 407	10 00	00	00	579 50	4700 00	583 52	583 52	584 60	91 01	8 59	603 67	492
	END CULVERTS												
* 10	3 410	10 00	00	00	578 00	1050 00	581 88	00	582 09	18 08	3 87	312 69	246
*100	3 410	10 00	00	00	578 00	4700 00	583 93	00	584 69	39 15	7 94	735 46	751
*	3 460	220 00	00	00	578 00	1050 00	582 84	582 84	583 63	40 90	7 57	180 99	164
*	3 460	220 00	00	00	578 00	4700 00	585 28	585 28	586 74	47 59	11 84	586 82	681
	3 530	352 00	00	00	580 00	1050 00	584 21	00	584 88	30 82	6 58	159 47	189
*	3 530	352 00	00	00	580 00	4700 00	587 45	587 45	588 55	28 81	9 50	754 80	875
*	3 570	220 00	00	00	582 00	1050 00	585 28	585 28	586 40	56 95	8 66	133 85	139
*	3 570	220 00	00	00	582 00	4700 00	588 93	588 93	590 49	39 03	11 51	562 75	752
*	3 600	247 60	00	00	586 00	1050 00	588 95	588 95	589 93	108 04	8 09	139 78	101
*	3 600	247 60	00	00	586 00	4700 00	591 97	591 97	593 39	68 90	10 96	543 40	566
*	3 621	240 00	00	00	590 40	1000 00	593 55	593 55	594 76	71 27	8 82	113 36	118
*	3 621	240 00	00	00	590 40	4500 00	596 52	596 52	597 51	32 43	9 77	731 32	790

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	0
*	3 678	313 00	00	00	590 90	1000 00	595 58	00	595 81	16 72	4 86	295 95	244
*	3 678	313 00	00	00	590 90	4500 00	597 84	00	598 17	12 33	5 75	1083 23	1281

EAR AND 100-YEAR STORM E

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	3 222	1050 00	571 41	00	00	00	62 92	00
*	3 222	4700 00	574 83	3 42	00	03	480 21	00
	3 310	1050 00	575 37	00	3 96	00	84 96	420 00
*	3 310	4700 00	578 40	3 03	3 57	00	591 04	420 00
	3 370	1050 00	578 43	00	3 06	00	83 94	290 00
*	3 370	4700 00	581 30	2 87	2 90	00	226 54	290 00
	3 405	1050 00	580 30	00	1 87	00	94 14	205 20
	3 405	4700 00	582 80	2 50	1 51	00	252 21	205 20
*	3 407	1050 00	581 39	00	1 09	00	137 56	10 00
*	3 407	4700 00	583 52	2 13	72	00	288 23	10 00
*	3 410	1050 00	581 88	00	49	00	154 77	10 00
*	3 410	4700 00	583 93	2 05	41	00	261 41	10 00
*	3 460	1050 00	582 84	00	96	00	125 43	220 00
*	3 460	4700 00	585 28	2 43	1 35	00	213 31	220 00
	3 530	1050 00	584 21	00	1 36	00	55 38	352 00
*	3 530	4700 00	587 45	3 25	2 18	00	351 73	352 00
*	3 570	1050 00	585 28	00	1 07	00	69 74	220 00
*	3 570	4700 00	588 93	3 65	1 47	00	193 14	220 00
*	3 600	1050 00	588 95	00	3 67	00	81 38	247 60
*	3 600	4700 00	591 97	3 02	3 04	00	188 04	247 60
*	3 621	1000 00	593 55	00	4 60	00	47 54	240 00
*	3 621	4500 00	596 52	2 97	4 55	00	337 86	240 00
*	3 678	1000 00	595 58	00	2 03	00	241 62	313 00
*	3 678	4500 00	597 84	2 26	1 32	00	411 29	313 00

SUMMARY OF ERRORS AND SPECIAL NOTES

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CAUTION SECNO=     3 222  PROFILE=  2  CRITICAL DEPTH ASSUMED

CAUTION SECNO=     3 310  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3 310  PROFILE=  2  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     3 310  PROFILE=  2  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=     3 370  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3 370  PROFILE=  2  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     3 370  PROFILE=  2  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=     3 407  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3 407  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     3 407  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=     3 407  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3 407  PROFILE=  2  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     3 407  PROFILE=  2  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=     3 410  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     3 410  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=     3 460  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3 460  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     3 460  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=     3 460  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3 460  PROFILE=  2  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     3 460  PROFILE=  2  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=     3 530  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3 530  PROFILE=  2  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=     3 570  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3 570  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     3 570  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=     3 570  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3 570  PROFILE=  2  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     3 570  PROFILE=  2  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=     3 600  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3 600  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     3 600  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=     3 600  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3 600  PROFILE=  2  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     3 600  PROFILE=  2  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=     3 621  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3 621  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     3 621  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=     3 621  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3 621  PROFILE=  2  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     3 621  PROFILE=  2  20 TRIALS ATTEMPTED TO BALANCE WSEL
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WARNING SECNO=      3 678  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      3 678  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
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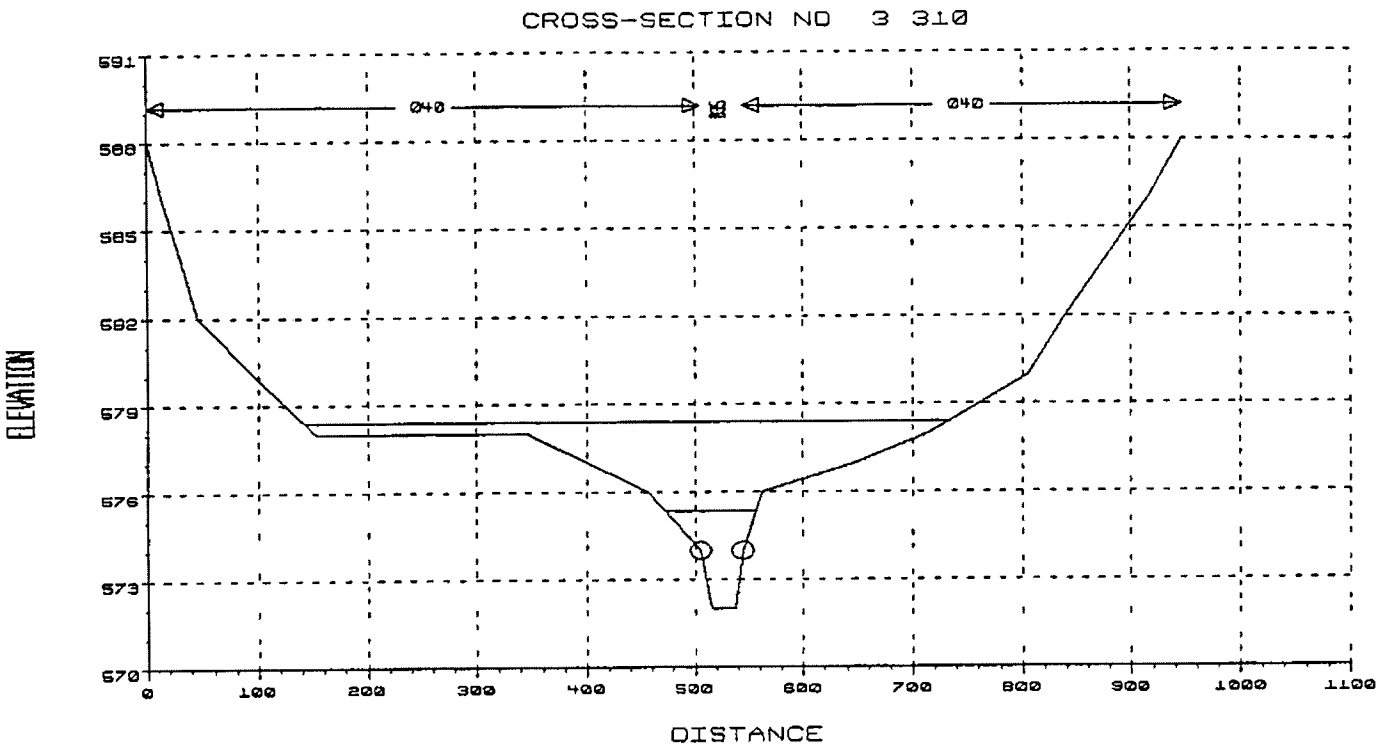
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040
591
588
585
582
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100
200
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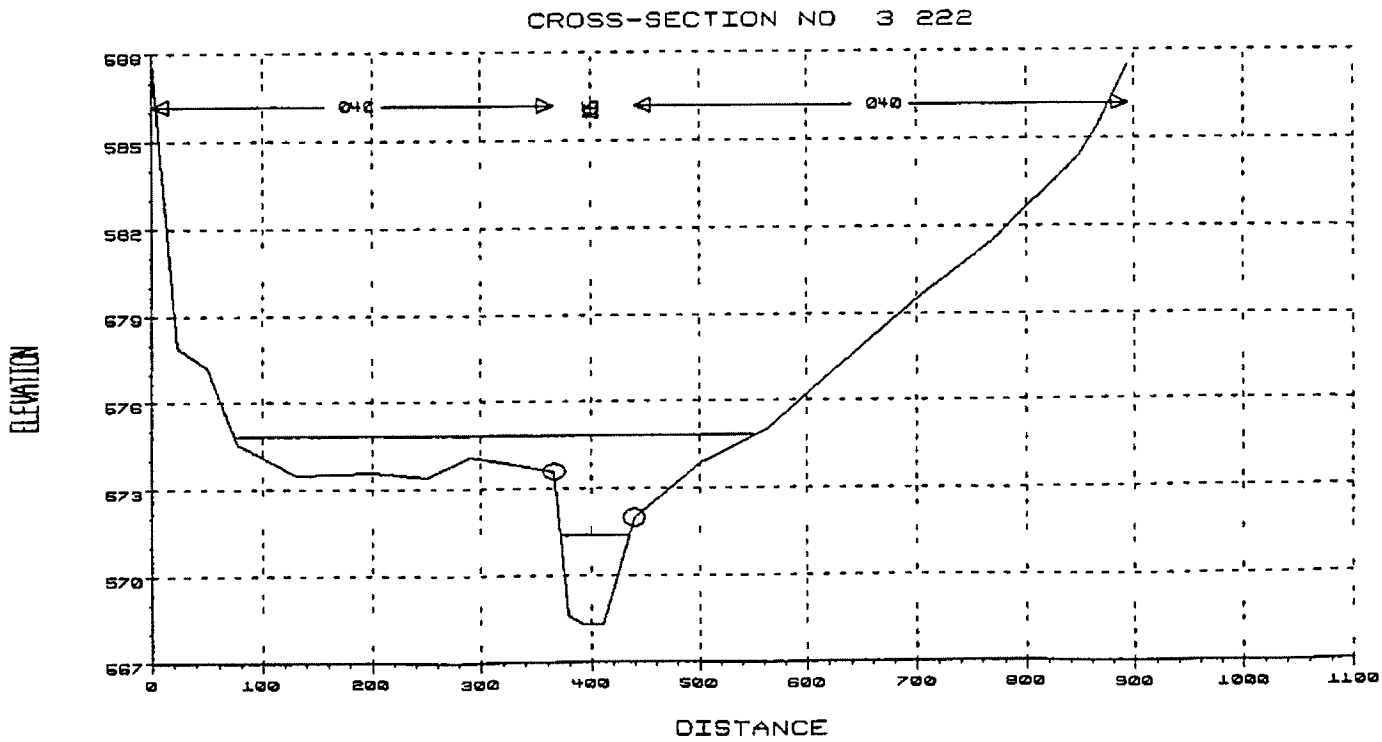
700
800
900
1000
1100
DISTANCE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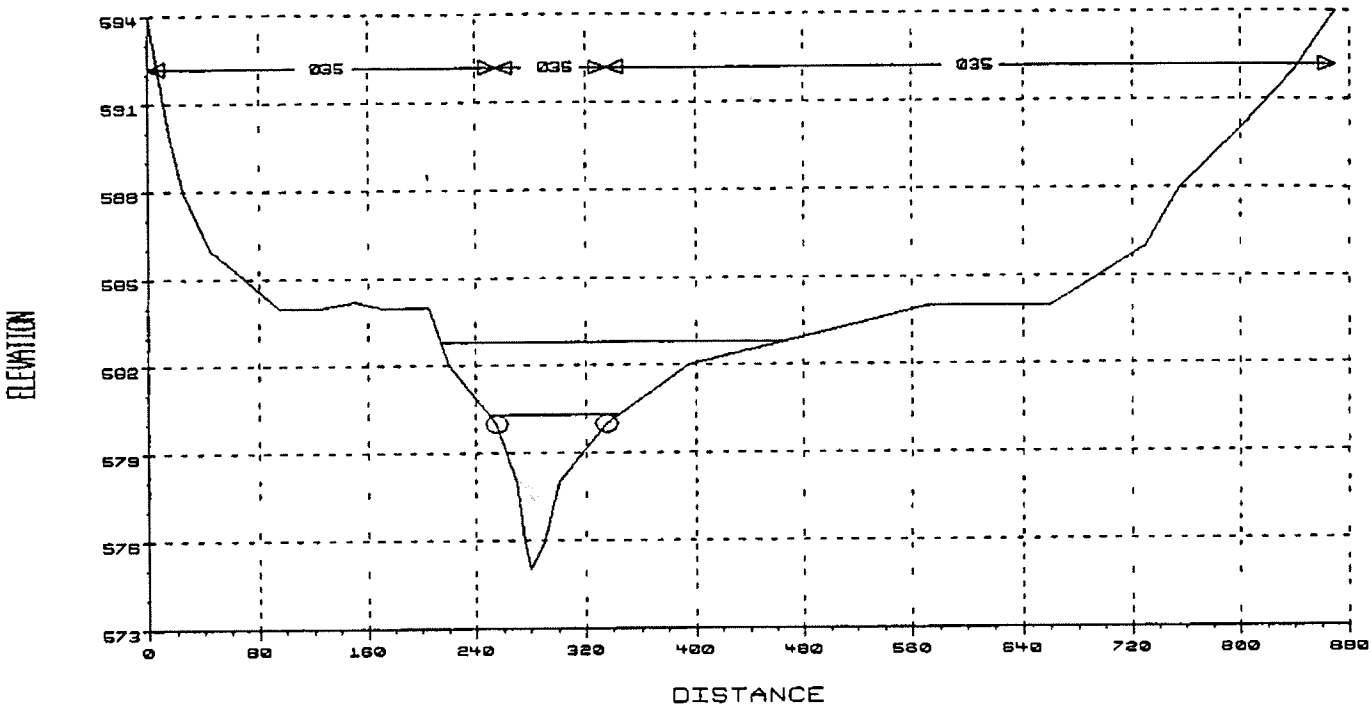
900
1000
1100
DISTANCE

CROSS-SECTION NO 3 405



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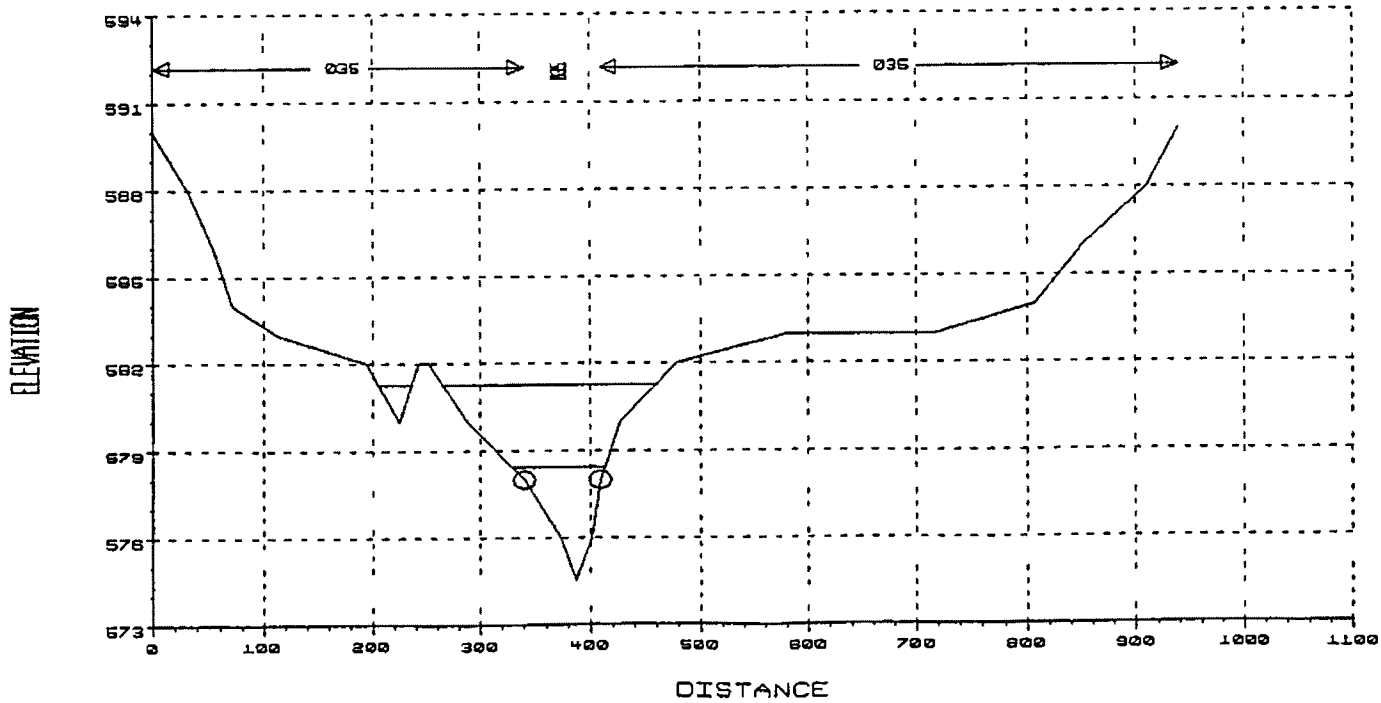

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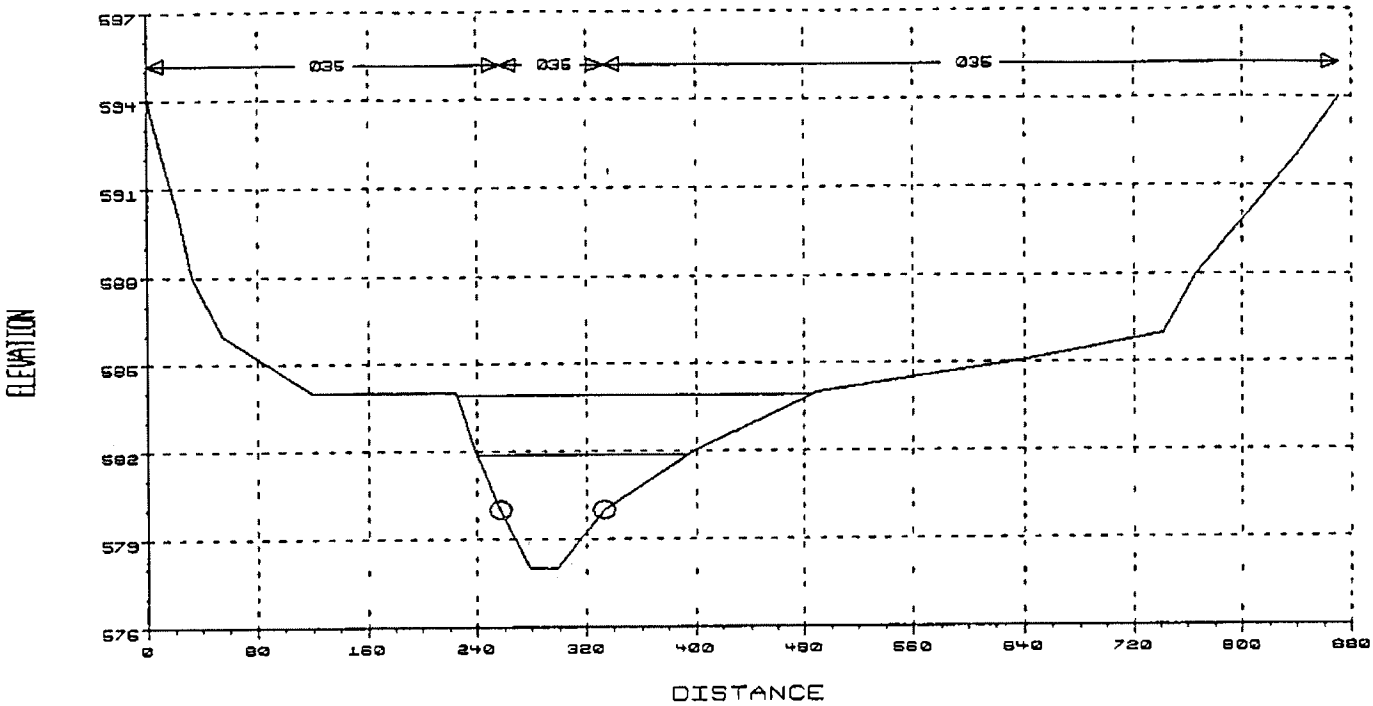

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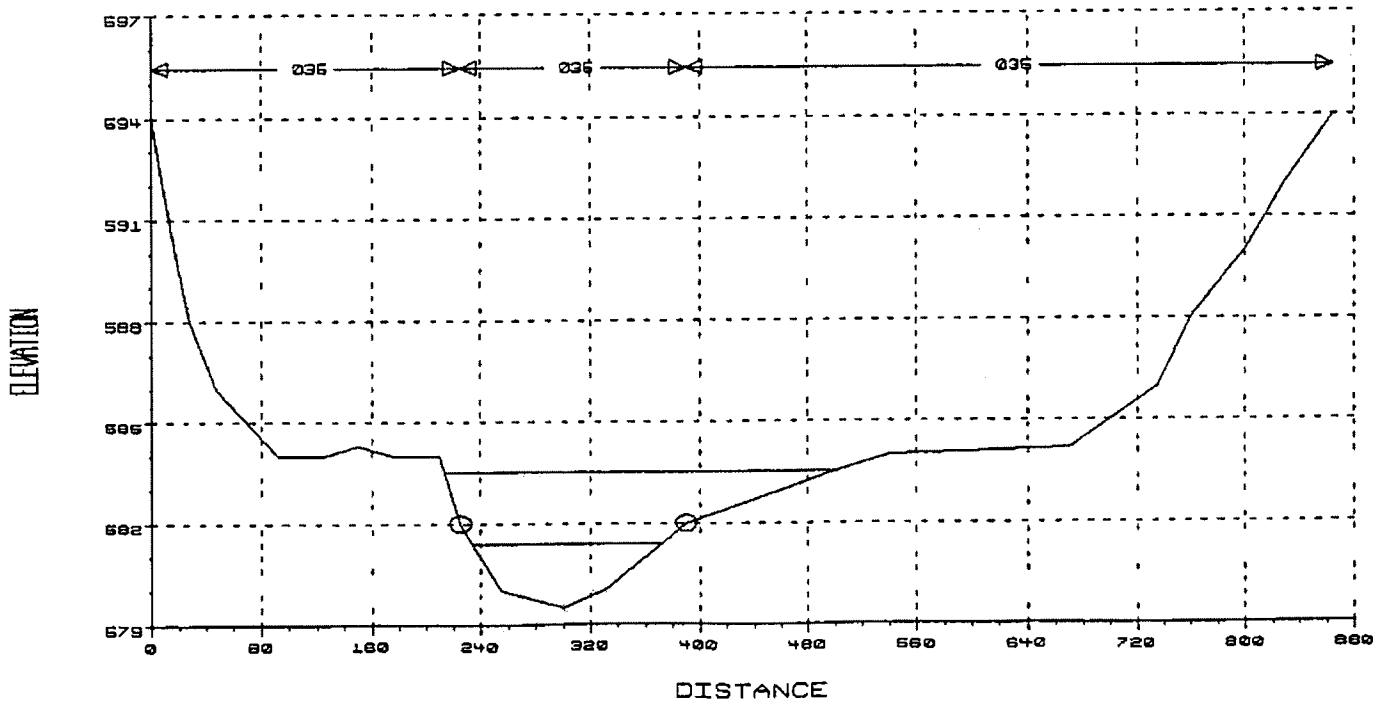

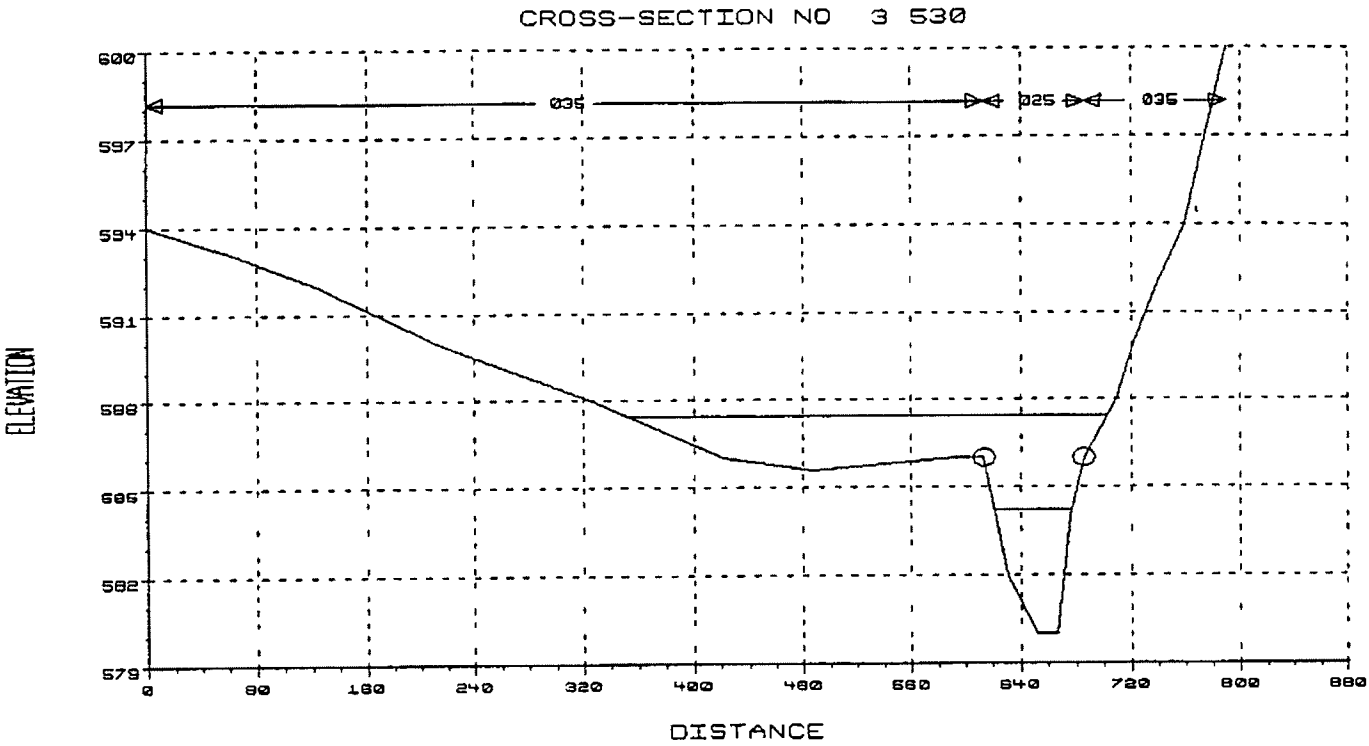
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DISTANCE
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025
035
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591
588
585
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320
400
480
560
640
720
800
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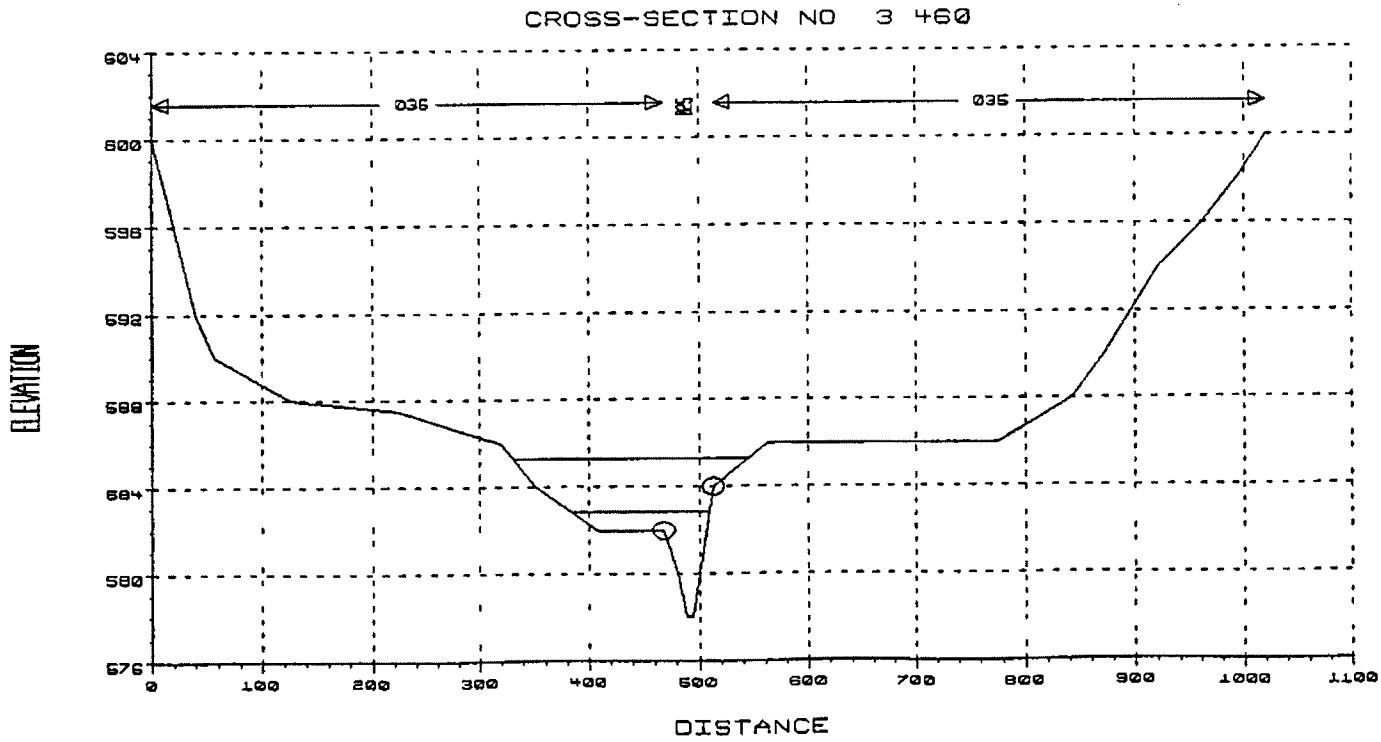
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DISTANCE
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600
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592
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576
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100
200
300
400
500
600
700
800
900
1000
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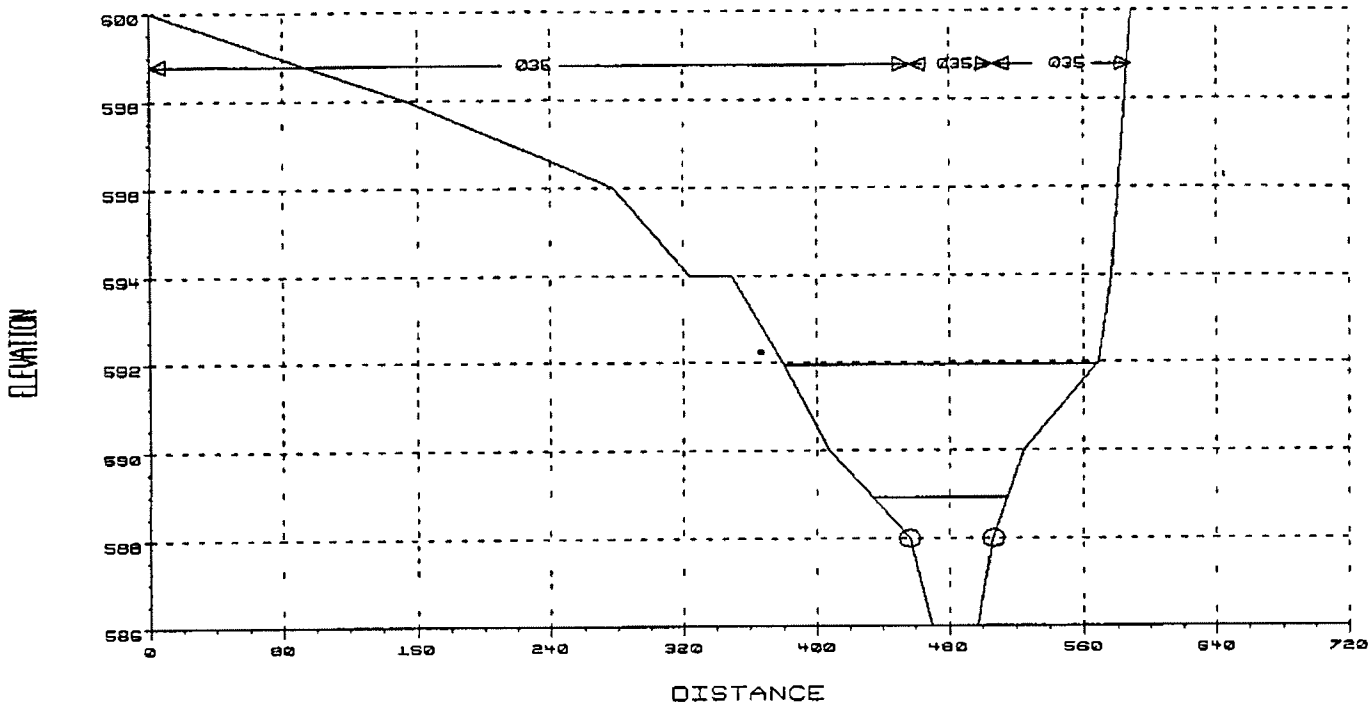
CROSS-SECTION NO 3 600



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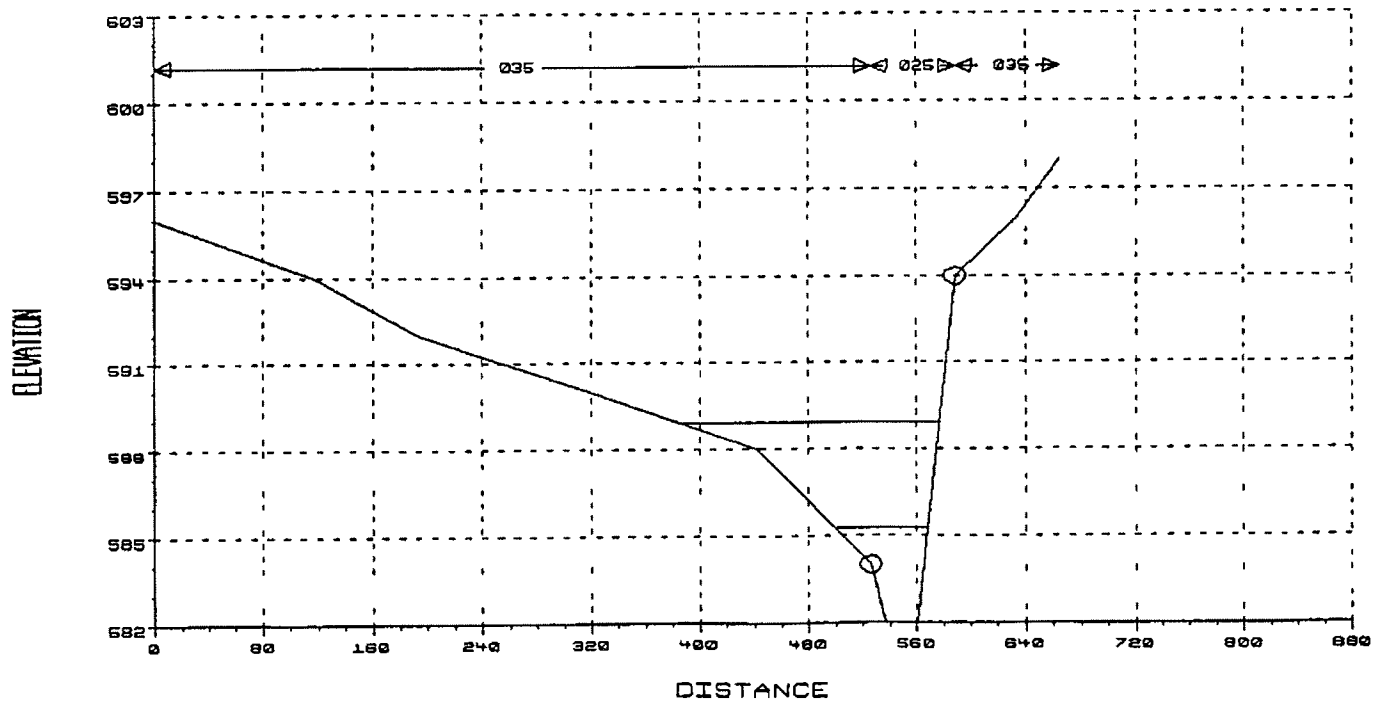

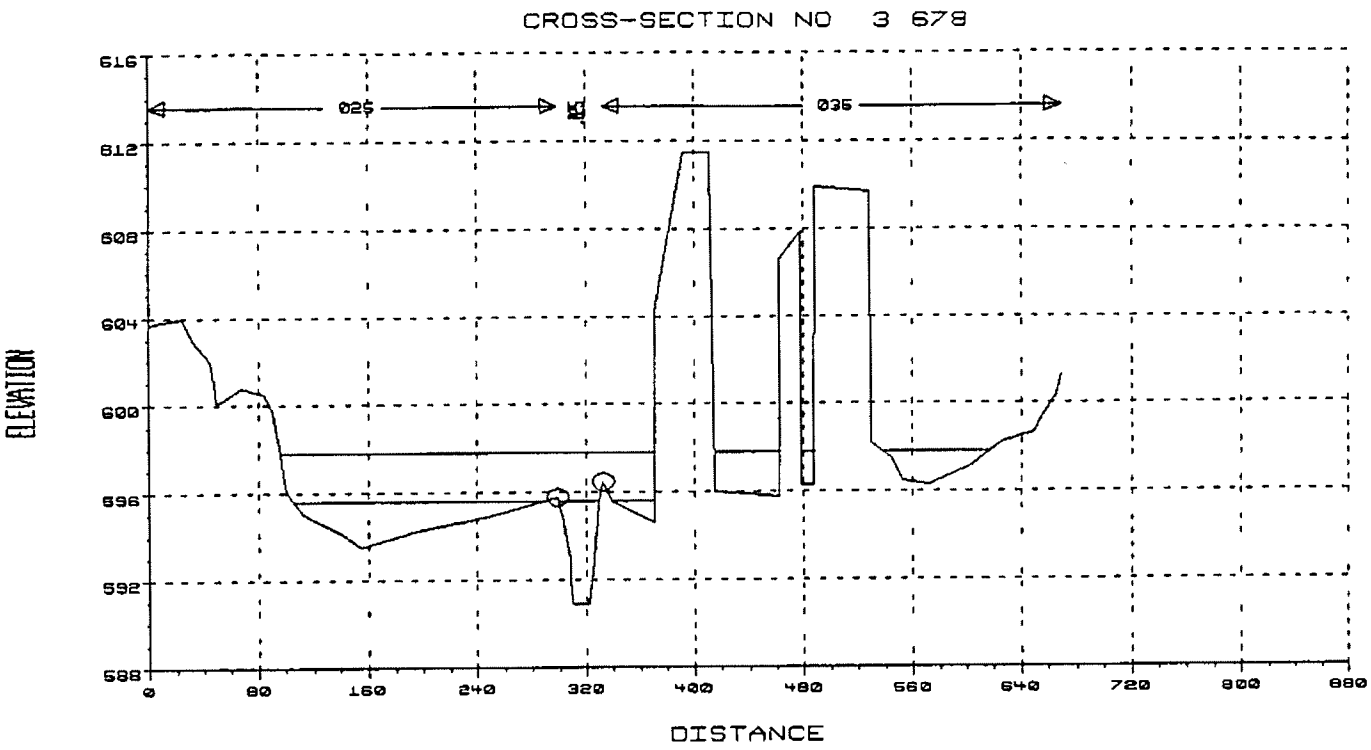
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035
616
612
608
604
600
596
592
588
ELEVATION
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80
160
240
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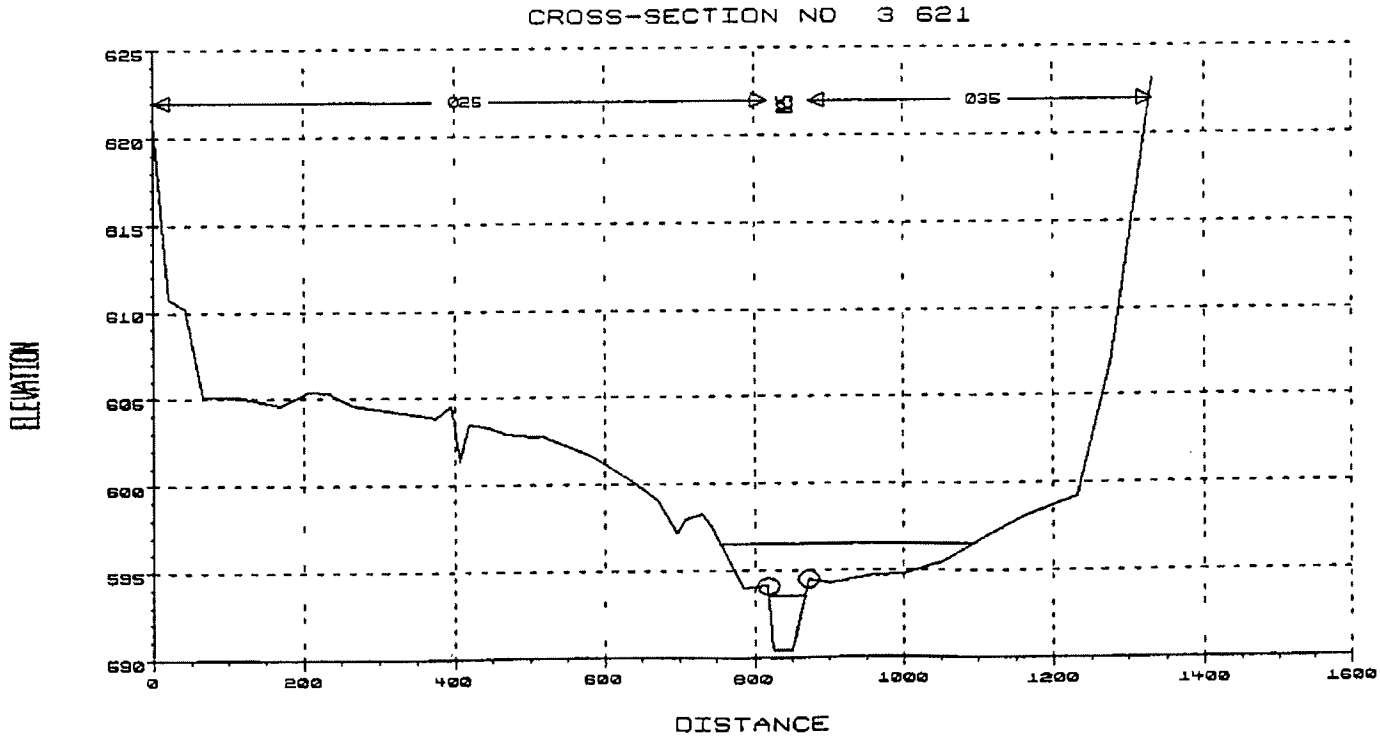
400
480
560
640
720
800
880
DISTANCE


CROSS-SECTION NO 3 621
025
035
625
620
615
610
605
600
595
590
ELEVATION
0
200
400
600
800
1000
1200
1400
1600
DISTANCE

APPENDIX B.II

Harbison Canyon Creek
100-year Floodplain and Floodway Analyses

DAVID EVANS AND ASSOCIATES INC.

ATTACHMENT 8

Revised or Post-Project Conditions Analysis
Harbison Canyon Creek
100-year Floodplain and Floodway Analyses

CLOUDSUB.HC2

```
*****************************************
*  HEC-2 WATER SURFACE PROFILES         *
*                                       *
*  Version   4 6 2   May 1991           *
*                                       *
*  RUN DATE    09DEC99    TIME   04 10 14 *
*****************************************
```

```
*********************************
*  U S  ARMY CORPS OF ENGINEERS
*  HYDROLOGIC ENGINEERING CENTER
*  609 SECOND STREET, SUITE D
*  DAVIS  CALIFORNIA 95616-4687
*          (916) 756-1104
*********************************
```

```
X     X  XXXXXXX   XXXXX              XXXXX
X     X  X        X     X            X     X
X     X  X        X                        X
XXXXXXX  XXXX     X          XXXXX    XXXXX
X     X  X        X                  X
X     X  X        X     X            X
X     X  XXXXXXX   XXXXX             XXXXXXX
```

THIS RUN EXECUTED 09DEC99 04 10 14

```
*************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4 6 2   May 1991
*************************************


THIS IS AN ARCHIVAL RUN ALL DATA AND RESULTS ARE SAVED ON UNIT   96

AC CLOUD RESIDENCE            DECEMBER 3  1999              J-13606
AC 100-YR FLOODPLAIN FLOODWAY RUN FOR HARBISON CANYON CREEK
AC SUBCRITICAL ANALYSIS                                  FNAME  CLOUDSUB HC2
AC ***************************************************************************
T1  CLOUD RESIDENCE
T2  HARBISON CANYON             FILENAME CLOUD1 HEC
T3  100-YEAR STORM EVENT

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

       0         2         0         0         0         0         0         0    574 80         0

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

      1         0        -1         0         0         0         0         0         0         0


J3  VARIABLE CODES FOR SUMMARY PRINTOUT

    150       200

NC      040       040       035         1         3
QT        2      4700      4700
ET                          7 1                                         346 7      439 5
X1    3 222        21     366 3     439 5
GR    587 8       0 0     577 9      23 4     577 2      50 3     574 6      76 4     573 5     131 1
GR    573 6     200 4     573 4     250 5     574 1     290 8     573 6     366 3     568 6     379 1
GR    568 3     392 4     568 3     410 2     572 0     439 5     573 9     501 9     575 0     564 0
GR    576 7     614 8     579 6     703 2     581 5     770 3     584 4     848 2     585 5     866 9
GR    587 5     893 6

ET                          7 1                                         450       550
X1     3 31      24 0     505 0     544 6       410       430       420
GR    588 0         0    586 00      13 6    584 00      30 2    582 00      45 8    580 00      97 6
GR    578 0     152 8    578 00     207 8    578 00     229 5    578 00     277 2    578 00     344 7
GR    576 0     456 5    574 00     505 0    572 00     515 0    572 00     527 1    572 00     537 3
GR    574 0     544 6    576 00     562 4    577 00     650 0    578 00     715 2    580 00     804 8
GR    582 0     838 4    584 00     876 8    586 00     915 9    588 00     946 4
```

```
NC      035       035       035
ET                          7 1                                     240       450
X1     3 37      23 0     340 1     408 9       300     295 0     290 0
GR    590 0         0     588 00     31 9     586 00      55 3     584 00      72 3     583 00     112 6
GR    582 0     194 9     580 00    225 3     582 00     242 3     582 00     251 5     580 00     288 4
GR    578 0     340 1     576 00    373 4     574 50     386 8     576 00     401 1     578 00     408 9
GR    580 0     427 3     582 00    473 3     583 00     578 9     583 00     716 2     584 00     806 8
GR    586 0     850 8     588 00    910 4     590 00     539 1
  BEGIN CULVERTS

ET                          7 1                                     245       350
X1     3 405     27 0     255 0      335     210 8     197 3     205 2
GR    594 0         0     592 00       7     590 00      15     588 00      25     586 00      45
GR    584 0        95     584 00     125     584 20     150     584 00     170     584 00     205 0
GR      582       220      580      255       578      270       576      275       575      280
GR      576       290      578      300       580      335       582      395     583 5      530
GR      584       570      584      660       586      730       588      755       590      800
GR      592       840      594      870

ET                          7 1                                     250       360
X1     3 407      24       225      390        10       10        10
GR      594         0      592        8       590       18       588       28       586       48
GR      584        92      584      125     584 3      150       584      175       584      200
GR      584       210      582      225       580      255     579 5      300       580      330
GR      582       390     583 5      500       584      540     584 2      670       586      735
GR      588       760      590      800       592      830       594      865

ET                          7 1                                     255       365
X1     3 41      22 0     256 8     332 7        10       10        10
GR    594 0         0     592 00     11 4     590 00      23 1     588 00      32 5     586 00      55 3
GR    584 0     119 8     584 00    192 2     584 00     224 5     582 00     238 8     580 00     256 8
GR    578 0     279 3     578 00    289 3     578 00     298 2     580 00     332 7     582 00     398 2
GR    584 0     489 8     585 00    631 5     586 00     741 8     588 00     765 9     590 00     803 2
GR    592 0     835 9     594 00    870 9
  END CULVERTS

NC      035       035       025
ET                          8 4
X1     3 46      25 0     467 8     513 1     230 0     205 0     220 0
GR    600 0         0     596 00     19 7     592 00      39 4     590 00      56 9     588 00     126 0
GR    587 5     224 3     586 00    319 4     584 00     351 1     582 00     408 2     582 00     467 8
GR    580 0     480 3     578 00    488 9       578       495     580 00     500 9     584 00     513 1
GR    586 0     561 8     586 0     724 4     586 00     775 7     588 00     842 0     590 00     871 2
GR    592 0     895 9     594 0     921 9     596 00     961 8     598 00     993 6     600 00    1019 6
  CLOUD RESIDENCE LOCATION

ET                          7 1                                     615       680
X1     3 53      21 0     613 4     685 6     344 0     372 0     352 0
GR    594 0         0     593 00     66 1     592 00     121 8     590 00     211 7     586 00     324 6
GR    586 0     422 0     585 60    487 3     586 00     593 0     586 00     593 4     586 00     613 4
GR    582 0     631 1     580 00    651 7     580 00     659 8     580 00     666 5     584 00     675 7
GR    586 0     685 5     588 00    709 6     590 00     722 7     592 00     739 2     594 00     758 8
GR    600 0     789 2
```

ET			7 1				315	588		
X1	3 57	13 0	526 2	588 7	214 0	336 0	220 0			
GR	596 0	0	594 00	110 0	592 00	193 7	590 00	318 0	588 00	441 1
GR	584 0	526 2	582 00	536 8	582 00	549 5	582 00	561 2	590 00	579 7
GR	594 0	588 7	596 00	633 4	598 00	664 8				
NC	035	035	035							
ET			7 1				428	516		
X1	3 60	16 0	456 5	506 5	258 2	232 4	247 6			
GR	600 0	0	598 00	153 1	596 00	276 1	594 00	323 4	594 00	348 7
GR	592 0	379 4	590 00	408 0	588 00	456 5	586 00	469 5	586 00	482 5
GR	586 0	497 1	588 00	506 5	590 00	524 3	592 00	568 6	594 00	576 3
GR	600 0	588 9								
NC	025	035	025							
QT	2	4500	4500							
ET			5 4							
X1	3 621	41	818 4	872 2	245	235	240			
GR	620 9	0 0	610 8	20 1	610 2	41 5	609 1	66 4	605 1	111 2
GR	604 6	168 0	605 4	207 1	605 3	232 7	604 6	264 4	603 9	175 6
GR	604 6	395 8	601 4	406 8	603 5	419 5	603 3	446 5	602 9	466 7
GR	602 8	501 4	602 8	518 1	602 4	538 2	601 6	584 3	600 2	638 3
GR	599 1	671 6	597 2	698 1	596 0	709 7	598 3	731 9	597 6	742 5
GR	595 6	767 2	594 0	786 2	594 1	818 4	590 4	825 0	590 4	835 5
GR	590 4	849 5	594 5	872 2	594 3	903 5	594 7	955 0	594 8	998 6
GR	595 5	1053 6	596 9	1108 8	598 1	1162 0	599 2	1232 4	606 8	1276 5
GR	623 1	1332 6								
ET	3 678		7 1				190	322		
X1	3 678	57	298 8	332 4	327	295	313			
GR	603 7	0 0	604 0	24 0	603 0	31 8	602 0	44 3	601 1	47 2
GR	600 1	49 8	600 2	52 9	600 3	67 1	600 5	84 3	599 7	90 6
GR	596 7	93 4	597 8	96 2	596 9	97 7	596 0	100 5	595 0	113 1
GR	594 1	141 7	593 5	155 0	594 3	196 2	594 9	247 9	595 8	298 8
GR	594 9	302 3	593 9	305 4	593 0	307 6	592 0	308 3	591 0	309 6
GR	590 9	310 0	590 9	315 8	590 9	322 1	591 9	323 5	592 8	325 3
GR	593 8	326 2	594 7	328 5	595 6	329 6	596 5	332 4	595 6	338 5
GR	594 6	370 2	604 2	370 6	611 5	391 7	611 5	411 1	596 0	415 5
GR	595 8	461 5	606 6	461 6	607 9	478 2	596 3	478 2	596 3	487 5
GR	609 9	488 5	609 7	528 5	598 2	529 3	597 5	543 6	596 5	552 7
GR	596 3	571 7	597 2	604 2	598 2	625 4	598 7	649 5	599 4	655 3
GR	600 4	665 3	601 3	669 0						

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	QLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*PROF 1

CCHV= 100 CEHV= 300

*SECNO 3 222

3720 CRITICAL DEPTH ASSUMED

3 222	6 53	574 83	574 83	574 80	575 70	87	00	00	573 60
4700 0	860 5	3350 3	489 3	315 3	385 8	141 6	0	0	572 00
00	2 73	8 68	3 46	040	035	040	000	568 30	74 11
004657	0	0	0	0	4	0	00	480 21	554 32

*SECNO 3 310

3685 20 TRIALS ATTEMPTED WSEL CWSEL

3693 PROBABLE MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

3 310	6 40	578 40	578 40	00	579 09	70	1 67	02	574 00
4700 0	1478 7	2137 9	1053 5	398 8	236 0	288 4	9 5	5 1	574 00
02	3 71	9 06	3 76	040	035	040	000	572 00	141 88
004281	410	420	420	20	6	0	00	591 04	732 92

*SECNO 3 370

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL CWSEL

3693 PROBABLE MINIMUM SPECIFIC ENERGY

3720 CRITICAL DEPTH ASSUMED

3 370	6 80	581 30	581 30	00	582 66	1 36	1 58	20	578 00
4700 0	827 0	3556 2	316 5	154 1	344 0	63 6	13 5	7 9	578 00
03	5 37	10 34	4 98	035	035	035	000	574 50	205 61
006997	300	290	255	20	8	0	00	226 54	460 34

*SECNO 3 405

3 405	7 80	582 80	582 78	00	584 06	1 26	1 40	01	580 00
4700 0	323 6	3776 1	600 3	65 1	385 8	135 7	16 2	9 0	580 00
03	4 97	9 79	4 42	035	035	035	000	575 00	214 06
006620	211	205	197	3	8	0	00	252 21	466 27

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	QLOSS	L BANK ELEV
Q	QLOB	QCH	QRCB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VRCB	XNL	XNCH	XNR	WTN	ELMIN	SSCA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

```
*SECNO 3 407
3685 20 TRIALS ATTEMPTED WSEL CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     3 407      4 02     583 52     583 52        00     584 60      1 08        08        02     582 00
    4700 0      29 2     4381 0      289 9       8 7      510 0      85 0      16 3       9 1     582 00
        03      3 36      8 59       3 41       035        035       035       000     579 50     213 58
    005101        10        10         10        20         11         0        00     286 23     501 81


*SECNO 3 410

3302 WARNING   CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE   KRATIO =  1 52

     3 410      5 93     583 93        00        00     584 69        76        06        03     580 00
    4700 0     319 3     3128 8     1261 9      65 9     392 8     276 7      16 5       9 2     580 00
        04      4 84      7 94       4 56       035        035       035       000     578 00     225 02
    003915        10        10         10         3          0         0        00     261 41     486 44


*SECNO 3 460

3301 HV CHANGED MORE THAN DIVIN5

3685 20 TRIALS ATTEMPTED WSEL CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     3 460      7 28     585 28     585 28        00     586 74      1 47        95        21     582 00
    4700 0     1948 3     2708 6      43 0     338 2     228 8      19 8      19 8      10 3     584 00
        04      5 76      11 84       2 17       035        025       035       000     578 00     330 67
    004759       230       220        205        20         11         0        00     213 31     544 18


*SECNO 3 530
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     3 530      7 45     587 45     587 45        00     588 55      1 10      1 37        04     586 00
    4700 0     1080 6     3596 1      23 2     363 4     378 7      12 6      25 2      12 6     586 00
        05      2 97      9 50       1 84       035        025       035       000     580 00     351 29
    002881       344       352        372         4          5         0        00     351 73     702 02
```

```
SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        QLOSS     L-BANK ELEV
Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


*SECNO 3 570
3685 20 TRIALS ATTEMPTED WSEL CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
   3 570      6 93     588 93     588 93        00     590 49      1 57        73        14     584 00
  4700 0    1392 5    3207 5         0     279 5     287 3         0      29 5      14 0     594 00
      06      5 06     11 51        00       035       025       000       000    582 00     384 08
  003903       214       220       336        20        11         0        00    193 14     577 22


*SECNO 3 600
3685 20 TRIALS ATTEMPTED WSEL CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
   3 600      5 97     591 97     591 97        00     593 39      1 42      1 27        01     588 00
  4700 0    1143 7    3023 8     532 5     171 7     276 0      95 7      31 7      15 1     588 00
      07      6 66     10 96      3 56       035       035       035       000    586 00     379 85
  006890       258       248       232        20        15         0        00    188 04     567 90


*SECNO 3 621
3685 20 TRIALS ATTEMPTED WSEL CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
   3 621      5 12     596 52     596 52        00     597 51        99      1 10        04     594 10
  4500 0     659 7    2642 3    1198 1     117 3     270 4     343 6      35 2      16 5     594 50
      08      5 62      9 77      3 49       025       025       035       000    590 40     755 87
  003243       245       240       235        20         5         0        00    337 86    1093 72


*SECNO 3 678

3265 DIVIDED FLOW


3301 HV CHANGED MORE THAN HVINS


3302 WARNING   CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE   KRATIO = 1 62

   3 678      6 94     597 84        00        00     598 17        33        59        07     595 80
  4500 0    2933 0     959 5     607 5     638 3     166 9     278 0      41 7      19 2     596 50
      10      4 59      5 75      2 19       025       025       035       000    590 90      96 08
  001233       327       313       295         2         0         0        00    411 29     617 75


T1  CLOUD RESIDENCE
T2  HARBISON CANYON
```

T3 FLOODWAY RUN

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	3	0	0	0	0	0	0	574.70	0

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	2	0	-1	0	0	0	0	0	0	0

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENEST

*PROF 2

CCHV= 100 CEHV= 300
*SECNO 3 222
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= 346 7 439 5 TYPE= 1 TARGET= 92 800

3 222	6 43	574 73	574 73	574 83	577 01	2 27	00	00	573 60
4700 0	78 3	4621 7	0	21 0	379 0	0	0	0	100000 00
00	3 73	12 19	00	040	035	000	000	568 30	346 70
009872	0	0	0	0	4	0	00	92 80	439 50

*SECNO 3 310

3470 ENCROACHMENT STATIONS= 450 0 550 0 TYPE= 1 TARGET= 100 000

3 310	6 76	578 76	00	578 40	560 58	1 82	3 53	05	574 00
4700 0	1482 6	3076 6	140 8	200 0	250 4	24 1	4 2	9	574 00
01	7 41	12 29	5 85	040	035	040	000	572 00	450 00
007272	410	420	430	2	0	0	00	100 00	550 00

*SECNO 3 370
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= 340 0 450 0 TYPE= 1 TARGET= 110 000

3 370	7 03	581 53	581 53	581 30	583 55	2 02	2 31	06	578 00
4700 0	3	4259 6	440 1	4	360 2	71 2	7 2	1 6	579 00
02	81	11 63	6 19	035	035	035	000	574 50	340 00
008612	300	290	295	3	6	0	00	110 00	450 00

*SECNO 3 405

3301 HV CHANGED MORE THAN HVINS

3470 ENCROACHMENT STATIONS= 245 0 350 0 TYPE= 1 TARGET= 105 000

3 405	8 67	583 67	00	582 80	584 91	1 24	1 27	08	580 00
4700 0	185 9	4215 0	299 1	33 9	456 5	51 4	9 5	2 1	580 00
02	5 49	9 23	5 82	035	035	035	000	575 00	245 00
004709	211	205	197	2	0	0	00	105 00	350 00

SECNO	DEPTH	CWSEL	CRINS	WSELK	EG	HV	HL	CLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH *	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 3 407

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= 250 0 360 0 TYPE= 1 TARGET= 110 000

3 407	4 29	583 79	583 79	583 52	585 74	1 94	07	21	100000 00
4700 0	0	4700 0	0	0	420 3	0	5 6	2 2	100000 00
02	00	11 16	00	000	035	000	000	579 50	250 00
012503	10	10	10	20	5	0	00	110 00	360 00

*SECNO 3 410

3301 HV CHANGED MORE THAN HVINS

3302 WARNING CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE KRATIO = 1 99

3470 ENCROACHMENT STATIONS= 255 0 365 0 TYPE= 1 TARGET= 110 000

3 410	6 97	584 97	00	583 93	585 89	92	06	10	580 00
4700 0	25 3	3806 9	867 8	8 5	472 1	144 7	9 9	2 2	580 00
03	2 59	8 06	6 00	035	035	035	000	578 00	255 00
003160	10	10	10	4	0	0	00	110 00	365 00

*SECNO 3 460
2800 NAT Q1= 681 28 WSELK= 585 28 ENC Q1= 681 28 WSEL= 586 08 RATIO= 0000
NAT Q1= 962 RATIOS LOB CH ROB= 4532 5213 0256 WSEL= 586 08

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= 424 3 513 1 TYPE= 4 TARGET= 292

3 450	7 87	585 87	585 87	585 28	586 13	2 30	91	41	582 00
4700 0	1248 0	3452 0	0	168 4	265 9	0	12 4	2 7	584 00
03	7 41	13 49	00	035	025	000	000	578 00	424 34
005611	230	220	205	20	8	0	00	88 76	513 10

```
SECNO     DEPTH     CWSEL     CRIWS     WSELX     EG        HV        HL        QLOSS     L-BANK ELEV
Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VCL       TWA       R BANK ELEV
TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


*SECNO 3 530

3470 ENCROACHMENT STATIONS=      615 0     680 0  TYPE=      1  TARGET=       65 000
     3 530      7 61    587 61        00    587 45    590 05      2 44      1 33        04 100000 00
    4700 0         0    4700 0         0         0     374 7         0      15 5       3 3 100000 00
        04        00     12 54        00       000       025       000       000    580 00    615 00
    004856       344       352       372         3         0         0        00     65 00    680 00


*SECNO 3 570
3685 20 TRIALS ATTEMPTED WSEL CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=      515 0     588 0  TYPE=      1  TARGET=       73 000
     3 570      7 28    589 28    589 28    588 93    592 15      2 87      1 13         13    584 00
    4700 0     408 5    4291 5         0      56 2     305 4         0      17 5       3 6 100000 00
        04      7 27     14 05        00       035       025       000       000    582 00    515 00
    005481       214       220       336        20         0         0        00     63 03    578 03


*SECNO 3 600

3301 HV CHANGED MORE THAN HVINS

7195 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=      428 0     516 0  TYPE=      1  TARGET=       88 000
     3 600      5 96    591 96    591 96    591 97    594 25      2 29      1 78         06    588 00
    4700 0     851 2    3589 8     259 0      96 1     275 5      32 5      19 7        4 1    588 00
        05      8 86     13 03      7 96       035       035       035       000    586 00    428 00
    009770       258       248       232         3        15         0        00     88 00    516 00


*SECNO 3 621
 2800 NAT Q1=     790 14  WSELK=     596 52  ENC Q1=     790 14  WSEL=     597 02  RATIO=     0000
 NAT Q1=    1033   RATIOS LOB  CH  ROB=     1603    5259    3138  WSEL=     597 02

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
```

SECNO	DEPTH	CWSEL	CRIWS	WSELX	EC	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	KNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= 504 5 976 3 TYPE= 4 TARGET= 235

3 621	6 32	596 72	596 72	596 52	593 26	1 54	1 47	06	594 10
4500 0	239 1	3198 2	1062 7	36 7	281 4	230 3	22 3	4 9	594 50
06	6 52	11 36	4 61	025	025	035	000	590 40	804 53
004158	245	240	235	20	8	0	00	171 76	976 29

*SECNO 3 678

3470 ENCROACHMENT STATIONS= 190 0 332 0 TYPE= 1 TARGET= 142 000

3 678	7 48	598 38	00	597 84	599 43	1 05	1 12	05	595 80
4500 0	2770 1	1729 9	0	375 3	184 3	0	26 3	5 9	100000 00
07	7 38	9 39	00	025	025	000	000	590 90	150 00
003049	327	313	295	3	0	0	00	142 00	332 00

THIS RUN EXECUTED 09DEC99 04 10 14

****
HEC-2 WATER SURFACE PROFILES

Version 4 6 2 May 1991
****

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

YEAR STORM EVENT

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	SG	10*KS	VCH	AREA	Q-
*	3 222	00	00	00	568 30	4700 00	574 83	574 83	575 70	46 57	8 68	842 74	688
*	3 222	00	00	00	568 30	4700 00	574 73	574 73	577 01	98 72	12 19	199 96	473
*	3 310	420 00	00	00	572 00	4700 00	578 40	578 40	579 09	42 81	9 06	923 17	718
	3 310	420 00	00	00	572 00	4700 00	578 76	00	580 58	72 72	12 29	474 45	551
*	3 370	290 00	00	00	574 50	4700 00	581 30	581 30	582 66	69 97	10 34	561 70	561
*	3 370	290 00	00	00	574 50	4700 00	581 53	581 53	583 55	86 12	11 83	431 77	506
	3 405	205 20	00	00	575 00	4700 00	582 30	582 78	584 06	66 20	9 79	566 65	577
	3 405	205 20	00	00	575 00	4700 00	583 67	00	584 91	47 09	9 23	541 75	684
*	3 407	10 00	00	00	579 50	4700 00	583 52	583 52	584 60	91 01	8 59	603 67	492
*	3 407	10 00	00	00	579 50	4700 00	583 79	583 79	585 74	125 03	11 18	420 33	420
*	3 410	10 00	00	00	576 00	4700 00	583 93	00	584 69	39 15	7 94	735 46	751
*	3 410	10 00	00	00	576 00	4700 00	584 97	00	585 89	31 60	8 06	625 57	836
*	3 460	220 00	00	00	578 00	4700 00	585 28	585 28	586 74	47 59	11 84	386 82	681
*	3 460	220 00	00	00	578 00	4700 00	585 87	585 87	588 18	56 11	13 49	424 29	627
*	3 530	352 00	00	00	580 00	4700 00	587 45	587 45	588 55	28 81	9 50	754 80	875
	3 530	352 00	00	00	580 00	4700 00	587 61	00	590 05	48 56	12 54	374 74	674
*	3 570	220 00	00	00	582 00	4700 00	588 93	588 93	590 49	39 03	11 51	562 75	752
*	3 570	220 00	00	00	582 00	4700 00	589 28	589 28	592 15	54 81	14 05	361 58	634
*	3 600	247 60	00	00	586 00	4700 00	591 97	591 97	593 39	58 90	10 96	543 40	566
*	3 600	247 60	00	00	586 00	4700 00	591 96	591 96	594 25	97 70	13 03	404 09	475
*	3 621	240 00	00	00	590 40	4500 00	596 52	596 52	597 51	32 43	9 77	731 32	790
*	3 621	240 00	00	00	590 40	4500 00	596 72	596 72	598 26	41 58	11 36	548 56	697

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*XS	VCH	AREA	QI
3 678	313 00	00	00	590 90	4500 00	597 84	00	598 17	12 33	5 75	1083 23	1261
3 678	313 00	00	00	590 90	4500 00	598 38	00	599 43	30 49	9 39	559 65	815

YEAR STORM EVENT

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	3 222	4700 00	574 93	00	00	03	480 21	00
*	3 222	4700 00	574 73	- 09	00	- 09	92 80	00
*	3 310	4700 00	578 40	00	3 57	00	591 04	420 00
	3 310	4700 00	578 76	36	4 03	36	100 00	420 00
*	3 370	4700 00	581 30	00	2 90	00	226 54	290 00
*	3 370	4700 00	581 53	24	2 77	24	110 00	290 00
	3 405	4700 00	582 80	00	1 51	00	252 21	205 20
	3 405	4700 00	583 67	87	2 14	87	105 00	205 20
*	3 407	4700 00	583 52	00	72	00	288 23	10 00
*	3 407	4700 00	583 79	27	13	27	110 00	10 00
*	3 410	4700 00	583 93	00	41	00	261 41	10 00
*	3 410	4700 00	584 97	1 04	1 18	1 04	110 00	10 00
*	3 460	4700 00	585 28	00	1 35	00	213 31	220 00
*	3 460	4700 00	585 87	60	90	60	88 76	220 00
*	3 530	4700 00	587 45	00	2 18	00	351 73	352 00
	3 530	4700 00	587 61	15	1 73	15	65 00	352 00
*	3 570	4700 00	588 93	00	1 47	00	193 14	220 00
*	3 570	4700 00	589 28	35	1 67	35	63 03	220 00
*	3 600	4700 00	591 97	00	3 04	00	188 04	247 60
*	3 600	4700 00	591 96	- 01	2 68	- 01	88 00	247 60
*	3 621	4500 00	596 52	00	4 55	00	337 86	240 00
*	3 621	4500 00	596 72	21	4 76	21	171 76	240 00
*	3 678	4500 00	597 84	00	1 32	00	411 29	313 00
	3 678	4500 00	598 38	54	1 66	54	142 00	313 00

SUMMARY OF ERRORS AND SPECIAL NOTES

```
CAUTION SECNO-      3 222  PROFILE-  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      3 222  PROFILE-  2  CRITICAL DEPTH ASSUMED

CAUTION SECNO-      3 310  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      3 310  PROFILE-  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO-      3 310  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO-      3 370  PROFILE-  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO-      3 370  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      3 370  PROFILE-  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO-      3 370  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      3 370  PROFILE-  2  MINIMUM SPECIFIC ENERGY

CAUTION SECNO-      3 407  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      3 407  PROFILE-  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO-      3 407  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=      3 407  PROFILE-  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO-      3 407  PROFILE=  2  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      3 407  PROFILE-  2  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO-      3 410  PROFILE-  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO-      3 410  PROFILE-  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO-      3 460  PROFILE-  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      3 460  PROFILE-  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO-      3 460  PROFILE-  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=      3 460  PROFILE-  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO-      3 460  PROFILE=  2  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      3 460  PROFILE-  2  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO-      3 530  PROFILE-  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO-      3 530  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO-      3 570  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      3 570  PROFILE-  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO-      3 570  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO-      3 570  PROFILE-  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO-      3 570  PROFILE=  2  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      3 570  PROFILE-  2  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=      3 600  PROFILE-  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO-      3 600  PROFILE-  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO-      3 600  PROFILE-  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=      3 600  PROFILE-  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO-      3 600  PROFILE=  2  MINIMUM SPECIFIC ENERGY

CAUTION SECNO-      3 621  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      3 621  PROFILE-  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO-      3 621  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=      3 621  PROFILE-  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO-      3 621  PROFILE=  2  PROBABLE MINIMUM SPECIFIC ENERGY
```

```
CAUTION SECNO=      3 621  PROFILE=  2  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=      3 678  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
```

FLOODWAY DATA YEAR STORM EVENT
PROFILE NO 2

STATION	FLOODWAY WIDTH	FLOODWAY SECTION AREA	FLOODWAY MEAN VELOCITY	WATER SURFACE ELEVATION WITH FLOODWAY	WATER SURFACE ELEVATION WITHOUT FLOODWAY	DIFFERENCE
3 222	93	400	11 6	574 7	574 8	- 1
3 310	100	474	9 9	578 8	578 4	4
3 370	110	432	10 9	581 5	581 3	2
3 405	105	542	8 7	583 7	582 8	9
3 407	110	420	11 2	583 8	583 5	3
3 410	110	626	7 5	584 9	583 9	1 0
3 460	89	424	11 1	585 9	585 3	6
3 530	65	375	12 5	587 7	587 5	2
3 570	63	362	13 0	589 1	588 9	4
3 600	88	404	11 6	592 0	592 0	0
3 621	172	549	9 2	596 7	596 5	2
3 678	142	560	8 0	598 3	597 8	5

APPENDIX B.III

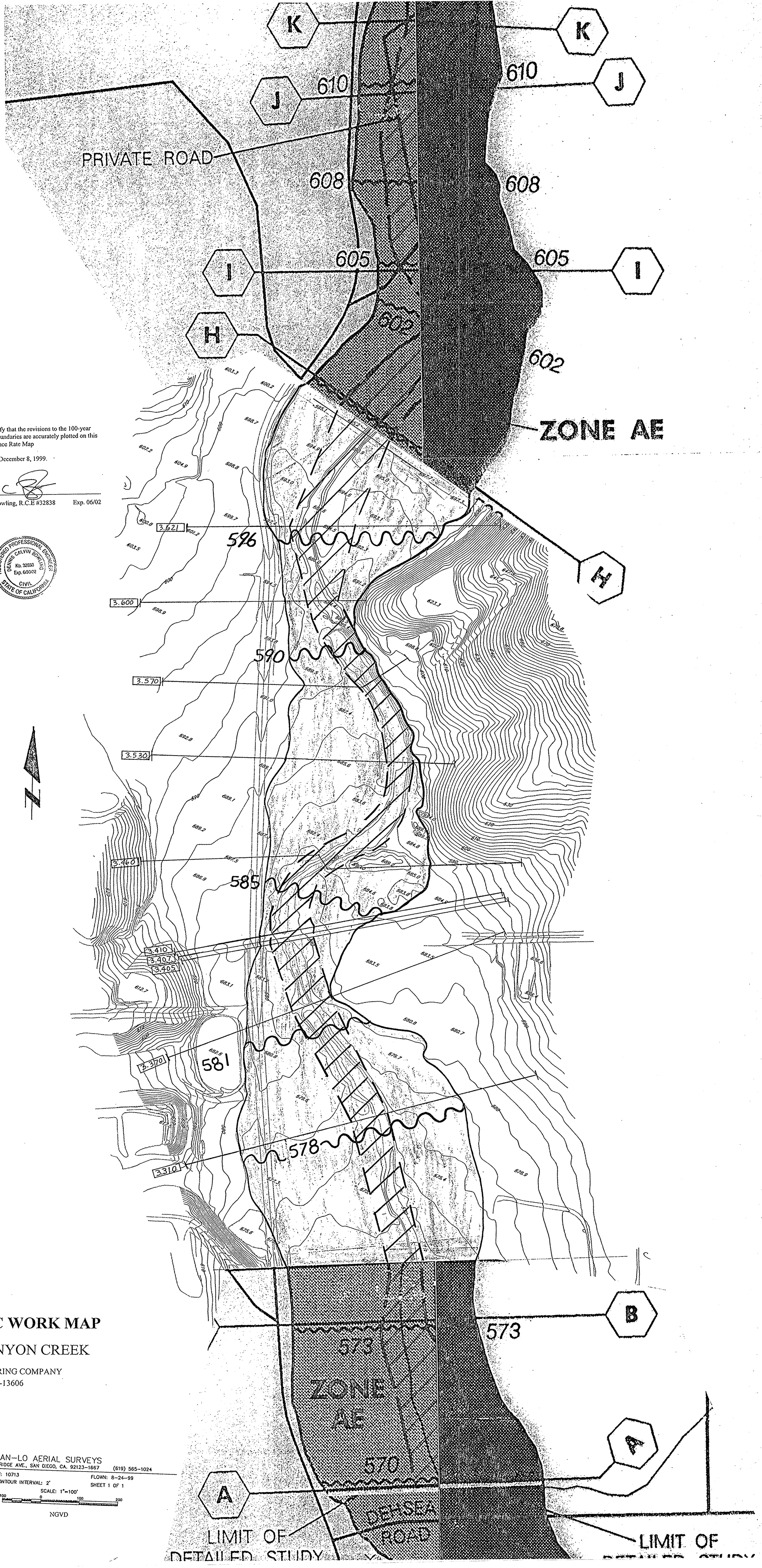
Harbison Canyon Creek
Existing Topographic Work Maps
FEMA Flood Insurance Rate Map

I hereby certify that the revisions to the 100-year floodplain boundaries are accurately plotted on this Flood Insurance Rate Map

On this day, December 8, 1999.

Dennis C. Bowling, R.C.E #32838 Exp. 06/02

REGISTERED PROFESSIONAL ENGINEER
DENNIS CALVIN BOWLING
No. 32838
Exp. 6/30/02
CIVIL
STATE OF CALIFORNIA



TOPOGRAPHIC WORK MAP

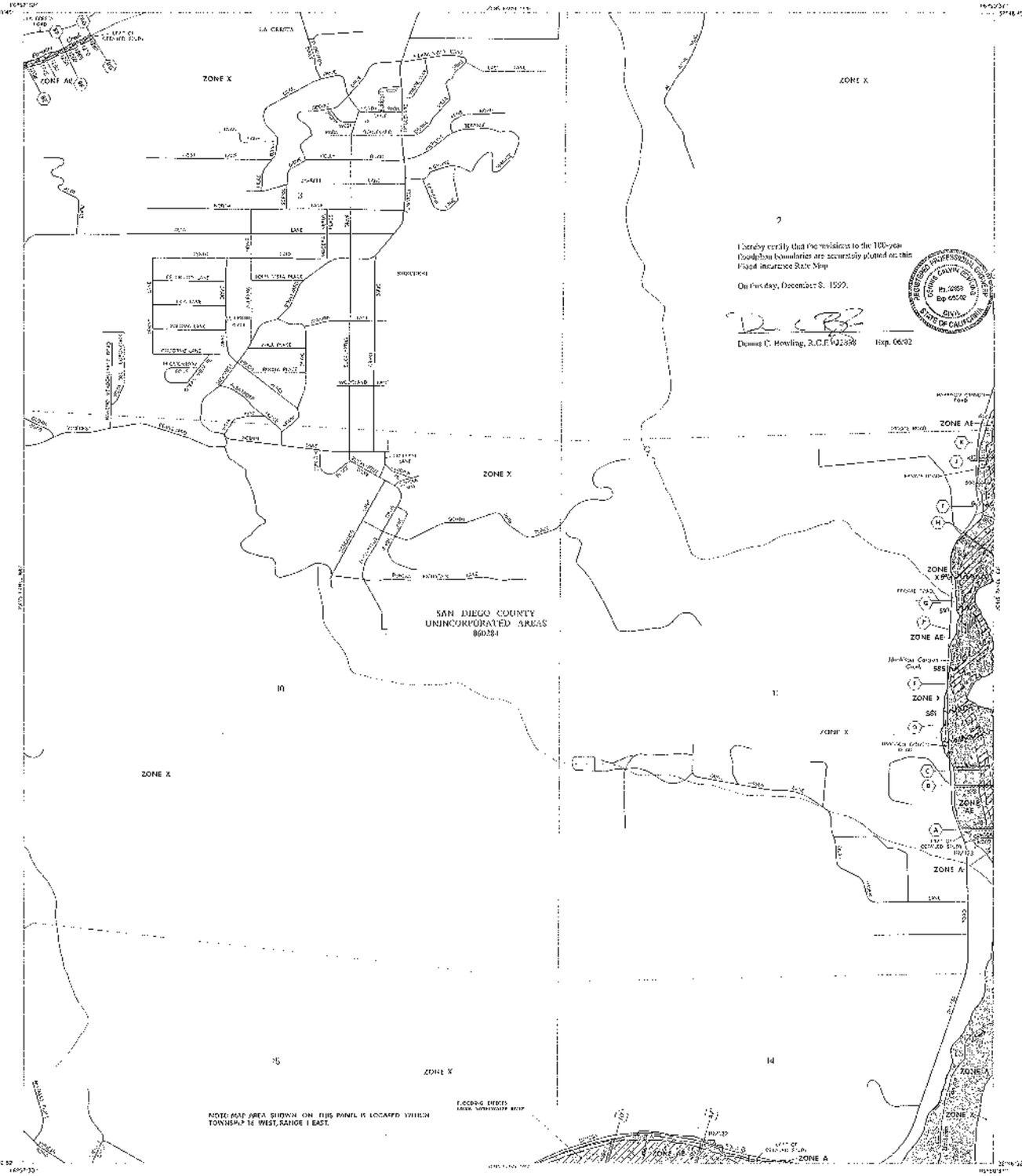
HARBISON CANYON CREEK

RICK ENGINEERING COMPANY
Job Number J-13606
December 8, 1999

SAN-LO AERIAL SURVEYS
4875 VIEWRIDGE AVE., SAN DIEGO, CA. 92123-1667 (619) 565-1024
JN: 10713 FLOWN: 8-24-99
CONTOUR INTERVAL: 2' SHEET 1 OF 1
SCALE: 1"=100'
100 0 100 200
NGVD

ELEVATION REFERENCE MARKS

REFERENCE ELEVATION (NGVD)	DESCRIPTION OF LOCATION
BM1[illegible] Sec. [illegible] [illegible]	[illegible]
BM1[illegible] Sec. [illegible] [illegible]	[illegible]



I hereby certify that the revisions to the 100-year floodplain boundaries are accurately plotted on this Flood Insurance Rate Map

On Friday, December 5, 1997.

Donna C. Howling, R.C.E. 42598 Exp. 06/02

REGISTERED PROFESSIONAL ENGINEER DONNA C. HOWLING No. 42598 Exp. 06/02 CIVIL STATE OF CALIFORNIA

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

ZONE A No base flood elevations determined.

ZONE AE Base flood elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR To be assigned the 100-year flood by federal flood protection system under construction; base flood elevations determined.

ZONE V Coastal flood with velocity hazard (wave action); no base flood elevations determined.

ZONE VE Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREA IN ZONE AE

OTHER FLOOD AREAS

ZONE X Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

ZONE X Areas determined to be outside the 500-year floodplain.

ZONE D Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS

Coastal Barrier (CB) | Coastal Barrier (CB) | Otherwise Protected Area (OPA)

Coastal barrier area is generally defined as adjacent to special flood hazard areas.

Flood Boundary

Floodway Boundary

Zone D Boundary

Boundary dividing Special Flood Hazard Areas and boundary dividing Special Flood Hazard Areas of different Base (100-year) Flood Elevations in areas of 100-year flood.

Cross Section Line

Base Flood Elevation in feet above National Geodetic Vertical Datum for the 100-year Flood Elevation Grid

Transect Reference Line

Bench Mark

Horizontal Reference Grid on North American Datum of 1927 (NAD 27) Projection

NOTES

[illegible]

MAP DESIGNATION
Refer to Preceding Page for Map Index

REFERENCE BASE OF
CONTINUOUS FLOOD INSURANCE RATE MAP

[illegible]

APPROXIMATE SCALE IN FEET

NATIONAL FLOOD INSURANCE PROGRAM

REVISED

FIRM

FLOOD INSURANCE RATE MAP

SAN DIEGO COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 1686 OF 2375

[illegible]

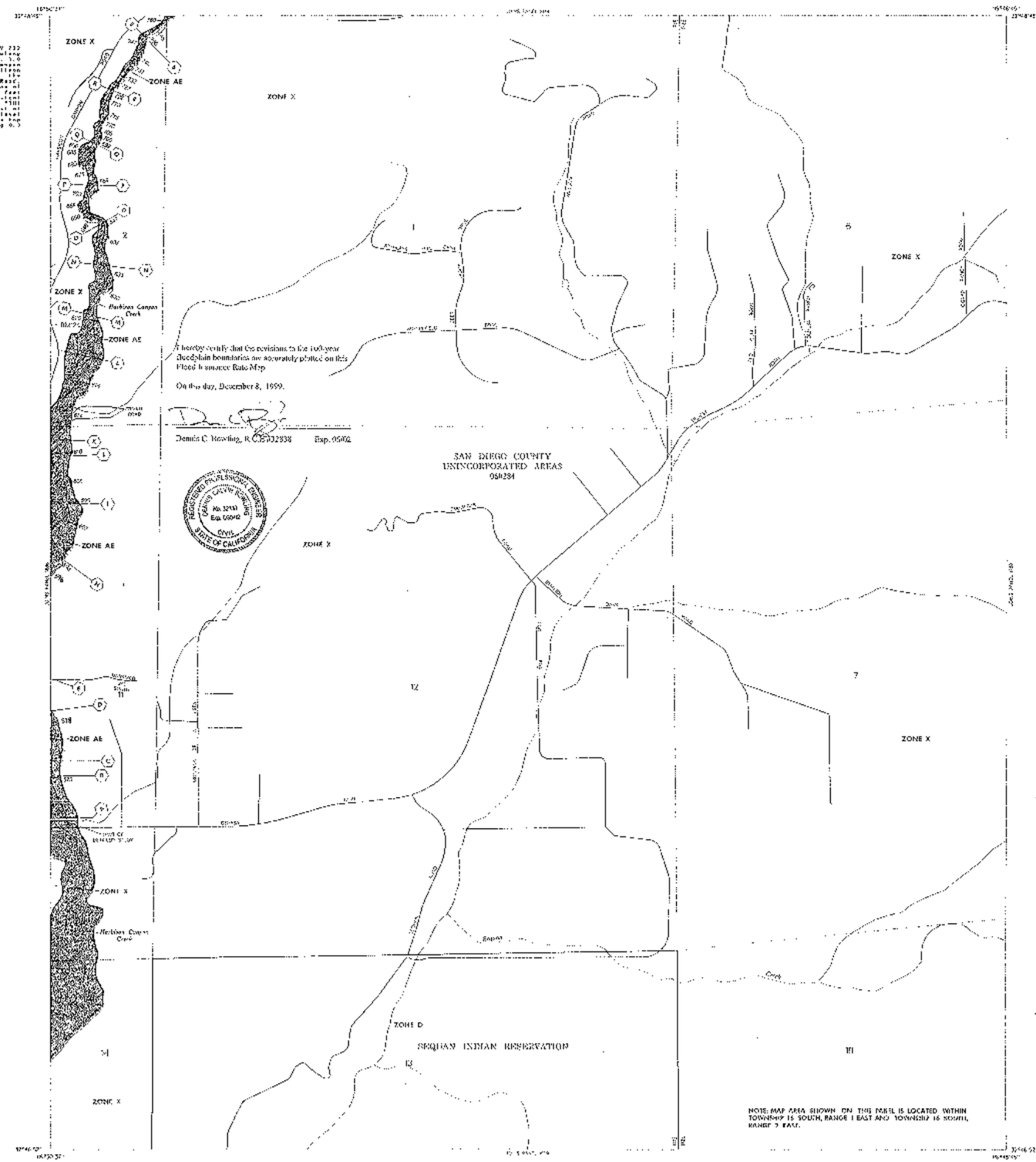
MAP NUMBER
06073C1686 F

EFFECTIVE DATE:
JUNE 19, 1997

Federal Emergency Management Agency

ELEVATION REFERENCE MARKS

REFERENCE MARK NAME	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
FM132	639.993	USC&GS bronze disk stamped "V 732 1968." Located 1.8 miles south along Dehesa Road from Dehesa School. 5.0 miles north along Wheeler Canyon Road, at the entrance to Elfin Community, 25 feet southwest of centerline of Cordilleras Canyon Road, 10 feet north of the centerline of the entrance road, 3.0 feet southwest of a Pulsar bus shelter post approximately 1 foot reading "THE ELFIN RANCHERO." 1.3 feet east of a wooden post, approximately level with the ground, and set in the top of a concrete post projecting 0.3 feet above the ground.



LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR/A1-A30 Area to be protected from 100-year flood by Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined.

UNMAPPED COASTAL BARRIERS

Otherwise Protected Area (OPA) | Coastal Barrier Resources System (CBRS) area | Coastal Barrier Resource System (CBRS) area

Cross-section line and letter designations, and transect line and number for Zone V Flood Hazard Areas

Flood Elevation

Floodway Boundary

Zone D Boundary

Boundary between Special Flood Hazard Areas and areas not in Special Flood Hazard Areas

Boundary between areas of different Flood Hazard Zones

Cross section line and letter designations

Base Flood Elevation at floodplain cross section line

Base Flood Elevation at floodplain boundary

Elevation reference mark

River mile

MAP REPOSITORY
Refer to Repository Listing on Map Index

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP

AND ITS
EFFECTIVE BASE(S) OF REVISION(S) TO THIS PANEL

For information on flood insurance, call the National Flood Insurance Program at 1-800-638-6620.

APPROXIMATE SCALE IN FEET

NOTES

Territorial limits are based on the Public Land Survey System (PLSS) and may not coincide with corporate limits or other boundaries.

Elevations shown on this map are based on NGVD 29. Users should be aware that BFEs shown on this map are based on NGVD 29 and may differ from those published on other Flood Insurance Rate Maps.

Areas of Special Flood Hazard shown on this map include Zones A, AE, AH, AO, AR, A1-A30, V, and VE.

Coastal areas are subject to Special Flood Hazards that may be greater than those shown on this map.

Elevations shown on this map are based on the North American Vertical Datum of 1988 (NAVD 88). Users should be aware that BFEs shown on this map are based on NAVD 88 and may differ from those published on other Flood Insurance Rate Maps.

Flood elevations shown on this map apply only landward of the limit of moderate wave action (LiMWA) or seaward of the Coastal Barrier Resources System (CBRS) boundary.

Coastal flood hazard areas are depicted on this map based on the 1% annual chance wave height. Base flood elevations are provided in the Flood Insurance Study Report.

The map shows the 0.2% annual chance floodplain of Coastal Barrier Resources System (CBRS) areas and Otherwise Protected Areas (OPA) only. The Federal Flood Insurance Program (NFIP) does not apply to CBRS areas.

Some flood hazard areas may be subject to erosion. The map does not account for erosion or other land movement that may affect flood hazards in the future. Users should be aware that flood hazards may change as a result of erosion.

For communities participating in the Flood Insurance Program, refer to the community's Flood Insurance Rate Map (FIRM) for the most up-to-date information.

For additional information, call the FEMA Map Service Center at 1-800-358-9616.

MAP REPOSITORY
Refer to Repository Listing on Map Index

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP

AND ITS
EFFECTIVE BASE(S) OF REVISION(S) TO THIS PANEL

NATIONAL FLOOD INSURANCE PROGRAM

REVISED

FIRM

FLOOD INSURANCE RATE MAP

SAN DIEGO COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 1 OF 2305

SEE MAP INDEX FOR PANELS NOT PRINTED

COMMUNITY NUMBER | PANEL | SUFFIX
UNINCORPORATED AREAS | 0 | 1 | F

MAP NUMBER
06073C0001 F

EFFECTIVE DATE:
JUNE 19, 1997

Federal Emergency Management Agency

APPENDIX C

HEC-RAS MODEL OF

EXISTING HEC 2 STUDY

APPENDIX C.I

Harbison Canyon Creek
10-year and 100-year Analyses

HEC-RAS Version 4.1.0 Jan 2010
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
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: Rick Engineering Analysis
Project File : HecRicks.prj
Run Date and Time: 11/17/2010 5:58:17 PM

Project in English units

PLAN DATA

Plan Title: Rick's reproduction of Hec-2
Plan File : f:\WINDATA\JOBS\12594 Carnevale -Harbison Canyon\HEC RAS\calcs\KCNV00000002 WBS 10009\HECRAS\HecRicks.p15

Geometry Title: Rick's Engineering Geometry
Geometry File : f:\WINDATA\JOBS\12594 Carnevale -Harbison Canyon\HEC RAS\calcs\KCNV00000002 WBS 10009\HECRAS\HecRicks.g01

Flow Title   : Rick's Engineering Flow
Flow File   : f:\WINDATA\JOBS\12594 Carnevale -Harbison Canyon\HEC RAS\calcs\KCNV00000002 WBS 10009\HECRAS\HecRicks.f01

Plan Summary Information:
Number of: Cross Sections =   7   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: Between every coordinate point (HEC2 Style)
    Friction Slope Method: Average Conveyance
    Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Rick's Engineering Flow
Flow File : f:\WINDATA\JOBS\12594 Carnevale -Harbison Canyon\HEC RAS\calcs\KCNV00000002 WBS 10009\HECRAS\HecRicks.f01

Flow Data (cfs)

River	Reach	RS	10 yr	100 yr
Harbison Creek	Culverts	530	1050	4700

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Harbison Creek	Culverts	10 yr	Known WS = 575.37	
Harbison Creek	Culverts	100 yr	Known WS = 578.4	

GEOMETRY DATA

Geometry Title: Rick's Engineering Geometry
Geometry File : f:\WINDATA\JOBS\12594 Carnevale -Harbison Canyon\HEC RAS\calcs\KCNV00000002 WBS 10009\HECRAS\HecRicks.g01

CROSS SECTION

RIVER: Harbison Creek
REACH: Culverts RS: 530

INPUT
Description:
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	59466.09998		593	121.8	592	211.7	590	324.6	588
422	586	487.3	585.6	593	586	593.4	586	613.4	586
631.1	582	651.7	580	659.8	580	666.5	580	675.7	584
685.6	586	709.6	588	722.7	590	739.2	592	758.8	594
789.2	600								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	613.4	.025	685.6	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
613.4	685.6	344	352	372	.1	.3

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	584.88	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.67	Wt. n-Val.		0.025	
W.S. Elev (ft)	584.21	Reach Len. (ft)	344.00	352.00	372.00
Crit W.S. (ft)		Flow Area (sq ft)		159.91	

E.G. Slope (ft/ft)	0.003060	Area (sq ft)		159.91		
Q Total (cfs)	1050.00	Flow (cfs)		1050.00		
Top Width (ft)	55.46	Top Width (ft)		55.46		
Vel Total (ft/s)	6.57	Avg. Vel. (ft/s)		6.57		
Max Chl Dpth (ft)	4.21	Hydr. Depth (ft)		2.88		
Conv. Total (cfs)	18982.5	Conv. (cfs)		18982.5		
Length Wtd. (ft)	351.48	Wetted Per. (ft)		56.65		
Min Ch El (ft)	580.00	Shear (lb/sq ft)		0.54		
Alpha	1.00	Stream Power (lb/ft s)	789.20	0.00	0.00	
Frctn Loss (ft)	1.25	Cum Volume (acre-ft)	0.53	3.78	0.18	
C & E Loss (ft)	0.01	Cum SA (acres)	0.78	1.45	0.23	

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 OUTPUT Profile #100 yr

E.G. Elev (ft)	588.56	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.14	Wt. n-Val.	0.035	0.025	0.035
W.S. Elev (ft)	587.42	Reach Len. (ft)	344.00	352.00	372.00
Crit W.S. (ft)	587.42	Flow Area (sq ft)	354.89	376.37	12.09
E.G. Slope (ft/ft)	0.002978	Area (sq ft)	354.89	376.37	12.09
Q Total (cfs)	4700.00	Flow (cfs)	1059.78	3618.00	22.23
Top Width (ft)	349.75	Top Width (ft)	260.52	72.20	17.03
Vel Total (ft/s)	6.32	Avg. Vel. (ft/s)	2.99	9.61	1.84
Max Chl Dpth (ft)	7.42	Hydr. Depth (ft)	1.36	5.21	0.71
Conv. Total (cfs)	86119.9	Conv. (cfs)	19418.7	66293.9	407.3
Length Wtd. (ft)	349.57	Wetted Per. (ft)	260.53	73.78	17.09
Min Ch El (ft)	580.00	Shear (lb/sq ft)	0.25	0.95	0.13
Alpha	1.83	Stream Power (lb/ft s)	789.20	0.00	0.00
Frctn Loss (ft)	1.26	Cum Volume (acre-ft)	6.30	7.92	2.55
C & E Loss (ft)	0.03	Cum SA (acres)	4.00	1.55	1.93

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: Harbison Creek
REACH: Culverts RS: 460

INPUT
Description: Cross Section X4
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	600	19.7	0001	596	39.4	0002	592	56.9	0002
224.3	587.5	319.4	586	351.1	584	408.2	582	467.8	582
480.3	580	488.9	578	495	578	500.9	580	513.1	584
561.8	586	724.4	586	775.7	586	842	588	871.2	590
895.9	592	921.9	594	961.8	596	993.6	598	1019.6	600

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	467.8	.025	513.1	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
467.8	513.1	230	220	205	.1	.3

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	583.63	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.79	Wt. n-Val.	0.035	0.025	
W.S. Elev (ft)	582.83	Reach Len. (ft)	230.00	220.00	205.00
Crit W.S. (ft)	582.83	Flow Area (sq ft)	59.57	120.22	
E.G. Slope (ft/ft)	0.004149	Area (sq ft)	59.57	120.22	
Q Total (cfs)	1050.00	Flow (cfs)	135.35	914.65	
Top Width (ft)	125.13	Top Width (ft)	83.39	41.74	
Vel Total (ft/s)	5.84	Avg. Vel. (ft/s)	2.27	7.61	
Max Chl Dpth (ft)	4.83	Hydr. Depth (ft)	0.71	2.88	
Conv. Total (cfs)	16301.5	Conv. (cfs)	2101.3	14200.2	
Length Wtd. (ft)	220.06	Wetted Per. (ft)	83.40	42.91	
Min Ch El (ft)	578.00	Shear (lb/sq ft)	0.18	0.73	
Alpha	1.50	Stream Power (lb/ft s)	1019.60	0.00	0.00
Frctn Loss (ft)	0.58	Cum Volume (acre-ft)	0.29	2.65	0.18
C & E Loss (ft)	0.17	Cum SA (acres)	0.45	1.06	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 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 OUTPUT Profile #100 yr

E.G. Elev (ft)	586.74	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.40	Wt. n-Val.	0.035	0.025	0.035
W.S. Elev (ft)	585.34	Reach Len. (ft)	230.00	220.00	205.00
Crit W.S. (ft)	585.34	Flow Area (sq ft)	347.13	231.78	21.91
E.G. Slope (ft/ft)	0.004484	Area (sq ft)	347.13	231.78	21.91
Q Total (cfs)	4700.00	Flow (cfs)	1966.58	2685.71	47.71
Top Width (ft)	215.93	Top Width (ft)	137.96	45.30	32.67
Vel Total (ft/s)	7.82	Avg. Vel. (ft/s)	5.67	11.59	2.18
Max Chl Dpth (ft)	7.34	Hydr. Depth (ft)	2.52	5.12	0.67
Conv. Total (cfs)	70187.4	Conv. (cfs)	29367.9	40107.0	712.5
Length Wtd. (ft)	220.34	Wetted Per. (ft)	138.04	46.66	32.70
Min Ch El (ft)	578.00	Shear (lb/sq ft)	0.70	1.39	0.19
Alpha	1.47	Stream Power (lb/ft s)	1019.60	0.00	0.00
Frctn Loss (ft)	0.92	Cum Volume (acre-ft)	3.53	5.46	2.41
C & E Loss (ft)	0.19	Cum SA (acres)	2.42	1.07	1.72

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 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: Harbison Creek
REACH: Culverts RS: 410

INPUT
Description: Cross Section X3
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	59411.40002		59223.09998		590	32.5	58855.29999		586
119.8	584	192.2	584	224.5	584	238.8	582	256.8	580
279.3	578	289.3	578	298.2	578	332.7	580	398.2	582
489.8	584	631.5	585	741.8	586	765.9	588	803.2	590
839.9	592	870.9	594						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	256.8	.035	332.7	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
256.8	332.7	10	10	10	.1	.3

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	582.09	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.21	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	581.88	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)		Flow Area (sq ft)	15.88	237.40	57.80
E.G. Slope (ft/ft)	0.001833	Area (sq ft)	15.88	237.40	57.80
Q Total (cfs)	1050.00	Flow (cfs)	27.58	921.68	100.74
Top Width (ft)	154.34	Top Width (ft)	16.91	75.90	61.53
Vel Total (ft/s)	3.38	Avg. Vel. (ft/s)	1.74	3.88	1.74
Max Chl Dpth (ft)	3.88	Hydr. Depth (ft)	0.94	3.13	0.94
Conv. Total (cfs)	24525.4	Conv. (cfs)	644.2	21528.2	2353.0
Length Wtd. (ft)	10.00	Wetted Per. (ft)	17.01	76.05	61.56
Min Ch El (ft)	578.00	Shear (lb/sq ft)	0.11	0.36	0.11
Alpha	1.19	Stream Power (lb/ft s)	870.90	0.00	0.00
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	0.09	1.75	0.04
C & E Loss (ft)	0.04	Cum SA (acres)	0.18	0.76	0.08

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 OUTPUT Profile #100 yr

E.G. Elev (ft)	584.69	Element	Left OB	Channel	Right OB

Vel Head (ft)	0.76	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	583.93	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)		Flow Area (sq ft)	66.13	393.25	277.55
E.G. Slope (ft/ft)	0.003897	Area (sq ft)	66.13	393.25	277.55
Q Total (cfs)	4700.00	Flow (cfs)	319.72	3116.51	1263.77
Top Width (ft)	261.71	Top Width (ft)	31.82	75.90	153.99
Vel Total (ft/s)	6.38	Avg. Vel. (ft/s)	4.84	7.92	4.55
Max Chl Dpth (ft)	5.93	Hydr. Depth (ft)	2.08	5.18	1.80
Conv. Total (cfs)	75293.4	Conv. (cfs)	5121.9	49926.1	20245.4
Length Wtd. (ft)	10.00	Wetted Per. (ft)	32.06	76.05	154.05
Min Ch El (ft)	578.00	Shear (lb/sq ft)	0.50	1.26	0.44
Alpha	1.20	Stream Power (lb/ft s)	870.90	0.00	0.00
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)	2.44	3.88	1.70
C & E Loss (ft)	0.03	Cum SA (acres)	1.98	0.77	1.28

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: Harbison Creek
REACH: Culverts RS: 407

INPUT
Description:
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	594	8	592	18	590	28	588	48	586
92	584	125	584	150	584.3	175	584	200	584
210	584	225	582	255	580	300	579.5	330	580
390	582	500	583.5	540	584	670	584.2	735	586
760	588	800	590	830	592	865	594		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	225	.035	390	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
225	390	10	10	10	.1	.3

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	582.01	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.62	Wt. n-Val.		0.035	
W.S. Elev (ft)	581.39	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)	581.39	Flow Area (sq ft)		166.47	
E.G. Slope (ft/ft)	0.017128	Area (sq ft)		166.47	
Q Total (cfs)	1050.00	Flow (cfs)		1050.00	
Top Width (ft)	137.55	Top Width (ft)		137.55	
Vel Total (ft/s)	6.31	Avg. Vel. (ft/s)		6.31	
Max Chl Dpth (ft)	1.89	Hydr. Depth (ft)		1.21	
Conv. Total (cfs)	8023.0	Conv. (cfs)		8023.0	
Length Wtd. (ft)	10.00	Wetted Per. (ft)		137.62	
Min Ch El (ft)	579.50	Shear (lb/sq ft)		1.29	
Alpha	1.00	Stream Power (lb/ft s)	865.00	0.00	0.00
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	0.09	1.70	0.03
C & E Loss (ft)	0.03	Cum SA (acres)	0.18	0.74	0.08

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: 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 OUTPUT Profile #100 yr

E.G. Elev (ft)	584.60	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.08	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	583.52	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)	583.52	Flow Area (sq ft)	8.67	509.64	84.78
E.G. Slope (ft/ft)	0.009126	Area (sq ft)	8.67	509.64	84.78
Q Total (cfs)	4700.00	Flow (cfs)	29.12	4381.95	288.93
Top Width (ft)	288.05	Top Width (ft)	11.40	165.00	111.65
Vel Total (ft/s)	7.79	Avg. Vel. (ft/s)	3.36	8.60	3.41
Max Chl Dpth (ft)	4.02	Hydr. Depth (ft)	0.76	3.09	0.76
Conv. Total (cfs)	49199.3	Conv. (cfs)	304.8	45870.0	3024.5
Length Wtd. (ft)	10.00	Wetted Per. (ft)	11.51	165.11	111.66
Min Ch El (ft)	579.50	Shear (lb/sq ft)	0.43	1.76	0.43
Alpha	1.15	Stream Power (lb/ft s)	865.00	0.00	0.00
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	2.43	3.78	1.66
C & E Loss (ft)	0.02	Cum SA (acres)	1.97	0.74	1.25

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: Harbison Creek
REACH: Culverts RS: 405

INPUT
Description: Cross Section X2
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	594	7	592	15	590	25	588	45	586
95	584	125	584	150	584.2	170	584	205	584
220	582	255	580	270	578	275	576	280	575
290	576	300	578	335	580	395	582	530	583.5
840	592	870	594						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	255	.035	335	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

255 335 211 205 197 .1 .3

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	580.75	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.52	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	580.23	Reach Len. (ft)	211.00	205.00	197.00
Crit W.S. (ft)		Flow Area (sq ft)	0.45	180.58	0.77
E.G. Slope (ft/ft)	0.006421	Area (sq ft)	0.45	180.58	0.77
Q Total (cfs)	1050.00	Flow (cfs)	0.35	1049.04	0.61
Top Width (ft)	90.73	Top Width (ft)	3.95	80.00	6.78
Vel Total (ft/s)	5.78	Avg. Vel. (ft/s)	0.79	5.81	0.79
Max Chl Dpth (ft)	5.23	Hydr. Depth (ft)	0.11	2.26	0.11
Conv. Total (cfs)	13103.4	Conv. (cfs)	4.4	13091.3	7.6
Length Wtd. (ft)	205.00	Wetted Per. (ft)	3.96	80.92	6.78
Min Ch El (ft)	575.00	Shear (lb/sq ft)	0.05	0.89	0.05
Alpha	1.01	Stream Power (lb/ft s)	870.00	0.00	0.00
Frctn Loss (ft)	1.60	Cum Volume (acre-ft)	0.09	1.66	0.03
C & E Loss (ft)	0.02	Cum SA (acres)	0.18	0.71	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 OUTPUT Profile #100 yr

E.G. Elev (ft)	584.05	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.27	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	582.78	Reach Len. (ft)	211.00	205.00	197.00
Crit W.S. (ft)	582.78	Flow Area (sq ft)	64.70	385.13	134.56
E.G. Slope (ft/ft)	0.006680	Area (sq ft)	64.70	385.13	134.56
Q Total (cfs)	4700.00	Flow (cfs)	322.25	3780.99	596.76
Top Width (ft)	251.33	Top Width (ft)	40.87	80.00	130.46
Vel Total (ft/s)	8.04	Avg. Vel. (ft/s)	4.98	9.82	4.44
Max Chl Dpth (ft)	7.78	Hydr. Depth (ft)	1.58	4.81	1.03
Conv. Total (cfs)	57507.5	Conv. (cfs)	3943.0	46262.8	7301.7
Length Wtd. (ft)	204.95	Wetted Per. (ft)	40.98	80.92	130.50
Min Ch El (ft)	575.00	Shear (lb/sq ft)	0.66	1.98	0.43
Alpha	1.26	Stream Power (lb/ft s)	870.00	0.00	0.00
Frctn Loss (ft)	1.39	Cum Volume (acre-ft)	2.42	3.67	1.63
C & E Loss (ft)	0.01	Cum SA (acres)	1.97	0.71	1.22

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: Harbison Creek
REACH: Culverts RS: 370

INPUT

Description: Cross Section X1

Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	59031.90002		58855.29999		58672.29999		584	112.6	583
194.9	582	225.3	580	242.3	582	251.5	582	288.4	580
340.1	578	373.4	576	386.8	574	401.1	576	408.9	578
427.3	580	478.3	582	578.9	583	716.2	583	806.8	584
850.8	586	910.4	588	939.3	590				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	340.1	.035	408.9	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
340.1	408.9	300	290	295	.1	.3

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	579.13	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.75	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	578.38	Reach Len. (ft)	300.00	290.00	295.00
Crit W.S. (ft)	578.14	Flow Area (sq ft)	1.82	150.00	0.65
E.G. Slope (ft/ft)	0.009666	Area (sq ft)	1.82	150.00	0.65
Q Total (cfs)	1050.00	Flow (cfs)	2.48	1046.64	0.88
Top Width (ft)	81.94	Top Width (ft)	9.69	68.80	3.45
Vel Total (ft/s)	6.89	Avg. Vel. (ft/s)	1.37	6.98	1.36
Max Chl Dpth (ft)	4.38	Hydr. Depth (ft)	0.19	2.18	0.19
Conv. Total (cfs)	10679.9	Conv. (cfs)	25.3	10645.7	9.0
Length Wtd. (ft)	290.37	Wetted Per. (ft)	9.70	69.40	3.47
Min Ch El (ft)	574.00	Shear (lb/sq ft)	0.11	1.30	0.11
Alpha	1.02	Stream Power (lb/ft s)	939.30	0.00	0.00
Frctn Loss (ft)	2.74	Cum Volume (acre-ft)	0.08	0.89	0.03
C & E Loss (ft)	0.02	Cum SA (acres)	0.15	0.36	0.05

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 OUTPUT Profile #100 yr

E.G. Elev (ft)	582.63	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.36	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	581.26	Reach Len. (ft)	300.00	290.00	295.00
Crit W.S. (ft)	581.26	Flow Area (sq ft)	150.71	348.76	62.02
E.G. Slope (ft/ft)	0.006864	Area (sq ft)	150.71	348.76	62.02
Q Total (cfs)	4700.00	Flow (cfs)	796.52	3599.11	304.37
Top Width (ft)	224.40	Top Width (ft)	104.97	68.80	50.63
Vel Total (ft/s)	8.37	Avg. Vel. (ft/s)	5.29	10.32	4.91
Max Chl Dpth (ft)	7.26	Hydr. Depth (ft)	1.44	5.07	1.23
Conv. Total (cfs)	56727.9	Conv. (cfs)	9613.8	43440.4	3673.7
Length Wtd. (ft)	293.16	Wetted Per. (ft)	105.16	69.40	50.76
Min Ch El (ft)	574.00	Shear (lb/sq ft)	0.61	2.15	0.52
Alpha	1.25	Stream Power (lb/ft s)	939.30	0.00	0.00
Frctn Loss (ft)	1.56	Cum Volume (acre-ft)	1.90	1.95	1.19
C & E Loss (ft)	0.20	Cum SA (acres)	1.61	0.36	0.81

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: 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 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: Harbison Creek
REACH: Culverts RS: 310

INPUT
Description:
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	58813.59998		58630.20001		58445.79999		58297.59998		580
152.8	578	207.8	578	229.5	578	277.2	578	344.7	578
456.5	576	505	574	515	572	527.1	572	537.3	572
544.6	574	562.4	576	650	577	715.2	578	804.8	580
838.4	582	876.8	584	915.8	586	946.4	588		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	505	.035	544.6	.04

Bank Sta: Left	Right	Coeff Contr.	Expan.
505	544.6	.1	.3

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	576.36	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.99	Wt. n-Val.	0.040	0.035	0.040
W.S. Elev (ft)	575.37	Reach Len. (ft)			
Crit W.S. (ft)	575.36	Flow Area (sq ft)	22.76	116.15	8.35
E.G. Slope (ft/ft)	0.009242	Area (sq ft)	22.76	116.15	8.35
Q Total (cfs)	1050.00	Flow (cfs)	63.12	963.80	23.08
Top Width (ft)	85.02	Top Width (ft)	33.22	39.60	12.19
Vel Total (ft/s)	7.13	Avg. Vel. (ft/s)	2.77	8.30	2.76
Max Chl Dpth (ft)	3.37	Hydr. Depth (ft)	0.68	2.93	0.68
Conv. Total (cfs)	10922.3	Conv. (cfs)	656.6	10025.6	240.1
Length Wtd. (ft)		Wetted Per. (ft)	33.25	40.07	12.27
Min Ch El (ft)	572.00	Shear (lb/sq ft)	0.39	1.67	0.39
Alpha	1.26	Stream Power (lb/ft s)	946.40	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	579.09	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.69	Wt. n-Val.	0.040	0.035	0.040
W.S. Elev (ft)	578.40	Reach Len. (ft)			
Crit W.S. (ft)	578.30	Flow Area (sq ft)	400.40	236.14	289.23
E.G. Slope (ft/ft)	0.004258	Area (sq ft)	400.40	236.14	289.23
Q Total (cfs)	4700.00	Flow (cfs)	1480.88	2134.38	1084.74
Top Width (ft)	591.36	Top Width (ft)	363.24	39.60	188.52
Vel Total (ft/s)	5.08	Avg. Vel. (ft/s)	3.70	9.04	3.75
Max Chl Dpth (ft)	6.40	Hydr. Depth (ft)	1.10	5.96	1.53

Conv. Total (cfs)	72030.1	Conv. (cfs)	22695.3	32710.5	16624.3
Length Wtd. (ft)		Wetted Per. (ft)	363.31	40.07	188.65
Min Ch El (ft)	572.00	Shear (lb/sq ft)	0.29	1.57	0.41
Alpha	1.73	Stream Power (lb/ft s)	946.40	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River:Harbison Creek

Reach	River Sta.	n1	n2	n3
Culverts	530	.035	.025	.035
Culverts	460	.035	.025	.035
Culverts	410	.035	.035	.035
Culverts	407	.035	.035	.035
Culverts	405	.035	.035	.035
Culverts	370	.035	.035	.035
Culverts	310	.04	.035	.04

SUMMARY OF REACH LENGTHS

River: Harbison Creek

Reach	River Sta.	Left	Channel	Right
Culverts	530	344	352	372
Culverts	460	230	220	205
Culverts	410	10	10	10
Culverts	407	10	10	10
Culverts	405	211	205	197
Culverts	370	300	290	295
Culverts	310			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Harbison Creek

Reach	River Sta.	Contr.	Expan.
Culverts	530	.1	.3
Culverts	460	.1	.3
Culverts	410	.1	.3
Culverts	407	.1	.3
Culverts	405	.1	.3
Culverts	370	.1	.3
Culverts	310	.1	.3

Profile Output Table - Standard Table 1-Carnevale

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev

E.G. Slope (ft/ft)	Vel Total (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # XS (cfs)	(ft)	(ft)	(ft)	(ft)
Culverts	530	10 yr	1050.00	580.00	584.21			584.88
0.003060	6.57	159.91	55.46	0.68				
Culverts	530	100 yr	4700.00	580.00	587.42	587.42		588.56
0.002978	6.32	743.35	349.75	1.03				
Culverts	460	10 yr	1050.00	578.00	582.83	582.83		583.63
0.004149	5.84	179.79	125.13	1.05				
Culverts	460	100 yr	4700.00	578.00	585.34	585.34		586.74
0.004484	7.82	600.82	215.93	1.00				
Culverts	410	10 yr	1050.00	578.00	581.88			582.09
0.001833	3.38	311.09	154.34	0.46				
Culverts	410	100 yr	4700.00	578.00	583.93			584.69
0.003897	6.38	736.93	261.71	0.73				
Culverts	407	10 yr	1050.00	579.50	581.39	581.39		582.01
0.017128	6.31	166.47	137.55	1.01				
Culverts	407	100 yr	4700.00	579.50	583.52	583.52		584.60
0.009126	7.79	603.09	288.05	1.02				
Culverts	405	10 yr	1050.00	575.00	580.23			580.75
0.006421	5.78	181.79	90.73	0.72				
Culverts	405	100 yr	4700.00	575.00	582.78	582.78		584.05
0.006680	8.04	584.39	251.33	1.04				
Culverts	370	10 yr	1050.00	574.00	578.38	578.14		579.13
0.009666	6.89	152.46	81.94	0.90				
Culverts	370	100 yr	4700.00	574.00	581.26	581.26		582.63
0.006864	8.37	561.49	224.40	1.04				
Culverts	310	10 yr	1050.00	572.00	575.37	575.36		576.36
0.009242	7.13	147.26	85.02	1.07				
Culverts	310	100 yr	4700.00	572.00	578.40	578.30		579.09
0.004258	5.08	925.77	591.36	0.94				

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Rick's repro

River: Harbison Creek Reach: Culverts RS: 530 Profile: 10 yr
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.
River: Harbison Creek Reach: Culverts RS: 530 Profile: 100 yr
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.
River: Harbison Creek Reach: Culverts RS: 460 Profile: 10 yr
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.
River: Harbison Creek Reach: Culverts RS: 460 Profile: 100 yr
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 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.
River: Harbison Creek Reach: Culverts RS: 410 Profile: 10 yr
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.
River: Harbison Creek Reach: Culverts RS: 410 Profile: 100 yr
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.
River: Harbison Creek Reach: Culverts RS: 407 Profile: 10 yr
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: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.
River: Harbison Creek Reach: Culverts RS: 407 Profile: 100 yr
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.
River: Harbison Creek Reach: Culverts RS: 405 Profile: 10 yr
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.
River: Harbison Creek Reach: Culverts RS: 405 Profile: 100 yr
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.
River: Harbison Creek Reach: Culverts RS: 370 Profile: 10 yr
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.
River: Harbison Creek Reach: Culverts RS: 370 Profile: 100 yr
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: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 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.

APPENDIX C.II

Harbison Canyon Creek
100-year Floodplain and Floodway Analyses

DAVID EVANS AND ASSOCIATES INC.

HEC-RAS Version 4.1.0 Jan 2010
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
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: Rick Engineering Analysis
Project File : HecRicks.prj
Run Date and Time: 11/17/2010 5:54:05 PM

Project in English units

PLAN DATA

Plan Title: Floddways - Method 1
Plan File : f:\WINDATA\JOBS\12594 Carnevale -Harbison Canyon\HEC RAS\calcs\KCNV00000002 WBS 10009\HECRAS\HecRicks.p03

Geometry Title: Rick's Engineering Geometry
Geometry File : f:\WINDATA\JOBS\12594 Carnevale -Harbison Canyon\HEC RAS\calcs\KCNV00000002 WBS 10009\HECRAS\HecRicks.g01

Flow Title   : Rick's Engineering Flow_Floddways
Flow File   : f:\WINDATA\JOBS\12594 Carnevale -Harbison Canyon\HEC RAS\calcs\KCNV00000002 WBS 10009\HECRAS\HecRicks.f02

Plan Summary Information:
Number of: Cross Sections =   7   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: Between every coordinate point (HEC2 Style)
    Friction Slope Method: Average Conveyance
    Computational Flow Regime: Subcritical Flow

Encroachment Data
   Equal Conveyance = True
   Left Offset   =   10

Right Offset = 10

River = Harbison Creek Reach = Culverts

RS	Profile	Method	Value1	Value2
530	Floodways	1	615	680
460	Floodways	1	424.3	513.1
410	Floodways	1	255	365
407	Floodways	1	250	360
405	Floodways	1	245	350
370	Floodways	1	340	450
310	Floodways	1	450	550

FLOW DATA

Flow Title: Rick's Engineering Flow_Floddways
Flow File : f:\WINDATA\JOBS\12594 Carnevale -Harbison Canyon\HEC RAS\calcs\KCNV00000002 WBS 10009\HECRAS\HecRicks.f02

Flow Data (cfs)

River	Reach	RS	100year	Floodways
Harbison Creek	Culverts	530	4700	4700

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Harbison Creek	Culverts	100year	Known WS = 578.4	
Harbison Creek	Culverts	Floodways	Known WS = 578.76	

GEOMETRY DATA

Geometry Title: Rick's Engineering Geometry
Geometry File : f:\WINDATA\JOBS\12594 Carnevale -Harbison Canyon\HEC RAS\calcs\KCNV00000002 WBS 10009\HECRAS\HecRicks.g01

CROSS SECTION

RIVER: Harbison Creek
REACH: Culverts RS: 530

INPUT
Description:
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	59466.09998		593	121.8	592	211.7	590	324.6	588
422	586	487.3	585.6	593	586	593.4	586	613.4	586
631.1	582	651.7	580	659.8	580	666.5	580	675.7	584
685.6	586	709.6	588	722.7	590	739.2	592	758.8	594

789.2 600

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	613.4	.025	685.6	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
613.4	685.6	344	352	372	.1	.3

CROSS SECTION OUTPUT Profile #100year

E.G. Elev (ft)	588.56	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.14	Wt. n-Val.	0.035	0.025	0.035
W.S. Elev (ft)	587.42	Reach Len. (ft)	344.00	352.00	372.00
Crit W.S. (ft)	587.42	Flow Area (sq ft)	354.89	376.37	12.09
E.G. Slope (ft/ft)	0.002978	Area (sq ft)	354.89	376.37	12.09
Q Total (cfs)	4700.00	Flow (cfs)	1059.78	3618.00	22.23
Top Width (ft)	349.75	Top Width (ft)	260.52	72.20	17.03
Vel Total (ft/s)	6.32	Avg. Vel. (ft/s)	2.99	9.61	1.84
Max Chl Dpth (ft)	7.42	Hydr. Depth (ft)	1.36	5.21	0.71
Conv. Total (cfs)	86119.9	Conv. (cfs)	19418.7	66293.9	407.3
Length Wtd. (ft)	349.57	Wetted Per. (ft)	260.53	73.78	17.09
Min Ch El (ft)	580.00	Shear (lb/sq ft)	0.25	0.95	0.13
Alpha	1.83	Stream Power (lb/ft s)	789.20	0.00	0.00
Frctn Loss (ft)	1.26	Cum Volume (acre-ft)	6.30	7.92	2.55
C & E Loss (ft)	0.03	Cum SA (acres)	4.00	1.55	1.93

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 OUTPUT Profile #Floodways

E.G. Elev (ft)	590.05	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.45	Wt. n-Val.		0.025	
W.S. Elev (ft)	587.60	Reach Len. (ft)	344.00	352.00	372.00
Crit W.S. (ft)	587.27	Flow Area (sq ft)		374.42	
E.G. Slope (ft/ft)	0.004870	Area (sq ft)		374.42	
Q Total (cfs)	4700.00	Flow (cfs)		4700.00	
Top Width (ft)	65.00	Top Width (ft)		65.00	
Vel Total (ft/s)	12.55	Avg. Vel. (ft/s)		12.55	
Max Chl Dpth (ft)	7.60	Hydr. Depth (ft)		5.76	
Conv. Total (cfs)	67352.5	Conv. (cfs)		67352.5	
Length Wtd. (ft)	350.94	Wetted Per. (ft)		71.11	
Min Ch El (ft)	580.00	Shear (lb/sq ft)		1.60	
Alpha	1.00	Stream Power (lb/ft s)	789.20	0.00	0.00
Frctn Loss (ft)	1.82	Cum Volume (acre-ft)	1.91	8.56	0.95
C & E Loss (ft)	0.05	Cum SA (acres)	0.51	1.51	0.37

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: Harbison Creek
REACH: Culverts RS: 460

INPUT
Description: Cross Section X4
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	60019.70001		59639.40002		59256.90002		590	126	588
224.3	587.5	319.4	586	351.1	584	408.2	582	467.8	582
480.3	580	488.9	578	495	578	500.9	580	513.1	584
561.8	586	724.4	586	775.7	586	842	588	871.2	590
895.9	592	921.9	594	961.8	596	993.6	598	1019.6	600

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	467.8	.025	513.1	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
467.8	513.1	230	220	205	.1	.3

CROSS SECTION OUTPUT Profile #100year

E.G. Elev (ft)	586.74	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.40	Wt. n-Val.	0.035	0.025	0.035
W.S. Elev (ft)	585.34	Reach Len. (ft)	230.00	220.00	205.00
Crit W.S. (ft)	585.34	Flow Area (sq ft)	347.13	231.78	21.91
E.G. Slope (ft/ft)	0.004484	Area (sq ft)	347.13	231.78	21.91
Q Total (cfs)	4700.00	Flow (cfs)	1966.58	2685.71	47.71
Top Width (ft)	215.93	Top Width (ft)	137.96	45.30	32.67
Vel Total (ft/s)	7.82	Avg. Vel. (ft/s)	5.67	11.59	2.18
Max Chl Dpth (ft)	7.34	Hydr. Depth (ft)	2.52	5.12	0.67
Conv. Total (cfs)	70187.4	Conv. (cfs)	29367.9	40107.0	712.5
Length Wtd. (ft)	220.34	Wetted Per. (ft)	138.04	46.66	32.70
Min Ch El (ft)	578.00	Shear (lb/sq ft)	0.70	1.39	0.19
Alpha	1.47	Stream Power (lb/ft s)	1019.60	0.00	0.00
Frctn Loss (ft)	0.92	Cum Volume (acre-ft)	3.53	5.46	2.41
C & E Loss (ft)	0.19	Cum SA (acres)	2.42	1.07	1.72

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 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 OUTPUT Profile #Floodways

E.G. Elev (ft)	588.17	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.29	Wt. n-Val.	0.035	0.025	
W.S. Elev (ft)	585.89	Reach Len. (ft)	230.00	220.00	205.00
Crit W.S. (ft)	585.89	Flow Area (sq ft)	169.19	256.59	
E.G. Slope (ft/ft)	0.005556	Area (sq ft)	169.19	256.59	

Q Total (cfs)	4700.00	Flow (cfs)	1250.68	3449.32	
Top Width (ft)	88.80	Top Width (ft)	43.50	45.30	
Vel Total (ft/s)	11.04	Avg. Vel. (ft/s)	7.39	13.44	
Max Chl Dpth (ft)	7.89	Hydr. Depth (ft)	3.89	5.66	
Conv. Total (cfs)	63054.0	Conv. (cfs)	16778.8	46275.2	
Length Wtd. (ft)	219.97	Wetted Per. (ft)	47.39	48.55	
Min Ch El (ft)	578.00	Shear (lb/sq ft)	1.24	1.83	
Alpha	1.21	Stream Power (lb/ft s)	1019.60	0.00	0.00
Frctn Loss (ft)	0.90	Cum Volume (acre-ft)	1.24	6.01	0.95
C & E Loss (ft)	0.41	Cum SA (acres)	0.34	1.06	0.37

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 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.
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.
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: Harbison Creek
REACH: Culverts RS: 410

INPUT
Description: Cross Section X3
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	59411.40002		59223.09998		590	32.5	58855.29999		586
119.8	584	192.2	584	224.5	584	238.8	582	256.8	580
279.3	578	289.3	578	298.2	578	332.7	580	398.2	582
489.8	584	631.5	585	741.8	586	765.9	588	803.2	590
839.9	592	870.9	594						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	256.8	.035	332.7	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
256.8	332.7	10	10	10	.1	.3

CROSS SECTION OUTPUT Profile #100year

E.G. Elev (ft)	584.69	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.76	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	583.93	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)		Flow Area (sq ft)	66.13	393.25	277.55
E.G. Slope (ft/ft)	0.003897	Area (sq ft)	66.13	393.25	277.55
Q Total (cfs)	4700.00	Flow (cfs)	319.72	3116.51	1263.77
Top Width (ft)	261.71	Top Width (ft)	31.82	75.90	153.99
Vel Total (ft/s)	6.38	Avg. Vel. (ft/s)	4.84	7.92	4.55

Max Chl Dpth (ft)	5.93	Hydr. Depth (ft)	2.08	5.18	1.80
Conv. Total (cfs)	75293.4	Conv. (cfs)	5121.9	49926.1	20245.4
Length Wtd. (ft)	10.00	Wetted Per. (ft)	32.06	76.05	154.05
Min Ch El (ft)	578.00	Shear (lb/sq ft)	0.50	1.26	0.44
Alpha	1.20	Stream Power (lb/ft s)	870.90	0.00	0.00
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)	2.44	3.88	1.70
C & E Loss (ft)	0.03	Cum SA (acres)	1.98	0.77	1.28

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 OUTPUT Profile #Floodways

E.G. Elev (ft)	585.89	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.92	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	584.97	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)		Flow Area (sq ft)	8.77	472.18	144.67
E.G. Slope (ft/ft)	0.003160	Area (sq ft)	8.77	472.18	144.67
Q Total (cfs)	4700.00	Flow (cfs)	25.34	3806.80	867.87
Top Width (ft)	110.00	Top Width (ft)	1.80	75.90	32.30
Vel Total (ft/s)	7.51	Avg. Vel. (ft/s)	2.89	8.06	6.00
Max Chl Dpth (ft)	6.97	Hydr. Depth (ft)	4.87	6.22	4.48
Conv. Total (cfs)	83610.9	Conv. (cfs)	450.8	67721.2	15438.9
Length Wtd. (ft)	10.00	Wetted Per. (ft)	6.58	76.05	36.30
Min Ch El (ft)	578.00	Shear (lb/sq ft)	0.26	1.22	0.79
Alpha	1.05	Stream Power (lb/ft s)	870.90	0.00	0.00
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)	0.77	4.17	0.61
C & E Loss (ft)	0.10	Cum SA (acres)	0.22	0.75	0.29

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.

CROSS SECTION

RIVER: Harbison Creek
REACH: Culverts RS: 407

INPUT
Description:
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	594	8	592	18	590	28	588	48	586
92	584	125	584	150	584.3	175	584	200	584
210	584	225	582	255	580	300	579.5	330	580
390	582	500	583.5	540	584	670	584.2	735	586
760	588	800	590	830	592	865	594		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	225	.035	390	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
225	390	10	10	10	.1	.3

CROSS SECTION OUTPUT Profile #100year

E.G. Elev (ft)	584.60	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.08	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	583.52	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)	583.52	Flow Area (sq ft)	8.67	509.64	84.78
E.G. Slope (ft/ft)	0.009126	Area (sq ft)	8.67	509.64	84.78
Q Total (cfs)	4700.00	Flow (cfs)	29.12	4381.95	288.93
Top Width (ft)	288.05	Top Width (ft)	11.40	165.00	111.65
Vel Total (ft/s)	7.79	Avg. Vel. (ft/s)	3.36	8.60	3.41
Max Chl Dpth (ft)	4.02	Hydr. Depth (ft)	0.76	3.09	0.76
Conv. Total (cfs)	49199.3	Conv. (cfs)	304.8	45870.0	3024.5
Length Wtd. (ft)	10.00	Wetted Per. (ft)	11.51	165.11	111.66
Min Ch El (ft)	579.50	Shear (lb/sq ft)	0.43	1.76	0.43
Alpha	1.15	Stream Power (lb/ft s)	865.00	0.00	0.00
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	2.43	3.78	1.66
C & E Loss (ft)	0.02	Cum SA (acres)	1.97	0.74	1.25

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 OUTPUT Profile #Floodways

E.G. Elev (ft)	585.74	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.94	Wt. n-Val.		0.035	
W.S. Elev (ft)	583.80	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)	583.80	Flow Area (sq ft)		420.67	
E.G. Slope (ft/ft)	0.012473	Area (sq ft)		420.67	
Q Total (cfs)	4700.00	Flow (cfs)		4700.00	
Top Width (ft)	110.00	Top Width (ft)		110.00	
Vel Total (ft/s)	11.17	Avg. Vel. (ft/s)		11.17	
Max Chl Dpth (ft)	4.30	Hydr. Depth (ft)		3.82	
Conv. Total (cfs)	42083.6	Conv. (cfs)		42083.6	
Length Wtd. (ft)	10.00	Wetted Per. (ft)		116.30	
Min Ch El (ft)	579.50	Shear (lb/sq ft)		2.82	
Alpha	1.00	Stream Power (lb/ft s)	865.00	0.00	0.00
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	0.77	4.07	0.60
C & E Loss (ft)	0.19	Cum SA (acres)	0.22	0.73	0.29

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 cross section had to be extended vertically during the critical depth 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.
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: Harbison Creek
REACH: Culverts RS: 405

INPUT
Description: Cross Section X2
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	594	7	592	15	590	25	588	45	586
95	584	125	584	150	584.2	170	584	205	584
220	582	255	580	270	578	275	576	280	575
290	576	300	578	335	580	395	582	530	583.5
840	592	870	594						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	255	.035	335	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
255	335	211	205	197	.1	.3

CROSS SECTION OUTPUT Profile #100year

E.G. Elev (ft)	584.05	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.27	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	582.78	Reach Len. (ft)	211.00	205.00	197.00
Crit W.S. (ft)	582.78	Flow Area (sq ft)	64.70	385.13	134.56
E.G. Slope (ft/ft)	0.006680	Area (sq ft)	64.70	385.13	134.56
Q Total (cfs)	4700.00	Flow (cfs)	322.25	3780.99	596.76
Top Width (ft)	251.33	Top Width (ft)	40.87	80.00	130.46
Vel Total (ft/s)	8.04	Avg. Vel. (ft/s)	4.98	9.82	4.44
Max Chl Dpth (ft)	7.78	Hydr. Depth (ft)	1.58	4.81	1.03
Conv. Total (cfs)	57507.5	Conv. (cfs)	3943.0	46262.8	7301.7
Length Wtd. (ft)	204.95	Wetted Per. (ft)	40.98	80.92	130.50
Min Ch El (ft)	575.00	Shear (lb/sq ft)	0.66	1.98	0.43
Alpha	1.26	Stream Power (lb/ft s)	870.00	0.00	0.00
Frctn Loss (ft)	1.39	Cum Volume (acre-ft)	2.42	3.67	1.63
C & E Loss (ft)	0.01	Cum SA (acres)	1.97	0.71	1.22

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 OUTPUT Profile #Floodways

E.G. Elev (ft)	584.86	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.29	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	583.57	Reach Len. (ft)	211.00	205.00	197.00
Crit W.S. (ft)		Flow Area (sq ft)	32.84	448.07	49.79
E.G. Slope (ft/ft)	0.005029	Area (sq ft)	32.84	448.07	49.79
Q Total (cfs)	4700.00	Flow (cfs)	183.25	4222.17	294.58
Top Width (ft)	105.00	Top Width (ft)	10.00	80.00	15.00

Vel Total (ft/s)	8.86	Avg. Vel. (ft/s)	5.58	9.42	5.92
Max Chl Dpth (ft)	8.57	Hydr. Depth (ft)	3.28	5.60	3.32
Conv. Total (cfs)	66274.8	Conv. (cfs)	2584.0	59537.0	4153.9
Length Wtd. (ft)	204.51	Wetted Per. (ft)	13.01	80.92	18.08
Min Ch El (ft)	575.00	Shear (lb/sq ft)	0.79	1.74	0.86
Alpha	1.06	Stream Power (lb/ft s)	870.00	0.00	0.00
Frctn Loss (ft)	1.30	Cum Volume (acre-ft)	0.77	3.97	0.59
C & E Loss (ft)	0.07	Cum SA (acres)	0.21	0.71	0.28

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: Harbison Creek
REACH: Culverts RS: 370

INPUT
Description: Cross Section X1
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	59031.90002		58855.29999		58672.29999		584	112.6	583
194.9	582	225.3	580	242.3	582	251.5	582	288.4	580
340.1	578	373.4	576	386.8	574	401.1	576	408.9	578
427.3	580	478.3	582	578.9	583	716.2	583	806.8	584
850.8	586	910.4	588	939.3	590				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	340.1	.035	408.9	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
340.1	408.9	300	290	295	.1	.3

CROSS SECTION OUTPUT Profile #100year

E.G. Elev (ft)	582.63	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.36	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	581.26	Reach Len. (ft)	300.00	290.00	295.00
Crit W.S. (ft)	581.26	Flow Area (sq ft)	150.71	348.76	62.02
E.G. Slope (ft/ft)	0.006864	Area (sq ft)	150.71	348.76	62.02
Q Total (cfs)	4700.00	Flow (cfs)	796.52	3599.11	304.37
Top Width (ft)	224.40	Top Width (ft)	104.97	68.80	50.63
Vel Total (ft/s)	8.37	Avg. Vel. (ft/s)	5.29	10.32	4.91
Max Chl Dpth (ft)	7.26	Hydr. Depth (ft)	1.44	5.07	1.23
Conv. Total (cfs)	56727.9	Conv. (cfs)	9613.8	43440.4	3673.7
Length Wtd. (ft)	293.16	Wetted Per. (ft)	105.16	69.40	50.76
Min Ch El (ft)	574.00	Shear (lb/sq ft)	0.61	2.15	0.52
Alpha	1.25	Stream Power (lb/ft s)	939.30	0.00	0.00
Frctn Loss (ft)	1.56	Cum Volume (acre-ft)	1.90	1.95	1.19
C & E Loss (ft)	0.20	Cum SA (acres)	1.61	0.36	0.81

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: 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 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 OUTPUT Profile #Floodways

E.G. Elev (ft)	583.49	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.98	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	581.51	Reach Len. (ft)	300.00	290.00	295.00
Crit W.S. (ft)	581.51	Flow Area (sq ft)	0.35	365.72	70.38
E.G. Slope (ft/ft)	0.008270	Area (sq ft)	0.35	365.72	70.38
Q Total (cfs)	4700.00	Flow (cfs)	0.29	4275.95	423.77
Top Width (ft)	110.00	Top Width (ft)	0.10	68.80	41.10
Vel Total (ft/s)	10.77	Avg. Vel. (ft/s)	0.82	11.69	6.02
Max Chl Dpth (ft)	7.51	Hydr. Depth (ft)	3.51	5.32	1.71
Conv. Total (cfs)	51682.0	Conv. (cfs)	3.2	47019.0	4659.8
Length Wtd. (ft)	291.88	Wetted Per. (ft)	3.61	69.40	41.85
Min Ch El (ft)	574.00	Shear (lb/sq ft)	0.05	2.72	0.87
Alpha	1.10	Stream Power (lb/ft s)	939.30	0.00	0.00
Frctn Loss (ft)	2.26	Cum Volume (acre-ft)	0.69	2.05	0.32
C & E Loss (ft)	0.05	Cum SA (acres)	0.19	0.36	0.16

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 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.
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.
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: Harbison Creek
REACH: Culverts RS: 310

INPUT
Description:
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	58813.59998		58630.20001		58445.79999		58297.59998		580
152.8	578	207.8	578	229.5	578	277.2	578	344.7	578
456.5	576	505	574	515	572	527.1	572	537.3	572
544.6	574	562.4	576	650	577	715.2	578	804.8	580
838.4	582	876.8	584	915.8	586	946.4	588		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

0	.04	505	.035	544.6	.04

Bank Sta: Left	Right	Coeff Contr.	Expan.
505	544.6	.1	.3

CROSS SECTION OUTPUT Profile #100year

E.G. Elev (ft)	579.09	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.69	Wt. n-Val.	0.040	0.035	0.040
W.S. Elev (ft)	578.40	Reach Len. (ft)			
Crit W.S. (ft)	578.31	Flow Area (sq ft)	400.40	236.14	289.23
E.G. Slope (ft/ft)	0.004258	Area (sq ft)	400.40	236.14	289.23
Q Total (cfs)	4700.00	Flow (cfs)	1480.88	2134.38	1084.74
Top Width (ft)	591.36	Top Width (ft)	363.24	39.60	188.52
Vel Total (ft/s)	5.08	Avg. Vel. (ft/s)	3.70	9.04	3.75
Max Chl Dpth (ft)	6.40	Hydr. Depth (ft)	1.10	5.96	1.53
Conv. Total (cfs)	72030.1	Conv. (cfs)	22695.3	32710.5	16624.3
Length Wtd. (ft)		Wetted Per. (ft)	363.31	40.07	188.65
Min Ch El (ft)	572.00	Shear (lb/sq ft)	0.29	1.57	0.41
Alpha	1.73	Stream Power (lb/ft s)	946.40	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

CROSS SECTION OUTPUT Profile #Floodways

E.G. Elev (ft)	580.58	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.82	Wt. n-Val.	0.040	0.035	0.040
W.S. Elev (ft)	578.76	Reach Len. (ft)			
Crit W.S. (ft)	578.44	Flow Area (sq ft)	199.92	250.40	24.07
E.G. Slope (ft/ft)	0.007277	Area (sq ft)	199.92	250.40	24.07
Q Total (cfs)	4700.00	Flow (cfs)	1482.49	3076.66	140.86
Top Width (ft)	100.00	Top Width (ft)	55.00	39.60	5.40
Vel Total (ft/s)	9.91	Avg. Vel. (ft/s)	7.42	12.29	5.85
Max Chl Dpth (ft)	6.76	Hydr. Depth (ft)	3.63	6.32	4.46
Conv. Total (cfs)	55097.8	Conv. (cfs)	17379.1	36067.5	1651.2
Length Wtd. (ft)		Wetted Per. (ft)	57.69	40.07	9.59
Min Ch El (ft)	572.00	Shear (lb/sq ft)	1.57	2.84	1.14
Alpha	1.19	Stream Power (lb/ft s)	946.40	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River:Harbison Creek

Reach	River Sta.	n1	n2	n3
Culverts	530	.035	.025	.035
Culverts	460	.035	.025	.035
Culverts	410	.035	.035	.035
Culverts	407	.035	.035	.035
Culverts	405	.035	.035	.035
Culverts	370	.035	.035	.035
Culverts	310	.04	.035	.04

SUMMARY OF REACH LENGTHS

River: Harbison Creek

Reach	River Sta.	Left	Channel	Right
Culverts	530	344	352	372
Culverts	460	230	220	205
Culverts	410	10	10	10
Culverts	407	10	10	10
Culverts	405	211	205	197
Culverts	370	300	290	295
Culverts	310			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Harbison Creek

Reach	River Sta.	Contr.	Expan.
Culverts	530	.1	.3
Culverts	460	.1	.3
Culverts	410	.1	.3
Culverts	407	.1	.3
Culverts	405	.1	.3
Culverts	370	.1	.3
Culverts	310	.1	.3

Profile Output Table - Standard Table 1-Carnevale

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Total	Flow Area	Top Width	Froude # XS
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Culverts	530	100year	4700.00	580.00	587.42	587.42	588.56	0.002978	6.32	743.35	349.75	1.03
Culverts	530	Floodways	4700.00	580.00	587.60	587.27	590.05	0.004870	12.55	374.42	65.00	0.92
Culverts	460	100year	4700.00	578.00	585.34	585.34	586.74	0.004484	7.82	600.82	215.93	1.00
Culverts	460	Floodways	4700.00	578.00	585.89	585.89	588.17	0.005556	11.04	425.78	88.80	0.98
Culverts	410	100year	4700.00	578.00	583.93		584.69	0.003897	6.38	736.93	261.71	0.73
Culverts	410	Floodways	4700.00	578.00	584.97		585.89	0.003160	7.51	625.62	110.00	0.57
Culverts	407	100year	4700.00	579.50	583.52	583.52	584.60	0.009126	7.79	603.09	288.05	1.02
Culverts	407	Floodways	4700.00	579.50	583.80	583.80	585.74	0.012473	11.17	420.67	110.00	1.01

```
  Culverts      405           100year     4700.00      575.00      582.78      582.78
584.05     0.006680        8.04      584.39      251.33          1.04
  Culverts      405           Floodways   4700.00      575.00      583.57
584.86     0.005029        8.86      530.70      105.00          0.71


  Culverts      370           100year     4700.00      574.00      581.26      581.26
582.63     0.006864        8.37      561.49      224.40          1.04
  Culverts      370           Floodways   4700.00      574.00      581.51      581.51
583.49     0.008270       10.77      436.45      110.00          1.00


  Culverts      310           100year     4700.00      572.00      578.40      578.31
579.09     0.004258        5.08      925.77      591.36          0.94
  Culverts      310           Floodways   4700.00      572.00      578.76      578.44
580.58     0.007277        9.91      474.38      100.00          0.88


Profile Output Table - Encroachment 1


  Reach          River Sta     Profile     W.S. Elev   Prof Delta WS   E.G. Elev   Top Wdth Act
 Q Left   Q Channel   Q Right   Enc Sta L   Ch Sta L   Ch Sta R   Enc Sta R
                                              (ft)          (ft)        (ft)          (ft)
  (cfs)       (cfs)     (cfs)        (ft)       (ft)       (ft)        (ft)


  Culverts      530           100year        587.42                      588.56         349.75
1059.78     3618.00     22.23                 613.40     685.60
  Culverts      530           Floodways      587.60           0.18       590.05          65.00
            4700.00                615.00     613.40     685.60      680.00


  Culverts      460           100year        585.34                      586.74         215.93
1966.58     2685.71     47.71                 467.80     513.10
  Culverts      460           Floodways      585.89           0.55       588.17          88.80
1250.68     3449.32                424.30     467.80     513.10      513.10


  Culverts      410           100year        583.93                      584.69         261.71
 319.72     3116.51   1263.77                 256.80     332.70
  Culverts      410           Floodways      584.97           1.04       585.89         110.00
  25.34     3806.80    867.87      255.00     256.80     332.70      365.00


  Culverts      407           100year        583.52                      584.60         288.05
  29.12     4381.95    288.93                 225.00     390.00
  Culverts      407           Floodways      583.80           0.28       585.74         110.00
            4700.00                250.00     225.00     390.00      360.00


  Culverts      405           100year        582.78                      584.05         251.33
 322.25     3780.99    596.76                 255.00     335.00
  Culverts      405           Floodways      583.57           0.79       584.86         105.00
 183.25     4222.17    294.58      245.00     255.00     335.00      350.00


  Culverts      370           100year        581.26                      582.63         224.40
 796.52     3599.11    304.37                 340.10     408.90
  Culverts      370           Floodways      581.51           0.25       583.49         110.00
   0.29     4275.95    423.77      340.00     340.10     408.90      450.00
```

```
  Culverts      310           100year        578.40                        579.09         591.36
1480.88     2134.38   1084.74                 505.00     544.60
  Culverts      310           Floodways      578.76            0.36        580.58         100.00
1482.49     3076.66    140.86      450.00     505.00     544.60      550.00
```

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : PROP FW

```
River: Harbison Creek  Reach: Culverts     RS: 530     Profile: 100year
     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.
River: Harbison Creek  Reach: Culverts     RS: 530     Profile: Floodways
     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.
River: Harbison Creek  Reach: Culverts     RS: 460     Profile: 100year
     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.
River: Harbison Creek  Reach: Culverts     RS: 460     Profile: Floodways
     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.
River: Harbison Creek Reach: Culverts RS: 410 Profile: Floodways
Warning:The cross section had to be extended vertically during the critical depth calculations.
River: Harbison Creek Reach: Culverts RS: 405 Profile: 100year
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.
River: Harbison Creek Reach: Culverts RS: 405 Profile: Floodways
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.
River: Harbison Creek Reach: Culverts RS: 370 Profile: 100year
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: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 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.
River: Harbison Creek Reach: Culverts RS: 370 Profile: Floodways
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 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.
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.
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.

APPENDIX D

HEC-RAS MODEL OF

PROPOSED CONDITIONS

APPENDIX D.I

Harbison Canyon Creek
10-year and 100-year Analyses

HEC-RAS Version 4.1.0 Jan 2010
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
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: Rick Engineering Analysis
Project File : HecRicks.prj
Run Date and Time: 11/17/2010 5:46:50 PM

Project in English units

PLAN DATA

Plan Title: Proposed 100year
Plan File : f:\WINDATA\JOBS\12594 Carnevale -Harbison Canyon\HEC RAS\calcs\KCNV00000002 WBS 10009\HECRAS\HecRicks.p22

Geometry Title: PR 7 Culv REV -DEA460
Geometry File : f:\WINDATA\JOBS\12594 Carnevale -Harbison Canyon\HEC RAS\calcs\KCNV00000002 WBS 10009\HECRAS\HecRicks.g07

Flow Title   : Rick's Engineering Flow
Flow File   : f:\WINDATA\JOBS\12594 Carnevale -Harbison Canyon\HEC RAS\calcs\KCNV00000002 WBS 10009\HECRAS\HecRicks.f01

Plan Summary Information:
Number of: Cross Sections =   6   Multiple Openings =   0
            Culverts   =   1   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: Between every coordinate point (HEC2 Style)
    Friction Slope Method: Average Conveyance
    Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Rick's Engineering Flow
Flow File : f:\WINDATA\JOBS\12594 Carnevale -Harbison Canyon\HEC RAS\calcs\KCNV00000002 WBS 10009\HECRAS\HecRicks.f01

Flow Data (cfs)

River	Reach	RS	10 yr	100 yr
Harbison Creek	Culverts	530	1050	4700

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Harbison Creek	Culverts	10 yr	Known WS = 575.37	
Harbison Creek	Culverts	100 yr	Known WS = 578.4	

GEOMETRY DATA

Geometry Title: PR 7 Culv REV -DEA460
Geometry File : f:\WINDATA\JOBS\12594 Carnevale -Harbison Canyon\HEC RAS\calcs\KCNV00000002 WBS 10009\HECRAS\HecRicks.g07

CROSS SECTION

RIVER: Harbison Creek
REACH: Culverts RS: 530

INPUT
Description:
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	59466.10004		593	121.8	592	211.7	590	324.6	588
422	586	487.3	585.6	593	586	593.4	586	613.4	586
631.1	582	651.7	580	659.8	580	666.5	580	675.7	584
685.6	586	709.6	588	722.7	590	739.2	592	758.8	594
789.2	600								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	613.4	.025	685.6	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
613.4	685.6	344	352	372	.1	.3

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	584.79	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.77	Wt. n-Val.		0.025	
W.S. Elev (ft)	584.02	Reach Len. (ft)	344.00	352.00	372.00
Crit W.S. (ft)		Flow Area (sq ft)		149.14	

E.G. Slope (ft/ft)	0.003689	Area (sq ft)		149.14	
Q Total (cfs)	1050.00	Flow (cfs)		1050.00	
Top Width (ft)	53.61	Top Width (ft)		53.61	
Vel Total (ft/s)	7.04	Avg. Vel. (ft/s)		7.04	
Max Chl Dpth (ft)	4.02	Hydr. Depth (ft)		2.78	
Conv. Total (cfs)	17287.7	Conv. (cfs)		17287.7	
Length Wtd. (ft)	351.59	Wetted Per. (ft)		54.76	
Min Ch El (ft)	580.00	Shear (lb/sq ft)		0.63	
Alpha	1.00	Stream Power (lb/ft s)	789.20	0.00	0.00
Frctn Loss (ft)	1.41	Cum Volume (acre-ft)	0.44	4.19	0.08
C & E Loss (ft)	0.02	Cum SA (acres)	0.77	1.46	0.23

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 OUTPUT Profile #100 yr

E.G. Elev (ft)	588.56	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.14	Wt. n-Val.	0.035	0.025	0.035
W.S. Elev (ft)	587.42	Reach Len. (ft)	344.00	352.00	372.00
Crit W.S. (ft)	587.42	Flow Area (sq ft)	354.89	376.37	12.09
E.G. Slope (ft/ft)	0.002978	Area (sq ft)	354.89	376.37	12.09
Q Total (cfs)	4700.00	Flow (cfs)	1059.78	3618.00	22.23
Top Width (ft)	349.75	Top Width (ft)	260.52	72.20	17.03
Vel Total (ft/s)	6.32	Avg. Vel. (ft/s)	2.99	9.61	1.84
Max Chl Dpth (ft)	7.42	Hydr. Depth (ft)	1.36	5.21	0.71
Conv. Total (cfs)	86119.9	Conv. (cfs)	19418.7	66293.9	407.3
Length Wtd. (ft)	349.97	Wetted Per. (ft)	260.53	73.78	17.09
Min Ch El (ft)	580.00	Shear (lb/sq ft)	0.25	0.95	0.13
Alpha	1.83	Stream Power (lb/ft s)	789.20	0.00	0.00
Frctn Loss (ft)	1.27	Cum Volume (acre-ft)	5.97	9.12	2.71
C & E Loss (ft)	0.02	Cum SA (acres)	3.92	1.56	2.07

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: Harbison Creek
REACH: Culverts RS: 460

INPUT
Description: Cross Section X4
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	58633.29999		58657.70001		585	106.3	582	182.2	582
183.3	582	196.3	581	205	578	218.2	578	227.5	581.796
228	582	239.7	582.936	253	584	287	585	322.5	587
344.8	587	361.8	586	530.5	586	579.8	590	635	595
734	600								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	183.3	.025	239.7	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
183.3	239.7	220	210	195	.1	.3

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	583.36	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.71	Wt. n-Val.	0.035	0.025	
W.S. Elev (ft)	582.64	Reach Len. (ft)	220.00	210.00	195.00
Crit W.S. (ft)	582.64	Flow Area (sq ft)	52.96	132.04	
E.G. Slope (ft/ft)	0.004381	Area (sq ft)	52.96	132.04	
Q Total (cfs)	1050.00	Flow (cfs)	108.40	941.60	
Top Width (ft)	140.19	Top Width (ft)	87.44	52.75	
Vel Total (ft/s)	5.68	Avg. Vel. (ft/s)	2.05	7.13	
Max Chl Dpth (ft)	4.64	Hydr. Depth (ft)	0.61	2.50	
Conv. Total (cfs)	15863.0	Conv. (cfs)	1637.6	14225.3	
Length Wtd. (ft)	210.45	Wetted Per. (ft)	87.46	54.10	
Min Ch El (ft)	578.00	Shear (lb/sq ft)	0.17	0.67	
Alpha	1.43	Stream Power (lb/ft s)	734.00	0.00	0.00
Frctn Loss (ft)	0.35	Cum Volume (acre-ft)	0.23	3.05	0.08
C & E Loss (ft)	0.17	Cum SA (acres)	0.43	1.03	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 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 OUTPUT Profile #100 yr

E.G. Elev (ft)	586.36	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.34	Wt. n-Val.	0.035	0.025	0.035
W.S. Elev (ft)	585.02	Reach Len. (ft)	220.00	210.00	195.00
Crit W.S. (ft)	585.02	Flow Area (sq ft)	306.50	265.54	38.36
E.G. Slope (ft/ft)	0.004499	Area (sq ft)	306.50	265.54	38.36
Q Total (cfs)	4700.00	Flow (cfs)	1661.96	2926.74	111.30
Top Width (ft)	230.17	Top Width (ft)	126.10	56.40	47.67
Vel Total (ft/s)	7.70	Avg. Vel. (ft/s)	5.42	11.02	2.90
Max Chl Dpth (ft)	7.02	Hydr. Depth (ft)	2.43	4.71	0.80
Conv. Total (cfs)	70073.4	Conv. (cfs)	24778.5	43635.4	1659.4
Length Wtd. (ft)	210.35	Wetted Per. (ft)	126.20	57.76	47.73
Min Ch El (ft)	578.00	Shear (lb/sq ft)	0.68	1.29	0.23
Alpha	1.45	Stream Power (lb/ft s)	734.00	0.00	0.00
Frctn Loss (ft)	0.59	Cum Volume (acre-ft)	3.35	6.52	2.49
C & E Loss (ft)	0.23	Cum SA (acres)	2.40	1.04	1.80

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: Harbison Creek
REACH: Culverts RS: 410

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	584	14	583	25	582	37	581	48	580
51.5	574.54	89	574.54	102	579	121	580	183	581
208	582	230	583.5	517	584	555.8	586		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	48	.035	121	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
48	121	40	40	40	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	48	580.6	F
121	555.8	580.6	F

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	580.90	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.16	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	580.74	Reach Len. (ft)	40.00	40.00	40.00
Crit W.S. (ft)	577.31	Flow Area (sq ft)	3.02	319.92	17.04
E.G. Slope (ft/ft)	0.000869	Area (sq ft)	3.02	319.92	17.04
Q Total (cfs)	1050.00	Flow (cfs)	1.95	1037.05	11.01
Top Width (ft)	127.13	Top Width (ft)	8.16	73.00	45.97
Vel Total (ft/s)	3.09	Avg. Vel. (ft/s)	0.64	3.24	0.65
Max Chl Dpth (ft)	6.20	Hydr. Depth (ft)	0.37	4.38	0.37
Conv. Total (cfs)	35616.6	Conv. (cfs)	66.1	35177.2	373.4
Length Wtd. (ft)	40.00	Wetted Per. (ft)	8.19	76.76	45.98
Min Ch El (ft)	574.54	Shear (lb/sq ft)	0.02	0.23	0.02
Alpha	1.09	Stream Power (lb/ft s)	555.80	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.09	1.96	0.04
C & E Loss (ft)		Cum SA (acres)	0.19	0.73	0.13

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

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	584.15	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.57	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	583.57	Reach Len. (ft)	40.00	40.00	40.00
Crit W.S. (ft)	581.89	Flow Area (sq ft)	72.74	526.56	261.86
E.G. Slope (ft/ft)	0.001917	Area (sq ft)	72.74	526.56	261.86
Q Total (cfs)	4700.00	Flow (cfs)	232.07	3533.63	934.29
Top Width (ft)	265.42	Top Width (ft)	42.01	73.00	150.41
Vel Total (ft/s)	5.46	Avg. Vel. (ft/s)	3.19	6.71	3.57
Max Chl Dpth (ft)	9.03	Hydr. Depth (ft)	1.73	7.21	1.74
Conv. Total (cfs)	107352.8	Conv. (cfs)	5300.7	80711.8	21340.2
Length Wtd. (ft)	40.00	Wetted Per. (ft)	42.16	76.76	150.49
Min Ch El (ft)	574.54	Shear (lb/sq ft)	0.21	0.82	0.21
Alpha	1.24	Stream Power (lb/ft s)	555.80	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	2.40	4.62	1.82
C & E Loss (ft)		Cum SA (acres)	1.97	0.73	1.35

CULVERT

RIVER: Harbison Creek
REACH: Culverts RS: 409

INPUT
Description:
Distance from Upstream XS = 8
Deck/Roadway Width = 24
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
35.79999	579.32	574.7	188.8	579.32	574.7

Upstream Bridge Cross Section Data
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	584	14	583	25	582	37	581	48	580
51.5	574.54	89	574.54	102	579	121	580	183	581
208	582	230	583.5	517	584	555.8	586		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	48	.035	121	.035

Bank Sta: Left Right Coeff Contr. Expan.
48 121 .1 .3
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	48	580.6	F
121	555.8	580.6	F

Downstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
31.70001	579.08	574.3	184.7	579.08	574.3

Downstream Bridge Cross Section Data
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	583	9	582	20	581	29	580	38.5	579

```
    47.5   574.1    84.5   574.1      90     578     106     579     138     580
     162     581     215     582     250   582.8   507.5     584

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .035    38.5    .035     106    .035

Bank Sta: Left   Right    Coeff Contr.   Expan.
          38.5     106             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0      41   580.6       F
     106   507.5   580.6       F

Upstream Embankment side slope              =     1.5 horiz. to 1.0 vertical
Downstream Embankment side slope            =     1.5 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1      Circular       4
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 3 - Groove end entrance; pipe projecting from fill
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss
Coef
                 2      36     .013     .013        0                    .5                 1
Number of Barrels =  7
Upstream   Elevation =  574.5
Centerline Stations
    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.
    54.5      60    65.5      71    76.5      82    87.5
Downstream Elevation =  574.14
Centerline Stations
    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.
      49    54.5      60    65.5      71    76.5      82

CULVERT OUTPUT  Profile #10 yr  Culv Group:  Culvert #1

  Q Culv Group (cfs)        640.47    Culv Full Len (ft)         36.00
  # Barrels                      7    Culv Vel US (ft/s)          7.28
  Q Barrel (cfs)             91.50    Culv Vel DS (ft/s)          7.28
  E.G. US. (ft)             580.91    Culv Inv El Up (ft)       574.50
  W.S. US. (ft)             580.74    Culv Inv El Dn (ft)       574.14
  E.G. DS (ft)              579.78    Culv Frctn Ls (ft)          0.15
  W.S. DS (ft)              579.53    Culv Exit Loss (ft)         0.57
  Delta EG (ft)               1.13    Culv Entr Loss (ft)         0.41
  Delta WS (ft)               1.22    Q Weir (cfs)              409.53
  E.G. IC (ft)              580.34    Weir Sta Lft (ft)          38.05
  E.G. OC (ft)              580.91    Weir Sta Rgt (ft)         177.06
  Culvert Control           Outlet    Weir Submerg                0.10
  Culv WS Inlet (ft)        578.50    Weir Max Depth (ft)         1.58
  Culv WS Outlet (ft)       578.14    Weir Avg Depth (ft)         1.01
  Culv Nml Depth (ft)                 Weir Flow Area (sq ft)    140.94
  Culv Crt Depth (ft)         2.90    Min El Weir Flow (ft)     579.33


CULVERT OUTPUT  Profile #100 yr  Culv Group:  Culvert #1
```

Q Culv Group (cfs)	653.74	Culv Full Len (ft)	36.00
# Barrels	7	Culv Vel US (ft/s)	7.43
Q Barrel (cfs)	93.39	Culv Vel DS (ft/s)	7.43
E.G. US. (ft)	584.15	Culv Inv El Up (ft)	574.50
W.S. US. (ft)	583.57	Culv Inv El Dn (ft)	574.14
E.G. DS (ft)	583.45	Culv Frctn Ls (ft)	0.15
W.S. DS (ft)	582.71	Culv Exit Loss (ft)	0.12
Delta EG (ft)	0.70	Culv Entr Loss (ft)	0.43
Delta WS (ft)	0.87	Q Weir (cfs)	4046.26
E.G. IC (ft)	583.84	Weir Sta Lft (ft)	0.00
E.G. OC (ft)	584.15	Weir Sta Rgt (ft)	519.64
Culvert Control	Outlet	Weir Submerg	0.59
Culv WS Inlet (ft)	578.50	Weir Max Depth (ft)	4.82
Culv WS Outlet (ft)	578.14	Weir Avg Depth (ft)	1.69
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	878.36
Culv Crt Depth (ft)	2.93	Min El Weir Flow (ft)	579.33

CROSS SECTION

RIVER: Harbison Creek
REACH: Culverts RS: 405

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	583	9	582	20	581	29	580	38.5	579
47.5	574.1	84.5	574.1	90	578	106	579	138	580
162	581	215	582	250	582.8	507.5	584		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	38.5	.035	106	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
38.5	106	200.8	195.2	187.3	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	41	580.6	F
106	507.5	580.6	F

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	579.78	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.25	Wt. n-Val.		0.035	
W.S. Elev (ft)	579.53	Reach Len. (ft)	200.80	195.20	187.30
Crit W.S. (ft)	576.91	Flow Area (sq ft)		260.07	
E.G. Slope (ft/ft)	0.001488	Area (sq ft)	1.31	263.09	4.43
Q Total (cfs)	1050.00	Flow (cfs)		1050.00	
Top Width (ft)	89.33	Top Width (ft)	5.00	67.50	16.83
Vel Total (ft/s)	4.04	Avg. Vel. (ft/s)		4.04	
Max Chl Dpth (ft)	5.43	Hydr. Depth (ft)		4.00	
Conv. Total (cfs)	27223.1	Conv. (cfs)		27223.1	
Length Wtd. (ft)	195.20	Wetted Per. (ft)		67.17	
Min Ch El (ft)	574.10	Shear (lb/sq ft)		0.36	
Alpha	1.00	Stream Power (lb/ft s)	507.50	0.00	0.00
Frctn Loss (ft)	0.60	Cum Volume (acre-ft)	0.09	1.81	0.04
C & E Loss (ft)	0.05	Cum SA (acres)	0.18	0.67	0.10

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, water surface was used.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	583.45	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.74	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	582.71	Reach Len. (ft)	200.80	195.20	187.30
Crit W.S. (ft)	581.36	Flow Area (sq ft)	65.84	477.76	230.42
E.G. Slope (ft/ft)	0.002476	Area (sq ft)	65.84	477.76	230.42
Q Total (cfs)	4700.00	Flow (cfs)	244.25	3630.56	825.19
Top Width (ft)	243.26	Top Width (ft)	35.86	67.50	139.91
Vel Total (ft/s)	6.07	Avg. Vel. (ft/s)	3.71	7.60	3.58
Max Chl Dpth (ft)	8.61	Hydr. Depth (ft)	1.84	7.08	1.65
Conv. Total (cfs)	94459.9	Conv. (cfs)	4908.9	72966.5	16584.5
Length Wtd. (ft)	194.87	Wetted Per. (ft)	36.05	70.02	139.96
Min Ch El (ft)	574.10	Shear (lb/sq ft)	0.28	1.05	0.25
Alpha	1.29	Stream Power (lb/ft s)	507.50	0.00	0.00
Frctn Loss (ft)	0.75	Cum Volume (acre-ft)	2.40	3.80	1.82
C & E Loss (ft)	0.06	Cum SA (acres)	1.94	0.67	1.22

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.

CROSS SECTION

RIVER: Harbison Creek
REACH: Culverts RS: 370

INPUT
Description: Cross Section X1
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	59031.89996		58855.29999		58672.29999		584	112.6	583
194.9	582	225.3	580	242.3	582	251.5	582	288.4	580
340.1	578	373.4	576	386.8	574	401.1	576	408.9	578
427.3	580	478.3	582	578.9	583	716.2	583	806.8	584
850.8	586	910.4	588	939.3	590				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	340.1	.035	408.9	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
340.1	408.9	300	290	295	.1	.3

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	579.13	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.75	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	578.38	Reach Len. (ft)	300.00	290.00	295.00
Crit W.S. (ft)	578.14	Flow Area (sq ft)	1.82	150.00	0.65
E.G. Slope (ft/ft)	0.009666	Area (sq ft)	1.82	150.00	0.65

Q Total (cfs)	1050.00	Flow (cfs)	2.48	1046.64	0.88
Top Width (ft)	81.94	Top Width (ft)	9.69	68.80	3.45
Vel Total (ft/s)	6.89	Avg. Vel. (ft/s)	1.37	6.98	1.36
Max Chl Dpth (ft)	4.38	Hydr. Depth (ft)	0.19	2.18	0.19
Conv. Total (cfs)	10679.9	Conv. (cfs)	25.3	10645.7	9.0
Length Wtd. (ft)	290.37	Wetted Per. (ft)	9.70	69.40	3.47
Min Ch El (ft)	574.00	Shear (lb/sq ft)	0.11	1.30	0.11
Alpha	1.02	Stream Power (lb/ft s)	939.30	0.00	0.00
Frctn Loss (ft)	2.74	Cum Volume (acre-ft)	0.08	0.89	0.03
C & E Loss (ft)	0.02	Cum SA (acres)	0.15	0.36	0.05

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 OUTPUT Profile #100 yr

E.G. Elev (ft)	582.63	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.36	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	581.26	Reach Len. (ft)	300.00	290.00	295.00
Crit W.S. (ft)	581.26	Flow Area (sq ft)	150.71	348.76	62.02
E.G. Slope (ft/ft)	0.006864	Area (sq ft)	150.71	348.76	62.02
Q Total (cfs)	4700.00	Flow (cfs)	796.52	3599.11	304.37
Top Width (ft)	224.40	Top Width (ft)	104.97	68.80	50.63
Vel Total (ft/s)	8.37	Avg. Vel. (ft/s)	5.29	10.32	4.91
Max Chl Dpth (ft)	7.26	Hydr. Depth (ft)	1.44	5.07	1.23
Conv. Total (cfs)	56727.9	Conv. (cfs)	9613.8	43440.4	3673.7
Length Wtd. (ft)	293.16	Wetted Per. (ft)	105.16	69.40	50.76
Min Ch El (ft)	574.00	Shear (lb/sq ft)	0.61	2.15	0.52
Alpha	1.25	Stream Power (lb/ft s)	939.30	0.00	0.00
Frctn Loss (ft)	1.56	Cum Volume (acre-ft)	1.90	1.95	1.19
C & E Loss (ft)	0.20	Cum SA (acres)	1.61	0.36	0.81

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: 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 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: Harbison Creek
REACH: Culverts RS: 310

INPUT
Description:
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	58813.60004		58630.20001		58445.80005		58297.60004		580
152.8	578	207.8	578	229.5	578	277.2	578	344.7	578
456.5	576	505	574	515	572	527.1	572	537.3	572

544.6	574	562.4	576	650	577	715.2	578	804.8	580
838.4	582	876.8	584	915.8	586	946.4	588		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	505	.035	544.6	.04

Bank Sta: Left	Right	Coeff Contr.	Expan.
505	544.6	.1	.3

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	576.36	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.99	Wt. n-Val.	0.040	0.035	0.040
W.S. Elev (ft)	575.37	Reach Len. (ft)			
Crit W.S. (ft)	575.36	Flow Area (sq ft)	22.76	116.15	8.35
E.G. Slope (ft/ft)	0.009242	Area (sq ft)	22.76	116.15	8.35
Q Total (cfs)	1050.00	Flow (cfs)	63.12	963.80	23.08
Top Width (ft)	85.02	Top Width (ft)	33.22	39.60	12.19
Vel Total (ft/s)	7.13	Avg. Vel. (ft/s)	2.77	8.30	2.76
Max Chl Dpth (ft)	3.37	Hydr. Depth (ft)	0.68	2.93	0.68
Conv. Total (cfs)	10922.3	Conv. (cfs)	656.6	10025.6	240.1
Length Wtd. (ft)		Wetted Per. (ft)	33.25	40.07	12.27
Min Ch El (ft)	572.00	Shear (lb/sq ft)	0.39	1.67	0.39
Alpha	1.26	Stream Power (lb/ft s)	946.40	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	579.09	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.69	Wt. n-Val.	0.040	0.035	0.040
W.S. Elev (ft)	578.40	Reach Len. (ft)			
Crit W.S. (ft)	578.30	Flow Area (sq ft)	400.40	236.14	289.23
E.G. Slope (ft/ft)	0.004258	Area (sq ft)	400.40	236.14	289.23
Q Total (cfs)	4700.00	Flow (cfs)	1480.88	2134.38	1084.74
Top Width (ft)	591.36	Top Width (ft)	363.24	39.60	188.52
Vel Total (ft/s)	5.08	Avg. Vel. (ft/s)	3.70	9.04	3.75
Max Chl Dpth (ft)	6.40	Hydr. Depth (ft)	1.10	5.96	1.53
Conv. Total (cfs)	72030.1	Conv. (cfs)	22695.3	32710.5	16624.3
Length Wtd. (ft)		Wetted Per. (ft)	363.31	40.07	188.65
Min Ch El (ft)	572.00	Shear (lb/sq ft)	0.29	1.57	0.41
Alpha	1.73	Stream Power (lb/ft s)	946.40	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River:Harbison Creek

Reach	River Sta.	n1	n2	n3
Culverts	530	.035	.025	.035
Culverts	460	.035	.025	.035
Culverts	410	.035	.035	.035
Culverts	409	Culvert		
Culverts	405	.035	.035	.035
Culverts	370	.035	.035	.035
Culverts	310	.04	.035	.04

SUMMARY OF REACH LENGTHS

River: Harbison Creek

Reach	River Sta.	Left	Channel	Right
Culverts	530	344	352	372
Culverts	460	220	210	195
Culverts	410	40	40	40
Culverts	409	Culvert		
Culverts	405	200.8	195.2	187.3
Culverts	370	300	290	295
Culverts	310			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Harbison Creek

Reach	River Sta.	Contr.	Expan.
Culverts	530	.1	.3
Culverts	460	.1	.3
Culverts	410	.1	.3
Culverts	409	Culvert	
Culverts	405	.1	.3
Culverts	370	.1	.3
Culverts	310	.1	.3

Profile Output Table - Standard Table 1-Carnevale

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev
E.G. Slope	Vel Total	Flow Area	Top Width	Froude # XS			
			(cfs)	(ft)	(ft)	(ft)	(ft)
(ft/ft)	(ft/s)	(sq ft)	(ft)				
Culverts	530	10 yr	1050.00	580.00	584.02		584.79
0.003689	7.04	149.14	53.61	0.74			
Culverts	530	100 yr	4700.00	580.00	587.42	587.42	588.56
0.002978	6.32	743.35	349.75	1.03			
Culverts	460	10 yr	1050.00	578.00	582.64	582.64	583.36
0.004381	5.68	185.00	140.19	1.04			
Culverts	460	100 yr	4700.00	578.00	585.02	585.02	586.36
0.004499	7.70	610.40	230.17	1.00			
Culverts	410	10 yr	1050.00	574.54	580.74	577.31	580.90
0.000869	3.09	339.99	127.13	0.35			
Culverts	410	100 yr	4700.00	574.54	583.57	581.89	584.15
0.001917	5.46	861.16	265.42	0.59			

```
  Culverts      409                     Culvert


  Culverts      405           10 yr     1050.00      574.10      579.53      576.91      579.78
   0.001488        4.04      260.07       89.33          0.36
  Culverts      405           100 yr    4700.00      574.10      582.71      581.36      583.45
   0.002476        6.07      774.01      243.26          0.68


  Culverts      370           10 yr     1050.00      574.00      578.38      578.14      579.13
   0.009666        6.89      152.46       81.94          0.90
  Culverts      370           100 yr    4700.00      574.00      581.26      581.26      582.63
   0.006864        8.37      561.49      224.40          1.04


  Culverts      310           10 yr     1050.00      572.00      575.37      575.36      576.36
   0.009242        7.13      147.26       85.02          1.07
  Culverts      310           100 yr    4700.00      572.00      578.40      578.30      579.09
   0.004258        5.08      925.77      591.36          0.94
```

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Rick's repro

```
River: Harbison Creek  Reach: Culverts     RS: 530     Profile: 10 yr
     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.
River: Harbison Creek  Reach: Culverts     RS: 530     Profile: 100 yr
     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.
River: Harbison Creek  Reach: Culverts     RS: 460     Profile: 10 yr
     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.
River: Harbison Creek  Reach: Culverts     RS: 460     Profile: 100 yr
     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 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.
River: Harbison Creek Reach: Culverts RS: 410 Profile: 10 yr
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.
River: Harbison Creek Reach: Culverts RS: 410 Profile: 100 yr
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.
River: Harbison Creek Reach: Culverts RS: 407 Profile: 10 yr
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: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.
River: Harbison Creek Reach: Culverts RS: 407 Profile: 100 yr
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.
River: Harbison Creek Reach: Culverts RS: 405 Profile: 10 yr
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.
River: Harbison Creek Reach: Culverts RS: 405 Profile: 100 yr
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.
River: Harbison Creek Reach: Culverts RS: 370 Profile: 10 yr
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.
River: Harbison Creek Reach: Culverts RS: 370 Profile: 100 yr
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: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 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.

APPENDIX D.II

Harbison Canyon Creek
100-year Floodplain and Floodway Analyses

DAVID EVANS AND ASSOCIATES INC.

HEC-RAS Version 4.1.0 Jan 2010
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
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: Rick Engineering Analysis
Project File : HecRicks.prj
Run Date and Time: 11/17/2010 6:02:10 PM

Project in English units

PLAN DATA

Plan Title: PR Floodway
Plan File : f:\WINDATA\JOBS\12594 Carnevale -Harbison Canyon\HEC RAS\calcs\KCNV00000002 WBS 10009\HECRAS\HecRicks.p23

Geometry Title: PR 7 Culv REV -DEA460
Geometry File : f:\WINDATA\JOBS\12594 Carnevale -Harbison Canyon\HEC RAS\calcs\KCNV00000002 WBS 10009\HECRAS\HecRicks.g07

Flow Title   : Rick's Engineering Flow_Floddways
Flow File   : f:\WINDATA\JOBS\12594 Carnevale -Harbison Canyon\HEC RAS\calcs\KCNV00000002 WBS 10009\HECRAS\HecRicks.f02

Plan Summary Information:
Number of: Cross Sections =   6   Multiple Openings =   0
            Culverts   =   1   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: Between every coordinate point (HEC2 Style)
    Friction Slope Method: Average Conveyance
    Computational Flow Regime: Subcritical Flow

Encroachment Data
   Equal Conveyance = True
   Left Offset   =   10

Right Offset = 10

River = Harbison Creek Reach = Culverts

RS	Profile	Method	Value1	Value2
530	Floodways	1	615	680
460	Floodways	1	138.7	227.5
410	Floodways	1	39	149
405	Floodways	1	29	134
370	Floodways	1	340	450
310	Floodways	1	450	550

FLOW DATA

Flow Title: Rick's Engineering Flow_Floddways
Flow File : f:\WINDATA\JOBS\12594 Carnevale -Harbison Canyon\HEC RAS\calcs\KCNV00000002 WBS 10009\HECRAS\HecRicks.f02

Flow Data (cfs)

River	Reach	RS	100year	Floodways
Harbison Creek	Culverts	530	4700	4700

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Harbison Creek	Culverts	100year	Known WS = 578.4	
Harbison Creek	Culverts	Floodways	Known WS = 578.76	

GEOMETRY DATA

Geometry Title: PR 7 Culv REV -DEA460
Geometry File : f:\WINDATA\JOBS\12594 Carnevale -Harbison Canyon\HEC RAS\calcs\KCNV00000002 WBS 10009\HECRAS\HecRicks.g07

CROSS SECTION

RIVER: Harbison Creek
REACH: Culverts RS: 530

INPUT
Description:
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	59466.10004		593	121.8	592	211.7	590	324.6	588
422	586	487.3	585.6	593	586	593.4	586	613.4	586
631.1	582	651.7	580	659.8	580	666.5	580	675.7	584
685.6	586	709.6	588	722.7	590	739.2	592	758.8	594
789.2	600								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	613.4	.025	685.6	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
613.4	685.6	344	352	372	.1	.3

CROSS SECTION OUTPUT Profile #100year

E.G. Elev (ft)	588.56	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.14	Wt. n-Val.	0.035	0.025	0.035
W.S. Elev (ft)	587.42	Reach Len. (ft)	344.00	352.00	372.00
Crit W.S. (ft)	587.42	Flow Area (sq ft)	354.89	376.37	12.09
E.G. Slope (ft/ft)	0.002978	Area (sq ft)	354.89	376.37	12.09
Q Total (cfs)	4700.00	Flow (cfs)	1059.78	3618.00	22.23
Top Width (ft)	349.75	Top Width (ft)	260.52	72.20	17.03
Vel Total (ft/s)	6.32	Avg. Vel. (ft/s)	2.99	9.61	1.84
Max Chl Dpth (ft)	7.42	Hydr. Depth (ft)	1.36	5.21	0.71
Conv. Total (cfs)	86119.9	Conv. (cfs)	19418.7	66293.9	407.3
Length Wtd. (ft)	349.97	Wetted Per. (ft)	260.53	73.78	17.09
Min Ch El (ft)	580.00	Shear (lb/sq ft)	0.25	0.95	0.13
Alpha	1.83	Stream Power (lb/ft s)	789.20	0.00	0.00
Frctn Loss (ft)	1.27	Cum Volume (acre-ft)	5.97	9.12	2.71
C & E Loss (ft)	0.02	Cum SA (acres)	3.92	1.56	2.07

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 OUTPUT Profile #Floodways

E.G. Elev (ft)	590.02	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.66	Wt. n-Val.		0.025	
W.S. Elev (ft)	587.36	Reach Len. (ft)	344.00	352.00	372.00
Crit W.S. (ft)	587.27	Flow Area (sq ft)		358.77	
E.G. Slope (ft/ft)	0.005564	Area (sq ft)		358.77	
Q Total (cfs)	4700.00	Flow (cfs)		4700.00	
Top Width (ft)	65.00	Top Width (ft)		65.00	
Vel Total (ft/s)	13.10	Avg. Vel. (ft/s)		13.10	
Max Chl Dpth (ft)	7.36	Hydr. Depth (ft)		5.52	
Conv. Total (cfs)	63011.8	Conv. (cfs)		63011.8	
Length Wtd. (ft)	351.01	Wetted Per. (ft)		70.63	
Min Ch El (ft)	580.00	Shear (lb/sq ft)		1.76	
Alpha	1.00	Stream Power (lb/ft s)	789.20	0.00	0.00
Frctn Loss (ft)	1.93	Cum Volume (acre-ft)	1.94	9.31	1.01
C & E Loss (ft)	0.11	Cum SA (acres)	0.53	1.45	0.39

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: Harbison Creek
REACH: Culverts RS: 460

INPUT
Description: Cross Section X4
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	58633.29999		58657.70001		585	106.3	582	182.2	582
183.3	582	196.3	581	205	578	218.2	578	227.5	581.796
228	582	239.7	582.936	253	584	287	585	322.5	587
344.8	587	361.8	586	530.5	586	579.8	590	635	595
734	600								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	183.3	.025	239.7	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
183.3	239.7	220	210	195	.1	.3

CROSS SECTION OUTPUT Profile #100year

E.G. Elev (ft)	586.36	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.34	Wt. n-Val.	0.035	0.025	0.035
W.S. Elev (ft)	585.02	Reach Len. (ft)	220.00	210.00	195.00
Crit W.S. (ft)	585.02	Flow Area (sq ft)	306.50	265.54	38.36
E.G. Slope (ft/ft)	0.004499	Area (sq ft)	306.50	265.54	38.36
Q Total (cfs)	4700.00	Flow (cfs)	1661.96	2926.74	111.30
Top Width (ft)	230.17	Top Width (ft)	126.10	56.40	47.67
Vel Total (ft/s)	7.70	Avg. Vel. (ft/s)	5.42	11.02	2.90
Max Chl Dpth (ft)	7.02	Hydr. Depth (ft)	2.43	4.71	0.80
Conv. Total (cfs)	70073.4	Conv. (cfs)	24778.5	43635.4	1659.4
Length Wtd. (ft)	210.35	Wetted Per. (ft)	126.20	57.76	47.73
Min Ch El (ft)	578.00	Shear (lb/sq ft)	0.68	1.29	0.23
Alpha	1.45	Stream Power (lb/ft s)	734.00	0.00	0.00
Frctn Loss (ft)	0.59	Cum Volume (acre-ft)	3.35	6.52	2.49
C & E Loss (ft)	0.23	Cum SA (acres)	2.40	1.04	1.80

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 OUTPUT Profile #Floodways

E.G. Elev (ft)	587.98	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.29	Wt. n-Val.	0.035	0.025	
W.S. Elev (ft)	585.69	Reach Len. (ft)	220.00	210.00	195.00

Crit W.S. (ft)	585.69	Flow Area (sq ft)	164.50	263.62	
E.G. Slope (ft/ft)	0.005448	Area (sq ft)	164.50	263.62	
Q Total (cfs)	4700.00	Flow (cfs)	1167.17	3532.83	
Top Width (ft)	88.80	Top Width (ft)	44.60	44.20	
Vel Total (ft/s)	10.98	Avg. Vel. (ft/s)	7.10	13.40	
Max Chl Dpth (ft)	7.69	Hydr. Depth (ft)	3.69	5.96	
Conv. Total (cfs)	63676.6	Conv. (cfs)	15813.1	47863.6	
Length Wtd. (ft)	210.55	Wetted Per. (ft)	48.29	49.38	
Min Ch El (ft)	578.00	Shear (lb/sq ft)	1.16	1.82	
Alpha	1.22	Stream Power (lb/ft s)	734.00	0.00	0.00
Frctn Loss (ft)	0.53	Cum Volume (acre-ft)	1.29	6.79	1.01
C & E Loss (ft)	0.51	Cum SA (acres)	0.36	1.01	0.39

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: Harbison Creek
REACH: Culverts RS: 410

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	584	14	583	25	582	37	581	48	580
51.5	574.54	89	574.54	102	579	121	580	183	581
208	582	230	583.5	517	584	555.8	586		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	48	.035	121	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
48	121	40	40	40	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	48	580.6	F
121	555.8	580.6	F

CROSS SECTION OUTPUT Profile #100year

E.G. Elev (ft)	584.15	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.57	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	583.57	Reach Len. (ft)	40.00	40.00	40.00
Crit W.S. (ft)	581.89	Flow Area (sq ft)	72.74	526.56	261.86
E.G. Slope (ft/ft)	0.001917	Area (sq ft)	72.74	526.56	261.86

Q Total (cfs)	4700.00	Flow (cfs)	232.07	3533.63	934.29
Top Width (ft)	265.42	Top Width (ft)	42.01	73.00	150.41
Vel Total (ft/s)	5.46	Avg. Vel. (ft/s)	3.19	6.71	3.57
Max Chl Dpth (ft)	9.03	Hydr. Depth (ft)	1.73	7.21	1.74
Conv. Total (cfs)	107352.8	Conv. (cfs)	5300.7	80711.8	21340.2
Length Wtd. (ft)	40.00	Wetted Per. (ft)	42.16	76.76	150.49
Min Ch El (ft)	574.54	Shear (lb/sq ft)	0.21	0.82	0.21
Alpha	1.24	Stream Power (lb/ft s)	555.80	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	2.40	4.62	1.82
C & E Loss (ft)		Cum SA (acres)	1.97	0.73	1.35

CROSS SECTION OUTPUT Profile #Floodways

E.G. Elev (ft)	585.43	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.60	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	584.83	Reach Len. (ft)	40.00	40.00	40.00
Crit W.S. (ft)	581.62	Flow Area (sq ft)	39.79	618.38	128.92
E.G. Slope (ft/ft)	0.001465	Area (sq ft)	39.79	618.38	128.92
Q Total (cfs)	4700.00	Flow (cfs)	135.94	4037.91	526.15
Top Width (ft)	110.00	Top Width (ft)	9.00	73.00	28.00
Vel Total (ft/s)	5.97	Avg. Vel. (ft/s)	3.42	6.53	4.08
Max Chl Dpth (ft)	10.29	Hydr. Depth (ft)	4.42	8.47	4.60
Conv. Total (cfs)	122807.2	Conv. (cfs)	3551.9	105507.4	13748.0
Length Wtd. (ft)	40.00	Wetted Per. (ft)	13.05	76.76	32.38
Min Ch El (ft)	574.54	Shear (lb/sq ft)	0.28	0.74	0.36
Alpha	1.09	Stream Power (lb/ft s)	555.80	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.78	4.66	0.72
C & E Loss (ft)		Cum SA (acres)	0.22	0.73	0.33

Warning: The cross section had to be extended vertically during the critical depth calculations.

CULVERT

RIVER: Harbison Creek
REACH: Culverts RS: 409

INPUT
Description:
Distance from Upstream XS = 8
Deck/Roadway Width = 24
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
35.79999	579.32	574.7	188.8	579.32	574.7

Upstream Bridge Cross Section Data
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	584	14	583	25	582	37	581	48	580
51.5	574.54	89	574.54	102	579	121	580	183	581
208	582	230	583.5	517	584	555.8	586		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	48	.035	121	.035

Bank Sta: Left	Right	Coeff Contr.	Expan.
48	121	.1	.3

Ineffective Flow num= 2

```
   Sta L   Sta R    Elev  Permanent
       0      48   580.6       F
     121   555.8   580.6       F

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
31.70001  579.08   574.3   184.7  579.08   574.3

Downstream Bridge Cross Section Data
Station Elevation Data    num=      14
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     583       9     582      20     581      29     580    38.5     579
    47.5   574.1    84.5   574.1      90     578     106     579     138     580
     162     581     215     582     250   582.8   507.5     584

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .035    38.5    .035     106    .035

Bank Sta: Left   Right    Coeff Contr.   Expan.
          38.5     106             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0      41   580.6       F
     106   507.5   580.6       F

Upstream Embankment side slope              =     1.5 horiz. to 1.0 vertical
Downstream Embankment side slope            =     1.5 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1      Circular       4
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 3 - Groove end entrance; pipe projecting from fill
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss
Coef
                  2      36     .013     .013        0                    .5                1
Number of Barrels =  7
Upstream   Elevation =  574.5
Centerline Stations
    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.
    54.5      60    65.5      71    76.5      82    87.5
Downstream Elevation =  574.14
Centerline Stations
    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.
      49    54.5      60    65.5      71    76.5      82

CULVERT OUTPUT  Profile #100year  Culv Group:  Culvert #1

  Q Culv Group (cfs)        653.74    Culv Full Len (ft)         36.00
  # Barrels                      7    Culv Vel US (ft/s)          7.43
  Q Barrel (cfs)             93.39    Culv Vel DS (ft/s)          7.43
  E.G. US. (ft)             584.15    Culv Inv El Up (ft)       574.50
  W.S. US. (ft)             583.57    Culv Inv El Dn (ft)       574.14
  E.G. DS (ft)              583.45    Culv Frctn Ls (ft)          0.15
```

W.S. DS (ft)	582.71	Culv Exit Loss (ft)	0.12
Delta EG (ft)	0.70	Culv Entr Loss (ft)	0.43
Delta WS (ft)	0.87	Q Weir (cfs)	4046.26
E.G. IC (ft)	583.84	Weir Sta Lft (ft)	0.00
E.G. OC (ft)	584.15	Weir Sta Rgt (ft)	519.64
Culvert Control	Outlet	Weir Submerg	0.59
Culv WS Inlet (ft)	578.50	Weir Max Depth (ft)	4.82
Culv WS Outlet (ft)	578.14	Weir Avg Depth (ft)	1.69
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	878.36
Culv Crt Depth (ft)	2.93	Min El Weir Flow (ft)	579.33

CULVERT OUTPUT Profile #Floodways Culv Group: Culvert #1

Q Culv Group (cfs)	751.03	Culv Full Len (ft)	36.00
# Barrels	7	Culv Vel US (ft/s)	8.54
Q Barrel (cfs)	107.29	Culv Vel DS (ft/s)	8.54
E.G. US. (ft)	585.43	Culv Inv El Up (ft)	574.50
W.S. US. (ft)	584.83	Culv Inv El Dn (ft)	574.14
E.G. DS (ft)	584.33	Culv Frctn Ls (ft)	0.20
W.S. DS (ft)	583.53	Culv Exit Loss (ft)	0.33
Delta EG (ft)	1.10	Culv Entr Loss (ft)	0.57
Delta WS (ft)	1.30	Q Weir (cfs)	3948.97
E.G. IC (ft)	584.81	Weir Sta Lft (ft)	39.00
E.G. OC (ft)	585.43	Weir Sta Rgt (ft)	149.00
Culvert Control	Outlet	Weir Submerg	0.67
Culv WS Inlet (ft)	578.50	Weir Max Depth (ft)	6.11
Culv WS Outlet (ft)	578.14	Weir Avg Depth (ft)	5.75
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	632.18
Culv Crt Depth (ft)	3.13	Min El Weir Flow (ft)	579.33

CROSS SECTION

RIVER: Harbison Creek
REACH: Culverts RS: 405

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	583	9	582	20	581	29	580	38.5	579
47.5	574.1	84.5	574.1	90	578	106	579	138	580
162	581	215	582	250	582.8	507.5	584		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	38.5	.035	106	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
38.5	106	200.8	195.2	187.3	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	41	580.6	F
106	507.5	580.6	F

CROSS SECTION OUTPUT Profile #100year

E.G. Elev (ft)	583.45	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.74	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	582.71	Reach Len. (ft)	200.80	195.20	187.30
Crit W.S. (ft)	581.36	Flow Area (sq ft)	65.84	477.76	230.42

E.G. Slope (ft/ft)	0.002476	Area (sq ft)	65.84	477.76	230.42
Q Total (cfs)	4700.00	Flow (cfs)	244.25	3630.56	825.19
Top Width (ft)	243.26	Top Width (ft)	35.86	67.50	139.91
Vel Total (ft/s)	6.07	Avg. Vel. (ft/s)	3.71	7.60	3.58
Max Chl Dpth (ft)	8.61	Hydr. Depth (ft)	1.84	7.08	1.65
Conv. Total (cfs)	94459.9	Conv. (cfs)	4908.9	72966.5	16584.5
Length Wtd. (ft)	194.87	Wetted Per. (ft)	36.05	70.02	139.96
Min Ch El (ft)	574.10	Shear (lb/sq ft)	0.28	1.05	0.25
Alpha	1.29	Stream Power (lb/ft s)	507.50	0.00	0.00
Frctn Loss (ft)	0.75	Cum Volume (acre-ft)	2.40	3.80	1.82
C & E Loss (ft)	0.06	Cum SA (acres)	1.94	0.67	1.22

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.

CROSS SECTION OUTPUT Profile #Floodways

E.G. Elev (ft)	584.33	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.80	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	583.53	Reach Len. (ft)	200.80	195.20	187.30
Crit W.S. (ft)	581.10	Flow Area (sq ft)	38.33	533.65	114.71
E.G. Slope (ft/ft)	0.002100	Area (sq ft)	38.33	533.65	114.71
Q Total (cfs)	4700.00	Flow (cfs)	152.64	4020.99	526.37
Top Width (ft)	105.00	Top Width (ft)	9.50	67.50	28.00
Vel Total (ft/s)	6.84	Avg. Vel. (ft/s)	3.98	7.53	4.59
Max Chl Dpth (ft)	9.43	Hydr. Depth (ft)	4.03	7.91	4.10
Conv. Total (cfs)	102555.9	Conv. (cfs)	3330.7	87739.7	11485.5
Length Wtd. (ft)	194.49	Wetted Per. (ft)	13.09	70.02	31.67
Min Ch El (ft)	574.10	Shear (lb/sq ft)	0.38	1.00	0.47
Alpha	1.10	Stream Power (lb/ft s)	507.50	0.00	0.00
Frctn Loss (ft)	0.72	Cum Volume (acre-ft)	0.78	4.07	0.72
C & E Loss (ft)	0.12	Cum SA (acres)	0.21	0.67	0.31

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.

CROSS SECTION

RIVER: Harbison Creek
REACH: Culverts RS: 370

INPUT
Description: Cross Section X1
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	59031.89996		58855.29999		58672.29999		584	112.6	583
194.9	582	225.3	580	242.3	582	251.5	582	288.4	580
340.1	578	373.4	576	386.8	574	401.1	576	408.9	578
427.3	580	478.3	582	578.9	583	716.2	583	806.8	584
850.8	586	910.4	588	939.3	590				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

```
       0    .035   340.1    .035   408.9    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         340.1   408.9              300     290     295             .1       .3
```

CROSS SECTION OUTPUT Profile #100year

E.G. Elev (ft)	582.63	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.36	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	581.26	Reach Len. (ft)	300.00	290.00	295.00
Crit W.S. (ft)	581.26	Flow Area (sq ft)	150.71	348.76	62.02
E.G. Slope (ft/ft)	0.006864	Area (sq ft)	150.71	348.76	62.02
Q Total (cfs)	4700.00	Flow (cfs)	796.52	3599.11	304.37
Top Width (ft)	224.40	Top Width (ft)	104.97	68.80	50.63
Vel Total (ft/s)	8.37	Avg. Vel. (ft/s)	5.29	10.32	4.91
Max Chl Dpth (ft)	7.26	Hydr. Depth (ft)	1.44	5.07	1.23
Conv. Total (cfs)	56727.9	Conv. (cfs)	9613.8	43440.4	3673.7
Length Wtd. (ft)	293.16	Wetted Per. (ft)	105.16	69.40	50.76
Min Ch El (ft)	574.00	Shear (lb/sq ft)	0.61	2.15	0.52
Alpha	1.25	Stream Power (lb/ft s)	939.30	0.00	0.00
Frctn Loss (ft)	1.56	Cum Volume (acre-ft)	1.90	1.95	1.19
C & E Loss (ft)	0.20	Cum SA (acres)	1.61	0.36	0.81

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: 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 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 OUTPUT Profile #Floodways

E.G. Elev (ft)	583.49	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.98	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	581.51	Reach Len. (ft)	300.00	290.00	295.00
Crit W.S. (ft)	581.51	Flow Area (sq ft)	0.35	365.72	70.38
E.G. Slope (ft/ft)	0.008270	Area (sq ft)	0.35	365.72	70.38
Q Total (cfs)	4700.00	Flow (cfs)	0.29	4275.95	423.77
Top Width (ft)	110.00	Top Width (ft)	0.10	68.80	41.10
Vel Total (ft/s)	10.77	Avg. Vel. (ft/s)	0.82	11.69	6.02
Max Chl Dpth (ft)	7.51	Hydr. Depth (ft)	3.51	5.32	1.71
Conv. Total (cfs)	51682.0	Conv. (cfs)	3.2	47019.0	4659.8
Length Wtd. (ft)	291.88	Wetted Per. (ft)	3.61	69.40	41.85
Min Ch El (ft)	574.00	Shear (lb/sq ft)	0.05	2.72	0.87
Alpha	1.10	Stream Power (lb/ft s)	939.30	0.00	0.00
Frctn Loss (ft)	2.26	Cum Volume (acre-ft)	0.69	2.05	0.32
C & E Loss (ft)	0.05	Cum SA (acres)	0.19	0.36	0.16

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 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.
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.
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: Harbison Creek
REACH: Culverts RS: 310

INPUT
Description:
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	58813.60004		58630.20001		58445.80005		58297.60004		580
152.8	578	207.8	578	229.5	578	277.2	578	344.7	578
456.5	576	505	574	515	572	527.1	572	537.3	572
544.6	574	562.4	576	650	577	715.2	578	804.8	580
838.4	582	876.8	584	915.8	586	946.4	588		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	505	.035	544.6	.04

Bank Sta: Left	Right	Coeff Contr.	Expan.
505	544.6	.1	.3

CROSS SECTION OUTPUT Profile #100year

E.G. Elev (ft)	579.09	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.69	Wt. n-Val.	0.040	0.035	0.040
W.S. Elev (ft)	578.40	Reach Len. (ft)			
Crit W.S. (ft)	578.31	Flow Area (sq ft)	400.40	236.14	289.23
E.G. Slope (ft/ft)	0.004258	Area (sq ft)	400.40	236.14	289.23
Q Total (cfs)	4700.00	Flow (cfs)	1480.88	2134.38	1084.74
Top Width (ft)	591.36	Top Width (ft)	363.24	39.60	188.52
Vel Total (ft/s)	5.08	Avg. Vel. (ft/s)	3.70	9.04	3.75
Max Chl Dpth (ft)	6.40	Hydr. Depth (ft)	1.10	5.96	1.53
Conv. Total (cfs)	72030.1	Conv. (cfs)	22695.3	32710.5	16624.3
Length Wtd. (ft)		Wetted Per. (ft)	363.31	40.07	188.65
Min Ch El (ft)	572.00	Shear (lb/sq ft)	0.29	1.57	0.41
Alpha	1.73	Stream Power (lb/ft s)	946.40	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

CROSS SECTION OUTPUT Profile #Floodways

E.G. Elev (ft)	580.58	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.82	Wt. n-Val.	0.040	0.035	0.040
W.S. Elev (ft)	578.76	Reach Len. (ft)			
Crit W.S. (ft)	578.44	Flow Area (sq ft)	199.92	250.40	24.07
E.G. Slope (ft/ft)	0.007277	Area (sq ft)	199.92	250.40	24.07
Q Total (cfs)	4700.00	Flow (cfs)	1482.49	3076.66	140.86
Top Width (ft)	100.00	Top Width (ft)	55.00	39.60	5.40
Vel Total (ft/s)	9.91	Avg. Vel. (ft/s)	7.42	12.29	5.85

Max Chl Dpth (ft)	6.76	Hydr. Depth (ft)	3.63	6.32	4.46
Conv. Total (cfs)	55097.8	Conv. (cfs)	17379.1	36067.5	1651.2
Length Wtd. (ft)		Wetted Per. (ft)	57.69	40.07	9.59
Min Ch El (ft)	572.00	Shear (lb/sq ft)	1.57	2.84	1.14
Alpha	1.19	Stream Power (lb/ft s)	946.40	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River:Harbison Creek

Reach	River Sta.	n1	n2	n3
Culverts	530	.035	.025	.035
Culverts	460	.035	.025	.035
Culverts	410	.035	.035	.035
Culverts	409	Culvert		
Culverts	405	.035	.035	.035
Culverts	370	.035	.035	.035
Culverts	310	.04	.035	.04

SUMMARY OF REACH LENGTHS

River: Harbison Creek

Reach	River Sta.	Left	Channel	Right
Culverts	530	344	352	372
Culverts	460	220	210	195
Culverts	410	40	40	40
Culverts	409	Culvert		
Culverts	405	200.8	195.2	187.3
Culverts	370	300	290	295
Culverts	310			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Harbison Creek

Reach	River Sta.	Contr.	Expan.
Culverts	530	.1	.3
Culverts	460	.1	.3
Culverts	410	.1	.3
Culverts	409	Culvert	
Culverts	405	.1	.3
Culverts	370	.1	.3
Culverts	310	.1	.3

Profile Output Table - Standard Table 1-Carnevale

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 Total (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # XS
Culverts	530	100year	4700.00	580.00	587.42	587.42	588.56	0.002978	6.32	743.35	349.75	1.03
Culverts	530	Floodways	4700.00	580.00	587.36	587.27	590.02	0.005564	13.10	358.77	65.00	0.98
Culverts	460	100year	4700.00	578.00	585.02	585.02	586.36	0.004499	7.70	610.40	230.17	1.00
Culverts	460	Floodways	4700.00	578.00	585.69	585.69	587.98	0.005448	10.98	428.12	88.80	0.97
Culverts	410	100year	4700.00	574.54	583.57	581.89	584.15	0.001917	5.46	861.16	265.42	0.59
Culverts	410	Floodways	4700.00	574.54	584.83	581.62	585.43	0.001465	5.97	787.09	110.00	0.41
Culverts	409	Culvert										
Culverts	405	100year	4700.00	574.10	582.71	581.36	583.45	0.002476	6.07	774.01	243.26	0.68
Culverts	405	Floodways	4700.00	574.10	583.53	581.10	584.33	0.002100	6.84	686.68	105.00	0.49
Culverts	370	100year	4700.00	574.00	581.26	581.26	582.63	0.006864	8.37	561.49	224.40	1.04
Culverts	370	Floodways	4700.00	574.00	581.51	581.51	583.49	0.008270	10.77	436.45	110.00	1.00
Culverts	310	100year	4700.00	572.00	578.40	578.31	579.09	0.004258	5.08	925.77	591.36	0.94
Culverts	310	Floodways	4700.00	572.00	578.76	578.44	580.58	0.007277	9.91	474.38	100.00	0.88

Profile Output Table - Encroachment 1

Reach	River Sta	Profile	W.S. Elev (ft)	Prof Delta WS (ft)	E.G. Elev (ft)	Top Wdth Act (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Enc Sta L (ft)	Ch Sta L (ft)	Ch Sta R (ft)	Enc Sta R (ft)
Culverts	530	100year	587.42		588.56	349.75	1059.78	3618.00	22.23		613.40	685.60	
Culverts	530	Floodways	587.36	-0.06	590.02	65.00		4700.00		615.00	613.40	685.60	680.00
Culverts	460	100year	585.02		586.36	230.17							

```
1661.96     2926.74    111.30                183.30     239.70
  Culverts      460           Floodways      585.69            0.67      587.98          88.80
1167.17     3532.83                138.70    183.30     239.70      227.50


  Culverts      410           100year        583.57                      584.15         265.42
 232.07     3533.63    934.29                 48.00     121.00
  Culverts      410           Floodways      584.83            1.26      585.43         110.00
 135.94     4037.91    526.15       39.00     48.00     121.00      149.00


  Culverts      409                          Culvert



  Culverts      405           100year        582.71                      583.45         243.26
 244.25     3630.56    825.19                 38.50     106.00
  Culverts      405           Floodways      583.53            0.83      584.33         105.00
 152.64     4020.99    526.37       29.00     38.50     106.00      134.00


  Culverts      370           100year        581.26                      582.63         224.40
 796.52     3599.11    304.37                340.10     408.90
  Culverts      370           Floodways      581.51            0.25      583.49         110.00
   0.29     4275.95    423.77      340.00    340.10     408.90      450.00


  Culverts      310           100year        578.40                      579.09         591.36
1480.88     2134.38   1084.74                505.00     544.60
  Culverts      310           Floodways      578.76            0.36      580.58         100.00
1482.49     3076.66    140.86      450.00    505.00     544.60      550.00
```

ERRORS WARNINGS AND NOTES

Errors Warnings and Notes for Plan : PROP FW

```
River: Harbison Creek  Reach: Culverts     RS: 530     Profile: 100year
     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.
River: Harbison Creek  Reach: Culverts     RS: 530     Profile: Floodways
     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.
River: Harbison Creek  Reach: Culverts     RS: 460     Profile: 100year
     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.
```

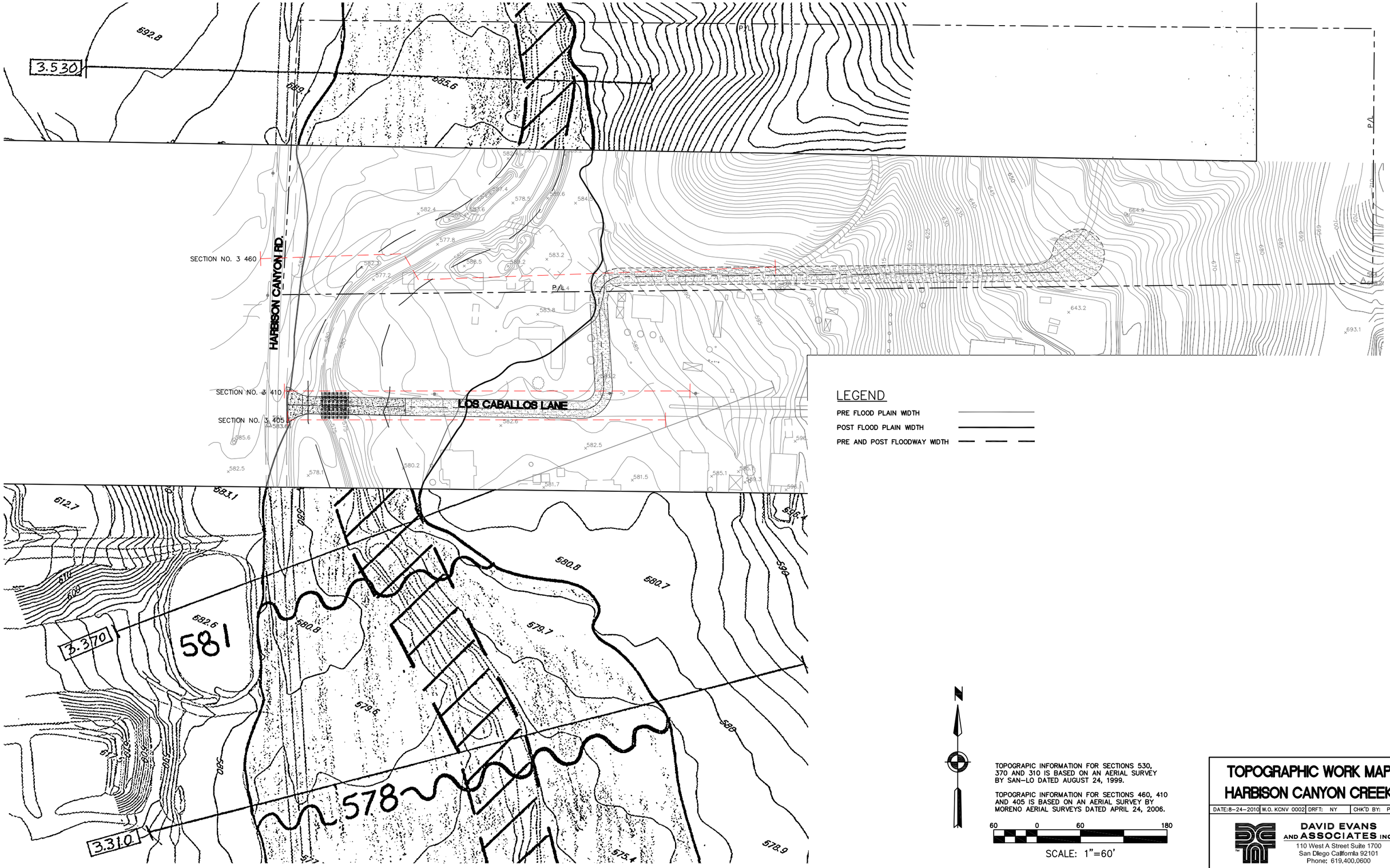
This may indicate the need for additional cross sections.
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning:During the standard step iterations, when the assumed water surface was 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.
River: Harbison Creek Reach: Culverts RS: 460 Profile: Floodways
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.
River: Harbison Creek Reach: Culverts RS: 410 Profile: Floodways
Warning:The cross section had to be extended vertically during the critical depth calculations.
River: Harbison Creek Reach: Culverts RS: 405 Profile: 100year
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.
River: Harbison Creek Reach: Culverts RS: 405 Profile: Floodways
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.
River: Harbison Creek Reach: Culverts RS: 370 Profile: 100year
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: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 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.
River: Harbison Creek Reach: Culverts RS: 370 Profile: Floodways
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 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.
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.
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.

APPENDIX D.III

Harbison Canyon Creek
Proposed Topographic Work Map

DAVID EVANS AND ASSOCIATES INC.



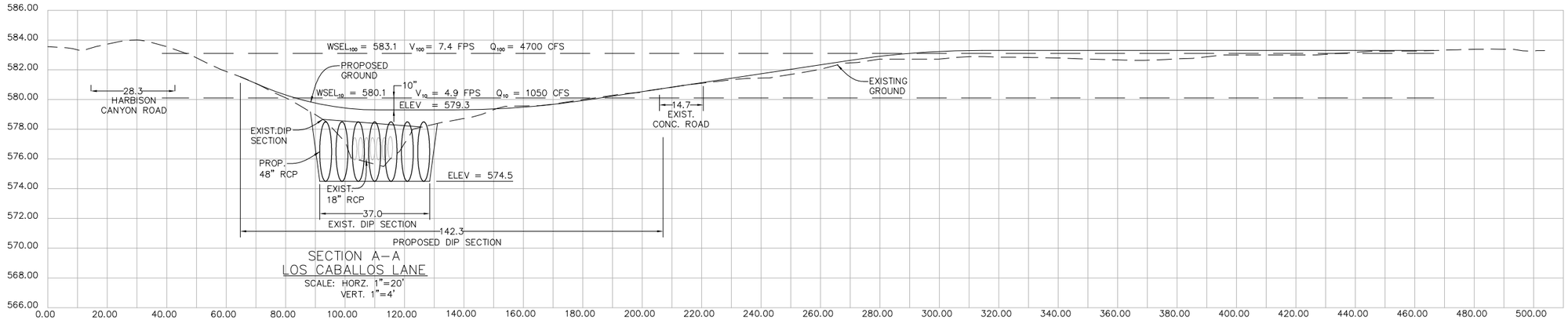
TOPOGRAPHIC WORK MAP
HARBISON CANYON CREEK

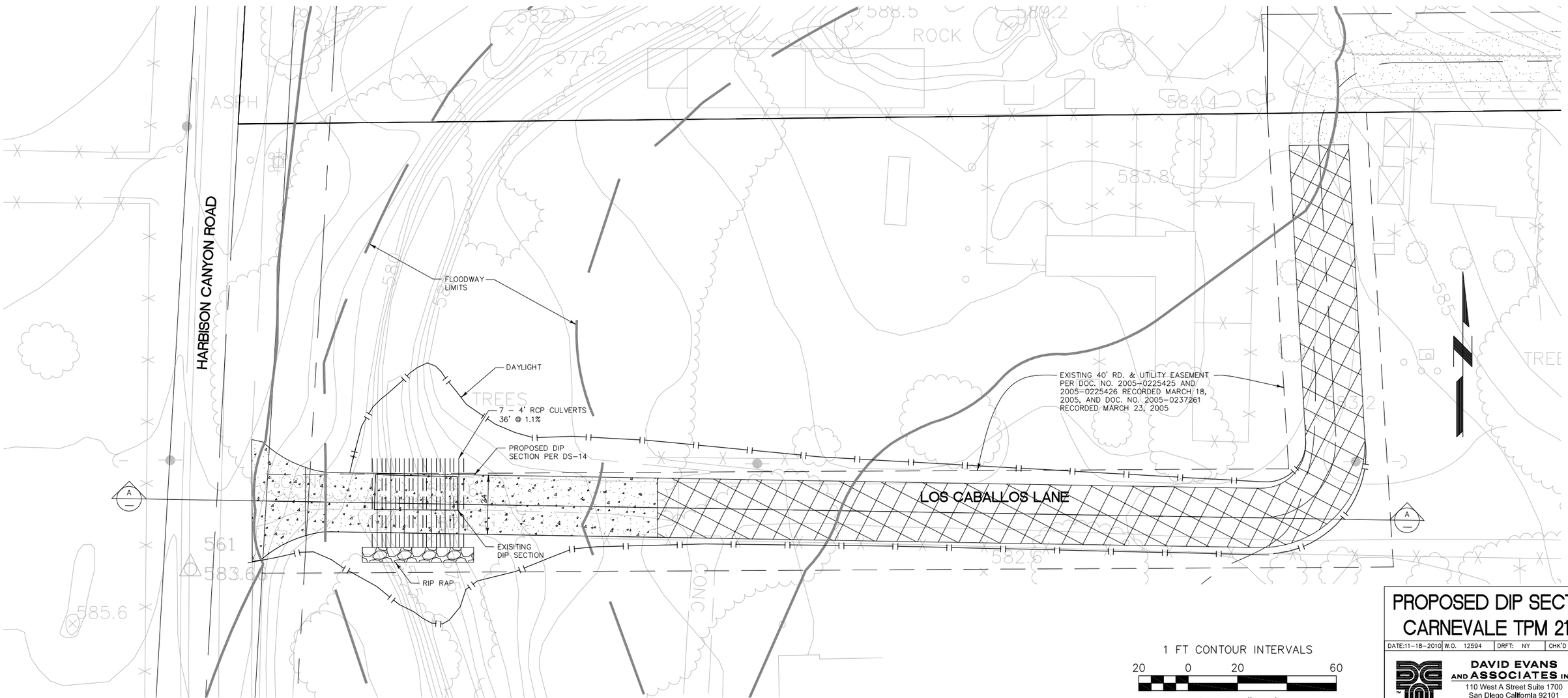
DATE:8-24-2010	W.O. KCNV 0002	DRFT: NY	CHK'D BY: PM

DAVID EVANS AND ASSOCIATES INC.
110 West A Street Suite 1700
San Diego California 92101
Phone: 619.400.0600

APPENDIX E

PROPOSED DIP SECTION EXHIBIT





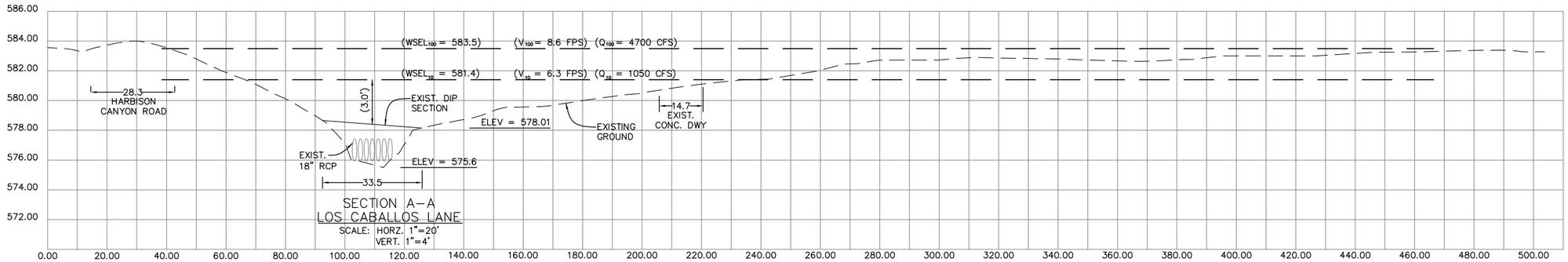
PROPOSED DIP SECTION
CARNEVALE TPM 21133

DATE:11-18-2010	W.O. 12594	DRFT: NY	CHK'D BY: PM

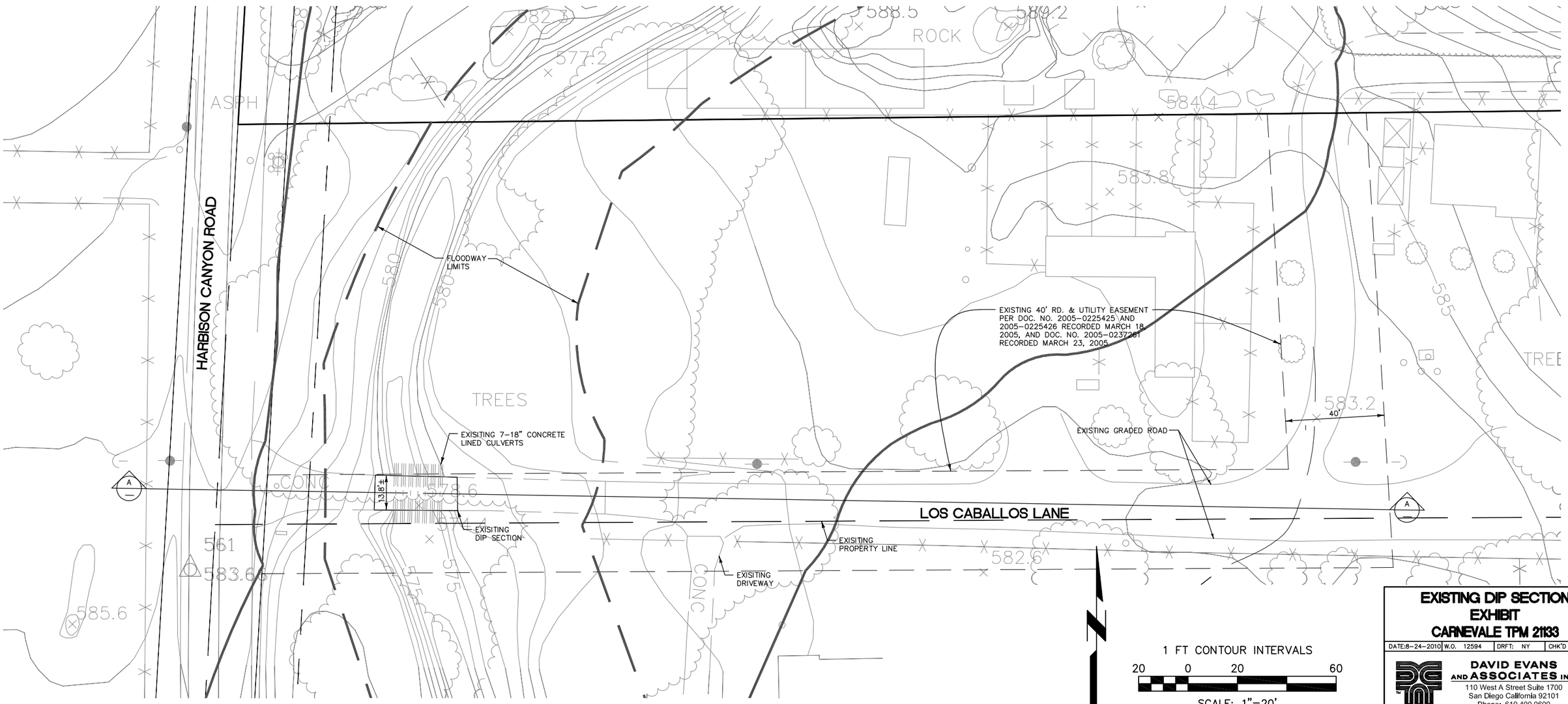
DAVID EVANS AND ASSOCIATES INC.
110 West A Street Suite 1700
San Diego California 92101
Phone: 619.400.0600

APPENDIX F

EXISTING DIP SECTION EXHIBIT



SECTION A–A
LOS CABALLOS LANE
SCALE: HORZ. 1"=20'
VERT. 1"=4'



EXISTING DIP SECTION EXHIBIT
CARNEVALE TPM 21133

DATE:8–24–2010	W.O. 12594	DRFT: NY	CHK'D BY: PM

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