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FINAL DRAINAGE REPORT
FOR
CHANNEL IMPROVEMENTS
CHAPEL HILLS DRIVE BRIDGE
OVER PINE CREEK

JB Engineering, Ltd.

JR Engineering, Ltd.
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FOR
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OVER PINE CREEK

March 1997
Revised October 1997
Revised February 1998
Revised June 1998

Prepared For:

LP47, LLC dba LA PLATA INVESTMENTS
7150 Campus Drive, Suite 365
Colorado Springs, CO 80920
(719) 260-7477

Prepared By:

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Job No. 8716.14

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DRAINAGE REPORT STATEMENT

ENGINEER'S STATEMENT:
The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the City for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.

Kyle R. Campbell, Colorado P.E. #29794
For and On Behalf of JR Engineering, Ltd.

8-14-98
Date

DEVELOPER'S STATEMENT:
I, the developer, have read and will comply with all of the requirements specified in this drainage report and plan.

Business Name: LP47, LLC dba La Plata Investments

By: Bob Ingels

Title:

Address: 7150 Campus Drive, Suite 365

Colorado Springs, CO 80920

CITY OF COLORADO SPRINGS ONLY:
Filed in accordance with Section 15-3-906 of the Code of the City of Colorado Springs, 1980, as amended.

for
City Engineer

8/28/98
Date

Conditions:

FINAL DRAINAGE REPORT FOR
CHANNEL IMPROVEMENTS
CHAPEL HILLS DRIVE BRIDGE OVER PINE CREEK

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APPENDIX

FINAL DRAINAGE REPORT FOR CHANNEL IMPROVEMENTS CHAPEL HILLS DRIVE BRIDGE OVER PINE CREEK

PURPOSE

This document is the Final Hydraulic Report for the Chapel Hills Drive Crossing of Pine Creek. The purpose of this report is to identify the impacts that the proposed bridge and channel improvements would have on the flows within Pine Creek. This report will analyze the ability of the proposed channel to convey the developed flows, as established by the approved Pine Creek Drainage Basin Planning Study and its amendments, and to analyze channel treatment requirements up and downstream of the bridge crossing.

GENERAL DESCRIPTION

The Chapel Hills Bridge at Pine Creek is located in Section 28, Township 12 South, Range 66 West of the Sixth Principal Meridian, in the City of Colorado Springs, County of El Paso. The site is bounded by the Pine Creek Golf Course with the 17th tee to the northeast, the 11th green to the southeast. the 12th tee to the southwest, and the 16th green to the northwest.

The proposed bridge over Pine Creek has a span of 50 feet +/- along the centerline of Chapel Hills Drive, which equates to 46.2 feet +/- between abutments perpendicular to the Pine Creek Channel. A reinforced concrete channel is proposed under the bridge. The channel is proposed to be a 20'10" wide, low flow channel with 8' wide golf cart paths on each side of the channel passing under the bridge. The concrete cart path surfaces are elevated 3' minimum above the channel bottom. Both levels convey stormwater in storms greater than 5-year frequency. During a 5-year frequency stormwater will overtop the cart path surface at Station 173.

Golf cart paths approach the channel to pass under the Chapel Hills Drive bridge, no cart path crossings of the channel are proposed.

Rip-rap channel lining is proposed for the short transition areas at the upstream and downstream ends of the concrete channel. Due to concerns by the U. S. Army Corps of Engineers about removal of vegetation that may support the Preble's jumping mouse, proposed channel treatment has been minimized.

HYDROLOGY

The Pine Creek Drainage Basin has been extensively studied by Obering, Wurth & Associates. Reference is made to the previous submittal, dated October 1988, entitled "Pine Creek Drainage Basin - Drainage Basin Planning Study," and the Amendment No. 1, dated July 1992. The design flow used for the channel analysis is 1800 cfs downstream of Chapel Hills Drive and 1330 cfs upstream of the Chapel Hills Drive Bridge. These figures are consistent with the DBPS Amendment No. 1.

HYDRAULICS

Topography for this project was obtained from the City BIS Department. The digital FIMS map reflects the 1995 update and therefore represents the most current conditions. For example, the FIMS map shows the Chapel Hills Drive temporary embankment.

To analyze the flow characteristics of the channel and the impact the bridge construction has on the channel, JR Engineering, Ltd. used HEC-RAS (River Analysis System), Version 1.2, developed by the US Army Corp of Engineers.

The roughness coefficients were selected from Table 10.2 of the Drainage Criteria Manual. Due to impact on possible mouse habitat, the channel protection has been limited as indicated on the attached plan. It is proposed that approximately 50 feet of channel upstream of the bridge and approximately 75 feet downstream will receive concrete or rip-rap treatment. A plunge pool/energy dissipater with grouted rip-rap is proposed at the bridge outlet. It is anticipated that due to the study area being within the golf course and its proximity to Chapel Hills Drive, the channel will be well maintained. The following "n" values were used:

n = 0.035 for areas intended to receive rip-rap, channel and overbank areas likely to have grass and low weeds.
n = 0.050 for overbank areas where heavy vegetation may develop
n = 0.015 for smooth concrete surfaces
n = 0.075 for main channel native condition
n = 0.085 for overbank native condition

The concrete channel section is proposed to have stone fillets, thus an "n" value of 0.035 was used for these areas.

The same roughness coefficients were used for the 2-year, 5-year, and 100-year storm events. The results of the HEC-RAS analysis are included in the appendix.

At Chapel Hills Drive, the channel was modeled with a 20'10" wide section to carry the low flows for approximately a 2-year event with golf cart paths elevated 3 feet above the lower channel to carry a portion of larger discharges. The depth of flow through the channel ranges from 1.8 feet for the 2-year storm to 3.94 feet for the 100-year storm. The exit velocities from the concrete channel are 14.91 fps and 9.57 fps (Sta. 159) for the 100-year and 2-year events respectively.

Review of the results of the HEC-RAS analysis may be summarized as follows:

Stations 185 through 240 upstream of the proposed bridge are proposed to be left undisturbed. Velocities generated during a 2-year frequency storm in this reach range from 3.37 fps at Station 230 to 5.68 fps at Station 210. Velocities generated during a 100-year frequency storm in this reach range from 5.16 fps at Station 185 to 7.10 fps at Station 230.

Channel Stations 161 through 181 upstream of the proposed bridge are proposed to be reinforced concrete with vertical drops. Calculated velocities for a 100-year frequency storm in this reach range from 6.52 fps to 17.90 fps.

Rip-rap channel treatment is proposed from the concrete cut-off wall at Station 181 to the easterly construction limits, as shown on the plans.

Stations through 142 through 159, downstream of the proposed bridge, incorporate a plunge pool/energy dissipater and are scheduled to receive rip-rap and grouted rip-rap. Note that the three (3) storm drain outlets are proposed to discharge into the grouted rip-rap plunge pool/energy dissipater. Calculated velocities generated by a 100-year frequency storm range from 19.46 fps at Station 156 to 4.86 fps at Station 153. At the downstream end of the rip-rap treatment (Station 142), velocities are predicted to be 6.14 fps and 9.74 fps for the 2-year and 100-year events respectively. The channel bottom downstream of Station 142 is heavily vegetated with willows that are expected to aid in resisting erosion from high velocities. The downstream edge of the rip-rap lining will be thickened to 5 feet to provide protection from potential future downstream degradation of the channel.

Stations 105 through 132 are proposed to be left undisturbed. Calculated velocities generated during a 2-year frequency storm range from 4.72 fps to 9.06 fps. Calculated velocities generated during a 100-year storm range from 8.52 fps to 13.17 fps.

FLOOD PLAIN STATEMENT

Portions of this project lie within the Pine Creek 100-year flood limits and thus require a Floodplain Development Permit. The permit application and supporting analysis have been submitted for revision of the existing permit.

RECOMMENDATIONS

As a result of this study, our analysis indicates that the installation of channel improvements and bridge at Chapel Hills will not adversely effect the surrounding properties. The 100-year storm event is passed under the bridge without any overtopping of the road and the exit velocities at the downstream end are manageable. Channel protection, to include both rip-rap and grouted rip-rap, will be required as one of the improvement plans for the bridge. Analysis of the proposed treatment is included in the appendix of this report. The areas to be treated and related details are shown on the attached plans.

The proposed improvements have been designed to minimize hydraulic effects on the upstream and downstream channel.

However, it should be noted that the 100-year frequency storm HEC-RAS analysis predicts velocities on the high side of the acceptable range upstream and downstream of the proposed improvements. Some channel erosion may occur in these areas during severe storms. These areas are to be maintained by the owners of the golf course. Frequent monitoring of the channel should be done so that if erosion occurs it can be treated before significant damage is done to the vegetative channel lining.

Increases in the peak rates of storm water runoff due to upstream development will be limited by future detention ponds presently under study.

It is, therefore, determined that the installation of the Chapel Hills Drive bridge and proposed channel improvements at Pine Creek will not adversely affect surrounding developments.

CONSTRUCTION COST

The construction cost of bridge and channel improvements has been estimated at $425,000.

MAINTENANCE

The drainage way, protective rip-rap areas, and the cart paths within the study zone will continue to be owned and maintained by the golf course.

In addition, the proposed bridge structure is to be maintained by the City, along with the necessary improvements for the road deck. A private maintenance agreement is currently being prepared to address the specific issues related to the channel and bridge.

REVISED BY:

John R Bessette

John R. Bessette, P.E.
Project Engineer
Land Development
For and On Behalf of JR Engineering, Ltd.

/cw/871614/Fnl-drng.doc

REFERENCES

1. "Pine Creek Drainage Basin - Drainage Basin Planning Study," Obering, Wurth & Associates, dated October 1988.

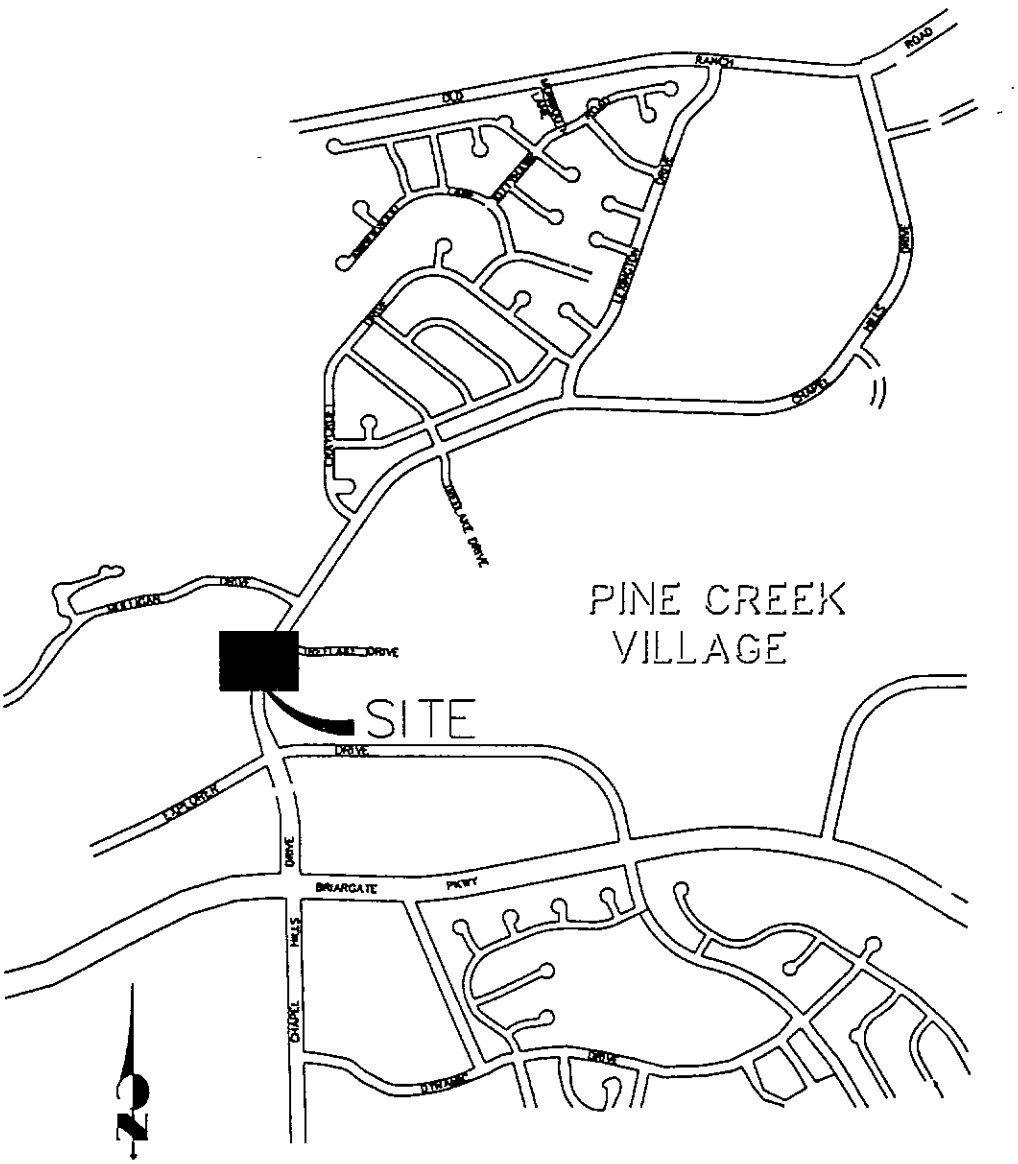
2. "Amendment No. 1 to Pine Creek Drainage Basin Planning Study," Obering, Wurth & Associates, dated July 1992.

3. "Master Development Drainage Plan for Briargate Business Campus in Pine Creek Basin," JR Engineering, Ltd., dated October 1996.

4. City of Colorado Springs/County of El Paso Drainage Criteria Manual, dated October, 1991.

APPENDIX

VICINITY MAP



VICINITY MAP
N.T.S.

FLOODPLAIN MAPS

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 506 OF 1300

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0506	F
EL PASO COUNTY UNINCORPORATED AREAS	080059	0506	F

MAP NUMBER
08041C0506 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 508 OF 1300

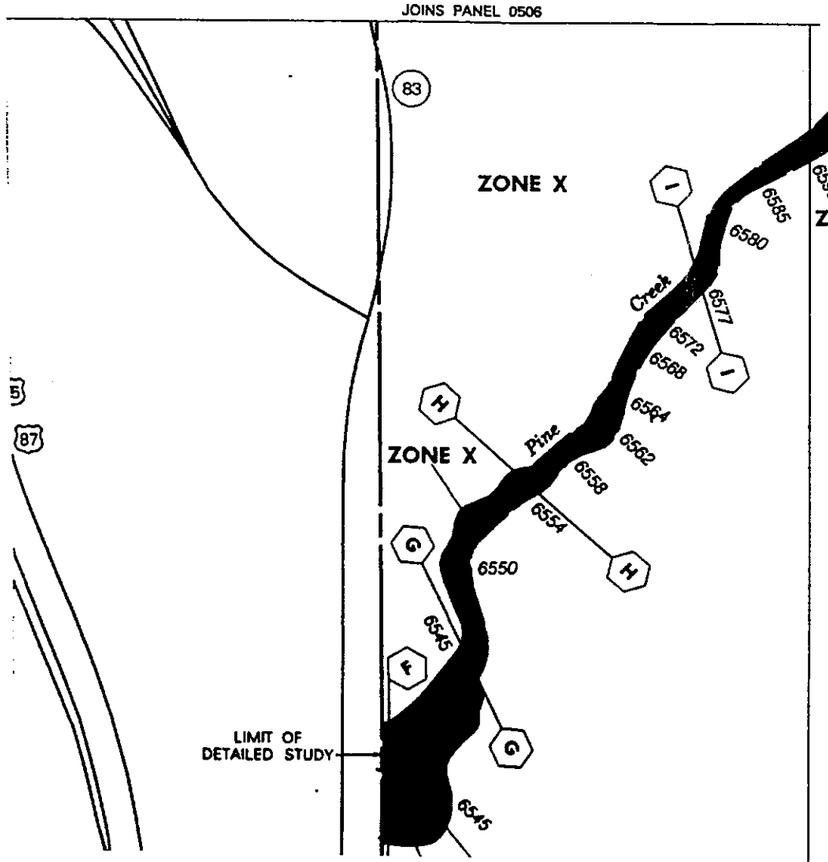
(SEE MAP INDEX FOR PANELS NOT PRINTED)

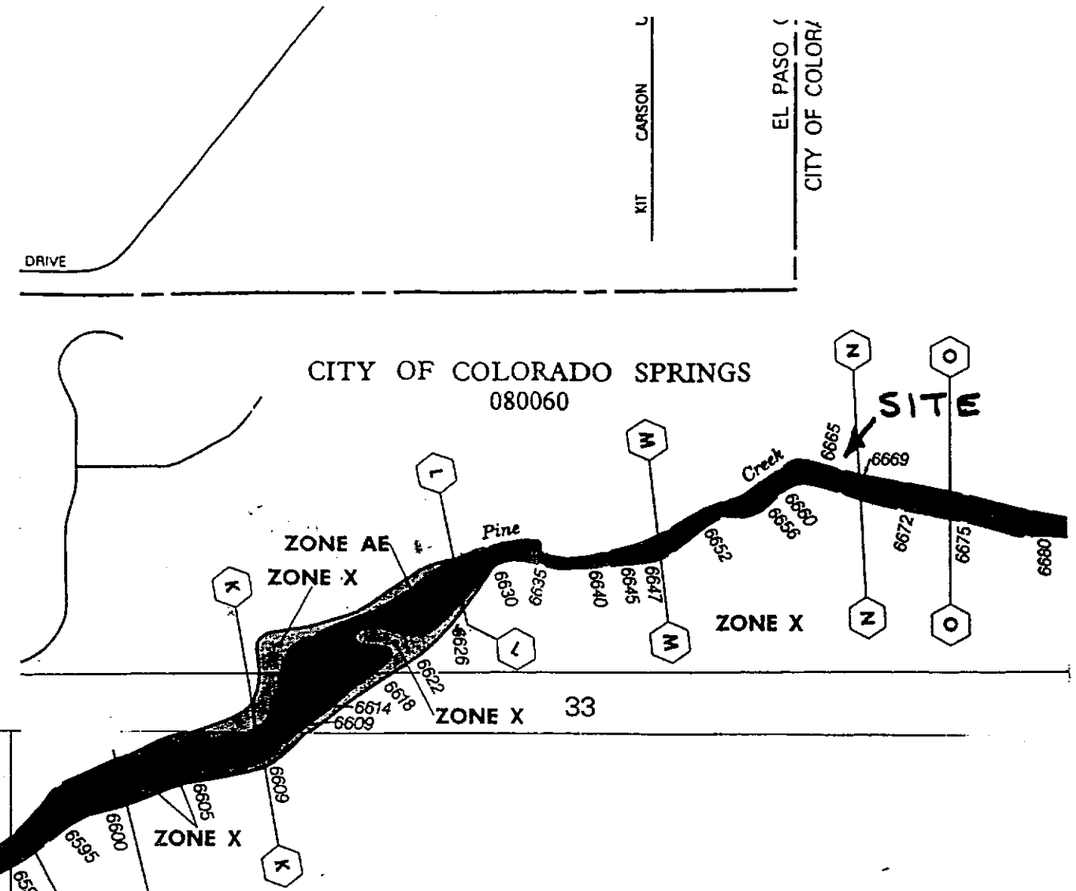
CONTAINS COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0508	F
EL PASO COUNTY UNINCORPORATED AREAS	080059	0508	F

MAP NUMBER
08041C0508 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency





CITY OF COLORADO SPRINGS
080060

ZONE X

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 12 SOUTH, RANGE 66 WEST AND TOWNSHIP 13 SOUTH, RANGE 66 WEST.

CHANNEL PROTECTION

PINE CREEK CHANNEL PROTECTION:

Station	Proposed Condition	Velocity (fps) 2-year	5-year	100-year
240	----------	3.57	5.21	6.44
230	To	3.37	6.06	7.10
210	remain	5.68	4.84	6.74
185	undisturbed	5.49	6.89	5.16

	Rip-rap			
181	----------	10.39	8.92	9.35
179		3.56	5.26	6.52
173	Reinforced	7.42	8.45	9.93
171	Concrete	16.39	17.86	17.90
162	Channel	13.11	14.43	11.78
161		12.40	14.39	14.43
159	----------	9.57	13.63	14.91
	Grouted			
156	Rip-rap	3.31	20.00	19.46
153	----------	1.97	3.42	4.86
145	Rip-rap	5.17	6.29	6.87
142	----------	6.14	7.98	9.74
132		9.06	11.40	13.17
122	To	6.38	8.32	9.81
115	Remain	5.35	7.23	8.72
110	Undisturbed	4.72	6.77	8.52
105	----------	5.82	8.29	10.64

PINE CREEK CHANNEL:
CALCULATE RIP-RAP REQUIREMENTS

Station 142 (Construction Limits) to 159

Maximum Velocity 9.74 fps

S = 0 to negative, edge of stilling basin

Use S = 0.06 for size estimate

$S_S = 2.5$

$$\frac{VS^{0.17}}{(S_S - 1)^{0.66}} = \frac{(9.8)(0.06)^{0.17}}{1.31} = 4.63$$

C.S.D.C.M. – TABLE 10-6

Type "H" Rip-rap $\frac{VS^{0.17}}{(S_S - 1)^{0.66}} = 4.6$ to 5.5

Use Type "H" Rip-rap
Depth required
$1.5\ D_{max} = (1.5)(30") = 45"$
$2.0\ D_{50} = (2.0)(18") = 36"$

Use 48" of Type "H" Rip-rap with 12" of Type II bedding

STATION 153 TO 159

To Include Plunge Pool/Energy Dissipater And Storm Drain Outlets:

Flows from Chapel Hill Drive, Briargate Parkway to Old Ranch Road

Sanitary and Storm Sewer Plans

A) 43" x 68" Ellip. RCP: Q = 325 cfs, V = 20 fps (assuming full pipe)

B) 34" x 53" Ellip. RCP: Q = 170 cfs, V = 17 fps (assuming full pipe)

Channel Velocities:

Highest: Sta. 156, 19.46 fps
Average: 13 fps
Average Slope: $\frac{1}{75} = 0.013 = S$

$S_S = 2.67$

$\frac{VS^{0.17}}{(S_S - 1)^{0.66}}$ = 5.6 to 6.4 for Type VH Rip-rap, per Colorado Springs Drainage Criteria Manual TABLE 10-6

$\frac{(20)(0.48)}{1.4} = 6.67 > 6.4$

Therefore, use Type VH Rip-rap and Grout Critical Area as shown on the plans.

Depth required
$1.5\ D_{max} = (1.5)(42") = 63"$
$2.0\ D_{50} = (2.0)(24") = 48"$
Use: 5' depth

Station 181 to Upstream Construction Limits

Maximum Velocity: 9.35

Average Slope: $^{1.3}/_{13} = 0.1$

$$\frac{VS^{0.17}}{(S_S - 1)^{0.66}} = \frac{(9.4)(0.68)^{0.17}}{1.4} = 4.57$$

$\frac{VS^{0.17}}{(S_S - 1)^{0.66}}$ = 4.6 to 5.5 for Type "H" Rip-rap per C.S.D.C.M. TABLE 10-6

Depth required
$1.5\ D_{max} = (1.5)(30") = 45"$
$2.0\ D_{50} = (2.0)(18") = 36"$

Use 48" depth of Type "H" Rip-rap with 12" of Type II bedding

SUMMARY TABLES

HEC-RAS Plan: Plan 33 Reach: PINE CREEK 6/2/98 2 YEAR

River Sta.	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
240	315.00	66.00	69.55		69.74	0.013072	3.57	88.20	43.45	0.44
230	315.00	66.00	68.71		68.89	0.011516	3.37	94.66	51.00	0.42
210	315.00	64.00	65.67	65.63	66.17	0.072398	5.68	55.48	50.30	0.95
185	315.00	64.00	65.27	65.27	65.74	0.003429	5.49	57.35	62.14	1.01
181	315.00	62.67	63.56	64.06	65.23	0.019475	10.39	30.32	35.95	1.99
179	315.00	61.67	64.09		64.29	0.000738	3.56	88.47	38.48	0.41
173	315.00	61.33	63.21	63.21	64.06	0.005832	7.42	42.44	25.06	1.01
171	315.00	58.25	59.17	60.13	63.34	0.057873	16.39	19.22	22.69	3.14
162	315.00	58.05	59.42	60.18	62.09	0.030733	13.11	24.03	20.28	2.12
161	315.00	57.90	59.34	60.04	61.72	0.026510	12.40	25.41	20.55	1.96
159	315.00	57.00	58.80	59.13	60.22	0.011829	9.57	32.91	20.84	1.34
156	375.00	54.00	58.15		58.32	0.001143	3.31	113.13	27.62	0.29
153	375.00	54.00	58.20	56.32	58.26	0.000568	1.97	190.77	68.96	0.21
145	375.00	56.00	57.79		58.21	0.011303	5.17	72.50	58.79	0.82
142	375.00	56.00	57.35	57.35	57.93	0.017337	6.14	61.10	52.80	1.01
132	375.00	55.00	56.14	56.52	57.41	0.285295	9.06	41.43	52.88	1.79
122	375.00	53.50	55.10	55.10	55.70	0.069513	6.38	62.59	54.20	1.00
115	375.00	52.00	53.74		54.18	0.040720	5.35	70.14	44.69	0.75
110	375.00	50.00	52.85		53.20	0.024137	4.72	80.40	44.41	0.60
105	375.00	49.60	51.66	51.44	52.19	0.047007	5.84	64.24	39.99	0.81

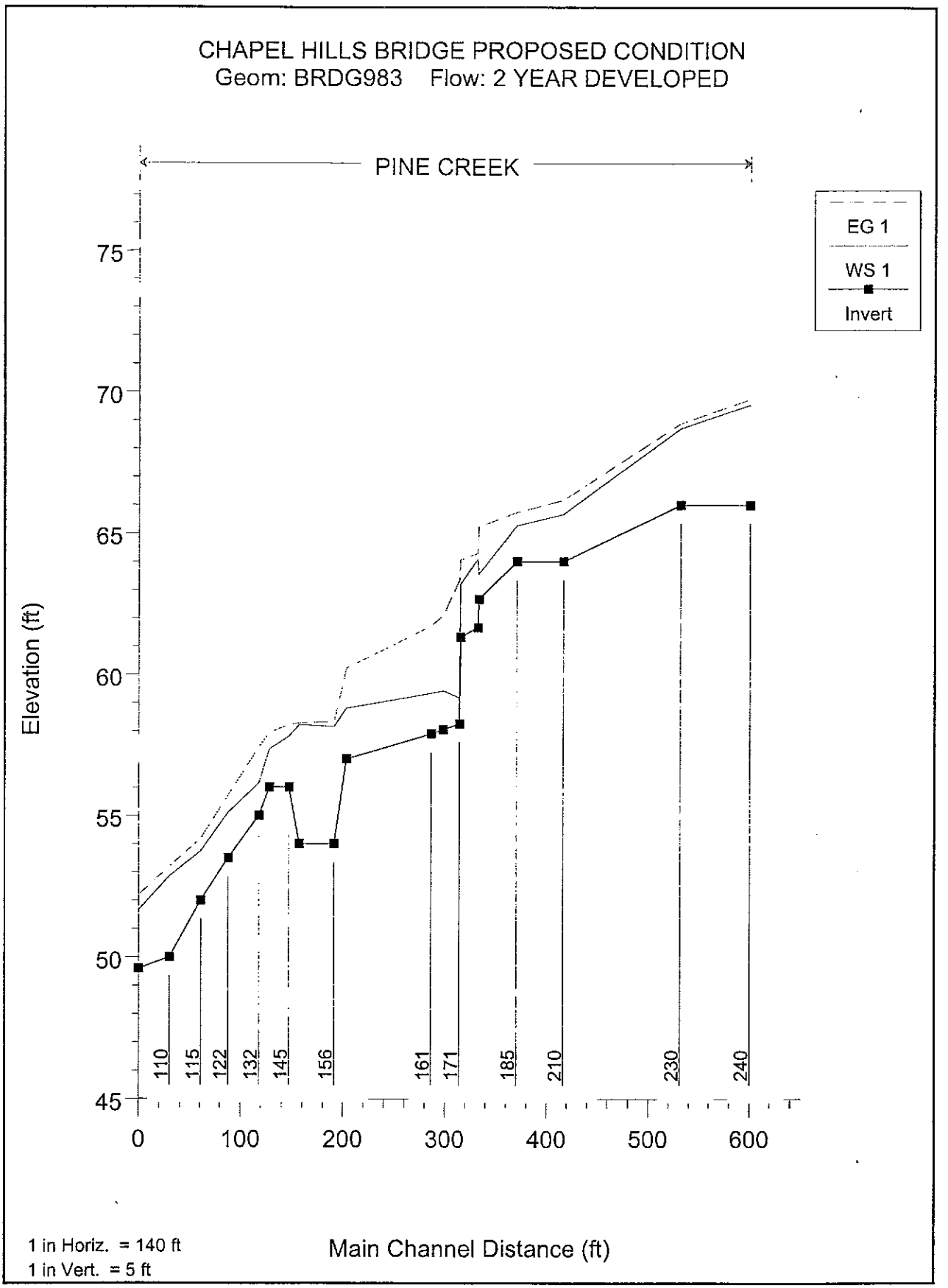
HEC-RAS Plan: Plan 31 Reach: PINE CREEK 6/2/98 5 YEAR

River Sta.	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
240	815.00	66.00	70.98		71.40	0.014859	5.21	158.48	53.37	0.51
230	815.00	66.00	69.55		70.11	0.023439	6.06	139.76	56.86	0.63
210	815.00	64.00	67.59	66.59	67.94	0.014721	4.84	176.69	73.66	0.50
185	815.00	64.00	66.13	66.13	66.86	0.038900	6.89	118.27	80.22	1.00
181	815.00	62.67	65.16	65.26	66.40	0.004460	8.92	91.81	47.79	1.02
179	815.00	61.67	65.75		66.17	0.000830	5.26	159.00	50.04	0.47
173	815.00	61.33	64.94	64.94	65.97	0.003094	8.45	105.48	50.10	0.81
171	815.00	58.25	60.25	61.64	65.21	0.030899	17.86	45.63	25.02	2.33
162	815.00	58.05	60.98	61.82	64.21	0.014089	14.43	56.49	20.91	1.55
161	815.00	57.90	60.83	62.01	64.05	0.013967	14.39	56.65	20.98	1.54
159	815.00	57.00	60.07	61.06	62.95	0.011771	13.63	60.94	39.57	1.43
156	950.00	54.00	55.76	57.36	61.97	0.115778	20.00	47.50	27.20	2.67
153	950.00	54.00	59.47		59.65	0.001053	3.42	278.04	69.03	0.30
145	950.00	56.00	58.97		59.58	0.008488	6.29	151.03	73.54	0.77
142	950.00	56.00	58.35	58.35	59.34	0.014305	7.98	119.38	61.93	1.00
132	950.00	55.00	56.92	57.51	58.92	0.180217	11.40	85.09	58.00	1.60
122	950.00	53.50	56.18	56.18	57.15	0.054153	8.32	127.75	66.23	1.01
115	950.00	52.00	55.05		55.86	0.033955	7.23	134.18	53.35	0.76
110	950.00	50.00	54.25		54.94	0.023992	6.77	146.31	49.99	0.65
105	950.00	49.60	52.86	52.67	53.93	0.047074	8.29	115.76	45.45	0.89

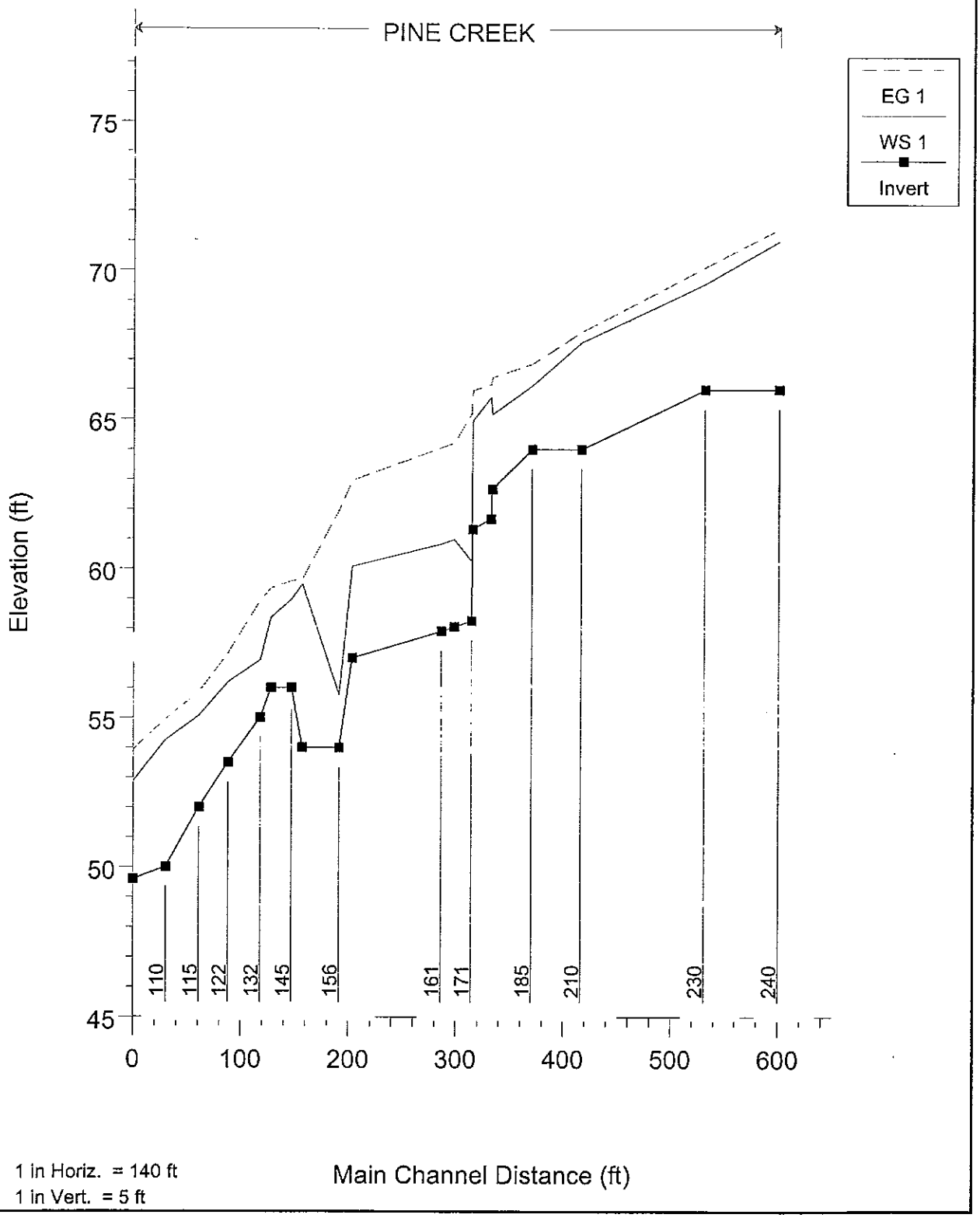
HEC-RAS Plan: Plan 30 Reach: PINE CREEK 6/2/98 100 YEAR

River Sta.	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
240	1330.00	66.00	71.96		72.60	0.015953	6.44	213.72	58.79	0.55
230	1330.00	66.00	70.56		71.32	0.021438	7.10	202.43	69.03	0.64
210	1330.00	64.00	68.03		68.71	0.023560	6.74	210.36	78.17	0.65
185	1330.00	64.00	67.50		67.94	0.010558	5.16	253.91	107.17	0.57
181	1330.00	62.67	66.28	66.28	67.58	0.002976	9.35	150.13	61.40	0.89
179	1330.00	61.67	66.74		67.37	0.000947	6.52	217.79	63.75	0.52
173	1330.00	61.33	65.76	65.76	67.12	0.003212	9.93	146.26	50.14	0.85
171	1330.00	58.25	61.40	62.88	66.38	0.017344	17.90	74.29	25.08	1.83
162	1330.00	58.05	63.10	63.54	65.09	0.004622	11.78	124.32	46.51	0.95
161	1330.00	57.90	61.97	62.85	64.91	0.008888	14.43	101.79	46.50	1.30
159	1330.00	57.00	60.94	61.89	64.09	0.009850	14.91	98.33	46.36	1.36
156	1800.00	54.00	57.40	59.14	63.28	0.049445	19.46	92.52	27.49	1.87
153	1800.00	54.00	60.81		61.17	0.001470	4.86	371.05	78.15	0.37
145	1800.00	56.00	60.38	59.59	61.11	0.005434	6.87	264.83	93.91	0.67
142	1800.00	56.00	59.42	59.42	60.89	0.012001	9.74	188.90	67.82	0.98
132	1800.00	55.00	57.87	58.63	60.49	0.128814	13.17	142.99	64.16	1.46
122	1800.00	53.50	57.36		58.66	0.044414	9.81	210.84	74.49	0.91
115	1800.00	52.00	56.52		57.66	0.028366	8.72	219.78	63.10	0.74
110	1800.00	50.00	55.78		56.85	0.022894	8.52	227.35	56.11	0.68
105	1800.00	49.60	54.10	54.03	55.83	0.047021	10.64	175.07	50.45	0.94

PROFILES

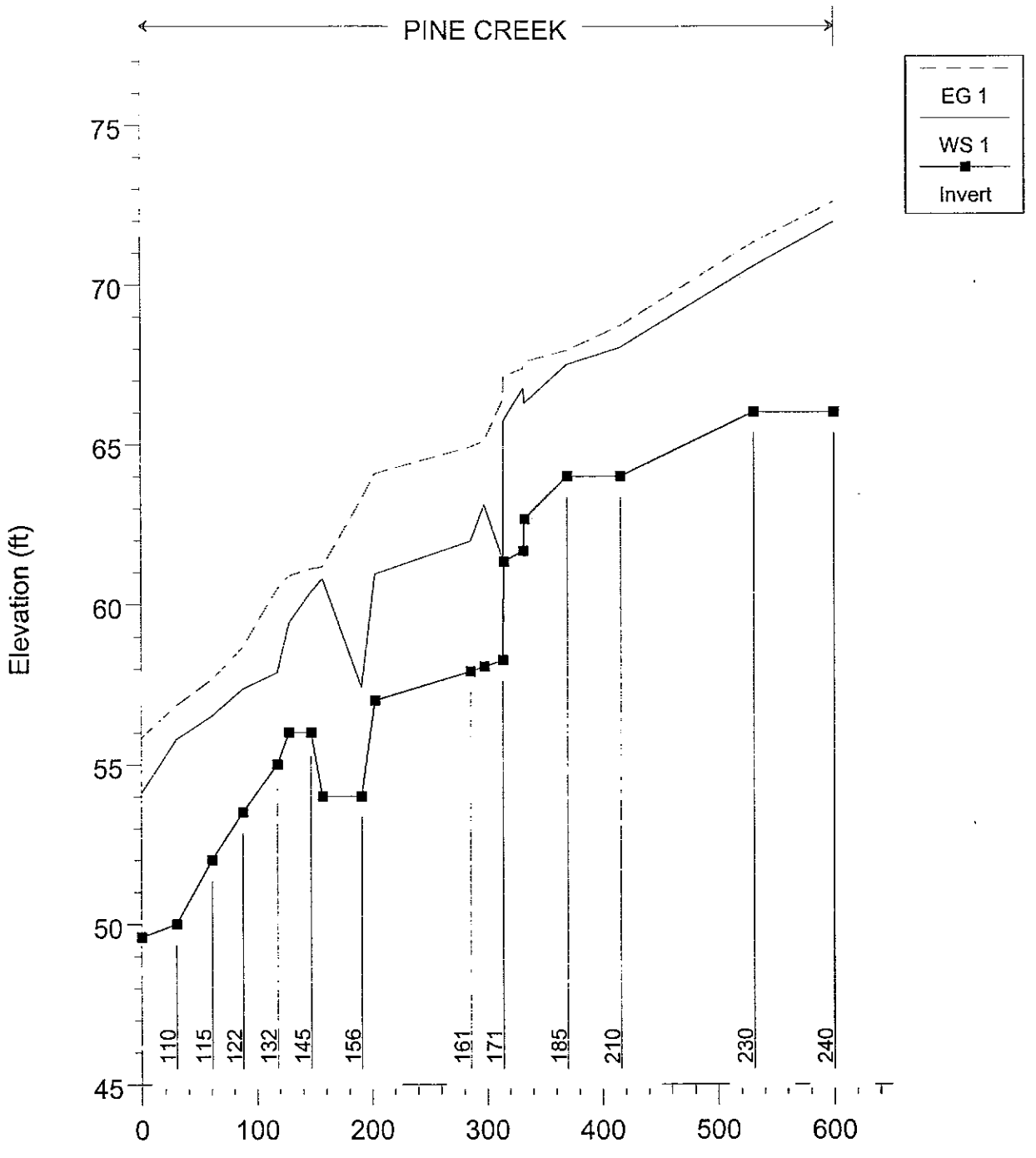

CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 2 YEAR DEVELOPED
PINE CREEK
EG 1
WS 1
Invert
Elevation (ft)
75
70
65
60
55
50
45
110
115
122
132
145
156
161
171
185
210
230
240
0
100
200
300
400
500
600
1 in Horiz. = 140 ft
1 in Vert. = 5 ft
Main Channel Distance (ft)

CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 5 YEAR DEVELOPED



1 in Horiz. = 140 ft
1 in Vert. = 5 ft

CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 100 YEAR DEVELOPED

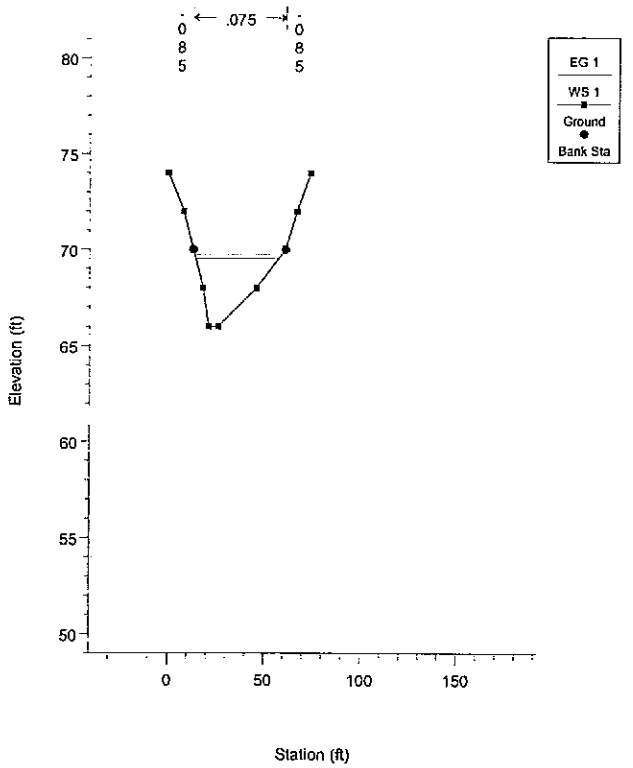


1 in Horiz. = 140 ft
1 in Vert. = 5 ft

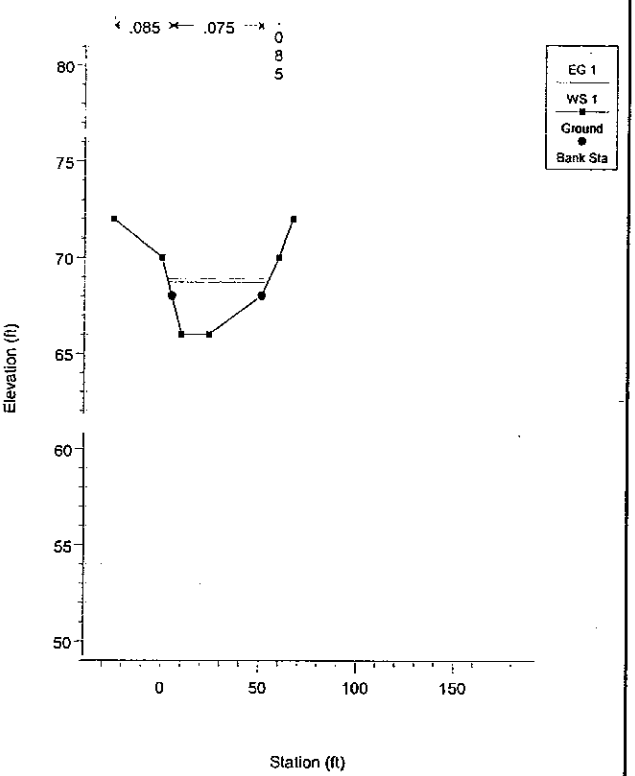
CROSS-SECTIONS

2 Year Storm

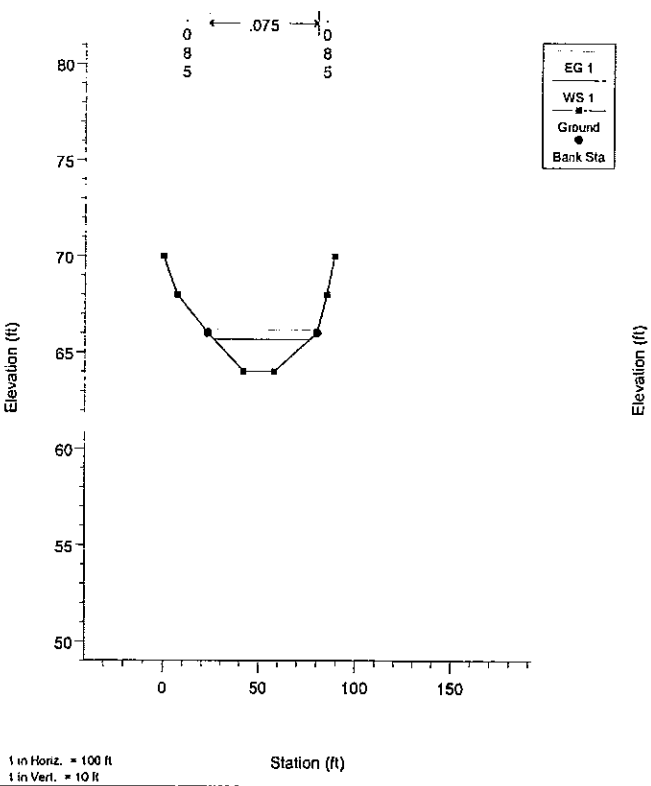
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 2 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 240



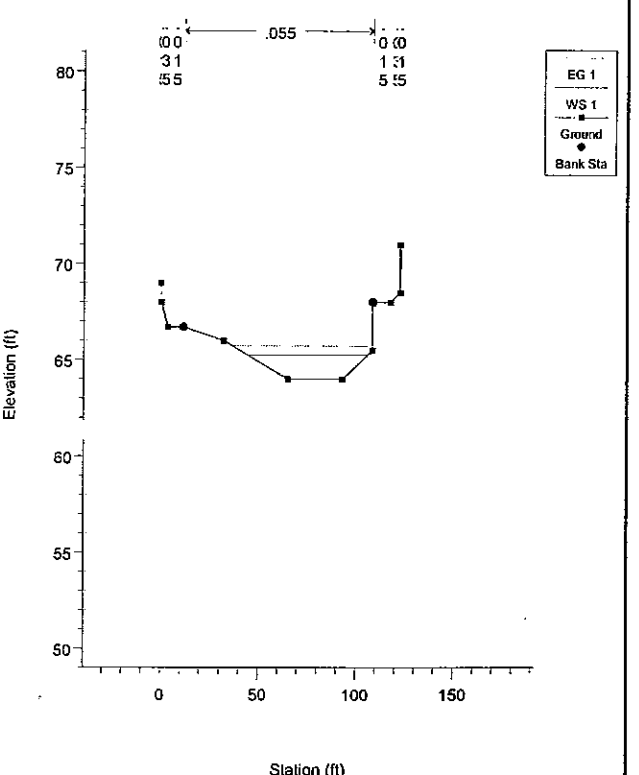
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 2 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 230



CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 2 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 210

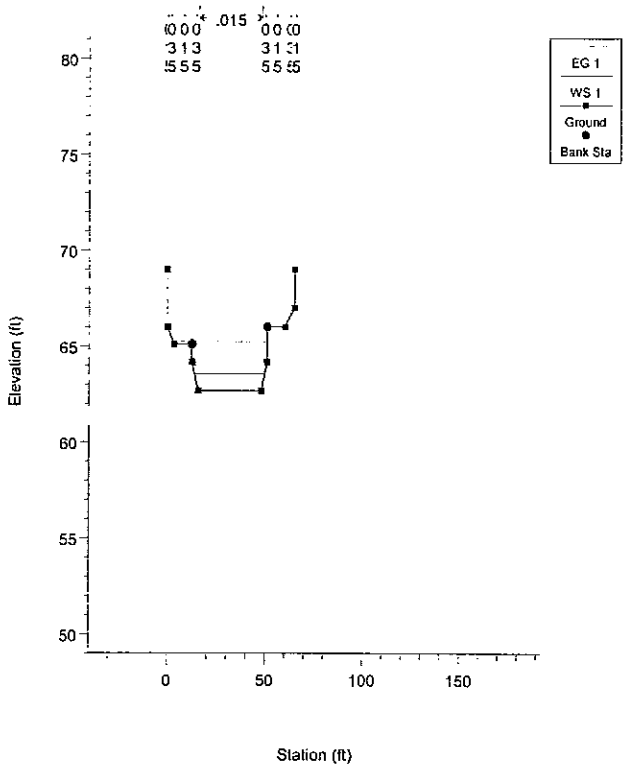


CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 2 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 185

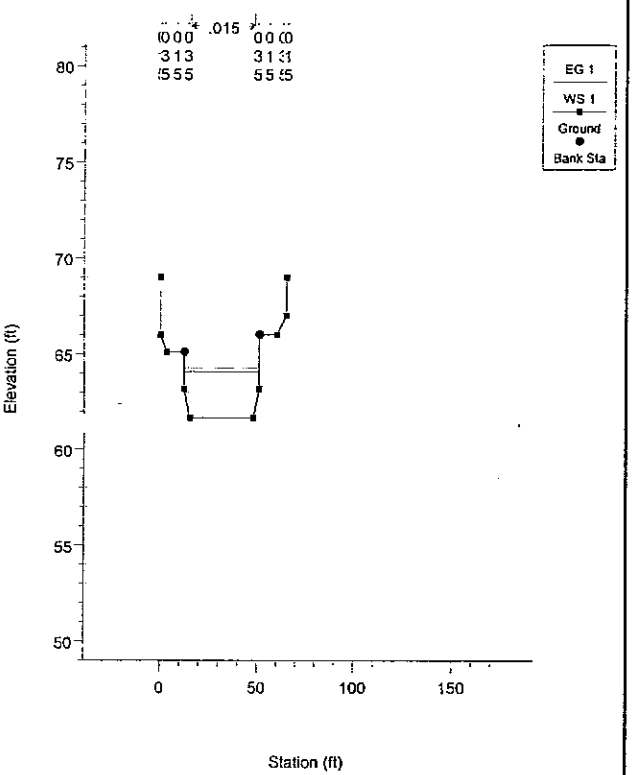


1 in Horiz. = 100 ft
1 in Vert. = 10 ft

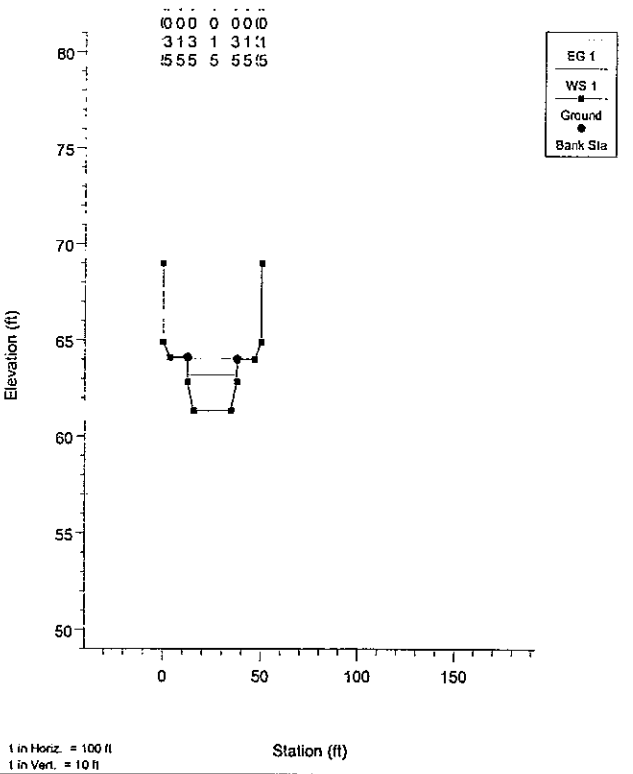
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 2 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 181



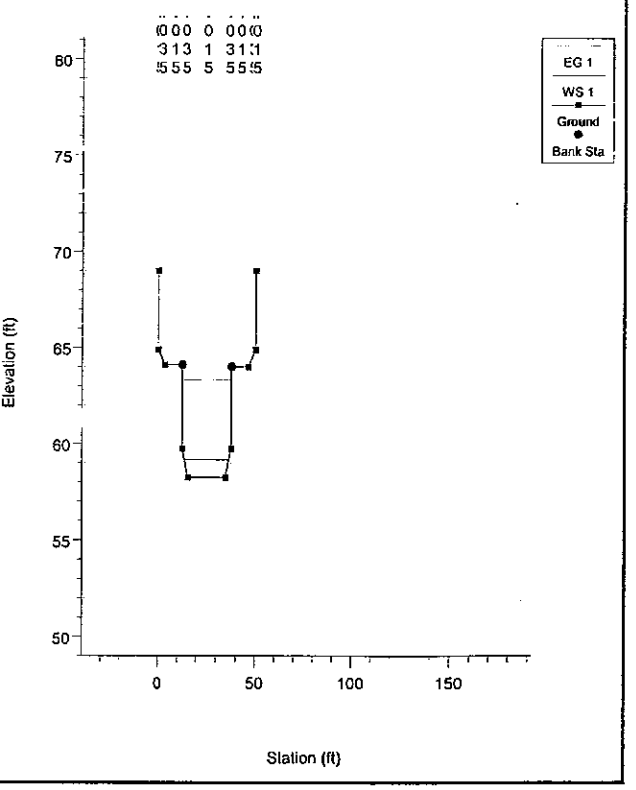
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 2 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 179



CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 2 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 173

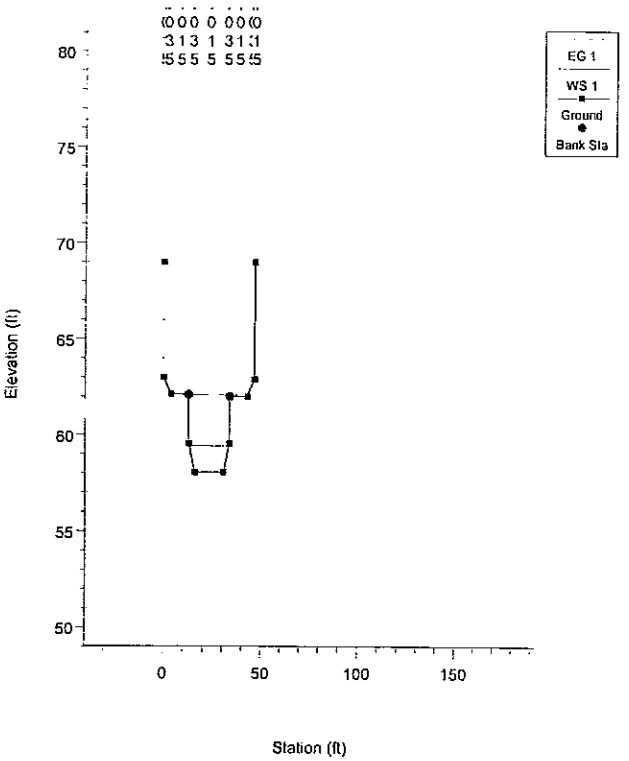


CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 2 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 171

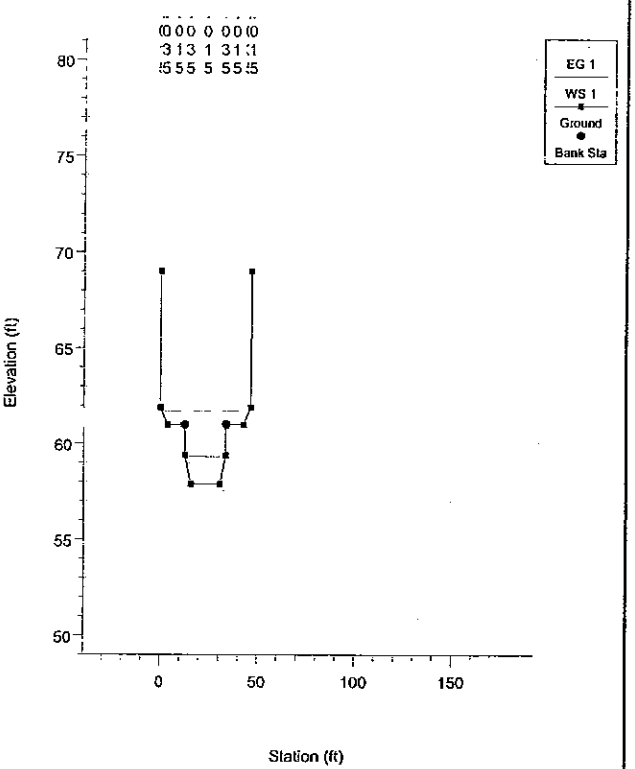


1 in Horiz. = 100 ft
1 in Vert. = 10 ft

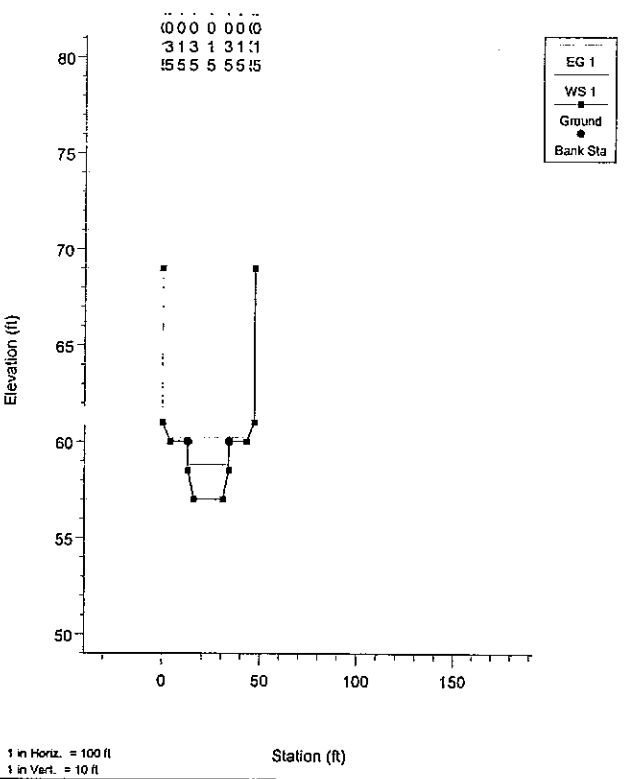
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 2 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 162



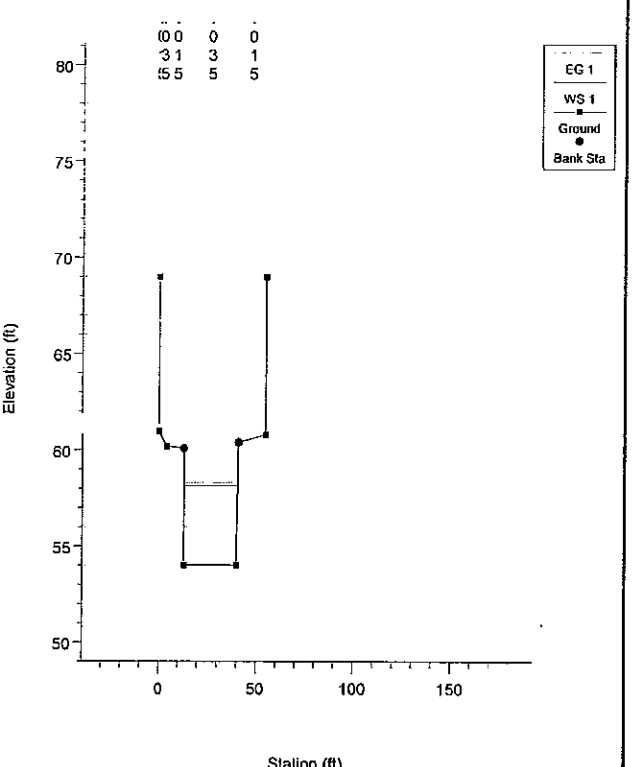
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 2 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 161



CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 2 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 159

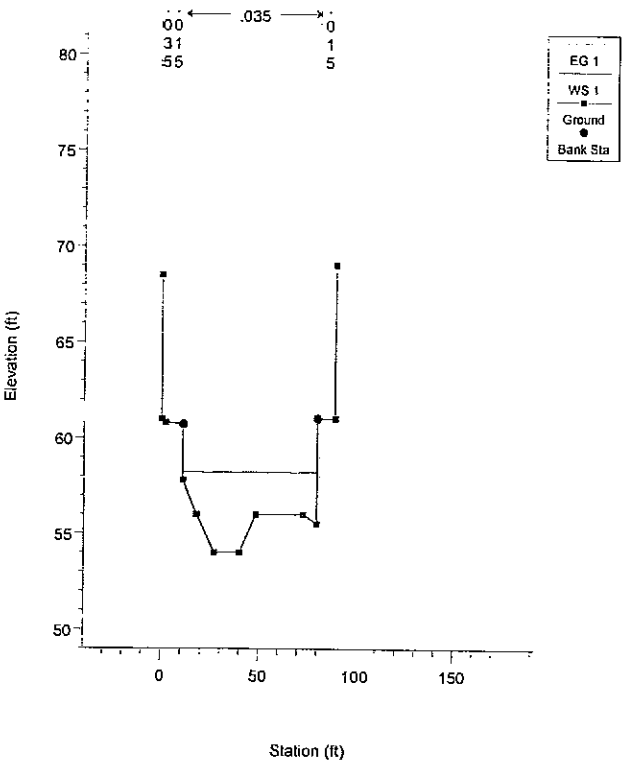


CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 2 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 156

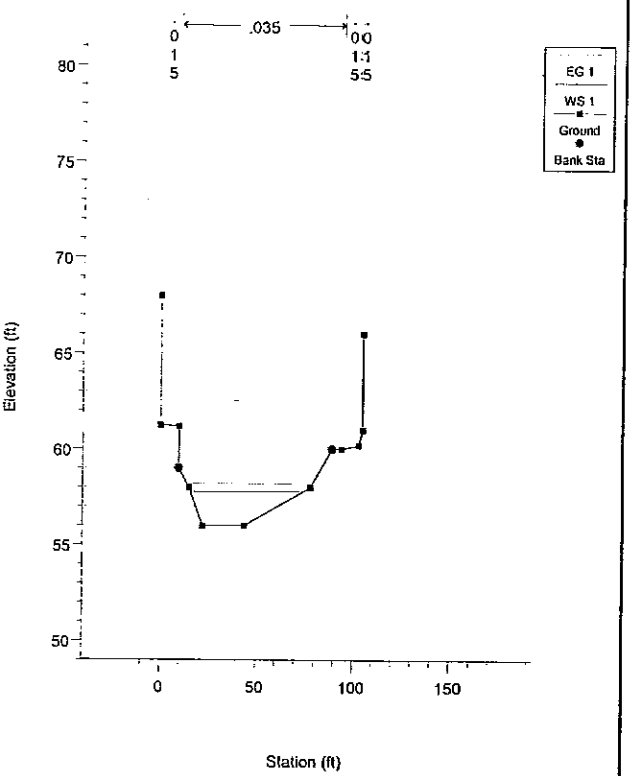


1 in Horiz. = 100 ft
1 in Vert. = 10 ft

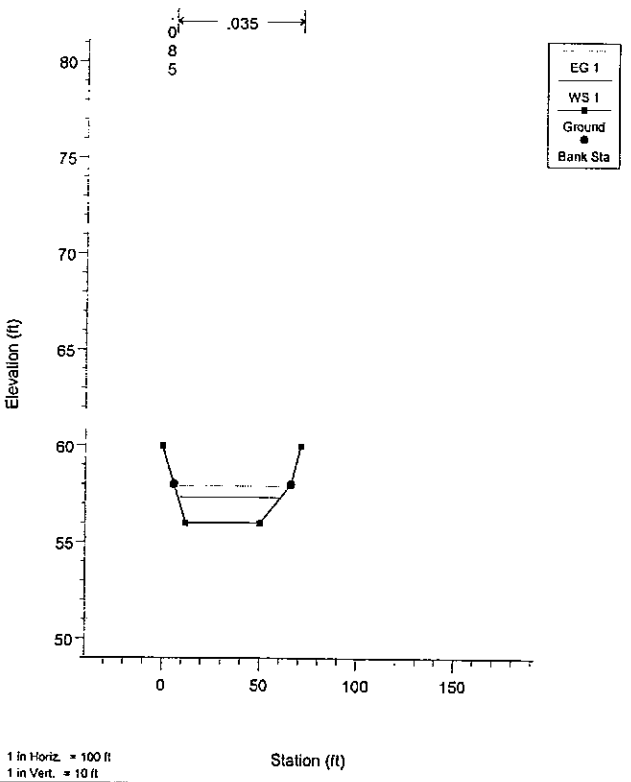
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 2 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 153



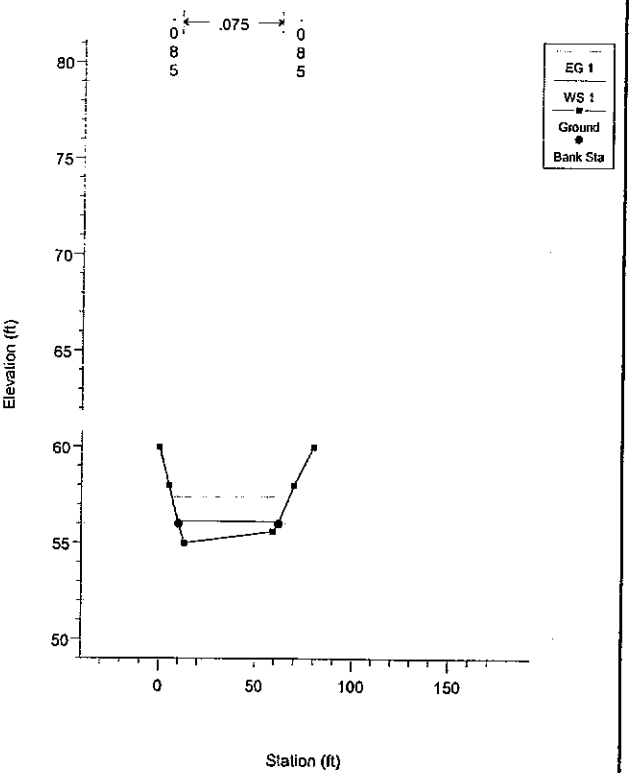
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 2 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 145



CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 2 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 142

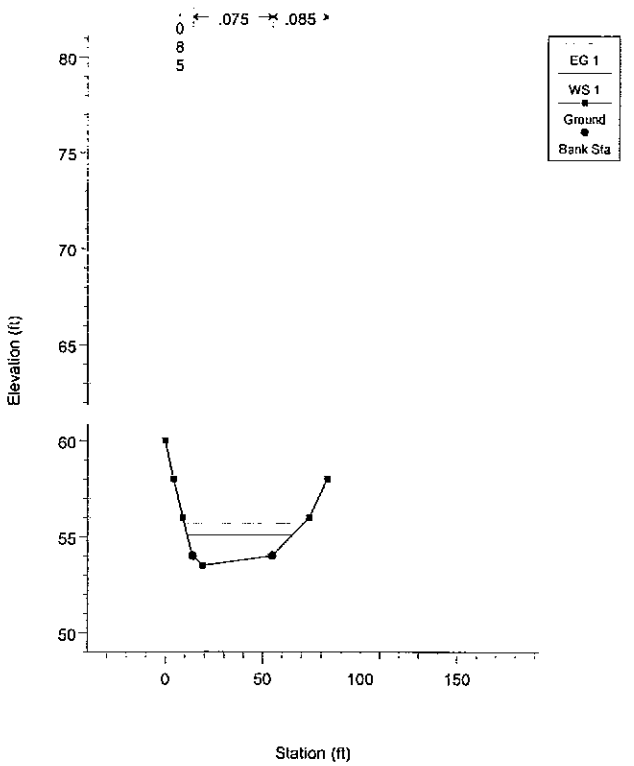


CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 2 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 132

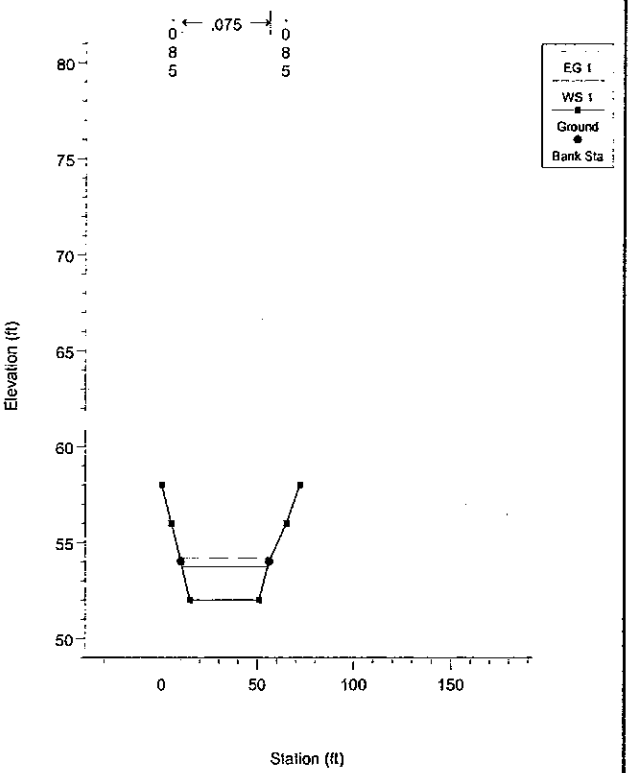


1 in Horiz. = 100 ft
1 in Vert. = 10 ft

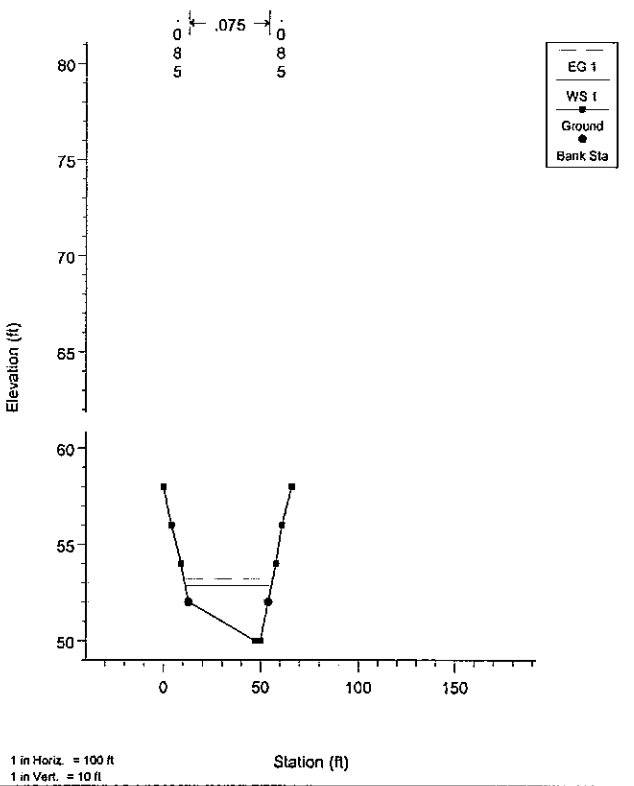
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 2 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 122



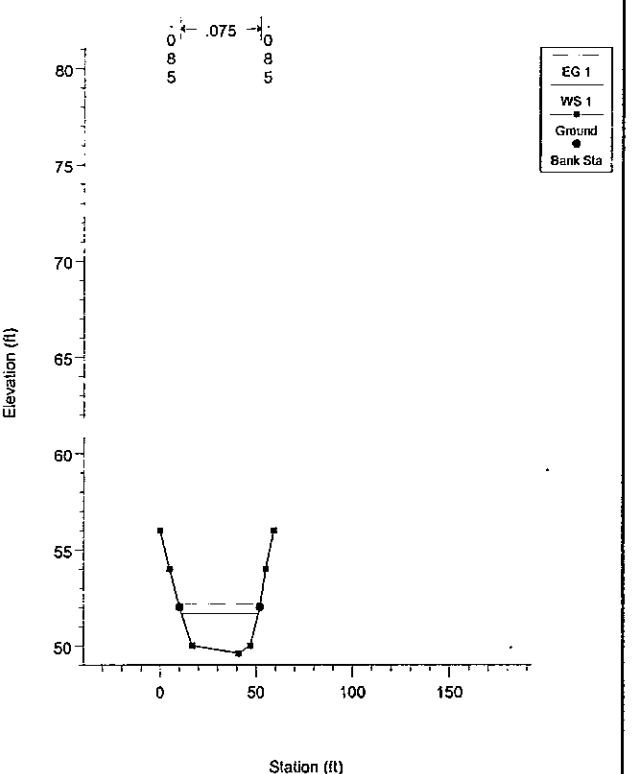
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 2 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 115



CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 2 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 110



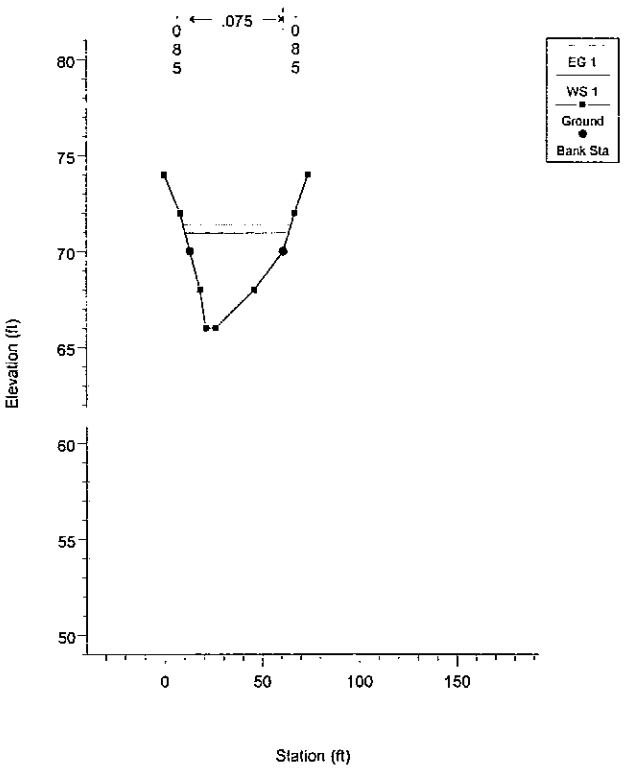
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 2 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 105



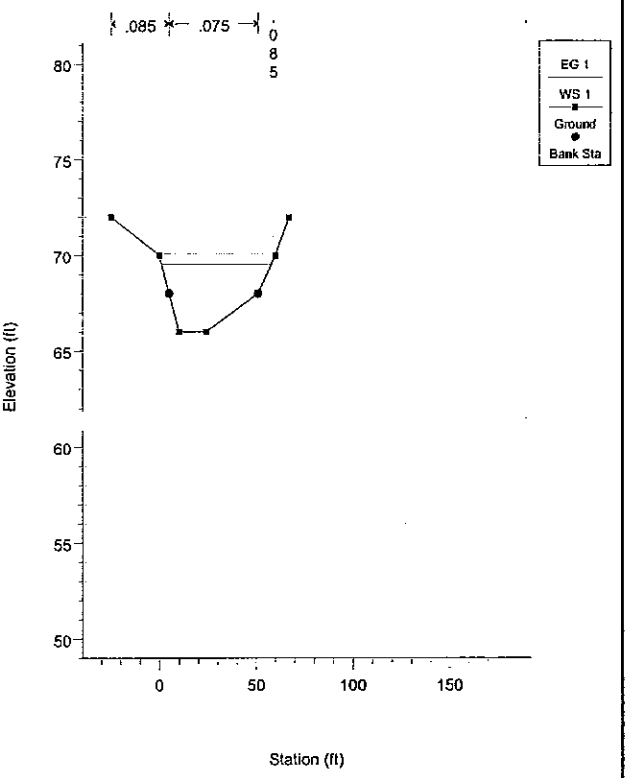
1 in Horiz. = 100 ft
1 in Vert. = 10 ft

5 Year Storm

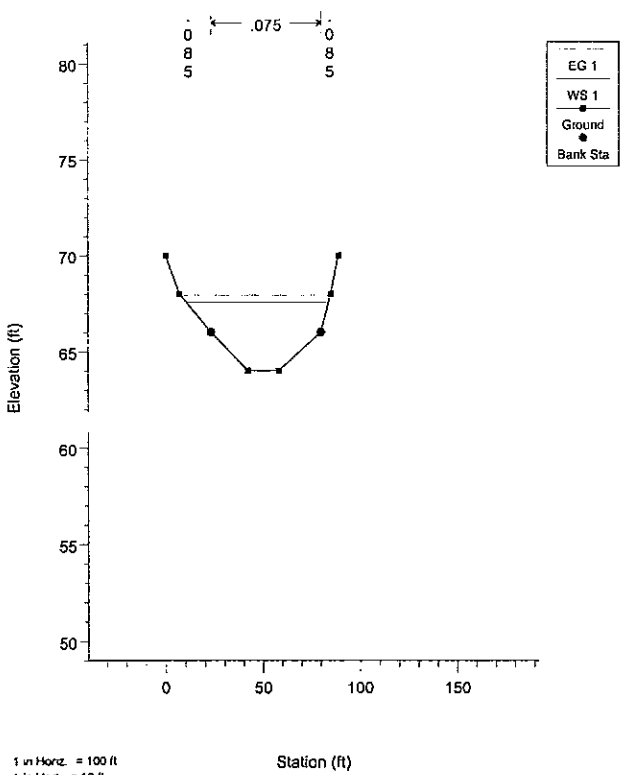
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 5 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 240



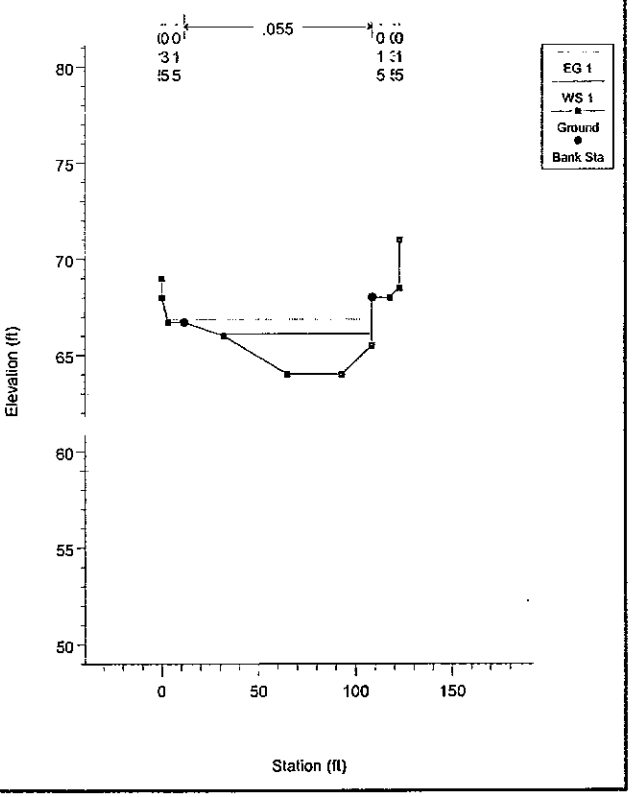
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 5 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 230



CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 5 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 210

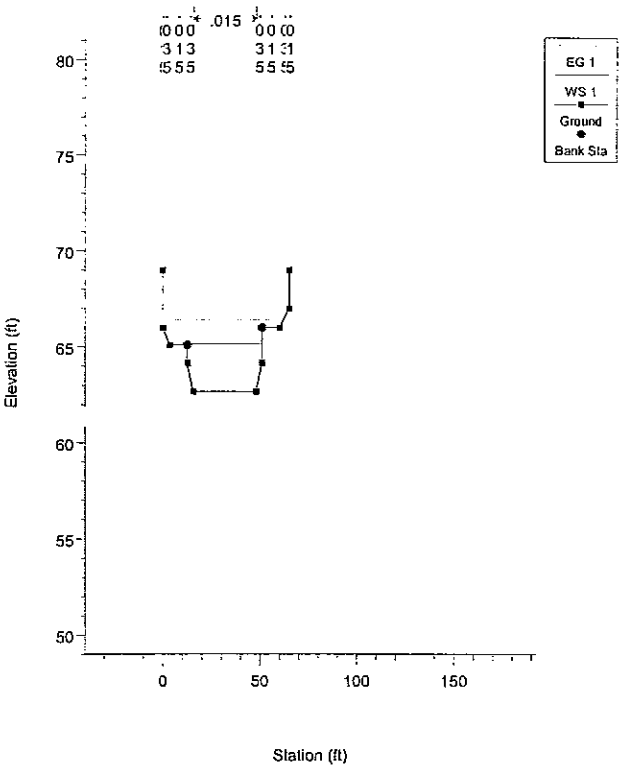


CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 5 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 185

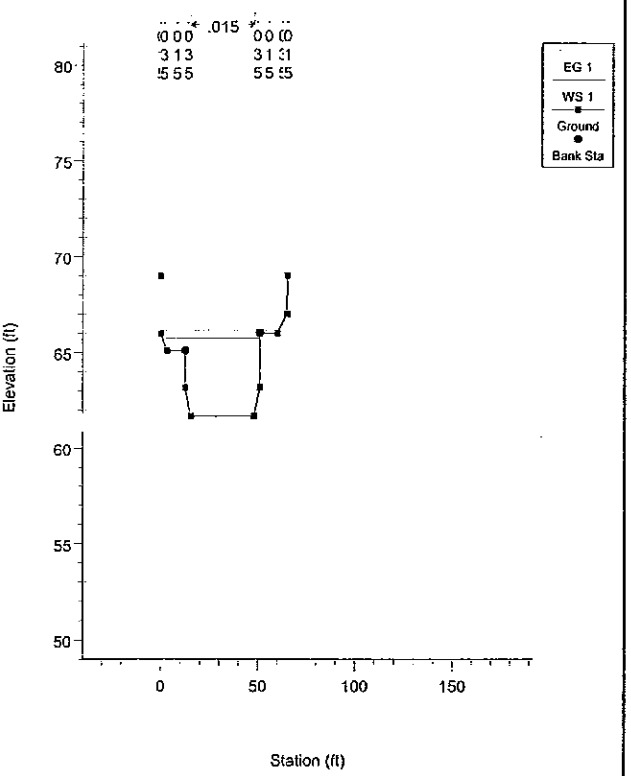


1 in Horiz. = 100 ft
1 in Vert. = 10 ft

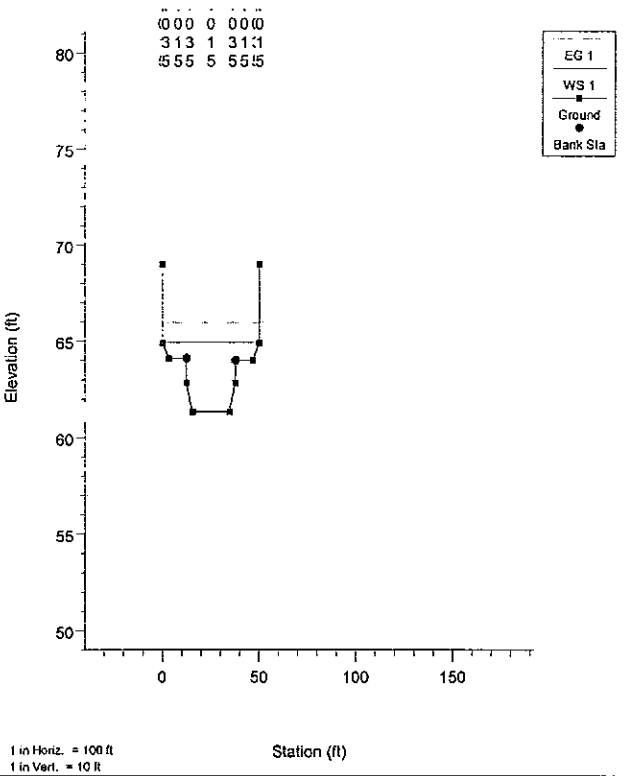
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 5 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 181



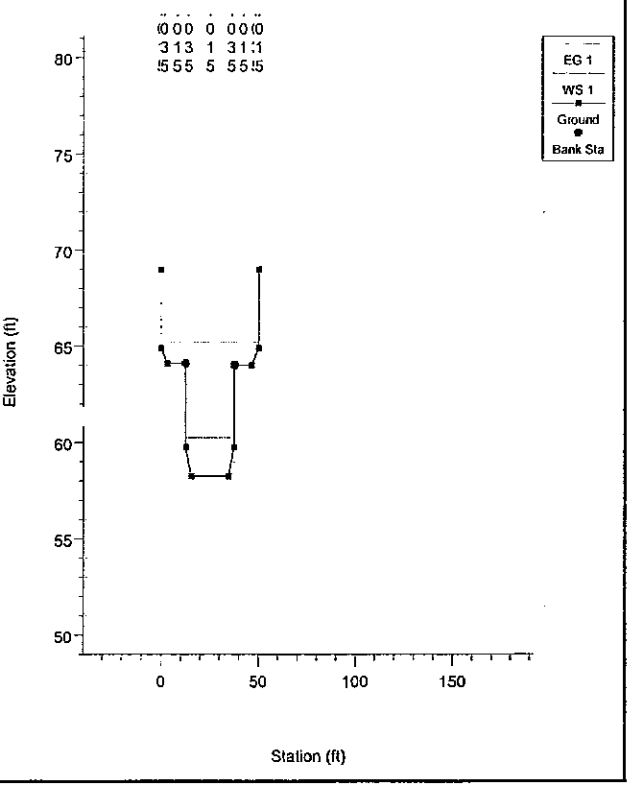
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 5 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 179



CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 5 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 173

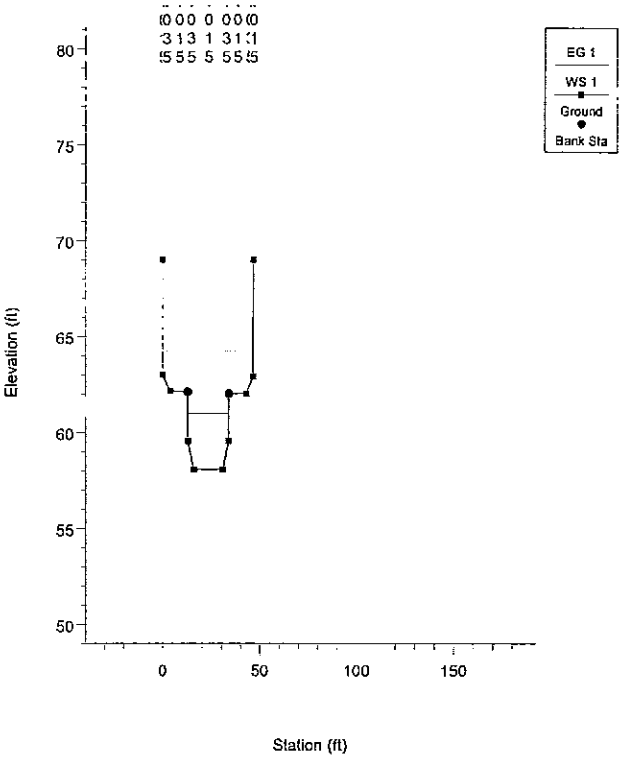


CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 5 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 171

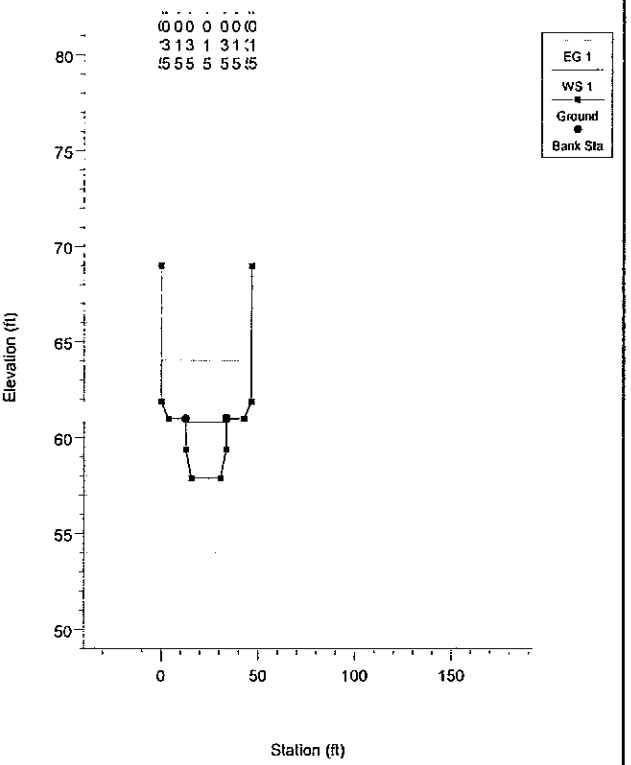


1 in Horiz. = 100 ft
1 in Vert. = 10 ft

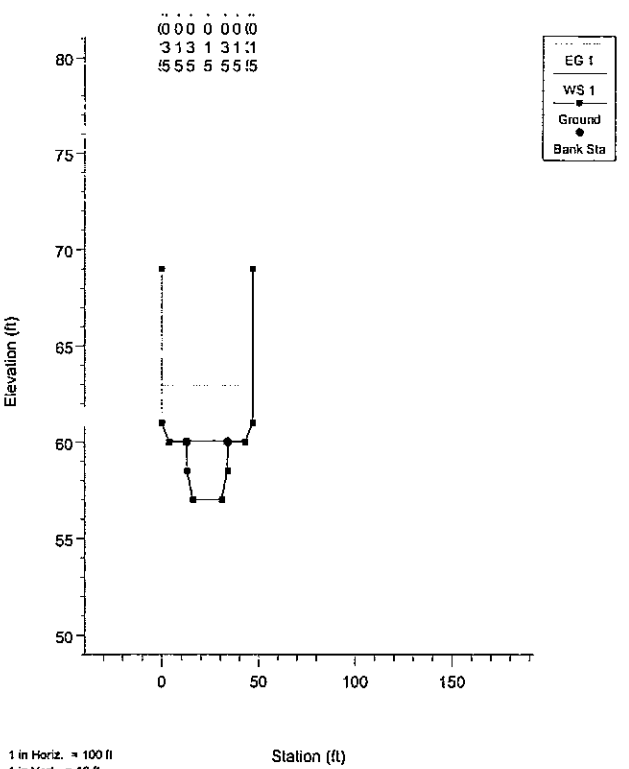
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 5 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 162



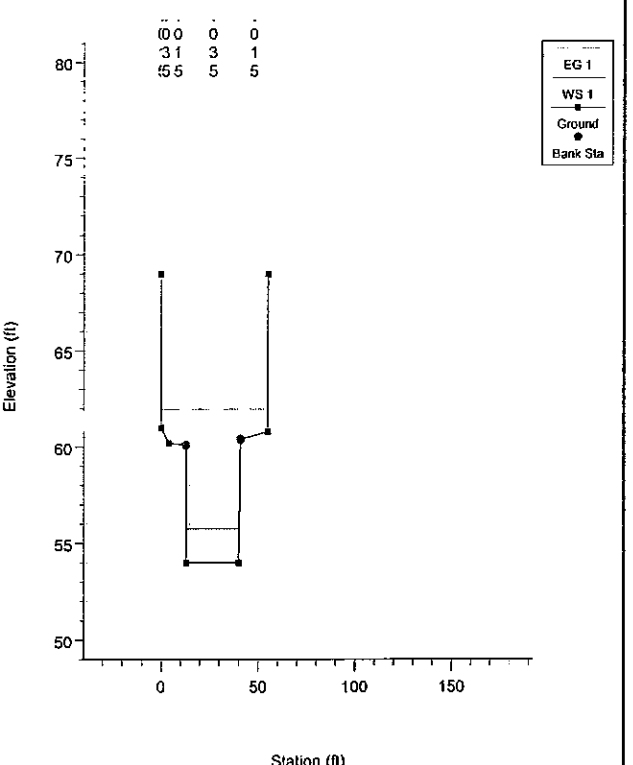
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 5 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 161



CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 5 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 159

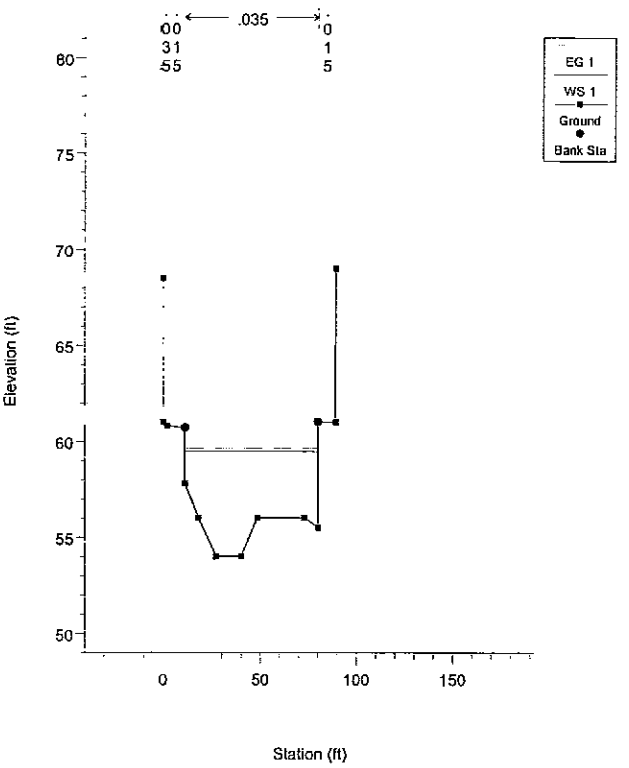


CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 5 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 156

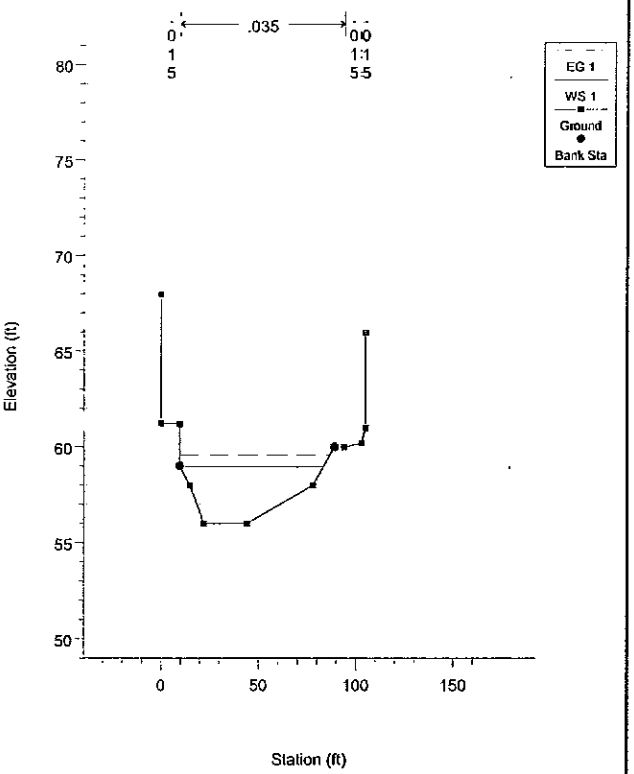


1 in Horiz. = 100 ft
1 in Vert. = 10 ft

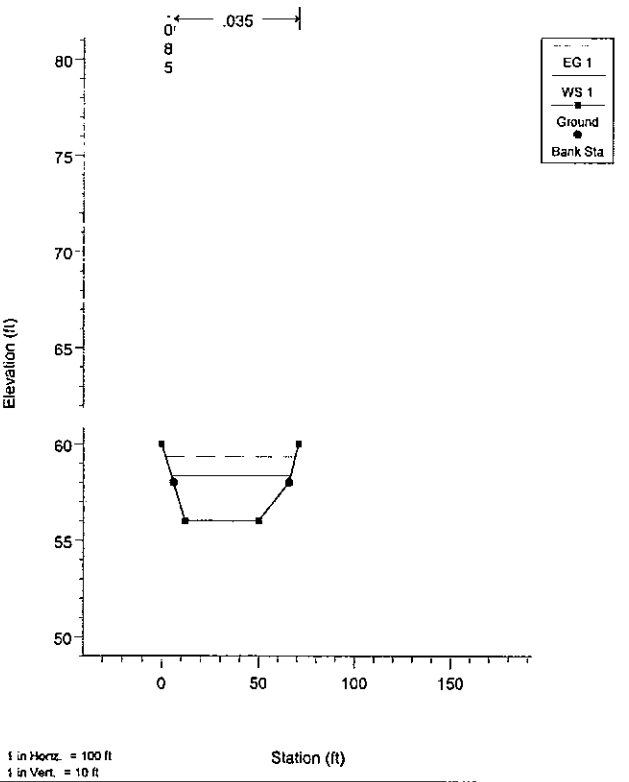
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 5 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 153



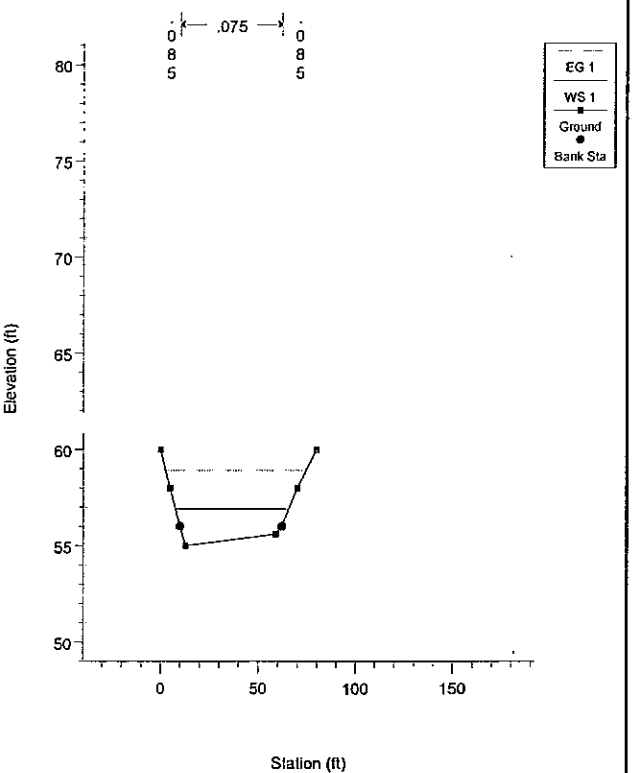
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 5 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 145



CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 5 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 142

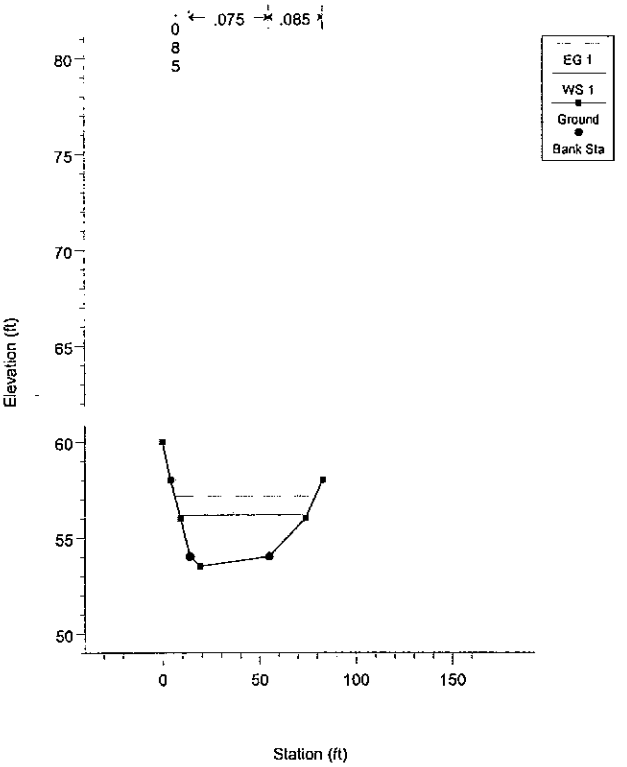


CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 5 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 132

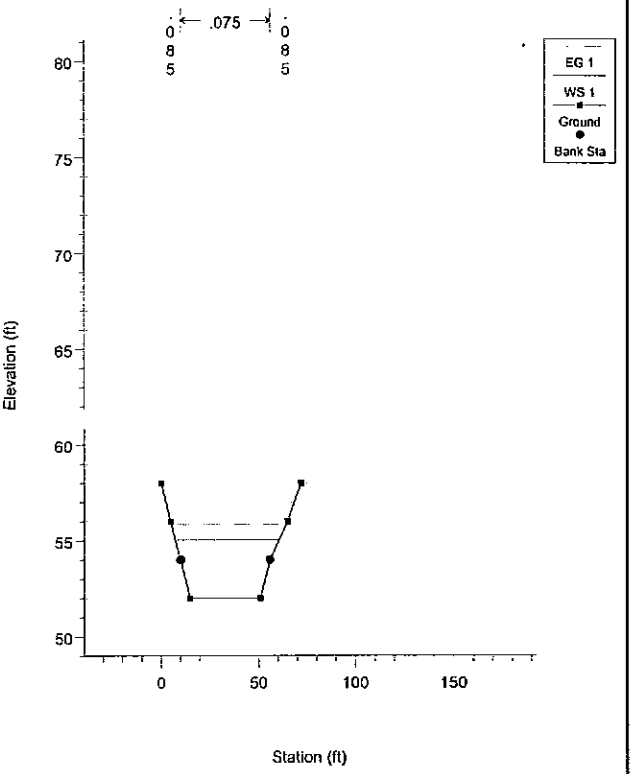


1 in Horiz. = 100 ft
1 in Vert. = 10 ft

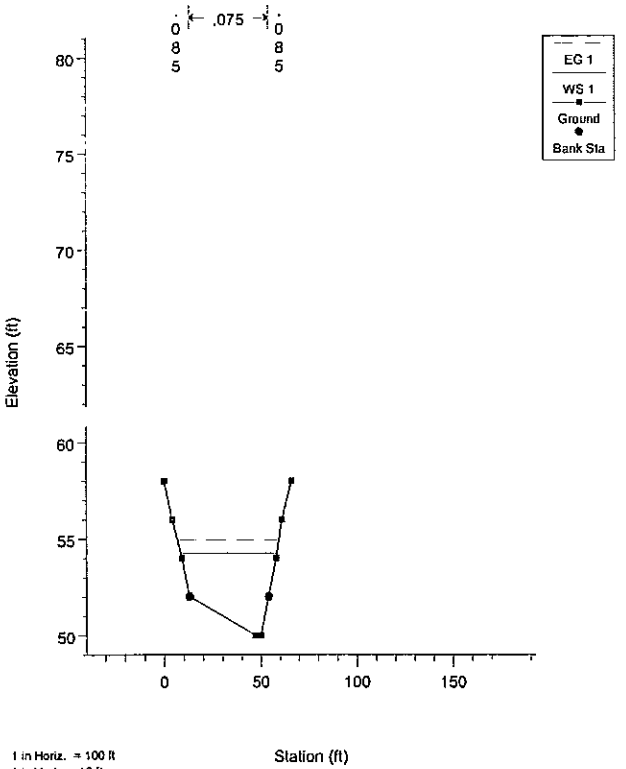
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 5 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 122



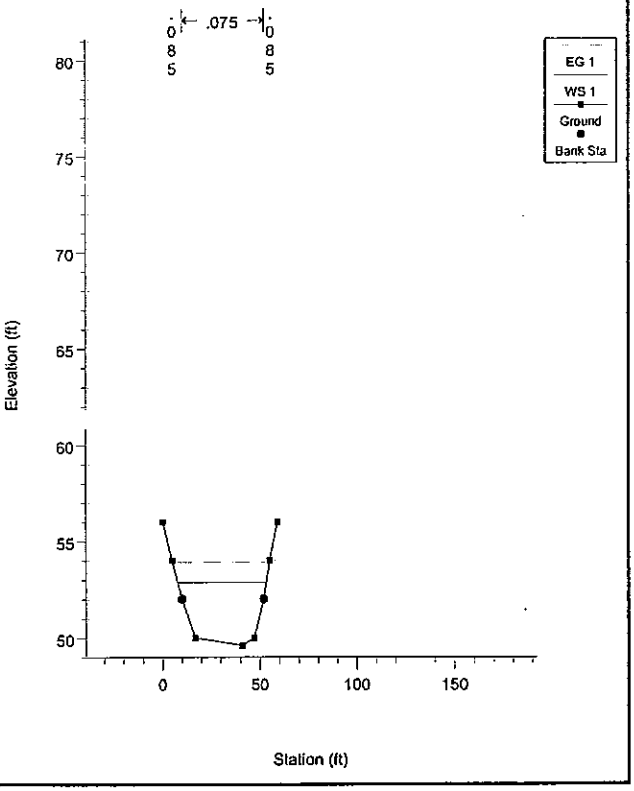
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 5 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 115



CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 5 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 110



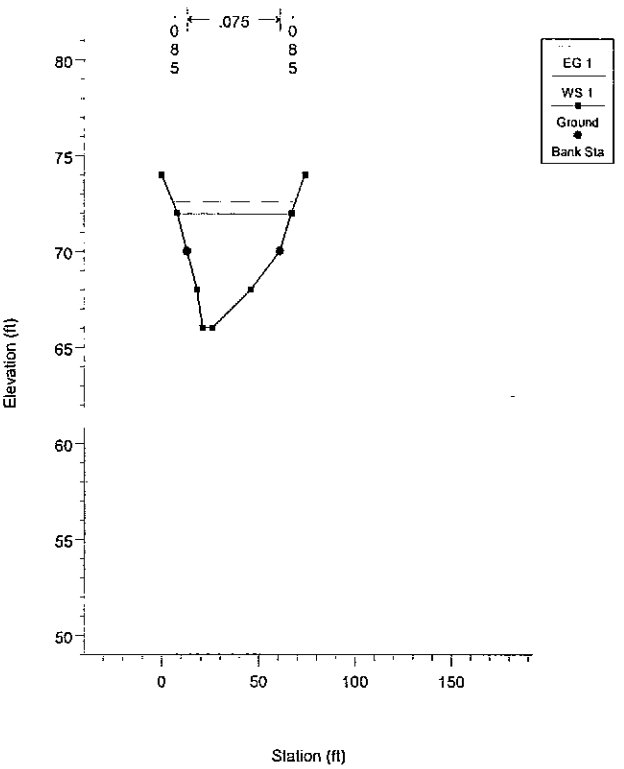
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 5 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 105



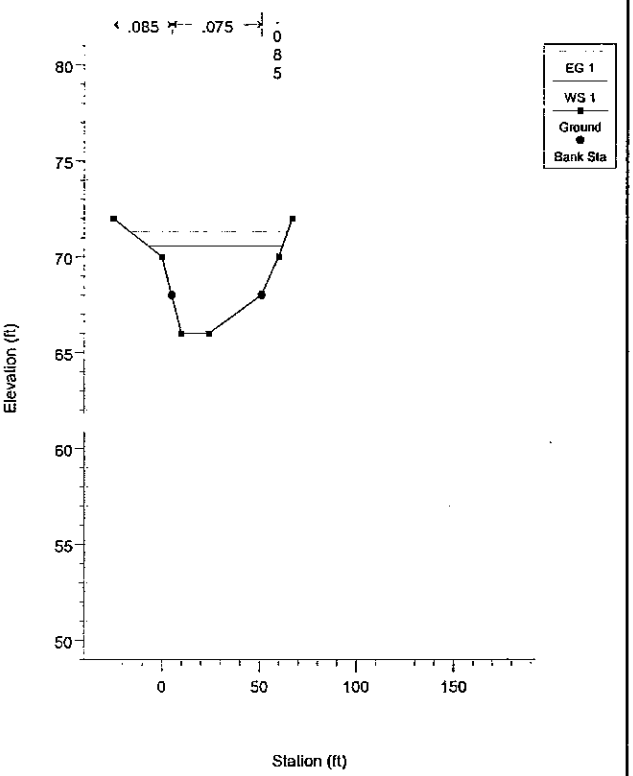
1 in Horiz. = 100 ft
1 in Vert. = 10 ft

100 Year Storm

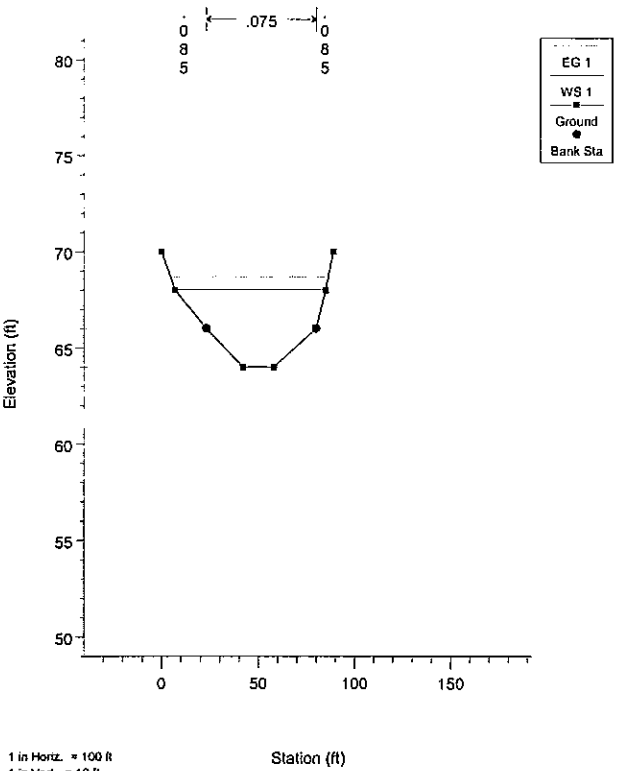
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 100 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 240



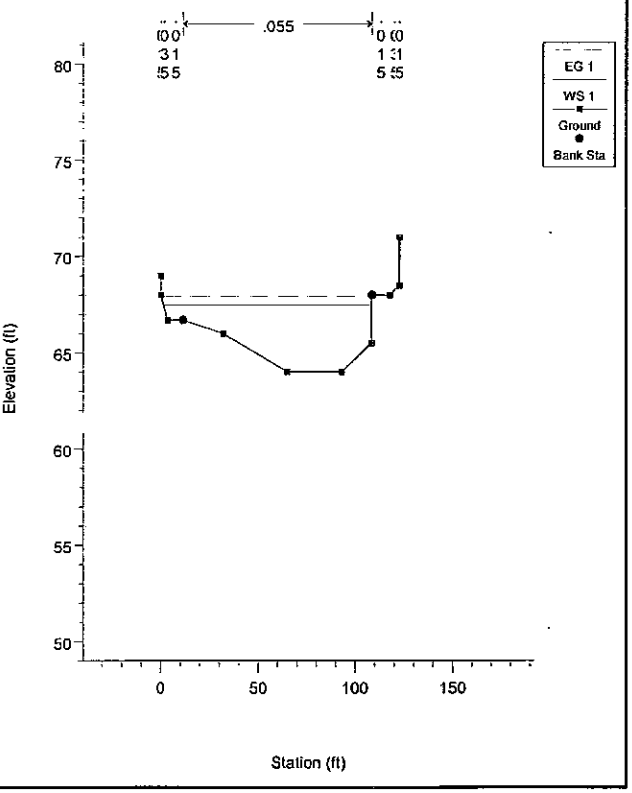
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 100 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 230



CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 100 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 210

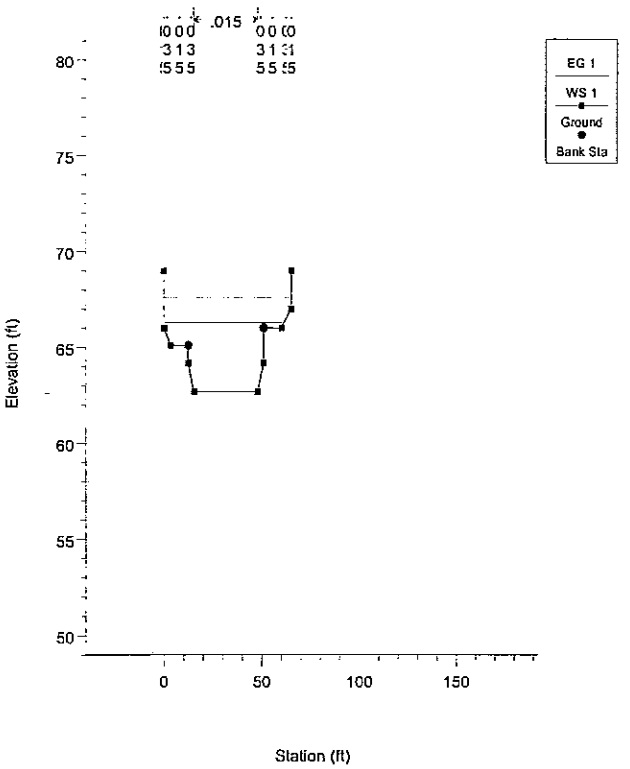


CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 100 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 185

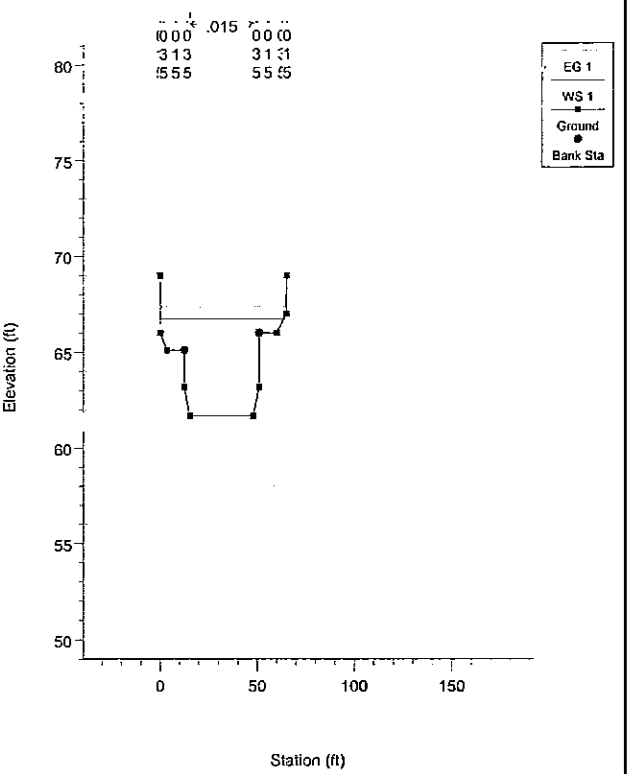


1 in Horiz. = 100 ft
1 in Vert. = 10 ft

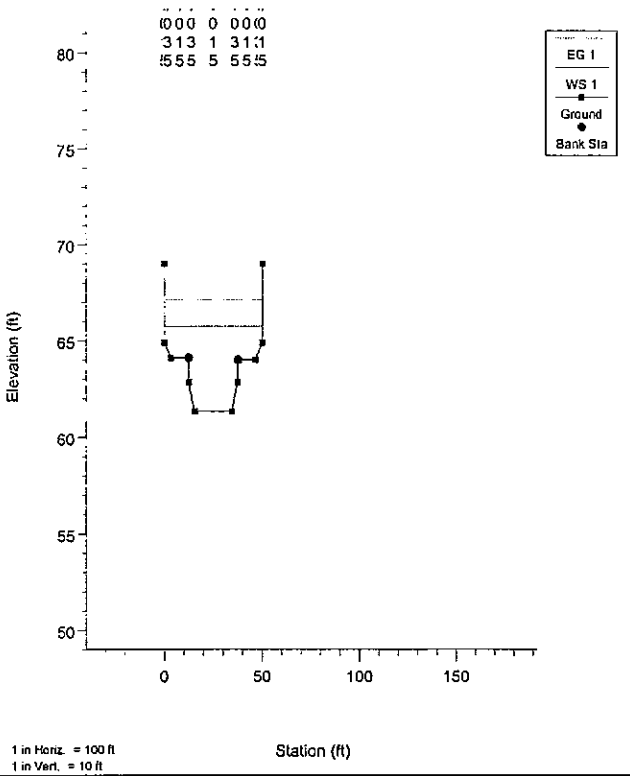
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 100 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 181



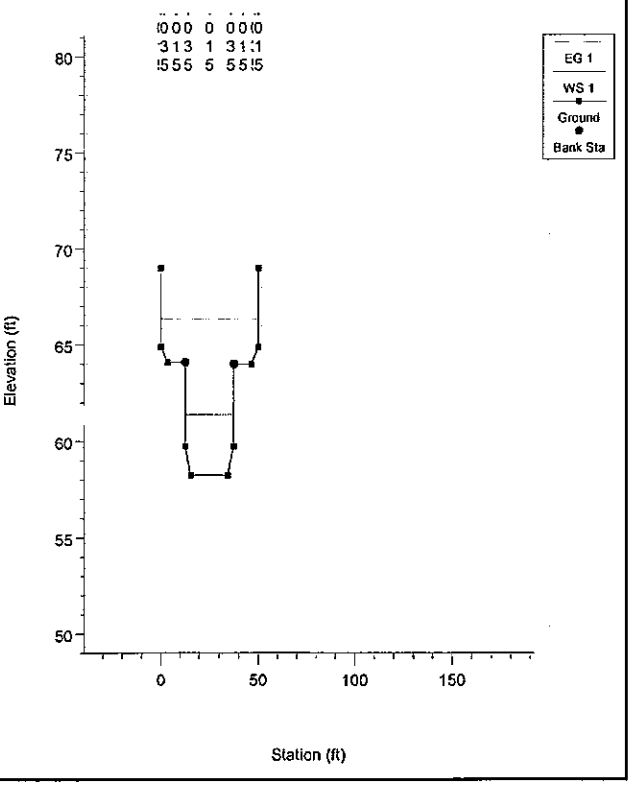
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 100 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 179



CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 100 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 173

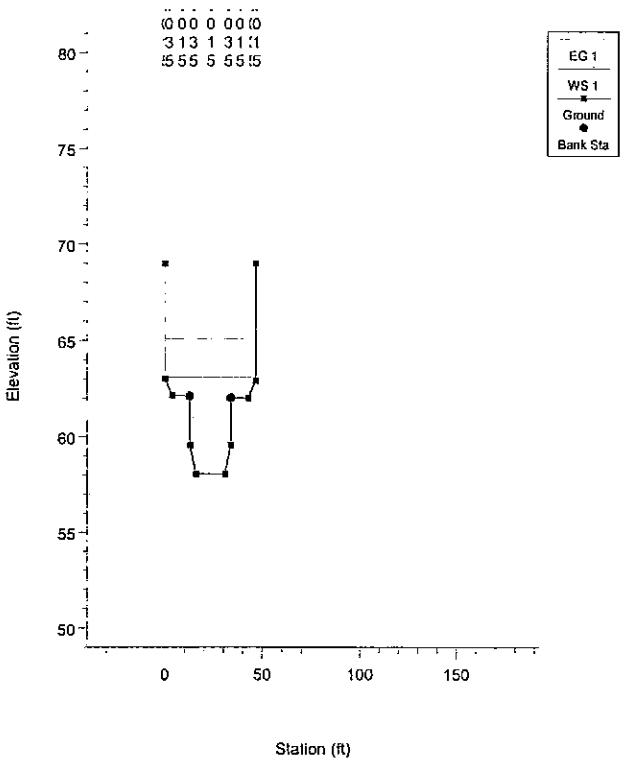


CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 100 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 171

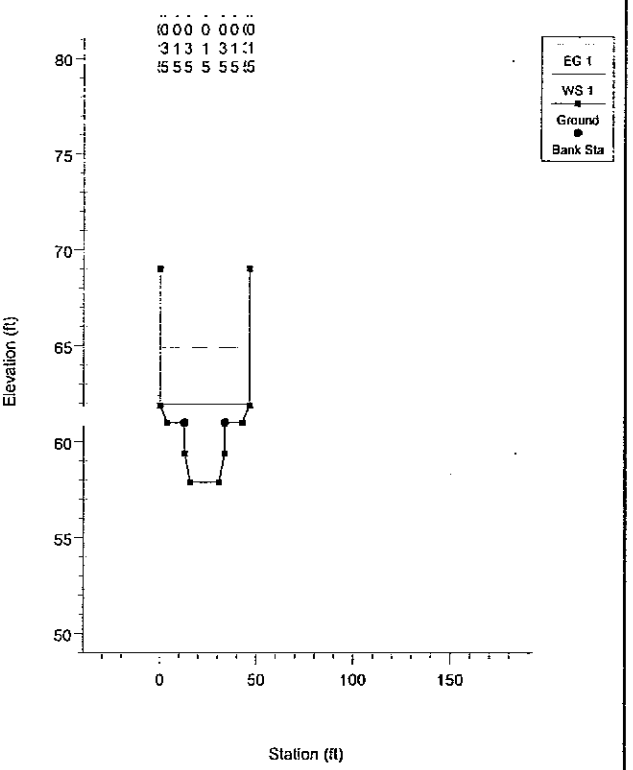


1 in Horiz. = 100 ft
1 in Vert. = 10 ft

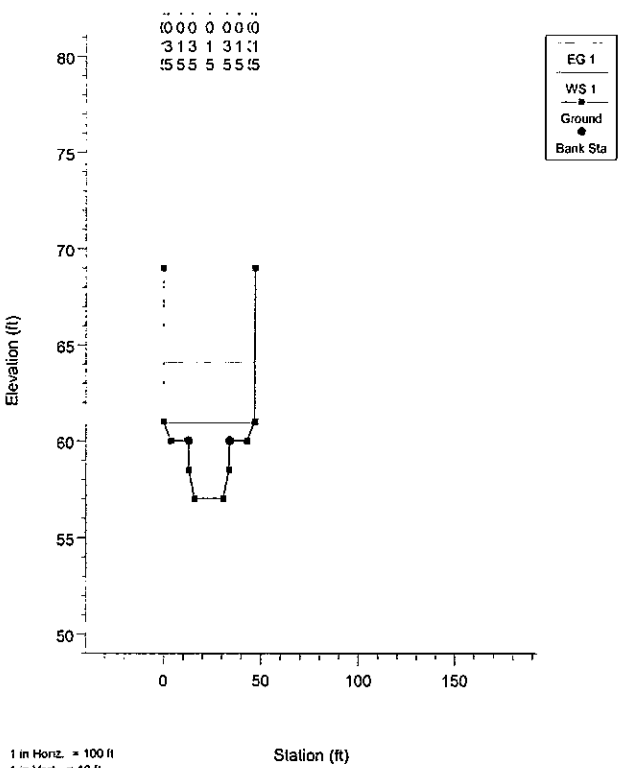
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 100 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 162



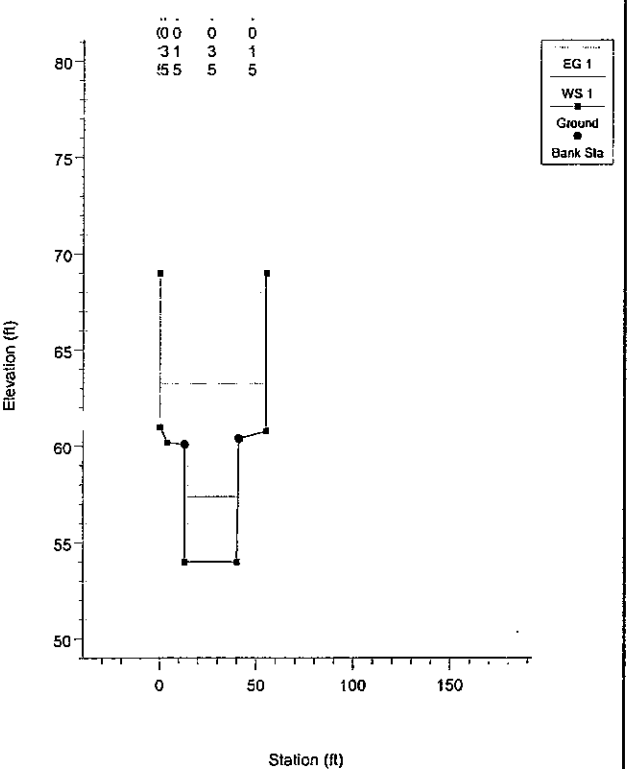
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 100 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 161



CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 100 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 159

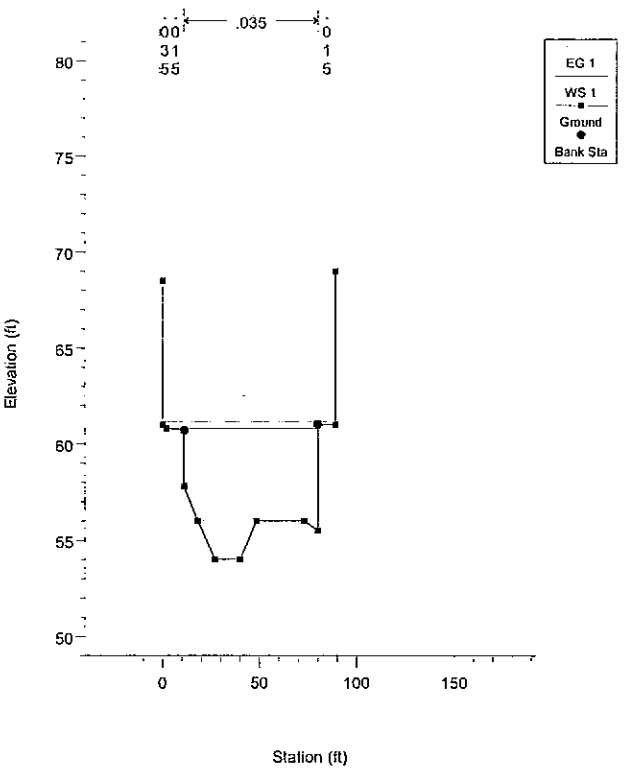


CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 100 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 156

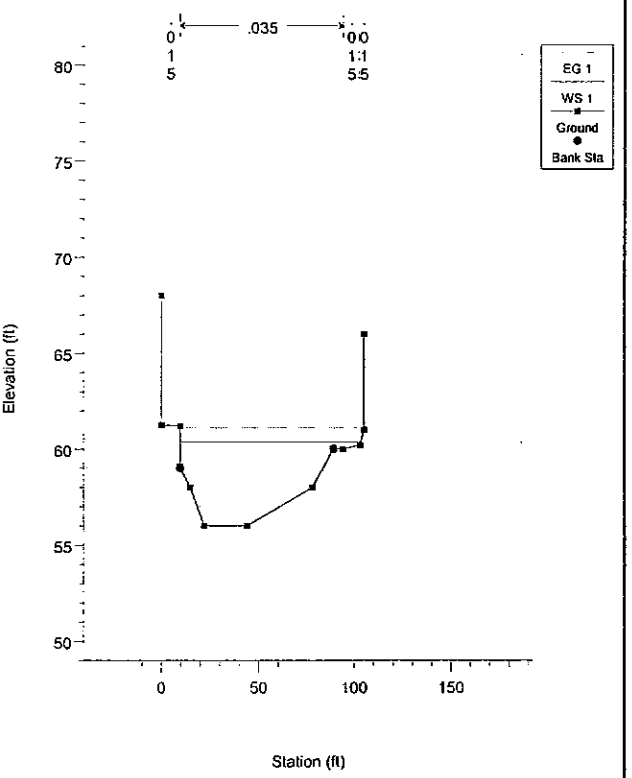


1 in Horiz. = 100 ft
1 in Vert. = 10 ft

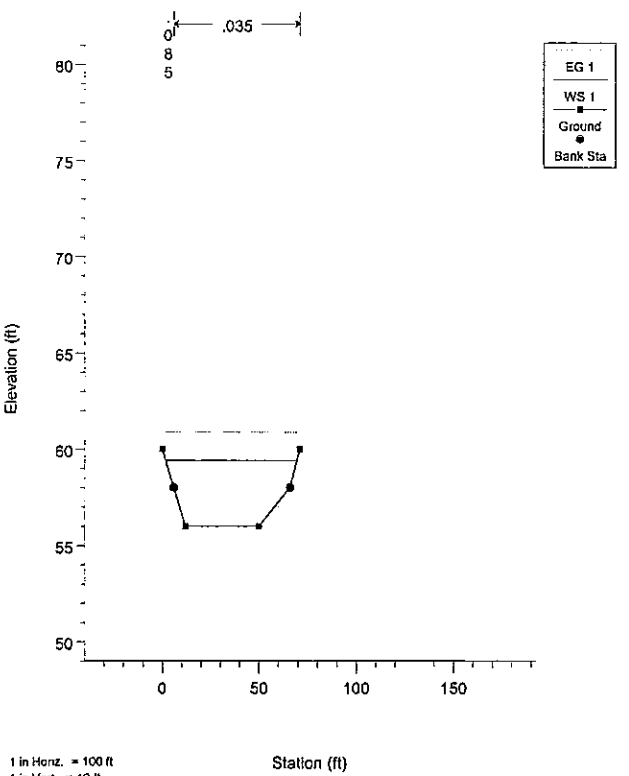
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 100 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 153



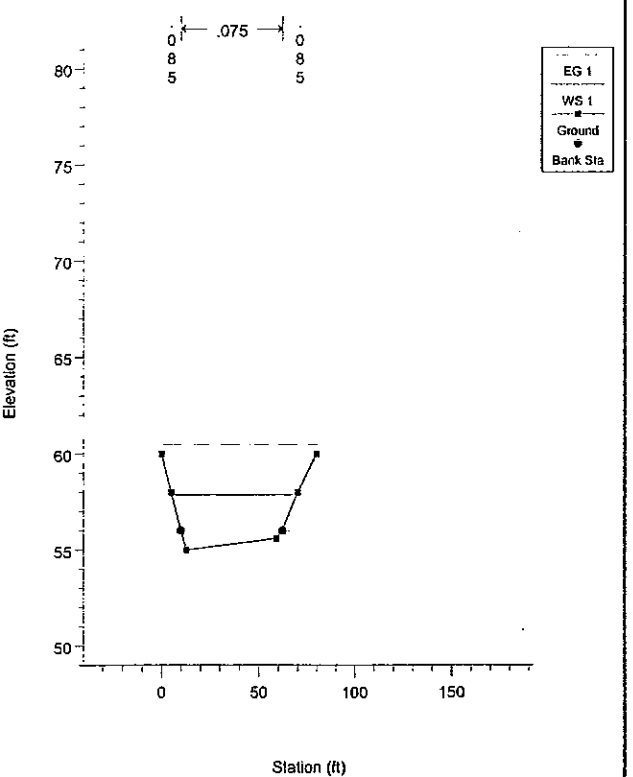
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 100 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 145



CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 100 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 142

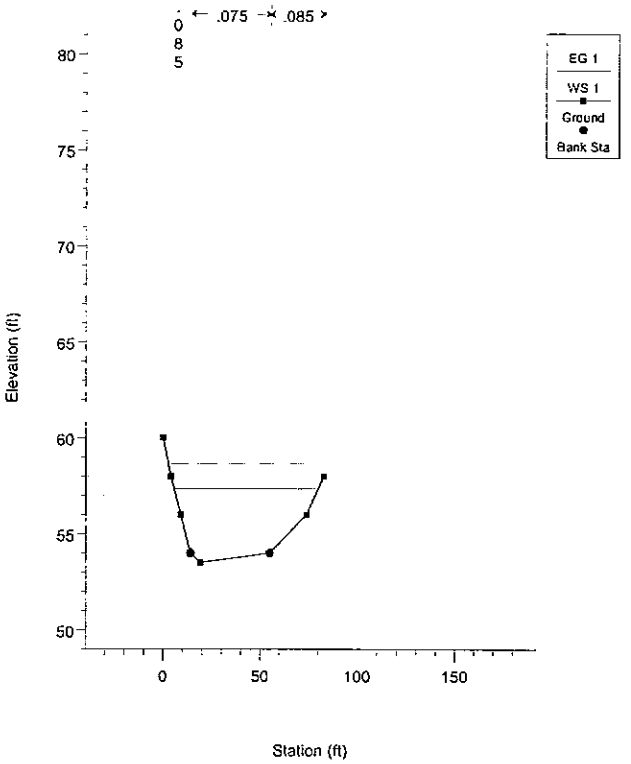


CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 100 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 132

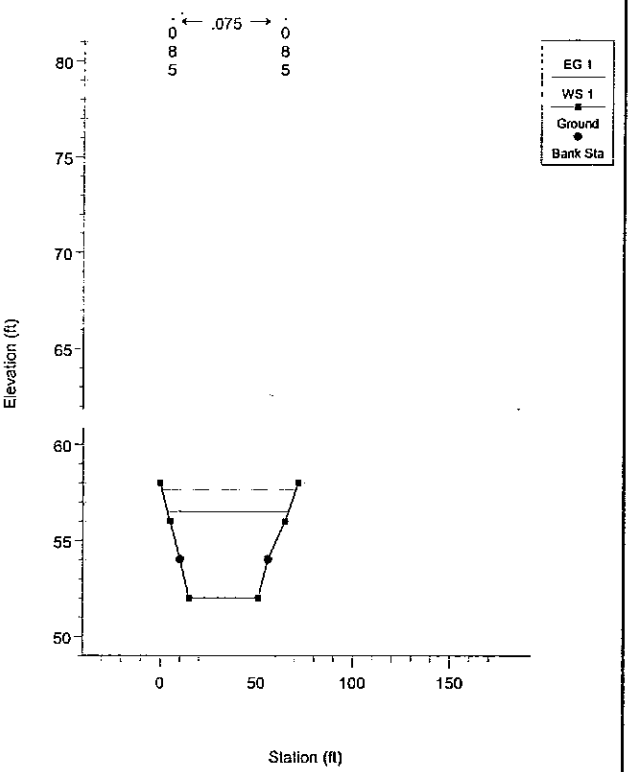


1 in Horiz. = 100 ft
1 in Vert. = 10 ft

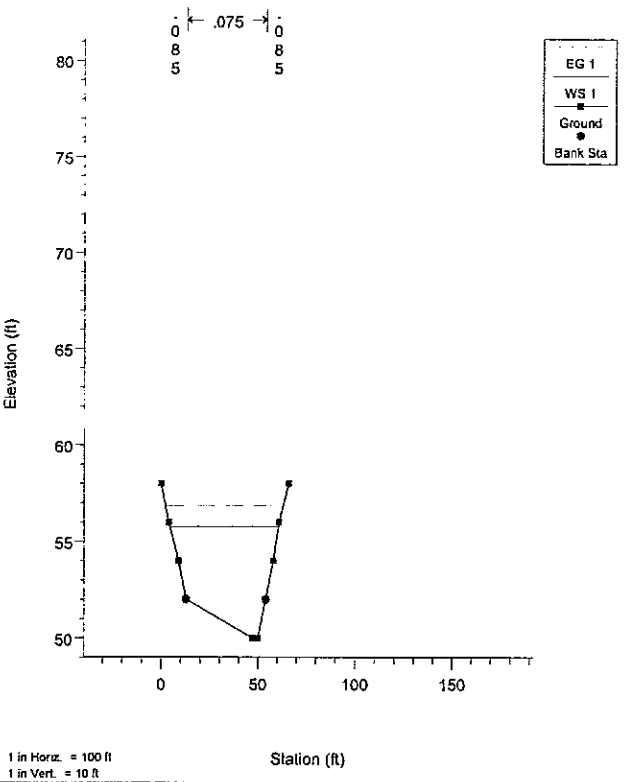
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 100 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 122



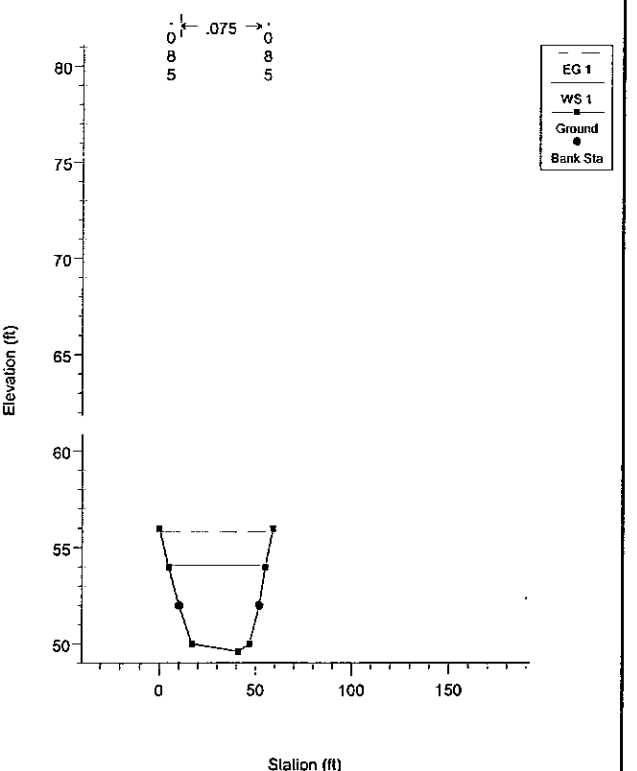
CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 100 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 115



CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 100 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 110



CHAPEL HILLS BRIDGE PROPOSED CONDITION
Geom: BRDG983 Flow: 100 YEAR DEVELOPED
PROPOSED COND. Riv Sta = 105



1 in Horiz. = 100 ft
1 in Vert. = 10 ft

HEC-RAS
INPUT/OUTPUT REPORT

2 Year Storm

HEC-RAS Version 1.2 April 1996
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

```
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
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2 YEAR

****

PROJECT DATA
Project Title: CHAPEL HILLS BRIDGE PROPOSED CONDITION
Project File : chb98.prj
Run Date and Time: 6/2/98 1:40:24 PM

Project in English units

****

PLAN DATA

Plan Title: Plan 32
Plan File : x:\870000.all\871614\hydro\hecras\pcch98\chb98.p32

Geometry Title: Plan 32
Geometry File : x:\870000.all\871614\hydro\hecras\pcch98\chb98.p32

Flow Title : Plan 32
Flow File : x:\870000.all\871614\hydro\hecras\pcch98\chb98.p32

Plan Summary Information:
Number of: Cross Sections = 20 Mulitple Openings = 0
Culverts = 0 Inline Weirs = 0
Bridges = 0

Computational Information
Water surface calculation tolerance = .01
Critical depth calculaton tolerance = .01
Maximum number of interations = 20
Maximum difference tolerance = .3
Flow tolerance factor = .001

Computational Flow Regime: Mixed Flow

Encroachment Data: None

Flow Distribution Locations: None

****

FLOW DATA

Flow Title: 2 YEAR DEVELOPED
Flow File : w:\hec\ras\chb98.f04

Flow Data (cfs)

Reach	Riv Sta	PF#1
PINE CREEK	240	315
PINE CREEK	156	375

Boundary Conditions

Reach	Profile	Upstream	Downstream
PINE CREEK	1	Normal S = .025	Normal S = .047

****

GEOMETRY DATA

Geometry Title: BRDG983
Geometry File : w:\hec\ras\chb98.g08

CROSS SECTION INPUT Reach: PINE CREEK River Station: 240
Description: PROPOSED COND.

Station Elevation Data, num = 10

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	74	8	72	13	70	18	68	21	66
26	66	46	68	61	70	67	72	74	74

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.085	13	.075	61	.085

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
13	61	69	69	68	.1	.3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 230
Description: PROPOSED COND.

Station Elevation Data, num = 8

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
-25	72	0	70	5	68	10	66	24	66
51	68	60	70	67	72				

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
-25	.085	5	.075	51	.085

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
5 51 111 115 120 .1 .3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 210
Description: PROPOSED COND.

Station Elevation Data, num = 8

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	70	7	68	23	66	42	64	58	64
80	66	85	68	89	70				

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.085	23	.075	80	.085

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
23 80 50 46 55 .1 .3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 185
Description: PROPOSED COND.

Station Elevation Data, num = 12

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	68	3.5	66.7	11.5	66.7	32	66
65	64	93	64	108.5	65.5	108.6	68	117.6	68
122.6	68.5	122.7	71						

Manning's n Values, num = 7

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	3.5	.015	11.5	.055	108.5	.015
117.6	.035	122.6	.015						

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
11.5 108.6 17 37 24 .2 .3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 181
Description: PROPOSED COND.

Station Elevation Data, num = 12

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	66	3.5	65.1	12.5	65.1	12.6	64.17
15.6	62.67	48	62.67	51	64.17	51.1	66	60.1	66
65.1	67	65.2	69						

Manning's n Values, num = 9

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	3.5	.015	12.6	.035	15.6	.015
48	.035	51	.015	60.1	.035	65.1	.015		

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
12.5 51.1 1 1 1 .2 .3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 179
Description: PROPOSED COND.

Station Elevation Data, num = 12

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	66	3.5	65.1	12.5	65.1	12.6	63.17
15.6	61.67	48	61.67	51	63.17	51.1	66	60.1	66
65.1	67	65.2	69						

Manning's n Values, num = 9

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	3.5	.015	12.6	.035	15.6	.015
48	.035	51	.015	60.1	.035	65.1	.015		

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
12.5	51.1	10	17	25	.3	.5

CROSS SECTION INPUT Reach: PINE CREEK River Station: 173
Description: PROPOSED COND.

Station Elevation Data, num = 12

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	64.9	3.5	64.1	12.5	64.1	12.6	62.83
15.6	61.33	34.6	61.33	37.6	62.83	37.7	64	46.7	64
50.2	64.9	50.3	69						

Manning's n Values, num = 9

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	3.5	.015	12.6	.035	15.6	.015
34.6	.035	37.6	.015	46.7	.035	50.2	.015		

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
12.5	37.7	1	1	1	.2	.4

CROSS SECTION INPUT Reach: PINE CREEK River Station: 171
Description: PROPOSED COND.

Station Elevation Data, num = 12

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	64.9	3.5	64.1	12.5	64.1	12.6	59.75
15.6	58.25	34.6	58.25	37.6	59.75	37.7	64	46.7	64
50.2	64.9	50.3	69						

Manning's n Values, num = 9

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	3.5	.015	12.6	.035	15.6	.015
34.6	.035	37.6	.015	46.7	.035	50.2	.015		

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
12.5	37.7	16	16	16	.2	.4

CROSS SECTION INPUT Reach: PINE CREEK River Station: 162
Description: PROPOSED COND.

Station Elevation Data, num = 12

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	63	3.8	62.15	12.8	62.1	12.9	59.55
15.9	58.05	30.7	58.05	33.7	59.55	33.8	62	42.8	62
46.6	62.9	46.7	69						

Manning's n Values, num = 9

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	3.8	.015	12.9	.035	15.9	.015
30.7	.035	33.7	.015	42.8	.035	46.6	.015		

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
12.8	33.8	12	12	.1	.1

CROSS SECTION INPUT Reach: PINE CREEK River Station: 161
Description: PROPOSED COND.

Station Elevation Data, num = 12

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	61.9	3.8	61	12.8	61	12.9	59.4
15.9	57.9	30.7	57.9	33.7	59.4	33.8	61	42.8	61
46.6	61.9	46.7	69						

Manning's n Values, num = 9

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	3.8	.015	12.9	.035	15.9	.015
30.7	.035	33.7	.015	42.8	.035	46.6	.015		

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
12.8	33.8	88	83	80	.1	.1

CROSS SECTION INPUT Reach: PINE CREEK River Station: 159
Description: PROPOSED COND.

Station Elevation Data, num = 12

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	61	3.9	60	12.9	60	13	58.5
16	57	30.8	57	33.8	58.5	33.9	60	42.9	60
46.9	61	47	69						

Manning's n Values, num = 9

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	3.9	.015	13	.035	16	.015
30.8	.035	33.8	.015	42.9	.035	46.9	.015		

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
12.9	33.9	7	12	16	.2	.3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 156
Description: PROPOSED COND.

Station Elevation Data, num = 9

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	61	4	60.2	13	60.1	13.1	54
40	54	41	60.4	55	60.8	55.1	69		

Manning's n Values, num = 5

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	4	.015	13	.035	40	.015

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

```
        13     41           31     34     37          .1      .3

CROSS SECTION INPUT    Reach: PINE CREEK     River Station: 153
Description: PROPOSED COND.

Station Elevation Data,  num = 14
   Sta.  Elev.   Sta.  Elev.   Sta.  Elev.   Sta.  Elev.   Sta.  Elev.
     0   68.5     .1    61      2   60.8     11   60.7    11.1   57.8
    18     56     27     54     40     54   48.5     56     73     56
    80   55.5   80.1     61   89.1     61   89.2     69

Manning's n Values,  num = 5
   Sta.  Value   Sta.  Value   Sta.  Value   Sta.  Value   Sta.  Value
     0   .015     .1   .035      2   .015   11.1   .035     80   .015

Bank Sta: Left   Right   Lengths: Left Channel   Right   Coeff Contr.   Expan.
        11   80.1           10     10      9          .1      .3

CROSS SECTION INPUT    Reach: PINE CREEK     River Station: 145
Description: PROPOSED COND.

Station Elevation Data,  num = 13
   Sta.  Elev.   Sta.  Elev.   Sta.  Elev.   Sta.  Elev.   Sta.  Elev.
     0     68     .1  61.25    9.5   61.2    9.6     59     15     58
    22     56     44     56     78     58     89     60     94     60
   103   60.2    105     61  105.1     66

Manning's n Values,  num = 5
   Sta.  Value   Sta.  Value   Sta.  Value   Sta.  Value   Sta.  Value
     0   .015    9.6   .035     94   .015    103   .035    105   .015

Bank Sta: Left   Right   Lengths: Left Channel   Right   Coeff Contr.   Expan.
         9.6     89           16     19     17          .1      .3

CROSS SECTION INPUT    Reach: PINE CREEK     River Station: 142
Description: PROPOSED COND.

Station Elevation Data,  num = 6
   Sta.  Elev.   Sta.  Elev.   Sta.  Elev.   Sta.  Elev.   Sta.  Elev.
     0     60      6     58     12     56     50     56     66     58
    71     60

Manning's n Values,  num = 2
   Sta.  Value   Sta.  Value
     0   .085      6   .035

Bank Sta: Left   Right   Lengths: Left Channel   Right   Coeff Contr.   Expan.
         6     66           15     10     10          .1      .3

CROSS SECTION INPUT    Reach: PINE CREEK     River Station: 132
Description: PROPOSED COND.

Station Elevation Data,  num = 8
   Sta.  Elev.   Sta.  Elev.   Sta.  Elev.   Sta.  Elev.   Sta.  Elev.
     0     60      5     58     10     56     13     55     59   55.6
    62     56     70     58     80     60
```

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.085	10	.075	62	.085

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
10	62	20	30	45	.1	.3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 122
Description: PROPOSED COND.

Station Elevation Data, num = 8

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	60	4	58	9	56	14	54	19	53.5
55	54	74	56	83	58				

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.085	14	.075	55	.085

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
14	55	35	27	26	.1	.3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 115
Description: PROPOSED COND.

Station Elevation Data, num = 8

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	58	5	56	10	54	15	52	51	52
56	54	65	56	72	58				

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.085	10	.075	56	.085

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
10	56	28	31	35	.1	.3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 110
Description: PROPOSED COND.

Station Elevation Data, num = 10

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	58	4	56	9	54	13	52	47	50
50	50	54	52	58	54	61	56	66	58

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.085	13	.075	54	.085

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
13	54	30	30	30	.1	.3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 105
Description: PROPOSED COND.

Station Elevation Data, num = 9

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	56	5	54	10	52	17	50	41	49.6
47	50	52	52	55	54	59	56		

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.085	10	.075	52	.085

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
10	52	0 0	0	.1	.3

****

SUMMARY OF MANNING'S N VALUES

Reach	River Sta.	n1	n2	n3	n4	n5	n6	n7	n8	n9	
PINE CREEK	240	.085	.075	.085							
PINE CREEK	230	.085	.075	.085							
PINE CREEK	210	.085	.075	.085							
PINE CREEK	185	.015	.035	.015	.055	.015	.035	.015			
PINE CREEK	181	.015	.035	.015	.035	.015	.035	.015	.035	.015	
PINE CREEK	179	.015	.035	.015	.035	.015	.035	.015	.035	.015	
PINE CREEK	173	.015	.035	.015	.035	.015	.035	.015	.035	.015	
PINE CREEK	171	.015	.035	.015	.035	.015	.035	.015	.035	.015	
PINE CREEK	162	.015	.035	.015	.035	.015	.035	.015	.035	.015	
PINE CREEK	161	.015	.035	.015	.035	.015	.035	.015	.035	.015	
PINE CREEK	159	.015	.035	.015	.035	.015	.035	.015	.035	.015	
PINE CREEK	156	.015	.035	.015	.035	.015					
PINE CREEK	153	.015	.035	.015	.035	.015					
PINE CREEK	145	.015	.035	.015	.035	.015					
PINE CREEK	142	.085	.035								
PINE CREEK	132	.085	.075	.085							
PINE CREEK	122	.085	.075	.085							
PINE CREEK	115	.085	.075	.085							
PINE CREEK	110	.085	.075	.085							
PINE CREEK	105	.085	.075	.085							

****

SUMMARY OF REACH LENGTHS

Reach	River Sta.	Left	Channel	Right
PINE CREEK	240	69	69	68
PINE CREEK	230	111	115	120
PINE CREEK	210	50	46	55
PINE CREEK	185	17	37	24
PINE CREEK	181	1	1	1
PINE CREEK	179	10	17	25
PINE CREEK	173	1	1	1
PINE CREEK	171	16	16	16
PINE CREEK	162	12	12	12

*PINE CREEK	*	161	*	88*	83*	80*
*PINE CREEK	*	159	*	7*	12*	16*
*PINE CREEK	*	156	*	31*	34*	37*
*PINE CREEK	*	153	*	10*	10*	9*
*PINE CREEK	*	145	*	16*	19*	17*
*PINE CREEK	*	142	*	15*	10*	10*
*PINE CREEK	*	132	*	20*	30*	45*
*PINE CREEK	*	122	*	35*	27*	26*
*PINE CREEK	*	115	*	28*	31*	35*
*PINE CREEK	*	110	*	30*	30*	30*
*PINE CREEK	*	105	*	0*	0*	0*

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

* Reach	* River Sta.	* Contr.*	Expan. *
*PINE CREEK	* 240	* .1*	.3*
*PINE CREEK	* 230	* .1*	.3*
*PINE CREEK	* 210	* .1*	.3*
*PINE CREEK	* 185	* .2*	.3*
*PINE CREEK	* 181	* .2*	.3*
*PINE CREEK	* 179	* .3*	.5*
*PINE CREEK	* 173	* .2*	.4*
*PINE CREEK	* 171	* .2*	.4*
*PINE CREEK	* 162	* .1*	.1*
*PINE CREEK	* 161	* .1*	.1*
*PINE CREEK	* 159	* .2*	.3*
*PINE CREEK	* 156	* .1*	.3*
*PINE CREEK	* 153	* .1*	.3*
*PINE CREEK	* 145	* .1*	.3*
*PINE CREEK	* 142	* .1*	.3*
*PINE CREEK	* 132	* .1*	.3*
*PINE CREEK	* 122	* .1*	.3*
*PINE CREEK	* 115	* .1*	.3*
*PINE CREEK	* 110	* .1*	.3*
*PINE CREEK	* 105	* .1*	.3*

5 Year Storm

HEC-RAS Version 1.2 April 1996
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

```
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
```

5 YEAR

****

PROJECT DATA
Project Title: CHAPEL HILLS BRIDGE PROPOSED CONDITION
Project File : chb98.prj
Run Date and Time: 6/2/98 1:24:18 PM

Project in English units

****

PLAN DATA

Plan Title: Plan 31
Plan File : x:\870000.all\871614\hydro\hecras\pcch98\chb98.p31

Geometry Title: Plan 31
Geometry File : x:\870000.all\871614\hydro\hecras\pcch98\chb98.p31

Flow Title : Plan 31
Flow File : x:\870000.all\871614\hydro\hecras\pcch98\chb98.p31

Plan Summary Information:
Number of: Cross Sections = 20 Mulitple Openings = 0
Culverts = 0 Inline Weirs = 0
Bridges = 0

Computational Information
Water surface calculation tolerance = .01
Critical depth calculaton tolerance = .01
Maximum number of interations = 20
Maximum difference tolerance = .3
Flow tolerance factor = .001

Computational Flow Regime: Mixed Flow

Encroachment Data: None

Flow Distribution Locations: None

****

FLOW DATA

Flow Title: 5 YEAR DEVELOPED
Flow File : w:\hec\ras\chb98.f03

Flow Data (cfs)

Reach	Riv Sta	PF#1
PINE CREEK	240	815
PINE CREEK	156	950

Boundary Conditions

Reach	Profile	Upstream	Downstream
PINE CREEK	1	Normal S = .025	Normal S = .047

****

GEOMETRY DATA

Geometry Title: BRDG983
Geometry File : w:\hec\ras\chb98.g08

CROSS SECTION INPUT Reach: PINE CREEK River Station: 240
Description: PROPOSED COND.

Station Elevation Data, num = 10

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	74	8	72	13	70	18	68	21	66
26	66	46	68	61	70	67	72	74	74

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.085	13	.075	61	.085

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
13	61	69	69	68	.1	.3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 230
Description: PROPOSED COND.

Station Elevation Data, num = 8

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
-25	72	0	70	5	68	10	66	24	66
51	68	60	70	67	72				

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
-25	.085	5	.075	51	.085

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
5 51 111 115 120 .1 .3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 210
Description: PROPOSED COND.

Station Elevation Data, num = 8

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	70	7	68	23	66	42	64	58	64
80	66	85	68	89	70				

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.085	23	.075	80	.085

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
23 80 50 46 55 .1 .3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 185
Description: PROPOSED COND.

Station Elevation Data, num = 12

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	68	3.5	66.7	11.5	66.7	32	66
65	64	93	64	108.5	65.5	108.6	68	117.6	68
122.6	68.5	122.7	71						

Manning's n Values, num = 7

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	3.5	.015	11.5	.055	108.5	.015
117.6	.035	122.6	.015						

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
11.5 108.6 17 37 24 .2 .3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 181
Description: PROPOSED COND.

Station Elevation Data, num = 12

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	66	3.5	65.1	12.5	65.1	12.6	64.17
15.6	62.67	48	62.67	51	64.17	51.1	66	60.1	66
65.1	67	65.2	69						

Manning's n Values, num = 9

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	3.5	.015	12.6	.035	15.6	.015
48	.035	51	.015	60.1	.035	65.1	.015		

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
12.5 51.1 1 1 1 .2 .3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 179
Description: PROPOSED COND.

Station Elevation Data, num = 12

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	66	3.5	65.1	12.5	65.1	12.6	63.17
15.6	61.67	48	61.67	51	63.17	51.1	66	60.1	66
65.1	67	65.2	69						

Manning's n Values, num = 9

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	3.5	.015	12.6	.035	15.6	.015
48	.035	51	.015	60.1	.035	65.1	.015		

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
12.5	51.1	10	17	25	.3	.5

CROSS SECTION INPUT Reach: PINE CREEK River Station: 173
Description: PROPOSED COND.

Station Elevation Data, num = 12

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	64.9	3.5	64.1	12.5	64.1	12.6	62.83
15.6	61.33	34.6	61.33	37.6	62.83	37.7	64	46.7	64
50.2	64.9	50.3	69						

Manning's n Values, num = 9

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	3.5	.015	12.6	.035	15.6	.015
34.6	.035	37.6	.015	46.7	.035	50.2	.015		

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
12.5	37.7	1	1	1	.2	.4

CROSS SECTION INPUT Reach: PINE CREEK River Station: 171
Description: PROPOSED COND.

Station Elevation Data, num = 12

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	64.9	3.5	64.1	12.5	64.1	12.6	59.75
15.6	58.25	34.6	58.25	37.6	59.75	37.7	64	46.7	64
50.2	64.9	50.3	69						

Manning's n Values, num = 9

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	3.5	.015	12.6	.035	15.6	.015
34.6	.035	37.6	.015	46.7	.035	50.2	.015		

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
12.5	37.7	16	16	16	.2	.4

CROSS SECTION INPUT Reach: PINE CREEK River Station: 162
Description: PROPOSED COND.

Station Elevation Data, num = 12

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	63	3.8	62.15	12.8	62.1	12.9	59.55
15.9	58.05	30.7	58.05	33.7	59.55	33.8	62	42.8	62
46.6	62.9	46.7	69						

Manning's n Values, num = 9

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	3.8	.015	12.9	.035	15.9	.015
30.7	.035	33.7	.015	42.8	.035	46.6	.015		

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
12.8	33.8	12	12	12	.1	.1

CROSS SECTION INPUT Reach: PINE CREEK River Station: 161
Description: PROPOSED COND.

Station Elevation Data, num = 12

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	61.9	3.8	61	12.8	61	12.9	59.4
15.9	57.9	30.7	57.9	33.7	59.4	33.8	61	42.8	61
46.6	61.9	46.7	69						

Manning's n Values, num = 9

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	3.8	.015	12.9	.035	15.9	.015
30.7	.035	33.7	.015	42.8	.035	46.6	.015		

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
12.8	33.8	88	83	80	.1	.1

CROSS SECTION INPUT Reach: PINE CREEK River Station: 159
Description: PROPOSED COND.

Station Elevation Data, num = 12

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	61	3.9	60	12.9	60	13	58.5
16	57	30.8	57	33.8	58.5	33.9	60	42.9	60
46.9	61	47	69						

Manning's n Values, num = 9

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	3.9	.015	13	.035	16	.015
30.8	.035	33.8	.015	42.9	.035	46.9	.015		

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
12.9	33.9	7	12	16	.2	.3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 156
Description: PROPOSED COND.

Station Elevation Data, num = 9

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	61	4	60.2	13	60.1	13.1	54
40	54	41	60.4	55	60.8	55.1	69		

Manning's n Values, num = 5

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	4	.015	13	.035	40	.015

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

13 41 31 34 37 .1 .3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 153
Description: PROPOSED COND.

Station Elevation Data, num = 14

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	68.5	.1	61	2	60.8	11	60.7	11.1	57.8
18	56	27	54	40	54	48.5	56	73	56
80	55.5	80.1	61	89.1	61	89.2	69		

Manning's n Values, num = 5

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	2	.015	11.1	.035	80	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
11	80.1	10	10	9	.1	.3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 145
Description: PROPOSED COND.

Station Elevation Data, num = 13

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	68	.1	61.25	9.5	61.2	9.6	59	15	58
22	56	44	56	78	58	89	60	94	60
103	60.2	105	61	105.1	66				

Manning's n Values, num = 5

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	9.6	.035	94	.015	103	.035	105	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
9.6	89	16	19	17	.1	.3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 142
Description: PROPOSED COND.

Station Elevation Data, num = 6

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	60	6	58	12	56	50	56	66	58
71	60								

Manning's n Values, num = 2

Sta.	Value	Sta.	Value
0	.085	6	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
6	66	15	10	10	.1	.3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 132
Description: PROPOSED COND.

Station Elevation Data, num = 8

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	60	5	58	10	56	13	55	59	55.6
62	56	70	58	80	60				

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.085	10	.075	62	.085

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
10	62	20	30	45	.1	.3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 122
Description: PROPOSED COND.

Station Elevation Data, num = 8

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	60	4	58	9	56	14	54	19	53.5
55	54	74	56	83	58				

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.085	14	.075	55	.085

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
14	55	35	27	26	.1	.3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 115
Description: PROPOSED COND.

Station Elevation Data, num = 8

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	58	5	56	10	54	15	52	51	52
56	54	65	56	72	58				

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.085	10	.075	56	.085

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
10	56	28	31	35	.1	.3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 110
Description: PROPOSED COND.

Station Elevation Data, num = 10

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	58	4	56	9	54	13	52	47	50
50	50	54	52	58	54	61	56	66	58

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.085	13	.075	54	.085

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
13	54	30	30	30	.1	.3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 105
Description: PROPOSED COND.

Station Elevation Data, num = 9

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	56	5	54	10	52	17	50	41	49.6
47	50	52	52	55	54	59	56		

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.085	10	.075	52	.085

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
10	52	0	0	0	.1	.3

****

SUMMARY OF MANNING'S N VALUES

Reach	River Sta.	n1	n2	n3	n4	n5	n6	n7	n8	n9	
PINE CREEK	240	.085	.075	.085							
PINE CREEK	230	.085	.075	.085							
PINE CREEK	210	.085	.075	.085							
PINE CREEK	185	.015	.035	.015	.055	.015	.035	.015			
PINE CREEK	181	.015	.035	.015	.035	.015	.035	.015	.035	.015	
PINE CREEK	179	.015	.035	.015	.035	.015	.035	.015	.035	.015	
PINE CREEK	173	.015	.035	.015	.035	.015	.035	.015	.035	.015	
PINE CREEK	171	.015	.035	.015	.035	.015	.035	.015	.035	.015	
PINE CREEK	162	.015	.035	.015	.035	.015	.035	.015	.035	.015	
PINE CREEK	161	.015	.035	.015	.035	.015	.035	.015	.035	.015	
PINE CREEK	159	.015	.035	.015	.035	.015	.035	.015	.035	.015	
PINE CREEK	156	.015	.035	.015	.035	.015					
PINE CREEK	153	.015	.035	.015	.035	.015					
PINE CREEK	145	.015	.035	.015	.035	.015					
PINE CREEK	142	.085	.035								
PINE CREEK	132	.085	.075	.085							
PINE CREEK	122	.085	.075	.085							
PINE CREEK	115	.085	.075	.085							
PINE CREEK	110	.085	.075	.085							
PINE CREEK	105	.085	.075	.085							

****

SUMMARY OF REACH LENGTHS

Reach	River Sta.	Left	Channel	Right
PINE CREEK	240	69	69	68
PINE CREEK	230	111	115	120
PINE CREEK	210	50	46	55
PINE CREEK	185	17	37	24
PINE CREEK	181	1	1	1
PINE CREEK	179	10	17	25
PINE CREEK	173	1	1	1
PINE CREEK	171	16	16	16
PINE CREEK	162	12	12	12

*PINE CREEK	*	161	*	88*	83*	80*
*PINE CREEK	*	159	*	7*	12*	16*
*PINE CREEK	*	156	*	31*	34*	37*
*PINE CREEK	*	153	*	10*	10*	9*
*PINE CREEK	*	145	*	16*	19*	17*
*PINE CREEK	*	142	*	15*	10*	10*
*PINE CREEK	*	132	*	20*	30*	45*
*PINE CREEK	*	122	*	35*	27*	26*
*PINE CREEK	*	115	*	28*	31*	35*
*PINE CREEK	*	110	*	30*	30*	30*
*PINE CREEK	*	105	*	0*	0*	0*

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

* Reach	* River Sta.	*	Contr.*	Expan. *
*PINE CREEK	* 240	*	.1*	.3*
*PINE CREEK	* 230	*	.1*	.3*
*PINE CREEK	* 210	*	.1*	.3*
*PINE CREEK	* 185	*	.2*	.3*
*PINE CREEK	* 181	*	.2*	.3*
*PINE CREEK	* 179	*	.3*	.5*
*PINE CREEK	* 173	*	.2*	.4*
*PINE CREEK	* 171	*	.2*	.4*
*PINE CREEK	* 162	*	.1*	.1*
*PINE CREEK	* 161	*	.1*	.1*
*PINE CREEK	* 159	*	.2*	.3*
*PINE CREEK	* 156	*	.1*	.3*
*PINE CREEK	* 153	*	.1*	.3*
*PINE CREEK	* 145	*	.1*	.3*
*PINE CREEK	* 142	*	.1*	.3*
*PINE CREEK	* 132	*	.1*	.3*
*PINE CREEK	* 122	*	.1*	.3*
*PINE CREEK	* 115	*	.1*	.3*
*PINE CREEK	* 110	*	.1*	.3*
*PINE CREEK	* 105	*	.1*	.3*

100 Year Storm

HEC-RAS Version 1.2 April 1996
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

```
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 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
```

100 YEAR

****

PROJECT DATA
Project Title: CHAPEL HILLS BRIDGE PROPOSED CONDITION
Project File : chb98.prj
Run Date and Time: 6/2/98 12:42:30 PM

Project in English units

****

PLAN DATA

Plan Title: Plan 30
Plan File : x:\870000.all\871614\hydro\hecras\pcch98\chb98.p30

Geometry Title: Plan 30
Geometry File : x:\870000.all\871614\hydro\hecras\pcch98\chb98.p30

Flow Title : Plan 30
Flow File : x:\870000.all\871614\hydro\hecras\pcch98\chb98.p30

Plan Summary Information:
Number of: Cross Sections = 20 Mulitple Openings = 0
Culverts = 0 Inline Weirs = 0
Bridges = 0

Computational Information
Water surface calculation tolerance = .01
Critical depth calculaton tolerance = .01
Maximum number of interations = 20
Maximum difference tolerance = .3
Flow tolerance factor = .001

Computational Flow Regime: Mixed Flow

Encroachment Data: None

Flow Distribution Locations: None

****

FLOW DATA

Flow Title: 100 YEAR DEVELOPED
Flow File : x:\870000.all\871614\hydro\hecras\pcch98\chb98.f01

Flow Data (cfs)

Reach	Riv Sta	PF#1
PINE CREEK	240	1330
PINE CREEK	156	1800

Boundary Conditions

Reach	Profile	Upstream	Downstream
PINE CREEK	1	Normal S = .025	Normal S = .047

****

GEOMETRY DATA

Geometry Title: BRDG983
Geometry File : w:\hec\ras\chb98.g08

CROSS SECTION INPUT Reach: PINE CREEK River Station: 240
Description: PROPOSED COND.

Station Elevation Data, num = 10

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	74	8	72	13	70	18	68	21	66
26	66	46	68	61	70	67	72	74	74

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.085	13	.075	61	.085

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
13	61	69	69	68	.1	.3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 230
Description: PROPOSED COND.

Station Elevation Data, num = 8

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
-25	72	0	70	5	68	10	66	24	66
51	68	60	70	67	72				

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
-25	.085	5	.075	51	.085

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
5 51 111 115 120 .1 .3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 210
Description: PROPOSED COND.

Station Elevation Data, num = 8

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	70	7	68	23	66	42	64	58	64
80	66	85	68	89	70				

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.085	23	.075	80	.085

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
23 80 50 46 55 .1 .3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 185
Description: PROPOSED COND.

Station Elevation Data, num = 12

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	68	3.5	66.7	11.5	66.7	32	66
65	64	93	64	108.5	65.5	108.6	68	117.6	68
122.6	68.5	122.7	71						

Manning's n Values, num = 7

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	3.5	.015	11.5	.055	108.5	.015
117.6	.035	122.6	.015						

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
11.5 108.6 17 37 24 .2 .3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 181
Description: PROPOSED COND.

Station Elevation Data, num = 12

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	66	3.5	65.1	12.5	65.1	12.6	64.17
15.6	62.67	48	62.67	51	64.17	51.1	66	60.1	66
65.1	67	65.2	69						

Manning's n Values, num = 9

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	3.5	.015	12.6	.035	15.6	.015
48	.035	51	.015	60.1	.035	65.1	.015		

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
12.5 51.1 1 1 1 .2 .3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 179
Description: PROPOSED COND.

Station Elevation Data, num = 12

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	66	3.5	65.1	12.5	65.1	12.6	63.17
15.6	61.67	48	61.67	51	63.17	51.1	66	60.1	66
65.1	67	65.2	69						

Manning's n Values, num = 9

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	3.5	.015	12.6	.035	15.6	.015
48	.035	51	.015	60.1	.035	65.1	.015		

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
12.5	51.1	10	17	25	.3	.5

CROSS SECTION INPUT Reach: PINE CREEK River Station: 173
Description: PROPOSED COND.

Station Elevation Data, num = 12

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	64.9	3.5	64.1	12.5	64.1	12.6	62.83
15.6	61.33	34.6	61.33	37.6	62.83	37.7	64	46.7	64
50.2	64.9	50.3	69						

Manning's n Values, num = 9

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	3.5	.015	12.6	.035	15.6	.015
34.6	.035	37.6	.015	46.7	.035	50.2	.015		

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
12.5	37.7	1	1	1	.2	.4

CROSS SECTION INPUT Reach: PINE CREEK River Station: 171
Description: PROPOSED COND.

Station Elevation Data, num = 12

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	64.9	3.5	64.1	12.5	64.1	12.6	59.75
15.6	58.25	34.6	58.25	37.6	59.75	37.7	64	46.7	64
50.2	64.9	50.3	69						

Manning's n Values, num = 9

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	3.5	.015	12.6	.035	15.6	.015
34.6	.035	37.6	.015	46.7	.035	50.2	.015		

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
12.5	37.7	16	16	16	.2	.4

CROSS SECTION INPUT Reach: PINE CREEK River Station: 162
Description: PROPOSED COND.

Station Elevation Data, num = 12

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	63	3.8	62.15	12.8	62.1	12.9	59.55
15.9	58.05	30.7	58.05	33.7	59.55	33.8	62	42.8	62
46.6	62.9	46.7	69						

Manning's n Values, num = 9

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	3.8	.015	12.9	.035	15.9	.015
30.7	.035	33.7	.015	42.8	.035	46.6	.015		

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
12.8	33.8	12	12	.1	.1

CROSS SECTION INPUT Reach: PINE CREEK River Station: 161
Description: PROPOSED COND.

Station Elevation Data, num = 12

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	61.9	3.8	61	12.8	61	12.9	59.4
15.9	57.9	30.7	57.9	33.7	59.4	33.8	61	42.8	61
46.6	61.9	46.7	69						

Manning's n Values, num = 9

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	3.8	.015	12.9	.035	15.9	.015
30.7	.035	33.7	.015	42.8	.035	46.6	.015		

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
12.8	33.8	88	83	80	.1	.1

CROSS SECTION INPUT Reach: PINE CREEK River Station: 159
Description: PROPOSED COND.

Station Elevation Data, num = 12

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	61	3.9	60	12.9	60	13	58.5
16	57	30.8	57	33.8	58.5	33.9	60	42.9	60
46.9	61	47	69						

Manning's n Values, num = 9

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	3.9	.015	13	.035	16	.015
30.8	.035	33.8	.015	42.9	.035	46.9	.015		

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
12.9	33.9	7	12	16	.2	.3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 156
Description: PROPOSED COND.

Station Elevation Data, num = 9

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	69	.1	61	4	60.2	13	60.1	13.1	54
40	54	41	60.4	55	60.8	55.1	69		

Manning's n Values, num = 5

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	4	.015	13	.035	40	.015

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

13	41	31	34	37	.1	.3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 153
Description: PROPOSED COND.

Station Elevation Data, num = 14

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	68.5	.1	61	2	60.8	11	60.7	11.1	57.8
18	56	27	54	40	54	48.5	56	73	56
80	55.5	80.1	61	89.1	61	89.2	69		

Manning's n Values, num = 5

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	.1	.035	2	.015	11.1	.035	80	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
11	80.1	10	10	9	.1	.3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 145
Description: PROPOSED COND.

Station Elevation Data, num = 13

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	68	.1	61.25	9.5	61.2	9.6	59	15	58
22	56	44	56	78	58	89	60	94	60
103	60.2	105	61	105.1	66				

Manning's n Values, num = 5

Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value	Sta.	Value
0	.015	9.6	.035	94	.015	103	.035	105	.015

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
9.6	89	16	19	17	.1	.3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 142
Description: PROPOSED COND.

Station Elevation Data, num = 6

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	60	6	58	12	56	50	56	66	58
71	60								

Manning's n Values, num = 2

Sta.	Value	Sta.	Value
0	.085	6	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
6	66	15	10	10	.1	.3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 132
Description: PROPOSED COND.

Station Elevation Data, num = 8

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	60	5	58	10	56	13	55	59	55.6
62	56	70	58	80	60				

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.085	10	.075	62	.085

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
10	62	20	30	45	.1	.3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 122
Description: PROPOSED COND.

Station Elevation Data, num = 8

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	60	4	58	9	56	14	54	19	53.5
55	54	74	56	83	58				

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.085	14	.075	55	.085

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
14	55	35	27	26	.1	.3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 115
Description: PROPOSED COND.

Station Elevation Data, num = 8

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	58	5	56	10	54	15	52	51	52
56	54	65	56	72	58				

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.085	10	.075	56	.085

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
10	56	28	31	35	.1	.3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 110
Description: PROPOSED COND.

Station Elevation Data, num = 10

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	58	4	56	9	54	13	52	47	50
50	50	54	52	58	54	61	56	66	58

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.085	13	.075	54	.085

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
13	54	30	30	30	.1	.3

CROSS SECTION INPUT Reach: PINE CREEK River Station: 105
Description: PROPOSED COND.

Station Elevation Data, num = 9

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	56	5	54	10	52	17	50	41	49.6
47	50	52	52	55	54	59	56		

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.085	10	.075	52	.085

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
10	52	0	0	0	.1	.3

****

SUMMARY OF MANNING'S N VALUES

Reach	River Sta.	n1	n2	n3	n4	n5	n6	n7	n8	n9	
PINE CREEK	240	.085	.075	.085							
PINE CREEK	230	.085	.075	.085							
PINE CREEK	210	.085	.075	.085							
PINE CREEK	185	.015	.035	.015	.055	.015	.035	.015			
PINE CREEK	181	.015	.035	.015	.035	.015	.035	.015	.035	.015	
PINE CREEK	179	.015	.035	.015	.035	.015	.035	.015	.035	.015	
PINE CREEK	173	.015	.035	.015	.035	.015	.035	.015	.035	.015	
PINE CREEK	171	.015	.035	.015	.035	.015	.035	.015	.035	.015	
PINE CREEK	162	.015	.035	.015	.035	.015	.035	.015	.035	.015	
PINE CREEK	161	.015	.035	.015	.035	.015	.035	.015	.035	.015	
PINE CREEK	159	.015	.035	.015	.035	.015	.035	.015	.035	.015	
PINE CREEK	156	.015	.035	.015	.035	.015					
PINE CREEK	153	.015	.035	.015	.035	.015					
PINE CREEK	145	.015	.035	.015	.035	.015					
PINE CREEK	142	.085	.035								
PINE CREEK	132	.085	.075	.085							
PINE CREEK	122	.085	.075	.085							
PINE CREEK	115	.085	.075	.085							
PINE CREEK	110	.085	.075	.085							
PINE CREEK	105	.085	.075	.085							

****

SUMMARY OF REACH LENGTHS

Reach	River Sta.	Left	Channel	Right
PINE CREEK	240	69	69	68
PINE CREEK	230	111	115	120
PINE CREEK	210	50	46	55
PINE CREEK	185	17	37	24
PINE CREEK	181	1	1	1
PINE CREEK	179	10	17	25
PINE CREEK	173	1	1	1
PINE CREEK	171	16	16	16
PINE CREEK	162	12	12	12

*PINE CREEK	*	161	*	88*	83*	80*
*PINE CREEK	*	159	*	7*	12*	16*
*PINE CREEK	*	156	*	31*	34*	37*
*PINE CREEK	*	153	*	10*	10*	9*
*PINE CREEK	*	145	*	16*	19*	17*
*PINE CREEK	*	142	*	15*	10*	10*
*PINE CREEK	*	132	*	20*	30*	45*
*PINE CREEK	*	122	*	35*	27*	26*
*PINE CREEK	*	115	*	28*	31*	35*
*PINE CREEK	*	110	*	30*	30*	30*
*PINE CREEK	*	105	*	0*	0*	0*

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

* Reach	* River Sta.	* Contr.*	Expan. *
*PINE CREEK	* 240	* .1*	.3*
*PINE CREEK	* 230	* .1*	.3*
*PINE CREEK	* 210	* .1*	.3*
*PINE CREEK	* 185	* .2*	.3*
*PINE CREEK	* 181	* .2*	.3*
*PINE CREEK	* 179	* .3*	.5*
*PINE CREEK	* 173	* .2*	.4*
*PINE CREEK	* 171	* .2*	.4*
*PINE CREEK	* 162	* .1*	.1*
*PINE CREEK	* 161	* .1*	.1*
*PINE CREEK	* 159	* .2*	.3*
*PINE CREEK	* 156	* .1*	.3*
*PINE CREEK	* 153	* .1*	.3*
*PINE CREEK	* 145	* .1*	.3*
*PINE CREEK	* 142	* .1*	.3*
*PINE CREEK	* 132	* .1*	.3*
*PINE CREEK	* 122	* .1*	.3*
*PINE CREEK	* 115	* .1*	.3*
*PINE CREEK	* 110	* .1*	.3*
*PINE CREEK	* 105	* .1*	.3*

DRAINAGE MAP