10/15/19 Pre-Proposal Meeting for Preliminary Engineering for Mann Valley

Question 1: For wetland delineations, should the consultant review the entire concept area or just the City property on Exhibit B?

The consultant should review wetland delineations for the entire area highlighted in Exhibit B.

Question 2: Does the City want a basic ALTA survey or specific items from Table A?

The City would like the consultant to complete Items 1, 3, 13, and 18 from Table A in addition to the minimum requirements of the ALTA survey. Exhibit E has been revised for the ALTA survey (see attached). The City will obtain the title commitments for the ALTA survey after a consultant agreement is in place.

Question 3: What are the City's expectations for 30 percent design?

Would like to see overall site utility layout in plan view and overall site grading in plan view to include street and stormwater areas. Also include preliminary plan and profile sheets showing utilities and streets. 30 percent does not include cross sections.

Question 4: What are the City's expectations for 30 percent design of the lift station?

Consultant shall provide preliminary lift station design and evaluation sufficient to identify a location and cost for the lift station. The selected consultant will be provided the ultimate flow rates for lift station design.

Question 5: What information should be provided for stormwater?

Preliminary stormwater modeling should be provided to determine sizes of ponding and area to be dedicated to stormwater management. 100 percent of the stormwater for the site will be handled with regional stormwater facilities. With 30 percent design, looking for the cost associated with stormwater management.

Question 6: When should consultants focus on the wetland delineation work?

Spring 2020.

Question 7: How much is the City interested in looking at the lots in the steep slope areas to see how developable they are?

The intent is to not do any mass site grading and other than for the roads and storm water management facilities, 30 percent does not include a grading plan. Lot layout shall be limited to the large developable areas that are not encumbered by stormwater, roadways, or steep slopes.

Question 8: What information is needed for water modeling?

The City works with a consultant for water modeling of the entire City. Water modeling has been completed for this area and any pertinent information will be provided to the selected consultant. The City will specify the size of all water mains.

Question 9: Will there have to be small utility coordination?

Coordination with small utilities is not necessary for preliminary design. However, small utilities along Radio Road and Division Street should be identified to aid in decision making for proposed water and sewer routing. The consultant shall identify private utility conflicts for proposed water and sewer improvements.

Question 10: Will the consultant need to provide a rough estimate for street lighting costs?

The City will provide an allowance amount for the consultant to include in their estimate for street lighting.

Question 11: Will the consultant need to provide a rough estimate for landscape design?

The City will provide an allowance amount for the consultant to include in their estimate for landscaping.

Question 12: Does the 30 percent plan include the water loop?

The 30 percent plans should include the water main extension along Radio Road to the future water main connection at Paulson Road. Using County contour surface data is sufficient for 30 percent design.

Question 13: Does the consultant need to identify a site for the PRV at the intersection of Radio Road and Powell Ave?

The City and the consultant will work together to identify a location and cost for the PRV.

Question 14: Is there a desire by the City to get the project finished before August 1, 2020?

Special consideration will be given to consultants that can minimally provide *cost estimates* by May 15, 2020 in order to meet the City's CIP schedule. Other deliverables can be provided after that date.

Question 15: What level of detail is the City looking for the traffic and transportation impacts as well as the intersections that will be required for Road A and Road B?

The consultant shall design an intersection with a left turn lane from Powell Ave. and an intersection with a right turn lane from CTH M. The City will provide a traffic count and will work with the selected consultant to determine timing of the count.

Question 16: Is the City looking for hydraulic sizing for the water crossing of Road A? Does 30 percent include coordination with FEMA?

See the attached Mann Valley Hydraulic Model. 30 percent does not involve coordination with FEMA.

Question 17: How can consultants obtain the latest GIS information?

Contact City Engineer Crystal Raleigh for shapefiles of the corporate limits and water/sewer infrastructure in DeSanctis Park. The North Loop Extension water plan is attached.

MANN VALLEY – PRELIMINARY ENGINEERING
CITY OF RIVER FALLS, WI

PRE-PROPOSAL MEETING
TUESDAY, OCTOBER 15, 9:00 AM
RIVER FALLS CITY HALL – TRAINING ROOM

ATTENDEE LIST

NAME	ORGANIZATION	PHONE#	EMAIL ADDRESS
John Parotti	SEH	715·861·4871	jparotti@sehinc.com
Erik Henningsgard	SEH	715.861.8373	ehenningsgard@sehinc.com
Zach Simpson	~~SEH~~ STRAND	608-251-4843	zach.simpson@strand.com
Ron Quanbeck	TKDA	651-221-4674	Ron.Quanbeck@TKDA.com
MATT HIEB	ACA	715-381-5277	mhieb@authconsulting.com
Kip Johnson	ACA	715.381-5277	kjohnson@authconsulting.com
Chuck Schwartz	MSA	651 272-0041	cschwartz@msa-ps.com
DAVE SIMONS	SEH	612.759.0764	dsimons@sehinc.com
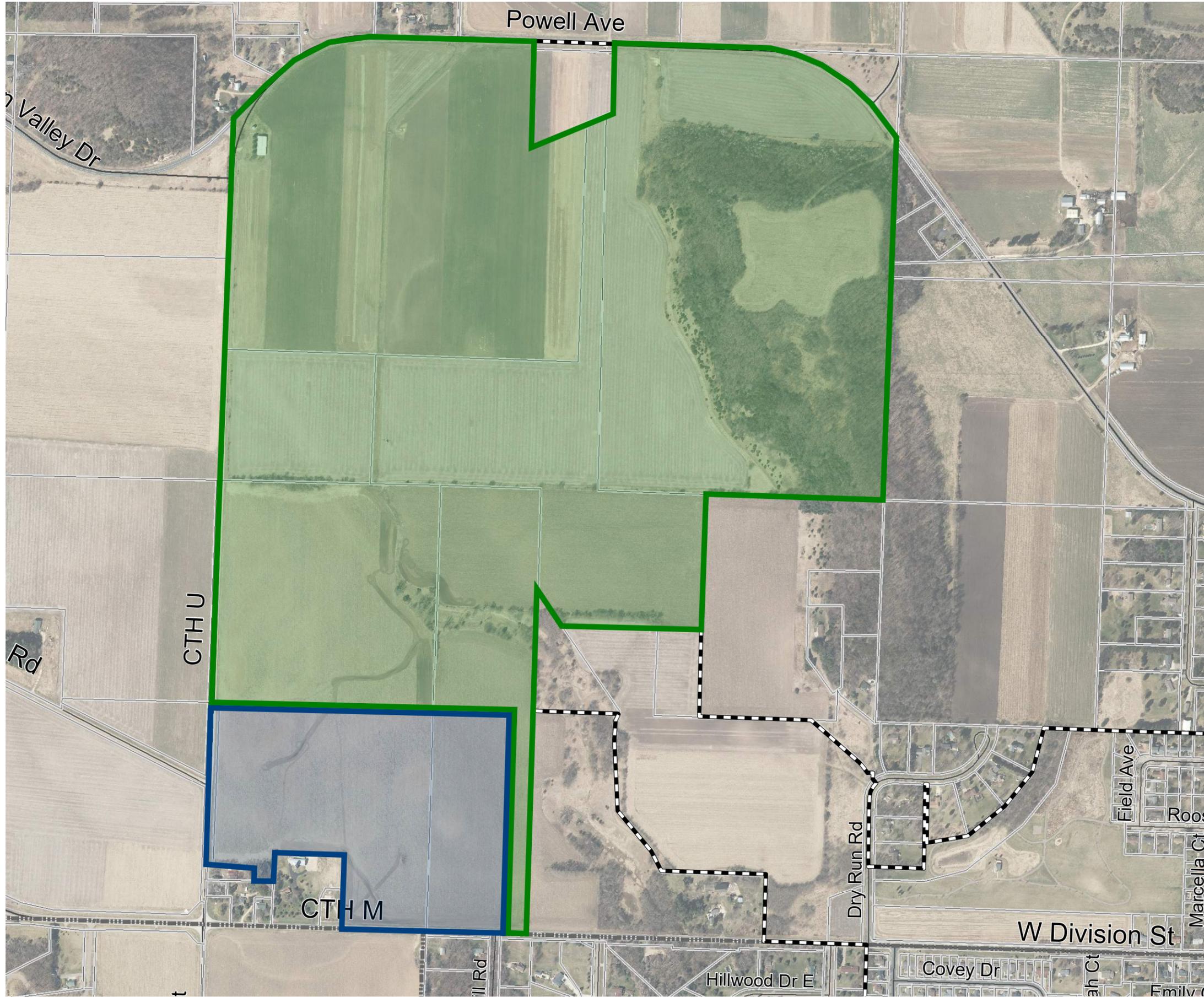
EXHIBIT E

ALTA / NSPS SURVEY LIMITS

MANN VALLEY PRELIMINARY DESIGN

LEGEND

ALTA / NSPS Survey Boundary for City Owned Property

Alternate ALTA / NSPS Survey Boundary for Adjacent Property

City of RIVER FALLS

Powell Ave

Valley Dr

CTH U

CTH M

Rd

Dry Run Rd

Field Ave

Roos

Marcella Ct

W Division St

Hillwood Dr E

Covey Dr

N

0   300   600   1,200 Ft

CASEY STREET

B-12 NO ROCK ENCOUNTERED
B-13 NO ROCK ENCOUNTERED

CASINGS SET IN ROCK

ST CROIX COUNTY, HWY

CITY OF RIVER FALLS.

NW RAMP

B-11 ROCK EL 945.3

STH 35

B-10 ROCK EL 948.4

SE RAMP

RADIO ROAD

B-9 ROCK EL 942.25

ROCK EL ~938

B-7 NO ROCK ENCOUNTERED

PROPOSED SANITARY SEWER

B-5 NO ROCK ENCOUNTERED

B-8 NO ROCK ENCOUNTERED

PAULSON ROAD

B-6 NO ROCK ENCOUNTERED

PROPOSED WATERMAIN

B-4 NO ROCK ENCOUNTERED

Mann Valley Preliminary Design Radio Road Water Main Connection Location

B-3 ROCK EL 958.4

A-11 ROCK EL 959.2

A-8 ROCK EL 962

A-9 ROCK EL 963.5

A-12 ROCK EL 961

A-14 ROCK EL 950

PROPOSED SANITARY SEWER

B-2 NO ROCK ENCOUNTERED

B-1 NO ROCK ENCOUNTERED

PARCEL LINES FROM ST. CROIX COUNTY

LIGHT POLE ADJUSTMENTS (BY OTHERS)

Light Pole	Ex Elevation (ft)	Pro Elevation (ft)
1	948.27	949.4
2	950.73	952.02
3	953.2	954.35
4	956.38	957.38
5	959.26	960.33
6	962.83	964.22
7	968.28	969.16
8	969.08	969.89
9	964.66	965.63
10	958.52	959.62
11	956.27	957.28
12	955.18	955.96

scale 150 0 150 300 / 75 feet
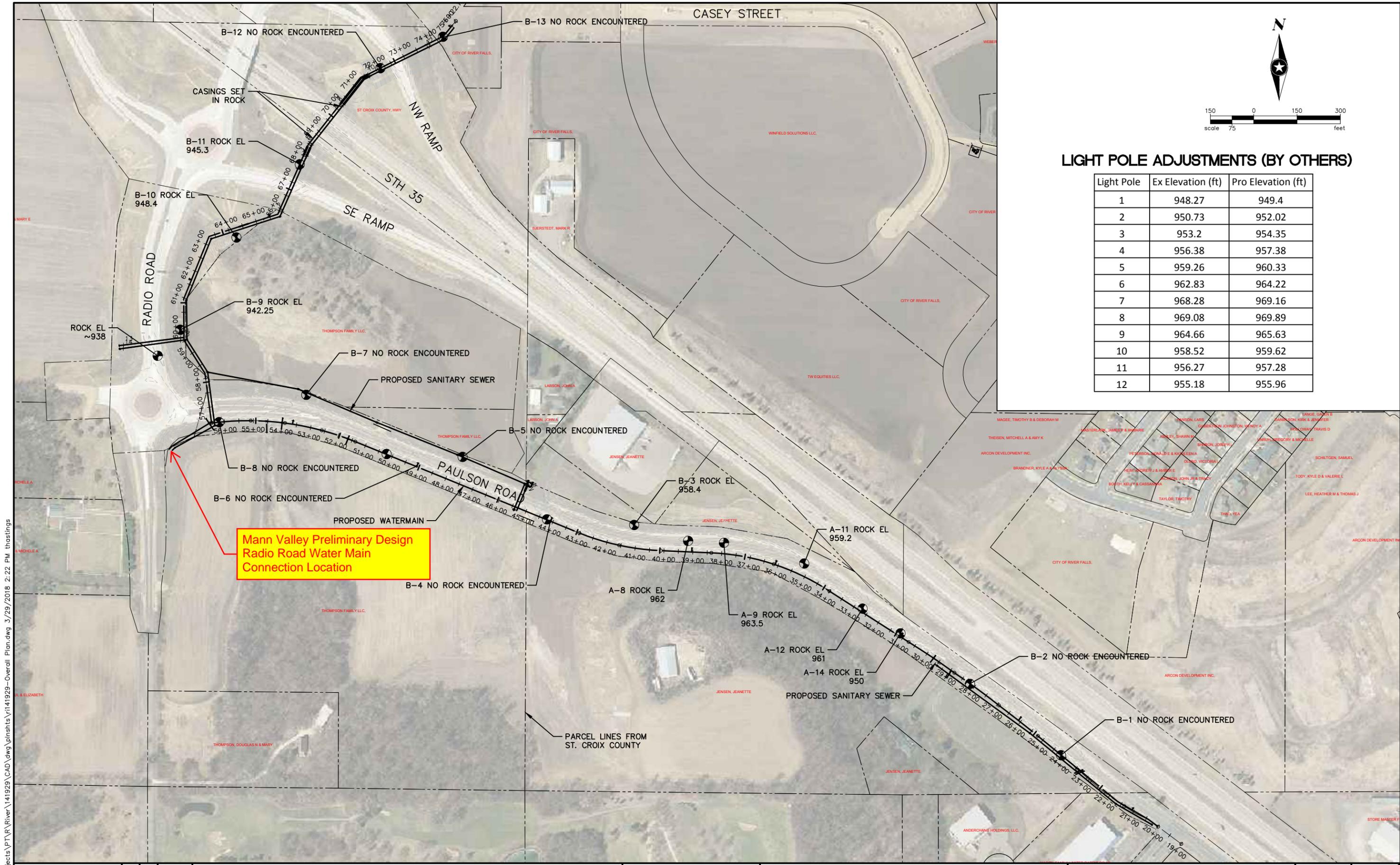
DRAWN BY: TJH
DESIGNER: EDH
CHECKED BY: DFS
DESIGN TEAM

NO. BY DATE REVISIONS

SEH
PHONE: 715.246.9906
156 HIGH STREET
SUITE 300
NEW RICHMOND, WI 54017
www.sehinc.com

**NORTH LOOP EXTENSION
RIVER FALLS, WISCONSIN**

OVERALL PLAN

FILE NO.
RIVER-141929

DATE
3/29/2018

2
55

PAULSON ROAD

16 LF — 12 PVC SDR 35 SAN SEW @ 0.28%

400

REMOVE RIP RAP

1 — 22.5° BEND

RIGHT OF WAY/PARCEL LINES
(TYPICAL)

401

1 — 11.25° BEND

83+80.90

**Mann Valley Preliminary Design
Radio Road Water Main
Connection Location**

207

PROPOSED 10' TRAIL

1 — 16"X6" REDUCER
1 — 6" GV AND BOX
1 — HYDRANT

scale 20 0 20 40 feet
scale 10

Profile

970	EXISTING GROUND	PROPOSED GRADING	970

STA= 83+49.88, 5.00 LT
TC= 959.70

965 / 965

400

18" STM SEW XING

960 / 960

401

2" INSULATION

955 / 955

16" DIP

13 LF 12" PVC
SDR 35 @ 0.28%

950 / 950

207

16" HDPE

158 LF 12" PVC SDR 35 @ 5.7%

INV. 949.00 (SW)
INV. 949.00 (NE)

945 / 945

186 LF 12" PVC SDR 35 @ 1.9%

940 / 940

SEE SHEET 22 FOR
DETAILS ON
MANHOLES 207 AND
400

935 / 935

| 949.1 / 949.11 | 952.1 / 952.14 | 964.7 / 964.67 | 964.5 / 964.46 | 958.8 / 958.84 | 956.8 / 956.85 | 957.9 / 957.87 | 959.8 / 959.75 | 960.9 / 960.85 |

79+75 80+00 81+00 82+00 83+00 83+80.90

Mann Valley
Hydraulic Model Result

Information in this Section:
QA/QC Checklist
CHECK-2 (printouts)
BOSS-HEC-2 (printouts)
CROSS-SECTIONS (plots)

STREAM: __MANN VALLEY__   BRANCH: __MAIN__
FILENAME: __RASMANNV__   METAJOB No.: __1__
By: MER   Checked By: _____
Date: __3/23/97__   Date: __/ /__

Model:
Version: __RMS HEC-2 Boss™ ver 3.0__

**Meets the Following Program Assumptions and
Limitations (Check Boxes):**   (YES)/ NO (Explain:_____)

☒ 1. Flow is Steady (Discharge Rate Constant During Study Time Interval)
☒ 2. Flow is Gradually Varied (Depth Changes Gradually over a Short Distance)
☒ 3. Flow is 1-Dimensional (Velocity Component in directions other than the direction of flow unaccounted for)
☒ 4. Small River Channel Slopes (less than 1:10)
☒ 5. Flow is Fully Turbulent and Boundary Friction can be Described by Manning's or Chezy's
☒ 6. Flow Boundary is Rigid
☒ 7. Water is Homogenous and Incompressible
☒ 8. Effects of Transverse Velocity Distributions can be Approximated Using Alpha and Channel Subdivision

General Input Data:

Computation Limits		from:	__8638__
		to:	__12460__

Study Limits (If Different than Computation Limits) __9576 → 12460 (MM → upstream)__
Starting WS Elevation = Normal Depth (preferred by FEMA), Slope-Area
(preferred by FEMA) or Other (with Comment)
Sensitivity Performed for Initial WS Elevation (Yes)/ No __~ several x-sections between bottom & study limits__
Friction Loss Computation Method / Comment __Automatic__

Study Discharge Rates(cfs)   Source: __ROCKY KEEHN__   __3500__
10-YR _____   50-YR _____   100-YR __800/1700 2000__ //2x 500-YR __2800__
Other: _____   Compare w/ FIS: _____
Cross-Section of Change in Q   __N/A__   __(would change d.s. of C.T.H. mm)__
Reason for Change in Q (tributary, etc.) _____
Storage Reasonably Taken Into Account __HydroCAD™ (TR-20 method used by Rocky) ~ yes__

Cross-Sections:

Survey By: _____   Previous FIS: _____
Source of Ground Geometry __From City__   Map: (Scale :) Contour Interval: 2' (Electronic)/Paper
Source of Geometry Below Water Surface __~ Rocky Keeh site visit__ Survey By: __SEH__ Previous FIS: _____
Numbering System   __~ distance from Kinnickiniz River__
Overbank Stationing / Channel Lengths Checked   __~yes, MER__
Spacing: __Ok ~ generally <500 ±__
Spacing Guidelines:
1. Where change in xs area or shape, roughness, and bed slope
2. Normal to flow lines
3. Significant changes in conveyance (width, depth, n values)
4. Above, below and within bridges
5. Head and tail of levees
6. All control sections
7. Below a confluence on main stream and above confluence on the tributary
8. Generally more cross-sections needed in urban areas, steeper slopes, and smaller streams
**** *NOT LESS THAN 1/2 MILE - SUGGEST 500 FT SPACING* ****

Left Overbank Description: __brush / crops__   Left Overbank Manning's n __varies 0.07 → 0.1__
Channel Description: __small, relatively clean__   Channel Manning's n __varies 0.04__
Right Overbank Description: __brush / crops__   Right Overbank Manning's n __varies 0.07 → 0.1__
Sources / Validation of Manning's n Values __RJK field visit, photos, USGS Documents/Methodology__
Manning's Values Compare with Original FIS   __N/A__

STREAM: MANN VALLEY
FILENAME: RASMANNN
By: MER
Date: 3/23/97

BRANCH: Main
METAJOB No.: 1
Checked By:
Date: / /

Bridge Hydraulics:

Name of Bridge	C.T.H M M
General Description:	42' 28" I Girder
Modeling Technique (Valley / Normal Bridge / Special Bridge)	Special Bridge
Source of Geometry Information / Datum	County Provided WSPRO Information / Unknown
Alignment / Skew Comments	—No adjustments made
Minimum Road / Low Member Elevations	880 / 876.55
Expansion /Contraction Coefficients Used	0.5/0.3
Pier Width / Shape Coefficient	N/A
Bridge Total Loss Coefficient (Generally 1.56)	1.56
Encroachments Used (Upstream / Downstream)	Downstream (4:1) / Bridge ~ width ~40' / upstream ~ not needed due to tapey
Compatibility w/ Bridge Design Hydraulic Info - Other	Used Info from bridge design WSPRO
Meets Roadway Authority Protection Requirements	Yes

Name of Bridge	
General Description:	
Modeling Technique (Valley / Normal Bridge / Special Bridge)	
Source of Geometry Information / Datum	
Alignment / Skew Comments	
Minimum Road / Low Member Elevations	
Expansion /Contraction Coefficients Used	
Pier Width / Shape Coefficient	
Bridge Total Loss Coefficient (Generally 1.56)	
Encroachments Used (Upstream / Downstream)	
Compatibility w/ Bridge Design Hydraulic Info - Other	
Meets Roadway Authority Protection Requirements	

Name of Bridge	
General Description:	
Modeling Technique (Valley / Normal Bridge / Special Bridge)	
Source of Geometry Information / Datum	
Alignment / Skew Comments	
Minimum Road / Low Member Elevations	
Expansion /Contraction Coefficients Used	
Pier Width / Shape Coefficient	
Bridge Total Loss Coefficient (Generally 1.56)	
Encroachments Used (Upstream / Downstream)	
Compatibility w/ Bridge Design Hydraulic Info - Other	
Meets Roadway Authority Protection Requirements	

SEH

QA / QC Checklist for HEC-2 Analysis

Job Name: _River Falls FIS_
SEH JOB# _A-RIVER 9601_
FILE: 17.00

STREAM: _MAIN VALLEY_	BRANCH: _MAIN_
FILENAME: _KRSMAHNV_	META JOB No.:
By: MER	Checked By:
Date: 3/23/97	Date: / /

Other (Dams etc.)

Description _N/A_

Modeling Method

Comments:

☒ **Calibration Data Available:**
Comments: _None Available - however bridge design CWSEL = 870.04, Q=700cfs_

☒ **Conveyance Range Messages Can Occur if (check if problem / reasonable):**
1. Large change in flow distribution from channel to overbanks or reverse
2. Large change in top widths
3. Additional flow from tributaries
4. Large change in capacity (cross-section, roughness, slope)
Comments: _@ Bridge, downstream @ study limits - ok._

☒ **Comments Regarding Other Areas of Instability or Locations of Interest**
NONE

☒ **Energy Grade Line Slope should not decrease by more than 50% or increase more than 100% between sections**
(if it does need more cross-sections to define reach) _Not a concern due to xs density_

☒ **Critical Depth Occurances (Run Supercritical Option to Check if Composite is Needed)**
Comments (Note: FEMA states, if supercritical flow, use critical water surface elevation): _Downstream of Bridge beyond study limits - ok._

☒ **Check Velocities if Reasonable - Should X-Section Geometry Be Altered to Account for Scour?**
_ok_

☒ **Bridge Hydraulics**
Check if flow depths, widths, etc. seem reasonable / Does it meet roadway authority's protection requirements
Check if calculated flow area - input flow area for special bridge option for full flow scenarios
Comments: _Looks good_

☒ **Comparison of Flood Profiles with Calibration Data**
Comments: _ok_

☒ **Comparison of Flood Profiles with Original FIS**
Comments: _N/A_

☒ **Comments on Reasonableness of Profile - Conclusions:**
Profile Appears Reasonable.

Report File = S:\WATER\ANONTECH\ROCKY\MANNV.NT2
ate: 11/17/97
ime: 7:20:55 PM

ECNO	XNL	XNR	XNCH	CCHV	CEHV	Structure
8638	0.07	0.07	0.04	0.1	0.3	
8989	0.07	0.07	0.04	0.1	0.3	
9256	0.07	0.07	0.04	0.1	0.3	
9536	0.07	0.07	0.04	0.3	0.5	
9576	0.07	0.07	0.04	0.3	0.5	SB+X2
9724	0.1	0.1	0.04	0.3	0.5	
10125	0.1	0.1	0.04	0.1	0.3	
10492	0.07	0.07	0.04	0.1	0.3	
10912	0.07	0.07	0.04	0.1	0.3	
11619	0.07	0.07	0.04	0.1	0.3	
12068	0.07	0.07	0.04	0.1	0.3	
12460	0.07	0.07	0.04	0.1	0.3	

-----Summary of Statistics------

		Minimum	Maximum
eft Overbank	N Value:	0.07	0.1
ight Overbank	N Value:	0.07	0.1
hannel	N Value:	0.04	0.04
Contraction Coefficient:		0.1	0.3
xpansion Coefficient:		0.3	0.5

-------Roughness Coefficient Check------

-------NC and NH records Check------

-----Transition Coefficient check------

-----Roughness Coefficient Check at Structures------

------Special Notes and Messages check------

-End Program---

Report File = S:\WATER\ANONTECH\ROCKY\MANNV.XS2
Date: 11/17/97
Time: 7:21:13 PM

SECNO	Xlob	Xrob	Xlch	CHWID	Topwid	Structure Flow Type
8638	0.00	0.00	0.00	3.89	97.72	
8989	350.86	348.96	351.46	3.96	57.66	C
9256	231.56	341.96	266.29	22.22	152.08	
9536	310.97	217.22	280.72	38.17	35.93	
9576	40.00	40.00	40.00	36.63	39.99	SB+X2
9724	172.68	150.30	148.29	13.44	195.50	
10125	384.03	462.31	400.84	4.27	230.15	
10492	370.23	360.72	366.80	4.66	110.32	
10912	399.80	453.69	420.48	4.38	183.75	
11619	724.54	685.20	706.87	3.81	75.85	
12068	470.13	435.88	448.72	3.98	110.85	
12460	349.37	411.55	392.45	4.47	158.85	

XS IF 04   D = divided flow
XS IF 05   E = extended cross section
XS IF 06   C = critical depth
XS IF 07   S = X5 record

------Distance Check-----

SECNO: 9724
XS DT 01   Both right and left overbank distances are
           longer than the channel distance.

----Channel Width Check----

SECNO: 9256
XS CW 02   Channel width changes by a factor of two when compared to the
           the downstream cross section.

SECNO: 10125
XS CW 02   Channel width changes by a factor of two when compared to the
           the downstream cross section.

----Spacing Check----

----Ineffective Flow Area----

----Location Check----

----Discharge Check----

XS DC 02   Constant discharge used for the entire profile.

----Starting WSEL Check----

XS SW 02   Known water-surface elevation of 865.43 is specified on the first J1 record.

--End Program---

CHECK-2 Program: Bridge Module

Report File = S:\WATER\ANONTECH\ROCKY\MANNV.BR2
Date: 11/17/97
Time: 7:22:08 PM

SECNO	MXLCEL	MNREL	EG	CWSEL	ELMIN	Structure
8638	-----	-----	866.52	865.43	856.9	
8989	-----	-----	875.47	873.63	864	
9256	-----	-----	876.06	875.96	864	
9536	-----	-----	877.4	875.38	866	
9576	876.55	880.3	878.01	876.46	866	SB+X2
9724	-----	-----	878.68	878.57	865.7	
10125	-----	-----	878.93	878.89	867.2	
10492	-----	-----	879.32	879.12	869.4	
10912	-----	-----	880.35	880.19	872.6	
11619	-----	-----	884.92	883.74	876	
12068	-----	-----	888.03	887.76	878.8	
12460	-----	-----	889.65	889.36	882	

SECNO: 9576
Type Structure: Special Bridge
Type of Flow: Special Bridge Reverts to Normal Bridge Method

Section	SECNO	XLCH	CWSEL	EG	TOPWID	CHWID	X3 Left	X3 Right
1	9256	266.29	875.96	876.06	152.08	22.22		
2	9536	280.72	875.38	877.4	35.93	38.17	0	0
3	9576	40	876.46	878.01	39.99	36.63	0	0
4	9724	148.29	878.57	878.68	195.5	13.44		
5	10125	400.84	878.89	878.93	230.15	4.27		

EGLWC:	877.78	QLOW:	2000	WRLEN:	0		
EGPRS:	876.46	QPR:	0				
BR.WS:	0	QWEIR:	0				
BR.VEL:	0	Q:	2000				
MNLRDEL:	880.3	MXLCEL:	876.55	ELLC:	876.55		
MNRRDEL:	880.3	MNRDEL:	880.3	ELTRD:	880.3		
XK:	0	XKOR:	1.56	COFQ:	2.63		
RDELEN:	40	BWC:	15	BWP:	0		
BAREA:	300	SS:	1	ELCHU:	0	ELCHD:	0

---BT records Check---

SECNO: 9576
GR BT 01   Left channel bank station is not specified within the BT data.
           GR and BT data may not be aligned properly.

SECNO: 9576
GR BT 02   Right channel bank station is not specified within the BT data.
           GR and BT data may not be aligned properly.

---Location check---

---X2 record check---

---X3 record check---

SECNO: 9536
GR X3 16   Section 2; Area below 880 and beyond left encroachment station
           1263.51 will be not be considered in the backwater computations.

SECNO: 9536
GR X3 17   Section 2; Area below 880 and beyond right encroachment station
           1307.99 will be not be considered in the backwater computations.

SECNO: 9576
GR X3 16   Section 3; Area below 880 and beyond left encroachment station
           1338.01 will be not be considered in the backwater computations.

```
ECNO:      9576
R X3 17   Section 3; Area below  880  and beyond right encroachment station
            1378  will be not be considered in the backwater computations.

  --Low Flow Check---

SECNO:      9576
BR LF 09   ELCHU value is not given on SB record. ELMIN at section 2
            will be used as ELCHU.
  269.5521      300

BR LF 08   Trapezoidal Area is  269.5521 ; BAREA is  300
            The difference between the two should not be more than 10%.

SECNO:      9576
BR LF 12   Special Bridge, revert back to normal bridge routine.
            The bridge should be remodeled as normal bridge routine.
            If the structure is a box or circular culvert, please use
            special culvert option.

ECNO:      9576
R PF 04   Computed XKOR of 1.71 is different from the XKOR of 1.56 on field 2 of SB record.
            CHECK2 uses an n value of  0.03  , which is less than the channel n value
            at section 3 by 0.01. The data used in the XKOR computation are:
            n =  0.03 ; A = 269.55; P = 80.94; R = 3.33; L =  40 ; Kf = 0.21; Ke = 0.50
            If the data is correct, the XKOR in the input file should be changed.
            Otherwise, please give explanation on the data used to compute the XKOR in
            the report file.
            If the structure is a box or circular culvert, use special culvert routine.

---Message Check---


  --End Program---
```

```
====================
 B O S S   H E C - 2  (tm)
====================
```

Copyright (C) 1988-92 Boss Corporation
All Rights Reserved

Version   : 3.00
Serial Number : 0020213.250

Licensed to Short Elliot Hendrickson, Inc.

PROGRAM ORIGIN :

Boss Hec-2 (tm) is an enhanced version of the U.S. Army Corps of Engineers
Hydrologic Engineering Center HEC-2 program for water-surface profile
computations. Program based upon the September 1990 version, updated on
August 1991.

DISCLAIMER :

PROJECT DESCRIPTION :

PROJECT TITLE : RIVER FALLS FLOOD INSURANCE STUDY
PROJECT NUMBER : A-RIVER9601.00
DESCRIPTION   : MANN VALLEY
ENGINEER   : M RYE/ R KEEHN
DATE OF RUN   : 11/12/1997
TIME OF RUN   : 6:36 am

```
T1      A-RIVER9601.00
T2      RIVER FALLS FLOOD INSURANCE STUDY
T3      MANN VALLEY
T4      File Name is MANNV.HC2 (BOSS HEC-2)
T4      Work was completed by Short Elliott Hendrickson, Inc., St Paul, MN
T4      No previous FIS information had been prepared for this reach.

JOB PARAMETERS :
-----------------

J1  ICHECK    INQ    NINV    IDIR    STRT    METRIC    HVINS       Q     WSEL      FQ
        0       2       0       0     0.0         0      0.0    850.0   863.38

J2   NPROF   IPLOT   PRFVS   XSECV   XSECH      FN    ALLDC     IBW    CHNIM   ITRACE
         1       1     0.0     0.0     0.0     0.0     -1.0    -6.0      0.0       15

USER-DEFINED SUMMARY TABLES (J3) :
------------------------------------

       150      38      43       1      51       3      61       4      58
         2      38      43       1      52       8      39      14      13
        15      38       1      13      55      16      14      26      17
        15      18

REQUESTED CROSS-SECTION PRINTOUTS (J5) :
------------------------------------------
        56

FRICTION LOSS EQUATION OPTION (J6) :
--------------------------------------
       -10     -10     -10

J6    IHLEQ   ICOPY   SUBDIV   STRTDS   RMILE
          1       0      0.0

NC      0.07      0.07      0.04      0.1      0.3
M.V. @ 8638' N/KINN
M.V. @ 8638' N/KINN

X1      8638        14    1043.73    1047.62        0.0       0.0       0.0
GR     870.0    1000.0     868.0    1003.88     866.0    1009.02     864.0    1015.08     862.0    1020.99
GR     860.0    1034.46    858.9    1043.73     856.9    1045.53     858.9    1047.62     858.0    1050.39
GR     862.0    1061.77    864.0    1073.39     866.0    1122.45     868.0    1139.72     860.0     860.0
NC      0.07      0.07      0.04       0.0       0.0
X1      8989        16    1037.61    1041.57     350.86    348.96    351.46
```

```
BOSS HEC-2  version 3.00                                         PAGE   3
     PROJECT TITLE : RIVER FALLS FLOOD INSURANCE STUDY
     PROJECT NUMBER : A-RIVER9601.00                             11/12/1997

GR    880.0    1000.0     878.0   1005.67     876.0    1011.4     874.0   1017.12     872.0   1022.85
GR    870.0   1028.58     868.0   1034.18     866.0   1037.61     864.0   1039.73     866.0   1041.57
GR    868.0   1048.34     870.0   1058.07     872.0   1067.87     878.0   1077.63     878.0   1097.55
GR    880.0   1107.53

X1     9256       19   1094.53   1116.75    231.56    341.96    266.29
X3        0      0.0       0.0       0.0   1023.92    1176.0     880.0       0.0
GR    880.0    1000.0     878.0   1009.03     876.0   1015.08     874.0   1023.33     872.0   1044.36
GR    874.0   1065.53     866.0   1086.89    866.99   1094.53     866.0   1102.02     864.0   1104.16
GR    870.0   1106.85     866.0   1116.75     870.0   1126.94     865.7   1156.03    878.17    1176.0
GR    872.0   1186.64     874.0   1205.33     878.0    1219.6     878.0   1233.84     871.33

NC      0.0      0.0       0.0       0.5       0.3

C.T.H. MM BRIDGE
C.T.H. MM BRIDGE

X1     9536       16   1263.51   1338.54    310.97    217.22    280.72
X3        0      0.0       0.0       0.0   1307.99    880.0     880.0       0.0
GR   1000.0    882.0     880.0     878.0    1071.55   1207.55   876.25    1256.38   1263.51
GR   1266.36    866.0     868.0    867.8    1267.04   1269.32    868.0    1275.4    1283.51
GR   1294.78   876.06    878.0     880.0    1301.68   1307.5     880.0    1384.35   1463.98
GR   1557.89

NC      0.07      0.0       0.0       0.0      15.0        0.0
SB      1.56      2.63     40.0       0.0     300.0        0.0
1ST CROSS-SECTION NO. OF ROAD
1ST CROSS-SECTION NO. OF ROAD

X1     9576       15   1338.54   1375.17     40.0      40.0      40.0
X2        0        1    876.55    880.3      40.0      40.0
X3        0      0.0       0.0    1338.01   1378.0    1378.0     880.0     880.0       0.0
GR   1000.0    884.0     882.0     880.0    1124.69   1200.47    878.0    1258.07   1338.54
GR   1359.86    868.0     866.0    870.0    1361.93   1363.73    872.0    1371.19   1372.19
GR   1373.44    874.0     876.0    880.0    1375.17   1378.17    882.0    1467.73   1548.3

NC      0.1      0.04       0.0       0.0       0.0
X1     9724       19   1092.18   1105.62      0.0     150.3     148.29
GR    884.0    956.66     880.0     878.0    1071.55   1017.58   876.0    1029.29   1040.33
GR   1051.92    872.0     868.0    867.7    1166.54   1092.18   867.7    1101.21   1103.39
GR   1105.62    874.16    875.44   877.18    1221.87   1178.59   877.18   1195.02   1204.3
GR   1213.6     880.04    880.79   882.0                          1240.39

NC      0.1      0.04       0.0       0.3       0.0
X1    10125       21   1112.51   1116.78      0.1     462.31    400.84
GR    892.0    785.08     891.2     890.78    845.6     876.83   890.2     920.21    935.06
GR   1000.0    880.0     878.0     876.0    1011.1     1022.18   874.0    1035.84   1051.8
GR   1091.62    870.0     869.2    874.0    1112.51    1114.61   869.2    1116.78   1143.71
GR   1167.1     874.0     876.0    878.0    1200.01    1220.64   878.0    1232.2    1251.59
GR   1269.82

NC      0.07     0.04       0.0       0.0       0.0
X1    10492       17   1057.63   1062.29    370.23    360.72    366.8
```

```
GR   886.0    974.22   882.37    989.83   880.0   1000.0    878.0   1007.16   876.0   1014.67
GR   874.0   1023.47   872.0    1038.62   871.4   1057.63   869.4   1059.89   871.4   1062.29
GR   872.0   1083.53   874.0    1092.27   876.0   1100.59   878.0   1108.79   880.0   1117.11
GR   883.54  1133.76   888.0    1154.78

NC    0.07     0.07      0.04
X1   10912      20     1138.67      0.0   399.8    453.69   420.48      1.0      0.0
GR   890.0    1000.0   888.0    1009.18   886.0   1018.45   884.0   1027.75   882.0   1036.98
GR   880.0   1047.25   878.0    1065.11   876.0   1095.24   874.6   1138.67   872.6   1140.69
GR   874.6   1143.05   876.0    1181.45   878.0   1206.95   880.0   1228.55   882.0   1245.37
GR   884.0   1262.37   886.0    1278.3    888.0   1289.94   890.0   1332.2    890.0   1357.42

NC    0.07     0.07      0.04
X1   11619      15     1088.14      0.0   724.54   685.2    706.87      1.0      0.0
GR   890.0    1000.0   888.0    1022.25   886.0   1032.68   884.0   1043.06   882.0   1054.41
GR   880.0   1061.91   878.0    1088.14   876.0   1089.87   878.0   1091.95   880.0   1100.9
GR   882.0   1110.93   884.0    1121.7    886.0   1133.81   888.0   1145.77   890.0   1165.74

NC    0.07     0.07      0.04
X1   12068      16     1055.59      0.0   470.13   435.88   448.72      1.0      0.0
GR   892.0    866.75   890.0     967.8    888.0   1000.0    886.0   1012.52   884.0   1020.08
GR   882.0   1031.11   880.8    1055.59   878.8   1057.79   880.8   1059.57   882.0   1082.63
GR   884.0   1093.33   886.0    1103.29   888.0   1113.65   890.0   1124.53   892.0   1145.5
GR   894.0   1216.73

NC    0.07     0.07      0.04      0.0
     MOST UPSTREAM C.S.
MOST UPSTREAM C.S.

X1   12460      16     1087.71      0.0   349.37   411.55   392.45      1.0      0.0
GR   892.0    829.24   892.0     872.42   890.0    943.19   890.0   1000.0    888.0   1034.25
GR   886.0   1058.23   884.0    1082.67   884.0   1087.71   882.0   1089.98   884.0   1092.18
GR   884.0   1097.25   886.0    1142.2    888.0   1158.45   890.0   1175.04   892.0   1204.63
GR   894.0   1244.82
```

STATUS: Friction loss equation index (IHLEQ) = 1. Therefore friction
        loss (HL) is calculated as a function of the profile type, which
        can vary from reach to reach. See documentation for further
        details.

FLOW DISTRIBUTION :

Cross-Section Number (SECNO)
Total Discharge (cfs, Q)   8638.000
                                                             .850
Computed Water Surface Elevation (ft MSL, CWSEL)   863.38

Station (ft) =	1016.9	1021.0	1034.5	1043.7	1047.6	1050.4
Flow (%) =		.7	17.8	28.4	28.6	8.1
Area (sq ft) =		2.8	32.1	36.4	21.3	10.9
Vel (ft/s) =		2.01	4.73	6.62	11.42	6.34
Depth (ft) =		.69	2.38	3.93	5.48	3.93

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```
Station (ft) =      1050.4     1061.8     1069.8
     Flow (%)      =             15.0        1.3
     Area (sq ft)  =             27.1        5.5
     Vel (ft/s)    =              4.71       2.07
     Depth (ft)    =              2.38        .69
```

FLOW DISTRIBUTION :

```
Cross-Section Number (SECNO)                           8989.000
Total Discharge (cfs, Q)                                 850
Computed Water Surface Elevation (ft MSL, CWSEL)         871.44
```

```
Station (ft) =      1024.5     1028.6     1034.2     1037.6     1041.6     1048.3
     Flow (%)      =              .7        7.6       12.0       39.3       25.4
     Area (sq ft)  =             3.0       13.7       15.2       25.5       30.0
     Vel (ft/s)    =             2.11       4.76       6.70      13.10       7.18
     Depth (ft)    =              .72       2.44       4.44       6.44       4.44
```

```
Station (ft) =      1048.3     1058.1     1065.1
     Flow (%)      =             13.6        1.3
     Area (sq ft)  =             23.7        5.1
     Vel (ft/s)    =              4.89       2.17
     Depth (ft)    =              2.44        .72
```

FLOW DISTRIBUTION :

```
Cross-Section Number (SECNO)                           9256.000
Total Discharge (cfs, Q)                                 850
Computed Water Surface Elevation (ft MSL, CWSEL)         873.09
```

```
Station (ft) =      1032.8     1044.4     1065.5     1086.9     1094.5     1116.8
     Flow (%)      =              .2        3.7       11.5        6.9       48.3
     Area (sq ft)  =             6.3       44.4       87.5       42.8      153.9
     Vel (ft/s)    =              .29        .72       1.12       1.38       2.67
     Depth (ft)    =              .55       2.10       4.10       5.60       6.93
```

```
Station (ft) =      1116.8     1126.9     1156.0     1176.0
     Flow (%)      =              9.3       15.7        4.3
     Area (sq ft)  =             57.1      119.2       48.6
     Vel (ft/s)    =             1.38       1.12        .75
     Depth (ft)    =             5.60       4.10       2.43
```

FLOW DISTRIBUTION :

```
Cross-Section Number (SECNO)                           9536.000
Total Discharge (cfs, Q)                                 850
Computed Water Surface Elevation (ft MSL, CWSEL)         873.80
```

```
Station (ft) =    1264.3    1301.7
     Flow (%)    =   100.0
     Area (sq ft) =  122.8
     Vel (ft/s)  =    6.92
     Depth (ft)  =    4.01
```

FLOW DISTRIBUTION :
- - - - - - - - - - -

```
Cross-Section Number (SECNO)                                    9576.000
Total Discharge (cfs, Q)                                             850
Computed Water Surface Elevation (ft MSL, CWSEL)                  874.06
```

```
Station (ft) =    1343.7    1375.2
     Flow (%)    =   100.0
     Area (sq ft) =  118.5
     Vel (ft/s)  =    7.17
     Depth (ft)  =    3.98
```

FLOW DISTRIBUTION :
- - - - - - - - - - -

```
Cross-Section Number (SECNO)                                    9724.000
Total Discharge (cfs, Q)                                             850
Computed Water Surface Elevation (ft MSL, CWSEL)                  875.17
```

```
Station (ft) =    1033.9    1040.3    1051.9    1071.6    1092.2    1105.6
     Flow (%)    =              .1       1.8       9.2      18.6      40.8
     Area (sq ft) =            3.8      25.2      81.9     127.3     103.5
     Vel (ft/s)  =             .26       .61       .96      1.24      3.35
     Depth (ft)  =             .59      2.17      4.17      6.17      7.70

Station (ft) =    1105.6    1166.5    1176.1
     Flow (%)    =    29.3        .1
     Area (sq ft) =  258.3       4.8
     Vel (ft/s)  =     .97       .23
     Depth (ft)  =    4.24       .51
```

FLOW DISTRIBUTION :
- - - - - - - - - - -

```
Cross-Section Number (SECNO)                                   10125.000
Total Discharge (cfs, Q)                                             850
Computed Water Surface Elevation (ft MSL, CWSEL)                  875.50
```

```
Station (ft) =    1025.6    1035.8    1051.8    1091.6    1112.5    1116.8
     Flow (%)    =              .3       3.4      22.5      18.5      10.9
     Area (sq ft) =            7.6      39.8     178.9     123.1      31.1
     Vel (ft/s)  =             .32       .72      1.07      1.28      2.99
     Depth (ft)  =             .75      2.49      4.49      5.89      7.29
```

FLOW DISTRIBUTION :
- - - - - - - - - - -

```
Station (ft) =   1116.8   1143.7   1167.1   1200.0   1215.4
   Flow (%)  =              23.9     13.2      7.0       .4
   Area (sq ft) =          158.7    105.1     82.1     11.5
   Vel (ft/s) =             1.28     1.06      .72      .32
   Depth (ft) =             5.89     4.49     2.49      .75
```

FLOW DISTRIBUTION :

```
Cross-Section Number (SECNO)                             10492.000
Total Discharge (cfs, Q)                                       850
Computed Water Surface Elevation (ft MSL, CWSEL)            876.05

Station (ft) =   1014.5   1023.5   1038.6   1057.6   1062.3   1083.5
   Flow (%)  =              1.2     12.7     29.1     16.1     32.5
   Area (sq ft) =           9.2     46.1     82.6     26.3     92.2
   Vel (ft/s) =            1.14     2.35     2.99     5.19     2.99
   Depth (ft) =            1.02     3.04     4.34     5.64     4.34

Station (ft) =   1083.5   1092.3   1100.6
   Flow (%)  =              7.3      1.2
   Area (sq ft) =          26.6      8.7
   Vel (ft/s) =            2.32     1.14
   Depth (ft) =            3.04     1.04
```

FLOW DISTRIBUTION :

```
Cross-Section Number (SECNO)                             10912.000
Total Discharge (cfs, Q)                                       850
Computed Water Surface Elevation (ft MSL, CWSEL)            877.89

Station (ft) =   1066.8   1095.2   1138.7   1143.1   1181.4   1205.6
   Flow (%)  =              5.0     40.9     13.7     36.2      4.2
   Area (sq ft) =          26.9    112.5     18.8     99.5     22.8
   Vel (ft/s) =            1.58     3.09     6.19     3.09     1.58
   Depth (ft) =             .95     2.59     4.29     2.59      .95
```

FLOW DISTRIBUTION :

```
Cross-Section Number (SECNO)                             11619.000
Total Discharge (cfs, Q)                                       850
Computed Water Surface Elevation (ft MSL, CWSEL)            882.67

Station (ft) =   1050.6   1054.4   1061.9   1088.1   1091.9   1100.9
   Flow (%)  =               .1      3.9     51.8     21.2     17.4
   Area (sq ft) =           1.3     12.6     96.4     21.6     32.9
   Vel (ft/s) =             .92     2.65     4.57     8.35     4.50
   Depth (ft) =             .34     1.68     3.68     5.68     3.68
```

```
Station (ft) =        1100.9      1110.9      1114.6
     Flow (%)    =         5.3         1.2
     Area (sq ft) =       16.8        2.68         .1
     Vel (ft/s)  =        2.68         .92
     Depth (ft)  =        1.68         .34
```

FLOW DISTRIBUTION :
- - - - - - - - - - - -

```
Cross-Section Number (SECNO)                                          12068.000
Total Discharge (cfs, Q)                                                    850
Computed Water Surface Elevation (ft MSL, CWSEL)                        885.31
```

```
Station (ft) =        1015.1      1020.1      1031.1      1055.6      1059.6      1082.6
     Flow (%)    =          .4         6.8        36.6        14.6        34.5
     Area (sq ft) =        3.3        25.6        95.9        22.0        90.4
     Vel (ft/s)  =         .97        2.26        3.25        5.65        3.24
     Depth (ft)  =         .66        2.32        3.92        5.52        3.92
```

```
Station (ft) =        1082.6      1093.3      1099.9
     Flow (%)    =         6.6          .5
     Area (sq ft) =       24.8         4.3
     Vel (ft/s)  =        2.26         .98
     Depth (ft)  =        2.32         .66
```

FLOW DISTRIBUTION :
- - - - - - - - - - - -

```
Cross-Section Number (SECNO)                                          12460.000
Total Discharge (cfs, Q)                                                    850
Computed Water Surface Elevation (ft MSL, CWSEL)                        887.40
```

```
Station (ft) =        1041.4      1058.2      1082.7      1087.7      1092.2      1097.3
     Flow (%)    =         2.0        22.4         8.3        16.3         8.3
     Area (sq ft) =       11.8        58.7        17.1        19.7        17.2
     Vel (ft/s)  =        1.43        3.25        4.11        7.02        4.11
     Depth (ft)  =         .70        2.40        3.40        4.40        3.40
```

```
Station (ft) =        1097.3      1142.2      1153.6
     Flow (%)    =        41.4         1.3
     Area (sq ft) =      107.9         8.0
     Vel (ft/s)  =        3.26        1.43
     Depth (ft)  =        2.40         .70
```

```
T1    A-RIVER9601.00
T2    RIVER FALLS FLOOD INSURANCE STUDY
T3    MANN VALLEY
```

JOB PARAMETERS :

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	3	0	0	0.0	0	0.0	1650.0	864.94	

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	2	1	0.0	0.0	0.0	0.0	-1.0	-6.0	0.0	15

STATUS: Friction loss equation index (IHLEQ) = 1. Therefore friction
        loss (HL) is calculated as a function of the profile type, which
        can vary from reach to reach. See documentation for further
        details.

FLOW DISTRIBUTION :

Cross-Section Number (SECNO)   8638.000
Total Discharge (cfs, Q)   1650
Computed Water Surface Elevation (ft MSL, CWSEL)   864.94

Station (ft) =	1012.2	1015.1	1021.0	1034.5	1043.7	1047.6
Flow (%) =		.1	2.7	20.5	24.5	21.5
Area (sq ft) =		1.3	11.5	53.1	50.9	27.4
Vel (ft/s) =		1.50	3.85	6.36	7.96	12.97
Depth (ft) =		.47	1.94	3.94	5.49	7.04

Station (ft) =	1047.6	1050.4	1061.8	1073.4	1096.4
Flow (%) =		7.0	17.2	5.4	1.0
Area (sq ft) =		15.2	44.8	22.5	10.8
Vel (ft/s) =		7.61	6.34	3.96	1.55
Depth (ft) =		5.49	3.94	1.94	.47

FLOW DISTRIBUTION :

Cross-Section Number (SECNO)   8989.000
Total Discharge (cfs, Q)   1650
Computed Water Surface Elevation (ft MSL, CWSEL)   873.09

Station (ft) =	1019.7	1022.8	1028.6	1034.2	1037.6	1041.6
Flow (%) =		.2	3.2	9.6	10.8	30.4
Area (sq ft) =		1.7	12.0	22.9	20.9	32.0
Vel (ft/s) =		1.81	4.42	6.90	8.50	15.66
Depth (ft) =		.55	2.09	4.09	6.09	8.09

```
Station (ft) =    1041.6    1048.3    1058.1    1067.9    1073.2
   Flow (%)    =              22.8      17.1       5.6       2.3
   Area (sq ft)=              41.2      39.8      20.5       2.9
   Vel (ft/s)  =               9.11      7.09      4.53      1.85
   Depth (ft)  =               6.09      4.09      2.09       .55
```

FLOW DISTRIBUTION :

```
Cross-Section Number (SECNO)                                    9256.000
Total Discharge (cfs, Q)                                            1650
Computed Water Surface Elevation (ft MSL, CWSEL)                  875.14

Station (ft) =    1023.9    1044.4    1065.5    1086.9    1094.5    1116.8
   Flow (%)    =               2.0       6.4      12.5       6.4      41.0
   Area (sq ft)=              44.3      87.6     131.1      58.4     199.3
   Vel (ft/s)  =                .75      1.21      1.57      1.81      3.39
   Depth (ft)  =               2.17      4.14      6.14      7.64      8.97

Station (ft) =    1116.8    1126.9    1156.0    1176.0
   Flow (%)    =               8.6      17.0       6.1
   Area (sq ft)=              77.9     178.6      89.3
   Vel (ft/s)  =               1.82      1.57      1.13
   Depth (ft)  =               7.64      6.14      4.47
```

FLOW DISTRIBUTION :

```
Cross-Section Number (SECNO)                                    9536.000
Total Discharge (cfs, Q)                                            1650
Computed Water Surface Elevation (ft MSL, CWSEL)                  875.79

Station (ft) =    1263.6    1301.7
   Flow (%)    =    100.0
   Area (sq ft)=    190.5
   Vel (ft/s)  =      8.66
   Depth (ft)  =      5.11
```

FLOW DISTRIBUTION :

```
Cross-Section Number (SECNO)                                    9576.000
Total Discharge (cfs, Q)                                            1650
Computed Water Surface Elevation (ft MSL, CWSEL)                  876.09

Station (ft) =    1338.0    1375.2    1378.0
   Flow (%)    =    100.0        .0
   Area (sq ft)=    186.3        .3
   Vel (ft/s)  =      8.85       .39
   Depth (ft)  =      5.09       .10
```

FLOW DISTRIBUTION :

Cross-Section Number (SECNO)
Total Discharge (cfs, Q)   9724.000
                                                        1650
Computed Water Surface Elevation (ft MSL, CWSEL)   877.72

Station (ft) =	1019.2	1029.3	1040.3	1051.9	1071.6	1092.2
Flow (%) =	.2	1.3	3.4	10.3	16.8	
Area (sq ft) =	8.6	30.0	54.7	131.8	179.8	
Vel (ft/s) =	.33	.70	1.01	1.29	1.54	
Depth (ft) =	.86	2.72	4.72	6.72	8.72	

Station (ft) =	1092.2	1105.6	1166.5	1178.6	1195.0	1200.0
Flow (%) =	33.3	32.6	1.6	.6		.0
Area (sq ft) =	137.7	413.4	35.1	23.1		1.3
Vel (ft/s) =	3.99	1.30	.74	.46		.15
Depth (ft) =	10.24	6.79	2.92	1.41		.27

FLOW DISTRIBUTION :

Cross-Section Number (SECNO)
Total Discharge (cfs, Q)   10125.000
                                                        1650
Computed Water Surface Elevation (ft MSL, CWSEL)   878.03

Station (ft) =	1010.9	1051.8	1091.6	1112.5	1116.8	1143.7
Flow (%) =	7.1	22.1	15.7	8.4	20.2	
Area (sq ft) =	133.0	279.8	176.0	42.0	226.9	
Vel (ft/s) =	.89	1.30	1.47	3.30	1.47	
Depth (ft) =	3.26	7.03	8.43	9.83	8.43	

Station (ft) =	1143.7	1167.1	1200.0	1232.2
Flow (%) =	13.0	10.4	3.1	
Area (sq ft) =	164.4	165.5	74.3	
Vel (ft/s) =	1.30	1.04	.68	
Depth (ft) =	7.03	5.03	2.31	

FLOW DISTRIBUTION :

Cross-Section Number (SECNO)
Total Discharge (cfs, Q)   10492.000
                                                        1650
Computed Water Surface Elevation (ft MSL, CWSEL)   878.40

Station (ft) =	1005.7	1014.7	1023.5	1038.6	1057.6	1062.3
Flow (%) =	.8	3.9	14.5	26.2	12.6	
Area (sq ft) =	10.8	29.9	81.8	127.4	37.3	
Vel (ft/s) =	1.15	2.13	2.93	3.40	5.57	
Depth (ft) =	1.21	3.40	5.40	6.70	8.00	

```
Station (ft) =       1062.3    1083.5    1092.3    1100.6    1108.8    1110.5
   Flow (%)      =               29.3       8.3       3.6        .8        .0
   Area (sq ft)  =              142.4      47.2      28.3      11.5        .3
   Vel (ft/s)    =               3.40      2.89      2.12      1.17       .32
   Depth (ft)    =               6.70      5.40      3.40      1.40       .20
```

FLOW DISTRIBUTION :
- - - - - - - - - -

```
Cross-Section Number (SECNO)                                          10912.000
Total Discharge (cfs, Q)                                                   1650
Computed Water Surface Elevation (ft MSL, CWSEL)                         879.57
```

```
Station (ft) =       1051.1    1065.1    1095.2    1138.7    1143.1    1181.4
   Flow (%)      =                 .7      10.9      36.7       9.2      32.4
   Area (sq ft)  =               11.1      77.6     185.6      26.2     164.1
   Vel (ft/s)    =               1.05      2.32      3.26      5.82      3.26
   Depth (ft)    =                .79      2.57      4.27      5.97      4.27
```

```
Station (ft) =       1181.4    1206.9    1223.9
   Flow (%)      =                9.2        .9
   Area (sq ft)  =               65.6      13.4
   Vel (ft/s)    =               2.32      1.05
   Depth (ft)    =               2.57       .79
```

FLOW DISTRIBUTION :
- - - - - - - - - -

```
Cross-Section Number (SECNO)                                          11619.000
Total Discharge (cfs, Q)                                                   1650
Computed Water Surface Elevation (ft MSL, CWSEL)                         883.73
```

```
Station (ft) =       1044.6    1054.4    1061.9    1088.1    1091.9    1100.9
   Flow (%)      =                1.1       5.6      50.0      17.9      16.8
   Area (sq ft)  =                8.5      20.4     124.0      25.6      42.3
   Vel (ft/s)    =               2.12      4.52      6.66     11.52      6.56
   Depth (ft)    =                .86      2.73      4.73      6.73      4.73
```

```
Station (ft) =       1100.9    1110.9    1120.2
   Flow (%)      =                7.6       1.0
   Area (sq ft)  =               27.3       8.0
   Vel (ft/s)    =               4.56      2.12
   Depth (ft)    =               2.73       .86
```

FLOW DISTRIBUTION :
- - - - - - - - - -

```
Cross-Section Number (SECNO)                                          12068.000
Total Discharge (cfs, Q)                                                   1650
Computed Water Surface Elevation (ft MSL, CWSEL)                         886.99
```

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PROJECT TITLE : RIVER FALLS FLOOD INSURANCE STUDY
PROJECT NUMBER : A-RIVER9601.00   11/12/1997

```
Station (ft) =   1006.3   1012.5   1020.1   1031.1   1055.6   1059.6
  Flow (%)    =               .2      1.9      8.7     34.3     11.7
  Area (sq ft)=              3.1     15.0     44.0    136.8     28.6
  Vel (ft/s)  =              .81     2.03     3.27     4.13     6.77
  Depth (ft)  =              .49     1.99     3.99     5.59     7.19

Station (ft) =   1059.6   1082.6   1093.3   1103.3   1108.4
  Flow (%)    =             32.3      8.4      2.5       .1
  Area (sq ft)=            128.9     42.7     19.8      2.5
  Vel (ft/s)  =             4.13     3.26     2.05      .81
  Depth (ft)  =             5.59     3.99     1.99      .49
```

FLOW DISTRIBUTION :

```
Cross-Section Number (SECNO)                              12460.000
Total Discharge (cfs, Q)                                      1650
Computed Water Surface Elevation (ft MSL, CWSEL)            888.82

Station (ft) =   1020.2   1034.3   1058.2   1082.7   1087.7   1092.2
  Flow (%)    =               .3      6.4     22.3      6.8     11.9
  Area (sq ft)=              5.8     43.7     93.4     24.3     26.0
  Vel (ft/s)  =              .89     2.40     3.94     4.61     7.52
  Depth (ft)  =              .41     1.82     3.82     4.82     5.82

Station (ft) =   1092.2   1097.3   1142.2   1158.4   1165.3
  Flow (%)    =              6.8     41.1      4.3       .2
  Area (sq ft)=             24.4    171.8     29.6      2.8
  Vel (ft/s)  =             4.61     3.95     2.40      .89
  Depth (ft)  =             4.82     3.82     1.82      .41
```

T1   A-RIVER9601.00
T2   RIVER FALLS FLOOD INSURANCE STUDY
T3   MANN VALLEY

JOB PARAMETERS :

	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	WSEL	FQ
J1	0	4	0	0	0.0	0	0.0	865.43	

	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	Q	ITRACE
J2	3	1	0.0	0.0	0.0	0.0	-1.0	-6.0	0.0	2000.0	15

STATUS: Friction loss equation index (IHLEQ) = 1. Therefore friction
         loss (HL) is calculated as a function of the profile type, which
         can vary from reach to reach. See documentation for further
         details.

FLOW DISTRIBUTION :
- - - - - - - - - - - - - - - - -

Cross-Section Number (SECNO)   8638.000
Total Discharge (cfs, Q)   2000
Computed Water Surface Elevation (ft MSL, CWSEL)   865.43

Station (ft) =	1010.7	1015.1	1021.0	1034.5	1043.7	1047.6
Flow (%)		.3	3.2	20.5	23.3	19.8
Area (sq ft)	=	3.1	14.4	59.7	55.4	29.3
Vel (ft/s)	=	1.98	4.46	6.86	8.40	13.53
Depth (ft)	=	.71	2.43	4.43	5.98	7.53

Station (ft) =	1047.6	1050.4	1061.8	1073.4	1108.5
Flow (%)	=	6.7	17.2	6.5	2.6
Area (sq ft)	=	16.6	50.4	28.2	25.1
Vel (ft/s)	=	8.04	6.84	4.58	2.05
Depth (ft)	=	5.98	4.43	2.43	.71

FLOW DISTRIBUTION :
- - - - - - - - - - - - - - - - -

Cross-Section Number (SECNO)   8989.000
Total Discharge (cfs, Q)   2000
Computed Water Surface Elevation (ft MSL, CWSEL)   873.63

Station (ft) =	1018.2	1022.8	1028.6	1034.2	1037.6	1041.6
Flow (%)		.5	3.9	9.8	10.3	28.3
Area (sq ft)	=	3.8	15.1	25.9	22.7	34.2
Vel (ft/s)	=	2.39	5.21	7.59	9.10	16.55
Depth (ft)	=	.82	2.63	4.63	6.63	8.63

Station (ft) =	1041.6	1048.3	1058.1	1067.9	1075.8
Flow (%)	=	21.9	17.6	6.9	.8
Area (sq ft)	=	44.9	45.1	25.8	6.5
Vel (ft/s)	=	9.76	7.79	5.34	2.45
Depth (ft)	=	6.63	4.63	2.63	.82

FLOW DISTRIBUTION :
- - - - - - - - - - - - - - - - -

Cross-Section Number (SECNO)   9256.000
Total Discharge (cfs, Q)   2000
Computed Water Surface Elevation (ft MSL, CWSEL)   875.83

Station (ft) =	1023.9	1044.4	1065.5	1086.9	1094.5	1116.8
Flow (%)		2.7	7.0	12.6	6.3	39.3
Area (sq ft)	=	58.4	102.2	145.9	63.7	214.6
Vel (ft/s)	=	.91	1.37	1.73	1.97	3.66
Depth (ft)	=	2.86	4.83	6.83	8.33	9.66

```
Station (ft) =      1116.8    1126.9    1156.0    1176.0
   Flow (%)    =              8.4      17.2       6.5
   Area (sq ft) =            84.9     198.6     103.1
   Vel (ft/s)  =             1.98      1.73      1.26
   Depth (ft)  =             8.33      6.83      5.16
```

FLOW DISTRIBUTION :
- - - - - - - - -

```
Cross-Section Number (SECNO)                          9536.000
Total Discharge (cfs, Q)                                  2000
Computed Water Surface Elevation (ft MSL, CWSEL)        876.42
```

```
Station (ft) =      1263.5    1301.7    1302.8
   Flow (%)    =             100.0       .0
   Area (sq ft) =           214.4        .2
   Vel (ft/s)  =             9.33        .60
   Depth (ft)  =             5.62        .18
```

FLOW DISTRIBUTION :
- - - - - - - - -

```
Cross-Section Number (SECNO)                          9576.000
Total Discharge (cfs, Q)                                  2000
Computed Water Surface Elevation (ft MSL, CWSEL)        876.87
```

```
Station (ft) =      1338.0    1338.5    1375.2    1378.0
   Flow (%)    =              .0      99.9        .1
   Area (sq ft) =            .3      203.0       1.6
   Vel (ft/s)  =             .96      9.84      1.20
   Depth (ft)  =             .54      5.54        .55
```

FLOW DISTRIBUTION :
- - - - - - - - -

```
Cross-Section Number (SECNO)                          9724.000
Total Discharge (cfs, Q)                                  2000
Computed Water Surface Elevation (ft MSL, CWSEL)        878.86
```

```
Station (ft) =    1010.1   1017.6   1029.3   1040.3   1051.9   1071.6
   Flow (%)    =            .0       .6      1.8      3.8     10.4
   Area (sq ft) =          3.2     21.7     42.6     67.9    154.2
   Vel (ft/s)  =           .19      .51      .84     1.11     1.35
   Depth (ft)  =           .43     1.86     3.86     5.86     7.86
```

```
Station (ft) =    1071.6   1092.2   1105.6   1166.5   1178.6   1195.0
   Flow (%)    =          16.0     30.9     32.8      2.1      1.3
   Area (sq ft) =        203.3    153.0    482.9     48.9     41.8
   Vel (ft/s)  =         1.57     4.04     1.36      .87      .64
   Depth (ft)  =         9.86    11.38     7.93     4.06     2.55
```

```
Station (ft) =    1195.0      1204.3      1210.7
     Flow (%)     =                .2          .0
     Area (sq ft) =     11.0      11.0         2.2
     Vel (ft/s)   =      .38       .38         .17
     Depth (ft)   =     1.18      1.18         .34
```

FLOW DISTRIBUTION :

```
Cross-Section Number (SECNO)                                 10125.000
Total Discharge (cfs, Q)                                         2000
Computed Water Surface Elevation (ft MSL, CWSEL)              879.14

Station (ft) =    1004.8      1035.8      1051.8      1091.6      1112.5      1116.8
     Flow (%)     =      3.1         5.4        21.7        14.8         7.7
     Area (sq ft) =     83.8        98.0       324.1       199.3        46.7
     Vel (ft/s)   =      .73        1.10        1.34        1.49        3.30
     Depth (ft)   =     2.70        6.14        8.14        9.54       10.94

Station (ft) =    1116.8      1143.7      1167.1      1200.0      1220.6      1237.6
     Flow (%)     =     19.1        12.7        11.2         3.6          .7
     Area (sq ft) =    256.9       190.4       202.0        85.4        27.8
     Vel (ft/s)   =     1.49        1.33        1.11         .85         .51
     Depth (ft)   =     9.54        8.14        6.14        4.14        1.64
```

FLOW DISTRIBUTION :

```
Cross-Section Number (SECNO)                                 10492.000
Total Discharge (cfs, Q)                                         2000
Computed Water Surface Elevation (ft MSL, CWSEL)              879.44

Station (ft) =    1002.0      1007.2      1014.7      1023.5      1038.6      1057.6
     Flow (%)     =       .1         1.4         4.5        14.7        25.2
     Area (sq ft) =      3.7        18.3        39.1        97.5       147.1
     Vel (ft/s)   =      .68        1.55        2.32        3.01        3.42
     Depth (ft)   =      .72        2.44        4.44        6.44        7.74

Station (ft) =    1057.6      1062.3      1083.5      1092.3      1100.6      1108.8
     Flow (%)     =     11.6        28.1         8.4         4.3         1.6
     Area (sq ft) =     42.1       164.4        56.3        36.9        20.0
     Vel (ft/s)   =     5.52        3.42        2.98        2.32        1.55
     Depth (ft)   =     9.04        7.74        6.44        4.44        2.44

Station (ft) =    1108.8      1114.8
     Flow (%)     =       .1
     Area (sq ft) =      4.3
     Vel (ft/s)   =      .69
     Depth (ft)   =      .72
```

FLOW DISTRIBUTION :

Cross-Section Number (SECNO)   10912.000
Total Discharge (cfs, Q)   2000
Computed Water Surface Elevation (ft MSL, CWSEL)   880.37

Station (ft) =   1045.3   1065.1   1095.2   1138.7   1143.1   1181.4
    Flow (%)   =   1.6   12.2   34.9   8.1   30.8
    Area (sq ft) =   24.9   101.6   220.3   29.7   194.8
    Vel (ft/s) =   1.31   2.41   3.16   5.48   3.16
    Depth (ft) =   1.26   3.37   5.07   6.77   5.07

Station (ft) =   1181.4   1206.9   1228.6   1231.7
    Flow (%)   =   10.4   2.0   .0
    Area (sq ft) =   86.0   29.7   .6
    Vel (ft/s) =   2.41   1.32   .35
    Depth (ft) =   3.37   1.37   .19

FLOW DISTRIBUTION :

Cross-Section Number (SECNO)   11619.000
Total Discharge (cfs, Q)   2000
Computed Water Surface Elevation (ft MSL, CWSEL)   884.06

Station (ft) =   1042.8   1054.4   1061.9   1088.1   1091.9   1100.9
    Flow (%)   =   1.6   6.0   49.3   17.1   16.6
    Area (sq ft) =   12.0   22.9   132.6   26.9   45.2
    Vel (ft/s) =   2.60   5.20   7.44   12.70   7.33
    Depth (ft) =   1.03   3.06   5.06   7.06   5.06

Station (ft) =   1100.9   1110.9   1121.7
    Flow (%)   =   8.1   1.5
    Area (sq ft) =   30.6   11.4
    Vel (ft/s) =   5.26   2.59
    Depth (ft) =   3.06   1.06

FLOW DISTRIBUTION :

Cross-Section Number (SECNO)   12068.000
Total Discharge (cfs, Q)   2000
Computed Water Surface Elevation (ft MSL, CWSEL)   887.56

Station (ft) =   1002.7   1012.5   1020.1   1031.1   1055.6   1059.6
    Flow (%)   =   .4   2.3   9.0   33.4   11.1
    Area (sq ft) =   7.7   19.4   50.3   150.9   30.9
    Vel (ft/s) =   1.11   2.42   3.59   4.43   7.16
    Depth (ft) =   .78   2.56   4.56   6.16   7.76

```
Station (ft) =      1059.6    1082.6    1093.3    1103.3    1111.4
    Flow (%)     =       31.5       8.8       3.1        .4
    Area (sq ft) =      142.1      48.8      25.5       6.3
    Vel (ft/s)   =       4.43      3.59      2.44      1.11
    Depth (ft)   =       6.16      4.56      2.56       .78
```

FLOW DISTRIBUTION :
- - - - - - - - - - - -

```
Cross-Section Number (SECNO)                          12460.000
Total Discharge (cfs, Q)                                  2000
Computed Water Surface Elevation (ft MSL, CWSEL)       889.34

Station (ft) =      1011.3    1034.3    1058.2    1082.7    1087.7    1092.2
    Flow (%)     =        .9        7.7       21.9       6.4       10.8
    Area (sq ft) =       15.4      56.2      106.1      26.9      28.4
    Vel (ft/s)   =       1.19      2.73       4.12      4.74      7.65
    Depth (ft)   =        .67      2.34       4.34      5.34      6.34

Station (ft) =      1092.2    1097.3    1142.2    1158.4    1169.6
    Flow (%)     =        6.4      40.3       5.2        .4
    Area (sq ft) =       27.1     195.2      38.1       7.5
    Vel (ft/s)   =       4.74      4.13       2.72      1.18
    Depth (ft)   =       5.34      4.34       2.34       .67
```

```
T1    A-RIVER9601.00
T2    RIVER FALLS FLOOD INSURANCE STUDY
T3    MANN VALLEY
```

JOB PARAMETERS :
- - - - - - - - - - -

	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
J1	0	5	0	0	0.0	0	0.0	2800.0	866.3	

	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
J2	15	1	0.0	0.0	0.0	0.0	-1.0	-6.0	0.0	15

STATUS: Friction loss equation index (IHLEQ) = 1. Therefore friction
        loss (HL) is calculated as a function of the profile type, which
        can vary from reach to reach. See documentation for further
        details.

FLOW DISTRIBUTION :

Cross-Section Number (SECNO)
Total Discharge (cfs, Q)
Computed Water Surface Elevation (ft MSL, CWSEL)

8638.000
2800
866.30

Station (ft) =	1008.2	1015.1	1021.0	1034.5	1043.7	1047.6
Flow (%) =		.8	3.8	19.8	21.0	17.1
Area (sq ft) =		8.0	19.5	71.4	63.5	32.7
Vel (ft/s) =		2.93	5.51	7.78	9.25	14.64
Depth (ft) =		1.17	3.30	5.30	6.85	8.40

Station (ft) =	1047.6	1050.4	1061.8	1073.4	1122.4	1125.0
Flow (%) =		6.0	16.7	7.7	7.0	.0
Area (sq ft) =		19.0	60.3	38.3	63.8	.4
Vel (ft/s) =		8.85	7.75	5.66	3.07	.72
Depth (ft) =		6.85	5.30	3.30	1.30	.15

FLOW DISTRIBUTION :

Cross-Section Number (SECNO)
Total Discharge (cfs, Q)
Computed Water Surface Elevation (ft MSL, CWSEL)

8989.000
2800
874.71

Station (ft) =	1015.1	1017.1	1022.8	1028.6	1034.2	1037.6
Flow (%) =		.0	1.4	5.0	10.0	9.6
Area (sq ft) =		.7	9.8	21.3	32.0	26.5
Vel (ft/s) =		1.38	3.93	6.59	8.77	10.11
Depth (ft) =		.36	1.71	3.71	5.71	7.71

Station (ft) =	1037.6	1041.6	1048.3	1058.1	1067.9	1077.6
Flow (%) =		24.7	20.2	17.9	8.8	2.4
Area (sq ft) =		38.5	52.2	55.6	36.4	16.7
Vel (ft/s) =		17.98	10.84	9.00	6.75	4.03
Depth (ft) =		9.71	7.71	5.71	3.71	1.71

Station (ft) =	1077.6	1081.2
Flow (%) =		.1	1.3
Area (sq ft) =		1.3
Vel (ft/s) =		1.42
Depth (ft) =		.36

FLOW DISTRIBUTION :

Cross-Section Number (SECNO)
Total Discharge (cfs, Q)
Computed Water Surface Elevation (ft MSL, CWSEL)

9256.000
2800
877.15

```
Station (ft) =     1023.9    1044.4    1065.5    1086.9    1094.5    1116.8
    Flow (%)     =      3.7       8.0      12.9       6.1      36.9
    Area (sq ft) =     85.4     130.2     174.1      73.8     244.0
    Vel (ft/s)   =     1.20      1.71      2.07      2.31      4.23
    Depth (ft)   =     4.18      6.15      8.15      9.65     10.98

Station (ft) =     1116.8    1126.9    1156.0    1176.0
    Flow (%)     =      8.1      17.5       6.9
    Area (sq ft) =     98.4     237.1     129.5
    Vel (ft/s)   =     2.31      2.07      1.50
    Depth (ft)   =     9.65      8.15      6.48

FLOW DISTRIBUTION :
------------------

Cross-Section Number (SECNO)                                      9536.000
Total Discharge (cfs, Q)                                             2800
Computed Water Surface Elevation (ft MSL, CWSEL)                   877.59

Station (ft) =     1263.5    1301.7    1306.3
    Flow (%)     =     99.8        .2
    Area (sq ft) =    259.2       3.5
    Vel (ft/s)   =    10.78      1.60
    Depth (ft)   =     6.79       .77

FLOW DISTRIBUTION :
------------------

Cross-Section Number (SECNO)                                      9576.000
Total Discharge (cfs, Q)                                             2800
Computed Water Surface Elevation (ft MSL, CWSEL)                   877.69

Station (ft) =     1338.0    1338.5    1375.2    1378.0
    Flow (%)     =       .0      99.6        .4
    Area (sq ft) =       .9     244.9       4.8
    Vel (ft/s)   =     1.12     11.39      2.13
    Depth (ft)   =     1.69      6.69      1.70

FLOW DISTRIBUTION :
------------------

Cross-Section Number (SECNO)                                      9724.000
Total Discharge (cfs, Q)                                             2800
Computed Water Surface Elevation (ft MSL, CWSEL)                   880.32

Station (ft) =      996.6    1040.3    1051.9    1071.6    1092.2    1105.6
    Flow (%)     =      3.7       4.1      10.4      15.1      28.3
    Area (sq ft) =    121.1      84.8     182.8     233.4     172.6
    Vel (ft/s)   =      .86      1.35      1.59      1.81      4.60
    Depth (ft)   =     2.77      7.31      9.31     11.31     12.84
```

```
Station (ft) =    1105.6    1166.5    1195.0    1224.5
  Flow (%)   =              32.6       4.8         9
  Area (sq ft) =            571.7     132.2      46.1
  Vel (ft/s) =              1.60      1.01       .57
  Depth (ft) =             9.38      4.64      1.57
```

FLOW DISTRIBUTION :
- - - - - - - - - - -

```
Cross-Section Number (SECNO)                          10125.000
Total Discharge (cfs, Q)                                   2800
Computed Water Surface Elevation (ft MSL, CWSEL)         880.63
```

```
Station (ft) =  995.9    1035.8   1051.8   1091.6   1112.5   1116.8
  Flow (%)   =           4.4      5.7      21.1     13.9     7.0
  Area (sq ft) =        136.4    121.7    383.4    230.4    53.1
  Vel (ft/s) =          .90      1.31     1.54     1.69     3.70
  Depth (ft) =          3.42     7.63     9.63    11.03    12.43
```

```
Station (ft) = 1116.8   1143.7   1167.1   1200.0   1220.6   1244.6
  Flow (%)   =          17.9     12.4     11.8     4.5      1.4
  Area (sq ft) =        297.0    225.2    251.0    116.1    58.2
  Vel (ft/s) =          1.69     1.54     1.32     1.07     .69
  Depth (ft) =         11.03     9.63     7.63     5.63     2.43
```

FLOW DISTRIBUTION :
- - - - - - - - - - -

```
Cross-Section Number (SECNO)                          10492.000
Total Discharge (cfs, Q)                                   2800
Computed Water Surface Elevation (ft MSL, CWSEL)         880.91
```

```
Station (ft) =  996.1    1023.5   1038.6   1057.6   1062.3   1083.5
  Flow (%)   =           8.0      14.6     23.8     10.6     26.6
  Area (sq ft) =        96.9     119.9    175.1    49.0     195.7
  Vel (ft/s) =          2.32     3.42     3.80     6.05     3.80
  Depth (ft) =          3.54     7.91     9.21    10.51     9.21
```

```
Station (ft) = 1083.5   1092.3   1100.6   1117.1   1121.4
  Flow (%)   =          8.3      4.9      3.2      2.0
  Area (sq ft) =        69.2     49.2     48.0     2.0
  Vel (ft/s) =          3.38     2.78     1.84     .51
  Depth (ft) =          7.91     5.91     2.90     .46
```

FLOW DISTRIBUTION :
- - - - - - - - - - -

```
Cross-Section Number (SECNO)                          10912.000
Total Discharge (cfs, Q)                                   2800
Computed Water Surface Elevation (ft MSL, CWSEL)         881.75
```

Station (ft) =	1038.3	1047.3	1065.1	1095.2	1138.7	1143.1
Flow (%)		.2	3.2	13.4	32.2	6.9
Area (sq ft)		7.8	49.0	142.9	279.8	35.7
Vel (ft/s)		.84	1.82	2.63	3.23	5.39
Depth (ft)		.87	2.74	4.74	6.44	8.14

Station (ft) =	1143.1	1181.4	1206.9	1228.6	1243.2
Flow (%)		28.5	11.3	3.9	.4
Area (sq ft)		247.4	120.9	59.2	12.8
Vel (ft/s)		3.23	2.63	1.82	.85
Depth (ft)		6.44	4.74	2.74	.87

FLOW DISTRIBUTION :
- - - - - - - - - - - - - - - - -

Cross-Section Number (SECNO)   11619.000
Total Discharge (cfs, Q)   2800
Computed Water Surface Elevation (ft MSL, CWSEL)   884.87

Station (ft) =	1038.5	1043.1	1054.4	1061.9	1088.1	1091.9
Flow (%)		.1	3.0	6.6	47.2	15.3
Area (sq ft)		2.0	21.2	29.0	154.0	30.0
Vel (ft/s)		1.50	3.97	6.37	8.58	14.27
Depth (ft)		.44	1.87	3.87	5.87	7.87

Station (ft) =	1091.9	1100.9	1110.9	1121.7	1127.0
Flow (%)		15.9	8.9	2.9	.1
Area (sq ft)		52.6	38.8	20.2	2.3
Vel (ft/s)		8.46	6.43	3.97	1.51
Depth (ft)		5.87	3.87	1.87	.44

FLOW DISTRIBUTION :
- - - - - - - - - - - - - - - - -

Cross-Section Number (SECNO)   12068.000
Total Discharge (cfs, Q)   2800
Computed Water Surface Elevation (ft MSL, CWSEL)   888.67

Station (ft) =	989.3	1000.0	1012.5	1020.1	1031.1	1055.6
Flow (%)		.1	1.4	3.1	9.4	31.8
Area (sq ft)		3.6	20.9	27.7	62.5	177.9
Vel (ft/s)		.64	1.86	3.10	4.20	5.01
Depth (ft)		.33	1.67	3.67	5.67	7.27

Station (ft) =	1055.6	1059.6	1082.6	1093.3	1103.3	1113.7
Flow (%)		10.0	30.0	9.1	4.1	1.1
Area (sq ft)		35.3	167.5	60.6	36.5	17.3
Vel (ft/s)		7.93	5.01	4.20	3.13	1.85
Depth (ft)		8.87	7.27	5.67	3.67	1.67

```
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Station (ft) =    1113.7    1117.3
   Flow (%)    =       .0
   Area (sq ft)=      1.2
   Vel (ft/s)  =       .63
   Depth (ft)  =       .33

FLOW DISTRIBUTION :
- - - - - - - - -

Cross-Section Number (SECNO)                         12460.000
Total Discharge (cfs, Q)                                  2800
Computed Water Surface Elevation (ft MSL, CWSEL)        890.38

Station (ft) =     989.1    1000.0    1034.3    1058.2    1082.7    1087.7
   Flow (%)    =       .0       3.0       9.4      20.8       5.7
   Area (sq ft)=      2.1      47.4      81.1     131.6      32.2
   Vel (ft/s)  =       .48      1.79      3.24      4.42      4.96
   Depth (ft)  =       .19      1.38      3.38      5.38      6.38

Station (ft) =    1087.7    1092.2    1097.3    1142.2    1158.4    1175.0
   Flow (%)    =                9.3       5.7      38.2       6.3       1.5
   Area (sq ft)=               33.0      32.4     242.0      55.0      23.0
   Vel (ft/s)  =                7.86      4.96      4.43      3.23      1.78
   Depth (ft)  =                7.38      6.38      5.38      3.38      1.38

Station (ft) =    1175.0    1180.7
   Flow (%)    =                1.1
   Area (sq ft)=                 .48
   Vel (ft/s)  =                 .19
   Depth (ft)  =
```

SPECIAL NOTE :
- - - - - - - - -

An asterisk (*) to the left of the cross-section number indicates a special
note is present in the SUMMARY OF WARNING AND STATUS MESSAGES section.

SUMMARY PRINTOUT : RIVER FALLS FLOOD INSURANCE STUDY
- - - - - - - - - - -   MANN VALLEY
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Cross-Section Number SECNO	Discharge Flow (cfs) Q	Computed W.S. Elevation (ft MSL) CWSEL	W.S. Elev Diff per Section (ft) DIFWSX	Energy Gradient Elevation (ft MSL) EG	Energy Elev Diff pre Prof. (ft) DIFEG	Water Surface Top Width (ft) TOPWID	Up/Down Convyance Ratio KRATIO	Critical W.S. Elevation (ft MSL) CRIWS
8638.000	850.00	863.38	.00	864.27	.00	52.88	.00	863.24
8638.000	1650.00	864.94	.00	865.98	1.71	84.22	.00	864.49
8638.000	2000.00	865.43	.00	866.52	2.25	97.72	.00	865.03
8638.000	2800.00	866.30	.00	867.50	3.22	116.79	.00	865.93
* 8989.000	850.00	871.44	8.06	872.79	.00	40.66	.98	871.44
* 8989.000	1650.00	873.09	8.15	874.80	2.00	53.48	.91	873.09
* 8989.000	2000.00	873.63	8.20	875.47	2.68	57.66	.90	873.63
* 8989.000	2800.00	874.71	8.41	876.77	3.98	66.10	.90	874.71
* 9256.000	850.00	873.09	1.66	873.16	.00	143.19	6.23	869.50
* 9256.000	1650.00	875.14	2.04	875.23	2.07	152.08	5.98	870.82
* 9256.000	2000.00	875.83	2.20	875.93	2.78	152.08	5.89	871.13
* 9256.000	2800.00	877.15	2.44	877.29	4.13	152.08	5.58	871.85
* 9536.000	850.00	873.80	.70	874.54	.00	30.60	.24	872.37
* 9536.000	1650.00	875.79	.66	876.96	2.41	37.30	.24	874.30
* 9536.000	2000.00	876.42	.60	877.77	3.23	39.26	.25	874.99
* 9536.000	2800.00	877.59	.44	879.39	4.85	42.78	.26	876.25
* 9576.000	850.00	874.06	.26	874.86	.00	29.80	.99	872.74
9576.000	1650.00	876.09	.30	877.31	2.45	39.99	1.00	874.70
9576.000	2000.00	876.87	.44	878.37	3.51	39.99	.64	875.37
9576.000	2800.00	877.69	.10	879.70	4.84	39.99	.96	.00
* 9724.000	850.00	875.17	1.11	875.25	.00	142.18	3.45	871.25
* 9724.000	1650.00	877.72	1.62	877.82	2.56	180.80	3.68	872.55
* 9724.000	2000.00	878.86	1.99	878.95	3.70	200.69	6.16	873.05
* 9724.000	2800.00	880.32	2.62	880.43	5.18	227.86	3.98	873.97
10125.000	850.00	875.50	.33	875.53	.00	189.78	.94	871.96

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Cross-Section Number SECNO	Discharge Flow (cfs) Q	Computed W.S. Elevation (ft MSL) CWSEL	W.S. Elev Diff per Section (ft) DIFWSX	Energy Gradient Elevation (ft MSL) EG	Energy Elev Diff pre Prof. (ft) DIFEG	Water Surface Top Width (ft) TOPWID	Up/Down Convyance Ratio KRATIO	Critical W.S. Elevation (ft MSL) CRIWS
10125.000	1650.00	878.03	.31	878.07	2.54	221.38	1.03	872.85
10125.000	2000.00	879.14	.28	879.17	3.64	232.78	1.04	873.15
10125.000	2800.00	880.63	.31	880.67	5.14	248.64	1.06	873.60
* 10492.000	850.00	876.05	.55	876.21	.00	86.26	.50	874.02
* 10492.000	1650.00	878.40	.37	878.59	2.38	104.74	.53	874.99
* 10492.000	2000.00	879.44	.30	879.62	3.41	112.76	.54	875.38
* 10492.000	2800.00	880.91	.28	881.12	4.91	125.31	.56	876.14
* 10912.000	850.00	877.89	1.85	878.08	.00	138.79	.69	876.99
10912.000	1650.00	879.57	1.17	879.74	1.66	172.89	.77	877.71
10912.000	2000.00	880.37	.94	880.52	2.44	186.36	.82	877.95
10912.000	2800.00	881.75	.83	881.89	3.81	204.89	.93	878.50
* 11619.000	850.00	882.67	4.78	883.11	.00	64.00	.85	881.61
* 11619.000	1650.00	883.73	4.16	884.54	1.43	75.61	.52	882.85
* 11619.000	2000.00	884.06	3.68	885.03	1.92	79.27	.42	883.30
* 11619.000	2800.00	884.87	3.13	886.09	2.97	88.44	.35	884.18
* 12068.000	850.00	885.31	2.64	885.50	.00	84.80	1.47	883.54
* 12068.000	1650.00	886.99	3.26	887.26	1.76	102.09	1.80	884.56
* 12068.000	2000.00	887.56	3.51	887.86	2.37	108.66	1.92	884.92
* 12068.000	2800.00	888.67	3.80	889.04	3.54	127.99	1.98	885.64
12460.000	850.00	887.40	2.09	887.66	.00	112.14	.72	886.63
12460.000	1650.00	888.82	1.83	889.11	1.45	145.09	.81	887.47
12460.000	2000.00	889.34	1.77	889.63	1.97	158.33	.85	887.64
12460.000	2800.00	890.38	1.71	890.69	3.03	191.60	.93	888.29

SUMMARY PRINTOUT : RIVER FALLS FLOOD INSURANCE STUDY
                   MANN VALLEY
                   A-RIVER9601.00

Cross-Section Number SECNO	Discharge Flow (cfs) Q	Computed W.S. Elevation (ft MSL) CWSEL	W.S. Elev Diff per Know/Comp (ft) DIFKWS	Flow Depth (ft) DEPTH	Channel Reach Length (ft) XLCH	Channel Flow (cfs) QCH	Left Overbank Flow (cfs) QLOB	Right Overbank Flow (cfs) QROB
8638.000	850.00	863.38	.00	6.48	.00	243.45	398.47	208.08
8638.000	1650.00	864.94	.00	8.04	.00	355.31	788.59	506.10
8638.000	2000.00	865.43	.00	8.53	.00	396.36	945.03	658.61
8638.000	2800.00	866.30	.00	9.40	.00	478.45	1273.27	1048.28
* 8989.000	850.00	871.44	.00	7.44	351.46	333.94	173.27	342.78
* 8989.000	1650.00	873.09	.00	9.09	351.46	501.96	391.83	756.21
* 8989.000	2000.00	873.63	.00	9.63	351.46	565.63	491.54	942.83
* 8989.000	2800.00	874.71	.00	10.71	351.46	691.64	727.52	1380.84
* 9256.000	850.00	873.09	.00	9.09	266.29	410.45	190.67	248.88
* 9256.000	1650.00	875.14	.00	11.14	266.29	675.68	450.84	523.48
* 9256.000	2000.00	875.83	.00	11.83	266.29	785.68	572.14	642.18
* 9256.000	2800.00	877.15	.00	13.15	266.29	1031.81	855.71	912.48
* 9536.000	850.00	873.80	.00	7.80	280.72	850.00	.00	.00
* 9536.000	1650.00	875.79	.00	9.79	280.72	1650.00	.00	.00
* 9536.000	2000.00	876.42	.00	10.42	280.72	1999.88	.00	.12
* 9536.000	2800.00	877.59	.00	11.59	280.72	2794.32	.00	5.68
* 9576.000	850.00	874.06	.00	8.06	40.00	850.00	.00	.00
9576.000	1650.00	876.09	.00	10.09	40.00	1649.89	.00	.11
9576.000	2000.00	876.87	.00	10.87	40.00	1997.85	.28	1.87
9576.000	2800.00	877.69	.00	11.69	40.00	2788.78	1.00	10.22
* 9724.000	850.00	875.17	.00	9.47	148.29	346.88	252.55	250.56
* 9724.000	1650.00	877.72	.00	12.02	148.29	549.68	526.01	574.31
* 9724.000	2000.00	878.86	.00	13.16	148.29	618.23	651.07	730.70
* 9724.000	2800.00	880.32	.00	14.62	148.29	793.43	932.42	1074.15
10125.000	850.00	875.50	.00	8.30	400.84	93.05	379.26	377.69
10125.000	1650.00	878.03	.00	10.83	400.84	138.60	741.09	770.31
10125.000	2000.00	879.14	.00	11.94	400.84	154.26	899.20	946.54
10125.000	2800.00	880.63	.00	13.43	400.84	196.44	1261.24	1342.32
* 10492.000	850.00	876.05	.00	6.65	366.80	136.48	365.81	347.72
* 10492.000	1650.00	878.40	.00	9.00	366.80	207.62	748.42	693.95

Cross-Section Number SECNO	Discharge Flow (cfs) Q	Computed W.S. Elevation (ft MSL) CWSEL	W.S. Elev Diff Know/Comp (ft) DIFKWS	Flow Depth (ft) DEPTH	Channel Reach Length (ft) XLCH	Channel Flow (cfs) QCH	Left Overbank Flow (cfs) QLOB	Right Overbank Flow (cfs) QROB
* 10492.000	2000.00	879.44	.00	10.04	366.80	232.64	918.17	849.19
* 10492.000	2800.00	880.91	.00	11.51	366.80	296.14	1300.39	1203.48
* 10912.000	850.00	877.89	.00	5.29	420.48	116.27	390.30	343.44
10912.000	1650.00	879.57	.00	6.97	420.48	152.38	796.52	701.11
10912.000	2000.00	880.37	.00	7.77	420.48	162.71	974.46	862.83
10912.000	2800.00	881.75	.00	9.15	420.48	192.26	1373.59	1234.15
11619.000	850.00	882.67	.00	6.67	706.87	180.53	475.11	194.35
* 11619.000	1650.00	883.73	.00	7.73	706.87	295.18	935.49	419.33
* 11619.000	2000.00	884.06	.00	8.06	706.87	341.40	1136.36	522.24
* 11619.000	2800.00	884.87	.00	8.87	706.87	428.07	1594.13	777.80
* 12068.000	850.00	885.31	.00	6.51	448.72	124.15	372.33	353.52
* 12068.000	1650.00	886.99	.00	8.19	448.72	193.79	741.90	714.31
* 12068.000	2000.00	887.56	.00	8.76	448.72	221.38	904.52	874.11
* 12068.000	2800.00	888.67	.00	9.87	448.72	279.68	1280.02	1240.31
12460.000	850.00	887.40	.00	5.40	392.45	138.15	278.10	433.75
12460.000	1650.00	888.82	.00	6.82	392.45	195.69	590.23	864.08
12460.000	2000.00	889.34	.00	7.34	392.45	216.80	736.70	1046.50
12460.000	2800.00	890.38	.00	8.38	392.45	259.54	1089.76	1450.71

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------ MANN VALLEY
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Cross-Section Number SECNO	Computed W.S. Elevation (ft MSL) CWSEL	Left Overbank Flow (cfs) QLOB	Left Overbank Velocity (ft/s) VLOB	Left Overbank Manning n *1,000 K*XNL	Channel Flow (cfs) QCH	Channel Mean Flow Velocity (ft/s) VCH	Channel Manning n *1,000 K*XNCH	Right Overbank Flow (cfs) QROB	Right Overbank Velocity (ft/s) VROB	Right Overbank Manning n *1,000 K*XNR
8638.000	863.38	398.47	5.59	70.00	243.45	11.42	40.00	208.08	4.78	70.00
8638.000	864.94	788.59	6.75	70.00	355.31	12.97	40.00	506.10	5.42	70.00
8638.000	865.43	945.03	7.13	70.00	396.36	13.53	40.00	658.61	5.47	70.00
8638.000	866.30	1273.27	7.84	70.00	478.45	14.64	40.00	1048.28	5.77	70.00
* * 8989.000	871.44	173.27	5.44	70.00	333.94	13.10	40.00	342.78	5.83	70.00
8989.000	873.09	391.83	6.81	70.00	501.96	15.66	40.00	756.21	7.24	70.00

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Cross-Section Number SECNO	Computed W.S. Elevation (ft MSL) CWSEL	Left Overbank Flow (cfs) QLOB	Left Overbank Velocity (ft/s) VLOB	Left Overbank Manning n * 1,000 K*XNL	Channel Flow (cfs) QCH	Channel Mean Flow Velocity (ft/s) VCH	Channel Manning n * 1,000 K*XNCH	Right Overbank Flow (cfs) QROB	Right Overbank Velocity (ft/s) VROB	Right Overbank Manning n * 1,000 K*XNR
* 8989.000	873.63	491.54	7.27	70.00	565.63	16.55	40.00	942.83	7.71	70.00
* 8989.000	874.71	727.52	8.06	70.00	691.64	17.98	40.00	1380.84	8.52	70.00
* 9256.000	873.09	190.67	1.05	70.00	410.45	2.67	40.00	248.88	1.11	70.00
* 9256.000	875.14	450.84	1.40	70.00	675.68	3.39	40.00	523.48	1.51	70.00
* 9256.000	875.83	572.14	1.55	70.00	785.68	3.66	40.00	642.18	1.66	70.00
* 9256.000	877.15	855.71	1.85	70.00	1031.81	4.23	40.00	912.48	1.96	70.00
* 9536.000	873.80	.00	.00	.00	850.00	6.92	40.00	.00	.00	.00
* 9536.000	875.79	.00	.00	.00	1650.00	8.66	40.00	.00	.00	.00
* 9536.000	876.42	.00	.00	.00	1999.88	9.33	40.00	.12	.60	70.00
* 9536.000	877.59	.00	.00	.00	2794.32	10.78	40.00	5.68	1.60	70.00
* 9576.000	874.06	.00	.00	.00	850.00	7.17	40.00	.00	.00	.00
* 9576.000	876.09	.00	.02	70.00	1649.89	8.85	40.00	.11	.39	70.00
* 9576.000	876.87	.28	.96	70.00	1997.85	9.84	40.00	1.87	1.20	70.00
* 9576.000	877.69	1.00	1.12	70.00	2788.78	11.39	40.00	10.22	2.13	70.00
* 9724.000	875.17	252.55	1.06	100.00	346.88	3.35	40.00	250.56	.95	100.00
* 9724.000	877.72	526.01	1.30	100.00	549.68	3.99	40.00	574.31	1.21	100.00
* 9724.000	878.86	651.07	1.32	100.00	618.23	4.04	40.00	730.70	1.25	100.00
* 9724.000	880.32	932.42	1.50	100.00	793.43	4.60	40.00	1074.15	1.43	100.00
* 10125.000	875.50	379.26	1.09	100.00	93.05	2.99	40.00	377.69	1.06	100.00
* 10125.000	878.03	741.09	1.26	100.00	138.60	3.30	40.00	770.31	1.22	100.00
* 10125.000	879.14	899.20	1.28	100.00	154.26	3.30	40.00	946.54	1.24	100.00
* 10125.000	880.63	1261.24	1.45	100.00	196.44	3.70	40.00	1342.32	1.42	100.00
* 10492.000	876.05	365.81	2.65	70.00	136.48	5.19	40.00	347.72	2.73	70.00
* 10492.000	878.40	748.42	2.99	70.00	207.62	5.57	40.00	693.95	3.02	70.00
* 10492.000	879.44	918.17	3.00	70.00	232.64	5.52	40.00	849.19	3.01	70.00
* 10492.000	880.91	1300.39	3.32	70.00	296.14	6.05	40.00	1203.48	3.31	70.00
* 10912.000	877.89	390.30	2.80	70.00	116.27	6.19	40.00	343.44	2.81	70.00
* 10912.000	879.57	796.52	2.90	70.00	152.38	5.82	40.00	701.11	2.88	70.00
* 10912.000	880.37	974.46	2.81	70.00	162.71	5.48	40.00	862.83	2.77	70.00
* 10912.000	881.75	1373.59	2.87	70.00	192.26	5.39	40.00	1234.15	2.80	70.00
* 11619.000	882.67	475.11	4.31	70.00	180.53	8.35	40.00	194.35	3.81	70.00
* 11619.000	883.73	935.49	6.12	70.00	295.18	11.52	40.00	419.33	5.40	70.00
* 11619.000	884.06	1136.36	6.78	70.00	341.40	12.70	40.00	522.24	5.98	70.00
* 11619.000	884.87	1594.13	7.73	70.00	428.07	14.27	40.00	777.80	6.83	70.00
* 12068.000	885.31	372.33	2.98	70.00	124.15	5.65	40.00	353.52	2.96	70.00

Cross-Section Number SECNO	Computed W.S. Elevation (ft MSL) CWSEL	Left Overbank Flow (cfs) QLOB	Left Overbank Velocity (ft/s) VLOB	Left Overbank Manning n * 1,000 K*XNL	Channel Flow (cfs) QCH	Channel Mean Flow Velocity (ft/s) VCH	Channel Manning n * 1,000 K*XNCH	Right Overbank Flow (cfs) QROB	Right Overbank Velocity (ft/s) VROB	Right Overbank Manning n * 1,000 K*XNR
* 12068.000	886.99	741.90	3.73	70.00	193.79	6.77	40.00	714.31	3.68	70.00
* 12068.000	887.56	904.52	3.96	70.00	221.38	7.16	40.00	874.11	3.92	70.00
* 12068.000	888.67	1280.02	4.38	70.00	279.68	7.93	40.00	1240.31	4.38	70.00
* 12460.000	887.40	278.10	3.18	70.00	138.15	7.02	40.00	433.75	3.26	70.00
* 12460.000	888.82	590.23	3.53	70.00	195.69	7.52	40.00	864.08	3.78	70.00
* 12460.000	889.34	736.70	3.60	70.00	216.80	7.65	40.00	1046.50	3.91	70.00
* 12460.000	890.38	1089.76	3.70	70.00	259.54	7.86	40.00	1450.71	4.11	70.00

SUMMARY PRINTOUT TABLE 150 : RIVER FALLS FLOOD INSURANCE STUDY
MANN VALLEY
A-RIVER9601.00

Cross-Section Number SECNO	Channel Reach Length (ft) XLCH	Top of Roadway Elevation (ft MSL) ELTRD	Max. Low Chord Elevation (ft MSL) ELLC	Minimum C.S. Elevation (ft MSL) ELMIN	Discharge Flow (cfs) Q	Computed W.S. Elevation (ft MSL) CWSEL	Critical W.S. Elevation (ft MSL) CRIWS	Energy Gradient Elevation (ft MSL) EG	Energy Gradient Slope * 10,000 10K*S	Channel Mean Flow Velocity (ft/s) VCH	Cross-Section Area (sq ft) AREA	Index (0.01 Convey .01K
8638.000	.00	.00	.00	856.90	850.00	863.38	863.24	864.27	158.35	11.42	136.12	67
8638.000	.00	.00	.00	856.90	1650.00	864.94	864.49	865.98	146.34	12.97	237.58	136
8638.000	.00	.00	.00	856.90	2000.00	865.43	865.03	866.52	145.53	13.53	282.15	165
8638.000	.00	.00	.00	856.90	2800.00	866.30	865.93	867.50	147.28	14.64	376.86	230
* 8989.000	351.46	.00	.00	864.00	850.00	871.44	871.44	872.79	165.97	13.10	116.18	65
* 8989.000	351.46	.00	.00	864.00	1650.00	873.09	873.09	874.80	175.03	15.66	194.02	124
* 8989.000	351.46	.00	.00	864.00	2000.00	873.63	873.63	875.47	179.17	16.55	224.04	145
* 8989.000	351.46	.00	.00	864.00	2800.00	874.71	874.71	876.77	180.83	17.98	290.87	208
* 9256.000	266.29	.00	.00	864.00	850.00	873.09	869.50	873.16	4.27	2.67	559.96	411
* 9256.000	266.29	.00	.00	864.00	1650.00	875.14	870.82	875.23	4.90	3.39	866.42	745
* 9256.000	266.29	.00	.00	864.00	2000.00	875.83	871.13	875.93	5.17	3.66	971.42	875
* 9256.000	266.29	.00	.00	864.00	2800.00	877.15	871.85	877.29	5.82	4.23	1172.22	1161
* 9536.000	280.72	.00	.00	866.00	850.00	873.80	872.37	874.54	71.76	6.92	122.76	100
* 9536.000	280.72	.00	.00	866.00	1650.00	875.79	874.30	876.96	81.81	8.66	190.51	182
* 9536.000	280.72	.00	.00	866.00	2000.00	876.42	874.99	877.77	83.52	9.33	214.63	218
* 9536.000	280.72	.00	.00	866.00	2800.00	877.59	876.25	879.39	86.64	10.78	262.77	300
9576.000	40.00	880.30	876.55	866.00	850.00	874.06	872.74	874.86	73.91	7.17	118.54	98

BOSS HEC-2 version 3.00
PROJECT TITLE : RIVER FALLS FLOOD INSURANCE STUDY
PROJECT NUMBER : A-RIVER9601.00

	Cross-Section Number SECNO	Channel Reach Length (ft) XLCH	Top of Roadway Elevation (ft MSL) ELTRD	Max. Low Chord Elevation (ft MSL) ELLC	Minimum C.S. Elevation (ft MSL) ELMIN	Discharge Flow (cfs) Q	Computed W.S. Elevation (ft MSL) CWSEL	Critical W.S. Elevation (ft MSL) CRIWS	Energy Gradient Elevation (ft MSL) EG	Energy Gradient Slope *10,000 10K*S	Channel Mean Flow Velocity (ft/s) VCH	Cross-Section Area (sq ft) AREA	Index (0.01 Convey) .01K
*	9576.000	40.00	880.30	876.55	866.00	1650.00	876.09	874.70	877.31	81.17	8.85	186.65	185
	9576.000	40.00	880.30	876.55	866.00	2000.00	876.87	875.37	878.37	202.68	9.84	204.80	140
	9576.000	40.00	880.30	876.55	866.00	2800.00	877.69	.00	879.70	93.23	11.39	250.59	285
*	9724.000	148.29	.00	.00	865.70	850.00	875.17	871.25	875.25	6.20	3.35	604.68	341
*	9724.000	148.29	.00	.00	865.70	1650.00	877.72	872.55	877.82	6.00	3.99	1015.54	677
*	9724.000	148.29	.00	.00	865.70	2000.00	878.86	873.05	878.95	5.34	4.04	1232.66	865
*	9724.000	148.29	.00	.00	865.70	2800.00	880.32	873.97	880.43	5.89	4.60	1544.76	1155
	10125.000	400.84	.00	.00	867.20	850.00	875.50	871.96	875.53	6.96	2.99	738.07	322
	10125.000	400.84	.00	.00	867.20	1650.00	878.03	872.85	878.07	5.71	3.30	1261.93	690
	10125.000	400.84	.00	.00	867.20	2000.00	879.14	873.15	879.17	4.95	3.30	1514.23	898
	10125.000	400.84	.00	.00	867.20	2800.00	880.63	873.60	880.67	5.25	3.70	1872.47	1222
*	10492.000	366.80	.00	.00	869.40	850.00	876.05	874.02	876.21	28.07	5.19	291.66	160
*	10492.000	366.80	.00	.00	869.40	1650.00	878.40	874.99	878.59	20.27	5.57	517.03	366
*	10492.000	366.80	.00	.00	869.40	2000.00	879.44	875.38	879.62	16.96	5.52	629.71	485
*	10492.000	366.80	.00	.00	869.40	2800.00	880.91	876.14	881.12	16.61	6.05	804.81	686
*	10912.000	420.48	.00	.00	872.60	850.00	877.89	876.99	878.08	59.66	6.19	280.48	110
	10912.000	420.48	.00	.00	872.60	1650.00	879.57	877.71	879.74	34.00	5.82	543.51	282
	10912.000	420.48	.00	.00	872.60	2000.00	880.37	877.95	880.52	25.50	5.48	687.66	396
	10912.000	420.48	.00	.00	872.60	2800.00	881.75	878.50	881.89	19.28	5.39	955.34	637
*	11619.000	706.87	.00	.00	876.00	850.00	882.67	881.61	883.11	81.93	8.35	182.90	93
*	11619.000	706.87	.00	.00	876.00	1650.00	883.73	882.85	884.54	124.41	11.52	256.18	147
*	11619.000	706.87	.00	.00	876.00	2000.00	884.06	883.30	885.03	141.90	12.70	281.68	167
*	11619.000	706.87	.00	.00	876.00	2800.00	884.87	884.18	886.09	154.92	14.27	350.09	224
*	12068.000	448.72	.00	.00	878.80	850.00	885.31	883.54	885.50	37.89	5.65	266.21	138
*	12068.000	448.72	.00	.00	878.80	1650.00	886.99	884.56	887.26	38.21	6.77	421.53	266
*	12068.000	448.72	.00	.00	878.80	2000.00	887.56	884.92	887.86	38.60	7.16	481.97	321
*	12068.000	448.72	.00	.00	878.80	2800.00	888.67	885.64	889.04	39.58	7.93	610.91	445
	12460.000	392.45	.00	.00	882.00	850.00	887.40	886.63	887.66	73.35	7.02	240.35	95
	12460.000	392.45	.00	.00	882.00	1650.00	888.82	887.47	889.11	57.90	7.52	421.83	216
	12460.000	392.45	.00	.00	882.00	2000.00	889.34	887.64	889.63	53.41	7.65	500.85	273
	12460.000	392.45	.00	.00	882.00	2800.00	890.38	888.29	890.69	46.12	7.86	680.71	412

SUMMARY PRINTOUT TABLE 150 : RIVER FALLS FLOOD INSURANCE STUDY
----- MANN VALLEY
A-RIVER9601.00

Cross-Section Number SECNO	Discharge Flow (cfs) Q	Computed W.S. Elevation (ft MSL) CWSEL	W.S. Diff per Profile (ft) DIFWSP	W.S. Elev Diff per Section (ft) DIFWSX	W.S. Elev Diff per Know/Comp (ft) DIFKWS	Water Surface Top Width (ft) TOPWID	Channel Reach Length (ft) XLCH	
8638.000	850.00	863.38	.00	.00	.00	52.88	.00	
8638.000	1650.00	864.94	1.56	.00	.00	84.22	.00	
8638.000	2000.00	865.43	.49	.00	.00	97.72	.00	
8638.000	2800.00	866.30	.87	.00	.00	116.79	.00	
8989.000	850.00	871.44	.00	8.06	.00	40.66	351.46	*
8989.000	1650.00	873.09	1.65	8.15	.00	53.48	351.46	*
8989.000	2000.00	873.63	.54	8.20	.00	57.66	351.46	*
8989.000	2800.00	874.71	1.08	8.41	.00	66.10	351.46	*
9256.000	850.00	873.09	.00	1.66	.00	143.19	266.29	*
9256.000	1650.00	875.14	2.04	2.04	.00	152.08	266.29	*
9256.000	2000.00	875.83	.69	2.20	.00	152.08	266.29	*
9256.000	2800.00	877.15	1.32	2.44	.00	152.08	266.29	*
9536.000	850.00	873.80	.00	.70	.00	30.60	280.72	*
9536.000	1650.00	875.79	1.99	.66	.00	37.30	280.72	*
9536.000	2000.00	876.42	.63	.60	.00	39.26	280.72	*
9536.000	2800.00	877.59	1.16	.44	.00	42.78	280.72	*
9576.000	850.00	874.06	.00	.26	.00	29.80	40.00	
9576.000	1650.00	876.09	2.03	.30	.00	39.99	40.00	
9576.000	2000.00	876.87	.78	.44	.00	39.99	40.00	*
9576.000	2800.00	877.69	.82	.10	.00	39.99	40.00	
9724.000	850.00	875.17	.00	1.11	.00	142.18	148.29	*
9724.000	1650.00	877.72	2.55	1.62	.00	180.80	148.29	*
9724.000	2000.00	878.86	1.14	1.99	.00	200.69	148.29	*
9724.000	2800.00	880.32	1.46	2.62	.00	227.86	148.29	*
10125.000	850.00	875.50	.00	.33	.00	189.78	400.84	*
10125.000	1650.00	878.03	2.53	.31	.00	221.38	400.84	*
10125.000	2000.00	879.14	1.11	.28	.00	232.78	400.84	*
10125.000	2800.00	880.63	1.49	.31	.00	248.64	400.84	
10492.000	850.00	876.05	.00	.55	.00	86.26	366.80	*
10492.000	1650.00	878.40	2.35	.37	.00	104.74	366.80	*

	Cross-Section Number SECNO	Discharge Flow (cfs) Q	Computed W.S. Elevation (ft MSL) CWSEL	W.S. Elev Diff per Profile (ft) DIFWSP	W.S. Elev Diff per Section (ft) DIFWSX	W.S. Elev Diff per Know/Comp (ft) DIFKWS	Water Surface Top Width (ft) TOPWID	Channel Reach Length (ft) XLCH
*	10492.000	2000.00	879.44	1.04	.30	.00	112.76	366.80
*	10492.000	2800.00	880.91	1.47	.28	.00	125.31	366.80
*	10912.000	850.00	877.89	.00	1.85	.00	138.79	420.48
	10912.000	1650.00	879.57	1.68	1.17	.00	172.89	420.48
	10912.000	2000.00	880.37	.80	.94	.00	186.36	420.48
	10912.000	2800.00	881.75	1.37	.83	.00	204.89	420.48
	11619.000	850.00	882.67	.00	4.78	.00	64.00	706.87
	11619.000	1650.00	883.73	1.06	4.16	.00	75.61	706.87
*	11619.000	2000.00	884.06	.33	3.68	.00	79.27	706.87
*	11619.000	2800.00	884.87	.82	3.13	.00	88.44	706.87
*								
*	12068.000	850.00	885.31	.00	2.64	.00	84.80	448.72
*	12068.000	1650.00	886.99	1.68	3.26	.00	102.09	448.72
*	12068.000	2000.00	887.56	.57	3.51	.00	108.66	448.72
*	12068.000	2800.00	888.67	1.11	3.80	.00	127.99	448.72
	12460.000	850.00	887.40	.00	2.09	.00	112.14	392.45
	12460.000	1650.00	888.82	1.42	1.83	.00	145.09	392.45
	12460.000	2000.00	889.34	.51	1.77	.00	158.33	392.45
	12460.000	2800.00	890.38	1.05	1.71	.00	191.60	392.45

SUMMARY OF WARNING AND STATUS MESSAGES :

Section 8989, profile 1, critical depth assumed.

Section 8989, profile 1, minimum specific energy.

Section 8989, profile 2, critical depth assumed.

Section 8989, profile 2, minimum specific energy.

Section 8989, profile 3, critical depth assumed.

Section 8989, profile 3, minimum specific energy.

Section 8989, profile 4, critical depth assumed.

Section 8989, profile 4, minimum specific energy.

Section 9256, profile 1, conveyance change outside acceptable range.

Section 9256, profile 2, conveyance change outside acceptable range.
Section 9256, profile 3, conveyance change outside acceptable range.
Section 9256, profile 4, conveyance change outside acceptable range.
Section 9536, profile 1, conveyance change outside acceptable range.
Section 9536, profile 2, conveyance change outside acceptable range.
Section 9536, profile 3, conveyance change outside acceptable range.
Section 9536, profile 4, conveyance change outside acceptable range.
Section 9576, profile 3, conveyance change outside acceptable range.
Section 9724, profile 1, conveyance change outside acceptable range.
Section 9724, profile 2, conveyance change outside acceptable range.
Section 9724, profile 3, conveyance change outside acceptable range.
Section 9724, profile 4, conveyance change outside acceptable range.
Section 10492, profile 1, conveyance change outside acceptable range.
Section 10492, profile 2, conveyance change outside acceptable range.
Section 10492, profile 3, conveyance change outside acceptable range.
Section 10492, profile 4, conveyance change outside acceptable range.
Section 10912, profile 1, conveyance change outside acceptable range.
Section 11619, profile 2, conveyance change outside acceptable range.
Section 11619, profile 3, conveyance change outside acceptable range.
Section 11619, profile 4, conveyance change outside acceptable range.
Section 12068, profile 1, conveyance change outside acceptable range.
Section 12068, profile 2, conveyance change outside acceptable range.
Section 12068, profile 3, conveyance change outside acceptable range.
Section 12068, profile 4, conveyance change outside acceptable range.

33 Warning and status message(s) generated

END OF OUTPUT

Cross-Section Plot 8638 ft

WS: 865.43ft   Crit.WS: 865.03ft   EGL: 866.52ft   Flow: 2000cfs

.070

.040

.070

Elevation   ft MSL

Horizontal Station   ft

—— Channel Bottom   —— Overbank Stations   —— Computed W. S.
- - - Critical W. S.   —— Energy Grade Line   —— Manning's n Values
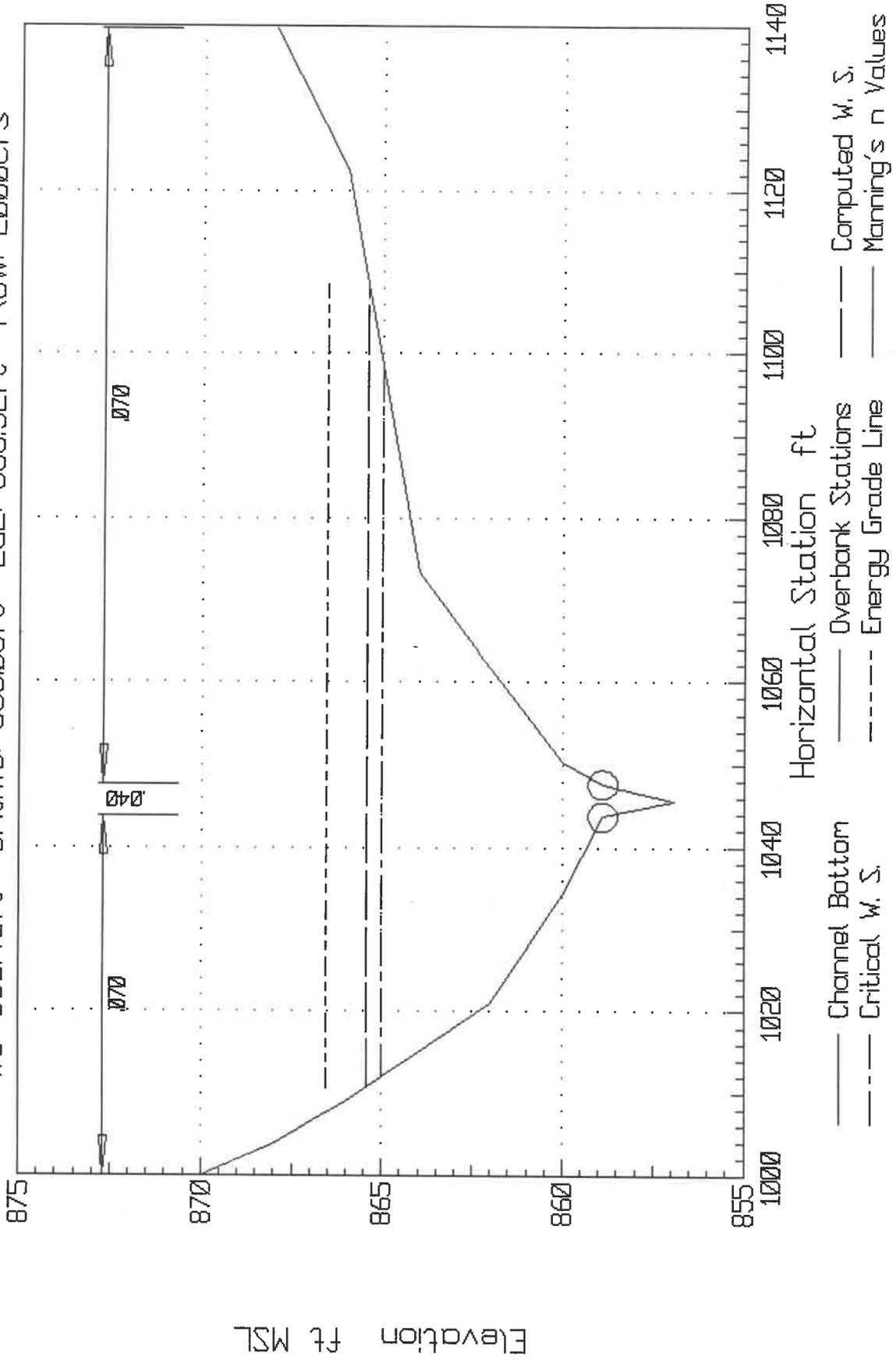
Mann Valley
100-year flow

Cross-Section Plot 8989 ft

WS: 873.63ft   Crit.WS: 873.63ft   EGL: 875.47ft   Flow: 2000cfs
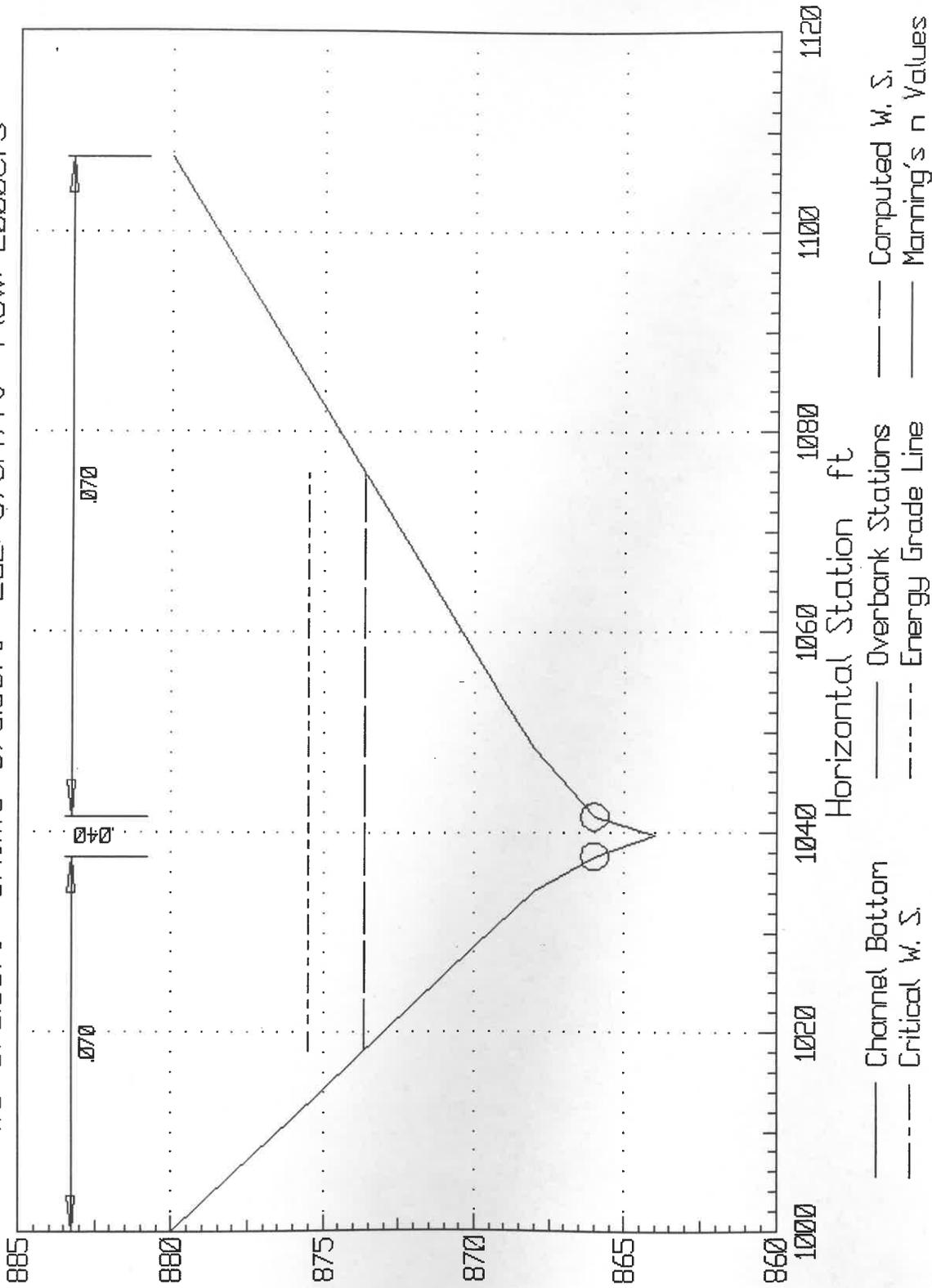
Mann Valley
100-year flow

Legend:
— Computed W. S.
— Manning's n Values
— Channel Bottom
— Overbank Stations
— Critical W. S.
- - - Energy Grade Line

Horizontal Station ft

Elevation ft MSL

.070   .040   .070

Cross-Section Plot 9256 ft

WS: 875.82ft Crit.WS: 871.12ft EGL: 875.93ft Flow: 2000cfs
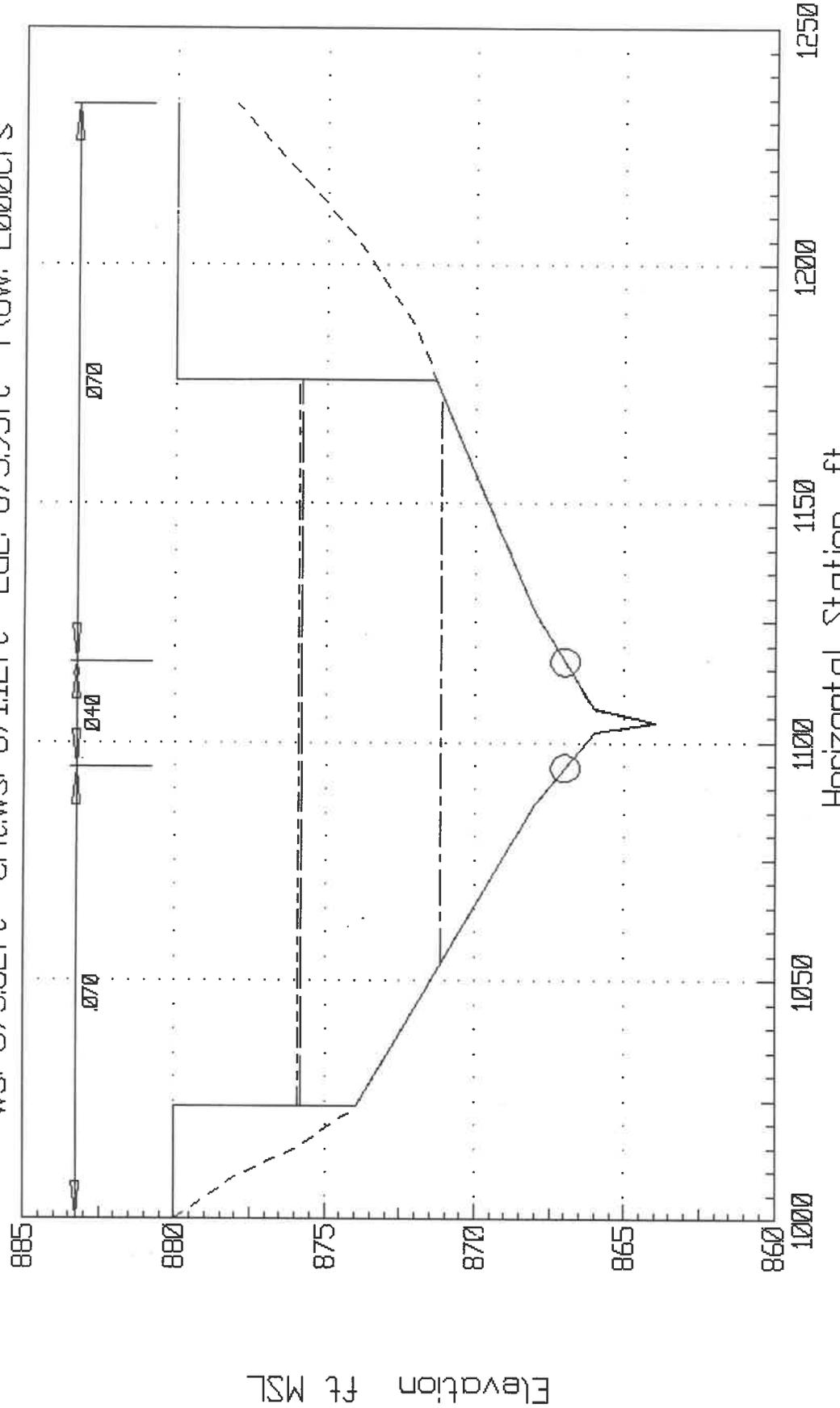
Legend:
- Original Channel
- Computed W. S.
- Manning's n Values
- Revised Channel
- Critical W. S.
- Overbank Stations
- Energy Grade Line

Mann Valley
100-year flow

Elevation ft MSL

Horizontal Station ft

Cross-Section Plot 9536 ft

WS: 876.42ft Crit.WS: 874.98ft EGL: 877.77ft Flow: 2000cfs

Legend:
- Original Channel
- Computed W. S.
- Manning's n Values
- Overbank Stations
- Energy Grade Line
- Revised Channel
- Critical W. S.

Mann Valley
100-year flow

Elevation ft MSL

Horizontal Station ft

Bridge Cross-Section Plot 9576 ft

WS: 876.86ft   Crit.WS: 875.36ft   EGL: 878.37ft   Flow: 2000cfs

Elevation ft MSL

Horizontal Station ft

Mann Valley
100-year flow
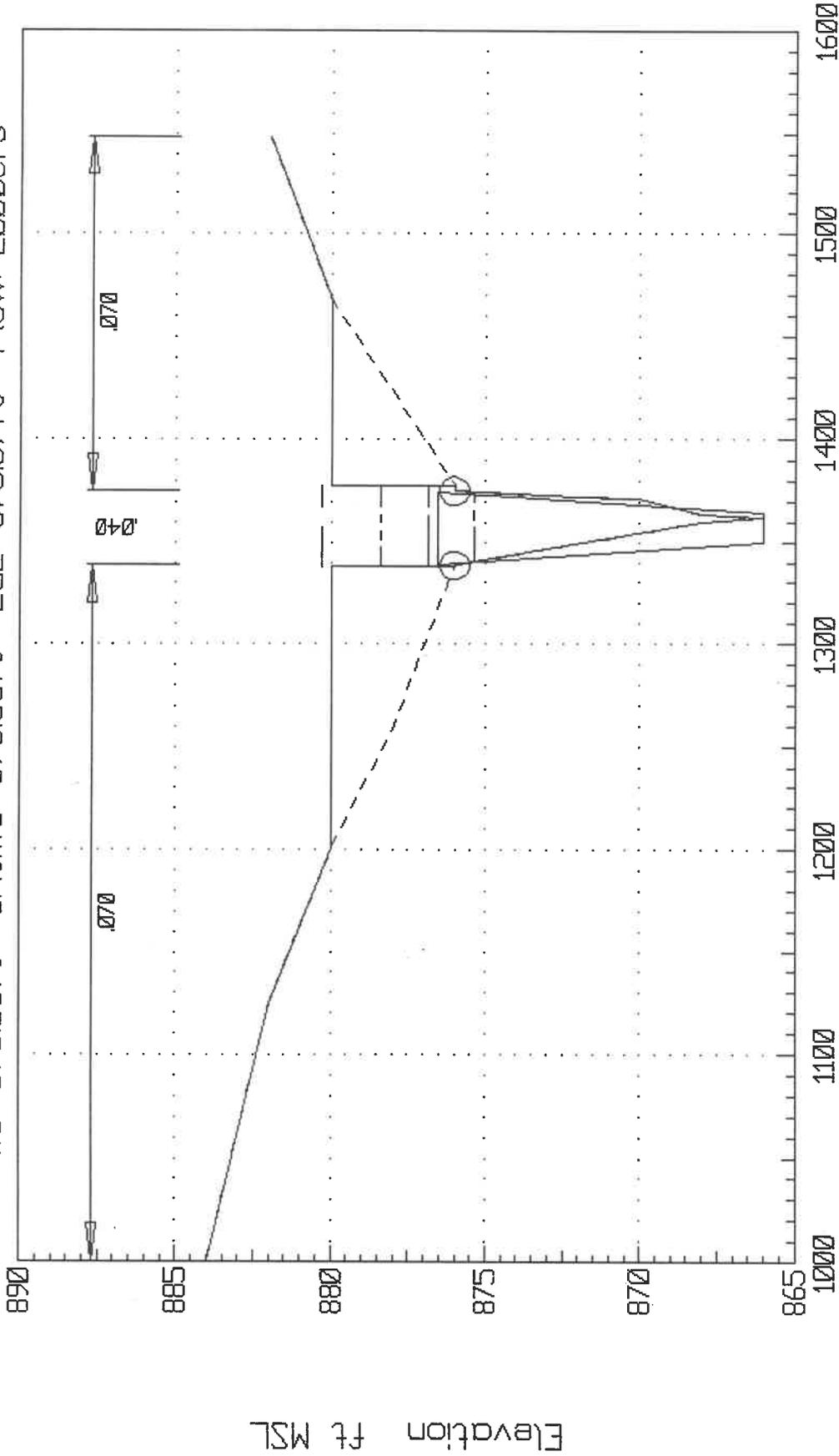
Original Channel
Bridge Low Chord
Computed W. S.
Manning's n Values

Revised Channel
Top of Roadway
Critical W. S.

Bridge Opening
Overbank Stations
Energy Grade Line

Cross-Section Plot 9724 ft

WS: 878.85ft Crit.WS: 873.04ft EGL: 878.95ft Flow: 2000cfs

Elevation ft MSL

Horizontal Station ft

Legend:
— Channel Bottom
— Critical W. S.
— Overbank Stations
----- Energy Grade Line
— Computed W. S.
— Manning's n Values
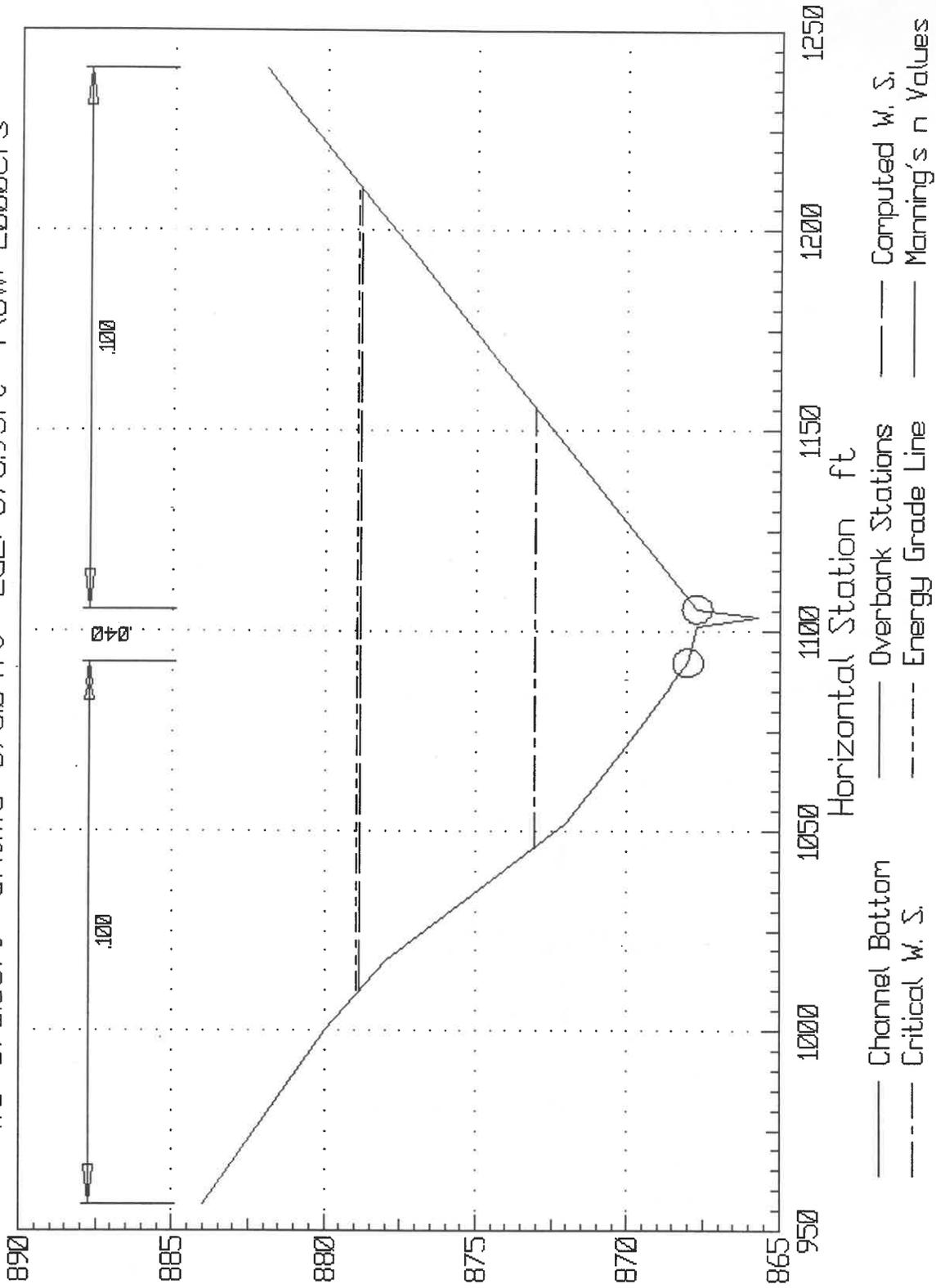
Mann Valley
100-year flow

Cross-Section Plot 10125 ft

WS: 879.13ft   Crit.WS: 873.15ft   EGL: 879.17ft   Flow: 2000cfs

Mann Valley
100-year flow

Legend:
— Channel Bottom
— Critical W. S.
— Overbank Stations
---- Energy Grade Line
— Computed W. S.
— Manning's n Values

Elevation   ft MSL

Horizontal Station   ft
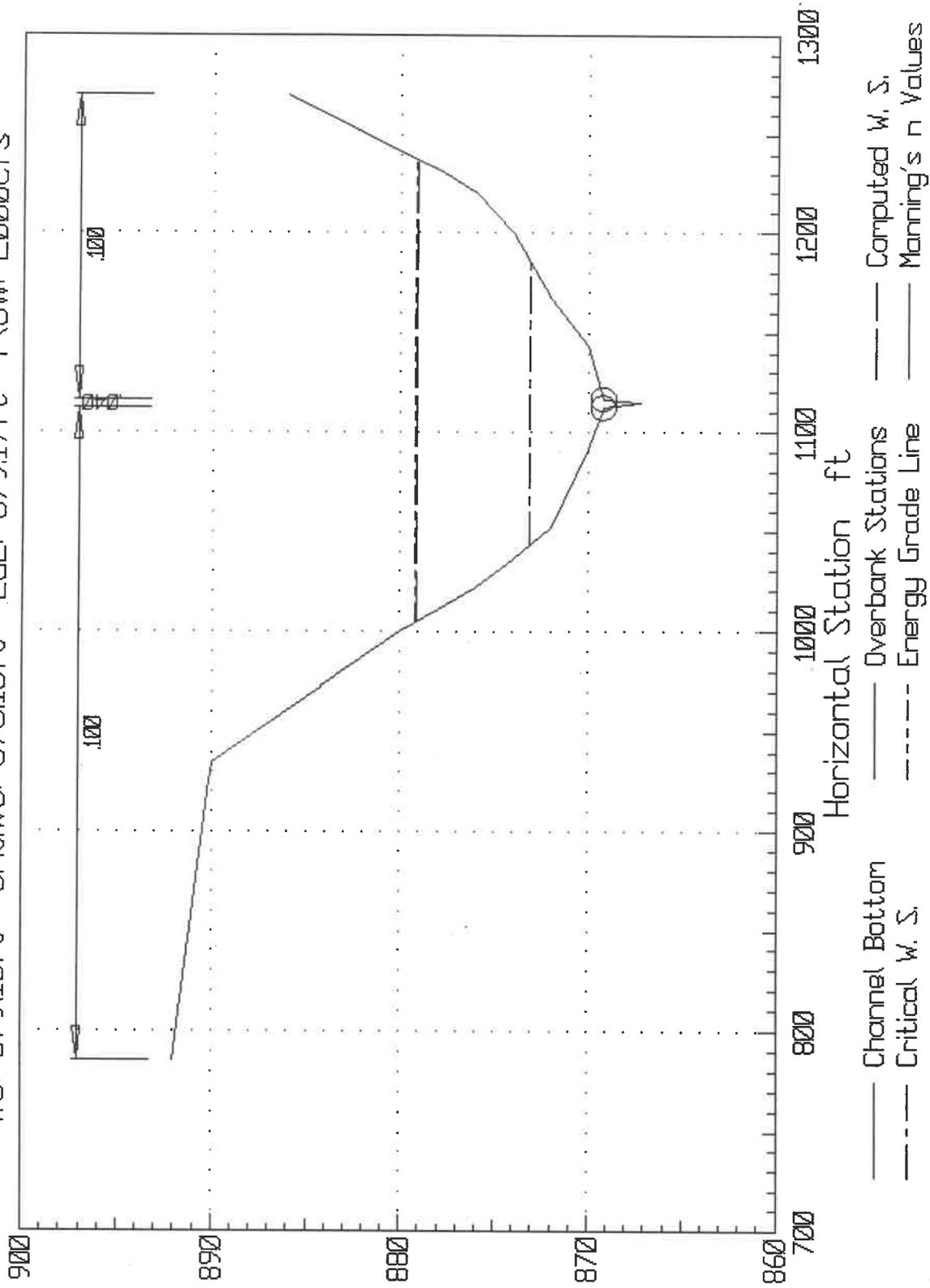
Cross-Section Plot 10492 ft

WS: 879.43ft   Crit.WS: 875.37ft   EGL: 879.61ft   Flow: 2000cfs

Horizontal Station ft

Elevation ft MSL

Legend:
— Channel Bottom
— Critical W. S.
— Computed W. S.
■ Overbank Stations
---- Energy Grade Line
Manning's n Values
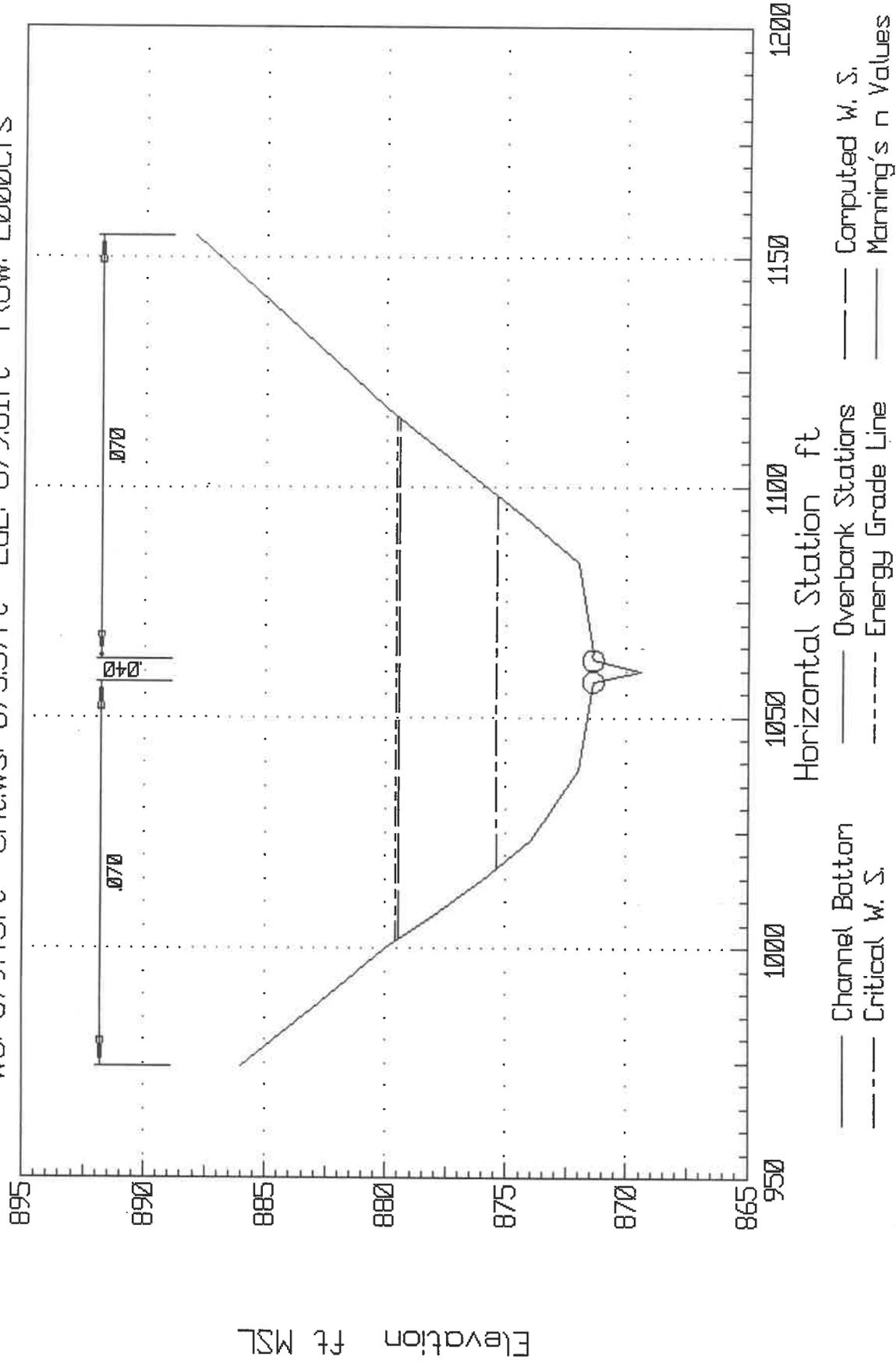
Mann Valley
100-year flow

Cross-Section Plot 10912 ft   Flow: 2000cfs

WS: 880.37ft Crit.WS: 877.94ft EGL: 880.52ft

Elevation ft MSL

Horizontal Station ft

Legend:
— Channel Bottom
— Critical W. S.
— Overbank Stations
---- Energy Grade Line
— Computed W. S.
— Manning's n Values
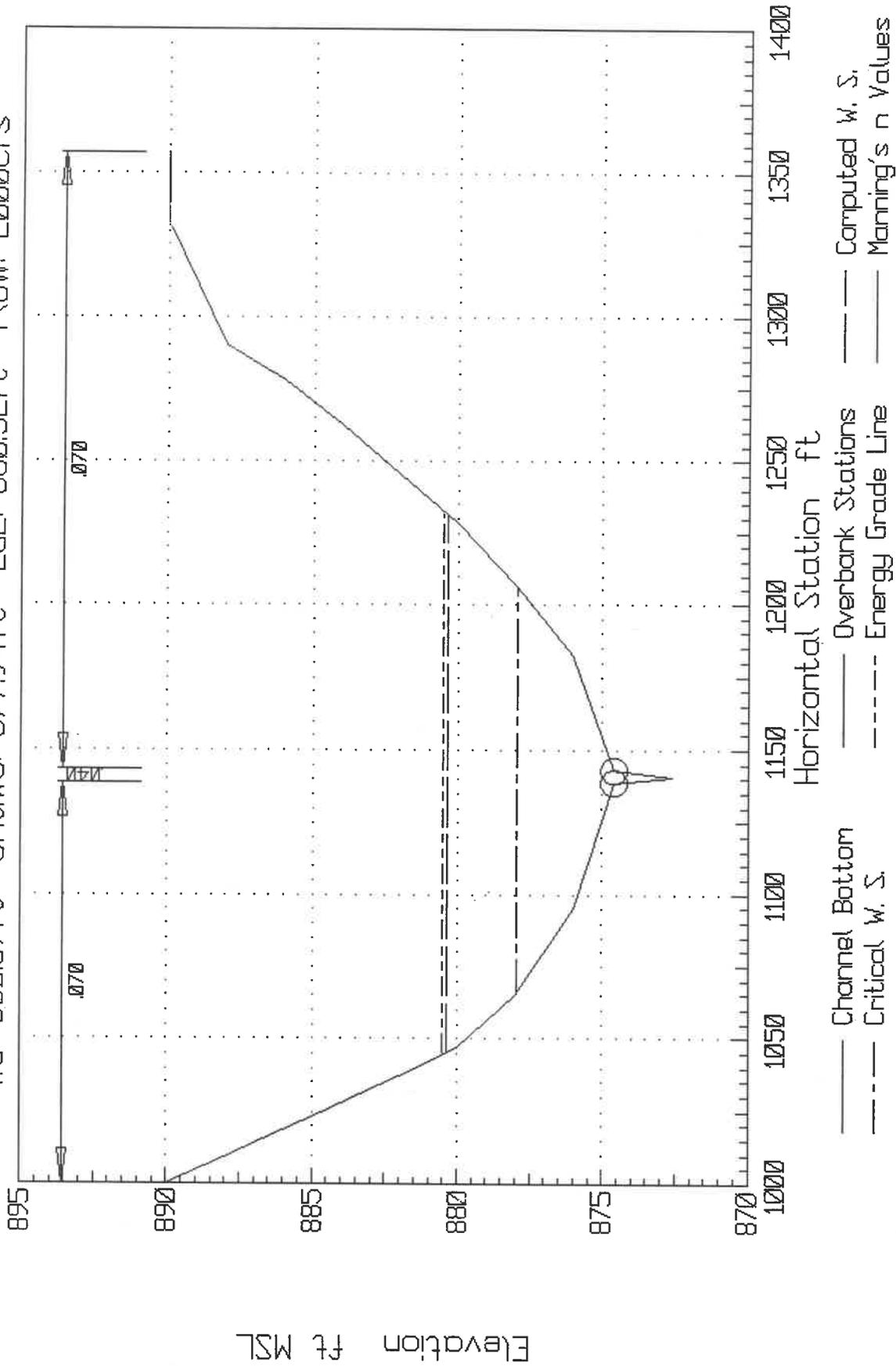
Mann Valley
100-year flow

Cross-Section Plot 11619 ft   Flow: 2000cfs

WS: 884.05ft   Crit.WS: 883.29ft   EGL: 885.03ft

Elevation ft MSL

Horizontal Station ft

Mann Valley
100-year flow

— Channel Bottom   — Computed W. S.
--- Critical W. S.   --- Overbank Stations
                         --- Energy Grade Line
                         — Manning's n Values

.070

.040

.070

895   890   885   880   875

1000   1050   1100   1150   1200
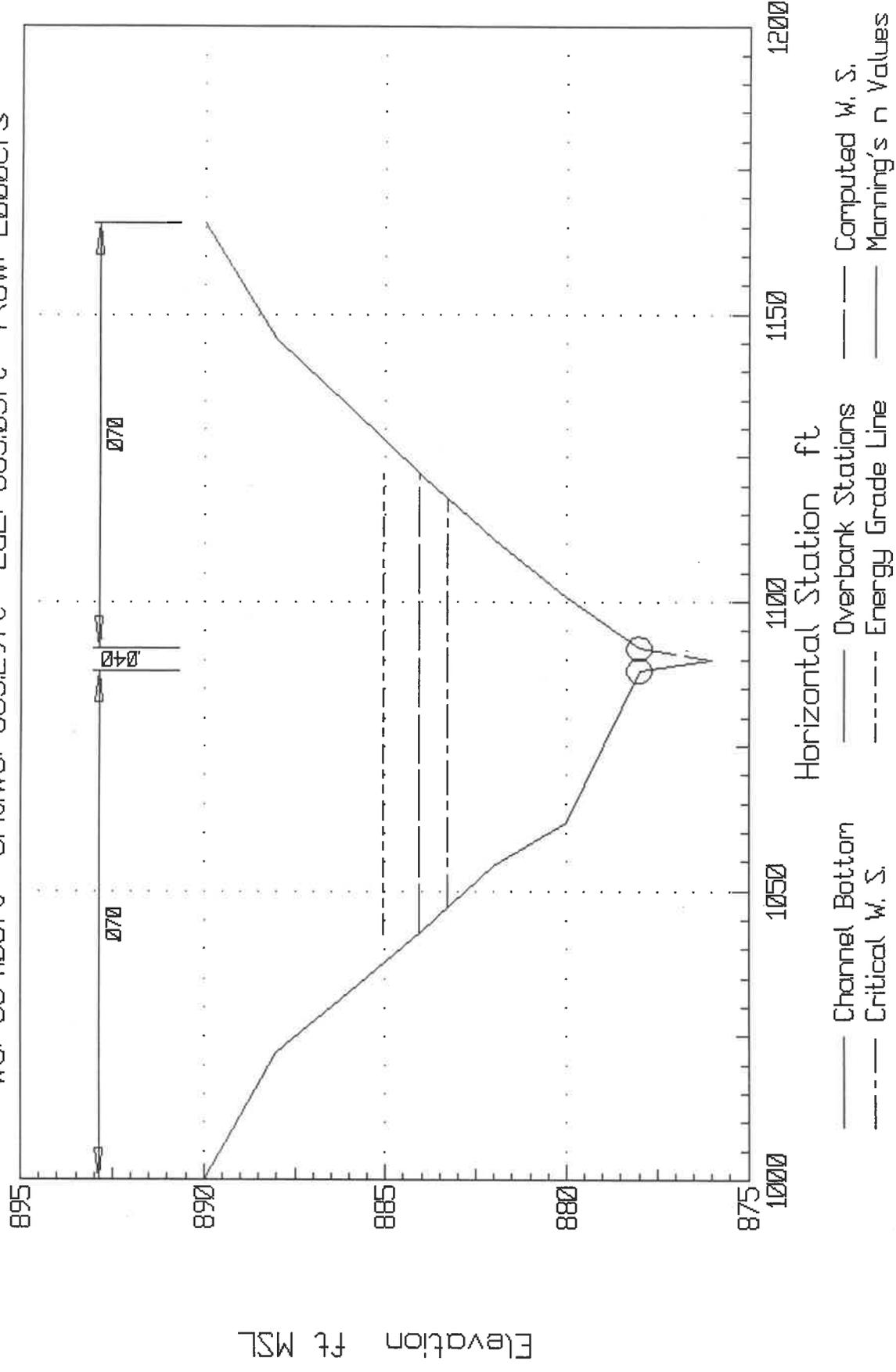
Cross-Section Plot 12068 ft

WS: 887.56ft Crit.WS: 884.92ft EGL: 887.86ft Flow: 2000cfs

Elevation ft MSL

Horizontal Station ft

Mann Valley
100-year flow

Legend:
— Channel Bottom
— Critical W. S.
— Computed W. S.
— Overbank Stations
----- Energy Grade Line
Manning's n Values

.070   .070   .070
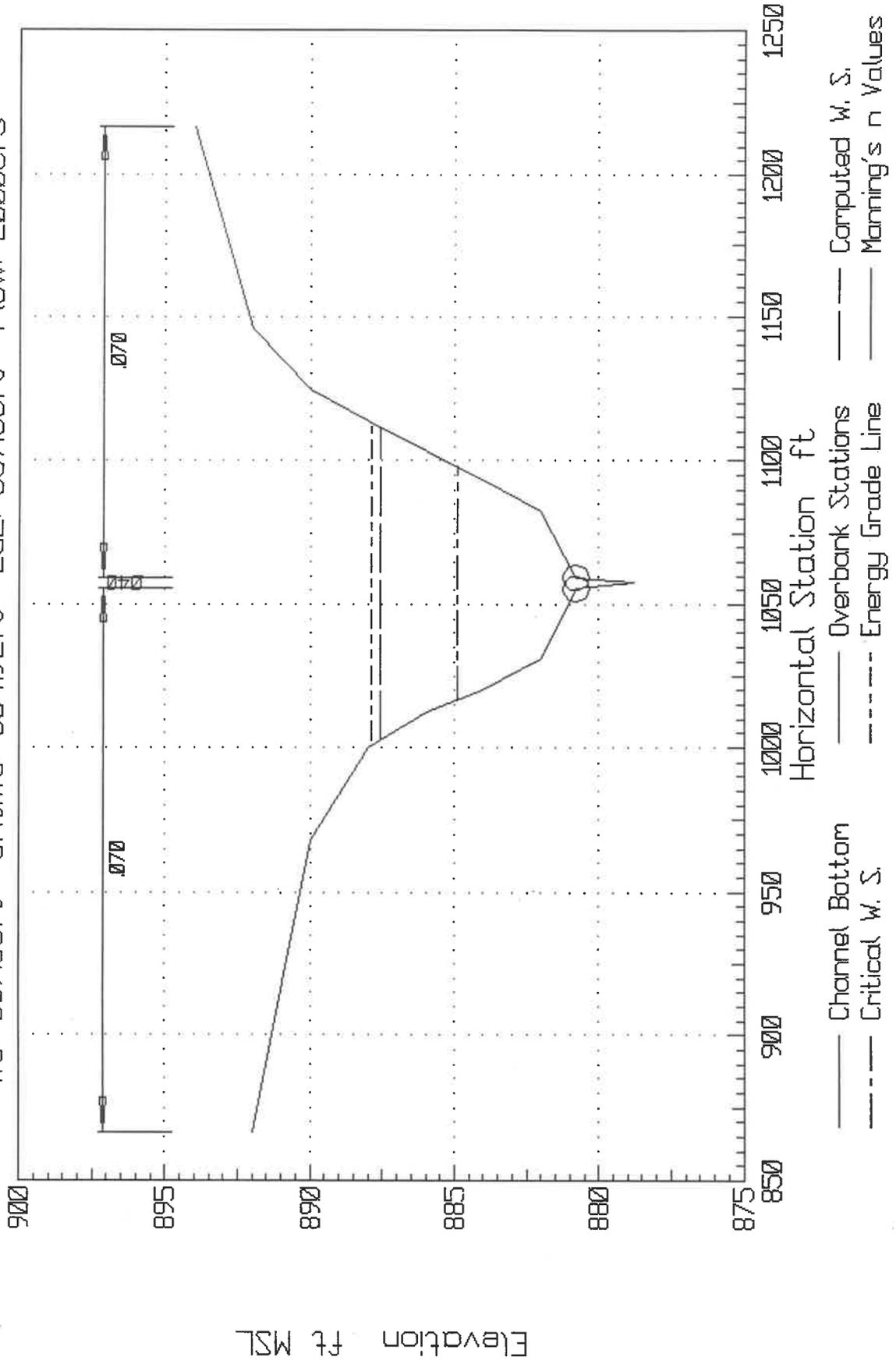
Cross-Section Plot 12460 ft

WS: 889.34ft Crit.WS: 887.64ft EGL: 889.63ft Flow: 2000cfs

Horizontal Station ft

Elevation ft MSL

Legend:
— Channel Bottom
— Computed W. S.
— Critical W. S.
— Overbank Stations
---- Energy Grade Line
— Manning's n Values
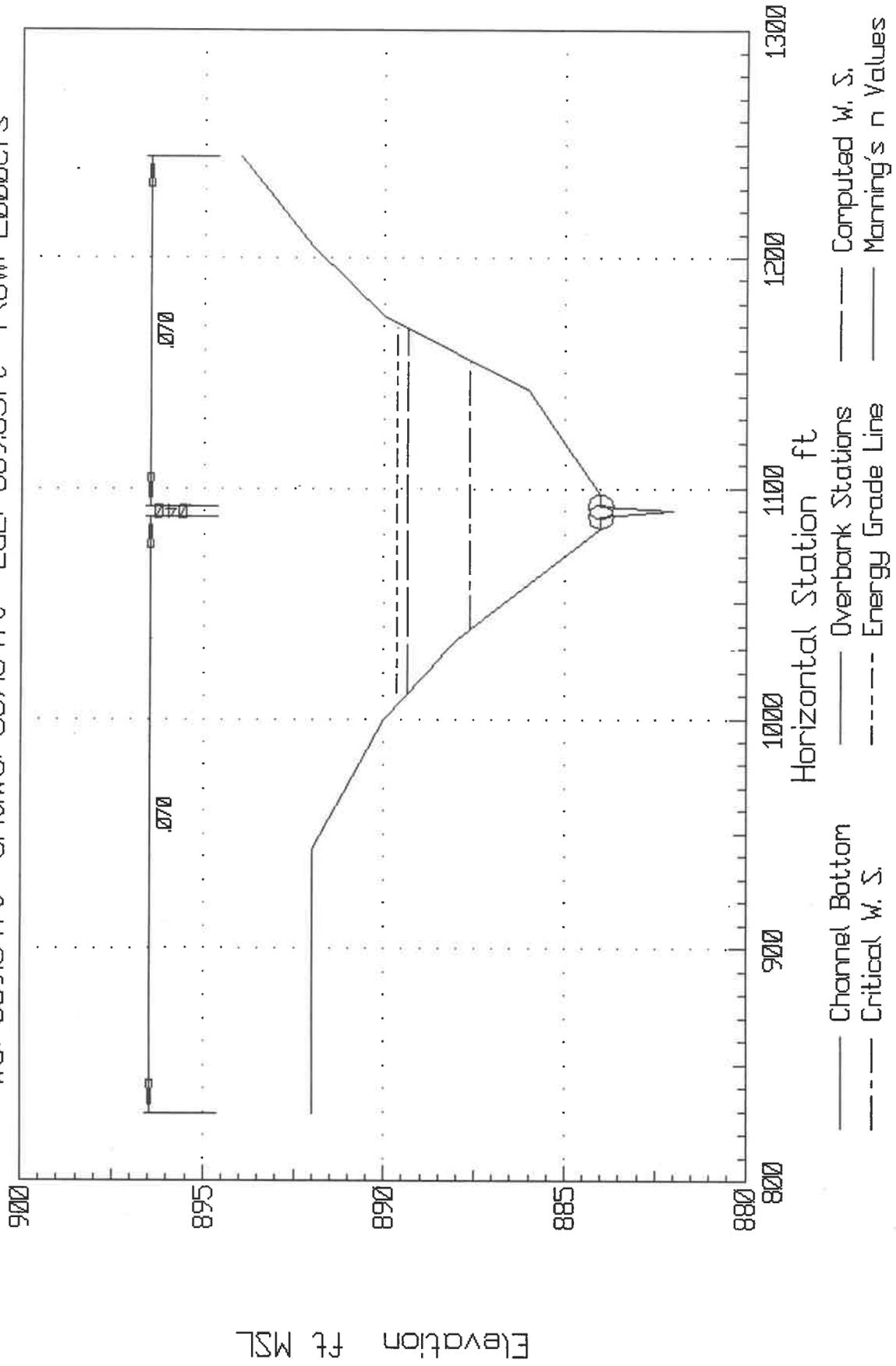
**Mann Valley
100-year flow**

Mann Valley

Backgound Data for Hydraulic Model

Stream and location: _MANN VALLEY ; c/o RIVER FALLS, WI_

Reach: _MANN 2ABOVE MM_

Event for which _n_ is assigned: _Q,100_

1. Is roughness uniform throughout the reach being considered? If not, _n_ should be assigned for the average condition of the reach. _Broken into reaches of homogeneous_

2. Is roughness uniformly distributed along the cross section? Is a division between channel and flood plain necessary? (Channel roughness uses steps 3–13, flood-plain roughness uses steps 14–23.) _Division Needed_ Is roughness uniformly distributed across the channel? If not, on what basis should _n_ for the individual segments be weighted?

3. Describe the channel. Are present conditions representative of those during the flood? If not, describe the probable conditions during the flood.

4. How will the roughness-producing effects of the following on the channel be accounted for?

    Bank roughness: _____

    Bedrock outcrops: _____

    Isolated boulders: _____

    Vegetation: _____

    Obstructions: _____

    Meander: _____

5–10. Computation of weighted _n_ for the channel

Segment number and material	Approximate dimensions, (ft)		Wetted perimeter, (ft)	Area, (ft²)	Median grain size, (mm)	Base _n_ for segment	Adjust-ments	Adjusted _n_	Weight factor	Adjusted _n_ times weight factor
	Width	Depth								
D.Sof M M	4	4	11.3	8	Sandy*	0.015				
just u.s. MM	4	4	11.3	8	Sandy	" "				
u.s. of MM	4	4	11.3	8	Sandy	" "				
									Sum	
									Weighted _n_ =	

*Based upon soils map.
Table 1

Figure 22. Sample form for computing _n_ values (modified from Aldridge and Garrett, 1973, fig. 4).

11–13. Computation of *n* for the channel
Adjustment factors for the channel

Factor	Describe conditions briefly	Adjustment
Irregularity, n_1	Moderate → all	0.01
Alignment, n_2	Occassional - all	0.001
Obstructions, n_3	Minor → all	0.01
Vegetation, n_4	Med	0.01
Meander, *m*	Minor	1.00
	Weighted *n* plus adjustments	.031
	Computed *n* =	.046 → use 0.04

14. Describe the flood plain.

   Are present conditions representative of those during the flood?

   If not, describe probable conditions during the flood.

15. Is the roughness coefficient to be determined by roughness factors only or is it to include vegetation-density method?

16. Is roughness uniformly distributed across the flood plain?

   If not, how should the flood plain be subdivided?

17–23. Computation of *n* for flood plain
Adjustment factors not using vegetation-density method

Subsection	Base *n*, n_b	Irregularity, n_1	Obstructions, n_3	Vegetation, n_4	Computed *n*
Below MM	0.015	Slightly 0.005	Mino 0.005	Large .05	.075 → use 0.0
Just above MM	" "	0.005	0.005	very large 0.08	.105 → use 0.1
U/S 6MM	" "	0.005	0.005	Large	.065 → use 0.0

Adjustment factors using vegetation-density method

Sub-section	Base *n*, n_b	Irregu-larity, n_1	Obstruc-tions, n_3	Vege-tation, n_4	Boundary roughness, $n_0 = n_b + n_1 + n_3 + n_4$	Vegetation density, Veg_d	Effective drag, C_*	Hydraulic radius, R	Computed *n*

Figure 22. Sample form for computing *n* values (modified from Aldridge and Garrett, 1973, fig. 4)—Continued.

Table 3. Adjustment values for factors that affect roughness of flood plains
[Modified from Aldridge and Garrett, 1973, table 2]

Flood-plain conditions		n value adjustment	Example
Degree of irregularity (n_1)	Smooth	0.000	Compares to the smoothest, flattest flood plain attainable in a given bed material.
	Minor	0.001–0.005	Is a flood plain slightly irregular in shape. A few rises and dips or sloughs may be visible on the flood plain.
	Moderate	0.006–0.010	Has more rises and dips. Sloughs and hummocks may occur.
	Severe	0.011–0.020	Flood plain very irregular in shape. Many rises and dips or sloughs are visible. Irregular ground surfaces in pastureland and furrows perpendicular to the flow are also included.
Variation of flood-plain cross section (n_2)		0.0	Not applicable.
Effect of obstructions (n_3)	Negligible	0.000–0.004	Few scattered obstructions, which include debris deposits, stumps, exposed roots, logs, or isolated boulders, occupy less than 5 percent of the cross-sectional area.
	Minor	0.005–0.019	Obstructions occupy less than 15 percent of the cross-sectional area.
	Appreciable	0.020–0.030	Obstructions occupy from 15 to 50 percent of the cross-sectional area.
Amount of vegetation (n_4)	Small	0.001–0.010	Dense growth of flexible turf grass, such as Bermuda, or weeds growing where the average depth of flow is at least two times the height of the vegetation, or supple tree seedlings such as willow, cottonwood, arrowweed, or saltcedar growing where the average depth of flow is at least three times the height of the vegetation.
	Medium	0.011–0.025	Turf grass growing where the average depth of flow is from one to two times the height of the vegetation, or moderately dense stemmy grass, weeds, or tree seedlings growing where the average depth of flow is from two to three times the height of the vegetation; brushy, moderately dense vegetation, similar to 1- to 2-year-old willow trees in the dormant season.
	Large	0.025–0.050	Turf grass growing where the average depth of flow is about equal to the height of the vegetation, or 8- to 10-year-old willow or cottonwood trees intergrown with some weeds and brush (none of the vegetation in foliage) where the hydraulic radius exceeds 2 ft, or mature row crops such as small vegetables, or mature field crops where depth of flow is at least twice the height of the vegetation.
	Very large	0.050–0.100	Turf grass growing where the average depth of flow is less than half the height of the vegetation, or moderate to dense brush, or heavy stand of timber with few down trees and little undergrowth where depth of flow is below branches, or mature field crops where depth of flow is less than the height of the vegetation.
	Extreme	0.100–0.200	Dense bushy willow, mesquite, and saltcedar (all vegetation in full foliage), or heavy stand of timber, few down trees, depth of flow reaching branches.
Degree of meander (m)		1.0	Not applicable.

Chow (1959) presents a table showing minimum, normal, and maximum values of n for flood plains covered by pasture and crops. These values are helpful for comparing the roughness values of flood plains having similar vegetation.

Vegetation-Density Method

For a wooded flood plain, the vegetation-density method can be used as an alternative to the previous method for determining n values for flood plains. In a wooded flood plain, where the tree diameters can be measured, the vegetation density of the flood plain can be determined.

Determining the vegetation density is an effective way of relating plant height and density characteristics, as a function of depth of flow, to the flow resistance of vegetation. Application of the flow-resistance model presented below requires an estimate of the vegetation density as a function of depth of flow. The procedure requires a direct or indirect determination of vegetation density at a given depth. If the change in n value through a range in depth is required, then an estimation of vegetation density through that range is necessary.

Techniques for Determining Vegetation Density

Petryk and Bosmajian (1975) developed a method of analysis of the vegetation density to determine the rough-

Table 2. Adjustment values for factors that affect the roughness of a channel
[Modified from Aldridge and Garrett, 1973, table 2]

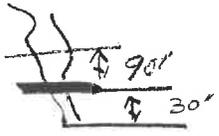| Channel conditions		n value adjustment[1]	Example
Degree of irregularity (n_1)	Smooth	0.000	Compares to the smoothest channel attainable in a given bed material.
	Minor	0.001–0.005	Compares to carefully dredged channels in good condition but having slightly eroded or scoured side slopes.
	Moderate	0.006–0.010	Compares to dredged channels having moderate to considerable bed roughness and moderately sloughed or eroded side slopes.
	Severe	0.011–0.020	Badly sloughed or scalloped banks of natural streams; badly eroded or sloughed sides of canals or drainage channels; unshaped, jagged, and irregular surfaces of channels in rock.
Variation in channel cross section (n_2)	Gradual	0.000	Size and shape of channel cross sections change gradually.
	Alternating occasionally	0.001–0.005	Large and small cross sections alternate occasionally, or the main flow occasionally shifts from side to side owing to changes in cross-sectional shape.
	Alternating frequently	0.010–0.015	Large and small cross sections alternate frequently, or the main flow frequently shifts from side to side owing to changes in cross-sectional shape.
Effect of obstruction (n_3)	Negligible	0.000–0.004	A few scattered obstructions, which include debris deposits, stumps, exposed roots, logs, piers, or isolated boulders, that occupy less than 5 percent of the cross-sectional area.
	Minor	0.005–0.015	Obstructions occupy less than 15 percent of the cross-sectional area, and the spacing between obstructions is such that the sphere of influence around one obstruction does not extend to the sphere of influence around another obstruction. Smaller adjustments are used for curved smooth-surfaced objects than are used for sharp-edged angular objects.
	Appreciable	0.020–0.030	Obstructions occupy from 15 to 50 percent of the cross-sectional area, or the space between obstructions is small enough to cause the effects of several obstructions to be additive, thereby blocking an equivalent part of a cross section.
	Severe	0.040–0.050	Obstructions occupy more than 50 percent of the cross-sectional area, or the space between obstructions is small enough to cause turbulence across most of the cross section.
Amount of vegetation (n_4)	Small	0.002–0.010	Dense growths of flexible turf grass, such as Bermuda, or weeds growing where the average depth of flow is at least two times the height of the vegetation; supple tree seedlings such as willow, cottonwood, arrowweed, or saltcedar growing where the average depth of flow is at least three times the height of the vegetation.
	Medium	0.010–0.025	Turf grass growing where the average depth of flow is from one to two times the height of the vegetation; moderately dense stemmy grass, weeds, or tree seedlings growing where the average depth of flow is from two to three times the height of the vegetation; brushy, moderately dense vegetation, similar to 1- to 2-year-old willow trees in the dormant season, growing along the banks, and no significant vegetation is evident along the channel bottoms where the hydraulic radius exceeds 2 ft.
	Large	0.025–0.050	Turf grass growing where the average depth of flow is about equal to the height of the vegetation; 8- to 10-year-old willow or cottonwood trees intergrown with some weeds and brush (none of the vegetation in foliage) where the hydraulic radius exceeds 2 ft; bushy willows about 1 year old intergrown with some weeds along side slopes (all vegetation in full foliage), and no significant vegetation exists along channel bottoms where the hydraulic radius is greater than 2 ft.
	Very large	0.050–0.100	Turf grass growing where the average depth of flow is less than half the height of the vegetation; bushy willow trees about 1 year old intergrown with weeds along side slopes (all vegetation in full foliage), or dense cattails growing along channel bottom; trees intergrown with weeds and brush (all vegetation in full foliage).
Degree of meandering[2] (m)	Minor	1.00	Ratio of the channel length to valley length is 1.0 to 1.2.
	Appreciable	1.15	Ratio of the channel length to valley length is 1.2 to 1.5.
	Severe	1.30	Ratio of the channel length to valley length is greater than 1.5.

[1] Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (table 1) before multiplying by the adjustment for meander.

[2] Adjustment values apply to flow confined in the channel and do not apply where downvalley flow crosses meanders.

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JOB A-RIVERS601-River Falls FIS
SHEET NO. 1 OF 7
CALCULATED BY _____ DATE 3/12/97
CHECKED BY _____ DATE
SCALE _____

CR M BRIDGE

FROM WIS PRO COUNTY HWY M MODEL

modeled reach:
30' downstream
90' upstream

BL Low chord = 876.55
Length of Bridge between abutments =
BRIDGE centered @ station 140

42.2'
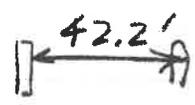
BD Depth of bridge deck = 3.43'
Elevation of the top of the deck

880.0
3.43'
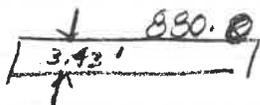
CD Sloping embankment and sloping spill through abutments.
Total Bridge width = 40'
Embankment Sideslope = 3:1
Embankment Elevation = 880.0

AB Slope Horizontal = 1.5 %

```
*              MANNINGS N
N              0.040
*
XS  (FULV) 530 * * * 0.006
*              X-SECTION AT BRIDGE
BR    BR1  530 876.55
BL 0         42.2 138 142
BD           3.43 880
CD           3 40 3 880
AB           1.5
N            0.045
```

```
              100YR.
Q             700
*
SK            0.006  — FOR INITIAL WS ~ energy grade slope (H/FT)
*
*    Name  X-SECTION STARTS AT STA 8+50 (ON PLAN AND PROFILE)
XS  (EXIT) 500
GR    0,880  28,878.00  44,876  53,874  75,872  101,870
GR    121,868  133,866  140,865.18  146,866  152,868
GR    167,870  180,872  190,874  205,874  234,872  280,872  320,880
SA
```

868
867
866
865

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SHEET NO. ___2___ OF ___4___
CALCULATED BY _AC_ DATE _3/23/11_
CHECKED BY _____ DATE _____
SCALE _____

C.T.H. MM BRIDGE

FROM WSPRO OUTPUT:

AREA @ 870.04 = 70 sf
BOTTOM ELEV= 866
SIDESLOPES = 3:1
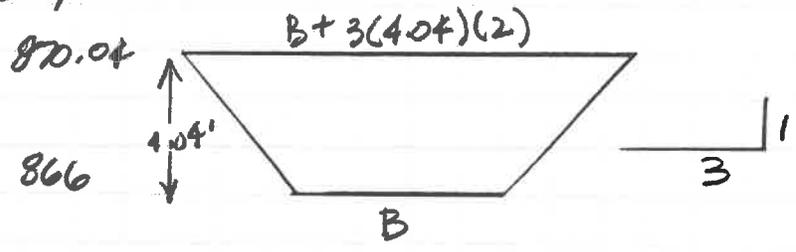
$$AREA = 70\,sf = \frac{B + \{B + 3(4.04)(2)\}}{2}(4.04)$$

$$\frac{70(2)}{4.04} = 2B + 6(4.04)$$

$$\frac{1}{2}\left\{\frac{70(2)}{4.04} - 6(4.04)\right\} = B = 5.2'$$

(TOP WIDTH OF FLOW = 5.2 + 3(4.04)(2) = 29.4'
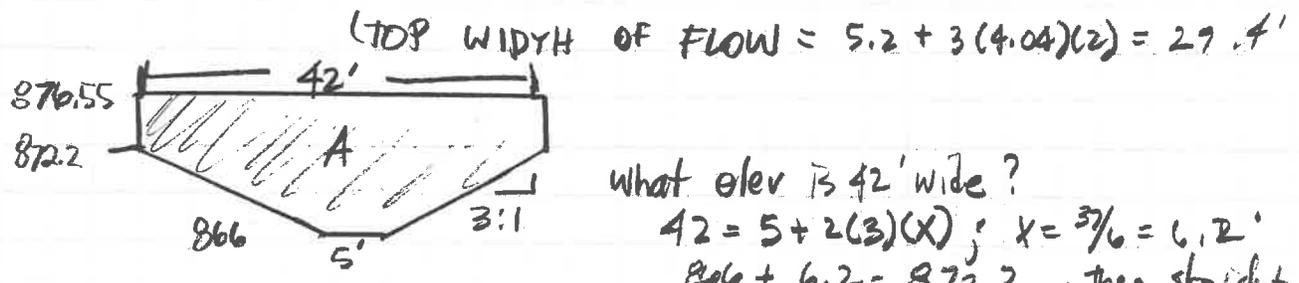
what elev is 42' wide?
42 = 5 + 2(3)(x); $x = \frac{37}{6} = 6.2'$
866 + 6.2 = 872.2 ...then straight

$$AVAIL\ AREA = (876.55 - 872.2)(42') + \frac{(5 + 42)}{2}(872.2 - 866)$$

$$= \quad 183 + 145 \;\boxed{= 328\ sf}\ available \rightarrow use\ 300\ sf$$
(account for add'l riprap, etc which may be present @ abutments)

wspro Avail modeled would be more based upon sideslope approx......

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SHEET NO. _3_ OF _4_
CALCULATED BY _____ DATE _3/23/97_
CHECKED BY _____ DATE _____
SCALE _____

TRAPEZOIDAL APPROXIMATION

$A = 328$ sf

TOP $= 42'$
BOTTOM $= ?$

876.55 ... 42'
328 sf
866 ... B
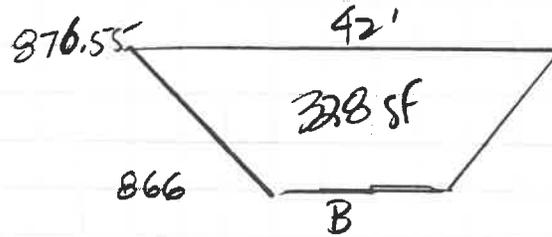
$$\left[(B+42)/2 \right](876.55 - 866) = 328$$

$$(B+42)/2 = \frac{328}{10.55} = 31$$

$$B = (31)2 - 42 = 20'$$

SIDESLOPE $=$ $42 = 20 + 2(SS)(876.55 - 866)$

$$\frac{22}{2(10.55)} = SS = 1.04 \Rightarrow 1:1$$

Check area @ 870.04

$T = 20 + 1(4.04)(2)$ 870.04
866
20'
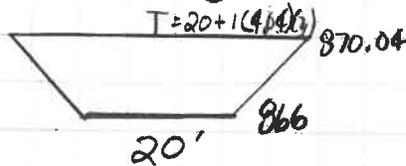
$$A = \frac{20 + (20 + 1(4.04)(2))}{2}\, 4.04$$
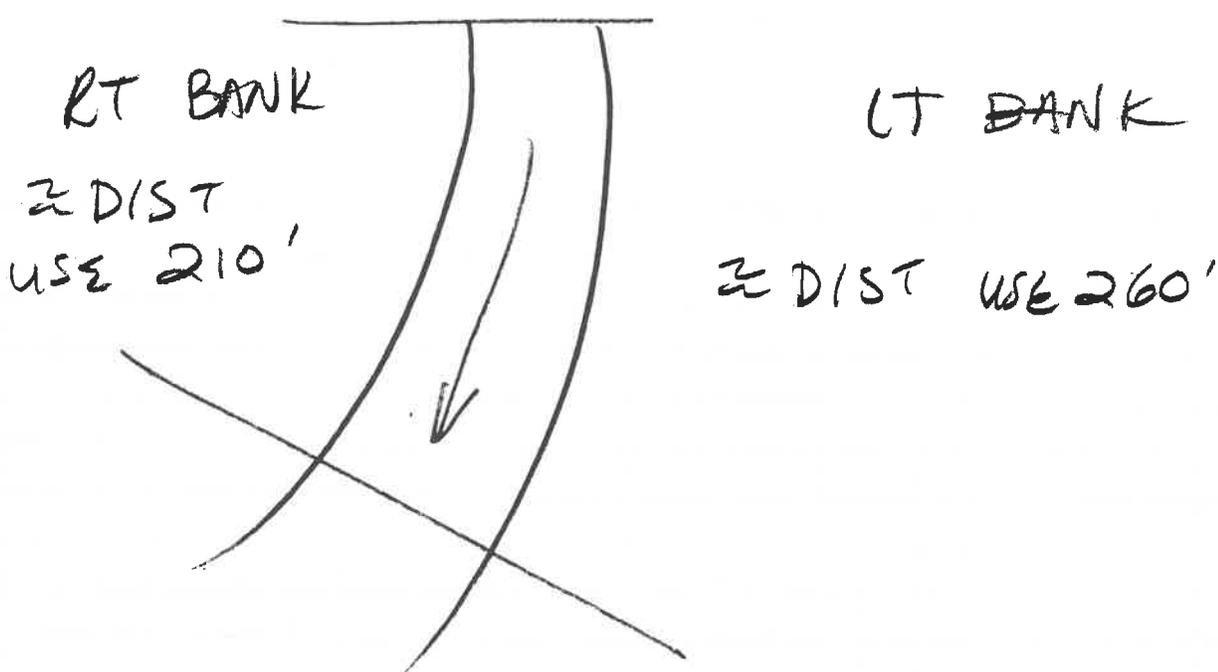
$$A = \frac{20 + 28}{2}(4.04) = 97\,sf$$

NOTE: THIS OVERESTIMATES AREA...

USE 15' BW w/1:1 $A_{(870.04)} = \frac{15 + (15 + 1(4.04)(2))}{2}(4.04) = 77sf$ OK

(w/in 10% OK)

Total then is $A_{(876.55)} = \frac{15 + (15 + 1(876.55 - 866)(2))}{2}(876.55 - 866) = 270\,sf$

w/ 18% of approximated area. - ok -use

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JOB _A-RIVER9601- River Falls FIS_

SHEET NO. _1_ OF _4_

CALCULATED BY _B.L._ DATE _3/23/9?_

CHECKED BY _____ DATE _____

SCALE _____

DOWNSTREAM ENCROACHMENT   (4:1 spread)

RT BANK

≈ DIST
USE 210'

LT BANK

≈ DIST USE 260'

THEN   RIGHT = 210/4 ≈ 50' RT OF RT BANK

LEFT = 260/4 ≈ 65' LT OF LT BANK

RT BANK STA = USE 1126.94
LT BANK STA = USE 1086.89

So encroach @ RT 1126.94 + 50 ⇒ 1177 create new use 1176

LT 1086.89 - 65 ⇒ 1022 ⇒ use 1023.33

✗ UPSTREAM ENCROACHMENT NOT NEEDED DUE TO
TOPOGRAPHY

```
T1          CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
T2          P-55-074 MANN VALLEY CREEK
T3          EXISTING CONDITIONS
*
*
J1          1
*
*           SDR     Q VEL XSTW YMIN   FR#    WSEL   EGL
J3           6      5  13   28   23    14      3     7
*
*
*           100YR.
2           700
*
3K          0.006
*
*           X-SECTION STARTS AT STA 8+50 (ON PLAN AND PROFILE)
XS   EXIT  500
GR          0,880 28,878.00 44,876 53,874 75,872 101,870
GR          121,868 133,866 140,865.18 146,866 152,868
GR          167,870 180,872 190,874 205,874 234,872 280,872 320,880
3A
*           MANNINGS N
N           0.040
*
KS   FULV  530 * * * 0.006
*           X-SECTION AT BRIDGE
BR   BR1   530 877.40 15
GR          131,877.4 131,866.18 140,865.36 146,866.18
GR          153,866.5 153,877.4 131,877.4
CD          2 30 2 880 45
I           0.045
*
*
AS   APPR  590
GR          0,880 13,874 50,872 95,870 103,868 138,868
GR          143,866 145,865.72 148,866 165,868 175,870
GR          188,872 208,874 220,876 232,878 240,880
3A
*           MANNINGS N
N           0.040
*
X
ER
```

1

WSPRO   FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188   MODEL FOR WATER-SURFACE PROFILE COMPUTATIONS
               (Input modified to free format by GKY&A 01/92)

         *** RUN DATE & TIME: 02-05-96 09:20

```
    T1        CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
    T2        P-55-074 MANN VALLEY CREEK
    T3        EXISTING CONDITIONS
    *
    *
    J1        1
```

J1 RECORD PARAMETERS:
DELTAY = 1.00   YTOL = .02   QTOL = .02   FNTEST = .80   IHFNOJ = -1

```
    *
    *         SDR   Q VEL XSTW YMIN  FR#  WSEL  EGL
    J3         6    5  13  28   23   14    3    7
    *
    *
    *         100YR.
    Q         700
*** Q-DATA FOR SEC-ID, ISEQ =                1
    *
    SK        0.006
    *
    *         X-SECTION STARTS AT STA 8+50 (ON PLAN AND PROFILE)
```

1

WSPRO   FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188   MODEL FOR WATER-SURFACE PROFILE COMPUTATIONS
               (Input modified to free format by GKY&A 01/92)

*** START PROCESSING CROSS SECTION - "EXIT "

```
    XS    EXIT 500
    GR        0,880 28,878.00 44,876 53,874 75,872 101,870
    GR        121,868 133,866 140,865.18 146,866 152,868
    GR        167,870 180,872 190,874 205,874 234,872 280,872 320,880
    SA
    *         MANNINGS N
    N         0.040
    *
```

*** FINISH PROCESSING CROSS SECTION - "EXIT "
*** CROSS SECTION "EXIT " WRITTEN TO DISK, RECORD NO. = 1

--- DATA SUMMARY FOR SECID "EXIT " AT SRD =   500.   ERR-CODE =   0

```
      SKEW      IHFNO     VSLOPE          EK        CK
       .0        0. ********        .50       .00
```

X-Y COORDINATE PAIRS (NGP = 18):

X	Y	X	Y	X	Y	X	Y
.0	880.00	28.0	878.00	44.0	876.00	53.0	874.00

```
           75.0  872.00      101.0  870.00      121.0  868.00      133.0  866.00
          140.0  865.18      146.0  866.00      152.0  868.00      167.0  870.00
          180.0  872.00      190.0  874.00      205.0  874.00      234.0  872.00
          280.0  872.00      320.0  880.00

     X-Y MAX-MIN POINTS:
         XMIN       Y           X     YMIN       XMAX       Y           X     YMAX
          .0    880.00      140.0  865.18      320.0  880.00         .0    880.00

  ROUGHNESS COEFFICIENTS (NSA =   1):
           .040
```

        CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
        P-55-074 MANN VALLEY CREEK
        EXISTING CONDITIONS
           *** RUN DATE & TIME: 02-05-96 09:20

*** START PROCESSING CROSS SECTION - "FULV "
   XS   FULV 530 * * * 0.006
    *   X-SECTION AT BRIDGE

*** FINISH PROCESSING CROSS SECTION - "FULV "
*** NO ROUGHNESS DATA INPUT, WILL PROPAGATE FROM PREVIOUS CROSS SECTION.
*** CROSS SECTION "FULV " WRITTEN TO DISK, RECORD NO. =   2

--- DATA SUMMARY FOR SECID "FULV " AT SRD =   530. ERR-CODE =   0

```
     SKEW        IHFNO       VSLOPE         EK          CK
      .0          0.         .0060         .50         .00

X-Y COORDINATE PAIRS   (NGP =   18):
     X-       Y           X      Y            X      Y            X      Y
      .0   880.18       28.0  878.18       44.0  876.18       53.0  874.18
     75.0  872.18      101.0  870.18      121.0  868.18      133.0  866.18
    140.0  865.36      146.0  866.18      152.0  868.18      167.0  870.18
    180.0  872.18      190.0  874.18      205.0  874.18      234.0  872.18
    280.0  872.18      320.0  880.18

  X-Y MAX-MIN POINTS:
      XMIN       Y           X     YMIN       XMAX       Y           X     YMAX
       .0   880.18      140.0  865.36      320.0  880.18         .0    880.18
```

ROUGHNESS COEFFICIENTS (NSA =   1):
          .040

        CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
        P-55-074 MANN VALLEY CREEK
        EXISTING CONDITIONS
           *** RUN DATE & TIME: 02-05-96 09:20

*** START PROCESSING CROSS SECTION - "BR1   "
   BR   BR1 530 877.40 15

```
    GR          131,877.4 131,866.18 140,865.36 146,866.18
    GR          153,866.5 153,877.4 131,877.4
    CD          2 30 2 880 45
    N           0.045
    *
    *

*** FINISH PROCESSING CROSS SECTION - "BR1   "
*** CROSS SECTION "BR1   " WRITTEN TO DISK, RECORD NO. =   3

--- DATA SUMMARY FOR SECID "BR1   " AT SRD =     530.  ERR-CODE =        0

      SKEW      IHFNO     VSLOPE         EK        CK
      15.0         0.      .0060        .50       .00

X-Y COORDINATE PAIRS   (NGP =    7):
       X        Y          X        Y          X        Y          X        Y
    131.0   877.40      131.0   866.18      140.0   865.36      146.0   866.18
    153.0   866.50      153.0   877.40      131.0   877.40

  X-Y MAX-MIN POINTS:
      XMIN         Y          X      YMIN       XMAX         Y          X      YMAX
    131.0   877.40      140.0   865.36      153.0   866.50      131.0   877.40

ROUGHNESS COEFFICIENTS (NSA =   1):
         .045

BRIDGE PARAMETERS:
  BRTYPE    BRWDTH      LSEL   USERCD   EMBSS    EMBELV     YABLT     YABRT
     2       30.0    877.40 *******    2.00    880.00 ******** ********

PIER DATA:  NPW =   0     PPCD = **
1
 WSPRO                FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188                 MODEL   FOR   WATER-SURFACE   PROFILE   COMPUTATIONS
                          (Input modified to free format by GKY&A 01/92)

         CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
         P-55-074 MANN VALLEY CREEK
         EXISTING CONDITIONS
            *** RUN DATE & TIME: 02-05-96  09:20

*** START PROCESSING CROSS SECTION - "APPR "
  AS   APPR 590
  GR          0,880 13,874 50,872 95,870 103,868 138,868
  GR          143,866 145,865.72 148,866 165,868 175,870
  GR          188,872 208,874 220,876 232,878 240,880
  SA
  *           MANNINGS N
  N           0.040
  *
  EX

*** FINISH PROCESSING CROSS SECTION - "APPR "
*** CROSS SECTION "APPR " WRITTEN TO DISK, RECORD NO. =   4

--- DATA SUMMARY FOR SECID "APPR " AT SRD =     590.  ERR-CODE =        0

      SKEW      IHFNO     VSLOPE         EK        CK
       .0         0.      .0060        .50       .00
```

X-Y COORDINATE PAIRS (NGP = 16):

X	Y	X	Y	X	Y	X	Y
.0	880.00	13.0	874.00	50.0	872.00	95.0	870.00
103.0	868.00	138.0	868.00	143.0	866.00	145.0	865.72
148.0	866.00	165.0	868.00	175.0	870.00	188.0	872.00
208.0	874.00	220.0	876.00	232.0	878.00	240.0	880.00

X-Y MAX-MIN POINTS:

XMIN	Y	X	YMIN	XMAX	Y	X	YMAX
.0	880.00	145.0	865.72	240.0	880.00	.0	880.00

ROUGHNESS COEFFICIENTS (NSA = 1):
          .040

BRIDGE PROJECTION DATA: XREFLT   XREFRT   FDSTLT   FDSTRT
                          ******* ******* ******* *******

+++ BEGINNING PROFILE CALCULATIONS --   1

WSPRO   FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188   MODEL FOR WATER-SURFACE PROFILE COMPUTATIONS
                       (Input modified to free format by GKY&A 01/92)

          CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
          P-55-074 MANN VALLEY CREEK
          EXISTING CONDITIONS
          *** RUN DATE & TIME: 02-05-96 09:20

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
EXIT :XS	******	101.	144.	.37	*****	870.34	869.04	700.	869.97
500.	******	167.	9033.	1.00	*****	*******	.58	4.85	
FULV :FV	30.	101.	146.	.36	.18	870.53	*******	700.	870.17
530.	30.	167.	9136.	1.00	.00	.02	.57	4.81	

          <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                        "APPR "   KRATIO = 1.62

APPR :AS	60.	82.	228.	.15	.22	870.74	*******	700.	870.60
590.	60.	179.	14834.	1.00	.00	.00	.35	3.08	

          <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

          <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
BR1 :BR	30.	131.	70.	2.33	.38	871.56	869.17	700.	869.23
530.	30.	153.	4331.	1.49	.85	.00	1.19	10.04	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
2.	****	1.	.821	******	877.40	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	

```
APPR :AS       30.     26.       596.      .02    .07   873.32   869.05       700.   873.30
            590.     33.     201.    50062.   1.00   1.69      .01      .11       1.17

            M(G)    M(K)        KQ     XLKQ    XRKQ     OTEL
            .774    .633    18268.    133.    155.    873.30
```

<center><<<<<END OF BRIDGE COMPUTATIONS>>>>></center>

```
1
WSPRO           FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188            MODEL   FOR   WATER-SURFACE   PROFILE   COMPUTATIONS
                    (Input modified to free format by GKY&A 01/92)

        CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
        P-55-074 MANN VALLEY CREEK
        EXISTING CONDITIONS
           *** RUN DATE & TIME: 02-05-96  09:20
   FIRST USER DEFINED TABLE.

    XSID:CODE      SRD       Q      VEL    XSTW     YMIN      FR#      WSEL       EGL
    EXIT :XS       500.    700.     4.85    65.   865.18      .58    869.97    870.34
    FULV :FV       530.    700.     4.81    66.   865.36      .57    870.17    870.53
    BR1  :BR       530.    700.    10.04    21.   865.36     1.19    869.23    871.56
    APPR :AS       590.    700.     1.17   175.   865.72      .11    873.30    873.32
   ER

   NORMAL  END  OF  WSPRO  EXECUTION.
```
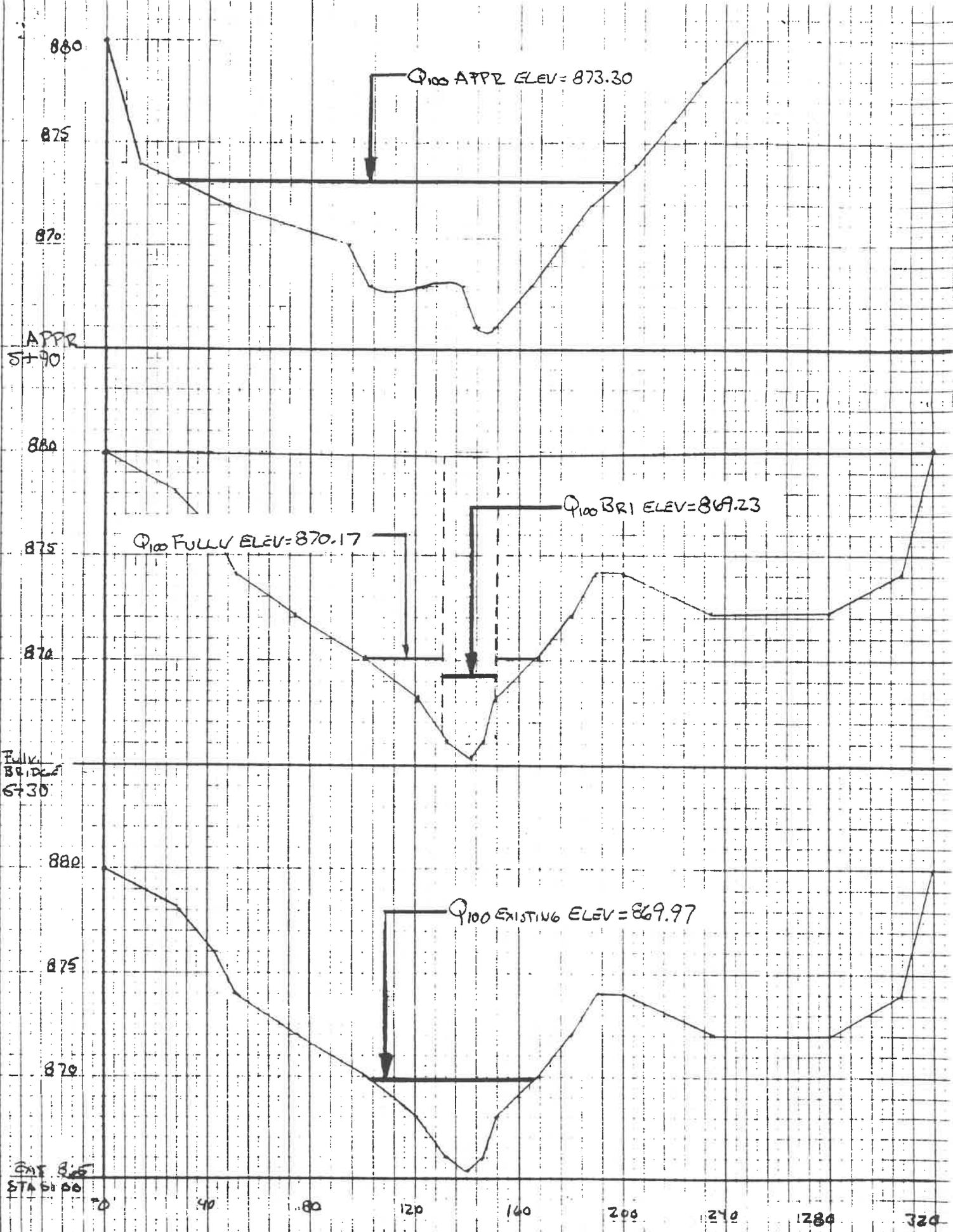
Q_{100} APPR ELEV = 873.30

Q_{100} BRI ELEV = 869.23

Q_{100} FULLV ELEV = 870.17

Q_{100} EXISTING ELEV = 869.97

Q_{100} EXISTING CONDITIONS

P-55-74 OLD

```
T1        CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
T2        P-55-149 MANN VALLEY CREEK
T3        PROPOSED 42FT 28" "I" GIRDER
*
*
J1        1
*
*         SDR   Q VEL XSTW YMIN  FR#  WSEL  EGL
J3        6     5  13   28   23   14    3    7
*
*
*         100YR.
Q         700
*
JK        0.006
*
*         X-SECTION STARTS AT STA 8+50 (ON PLAN AND PROFILE)
XS   EXIT 500
GR        0,880 28,878.00 44,876 53,874 75,872 101,870
GR        121,868 133,866 140,865.18 146,866 152,868
GR        167,870 180,872 190,874 205,874 234,872 280,872 320,880
SA
*
N         MANNINGS N
N         0.040
*
XS   FULV 530 * * * 0.006
*         X-SECTION AT BRIDGE
BR   BR1  530 876.55
BL 0      42.2 138 142
BD        3.43 880
CD        3 40 3 880
AB        1.5
J         0.045
*
*
AS   APPR 590
GR        0,880 13,874 50,872 95,870 103,868 138,868
GR        143,866 145,865.72 148,866 165,868 175,870
GR        188,872 208,874 220,876 232,878 240,880
SA
*         MANNINGS N
J         0.040
*
EX
ER
```

1

            *** RUN DATE & TIME: 02-05-96   09:32

    T1   CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
    T2   P-55-149 MANN VALLEY CREEK
    T3   PROPOSED 42FT 28" "I" GIRDER
    *
    *
    J1   1

J1 RECORD PARAMETERS:
DELTAY = 1.00   YTOL = .02   QTOL = .02   FNTEST = .80   IHFNOJ =|

    *
    *   SDR   Q VEL XSTW YMIN FR#   WSEL EGL
    J3   6   5 13   28   23   14   3   7
    *
    *
    *   100YR.
    Q   700
*** Q-DATA FOR SEC-ID, ISEQ =   1
    *
    SK   0.006
    *
    *   X-SECTION STARTS AT STA 8+50 (ON PLAN AND PROFILE)
—1

          CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
          P-55-149 MANN VALLEY CREEK
          PROPOSED 42FT 28" "I" GIRDER
            *** RUN DATE & TIME: 02-05-96   09:32

*** START PROCESSING CROSS SECTION - "EXIT "
   XS   EXIT 500
   GR   0,880 28,878.00 44,876 53,874 75,872 101,870
   GR   121,868 133,866 140,865.18 146,866 152,868
   GR   167,870 180,872 190,874 205,874 234,872 280,872 320,880
   SA
   *   MANNINGS N
   N   0.040
   *

*** FINISH PROCESSING CROSS SECTION - "EXIT "
*** CROSS SECTION "EXIT " WRITTEN TO DISK, RECORD NO. = 1

--- DATA SUMMARY FOR SECID "EXIT " AT SRD =   500. ERR-CODE = |

     SKEW   IHFNO   VSLOPE   EK   CK
      .0   0. ********   .50   .00

X-Y COORDINATE PAIRS   (NGP =   18):
      X   Y   X   Y   X   Y   X |
      .0   880.00   28.0   878.00   44.0   876.00   53.0   874|

```
    75.0  872.00      101.0  870.00     121.0  868.00     133.0  866.00
   140.0  865.18      146.0  866.00     152.0  868.00     167.0  870.00
   180.0  872.00      190.0  874.00     205.0  874.00     234.0  872.00
   280.0  872.00      320.0  880.00
```

```
  X-Y MAX-MIN POINTS:
     XMIN       Y           X    YMIN      XMAX       Y          X     YMAX
       .0  880.00      140.0  865.18     320.0  880.00       .0   880.00
```

```
ROUGHNESS COEFFICIENTS (NSA =   1):
       .040
```

```
        CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
        P-55-149 MANN VALLEY CREEK
        PROPOSED 42FT 28" "I" GIRDER
           *** RUN DATE & TIME: 02-05-96  09:32
```

```
*** START PROCESSING CROSS SECTION - "FULV "
   XS   FULV 530 * * * 0.006
    *          X-SECTION AT BRIDGE
```

```
*** FINISH PROCESSING CROSS SECTION - "FULV "
*** NO ROUGHNESS DATA INPUT, WILL PROPAGATE FROM PREVIOUS CROSS SECTION.
*** CROSS SECTION "FULV " WRITTEN TO DISK, RECORD NO. =   2
```

```
--- DATA SUMMARY FOR SECID "FULV " AT SRD =     530.  ERR-CODE =       0
```

```
   SKEW     IHFNO    VSLOPE          EK        CK
     .0       0.       .0060        .50       .00
```

```
X-Y COORDINATE PAIRS   (NGP =  18):
     X       Y           X       Y            X       Y           X       Y
     .0  880.18       28.0  878.18        44.0  876.18       53.0  874.18
   75.0  872.18      101.0  870.18       121.0  868.18      133.0  866.18
  140.0  865.36      146.0  866.18       152.0  868.18      167.0  870.18
  180.0  872.18      190.0  874.18       205.0  874.18      234.0  872.18
  280.0  872.18      320.0  880.18
```

```
  X-Y MAX-MIN POINTS:
     XMIN       Y           X    YMIN      XMAX       Y          X     YMAX
       .0  880.18      140.0  865.36     320.0  880.18       .0   880.18
```

```
ROUGHNESS COEFFICIENTS (NSA =   1):
       .040
```

```
*** START PROCESSING CROSS SECTION - "BR1  "
   BR   BR1  530 876.55
```

```
   BL 0         42.2 138 142
   BD           3.43 880
   CD           3 40 3 880
   AB           1.5
   N            0.045
   *
   *


*** FINISH PROCESSING CROSS SECTION - "BR1  "
*** CROSS SECTION "BR1  " WRITTEN TO DISK, RECORD NO. = 3

--- DATA SUMMARY FOR SECID "BR1  " AT SRD =    530.  ERR-CODE =      (

      SKEW      IHFNO      VSLOPE        EK         CK
       .0         0.       .0060        .50        .00

X-Y COORDINATE PAIRS  (NGP =   6):
        X       Y          X       Y          X       Y          X       Y
    118.9   876.57     134.8   865.97     140.0   865.36     145.4   866.09
    161.1   876.57     118.9   876.57

 X-Y MAX-MIN POINTS:
      XMIN       Y          X     YMIN       XMAX       Y          X      YMAX
    118.9   876.57     140.0   865.36     161.1   876.57     118.9   876.57

ROUGHNESS COEFFICIENTS (NSA =  1):
         .045

BRIDGE PARAMETERS:
  BRTYPE  BRWDTH      LSEL  USERCD   EMBSS    EMBELV  ABSLPL  ABSLPR
     3      40.0    876.55 *******    3.00    880.00    1.50 *******

DESIGN DATA:       BRLEN  LOCOPT  XCONLT  XCONRT
                    42.2      0.    138.    142.

                   GIRDEP  BDELEV   BDSLP   BDSTA
                    3.43   880.00 ******* *******

PIER DATA:  NPW =  0     PPCD = **
1
 WSPRO              FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188                MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                       (Input modified to free format by GKY&A 01/92)

         CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
         P-55-149 MANN VALLEY CREEK
         PROPOSED 42FT 28" "I" GIRDER
           *** RUN DATE & TIME: 02-05-96  09:32

*** START PROCESSING CROSS SECTION - "APPR "
  AS    APPR 590
  GR        0,880 13,874 50,872 95,870 103,868 138,868
  GR        143,866 145,865.72 148,866 165,868 175,870
  GR        188,872 208,874 220,876 232,878 240,880
  SA
  *         MANNINGS N
  N         0.040
  *
  EX
```

```
*** FINISH PROCESSING CROSS SECTION - "APPR "
*** CROSS SECTION "APPR " WRITTEN TO DISK, RECORD NO. =   4

--- DATA SUMMARY FOR SECID "APPR " AT SRD =      590.  ERR-CODE =        0

      SKEW      IHFNO     VSLOPE         EK          CK
       .0        0.       .0060         .50         .00

X-Y COORDINATE PAIRS  (NGP =   16):
      X        Y         X        Y          X        Y          X        Y
      .0   880.00      13.0   874.00      50.0   872.00      95.0   870.00
   103.0   868.00     138.0   868.00     143.0   866.00     145.0   865.72
   148.0   866.00     165.0   868.00     175.0   870.00     188.0   872.00
   208.0   874.00     220.0   876.00     232.0   878.00     240.0   880.00

 X-Y MAX-MIN POINTS:
    XMIN       Y          X      YMIN       XMAX       Y          X      YMAX
     .0   880.00      145.0   865.72      240.0   880.00        .0   880.00

-ROUGHNESS COEFFICIENTS (NSA =   1):
        .040

BRIDGE PROJECTION DATA:  XREFLT  XREFRT  FDSTLT  FDSTRT
                         ******* ******* ******* *******

 +++ BEGINNING PROFILE CALCULATIONS --   1

 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188          MODEL   FOR   WATER-SURFACE   PROFILE   COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)

        CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
        P-55-149 MANN VALLEY CREEK
        PROPOSED 42FT 28" "I" GIRDER
          *** RUN DATE & TIME: 02-05-96  09:32

 XSID:CODE    SRDL     LEW     AREA     VHD      HF      EGL      CRWS        Q    WEL
        SRD    FLEN     REW       K     ALPH     HO      ERR      FR#       VEL

 EXIT :XS   ******   101.      144.    .37  *****  870.34   869.04      700.  10.97
        500. ******   167.     9033.   1.00  ***** *******      .58      4.85

 FULV :FV     30.     101.      146.    .36    .18  870.53  *******     700.  10.17
        530.    30.    167.     9136.   1.00    .00     .02      .57      4.81
           <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                     "APPR "      KRATIO =  1.62

 APPR :AS     60.      82.      228.    .15    .22  870.74  *******     700.  10.60
        590.    60.    179.    14834.   1.00    .00     .00      .35      3.08
           <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>

 ===285 CRITICAL WATER-SURFACE ELEVATION  A _ S _ S _ U _ M _ E _ D !!!!!
                    SECID "BR1  "    Q,CRWS = _ 700. _ 870.04

          <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE    SRDL     LEW     AREA     VHD      HF      EGL      CRWS        Q    WEL
        SRD    FLEN     REW       K     ALPH     HO      ERR      FR#       VEL
```
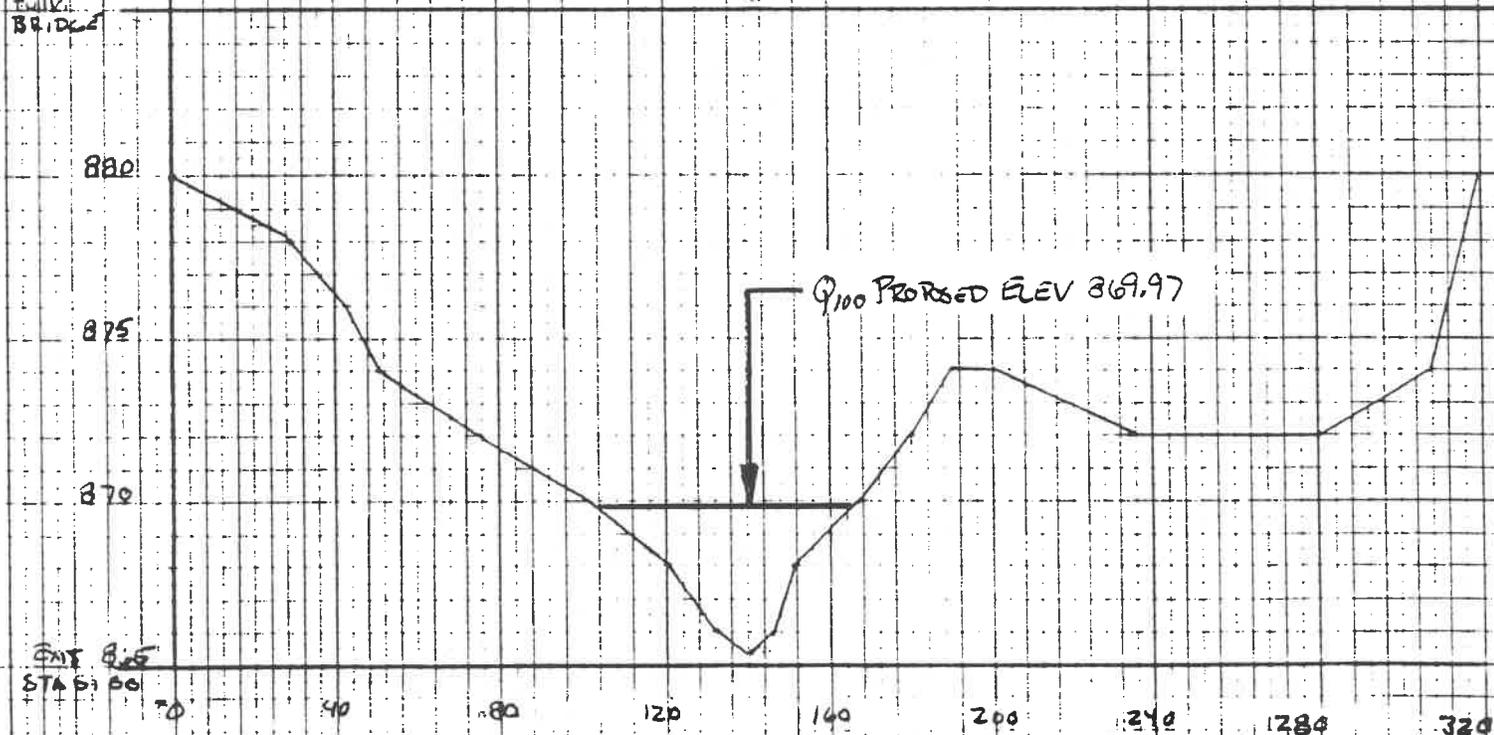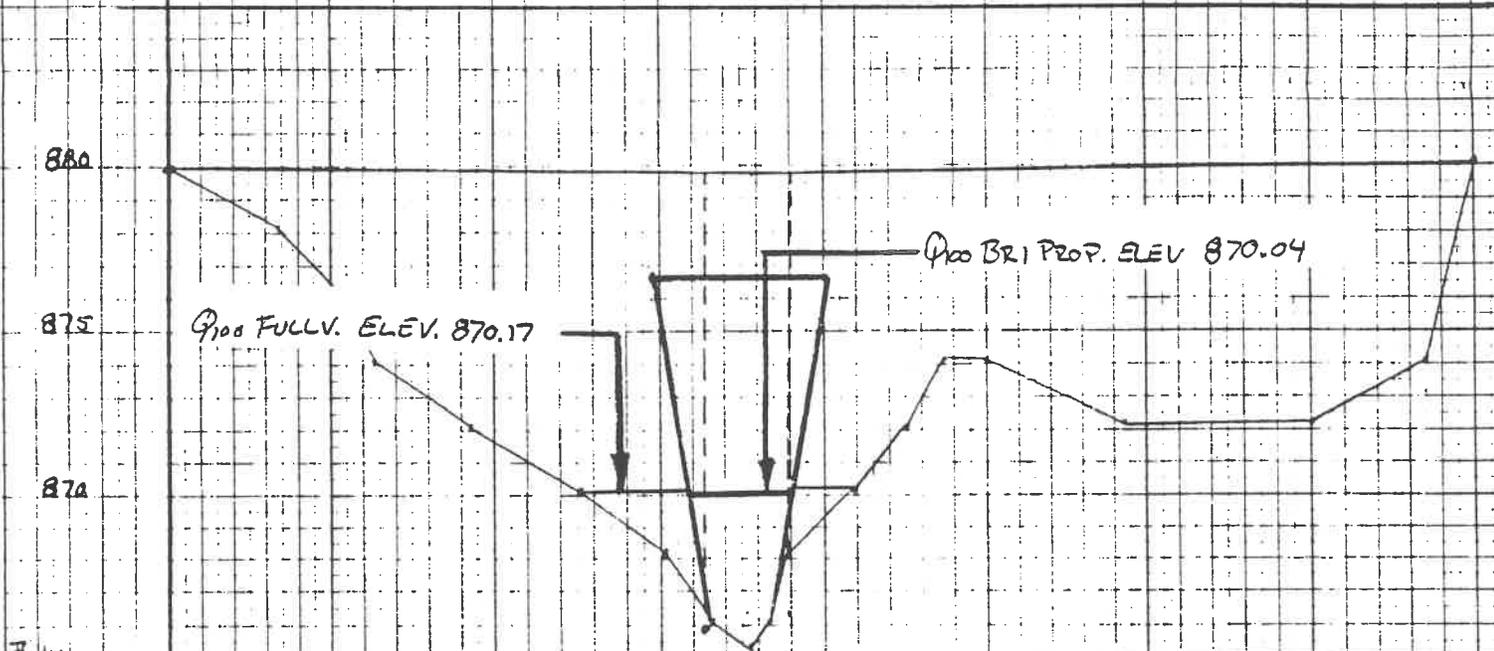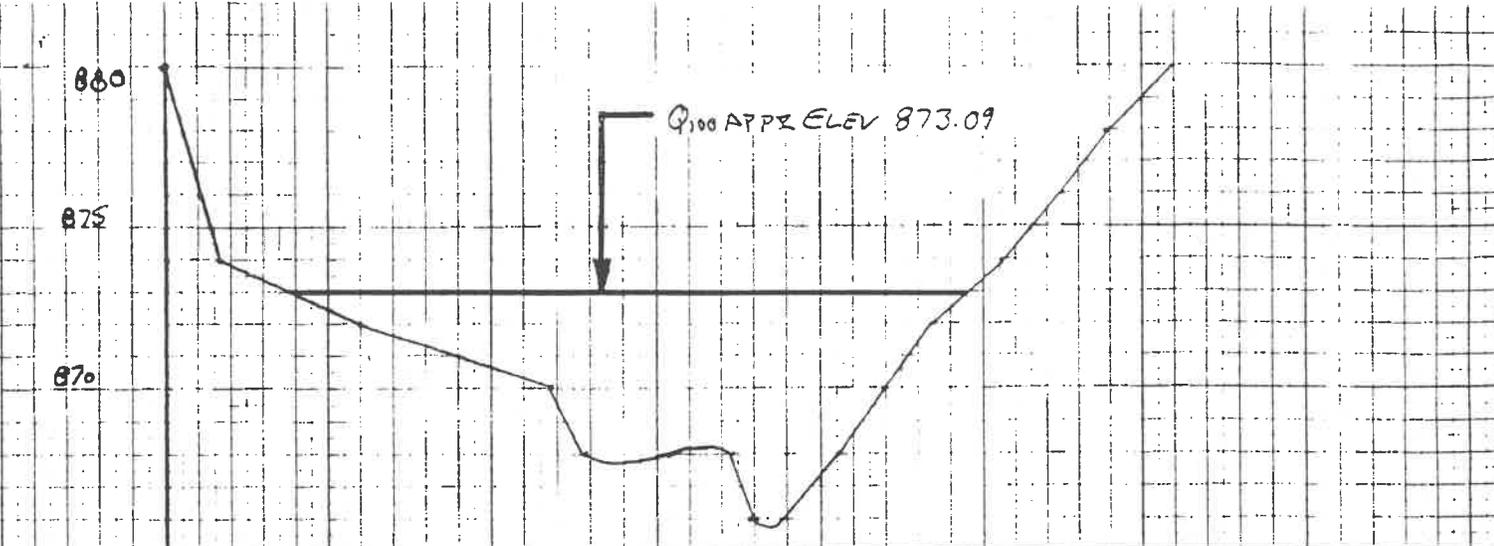
```
BR1   :BR       30.    129.        70.   1.62 ***** 871.66  870.04    700804
       530.      30.    151.      4595.   1.04 ***** *******    1.02    9.9

      TYPE PPCD FLOW      C    P/A      LSEL    BLEN    XLAB    XRAB
       3.  ****   1.    .980 ******   876.55     42.    135.    145.

  XSID:CODE    SRDL     LEW     AREA   VHD    HF      EGL     CRWS      QSEL
       SRD     FLEN     REW        K  ALPH    HO      ERR      FR#       VL

  APPR :AS      20.     30.     561.   .02    .05  873.12   869.05    700809
       590.     23.    199.   46220.  1.00   1.41     .00      .12     1.3

        M(G)    M(K)      KQ    XLKQ    XRKQ    OTEL
        .764    .655  15956.    135.    154.  873.09

                    <<<<<END OF BRIDGE COMPUTATIONS>>>>>
1
 WSPRO              FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURV
 P060188               MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                    (Input modified to free format by GKY&A 01/92)

        CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
        P-55-149 MANN VALLEY CREEK
        PROPOSED 42FT 28" "I" GIRDER
           *** RUN DATE & TIME: 02-05-96  09:32
  FIRST USER DEFINED TABLE.

     XSID:CODE     SRD       Q     VEL    XSTW     YMIN     FR#    WSEL  L
     EXIT :XS     500.    700.    4.85     65.   865.18     .58  869.97  4
     FULV :FV     530.    700.    4.81     66.   865.36     .57  870.17  3
     BR1  :BR     530.    700.    9.99     23.   865.36    1.02  870.04  6
     APPR :AS     590.    700.    1.25    169.   865.72     .12  873.09  2
  ER

  NORMAL- END  OF  WSPRO  EXECUTION.
```

Q_{100} APPR ELEV 873.09

Q_{100} FULL V. ELEV. 870.17

Q_{100} BRI PROP. ELEV 870.04

Q_{100} PROPOSED ELEV 369.97

Q_{100} PROPOSED BRIDGE

42' SINGLE SPAN 28" I GIRDER

B-55-149

```
T1          CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
 2          P-55-149 MANN VALLEY CREEK
 3          PROPOSED 38FT 28" "I" GIRDER
*

 1          1
*

*           SDR   Q VEL XSTW YMIN  FR#  WSEL  EGL
 3           6    5  13  28   23   14    3    7

*

            100YR.
            700
*
CK          0.006

*           X-SECTION STARTS AT STA 8+50 (ON PLAN AND PROFILE)
XS   EXIT 500
GR          0,880 28,878.00 44,876 53,874 75,872 101,870
GR          121,868 133,866 140,865.18 146,866 152,868
GR          167,870 180,872 190,874 205,874 234,872 280,872 320,880

            MANNINGS N
N           0.040
*
IB   FULV 530 * * * 0.006
            X-SECTION AT BRIDGE
BR   BR1  530 876.55
BT 0        38.2 138 142
BD          3.43 880
CD          3 40 3 880
TB          1.5
N           0.045
*
*
IB   APPR 590
GR          0,880 13,874 50,872 95,870 103,868 138,868
GR          143,866 145,865.72 148,866 165,868 175,870
GR          188,872 208,874 220,876 232,878 240,880

            MANNINGS N
N           0.040

EX
ER
```

```
1
```

WSPRO   FEDERAL HIGHWAY ADMINISTRATION – U. S. GEOLOGICAL SURVEY
P060188   MODEL FOR WATER–SURFACE PROFILE COMPUTATIONS
                (Input modified to free format by GKY&A 01/92)

           *** RUN DATE & TIME: 02-05-96   09:43

    T1   CERNOHOUSE BRIDGE 96–M–1 ST.CROIX COUNTY CTH M
    T2   P–55–149 MANN VALLEY CREEK
    T3   PROPOSED 38FT 28" "I" GIRDER
    *
    *
    J1   1

J1 RECORD PARAMETERS:
DELTAY = 1.00   YTOL = .02   QTOL = .02   FNTEST = .80   IHFNOJ = –1

    *
    *   SDR   Q VEL XSTW YMIN   FR#   WSEL   EGL
    J3   6   5 13 28   23   14   3   7
    *
    *
    *   100YR.
    Q   700
*** Q–DATA FOR SEC-ID, ISEQ =   1
    *
    SK   0.006
    *
    *   X–SECTION STARTS AT STA 8+50 (ON PLAN AND PROFILE)

      CERNOHOUSE BRIDGE 96–M–1 ST.CROIX COUNTY CTH M
      P–55–149 MANN VALLEY CREEK
      PROPOSED 38FT 28" "I" GIRDER
        *** RUN DATE & TIME: 02-05-96   09:43

*** START PROCESSING CROSS SECTION – "EXIT "
    XS   EXIT 500
    GR   0,880 28,878.00 44,876 53,874 75,872 101,870
    GR   121,868 133,866 140,865.18 146,866 152,868
    GR   167,870 180,872 190,874 205,874 234,872 280,872 320,880
    SA
    *   MANNINGS N
    N   0.040
    *

*** FINISH PROCESSING CROSS SECTION – "EXIT "
*** CROSS SECTION "EXIT " WRITTEN TO DISK, RECORD NO. = 1

--- DATA SUMMARY FOR SECID "EXIT " AT SRD =   500.   ERR-CODE =   0

     SKEW   IHFNO   VSLOPE   EK   CK
      .0   0. ********   .50   .00

X-Y COORDINATE PAIRS   (NGP =   18):
     X   Y   X   Y   X   Y   X   Y
    .0   880.00   28.0   878.00   44.0   876.00   53.0   874.00

```
      75.0  872.00    101.0  870.00    121.0  868.00    133.0  866.0
     140.0  865.18    146.0  866.00    152.0  868.00    167.0  870.0
     180.0  872.00    190.0  874.00    205.0  874.00    234.0  872.0
     280.0  872.00    320.0  880.00
```

  X-Y MAX-MIN POINTS:
```
     XMIN        Y          X     YMIN      XMAX        Y          X     YMX
      .0   880.00      140.0  865.18      320.0   880.00       .0   880.0
```

ROUGHNESS COEFFICIENTS (NSA = 1):
```
          .040
```

WSPRO   FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188   MODEL   FOR   WATER-SURFACE   PROFILE   COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)

        CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
        P-55-149 MANN VALLEY CREEK
        PROPOSED 38FT 28" "I" GIRDER
           *** RUN DATE & TIME: 02-05-96 09:43

*** START PROCESSING CROSS SECTION - "FULV "
   XS   FULV 530 * * * 0.006
    *   X-SECTION AT BRIDGE

*** FINISH PROCESSING CROSS SECTION - "FULV "
*** NO ROUGHNESS DATA INPUT, WILL PROPAGATE FROM PREVIOUS CROSS SECTION.
*** CROSS SECTION "FULV " WRITTEN TO DISK, RECORD NO. =   2

--- DATA SUMMARY FOR SECID "FULV " AT SRD =   530. ERR-CODE =   0

     SKEW   IHFNO   VSLOPE   EK   CK
      .0   0.   .0060   .50   .00

X-Y COORDINATE PAIRS   (NGP = 18):
```
      X        Y          X      Y          X      Y          X      Y
      .0   880.18      28.0   878.18      44.0   876.18      53.0   874.B
     75.0   872.18    101.0   870.18     121.0   868.18     133.0   866.B
    140.0   865.36    146.0   866.18     152.0   868.18     167.0   870.B
    180.0   872.18    190.0   874.18     205.0   874.18     234.0   872.B
    280.0   872.18    320.0   880.18
```

  X-Y MAX-MIN POINTS:
```
     XMIN        Y          X     YMIN      XMAX        Y          X     YMX
      .0   880.18      140.0  865.36      320.0   880.18       .0   880.B
```

ROUGHNESS COEFFICIENTS (NSA = 1):
```
          .040
```

WSPRO   FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188   MODEL   FOR   WATER-SURFACE   PROFILE   COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)

        CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
        P-55-149 MANN VALLEY CREEK
        PROPOSED 38FT 28" "I" GIRDER
           *** RUN DATE & TIME: 02-05-96 09:43

*** START PROCESSING CROSS SECTION - "BR1   "
   BR   BR1 530 876.55

```
    BL  0        38.2 138 142
    BD           3.43 880
    CD           3 40 3 880
    AB           1.5
    N            0.045
    *
    *
```

*** FINISH PROCESSING CROSS SECTION - "BR1   "
*** CROSS SECTION "BR1   " WRITTEN TO DISK, RECORD NO. = 3

--- DATA SUMMARY FOR SECID "BR1   " AT SRD =   530. ERR-CODE =   0

```
     SKEW       IHFNO      VSLOPE        EK         CK
      .0         0.        .0060        .50        .00
```

X-Y COORDINATE PAIRS (NGP =   6):

X	Y	X	Y	X	Y	X	Y
120.9	876.57	137.2	865.69	140.0	865.36	142.8	865.75
159.1	876.57	120.9	876.57				

X-Y MAX-MIN POINTS:

XMIN	Y	X	YMIN	XMAX	Y	X	YMAX
120.9	876.57	140.0	865.36	159.1	876.57	120.9	876.57

ROUGHNESS COEFFICIENTS (NSA = 1):
        .045

BRIDGE PARAMETERS:

BRTYPE	BRWDTH	LSEL	USERCD	EMBSS	EMBELV	ABSLPL	ABSLPR
3	40.0	876.55	*******	3.00	880.00	1.50	*******

DESIGN DATA:

	BRLEN	LOCOPT	XCONLT	XCONRT
	38.2	0.	138.	142.

	GIRDEP	BDELEV	BDSLP	BDSTA
	3.43	880.00	*******	*******

PIER DATA: NPW = 0   PPCD = **

        CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
        P-55-149 MANN VALLEY CREEK
        PROPOSED 38FT 28" "I" GIRDER
           *** RUN DATE & TIME: 02-05-96 09:43

*** START PROCESSING CROSS SECTION - "APPR "
```
   AS    APPR 590
   GR        0,880 13,874 50,872 95,870 103,868 138,868
   GR        143,866 145,865.72 148,866 165,868 175,870
   GR        188,872 208,874 220,876 232,878 240,880
   SA
   *         MANNINGS N
   N         0.040
   *
   EX
```

```
*** FINISH PROCESSING CROSS SECTION - "APPR "
*** CROSS SECTION "APPR " WRITTEN TO DISK, RECORD NO. =    4

--- DATA SUMMARY FOR SECID "APPR " AT SRD =      590.  ERR-CODE =        0

       SKEW      IHFNO     VSLOPE          EK       CK
        .0         0.      .0060          .50      .00

X-Y COORDINATE PAIRS  (NGP =   16):
       X       Y          X       Y          X       Y          X       Y
        .0   880.00      13.0   874.00      50.0   872.00      95.0   870.00
     103.0   868.00     138.0   868.00     143.0   866.00     145.0   865.72
     148.0   866.00     165.0   868.00     175.0   870.00     188.0   872.00
     208.0   874.00     220.0   876.00     232.0   878.00     240.0   880.00

 X-Y MAX-MIN POINTS:
      XMIN       Y          X      YMIN       XMAX       Y          X      YMAX
        .0   880.00     145.0   865.72      240.0   880.00         .0   880.00

ROUGHNESS COEFFICIENTS (NSA =   1):
         .040

BRIDGE PROJECTION DATA:   XREFLT   XREFRT   FDSTLT   FDSTRT
                          *******  *******  *******  *******

+++ BEGINNING PROFILE CALCULATIONS --    1

WSPRO             FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188               MODEL   FOR   WATER-SURFACE   PROFILE   COMPUTATIONS
                      (Input modified to free format by GKY&A 01/92)

         CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
         P-55-149 MANN VALLEY CREEK
         PROPOSED 38FT 28" "I" GIRDER
           *** RUN DATE & TIME: 02-05-96  09:43

 XSID:CODE    SRDL     LEW      AREA    VHD      HF       EGL      CRWS        Q     WSEL
        SRD   FLEN     REW        K    ALPH     HO       ERR       FR#       VEL

EXIT :XS    ******    101.      144.    .37 ***** 870.34   869.04    700.   869.97
       500. ******    167.     9033.   1.00 ***** *******            .58    4.85

FULV :FV     30.      101.      146.    .36    .18  870.53 *******    700.   870.17
       530.   30.      167.     9136.   1.00   .00    .02      .57    4.81
           <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                          "APPR "     KRATIO =  1.62

APPR :AS     60.       82.      228.    .15    .22  870.74 *******    700.   870.60
       590.   60.      179.    14834.   1.00   .00    .00      .35    3.08
           <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

 ===285 CRITICAL WATER-SURFACE ELEVATION  A _ S _ S _ U _ M _ E _ D !!!!!
                      SECID "BR1  "      Q,CRWS =    700.    870.79

             <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE    SRDL     LEW      AREA    VHD      HF       EGL      CRWS        Q     WSEL
        SRD   FLEN     REW        K    ALPH     HO       ERR       FR#       VEL
```
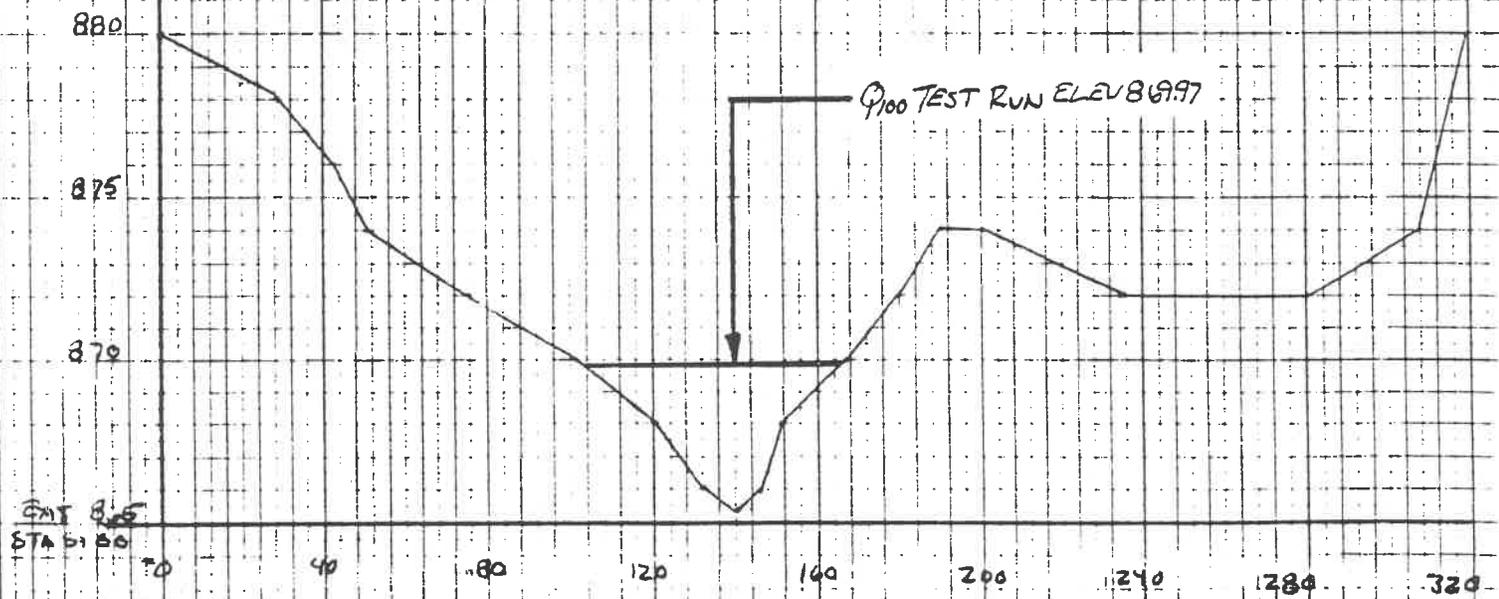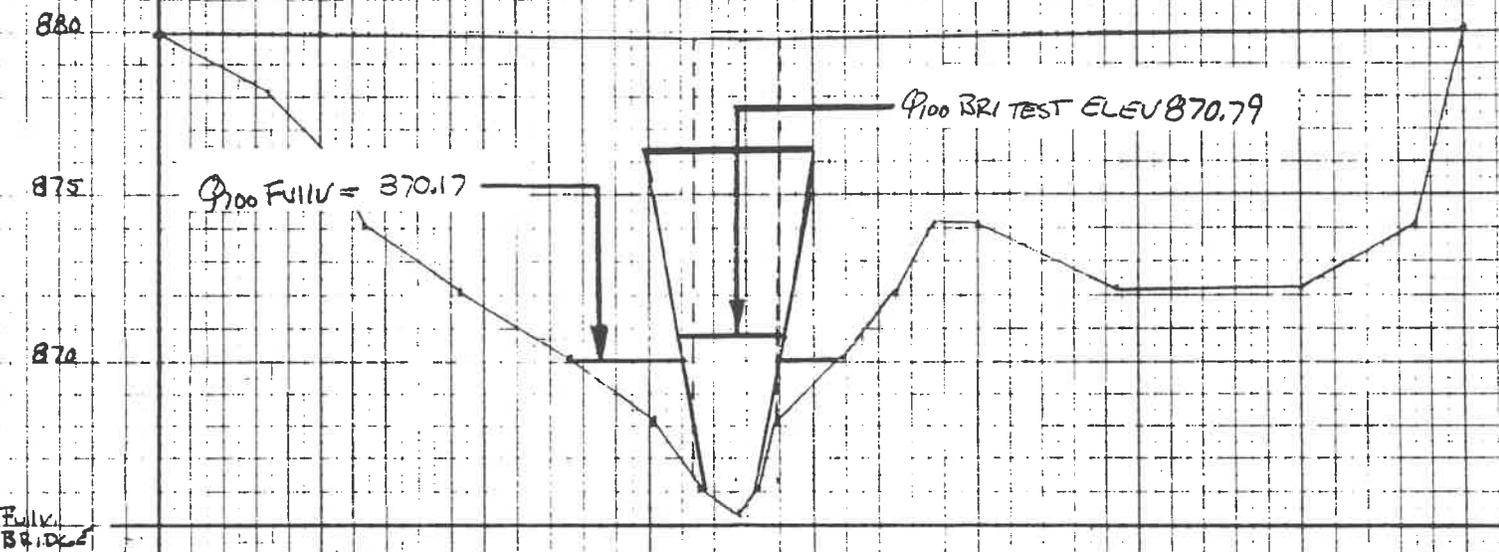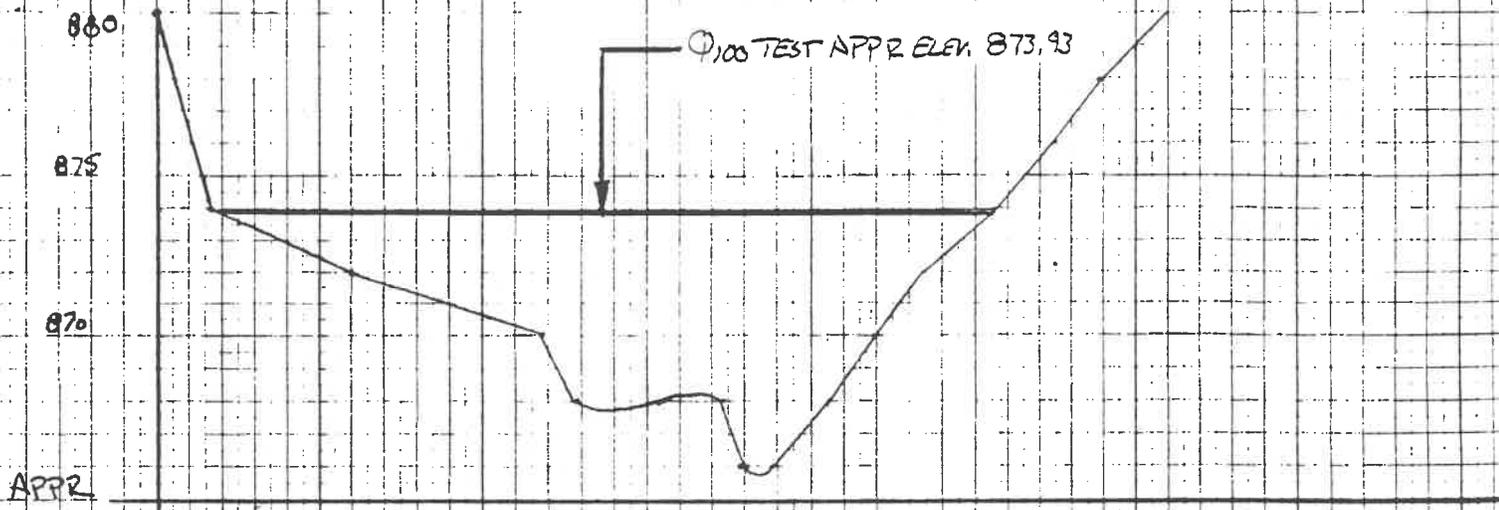
```
BR1  :BR         30.   130.        68.  1.73 ***** 872.52 870.79    700. 870.79
     530.        30.   150.      4530.  1.06 ***** *******   1.03  10.27

     TYPE PPCD FLOW       C    P/A    LSEL    BLEN    XLAB    XRAB
       3. ****   1.    .974 ****** 876.55     38.    137.    143.

  XSID:CODE    SRDL    LEW     AREA    VHD    HF     EGL    CRWS       Q    WSEL
       SRD    FLEN    REW        K   ALPH    HO     ERR     FR#     VEL

APPR :AS       20.    14.      713.    .02    .04  873.95  869.05    700. 873.93
     590.      23.   207.    63101.   1.00   1.39     .00     .09     .98

      M(G)    M(K)       KQ    XLKQ    XRKQ    OTEL
      .805    .723    17506.    136.    154.  873.93

                <<<<<END OF BRIDGE COMPUTATIONS>>>>>

WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188           MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                  (Input modified to free format by GKY&A 01/92)

         CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
         P-55-149 MANN VALLEY CREEK
         PROPOSED 38FT 28" "I" GIRDER
           *** RUN DATE & TIME: 02-05-96  09:43
    FIRST USER DEFINED TABLE.

     XSID:CODE    SRD       Q     VEL    XSTW     YMIN    FR#     WSEL    EGL
     EXIT :XS    500.    700.    4.85     65.   865.18    .58   869.97  870.34
     FULV :FV    530.    700.    4.81     66.   865.36    .57   870.17  870.53
     BR1  :BR    530.    700.   10.27     21.   865.36   1.03   870.79  872.52
     APPR :AS    590.    700.     .98    193.   865.72    .09   873.93  873.95
    ER

    NORMAL  END  OF  WSPRO  EXECUTION.
```

φ_{100} TEST APPR ELEV. 873.93

φ_{100} BRI TEST ELEV 870.79

φ_{100} FULLV = 870.17

φ_{100} TEST RUN ELEV 869.97

φ_{100} TEST RUN 38 FT
SINGLE SPAN I GIRDER

```
T1        CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
 2        P-55-149 MANN VALLEY CREEK
  3       PROPOSED 40FT FLAT SLAB
 *
 *
  1        1

 *        SDR    Q VEL XSTW YMIN   FR#  WSEL   EGL
  3        6     5  13   28   23   14    3     7

 *
           100YR.
           700

 *
SK         0.006

           X-SECTION STARTS AT STA 8+50 (ON PLAN AND PROFILE)
XS   EXIT 500
  R        0,880 28,878.00 44,876 53,874 75,872 101,870
  R        121,868 133,866 140,865.18 146,866 152,868
GR         167,870 180,872 190,874 205,874 234,872 280,872 320,880

           MANNINGS N
N          0.040
 *
  3   FULV 530 * * * 0.006
           X-SECTION AT BRIDGE
BR   BR1  530 876.7
    0      42.2 138 142
           2.32 880
CD         3 40 3 880
 B         1.5
           0.045

 *
  3   APPR 590
           0,880 13,874 50,872 95,870 103,868 138,868
GR         143,866 145,865.72 148,866 165,868 175,870
           188,872 208,874 220,876 232,878 240,880

           MANNINGS N
N          0.040

EX
ER
```

1

          *** RUN DATE & TIME: 02-05-96   09:27

   T1   CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
   T2   P-55-149 MANN VALLEY CREEK
   T3   PROPOSED 40FT FLAT SLAB
   *
   *
   J1   1

J1 RECORD PARAMETERS:
DELTAY = 1.00   YTOL = .02   QTOL = .02   FNTEST = .80   IHFNOJ = -1

   *
   *   SDR   Q VEL XSTW YMIN FR# WSEL EGL
   J3   6   5 13 28   23   14   3   7
   *
   *
   *   100YR.
   Q   700
*** Q-DATA FOR SEC-ID, ISEQ =   1
   *
   SK   0.006
   *
   *   X-SECTION STARTS AT STA 8+50 (ON PLAN AND PROFILE)

          CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
          P-55-149 MANN VALLEY CREEK
          PROPOSED 40FT FLAT SLAB
             *** RUN DATE & TIME: 02-05-96   09:27

*** START PROCESSING CROSS SECTION - "EXIT "
   XS   EXIT 500
   GR   0,880 28,878.00 44,876 53,874 75,872 101,870
   GR   121,868 133,866 140,865.18 146,866 152,868
   GR   167,870 180,872 190,874 205,874 234,872 280,872 320,880
   SA
   *   MANNINGS N
   N   0.040
   *

*** FINISH PROCESSING CROSS SECTION - "EXIT "
*** CROSS SECTION "EXIT " WRITTEN TO DISK, RECORD NO. = 1

--- DATA SUMMARY FOR SECID "EXIT " AT SRD =   500. ERR-CODE =   0

     SKEW   IHFNO   VSLOPE   EK   CK
      .0   0. ********   .50   .00

X-Y COORDINATE PAIRS (NGP = 18):
       X   Y   X   Y   X   Y   X   Y
      .0 880.00   28.0 878.00   44.0 876.00   53.0 874.00

```
       75.0  872.00        101.0  870.00       121.0  868.00       133.0  866.00
      140.0  865.18        146.0  866.00       152.0  868.00       167.0  870.00
      180.0  872.00        190.0  874.00       205.0  874.00       234.0  872.00
      280.0  872.00        320.0  880.00
```

   X-Y MAX-MIN POINTS:
       XMIN   Y   X   YMIN   XMAX   Y   X   YMAX
        .0   880.00   140.0 865.18   320.0   880.00   .0   880.00

ROUGHNESS COEFFICIENTS (NSA = 1):
        .040

1

        CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
        P-55-149 MANN VALLEY CREEK
        PROPOSED 40FT FLAT SLAB
           *** RUN DATE & TIME: 02-05-96 09:27

*** START PROCESSING CROSS SECTION - "FULV "
   XS   FULV 530 * * * 0.006
     *   X-SECTION AT BRIDGE

*** FINISH PROCESSING CROSS SECTION - "FULV "
*** NO ROUGHNESS DATA INPUT, WILL PROPAGATE FROM PREVIOUS CROSS SECTION.
*** CROSS SECTION "FULV " WRITTEN TO DISK, RECORD NO. = 2

--- DATA SUMMARY FOR SECID "FULV " AT SRD =   530. ERR-CODE =   0

     SKEW   IHFNO   VSLOPE   EK   CK
      .0   0.   .0060   .50   .00

   X-Y COORDINATE PAIRS   (NGP = 18):
        X   Y   X   Y   X   Y   X   Y
        .0   880.18   28.0   878.18   44.0   876.18   53.0   874.18
       75.0   872.18   101.0   870.18   121.0   868.18   133.0   866.18
      140.0   865.36   146.0   866.18   152.0   868.18   167.0   870.18
      180.0   872.18   190.0   874.18   205.0   874.18   234.0   872.18
      280.0   872.18   320.0   880.18

   X-Y MAX-MIN POINTS:
       XMIN   Y   X   YMIN   XMAX   Y   X   YMAX
        .0   880.18   140.0 865.36   320.0   880.18   .0   880.18

ROUGHNESS COEFFICIENTS (NSA = 1):
        .040
1

        CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
        P-55-149 MANN VALLEY CREEK
        PROPOSED 40FT FLAT SLAB
           *** RUN DATE & TIME: 02-05-96 09:27

*** START PROCESSING CROSS SECTION - "BR1   "
   BR   BR1 530 876.7

```
BL  0        42.2 138 142
BD           2.32 880
CD           3 40 3 880
AB           1.5
N            0.045
*
*


*** FINISH PROCESSING CROSS SECTION - "BR1  "
*** CROSS SECTION "BR1  " WRITTEN TO DISK, RECORD NO. =   3

--- DATA SUMMARY FOR SECID "BR1  " AT SRD =     530.  ERR-CODE =       0

      SKEW       IHFNO      VSLOPE         EK         CK
       .0         0.        .0060        .50        .00

X-Y COORDINATE PAIRS  (NGP =    6):
      X      Y          X       Y           X      Y          X      Y
   118.9  877.68     136.8  865.74      140.0  865.36     143.3  865.8|
   161.1  877.68     118.9  877.68

 X-Y MAX-MIN POINTS:
    XMIN        Y          X      YMIN       XMAX       Y          X      YMA|
   118.9  877.68     140.0  865.36      161.1  877.68     118.9  877.6|

ROUGHNESS COEFFICIENTS (NSA =  1):
         .045


BRIDGE PARAMETERS:
 BRTYPE  BRWDTH     LSEL  USERCD   EMBSS    EMBELV  ABSLPL  ABSLPR
    3     40.0    876.70 *******    3.00    880.00    1.50 *******

DESIGN DATA:     BRLEN  LOCOPT  XCONLT  XCONRT
                  42.2     0.    138.    142.

                 GIRDEP  BDELEV   BDSLP   BDSTA
                  2.32   880.00 ******* *******

PIER DATA:  NPW =  0     PPCD = **

WSPRO            FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188               MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                      (Input modified to free format by GKY&A 01/92)

         CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
         P-55-149 MANN VALLEY CREEK
         PROPOSED 40FT FLAT SLAB
            *** RUN DATE & TIME: 02-05-96  09:27

*** START PROCESSING CROSS SECTION - "APPR "
  AS    APPR 590
  GR        0,880 13,874 50,872 95,870 103,868 138,868
  GR        143,866 145,865.72 148,866 165,868 175,870
  GR        188,872 208,874 220,876 232,878 240,880
  SA
  *         MANNINGS N
  N         0.040
  *
  EX
```

```
       : ●

*** FINISH PROCESSING CROSS SECTION - "APPR "
*** CROSS SECTION "APPR " WRITTEN TO DISK, RECORD NO. =  4

--- DATA SUMMARY FOR SECID "APPR " AT SRD =    590.  ERR-CODE =       0

      SKEW      IHFNO     VSLOPE        EK        CK
       .0        0.       .0060       .50       .00

X-Y COORDINATE PAIRS  (NGP =  16):
       X      Y          X       Y          X       Y          X       Y
        .0  880.00      13.0  874.00      50.0  872.00      95.0  870.00
     103.0  868.00     138.0  868.00     143.0  866.00     145.0  865.72
     148.0  866.00     165.0  868.00     175.0  870.00     188.0  872.00
     208.0  874.00     220.0  876.00     232.0  878.00     240.0  880.00

 X-Y MAX-MIN POINTS:
    XMIN        Y        X     YMIN      XMAX       Y        X     YMAX
      .0   880.00    145.0  865.72     240.0  880.00       .0  880.00

ROUGHNESS COEFFICIENTS (NSA =  1):
        .040

BRIDGE PROJECTION DATA:  XREFLT  XREFRT  FDSTLT  FDSTRT
                         ******* ******* ******* *******

+++ BEGINNING PROFILE CALCULATIONS --    1

 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188           MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                   (Input modified to free format by GKY&A 01/92)

        CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
        P-55-149 MANN VALLEY CREEK
        PROPOSED 40FT FLAT SLAB
          *** RUN DATE & TIME: 02-05-96  09:27

 XSID:CODE    SRDL     LEW      AREA     VHD      HF      EGL     CRWS       Q   WSEL
       SRD    FLEN     REW         K    ALPH      HO      ERR      FR#      VEL

 EXIT :XS   ******    101.      144.    .37  *****  870.34  869.04     700. 869.97
            500. ******    167.     9033.   1.00  *****  *******      .58    4.85

 FULV :FV      30.    101.      146.    .36     .18  870.53  *******    700. 870.17
            530.      30.    167.     9136.   1.00     .00      .02      .57    4.81
           <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                         "APPR "      KRATIO =  1.62

 APPR :AS      60.     82.      228.    .15     .22  870.74  *******    700. 870.60
            590.      60.    179.    14834.   1.00     .00      .00      .35    3.08
           <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

 ===285 CRITICAL WATER-SURFACE ELEVATION  A _ S _ S _ U _ M _ E _ D !!!!
                  SECID "BR1  "     Q,CRWS =    700.    870.63

           <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE    SRDL     LEW      AREA     VHD      HF      EGL     CRWS       Q   WSEL
             SRD     FLEN     REW         K    ALPH      HO      ERR      FR#      VEL
```

```
BR1  :BR      30.    129.        68.   1.72 *****   872.35   870.63    700. 870.61
      530.    30.    151.      4534.   1.05 ***** *******      1.03   10.21

      TYPE PPCD FLOW       C    P/A    LSEL    BLEN   XLAB    XRAB
       3. ****    1.    .975 ******  876.70     42.   137.    143.

   XSID:CODE    SRDL    LEW     AREA    VHD     HF     EGL    CRWS    |    WSEI
         SRD    FLEN    REW        K   ALPH     HO     ERR     FR#   VEI

   APPR :AS      20.    17.      684.    .02    .04  873.80  869.05    700. 873.71
         590.    23.   206.    59778.   1.00   1.40     .02     .09   1.01

         M(G)    M(K)          KQ    XLKQ    XRKQ     OTEL
         .798    .712     17107.    136.    154.   873.78

                <<<<<END OF BRIDGE COMPUTATIONS>>>>>
1
  WSPRO            FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
  P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                    (Input modified to free format by GKY&A 01/92)

          CERNOHOUSE BRIDGE 96-M-1 ST.CROIX COUNTY CTH M
          P-55-149 MANN VALLEY CREEK
          PROPOSED 40FT FLAT SLAB
            *** RUN DATE & TIME: 02-05-96  09:27
      FIRST USER DEFINED TABLE.

      XSID:CODE     SRD       Q      VEL    XSTW     YMIN      FR#     WSEL    EGL
      EXIT :XS     500.    700.     4.85     65.   865.18      .58   869.97 870.34
      FULV :FV     530.    700.     4.81     66.   865.36      .57   870.17 870.53
      BR1  :BR     530.    700.    10.25     21.   865.36     1.03   870.63 872.35
      APPR :AS     590.    700.     1.02    189.   865.72      .09   873.78 873.80
      ER

1  NORMAL  END  OF  WSPRO  EXECUTION.
```

River Falls Flood Insurance Study
Short Elliott Hendrickson, Inc.
Photgraph date: 12-17-96
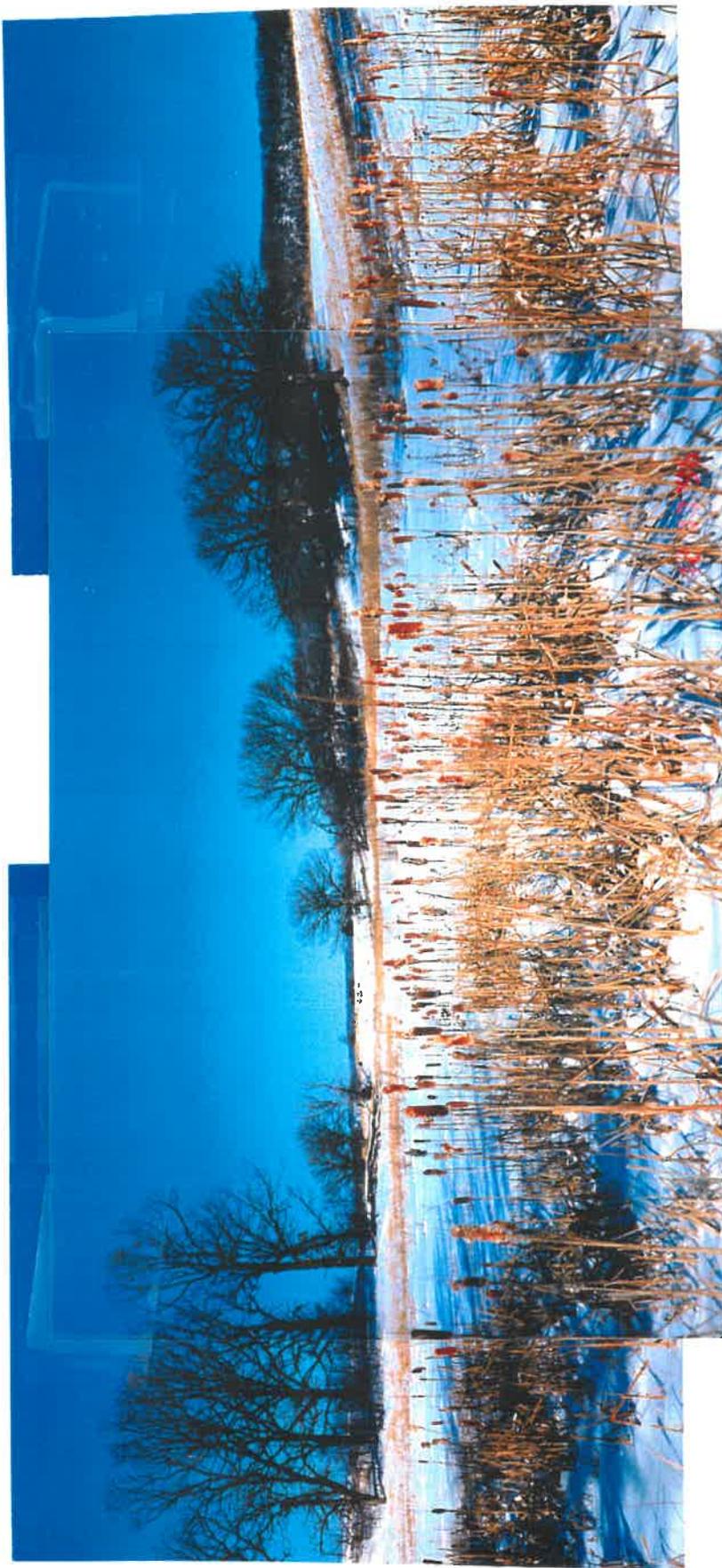

Mann Valley looking upstream at Station 9576

River Falls Flood Insurance Study
Short Elliott Hendrickson, Inc.
Photgraph date: 12-17-96

Mann Valley looking upstream at Station 10125

River Falls Flood Insurance Study
Short Elliott Hendrickson, Inc.
Photgraph date: 12-17-96

Mann Valley looking upstream at Station 10492

River Falls Flood Insurance Study
Short Elliott Hendrickson, Inc.
Photgraph date: 12-17-96

Mann Valley looking upstream at Station 10912

SEH