Property of
Flood Control District of MC Library
Please return to
2801 W. Durango
Phoenix, AZ 85009

FINAL II DRAINAGE DESIGN REPORT
APPENDIX III
FOR
SUPERSTITION FREEWAY (SR 360)
ELLSWORTH ROAD - IRONWOOD DRIVE
PROJECT NO. F-028-1-513
CONTRACT NO. 86-34

Submitted To:
Arizona Statewide Management Consultant
Sverdrup Corporation

May, 1988
(Revised September, 1988)

Prepared For:
Arizona Department of Transportation

Prepared By:
Coe & Van Loo Consulting Engineers, Inc.

CVL Job. No. 0257-100

CVL-8-0095

FINAL I DRAINAGE DESIGN REPORT
FOR
SUPERSTITION FREEWAY
ELLSWORTH ROAD - IRONWOOD DRIVE

TABLE OF CONTENTS

	PAGE
LIST OF SYMBOLS	iii
1.0 INTRODUCTION	
1.1 General	1
1.2 Project Location	2
1.3 Existing Drainage Features	5
2.0 SCOPE OF WORK	
2.1 Outline	6
2.2 Off-site Drainage Scheme	7
3.0 DESIGN PROCEDURES	
3.1 Outline	8
3.2 Pavement Drainage	
3.2.1 Freeway Mainline	8
3.2.2 Crossroads	9
3.3 Median Drainage	9
3.4 Storm Sewer	10
4.0 ON-SITE DRAINAGE PLAN	
4.1 Outline	11
4.2 Drainage Scheme	11
5.0 OFF-SITE DRAINAGE PLAN	
5.1 Outline	14
5.2 Drainage Scheme	14
5.3 Hydrology	15
5.4 Interceptor Channels	15
5.5 Detention Basins	16
5.5.1 Ellsworth Road	17
5.5.2 C.A.P. Canal	17
BIBLIOGRAPHY	20

LIST OF FIGURES

1. VICINITY MAP 3
2. PROJECT LOCATION 4

LIST OF PLATES

1. OFF-SITE DRAINAGE SCHEME
2. OFF-SITE HYDROLOGY SCHEMATIC
3. CULVERT PROFILES
4. CULVERT PROFILES

APPENDIX I
(General)

A. Drainage Design Criteria/Guidelines - Sverdrup (ASMC)
B. Project Specific Drainage Design Criteria - CVL
C. Applicable Details
D. Extracts from Computer Users Manual "Water Surface and Pressure Gradient"

APPENDIX II
(On-Site Drainage)

A. Development of Rainfall-Intensity-Duration-Frequency Curves
B. Development of Spread-Discharge Relationships
C. Standard Charts and Computational Sheets
D. Design Procedures
E. Drainage Concept Plan Development
F. Catch Basin Inlet Computations
G. Catch Basin Connector Pipe Computations

APPENDIX III
(Off-Site Drainage)

A. Hydrologic Model (HEC-1)
B. Water Surface Profiles for Channel Systems
C. Side Channel Spillway Computations
D. Plunge Pool Design Computations
E. Local Runoff to Ellsworth Basin
F. Pipe and Drop Inlet at Ironwood Drive
G. Culvert Summary Computations

LIST OF SYMBOLS

a	Gutter depression, in.
A	Cross-sectional area of flow, ft^2
B	Bottom width in a trapezoidal channel, ft.
C	Rational equation coefficient of runoff.
d, D	Depth of flow at the curb face, ft.
	Depth of flow in an open channel, ft.
	Diameter of a circular section, ft.
DA	Drainage area, acres
d_c	Critical depth, ft.
DHW	Design headwater depth, ft.
E	Interception efficiency of an inlet.
E_o	Ratio of flow in a chosen width, usually the width of a grate, to total gutter flow.
g	Acceleration of gravity, ft/s/s.
H	Total head loss due to entry, exit and friction losses, ft.
HW	Headwater depth, ft.
H_o	Outlet control water elevation.
i, I	Rainfall intensity, in/hr.
K	Conveyance; the quantity flow rate divided by the square root of the longitudinal slope; $Q/\sqrt{S}$
K_e	Entrance loss coefficient
L	Overland flow length, ft
	Length of inlet, ft.
	Length of pipe, ft.
L_T	Length of curb-opening or slotted drain inlet required for total gutter flow interception, ft.
n	Coefficient of roughness in Manning's equation.
P	Perimeter of a grate opening disregarding bars and neglecting the side against the curb, ft.
Q	Flow rate; discharge from contributing area, ft^3/s.
Q_b, Q_c	Bypass or carryover flow; the portion of total gutter flow which is not intercepted by an inlet, ft^3/s.

Q_i	Intercepted flow; the portion of total gutter flow which is intercepted by an inlet, ft^3/s.
Q_T	Total discharge from contributing area plus bypass flow, ft^3/s.
S, S_o	Longitudinal slope of gutter or channel, ft/ft.
S_e	Equivalent straight cross-slope for a gutter section with a composite cross-slope.
S_x	Pavement cross-slope, ft/ft.
S_w	Cross-slope of a depressed gutter, ft/ft.
S'_w	Cross-slope of a depressed gutter section measured from the normal cross-slope of the pavement, ft/ft.
T	Spread of water on the pavement, ft.
t_c	Time of concentration for use in the Rational Method, min.
TW	Tailwater elevation, ft.
V	Velocity, ft/s.
V	Average velocity in a reach of gutter, ft/s.
V_o	Velocity of flow at which splash-over first occurs over grate, ft/s
W	Width of a grate, ft.; Width of a depressed gutter, ft.
Z	Reciprocal of cross-slope.
Z_w	Reciprocal of cross-slope for gutter ($1/S_w$).
Z_x	Reciprocal of cross-slope for pavement ($1/S_x$).

APPENDIX III

A. HYDROLOGIC MODEL (HEC-1)

```
LIN      ID  ....  ....  ....  ....  ....  5...  6...  7...  8...  ....  ....

 87      KK   CO116
 88      KM        COMBINE FLOWS INTO EAST SIDE OF PROPOSED WEEKES WASH DAM
 89      HC      2

 90      KK    R017
 91      KM        ROUTE FLOWS TO BREAKOUT AREA
 92      RS     2.0    ELEV     1.0
 93      RC   0.085   0.040   0.085    2600  0.0077     9.0
 94      RX     100     115     225     231     266     272     283     397
 95      RY     9.0     5.0     4.0     1.0     1.0     4.0     5.0     9.0

 96      KK   SUB18
 97      KM        RUNOFF FROM NORTH OF PROPOSED WEEKES WASH DAM
 98      BA     0.8
 99      LS              91
100      UC     0.3

101      KK   CO118
102      KM        TOTAL INFLOW TO PROPOSED WEEKES WASH DAM AND BREAKOUT AREA
103      HC      2

104      KK    R019
105      KM        ROUTE WEEKES WASH FLOWS TO SUPESTITION BLVD.
106      RS     6.0    ELEV     1.0
107      RC   0.085   0.085   0.085   12200  0.0111    12.0
108      RX     100     130     150     170     800     820     900     905
109      RY     9.0     7.0     7.0     1.0     1.0     7.0    12.0    12.0

110      KK   SUB20
111      KM        LOCAL RUNOFF BETWEEN PROPESED WEEKES WASH DAM AND SUPERSTITION BLVD.
112      BA    0.95
113      LS              82
114      UD    0.35

115      KK   CO120
116      KM        COMBINE FLOWS IN WEEKES WASH AT SUPERSTITION BLVD.
117      HC      2

118      KK  BRKOUT
119      KM        DIVERT WEEKES WASH BREAKOUT TO THE WEST(TO SUPERST. FWY)
120      KO      1
121      DT    D120
122      DI      0     100    1065    7500   10000   12500
123      DQ      0       0     580    3750    4000    5000

124      KK   DBRKO
125      KM        REMOVE FLOWS PAST BREAKOUT FROM THIS MODEL
126      DT    DOUT
127      DI      0   20000
128      DQ      0   20000
```

```
LIN      ID  ...1....2....3....4....5....6....7....8....9....1
129      KK  SUB200
130      KM        LOCAL RUNOFF AT IRONWOOD AND FREEWAY
131      KM        BEBINNING OF SUPERSTITICN FREEWAY MCDEL WITH 3.65" OF RAINFALL
132      PG      2   3.65
133      PG     20
134      IN     30                    48
135      PI  0.019   0.020   0.020   0.022   0.022   0.023   0.025   0.025   0.026   0.028
136      PI  0.029   0.031   0.033   0.035   0.038   0.042   0.046   0.051   0.057   0.067
137      PI  0.085   0.113   0.176   1.387   0.262   0.136   0.097   0.076   0.067   0.058
138      PI  0.050   0.046   0.041   0.038   0.035   0.033   0.031   0.029   0.027   0.027
139      PI  0.025   0.024   0.023   0.022   0.022   0.020   0.020   0.019
140      BA   0.06
141      UK    650  0.0175    0.20     100
142      RK   1000   0.010   0.040   0.008    TRAP     2.0     4.0
143      RK   1500  0.0040   0.016           TRAP     3.5     1.5

144      KK  DIV200
145      KM        STORE HYDROGRAPH IN D200
146      DT   D200
147      DI      0    1000   10000
148      DG      3    1000   10000

149      KK  SUB202
150      KM        LOCAL RUNOFF TO 2100 FEET WEST OF IRONWOOD
151      PR     20
152      PW      1
153      PT      2
154      PW      1
155      BA   0.24
156      LS            85.7
157      UK    650  0.0175   0.200     100
158      RK   3600   0.010   0.040    0.04    TRAP     2.0     4.0
159      RK   2100  0.0040   0.016            TRAP     3.5     1.5

160      KK  SUB204
161      KM        LOCAL RUNOFF TO IRRIGATION DAM (ASSUME NO ATTENUATION)
162      PR     20
163      PW      1
164      PT      2
165      PW      1
166      BA   0.70
167      LS             84
168      UK    650  0.0175   0.200     100
169      RK   6300  0.0083   0.040   0.043    TRAP     2.0     4.0
170      RK   2500  0.0048   0.035            TRAP    10.0     3.0

171      KK  CO204
172      KM        COMBINE FLOWS ALONG SR360 AT IRRIGATION EMBANKMENT
173      HC      2
```

```
LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9.......10

 174        KK  DIV204
 175        KM        STORE HYDROGRAPH IN D204
 176        DT    D204
 177        DI       0   10000
 178        DQ       0   10000

 179        KK  SUB206
 180        KM        LOCAL RUNOFF TO MERIDIAN DRIVE
 181        PR      20
 182        PL       1
 183        PT       2
 184        PW       1
 185        BA    0.05
 186        LS              83
 187        UK     500   0.023   0.200     100
 188        RK    1600   0.013   0.040   0.043    TRAP     2.0     4.0
 189        RK    1835   0.040   0.016            TRAP     9.3     1.5

 190        KK  DIV206
 191        KM        STORE HYDROGRAPH IN D206
 192        DT    D206
 193        DI       0   10000
 194        DQ       0   10000

 195        KK       1
 196        KM         COMBINE HYDROGRAPHS TO REDUCE # IN STACK
 197        HC       3

 198        KK  RED120
 199        KM        RETREIVE DIVERTED WEEKES WASH BREAKOUT HYDROGRAPH
 200        DR    D120

 201        KK  ROWEEK
 202        KM        ROUTE WEEKES WASH BREAKOUT FLOWS TO US60
 203        RK    6500    0.01   0.065            TRAP      25      30

 204        KK   SUB74
 205        KM        LOCAL RUNOFF TO APACHE TRAIL
 206        PR      20
 207        PW       1
 208        PT       2
 209        PL       1
 210        BA    2.78
 211        LS              85
 212        UK    1500   0.015   0.200     100
 213        RK    5000   0.013   0.040   0.005    TRAP     2.0     4.0
 214        RK    8400   0.005   0.035            TRAP    15.0     3.0

 215        KK    C074
 216        KM        COMBINE LOCAL WITH WEEKES WASH BREAKOUT
 217        HC       2
```

```
LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
 218      KK    R074
 219      KM          ROUTE FLOWS FROM APACHE TRAIL TO C.A.P. (SUB76)
 220      RK   14400   0.010   0.035              TRAP    15.0     3.0

 221      KK   SUB76
 222      KM          LOCAL RUNOFF TO C.A.P.
 223      PR      20
 224      PW       1
 225      PT       2
 226      PW       1
 227      BA    2.13
 228      LS              84
 229      UK    1250   0.013   0.200     100
 230      RK    7000   0.010   0.040   0.176    TRAP     2.0      4.0
 231      RK   14400   0.010   0.035            TRAP    15.0      3.0

 232      KK    C076
 233      KM          COMBINE FLOWS AT C.A.P. TO BOTH OVERCHUTES (STA 563+50 & 552+50)
 234      HC       2

 235      KK  DIV76A
 236      KM          DIVERT FLOW IN EXCESS OF OVERCHUTE CAPACITY TO NORTHWEST
 237      DT   CCAP1
 238      DI       0    2425    2975    3920    5525    6675
 239      DQ       0       0     125     745    2050    3000

 240      KK  DIV76B
 241      KM          DIVERT 50% OF FLOW TO OVERCHUTE(STA. 563+50) FOR SMALLER BASIN
 242      DT   CCAP2
 243      DI       0    1000    3000    6000
 244      DQ       0     500    1500    3000

 245      KK  RECAP2
 246      KM          RETREIVE DIVERTED FLOWS CAP2
 247      DR   CCAP2

 248      KK  SUB238
 249      KM          LOCAL RUNOFF TO C.A.P. OVERCHUTE (STA 574+50)
 250      PR      20
 251      PW       1
 252      PT       2
 253      PW       1
 254      BA    0.06
 255      LS              83
 256      UK     500   0.023    0.20     100
 257      RK    1900   0.010   0.040    0.03    TRAP     2.0      4.0
 258      RK     885   0.004   0.016            TRAP     5.3      1.5

 259      KK  SUBAS1
 260      KM          RUNOFF ONTO CAP SOUTH DETENTION BASIN AREA
 261      BA    0.06
 262      LS              85
 263      UD    0.15
```

```
LINE          IC.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

 264          KK  BASIN1
 265          KM          COMBINE FLOWS INTO SUBBASIN1
 266          HC       3

 267          KK  ROBASS
 268          KM        ROUTE COMBINED FLOWS THRL CAP SOUTH DETENTION BASIN
 269          KO        1        2
 270          RS      1.0     ELEV    49.5
 271          SV        0      300      340
 272          SE     49.5       60       61
 273          SL     49.5    28.27      0.6      0.5
 274          SS       60      200      2.6      1.5

 275          KK  DIVBAS
 276          KM        DIVERT TO REMOVE HYDROGRAPH FROM STACK
 277          DT    BASS
 278          DI        0     1000     5000
 279          DQ        0     1000     5000

 280          KK   SUB70
 281          KM        LOCAL RUNOFF TO APACHE TRAIL
 282          PR       20
 283          PW        1
 284          PT        2
 285          PL        1
 286          BA     1.35
 287          LS              85
 288          UK     1300    0.011    0.200      100
 289          RK     3500    0.012    0.040   0.0502     TRAP      2.0      4.0
 290          RK    11210    0.011    0.035              TRAP     10.0      3.0

 291          KK     R070
 292          KM        ROUTE FLOWS FROM APACHE TRAIL TO C.A.P.
 293          RK     8310 0.0090    0.035              TRAP     10.0      3.0

 294          KK   SUB72
 295          KM        LOCAL RUNOFF TO C.A.P. OVERCHUTES (STA 542+50 & 529+50)
 296          PR       20
 297          PW        1
 298          PT        2
 299          PL        1
 300          BA     1.38
 301          LS              85
 302          UK     1250    0.011    0.200      100
 303          RK     2500    0.009    0.040   0.0355     TRAP      2.0      4.0
 304          RK     8800    0.009    0.035              TRAP     10.0      3.0

 305          KK    CC72A
 306          KM        COMBINE FLOWS AT C.A.P. OVERCHUTES
 307          HC        2
```

```
LINE      ID  ....1....2....3....4....5....6....7....8....9....0
308       KK    RE72
309       KM          RETREIVE DIVERTED FLOWS FROM D/S CAP OVERCHUTES
310       DR   DCAP1

311       KK    C072
312       KM          COMBINE FLOWS AT C.A.P. OVERCHUTES(INCLUDING DIVERTED Q)
313       HC       2

314       KK  SUBAS2
315       KM          RUNOFF ONTO CAP NORTH DETENTION BASIN
316       BA    0.08
317       LS              85
318       UD    0.18

319       KK  BASIN2
320       KM          COMBINE FLOWS INTO WEST BASIN (#2)
321       HC       4

322       KK  RCBASN
323       KM          ROUTE FLOWS THRU CAP NORTH DETENTION BASIN
324       KO       1       2
325       RS       1    ELEV    36.0
326       SV       0   12.35    63.5   210.3   367.5   535.1  667.85  713.55
327       SE    36.0    38.0    40.0    44.0    48.0    52.0    55.0    56.0
328       SL    36.0   28.27     0.6     0.5
329       SS      55     200     2.6     1.5

330       KK   RBASN
331       KM          ROUTE ROBASN OUTFLOW TO 1800' W. OF SIGNAL BUTTE
332       RK    4400   0.004   0.015            TRAP     6.0     2.0

333       KK  SUB212
334       KM          LOCAL RUNOFF BELOW C.A.P. ABOVE SOUTHERN AVE.
335       BA    0.07
336       LS              83
337       UK     250   0.010   0.200     100
338       RK    1000   0.010   0.040   0.020    TRAP     2.0     4.0
339       RK    1500   0.007   0.035            TRAP    25.0     2.0

340       KK  SUB214
341       KM          LOCAL RUNOFF AT SIGNAL BUTTE AND SF360
342       BA    0.17
343       LS              83
344       UK     250   0.010   0.200     100
345       RK    1000   0.009    0.04    0.03    TRAP     2.0     4.0
346       RK    2450  0.0066   0.025            TRAP    10.0     2.0

347       KK   C0214
348       KM          COMBINE ROBASN,SUB212 & SUB214 FLOWS AND CROSS UNDER FREEWAY
349       KC       1
350       HC       3
```

```
LINE      ID   ....1....2....3....4....5....6....7....8....9....10
437       KK    C037
438       KM        COMBINE OVERCHUTE AND FREEWAY FLOW 2600' W. OF CRISMON
439       HC       2

440       KK   SUB218
441       KM         LOCAL RUNOFF TO 2600 FEET WEST OF CRISMON AT THE FREEWAY
442       PR      20
443       PW       1
444       PT       2
445       PW       1
446       BA    1.21
447       LS            83.3
448       UK     500   0.010    0.20     100
449       RK    7000   0.008   0.040    0.20    TRAP    25.0     2.0
450       RK    2600  0.0070   0.035            TRAP    35.0     3.0

451       KK    C0218
452       KM         COMBINE TOTAL FLOW IN FREEWAY 2600 FEET WEST OF CRISMON
453       HC       2

454       KK    C0219
455       KM         COMBINE FLOWS AT 2600 FEET WEST OF CRISMON
456       HC       2

457       KK    R0219
458       KM          ROUTE FLOWS TO ELLSWORTH REGIONAL DET. BASIN
459       RK    1000  0.0023   0.016            TRAP    27.0     3.0

460       KK   SUB220
461       KM         LOCAL RUNOFF AT ELLSWORTH AND FREEWAY
462       PR      20
463       PW       1
464       PT       2
465       PW       1
466       BA    0.84
467       LS            85.7
468       UK    1250   0.010   0.200     100
469       RK    3500   0.010   0.040   0.128    TRAP     2.0     4.0
470       RK    3550   0.006   0.035            TRAP    10.0     3.0

471       KK    C0220
472       KM         COMBINED FLOW INTO DETENTION BASIN NO. OF SR360
473       HC       2

474       KK    ROUT
475       KM         ROUTE FLOW THRU ELLSWORTH DETENTION BASIN(24" EQUIV. OUTLET PIPE)
476       KO       1       2
477       RS       1    ELEV      56
478       SV       0     617     650
479       SE      56      74      75
480       SL      56    3.14     0.6     0.5
481       SS      74     200     2.6     1.5
482       ZZ
```

100-Year 24-Hour Peak Discharges (cfs)

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	SUB06	2457.	12.00	426.	133.	107.	1.86		
ROUTED TO	R007	2552.	12.25	426.	133.	108.	1.86	4.99	12.25
HYDROGRAPH AT	SUB08	1630.	12.00	268.	84.	68.	1.19		
2 COMBINED AT	C0108	3581.	12.00	694.	217.	175.	3.05		
ROUTED TO	R009	3297.	12.25	694.	217.	175.	3.05	5.92	12.25
HYDROGRAPH AT	SUB10	2475.	12.25	544.	171.	138.	2.27		
2 COMBINED AT	C0110	5683.	12.25	1238.	388.	314.	5.32		
ROUTED TO	R011	5069.	12.50	1237.	388.	314.	5.32	6.78	12.50
HYDROGRAPH AT	SUB12	2085.	12.00	343.	109.	88.	1.37		
2 COMBINED AT	C0112	6166.	12.25	1579.	497.	401.	6.69		
ROUTED TO	R013	5966.	12.50	1579.	497.	401.	6.69	7.03	12.50
HYDROGRAPH AT	SUB14	1751.	12.00	368.	118.	95.	1.39		
2 COMBINED AT	C0114	7444.	12.25	1946.	614.	496.	8.08		
HYDROGRAPH AT	SUB16	960.	12.00	206.	64.	52.	0.90		
2 COMBINED AT	C0116	8371.	12.25	2152.	679.	548.	8.98		
ROUTED TO	R017	8175.	12.50	2152.	679.	548.	8.98	9.38	12.50
HYDROGRAPH AT	SUB18	976.	12.00	206.	66.	53.	0.80		
2 COMBINED AT	C0118	8784.	12.25	2357.	744.	601.	9.78		
ROUTED TO	R019	8596.	13.00	2317.	744.	600.	9.78	4.18	13.00
HYDROGRAPH AT	SUB21	830.	12.25	184.	57.	46.	0.95		
2 COMBINED AT	C0120	8246.	13.00	2484.	801.	646.	10.73		
DIVERSION TO	D120	3835.	13.00	1254.	387.	312.	10.73		
HYDROGRAPH AT	BRKOLT	4511.	13.00	1230.	414.	334.	10.73		
DIVERSION TO	DOLT	4511.	0.25	1230.	414.	334.	10.73		
HYDROGRAPH AT	DBRKO	0.	0.25	0.	0.	0.	10.73		
HYDROGRAPH AT	SUB2[illegible]	42.	12.50	11.	3.	3.	0.06		
DIVERSION TO	D2[illegible]0	42.	0.25	11.	3.	3.	0.06		
HYDROGRAPH AT	DIV2[illegible]0	0.	0.25	0.	0.	0.	0.06		
HYDROGRAPH AT	SUB212	171.	12.50	43.	14.	11.	0.24		

50-Year 24-Hour Peak Discharges (cfs)

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	SUB16	2899.	12.00	363.	113.	91.	1.86		
ROUTED TO	R017	1740.	12.25	363.	113.	92.	1.86	4.79	12.25
HYDROGRAPH AT	SUB08	1386.	12.00	229.	71.	57.	1.19		
2 COMBINED AT	C0108	3062.	12.00	592.	184.	149.	3.05		
ROUTED TO	R015	2636.	12.25	592.	184.	149.	3.05	5.59	12.25
HYDROGRAPH AT	SUB10	2121.	12.25	467.	146.	118.	2.27		
2 COMBINED AT	C0110	4757.	12.25	1058.	331.	267.	5.32		
ROUTED TO	R011	4310.	12.50	1058.	331.	267.	5.32	6.45	12.50
HYDROGRAPH AT	SUB12	1801.	12.00	296.	93.	75.	1.37		
2 COMBINED AT	C0112	5128.	12.25	1353.	424.	343.	6.69		
ROUTED TO	R013	5027.	12.50	1353.	424.	343.	6.69	6.65	12.50
HYDROGRAPH AT	SUB14	1519.	12.00	320.	102.	82.	1.39		
2 COMBINED AT	C0114	6254.	12.25	1671.	526.	425.	8.08		
HYDROGRAPH AT	SUB16	812.	12.00	176.	55.	44.	0.90		
2 COMBINED AT	C0116	7045.	12.25	1847.	581.	469.	8.98		
ROUTED TO	R017	6817.	12.50	1847.	581.	469.	8.98	8.79	12.50
HYDROGRAPH AT	SUB18	844.	12.00	179.	57.	46.	0.80		
2 COMBINED AT	C0118	7424.	12.25	2025.	638.	515.	9.78		
ROUTED TO	R019	6645.	13.00	1975.	637.	514.	9.78	3.83	13.00
HYDROGRAPH AT	SUB20	689.	12.25	154.	48.	38.	0.95		
2 COMBINED AT	C0120	6855.	13.00	2165.	685.	552.	10.73		
DIVERSION TO	D120	3433.	13.00	1677.	331.	267.	10.73		
HYDROGRAPH AT	BRKOLT	3423.	13.00	1029.	353.	285.	10.73		
DIVERSION TO	DOLT	3423.	0.25	1029.	353.	285.	10.73		
HYDROGRAPH AT	DBRKO	0.	0.25	0.	0.	0.	10.73		
HYDROGRAPH AT	SUB220	32.	12.50	9.	3.	2.	0.06		
DIVERSION TO	D220	32.	0.25	9.	3.	2.	0.06		
HYDROGRAPH AT	DIV220	0.	0.25	0.	0.	0.	0.06		
HYDROGRAPH AT	SUB222	127.	12.50	35.	11.	9.	0.24		
HYDROGRAPH AT	SUB224	275.	12.75	20.	29.	24.	0.70		

HYDROGRAPH AT	SUB452	72.	12.00	12.	4.	3.	0.02		
4 COMBINED AT	BASIN2	3556.	13.50	1270.	411.	331.	7.84		
ROUTED TO	RBASN	498.	17.25	491.	320.	258.	7.84	49.42	17.25
ROUTED TO	RBASN	498.	17.25	491.	318.	257.	7.84		
HYDROGRAPH AT	SUB212	47.	12.50	9.	3.	2.	0.07		
HYDROGRAPH AT	SUB214	113.	12.50	23.	7.	6.	0.17		
3 COMBINED AT	C0214	508.	17.00	500.	328.	265.	8.08		
HYDROGRAPH AT	SUB38	448.	12.75	129.	42.	33.	0.99		
ROUTED TO	R038	426.	12.75	125.	42.	34.	0.99		
HYDROGRAPH AT	SUB40	315.	12.50	63.	20.	16.	0.45		
2 COMBINED AT	C040	609.	12.75	190.	61.	49.	1.44		
DIVERSION TO	D40	305.	12.75	95.	31.	25.	1.44		
HYDROGRAPH AT	DIV40	305.	12.75	95.	31.	25.	1.44		
ROUTED TO	R040	304.	13.00	96.	31.	25.	1.44		
HYDROGRAPH AT	SUB216	241.	12.75	76.	25.	20.	0.55		
2 COMBINED AT	C0216	541.	12.75	172.	56.	45.	1.99		
ROUTED TO	R0216	509.	13.00	171.	56.	45.	1.99		
HYDROGRAPH AT	RED40	305.	12.75	95.	31.	25.	0.00		
ROUTED TO	R041	286.	13.00	93.	30.	25.	0.00		
HYDROGRAPH AT	SUB34	581.	13.00	234.	77.	62.	1.84		
ROUTED TO	R034	565.	13.25	234.	77.	62.	1.84		
HYDROGRAPH AT	SUB36	211.	12.50	46.	14.	12.	0.33		
2 COMBINED AT	C036	641.	13.00	277.	92.	74.	2.17		
ROUTED TO	R036	633.	13.25	273.	91.	74.	2.17		
2 COMBINED AT	C037	887.	13.00	366.	122.	98.	2.17		
HYDROGRAPH AT	SUB218	477.	12.75	150.	49.	40.	1.21		
2 COMBINED AT	C0218	1274.	13.00	514.	171.	138.	3.38		
2 COMBINED AT	C0219	1783.	13.00	685.	227.	183.	5.37		
ROUTED TO	R0219	1779.	13.00	686.	227.	183.	5.37		
HYDROGRAPH AT	SUB22[illegible]	257.	13.00	117.	39.	31.	0.84		
2 COMBINED AT	C022[illegible]	2036.	13.00	8[illegible]1.	266.	214.	6.21		
ROUTED TO	ROLT	54.	27.75	54.	35.	29.	6.21	69.37	28.00

*** NORMAL END OF HEC-1 ***

10-Year 24-Hour
Peak Discharges (cfs)

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	SUBC6	1321.	12.00	233.	72.	58.	1.86		
ROUTED TO	R007	1180.	12.00	233.	72.	58.	1.86	4.25	12.00
HYDROGRAPH AT	SUBC8	876.	12.00	145.	45.	36.	1.19		
2 COMBINED AT	C0108	2056.	12.00	378.	117.	95.	3.05		
ROUTED TO	R009	1619.	12.25	378.	117.	95.	3.05	4.89	12.25
HYDROGRAPH AT	SUB1C	1378.	12.25	304.	95.	76.	2.27		
2 COMBINED AT	C0110	2996.	12.25	682.	212.	171.	5.32		
ROUTED TO	R011	2741.	12.50	682.	212.	171.	5.32	5.62	12.50
HYDROGRAPH AT	SUB12	1197.	12.00	197.	61.	50.	1.37		
2 COMBINED AT	C0112	3210.	12.25	877.	273.	221.	6.69		
ROUTED TO	R013	3176.	12.50	877.	273.	221.	6.69	5.78	12.50
HYDROGRAPH AT	SUB14	1823.	12.00	218.	69.	55.	1.39		
2 COMBINED AT	C0114	4810.	12.25	1093.	341.	276.	8.08		
HYDROGRAPH AT	SUB16	506.	12.25	113.	35.	28.	0.90		
2 COMBINED AT	C0116	4516.	12.25	1206.	376.	304.	8.98		
ROUTED TO	R017	4393.	12.50	1205.	376.	304.	8.98	7.58	12.50
HYDROGRAPH AT	SUB18	560.	12.00	120.	38.	30.	0.80		
2 COMBINED AT	C0118	4761.	12.25	1325.	414.	334.	9.78		
ROUTED TO	R019	4107.	13.25	1267.	414.	334.	9.78	3.12	13.25
HYDROGRAPH AT	SUB20	405.	12.25	92.	28.	23.	0.95		
2 COMBINED AT	C0120	4204.	13.25	1329.	442.	357.	10.73		
DIVERSION TO	D120	2126.	13.25	678.	207.	167.	10.73		
HYDROGRAPH AT	BRKOLT	2078.	13.25	650.	235.	190.	10.73		
DIVERSION TO	DOUT	2078.	0.25	650.	235.	190.	10.73		
HYDROGRAPH AT	DBRKO	0.	0.25	0.	0.	0.	10.73		
HYDROGRAPH AT	SUB2C0	16.	12.75	5.	2.	1.	0.06		
DIVERSION TO	D2C0	16.	0.25	5.	2.	1.	0.06		
HYDROGRAPH AT	DIV2OO	0.	0.25	0.	0.	0.	0.06		
HYDROGRAPH AT	SUB2G2	60.	12.75	20.	7.	5.	0.24		

HYDROGRAPH AT	SUB2C4	121.	13.00	49.	17.	14.	0.70		
2 COMBINED AT	CO2C4	173.	13.00	69.	23.	19.	0.94		
DIVERSION TO	D2C4	173.	0.25	69.	23.	19.	0.94		
HYDROGRAPH AT	DIV2C4	0.	0.25	0.	0.	0.	0.94		
HYDROGRAPH AT	SUB2C6	11.	12.50	4.	1.	1.	0.05		
DIVERSION TO	D2C6	11.	0.25	4.	1.	1.	0.05		
HYDROGRAPH AT	DIV2C6	0.	0.25	0.	0.	0.	0.05		
3 COMBINED AT	1	0.	0.25	0.	0.	0.	1.05		
HYDROGRAPH AT	RED12C	2126.	13.25	678.	207.	167.	0.00		
ROUTED TO	ROWEEK	1958.	13.50	671.	206.	167.	0.00		
HYDROGRAPH AT	SUB74	317.	13.75	189.	68.	55.	2.78		
2 COMBINED AT	CO74	2259.	13.50	860.	275.	222.	2.78		
ROUTED TO	RO74	2167.	13.75	852.	273.	221.	2.78		
HYDROGRAPH AT	SUB76	238.	13.75	133.	48.	39.	2.13		
2 COMBINED AT	CO76	2405.	13.75	983.	322.	259.	4.91		
DIVERSION TO	DCAF1	0.	13.75	0.	0.	0.	4.91		
HYDROGRAPH AT	DIV76A	2405.	13.75	983.	322.	259.	4.91		
DIVERSION TO	DCAF2	1202.	13.75	491.	161.	130.	4.91		
HYDROGRAPH AT	DIV76B	1202.	13.75	491.	161.	130.	4.91		
HYDROGRAPH AT	RECAF2	1202.	13.75	491.	161.	130.	0.00		
HYDROGRAPH AT	SUB2C8	13.	12.50	4.	1.	1.	0.06		
HYDROGRAPH AT	SUBAS1	33.	12.00	5.	2.	1.	0.06		
3 COMBINED AT	BASIN1	1210.	13.75	496.	164.	132.	0.12		
ROUTED TO	ROBASS	302.	16.50	289.	149.	120.	0.12	54.42	16.50
DIVERSION TO	BASS	302.	0.25	289.	149.	120.	0.12		
HYDROGRAPH AT	DIVBAS	0.	0.25	0.	0.	0.	0.12		
HYDROGRAPH AT	SUB70	203.	13.50	100.	34.	28.	1.35		
ROUTED TO	RO70	199.	13.50	98.	34.	27.	1.35		
HYDROGRAPH AT	SUB72	175.	13.50	100.	35.	28.	1.38		
2 COMBINED AT	CO72A	374.	13.50	197.	69.	56.	2.73		
HYDROGRAPH AT	RE72	0.	0.25	0.	0.	0.	0.00		
2 COMBINED AT	CO72	374.	13.50	197.	69.	56.	2.73		
HYDROGRAPH AT	SUBAS2	41.	12.00	7.	2.	2.	0.08		
4 COMBINED AT	BASIN2	1576.	13.75	687.	232.	187.	7.84		

HYDROGRAPH AT	SUBAS2	41.	12.00	7.	2.	2.	0.08		
4 COMBINED AT	BASIN2	1576.	13.75	687.	232.	187.	7.84		
ROUTED TO	ROBASN	372.	17.00	364.	222.	179.	7.84	43.49	17.00
ROUTED TO	RBASN	372.	17.00	364.	221.	179.	7.84		
HYDROGRAPH AT	SUB212	19.	12.50	5.	2.	1.	0.07		
HYDROGRAPH AT	SUB214	47.	12.50	12.	4.	3.	0.17		
3 COMBINED AT	CO214	378.	17.00	369.	227.	183.	8.08		
HYDROGRAPH AT	SUB38	187.	13.00	69.	23.	19.	0.99		
ROUTED TO	RO38	176.	13.25	69.	23.	19.	0.99		
HYDROGRAPH AT	SUB40	128.	12.50	34.	11.	9.	0.45		
2 COMBINED AT	CO40	249.	13.00	101.	34.	28.	1.44		
DIVERSION TO	D40	124.	13.00	51.	17.	14.	1.44		
HYDROGRAPH AT	DIV40	124.	13.00	51.	17.	14.	1.44		
ROUTED TO	RO40	121.	13.25	50.	17.	14.	1.44		
HYDROGRAPH AT	SUB216	107.	13.00	42.	14.	12.	0.55		
2 COMBINED AT	CO216	218.	13.25	92.	31.	25.	1.99		
ROUTED TO	RO216	216.	13.25	92.	31.	25.	1.99		
HYDROGRAPH AT	RED40	124.	13.00	51.	17.	14.	0.00		
ROUTED TO	RO41	113.	13.50	49.	17.	14.	0.00		
HYDROGRAPH AT	SUB34	234.	13.75	121.	43.	34.	1.84		
ROUTED TO	RO34	232.	13.75	120.	43.	34.	1.84		
HYDROGRAPH AT	SUB36	86.	12.50	25.	8.	7.	0.33		
2 COMBINED AT	CO36	261.	13.75	142.	51.	41.	2.17		
ROUTED TO	RO36	258.	13.75	140.	50.	41.	2.17		
2 COMBINED AT	CO37	360.	13.75	189.	67.	54.	2.17		
HYDROGRAPH AT	SUB218	187.	13.00	80.	28.	22.	1.21		
2 COMBINED AT	CO218	516.	13.50	267.	95.	77.	3.38		
2 COMBINED AT	CO219	722.	13.50	359.	126.	102.	5.37		
ROUTED TO	RO219	721.	13.50	359.	126.	102.	5.37		
HYDROGRAPH AT	SUB220	111.	13.50	64.	22.	18.	0.84		
2 COMBINED AT	CO220	831.	13.50	422.	149.	120.	6.21		
ROUTED TO	ROUT	40.	28.00	40.	25.	20.	6.21	63.18	28.00

*** NORMAL END OF HEC-1 ***

C TO	ROLT	46.	28.00	46.	29.	24.	6.21	65.46	28.00

100-Year 24-Hour Outflow Hydrographs

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

                 *************
                 *           *
267 KK           *   ROBASS  *    "South" Basin Outlet Hydrograph
                 *           *
                 *************

269 KO              OUTPUT CONTROL VARIABLES
                          IPRNT          1  PRINT CONTROL
                          IPLOT          2  PLOT CONTROL
                          QSCAL         0.  HYDROGRAPH PLOT SCALE

                 HYDROGRAPH ROUTING DATA

270 RS              STORAGE ROUTING
                          NSTPS          1  NUMBER OF SUBREACHES
                           ITYP       ELEV  TYPE OF INITIAL CONDITION
                          RSVRIC      49.50  INITIAL CONDITION
                              X        0.00  WORKING R AND D COEFFICIENT

271 SV                 STORAGE        0.0      300.0     340.0

272 SE              ELEVATION       49.50      60.00     61.00

273 SL              LOW-LEVEL OUTLET
                          ELEVL       49.50  ELEVATION AT CENTER OF OUTLET
                          CAREA       28.27  CROSS-SECTIONAL AREA
                           COCL        0.60  COEFFICIENT
                           EXPL        0.50  EXPONENT OF HEAD

274 SS              SPILLWAY
                           CREL       60.00  SPILLWAY CREST ELEVATION
                          SPWID      200.00  SPILLWAY WIDTH
                           COCW        2.60  WEIR COEFFICIENT
                           EXPW        1.50  EXPONENT OF HEAD

                                        ***

                                COMPUTED OUTFLOW-ELEVATION DATA

          OUTFLOW      0.00    229.62    244.24    263.86    279.90    301.95    327.76    358.40    395.35    440.80
        ELEVATION     49.50     52.35     52.72     53.18     53.73     54.43     55.31     56.44     57.95     60.00

          OUTFLOW    442.12    447.49    459.79    481.50    516.69    567.04    635.81    725.86    840.08    981.32
        ELEVATION     60.02     60.05     60.10     60.17     60.26     60.37     60.50     60.65     60.81     61.00

                                COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE      0.00     81.40     92.10    105.06    120.96    140.76    165.86    198.31    241.32    300.00
          OUTFLOW      0.00    229.62    244.24    263.86    279.90    301.95    327.76    358.40    395.35    440.80
        ELEVATION     49.50     52.35     52.72     53.18     53.73     54.43     55.31     56.44     57.95     60.00

          STORAGE    300.62    301.96    304.07    306.93    310.55    314.92    320.05    325.95    332.59    340.00
          OUTFLOW    442.12    447.49    459.79    481.50    516.69    567.04    635.81    725.86    840.08    981.32
        ELEVATION     60.02     60.05     60.10     60.17     60.26     60.37     60.50     60.65     60.81     61.00

*****************************************************************************************************************************

                                HYDROGRAPH AT STATION   ROBASS

*****************************************************************************************************************************
```

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0930	1	0.	0.0	49.5	1		1000	41	0.	0.1	49.5	1		2000	81	401.	249.0	58.2
1		0945	2	0.	0.0	49.5	1		1015	42	0.	0.1	49.5	1		2015	82	398.	245.3	58.1
1		1000	3	0.	0.0	49.5	1		1030	43	0.	0.2	49.5	1		2030	83	396.	241.7	58.0
1		1015	4	0.	0.0	49.5	1		1045	44	1.	0.2	49.5	1		2045	84	392.	237.9	57.8
1		1030	5	0.	0.0	49.5	1		1100	45	1.	0.3	49.5	1		2100	85	389.	234.2	57.7
1		1045	6	0.	0.0	49.5	1		1115	46	1.	0.3	49.5	1		2115	86	386.	230.4	57.6
1		1100	7	0.	0.0	49.5	1		1130	47	1.	0.5	49.5	1		2130	87	383.	226.6	57.4
1		1115	8	0.	0.0	49.5	1		1145	48	3.	1.0	49.5	1		2145	88	379.	222.7	57.3
1		1130	9	0.	0.0	49.5	1		1200	49	7.	2.5	49.6	1		2200	89	376.	218.8	57.2
1		1145	10	0.	0.0	49.5	1		1215	50	15.	5.4	49.7	1		2215	90	373.	214.9	57.0
1		1200	11	0.	0.0	49.5	1		1230	51	36.	12.7	49.9	1		2230	91	369.	210.9	56.9
1		1215	12	0.	0.0	49.5	1		1245	52	85.	30.1	50.6	1		2245	92	366.	206.9	56.7
1		1230	13	0.	0.0	49.5	1		1300	53	161.	57.2	51.5	1		2300	93	362.	202.9	56.6
1		1245	14	0.	0.0	49.5	1		1315	54	239.	88.0	52.6	1		2315	94	359.	198.8	56.5
1		1300	15	0.	0.0	49.5	1		1330	55	277.	118.4	53.6	1		2330	95	355.	194.8	56.3
1		1315	16	0.	0.0	49.5	1		1345	56	309.	147.2	54.7	1		2345	96	351.	190.7	56.2
1		1330	17	0.	0.0	49.5	1		1400	57	325.	173.9	55.6	2		0000	97	347.	186.6	56.0
1		1345	18	0.	0.0	49.5	1		1415	58	358.	197.7	56.4	2		0015	98	344.	182.5	55.9
1		1400	19	0.	0.0	49.5	1		1430	59	375.	218.1	57.1	2		0030	99	340.	178.5	55.7
1		1415	20	0.	0.0	49.5	1		1445	60	389.	234.3	57.7	2		0045	100	336.	174.4	55.6
1		1430	21	0.	0.0	49.5	1		1500	61	400.	246.7	58.1	2		0100	101	332.	170.2	55.5
1		1445	22	0.	0.0	49.5	1		1515	62	407.	256.0	58.5	2		0115	102	328.	166.1	55.3
1		1500	23	0.	0.0	49.5	1		1530	63	412.	263.1	58.7	2		0130	103	324.	161.9	55.2
1		1515	24	0.	0.0	49.5	1		1545	64	416.	268.3	58.9	2		0145	104	319.	157.7	55.0
1		1530	25	0.	0.0	49.5	1		1600	65	419.	272.2	59.0	2		0200	105	315.	153.4	54.9
1		1545	26	0.	0.0	49.5	1		1615	66	421.	274.9	59.1	2		0215	106	311.	149.1	54.7
1		1600	27	0.	0.0	49.5	1		1630	67	423.	276.6	59.2	2		0230	107	306.	144.8	54.6
1		1615	28	0.	0.0	49.5	1		1645	68	423.	277.5	59.2	2		0245	108	302.	140.4	54.4
1		1630	29	0.	0.0	49.5	1		1700	69	423.	277.6	59.2	2		0300	109	297.	136.0	54.3
1		1645	30	0.	0.0	49.5	1		1715	70	423.	277.2	59.2	2		0315	110	292.	131.6	54.1
1		1700	31	0.	0.0	49.5	1		1730	71	422.	276.2	59.2	2		0330	111	287.	127.1	54.0
1		1715	32	0.	0.0	49.5	1		1745	72	421.	274.7	59.1	2		0345	112	282.	122.7	53.8
1		1730	33	0.	0.0	49.5	1		1800	73	420.	272.9	59.0	2		0400	113	277.	118.1	53.6
1		1745	34	0.	0.0	49.5	1		1815	74	418.	270.7	59.0	2		0415	114	271.	113.6	53.5
1		1800	35	0.	0.0	49.5	1		1830	75	416.	268.2	58.9	2		0430	115	266.	109.0	53.3
1		1815	36	0.	0.0	49.5	1		1845	76	414.	265.4	58.8	2		0445	116	260.	104.4	53.2
1		1830	37	0.	0.0	49.5	1		1900	77	412.	262.4	58.7	2		0500	117	254.	99.9	53.0
1		1845	38	0.	0.0	49.5	1		1915	78	409.	259.3	58.6	2		0515	118	248.	95.4	52.8
1		1900	39	0.	0.1	49.5	1		1930	79	407.	256.3	58.5	2		0530	119	243.	90.9	52.7
1		1915	40	0.	0.1	49.5	1		1945	80	404.	252.5	58.3	2		0545	120	237.	86.5	52.5

****

PEAK FLOW (CFS)	TIME (HR)		6-HR	MAXIMUM AVERAGE FLOW 24-HR	72-HR	29.75-HR
423.	17.00	(CFS)	412.	249.	201.	291.
		(INCHES)	31.952	77.278	77.278	77.278
		(AC-FT)	204.	495.	495.	495.

PEAK STORAGE (AC-FT)	TIME (HR)	6-HR	MAXIMUM AVERAGE STORAGE 24-HR	72-HR	29.75-HR
278.	17.00	263.	140.	113.	113.

PEAK STAGE (FEET)	TIME (HR)	6-HR	MAXIMUM AVERAGE STAGE 24-HR	72-HR	29.75-HR
59.22	17.00	58.72	54.39	53.45	53.45

CUMULATIVE AREA = 4.12 SQ MI

STATION 6PEASS

*** ***

```
            *************
            *           *
322 KK      *   ROBASN  *    "North" Basin Outlet Hydrograph
            *           *
            *************

324 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          1  PRINT CONTROL
                      IPLOT          2  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

              HYDROGRAPH ROUTING DATA

325 RS          STORAGE ROUTING
                      NSTPS          1  NUMBER OF SUBREACHES
                       ITYP       ELEV  TYPE OF INITIAL CONDITION
                     RSVRIC      36.00  INITIAL CONDITION
                          X       0.00  WORKING R AND D COEFFICIENT

326 SV            STORAGE        0.0     12.3     63.5    210.3    367.5    535.1    667.8    713.5

327 SE          ELEVATION      36.00    38.00    40.00    44.00    48.00    52.00    55.00    56.00

328 SL          LOW-LEVEL OUTLET
                      ELEVL      36.00  ELEVATION AT CENTER OF OUTLET
                      CAREA      28.27  CROSS-SECTIONAL AREA
                       COCL       0.60  COEFFICIENT
                       EXPL       0.50  EXPONENT OF HEAD

329 SS          SPILLWAY
                       CREL      55.00  SPILLWAY CREST ELEVATION
                      SPWID     200.00  SPILLWAY WIDTH
                       COCW       2.60  WEIR COEFFICIENT
                       EXPW       1.50  EXPONENT OF HEAD
```

***

COMPUTED OUTFLOW-ELEVATION DATA

OUTFLOW	[illegible]	233.08	252.21	274.77	301.76	334.62	375.53	427.82	497.03	592.96
ELEVATION	36.00	38.94	39.44	40.08	40.92	42.05	43.62	45.89	49.35	55.00
OUTFLOW	594.03	598.93	610.60	631.97	665.99	715.58	783.68	873.22	987.14	1128.37
ELEVATION	55.01	55.05	55.10	55.17	55.26	55.37	55.50	55.65	55.81	56.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	[illegible]	12.35	36.28	49.11	63.50	66.43	97.28	138.76	196.37	210.30
OUTFLOW	[illegible]	192.38	233.08	252.21	272.77	274.77	301.76	334.62	375.53	384.77
ELEVATION	[illegible]	38.00	38.94	39.44	40.00	40.08	40.92	42.05	43.62	44.00
STORAGE	284.63	367.50	424.05	535.13	667.85	668.49	669.98	672.36	675.61	679.74
OUTFLOW	427.82	471.24	497.03	544.14	592.96	594.03	598.93	610.60	631.97	665.99
ELEVATION	45.89	48.00	49.35	52.00	55.00	55.01	55.05	55.10	55.17	55.26
STORAGE	684.74	693.63	697.39	705.03	713.55					
OUTFLOW	715.58	783.68	873.22	987.14	1128.37					
ELEVATION	55.37	55.50	55.65	55.81	56.00					

HYDROGRAPH AT STATION ROBASN

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	0.0	36.0	1		1000	41	1.	0.1	36.0	1		2000	81	545.	538.4	52.1
1		0015	2	0.	0.0	36.0	1		1015	42	1.	0.1	36.0	1		2015	82	544.	534.0	52.0
1		0030	3	0.	0.0	36.0	1		1030	43	2.	0.1	36.0	1		2030	83	542.	529.3	51.9
1		0045	4	0.	0.0	36.0	1		1045	44	2.	0.1	36.0	1		2045	84	540.	524.6	51.7
1		0100	5	0.	0.0	36.0	1		1100	45	3.	0.2	36.0	1		2100	85	538.	519.7	51.6
1		0115	6	0.	0.0	36.0	1		1115	46	4.	0.3	36.0	1		2115	86	536.	514.8	51.5
1		0130	7	0.	0.0	36.0	1		1130	47	6.	0.4	36.1	1		2130	87	533.	509.7	51.4
1		0145	8	0.	0.0	36.0	1		1145	48	15.	1.1	36.2	1		2145	88	531.	504.5	51.3
1		0200	9	0.	0.0	36.0	1		1200	49	42.	2.7	36.4	1		2200	89	529.	499.2	51.1
1		0215	10	0.	0.0	36.0	1		1215	50	117.	7.5	37.2	1		2215	90	527.	493.8	51.0
1		0230	11	0.	0.0	36.0	1		1230	51	210.	22.6	38.4	1		2230	91	524.	488.3	50.9
1		0245	12	0.	0.0	36.0	1		1245	52	261.	55.7	39.7	1		2245	92	522.	482.8	50.8
1		0300	13	0.	0.0	36.0	1		1300	53	314.	113.1	41.4	1		2300	93	520.	477.1	50.6
1		0315	14	0.	0.0	36.0	1		1315	54	374.	193.7	43.5	1		2315	94	517.	471.4	50.5
1		0330	15	0.	0.0	36.0	1		1330	55	425.	279.6	45.8	1		2330	95	515.	465.6	50.3
1		0345	16	0.	0.0	36.0	1		1345	56	463.	352.7	47.6	1		2345	96	512.	459.7	50.2
1		0400	17	0.	0.0	36.0	1		1400	57	490.	408.2	49.0	2		0000	97	510.	453.8	50.1
1		0415	18	0.	0.0	36.0	1		1415	58	507.	448.4	49.9	2		0015	98	507.	447.7	49.9
1		0430	19	0.	0.0	36.0	1		1430	59	520.	477.7	50.6	2		0030	99	504.	441.6	49.8
1		0445	20	0.	0.0	36.0	1		1445	60	529.	499.9	51.2	2		0045	100	502.	435.5	49.6
1		0500	21	0.	0.0	36.0	1		1500	61	537.	517.1	51.6	2		0100	101	499.	429.2	49.5
1		0515	22	0.	0.0	36.0	1		1515	62	542.	530.5	51.9	2		0115	102	496.	422.8	49.3
1		0530	23	0.	0.0	36.0	1		1530	63	546.	541.0	52.1	2		0130	103	493.	416.2	49.2
1		0545	24	0.	0.0	36.0	1		1545	64	549.	549.1	52.3	2		0145	104	490.	409.5	49.0
1		0600	25	0.	0.0	36.0	1		1600	65	552.	555.4	52.5	2		0200	105	487.	402.7	48.8
1		0615	26	0.	0.0	36.0	1		1615	66	553.	560.2	52.6	2		0215	106	484.	395.8	48.7
1		0630	27	0.	0.0	36.0	1		1630	67	555.	563.7	52.6	2		0230	107	481.	388.7	48.5
1		0645	28	0.	0.0	36.0	1		1645	68	556.	566.0	52.7	2		0245	108	478.	381.5	48.3
1		0700	29	0.	0.0	36.0	1		1700	69	556.	567.3	52.7	2		0300	109	474.	374.2	48.2
1		0715	30	0.	0.0	36.0	1		1715	70	556.	567.7	52.7	2		0315	110	471.	366.8	48.0
1		0730	31	0.	0.0	36.0	1		1730	71	556.	567.4	52.7	2		0330	111	467.	359.3	47.8
1		0745	32	0.	0.0	36.0	1		1745	72	556.	566.4	52.7	2		0345	112	463.	351.7	47.6
1		0800	33	0.	0.0	36.0	1		1800	73	555.	564.9	52.7	2		0400	113	459.	343.9	47.4
1		0815	34	0.	0.0	36.0	1		1815	74	554.	562.8	52.6	2		0415	114	455.	336.1	47.2
1		0830	35	0.	0.0	36.0	1		1830	75	553.	560.3	52.6	2		0430	115	451.	328.2	47.0
1		0845	36	0.	0.0	36.0	1		1845	76	552.	557.4	52.5	2		0445	116	447.	320.3	46.8
1		0900	37	0.	0.0	36.0	1		1900	77	551.	554.2	52.4	2		0500	117	442.	312.3	46.6
1		0915	38	1.	0.0	36.0	1		1915	78	550.	550.6	52.4	2		0515	118	438.	304.3	46.4
1		0930	39	1.	0.0	36.0	1		1930	79	548.	546.8	52.3	2		0530	119	434.	296.3	46.2
1		0945	40	1.	0.1	36.0	1		1945	80	547.	542.7	52.2	2		0545	120	430.	288.3	46.0

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	29.75-HR
556.	17.25	(CFS)	550.	364.	294.	294.
		(INCHES)	0.652	1.726	1.726	1.726
		(AC-FT)	273.	722.	722.	722.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	29.75-HR
568.	17.25	551.	321.	259.	259.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	29.75-HR
52.74	17.25	52.35	45.97	44.05	44.05

DRAINAGE AREA = 7.44 SQ MI

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

                 *************
                 *           *
347 KK           *   CO214   *     Sta 1109+80. Culvert Outlet Hydrograph
                 *           *     Routed Hydrograph from "North" Basin
                 *************

349 KO             OUTPUT CONTROL VARIABLES
                         IPRNT          1  PRINT CONTROL
                         IPLOT          2  PLOT CONTROL
                         OSCAL         0.  HYDROGRAPH PLOT SCALE

350 HC             HYDROGRAPH COMBINATION
                         ICOMP          3  NUMBER OF HYDROGRAPHS TO COMBINE
                                                                  ***
```

HYDROGRAPH AT STATION CO214
SUM OF 3 HYDROGRAPHS

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0730	31	0.	1		1500	61	552.	1		2230	91	531.
1		0015	2	0.	1		0745	32	0.	1		1515	62	557.	1		2245	92	529.
1		0030	3	0.	1		0800	33	0.	1		1530	63	560.	1		2300	93	526.
1		0045	4	0.	1		0815	34	0.	1		1545	64	563.	1		2315	94	524.
1		0100	5	0.	1		0830	35	0.	1		1600	65	564.	1		2330	95	521.
1		0115	6	0.	1		0845	36	0.	1		1615	66	566.	1		2345	96	519.
1		0130	7	0.	1		0900	37	0.	1		1630	67	567.	2		0000	97	516.
1		0145	8	0.	1		0915	38	0.	1		1645	68	567.	2		0015	98	513.
1		0200	9	0.	1		0930	39	0.	1		1700	69	567.	2		0030	99	510.
1		0215	10	0.	1		0945	40	1.	1		1715	70	567.	2		0045	100	507.
1		0230	11	0.	1		1000	41	1.	1		1730	71	566.	2		0100	101	504.
1		0245	12	0.	1		1015	42	1.	1		1745	72	566.	2		0115	102	500.
1		0300	13	0.	1		1030	43	2.	1		1800	73	565.	2		0130	103	497.
1		0315	14	0.	1		1045	44	3.	1		1815	74	564.	2		0145	104	494.
1		0330	15	0.	1		1100	45	4.	1		1830	75	563.	2		0200	105	490.
1		0345	16	0.	1		1115	46	6.	1		1845	76	561.	2		0215	106	487.
1		0400	17	0.	1		1130	47	10.	1		1900	77	560.	2		0230	107	483.
1		0415	18	0.	1		1145	48	17.	1		1915	78	558.	2		0245	108	480.
1		0430	19	0.	1		1200	49	96.	1		1930	79	557.	2		0300	109	477.
1		0445	20	0.	1		1215	50	297.	1		1945	80	555.	2		0315	110	473.
1		0500	21	0.	1		1230	51	377.	1		2000	81	553.	2		0330	111	469.
1		0515	22	0.	1		1245	52	329.	1		2015	82	551.	2		0345	112	465.
1		0530	23	0.	1		1300	53	243.	1		2030	83	549.	2		0400	113	461.
1		0545	24	0.	1		1315	54	393.	1		2045	84	547.	2		0415	114	457.
1		0600	25	0.	1		1330	55	441.	1		2100	85	545.	2		0430	115	453.
1		0615	26	0.	1		1345	56	480.	1		2115	86	543.	2		0445	116	448.
1		0630	27	0.	1		1400	57	507.	1		2130	87	541.	2		0500	117	444.
1		0645	28	0.	1		1415	58	524.	1		2145	88	538.	2		0515	118	440.
1		0700	29	0.	1		1430	59	536.	1		2200	89	536.	2		0530	119	436.
1		0715	30	0.	1		1445	60	545.	1		2215	90	533.	2		0545	120	432.

PEAK FLOW TIME MAXIMUM AVERAGE FLOW

```
*****************************************************************************************************************

PEAK FLOW    TIME                          MAXIMUM AVERAGE FLOW
  (CFS)      (HR)                  6-HR       24-HR       72-HR     29.75-HR
   567.      17.[illegible]   (CFS)   560.        375.        302.        302.
                            (INCHES)  0.645       1.724       1.724       1.724
                             (AC-FT)   278.        743.        743.        743.

                        CUMULATIVE AREA =    6.00 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            *************
            *           *
474 RK      *   ROUT    *      "Ellsworth" Basin Outlet Hydrograph
            *           *
            *************

476 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          1  PRINT CONTROL
                      IPLOT          2  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

              HYDROGRAPH ROUTING DATA

477 RS          STORAGE ROUTING
                      NSTPS          1  NUMBER OF SUBREACHES
                       ITYP       ELEV  TYPE OF INITIAL CONDITION
                     RSVRIC      56.00  INITIAL CONDITION
                          X       0.03  WORKING R AND D COEFFICIENT

478 SV          STORAGE        0.0      617.6      650.0

479 SE          ELEVATION     56.00      74.00      75.00

480 SL          LOW-LEVEL OUTLET
                      ELEVL      56.00  ELEVATION AT CENTER OF OUTLET
                      CAREA       3.14  CROSS-SECTIONAL AREA
                       COQL       1.60  COEFFICIENT
                       EXPL       0.50  EXPONENT OF HEAD

481 SS          SPILLWAY
                       CREL      74.00  SPILLWAY CREST ELEVATION
                      SPWID     200.00  SPILLWAY WIDTH
                       COQW       2.60  WEIR COEFFICIENT
                       EXPW       1.50  EXPONENT OF HEAD

                                   ***

                                COMPUTED OUTFLOW-ELEVATION DATA

        OUTFLOW      0.00      15.22     16.82     18.80     21.31     24.59     29.07     35.55     45.74     64.10
      ELEVATION     56.00      57.01     57.24     57.55     57.99     58.65     59.70     61.54     65.16     74.00

        OUTFLOW     64.66      68.45     78.53     98.01    130.00    177.58    243.86    331.93    444.90    585.86
      ELEVATION     74.01      74.04     74.09     74.16     74.25     74.36     74.49     74.64     74.81     75.00

                                COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

        STORAGE      0.00      34.76     42.47     53.07     68.18     91.81    126.91    189.74    314.06    617.00
        OUTFLOW      0.00      15.22     16.82     18.80     21.31     24.59     29.07     35.55     45.74     64.10
      ELEVATION     56.00      57.01     57.24     57.55     57.99     58.65     59.70     61.54     65.16     74.00

        STORAGE      [illegible]
```

APPENDIX III

B. WATER SURFACE PROFILES FOR CHANNEL SYSTEMS

WATER SURFACE PROFILES FOR CHANNEL SYSTEMS

Included are the water surface profiles for all concrete-lined collector and interceptor channels and spillways. The WSPG program was used throughout the project except for one (1) drainage channel. The WSPG program is not designed to handle inflow as sheet flow and due to the way it computes lateral inflows, its use was not found applicable for significant flow rate increases; as a result, the HEC-2 was used in these instances.

Normal depth calculations were used for the two (2) spillways conveying flows from the C.A.P Canal overchutes to the C.A.P. "South" detention basin.

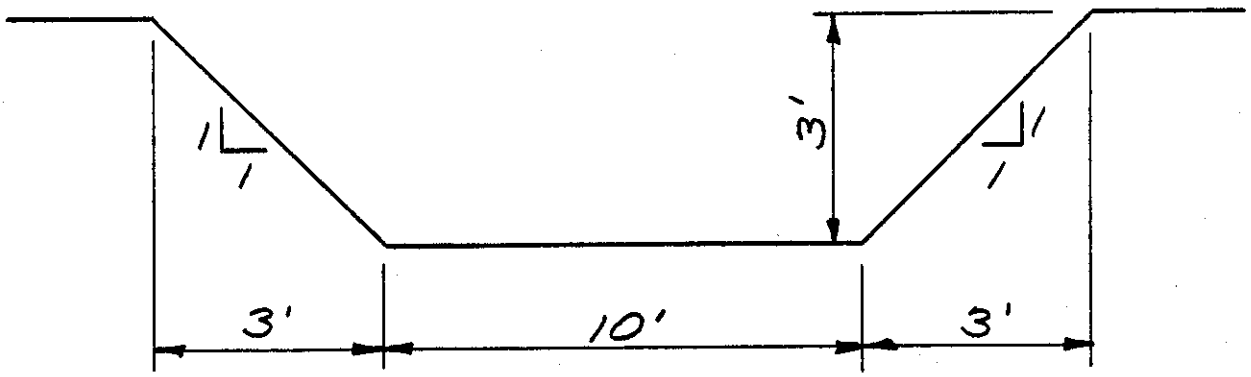
Freeboard is included in the final channel design. Since flow depths vary within a given channel reach, freeboard was determined for each discharge rate and each channel size for the worst case situation. The amount of freeboard was determined using the formula specified in Appendix I-B.

FROM STATION	TO STATION	Q (CFS)	SLOPE (FT/FT)	MAXIMUM FLOW DEPTH (FT)	VELOCITY AT MAX. FLOW DEPTH (FPS)	SUB-CRITICAL OR SUPER-CRITICAL	REQUIRED[6] FREEBOARD (FT)	REQUIRED DEPTH (FT)	DESIGN DEPTH (FT)
CHANNEL 1									
7+69	8+85	352	0.11523	1.8	16.3	SUPER-CRITICAL	1.0	2.8	2.5[1]
8+85	9+00	352	0.11523	2.6	10.9	SUPER-CRITICAL	1.0	3.6	4.0
9+00	10+00	352	0.00595	3.0	8.9	SUPER-CRITICAL	1.0	4.0	4.0
10+00	10+34	352	0.00600	3.2	9.7	SUPER-CRITICAL	1.0	4.2	4.0
10+34	10+44	352	0.00600	3.4	9.2	SUPER-CRITICAL	1.0	4.4	3.0[2]
CHANNEL 2									
2+34	3+80	2586	0.1234	3.8	21.7	SUPER-CRITICAL	1.0	4.8	6.5
3+80	10+00[3]	2586	0.0054	5.4	15.6	SUPER-CRITICAL	1.4	6.8	7.5
1050+00[3]	1067+50	VARIES	0.0054	5.0	14.8	SUPER-CRITICAL	1.3	6.3	6.5
1067+50	1075+00	VARIES	0.0091	4.6	10.5	SUPER-CRITICAL	1.2	5.8	6.0
1075+00	1075+85	VARIES	0.0052	4.6	10.5	SUPER-CRITICAL	1.2	5.8	6.0
1077+68	1112+00	VARIES	0.0052	4.0	11.7	SUPER-CRITICAL	1.0	5.0	5.0
CHANNEL 3									
6+35	10+00[4]	567	0.0030	4.1	9.7	SUPER-CRITICAL	1.0	5.1	6.0
1113+50[4]	1118+00	567	0.0040	3.8	10.9	SUPER-CRITICAL	1.0	4.8	6.0
1118+00	1128+84	567	0.0071	4.2	9.3	SUPER-CRITICAL	1.1	5.3	6.0
1131+00	1153+00	567	0.00425	4.2	9.3	SUPER-CRITICAL	1.1	5.3	6.0
1153+00	1155+50	567	0.00425	5.2	4.2	SUB-CRITICAL	1.1	6.3	16.0

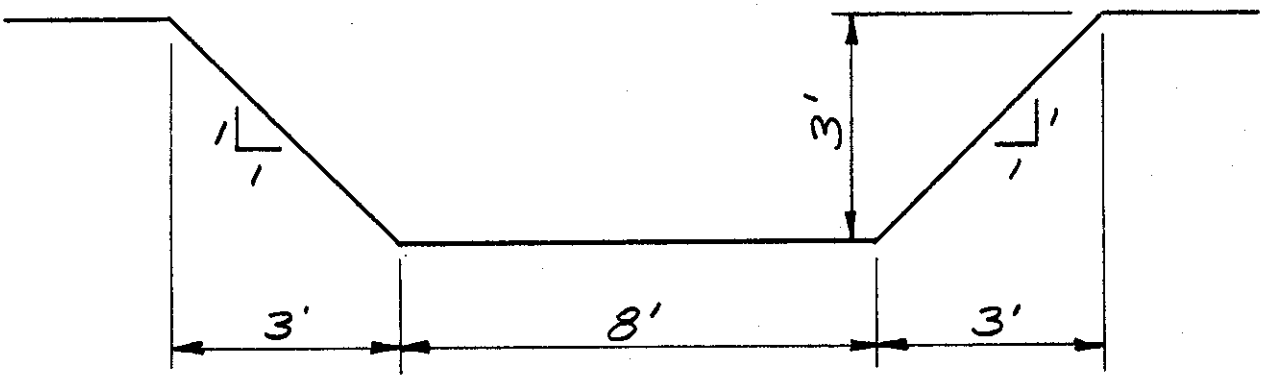
FROM STATION	TO STATION	Q (CFS)	SLOPE (FT/FT)	MAXIMUM FLOW DEPTH (FT)	VELOCITY AT MAX. FLOW DEPTH (FPS)	SUB-CRITICAL OR SUPER-CRITICAL	REQUIRED[6] FREEBOARD (FT)	REQUIRED DEPTH (FT)	DESIGN DEPTH (FT)
CHANNEL 4									
32+02	30+98	3000	0.0350	5.1	13.0	SUPER-CRITICAL	1.3	6.4	8.0
30+98	25+32	3000	0.0015	5.9	11.0	SUB-CRITICAL	1.6	7.5	8.0
25+32	12+15	1500	0.0015	8.1	3.8	SUB-CRITICAL	1.7	9.8	10.0
CHANNEL 5									
SPILLWAY INTO CAP NORTH DETENTION BASIN									
CHANNEL 6									
6+84	10+00	423	0.00337	2.5	11.2	SUPER-CRITICAL	1.0	3.5	5.0
CHANNEL 7									
6+32	6+97	566	0.01771	4.4	6.2	SUB-CRITICAL	1.0	5.4	5.9
6+97	8+20	566	0.00600	3.2	6.6	SUB-CRITICAL	1.0	4.2	5.0
8+25	10+00[5]	264	0.00618	1.2	9.4	SUPER-CRITICAL	1.0	2.2	4.0
1205+40[5]	1216+50	264	0.00620	3.0	7.9	SUPER-CRITICAL	1.0	4.0	4.0
1216+50	1227+00	171	0.00620	2.0	9.3	SUPER-CRITICAL	1.0	3.0	4.0
1227+00	1235+00	171	0.00740	2.4	7.2	SUPER-CRITICAL	1.0	3.4	4.0

(1) SPILLWAY AS CHANNEL ENTERS ELLSWORTH DETENTION BASIN.
(2) CHANNEL DESIGNED AND CONSTRUCTED BY MARICOPA COUNTY HIGHWAY DEPARTMENT
(3) EQUATION 10+00 = 1050+00
(4) EQUATION 10+00 = 1113+50
(5) EQUATION 10+00 = 1205+40
(6) BASED ON: SUB-CRITICAL FLOW = 0.2 X (DEPTH $+V^2/SG$), SUPER-CRITICAL = 0.25 X DEPTH, 1.0 FOOT MIN.

SECTIONS FOR CHANNEL - 1



SECTION 1
NTS



SECTION 2
NTS

INPUT DATA

```
0
T1 SUPERSTITION FREEWAY - ADOT
T2 CHANNEL-1     ELLSWORTH RD. COLLECTION CHANNEL
T3 CVL. REVISED MAY,1988
SO     769.041454.30  1       .015
R      900.001469.59  1       .015
R      926.081469.55  1       .015
R     1000.001469.99  1       .015                          78.0
R     1034.451470.20  2       .018
R     1044.451470.26  2       .018
SH                    2       .018
CD   1  1               4.0     10.0  1.0  1.0
CD   2  1               3.0      8.0  1.0  1.0
```

ELLSWORTH ROAD COLLECTION CHANNEL

CHANNEL-1

F0515P
WATER SURFACE PROFILE LISTING
SUPERSTITION FREEWAY - ADOT
CHANNEL-1 ELLSWORTH RD. COLLECTION CHANNEL
CVL. REVISED MAY,1988

STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
769.04	1454.30	1.139	1455.439	352.0	27.75	11.955	1467.394	0.00	3.035	4.00	10.00	1.00	0	0.00
18.80	0.11523					.079233	1.49		1.032			1.00		
787.84	1456.47	1.171	1457.637	352.0	26.91	11.247	1468.884	0.00	3.035	4.00	10.00	1.00	0	0.00
21.70	0.11523					.070489	1.53		1.032			1.00		
809.54	1458.97	1.222	1460.189	352.0	25.66	10.225	1470.414	0.00	3.035	4.00	10.00	1.00	0	0.00
16.17	0.11523					.061027	0.99		1.032			1.00		
825.71	1460.83	1.276	1462.106	352.0	24.47	9.296	1471.402	0.00	3.035	4.00	10.00	1.00	0	0.00
12.65	0.11523					.052857	0.67		1.032			1.00		
838.36	1462.29	1.332	1463.620	352.0	23.33	8.450	1472.070	0.00	3.035	4.00	10.00	1.00	0	0.00
10.24	0.11523					.045800	0.47		1.032			1.00		
848.60	1463.47	1.389	1464.856	352.0	22.24	7.683	1472.539	0.00	3.035	4.00	10.00	1.00	0	0.00
8.45	0.11523					.039702	0.34		1.032			1.00		
857.05	1464.44	1.450	1465.891	352.0	21.21	6.985	1472.876	0.00	3.035	4.00	10.00	1.00	0	0.00
7.08	0.11523					.034429	0.24		1.032			1.00		
864.13	1465.26	1.512	1466.769	352.0	20.22	6.349	1473.118	0.00	3.035	4.00	10.00	1.00	0	0.00
6.00	0.11523					.029870	0.18		1.032			1.00		
870.13	1465.95	1.577	1467.526	352.0	19.28	5.772	1473.298	0.00	3.035	4.00	10.00	1.00	0	0.00
5.13	0.11523					.025926	0.13		1.032			1.00		
875.26	1466.54	1.644	1468.183	352.0	18.38	5.248	1473.431	0.00	3.035	4.00	10.00	1.00	0	0.00
4.39	0.11523					.022513	0.10		1.032			1.00		
879.65	1467.04	1.714	1468.759	352.0	17.53	4.778	1473.529	0.00	3.035	4.00	10.00	1.00	0	0.00
3.77	0.11523					.019557	0.07		1.032			1.00		

COMPUTED DWR 9/89
CHECKED PWR+ 9/89

F0515P
WATER SURFACE PROFILE LISTING

SUPERSTITION FREEWAY - ADOT
CHANNEL-1 ELLSWORTH RD. COLLECTION CHANNEL
CVL. REVISED MAY,1988

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVSPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
883.42	1467.48	1.787	1469.267	352.0	16.71	4.337	1473.604	0.00	3.035		4.00	10.00	1.00	0	0.00
3.25	0.11523					.016996	0.06			1.032			1.00		
886.67	1467.85	1.862	1469.716	352.0	15.93	3.942	1473.658	0.00	3.035		4.00	10.00	1.00	0	0.00
2.79	0.11523					.014776	0.04			1.032			1.00		
889.46	1468.18	1.940	1470.115	352.0	15.19	3.584	1473.699	0.00	3.035		4.00	10.00	1.00	0	0.00
2.39	0.11523					.012853	0.03			1.032			1.00		
891.85	1468.45	2.021	1470.472	352.0	14.49	3.258	1473.730	0.00	3.035		4.00	10.00	1.00	0	0.00
2.04	0.11523					.011184	0.02			1.032			1.00		
893.89	1468.69	2.105	1470.791	352.0	13.81	2.962	1473.753	0.00	3.035		4.00	10.00	1.00	0	0.00
1.73	0.11523					.009736	0.02			1.032			1.00		
895.62	1468.88	2.192	1471.077	352.0	13.17	2.693	1473.770	0.00	3.035		4.00	10.00	1.00	0	0.00
1.45	0.11523					.008479	0.01			1.032			1.00		
897.07	1469.05	2.283	1471.335	352.0	12.56	2.448	1473.783	0.00	3.035		4.00	10.00	1.00	0	0.00
1.19	0.11523					.007387	0.01			1.032			1.00		
898.26	1469.19	2.376	1471.566	352.0	11.97	2.225	1473.791	0.00	3.035		4.00	10.00	1.00	0	0.00
0.97	0.11523					.006438	0.01			1.032			1.00		
899.23	1469.30	2.473	1471.775	352.0	11.41	2.023	1473.798	0.00	3.035		4.00	10.00	1.00	0	0.00
0.77	0.11523					.005613	0.00			1.032			1.00		
900.00	1469.39	2.573	1471.963	352.0	10.88	1.839	1473.802	0.00	3.035		4.00	10.00	1.00	0	0.00
26.08	0.00614					.005095	0.13			2.456			1.00		
926.08	1469.55	2.612	1472.162	352.0	10.68	1.773	1473.935	0.90	3.035		4.00	10.00	1.00	0	0.00
38.27	0.00595					.004695	0.18			2.478			1.00		

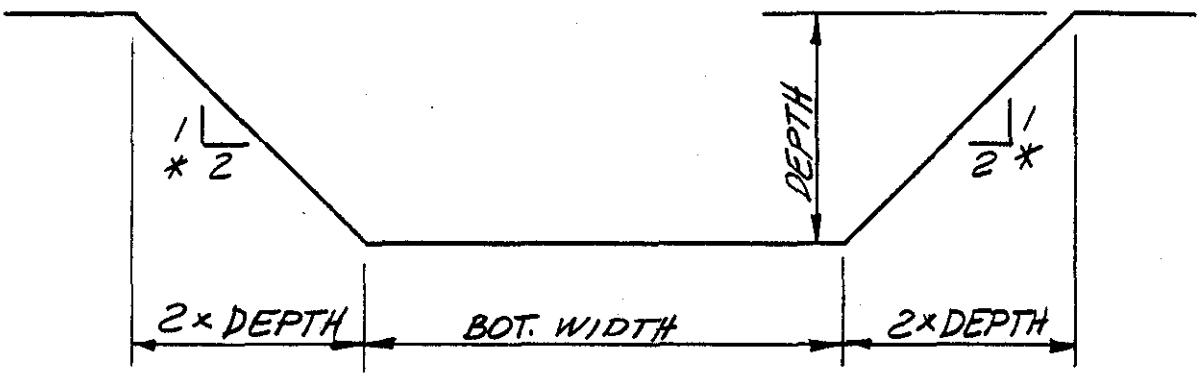
SUPERSTITION FREEWAY - ADOT
CHANNEL-1 ELLSWORTH RD. COLLECTION CHANNEL
CVL. REVISED MAY,1988

STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
964.35	1469.78	2.699	1472.477	352.0	10.27	1.638	1474.115	0.84	3.035	4.00	10.00	1.00	0	0.00
22.71	0.00595					.004148	0.09		2.478			1.00		
987.06	1469.91	2.807	1472.720	352.0	9.79	1.489	1474.209	0.77	3.035	4.00	10.00	1.00	0	0.00
10.19	0.00595					.003621	0.04		2.478			1.00		
997.25	1469.97	2.919	1472.893	352.0	9.34	1.353	1474.246	0.71	3.035	4.00	10.00	1.00	0	0.00
2.75	0.00595					.003161	0.01		2.478			1.00		
1000.00	1469.99	3.035	1473.025	352.0	8.90	1.229	1474.254	0.66	3.035	4.00	10.00	1.00	0	0.00
1000.00	1469.99	3.126	1473.116	352.0	10.12	1.590	1474.706	0.00	3.379	3.00	8.00	1.00	0	0.00
34.45	0.00610					.005401	0.19		3.070			1.00		
1034.45	1470.20	3.229	1473.429	352.0	9.71	1.463	1474.892	0.00	3.379	3.00	8.00	1.00	0	0.00
4.13	0.00600					.005015	0.02		3.083			1.00		
1038.58	1470.23	3.256	1473.481	352.0	9.61	1.433	1474.914	0.00	3.379	3.00	8.00	1.00	0	0.00
5.87	0.00600					.004632	0.03		3.083			1.00		
1044.45	1470.26	3.379	1473.639	352.0	9.15	1.301	1474.940	0.00	3.379	3.00	8.00	1.00	0	0.00

CHANNEL-2 SECTION & SUMMARY

STA	TO STA	*Q100	FL ELEV	BOT WIDTH	DEPTH
1112+00	1094+50	1	1511.1	6	5
1094+50	1094+00	332	1502.0	6-8	5
1094+00	1077+98	341	1501.8	8	5
1077+98	1077+68	761	1493.4	8-20.83	5-6
1077+68	1076+15	769	1493.3	BOX CULVERTS	
1076+15	1075+85	769	1492.5	20.83-8	6
1075+85	1068+00	786	1492.3	8	6
1068+00	1067+50	1227	1485.8	8-20	6-6.5
1067+50	1050+00	1255	1485.2	20	6.5
1050+00	1043+80	2238		20	6.5-7.5
1043+80	1042+84	2586		RIPRAP SPILLWAY	

* THIS IS ANTICIPATED UPHILL DRAINAGE AT THE UPPER STATION AND INCREASES PROPORTIONALLY TO THE LOWER STATION DOWNSTREAM.



SECTION
NTS

* side slopes transition to vertical at the box culverts

STATIONING SHOWN IS FWY ℄ STATIONING
EXCEPT AS NOTED

THIS RUN EXECUTED MON, MAY 30 1988 13:05:39

```
**************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION - - 50,51,52,53,54,55,56
**************************************************

T1              SUPERSTITION FREEWAY - ADOT
T2 CHANNEL-2 (N. R/W CHANNEL)....ELLSWORTH RD TO STA 1112+00
T3 CVL REVISED MAY,1988 - - - 100YR.-24HR. EVENT (CH. SYS. 1)

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

      0.      2.       0.       1.  0.005200     0.00     0.0      0.  1514.400   0.000

J2  NPROF    IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

    -1.000   0.000   -1.000    0.000    3.000    0.000   -1.000    0.000    0.000    0.000

J3  VARIABLE CODES FOR SUMMARY PRINTOUT

    38.000  43.000   1.000    2.000    0.000   42.000   63.000    3.000   26.000   53.000

     4.000  54.000  39.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000

NC      0.015    0.015    0.015    0.100    0.300    0.600    0.000    0.000    0.000    0.000
QT      1.000    1.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
X1 111200.000    4.000    0.100   26.100  400.000  400.000  400.000    0.000    0.000    0.000
GR   1516.100    0.100 1511.130   10.100 1511.130   16.100 1516.130   26.100    0.000    0.000

QT      1.000   76.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
X1 110800.000    4.000    0.100   26.100  450.000  450.000  450.000    0.000    0.000    0.000
GR   1514.100    0.100 1509.100   10.100 1509.100   16.100 1514.100   26.100    0.000    0.000

QT      1.000  161.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
X1 110350.000    4.000    0.100   26.100  450.000  450.000  450.000    0.000    0.000    0.000
GR   1511.700    0.100 1506.700   10.100 1506.700   16.100 1511.700   26.100    0.000    0.000

QT      1.000  246.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
X1 109900.000    4.000    0.100   26.100  450.000  450.000  450.000    0.000    0.000    0.000
GR   1509.400    0.100 1504.400   10.100 1504.400   16.100 1509.400   26.100    0.000    0.000

QT      1.000  332.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
X1 109450.000    4.000    0.100   26.100   50.000   50.000   50.000    0.000    0.000    0.000
GR   1507.000    0.100 1502.030   10.100 1502.030   16.100 1507.040   26.100    0.000    0.000
```

CHANNEL-2
ELLSWORTH BASIN, STA 1042+34 TO STA 1112+00

COMPUTED TMO 7/87
CHECKED
REVISED RWH 5/88

UPSTREAM

DOWNSTREAM

Oxford

GT	1.000	341.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
X1	109400.000	4.000	0.100	28.100	550.000	550.000	550.000	0.000	0.000	0.000	
GR	1506.880	0.100	1501.770	10.100	1501.770	18.100	1506.770	28.100	0.000	0.000	
GT	1.000	485.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
X1	108850.000	4.000	0.100	28.100	550.000	550.000	550.000	0.000	0.000	0.000	
GR	1503.900	0.100	1498.900	10.100	1498.900	18.100	1503.900	28.100	0.000	0.000	
GT	1.000	629.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
X1	108300.000	4.000	0.100	28.100	502.000	502.000	502.000	0.000	0.000	0.000	
GR	1501.100	0.100	1496.100	10.100	1496.100	18.100	1501.100	28.100	0.000	0.000	
GT	1.000	761.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
X1	107798.000	4.000	0.100	28.100	30.000	30.000	30.000	0.000	0.000	0.000	
GR	1498.400	0.100	1493.440	10.100	1493.440	18.100	1498.440	28.100	0.000	0.000	
GT	1.000	769.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	BEGIN CRISMON
X1	107768.000	8.000	0.100	20.970	153.000	153.000	153.000	0.000	0.000	0.000	ROAD BOX
GR	1499.300	0.100	1493.280	0.110	1493.280	10.110	1499.280	10.120	1499.280	10.950	CULVERT
GR	1493.300	10.960	1493.280	20.960	1499.280	20.970	0.000	0.000	0.000	0.000	
X1	107615.000	8.000	0.100	20.970	30.000	30.000	30.000	0.000	0.000	0.000	
GR	1498.500	0.100	1492.490	0.110	1492.490	10.110	1498.490	10.120	1498.490	10.950	
GR	1492.500	10.960	1492.490	20.960	1498.490	20.970	0.000	0.000	0.000	0.000	
GT	1.000	786.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
X1	107585.000	4.000	0.100	28.100	85.000	85.000	85.000	0.000	0.000	0.000	
GR	1497.300	0.100	1492.330	10.100	1492.330	18.100	1497.330	28.100	0.000	0.000	
GT	1.000	834.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
X1	107500.000	4.000	0.100	28.100	350.000	350.000	350.000	0.000	0.000	0.000	
GR	1496.900	0.100	1491.890	10.100	1491.890	18.100	1496.890	28.100	0.000	0.000	
GT	1.000	1130.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
X1	107150.000	4.000	0.100	28.100	350.000	350.000	350.000	0.000	0.000	0.000	
GR	1493.700	0.100	1488.710	10.100	1488.710	18.100	1493.710	28.100	0.000	0.000	
GT	1.000	1227.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	BEGIN CHNL
X1	106800.000	4.000	0.100	28.100	50.000	50.000	50.000	0.000	0.000	0.000	TRANSITION
GR	1490.500	0.100	1485.520	10.100	1485.520	18.100	1490.520	28.100	0.000	0.000	
GT	1.000	1255.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
X1	106750.000	4.000	0.100	46.100	400.000	400.000	400.000	0.000	0.000	0.000	
GR	1491.700	0.100	1485.240	13.100	1485.240	33.100	1491.740	46.100	0.000	0.000	
GT	1.000	1480.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
X1	106351.000	4.000	0.100	46.100	450.000	450.000	450.000	0.000	0.000	0.000	
GR	1489.600	0.100	1483.120	13.100	1483.120	33.100	1489.630	46.100	0.000	0.000	

FWY ℄ STA. 1050+00 EQ CHNSTA 10+00 (7+25)

(3+80)

(3+60)

(2+34)

GT	1.000	1732.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	105990.000	4.000	0.100	46.100	450.000	450.000	450.000	0.000	0.000	0.000
GR	1487.200	0.100	1480.700	13.100	1480.700	33.100	1487.200	46.100	0.000	0.000
GT	1.000	1985.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	105450.000	4.000	0.100	46.100	450.000	450.000	450.000	0.000	0.000	0.000
GR	1484.700	0.100	1478.200	13.100	1478.200	33.100	1484.700	46.100	0.000	0.000
GT	1.000	2238.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	105000.000	4.000	0.100	46.100	274.900	274.900	274.900	0.000	0.000	0.000
GR	1482.300	0.100	1475.790	13.100	1475.790	33.100	1482.290	46.100	0.000	0.000
GT	1.000	2392.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	104725.000	4.000	0.100	46.100	345.000	345.000	345.000	0.000	0.000	0.000
GR	1483.800	0.100	1474.320	13.100	1474.320	33.100	1480.820	46.100	0.000	0.000
GT	1.000	2586.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	104380.000	4.000	0.100	46.100	20.000	20.000	20.000	0.000	0.000	0.000
GR	1479.300	0.100	1472.450	13.100	1472.450	33.100	1478.950	46.100	0.000	0.000
NC	0.030	0.130	0.333	0.133	0.300	0.000	0.000	0.000	0.000	0.000
X1	104360.000	4.000	0.100	48.300	126.000	126.000	126.000	0.000	0.000	0.000
GR	1476.000	0.100	1469.980	12.100	1469.980	36.200	1476.000	48.300	0.000	0.000
X1	104234.000	4.000	0.100	62.100	0.000	0.000	0.000	0.000	0.000	0.000
GR	1457.500	0.100	1454.500	6.100	1454.500	56.100	1457.500	62.100	0.000	0.000
ED	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

THIS RUN EXECUTED MON, MAY 30 1988 13:05:43

```
*****************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION - 50,51,52,53,54,55,56
*****************************************************
```

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

EVISED MAY,1988 100

SUMMARY PRINTOUT

SECNO	Q	CWSEL	CRIWS	DEPTH	ELMIN	TELMX	EG	VCH	SSTA	TOPWID	ENDST	XLCH
* 111200.000	1.00	1511.22	1511.22	0.09	1511.13	1516.10	1511.27	1.71	9.91	6.38	16.29	0.00
* 110800.000	76.00	1510.54	1510.54	1.44	1509.10	1514.10	1511.09	5.92	7.21	11.77	18.99	400.00
* 110350.000	161.00	1508.89	1508.89	2.19	1506.70	1511.70	1509.67	7.09	5.72	14.76	20.48	450.00
109900.000	246.00	1507.02	1507.15	2.62	1504.40	1509.40	1508.10	8.34	4.86	16.49	21.34	450.00
109450.000	332.00	1505.00	1505.24	2.97	1502.03	1507.00	1506.36	9.38	4.13	17.88	22.02	450.00
109000.000	341.00	1504.19	1504.74	2.42	1501.77	1506.77	1506.36	10.98	5.29	17.65	22.94	50.00
108850.000	485.00	1502.25	1502.49	3.35	1498.99	1503.50	1503.77	9.09	3.42	21.36	24.78	550.00
108300.000	629.00	1499.75	1500.21	3.65	1496.10	1501.10	1501.72	11.25	2.80	22.61	25.40	550.00
107798.000	761.00	1497.48	1497.97	4.04	1493.44	1498.40	1499.60	11.69	1.96	24.22	26.18	502.00
107768.000	769.00	1495.88	1496.85	2.60	1493.28	1499.28	1499.28	14.80	0.11	20.02	20.96	30.00
* 107615.000	769.00	1496.06	1496.06	3.57	1492.49	1498.49	1497.86	10.77	0.10	20.02	20.97	153.00
* 107585.000	796.00	1496.94	1496.94	4.61	1492.33	1497.30	1498.46	9.90	0.83	26.48	27.31	30.00
107530.000	834.00	1496.51	1496.65	4.62	1491.89	1496.89	1498.21	10.46	0.87	26.48	27.35	85.00
107150.000	1030.00	1492.84	1493.95	4.14	1488.70	1493.70	1496.47	15.28	1.82	24.56	26.38	350.00
106800.000	1227.00	1490.00	1491.13	4.48	1485.52	1490.50	1494.01	16.08	1.08	26.00	27.08	350.00
106750.000	1255.00	1487.87	1489.51	2.63	1485.24	1491.70	1493.39	18.85	7.80	30.57	38.37	50.00
106350.000	1480.00	1487.04	1487.79	3.94	1483.10	1489.60	1489.85	13.44	5.21	35.79	40.99	400.00

SECNO	Q	CWSEL	CRTWS	DEPTH	ELMIN	TELMX	EG	VCH	SSTA	TOPWID	ENDST	XLCH
105900.000	1732.00	1485.13	1485.82	4.43	1480.79	1487.20	1487.98	13.53	4.23	37.73	41.97	450.00
105450.000	1985.00	1482.90	1483.73	4.70	1478.20	1464.70	1486.11	14.39	3.71	38.78	42.49	450.00
105000.000	2238.00	1480.61	1481.71	5.03	1475.79	1482.29	1484.23	14.82	3.06	40.09	43.15	450.00
104725.000	2392.00	1479.51	1480.47	5.19	1474.32	1480.80	1483.07	15.14	2.68	40.81	43.49	274.90
104380.000	2586.00	1477.85	1478.87	5.40	1472.45	1478.55	1481.61	15.56	2.38	41.52	43.90	345.00
104369.000	2586.00	1473.75	1475.93	3.77	1469.98	1476.00	1481.36	21.69	4.59	39.19	43.77	20.00
104234.000	2586.00	1456.14	1458.56	1.64	1454.50	1457.50	1469.75	29.61	2.82	56.56	59.38	126.00

INPUT DATA


```
0
T1 SUPERSTITION FREEWAY- ADOT
T2 CHANNEL-3 NORTH BASIN OUTLET MED STA 1138+94 TO 1155+50
T3 CVL  REVISED MAY,1988    100YR-24HR EVENT
SO    110695.1512.31  1      .015
TS    110795.1512.31  4      .015
BX                    5      .015
R     110985.1513.16  5      .015
BE                    4      .015
TS    111915.1513.25  6      .015
R     111257.1513.98  6      .015
R     111350.1514.26  6      .015
R     111890.1516.06  6      .015                    112.5
R     112884.1523.79  6      .015
TS    112914.1524.03  4      .015
BX                    5      .015
R     113370.1525.12  5      .015
BE                    4      .015
TS    113100.1525.25  6      .015
R     115300.1534.60  6      .015
TS    115350.1534.81  7      .015
R     115550.1535.66  7      .015
SH                    7      .015                          1552.74
CD    1  1              5.0    35.88 0.0  0.0
CD    4  1              6.0    16.83 0.0  0.0
CD    5  3    1    0.83 6.0    16.83 0.0  0.0
CD    6  1              6.0     6.00 2.0  2.0
CD    7  1             12.0    15.00 2.0  2.0
```

NOTE: Q_{100} VARIES FROM 556cfs@OUTLET OF BASIN TO 567 cfs @ FREEWAY CROSSING, PER HEC-1 AND PLATE 1. ONLY Q=567 cfs IS USED FOR HYDRAULIC PURPOSES

CHANNEL-3

NORTH BASIN OUTLET CHANNEL

F0515P
WATER SURFACE PROFILE LISTING

SUPERSTITION FREEWAY- ADOT
CHANNEL-3 NORTH BASIN OUTLET MED STA 1108+94 TO 1155+50
CVL REVISED MAY,1988 100YR-24HR EVENT

STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
110695.00	1512.31	0.999	1513.309	567.0	15.82	3.885	1517.194	0.00	1.980	5.00	35.88	0.00	0	0.00
TRANS STR	0.00300					.016592	0.17					0.00		
110735.00	1512.31	2.757	1515.067	567.0	12.22	2.319	1517.386	0.00	3.280	6.00	16.83	0.00	0	0.00
BRIDGE EXIT												0.00		
110705.00	1512.31	3.392	1515.702	567.0	10.45	1.695	1517.397	0.00	3.392	6.00	16.83	0.00	1	0.83
7.12	0.00304					.004648	0.03		4.067			0.00		
110712.12	1512.33	3.558	1515.890	567.0	9.96	1.541	1517.431	0.00	3.392	6.00	16.83	0.00	1	0.83
31.97	0.00304					.004086	0.13		4.067			0.00		
110744.09	1512.43	3.731	1516.160	567.0	9.59	1.401	1517.561	0.00	3.392	6.00	16.83	0.00	1	0.83
98.11	0.00304					.003595	0.35		4.067			0.00		
110842.20	1512.73	3.913	1516.640	567.0	9.06	1.273	1517.913	0.00	3.392	6.00	16.83	0.00	1	0.83
106.07	0.00304					.003295	0.35		4.067			0.00		
110948.27	1513.05	3.976	1517.025	567.0	8.91	1.233	1518.258	0.00	3.392	6.00	16.83	0.00	1	0.83
HYDRAULIC JUMP												0.00		
110948.27	1513.05	2.863	1515.912	567.0	12.38	2.389	1518.292	0.00	3.392	6.00	16.83	0.00	1	0.83
16.49	0.00304					.008356	0.14		4.067			0.00		
110964.76	1513.11	2.750	1515.849	567.0	12.89	2.579	1518.428	0.00	3.392	6.00	16.83	0.00	1	0.83
20.24	0.00304					.009452	0.19		4.067			0.00		
110985.00	1513.16	2.622	1515.782	567.0	13.52	2.836	1518.618	0.00	3.392	6.00	16.83	0.00	1	0.83
BRIDGE ENTRANCE	BOX CULVERT ACROSS FREEWAY											0.00		
110985.00	1513.16	2.461	1515.561	567.0	14.03	3.056	1518.617	0.00	3.280	6.00	16.83	0.00	0	0.00
TRANS STR	0.00300					.005866	0.18					0.00		

COMPUTED TMO 7/87
CHECKED
& REVISED RWH 5/88

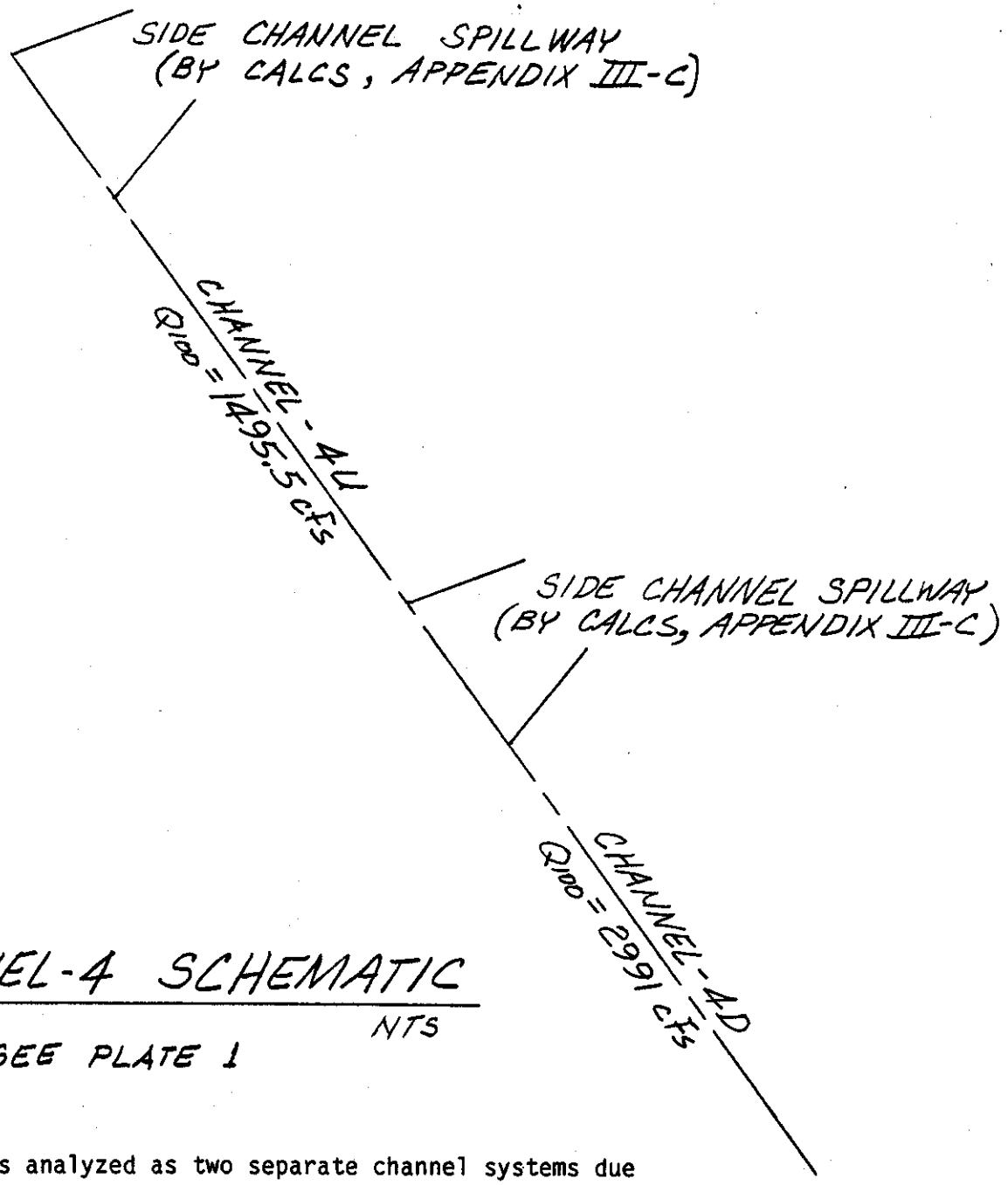
F0515P
WATER SURFACE PROFILE LISTING

SUPERSTITION FREEWAY- ADOT
CHANNEL-3 NORTH BASIN OUTLET MED STA 1108+94 TO 1155+50
CVL REVISED MAY,1980 100YR-24HR EVENT

STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
111015.00	1513.25	4.101	1517.351	567.0	9.74	1.472	1518.823	0.00	4.231	6.00	6.00	2.00	0	0.00
124.97	0.00302					.003017	0.38		4.101			2.00		
111139.97	1513.63	4.101	1517.728	567.0	9.74	1.472	1519.230	0.00	4.231	6.00	6.00	2.00	0	0.00
117.03	0.00302					.003206	0.38		4.101			2.00		
111257.09	1513.98	3.989	1517.969	567.0	10.17	1.606	1519.575	0.81	4.231	6.00	6.00	2.00	0	0.00
33.51	0.00361					.003495	0.12		4.103			2.00		
111290.51	1514.08	3.935	1518.016	567.0	10.39	1.676	1519.692	0.84	4.231	6.00	6.00	2.00	0	0.00
59.49	0.00391					.003843	0.23		4.103			2.00		
111350.00	1514.26	3.817	1518.077	567.0	10.98	1.844	1519.921	0.00	4.231	6.00	6.00	2.00	0	0.00
110.28	0.00400					.004173	0.46		3.836			2.00		
111460.28	1514.70	3.781	1518.482	567.0	11.06	1.899	1520.381	0.00	4.231	6.00	6.00	2.00	0	0.00
137.80	0.00400					.004549	0.63		3.836			2.00		
111598.08	1515.25	3.666	1518.918	567.0	11.60	2.089	1521.007	0.00	4.231	6.00	6.00	2.00	0	0.00
83.08	0.00400					.005175	0.43		3.836			2.00		
111681.16	1515.59	3.555	1519.140	567.0	12.17	2.298	1521.438	0.00	4.231	6.00	6.00	2.00	0	0.00
64.31	0.00400					.005887	0.38		3.836			2.00		
111745.47	1515.84	3.447	1519.289	567.0	12.76	2.528	1521.817	0.00	4.231	6.00	6.00	2.00	0	0.00
54.53	0.00400					.006698	0.37		3.836			2.00		
111800.00	1516.06	3.341	1519.401	567.0	13.38	2.781	1522.182	0.00	4.231	6.00	6.00	2.00	0	0.00
480.07	0.00713					.007130	3.42		3.341			2.00		
112280.07	1519.48	3.341	1522.824	567.0	13.38	2.781	1525.605	0.00	4.231	6.00	6.00	2.00	0	0.00
342.54	0.00713					.006821	2.34		3.341			2.00		

F0515P
WATER SURFACE PROFILE LISTING
SUPERSTITION FREEWAY- ADOT
CHANNEL-3 NORTH BASIN OUTLET MED STA 1108+94 TO 1155+50
CVL REVISED MAY,1988 100YR-24HR EVENT

STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
112622.61	1521.93	3.415	1525.341	567.0	12.94	2.600	1527.941	0.00	4.231	6.00	6.00	2.00	0	0.00
126.96	0.00713					.006117	0.78		3.341			2.00		
112749.57	1522.83	3.523	1526.354	567.0	12.34	2.364	1528.718	0.00	4.231	6.00	6.00	2.00	0	0.00
59.54	0.00713					.005376	0.32		3.341			2.00		
112809.11	1523.26	3.633	1526.889	567.0	11.76	2.149	1529.038	0.00	4.231	6.00	6.00	2.00	0	0.00
34.12	0.00713					.004726	0.16		3.341			2.00		
112843.23	1523.50	3.746	1527.245	567.0	11.22	1.954	1529.199	0.00	4.231	6.00	6.00	2.00	0	0.00
20.60	0.00713					.004155	0.09		3.341			2.00		
112863.83	1523.65	3.863	1527.509	567.0	10.69	1.776	1529.285	0.00	4.231	6.00	6.00	2.00	0	0.00
12.12	0.00713					.003654	0.04		3.341			2.00		
112875.95	1523.73	3.982	1527.715	567.0	10.20	1.615	1529.333	0.00	4.231	6.00	6.00	2.00	0	0.00
6.22	0.00713					.003213	0.02		3.341			2.00		
112882.17	1523.78	4.104	1527.881	567.0	9.72	1.468	1529.349	0.00	4.231	6.00	6.00	2.00	0	0.00
1.83	0.00713					.002824	0.01		3.341			2.00		
112884.00	1523.79	4.231	1528.021	567.0	9.27	1.333	1529.354	0.00	4.231	6.00	6.00	2.00	0	0.00
TRANS STR	0.00700					.001952	0.06					2.00		
112914.00	1524.00	4.619	1528.619	567.0	7.29	0.826	1529.445	0.00	3.280	6.00	16.83	0.00	0	0.00
BRIDGE EXIT												0.00		
112914.00	1524.00	4.461	1528.461	567.0	7.94	0.980	1529.441	0.00	3.392	6.00	16.83	0.00	1	0.83
23.61	0.00718					.002536	0.06		2.961			0.00		
112937.61	1524.17	4.253	1528.423	567.0	8.33	1.078	1529.501	0.00	3.392	6.00	16.83	0.00	1	0.83
17.58	0.00718					.002844	0.05		2.961			0.00		



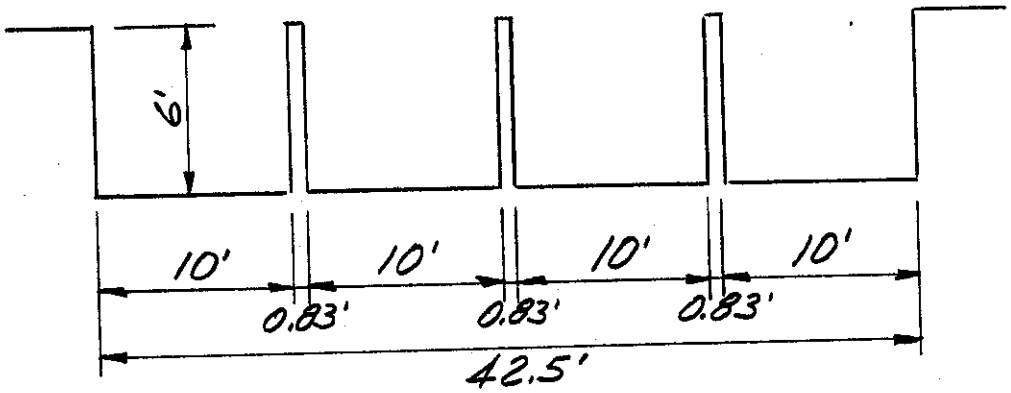
CHANNEL-4 SCHEMATIC

NTS

ALSO SEE PLATE 1

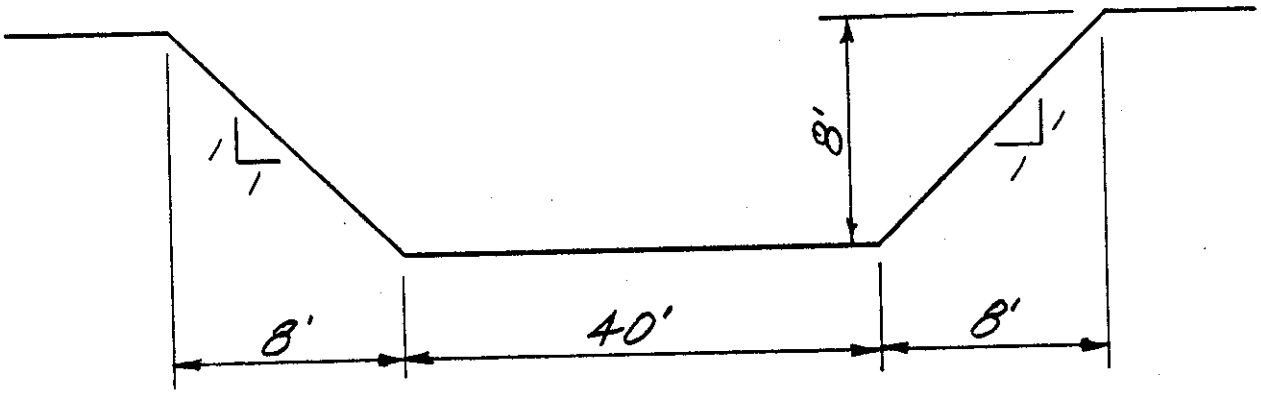
This channel is analyzed as two separate channel systems due to the complexity of the side channel spillways. Initially the water surface profile analysis was performed for the lower channel "Channel-4D"; the resulting water surface elevation CAP overchute Sta. 542+50 was used for the side spillway calculations shown in Appendix III-C(depth=5.93) THe water surface at the upstream end of the spillway(depth=8.08) was then used for the starting water surface elevation for the upper channel system, "Channel-4U.

SECTIONS FOR CHANNEL - 4D



SECTION 2

NTS



SECTION 4

NTS

INPUT DATA

```
0
T1 SUPERSTITION FREEWAY - ADCT
T2 CHANNEL-4D..LOWER CAP COLLECTION CHANNEL/CBC AT SOUTHERN AVE.
T3 CVL REVISED MAY,1988      100YR-24HR-EVENT,-Q=2991 CFS
SO       0.1 1536.50  5        015                  1539.00
TS      20.1 1536.50  1        015
BX                    2        015
R      382.0 1547.96  2        015
BE                    1        670
TS     390.0 1548.48  4        015
R      487.0 1551.63  4        015
R      711.921551.97  4        015                          263.0
R     1077.921552.52  4        015
SH                    4        015                  1558.45
CD   1  1                8.0    42.50 0.   0.
CD   2  2   3   2.50     6.0    42.50 0.   0.
CD   4  1                8.0    43.00 1.   1.
CD   5  1                6.0    51.95 0.   0.
```

CHANNEL STA.
35+84.82
35+64.82
32+02.92
31+94.92
30+97.92
28+73.00
25+07.00

CHANNEL 4-D
LOWER CAP COLLECTION CHANNEL

F0515P
WATER SURFACE PROFILE LISTING

SUPERSTITION FREEWAY - ADOT
CHANNEL-4D..LOWER CAP COLLECTION CHANNEL/CBC AT SOUTHERN AVE.
CVL REVISED MAY,1988 100YR-24HR EVENT, Q=2991 CFS

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
0.10 (35+84.82)	1536.50	2.186	1538.686	2991.0	26.34	10.773	1549.459	0.00	4.688	6.00	51.95	0.00	0	0.00
TRANS STR	0.00005					.024598	0.49					0.00		
20.13 (35+64.82)	1536.50	2.736	1539.286	2991.0	26.01	10.503	1549.789	0.00	5.359	8.00	42.50	0.00	0	0.00
BRIDGE EXIT												0.00		
20.13 (35+64.82)	1536.50	3.387	1539.887	2991.0	25.23	9.882	1549.769	0.00	6.000	6.00	42.50	0.00	3	2.50
91.33	0.03167					.026245	2.40		3.213			0.00		
111.46 (34+73.52)	1539.39	3.496	1542.887	2991.0	24.45	9.279	1552.166	0.00	6.000	6.00	42.50	0.00	3	2.50
83.21	0.03167					.023578	1.96		3.213			0.00		
194.61 (33+90.31)	1542.93	3.666	1545.692	2991.0	23.31	8.436	1554.128	0.00	6.000	6.00	42.50	0.00	3	2.50
53.64	0.03167					.020706	1.11		3.213			0.00		
248.25 (33+36.67)	1543.73	3.845	1547.570	2991.0	22.22	7.669	1555.239	0.00	6.000	6.00	42.50	0.00	3	2.50
37.83	0.03167					.018197	0.69		3.213			0.00		
286.08 (32+98.84)	1544.92	4.033	1548.956	2991.0	21.19	6.972	1555.928	0.00	6.000	6.00	42.50	0.00	3	2.50
27.90	0.03167					.016005	0.45		3.213			0.00		
313.98 (32+70.94)	1545.81	4.230	1553.036	2991.0	20.20	6.330	1556.374	0.00	6.000	6.00	42.50	0.00	3	2.50
21.03	0.03167					.014087	0.30		3.213			0.00		
335.01 (32+49.91)	1546.47	4.436	1550.908	2991.0	19.26	5.762	1556.670	0.00	6.000	6.00	42.50	0.00	3	2.50
15.95	0.03167					.012408	0.20		3.213			0.00		
350.96 (32+33.96)	1546.98	4.653	1551.630	2991.0	18.37	5.238	1556.868	0.00	6.000	6.00	42.50	0.00	3	2.50
12.02	0.03167					.010938	0.13		3.213			0.00		
362.98 (32+21.94)	1547.36	4.980	1552.239	2991.0	17.51	4.762	1557.030	0.00	6.000	6.00	42.50	0.00	3	2.50
8.84	0.03167					.009649	0.09		3.213			0.00		

COMPUTED TWO 7/87
CHECKED
& REVISED PLZ24 5/88

WATER SURFACE PROFILE LISTING

SUPERSTITION FREEWAY - ADOT
CHANNEL-4D..LOWER CAP COLLECTION CHANNEL/CBC AT SOUTHERN AVE.
~~CVL REVISED MAY,1988 100YR-24HR EVENT, Q=2591 CFS~~

STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
(371.82) (32+13.10)	1547.64	5.118	1552.756	2991.0	16.70	4.329	1557.085	0.00	6.000	6.00	42.50	0.00	3	2.50
6.21	0.03167					.008518	0.05		3.213			0.00		
(378.03) (32+06.89)	1547.83	5.368	1553.202	2991.0	15.92	3.935	1557.137	0.00	6.000	6.00	42.50	0.00	3	2.50
3.97	0.03167					.007526	0.03		3.213			0.00		
(382.00) (32+02.92)	1547.96	5.630	1553.590	2991.0	15.18	3.578	1557.168	0.00	6.000	6.00	42.50	0.00	3	2.50
BRIDGE ENTRANCE												0.00		
(382.00) (32+02.92)	1547.96	3.236	1551.196	2991.0	21.75	7.345	1558.541	0.00	5.359	8.00	42.50	0.00	0	0.00
TRANS STR	0.06500					.011570	0.09					0.00		
(390.00) (31+94.92)	1548.40	3.285	1551.765	2991.0	21.33	6.869	1558.634	0.00	5.328	8.00	40.00	1.00	0	0.00
2.60	0.03247					.010887	0.03		2.372			1.00		
(392.60) (31+92.32)	1548.56	3.301	1551.865	2991.0	20.92	6.798	1558.663	0.00	5.328	8.00	40.00	1.00	0	0.00
20.91	0.03247					.010959	0.21		2.372			1.00		
(413.51) (31+71.41)	1549.24	3.450	1552.694	2991.0	19.95	6.180	1558.874	0.00	5.328	8.00	40.00	1.00	0	0.00
17.08	0.03247					.008682	0.15		2.372			1.00		
(430.59) (31+54.33)	1549.80	3.686	1553.484	2991.0	19.02	5.618	1559.022	0.00	5.328	8.00	40.00	1.00	0	0.00
13.96	0.03247					.007495	0.10		2.372			1.00		
(444.55) (31+40.37)	1550.25	3.768	1554.020	2991.0	18.14	5.108	1559.128	0.00	5.328	8.00	40.00	1.00	0	0.00
11.37	0.03247					.006473	0.07		2.372			1.00		
(455.92) (31+29.00)	1550.62	3.937	1554.558	2991.0	17.29	4.643	1559.201	0.00	5.328	8.00	40.00	1.00	0	0.00
9.17	0.03247					.005593	0.05		2.372			1.00		
(465.09) (31+19.83)	1550.92	4.112	1555.033	2991.0	16.49	4.221	1559.251	0.00	5.328	8.00	40.00	1.00	0	0.00
7.26	0.03247					.004835	0.04		2.372			1.00		

ENTRANCE TO BOX CULVERT UNDER SOUTHERN AVE.

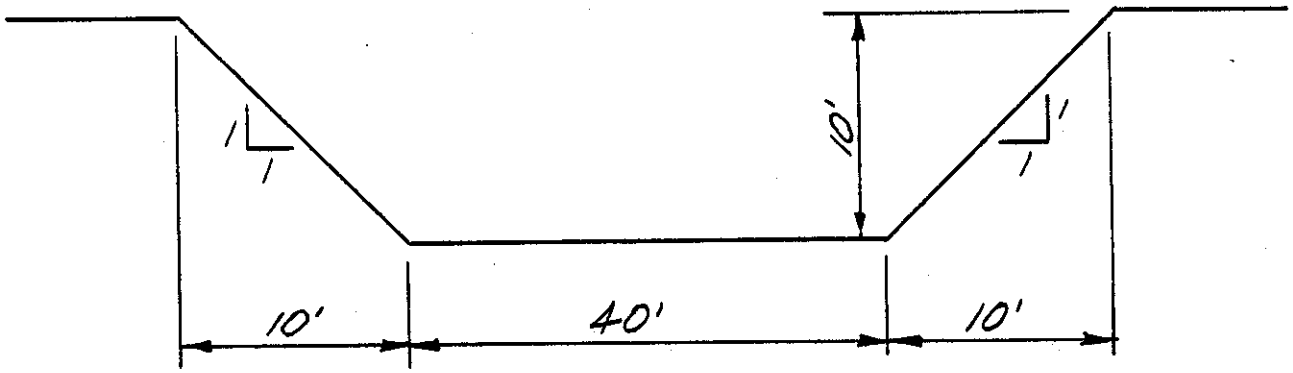
WATER SURFACE PROFILE LISTING

SUPERSTITION FREEWAY - ADOT
CHANNEL-4D..LOWER CAP COLLECTION CHANNEL/CBC AT SOUTHERN AVE.
CVL REVISED MAY,1988 100YR-24HR EVENT, Q=2991 CFS

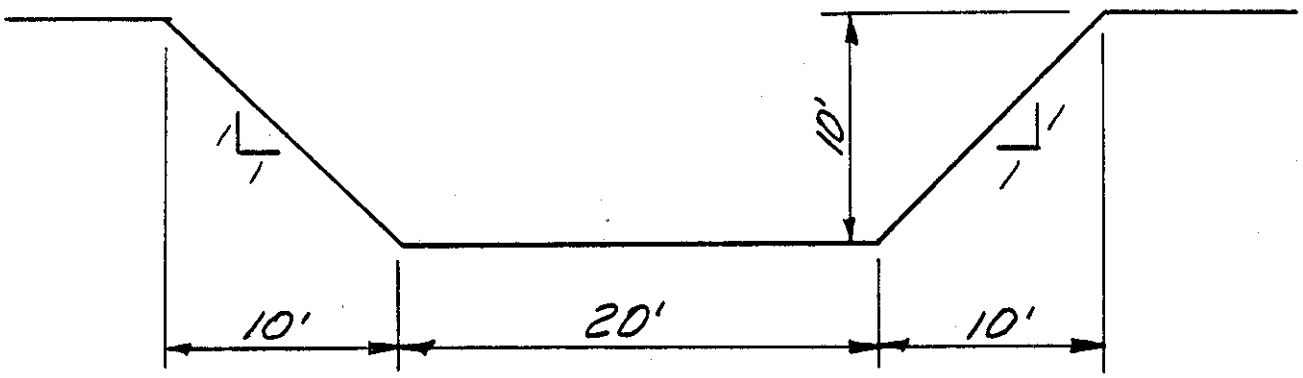
STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
(472.35 31+12.57)	1551.15	4.295	1555.449	2991.0	15.72	3.837	1559.286	0.00	5.328	8.00	40.00	1.00	0	0.00
5.60	0.03247					.034180	0.02		2.372			1.00		
(477.95 31+06.97)	1551.34	4.486	1555.822	2991.0	14.99	3.489	1559.311	0.00	5.328	8.00	40.00	1.00	0	0.00
4.13	0.03247					.003616	0.01		2.372			1.00		
(482.08 31+02.84)	1551.47	4.684	1556.154	2991.0	14.29	3.171	1559.325	0.00	5.328	8.00	40.00	1.00	0	0.00
2.80	0.03247					.003129	0.01		2.372			1.00		
(484.88 31+00.04)	1551.56	4.890	1556.451	2991.0	13.63	2.883	1559.334	0.00	5.328	8.00	40.00	1.00	0	0.00
1.61	0.03247					.002709	0.00		2.372			1.00		
(486.49 30+98.43)	1551.61	5.104	1556.717	2991.0	12.99	2.621	1559.338	0.00	5.328	8.00	40.00	1.00	0	0.00
0.51	0.03247					.002346	0.00		2.372			1.00		
(487.00 30+97.92)	1551.63	5.328	1556.958	2991.0	12.38	2.382	1559.340	0.53	5.328	8.00	40.00	1.00	0	0.00
29.08	0.00151					.002032	0.06		5.938			1.00		
(516.08 30+68.84)	1551.67	5.562	1557.234	2991.0	11.81	2.165	1559.399	0.48	5.328	8.00	40.00	1.00	0	0.00
175.88	0.00151					.001761	0.31		5.938			1.00		
(691.96 28+92.96)	1551.94	5.806	1557.740	2991.0	11.26	1.968	1559.708	0.44	5.328	8.00	40.00	1.00	0	0.00
19.96	0.00151					.001631	0.03		5.938			1.00		
(711.92 28+73.00)	1551.97	5.810	1557.780	2991.0	11.24	1.961	1559.741	0.00	5.328	8.00	40.00	1.00	0	0.00
366.00	0.00151					.001578	0.58		5.948			1.00		
(1077.92 25+07.00)	1552.52	5.916 *	1558.436	2991.0	11.01	1.882	1560.318	0.00	5.328	8.00	40.00	1.00	0	0.00

BEGINNING OF CAP OVERCHUTE
THIS IS THE STARTING WATER SURFACE ELEVATION FOR
SIDE SPILLWAY CALCS. APPDX. III-C

SECTIONS FOR CHANNEL-4U



SECTION 1



SECTION 2

INPUT DATA

```
G
T1 SUPERSTITION FREEWAY - ADOT
T2 CHANNEL-4U...UPPER C.A.P. OVERCHUTE COLLECTION CHANNEL
T3 CVL, REVISED MAY 1988,Q=1500 CFS. START WS FROM SIDE SPLWY
SO       0.0 1552.75  1      .015                    1560.85
R       25.0 1552.79  1      .015
TS      75.0 1552.86  2      .015
R     1140.0 1554.46  2      .015
SH                    2      .015
CO   1  1              10.0    40.0  1.0  1.0
CO   2  1              10.0    20.0  1.0  1.0
```

CHANNEL STA
23+55.00
23+30.00
22+80.00
12+15.00

CHANNEL 4-U
UPPER CAP. COLLECTION CHANNEL

FC515P
WATER SURFACE PROFILE LISTING

SUPERSTITION FREEWAY - ADOT
CHANNEL-4U...UPPER C.A.P. OVERCHUTE COLLECTION CHANNEL
CVL, REVISED MAY 1988,Q=1500 CFS. START WS FROM SIDE SPLWY

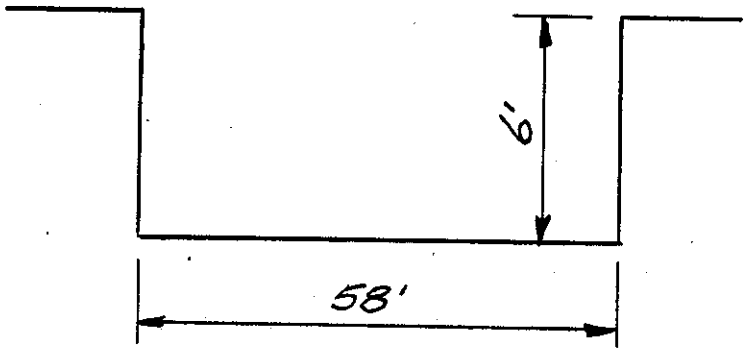
STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
0.00 (23+55.00)	1552.75	8.109	1560.850 *	1495.5	3.84	0.229	1561.079	0.00	3.414	10.00	40.00	1.00	0	0.00
25.00	0.00160					.000133	0.00		3.861			1.00		
25.00 (23+30.00)	1552.79	8.061	1560.851	1495.5	3.86	0.231	1561.082	0.00	3.414	10.00	40.00	1.00	0	0.00
TRANS STR	0.00140					.000375	0.02					1.00		
75.00 (22+80.00)	1552.86	7.534	1560.394	1495.5	7.21	0.807	1561.201	0.00	5.101	10.00	20.00	1.00	0	0.00
233.63	0.00150					.000660	0.15		5.847			1.00		
308.63 (20+46.37)	1553.21	7.257	1560.468	1495.5	7.56	0.888	1561.356	0.00	5.101	10.00	20.00	1.00	0	0.00
240.64	0.00150					.000754	0.18		5.847			1.00		
549.27 (18+05.73)	1553.57	6.988	1560.560	1495.5	7.93	0.977	1561.537	0.00	5.101	10.00	20.00	1.00	0	0.00
254.07	0.00150					.000862	0.22		5.847			1.00		
803.34 (15+51.66)	1553.95	6.727	1560.681	1495.5	8.32	1.074	1561.755	0.00	5.101	10.00	20.00	1.00	0	0.00
279.98	0.00150					.000986	0.28		5.847			1.00		
1083.32 (12+71.68)	1554.37	6.475	1560.849	1495.5	8.72	1.182	1562.031	0.00	5.101	10.00	20.00	1.00	0	0.00
56.68	0.00150					.001065	0.06		5.847			1.00		
1140.00 (12+15.00)	1554.46	6.433 **	1560.890	1495.5	8.80	1.202	1562.092	0.00	5.101	10.00	20.00	1.00	0	0.00

* THIS IS THE STARTING WATER SURFACE ELEVATION FROM SIDE SPILLWAY CALCS. APPDX. III-C

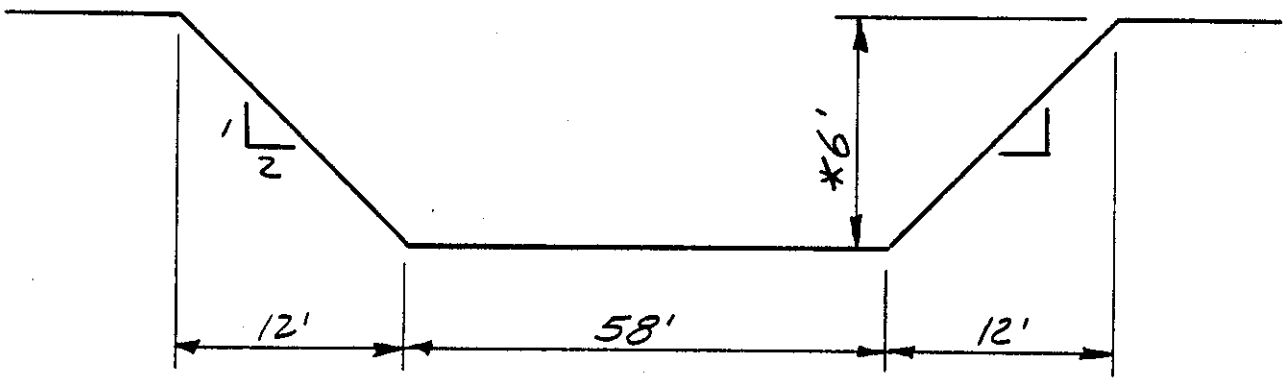
** THIS IS THE STARTING WATER SURFACE ELEVATION FOR SPILLWAY CALCS. IN APPDX. III-C

COMPUTED TMO 7/87
CHECKED
REVISED PW24 5/88

SECTIONS FOR CHANNEL-5



SECTION 2



SECTION 1
NTS

INPUT DATA

```
C
T1 SUPERSTITION FREEWAY - ADOT
T2 CAP OVERCHUTE STA. 552+50 SPILLWAY FOR 5-72" PIPES
T3 CVL, REVISED MAY,1988
SO        0.0 1539.50  1        .015
R       130.0 1557.41  1        .015
R       156.5 1557.77  1        .015
TS      186.5 1558.07  2        .015
R       200.0 1558.11  2        .015
SH                     2        .015
CD    1  1               6.0     58.0  2.0  2.0  0.0
CD    2  1               6.0     58.0  1.0  0.0
```

CHANNEL-5

CAP OVERCHUTE SPILLWAY

F0515P
WATER SURFACE PROFILE LISTING
SUPERSTITION FREEWAY - ADOT
CAP OVERCHUTE STA. 552+50 SPILLWAY FOR 5-72" PIPES
CVL. REVISED MAY,1988

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID-NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
116.63	1555.57	1.576	1557.144	1719.0	17.83	4.938	1562.082	0.00	2.909	6.00	58.00	2.00	0	0.00
3.14	0.13777					.017826	0.06		0.875			2.00		
119.77	1556.36	1.649	1557.649	1719.0	17.90	4.489	1562.138	0.00	2.909	6.00	58.00	2.00	0	0.00
2.71	0.13777					.015311	0.04		0.875			2.00		
122.48	1556.37	1.726	1558.100	1719.0	16.21	4.081	1562.181	0.00	2.909	6.00	58.00	2.00	0	0.00
2.34	0.13777					.013154	0.03		0.875			2.00		
124.82	1556.70	1.805	1558.501	1719.0	15.46	3.710	1562.211	0.00	2.909	6.00	58.00	2.00	0	0.00
2.01	0.13777					.011305	0.02		0.875			2.00		
126.83	1556.97	1.888	1558.861	1719.0	14.74	3.373	1562.234	0.00	2.909	6.00	58.00	2.00	0	0.00
1.71	0.13777					.009718	0.02		0.875			2.00		
128.54	1557.21	1.975	1559.184	1719.0	14.05	3.066	1562.250	0.00	2.909	6.00	58.00	2.00	0	0.00
1.46	0.13777					.008356	0.01		0.875			2.00		
130.00	1557.41	2.065	1559.475	1719.0	13.48	2.787	1562.262	0.00	2.909	6.00	58.00	2.00	0	0.00
2.25	0.01358					.007685	0.02		1.746			2.00		
132.25	1557.44	2.072	1559.513	1719.0	13.35	2.768	1562.281	0.00	2.909	6.00	58.00	2.00	0	0.00
24.25	0.01358					.067108	0.17		1.746			2.00		
156.50	1557.77	2.166	1559.936	1719.0	12.73	2.516	1562.452	0.00	2.909	6.00	58.00	2.00	0	0.00
TRANS STR	0.01003					.004701	0.14					2.00		
186.50	1558.37	2.929	1560.999	1719.0	10.12	1.590	1562.589	0.00	3.011	6.00	58.00	0.00	0	0.00
13.50	0.00296					.002710	0.04		2.887			0.00		
* 200.00	1558.11	3.011	1561.121	1719.0	9.84	1.504	1562.625	0.00	3.011	6.00	58.00	0.00	0	0.00

* OUTLET FROM 5-72" DIA. PIPES CONSTRUCTED UNDER SOUTHERN AVE.

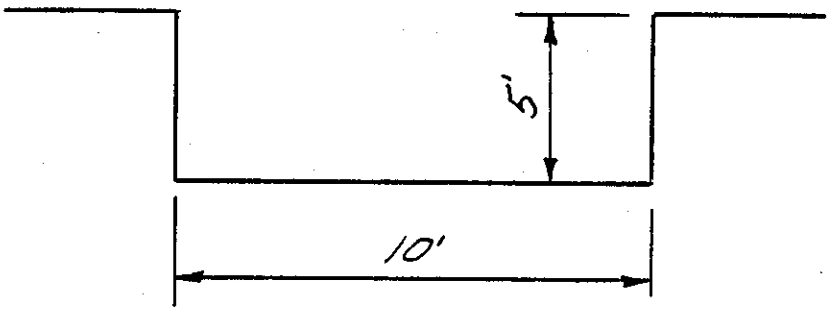
COMPUTED TMO 7/87
CHECKED
& REVISED PWRH 5/88

F0515P
WATER SURFACE PROFILE LISTING

SUPERSTITION FREEWAY - ADOT
CAP OVERCHUTE STA. 552+50 SPILLWAY FOR 5-72" PIPES
CVL, REVISED MAY,1988

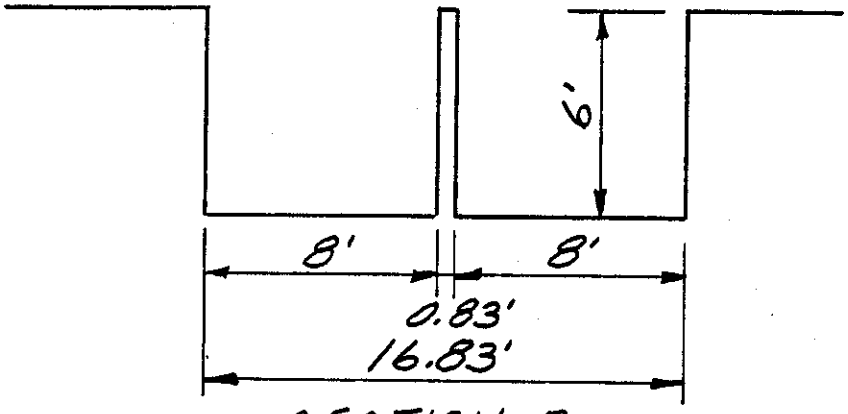
STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
0.00	1539.50	0.956	1540.456	1719.0	30.01	13.981	1554.437	0.00	2.909		6.00	58.00	2.00	0	0.00
26.95	0.13777					.095754	2.58			0.875			2.00		
26.95	1543.21	0.998	1544.211	1719.0	28.72	12.866	1557.019	0.00	2.909		6.00	58.00	2.00	0	0.00
20.25	0.13777					.082598	1.67			0.875			2.00		
47.20	1546.00	1.045	1547.048	1719.0	27.38	11.644	1558.692	0.00	2.909		6.00	58.00	2.00	0	0.00
15.07	0.13777					.078798	1.07			0.875			2.00		
62.27	1548.08	1.094	1549.173	1719.0	26.11	10.585	1559.758	0.00	2.909		6.00	58.00	2.00	0	0.00
11.82	0.13777					.060681	0.72			0.875			2.00		
74.09	1549.71	1.145	1550.852	1719.0	24.89	9.623	1560.475	0.00	2.909		6.00	58.00	2.00	0	0.00
9.57	0.13777					.052026	0.50			0.875			2.00		
83.66	1551.03	1.199	1552.225	1719.0	23.74	8.748	1560.973	0.00	2.909		6.00	58.00	2.00	0	0.00
7.94	0.13777					.044614	0.35			0.875			2.00		
91.60	1552.12	1.255	1553.374	1719.0	22.63	7.953	1561.327	0.00	2.909		6.00	58.00	2.00	0	0.00
6.67	0.13777					.038266	0.26			0.875			2.00		
98.27	1553.04	1.314	1554.353	1719.0	21.58	7.238	1561.583	0.00	2.909		6.00	58.00	2.00	0	0.00
5.68	0.13777					.032829	0.19			0.875			2.00		
103.95	1553.82	1.375	1555.196	1719.0	20.57	6.573	1561.769	0.00	2.909		6.00	58.00	2.00	0	0.00
4.87	0.13777					.028172	0.14			0.875			2.00		
108.82	1554.49	1.439	1555.931	1719.0	19.62	5.975	1561.906	0.00	2.909		6.00	58.00	2.00	0	0.00
4.19	0.13777					.024180	0.10			0.875			2.00		
113.01	1555.57	1.506	1556.575	1719.0	18.78	5.432	1562.007	0.00	2.909		6.00	58.00	2.00	0	0.00
3.62	0.13777					.020758	0.08			0.875			2.00		

SECTIONS FOR CHANNEL 6



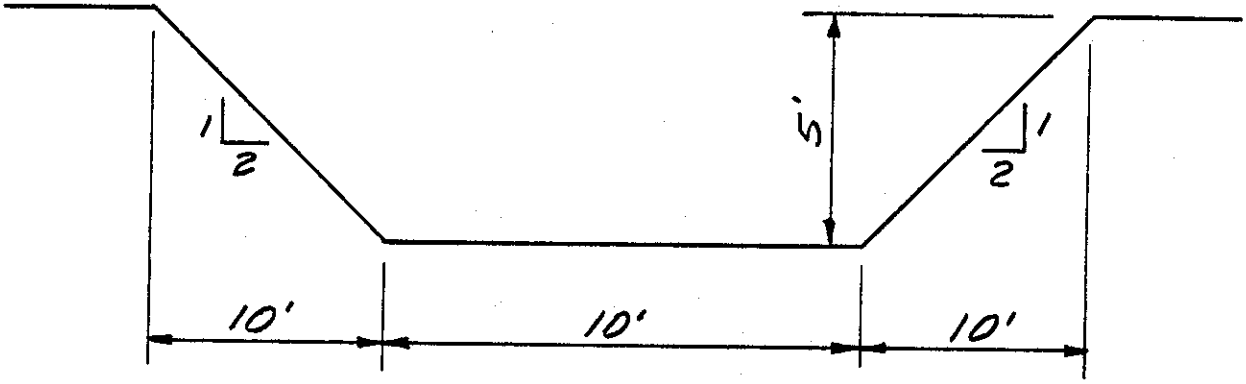
SECTION 1

NTS



SECTION 3

NTS



SECTION 4

NTS

INPUT DATA

```
T1 SUPERSTITION FREEWAY - ADOT
T2 C.A.P. SOUTH BASIN OUTLET STRUCTURE AND FREEWAY CROSSING
T3 CVL -REVISED MAY.1980---100YR-24HR-EVENT
SO     345.0 1550.00  1       .030                    1551.81
R      375.0 1545.00  1       .030
TS     445.0 1547.27  2       .015
BX     445.0 1547.27  3       .015
R      654.0 1543.18  3       .015
BE     654.0 1543.18  2       .015
TS     684.0 1548.29  4       .015
R      736.0 1548.37  4       .015
R      789.0 1548.65  4       .015                                114.0
R     1000.0 1549.36  4       .015
TS    1010.0 1549.38  5       .015
R     1172.0 1549.50  6       .012
SH                    6                              1559.22
CD   1  1                5.0     66.0   0.0   0.0
CD   2  1                6.0     16.83  3.0   3.5
CD   3  3   1    0.83   6.0     16.83  0.0   0.0
CD   4  1                5.0     10.0   2.0   2.0
CD   5  1                6.0      6.0   0.0   0.3
CD   6  4                6.0
```

CHANNEL 6

SOUTH BASIN OUTLET CHANNEL

REFER TO SHT. 14 OF DESIGN PLANS, STATIONING IS IDENTICAL

F0515P
WATER SURFACE PROFILE LISTING
SUPERSTITION FREEWAY - ADOT
C.A.P. SOUTH BASIN OUTLET STRUCTURE AND FREEWAY CROSSING
CVL REVISED MAY,1983 100YR-24HR EVENT

STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH	HGT/ DIA	BASE/ ID-ND.	ZL / ZR	NO PIER	AVBPR
345.00	1550.00	1.819	1551.819*	423.0	3.54	0.195	1552.005	0.00	1.085	5.00	66.00	0.00	0	0.00
0.43	-.16667					.002305	0.00		0.000			0.00		
345.43	1549.93	1.966	1551.829	423.0	3.37	0.177	1552.006	0.00	1.085	5.00	66.00	0.00	0	0.00
0.46	-.16667					.001966	0.00		0.000			0.00		
345.89	1549.85	1.996	1551.847	423.0	3.21	0.160	1552.007	0.00	1.085	5.00	66.00	0.00	0	0.00
0.51	-.16667					.001677	0.00		0.000			0.00		
346.40	1549.77	2.095	1551.862	423.0	3.06	0.145	1552.007	0.00	1.085	5.00	66.00	0.00	0	0.00
0.54	-.16667					.001431	0.00		0.000			0.00		
346.94	1549.68	2.206	1551.876	423.0	2.91	0.132	1552.008	0.00	1.085	5.00	66.00	0.00	0	0.00
0.58	-.16667					.001220	0.00		0.000			0.00		
347.52	1549.58	2.318	1551.889	423.0	2.77	0.120	1552.009	0.00	1.085	5.00	66.00	0.00	0	0.00
0.63	-.16667					.001042	0.00		0.000			0.00		
348.15	1549.48	2.426	1551.902	423.0	2.64	0.108	1552.010	0.00	1.085	5.00	66.00	0.00	0	0.00
0.66	-.16667					.000890	0.00		0.000			0.00		
348.81	1549.37	2.547	1551.912	423.0	2.52	0.098	1552.010	0.00	1.085	5.00	66.00	0.00	0	0.00
0.71	-.16667					.000759	0.00		0.000			0.00		
349.52	1549.25	2.674	1551.921	423.0	2.40	0.089	1552.010	0.00	1.085	5.00	66.00	0.00	0	0.00
0.75	-.16667					.000649	0.00		0.000			0.00		
350.27	1549.12	2.808	1551.930	423.0	2.28	0.081	1552.011	0.00	1.085	5.00	66.00	0.00	0	0.00
0.79	-.16667					.000554	0.00		0.000			0.00		
351.06	1548.99	2.948	1551.938	423.0	2.17	0.073	1552.011	0.00	1.085	5.00	66.00	0.00	0	0.00
0.84	-.16667					.000473	0.00		0.000			0.00		

* WATER SURFACE ELEVATION AT OUTLET CONTROLLED BY WEIR FLOW OUT OF THE SETTLING BASIN. SEE WEIR CALCS. FOR STA 1161+00

COMPUTED TWO 7/87
CHECKED
& REVISED RWH 5/88

F3515P
WATER SURFACE PROFILE LISTING
SUPERSTITION FREEWAY - ADOT
C.A.P. SOUTH BASIN OUTLET STRUCTURE AND FREEWAY CROSSING
CVL REVISED MAY,1988 100YR-24HR EVENT

STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
351.93	1548.85	3.096	1551.946	423.0	2.07	0.067	1552.013	0.00	1.085	5.00	66.00	0.00	0	0.00
0.89	-.16667					.000494	0.00		0.000			0.00		
352.79	1548.79	3.258	1551.952	423.0	1.97	0.060	1552.012	0.00	1.085	5.00	66.00	0.00	0	0.00
0.94	-.16667					.000346	0.00		0.000			0.00		
353.73	1548.54	3.413	1551.958	423.0	1.88	0.055	1552.013	0.00	1.085	5.00	66.00	0.00	0	0.00
0.99	-.16667					.000296	0.00		0.000			0.00		
354.72	1548.38	3.584	1551.964	423.0	1.79	0.050	1552.014	0.00	1.085	5.00	66.00	0.00	0	0.00
1.05	-.16667					.000253	0.00		0.000			0.00		
355.77	1548.21	3.763	1551.968	423.0	1.70	0.045	1552.013	0.00	1.085	5.00	66.00	0.00	0	0.00
1.12	-.16667					.000216	0.00		0.000			0.00		
356.87	1548.02	3.951	1551.973	423.0	1.62	0.041	1552.014	0.00	1.085	5.00	66.00	0.00	0	0.00
1.16	-.16667					.000185	0.00		0.000			0.00		
358.03	1547.83	4.149	1551.977	423.0	1.54	0.037	1552.014	0.00	1.085	5.00	66.00	0.00	0	0.00
1.22	-.16667					.000158	0.00		0.000			0.00		
359.25	1547.62	4.356	1551.980	423.0	1.47	0.034	1552.014	0.00	1.085	5.00	66.00	0.00	0	0.00
1.29	-.16667					.000136	0.00		0.000			0.00		
360.54	1547.41	4.574	1551.984	423.0	1.40	0.030	1552.014	0.00	1.085	5.00	66.00	0.00	0	0.00
1.36	-.16667					.000116	0.00		0.000			0.00		
361.90	1547.18	4.802	1551.986	423.0	1.33	0.028	1552.014	0.00	1.085	5.00	66.00	0.00	0	0.00
1.42	-.16667					.000099	0.00		0.000			0.00		
363.32	1546.95	5.043	1551.990	423.0	1.27	0.025	1552.015	0.00	1.085	5.00	66.00	0.00	0	0.00
1.50	-.16667					.000085	0.00		0.000			0.00		

WATER SURFACE PROFILE LISTING

SUPERSTITION FREEWAY - ADOT
C.A.P. SOUTH BASIN OUTLET STRUCTURE AND FREEWAY CROSSING
CVL REVISED MAY,1988 100YR-24HR EVENT

STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH	HGT/ DIA	BASE/ ID-NO.	ZL / ZR	NO PIER	AVBPR
364.82	1546.7[illegible]	5.295	1551.992	423.0	1.21	0.023	1552.015	0.00	1.085	5.00	66.00	0.00	0	0.00
1.57	-.16667					.000073	0.00		0.000			0.00		
366.39	1546.43	5.559	1551.994	423.0	1.15	0.021	1552.015	0.00	1.085	5.00	66.00	0.00	0	0.00
1.66	-.16667					.000063	0.00		0.000			0.00		
368.05	1546.16	5.837	1551.996	423.0	1.10	0.019	1552.015	0.00	1.085	5.00	66.00	0.00	0	0.00
1.74	-.16667					.000054	0.00		0.000			0.00		
369.79	1545.87	6.129	1551.998	423.0	1.05	0.017	1552.015	0.00	1.085	5.00	66.00	0.00	0	0.00
1.83	-.16667					.000047	0.00		0.000			0.00		
371.62	1545.56	6.436	1552.000	423.0	1.00	0.015	1552.015	0.00	1.085	5.00	66.00	0.00	0	0.00
1.92	-.16667					.000040	0.00		0.000			0.00		
373.54	1545.24	6.758	1552.001	423.0	0.95	0.014	1552.015	0.00	1.085	5.00	66.00	0.00	0	0.00
1.46	-.16667					.000035	0.00		0.000			0.00		
375.01	1545.0[illegible]	7.0[illegible]2	1552.002	423.0	0.92	0.013	1552.015	0.00	1.085	5.00	66.00	0.00	0	0.00
TRANS STR	0.03243					.000428	0.03					0.00		
445.00	1547.27	4.324	1551.594	423.0	5.81	0.525	1552.119	3.00	2.698	6.00	16.83	0.00	0	0.00
BRIDGE EXIT	END BOX CULVERT FWY ℄ STA 116+00											0.00		
445.00	1547.27	4.244	1551.514	423.0	6.23	0.603	1552.117	3.00	2.790	6.00	16.83	0.00	1	0.83
50.34	0.00435					.001611	0.08		2.871			0.00		
495.34	1547.49	4.246	1551.534	423.0	6.53	0.663	1552.197	3.00	2.790	6.00	16.83	0.00	1	0.83
48.33	0.00435					.001829	0.09		2.871			0.00		
543.67	1547.70	3.858	1551.556	423.0	6.85	0.729	1552.285	3.00	2.790	6.00	16.83	0.00	1	0.83
46.86	0.00435					.002078	0.10		2.871			0.00		

F0515P
WATER SURFACE PROFILE LISTING
SUPERSTITION FREEWAY - ADOT
C.A.P. SOUTH BASIN OUTLET STRUCTURE AND FREEWAY CROSSING
CVL REVISED MAY,1989 100YR-24HR EVENT

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
590.22	1547.96	3.679	1551.581	423.0	7.19	0.802	1552.383	0.00	2.790	6.00	16.83	0.00	1	0.83
45.71	0.00435					.002363	0.11		2.871			0.00		
635.93	1548.19	3.597	1551.608	423.0	7.54	0.882	1552.490	0.00	2.790	6.00	16.83	0.00	1	0.83
15.25	0.00435					.002574	0.04		2.871			0.00		
651.18	1548.17	3.448	1551.615	423.0	7.67	0.913	1552.528	0.00	2.790	6.00	16.83	0.00	1	0.83
HYDRAULIC JUMP												0.00		
651.18	1548.17	2.218	1551.385	423.0	11.92	2.206	1552.591	0.00	2.790	6.00	16.83	0.00	1	0.83
2.82	0.00435					.009082	0.03		2.871			0.00		
654.00	1548.18	2.236	1551.386	423.0	11.98	2.239	1552.616	0.00	2.790	6.00	16.83	0.00	1	0.83
BRIDGE ENTRANCE	BEGIN BOX CULVERT UNDER FREEWAY ℄ STA 1161+00											0.00		
654.00	1548.18	2.013	1550.193	423.0	12.49	2.422	1552.615	0.00	2.698	6.00	16.83	0.00	0	0.00
654.00	1548.18	3.611	1551.791	423.0	6.96	0.752	1552.543	0.00	2.698	6.00	16.83	0.00	0	0.00
TRANS STR	0.00367											0.00		
684.00	1548.29	2.513	1550.803	423.0	11.20	1.948	1552.751	0.00	3.086	5.00	10.00	2.00	0	0.00
22.00	0.00364					.006161	0.14		2.861			2.00		
706.00	1548.37	2.464	1550.834	423.0	11.50	2.053	1552.887	0.00	3.086	5.00	10.00	2.00	0	0.00
19.69	0.00337					.006640	0.13		2.919			2.00		
725.69	1548.44	2.414	1550.858	423.0	11.81	2.168	1552.010	0.00	3.086	5.00	10.00	2.00	0	0.00
32.69	0.00337					.007388	0.24		2.919			2.00		
758.38	1548.55	2.325	1550.876	423.0	12.39	2.384	1552.260	1.05	3.086	5.00	10.00	2.00	0	0.00
30.62	0.00337					.008450	0.26		2.919			2.00		
789.00	1548.65	2.246	1550.896	423.0	13.00	2.623	1552.519	0.00	3.086	5.00	10.00	2.00	0	0.00

WATER SURFACE PROFILE LISTING

SUPERSTITION FREEWAY - ADOT
C.A.P. SOUTH BASIN OUTLET STRUCTURE AND FREEWAY CROSSING
CVL REVISED MAY,1988 100YR-24HR EVENT

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
23.03	0.00337					.009527	0.22			2.920			2.00		
812.00	1548.73	2.182	1551.909	423.0	13.50	2.829	1553.738	0.00	3.086		5.00	10.00	2.00	0	0.00
27.63	0.00337					.010762	0.30			2.920			2.00		
839.63	1548.82	2.103	1551.923	423.0	14.16	3.112	1554.035	0.00	3.086		5.00	10.00	2.00	0	0.00
26.26	0.00337					.012319	0.32			2.920			2.00		
865.85	1548.91	2.327	1556.936	423.0	14.85	3.424	1554.363	0.00	3.086		5.00	10.00	2.00	0	0.00
25.02	0.00337					.014105	0.35			2.920			2.00		
890.89	1548.99	1.953	1553.946	423.0	15.57	3.766	1554.712	0.00	3.086		5.00	10.00	2.00	0	0.00
23.85	0.00337					.016156	0.39			2.920			2.00		
914.74	1549.07	1.882	1550.955	423.0	16.33	4.142	1555.097	0.00	3.086		5.00	10.00	2.00	0	0.00
22.77	0.00337					.018510	0.42			2.920			2.00		
937.51	1549.15	1.812	1550.962	423.0	17.13	4.557	1555.519	0.00	3.086		5.00	10.00	2.00	0	0.00
21.77	0.00337					.021215	0.46			2.920			2.00		
959.28	1549.22	1.745	1550.968	423.0	17.97	5.012	1555.987	0.00	3.086		5.00	10.00	2.00	0	0.00
23.81	0.00337					.024324	0.51			2.920			2.00		
980.09	1549.29	1.680	1550.973	423.0	18.84	5.514	1556.487	0.00	3.086		5.00	10.00	2.00	0	0.00
19.91	0.00337					.027898	0.56			2.920			2.00		
1000.00	1549.36	1.617	1550.977	423.0	19.76	6.065	1557.042	0.00	3.086		5.00	10.00	2.00	0	0.00
TRANS STR	0.00239	BEGIN BASIN OUTLET PIPE				.018580	0.19						2.00		
1010.00	1549.38	5.366	1554.746	423.0	13.14	2.681	1557.427	0.00	5.366		6.00	6.00	0.00	0	0.00
1016.00	1549.38	5.434	1554.814	423.0	15.71	3.833	1558.647	0.00	5.434		6.00	0.00	0.00	0	0.00
29.13	0.00194					.007661	0.22			6.000			0.00		

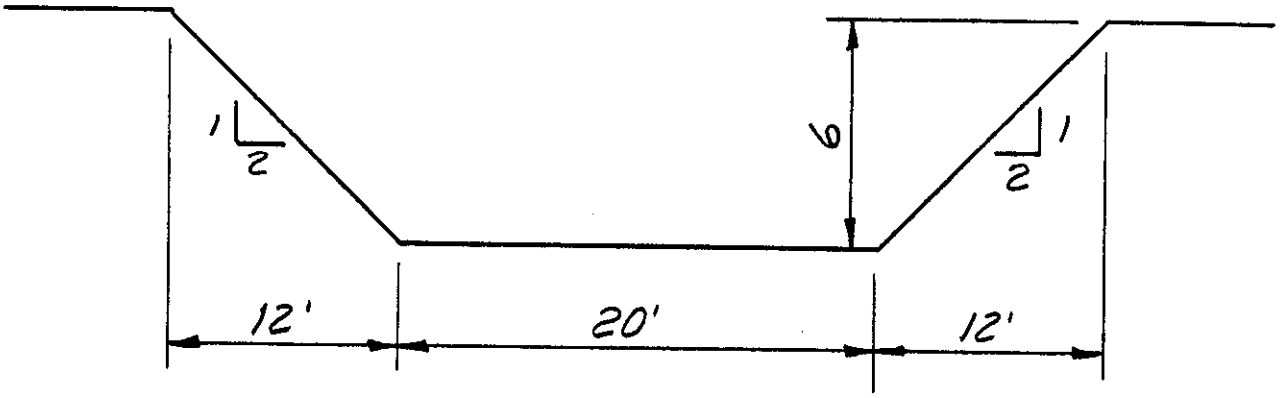
WATER SURFACE PROFILE LISTING

SUPERSTITION FREEWAY - ADOT
C.A.P. SOUTH BASIN OUTLET STRUCTURE AND FREEWAY CROSSING
CVL REVISED MAY,1988 100YR-24HR EVENT

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID-NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
1039.13	1549.44	5.949	1555.385	423.0	14.98	3.484	1558.869	0.00	5.434	6.00	0.00	0.00	0	0.00
6.75	0.00194					.008141	0.05		6.000			0.00		
1045.85	1549.45	6.440	1555.449	423.0	14.96	3.476	1558.925	0.00	5.434	6.00	0.00	0.00	0	0.00
26.15	0.00194					.008454	0.22		6.000			0.00		
1072.00	1549.50	6.172	1555.672	423.0	14.96	3.476	1559.148	0.00	5.434	6.00	0.00	0.00	0	0.00

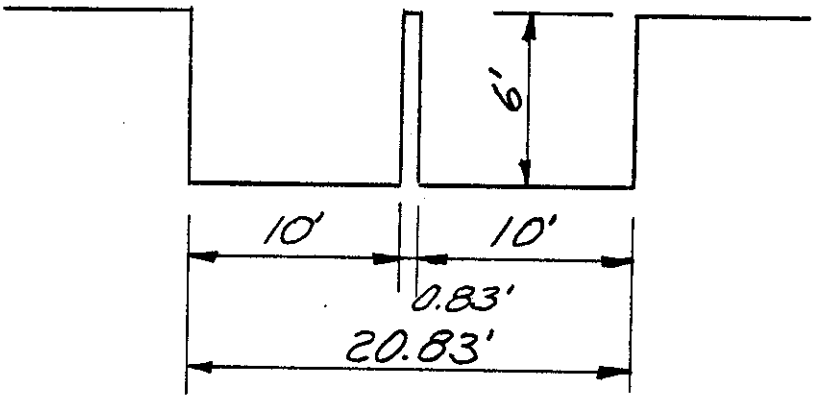
SECTIONS FOR CHANNEL 7

1/2



SECTION 1

NTS



SECTION 3

NTS

CHANNEL 7
STA 1199+02(dike) to STA 1235+00(Ironwood Drive)

Subarea 204 (Plate 2) has an area of 0.70 mi^2 that drains to a concentration point at the dike. An interceptor channel from the dike eastward to Ironwood DRive is designed to intercept sheet flow from Subarea 202 and part of Subarea 204. Examination of the drainage area indicates that approximately 0.165 mi^2 of Subarea 204 contributes directly to the interceptor channel, the remainder collects behind the dike and is then conveyed south to the location of the future freeway culvert crossing. In order to account for this concentrated flow that reaches the freeway and to avoid oversizing the interceptor channel, the channel inflow was obtained by prorating according to the drainage area as follows:

$$\text{Max. anticipated additional flow in channel} = \frac{0.165}{0.70} \times 395 = 93 \text{ cfs}$$

Max. channel flow = 93 + 171 = 264 cfs

INPUT DATA

```
T1 SUPERSTITION FREEWAY- ADOT
T2 INTERCEPTOR CHANNEL MEDIAN STA.1235+00 TO 1235+00
T3 CVL  REVISED MAY,1988  100YR-24HR EVENT   CHANNEL-7
SO    119902.1578.21  8       .030                  1583.16
R     119917.1578.21  7       .030
TS    119990.1578.21  2       .015
BX                    3       .015
R     120172.1578.59  3       .015
BE                    2       .670
TS    120202.1579.11  1       .015
R     120237.1579.73  1       .015
TS    120360.1580.50  9       .015
JX    120365.1580.53  9  4    .015   302.0         1580.53         22.5
R     120370.1580.56  1       .015
R     120540.1581.61  1       .015                          131.5
TS    120590.1581.92  6       .015
R     120800.1583.22  6       .015
JX    121650.1588.49  6  4    .015    93.0         1588.49          0.1
R     122700.1595.00  6       .015
R     123500.1600.92  6       .015
SH                    6       .015
CD    1  1              6.0    20.00 2.0  2.0
CD    2  1              6.0    20.83 0.0  0.0
CD    3  3    1    0.83 6.0    20.83 0.0  0.0
CD    4  1              6.0    20.0  2.0  2.0
CD    6  1              4.0     5.0  2.0  2.0
CD    7  1              6.0   135.0  5.0  5.0
CD    8  1              2.0   170.0  0.0  0.0
CD    9  1              6.0    70.0  2.0  2.0
```

CHANNEL-7

EXISTING DIKE TO IRONWOOD DRIVE

F0515P
WATER SURFACE PROFILE LISTING
SUPERSTITION FREEWAY- ADOT
INTERCEPTOR CHANNEL MEDIAN STA.1205+00 TO 1235+00
CVL REVISED MAY,1998 100YR-24HR EVENT CHANNEL-7

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
120230.47	1579.61	3.428	1583.042	566.0	6.15	0.587	1583.629	0.00	2.659	6.00	20.00	2.00	0	0.00
4.19	0.01771					.001153	0.00		1.542			2.00		
120234.66	1579.69	3.338	1582.989	566.0	6.45	0.646	1583.635	0.00	2.659	6.00	20.00	2.00	0	0.00
2.34	0.01771					.001287	0.00		1.542			2.00		
120237.00	1579.73	3.222	1582.952	566.0	6.64	0.685	1583.637	0.00	2.659	6.00	20.00	2.00	0	0.00
TRANS STR	0.00626					.000737	0.09					2.00		
120360.00	1580.50	3.197	1583.697	566.0	2.32	0.083	1583.780	0.00	1.251	6.00	70.00	2.00	0	0.00
JUNCT STR	0.00600											2.00		
120365.00	1580.53	0.756	1581.286	264.0	4.09	0.371	1581.657	0.00	0.756	6.00	70.00	2.00	0	0.00
120365.00	1580.53	1.246	1581.776	264.0	9.42	1.379	1583.155	0.00	1.657	6.00	20.00	2.00	0	0.00
5.03	0.00600					.000087	0.04		1.355			2.00		
120370.03	1580.56	1.239	1581.799	264.0	9.48	1.396	1583.195	0.69	1.657	6.00	20.00	2.00	0	0.00
7.27	0.00618					.000281	0.06		1.344			2.00		
120377.27	1580.60	1.229	1581.834	264.0	9.57	1.422	1583.256	0.70	1.657	6.00	20.00	2.00	0	0.00
31.36	0.00618					.009659	0.28		1.344			2.00		
120408.63	1580.80	1.177	1581.976	264.0	10.04	1.564	1583.540	0.76	1.657	6.00	20.00	2.00	0	0.00
24.73	0.00618					.010493	0.26		1.344			2.00		
120433.33	1580.95	1.127	1582.078	264.0	10.53	1.723	1583.798	0.83	1.657	6.00	20.00	2.00	0	0.00
20.77	0.00618					.012157	0.25		1.344			2.00		
120454.10	1581.08	1.079	1582.158	264.0	11.04	1.892	1584.050	0.91	1.657	6.00	20.00	2.00	0	0.00
18.19	0.00618					.014391	0.26		1.344			2.00		
120472.29	1581.19	1.033	1582.224	264.0	11.58	2.381	1584.305	0.99	1.657	6.00	20.00	2.00	0	0.00

(6+97)

(8+25)

SUPERSTITION FREEWAY- ADOT
INTERCEPTOR CHANNEL MEDIAN STA.1235+00 TO 1235+00
CVL REVISED MAY,1989 100YR-24HR EVENT CHANNEL-7

STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
1.88	0.00619					.003121	0.01		2.516			2.00		
120800.00	1583.22	3.019	1586.239	264.0	7.92	0.975	1587.214	0.00	3.019	4.00	5.00	2.00	0	0.00
JUNCT STR	0.00620											2.00		
121650.00	1588.49	2.027	1590.517	171.0	9.32	1.348	1591.865	0.00	2.412	4.00	5.00	2.00	0	0.00
830.71	0.00620					.006204	4.97		2.027			2.00		
122450.71	1593.45	2.327	1595.481	171.0	9.32	1.349	1596.829	0.00	2.412	4.00	5.00	2.00	0	0.00
150.94	0.00620					.006353	0.96		2.027			2.00		
122601.65	1594.39	2.003	1596.393	171.0	9.48	1.395	1597.788	0.00	2.412	4.00	5.00	2.00	0	0.00
98.35	0.00620					.006956	0.68		2.027			2.00		
122700.00	1595.00	1.938	1596.938	171.0	9.94	1.534	1598.472	0.00	2.412	4.00	5.00	2.00	0	0.00
513.17	0.00740					.007410	3.80		1.938			2.00		
123213.17	1598.06	1.938	1600.735	171.0	9.94	1.534	1602.269	0.00	2.412	4.00	5.00	2.00	0	0.00
170.41	0.00740					.007082	1.21		1.938			2.00		
123383.58	1600.06	1.984	1602.043	171.0	9.61	1.434	1603.477	0.00	2.412	4.00	5.00	2.00	0	0.00
60.41	0.00740					.006341	0.38		1.938			2.00		
123443.99	1600.51	2.050	1602.556	171.0	9.16	1.304	1603.860	0.00	2.412	4.00	5.00	2.00	0	0.00
27.40	0.00740					.005566	0.15		1.938			2.00		
123471.39	1600.71	2.119	1602.827	171.0	8.74	1.185	1604.012	0.00	2.412	4.00	5.00	2.00	0	0.00
14.95	0.00740					.004885	0.07		1.938			2.00		
123486.34	1600.82	2.189	1603.008	171.0	8.33	1.078	1604.086	0.00	2.412	4.00	5.00	2.00	0	0.00
8.32	0.00740					.004289	0.04		1.938			2.00		
123494.66	1600.88	2.261	1603.142	171.0	7.94	0.980	1604.122	0.00	2.412	4.00	5.00	2.00	0	0.00

APPENDIX III

C. SIDE CHANNEL SPILLWAY COMPUTATIONS

SIDE CHANNEL SPILLWAY CALCULATIONS

In order to evaluate flow depths in the C.A.P. overchute collection channel at the two (2) overchutes, a side channel spillway analysis was performed. This procedure, as outlined in "Design of Small Dams" published by the Bureau of Reclamation, is for a weir or spillway discharging into a channel which is perpendicular to the spillway's stream lines. Analysis moves upstream using an incremental distance with decreasing discharge to determine the water surface profile along the length of the weir. The referenced publication also recommends a deep channel having subcritical flow to better absorb energy and produce less cross-wave action.

The southern most overchute was analyzed first in order to determine water surface elevations at its upstream end. This water surface elevation was used in WSPG to determine what the water surface elevation would be at the downstream end of the northern overchute. The side channel spillway analysis was then repeated. The resulting water surface profiles at these two (2) overchutes was thus determined to control the depth and elevation at which the channel invert was set.

Side Spillways

Side Channel spillway calculations are taken from the USBR publication "Design of Small Dams" Refer to Chapter IX Part C "Hydraulics of Control Structures", Section 202 for Side Channel Spillways.

The basic equation used is:—

$$\Delta y = \frac{Q_2}{g}\frac{(V_1+V_2)}{(Q_1+Q_2)}\left[(V_2-V_1) + \frac{V_1(Q_2-Q_1)}{Q_2}\right]$$

where: Δy = Change in water surface from Section 2 to Section 1

V = Velocity of flow

Q = Flow rate.

Section 2 is the downstream section whose parameters are already known. Computations proceed to the upstream section.

WEIR FLOW CALC'S FOR C.A.P.
OVERCHUTE STA. 542+50

Q=1500cfs (Q= 1495.5 cfs Plate 1, 2991/2, Use 1500cfs)

CREST LENGTH = 150'

CREST WIDTH = 6', ELEV. 1564.00

C VALUE OF CREST = 2.66 (KING & BRATER, TABLE 5-3)

$$H = \left[\frac{1500}{150'(2.66)}\right]^{2/3} = 2.43'$$

Q PER FT OF WEIR = $\frac{1500}{150}$ = 10cfs/FT

FOR SIDE SPILLWAY CALC'S, USE 6 SECTIONS @ 25 FT/SECTION
EACH SECTION = 250cfs.

WILL USE A CHANNEL PROFILE DATUM OF 100.00 & THEN READJUST FE TO CORRECT M.S.L. ELEV., ONCE CHANNEL PROFILE & ALIGN. ARE SET. SOUTH END OF WEIR CREST IS = TO STA 150+00 & NORTH END = STA 0+00.

THIS C.A.P. OVERCHUTE WILL WEIR OVER EXISTING OVERCHUTE CREST INTO A CHANNEL ALREADY CARRYING 1500cfs. WILL USE SAME SIDE CHANNEL SPILLWAY CALC'S TO DETERMINE MAX. W.S.E. FOR EACH SECTION (25') FROM NORTH END OF CREST TO SOUTH END OF CREST.

DEPTH FOR 2991 cfs = 5.92' (WSPG STA 25+07.00)

$$Q = \frac{1.49}{0.015}(272.36)(4.80)^{2/3}(0.0015)^{1/2}$$
$$= 2997 \checkmark$$

FOR THIS OVERCHUTE ANALYSIS, WILL ASSUME THAT THE CHANNEL TRANSITION OCCURRED UPSTREAM OF SPILLWAY STA. 0+00

FROM SIDE CHANNEL SPILLWAY ANALYSIS

MAX. W.S.E. @~8.1 FT ABOVE CHANNEL FE, WILL LOWER FE AN ADDITIONAL 1.0 FT TO PREVENT WEIR FLOW OVER CREST FROM BEING SUBMERGED
∴ DEPRESS CHANNEL A TOTAL OF 8.1 + 1.0 = 9.1 FT, 1564.00 - 9.1 = 1554.90 (MIN
@ U/S END OF OVERCHUTE SPILLWAY

[redacted]

THE CHANNEL SPILLWAY CALC'S

(1500 IN CHANNEL) C.A.P. OVERCHUTE STA. 542+50

Q=1500cfs, BOTTOM WIDTH = 40' SIDE SLOPES = 1:1, CHANNEL SLOPE = 0.0015 ft/ft

STA. (1)	Δx (2)	℄ ELEV. (3)	TRIAL Δy (4)	W.S.E. (5)	d (6)	A (7)	Q_1 (8)	n (9)	Q_1+Q_2 (10)	$\frac{Q_1}{2(Q_1+Q_2)}$ (11)	n_1+n_2 (12)	n_2-n_1 (13)	Q_2-Q_1 (14)	$\frac{Q_2-Q_1}{Q_1}$ (15)	$\frac{n_2(Q_2-Q_1)}{Q_1}$ (16)	(13)÷(16) (17)	Δy=(11)·(12)·(17) (18)	REMARKS (19)
150+00		100.00		105.92	5.92	272.4	3000	11.0										
125	25'	100.04	1.00	106.92	6.88	322.5	2750	8.53	5750	0.0148	19.53	2.47	250	0.091	1.00	3.47	1.00	OK
100	25'	100.08	0.75	107.68	7.60	361.8	2500	6.91	5250	0.0148	15.42	1.60	250	0.100	0.85	2.45	0.56	TOO LOW
			0.58	107.51	7.43	352.4		7.09			15.60	1.42				2.27	0.52	TOO LOW
			0.50	107.43	7.35	348.0		7.18			15.69	1.33				2.18	0.51	OK
75	25'	100.11	0.37	107.80	7.69	366.7	2250	6.13	4750	0.0147	13.31	1.05	250	0.111	0.80	1.85	0.36	OK
50	25'	100.15	0.23	108.03	7.88	377.3	2000	5.30	4250	0.0146	11.43	0.83	250	0.125	0.77	1.60	0.27	TOO HIGH
			0.25	108.05	7.90	378.4		5.29			11.42	0.84				1.61	0.27	TOO HIGH
			0.27	108.07	7.92	379.5		5.27			11.40	0.86				1.63	0.27	OK
25	25'	100.19	0.15	108.22	8.03	385.7	1750	4.54	3750	0.0145	9.81	0.73	250	0.143	0.65	1.38	0.20	TOO HIGH
			0.20	108.27	8.08*	388.5		4.50			9.77	0.77				1.42	0.20	OK
0																		

* Use depth = 8.10 ft. as starting water surface for Channel 4-U.

SUGGEST. FWY

6/18/87

TMD

0257-10-0

NATIONAL 42-381 50 SHEETS 5 SQUARE 42-382 100 SHEETS 5 SQUARE 42-389 200 SHEETS 5 SQUARE

WEIR FLOW CALC.'s FOR C.A.P.
OVERCHUTE STA. 529+50

Q = 1500 cfs (Q = 1495.5 cfs Plate 1, use 1500 cfs)

CREST LENGTH = 150'

CREST WIDTH = 6', ELEV. 1564.00 ±

C VALUE OF CREST = 2.66 (SOURCE: KING & BRATER, TABLE 5-3)

$$H = \left[\frac{1500\text{cfs}}{150(2.66)}\right]^{2/3} = 2.43'$$

Q PER FT OF WEIR = $\frac{1500}{150}$ = 10 cfs/FT

FOR SIDE SPILLWAY CALC'S, USE 25 FT SECTIONS

∴ 25' × 10 cfs/FT = 250 cfs/CALC SECTION

1500 cfs / 250 cfs = 6 SECTIONS

WILL USE A CHANNEL PROFILE DATUM OF 100.00 & THEN READJUST ℄ TO CORRECT M.S.L. ELEV. ONCE CHANNEL PROFILE & ALIGNMENT ARE SET. SOUTH END OF CREST IS = TO STA 150+00. NORTH END = STA 0.00

$d_c \approx \sqrt[3]{\frac{q^2}{g}}$, WHERE $q = \frac{1500}{20}$ = 75 cfs/FT OF CHANNEL WIDTH

$d_c = \sqrt[3]{\frac{75^2}{32.2}} \approx 5.58$ FT

$v_c = \frac{q'}{d_c} = \frac{75}{5.58} = 13.44$ FT/SEC

$h_{v_c} = \frac{v_c^2}{2g} = \frac{13.44^2}{64.4} = 2.81$ FT

$d_N = 5.84'$, $Q = \frac{1.49}{0.015}(150.91)(4.13^{2/3})(0.0015^{1/2})$

= 1495 cfs ✓

FROM SIDE CHANNEL SPILLWAY ANALYSIS

MAX. W.S.E. IN CHANNEL BELOW SPILLWAY = 8.22', LOWER 1.0' TO PREVENT WEIR FROM SUBMERGING. AND — FREEBOARD @ SPILLWAY

(8.30' + 1.0 FT = 9.30')

℄ ELEV. OF CHANNEL TO BE @ 1564.00 − 9.30' = 1554.70 OR LESS.

[redacted] 4.P. OVERCHUTE STA. 529+50 [redacted] CH[redacted]RTH [redacted]

Q=1500cfs, BOTTOM WIDTH = 20 SIDE SLOPES = 1:1, CHANNEL SLOPE = 0.0015 %

	STA. (1)	Δx (2)	FE ELEV. (3)	TRIAL Δy (4)	W.S.E (5)	d (6)	A (7)	Q_1 (8)	n (9)	Q_1+Q_2 (10)	$\frac{Q_3}{3(Q_1+Q_2)}$ (11)	n_1+n_2 (12)	n_2-n_1 (13)	Q_2-Q_1 (14)	$\frac{Q_2-Q_1}{Q_1}$ (15)	$\frac{n_2(Q_2-Q_1)}{Q_1}$ (16)	(13)+(16) (17)	Δy=(11)-(12)(17) (18)	Remarks (19)
6/18/87	150+00		100.00		106.61	6.61*	175.9	1500	8.53										
TMD	125	25'	100.04	1.00	107.61	7.57	208.7	1250	5.99	2750	0.0141	14.52	2.54	250	0.200	1.71	4.25	0.87	TOO HIGH
				0.91	107.52	7.48	205.6	1250	6.08	"	"	14.61	2.45	"	"	"	4.16	0.86	"
				0.85	107.46	7.42	203.4	"	6.14	"	"	14.67	2.39	"	"	"	4.10	0.84	OK
	100	25'	100.08	0.45	107.91	7.83	217.9	1000	4.59	2250	0.0138	10.73	1.55	250	0.250	1.53	3.08	0.46	OK
SOUTHEAST FWY	75	25'	100.11	0.29	108.20	8.09	227.2	750	3.30	1750	0.0133	7.89	1.29	250	0.333	1.53	2.82	0.30	OK
	50	25'	100.15	0.17	108.37	8.22	232.0	500	2.16	1250	0.0124	5.46	1.14	250	0.500	1.65	2.79	0.19	TOO LOW
				0.19	108.39	8.24	232.7	"	2.15	"	0.0124	5.45	1.15	"	"	"	2.78	0.19	OK
	25	25'	100.19	0.10	108.49	8.30	234.9	250	1.06	750	0.0104	3.21	1.09	250	1.00	2.15	3.24	0.11	OK

* STARTING WATER SURFACE TAKEN FROM WSPG CHANNEL 4-U. SHOWS 6.43', 6.61' CLOSE ENOUGH

0257-10-0

NATIONAL 42-381 50 SHEETS 5 SQUARE 42-382 100 SHEETS 5 SQUARE 42-389 200 SHEETS 5 SQUARE

SUMMARY OF C.A.P. OVERCHUTE
SIDE CHANNEL SPILLWAYS
STA. 529+50 & 542+50

OVERCHUTE STA. 529+50 — Q=1500cfs

POOL CREST ELEV. 1564.00
REQUIRED FL DEPTH BELOW CREST: 9.30FT
FL @ NORTH END OF CHANNEL BELOW CREST: 1554.70

OVERCHUTE STA. 542+50

POOL CREST ELEV. 1564.00
REQUIRED FL DEPTH BELOW CREST: 9.6 FT
FL @ NORTH END OF CHANNEL BELOW CREST: 1554.40 — Q= 1500 cfs

TOTAL Q = 3000 cfs

OVERCHUTE 529+50 CONTROLS CHANNEL FL ELEV. SINCE IT IS LOWER & IS U/S OF OVERCHUTE 542+50.

BEGIN CHANNEL @ ELEV. 1554.70 @ A DISTANCE OF ±350 FT U/S OF SUNLAND AVE. (ALONG CHANNEL ℄)

@ OVERCHUTE STA. 542+50, FL OF COLLECTOR CHANNEL @ U/S END OF SPILLWAY
= 1554.78 - (1355')(0.0015'/') = 1552.75 (11.15' DROP FROM SPILLWAY CREST)
11.15' > 9.1', OK!

APPENDIX III

D. PLUNGE POOL DESIGN

PLUNGE POOL DESIGN

Located at the base of all major spillway structures in the detention basins is a dumped rip-rap plunge pool structure to prevent erosion around the base of the spillway. These plunge pool basins were designed using methods described in the ADOT Hydrology and Hydraulics Training Session Manual and HEC-14, Section VI. HEC-14 sizes the basin length based upon the length of the hydraulic jump, design flow rate and Froude number.

Rip-rap diameter (d_{50}) was obtained from ADOT's rip-rap plunge basin design for velocities in the range experienced at the base of the spillways. The detention basin's plunge pools were designed for maximum discharge, however, when the detention basins experience peak inflow there will be approximately 2 feet of water in the basin. This will result in approximately 5 feet of water depth in the plunge pool (100-year event) which will further dissipate spillway energy.

A bedding material in conjunction with filter fabric is required below the rip-rap in order to prevent loss of fine soil material. Filter fabric strength is based upon the use of dumped rip-rap in all basins.

SOURCE & HYDROLOGY & HYDRAULICS TRAINING SESSION ADOT, STRUCTURES SECTION 1/2

RIPRAP PLUNGE BASIN

A plunge basin energy dissipator developed by the U.S. Bureau of Reclamation and refined by the Colorado State Highway Department is shown in Figure 2-8. The dimensions, based on incoming velocity, are listed in Table 2-2.

The obvious advantages to this design are ease of construction and relatively low cost. It would, of course, be neither as permanent nor as maintenance-free as a concrete structure.

Figure 2-8

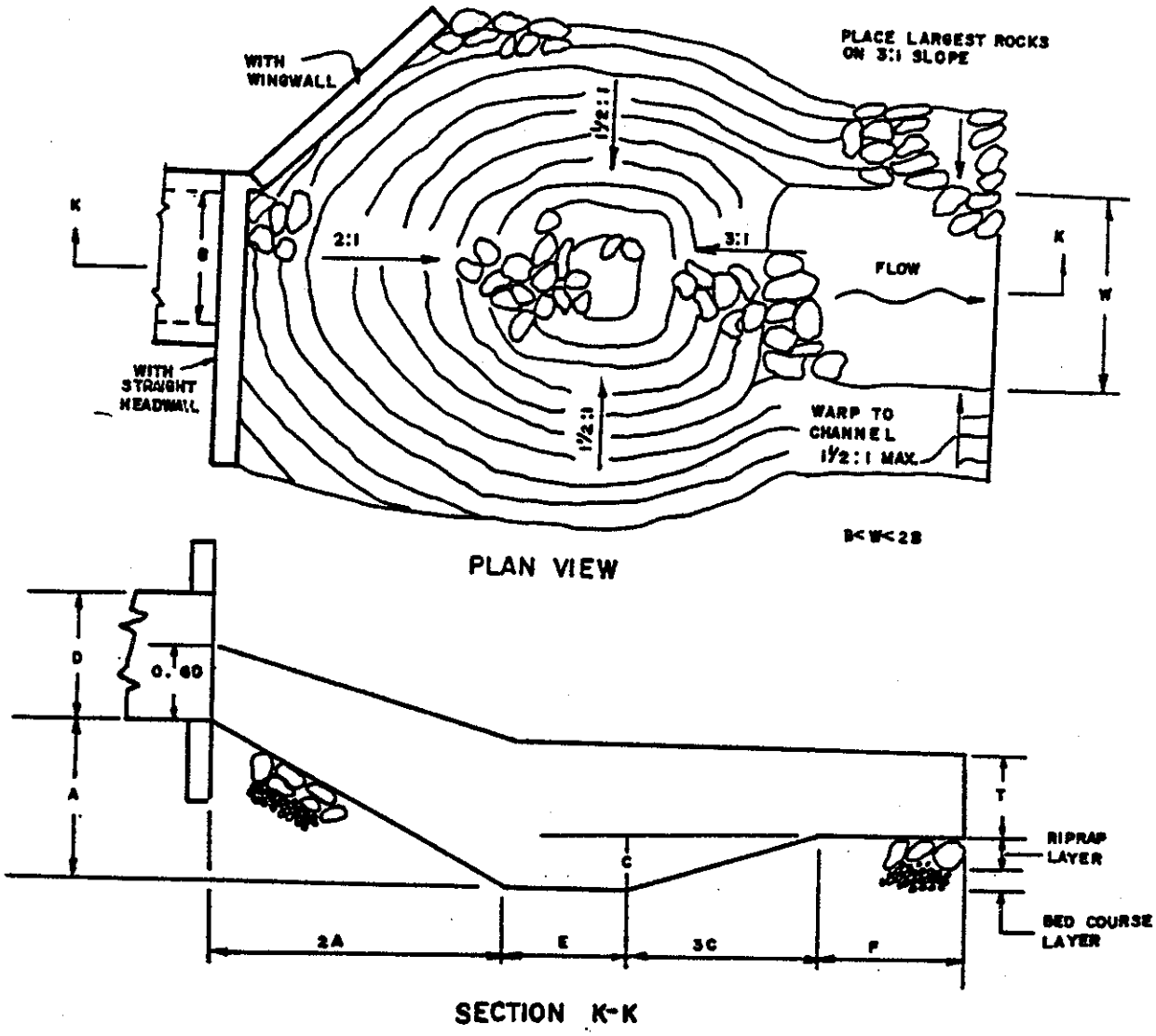


TABLE 2–2

PIPE DIA. (Inches)	BASIN DIMENSIONS (Feet)														
	V ≤18 f.p.s.					18 <V <24					24 <V <30				
	A	C	E	T	F	A	C	E	T	F	A	C	E	T	F
24	3	1.5	3	1.5	4	3	1.5	5	1.5	4	4	2	7	1.5	4
30	3	1.5	3	2	4	3	1.5	5	2	4	4	2	7	2	4
36	3	1.5	3	2.5	5	3	1.5	5	2.5	5	4	2	7	2.5	5
42	3	1.5	3	3	5	3	1.5	5	3	5	4	2	7	3	5
48	3	1.5	3	3	6	4	2	5	3	6	5	2.5	7	3	6
54	3	1.5	3	4	7	4	2	5	4	7	5	2.5	7	4	7
60	4	2	3	4	8	4	2	5	4	8	6	3	7	4	8
66	4	2	3	5	8	5	2.5	5	5	8	6	3	7	5	8
72	4	2	3	5	9	5	2.5	5	5	9	6	3	7	5	9
84	5	2.5	3	5.5	11	6	3	5	5.5	11	7	3.5	7	5.5	11
96	6	3	3	6	12	7	3.5	5	6	12	8	4	7	6	12

RIPRAP DIMENSIONS (Inches)									
RIPRAP SIZE	RIPRAP THICKNESS	BEDDING THICKNESS	RIPRAP SIZE	RIPRAP THICKNESS	BEDDING THICKNESS	RIPRAP SIZE	RIPRAP THICKNESS	BEDDING THICKNESS
16	18	6	24	24	8	24	30	10

d_{50}=24"

It is a well-established fact that better performance of riprap results when it is placed over bed course material. Riprap placed directly on fine soil will often fail because the action of the water removes the fine material from beneath the riprap. Therefore, all riprap should be placed over a layer of bed course material unless the supporting base material is of similar gradation to the bed course specification. Table 2-2 shows the minimum layer thickness of the bed course material.

Plunge basins such as those illustrated in Figures 2-8 and 2-9 should be used only where the jet discharges into the air and then plunges downward into the basin. If the angle of impingement is too flat, the jet will ride across the surface at high velocity. This will cause waves and eddies in the basin sufficient to erode the side slopes, and there will be high exit velocities.

ELLSWORTH RD. COLLECTOR CHANNEL
SPILLWAY CALC'S (CHANNEL-1)

$Q = 352 cfs$
$S = 0.0900'/'$
$N = 0.015$
$Z = 1:1$ SLOPES
$BW = 10 FT$
$V = 25.8 FPS$
$FR^{\#} = 4.11$
$y_1 = 1.22 FT$

$$FR^{\#} = \frac{V_1}{\sqrt{g y_1}}$$

$$t = BW/Zy_1$$

$$t = \frac{10}{1.22} = 8.2$$

$FR_2^{\#} = 4.11$

FIG VI-9

$J_2 = \frac{y_2}{y_1} = 4.8$

$y_1 = 1.22'$

$y_2 = 1.22(4.8) = 5.86$

(N/A)

FIG VI-10

$J_2 = \frac{y_2}{y_1} =$

$y_1 =$

$y_2 =$

(N/A)

FIG VI-12

$FR_2^{\#} = 4.11$

$Z = 1:1$

$L_j/y_1 = 80$

$y_1 = 1.22'$

$\therefore L_{j_2} = 1.22(80) = 96'$

$t = \frac{b}{Zy} = \frac{10}{1.22} = 8.2 \rightarrow 8$

$L_j/y_1 = 80$

$y_1 = 1.22'$

$\therefore L_{j_2} = 1.22'(80) = 96''$

ELLSWORTH BASIN INTERCEPTOR CHANNEL
SPILLWAY CALC'S (CHANNEL-2)
(USING HEC-14, DEC/75, SEC VI).

$Q = 2586$ cfs
$\Delta = 0.1236\,Y_1$
$N = 0.030$
$Z = 2:1$ SIDE SLOPES
$BW = 50$
$V = 29.6$ '/s
$\mathbb{F}_R^{\#} = 4.07$
$Y_1 = 1.64$

$t = \frac{50}{2 \times 1.64} = 15.24$

(FIG VI-9) $\mathbb{F}_R^{\#} = 4.07$

$J_1 = \frac{Y_2}{Y_1} = 5.0$

$\therefore y_2 = 5.0(1.64) = 8.2$ FT (N/A)

(FIG VI-10) $\mathbb{F}_R^{\#} = 4.07$

$J = \frac{Y_2}{Y_1} = 4.8$

$\therefore y_2 = 4.8(1.64) = 7.9$ FT (N/A)

(FIG VI-12) $\mathbb{F}_{R_1}^{\#} = 4.07$ (Using $t=4$, $z=2$)

$L_j/Y_1 = 130$

$Y_1 = 1.64'$

$L_j = 1.64(130) = 213$ FT Do not use

$\mathbb{F}_{R_1}^{\#} = 4.07$ (Using $t=16$, $z=1/2$)

$L_j/Y_1 = 63$

$Y_1 = 1.64$

$L_j = 1.64(63) = 103$ FT (USE, SINCE THE BASIN FLARES OUT)

INTERCEPTOR CHANNEL

$Fr_1^{\#} = 4.07$

$t_1 = \frac{b}{zy} = \frac{50}{2(1.64)} \doteq 15$

$z \doteq 2:1$

ELLSWORTH COLLECTOR CHANNEL

$Fr_2^{\#} = 4.11$

$t_2 = \frac{b}{zy} = \frac{10}{1(1.22)} = 8.2 \rightarrow 8$

$z = 1:1$

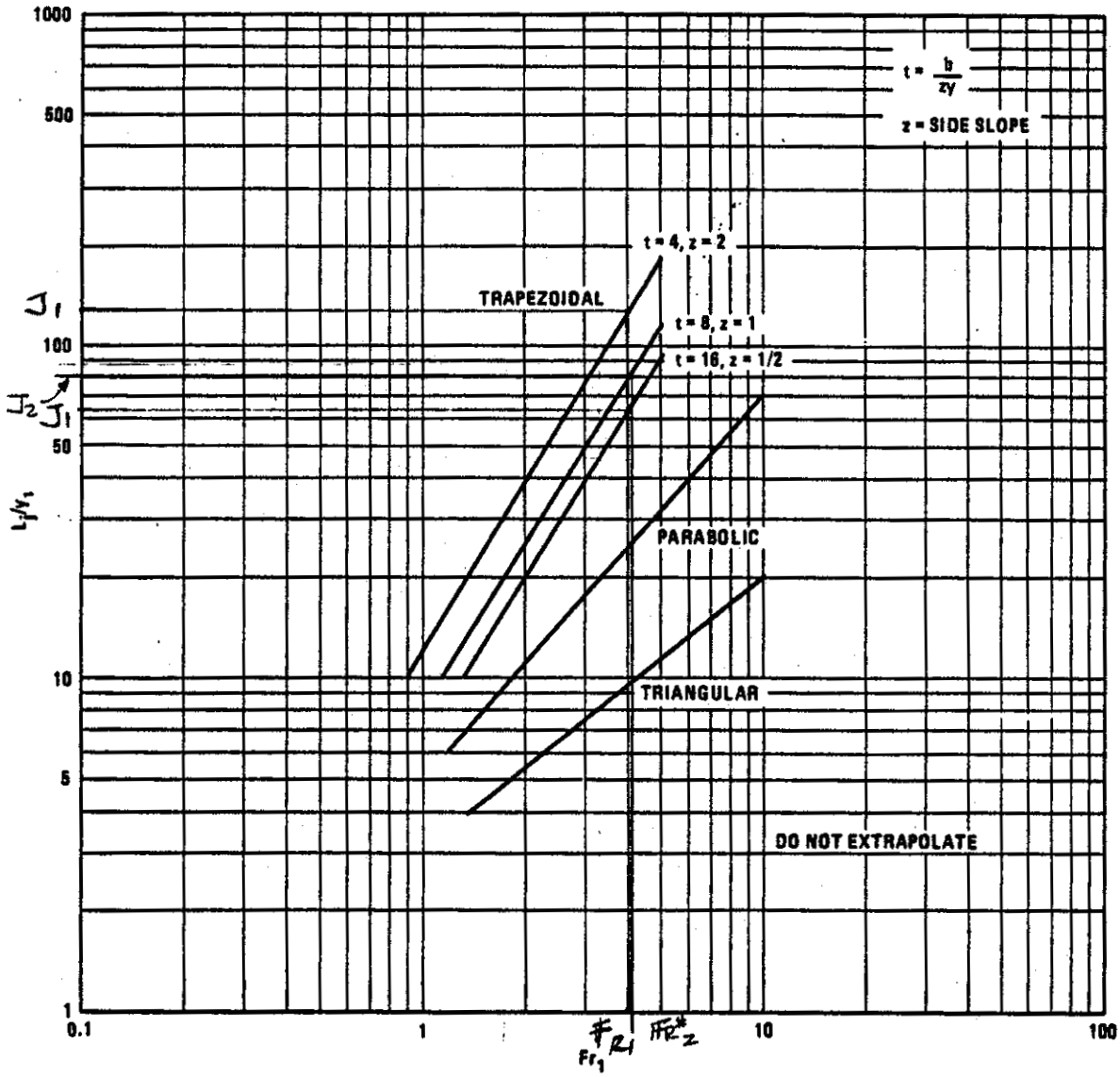


FIGURE VI-12. HYDRAULIC JUMP LENGTH FOR NONRECTANGULAR CHANNELS

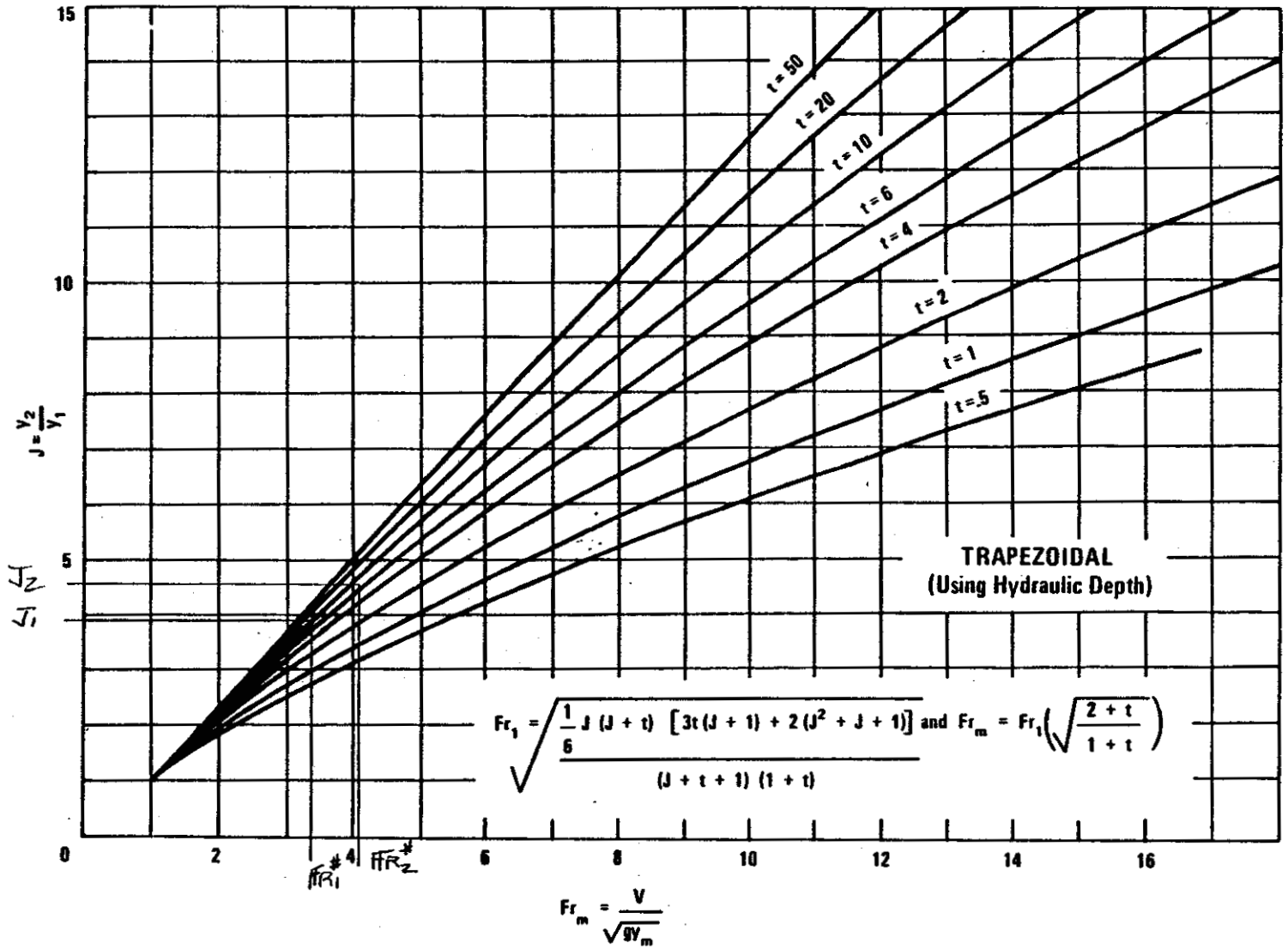
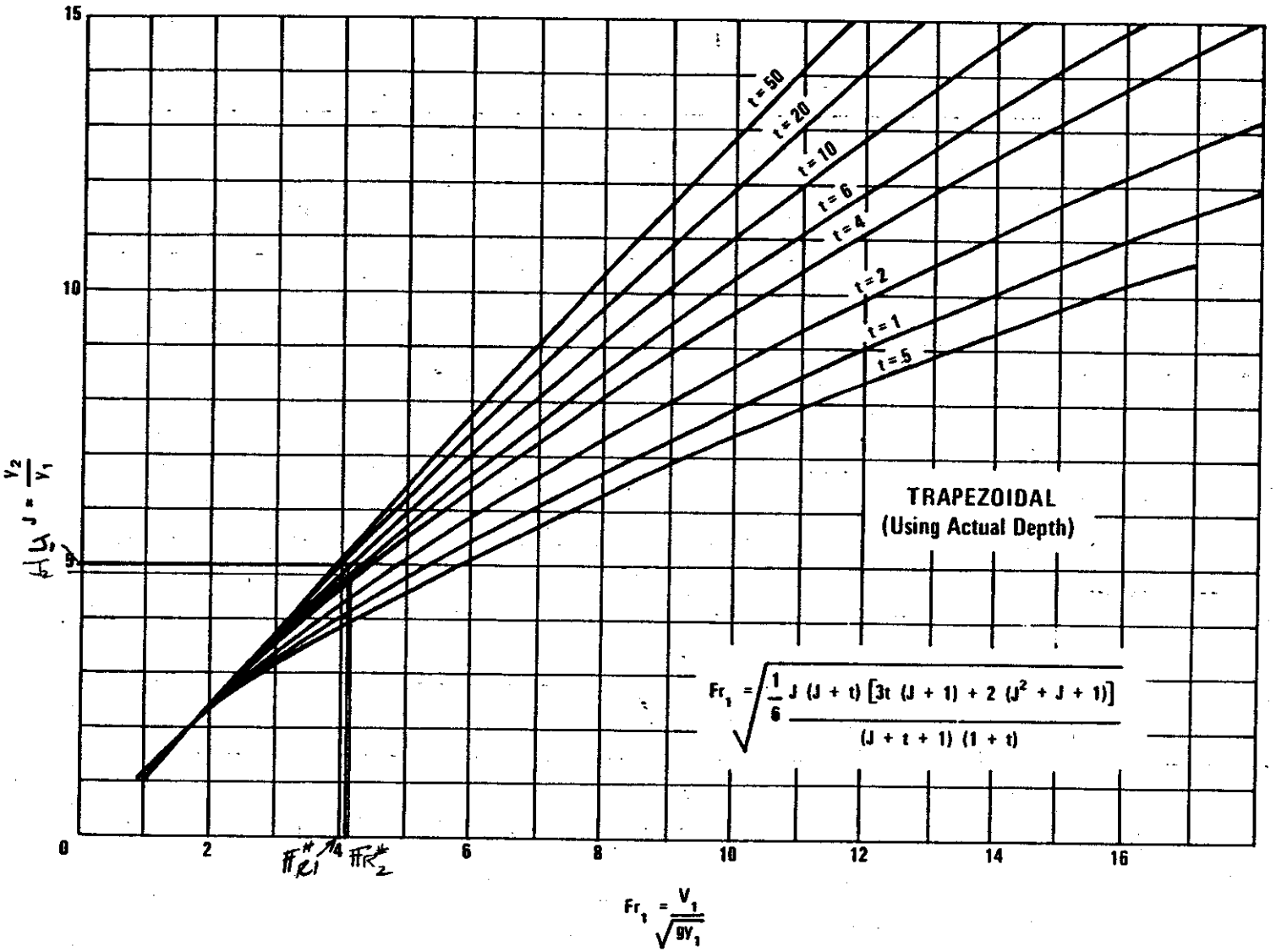


FIGURE VI-10 HYDRAULIC JUMP – HORIZONTAL, TRAPEZOIDAL CHANNEL (HYDRAULIC DEPTH)



$t_1 = \frac{b}{zy} = \frac{50}{2(1.64)} = 15.2$

$FR_1^* = 4.07$

$t_2 = \frac{10}{1(1.22)} = 8.2 \rightarrow 8.0$

$FR^* = 4.11$

FIGURE VI-9 HYDRAULIC JUMP – HORIZONTAL, TRAPEZOIDAL CHANNEL (ACTUAL DEPTH)

* t_1 = INTERCEPTOR CHANNEL
t_2 = ELLSWORTH RD. COLLECTOR CHANNEL

SUPERSTITION FWY #0257090
ELLSWORTH BASIN INTERCEPTOR
CHANNEL SPILLWAY/APRON

C.A.P. BASIN 'SOUTH' OVERCHUTE SPILLWAY
STA. 563+50
(USING HEC-14, DEC/75, SEC VI)

$Q = 1719$ cfs
$S = 0.1658$ ft/ft
$N = 0.015$
$Z = 2:1$ *(SIDE SLOPES VARY FROM 5:1 @ top of BASIN to 2:1 @ bottom, WILL USE 2:1 WHICH WILL YIELD A MORE CONSERVATIVE L_j)
$BW = 140$ ft
$V = 25.3$ ft/sec
$FR_1^* = 6.32$
$y_1 = 0.5$

(FIG VI-9) $FR^* = 6.32$
$J_1 = \frac{y_2}{y_1} = 9.2$, $0.5(9.2) = 4.6$ (N/A)

(FIG VI-10) $FR^* = 6.32$
$J = \frac{y_2}{y_1} = 9.0$, $0.5(9) = 4.5$ (N/A)

(FIG VI-12) $FR_1^* = 6.32$ (w/ $Z = 2:1$)
$L_j / y_1 = 290'$,
$L_j = 290(0.5) = 145'$ (X)

w/ $t = 16$, t ACTUAL $= \frac{b}{2y} = \frac{140}{2(0.5)} = 140$, $L_{j\,t=16} > L_{j\,t=140}$ WHICH IS NOT ON FIGURE,

$FR_1^* = 6.32$ ($t = 16$)
$L_j / y_1 = 140$.
$L_j = 140(0.5) = 70'$ (USE, SINCE BASIN FLARES OUT)

C.A.P. BASIN 'SOUTH' OVERCHUTE SPILLWAY
STA. 574+50
(USING HEC-14, DEC/75, SEC VI)

Q = 400 cfs ** (BUREAU OF RECLAMATIONS OVERCHUTE DESIGN Q)
A = 0.1657 y_1
N = 0.015
Z = 2:1 * (SIDE SLOPES VARY FROM 5:1 @ TOP OF BASIN TO 2:1 @ BOTTOM, WILL USE 2:1 WHICH WILL YIELD A MORE CONSERVATIVE L_j)
BW = 70 FT
V = 18.8 FT/SEC
$F_R^* = 5.9$
$y_1 = 0.32$

(FIG VI-9) $F_R^* = 6.1$
$J_1 = \frac{y_2}{y_1} = 8.5$ $y_2 = 0.32(8.5) = 2.7$ FT (N/A)

(FIG VI-10) $F_R^* = 6.1$
$J_1 = \frac{y_2}{y_1} = 8.6$ $y_2 = 0.32(8.6) = 2.8$ FT (N/A)

(FIG VI-12) $F_R^* = 6.1$
$L_j / y_1 = 270'$ (w/z = 2:1)
$L_j = 270'(0.32) = 86$ FT (X)

(w/t = 16; t ACTUAL = $\frac{b}{zy} = \frac{70}{2(.32)} \doteq 109$, $L_{j_{t=16}} > L_{j_{t=109}}$ WHICH IS NOT ON FIGURE)

$L_j / y_1 = 130$ (w/t = 16)
$L_j = 130(0.32) \doteq 42$ (USE, SINCE BASIN FLARES OUT)

** NOTE: Plate 1 indicates a $Q_{100} = 45$ cfs as determined from the original hydrology by A-N West. The USBR indicates a design flow of 400 cfs. The 400 cfs is used for spillway and energy dissipator design.

$2y \quad 2(0.5)$

$t_2 = \frac{b}{2y} = \frac{70}{2(0.32)} = 109$

$t_2 =$ C.A... ERCH STA... 4+5

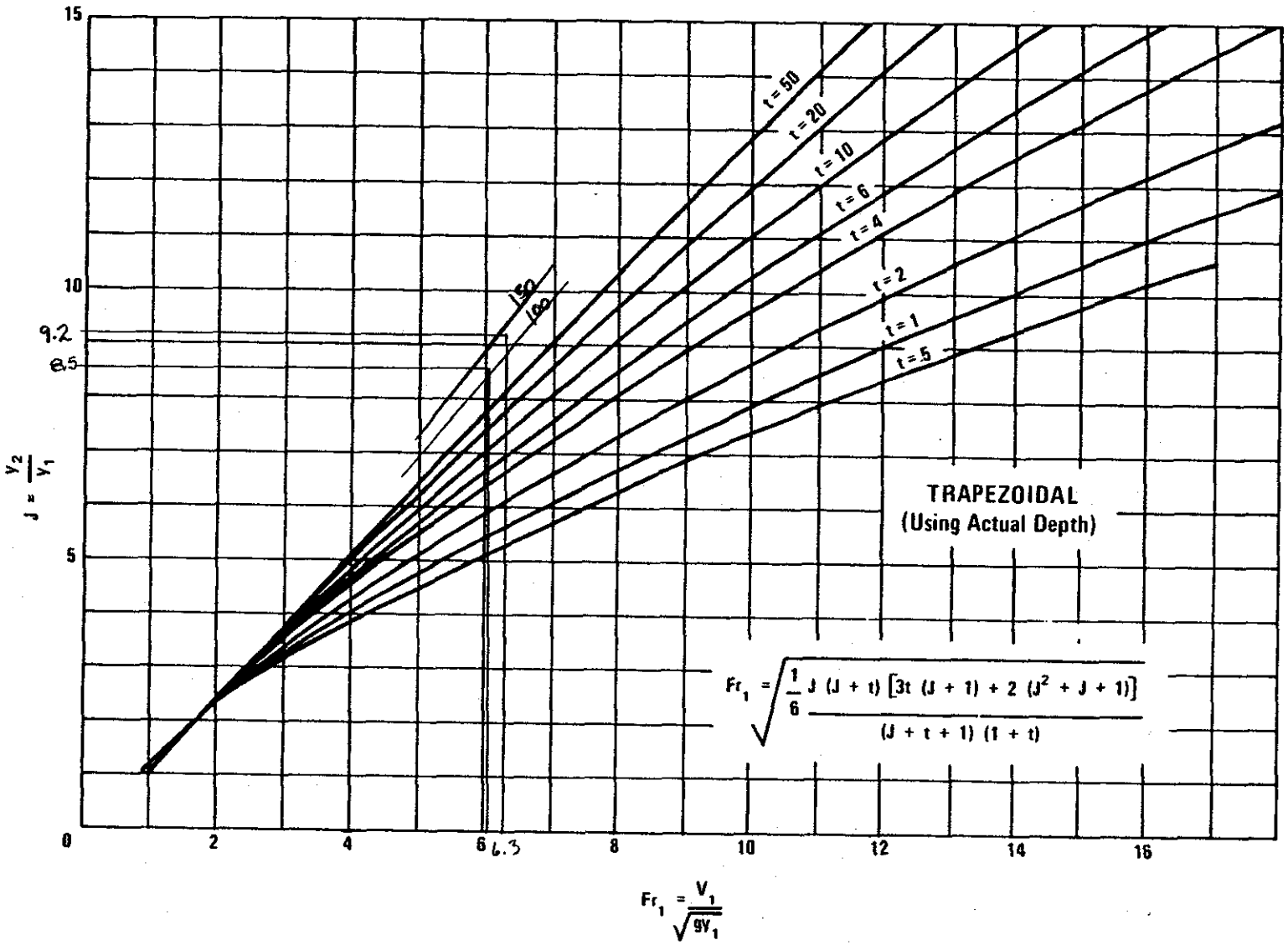


FIGURE VI-9 HYDRAULIC JUMP – HORIZONTAL, TRAPEZOIDAL CHANNEL (ACTUAL DEPTH)

5/5

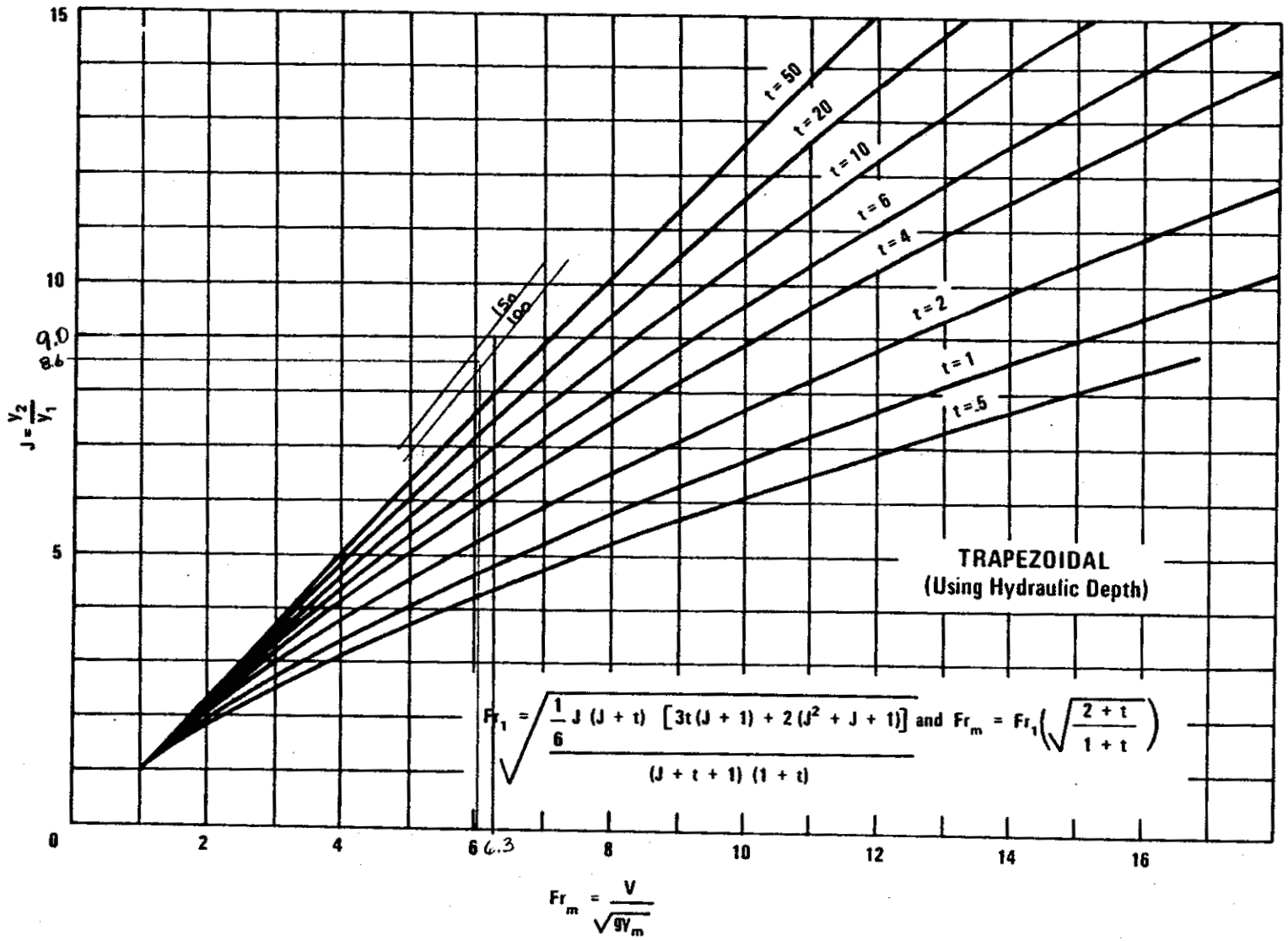


FIGURE VI-10 HYDRAULIC JUMP – HORIZONTAL, TRAPEZOIDAL CHANNEL (HYDRAULIC DEPTH)

5/5

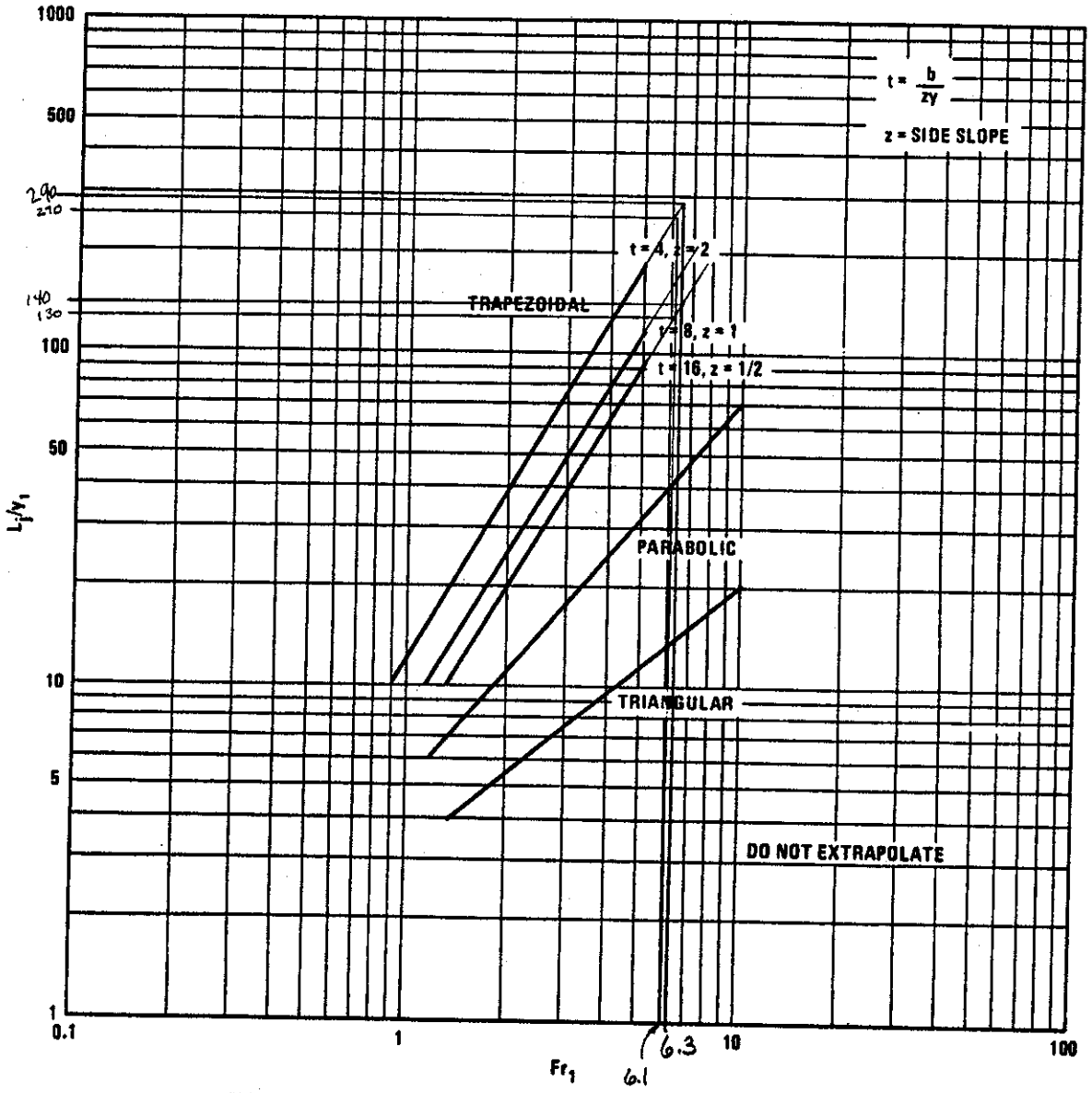


FIGURE VI-12. HYDRAULIC JUMP LENGTH FOR NONRECTANGULAR CHANNELS

C.A.P. COLLECTION CHANNEL
PLUNGE POOL
(SOURCE: Hec-14, 12/75, SEC VI)

Q = 3000 cfs (Plate 1 indicates 2991)
V = 26.34 fps (FROM WSPG ANALYSIS @ OUTLET APRON)
depth = 2.19' = y_1
BW = 51.95'
$F_R^* = 3.14$
Z = 2:1
N = 0.015

(FIG VI-9) $F_R^* = 3.14$

$J = \frac{y_2}{y_1} = 3.7$ $y_2 = 3.7(2.19) = 8.1$ (N/A)

(FIG VI-10) $F_R^* = 3.14$

$J = \frac{y_2}{y_1} = 3.8$ $y_2 = 3.8(2.19) = 8.3$ (N/A)

(FIG VI-12) $F_{R_1} = 3.14$ (With t = 4, z = 2)

$L_j/y_1 = 87$, $L_j = 87(2.19) = 190'$ (X)

$F_R^* = 3.14$ (With t = 16.2 = 1/2

$L_j/y_1 = 35$, $L_j = 35(2.19) = 77'$

C.A.P. OVERCHUTE STA. 552+50
SPILLWAY PLUNGE POOL
(SOURCE: HEC-14, 12/75, SEC VI)

$Q = 1719$ cfs
$q = 0.1745$ ′/′
$V = 34.47$ fps
$BW = 65'$
$FR^{\#} = 6.96$
$Z = 2:1$
$y_1 = 0.78'$

(FIG VI-9)
$FR^{\#} = 6.96$

$J = y_2/y_1 = 8.7$, $y_2 = 8.7(0.78) = 6.8$ (N/A)

(FIG VI-10)
$FR^{\#} = 6.96$

$J = y_2/y_1 = 8.6$, $y_2 = 8.6(0.78) = 6.7$ (N/A)

(FIG VI-12)
$FR^{\#} = 6.96$

$L_j/y_1 = 310$, $L_j = 310(0.78) = 242$ ($Z = 2:1$)
(X)*

$FR^{\#} = 6.96$

$L_j/y_1 = 160$, $L_j = 160(0.78) = 124.8 \rightarrow 125$ ($t = 16$, ACTUAL WOULD YIELD A LOWER L_j/y_1)
(X)*

* these results are unrealistic considering depth of flow. ∴ will design this plunge pool the same as the C.A.P. collection channel plunge pool. ($Q = 3000$ cfs)

Note: when peak Q hits basin there is ~ 2 ft of water in the basin which will facilitate the absorbtion of this spillway energy.

5/5

t = 8.17 → 8
t ≈ 42

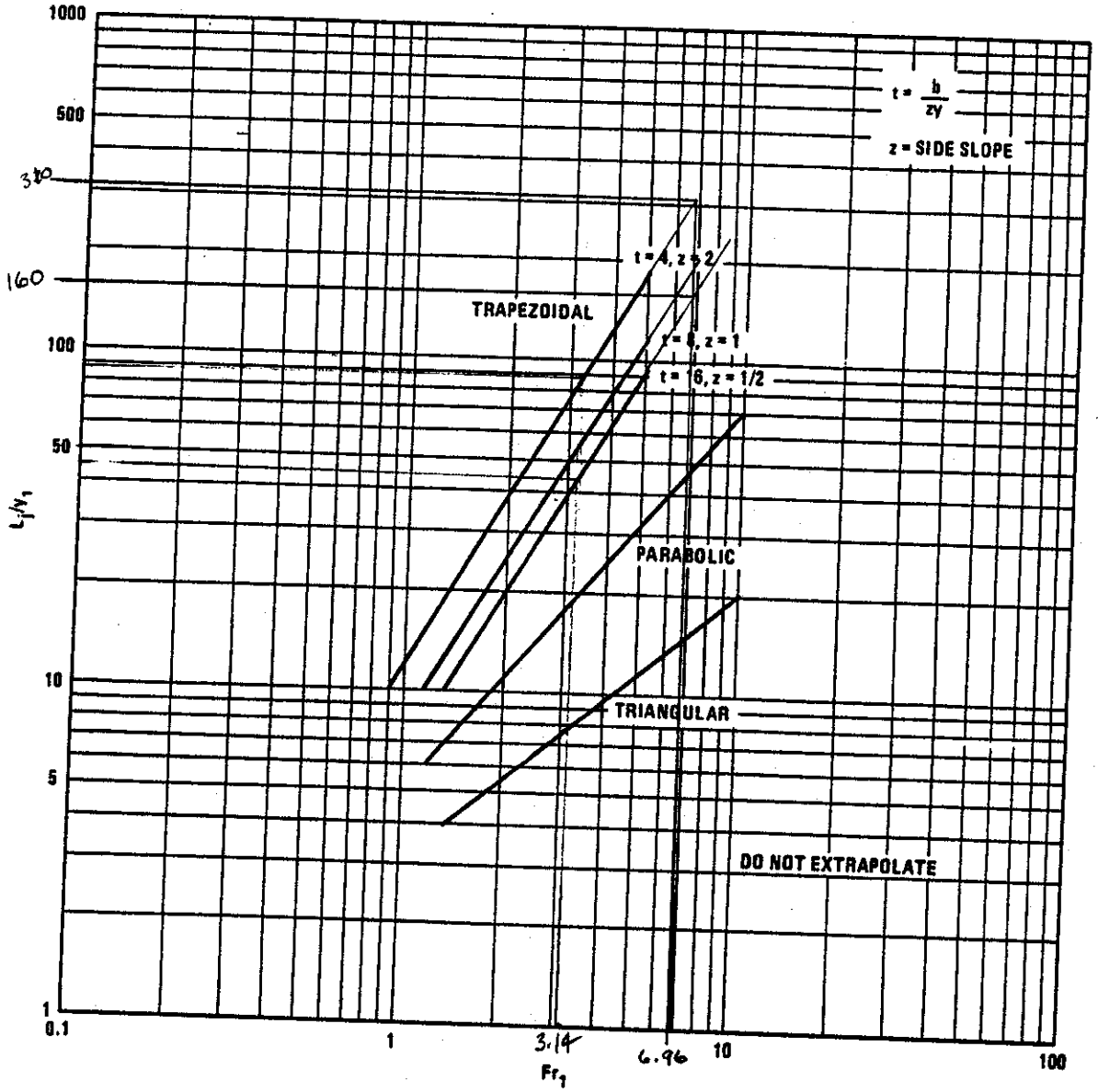


FIGURE VI-12. HYDRAULIC JUMP LENGTH FOR NONRECTANGULAR CHANNELS

$t_1 = 8.11$ (pg 1)

$t_2 = 42$ (pg 2)

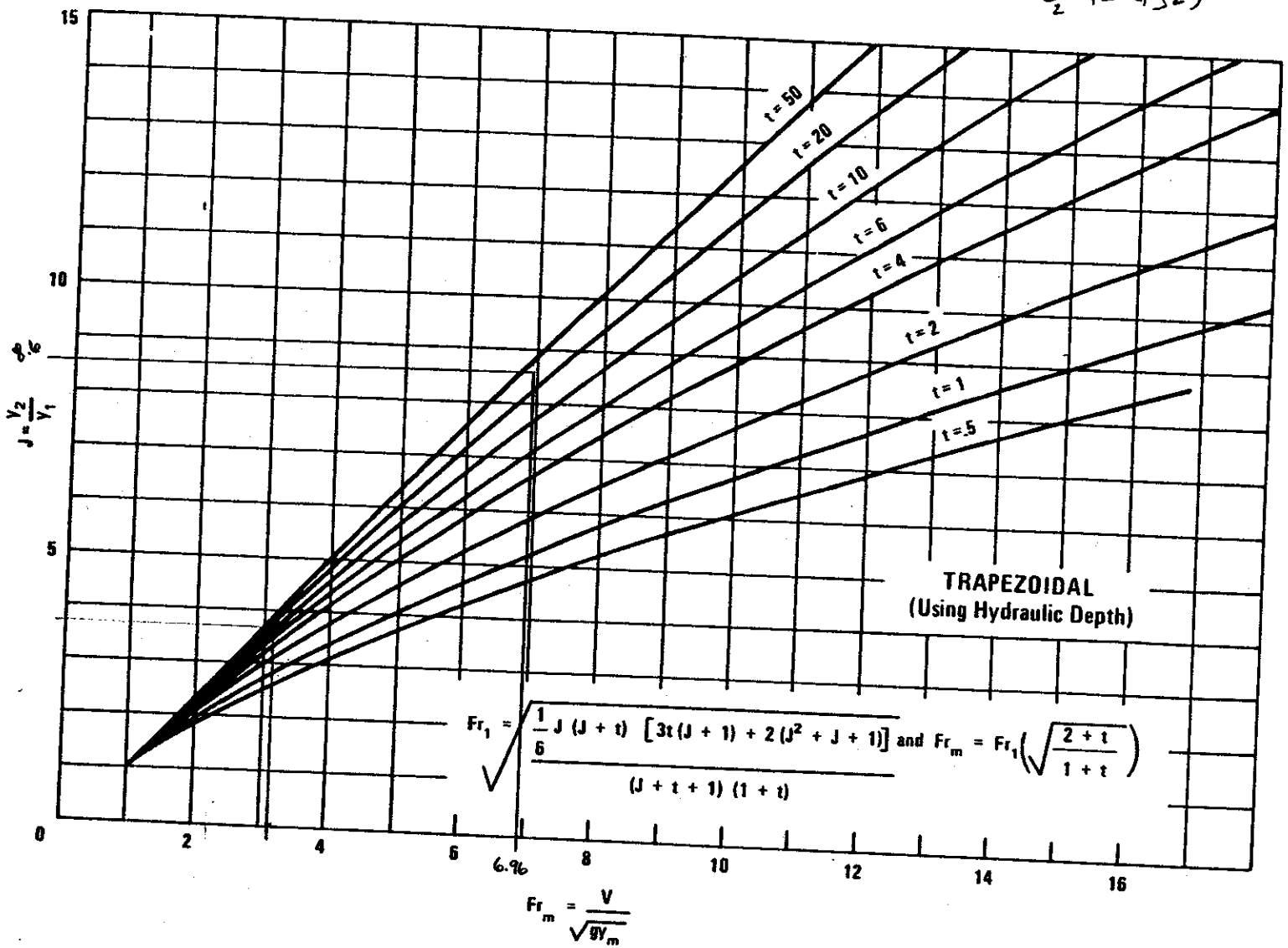


FIGURE VI-10 HYDRAULIC JUMP – HORIZONTAL, TRAPEZOIDAL CHANNEL (HYDRAULIC DEPTH)

45

t_1 = C.A.P. COLLECTION CHANNEL SPILLWAY

$t_1 = \frac{b}{2y} = \frac{1.95}{2(2.19)} = 11.1$

t_2 = C.A.P. OVERCHUTE STA 552+50 SPILLWAY

$t_2 = \frac{65}{2(0.78)} \cong 42$

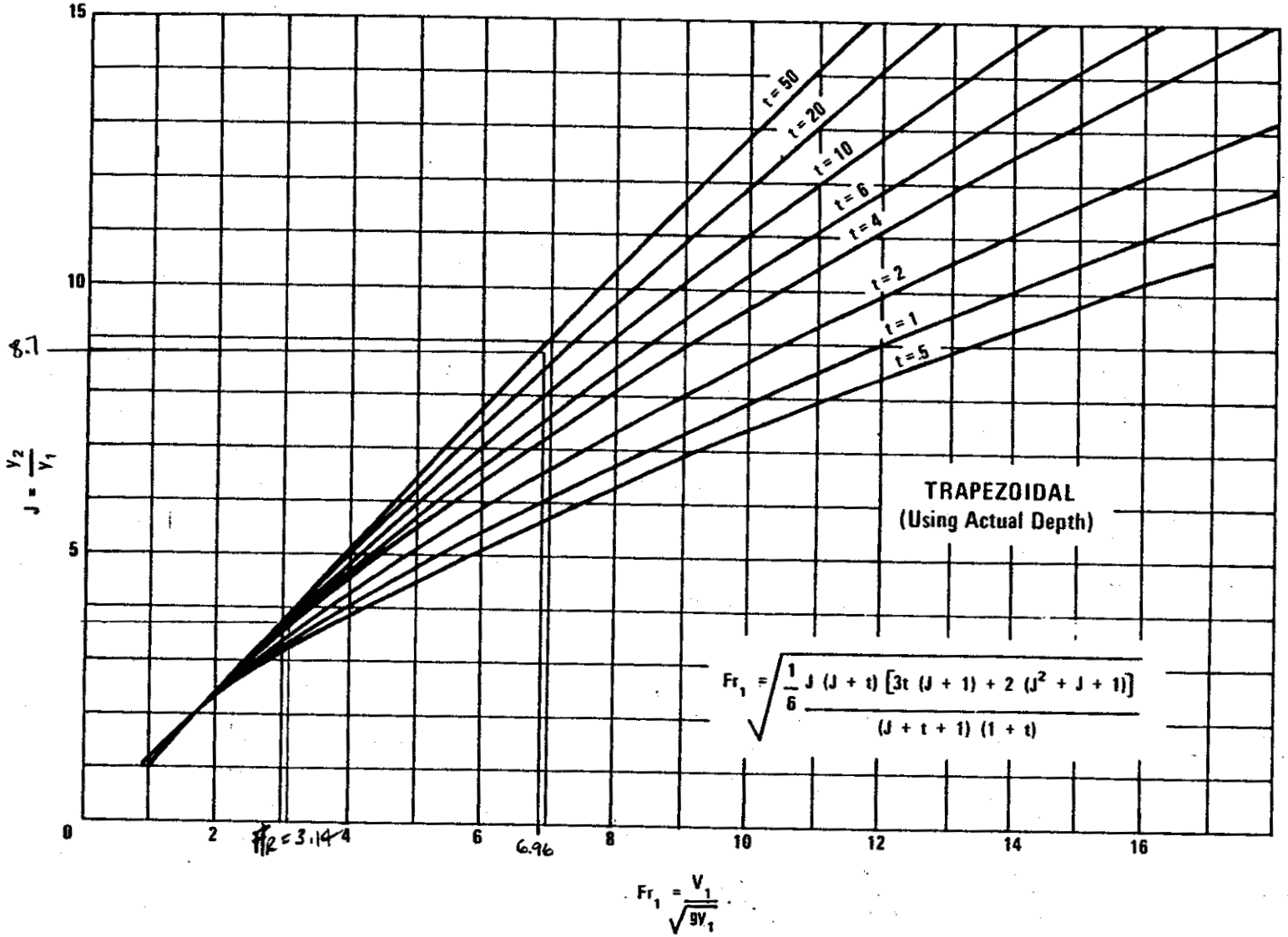


FIGURE VI-9 HYDRAULIC JUMP – HORIZONTAL, TRAPEZOIDAL CHANNEL (ACTUAL DEPTH)

APPENDIX III

E. LOCAL RUNOFF TO ELLSWORTH BASIN

LOCAL RUNOFF TO ELLSWORTH BASIN

The majority of the flow discharging into the Ellsworth Road detention basin is from two (2) concrete-lined spillways. However, an area south of Southern Avenue and north of the basin will generate sheet flow over the basin sides unless a collector channel is constructed. A cut ditch has therefore been located along the north and east sides of the basin to prevent excess rill action on the basins side slopes.

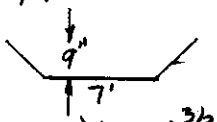
To determine what the discharge is along each side, the drainage area above each side was determined assuming the north boundary to be Southern Avenue. Runoff from these two (2) areas was determined by prorating the total area contributing to the basin (excluding the interceptor channels contribution).

COLLECTOR CHANNEL(S) ON EAST SIDE OF BASIN

49cfs TOTAL
PROVIDE 4 CHANNELS & SPILLWAYS

$\therefore$ Q PER SPILLWAY = $49/4 \cong 13$cfs

EACH SPILLWAY

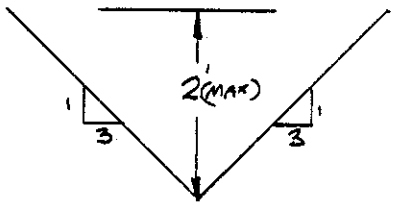


$Q = CLH^{3/2} = 3.0(7')(0.75)^{3/2} = 13.6$ cfs (MIN.) ok

COLLECTOR CHANNEL ALONG NORTH SIDE OF BASIN

Q = 18cfs

$S \cong 0.0070\%$



DESIGN OF CUT DITCH:

USE 3:1 SIDE SLOPES

CAPACITY @ 2': $A = 3(2)^2 = 12\,FT^2$, $WP = 2(2)\sqrt{1+3^2} = 12.65$, $R = 0.95$

$Q = \frac{1.49}{0.027}(12)(0.95)^{2/3}(0.007)^{1/2} = 53.5 \rightarrow 54$cfs, ok (54 > 18cfs)

$Q_{MAX} = 54\text{cfs}/12\,FT^2 = 4.5\,FT/SEC$

APPENDIX III

F. PIPE AND DROP INLET AT IRONWOOD DRIVE

PIPE AND DROP INLET AT IRONWOOD DRIVE

A portion of the freeway's local runoff resulting from east of Ironwood Drive will be intercepted and directed into the interceptor channel within the CVL design section. Tudor Engineering, design consultants for the freeway section east of Ironwood Drive determined the 50 year runoff from the contributing area. This was further developed by CVL for the 100-year runoff and incorporated into the final design results.

A drop inlet will be used to prevent the cut ditch east of Ironwood Drive from being too deep. Using the 100-year flow, the length of the weir for the drop inlet was determined and a HEC-5 analysis performed.

Ironwood Drive

Crossroad culvert

As shown on the following hydrologic data sheets, the Q_{100} crossing Ironwood Drive from the Tudor Engineering design section = 33 cfs
In addition, under Phase III of the contract a storm drain and catch basin system is designed to intercept street flows within Ironwood Drive as they approach the freeway from the north. As described in the design procedures of this report, Appendix II-D for crossroad drainage design, with the curbs flowing full at the north ADOT R/W potential street flow, $Q = K\sqrt{S}$

$= 339\sqrt{S}$ (half street)

Ironwood Drive has a longitudinal slope of 0.0094

$$Q_{max} = 2 \times 339 \times \sqrt{0.0094} = 66 \text{ cfs}$$

Combined with 33 cfs from east of Ironwood

$$Q_{TOTAL} = 66 + 33 = 99 \text{ cfs}$$

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET

S C S METHOD: PART I

LOCATION DATA:

Highway Superstition Freeway County Maricopa
Location E-O-W North of Fwy between North Diversion Dam & Stat. 1250+50
Project No. _____ Station 1250+50
Name of Stream _____

DESIGN DATA:

Design Frequency	50	years
Drainage Area	.0181	square miles
Drainage Length	320	feet
Elevation		
Top of Drainage Area	1628	feet
At Structure	1617.2	feet
Drainage Area Slope	1.03	%
Drainage Width	1050	feet
Width factor W_f	1.10	
Vegetative Cover Type		
Vegetative Cover Density		%
Soil Group		
Precipitation		
P = 6 hour =	2.87	inches
P = 24 hour =	3.65	inches

DESIGN COMPUTATION:

Precipitation	P = 1 hour =	2.11	inches
Curve Number		86	
Runoff	Q =	0.93	inches
Time of Concentration	Tc	0.17	hours
Time of Peak	Tp = (Tc)(Wf)	0.19	hours

Peak Discharge $Qp = \frac{484\,AQ}{Tp} = \frac{484(.018)(.93)}{0.19}$

= 28.9 cfs

Computed by B. Braaten Date 5/11/87

x Tc Calc.
450 ft overland flow at 1 ft/sec = 0.13 hr
550 ft channel flow at 4 ft/sec = 0.04 hr
0.17 hr

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET

S C S METHOD: PART I

LOCATION DATA:

Highway: SUPERSTITION FWY County: MARICOPA
Location: NORTH R/W BETWEEN IRONWOOD DR & STA 1250+50
Project No.: Station:
Name of Stream: ON-SITE

DESIGN DATA:

Design Frequency	100	years
Drainage Area	0.0121	square miles
Drainage Length	320	feet
Elevation		
Top of Drainage Area	1628	feet
At Structure	1617.2	feet
Drainage Area Slope	1.03	%
Drainage Width	1050	feet
Width factor W_f	1.10	
Vegetative Cover Type		
Vegetative Cover Density		%
Soil Group		
Precipitation		
P = 6 hour =	2.87	inches
P = 24 hour =	3.65	inches

DESIGN COMPUTATION:

Precipitation	P = 1 hour =	2.39	inches
Curve Number		86	
Runoff	Q =	1.06	inches
Time of Concentration	Tc	0.17	hours
Time of Peak	Tp = (Tc)(W_f)	0.19	hours
Peak Discharge	$Qp = \frac{484\,AQ}{Tp} =$	32.7cfs	
	=	33cfs	cfs

Computed by: TMOliver Date: 8/17/87
PWRH 5/88

NOTE: THE ABOVE HYDROLOGIC DATA WAS DETERMINED BY TUDOR ENG. FOR THE 50YR EVENT; C.V.L. USED THE SAME INFOR. (EXCEPT PRECIP) TO CALC. THE 100YR EVENT.

PROJECT: ADOT Superst. rwy

DESIGNER: [illegible]

DATE: 9/87

HYDROLOGIC AND CHANNEL INFORMATION

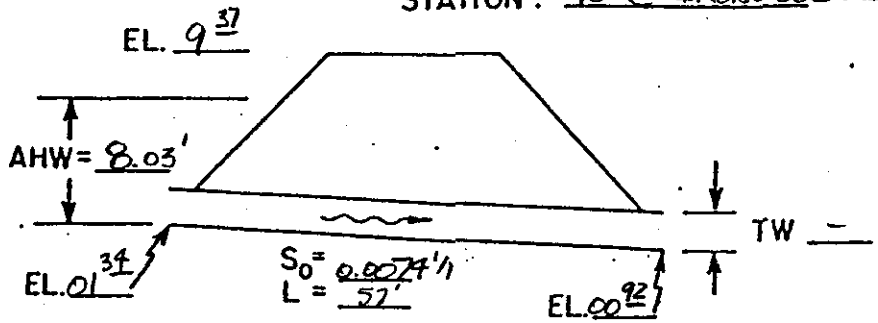
Q_1 = 66+33=99 TW_1 = –

Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: 48" @ IRONWOOD DR.



MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT. HW/D	INLET CONT. HW	OUTLET CONTROL HW=H+h_o−LS_o: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
1-RCP	99	48"	1.30	5.20	0.2	1.35	3.05	3.53	–	3.53	0.42	4.46	INLET 5.20	8.4		OK

SUMMARY & RECOMMENDATIONS:

USE 1-48" RCP, HW CONTROLS 30" PIPE UPSTREAM WITH TW FOR 30" PIPE = 5.20'

$v = \frac{Q}{A} = \frac{99}{11.79} = 8.4'/sec$

RWRH 5/88

4/5

ADOT

PROJECT: Superst. Fwy

DESIGN: T.D.

DATE: 9/87

HYDROLOGIC AND CHANNEL INFORMATION

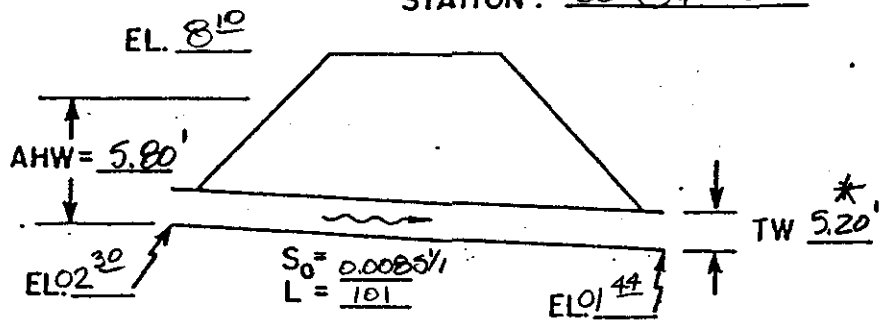
Q_1 = 33 cfs TW_1 = 5.20'

Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: 30" @ IRONWOOD DR.



MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT. HW/D	INLET CONT. HW	OUTLET CONTROL HW=H + h_o − LS_o: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
1-RCP	33	30"	1.34	3.35	0.2	1.25	1.85	2.18	5.2	5.2	0.86'	5.59	OUTLET 5.59			OK

SUMMARY & RECOMMENDATIONS:

PWH 5/88

* TW FROM DOWNSTREAM 48" PIPE

USE 1-30" RCP PIPE WITH DROP INLET (6' WEIR LENGTH)

C E & VAN LOO
PLANNING • ENGINEERING
LANDSCAPE ARCHITECTURE

Project SUPERST. FWY
Project No. 0257-10-0
Sheet No. 3 of 5
Calculated by TMO Date 8/13/87
Checked by _____ Date _____

WIDTH OF DROP INLET @
IRONWOOD DR. 30" PIPE

$Q = 24$ cfs FOR 50 YR (FROM TUDOR ENG)

USE 30 cfs ± FOR 100 YR

$Q = CLH^{3/2}$ WHERE $C = 3.0$, $Q = 30$ cfs, L & H VARY

1. SOLVE FOR H WITH $L = 5.0'$

$$H = \left(\frac{Q}{CL}\right)^{2/3} = \left[\frac{30}{3.0(5)}\right]^{2/3} = 1.60'$$

2. SOLVE FOR H WITH $L = 6.0'$

$$H = \left[\frac{30}{(3.0)6}\right]^{2/3} = 1.41$$, W.S.E. @ 1606.46 ±

OK, USE 6' WEIR WIDTH

4550 NORTH 12TH STREET • PHOENIX, ARIZONA 85014 • PHONE (602) 264-6831

ARIZONA DEPARTMENT OF TRANSPORTATION

STRUCTURE SUMMARY SHEET

LOCATION DATA
Highway: Superstition Freeway (SR360)
Location: Ellsworth Road - Ironwood Drive
Project No: F-028-1-313PE, 513C

DESIGN DATA
Frequency 100 Years

STRUCTURE DATA

Station	IRONWOOD DR., MED & STA. 1235+79.49
Drainage Area	0.0121 mi²
Design Frequency and Discharge	33 cfs
Type, Size and Length of Structure	1-30" x 101' RCP
Inlet and Outlet Treatment (headwall, end section, etc.)	INLET - DROP INLET, OUTLET - INTO MANHOLE
Invert Elevations and Slope in Percent	IN - 1602.32, OUT - 1601.44, S=0.0085%
Subgrade Elevation	1608.10
Allowable Headwater Elevation	1608.10
Design Headwater Elevation	1607.89
Record High Water (if Applicable)	–
Natural Channel Velocity	–
Culvert Outlet Velocity	–
Outlet Protection (type)	MANHOLE
Ponding Beyond Right-of-Way - Reference Paragraph B 6 C 10	–

COE & VAN LOO CONSULTING ENGINEERS, INC.

CVL-8-0097

ARIZONA DEPARTMENT OF TRANSPORTATION

STRUCTURE SUMMARY SHEET

LOCATION DATA

Highway: Superstition Freeway (SR360)
Location: Ellsworth Road - Ironwood Drive
Project No: F-028-1-313PE, 513C

DESIGN DATA

Frequency 100 Years

STRUCTURE DATA

Station	IRONWOOD DR., MED ℄ STA. 1235+79.57
Drainage Area	–
Design Frequency and Discharge	99 CFS
Type, Size and Length of Structure	1-48"x57' RCP
Inlet and Outlet Treatment (headwall, end section, etc.)	INLET - MANHOLE OUTLET - HEADWALL ONLY
Invert Elevations and Slope in Percent	IN - 1601.34 OUT - 1600.92, S=0.0074 ft/ft
Subgrade Elevation	1608.79
Allowable Headwater Elevation	1609.37 (IN MANHOLE)
Design Headwater Elevation	1606.54
Record High Water (if Applicable)	–
Natural Channel Velocity	–
Culvert Outlet Velocity	8.4 ft/sec
Outlet Protection (type)	LINED CHANNEL
Ponding Beyond Right-of-Way - Reference Paragraph B 6 C 10	–

COE & VAN LOO CONSULTING ENGINEERS, INC.

CVL-8-0097

APPENDIX III

G. CULVERT SUMMARY COMPUTATIONS

ARIZONA DEPARTMENT OF TRANSPORTATION

CULVERT COMPUTATION RECORD

PROJECT: SUPERSTITION FWY

STATION: 1076+92.96 CRISMON ROAD

DESIGNER: TMO 7/87

DATE: _____

HYDROLOGIC AND CHANNEL INFORMATION

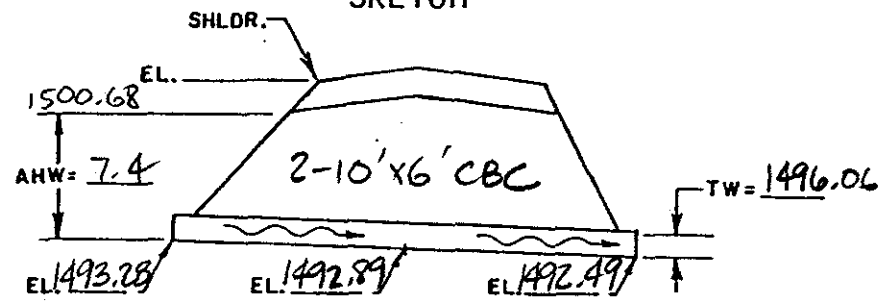
DRAINAGE AREA _____

Q_1 = 769 cfs (Q100) TW_1 = _____

Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}; Q_2 = CHECK DISCHARGE, SAY Q_{50})

SKETCH



S_o = 0.0052'/1 L = 153' L/100 S_o = 0.79'

MEAN STREAM VELOCITY = _____

CULVERT DESCRIPTION		Q	CAP. CHART HW	HEADWATER COMPUTATION										CONTROL HW	OUTLET VELOCITY	COST	DHW ELEV.	COMMENTS
				INLET CONT.		OUTLET CONTROL $HW = H + h_o - LS_o$												
SIZE	ENTR. TYPE			$\frac{HW}{D}$	HW	K_e	H	d_c	$\frac{d_c + D}{2}$	TW	h_o	LS_o	HW					
10'x6'	TRANS.	384.5		0.92	5.5	0.2	1.0	3.65	4.8	3.57	4.8	0.79	5.01	5.5*	10.77			

SUMMARY & RECOMMENDATIONS

*NOTE: Refer to water surface profile analysis for true water surface elevs.

CHK RWH 5/88

ARIZONA DEPARTMENT OF TRANSPORTATION

CULVERT COMPUTATION RECORD

PROJECT: SUPERSTITION FWY

DESIGNER: TMO 7/87

STATION: 1109+80

DATE: _____

HYDROLOGIC AND CHANNEL INFORMATION

DRAINAGE AREA _____

Q_1 = 567 (Q_{100})

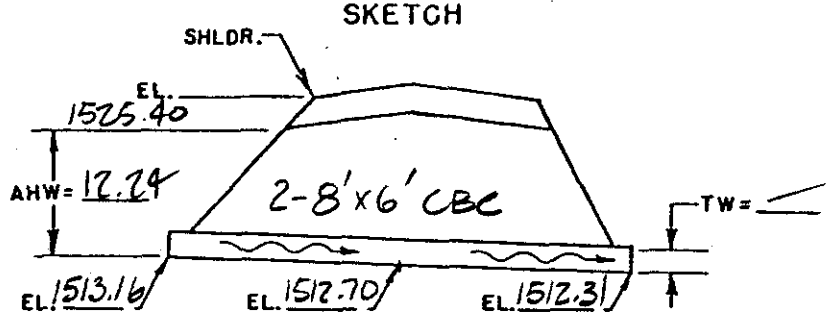
Q_2 = _____

TW_1 = _____

TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}; Q_2 = CHECK DISCHARGE, SAY Q_{50})

SKETCH



S_0 = 0.0030 L = 280' L/100 S_0 = 0.85'

MEAN STREAM VELOCITY = _____

CULVERT DESCRIPTION		Q	CAP. CHART HW	HEADWATER COMPUTATION										CONTROL HW	OUTLET VELOCITY	COST	DHW ELEV.	COMMENTS
				INLET CONT.		OUTLET CONTROL $HW = H + h_o - LS_o$												
SIZE	ENTR. TYPE			$\frac{HW}{D}$	HW	K_e	H	d_c	$\frac{d_c + D}{2}$	TW	h_o	LS_o	HW					
8'x6'	TRANS.	283.5		0.91	5.46	0.2	1:0	3.3	4.65	—	4.65	0.85	4.8	5.46*	7.6			

SUMMARY & RECOMMENDATIONS

*NOTE: Refer to water surface profile analysis for true water surface elevs.

CHK PWH 5/88

20-4403 12-74

ARIZONA DEPARTMENT OF TRANSPORTATION

CULVERT COMPUTATION RECORD

PROJECT: SUPERSTITION FWY

STATION: 1129+94.82

DESIGNER: TMO 7/87

DATE: _____

HYDROLOGIC AND CHANNEL INFORMATION

DRAINAGE AREA _____

Q_1 = 567 (Q100)

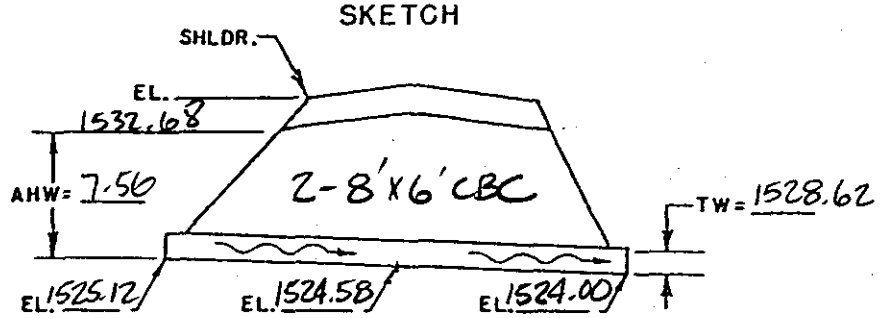
Q_2 = _____

TW_1 = _____

TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50})

SKETCH



S_o = 0.0071 L = 157' L/100 S_o = 1.12

MEAN STREAM VELOCITY = _____

HEADWATER COMPUTATION

CULVERT DESCRIPTION		Q	CAP. CHART HW	INLET CONT.		OUTLET CONTROL HW = H + h_o − LS_o								CONTROL HW	OUTLET VELOCITY	COST	DHW ELEV.	COMMENTS
SIZE	ENTR. TYPE			HW/D	HW	K_e	H	d_c	$\frac{d_c + D}{2}$	TW	h_o	LS_o	HW					
8'x6'	TRANS.	283.5		0.91	5.46	0.2	0.87	3.3	4.65	4.62	4.65	1.12	4.33	5.46*	7.67			

SUMMARY & RECOMMENDATIONS

* NOTE: Refer to water surface profile analysis for true water surface elevs.

CHK RWRH 5/88

ARIZONA DEPARTMENT OF TRANSPORTATION

CULVERT COMPUTATION RECORD

PROJECT: SUPERSTITION FWY

DESIGNER: TMO 7/87

STATION: 1161+00

DATE:

HYDROLOGIC AND CHANNEL INFORMATION

DRAINAGE AREA

Q_1 = 423 (Q_{100})

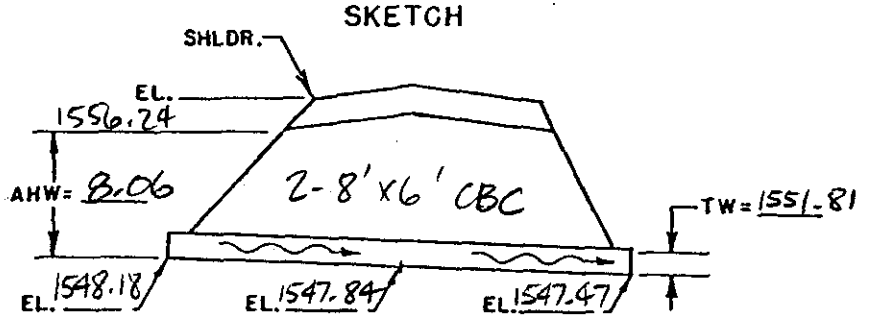
Q_2 =

TW_1 =

TW_2 =

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50})

SKETCH



S_o = 0.0034/1 L = 209' L/100 S_o = 0.71

MEAN STREAM VELOCITY =

CULVERT DESCRIPTION		Q	CAP. CHART HW	HEADWATER COMPUTATION										CONTROL HW	OUTLET VELOCITY	COST	DHW ELEV.	COMMENTS
				INLET CONT.		OUTLET CONTROL $HW = H + h_o - LS_o$												
SIZE	ENTR. TYPE			$\frac{HW}{D}$	HW	K_e	H	d_c	$\frac{d_c + D}{2}$	TW	h_o	LS_o	HW					
8'x6'	TRANS.	211.5		0.71	4.26	0.2	0.5	2.75	4.4	4.34	4.4	0.7	4.2	4.26*	6.1			

* SUMMARY & RECOMMENDATIONS

NOTE: Refer to water surface profile analysis for true water surface elevs.

CHK PWRH 5/88

ARIZONA DEPARTMENT OF TRANSPORTATION

CULVERT COMPUTATION RECORD

PROJECT: SUPERSTITION FWY.

STATION: 1186+00

DESIGNER: TMO

DATE: 9/87

HYDROLOGIC AND CHANNEL INFORMATION

DRAINAGE AREA Sub-Area 206

Q_1 = 38 (100-year)

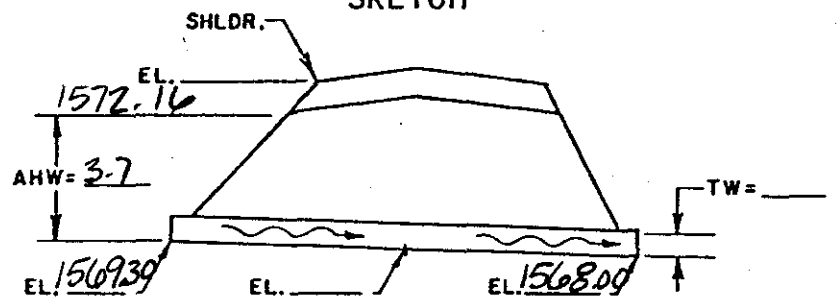
Q_2 = _____

TW_1 = _____

TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50})

SKETCH



S_o = 0.00657'/' L = 198' L/100 S_o = 1.30

MEAN STREAM VELOCITY = _____

CULVERT DESCRIPTION		Q	CAP. CHART HW	HEADWATER COMPUTATION										CONTROL HW	OUTLET VELOCITY	COST	DHW ELEV.	COMMENTS
				INLET CONT.		OUTLET CONTROL $HW = H + h_o - LS_o$												
SIZE	ENTR. TYPE			$\frac{HW}{D}$	HW	K_e	H	d_c	$\frac{d_c + D}{2}$	TW	h_o	LS_o	HW					
30"	Square Headwall	19		0.92	2.76	0.2	0.7	1.5	2.25	—	2.25	1.30	1.65	2.76	4.0			O.K.

SUMMARY & RECOMMENDATIONS

CHK PWRH 5/88

ARIZONA DEPARTMENT OF TRANSPORTATION

CULVERT COMPUTATION RECORD

PROJECT: SUPERSTITION FWY

STATION: 1205+20

DESIGNER: TMO 7/87

DATE:

HYDROLOGIC AND CHANNEL INFORMATION

DRAINAGE AREA

Q_1 = 566 (Q100)

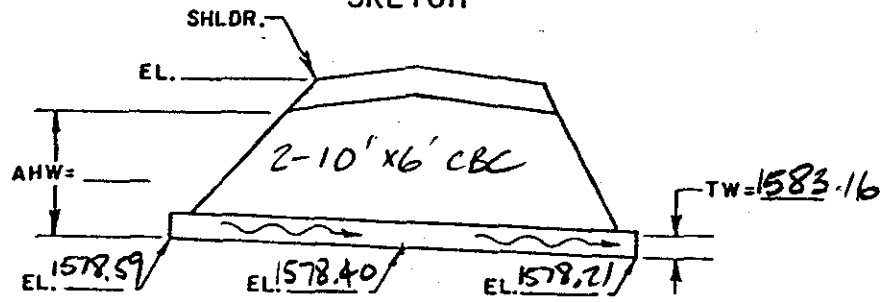
Q_2 =

TW_1 =

TW_2 =

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50})

SKETCH



S_0 = 0.0021'/'

L = 182

L/100 S_0 = 0.38'

MEAN STREAM VELOCITY =

CULVERT DESCRIPTION		Q	CAP. CHART HW	HEADWATER COMPUTATION										CONTROL HW	OUTLET VELOCITY	COST	DHW ELEV.	COMMENTS
				INLET CONT.		OUTLET CONTROL $HW = H + h_0 - LS_0$												
SIZE	ENTR. TYPE			$\frac{HW}{D}$	HW	K_e	H	d_c	$\frac{d_c + D}{2}$	TW	h_0	LS_0	HW					
10'x6'		283		0.74	4.44	0.2	0.55	3.0	4.5	4.95	4.95	0.38	5.12	5.12*	5.7			

* SUMMARY & RECOMMENDATIONS

NOTE: Refer to water surface profile analysis for true water surface elevs.

CHK PWH 5/88

ARIZONA DEPARTMENT OF TRANSPORTATION

STRUCTURE SUMMARY SHEET

LOCATION DATA
Highway: Superstition Freeway (SR360)
Location: Ellsworth Road - Ironwood Drive
Project No: F-028-1-313PE, 513C

DESIGN DATA
Frequency 100 Years

STRUCTURE DATA

Station	CRISMON RD., MED ℄ STA. 1076+92.47
Drainage Area	-
Design Frequency and Discharge	769 cfs
Type, Size and Length of Structure	2-10'x6'x153 CBC.
Inlet and Outlet Treatment (headwall, end section, etc.)	INLET - — OUTLET - —
Invert Elevations and Slope in Percent	IN - 1493.28 OUT - 1492.99, S=0.0052%
Subgrade Elevation	1501.18
Allowable Headwater Elevation	1500.68
Design Headwater Elevation	1598.78
Record High Water (if Applicable)	-
Natural Channel Velocity	-
Culvert Outlet Velocity	10.8
Outlet Protection (type)	LINED CHANNEL
Ponding Beyond Right-of-Way - Reference Paragraph B 6 C 10	-

COE & VAN LOO CONSULTING ENGINEERS, INC.

CVL-8-0097

ARIZONA DEPARTMENT OF TRANSPORTATION

STRUCTURE SUMMARY SHEET

LOCATION DATA
Highway: Superstition Freeway (SR360)
Location: Ellsworth Road - Ironwood Drive
Project No: F-028-1-313PE, 513C

DESIGN DATA
Frequency 100 Years

STRUCTURE DATA

Station	MED ℄ STA. 1109+80
Drainage Area	-
Design Frequency and Discharge	567cfs
Type, Size and Length of Structure	2-8'x6'x280' CBC
Inlet and Outlet Treatment (headwall, end section, etc.)	INLET - — OUTLET - HEADWALL WINGS & APRON
Invert Elevations and Slope in Percent	IN - 1513.16 OUT - 1512.31, S=0.0030'/'
Subgrade Elevation	1525.90
Allowable Headwater Elevation	1525.40
Design Headwater Elevation	1518.62
Record High Water (if Applicable)	-
Natural Channel Velocity	-
Culvert Outlet Velocity	7.6'/sec
Outlet Protection (type)	-
Ponding Beyond Right-of-Way - Reference Paragraph B 6 C 10	-

COE & VAN LOO CONSULTING ENGINEERS, INC.

CVL-8-0097

ARIZONA DEPARTMENT OF TRANSPORTATION

STRUCTURE SUMMARY SHEET

LOCATION DATA
Highway: Superstition Freeway (SR360)
Location: Ellsworth Road - Ironwood Drive
Project No: F-028-1-313PE, 513C

DESIGN DATA
Frequency 100 Years

STRUCTURE DATA

Station	SIGNAL BUTTE RD, MED ℄ STA 1129+94.49
Drainage Area	—
Design Frequency and Discharge	567 cfs
Type, Size and Length of Structure	2-8'x6'x157 C.B.C.
Inlet and Outlet Treatment (headwall, end section, etc.)	INLET - — OUTLET - —
Invert Elevations and Slope in Percent	IN - 1525.12 OUT - 1524.00, S=0.0071 ft/ft
Subgrade Elevation	1533.18
Allowable Headwater Elevation	1532.68
Design Headwater Elevation	1530.58
Record High Water (if Applicable)	-
Natural Channel Velocity	-
Culvert Outlet Velocity	7.7 ft/sec
Outlet Protection (type)	LINED CHANNEL
Ponding Beyond Right-of-Way - Reference Paragraph B 6 C 10	—

COE & VAN LOO CONSULTING ENGINEERS, INC.

CVL-8-0097

ARIZONA DEPARTMENT OF TRANSPORTATION

STRUCTURE SUMMARY SHEET

LOCATION DATA
Highway: Superstition Freeway (SR360)
Location: Ellsworth Road - Ironwood Drive
Project No: F-028-1-313PE, 513C

DESIGN DATA
Frequency 100 Years

STRUCTURE DATA

Station	MED ℄ STA 1161+00
Drainage Area	–
Design Frequency and Discharge	423 cfs
Type, Size and Length of Structure	2-8'x6'x209' CBC.
Inlet and Outlet Treatment (headwall, end section, etc.)	INLET - — OUTLET - HEADWALL WINGS & APRON
Invert Elevations and Slope in Percent	IN - 1548.18 OUT - 1547.17, S=0.0035'/'
Subgrade Elevation	1556.74
Allowable Headwater Elevation	1556.24
Design Headwater Elevation	1552.44
Record High Water (if Applicable)	–
Natural Channel Velocity	–
Culvert Outlet Velocity	6.1 '/sec
Outlet Protection (type)	STILLING BASIN
Ponding Beyond Right-of-Way - Reference Paragraph B 6 C 10	–

COE & VAN LOO CONSULTING ENGINEERS, INC.

CVL-8-0097

ARIZONA DEPARTMENT OF TRANSPORTATION

STRUCTURE SUMMARY SHEET

LOCATION DATA
Highway: Superstition Freeway (SR360)
Location: Ellsworth Road - Ironwood Drive
Project No: F-028-1-313PE, 513C

DESIGN DATA
Frequency 100 Years

STRUCTURE DATA

Station	MED ℄ STA. 1186+00
Drainage Area	0.05 MI^2
Design Frequency and Discharge	38 cfs
Type, Size and Length of Structure	2-30"x198' RCP
Inlet and Outlet Treatment (headwall, end section, etc.)	INLET & OUTLET - L HEADWALLS
Invert Elevations and Slope in Percent	IN - 1569.30 OUT - 1568.00, S=0.0066'/'
Subgrade Elevation	1572.66
Allowable Headwater Elevation	1572.16
Design Headwater Elevation	1572.06
Record High Water (if Applicable)	-
Natural Channel Velocity	-
Culvert Outlet Velocity	4.0'/sec
Outlet Protection (type)	NONE
Ponding Beyond Right-of-Way - Reference Paragraph B 6 C 10	-

COE & VAN LOO CONSULTING ENGINEERS, INC.

CVL-8-0097

ARIZONA DEPARTMENT OF TRANSPORTATION

STRUCTURE SUMMARY SHEET

LOCATION DATA
Highway: Superstition Freeway (SR360)
Location: Ellsworth Road - Ironwood Drive
Project No: F-028-1-313PE, 513C

DESIGN DATA
Frequency 100 Years

STRUCTURE DATA

Station	MED ℄ STA 1205+20
Drainage Area	0.94 MI²
Design Frequency and Discharge	599 cfs
Type, Size and Length of Structure	2-10'x6'x182' C.B.C.
Inlet and Outlet Treatment (headwall, end section, etc.)	OUTLET - HEADWALL WINGS & APRON
Invert Elevations and Slope in Percent	INLET - 1578 59 OUTLET - 1578 21, S=0.0021 ft/ft
Subgrade Elevation	1586 26
Allowable Headwater Elevation	1586 26
Design Headwater Elevation	1583 71
Record High Water (if Applicable)	-
Natural Channel Velocity	-
Culvert Outlet Velocity	5.7 ft/sec
Outlet Protection (type)	STILLING POOL
Ponding Beyond Right-of-Way - Reference Paragraph B 6 C 10	-

COE & VAN LOO CONSULTING ENGINEERS, INC.

CVL-8-0097

SUPERSTITION FREEWAY
ELLSWORTH RD. – IRONWOOD RD.
MARICOPA COUNTY – PINAL COUNTY

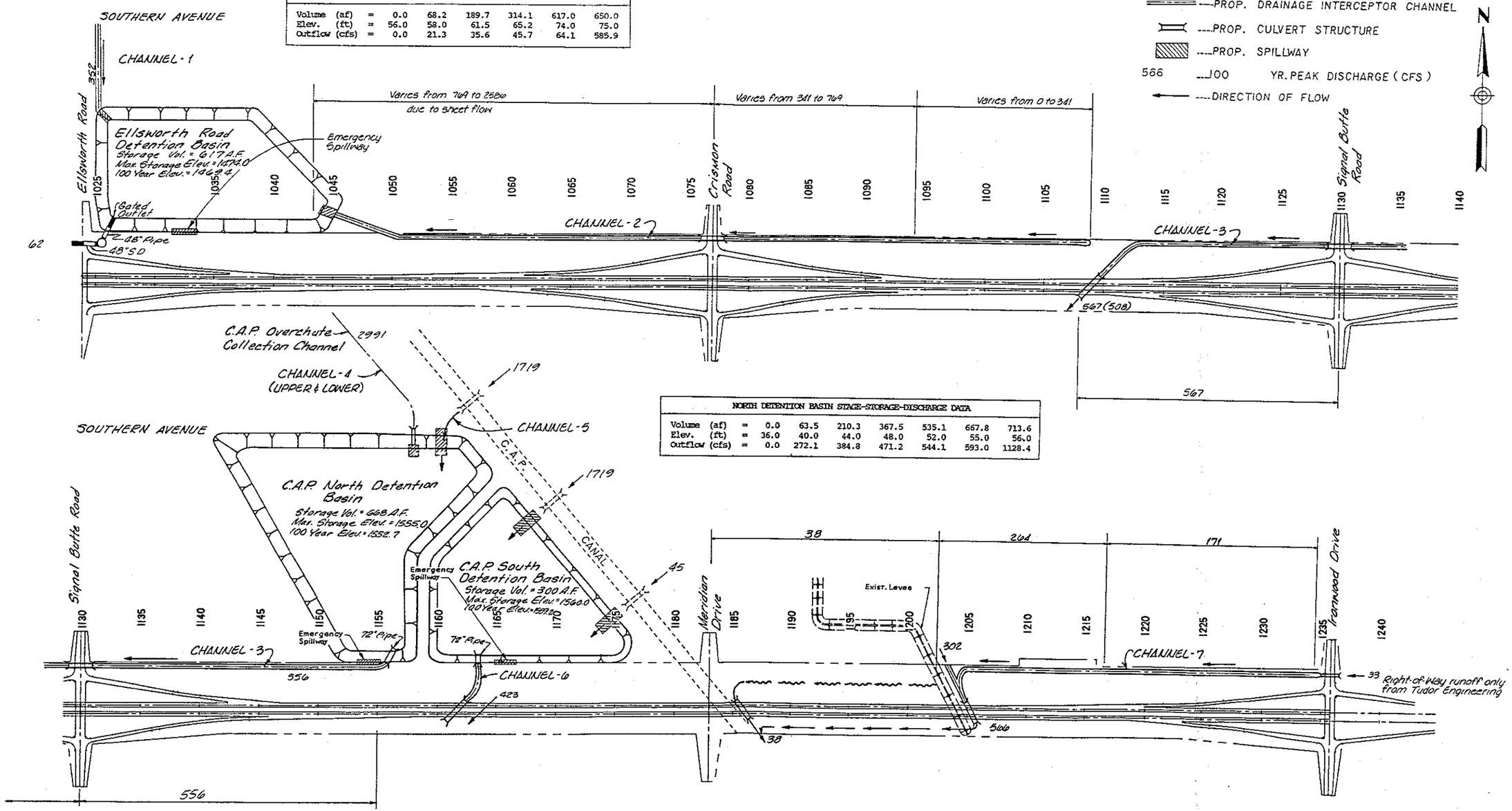
0 400 800 1200
200 Scale in Feet

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	F-028-1-513			

LEGEND
- PROP. DRAINAGE INTERCEPTOR CHANNEL
- PROP. CULVERT STRUCTURE
- PROP. SPILLWAY
- 566 100 YR. PEAK DISCHARGE (CFS)
- DIRECTION OF FLOW

N

ELLSWORTH DETENTION BASIN STAGE-STORAGE-DISCHARGE DATA							
Volume (af)	=	0.0	68.2	189.7	314.1	617.0	650.0
Elev. (ft)	=	56.0	58.0	61.5	65.2	74.0	75.0
Outflow (cfs)	=	0.0	21.3	35.6	45.7	64.1	585.9



NORTH DETENTION BASIN STAGE-STORAGE-DISCHARGE DATA								
Volume (af)	=	0.0	63.5	210.3	367.5	535.1	667.8	713.6
Elev. (ft)	=	36.0	40.0	44.0	48.0	52.0	55.0	56.0
Outflow (cfs)	=	0.0	272.1	384.8	471.2	544.1	593.0	1128.4

SOUTH DETENTION BASIN STAGE-STORAGE-DISCHARGE DATA								
Volume (af)	=	0.0	105.1	165.9	241.3	300.0	340.0	
Elev. (ft)	=	49.5	53.2	55.3	58.0	60.0	61.0	
Outflow (cfs)	=	0.0	260.9	328.8	395.4	440.8	981.3	

	NAME	DATE
DESIGN	T.M. Oliver	9/82
DRAWN	Jan	9/87
CHECKED	P.W.R. II	5/86
APPROVED		
ROUTE	MILEPOST	LOCATION

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
COE & VAN LOO CONSULTING ENGINEERS INC.

OFFSITE DRAINAGE SYSTEM

SHEET 1 OF 1

DATE | LOCATION | REVISIONS | FINISHED PLANS | SURVEY NO.

BRUNING 103549-1

Appendix II

___ OF ___

PLATE 1

SUPERSTITION FREEWAY
ELLSWORTH RD. – IRONWOOD RD.
MARICOPA COUNTY – PINAL COUNTY

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	F-020-1-513			

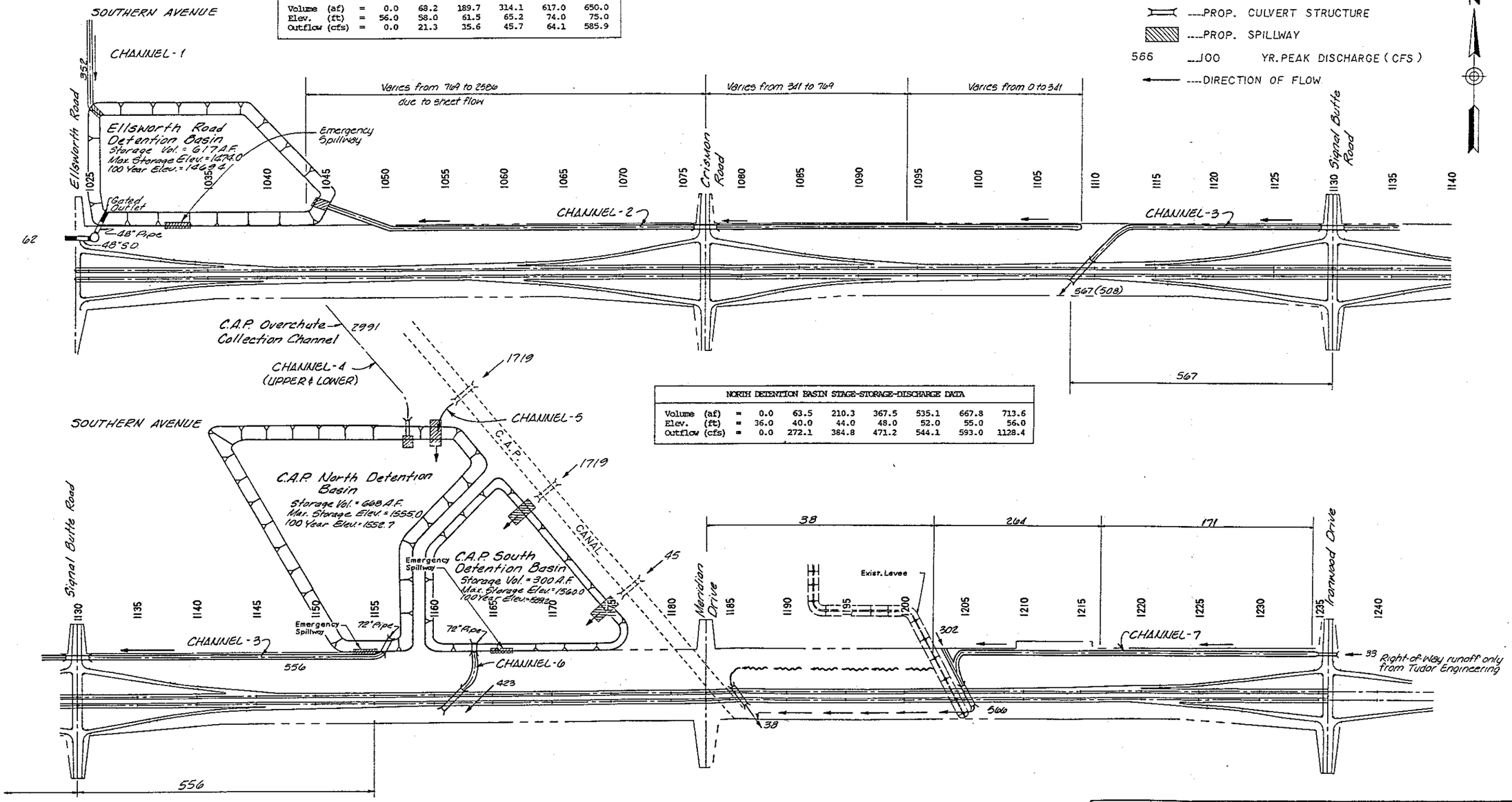
0 400 800 1200
200 Scale in Feet

LEGEND
- PROP. DRAINAGE INTERCEPTOR CHANNEL
- PROP. CULVERT STRUCTURE
- PROP. SPILLWAY
- 566 100 YR. PEAK DISCHARGE (CFS)
- DIRECTION OF FLOW

N

ELLSWORTH DETENTION BASIN STAGE-STORAGE-DISCHARGE DATA

Volume (af)	=	0.0	68.2	189.7	314.1	617.0	650.0
Elev. (ft)	=	56.0	58.0	61.5	65.2	74.0	75.0
Outflow (cfs)	=	0.0	21.3	35.6	45.7	64.1	585.9



NORTH DETENTION BASIN STAGE-STORAGE-DISCHARGE DATA

Volume (af)	=	0.0	63.5	210.3	367.5	535.1	667.8	713.6
Elev. (ft)	=	36.0	40.0	44.0	48.0	52.0	55.0	56.0
Outflow (cfs)	=	0.0	272.1	384.8	471.2	544.1	593.0	1128.4

SOUTH DETENTION BASIN STAGE-STORAGE-DISCHARGE DATA

Volume (af)	=	0.0	105.1	165.9	241.3	300.0	340.0
Elev. (ft)	=	49.5	53.2	55.3	58.0	60.0	61.0
Outflow (cfs)	=	0.0	260.9	328.8	395.4	440.8	981.3

	NAME	DATE
DESIGN	T.M. Oliver	3/87
DRAWN	Jan	7/87
CHECKED	P.W.R. II	5/88
APPROVED		
ROUTE	MILEPOST	LOCATION

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
COE & VAN LOO CONSULTING ENGINEERS INC.

OFFSITE DRAINAGE SYSTEM

SHEET 1 OF 1

DATE | LOCATION | REVISIONS | FINISHED PLANS | SURVEY NO.

BRUNING 103549-1

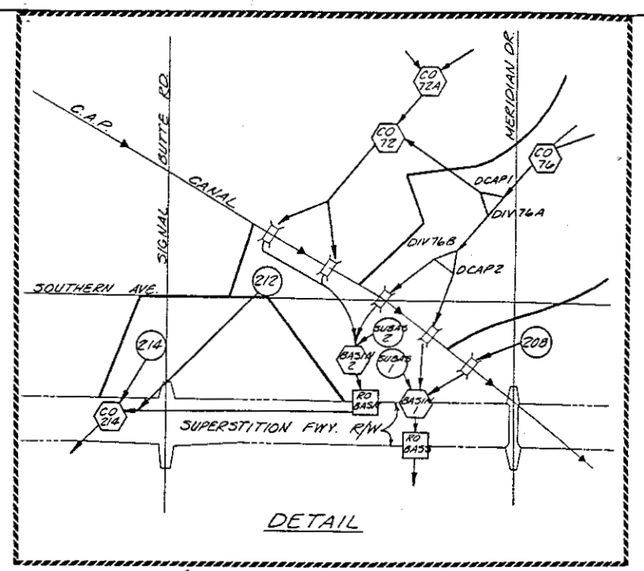
Appendix II

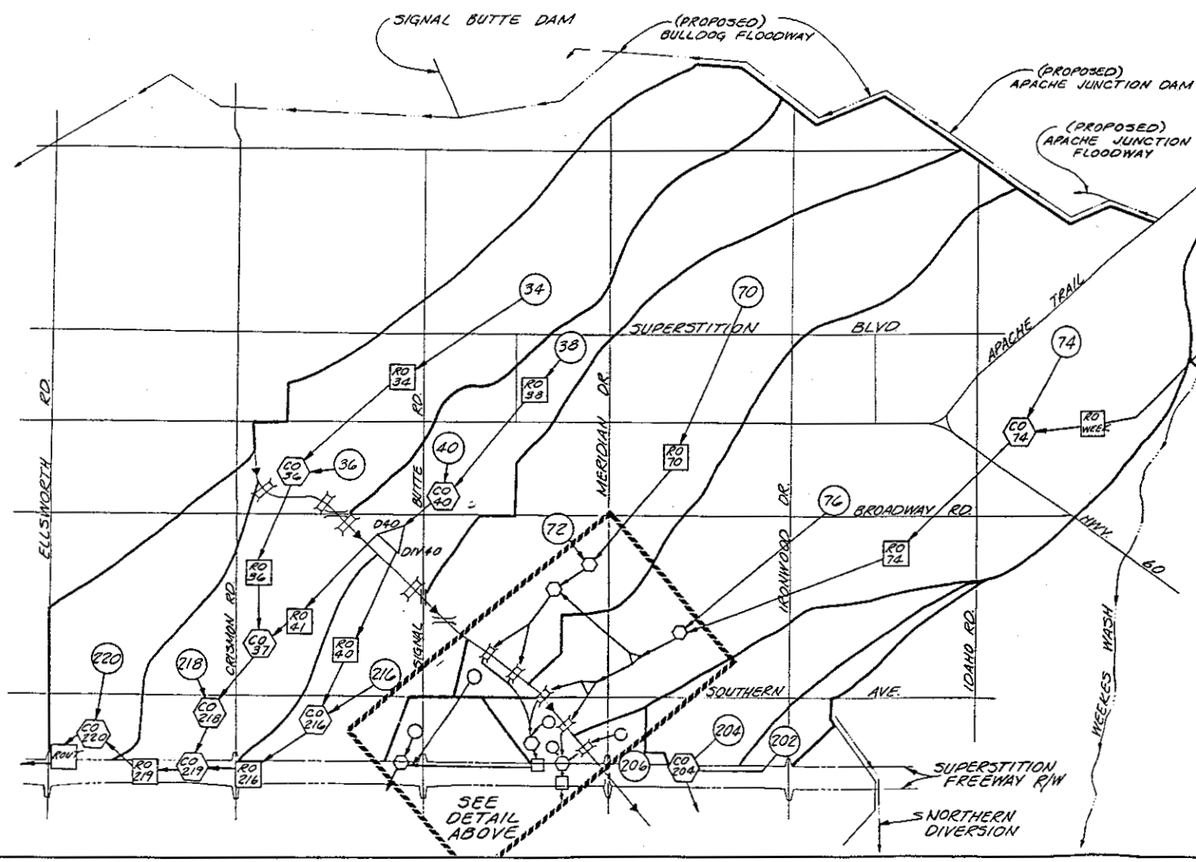
OF

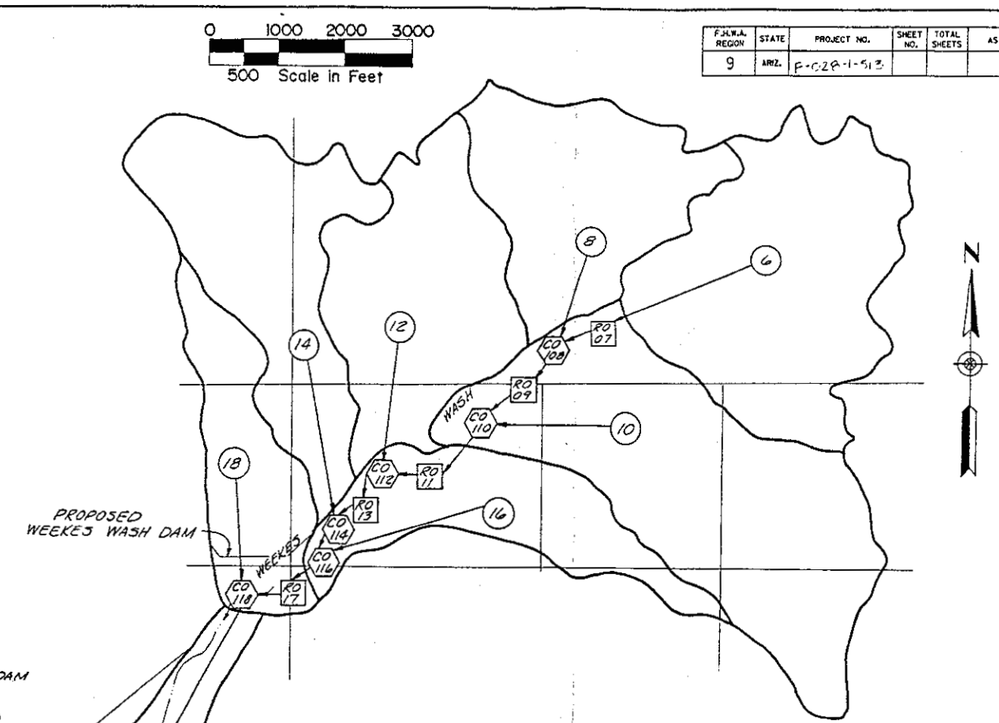
PLATE 1

SUPERSTITION FREEWAY
ELLSWORTH RD. – IRONWOOD RD.
MARICOPA COUNTY – PINAL COUNTY

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	F-028-1-513			







LEGEND

- C.A.P. OVERCHUTE
- SUBAREA CALCULATION
- COMBINED HYDROGRAPH
- ROUTE HYDROGRAPH
- DIVERT HYDROGRAPH
- ROAD OR STREET AS INDICATED
- BRIDGE
- FLOODWAY (DIVERSION CHANNEL)
- CENTRAL ARIZONA PROJECT CANAL

	NAME	DATE
DESIGN	T.M. Oliver	8/87
DRAWN	N. Westfall	8/87
CHECKED	P.W.R.H.	5/88
APPROVED		
ROUTE	MILEPOST	LOCATION

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
COE & VAN LOO CONSULTING ENGINEERS INC

HYDROLOGY SCHEMATIC

SHEET 1 OF 1

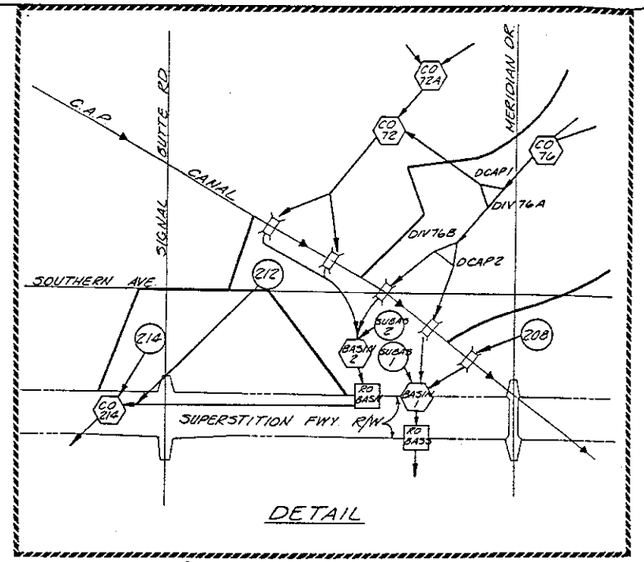
SURVEY NO.	FINISHED PLANS	REVISIONS	LOCATION	DATE

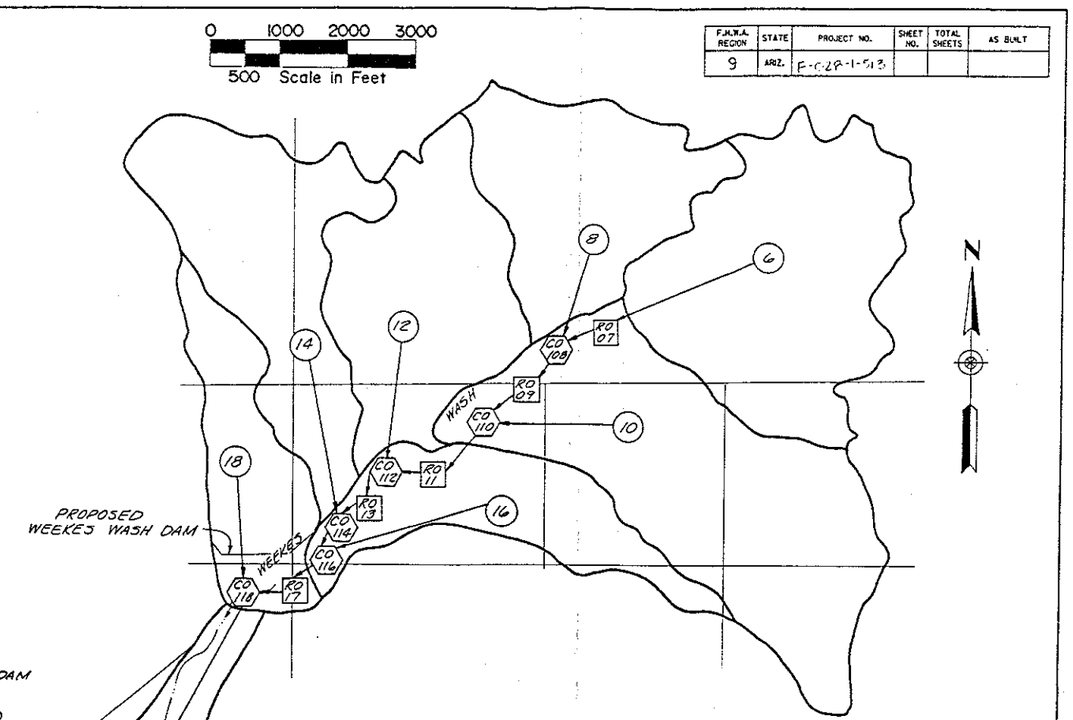
BRUNING 103549-1

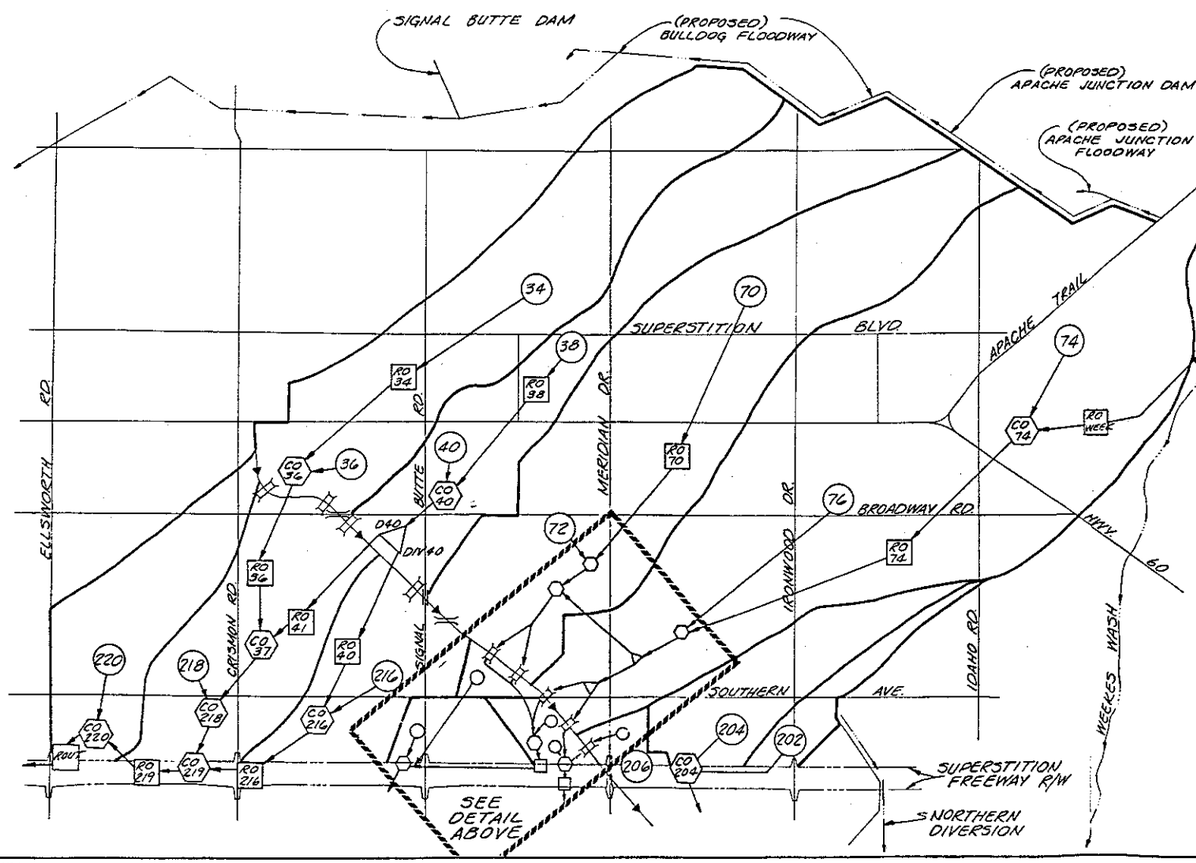
OF

SUPERSTITION FREEWAY
ELLSWORTH RD. – IRONWOOD RD.
MARICOPA COUNTY – PINAL COUNTY

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	F-028-1-513			







LEGEND

- C.A.P. OVERCHUTE
- SUBAREA CALCULATION
- COMBINED HYDROGRAPH
- ROUTE HYDROGRAPH
- DIVERT HYDROGRAPH
- ROAD OR STREET AS INDICATED
- BRIDGE
- FLOODWAY (DIVERSION CHANNEL)
- CENTRAL ARIZONA PROJECT CANAL

	NAME	DATE
DESIGN	T.M. Oliver	8/87
DRAWN	N. Westfall	8/87
CHECKED	P.W.R.H.	5/88
APPROVED		
ROUTE	MILEPOST	LOCATION

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
COE & VAN LOO CONSULTING ENGINEERS INC

HYDROLOGY SCHEMATIC

SHEET 1 OF 1

DATE	LOCATION	REVISIONS	FINISHED PLANS	SURVEY NO.

BRUNING 103549-1

___ OF ___

PLATE 2