DRAINAGE REPORT

FISHER CANYON CHANNEL MASTER

FROM COUNTRY BROADMOOR FILING #1 TO CHEYENNE MEADOWS CHANNEL

COLORADO SPRINGS, COLORADO

DREXEL, BARRELL & CO.

ENGINEERS — SURVEYORS

1700 38TH STREET BOULDER, COLORADO 80301 (303) 442-4338

DRAINAGE REPORT

FISHER CANYON CHANNEL MASTER

FROM COUNTRY BROADMOOR FILING #1 TO

CHEYENNE MEADOWS CHANNEL

COLORADO SPRINGS, COLORADO

August 25, 1982

Prepared By: DREXEL, BARRELL & CO.
1700 38th Street
Boulder, Colorado

Prepared For: Gates Land Company

E-2589

CERTIFICATIONS

I, Barbara Weiss , a registered engineer in the State of Colorado, hereby certify that the attached drainage plan and report for Fisher Canyon Channel ,were prepared under my direction and supervision and are correct to the best of my knowledge and belief. I further certify that said drainage report is in accordance with all City of Colorado Springs ordinances, specifications, and criteria to the best of my knowledge.

BARBARA NAN WEISS
REGISTERED
Barbara Weiss 15711
PROFESSIONAL ENGINEER
STATE OF COLORADO

The developer has read and will comply with all of the requirements specified in this drainage report as approved by the City Engineer.

By
Robert F. Svejkovsky
Director of Engineering

Filed: Sept 16, 1992
City Engineer

DRAINAGE REPORT

FISHER CANYON CHANNEL

FROM COUNTRY BROADMOOR FILING #1 TO

CHEYENNE MEADOWS CHANNEL

COLORADO SPRINGS, COLORADO

This report details Fisher Canyon Channel from the box culvert under Wycliffe Road at Country Broadmoor #1 to Cheyenne Meadows Channel. The design flow for this portion of channel is 1355 cfs., the 100 year flow. This flow was documented in a report prepared by Drexel, Barrell in August 1979.

A concrete lined channel is planned to connect the box culvert in Wycliffe Drive to the box culvert planned for State Highway 115. This channel is designed to have 2:1 side slopes and a bottom width of 10'. Flow depth is 4' with an additional 1' provided for freeboard. Excessive velocity will be controlled by three drop structures to a maximum of 20 fps. Supercritical flow exists in this channel.

At State Highway 115 a double 10' by 6' box culvert has been proposed. A warped transition from the concrete channel will direct flow to the box culvert. Maximum flow depth in the culvert is 3.5'.

Fisher Canyon Channel merges with Cheyenne Meadows Channel east of State Highway 115. A transition channel is needed to direct flow from the box culvert under Highway 115 to Cheyenne Meadows Channel, which is an existing rip rap channel. A large rip rap channel is proposed to convey the design flow of 1355 cfs. from supercritical flow at the box culvert exit to subcritical flow in Cheyenne Meadows Channel. Rip rap has been sized to protect the transition channel from high velocities occuring at the box culvert exit. The channel side slopes are 2:1 with the channel bottom varying from a width of 21' to 12' near the confluence of Cheyenne Meadows Channel. An hydraulic jump will occur as the flow combines with water in Cheyenne Meadows Channel. Because the Froude number is small, F=1.3, the change in water surface from supercritical to subcritical flow is gradual. Only a slightly ruffled water surface will be evident. The water surface profile for both a storm of 1355 cfs. and 800 cfs. was analyzed.

In summary, construction of this proposed section of Fisher Canyon Channel will provide an outfall for both the upper reaches of the canyon and lower improved reach of the concrete lined channel. Flow will be transitioned from supercritical flow in Fisher Canyon Channel to subcritical flow existing in Cheyenne Meadows Channel.

Calculations and construction plans are included for your review in the appendix.

Respectfully submitted,

Barbara Weiss

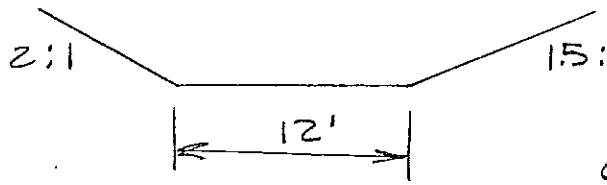
Barbara Weiss

Project: Box Culvert @ Hwy 115 | Job No: E-2559

Client: Gates | By: BMW | Date: June 11, 1982

Cheyenne Meadows channel - existing 100yr

Q = 485 + 124 + 1355 = 1964 cfs
(Curn) (Cross Trail) Fisher



design

riprap

n = 0.035 { n = 0.045

@ S 1.49%
D = 6.5' D = 7.4'
V = 13. fps V = 10.8 fps

@ S = .78%
D = 7.6' D = 8.6'
V = 10.2 fps V = 8.5 fps }
Dc = 6.8'

downstream of Fisher channel confluence

actual

S = 1.2%
B = 8' (min.)
Z = 2:1
n = 0.04

max → D = 7.8' Dc = 7.2'
V = 10.3 fps

@ B = 12' D = 7'

Project: Box Culvert @ Hwy 115 | Job No: E-2589

Client: Gates | By: BNW | Date: June 11, 1982

Box Culvert Grade Alternates

Double 10'x4'high @1%

@ exit $D_o = 3.8'$ $F = \frac{V}{\sqrt{gL}}$

$L = 3.8$ $V = \frac{1355}{3.8(20)} = 17.8$ fps

$F = \frac{17.8}{\sqrt{32.2(3.8)}} = 1.6$ 1.5

if $S = 2\%$ ← Use

$D_n = 3.2$ $V = 21.2$ $F = 2.1$ (exit culvert)

assume $D_o = 3.3'$

$V = 20.5$ fps

$F = \frac{20.5}{\sqrt{32.2(3.3)}} = 2.0$

$F < 3$

@ $S = 3\%$ straight grade $\Delta 7.5'$

$D_n = 2.8$ $V = 25.5$ fps

for 20' channel

$D_n = 2.5$ $V = 27.1$

$F = \frac{27.1}{\sqrt{32.2 \times 2.5}} = 3$

DREXEL, BARRELL & CO. LAND SURVEYORS CIVIL ENGINEERS

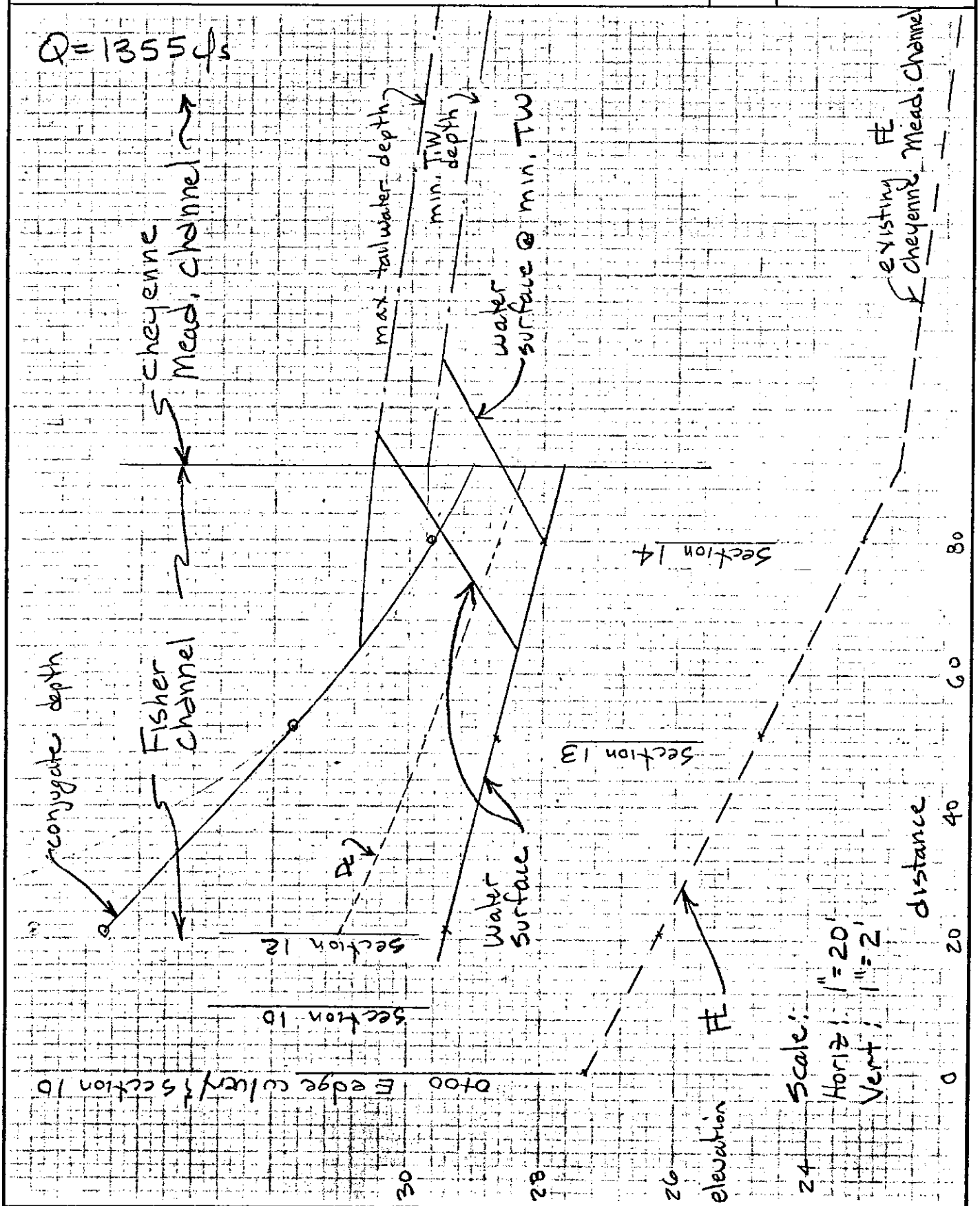
Project: Fisher channel @ Cheyenne Meadows channel

Job No: E-2589

Client: Gates

By: BNW

Date: 7/8/82



Project: Fisher channel @ cheyenne Mead. channel | Job Nº: E-2589

Client: Gates | By: BNW | Date: 7/8/82

determine conjugate depths for Q = 1355 cfs

side slope = 2:1

S = 0.042

n = 0.04

for bottom width (b) = 12' D_c = 5.4

$E = y + \alpha V^2/2g$

d	A	V	E
3.5	66.5	20.3	10.6
3.9	77	17.5	9.2
4.2	86	15.8	8.5
6.0	144	9.4	7.5
8.0	224	6.0	8.6
10.0	320	4.2	10.3 ~ ok
4.7	100	13.5	7.8 y_1 = 6.5

for bottom width (b) = 15 D_c = 5.0

3.1	66	20.6	10.4
3.9	89	15.2	7.9
9	297	4.6	9.4
10	350	3.9	10.3 ok
7	203	6.7	7.8

for bottom width (b) = 18' D_c = 4.7

2.5	57.5	23.6	12.0
9	324	4.2	9.3
12	504	2.7	12.1
3.2	78	17.4	8.3
6	180	7.5	7.0
7.2	233	5.8	7.7
9			8.4

Project: Fisher Channel @ Cheyenne Meadows Channel | Job No: E-2589

Client: Gates | By: BNW | Date: 7/8/82

Determination of jump Length Q = 1355 c/s

$F = \frac{V}{\sqrt{gL}}$

@ D = 4.0' = L B = 14'

V = 15

F = 1.3

from Fig 15.4 Chow

$\frac{L}{y_2} = 4$ $y_2 = 7.8$ L = 31' conservative

(F = 1.1) $y_2 = 7.2$ L = 29'

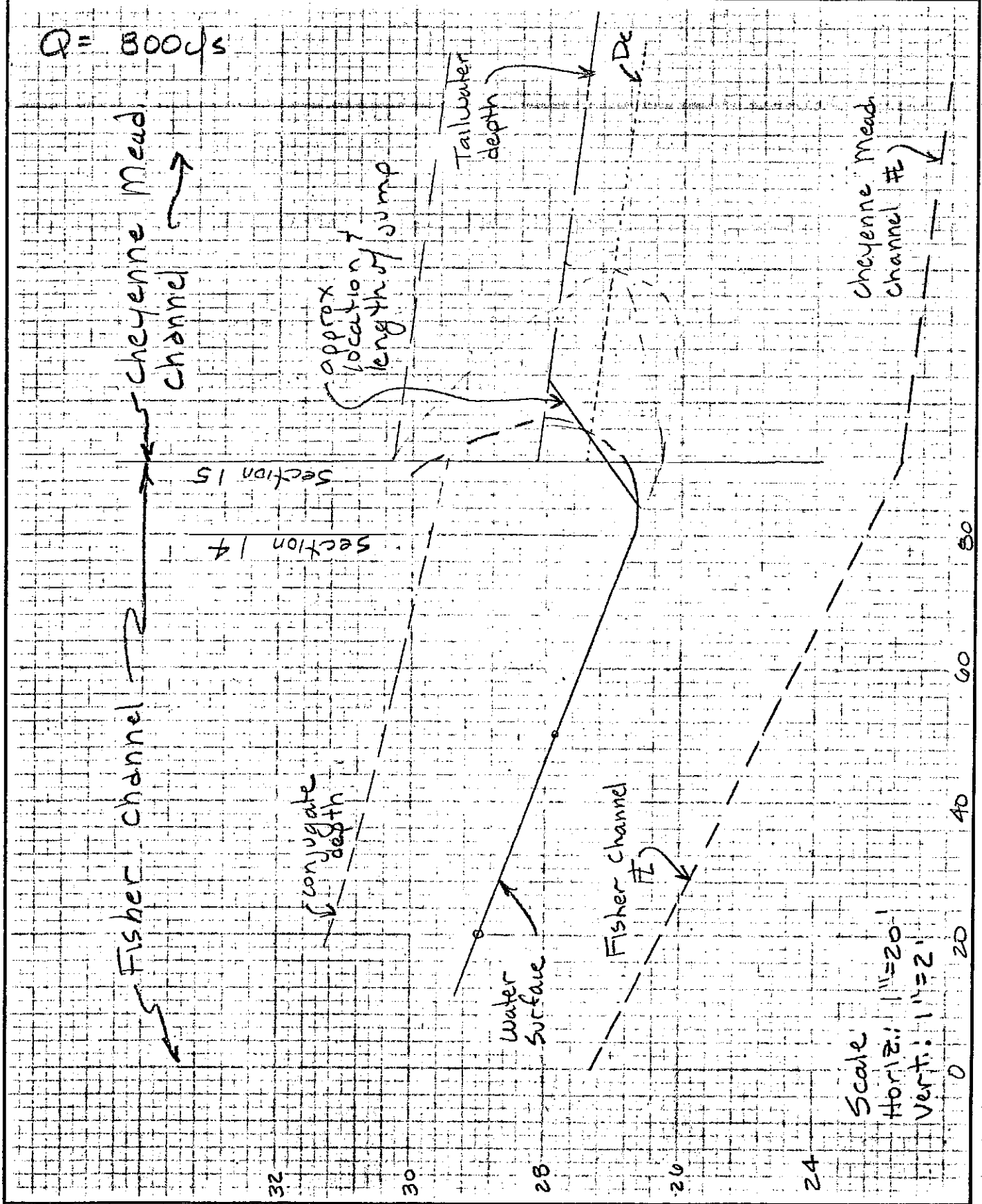
F < 1.7 ∴

- change from low to high stage is gradual
- a slightly ruffled water surface will be evident

DREXEL, BARRELL & CO. LAND SURVEYORS CIVIL ENGINEERS

Project	Job Nº
Fisher Channel @ Cheyenne Meadows	E-2589

Client	By	Date
Gates	BNW	7/9/82



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BOULDER, COLORADO 80301

3405 N. EL PASO STREET (303) 633-5029
COLORADO SPRINGS, COLORADO 80907

Project | Job Nº E-

Client Gales | By BNW | Date 7/12/82

For Fisher Channel of Q = 800 cfs

assume Curr Reservoir doesn't overflow

Flow in Cheyenne Meadow channel = 873 cfs

@ n = 0.04
S = 1.2%
Z = 2:1
B = 8'
D = 5.4' V = 8.7 fps
Dc = 4.9

for D = 3.5 E = 7.5
D = 6.0 E = 6.8
7.0 E = 7.4

ck conjugate Depths Fisher chanel

12' bottom width Dc = 4.7
D = 3.5' E = 6.4
D = 6.0 E = 6.5

15' bottom width Dc = 3.7
D = 3.1 E = 5.6
D = 5.0 E 5.7

18' bottom width Dc = 3.4
D = 2.7 E = 5.4
D = 4.0 E = 4.1
D = 5.0 E = 5.6

DREXEL, BARRELL & CO. LAND SURVEYORS CIVIL ENGINEERS

Project: Fisher Channel | Job Nº: E-2589

Client: Gates | By: BNW | Date: 7/9/82

Size riprap - culvert exit (1355 c/s)

$\frac{Q}{Wh} = \frac{1355}{20(6)} = 11$

DRCOG Volume II
DRCOG section 5

$\frac{Y_t}{H} = \frac{3.5}{6} = .58$

Type L (9") NG

Type VH 100% 36"
35-55% 24" {% smaller than}
10%

at least 30% shall be 36"

check section 5.4.2

NG exceeds range of chart

try Fig. V-6 (attached)

V max bottom = 21 fps or 36" Rock

@ section 12 (wingwalls end) @20'.
V = 18 fps 36" rock OK

∴ use 36" rock

at least 50% rock must be larger than 36"
6' deep for 30'

@ 30' (past section 13) V = 17 fps 24" diam OK
3.5' deep

DREXEL, BARRELL & CO. LAND SURVEYORS CIVIL ENGINEERS

Project: Fisher channel @ Cheyenne Meadows channel | Job No: E-2589

Client: Gates | By: BMW | Date: 7/12/82

Size Riprap cont'd

Bedding req'ments

Filter fabric - lapped min of 12" at roll edges w/ upstream fabric placed on top of downstream fabric

perfered - granular bedding
4" lower layer CDH 703.02 Coarse Agg. for concrete
4" upper layer CDH 703.09 Filter material Class A

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3405 N. EL PASO STREET (303) 633-5029 COLORADO SPRINGS, COLORADO 80907

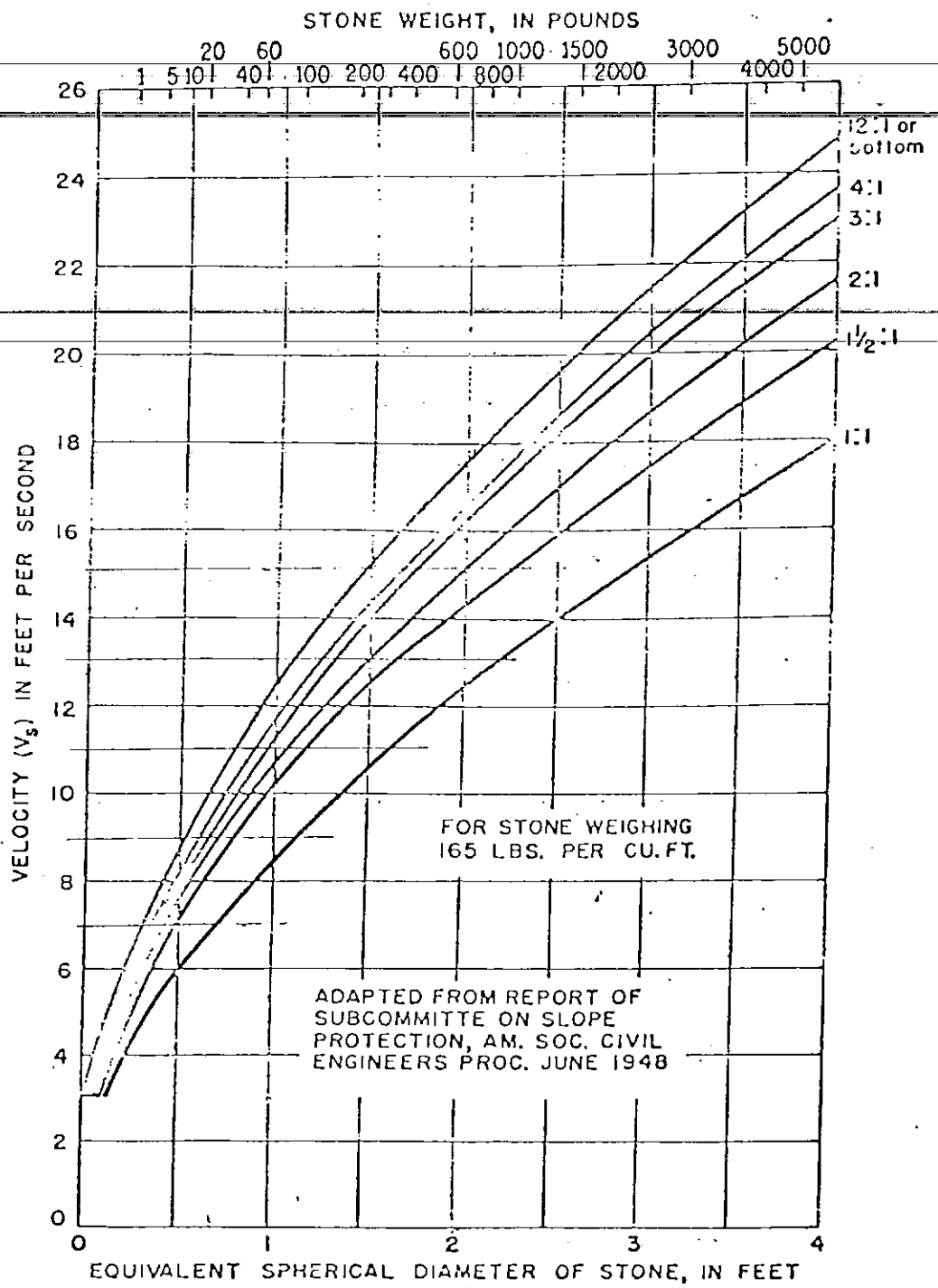

Fig. V-6 — Size of stone that will resist displacement for various velocities and side slopes.

Input Data - Water Surface Profile thru Box Culvert to Cheyenne Meadows channel

```
....!....1....!....2....!....3....!....4....!....5....!....6....!....7....!....8
JOB.
ACCOUNT,D709001,DREXEL,E2589.
GET,HEC2/LIB.
HEC2.
GOEXIT.
EXIT.
NOEXIT.
PUT,OUTPUT=HWY115.
COST.
DFD,XXX,R.
EOR.
T1        E2589
T2         GATES
T3
J1                                  1                                   Q=800
                                                                        Q= 1355    34.2
NC                        .015      .1       .3
X1      1       4        10        40                          10
GR   35.2      10     30.2        20     30.2        30     35.2        40
X1    1.5       4     12.2     37.5                           10
GR   35.1    12.2     30.1        17     30.1        33     35.1     37.5
X1      2       8     14.5     35.51                          10
GR     36    14.5       30    14.51       30     24.5       36    24.51       36    25.5
GR     30   25.51       30     35.5       36    35.51
X1      3       8     14.5     35.51                          20
GR   35.9    14.5     29.8    14.51     29.8     24.5     35.9    24.51     35.9    25.5
GR   29.8   25.51     29.8     35.5     35.9    35.51
X1      4                                                     20                -.4
```

```
    ....!....1....!....2....!....3....!....4....!....5....!....6....!....7....!....8
28
   X1     5                                          20           -.4
29
   X1     6                                          30           -.4
30
   X1     7                                          30           -.6
31
   X1     8                                          18           -.6
32
   X1     9                                           1           -.37
33
   NH     3   .015    14.51     .04    35.5     .015    35.51
34
   X1    10       4    14.5   35.51                    10
35
   GR    33    14.5      27   14.51      27    35.5      33   35.51
36
   NH     3    .015     9.1    .04     42.9    .015      43
37
   X1    11       6       9     43                    10
38
   GR    33       9   29.57     9.1   26.57      15   26.57      35   29.57    42.9
39
   GR    33      43
40
   NC                   .04
41
   X1    12       4       6     44                    30
42
   GR 31.14       6    26.4     16   26.14      34   31.14      44
43
   X1    13       4     7.5   42.5                    30
44
   GR 29.79     7.5   24.79   17.5   24.79    32.5   29.79    42.5
45
   X1    14       4       9     41                    10
46
   GR 28.44       9   23.44     19   23.44      31   28.44      41
47
   X1    15       4       1     49                    30
48
   GR  32.5       1    22.5     21    22.5      29    32.5      49
49
   X1    16                                          30          -.36
50
   X1    17                                          30          -.36
51
   X1    18                                                      -.36
52
   EJ
53

54
```

```
T1        EC589               Q=1355 cfs
T2        GATES               Hec II run from Input Data
T3
J1  ICHECK    INQ     NINV     IDIR     STRT      METRIC   HVINS    Q       WSEL     FQ

      0.       0.       0.       1.  0.000000    0.00     0.0    1355.   34.200   0.000

NC    0.000    0.000    .015     .100     .300     0.000    0.000    0.000    0.000

X1    1.000    4.000   10.000   40.000    0.000    0.000   10.000    0.000    0.000   0
GR   35.200   10.000   30.200   20.000   30.200   30.000   35.200   40.000    0.000

      X1      1.500    4.000   12.200   37.500    0.000    0.000   10.000    0.000    0.0
GR   35.100   12.200   30.100   17.000   30.100   33.000   35.100   37.500    0.000

X1    2.000    8.000   14.500   35.510    0.000    0.000   10.000    0.000    0.000
GR   36.000   14.500   30.000   14.510   30.000   24.500   36.000   24.510   36.000
GR   30 35.500   36.000   35.510    0.000    0.000    0.000    0.000

X1    3.000    8.000   14.500   35.510    0.000    0.000   20.000    0.000    0.000
GR   35.900   14.500   29.800   14.510   29.800   24.500   35.900   24.510   35.900
GR   290 25.510   29.800   35.500   35.900   35.510    0.000    0.000    0.000    0.000

X1    4.000    0.000    0.000    0.000    0.000    0.000   20.000    0.000    -.400

X1    5.000    0.000    0.000    0.000    0.000    0.000   20.000    0.000    -.400

X1    6.000    0.000    0.000    0.000    0.000    0.000   30.000    0.000    -.400

X1    7.000    0.000    0.000    0.000    0.000    0.000   30.000    0.000    -.600

X1    8.000    0.000    0.000    0.000    0.000    0.000   18.000    0.000    -.600   1
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X1    9.000    0.000    0.000    0.000    0.000    0.000    1.000    0.000    -.370
NH    3.000     .015   14.510     .040   35.500     .015   35.510    0.000    0.000

X1   10.000    4.000   14.500   35.510    0.000    0.000   10.000    0.000    0.000
GR   33.000   14.500   27.000   14.510   27.000   35.500   33.000   35.510    0.000
NH    3.000     .015    9.100     .040   42.900     .015   43.000    0.000    0.000

X1   11.000    6.000    9.000   43.000    0.000    0.000   10.000    0.000    0.000
GR   33.000    9.000   29.570    9.100   26.570   15.000   26.570   35.000   29.570
GR   330  0.000    0.000    0.000    0.000    0.000    0.000
NC    0.000    0.000     .040    0.000    0.000    0.000    0.000    0.000    0.000

X1   12.000    4.000    6.000   44.000    0.000    0.000   30.000    0.000    0.000
GR   31.140    6.000   25.400   16.000   26.140   34.000   31.140   44.000    0.000

X1   13.000    4.000    7.500   42.500    0.000    0.000   30.000    0.000    0.000
GR   29.790    7.500   24.790   17.500   24.790   32.500   29.790   42.500    0.000
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 X1     14.000      4.000      9.000     41.000      0.000      0.000     10.000      0.000      0.000
GR     28.440      9.000     23.440     19.000     23.440     31.000     28.440     41.000      0.000

X1     15.000      4.000      1.000     49.000      0.000      0.000     30.000      0.000      0.000
GR     32.500      1.000     22.500     21.000     22.500     29.000     32.500     49.000      0.000

X1     16.000      0.000      0.000      0.000      0.000      0.000     30.000      0.000      -.360

X1     17.000      0.000      0.000      0.000      0.000      0.000     30.000      0.000      -.360

X1     18.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      -.360
0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
1
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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       SLOPE     XLOBL     XLCH      XLOBR     ITRIAL
CORAR     TOPWID     ENDST


 *PROF 1

 CCHV=    .100 CEHV=    .300
 *SECNO 1.000
      1.00      4.00     34.20     35.85     34.20     39.70      5.50      0.00      0.00     35.20
     1355.        0.     1355.       0.        0.       72.        0.        0.        0.     35.20
      0.00      0.00     18.82      0.00      .000      .015      .000      .010199        0.        0.        0.
    0.00     26.00     38.00
0
 *SECNO 1.500
      1.50      3.60     33.70     35.47      0.00     39.56      5.86       .10       .04     35.10
     1355.        0.     1355.       0.        0.       70.        0.        0.        0.     35.10
       .00      0.00     19.42      0.00      .000      .    .014    30.   .010227        0.       10.        0.
    0.00     22.71     36.24
0
 *SECNO 2.000

 3265 DIVIDED FLOW

      2.00      3.46     33.46     35.22      0.00     39.43      5.97       .12       .01     36.00
     1355.        0.     1355.       0.        0.       69.        0.        0.        0.     36.00
       .00      0.00     19.61      0.00      .000      .015  .014    30   .015101        0.       10.        0.
    0.00     20.00     35.51
0
 *SECNO 3.000

 3265 DIVIDED FLOW

      3.00      3.44     33.24     35.03      0.00     39.27      6.03       .15       .01     35.90
     1355.        0.     1355.       0.        0.       69.        0.        0.        0.     35.90
       .00      0.00     19.71      0.00      .000      .015       29.80     .015310        0.       10.        0.
    0.00     20.00     35.51
0
 *SECNO 4.000

 3265 DIVIDED FLOW

      4.00      3.[illegible]     32.[illegible]     34.[illegible]     [illegible].00     38.93      6.14       .31       .01     35.50
```

51 0. 20. 0. 10 11 0 0.00 20.00 35.51
0
1
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SECNO DEPTH CWSEL CRIWS WSELK EG HV HL OLOSS BANK ELEV
Q QL QCH QROB ALOB ACH AROB VOL TWA LEFT/RIGHT
TIME VLOB VCH VROB XNL XNCH XNR WTN SLOPE XLOBL XLCH XLOBR ITRI
NT CORAR TOPWID ENDST

*SECNO 5.000

3265 DIVIDED FLOW

5.00 3.38 32.38 34.21 0.00 38.62 6.24 .32 .01 35.10
1355. 0. 1355. 0. 0. 68. 0. 0. 0. 35.10
.00 0.00 20.04 0.00 .015 .000 0 14.50 .016059 0. 20. 0. 10
0.00 20.00 35.51
0
*SECNO 6.000

3265 DIVIDED FLOW

6.00 3.36 31.96 33.81 0.00 38.29 6.33 .32 .01 34.70
1355. 0. 1355. 0. 0. 67. 0. 0. 0. 34.70
.00 0.00 20.19 0.000 .015 .000 .60 14. .016387 0. 20. 0. 10
0.00 20.00 35.51
0
*SECNO 7.000

3265 DIVIDED FLOW

7.00 3.33 31.33 33.21 0.00 37.78 6.45 .50 .01 34.10
1355. 0. 1355. 0. 0. 66. 0. 0. 0. 34.10
.00 0.00 20.38 0.00 .000 .014 0
.016 0. 30. 0. 7 14 0 0.00 20.00 35.51
)
*SECNO 8.000

3265 DIVIDED FLOW

8.00 3.30 30.70 32.61 0.00 37.26 6.56 .51 .01 33.50
1355. 0. 1355. 0. 0. 66. 0. 0. 0. 33.50
.00 0.00 20.55 0.00 .000 .015 .014 .017213 0. 30. 0. 7
0.00 20.00 35.51
0
*SECNO 9.000

07/09/82. 14.34.52. PAGE

SECNO DEPTH CWSEL CRIWS WSELK EG HV HL OLOSS BANK ELEV
Q QL QCH QROB ALOB ACH AROB VOL TWA LEFT/RIGHT
TIME VLOB VCH VROB XNL XNCH XNR WTN SLOPE XLOBL XLCH XLOBR ITRIAL
CORAR TOPWID ENDST

3265 DIVIDED FLOW

9.00 3.29 30.32 32.24 0.00 36.94 6.62 .31 .01 33.13

```
 1490 NH CARD USED
 *SECNO 10.000
     10.00     3.09    30.09    32.04     0.00    36.89     6.80      .03      .02    33.00
     1355.        0.    1355.       0.       0.      65.       0.       0.       0.    33.00
       .00     0.00    20.93     0.00     .000      00     .014    2  .070712        0.       1.       0.
    0.00    21.00    35.51
0
 1490 NH CARD USED
 *SECNO 11.000
     11.00     2.50    29.07    30.86     0.00    35.95     6.88      .93      .01    33.00
     1355.        0.    1355.       0.       0.      64.       0.       0.       0.    33.00
       .00     0.00    21.04     0.00     .000       0     .000     .  .129238        0.      10.       0.
    0.00    31.50    41.58
0
 *SECNO 12.000

 3301 HV CHANGED MORE THAN HVINS

     12.00     3.21    29.35    30.93     0.00    34.43     5.08      .98      .54    31.14
     1355.        0.    1355.       0.       0.      75.       0.       0.       0.    31.14
       .00     0.00    18.09     0.00     .000     .040     .000     .076452        0.      10.       0.
    0.00    30.64    40.42
0
 *SECNO 13.000

 3301 HV CHANGED MORE THAN HVINS

     13.00     3.90    28.69    29.79     0.00    32.29     3.59     1.70      .45    29.79
     1355.        0.    1355.       0.       0.      89.       0.       0.       0.    29.79
       .00     0.00    15.21     0.00     .000     .040     .000     .043662        0.      30.       0.
    0.00    30.62    40.31
0
1
  07/09/82.   14.34.52.


    SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS   BANK ELEV
    Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA   LEFT/RIGHT
    TIME     VLOB     VCH      VROB     XNL      XNCH     XNR        SLOPE    XLOBL    XLCH     XLOBR    ITRIAL
CORAR    TOPWID     ENDST


 *SECNO 14.000

 3301 HV CHANGED MORE THAN HVINS

     14.00     4.68    28.12    28.80     0.00    30.98     2.86     1.08      .22    28.44
     1355.        0.    1355.       0.       0.     100.       0.       0.       0.    28.44
       .00     0.00    13.58     0.00     .000     .040     .000     9.65
   .030430        0.      30.       0.        7       11        0     0.00    30.70    40.35
0
 *SECNO 15.000

 3301 HV CHANGED MORE THAN HVINS

     15.00     6.00    28.50    28.56     0.00    30.49     1.99      .23      .26    32.50
     1355.        0.    1355.       0.       0.     120.       0.       0.       0.    32.50
       .00     0.00    11.31     0.00     .000     .040     .000     .021    22.50     9.01
   .017817        0.      10.       0.        2       11        0     0.00    31.98    40.99
0
 *SECNO 16.000
 3665 20 TRIALS ATTEMPTED WSEL,CWSEL
 3693 PROBABLE MINIMUM SPECIFIC ENERGY
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      .00     0.00    11.07     0.00     .000     .040     .000   [illegible]  [illegible]  [illegible]
   .016850      0.      30.       0.       20        5        0     0.00    32.29    41.15
0
 *SECNO 17.000
 3685 20 TRIALS ATTEMPTED WSEL,CWSEL
 3693 PROBABLE MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
     17.00    6.06    27.84    27.84     0.00    29.76     1.92      .51      .10    31.78
     1355.      0.    1355.       0.       0.     122.       0.       1.       0.     31.78
       .01    0.00    11.12     0.00     .000     .040     .000     .025    21.78     8.88
   .017039      0.      30.       0.       20        5        0     0.00    32.23    41.12
0
 *SECNO 18.000
 3685 20 TRIALS ATTEMPTED WSEL,CWSEL
 3693 PROBABLE MINIMUM SPECIFIC ENERGY
1
  07/09/82.   14.34.52.


   SECNO     DEPTH    CWSEL    CRIWS     WSELK     EG        HV       HL       OLOSS    BANK ELEV
   Q         QL  QROB     ALOB     ACH       AROB      VOL       TWA   LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WT LMIN     SOPE     XLOBL     XLCH      XLOBR
ICONT    CORAR    TOPWID      ENDST


 3720 CRITICAL DEPTH ASSUMED
     18.00    6.06    27.48    27.48     0.00    29.40     1.92      .51      .10    31.42
     1355.      0.    1355.       0.       0.     122.       0.       1.       0.     31.42
       .01    0.00    11.11    0.000     .000     .026    21.42     8.88
   .016991      0.      30.       0.       20        5        0     0.00    32.25    41.12
0
1
 PROFILE FOR STREAM



 PLOTTED POINTS (BY PRIORITY)-E-ENERGY,W-WATER SURFACE,I-INVERT,C-CRITICAL W.S.,L-LEFT BANK,R-RIGHT BANK,M-LOWE


 ELEVATION    20.       22.       24.       26.  6↑  28.       30.       32.       34.      36.        SECN
  ↑↑↑w+§↑h↑    ↑↑1↑↑↑↑↑↑↑ 0.  .         .         .         .         .        .I        .        .W   L  C.
       2.  .            .         .  .      .         .        .I         .        W    L  C.          .    E
          4.  .         .         .         .         .        .I        .        W    L C .          .
          6.  .         .       - .         .         .        .I        .       W.    L C .          .
          8.  .         .         .         .         .        .I        .       W.    L C .          .
    1.50 10.  .         .      `  .         .         .        .I        .       W.   L C  .          .
         12.  .         .         .         .         .         I        .      W .   LC   .          .
         14.  .         .         .         .         .         I        .      W .    C   .          .
         16.  .         .         .         .         .         I        .      W .    CL  .          .
         18.  .         .         .         .         .         I        .      W .   C  L.          .
    2.00 20.  .         .         .         .         .         I        .     W  .   C   L          .
         22.  .         .         .         .         .         I        .     W  .   C   L          .
         24.  .         .         .         .         .         I        .     W  .   C   L          .
         26.  .         .         .         .         .        I.        .     W  .   C   L          .
         28.  .         .         .         .         .        I.        .    W   .  C    L          .
    3.00 30.  .         .         .         .         .        I.        .    W   .  C    L          .
         32.  .         .         .         .         .        I.        .    W   .  C   L.          .
         34.  .         .         .         .         .        I.        .    W   .  C   L.          .
         36.  .         .         .         .         .       I .        .    W   .  C   L.          .
         38.  .         .         .         .         .       I .        .   W    . C    L.          .
         40.  .         .         .         .         .       I .        .   W    . C    L.          .
         42.  .         .         .         .         .       I .        .   W    . C   L .          .
         44.  .         .         .         .         .       I .        .   W    . C   L .          .
         45.  .         .         .         .         .      I  .        .  W     . C   L .          .
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Q = 800 c/s
HEC II run from Input Data

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**************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED APRI 1980
  ERROR CORR -  01,02,03,04
  MODIFICATION -  50,51,52,53,54
**************************************************

T1        E2589
T2        GATES
T3
J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

        0.        0.        0.        1.  0.000000      0.00      0.0     800.    34.200     0.000

NC      0.000     0.000     .015      .100      .300      0.000     0.000     0.000     0.000


X1      1.000     4.000    10.000    40.000     0.000     0.000    10.000     0.000     0.000
GR     35.200    10.000    30.200    20.000    30.200    30.000    35.200    40.000     0.000

        X1    1.500     4.000    12.200    37.500     0.000     0.000    10.000     0.000
GR     35.100    12.200    30.100    17.000    30.100    33.000    35.100    37.500     0.000


X1      2.000     8.000    14.500    35.510     0.000     0.000    10.000     0.000     0.000
GR     36.000    14.500    30.000    14.510    30.000    24.500    36.000    24.510    36.000
GR     30 30.000    35.500    36.000    35.510     0.000     0.000     0.000     0.000


X1      3.000     8.000    14.500    35.510     0.000     0.000    20.000     0.000     0.000
GR     35.900    14.500    29.800    14.510    29.800    24.500    35.900    24.510    35.900
GR     290  25.510    29.800    35.500    35.900    35.510     0.000     0.000     0.000


X1      4.000     0.000     0.000     0.000     0.000     0.000    20.000     0.000     -.400


X1      5.000     0.000     0.000     0.000     0.000     0.000    20.000     0.000     -.400


X1      6.000     0.000     0.000     0.000     0.000     0.000    30.000     0.000     -.400


X1      7.000     0.000     0.000     0.000     0.000     0.000    30.000     0.000     -.600

X1      8.000     0.000     0.000     0.000     0.000     0.000    18.000     0.000     -.600
1
  07/12/82.   14.09.18.


X1      9.000     0.000     0.000     0.000     0.000     0.000     1.000     0.000     -.370
NH      3.000      .015    14.510      .040    35.500      .015    35.510     0.000     0.000

X1  .000     4.000    14.500    35.510     0.000     0.000    10.000     0.000     0.000     0.0
GR     33.000    14.500    27.000    14.510    27.000    35.500    33.000    35.510     0.000
NH      3.000     .015     9.100      .040    42.900      .015    43.000     0.000     0.000
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GR     33.000      9.000     29.570      9.100     26.570     15.000     26.570     35.000     29.570
GR     33    0.000       0.000       0.000       0.000       0.000       0.000       0.000
NC      0.000      0.000      .040       0.000      0.000      0.000      0.000      0.000      0.000


X1     12.000      4.000      6.000     44.000      0.000      0.000     30.000      0.000      0.000
GR     31.140      6.000     26.400     16.000     26.140     34.000     31.140     44.000      0.000


X1     13.000      4.000      7.500     42.500      0.000      0.000     30.000      0.000      0.000
GR     29.790      7.500     24.790     17.500     24.790     32.500     29.790     42.500      0.000


X1     14.000      4.000      9.000     41.000      0.000      0.000     10.000      0.000      0.000
GR     28.440      9.000     23.440     19.000     23.440     31.000     28.440     41.000      0.000


X1     15.000      4.000      1.000     49.000      0.000      0.000     30.000      0.000      0.000
GR     32.500      1.000     22.500     21.000     22.500     29.000     32.500     49.000      0.000


1.000      0.000      0.000      0.000      0.000      0.000     30.000      0.000      -.360      0.000


X1     17.000      0.000      0.000      0.000      0.000      0.000     30.000      0.000      -.360


X1     18.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      -.360
0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
1
  07/12/8298.                                                                          PAGE    3


   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR         SLOPE     XLOBL     XLCH      XLOBR     ITRIAL
CORAR     TOPWID     ENDST


*PROF 1

CCHV=    .100 CEHV=    .300
*SECNO 1.000
     1.00      4.00     34.20     34.55     34.20     36.12      1.92      0.00      0.00     35.20
     800.       0.      800.       0.        0.       72.        0.        0.        0.      35.20
     0.00      0.00       0.00     .000      .015      .000     0.000     .003552        0.        0.        0.
   0.00     26.00     38.00
0
*SECNO 1.500

3301 HV CHANGED MORE THAN HVINS

     1.50      3.21     33.31     34.01      0.00     36.00      2.68       .04       .08     35.10
     800.       0.      800.       0.        0.       61.        0.        0.        0.      35.10
      .00      0.00     14      0.00      .000      .015      .000     .  .005306        0.       10.        0.       10
   0.00     21.96     35.89
0
*SECNO 2.000

3255 DIVIDED FLOW

     2.00      2.85     32.86     33.67      0.00     35.89      3.03       .07       .03     36.00
     800.       0.      800.       0.        0.       57.        0.        0.        0.      36.00
      .00      0.00     13.98      0.00      .000      .015     14     30.0     .003948        0.       10.        0.       15
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*SECNO 3.000

3265 DIVIDED FLOW

3.00	2.80	32.60	33.46	0.00	35.79	3.19	.09	.02	35.90
800.	0.	800.	0.	0.	56.	0.	0.	0.	35.90
.00	0.00	14.32	0.00	.000	.015	.000	.014	29.80	14.51
.009600	0.	10.	0.	7	11	0	0.00	20.00	35.50

0

*SECNO 4.000

1

07/12/82. 14.09.18.

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

3265 DIVIDED FLOW

4.00	2.67	32.07	33.07	0.00	35.55	3.48	.20	.03	35.50
800.	0.	800.	0.	0.	53.	0.	0.	0.	35.50
.00	0.00	14.98	0.00	.000	.015	.000	.014	29.40	14.51
.010911	0.	20.	0.	16	11	0	0.00	20.00	35.50

0

*SECNO 5.000

3265 DIVIDED FLOW

5.00	2.58	31.58	32.67	0.00	35.30	3.72	.23	.02	35.10
800.	0.	800.	0.	0.	52.	0.	0.	0.	35.10
.00	0.00	15.48	0.00	.000	.015	.000	.014	29.00	14.51
.011989	0.	20.	0.	5	11	0	0.00	20.00	35.50

0

*SECNO 6.000

3265 DIVIDED FLOW

6.00	2.52	31.12	32.27	0.00	35.03	3.91	.25	.02	34.70
800.	0.	800.	0.	0.	50.	0.	0.	0.	34.70
.00	0.00	15.88	0.00	.000	.015	.000	.014	28.60	14.51
.012901	0.	20.	0.	5	11	0	0.00	20.00	35.50

0

*SECNO 7.000

3265 DIVIDED FLOW

7.00	2.45	30.45	31.67	0.00	34.60	4.16	.40	.02	34.10
800.	0.	800.	0.	0.	49.	0.	0.	0.	34.10
.00	0.00	16.36	0.00	.000	.015	.000	.014	28.00	14.51
.014068	0.	30.	0.	14	11	0	0.00	20.00	35.50

0

*SECNO 8.000

3265 DIVIDED FLOW

1

07/12/82. 14.09.18.

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV

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     TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELEV.     SSTA
     SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

       8.00      2.39     29.79     31.08      0.00     34.15      4.36       .44       .02     33.50
       800.       0.       800.       0.        0.       48.        0.        0.        0.      33.50
        .00      0.00     16.75      0.00      .000     .015      .000    0  14.51
    .015073        0.       30.       0.        8        11         0      0.00     20.00     35.50
0
 *SECNO 9.000

 3265 DIVIDED FLOW

       9.00      2.37     29.40     30.70      0.00     33.86      4.46       .28       .01     33.13
       800.       0.       800.       0.        0.       47.        0.        0.        0.      33.13
        .00      0.00     16.95      0.00      .000     .015      .000
    .015584        0.       18.       0.        3        14         0      0.00     20.00     35.50
0
 1490 NH CARD USED
 *SECNO 10.000
      10.00      2.21     29.21     30.56      0.00     33.82      4.60       .03       .01     33.00
       800.       0.       800.       0.        0.       46.        0.        0.        0.      33.00
        .00      0.00     17.22      0.00      .000     .015      .000     14.51
    .074510        0.        1.       0.        7        11         0      0.00     21.00     35.50
0
 1490 NH CARD USED
 *SECNO 11.000
      11.00      1.95     28.52     29.77      0.00     32.85      4.32       .89       .08     33.00
       800.       0.       800.       0.        0.       48.        0.        0.        0.      33.00
        .00      0.00     16.68      0.00      .000     .040      .000    1
    .107106        0.       10.       0.        8        11         0      0.00     29.00     40.15
0
 *SECNO 12.000

 3301 HV CHANGED MORE THAN HVINS

      12.00      2.66     28.80     29.70      0.00     31.68      2.87       .74       .43     31.14
       800.       0.       800.       0.        0.       59.        0.        0.        0.      31.14
        .00      0.00     13.61      0.00      .000     .040      .000    3
    .053637        0.       10.       0.        2        14         0      0.00     28.40     39.33
0
1
  07/12/82.   14.09.18.


    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       TA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID     ENDST


 *SECNO 13.000

 3301 HV CHANGED MORE THAN HVINS

      13.00      3.10     27.89     28.52      0.00     30.20      2.31      1.31       .17     29.79
       800.       0.       800.       0.        0.       66.        0.        0.        0.      29.79
        .00      0.00     12.21      0.00      .000     .040      .000      .036150          0.       30.       0.
    0.00     27.37     38.69
0
 *SECNO 14.000
      14.00      3.57     27.01     27.52      0.00     29.16      2.15      1.00       .05     28.44
       800.       0.       800.       0.        0.       68.        0.        0.        0.      28.44
        .00      0.00     11.76      0.00      .000          .000      .028    .030581          0.       30.       0.
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0
 *SECNO 15.000
    15.00     4.11    26.61    27.15     0.00    28.84     2.23      .30      .01    32.50
     800.       0.     800.       0.       0.      67.       0.       0.       0.    32.50
      .00     0.00    11.99     0.00     .000     .040     .000    12.78
   .030251       0.      10.       0.       14       11        0     0.00    24.45    37.22
0
 *SECNO 16.000

 3301 HV CHANGED MORE THAN HVINS

 3685 20 TRIALS ATTEMPTED WSEL,CWSEL
 3693 PROBABLE MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
    16.00     4.66    26.80    26.80     0.00    28.33     1.52      .69      .22    32.14
     800.       0.     800.       0.       0.      81.       0.       0.       0.    32.14
      .01     0.00     9.91     0.00     .000     .040     .000    03    22.14    11.68
   .018027       0.      30.       0.       20        8        0     0.00    26.65    38.32
0
 *SECNO 17.000
 3685 20 TRIALS ATTEMPTED WSEL,CWSEL
 3693 PROBABLE MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
    17.00     4.65    26.43    26.43     0.00    27.97     1.53      .54      .34    31.78
     800.       0.     800.       0.       0.      80.       0.       0.       0.    31.78
      .01     0.00     9.94     0.00     .000     .040     .000
   .018193       0.      30.       0.       20        5        0     0.00    26.60    38.30
0
1
  07/12/82.   14.09.19.


   SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS   BANK ELEV
   Q        QL QCH      QROB     ALOB     ACH      AROB     VOL      TWA   LEFT/RIGHT
   TIME     VLOB     VCH      VROB     XNL      XNCH     XNRWTN     E    SLOPE    XLOBL    XLCH     XLOBR    IT
NT    CORAR    TOPWID     ENDST


 *SECNO 18.000
 3685 20 TRIALS ATTEMPTED WSEL,CWSEL
 3693 PROBABLE MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
    18.00     4.65    26.07    26.07     0.00    27.61     1.53      .55      .34    31.42
     800.       0.     800.       0.       0.      81.       0.       0.       0.    31.42
      .01     0.00     9.93     0.00     .000     .040     .000
   .018152       0.      30.       0.       20        5        0     0.00    26.61    38.31
0
1
 PROFILE FOR STREAM


 PLOTTED POINTS (BY PRIORITY)-E-ENERGY,W-WATER SURFACE,I-INVERT,C-CRITICAL W.S.,L-LEFT BANK,R-RIGHT BANK,M-LOWER

 ELEVATION    20.       22.       24.       26.       28.       30.       32.       34.       36.          SECNOI

     1.00      0.  .         .         .         .         .        .I         .          .W C  L    .E         .
           2.    .         .         .         .         .        .I         .        W C    L    E           .
                 4.  .         .         .         .         .        .I         .          W.  C    L    E         .
                 6.  .         .         .         .         .        .I         .        W  .C    L    E,        .
                 8.  .         .         .         .         .        .I         .        W   .C    L    E         .
     1.50       10.  .         .         .         .         .        .I         .        W   C     L    E         .
                12.  .         .         .         .         .        I          .        W   C     L    E         .
```