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MARICOPA COUNTY
ARIZONA

McKELLIPS ROAD DRAINAGE STRUCTURE AT GRANITE REEF WASH

MCDOT Contract No. 68736/1991-12

INCA Project No. 6921

Registered Professional Engineer (Civil)
CERTIFICATE NO. 21872
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ARIZONA, U.S.A.

FINAL DRAINAGE REPORT

February 15, 1993

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1. INTRODUCTION

This drainage report has been prepared for the Maricopa County Highway Department in connection with the design of the proposed box culvert crossing and subsequent road improvements at Granite Reef Wash (84th Street) and McKellips Road.

The purpose of this report is three-fold:

1. To determine the design Q for the 100-year storm water runoff flow in the Granite Reef Wash crossing at McKellips Road. Then convey the Q100 flow under McKellips Road via box culverts with overtopping not exceeding the roadway 6" above the lowest point on the proposed curb line of McKellips Road. The storm water would then be conveyed from the box culverts south by an improved channel for approximately 900' and by the existing channel to the Salt River.

2. To determine the design Q for the 100 year storm at the entrances to the existing mobile home parks at the east and west limits of the new roadway construction, and to convey the storm water along the south side of the new roadway via ditches to Granite Reef Wash and thence south to the Salt River.

3. To determine the storm water flows produced by the roadway for the 10-year design storm period, and the mobile home parks for the 5-year design storm period: collect the flows by catch basins on the north side of McKellips, and convey the water by new storm drain pipes into the new roadway drainage ditch on the south side of McKellips Road. The new roadway ditches will flow into the Granite Reef Wash (see Item 2, above).This design will maintain at least one dry lane (the inside lane) in each direction of travel.

2. DRAINAGE BASIN CHARACTERISTICS

2.1 Existing Drainage Areas

A. The drainage area that affects the Granite Reef Wash includes a primarily agricultural section of the Salt River Indian Reservation to the east and north of Thomas Road. A second area that includes a predominantly urban, highly developed residential area bordered by Pima Road on the east, Thomas Road on the north, and a grade break east of Hayden Road on the west, and McKellips Road on the south.

B. The area affecting the roadway drainage lies in Sections 1 & 12 of T1N, R4E of the Gila and Salt River Base and Meridian in Maricopa County. The portion that lies west of the mid-section line of Section 1, and north of the monument line that separates Sections 1 and 12, is in the City of Scottsdale. The Salt River Indian Reservation lies to the south of the monument line and extends to the north for 1/4 mile in the eastern 1/2 of Section 1, and encompasses the Shadow Mountain Village mobile home park located in this area. The limits of the roadway drainage are bordered by the north line of the two mobile home parks that lie east and west of Granite Reef Wash (84th St.), by Pima Road on the east, by a grade break in McKellips Road approximately 1000' east of Hayden Road, which is the west limit; and by McKellips Road on the south. Most of the area is developed as mobile home parks (see Fig. 1, Drainage Areas 3 and 8). The contributing roadway portion consists of pavement areas and landscaped areas to the north of the pavement (see Figs. 2 and 3).

2.2 Existing Flow Paths

A. The areas contributing to Granite Reef Wash begin on the Salt River Indian Reservation and generally flow:

- westerly and southerly across agricultural fields to a concentration point at Thomas Road and Pima Road;
- thence southwesterly via 87th Street (a paved, inverted crown street - see Fig. 4), to a drainage channel on the north side of McDowell Road (approximately 380');
- thence west and south in the channel crossing McDowell Road in a box culvert (12' x 8').

- Once across McDowell Road, flow continues southwesterly in a channel to an existing culvert that can only carry a small portion of the flow. The remaining flow is carried through a subdivision to Granite Reef Road via 84th Place, a paved street. Granite Reef Road, an inverted crowned street, then conveys the flow south to a channel that begins approximately 1530' north of McKellips Road. The flow continues southerly in the channel through a box culvert (13' x 7'-9") at the well site approximately 1300' north of McKellips Road, and then in the channel (bordered by block property walls on the east and west sides) to McKellips Road where it presently crosses McKellips in a dip section and continues south in a channel to the Salt River.

B. The existing mobile home parks contribute the majority of the runoff to the McKellips Road roadway at the entrances to the parks. An 18" storm drain pipe conveys some of the flow from the east side of the west mobile home park directly to Granite Reef Wash. The fountain area of the west park, as well as the westernmost areas, do not contribute any runoff. The mobile home park on the east side of Granite Reef Wash has three (3) areas and points of concentration exiting the park: the two entrances and an outlet through the wall, which is about 1290' east of Granite Reef Wash. Only the westernmost area will contribute to this project area as further explained in this section. Only the roadway flows from west of the existing pipe culvert crossing in McKellips Road approximately 1350 feet east of Granite Reef will be considered. The flows east of the culvert crossing will be conveyed by the culvert or will flow from the roadway southerly along an existing ditch. The storm water that flows from the mobile home parks and contributes to the McKellips roadway flow travels through the parks to their entrances at McKellips Road and then westerly to either Granite Reef Wash (the western most area) or to the existing culvert and ditch mentioned above.

C. Additional flows towards Granite Reef Wash flow along McKellips Road from the east (Pima Road) and from the west, about 1600' from a grade break in McKellips Road. The flows from east of Pima Road will fill the prism of the roadway on the north side of McKellips/Pima Road intersection, top the roadway centerline and then continue southwesterly in an overland condition. The flows along the west side of Pima from the north will flow westerly along the north side of McKellips Road to an existing culvert about 1350 feet east of Granite Reef Wash that conveys the water under McKellips Road and then by ditch to the south. This pipe appears to be capable of removing all the runoff from the north side of McKellips Road, and thus no additional flows from east of this pipe will be included

in design. The flows from the west side of Granite Reef Wash will flow easterly to Granite Reef Wash along the north side of McKellips Road in the existing curb and gutter and along the south side in the roadside ditch area created by the irrigation ditch.

D. The flows in Granite Reef Wash are restricted to the Wash by:

- block walls that parallel the Wash on the east and west, north of McKellips Road.
- banks on the east and west side of the Wash, south of McKellips Road.

E. The flows along McKellips Road are restricted to the roadway by:

- a block wall long the north side;
- an elevated concrete-lined irrigation ditch on the south side, west of the Wash;
- a bank on the south side, east of the Wash caused by the depressed roadway profile.

3. PROPOSED CONDITIONS

3.1 Granite Reef Wash Crossing at McKellips Road

A box culvert crossing is proposed at McKellips Road to prevent the 100-year runoff from the Granite Reef Wash from flowing across proposed McKellips Road improvements at more than 6 inches deep. Because of a high point in the existing channel south of McKellips Road, the existing channel will be improved approximately 900 feet to the south. The optimum channel/box culvert combination that will prevent the design flow from exceeding more than 6" over the top of the low point in the proposed McKellips Road will be designed using the HEC-2 program with the special culvert option.

3.2 McKellips Road Roadway

The McKellips Road roadway will be elevated to cross over the proposed box culvert, causing the roadway to be higher than existing. This will prevent the current flows from the existing mobile home parks to the east and west to drain along the sides of McKellips Road to Granite Reef Wash. The new vertical alignment will cause a ponding situation in front of the mobile home parks that will need to be drained. A storm drain pipe/box and catch basin system (see Figs. 2 and 3) is proposed to drain the low point areas for the 10-year storm runoff from the parks and the roadway. This system will be designed to maintain at least one dry lane in each direction of travel. A grated catch basin that covers almost the entire width of the entrances to the mobile home parks will be constructed in a sump condition to intercept the storm water exiting the parks. This will decrease the amount of runoff to the roadway and help keep the entrances drier. Any storm water from the north side of the McKellips roadway coming from the west of the westernmost park will be conveyed by the curb and gutter to the grated catch basins at the park entrance. A small ditch (2' wide x 3" deep) is proposed on the north side of the new sidewalk to the west of Granite Reef Wash, to remove nuisance water caused by the landscape irrigation system. This ditch will drain west to a new dual (front and back openings) inlet catch basin on the east side of the westernmost mobile home park entrance. The center of the box over Granite Reef is the high point in the roadway. Water will flow from this point east and west to the inlet catch basins located at the park entrances. The inlet catch basin will be capable of maintaining a dry lane condition for the 10-year design storm. A drop box catch basin is proposed for the east side of the easternmost mobile home park entrance to intercept runoff flowing west in the existing swale line along the north side of McKellips Road. The 4:1 foreslope north of the new sidewalk on the east side of Granite Reef Wash will provide a "V" ditch that will drain the runoff east to a new dual inlet catch basin at the west side of

the west entrance to the easternmost mobile home park. Ponding of runoff for storms greater than the 10-year event will occur on the north side of McKellips Road at both of the mobile home park entrances. When the ponding reaches sufficient depth at the low points, runoff will cross to the south side of McKellips Road and be conveyed to Granite Reef Wash by a proposed box culvert system (see Figs. 2 and 3) that is capable of carrying the calculated 100-year runoff from the mobile home parks and roadway while not exceeding the required 8-inch maximum depth above lowest gutter elevation (Scottsdale criteria) at the west mobile home park and not exceeding the required 6-inch maximum flow depth over centerline of road (Flood Control District of Maricopa County criteria) at the east mobile home park. The box culvert systems on the south side of McKellips on the east, and west sides of Granite Reef Wash will convey the runoff flows into the Wash. Box culverts were designed so access to both sides of the wash from McKellips Road can be obtained and access to the private irrigation will be provided. The ponding on the north side of McKellips Road will be drained by the catch basins when storms greater than a 10-year design frequency have sufficiently subsided. The ponding for the 100-year storm runoff will reach an elevation of about 1187.35 at the west mobile home park, which is about 7.3" above the lowest gutter elevation thus meeting the maximum 8" criteria and is about 3" above the existing pavement elevation at the easterly intersection inside the park. The lowest finished floor elevation in the west mobile home park is 1188.2; thus the new high water elevation is more than 1 ft. below the lowest finished floor elevation. At the east mobile home park, the ponding will reach an elevation of about 1187.13, which is about 3.6" above the lowest top of crown elevation thus meeting the maximum 6" over crown criteria and is less than the pavement elevation at the west intersection inside the park. The lowest finished floor elevation in the east mobile home park is 1188.5; thus the new high water elevation will be more than 1 ft. below the lowest finished floor elevation. The limits of the ponding are shown in Figs. 5 and 6.

4. DESIGN ASSUMPTIONS AND COMPUTER SOFTWARE UTILIZED

4.1 Design Assumptions

A. Manning's "n" values

1. Overbank (ground): 0.025
2. Overbank (asphalt): 0.015
3. Existing Channel: 0.030
4. New Channel: 0.020
5. Box Culvert: 0.013
6. Pipe Culverts: 0.013

B. Coefficients

1. Headwall Entrance (Box): 0.20
2. Headwall Entrance (Pipe): 0.50
3. Weir (Roadway & Wall): 3.00
4. Rational Formula (C) for Existing Non-Paved Roadway Areas: 0.30
5. Rational Formula (C) for Existing Desert Landscaped Areas in MH Parks: 0.35
6. Rational Formula (C) for Roadway Areas: 0.95
7. Rational Formula (C) for Park Area: 0.10

C. Calculation Factors

1. For MCUHP-1 and HEC-1
   a. Initial Loss (STRL) (for "C" soil group)= IA + IL = 0.068 + 0.50 = 0.568

      IL (dry) - 0.5, IA (D.A. 8) = 67% x 0.05 + 33% x 0.068 0.60

   b. Uniform Loss Rate (CNSTL) (for "C" soil group, normal conditions): 0.15
   c. Runoff Coefficient RTIMP = Roof area reduced by 25% to account for runoff from roofs falling on non-paved areas first, prior to running off to paved areas. All paved areas included appear to be hydraulically connected.
      West Side = 52
      East side = 56

C. Calculation Factors - Continued

d. Point Rainfall Depth (6-hour precipitation):

1. 5-year: 1.6 inches

   10-year: 1.95 inches

2. 100-year: 3.2 inches

e. Urban Watershed

4.2 Computer Software Utilized

Software	Purpose (to determine)	Output Location (Appendix)
MCUHP-1 and HEC-1	10- and 100-Year Storm Runoff for MHPs	B
HEC-2	100-Year Storm Runoff effects on Granite Reef Wash	C
HY-8	Water Surface Elevations of of 100-Year Runoff from MHPs and Roadway	D
THYSYS	Capacity of Inlets and Hydraulic Grade Line of Storm Drain System	E

5. ESTIMATION OF STORM WATER RUNOFF FLOWS

5.1 Methodology Used to Estimate the Runoff

A. For Granite Reef Wash, the latest revised version of the Flood Insurance Study for Maricopa County, September 4, 1991, that was prepared for the Federal Emergency Management Agency (FEMA) was used to obtain the 100-year runoff flow.

B. For the 10- and 100-year flows to McKellips Road from the roadway areas, the Rational Method (see Appendix 'A') presented by the Flood Control District of Maricopa County in their Hydrologic Design Manual was used due to the small contributing areas. The rainfall intensity is based on Fig. 3.2 - Rainfall Intensity - Duration - Frequency Relation Chart. The Flood Control District's MCUHP-1 Method and HEC-1 will be used for the mobile home parks (10- and 100-year design frequency). The initial loss plus uniform loss rate method for hydrologic soil group "C" (the soil group is "B" for these areas, but "C" will be used due to extensive roof and pavement areas), and an urban hydrograph will be used.

5.2 Runoff To Granite Reef Wash

From the September 4, 1991 FEMA study, a peak runoff of 1417 cfs is shown at the well site approximately 1300' north of McKellips. There is a retaining wall on the east side of the Granite Reef Wash channel, with a low point elevation of 1196.06 that is about 0.5' below the existing ground elevation over the top of the existing box culvert at the well site. This low point in the wall acts as a side weir, limiting the amount of runoff that flows south down the channel. Any flow diverted by the weir will flow easterly in an alley north of the Shadow Mountain Village mobile home park to Pima Road, and south along Pima Road. Using the Corps of Engineers' HEC-2 program with split flow option, it is estimated that about 1360 cfs will continue south down the Granite Reef Wash channel if the existing box culvert is removed (an assumed future condition) with the remaining 57 cfs flowing easterly down the forementioned alley. Without the removal of the box culvert, an estimated 845 cfs will flow down the channel to McKellips Road per the Mathews project that upgrades the channel south of the well site and north of this project. No attempt was made to model the existing box and channel at the well site due to insufficient topographic data and funds. After the Pima-Outer Loop Freeway outfall channel is constructed east of Pima Road, the runoff from east of the freeway will effectively be removed from the Granite Reef Wash drainage area, and only the areas west of the new freeway will contribute. The FEMA report showing a 100-year runoff at 644 cfs at Pima Road would not enter Granite Reef Wash, but because of a significantly reduced Tc and almost fully developed urban contributing areas, it is assumed that the 100-year

runoff will be approximately 1160 cfs at McKellips Road, with the existing box culvert of the well site removed. This figure corresponds to the present 50-year flow stated in the FEMA report, and this figure will be used for the design flow for the box culverts and the improved channel to the south of McKellips although the 1360 cfs possible flow will be evaluated as well as a precaution. The proposed channel south of the removed well site box culvert would need to be enlarged in order to convey this flow within the channel banks. An extensive hydrologic study of the area north of the well site should be conducted if the box is to be removed to determine the actual 100-year storm runoff to the well site area. There is a large amount of retention as well as block walls around properties that would not contribute that needs to be included in the calculations.

5.3 Runoff to McKellips Road

Eight separate areas - two larger developed areas (mobile home parks) and six smaller roadway areas - were identified as contributing areas (see Figs. 2 and 3). The 10- and 100-year runoff flows for each area are shown below.

TABLE 5.3
ANALYSIS OF DRAINAGE AREAS

Drain Area	Area (AC.)	Drain Length (mi.)	Slope (ft/mi.)	C[1]	CA	Tc (min)[2] 10-yr	Tc (min)[2] 100-yr	i (in/hr) 10-yr	i (in/hr) 100-yr	Q = CiA[2] 10-yr	Q = CiA[2] 100-yr
Westside GRW:											
1	1.76	0.292	8.5	0.69	1.21	19.1	15.5	3.3	5.9	2.6	4.6
2	1.32	0.201	8.5	0.77	1.02	16.1	13.1	3.6	6.3	3.7	6.4
3	27.20	0.341	17.0	0.71	19.31	18.03[3]	14.0[3]	3.1[3]	6.1[3]	59[3]	18[3]
4	0.22	0.072	15.3	0.46	0.10	16.8	12.8	3.1	6.3	0.3	0.7
5	0.30	0.080	22.0	0.95	0.29	7.9	7.3	4.6	7.8	1.5	2.5
6	0.40	0.095	20.7	0.95	0.38	8.9	7.2	4.7	8.0	1.8	3.0
7	0.49	0.095	5.3	0.30	0.15	14.5	12.2	3.8	6.1	0.6	0.9
Eastside GRW:											
8	38.43	0.297	15.5	0.75	28.82	16.0[3]	13.0[3]	3.4[3]	6.5[3]	98[3]	187[3]
9	0.49	0.100	23.3	0.38	0.19	8.7	7.1	4.7	8.0	0.9	1.5
10	0.37	0.088	23.3	0.95	0.35	8.1	6.7	4.9	8.1	1.7	2.8
11	0.44	0.105	23.3	0.95	0.42	8.9	7.4	4.7	7.8	2.0	3.3
12	0.42	0.086	5.3	0.30	0.13	13.6	11.5	4.0	6.3	0.5	0.8
13	0.89	0.146	8.7	0.61	0.54	15.2	12.4	3.8	6.4	2.1	3.5
14	1.22	0.129	8.7	0.51	0.62	13.8	11.4	4.0	6.6	2.5	4.1
15	0.21	0.015	36.3	0.95	0.20	5.0	5.0	5.8	9.0	1.2	1.8

1 Composite Calculation Sheets, Appendix F
2 See Tc, i & Q Calculation Sheets, Appendix F
3 Based on FCDMC's Hydrologic Design Manual - MCUHP-1: 6-hour storm + HEC-1, Appendix B

5.4 Runoffs from Individual Drainage Areas

The following table summarizes the calculated runoffs from the individual drainage areas for both the 10- and 100-year storm frequencies.

TABLE 5.4

SUMMARY OF RUNOFF FLOWS

Drain Area	Stormwater Runoff 10-year	100-year
Westside GRW:		
1	2.6	4.6
2	3.7	6.4
3	59	118
4	0.3	0.7
5	1.5	2.5
6	1.8	3.0
7	0.6	0.9
Eastside GRW:		
8	98	187
9	0.9	1.5
10	1.7	2.8
11	2.0	3.3
12	0.5	0.8
13	2.1	3.5
14	2.5	1.2
15	1.2	1.8

5.5 Total Runoff at each Ponding Area

The following table summarizes the drainage areas to show the total runoff at each ponding area on the north side and to show the total runoff to concentration points on the south side of McKellips.

TABLE 5.5

SUMMATION OF COMBINED SUB AREAS

Combined Sub Areas		Summation of Q's 10-year	100-year
A2 - A5	(@ W. MHP entrance)	64.5[1]	126.4[2]
A1 - A6	(@ W. end ditch W. of GRW)	67.6[1]	136.2
A1 - A7	(@ Sta. 19+40)	68.2[1]	137.1
B8 - B10, B14 - B15	(@ E. MHP entrance)	103.8[1]	196.2[3]
B8 - B11, B3 - B15	(@ E. end ditch E. of GRW)	107.4[1]	201.1
B8 - B15	(@ Sta. 20+77)	107.9[1]	201.9

1. From THYSYS (see Appendix E)
2. @ Tc = 14.0 & i = 6.1
3. @ Tc = 13.0 & i = 6.5

5.6 HEC-2 Data

The following table summarizes the data computed using the HEC-2 program.

TABLE 5.6
Summary of HEC-2 Computations (Appendix "B")

Descrip. of Computation	Location of Area	Drng Areas Involved	Calc. Q100 cfs	Calc. Water Surface Elev.	Vel.[1] (fps)	Remarks
Existing Condition: (no imprv.)	Granite Reef Wash Sta. 20+00 M/L of McKellips Road	Contributing Areas from North	1360	1189.25	6.5	Exist. lowest FF elevs. in MH parks are 88.2 and 88.5 (W & E, respectively); thus, MH parks are in jeopardy.
			1160	1188.99	6.1	
Proposed Condition: Box Culvert and Improved Channel (38' bottom) to south	Granite Reef Wash Sta. 20+67 Upstrm Hdwl of New Box	Contributing Areas from North	1360	1186.45	7.9	The low points @ C/L McKellips are 1186.8 in front of the east MH park and 1187.2 in front of west MH park. Thus, the new 100-year flood elev. from Granite Reef Wash is less than the lowest point at the centerline of McKellips. The 1160 and 1360 cfs will remain in the channel at the north wingwall of the new box. The min. elevation at the wingwall is 1188.9 which are the left and right banks.
			1160	1186.01	7.3	
						Top Irr. Ditch = 88.08

1. Channel Velocity is Velocity at Station 19+00.

The Q100 flows are higher than the banks of the proposed channel and the existing masonry walls north of the new box (up to 2.6'). There are no holes in the walls, so the runoff will not flow into the mobil home parks.

6. DESIGN OF CATCH BASINS AND STORM DRAIN SYSTEMS FOR McKELLIPS ROAD

6.1 West Mobile Home Park Area (approximately Sta. 15+30)

A. For 10-year storm runoff from roadway, plus mobile home park, at least one (1) dry lane of traffic flow in each direction is required.
Use middle 12' for traffic 34' - 12' = 22'
available from curb edge: 22 x 1.50% = 0.33[1] max. d
= 87.06 max. water surface elevation

1. North side of McKellips:
Q_{10} = 64.5 cfs (see page 12, D.A. #2 - 5)

a. Drop Inlets @ Mobile Home Park Entrance
Use C.O.P. Type "N" (13 - Type 2 grates)
Q_{10} = 62.7 cfs (see Page 11, D.A. #2 + #3)
d = 87.06 - 86.00 = 0.46' sump
Clear opening area of grates = 4.25sf x 13 = 55.2 sq. ft. (THYSYS will reduce by 0.5 for sump condiditon)
$Q_{'N'}$ = from THYSYS = 105.0 cfs > 64.5 cfs ∴ OK

b. Use double opening (front and back) catch basin on east side of mobile home park entrance.
The catch basin will be in a sump = 87.06 - 86.74 + 2" = 0.49'
Q_{10} = 1.5 cfs (see Page 11, D.A. #5)
Use C.O.P. 1568, Type L (I4 + I5), Length = 8.0'
For street side:
Q_L = from THYSYS = 6.7 (inlety length reduces by 0.5 for F_R) > 1.5 cfs ∴ OK
For back of sidewalk (Q_{10} = 0.3 cfs, see Page 11, D.A. #4)
Sump = 0.49', Q_L is same as above
$Q_{'L'}$ = 4.4 cfs > 0.3 cfs ∴ OK

c. Total North Side: Q_{in} = 116.1 cfs > 64.5 cfs ∴ OK

2. South Side of McKellips Road:

a. Sta. 15+30: Junction Structure w/ Grate (ADOT C-15.90)

Q_{10} = 3.1 cfs (see Page 11, D.A. #1 + 6)

Sump = 1/2 elevation difference of grate = 0.6 x 0.5 = 0.3'

Q_{in} = from THYSYS = 9.5 cfs > 3.1 cfs ∴ OK

b. Sta. 19+40: Junction Structure w/ Grate (ADOT C-15.90)

Q_{10} = 0.6 cfs (see Page 11, D.A. #7)

Sump = 0.3' (same as above)

Q_{in} = from THYSYS = 9.5 cfs > 0.6 cfs ∴ OK

B. Design of Storm Drain System

1. Use THYSYS (see Pgs. E2-4). The head loss at each junction is calculated by hand (see Pages G-1 and G-2 and included as input into THYSYS.
2. Summary of Pipe & Box Sizes:
   a. from Type 'L' to Type 'N: 18" pipe
   b. from Type 'N' to Junction Structure (@ Sta. 15+30): Three 36" pipes
   c. from Junction Structure (@ Sta. 15+30) to Granite Reef Wash
      One 8' x 3' box

6.2 East Mobile Home Park Area

A. For 10-year storm runoff from roadway plus mobile home park:

For one (L) dry lane condition:

22' @ 1.5% = 0.33' max. d = 86.65 max. water surface elevation

1. North Side of McKellips:

Q_{10} = 103.8 cfs (see Page 12, D.A. #8 - 10, 14 & 15)

a. Drop Inlet (I8) @ Mobile Home Park Entrance

Q_{10} = 99.2 cfs: See page 11, D.A. #8 + 15)

Use C.O.P. Type 'N' (13 - Type 2 grates) (use .50 reduction factor F_R)

d = 86.65 - 86.00 = 0.65'

$Q_{'N'}$ = from THYSYS = 125.0 cfs > 99.2 cfs ∴ OK

b. Use double opening (front & back) catch basin on west side of mobile home park entrance.

The catch basin will be in a sump = 86.65 - 86.33 + 2" = 0.49'

Q_{10} = 1.7 cfs (see Page 11, D.A. #10)

Use C.O.P. 1568, Type 'L' (I10 + I9)

for street side: (I10)

$Q_{'L'}$ = from THYSYS = 6.7 cfs > 1.7 cfs ∴ OK

for back of sidewalk (Q_{10} = 0.9 cfs: see Page 11, D.A. #9) (I9)

sump = 0.49'

$Q_{'L'}$ = same as above, 4.4 cfs > 0.9 cfs ∴ OK

c. Type 'F' on E. side of W. entrance to E. Mobile Home Park, use 0.25 F_R due to being the first catch basin in an earthen roadside swale where dirt and debris can accumulate.

Q_{10} = 2.5 cfs: see page 11, D.A. #14 3.4 cfs

sump = 86.65 - 85.80 = 0.85'

Clear opening area of grate = 5.44 sq. ft. (THYSYS will reduce by 0.5 for sump condition)

$Q_{'F'}$ = from THYSYS = 14.1 cfs x ½ (for F_R = 7.0 cfs > 2.5 cfs ∴ OK =

d. Total Q_{in} @ dry lane condition elev. = 143.1 cfs > 103.8 cfs ∴ OK

2. South side of McKellips:

a. Sta. 25+20: Junction Structure w/ Grate (ADOT C-15.90)

Q_{10} = 3.6 cfs (see Page 11, D.A. #11 + #13)

Sump = 1/2 elevation difference of grate = 0.5 x 0.6' = 0.3'

Q_{in} = from THYSYS = 19.1 cfs 3.6 cfs ∴ OK

b. Sta. 20+77: Junction Structure w/ Grate (ADOT C-15.90)

Q_{10} = 0.5 cfs (see Page 11, D.A. #12)

Sump = 0.31

Q_{in} = from THYSYS = 19.1 cfs > 0.5 cfs ∴ OK

B. Design of Storm Drain System

1. Use THYSYS (see Pages E5-7). The head loss at each junction is calculated by hand (see Pages G-3 and G-4) and included as input into THYSYS.

2. Summary of Pipe Sizes

a. From Type 'L' to Type 'N':	18" pipe
b. From Type 'F' to Type 'N':	18" pipe
c. From Type 'N' to Junction Structure (@ Sta. 25+20):	Four 36" pipes
d. From Junction Structure (@ Sta. 25+20) to Granite Reef Wash:	One 8'x 3' box culvert.

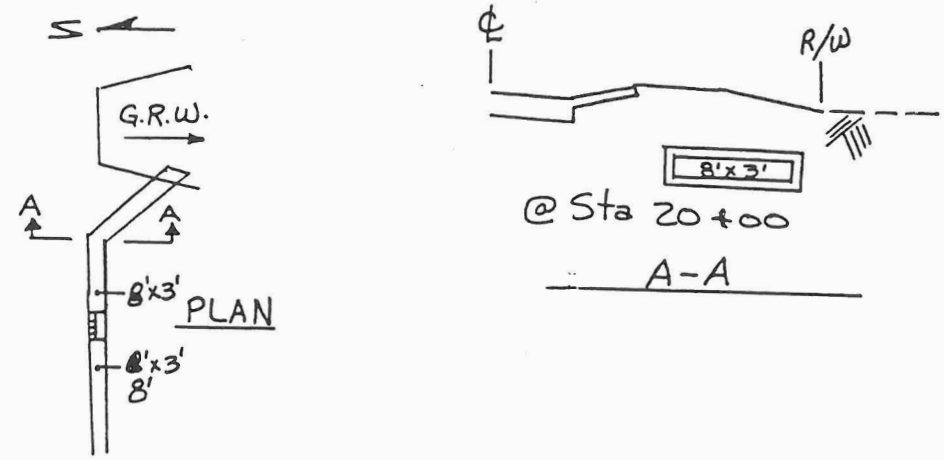
6.3 Table 6.3 following, summarizes the THYSYS computer calculations for the 10-year storm frequency.

7. STORM DRAIN SYSTEMS, ROADSIDE DRAINAGE DITCHES - EAST AND WEST OF GRANITE REEF WASH

7.1 Determine the 100-year storm runoff water surface by using HY-8 (Appendix D) to compute the flow in the storm drain pipe, and the overtopping elevation of the remaining flow. The overtopping profile will be of ground above the pipes or box (from McKellips centerline to new right-of-way line (east side), or top of relocated irrigation ditch (west side).

A. For West Side of Granite Reef Wash (GRW):

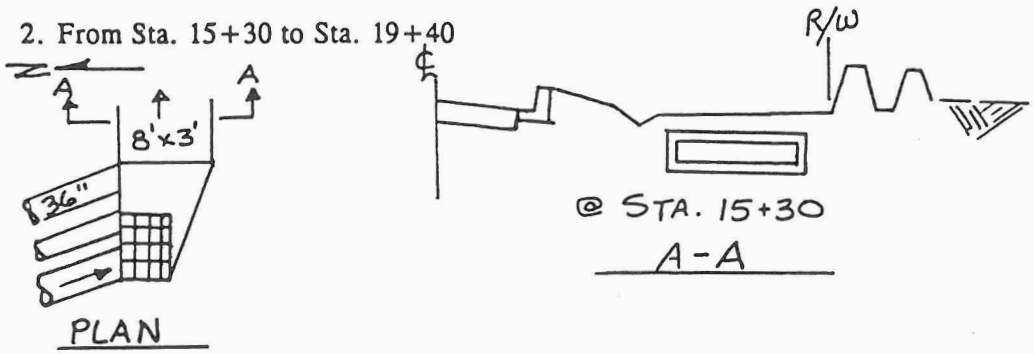
1. From Sta. 19+40 to GRW



The 100-year runoff water surface elevation in GRW is about 1183.07 for a Tc of about 30 minutes.

Use HY-8 with Q_{100} = 137.1, and treat the junction structure as a straight headwall. The results are summarized in Table 7.1, from HY-8 (Appendix D).

2. From Sta. 15+30 to Sta. 19+40

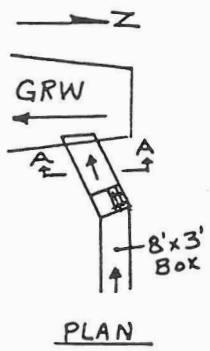


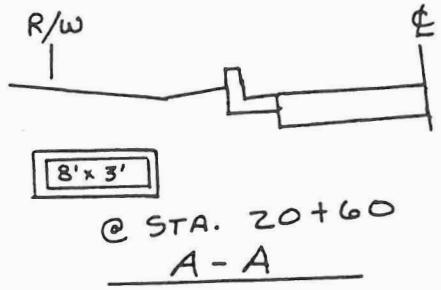
The 100-year flow is 136.2 cfs, and the elevation = 1186.35 from HY-8.

The results are summarized in Table 7.1, from HY-8.

B. For East Side of Granite Reef Wash (GRW)

1. From Sta. 20+77 to GRW

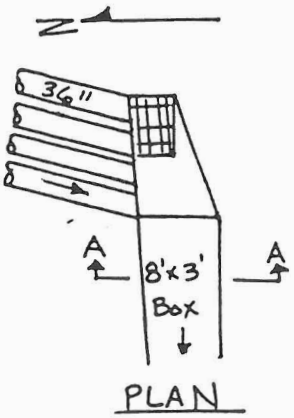


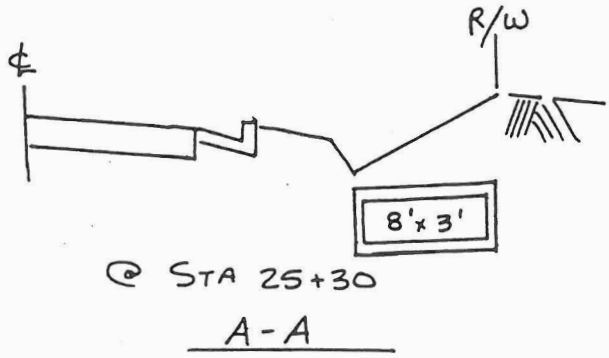


The 100-year flow is 201.9 cfs. The Q100 water surface elevation in Granite Reef Wash channel is 1183.07.

The results are summarized in table 7.1, from HY-8 (Appendix D).

2. From Sta. 25+20 to Sta. 20+77





The 100-year flow is 201.1 cfs @ elevation =1186.50 from HY-8.

The results from HY-8 are summarized in Table 7.1.

7.2 The following table summarizes the 100-year flows in the boxes and ditch above the boxes, and the water surface elevations for the 100-year storm runoff (computed using HY-8, Appendix D):

Table 7.1
Summary of 100-Year Flow Elevations for South Side of McKellips Road

Storm Water Flows (cfs)[1] Ditch	Q_{100}	Q_{pipe}	Q_{ditch}	Water Surface Elevation Q_{100}	Lowest top of Rd. Elev.	Depth above top of Rd. (ft)	Lowest pt. of top of bank south of box	Depth above low point Rd. (ft)
West of Granite Reef Wash								
Sta. 19+40Rt to GRW	137	137		1185.57	1187.24	-1.67	1186.92[2]	-0.32
Sta. 15+30Rt to 19+40Rt	136	136		1186.35		-0.89		
Sta. 15+07Lt to 15+30Rt	126	116	10	1187.35		+0.11		
East of Granite Reef Wash								
Sta. 25+20Rt to GRW	202	177	25	1186.50	1186.83	-0.33	1187.73[3]	0.90
Sta. 25+45Lt to 25+20Rt	193	120	73	1187.13		+0.30		

1 From Page 12, Table 5.5.
2 At new south right-of-way line at Sta. 20+00.
3 At new south right-of-way line at Sta. 24+00.

As shown in Table 7.1, the depth above the lowest top of road elevation is about 1½" on the west side of Granite Reef Wash, and about 3½" on the east side. The peak flows have a short time span and then decrease rapidly according to the hydrographs from the HEC-1 computations (Appendix B). The peak flows will be reduced in half within a 15 minute period after peaking.

The highest elevation that should possibly occur in any storm would be based on the lowest points south of the boxes. These points are shown in Table 7.1, and should not adversely affect the lowest mobile home park floor elevations of 1188.2 on the west and 1188.5 on the east.

8. DETERMINE THE OVERTOPPING ELEVATION OF McKELLIPS ROAD FOR THE FLOWS FROM THE MOBILE HOME PARKS

The proposed sag vertical curve alignment of McKellips will act as a broad-crested weir that will meter water over the centerline of the roadway. The weir equation $Q = 3.0\ L\ d^{1.5}$ is used to determine the overtopping flow. The following table shows the depth, length of weir and Q over the roadway:

	WEST MH PARK		EAST MH PARK	
Depth	Length of Weir	Overtopping Q (cfs)	Length of Weir	Overtopping Q (cfs)
0.1	125	11.9	130	12.3
0.2	179	48.0	183	49.1
0.3	224	110.4	222	109.0
0.4		> 128.6	437	331.7
Q_{100} from MHPs:		128.6		193.1

From the above table, it can be concluded by intrapolation that if the designed storm drain system on the north side of McKellips failed completely, the Q_{100} runoff flows from the roadway and mobile home parks would overtop the low points of McKellips Road by less than 4.8" on the west side and 4.1" on the east side, which are less than the 6" maximum allowed.

9. DETERMINE THE AMOUNT THAT WILL BE CONVEYED BY THE CATCH BASINS AND STORM DRAIN PIPES UNDER McKELLIPS, AND THE AMOUNT THAT OVERTOPS McKELLIPS

At the overtopping elevations, the catch basins are capable of accepting much more storm water than the storm drain pipes are capable of conveying, because they are limited by the backwater effects of the 100-year flows in the ditches. The capacities of the pipes will be determined by using HY-8 and the 100-year water surface elevations to arrive at the same elevation as the overtopping elevation. By interpolation, a determination will be made to arrive at an elevation that the summation of the pipe flows and the overtopping flow will equal the total flow from the mobile home parks. The water surface elevations in the ditches are 1186.08 for the west side, and 1185.92 for the east side. The following table summarizes the results.

	West Mobile Home Park				East Mobile Home Park			
Depth	Elev.	Over-topping	S.D. Pipes	Total	Elev.	Over-topping	S.D. Pipes	Total
0.1	87.34	11.9	58	69.9	86.93	12.3	48	60.3
0.2	87.44	48.0	58	106.0	87.03	49.1	48	97.1
0.3	87.54	110.4	58	168.4	87.13	109.0	48	157.0
0.4					87.23	331.7	48	379.7
0.26	87.50	83.2	58	141.2				
0.33					87.16	138.8	48	186.8

The 100-year storm-water flow overtopping of the centerline of the roadway be the flows from the mobile home parks is about 3" at the west mobile home park, and 4" at the east mobile home park.

FIGURES

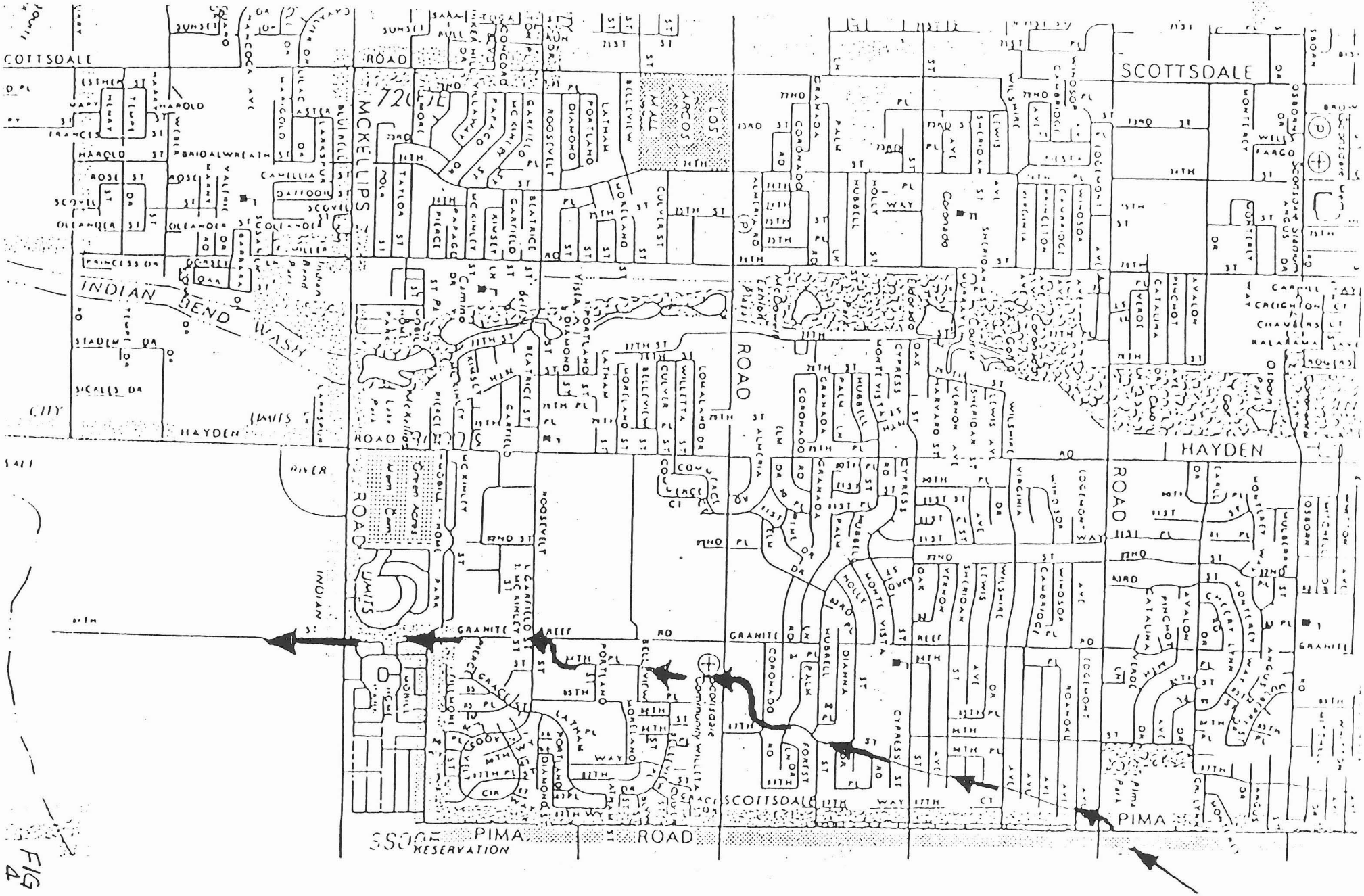

COTTSDALE
SCOTTSDALE
HAYDEN
MCKELLIPS
ROAD
INDIAN BEND WASH
CITY LIMITS
GRANITE REEF
PIMA ROAD
SCOTTSDALE
PIMA
RESERVATION
Community Wilderness
Los Arcos Mall
Camelback Inn
Scottsdale Stadium
Cactus Park
Indian Bend Park
Vista Del Camino Park
Eldorado Park
Pima Park
Cactus Park
Granite Reef Community Wilderness
Scottsdale Community Wilderness
Pima Park
Pima Reservation

FIG 4

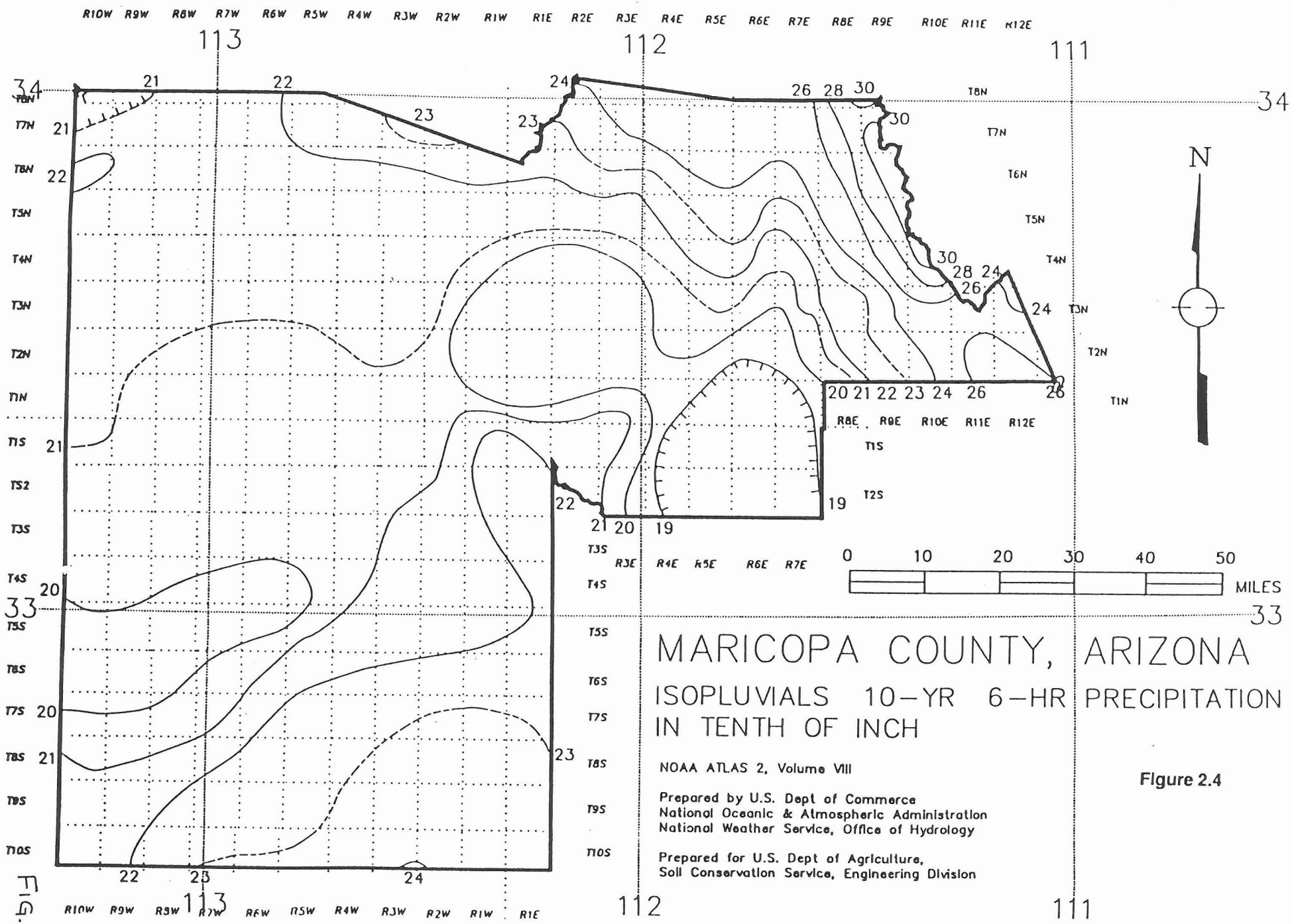


Figure 2.4

Fig. 5

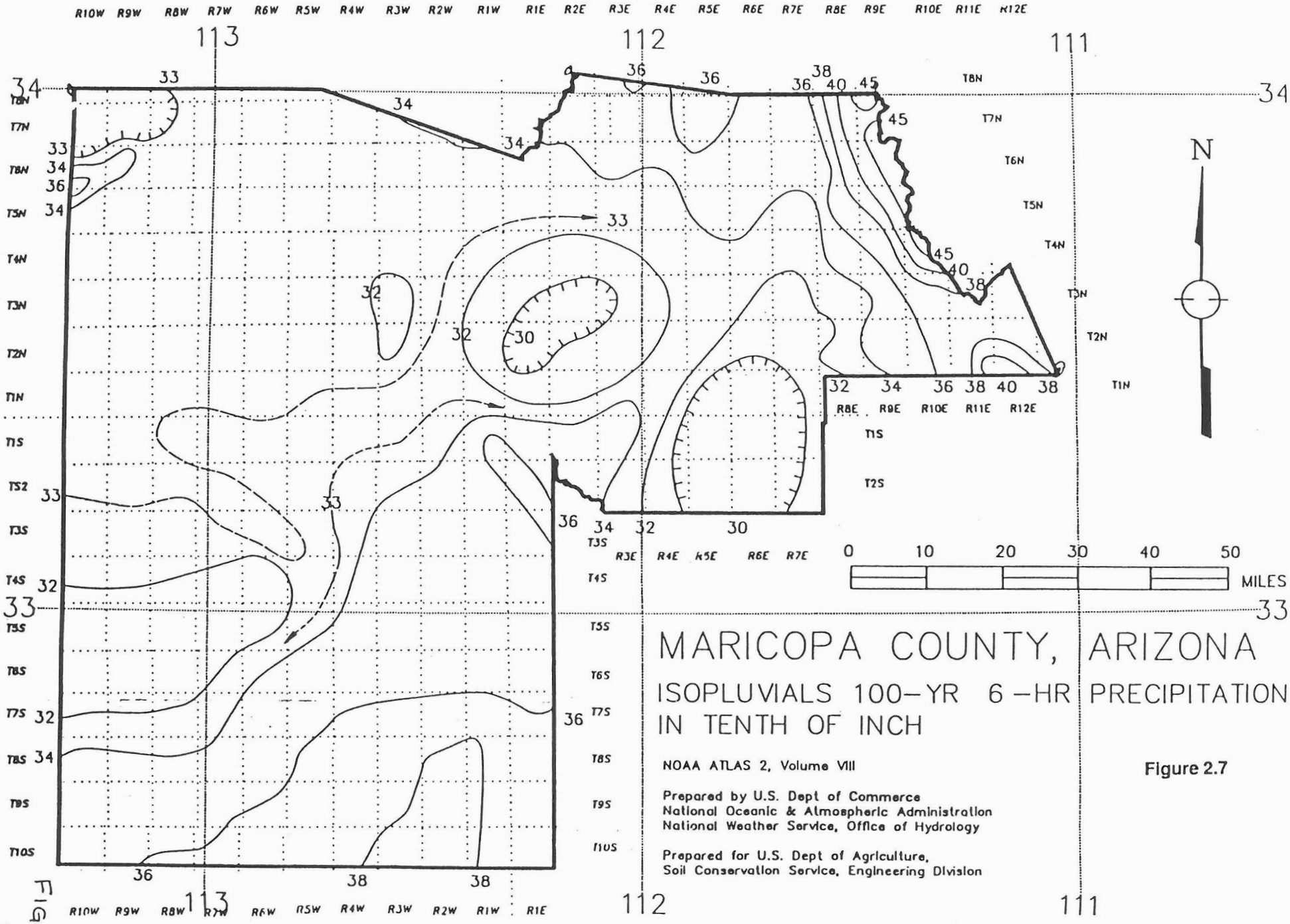


Figure 2.7

Fig. 6

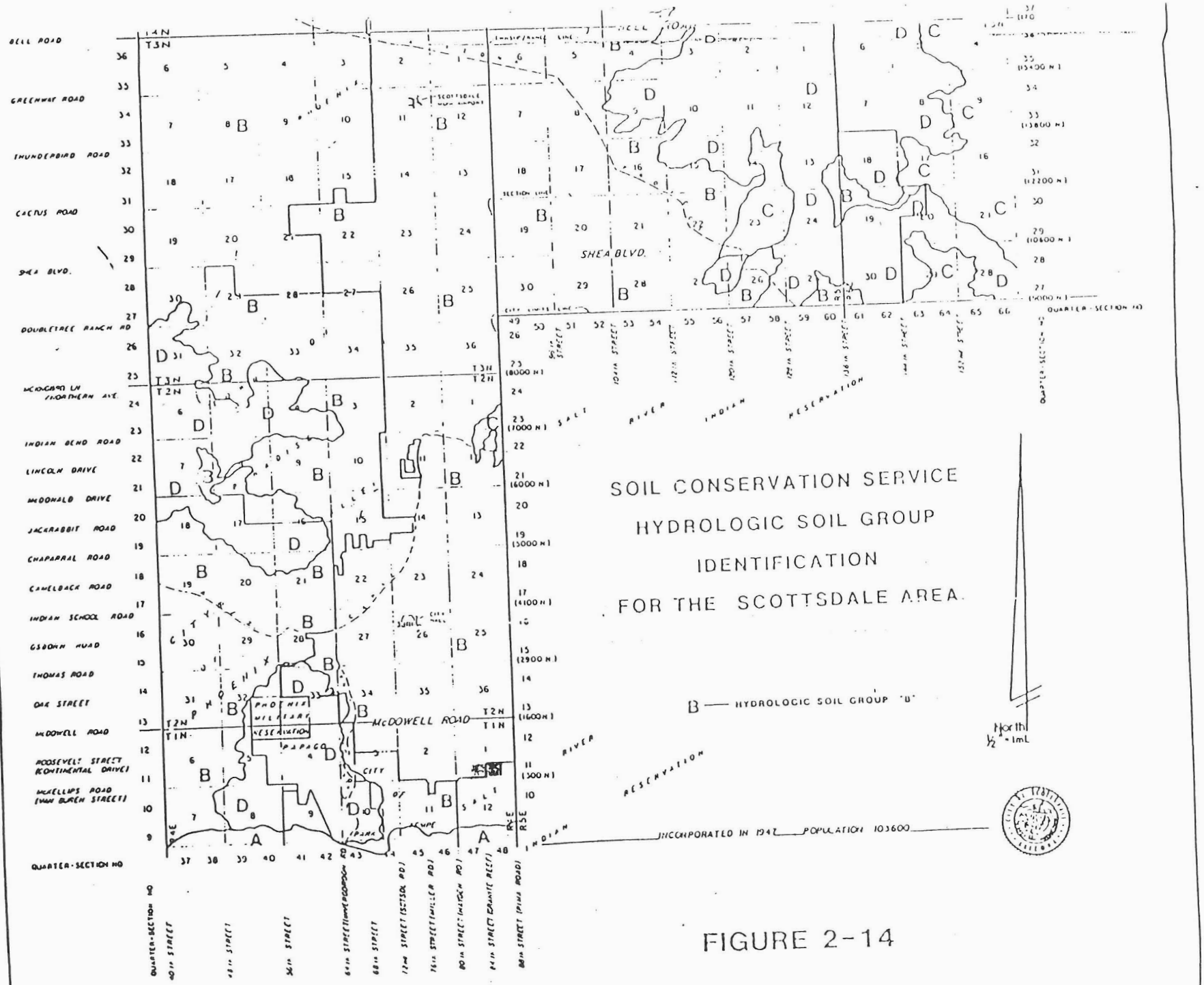

SOIL CONSERVATION SERVICE
HYDROLOGIC SOIL GROUP
IDENTIFICATION
FOR THE SCOTTSDALE AREA.
B — HYDROLOGIC SOIL GROUP "B"
North
½" = 1mi
INCORPORATED IN 1947 POPULATION 103600
McDOWELL ROAD
SHEA BLVD.
SALT RIVER INDIAN RESERVATION
BELL ROAD
GREENWAY ROAD
THUNDERBIRD ROAD
CACTUS ROAD
SHEA BLVD.
DOUBLETREE RANCH RD
INDIAN BEND ROAD
LINCOLN DRIVE
McDONALD DRIVE
JACKRABBIT ROAD
CHAPARRAL ROAD
CAMELBACK ROAD
INDIAN SCHOOL ROAD
THOMAS ROAD
OAK STREET
McDOWELL ROAD
ROOSEVELT STREET (CONTINENTAL DRIVE)
McKELLIPS ROAD (VAN BUREN STREET)
QUARTER-SECTION NO
PHOENIX MILITARY RESERVATION
PARADISE
CITY OF SCOTTSDALE

FIGURE 2-14

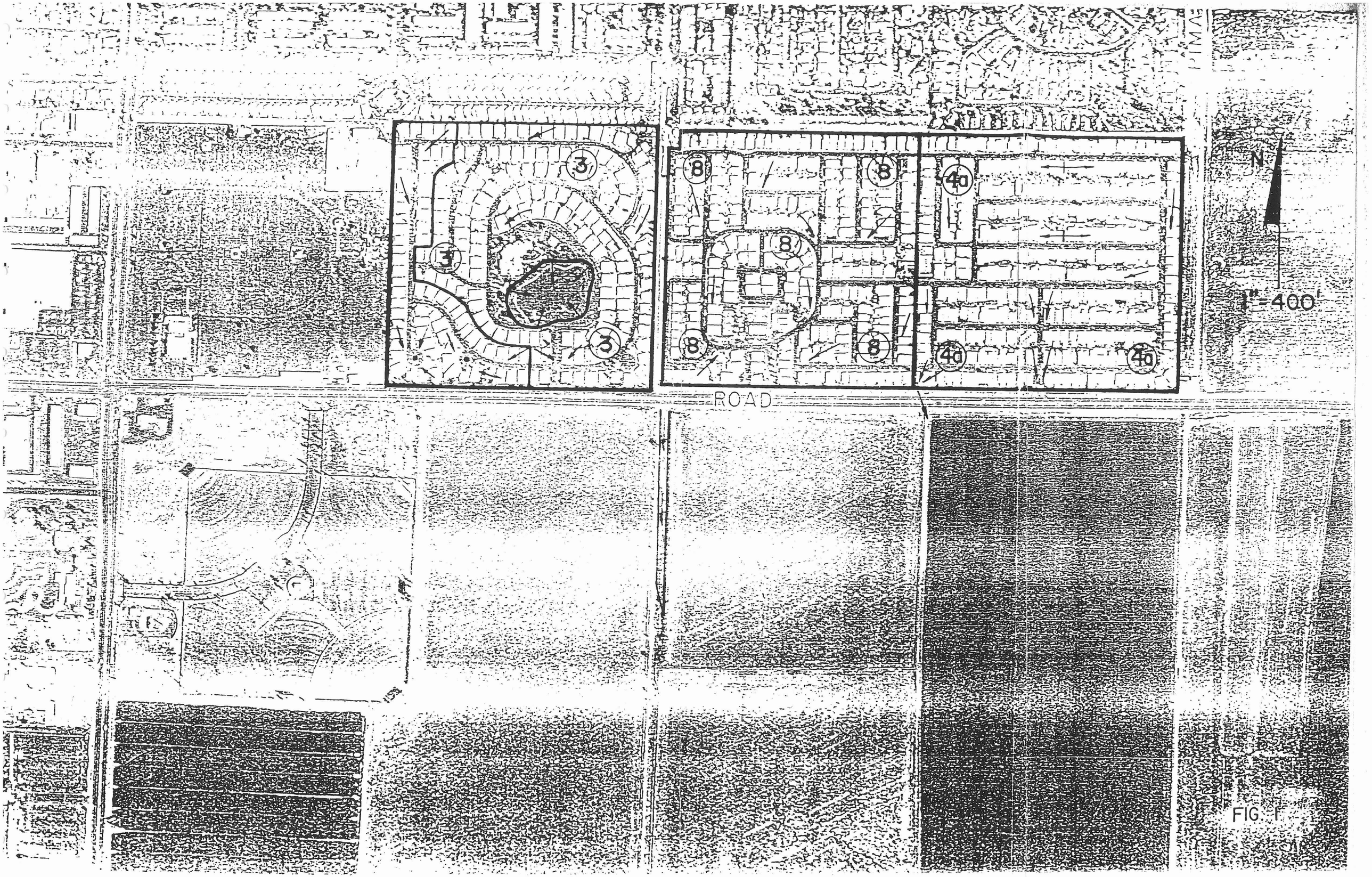


FIG. 1

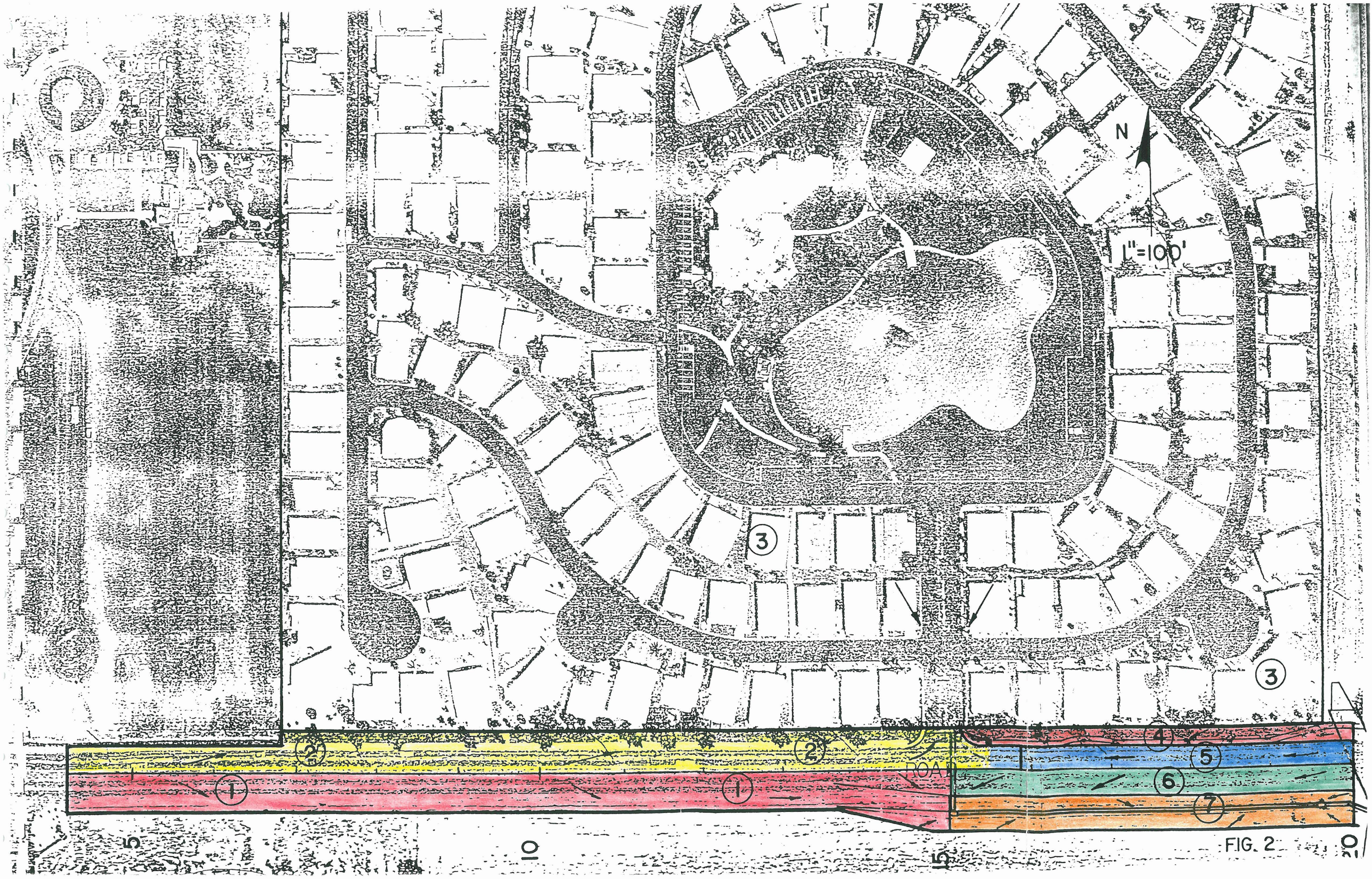


FIG. 2

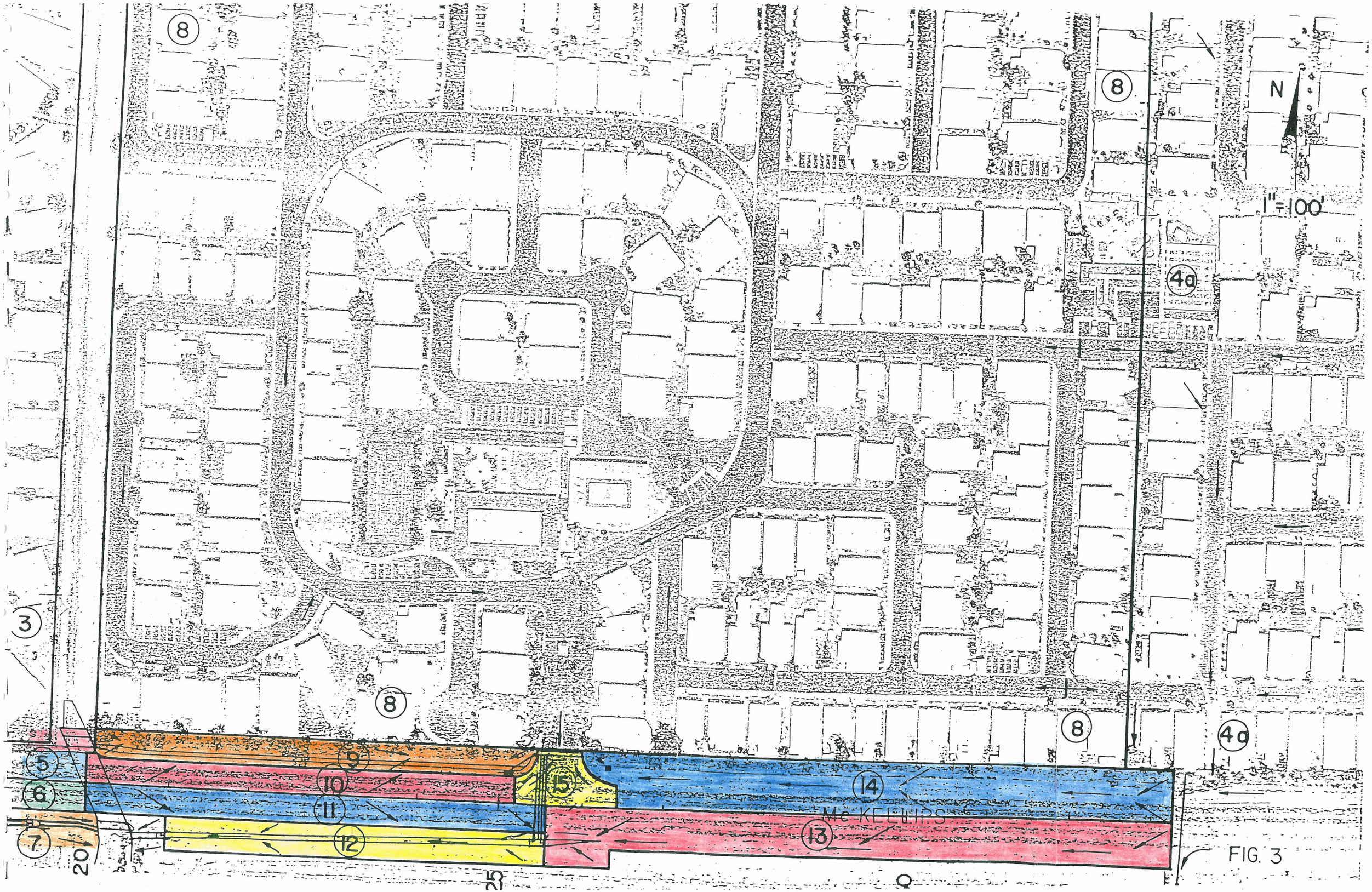


FIG. 3

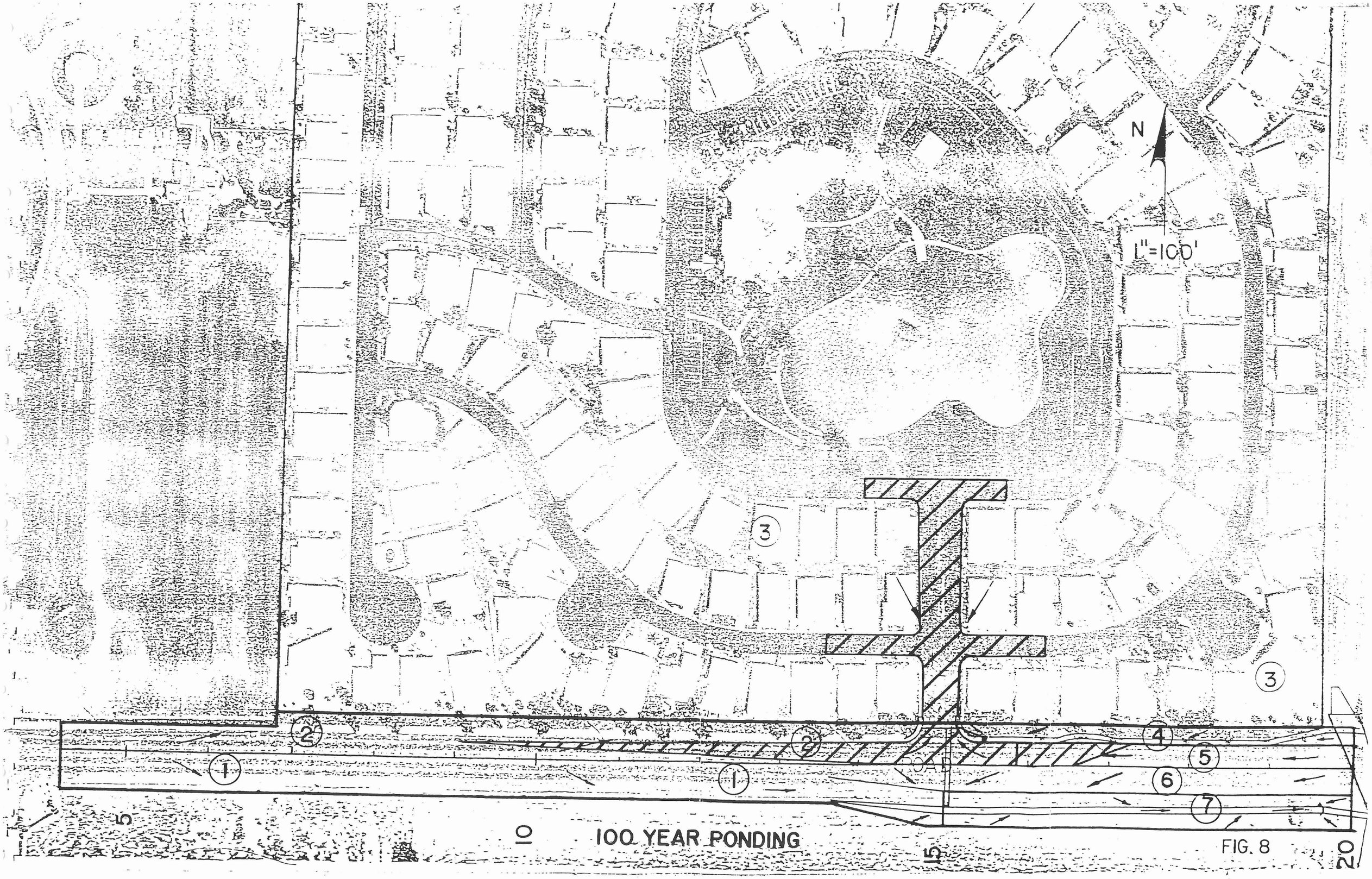


FIG. 8

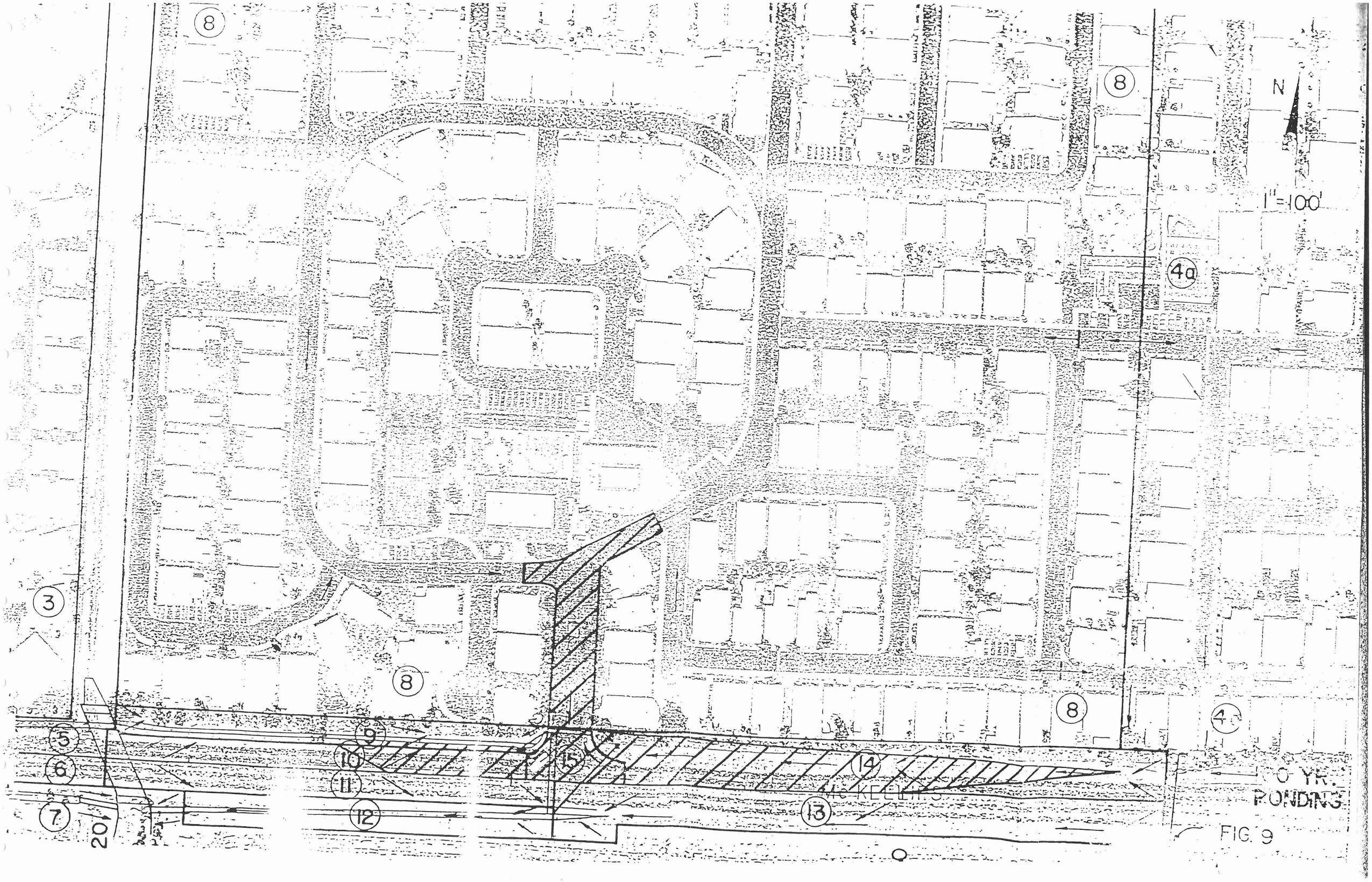

8
8
N
1"=100'
4a
3
8
8
4c
5
6
7
9
10
11
12
15
14
13
McKEEHINS
20
10 YR.
PONDING

FIG. 9

APPENDIX "A"

Rational Method of
Flood Control District of
Maricopa County
Hydrologic Design Manual
September 1, 1990

3

Rational Method

3.1 General

The Rational Method was originally developed to estimate runoff from small areas and its use should be generally limited to those conditions. For the purposes of this manual, its use should be limited to areas of up to 160 acres. In such cases the peak discharge and the volume of runoff from rainfall events up to and including the 100-year, 2-hour duration storm falling within the boundaries of the proposed development are to be retained. If the development involves channel routing, the procedures given in Chapters 4 through 6 should be used, since the peak generated by the Rational Method cannot be directly routed.

3.2 Rational Equation

The Rational Equation relates rainfall intensity, a runoff coefficient and the watershed size to the generated peak discharge. The following shows this relationship:

$$Q = CiA \tag{3.1}$$

where

Q	=	the runoff (cfs) from a given area.
C	=	a coefficient relating the runoff to rainfall.
i	=	average rainfall intensity (inches/hour), lasting for a Tc.
Tc	=	the time of concentration (hours).
A	=	drainage area (acres).

The Rational Equation is based on the concept that the application of a steady, uniform rainfall intensity will produce a peak discharge at such a time when all points of the watershed are contributing to the outflow at the point of design. Such

A-1

a condition is met when the elapsed time is equal to the time of concentration, Tc, which is defined to be the floodwave travel time from the most remote part of the watershed to the point of design. The time of concentration should be computed by applying the following equation developed by Papadakis and Kazan (1987):

$$Tc = 11.4\, L^{0.5} K_b^{0.52} S^{-0.31} i^{-0.38} \qquad (3.2)$$

where

Tc	=	time of concentration in hours
L	=	length of the longest flow path in miles
K_b	=	watershed resistance coefficient (see Figure 3.1, or Table 3.1)
S	=	water course slope in feet/mile
i	=	rainfall intensity in inches/hour*

*It should be noted that i is the "rainfall excess intensity" as originally developed. However, when used in the Rational Equation, rainfall intensity and rainfall excess intensity provide similar values because of the hydrologic characteristics of small, urban watersheds which result in minimal rainfall loss. This is because of the extent of imperviousness associated with urban watersheds and the fact that the time of concentration is usually very short.

Table 3.1
Equation for Estimating K_b in the Tc Equation

$K_b = m \log A + b$ Where A is drainage area, in acres		
Land Classification (1)	**Equation Parameters**	
	m (2)	**b (3)**
Urban	−0.00625	0.04
Bare or nearly bare ground (bare, agricultural land, desert rangeland)	−0.01375	0.08
Rough and/or moderate vegetation (hillslopes, alluvial fan)	−0.025	0.15
Very rough and/or dense vegetation (mountains)	−0.030	0.20

3.4 Limitations

Application of the Rational Method is appropriate for small watersheds. This is based on the assumption that the rainfall intensity is to be uniformly distributed over the drainage area at a uniform rate lasting for the duration of the storm.

3.5 Application

The Rational Method can be used to calculate the generated peak discharge and runoff volume for small drainage areas.

3.5.1 Peak Discharge Calculation

1. Determine the area within the development boundaries.

2. Select the runoff coefficient, C from Table 3.2

3. Calculate time of concentration (see example 4). This is to be done by an iterative process. Select a duration from the I-D-F curves, Figure 3.2. This value should not be longer than two hours and normally it will be less than an hour. Determine the maximum rainfall intensity indicated on the I-D-F curve for a frequency that includes the 100-year. The intensity value of the corresponding Tc in the above is for the Phoenix Metro area. Use i_p in the following equation for estimating i for other areas:

$$i = i_p \frac{(P^6{}_{10})}{2.07} \tag{3.3}$$

where

i	=	the desired intensity for a given duration and frequency.
i_p	=	the intensity for the Phoenix Metro area.
$P^6{}_{10}$	=	the 10-year, 6-hour precipitation depth at the point of interest. (Can be read from Figure 2.4.)

4. Use the adjusted intensity in Equation 3.2 to calculate time of concentration. Repeat this process until the selected and computed Tc values are reasonably close. For more details see Example 4.

5. Determine peak discharge (Q) by using the above value of i in Equation 3.1.

3.5.2 Volume Calculations

Volume calculation should be done by applying the following equation:

$$V = C\left(\frac{P}{12}\right)A \tag{3.4}$$

where

V = Calculated volume in acre-feet

C = Runoff coefficient from Table 3.2

P = Rainfall depth in inches

A = Drainage area in acres

In the case of volume calculations for retention/detention design, P equals the 100-year, 2-hour depth, in inches, from Section 2.4.

Table 3.2
C Coefficients for Use with the Rational Formula

Streets	
Asphaltic	0.70 - 0.95
Concrete	0.80 - 0.95
Gravel roadways & shoulders	0.40 - 0.60
Industrial Areas	
Flat commercial (about %90 impervious)	0.80
Heavy	0.60 - 0.90
Light	0.50 - 0.80
Business Areas	
Downtown	0.70 - 0.95
Neighborhood	0.50 - 0.70
Residential Areas	
Lawns - flat	0.05 - 0.15
- steep	0.15 - 0.35
Suburban	0.25 - 0.40
Single family	0.30 - 0.50
Multi - unit	0.40 - 0.60
Apartment	0.50 - 0.70
Parks, Cemeteries	0.10 - 0.25
Playgrounds	0.20 - 0.30
Agricultural Areas	0.10 - 0.20
Bare ground	0.20 - 0.30
Undeveloped Desert	0.30 - 0.40
Mountain Terrain (slopes > 10 percent)	0.60 - 0.80

APPENDIX "B"

HEC-1 Computation Runs

```
****************************************
*                                      *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*           SEPTEMBER 1990             *
*            VERSION 4.0               *
*                                      *
* RUN DATE  03/13/1992  TIME  06:51:24 *
*                                      *
****************************************
```

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

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X        XXXXX X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX        XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

Q10-6hr. West Mobil Home Park


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

  1           ID    West Trailer Park 10-Yr., 6 Hr. Storm Runoff using MCUHP1
  2           IT       3                    121
  3           IO       5       2

  4           KK   SB-3
  5           KM   SUB-BASIN SB-3
  6           BA    .043
  7           IN      15
  8           PB   1.899
  9           PC    .000    .008    .016    .025    .033    .041    .050    .058    .066    .074
 10           PC    .087    .099    .118    .138    .216    .377    .834    .911    .931    .950
 11           PC    .962    .972    .983    .991   1.000
 12           LU    .568    .150  52.000
 13           UC    .300    .249
 14           UA       0       5      16      30      65      77      84      90      94      97
 15           UA     100
 16           ZZ
```

```
****************************************
*                                      *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*          SEPTEMBER 1990              *
*           VERSION 4.0                *
*                                      *
* RUN DATE  03/13/1992  TIME  06:48:00 *
*                                      *
****************************************
```

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

West Trailer Park 10-Yr., 6 Hr. Storm Runoff using MCUHP1

```
3 IO          OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          2  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

  IT          HYDROGRAPH TIME DATA
                     NMIN          3  MINUTES IN COMPUTATION INTERVAL
                    IDATE      1   0  STARTING DATE
                    ITIME       0000  STARTING TIME
                       NQ        121  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE      1   0  ENDING DATE
                   NDTIME       0600  ENDING TIME
                    ICENT         19  CENTURY MARK

              COMPUTATION INTERVAL     .05 HOURS
                   TOTAL TIME BASE    6.00 HOURS

       ENGLISH UNITS
            DRAINAGE AREA          SQUARE MILES
            PRECIPITATION DEPTH    INCHES
            LENGTH, ELEVATION      FEET
            FLOW                   CUBIC FEET PER SECOND
            STORAGE VOLUME         ACRE-FEET
            SURFACE AREA           ACRES
            TEMPERATURE            DEGREES FAHRENHEIT
```

STATION SB-3

				(O) OUTFLOW										
		0.	10.	20.	30.	40.	50.	60.	0.	0.	0.	0.	0.	0.
												(L) PRECIP,	(X) EXCESS	
		.00	.00	.00	.00	.00	.00	.00	.00	.20	.15	.10	.05	.00
)AHRMN	PER													
10000	10	.	.	.	.	.	.	.	.	.	.	.	.	.
10003	20	.	.	.	.	.	.	.	.	.	.	.	.	L.
10006	30	.	.	.	.	.	.	.	.	.	.	.	.	L.
10009	40	.	.	.	.	.	.	.	.	.	.	.	.	L.
10012	50	.	.	.	.	.	.	.	.	.	.	.	.	L.
10015	60	.	.	.	.	.	.	.	.	.	.	.	.	L.
10018	70	.	.	.	.	.	.	.	.	.	.	.	.	L.
10021	8.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10024	9.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10027	10.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10030	11.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10033	12.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10036	13.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10039	14.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10042	15.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10045	16.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10048	17.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10051	18.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10054	19.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10057	20.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10100	21.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10103	22.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10106	23.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10109	24.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10112	25.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10115	26.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10118	27.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10121	28.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10124	29.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10127	30.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10130	31.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10133	32.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10136	33.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10139	34.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10142	35.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10145	36.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10148	37.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10151	38.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10154	39.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10157	40.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10200	41.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10203	42.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10206	43.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10209	44.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10212	45.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10215	46.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10218	47.0	.	.	.	.	.	.	.	.	.	.	.	.	X.
10221	48.0	.	.	.	.	.	.	.	.	.	.	.	.	X.
10224	49.0	.	.	.	.	.	.	.	.	.	.	.	.	X.
10227	50.0	.	.	.	.	.	.	.	.	.	.	.	.	X.
10230	51.0	.	.	.	.	.	.	.	.	.	.	.	.	X.
10233	52.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10236	53.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10239	54.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10242	55.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10245	56.0	.	.	.	.	.	.	.	.	.	.	.	.	L.
10248	57.0	.	.	.	.	.	.	.	.	.	.	.	.	X.
10251	58.0	.	.	.	.	.	.	.	.	.	.	.	.	X.
10254	59.0	.	.	.	.	.	.	.	.	.	.	.	.	X.

```
10257  60.O        .         .         .         .         .         .         .         .         .         .         .       X.
10300  61. O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . X.
10303  62. O       .         .         .         .         .         .         .         .         .         .         .      LX.
10306  63. O       .         .         .         .         .         .         .         .         .         .         .      LX.
10309  64. O       .         .         .         .         .         .         .         .         .         .         .      LX.
10312  65. O       .         .         .         .         .         .         .         .         .         .         .      LX.
10315  66. O       .         .         .         .         .         .         .         .         .         .         .      LX.
10318  67. O       .         .         .         .         .         .         .         .         .         .         .  LLLXXX.
10321  68. O       .         .         .         .         .         .         .         .         .         .         .  LLLXXX.
10324  69.  O      .         .         .         .         .         .         .         .         .         .         .  LLLXXX.
10327  70.   O     .         .         .         .         .         .         .         .         .         .         .  LLLXXX.
10330  71. . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LLLXXX.
10333  72.    O    .         .         .         .         .         .         .         .         .         .      LLLLLLXXXXXX.
10336  73.     O   .         .         .         .         .         .         .         .         .         .      LLLLLLXXXXXX.
10339  74.       O .         .         .         .         .         .         .         .         .         .      LLLXXXXXXXXX.
10342  75.         O         .         .         .         .         .         .         .         .         .      XXXXXXXXXXXX.
10345  76.         . O       .         .         .         .         .         .         .         .         .      XXXXXXXXXXXX.
10348  77.         .     O   .         .         .         .         .         .         .         .   LXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX.
10351  78.         .         .O        .         .         .         .         .         .         .   LXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX.
10354  79.         .         .         O         .         .         .         .         .         .   LXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX.
10357  80.         .         .         .         O         .         .         .         .         .   LXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX.
10400  81. . . . . . . . . . . . . . . . . . . . . . . . .O. . . . . . . . . . . . . . . . . LXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX.
10403  82.         .         .         .         .         .     O   .         .         .         .         .         .  LXXXXX.
10406  83.         .         .         .         .         .        O.         .         .         .         .         .  LXXXXX.
10409  84.         .         .         .         .         .      O  .         .         .         .         .         .  LXXXXX.
10412  85.         .         .         .         .         .O        .         .         .         .         .         .  LXXXXX.
10415  86.         .         .         .         .     O   .         .         .         .         .         .         .  LXXXXX.
10418  87.         .         .         .         O         .         .         .         .         .         .         .      LX.
10421  88.         .         .         .    O    .         .         .         .         .         .         .         .      LX.
10424  89.         .         .         O         .         .         .         .         .         .         .         .      LX.
10427  90.         .         .    O    .         .         .         .         .         .         .         .         .      LX.
10430  91. . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .LX.
10433  92.         .       O .         .         .         .         .         .         .         .         .         .       X.
10436  93.         .    O    .         .         .         .         .         .         .         .         .         .       X.
10439  94.         .  O      .         .         .         .         .         .         .         .         .         .       X.
10442  95.         .O        .         .         .         .         .         .         .         .         .         .       X.
10445  96.        O.         .         .         .         .         .         .         .         .         .         .       X.
10448  97.       O .         .         .         .         .         .         .         .         .         .         .       L.
10451  98.      O  .         .         .         .         .         .         .         .         .         .         .       L.
10454  99.     O   .         .         .         .         .         .         .         .         .         .         .       L.
10457 100.    O    .         .         .         .         .         .         .         .         .         .         .       L.
10500 101. . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . L.
10503 102.   O     .         .         .         .         .         .         .         .         .         .         .       L.
10506 103.  O      .         .         .         .         .         .         .         .         .         .         .       L.
10509 104.  O      .         .         .         .         .         .         .         .         .         .         .       L.
10512 105.  O      .         .         .         .         .         .         .         .         .         .         .       L.
10515 106. O       .         .         .         .         .         .         .         .         .         .         .       L.
10518 107. O       .         .         .         .         .         .         .         .         .         .         .       L.
10521 108. O       .         .         .         .         .         .         .         .         .         .         .       L.
10524 109.O        .         .         .         .         .         .         .         .         .         .         .       L.
10527 110.O        .         .         .         .         .         .         .         .         .         .         .       L.
10530 111.O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . L.
10533 112.O        .         .         .         .         .         .         .         .         .         .         .       L.
10536 113.O        .         .         .         .         .         .         .         .         .         .         .       L.
10539 114.O        .         .         .         .         .         .         .         .         .         .         .       L.
10542 115.O        .         .         .         .         .         .         .         .         .         .         .       L.
10545 116.O        .         .         .         .         .         .         .         .         .         .         .       L.
10548 117.O        .         .         .         .         .         .         .         .         .         .         .       L.
10551 118.O        .         .         .         .         .         .         .         .         .         .         .       L.
10554 119.O        .         .         .         .         .         .         .         .         .         .         .       L.
10557 120.O        .         .         .         .         .         .         .         .         .         .         .       L.
10600 121.O--------.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.-------L.
```

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	SB-3	59.	4.10	7.	7.	7.	.04		

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

Q100-6hr West Mobil Home Park


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

  1           ID   West Trailer Park 100-Year, 6 Hr. Storm Runoff using MCUHP1
  2           IT      3                    121
  3           IO      5       2

  4           KK   SB-3
  5           KM   SUB-BASIN SB-3
  6           BA    .043
  7           IN      15
  8           PB   3.198
  9           PC    .000    .008    .016    .025    .033    .041    .050    .058    .066    .074
 10           PC    .087    .099    .118    .138    .216    .377    .834    .911    .931    .950
 11           PC    .962    .972    .983    .991   1.000
 12           LU    .568    .150  52.000
 13           UC    .233    .188
 14           UA       0       5      16      30      65      77      84      90      94      97
 15           UA     100
 16           ZZ
```

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*            SEPTEMBER 1990             *
*             VERSION 4.0               *
*                                       *
*  RUN DATE  03/13/1992  TIME  06:49:33 *
*                                       *
*****************************************
```

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

West Trailer Park 100-Year, 6 Hr. Storm Runoff using MCUHP1

```
3 IO          OUTPUT CONTROL VARIABLES
                   IPRNT          5  PRINT CONTROL
                   IPLOT          2  PLOT CONTROL
                   QSCAL         0.  HYDROGRAPH PLOT SCALE

  IT          HYDROGRAPH TIME DATA
                    NMIN          3  MINUTES IN COMPUTATION INTERVAL
                   IDATE      1    0  STARTING DATE
                   ITIME       0000  STARTING TIME
                      NQ        121  NUMBER OF HYDROGRAPH ORDINATES
                  NDDATE      1    0  ENDING DATE
                  NDTIME       0600  ENDING TIME
                   ICENT         19  CENTURY MARK

             COMPUTATION INTERVAL     .05 HOURS
                  TOTAL TIME BASE    6.00 HOURS

       ENGLISH UNITS
            DRAINAGE AREA          SQUARE MILES
            PRECIPITATION DEPTH    INCHES
            LENGTH, ELEVATION      FEET
            FLOW                   CUBIC FEET PER SECOND
            STORAGE VOLUME         ACRE-FEET
            SURFACE AREA           ACRES
            TEMPERATURE            DEGREES FAHRENHEIT
```

STATION SB-3

				(O) OUTFLOW									
		0.	20.	40.	60.	80.	100.	120.	0.	0.	0.	0.	0.	0.
												(L) PRECIP,	(X) EXCESS	
		.0	.0	.0	.0	.0	.0	.0	.0	.0	.3	.2	.1	.0
DAHRMN	PER													
10000	10													
10003	20													L.
10006	30													L.
10009	40													L.
10012	50													L.
10015	60													L.
10018	70													L.
10021	8.0													L.
10024	9.0													L.
10027	10.0													L.
10030	11.0													L.
10033	12.0													L.
10036	13.0													L.
10039	14.0													L.
10042	15.0													L.
10045	16.0													L.
10048	17.0													L.
10051	18.0													L.
10054	19.0													L.
10057	20.0													L.
10100	21.0													L.
10103	22.0													L.
10106	23.0													L.
10109	24.0													L.
10112	25.0													L.
10115	26.0													L.
10118	27.0													L.
10121	28.0													L.
10124	29.0													L.
10127	30.0													L.
10130	31.0													L.
10133	32.0													L.
10136	33.0													L.
10139	34.0													L.
10142	35.0													L.
10145	36.0													L.
10148	37.0													L.
10151	38.0													L.
10154	39.0													L.
10157	40.0													L.
10200	41.0													L.
10203	42.0													L.
10206	43.0													L.
10209	44.0													L.
10212	45.0													L.
10215	46.0													L.
10218	47.0													L.
10221	48.0													L.
10224	49.0													L.
10227	50.0													L.
10230	51.0													L.
10233	52.0													L.
10236	53.0													L.
10239	54.0													L.
10242	55.0													L.
10245	56.0													L.
10248	57.0													X.
10251	58.0													X.
10254	59.0													X.

```
10257  60.0          .         .         .         .         .         .         .         .         .         .         .         x.
10300  61.0. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .x.
10303  62. 0         .         .         .         .         .         .         .         .         .         .         .         x.
10306  63. 0         .         .         .         .         .         .         .         .         .         .         .         x.
10309  64. 0         .         .         .         .         .         .         .         .         .         .         .         x.
10312  65. 0         .         .         .         .         .         .         .         .         .         .         .         x.
10315  66. 0         .         .         .         .         .         .         .         .         .         .         .         x.
10318  67. 0         .         .         .         .         .         .         .         .         .         .         .      LLxxx.
10321  68. 0         .         .         .         .         .         .         .         .         .         .         .      LLxxx.
10324  69.  0        .         .         .         .         .         .         .         .         .         .         .      Lxxxx.
10327  70.   0       .         .         .         .         .         .         .         .         .         .         .      xxxxx.
10330  71. . . 0 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .xxxxx.
10333  72.      0 .         .         .         .         .         .         .         .         .         .         .   xxxxxxxxxx.
10336  73.        0         .         .         .         .         .         .         .         .         .         .   xxxxxxxxxx.
10339  74.        .  0      .         .         .         .         .         .         .         .         .         .   xxxxxxxxxx.
10342  75.        .     0   .         .         .         .         .         .         .         .         .         .   xxxxxxxxxx.
10345  76.        .       0.          .         .         .         .         .         .         .         .         .   xxxxxxxxxx.
10348  77.        .         . 0       .         .         .         .         .         .         .         .xxxxxxxxxxxxxxxxxxxxxxxxxxxx.
10351  78.        .         .      0. .         .         .         .         .         .         .         .xxxxxxxxxxxxxxxxxxxxxxxxxxxx.
10354  79.        .         .         .   0     .         .         .         .         .         .         .xxxxxxxxxxxxxxxxxxxxxxxxxxxx.
10357  80.        .         .         .       0 .         .         .         .         .         .         .xxxxxxxxxxxxxxxxxxxxxxxxxxxx.
10400  81. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .xxxxxxxxxxxxxxxxxxxxxxxxxxxx.
10403  82.        .         .         .         .         .         .      0.         .         .         .         .         .   xxxxx.
10406  83.        .         .         .         .         .         .    0 .         .         .         .         .         .   xxxxx.
10409  84.        .         .         .         .         .         0         .         .         .         .         .         .   xxxxx.
10412  85.        .         .         .         .       0 .         .         .         .         .         .         .         .   xxxxx.
10415  86.        .         .         .         .   0     .         .         .         .         .         .         .         .   xxxxx.
10418  87.        .         .         .       0         .         .         .         .         .         .         .         .      x.
10421  88.        .         .         .   0     .         .         .         .         .         .         .         .         .      x.
10424  89.        .         .       0         .         .         .         .         .         .         .         .         .      x.
10427  90.        .     0   .         .         .         .         .         .         .         .         .         .         .      x.
10430  91. . . . . . .0. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .x.
10433  92.        .0        .         .         .         .         .         .         .         .         .         .         .      x.
10436  93.       0.         .         .         .         .         .         .         .         .         .         .         .      x.
10439  94.     0 .         .         .         .         .         .         .         .         .         .         .         .      x.
10442  95.    0  .         .         .         .         .         .         .         .         .         .         .         .      x.
10445  96.   0   .         .         .         .         .         .         .         .         .         .         .         .      x.
10448  97.  0    .         .         .         .         .         .         .         .         .         .         .         .      L.
10451  98.  0    .         .         .         .         .         .         .         .         .         .         .         .      L.
10454  99. 0     .         .         .         .         .         .         .         .         .         .         .         .      L.
10457 100. 0     .         .         .         .         .         .         .         .         .         .         .         .      L.
10500 101. 0 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .L.
10503 102. 0     .         .         .         .         .         .         .         .         .         .         .         .      L.
10506 103. 0     .         .         .         .         .         .         .         .         .         .         .         .      L.
10509 104.0      .         .         .         .         .         .         .         .         .         .         .         .      L.
10512 105.0      .         .         .         .         .         .         .         .         .         .         .         .      L.
10515 106.0      .         .         .         .         .         .         .         .         .         .         .         .      L.
10518 107.0      .         .         .         .         .         .         .         .         .         .         .         .      L.
10521 108.0      .         .         .         .         .         .         .         .         .         .         .         .      L.
10524 109.0      .         .         .         .         .         .         .         .         .         .         .         .      L.
10527 110.0      .         .         .         .         .         .         .         .         .         .         .         .      L.
10530 111.0. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .L.
10533 112.0      .         .         .         .         .         .         .         .         .         .         .         .      L.
10536 113.0      .         .         .         .         .         .         .         .         .         .         .         .      L.
10539 114.0      .         .         .         .         .         .         .         .         .         .         .         .      L.
10542 115.0      .         .         .         .         .         .         .         .         .         .         .         .      L.
10545 116.0      .         .         .         .         .         .         .         .         .         .         .         .      L.
10548 117.0      .         .         .         .         .         .         .         .         .         .         .         .      L.
10551 118.0      .         .         .         .         .         .         .         .         .         .         .         .      L.
10554 119.0      .         .         .         .         .         .         .         .         .         .         .         .      L.
10557 120.0      .         .         .         .         .         .         .         .         .         .         .         .      L.
10600 121.0--------.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------L.
```

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	SB-3	118.	4.05	13.	13.	13.	.04		

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

Q10-6hr East Mobile Home Park


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

  1           ID   East Trailer Park 10-Yr., 6 Hr. Storm Runoff using MCUHP1
  2           IT      3                    121
  3           IO      5       2

  4           KK   SB-8
  5           KM   SUB-BASIN SB-8
  6           BA    .060
  7           IN      15
  8           PB   1.899
  9           PC    .000    .008    .016    .025    .033    .041    .050    .058    .066    .074
 10           PC    .087    .099    .118    .138    .216    .377    .834    .911    .931    .950
 11           PC    .962    .972    .983    .991   1.000
 12           LU    .568    .150  56.000
 13           UC    .267    .161
 14           UA       0       5      16      30      65      77      84      90      94      97
 15           UA     100
 16           ZZ
```

```
*****************************************
*                                       *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *
*           SEPTEMBER 1990              *
*            VERSION 4.0                *
*                                       *
*  RUN DATE  03/13/1992  TIME  06:43:00 *
*                                       *
*****************************************
```

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

East Trailer Park 10-Yr., 6 Hr. Storm Runoff using MCUHP1

```
3 IO        OUTPUT CONTROL VARIABLES
                 IPRNT          5  PRINT CONTROL
                 IPLOT          2  PLOT CONTROL
                 QSCAL         0.  HYDROGRAPH PLOT SCALE

  IT        HYDROGRAPH TIME DATA
                  NMIN          3  MINUTES IN COMPUTATION INTERVAL
                 IDATE     1    0  STARTING DATE
                 ITIME        0000  STARTING TIME
                    NQ         121  NUMBER OF HYDROGRAPH ORDINATES
                NDDATE     1    0  ENDING DATE
                NDTIME        0600  ENDING TIME
                 ICENT          19  CENTURY MARK

            COMPUTATION INTERVAL     .05 HOURS
                 TOTAL TIME BASE    6.00 HOURS

      ENGLISH UNITS
           DRAINAGE AREA          SQUARE MILES
           PRECIPITATION DEPTH    INCHES
           LENGTH, ELEVATION      FEET
           FLOW                   CUBIC FEET PER SECOND
           STORAGE VOLUME         ACRE-FEET
           SURFACE AREA           ACRES
           TEMPERATURE            DEGREES FAHRENHEIT
```

STATION SB-8

				(O) OUTFLOW									
		0.	20.	40.	60.	80.	100.	0.	0.	0.	0.	0.	0.
												(L) PRECIP,	(X) EXCESS
		.00	.00	.00	.00	.00	.00	.00	.00	.20	.15	.10	.05	.00
DAHRMN	PER													
10000	10													
10003	20													L.
10006	30													L.
10009	40													L.
10012	50													L.
10015	60													L.
10018	70													L.
10021	8.0													L.
10024	9.0													L.
10027	10.0													L.
10030	11.0													L.
10033	12.0													L.
10036	13.0													L.
10039	14.0													L.
10042	15.0													L.
10045	16.0													L.
10048	17.0													L.
10051	18.0													L.
10054	19.0													L.
10057	20.0													L.
10100	21.0													L.
10103	22.0													L.
10106	23.0													L.
10109	24.0													L.
10112	25.0													L.
10115	26.0													L.
10118	27.0													L.
10121	28.0													L.
10124	29.0													L.
10127	30.0													L.
10130	31.0													L.
10133	32.0													L.
10136	33.0													L.
10139	34.0													L.
10142	35.0													L.
10145	36.0													L.
10148	37.0													L.
10151	38.0													L.
10154	39.0													L.
10157	40.0													L.
10200	41.0													L.
10203	42.0													L.
10206	43.0													L.
10209	44.0													L.
10212	45.0													L.
10215	46.0													L.
10218	47.0													X.
10221	48.0													X.
10224	49.0													X.
10227	50.0													X.
10230	51.0													X.
10233	52.0													X.
10236	53.0													X.
10239	54.0													X.
10242	55.0													X.
10245	56.0													X.
10248	57.0													X.
10251	58.0													X.
10254	59.0													X.

```
10257  60.0        .         .         .         .         .         .         .         .         .         .         .        X.
10300  61.0. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
10303  62.0        .         .         .         .         .         .         .         .         .         .         .       LX.
10306  63.0        .         .         .         .         .         .         .         .         .         .         .       LX.
10309  64.0        .         .         .         .         .         .         .         .         .         .         .       LX.
10312  65. 0       .         .         .         .         .         .         .         .         .         .         .       LX.
10315  66. 0       .         .         .         .         .         .         .         .         .         .         .       LX.
10318  67. 0       .         .         .         .         .         .         .         .         .         .         .   LLLXXX.
10321  68. 0       .         .         .         .         .         .         .         .         .         .         .   LLLXXX.
10324  69.  0      .         .         .         .         .         .         .         .         .         .         .   LLLXXX.
10327  70.   0     .         .         .         .         .         .         .         .         .         .         .   LLLXXX.
10330  71. . 0 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LLLXXX.
10333  72.    0    .         .         .         .         .         .         .         .         .         .       LLLLLXXXXXXX.
10336  73.     0   .         .         .         .         .         .         .         .         .         .       LLLLLXXXXXXX.
10339  74.      0  .         .         .         .         .         .         .         .         .         .       LLLXXXXXXXXX.
10342  75.        0.         .         .         .         .         .         .         .         .         .       XXXXXXXXXXXX.
10345  76.         .0        .         .         .         .         .         .         .         .         .       XXXXXXXXXXXX.
10348  77.         .    0    .         .         .         .         .         .         .    LXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX.
10351  78.         .         .0        .         .         .         .         .         .    LXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX.
10354  79.         .         .        0.         .         .         .         .         .    LXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX.
10357  80.         .         .         .      0  .         .         .         .         .    LXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX.
10400  81. . . . . . . . . . . . . . . . . . . . . 0 . . . . . . . . . . . . . . . . . . . .LXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX.
10403  82.         .         .         .         .        0.         .         .         .         .         .   LXXXXX.
10406  83.         .         .         .         .       0 .         .         .         .         .         .   LXXXXX.
10409  84.         .         .         .         .  0      .         .         .         .         .         .   LXXXXX.
10412  85.         .         .         .     0   .         .         .         .         .         .         .   LXXXXX.
10415  86.         .         .         0         .         .         .         .         .         .         .   LXXXXX.
10418  87.         .         .   0     .         .         .         .         .         .         .         .       LX.
10421  88.         .         0         .         .         .         .         .         .         .         .       LX.
10424  89.         .     0   .         .         .         .         .         .         .         .         .       LX.
10427  90.         . 0       .         .         .         .         .         .         .         .         .       LX.
10430  91. . . . .0. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LX.
10433  92.     0   .         .         .         .         .         .         .         .         .         .         .        X.
10436  93.    0    .         .         .         .         .         .         .         .         .         .         .        X.
10439  94.   0     .         .         .         .         .         .         .         .         .         .         .        X.
10442  95.  0      .         .         .         .         .         .         .         .         .         .         .        X.
10445  96. 0       .         .         .         .         .         .         .         .         .         .         .        X.
10448  97. 0       .         .         .         .         .         .         .         .         .         .         .        X.
10451  98. 0       .         .         .         .         .         .         .         .         .         .         .        X.
10454  99. 0       .         .         .         .         .         .         .         .         .         .         .        X.
10457 100. 0       .         .         .         .         .         .         .         .         .         .         .        X.
10500 101.0. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
10503 102.0        .         .         .         .         .         .         .         .         .         .         .        L.
10506 103.0        .         .         .         .         .         .         .         .         .         .         .        L.
10509 104.0        .         .         .         .         .         .         .         .         .         .         .        L.
10512 105.0        .         .         .         .         .         .         .         .         .         .         .        L.
10515 106.0        .         .         .         .         .         .         .         .         .         .         .        L.
10518 107.0        .         .         .         .         .         .         .         .         .         .         .        L.
10521 108.0        .         .         .         .         .         .         .         .         .         .         .        L.
10524 109.0        .         .         .         .         .         .         .         .         .         .         .        L.
10527 110.0        .         .         .         .         .         .         .         .         .         .         .        L.
10530 111.0. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .L.
10533 112.0        .         .         .         .         .         .         .         .         .         .         .        L.
10536 113.0        .         .         .         .         .         .         .         .         .         .         .        L.
10539 114.0        .         .         .         .         .         .         .         .         .         .         .        L.
10542 115.0        .         .         .         .         .         .         .         .         .         .         .        L.
10545 116.0        .         .         .         .         .         .         .         .         .         .         .        L.
10548 117.0        .         .         .         .         .         .         .         .         .         .         .        L.
10551 118.0        .         .         .         .         .         .         .         .         .         .         .        L.
10554 119.0        .         .         .         .         .         .         .         .         .         .         .        L.
10557 120.0        .         .         .         .         .         .         .         .         .         .         .        L.
10600 121.0--------.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.--------L.
```

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	SB-8	98.	4.05	10.	10.	10.	.06		

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

Q100 - 6hr. East Mobil Home Park


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

  1           ID   East Trailer Park 100-Yr., 6 Hr. Storm Runoff using MCUHP1
  2           IT      3                    121
  3           IO      5       2

  4           KK   SB-8
  5           KM   SUB-BASIN SB-8
  6           BA    .060
  7           IN      15
  8           PB   3.198
  9           PC    .000    .008    .016    .025    .033    .041    .050    .058    .066    .074
 10           PC    .087    .099    .118    .138    .216    .377    .834    .911    .931    .950
 11           PC    .962    .972    .983    .991   1.000
 12           LU    .568    .150  56.000
 13           UC    .217    .128
 14           UA       0       5      16      30      65      77      84      90      94      97
 15           UA     100
 16           ZZ
```

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*****************************************
*                                       *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *
*          SEPTEMBER 1990               *
*           VERSION 4.0                 *
*                                       *
* RUN DATE  03/12/1992  TIME  06:51:05  *
*                                       *
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*****************************************
*                                       *
*   U.S. ARMY CORPS OF ENGINEERS        *
*   HYDROLOGIC ENGINEERING CENTER       *
*         609 SECOND STREET             *
*      DAVIS, CALIFORNIA 95616          *
*          (916) 756-1104               *
*                                       *
*****************************************
```

East Trailer Park 100-Yr., 6 Hr. Storm Runoff using MCUHP1

```
3 IO        OUTPUT CONTROL VARIABLES
                 IPRNT          5  PRINT CONTROL
                 IPLOT          2  PLOT CONTROL
                 QSCAL         0.  HYDROGRAPH PLOT SCALE

  IT        HYDROGRAPH TIME DATA
                  NMIN          3  MINUTES IN COMPUTATION INTERVAL
                 IDATE      1   0  STARTING DATE
                 ITIME       0000  STARTING TIME
                    NQ        121  NUMBER OF HYDROGRAPH ORDINATES
                NDDATE      1   0  ENDING DATE
                NDTIME       0600  ENDING TIME
                 ICENT         19  CENTURY MARK

            COMPUTATION INTERVAL     .05 HOURS
                 TOTAL TIME BASE    6.00 HOURS

      ENGLISH UNITS
           DRAINAGE AREA          SQUARE MILES
           PRECIPITATION DEPTH    INCHES
           LENGTH, ELEVATION      FEET
           FLOW                   CUBIC FEET PER SECOND
           STORAGE VOLUME         ACRE-FEET
           SURFACE AREA           ACRES
           TEMPERATURE            DEGREES FAHRENHEIT
```

STATION SB-8

			(O) OUTFLOW										
		0.	40.	80.	120.	160.	200.	0.	0.	0.	0.	0.	0.	0.
												(L) PRECIP,	(X) EXCESS	
		.0	.0	.0	.0	.0	.0	.0	.0	.0	.3	.2	.1	.0
DAHRMN	PER													
10000	10													
10003	20													L.
10006	30													L.
10009	40													L.
10012	50													L.
10015	60													L.
10018	70													L.
10021	80													L.
10024	9.0													L.
10027	10.0													L.
10030	11.0													L.
10033	12.0													L.
10036	13.0													L.
10039	14.0													L.
10042	15.0													L.
10045	16.0													L.
10048	17.0													L.
10051	18.0													L.
10054	19.0													L.
10057	20.0													L.
10100	21.0													L.
10103	22.0													L.
10106	23.0													L.
10109	24.0													L.
10112	25.0													L.
10115	26.0													L.
10118	27.0													L.
10121	28.0													L.
10124	29.0													L.
10127	30.0													L.
10130	31.0													L.
10133	32.0													L.
10136	33.0													L.
10139	34.0													L.
10142	35.0													L.
10145	36.0													L.
10148	37.0													L.
10151	38.0													L.
10154	39.0													L.
10157	40.0													L.
10200	41.0													L.
10203	42.0													L.
10206	43.0													L.
10209	44.0													L.
10212	45.0													L.
10215	46.0													L.
10218	47.0													L.
10221	48.0													L.
10224	49.0													L.
10227	50.0													L.
10230	51.0													L.
10233	52.0													L.
10236	53.0													L.
10239	54.0													L.
10242	55.0													L.
10245	56.0													L.
10248	57.0													X.
10251	58.0													X.
10254	59.0													X.

```
10257  60.0        .         .         .         .         .         .         .         .         .         .         .        X.
10300  61.0. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
10303  62.0        .         .         .         .         .         .         .         .         .         .         .        X.
10306  63.0        .         .         .         .         .         .         .         .         .         .         .        X.
10309  64.0        .         .         .         .         .         .         .         .         .         .         .        X.
10312  65.0        .         .         .         .         .         .         .         .         .         .         .        X.
10315  66.0        .         .         .         .         .         .         .         .         .         .         .        X.
10318  67.0        .         .         .         .         .         .         .         .         .         .         .    LLXXX.
10321  68. O       .         .         .         .         .         .         .         .         .         .         .    LLXXX.
10324  69.  O      .         .         .         .         .         .         .         .         .         .         .    LXXXX.
10327  70.   O     .         .         .         .         .         .         .         .         .         .         .    XXXXX.
10330  71. . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .XXXXX.
10333  72.      O  .         .         .         .         .         .         .         .         .         .         XXXXXXXXXX.
10336  73.        O.         .         .         .         .         .         .         .         .         .         XXXXXXXXXX.
10339  74.         . O       .         .         .         .         .         .         .         .         .         XXXXXXXXXX.
10342  75.         .   O     .         .         .         .         .         .         .         .         .         XXXXXXXXXX.
10345  76.         .     O   .         .         .         .         .         .         .         .         .         XXXXXXXXXX.
10348  77.         .       O .         .         .         .         .         .         .         .XXXXXXXXXXXXXXXXXXXXXXXXXXXXX.
10351  78.         .         .   O     .         .         .         .         .         .         .XXXXXXXXXXXXXXXXXXXXXXXXXXXXX.
10354  79.         .         .         . O       .         .         .         .         .         .XXXXXXXXXXXXXXXXXXXXXXXXXXXXX.
10357  80.         .         .         .        O.         .         .         .         .         .XXXXXXXXXXXXXXXXXXXXXXXXXXXXX.
10400  81. . . . . . . . . . . . . . . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . .XXXXXXXXXXXXXXXXXXXXXXXXXXXXX.
10403  82.         .         .         .         .      O  .         .         .         .         .         .         .    XXXXX.
10406  83.         .         .         .         .  O      .         .         .         .         .         .         .    XXXXX.
10409  84.         .         .         .    O    .         .         .         .         .         .         .         .    XXXXX.
10412  85.         .         .      O  .         .         .         .         .         .         .         .         .    XXXXX.
10415  86.         .         .O        .         .         .         .         .         .         .         .         .    XXXXX.
10418  87.         .      O  .         .         .         .         .         .         .         .         .         .        X.
10421  88.         .  O      .         .         .         .         .         .         .         .         .         .        X.
10424  89.        O          .         .         .         .         .         .         .         .         .         .        X.
10427  90.      O  .         .         .         .         .         .         .         .         .         .         .        X.
10430  91. . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
10433  92.   O     .         .         .         .         .         .         .         .         .         .         .        X.
10436  93.  O      .         .         .         .         .         .         .         .         .         .         .        X.
10439  94.  O      .         .         .         .         .         .         .         .         .         .         .        X.
10442  95. O       .         .         .         .         .         .         .         .         .         .         .        X.
10445  96. O       .         .         .         .         .         .         .         .         .         .         .        X.
10448  97. O       .         .         .         .         .         .         .         .         .         .         .        L.
10451  98. O       .         .         .         .         .         .         .         .         .         .         .        L.
10454  99.0        .         .         .         .         .         .         .         .         .         .         .        L.
10457 100.0        .         .         .         .         .         .         .         .         .         .         .        L.
10500 101.0. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .L.
10503 102.0        .         .         .         .         .         .         .         .         .         .         .        L.
10506 103.0        .         .         .         .         .         .         .         .         .         .         .        L.
10509 104.0        .         .         .         .         .         .         .         .         .         .         .        L.
10512 105.0        .         .         .         .         .         .         .         .         .         .         .        L.
10515 106.0        .         .         .         .         .         .         .         .         .         .         .        L.
10518 107.0        .         .         .         .         .         .         .         .         .         .         .        L.
10521 108.0        .         .         .         .         .         .         .         .         .         .         .        L.
10524 109.0        .         .         .         .         .         .         .         .         .         .         .        L.
10527 110.0        .         .         .         .         .         .         .         .         .         .         .        L.
10530 111.0. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .L.
10533 112.0        .         .         .         .         .         .         .         .         .         .         .        L.
10536 113.0        .         .         .         .         .         .         .         .         .         .         .        L.
10539 114.0        .         .         .         .         .         .         .         .         .         .         .        L.
10542 115.0        .         .         .         .         .         .         .         .         .         .         .        L.
10545 116.0        .         .         .         .         .         .         .         .         .         .         .        L.
10548 117.0        .         .         .         .         .         .         .         .         .         .         .        L.
10551 118.0        .         .         .         .         .         .         .         .         .         .         .        L.
10554 119.0        .         .         .         .         .         .         .         .         .         .         .        L.
10557 120.0        .         .         .         .         .         .         .         .         .         .         .        L.
10600 121.0--------.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.--------L.
```

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	SB-8	187.	4.05	18.	18.	18.	.06		

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

APPENDIX "C"

HEC-2 Computation Runs

```
          540.  C   I   .       .       .  RM   L W E     .       .       .       .       .       .
          550.  C   I   .       .       .  R   L.W  E     .       .       .       .       .       .
          560.  C   I   .       .       .  MR  L W  E     .       .       .       .       .       .
          570.  C  I    .       .       .  MR   LW  E     .       .       .       .       .       .
          580.  C  I    .       .       .   MR  LW   E    .       .       .       .       .       .
          590.  C  I    .       .       .   M R L.W  E    .       .       .       .       .       .
1700.00   600.  .  I    .       .       .   M  RL.W   E   .       .       .       .       .       .
          610.  .  I    .       .    C  .   M  R LW   E   .       .       .       .       .       .
          620.  .  I    . C     .       .   M  R LW   E   .       .       .       .       .       .
          630.  C  I    .       .       .   M  R LW   E   .       .       .       .       .       .
          640.  C  I    .       .       .   M  R L W  E   .       .       .       .       .       .
          650.  C  I    .       .       .   M  R L W  E   .       .       .       .       .       .
          660.  C  I    .       .       .    M  RL W  E   .       .       .       .       .       .
          670.  C  I    .       .       .    M  R.LW  E   .       .       .       .       .       .
          680.  C   I   .       .       .    M  R.LW   E  .       .       .       .       .       .
          690.  C   I   .       .       .    M  R.L W  E  .       .       .       .       .       .
          700.  C   I   .       .       .    M  R.L W  E  .       .       .       .       .       .
          710.  C   I   .       .       .    M   RL W  E  .       .       .       .       .       .
          720.  C   I   .       .       .    M   RL W  E  .       .       .       .       .       .
          730.  C   I   .       .       .    M   R LW  E  .       .       .       .       .       .
          740.  C   I   .       .       .    M   R L W E  .       .       .       .       .       .
          750.  C   I   .       .       .    M   R L W E  .       .       .       .       .       .
          760.  C   I   .       .       .     M  R L W  E .       .       .       .       .       .
          770.  C   I   .       .       .     M  .RL W  E .       .       .       .       .       .
          780.  C   I   .       .       .     M  .RL W  E .       .       .       .       .       .
          790.  C   I   .       .       .     M  .R LW  E .       .       .       .       .       .
          800.  C   I   .       .       .     M  .R L W E .       .       .       .       .       .
          810.  C   I   .       .       .     M  .R L W E .       .       .       .       .       .
          820.  C   I   .       .       .     M  . RL W E .       .       .       .       .       .
          830.  C    I  .       .       .     M  . RL W E .       .       .       .       .       .
          840.  C    I  .       .       .     M  . RL W  E.       .       .       .       .       .
          850.  C    I  .       .       .     M  . R L W E.       .       .       .       .       .
          860.  C    I  .       .       .      M . R L W E.       .       .       .       .       .
          870.  C    I  .       .       .      M . R L W E.       .       .       .       .       .
          880.  C    I  .       .       .      M .  RL W E.       .       .       .       .       .
          890.  C    I  .       .       .      M .  RL W E.       .       .       .       .       .
1800.00   900.  C    I  .       .       .      M .  RL  WE.       .       .       .       .       .
          910.  C    I  .       .       .      M .  R  LWE.       .       .       .       .       .
          920.  C    I  .       .       .      M .  R   WE.       .       .       .       .       .
          930.  C     I .       .       .      M .  R   WLE.      .       .       .       .       .
          940.  C     I .       .       .      M .  R   W E.      .       .       .       .       .
1850.00   950.  C     I .       .       .      M .  R   W EL      .       .       .       .       .
          960.  C     I .       .       .      M .   R  W E.L     .       .       .       .       .
          970.  C     I .       .       .      M .   R  W E. L    .       .       .       .       .
          980.  C     I .       .       .      M .   R  W E.  L   .       .       .       .       .
          990.  C     I .       .       .      M .   R  W E.   L  .       .       .       .       .
1900.00  1000.  C      I .       .       .     M .   R  W E.    L .       .       .       .       .
         1010.  C      I .       .       .     M .    R W E.  L  .       .       .       .       .
         1020.  C      I .       .       .     M .    R  W EL    .       .       .       .       .
         1030.  C      I .       .       .     M .    R  WLE     .       .       .       .       .
         1040.  C      I .       .       .     M .     RL WE     .       .       .       .       .
         1050.  C      I .       .       .     M .    LR  WE     .       .       .       .       .
1960.00  1060.  C      I .       .       .     M . L  R   E      .       .       .       .       .
         1070.  C        .  I    .       .       ML  R    E      .       .       .       .       .
         1080.  C        .       I       .      L.RM      E      .       .       .       .       .
         1090.  C        .       .    I  .     LR .  M    E      .       .       .       .       .
2000.00  1100.  C        .       .       .I  LR  .    M  E      .       .       .       .       .
         1110.  C        .       .       .I    LR.  M    E      .       .       .       .       .
         1120.  C        .       .       .I      . LM     .E     .       .       .       .       .
         1130.  C        .       .       .I      .M   RL  .WE    .       .       .       .       .
         1140.  C        .       .       I      M.      RL. E    .       .       .       .       .
         1150.  .        .      C.       I     M .        .RWE  .       .       .       .       .
2054.00  1160.  .        .       .       I    M  .        . REL .       .       .       .       .
2055.00  1170.  .        .       .       I     M .        . R LE .       .       .       .       .
2074.00  1180.  .        .       .       .I      .        L R     W.    E  .       . M     .       .
         1190.  .        .       .       . I     .        . L     .W      E.       . M     .       .
```

```
2100.00  1200.  .        .        .        .  I  .        .  RL    .    W  .  E    .    M    .        .
2200.00  1210.  .        .        .        .   I  .        .  R    L .    W  .  E    .    M    .        .
2300.00  1220.  .        .        .        .     I .        .  R    L .     W .  E    .    M    .        .
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THIS RUN EXECUTED 13MAR92 08:04:04

****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

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

LL Date: 10/7/91

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	1100.000	.00	.00	.00	80.00	1360.00	85.00	.00	85.67	48.93	7.50	229.12	194.43
	1200.000	100.00	.00	.00	80.30	1360.00	85.54	.00	86.13	41.78	6.94	234.14	210.39
	1300.000	100.00	.00	.00	80.90	1360.00	85.98	.00	86.51	34.34	6.54	248.49	232.07
	1400.000	100.00	.00	.00	79.90	1360.00	86.43	.00	86.82	26.30	5.79	287.24	265.18
	1500.000	100.00	.00	.00	79.30	1360.00	86.58	.00	87.19	34.99	7.31	241.34	229.91
	1600.000	100.00	.00	.00	80.40	1360.00	87.06	.00	87.50	23.70	6.15	278.72	279.36
*	1700.000	100.00	.00	.00	80.10	1360.00	87.46	87.46	88.21	38.43	7.74	229.45	219.37
*	1800.000	300.00	.00	.00	80.50	1360.00	88.63	.00	88.96	16.18	5.31	325.85	338.11
	1850.000	50.00	.00	.00	80.70	1360.00	88.69	.00	89.05	17.32	5.66	391.26	326.76
	1900.000	50.00	.00	.00	80.80	1360.00	88.71	.00	89.19	23.45	6.45	350.26	280.84
*	1960.000	60.00	.00	.00	80.90	1360.00	89.24	.00	89.25	.55	.92	1982.76	1838.50
*	2000.000	40.00	.00	.00	85.59	1360.00	89.25	.00	89.25	.02	.31	5935.78	9597.82
*	2054.000	54.00	.00	.00	85.30	1360.00	89.80	89.80	89.93	18.06	4.04	509.36	320.04
*	2055.000	1.00	.00	.00	85.30	1360.00	90.23	90.23	90.23	.44	.60	1712.05	2047.31
*	2074.000	19.00	.00	.00	85.60	1360.00	91.05	91.05	92.49	50.80	10.38	151.41	190.82
*	2100.000	26.00	.00	.00	86.40	1360.00	92.42	92.42	93.87	40.42	10.37	157.19	213.90
*	2200.000	.00	.00	.00	86.60	1360.00	92.52	92.52	94.01	44.02	10.42	154.35	204.99

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	2300.000	.00	.00	.00	86.85	1360.00	92.73	92.73	94.18	44.00	10.47	156.74	205.02

LL Date: 10/7/91

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	1100.000	1360.00	85.00	.00	.00	.40	145.87	.00
	1200.000	1360.00	85.54	.00	.54	.00	122.71	100.00
	1300.000	1360.00	85.98	.00	.44	.00	126.85	100.00
	1400.000	1360.00	86.43	.00	.46	.00	156.00	100.00
	1500.000	1360.00	86.58	.00	.15	.00	142.94	100.00
	1600.000	1360.00	87.06	.00	.49	.00	148.00	100.00
*	1700.000	1360.00	87.46	.00	.40	.00	145.83	100.00
*	1800.000	1360.00	88.63	.00	1.17	.00	145.00	300.00
	1850.000	1360.00	88.69	.00	.06	.00	171.00	50.00
	1900.000	1360.00	88.71	.00	.02	.00	167.39	50.00
*	1960.000	1360.00	89.24	.00	.53	.00	1100.00	60.00
*	2000.000	1360.00	89.25	.00	.01	.00	3300.00	40.00
*	2054.000	1360.00	89.80	.00	.55	.00	503.25	54.00
*	2055.000	1360.00	90.23	.00	.43	.00	640.01	1.00
*	2074.000	1360.00	91.05	.00	.83	.00	53.03	19.00
*	2100.000	1360.00	92.42	.00	1.37	.00	53.05	26.00
*	2200.000	1360.00	92.52	.00	.10	.00	53.05	.00
*	2300.000	1360.00	92.73	.00	.21	.00	53.06	.00

SUMMARY OF ERRORS AND SPECIAL NOTES

```
CAUTION SECNO=   1700.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=   1700.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=   1700.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=   1800.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=   1960.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=   2000.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=   2054.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=   2054.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=   2054.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=   2055.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=   2055.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=   2055.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=   2074.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=   2074.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=   2074.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=   2100.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=   2100.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=   2100.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=   2200.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=   2200.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=   2200.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=   2300.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=   2300.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=   2300.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
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*-----------------------------------*
|              S U M P O            |
|                                   |
|   Interactive Summary Printout    |
|   for MS/PC-DOS micro computers   |
|              May 1991             |
*-----------------------------------*
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NOTE - Asterisk (*) at left of profile number indicates message in summary of errors list

LL Date: 10/7/91

Summary Printout

	SECNO	Q	CWSEL	DEPTH	QCH	VCH	EG	QCULV
	1100.00	1360.00	85.00	5.00	870.62	7.50	85.67	.00
	1200.00	1360.00	85.54	5.24	860.31	6.94	86.13	.00
	1300.00	1360.00	85.98	5.08	918.72	6.54	86.51	.00
	1400.00	1360.00	86.43	6.53	665.96	5.79	86.82	.00
	1500.00	1360.00	86.58	7.28	814.09	7.31	87.19	.00
	1600.00	1360.00	87.06	6.66	706.26	6.15	87.50	.00
*	1700.00	1360.00	87.46	7.36	1013.87	7.74	88.21	.00
*	1800.00	1360.00	88.63	8.13	857.25	5.31	88.96	.00
	1850.00	1360.00	88.69	7.99	940.60	5.66	89.05	.00
	1900.00	1360.00	88.71	7.91	982.28	6.45	89.19	.00
*	1960.00	1360.00	89.24	8.34	557.38	.92	89.25	.00
*	2000.00	1360.00	89.25	3.66	249.71	.31	89.25	.00
*	2054.00	1360.00	89.80	4.50	342.08	4.04	89.93	.00
*	2055.00	1360.00	90.23	4.93	63.41	.60	90.23	.00
*	2074.00	1360.00	91.05	5.45	1060.77	10.38	92.49	.00
*	2100.00	1360.00	92.42	6.02	1127.92	10.37	93.87	.00
*	2200.00	1360.00	92.52	5.92	1161.63	10.42	94.01	.00
*	2300.00	1360.00	92.73	5.88	1097.79	10.47	94.18	.00

Q = 1160 cfs WITH EXISTING CHANNEL

THIS RUN EXECUTED 13MAR92 08:00:15

****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

T1 Granite Reef Channel - 900 ft. South of McKellips Rd. to 300 ft. North
T2 McKellips Rd. & 84th St. - Proj. No. 692102
T3 By: JLL Date: 10/7/91

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ	
	0				+.0049			1160	84.6		
NC	.025	.025	.03		.1	.3					
X1	1100	14	1927		1962	0	0	0			
X3	10										
GR	84.4	1900	84.2		1922	84.6	1927	80.0	1941	80.15	1950
GR	84.2	1962	83.6		2002	85.1	2017	82.7	2020	82.7	2021
GR	84.6	2023	84.6		2025	83.6	2027	83.4	2047		
X1	1200	14	1922		1960	100	100	100			
X3	10										
GR	84.9	1900	85.0		1914	85.8	1922	80.5	1940	80.3	1949
GR	80.3	1950	84.9		1960	83.6	1988	85.7	2015	83.1	2020
GR	83.1	2021	85.1		2024	83.9	2027	83.9	2048		
X1	1300	14	1917		1961	100	100	100			
X3	10										
GR	85.4	1900	85.5		1908	87.4	1917	80.9	1937	81.0	1952
GR	85.4	1961	84.2		1967	84.2	1974	86.2	2015	83.5	2020
GR	83.5	2021	85.6		2024	84.5	2026	84.4	2053		
X1	1400	14	1925		1956	100	100	100			
X3	10										
GR	85.8	1900	85.9		1921	86.3	1925	79.9	1939	80.0	1941
GR	85.5	1956	84.4		1965	84.4	1997	86.1	2015	84.0	2019
GR	84.0	2020	86.0		2024	85.1	2028	84.8	2056		
X1	1500	12	1928		1953	100	100	100			
X3	10										
GR	86.4	1900	86.1		1928	80.4	1937	79.3	1942	85.2	1953
GR	84.5	1989	86.5		2015	84.3	2019	84.3	2020	86.6	2024
GR	85.7	2026	85.4		2043						
X1	1600	14	1929		1954	100	100	100			
X3	10										
GR	86.8	1900	86.6		1929	80.5	1939	80.4	1946	85.4	1954
GR	84.9	1987	85.1		2011	86.7	2015	84.7	2018	84.7	2019
GR	86.6	2021	86.9		2023	86.1	2024	85.9	2048		

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X1    1700     12    1928    1957     100     100     100
X3      10
GR    87.1   1900    87.2    1928    80.4    1941    80.1    1947    86.8    1957
GR    86.2   2011    87.5    2015    85.2    2018    85.2    2019    87.3    2023
GR    86.4   2024    86.3    2046

X1    1800     16    1927    1960     300     300     300
X3      10
GR    87.1   1900    87.0    1906    88.2    1927    86.2    1933    80.5    1942
GR    80.6   1949    86.4    1958    87.9    1960    87.0    1975    87.0    2007
GR    87.6   2014    85.6    2018    85.6    2018    88.0    2022    86.8    2025
GR    86.9   2045

NH       4     .1    1928     .03    1961    .025    2025      .1    2100
X1    1850     14    1928    1961      50      50      50
X3      10
GR    87.3   1900    87.6    1909    89.3    1928    80.8    1942    80.7    1951
GR    88.0   1961    87.1    1974    87.2    2007    87.9    2014    85.7    2017
GR    85.7   2019    88.2    2022    87.0    2025    86.9    2100

NH       4     .1    1928     .03    1962    .025    2026      .1    2100
X1    1900     16    1928    1962      50      50      50
X3      10
GR    87.9   1900    88.3    1913    90.4    1928    88.2    1934    81.1    1943
GR    80.8   1953    88.2    1962    87.2    1972    87.7    1996    87.4    2009
GR    88.2   2013    85.8    2017    85.9    2018    88.4    2022    87.2    2026
GR    87.0   2100

NC    .025    .025     .03      .1      .3
X1    1960     13    1900    2050      60      60      60
X3      10
GR    87.0   1000    87.4    1200    87.8    1400    87.9    1600    88.4    1800
GR    88.0   1900    85.9    1940    80.9    1946    80.9    1971    84.5    1977
GR    84.8   2000    88.6    2050    88.3    2100

NC    .015    .015    .015      .1      .3
X1    2000     15    1800    2050      40      40      40
GR   88.52    350   88.27     500   87.46    1000   86.71    1500   86.27    1800
GR   86.18   1850   86.06    1900   85.83    1950   85.59    2000   86.44    2050
GR   86.56   2100   87.24    2500   87.99    3000   88.77    3500   88.84    3650

NC    .025     .03    .025      .1      .3
X1    2054     15    1983    2037      54      54      54
X3      10
GR    86.8   1400    87.3    1700    87.5    1900    89.3    1936    90.2    1983
GR    89.7   2000    89.1    2004    88.4    2013    85.8    2020    85.3    2028
GR    89.7   2037    89.1    2200    89.0    2342    88.1    2450    86.7    2500
  Begin 6 ft. High Block on West Side of Channel
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X1     2055       13     1983     2037        1        1        1
X3       10
GR     86.8     1400     87.3     1700     87.5     1900     89.3     1936     90.2     1983
GR     89.7     2000     89.1     2004     88.4     2013     85.8     2020     85.3     2028
GR     89.7     2037     89.8     2040     95.8   2040.1
   Begin 6 ft. High Block Wall on East Side of Channel

X1     2074       12     2014     2039       19       19       19
GR     96.5   1986.9     90.5     1987     90.0     1990     86.2     1993     86.2     1994
GR     90.1     1997     89.3     2014     85.6     2022     85.7     2030     89.7     2039
GR     89.7     2040     95.7   2040.1
   Sta. 21+00 = Sta. 11+00 City of Scottsdale's Channel Improvement Plans

X1     2100       10     2015     2037       26       26       26
GR     97.6   1986.9     91.6     1987     91.1     1991     91.2     2000     90.2     2015
GR     86.4     2023     86.4     2032     89.8     2037     90.4     2040     96.4   2040.1

X1     2200       10     2012     2036
GR     97.7   1986.9     91.7     1987     91.2     1991     91.2     2000     91.0     2012
GR     86.6     2022     86.6     2031     90.0     2036     90.2     2040     96.2   2040.1

X1     2300       10     2013   2035.5
GR     97.7   1986.9     91.7     1987     91.2     1991     91.2     2000     91.0     2013
GR    86.85     2022    86.85     2030     90.0   2035.5     90.2     2040     96.2   2040.1
```

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

*PROF 1

CCHV= .100 CEHV= .300
*SECNO 1100.000

3265 DIVIDED FLOW

3280 CROSS SECTION 1100.00 EXTENDED 1.42 FEET

1100.000	4.82	84.82	.00	84.60	85.45	.64	.00	.00	84.60
1160.0	35.2	793.3	331.5	13.5	109.7	79.7	.0	.0	84.20
.00	2.60	7.23	4.16	.025	.030	.025	.000	80.00	1900.00
.004896	0.	0.	0.	0	0	5	.00	143.84	2047.00

*SECNO 1200.000

3265 DIVIDED FLOW

3280 CROSS SECTION 1200.00 EXTENDED 1.48 FEET

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 85.80 ELREA= 84.90

1200.000	5.08	85.38	.00	.00	85.90	.52	.43	.01	85.80
1160.0	.0	767.0	393.0	.0	118.1	96.8	.5	.3	84.90
.00	.00	6.49	4.06	.000	.030	.025	.000	80.30	1923.43
.003825	100.	100.	100.	2	0	0	.00	119.83	2048.00

*SECNO 1300.000

3265 DIVIDED FLOW

3280 CROSS SECTION 1300.00 EXTENDED 1.36 FEET

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 87.40 ELREA= 85.40

1300.000	4.86	85.76	.00	.00	86.26	.50	.36	.00	87.40
1160.0	.0	829.9	330.1	.0	131.4	88.7	1.0	.6	85.40
.01	.00	6.32	3.72	.000	.030	.025	.000	80.90	1922.06
.003412	100.	100.	100.	2	0	0	.00	121.02	2053.00

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

*SECNO 1400.000
3280 CROSS SECTION 1400.00 EXTENDED 1.39 FEET

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 86.30 ELREA= 85.50

1400.000	6.28	86.18	.00	.00	86.58	.40	.31	.01	86.30
1160.0	.0	626.6	533.4	.0	107.2	133.7	1.5	.9	85.50
.02	.00	5.84	3.99	.000	.030	.025	.000	79.90	1925.25
.002904	100.	100.	100.	2	0	0	.00	130.75	2056.00

*SECNO 1500.000

3265 DIVIDED FLOW

3280 CROSS SECTION 1500.00 EXTENDED .97 FEET

1500.000	7.07	86.37	.00	.00	86.96	.58	.32	.06	86.10
1160.0	3.3	747.1	409.6	3.5	106.1	102.0	2.0	1.2	85.20
.02	.93	7.04	4.02	.025	.030	.025	.000	79.30	1902.39
.003461	100.	100.	100.	2	0	0	.00	137.85	2043.00

*SECNO 1600.000

3265 DIVIDED FLOW

3280 CROSS SECTION 1600.00 EXTENDED .96 FEET

1600.000	6.46	86.86	.00	.00	87.25	.40	.28	.02	86.60
1160.0	4.0	644.2	511.8	4.7	109.7	134.5	2.6	1.5	85.40
.03	.85	5.87	3.81	.025	.030	.025	.000	80.40	1900.00
.002290	100.	100.	100.	2	0	0	.00	147.71	2048.00

*SECNO 1700.000

3265 DIVIDED FLOW

3280 CROSS SECTION 1700.00 EXTENDED .92 FEET

3685 20 TRIALS ATTEMPTED WSEL,CWSEL

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

3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
  1700.000     7.12     87.22     87.22       .00     87.97       .75       .29       .11     87.20
    1160.0      1.4     938.4     220.2       2.1     124.1      69.0       3.1       1.8     86.80
       .03      .66      7.56      3.19      .025      .030      .025      .000     80.10   1900.00
   .003937     100.      100.      100.        20         8         0       .00    144.57   2046.00

*SECNO 1800.000
3280 CROSS SECTION   1800.00 EXTENDED      1.51 FEET

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.60

  1800.000     7.92     88.42       .00       .00     88.72       .30       .70       .04     88.20
    1160.0     55.1     777.7     327.2      25.2     154.6     115.3       4.8       2.8     87.90
       .05     2.19      5.03      2.84      .025      .030      .025      .000     80.50   1900.00
   .001544     300.      300.      300.         1         0         0       .00    145.00   2045.00

1490 NH CARD USED
*SECNO 1850.000
3280 CROSS SECTION   1850.00 EXTENDED      1.57 FEET

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       89.30 ELREA=       88.00

  1850.000     7.77     88.47       .00       .00     88.81       .33       .08       .01     89.30
    1160.0       .0     846.6     313.4        .0     159.3     194.3       5.1       3.0     88.00
       .05      .00      5.32      1.61      .000      .030      .046      .000     80.70   1929.36
   .001595      50.       50.       50.         2         0         0       .00    170.64   2100.00

1490 NH CARD USED
*SECNO 1900.000
3280 CROSS SECTION   1900.00 EXTENDED      1.48 FEET

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       90.40 ELREA=       88.20

  1900.000     7.68     88.48       .00       .00     88.94       .46       .09       .04     90.40
    1160.0       .0     892.2     267.8        .0     145.7     165.9       5.5       3.2     88.20
       .06      .00      6.12      1.61      .000      .030      .049      .000     80.80   1933.24
   .002191      50.       50.       50.         2         0         0       .00    166.76   2100.00
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SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

CCHV=     .100 CEHV=     .300
*SECNO 1960.000
3280 CROSS SECTION   1960.00 EXTENDED      1.98 FEET

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  5.94

 1960.000      8.08     88.98       .00       .00     88.99       .01       .01       .04     88.00
   1160.0     620.0     531.8       8.1    1104.8     568.4      26.7       6.9       4.1     88.60
      .08       .56       .94       .30      .025      .030      .025      .000     80.90   1000.00
  .000062       60.       60.       60.         2         0         0       .00   1100.00   2100.00

CCHV=     .100 CEHV=     .300
*SECNO 2000.000
3280 CROSS SECTION   2000.00 EXTENDED      .47 FEET

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  5.21

 2000.000      3.40     88.99       .00       .00     88.99       .00       .00       .00     86.27
   1160.0     527.1     232.0     400.9    2356.7     747.2    1983.5      10.0       6.1     86.44
      .13       .22       .31       .20      .015      .015      .015      .000     85.59    350.00
  .000002       40.       40.       40.         2         0         0       .00   3300.00   3650.00

CCHV=     .100 CEHV=     .300
*SECNO 2054.000
3280 CROSS SECTION   2054.00 EXTENDED      3.05 FEET

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

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      90.20 ELREA=      89.70

 2054.000      4.45     89.75     89.75       .00     89.86       .11       .00       .03     90.20
   1160.0        .0     303.6     856.4        .0      82.9     404.3      13.5       8.5     89.70
      .13       .00      3.66      2.12      .000      .025      .030      .000     85.30   1998.25
  .001452       54.       54.       54.        20        18         0       .00    501.75   2500.00
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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 2055.000
3280 CROSS SECTION 2055.00 EXTENDED 3.44 FEET

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

2055.000	4.94	90.24	90.24	.00	90.25	.01	.00	.01	90.20
1160.0	1105.4	54.3	.2	1615.5	106.0	1.5	13.5	8.5	89.70
.13	.68	.51	.16	.025	.025	.030	.000	85.30	1400.00
.000031	1.	1.	1.	20	21	0	.00	640.01	2040.01

*SECNO 2074.000

3301 HV CHANGED MORE THAN HVINS

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

2074.000	5.13	90.73	90.73	.00	92.06	1.33	.00	.40	89.30
1160.0	224.2	933.6	2.3	39.1	94.1	1.0	13.9	8.6	89.70
.13	5.74	9.92	2.25	.025	.025	.030	.000	85.60	1987.00
.005178	19.	19.	19.	20	8	0	.00	53.02	2040.02

*SECNO 2100.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

2100.000	5.70	92.10	92.10	.00	93.43	1.33	.12	.00	90.20
1160.0	137.9	1000.2	21.9	32.6	101.7	6.0	14.0	8.7	89.80
.13	4.23	9.83	3.63	.025	.025	.030	.000	86.40	1986.99
.003967	26.	26.	26.	20	8	0	.00	53.04	2040.03

*SECNO 2200.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

2200.000	5.60	92.20	92.20	.00	93.57	1.37	.00	.01	91.00
1160.0	99.3	1026.3	34.3	25.2	103.9	8.4	14.0	8.7	90.00
.13	3.94	9.88	4.07	.025	.025	.030	.000	86.60	1986.99
.004348	0.	0.	0.	20	5	0	.00	53.04	2040.03

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

'SECNO 2300.000
;685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
;720 CRITICAL DEPTH ASSUMED

2300.000	5.58	92.43	92.43	.00	93.75	1.32	.00	.00	91.00
1160.0	143.9	970.5	45.6	32.2	98.2	10.5	14.0	8.7	90.00
.13	4.46	9.89	4.34	.025	.025	.030	.000	86.85	1986.99
.004287	0.	0.	0.	20	5	0	.00	53.05	2040.04

PROFILE FOR STREAM LL Date: 10/7/91

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

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ELEVATION   79.      81.      83.      85.      87.      89.      91.      93.      95.      97.
   SECNO   CUMDIS

 1100.00     0.  C I     .       M  R L W .E      .       .       .       .       .       .       .
            10.  C  I    .       .M  R LW .E      .       .       .       .       .       .       .
            20.  C  I    .       .M  R  W .E      .       .       .       .       .       .       .
            30.  C  I    .       .M   R W .E      .       .       .       .       .       .       .
            40.  C  I    .       .M   R  W. E     .       .       .       .       .       .       .
            50.  C  I    .       . M  R  W. E     .       .       .       .       .       .       .
            60.  C  I    .       . M   R WL E     .       .       .       .       .       .       .
            70.  C   I   .       . M   R  WLE     .       .       .       .       .       .       .
            80.  C   I   .       . M   R  WL E    .       .       .       .       .       .       .
            90.  C   I   .       .  M   R W LE    .       .       .       .       .       .       .
 1200.00   100.  C   I   .       .  M   R W  E    .       .       .       .       .       .       .
           110.  C   I   .       .  M   R .W E    .       .       .       .       .       .       .
           120.  C    I  .       .  M   R .W EL   .       .       .       .       .       .       .
           130.  C    I  .       .  M   R.W  EL   .       .       .       .       .       .       .
           140.  C    I  .       .  M   R.W  E L  .       .       .       .       .       .       .
           150.  C    I  .       .  M   R.W  E L  .       .       .       .       .       .       .
           160.  C     I .       .  M   R. W E  L .       .       .       .       .       .       .
           170.  C     I .       .   M   R W E   L .      .       .       .       .       .       .
           180.  C     I .       .   M   R W E   L.       .       .       .       .       .       .
           190.  C      I .      .   M   R W  E   L       .       .       .       .       .       .
 1300.00   200.  C      I .      .   M   R W  E   L       .       .       .       .       .       .
           210.  C     I  .       .   M  .R W E   L       .       .       .       .       .       .
           220.  C     I  .       .   M  .R W E  L.       .       .       .       .       .       .
           230.  C    I   .       .   M  .R W E  L.       .       .       .       .       .       .
           240.  C    I   .       .   M  .R W E  L .      .       .       .       .       .       .
           250.  C   I    .       .   M  .R W  E L .      .       .       .       .       .       .
           260.  C   I    .       .    M  .R  W EL  .     .       .       .       .       .       .
           270.  C  I     .       .    M  .R  W EL  .     .       .       .       .       .       .
           280.  C  I     .       .    M  .R  W E   .     .       .       .       .       .       .
           290.  C I      .       .    M  .R  W E   .     .       .       .       .       .       .
 1400.00   300.  C I      .       .     M .R  WLE   .     .       .       .       .       .       .
           310.  C I      .       .     M .R   W E  .     .       .       .       .       .       .
           320.  C I      .       .     M .R   W E  .     .       .       .       .       .       .
           330.  C I      .       .     M .R   W E  .     .       .       .       .       .       .
           340.  C I      .       .      MR    W E  .     .       .       .       .       .       .
           350.  CI       .       .      MR   LW E  .     .       .       .       .       .       .
           360.  CI       .       .      MR   LW  E .     .       .       .       .       .       .
           370.  CI       .       .       R   LW  E .     .       .       .       .       .       .
           380.  CI       .       .       R   LW  E .     .       .       .       .       .       .
           390.  I        .       .       R   LW  E .     .       .       .       .       .       .
 1500.00   400.  I        .       .      RM   LW  E .     .       .       .       .       .       .
           410.  CI       .       .       RM  L W E .     .       .       .       .       .       .
           420.  CI       .       .       RM  L W  E.     .       .       .       .       .       .
           430.  C I      .       .       RM   LW  E.     .       .       .       .       .       .
           440.  C I      .       .       RM   LW  E.     .       .       .       .       .       .
           450.  C  I     .       .       R M  L W E.     .       .       .       .       .       .
           460.  C  I     .       .       R M  L W E.     .       .       .       .       .       .
           470.  C   I    .       .       R M   LW E.     .       .       .       .       .       .
           480.  C   I    .       .       R M   LW E.     .       .       .       .       .       .
           490.  C    I   .       .       R  M  L W E     .       .       .       .       .       .
 1600.00   500.  C    I   .       .       R  M  L W E     .       .       .       .       .       .
           510.  C    I   .       .       .R M   LW E     .       .       .       .       .       .
           520.  C    I   .       .       . RM   LW E     .       .       .       .       .       .
           530.  C    I   .       .       .  RM  LW .E    .       .       .       .       .       .
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          540.  C   I   .       .       .  RM   LW.E      .       .       .       .       .       .
          550.  C   I   .       .       .   R   LW. E     .       .       .       .       .       .
          560.  C   I   .       .       .   MR  LW. E     .       .       .       .       .       .
          570.  C  I    .       .       .   MR   W. E     .       .       .       .       .       .
          580.  C  I    .       .       .    MR  W.  E    .       .       .       .       .       .
          590.  C  I    .       .       .    M R W.  E    .       .       .       .       .       .
1700.00   600.  .  I    .       .       .    M  RLW  E    .       .       .       .       .       .
          610.  .  I    .       .    C  .    M  R W  E    .       .       .       .       .       .
          620.  .  I    .C      .       .    M  R W   E   .       .       .       .       .       .
          630.  C  I    .       .       .    M  R W   E   .       .       .       .       .       .
          640.  C  I    .       .       .    M  R W   E   .       .       .       .       .       .
          650.  C  I    .       .       .    M  R LW  E   .       .       .       .       .       .
          660.  C  I    .       .       .     M  RLW  E   .       .       .       .       .       .
          670.  C  I    .       .       .     M  R.W  E   .       .       .       .       .       .
          680.  C   I   .       .       .     M  R.W  E   .       .       .       .       .       .
          690.  C   I   .       .       .     M  R.W  E   .       .       .       .       .       .
          700.  C   I   .       .       .     M  R.LW  E  .       .       .       .       .       .
          710.  C   I   .       .       .     M   RLW  E  .       .       .       .       .       .
          720.  C   I   .       .       .     M   RLW  E  .       .       .       .       .       .
          730.  C   I   .       .       .     M   R W  E  .       .       .       .       .       .
          740.  C   I   .       .       .     M   R W  E  .       .       .       .       .       .
          750.  C   I   .       .       .     M   R LW E  .       .       .       .       .       .
          760.  C   I   .       .       .      M  R LW E  .       .       .       .       .       .
          770.  C   I   .       .       .      M  .RLW E  .       .       .       .       .       .
          780.  C   I   .       .       .      M  .RLW  E .       .       .       .       .       .
          790.  C   I   .       .       .      M  .R W  E .       .       .       .       .       .
          800.  C   I   .       .       .      M  .R LW E .       .       .       .       .       .
          810.  C   I   .       .       .      M  .R LW E .       .       .       .       .       .
          820.  C   I   .       .       .      M  . RLW E .       .       .       .       .       .
          830.  C    I  .       .       .      M  . RLW E .       .       .       .       .       .
          840.  C    I  .       .       .      M  . RLW E .       .       .       .       .       .
          850.  C    I  .       .       .      M  . R LWE .       .       .       .       .       .
          860.  C    I  .       .       .       M . R LW E .       .       .       .       .       .
          870.  C    I  .       .       .       M . R LW E .       .       .       .       .       .
          880.  C    I  .       .       .       M .  RLW E .       .       .       .       .       .
          890.  C    I  .       .       .       M .  RLW E .       .       .       .       .       .
1800.00   900.  C    I  .       .       .       M .  RL WE .       .       .       .       .       .
          910.  C    I  .       .       .       M .  R  WE .       .       .       .       .       .
          920.  C    I  .       .       .       M .  R  WE .       .       .       .       .       .
          930.  C     I .       .       .       M .  R  WEL .      .       .       .       .       .
          940.  C     I .       .       .       M .  R  WE L.      .       .       .       .       .
1850.00   950.  C     I .       .       .       M .  R  W E L      .       .       .       .       .
          960.  C     I .       .       .       M .   R W E .L     .       .       .       .       .
          970.  C     I .       .       .       M .   R W E . L    .       .       .       .       .
          980.  C     I .       .       .       M .   R W E .  L   .       .       .       .       .
          990.  C     I .       .       .       M .   R W E .   L  .       .       .       .       .
1900.00  1000.  C      I .      .       .       M .   R W E .    L .       .       .       .       .
         1010.  C      I .      .       .       M .    RW E .  L  .       .       .       .       .
         1020.  C      I .      .       .       M .    R WE .L    .       .       .       .       .
         1030.  C      I .      .       .       M .    R WEL.     .       .       .       .       .
         1040.  C      I .      .       .       M .     RLE .     .       .       .       .       .
         1050.  C      I .      .       .       M .    LR E .     .       .       .       .       .
1960.00  1060.  C      I .      .       .       M .  L  R E .     .       .       .       .       .
         1070.  C        .  I   .       .         ML  R   E .     .       .       .       .       .
         1080.  C        .      I       .        L.RM    E .     .       .       .       .       .
         1090.  C        .      .    I  .      LR .   M   E .     .       .       .       .       .
2000.00  1100.  C        .      .       .I   LR   .    M E .     .       .       .       .       .
         1110.  C        .      .       .I     LR.   M    E.     .       .       .       .       .
         1120.  C        .      .       .I       . LM      E     .       .       .       .       .
         1130.  C        .      .       .I       .M   RL   .E    .       .       .       .       .
         1140.  C        .      .       I        M.       RL.WE  .       .       .       .       .
         1150.  .        .      C.      I       M .         .REL .       .       .       .       .
2054.00  1160.  .        .      .       I      M  .         . WEL .       .       .       .       .
2055.00  1170.  .        .      .       I       M .         . R LE .       .       .       .       .
2074.00  1180.  .        .      .       .I       .         L R   W .  E   .       . M     .       .
         1190.  .        .      .       . I      .         . L     W    E .       . M     .       .
```

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2100.00  1200.  .        .        .        .  I  .        .  RL    .  W    .E       .   M   .        .
2200.00  1210.  .        .        .        .   I .        .  R   L .  W    .E       .  M    .        .
2300.00  1220.  .        .        .        .     I .        .  R   L .    W  . E      .  M    .        .
```

THIS RUN EXECUTED 13MAR92 08:00:21

****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

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

LL Date: 10/7/91

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	1100.000	.00	.00	.00	80.00	1160.00	84.82	.00	85.45	48.96	7.23	202.95	165.77
	1200.000	100.00	.00	.00	80.30	1160.00	85.38	.00	85.90	38.25	6.49	214.93	187.55
	1300.000	100.00	.00	.00	80.90	1160.00	85.76	.00	86.26	34.12	6.32	220.10	198.59
	1400.000	100.00	.00	.00	79.90	1160.00	86.18	.00	86.58	29.04	5.84	240.94	215.26
	1500.000	100.00	.00	.00	79.30	1160.00	86.37	.00	86.96	34.61	7.04	211.59	197.18
	1600.000	100.00	.00	.00	80.40	1160.00	86.86	.00	87.25	22.90	5.87	248.93	242.43
*	1700.000	100.00	.00	.00	80.10	1160.00	87.22	87.22	87.97	39.37	7.56	195.18	184.87
*	1800.000	300.00	.00	.00	80.50	1160.00	88.42	.00	88.72	15.44	5.03	295.07	295.23
	1850.000	50.00	.00	.00	80.70	1160.00	88.47	.00	88.81	15.95	5.32	353.56	290.42
	1900.000	50.00	.00	.00	80.80	1160.00	88.48	.00	88.94	21.91	6.12	311.61	247.83
*	1960.000	60.00	.00	.00	80.90	1160.00	88.98	.00	88.99	.62	.94	1699.83	1473.08
*	2000.000	40.00	.00	.00	85.59	1160.00	88.99	.00	88.99	.02	.31	5087.41	7679.28
*	2054.000	54.00	.00	.00	85.30	1160.00	89.75	89.75	89.86	14.52	3.66	487.18	304.40
*	2055.000	1.00	.00	.00	85.30	1160.00	90.24	90.24	90.25	.31	.51	1723.01	2067.81
*	2074.000	19.00	.00	.00	85.60	1160.00	90.73	90.73	92.06	51.78	9.92	134.25	161.20
*	2100.000	26.00	.00	.00	86.40	1160.00	92.10	92.10	93.43	39.67	9.83	140.34	184.17
*	2200.000	.00	.00	.00	86.60	1160.00	92.20	92.20	93.57	43.48	9.88	137.54	175.91

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	2300.000	.00	.00	.00	86.85	1160.00	92.43	92.43	93.75	42.87	9.89	140.92	177.16

.L Date: 10/7/91

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	1100.000	1160.00	84.82	.00	.00	.22	143.84	.00
	1200.000	1160.00	85.38	.00	.56	.00	119.83	100.00
	1300.000	1160.00	85.76	.00	.38	.00	121.02	100.00
	1400.000	1160.00	86.18	.00	.43	.00	130.75	100.00
	1500.000	1160.00	86.37	.00	.19	.00	137.85	100.00
	1600.000	1160.00	86.86	.00	.49	.00	147.71	100.00
*	1700.000	1160.00	87.22	.00	.37	.00	144.57	100.00
*	1800.000	1160.00	88.42	.00	1.19	.00	145.00	300.00
	1850.000	1160.00	88.47	.00	.06	.00	170.64	50.00
	1900.000	1160.00	88.48	.00	.00	.00	166.76	50.00
*	1960.000	1160.00	88.98	.00	.50	.00	1100.00	60.00
*	2000.000	1160.00	88.99	.00	.01	.00	3300.00	40.00
*	2054.000	1160.00	89.75	.00	.76	.00	501.75	54.00
	2055.000	1160.00	90.24	.00	.49	.00	640.01	1.00
*	2074.000	1160.00	90.73	.00	.49	.00	53.02	19.00
	2100.000	1160.00	92.10	.00	1.37	.00	53.04	26.00
*	2200.000	1160.00	92.20	.00	.10	.00	53.04	.00
-	2300.000	1160.00	92.43	.00	.23	.00	53.05	.00

SUMMARY OF ERRORS AND SPECIAL NOTES

```
CAUTION SECNO=   1700.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=   1700.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=   1700.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=   1800.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=   1960.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=   2000.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=   2054.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=   2054.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=   2054.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=   2055.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=   2055.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=   2055.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=   2074.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=   2074.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=   2074.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=   2100.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=   2100.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=   2100.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=   2200.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=   2200.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=   2200.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=   2300.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=   2300.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=   2300.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
```

Q=1160 cfs WITH NEW CHANNEL

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*-----------------------------------*
|              S U M P O            |
|                                   |
|   Interactive Summary Printout    |
|   for MS/PC-DOS micro computers   |
|              May 1991             |
*-----------------------------------*
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NOTE - Asterisk (*) at left of profile number indicates message in summary of errors list

LL Date: 1/03/92

Summary Printout

	SECNO	Q	CWSEL	DEPTH	QCH	VCH	QLOB	VLOB	QROB	VROB	TOPWID	QWEIR	BW
*	.00	1160.00	82.38	2.98	144.77	6.41	336.97	5.46	678.26	5.45	195.60	.00	.01
*	200.00	1160.00	83.31	3.91	107.57	3.40	328.82	3.31	723.61	3.23	200.00	.00	.01
	400.00	1160.00	83.61	3.61	188.89	3.53	224.24	3.23	746.87	3.34	200.00	.00	.01
	600.00	1160.00	83.92	3.52	95.52	2.98	371.88	3.28	692.60	3.08	200.00	.00	.01
	800.00	1160.00	84.18	3.58	643.02	4.08	31.40	1.84	485.59	3.20	198.49	.00	.01
	1000.00	1160.00	84.56	4.36	593.89	5.69	10.02	1.38	556.09	3.70	198.88	.00	.01
	1100.00	1160.00	84.92	4.92	649.61	4.97	22.07	1.81	488.32	3.23	199.44	.00	.01
*	1200.00	1160.00	84.93	4.83	1160.00	5.48	.00	.00	.00	.00	51.81	.00	.01
	1300.00	1160.00	85.02	4.82	1160.00	5.49	.00	.00	.00	.00	51.85	.00	.01
	1340.00	1160.00	85.05	4.83	1160.00	5.46	.00	.00	.00	.00	52.01	.00	.01
	1400.00	1160.00	85.08	4.81	1160.00	5.47	.00	.00	.00	.00	52.01	.00	.01
	1500.00	1160.00	85.14	4.81	1160.00	5.48	.00	.00	.00	.00	52.01	.00	.01
*	1600.00	1160.00	84.83	4.44	1160.00	8.19	.00	.00	.00	.00	45.84	.00	.01
*	1700.00	1160.00	85.63	5.18	1160.00	5.03	.00	.00	.00	.00	53.14	.00	.01
	1800.00	1160.00	85.67	5.16	1160.00	5.06	.00	.00	.00	.00	52.83	.00	.01
	1900.00	1160.00	85.71	5.14	1160.00	5.07	.00	.00	.00	.00	52.98	.00	.01
	1921.00	1160.00	85.79	5.21	1160.00	4.66	.00	.00	.00	.00	53.97	.00	.01
	1931.00	1160.00	85.82	5.23	1160.00	4.51	.00	.00	.00	.00	51.76	.00	.01
*	1951.00	1160.00	85.59	4.99	1160.00	6.46	.00	.00	.00	.00	36.02	.00	.01
	2067.00	1160.00	86.01	5.31	1160.00	7.28	.00	.00	.00	.00	30.00	.00	.01
	2077.00	1160.00	86.44	5.74	1160.00	5.32	.00	.00	.00	.00	38.04	.00	.01
*	2112.00	1160.00	90.72	7.09	1126.09	11.02	29.74	2.45	4.17	1.41	45.83	.00	.01
	2212.00	1160.00	91.48	7.55	1056.50	9.47	82.79	2.80	20.71	2.23	53.03	.00	.01
*	2312.00	1160.00	91.45	7.22	1097.73	10.43	46.96	2.42	15.32	2.18	53.02	.00	.01
*	2412.00	1160.00	91.74	7.21	1096.44	10.44	48.54	2.44	15.02	2.17	53.02	.00	.01

why station #'s are different than the other HEC-II runs?

Q = 1160 cfs WITH NEW CHANNEL

THIS RUN EXECUTED 15FEB93 09:52:19

****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

T1 Granite Reef Channel - 2000 ft. South of McKellips Rd. to 400 ft. North
T2 McKellips Rd. & 84th St. - Proj. No. 692102
T3 By: JLL Date: 1/03/92
T4 Channel Imprvmnts: Sta 12+00 to 19+45, 38' bottom, C/L 40' E. M/L = 1960
T5 Slope = .00053 ft/ft, No Bank Protection Sta. 11+00 to 13+40, Bank
T6 Protection From Sta. 13+40 to 19+45, M/L = 2000
T7 Box Culvert with Headwalls: 3 -10' x 6'
T8 Q100=1160 cfs, cross sections looking downstream
T9 The Starting W.S. Elev. @ Sta 0+00 is = to the Critical Depth of the Exist.

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0				-1			1160		

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	1		-1					6		

NC	.025	.025	.03	.1	.3					
X1	0	12	1957	1969	0	0	0			
X3	10									
GR	81.0	1900	81.6	1957	79.4	1962	81.6	1969	80.8	1971
GR	80.7	1980	82.0	2000	82.5	2016	80.5	2019	82.5	2022
GR	81.6	2024	81.1	2100						
X1	200	13	1955	1967	200	200	200			
X3	10									
GR	81.2	1900	81.8	1955	79.4	1958	82.0	1967	81.2	1970
GR	80.9	1977	82.1	2000	82.4	2012	82.6	2016	80.6	2019
GR	82.6	2022	81.9	2025	81.2	2100				
X1	400	13	1942	1964	200	200	200			
X3	10									
GR	81.5	1900	82.4	1942	80.0	1958	82.2	1964	81.7	1966
GR	81.2	1982	82.1	2000	82.9	2011	83.2	2014	80.8	2018
GR	82.8	2021	82.4	2024	81.6	2100				
X1	600	13	1958	1972	200	200	200			
X3	10									
GR	81.8	1900	82.0	1953	83.2	1958	80.4	1965	82.5	1972
GR	81.5	1982	82.3	2000	82.3	2008	83.5	2013	81.1	2018
GR	83.1	2021	82.5	2024	81.8	2100				

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X1     800      12     1927     1985      200      200      200
X3      10
GR    83.5    1900     83.6     1927     81.2     1939     80.6     1972     83.5     1985
GR    83.6    2000     83.3     2012     84.5     2016     81.7     2020     83.6     2023
GR    82.7    2027     82.4     2100

X1    1000      12     1928     1964      200      200      200
X3      10
GR    84.2    1900     84.4     1928     80.2     1942     80.2     1946     80.5     1952
GR    83.6    1964     83.6     2000     83.9     2011     84.7     2016     82.4     2020
GR    83.6    2022     83.0     2100

X1    1100      15     1925     1968      100      100      100
X3      10
GR    84.6    1900     84.4     1914     84.3     1925     80.1     1942     80.0     1950
GR    84.8    1968     83.5     1972     83.5     1990     83.7     2000     84.1     2011
GR    85.0    2016     82.7     2020     84.3     2022     83.9     2050     83.3     2100
   Begin unlined channel improvements, cst c/l = 1954, bottom width = 38',
    side slopes = 1 1/2:1, long. slope = 0.053%, n = .02

NC   0.025    0.025    0.020
X1    1200      14   1926.3   1981.9      100      100      100
X3      10
GR    84.9    1900     85.1     1915     86.2   1926.3     80.3     1935     80.1     1954
GR    80.3    1973     86.2   1981.9     86.0   1991.9     83.7     2000     84.3     2010
GR    83.0    2020     85.0     2022     84.5     2025     83.6     2100

X1    1300      14   1926.3     1982      100      100      100
X3      10
GR    85.6    1900     85.8     1915     86.3   1926.3     80.4     1935     80.2     1954
GR    80.4    1973     86.3     1982     86.1     1992     84.3     2000     86.2     2015
GR    83.5    2019     85.4     2022     84.6     2025     84.1     2100

NC   0.025    0.025    0.016
X1    1340      14   1926.3     1982       40       40       40
   End of unlined channel
   Begin gunite lined channel, n = 0.016, Side slopes = 1 1/2 : 1
X3      10
GR    85.7    1900     85.7     1915    86.27   1926.3    80.41     1935    80.22     1954
GR   80.41    1973    86.28     1982     86.1     1992     84.3     1999     84.9     2010
GR    83.6    2019     85.6     2022     84.9     2025     84.3     2100

X1    1400      13   1926.3     1982       60       60       60
X3      10
GR    85.8    1900     85.6     1915    86.31   1926.3    80.46     1935    80.27     1954
GR   80.46    1973    86.31     1982     86.1     1992     84.3     1999     84.8     2010
GR    85.8    2021     85.3     2024     84.6     2100
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X1	1500	13	1926.3	1982	100	100	100			
X3	10									
GR	86.3	1900	86.2	1915	86.36	1926.3	80.52	1935	80.33	1954
GR	80.52	1973	86.36	1982	86.2	1992	84.9	1997	86.4	2015
GR	86.1	2021	85.6	2024	85.0	2100				
X1	1600	13	1926	1982	100	100	100			
X3	10									
GR	86.9	1900	86.9	1915	86.75	1926	80.58	1935	80.39	1954
GR	86.42	1982	86.2	1992	84.7	1998	86.7	2016	84.8	2018
GR	86.6	2022	86.1	2024	85.6	2100				
X1	1700	14	1925.3	1982	100	100	100			
X3	10									
GR	87.3	1900	87.4	1915	87.14	1925.3	80.64	1935	80.45	1954
GR	80.64	1973	86.47	1982	86.3	1992	86.1	1993	87.1	2016
GR	87.3	2022	86.6	2024	86.0	2050	86.0	2100		
X1	1800	13	1925	1983	100	100	100			
X3	10									
GR	87.2	1900	87.7	1915	87.57	1925	80.70	1935	80.51	1954
GR	80.70	1973	87.23	1983	87.1	1993	87.6	2016	85.7	2018
GR	88.0	2022	87.0	2025	86.5	2100				
X1	1900	15	1924	1983	100	100	100			
X3	10									
GR	87.5	1900	87.7	1915	88.0	1924	80.76	1935	80.57	1954
GR	80.76	1973	87.4	1983	87.8	1994	88.5	2000	88.3	2009
GR	88.8	2012	86.0	2019	88.0	2020	87.5	2024	86.7	2100
X1	1921	15	1926.9	1985	21	21	21			
X3	10									
GR	88.6	1912	88.8	1915	88.3	1926	89.3	1926.1	89.3	1926.9
GR	88.3	1927	80.85	1934	80.58	1957	80.76	1978	87.37	1985
GR	87.2	1996	87.5	1997.3	87.6	2001	87.3	2007	88.3	2013
X1	1931	15	1934.9	1988.1	10	10	10			
X3	10									
GR	88.7	1903	88.7	1915	88.3	1934	89.27	1934.1	89.27	1934.9
GR	80.86	1935	80.59	1962	80.78	1984	88.23	1988	89.23	1988.1
GR	89.23	1988.8	88.24	1988.9	87.5	1999	88.0	2000	87.4	2002
X1	1951	14	1946.0	1982.1	20	20	20			
X3	10							89.15	89.15	
GR	86.9	1894	87.1	1920	88.2	1945.1	89.15	1945.2	89.15	1946.0
GR	80.60	1946.1	80.60	1963.5	80.60	1982	89.15	1982.1	89.15	1982.9
GR	88.20	1983.0	87.7	1998	85.8	1999	86.0	2004		

OV

```
NC    0.025     0.025     0.015
    SC RECORD DEFINES TRIPLE 10  FT. X 6 FT. BOX CULVERTS
SC    3.012       .2       3.0        0       6.0      10.0       111      11.4      80.7      80.6
   CROSS-SECTION 2055 AT UPSTREAM FACE OF CULVERT WITH EFFECTIVE FLOW OPTION
   X2.3 = 2 INDICATES CULVERT OPTION
   BT DATA IS MCKELLIPS RD. PROFILE
   HIGHER GROUND ELVS.(S. SIDE OF RD.,EAST OF BOX) THAN RD. ARE
   USED (A RD. CUT SITUATION) WHERE APPLICABLE.  THE HIGHER OF THE C/L OF
   McKELLIPS RD. OR THE TOP OF THE RELOCATED IRRIG. DITCH (WEST OF BOX) WHERE
   HIGHER THAN THE EXIST. GRADE IS USED.
   MINIMUM ELEV. THAT WATER WILL FLOW INTO THE McKELLIPS ROADWAY ON THE NORTH
   SIDE IS = 88.9, THE BANK ELEV. @ THE END OF THE NORTH WINGWALLS.
X1    2067        25      2000      2030       111       111       111
X2                         2                  87.4
X3      10                                                        89.2      89.2
BT     -24       400      88.5                600      88.2                800      87.8
BT               1000      87.5               1100      87.4               1300      87.9
BT               1450      88.1               1500      88.0               1550      87.9
BT               1750      89.7               1900      89.8               2000      92.0
BT               2034      92.0               2071      89.9               2150      89.4
BT               2250      88.3               2342      88.1               2450      88.1
BT               2600      88.1               2800      87.9               3000      87.9
BT               3200      88.4               3400      88.6               3600      88.8
GR    88.5       400      88.0        500      87.6       600      87.6       700      87.3       800
GR    87.0      1000      86.9       1150      86.6      1300      86.5      1450      87.4      1550
GR    86.7      1750      88.3       1982      89.2      1994      80.7      2000      80.7      2030
GR    89.2    2030.1      88.8       2041      88.7      2060      87.7      2200      86.6      2400
GR    87.1      2600      87.4       2800      87.9      3000      87.6      3300      88.8      3600
   CROSS-SECTION 21+12 IS A FULL FLOW SECTION UPSTREAM FROM CULVERT (CHANNEL
      IMPROVED PER SCOTTSDALE'S PLANS). STA 21+12 = C.O.S. 11+00
   THE M/L RUNNING NORTH IS STA 2000 FOR THE OFFSETS TO THE CROSSSECTIONS

NC     .02      .025      .015
X1    2077         9      1994    2032.1        10        10        10
X3      10
GR    89.0      1975      88.9      1993      89.2      1994     80.70    1994.1     80.70      2032
GR    89.2    2032.1      88.9      2033      89.0      2039      95.0    2039.1

X1    2112         9      2015      2033        45        45        45
X3      10
GR    97.2    1986.9      91.2      1987      90.0      2005      89.8      2015     83.63      2019
GR   83.63      2029      90.2      2033      90.4      2040      96.4    2040.1

X1    2212         9      2015      2033       100       100       100
X3      10
GR    97.2    1986.9      91.2      1987      90.1      2005      89.9      2015     83.93      2019
GR   83.93      2029      90.1      2033      90.2      2040      96.2    2040.1
```

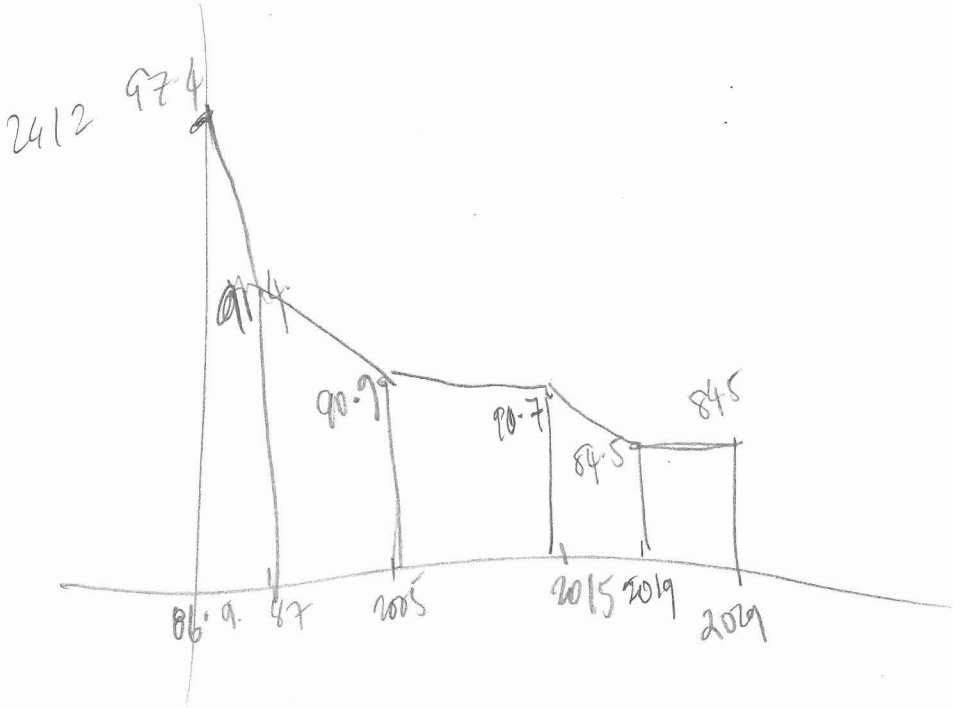
OK INDOT

OK

OK

OK

X1	2312	9	2015	2033	100	100	100			
X3	10									
GR	97.2	1986.9	91.2	1987	90.6	2005	90.4	2015	84.23	2019
GR	84.23	2029	90.4	2033	90.5	2040	96.5	2040.1		
X1	2412	9	2015	2033	100	100	100			
X3	10									
GR	97.4	1986.9	91.4	1987	90.9	2005	90.7	2015	84.53	2019
GR	84.53	2029	90.7	2033	90.8	2040	96.8	2040.1		



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

*PROF 1

CCHV= .100 CEHV= .300
*SECNO .000
2096 WSEL NOT GIVEN, AVG OF MAX, MIN USED

3265 DIVIDED FLOW

3280 CROSS SECTION .00 EXTENDED 1.38 FEET

3720 CRITICAL DEPTH ASSUMED

.000	2.98	82.38	82.38	.00	82.87	.48	.00	.00	81.60
1160.0	337.0	144.8	678.3	61.7	22.6	124.4	.0	.0	81.60
.00	5.46	6.41	5.45	.025	.030	.025	.000	79.40	1900.00
.007857	0.	0.	0.	0	20	0	.00	195.60	2100.00

*SECNO 200.000
3280 CROSS SECTION 200.00 EXTENDED 2.11 FEET

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.31

200.000	3.91	83.31	.00	.00	83.47	.17	.57	.03	81.80
1160.0	328.8	107.6	723.6	99.5	31.6	223.8	1.3	.9	82.00
.02	3.31	3.40	3.23	.025	.030	.025	.000	79.40	1900.00
.001476	200.	200.	200.	3	0	0	.00	200.00	2100.00

*SECNO 400.000
3280 CROSS SECTION 400.00 EXTENDED 2.10 FEET

400.000	3.61	83.61	.00	.00	83.78	.17	.31	.00	82.40
1160.0	224.2	188.9	746.9	69.5	53.5	223.6	2.9	1.8	82.20
.03	3.23	3.53	3.34	.025	.030	.025	.000	80.00	1900.00
.001606	200.	200.	200.	2	0	0	.00	200.00	2100.00

*SECNO 600.000
3280 CROSS SECTION 600.00 EXTENDED 2.12 FEET

600.000	3.52	83.92	.00	.00	84.07	.15	.29	.00	83.20
1160.0	371.9	95.5	692.6	113.5	32.1	224.6	4.5	2.7	82.50
.05	3.28	2.98	3.08	.025	.030	.025	.000	80.40	1900.00
.001293	200.	200.	200.	0	0	0	.00	200.00	2100.00

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

*SECNO 800.000

3265 DIVIDED FLOW

3280 CROSS SECTION 800.00 EXTENDED 1.78 FEET

800.000	3.58	84.18	.00	.00	84.39	.21	.30	.02	83.60
1160.0	31.4	643.0	485.6	17.1	157.5	151.9	6.1	3.7	83.50
.07	1.84	4.08	3.20	.025	.030	.025	.000	80.60	1900.00
.001818	200.	200.	200.	2	0	0	.00	198.49	2100.00

*SECNO 1000.000

3265 DIVIDED FLOW

3280 CROSS SECTION 1000.00 EXTENDED 1.56 FEET

1000.000	4.36	84.56	.00	.00	84.92	.36	.48	.04	84.40
1160.0	10.0	593.9	556.1	7.3	104.4	150.2	7.5	4.6	83.60
.08	1.38	5.69	3.70	.025	.030	.025	.000	80.20	1900.00
.003305	200.	200.	200.	2	0	0	.00	198.88	2100.00

*SECNO 1100.000

3265 DIVIDED FLOW

3280 CROSS SECTION 1100.00 EXTENDED 1.62 FEET

1100.000	4.92	84.92	.00	.00	85.20	.28	.28	.01	84.30
1160.0	22.1	649.6	488.3	12.2	130.7	151.4	8.1	5.0	84.80
.08	1.81	4.97	3.23	.025	.030	.025	.000	80.00	1900.00
.002369	100.	100.	100.	2	0	0	.00	199.44	2100.00

*SECNO 1200.000
3280 CROSS SECTION 1200.00 EXTENDED 1.33 FEET

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.63

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

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 86.20 ELREA= 86.20

1200.000	4.83	84.93	.00	.00	85.40	.47	.14	.05	86.20
1160.0	.0	1160.0	.0	.0	211.7	.0	8.7	5.3	86.20
.09	.00	5.48	.00	.000	.020	.000	.000	80.10	1928.17
.000893	100.	100.	100.	2	0	0	.00	51.81	1979.99

*SECNO 1300.000
3280 CROSS SECTION 1300.00 EXTENDED .92 FEET

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 86.30 ELREA= 86.30

1300.000	4.82	85.02	.00	.00	85.49	.47	.09	.00	86.30
1160.0	.0	1160.0	.0	.0	211.2	.0	9.2	5.4	86.30
.10	.00	5.49	.00	.000	.020	.000	.000	80.20	1928.19
.000901	100.	100.	100.	2	0	0	.00	51.85	1980.04

*SECNO 1340.000
3280 CROSS SECTION 1340.00 EXTENDED .75 FEET

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 86.27 ELREA= 86.28

1340.000	4.83	85.05	.00	.00	85.51	.46	.03	.00	86.27
1160.0	.0	1160.0	.0	.0	212.6	.0	9.4	5.5	86.28
.10	.00	5.46	.00	.000	.016	.000	.000	80.22	1928.11
.000566	40.	40.	40.	0	0	0	.00	52.01	1980.12

*SECNO 1400.000
3280 CROSS SECTION 1400.00 EXTENDED .49 FEET

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 86.31 ELREA= 86.31

1400.000	4.81	85.08	.00	.00	85.55	.46	.03	.00	86.31
1160.0	.0	1160.0	.0	.0	212.0	.0	9.7	5.6	86.31
.10	.00	5.47	.00	.000	.016	.000	.000	80.27	1928.11
.000571	60.	60.	60.	1	0	0	.00	52.01	1980.12

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

*SECNO 1500.000
3280 CROSS SECTION 1500.00 EXTENDED .14 FEET

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 86.36 ELREA= 86.36

1500.000	4.81	85.14	.00	.00	85.61	.47	.06	.00	86.36
1160.0	.0	1160.0	.0	.0	211.6	.0	10.2	5.7	86.36
.11	.00	5.48	.00	.000	.016	.000	.000	80.33	1928.12
.000575	100.	100.	100.	0	0	0	.00	52.01	1980.12

*SECNO 1600.000

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .56

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 86.75 ELREA= 86.42

1600.000	4.44	84.83	.00	.00	85.87	1.04	.09	.17	86.75
1160.0	.0	1160.0	.0	.0	141.7	.0	10.6	5.8	86.42
.11	.00	8.19	.00	.000	.016	.000	.000	80.39	1928.80
.001818	100.	100.	100.	3	0	0	.00	45.84	1974.63

*SECNO 1700.000

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.02

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 87.14 ELREA= 86.47

1700.000	5.18	85.63	.00	.00	86.02	.39	.08	.06	87.14
1160.0	.0	1160.0	.0	.0	230.8	.0	11.0	5.9	86.47
.11	.00	5.03	.00	.000	.016	.000	.000	80.45	1927.56
.000445	100.	100.	100.	3	0	0	.00	53.14	1980.70

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

*SECNO 1800.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 87.57 ELREA= 87.23

1800.000	5.16	85.67	.00	.00	86.06	.40	.04	.00	87.57
1160.0	.0	1160.0	.0	.0	229.1	.0	11.5	6.0	87.23
.12	.00	5.06	.00	.000	.016	.000	.000	80.51	1927.77
.000453	100.	100.	100.	2	0	0	.00	52.83	1980.60

*SECNO 1900.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 88.00 ELREA= 87.40

1900.000	5.14	85.71	.00	.00	86.11	.40	.05	.00	88.00
1160.0	.0	1160.0	.0	.0	228.9	.0	12.1	6.1	87.40
.13	.00	5.07	.00	.000	.016	.000	.000	80.57	1927.48
.000455	100.	100.	100.	0	0	0	.00	52.98	1980.46

*SECNO 1921.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 89.30 ELREA= 87.37

1921.000	5.21	85.79	.00	.00	86.13	.34	.01	.01	89.30
1160.0	.0	1160.0	.0	.0	249.0	.0	12.2	6.2	87.37
.13	.00	4.66	.00	.000	.016	.000	.000	80.58	1929.36
.000361	21.	21.	21.	2	0	0	.00	53.97	1983.33

*SECNO 1931.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 89.27 ELREA= 89.23

1931.000	5.23	85.82	.00	.00	86.13	.32	.00	.00	89.27
1160.0	.0	1160.0	.0	.0	257.2	.0	12.2	6.2	89.23
.13	.00	4.51	.00	.000	.016	.000	.000	80.59	1934.94
.000336	10.	10.	10.	2	0	0	.00	51.76	1986.70

*SECNO 1951.000

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

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .65

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 89.15 ELREA= 89.15

1951.000	4.99	85.59	.00	.00	86.24	.65	.01	.10	89.15
1160.0	.0	1160.0	.0	.0	179.6	.0	12.3	6.2	89.15
.13	.00	6.46	.00	.000	.016	.000	.000	80.60	1946.04
.000784	20.	20.	20.	2	0	0	.00	36.02	1982.06

SPECIAL CULVERT

SC	CUNO	CUNV	ENTLC	COFQ	RDLEN	RISE	SPAN	CULVLN	CHRT	SCL	ELCHU	ELCHD
	3	.012	.20	3.00	.00	6.00	10.00	111.00	11	4	80.70	80.60

CHART 11 - BOX CULVERT; SKEWED HEADWALL; CHAMFERED OR BEVELED INLET EDGES
SCALE 4 - HEADWALL SKEWED 10 TO 45 DEGREES; INLET EDGES BEVELED

*SECNO 2067.000

SPECIAL CULVERT OUTLET CONTROL
EGIC = 86.396 EGOC = 86.834 PCWSE= 85.592 ELTRD= 87.400

SPECIAL CULVERT

EGIC	EGOC	H4	QWEIR	QCULV	VCH	ACULV	ELTRD	WEIRLN
86.40	86.83	.59	0.	1160.	7.279	180.0	87.40	0.

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 89.20 ELREA= 89.20

2067.000	5.31	86.01	.00	.00	86.83	.82	.59	.00	80.70
1160.0	.0	1160.0	.0	.0	159.4	.0	12.8	6.3	80.70
.13	.00	7.28	.00	.000	.015	.000	.000	80.70	2000.00
.000582	111.	111.	111.	3	0	0	.00	30.00	2030.00

*SECNO 2077.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 89.20 ELREA= 89.20

2077.000	5.74	86.44	.00	.00	86.88	.44	.00	.04	89.20
1160.0	.0	1160.0	.0	.0	218.0	.0	12.8	6.3	89.20
.13	.00	5.32	.00	.000	.015	.000	.000	80.70	1994.03
.000398	10.	10.	10.	2	0	0	.00	38.04	2032.07

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

*SECNO 2112.000

3301 HV CHANGED MORE THAN HVINS

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

2112.000	7.09	90.72	90.72	.00	92.56	1.83	.03	.42	89.80
1160.0	29.7	1126.1	4.2	12.1	102.2	3.0	13.0	6.3	90.20
.13	2.45	11.02	1.41	.020	.015	.025	.000	83.63	1994.17
.001899	45.	45.	45.	20	11	0	.00	45.83	2040.01

*SECNO 2212.000

3301 HV CHANGED MORE THAN HVINS

2212.000	7.55	91.48	.00	.00	92.76	1.28	.15	.06	89.90
1160.0	82.8	1056.5	20.7	29.6	111.5	9.3	13.3	6.5	90.10
.14	2.80	9.47	2.23	.020	.015	.025	.000	83.93	1987.00
.001215	100.	100.	100.	6	0	0	.00	53.03	2040.02

*SECNO 2312.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

2312.000	7.22	91.45	91.45	.00	93.05	1.60	.14	.10	90.40
1160.0	47.0	1097.7	15.3	19.4	105.3	7.0	13.6	6.6	90.40
.14	2.42	10.43	2.18	.020	.015	.025	.000	84.23	1987.00
.001603	100.	100.	100.	3	8	0	.00	53.02	2040.02

shotcrete

*SECNO 2412.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

2412.000	7.21	91.74	91.74	.00	93.34	1.60	.16	.00	90.70
1160.0	48.5	1096.4	15.0	19.9	105.0	6.9	13.9	6.7	90.70
.14	2.44	10.44	2.17	.020	.015	.025	.000	84.53	1986.99
.001612	100.	100.	100.	2	5	0	.00	53.02	2040.02

THIS RUN EXECUTED 15FEB93 09:52:20

****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

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

LL Date: 1/03/92

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	.000	.00	.00	.00	79.40	1160.00	82.38	82.38	82.87	78.57	6.41	208.68	130.87
*	200.000	200.00	.00	.00	79.40	1160.00	83.31	.00	83.47	14.76	3.40	354.86	301.95
	400.000	200.00	.00	.00	80.00	1160.00	83.61	.00	83.78	16.06	3.53	346.65	289.42
	600.000	200.00	.00	.00	80.40	1160.00	83.92	.00	84.07	12.93	2.98	370.18	322.57
	800.000	200.00	.00	.00	80.60	1160.00	84.18	.00	84.39	18.18	4.08	326.47	272.06
	1000.000	200.00	.00	.00	80.20	1160.00	84.56	.00	84.92	33.05	5.69	261.94	201.77
	1100.000	100.00	.00	.00	80.00	1160.00	84.92	.00	85.20	23.69	4.97	294.28	238.33
*	1200.000	100.00	.00	.00	80.10	1160.00	84.93	.00	85.40	8.93	5.48	211.74	388.20
	1300.000	100.00	.00	.00	80.20	1160.00	85.02	.00	85.49	9.01	5.49	211.20	386.46
	1340.000	40.00	.00	.00	80.22	1160.00	85.05	.00	85.51	5.66	5.46	212.58	487.38
	1400.000	60.00	.00	.00	80.27	1160.00	85.08	.00	85.55	5.71	5.47	212.02	485.32
	1500.000	100.00	.00	.00	80.33	1160.00	85.14	.00	85.61	5.75	5.48	211.59	483.77
*	1600.000	100.00	.00	.00	80.39	1160.00	84.83	.00	85.87	18.18	8.19	141.65	272.09
*	1700.000	100.00	.00	.00	80.45	1160.00	85.63	.00	86.02	4.45	5.03	230.78	550.13
	1800.000	100.00	.00	.00	80.51	1160.00	85.67	.00	86.06	4.53	5.06	229.08	545.18
	1900.000	100.00	.00	.00	80.57	1160.00	85.71	.00	86.11	4.55	5.07	228.86	543.61
	1921.000	21.00	.00	.00	80.58	1160.00	85.79	.00	86.13	3.61	4.66	249.02	610.27

use this as TW dpth
in GRW to calculate
10-yr side flows coming in.

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	1931.000	10.00	.00	.00	80.59	1160.00	85.82	.00	86.13	3.36	4.51	257.25	632.89
*	1951.000	20.00	.00	.00	80.60	1160.00	85.59 OK	.00	86.24	7.84	6.46	179.57	414.17
	2067.000	111.00	87.40	.00	80.70	1160.00	86.01 OK	.00	86.83	5.82	7.28	159.37	480.70
	2077.000	10.00	.00	.00	80.70	1160.00	86.44 OK	.00	86.88	3.98	5.32	218.04	581.36
*	2112.000	45.00	.00	.00	83.63	1160.00	90.72 OK	90.72	92.56	18.99	11.02	117.25	266.22
	2212.000	100.00	.00	.00	83.93	1160.00	91.48 OK	.00	92.76	12.15	9.47	150.35	332.76
*	2312.000	100.00	.00	.00	84.23	1160.00	91.45 OK	91.45	93.05	16.03	10.43	131.72	289.76
*	2412.000	100.00	.00	.00	84.53	1160.00	91.74 OK	91.74	93.34	16.12	10.44	131.88	288.94

LL Date: 1/03/92

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	.000	1160.00	82.38	.00	.00	.00	195.60	.00
*	200.000	1160.00	83.31	.00	.92	.00	200.00	200.00
	400.000	1160.00	83.61	.00	.30	.00	200.00	200.00
	600.000	1160.00	83.92	.00	.31	.00	200.00	200.00
	800.000	1160.00	84.18	.00	.26	.00	198.49	200.00
	1000.000	1160.00	84.56	.00	.38	.00	198.88	200.00
	1100.000	1160.00	84.92	.00	.36	.00	199.44	100.00
*	1200.000	1160.00	84.93	.00	.01	.00	51.81	100.00
	1300.000	1160.00	85.02	.00	.09	.00	51.85	100.00
	1340.000	1160.00	85.05	.00	.03	.00	52.01	40.00
	1400.000	1160.00	85.08	.00	.03	.00	52.01	60.00
	1500.000	1160.00	85.14	.00	.06	.00	52.01	100.00
*	1600.000	1160.00	84.83	.00	-.31	.00	45.84	100.00
*	1700.000	1160.00	85.63	.00	.79	.00	53.14	100.00
	1800.000	1160.00	85.67	.00	.04	.00	52.83	100.00
	1900.000	1160.00	85.71	.00	.04	.00	52.98	100.00
	1921.000	1160.00	85.79	.00	.08	.00	53.97	21.00
	1931.000	1160.00	85.82	.00	.03	.00	51.76	10.00
*	1951.000	1160.00	85.59	.00	-.22	.00	36.02	20.00
	2067.000	1160.00	86.01	.00	.42	.00	30.00	111.00
	2077.000	1160.00	86.44	.00	.43	.00	38.04	10.00
*	2112.000	1160.00	90.72	.00	4.28	.00	45.83	45.00
	2212.000	1160.00	91.48	.00	.76	.00	53.03	100.00
*	2312.000	1160.00	91.45	.00	-.03	.00	53.02	100.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	2412.000	1160.00	91.74	.00	.29	.00	53.02	100.00

SUMMARY OF ERRORS AND SPECIAL NOTES

```
CAUTION SECNO=      .000  PROFILE=  1  CRITICAL DEPTH ASSUMED

WARNING SECNO=   200.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=  1200.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=  1600.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=  1700.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=  1951.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=  2112.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=  2112.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=  2112.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=  2312.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=  2312.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=  2412.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
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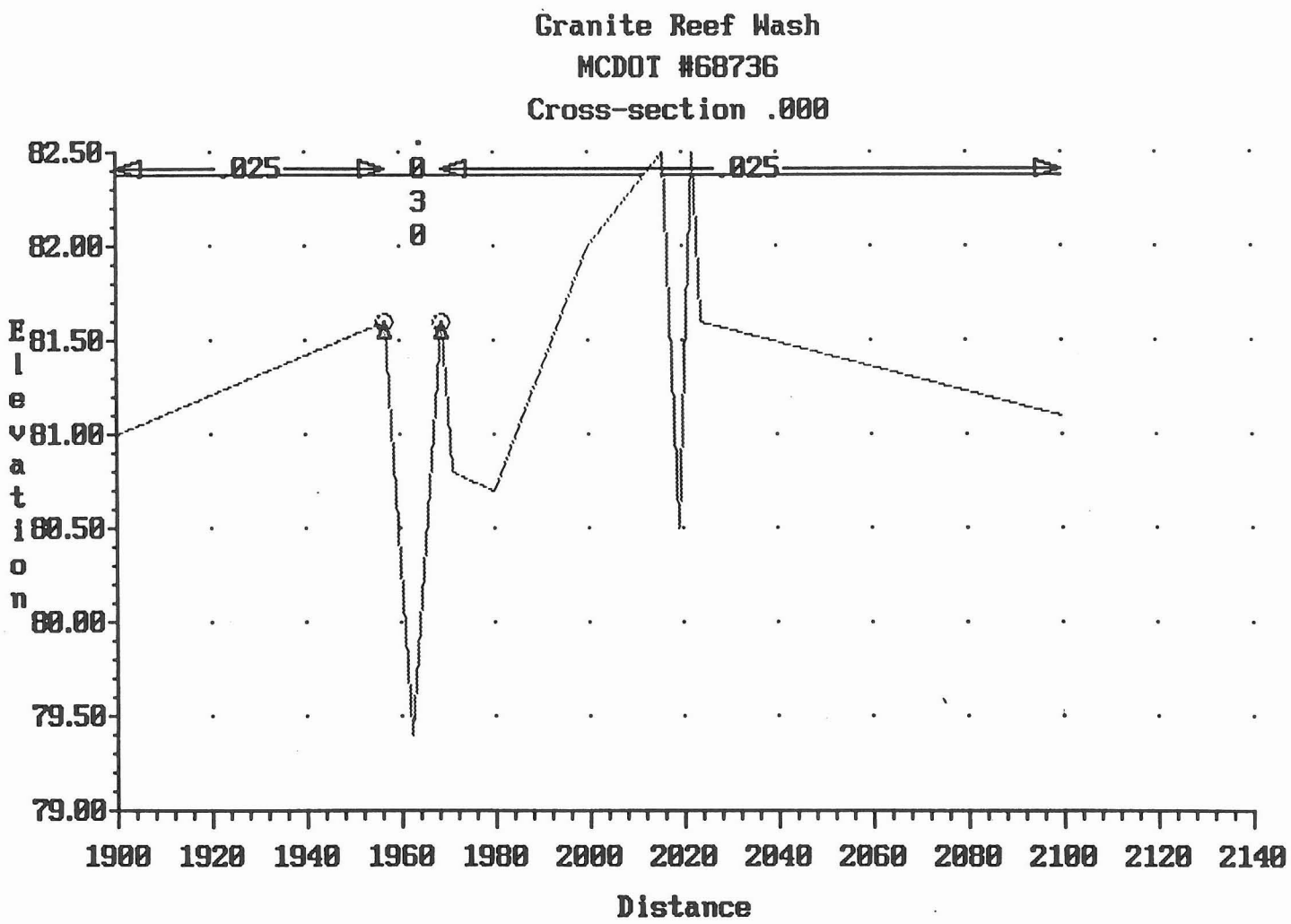
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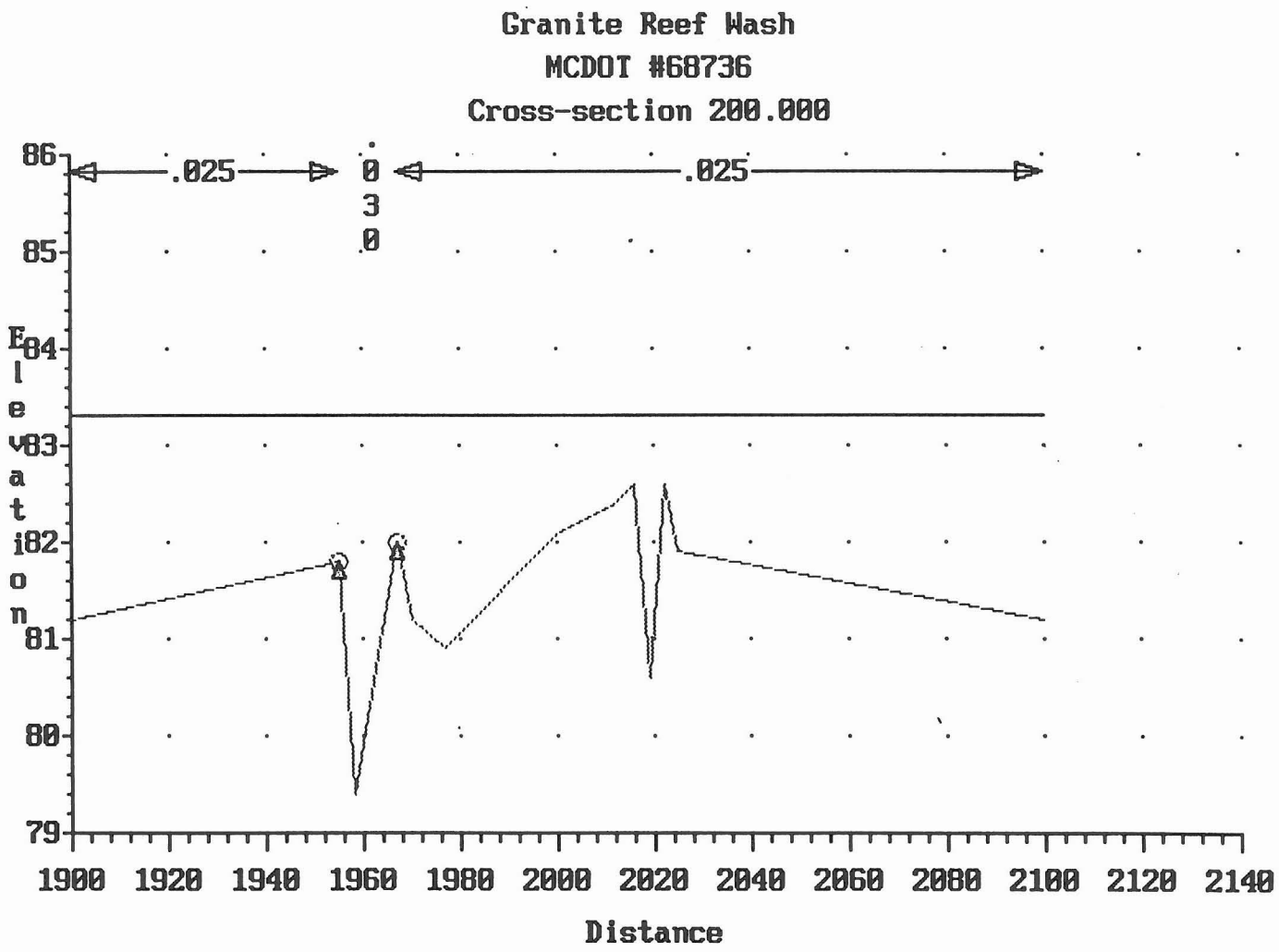
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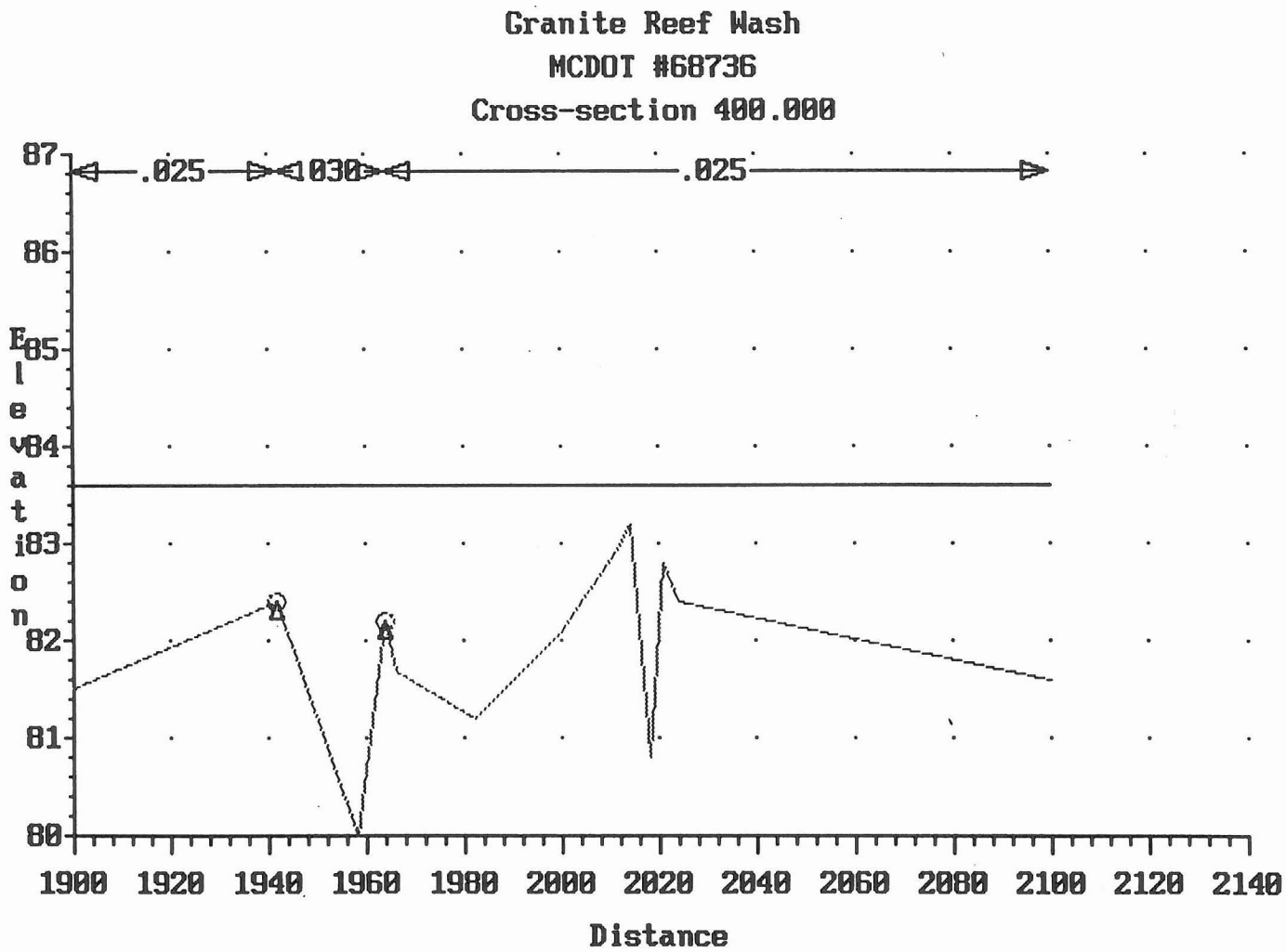
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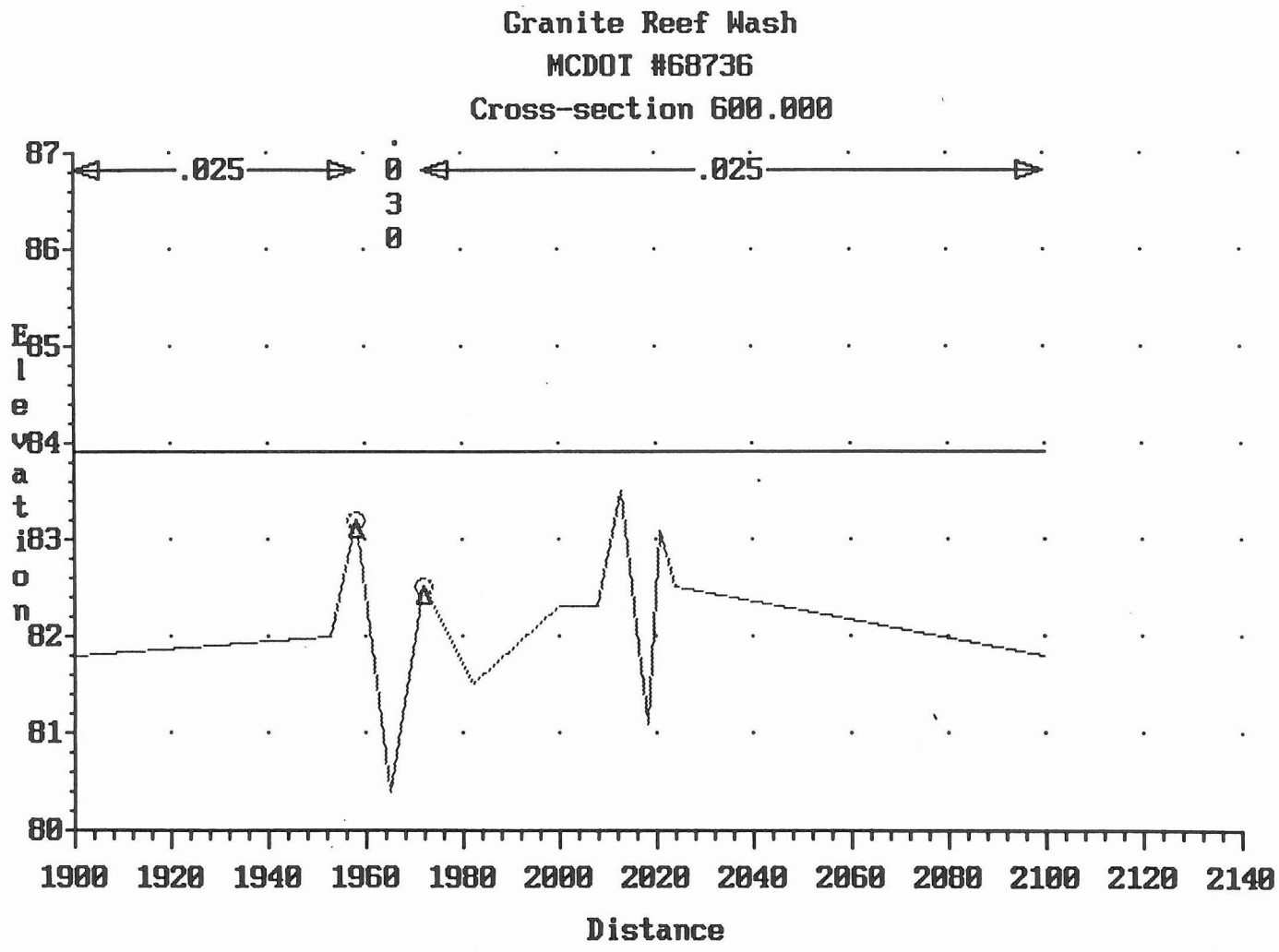
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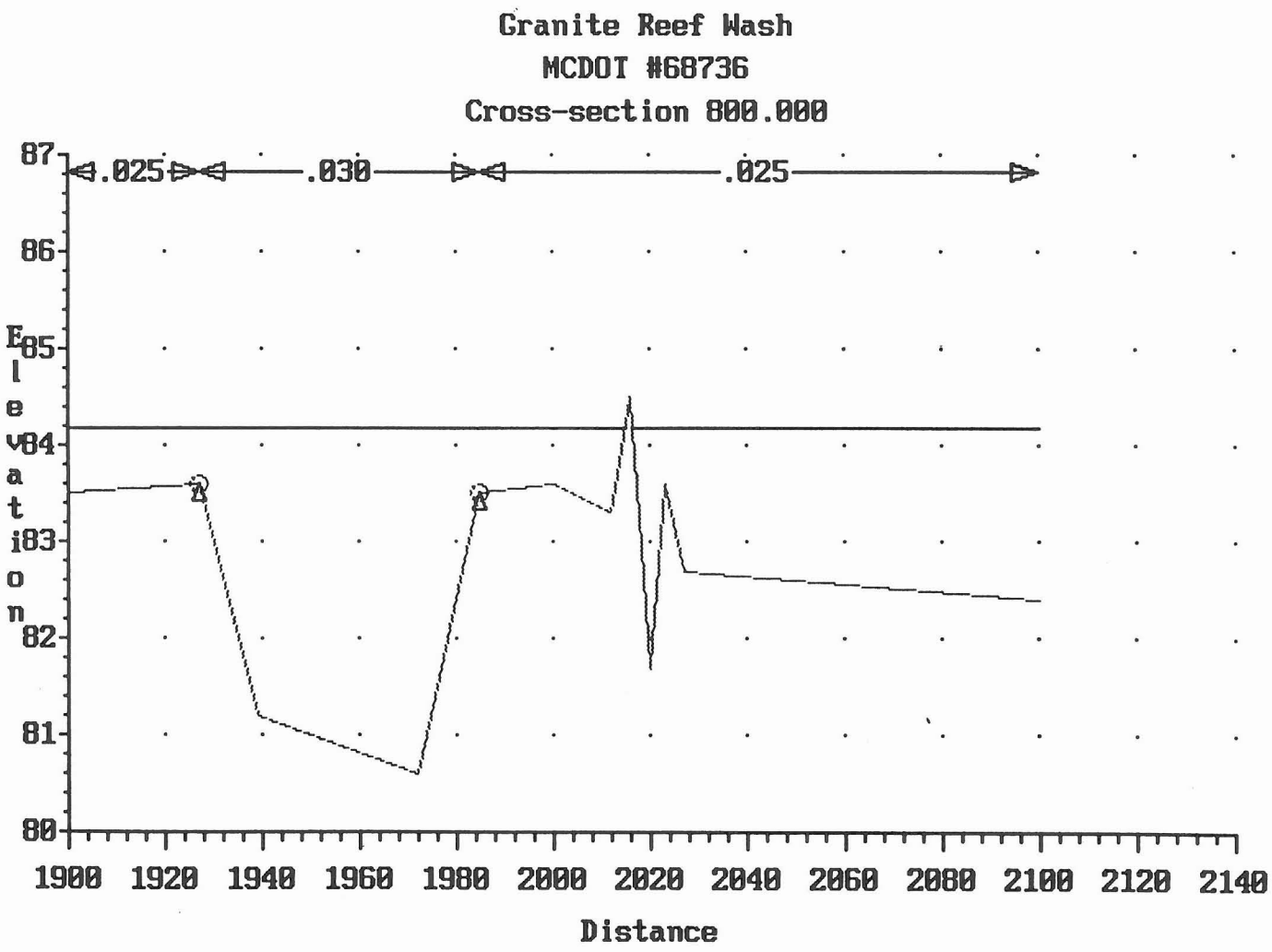
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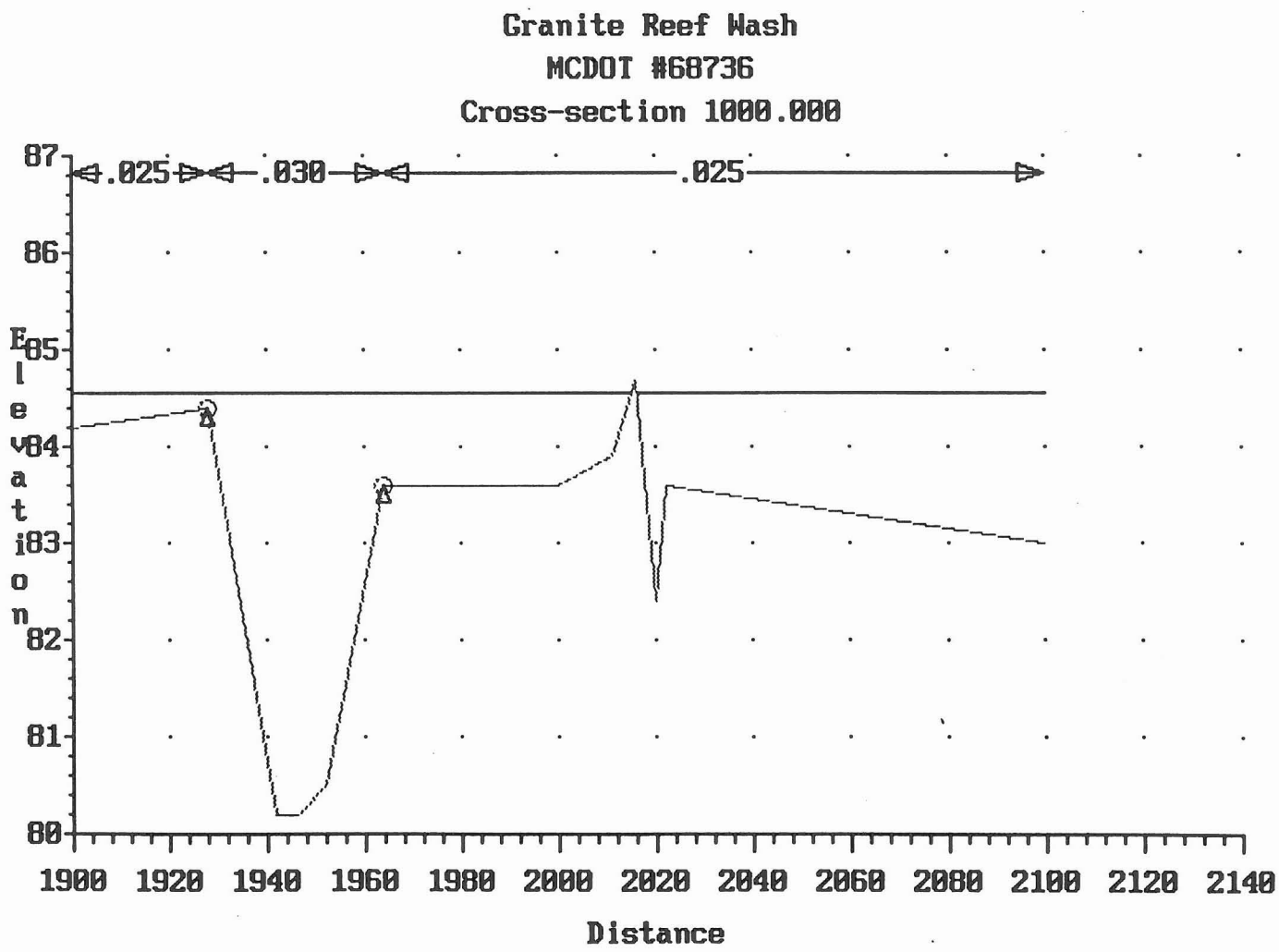
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Granite Reef Wash
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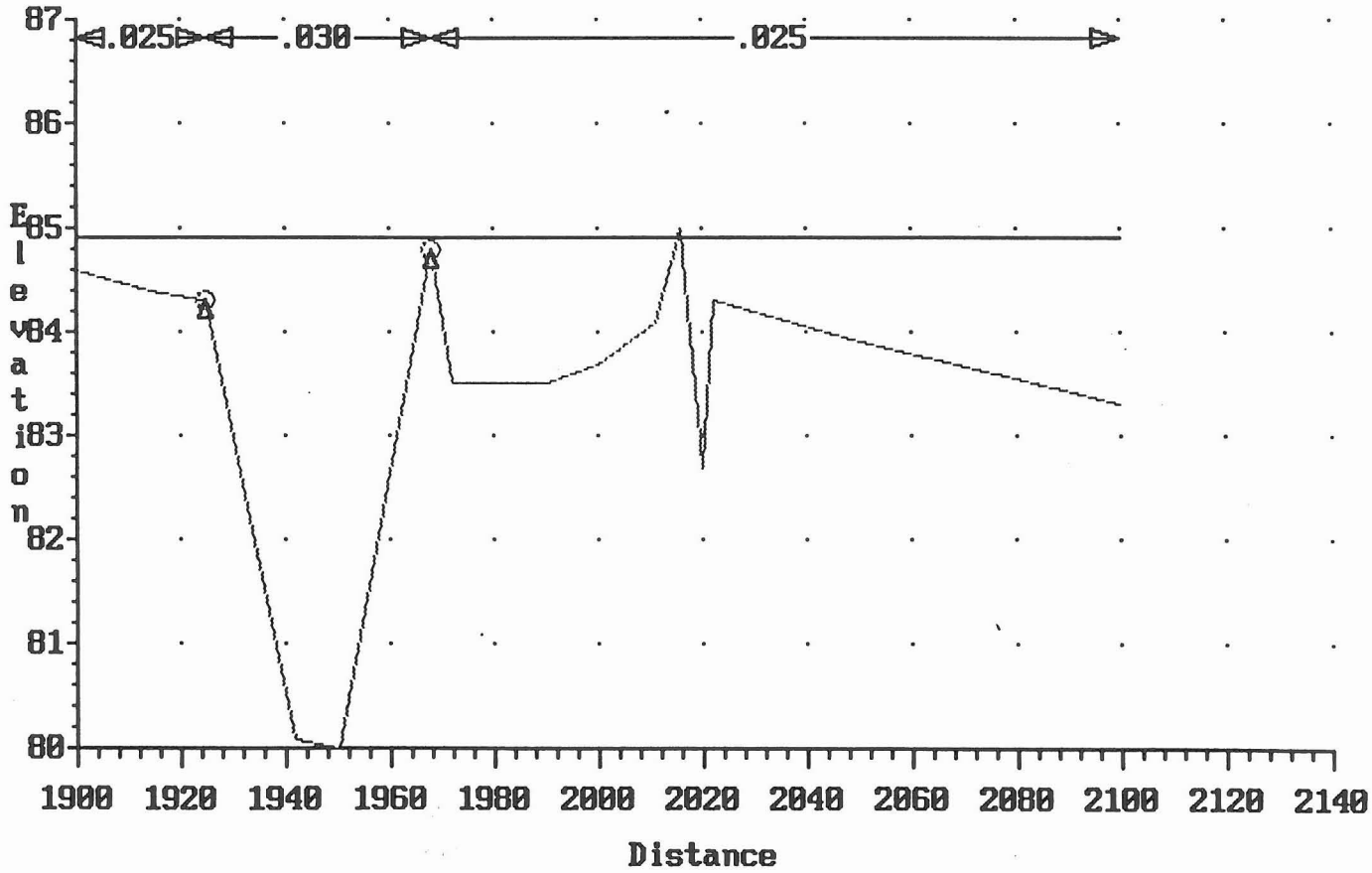
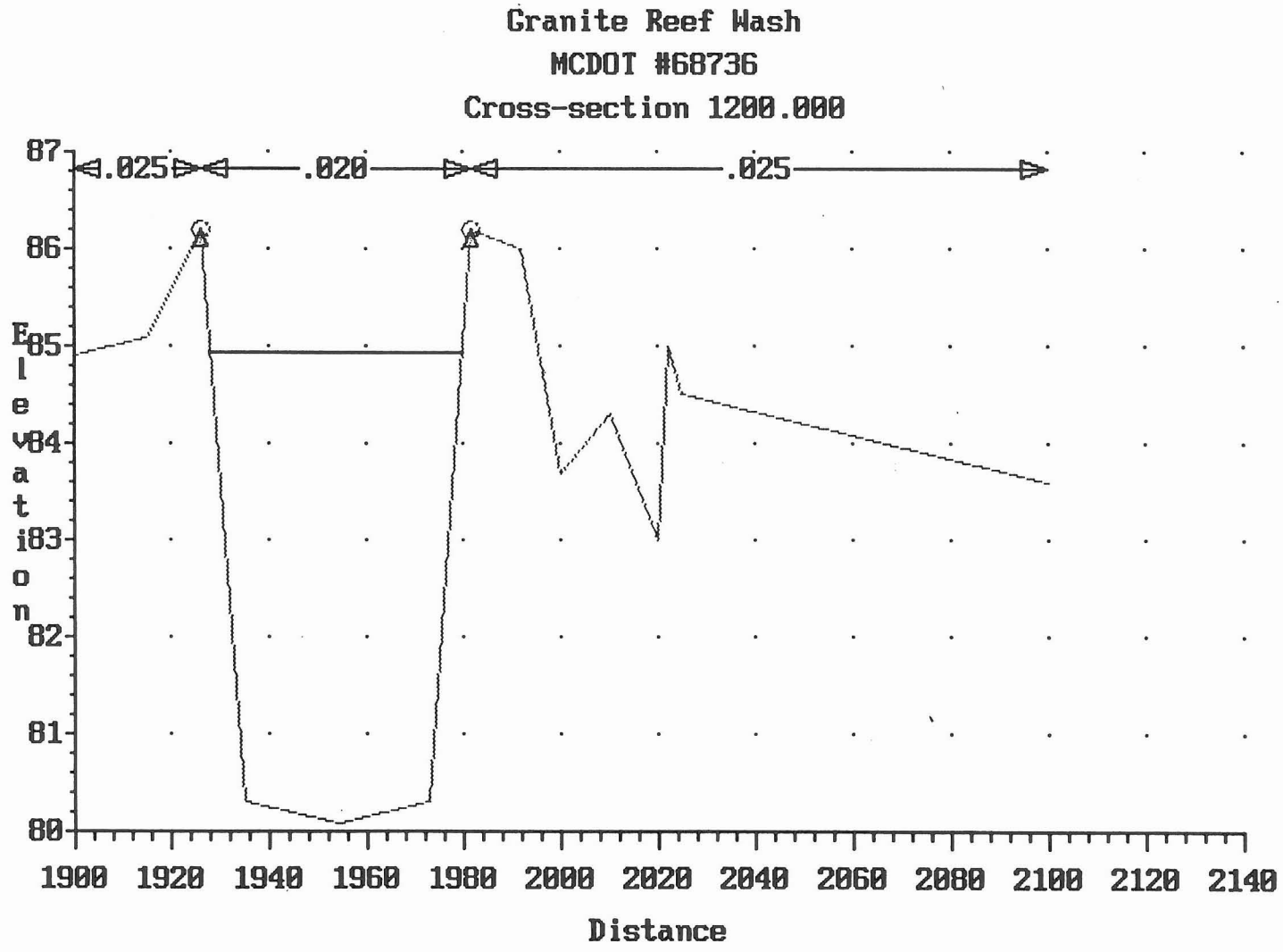
Cross-section 1100.000

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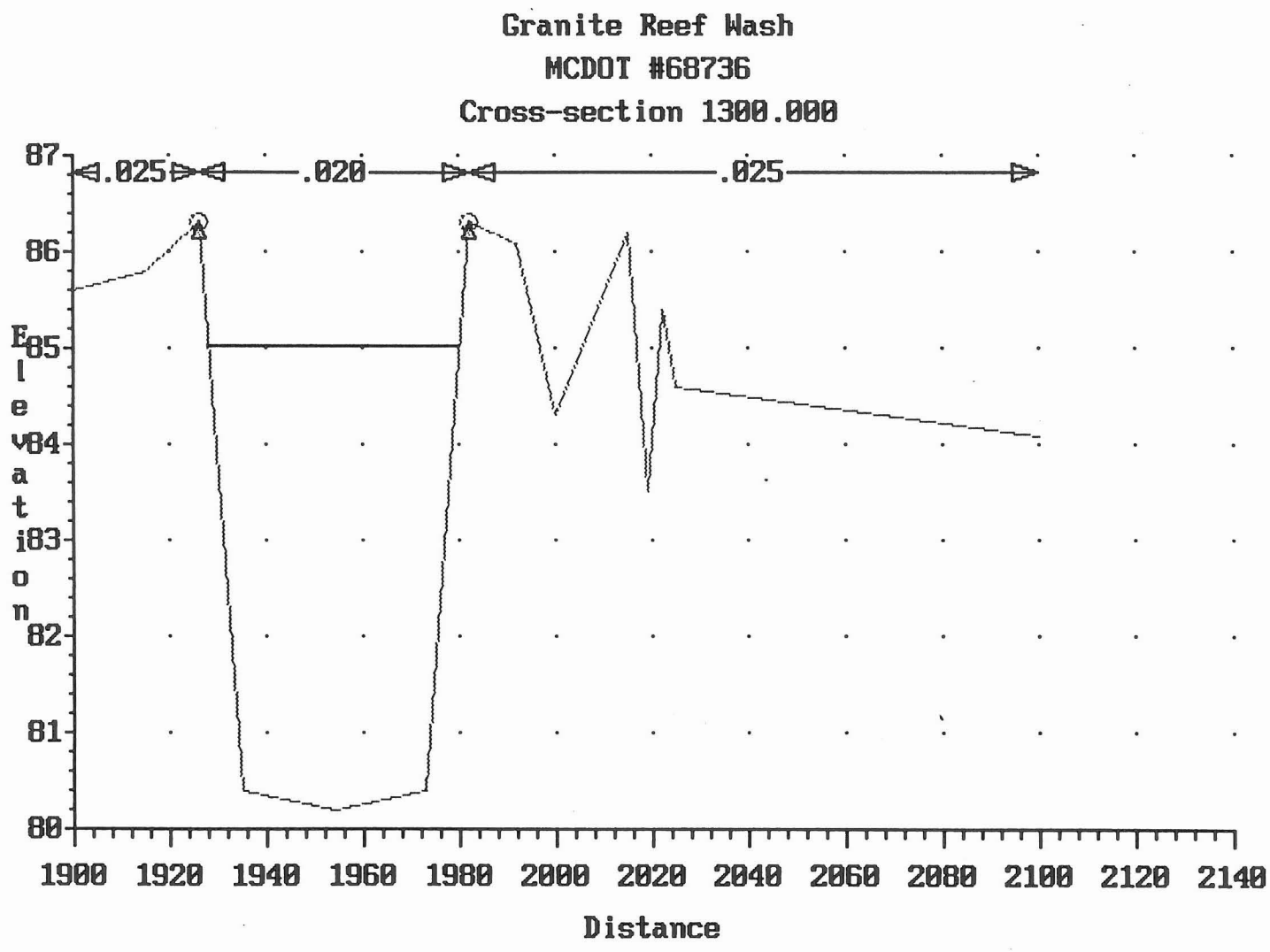
Distance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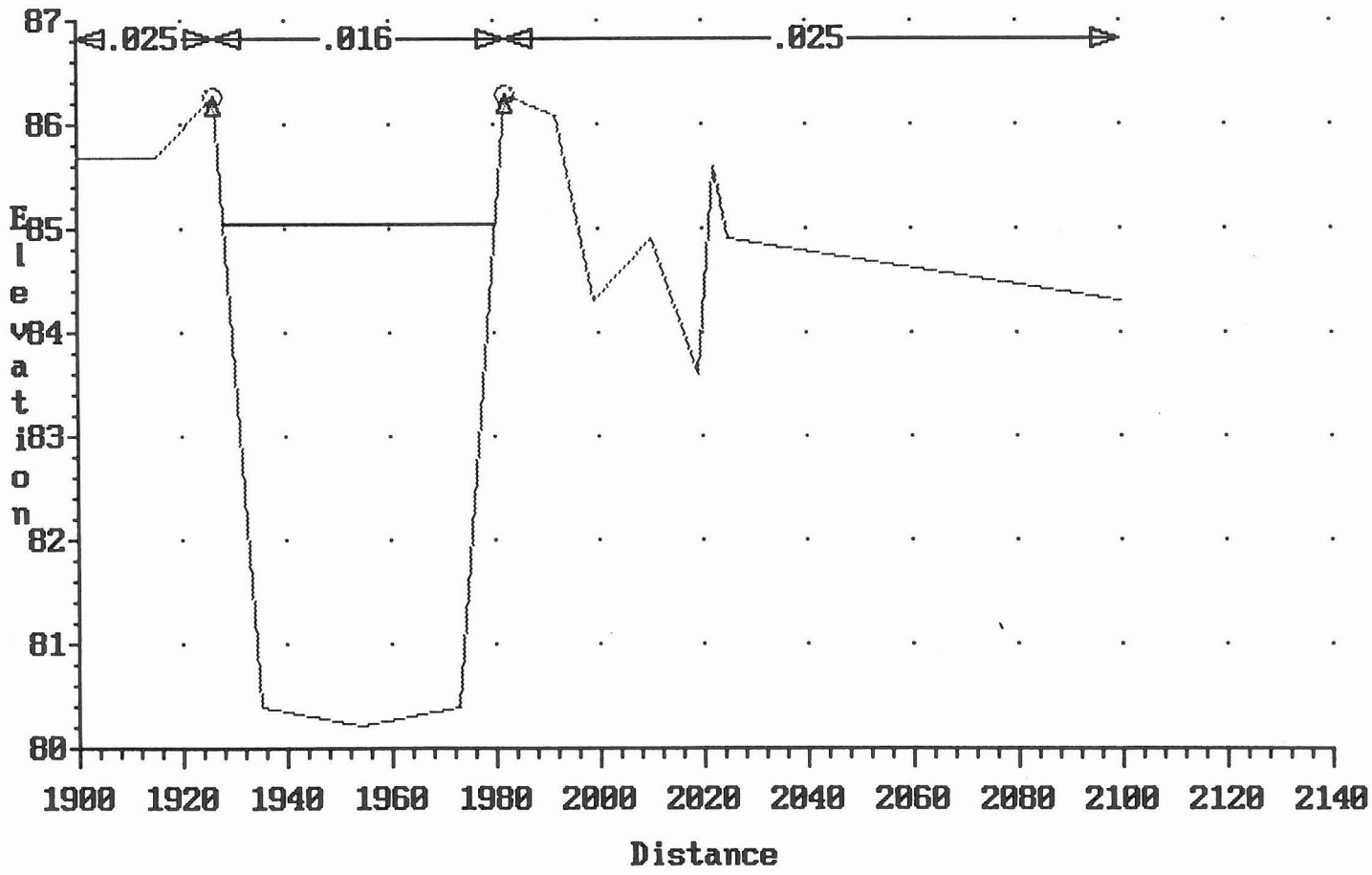
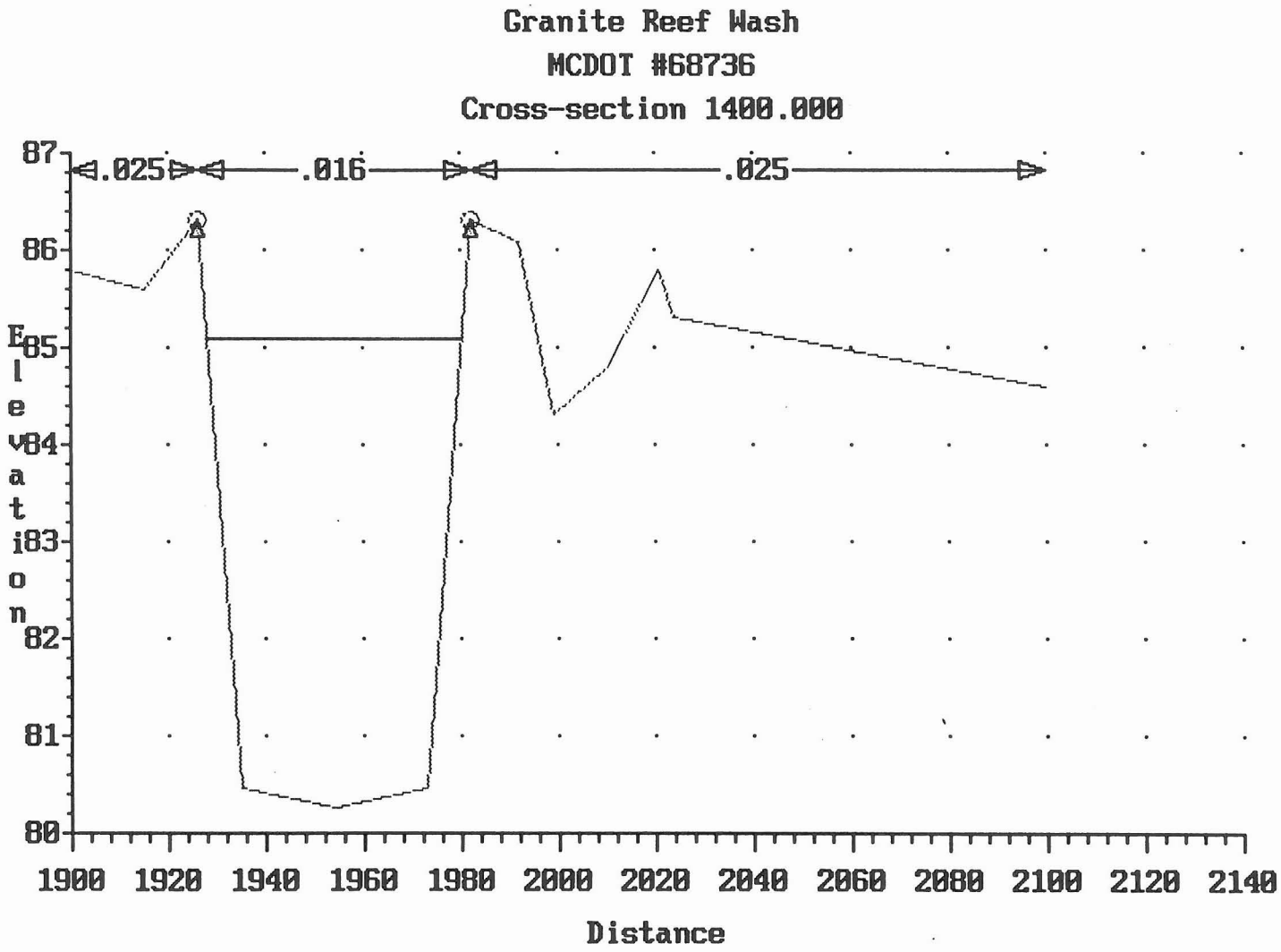
Granite Reef Wash

MCDOT #68736

Cross-section 1340.000

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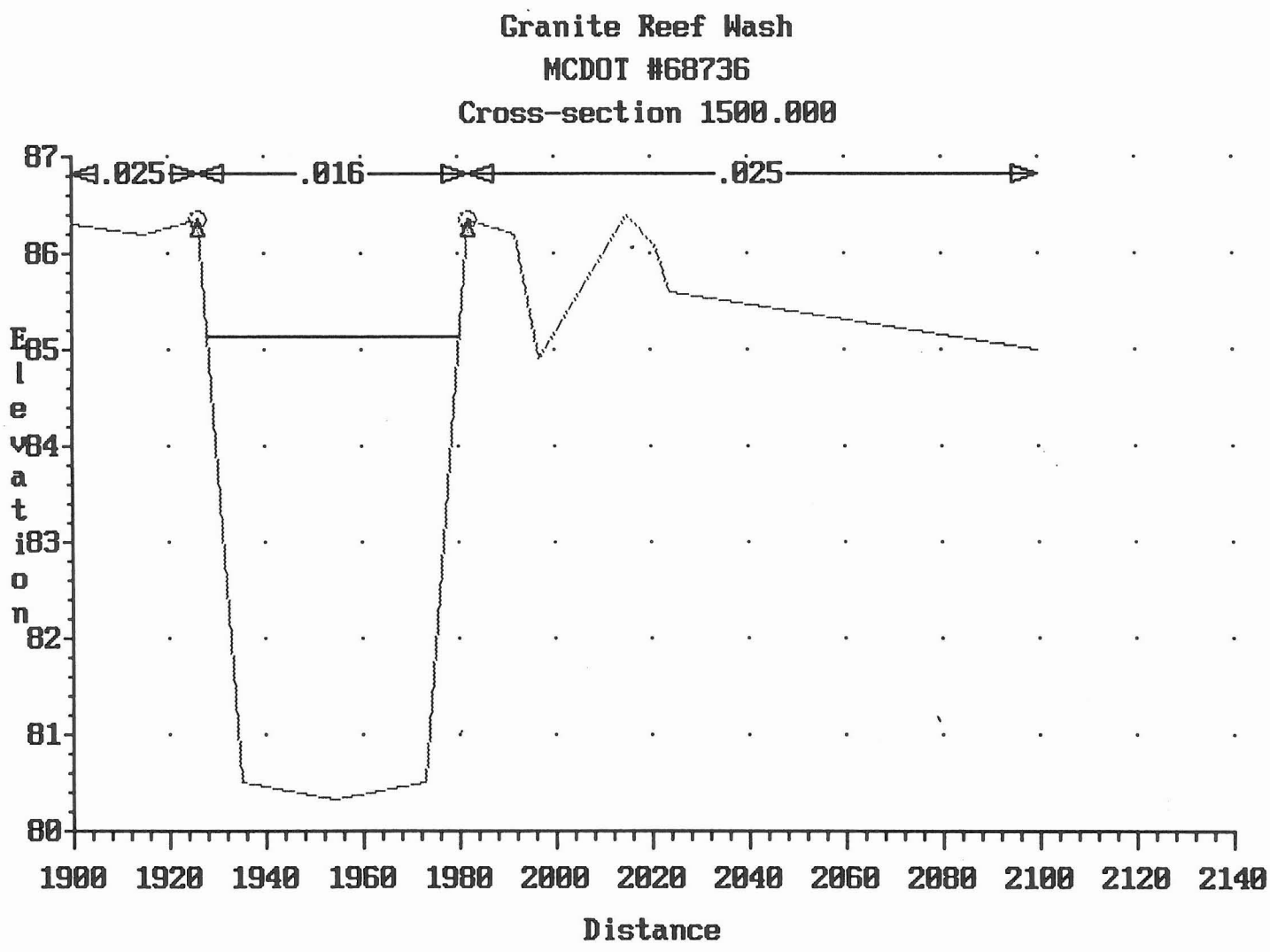
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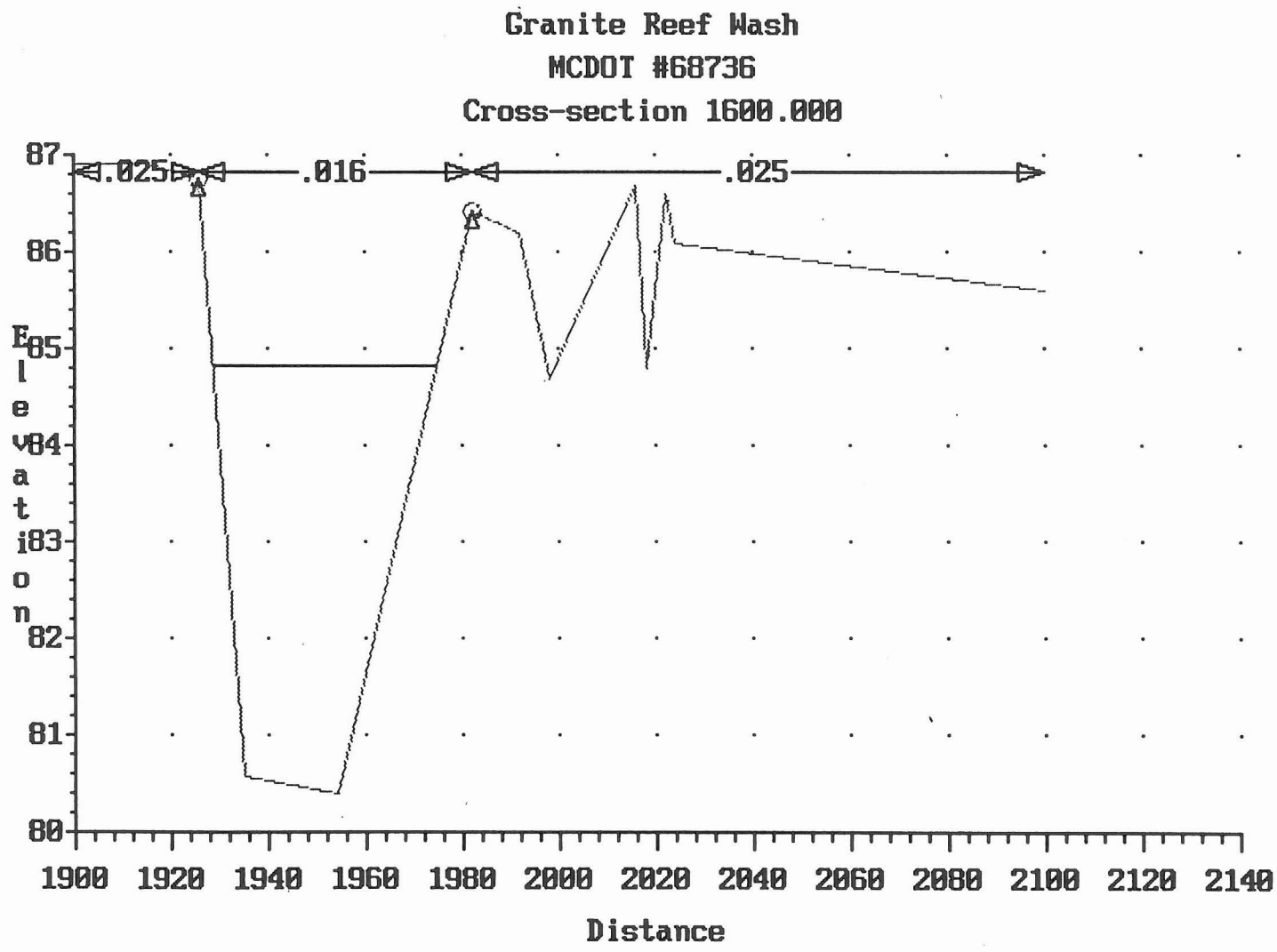
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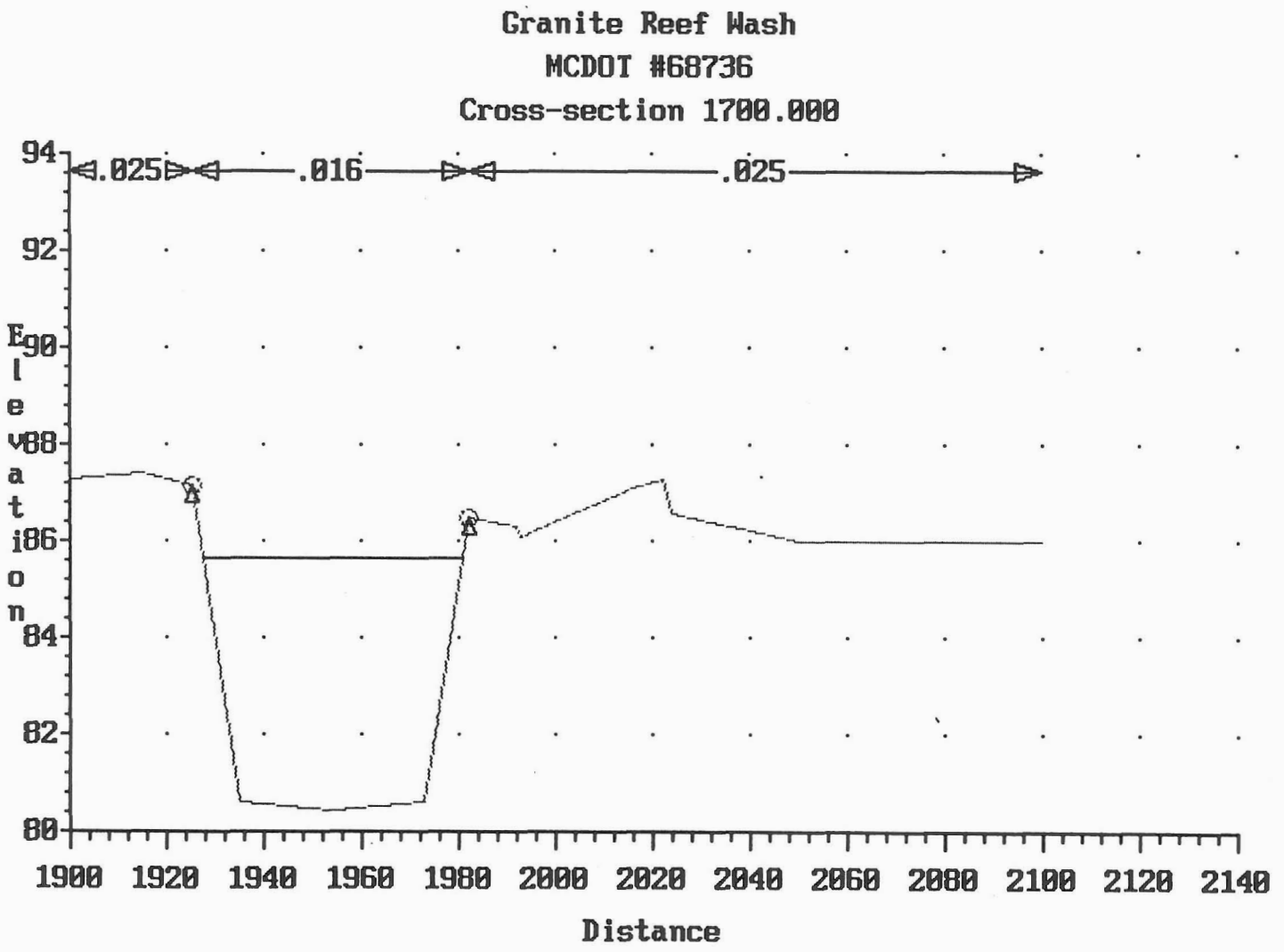
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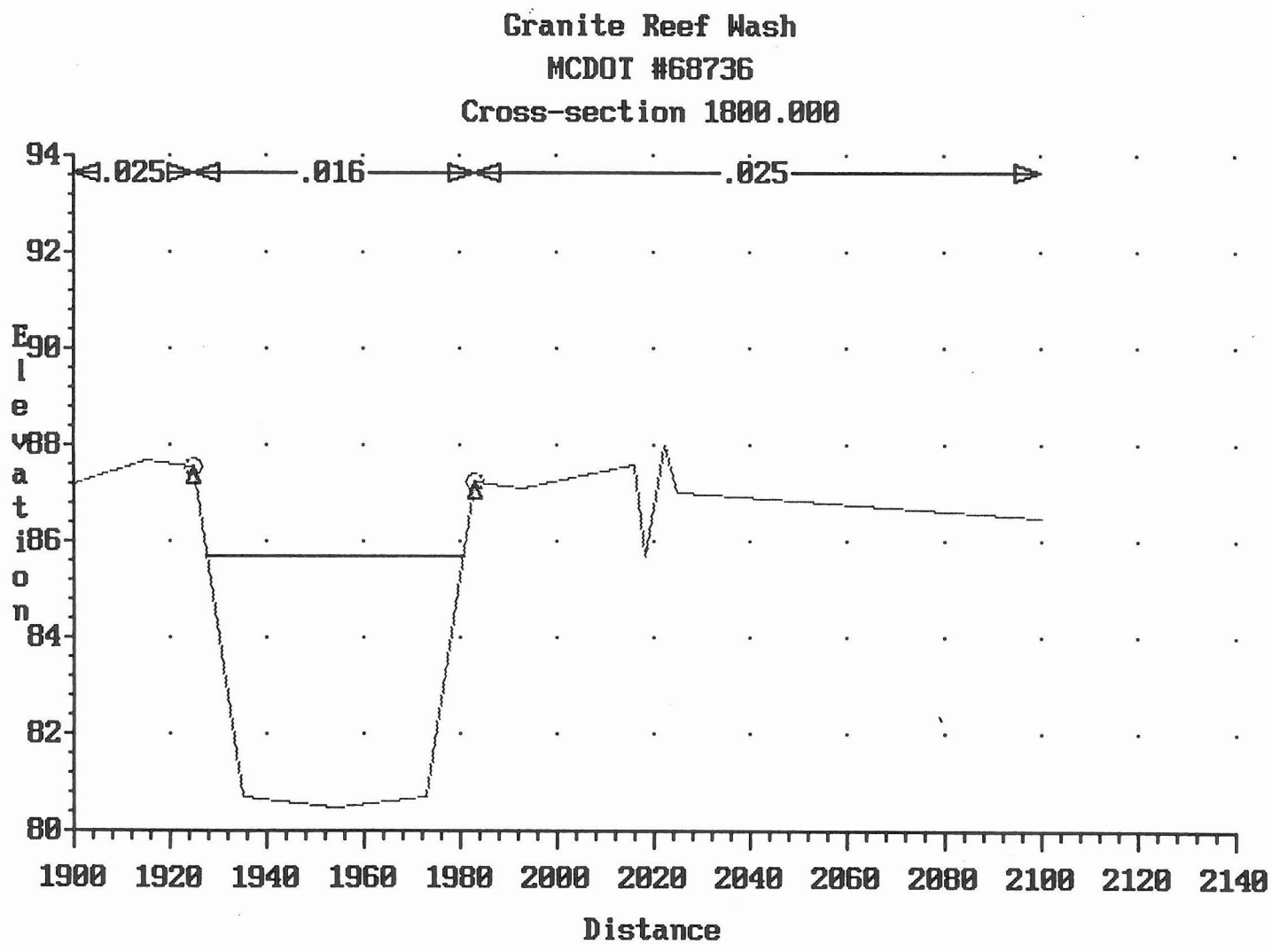
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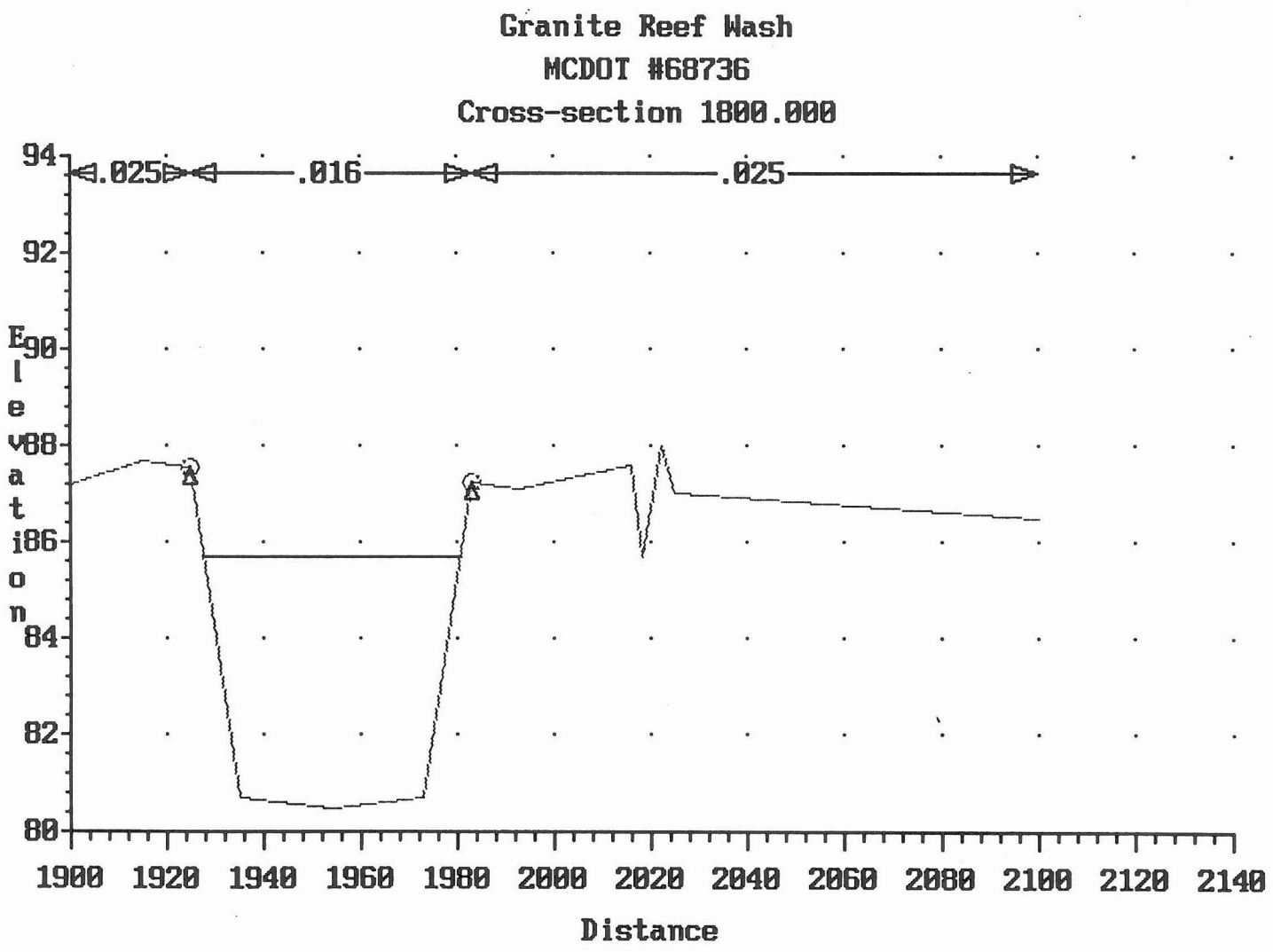
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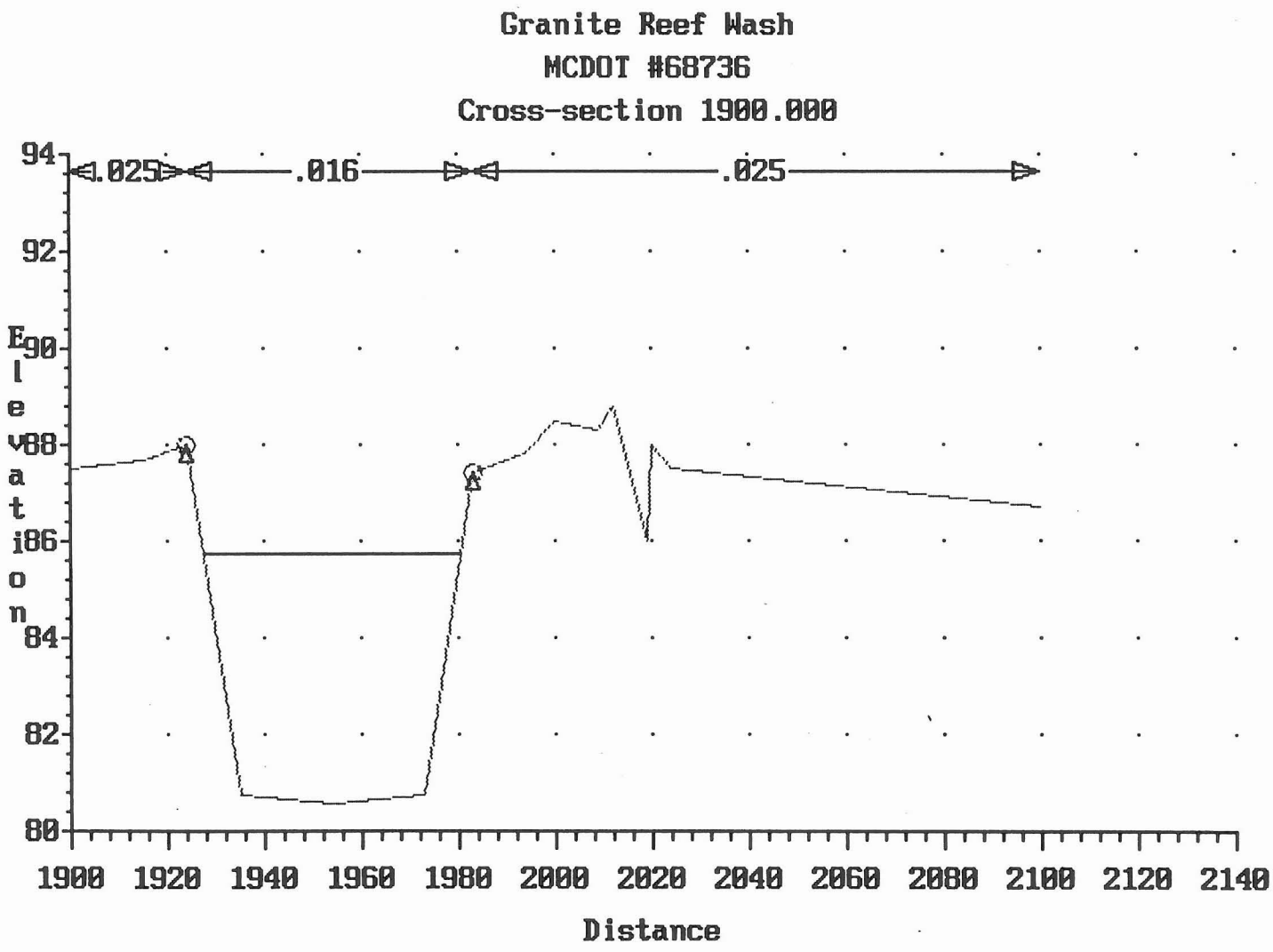
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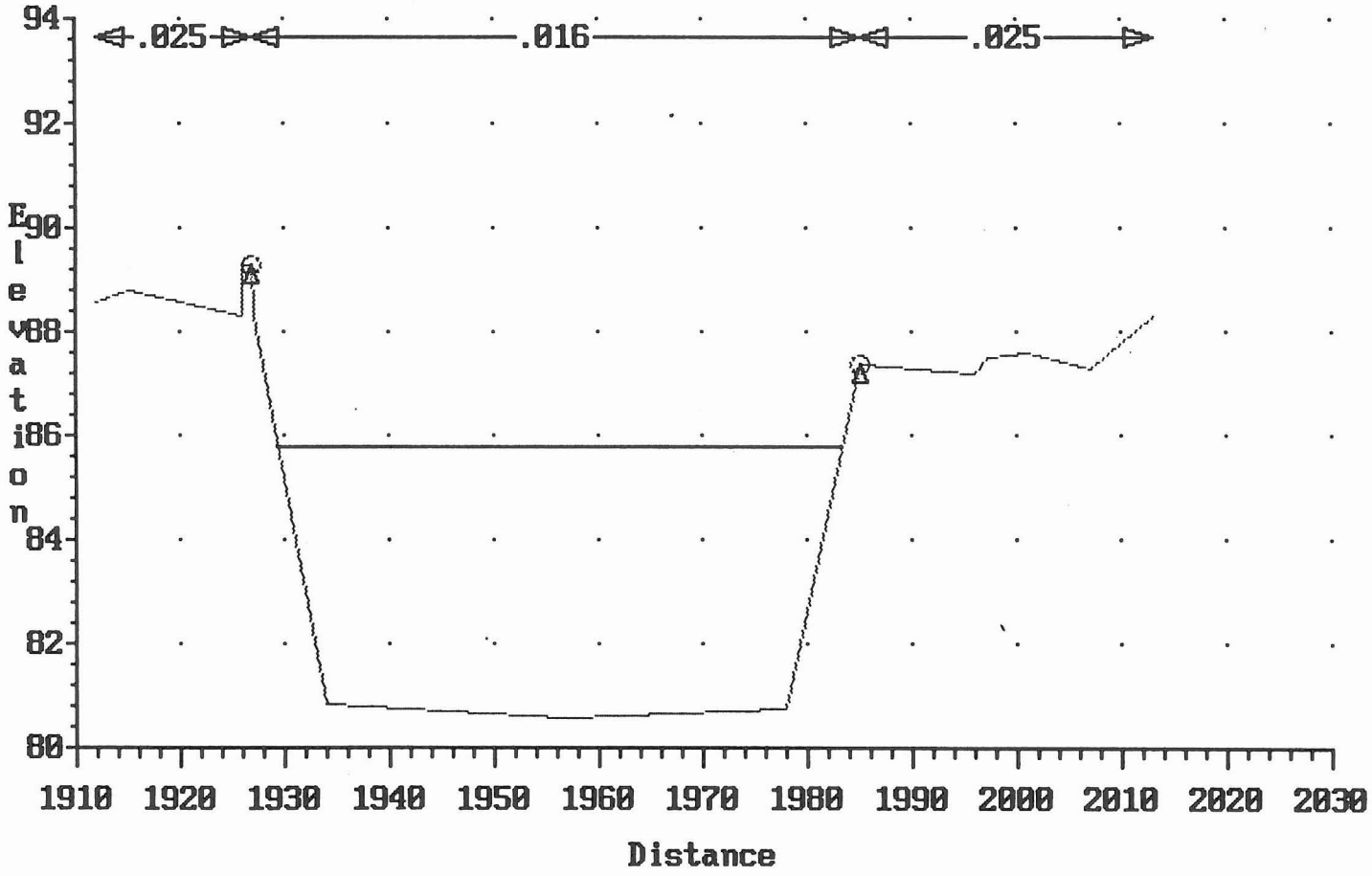
Granite Reef Wash
MCDOT #68736
Cross-section 1921.000



Granite Reef Wash
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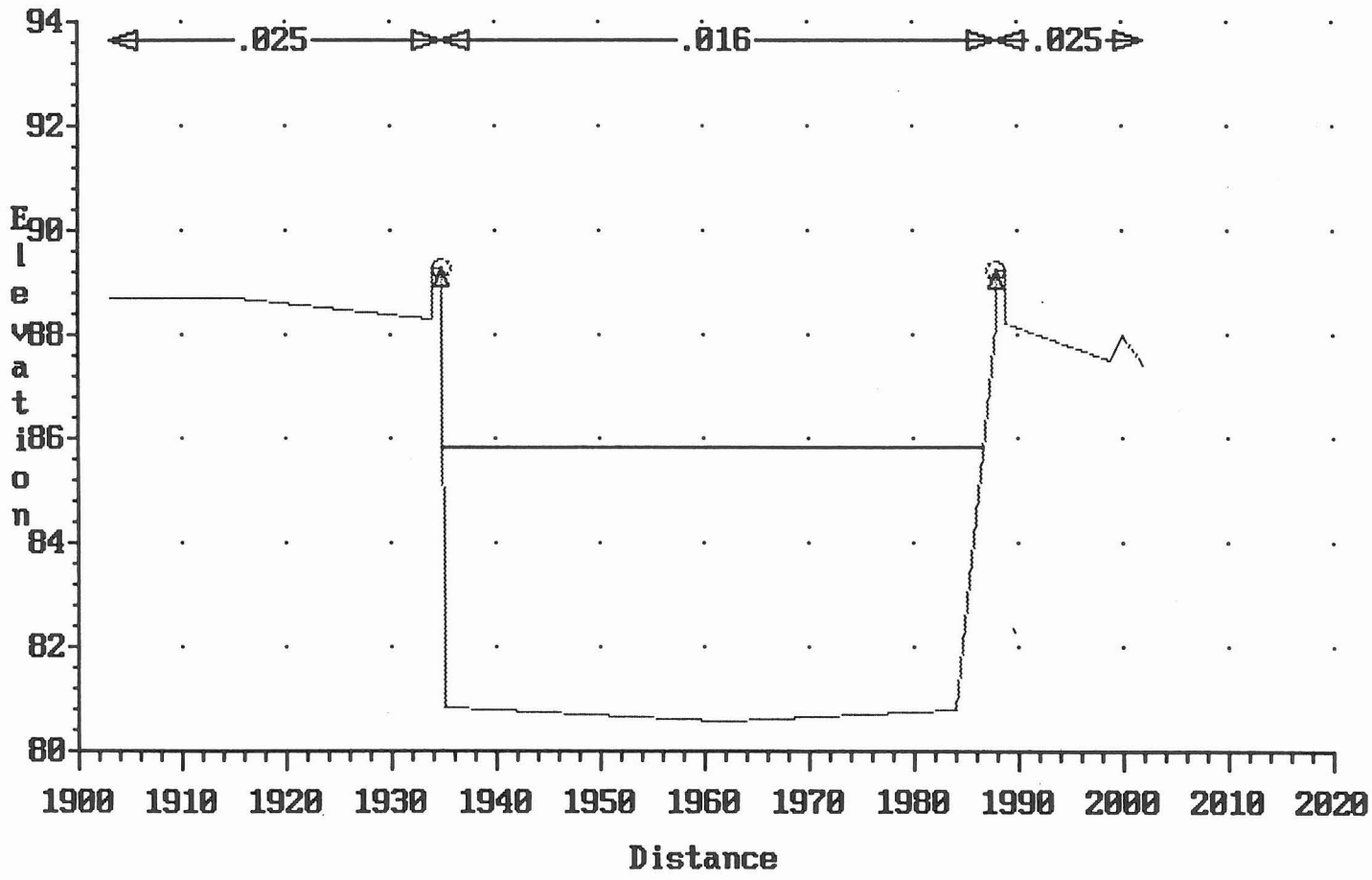

Granite Reef Wash
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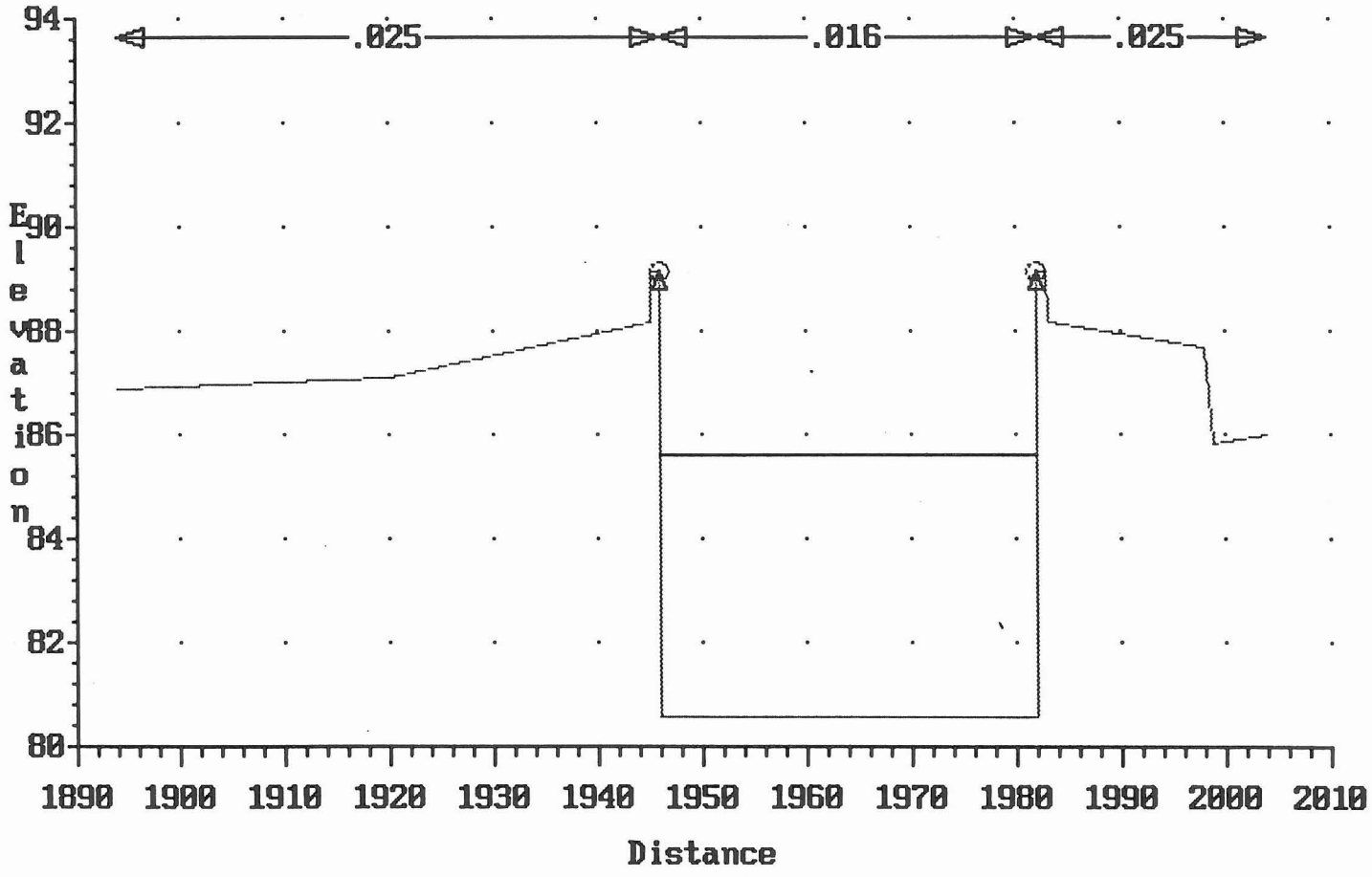

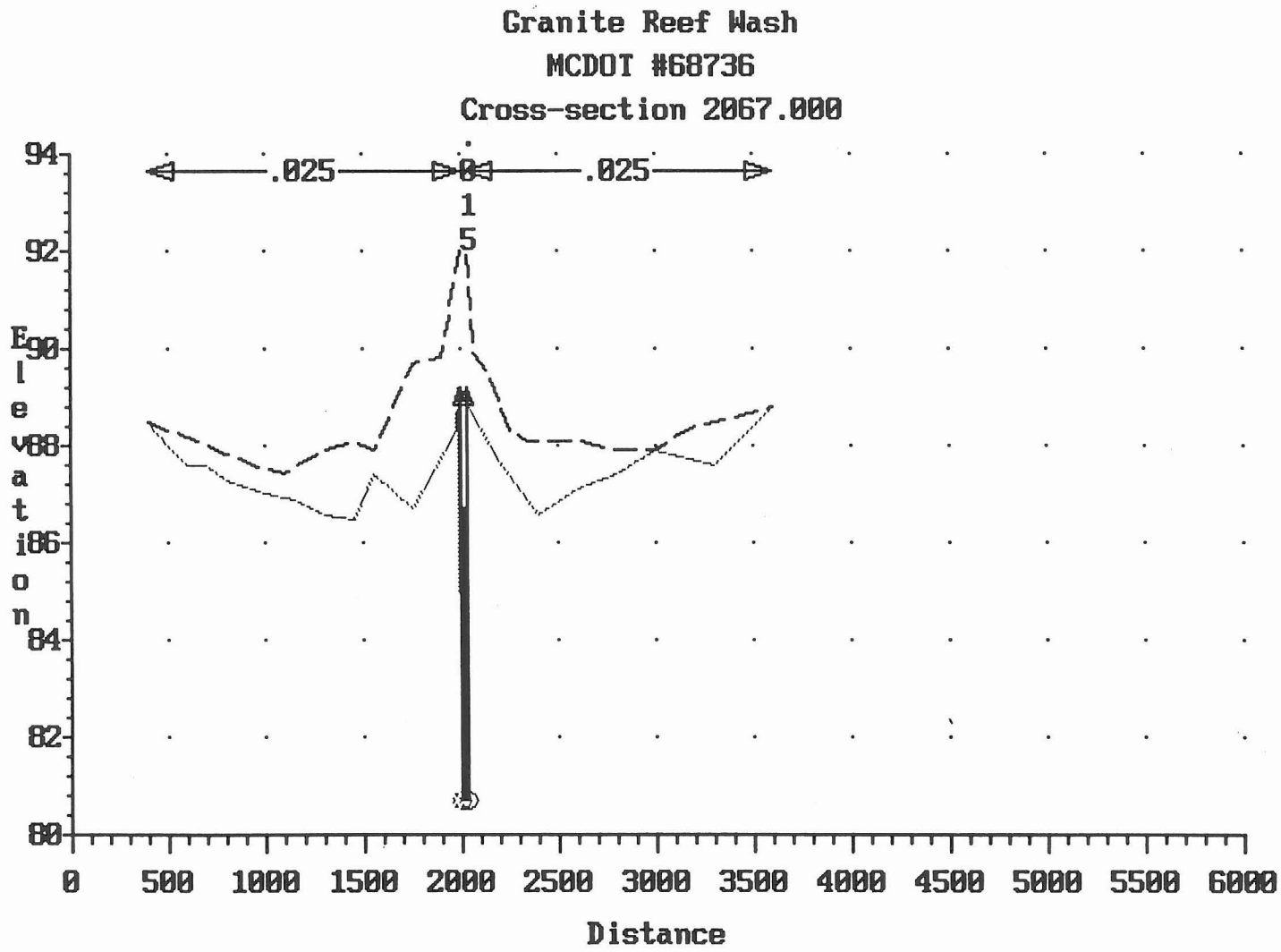
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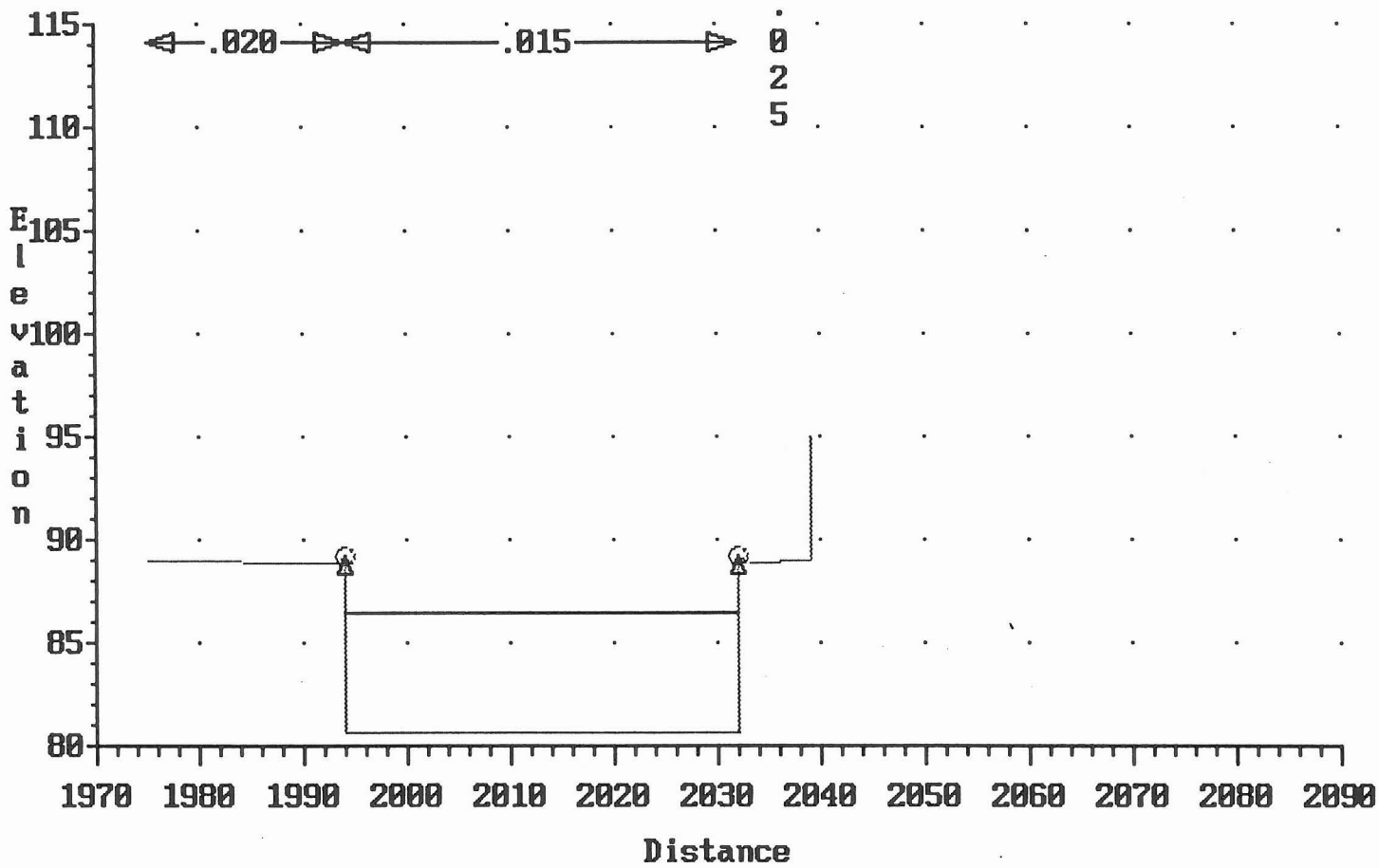
Granite Reef Wash
MCDOT #68736
Cross-section 2077.000



Granite Reef Wash
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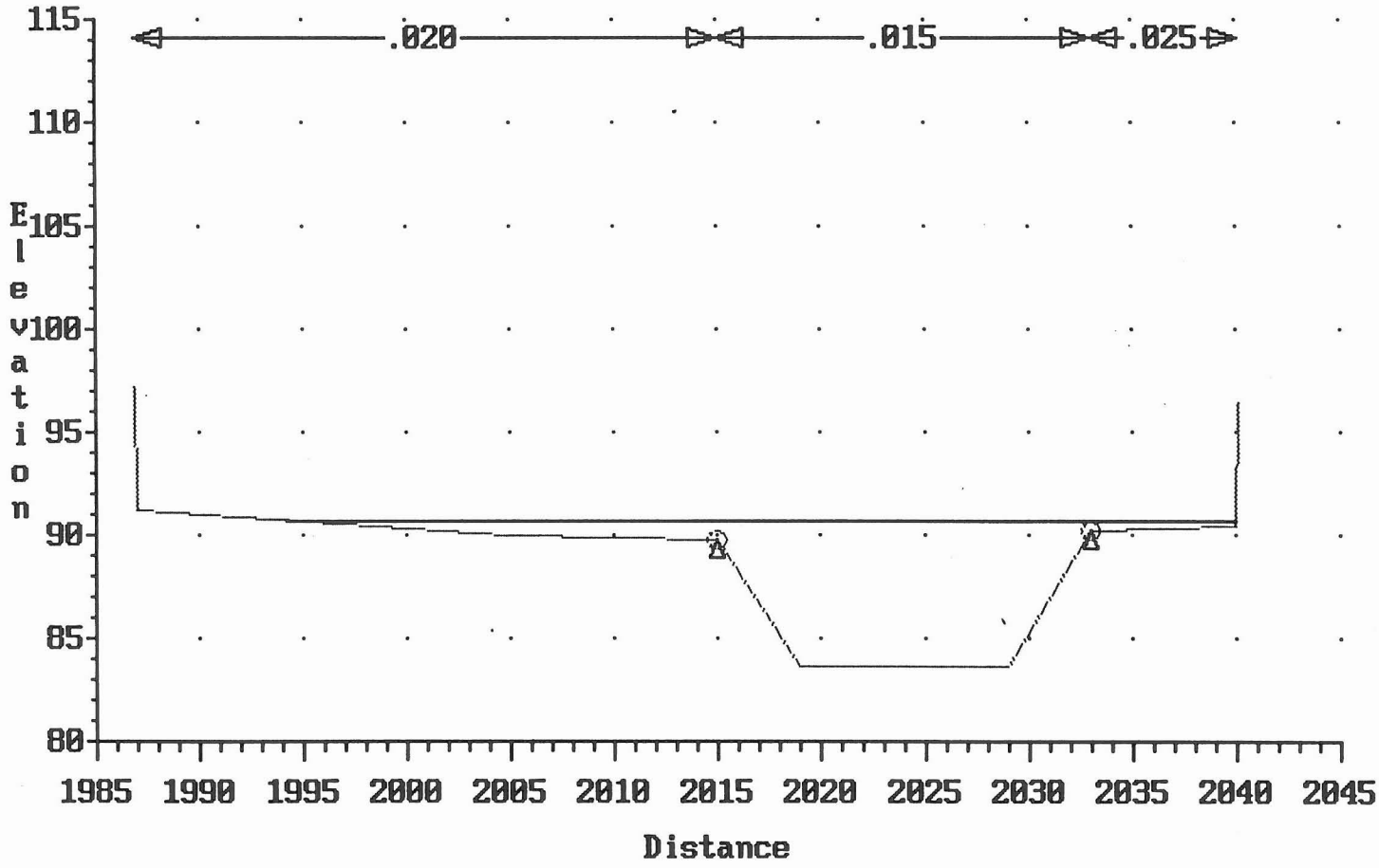

Granite Reef Wash
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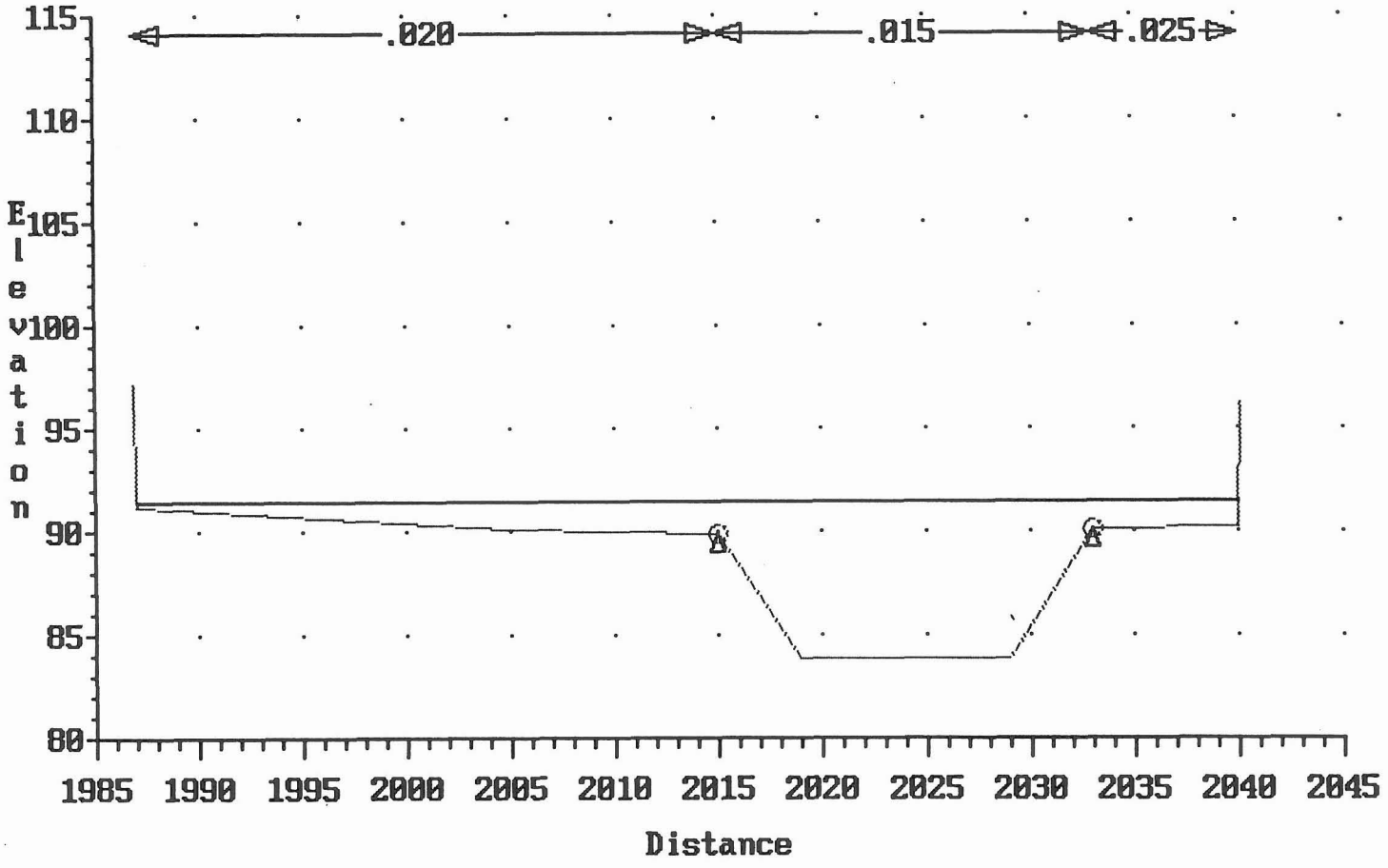

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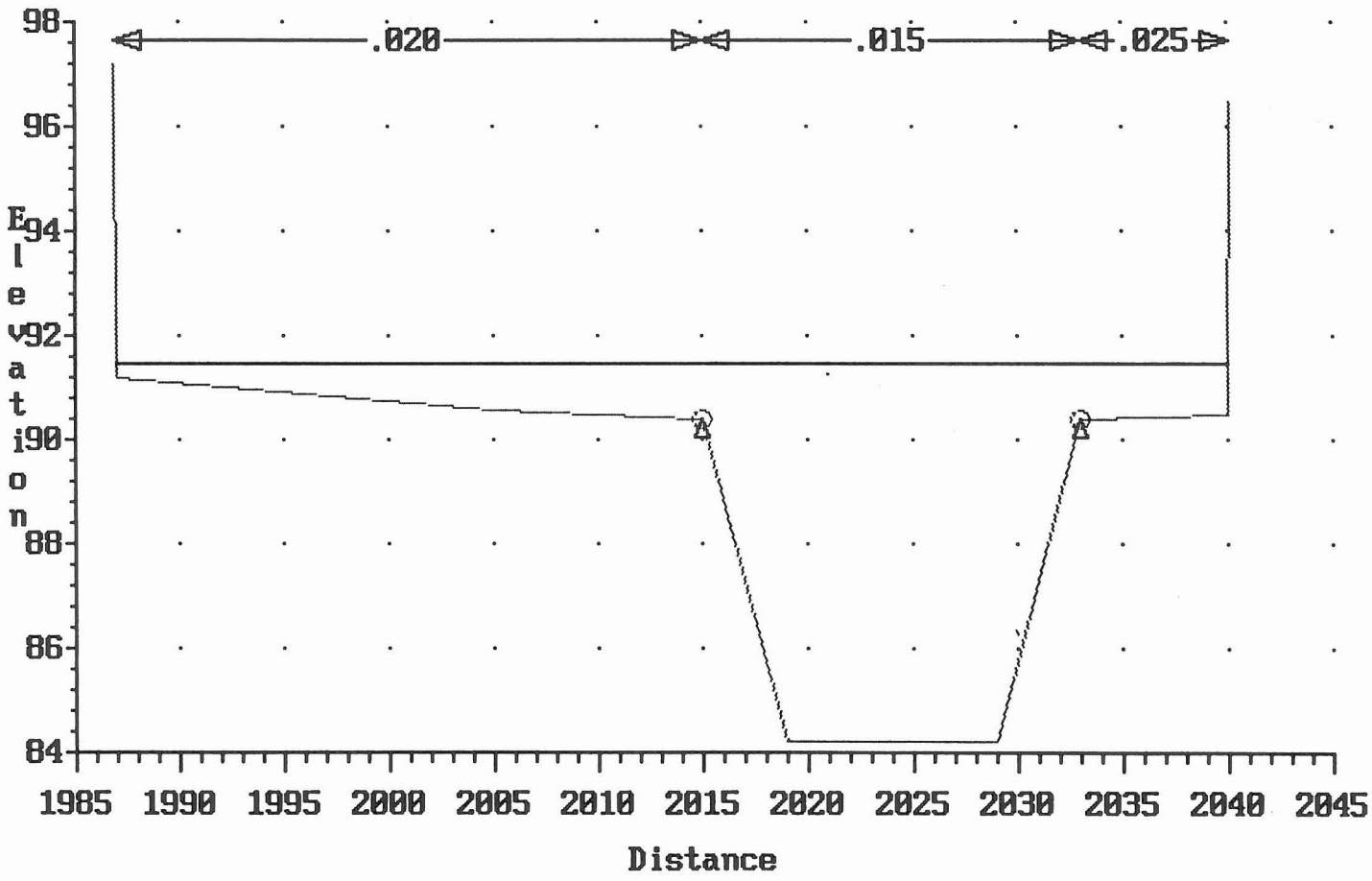

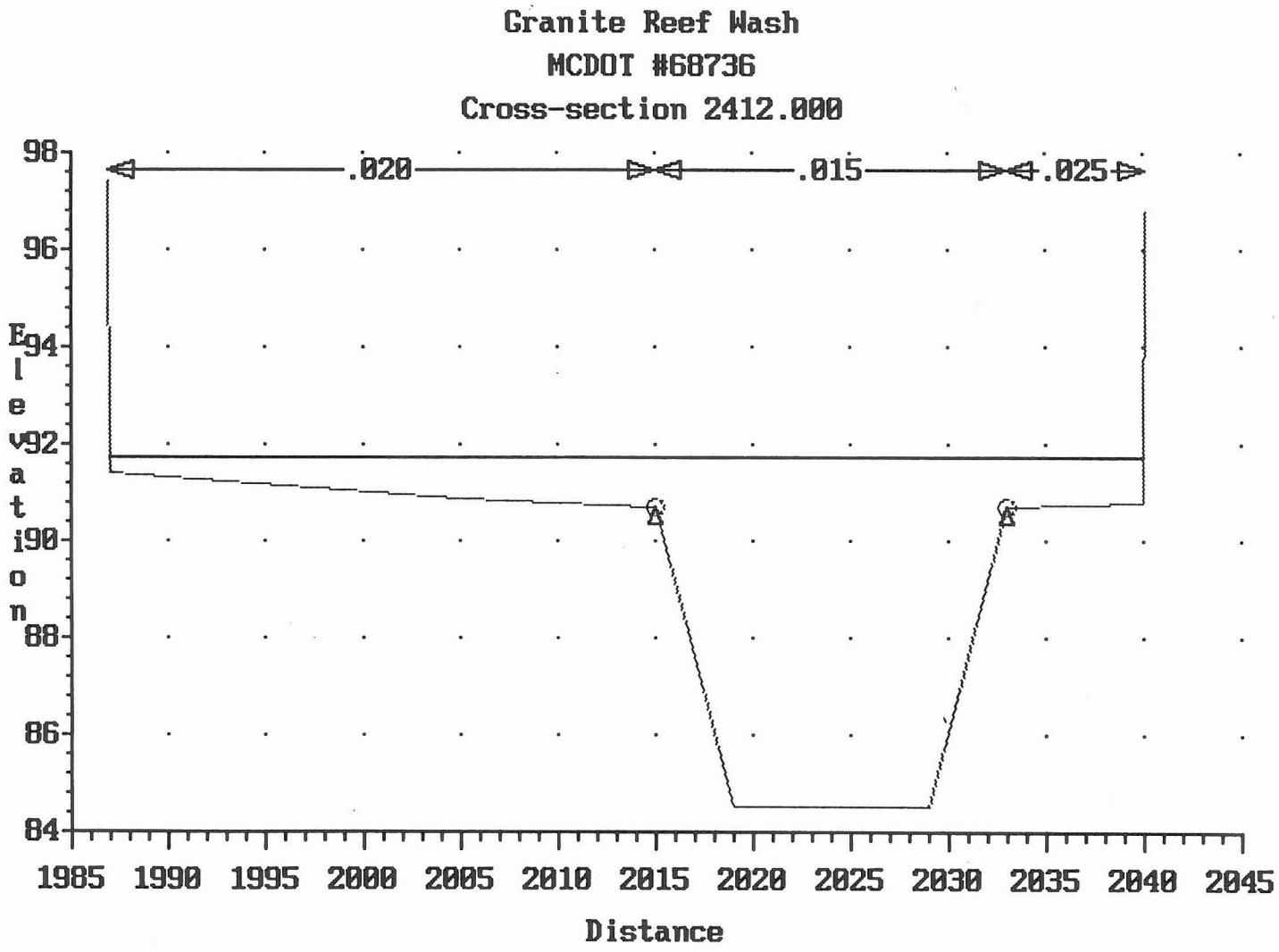
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98
96
94
92
90
88
86
84
Elevation
1985
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
Distance

Q=1360 cfs WITH NEW CHANNEL

```
*-----------------------------------*
|              S U M P O            |
|                                   |
|   Interactive Summary Printout    |
|   for MS/PC-DOS micro computers   |
|              May 1991             |
*-----------------------------------*
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NOTE - Asterisk (*) at left of profile number indicates message in summary of errors list

LL Date: 1/03/92

Summary Printout

	SECNO	Q	CWSEL	DEPTH	QCH	VCH	QLOB	VLOB	QROB	VROB	TOPWID	QWEIR	BW
*	.00	1360.00	82.47	3.07	162.17	6.88	397.14	5.98	800.69	5.92	198.72	.00	.01
*	200.00	1360.00	83.48	4.08	120.49	3.58	384.94	3.53	854.57	3.46	200.00	.00	.01
	400.00	1360.00	83.78	3.78	212.52	3.70	265.21	3.44	882.27	3.56	200.00	.00	.01
	600.00	1360.00	84.10	3.70	109.13	3.16	432.34	3.49	818.53	3.31	200.00	.00	.01
	800.00	1360.00	84.37	3.77	718.73	4.28	47.86	2.17	593.41	3.43	199.36	.00	.01
	1000.00	1360.00	84.74	4.54	642.54	5.79	23.59	1.91	693.87	3.97	200.00	.00	.01
	1100.00	1360.00	85.08	5.08	714.80	5.19	35.73	2.19	609.47	3.52	200.00	.00	.01
*	1200.00	1360.00	85.03	4.93	1360.00	6.26	.00	.00	.00	.00	52.13	.00	.01
	1300.00	1360.00	85.15	4.95	1360.00	6.23	.00	.00	.00	.00	52.26	.00	.01
	1340.00	1360.00	85.20	4.98	1360.00	6.18	.00	.00	.00	.00	52.45	.00	.01
	1400.00	1360.00	85.24	4.97	1360.00	6.17	.00	.00	.00	.00	52.49	.00	.01
	1500.00	1360.00	85.31	4.98	1360.00	6.17	.00	.00	.00	.00	52.53	.00	.01
*	1600.00	1360.00	84.87	4.48	1360.00	9.48	.00	.00	.00	.00	46.08	.00	.01
*	1700.00	1360.00	85.99	5.54	1360.00	5.43	.00	.00	.00	.00	54.24	.00	.01
	1800.00	1360.00	86.04	5.53	1360.00	5.47	.00	.00	.00	.00	53.93	.00	.01
	1900.00	1360.00	86.08	5.51	1360.00	5.47	.00	.00	.00	.00	54.11	.00	.01
	1921.00	1360.00	86.17	5.59	1360.00	5.04	.00	.00	.00	.00	54.73	.00	.01
	1931.00	1360.00	86.20	5.61	1360.00	4.91	.00	.00	.00	.00	51.97	.00	.01
*	1951.00	1360.00	85.92	5.32	1360.00	7.11	.00	.00	.00	.00	36.02	.00	.01
	2067.00	1360.00	86.45	5.75	1360.00	7.89	.00	.00	.00	.00	30.00	.00	.01
	2077.00	1360.00	86.96	6.26	1360.00	5.72	.00	.00	.00	.00	38.05	.00	.01
*	2112.00	1360.00	91.39	7.76	1248.11	10.92	94.19	3.23	17.70	2.31	53.02	.00	.01
	2212.00	1360.00	91.98	8.05	1177.38	9.77	149.38	3.43	33.24	2.60	53.04	.00	.01
*	2312.00	1360.00	91.88	7.65	1231.95	10.90	101.27	3.22	26.78	2.67	53.03	.00	.01
*	2412.00	1360.00	92.18	7.65	1227.79	10.86	105.46	3.25	26.76	2.66	53.04	.00	.01

Q = 1360 cfs WITH NEW CHANNEL

THIS RUN EXECUTED 15FEB93 10:30:06

****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

T1 Granite Reef Channel - 2000 ft. South of McKellips Rd. to 400 ft. North
T2 McKellips Rd. & 84th St. - Proj. No. 692102
T3 By: JLL Date: 1/03/92
T4 Channel Imprvmnts: Sta 12+00 to 19+45, 38' bottom, C/L 40' E. M/L = 1960
T5 Slope = .00053 ft/ft, No Bank Protection Sta. 11+00 to 13+40, Bank
T6 Protection From Sta. 13+40 to 19+45, M/L = 2000
T7 Box Culvert with Headwalls: 3 -10' x 6'
T8 Q100=1160 cfs, cross sections looking downstream
T9 The Starting W.S. Elev. @ Sta 0+00 is = to the Critical Depth of the Exist.

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0				-1			1360		

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	1		-1					6		

NC	.025	.025	.03	.1	.3					
X1	0	12	1957	1969	0	0	0			
X3	10									
GR	81.0	1900	81.6	1957	79.4	1962	81.6	1969	80.8	1971
GR	80.7	1980	82.0	2000	82.5	2016	80.5	2019	82.5	2022
GR	81.6	2024	81.1	2100						
X1	200	13	1955	1967	200	200	200			
X3	10									
GR	81.2	1900	81.8	1955	79.4	1958	82.0	1967	81.2	1970
GR	80.9	1977	82.1	2000	82.4	2012	82.6	2016	80.6	2019
GR	82.6	2022	81.9	2025	81.2	2100				
X1	400	13	1942	1964	200	200	200			
X3	10									
GR	81.5	1900	82.4	1942	80.0	1958	82.2	1964	81.7	1966
GR	81.2	1982	82.1	2000	82.9	2011	83.2	2014	80.8	2018
GR	82.8	2021	82.4	2024	81.6	2100				
X1	600	13	1958	1972	200	200	200			
X3	10									
GR	81.8	1900	82.0	1953	83.2	1958	80.4	1965	82.5	1972
GR	81.5	1982	82.3	2000	82.3	2008	83.5	2013	81.1	2018
GR	83.1	2021	82.5	2024	81.8	2100				

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:1      800       12      1927      1985       200       200       200
X3       10
GR      83.5     1900      83.6      1927      81.2      1939      80.6      1972      83.5      1985
:R      83.6     2000      83.3      2012      84.5      2016      81.7      2020      83.6      2023
:R      82.7     2027      82.4      2100

X1      1000       12      1928      1964       200       200       200
(3       10
:R      84.2     1900      84.4      1928      80.2      1942      80.2      1946      80.5      1952
GR      83.6     1964      83.6      2000      83.9      2011      84.7      2016      82.4      2020
:R      83.6     2022      83.0      2100

X1      1100       15      1925      1968       100       100       100
X3       10
:R      84.6     1900      84.4      1914      84.3      1925      80.1      1942      80.0      1950
:R      84.8     1968      83.5      1972      83.5      1990      83.7      2000      84.1      2011
GR      85.0     2016      82.7      2020      84.3      2022      83.9      2050      83.3      2100
   Begin unlined channel improvements, cst c/l = 1954, bottom width = 38',
    side slopes = 1 1/2:1, long. slope = 0.053%, n = .02

NC    0.025    0.025     0.020
X1     1200       14    1926.3    1981.9       100       100       100
X3       10
GR      84.9     1900      85.1      1915      86.2    1926.3      80.3      1935      80.1      1954
GR      80.3     1973      86.2    1981.9      86.0    1991.9      83.7      2000      84.3      2010
GR      83.0     2020      85.0      2022      84.5      2025      83.6      2100

X1     1300       14    1926.3      1982       100       100       100
X3       10
GR      85.6     1900      85.8      1915      86.3    1926.3      80.4      1935      80.2      1954
GR      80.4     1973      86.3      1982      86.1      1992      84.3      2000      86.2      2015
GR      83.5     2019      85.4      2022      84.6      2025      84.1      2100

NC    0.025    0.025     0.016
X1     1340       14    1926.3      1982        40        40        40
   End of unlined channel
   Begin gunite lined channel, n = 0.016, Side slopes = 1 1/2 : 1
X3       10
GR      85.7     1900      85.7      1915     86.27    1926.3     80.41      1935     80.22      1954
GR     80.41     1973     86.28      1982      86.1      1992      84.3      1999      84.9      2010
GR      83.6     2019      85.6      2022      84.9      2025      84.3      2100

X1     1400       13    1926.3      1982        60        60        60
X3       10
GR      85.8     1900      85.6      1915     86.31    1926.3     80.46      1935     80.27      1954
GR     80.46     1973     86.31      1982      86.1      1992      84.3      1999      84.8      2010
GR      85.8     2021      85.3      2024      84.6      2100
```

1	1500	13	1926.3	1982	100	100	100			
X3	10									
GR	86.3	1900	86.2	1915	86.36	1926.3	80.52	1935	80.33	1954
R	80.52	1973	86.36	1982	86.2	1992	84.9	1997	86.4	2015
R	86.1	2021	85.6	2024	85.0	2100				
X1	1600	13	1926	1982	100	100	100			
3	10									
_R	86.9	1900	86.9	1915	86.75	1926	80.58	1935	80.39	1954
GR	86.42	1982	86.2	1992	84.7	1998	86.7	2016	84.8	2018
⁻R	86.6	2022	86.1	2024	85.6	2100				
x1	1700	14	1925.3	1982	100	100	100			
X3	10									
R	87.3	1900	87.4	1915	87.14	1925.3	80.64	1935	80.45	1954
R	80.64	1973	86.47	1982	86.3	1992	86.1	1993	87.1	2016
GR	87.3	2022	86.6	2024	86.0	2050	86.0	2100		
(1	1800	13	1925	1983	100	100	100			
(3	10									
GR	87.2	1900	87.7	1915	87.57	1925	80.70	1935	80.51	1954
GR	80.70	1973	87.23	1983	87.1	1993	87.6	2016	85.7	2018
R	88.0	2022	87.0	2025	86.5	2100				
X1	1900	15	1924	1983	100	100	100			
(3	10									
R	87.5	1900	87.7	1915	88.0	1924	80.76	1935	80.57	1954
GR	80.76	1973	87.4	1983	87.8	1994	88.5	2000	88.3	2009
GR	88.8	2012	86.0	2019	88.0	2020	87.5	2024	86.7	2100
(1	1921	15	1926.9	1985	21	21	21			
X3	10									
GR	88.6	1912	88.8	1915	88.3	1926	89.3	1926.1	89.3	1926.9
R	88.3	1927	80.85	1934	80.58	1957	80.76	1978	87.37	1985
GR	87.2	1996	87.5	1997.3	87.6	2001	87.3	2007	88.3	2013
(1	1931	15	1934.9	1988.1	10	10	10			
(3	10									
GR	88.7	1903	88.7	1915	88.3	1934	89.27	1934.1	89.27	1934.9
GR	80.86	1935	80.59	1962	80.78	1984	88.23	1988	89.23	1988.1
R	89.23	1988.8	88.24	1988.9	87.5	1999	88.0	2000	87.4	2002
X1	1951	14	1946.0	1982.1	20	20	20			
X3	10							89.15	89.15	
GR	86.9	1894	87.1	1920	88.2	1945.1	89.15	1945.2	89.15	1946.0
GR	80.60	1946.1	80.60	1963.5	80.60	1982	89.15	1982.1	89.15	1982.9
GR	88.20	1983.0	87.7	1998	85.8	1999	86.0	2004		

```
NC    0.025     0.025     0.015
   SC RECORD DEFINES TRIPLE 10  FT. X 6 FT. BOX CULVERTS
SC    3.012       .2       3.0         0       6.0      10.0       111      11.4      80.7      80.6
   CROSS-SECTION 2055 AT UPSTREAM FACE OF CULVERT WITH EFFECTIVE FLOW OPTION
   X2.3 = 2 INDICATES CULVERT OPTION
   BT DATA IS MCKELLIPS RD. PROFILE
   HIGHER GROUND ELVS.(S. SIDE OF RD.,EAST OF BOX) THAN RD. ARE
   USED (A RD. CUT SITUATION) WHERE APPLICABLE.  THE HIGHER OF THE C/L OF
   McKELLIPS RD. OR THE TOP OF THE RELOCATED IRRIG. DITCH (WEST OF BOX) WHERE
   HIGHER THAN THE EXIST. GRADE IS USED.
   MINIMUM ELEV. THAT WATER WILL FLOW INTO THE McKELLIPS ROADWAY ON THE NORTH
   SIDE IS = 88.9, THE BANK ELEV. @ THE END OF THE NORTH WINGWALLS.
X1    2067       25     2000     2030      111      111      111
X2                        2                87.4
X3      10                                                          89.2      89.2
BT     -24      400     88.5               600     88.2               800     87.8
BT              1000     87.5              1100     87.4              1300     87.9
BT              1450     88.1              1500     88.0              1550     87.9
BT              1750     89.7              1900     89.8              2000     92.0
BT              2034     92.0              2071     89.9              2150     89.4
BT              2250     88.3              2342     88.1              2450     88.1
BT              2600     88.1              2800     87.9              3000     87.9
BT              3200     88.4              3400     88.6              3600     88.8
GR    88.5      400     88.0       500     87.6       600     87.6       700     87.3       800
GR    87.0     1000     86.9      1150     86.6      1300     86.5      1450     87.4      1550
GR    86.7     1750     88.3      1982     89.2      1994     80.7      2000     80.7      2030
GR    89.2   2030.1     88.8      2041     88.7      2060     87.7      2200     86.6      2400
GR    87.1     2600     87.4      2800     87.9      3000     87.6      3300     88.8      3600
   CROSS-SECTION 21+12 IS A FULL FLOW SECTION UPSTREAM FROM CULVERT (CHANNEL
      IMPROVED PER SCOTTSDALE'S PLANS). STA 21+12 = C.O.S. 11+00
   THE M/L RUNNING NORTH IS STA 2000 FOR THE OFFSETS TO THE CROSSSECTIONS

NC     .02     .025     .015
X1    2077       9     1994    2032.1       10       10       10
X3      10
GR    89.0    1975     88.9      1993     89.2      1994    80.70    1994.1    80.70      2032
GR    89.2  2032.1     88.9      2033     89.0      2039     95.0    2039.1

X1    2112       9     2015      2033       45       45       45
X3      10
GR    97.2  1986.9     91.2      1987     90.0      2005     89.8      2015    83.63      2019
GR   83.63    2029     90.2      2033     90.4      2040     96.4    2040.1

X1    2212       9     2015      2033      100      100      100
X3      10
GR    97.2  1986.9     91.2      1987     90.1      2005     89.9      2015    83.93      2019
GR   83.93    2029     90.1      2033     90.2      2040     96.2    2040.1
```

1	2312	9	2015	2033	100	100	100			
X3	10									
GR	97.2	1986.9	91.2	1987	90.6	2005	90.4	2015	84.23	2019
R	84.23	2029	90.4	2033	90.5	2040	96.5	2040.1		
X1	2412	9	2015	2033	100	100	100			
X3	10									
R	97.4	1986.9	91.4	1987	90.9	2005	90.7	2015	84.53	2019
GR	84.53	2029	90.7	2033	90.8	2040	96.8	2040.1		

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

*PROF 1

CCHV= .100 CEHV= .300
'SECNO .000
!096 WSEL NOT GIVEN, AVG OF MAX, MIN USED

3265 DIVIDED FLOW

3280 CROSS SECTION .00 EXTENDED 1.47 FEET

3720 CRITICAL DEPTH ASSUMED

.000	3.07	82.47	82.47	.00	83.04	.57	.00	.00	81.60
1360.0	397.1	162.2	800.7	66.4	23.6	135.2	.0	.0	81.60
.00	5.98	6.88	5.92	.025	.030	.025	.000	79.40	1900.00
.008527	0.	0.	0.	0	19	0	.00	198.72	2100.00

*SECNO 200.000
3280 CROSS SECTION 200.00 EXTENDED 2.28 FEET

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.39

200.000	4.08	83.48	.00	.00	83.67	.19	.59	.04	81.80
1360.0	384.9	120.5	854.6	109.0	33.7	246.8	1.4	.9	82.00
.02	3.53	3.58	3.46	.025	.030	.025	.000	79.40	1900.00
.001497	200.	200.	200.	3	0	0	.00	200.00	2100.00

*SECNO 400.000
3280 CROSS SECTION 400.00 EXTENDED 2.28 FEET

400.000	3.78	83.78	.00	.00	83.98	.20	.31	.00	82.40
1360.0	265.2	212.5	882.3	77.0	57.4	247.9	3.2	1.8	82.20
.03	3.44	3.70	3.56	.025	.030	.025	.000	80.00	1900.00
.001606	200.	200.	200.	2	0	0	.00	200.00	2100.00

*SECNO 600.000
3280 CROSS SECTION 600.00 EXTENDED 2.29 FEET

600.000	3.70	84.10	.00	.00	84.27	.17	.29	.00	83.20
1360.0	432.3	109.1	818.5	123.8	34.6	247.4	5.0	2.8	82.50
.05	3.49	3.16	3.31	.025	.030	.025	.000	80.40	1900.00
.001315	200.	200.	200.	0	0	0	.00	200.00	2100.00

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

*SECNO 800.000

3265 DIVIDED FLOW

3280 CROSS SECTION 800.00 EXTENDED 1.97 FEET

800.000	3.77	84.37	.00	.00	84.60	.23	.31	.02	83.60
1360.0	47.9	718.7	593.4	22.0	168.1	172.8	6.8	3.7	83.50
.06	2.17	4.28	3.43	.025	.030	.025	.000	80.60	1900.00
.001827	200.	200.	200.	2	0	0	.00	199.36	2100.00

*SECNO 1000.000

3280 CROSS SECTION 1000.00 EXTENDED 1.74 FEET

1000.000	4.54	84.74	.00	.00	85.11	.37	.47	.04	84.40
1360.0	23.6	642.5	693.9	12.3	111.0	174.8	8.3	4.6	83.60
.07	1.91	5.79	3.97	.025	.030	.025	.000	80.20	1900.00
.003161	200.	200.	200.	2	0	0	.00	200.00	2100.00

*SECNO 1100.000

3280 CROSS SECTION 1100.00 EXTENDED 1.79 FEET

1100.000	5.08	85.08	.00	.00	85.39	.31	.27	.01	84.30
1360.0	35.7	714.8	609.5	16.3	137.8	173.1	9.0	5.0	84.80
.08	2.19	5.19	3.52	.025	.030	.025	.000	80.00	1900.00
.002406	100.	100.	100.	2	0	0	.00	200.00	2100.00

*SECNO 1200.000

3280 CROSS SECTION 1200.00 EXTENDED 1.44 FEET

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.45

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 86.20 ELREA= 86.20

1200.000	4.93	85.03	.00	.00	85.64	.61	.16	.09	86.20
1360.0	.0	1360.0	.0	.0	217.3	.0	9.6	5.3	86.20
.08	.00	6.26	.00	.000	.020	.000	.000	80.10	1928.02
.001137	100.	100.	100.	2	0	0	.00	52.13	1980.15

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

*SECNO 1300.000
3280 CROSS SECTION 1300.00 EXTENDED 1.05 FEET

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 86.30 ELREA= 86.30

1300.000	4.95	85.15	.00	.00	85.76	.60	.11	.00	86.30
1360.0	.0	1360.0	.0	.0	218.4	.0	10.1	5.5	86.30
.09	.00	6.23	.00	.000	.020	.000	.000	80.20	1927.99
.001122	100.	100.	100.	2	0	0	.00	52.26	1980.25

*SECNO 1340.000
280 CROSS SECTION 1340.00 EXTENDED .90 FEET

495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 86.27 ELREA= 86.28

1340.000	4.98	85.20	.00	.00	85.79	.59	.03	.00	86.27
1360.0	.0	1360.0	.0	.0	220.2	.0	10.3	5.5	86.28
.09	.00	6.18	.00	.000	.016	.000	.000	80.22	1927.89
.000701	40.	40.	40.	0	0	0	.00	52.45	1980.34

SECNO 1400.000
280 CROSS SECTION 1400.00 EXTENDED .65 FEET

495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 86.31 ELREA= 86.31

1400.000	4.97	85.24	.00	.00	85.83	.59	.04	.00	86.31
1360.0	.0	1360.0	.0	.0	220.3	.0	10.6	5.6	86.31
.09	.00	6.17	.00	.000	.016	.000	.000	80.27	1927.88
.000701	60.	60.	60.	1	0	0	.00	52.49	1980.37

SECNO 1500.000
3280 CROSS SECTION 1500.00 EXTENDED .31 FEET

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 86.36 ELREA= 86.36

1500.000	4.98	85.31	.00	.00	85.90	.59	.07	.00	86.36
1360.0	.0	1360.0	.0	.0	220.5	.0	11.1	5.7	86.36
.10	.00	6.17	.00	.000	.016	.000	.000	80.33	1927.86
.000699	100.	100.	100.	0	0	0	.00	52.53	1980.39

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

*SECNO 1600.000

301 HV CHANGED MORE THAN HVINS

302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .54

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 86.75 ELREA= 86.42

1600.000	4.48	84.87	.00	.00	86.26	1.39	.12	.24	86.75
1360.0	.0	1360.0	.0	.0	143.5	.0	11.5	5.8	86.42
.10	.00	9.48	.00	.000	.016	.000	.000	80.39	1928.74
.002410	100.	100.	100.	3	0	0	.00	46.08	1974.82

*SECNO 1700.000

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.24

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 87.14 ELREA= 86.47

1700.000	5.54	85.99	.00	.00	86.45	.46	.09	.09	87.14
1360.0	.0	1360.0	.0	.0	250.2	.0	12.0	5.9	86.47
.11	.00	5.43	.00	.000	.016	.000	.000	80.45	1927.02
.000481	100.	100.	100.	3	0	0	.00	54.24	1981.26

*SECNO 1800.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 87.57 ELREA= 87.23

1800.000	5.53	86.04	.00	.00	86.50	.46	.05	.00	87.57
1360.0	.0	1360.0	.0	.0	248.8	.0	12.6	6.0	87.23
.11	.00	5.47	.00	.000	.016	.000	.000	80.51	1927.24
.000488	100.	100.	100.	2	0	0	.00	53.93	1981.17

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

*SECNO 1900.000

495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 88.00 ELREA= 87.40

1900.000	5.51	86.08	.00	.00	86.55	.46	.05	.00	88.00
1360.0	.0	1360.0	.0	.0	248.8	.0	13.1	6.2	87.40
.12	.00	5.47	.00	.000	.016	.000	.000	80.57	1926.91
.000489	100.	100.	100.	0	0	0	.00	54.11	1981.02

*SECNO 1921.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 89.30 ELREA= 87.37

1921.000	5.59	86.17	.00	.00	86.56	.39	.01	.01	89.30
1360.0	.0	1360.0	.0	.0	269.7	.0	13.3	6.2	87.37
.12	.00	5.04	.00	.000	.016	.000	.000	80.58	1929.00
.000390	21.	21.	21.	2	0	0	.00	54.73	1983.73

*SECNO 1931.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 89.27 ELREA= 89.23

1931.000	5.61	86.20	.00	.00	86.57	.37	.00	.00	89.27
1360.0	.0	1360.0	.0	.0	277.0	.0	13.3	6.2	89.23
.12	.00	4.91	.00	.000	.016	.000	.000	80.59	1934.94
.000367	10.	10.	10.	2	0	0	.00	51.97	1986.91

*SECNO 1951.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .64

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 89.15 ELREA= 89.15

1951.000	5.32	85.92	.00	.00	86.70	.78	.01	.12	89.15
1360.0	.0	1360.0	.0	.0	191.4	.0	13.4	6.2	89.15
.12	.00	7.11	.00	.000	.016	.000	.000	80.60	1946.04
.000888	20.	20.	20.	2	0	0	.00	36.02	1982.06

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

PECIAL CULVERT

SC	CUNO	CUNV	ENTLC	COFQ	RDLEN	RISE	SPAN	CULVLN	CHRT	SCL	ELCHU	ELCHD
	3	.012	.20	3.00	.00	6.00	10.00	111.00	11	4	80.70	80.60

_HART 11 - BOX CULVERT; SKEWED HEADWALL; CHAMFERED OR BEVELED INLET EDGES
SCALE 4 - HEADWALL SKEWED 10 TO 45 DEGREES; INLET EDGES BEVELED

140, NORMAL DEPTH EXCEEDS CULVERT HEIGHT
-SECNO 2067.000
5140, NORMAL DEPTH EXCEEDS CULVERT HEIGHT
140, NORMAL DEPTH EXCEEDS CULVERT HEIGHT
140, NORMAL DEPTH EXCEEDS CULVERT HEIGHT
5140, NORMAL DEPTH EXCEEDS CULVERT HEIGHT

PECIAL CULVERT OUTLET CONTROL
GIC = 87.034 EGOC = 87.412 PCWSE= 85.920 ELTRD= 87.400

5140, NORMAL DEPTH EXCEEDS CULVERT HEIGHT
140, NORMAL DEPTH EXCEEDS CULVERT HEIGHT
140, NORMAL DEPTH EXCEEDS CULVERT HEIGHT
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5140, NORMAL DEPTH EXCEEDS CULVERT HEIGHT
5140, NORMAL DEPTH EXCEEDS CULVERT HEIGHT
PECIAL CULVERT

EGIC	EGOC	H4	QWEIR	QCULV	VCH	ACULV	ELTRD	WEIRLN
87.03	87.41	.71	0.	1360.	7.886	180.0	87.40	0.

495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 89.20 ELREA= 89.20

2067.000	5.75	86.45	.00	.00	87.41	.97	.71	.00	80.70
1360.0	.0	1360.0	.0	.0	172.5	.0	13.9	6.3	80.70
.12	.00	7.89	.00	.000	.015	.000	.000	80.70	2000.00
.000615	111.	111.	111.	3	0	0	.00	30.00	2030.00

*SECNO 2077.000

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


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       89.20 ELREA=       89.20

  2077.000     6.26     86.96       .00       .00     87.46       .51       .01       .05     89.20
    1360.0       .0    1360.0       .0       .0     237.9       .0      13.9       6.3     89.20
       .12      .00      5.72       .00      .000      .015      .000      .000     80.70   1994.03
   .000421      10.       10.       10.         2         0         0       .00     38.05   2032.07


 SECNO 2112.000

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
  2112.000     7.76     91.39     91.39       .00     93.11      1.71       .03       .36     89.80
    1360.0     94.2    1248.1      17.7      29.2     114.3       7.7      14.1       6.4     90.20
       .12     3.23     10.92      2.31      .020      .015      .025      .000     83.63   1987.00
   .001607      45.       45.       45.        20        12         0       .00     53.02   2040.02


*SECNO 2212.000
  2212.000     8.05     91.98       .00       .00     93.28      1.31       .14       .04     89.90
    1360.0    149.4    1177.4      33.2      43.5     120.5      12.8      14.5       6.5     90.10
       .13     3.43      9.77      2.60      .020      .015      .025      .000     83.93   1986.99
   .001166      100.      100.      100.         5         0         0       .00     53.04   2040.03


*SECNO 2312.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
  2312.000     7.65     91.88     91.88       .00     93.57      1.68       .14       .11     90.40
    1360.0    101.3    1231.9      26.8      31.5     113.0      10.0      14.9       6.6     90.40
       .13     3.22     10.90      2.67      .020      .015      .025      .000     84.23   1986.99
   .001593      100.      100.      100.         3        11         0       .00     53.03   2040.02


*SECNO 2412.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
  2412.000     7.65     92.18     92.18       .00     93.85      1.67       .16       .00     90.70
    1360.0    105.5    1227.8      26.8      32.5     113.1      10.1      15.3       6.7     90.70
       .13     3.25     10.86      2.66      .020      .015      .025      .000     84.53   1986.99
   .001579      100.      100.      100.        20         5         0       .00     53.04   2040.02
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THIS RUN EXECUTED 15FEB93 10:30:08

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HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

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

LL Date: 1/03/92

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	.000	.00	.00	.00	79.40	1360.00	82.47	82.47	83.04	85.27	6.88	225.21	147.28
*	200.000	200.00	.00	.00	79.40	1360.00	83.48	.00	83.67	14.97	3.58	389.48	351.45
	400.000	200.00	.00	.00	80.00	1360.00	83.78	.00	83.98	16.06	3.70	382.33	339.36
	600.000	200.00	.00	.00	80.40	1360.00	84.10	.00	84.27	13.15	3.16	405.80	375.03
	800.000	200.00	.00	.00	80.60	1360.00	84.37	.00	84.60	18.27	4.28	362.89	318.17
	1000.000	200.00	.00	.00	80.20	1360.00	84.74	.00	85.11	31.61	5.79	298.12	241.89
	1100.000	100.00	.00	.00	80.00	1360.00	85.08	.00	85.39	24.06	5.19	327.17	277.26
*	1200.000	100.00	.00	.00	80.10	1360.00	85.03	.00	85.64	11.37	6.26	217.27	403.37
	1300.000	100.00	.00	.00	80.20	1360.00	85.15	.00	85.76	11.22	6.23	218.36	406.09
	1340.000	40.00	.00	.00	80.22	1360.00	85.20	.00	85.79	7.01	6.18	220.20	513.56
	1400.000	60.00	.00	.00	80.27	1360.00	85.24	.00	85.83	7.01	6.17	220.31	513.78
	1500.000	100.00	.00	.00	80.33	1360.00	85.31	.00	85.90	6.99	6.17	220.54	514.48
*	1600.000	100.00	.00	.00	80.39	1360.00	84.87	.00	86.26	24.10	9.48	143.51	277.03
*	1700.000	100.00	.00	.00	80.45	1360.00	85.99	.00	86.45	4.81	5.43	250.24	619.95
	1800.000	100.00	.00	.00	80.51	1360.00	86.04	.00	86.50	4.88	5.47	248.77	615.80
	1900.000	100.00	.00	.00	80.57	1360.00	86.08	.00	86.55	4.89	5.47	248.79	614.91
	1921.000	21.00	.00	.00	80.58	1360.00	86.17	.00	86.56	3.90	5.04	269.75	688.75

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	1931.000	10.00	.00	.00	80.59	1360.00	86.20	.00	86.57	3.67	4.91	277.00	709.48
	1951.000	20.00	.00	.00	80.60	1360.00	85.92	.00	86.70	8.88	7.11	191.41	456.31
	2067.000	111.00	87.40	.00	80.70	1360.00	86.45	.00	87.41	6.15	7.89	172.46	548.33
	2077.000	10.00	.00	.00	80.70	1360.00	86.96	.00	87.46	4.21	5.72	237.85	662.74
*	2112.000	45.00	.00	.00	83.63	1360.00	91.39	91.39	93.11	16.07	10.92	151.12	339.26
	2212.000	100.00	.00	.00	83.93	1360.00	91.98	.00	93.28	11.66	9.77	176.81	398.33
*	2312.000	100.00	.00	.00	84.23	1360.00	91.88	91.88	93.57	15.93	10.90	154.57	340.77
*	2412.000	100.00	.00	.00	84.53	1360.00	92.18	92.18	93.85	15.79	10.86	155.64	342.21

.L Date: 1/03/92

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	.000	1360.00	82.47	.00	.00	.00	198.72	.00
*	200.000	1360.00	83.48	.00	1.01	.00	200.00	200.00
	400.000	1360.00	83.78	.00	.30	.00	200.00	200.00
	600.000	1360.00	84.10	.00	.31	.00	200.00	200.00
	800.000	1360.00	84.37	.00	.27	.00	199.36	200.00
	1000.000	1360.00	84.74	.00	.37	.00	200.00	200.00
	1100.000	1360.00	85.08	.00	.34	.00	200.00	100.00
*	1200.000	1360.00	85.03	.00	-.05	.00	52.13	100.00
	1300.000	1360.00	85.15	.00	.12	.00	52.26	100.00
	1340.000	1360.00	85.20	.00	.05	.00	52.45	40.00
	1400.000	1360.00	85.24	.00	.04	.00	52.49	60.00
	1500.000	1360.00	85.31	.00	.07	.00	52.53	100.00
*	1600.000	1360.00	84.87	.00	-.44	.00	46.08	100.00
*	1700.000	1360.00	85.99	.00	1.12	.00	54.24	100.00
	1800.000	1360.00	86.04	.00	.04	.00	53.93	100.00
	1900.000	1360.00	86.08	.00	.05	.00	54.11	100.00
	1921.000	1360.00	86.17	.00	.09	.00	54.73	21.00
	1931.000	1360.00	86.20	.00	.03	.00	51.97	10.00
*	1951.000	1360.00	85.92	.00	-.28	.00	36.02	20.00
	2067.000	1360.00	86.45	.00	.53	.00	30.00	111.00
	2077.000	1360.00	86.96	.00	.51	.00	38.05	10.00
*	2112.000	1360.00	91.39	.00	4.44	.00	53.02	45.00
	2212.000	1360.00	91.98	.00	.58	.00	53.04	100.00
*	2312.000	1360.00	91.88	.00	-.09	.00	53.03	100.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	2412.000	1360.00	92.18	.00	.30	.00	53.04	100.00

SUMMARY OF ERRORS AND SPECIAL NOTES

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 AUTION SECNO=       .000  PROFILE=  1  CRITICAL DEPTH ASSUMED

'ARNING SECNO=    200.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=   1200.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

IARNING SECNO=   1600.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=   1700.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

IARNING SECNO=   1951.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=   2112.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=   2112.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=   2112.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=   2312.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=   2312.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=   2412.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=   2412.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=   2412.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
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APPENDIX "D"

HY-8 Computation Runs

@ STA. 15+07 LT.

CURRENT DATE: 04-17-1992
CURRENT TIME: 08:23:31

FILE DATE: 12-11-1991
FILE NAME: WTP100-1

FHWA CULVERT ANALYSIS
HY-8, VERSION 3.2

CULV	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	81.53	81.40	96.00	3 RCP	3.00	3.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: WTP100-1 DATE: 12-11-1991

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
86.15	0	0	0	0	0	0	0	0	1
86.16	13	13	0	0	0	0	0	0	1
86.20	26	26	0	0	0	0	0	0	1
86.26	39	39	0	0	0	0	0	0	1
86.34	51	51	0	0	0	0	0	0	1
86.45	64	64	0	0	0	0	0	0	1
86.58	77	77	0	0	0	0	0	0	1
86.73	90	90	0	0	0	0	0	0	1
86.91	103	103	0	0	0	0	0	0	1
87.12	116	116	0	0	0	0	0	0	1
87.29	129	126	0	0	0	0	0	2	26
87.24	123	123	0	0	0	0	0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: WTP100-1 DATE: 12-11-1991

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
86.15	0.00	0	0	0.00
86.16	0.00	13	0	0.00
86.20	0.00	26	0	0.00
86.26	0.00	39	0	0.00
86.34	0.00	51	0	0.00
86.45	0.00	64	0	0.00
86.58	0.00	77	0	0.00
86.73	0.00	90	0	0.00
86.91	0.00	103	0	0.00
87.12	0.00	116	0	0.00
87.29	-0.00	129	1	0.92

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 04-17-1992
CURRENT TIME: 08:23:31

FILE DATE: 12-11-1991
FILE NAME: WTP100-1

CULVERT # 1

PERFORMANCE CURVE FOR 3 BARREL(S)

Q (cfs)	HWE (ft)	TWE (ft)	ICH (ft)	OCH (ft)	FLOW TYPE	CCE (ft)	FCE (ft)	TCE (ft)	VO (fps)
0	86.15	86.15	0.00	4.62	0-NF	0.00	81.53	0.00	0.00
13	86.16	86.15	0.89	4.63	4-FF	0.00	0.00	0.00	0.61
26	86.20	86.15	1.27	4.67	4-FF	0.00	0.00	0.00	1.21
39	86.26	86.15	1.60	4.73	4-FF	0.00	0.00	0.00	1.82
51	86.34	86.15	1.91	4.81	4-FF	0.00	0.00	0.00	2.43
64	86.45	86.15	2.19	4.92	4-FF	0.00	0.00	0.00	3.03
77	86.58	86.15	2.45	5.05	4-FF	0.00	0.00	0.00	3.64
90	86.73	86.15	2.70	5.20	4-FF	0.00	0.00	0.00	4.25
103	86.91	86.15	2.95	5.38	4-FF	0.00	0.00	0.00	4.85
116	87.12	86.15	3.21	5.59	4-FF	0.00	0.00	0.00	5.46
126	87.29	86.15	3.42	5.76	4-FF	0.00	0.00	0.00	5.93

El. inlet face invert 81.53 ft El. outlet invert 81.40 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	1626.00
INLET ELEVATION (FT)	81.53
OUTLET STATION (FT)	1530.00
OUTLET ELEVATION (FT)	81.40
NUMBER OF BARRELS	3.00
SLOPE (V-FT/H-FT)	0.0014
CULVERT LENGTH ALONG SLOPE (FT)	96.00

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	3.00 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 04-17-1992
CURRENT TIME: 08:23:31

FILE DATE: 12-11-1991
FILE NAME: WTP100-1

TAILWATER

CONSTANT WATER SURFACE ELEVATION
86.15

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE PAVED
EMBANKMENT TOP WIDTH (FT) 68.00
***** USER DEFINED ROADWAY PROFILE

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	87.59
2	50.00	87.54
3	100.00	87.49
4	150.00	87.39
5	200.00	87.29
6	250.00	87.24
7	300.00	87.27
8	350.00	87.39
9	400.00	87.59
10	450.00	87.83

@ STA. 15+30 RT.

CURRENT DATE: 04-17-1992
CURRENT TIME: 08:25:16

FILE DATE: 03-11-1992
FILE NAME: 1530W2

FHWA CULVERT ANALYSIS
HY-8, VERSION 3.2

CULV	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	81.40	80.90	410.00	1 RCB	8.00	3.00	.013	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: 1530W2 DATE: 03-11-1992

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
84.51	0	0	0	0	0	0	0	0	1
84.53	14	14	0	0	0	0	0	0	1
84.58	27	27	0	0	0	0	0	0	1
84.66	41	41	0	0	0	0	0	0	1
84.77	54	54	0	0	0	0	0	0	1
84.92	68	68	0	0	0	0	0	0	1
85.10	82	82	0	0	0	0	0	0	1
85.32	95	95	0	0	0	0	0	0	1
85.56	109	109	0	0	0	0	0	0	1
85.84	123	123	0	0	0	0	0	0	1
86.15	136	136	0	0	0	0	0	0	1
86.92	165	165	0	0	0	0	0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: 1530W2 DATE: 03-11-1992

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
84.51	0.00	0	0	0.00
84.53	0.00	14	0	0.00
84.58	0.00	27	0	0.00
84.66	0.00	41	0	0.00
84.77	0.00	54	0	0.00
84.92	0.00	68	0	0.00
85.10	0.00	82	0	0.00
85.32	0.00	95	0	0.00
85.56	0.00	109	0	0.00
85.84	0.00	123	0	0.00
86.15	0.00	136	0	0.00

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 04-17-1992
CURRENT TIME: 08:25:16

FILE DATE: 03-11-1992
FILE NAME: 1530W2

CULVERT # 1

PERFORMANCE CURVE FOR 1 BARREL(S)

Q (cfs)	HWE (ft)	TWE (ft)	ICH (ft)	OCH (ft)	FLOW TYPE	CCE (ft)	FCE (ft)	TCE (ft)	VO (fps)
0	84.51	84.51	0.00	3.11	0-NF	0.00	81.40	0.00	0.00
14	84.53	84.51	0.78	3.13	4-FF	0.00	0.00	0.00	0.57
27	84.58	84.51	1.22	3.18	4-FF	0.00	0.00	0.00	1.13
41	84.66	84.51	1.60	3.26	4-FF	0.00	0.00	0.00	1.70
54	84.77	84.51	1.92	3.37	4-FF	0.00	0.00	0.00	2.27
68	84.92	84.51	2.22	3.52	4-FF	0.00	0.00	0.00	2.84
82	85.10	84.51	2.50	3.70	4-FF	0.00	0.00	0.00	3.40
95	85.32	84.51	2.77	3.92	4-FF	0.00	0.00	0.00	3.97
109	85.56	84.51	3.04	4.16	4-FF	0.00	0.00	0.00	4.54
123	85.84	84.51	3.32	4.44	4-FF	0.00	0.00	0.00	5.11
136	86.15	84.51	3.60	4.75	4-FF	0.00	0.00	0.00	5.67

El. inlet face invert 81.40 ft El. outlet invert 80.90 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	1530.00
INLET ELEVATION (FT)	81.40
OUTLET STATION (FT)	1940.00
OUTLET ELEVATION (FT)	80.90
NUMBER OF BARRELS	1.00
SLOPE (V-FT/H-FT)	0.0012
CULVERT LENGTH ALONG SLOPE (FT)	410.00

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	BOX
BARREL SPAN	8.00 FT
BARREL RISE	3.00 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.013
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE (90&15 DEG. FLARE)
INLET DEPRESSION	NONE

CURRENT DATE: 04-17-1992
CURRENT TIME: 08:25:16

FILE DATE: 03-11-1992
FILE NAME: 1530W2

TAILWATER

CONSTANT WATER SURFACE ELEVATION
84.51

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE GRAVEL
EMBANKMENT TOP WIDTH (FT) 10.00
***** USER DEFINED ROADWAY PROFILE

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	89.00
2	34.00	88.32
3	37.50	88.90
4	39.20	88.70
5	60.00	86.92

@ STA. 19+40 RT.

CURRENT DATE: 04-17-1992
CURRENT TIME: 08:27:00

FILE DATE: 03-11-1992
FILE NAME: 1940W

FHWA CULVERT ANALYSIS
HY-8, VERSION 3.2

CULV	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	80.90	80.80	72.00	1 RCB	8.00	3.00	.013	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: 1940W DATE: 03-11-1992

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
83.07	0	0	0	0	0	0	0	0	1
83.09	14	14	0	0	0	0	0	0	1
83.14	27	27	0	0	0	0	0	0	1
83.22	41	41	0	0	0	0	0	0	1
83.33	55	55	0	0	0	0	0	0	1
83.46	69	69	0	0	0	0	0	0	1
83.63	82	82	0	0	0	0	0	0	1
83.82	96	96	0	0	0	0	0	0	1
83.99	110	110	0	0	0	0	0	0	1
84.24	123	123	0	0	0	0	0	0	1
84.51	137	137	0	0	0	0	0	0	1
86.92	229	229	0	0	0	0	0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: 1940W DATE: 03-11-1992

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
83.07	0.00	0	0	0.00
83.09	0.00	14	0	0.00
83.14	0.00	27	0	0.00
83.22	0.00	41	0	0.00
83.33	0.00	55	0	0.00
83.46	0.00	69	0	0.00
83.63	0.00	82	0	0.00
83.82	0.00	96	0	0.00
83.99	0.00	110	0	0.00
84.24	0.00	123	0	0.00
84.51	0.00	137	0	0.00

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 04-17-1992
CURRENT TIME: 08:27:00

FILE DATE: 03-11-1992
FILE NAME: 1940W

CULVERT # 1

PERFORMANCE CURVE FOR 1 BARREL(S)

Q (cfs)	HWE (ft)	TWE (ft)	ICH (ft)	OCH (ft)	FLOW TYPE	CCE (ft)	FCE (ft)	TCE (ft)	VO (fps)
0	83.07	83.07	0.00	2.17	0-NF	0.00	80.90	0.00	0.00
14	83.09	83.07	0.78	2.19	3-M1	0.00	0.00	0.00	0.75
27	83.14	83.07	1.23	2.24	3-M1	0.00	0.00	0.00	1.51
41	83.22	83.07	1.60	2.32	3-M1	0.00	0.00	0.00	2.26
55	83.33	83.07	1.93	2.43	3-M1	0.00	0.00	0.00	3.02
69	83.46	83.07	2.23	2.56	3-M1	0.00	0.00	0.00	3.77
82	83.63	83.07	2.51	2.73	3-M1	0.00	0.00	0.00	4.53
96	83.82	83.07	2.79	2.92	3-M1	0.00	0.00	0.00	5.28
110	83.99	83.07	3.06	3.09	3-M2	0.00	0.00	0.00	6.04
123	84.24	83.07	3.33	3.34	3-M2	0.00	0.00	0.00	6.79
137	84.51	83.07	3.61	3.59	3-M2	0.00	0.00	0.00	7.55

El. inlet face invert 80.90 ft El. outlet invert 80.80 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	1940.00
INLET ELEVATION (FT)	80.90
OUTLET STATION (FT)	2012.00
OUTLET ELEVATION (FT)	80.80
NUMBER OF BARRELS	1.00
SLOPE (V-FT/H-FT)	0.0014
CULVERT LENGTH ALONG SLOPE (FT)	72.00

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	BOX
BARREL SPAN	8.00 FT
BARREL RISE	3.00 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.013
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE (90&15 DEG. FLARE)
INLET DEPRESSION	NONE

CURRENT DATE: 04-17-1992
CURRENT TIME: 08:27:00

FILE DATE: 03-11-1992
FILE NAME: 1940W

TAILWATER

CONSTANT WATER SURFACE ELEVATION
83.07

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE GRAVEL
EMBANKMENT TOP WIDTH (FT) 20.00
***** USER DEFINED ROADWAY PROFILE

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	89.00
2	34.00	88.32
3	37.50	88.85
4	39.20	88.70
5	60.00	86.92
6	100.00	87.56

Is this 100-YR W.S.E. in GPW? If not it should be!

@ STA. 25+45 LT.

CURRENT DATE: 04-17-1992
CURRENT TIME: 08:34:37

FILE DATE: 03-12-1992
FILE NAME: ETP99-N2

FHWA CULVERT ANALYSIS
HY-8, VERSION 3.2

CULV	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	81.61	81.45	105.00	4 RCP	3.00	3.00	.013	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: ETP99-N2 DATE: 03-12-1992

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
86.50	0	0	0	0	0	0	0	0	1
86.52	19	19	0	0	0	0	0	0	1
86.57	39	39	0	0	0	0	0	0	1
86.65	58	58	0	0	0	0	0	0	1
86.76	77	77	0	0	0	0	0	0	1
86.89	97	94	0	0	0	0	0	2	19
86.97	116	103	0	0	0	0	0	12	13
87.02	135	109	0	0	0	0	0	25	10
87.06	154	113	0	0	0	0	0	40	8
87.10	174	117	0	0	0	0	0	56	7
87.13	193	120	0	0	0	0	0	72	6
86.83	86	86	0	0	0	0	0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: ETP99-N2 DATE: 03-12-1992

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
86.50	0.00	0	0	0.00
86.52	0.00	19	0	0.00
86.57	0.00	39	0	0.00
86.65	0.00	58	0	0.00
86.76	0.00	77	0	0.00
86.89	-0.00	97	1	0.84
86.97	-0.00	116	1	0.90
87.02	-0.00	135	1	0.89
87.06	-0.00	154	1	0.84
87.10	-0.00	174	1	0.76
87.13	-0.00	193	2	0.81

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 04-17-1992
CURRENT TIME: 08:34:37

FILE DATE: 03-12-1992
FILE NAME: ETP99-N2

CULVERT # 1

PERFORMANCE CURVE FOR 4 BARREL(S)

Q (cfs)	HWE (ft)	TWE (ft)	ICH (ft)	OCH (ft)	FLOW TYPE	CCE (ft)	FCE (ft)	TCE (ft)	VO (fps)
0	86.50	86.50	0.00	4.89	0-NF	0.00	81.61	0.00	0.00
19	86.52	86.50	0.94	4.91	4-FF	0.00	0.00	0.00	0.68
39	86.57	86.50	1.35	4.96	4-FF	0.00	0.00	0.00	1.37
58	86.65	86.50	1.72	5.04	4-FF	0.00	0.00	0.00	2.05
77	86.76	86.50	2.06	5.15	4-FF	0.00	0.00	0.00	2.73
94	86.89	86.50	2.32	5.28	4-FF	0.00	0.00	0.00	3.32
103	86.96	86.50	2.45	5.35	4-FF	0.00	0.00	0.00	3.63
109	87.02	86.50	2.53	5.41	4-FF	0.00	0.00	0.00	3.84
113	87.06	86.50	2.60	5.45	4-FF	0.00	0.00	0.00	4.00
117	87.10	86.50	2.65	5.49	4-FF	0.00	0.00	0.00	4.13
120	87.13	86.50	2.69	5.52	4-FF	0.00	0.00	0.00	4.23

El. inlet face invert 81.61 ft El. outlet invert 81.45 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	434.00
INLET ELEVATION (FT)	81.61
OUTLET STATION (FT)	539.00
OUTLET ELEVATION (FT)	81.45
NUMBER OF BARRELS	4.00
SLOPE (V-FT/H-FT)	0.0015
CULVERT LENGTH ALONG SLOPE (FT)	105.00

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	3.00 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.013
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 04-17-1992
CURRENT TIME: 08:34:37

FILE DATE: 03-12-1992
FILE NAME: ETP99-N2

TAILWATER

CONSTANT WATER SURFACE ELEVATION
86.50

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE PAVED
EMBANKMENT TOP WIDTH (FT) 68.00
***** USER DEFINED ROADWAY PROFILE

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	87.77
2	50.00	87.52
3	100.00	87.26
4	150.00	87.02
5	200.00	86.88
6	250.00	86.83
7	300.00	86.89
8	350.00	87.02
9	400.00	87.04
10	500.00	87.16

@ STA. 25 + 20 RT.

CURRENT DATE: 04-17-1992
CURRENT TIME: 08:40:34

FILE DATE: 03-11-1992
FILE NAME: 2520E2

FHWA CULVERT ANALYSIS
HY-8, VERSION 3.2

CULV	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	81.45	80.80	468.00	1 RCB	8.00	3.00	.013	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: 2520E2 DATE: 03-11-1992

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
83.07	0	0	0	0	0	0	0	0	1
83.15	20	20	0	0	0	0	0	0	1
83.38	40	40	0	0	0	0	0	0	1
83.70	61	61	0	0	0	0	0	0	1
84.07	81	81	0	0	0	0	0	0	1
84.42	101	101	0	0	0	0	0	0	1
84.81	121	121	0	0	0	0	0	0	1
85.16	141	141	0	0	0	0	0	0	1
85.83	162	161	0	0	0	0	0	0	3
86.29	182	171	0	0	0	0	0	9	6
86.50	202	177	0	0	0	0	0	24	5
85.81	161	161	0	0	0	0	0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: 2520E2 DATE: 03-11-1992

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
83.07	0.00	0	0	0.00
83.15	0.00	20	0	0.00
83.38	0.00	40	0	0.00
83.70	0.00	61	0	0.00
84.07	0.00	81	0	0.00
84.42	0.00	101	0	0.00
84.81	0.00	121	0	0.00
85.16	0.00	141	0	0.00
85.83	-0.00	162	0	0.09
86.29	-0.01	182	1	0.58
86.50	-0.01	202	1	0.55

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 04-17-1992
CURRENT TIME: 08:40:34

FILE DATE: 03-11-1992
FILE NAME: 2520E2

CULVERT # 1

PERFORMANCE CURVE FOR 1 BARREL(S)

Q (cfs)	HWE (ft)	TWE (ft)	ICH (ft)	OCH (ft)	FLOW TYPE	CCE (ft)	FCE (ft)	TCE (ft)	VO (fps)
0	83.07	83.07	0.00	1.62	0-NF	0.00	81.45	0.00	0.00
20	83.15	83.07	1.00	1.70	3-M1	0.00	0.00	0.00	1.11
40	83.38	83.07	1.58	1.93	3-M1	0.00	0.00	0.00	2.22
61	83.70	83.07	2.06	2.25	3-M1	0.00	0.00	0.00	3.34
81	84.07	83.07	2.48	2.62	3-M1	0.00	0.00	0.00	4.45
101	84.42	83.07	2.88	2.97	3-M2	0.00	0.00	0.00	5.56
121	84.81	83.07	3.29	3.36	3-M2	0.00	0.00	0.00	6.67
141	85.16	83.07	3.70	3.71	3-M2	0.00	0.00	0.00	7.78
161	85.83	83.07	4.15	4.38	7-FF	0.00	0.00	0.00	8.64
171	86.29	83.07	4.39	4.84	7-FF	0.00	0.00	0.00	8.82
177	86.50	83.07	4.52	5.05	7-FF	0.00	0.00	0.00	8.91

El. inlet face invert 81.45 ft El. outlet invert 80.80 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	2520.00
INLET ELEVATION (FT)	81.45
OUTLET STATION (FT)	2988.00
OUTLET ELEVATION (FT)	80.80
NUMBER OF BARRELS	1.00
SLOPE (V-FT/H-FT)	0.0014
CULVERT LENGTH ALONG SLOPE (FT)	468.00

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	BOX
BARREL SPAN	8.00 FT
BARREL RISE	3.00 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.013
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE (90&15 DEG. FLARE)
INLET DEPRESSION	NONE

CURRENT DATE: 04-17-1992
CURRENT TIME: 08:40:34

FILE DATE: 03-11-1992
FILE NAME: 2520E2

TAILWATER

CONSTANT WATER SURFACE ELEVATION
83.07

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE GRAVEL
EMBANKMENT TOP WIDTH (FT) 1.00
***** USER DEFINED ROADWAY PROFILE

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	86.85
2	0.40	86.17
3	34.10	86.67
4	40.00	86.00
5	50.00	85.81
6	60.00	87.80

Is this 100-YR W.S.E. in GRW?
OR 10-YR W.S.-E?
If not it should be 100-YR!

Q100 = 1360 cfs WITH EXISTING CHANNEL

THIS RUN EXECUTED 13MAR92 08:03:58

****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

T1 Granite Reef Channel - 900 ft. South of McKellips Rd. to 300 ft. North
T2 McKellips Rd. & 84th St. - Proj. No. 692102
T3 By: JLL Date: 10/7/91

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ	
	0				+.0049			1360	84.6		
NC	.025	.025	.03		.1	.3					
X1	1100	14	1927		1962	0	0	0			
X3	10										
GR	84.4	1900	84.2		1922	84.6	1927	80.0	1941	80.15	1950
GR	84.2	1962	83.6		2002	85.1	2017	82.7	2020	82.7	2021
GR	84.6	2023	84.6		2025	83.6	2027	83.4	2047		
X1	1200	14	1922		1960	100	100	100			
X3	10										
GR	84.9	1900	85.0		1914	85.8	1922	80.5	1940	80.3	1949
GR	80.3	1950	84.9		1960	83.6	1988	85.7	2015	83.1	2020
GR	83.1	2021	85.1		2024	83.9	2027	83.9	2048		
X1	1300	14	1917		1961	100	100	100			
X3	10										
GR	85.4	1900	85.5		1908	87.4	1917	80.9	1937	81.0	1952
GR	85.4	1961	84.2		1967	84.2	1974	86.2	2015	83.5	2020
GR	83.5	2021	85.6		2024	84.5	2026	84.4	2053		
X1	1400	14	1925		1956	100	100	100			
X3	10										
GR	85.8	1900	85.9		1921	86.3	1925	79.9	1939	80.0	1941
GR	85.5	1956	84.4		1965	84.4	1997	86.1	2015	84.0	2019
GR	84.0	2020	86.0		2024	85.1	2028	84.8	2056		
X1	1500	12	1928		1953	100	100	100			
X3	10										
GR	86.4	1900	86.1		1928	80.4	1937	79.3	1942	85.2	1953
GR	84.5	1989	86.5		2015	84.3	2019	84.3	2020	86.6	2024
GR	85.7	2026	85.4		2043						
X1	1600	14	1929		1954	100	100	100			
X3	10										
GR	86.8	1900	86.6		1929	80.5	1939	80.4	1946	85.4	1954
GR	84.9	1987	85.1		2011	86.7	2015	84.7	2018	84.7	2019
GR	86.6	2021	86.9		2023	86.1	2024	85.9	2048		

```
X1    1700     12    1928    1957     100     100     100
X3      10
GR    87.1   1900    87.2    1928    80.4    1941    80.1    1947    86.8    1957
GR    86.2   2011    87.5    2015    85.2    2018    85.2    2019    87.3    2023
GR    86.4   2024    86.3    2046

X1    1800     16    1927    1960     300     300     300
X3      10
GR    87.1   1900    87.0    1906    88.2    1927    86.2    1933    80.5    1942
GR    80.6   1949    86.4    1958    87.9    1960    87.0    1975    87.0    2007
GR    87.6   2014    85.6    2018    85.6    2018    88.0    2022    86.8    2025
GR    86.9   2045

NH       4     .1    1928     .03    1961    .025    2025      .1    2100
X1    1850     14    1928    1961      50      50      50
X3      10
GR    87.3   1900    87.6    1909    89.3    1928    80.8    1942    80.7    1951
GR    88.0   1961    87.1    1974    87.2    2007    87.9    2014    85.7    2017
GR    85.7   2019    88.2    2022    87.0    2025    86.9    2100

NH       4     .1    1928     .03    1962    .025    2026      .1    2100
X1    1900     16    1928    1962      50      50      50
X3      10
GR    87.9   1900    88.3    1913    90.4    1928    88.2    1934    81.1    1943
GR    80.8   1953    88.2    1962    87.2    1972    87.7    1996    87.4    2009
GR    88.2   2013    85.8    2017    85.9    2018    88.4    2022    87.2    2026
GR    87.0   2100

NC    .025   .025     .03      .1      .3
X1    1960     13    1900    2050      60      60      60
X3      10
GR    87.0   1000    87.4    1200    87.8    1400    87.9    1600    88.4    1800
GR    88.0   1900    85.9    1940    80.9    1946    80.9    1971    84.5    1977
GR    84.8   2000    88.6    2050    88.3    2100

NC    .015   .015    .015      .1      .3
X1    2000     15    1800    2050      40      40      40
GR   88.52    350   88.27     500   87.46    1000   86.71    1500   86.27    1800
GR   86.18   1850   86.06    1900   85.83    1950   85.59    2000   86.44    2050
GR   86.56   2100   87.24    2500   87.99    3000   88.77    3500   88.84    3650

NC    .025    .03    .025      .1      .3
X1    2054     15    1983    2037      54      54      54
X3      10
GR    86.8   1400    87.3    1700    87.5    1900    89.3    1936    90.2    1983
GR    89.7   2000    89.1    2004    88.4    2013    85.8    2020    85.3    2028
GR    89.7   2037    89.1    2200    89.0    2342    88.1    2450    86.7    2500
  Begin 6 ft. High Block on West Side of Channel
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X1     2055       13     1983     2037        1        1        1
X3       10
GR     86.8     1400     87.3     1700     87.5     1900     89.3     1936     90.2     1983
GR     89.7     2000     89.1     2004     88.4     2013     85.8     2020     85.3     2028
GR     89.7     2037     89.8     2040     95.8   2040.1
   Begin 6 ft. High Block Wall on East Side of Channel

X1     2074       12     2014     2039       19       19       19
GR     96.5   1986.9     90.5     1987     90.0     1990     86.2     1993     86.2     1994
GR     90.1     1997     89.3     2014     85.6     2022     85.7     2030     89.7     2039
GR     89.7     2040     95.7   2040.1
   Sta. 21+00 = Sta. 11+00 City of Scottsdale's Channel Improvement Plans

X1     2100       10     2015     2037       26       26       26
GR     97.6   1986.9     91.6     1987     91.1     1991     91.2     2000     90.2     2015
GR     86.4     2023     86.4     2032     89.8     2037     90.4     2040     96.4   2040.1

X1     2200       10     2012     2036
GR     97.7   1986.9     91.7     1987     91.2     1991     91.2     2000     91.0     2012
GR     86.6     2022     86.6     2031     90.0     2036     90.2     2040     96.2   2040.1

X1     2300       10     2013   2035.5
GR     97.7   1986.9     91.7     1987     91.2     1991     91.2     2000     91.0     2013
GR    86.85     2022    86.85     2030     90.0   2035.5     90.2     2040     96.2   2040.1
```

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

*PROF 1

CCHV= .100 CEHV= .300
*SECNO 1100.000

3265 DIVIDED FLOW

3280 CROSS SECTION 1100.00 EXTENDED 1.60 FEET

1100.000	5.00	85.00	.00	84.60	85.67	.67	.00	.00	84.60
1360.0	58.4	870.6	431.0	18.4	116.0	94.7	.0	.0	84.20
.00	3.18	7.50	4.55	.025	.030	.025	.000	80.00	1900.00
.004893	0.	0.	0.	0	0	5	.00	145.87	2047.00

*SECNO 1200.000

3265 DIVIDED FLOW

3280 CROSS SECTION 1200.00 EXTENDED 1.64 FEET

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 85.80 ELREA= 84.90

1200.000	5.24	85.54	.00	.00	86.13	.59	.45	.01	85.80
1360.0	.0	860.3	499.7	.0	124.0	110.2	.5	.3	84.90
.00	.00	6.94	4.54	.000	.030	.025	.000	80.30	1922.89
.004178	100.	100.	100.	2	0	0	.00	122.71	2048.00

*SECNO 1300.000

3265 DIVIDED FLOW

3280 CROSS SECTION 1300.00 EXTENDED 1.59 FEET

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 87.40 ELREA= 85.40

1300.000	5.08	85.98	.00	.00	86.51	.53	.38	.01	87.40
1360.0	.0	918.7	441.3	.0	140.4	108.1	1.1	.6	85.40
.01	.00	6.54	4.08	.000	.030	.025	.000	80.90	1921.35
.003434	100.	100.	100.	1	0	0	.00	126.85	2053.00

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

*SECNO 1400.000
3280 CROSS SECTION 1400.00 EXTENDED 1.64 FEET

1400.000	6.53	86.43	.00	.00	86.82	.39	.30	.01	86.30
1360.0	27.7	666.0	666.4	13.6	114.9	158.7	1.7	.9	85.50
.02	2.03	5.79	4.20	.025	.030	.025	.000	79.90	1900.00
.002630	100.	100.	100.	2	0	0	.00	156.00	2056.00

*SECNO 1500.000

3265 DIVIDED FLOW

3280 CROSS SECTION 1500.00 EXTENDED 1.18 FEET

1500.000	7.28	86.58	.00	.00	87.19	.61	.30	.07	86.10
1360.0	15.8	814.1	530.1	9.4	111.4	120.6	2.3	1.3	85.20
.02	1.69	7.31	4.39	.025	.030	.025	.000	79.30	1900.00
.003499	100.	100.	100.	2	0	0	.00	142.94	2043.00

*SECNO 1600.000
3280 CROSS SECTION 1600.00 EXTENDED 1.16 FEET

1600.000	6.66	87.06	.00	.00	87.50	.43	.29	.02	86.60
1360.0	15.5	706.3	638.2	10.6	114.8	153.4	2.9	1.6	85.40
.02	1.47	6.15	4.16	.025	.030	.025	.000	80.40	1900.00
.002370	100.	100.	100.	3	0	0	.00	148.00	2048.00

*SECNO 1700.000

3265 DIVIDED FLOW

3280 CROSS SECTION 1700.00 EXTENDED 1.16 FEET

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

1700.000	7.36	87.46	87.46	.00	88.21	.75	.30	.09	87.20
1360.0	14.6	1013.9	331.6	8.7	131.0	89.8	3.5	1.9	86.80
.03	1.68	7.74	3.69	.025	.030	.025	.000	80.10	1900.00
.003843	100.	100.	100.	20	8	0	.00	145.83	2046.00

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

*SECNO 1800.000
3280 CROSS SECTION 1800.00 EXTENDED 1.72 FEET

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.54

1800.000	8.13	88.63	.00	.00	88.96	.33	.71	.04	88.20
1360.0	78.4	857.3	424.4	30.9	161.6	133.3	5.4	2.9	87.90
.05	2.53	5.31	3.18	.025	.030	.025	.000	80.50	1900.00
.001618	300.	300.	300.	1	0	0	.00	145.00	2045.00

1490 NH CARD USED
*SECNO 1850.000
3280 CROSS SECTION 1850.00 EXTENDED 1.80 FEET

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 89.30 ELREA= 88.00

1850.000	7.99	88.69	.00	.00	89.05	.36	.08	.01	89.30
1360.0	.0	940.6	419.4	.0	166.3	225.0	5.8	3.1	88.00
.05	.00	5.66	1.86	.000	.030	.046	.000	80.70	1929.00
.001732	50.	50.	50.	2	0	0	.00	171.00	2100.00

1490 NH CARD USED
*SECNO 1900.000
3280 CROSS SECTION 1900.00 EXTENDED 1.71 FEET

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 90.40 ELREA= 88.20

1900.000	7.91	88.71	.00	.00	89.19	.48	.10	.04	90.40
1360.0	.0	982.3	377.7	.0	152.4	197.9	6.2	3.3	88.20
.05	.00	6.45	1.91	.000	.030	.048	.000	80.80	1932.61
.002345	50.	50.	50.	2	0	0	.00	167.39	2100.00

CCHV= .100 CEHV= .300
*SECNO 1960.000
3280 CROSS SECTION 1960.00 EXTENDED 2.24 FEET

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


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  6.55

  1960.000      8.34     89.24       .00       .00     89.25       .01       .01       .05     88.00
    1360.0     787.9     557.4      14.7    1336.3     607.0      39.5       7.8       4.2     88.60
       .08       .59       .92       .37      .025      .030      .025      .000     80.90   1000.00
   .000055       60.       60.       60.         2         0         0       .00   1100.00   2100.00


CCHV=     .100 CEHV=     .300
*SECNO 2000.000
3280 CROSS SECTION   2000.00 EXTENDED       .73 FEET


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  5.22

  2000.000      3.66     89.25       .00       .00     89.25       .00       .00       .00     86.27
    1360.0     619.4     249.7     490.9    2729.5     811.4    2394.8      11.5       6.2     86.44
       .12       .23       .31       .20      .015      .015      .015      .000     85.59    350.00
   .000002       40.       40.       40.         2         0         0       .00   3300.00   3650.00


CCHV=     .100 CEHV=     .300
*SECNO 2054.000
3280 CROSS SECTION   2054.00 EXTENDED      3.10 FEET

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

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       90.20 ELREA=       89.70

  2054.000      4.50     89.80     89.80       .00     89.93       .13       .00       .04     90.20
    1360.0        .0     342.1    1017.9        .0      84.6     424.7      15.5       8.6     89.70
       .13       .00      4.04      2.40      .000      .025      .030      .000     85.30   1996.75
   .001806       54.       54.       54.        20        11         0       .00    503.25   2500.00


*SECNO 2055.000
3280 CROSS SECTION   2055.00 EXTENDED      3.43 FEET

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

3720 CRITICAL DEPTH ASSUMED
  2055.000      4.93     90.23     90.23       .00     90.23       .01       .00       .01     90.20
    1360.0    1296.3      63.4        .3    1605.6     105.1       1.4      15.5       8.6     89.70
       .13       .81       .60       .18      .025      .025      .030      .000     85.30   1400.00
   .000044        1.        1.        1.        20        30         0       .00    640.01   2040.01

*SECNO 2074.000

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
  2074.000      5.45     91.05     91.05       .00     92.49      1.43       .00       .43     89.30
    1360.0     295.9    1060.8       3.3      47.8     102.2       1.4      15.9       8.7     89.70
       .13      6.19     10.38      2.41      .025      .025      .030      .000     85.60   1986.99
   .005080       19.       19.       19.        20         8         0       .00     53.03   2040.02

*SECNO 2100.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
  2100.000      6.02     92.42     92.42       .00     93.87      1.45       .12       .00     90.20
    1360.0     205.1    1127.9      27.0      41.5     108.7       7.0      16.0       8.8     89.80
       .13      4.94     10.37      3.87      .025      .025      .030      .000     86.40   1986.99
   .004042       26.       26.       26.        20         8         0       .00     53.05   2040.03

*SECNO 2200.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
  2200.000      5.92     92.52     92.52       .00     94.01      1.49       .00       .01     91.00
    1360.0     156.2    1161.6      42.2      33.1     111.5       9.7      16.0       8.8     90.00
       .13      4.71     10.42      4.34      .025      .025      .030      .000     86.60   1986.99
   .004402        0.        0.        0.        20         5         0       .00     53.05   2040.04

*SECNO 2300.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3720 CRITICAL DEPTH ASSUMED

2300.000	5.88	92.73	92.73	.00	94.18	1.45	.00	.00	91.00
1360.0	207.3	1097.8	54.9	40.0	104.9	11.9	16.0	8.8	90.00
.13	5.18	10.47	4.62	.025	.025	.030	.000	86.85	1986.98
.004400	0.	0.	0.	20	5	0	.00	53.06	2040.04

PROFILE FOR STREAM LL Date: 10/7/91

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

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ELEVATION   79.      81.      83.      85.      87.      89.      91.      93.      95.      97.
   SECNO   CUMDIS

 1100.00     0.  C I     .       M  R L W . E     .       .       .       .       .       .       .
            10.  C  I    .       .M  R L W. E     .       .       .       .       .       .       .
            20.  C  I    .       .M  R  LW. E     .       .       .       .       .       .       .
            30.  C  I    .       .M   R LW.  E    .       .       .       .       .       .       .
            40.  C  I    .       .M   R  LW  E    .       .       .       .       .       .       .
            50.  C  I    .       . M  R  LW  E    .       .       .       .       .       .       .
            60.  C  I    .       . M   R  W  E    .       .       .       .       .       .       .
            70.  C   I   .       . M   R  WL E    .       .       .       .       .       .       .
            80.  C   I   .       . M   R  .W  E   .       .       .       .       .       .       .
            90.  C   I   .       .  M   R .WL E   .       .       .       .       .       .       .
 1200.00   100.  C   I   .       .  M   R .W LE   .       .       .       .       .       .       .
           110.  C   I   .       .  M   R .W LE   .       .       .       .       .       .       .
           120.  C    I  .       .  M   R . W LE  .       .       .       .       .       .       .
           130.  C    I  .       .   M   R. W  E  .       .       .       .       .       .       .
           140.  C    I  .       .   M   R. W  EL .       .       .       .       .       .       .
           150.  C    I  .       .   M   R. W  EL .       .       .       .       .       .       .
           160.  C     I .       .   M   R.  W E L .       .       .       .       .       .       .
           170.  C     I .       .    M   R  W E  L .      .       .       .       .       .       .
           180.  C     I .       .    M   R  W  E  L.      .       .       .       .       .       .
           190.  C      I .      .    M   R  W  E  L       .       .       .       .       .       .
 1300.00   200.  C      I .      .    M   R  W  E  L       .       .       .       .       .       .
           210.  C     I  .      .     M  .R  W E  L       .       .       .       .       .       .
           220.  C     I  .      .     M  .R  W E  L.      .       .       .       .       .       .
           230.  C    I   .      .     M  .R  W  E L.      .       .       .       .       .       .
           240.  C    I   .      .     M  .R  W  EL .      .       .       .       .       .       .
           250.  C   I    .      .     M  .R   W EL .      .       .       .       .       .       .
           260.  C   I    .      .      M .R   W E  .      .       .       .       .       .       .
           270.  C  I     .      .      M .R   W E  .      .       .       .       .       .       .
           280.  C  I     .      .      M .R   WLE  .      .       .       .       .       .       .
           290.  C I      .      .      M .R   WLE  .      .       .       .       .       .       .
 1400.00   300.  C I      .      .       M .R   LW E .     .       .       .       .       .       .
           310.  C I      .      .       M .R   LW E .     .       .       .       .       .       .
           320.  C I      .      .       M .R   LW E .     .       .       .       .       .       .
           330.  C I      .      .       M .R   LW E .     .       .       .       .       .       .
           340.  C I      .      .        MR    LW E .    .       .       .       .       .       .
           350.  CI       .      .        MR   L W  E.     .       .       .       .       .       .
           360.  CI       .      .        MR   L W  E.     .       .       .       .       .       .
           370.  CI       .      .         R   L W  E.     .       .       .       .       .       .
           380.  CI       .      .         R   L W  E.     .       .       .       .       .       .
           390.  I        .      .         R   L W  E.     .       .       .       .       .       .
 1500.00   400.  I        .      .        RM   L W  E.     .       .       .       .       .       .
           410.  CI       .      .         RM  L  W  E     .       .       .       .       .       .
           420.  CI       .      .         RM  L  W  E     .       .       .       .       .       .
           430.  C I      .      .         RM   L W  E     .       .       .       .       .       .
           440.  C I      .      .         RM   L W  E     .       .       .       .       .       .
           450.  C  I     .      .         R M  L  W E     .       .       .       .       .       .
           460.  C  I     .      .         R M  L  W E     .       .       .       .       .       .
           470.  C   I    .      .         R M   L W .E    .       .       .       .       .       .
           480.  C   I    .      .         R M   L W .E    .       .       .       .       .       .
           490.  C    I   .      .         R  M  L  W.E    .       .       .       .       .       .
 1600.00   500.  C    I   .      .         R  M  L  W.E    .       .       .       .       .       .
           510.  C    I   .      .         .R M   L W.E    .       .       .       .       .       .
           520.  C    I   .      .         . RM   L W. E   .       .       .       .       .       .
           530.  C    I   .      .         .  RM  L W. E   .       .       .       .       .       .
```

APPENDIX "E"

THYSYS Computation Runs

```
*****************************************************************************
*            THYSYS                  * THYSYS S/N   :                        *
*      TEXAS HYDRAULIC SYSTEM        * HMVersion    :  4.00                 *
*                                    * Date         :  5/07/92              *
*   TEXAS DEPARTMENT OF HIGHWAYS     * Time         :  6:45:12              *
*             AND                    * Input file   : 692102A1.THY          *
*      PUBLIC TRANSPORTATION         * Output file  : 692102A1.OUT          *
*                                    *                                      *
*                                    *                                      *
*****************************************************************************
```

LINE "A"
WEST SIDE OF GRANITE REEF WASH

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

```
::::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::::
:::                                    :::
:::  Full Microcomputer Implementation :::
:::                by                  :::
:::       Haestad Methods, Inc.        :::
:::                                    :::
::::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::::
```

37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

```
$McKellips Rd. @ Granite Reef Wash
$MCDOT #68736   INCA #692102
$Date: 3/25/92   Filename: 692102A2.THY
$Storm Drain System on W. Side of Granite Reef Wash (GRW)
$For 10 Yr. Storm Flows.  The Q10 Flow in GRW is Approx. 250 cfs @ Tc=20 min.
$The Q10 Water Elev. for 250 cfs = 82.48
$The Top of Grate Elev. @ the Mobile Home Park (MHP) Entrance = 86.60
$The Gutter Elev. @ the E. Curb Return (@ the C.B.) = 86.74
$The Max. Water Surface Elev. for a Dry-Lane Condition = 87.17
SEWER              ANALYSIS            INLET     SEWER     FREQUENCY=10 YR
COEF DESC A=ROADWAY B=NON-RDW C=       D=        E=        E=
RAT COEF                               MIN TC =     5. .524 13.9   0.
SEW0019--NO RUNOFF COEFFICIENTS GIVEN.
DA I  5                                          T 8.     18       3   1.5
DA I  4                                          T17.                  0.3
DA I  3                                          T18.                 62.7
DA I  1                                          T19.                  5.2
DA I  7                                          T15.                  0.6
JUNC I  5 TYPE= CSAG  .43 .219 18.0  1.5 66.7 .016 0.17  5.9  4.0  1.7
JUNC I  4 TYPE= CSAG                              0.01  5.9  4.0  1.7
SEW0075-- INADEQUATE INFO OF JUNC CARD FOR ANALYSIS OF GUTTER APPROACH TO SAG INLET- PLEASE PROVIDE APPROACH INFO
JUNC J  1 TYPE=JUNCT
JUNC I  3 TYPE= GSAG  .57  .40  90.  36.      .016  .01  5.5      55.2
JUNC I  1 TYPE= GSAG                                   3.6   6.  6.2
SEW0075-- INADEQUATE INFO OF JUNC CARD FOR ANALYSIS OF GUTTER APPROACH TO SAG INLET- PLEASE PROVIDE APPROACH INFO
JUNC I  7 TYPE= GSAG                                   3.6   6.  6.2
SEW0075-- INADEQUATE INFO OF JUNC CARD FOR ANALYSIS OF GUTTER APPROACH TO SAG INLET- PLEASE PROVIDE APPROACH INFO
JUNC J  2 TYPE=JUNCT
JUNC J  3 TYPE=JUNCT
JUNC J  4 TYPE=JUNCT
SJUN I  5                1186.24              .147 .219  63. 37.

SEW0045--PROBABLE BLANK CARD.  CARD IGNORED.
OUTLET    STATIONING     2017 T.W. ELEV    82.48   J  4
DSGN  A8  I  4 J  1 US  83.22 DS  83.21   1.            .013      24.
DSGN  A9  I  5 J  1 US  83.22 DS  83.21   1.            .013      24.
DSGN  A1  J  1 I  3 US  83.21 DS  83.13  28.            .013      24.
DSGN  A2  I  3 I  1 US  84.53 DS  84.40  96.            .013      36.
DSGN  A3  I  1 I  7 US  84.40 DS  83.89 402.            .013          BOX
DSGN  A5  I  7 J  2 US  83.89 DS  83.83  52.            .013          BOX
DSGN  A6  J  2 J  3 US  83.83 DS  83.80  20.            .013          BOX
DSGN  A7  J  3 J  4 US  83.80 DS  83.79   1.            .013          BOX
ANAL  A8  I  4 J  1     1  18.
ANAL  A9  I  5 J  1     1  18.
ANAL  A1  J  1 I  3     1  18.          0.09
ANAL  A2  I  3 I  1     3  36.          0.73
ANAL  A3  I  1 I  7     1   3.   8.     0.16
ANAL  A5  I  7 J  2     1   3.   8.     0.02
ANAL  A6  J  2 J  3     1   3.   8.     0.01
ANAL  A7  J  3 J  4     1   3.   8.     0.13
ENDATA
SEW0048--DATA MISSING ON RAT COEF CARD D-2.
```

SEWER

INLET ANALYSIS

INLET I.D.	TYPE	FLOW (CFS)	INLET CAPACITY (CFS)	CARRYOVER (CFS)	CARRYOVER ASSIGNMENT INLET I.D.	CALCULATED POND WIDTH (FT)	ACTUAL LENGTH (FT)	MINIMUM COMPUTED LENGTH REQUIRED (FT)	ACTUAL AREA (SQ FT)	MINIMUM AREA REQUIRED (SQ FT)	ACTUAL HEAD (FT)
I 5	CSAG	1.50	6.65	0.00	---	0.00	4.0	0.9	0.00	0.00	0.25
ANALYSIS OF APPROACHES TO SAG INLET I 5: RIGHT APPROACH - FLOW = 0.6, PONDING WIDTH = 8.55*											
					LEFT APPROACH - FLOW = 0.9, PONDING WIDTH = 11.89*						
I 4	CSAG	0.30	4.39	0.00	---	0.00	4.0	0.3	0.00	0.00	0.08
I 3	GSAG	62.70	104.97	0.00	---	0.00	0.0	0.0	55.20	32.97	0.16
I 1	GSAG	5.20	9.54	0.00	---	0.00	0.0	0.0	6.20	3.38	0.09
I 7	GSAG	0.60	9.54	0.00	---	0.00	0.0	0.0	6.20	0.39	0.00

SEW0061-- * CALCULATED PONDED WIDTH EXCEEDS ALLOWABLE PONDED WIDTH. CALCULATIONS
CONTINUE WITH NO SPECIFIC ACTION TAKEN.

SEWER

SEWER ANALYSIS

CONFIGURATION DATA

RUN	U.S. ID	D.S. ID	U.S. F.L. ELEV	D.S. F.L. ELEV	LENGTH FEET	SLOPE	BBLS	RISE	SPAN	SHAPE
A8	I 4	J 1	81.72	81.71	1	0.01000	1	18	18	CIRC
A9	I 5	J 1	81.72	81.71	1	0.01000	1	18	18	CIRC
A1	J 1	I 3	81.71	81.63	28	0.00286	1	18	18	CIRC
A2	I 3	I 1	81.53	81.40	96	0.00135	3	36	36	CIRC
A3	I 1	I 7	81.40	80.89	402	0.00127	1	3	8	BOX
A5	I 7	J 2	80.89	80.83	52	0.00115	1	3	8	BOX
A6	J 2	J 3	80.83	80.80	20	0.00150	1	3	8	BOX
A7	J 3	J 4	80.80	80.79	1	0.01000	1	3	8	BOX

HYDRAULIC DATA

RUN	U.S. ID	D.S. ID	'N'	JUNC LOSS	FLOW	U.S. HEAD	D.S. HEAD	HYDR. GRAD	DEPTH	VELOC.	PIPE CAPAC.
A8	I 4	J 1	0.013	0.00	0.30	84.55	84.55	0.00001	0.12	0.2**	10.5
A9	I 5	J 1	0.013	0.00	1.50	84.55	84.55	0.00020	0.26	0.8**	10.5
A1	J 1	I 3	0.013	0.09	1.80	84.55	84.45	0.00029	0.39	1.0**	5.6
A2	I 3	I 1	0.013	0.73	64.50	84.45	83.59	0.00104	0.73	3.9*	73.6
A3	I 1	I 7	0.013	0.16	69.70	83.40	82.82	0.00057	1.84*	2.9**	103.6
A5	I 7	J 2	0.013	0.02	70.30	82.82	82.74	0.00058	1.91*	2.9**	98.8
A6	J 2	J 3	0.013	0.01	70.30	82.63	82.61	0.00058	1.74*	2.9**	112.6
A7	J 3	J 4	0.013	0.13	70.30	82.61	82.48	0.00058	0.93*	2.9**	290.8

* BOX DEPTHS IN FEET

SEW0069--**PIPE FLOWING FULL DUE TO DOWNSTREAM CONTROL, NOT INSUFFICIENT CAPACITY- VELOCITY IS BASED ON FULL FLOW.
JUNCTION LOSSES MAY NEED TO BE CONSIDERED AT SUBMERGED JUNCTIONS

SEW0071--*PIPE FLOW DEPTH > NORMAL DEPTH DUE TO DOWNSTREAM CONTROL, NOT INSUFFICIENT CAPACITY- VELOCITY IS
BASED ON ELEVATION OF HYDRAULIC GRADE LINE AT DOWNSTREAM ELEVATION.
JUNCTION LOSSES MAY NEED TO BE CONSIDERED AT SUBMERGED JUNCTIONS

```
*****************************************************************************
*              THYSYS                 * THYSYS S/N   :                        *
*       TEXAS HYDRAULIC SYSTEM        * HMVersion    :  4.00                 *
*                                     * Date         :  5/07/92              *
*    TEXAS DEPARTMENT OF HIGHWAYS     * Time         :  6:10:41              *
*                AND                  * Input file   : 692102B1.THY          *
*       PUBLIC TRANSPORTATION         * Output file  : 692102B1.OUT          *
*                                     *                                      *
*                                     *                                      *
*****************************************************************************
```

LINE "B"

EAST SIDE OF GRANITE REEF WASH

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

```
::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::
:::                                  :::
:::  Full Microcomputer Implementation :::
:::                by                :::
:::       Haestad Methods, Inc.      :::
:::                                  :::
::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::
```

37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

```
$McKellips Rd. @ Granite Reef Wash
$McDOT #68736   INCA #692102
$Date: 3/5/92   Filename: 69210282.THY
$Storm Drain System on E. Side of Granite Reef Wash (GRW)
$For 10 Yr. Storm Flows.  The Q10 Flow in GRW is Approx. 250 cfs for Tc=21 min
$The Q10 Water Elev. for 250 cfs = 82.48
$The Top of Grate Elev. @ the Mobile Home Park Entrance = 86.00
$The Gutter Elev. @ the W. Curb Return (@the C.B.) = 86.34
$The Top of Grate Elev. @ the Type "F" C.B. (E. of Entrance) = 86.00
$The Max. Water Surface Elev. for a Dry-Lane Condition = 86.65
SEWER              ANALYSIS            INLET     SEWER     FREQUENCY=10 YR
COEF DESC A=ROADWAY B=NON-RDW C=       D=        E=        E=
RAT COEF                               MIN TC =     5. .524 13.9   0.
SEW0019--NO RUNOFF COEFFICIENTS GIVEN.
DA I  8                                          T16.     18       3  98.7
DA I  9                                          T 9.                 0.9
DA I 10                                          T 8.                 1.7
DA I 14                                          T14.                 2.5
DA I 13                                          T15.                 3.7
DA I 12                                          T14.                 0.5
JUNC I  8 TYPE= GSAG                                   7.8      55.2
SEW0075-- INADEQUATE INFO OF JUNC CARD FOR ANALYSIS OF GUTTER APPROACH TO SAG INLET- PLEASE PROVIDE APPROACH INFO
JUNC I  9 TYPE= CSAG                              0.01  5.9  4.0  2.0
SEW0075-- INADEQUATE INFO OF JUNC CARD FOR ANALYSIS OF GUTTER APPROACH TO SAG INLET- PLEASE PROVIDE APPROACH INFO
JUNC I 10 TYPE= CSAG  22. .204 50.0  34.      .016 0.17  5.9  4.0  2.0
JUNC J  1 TYPE=JUNCT
JUNC I 14 TYPE= GSAG                                  10.2      5.44
SEW0075-- INADEQUATE INFO OF JUNC CARD FOR ANALYSIS OF GUTTER APPROACH TO SAG INLET- PLEASE PROVIDE APPROACH INFO
JUNC I 13 TYPE= GSAG                                   3.6      12.4
SEW0075-- INADEQUATE INFO OF JUNC CARD FOR ANALYSIS OF GUTTER APPROACH TO SAG INLET- PLEASE PROVIDE APPROACH INFO
JUNC I 12 TYPE= GSAG                                   3.6      12.4
SEW0075-- INADEQUATE INFO OF JUNC CARD FOR ANALYSIS OF GUTTER APPROACH TO SAG INLET- PLEASE PROVIDE APPROACH INFO
JUNC J  2 TYPE=JUNCT
JUNC J  3 TYPE=JUNCT
CARRYOVER FROM I 10 TO   I  8
CARRYOVER FROM I 13 TO   I 12
OUTLET    STATIONING     2055 T.W. ELEV   82.48   J  3
DSGN  B7  I  9 J  1 US  83.85 DS  83.84   1.          .013
DSGN  B8  I 10 J  1 US  83.85 DS  83.84   1.          .013
DSGN  B1  J  1 I  8 US  83.84 DS  83.81  28.          .013
DSGN  B2  I 14 I  8 US  83.50 DS  83.31  38.          .013
DSGN  B3  I  8 I 13 US  84.61 DS  84.45 105.          .013          CIRC
DSGN  B4  I 13 I 12 US  84.45 DS  83.84 443.          .013          BOX
DSGN  B5  I 12 J  2 US  83.84 DS  83.80  25.          .013          BOX
DSGN  B6  J  2 J  3 US  83.80 DS  83.79   1.          .013          BOX
ANAL  B7  I  9 J  1     1  18.
ANAL  B8  I 10 J  1     1  18.
ANAL  B1  J  1 I  8     1  18.          0.18
ANAL  B2  I 14 I  8     1  18.          0.11
ANAL  B3  I  8 I 13     4  36.          0.38
ANAL  B4  I 13 I 12     1  3.0  8.0     0.31
ANAL  B5  I 12 J  2     1  3.0  8.0     0.09
ANAL  B6  J  2 J  3     1  3.0  8.0     0.29
ENDATA
EW0046--CARRYOVER SPECIFIED FOR LINE I INLET 10 WHICH IS NOT SPECIFIED
```

SEWER

INLET ANALYSIS

INLET I.D.	TYPE	FLOW (CFS)	INLET CAPACITY (CFS)	CARRYOVER (CFS)	CARRYOVER ASSIGNMENT INLET I.D.	CALCULATED POND WIDTH (FT)	ACTUAL LENGTH (FT)	MINIMUM COMPUTED LENGTH REQUIRED (FT)	ACTUAL AREA (SQ FT)	MINIMUM AREA REQUIRED (SQ FT)	ACTUAL HEAD (FT)
I 8	GSAG	98.70	125.01	0.00	---	0.00	0.0	0.0	55.20	43.58	0.41
I 9	CSAG	0.90	4.39	0.00	---	0.00	4.0	0.8	0.00	0.00	0.17
I10	CSAG	1.70	6.65	0.00	---	0.00	4.0	1.0	0.00	0.00	0.27
I14	GSAG	2.50	14.09	0.00	---	0.00	0.0	0.0	5.44	0.97	0.03
I13	GSAG	3.70	19.08	0.00	---	0.00	0.0	0.0	12.40	2.40	0.01
I12	GSAG	0.50	19.08	0.00	---	0.00	0.0	0.0	12.40	0.32	0.00

SEWER

SEWER ANALYSIS

CONFIGURATION DATA

RUN	U.S. ID	D.S. ID	U.S. F.L. ELEV	D.S. F.L. ELEV	LENGTH FEET	SLOPE	BBLS	RISE	SPAN	SHAPE
B7	I 9	J 1	82.35	82.34	1	0.01000	1	18	18	CIRC
B8	I10	J 1	82.35	82.34	1	0.01000	1	18	18	CIRC
B1	J 1	I 8	82.34	82.31	28	0.00107	1	18	18	CIRC
B2	I14	I 8	82.00	81.81	38	0.00500	1	18	18	CIRC
B3	I 8	I13	81.61	81.45	105	0.00152	4	36	36	CIRC
B4	I13	I12	81.45	80.84	443	0.00138	1	3	8	BOX
B5	I12	J 2	80.84	80.80	25	0.00160	1	3	8	BOX
B6	J 2	J 3	80.80	80.79	1	0.01000	1	3	8	BOX

HYDRAULIC DATA

RUN	U.S. ID	D.S. ID	'N'	JUNC LOSS	FLOW	U.S. HEAD	D.S. HEAD	HYDR. GRAD	DEPTH	VELOC.	PIPE CAPAC.
B7	I 9	J 1	0.013	0.00	0.90	84.91	84.91	0.00007	0.20	0.5**	10.5
B8	I10	J 1	0.013	0.00	1.70	84.91	84.91	0.00026	0.27	1.0**	10.5
B1	J 1	I 8	0.013	0.18	2.60	84.91	84.71	0.00061	0.65	1.5**	3.4
B2	I14	I 8	0.013	0.11	2.50	84.84	84.71	0.00057	0.40	1.4**	7.4
B3	I 8	I13	0.013	0.38	103.80	84.71	84.17	0.00151	0.82	3.9*	104.1
B4	I13	I12	0.013	0.31	107.50	84.17	83.25	0.00137	2.41*	4.5**	107.9
B5	I12	J 2	0.013	0.09	108.00	83.23	83.10	0.00138	2.30*	4.5**	116.3
B6	J 2	J 3	0.013	0.29	108.00	82.77	82.48	0.00138	1.23*	4.5**	290.8

* BOX DEPTHS IN FEET

SEW0069--**PIPE FLOWING FULL DUE TO DOWNSTREAM CONTROL, NOT INSUFFICIENT CAPACITY- VELOCITY IS BASED ON FULL FLOW.
JUNCTION LOSSES MAY NEED TO BE CONSIDERED AT SUBMERGED JUNCTIONS

SEW0071--*PIPE FLOW DEPTH > NORMAL DEPTH DUE TO DOWNSTREAM CONTROL, NOT INSUFFICIENT CAPACITY- VELOCITY IS
BASED ON ELEVATION OF HYDRAULIC GRADE LINE AT DOWNSTREAM ELEVATION.
JUNCTION LOSSES MAY NEED TO BE CONSIDERED AT SUBMERGED JUNCTIONS

APPENDIX "F"

Calculation of Composite "C" Values,
Tc, i and Q for Rational Method

INCA
INCA ENGINEERS INC.

Sheet No _____ of _____
Job Number _____

TITLE _____
SUBJECT _____
MADE BY _____ DATE _____ CHECKED BY _____ DATE _____

CALCULATION OF COMPOSITE 'C' VALUES (cont'd.)

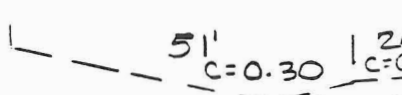
Drainage Area No. 8 (East Trailer Park)

For a Selected Block
Selected Area = 103,000 sf
Street = 21,450 sf
Roof = 47,872 sf
69,322 sf
Lawns, etc. 33,678 sf

69,322 sf x 0.95 + 33,678 sf x 0.35 / 103,000 = 0.754

USE 'C' = 0.75

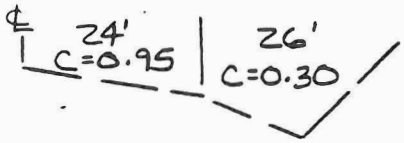
Drainage Area No. 14 (North Side McKellips Rd.)



Exist. Pavement Area C = 51' x 0.30 + 24' x 0.95 / 75' = 0.508

USE 'C' = 0.51

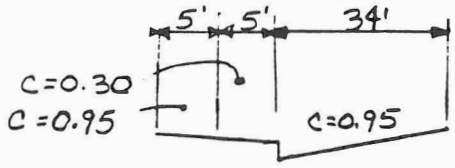
Drainage Area No. 13 (South Side of McKellips Rd.)



Exist. Pavement Area C = 24' x 0.95 + 26' x 0.30 / 50' = 0.612

USE 'C' = 0.61

Drainage Area No. 10 (North Side of McKellips Rd.)



C = 39 x 0.95 + 5 x 0.30 / 44 = 0.876

USE 'C' = 0.88

Sheet No.____ of ____

CALCULATION OF Tc,i & Q FOR RATIONAL METHOD

Project Name: McKellips Road @ 84th Street (Granite Reef Wash) Client Name: MCHD

INCA Project No. 692102 Client Project No. 68736/1991-12

Calculated by: J. Lynck Date: 11-14-91

Checked by: _____ Date: _____

Watershed: Drainage Area No. 1

Rainfall Frequency: 10 - year

A = 1.14 ac.

L = 0.202 mi.

S = 3.5 ft/mi.

i = _____ (from Fig. 3.2: Rainfall Intensity-Duration-Frequency Relationship, Phoenix Metro Area) (Fig._____)

C = 0.69 (from Table 3.2: Coefficients for Use with the Rational Formula) (Fig._____)

Tb = m log A + b

Tb = (-0.00625) log (1.14) + (0.04)

Kb = 0.0[illegible]

Tc = 11.4 L^.50 Kb^.52 S^-.31 i^-.38

Tc = (0.4[illegible]) i^-.38 x 60

Trial Tc	i	Calc Tc
16	3.6	18.4
19	3.3	19.1 OK

Tc = 19.1 min.

Q = CiA

Q = (0.69)(3.3)(1.14)

i = 3.3 in/hr.

Q = 2.6 cfs

Sheet No.____ of ____

CALCULATION OF Tc,i & Q FOR RATIONAL METHOD

Project Name: McKellips Road @ 84th Street (Granite Reef Wash) Client Name: MCHD

INCA Project No. 692102 Client Project No. 68736/1991-12

Calculated by: J. Lynck Date: 11-14-91

Checked by: _____ Date: _____

Watershed: Drainage Area No. 2

Rainfall Frequency: 10 - year

A = 1.32 ac.

L = 0.201 mi.

S = 3.5 ft/mi.

i = _____ (from Fig. 3.2: Rainfall Intensity-Duration-Frequency Relationship, Phoenix Metro Area) (Fig._____)

C = 0.77 (from Table 3.2: Coefficients for Use with the Rational Formula) (Fig._____)

Kb = m log A + b

Kb = (-0.00625) log (1.32) + (0.04)

Kb = 0.0318

$Tc = 11.4\ L^{.50}\ Kb^{.52}\ S^{-.31}\ i^{-.38}$

$Tc = (0.4373)\ i^{-.38} \times 60$

Trial Tc	i	Calc Tc
18	3.4	16.5
16	3.6	16.1 OK

Tc = 16.1 min.

Q = CiA

Q = (0.77)(3.6)(1.32)

i = 3.6 in/hr.

Q = 3.7 cfs

Sheet No.____ of ____

CALCULATION OF Tc,i & Q FOR RATIONAL METHOD

Project Name: McKellips Road @ 84th Street (Granite Reef Wash) Client Name: MCHD

INCA Project No. 692102 Client Project No. 68736/1991-12

Calculated by: J. Lynck Date: 11-14-91

Checked by: _____ Date: _____

Watershed: Drainage Area No. 4

Rainfall Frequency: 10 - year

A = 0.22 ac.

L = 0.[illegible] mi.

S = 15.3 ft/mi.

i = _____ (from Fig. 3.2: Rainfall Intensity-Duration-Frequency Relationship, Phoenix Metro Area) (Fig._____)

C = 0.46 (from Table 3.2: Coefficients for Use with the Rational Formula) (Fig._____)

Kb = m log A + b

Kb = (-0.00625) log (0.22) + (0.04)

Kb = 0.0441

$Tc = 11.4\,L^{.50}\,Kb^{.52}\,S^{-.31}\,i^{-.38}$

$Tc = (0.4293)\,i^{-.38} \times 60$

Trial Tc	i	Calc Tc	
10	4.5	14.5	
16	3.2	16.6	
17	3.1	16.8	ok

Tc = 16.8 min.

Q = CiA

Q = (0.46)(3.1)(0.22)

i = 3.1 in/hr.

Q = 0.3 cfs

Sheet No.____ of ____

CALCULATION OF Tc,i & Q FOR RATIONAL METHOD

Project Name: McKellips Road @ 84th Street (Granite Reef Wash) Client Name: MCHD

INCA Project No. 692102 Client Project No. 68736/1991-12

Calculated by: J. Lynck Date: 11-14-91

Checked by: Date:

Watershed: Drainage Area No. 5

Rainfall Frequency: 10 - year

A = 0.33 ac.

L = 0.080 mi.

S = 22.0 ft/mi.

i = _____ (from Fig. 3.2: Rainfall Intensity-Duration-Frequency Relationship, Phoenix Metro Area) (Fig._____)

C = 0.95 (from Table 3.2: Coefficients for Use with the Rational Formula) (Fig._____)

Kb = m log A + b

Kb = (-0.00625) log (0.33) + (0.04)

Kb = 0.0420

$Tc = 11.4\,L^{.50}\,Kb^{.52}\,S^{-.31}\,i^{-.38}$

$Tc = (0.2409)\,i^{-.38} \times 60$

Trial Tc	i	Calc Tc
13	4.0	8.5
8	4.9	7.9 ok

Tc = 7.9 min.

Q = CiA

Q = (0.95)(4.9)(0.33)

i = 4.9 in/hr.

Q = 1.5 cfs

Sheet No.____ of ____

CALCULATION OF Tc,i & Q FOR RATIONAL METHOD

Project Name: McKellips Road @ 84th Street (Granite Reef Wash) Client Name: MCHD

INCA Project No. 692102 Client Project No. 68736/1991-12

Calculated by: J. Lynck Date: 11-14-91

Checked by: _____ Date: _____

Watershed: Drainage Area No. 6

Rainfall Frequency: 10 - year

A = 0.40 ac.

L = 0.075 mi.

S = 20.7 ft/mi.

i = _____ (from Fig. 3.2: Rainfall Intensity-Duration-Frequency Relationship, Phoenix Metro Area) (Fig._____)

C = 0.95 (from Table 3.2: Coefficients for Use with the Rational Formula) (Fig._____)

Kb = m log A + b

Kb = (-0.00625) log (0.40) + (0.04)

Kb = 0.4249

$Tc = 11.4\,L^{.50}\,Kb^{.52}\,S^{-.31}\,i^{-.38}$

Tc = (0.2658) $i^{-.38}$ x 60

Trial Tc	i	Calc Tc
8	4.9	8.7
9	4.7	8.9 OK

Tc = 8.9 min.

Q = CiA

Q = (0.95)(4.7)(0.40)

i = 4.7 in/hr.

Q = 1.8 cfs

Sheet No.____ of ____

CALCULATION OF Tc,i & Q FOR RATIONAL METHOD

Project Name: McKellips Road @ 84th Street (Granite Reef Wash) Client Name: MCHD

INCA Project No. 692102 Client Project No. 68736/1991-12

Calculated by: J. Lynck Date: 11-14-91

Checked by: _____ Date: _____

Watershed: Drainage Area No. 7

Rainfall Frequency: 10 - year

A = 0.49 ac.

L = [illegible] mi.

S = 5.[illegible] ft/mi.

i = _____ (from Fig. 3.2: Rainfall Intensity-Duration-Frequency Relationship, Phoenix Metro Area) (Fig._____)

C = 0.30 (from Table 3.2: Coefficients for Use with the Rational Formula) (Fig._____)

Kb = m log A + b

Kb = (-0.00625) log ([illegible]) + (0.04)

Kb = 0.0419

$Tc = 11.4\,L^{.50}\,Kb^{.52}\,S^{-.31}\,i^{-.38}$

Tc = (0.4027) $i^{-.38}$ x 60

Trial Tc	i	Calc Tc	
16	3.7	14.7	
14	3.8	14.5	OK

Tc = 14.5 min.

Q = CiA

Q = (0.30)(3.8)(0.49)

i = 3.8 in/hr.

Q = 0.6 cfs

Sheet No.____ of ____

CALCULATION OF Tc,i & Q FOR RATIONAL METHOD

Project Name: McKellips Road @ 84th Street (Granite Reef Wash) Client Name: MCHD

INCA Project No. 692102 Client Project No. 68736/1991-12

Calculated by: J. Lynck Date: 11-14-91

Checked by: ____ Date: ____

Watershed: Drainage Area No. 9

Rainfall Frequency: 10 - year

A = 0.49 ac.

L = 0.100 mi.

S = 23.3 ft/mi.

i = ____ (from Fig. 3.2: Rainfall Intensity-Duration-Frequency Relationship, Phoenix Metro Area) (Fig.____)

C = 0.33 (from Table 3.2: Coefficients for Use with the Rational Formula) (Fig.____)

Kb = m log A + b

Kb = (-0.00625) log (0.49) + (0.04)

Kb = 0.0417

$$Tc = 11.4\, L^{.50}\, Kb^{.52}\, S^{-.31}\, i^{-.38}$$

$$Tc = (0.3611)\, i^{-.38} \times 60$$

Trial Tc	i	Calc Tc	
9	4.7	8.7	OK

Tc = 8.7 min.

Q = CiA

Q = (0.38)(4.7)(0.49)

i = 4.7 in/hr.

Q = 0.9 cfs

CALCULATION OF Tc,i & Q FOR RATIONAL METHOD

Project Name: McKellips Road @ 84th Street (Granite Reef Wash) Client Name: MCHD

INCA Project No. 692102 Client Project No. 68736/1991-12

Calculated by: J. Lynck Date: 11-14-91

Checked by: _____ Date: _____

Watershed: Drainage Area No. 10

Rainfall Frequency: 10 - year

A = 0.37 ac.

L = 0.088 mi.

S = [illegible] ft/mi.

i = _____ (from Fig. 3.2: Rainfall Intensity-Duration-Frequency Relationship, Phoenix Metro Area) (Fig._____)

C = 0.95 (from Table 3.2: Coefficients for Use with the Rational Formula) (Fig._____)

Kb = m log A + b

Kb = (-0.00625) log (0.37) + (0.04)

Kb = 0.0427

Tc = $11.4\,L^{.50}\,Kb^{.52}\,S^{-.31}\,i^{-.38}$

Tc = (0.3472) i x 60

Trial Tc	i	Calc Tc
8	4.9	8.1 OK

Tc = 8.1 min.

Q = CiA

Q = (0.95)(4.9)(0.37)

i = 4.9 in/hr.

Q = 1.7 cfs

Sheet No.____ of ____

CALCULATION OF Tc,i & Q FOR RATIONAL METHOD

Project Name: McKellips Road @ 84th Street (Granite Reef Wash) Client Name: MCHD

INCA Project No. 692102 Client Project No. 68736/1991-12

Calculated by: J. Lynck Date: 11-14-91

Checked by: ____ Date: ____

Watershed: Drainage Area No. 11

Rainfall Frequency: 10 - year

A = 0.44 ac.

L = 0.105 mi.

S = 23.3 ft/mi.

i = ____ (from Fig. 3.2: Rainfall Intensity-Duration-Frequency Relationship, Phoenix Metro Area) (Fig.____)

C = 0.95 (from Table 3.2: Coefficients for Use with the Rational Formula) (Fig.____)

Kb = m log A + b

Kb = (-0.00625) log (0.44) + (0.04)

Kb = 0.0422

$Tc = 11.4\,L^{.50}\,Kb^{.52}\,S^{-.31}\,i^{-.38}$

Tc = (0.2685) $i^{-.38}$ x 60

Trial Tc	i	Calc Tc
9	4.7	8.9 ok

Tc = 8.9 min.

Q = CiA

Q = (0.95)(4.7)(0.44)

i = 4.7 in/hr.

Q = 2.0 cfs

CALCULATION OF Tc,i & Q FOR RATIONAL METHOD

Project Name: McKellips Road @ 84th Street (Granite Reef Wash) Client Name: MCHD

INCA Project No. 692102 Client Project No. 68736/1991-12

Calculated by: J. Lynck Date: 11-14-91

Checked by: ____ Date: ____

Watershed: Drainage Area No. 12

Rainfall Frequency: 10 - year

A = 0.42 ac.

L = 0.086 mi.

S = 5.3 ft/mi.

i = ____ (from Fig. 3.2: Rainfall Intensity-Duration-Frequency Relationship, Phoenix Metro Area) (Fig.____)

C = 0.30 (from Table 3.2: Coefficients for Use with the Rational Formula) (Fig.____)

Kb = m log A + b

Kb = (-0.00625) log (0.42) + (0.04)

Kb = 0.0424

$$Tc = 11.4\,L^{.50}\,Kb^{.52}\,S^{-.31}\,i^{-.38}$$

Tc = (0.5551) $i^{-.38}$ x 60

Trial Tc	i	Calc Tc	
16	3.7	14.1	
13.5	4.0	13.6	OK

Tc = 13.6 min.

i = 4.0 in/hr.

Q = CiA

Q = (0.30)(4.0)(0.42)

Q = 0.5 cfs

Sheet No.____ of ____

CALCULATION OF Tc,i & Q FOR RATIONAL METHOD

Project Name: McKellips Road @ 84th Street (Granite Reef Wash) Client Name: MCHD

INCA Project No. 692102 Client Project No. 68736/1991-12

Calculated by: J. Lynck Date: 11-14-91

Checked by: ____ Date: ____

Watershed: Drainage Area No. 13

Rainfall Frequency: 10 - year

A = 0.57 ac.

L = 0.176 mi.

S = 3.7 ft/mi.

i = ____ (from Fig. 3.2: Rainfall Intensity-Duration-Frequency Relationship, Phoenix Metro Area) (Fig.____)

C = 0.61 (from Table 3.2: Coefficients for Use with the Rational Formula) (Fig.____)

Kb = m log A + b

Kb = (-0.00625) log (0.57) + (0.04)

Kb = 0.0403

Tc = $11.4\,L^{.50}\,Kb^{.52}\,S^{-.31}\,i^{-.38}$

Tc = (0.4195) $i^{-.38}$ x 60

Trial Tc	i	Calc Tc	
16	3.7	15.3	
15	3.8	15.2	OK

Tc = 15.2 min.

Q = CiA

Q = (0.61)(3.8)(0.89)

i = 3.9 in/hr.

Q = 2.1 cfs

CALCULATION OF Tc,i & Q FOR RATIONAL METHOD

Project Name: McKellips Road @ 84th Street (Granite Reef Wash) Client Name: MCHD

INCA Project No. 692102 Client Project No. 68736/1991-12

Calculated by: J. Lynck Date: 11-14-91

Checked by: _____ Date: _____

Watershed: Drainage Area No. 14

Rainfall Frequency: 10 - year

A = 1.22 ac.

L = 0.129 mi.

S = 5.7 ft/mi.

i = _____ (from Fig. 3.2: Rainfall Intensity-Duration-Frequency Relationship, Phoenix Metro Area) (Fig._____)

C = 0.51 (from Table 3.2: Coefficients for Use with the Rational Formula) (Fig._____)

Kb = m log A + b

Kb = (-0.00625) log (1.22) + (0.04)

Kb = 0.0395

$$Tc = 11.4\,L^{.50}\,Kb^{.52}\,S^{-.31}\,i^{-.38}$$

$$Tc = (0.3877)\,i^{-.38} \times 60$$

Trial Tc	i	Calc Tc	
15	3.8	14.1	
13.5	4.0	13.8	OK

Tc = 13.8 min.

Q = CiA

Q = (0.51)(4.0)(1.22)

i = 4.0 in/hr.

Q = 2.5 cfs

Sheet No.____ of ____

CALCULATION OF Tc,i & Q FOR RATIONAL METHOD

Project Name: McKellips Road @ 84th Street (Granite Reef Wash) Client Name: MCHD

INCA Project No. 692102 Client Project No. 68736/1991-12

Calculated by: J. Lynck Date: 11-14-91

Checked by: ____ Date: ____

Watershed: Drainage Area No. 15

Rainfall Frequency: 10 - year

A = 0.21 ac.

L = 0.015 mi.

S = 36.3 ft/mi.

i = ____ (from Fig. 3.2: Rainfall Intensity-Duration-Frequency Relationship, Phoenix Metro Area) (Fig.____)

C = 0.95 (from Table 3.2: Coefficients for Use with the Rational Formula) (Fig.____)

Kb = m log A + b

Kb = (-0.00625) log (0.21) + (0.04)

Kb = 0.0412

$Tc = 11.4\,L^{.50}\,Kb^{.52}\,S^{-.31}\,i^{-.38}$

$Tc = (0.0906)\,i^{-.38} \times 60$

Trial Tc	i	Calc Tc
5	5.8	2.8

Tc = 5.0 min.

i = 5.8 in/hr.

Q = CiA

Q = (0.95)(5.8)(0.21)

Q = 1.2 cfs

CALCULATION OF Tc,i & Q FOR RATIONAL METHOD

Project Name: McKellips Road @ 84th Street (Granite Reef Wash) Client Name: MCHD

INCA Project No. 692102 Client Project No. 68736/1991-12

Calculated by: J. Lynck Date: 11-14-91

Checked by: _____ Date: _____

Watershed: Drainage Area No. 1

Rainfall Frequency: 100 - year

A = 1.14 ac.

L = 0.203 mi.

S = 3.5 ft/mi.

i : from Fig. 3.2: Rainfall Intensity-Duration-Frequency Relationship, Phoenix Metro Area (Fig.____)(See below)

C = 0.69 (from Table 3.2: Coefficients for Use with the Rational Formula) (Fig.____)

Kb = m log A + b

Kb = (-0.00625) log (1.14) + (0.04)

Kb = 0.0376

$Tc = 11.4\,L^{.50}\,Kb^{.52}\,S^{-.31}\,i^{-.38}$

Tc = (0.4999) $i^{-.38}$ x 60

Trial Tc	i	Calc Tc
15	5.9	15.3
16	5.8	15.4

Tc = 15.5 min.

Q = CiA

Q = (0.69)(5.9)(1.14)

i = 5.9 in/hr.

Q = 4.6 cfs

CALCULATION OF Tc,i & Q FOR RATIONAL METHOD

Project Name: McKellips Road @ 84th Street (Granite Reef Wash) Client Name: MCHD

INCA Project No. 692102 Client Project No. 68736/1991-12

Calculated by: J. Lynck Date: 11-14-91

Checked by: _____ Date: _____

Watershed: Drainage Area No. 2

Rainfall Frequency: 100 - year

A = 1.32 ac.

L = 0.601 mi.

S = 2.5 ft/mi.

i : from Fig. 3.2: Rainfall Intensity-Duration-Frequency Relationship, Phoenix Metro Area (Fig._____)(See below)

C = 0.77 (from Table 3.2: Coefficients for Use with the Rational Formula) (Fig._____)

Kb = m log A + b

Kb = (-0.00625) log (1.32) + (0.04)

Kb = 0.035

$$Tc = 11.4\,L^{.50}\,Kb^{.52}\,S^{-.31}\,i^{-.38}$$

$$Tc = (0.1553)\,i^{-.38} \times 60$$

Trial Tc	i	Calc Tc
15	5.9	13.4
13	6.3	13.1

Tc = 13.1 min.

i = 6.3 in/hr.

Q = CiA

Q = (0.77)(6.3)(1.32)

Q = 6.4 cfs

CALCULATION OF Tc,i & Q FOR RATIONAL METHOD

Project Name: McKellips Road @ 84th Street (Granite Reef Wash) Client Name: MCHD

INCA Project No. 692102 Client Project No. 68736/1991-12

Calculated by: J. Lynck Date: 11-14-91

Checked by: _____ Date: _____

Watershed: Drainage Area No. 4

Rainfall Frequency: 100 - year

A = 0.22 ac.

L = 0.072 mi.

S = 15.3 ft/mi.

i : from Fig. 3.2: Rainfall Intensity-Duration-Frequency Relationship, Phoenix Metro Area (Fig._____)(See below)

C = 0.46 (from Table 3.2: Coefficients for Use with the Rational Formula) (Fig._____)

Kb = m log A + b

Kb = (-0.00625) log (0.22) + (0.04)

Kb = 0.0441

$Tc = 11.4\, L^{.50}\, Kb^{.52}\, S^{-.31}\, i^{-.38}$

$Tc = (0.4293)\, i^{-.38} \times 60$

Trial Tc	i	Calc Tc
13	6.3	12.8

Tc = 12.8 min.

i = 6.3 in/hr.

Q = CiA

Q = (0.46)(6.3)(0.22)

Q = 0.7 cfs

Sheet No.____ of ____

CALCULATION OF Tc,i & Q FOR RATIONAL METHOD

Project Name: McKellips Road @ 84th Street (Granite Reef Wash) Client Name: MCHD

INCA Project No. 692102 Client Project No. 68736/1991-12

Calculated by: J. Lynck Date: 11-14-91

Checked by: ____ Date: ____

Watershed: Drainage Area No. 5

Rainfall Frequency: 100 - year

A = 0.33 ac.

L = [illegible] mi.

S = ____ ft/mi.

i : from Fig. 3.2: Rainfall Intensity-Duration-Frequency Relationship, Phoenix Metro Area (Fig.____)(See below)

C = 0.95 (from Table 3.2: Coefficients for Use with the Rational Formula) (Fig.____)

Kb = m log A + b

Kb = (-0.00625) log (0.33) + (0.04)

Kb = [illegible]

Tc = 11.4 L^.50 Kb^.52 S^-.31 i^-.38

Tc = ([illegible]) i^-.38 x 60

Trial Tc	i	Calc Tc
10	7.0	6.9
6	8.5	7.1
6.5	8.2	7.2
7.5	7.8	7.3

Tc = 7.3 min.

Q = CiA

Q = (0.95)(7.8)(0.33)

i = 7.8 in/hr.

Q = 2.5 cfs

CALCULATION OF Tc,i & Q FOR RATIONAL METHOD

Project Name: McKellips Road @ 84th Street (Granite Reef Wash) Client Name: MCHD

INCA Project No. 692102 Client Project No. 68736/1991-12

Calculated by: J. Lynck Date: 11-14-91

Checked by: _____ Date: _____

Watershed: Drainage Area No. 6

Rainfall Frequency: 100 - year

A = 0.40 ac.

L = 0.075 mi.

S = 50.7 ft/mi.

i : from Fig. 3.2: Rainfall Intensity-Duration-Frequency Relationship, Phoenix Metro Area (Fig._____)(See below)

C = 0.95 (from Table 3.2: Coefficients for Use with the Rational Formula) (Fig._____)

Kb = m log A + b

Kb = (-0.00625) log (0.40) + (0.04)

Kb = 0.4249

$Tc = 11.4\, L^{.50}\, Kb^{.52}\, S^{-.31}\, i^{-.38}$

$Tc = (0.2658)\, i^{-.38} \times 60$

Trial Tc	i	Calc Tc
8	7.5	7.4
7	8.0	7.2

Tc = 7.2 min.

i = 8.0 in/hr.

Q = CiA

Q = (0.95)(8.0)(0.40)

Q = 3.0 cfs

CALCULATION OF Tc,i & Q FOR RATIONAL METHOD

Project Name: McKellips Road @ 84th Street (Granite Reef Wash) Client Name: MCHD

INCA Project No. 692102 Client Project No. 68736/1991-12

Calculated by: J. Lynck Date: 11-14-91

Checked by: _____ Date: _____

Watershed: Drainage Area No. 7

Rainfall Frequency: 100 - year

A = 0.49 ac.

L = 0.025 mi.

S = 5.3 ft/mi.

i : from Fig. 3.2: Rainfall Intensity-Duration-Frequency Relationship, Phoenix Metro Area (Fig._____)(See below)

C = 0.30 (from Table 3.2: Coefficients for Use with the Rational Formula) (Fig._____)

Kb = m log A + b

Kb = (-0.00625) log (0.49) + (0.04)

Kb = 0.0419

Tc = 11.4 L^.50 Kb^.52 S^-.31 i^-.38

Tc = (0.4027) i^-.38 x 60

Trial Tc	i	Calc Tc
13	6.3	12.0
11.5	6.1	12.2

Tc = 12.2 min.

Q = CiA

Q = (0.30)(6.1)(0.49)

i = 6.1 in/hr.

Q = 0.9 cfs

CALCULATION OF Tc,i & Q FOR RATIONAL METHOD

Project Name: McKellips Road @ 84th Street (Granite Reef Wash) Client Name: MCHD

INCA Project No. 692102 Client Project No. 68736/1991-12

Calculated by: J. Lynck Date: 11-14-91

Checked by: _____ Date: _____

Watershed: Drainage Area No. 9

Rainfall Frequency: 100 - year

A = 0.49 ac.

L = 0.100 mi.

S = 33.3 ft/mi.

i : from Fig. 3.2: Rainfall Intensity-Duration-Frequency Relationship, Phoenix Metro Area (Fig.____)(See below)

C = 0.38 (from Table 3.2: Coefficients for Use with the Rational Formula) (Fig.____)

Kb = m log A + b

Kb = (-0.00625) log (0.49) + (0.04)

Kb = 0.0419

$$Tc = 11.4\,L^{.50}\,Kb^{.52}\,S^{-.31}\,i^{-.38}$$

$$Tc = (0.2611)\,i^{-.38} \times 60$$

Trial Tc	i	Calc Tc
9	7.2	7.4
7	8.0	7.1

Tc = 7.1 min.

Q = CiA

Q = (0.38)(8.0)(0.49)

i = 8.0 in/hr.

Q = 1.5 cfs

CALCULATION OF Tc,i & Q FOR RATIONAL METHOD

Project Name: McKellips Road @ 84th Street (Granite Reef Wash) Client Name: MCHD

INCA Project No. 692102 Client Project No. 68736/1991-12

Calculated by: J. Lynck Date: 11-14-91

Checked by: _____ Date: _____

Watershed: Drainage Area No. 10

Rainfall Frequency: 100 - year

A = [illegible] ac.

L = 0.333 mi.

S = 23.3 ft/mi.

i : from Fig. 3.2: Rainfall Intensity-Duration-Frequency Relationship, Phoenix Metro Area (Fig._____)(See below)

C = 0.95 (from Table 3.2: Coefficients for Use with the Rational Formula) (Fig._____)

Kb = m log A + b

Kb = (-0.00625) log (0.37) + (0.04)

Kb = 0.2472

Tc = 11.4 $L^{.50}$ $Kb^{.52}$ $S^{-.31}$ $i^{-.38}$

Tc = (0.2472) $i^{-.38}$ x 60

Trial Tc	i	Calc Tc
7	8.0	6.7
6.6	8.1	6.7

Tc = 6.7 min.

Q = CiA

Q = (0.95)(8.1)(0.37)

i = 8.1 in/hr.

Q = 2.8 cfs

CALCULATION OF Tc,i & Q FOR RATIONAL METHOD

Project Name: McKellips Road @ 84th Street (Granite Reef Wash) Client Name: MCHD

INCA Project No. 692102 Client Project No. 68736/1991-12

Calculated by: J. Lynck Date: 11-14-91

Checked by: _____ Date: _____

Watershed: Drainage Area No. 11

Rainfall Frequency: 100 - year

A = 0.44 ac.

L = 0.105 mi.

S = [illegible] ft/mi.

i : from Fig. 3.2: Rainfall Intensity-Duration-Frequency Relationship, Phoenix Metro Area (Fig._____)(See below)

C = 0.95 (from Table 3.2: Coefficients for Use with the Rational Formula) (Fig._____)

Kb = m log A + b

Kb = (-0.00625) log (0.44) + (0.04)

Kb = 0.0422

$Tc = 11.4\,L^{.50}\,Kb^{.52}\,S^{-.31}\,i^{-.38}$

$Tc = (0.0265)\,i^{-.38} \times 60$

Trial Tc	i	Calc Tc
7	8.0	7.3
7.5	7.8	7.4

Tc = 7.4 min.

i = 7.8 in/hr.

Q = CiA

Q = (0.95)(7.8)(0.44)

Q = 3.3 cfs

Sheet No.____ of ____

CALCULATION OF Tc,i & Q FOR RATIONAL METHOD

Project Name: McKellips Road @ 84th Street (Granite Reef Wash) Client Name: MCHD

INCA Project No. 692102 Client Project No. 68736/1991-12

Calculated by: J. Lynck Date: 11-14-91

Checked by: _____ Date: _____

Watershed: Drainage Area No. 12

Rainfall Frequency: 100 - year

A = 0.42 ac.

L = 0.086 mi.

S = 5.3 ft/mi.

i : from Fig. 3.2: Rainfall Intensity-Duration-Frequency Relationship, Phoenix Metro Area (Fig._____)(See below)

C = 0.30 (from Table 3.2: Coefficients for Use with the Rational Formula) (Fig._____)

Kb = m log A + b

Kb = (-0.00625) log (0.42) + (0.04)

Kb = 0.0424

$$Tc = 11.4\, L^{.50}\, Kb^{.52}\, S^{-.31}\, i^{-.38}$$

$$Tc = (0.3851)\, i^{-.38} \times 60$$

Trial Tc	i	Calc Tc
10	6.9	11.1
12	6.5	11.3
11.3	6.2	11.6

Tc = 11.5 min.

i = 6.3 in/hr.

Q = CiA

Q = (0.30)(6.3)(0.42)

Q = 0.8 cfs

CALCULATION OF Tc,i & Q FOR RATIONAL METHOD

Project Name: McKellips Road @ 84th Street (Granite Reef Wash) Client Name: MCHD

INCA Project No. 692102 Client Project No. 68736/1991-12

Calculated by: J. Lynck Date: 11-14-91

Checked by: _____ Date: _____

Watershed: Drainage Area No. 13

Rainfall Frequency: 100 - year

A = 0.89 ac.

L = 0.146 mi.

S = 3.7 ft/mi.

i : from Fig. 3.2: Rainfall Intensity-Duration-Frequency Relationship, Phoenix Metro Area (Fig._____)(See below)

C = 0.61 (from Table 3.2: Coefficients for Use with the Rational Formula) (Fig._____)

Kb = m log A + b

Kb = (-0.00625) log (0.89) + (0.04)

Kb = 0.0403

$$Tc = 11.4\,L^{.50}\,Kb^{.52}\,S^{-.31}\,i^{-.38}$$

$$Tc = (0.4195)\,i^{-.38} \times 60$$

Trial Tc	i	Calc Tc
12	6.5	12.4
12.5	6.4	12.4

Tc = 12.4 min.

Q = CiA

Q = (0.61)(6.4)(0.89)

i = 6.4 in/hr.

Q = 3.5 cfs

CALCULATION OF Tc,i & Q FOR RATIONAL METHOD

Project Name: McKellips Road @ 84th Street (Granite Reef Wash) Client Name: MCHD

INCA Project No. 692102 Client Project No. 68736/1991-12

Calculated by: J. Lynck Date: 11-14-91

Checked by: _____ Date: _____

Watershed: Drainage Area No. 14

Rainfall Frequency: 100 - year

A = 1.22 ac.

L = 0.129 mi.

S = 8.7 ft/mi.

i : from Fig. 3.2: Rainfall Intensity-Duration-Frequency Relationship, Phoenix Metro Area (Fig.____)(See below)

C = 0.51 (from Table 3.2: Coefficients for Use with the Rational Formula) (Fig.____)

Kb = m log A + b

Kb = (-0.00625) log (1.22) + (0.04)

Kb = 0.0375

Tc = 11.4 L^.50 Kb^.52 S^-.31 i^-.38

Tc = (0.3899) i^-.38 x 60

Trial Tc	i	Calc Tc
13	6.3	11.6
11.5	6.6	11.4

Tc = 11.4 min.

Q = CiA

Q = (0.51)(6.6)(1.22)

i = 6.6 in/hr.

Q = 4.1 cfs

CALCULATION OF Tc,i & Q FOR RATIONAL METHOD

Project Name: McKellips Road @ 84th Street (Granite Reef Wash) Client Name: MCHD

INCA Project No. 692102 Client Project No. 68736/1991-12

Calculated by: J. Lynck Date: 11-14-91

Checked by: _____ Date: _____

Watershed: Drainage Area No. 15

Rainfall Frequency: 100 - year

A = 0.21 ac.

L = 0.015 mi.

S = 26.3 ft/mi.

i : from Fig. 3.2: Rainfall Intensity-Duration-Frequency Relationship, Phoenix Metro Area (Fig._____)(See below)

C = 0.95 (from Table 3.2: Coefficients for Use with the Rational Formula) (Fig._____)

Kb = m log A + b

Kb = (-0.00625) log (0.21) + (0.04)

Kb = 0.0442

$Tc = 11.4\ L^{.50}\ Kb^{.52}\ S^{-.31}\ i^{-.38}$

$Tc = (0.0736)\ i^{-.38} \times 60$

Trial Tc	i	Calc Tc
5	9.0	2.4

Tc = 5.0 min.

i = 9.0 in/hr.

Q = CiA

Q = (0.95)(9.0)(0.21)

Q = 1.8 cfs

APPENDIX "G"

Head Losses for Storm Drain System
Hydraulics at Inlet End of New Box culvert

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Sheet No ____ of ____
Job Number [illegible]

TITLE McKellips Rd. @ Granite Reef Wash-II-IGT [illegible]
SUBJECT Head Losses For Storm Drain System
MADE BY JLL DATE 3/6/92 CHECKED BY ____ DATE ____

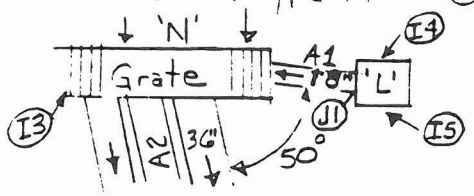
The Head Losses will be calculated using the [illegible] Manual for Maricopa Co., Ariz., Vol. II Hydraulics

1. Design Assumptions: Square or Rectangular Manhole with no [illegible] or curved bottom [illegible] square-edged entrance charts will be used.

[illegible] Loss Calculations

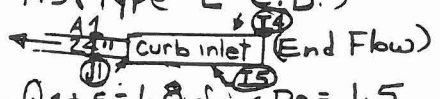
A. For Line 'A' - Storm Drain System on W. side of Granite Reef Wash

1. For Inlet # I-3 (Type 'N' C.B.)



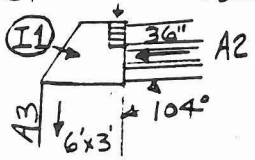
from pg. 13 : $Q_L + Q_G = Q_o$, $Q_L = 1.8$ cfs, $Q_G = 62.7$ [illegible]
$Q_L/Q_o = 1.8/64.5 = 0.03$, $Q_G/Q_o = 62.7/64.5 = 0.97$
$D_L/D_o = 18/36 = 0.50$
$V = 3.$ fps, $\therefore V^2/2g = 0.2$, $d = 2.83'$, $D_u/D_o =$ [illegible]
try $d = 3.9'$, $d/D_o = 3.9/3.0 = 1.3$
$K_L = 2.0$ for pipe $+ 1.0$ for grate $= 3.0$
K_{bend} for $130° = 40° = 0.32'$ (from Fig. 4.16)
Total $h_\ell = (3.0 + 0.32)(0.22') = 0.73'$

2. For Inlet # I-4&5 (Type 'L' C.B.)



from pg. 13, $Q_{4+5} = 1.8$ cfs, $D_o = 1.5$
for $d = 3.77'$, $V = 1.0$ fps $\therefore V^2/2g = 0.02$, try $d = 3.9'$
for $d/D_o = 2.5$, $K_g = 4.6$
$h_g = 4.6(0.02) = 0.09' + 3.77' = 3.86'$ OK

3. For Inlet # I-1 (Junction Structure w/ Grate)



from Fig. 4.10: $Q_u/Q_o = 64.5/69.7 = 0.93$, use 0.9
$D_u/D_o = 3.0/3.0 = 1$, $K_u = 0.5$, $d/D_o < 1$ $\therefore$ no increment
Grate Inflow is negligible $\therefore K_G = 0.$

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Sheet No 2 of _____
Job Number 692102

TITLE McKellips Rd. @ Granite Reef Wash - MCDot 68736
SUBJECT Head Losses For Storm Drain System
MADE BY JLL DATE 3/6/92 CHECKED BY _____ DATE _____

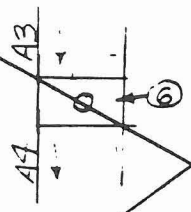
3. cont'd.

For bend = 76°, Deflector Pipe, $K_b = 0.7$

Total $K = 0.7 + 0.5$

$h_f = 1.2 \times V^2/2g\ (2.9^2/64.4) = 0.16'$

~~4. For Inlet # A-6 (Curb Opening Inlet)~~

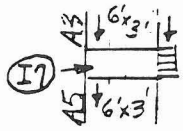


~~from Fig. 4.3:~~

~~$D_u/D_o = 1.0$, $A/D_u = 4/3.5 = 1.1$ ∴ $K_u = 0.1$~~

~~$h_f = K_u \times V^2/2g = 0.1 \times (4.1^2/64.4) = 0.03'$~~

5. For Inlet # I-7 (Junction Structure w/Grate)



from Fig. 4.9

$D_u/D_o = 1.0$, $Q_G/Q_o = 0.60/70.3 = 0.009$, use 0

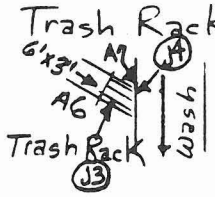
$K_u = 0.1$ ∴ $h_f = 0.1 \times (2.9^2/64.4) = 0.01'$

6. For Pipe Bend (# J-2)

from Fig. 4.16, for $r/D \geq 6$, $K_b = 0.06$

$h_b = 0.06\ (2.9^2/64.4) = 0.01'$

7. For Trash Rack



For $Q_{10} = 68.2$ cfs

For Trash Rack: $W = 1'' = 0.08'$, $X = 3'' = 0.25$.

Circular, $\theta_g = 44°$

from Fig 4.72, $F^* = 9$

from Eq. 4.10, $H_g = 9 \times 1.79 \times \left(\frac{0.08}{0.25}\right)^{4/3} \times \left(\frac{2.9^2}{64.4}\right) \times \sin 44° = 0.32'$

Approach $\phi = 0°$; Loss Factor (Table 4.5) $= 0.4 \times 0.32 = 0.13'$

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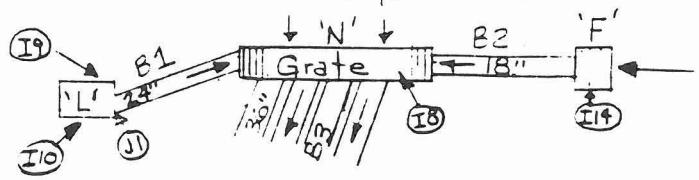
Sheet No 3 of _____
Job Number 692102

TITLE McKellips Rd. @ Granite Reef Wash - MCDOT 68736
SUBJECT Head Losses For Storm Drain System
MADE BY JLL DATE 3/6/92 CHECKED BY _____ DATE _____

B. For Line 'B' - Storm Drain System on E. Side of Granite Reef Wash

1. For Inlet # I8 (Type 'N' C.B.)



a. for Run F 1: from Fig 4.11; $Q_G + Q_R + Q_L = Q_o$

$Q_L = 2.6$ cfs, $Q_R = 2.5$ cfs, $Q_G = 98.7$, $Q_o = 103.8$ cfs

$V_L = 2.1$ fps, $V_R = 2.1$ fps ∴ $K_R = 1.3$

for H&L; $D_{inv}/D_o = 0.5$, $Q_{inv}/Q_o = 2.5/103.8 = 0.02$, use 0.1 (2.6)

H (for $D_{inv}/D_{RV} = 1.0$ & $Q_{inv}/Q_o = 0.1$) = Use 2.0

L (for $D_{RV}/D_o = 0.5$ & $Q_{RV}/Q_o = 0.1$) = 0.25

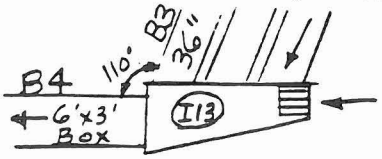
$K_L = H - L = 1.75$

$h_{L=R} = 1.75 \times (3.7^2/64.4) = 0.38'$

2. For Inlet # I9 & I10 (Type 'L' C.B.) (see sketch above)
from Fig. 4.7 (End Flow)
for $d = 3.6'$, $d/D_o = 3.6/1.5 = 2.4$, $K_g = 5.2$
$h_g = 5.2 \times (1.5^2/64.4) = 0.18' + 3.43' = 3.61'$ OK

3. For Inlet # I14 (Type 'F' C.B.) (see sketch above)
From Fig. 4.7 (Side Flow)
max. $d = 3.9'$ $d/D_o = 3.9/1.5 = 2.6$ ∴ $K_G = 3.6$
$h_g = 3.6 \times (1.4^2/64.4) = 0.11'$

4. For Inlet # I13 (Junction Structure w/Grate)



From Fig. 4.9 $Q_u/Q_o = 103.8/107.4 = 0.97$, $D_u/D_o = 3.0/3.0 = 1.0$
∴ $K_u = 0.25$

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Sheet No ___ of ___

Job Number [illegible]

TITLE McKellips Rd @ Granite Roof Wash - MCDOT 68736

SUBJECT Head Losses For Storm Drain System

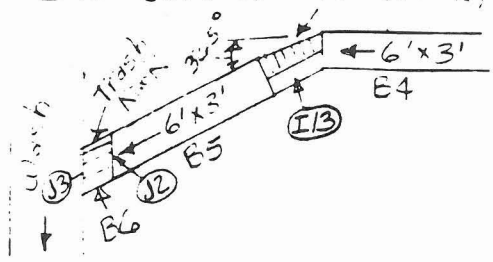
MADE BY JLL DATE 3/6/92 CHECKED BY ___ DATE ___

Grate Inflow is negligible, use $K_G = 0.1$

For $K_{bend} = 70°$, $K_b = 0.64$ (from Fig. 4.16, Deflector)

Total $h_e = (0.5 + 0.1 + 0.64) \times 4.5^2/2g = 0.31'$

5. For Inlet #I-13 (Junction structure [illegible])



From Fig. 4.9 $D_u/D_o = 1.0$, $Q_u/Q_o = 107.4/107.9 = 1.0$

$K_u = 0.1$, for $K_{bend} = 32.5°$, $K_b = 0.16$ (Fig. 4.16 - Deflector)

$h_e = (0.1 + 0.16)(4.5^2/64.4) = 0.09'$

6. For Trash Rack Losses (#J2) (see sketch above)

for Trash Rack: $E^* = 9$, see sht. 2 - no. 7)

$H_e = 9 \times 1.09 \times \left(\frac{0.33}{0.75}\right)^{4/3} \times \left(\frac{4.5^2}{64.4}\right) \times \sin 40° = 0.72'$

For Approach $\phi = 0°$, Loss Factor $= 0.4 \times 0.72' = 0.29'$

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Sheet No 1 of _____

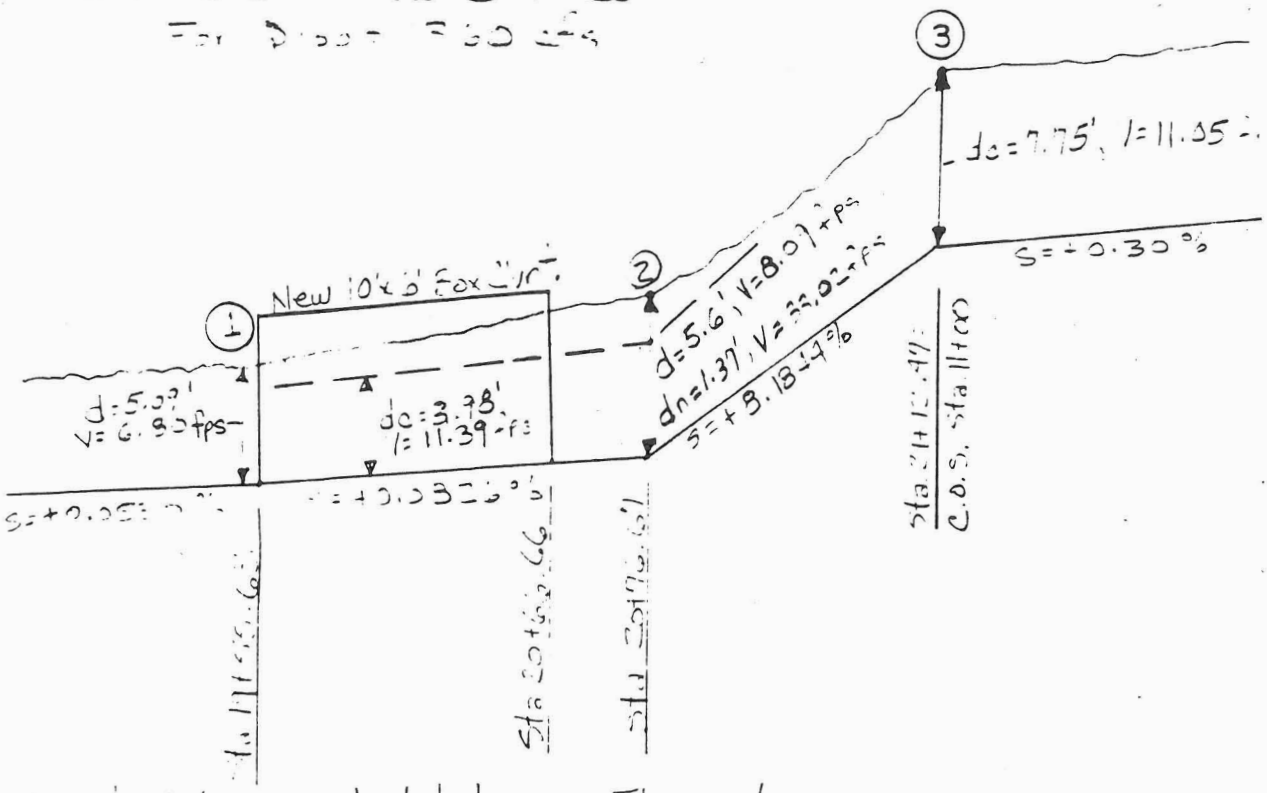
Job Number 692102

TITLE McKellips Rd [illegible] Road [illegible]

SUBJECT Hydraulics @ Inlet End of New Box Culvert

MADE BY [illegible] DATE 2/17/92 CHECKED BY _____ DATE _____

Determine Whether a Hydraulic Jump Occurs at Inlet End of New Box Culvert For Q100 = 650 cfs



The dn & V are calculated using Flowmaster

The dc & V's are taken from HEC-2 runs of 1/16/92 & 2/17/92.

The pertinent areas of each are attached.

For Sec. 1

Froude No. = $V/(gD)^{0.5} = 6.80/(g \times 5.09')^{0.5} = 0.53$ ∴ subcritical

For Sec. 2 : Froude No. = $8.09/(g \times 5.60')^{0.5} = 0.60$ ∴ subcritical

at critical depth : Froude No. = $11.39/(g \times 3.98')^{0.5} = 1.01$ ∴ Transition Area

For Sec. 3 : Froude No. = $11.05/(g \times 7.75)^{0.5} = 0.70$ ∴ Subcritical

Froude No. @ dn = 4.97 ∴ Supercritical

Conclusion

A hydraulic jump probably does occur, due to the shortness of the steep slope, the normal depth of 1.37' probably would not be reached and due to the backwater effect of the channel & box culvert the depth of the run off would probably cause the jump to be in a drowned condition and should probably occur inside the box culvert.

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

*PROF 1

*SECNO 2066.000
3720 CRITICAL DEPTH ASSUMED

3685 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 87.50 ELREA= 87.50

2066.000	3.98	84.68	84.68	85.00	86.69	2.01	.00	.00	80.70
1360.0	.2	1360.0	.0	.0	119.5	.0	.0	.0	80.70
.00	.00	11.39	.00	.000	.015	.000	.000	80.70	1997.00
.002093	0.	0.	0.	0	10	0	.00	30.00	2027.00

*SECNO 2112.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3093 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

2112.000	7.75	91.33	91.33	.00	93.14	1.76	.08	.00	89.80
1360.0	74.7	1232.5	25.3	23.3	114.0	7.6	.1	.0	90.20
.00	2.39	11.03	3.42	.025	.015	.017	.000	83.63	1987.00
.001349	43.	45.	45.	20	13	0	.00	53.02	2040.02

*SECNO 2212.000

2212.000	7.92	91.85	.00	.00	93.29	1.43	.15	.00	89.90
1360.0	111.1	1202.4	46.5	40.3	118.4	12.0	.5	.2	90.10
.00	2.76	10.15	3.28	.025	.015	.017	.000	83.93	1986.99
.001289	100.	100.	100.	5	0	0	.00	53.04	2040.03

*SECNO 2312.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3093 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

2312.000	7.66	91.39	91.89	.00	93.59	1.70	.14	.00	90.40
1360.0	82.2	1238.0	39.8	31.7	113.2	10.1	.9	.3	90.40
.01	2.59	10.94	3.95	.025	.015	.017	.000	84.23	1986.99
.001602	100.	100.	100.	20	8	0	.00	53.03	2040.02

SECNO 2412.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL

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

EXCAVATION DATA
AEX= 242.03Q-FT VEXR= .9K*CU-YD VEXT= 4.8K*CU-YD

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 89.97 ELREA= 87.64

1900.000	5.12	85.69	.00	.00	86.16	.47	.05	.01	89.97
1360.0	.0	1360.0	.0	.0	246.1	.0	5.5	1.7	87.64
.05	.00	5.53	.00	.000	.015	.000	.000	80.57	1932.62
.000483	100.	100.	100.	1	0	0	.00	56.00	1988.61

CCHV= .600 CEHV= .300
*SECNO 1945.000

3301 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .70

1945.000	7.00	85.69	.00	.00	86.30	.61	.03	.11	80.60
1360.0	132.5	1039.9	187.6	32.5	153.0	45.0	5.7	1.8	80.60
.05	4.03	6.33	4.17	.020	.020	.020	.000	80.60	1927.25
.000954	45.	45.	45.	1	0	0	.00	60.40	1987.65

SPECIAL CULVERT

BC	CUNO	CONV	ENTLC	COFQ	RDLCN	RISE	SPAN	CULVLN	CHRT	SCL	ELCHU	ELCHD
	3	.012	.20	3.00	.00	6.00	10.00	111.00	11	4	80.70	80.60

CHART 11 - BOX CULVERT; SKEWED HEADWALL; CHAMFERED OR BEVELED INLET EDGES
SCALE 4 - HEADWALL SKEWED 10 TO 45 DEGREES; INLET EDGES BEVELED

5140, NORMAL DEPTH EXCEEDS CULVERT HEIGHT
1490 NH CARD USED
*SECNO 2060.000

SPECIAL CULVERT OUTLET CONTROL
EGIC = 87.034 EGOC = 87.319 PCWSE= 85.689 ELTRD= 87.400

SPECIAL CULVERT

EGIC	EGOC	H4	QWEIR	QCULV	VCH	ACULV	ELTRD	WEIRLN
87.03	87.32	1.02	0.	1360.	8.085	180.0	87.40	0.

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 87.50 ELREA= 87.50

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALCB	ACH	ARCB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST
2066.000	5.60	86.30	.00	.00	87.32	1.02	1.02	.00	80.70
1360.0	.0	1360.0	.0	.0	168.2	.0	6.2	1.9	80.70
.05	.00	8.09	.00	.000	.015	.000	.000	80.70	1997.00
.000669	111.	111.	111.	3	0	0	.00	30.00	2027.00

SECNO 2112.000
385 20 TRIALS ATTEMPTED WSEL,CWSEL
393 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

2112.000	7.79	91.42	91.42	.00	92.84	1.43	.05	.33	89.80
1360.0	160.3	1162.0	37.6	29.9	114.7	7.8	6.4	1.9	90.20
.05	5.37	10.13	4.81	.015	.020	.015	.000	83.63	1987.00
.002446	45.	45.	45.	20	17	0	.00	53.02	2040.02

SECNO 2212.000

301 HV CHANGED MORE THAN HVINS

302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.69

2212.000	8.92	92.85	.00	.00	93.46	.61	.13	.49	89.90
1360.0	347.3	926.7	85.5	68.1	136.3	18.9	6.8	2.1	90.10
.06	5.11	6.80	4.51	.015	.020	.015	.000	83.93	1986.97
.000852	100.	100.	100.	6	0	0	.00	53.07	2040.04

SECNO 2312.000

2312.000	8.70	92.93	.00	.00	93.63	.70	.09	.07	90.40
1360.0	314.6	962.4	82.9	60.8	131.9	17.4	7.3	2.2	90.40
.06	5.18	7.30	4.77	.015	.020	.015	.000	84.23	1986.97
.001035	100.	100.	100.	2	0	0	.00	53.07	2040.04

SECNO 2412.000

2412.000	8.49	93.02	.00	.00	93.80	.78	.11	.06	90.70
1360.0	294.8	986.9	78.3	55.9	128.1	15.9	7.8	2.3	90.70
.07	5.27	7.70	4.91	.015	.020	.015	.000	84.53	1986.97
.001196	100.	100.	100.	0	0	0	.00	53.06	2040.04

Rectangular Channel Analysis & Design
Open Channel - Uniform Flow

Work sheet Name:

Connect In Flow @ Box Culvt. Inlet (NOT possible)

Solve For Depth

Given Input Data:

Bottom Width..... 10.00 ft
Manning's n..... 0.017
Channel Slope..... 0.0013 ft/ft
Discharge..... 1000.00 cfs

Computed Results:

Depth..... 1.37 ft
Velocity..... 33.02 fps
Flow Area..... 41.19 sf
Flow Top Width..... 30.00 ft
Wetted Perimeter..... 32.75 ft
Critical Depth..... 4.00 ft
Critical Slope..... 0.0018 ft/ft
Froude Number..... 4.97 (Flow is Supercritical)

APPENDIX "H"

Figures from Drainage Design Manual for Maricopa County, Arizona, Volume II, Hydraulics

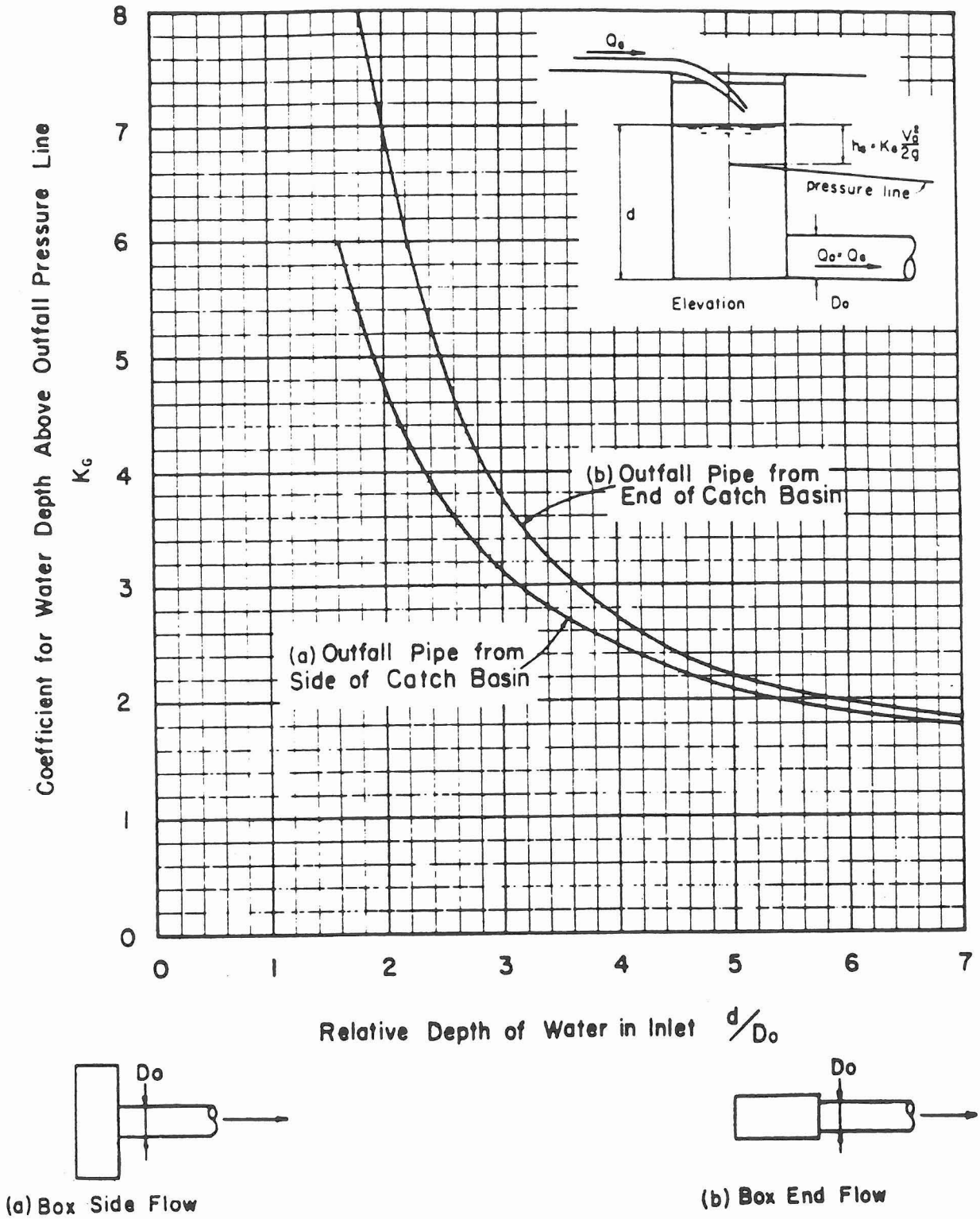


Figure 4.7
Catch Basin with Inlet Flow Only

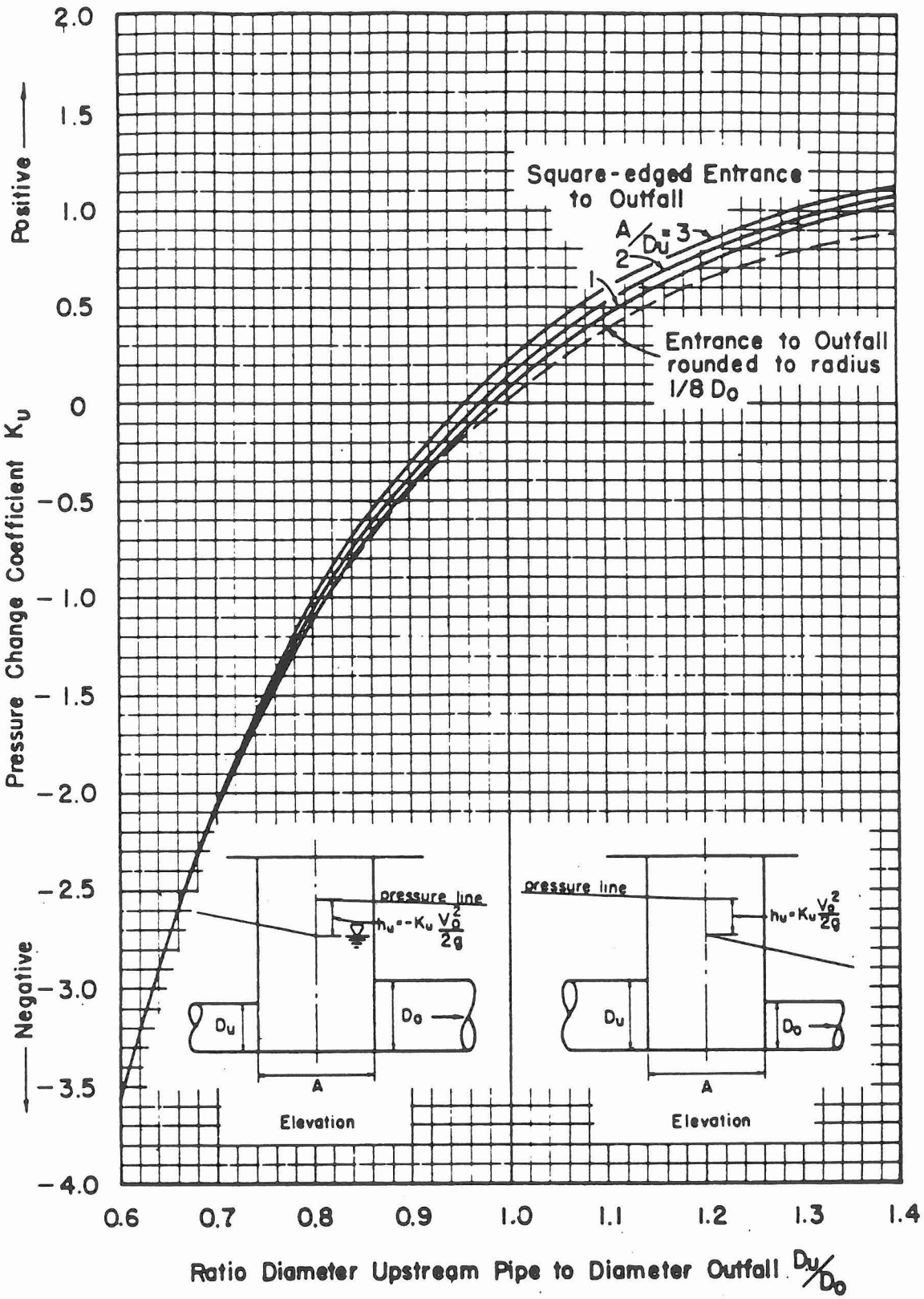
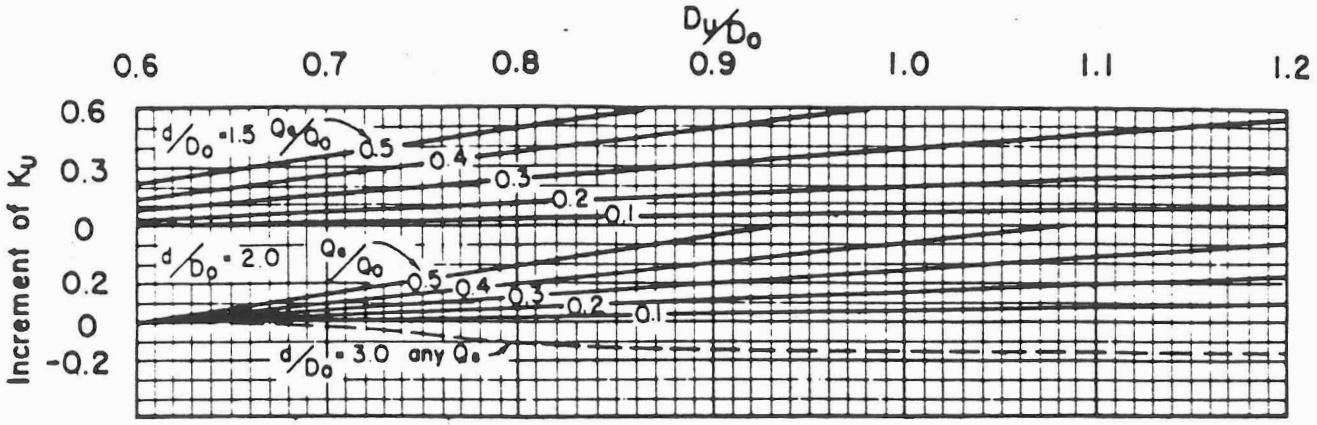


Figure 4.8
Flow Straight Through Any Manhole



Supplementary Chart for Modification of K_u for Depth in Inlet other than $2.5\,D_o$

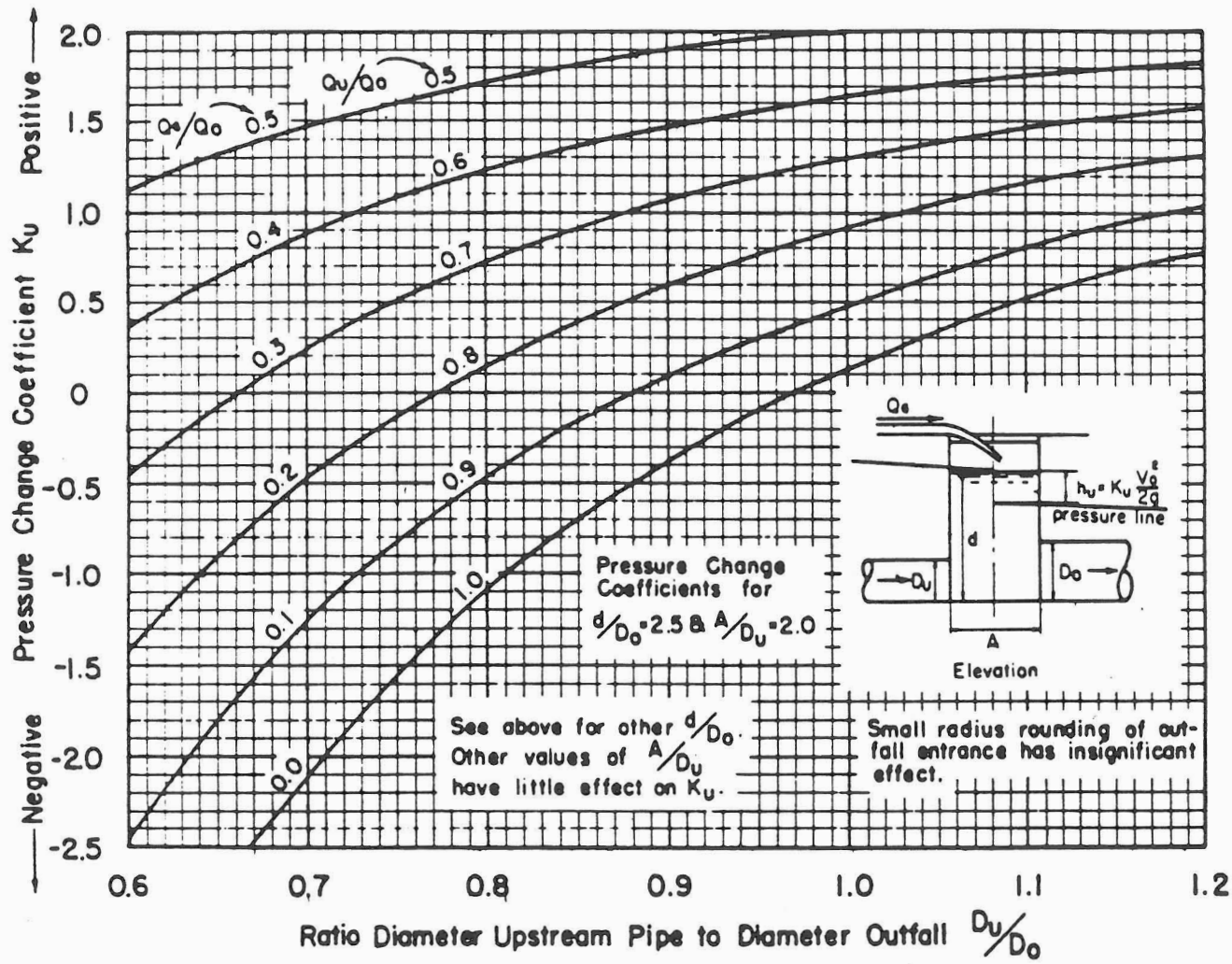
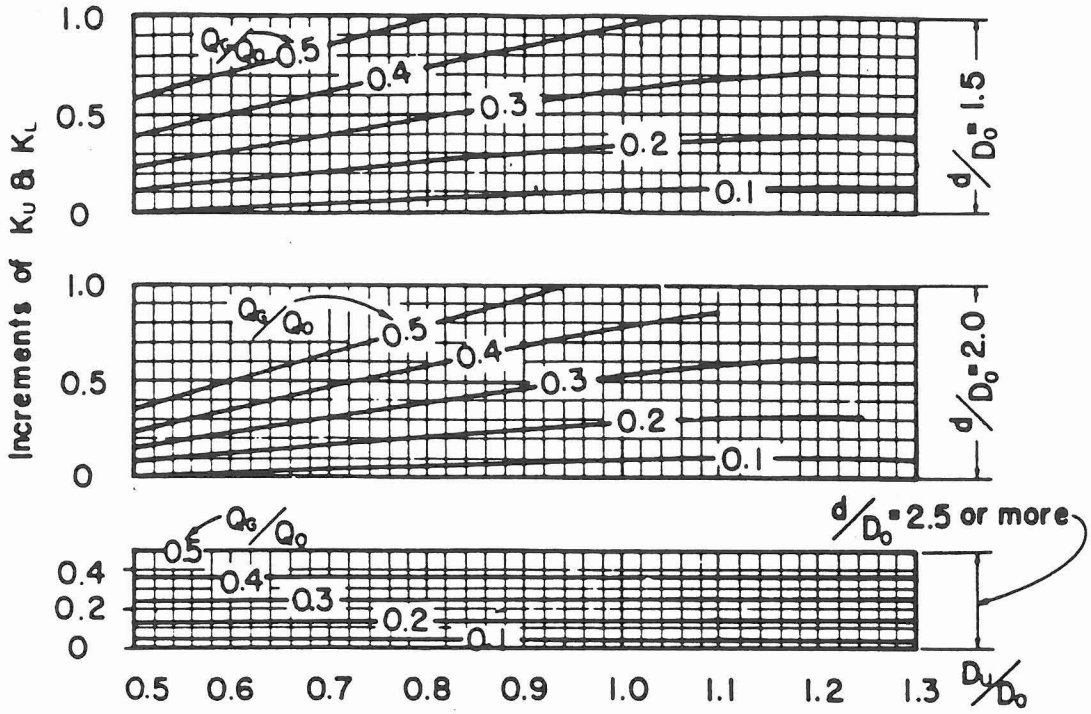


Figure 4.9
Rectangular Manhole with Through Pipeline and Inlet Flow



Supplementary Chart for Modification of K_U & K_L for Grate Flow

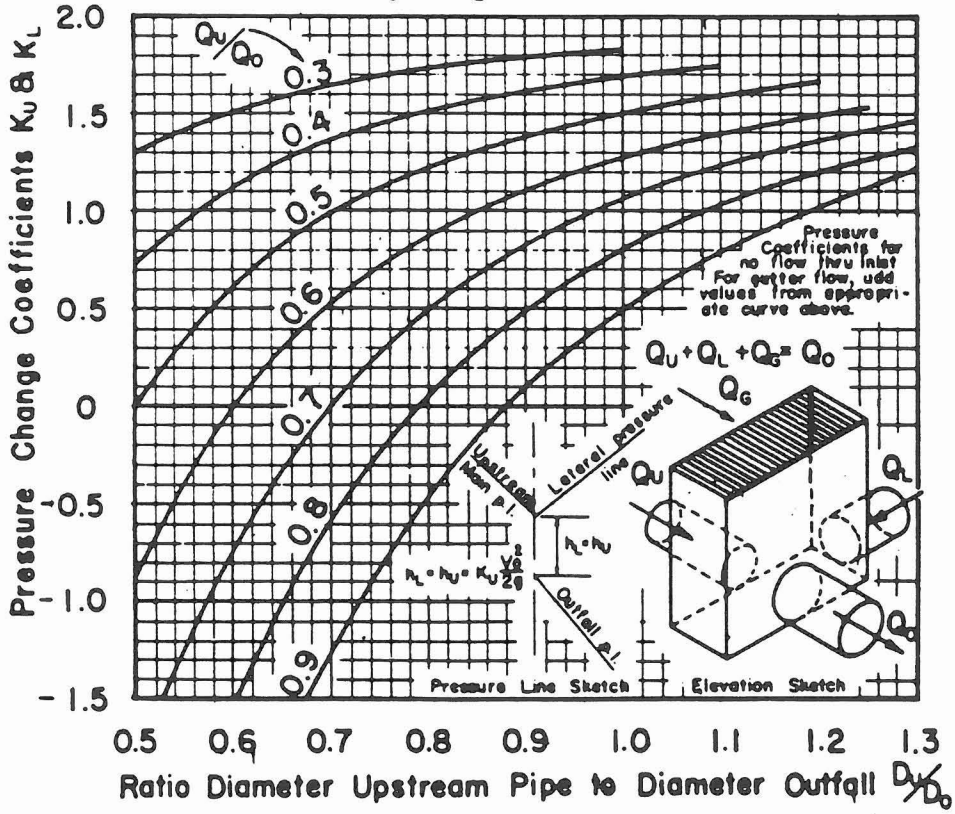


Figure 4.10
Rectangular Manhole with In-line Upstream Main and 90 Degree Lateral Pipe
(With or Without Inlet Flow)

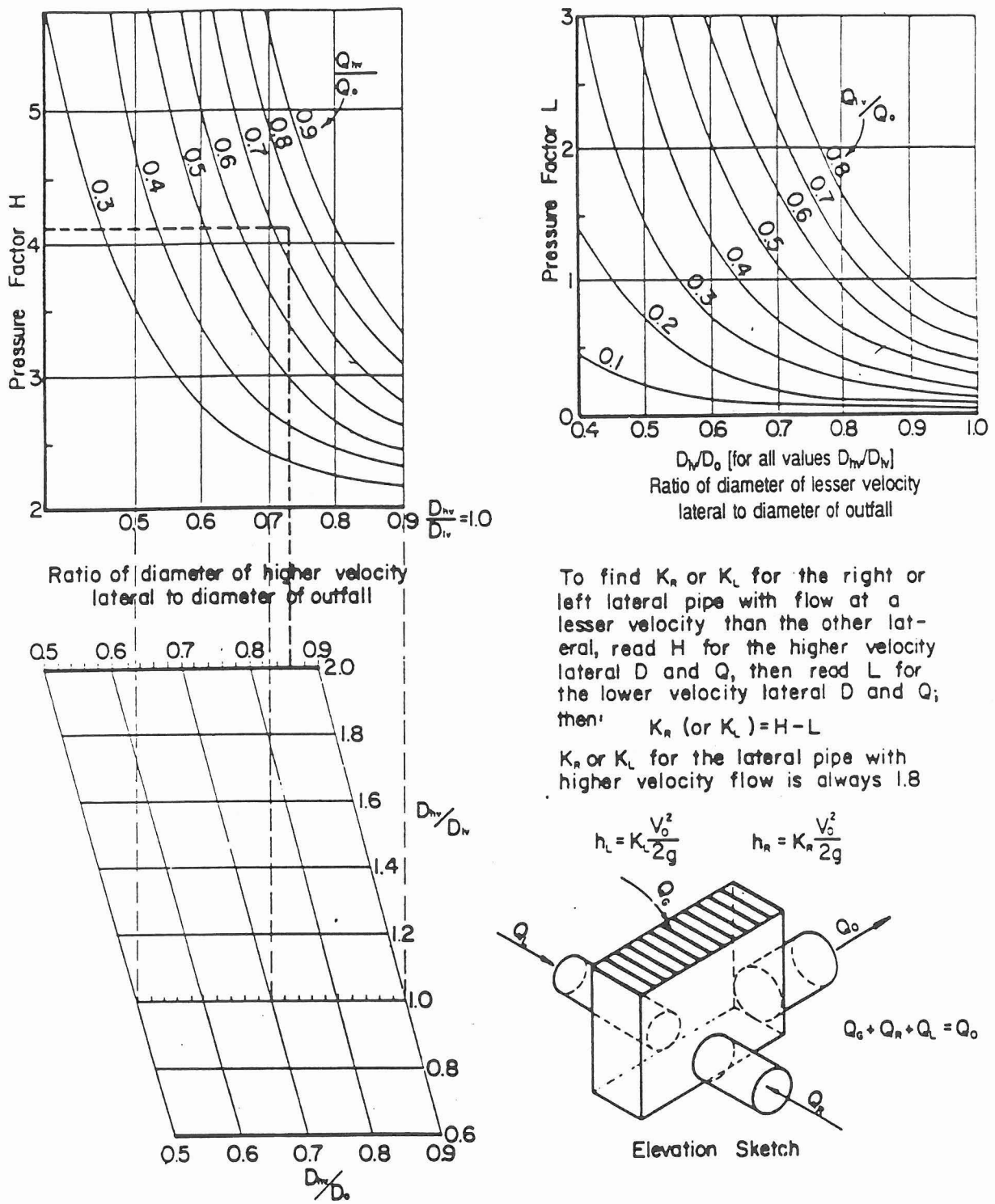


Figure 4.11
Rectangular Manhole with In-line Opposed Lateral Pipes Each at 90 Degrees to Outfall (With or Without Grate Flow)
(University of Missouri 1958)

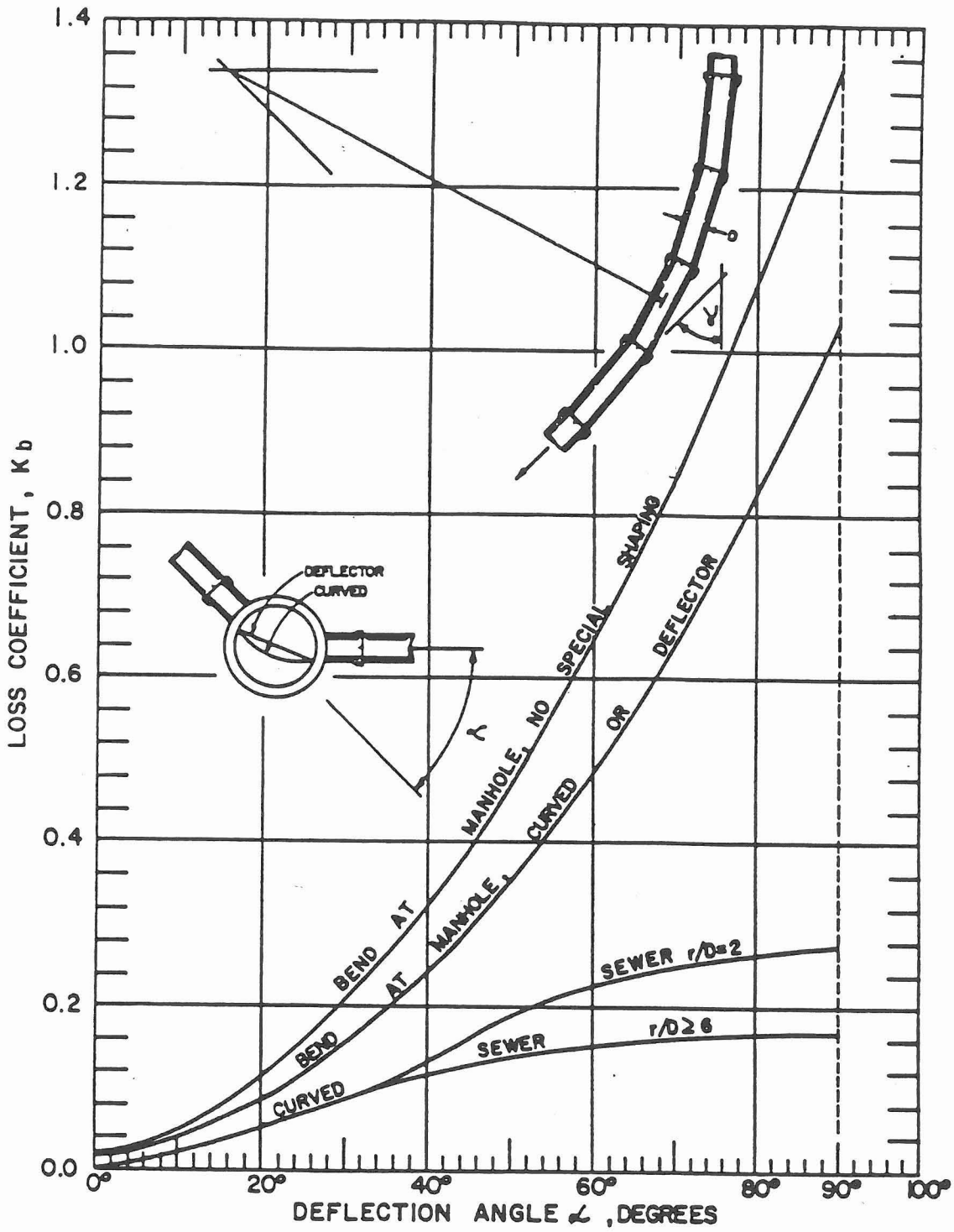


Figure 4.16
Sewer Bend Loss Coefficient
(University of Missouri 1958)