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Registered Professional Engineer (Civil)
CERTIFICATE NO.
20869
MIKE P.
LOKEY
Date Signed 5-13-91
ARIZONA, U.S.A.

APPENDICES TO:

DRAINAGE REPORT FOR BELL ROAD

SECTION 6

Prepared by:

DONOHUE & ASSOCIATES, INC.
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PHOENIX, AZ 85016

MAY 13, 1991

LIST OF APPENDICES

APPENDIX 1 - DRAINAGE DESIGN CRITERIA
APPENDIX 2 - HEC-I MODEL INPUT/OUTPUT
APPENDIX 3 - CATCH BASIN INLET CAPACITY/SIZE DETERMINATIONS
APPENDIX 4 - THYSYS PROGRAM INPUT/OUTPUT AND DOCUMENTATION
APPENDIX 5 - STORM DRAIN PLAN, PROFILE, AND HGL'S
APPENDIX 6 - CORRESPONDENCE
APPENDIX 7 - HEC-II MODEL INPUT/OUTPUT
APPENDIX 8 - BRIDGE SCOUR COMPUTATIONS AND SOILS REPORT EXCERPTS
APPENDIX 9 - BRIDGE MODIFICATION DETAILS

APPENDIX 1

DRAINAGE DESIGN CRITERIA

PAVEMENT DRAINAGE

A. Hydrology

1. Design frequencies: 10-year storm for Maricopa County and City of Glendale; 2-year storm for City of Peoria and City of Phoenix.

2. Precipitation values: City of Phoenix rainfall intensity, duration and frequency curves.

3. Hydrologic methodology: Rational Method.

4. Runoff coefficients:

a.	Paved surfaces (Asphalt or Concrete)	0.9
b.	Earthen Ditches, Desert Landscaping	0.6

5. Times of concentration: sum of gutter flow or 10 minutes minimum.

6. Landscaped medians will retain all direct precipitation.

B. Hydraulic Design

1. Allowable spread: 2 lanes in each direction of Bell road must remain open during the design storm event.

2. Maximum allowable depth: 0.5 feet.

3. Spread and depth calculations: F.H.W.A. HEC No. 12.

4. Inlet, catch basin analysis: F.H.W.A. HEC No. 12.

5. Catch basin inlet clogging factors:

a.	Curb-opening inlets on a continuous grade	0.25
b.	Inlets in sag locations	0.50
c.	Grate inlets on a continuous grade	0.50
d.	Combination Inlets	F.H.W.A. HEC No. 12

6. Manning's "n":

a.	Asphaltic concrete	0.016
b.	Concrete pavement	0.013
c.	Composite asphalt pavement with concrete gutter	0.016

STORM DRAIN DESIGN

A. Hydrology

1. Design frequencies: 10-year, 24-hour storm for Maricopa County; 2-year, 24-hour storm for City of Peoria and City of Phoenix; 10-year, 2-hour storm for City of Glendale.

2. Hydrologic methodology: HEC-I.

B. Hydraulic Design

1. Method for hydraulic grade line analysis: Manning's Equation for friction losses, pressure and momentum method to analyze losses at bends, junctions, transitions and manholes.

2. Manning's "n":

a.	Concrete pipe (RCP)	0.013
b.	Concrete pipe (CIPP)	0.015
c.	Corrugated metal pipe	0.024

3. Minimum velocities:

a.	Lateral	3 fps
b.	Trunk	5 fps

4. Minimum pipe size:

a.	Laterals	15"
b.	Trunk	18"

5. Freeboard: hydraulic grade line must be 0.5 feet or more below gutter at intermediate inlets, and 3 feet or more below gutter at the uppermost inlet in a system.

6. Manhole intervals (City of Glendale):

a.	Under 36"	400 feet
b.	36" and greater	660 feet

VI. OPEN CHANNELS

A. Hydrology

1. Design frequencies: 10-year, 24-hour storm for Maricopa County; 2-year, 24-hour storm for City of Peoria and City of Phoenix; 10-year, 2-hour storm for City of Glendale.

2. Hydrologic methodology: HEC-1 with procedures as outlined in Section IX.

B. Hydraulic Design

1. Hydraulic methodology:

   Normal depth flow analysis using the Manning Equation unless complex channel geometry or flow conditions require more detailed analysis.

2. Manning's "n":

   a. Uniform earthen channels.....0.027
   b. Gunite channels.....0.020
   c. Concrete.....0.013
   d. Soil cement.....0.018
   e. Dumped rip-rap.....0.033
   f. Grouted rip-rap.....0.028

3. Velocities: Minimum and maximum allowable velocities should be evaluated on a case by case basis depending on soils, sediment conditions and proposed linings.

4. Side slopes (earthen channels): maximum 4:1, unless soil analysis indicates otherwise.

5. Freeboard:
   a. Subcritical -- 0.2 $(d + V^2/2g)$
   b. Super-critical -- 0.25d
   c. Minimum of 1.0 above HGL in all cases

6. Erosion and scour protection: F.H.W.A. HEC No. 15.

VII. DETENTION BASINS

A. Hydrology

1. Design frequencies: 10-year, 24-hour storm for Maricopa County; 10-year, 2-hour storm for City of Glendale; 2-year, 24-hour storm for City of Peoria and City of Phoenix.

2. Hydrologic methodology: HEC-1 with Modified Puls storage routing routine.

B. Hydraulic Design

1. Outlet design: inlet and outlet control analysis as per FHWA HEC No. 5.

2. Maximum depth: 10 feet.

3. Maximum side slopes: 4:1.

4. Freeboard: 1.5 feet.

5. Drain time: Within 36 hours.

6. Provisions should be made for an emergency spillway to safely convey 100-year storm outflows.

VIII. CULVERTS

A. Hydrology

1. Design frequencies: 10-year, 24-hour storm for Maricopa County and City of Glendale; 2-year, 24-hour storm for City of Peoria and City of Phoenix.

2. Hydrologic methodology:
   a. On-site -- Rational Method
   b. Off-site -- HEC-1 with procedures as outlined in Section IX

B. Hydraulic Design

1. Capacity calculations: F.H.W.A. HEC No. 5.

2. Maximum allowable headwater: One (1) foot below roadway shoulder or 1 foot below top of upstream channel bank.

3. Manning's "n":

   a. Concrete pipe/box culvert.....0.012
   b. Corrugated metal.....0.024

4. Culvert outlet protection: Ratio of outlet velocity to natural stream velocity per ADOT method.

Ratio of Outlet Velocity to Natural Stream Velocity	Outlet Protection
1.0 to 1.5	No protection required
1.5 to 2.0 with outlet velocity less than 10 fps	Dumped rock rip-rap
1.5 to 2.5 with outlet velocity greater than 10 fps	Wire tied or grouted rock rip-rap
Greater than 2.5	Concrete energy dissipator or consider larger culvert

5. Minimum size:
   a. Concrete box culvert.....6'x4'
   b. Circular pipe.....18"
   c. Elliptical Pipe.....18"x29"

IX. CRITERIA USED FOR HEC-1 COMPUTER MODELING

The following criteria were used for HEC-1 computer modeling of the selected stormwater/floodwater management plan, and should be used for consistency in developing the final plans:

- o A 24-hour storm duration

- o The City of Phoenix rainfall table for the 24-hour storm (City of Phoenix s-curve) (See Table 1).

- o The City of Phoenix precipitation depth values per Technical Memorandum WBTM WR-44 (See Table 2).

- o Precipitation depths need not be varied through the watersheds.

- o City of Phoenix curve numbers (CN's) are based on hydrologic soils groups and zoning (See Table 3). Where areas have not been identified on this table, the standard SCS techniques to develop curve numbers should be followed. For subareas within the City of Glendale, Peoria and Maricopa County, equivalent zoning classifications are translated to the City of Phoenix zoning classifications (See Table 4) and the City of Phoenix curve numbers based on hydrologic soil groups and zoning are applied.

- o The SCS unit graph method should be used for undeveloped areas only.

- o The kinematic wave method for calculating runoff should be used for developed areas. An average overland flow roughness coefficient of 0.17 should be used.

- o Two (2) different lag time equations should be used depending on the size and shape of the subareas as follows:

For small watersheds of regular shape, the following equation should be used. This is based on the SCS modified curve number method:

$$\text{Lag} = \frac{L^{0.8}(1000/CN - 9)^{0.7}}{(1900)s^{.5}}$$

where L = length of the longest watercourse (in feet)

s = the overall slope of the longest watercourse, from headwater to concentration point (in percent)

Lag = lag time (in hours)

Adjustments to lag time for this equation, based on the percent of the hydraulic length that has been modified and the percent of impervious area are made per SCS Technical Release 55, pages 3-8 and 3-9 (See Figures 1 and 2 and Table 5).

For large and/or elongated watersheds, the equation below should be used. This is based on the modified Snyders equation:

$$Lag = 24n(LL_{ca}/s^{0.5})^{0.38}$$

where L = the length of the longest watercourse (in miles)

l_{ca} = the upstream length along the longest watercourse to a point opposite the subbasin centroid (in miles)

s = the overall slope of the longest watercourse, from headwater to concentration point (in feet/mile)

n = the overland flow roughness factor for the subbasin

Lag = lag time (in hours)

Values of "n" for the above equation are as follows:

"n" values for undeveloped areas:

0.05 where slopes > 0.04'/ft
0.035 slopes from 0.01 to 0.04'/ft
0.030 slopes flatter than 0.01'/ft

"n" values for developed areas:

0.022 3-5 houses/acre
0.030 1-2 houses/acre
0.020 multiple residential and light commercial

TABLE 1

CURRENT CITY OF PHOENIX ENGINEER DEPARTMENT
24-HOUR RAINFALL DISTRIBUTION

Time (hours)	Total Rainfall %	Time (hours)	Total Rainfall %
0	0.0	12.5	83.0
.5	0.4	13.0	86.0
1.0	0.8	13.5	88.0
1.5	1.3	14.0	89.3
2.0	1.8	14.5	90.7
2.5	2.2	15.0	92.0
3.0	2.6	15.5	92.4
3.5	3.1	16.0	92.8
4.0	3.5	16.5	93.3
4.5	4.0	17.0	93.7
5.0	4.4	17.5	94.2
5.5	4.8	18.0	94.7
6.0	5.3	18.5	95.1
6.5	5.7	19.0	95.6
7.0	6.2	19.5	96.0
7.5	6.6	20.0	96.4
8.0	7.1	20.5	96.9
8.5	7.5	21.0	97.3
9.0	8.0	21.5	97.8
9.5	9.3	22.0	98.2
10.0	10.7	22.5	98.7
10.5	12.0	23.0	99.1
11.0	14.0	23.5	99.5
11.5	17.0	24.0	1.0
12.0	50.0		

TABLE 2

PHOENIX WBO RECORDS*

(24-HOUR DURATION STORM)

Return Periods, Years	Precipitation, Inches
1	1.02
2	1.44
5	2.10
10	2.53
25	3.12
50	3.57
100	4.04

*Technical Memorandum WBTM WR-44

APPENDIX 2

HEC-I MODEL INPUT/OUTPUT

Donohue
CONSULTING ENGINEERS
PHOENIX, ARIZONA

CLIENT _____ DATE _____
PROJECT _____ BY _____
PROJECT NO. _____ PAGE NO. ____

RAINFALL SUMMARY

PRECIP

Freq.	DURATION 30 min	1 hr	2 hr	24 hr
10	1.27	1.61	1.72	2.53
25	1.60	2.02	2.15	3.12
100	2.10	2.66	2.82	4.04

DISTRIBUTION

30 MIN – USE COPhx 24 dist. MODIFY BY CHANGING IN to 0.5 MIN.

2 HR – USE FCD-MC 2-HR STORM DISTRIB.

24 HR – COPhx 24 HR DIST.

$\Delta R/0$ CHARTS ~~ARE~~ USED IN HEC1 GET MULTIPLE PRECIP RATIOS for RATIONAL EQ.

from COPhx S.D.D.M., p 24
(10 yr – 30 min = 3.9 in
FCD, HDM Fig 3.2 (10-10 = 4.5

USE 4.3 in/hr

Donohue
CONSULTING ENGINEERS
PHOENIX, ARIZONA

CLIENT _____ DATE _____
PROJECT _____ BY _____
PROJECT NO. _____ PAGE NO. ____

Runoff Parameters

Kinematic Wave Reqmts (2 Run-off elements) — Area, INITABS, CN, L, S, N, %

A review of the Westcor Masterplan indicated an approx 30/70 split between Buildings & Parking

Buildings will have a run length approx 250' & slope of 1.5%. Curve Number is 95, w/ init abst. = 0.15 in

Parking will have longer run lengths, L = 400', flatter slopes ≈ 0.6%, Curve Number of 91 and init abs = 0.25 in.

Collector Channel parameters are based on assumed trunk sewer layout.

MEMORANDUM

DATE: November 19, 1990

TO: File

FROM: Burke P. Lokey

RE: Bell Road Improvements, 83rd Avenue to 67th Avenue
Donohue Project No. 16481
HEC1, Kinematic Wave Analysis

Donohue ENGINEERS ARCHITECTS SCIENTISTS

In response to comments from Dan Sherwood of Glendale and Dave Healy of Parsons Brinckerhoff Quade & Douglas, a sensitivity analysis was performed to the parameters used in the kinematic wave model for Bell Road off-site flows. A single block, "SUB 1" of the original model was isolated and used to test several of the UK and RK card parameters. These included slope, length, and roughness on the UK card and slope, bottom width, side slopes, and Manning's N for the RK card. In addition, a TR-55 model was prepared and a Rational formula value using the Tc from TR-55 procedures was calculated. The analysis showed that the RK parameters had relatively little influence on the total flow. Slope, on the UK card, had significant influence on flows, as well as length. Roughness had a lesser affect. Table 1 tabulates the UK variation and their results.

Table 1

Vary Slope	Slope (ft/ft)	Velocity (fps)	Q (cfs)
Case 1	.001	.08	102
Case 4A1	.002	.11	129
Case 4A2	.003	.13	143
Case 4A3	.005	.16	154
Case 4A4	.008	.19	163

Vary Length	Length (ft)	Q (cfs)
Case 1	230	102
Case 4B1	150	135
Case 4B2	200	113
Case 4B2	300	82

Vary Roughness	N	Velocity (fps)	Q (fps)
Case 1	.17	.08	102
Case 4C1	.15	.09	112
Case 4C2	.20	.07	89

5343 North 16th Street
Suite 400
Phoenix, Arizona 85016
602.279.3541
Fax 602.279.1334

The results of the original model agree reasonably well with the separate calculations performed using TR-55 and Rational.

Subsequent to discussions with Glendale and PBQ&D, it was agreed to increase the UK slope from 0.001 ft/ft to 0.002 ft/ft. This change was performed for the residential areas and increased the flows 30%, as shown in the output file, to 285 cfs at Bell Road and 75th Avenue.

Donohue ENGINEERS ARCHITECTS SCIENTISTS

BPL/slw

51M/MI/AT5

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*           SEPTEMBER 1990             *
*            VERSION 4.0               *
*                                      *
*  RUN DATE  05/01/1991  TIME  15:38:51 *
*                                      *
****************************************
```

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

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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
```

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

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

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

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

  1           ID            75TH AVE OUTFALL
  2           ID            10 YEAR STORM    Future Condition
  3           IT       5                     289
  4           IO       3

  5           KK    SUB1
  6           KM            HIDDEN MANOR @ Grover & 79th
  7           IN      30
  8           PB    2.53
  9           PC    .000    .004    .008    .013    .018    .022    .026    .031    .035    .040
 10           PC    .044    .048    .053    .057    .062    .066    .071    .075    .080    .093
 11           PC    .107    .120    .140    .170    .500    .830    .860    .880    .893    .907
 12           PC    .920    .924    .928    .933    .937    .942    .947    .951    .956    .960
 13           PC    .964    .969    .973    .978    .982    .987    .991    .995   1.000
 14           BA   .2599
 15           LS             84
 16           UK     230    .001     .17     100
 17           RK    1400    .003    .020   .0179    TRAP      40       3
 18           RK    2400    .007    .020   .2599    TRAP      40       3      NO

 19           KK    1350
 20           KM            ROUTE HIDDEN MANOR THRU PARK TO 1300
 21           RK    1400   .0015    .035            TRAP      50       5

 22           KK    SUB2
 23           KM            EXSTG RESID. DEV. EAST OF 75TH, NORTH OF GROVER
 24           BA   .2700
 25           LS             84
 26           UK     300    .001     .17     100
 27           RK    1200   .0025    .020   .0225    TRAP      36       4
 28           RK    2900    .005    .020    0.27    TRAP      36       4      NO

 29           KK    1355
 30           KM            ROUTE SUB2  TO 1300
 31           RK    1300    .007    .013            CIRC     4.5

 32           KK    1300
 33           KM            COMBINE SUB1 & SUB2
 34           HC       2

 35           KK    1250
 36           KM            ROUTE 1300 TO 1200
 37           RK     800   .0020    .013            CIRC       5

 38           KK   STJHN
 39           KM            Roadway Drainage from St. Johns
 40           BA   .0069
 41           LS             95
 42           UK      30     .02      .1     100
 43           RK     400  .00125    .020   .0009    TRAP      40       3
 44           RK    3200  .00125    .013   .0069    CIRC       3              NO
```

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

 45           KK    SUB3
 46           KM            EXSTG RESID. DEV. EAST OF 75TH, SOUTH OF GROVER
 47           BA   .0818
 48           LS              84
 49           UK     250    .004     .17     100
 50           RK    4200    .005    .020    .077    TRAP      32       4      NO

 51           KK    1200
 52           KM            COMBINE SUB1,2,3 & STJHN @ 1200
 53           HC       3

 54           KK    1150
 55           KM            ROUTE 1300 TO BELL
 56           RK    1800   .0020    .013            CIRC       5

 57           KK   BELLE
 58           KM            BELL ROADWAY DRAINAGE FROM SKUNK CREEK TO 75TH
 59           BA    .007
 60           LS              95
 61           UK      50    .020     .10     100    .
 62           RK     500    .005    .020  .00088    TRAP      50       3
 63           RK    2000    .005    .013            CIRC     3.0       0

 64           KK    1100
 65           KM            COMBINE BELLE AND 1100
 66           HC       2

 67           KK    1000
 68           KM            75TH AVE OUTFALL
 69           RK     900    .003    .013            CIRC     6.0
 70           ZZ
```

```
                                         ****
                   FLOOD HYDROGRAPH PACKAGE HEC-1 (IBM XT 512K VERSION) -FEB 1,1985
     U.S. ARMY CORPS OF ENGINEERS, THE HYDROLOGIC ENGINEERING CENTER, 609 SECOND STREET, DAVIS, CA. 95616
                                         ****



                           75TH AVE OUTFALL
                           10 YEAR STORM    Future Condition

  4 IO         OUTPUT CONTROL VARIABLES
                    IPRNT           3  PRINT CONTROL
                    IPLOT           0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE

    IT         HYDROGRAPH TIME DATA
                     NMIN           5  MINUTES IN COMPUTATION INTERVAL
                    IDATE      1    0  STARTING DATE
                    ITIME        0000  STARTING TIME
                       NQ         289  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE      2    0  ENDING DATE
                   NDTIME        0000  ENDING TIME

                COMPUTATION INTERVAL     .08 HOURS
                     TOTAL TIME BASE   24.00 HOURS

         ENGLISH UNITS


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

           ***************
           *             *
  5 KK     *      SUB1   *
           *             *
           ***************
                           HIDDEN MANOR @ Grover & 79th

  7 IN         TIME DATA FOR INPUT TIME SERIES
                   JXMIN           30  TIME INTERVAL IN MINUTES
                  JXDATE      1     0  STARTING DATE
                  JXTIME            0  STARTING TIME

             SUBBASIN RUNOFF DATA

 14 BA         SUBBASIN CHARACTERISTICS
                   TAREA          .26  SUBBASIN AREA

               PRECIPITATION DATA

  8 PB             STORM         2.53  BASIN TOTAL PRECIPITATION

  9 PI          INCREMENTAL PRECIPITATION PATTERN
                    .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                    .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                    .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                    .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                    .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                    .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                    .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                    .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                    .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.01	.00	.00	.01	.00	.05	.05
.06	.06	.06	.05	.06	.06	.06	.06	.05	.06
.00	.00	.01	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

```
15 LS          SCS LOSS RATE
                    STRTL        .38  INITIAL ABSTRACTION
                   CRVNBR      84.00  CURVE NUMBER
                    RTIMP        .00  PERCENT IMPERVIOUS AREA

               KINEMATIC WAVE
16 UK            OVERLAND-FLOW ELEMENT NO. 1
                        L       230.  OVERLAND FLOW LENGTH
                        S      .0010  SLOPE
                        N       .170  ROUGHNESS COEFFICIENT
                       PA      100.0  PERCENT OF SUBBASIN
17 RK            COLLECTOR CHANNEL
                        L      1400.  CHANNEL LENGTH
                        S      .0030  SLOPE
                        N       .020  CHANNEL ROUGHNESS COEFFICIENT
                       CA        .02  CONTRIBUTING AREA
                    SHAPE       TRAP  CHANNEL SHAPE
                       WD      40.00  BOTTOM WIDTH OR DIAMETER
                        Z       3.00  SIDE SLOPE
18 RK            MAIN CHANNEL
                        L      2400.  CHANNEL LENGTH
                        S      .0070  SLOPE
                        N       .020  CHANNEL ROUGHNESS COEFFICIENT
                       CA        .26  CONTRIBUTING AREA
                    SHAPE       TRAP  CHANNEL SHAPE
                       WD      40.00  BOTTOM WIDTH OR DIAMETER
                        Z       3.00  SIDE SLOPE
                   RUPSTQ         NO  ROUTE UPSTREAM HYDROGRAPH

                                                    ***

        COMPUTED KINEMATIC PARAMETERS
            ELEMENT        ALPHA        M      DT (MIN)   DX (FT)
                  1       .2772    1.667        5.00       28.75
                  3       .4929    1.536        5.00      700.00
                  4       .7528    1.536        5.00     1200.00

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

                      HYDROGRAPH AT STATION     SUB1

   TOTAL RAINFALL =    2.53, TOTAL LOSS =    1.39, TOTAL EXCESS =    1.14

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
  (CFS)       (HR)                 6-HR       24-HR       72-HR     24.00-HR
```

94.	12.92	(CFS)	25.	7.	7.	7.
		(INCHES)	.895	1.002	1.002	1.002
		(AC-FT)	12.	14.	14.	14.

CUMULATIVE AREA = .26 SQ MI

*** ***

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          **************
          *            *
 19 KK    *     1350   *
          *            *
          **************
```

ROUTE HIDDEN MANOR THRU PARK TO 1300

HYDROGRAPH ROUTING DATA

21 RK KINEMATIC WAVE STREAM ROUTING

L	1400.	CHANNEL LENGTH
S	.0015	SLOPE
N	.035	CHANNEL ROUGHNESS COEFFICIENT
CA	.00	CONTRIBUTING AREA
SHAPE	TRAP	CHANNEL SHAPE
WD	50.00	BOTTOM WIDTH OR DIAMETER
Z	5.00	SIDE SLOPE

***

KINEMATIC STREAM ROUTING USED FOR THIS REACH

COMPUTED KINEMATIC PARAMETERS

ALPHA	M	DT (MIN)	DX (FT)
.1871	1.515	5.00	700.00

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

HYDROGRAPH AT STATION 1350

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.00-HR
94.	13.00	(CFS)	25.	7.	7.	7.
		(INCHES)	.890	.995	.995	.995
		(AC-FT)	12.	14.	14.	14.

CUMULATIVE AREA = .26 SQ MI

*** ***

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          **************
          *            *
 22 KK    *     SUB2   *
          *            *
          **************
```

EXSTG RESID. DEV. EAST OF 75TH, NORTH OF GROVER

SUBBASIN RUNOFF DATA

24 BA SUBBASIN CHARACTERISTICS

TAREA	.27	SUBBASIN AREA

PRECIPITATION DATA

8 PB

STORM	2.53	BASIN TOTAL PRECIPITATION

9 PI INCREMENTAL PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.01	.00	.00	.01	.00	.06	.05
.06	.06	.06	.05	.06	.06	.06	.06	.05	.06
.00	.00	.01	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

25 LS SCS LOSS RATE

STRTL	.38	INITIAL ABSTRACTION
CRVNBR	84.00	CURVE NUMBER
RTIMP	.00	PERCENT IMPERVIOUS AREA

KINEMATIC WAVE

26 UK OVERLAND-FLOW ELEMENT NO. 1

L	300.	OVERLAND FLOW LENGTH
S	.0010	SLOPE
N	.170	ROUGHNESS COEFFICIENT
PA	100.0	PERCENT OF SUBBASIN

27 RK COLLECTOR CHANNEL

L	1200.	CHANNEL LENGTH
S	.0025	SLOPE
N	.020	CHANNEL ROUGHNESS COEFFICIENT
CA	.02	CONTRIBUTING AREA
SHAPE	TRAP	CHANNEL SHAPE
WD	36.00	BOTTOM WIDTH OR DIAMETER
Z	4.00	SIDE SLOPE

28 RK MAIN CHANNEL

L	2900.	CHANNEL LENGTH
S	.0050	SLOPE
N	.020	CHANNEL ROUGHNESS COEFFICIENT
CA	.27	CONTRIBUTING AREA
SHAPE	TRAP	CHANNEL SHAPE
WD	36.00	BOTTOM WIDTH OR DIAMETER

```
                    Z        4.00  SIDE SLOPE
               RUPSTQ          NO  ROUTE UPSTREAM HYDROGRAPH

                                                        ***

      COMPUTED KINEMATIC PARAMETERS
         ELEMENT        ALPHA        M      DT (MIN)   DX (FT)
               1       .2772    1.667        5.00       30.00
               3       .5125    1.504        5.00      600.00
               4       .7248    1.504        5.00     1450.00

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

                    HYDROGRAPH AT STATION     SUB2

  TOTAL RAINFALL =    2.53, TOTAL LOSS =    1.39, TOTAL EXCESS =    1.14

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
 (CFS)        (HR)                 6-HR       24-HR       72-HR     24.00-HR
   81.       13.00       (CFS)      25.         7.          7.          7.
                       (INCHES)    .871        .983        .983        .983
                        (AC-FT)     13.         14.         14.         14.

                     CUMULATIVE AREA =     .27 SQ MI


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

          **************
          *            *
 29 KK    *      1355  *
          *            *
          **************
                                ROUTE SUB2  TO 1300

            HYDROGRAPH ROUTING DATA

 31 RK        KINEMATIC WAVE STREAM ROUTING
                       L       1300.  CHANNEL LENGTH
                       S      .0070  SLOPE
                       N       .013  CHANNEL ROUGHNESS COEFFICIENT
                      CA        .00  CONTRIBUTING AREA
                   SHAPE       CIRC  CHANNEL SHAPE
                      WD       4.50  BOTTOM WIDTH OR DIAMETER
                       Z        .00  SIDE SLOPE

                                                        ***

       KINEMATIC STREAM ROUTING USED FOR THIS REACH

      COMPUTED KINEMATIC PARAMETERS
         ALPHA        M      DT (MIN)   DX (FT)
        6.6486    1.250        2.50      650.00

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

                    HYDROGRAPH AT STATION     1355

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
 (CFS)        (HR)                 6-HR       24-HR       72-HR     24.00-HR
```

```
    81.     13.08       (CFS)       25.         7.          7.          7.
                     (INCHES)      .871       .982        .982        .982
                      (AC-FT)       13.         14.         14.         14.

                     CUMULATIVE AREA =     .27 SQ MI


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


          **************
          *            *
 32 KK    *      1300  *
          *            *
          **************
                                COMBINE SUB1 & SUB2

 34 HC          HYDROGRAPH COMBINATION
                     ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                          ***

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

                      HYDROGRAPH AT STATION     1300

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
  (CFS)       (HR)                 6-HR       24-HR       72-HR     24.00-HR
   175.     13.08       (CFS)       50.         14.         14.         14.
                     (INCHES)      .879       .988        .988        .988
                      (AC-FT)       25.         28.         28.         28.

                     CUMULATIVE AREA =     .53 SQ MI


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


          **************
          *            *
 35 KK    *      1250  *
          *            *
          **************
                                ROUTE 1300 TO 1200

            HYDROGRAPH ROUTING DATA

 37 RK          KINEMATIC WAVE STREAM ROUTING
                         L        800.  CHANNEL LENGTH
                         S       .0020  SLOPE
                         N        .013  CHANNEL ROUGHNESS COEFFICIENT
                        CA         .00  CONTRIBUTING AREA
                     SHAPE        CIRC  CHANNEL SHAPE
                        WD        5.00  BOTTOM WIDTH OR DIAMETER
                         Z         .00  SIDE SLOPE

                                                          ***


        KINEMATIC STREAM ROUTING USED FOR THIS REACH
```

COMPUTED KINEMATIC PARAMETERS

ALPHA	M	DT (MIN)	DX (FT)
3.5158	1.250	2.50	400.00

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

HYDROGRAPH AT STATION 1250

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.00-HR
174.	13.08	(CFS)	50.	14.	14.	14.
		(INCHES)	.879	.988	.988	.988
		(AC-FT)	25.	28.	28.	28.

CUMULATIVE AREA = .53 SQ MI

*** ***

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          **************
          *            *
 38 KK    *     STJHN  *
          *            *
          **************
```

Roadway Drainage from St. Johns

SUBBASIN RUNOFF DATA

40 SA SUBBASIN CHARACTERISTICS

TAREA .01 SUBBASIN AREA

PRECIPITATION DATA

8 PB STORM 2.53 BASIN TOTAL PRECIPITATION

9 PI INCREMENTAL PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.01	.00	.00	.01	.00	.06	.05
.06	.06	.06	.05	.06	.06	.06	.06	.05	.06
.00	.00	.01	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

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                .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                .00      .00      .00      .00      .00      .00      .00      .00

41 LS        SCS LOSS RATE
                 STRTL        .11  INITIAL ABSTRACTION
                CRVNBR      95.00  CURVE NUMBER
                 RTIMP        .00  PERCENT IMPERVIOUS AREA

             KINEMATIC WAVE
42 UK          OVERLAND-FLOW ELEMENT NO. 1
                L         30.  OVERLAND FLOW LENGTH
                       S      .0200  SLOPE
                       N       .100  ROUGHNESS COEFFICIENT
                      PA      100.0  PERCENT OF SUBBASIN
43 RK          COLLECTOR CHANNEL
                       L       400.  CHANNEL LENGTH
                       S      .0012  SLOPE
                       N       .020  CHANNEL ROUGHNESS COEFFICIENT
                      CA        .00  CONTRIBUTING AREA
                   SHAPE       TRAP  CHANNEL SHAPE
                      WD      40.00  BOTTOM WIDTH OR DIAMETER
                       Z       3.00  SIDE SLOPE
44 RK          MAIN CHANNEL
                       L      3200.  CHANNEL LENGTH
                       S      .0012  SLOPE
                       N       .013  CHANNEL ROUGHNESS COEFFICIENT
                      CA        .01  CONTRIBUTING AREA
                   SHAPE       CIRC  CHANNEL SHAPE
                      WD       3.00  BOTTOM WIDTH OR DIAMETER
                       Z        .00  SIDE SLOPE
                  RUPSTQ         NO  ROUTE UPSTREAM HYDROGRAPH

                                                        ***

        COMPUTED KINEMATIC PARAMETERS
            ELEMENT        ALPHA        M      DT (MIN)   DX (FT)
                  1     2.1072    1.667        5.00       15.00
                  3      .3181    1.536        5.00      100.00
                  4     2.6260    1.250        5.00     1600.00

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

                     HYDROGRAPH AT STATION    STJHN

   TOTAL RAINFALL =    2.53, TOTAL LOSS =     .54, TOTAL EXCESS =    1.99

 PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
  (CFS)        (HR)                 6-HR       24-HR       72-HR     24.00-HR
     7.       12.58       (CFS)       1.          0.          0.          0.
                        (INCHES)    1.719       1.889       1.889       1.889
                         (AC-FT)       1.          1.          1.          1.

                     CUMULATIVE AREA =     .01 SQ MI


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

            **************
            *            *
45 KK       *     SUB3   *
            *            *
            **************
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EXSTG RESID. DEV. EAST OF 75TH, SOUTH OF GROVER

SUBBASIN RUNOFF DATA

47 BA SUBBASIN CHARACTERISTICS

TAREA	.08	SUBBASIN AREA

PRECIPITATION DATA

8 PB

STORM	2.53	BASIN TOTAL PRECIPITATION

9 PI INCREMENTAL PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.01	.00	.00	.01	.00	.06	.05
.06	.06	.06	.05	.06	.06	.06	.06	.05	.06
.00	.00	.01	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

48 LS SCS LOSS RATE

STRTL	.38	INITIAL ABSTRACTION
CRVNBR	84.00	CURVE NUMBER
RTIMP	.00	PERCENT IMPERVIOUS AREA

KINEMATIC WAVE

49 UK OVERLAND-FLOW ELEMENT NO. 1

L	250.	OVERLAND FLOW LENGTH
S	.0040	SLOPE
N	.170	ROUGHNESS COEFFICIENT
PA	100.0	PERCENT OF SUBBASIN

50 RK MAIN CHANNEL

L	4200.	CHANNEL LENGTH
S	.0050	SLOPE
N	.020	CHANNEL ROUGHNESS COEFFICIENT
CA	.08	CONTRIBUTING AREA
SHAPE	TRAP	CHANNEL SHAPE
WD	32.00	BOTTOM WIDTH OR DIAMETER
Z	4.00	SIDE SLOPE
RUPSTQ	NO	ROUTE UPSTREAM HYDROGRAPH

***

COMPUTED KINEMATIC PARAMETERS

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)
1	.5543	1.667	5.00	41.67
3	.7864	1.494	5.00	2100.00

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

HYDROGRAPH AT STATION SUB3

TOTAL RAINFALL = 2.53, TOTAL LOSS = 1.39, TOTAL EXCESS = 1.14

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.00-HR
40.	12.75	(CFS)	8.	2.	2.	2.
		(INCHES)	.925	1.032	1.032	1.032
		(AC-FT)	4.	5.	5.	5.

CUMULATIVE AREA = .08 SQ MI

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          **************
          *            *
 51 KK    *      1200  *
          *            *
          **************
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COMBINE SUB1,2,3 & STJHN @ 1200

53 HC HYDROGRAPH COMBINATION
ICOMP 3 NUMBER OF HYDROGRAPHS TO COMBINE

***

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

HYDROGRAPH AT STATION 1200

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.00-HR
205.	13.00	(CFS)	59.	17.	17.	17.
		(INCHES)	.885	1.003	1.003	1.003
		(AC-FT)	29.	33.	33.	33.

CUMULATIVE AREA = .62 SQ MI

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          **************
          *            *
 54 KK    *      1150  *
          *            *
          **************
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ROUTE 1300 TO BELL

HYDROGRAPH ROUTING DATA

56 RK KINEMATIC WAVE STREAM ROUTING
L 1800. CHANNEL LENGTH
S .0020 SLOPE

N	.013	CHANNEL ROUGHNESS COEFFICIENT
CA	.00	CONTRIBUTING AREA
SHAPE	CIRC	CHANNEL SHAPE
WD	5.00	BOTTOM WIDTH OR DIAMETER
Z	.00	SIDE SLOPE

***

KINEMATIC STREAM ROUTING USED FOR THIS REACH

COMPUTED KINEMATIC PARAMETERS

ALPHA	M	DT (MIN)	DX (FT)
3.6168	1.250	2.50	900.00

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

HYDROGRAPH AT STATION 1150

PEAK FLOW (CFS)	TIME (HR)		6-HR	MAXIMUM AVERAGE FLOW 24-HR	72-HR	24.00-HR
205.	13.00	(CFS)	59.	17.	17.	17.
		(INCHES)	.886	1.002	1.002	1.002
		(AC-FT)	29.	33.	33.	33.

CUMULATIVE AREA = .62 SQ MI

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          **************
          *            *
 57 KK    *     BELLE  *
          *            *
          **************
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BELL ROADWAY DRAINAGE FROM SKUNK CREEK TO 75TH

SUBBASIN RUNOFF DATA

59 BA SUBBASIN CHARACTERISTICS

TAREA	.01	SUBBASIN AREA

PRECIPITATION DATA

8 PB	STORM	2.53	BASIN TOTAL PRECIPITATION

9 PI INCREMENTAL PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.01	.00	.00	.01	.00	.06	.05

.06	.06	.06	.05	.06	.06	.06	.06	.05	.06
.00	.00	.01	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

```
60 LS        SCS LOSS RATE
                  STRTL        .11  INITIAL ABSTRACTION
                 CRVNBR      95.00  CURVE NUMBER
                  RTIMP        .00  PERCENT IMPERVIOUS AREA

             KINEMATIC WAVE
61 UK          OVERLAND-FLOW ELEMENT NO. 1
                      L        50.  OVERLAND FLOW LENGTH
                      S      .0200  SLOPE
                      N       .100  ROUGHNESS COEFFICIENT
                     PA      100.0  PERCENT OF SUBBASIN
62 RK          COLLECTOR CHANNEL
                      L       500.  CHANNEL LENGTH
                      S      .0050  SLOPE
                      N       .020  CHANNEL ROUGHNESS COEFFICIENT
                     CA        .00  CONTRIBUTING AREA
                  SHAPE       TRAP  CHANNEL SHAPE
                     WD      50.00  BOTTOM WIDTH OR DIAMETER
                      Z       3.00  SIDE SLOPE
63 RK          MAIN CHANNEL
                      L      2000.  CHANNEL LENGTH
                      S      .0050  SLOPE
                      N       .013  CHANNEL ROUGHNESS COEFFICIENT
                     CA        .01  CONTRIBUTING AREA
                  SHAPE       CIRC  CHANNEL SHAPE
                     WD       3.00  BOTTOM WIDTH OR DIAMETER
                      Z        .00  SIDE SLOPE
                 RUPSTQ         NO  ROUTE UPSTREAM HYDROGRAPH

                                                   ***

      COMPUTED KINEMATIC PARAMETERS
         ELEMENT        ALPHA        M      DT (MIN)   DX (FT)
              1    2.1072    1.667        5.00       25.00
              3     .5374    1.554        5.00      166.67
              4    5.2519    1.250        5.00     1000.00

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

                    HYDROGRAPH AT STATION    BELLE

  TOTAL RAINFALL =    2.53, TOTAL LOSS =     .54, TOTAL EXCESS =    1.99

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
 (CFS)        (HR)                  6-HR       24-HR       72-HR     24.00-HR
    7.       12.58        (CFS)       1.          0.          0.          0.
                         (INCHES)    1.758       1.931       1.931       1.931
                         (AC-FT)       1.          1.          1.          1.

                    CUMULATIVE AREA =     .01 SQ MI
```

*** **

```
          **************
          *            *
 64 KK    *      1100  *
          *            *
          **************
```

COMBINE BELLE AND 1100

```
 66 HC        HYDROGRAPH COMBINATION
                   ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE
```

***

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

HYDROGRAPH AT STATION 1100

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.00-HR
206.	13.00	(CFS)	60.	17.	17.	17.
		(INCHES)	.889	1.013	1.013	1.013
		(AC-FT)	30.	34.	34.	34.

CUMULATIVE AREA = .63 SQ MI

*** **

```
          **************
          *            *
 67 KK    *      1000  *
          *            *
          **************
```

75TH AVE OUTFALL

HYDROGRAPH ROUTING DATA

```
 69 RK        KINEMATIC WAVE STREAM ROUTING
                     L       900.  CHANNEL LENGTH
                     S      .0030  SLOPE
                     N       .013  CHANNEL ROUGHNESS COEFFICIENT
                    CA        .00  CONTRIBUTING AREA
                 SHAPE       CIRC  CHANNEL SHAPE
                    WD       6.00  BOTTOM WIDTH OR DIAMETER
                     Z        .00  SIDE SLOPE
```

***

KINEMATIC STREAM ROUTING USED FOR THIS REACH

COMPUTED KINEMATIC PARAMETERS

ALPHA	M	DT (MIN)	DX (FT)
4.5663	1.250	2.50	450.00

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

HYDROGRAPH AT STATION 1000

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.00-HR
205.	13.08	(CFS)	60.	17.	17.	17.
		(INCHES)	.889	1.012	1.012	1.012
		(AC-FT)	30.	34.	34.	34.

CUMULATIVE AREA = .63 SQ MI

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	SUB1	94.	12.92	25.	7.	7.	.26		

ROUTED TO	1350	94.	13.00	25.	7.	7.	.26
HYDROGRAPH AT	SUB2	81.	13.00	25.	7.	7.	.27
ROUTED TO	1355	81.	13.08	25.	7.	7.	.27
2 COMBINED AT	1300	175.	13.08	50.	14.	14.	.53
ROUTED TO	1250	174.	13.08	50.	14.	14.	.53
HYDROGRAPH AT	STJHN	7.	12.58	1.	0.	0.	.01
HYDROGRAPH AT	SUB3	40.	12.75	8.	2.	2.	.08
3 COMBINED AT	1200	205.	13.00	59.	17.	17.	.62
ROUTED TO	1150	205.	13.00	59.	17.	17.	.62
HYDROGRAPH AT	BELLE	7.	12.58	1.	0.	0.	.01
2 COMBINED AT	1100	206.	13.00	60.	17.	17.	.63
ROUTED TO	1000	205.	13.08	60.	17.	17.	.63

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

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

  1           ID          75TH AVE OUTFALL
  2           ID          100 YEAR STORM - 24 HOUR DURATION
  3           ID          FUTURE CONDITION
  4           IT      5                   289
  5           IO      3

  6           KK    SUB1
  7           KM          HIDDEN MANOR @ Grover & 79th
  8           IN     30
  9           PB   4.04
 10           PC   .000    .004    .008    .013    .018    .022    .026    .031    .035    .040
 11           PC   .044    .048    .053    .057    .062    .066    .071    .075    .080    .093
 12           PC   .107    .120    .140    .170    .500    .830    .860    .880    .893    .907
 13           PC   .920    .924    .928    .933    .937    .942    .947    .951    .956    .960
 14           PC   .964    .969    .973    .978    .982    .987    .991    .995   1.000
 15           BA  .2599
 16           LS            84
 17           UK    230    .001     .17     100
 18           RK   1400    .003    .020  .01785    TRAP     40      3
 19           RK   2400    .007    .020  0.2499    TRAP     40      3      NO

 20           KK   1350
 21           KM          ROUTE HIDDEN MANOR THRU PARK TO 1300
 22           RK   1400   .0015    .035            TRAP     50      5

 23           KK   SUB2
 24           KM          EXSTG RESID. DEV. EAST OF 75TH, NORTH OF GROVER
 25           BA   0.27
 26           LS            84
 27           UK    300    .001     .17     100
 28           RK   1200   .0025    .020   .0225    TRAP     36      4
 29           RK   2900    .005    .020    0.27    TRAP     36      4      NO

 30           KK   1355
 31           KM          ROUTE SUB2  TO 1300
 32           RK   1300    .007    .013            CIRC    4.5

 33           KK   1300
 34           KM          COMBINE SUB1 & SUB2
 35           HC      2

 36           KK   1250
 37           KM          ROUTE 1300 TO 1200
 38           RK    800   .0020    .013            CIRC      5

 39           KK  STJHN
 40           KM          Roadway Drainage from St. Johns
 41           BA  .0069
 42           LS            95
 43           UK     30     .02      .1     100
 44           RK    400  .00125    .020   .0009    TRAP     40      3
 45           RK   3200  .00125    .013   .0069    CIRC      3              NO
```

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

 46           KK    SUB3
 47           KM           EXSTG RESID. DEV. EAST OF 75TH, SOUTH OF GROVER
 48           BA   .0818
 49           LS             84
 50           UK     250   .004     .17     100
 51           RK    4200   .005    .020    .077    TRAP      32       4      NO

 52           KK    1200
 53           KM           COMBINE SUB1,2,3 & STJHN @ 1200
 54           HC       3

 55           KK    1150
 56           KM           ROUTE 1300 TO BELL
 57           RK    1800  .0020    .013            CIRC       5

 58           KK   BELLE
 59           KM           BELL ROADWAY DRAINAGE FROM SKUNK CREEK TO 75TH
 60           BA    .007
 61           LS             95
 62           UK      50   .020     .10     100
 63           RK     500   .005    .020  .00088    TRAP      50       3
 64           RK    2000   .005    .013            CIRC     3.0       0

 65           KK    1100
 66           KM           COMBINE BELLE AND 1100
 67           HC       2

 68           KK    1000
 69           KM           75TH AVE OUTFALL
 70           RK     900   .003    .013            CIRC     6.0
 71           ZZ
```

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*            SEPTEMBER 1990            *
*             VERSION 4.0              *
*                                      *
* RUN DATE  05/01/1991  TIME  15:38:51 *
*                                      *
****************************************
```

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

```
                                75TH AVE OUTFALL
                                100 YEAR STORM - 24 HOUR DURATION
                                FUTURE CONDITION

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

    IT          HYDROGRAPH TIME DATA
                       NMIN          5  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1   0  STARTING DATE
                      ITIME       0000  STARTING TIME
                         NQ        289  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      2   0  ENDING DATE
                     NDTIME       0000  ENDING TIME
                      ICENT         19  CENTURY MARK

                 COMPUTATION INTERVAL     .08 HOURS
                      TOTAL TIME BASE   24.00 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


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


            **************
            *            *
  6 KK      *     SUB1   *
            *            *
            **************
                                HIDDEN MANOR @ Grover & 79th

  8 IN          TIME DATA FOR INPUT TIME SERIES
                      JXMIN         30  TIME INTERVAL IN MINUTES
                     JXDATE      1   0  STARTING DATE
                     JXTIME          0  STARTING TIME

              SUBBASIN RUNOFF DATA
```

```
15 BA        SUBBASIN CHARACTERISTICS
                  TAREA        .26  SUBBASIN AREA

             PRECIPITATION DATA

 9 PB             STORM       4.04  BASIN TOTAL PRECIPITATION

10 PI          INCREMENTAL PRECIPITATION PATTERN
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .01      .00      .00      .01      .00      .06      .05
                 .06      .06      .06      .05      .06      .06      .06      .06      .05      .06
                 .00      .00      .01      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00

16 LS        SCS LOSS RATE
                  STRTL        .38  INITIAL ABSTRACTION
                 CRVNBR      84.00  CURVE NUMBER
                  RTIMP        .00  PERCENT IMPERVIOUS AREA

             KINEMATIC WAVE
17 UK          OVERLAND-FLOW ELEMENT NO. 1
                      L       230.  OVERLAND FLOW LENGTH
                      S      .0010  SLOPE
                      N       .170  ROUGHNESS COEFFICIENT
                     PA      100.0  PERCENT OF SUBBASIN
                  DXMIN          5  MINIMUM NUMBER OF DX INTERVALS

             KINEMATIC WAVE
18 RK          COLLECTOR CHANNEL
                      L      1400.  CHANNEL LENGTH
                      S      .0030  SLOPE
                      N       .020  CHANNEL ROUGHNESS COEFFICIENT
                     CA        .02  CONTRIBUTING AREA
                  SHAPE       TRAP  CHANNEL SHAPE
                     WD      40.00  BOTTOM WIDTH OR DIAMETER
                      Z       3.00  SIDE SLOPE
                 NDXMIN          2  MINIMUM NUMBER OF DX INTERVALS
19 RK          MAIN CHANNEL
                      L      2400.  CHANNEL LENGTH
                      S      .0070  SLOPE
                      N       .020  CHANNEL ROUGHNESS COEFFICIENT
```

```
          CA        .26  CONTRIBUTING AREA
       SHAPE       TRAP  CHANNEL SHAPE
          WD      40.00  BOTTOM WIDTH OR DIAMETER
           Z       3.00  SIDE SLOPE
      NDXMIN          2  MINIMUM NUMBER OF DX INTERVALS
      RUPSTQ         NO  ROUTE UPSTREAM HYDROGRAPH
```

***

COMPUTED KINEMATIC PARAMETERS
VARIABLE TIME STEP
(DT SHOWN IS A MINIMUM)

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
PLANE1	.28	1.67	2.54	19.17	332.95	750.28	2.32	.13
COLLECTOR1	.49	1.54	2.58	466.67	313.37	755.07	2.30	3.11
MAIN	.75	1.54	1.30	800.00	309.26	756.95	2.29	10.40

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3335E+02 OUTFLOW= .3173E+02 BASIN STORAGE= .4006E+00 PERCENT ERROR= 3.7

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	.75	1.54	5.00	306.06	755.00	2.29

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

HYDROGRAPH AT STATION SUB1

TOTAL RAINFALL = 4.04, TOTAL LOSS = 1.63, TOTAL EXCESS = 2.41

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.00-HR
306.	12.58	(CFS)	58.	16.	16.	16.
		(INCHES)	2.084	2.287	2.287	2.287
		(AC-FT)	29.	32.	32.	32.

CUMULATIVE AREA = .26 SQ MI

*** **

```
          **************
          *            *
 20 KK    *      1350  *
          *            *
          **************
```

ROUTE HIDDEN MANOR THRU PARK TO 1300

HYDROGRAPH ROUTING DATA

```
 22 RK        KINEMATIC WAVE STREAM ROUTING
                    L      1400.  CHANNEL LENGTH
                    S      .0015  SLOPE
                    N       .035  CHANNEL ROUGHNESS COEFFICIENT
                   CA        .00  CONTRIBUTING AREA
                SHAPE       TRAP  CHANNEL SHAPE
                   WD      50.00  BOTTOM WIDTH OR DIAMETER
                    Z       5.00  SIDE SLOPE
```

NOXMIN 2 MINIMUM NUMBER OF DX INTERVALS

***

COMPUTED KINEMATIC PARAMETERS
VARIABLE TIME STEP
(DT SHOWN IS A MINIMUM)

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	.19	1.51	2.31	466.67	304.81	761.14	2.27	3.50

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3170E+02 EXCESS= .0000E+00 OUTFLOW= .3148E+02 BASIN STORAGE= .1779E+00 PERCENT ERROR= .

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	.19	1.51	5.00	302.83	760.00	2.27

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

HYDROGRAPH AT STATION 1350

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.00-HR
303.	12.67	(CFS)	58.	16.	16.	16.
		(INCHES)	2.076	2.270	2.270	2.270
		(AC-FT)	29.	31.	31.	31.

CUMULATIVE AREA = .26 SQ MI

*** *

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          **************
          *            *
 23 KK    *     SUB2   *
          *            *
          **************
```

EXSTG RESID. DEV. EAST OF 75TH, NORTH OF GROVER

SUBBASIN RUNOFF DATA

25 BA SUBBASIN CHARACTERISTICS
TAREA .27 SUBBASIN AREA

PRECIPITATION DATA

9 PB STORM 4.04 BASIN TOTAL PRECIPITATION

10 PI INCREMENTAL PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.01	.00	.00	.01	.00	.06	.05
.06	.06	.06	.05	.06	.06	.06	.06	.05	.06
.00	.00	.01	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

```
26 LS        SCS LOSS RATE
                  STRTL        .38  INITIAL ABSTRACTION
                 CRVNBR      84.00  CURVE NUMBER
                  RTIMP        .00  PERCENT IMPERVIOUS AREA

             KINEMATIC WAVE
27 UK          OVERLAND-FLOW ELEMENT NO. 1
                      L       300.  OVERLAND FLOW LENGTH
                      S      .0010  SLOPE
                      N       .170  ROUGHNESS COEFFICIENT
                     PA      100.0  PERCENT OF SUBBASIN
                  DXMIN          5  MINIMUM NUMBER OF DX INTERVALS

             KINEMATIC WAVE
28 RK          COLLECTOR CHANNEL
                      L      1200.  CHANNEL LENGTH
                      S      .0025  SLOPE
                      N       .020  CHANNEL ROUGHNESS COEFFICIENT
                     CA        .02  CONTRIBUTING AREA
                  SHAPE       TRAP  CHANNEL SHAPE
                     WD      36.00  BOTTOM WIDTH OR DIAMETER
                      Z       4.00  SIDE SLOPE
                 NDXMIN          2  MINIMUM NUMBER OF DX INTERVALS
29 RK          MAIN CHANNEL
                      L      2900.  CHANNEL LENGTH
                      S      .0050  SLOPE
                      N       .020  CHANNEL ROUGHNESS COEFFICIENT
                     CA        .27  CONTRIBUTING AREA
                  SHAPE       TRAP  CHANNEL SHAPE
                     WD      36.00  BOTTOM WIDTH OR DIAMETER
                      Z       4.00  SIDE SLOPE
                 NDXMIN          2  MINIMUM NUMBER OF DX INTERVALS
                 RUPSTQ         NO  ROUTE UPSTREAM HYDROGRAPH
```

***

COMPUTED KINEMATIC PARAMETERS
VARIABLE TIME STEP
(DT SHOWN IS A MINIMUM)

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
PLANE1	.28	1.67	2.87	21.43	297.59	752.15	2.30	.13
COLLECTOR1	.51	1.50	2.31	400.00	288.60	756.58	2.29	3.09

MAIN	6.65	1.25	5.00		278.80	760.00	2.27

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

HYDROGRAPH AT STATION 1355

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.00-HR
279.	12.67	(CFS)	60.	17.	17.	17.
		(INCHES)	2.068	2.275	2.275	2.275
		(AC-FT)	30.	33.	33.	33.

CUMULATIVE AREA = .27 SQ MI

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           **************
           *            *
33 KK      *    1300    *
           *            *
           **************
```

COMBINE SUB1 & SUB2

35 HC HYDROGRAPH COMBINATION
ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

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

HYDROGRAPH AT STATION 1300

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.00-HR
582.	12.67	(CFS)	118.	32.	32.	32.
		(INCHES)	2.069	2.272	2.272	2.272
		(AC-FT)	58.	64.	64.	64.

CUMULATIVE AREA = .53 SQ MI

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           **************
           *            *
36 KK      *    1250    *
           *            *
           **************
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ROUTE 1300 TO 1200

HYDROGRAPH ROUTING DATA

38 RK KINEMATIC WAVE STREAM ROUTING

L	800.	CHANNEL LENGTH
S	.0020	SLOPE
N	.013	CHANNEL ROUGHNESS COEFFICIENT
CA	.00	CONTRIBUTING AREA

```
SHAPE        CIRC  CHANNEL SHAPE
   WO        5.00  BOTTOM WIDTH OR DIAMETER
    Z         .00  SIDE SLOPE
NOXMIN          2  MINIMUM NUMBER OF DX INTERVALS
```

***

COMPUTED KINEMATIC PARAMETERS
VARIABLE TIME STEP
(DT SHOWN IS A MINIMUM)

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	3.62	1.25	.42	266.67	581.42	760.83	2.27	12.49

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6422E+02 EXCESS= .0000E+00 OUTFLOW= .6420E+02 BASIN STORAGE= .2469E-01 PERCENT ERROR= .0

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	3.62	1.25	5.00	577.23	765.00	2.27

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

HYDROGRAPH AT STATION 1250

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.00-HR
577.	12.75	(CFS)	118.	32.	32.	32.
		(INCHES)	2.070	2.272	2.272	2.272
		(AC-FT)	59.	64.	64.	64.

CUMULATIVE AREA = .53 SQ MI

*** ***

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          **************
          *            *
 39 KK    *    STJHN   *
          *            *
          **************
```

Roadway Drainage from St. Johns

SUBBASIN RUNOFF DATA

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41 BA        SUBBASIN CHARACTERISTICS
                  TAREA        .01  SUBBASIN AREA

             PRECIPITATION DATA

 9 PB              STORM       4.04  BASIN TOTAL PRECIPITATION

10 PI          INCREMENTAL PRECIPITATION PATTERN
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
                 .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
```

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.01	.00	.00	.01	.00	.06	.05
.06	.06	.06	.05	.06	.06	.06	.06	.05	.06
.00	.00	.01	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

```
42 LS        SCS LOSS RATE
                  STRTL        .11  INITIAL ABSTRACTION
                 CRVNBR      95.00  CURVE NUMBER
                  RTIMP        .00  PERCENT IMPERVIOUS AREA

             KINEMATIC WAVE
43 UK          OVERLAND-FLOW ELEMENT NO. 1
                      L        30.  OVERLAND FLOW LENGTH
                      S      .0200  SLOPE
                      N       .100  ROUGHNESS COEFFICIENT
                     PA      100.0  PERCENT OF SUBBASIN
                  DXMIN          5  MINIMUM NUMBER OF DX INTERVALS

             KINEMATIC WAVE
44 RK          COLLECTOR CHANNEL
                      L       400.  CHANNEL LENGTH
                      S      .0012  SLOPE
                      N       .020  CHANNEL ROUGHNESS COEFFICIENT
                     CA        .00  CONTRIBUTING AREA
                  SHAPE       TRAP  CHANNEL SHAPE
                     WD      40.00  BOTTOM WIDTH OR DIAMETER
                      Z       3.00  SIDE SLOPE
                 NDXMIN          2  MINIMUM NUMBER OF DX INTERVALS
45 RK          MAIN CHANNEL
                      L      3200.  CHANNEL LENGTH
                      S      .0012  SLOPE
                      N       .013  CHANNEL ROUGHNESS COEFFICIENT
                     CA        .01  CONTRIBUTING AREA
                  SHAPE       CIRC  CHANNEL SHAPE
                     WD       3.00  BOTTOM WIDTH OR DIAMETER
                      Z        .00  SIDE SLOPE
                 NDXMIN          2  MINIMUM NUMBER OF DX INTERVALS
                 RUPSTQ         NO  ROUTE UPSTREAM HYDROGRAPH

                                        ***
                        COMPUTED KINEMATIC PARAMETERS
                             VARIABLE TIME STEP
                          (DT SHOWN IS A MINIMUM)

   ELEMENT    ALPHA      M       DT       DX      PEAK   TIME TO     VOLUME   MAXIMUM
                                                         PEAK                 CELERITY
                                (MIN)     (FT)    (CFS)   (MIN)      (IN)     (FPS)
```

PLANE1	2.11	1.67	.47	6.00	11.62	749.81	3.46	.22
COLLECTOR1	.32	1.54	2.49	133.33	11.58	747.98	3.44	.93
MAIN	2.63	1.25	3.94	1066.67	11.53	749.68	3.43	4.67

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1277E+01 OUTFLOW= .1261E+01 BASIN STORAGE= .1138E-01 PERCENT ERROR= .4

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	2.63	1.25	5.00	11.50	750.00	3.42

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

HYDROGRAPH AT STATION STJHN

TOTAL RAINFALL = 4.04, TOTAL LOSS = .57, TOTAL EXCESS = 3.47

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.00-HR
12.	12.50	(CFS)	2.	1.	1.	1.
		(INCHES)	3.070	3.423	3.423	3.423
		(AC-FT)	1.	1.	1.	1.

CUMULATIVE AREA = .01 SQ MI

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          **************
          *            *
 46 KK    *     SUB3   *
          *            *
          **************
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EXSTG RESID. DEV. EAST OF 75TH, SOUTH OF GROVER

SUBBASIN RUNOFF DATA

48 BA SUBBASIN CHARACTERISTICS

TAREA .08 SUBBASIN AREA

PRECIPITATION DATA

9 PB STORM 4.04 BASIN TOTAL PRECIPITATION

10 PI INCREMENTAL PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.01	.00	.00	.01	.00	.06	.05
.06	.06	.06	.05	.06	.06	.06	.06	.05	.06

.00	.00	.01	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

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49 LS        SCS LOSS RATE
                 STRTL        .38  INITIAL ABSTRACTION
                CRVNBR      84.00  CURVE NUMBER
                 RTIMP        .00  PERCENT IMPERVIOUS AREA

             KINEMATIC WAVE
50 UK          OVERLAND-FLOW ELEMENT NO. 1
                     L       250.  OVERLAND FLOW LENGTH
                     S      .0040  SLOPE
                     N       .170  ROUGHNESS COEFFICIENT
                    PA      100.0  PERCENT OF SUBBASIN
                 DXMIN          5  MINIMUM NUMBER OF DX INTERVALS

             KINEMATIC WAVE
51 RK          MAIN CHANNEL
                     L      4200.  CHANNEL LENGTH
                     S      .0050  SLOPE
                     N       .020  CHANNEL ROUGHNESS COEFFICIENT
                    CA        .08  CONTRIBUTING AREA
                 SHAPE       TRAP  CHANNEL SHAPE
                    WD      32.00  BOTTOM WIDTH OR DIAMETER
                     Z       4.00  SIDE SLOPE
                NDXMIN          2  MINIMUM NUMBER OF DX INTERVALS
                RUPSTQ         NO  ROUTE UPSTREAM HYDROGRAPH
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COMPUTED KINEMATIC PARAMETERS
VARIABLE TIME STEP
(DT SHOWN IS A MINIMUM)

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
PLANE1	.55	1.67	3.26	41.67	111.76	750.06	2.34	.21
MAIN	.79	1.49	3.65	1400.00	106.20	751.13	2.32	6.49

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1050E+02 OUTFLOW= .1011E+02 BASIN STORAGE= .3375E+00 PERCENT ERROR= .4

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	.79	1.49	5.00	105.14	750.00	2.31

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

HYDROGRAPH AT STATION SUB3

TOTAL RAINFALL = 4.04, TOTAL LOSS = 1.63, TOTAL EXCESS = 2.41

```
PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
  (CFS)       (HR)                  6-HR       24-HR       72-HR     24.00-HR
   105.      12.50        (CFS)      19.          5.          5.          5.
                        (INCHES)    2.109       2.314       2.314       2.314
                         (AC-FT)      9.         10.         10.         10.

                       CUMULATIVE AREA =     .08 SQ MI
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          **************
          *            *
 52 KK    *      1200  *
          *            *
          **************
                                COMBINE SUB1,2,3 & STJHN @ 1200

 54 HC          HYDROGRAPH COMBINATION
                      ICOMP          3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                          ***

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

                        HYDROGRAPH AT STATION     1200

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
  (CFS)       (HR)                  6-HR       24-HR       72-HR     24.00-HR
   676.      12.67        (CFS)     138.         38.         38.         38.
                        (INCHES)    2.078       2.291       2.291       2.291
                         (AC-FT)     69.         76.         76.         76.

                       CUMULATIVE AREA =     .62 SQ MI
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          **************
          *            *
 55 KK    *      1150  *
          *            *
          **************
                                ROUTE 1300 TO BELL

            HYDROGRAPH ROUTING DATA

 57 RK          KINEMATIC WAVE STREAM ROUTING
                          L       1800.  CHANNEL LENGTH
                          S      .0020  SLOPE
                          N       .013  CHANNEL ROUGHNESS COEFFICIENT
                         CA        .00  CONTRIBUTING AREA
                      SHAPE       CIRC  CHANNEL SHAPE
                         WD       5.00  BOTTOM WIDTH OR DIAMETER
                          Z        .00  SIDE SLOPE
                     NDXMIN          2  MINIMUM NUMBER OF DX INTERVALS

                                                          ***
                                  COMPUTED KINEMATIC PARAMETERS
```

VARIABLE TIME STEP
(DT SHOWN IS A MINIMUM)

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	3.62	1.25	.79	600.00	674.37	762.06	2.29	12.87

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7558E+02 EXCESS= .0000E+00 OUTFLOW= .7554E+02 BASIN STORAGE= .6279E-01 PERCENT ERROR= .0

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	3.62	1.25	5.00	666.67	765.00	2.29

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

HYDROGRAPH AT STATION 1150

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.00-HR
667.	12.75	(CFS)	138.	38.	38.	38.
		(INCHES)	2.078	2.289	2.289	2.289
		(AC-FT)	69.	76.	76.	76.

CUMULATIVE AREA = .62 SQ MI

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              **************
              *            *
 58 KK        *    BELLE   *
              *            *
              **************
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BELL ROADWAY DRAINAGE FROM SKUNK CREEK TO 75TH

SUBBASIN RUNOFF DATA

60 BA SUBBASIN CHARACTERISTICS
TAREA .01 SUBBASIN AREA

PRECIPITATION DATA

9 PB STORM 4.04 BASIN TOTAL PRECIPITATION

10 PI INCREMENTAL PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

.00	.00	.00	.01	.00	.00	.01	.00	.06	.05
.06	.06	.06	.05	.06	.06	.06	.06	.05	.06
.00	.00	.01	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

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61 LS        SCS LOSS RATE
                  STRTL        .11  INITIAL ABSTRACTION
                 CRVNBR      95.00  CURVE NUMBER
                  RTIMP        .00  PERCENT IMPERVIOUS AREA

             KINEMATIC WAVE
62 UK          OVERLAND-FLOW ELEMENT NO. 1
                      L        50.  OVERLAND FLOW LENGTH
                      S      .0200  SLOPE
                      N       .100  ROUGHNESS COEFFICIENT
                     PA      100.0  PERCENT OF SUBBASIN
                  DXMIN          5  MINIMUM NUMBER OF DX INTERVALS

             KINEMATIC WAVE
63 RK          COLLECTOR CHANNEL
                      L       500.  CHANNEL LENGTH
                      S      .0050  SLOPE
                      N       .020  CHANNEL ROUGHNESS COEFFICIENT
                     CA        .00  CONTRIBUTING AREA
                  SHAPE       TRAP  CHANNEL SHAPE
                     WD      50.00  BOTTOM WIDTH OR DIAMETER
                      Z       3.00  SIDE SLOPE
                 NDXMIN          2  MINIMUM NUMBER OF DX INTERVALS
64 RK          MAIN CHANNEL
                      L      2000.  CHANNEL LENGTH
                      S      .0050  SLOPE
                      N       .013  CHANNEL ROUGHNESS COEFFICIENT
                     CA        .01  CONTRIBUTING AREA
                  SHAPE       CIRC  CHANNEL SHAPE
                     WD       3.00  BOTTOM WIDTH OR DIAMETER
                      Z        .00  SIDE SLOPE
                 NDXMIN          2  MINIMUM NUMBER OF DX INTERVALS
                 RUPSTQ         NO  ROUTE UPSTREAM HYDROGRAPH
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COMPUTED KINEMATIC PARAMETERS
VARIABLE TIME STEP
(DT SHOWN IS A MINIMUM)

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
PLANE1	2.11	1.67	.67	10.00	11.79	749.66	3.46	.28
COLLECTOR1	.54	1.55	2.19	166.67	11.75	748.11	3.44	1.33
MAIN	5.25	1.25	1.52	666.67	11.74	749.99	3.43	8.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1296E+01 OUTFLOW= .1282E+01 BASIN STORAGE= .8083E-02 PERCENT ERROR= .4

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN 5.25 1.25 5.00 11.74 750.00 3.43

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

HYDROGRAPH AT STATION BELLE

TOTAL RAINFALL = 4.04, TOTAL LOSS = .57, TOTAL EXCESS = 3.47

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.00-HR
12.	12.50	(CFS)	2.	1.	1.	1.
		(INCHES)	3.075	3.432	3.432	3.432
		(AC-FT)	1.	1.	1.	1.

CUMULATIVE AREA = .01 SQ MI

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          **************
          *            *
 65 KK    *     1100   *
          *            *
          **************
```

COMBINE BELLE AND 1100

67 HC HYDROGRAPH COMBINATION
ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

***

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

HYDROGRAPH AT STATION 1100

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.00-HR
670.	12.75	(CFS)	140.	39.	39.	39.
		(INCHES)	2.083	2.302	2.302	2.302
		(AC-FT)	70.	77.	77.	77.

CUMULATIVE AREA = .63 SQ MI

*** **

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          **************
          *            *
 68 KK    *     1000   *
          *            *
          **************
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75TH AVE OUTFALL

HYDROGRAPH ROUTING DATA

69 RK KINEMATIC WAVE STREAM ROUTING

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TO KK          KINEMATIC WAVE STREAM ROUTING
                         L        900.  CHANNEL LENGTH
                         S       .0030  SLOPE
                         N        .013  CHANNEL ROUGHNESS COEFFICIENT
                        CA         .00  CONTRIBUTING AREA
                     SHAPE        CIRC  CHANNEL SHAPE
                        WD        6.00  BOTTOM WIDTH OR DIAMETER
                         Z         .00  SIDE SLOPE
                    NOXMIN           2  MINIMUM NUMBER OF DX INTERVALS

                                                  ***
                              COMPUTED KINEMATIC PARAMETERS
                                   VARIABLE TIME STEP
                                (DT SHOWN IS A MINIMUM)

                 ELEMENT    ALPHA       M        DT       DX      PEAK    TIME TO     VOLUME    MAXIMUM
                                                                           PEAK                  CELERITY
                                                (MIN)     (FT)    (CFS)    (MIN)      (IN)      (FPS)

                 MAIN         4.57     1.25       .34    300.00   669.90   765.38      2.30     15.48


CONTINUITY SUMMARY (AC-FT) - INFLOW= .7681E+02  EXCESS= .0000E+00 OUTFLOW= .7679E+02 BASIN STORAGE= .2639E-01 PERCENT ERROR=    .0

                                   INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                 MAIN         4.57     1.25      5.00            669.63   765.00      2.30

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

                     HYDROGRAPH AT STATION     1000

PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
  (CFS)       (HR)                 6-HR       24-HR       72-HR     24.00-HR
   670.      12.75       (CFS)     140.        39.         39.         39.
                       (INCHES)   2.084       2.302       2.302       2.302
                       (AC-FT)     70.         77.         77.         77.

                     CUMULATIVE AREA =     .63 SQ MI
```

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	SUB1	306.	12.58	58.	16.	16.	.26		
ROUTED TO	1350	303.	12.67	58.	16.	16.	.26		
HYDROGRAPH AT	SUB2	283.	12.67	60.	17.	17.	.27		
ROUTED TO	1355	279.	12.67	60.	17.	17.	.27		
2 COMBINED AT	1300	582.	12.67	118.	32.	32.	.53		
ROUTED TO	1250	577.	12.75	118.	32.	32.	.53		
HYDROGRAPH AT	STJHN	12.	12.50	2.	1.	1.	.01		
HYDROGRAPH AT	SUB3	105.	12.50	19.	5.	5.	.08		
3 COMBINED AT	1200	676.	12.67	138.	38.	38.	.62		
ROUTED TO	1150	667.	12.75	138.	38.	38.	.62		
HYDROGRAPH AT	BELLE	12.	12.50	2.	1.	1.	.01		
2 COMBINED AT	1100	670.	12.75	140.	39.	39.	.63		
ROUTED TO	1000	670.	12.75	140.	39.	39.	.63		

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	INTERPOLATED TO COMPUTATION INTERVAL DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)
SUB1	MANE	1.30	309.26	756.95	2.29	5.00	306.06	755.00	2.29

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3335E+02 OUTFLOW= .3173E+02 BASIN STORAGE= .4006E+00 PERCENT ERROR= 3.7

1350	MANE	2.31	304.81	761.14	2.27	5.00	302.93	760.00	2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3170E+02 EXCESS= .0000E+00 OUTFLOW= .3148E+02 BASIN STORAGE= .1779E+00 PERCENT ERROR= .1

SUB2	MANE	1.87	283.72	762.10	2.28	5.00	282.66	760.00	2.28

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3465E+02 OUTFLOW= .3278E+02 BASIN STORAGE= .4397E+00 PERCENT ERROR= 4.1

1355	MANE	.57	282.31	761.13	2.27	5.00	278.80	760.00	2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3276E+02 EXCESS= .0000E+00 OUTFLOW= .3275E+02 BASIN STORAGE= .1427E-01 PERCENT ERROR= .0

1250	MANE	.42	581.42	760.83	2.27	5.00	577.23	765.00	2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6422E+02 EXCESS= .0000E+00 OUTFLOW= .6420E+02 BASIN STORAGE= .2469E-01 PERCENT ERROR= .0

STJHN	MANE	3.94	11.53	749.68	3.43	5.00	11.50	750.00	3.42

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1277E+01 OUTFLOW= .1261E+01 BASIN STORAGE= .1138E-01 PERCENT ERROR= .4

SUB3	MANE	3.65	106.20	751.13	2.32	5.00	105.14	750.00	2.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1050E+02 OUTFLOW= .1011E+02 BASIN STORAGE= .3375E+00 PERCENT ERROR= .4

1150	MANE	.79	674.37	762.06	2.29	5.00	666.67	765.00	2.29

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7558E+02 EXCESS= .0000E+00 OUTFLOW= .7554E+02 BASIN STORAGE= .6279E-01 PERCENT ERROR= .0

BELLE	MANE	1.52	11.74	749.99	3.43	5.00	11.74	750.00	3.43

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1296E+01 OUTFLOW= .1282E+01 BASIN STORAGE= .8083E-02 PERCENT ERROR= .4

1000	MANE	.34	669.90	765.38	2.30	5.00	669.63	765.00	2.30

```
CONTINUITY SUMMARY (AC-FT) - INFLOW= .7681E+02 EXCESS= .0000E+00 OUTFLOW= .7679E+02 BASIN STORAGE= .2639E-01 PERCENT ERROR=    .0


*** NORMAL END OF HEC-1 ***
Elapsed Time - 00:00:32.13   (32.13 Seconds)
NORMAL END OF HEC-1
```

HEC1 S/N: HMVersion: 6.00 Data File: t2.HC1

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*           SEPTEMBER 1990             *
*            VERSION 4.0               *
*                                      *
*  RUN DATE  05/08/1991  TIME  14:01:24 *
*                                      *
****************************************
```

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

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

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

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

  1           ID           OUTFALL @ GRADE SEP. STRUCTURE
  2           ID           PEAK Q INCLUDES WESTCOR MALL
  3           ID           100 YR, 25-YR, & 10 YR 2-HR  Storm Distrib.
  4           ID                    FCD 2-HR DISTRIB.
  5           IT       5                   289
  6           IO       5
  7           JR    PREC     1.0    .752    .610

  8           KK  NWMALL
  9           KM           NW MALL drainage
 10           IN       5
 11           PB    2.82
 12           PC      .5     1.3     2.0     2.9     3.7       5     7.5      11      16      23
 13           PC      32      45      64    73.3    80.3    85.3    88.8    91.3    93.7    95.7
 14           PC    97.2    98.4    99.3     100
 15           BA    .106
 16           LS     .15      95             .25      91
 17           UK     250   .0150     .17      30       6
 18           UK     400   .0060     .17      70       6
 19           RK    4400    .003    .013    .106    CIRC     4.5             NO       6

 20           KK  NEMALL
 21           KM           NE MALL drainage
 22           BA    .188
 23           LS     .15      95             .25      91
 24           UK     250   .0150     .17      30
 25           UK     400   .0060     .17      70
 26           RK     860   .0092    .013    .038    CIRC     3.5
 27           RK    2400   .0055    .013    .188    CIRC       5             NO

 28           KK    1400
 29           HC       2

 30           KK    1255
 31           KM           route 1400 to 1200
 32           RK     500    .001    .013            CIRC     6.5

 33           KK     79N
 34           KM           Roadway drainage - 79th Ave north of Bell
 35           BA   .0184
 36           LS              95
 37           UK      35     .02     .10     100
 38           RK     500    .003    .017    .002    TRAP      70       3
 39           RK    5700   .0045    .013   .0184    CIRC     2.5             NO

 40           KK   BELLW
 41           KM           Roadway Drainage - Bell west of grade seperation structure
 42           BA   .0071
 43           LS              95
 44           UK      55     .02     .10     100
 45           RK     600    .003    .017    .004    TRAP      50       3
 46           RK    1300   .0016    .013   .0071    CIRC     2.5             NO
```

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

  47          KK    1300
  48          HC       2

  49          KK    1250
  50          KM           route 1300 to 1200
  51          RK     500  .0015    .013           CIRC       3

  52          KK   BELLC
  53          KM           Roadway Drainage - Bell east of grade seperation structure
  54          BA   .0083
  55          LS             95
  56          UK      55    .02      .1     100
  57          RK     700   .003    .017   .0028    TRAP      50       3
  58          RK    2100  .0030    .013   .0083    CIRC     2.5             NO

  59          KK    1200
  60          HC       3

  61          KK    1150
  62          KM           route 1200 to 1100
  63          RK    1250   .003    .013           CIRC       7

  64          KK  PWRCTR
  65          KM           Power Center Shopping
  66          BA    .057
  67          LS     .15     95             .25      91
  68          UK     250  .0150     .17      30
  69          UK     400  .0060     .17      70
  70          RK    2000   .001    .013    .057    CIRC       4             NO

  71          KK  PARADS
  72          KM           Roadway Drainage from Paradise Lane
  73          BA    .003
  74          LS             95
  75          UK      40    .02     .10     100
  76          RK    1000   .005    .013    .003    CIRC     2.5             NO

  77          KK    1100
  78          KM           combine 1200 w/ PWRCTR & PARADS
  79          HC       3

  80          KK    1000
  81          KM           Route to Outfall
  82          RK    1850   .003    .013           CIRC       7
  83          ZZ
```

```
****************************************
*                                      *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*          SEPTEMBER 1990              *
*           VERSION 4.0                *
*                                      *
* RUN DATE  05/08/1991  TIME  14:01:24 *
*                                      *
****************************************
```

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

```
                    OUTFALL @ GRADE SEP. STRUCTURE
                    PEAK Q INCLUDES WESTCOR MALL
                    100 YR, 25-YR, & 10 YR 2-HR  Storm Distrib.
                            FCD 2-HR DISTRIB.

  6 IO        OUTPUT CONTROL VARIABLES
                   IPRNT          5  PRINT CONTROL
                   IPLOT          0  PLOT CONTROL
                   QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT         HYDROGRAPH TIME DATA
                    NMIN          5  MINUTES IN COMPUTATION INTERVAL
                   IDATE      1   0  STARTING DATE
                   ITIME       0000  STARTING TIME
                      NQ        289  NUMBER OF HYDROGRAPH ORDINATES
                  NDDATE      2   0  ENDING DATE
                  NDTIME       0000  ENDING TIME
                   ICENT         19  CENTURY MARK

              COMPUTATION INTERVAL     .08 HOURS
                   TOTAL TIME BASE   24.00 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

   JP         MULTI-PLAN OPTION
                   NPLAN          1  NUMBER OF PLANS

   JR         MULTI-RATIO OPTION
                 RATIOS OF PRECIPITATION
               1.00       .76       .61
```

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

					RATIOS APPLIED TO PRECIPITATION		
OPERATION	STATION	AREA	PLAN		RATIO 1	RATIO 2	RATIO 3
					1.00	.76	.61
HYDROGRAPH AT	NWMALL	.11	1	FLOW	157.	94.	60.
				TIME	1.25	1.25	1.25
HYDROGRAPH AT	NEMALL	.19	1	FLOW	277.	167.	107.
				TIME	1.17	1.17	1.25
2 COMBINED AT	1400	.29	1	FLOW	432.	259.	168.
				TIME	1.17	1.25	1.25
ROUTED TO	1255	.29	1	FLOW	432.	259.	166.
				TIME	1.25	1.25	1.25
HYDROGRAPH AT	79N	.02	1	FLOW	49.	34.	26.
				TIME	1.08	1.17	1.17
HYDROGRAPH AT	BELLW	.01	1	FLOW	22.	16.	12.
				TIME	1.08	1.08	1.08
2 COMBINED AT	1300	.03	1	FLOW	71.	49.	35.
				TIME	1.08	1.08	1.17
ROUTED TO	1250	.03	1	FLOW	68.	46.	35.
				TIME	1.08	1.17	1.17
HYDROGRAPH AT	BELLC	.01	1	FLOW	25.	18.	13.
				TIME	1.08	1.08	1.08
3 COMBINED AT	1200	.33	1	FLOW	510.	312.	205.
				TIME	1.17	1.17	1.25
ROUTED TO	1150	.33	1	FLOW	501.	309.	204.
				TIME	1.17	1.25	1.25
HYDROGRAPH AT	PWRCTR	.06	1	FLOW	84.	50.	32.
				TIME	1.25	1.25	1.25
HYDROGRAPH AT	PARADS	.00	1	FLOW	11.	8.	6.
				TIME	1.00	1.00	1.00
3 COMBINED AT	1100	.39	1	FLOW	590.	361.	238.
				TIME	1.17	1.25	1.25
ROUTED TO	1000	.39	1	FLOW	586.	359.	232.
				TIME	1.25	1.25	1.33

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	INTERPOLATED TO COMPUTATION INTERVAL DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)
FOR PLAN = 1 RATIO= 1.00									
NWMALL	MANE	1.14	157.00	72.91	1.95	5.00	156.64	75.00	1.95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1113E+02 OUTFLOW= .1105E+02 BASIN STORAGE= .9549E-02 PERCENT ERROR= .6

FOR PLAN = 1 RATIO= 1.00									
NWMALL	MANE	1.14	157.00	72.91	1.95	5.00	156.64	75.00	1.95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1113E+02 OUTFLOW= .1105E+02 BASIN STORAGE= .9549E-02 PERCENT ERROR= .6

FOR PLAN = 1 RATIO= .76									
NWMALL	MANE	1.27	94.01	75.07	1.34	5.00	94.00	75.00	1.34

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7624E+01 OUTFLOW= .7553E+01 BASIN STORAGE= .8837E-02 PERCENT ERROR= .8

FOR PLAN = 1 RATIO= .61									
NWMALL	MANE	1.31	60.47	76.66	.96	5.00	60.29	75.00	.96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5472E+01 OUTFLOW= .5416E+01 BASIN STORAGE= .9168E-02 PERCENT ERROR= .9

FOR PLAN = 1 RATIO= 1.00									
NEMALL	MANE	.94	277.43	70.90	1.95	5.00	277.20	70.00	1.95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1973E+02 OUTFLOW= .1956E+02 BASIN STORAGE= .3437E-02 PERCENT ERROR= .9

FOR PLAN = 1 RATIO= 1.00									
NEMALL	MANE	.94	277.43	70.90	1.95	5.00	277.20	70.00	1.95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1973E+02 OUTFLOW= .1956E+02 BASIN STORAGE= .3437E-02 PERCENT ERROR= .9

FOR PLAN = 1 RATIO= .76									
NEMALL	MANE	.93	168.09	71.29	1.34	5.00	167.36	70.00	1.34

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1352E+02 OUTFLOW= .1340E+02 BASIN STORAGE= .3250E-02 PERCENT ERROR= .9

FOR PLAN = 1 RATIO= .61									
NEMALL	MANE	1.05	107.46	74.87	.96	5.00	107.39	75.00	.96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9706E+01 OUTFLOW= .9599E+01 BASIN STORAGE= .3488E-02 PERCENT ERROR= 1.1

```
FOR PLAN = 1  RATIO= 1.00
    1255  MANE          .40    432.00     70.87      1.95      5.00    431.84     75.00        1.95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3061E+02 EXCESS= .0000E+00 OUTFLOW= .3061E+02 BASIN STORAGE= .1457E-03 PERCENT ERROR=    .0

FOR PLAN = 1  RATIO=  .76
    1255  MANE          .47    258.89     75.26      1.34      5.00    258.78     75.00        1.34

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2095E+02 EXCESS= .0000E+00 OUTFLOW= .2095E+02 BASIN STORAGE= .1370E-03 PERCENT ERROR=    .0

FOR PLAN = 1  RATIO=  .61
    1255  MANE          .46    167.37     76.00       .96      5.00    166.13     75.00         .96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1503E+02 EXCESS= .0000E+00 OUTFLOW= .1503E+02 BASIN STORAGE= .1359E-03 PERCENT ERROR=    .0

FOR PLAN = 1  RATIO= 1.00
     79N  MANE         3.22     51.48     67.01      2.27      5.00     49.27     65.00        2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2231E+01 OUTFLOW= .2225E+01 BASIN STORAGE= .5281E-04 PERCENT ERROR=    .3

FOR PLAN = 1  RATIO= 1.00
     79N  MANE         3.22     51.48     67.01      2.27      5.00     49.27     65.00        2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2231E+01 OUTFLOW= .2225E+01 BASIN STORAGE= .5281E-04 PERCENT ERROR=    .3

FOR PLAN = 1  RATIO=  .76
     79N  MANE         3.52     35.95     68.06      1.62      5.00     34.36     70.00        1.62

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1595E+01 OUTFLOW= .1588E+01 BASIN STORAGE= .5465E-04 PERCENT ERROR=    .4

FOR PLAN = 1  RATIO=  .61
     79N  MANE         2.73     26.02     70.96      1.21      5.00     25.96     70.00        1.21

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1195E+01 OUTFLOW= .1190E+01 BASIN STORAGE= .4381E-04 PERCENT ERROR=    .4

FOR PLAN = 1  RATIO= 1.00
   BELLW  MANE         1.38     23.44     63.08      2.27      5.00     21.93     65.00        2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .8610E+00 OUTFLOW= .8603E+00 BASIN STORAGE= .1778E-04 PERCENT ERROR=    .1

FOR PLAN = 1  RATIO= 1.00
   BELLW  MANE         1.38     23.44     63.08      2.27      5.00     21.93     65.00        2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .8610E+00 OUTFLOW= .8603E+00 BASIN STORAGE= .1778E-04 PERCENT ERROR=    .1

FOR PLAN = 1  RATIO=  .76
   BELLW  MANE         1.43     16.42     64.47      1.62      5.00     16.08     65.00        1.62
```

```
CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .6153E+00 OUTFLOW= .6144E+00 BASIN STORAGE= .1486E-04 PERCENT ERROR=    .2

        FOR PLAN = 1  RATIO=  .61
           BELLW  MANE        1.43     12.04     64.28      1.21      5.00     11.95     65.00        1.21

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4612E+00 OUTFLOW= .4598E+00 BASIN STORAGE= .1677E-04 PERCENT ERROR=    .3

        FOR PLAN = 1  RATIO= 1.00
            1250  MANE         .48     70.87     65.92      2.27      5.00     68.31     65.00        2.28

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3089E+01 EXCESS= .0000E+00 OUTFLOW= .3089E+01 BASIN STORAGE= .1533E-05 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .76
            1250  MANE         .60     48.51     66.39      1.62      5.00     46.39     70.00        1.63

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2206E+01 EXCESS= .0000E+00 OUTFLOW= .2206E+01 BASIN STORAGE= .1576E-05 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .61
            1250  MANE         .58     35.07     70.67      1.21      5.00     34.89     70.00        1.22

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1649E+01 EXCESS= .0000E+00 OUTFLOW= .1650E+01 BASIN STORAGE= .1589E-05 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO= 1.00
           BELLC  MANE        1.58     25.37     63.85      2.27      5.00     25.15     65.00        2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1007E+01 OUTFLOW= .1006E+01 BASIN STORAGE= .2502E-04 PERCENT ERROR=    .1

        FOR PLAN = 1  RATIO= 1.00
           BELLC  MANE        1.58     25.37     63.85      2.27      5.00     25.15     65.00        2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1007E+01 OUTFLOW= .1006E+01 BASIN STORAGE= .2502E-04 PERCENT ERROR=    .1

        FOR PLAN = 1  RATIO=  .76
           BELLC  MANE        1.67     17.77     64.73      1.62      5.00     17.75     65.00        1.62

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7193E+00 OUTFLOW= .7170E+00 BASIN STORAGE= .2211E-04 PERCENT ERROR=    .3

        FOR PLAN = 1  RATIO=  .61
           BELLC  MANE        1.83     12.97     67.38      1.21      5.00     12.52     65.00        1.21

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5391E+00 OUTFLOW= .5367E+00 BASIN STORAGE= .2797E-04 PERCENT ERROR=    .4

        FOR PLAN = 1  RATIO= 1.00
            1150  MANE         .63    508.34     71.39      1.99      5.00    501.48     70.00        1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3473E+02 EXCESS= .0000E+00 OUTFLOW= .3474E+02 BASIN STORAGE= .2354E-03 PERCENT ERROR=    .0
```

```
FOR PLAN = 1  RATIO=  .76
    1150  MANE          .52    311.68     71.12      1.37      5.00    308.53     75.00        1.37

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2390E+02 EXCESS= .0000E+00 OUTFLOW= .2390E+02 BASIN STORAGE= .2268E-03 PERCENT ERROR=    .0

FOR PLAN = 1  RATIO=  .61
    1150  MANE          .60    204.96     76.27       .99      5.00    203.54     75.00         .99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1723E+02 EXCESS= .0000E+00 OUTFLOW= .1724E+02 BASIN STORAGE= .2190E-03 PERCENT ERROR=    .0

FOR PLAN = 1  RATIO= 1.00
  PWRCTR  MANE         1.84     83.89     71.63      1.95      5.00     83.61     75.00        1.95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5983E+01 OUTFLOW= .5932E+01 BASIN STORAGE= .4782E-02 PERCENT ERROR=    .8

FOR PLAN = 1  RATIO= 1.00
  PWRCTR  MANE         1.84     83.89     71.63      1.95      5.00     83.61     75.00        1.95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5983E+01 OUTFLOW= .5932E+01 BASIN STORAGE= .4782E-02 PERCENT ERROR=    .8

FOR PLAN = 1  RATIO=  .76
  PWRCTR  MANE         1.96     50.53     73.93      1.34      5.00     50.27     75.00        1.34

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4100E+01 OUTFLOW= .4063E+01 BASIN STORAGE= .4625E-02 PERCENT ERROR=    .8

FOR PLAN = 1  RATIO=  .61
  PWRCTR  MANE         2.06     32.27     76.11       .96      5.00     32.22     75.00         .96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2943E+01 OUTFLOW= .2912E+01 BASIN STORAGE= .4898E-02 PERCENT ERROR=    .9

FOR PLAN = 1  RATIO= 1.00
  PARADS  MANE          .73     11.44     60.03      2.27      5.00     11.43     60.00        2.29

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3638E+00 OUTFLOW= .3635E+00 BASIN STORAGE= .1873E-05 PERCENT ERROR=    .1

FOR PLAN = 1  RATIO= 1.00
  PARADS  MANE          .73     11.44     60.03      2.27      5.00     11.43     60.00        2.29

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3638E+00 OUTFLOW= .3635E+00 BASIN STORAGE= .1873E-05 PERCENT ERROR=    .1

FOR PLAN = 1  RATIO=  .76
  PARADS  MANE          .90      8.26     60.40      1.62      5.00      8.17     60.00        1.63

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2600E+00 OUTFLOW= .2597E+00 BASIN STORAGE= .2039E-05 PERCENT ERROR=    .1

FOR PLAN = 1  RATIO=  .61
```

```
          PARADS  MANE          .94      6.20      60.80      1.22      5.00      6.12      60.00        1.22

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1949E+00 OUTFLOW= .1946E+00 BASIN STORAGE= .2180E-05 PERCENT ERROR=    .1

        FOR PLAN = 1  RATIO= 1.00
           1000  MANE          .67    589.10      71.78      1.99      5.00    586.12      75.00        1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4107E+02 EXCESS= .0000E+00 OUTFLOW= .4109E+02 BASIN STORAGE= .4038E-03 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .76
           1000  MANE          .74    361.31      76.50      1.37      5.00    359.42      75.00        1.37

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2825E+02 EXCESS= .0000E+00 OUTFLOW= .2825E+02 BASIN STORAGE= .3888E-03 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .61
           1000  MANE          .93    237.22      76.74       .98      5.00    232.08      80.00         .99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2036E+02 EXCESS= .0000E+00 OUTFLOW= .2036E+02 BASIN STORAGE= .3758E-03 PERCENT ERROR=    .0


*** NORMAL END OF HEC-1 ***
Elapsed Time - 00:01:25.79   (85.79 Seconds)
NORMAL END OF HEC-1
```

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*            SEPTEMBER 1990            *
*             VERSION 4.0              *
*                                      *
*  RUN DATE  05/08/1991  TIME  14:02:53 *
*                                      *
****************************************
```

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

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

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

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

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

  1           ID           OUTFALL @ GRADE SEP. STRUCTURE
  2           ID           PEAK Q INCLUDES WESTCOR MALL
  3           ID           100 YR, 25 YR, & 10 YR 24-HR  Storm Distrib.
  4           ID                    COP 24-HR DISTRIB.(IN=30)
  5           IT      5                   289
  6           IO      5
  7           JR   PREC     1.0    .772    .626

  8           KK  NWMALL
  9           KM           NW MALL drainage
 10           IN     30
 11           PB   4.04
 12           PI    0.0     0.0     0.0     0.0     0.0     0.0     0.4     0.4     0.5     0.5
 13           PI    0.4     0.4     0.5     0.4     0.5     0.4     0.4     0.5     0.4     0.5
 14           PI    0.4     0.5     0.4     0.5     1.3     1.4     1.3     2.0     3.0    33.0
 15           PI   33.0     3.0     2.0     1.3     1.4     1.3     0.4     0.4     0.5     0.4
 16           PI    0.5     0.5     0.4     0.5     0.4     0.4     0.5     0.4     0.5     0.4
 17           PI    0.5     0.4     0.4     0.5     0.0     0.0     0.0     0.0     0.0     0.0
 18           BA   .106
 19           LS    .15      95            .25      91
 20           UK    250   .0150     .17      30
 21           UK    400   .0060     .17      70
 22           RK   4400    .003    .013    .106    CIRC     4.5             NO

 23           KK  NEMALL
 24           KM           NE MALL drainage
 25           BA   .188
 26           LS    .15      95            .25      91
 27           UK    250   .0150     .17      30
 28           UK    400   .0060     .17      70
 29           RK    860   .0082    .013    .027    CIRC     3.5
 30           RK   2400   .0055    .013    .188    CIRC       5             NO

 31           KK   1400
 32           HC      2

 33           KK   1255
 34           KM           route 1400 to 1200
 35           RK    500    .001    .013            CIRC     6.5

 36           KK    79N
 37           KM           Roadway drainage - 79th Ave north of Bell
 38           BA  .0184
 39           LS              95
 40           UK     35     .02     .10     100
 41           RK    500    .003    .017    .002    TRAP      70       3
 42           RK   5700   .0045    .013   .0184    CIRC     2.5             NO

 43           KK  BELLW
 44           KM           Roadway Drainage - Bell west of grade seperation structure
 45           BA  .0071
 46           LS              95
 47           UK     55     .02     .10     100
 48           RK    600    .003    .017    .004    TRAP      50       3
 49           RK   1300   .0016    .013   .0071    CIRC     2.5             NO
```

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

  50          KK    1300
  51          HC       2

  52          KK    1250
  53          KM           route 1300 to 1200
  54          RK     500  .0015    .013           CIRC       3

  55          KK   BELLC
  56          KM           Roadway Drainage - Bell east of grade seperation structure
  57          BA   .0083
  58          LS             95
  59          UK      55    .02      .1     100
  60          RK     700   .003    .017   .0028    TRAP      50       3
  61          RK    2100  .0030    .013   .0083    CIRC     2.5             NO

  62          KK    1200
  63          HC       3

  64          KK    1150
  65          KM           route 1200 to 1100
  66          RK    1250   .003    .013           CIRC       7

  67          KK  PWRCTR
  68          KM           Power Center Shopping
  69          BA    .057
  70          LS     .15     95             .25      91
  71          UK     250  .0150     .17      30
  72          UK     400  .0060     .17      70
  73          RK    2000   .001    .013    .057    CIRC       4             NO

  74          KK  PARADS
  75          KM           Roadway Drainage from Paradise Lane
  76          BA    .003
  77          LS             95
  78          UK      40    .02     .10     100
  79          RK    1000   .005    .013    .003    CIRC     2.5             NO

  80          KK    1100
  81          KM           combine 1200 w/ PWRCTR & PARADS
  82          HC       3

  83          KK    1000
  84          KM           Route to Outfall
  85          RK    1850   .003    .013           CIRC       7
  86          ZZ
```

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*           SEPTEMBER 1990             *
*            VERSION 4.0               *
*                                      *
* RUN DATE  05/08/1991  TIME  14:02:53 *
*                                      *
****************************************
```

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

```
                    OUTFALL @ GRADE SEP. STRUCTURE
                    PEAK Q INCLUDES WESTCOR MALL
                    100 YR, 25 YR, & 10 YR 24-HR  Storm Distrib.
                            COP 24-HR DISTRIB.(IN=30)

  6 IO        OUTPUT CONTROL VARIABLES
                  IPRNT          5  PRINT CONTROL
                  IPLOT          0  PLOT CONTROL
                  QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT         HYDROGRAPH TIME DATA
                   NMIN          5  MINUTES IN COMPUTATION INTERVAL
                  IDATE      1   0  STARTING DATE
                  ITIME       0000  STARTING TIME
                     NQ        289  NUMBER OF HYDROGRAPH ORDINATES
                 NDDATE      2   0  ENDING DATE
                 NDTIME       0000  ENDING TIME
                  ICENT         19  CENTURY MARK

              COMPUTATION INTERVAL     .08 HOURS
                   TOTAL TIME BASE   24.00 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

   JP         MULTI-PLAN OPTION
                  NPLAN          1  NUMBER OF PLANS

   JR         MULTI-RATIO OPTION
                RATIOS OF PRECIPITATION
               1.00       .77       .63
```

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1	RATIO 2	RATIO 3
					1.00	.77	.63
HYDROGRAPH AT	NWMALL	.11	1	FLOW	172.	126.	96.
				TIME	15.50	15.50	15.50
HYDROGRAPH AT	NEMALL	.19	1	FLOW	306.	227.	173.
				TIME	15.50	15.50	15.50
2 COMBINED AT	1400	.29	1	FLOW	478.	353.	268.
				TIME	15.50	15.50	15.50
ROUTED TO	1255	.29	1	FLOW	478.	352.	266.
				TIME	15.50	15.50	15.50
HYDROGRAPH AT	79N	.02	1	FLOW	32.	24.	19.
				TIME	15.50	15.50	15.50
HYDROGRAPH AT	BELLW	.01	1	FLOW	12.	9.	7.
				TIME	15.50	15.50	15.50
2 COMBINED AT	1300	.03	1	FLOW	44.	33.	27.
				TIME	15.50	15.50	15.50
ROUTED TO	1250	.03	1	FLOW	44.	33.	27.
				TIME	15.50	15.50	15.50
HYDROGRAPH AT	BELLC	.01	1	FLOW	14.	11.	9.
				TIME	15.50	15.50	15.50
3 COMBINED AT	1200	.33	1	FLOW	536.	396.	302.
				TIME	15.50	15.50	15.50
ROUTED TO	1150	.33	1	FLOW	536.	395.	298.
				TIME	15.50	15.50	15.50
HYDROGRAPH AT	PWRCTR	.06	1	FLOW	93.	68.	52.
				TIME	15.50	15.50	15.50
HYDROGRAPH AT	PARADS	.00	1	FLOW	5.	4.	3.
				TIME	15.42	15.42	15.42
3 COMBINED AT	1100	.39	1	FLOW	633.	467.	353.
				TIME	15.50	15.50	15.50
ROUTED TO	1000	.39	1	FLOW	632.	463.	347.
				TIME	15.50	15.50	15.50

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	INTERPOLATED TO COMPUTATION INTERVAL DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)
FOR PLAN = 1 RATIO= 1.00									
NWMALL	MANE	2.09	172.41	927.91	3.06	5.00	172.04	930.00	3.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1770E+02 OUTFLOW= .1730E+02 BASIN STORAGE= .3719E+00 PERCENT ERROR= .2

FOR PLAN = 1 RATIO= 1.00									
NWMALL	MANE	2.09	172.41	927.91	3.06	5.00	172.04	930.00	3.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1770E+02 OUTFLOW= .1730E+02 BASIN STORAGE= .3719E+00 PERCENT ERROR= .2

FOR PLAN = 1 RATIO= .77									
NWMALL	MANE	2.21	126.47	928.90	2.19	5.00	126.43	930.00	2.18

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1272E+02 OUTFLOW= .1236E+02 BASIN STORAGE= .3270E+00 PERCENT ERROR= .2

FOR PLAN = 1 RATIO= .63									
NWMALL	MANE	2.36	95.69	932.20	1.65	5.00	95.65	930.00	1.64

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9593E+01 OUTFLOW= .9303E+01 BASIN STORAGE= .2640E+00 PERCENT ERROR= .3

FOR PLAN = 1 RATIO= 1.00									
NEMALL	MANE	.89	307.47	928.88	3.06	5.00	306.26	930.00	3.07

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3140E+02 OUTFLOW= .3069E+02 BASIN STORAGE= .1076E+00 PERCENT ERROR= 1.9

FOR PLAN = 1 RATIO= 1.00									
NEMALL	MANE	.89	307.47	928.88	3.06	5.00	306.26	930.00	3.07

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3140E+02 OUTFLOW= .3069E+02 BASIN STORAGE= .1076E+00 PERCENT ERROR= 1.9

FOR PLAN = 1 RATIO= .77									
NEMALL	MANE	.96	227.07	930.27	2.19	5.00	226.99	930.00	2.19

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2256E+02 OUTFLOW= .2192E+02 BASIN STORAGE= .1028E+00 PERCENT ERROR= 2.4

FOR PLAN = 1 RATIO= .63									
NEMALL	MANE	.87	173.18	930.67	1.65	5.00	172.79	930.00	1.65

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1701E+02 OUTFLOW= .1651E+02 BASIN STORAGE= .7878E-01 PERCENT ERROR= 2.5

```
FOR PLAN = 1  RATIO= 1.00
    1255  MANE        .34    478.07    930.08      3.06      5.00    478.04    930.00        3.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4805E+02 EXCESS= .0000E+00 OUTFLOW= .4804E+02 BASIN STORAGE= .1165E-01 PERCENT ERROR=    .0

FOR PLAN = 1  RATIO=  .77
    1255  MANE        .45    352.58    930.24      2.18      5.00    352.27    930.00        2.19

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3427E+02 EXCESS= .0000E+00 OUTFLOW= .3426E+02 BASIN STORAGE= .1068E-01 PERCENT ERROR=    .0

FOR PLAN = 1  RATIO=  .63
    1255  MANE        .38    268.08    930.77      1.65      5.00    266.49    930.00        1.65

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2583E+02 EXCESS= .0000E+00 OUTFLOW= .2583E+02 BASIN STORAGE= .7952E-02 PERCENT ERROR=    .0

FOR PLAN = 1  RATIO= 1.00
     79N  MANE       3.55     31.67    929.97      3.43      5.00     31.66    930.00        3.43

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3406E+01 OUTFLOW= .3369E+01 BASIN STORAGE= .2357E-01 PERCENT ERROR=    .4

FOR PLAN = 1  RATIO= 1.00
     79N  MANE       3.55     31.67    929.97      3.43      5.00     31.66    930.00        3.43

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3406E+01 OUTFLOW= .3369E+01 BASIN STORAGE= .2357E-01 PERCENT ERROR=    .4

FOR PLAN = 1  RATIO=  .77
     79N  MANE       3.74     24.04    930.84      2.53      5.00     24.04    930.00        2.53

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2518E+01 OUTFLOW= .2486E+01 BASIN STORAGE= .2162E-01 PERCENT ERROR=    .4

FOR PLAN = 1  RATIO=  .63
     79N  MANE       3.90     19.13    928.51      1.96      5.00     19.09    930.00        1.96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1954E+01 OUTFLOW= .1928E+01 BASIN STORAGE= .1784E-01 PERCENT ERROR=    .4

FOR PLAN = 1  RATIO= 1.00
   BELLW  MANE       1.53     12.26    928.50      3.44      5.00     12.25    930.00        3.44

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1314E+01 OUTFLOW= .1303E+01 BASIN STORAGE= .7885E-02 PERCENT ERROR=    .3

FOR PLAN = 1  RATIO= 1.00
   BELLW  MANE       1.53     12.26    928.50      3.44      5.00     12.25    930.00        3.44

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1314E+01 OUTFLOW= .1303E+01 BASIN STORAGE= .7885E-02 PERCENT ERROR=    .3

FOR PLAN = 1  RATIO=  .77
   BELLW  MANE       1.52      9.33    928.43      2.54      5.00      9.32    930.00        2.54
```

```
CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9714E+00 OUTFLOW= .9618E+00 BASIN STORAGE= .7129E-02 PERCENT ERROR=    .3

        FOR PLAN = 1  RATIO=  .63
           BELLW  MANE        1.72      7.44    930.23      1.97      5.00      7.44    930.00        1.97

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7540E+00 OUTFLOW= .7454E+00 BASIN STORAGE= .6025E-02 PERCENT ERROR=    .3

        FOR PLAN = 1  RATIO= 1.00
            1250  MANE         .57     43.89    930.20      3.43      5.00     43.89    930.00        3.43

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4669E+01 EXCESS= .0000E+00 OUTFLOW= .4668E+01 BASIN STORAGE= .1956E-02 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .77
            1250  MANE         .51     33.34    930.60      2.53      5.00     33.33    930.00        2.53

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3443E+01 EXCESS= .0000E+00 OUTFLOW= .3442E+01 BASIN STORAGE= .1574E-02 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .63
            1250  MANE         .56     26.51    930.49      1.96      5.00     26.50    930.00        1.96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2670E+01 EXCESS= .0000E+00 OUTFLOW= .2669E+01 BASIN STORAGE= .1314E-02 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO= 1.00
           BELLC  MANE        1.75     14.31    929.49      3.43      5.00     14.29    930.00        3.43

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1536E+01 OUTFLOW= .1520E+01 BASIN STORAGE= .1022E-01 PERCENT ERROR=    .4

        FOR PLAN = 1  RATIO= 1.00
           BELLC  MANE        1.75     14.31    929.49      3.43      5.00     14.29    930.00        3.43

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1536E+01 OUTFLOW= .1520E+01 BASIN STORAGE= .1022E-01 PERCENT ERROR=    .4

        FOR PLAN = 1  RATIO=  .77
           BELLC  MANE        1.95     10.88    928.72      2.54      5.00     10.87    930.00        2.53

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1136E+01 OUTFLOW= .1123E+01 BASIN STORAGE= .8117E-02 PERCENT ERROR=    .4

        FOR PLAN = 1  RATIO=  .63
           BELLC  MANE        2.03      8.67    929.43      1.96      5.00      8.66    930.00        1.96

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .8815E+00 OUTFLOW= .8696E+00 BASIN STORAGE= .7548E-02 PERCENT ERROR=    .5

        FOR PLAN = 1  RATIO= 1.00
            1150  MANE         .49    535.88    930.43      3.10      5.00    535.60    930.00        3.10

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5425E+02 EXCESS= .0000E+00 OUTFLOW= .5423E+02 BASIN STORAGE= .2187E-01 PERCENT ERROR=    .0
```

```
FOR PLAN = 1  RATIO=  .77
   1150  MANE          .59    395.40    930.92      2.22      5.00    394.58    930.00        2.22

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3883E+02 EXCESS= .0000E+00 OUTFLOW= .3882E+02 BASIN STORAGE= .1875E-01 PERCENT ERROR=    .0

FOR PLAN = 1  RATIO=  .63
   1150  MANE          .66    300.62    931.15      1.68      5.00    298.18    930.00        1.68

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2937E+02 EXCESS= .0000E+00 OUTFLOW= .2936E+02 BASIN STORAGE= .1468E-01 PERCENT ERROR=    .0

FOR PLAN = 1  RATIO= 1.00
  PWRCTR  MANE         1.71     92.89    928.15      3.06      5.00     92.51    930.00        3.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9520E+01 OUTFLOW= .9307E+01 BASIN STORAGE= .1963E+00 PERCENT ERROR=    .2

FOR PLAN = 1  RATIO= 1.00
  PWRCTR  MANE         1.71     92.89    928.15      3.06      5.00     92.51    930.00        3.06

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9520E+01 OUTFLOW= .9307E+01 BASIN STORAGE= .1963E+00 PERCENT ERROR=    .2

FOR PLAN = 1  RATIO=  .77
  PWRCTR  MANE         1.89     68.44    929.32      2.19      5.00     68.27    930.00        2.19

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .6839E+01 OUTFLOW= .6649E+01 BASIN STORAGE= .1731E+00 PERCENT ERROR=    .2

FOR PLAN = 1  RATIO=  .63
  PWRCTR  MANE         1.91     51.87    931.10      1.65      5.00     51.74    930.00        1.64

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5158E+01 OUTFLOW= .5003E+01 BASIN STORAGE= .1404E+00 PERCENT ERROR=    .3

FOR PLAN = 1  RATIO= 1.00
  PARADS  MANE          .96      5.19    928.78      3.46      5.00      5.18    925.00        3.46

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5552E+00 OUTFLOW= .5532E+00 BASIN STORAGE= .1793E-02 PERCENT ERROR=    .0

FOR PLAN = 1  RATIO= 1.00
  PARADS  MANE          .96      5.19    928.78      3.46      5.00      5.18    925.00        3.46

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5552E+00 OUTFLOW= .5532E+00 BASIN STORAGE= .1793E-02 PERCENT ERROR=    .0

FOR PLAN = 1  RATIO=  .77
  PARADS  MANE          .93      3.96    928.94      2.55      5.00      3.95    925.00        2.55

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4105E+00 OUTFLOW= .4087E+00 BASIN STORAGE= .1359E-02 PERCENT ERROR=    .1

FOR PLAN = 1  RATIO=  .63
  PARADS  MANE         1.03      3.16    928.81      1.98      5.00      3.15    925.00        1.98
```

```
CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3186E+00 OUTFLOW= .3171E+00 BASIN STORAGE= .1333E-02 PERCENT ERROR=    .1

        FOR PLAN = 1  RATIO= 1.00
           1000  MANE          .81    632.13    930.39      3.10      5.00    631.79    930.00        3.10

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6411E+02 EXCESS= .0000E+00 OUTFLOW= .6408E+02 BASIN STORAGE= .3780E-01 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .77
           1000  MANE          .73    465.73    931.08      2.22      5.00    463.27    930.00        2.22

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4589E+02 EXCESS= .0000E+00 OUTFLOW= .4587E+02 BASIN STORAGE= .3184E-01 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .63
           1000  MANE          .89    351.76    931.55      1.68      5.00    346.58    930.00        1.68

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3469E+02 EXCESS= .0000E+00 OUTFLOW= .3467E+02 BASIN STORAGE= .2557E-01 PERCENT ERROR=    .0


*** NORMAL END OF HEC-1 ***
Elapsed Time - 00:01:52.59   (112.59 Seconds)
NORMAL END OF HEC-1
```

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*          SEPTEMBER 1990              *
*           VERSION 4.0                *
*                                      *
* RUN DATE  05/08/1991  TIME  13:59:56 *
*                                      *
****************************************
```

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

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

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

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

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

  1           ID           OUTFALL @ GRADE SEP. STRUCTURE
  2           ID           PEAK Q INCLUDES WESTCOR MALL
  3           ID           100 YR, 25 YR, & 10 YR 30-MIN Storm Distrib
  4           ID                    COP 24-HR DISTRIB.(MOD >> IN=.5)
  5           IT      5                   289
  6           IO      5
  7           JR   PREC     1.0    .762    .605

  8           KK  NWMALL
  9           KM           NW MALL drainage
 10           IN     .5
 11           PB   2.10
 12           PI    0.0     0.0     0.0     0.0     0.0     0.0     0.4     0.4     0.5     0.5
 13           PI    0.4     0.4     0.5     0.4     0.5     0.4     0.4     0.5     0.4     0.5
 14           PI    0.4     0.5     0.4     0.5     1.3     1.4     1.3     2.0     6.0    30.0
 15           PI   30.0     6.0     2.0     1.3     1.4     1.3     0.4     0.4     0.5     0.4
 16           PI    0.5     0.5     0.4     0.5     0.4     0.4     0.5     0.4     0.5     0.4
 17           PI    0.5     0.4     0.4     0.5     0.0     0.0     0.0     0.0     0.0     0.0
 18           BA   .106
 19           LS    .15      95            .25      91
 20           UK    250   .0150     .17      30
 21           UK    400   .0060     .17      70
 22           RK   4400    .003    .013    .106    CIRC     4.5             NO

 23           KK  NEMALL
 24           KM           NE MALL drainage
 25           BA   .188
 26           LS    .15      95            .25      91
 27           UK    250   .0150     .17      30
 28           UK    400   .0060     .17      70
 29           RK    860   .0082    .013    .027    CIRC     3.5
 30           RK   2400   .0055    .013    .188    CIRC       5             NO

 31           KK   1400
 32           HC      2

 33           KK   1255
 34           KM           route 1400 to 1200
 35           RK    500    .001    .013            CIRC     6.5

 36           KK    79N
 37           KM           Roadway drainage - 79th Ave north of Bell
 38           BA  .0184
 39           LS              95
 40           UK     35     .02     .10     100
 41           RK    500    .003    .017    .002    TRAP      70       3
 42           RK   5700   .0045    .013   .0184    CIRC     2.5             NO

 43           KK  BELLW
 44           KM           Roadway Drainage - Bell west of grade seperation structure
 45           BA  .0071
 46           LS              95
 47           UK     55     .02     .10     100
 48           RK    600    .003    .017    .004    TRAP      50       3
 49           RK   1300   .0016    .013   .0071    CIRC     2.5             NO
```

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

 50           KK    1300
 51           HC       2

 52           KK    1250
 53           KM            route 1300 to 1200
 54           RK     500   .0015    .013            CIRC       3

 55           KK   8ELLC
 56           KM            Roadway Drainage - Bell east of grade seperation structure
 57           BA   .0083
 58           LS              95
 59           UK      55     .02      .1     100
 60           RK     700    .003    .017   .0028    TRAP      50       3
 61           RK    2100   .0030    .013   .0083    CIRC     2.5             NO

 62           KK    1200
 63           HC       3

 64           KK    1150
 65           KM            route 1200 to 1100
 66           RK    1250    .003    .013            CIRC       7

 67           KK  PWRCTR
 68           KM            Power Center Shopping
 69           BA    .057
 70           LS     .15      95             .25      91
 71           UK     250   .0150     .17      30
 72           UK     400   .0060     .17      70
 73           RK    2000    .001    .013    .057    CIRC       4             NO

 74           KK  PARADS
 75           KM            Roadway Drainage from Paradise Lane
 76           BA    .003
 77           LS              95
 78           UK      40     .02     .10     100
 79           RK    1000    .005    .013    .003    CIRC     2.5             NO

 80           KK    1100
 81           KM            combine 1200 w/ PWRCTR & PARADS
 82           HC       3

 83           KK    1000
 84           KM            Route to Outfall
 85           RK    1850    .003    .013            CIRC       7
 86           ZZ
```

```
*                                    *                                    *                                    *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1) *                                    *  U.S. ARMY CORPS OF ENGINEERS      *
*          SEPTEMBER 1990            *                                    *  HYDROLOGIC ENGINEERING CENTER     *
*           VERSION 4.0              *                                    *        609 SECOND STREET           *
*                                    *                                    *     DAVIS, CALIFORNIA 95616        *
* RUN DATE  05/08/1991  TIME  13:59:56 *                                  *        (916) 756-1104              *
*                                    *                                    *                                    *
**************************************                                    **************************************
```

```
                              OUTFALL @ GRADE SEP. STRUCTURE
                              PEAK Q INCLUDES WESTCOR MALL
                              100 YR, 25 YR, & 10 YR 30-MIN Storm Distrib
                                       COP 24-HR DISTRIB.(MOD >> IN=.5)

  6 IO        OUTPUT CONTROL VARIABLES
                   IPRNT          5  PRINT CONTROL
                   IPLOT          0  PLOT CONTROL
                   QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT         HYDROGRAPH TIME DATA
                    NMIN          5  MINUTES IN COMPUTATION INTERVAL
                   IDATE      1    0  STARTING DATE
                   ITIME       0000  STARTING TIME
                      NQ        289  NUMBER OF HYDROGRAPH ORDINATES
                  NDDATE      2    0  ENDING DATE
                  NDTIME       0000  ENDING TIME
                   ICENT         19  CENTURY MARK

              COMPUTATION INTERVAL     .08 HOURS
                   TOTAL TIME BASE   24.00 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

   JP         MULTI-PLAN OPTION
                   NPLAN          1  NUMBER OF PLANS

   JR         MULTI-RATIO OPTION
                 RATIOS OF PRECIPITATION
               1.00       .76       .61
```

```
          PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                          FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                        TIME TO PEAK IN HOURS
```

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1	RATIO 2	RATIO 3
					1.00	.76	.61
HYDROGRAPH AT	NWMALL	.11	1	FLOW	116.	64.	36.
				TIME	2.75	2.75	2.83
HYDROGRAPH AT	NEMALL	.19	1	FLOW	218.	121.	67.
				TIME	2.67	2.75	2.75
2 COMBINED AT	1400	.29	1	FLOW	325.	185.	101.
				TIME	2.67	2.75	2.75
ROUTED TO	1255	.29	1	FLOW	318.	180.	100.
				TIME	2.75	2.75	2.83
HYDROGRAPH AT	79N	.02	1	FLOW	52.	33.	23.
				TIME	2.67	2.75	2.75
HYDROGRAPH AT	BELLW	.01	1	FLOW	24.	17.	13.
				TIME	2.58	2.67	2.67
2 COMBINED AT	1300	.03	1	FLOW	75.	46.	30.
				TIME	2.67	2.67	2.75
ROUTED TO	1250	.03	1	FLOW	70.	43.	30.
				TIME	2.67	2.75	2.75
HYDROGRAPH AT	BELLC	.01	1	FLOW	28.	19.	12.
				TIME	2.67	2.67	2.67
3 COMBINED AT	1200	.33	1	FLOW	405.	236.	137.
				TIME	2.67	2.75	2.75
ROUTED TO	1150	.33	1	FLOW	394.	229.	131.
				TIME	2.75	2.75	2.83
HYDROGRAPH AT	PWRCTR	.06	1	FLOW	62.	36.	20.
				TIME	2.67	2.75	2.83
HYDROGRAPH AT	PARADS	.00	1	FLOW	13.	9.	7.
				TIME	2.58	2.58	2.58
3 COMBINED AT	1100	.39	1	FLOW	458.	266.	151.
				TIME	2.75	2.75	2.83
ROUTED TO	1000	.39	1	FLOW	451.	248.	151.
				TIME	2.75	2.75	2.83

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO	VOLUME	DT	INTERPOLATED TO COMPUTATION INTERVAL PEAK	TIME TO	VOLUME

```
                                        PEAK                                PEAK

                          (MIN)    (CFS)     (MIN)    (IN)    (MIN)    (CFS)    (MIN)     (IN)

        FOR PLAN = 1  RATIO= 1.00
          NWMALL  MANE       2.29   119.90   163.29    1.28     5.00   116.31   165.00     1.28

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7374E+01 OUTFLOW= .7257E+01 BASIN STORAGE= .9680E-02 PERCENT ERROR=   1.5

        FOR PLAN = 1  RATIO= 1.00
          NWMALL  MANE       2.29   119.90   163.29    1.28     5.00   116.31   165.00     1.28

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7374E+01 OUTFLOW= .7257E+01 BASIN STORAGE= .9680E-02 PERCENT ERROR=   1.5

        FOR PLAN = 1  RATIO=  .76
          NWMALL  MANE       2.63    65.18   166.81     .85     5.00    64.34   165.00      .85

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4888E+01 OUTFLOW= .4805E+01 BASIN STORAGE= .1104E-01 PERCENT ERROR=   1.5

        FOR PLAN = 1  RATIO=  .61
          NWMALL  MANE       2.88    36.38   170.38     .58     5.00    36.36   170.00      .58

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3344E+01 OUTFLOW= .3291E+01 BASIN STORAGE= .9911E-02 PERCENT ERROR=   1.3

        FOR PLAN = 1  RATIO= 1.00
          NEMALL  MANE        .94   220.07   161.30    1.28     5.00   218.14   160.00     1.29

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1308E+02 OUTFLOW= .1288E+02 BASIN STORAGE= .2723E-02 PERCENT ERROR=   1.5

        FOR PLAN = 1  RATIO= 1.00
          NEMALL  MANE        .84   220.07   161.30    1.28     5.00   218.14   160.00     1.29

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1308E+02 OUTFLOW= .1288E+02 BASIN STORAGE= .2723E-02 PERCENT ERROR=   1.5

        FOR PLAN = 1  RATIO=  .76
          NEMALL  MANE        .98   121.56   164.36     .85     5.00   120.60   165.00      .85

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .8670E+01 OUTFLOW= .8527E+01 BASIN STORAGE= .3057E-02 PERCENT ERROR=   1.6

        FOR PLAN = 1  RATIO=  .61
          NEMALL  MANE       1.12    68.20   166.33     .58     5.00    67.09   165.00      .58

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5930E+01 OUTFLOW= .5840E+01 BASIN STORAGE= .2808E-02 PERCENT ERROR=   1.5

        FOR PLAN = 1  RATIO= 1.00
             1255  MANE        .41   324.16   160.81    1.29     5.00   317.85   165.00     1.29

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2016E+02 EXCESS= .0000E+00 OUTFLOW= .2016E+02 BASIN STORAGE= .1620E-03 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .76
             1255  MANE        .42   183.89   165.71     .85     5.00   180.49   165.00      .85
```

```
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1333E+02 EXCESS= .0000E+00 OUTFLOW= .1333E+02 BASIN STORAGE= .1709E-03 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .61
           1255  MANE          .49    101.04    166.35      .58      5.00     99.61    170.00        .58

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9122E+01 EXCESS= .0000E+00 OUTFLOW= .9122E+01 BASIN STORAGE= .1571E-03 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO= 1.00
            79N  MANE         2.03     54.42    161.88     1.57      5.00     52.07    160.00       1.57

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1549E+01 OUTFLOW= .1537E+01 BASIN STORAGE= .6867E-04 PERCENT ERROR=    .8

        FOR PLAN = 1  RATIO= 1.00
            79N  MANE         2.03     54.42    161.88     1.57      5.00     52.07    160.00       1.57

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1549E+01 OUTFLOW= .1537E+01 BASIN STORAGE= .6867E-04 PERCENT ERROR=    .8

        FOR PLAN = 1  RATIO=  .76
            79N  MANE         2.16     34.59    162.99     1.09      5.00     33.37    165.00       1.10

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1085E+01 OUTFLOW= .1073E+01 BASIN STORAGE= .5425E-04 PERCENT ERROR=   1.1

        FOR PLAN = 1  RATIO=  .61
            79N  MANE         2.31     22.75    166.02      .79      5.00     22.50    165.00        .79

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7876E+00 OUTFLOW= .7782E+00 BASIN STORAGE= .6173E-04 PERCENT ERROR=   1.2

        FOR PLAN = 1  RATIO= 1.00
           BELLW  MANE        1.34     28.14    157.00     1.57      5.00     23.69    155.00       1.57

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5976E+00 OUTFLOW= .5956E+00 BASIN STORAGE= .1922E-04 PERCENT ERROR=    .3

        FOR PLAN = 1  RATIO= 1.00
           BELLW  MANE        1.34     28.14    157.00     1.57      5.00     23.69    155.00       1.57

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5976E+00 OUTFLOW= .5956E+00 BASIN STORAGE= .1922E-04 PERCENT ERROR=    .3

        FOR PLAN = 1  RATIO=  .76
           BELLW  MANE        1.47     18.96    158.06     1.10      5.00     17.12    160.00       1.10

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4187E+00 OUTFLOW= .4153E+00 BASIN STORAGE= .1865E-04 PERCENT ERROR=    .8

        FOR PLAN = 1  RATIO=  .61
           BELLW  MANE        1.58     12.88    159.54      .80      5.00     12.57    160.00        .79

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3039E+00 OUTFLOW= .3016E+00 BASIN STORAGE= .2001E-04 PERCENT ERROR=    .8

        FOR PLAN = 1  RATIO= 1.00
```

```
     1250  MANE          .43     73.72    160.68      1.57      5.00     70.33    160.00        1.58

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2134E+01 EXCESS= .0000E+00 OUTFLOW= .2136E+01 BASIN STORAGE= .2058E-05 PERCENT ERROR=   -.1

   FOR PLAN = 1  RATIO=  .76
     1250  MANE          .58     45.60    161.04      1.10      5.00     42.73    165.00        1.10

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1490E+01 EXCESS= .0000E+00 OUTFLOW= .1491E+01 BASIN STORAGE= .2053E-05 PERCENT ERROR=   -.1

   FOR PLAN = 1  RATIO=  .61
     1250  MANE          .63     29.64    165.59       .79      5.00     29.57    165.00         .80

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1078E+01 EXCESS= .0000E+00 OUTFLOW= .1079E+01 BASIN STORAGE= .1943E-05 PERCENT ERROR=   -.1

   FOR PLAN = 1  RATIO= 1.00
     BELLC  MANE         1.56     29.73    158.28      1.57      5.00     28.13    160.00        1.57

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .6986E+00 OUTFLOW= .6945E+00 BASIN STORAGE= .2781E-04 PERCENT ERROR=    .6

   FOR PLAN = 1  RATIO= 1.00
     BELLC  MANE         1.56     29.73    158.28      1.57      5.00     28.13    160.00        1.57

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .6986E+00 OUTFLOW= .6945E+00 BASIN STORAGE= .2781E-04 PERCENT ERROR=    .6

   FOR PLAN = 1  RATIO=  .76
     BELLC  MANE         1.72     18.99    160.10      1.09      5.00     18.80    160.00        1.09

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4894E+00 OUTFLOW= .4841E+00 BASIN STORAGE= .3109E-04 PERCENT ERROR=   1.1

   FOR PLAN = 1  RATIO=  .61
     BELLC  MANE         1.83     12.67    162.16       .80      5.00     11.87    160.00         .80

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3553E+00 OUTFLOW= .3524E+00 BASIN STORAGE= .3401E-04 PERCENT ERROR=    .8

   FOR PLAN = 1  RATIO= 1.00
     1150  MANE          .62    403.62    161.50      1.32      5.00    394.23    165.00        1.32

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2303E+02 EXCESS= .0000E+00 OUTFLOW= .2303E+02 BASIN STORAGE= .2667E-03 PERCENT ERROR=    .0

   FOR PLAN = 1  RATIO=  .76
     1150  MANE          .58    234.40    165.94       .88      5.00    228.86    165.00         .88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1533E+02 EXCESS= .0000E+00 OUTFLOW= .1533E+02 BASIN STORAGE= .2771E-03 PERCENT ERROR=    .0

   FOR PLAN = 1  RATIO=  .61
     1150  MANE          .70    136.85    166.50       .60      5.00    130.68    170.00         .61

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1057E+02 EXCESS= .0000E+00 OUTFLOW= .1057E+02 BASIN STORAGE= .2556E-03 PERCENT ERROR=    .0

   FOR PLAN = 1  RATIO= 1.00
     DWRCTD  MANE         1.87     65.00    161.82      1.20      5.00     62.28    160.00        1.20
```

```
PWRCTR  MANE        1.87     65.09    161.82      1.29      5.00     62.28    160.00        1.29

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3966E+01 OUTFLOW= .3907E+01 BASIN STORAGE= .5165E-02 PERCENT ERROR=   1.4

        FOR PLAN = 1  RATIO= 1.00
          PWRCTR  MANE        1.87     65.09    161.82      1.29      5.00     62.28    160.00        1.29

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3966E+01 OUTFLOW= .3907E+01 BASIN STORAGE= .5165E-02 PERCENT ERROR=   1.4

        FOR PLAN = 1  RATIO=  .76
          PWRCTR  MANE        2.11     35.63    164.16       .85      5.00     35.53    165.00         .85

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2629E+01 OUTFLOW= .2586E+01 BASIN STORAGE= .5893E-02 PERCENT ERROR=   1.4

        FOR PLAN = 1  RATIO=  .61
          PWRCTR  MANE        2.25     19.89    167.61       .58      5.00     19.57    170.00         .58

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1798E+01 OUTFLOW= .1770E+01 BASIN STORAGE= .5288E-02 PERCENT ERROR=   1.2

        FOR PLAN = 1  RATIO= 1.00
          PARADS  MANE         .72     13.21    154.42      1.57      5.00     13.21    155.00        1.62

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2525E+00 OUTFLOW= .2520E+00 BASIN STORAGE= .2449E-05 PERCENT ERROR=    .2

        FOR PLAN = 1  RATIO= 1.00
          PARADS  MANE         .72     13.21    154.42      1.57      5.00     13.21    155.00        1.62

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2525E+00 OUTFLOW= .2520E+00 BASIN STORAGE= .2449E-05 PERCENT ERROR=    .2

        FOR PLAN = 1  RATIO=  .76
          PARADS  MANE         .73      9.50    154.58      1.10      5.00      9.49    155.00        1.13

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1769E+00 OUTFLOW= .1765E+00 BASIN STORAGE= .2355E-05 PERCENT ERROR=    .2

        FOR PLAN = 1  RATIO=  .61
          PARADS  MANE         .83      7.05    154.87       .80      5.00      7.03    155.00         .81

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1284E+00 OUTFLOW= .1281E+00 BASIN STORAGE= .2490E-05 PERCENT ERROR=    .3

        FOR PLAN = 1  RATIO= 1.00
             1000  MANE         .81    454.80    166.29      1.32      5.00    451.41    165.00        1.32

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2724E+02 EXCESS= .0000E+00 OUTFLOW= .2725E+02 BASIN STORAGE= .4710E-03 PERCENT ERROR=    .0

        FOR PLAN = 1  RATIO=  .76
             1000  MANE         .84    262.44    167.19       .88      5.00    248.27    165.00         .88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1812E+02 EXCESS= .0000E+00 OUTFLOW= .1813E+02 BASIN STORAGE= .4787E-03 PERCENT ERROR=    .0
```

```
FOR PLAN = 1  RATIO=  .61
    1000  MANE          .97    150.78    170.37       .60      5.00    150.77    170.00        .60

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1248E+02 EXCESS= .0000E+00 OUTFLOW= .1248E+02 BASIN STORAGE= .4487E-03 PERCENT ERROR=    .0


*** NORMAL END OF HEC-1 ***
Elapsed Time - 00:01:23.71   (83.71 Seconds)
NORMAL END OF HEC-1
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APPENDIX 3

CATCH BASIN INLET CAPACITY/SIZE DETERMINATIONS

BELL RD 14-May-91 file=cbdater1.wk1 dsgn: chkd:

INPUT @NODE	CB#	INLET STATION	BEGIN STA	END STA	LENGTH (ft)	PVMT WIDTH	OFFSITE WIDTH	PVMT AREA	OFFSITE AREA	CA	Q tot (cfs)
(TRNK1)		83RD TO ADOT BOX CULVERT									
A8	4	STA.395+70	39740	39570	170	75	20	0.29	0.08	0.31	1.33
A9	5	STA.395+70	39740	39570	170	52	20	0.20	0.08	0.23	0.99
A8	3	STA.394+70	39570	39470	100	75	20	0.17	0.05	0.18	0.78
A5	2	STA.392+60	39275	38560	715	62	20	1.02	0.33	1.11	4.79
A5	1	STA.391+80	39275	38424	851	59	20	1.15	0.39	1.27	5.47
(TRNK2)		83RD TO TRAMWAY									
C5	6	STA.404+71	40722	39740	982	52	25	1.17	0.56	1.39	5.99
B4	7	STA.404+79	40722	39740	982	52	25	1.17	0.56	1.39	5.99
C3	8	STA.406+10	41133	40722	411	67	25	0.63	0.24	0.71	3.06
B3	9	STA.406+10	41133	40722	411	52	25	0.49	0.24	0.58	2.51
(TRNK2)		75TH TO TRAMWAY									
E6	14	STA.421+66	43300	41365	1935	56	30	1.72	0.92	2.10	9.01
D5	15	STA.421+64	43300	42135	1165	56	30	1.50	0.80	1.83	7.87
E4	12	STA.419+65	42060	41700	360	50	36	0.41	0.30	0.55	2.37
D4	13	STA.419+65	41965	41700	265	75	18	0.46	0.11	0.48	2.05
E2	10	STA.414+00	41700	41143	557	52	45	0.66	0.58	0.94	4.06
D2	11	STA.414+00	41700	41133	567	52	45	0.68	0.59	0.96	4.13
(TRNK3)		SKUNK BRIDGE TO 75TH									
C4	22	STA.450+95	45397	45095	302	46	0	0.32	0.00	0.29	1.23
C3	20	STA.447+75	45095	44775	320	48	20	0.35	0.15	0.41	1.74
B7	21	STA.447+75	45323	44775	548	40	30	0.50	0.38	0.68	2.92
D3	18	STA.438+45	44775	43845	930	40	32	0.85	0.68	1.18	5.07
D2	16	STA.434+60	43845	43460	385	76	20	0.67	0.18	0.71	3.06
B4	19	STA.442+00	44775	43800	975	40	32	0.90	0.72	1.24	5.31
B2	17	STA.437+45	44180	43745	435	52	32	0.52	0.32	0.66	2.83
(TRNK4)		SKUNK BRIDGE EAST									
A13	NA	STA.481+00	48651	48100	551	40	25	0.51	0.32	0.65	2.77
A13	NA	STA.481+00	48651	48100	551	40	25	0.51	0.32	0.65	2.77
A11	27	STA.474+10	48100	47410	690	40	25	0.63	0.40	0.81	3.47
A10	26	STA.474+10	48100	47410	690	40	25	0.63	0.40	0.81	3.47
A6	25	STA.463+90	47390	46390	1000	40	25	0.92	0.57	1.17	5.03
A6	28	STA.463+90	47390	46390	1000	40	25	0.92	0.57	1.17	5.03
A4	23	STA.461+00	46390	45724	666	40	25	0.61	0.38	0.78	3.35
A5	24	STA.461+50	46390	45650	740	40	10	0.68	0.17	0.71	3.07

NOTES

C_Offsite	C(o/s)	0.6
C_Pavement	C(pvmt)	0.9
Intensity(in/hr)	I(10)	4.3

GUTTER SPREAD CALCULATIONS*

Inlet #	Inlet Station	Q (cfs)	S_x (ft/ft)	S_o (ft/ft)	T_{actual} (ft)	$T_{allowable}$ (ft)
4	395+70	1.33	0.015	0.0031	13.5	28.5
5	395+70	0.99	0.015	0.0021	11.5	
3	394+70	0.78	0.010	0.0020	13.5	
2	392+60	4.79	0.015	0.0028	20.0	
1	391+80	5.47	0.020	0.0032	17.0	
6	404+71	5.99	0.020	0.0054	15.0	
7	404+79	5.99	0.020	0.0048	16.5	
8	408+10	3.06	0.020	0.0021	15.0	
9	408+10	2.51	0.020	0.0021	14.0	
14	421+86	9.01	0.020	0.0042	19.0	
15	421+84	7.87	0.020	0.0041	18.0	
12	419+65	2.37	0.020	0.0022	13.0	
13	419+65	2.05	0.010	0.0023	20.0	
10	414+00	4.06	0.020	0.0030	15.0	
11	414+00	4.13	0.020	0.0030	15.0	
22	450+95	1.23	0.020	0.0021	10.0	16.5
20	447+75	1.74	0.010	0.0150	12.5	
21	447+75	2.92	0.020	0.0153	10.0	
18	437+85	5.07	0.020	0.0056	14.5	
16	434+60	3.06	0.010	0.0023	22.5	28.5
19	442+00	5.31	0.020	0.0046	16.0	16.5
17	437+45	2.83	0.015	0.0024	16.5	
NA	481+00	2.77	NA	0.0070		
NA	481+00	2.77	NA	0.0070		
27	474+10	3.47	0.015	0.0070	14.5	
28	474+10	3.47	0.020	0.0071	12.5	
25	463+90	5.03	0.020	0.0030	16.5	
26	463+90	5.03	0.020	0.0037	15.5	
23	461+00	3.35	0.020	0.0030	14.0	
24	461+50	3.07	0.020	0.0038	13.0	

* FHWA HEC-12, Chart 3

Dsn: CMG 5/9/91
Chkd: BPL 5/30/91

CATCH BASINS ON A CONTINUOUS GRADE (HEC-12)

Input Node	Inlet #	Inlet Station	T	E_o	S_o	S_x	S_E	Q (cfs)	Depth (ft)	L_T (ft)
A8	4	395+70	13.5	0.32	0.0031	0.015	0.033	1.33	0.37	16.3
A9	5	395+70	11.5	0.37	0.0021	0.015	0.036	0.99	0.34	11.0
A8	3	394+70	13.5	0.36	0.0020	0.010	0.030	0.78	0.30	11.3
C3	8	408+10	15.0	0.28	0.0021	0.020	0.036	3.06	0.47	18.1
B3	9	408+10	14.0	0.30	0.0021	0.020	0.037	2.51	0.45	16.3
D4	13	419+65	20.0	0.25	0.0023	0.010	0.024	2.16	0.37	19.4
C4	22	451+00	10.0	0.39	0.0021	0.020	0.042	1.23	0.36	11.0
C3	20	447+75	12.5	0.36	0.0150	0.010	0.030	1.74	0.29	25.0
B7	21	447+75	10.0	0.39	0.0153	0.020	0.042	2.92	0.37	25.0
D3	18	438+45	14.5	0.28	0.0056	0.020	0.036	5.07	0.47	28.8
B4	19	442+00	16.0	0.26	0.0046	0.020	0.034	5.31	0.49	28.8
B2	17	437+45	16.5	0.28	0.0024	0.020	0.036	2.83	0.50	18.1
D2	16	434+60	22.5	0.22	0.0023	0.010	0.022	3.06	0.35	21.9
A11	27	474+10	14.5	0.24	0.0070	0.015	0.031	3.41	0.30	28.1
A10	28	474+10	12.5	0.34	0.0071	0.020	0.039	3.47	0.33	24.4
A6	25	463+90	16.5	0.29	0.0030	0.020	0.036	5.03	0.50	23.1
A6	26	463+90	15.5	0.29	0.0037	0.020	0.036	5.03	0.48	25.6

$n = 0.016$

$D = \text{depth} = TS_x + 2/12$

E_o = ratio of flow in the depressed section to total gutter flow

S_o = street slope in direction of flow

S_x = street cross-slope

$S_E = S_x + S_w' E_o$ $\qquad S_w' = 1''/18'' = 0.056$

S_w' = cross-slope of the gutter measured from the cross-slope of the pavement S_x

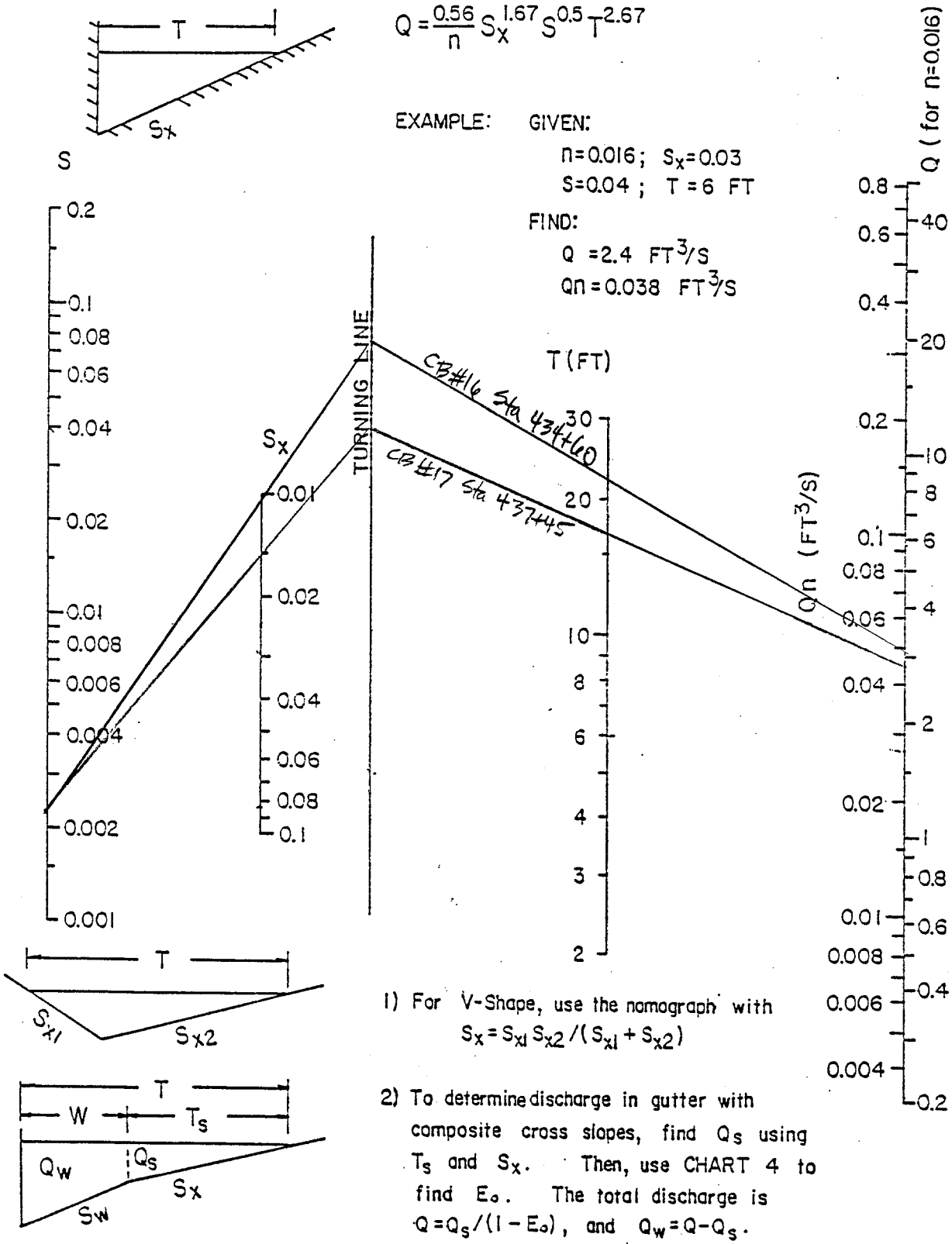
Q = design discharge (cfs)

L_T = required length of curb opening for 100% interception, includes 25% clogging factor

L = length of curb opening provided (ft)

Dan: CMF 5/6/91

AKD: BRR 5/15/91



$$Q = \frac{0.56}{n} S_x^{1.67} S^{0.5} T^{2.67}$$

EXAMPLE: GIVEN:

$n = 0.016$; $S_x = 0.03$

$S = 0.04$; $T = 6$ FT

FIND:

$Q = 2.4$ FT^3/S

$Qn = 0.038$ FT^3/S

1) For V-Shape, use the nomograph with $S_x = S_{x1} S_{x2} / (S_{x1} + S_{x2})$

2) To determine discharge in gutter with composite cross slopes, find Q_s using T_s and S_x. Then, use CHART 4 to find E_o. The total discharge is $Q = Q_s / (1 - E_o)$, and $Q_w = Q - Q_s$.

CHART 3. Flow in triangular gutter sections.

Dsn: CMG 5/9/91

Inlet #16 - Station 434+60
$W/T = 1.5/22.5 = 0.067$
$S_w/S_x = 0.056/0.01 = 5.5$
$E_o \approx 0.22$

Inlet #17 sta 437+45
$W/T = 1.5/16.5 = 0.09$
$S_w/S_x = 0.056/0.02 = 2.8$
$E_o = 0.28$

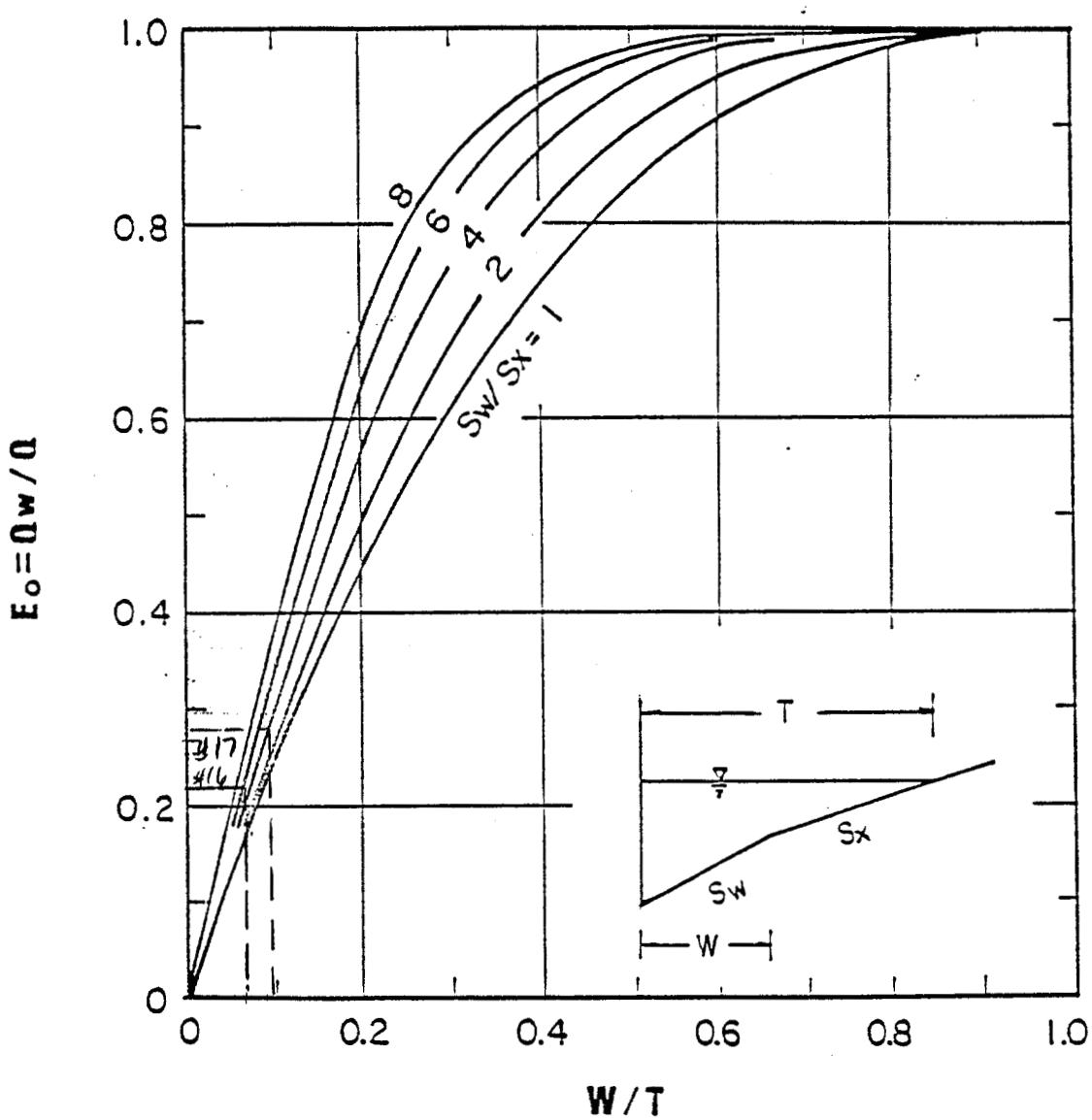


CHART 4. Ratio of frontal flow to total gutter flow.

Dsn: CMG 5/9/91

CB#16 & #17

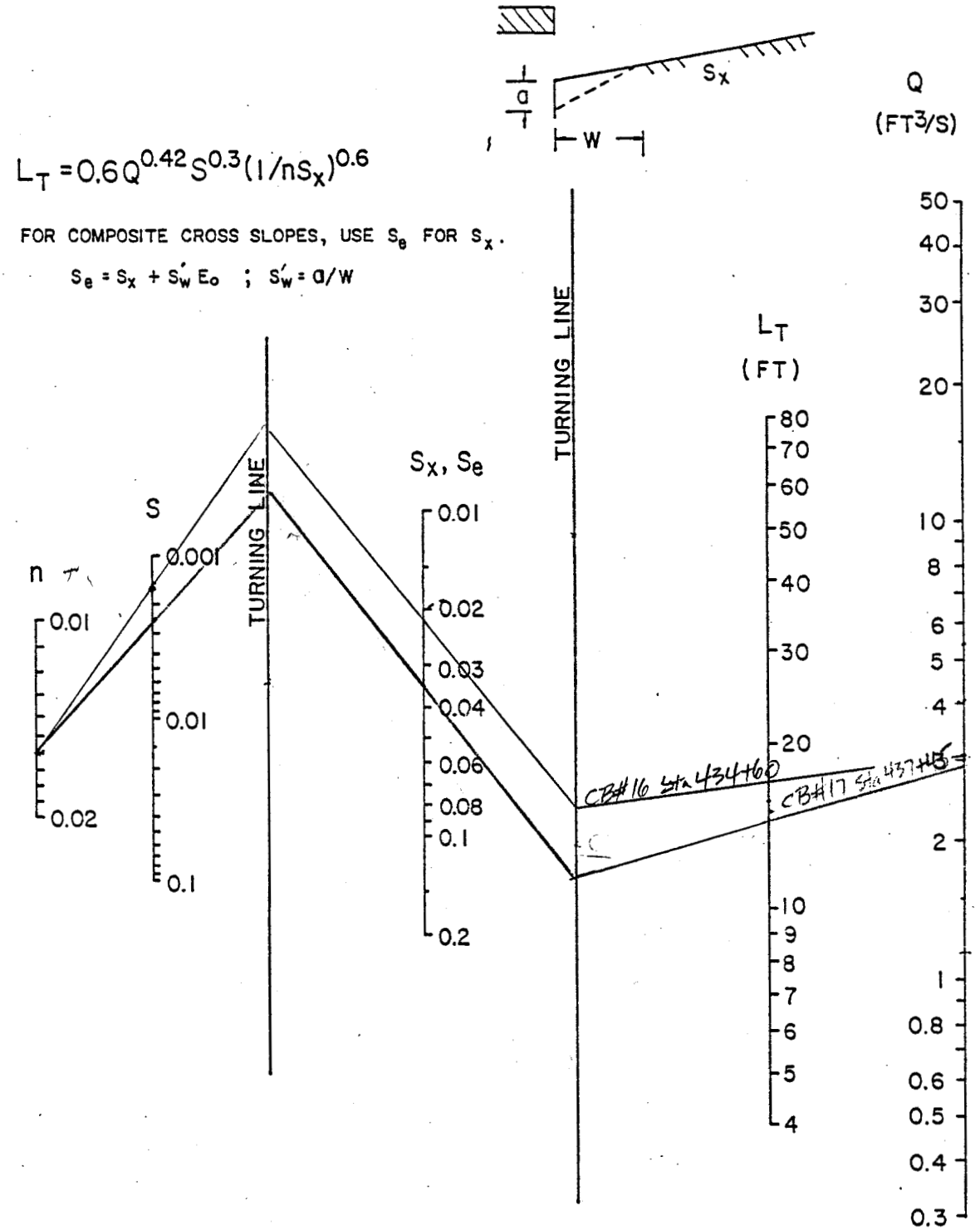
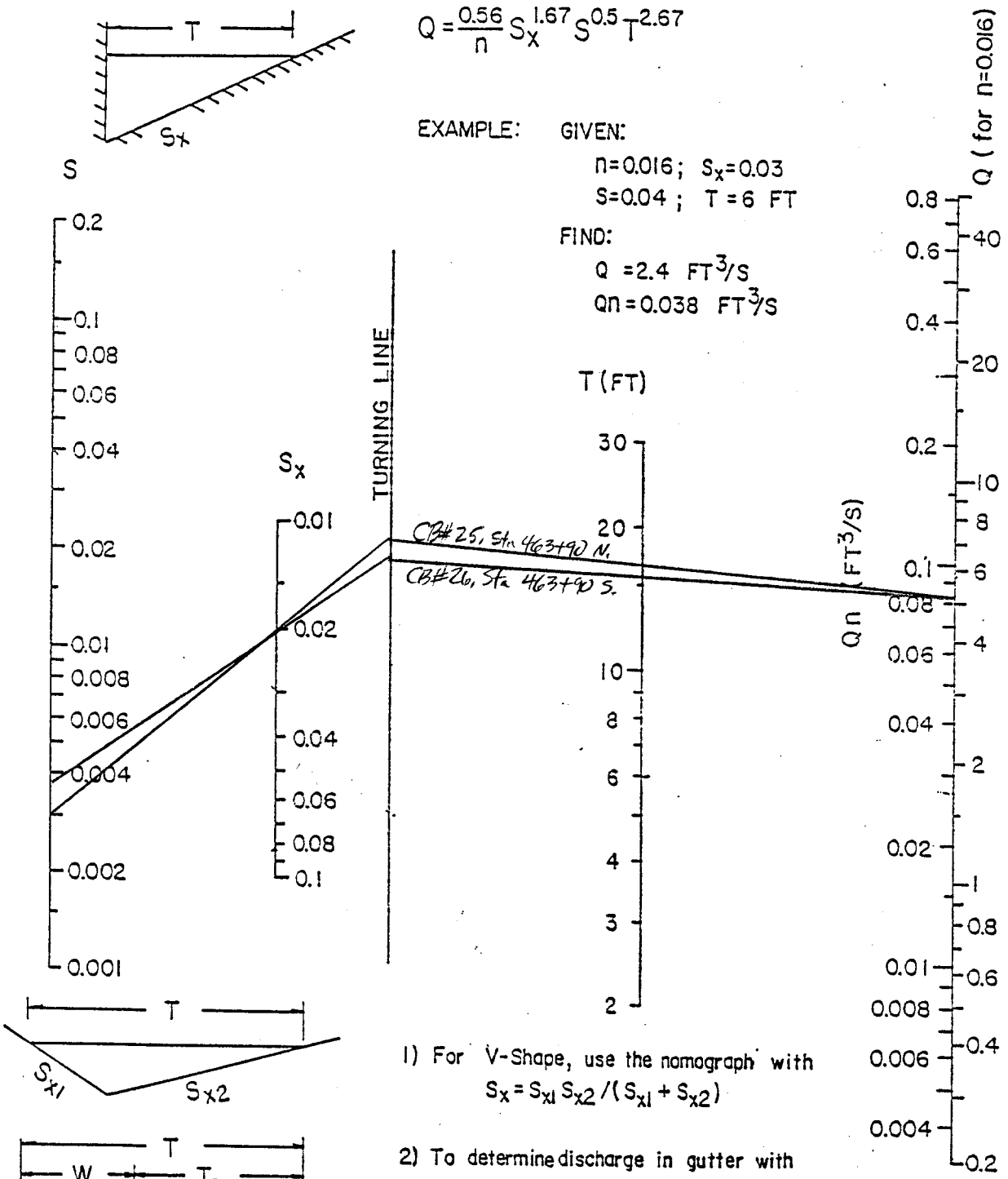


CHART 9. Curb-opening and slotted drain inlet length for total interception.

Dsn: CMG 5/9/91



$$Q = \frac{0.56}{n} S_x^{1.67} S^{0.5} T^{2.67}$$

EXAMPLE: GIVEN:

$n = 0.016$; $S_x = 0.03$

$S = 0.04$; $T = 6$ FT

FIND:

$Q = 2.4$ FT^3/S

$Qn = 0.038$ FT^3/S

1) For V-Shape, use the nomograph with $S_x = S_{x1} S_{x2} / (S_{x1} + S_{x2})$

2) To determine discharge in gutter with composite cross slopes, find Q_s using T_s and S_x. Then, use CHART 4 to find E_o. The total discharge is $Q = Q_s / (1 - E_o)$, and $Q_w = Q - Q_s$.

CHART 3. Flow in triangular gutter sections.

Dsn: CMB 5/9/91

Inlet #25 - Station 463+90
$W/T = 1.5/16.5 = 0.091$
$S_W/S_X = 0.055/0.02 = 2.8$
$E_o = 0.29$

Inlet #26 - Station 463+90
$W/T = 1.5/15.5 = 0.097$
$S_W/S_X = 0.055/0.02 = 2.8$
$E_o = 0.29$

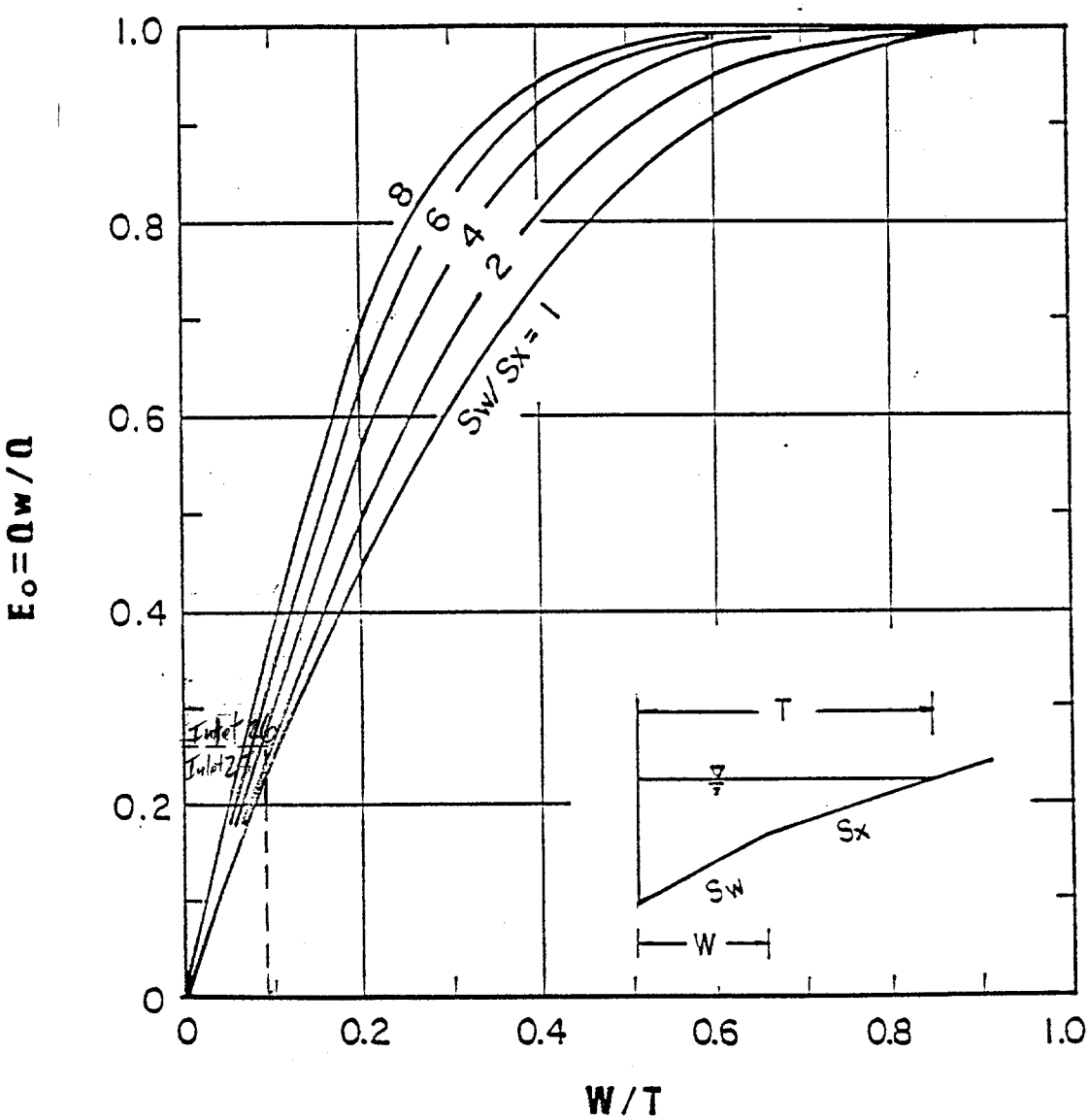


CHART 4. Ratio of frontal flow to total gutter flow.

Dsn: CMG 5/9/91

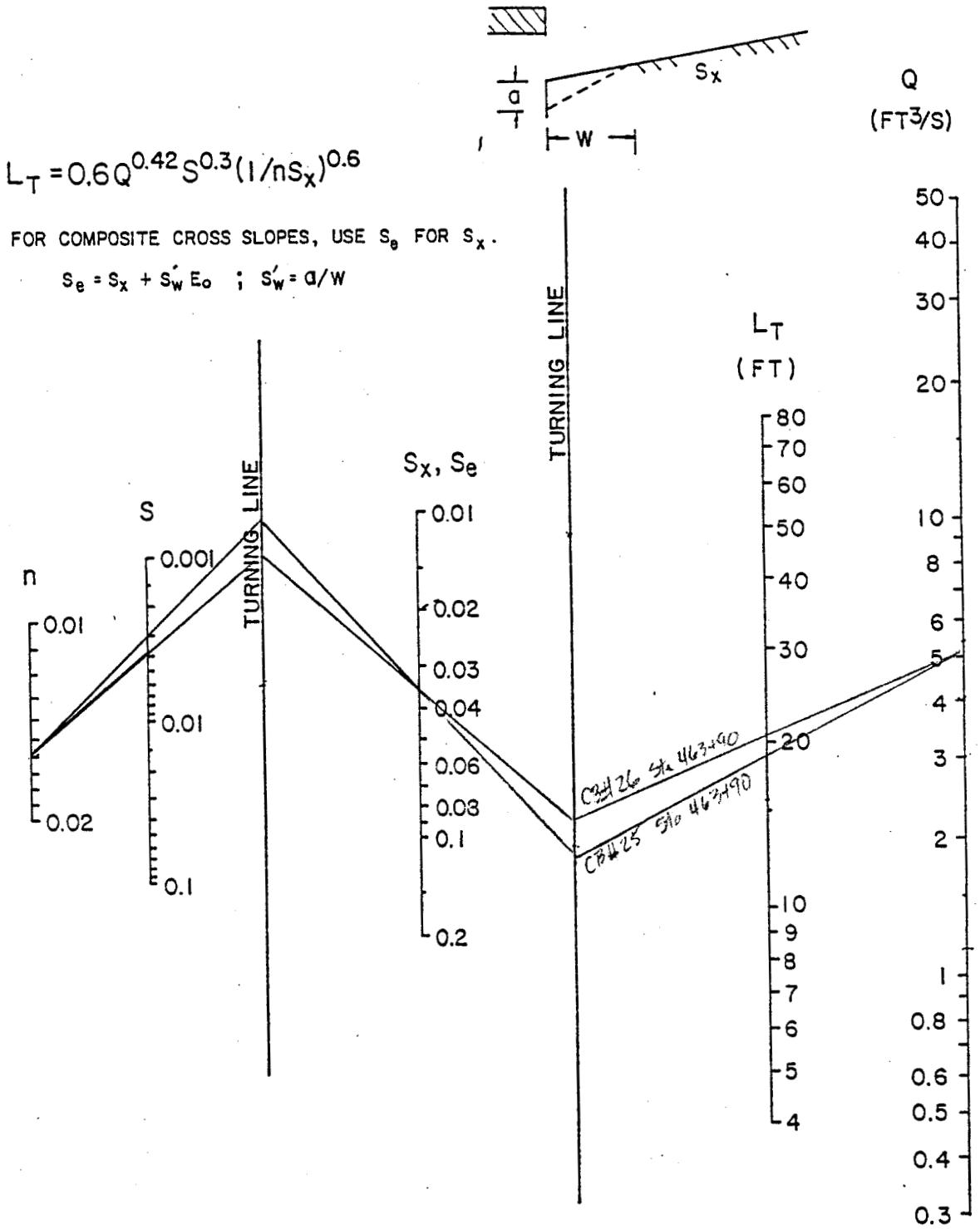
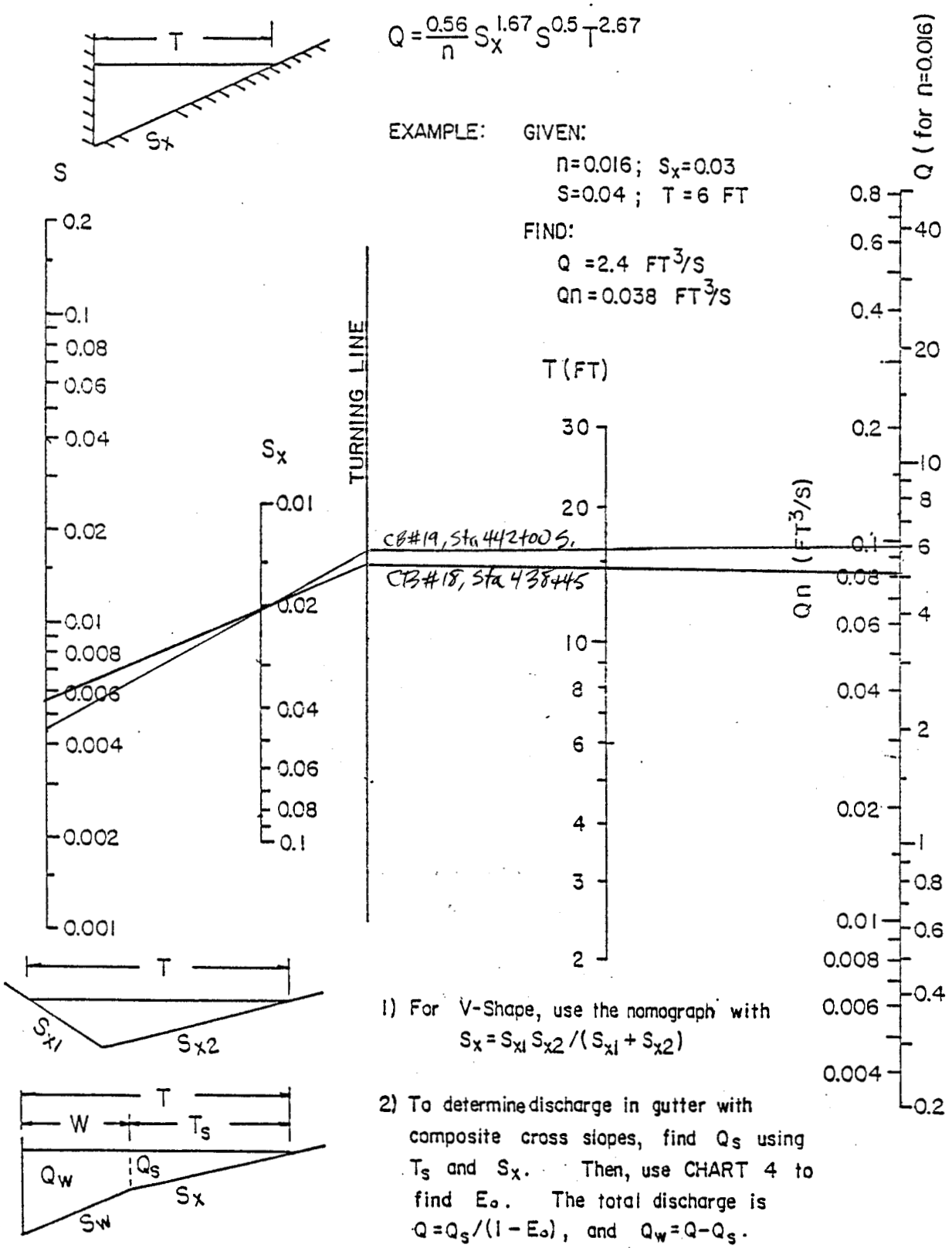


CHART 9. Curb-opening and slotted drain inlet length for total interception.

Dsn: CMG 5/9/91



$$Q = \frac{0.56}{n} S_x^{1.67} S^{0.5} T^{2.67}$$

EXAMPLE: GIVEN:

$n = 0.016$; $S_x = 0.03$

$S = 0.04$; $T = 6$ FT

FIND:

$Q = 2.4$ FT³/S

$Qn = 0.038$ FT³/S

1) For V-Shape, use the nomograph with $S_x = S_{x1} S_{x2} / (S_{x1} + S_{x2})$

2) To determine discharge in gutter with composite cross slopes, find Q_s using T_s and S_x. Then, use CHART 4 to find E_o. The total discharge is $Q = Q_s / (1 - E_o)$, and $Q_w = Q - Q_s$.

CHART 3. Flow in triangular gutter sections.

Dsn: CMG 5/9/91

Inlet #18 - Station 438+45
W/T = 1.5/14.5 = 0.103
Sw/Sx = 0.055/0.02 = 2.8
Eo = 0.28

Inlet #19 - Station 442+00
W/T = 1.5/16 = 0.094
Sw/Sx = 0.055/0.02 = 2.8
Eo = 0.26

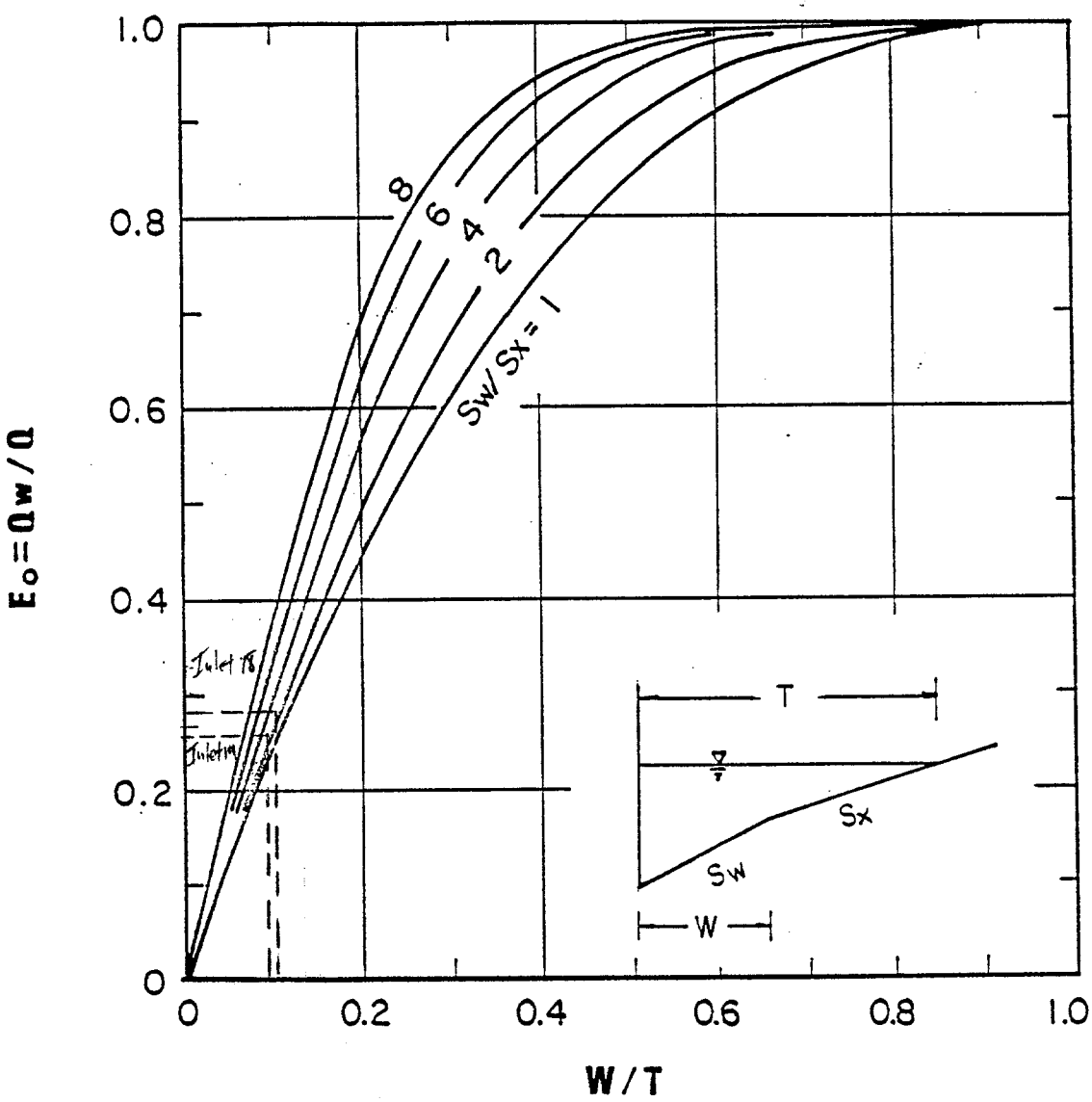


CHART 4. Ratio of frontal flow to total gutter flow.

Dsn: CMG 5/9/91

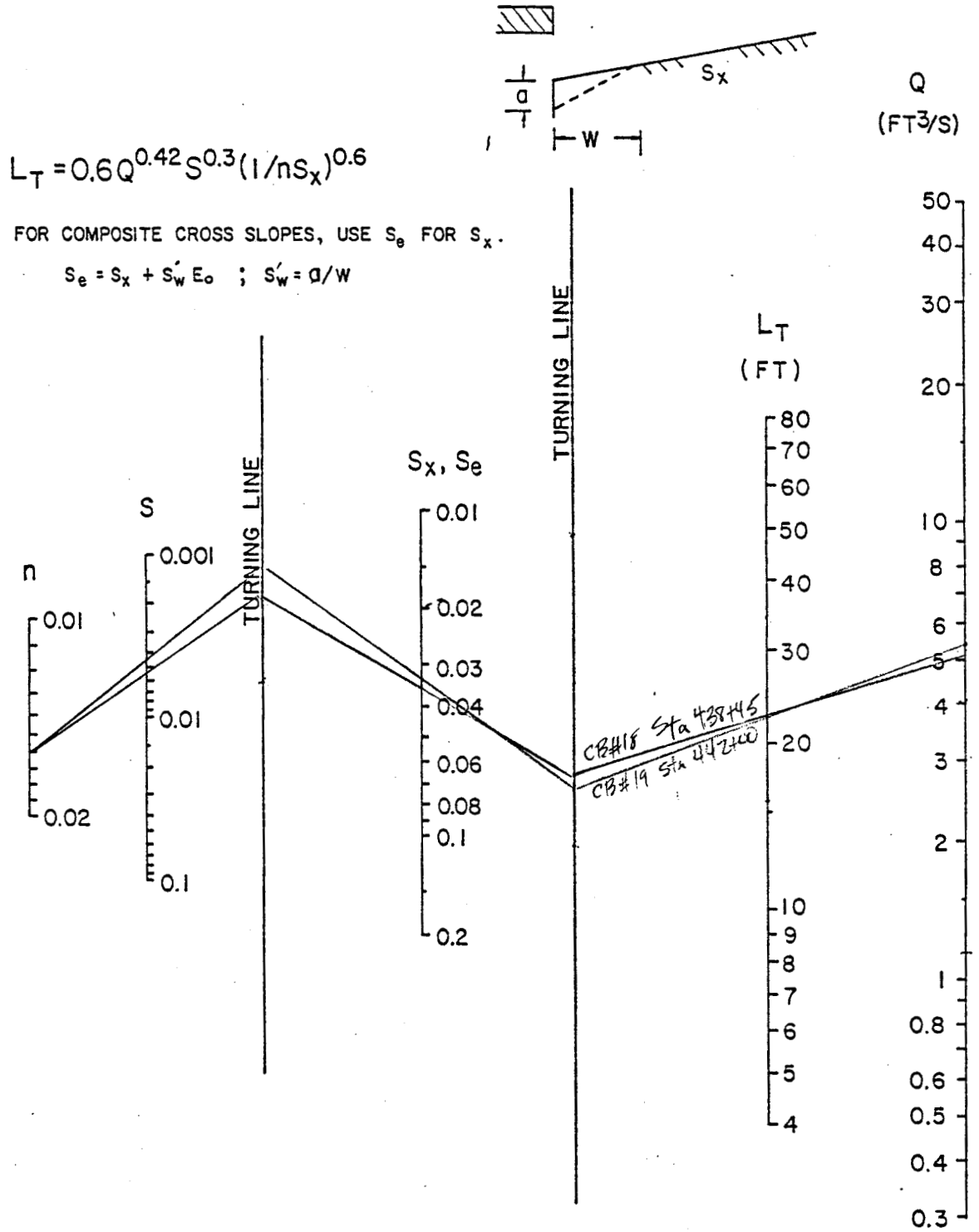
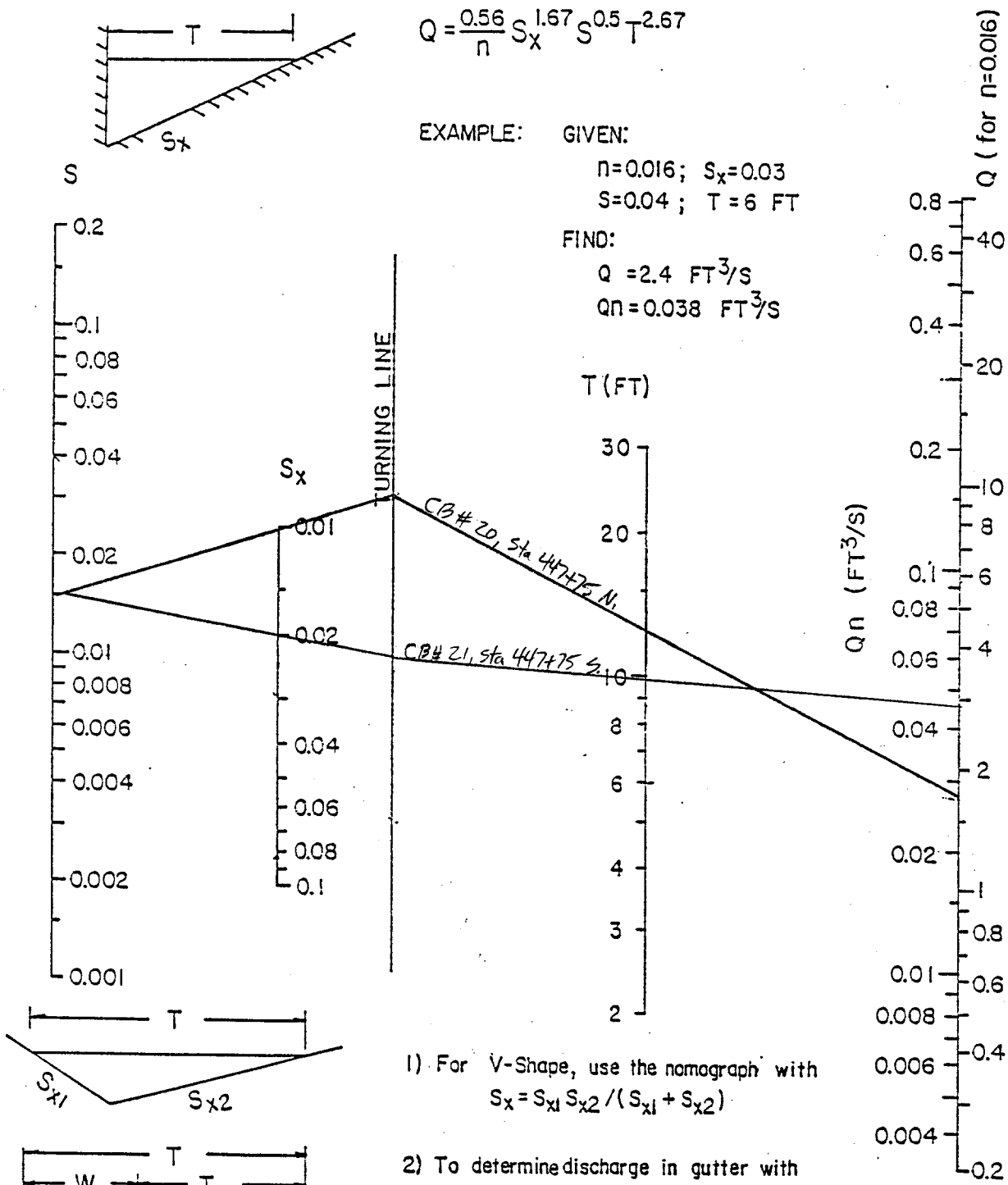


CHART 9. Curb-opening and slotted drain inlet length for total interception.

Dsn: CMG 5/91/91



$$Q = \frac{0.56}{n} S_x^{1.67} S^{0.5} T^{2.67}$$

EXAMPLE: GIVEN:

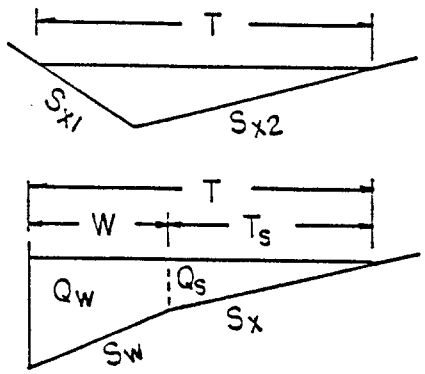
$n = 0.016$; $S_x = 0.03$

$S = 0.04$; $T = 6$ FT

FIND:

$Q = 2.4$ FT^3/S

$Qn = 0.038$ FT^3/S



1) For V-Shape, use the nomograph with $S_x = S_{x1} S_{x2} / (S_{x1} + S_{x2})$

2) To determine discharge in gutter with composite cross slopes, find Q_s using T_s and S_x. Then, use CHART 4 to find E_o. The total discharge is $Q = Q_s / (1 - E_o)$, and $Q_w = Q - Q_s$.

CHART 3. Flow in triangular gutter sections.

Dsn: CMG 5/9/91

Inlet #20 - Station 447+75
W/T = 1.5/12.5 = 0.12
Sw/Sx = 0.055/0.010 = 5.5
Eo = 0.36

Inlet # 21 - Station 447+75
W/T = 1.5/10.0 = 0.15
Sw/Sx = 0.055/0.020 = 2.8
Eo = 0.39

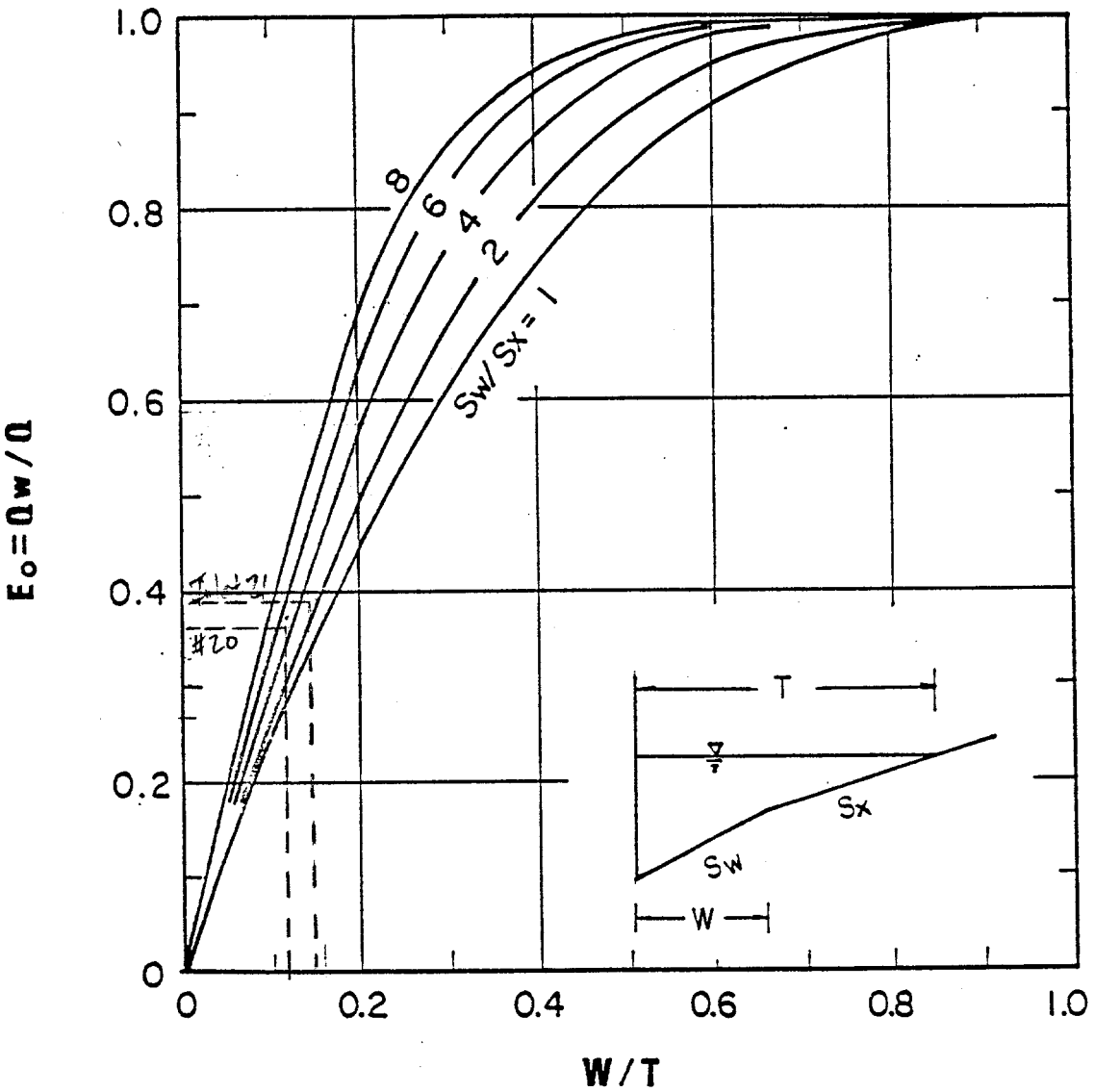


CHART 4. Ratio of frontal flow to total gutter flow.

Dsn: CMG 5/9/91

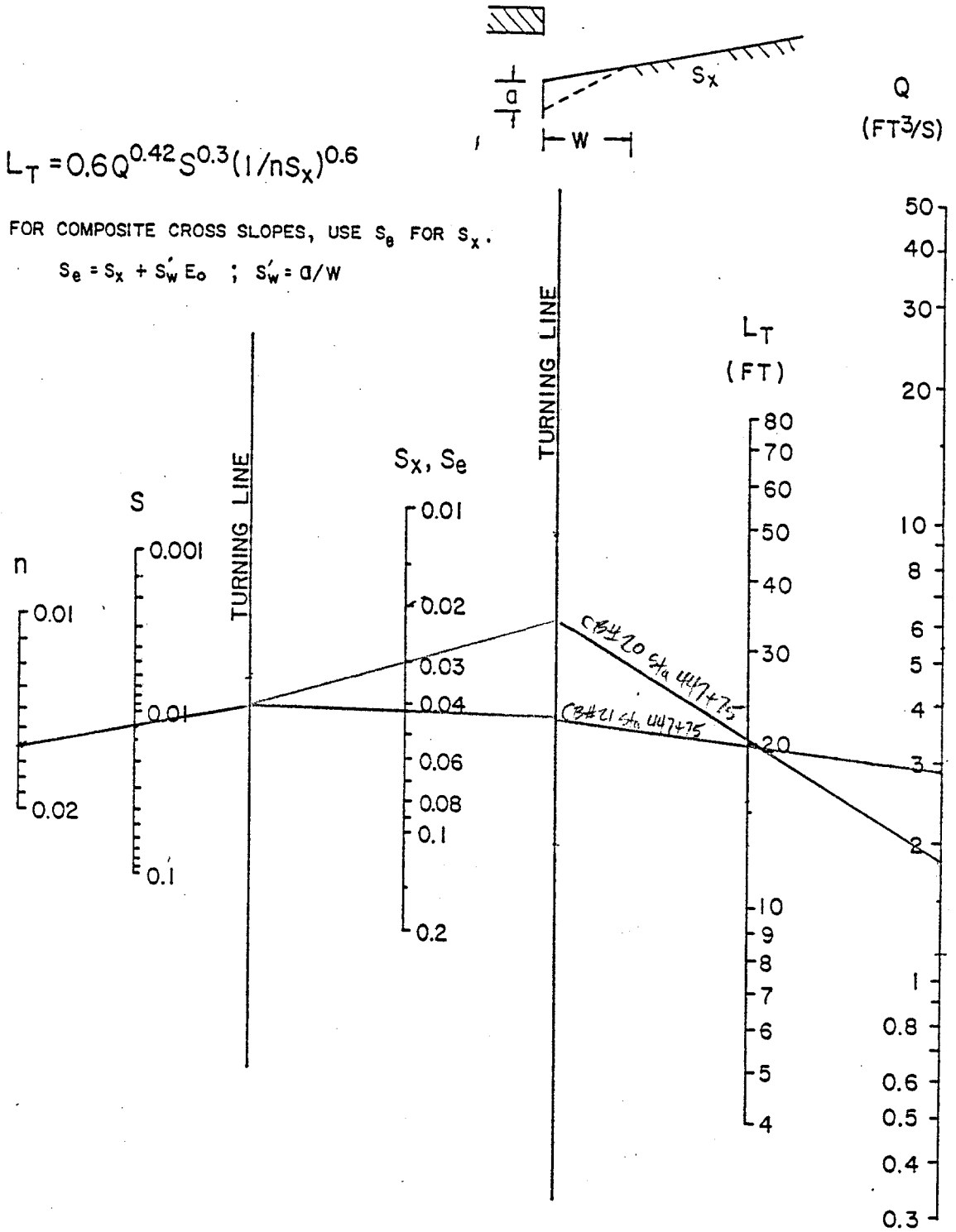
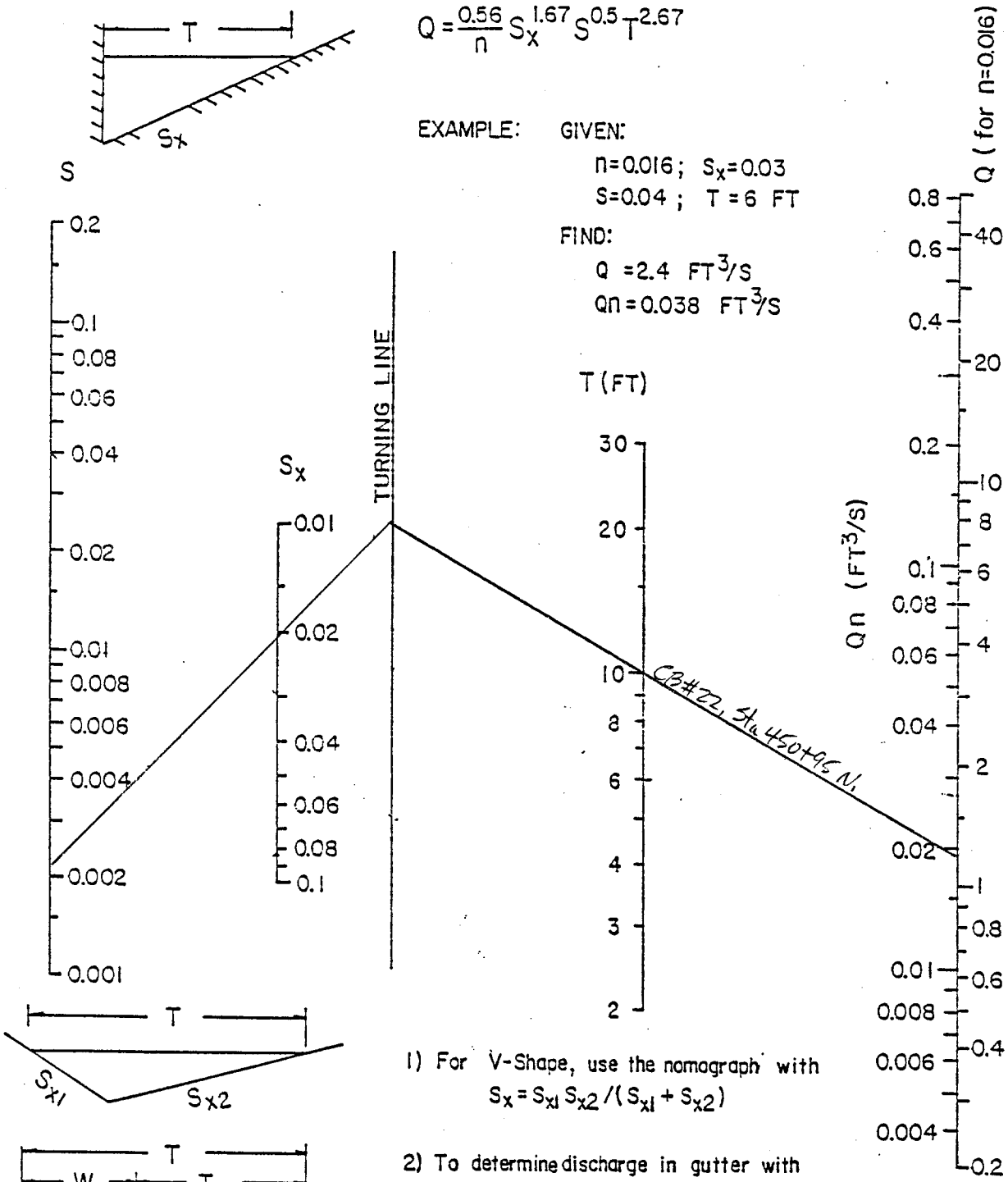


CHART 9. Curb-opening and slotted drain inlet length for total interception.

Dsn: CMG 5/9/91



$$Q = \frac{0.56}{n} S_x^{1.67} S^{0.5} T^{2.67}$$

EXAMPLE: GIVEN:

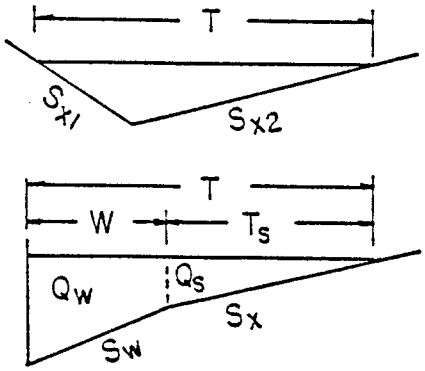
$n = 0.016$; $S_x = 0.03$

$S = 0.04$; $T = 6$ FT

FIND:

$Q = 2.4$ FT^3/S

$Qn = 0.038$ FT^3/S



1) For V-Shape, use the nomograph with $S_x = S_{x1} S_{x2} / (S_{x1} + S_{x2})$

2) To determine discharge in gutter with composite cross slopes, find Q_s using T_s and S_x. Then, use CHART 4 to find E_o. The total discharge is $Q = Q_s / (1 - E_o)$, and $Q_w = Q - Q_s$.

CHART 3. Flow in triangular gutter sections.

Dsn: CMB 5/9/91

Inlet #22 - Station 450+95
W/T = 1.5/10.0 = 0.15
Sw/Sx = 0.055 / 0.02 = 2.8
Eo = 0.39

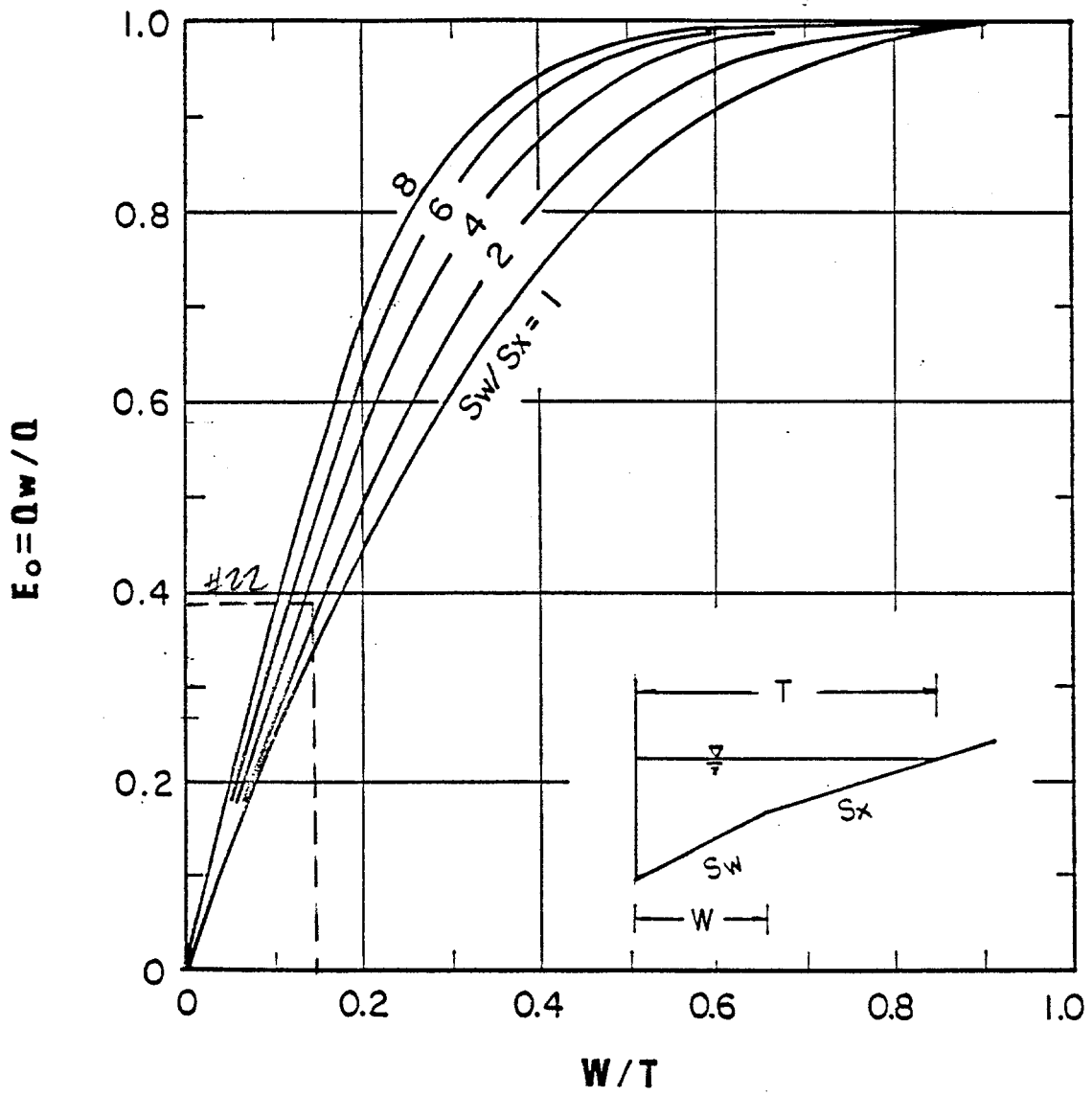


CHART 4. Ratio of frontal flow to total gutter flow.

Dsn: CMG 5/9/91

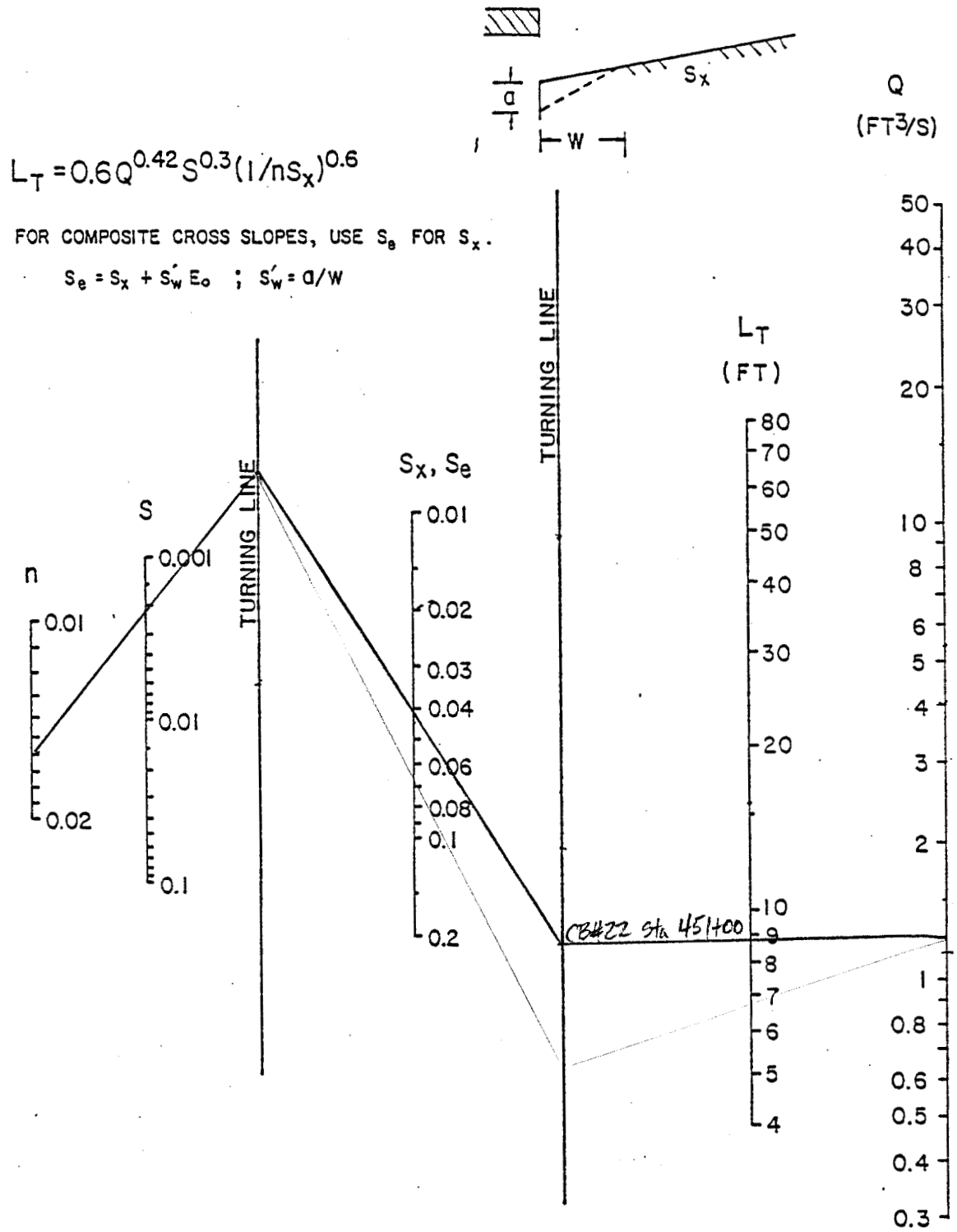
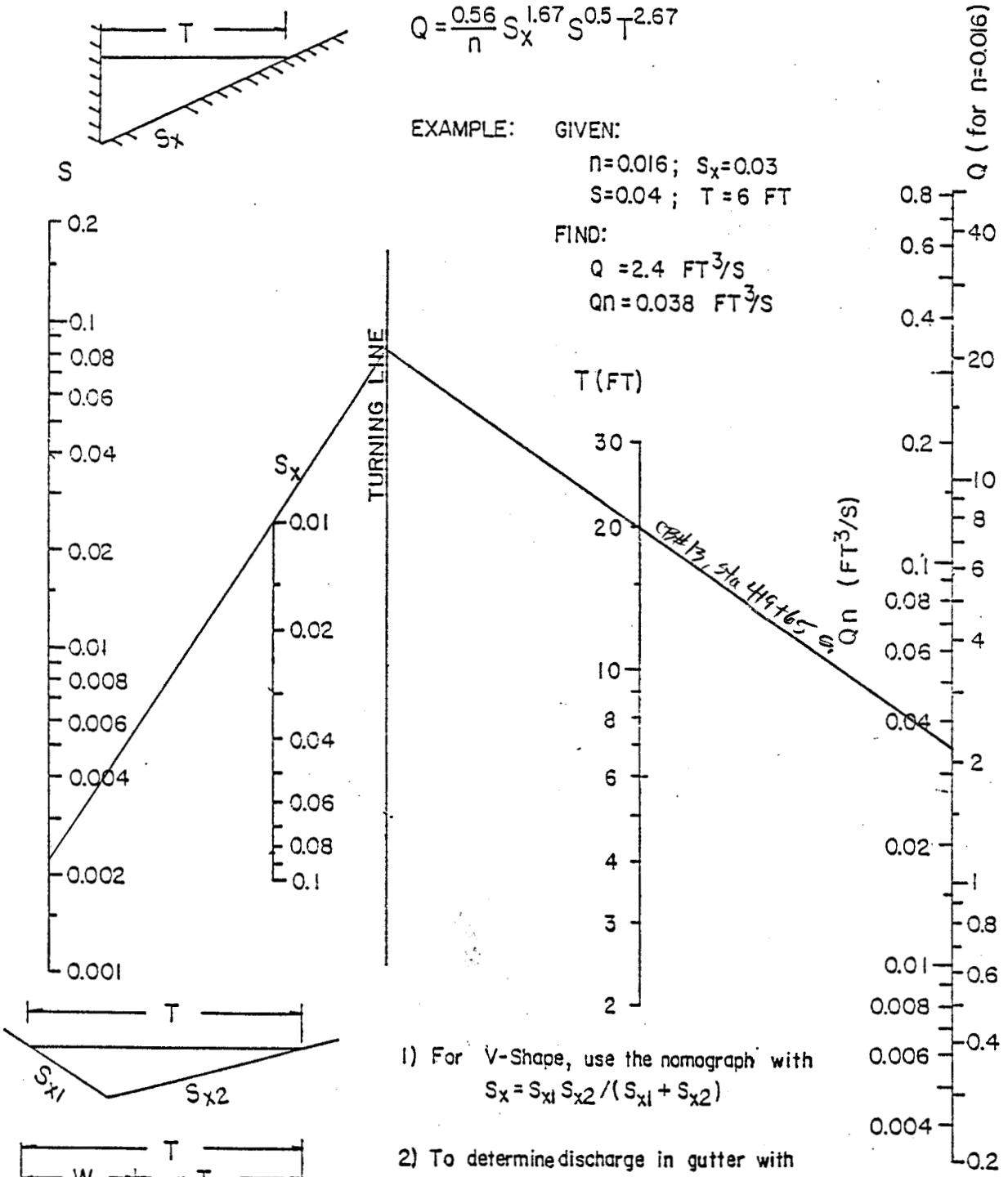


CHART 9. Curb-opening and slotted drain inlet length for total interception.

Dsn: CMG 5/9/91

$$Q = \frac{0.56}{n} S_x^{1.67} S^{0.5} T^{2.67}$$



EXAMPLE: GIVEN:

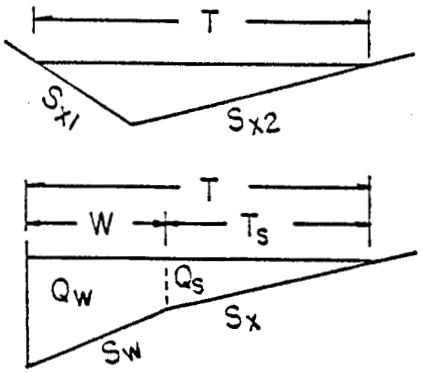
$n = 0.016$; $S_x = 0.03$

$S = 0.04$; $T = 6$ FT

FIND:

$Q = 2.4$ FT^3/S

$Qn = 0.038$ FT^3/S



1) For V-Shape, use the nomograph with $S_x = S_{x1} S_{x2} / (S_{x1} + S_{x2})$

2) To determine discharge in gutter with composite cross slopes, find Q_s using T_s and S_x. Then, use CHART 4 to find E_o. The total discharge is $Q = Q_s / (1 - E_o)$, and $Q_w = Q - Q_s$.

CHART 3. Flow in triangular gutter sections.

Dsn: CMB 5/9/91

Inlet #13 - Station 419+65

$W/T = 1.5/20.0 = 0.075$

$S_w/S_x = 0.055/0.010 = 5.55$

$E_o = 0.26$

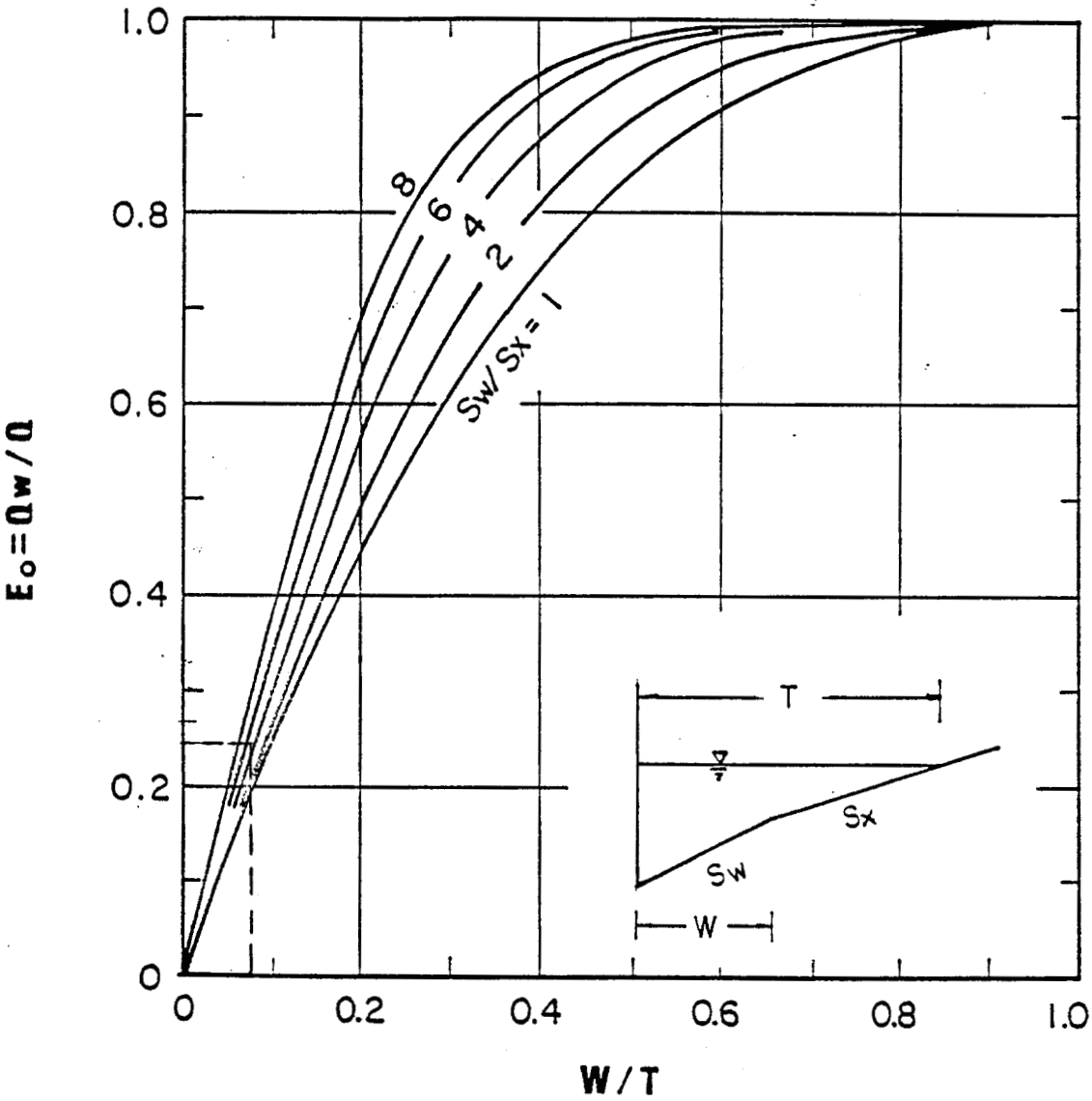


CHART 4. Ratio of frontal flow to total gutter flow.

Dsn: CMG 5/9/91

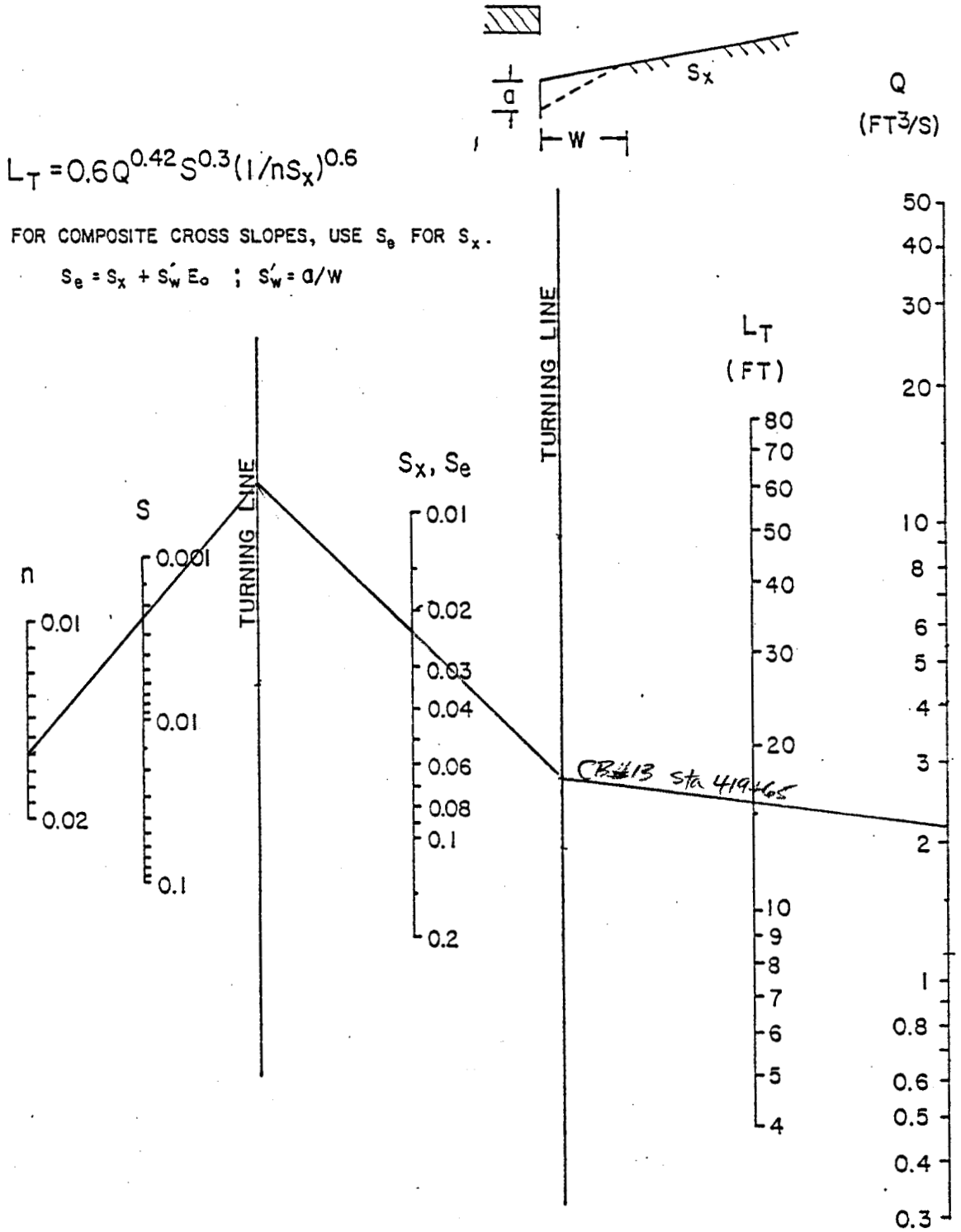
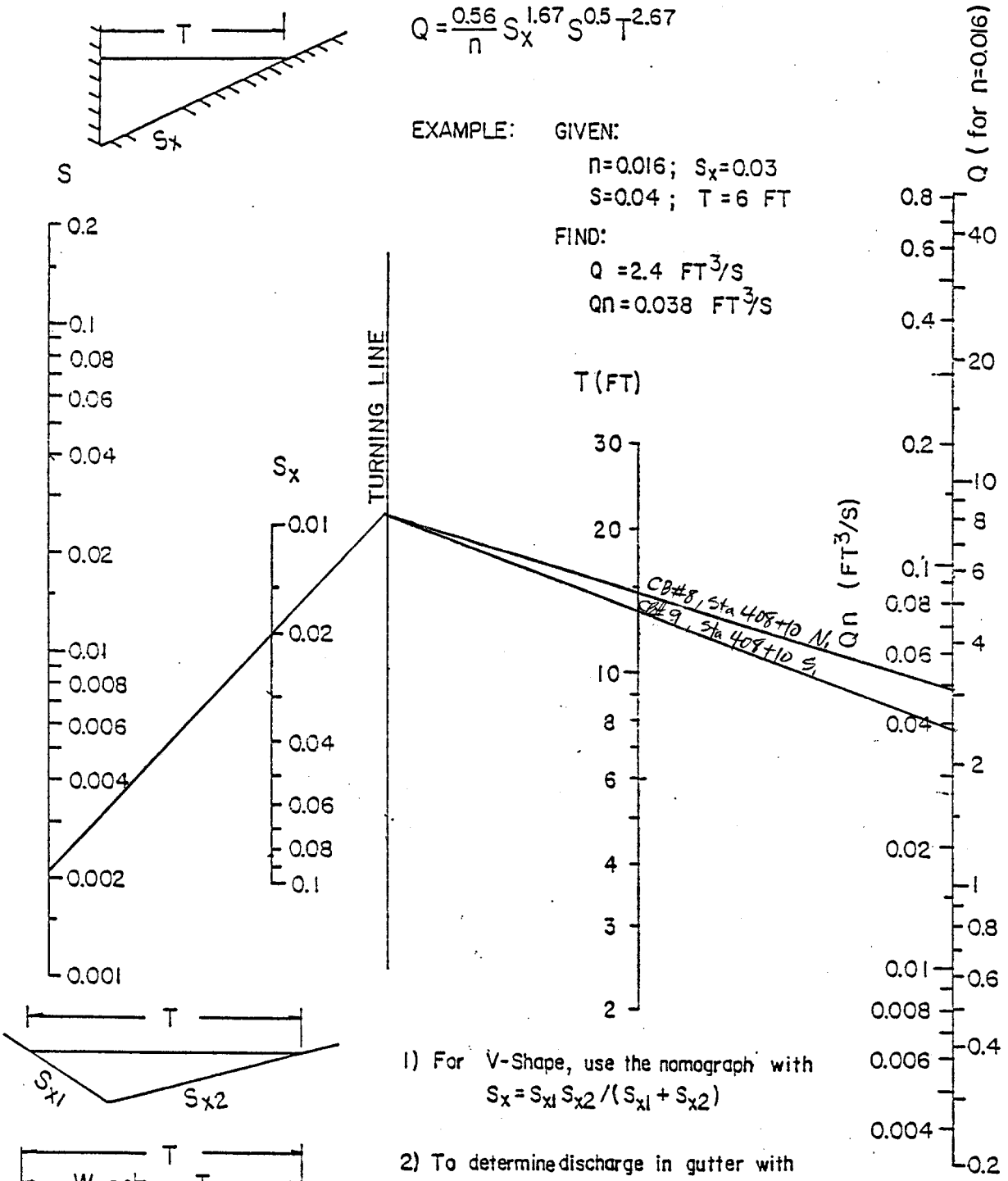


CHART 9. Curb-opening and slotted drain inlet length for total interception.

Dsn: CMb 5/9/91



$$Q = \frac{0.56}{n} S_x^{1.67} S^{0.5} T^{2.67}$$

EXAMPLE: GIVEN:

$n = 0.016$; $S_x = 0.03$

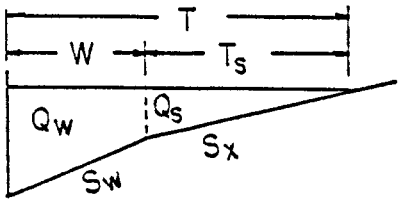
$S = 0.04$; $T = 6$ FT

FIND:

$Q = 2.4$ FT³/S

$Qn = 0.038$ FT³/S

1) For V-Shape, use the nomograph with $S_x = S_{x1} S_{x2} / (S_{x1} + S_{x2})$



2) To determine discharge in gutter with composite cross slopes, find Q_s using T_s and S_x. Then, use CHART 4 to find E_o. The total discharge is $Q = Q_s/(1 - E_o)$, and $Q_w = Q - Q_s$.

CHART 3. Flow in triangular gutter sections.

Dsn: CMB 5/9/91

Inlet #8 - Station 408+10
W/T = 1.5/15.0 = 0.10
Sw/Sx = 0.055/0.02 = 2.8
Eo = 0.28

Inlet #9 - Station 408+10
W/T = 1.5/14.0 = 0.11
Sw/Sx = 0.055/0.02 = 2.8
Eo = 0.30

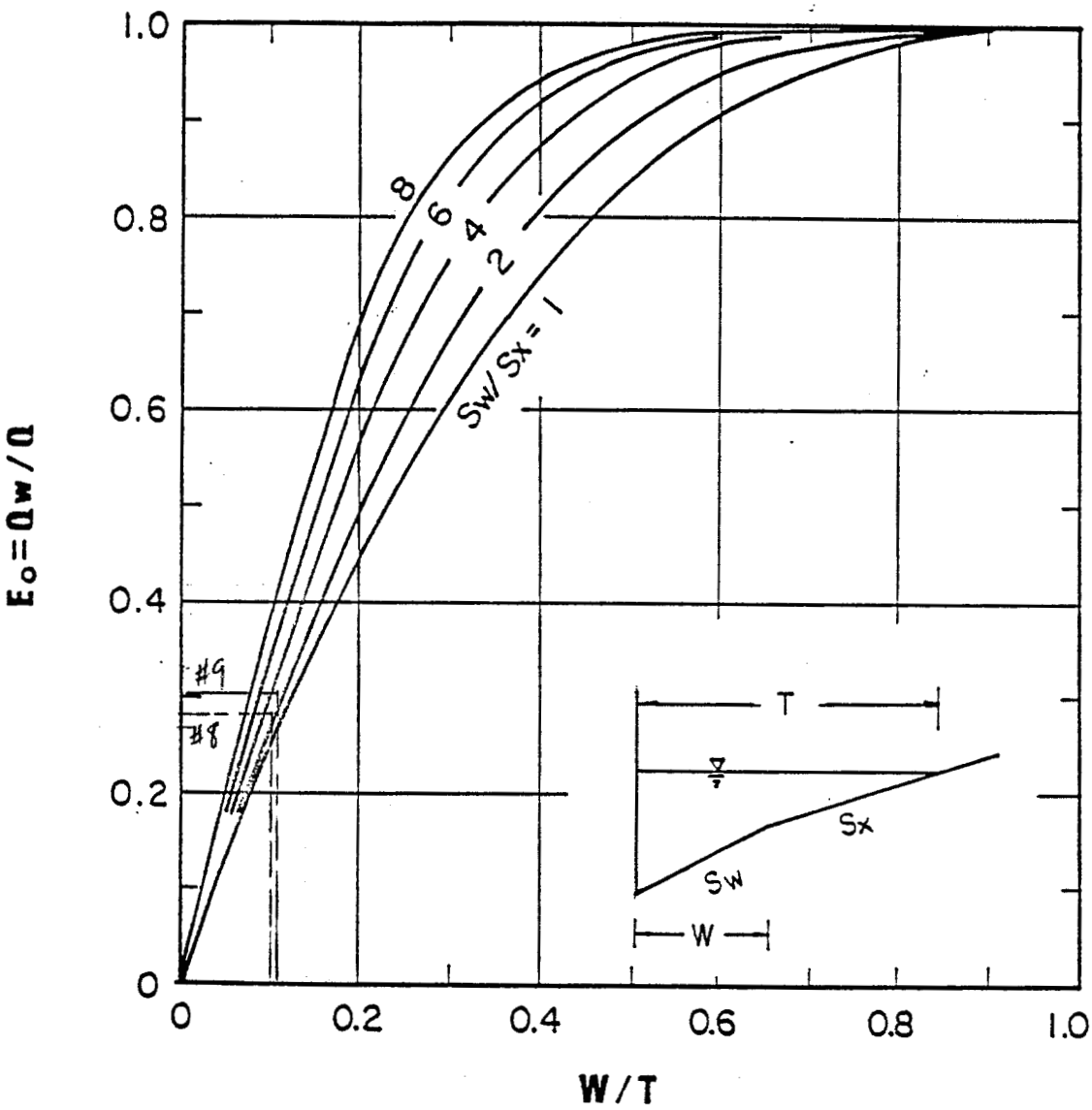


CHART 4. Ratio of frontal flow to total gutter flow.

Dsu: CMG 5/9/91

$$L_T = 0.6 Q^{0.42} S^{0.3} (1/nS_x)^{0.6}$$

FOR COMPOSITE CROSS SLOPES, USE S_e FOR S_x.

$S_e = S_x + S_w' E_o$; $S_w' = a/W$

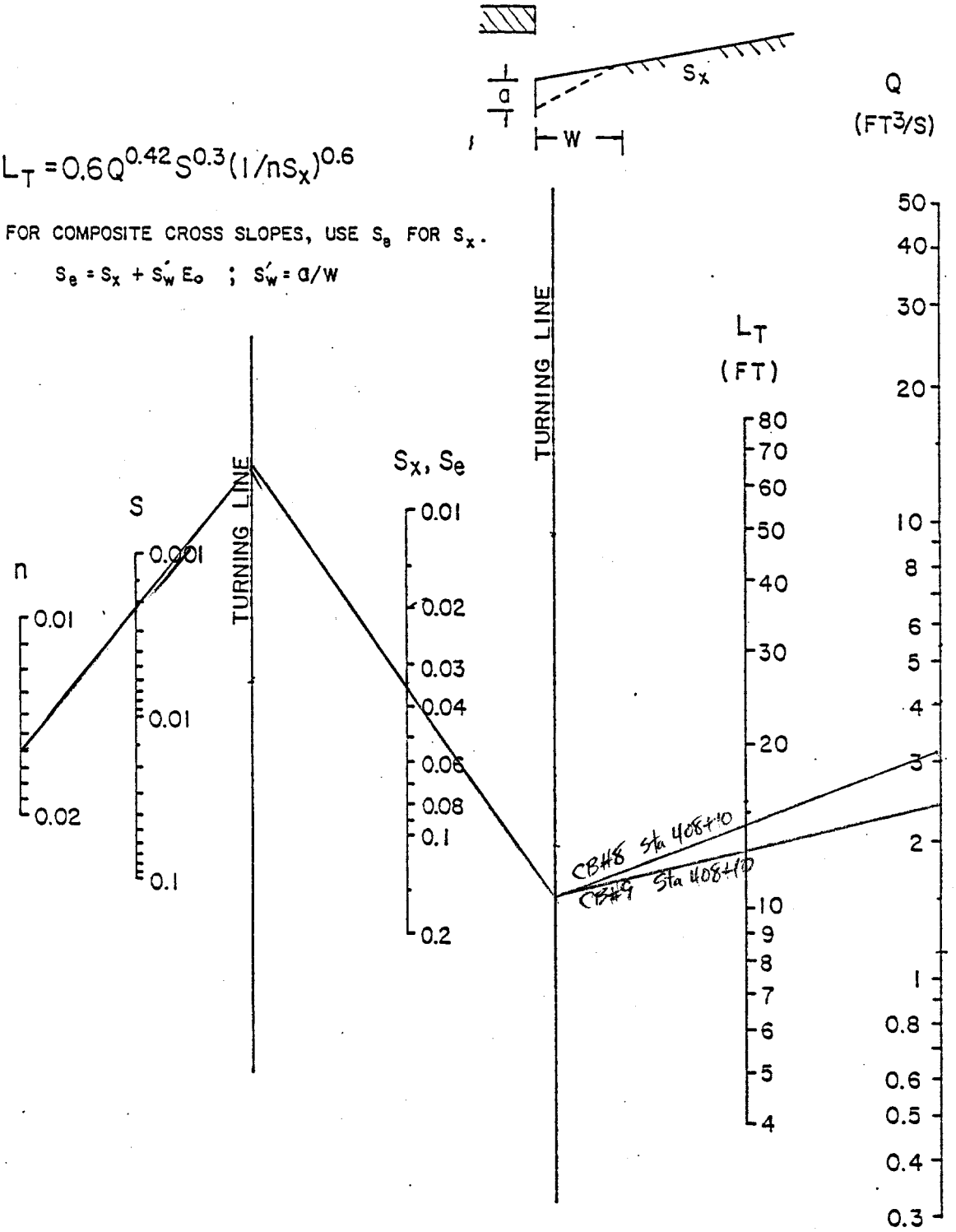
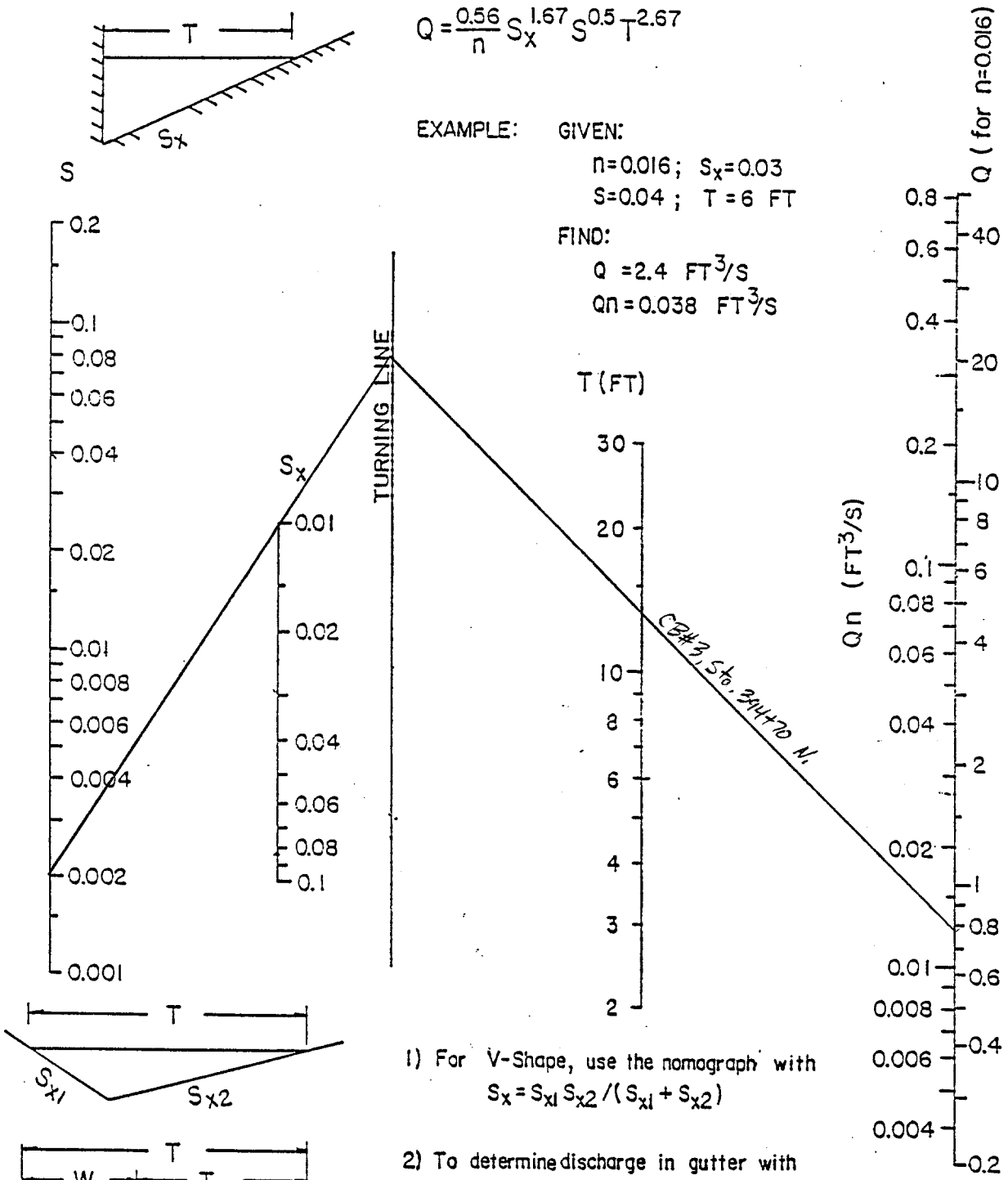


CHART 9. Curb-opening and slotted drain inlet length for total interception.

Dsn: CMG 5/9/91



1) For V-Shape, use the nomograph with $S_x = S_{x1} S_{x2} / (S_{x1} + S_{x2})$

2) To determine discharge in gutter with composite cross slopes, find Q_s using T_s and S_x. Then, use CHART 4 to find E_o. The total discharge is $Q = Q_s/(1 - E_o)$, and $Q_w = Q - Q_s$.

CHART 3. Flow in triangular gutter sections.

Dsn: CMB 5/9/91

Inlet #3 - Station 394+70
W/T = 1.5/13.5 = 0.11
Sw/Sx = 0.055/0.010 = 5.5
Eo = 0.36

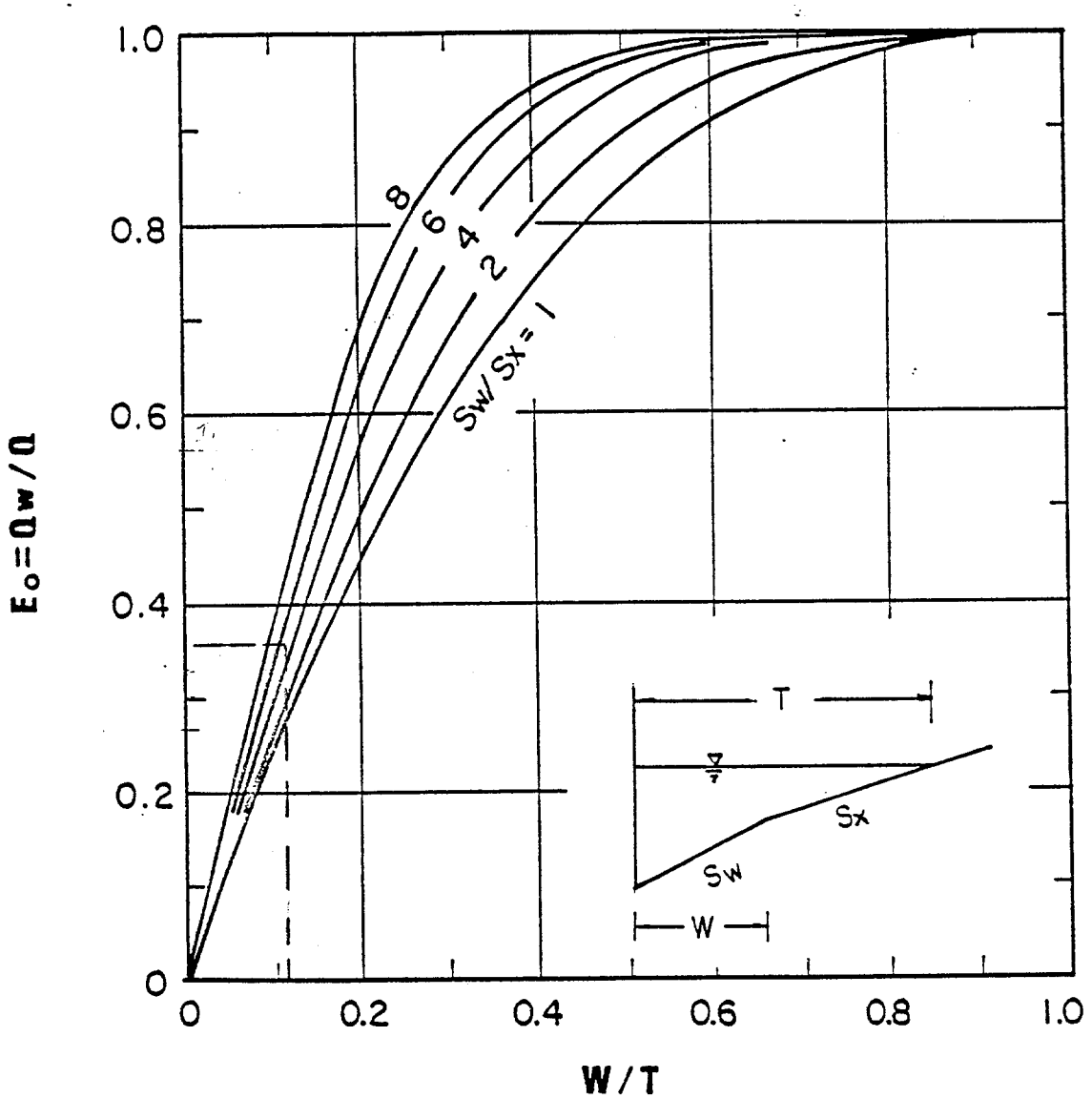


CHART 4. Ratio of frontal flow to total gutter flow.

Dsn: CMG 5/9/91

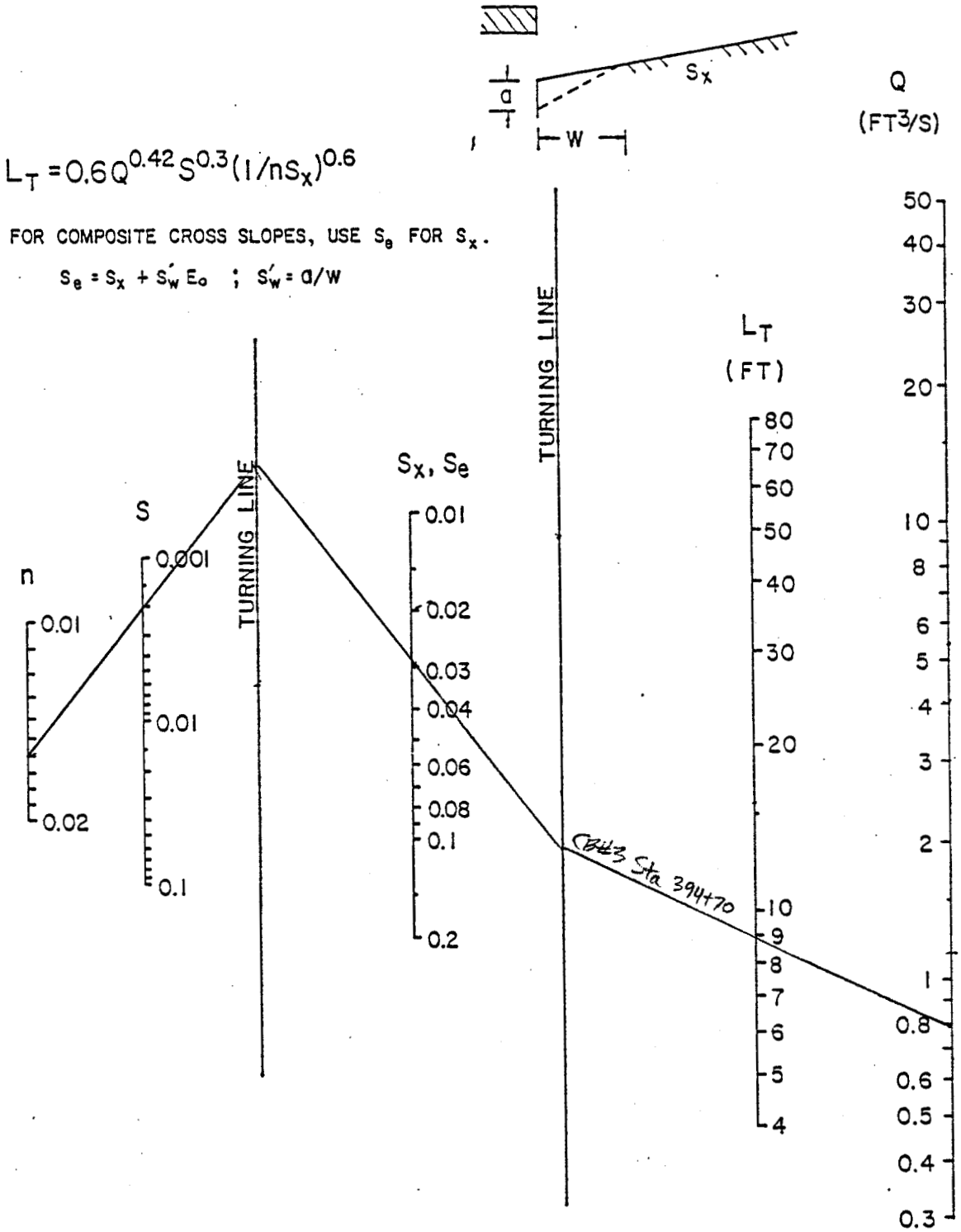
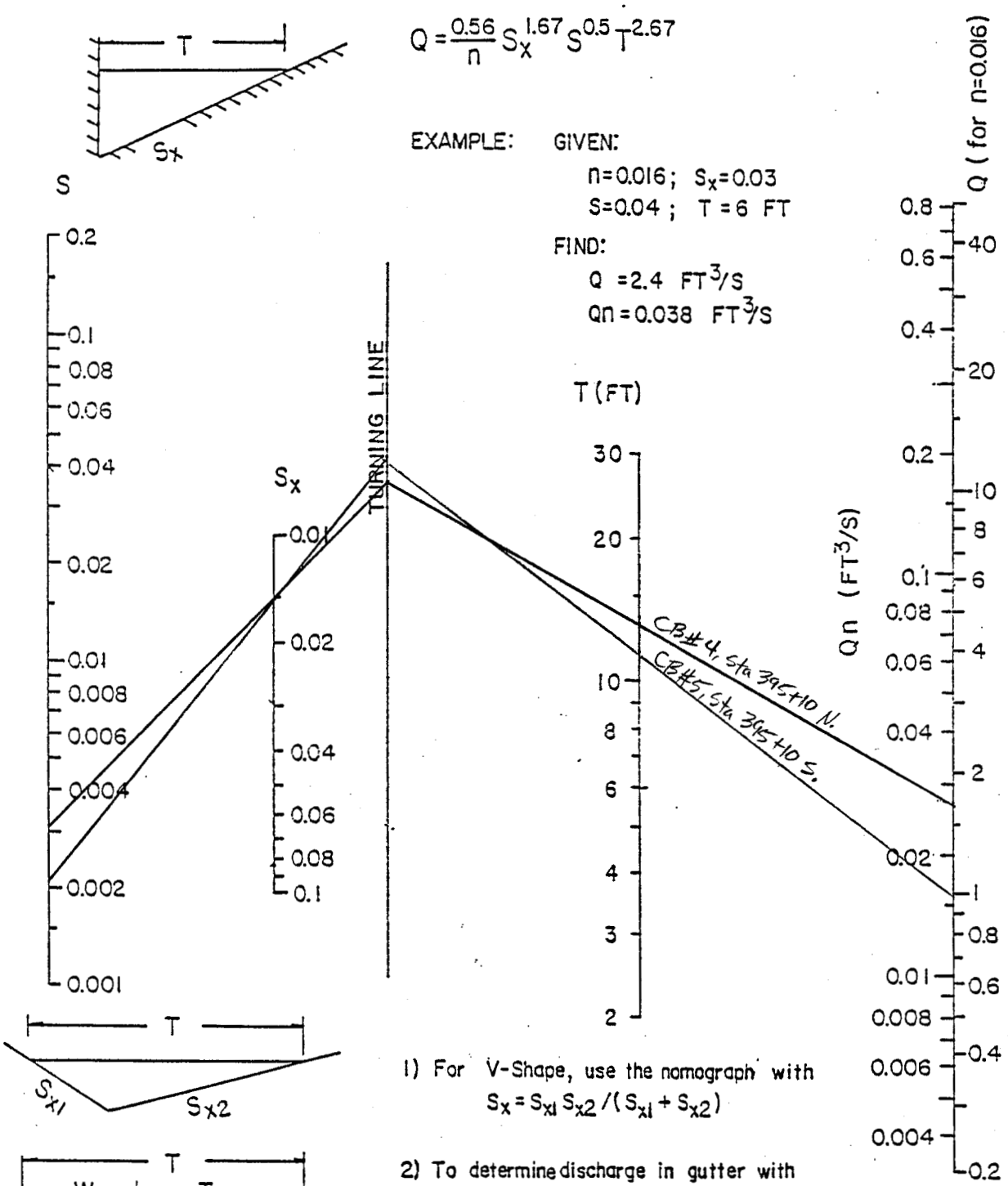


CHART 9. Curb-opening and slotted drain inlet length for total interception.

Dsn: CMG 5/9/91



$$Q = \frac{0.56}{n} S_x^{1.67} S^{0.5} T^{2.67}$$

EXAMPLE: GIVEN:

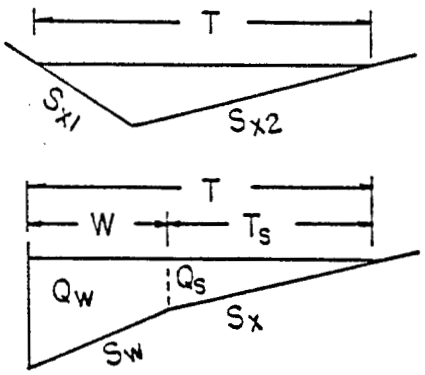
$n = 0.016$; $S_x = 0.03$

$S = 0.04$; $T = 6$ FT

FIND:

$Q = 2.4$ FT^3/S

$Qn = 0.038$ FT^3/S



1) For V-Shape, use the nomograph with $S_x = S_{x1} S_{x2} / (S_{x1} + S_{x2})$

2) To determine discharge in gutter with composite cross slopes, find Q_s using T_s and S_x. Then, use CHART 4 to find E_o. The total discharge is $Q = Q_s / (1 - E_o)$, and $Q_w = Q - Q_s$.

CHART 3. Flow in triangular gutter sections.

Dsn: CMG 5/9/91

Inlet #4 - Station 395+70
$w/T = 1.5/13.5 = 0.11$
$S_w/S_x = 0.055/0.015 = 3.7$
$E_o = 0.32$

Inlet #5 - Station 395+10
$w/T = 1.5/11.5 = 0.13$
$S_w/S_x = 0.055/0.015 = 3.7$
$E_o = 0.37$

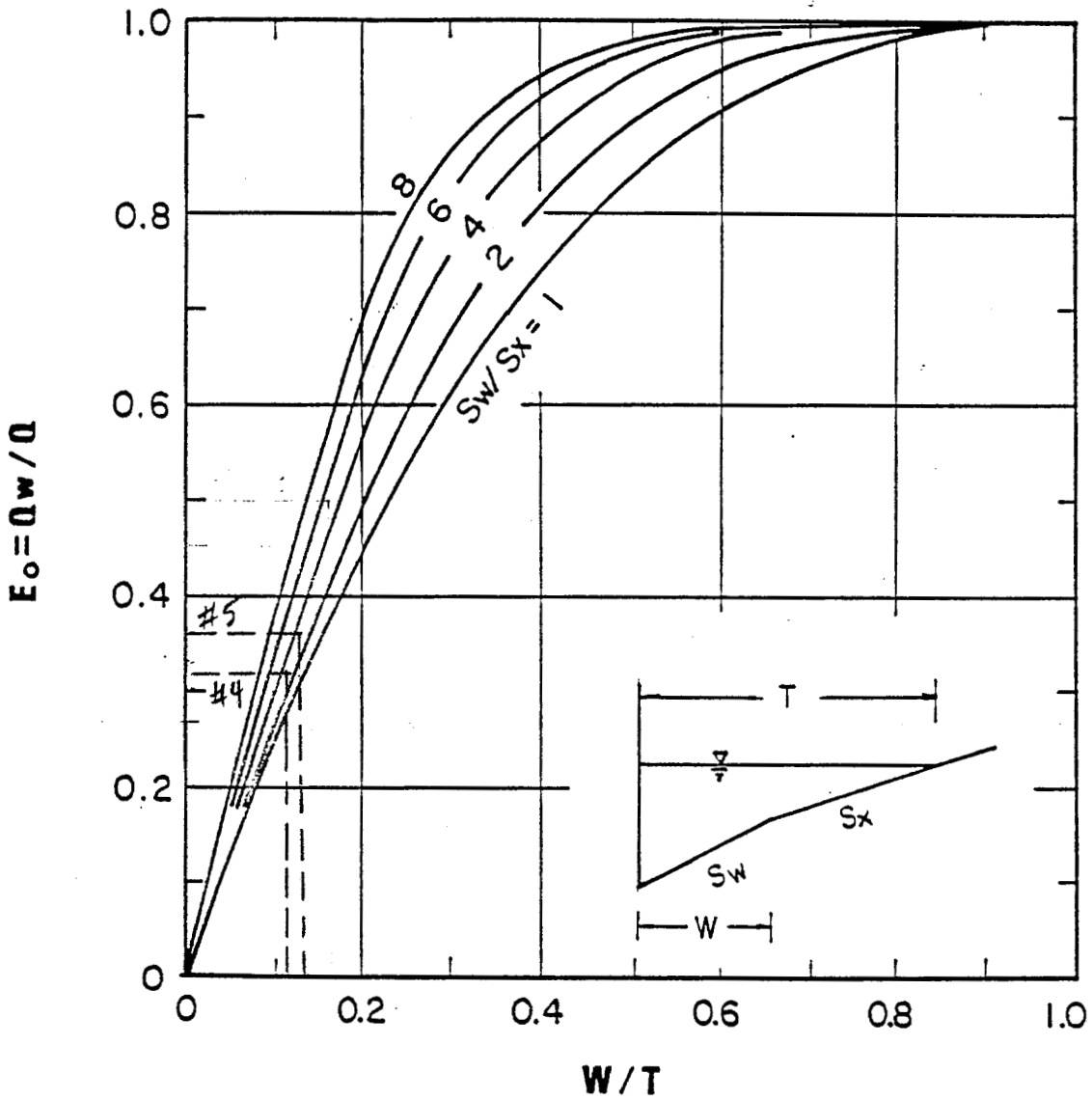


CHART 4. Ratio of frontal flow to total gutter flow.

Dsn: CMG 5/9/91

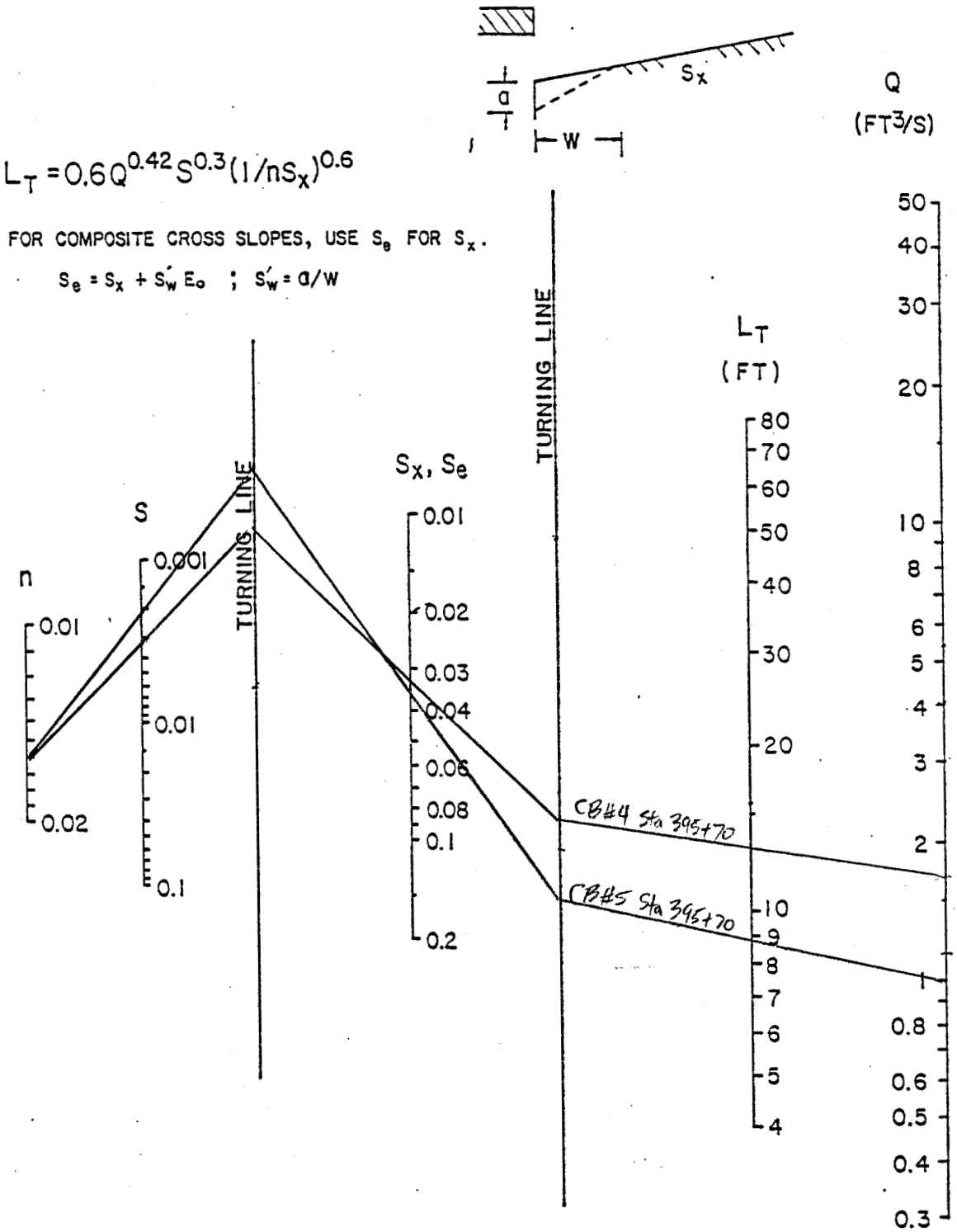
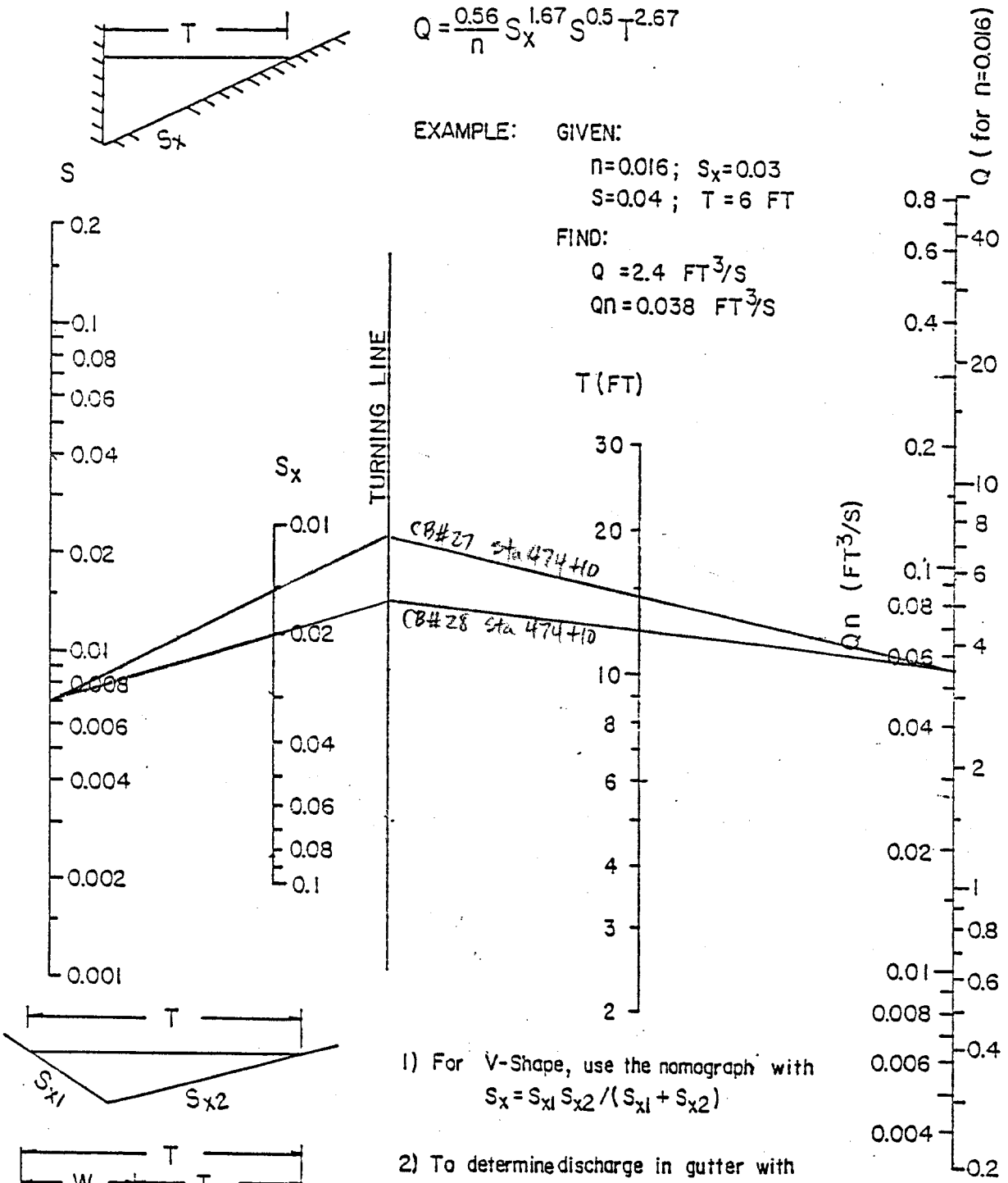


CHART 9. Curb-opening and slotted drain inlet length for total interception.

Dsn: CME 5/9/91



$$Q = \frac{0.56}{n} S_x^{1.67} S^{0.5} T^{2.67}$$

EXAMPLE: GIVEN:

$n = 0.016$; $S_x = 0.03$

$S = 0.04$; $T = 6$ FT

FIND:

$Q = 2.4$ FT^3/S

$Qn = 0.038$ FT^3/S

1) For V-Shape, use the nomograph with $S_x = S_{x1} S_{x2} / (S_{x1} + S_{x2})$

2) To determine discharge in gutter with composite cross slopes, find Q_s using T_s and S_x. Then, use CHART 4 to find E_o. The total discharge is $Q = Q_s / (1 - E_o)$, and $Q_w = Q - Q_s$.

CHART 3. Flow in triangular gutter sections.

Dsn: CMG 5/9/91

Inlet # 27 Station 474+10
$W/T = 1.5/14.5 = 0.10$
$S_w/S_x = 0.055/0.015 = 3.7$
$E_o = 0.29$

Inlet # 28 Station 474+10
$W/T = 1.5/12.5 = 0.12$
$S_w/S_x = 0.055/0.020 = 2.8$
$E_o = 0.34$

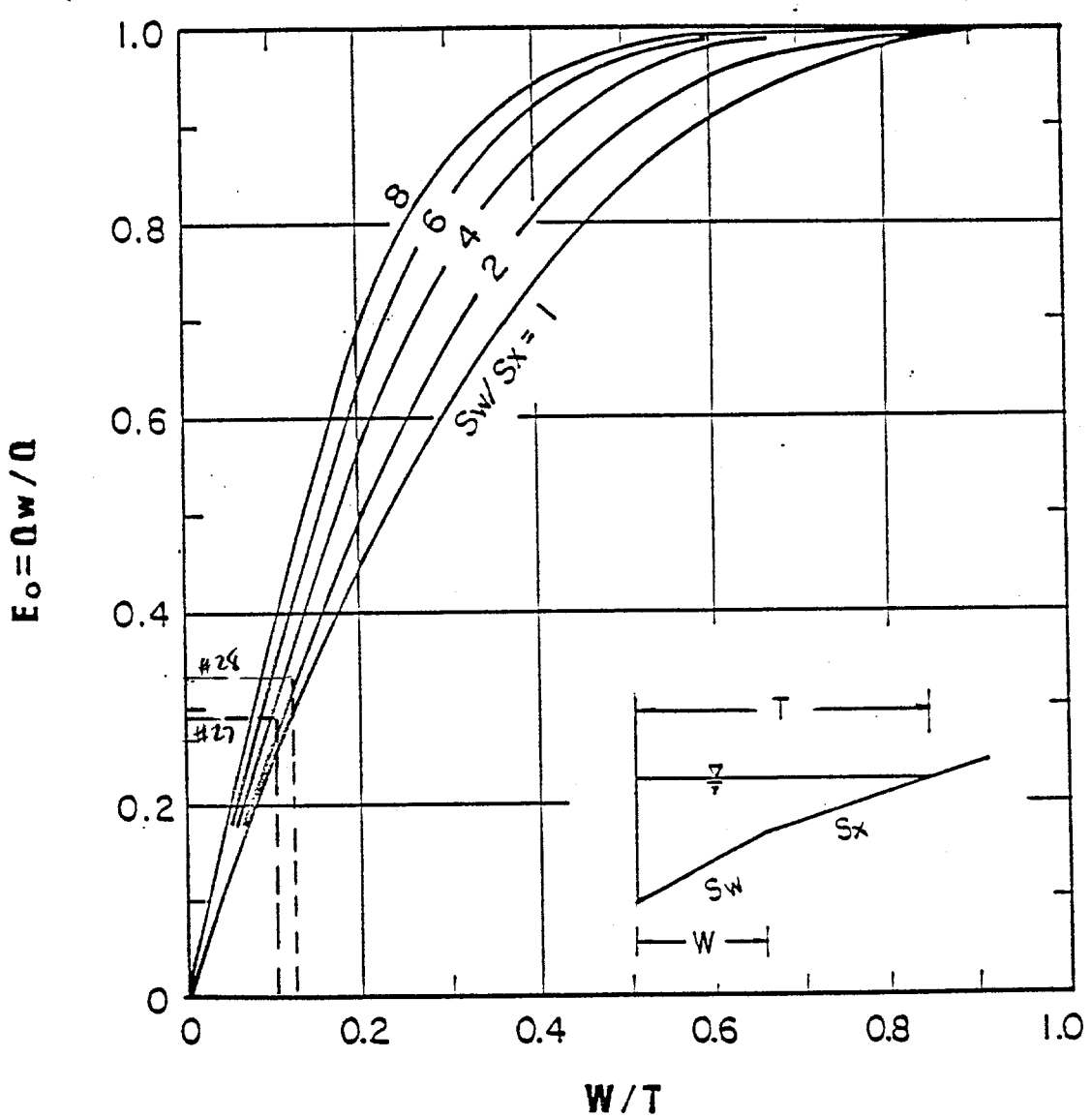


CHART 4. Ratio of frontal flow to total gutter flow.

Dsn: CMG 5/9/91

$$L_T = 0.6 Q^{0.42} S^{0.3} (1/nS_x)^{0.6}$$

FOR COMPOSITE CROSS SLOPES, USE S_e FOR S_x.

$S_e = S_x + S'_w E_o$; $S'_w = a/W$

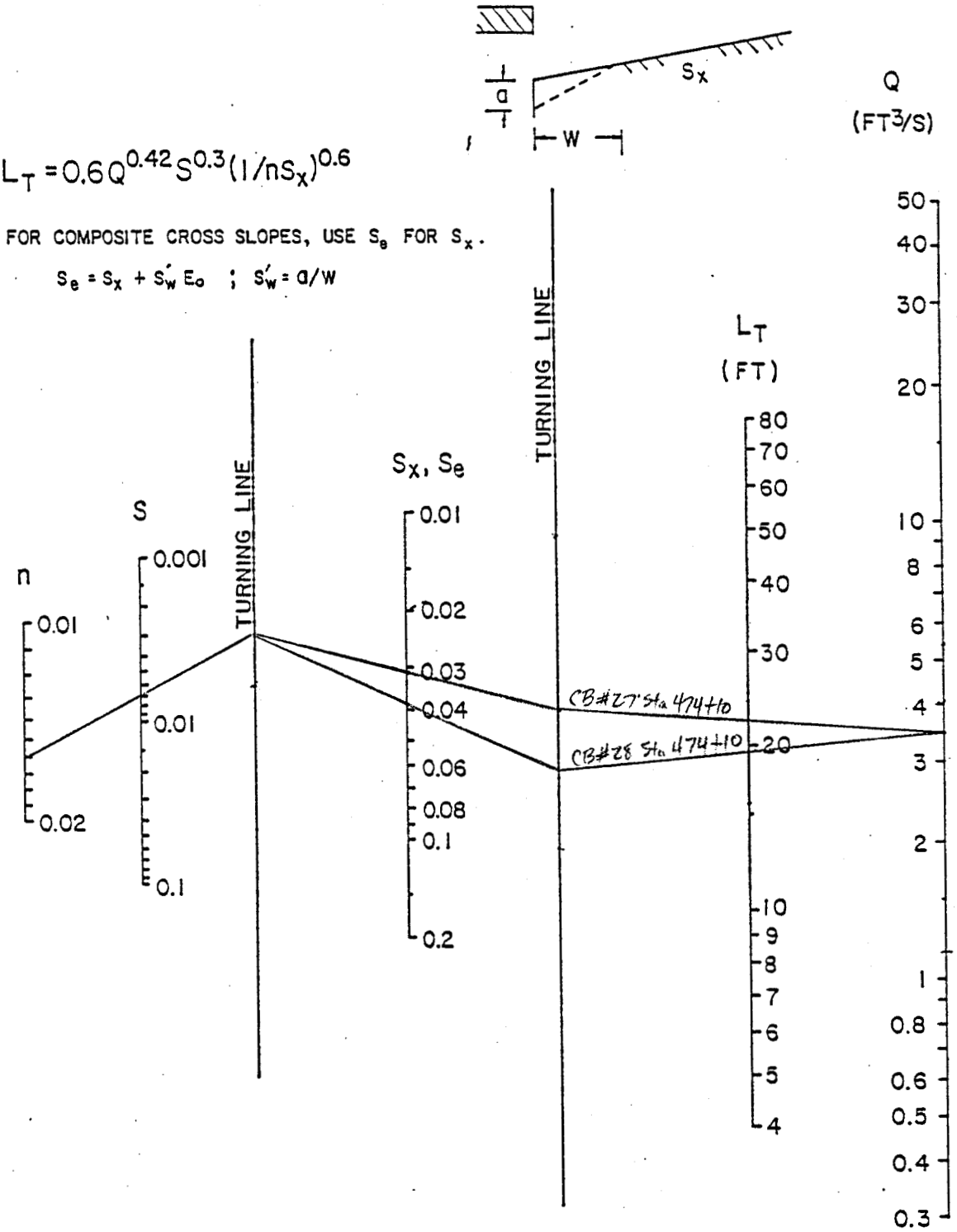


CHART 9. Curb-opening and slotted drain inlet length for total interception.

Dsn: CMB 5/9/91

CATCH BASINS IN A SOUP (HEC-12)

Input Node	Inlet #	Inlet Station	Q(cfs)	T	Sx	Depth	P	L(ft)	LX1.5 (ft)
A5	2	392+60	4.79	20.0	0.015	0.47ft	6.5	3.8	5.7
A5	1	391+80	5.47	17.0	0.020	0.50	6.6	3.9	5.9
C5	6	404+79	5.99	15.0	0.020	0.47	7.5	4.8	7.2
B4	7	404+79	5.99	16.5	0.020	0.50	8.1	5.4	8.1
E6	14	421+86	9.01	19.0	0.020	0.55	9.5	6.8	10.2
D5	15	421+84	7.87	18.0	0.020	0.53	9.0	6.3	9.5
E2	10	414+00	4.06	15.0	0.020	0.47	5.8	3.1	4.7
D2	11	414+00	4.13	15.0	0.020	0.47	5.8	3.1	4.7
E4	12	419+65	2.37	13.0	0.020	0.43	4.0	1.3	2.0
A4	23	461+00	3.35	14.0	0.020	0.45	5.1	2.4	3.6
A5	24	461+50	3.07	13.0	0.020	0.43	5.2	2.5	3.8

Depth = allowable depth based on dry lane criteria = $TSx + 2/12$

T_A = allowable spread (ft)
Sx = cross-slope of pavement

L = length of curb opening provided (1.5xL includes clogging factor)

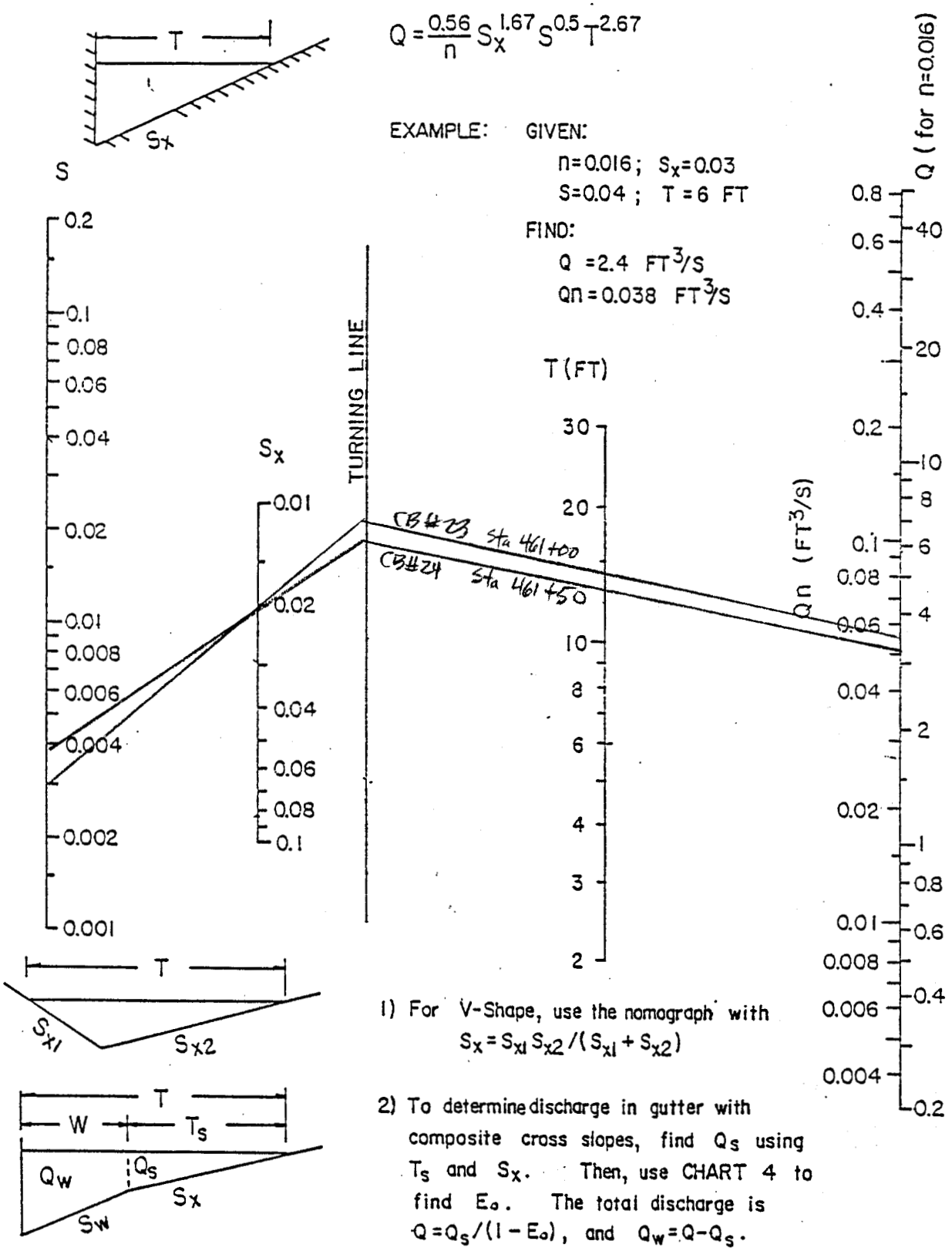
P = L + 1.8W (where W = width of inlet depression = 1.5 ft)

L = P − 1.8W

* maximum allowable depth equal to curb height at inlet (ie 0.67 ft)

Dsn: CMB 5/9/01
Chkd: SPC 5/30/01

$$Q = \frac{0.56}{n} S_x^{1.67} S^{0.5} T^{2.67}$$



EXAMPLE: GIVEN:

$n = 0.016$; $S_x = 0.03$

$S = 0.04$; $T = 6$ FT

FIND:

$Q = 2.4$ FT^3/S

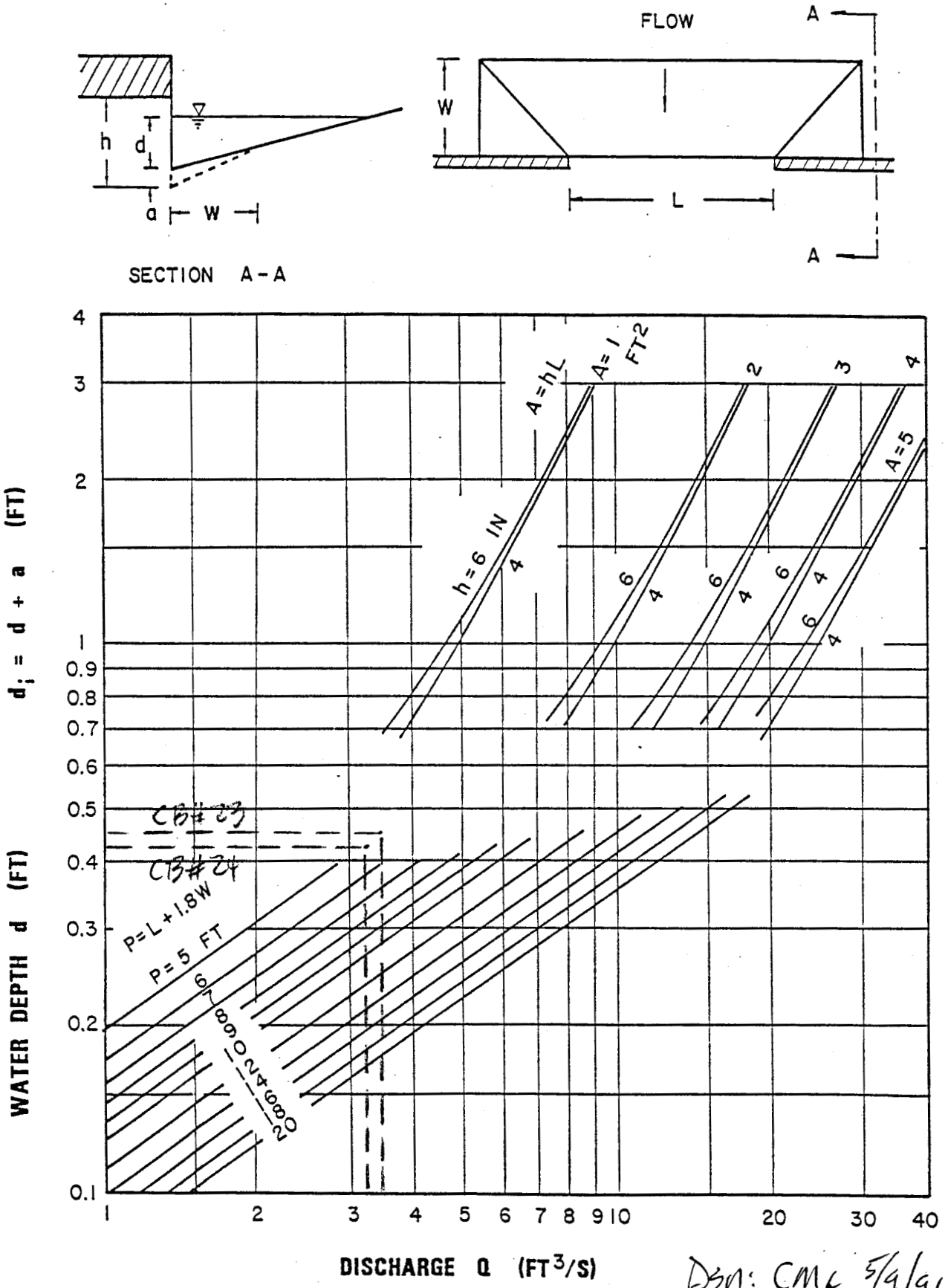
$Qn = 0.038$ FT^3/S

1) For V-Shape, use the nomograph with $S_x = S_{x1} S_{x2} / (S_{x1} + S_{x2})$

2) To determine discharge in gutter with composite cross slopes, find Q_s using T_s and S_x. Then, use CHART 4 to find E_o. The total discharge is $Q = Q_s/(1 - E_o)$, and $Q_w = Q - Q_s$.

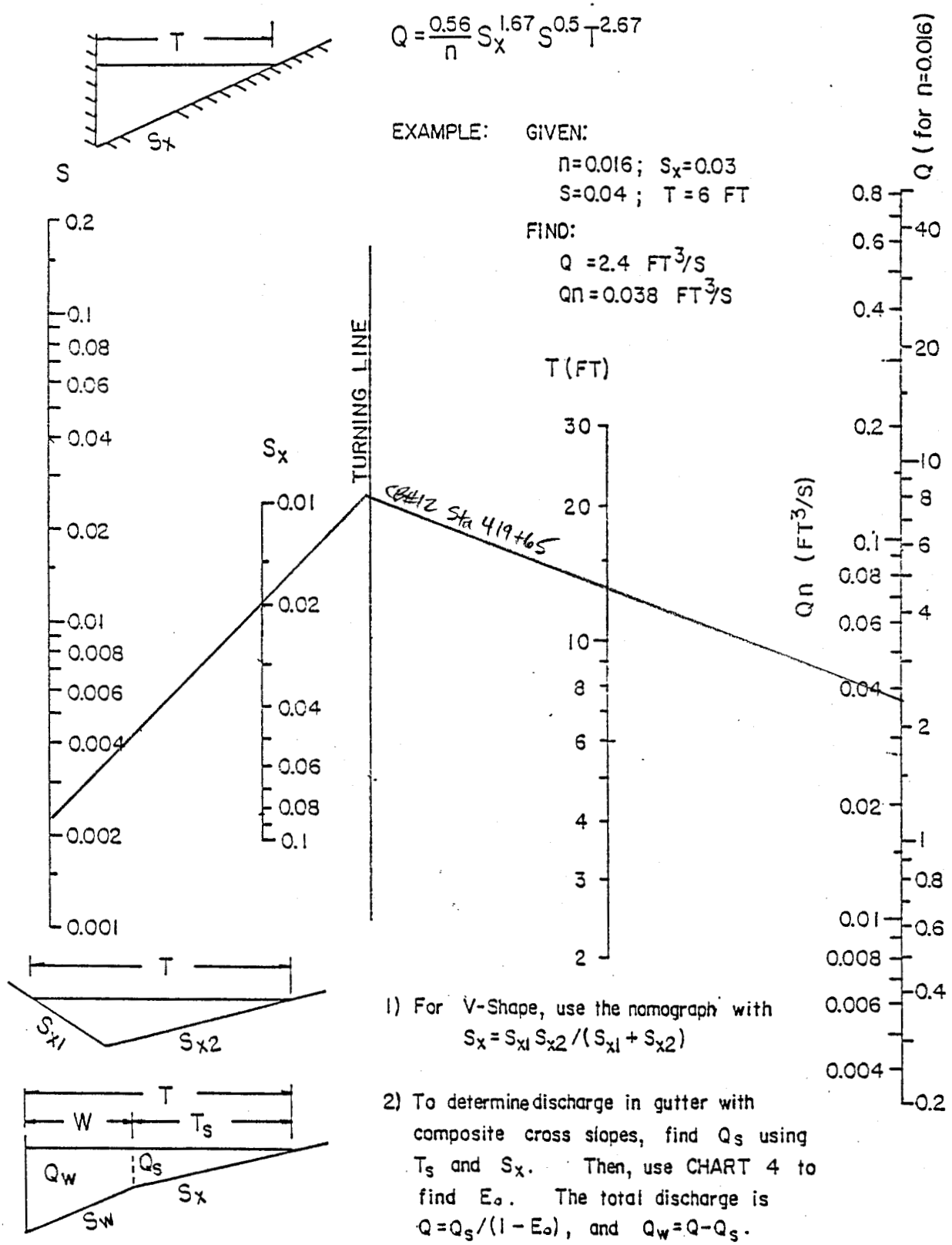
CHART 3. Flow in triangular gutter sections.

Dsn: CMG 5/9/91



Dsn: CMG 5/9/91

CHART 12. Depressed curb-opening inlet capacity in sump locations.



$$Q = \frac{0.56}{n} S_x^{1.67} S^{0.5} T^{2.67}$$

EXAMPLE: GIVEN:

$n = 0.016$; $S_x = 0.03$

$S = 0.04$; $T = 6$ FT

FIND:

$Q = 2.4$ FT^3/S

$Qn = 0.038$ FT^3/S

1) For V-Shape, use the nomograph with $S_x = S_{x1} S_{x2} / (S_{x1} + S_{x2})$

2) To determine discharge in gutter with composite cross slopes, find Q_s using T_s and S_x. Then, use CHART 4 to find E_o. The total discharge is $Q = Q_s / (1 - E_o)$, and $Q_w = Q - Q_s$.

CHART 3. Flow in triangular gutter sections.

Dsn: CMG 5/9/91

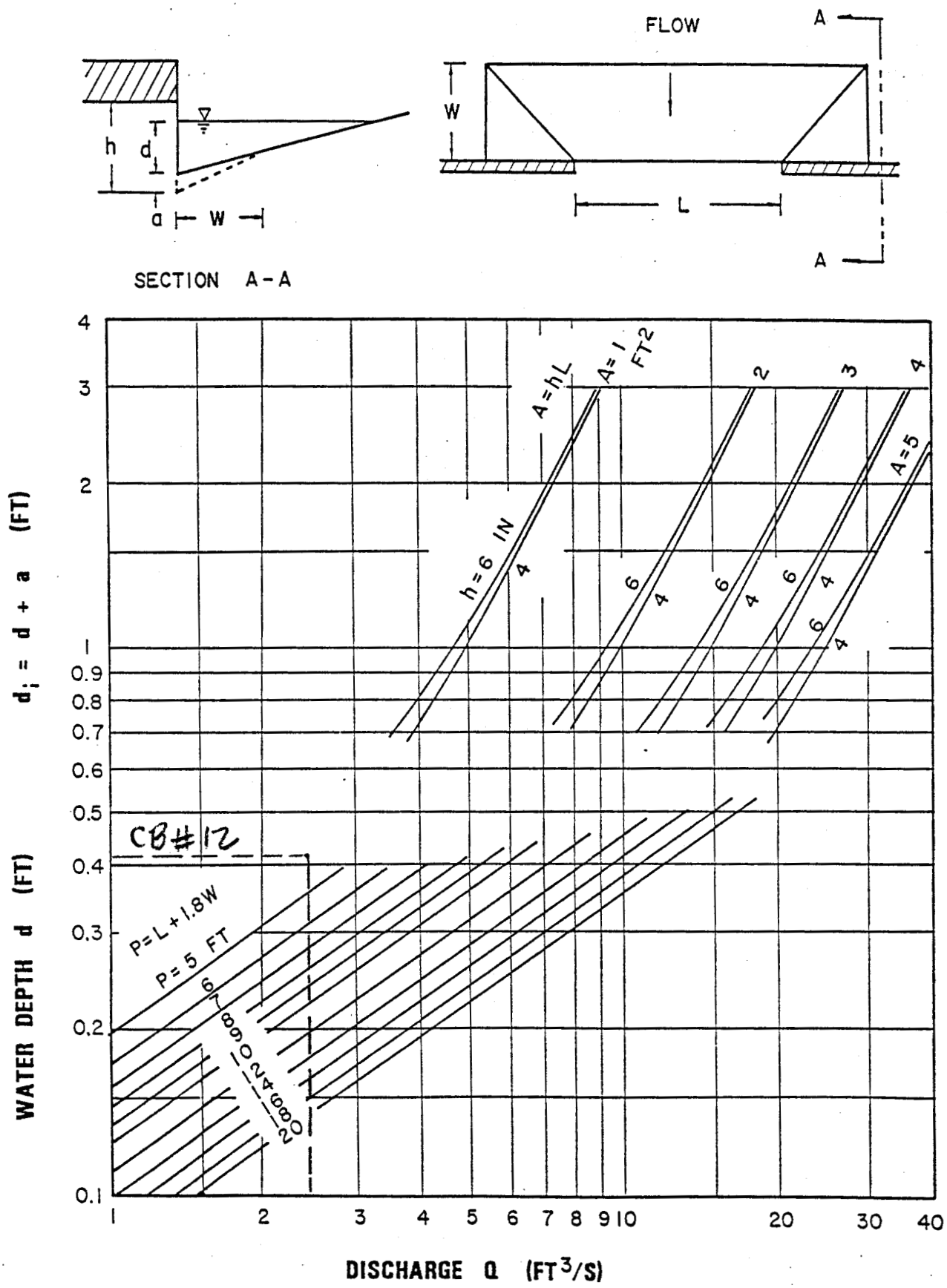


CHART 12. Depressed curb-opening inlet capacity in sump locations.

Dsn: CMG 5/9/91

$$Q = \frac{0.56}{n} S_x^{1.67} S^{0.5} T^{2.67}$$

EXAMPLE: GIVEN:

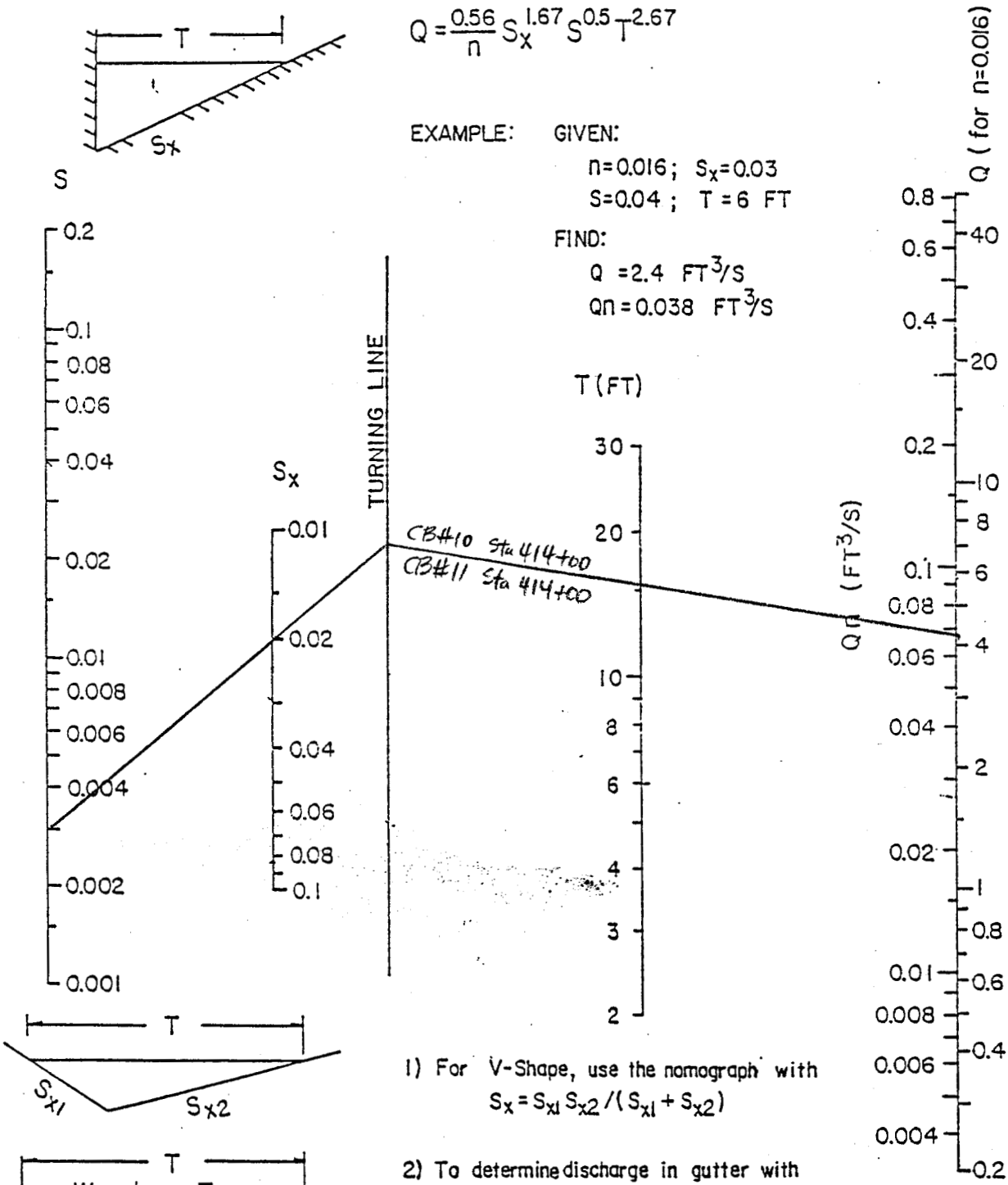
$n = 0.016$; $S_x = 0.03$

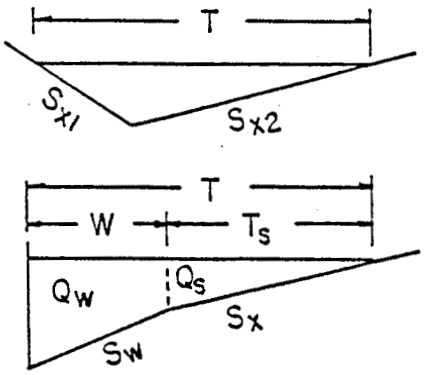
$S = 0.04$; $T = 6$ FT

FIND:

$Q = 2.4$ FT^3/S

$Qn = 0.038$ FT^3/S





1) For V-Shape, use the nomograph with $S_x = S_{x1} S_{x2} / (S_{x1} + S_{x2})$

2) To determine discharge in gutter with composite cross slopes, find Q_s using T_s and S_x. Then, use CHART 4 to find E_o. The total discharge is $Q = Q_s / (1 - E_o)$, and $Q_w = Q - Q_s$.

CHART 3. Flow in triangular gutter sections.

Dsn: CMG 5/9/91

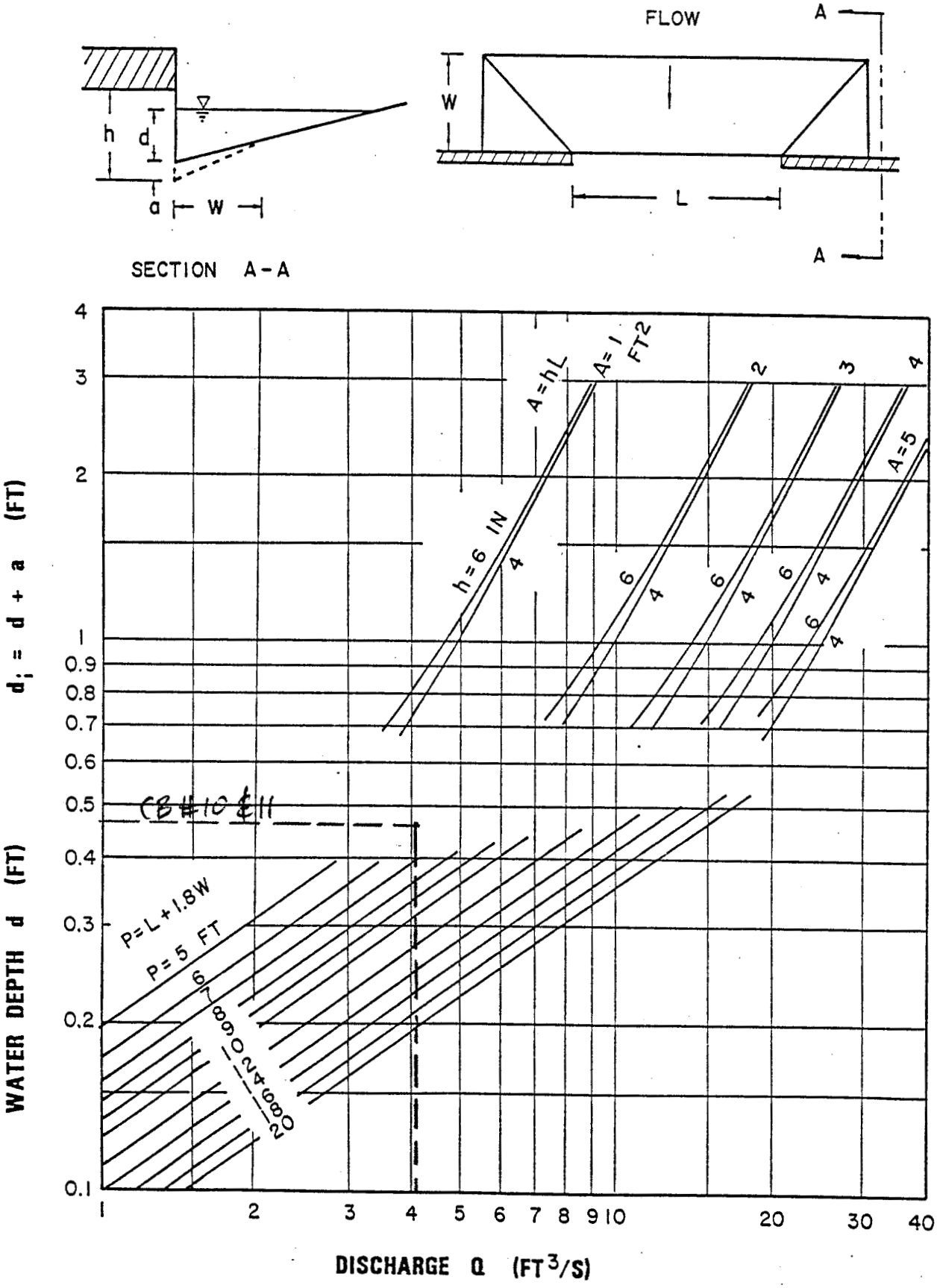
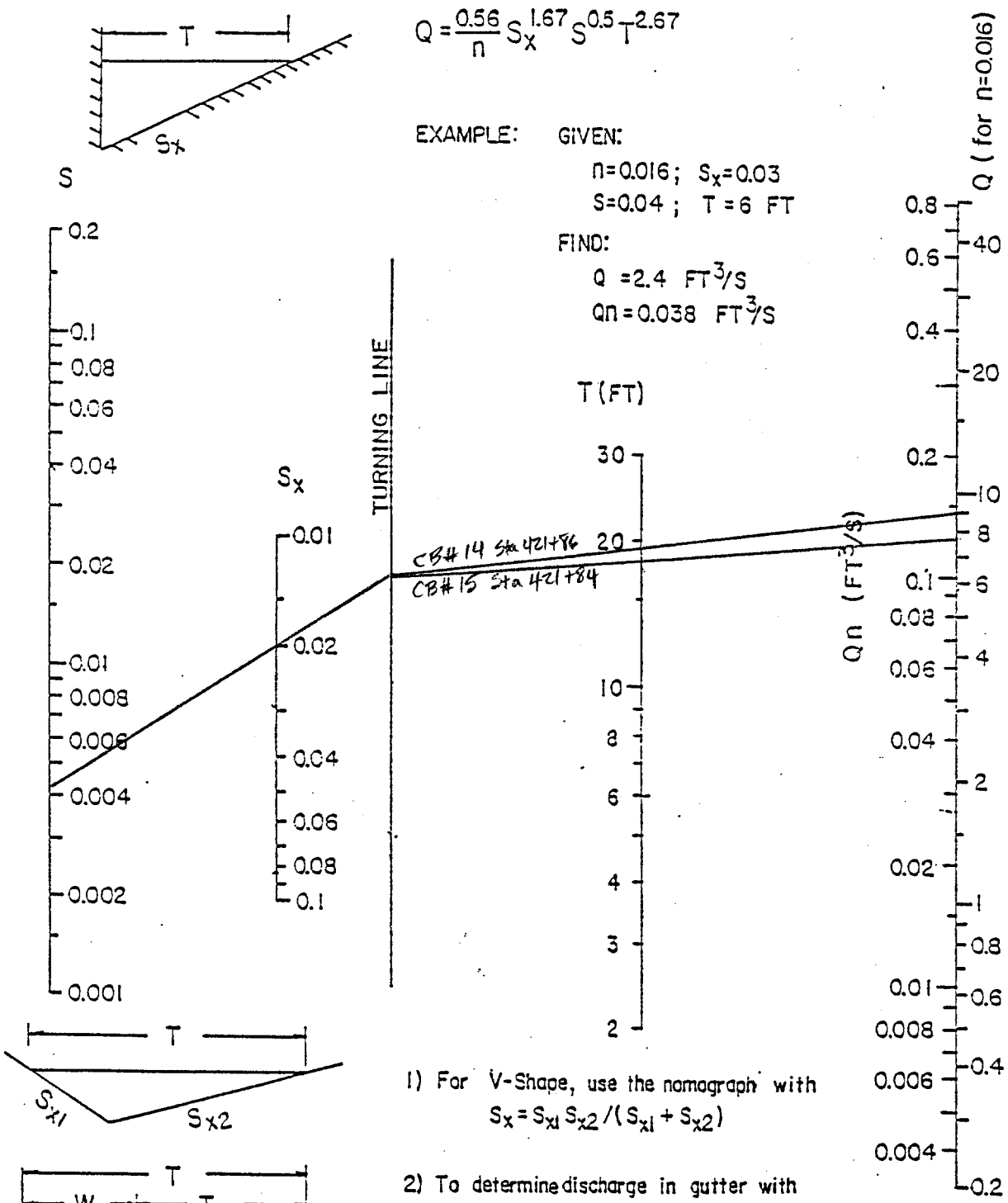


CHART 12. Depressed curb-opening inlet capacity in sump locations.

Dsn: CMG 5/9/91



$$Q = \frac{0.56}{n} S_x^{1.67} S^{0.5} T^{2.67}$$

EXAMPLE: GIVEN:

$n = 0.016$; $S_x = 0.03$

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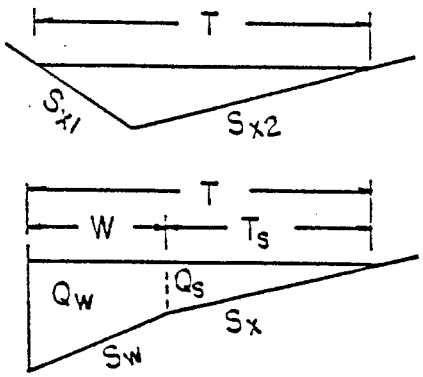
FIND:

$Q = 2.4$ FT³/S

$Qn = 0.038$ FT³/S



1) For V-Shape, use the nomograph with $S_x = S_{x1} S_{x2} / (S_{x1} + S_{x2})$

2) To determine discharge in gutter with composite cross slopes, find Q_s using T_s and S_x. Then, use CHART 4 to find E_o. The total discharge is $Q = Q_s / (1 - E_o)$, and $Q_w = Q - Q_s$.

CHART 3. Flow in triangular gutter sections.

Dsn: CMG 5/9/91

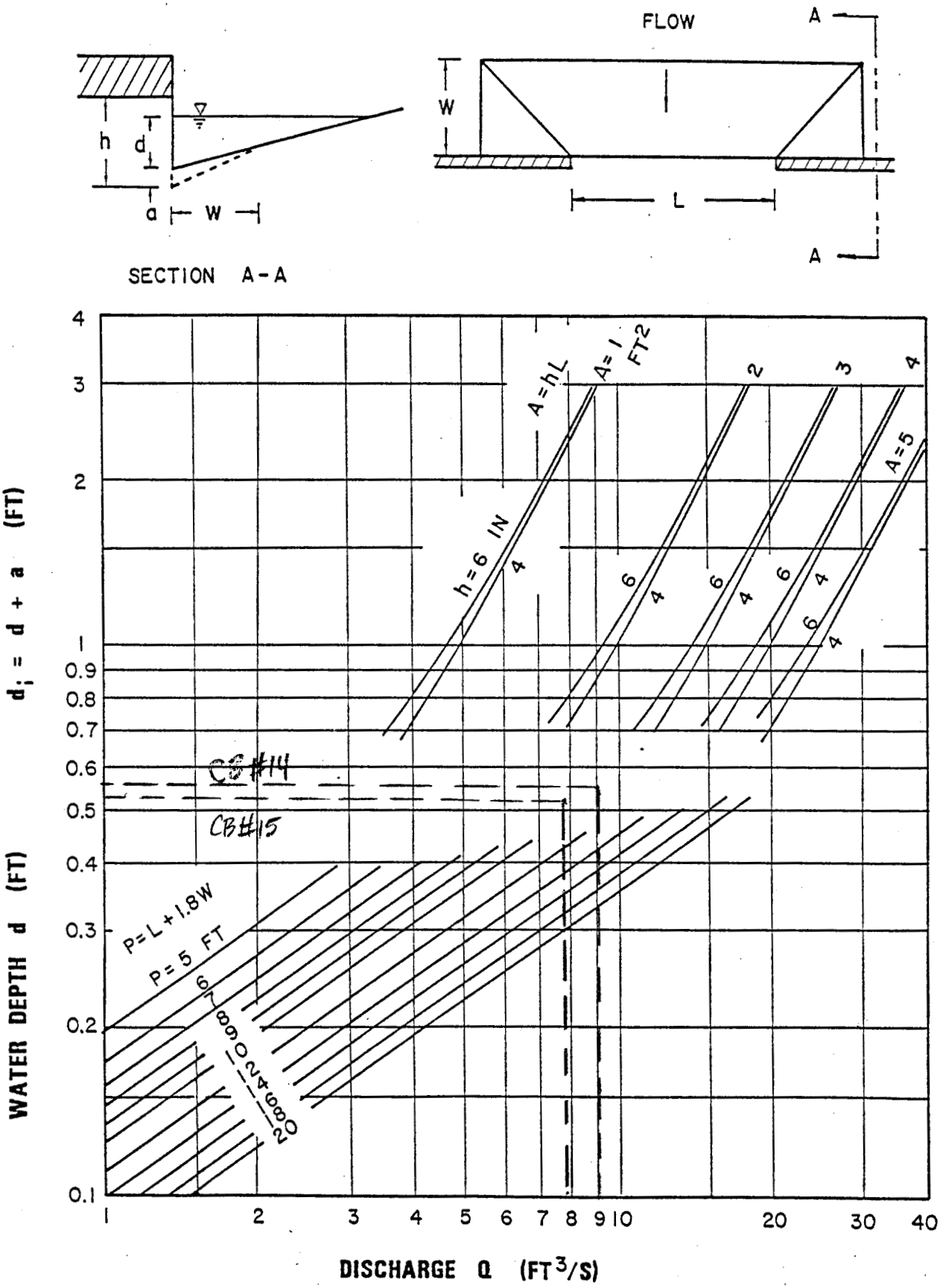
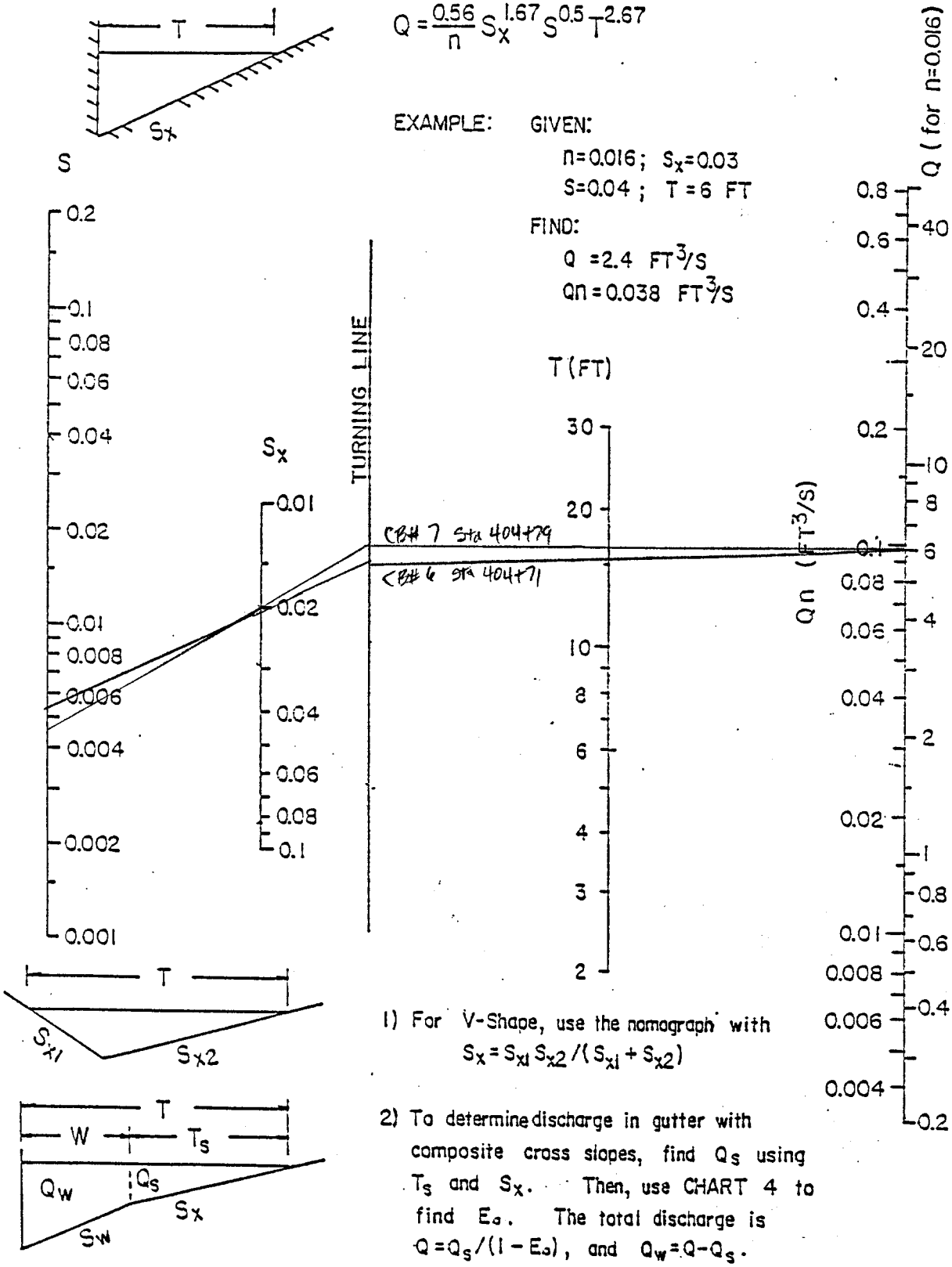


CHART 12. Depressed curb-opening inlet capacity in sump locations.

Dsn: CMG 5/9/91

$$Q = \frac{0.56}{n} S_x^{1.67} S^{0.5} T^{2.67}$$



EXAMPLE: GIVEN:

$n = 0.016$; $S_x = 0.03$

$S = 0.04$; $T = 6$ FT

FIND:

$Q = 2.4$ FT³/S

$Qn = 0.038$ FT³/S

1) For V-Shape, use the nomograph with $S_x = S_{x1} S_{x2} / (S_{x1} + S_{x2})$

2) To determine discharge in gutter with composite cross slopes, find Q_s using T_s and S_x. Then, use CHART 4 to find E_o. The total discharge is $Q = Q_s / (1 - E_o)$, and $Q_w = Q - Q_s$.

CHART 3. Flow in triangular gutter sections.

Dsn: CMG 5/9/91

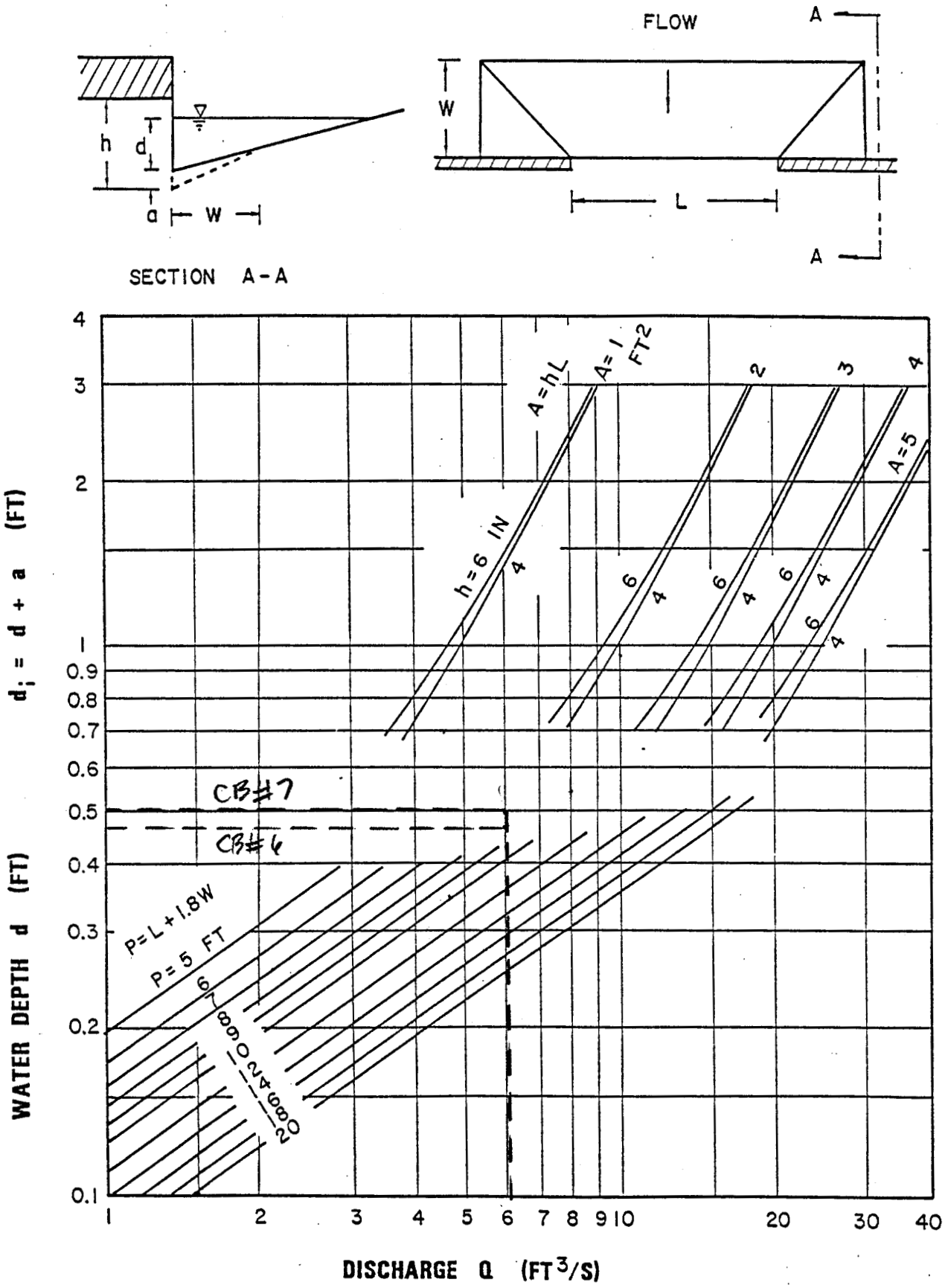


CHART 12. Depressed curb-opening inlet capacity in sump locations.

Dsn: CMG 5/9/91

$$Q = \frac{0.56}{n} S_x^{1.67} S^{0.5} T^{2.67}$$

EXAMPLE: GIVEN:

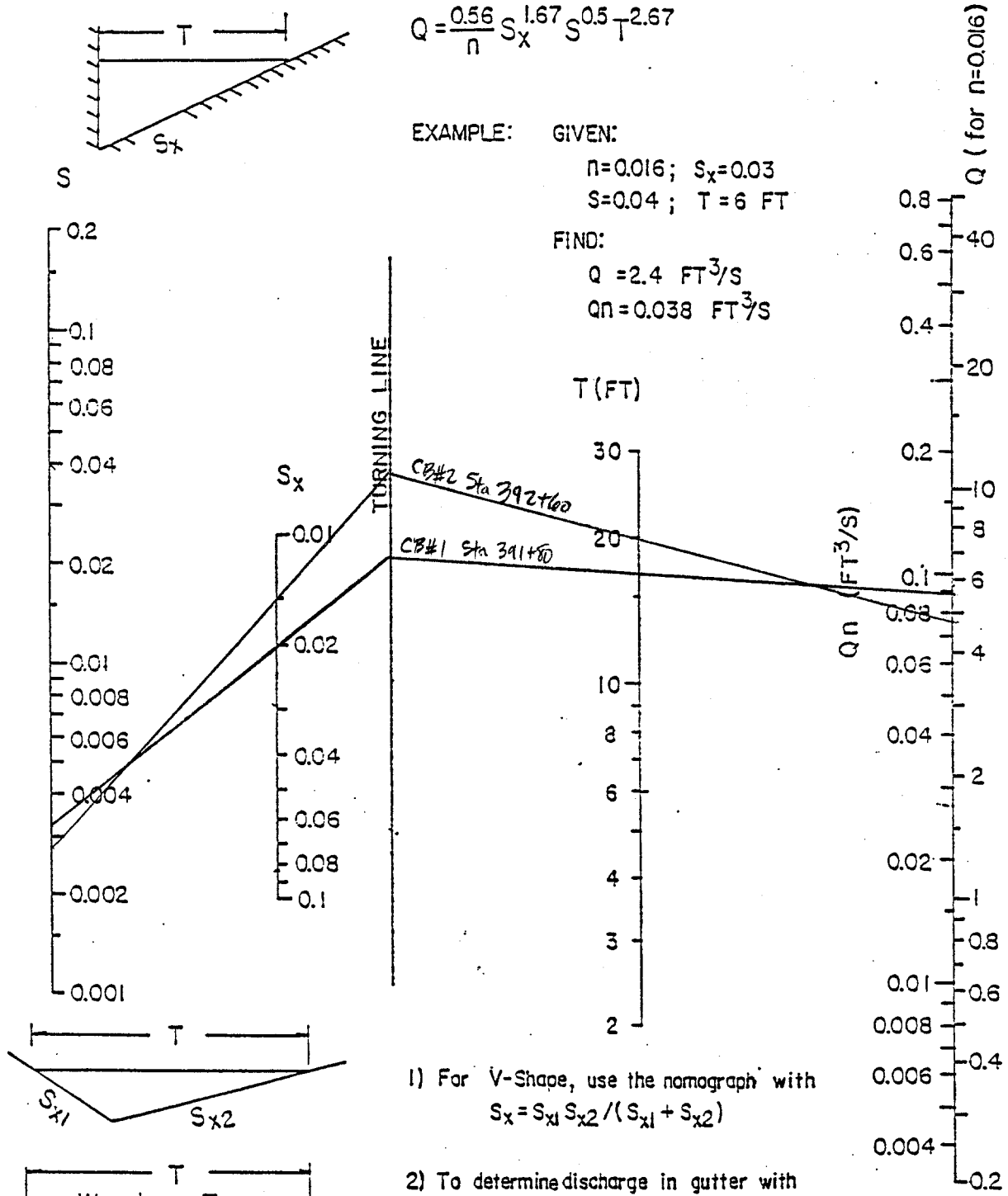
$n = 0.016$; $S_x = 0.03$

$S = 0.04$; $T = 6$ FT

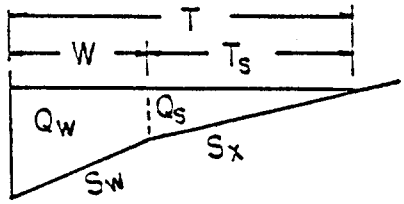
FIND:

$Q = 2.4$ FT^3/S

$Qn = 0.038$ FT^3/S



1) For V-Shape, use the nomograph with $S_x = S_{x1} S_{x2} / (S_{x1} + S_{x2})$



2) To determine discharge in gutter with composite cross slopes, find Q_s using T_s and S_x. Then, use CHART 4 to find E_o. The total discharge is $Q = Q_s/(1 - E_o)$, and $Q_w = Q - Q_s$.

CHART 3. Flow in triangular gutter sections.

Dsn: CMG 5/9/91

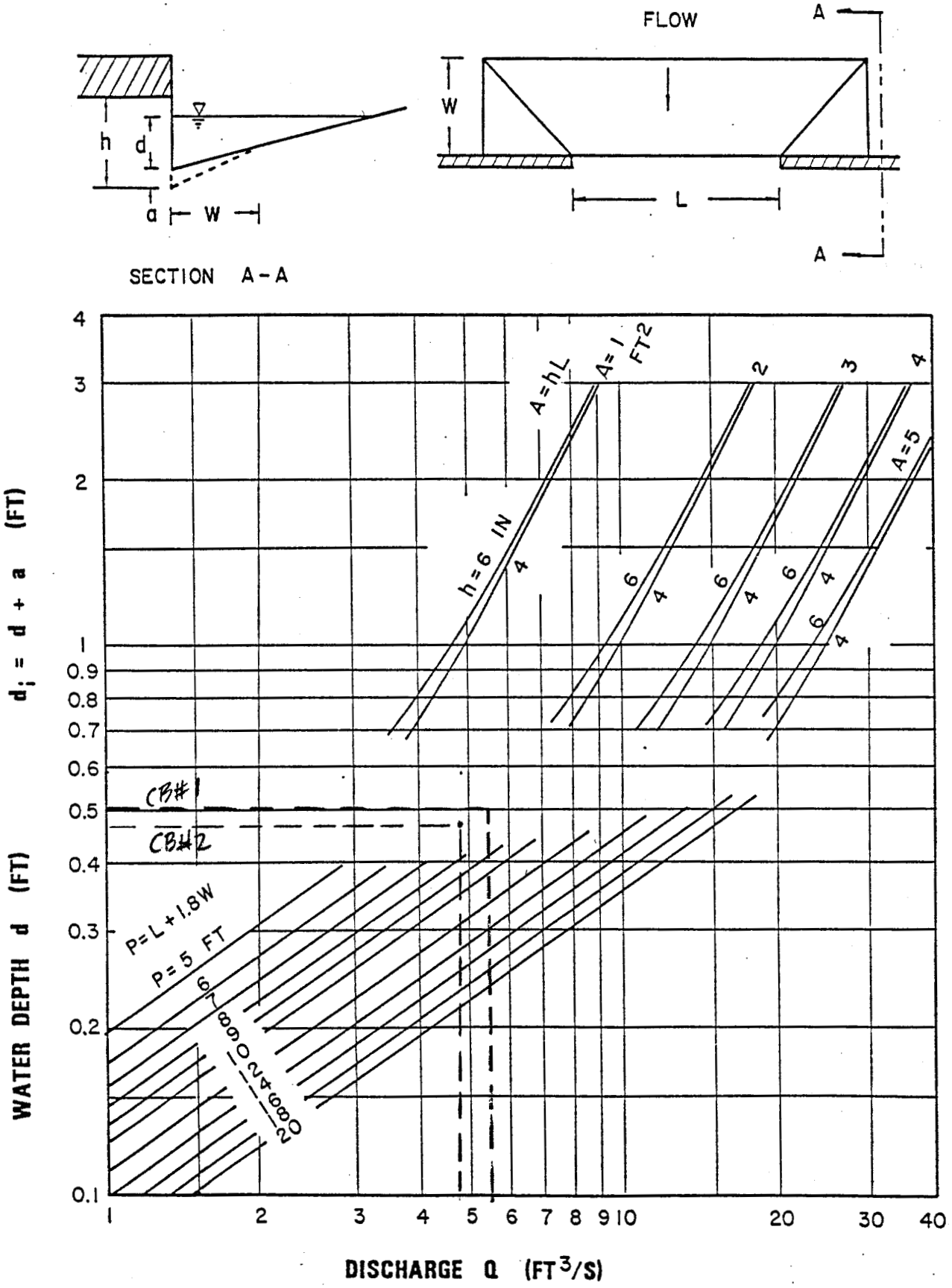


CHART 12. Depressed curb-opening inlet capacity in sump locations.

Dsn: CMG 5/9/91

APPENDIX 4

THYSYS PROGRAM INPUT/OUTPUT AND DOCUMENTATION

```
$      Bell Road - 83rd to 67th, MARICOPA COUNTY HIGHWAY DEPT
$      83rd Outfall, Sta 383+25 to 395+70
$      10 Yr - 24 Hr Storm (TRUNK_1A.DAT)
$      REVISED 4-8-91
SEWER              ANALYSIS                    SEWER     FREQUENCY=10 YR
$
JUNC A  2 TYPE=JUNCT
JUNC A  3 TYPE=JUNCT
JUNC A  4 TYPE=JUNCT
JUNC A  5 TYPE=JUNCT
JUNC A  6 TYPE-JUNCT
JUNC A  7 TYPE=JUNCT
JUNC A  8 TYPE=JUNCT
JUNC A  9 TYPE=JUNCT
JUNC A 10 TYPE=JUNCT
JUNC A 11 TYPE=JUNCT
$
OUTLET    STATIONING  38325   T.W. ELEV 1198.0     A  1
$
DSGN   1  A 11 A 10 US 1201.1 DS 1200.6  133       0.99 .013 .      48 CIRC
DSGN   2  A 10 A  9 US 1200.4 DS 1200.3   18       1.33 .013 .5     48 CIRC
DSGN   3  A  9 A  8 US 1200.3 DS 1200.1   80            .013 .1     48 CIRC
DSGN   4  A  8 A  7 US 1200.1 DS 1199.5  117       0.78 .013 .1     48 CIRC
DSGN   5  A  7 A  6 US 1199.5 DS 1199.4   94          7 .013 .5     48 CIRC
DSGN   6  A  6 A  5 US 1199.4 DS 1199.3   80       4.79 .013 .1     48 CIRC
DSGN   7  A  5 A  4 US 1199.3 DS 1199.2  155       5.47 .013 .1     48 CIRC
DSGN   8  A  4 A  3 US 1199.2 DS 1199.0  265            .013 .1     48 CIRC
DSGN   9  A  3 A  2 US 1199.0 DS 1198.7  300            .013 .1     48 CIRC
DSGN  10  A  2 A  1 US 1197.2 DS 1197.0   35          2 .013        60 CIRC
$
ANAL   1  A 11 A 10     1   15
ANAL   2  A 10 A  9     1   18            .5
ANAL   3  A  9 A  8     1   18            .1
ANAL   4  A  8 A  7     1   18            .1
ANAL   5  A  7 A  6     1   27            .5
ANAL   6  A  6 A  5     1   30            .1
ANAL   7  A  5 A  4     1   30            .1
ANAL   8  A  4 A  3     1   30            .1
ANAL   9  A  3 A  2     1   30            .1
ANAL  10  A  2 A  1     1   48
$
ENDATA
```

App. 1.4

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	BRLS	RISE	SPAN	SHAPE
1	A11	A10	1199.85	1199.35	133	0.00376	1	15	15	CIRC
2	A10	A 9	1198.90	1198.80	18	0.00555	1	18	18	CIRC
3	A 9	A 8	1198.80	1198.60	80	0.00250	1	18	18	CIRC
4	A 8	A 7	1198.60	1198.00	117	0.00513	1	18	18	CIRC
5	A 7	A 6	1197.25	1197.15	94	0.00106	1	27	27	CIRC
6	A 6	A 5	1196.90	1196.80	80	0.00125	1	30	30	CIRC
7	A 5	A 4	1196.80	1196.70	155	0.00065	1	30	30	CIRC
8	A 4	A 3	1196.70	1196.50	265	0.00075	1	30	30	CIRC
9	A 3	A 2	1196.50	1196.20	300	0.00100	1	30	30	CIRC
10	A 2	A 1	1193.20	1193.00	35	0.00571	1	48	48	CIRC

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.	
1	A11	A10	0.013	0.00	0.99	1202.46	1202.43	0.00023	0.34	2.7	4.0	
2	A10	A 9	0.013	0.50	2.32	1202.43	1201.92	0.00049	0.38	3.8	7.8	
3	A 9	A 8	0.013	0.10	2.32	1201.92	1201.78	0.00049	0.47	2.8	5.3	
4	A 8	A 7	0.013	0.10	3.10	1201.78	1201.58	0.00087	0.45	4.0	7.5	
5	A 7	A 6	0.013	0.50	10.10	1201.58	1200.98	0.00106	0.83	2.9	10.1	
6	A 6	A 5	0.013	0.10	14.89	1200.98	1200.77	0.00132	1.00	3.0	14.5	**
7	A 5	A 4	0.013	0.10	20.36	1200.77	1200.29	0.00246	1.00	4.1	10.4	**
8	A 4	A 3	0.013	0.10	20.36	1200.29	1199.54	0.00246	1.00	4.1	11.3	**
9	A 3	A 2	0.013	0.10	20.36	1199.54	1198.70	0.00246	1.00	4.1	13.0	**
10	A 2	A 1	0.013	0.00	22.36	1198.01	1198.00	0.00024	0.31	6.7	108.6	

```
*****************************
*                           *
*          THYSYS           *
*                           *
*   TEXAS HYDRAULICS SYSTEM *
*                           *
*****************************
```



```
$ REVISED 5-17-91
$      Bell Road - 83rd to 67th, MARICOPA COUNTY HIGHWAY DEPT
$      Tram  Outfall, Sta 397+00 to 433+50
$        OFF-SITE DRAINAGE FLOWS ADJUSTED AT BRANCH JUNCTIONS
$        ROADWAY DRAINAGE > 10-YR PEAKS FROM RATIONAL ANALYSIS
$
SEWER              ANALYSIS                    SEWER     FREQUENCY=10 YR
$
$        10-Yr, 24-Hr Storm (TRunk_2a.DAT)
$
JUNC A  2 TYPE=JUNCT
JUNC A  3 TYPE=JUNCT
JUNC A  4 TYPE=JUNCT
JUNC A  5 TYPE=JUNCT
JUNC A  6 TYPE-JUNCT
JUNC A  7 TYPE=JUNCT
JUNC A  8 TYPE=JUNCT
JUNC A  9 TYPE=JUNCT
JUNC A 10 TYPE=JUNCT
```

```
JUNC A 11 TYPE=JUNCT
JUNC B  0 TYPE=JUNCT
JUNC B  1 TYPE=JUNCT
JUNC B  2 TYPE=JUNCT
JUNC B  3 TYPE=JUNCT
JUNC B  4 TYPE=JUNCT
JUNC C  2 TYPE=JUNCT
JUNC C  3 TYPE=JUNCT
JUNC C  4 TYPE=JUNCT
JUNC C  5 TYPE=JUNCT
JUNC D  2 TYPE=JUNCT
JUNC D  3 TYPE=JUNCT
JUNC D  4 TYPE=JUNCT
JUNC D  5 TYPE=JUNCT
JUNC E  2 TYPE=JUNCT
JUNC E  3 TYPE=JUNCT
JUNC E  4 TYPE=JUNCT
JUNC E  5 TYPE=JUNCT
JUNC E  6 TYPE=JUNCT
$
OUTLET    STATIONING  600.0   T.W. ELEV 1180.5     A  1
$
DSGN   1  A 10 A  9 US 1191.0 DS 1190.3  100        96 .013       54 CIRC
DSGN   2  A 11 A  9 US 1191.0 DS 1190.3  100       173 .013       66 CIRC
DSGN   3  A  9 A  8 US 1190.3 DS 1189.0  320        -1 .013 .5    84 CIRC
DSGN   4  A  8 A  7 US 1189.0 DS 1187.9  252           .013 .1    84 CIRC
DSGN   5  A  7 A  6 US 1187.9 DS 1187.0  218     -24.6 .013 .3    84 CIRC
DSGN   6  A  6 A  5 US 1187.0 DS 1185.8  515        -2 .013 .1    84 CIRC
DSGN   7  A  5 A  4 US 1185.8 DS 1184.5  515           .013 .1    84 CIRC
DSGN   8  A  4 A  3 US 1184.5 DS 1183.1  610        51 .013 .3    96 CIRC
DSGN   9  A  3 A  2 US 1183.1 US 1182.0  436           .013 .1    96 CIRC
DSGN  10  A  2 A  1 US 1182.0 DS 1181.0  436           .013 .1    96 CIRC
DSGN  11  B  4 B  3 US 1196.8 DS 1194.5  331       6.0 .013 .1    21 CIRC
DSGN  12  B  3 B  2 US 1194.5 DS 1193.3  250       2.5 .013 .1    24 CIRC
DSGN  13  B  0 A  6 US 1187.6 DS 1187.0   30           .013 .1    36 CIRC
DSGN  14  C  5 C  4 US 1196.5 DS 1195.5  239       6.0 .013 .1    21 CIRC
DSGN  15  C  4 C  3 US 1195.5 DS 1195.0   92        19 .013 .1    30 CIRC
DSGN  16  C  3 C  2 US 1195.0 DS 1194.0  200       3.1 .013       30 CIRC
DSGN  17  C  2 B  2 US 1194.0 DS 1193.3  142           .013 .5    30 CIRC
DSGN  18  E  6 E  5 US 1196.0 DS 1195.5  111       9.0 .013 .1    21 CIRC
DSGN  19  E  5 E  4 US 1195.5 DS 1195.3   74         4 .013 .5    24 CIRC
DSGN  20  E  4 E  3 US 1195.3 DS 1194.8  255       2.4 .013 .1    24 CIRC
DSGN  21  E  3 E  2 US 1194.8 DS 1194.1  310           .013 .1    24 CIRC
DSGN  22  E  2 D  2 US 1194.1 DS 1193.6  136       4.1 .013 .5    24 CIRC
DSGN  23  D  5 D  4 US 1196.2 DS 1195.9  219       7.9 .013 .1    21 CIRC
DSGN  24  D  4 D  3 US 1195.9 DS 1194.6  280       2.1 .013       24 CIRC
DSGN  25  D  3 D  2 US 1194.6 DS 1193.6  285           .013 .1    24 CIRC
DSGN  26  D  2 A  7 US 1193.6 DS 1186.1  200       4.1 .013 .5    30 CIRC
DSGN  27  B  2 B  1 US 1193.3 DS 1192.1   58      -9.6 .013 .5    36 CIRC
DSGN  28  B  1 B  0 US 1192.1 DS 1187.0  208           .013 .1    36 CIRC
$
ANAL   1  A 10 A  9     1   54
ANAL   2  A 11 A  9     1   66
ANAL   3  A  9 A  8     1   84            .5
ANAL   4  A  8 A  7     1   84            .1
ANAL   5  A  7 A  6     1   84            .3
ANAL   6  A  6 A  5     1   84            .1
ANAL   7  A  5 A  4     1   84            .1
ANAL   8  A  4 A  3     1   96            .3
ANAL   9  A  3 A  2     1   96            .1
ANAL  10  A  2 A  1     1   96            .1
ANAL  11  B  4 B  3     1   21            .1
ANAL  12  B  3 B  2     1   24            .1
ANAL  13  B  0 A  6     1   36            .1
ANAL  14  C  5 C  4     1   21            .1
ANAL  15  C  4 C  3     1   30            .1
```

```
ANAL  16  C  3 C  2     1   30
ANAL  17  C  2 8  2     1   30            .5
ANAL  18  E  6 E  5     1   21            .1
ANAL  19  E  5 E  4     1   24            .5
ANAL  20  E  4 E  3     1   24            .1
ANAL  21  E  3 E  2     1   24            .1
ANAL  22  E  2 D  2     1   24            .5
ANAL  23  D  5 D  4     1   21            .1
ANAL  24  D  4 D  3     1   24
ANAL  25  D  3 D  2     1   24            .1
ANAL  26  D  2 A  7     1   30            .5
ANAL  27  B  2 B  1     1   36            .5
ANAL  28  B  1 B  0     1   36            .1
$
ENDATA
```


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
1	A10	A 9	1186.50	1185.80	100	0.00700	1	54	54	CIRC
2	A11	A 9	1185.50	1184.80	100	0.00700	1	66	66	CIRC
3	A 9	A 8	1183.30	1182.00	320	0.00406	1	84	84	CIRC
4	A 8	A 7	1182.00	1180.90	252	0.00436	1	84	84	CIRC
5	A 7	A 6	1180.90	1180.00	218	0.00413	1	84	84	CIRC

6	A 6	A 5	1180.00	1178.80	515	0.00233	1	84	84	CIRC
7	A 5	A 4	1178.80	1177.50	515	0.00252	1	84	84	CIRC
8	A 4	A 3	1176.50	1175.10	610	0.00230	1	96	96	CIRC
9	A 3	A 2	1175.10	1174.00	436	0.00252	1	96	96	CIRC
10	A 2	A 1	1174.00	1173.00	436	0.00229	1	96	96	CIRC
11	B 4	B 3	1195.05	1192.75	331	0.00695	1	21	21	CIRC
12	B 3	B 2	1192.50	1191.30	250	0.00480	1	24	24	CIRC
13	B 0	A 6	1184.60	1184.00	30	0.02000	1	36	36	CIRC
14	C 5	C 4	1194.75	1193.75	239	0.00418	1	21	21	CIRC
15	C 4	C 3	1193.00	1192.50	92	0.00543	1	30	30	CIRC
16	C 3	C 2	1192.50	1191.50	200	0.00500	1	30	30	CIRC
17	C 2	B 2	1191.50	1190.80	142	0.00493	1	30	30	CIRC
18	E 6	E 5	1194.25	1193.75	111	0.00450	1	21	21	CIRC
19	E 5	E 4	1193.50	1193.30	74	0.00270	1	24	24	CIRC
20	E 4	E 3	1193.30	1192.80	255	0.00196	1	24	24	CIRC
21	E 3	E 2	1192.80	1192.10	310	0.00226	1	24	24	CIRC
22	E 2	D 2	1192.10	1191.60	136	0.00368	1	24	24	CIRC
23	D 5	D 4	1194.45	1194.15	219	0.00137	1	21	21	CIRC
24	D 4	D 3	1193.90	1192.60	280	0.00464	1	24	24	CIRC
25	D 3	D 2	1192.60	1191.60	285	0.00351	1	24	24	CIRC
26	D 2	A 7	1191.10	1183.60	200	0.03750	1	30	30	CIRC
27	B 2	B 1	1190.30	1189.10	58	0.02069	1	36	36	CIRC
28	B 1	B 0	1189.10	1184.00	208	0.02452	1	36	36	CIRC

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.
1	A10	A 9	0.013	0.00	96.00	1188.97	1188.28	0.00238	0.55	10.7	164.5
2	A11	A 9	0.013	0.00	173.00	1188.64	1188.04	0.00265	0.57	12.4	280.9
3	A 9	A 8	0.013	0.50	268.00	1188.04	1186.98	0.00176	0.60	11.1	407.2
4	A 8	A 7	0.013	0.10	268.00	1186.98	1186.43	0.00176	0.58	11.6	422.1
5	A 7	A 6	0.013	0.30	277.00	1186.43	1185.72	0.00188	0.61	11.3	410.5
6	A 6	A 5	0.013	0.10	302.00	1185.72	1184.47	0.00223	0.81	9.0	308.4
7	A 5	A 4	0.013	0.10	302.00	1184.47	1183.22	0.00223	0.78	9.4	321.0
8	A 4	A 3	0.013	0.30	353.00	1183.22	1182.01	0.00150	0.69	9.5	437.0
9	A 3	A 2	0.013	0.10	353.00	1182.01	1181.25	0.00150	0.66	10.0	458.1
10	A 2	A 1	0.013	0.10	353.00	1181.25	1180.50	0.00150	0.69	9.5	436.8

11	B 4	B 3	0.013	0.10	6.00	1195.89	1193.59	0.00143	0.48	5.3	13.2	
12	B 3	B 2	0.013	0.10	8.50	1193.56	1192.36	0.00141	0.53	5.0	15.7	
13	B 0	A 6	0.013	0.10	27.00	1185.87	1185.72	0.00164	0.37	11.4	94.3	
14	C 5	C 4	0.013	0.10	6.00	1195.81	1195.37	0.00143	0.55	4.4	10.2	
15	C 4	C 3	0.013	0.10	25.00	1195.37	1194.93	0.00372	0.70	6.8	30.2	
16	C 3	C 2	0.013	0.00	28.10	1194.93	1193.99	0.00469	0.80	6.7	29.0	
17	C 2	B 2	0.013	0.50	28.10	1193.99	1192.83	0.00469	0.81	6.6	28.8	
18	E 6	E 5	0.013	0.10	9.00	1199.13	1198.67	0.00323	0.71	4.9	10.6	
19	E 5	E 4	0.013	0.50	13.00	1198.67	1197.93	0.00330	1.00	4.1	11.8	**
20	E 4	E 3	0.013	0.10	15.40	1197.93	1196.65	0.00463	1.00	4.9	10.0	**
21	E 3	E 2	0.013	0.10	15.40	1196.65	1195.11	0.00463	1.00	4.9	10.8	**
22	E 2	D 2	0.013	0.50	19.50	1195.11	1193.60	0.00743	1.00	6.2	13.7	**
23	D 5	D 4	0.013	0.10	7.90	1196.54	1195.90	0.00249	1.00	3.3	5.9	**
24	D 4	D 3	0.013	0.00	10.00	1195.08	1193.90	0.00195	0.59	5.2	15.4	
25	D 3	D 2	0.013	0.10	10.00	1193.90	1192.90	0.00195	0.65	4.6	13.4	
26	D 2	A 7	0.013	0.50	33.60	1192.25	1186.43	0.00671	0.46	15.2	79.4	
27	B 2	B 1	0.013	0.50	27.00	1191.41	1190.21	0.00164	0.37	11.4	95.9	
28	B 1	B 0	0.013	0.10	27.00	1190.15	1185.87	0.00164	0.35	12.2	104.4	

SEW0008--CAPACITY OF RUN 19 IS EXCEEDED.
SEW0008--CAPACITY OF RUN 20 IS EXCEEDED.
SEW0008--CAPACITY OF RUN 21 IS EXCEEDED.
SEW0008--CAPACITY OF RUN 22 IS EXCEEDED.
SEW0008--CAPACITY OF RUN 23 IS EXCEEDED.

STATIONING

RUN	UPSTREAM JUNCTION ID	STATIONING
1	A10	4002
2	A11	4002
3	A 9	3902
4	A 8	3582
5	A 7	3330
6	A 6	3112
7	A 5	2597
8	A 4	2082
9	A 3	1472
10	A 2	1036

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            11                  B 4                  3989
            12                  B 3                  3658
            13                  B 0                  3142
            14                  C 5                  4081
            15                  C 4                  3842
            16                  C 3                  3750
            17                  C 2                  3550
            18                  E 6                  4416
            19                  E 5                  4305
            20                  E 4                  4231
            21                  E 3                  3976
            22                  E 2                  3666
            23                  D 5                  4314
            24                  D 4                  4095
            25                  D 3                  3815
            26                  D 2                  3530
            27                  B 2                  3408
            28                  B 1                  3350
SEWER              ANALYSIS                    SEWER     FREQUENCY=25 YR
$
$        25-Yr, 24-Hr Storm (TRUNK_2A.DAT)
$
JUNC A  2 TYPE=JUNCT
JUNC A  3 TYPE=JUNCT
JUNC A  4 TYPE=JUNCT
JUNC A  5 TYPE=JUNCT
JUNC A  6 TYPE-JUNCT
JUNC A  7 TYPE=JUNCT
JUNC A  8 TYPE=JUNCT
JUNC A  9 TYPE=JUNCT
JUNC A 10 TYPE=JUNCT
JUNC A 11 TYPE=JUNCT
JUNC B  0 TYPE=JUNCT
JUNC B  1 TYPE=JUNCT
JUNC B  2 TYPE=JUNCT
JUNC B  3 TYPE=JUNCT
JUNC B  4 TYPE=JUNCT
JUNC C  2 TYPE=JUNCT
JUNC C  3 TYPE=JUNCT
JUNC C  4 TYPE=JUNCT
JUNC C  5 TYPE=JUNCT
JUNC D  2 TYPE=JUNCT
JUNC D  3 TYPE=JUNCT
JUNC D  4 TYPE=JUNCT
JUNC D  5 TYPE=JUNCT
JUNC E  2 TYPE=JUNCT
JUNC E  3 TYPE=JUNCT
JUNC E  4 TYPE=JUNCT
JUNC E  5 TYPE=JUNCT
JUNC E  6 TYPE=JUNCT
$
OUTLET    STATIONING  600.0   T.W. ELEV 1180.5     A  1
$
DSGN   1  A 10 A  9 US 1191.0 DS 1190.3  100        126 .013       60 CIRC
DSGN   2  A 11 A  9 US 1191.0 DS 1190.3  100        227 .013       66 CIRC
DSGN   3  A  9 A  8 US 1190.3 DS 1189.0  320            .013 .5    84 CIRC
DSGN   4  A  8 A  7 US 1189.0 DS 1187.9  252            .013 .1    84 CIRC
DSGN   5  A  7 A  6 US 1187.9 DS 1187.0  218      -22.6 .013 .3    84 CIRC
DSGN   6  A  6 A  5 US 1187.0 DS 1185.8  515            .013 .1    84 CIRC
DSGN   7  A  5 A  4 US 1185.8 DS 1184.5  515            .013 .1    84 CIRC
DSGN   8  A  4 A  3 US 1184.5 DS 1183.1  610         71 .013 .3    96 CIRC
DSGN   9  A  3 A  2 US 1183.1 US 1182.0  436            .013 .1    96 CIRC
DSGN  10  A  2 A  1 US 1182.0 DS 1181.0  436            .013 .1    96 CIRC
DSGN  11  B  4 B  3 US 1196.8 DS 1194.5  331        6.0 .013 .1    21 CIRC
DSGN  12  B  3 B  2 US 1194.5 DS 1193.3  250        2.5 .013 .1    24 CIRC
DSGN  13  B  0 A  6 US 1187.6 DS 1187.0   30            .013 .1    36 CIRC
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DSGN  14  C  5 C  4 US 1196.5 DS 1195.5  239        6.0 .013 .1    21 CIRC
DSGN  15  C  4 C  3 US 1195.5 DS 1195.0   92         19 .013 .1    30 CIRC
DSGN  16  C  3 C  2 US 1195.0 DS 1194.0  200        3.1 .013       30 CIRC
DSGN  17  C  2 B  2 US 1194.0 DS 1193.3  142            .013 .5    30 CIRC
DSGN  18  E  6 E  5 US 1196.0 DS 1195.5  111        9.0 .013 .1    21 CIRC
DSGN  19  E  5 E  4 US 1195.5 DS 1195.3   74          4 .013 .5    24 CIRC
DSGN  20  E  4 E  3 US 1195.3 DS 1194.8  255        2.4 .013 .1    24 CIRC
DSGN  21  E  3 E  2 US 1194.8 DS 1194.1  310            .013 .1    24 CIRC
DSGN  22  E  2 D  2 US 1194.1 DS 1193.6  136        4.1 .013 .5    24 CIRC
DSGN  23  D  5 D  4 US 1196.2 DS 1195.9  219        7.9 .013 .1    21 CIRC
DSGN  24  D  4 D  3 US 1195.9 DS 1194.6  280        2.1 .013       24 CIRC
DSGN  25  D  3 D  2 US 1194.6 DS 1193.6  285            .013 .1    24 CIRC
DSGN  26  D  2 A  7 US 1193.6 DS 1186.1  200        4.1 .013 .5    30 CIRC
DSGN  27  B  2 B  1 US 1193.3 DS 1192.1   58       -8.6 .013 .5    36 CIRC
DSGN  28  B  1 B  0 US 1192.1 DS 1187.0  208            .013 .1    36 CIRC
$
ANAL   1  A 10 A  9     1   54
ANAL   2  A 11 A  9     1   66
ANAL   3  A  9 A  8     1   84            .5
ANAL   4  A  8 A  7     1   84            .1
ANAL   5  A  7 A  6     1   84            .3
ANAL   6  A  6 A  5     1   84            .1
ANAL   7  A  5 A  4     1   84            .1
ANAL   8  A  4 A  3     1   96            .3
ANAL   9  A  3 A  2     1   96            .1
ANAL  10  A  2 A  1     1   96            .1
ANAL  11  B  4 B  3     1   21            .1
ANAL  12  B  3 B  2     1   24            .1
ANAL  13  B  0 A  6     1   36            .1
ANAL  14  C  5 C  4     1   21            .1
ANAL  15  C  4 C  3     1   30            .1
ANAL  16  C  3 C  2     1   30
ANAL  17  C  2 B  2     1   30            .5
ANAL  18  E  6 E  5     1   21            .1
ANAL  19  E  5 E  4     1   24            .5
ANAL  20  E  4 E  3     1   24            .1
ANAL  21  E  3 E  2     1   24            .1
ANAL  22  E  2 D  2     1   24            .5
ANAL  23  D  5 D  4     1   21            .1
ANAL  24  D  4 D  3     1   24
ANAL  25  D  3 D  2     1   24            .1
ANAL  26  D  2 A  7     1   30            .5
ANAL  27  B  2 B  1     1   36            .5
ANAL  28  B  1 B  0     1   36            .1
$
ENDATA
```

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
1	A10	A 9	1186.50	1185.80	100	0.00700	1	54	54	CIRC
2	A11	A 9	1185.50	1184.80	100	0.00700	1	66	66	CIRC
3	A 9	A 8	1183.30	1182.00	320	0.00406	1	84	84	CIRC
4	A 8	A 7	1182.00	1180.90	252	0.00436	1	84	84	CIRC
5	A 7	A 6	1180.90	1180.00	218	0.00413	1	84	84	CIRC

6	A 6	A 5	1180.00	1178.80	515	0.00233	1	84	84	CIRC
7	A 5	A 4	1178.80	1177.50	515	0.00252	1	84	84	CIRC
8	A 4	A 3	1176.50	1175.10	610	0.00230	1	96	96	CIRC
9	A 3	A 2	1175.10	1174.00	436	0.00252	1	96	96	CIRC
10	A 2	A 1	1174.00	1173.00	436	0.00229	1	96	96	CIRC
11	B 4	B 3	1195.05	1192.75	331	0.00695	1	21	21	CIRC
12	B 3	B 2	1192.50	1191.30	250	0.00480	1	24	24	CIRC
13	B 0	A 6	1184.60	1184.00	30	0.02000	1	36	36	CIRC
14	C 5	C 4	1194.75	1193.75	239	0.00418	1	21	21	CIRC
15	C 4	C 3	1193.00	1192.50	92	0.00543	1	30	30	CIRC
16	C 3	C 2	1192.50	1191.50	200	0.00500	1	30	30	CIRC
17	C 2	B 2	1191.50	1190.80	142	0.00493	1	30	30	CIRC
18	E 6	E 5	1194.25	1193.75	111	0.00450	1	21	21	CIRC
19	E 5	E 4	1193.50	1193.30	74	0.00270	1	24	24	CIRC
20	E 4	E 3	1193.30	1192.80	255	0.00196	1	24	24	CIRC
21	E 3	E 2	1192.80	1192.10	310	0.00226	1	24	24	CIRC
22	E 2	D 2	1192.10	1191.60	136	0.00368	1	24	24	CIRC
23	D 5	D 4	1194.45	1194.15	219	0.00137	1	21	21	CIRC
24	D 4	D 3	1193.90	1192.60	280	0.00464	1	24	24	CIRC
25	D 3	D 2	1192.60	1191.60	285	0.00351	1	24	24	CIRC
26	D 2	A 7	1191.10	1183.60	200	0.03750	1	30	30	CIRC
27	B 2	B 1	1190.30	1189.10	58	0.02069	1	36	36	CIRC
28	B 1	B 0	1189.10	1184.00	208	0.02452	1	36	36	CIRC

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.
1	A10	A 9	0.013	0.00	126.00	1193.16	1192.75	0.00411	0.66	11.3	164.5
2	A11	A 9	0.013	0.00	227.00	1193.21	1192.75	0.00457	0.69	13.0	280.9
3	A 9	A 8	0.013	0.50	353.00	1192.75	1191.28	0.00305	0.73	11.7	407.2
4	A 8	A 7	0.013	0.10	353.00	1191.28	1190.41	0.00305	0.71	12.1	422.1
5	A 7	A 6	0.013	0.30	364.00	1190.41	1189.40	0.00325	0.74	11.9	410.5
6	A 6	A 5	0.013	0.10	392.00	1189.40	1187.36	0.00377	1.00	10.2	308.4 **
7	A 5	A 4	0.013	0.10	392.00	1187.36	1185.32	0.00377	1.00	10.2	321.0 **
8	A 4	A 3	0.013	0.30	463.00	1185.32	1183.45	0.00258	1.00	9.2	437.0 **
9	A 3	A 2	0.013	0.10	463.00	1183.45	1182.22	0.00258	1.00	9.2	458.1 **
10	A 2	A 1	0.013	0.10	463.00	1182.22	1181.00	0.00258	1.00	9.2	436.8 **

11	B 4	B 3	0.013	0.10	6.00	1195.89	1193.59	0.00143	0.48	5.3	13.2	
12	B 3	B 2	0.013	0.10	8.50	1193.56	1192.36	0.00141	0.53	5.0	15.7	
13	B 0	A 6	0.013	0.10	28.00	1189.55	1189.40	0.00176	0.38	11.4	94.3	
14	C 5	C 4	0.013	0.10	6.00	1195.81	1195.37	0.00143	0.55	4.4	10.2	
15	C 4	C 3	0.013	0.10	25.00	1195.37	1194.93	0.00372	0.70	6.8	30.2	
16	C 3	C 2	0.013	0.00	28.10	1194.93	1193.99	0.00469	0.80	6.7	29.0	
17	C 2	B 2	0.013	0.50	28.10	1193.99	1192.83	0.00469	0.81	6.6	28.8	
18	E 6	E 5	0.013	0.10	9.00	1199.13	1198.67	0.00323	0.71	4.9	10.6	
19	E 5	E 4	0.013	0.50	13.00	1198.67	1197.93	0.00330	1.00	4.1	11.8	**
20	E 4	E 3	0.013	0.10	15.40	1197.93	1196.65	0.00463	1.00	4.9	10.0	**
21	E 3	E 2	0.013	0.10	15.40	1196.65	1195.11	0.00463	1.00	4.9	10.8	**
22	E 2	D 2	0.013	0.50	19.50	1195.11	1193.60	0.00743	1.00	6.2	13.7	**
23	D 5	D 4	0.013	0.10	7.90	1196.54	1195.90	0.00249	1.00	3.3	5.9	**
24	D 4	D 3	0.013	0.00	10.00	1195.08	1193.90	0.00195	0.59	5.2	15.4	
25	D 3	D 2	0.013	0.10	10.00	1193.90	1192.90	0.00195	0.65	4.6	13.4	
26	D 2	A 7	0.013	0.50	33.60	1192.25	1190.41	0.00671	0.46	15.2	79.4	
27	B 2	B 1	0.013	0.50	28.00	1191.41	1190.21	0.00176	0.37	11.8	95.9	
28	B 1	B 0	0.013	0.10	28.00	1190.18	1189.55	0.00176	0.36	12.2	104.4	


```
SEW0008--CAPACITY OF RUN   6 IS EXCEEDED.
SEW0008--CAPACITY OF RUN   7 IS EXCEEDED.
SEW0008--CAPACITY OF RUN   8 IS EXCEEDED.
SEW0008--CAPACITY OF RUN   9 IS EXCEEDED.
SEW0008--CAPACITY OF RUN  10 IS EXCEEDED.
SEW0008--CAPACITY OF RUN  19 IS EXCEEDED.
SEW0008--CAPACITY OF RUN  20 IS EXCEEDED.
SEW0008--CAPACITY OF RUN  21 IS EXCEEDED.
SEW0008--CAPACITY OF RUN  22 IS EXCEEDED.
SEW0008--CAPACITY OF RUN  23 IS EXCEEDED.
```

STATIONING

RUN	UPSTREAM JUNCTION ID	STATIONING
1	A10	4002
2	A11	4002
3	A 9	3902
4	A 8	3582
5	A 7	3330
6	A 6	3112
7	A 5	2597
8	A 4	2082
9	A 3	1472
10	A 2	1036

```
            11                  B 4                     3989
            12                  B 3                     3658
            13                  B 0                     3142
            14                  C 5                     4081
            15                  C 4                     3842
            16                  C 3                     3750
            17                  C 2                     3550
            18                  E 6                     4416
            19                  E 5                     4305
            20                  E 4                     4231
            21                  E 3                     3976
            22                  E 2                     3666
            23                  D 5                     4314
            24                  D 4                     4095
            25                  D 3                     3815
            26                  D 2                     3530
            27                  B 2                     3408
            28                  B 1                     3350
SEWER              ANALYSIS                    SEWER     FREQUENCY=00 YR
$
$      100-Yr, 2-Hr Storm (TRUNK_2A.DAT)
$
JUNC A  2 TYPE=JUNCT
JUNC A  3 TYPE=JUNCT
JUNC A  4 TYPE=JUNCT
JUNC A  5 TYPE=JUNCT
JUNC A  6 TYPE-JUNCT
JUNC A  7 TYPE=JUNCT
JUNC A  8 TYPE=JUNCT
JUNC A  9 TYPE=JUNCT
JUNC A 10 TYPE=JUNCT
JUNC A 11 TYPE=JUNCT
JUNC B  0 TYPE=JUNCT
JUNC B  1 TYPE=JUNCT
JUNC B  2 TYPE=JUNCT
JUNC B  3 TYPE=JUNCT
JUNC B  4 TYPE=JUNCT
JUNC C  2 TYPE=JUNCT
JUNC C  3 TYPE=JUNCT
JUNC C  4 TYPE=JUNCT
JUNC C  5 TYPE=JUNCT
JUNC D  2 TYPE=JUNCT
JUNC D  3 TYPE=JUNCT
JUNC D  4 TYPE=JUNCT
JUNC D  5 TYPE=JUNCT
JUNC E  2 TYPE=JUNCT
JUNC E  3 TYPE=JUNCT
JUNC E  4 TYPE=JUNCT
JUNC E  5 TYPE=JUNCT
JUNC E  6 TYPE=JUNCT
$
OUTLET    STATIONING  600.0   T.W. ELEV 1180.5     A  1
$
DSGN   1  A 10 A  9 US 1191.0 DS 1190.3  100        157 .013       60 CIRC
DSGN   2  A 11 A  9 US 1191.0 DS 1190.3  100        277 .013       66 CIRC
DSGN   3  A  9 A  8 US 1190.3 DS 1189.0  320         -1 .013 .5    84 CIRC
DSGN   4  A  8 A  7 US 1189.0 DS 1187.9  252            .013 .1    84 CIRC
DSGN   5  A  7 A  6 US 1187.9 DS 1187.0  218        -17 .013 .3    84 CIRC
DSGN   6  A  6 A  5 US 1187.0 DS 1185.8  515        -19 .013 .1    84 CIRC
DSGN   7  A  5 A  4 US 1185.8 DS 1184.5  515            .013 .1    84 CIRC
DSGN   8  A  4 A  3 US 1184.5 DS 1183.1  610         80 .013 .3    96 CIRC
DSGN   9  A  3 A  2 US 1183.1 US 1182.0  436            .013 .1    96 CIRC
DSGN  10  A  2 A  1 US 1182.0 DS 1181.0  436            .013 .1    96 CIRC
DSGN  11  B  4 B  3 US 1196.8 DS 1194.5  331        6.0 .013 .1    21 CIRC
DSGN  12  B  3 B  2 US 1194.5 DS 1193.3  250        2.5 .013 .1    24 CIRC
DSGN  13  B  0 A  6 US 1187.6 DS 1187.0   30            .013 .1    36 CIRC
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```
DSGN  14  C  5 C  4 US 1196.5 DS 1195.5  239        6.0 .013 .1    21 CIRC
DSGN  15  C  4 C  3 US 1195.5 DS 1195.0   92         19 .013 .1    30 CIRC
DSGN  16  C  3 C  2 US 1195.0 DS 1194.0  200        3.1 .013       30 CIRC
DSGN  17  C  2 B  2 US 1194.0 DS 1193.3  142            .013 .5    30 CIRC
DSGN  18  E  6 E  5 US 1196.0 DS 1195.5  111        9.0 .013 .1    21 CIRC
DSGN  19  E  5 E  4 US 1195.5 DS 1195.3   74       12.6 .013 .5    24 CIRC
DSGN  20  E  4 E  3 US 1195.3 DS 1194.8  255        2.4 .013 .1    24 CIRC
DSGN  21  E  3 E  2 US 1194.8 DS 1194.1  310            .013 .1    24 CIRC
DSGN  22  E  2 D  2 US 1194.1 DS 1193.6  136        4.1 .013 .5    24 CIRC
DSGN  23  D  5 D  4 US 1196.2 DS 1195.9  219        7.9 .013 .1    21 CIRC
DSGN  24  D  4 D  3 US 1195.9 DS 1194.6  280        2.1 .013       24 CIRC
DSGN  25  D  3 D  2 US 1194.6 DS 1193.6  285            .013 .1    24 CIRC
DSGN  26  D  2 A  7 US 1193.6 DS 1186.1  200        4.1 .013 .5    30 CIRC
DSGN  27  B  2 B  1 US 1193.3 DS 1192.1   58        4.4 .013 .5    36 CIRC
DSGN  28  B  1 B  0 US 1192.1 DS 1187.0  208            .013 .1    36 CIRC
$
ANAL   1  A 10 A  9     1   54
ANAL   2  A 11 A  9     1   66
ANAL   3  A  9 A  8     1   84            .5
ANAL   4  A  8 A  7     1   84            .1
ANAL   5  A  7 A  6     1   84            .3
ANAL   6  A  6 A  5     1   84            .1
ANAL   7  A  5 A  4     1   84            .1
ANAL   8  A  4 A  3     1   96            .3
ANAL   9  A  3 A  2     1   96            .1
ANAL  10  A  2 A  1     1   96            .1
ANAL  11  B  4 B  3     1   21            .1
ANAL  12  B  3 B  2     1   24            .1
ANAL  13  B  0 A  6     1   36            .1
ANAL  14  C  5 C  4     1   21            .1
ANAL  15  C  4 C  3     1   30            .1
ANAL  16  C  3 C  2     1   30
ANAL  17  C  2 B  2     1   30            .5
ANAL  18  E  6 E  5     1   21            .1
ANAL  19  E  5 E  4     1   24            .5
ANAL  20  E  4 E  3     1   24            .1
ANAL  21  E  3 E  2     1   24            .1
ANAL  22  E  2 D  2     1   24            .5
ANAL  23  D  5 D  4     1   21            .1
ANAL  24  D  4 D  3     1   24
ANAL  25  D  3 D  2     1   24            .1
ANAL  26  D  2 A  7     1   30            .5
ANAL  27  B  2 B  1     1   36            .5
ANAL  28  B  1 B  0     1   36            .1
$
ENDATA
```

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
1	A10	A 9	1186.50	1185.80	100	0.00700	1	54	54	CIRC
2	A11	A 9	1185.50	1184.80	100	0.00700	1	66	66	CIRC
3	A 9	A 8	1183.30	1182.00	320	0.00406	1	84	84	CIRC
4	A 8	A 7	1182.00	1180.90	252	0.00436	1	84	84	CIRC
5	A 7	A 6	1180.90	1180.00	218	0.00413	1	84	84	CIRC

6	A 6	A 5	1180.00	1178.80	515	0.00233	1	84	84	CIRC
7	A 5	A 4	1178.80	1177.50	515	0.00252	1	84	84	CIRC
8	A 4	A 3	1176.50	1175.10	610	0.00230	1	96	96	CIRC
9	A 3	A 2	1175.10	1174.00	436	0.00252	1	96	96	CIRC
10	A 2	A 1	1174.00	1173.00	436	0.00229	1	96	96	CIRC
11	B 4	B 3	1195.05	1192.75	331	0.00695	1	21	21	CIRC
12	B 3	B 2	1192.50	1191.30	250	0.00480	1	24	24	CIRC
13	B 0	A 6	1184.60	1184.00	30	0.02000	1	36	36	CIRC
14	C 5	C 4	1194.75	1193.75	239	0.00418	1	21	21	CIRC
15	C 4	C 3	1193.00	1192.50	92	0.00543	1	30	30	CIRC
16	C 3	C 2	1192.50	1191.50	200	0.00500	1	30	30	CIRC
17	C 2	B 2	1191.50	1190.80	142	0.00493	1	30	30	CIRC
18	E 6	E 5	1194.25	1193.75	111	0.00450	1	21	21	CIRC
19	E 5	E 4	1193.50	1193.30	74	0.00270	1	24	24	CIRC
20	E 4	E 3	1193.30	1192.80	255	0.00196	1	24	24	CIRC
21	E 3	E 2	1192.80	1192.10	310	0.00226	1	24	24	CIRC
22	E 2	D 2	1192.10	1191.60	136	0.00368	1	24	24	CIRC
23	D 5	D 4	1194.45	1194.15	219	0.00137	1	21	21	CIRC
24	D 4	D 3	1193.90	1192.60	280	0.00464	1	24	24	CIRC
25	D 3	D 2	1192.60	1191.60	285	0.00351	1	24	24	CIRC
26	D 2	A 7	1191.10	1183.60	200	0.03750	1	30	30	CIRC
27	B 2	B 1	1190.30	1189.10	58	0.02069	1	36	36	CIRC
28	B 1	B 0	1189.10	1184.00	208	0.02452	1	36	36	CIRC

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.	
1	A10	A 9	0.013	0.00	157.00	1198.40	1197.76	0.00637	0.79	11.7	164.5	
2	A11	A 9	0.013	0.00	277.00	1198.44	1197.76	0.00680	0.82	13.3	280.9	
3	A 9	A 8	0.013	0.50	433.00	1197.76	1195.79	0.00459	1.00	11.3	407.2	**
4	A 8	A 7	0.013	0.10	433.00	1195.79	1194.53	0.00459	1.00	11.3	422.1	**
5	A 7	A 6	0.013	0.30	458.20	1194.53	1193.11	0.00514	1.00	11.9	410.5	**
6	A 6	A 5	0.013	0.10	480.20	1193.11	1190.10	0.00565	1.00	12.5	308.4	**
7	A 5	A 4	0.013	0.10	480.20	1190.10	1187.09	0.00565	1.00	12.5	321.0	**
8	A 4	A 3	0.013	0.30	560.20	1187.09	1184.49	0.00377	1.00	11.1	437.0	**
9	A 3	A 2	0.013	0.10	560.20	1184.49	1182.74	0.00377	1.00	11.1	458.1	**
10	A 2	A 1	0.013	0.10	560.20	1182.74	1181.00	0.00377	1.00	11.1	436.8	**

11	B 4	B 3	0.013	0.10	6.00	1195.96	1195.38	0.00143	0.48	5.3	13.2	
12	B 3	B 2	0.013	0.10	8.50	1195.38	1194.93	0.00141	0.53	5.0	15.7	
13	B 0	A 6	0.013	0.10	41.00	1193.32	1193.11	0.00378	0.46	12.9	94.3	
14	C 5	C 4	0.013	0.10	6.00	1197.92	1197.48	0.00143	0.55	4.4	10.2	
15	C 4	C 3	0.013	0.10	25.00	1197.48	1197.04	0.00372	0.70	6.8	30.2	
16	C 3	C 2	0.013	0.00	28.10	1197.04	1196.10	0.00469	0.80	6.7	29.0	
17	C 2	B 2	0.013	0.50	28.10	1196.10	1194.93	0.00469	0.81	6.6	28.8	
18	E 6	E 5	0.013	0.10	9.00	1207.94	1207.48	0.00323	0.71	4.9	10.6	
19	E 5	E 4	0.013	0.50	21.60	1207.48	1206.31	0.00912	1.00	6.9	11.8	**
20	E 4	E 3	0.013	0.10	24.00	1206.31	1203.34	0.01126	1.00	7.6	10.0	**
21	E 3	E 2	0.013	0.10	24.00	1203.34	1199.75	0.01126	1.00	7.6	10.8	**
22	E 2	D 2	0.013	0.50	28.10	1199.75	1197.15	0.01543	1.00	8.9	13.7	**
23	D 5	D 4	0.013	0.10	7.90	1199.00	1198.35	0.00249	1.00	3.3	5.9	**
24	D 4	D 3	0.013	0.00	10.00	1198.35	1197.81	0.00195	0.59	5.2	15.4	
25	D 3	D 2	0.013	0.10	10.00	1197.81	1197.15	0.00195	0.65	4.6	13.4	
26	D 2	A 7	0.013	0.50	42.20	1197.15	1194.53	0.01059	0.52	16.4	79.4	
27	B 2	B 1	0.013	0.50	41.00	1194.93	1194.21	0.00378	0.46	12.9	95.9	
28	B 1	B 0	0.013	0.10	41.00	1194.21	1193.32	0.00378	0.44	13.7	104.4	


```
SEW0008--CAPACITY OF RUN   3 IS EXCEEDED.
SEW0008--CAPACITY OF RUN   4 IS EXCEEDED.
SEW0008--CAPACITY OF RUN   5 IS EXCEEDED.
SEW0008--CAPACITY OF RUN   6 IS EXCEEDED.
SEW0008--CAPACITY OF RUN   7 IS EXCEEDED.
SEW0008--CAPACITY OF RUN   8 IS EXCEEDED.
SEW0008--CAPACITY OF RUN   9 IS EXCEEDED.
SEW0008--CAPACITY OF RUN  10 IS EXCEEDED.
SEW0008--CAPACITY OF RUN  19 IS EXCEEDED.
SEW0008--CAPACITY OF RUN  20 IS EXCEEDED.
SEW0008--CAPACITY OF RUN  21 IS EXCEEDED.
SEW0008--CAPACITY OF RUN  22 IS EXCEEDED.
SEW0008--CAPACITY OF RUN  23 IS EXCEEDED.
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*****************************
*                           *
*          THYSYS           *
*                           *
*  TEXAS HYDRAULICS SYSTEM  *
*                           *
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TEXAS DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION

PC/THYSYS — TEXAS HYDRAULIC SYSTEM - 221108 — V 2.3.PC 1/89

THYSYS

```
$ Bell Road - 83rd to 67th
$ 75th Outfall, Sta 433+65 to 456+00
$ 10 Yr - 24 Hr Storm (TRUNK_3.DAT)
SEWER          ANALYSIS                SEWER     FREQUENCY=10 YR
$
JUNC A  1 TYPE=JUNCT
JUNC A  2 TYPE=JUNCT
JUNC A  3 TYPE=JUNCT
JUNC A  4 TYPE=JUNCT
JUNC A  6 TYPE=JUNCT
JUNC B  2 TYPE=JUNCT
JUNC B  3 TYPE=JUNCT
JUNC B  4 TYPE=JUNCT
JUNC B  5 TYPE=JUNCT
JUNC B  6 TYPE=JUNCT
JUNC B  7 TYPE=JUNCT
JUNC C  2 TYPE=JUNCT
JUNC C  3 TYPE=JUNCT
JUNC C  4 TYPE=JUNCT
```

```
JUNC D  2 TYPE=JUNCT
JUNC D  3 TYPE=JUNCT
$
OUTLET    STATIONING 1040.0   T.W. ELEV 1200.      A  1
$
DSGN   1  A  6 A  5 US 1200.8 DS 1200.5  178        285 .013       84 CIRC
DSGN   2  A  5 A  4 US 1200.5 DS 1199.5  440            .013       84 CIRC
DSGN   3  A  4 A  3 US 1199.5 DS 1199.2  150            .013       84 CIRC
DSGN   4  A  3 A  2 US 1199.2 DS 1198.9  155            .013       84 CIRC
DSGN   5  A  2 A  1 US 1198.9 DS 1198.5  135            .013       84 CIRC
DSGN   6  C  4 C  3 US 1211.3 DS 1210.3  325       1.23 .013       48 CIRC
DSGN   7  C  3 C  2 US 1210.3 DS 1207.4   91       1.74 .013   .1  48 CIRC
DSGN   8  C  2 B  6 US 1207.4 DS 1206.9   88          6 .013   .5  48 CIRC
DSGN   9  B  7 B  6 US 1207.4 DS 1206.9   91       2.92 .013       48 CIRC
DSGN  10  B  6 B  5 US 1206.9 DS 1205.4  189            .013   .5  48 CIRC
DSGN  11  B  5 B  4 US 1205.4 DS 1203.1  295            .013   .1  48 CIRC
DSGN  12  B  4 B  3 US 1203.1 DS 1201.5  315       5.49 .013   .1  48 CIRC
DSGN  13  B  3 B  2 US 1201.5 DS 1200.8  140            .013   .1  48 CIRC
DSGN  14  B  2 A  5 US 1200.8 DS 1198.9  380       2.88 .013   .1  48 CIRC
DSGN  15  D  3 D  2 US 1201.7 DS 1200.5  385       5.97 .013       48 CIRC
DSGN  16  D  2 A  5 US 1200.5 DS 1197.8  141       1.75 .013   .5  48 CIRC
$
ANAL   1  A  6 A  5     1   78
ANAL   2  A  5 A  4     1   78            .1
ANAL   3  A  4 A  3     1   78            .1
ANAL   4  A  3 A  2     1   78            .3
ANAL   5  A  2 A  1     1   78            .3
ANAL   6  C  4 C  3     1   15
ANAL   7  C  3 C  2     1   15            .1
ANAL   8  C  2 B  6     1   24            .5
ANAL   9  B  7 B  6     1   24
ANAL  10  B  6 B  5     1   24            .5
ANAL  11  B  5 B  4     1   24            .1
ANAL  12  B  4 B  3     1   24            .1
ANAL  13  B  3 B  2     1   24            .1
ANAL  14  B  2 A  5     1   24            .1
ANAL  15  D  3 D  2     1   18
ANAL  16  D  2 A  5     1   18            .3
$
ENDATA
```

TEXAS DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION

PC/THYSYS — TEXAS HYDRAULIC SYSTEM - 221108 — V 2.3.PC 1/89

THYSYS

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
1	A 6	A 5	1194.30	1194.00	178	0.00169	1	78	78	CIRC
2	A 5	A 4	1194.00	1193.00	440	0.00227	1	78	78	CIRC
3	A 4	A 3	1193.00	1192.70	150	0.00200	1	78	78	CIRC
4	A 3	A 2	1192.70	1192.40	155	0.00194	1	78	78	CIRC
5	A 2	A 1	1192.40	1192.00	135	0.00296	1	78	78	CIRC

6	C 4	C 3	1210.05	1209.05	325	0.00308	1	15	15	CIRC
7	C 3	C 2	1209.05	1206.15	91	0.03187	1	15	15	CIRC
8	C 2	B 6	1205.40	1204.90	88	0.00568	1	24	24	CIRC
9	B 7	B 6	1205.40	1204.90	91	0.00549	1	24	24	CIRC
10	B 6	B 5	1204.90	1203.40	189	0.00794	1	24	24	CIRC
11	B 5	B 4	1203.40	1201.10	295	0.00780	1	24	24	CIRC
12	B 4	B 3	1201.10	1199.50	315	0.00508	1	24	24	CIRC
13	B 3	B 2	1199.50	1198.80	140	0.00500	1	24	24	CIRC
14	B 2	A 5	1198.80	1196.90	380	0.00500	1	24	24	CIRC
15	D 3	D 2	1200.20	1199.00	385	0.00312	1	18	18	CIRC
16	D 2	A 5	1199.00	1196.30	141	0.01915	1	18	18	CIRC

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.
1	A 6	A 5	0.013	0.00	285.00	1204.46	1203.94	0.00296	1.00	8.6	215.3 **
2	A 5	A 4	0.013	0.10	312.98	1203.94	1202.27	0.00356	1.00	9.4	249.9 **
3	A 4	A 3	0.013	0.10	312.98	1202.27	1201.63	0.00356	1.00	9.4	234.5 **
4	A 3	A 2	0.013	0.30	312.98	1201.63	1200.78	0.00356	1.00	9.4	230.6 **
5	A 2	A 1	0.013	0.30	312.98	1200.78	1200.00	0.00356	1.00	9.4	285.4 **
6	C 4	C 3	0.013	0.00	1.23	1212.96	1212.84	0.00036	0.41	2.6	3.6
7	C 3	C 2	0.013	0.10	2.97	1212.84	1212.55	0.00211	0.35	7.8	11.5
8	C 2	B 6	0.013	0.50	8.97	1212.55	1211.91	0.00157	0.52	5.4	17.1
9	B 7	B 6	0.013	0.00	2.92	1211.92	1211.91	0.00017	0.28	4.1	16.8
10	B 6	B 5	0.013	0.50	11.89	1211.91	1210.89	0.00276	0.56	6.6	20.2

11	B 5	B 4	0.013	0.10	11.89	1210.89	1209.97	0.00276	0.56	6.6	20.0	
12	B 4	B 3	0.013	0.10	17.38	1209.97	1208.01	0.00590	1.00	5.5	16.1	**
13	B 3	B 2	0.013	0.10	17.38	1208.01	1207.08	0.00590	1.00	5.5	16.0	**
14	B 2	A 5	0.013	0.10	20.26	1207.08	1203.94	0.00802	1.00	6.4	16.0	**
15	D 3	D 2	0.013	0.00	5.97	1206.24	1205.00	0.00323	1.00	3.4	5.9	**
16	D 2	A 5	0.013	0.30	7.72	1205.00	1203.94	0.00540	0.52	8.3	14.5	


```
SEW0008--CAPACITY OF RUN   1 IS EXCEEDED.
SEW0008--CAPACITY OF RUN   2 IS EXCEEDED.
SEW0008--CAPACITY OF RUN   3 IS EXCEEDED.
SEW0008--CAPACITY OF RUN   4 IS EXCEEDED.
SEW0008--CAPACITY OF RUN   5 IS EXCEEDED.
SEW0008--CAPACITY OF RUN  12 IS EXCEEDED.
SEW0008--CAPACITY OF RUN  13 IS EXCEEDED.
SEW0008--CAPACITY OF RUN  14 IS EXCEEDED.
SEW0008--CAPACITY OF RUN  15 IS EXCEEDED.
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$      Bell Road - 83rd to 67th, MARICOPA COUNTY HIGHWAY DEPT
$      Skunk Outfall, Sta 456+00 to 486+00
$      10 Yr - 24 Hr Storm (TRUNK_4.DAT)
$              REVISED 5-8-91
SEWER              ANALYSIS                    SEWER     FREQUENCY=10 YR
$
JUNC A  2 TYPE=JUNCT
JUNC A  3 TYPE=JUNCT
JUNC A  4 TYPE=JUNCT
JUNC A  5 TYPE=JUNCT
JUNC A  6 TYPE-JUNCT
JUNC A  7 TYPE=JUNCT
JUNC A  8 TYPE=JUNCT
JUNC A  9 TYPE=JUNCT
JUNC A 10 TYPE=JUNCT
JUNC A 11 TYPE=JUNCT
$
OUTLET    STATIONING  45595   T.W. ELEV 1212.5     A  1
$
DSGN   1  A 13 A 12 US 1224.2 DS 1221.8  200          6 .013       48 CIRC
DSGN   2  A 12 A 11 US 1221.8 DS 1218.5  240            .013       48 CIRC
DSGN   3  A 11 A 10 US 1218.5 DS 1217.5   52       3.56 .013       48 CIRC
DSGN   4  A 10 A  9 US 1218.0 DS 1217.5  260       3.56 .013       48 CIRC
DSGN   5  A  9 A  8 US 1217.5 DS 1216.7  250            .013       48 CIRC
DSGN   6  A  8 A  7 US 1216.7 DS 1215.3  300            .013       48 CIRC
DSGN   7  A  7 A  6 US 1215.3 DS 1214.2  210            .013       48 CIRC
DSGN   8  A  6 A  5 US 1214.7 DS 1214.0  240      10.06 .013       48 CIRC
DSGN   9  A  5 A  4 US 1214.0 DS 1213.8   50       3.07 .013       48 CIRC
DSGN  10  A  4 A  3 US 1213.3 DS 1212.6  300       3.35 .013       48 CIRC
DSGN  11  A  3 A  2 US 1212.6 DS 1212.3  133            .013       48 CIRC
DSGN  12  A  2 A  1 US 1212.3 DS 1212.1   89            .013       48 CIRC
$
ANAL   1  A 13 A 12     1   18            .1
ANAL   2  A 12 A 11     1   18            .1
ANAL   3  A 11 A 10     1   18            .5
ANAL   4  A 10 A  9     1   24            .5
ANAL   5  A  9 A  8     1   24            .1
ANAL   6  A  8 A  7     1   24            .1
ANAL   7  A  7 A  6     1   24            .1
ANAL   8  A  6 A  5     1   24            .1
ANAL   9  A  5 A  4     1   24            .1
ANAL  10  A  4 A  3     1   30            .1
ANAL  11  A  3 A  2     1   36            .3
ANAL  12  A  2 A  1     1   36            .3
$
ENDATA
```

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
1	A13	A12	1222.70	1220.30	200	0.01200	1	18	18	CIRC
2	A12	A11	1220.30	1217.00	240	0.01375	1	18	18	CIRC
3	A11	A10	1217.00	1216.00	52	0.01923	1	18	18	CIRC
4	A10	A 9	1216.00	1215.50	260	0.00192	1	24	24	CIRC
5	A 9	A 8	1215.50	1214.70	250	0.00320	1	24	24	CIRC
6	A 8	A 7	1214.70	1213.30	300	0.00467	1	24	24	CIRC
7	A 7	A 6	1213.30	1212.20	210	0.00524	1	24	24	CIRC
8	A 6	A 5	1212.70	1212.00	240	0.00292	1	24	24	CIRC
9	A 5	A 4	1212.00	1211.80	50	0.00400	1	24	24	CIRC
10	A 4	A 3	1210.80	1210.10	300	0.00233	1	30	30	CIRC
11	A 3	A 2	1209.60	1209.30	133	0.00226	1	36	36	CIRC
12	A 2	A 1	1209.30	1209.10	89	0.00225	1	36	36	CIRC

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.	
1	A13	A12	0.013	0.10	6.00	1225.39	1224.64	0.00326	0.52	6.5	11.5	
2	A12	A11	0.013	0.10	6.00	1224.64	1223.76	0.00326	0.50	6.8	12.3	
3	A11	A10	0.013	0.50	9.56	1223.76	1222.82	0.00828	0.60	8.6	14.6	
4	A10	A 9	0.013	0.50	13.12	1222.82	1221.45	0.00336	1.00	4.2	9.9	**
5	A 9	A 8	0.013	0.10	13.12	1221.45	1220.51	0.00336	1.00	4.2	12.8	**
6	A 8	A 7	0.013	0.10	13.12	1220.51	1219.40	0.00336	0.71	5.5	15.5	
7	A 7	A 6	0.013	0.10	13.12	1219.40	1218.59	0.00336	0.68	5.8	16.4	
8	A 6	A 5	0.013	0.10	23.18	1218.59	1215.97	0.01050	1.00	7.4	12.2	**
9	A 5	A 4	0.013	0.10	26.25	1215.97	1215.20	0.01347	1.00	8.4	14.3	**
10	A 4	A 3	0.013	0.10	29.60	1215.20	1213.54	0.00521	1.00	6.0	19.8	**
11	A 3	A 2	0.013	0.30	29.60	1213.54	1212.98	0.00197	0.78	5.0	31.7	
12	A 2	A 1	0.013	0.30	29.60	1212.98	1212.50	0.00197	0.78	5.0	31.6	

```
SEW0008--CAPACITY OF RUN   4 IS EXCEEDED.
SEW0008--CAPACITY OF RUN   5 IS EXCEEDED.
SEW0008--CAPACITY OF RUN   8 IS EXCEEDED.
SEW0008--CAPACITY OF RUN   9 IS EXCEEDED.
SEW0008--CAPACITY OF RUN  10 IS EXCEEDED.
```

```
$      Bell Road - 83rd to 67th, MARICOPA COUNTY HIGHWAY DEPT
$      83rd Outfall, Sta 383+25 to 395+70
$      10 Yr - 24 Hr Storm (TRUNK_1A.DAT)
$      REVISED 4-8-91
SEWER              ANALYSIS                    SEWER     FREQUENCY=10 YR
$
JUNC A  2 TYPE=JUNCT
JUNC A  3 TYPE=JUNCT
JUNC A  4 TYPE=JUNCT
JUNC A  5 TYPE=JUNCT
JUNC A  6 TYPE-JUNCT
JUNC A  7 TYPE=JUNCT
JUNC A  8 TYPE=JUNCT
JUNC A  9 TYPE=JUNCT
JUNC A 10 TYPE=JUNCT
JUNC A 11 TYPE=JUNCT
$
OUTLET    STATIONING  38325   T.W. ELEV 1198.0     A  1
$
DSGN   1  A 11 A 10 US 1201.1 DS 1200.6  133       0.99 .013       48 CIRC
DSGN   2  A 10 A  9 US 1200.4 DS 1200.3   18       1.33 .013 .5    48 CIRC
DSGN   3  A  9 A  8 US 1200.3 DS 1200.1   80            .013 .1    48 CIRC
DSGN   4  A  8 A  7 US 1200.1 DS 1199.5  117       0.78 .013 .1    48 CIRC
DSGN   5  A  7 A  6 US 1199.5 DS 1199.4   94          7 .013 .5    48 CIRC
DSGN   6  A  6 A  5 US 1199.4 DS 1199.3   80       4.79 .013 .1    48 CIRC
DSGN   7  A  5 A  4 US 1199.3 DS 1199.2  155       5.47 .013 .1    48 CIRC
DSGN   8  A  4 A  3 US 1199.2 DS 1199.0  265            .013 .1    48 CIRC
DSGN   9  A  3 A  2 US 1199.0 DS 1198.7  300            .013 .1    48 CIRC
DSGN  10  A  2 A  1 US 1197.2 DS 1197.0   35          2 .013       60 CIRC
$
ANAL   1  A 11 A 10     1   15
ANAL   2  A 10 A  9     1   18            .5
ANAL   3  A  9 A  8     1   18            .1
ANAL   4  A  8 A  7     1   18            .1
ANAL   5  A  7 A  6     1   27            .5
ANAL   6  A  6 A  5     1   30            .1
ANAL   7  A  5 A  4     1   30            .1
ANAL   8  A  4 A  3     1   30            .1
ANAL   9  A  3 A  2     1   30            .1
ANAL  10  A  2 A  1     1   48
$
ENDATA
```

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
1	A11	A10	1199.85	1199.35	133	0.00376	1	15	15	CIRC
2	A10	A 9	1198.90	1198.80	18	0.00555	1	18	18	CIRC
3	A 9	A 8	1198.80	1198.60	80	0.00250	1	18	18	CIRC
4	A 8	A 7	1198.60	1198.00	117	0.00513	1	18	18	CIRC
5	A 7	A 6	1197.25	1197.15	94	0.00106	1	27	27	CIRC
6	A 6	A 5	1196.90	1196.80	80	0.00125	1	30	30	CIRC
7	A 5	A 4	1196.80	1196.70	155	0.00065	1	30	30	CIRC
8	A 4	A 3	1196.70	1196.50	265	0.00075	1	30	30	CIRC
9	A 3	A 2	1196.50	1196.20	300	0.00100	1	30	30	CIRC
10	A 2	A 1	1193.20	1193.00	35	0.00571	1	48	48	CIRC

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.	
1	A11	A10	0.013	0.00	0.99	1202.46	1202.43	0.00023	0.34	2.7	4.0	
2	A10	A 9	0.013	0.50	2.32	1202.43	1201.92	0.00049	0.38	3.8	7.8	
3	A 9	A 8	0.013	0.10	2.32	1201.92	1201.78	0.00049	0.47	2.8	5.3	
4	A 8	A 7	0.013	0.10	3.10	1201.78	1201.58	0.00087	0.45	4.0	7.5	
5	A 7	A 6	0.013	0.50	10.10	1201.58	1200.98	0.00106	0.83	2.9	10.1	
6	A 6	A 5	0.013	0.10	14.89	1200.98	1200.77	0.00132	1.00	3.0	14.5	**
7	A 5	A 4	0.013	0.10	20.36	1200.77	1200.29	0.00246	1.00	4.1	10.4	**
8	A 4	A 3	0.013	0.10	20.36	1200.29	1199.54	0.00246	1.00	4.1	11.3	**
9	A 3	A 2	0.013	0.10	20.36	1199.54	1198.70	0.00246	1.00	4.1	13.0	**
10	A 2	A 1	0.013	0.00	22.36	1198.01	1198.00	0.00024	0.31	6.7	108.6	

```
$ REVISED 5-7-91
$     Bell Road - 83rd to 67th, MARICOPA COUNTY HIGHWAY DEPT
$     Tram  Outfall, Sta 397+00 to 433+50
$       OFF-SITE DRAINAGE FLOWS ADJUSTED AT BRANCH JUNCTIONS
$       ROADWAY DRAINAGE > 10-YR PEAKS FROM RATIONAL ANALYSIS
$
SEWER              ANALYSIS                    SEWER     FREQUENCY=10 YR
$
$       10-Yr, 24-Hr Storm (TRNK_2R3.DAT)
$
JUNC A  2 TYPE=JUNCT
JUNC A  3 TYPE=JUNCT
JUNC A  4 TYPE=JUNCT
JUNC A  5 TYPE=JUNCT
JUNC A  6 TYPE-JUNCT
JUNC A  7 TYPE=JUNCT
JUNC A  8 TYPE=JUNCT
JUNC A  9 TYPE=JUNCT
JUNC A 10 TYPE=JUNCT
JUNC A 11 TYPE=JUNCT
JUNC B  0 TYPE=JUNCT
JUNC B  1 TYPE=JUNCT
JUNC B  2 TYPE=JUNCT
JUNC B  3 TYPE=JUNCT
JUNC B  4 TYPE=JUNCT
JUNC C  2 TYPE=JUNCT
JUNC C  3 TYPE=JUNCT
JUNC C  4 TYPE=JUNCT
JUNC C  5 TYPE=JUNCT
JUNC D  2 TYPE=JUNCT
JUNC D  3 TYPE=JUNCT
JUNC D  4 TYPE=JUNCT
JUNC D  5 TYPE=JUNCT
JUNC E  2 TYPE=JUNCT
JUNC E  3 TYPE=JUNCT
JUNC E  4 TYPE=JUNCT
JUNC E  5 TYPE=JUNCT
JUNC E  6 TYPE=JUNCT
$
OUTLET    STATIONING  600.0   T.W. ELEV 1180.5     A  1
$
```

```
DSGN   1  A 10 A  9 US 1191.0 DS 1190.3  100         96 .013       60 CIRC
DSGN   2  A 11 A  9 US 1191.0 DS 1190.3  100        173 .013       66 CIRC
DSGN   3  A  9 A  8 US 1190.3 DS 1189.0  320         -1 .013 .5    84 CIRC
DSGN   4  A  8 A  7 US 1189.0 DS 1187.9  252            .013 .1    84 CIRC
DSGN   5  A  7 A  6 US 1187.9 DS 1187.0  218      -24.6 .013 .3    84 CIRC
DSGN   6  A  6 A  5 US 1187.0 DS 1185.8  515         -2 .013 .1    84 CIRC
DSGN   7  A  5 A  4 US 1185.8 DS 1184.5  460            .013 .1    84 CIRC
DSGN   8  A  4 A  3 US 1184.5 DS 1183.1  610         51 .013 .3    96 CIRC
DSGN   9  A  3 A  2 US 1183.1 US 1182.0  436            .013 .1    96 CIRC
DSGN  10  A  2 A  1 US 1182.0 DS 1181.0  436            .013 .1    96 CIRC
DSGN  11  B  4 B  3 US 1196.2 DS 1194.6  321        6.0 .013 .1    48 CIRC
DSGN  12  B  3 B  2 US 1194.6 DS 1193.8  250        2.5 .013 .1    48 CIRC
DSGN  13  B  0 A  6 US 1187.6 DS 1187.0   30            .013 .1    48 CIRC
DSGN  14  C  5 C  4 US 1196.5 DS 1195.5  218        6.0 .013 .1    48 CIRC
DSGN  15  C  4 C  3 US 1195.5 DS 1195.0   92         19 .013 .1    48 CIRC
DSGN  16  C  3 C  2 US 1195.0 DS 1194.0  200        3.1 .013       48 CIRC
DSGN  17  C  2 B  2 US 1194.0 DS 1193.3  142            .013 .5    48 CIRC
DSGN  18  E  6 E  5 US 1196.0 DS 1195.5  111        9.0 .013 .1    48 CIRC
DSGN  19  E  5 E  4 US 1195.5 DS 1195.3   74          4 .013 .5    48 CIRC
DSGN  20  E  4 E  3 US 1195.3 DS 1194.8  255        2.4 .013 .1    48 CIRC
DSGN  21  E  3 E  2 US 1194.8 DS 1194.1  310            .013 .1    48 CIRC
DSGN  22  E  2 D  2 US 1194.1 DS 1193.6  136        4.1 .013 .5    48 CIRC
DSGN  23  D  5 D  4 US 1196.1 DS 1195.6  186        7.9 .013 .1    48 CIRC
DSGN  24  D  4 D  3 US 1195.6 DS 1194.6  280        2.1 .013       48 CIRC
DSGN  25  D  3 D  2 US 1194.6 DS 1193.6  285            .013 .1    48 CIRC
DSGN  26  D  2 A  7 US 1193.6 DS 1186.1  190        4.1 .013 .5    48 CIRC
DSGN  27  B  2 B  1 US 1193.3 DS 1192.1   58       -9.6 .013 .5    48 CIRC
DSGN  28  B  1 B  0 US 1192.1 DS 1187.6  208            .013 .1    48 CIRC
$
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```
ANAL   1  A 10 A  9     1   54
ANAL   2  A 11 A  9     1   66
ANAL   3  A  9 A  8     1   84            .5
ANAL   4  A  8 A  7     1   84            .1
ANAL   5  A  7 A  6     1   84            .3
ANAL   6  A  6 A  5     1   84            .1
ANAL   7  A  5 A  4     1   84            .1
ANAL   8  A  4 A  3     1   96            .3
ANAL   9  A  3 A  2     1   96            .1
ANAL  10  A  2 A  1     1   96            .1
ANAL  11  B  4 B  3     1   18            .1
ANAL  12  B  3 B  2     1   21            .1
ANAL  13  B  0 A  6     1   36            .1
ANAL  14  C  5 C  4     1   18            .1
ANAL  15  C  4 C  3     1   30            .1
ANAL  16  C  3 C  2     1   30
ANAL  17  C  2 B  2     1   30            .5
ANAL  18  E  6 E  5     1   21            .1
ANAL  19  E  5 E  4     1   24            .5
ANAL  20  E  4 E  3     1   24            .1
ANAL  21  E  3 E  2     1   24            .1
ANAL  22  E  2 D  2     1   24            .5
ANAL  23  D  5 D  4     1   21            .1
ANAL  24  D  4 D  3     1   24
ANAL  25  D  3 D  2     1   24            .1
ANAL  26  D  2 A  7     1   30            .5
ANAL  27  B  2 B  1     1   36            .5
ANAL  28  B  1 B  0     1   36            .1
$
ENDATA
```

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
1	A10	A 9	1186.50	1185.80	100	0.00700	1	54	54	CIRC
2	A11	A 9	1185.50	1184.80	100	0.00700	1	66	66	CIRC
3	A 9	A 8	1183.30	1182.00	320	0.00406	1	84	84	CIRC
4	A 8	A 7	1182.00	1180.90	252	0.00436	1	84	84	CIRC
5	A 7	A 6	1180.90	1180.00	218	0.00413	1	84	84	CIRC
6	A 6	A 5	1180.00	1178.80	515	0.00233	1	84	84	CIRC
7	A 5	A 4	1178.80	1177.50	460	0.00283	1	84	84	CIRC
8	A 4	A 3	1176.50	1175.10	610	0.00230	1	96	96	CIRC
9	A 3	A 2	1175.10	1174.00	436	0.00252	1	96	96	CIRC
10	A 2	A 1	1174.00	1173.00	436	0.00229	1	96	96	CIRC
11	B 4	B 3	1194.70	1193.10	321	0.00498	1	18	18	CIRC
12	B 3	B 2	1192.85	1192.05	250	0.00320	1	21	21	CIRC
13	B 0	A 6	1184.60	1184.00	30	0.02000	1	36	36	CIRC
14	C 5	C 4	1195.00	1194.00	218	0.00459	1	18	18	CIRC
15	C 4	C 3	1193.00	1192.50	92	0.00543	1	30	30	CIRC
16	C 3	C 2	1192.50	1191.50	200	0.00500	1	30	30	CIRC
17	C 2	B 2	1191.50	1190.80	142	0.00493	1	30	30	CIRC
18	E 6	E 5	1194.25	1193.75	111	0.00450	1	21	21	CIRC
19	E 5	E 4	1193.50	1193.30	74	0.00270	1	24	24	CIRC
20	E 4	E 3	1193.30	1192.80	255	0.00196	1	24	24	CIRC
21	E 3	E 2	1192.80	1192.10	310	0.00226	1	24	24	CIRC
22	E 2	D 2	1192.10	1191.60	136	0.00368	1	24	24	CIRC
23	D 5	D 4	1194.35	1193.85	186	0.00269	1	21	21	CIRC
24	D 4	D 3	1193.60	1192.60	280	0.00357	1	24	24	CIRC
25	D 3	D 2	1192.60	1191.60	285	0.00351	1	24	24	CIRC
26	D 2	A 7	1191.10	1183.60	190	0.03947	1	30	30	CIRC
27	B 2	B 1	1190.30	1189.10	58	0.02069	1	36	36	CIRC
28	B 1	B 0	1189.10	1184.60	208	0.02163	1	36	36	CIRC

TEXAS DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION
TEXAS HYDRAULIC SYSTEM - 221108
THYSYS

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.	
1	A10	A 9	0.013	0.00	96.00	1188.97	1188.28	0.00238	0.55	10.7	164.5	
2	A11	A 9	0.013	0.00	173.00	1188.64	1188.04	0.00265	0.57	12.4	280.9	
3	A 9	A 8	0.013	0.50	268.00	1188.04	1186.97	0.00176	0.60	11.1	407.2	
4	A 8	A 7	0.013	0.10	268.00	1186.97	1186.43	0.00176	0.58	11.6	422.1	
5	A 7	A 6	0.013	0.30	277.00	1186.43	1185.72	0.00188	0.61	11.3	410.5	
6	A 6	A 5	0.013	0.10	302.00	1185.72	1184.47	0.00223	0.81	9.0	308.4	
7	A 5	A 4	0.013	0.10	302.00	1184.35	1183.22	0.00223	0.74	9.9	339.6	
8	A 4	A 3	0.013	0.30	353.00	1183.22	1182.01	0.00150	0.69	9.5	437.0	
9	A 3	A 2	0.013	0.10	353.00	1182.01	1181.25	0.00150	0.66	10.0	458.1	
10	A 2	A 1	0.013	0.10	353.00	1181.25	1180.50	0.00150	0.69	9.5	436.8	
11	B 4	B 3	0.013	0.10	6.00	1195.73	1194.25	0.00326	0.69	4.6	7.4	
12	B 3	B 2	0.013	0.10	8.50	1194.25	1193.43	0.00288	0.79	4.2	9.0	
13	B 0	A 6	0.013	0.10	27.00	1185.87	1185.72	0.00164	0.37	11.4	94.3	
14	C 5	C 4	0.013	0.10	6.00	1196.18	1195.37	0.00326	0.71	4.5	7.1	
15	C 4	C 3	0.013	0.10	25.00	1195.37	1194.93	0.00372	0.70	6.8	30.2	
16	C 3	C 2	0.013	0.00	28.10	1194.93	1193.99	0.00469	0.80	6.7	29.0	
17	C 2	B 2	0.013	0.50	28.10	1193.99	1192.83	0.00469	0.81	6.6	28.8	
18	E 6	E 5	0.013	0.10	9.00	1199.13	1198.67	0.00323	0.71	4.9	10.6	
19	E 5	E 4	0.013	0.50	13.00	1198.67	1197.93	0.00330	1.00	4.1	11.8	**
20	E 4	E 3	0.013	0.10	15.40	1197.93	1196.65	0.00463	1.00	4.9	10.0	**
21	E 3	E 2	0.013	0.10	15.40	1196.65	1195.11	0.00463	1.00	4.9	10.8	**
22	E 2	D 2	0.013	0.50	19.50	1195.11	1193.60	0.00743	1.00	6.2	13.7	**
23	D 5	D 4	0.013	0.10	7.90	1195.81	1195.25	0.00249	0.80	3.8	8.2	
24	D 4	D 3	0.013	0.00	10.00	1194.90	1193.90	0.00195	0.65	4.6	13.5	
25	D 3	D 2	0.013	0.10	10.00	1193.90	1192.90	0.00195	0.65	4.6	13.4	
26	D 2	A 7	0.013	0.50	33.60	1192.22	1186.43	0.00671	0.45	15.7	81.5	
27	B 2	B 1	0.013	0.50	27.00	1191.41	1190.21	0.00164	0.37	11.4	95.9	
28	B 1	B 0	0.013	0.10	27.00	1190.18	1185.87	0.00164	0.36	11.8	98.1	

```
SEWER              ANALYSIS                    SEWER     FREQUENCY=25 YR
$
$        25-Yr, 24-Hr Storm (TRNK_2R3.DAT)
$
OUTLET    STATIONING  600.0   T.W. ELEV 1180.5     A  1
$
DSGN   1  A 10 A  9 US 1191.0 DS 1190.3  100        126 .013       60 CIRC
DSGN   2  A 11 A  9 US 1191.0 DS 1190.3  100        227 .013       66 CIRC
DSGN   3  A  9 A  8 US 1190.3 DS 1189.0  320            .013 .5    84 CIRC
DSGN   4  A  8 A  7 US 1189.0 DS 1187.9  252            .013 .1    84 CIRC
DSGN   5  A  7 A  6 US 1187.9 DS 1187.0  218      -22.6 .013 .3    84 CIRC
DSGN   6  A  6 A  5 US 1187.0 DS 1185.8  515            .013 .1    84 CIRC
DSGN   7  A  5 A  4 US 1185.8 DS 1184.5  460            .013 .1    84 CIRC
DSGN   8  A  4 A  3 US 1184.5 DS 1183.1  610         71 .013 .3    96 CIRC
DSGN   9  A  3 A  2 US 1183.1 US 1182.0  436            .013 .1    96 CIRC
DSGN  10  A  2 A  1 US 1182.0 DS 1181.0  436            .013 .1    96 CIRC
DSGN  11  B  4 B  3 US 1196.2 DS 1194.6  321        6.0 .013 .1    48 CIRC
DSGN  12  B  3 B  2 US 1194.6 DS 1193.8  250        2.5 .013 .1    48 CIRC
DSGN  13  B  0 A  6 US 1187.6 DS 1187.0   30            .013 .1    48 CIRC
DSGN  14  C  5 C  4 US 1196.5 DS 1195.5  218        6.0 .013 .1    48 CIRC
DSGN  15  C  4 C  3 US 1195.5 DS 1195.0   92         24 .013 .1    48 CIRC
DSGN  16  C  3 C  2 US 1195.0 DS 1194.0  200        3.1 .013       48 CIRC
DSGN  17  C  2 B  2 US 1194.0 DS 1193.3  142            .013 .5    48 CIRC
DSGN  18  E  6 E  5 US 1196.0 DS 1195.5  111        9.0 .013 .1    48 CIRC
DSGN  19  E  5 E  4 US 1195.5 DS 1195.3   74          4 .013 .5    48 CIRC
DSGN  20  E  4 E  3 US 1195.3 DS 1194.8  255        2.4 .013 .1    48 CIRC
DSGN  21  E  3 E  2 US 1194.8 DS 1194.1  310            .013 .1    48 CIRC
DSGN  22  E  2 D  2 US 1194.1 DS 1193.6  136        4.1 .013 .5    48 CIRC
DSGN  23  D  5 D  4 US 1196.1 DS 1195.6  186        7.9 .013 .1    48 CIRC
DSGN  24  D  4 D  3 US 1195.6 DS 1194.6  280        2.1 .013       48 CIRC
DSGN  25  D  3 D  2 US 1194.6 DS 1193.6  285            .013 .1    48 CIRC
DSGN  26  D  2 A  7 US 1193.6 DS 1186.1  190        4.1 .013 .5    48 CIRC
DSGN  27  B  2 B  1 US 1193.3 DS 1192.1   58       -8.6 .013 .5    48 CIRC
DSGN  28  B  1 B  0 US 1192.1 DS 1187.6  208            .013 .1    48 CIRC
$
```

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
1	A10	A 9	1186.50	1185.80	100	0.00700	1	54	54	CIRC
2	A11	A 9	1185.50	1184.80	100	0.00700	1	66	66	CIRC
3	A 9	A 8	1183.30	1182.00	320	0.00406	1	84	84	CIRC
4	A 8	A 7	1182.00	1180.90	252	0.00436	1	84	84	CIRC
5	A 7	A 6	1180.90	1180.00	218	0.00413	1	84	84	CIRC
6	A 6	A 5	1180.00	1178.80	515	0.00233	1	84	84	CIRC
7	A 5	A 4	1178.80	1177.50	460	0.00283	1	84	84	CIRC
8	A 4	A 3	1176.50	1175.10	610	0.00230	1	96	96	CIRC
9	A 3	A 2	1175.10	1174.00	436	0.00252	1	96	96	CIRC
10	A 2	A 1	1174.00	1173.00	436	0.00229	1	96	96	CIRC
11	B 4	B 3	1194.70	1193.10	321	0.00498	1	18	18	CIRC
12	B 3	B 2	1192.85	1192.05	250	0.00320	1	21	21	CIRC
13	B 0	A 6	1184.60	1184.00	30	0.02000	1	36	36	CIRC
14	C 5	C 4	1195.00	1194.00	218	0.00459	1	18	18	CIRC
15	C 4	C 3	1193.00	1192.50	92	0.00543	1	30	30	CIRC
16	C 3	C 2	1192.50	1191.50	200	0.00500	1	30	30	CIRC
17	C 2	B 2	1191.50	1190.80	142	0.00493	1	30	30	CIRC
18	E 6	E 5	1194.25	1193.75	111	0.00450	1	21	21	CIRC
19	E 5	E 4	1193.50	1193.30	74	0.00270	1	24	24	CIRC
20	E 4	E 3	1193.30	1192.80	255	0.00196	1	24	24	CIRC
21	E 3	E 2	1192.80	1192.10	310	0.00226	1	24	24	CIRC
22	E 2	D 2	1192.10	1191.60	136	0.00368	1	24	24	CIRC
23	D 5	D 4	1194.35	1193.85	186	0.00269	1	21	21	CIRC
24	D 4	D 3	1193.60	1192.60	280	0.00357	1	24	24	CIRC
25	D 3	D 2	1192.60	1191.60	285	0.00351	1	24	24	CIRC
26	D 2	A 7	1191.10	1183.60	190	0.03947	1	30	30	CIRC
27	B 2	B 1	1190.30	1189.10	58	0.02069	1	36	36	CIRC
28	B 1	B 0	1189.10	1184.60	208	0.02163	1	36	36	CIRC

TEXAS DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION
TEXAS HYDRAULIC SYSTEM - 221108
THYSYS

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.
1	A10	A 9	0.013	0.00	126.00	1193.13	1192.72	0.00411	0.66	11.3	164.5
2	A11	A 9	0.013	0.00	227.00	1193.18	1192.72	0.00457	0.69	13.0	280.9
3	A 9	A 8	0.013	0.50	353.00	1192.72	1191.25	0.00305	0.73	11.7	407.2
4	A 8	A 7	0.013	0.10	353.00	1191.25	1190.38	0.00305	0.71	12.1	422.1
5	A 7	A 6	0.013	0.30	364.00	1190.38	1189.37	0.00325	0.74	11.9	410.5
6	A 6	A 5	0.013	0.10	397.00	1189.37	1187.28	0.00386	1.00	10.3	308.4 **
7	A 5	A 4	0.013	0.10	397.00	1187.28	1185.40	0.00386	1.00	10.3	339.6 **
8	A 4	A 3	0.013	0.30	468.00	1185.40	1183.50	0.00263	1.00	9.3	437.0 **
9	A 3	A 2	0.013	0.10	468.00	1183.50	1182.25	0.00263	1.00	9.3	458.1 **
10	A 2	A 1	0.013	0.10	468.00	1182.25	1181.00	0.00263	1.00	9.3	436.8 **
11	B 4	B 3	0.013	0.10	6.00	1195.73	1194.25	0.00326	0.69	4.6	7.4
12	B 3	B 2	0.013	0.10	8.50	1194.25	1193.43	0.00288	0.79	4.2	9.0
13	B 0	A 6	0.013	0.10	33.00	1189.54	1189.37	0.00245	0.41	12.1	94.3
14	C 5	C 4	0.013	0.10	6.00	1197.43	1196.62	0.00326	0.71	4.5	7.1
15	C 4	C 3	0.013	0.10	30.00	1196.62	1196.03	0.00535	0.82	7.0	30.2
16	C 3	C 2	0.013	0.00	33.10	1196.03	1194.72	0.00651	1.00	6.7	29.0 **
17	C 2	B 2	0.013	0.50	33.10	1194.72	1193.30	0.00651	1.00	6.7	28.8 **
18	E 6	E 5	0.013	0.10	9.00	1199.13	1198.67	0.00323	0.71	4.9	10.6
19	E 5	E 4	0.013	0.50	13.00	1198.67	1197.93	0.00330	1.00	4.1	11.8 **
20	E 4	E 3	0.013	0.10	15.40	1197.93	1196.65	0.00463	1.00	4.9	10.0 **
21	E 3	E 2	0.013	0.10	15.40	1196.65	1195.11	0.00463	1.00	4.9	10.8 **
22	E 2	D 2	0.013	0.50	19.50	1195.11	1193.60	0.00743	1.00	6.2	13.7 **
23	D 5	D 4	0.013	0.10	7.90	1195.81	1195.25	0.00249	0.80	3.8	8.2
24	D 4	D 3	0.013	0.00	10.00	1194.90	1193.90	0.00195	0.65	4.6	13.5
25	D 3	D 2	0.013	0.10	10.00	1193.90	1192.90	0.00195	0.65	4.6	13.4
26	D 2	A 7	0.013	0.50	33.60	1192.22	1190.38	0.00671	0.45	15.7	81.5
27	B 2	B 1	0.013	0.50	33.00	1191.53	1190.33	0.00245	0.41	12.1	95.9
28	B 1	B 0	0.013	0.10	33.00	1190.30	1189.54	0.00245	0.40	12.5	98.1

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SEWER              ANALYSIS                    SEWER     FREQUENCY=00 YR
$
$      100-Yr, 2-Hr Storm (TRNK_2R3.DAT)
$
OUTLET    STATIONING  600.0   T.W. ELEV 1180.5     A  1
$
DSGN   1  A 10 A  9 US 1191.0 DS 1190.3  100        155 .013       60 CIRC
DSGN   2  A 11 A  9 US 1191.0 DS 1190.3  100        277 .013       66 CIRC
DSGN   3  A  9 A  8 US 1190.3 DS 1189.0  320         -1 .013 .5    84 CIRC
DSGN   4  A  8 A  7 US 1189.0 DS 1187.9  252            .013 .1    84 CIRC
DSGN   5  A  7 A  6 US 1187.9 DS 1187.0  218        -17 .013 .3    84 CIRC
DSGN   6  A  6 A  5 US 1187.0 DS 1185.8  515        -19 .013 .1    84 CIRC
DSGN   7  A  5 A  4 US 1185.8 DS 1184.5  460            .013 .1    84 CIRC
DSGN   8  A  4 A  3 US 1184.5 DS 1183.1  610         80 .013 .3    96 CIRC
DSGN   9  A  3 A  2 US 1183.1 US 1182.0  436            .013 .1    96 CIRC
DSGN  10  A  2 A  1 US 1182.0 DS 1181.0  436            .013 .1    96 CIRC
DSGN  11  B  4 B  3 US 1196.2 DS 1194.6  321        6.0 .013 .1    48 CIRC
DSGN  12  B  3 B  2 US 1194.6 DS 1193.8  250        2.5 .013 .1    48 CIRC
DSGN  13  B  0 A  6 US 1187.6 DS 1187.0   30            .013 .1    48 CIRC
DSGN  14  C  5 C  4 US 1196.5 DS 1195.5  218        6.0 .013 .1    48 CIRC
DSGN  15  C  4 C  3 US 1195.5 DS 1195.0   92         49 .013 .1    48 CIRC
DSGN  16  C  3 C  2 US 1195.0 DS 1194.0  200        3.1 .013       48 CIRC
DSGN  17  C  2 B  2 US 1194.0 DS 1193.3  142            .013 .5    48 CIRC
DSGN  18  E  6 E  5 US 1196.0 DS 1195.5  111        9.0 .013 .1    48 CIRC
DSGN  19  E  5 E  4 US 1195.5 DS 1195.3   74       12.6 .013 .5    48 CIRC
DSGN  20  E  4 E  3 US 1195.3 DS 1194.8  255        2.4 .013 .1    48 CIRC
DSGN  21  E  3 E  2 US 1194.8 DS 1194.1  310            .013 .1    48 CIRC
DSGN  22  E  2 D  2 US 1194.1 DS 1193.6  136        4.1 .013 .5    48 CIRC
DSGN  23  D  5 D  4 US 1196.1 DS 1195.6  186        7.9 .013 .1    48 CIRC
DSGN  24  D  4 D  3 US 1195.6 DS 1194.6  280        2.1 .013       48 CIRC
DSGN  25  D  3 D  2 US 1194.6 DS 1193.6  285            .013 .1    48 CIRC
DSGN  26  D  2 A  7 US 1193.6 DS 1186.1  190        4.1 .013 .5    48 CIRC
DSGN  27  B  2 B  1 US 1193.3 DS 1192.1   58        4.4 .013 .5    48 CIRC
DSGN  28  B  1 B  0 US 1192.1 DS 1187.6  208            .013 .1    48 CIRC
$
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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
1	A10	A 9	1186.50	1185.80	100	0.00700	1	54	54	CIRC
2	A11	A 9	1185.50	1184.80	100	0.00700	1	66	66	CIRC
3	A 9	A 8	1183.30	1182.00	320	0.00406	1	84	84	CIRC
4	A 8	A 7	1182.00	1180.90	252	0.00436	1	84	84	CIRC
5	A 7	A 6	1180.90	1180.00	218	0.00413	1	84	84	CIRC
6	A 6	A 5	1180.00	1178.80	515	0.00233	1	84	84	CIRC
7	A 5	A 4	1178.80	1177.50	460	0.00283	1	84	84	CIRC
8	A 4	A 3	1176.50	1175.10	610	0.00230	1	96	96	CIRC
9	A 3	A 2	1175.10	1174.00	436	0.00252	1	96	96	CIRC
10	A 2	A 1	1174.00	1173.00	436	0.00229	1	96	96	CIRC
11	B 4	B 3	1194.70	1193.10	321	0.00498	1	18	18	CIRC
12	B 3	B 2	1192.85	1192.05	250	0.00320	1	21	21	CIRC
13	B 0	A 6	1184.60	1184.00	30	0.02000	1	36	36	CIRC
14	C 5	C 4	1195.00	1194.00	218	0.00459	1	18	18	CIRC
15	C 4	C 3	1193.00	1192.50	92	0.00543	1	30	30	CIRC
16	C 3	C 2	1192.50	1191.50	200	0.00500	1	30	30	CIRC
17	C 2	B 2	1191.50	1190.80	142	0.00493	1	30	30	CIRC
18	E 6	E 5	1194.25	1193.75	111	0.00450	1	21	21	CIRC
19	E 5	E 4	1193.50	1193.30	74	0.00270	1	24	24	CIRC
20	E 4	E 3	1193.30	1192.80	255	0.00196	1	24	24	CIRC
21	E 3	E 2	1192.80	1192.10	310	0.00226	1	24	24	CIRC
22	E 2	D 2	1192.10	1191.60	136	0.00368	1	24	24	CIRC
23	D 5	D 4	1194.35	1193.85	186	0.00269	1	21	21	CIRC
24	D 4	D 3	1193.60	1192.60	280	0.00357	1	24	24	CIRC
25	D 3	D 2	1192.60	1191.60	285	0.00351	1	24	24	CIRC
26	D 2	A 7	1191.10	1183.60	190	0.03947	1	30	30	CIRC
27	B 2	B 1	1190.30	1189.10	58	0.02069	1	36	36	CIRC
28	B 1	B 0	1189.10	1184.60	208	0.02163	1	36	36	CIRC

TEXAS DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION
TEXAS HYDRAULIC SYSTEM - 221108
THYSYS

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.	
1	A10	A 9	0.013	0.00	155.00	1199.27	1198.65	0.00621	0.78	11.6	164.5	
2	A11	A 9	0.013	0.00	277.00	1199.33	1198.65	0.00680	0.82	13.3	280.9	
3	A 9	A 8	0.013	0.50	431.00	1198.65	1196.69	0.00455	1.00	11.2	407.2	**
4	A 8	A 7	0.013	0.10	431.00	1196.69	1195.45	0.00455	1.00	11.2	422.1	**
5	A 7	A 6	0.013	0.30	456.20	1195.45	1194.03	0.00510	1.00	11.9	410.5	**
6	A 6	A 5	0.013	0.10	508.20	1194.03	1190.68	0.00633	1.00	13.2	308.4	**
7	A 5	A 4	0.013	0.10	508.20	1190.68	1187.66	0.00633	1.00	13.2	339.6	**
8	A 4	A 3	0.013	0.30	588.20	1187.66	1184.83	0.00416	1.00	11.7	437.0	**
9	A 3	A 2	0.013	0.10	588.20	1184.83	1182.91	0.00416	1.00	11.7	458.1	**
10	A 2	A 1	0.013	0.10	588.20	1182.91	1181.00	0.00416	1.00	11.7	436.8	**
11	B 4	B 3	0.013	0.10	6.00	1200.06	1198.91	0.00326	0.69	4.6	7.4	
12	B 3	B 2	0.013	0.10	8.50	1198.91	1198.09	0.00288	0.79	4.2	9.0	
13	B 0	A 6	0.013	0.10	71.00	1194.47	1194.03	0.01133	0.65	14.6	94.3	
14	C 5	C 4	0.013	0.10	6.00	1208.02	1207.21	0.00326	0.71	4.5	7.1	
15	C 4	C 3	0.013	0.10	55.00	1207.21	1205.45	0.01798	1.00	11.2	30.2	**
16	C 3	C 2	0.013	0.00	58.10	1205.45	1201.44	0.02007	1.00	11.8	29.0	**
17	C 2	B 2	0.013	0.50	58.10	1201.44	1198.09	0.02007	1.00	11.8	28.8	**
18	E 6	E 5	0.013	0.10	9.00	1208.75	1208.29	0.00323	0.71	4.9	10.6	
19	E 5	E 4	0.013	0.50	21.60	1208.29	1207.12	0.00912	1.00	6.9	11.8	**
20	E 4	E 3	0.013	0.10	24.00	1207.12	1204.15	0.01126	1.00	7.6	10.0	**
21	E 3	E 2	0.013	0.10	24.00	1204.15	1200.56	0.01126	1.00	7.6	10.8	**
22	E 2	D 2	0.013	0.50	28.10	1200.56	1197.96	0.01543	1.00	8.9	13.7	**
23	D 5	D 4	0.013	0.10	7.90	1199.72	1199.16	0.00249	0.80	3.8	8.2	
24	D 4	D 3	0.013	0.00	10.00	1199.16	1198.61	0.00195	0.65	4.6	13.5	
25	D 3	D 2	0.013	0.10	10.00	1198.61	1197.96	0.00195	0.65	4.6	13.4	
26	D 2	A 7	0.013	0.50	42.20	1197.96	1195.45	0.01059	0.51	16.8	81.5	
27	B 2	B 1	0.013	0.50	71.00	1198.09	1196.93	0.01133	0.65	14.6	95.9	
28	B 1	B 0	0.013	0.10	71.00	1196.93	1194.47	0.01133	0.64	14.9	98.1	

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$       Bell Road - 83rd to 67th
$       75th Outfall, Sta 433+65 to 456+00
$       10 Yr - 24 Hr Storm (TRUNK_3.DAT)
$       REVISED 4-8-91
SEWER            ANALYSIS                    SEWER     FREQUENCY=10 YR
$
JUNC A  1 TYPE=JUNCT
JUNC A  2 TYPE=JUNCT
JUNC A  3 TYPE=JUNCT
JUNC A  4 TYPE=JUNCT
JUNC A  6 TYPE=JUNCT
JUNC B  2 TYPE=JUNCT
JUNC B  3 TYPE=JUNCT
JUNC B  4 TYPE=JUNCT
JUNC B  5 TYPE=JUNCT
JUNC B  6 TYPE=JUNCT
JUNC B  7 TYPE=JUNCT
JUNC C  2 TYPE=JUNCT
JUNC C  3 TYPE=JUNCT
JUNC C  4 TYPE=JUNCT
JUNC D  2 TYPE=JUNCT
JUNC D  3 TYPE=JUNCT
$
OUTLET   STATIONING 1040.0   T.W. ELEV 1200.     A  1
$
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DSGN   1  A  6 A  5 US 1200.8 DS 1200.5  190        285 .013       84 CIRC
DSGN   2  A  5 A  4 US 1200.5 DS 1199.5  440        -28 .013       84 CIRC
DSGN   3  A  4 A  3 US 1199.5 DS 1199.2  150            .013       84 CIRC
DSGN   4  A  3 A  2 US 1199.2 DS 1198.9  155            .013       84 CIRC
DSGN   5  A  2 A  1 US 1198.9 DS 1198.5  155            .013       84 CIRC
DSGN   6  C  4 C  3 US 1211.3 DS 1210.3  325       1.23 .013       48 CIRC
DSGN   7  C  3 C  2 US 1210.3 DS 1207.4   91       1.74 .013   .1  48 CIRC
DSGN   8  C  2 B  6 US 1207.4 DS 1206.9   88          6 .013   .5  48 CIRC
DSGN   9  B  7 B  6 US 1207.4 DS 1206.9   91       2.92 .013       48 CIRC
DSGN  10  B  6 B  5 US 1206.9 DS 1205.4  189            .013   .5  48 CIRC
DSGN  11  B  5 B  4 US 1205.4 DS 1203.1  295            .013   .1  48 CIRC
DSGN  12  B  4 B  3 US 1203.1 DS 1201.5  315       5.31 .013   .1  48 CIRC
DSGN  13  B  3 B  2 US 1201.5 DS 1200.8  140            .013   .1  48 CIRC
DSGN  14  B  2 A  5 US 1200.8 DS 1198.9  380       2.83 .013   .1  48 CIRC
DSGN  15  D  3 D  2 US 1201.5 DS 1200.5  325       5.07 .013       48 CIRC
DSGN  16  D  2 A  5 US 1200.5 DS 1197.5  141       3.06 .013   .5  48 CIRC
$
ANAL   1  A  6 A  5     1   78
ANAL   2  A  5 A  4     1   78            .1
ANAL   3  A  4 A  3     1   78            .1
ANAL   4  A  3 A  2     1   78            .3
ANAL   5  A  2 A  1     1   78            .3
ANAL   6  C  4 C  3     1   15
ANAL   7  C  3 C  2     1   15            .1
ANAL   8  C  2 B  6     1   24            .5
ANAL   9  B  7 B  6     1   24
ANAL  10  B  6 B  5     1   24            .5
ANAL  11  B  5 B  4     1   24            .1
ANAL  12  B  4 B  3     1   24            .1
ANAL  13  B  3 B  2     1   24            .1
ANAL  14  B  2 A  5     1   24            .1
ANAL  15  D  3 D  2     1   18
ANAL  16  D  2 A  5     1   18            .3
$
ENDATA
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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
1	A 6	A 5	1194.30	1194.00	190	0.00158	1	78	78	CIRC
2	A 5	A 4	1194.00	1193.00	440	0.00227	1	78	78	CIRC
3	A 4	A 3	1193.00	1192.70	150	0.00200	1	78	78	CIRC
4	A 3	A 2	1192.70	1192.40	155	0.00194	1	78	78	CIRC
5	A 2	A 1	1192.40	1192.00	155	0.00258	1	78	78	CIRC
6	C 4	C 3	1210.05	1209.05	325	0.00308	1	15	15	CIRC
7	C 3	C 2	1209.05	1206.15	91	0.03187	1	15	15	CIRC
8	C 2	B 6	1205.40	1204.90	88	0.00568	1	24	24	CIRC
9	B 7	B 6	1205.40	1204.90	91	0.00549	1	24	24	CIRC
10	B 6	B 5	1204.90	1203.40	189	0.00794	1	24	24	CIRC
11	B 5	B 4	1203.40	1201.10	295	0.00780	1	24	24	CIRC
12	B 4	B 3	1201.10	1199.50	315	0.00508	1	24	24	CIRC
13	B 3	B 2	1199.50	1198.80	140	0.00500	1	24	24	CIRC
14	B 2	A 5	1198.80	1196.90	380	0.00500	1	24	24	CIRC
15	D 3	D 2	1200.00	1199.00	325	0.00308	1	18	18	CIRC
16	D 2	A 5	1199.00	1196.00	141	0.02128	1	18	18	CIRC

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.
1	A 6	A 5	0.013	0.00	285.00	1204.02	1203.46	0.00296	1.00	8.6	208.3 **
2	A 5	A 4	0.013	0.10	285.16	1203.46	1202.06	0.00296	1.00	8.6	249.9 **
3	A 4	A 3	0.013	0.10	285.16	1202.06	1201.52	0.00296	1.00	8.6	234.5 **
4	A 3	A 2	0.013	0.30	285.16	1201.52	1200.76	0.00296	1.00	8.6	230.6 **
5	A 2	A 1	0.013	0.30	285.16	1200.76	1200.00	0.00296	1.00	8.6	266.3 **
6	C 4	C 3	0.013	0.00	1.23	1212.36	1212.24	0.00036	0.41	2.6	3.6
7	C 3	C 2	0.013	0.10	2.97	1212.24	1211.95	0.00211	0.35	7.8	11.5
8	C 2	B 6	0.013	0.50	8.97	1211.95	1211.31	0.00157	0.52	5.4	17.1
9	B 7	B 6	0.013	0.00	2.92	1211.32	1211.31	0.00017	0.28	4.1	16.8
10	B 6	B 5	0.013	0.50	11.89	1211.31	1210.29	0.00276	0.56	6.6	20.2
11	B 5	B 4	0.013	0.10	11.89	1210.29	1209.37	0.00276	0.56	6.6	20.0
12	B 4	B 3	0.013	0.10	17.20	1209.37	1207.45	0.00578	1.00	5.5	16.1 **
13	B 3	B 2	0.013	0.10	17.20	1207.45	1206.54	0.00578	1.00	5.5	16.0 **
14	B 2	A 5	0.013	0.10	20.03	1206.54	1203.46	0.00784	1.00	6.4	16.0 **
15	D 3	D 2	0.013	0.00	5.07	1205.36	1204.61	0.00233	0.73	3.7	5.8
16	D 2	A 5	0.013	0.30	8.13	1204.61	1203.46	0.00599	0.52	8.8	15.3

```
$      Bell Road - 83rd to 67th, MARICOPA COUNTY HIGHWAY DEPT
$      Skunk Outfall, Sta 456+00 to 486+00
$      10 Yr - 24 Hr Storm (TRUNK_4.DAT)
$      REVISED 4-8-91
SEWER              ANALYSIS                    SEWER     FREQUENCY=10 YR
$
JUNC A  2 TYPE=JUNCT
JUNC A  3 TYPE=JUNCT
JUNC A  4 TYPE=JUNCT
JUNC A  5 TYPE=JUNCT
JUNC A  6 TYPE-JUNCT
JUNC A  7 TYPE=JUNCT
JUNC A  8 TYPE=JUNCT
JUNC A  9 TYPE=JUNCT
JUNC A 10 TYPE=JUNCT
JUNC A 11 TYPE=JUNCT
$
OUTLET    STATIONING  45595   T.W. ELEV 1212.5     A  1
$
DSGN   1  A 13 A 12 US 1224.1 DS 1221.8  200         6 .013       48 CIRC
DSGN   2  A 12 A 11 US 1221.8 DS 1218.3  240           .013       48 CIRC
DSGN   3  A 11 A 10 US 1218.3 DS 1217.8   52      3.56 .013       48 CIRC
DSGN   4  A 10 A  9 US 1217.8 DS 1216.8  260      3.56 .013       48 CIRC
DSGN   5  A  9 A  8 US 1216.8 DS 1216.0  250           .013       48 CIRC
DSGN   6  A  8 A  7 US 1216.0 DS 1214.6  300           .013       48 CIRC
DSGN   7  A  7 A  6 US 1214.6 DS 1214.3  210           .013       48 CIRC
DSGN   8  A  6 A  5 US 1214.3 DS 1213.5  240     10.06 .013       48 CIRC
DSGN   9  A  5 A  4 US 1213.5 DS 1213.3   50      3.07 .013       48 CIRC
DSGN  10  A  4 A  3 US 1213.3 DS 1212.6  300      3.35 .013       48 CIRC
DSGN  11  A  3 A  2 US 1212.6 DS 1212.3  133           .013       48 CIRC
DSGN  12  A  2 A  1 US 1212.3 DS 1212.1  120           .013       48 CIRC
$
ANAL   1  A 13 A 12     1   18            .1
ANAL   2  A 12 A 11     1   18            .1
ANAL   3  A 11 A 10     1   18            .5
ANAL   4  A 10 A  9     1   24            .5
ANAL   5  A  9 A  8     1   24            .1
ANAL   6  A  8 A  7     1   24            .1
ANAL   7  A  7 A  6     1   24            .1
ANAL   8  A  6 A  5     1   30            .1
ANAL   9  A  5 A  4     1   30            .1
ANAL  10  A  4 A  3     1   30            .1
ANAL  11  A  3 A  2     1   36            .3
ANAL  12  A  2 A  1     1   36            .3
$
ENDATA
```

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
1	A13	A12	1222.60	1220.30	200	0.01150	1	18	18	CIRC
2	A12	A11	1220.30	1216.80	240	0.01458	1	18	18	CIRC
3	A11	A10	1216.80	1216.30	52	0.00962	1	18	18	CIRC
4	A10	A 9	1215.80	1214.80	260	0.00385	1	24	24	CIRC
5	A 9	A 8	1214.80	1214.00	250	0.00320	1	24	24	CIRC
6	A 8	A 7	1214.00	1212.60	300	0.00467	1	24	24	CIRC
7	A 7	A 6	1212.60	1212.30	210	0.00143	1	24	24	CIRC
8	A 6	A 5	1211.80	1211.00	240	0.00333	1	30	30	CIRC
9	A 5	A 4	1211.00	1210.80	50	0.00400	1	30	30	CIRC
10	A 4	A 3	1210.80	1210.10	300	0.00233	1	30	30	CIRC
11	A 3	A 2	1209.60	1209.30	133	0.00226	1	36	36	CIRC
12	A 2	A 1	1209.30	1209.10	120	0.00167	1	36	36	CIRC

HYDRAULIC DATA

ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. 1 IS 1.47

RUN	U.S. ID	D.S. ID	'N'	JUNC LOSS	FLOW	U.S. HEAD	D.S. HEAD	HYDR. GRAD	DEPTH	VELOC.	PIPE CAPAC.	
1	A13	A12	0.013	0.10	6.00	1224.17	1222.48	0.00326	0.52	6.5	11.3	
2	A12	A11	0.013	0.10	6.00	1222.48	1221.59	0.00326	0.49	7.0	12.7	
3	A11	A10	0.013	0.50	9.56	1221.59	1220.66	0.00828	0.77	6.5	10.3	
4	A10	A 9	0.013	0.50	13.12	1220.66	1219.29	0.00336	0.78	5.0	14.0	
5	A 9	A 8	0.013	0.10	13.12	1219.29	1218.35	0.00336	1.00	4.2	12.8	**
6	A 8	A 7	0.013	0.10	13.12	1218.35	1217.24	0.00336	0.71	5.5	15.5	
7	A 7	A 6	0.013	0.10	13.12	1217.24	1216.43	0.00336	1.00	4.2	8.5	**
8	A 6	A 5	0.013	0.10	23.18	1216.43	1215.57	0.00319	0.81	5.4	23.7	
9	A 5	A 4	0.013	0.10	26.25	1215.57	1215.26	0.00410	1.00	5.3	25.9	**
10	A 4	A 3	0.013	0.10	29.60	1215.26	1213.60	0.00521	1.00	6.0	19.8	**
11	A 3	A 2	0.013	0.30	29.60	1213.60	1213.04	0.00197	0.78	5.0	31.7	
12	A 2	A 1	0.013	0.30	29.60	1213.04	1212.50	0.00197	1.00	4.2	27.2	**

SEWER SUBSYSTEM

I. DESCRIPTION

The SEWER subsystem has three functions (options). They are as follows:

1. To compute the flow for each drainage area (RUNOFF)
2. To design or analyze inlets (INLET)
3. To design or analyze a sewer pipe network (SEWER).

In the RUNOFF option, the flow for each drainage area is computed by the Rational Method with the option of adding a base flow to the calculated values.

In the INLET option, inlets are analyzed or designed. Design flows for inlets may be computed in the RUNOFF calculations mentioned above or they may be supplied directly for each inlet. In the Design of Curb on Grade and Grate on Grade inlets there is the choice of specifying CARRYOVER which will allow a portion of the water to flow past an inlet to another designated inlet. However, it should be noted that CARRYOVER is only beneficial in optimizing inlet lengths since the design flow directed at any inlet is neither increased nor decreased by carry over quantities for pipe sizing computations. In analysis, the theoretical ponding depth is computed with no carry over even though the inlet may be inadequate. The following types of inlets are available: (1) CURB on GRADE, (2) CURB at SAG, (3) GRATE on GRADE, and (4) GRATE at SAG.

The SEWER function designs or analyzes a sewer pipe network. If inlet flows have been provided in the other option(s), there is the choice of adding a flow and/or a CA value for each inlet. An added function of the SEWER option is a graphical printout of the pipe flow lines, hydraulic gradient lines, and stationing of the junctions.

II. INPUT

The data form for the SEWER subsystem is printed on the front and back and is shown in Figures 6-1 and 6-2.

General

The SEWER subsystem does not interact with any of the other subsystems of THYSYS. It receives no information from other subsystems and feeds no information to other subsystems. Therefore, all data to be used in a SEWER problem must be entered in the SEWER input. It is also important that no SEWER problem be placed within a series of CULBRG problems where CULBRG results are to be saved for a PLAN SUMMARY.

The input required for sewer pipe design includes upstream and downstream soffit elevations and "maximum size rise". This input procedure allows the user to bury the pipe as much or as little as he deems necessary. A straight line connecting the upstream and downstream soffit elevations describes the inside top of the pipe run. Then, by specifying "maximum size rise", the user indicates a line defining the greatest depth to which there will be a design. This allows the user to clear any utility lines or other obstacles which may be in the path of the run. Output for sewer pipe design will include the flow line elevations as determined by the program. At first, the above overall technique appears to be a departure from the established technique of storm sewer design; however, it will be seen from using this subsystem that the departure is more apparent than real. The difference is, mainly, that the computer must have on record all information and criteria controlling the design whereas the engineer may not necessarily note or record all data and criteria used in his design.

The following is a list of terms and rules that apply to this subsystem. In this discussion the term "points" will be used to refer to inlets, outlets, or junctions. The term "junction" encompasses manholes, pipe junctions, changes in grade and size changes. Figure 6-3 indicates the application of these terms.

1. A line is composed of a series of one or more inlets and junctions; and, generally, terminates at either a junction or an outlet. Each designated line is identified by one of the alphabetic characters A through Z. Each alphabetic character is known as a LINE LETTER on the input form. The maximum number of lines is 26.

2. Each inlet, outlet, and junction is called a point and is identified by a unique combination of alphabetic and numeric characters. The alphabetic character must be the same as that of the line to which the point is assigned. "E16", for instance, indicates that the point is on Line E. The numeric characters may range from 1 through 99. A maximum of 100 points may be used. If the sewer network is larger than the allowed limits, it may be broken into smaller segments which the program can accept and run as separate problems. If this proves necessary, it should be done in consultation with the Bridge Division Hydraulic Section.

3. A run lies between two points. Runs are generally identified by simply numbering them from 1 to 99. Optionally, the identification can be any combination of up to three alphanumeric characters.

4. A maximum of three Runs may enter a Junction and only one Run may leave a Junction.

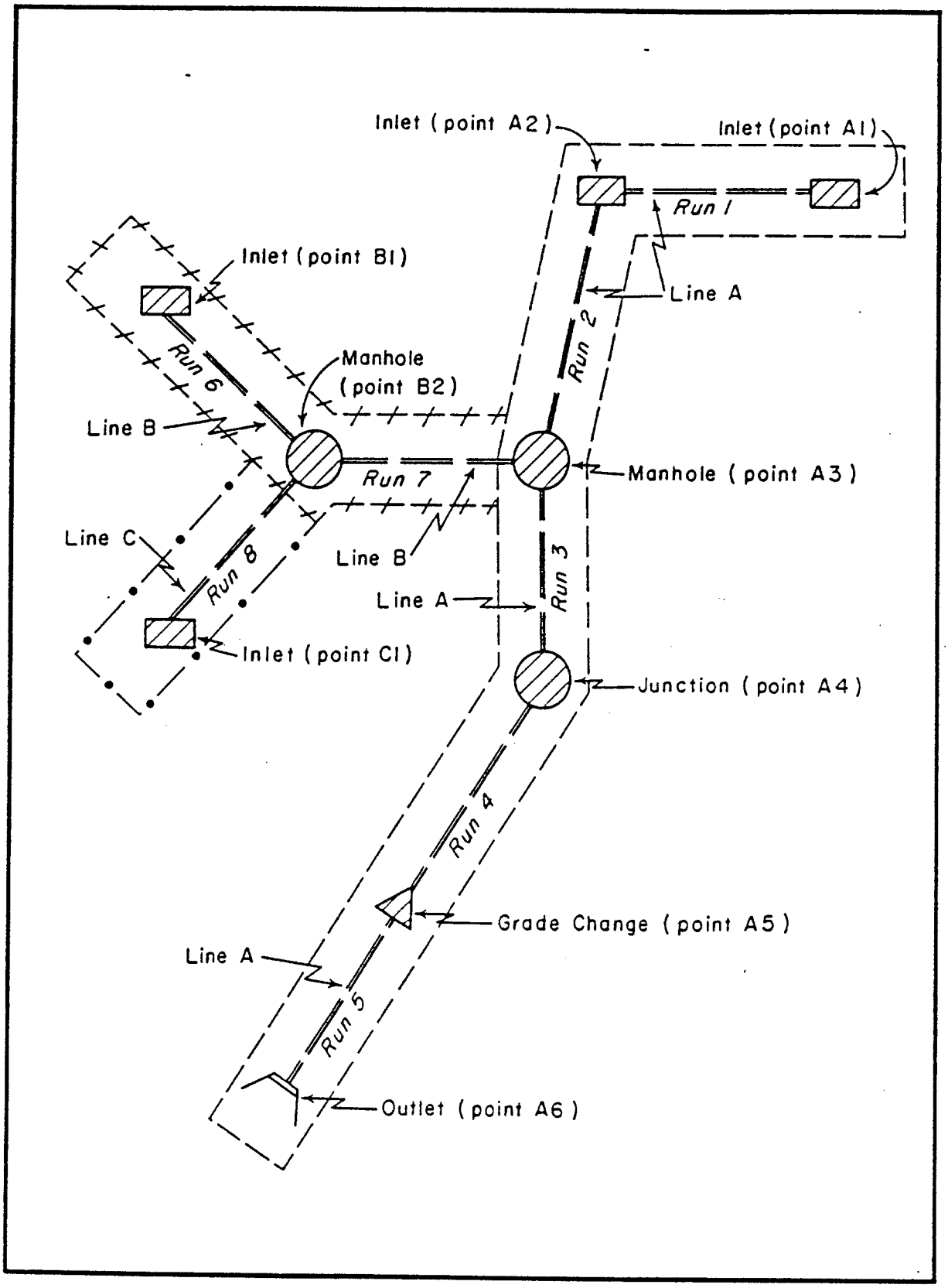
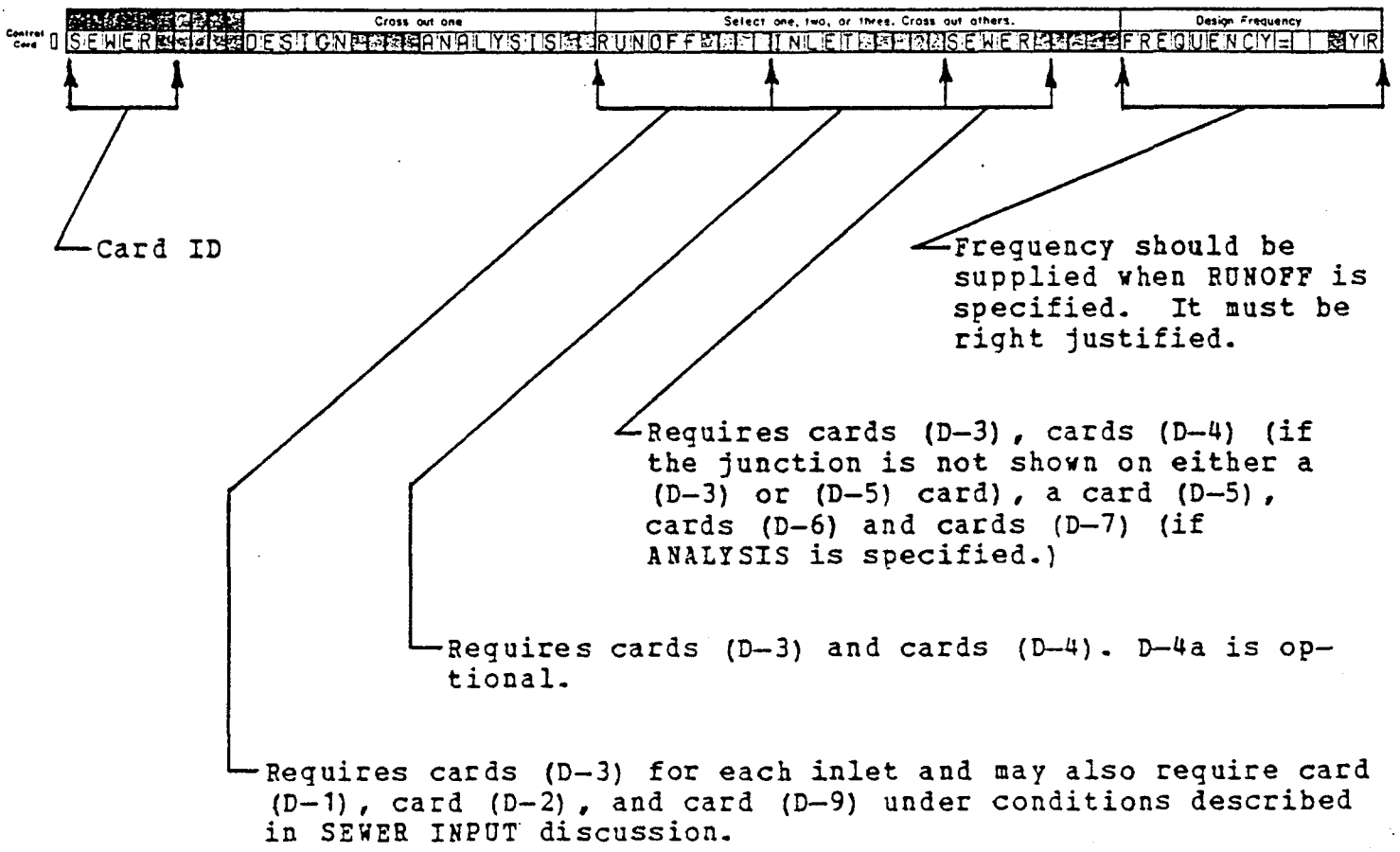


FIGURE 6-3. ILLUSTRATION OF POINTS, RUNS, AND LINES AS USED IN SEWER SUBSYSTEM

SEWER CONTROL CARD

As in the other subsystems of THYSYS, the SEWER subsystem allows the user several options in order to achieve flexibility. On the SEWER Control Card the first option is a choice between DESIGN or ANALYSIS. The user must select one of these. If the DESIGN option is specified the program will use the information provided on subsequent cards to design inlets and/or a sewer network capable of handling a given flow for a given flood frequency. If the ANALYSIS option is specified, the program will analyze existing inlets and/or a sewer network to determine the capability to handle a given flow. The flood frequency is not required for calculations but should be provided since it is included in several reports.

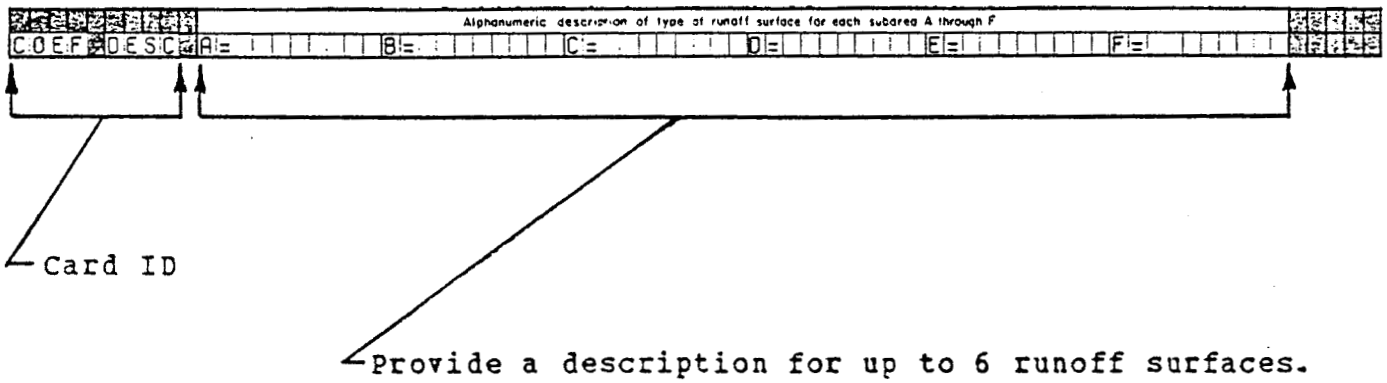


With either DESIGN or ANALYSIS the user may select any combination of three procedures based on the amount of information already known. These procedures are RUNOFF, INLET, and SEWER. A minimum of one of these procedures must be specified and up to three may be specified at one time.

If flows to all inlets are known it is not necessary for the user to specify the RUNOFF option. However, if he wishes a report reflecting the input flows, the RUNOFF option must be specified. If flow to any one inlet is not known, then the RUNOFF option must be specified. The INLET option must be specified if the user wishes to DESIGN or ANALYZE inlets. The SEWER option must be specified in order to DESIGN or ANALYZE a sewer pipe network.

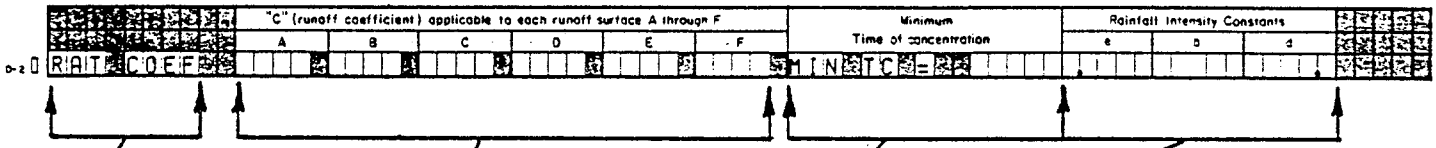
COEF DESC CARD (D-1)

If RUNOFF is specified on the SEWER Control Card and flow to any one inlet is not known, then this card is required. The user may enter up to six eight-letter descriptions of runoff surfaces contributing to the unknown flows. These descriptions are primarily for output identification and may consist of any combination of alphabetic and/or numeric (alphanumeric) characters.



RAT COEF CARD (D-2)

This card is required when RUNOFF is specified on the SEWER Control Card and flow to any one inlet is not known. The user must enter runoff coefficents relating to the surfaces described on the previous card. Care should be taken to assure that the spaces with the same reference letters are used to refer to each subarea on Cards D-1, D-2 and D-3. Minimum allowable time of concentration is to be entered on this card along with rainfall intensity factors e, b and d from the Hydraulic Manual. If MIN TC is not entered, 10 minutes will be assumed.



Card ID

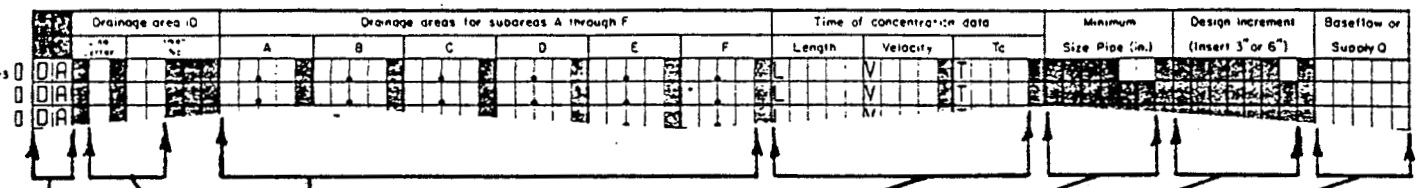
Rainfall intensity factors (decimal) from Hydraulic Manual, Chapter 2.

Minimum allowable time of concentration in minutes (decimal). If no entry, 10 minutes will be assumed.

Specify the runoff coef. "C" for each runoff surface (decimal). Refer to Hydraulic Manual for coefficient determination.

DA CARD (D-3)

In every problem computed in this subsystem, one of these cards must be included for each inlet regardless of whether the flow to the inlet is known or not known. If the flow to the inlet is known, it may be entered in the field BASEFLOW OR SUPPLY Q of this card and the other information for this inlet need not be supplied.



Card ID

Base flow or discharge (Q), if known, for each inlet in ft^3/sec (decimal).

Increments of pipe sizes to be considered in sewer design. If blank, 3" will be assumed.

Minimum Size Pipe (in) to be considered in sewer design.

If TC is known, it must be entered with LENGTH and VELOCITY omitted. TC must be given in minutes (decimal). If TC is not known, LENGTH in feet and VELOCITY in ft/sec as described in the <u>Hydraulic Manual</u> must be provided (decimal).

If the discharge to this inlet is to be computed, necessary data must be supplied in this section. RUNOFF must be specified on the SEWER Control Card and Cards (D-1) and (D-2) must be supplied. Drainage area size for each subarea must be specified (decimal).

Required - LINE LETTER must be an alphabetic character and INLET NO. must be a number. This ID must exactly match this inlet's ID on a (D-4), (D-6) or (D-7) Card. (Maximum total of 100 different ID's can be accepted. These ID's can originate from this card, Card (D-4) or Card (D-5).

For inlets where the flow is not known, it is necessary to provide data to allow the program to compute the flow using the Rational Method. The area of each type of runoff surface contributing to the flow to the inlet must be indicated in the subarea fields A thru F. In most cases the user will know these areas in acres and will use

acres as units for these drainage area entries. However, if it is more convenient, the user may enter these areas in units of square miles or square inches measured directly from a map. If square miles or square inches are used, it is necessary that a SCALE card (D-9) be included indicating SQ MILES or SQ INCHES. If SQ INCHES is used the SCALE (ft/in) of the map from which the square inches were measured must also be given.

For inlets where the flow is not known, it is also required that information relative to time of concentration be included. For each of these inlets the user must provide a LENGTH-VELOCITY combination or a <u>known</u> time of concentration (TC). If all three values are left blank or indicated as zero, the time of concentration for the drainage area served by the inlet will be assumed as the minimum TC. (This minimum may be specified on RAT COEF card (D-2); but, if not, the minimum time of concentration is assumed to be 10 minutes.) For RUNOFF calculations and for INLET calculations, the time of concentration used in discharge determination will be no less than the specified minimum (or 10 minutes if not specified). However, in the SEWER calculations, if the input L and V or TC yield a time of concentration of less than the established minimum, the input value will be used as a base for time of concentration accumulation as calculations proceed through the sewer subsystem. No discharge in the sewer subsystem will be based on this accumulated time of concentration unless and until its value has equalled or exceeded the established minimum. Therefore, if the established minimum time of concentration is 10 minutes and the input time of concentration for the most remote drainage area is 5 minutes, the accumulated time of concentration will be based on the 5 minutes. However, discharge

will be based on the 10 minute minimum until the accumulated time of concentration equals or exceeds this minimum. The inlet serving this drainage area will be designed or analyzed on the basis of a discharge which has been calculated with no less than the established minimum time of concentration. The user may also specify the MINIMUM SIZE PIPE (IN) and a DESIGN INCREMENT (INSERT 3" OR 6") on the first D-3 card.

If the user provides the data necessary for the Rational solution of flow to an inlet and also wishes to provide a BASEFLOW, he may enter it in the field BASEFLOW OR SUPPLY Q of this card. This value will then be added to the computed flow and the sum will be considered as the flow to the inlet.

JUNC CARD (D-4)

Table 6-I indicates the required entries for each type of inlet used.

TABLE 6-I. REQUIRED ENTRIES FOR EACH TYPE OF INLET USED FOR CARD D-4

	INLET TYPE		Maximum Ponding Width (ft.)	Gutter Slope %	Slope Z 1	Distance for slope Z 1	Slope Z 2	Mannings "n" value (gutter)	Gutter Depression "a" (ft.)	Max ponding depth above grate or gutter (in.)	Analysis only		Width of Grate on Grade (ft.)
	DESCRIPTION	INPUT CODE									Inlet length (ft.)	Inlet area (sq.ft.)	
DESIGN	Curb on Grade	CURB	X	X	X	X	X	X	X				
	Curb @ Sag	CSAG							X	X			
	Grate on Grade	GRATE	X	X	X	X	X	X	X				X
	Grate @ Sag	GSAG								X			
	Grate & Curb on Grade		NOT AVAILABLE										
	Grate & Curb @ Sag	GCSAG								X			
ANALYSIS	Curb on Grade	CURB		X	X	X	X	X	X		X		
	Curb @ Sag	CSAG							X	X	X		
	Grate on Grade		NOT AVAILABLE										
	Grate @ Sag	GSAG								X		X	
	Grate & Curb on Grade	GC								X	X	X	
	Grate & Curb @ Sag	GCSAG								X	X	X	

A JUNC card (D-4) is required for each inlet when INLET is specified on the SEWER Control card. This permits the user to provide required data describing each inlet and its approaches.

	Junc ID			Maximum ponding width (ft.)	Gutter Slope %	Slope Z 1	Distance for slope Z 1	Slope Z 2	Mannings "n" value (gutter)	Gutter Depression "a" (ft.)	Max ponding depth above grate or gutter (in.)	Analysis only		Width of Grate on Grade (ft.)
	Line letter	Inlet No.										Inlet length (ft.)	Inlet area (sq. ft.)	
0-4 0	JUNC		TYPE=											
0	JUNC		TYPE=											
0	JUNC		TYPE=											

Card ID

Manning's "n" value as defined in Hydraulic Manual (decimal).

Reciprocal of Trans. Slope Z 2 in ft/ft (decimal). If no entry, Slope Z 1 is assumed.

Distance in feet from curb to beginning of Trans. Slope Z 1 if both transverse slopes are given (decimal). If only one slope is given or if they are equal, omit this entry and a value of 1.0 will be assumed.

Reciprocal of Transverse Slope Z 1 (decimal). If blank, Slope Z 2 assumed.

Longitudinal gutter slope in per cent (decimal).

Maximum allowable ponding width in feet (decimal).

Enter the symbol on the right side of the table for the type of inlet desired (left justified). If entry is JUNCT, other entries on the card may be omitted.

Required - LINE LETTER must be an alphabetic character and INLET NO. must be a number. This ID must exactly match the corresponding ID on a Card (D-3), Card (D-6) or Card (D-7). (Maximum total of 100 different ID's can be accepted. These ID's can originate from this card and Card (D-5).

When SEWER is specified on the SEWER Control Card, the JUNC Cards (D-4) are required to provide identification for each junction which is not associated with an inlet or outlet or not otherwise previously identified in the sewer network. This would apply to manholes, changes in grade, changes in size of pipe or junctions where two or more pipes join. In this case only the first twenty columns of Card D-4 need to be completed.

JUNC Card Continued

	Junc ID			Maximum ponding width (ft.)	Gutter Slope %	Slope Z1	Distance for slope Z1	Slope Z2	Mannings "n" value (gutter)	Gutter Depression "a" (ft.)	Max ponding depth above grate or gutter (in.)	Analysis only		Width of Grate on Grade (ft.)
	Line letter	Inlet No.										Inlet length (ft.)	Inlet area (sq. ft.)	
0 JUNC			TYPE=											
0 JUNC			TYPE=											
0 JUNC			TYPE=											

Gutter depression in feet (decimal).

Maximum allowable ponding depth in inches. Not required when CURB specified (decimal).

Inlet length in feet (decimal).

Inlet area in sq ft (decimal).

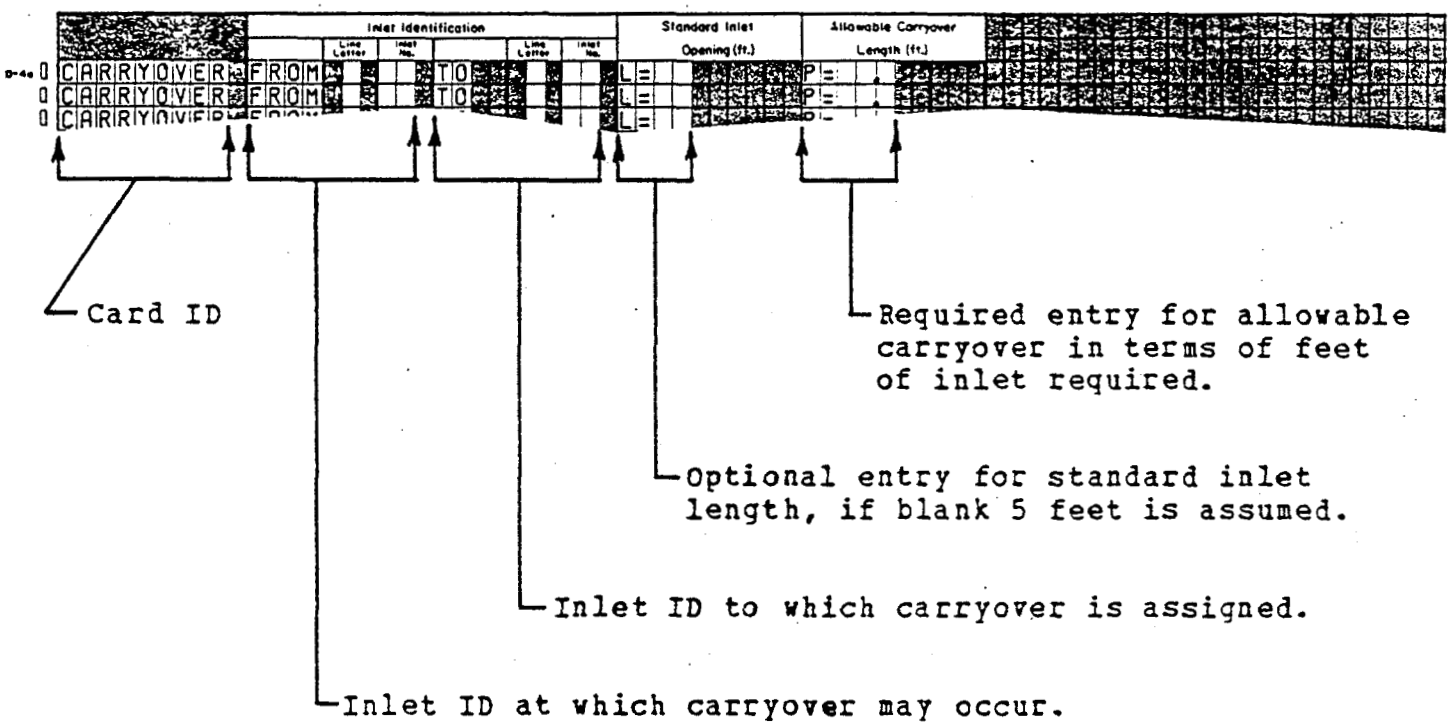
Transverse width in feet (decimal) used in GRATE computations when GRATE ON GRADE is specified. If left blank, 3 feet assumed.

The WIDTH OF GRATE ON GRADE is an optional entry when GRATE ON GRADE is specified and is used to enter the transverse width used in GRATE computations. If left blank the program will default to a standard width of three feet.

CARRYOVER CARD (D-4a)

This card is required when CARRYOVER is desired and can only be used when CURB or GRATE has been entered as the type of inlet on the D-4 card.

Under INLET IDENTIFICATION the inlet ID at which carryover may occur and the inlet ID to which the carryover is assigned must be specified. There are no limitations to this assignment except that such ID must be on the sewer system under consideration by the current computer run.



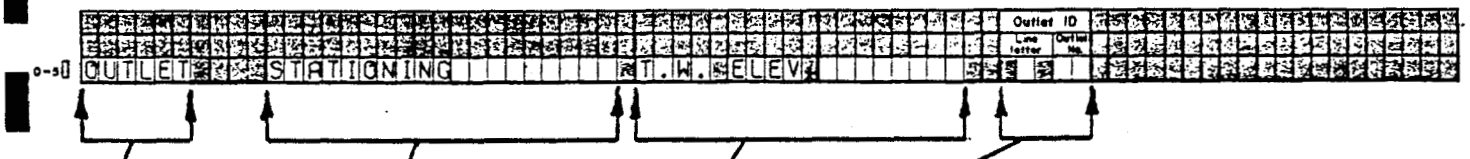
An entry for STANDARD INLET OPENING is optional. If used, the value represents a standard inlet length measured parallel to the curb line for either curb or grate inlets. If no entry is made, a value of five feet is assumed.

An entry in the ALLOWABLE CARRYOVER field is required and specifies the allowable carryover in terms <u>of feet of inlet required</u> for Grate on Grade and Curb on Grade. If, for example, an inlet opening

were computed to be 8.29 feet in length, and the specified allowable carryover is 4.0 feet with a 5 foot standard length, carryover would be allowed and computed. If the specified allowable carryover had been 3.0 feet instead of 4.0, carryover would not be allowed nor computed.

OUTLET CARD (D-5)

An OUTLET card (D-5) is required only when SEWER is specified on the SEWER Control Card. This card supplies the required data describing the location, T.W. elevation, and identification of the outlet of the sewer network. A usual practice is to assign this station the number of 0.0.



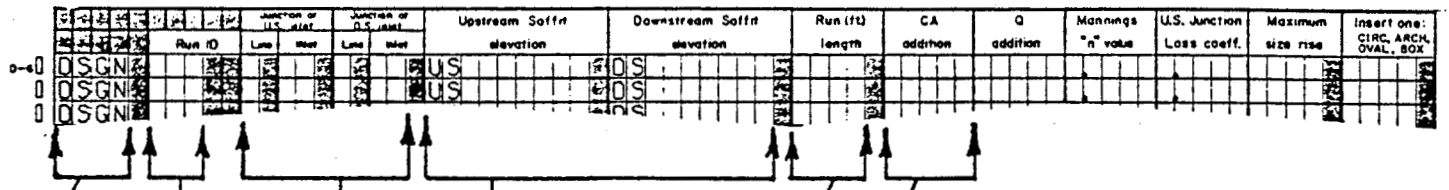
Card ID

Required. LINE LETTER must be an alphabetic character and OUTLET NO. must be a number. This ID must exactly match the corresponding ID on a (D-6) or (D-7) card. The maximum for different ID's on Cards D-3, D-4, and D-5 cannot exceed 100.

Tailwater elevation must be entered (decimal). If not actually known, it is suggested that the user enter soffit elevation of the outlet.

Numeric station description (decimal). For example, a station normally described as 22+56.0 should be entered as 2256.0.

DSGN CARD (D-6)



Card ID

CA as defined in Hydraulic Manual to be added to upstream inlet only if not included in flow determination from cards (D-2) and (D-3) (decimal).

Length of RUN in feet (decimal).

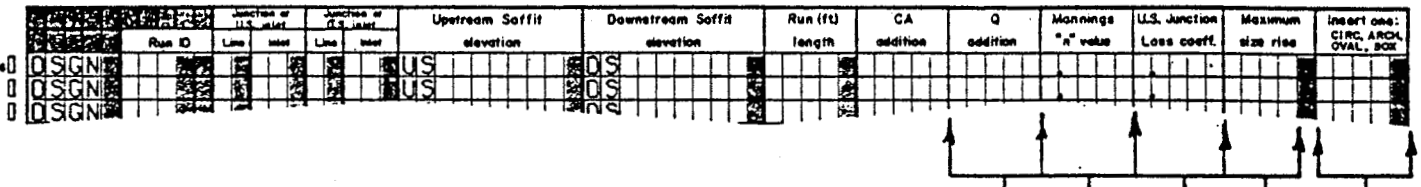
Upstream and downstream elevs. of the top inside surface (soffit) of the RUN (decimal).

ID of the upstream and downstream limits of the RUN.

Run ID may be any combination of alphanumeric characters. (Must not be duplicated.)

These cards are required to describe runs any time SEWER is specified on the SEWER Control Card, regardless of whether the problem is a DESIGN or ANALYSIS. A DSGN card (D-6) must be included to describe each run in the sewer network (maximum of 99). All entries are required except CA ADDITION and Q ADDITION. LINE LETTER and INLET NO. must exactly match the ID's for corresponding inlets on cards (D-3), (D-4), and (D-5).

DSGN Card Continued



Flow to be added to upstream inlet is entered here when INLET is specified and flow addition enters the network by means other than an inlet. (Useful in accommodating previously determined carryover values – may be positive or negative.)

Manning's "n" value for the RUN (decimal). If no entry, .012 will be assumed.

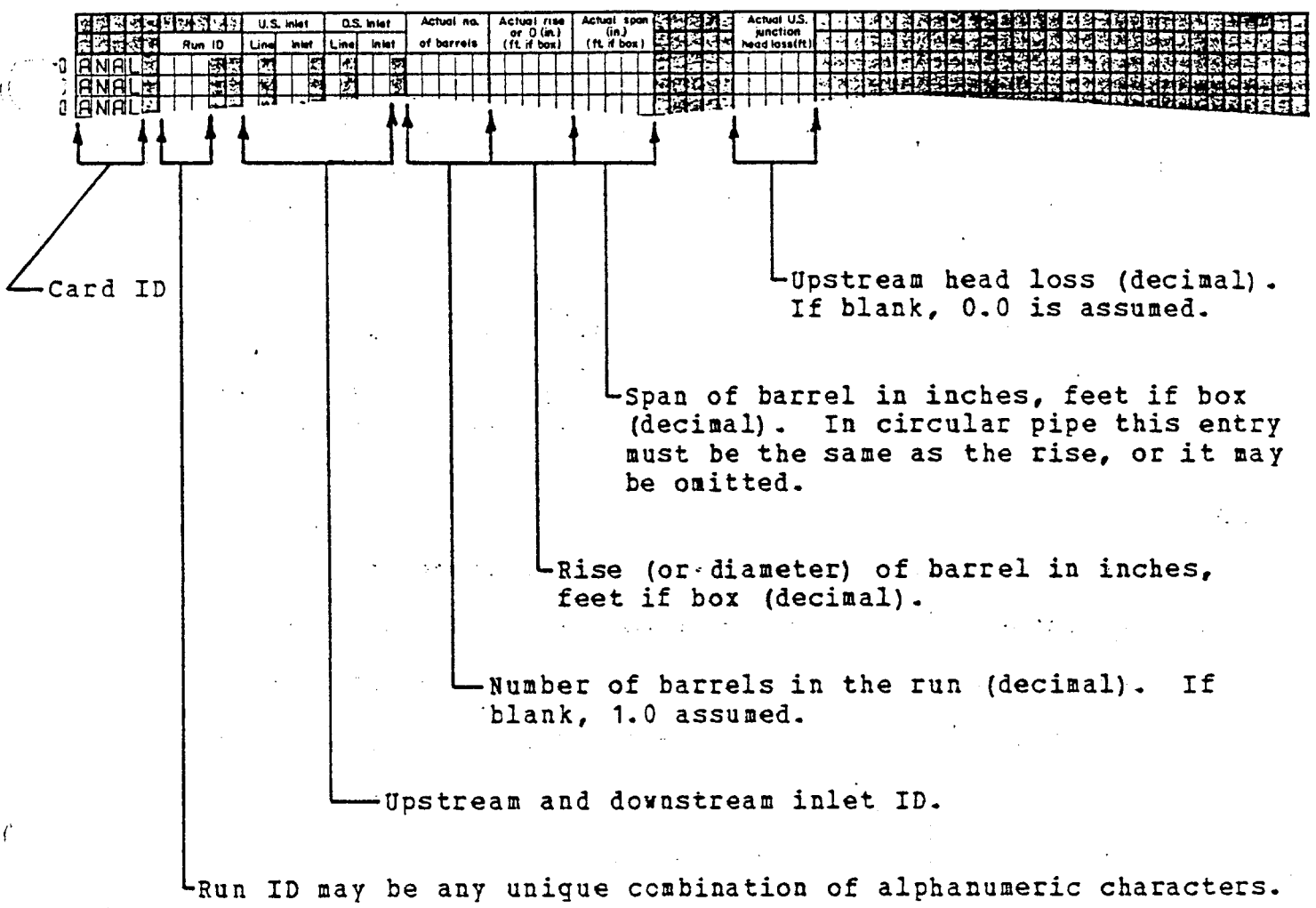
Upstream Junction Loss Coeff (decimal). If no entry, 0.0 will be assumed.

Max. barrel size for design of a RUN (decimal). Units are inches unless BOX specified. Then units are feet.

Barrel shape entered as shown and left justified. If blank, CIRC assumed.

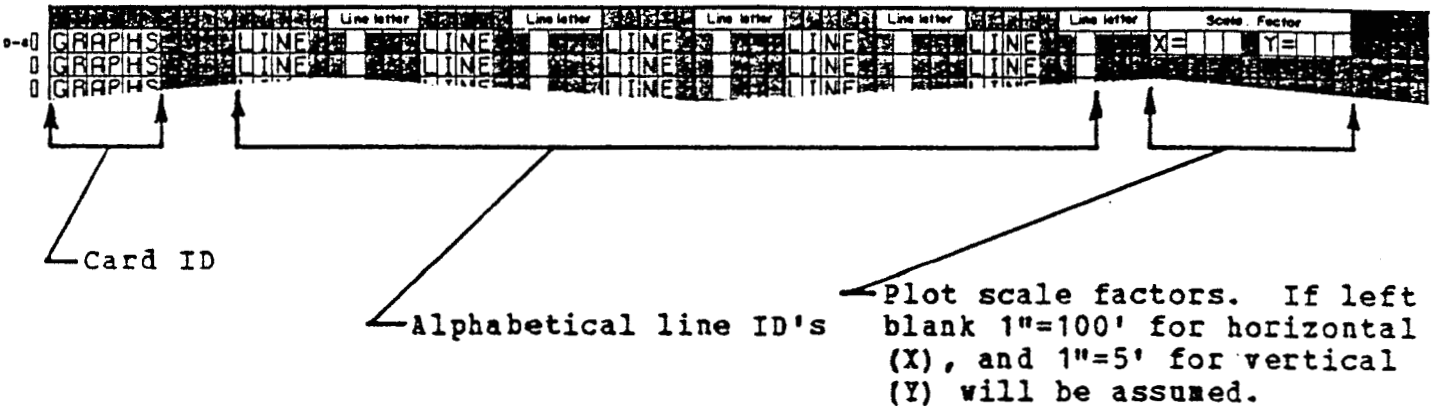
ANAL CARD (D-7)

These cards are used to supply further information when SEWER is specified on the SEWER Control Card and the problem is an ANALYSIS. The identifiers used to describe the points and runs in a sewer network must always be consistent in every respect whenever reference is made on different cards to the same point or run. One card must be used for each run (maximum of 99). All entries required. LINE LETTER and INLET NO. must exactly match the ID's for corresponding inlets on card (D-3), (D-4), and (D-5).



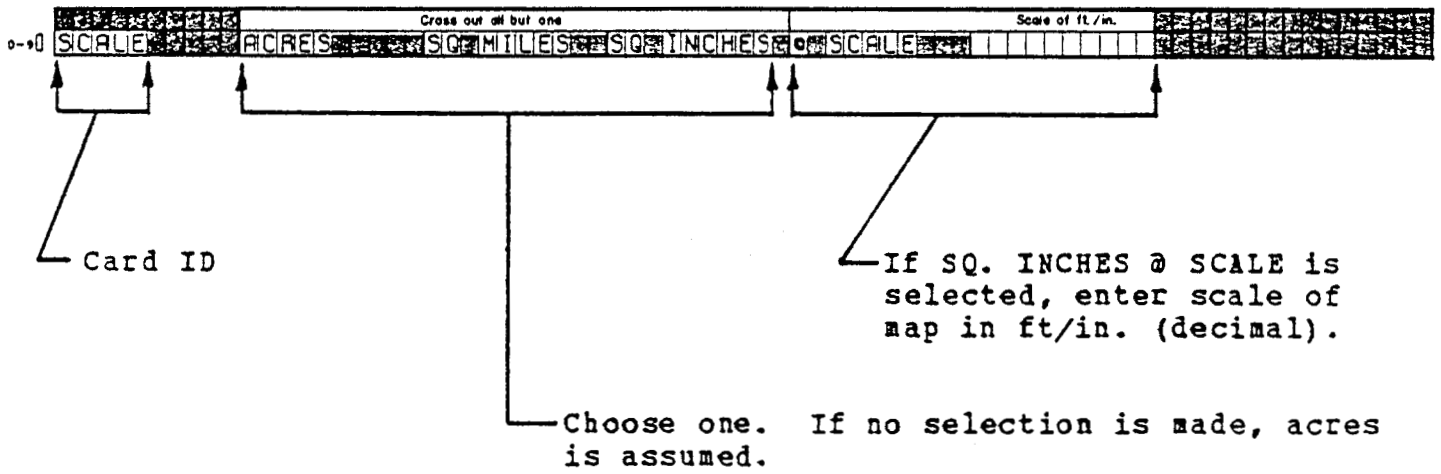
GRAPHS CARD (D-8)

The optional GRAPHS cards (D-8) may be used to secure a graphical printout of the data generated for any lines in the problem. Graphs may be requested for any or all of the allowed 26 lines. The graph will include plots of the flow line elevation profile, soffit elevation profile, hydraulic gradient profile, normal depth of flow, and identifiers for each line requested. The LINE LETTER designations of the lines to be graphed must be entered on GRAPHS cards (D-8) with up to five per card.



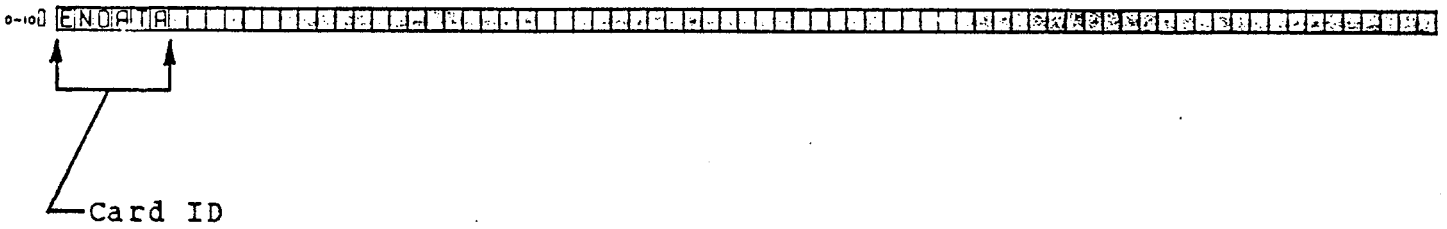
SCALE CARD (D-9)

This card is required only when the areas entered on DA cards (D-3) are expressed in units of square miles or in square inches as read directly from a map. In the latter case the SCALE of the map (feet per inch) must be entered in the field scale of ft/in. If the areas on DA cards are expressed in acres, then this card may be omitted or ACRES may be specified on this card.



ENDATA CARD (D-10)

An ENDATA card (D-10) is required at the end of each set of data associated with one problem.



Card Use Checklist

A tabulation of the required and optional cards for each of the SEWER options is shown in Figure 6-4. This may be used to check the completed input form for possible omissions prior to submission.

SEWER

CARD IDENT.	CARD TYPE OR REFERENCE	DESIGN							ANALYSIS						
		RUNOFF	INLET	SEWER	RUNOFF & INLET	RUNOFF & SEWER	INLET & SEWER	RUNOFF INLET & SEWER	RUNOFF	INLET	SEWER	RUNOFF & INLET	RUNOFF & SEWER	INLET & SEWER	RUNOFF INLET & SEWER
CONTROL CARD	SEWER	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
D-1	COEF DESC	YES			YES	YES		YES	YES			YES	YES		YES
D-2	RAT COEF	YES			YES	YES		YES	YES			YES	YES		YES
D-3	DA	YES[1]	YES[7]	YES[7]	YES[2]	YES[2]	YES[7]	YES[2]	YES[1]	YES[7]	YES[7]	YES[2]	YES[2]	YES[7]	YES[2]
D-4	JUNC		YES[3]	YES[3]	YES[3]	YES[3]	YES[3]	YES[3]		YES[3]	YES[3]	YES[3]	YES[3]	YES[3]	YES[3]
D-4a	CARRY OVER		OPTIONAL		OPTIONAL		OPTIONAL	OPTIONAL							
D-5	OUTLET			YES		YES	YES	YES			YES		YES	YES	YES
D-6	DSGN			YES[4]		YES[4]	YES[4]	YES[4]			YES[4]		YES[4]	YES[4]	YES[4]
D-7	ANAL										YES[8]		YES[8]	YES[8]	YES[8]
D-8	GRAPHS			OPTIONAL[5]		OPTIONAL[5]	OPTIONAL[5]	OPTIONAL[5]			OPTIONAL[5]		OPTIONAL[5]	OPTIONAL[5]	OPTIONAL[5]
D-9	SCALE	OPTIONAL[6]			OPTIONAL[6]	OPTIONAL[6]		OPTIONAL[6]	OPTIONAL[6]		OPTIONAL[6]	OPTIONAL[6]	OPTIONAL[6]	OPTIONAL[6]	OPTIONAL[6]
D-10	ENDATA	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

[1] Include a DA Card for each Drainage Area.
[2] Include a DA Card for each inlet.
[3] Include a JUNC Card for each inlet and junction not otherwise identified.
[4] Include a DSGN Card for each pipe run.
[5] If graphs of named lines are needed.
[6] If units other than acres are used.
[7] Include a DA Card for each inlet with SUPPLY Q specified.
[8] Include an ANAL Card for each pipe run.

FIGURE 6-4. CARD USE CHECKLIST

III. OUTPUT

Output for the SEWER subsystem may consist of any of five reports based on the procedures requested by the user in the input data.

Runoff Calculations

The report for this procedure is the same for both design and analysis and includes the following:

1. Frequency (yrs) - given
2. Surface descriptions and rational coefficients for up to six runoff surfaces - given
3. Minimum time of concentration (minutes) - given or automatically set to 10.
4. Rainfall intensity factors (e, b and d) - given
5. A table including for each inlet or junction:
   a. Identification of inlet or junction - given
   b. CA - computed
   c. TC (minutes) - computed
   d. Supply Q (cfs) - base flow or given discharge to be included in the total flow - given
   e. Rainfall intensity (inches per hour) - computed
   f. Total flow (cfs) - total discharge (including SUPPLY Q) to this inlet or junction - computed.

   NOTE: Also included are other junctions which have no contributing discharge.

Sewer Design and Analysis

The reports for SEWER DESIGN and ANALYSIS are identical and consist of the following:

1. A table of configuration data including for each run:

a. Run identification - given

b. Upstream and downstream junction identifications - given

c. Upstream and downstream flow line elevations (ft) - computed

d. Length of run (ft) - given

e. Slope (ft/ft) - computed from given data

f. Number of barrels - computed (given for analysis)

g. Rise (ft if BOX; inches if any other shape) - computed (given for analysis)

h. Span (ft if BOX; inches if any other shape) - computed (given for analysis)

i. Shape - given

2. A table of hydraulic data including for each run:

a. Run identification - given

b. Upstream and downstream junction identifications - given

c. "n" value (Manning's friction factor) - given

d. Junction loss - given

e. Flow (cfs) - given or computed

f. Upstream and downstream heads (ft) - computed

g. Hydraulic gradient slope (ft/ft) - computed

h. Depth (for most shapes depth will be expressed as a ratio of water depth over rise; for box shapes depth will be expressed in feet and noted as such in the report) - computed

i. Velocity (fps) - computed

j. Pipe capacity (cfs) - This is the maximum volume of flow which could be handled by this run - computed

3. A table defining stationing as follows:

a. Run identification - given

b. Upstream junction identification - given

c. Stationing (ft referenced to outlet station) - computed.

Inlet Design

This report consists of a table which reflects for each inlet:

1. Inlet identification - given
2. Inlet type - given
3. Flow (cfs) - given or computed
4. Minimum length required - computed
5. Minimum standard length required - computed
6. Standard inlet opening - given or 5 feet assumed
7. Grate width - given or 3 feet assumed
8. Carryover - CFS computed (where allowed)
9. Carryover assignment inlet ID - given
10. Minimum area of grate required (sq ft) - computed
11. Ponding width - computed

Inlet Analysis

This report consists of a table which reflects for each inlet:

1. Inlet identification - given
2. Inlet type - given
3. Flow (cfs) - given or computed
4. Inlet capacity (cfs) - computed
5. Carryover (cfs) - computed
6. Ponding width (ft) - computed
7. Actual length (ft) - given
8. Required length (ft) - computed length of inlet needed to pass the given flow
9. Actual area (sq ft) - given

10. Required area (sq ft) - computed area of inlet required to pass the given flow

11. Actual head (ft) - computed.

Graphs

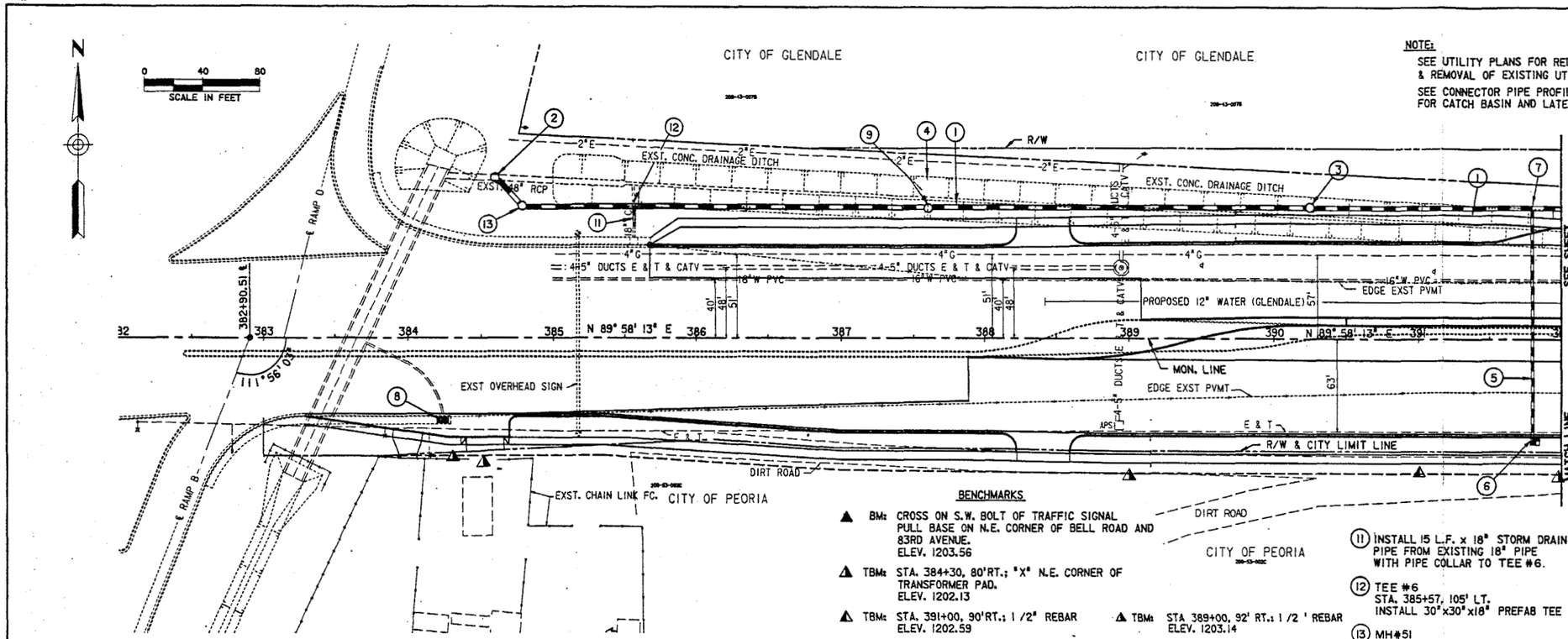
This output consists of a computer line plot of: (1) the flow line and soffit line of the inside of the barrel; (2) the calculated uniform (normal) depth of flow in the barrel; (3) the calculated hydraulic gradient line; (4) identifiers such as line letter, run name, run size and length, junction ID's, and tailwater elevation (labeled T.W.); and (5) elevation scale.

Standard scales on the plot are 1"=5' vertically and 1"=100' horizontally. Either or both scales may be varied by the user by inserting the new scale factors in the proper place on the first GRAPHS card (D-8). (X= for horizontal and Y= for vertical scale.) Any and all lines which are part of the storm sewer system may be plotted. The plot can be used for direct application in the plans.

The hydraulic gradient line on the plot is represented by the short-dashed line; the uniform depth of flow in the barrel is represented by the long-dashed line; and the flow line and soffit line are represented by solid lines. In analysis, if the barrel is flowing full, the uniform depth line is coincident with the soffit line.

APPENDIX 5

STORM DRAIN PLAN, PROFILE, AND HGL'S



NOTE:

SEE UTILITY PLANS FOR RELOCATION & REMOVAL OF EXISTING UTILITIES.

SEE CONNECTOR PIPE PROFILE FOR CATCH BASIN AND LATERAL DETAILS.

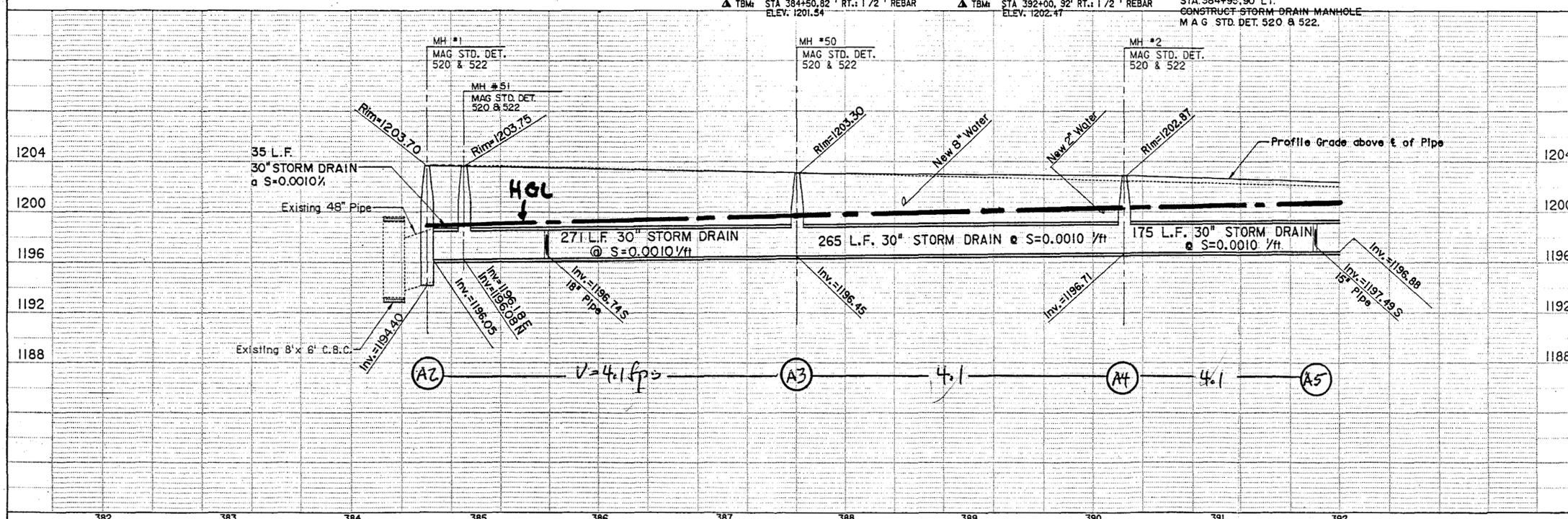
Donohue ENGINEERS ARCHITECTS SCIENTISTS
1055 West Indian School Road
Phoenix, Arizona 85015
(602) 279-1541
Telephone (602) 279-1374

CONSTRUCTION NOTES:

1. INSTALL 740 L.F.x 30" STORM DRAIN PIPE
2. MH #1
   STA. 384+60, 109' LT.
   CONSTRUCT STORM DRAIN MANHOLE
   M A G STD. DET. 520 & 522.
3. MH #2
   STA. 390+25, 90' LT.
   CONSTRUCT STORM DRAIN MANHOLE
   M A G STD. DET. 520 & 522.
4. STA. 385+00 TO STA. 392+50
   REMOVE EXISTING CONCRETE DRAINAGE DITCH.
5. INSTALL 157 LFx15" STORM DRAIN PIPE & PIPE COLLAR
6. CB #1
   STA. 391+80, 66' RT.
   CONSTRUCT CONCRETE CATCH BASIN
   C.O.PHX. STD. DET. P-1569
   M-1, L=6', V=3'6".
7. TEE # 1
   STA. 391+80, 90.00 LT.
   INSTALL 30"x30"x15" PREFAB TEE
8. CB #29
   STA. 384+23.4, 53' RT.
   CONSTRUCT CONCRETE CATCH BASIN
   C.O.PHX. STD. DET. P-1570
   TYPE N, DOUBLE BASIN, V=6',
   AND CONNECT TO EXISTING LINE.
9. MH #50
   STA. 387+60, 98.82' LT.
   CONSTRUCT STORM DRAIN MANHOLE
   M A G. STD. DET. 520 & 522.
10. REMOVE APPROXIMATELY 65 L.F. OF 48" PIPE.
11. INSTALL 15 L.F. x 18" STORM DRAIN PIPE FROM EXISTING 18" PIPE WITH PIPE COLLAR TO TEE #6.
12. TEE #6
    STA. 385+57, 105' LT.
    INSTALL 30"x30"x18" PREFAB TEE
13. MH#51
    STA. 384+95, 90' LT.
    CONSTRUCT STORM DRAIN MANHOLE
    M A G STD. DET. 520 & 522.

BENCHMARKS

- BM: CROSS ON S.W. BOLT OF TRAFFIC SIGNAL PULL BASE ON N.E. CORNER OF BELL ROAD AND 83RD AVENUE. ELEV. 1203.56
- TBM: STA. 384+30, 80'RT.; "X" N.E. CORNER OF TRANSFORMER PAD. ELEV. 1202.13
- TBM: STA. 391+00, 90'RT.; 1/2" REBAR ELEV. 1202.59
- TBM: STA 384+50.82 ' RT.: 1/2 ' REBAR ELEV. 1201.54
- TBM: STA 389+00, 92' RT.: 1/2 ' REBAR ELEV. 1203.14
- TBM: STA 392+00, 92' RT.: 1/2 ' REBAR ELEV. 1202.47



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5850 W. Glendale Avenue
Glendale, Arizona 85301 (602) 435-4152

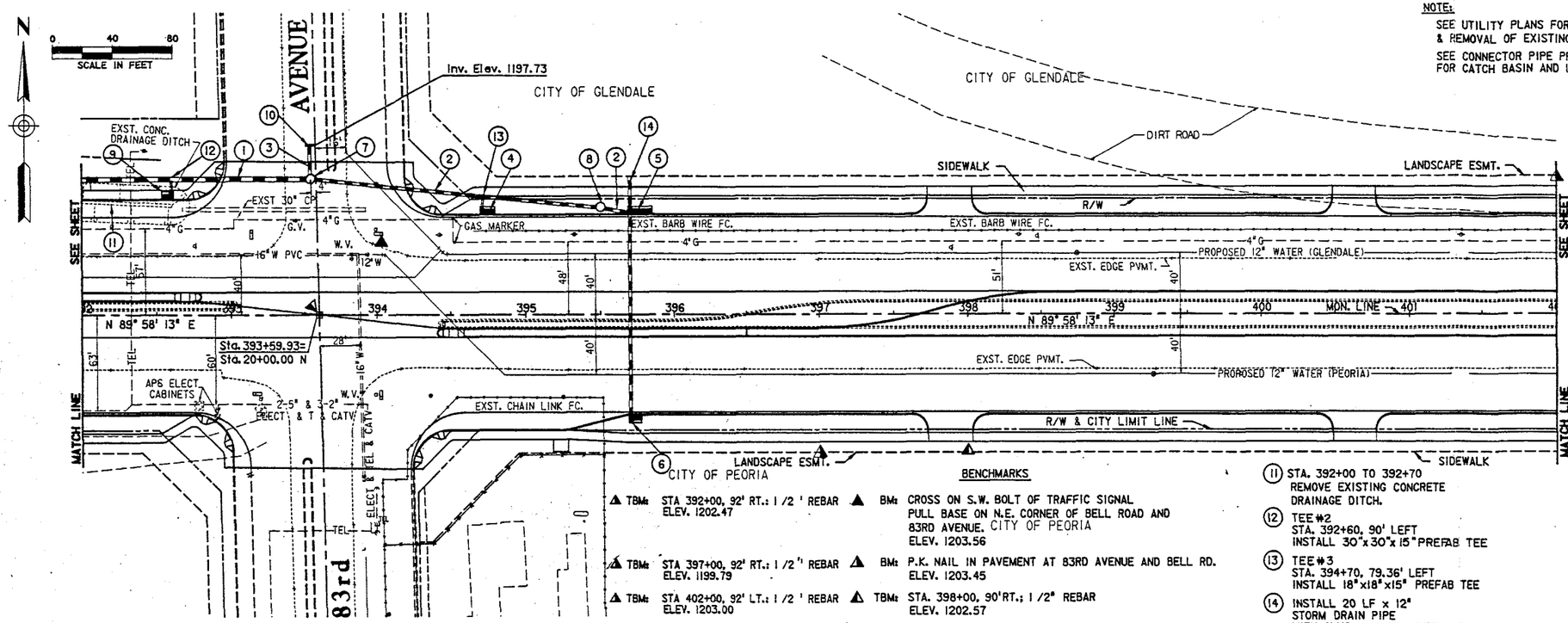
No.	Date	Description	Designed	Drawn	Checked
		REVISIONS			

BELL ROAD IMPROVEMENTS
OUTER LOOP TO 67TH AVE.
STORM DRAIN PLANS

2S3-1100

SHT. 53
OF 126

NOTE:
SEE UTILITY PLANS FOR RELOCATION & REMOVAL OF EXISTING UTILITIES.
SEE CONNECTOR PIPE PROFILE FOR CATCH BASIN AND LATERAL DETAILS.

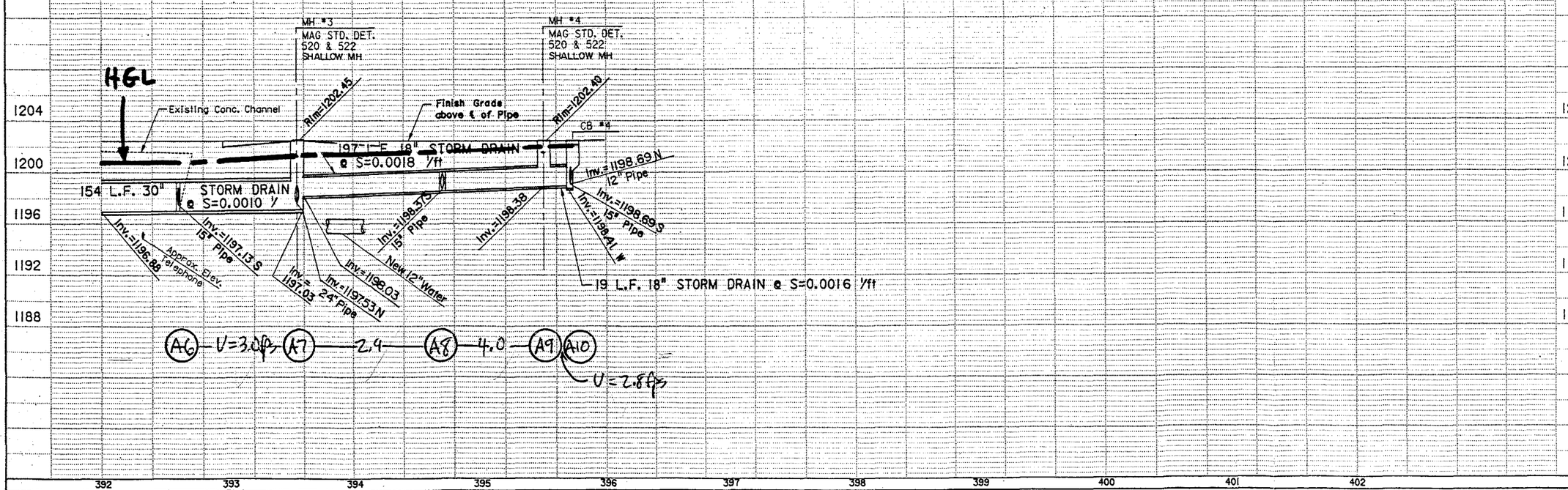


BENCHMARKS

- ▲ TBM: STA 392+00, 92' RT.: 1 /2 ' REBAR ELEV. 1202.47
- ▲ TBM: STA 397+00, 92' RT.: 1 /2 " REBAR ELEV. 1199.79
- ▲ TBM: STA 402+00, 92' LT.: 1 /2 ' REBAR ELEV. 1203.00
- ▲ BM: CROSS ON S.W. BOLT OF TRAFFIC SIGNAL PULL BASE ON N.E. CORNER OF BELL ROAD AND 83RD AVENUE. CITY OF PEORIA ELEV. 1203.56
- ▲ BM: P.K. NAIL IN PAVEMENT AT 83RD AVENUE AND BELL RD. ELEV. 1203.45
- ▲ TBM: STA. 398+00, 90'RT.; 1 /2" REBAR ELEV. 1202.57
- ▲ BM: B.C. IN PAVEMENT AT 79TH AVENUE AND BELL ROAD ELEV. 1200.65

CONSTRUCTION NOTES

1. INSTALL 154 L.F.x 30" STORM DRAIN PIPE
2. INSTALL 216 L.F.x 18" STORM DRAIN PIPE.
3. INSTALL 20 L.F.x 24" STORM DRAIN PIPE.
4. CB #3
   STA. 394+70, 66' LEFT CONSTRUCT CONCRETE CATCH BASIN C.O.PHX STD. DET. P-1569, M-1, L=10', V=4' WITH 10 L.F. x 15" LATERAL. CONNECT TO MAIN WITH PREFAB TEE #3.
5. CB #4
   STA. 395+70, 66' LEFT, CONSTRUCT CONCRETE CATCH BASIN C.O.PHX. STD. DET. P-1569, M-1, L=17', V=4'2" WITH 18" OUTLET TO MAIN.
6. CB #5
   STA. 395+70, 66' RIGHT, CONSTRUCT CONCRETE CATCH BASIN C.O.PHX. STD. DET. P-1569, M-1, L=10', V=4' WITH 133' x 15" LATERAL.
7. MH #3
   STA. 393+54.4, 90' LEFT
   CONSTRUCT STORM DRAIN MANHOLE MAG STD. DET. 520 & 522.
8. MH #4
   STA. 395+50, 72' LEFT
   CONSTRUCT STORM DRAIN MANHOLE MAG STD. DET. 520 & 522.
9. CB #2
   STA. 392+60, 76' LEFT, CONSTRUCT CONCRETE CATCH BASIN C.O.PHX. STD. DET. P-1569, M-1, L=6', V=4' WITH 11 L.F.x 15" LATERAL. CONNECT TO MAIN WITH PREFAB TEE #2.
10. CONSTRUCT DRAIN LINE PLUG, 20"
    STA. 393+54.4, 110' LEFT
    MAG STD. DET. 427
11. STA. 392+00 TO 392+70
    REMOVE EXISTING CONCRETE DRAINAGE DITCH.
12. TEE #2
    STA. 392+60, 90' LEFT
    INSTALL 30"x30"x15" PREFAB TEE
13. TEE #3
    STA. 394+70, 79.36' LEFT
    INSTALL 18"x18"x15" PREFAB TEE
14. INSTALL 20 LF x 12" STORM DRAIN PIPE WITH PLUG MAG STD. DET. 427



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Glendale, Arizona 85301 (602) 435-4152

Designed
Drawn
Checked

No.	Date	Description
		REVISIONS

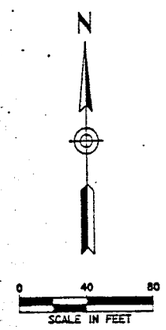
BELL ROAD IMPROVEMENTS
OUTER LOOP TO 67TH AVE.
STORM DRAIN PLANS

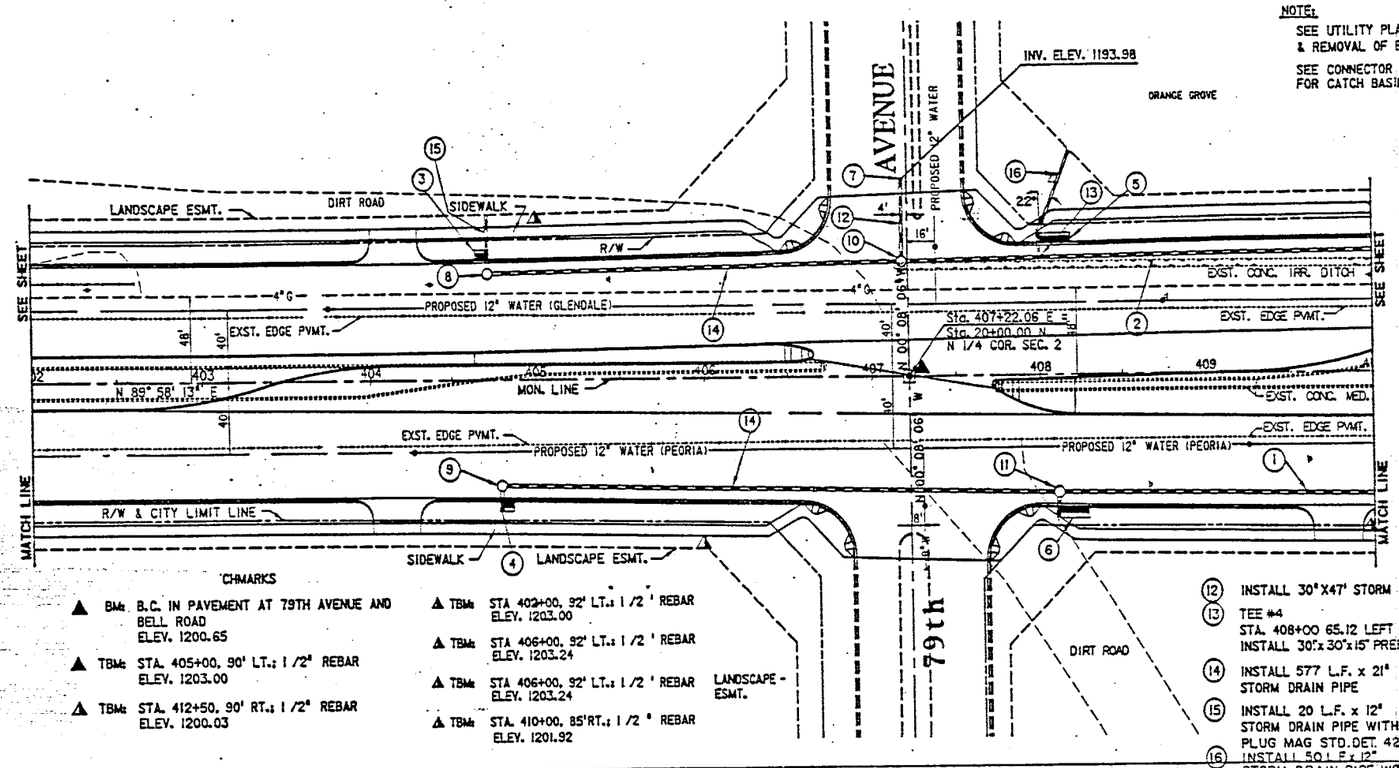
253-100

SHT. 14
OF 16

NOTE:
SEE UTILITY PLANS FOR RELOCATION & REMOVAL OF EXISTING UTILITIES.

SEE CONNECTOR PIPE PROFILE FOR CATCH BASIN AND LATERAL DETAILS.



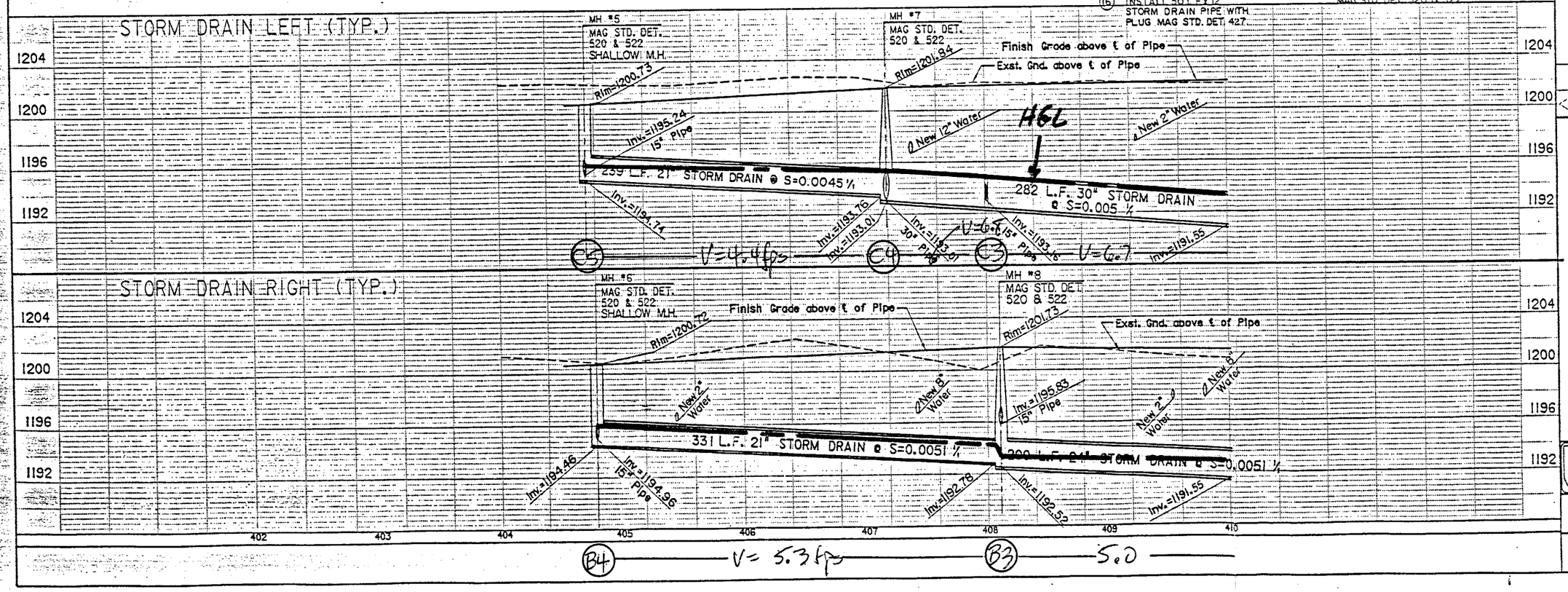


BMs

- ▲ BM: B.C. IN PAVEMENT AT 79TH AVENUE AND BELL ROAD ELEV. 1200.65
- ▲ TBM: STA. 405+00, 90' LT.: 1/2" REBAR ELEV. 1203.00
- ▲ TBM: STA. 412+50, 90' RT.: 1/2" REBAR ELEV. 1200.03
- ▲ TBM: STA 402+00, 92' LT.: 1/2" REBAR ELEV. 1203.00
- ▲ TBM: STA 406+00, 92' LT.: 1/2" REBAR ELEV. 1203.24
- ▲ TBM: STA 406+00, 92' LT.: 1/2" REBAR ELEV. 1203.24
- ▲ TBM: STA. 410+00, 85'RT.: 1/2" REBAR ELEV. 1201.92

CONSTRUCTION NOTES:

1. INSTALL 200 L.F.x 24" STORM DRAIN PIPE
2. INSTALL 282 L.F.x 30" STORM DRAIN PIPE
3. CB #6
   STA. 404+72, 68.27 LEFT, CONSTRUCT CONCRETE CATCH BASIN C.O.PHX. STD. DET. P-1569, M-1, L=6', V=4'6" WITH 8 L.F. x 15" LATERAL.
4. CB #7
   STA. 404+79, 68.27 RIGHT, CONSTRUCT CONCRETE CATCH BASIN C.O.PHX. STD. DET. P-1569, M-1, L=6', V=5' WITH 8 L.F. x 15" LATERAL.
5. CB #8
   STA. 408+00, 73.70' LEFT
   CONSTRUCT CONCRETE CATCH BASIN C.O.PHX. STD. DET. P-1569, M-1, L=17', V=7'7" WITH 9 L.F. x 15" LATERAL AND PIPE COLLAR. CONNECT TO MAIN WITH PREFAB TEE #4.
6. CB #9
   STA. 408+10, 73.71' RIGHT, CONSTRUCT CONCRETE CATCH BASIN C.O.PHX. STD. DET. P-1569, M-1, L=17', V=4' WITH 8 L.F. x 15" LATERAL.
7. CONSTRUCT DRAIN LINE PLUG (MAG DTL. 427)
   STA. 407+18, 111' LEFT
8. MH #5
   STA. 404+72, 59' LEFT
   CONSTRUCT STORM DRAIN MANHOLE MAG STD. DET. 520 & 522
9. MH #6
   STA. 404+79, 59' RIGHT
   CONSTRUCT STORM DRAIN MANHOLE MAG STD. DET. 520 & 522
10. MH #7
    STA. 407+18.06, 64' LEFT
    CONSTRUCT STORM DRAIN MANHOLE MAG STD. DET. 520 & 522
11. MH #8
    STA. 408+10, 65' RIGHT
    CONSTRUCT STORM DRAIN MANHOLE MAG STD. DET. 520 & 522
12. INSTALL 30"X47" STORM DRAIN PIPE
13. TEE #4
    STA. 408+00 65.12 LEFT
    INSTALL 30"x30"x15" PREFAB TEE
14. INSTALL 577 L.F. x 21" STORM DRAIN PIPE
15. INSTALL 20 L.F. x 12" STORM DRAIN PIPE WITH PLUG MAG STD. DET. 427.
16. INSTALL 50 L.F. x 12" STORM DRAIN PIPE WITH PLUG MAG STD. DET. 427



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Designed | Drawn | Checked

No.	Date	Description

REVISIONS

BELL ROAD IMPROVEMENTS
OUTER LOOP TO 67TH AVE.
STORM DRAIN PLANS

263-1160

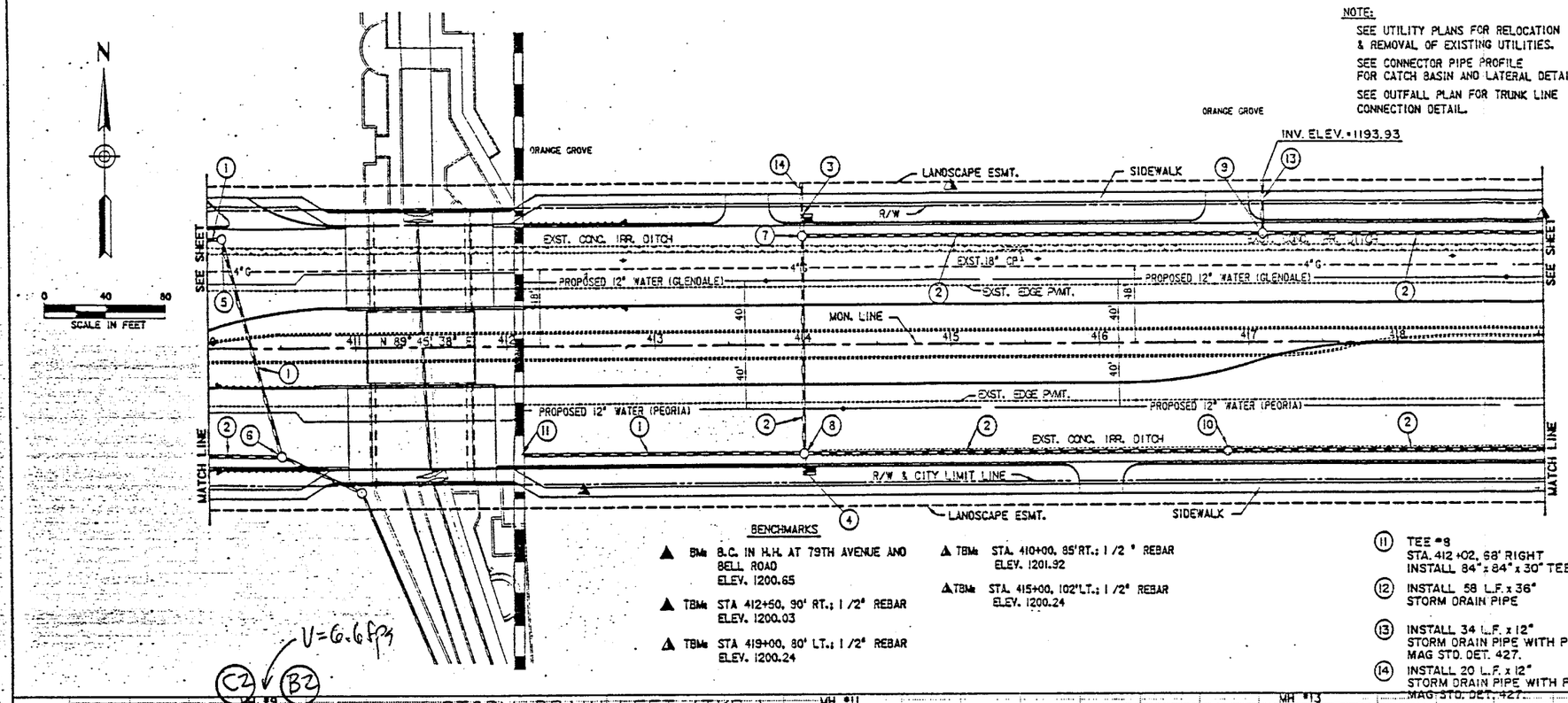
SHT. 5 OF 12

NOTE:

SEE UTILITY PLANS FOR RELOCATION & REMOVAL OF EXISTING UTILITIES.

SEE CONNECTOR PIPE PROFILE FOR CATCH BASIN AND LATERAL DETAILS.

SEE OUTFALL PLAN FOR TRUNK LINE CONNECTION DETAIL.

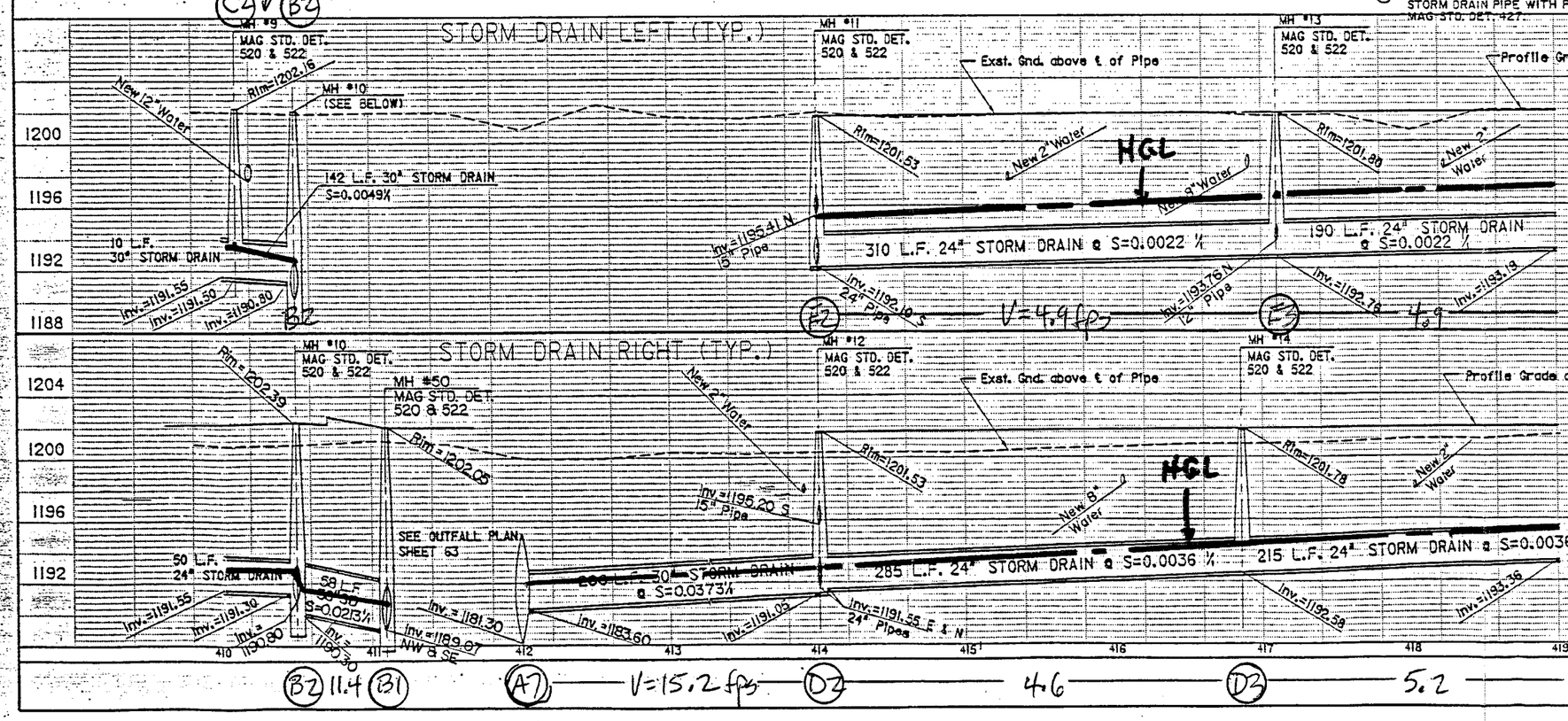


BENCHMARKS

- BM: B.C. IN H.H. AT 79TH AVENUE AND BELL ROAD ELEV. 1200.65
- TBM: STA 412+50, 90' RT.; 1/2" REBAR ELEV. 1200.03
- TBM: STA 419+00, 80' LT.; 1/2" REBAR ELEV. 1200.24
- TBM: STA. 410+00, 85'RT.; 1/2" REBAR ELEV. 1201.92
- TBM: STA. 415+00, 102'LT.; 1/2" REBAR ELEV. 1200.24

CONSTRUCTION NOTES:

1. INSTALL 352 L.F. x 30" STORM DRAIN PIPE
2. INSTALL 1186 L.F. x 24" STORM DRAIN PIPE
3. CB #10
   STA. 414+00, 76' LEFT
   CONSTRUCT CONCRETE CATCH BASIN, C.O.PHX. STD. DET. D-1569, M-1, L=6', V=6'3" WITH 9 L.F. x 15" LATERAL.
4. CB #11
   STA. 414+00, 76' RIGHT
   CONSTRUCT CONCRETE CATCH BASIN, C.O.PHX. STD. DET. D-1569, M-1, L=6', V=6'3" WITH 9 L.F. x 15" LATERAL.
5. MH #9
   STA. 410+10, 68' LEFT
   CONSTRUCT STORM DRAIN MANHOLE MAG STD. DET. 520 & 522.
6. MH #10
   STA. 410+50, 68' RIGHT
   CONSTRUCT STORM DRAIN MANHOLE MAG STD. DET. 520 & 522.
7. MH #11
   STA. 414+00, 68' LEFT
   CONSTRUCT STORM DRAIN MANHOLE MAG STD. DET. 520 & 522.
8. MH #12
   STA. 414+00, 68' RIGHT
   CONSTRUCT STORM DRAIN MANHOLE MAG STD. DET. 520 & 522.
9. MH #13
   STA. 417+10, 68' LEFT
   CONSTRUCT STORM DRAIN MANHOLE MAG STD. DET. 520 & 522.
10. MH #14
    STA. 416+85, 68' RIGHT
    CONSTRUCT STORM DRAIN MANHOLE MAG STD. DET. 520 & 522.
11. TEE #8
    STA. 412+02, 68' RIGHT
    INSTALL 84" x 84" x 30" TEE
12. INSTALL 58 L.F. x 36" STORM DRAIN PIPE
13. INSTALL 34 L.F. x 12" STORM DRAIN PIPE WITH PLUG MAG STD. DET. 427.
14. INSTALL 20 L.F. x 12" STORM DRAIN PIPE WITH PLUG MAG STD. DET. 427.



CITY OF GLENDALE
PUBLIC WORKS / ENGINEERING
5850 W. Glendale Avenue
Glendale, Arizona 85301 (602) 435-4152

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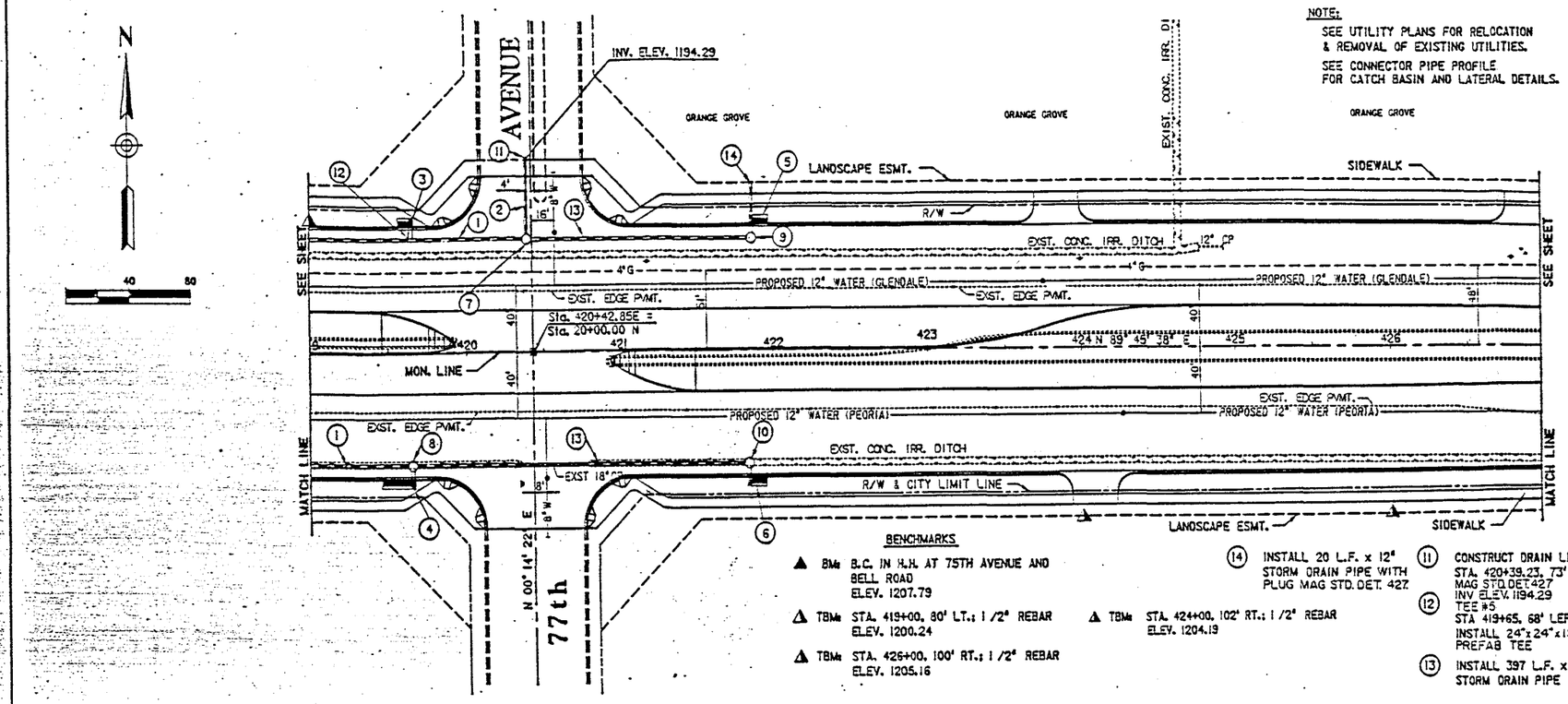
No.	Date	Description
		REVISIONS

BELL ROAD IMPROVEMENTS
OUTER LOOP TO 67TH AVE.
STORM DRAIN PLANS

253-150

SHT. 5 OF 126



NOTE:

SEE UTILITY PLANS FOR RELOCATION & REMOVAL OF EXISTING UTILITIES.

SEE CONNECTOR PIPE PROFILE FOR CATCH BASIN AND LATERAL DETAILS.

BENCHMARKS

▲ BM: B.C. IN H.H. AT 75TH AVENUE AND BELL ROAD ELEV. 1207.79

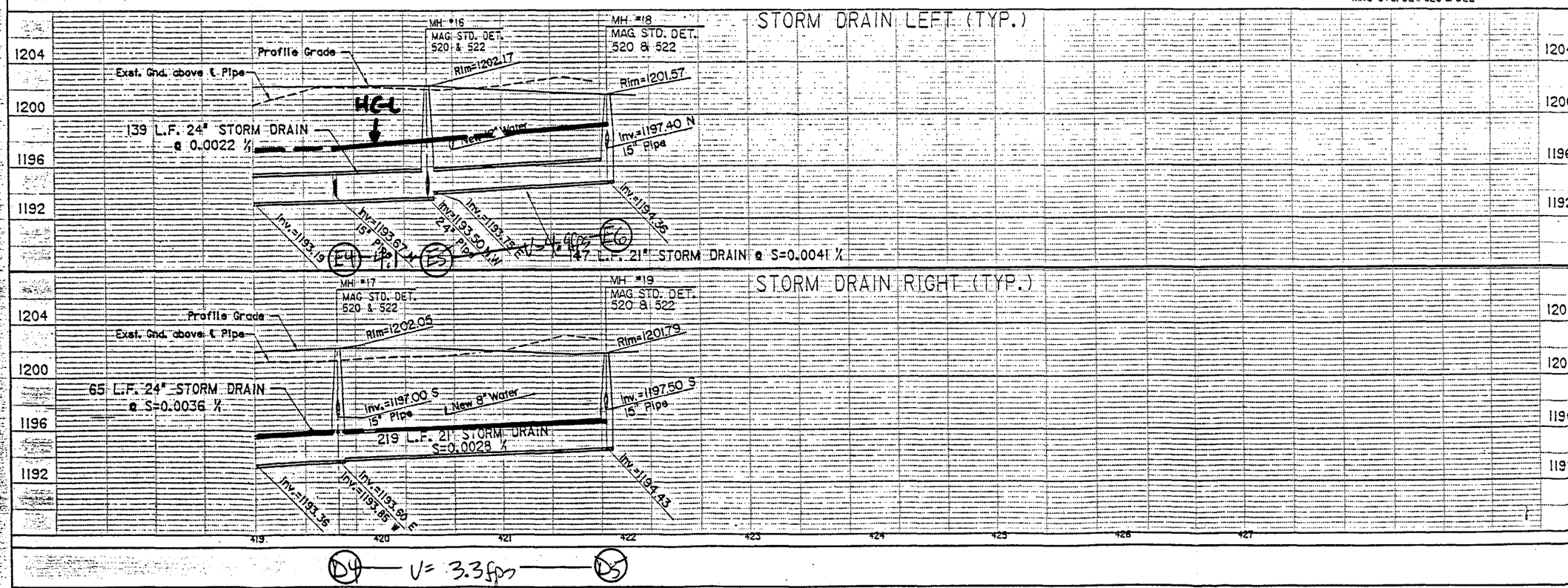
△ TBM: STA. 419+00, 80' LT.: 1/2" REBAR ELEV. 1200.24

△ TBM: STA. 426+00, 100' RT.: 1/2" REBAR ELEV. 1205.16

△ TBM: STA. 424+00, 102' RT.: 1/2" REBAR ELEV. 1204.19

CONSTRUCTION NOTES:

1. INSTALL 204 L.F. x 24" STORM DRAIN PIPE
2. INSTALL 49 L.F. x 24" STORM DRAIN PIPE
3. CB #12 STA. 419+65, 76' LEFT CONSTRUCT CONCRETE CATCH BASIN C.O.PHX. STD. DET. P-1569, M-1, L=6', V=7' WITH 9 L.F. x 15" LATERAL CONNECT TO MAIN WITH PREFAB TEE #5.
4. CB #13 STA. 419+65, 76' RIGHT, CONSTRUCT CONCRETE CATCH BASIN C.O.PHX. STD. DET. P-1569, M-1, L=17', V=4' WITH 9 L.F. x 15" LATERAL.
5. CB #14 STA. 421+86, 76' LEFT, CONSTRUCT CONCRETE CATCH BASIN C.O.PHX. STD. DET. P-1569, M-1, L=10', V=4' WITH 9 L.F. x 15" LATERAL.
6. CB #15 STA. 421+84, 76' RIGHT, CONSTRUCT CONCRETE CATCH BASIN C.O.PHX. STD. DET. P-1569, M-1, L=10', V=4' WITH 9 L.F. x 15" LATERAL.
7. MH #16 STA. 420+39, 68' LEFT CONSTRUCT STORM DRAIN MANHOLE MAG STD. DET. 520 & 522.
8. MH #17 STA. 419+65, 68' RIGHT CONSTRUCT STORM DRAIN MANHOLE MAG STD. DET. 520 & 522.
9. MH #18 STA. 421+86, 68' LEFT CONSTRUCT STORM DRAIN MANHOLE MAG STD. DET. 520 & 522
10. MH #19 STA. 421+84, 68' RIGHT CONSTRUCT STORM DRAIN MANHOLE MAG STD. DET. 520 & 522
11. CONSTRUCT DRAIN LINE PLUG STA. 420+39.23, 73' LT. MAG STD. DET. 427 INV ELEV. 1194.29
12. TEE #5 STA 419+65, 68' LEFT INSTALL 24" x 24" x 15" PREFAB TEE
13. INSTALL 397 L.F. x 21" STORM DRAIN PIPE
14. INSTALL 20 L.F. x 12" STORM DRAIN PIPE WITH PLUG MAG STD. DET. 427



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Glendale, Arizona 85301 (602) 435-4152

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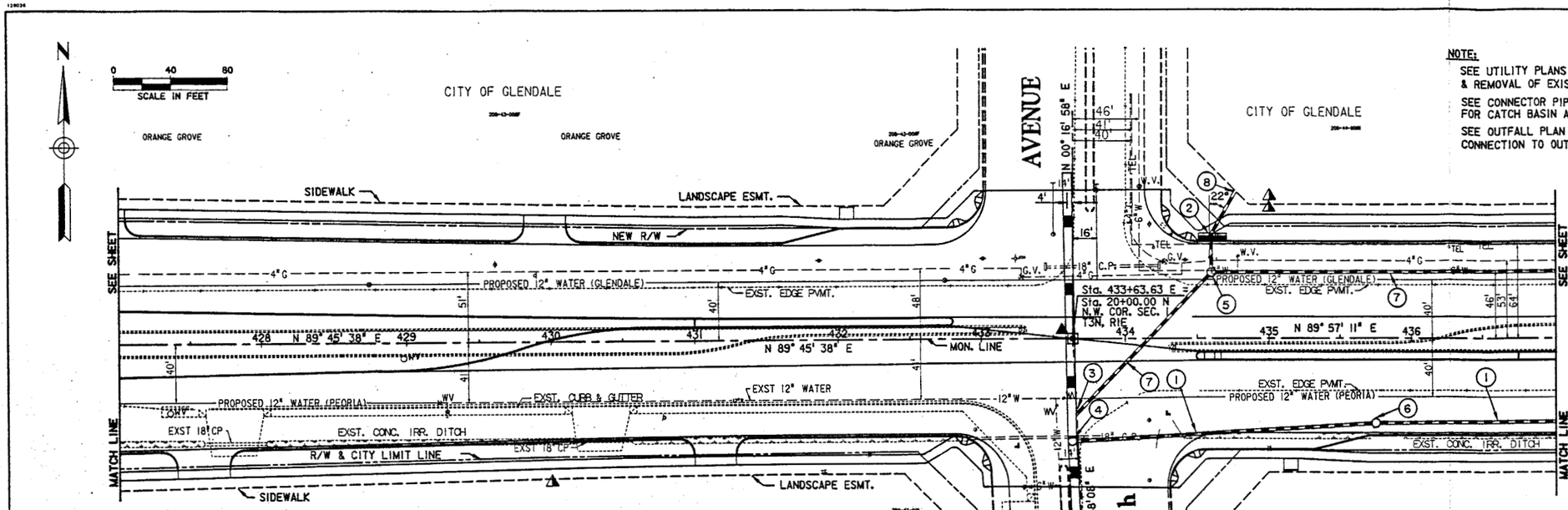
BELL ROAD IMPROVEMENTS
OUTER LOOP TO 67TH AVE.
STORM DRAIN PLANS

SHT. 5-1
OF 12-6



NOTE:

SEE UTILITY PLANS FOR RELOCATION & REMOVAL OF EXISTING UTILITIES.

SEE CONNECTOR PIPE PROFILE FOR CATCH BASIN AND LATERAL DETAILS.

SEE OUTFALL PLAN FOR CONNECTION TO OUTFALL TRUNKS.

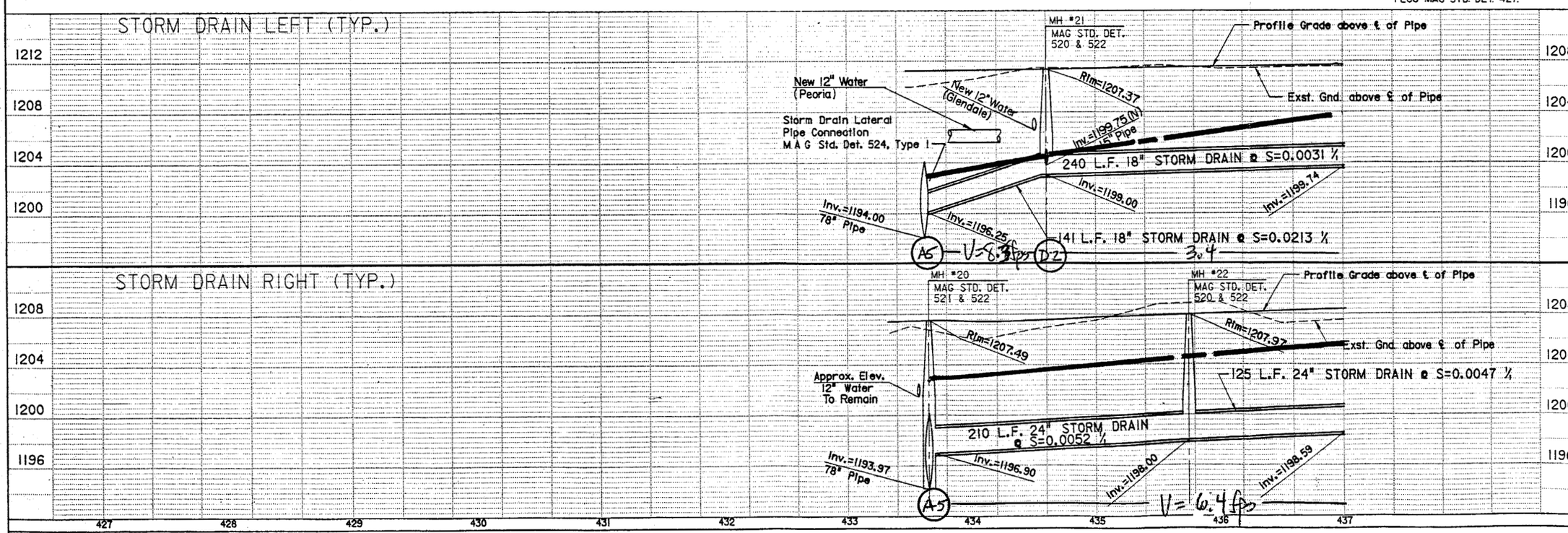
Donohue ENGINEERS ARCHITECTS SCIENTISTS
8501 West Indian School Road
Phoenix, Arizona 85037
602.279.1541
Tucson 602.279.1334

BENCHMARKS

- BM: B.C. IN H.H. AT 75TH AVENUE AND BELL ROAD ELEV. 1207.79
- TBM: STA. 435+00, 90' LT.; 1/2" REBAR ELEV. 1207.76
- TBM: STA. 435+00, 92' LT.; 1/2" REBAR ELEV. 1207.81
- TBM: STA. 430+00, 95' RT.; 1/2" REBAR ELEV. 1206.31

CONSTRUCTION NOTES:

1. INSTALL 335 L.F. x 24" STORM DRAIN PIPE
2. CB #16
   STA. 434+62, 66' LEFT
   CONSTRUCT CONCRETE CATCH BASIN, C.O.PHX. STD. DET. P-1569, M-2, L=10', V=7'5" WITH 21 L.F. x 15" LATERAL.
3. 78"x78"x18" PREFAB WYE #1
   STA. 433+63, 53' RIGHT
   CONSTRUCT STORM DRAIN LATERAL PIPE CONNECTION.
4. MH #20
   STA. 433+65, 70' RIGHT
   MAG STD. DET. 521 & 522.
5. MH #21
   STA. 434+60, 46' LEFT
   CONSTRUCT STORM DRAIN MANHOLE
   MAG STD. DET. 520 & 521.
6. MH #22
   STA. 435+75, 58' RIGHT
   CONSTRUCT STORM DRAIN MANHOLE
   MAG STD. DET. 520 & 522.
7. INSTALL 381 L.F. x 18" STORM DRAIN PIPE
8. INSTALL 36 L.F. x 12" STORM DRAIN PIPE WITH PLUG MAG STD. DET. 427.



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PUBLIC WORKS / ENGINEERING
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Glendale, Arizona 85301 (602) 435-4152

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REVISIONS

BELL ROAD IMPROVEMENTS
OUTER LOOP TO 67TH AVE.
STORM DRAIN PLANS

263-1100

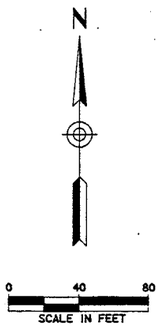
SHT. 56
OF 126

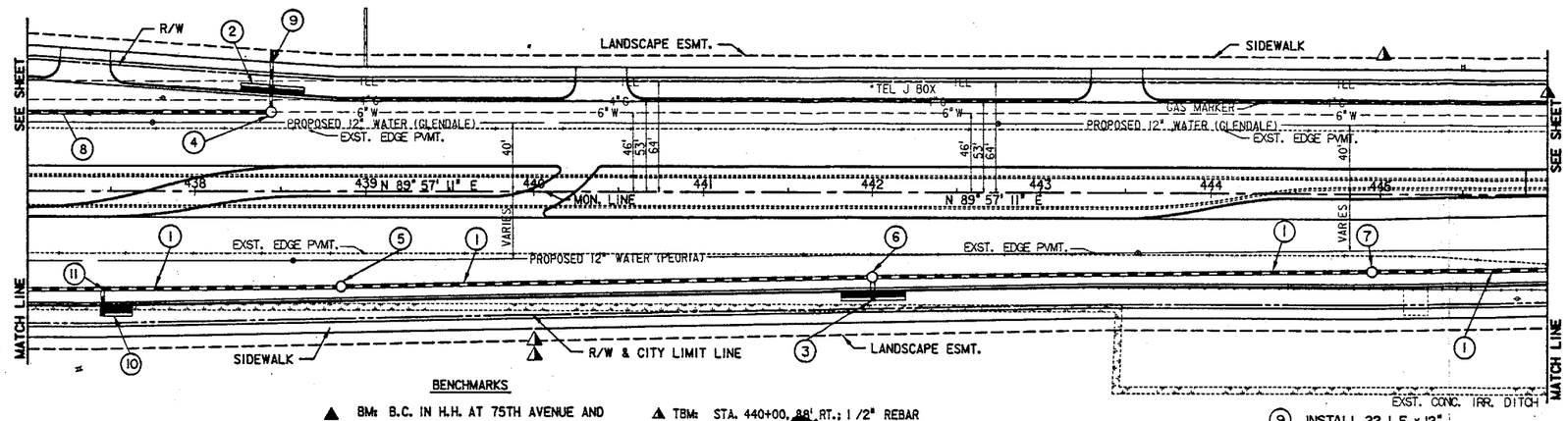
NOTE:

SEE UTILITY PLANS FOR RELOCATION & REMOVAL OF EXISTING UTILITIES.

SEE CONNECTOR PIPE PROFILE FOR CATCH BASIN AND LATERAL DETAILS.

Donahue Engineers Architects Scientists
1055 West Indian School Road
Phoenix, Arizona 85017
(602) 279-3541
Telefax (602) 279-1134



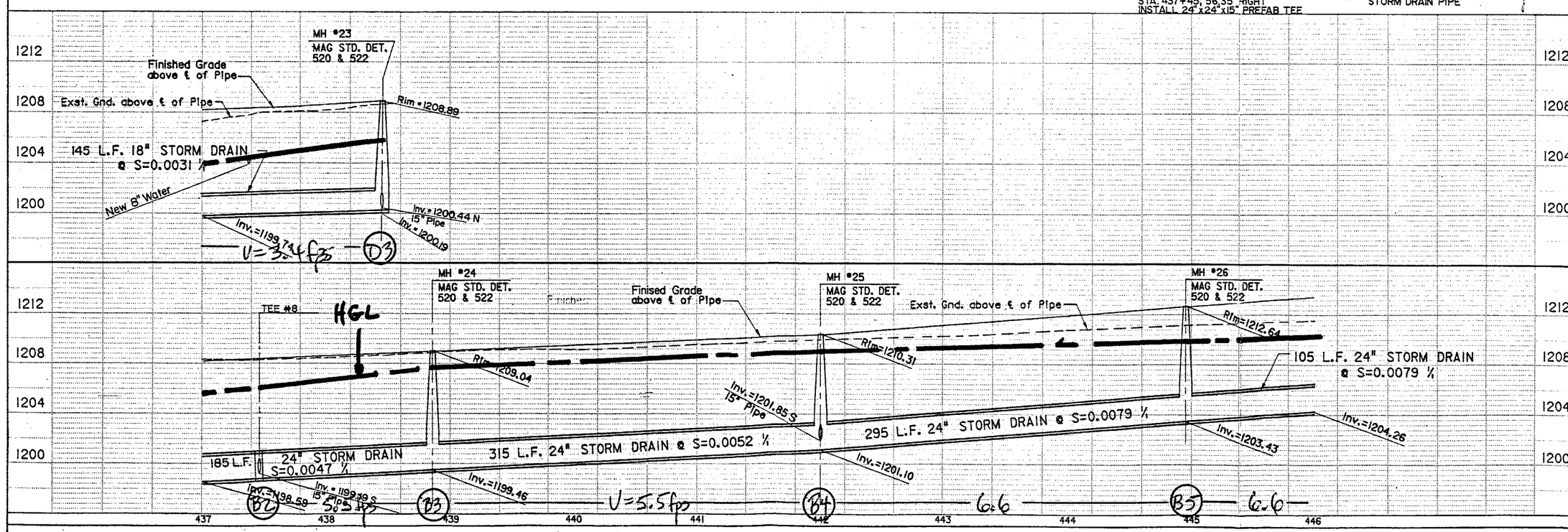


BENCHMARKS

- BM: B.C. IN H.H. AT 75TH AVENUE AND BELL ROAD ELEV. 1207.79
- TBM: STA. 440+00, 85' RT.; 1/2" REBAR ELEV. 1211.09
- TBM: STA. 446+00, 60' LT.; 1/2" REBAR ELEV. 1211.65
- TBM: STA. 440+00, 88' RT.; 1/2" REBAR ELEV. 1211.16
- TBM: STA. 445+00, 82' LT.; 1/2" REBAR ELEV. 1211.71

CONSTRUCTION NOTES:

1. INSTALL 900 L.F. x 24" STORM DRAIN PIPE
2. CB #18
   STA. 438+45, 56.60' LEFT
   CONSTRUCT CONCRETE CATCH BASIN
   C.O. PHX. STD. DET. P-1569, M-2, L=17'
   V=7'5" WITH 11 L.F. x 15" LATERAL
3. CB #19
   STA. 442+00, 56.80' RIGHT
   CONSTRUCT CONCRETE CATCH BASIN
   C.O. PHX. STD. DET. P-1569, M-2, L=17'
   V=7'9" WITH 8 L.F. x 15" LATERAL
4. MH #23
   STA. 437+85, 46' LEFT
   CONSTRUCT STORM DRAIN MANHOLE
   MAG STD. DET. 520 & 522
5. MH #24
   STA. 438+85, 55' RIGHT
   CONSTRUCT STORM DRAIN MANHOLE
   MAG STD. DET. 520 & 522
6. MH #25
   STA. 442+00, 49' RIGHT
   CONSTRUCT STORM DRAIN MANHOLE
   MAG STD. DET. 520 & 522
7. MH #26
   STA. 444+95, 45' RIGHT
   CONSTRUCT STORM DRAIN MANHOLE
   MAG STD. DET. 520 & 522
8. INSTALL 145 L.F. x 18" STORM DRAIN PIPE
9. INSTALL 22 L.F. x 12" STORM DRAIN PIPE
10. CB #17
    STA. 437+45, 65'9" RIGHT
    CONSTRUCT CONCRETE CATCH BASIN
    C.O. PHX. STD. DET. P-1569, M-1, L=17'
    V=5'5" WITH 10 L.F. x 15" LATERAL
11. TEE #8
    STA. 437+45, 56.35' RIGHT
    INSTALL 24" x 24" x 15" PREFAB TEE



CITY OF GLENDALE
PUBLIC WORKS / ENGINEERING
5850 W. Glendale Avenue
Glendale, Arizona 85301 (602) 435-4152

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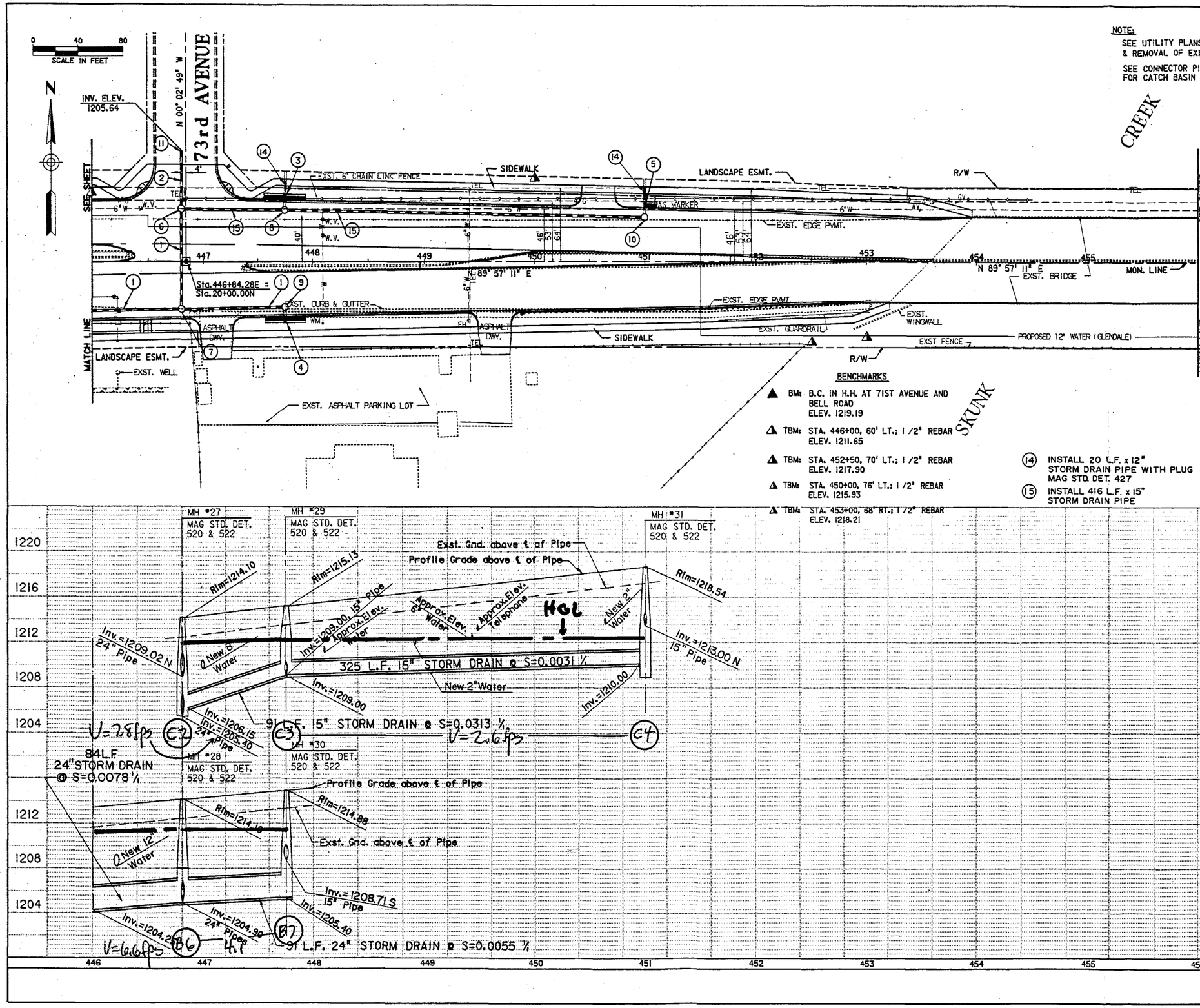
No.	Date	Description
		REVISIONS

BELL ROAD IMPROVEMENTS
OUTER LOOP TO 67TH AVE.
STORM DRAIN PLANS

263-1100

SHT. 11
OF 12



NOTE:
SEE UTILITY PLANS FOR RELOCATION & REMOVAL OF EXISTING UTILITIES.

SEE CONNECTOR PIPE PROFILE FOR CATCH BASIN AND LATERAL DETAILS.

Donahue ENGINEERS ARCHITECTS SCIENTISTS
1515 West Indian School Road
Phoenix, Arizona 85017
602 279 7141
Telecopier 602 279 1134

CONSTRUCTION NOTES:

1. INSTALL 263 L.F.x 24" STORM DRAIN PIPE
2. INSTALL 46 L.F.x 24" STORM DRAIN PIPE
3. CB #20
   STA. 447+75, 53.38' LEFT
   CONSTRUCT CONCRETE CATCH BASIN
   C.O.PHX. STD. DET. P-1569, M-2, L=17', V=4' WITH 9 L.F. x 15" LATERAL.
4. CB #21
   STA. 447+75, 47.28' RIGHT
   CONSTRUCT CONCRETE CATCH BASIN
   C.O.PHX. STD. DET. P-1569, M-2, L=17', V=7'9" WITH 8 L.F. x 15" LATERAL.
5. CB #22
   STA. 451+00, 45.25' LEFT
   CONSTRUCT CONCRETE CATCH BASIN
   C.O.PHX. STD. DET. P-1569, M-1, L=10', V=4' WITH 7 L.F. x 15" LATERAL.
6. MH #27
   STA. 446+84, 46' LEFT
   CONSTRUCT STORM DRAIN MANHOLE
   MAG STD. DET. 520 & 522
7. MH #28
   STA. 446+84, 42' RIGHT
   CONSTRUCT STORM DRAIN MANHOLE
   MAG STD. DET. 520 & 522
8. MH #29
   STA. 447+75, 45' LEFT
   CONSTRUCT STORM DRAIN MANHOLE
   MAG STD. DET. 520 & 522
9. MH #30
   STA. 447+75, 40' RIGHT
   CONSTRUCT STORM DRAIN MANHOLE
   MAG STD. DET. 520 & 522
10. MH #31
    STA. 451+00, 39' LEFT
    CONSTRUCT STORM DRAIN MANHOLE
    MAG STD. DET. 520 & 522
11. STA. 446+84, 92' LEFT
    CONSTRUCT DRAIN LINE PLUG
    MAG STD. DET. 427
14. INSTALL 20 L.F. x 12" STORM DRAIN PIPE WITH PLUG MAG STD. DET. 427
15. INSTALL 416 L.F. x 15" STORM DRAIN PIPE

BENCHMARKS

- BM: B.C. IN H.H. AT 71ST AVENUE AND BELL ROAD ELEV. 1219.19
- TBM: STA. 446+00, 60' LT.; 1/2" REBAR ELEV. 1211.65
- TBM: STA. 452+50, 70' LT.; 1/2" REBAR ELEV. 1217.90
- TBM: STA. 450+00, 76' LT.; 1/2" REBAR ELEV. 1215.93
- TBM: STA. 453+00, 68' RT.; 1/2" REBAR ELEV. 1218.21

CITY OF GLENDALE
PUBLIC WORKS / ENGINEERING
5850 W. Glendale Avenue
Glendale, Arizona 85301 (602) 435-4152

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No.	Date	Description
		REVISIONS

BELL ROAD IMPROVEMENTS
OUTER LOOP TO 67TH AVE.
STORM DRAIN PLANS

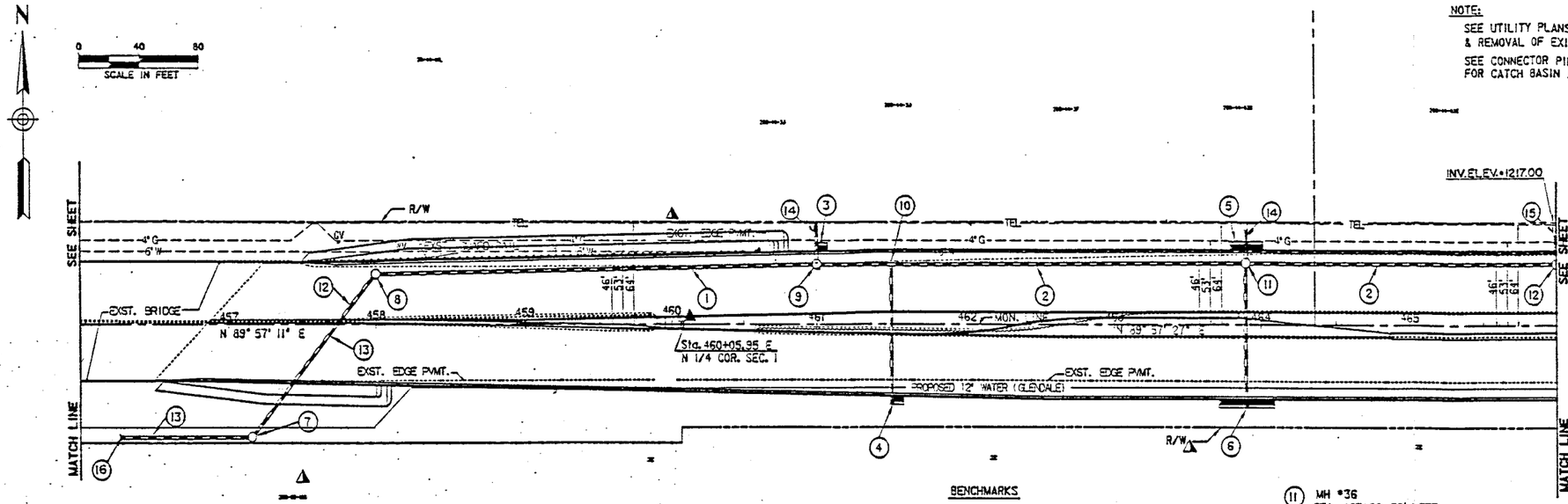
263-1100

SHT. 60
OF 126

NOTE:

SEE UTILITY PLANS FOR RELOCATION & REMOVAL OF EXISTING UTILITIES.

SEE CONNECTOR PIPE PROFILE FOR CATCH BASIN AND LATERAL DETAILS.

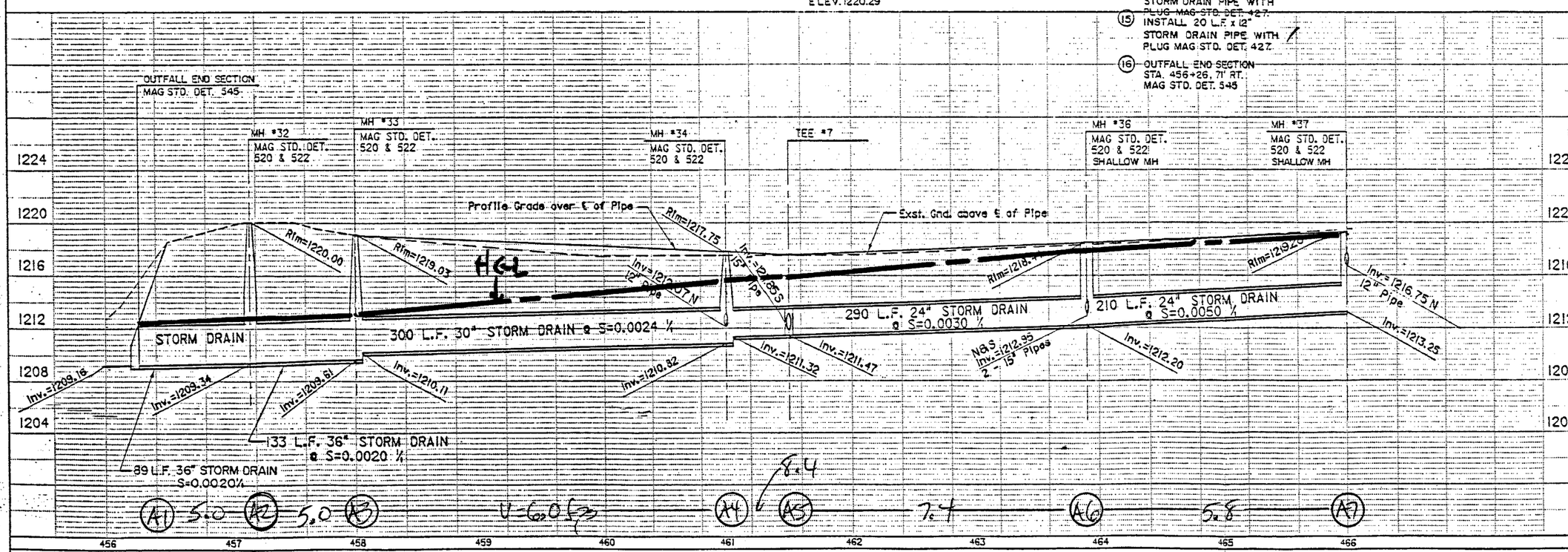


CONSTRUCTION NOTES:

1. INSTALL 300 L.F.x 30" STORM DRAIN PIPE
2. INSTALL 500 L.F.x 24" STORM DRAIN PIPE
3. CB #23 STA. 461+00, 45.90' LEFT CONSTRUCT CONCRETE CATCH BASIN C.O.PHX. STD. DET. P-1569, M-1, L=6', V=4' WITH 8 L.F. x 15" LATERAL
4. CB #24 STA. 461+50, 45.23' RIGHT CONSTRUCT CONCRETE CATCH BASIN C.O.PHX. STD. DET. P-1569, M-1, L=6', V=4' WITH 84 L.F. x 15" LATERAL.
5. CB #25 STA. 463+90, 47' LEFT CONSTRUCT CONCRETE CATCH BASIN C.O.PHX. STD. DET. P-1569, M-2, L=10', V=5' WITH 9 L.F. x 15" LATERAL.
6. CB #26 STA. 463+90, 47' RIGHT CONSTRUCT CONCRETE CATCH BASIN C.O.PHX. STD. DET. P-1569, M-2, L=17', V=4' WITH 87 L.F. x 15" LATERAL.
7. MH #32 STA. 457+15, 71' RIGHT CONSTRUCT STORM DRAIN MANHOLE MAG STD. DET. 520 & 522.
8. MH # 33 STA. 458+00, 32' LEFT CONSTRUCT STORM DRAIN MANHOLE MAG STD. DET. 520 & 522.
9. MH #34 STA. 461+00, 38' LEFT CONSTRUCT STORM DRAIN MANHOLE MAG STD. DET. 520 & 522.
10. TEE #7 STA. 461+50, 38' LEFT INSTALL PREFAB 24"x24"x15" TEE
11. MH #36 STA. 463+90, 39' LEFT CONSTRUCT STORM DRAIN MANHOLE MAG STD. DET. 520 & 522.
12. MH #37 STA. 466+00, 39' LEFT CONSTRUCT STORM DRAIN MANHOLE MAG STD. DET. 520 & 522.
13. INSTALL 222 L.F.x 36" STORM DRAIN PIPE
14. INSTALL 12 L.F. x12" STORM DRAIN PIPE WITH PLUG MAG STD. DET. 427.
15. INSTALL 20 L.F. x 12" STORM DRAIN PIPE WITH PLUG MAG STD. DET. 427.
16. OUTFALL END SECTION STA. 456+26, 71' RT. MAG STD. DET. 545

BENCHMARKS

- BM: B.C. IN H.H. AT 71ST AVENUE AND BELL ROAD ELEV. 1219.19
- TBM: STA. 460+00, 70' LT.; 1/2" REBAR ELEV. 1217.21
- TBM: STA. 457+50, 96' RT.; 1/2" REBAR ELEV. 1219.22
- TBM: STA. 463+00, 67' RT., 1/2" REBAR ELEV. 1220.29



CITY OF GLENDALE
PUBLIC WORKS / ENGINEERING
5850 W. Glendale Avenue
Glendale, Arizona 85301 (602) 435-4152

No.	Date	Description
		REVISIONS

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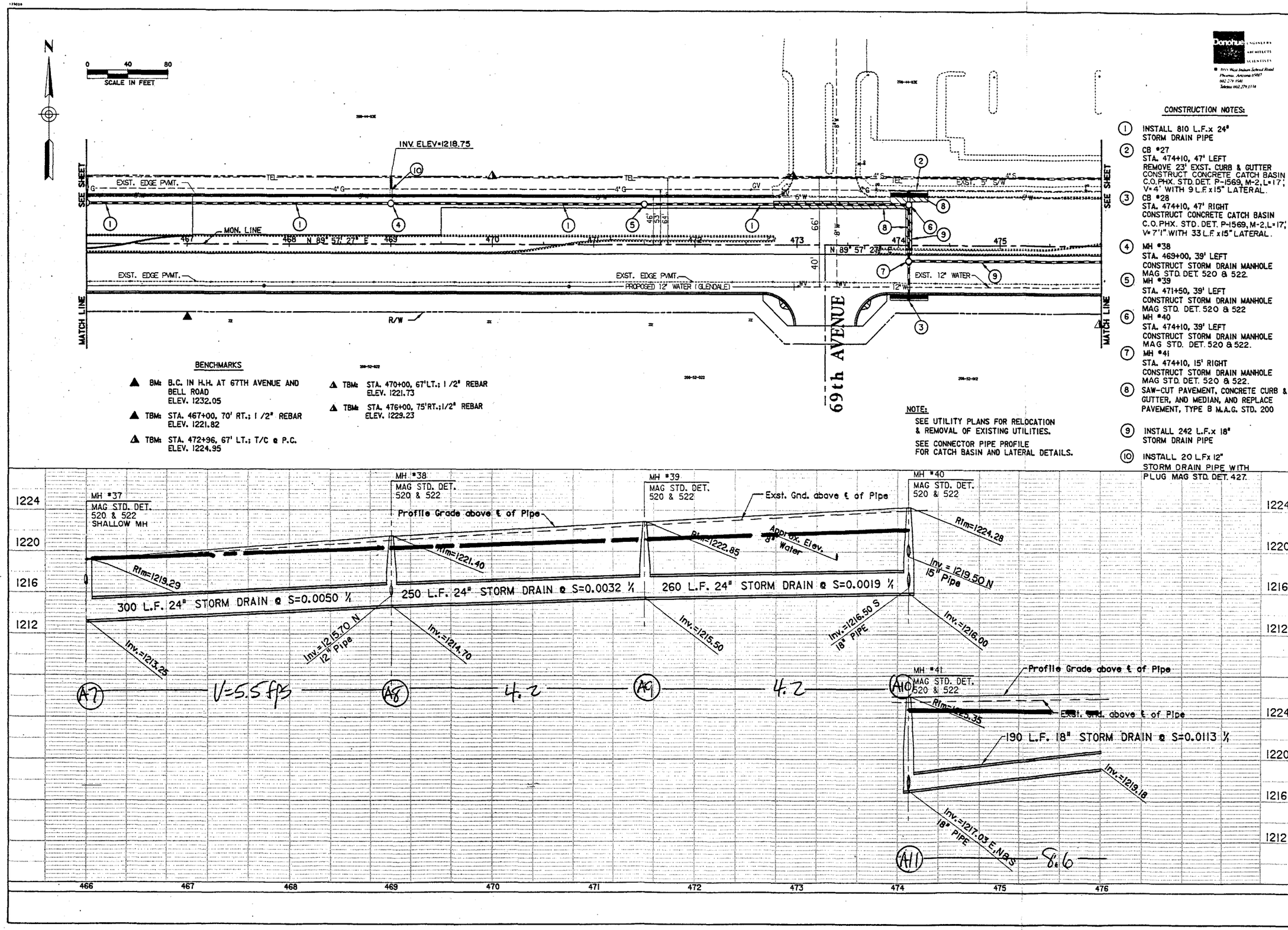
BELL ROAD IMPROVEMENTS
OUTER LOOP TO 67TH AVE.
STORM DRAIN PLANS

263-165

SHT. 121
OF 126



Donohue ENGINEERS ARCHITECTS SCIENTISTS
3033 West Indian School Road
Phoenix, Arizona 85017
602 279 1541
Telecopy 602 279 1174

CITY OF GLENDALE
PUBLIC WORKS / ENGINEERING
5850 W. Glendale Avenue
Glendale, Arizona 85301 (602) 435-4152

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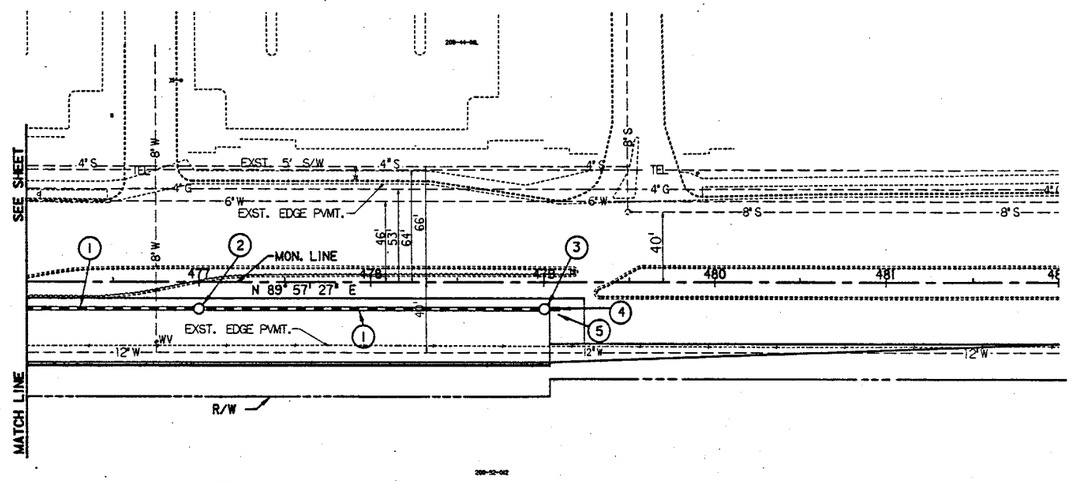
REVISIONS

BELL ROAD IMPROVEMENTS
OUTER LOOP TO 67TH AVE.
STORM DRAIN PLANS

CALL FOR THE BLUE STAKES 263-1100

SHT. 62
OF 126



BENCHMARKS

- BM: B.C. IN H.H. AT 67TH AVENUE AND BELL ROAD ELEV. 1232.05
- TBM: STA. 467+00, 70' RT.; 1/2" REBAR ELEV. 1221.82
- TBM: STA. 472+96, 67' LT.; T/C @ P.C. ELEV. 1224.95

N

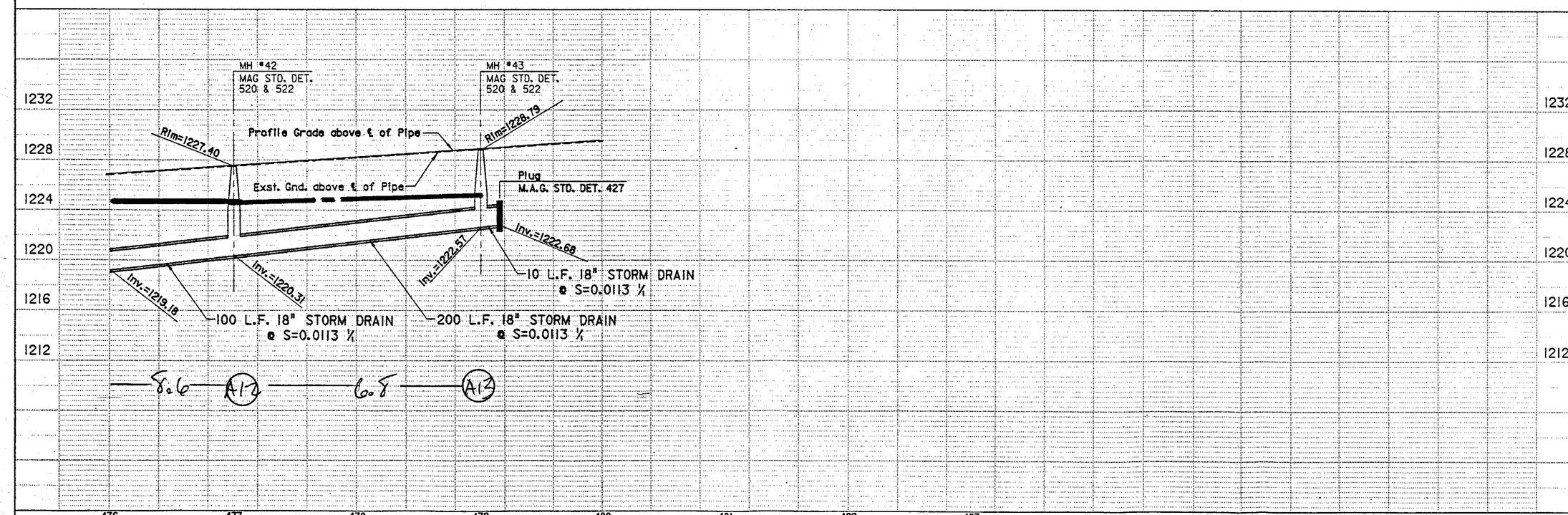
0 40 80
SCALE IN FEET

Donohue ENGINEERS ARCHITECTS SCIENTISTS
5115 West Indian School Road
Phoenix, Arizona 85017
602 279 7541
Telefax 602 279 1134

CONSTRUCTION NOTES:

1. INSTALL 310 L.F.x 24" STORM DRAIN PIPE
2. MH #42 STA. 477+00, 15' RIGHT CONSTRUCT STORM DRAIN MANHOLE
3. MH #43 STA. 479+00, 15' RIGHT CONSTRUCT STORM DRAIN MANHOLE
4. (MAG STD DTL 427) STA. 479+15, 15' RIGHT CONSTRUCT DRAINLINE PLUG
5. SAWCUT PAVEMENT FOR PIPE EXTENSION AND REPLACE PAVEMENT M.A.G. STD. DET. 200, TYPE T.

NOTE:
SEE UTILITY PLANS FOR RELOCATION & REMOVAL OF EXISTING UTILITIES.



CITY OF GLENDALE
PUBLIC WORKS / ENGINEERING
5850 W. Glendale Avenue
Glendale, Arizona 85301 (602) 435-4152

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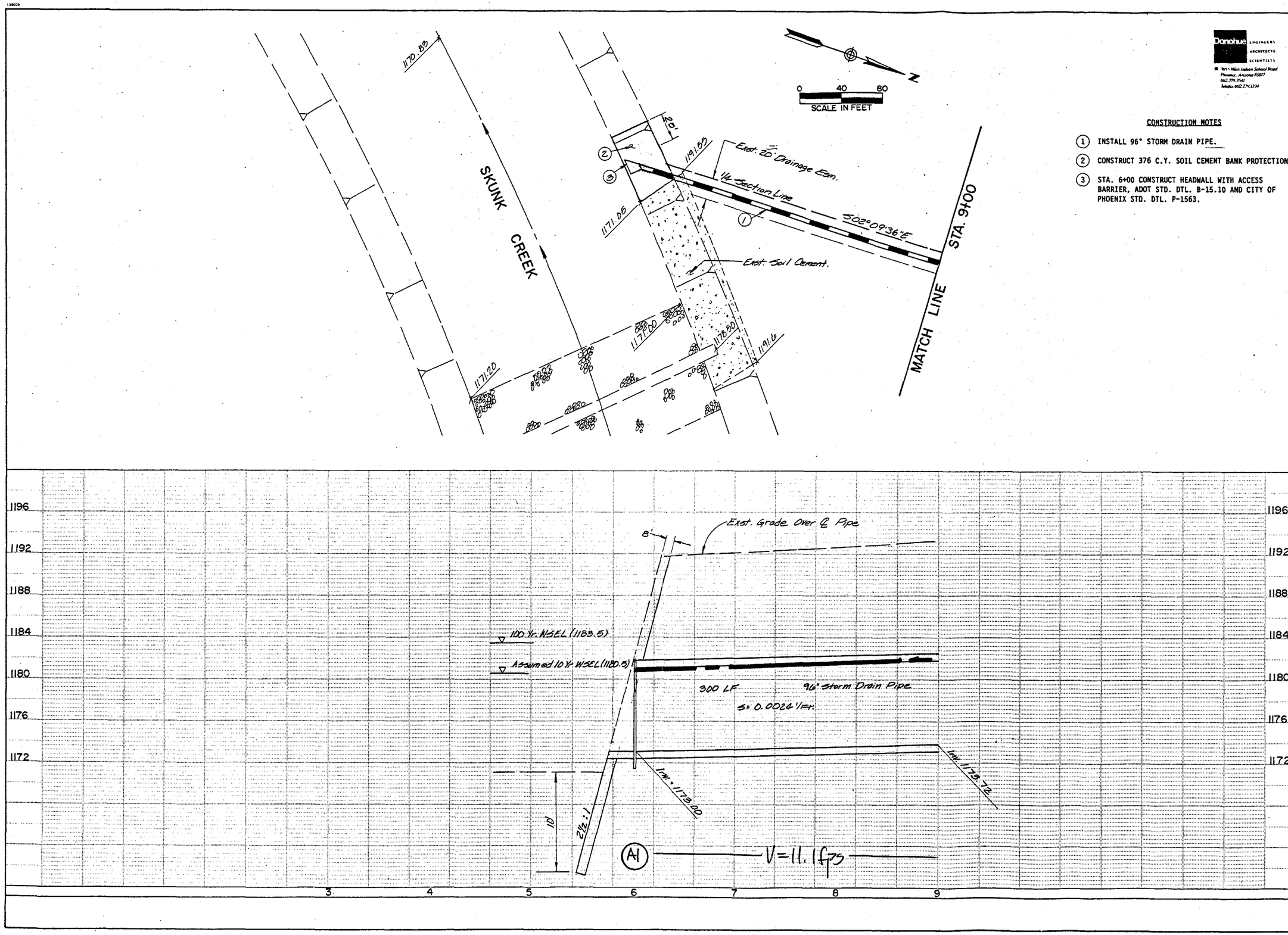
No.	Date	Description
		REVISIONS

BELL ROAD IMPROVEMENTS
OUTER LOOP TO 67TH AVE.
STORM DRAIN PLANS

263-100

SHT. 63
OF 126



Donohue ENGINEERS ARCHITECTS SCIENTISTS
1895 West Indian School Road
Phoenix, Arizona 85017
602-279-3541
Telefax 602-279-1334

CONSTRUCTION NOTES

1. INSTALL 96" STORM DRAIN PIPE.
2. CONSTRUCT 376 C.Y. SOIL CEMENT BANK PROTECTION.
3. STA. 6+00 CONSTRUCT HEADWALL WITH ACCESS BARRIER, ADOT STD. DTL. B-15.10 AND CITY OF PHOENIX STD. DTL. P-1563.

GLENDALE ARIZONA 1910

CITY OF GLENDALE
PUBLIC WORKS / ENGINEERING
5850 W. Glendale Avenue
Glendale, Arizona 85301 (602) 435-4152

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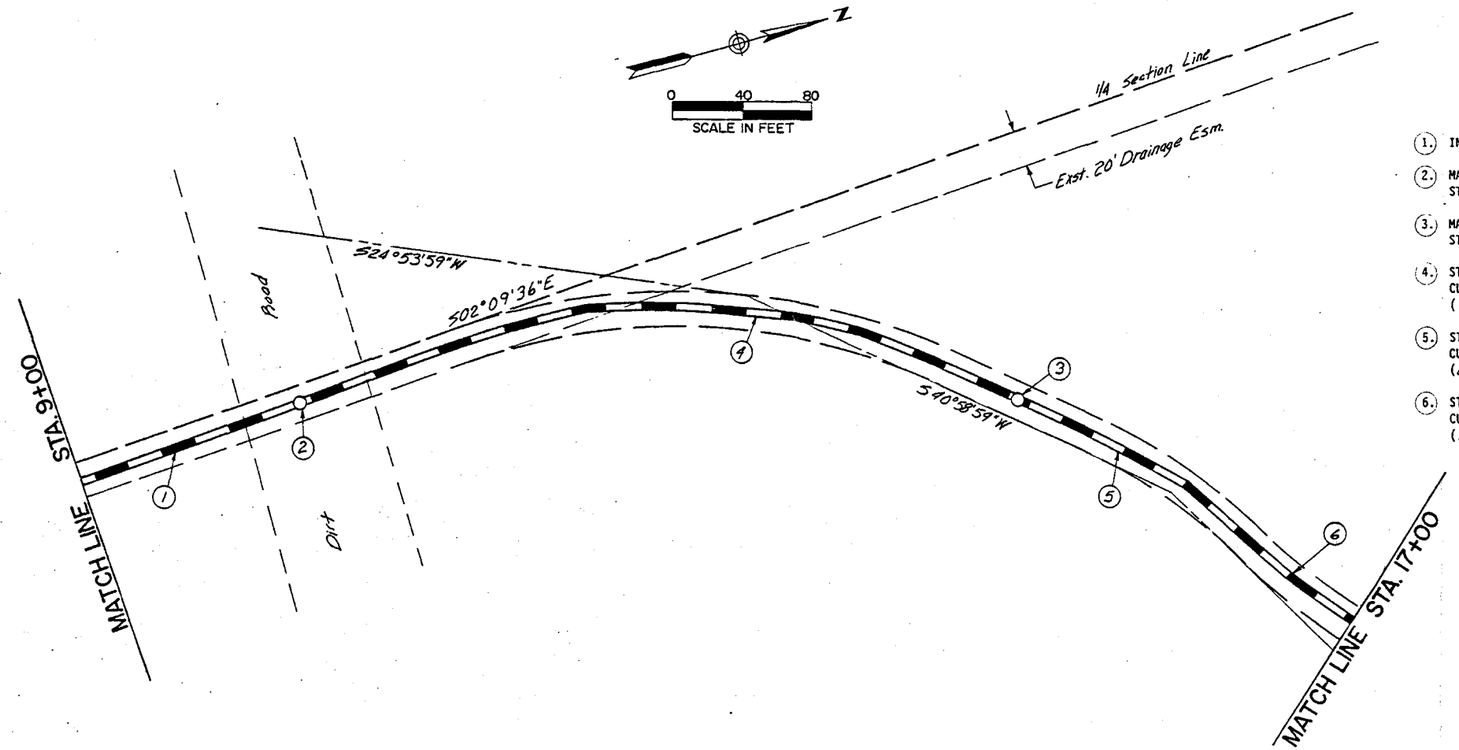
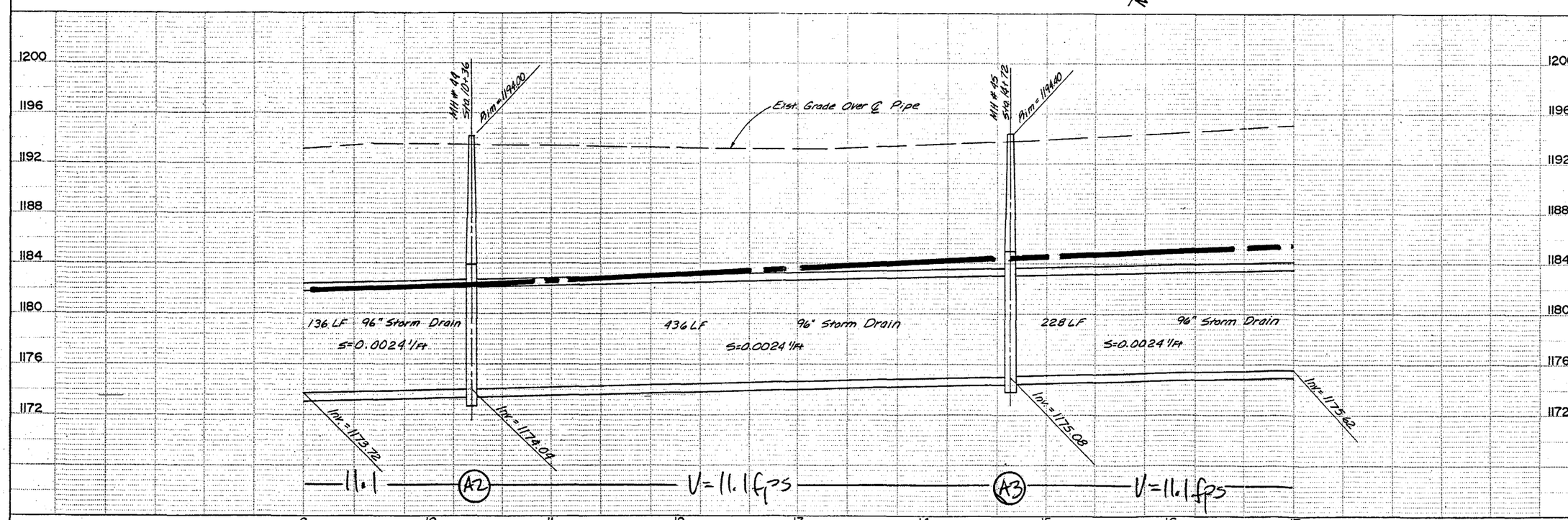
REVISIONS

BELL ROAD IMPROVEMENTS
OUTER LOOP TO 67TH AVE.
STORM DRAIN OUTFALL PLAN

Two working days before you dig ... call Blue Stakes 263-1100 Blue Stakes of Arizona Call 1-(800)-277-1133

SHT. 64
OF 126





Donohue ENGINEERS ARCHITECTS SCIENTISTS
5555 West Indian School Road
Phoenix, Arizona 85031
602.279.1541
Telefax 602.276.1314

CONSTRUCTION NOTES

1. INSTALL 96" STORM DRAIN PIPE.
2. MANHOLE #44, STA. 10+36, CONSTRUCT STORM DRAIN MANHOLE (MAG STD. DET. 521 & 522).
3. MANHOLE #45, STA. 14+72, CONSTRUCT STORM DRAIN MANHOLE (MAG STD. DET. 521 & 522).
4. STA. 11+36.68 TO STA. 14+22.96, CONSTRUCT STORM DRAIN ALONG CURVED ALIGNMENT. ($\Delta = 43^{0}09'52"$, R = 380')
5. STA. 15+20.96 TO STA. 16+25.02, CONSTRUCT STORM DRAIN ALONG CUVED ALIGNMENT. ($\Delta = 18^{0}45'00"$, R = 318')
6. STA. 16+25.02 TO STA. 20+81.95 CONSTRUCT STORM DRAIN ALONG CURVED ALIGNMENT. ($\Delta = 62^{0}08'23"$, R = 421.31')

GLENDALE ARIZONA 1910

CITY OF GLENDALE
PUBLIC WORKS / ENGINEERING
5850 W. Glendale Avenue
Glendale, Arizona 85301 (602) 435-4152

Designed
Drawn
Checked

No.	Date	Description

REVISIONS

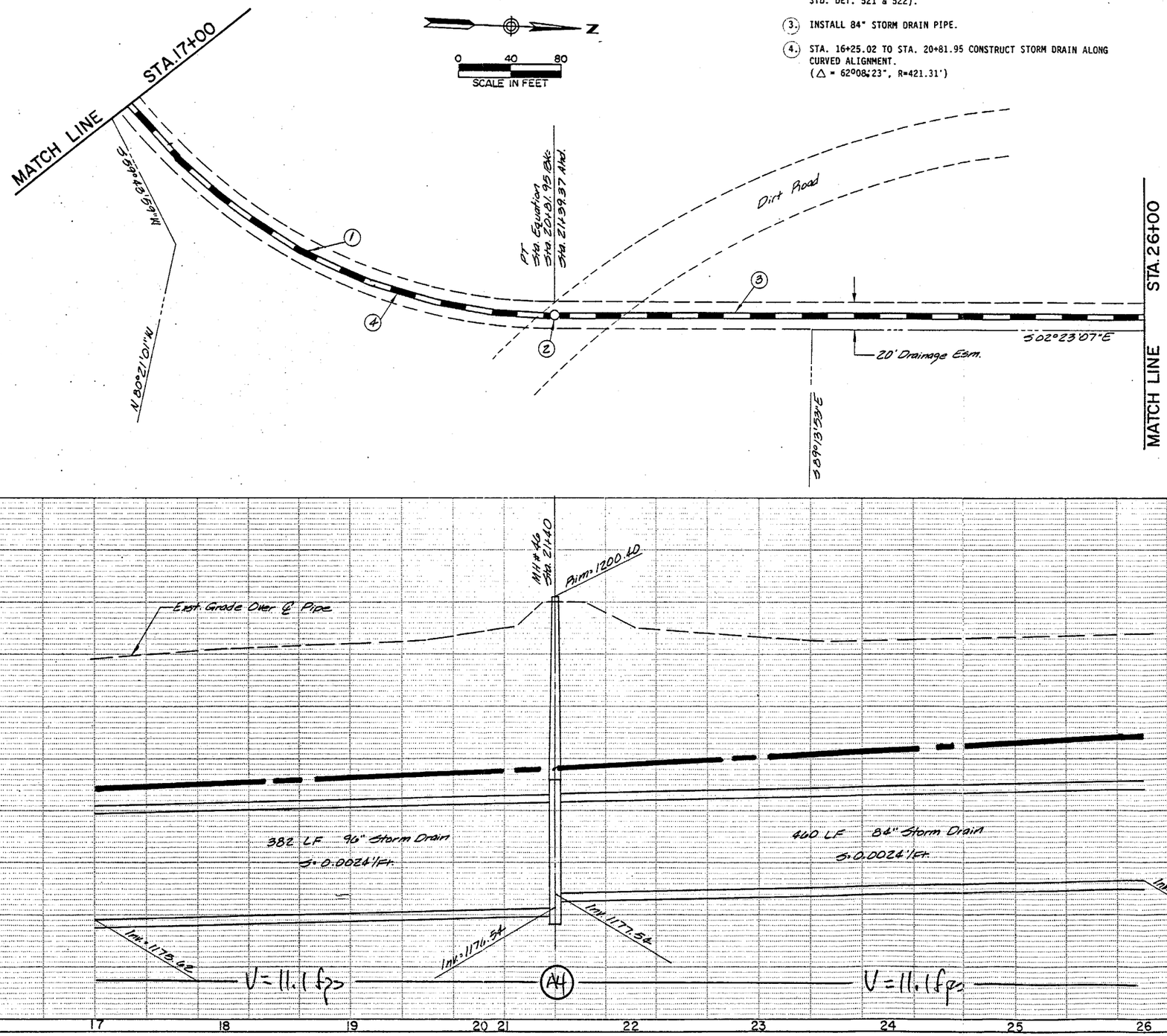
BELL ROAD IMPROVEMENTS
OUTER LOOP TO 67TH AVE.
STORM DRAIN OUTFALL PLAN

2S3-100

SHT. ____
OF ____

CONSTRUCTION NOTES

1. INSTALL 96" STORM DRAIN PIPE.
2. MANHOLE #46, STA. 21+40, CONSTRUCT STORM DRAIN MANHOLE (MAG STD. DET. 521 & 522).
3. INSTALL 84" STORM DRAIN PIPE.
4. STA. 16+25.02 TO STA. 20+81.95 CONSTRUCT STORM DRAIN ALONG CURVED ALIGNMENT. (Δ = 62°08'23", R=421.31')



Donohue ENGINEERS ARCHITECTS SCIENTISTS
4625 West Indian School Road
Phoenix, Arizona 85031
(602) 279-1141
Telexes (602) 279-1334

CITY OF GLENDALE
PUBLIC WORKS / ENGINEERING
5850 W. Glendale Avenue
Glendale, Arizona 85301 (602) 435-4152

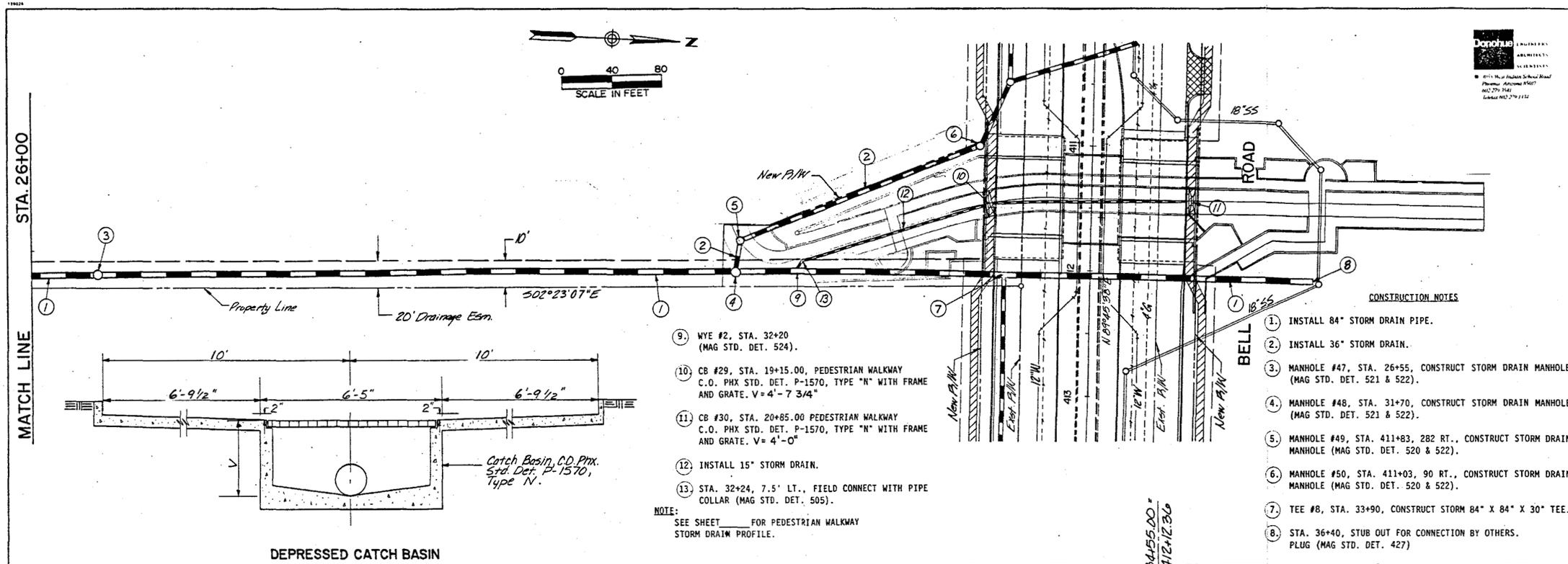
Designed	Drawn	Checked

No.	Date	Description
		REVISIONS

BELL ROAD IMPROVEMENTS
OUTER LOOP TO 67TH AVE.
STORM DRAIN OUTFALL PLAN

IT'S THE LAW! CALL 263-1100 FOR THE BLUE STAKES
263-1100
Blue Stake Center
CALL CARLETT

SHT. ____
OF ____

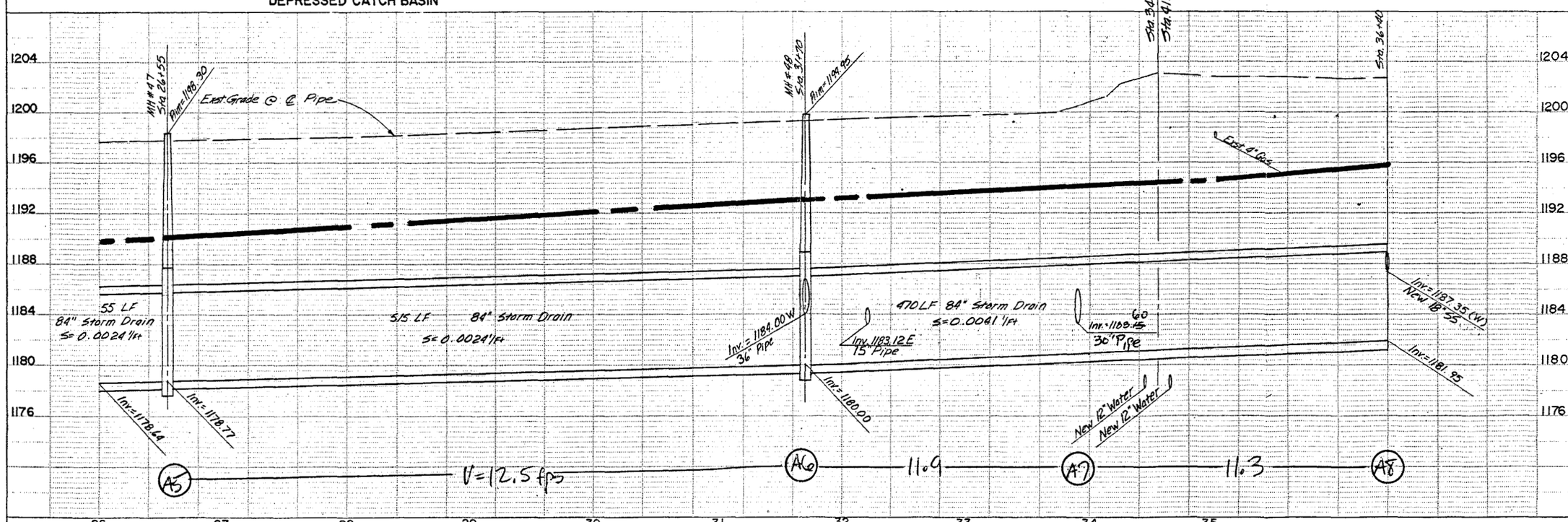


DEPRESSED CATCH BASIN

CONSTRUCTION NOTES

1. INSTALL 84" STORM DRAIN PIPE.
2. INSTALL 36" STORM DRAIN.
3. MANHOLE #47, STA. 26+55, CONSTRUCT STORM DRAIN MANHOLE (MAG STD. DET. 521 & 522).
4. MANHOLE #48, STA. 31+70, CONSTRUCT STORM DRAIN MANHOLE (MAG STD. DET. 521 & 522).
5. MANHOLE #49, STA. 411+83, 282 RT., CONSTRUCT STORM DRAIN MANHOLE (MAG STD. DET. 520 & 522).
6. MANHOLE #50, STA. 411+03, 90 RT., CONSTRUCT STORM DRAIN MANHOLE (MAG STD. DET. 520 & 522).
7. TEE #8, STA. 33+90, CONSTRUCT STORM 84" X 84" X 30" TEE.
8. STA. 36+40, STUB OUT FOR CONNECTION BY OTHERS. PLUG (MAG STD. DET. 427)
9. WYE #2, STA. 32+20 (MAG STD. DET. 524).
10. CB #29, STA. 19+15.00, PEDESTRIAN WALKWAY C.O. PHX STD. DET. P-1570, TYPE "N" WITH FRAME AND GRATE. V = 4'-7 3/4"
11. CB #30, STA. 20+85.00 PEDESTRIAN WALKWAY C.O. PHX STD. DET. P-1570, TYPE "N" WITH FRAME AND GRATE. V= 4'-0"
12. INSTALL 15" STORM DRAIN.
13. STA. 32+24, 7.5' LT., FIELD CONNECT WITH PIPE COLLAR (MAG STD. DET. 505).

NOTE:
SEE SHEET_____FOR PEDESTRIAN WALKWAY STORM DRAIN PROFILE.



Donohue ENGINEERS ARCHITECTS SCIENTISTS
8115 W. at Indian School Road
Phoenix, Arizona 85037
(602) 279-7541
Telecopier (602) 279-1132

CITY OF GLENDALE
PUBLIC WORKS / ENGINEERING
5850 W. Glendale Avenue
Glendale, Arizona 85301 (602) 435-4152

Designed | Drawn | Checked

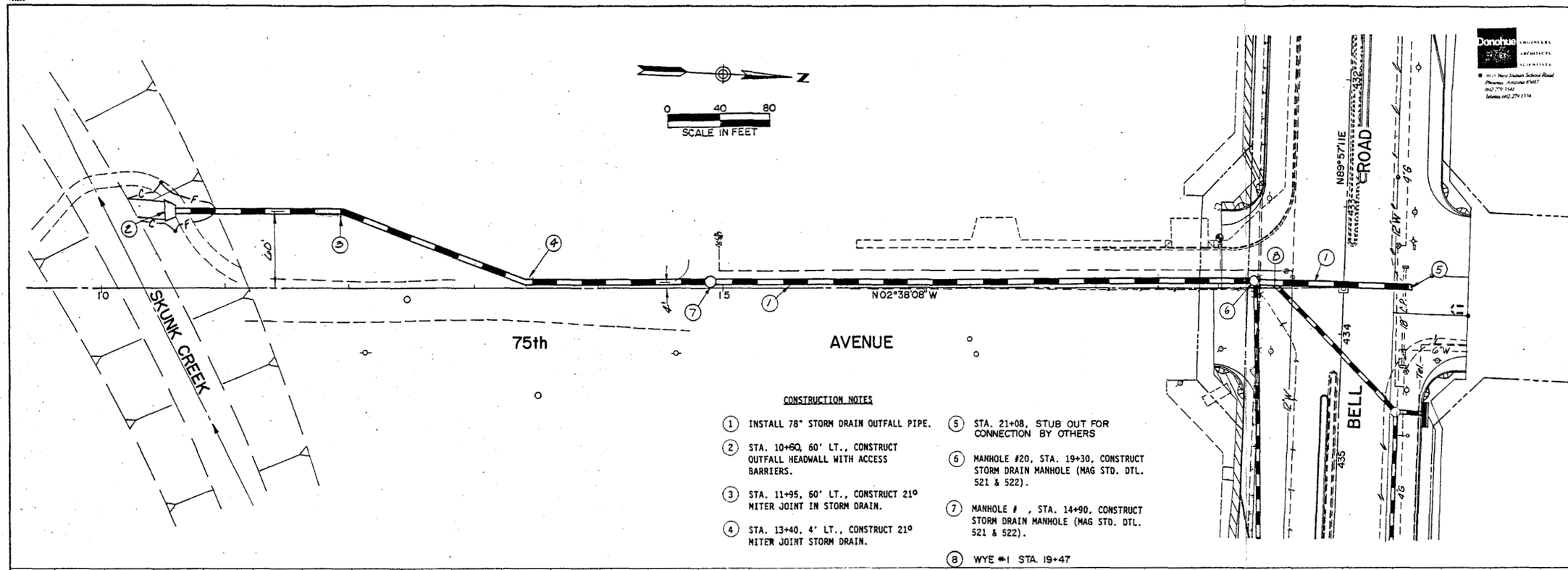
No.	Date	Description

REVISIONS

BELL ROAD IMPROVEMENTS
OUTER LOOP TO 67TH AVE.
STORM DRAIN OUTFALL PLAN

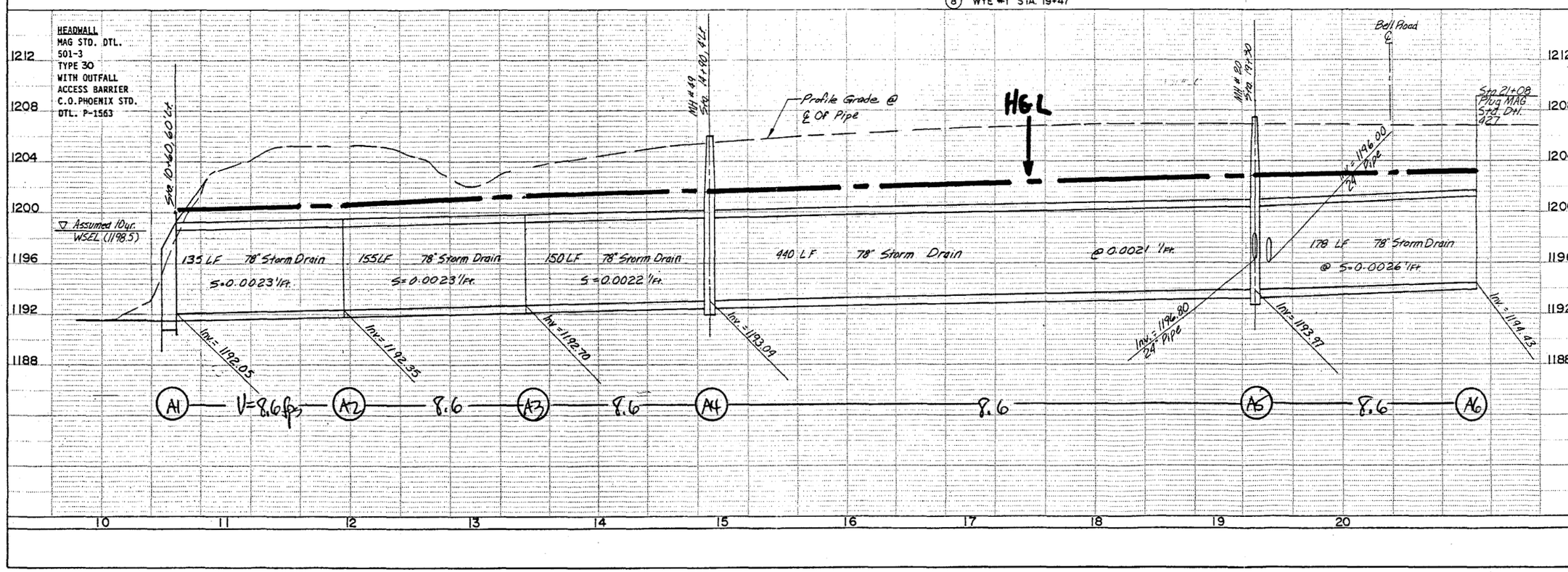
263-1130

SHT. 57
OF 126



CONSTRUCTION NOTES

1. INSTALL 78" STORM DRAIN OUTFALL PIPE.
2. STA. 10+60, 60' LT., CONSTRUCT OUTFALL HEADWALL WITH ACCESS BARRIERS.
3. STA. 11+95, 60' LT., CONSTRUCT 21° MITER JOINT IN STORM DRAIN.
4. STA. 13+40, 4' LT., CONSTRUCT 21° MITER JOINT STORM DRAIN.
5. STA. 21+08, STUB OUT FOR CONNECTION BY OTHERS
6. MANHOLE #20, STA. 19+30, CONSTRUCT STORM DRAIN MANHOLE (MAG STD. DTL. 521 & 522).
7. MANHOLE # , STA. 14+90, CONSTRUCT STORM DRAIN MANHOLE (MAG STD. DTL. 521 & 522).
8. WYE #1 STA. 19+47



BELL ROAD IMPROVEMENTS
OUTER LOOP TO 67TH AVE.
STORM DRAIN OUTFALL PLAN

Designed | Drawn | Checked

REVISIONS: No. | Date | Description

263-1100

SHT. 68 OF 126

APPENDIX 6

CORRESPONDENCE

CHARLES G. NIXON, P.E.
DENNIS L. DeWITT, P.E.

Val-Tec, Inc.

CONSULTING CIVIL ENGINEERS *In Arizona Since 1975* SITE DEVELOPMENT SPECIALISTS

August 3, 1990

Flood Control District of Maricopa County
3335 West Durango Street
Phoenix, Az. 85009

DONOHUE
AUG 06 1990
RECEIVED

Attn. Dave Johnson

RE: North Valley Mall
Stormwater Outfall to Skunk Creek
VT12-04

Dear Dave:

As stated in our previous discussion, Val-Tec, Inc., along with Donohue & Associates, is currently working with the Cities of Glendale and Peoria to design a stormwater outfall pipe extending from the proposed North Valley Mall to Skunk Creek. This sewer will be designed by convey the 100 year stormwater runoff from approximately 147 acres of commercial development North of Bell Road and an additional 55 acres of commercial development South of Bell Road. The sewer will also serve as the stormwater outfall for a portion of Bell Road between 75th and 83rd Avenues and 79th Avenue between Bell Road and Union Hills.

The current design of this sewer utilizes the 100 year water surface elevation in Skunk Creek as the tailwater elevation for the 100 year hydraulic design of the outfall pipe. Upon review of the preliminary hydraulic design, Val-Tec has proposed that the 100 year water surface elevation is overly conservative and has suggested that the 10 year elevation be used instead.

A similar criteria was recently used in the A.D.O.T. design of the Phoenix and Tempe large diameter drainage tunnels. In this case a 10 year flow in the Salt River was used as the tailwater elevation for the 50 and 100 year hydraulic design of the tunnels.

Our recommendation is based primarily on the differences on the size and configuration of the Skunk Creek watershed and the North Valley Mall drainage area. The 100 year flow from the North Valley Mall represents approximately 0.1% of the 100 year flow in Skunk Creek and will have a time of concentration of approximately 35 minutes.

1889 E. CAMELBACK RD., SUITE 'A', PHOENIX, AZ 85016 (602) 265-6417

Parsons Brinckerhoff 100 YEARS

Parsons Brinckerhoff Quade & Douglas, Inc.

Engineers
Architects
Planners

1501 W. Fountainhead Parkway
Suite 400
Tempe, Arizona 85282
602-966-8295
Fax: 602-966-9234

P.O. Box 24158
Tempe, Arizona 85285-4158

April 12, 1990

Mr. Rich DeBoer
ARIZONA STATE HIGHWAY DEPARTMENT
Urban Highways Section
217 South 17th Avenue
Phoenix, Arizona 85007

Subject: Bell Road - Outer Loop to 67th Avenue
MCHD Project No. 68546

Re: Drainage of Bell Road Between Outer Loop and 83rd Avenue

Dear Mr. DeBoer:

The purpose of this letter is to seek ADOT approval to discharge roadway drainage from Bell Road between (relocated) 83rd Avenue and the Outer Loop to an ADOT drainage channel at the southeast corner of the Bell Road Traffic Interchange. The required catch basins and storm drains would be constructed as part of the above-referenced project, tentatively scheduled for winter 1991.

A peak flow of approximately 10 cfs would be discharged to the ADOT channel. This estimate was calculated by the rational method using the following parameters:

- Design frequency = 10 years
- Time of concentration = 10 minutes
- Runoff coefficient (C) = 0.95
- Rainfall intensity (i) = 3.8 inches/hour
- Area (A) = 2.8 acres

We believe that drainage from Bell Road would not overload the existing ADOT channel or other downstream facilities for the following reasons:

- Bell Road between the Outer Loop and (relocated) 83rd Avenue is assumed to be already included in the drainage area used to calculate the runoff to the ADOT channel and therefore will not add additional flow to the present peak flow.

- The time of concentration of on-site flows is assumed to be very short in comparison with that of off-site flows; therefore, by the time the peak off-site flow reaches the channel the peak on-site flow will have receded to an insignificant level.

We would appreciate it very much if you could review this request as soon as possible, since this project has a tight design schedule. If you have nay questions, please call me at 966-8295.

Very truly yours,

PARSONS BRINCKERHOFF QUADE & DOUGLAS, INC.

David C. Healey

David C. Healey, P.E.
Section Engineer

DCH/lls

c: Kent McLain, MCHD
Larry Broyles, City of Glendale
File 206-5.1

ARIZONA DEPARTMENT OF TRANSPORTATION

HIGHWAYS DIVISION

206 South Seventeenth Avenue Phoenix, Arizona 85007

ROSE MOFFORD
Governor

CHARLES L. MILLER
Director

THOMAS A. BRYANT, II
State Engineer

RECEIVED

MAY 03 1990

PARSONS
BRINCKERHOFF

April 26, 1990

David C. Healey, P.E.
Section Engineer
Parsons, Brinkerhoff, Quade & Douglas, Inc.
1501 W. Fountainhead Parkway, Suite 400
Tempe, Arizona 85282

Re: Drainage of Bell Road Between Agua Fria Freeway and 83rd Avenue

Dear Mr. Healey:

We have reviewed your April 12, 1990 letter and find your proposal acceptable. The discharge stormwater into ADOT's drainage channel at the southeast corner of the freeway and Bell Road does not adversely effect the channel's ability to convey the design discharge to the New River.

Most of the drainage between the freeway and Bell Road was included in the design of the channel. Because of the southerly sloping ground and the lack of curbs on the south half of Bell Road, the small area for the south one-half of Bell Road pavement was not specifically included within the overall drainage design. ADOT's drainage channel south of Bell Road does not intercept any overland flow.

The drainage channel peak design flow rate of 400 cfs comes primarily from the depressed roadways at Union Hills and along Beardsley Road. The time of concentration for the channel is significantly larger than the 10 minutes you have used for Bell Road. Peak flows from Bell Road will most likely not be coincident and not add to the peak flow of ADOT's channel..

We have found that the 10-minute, 10-year storm intensity used by the Section Designer is nominally higher than your design value (4.38 vs. 3.8 inches per hour). However, your adjusted peak flow rate of 11.7 cfs is insignificant compared with the design flow rate for the channel and is well within the accuracy of the hydrologic calculation.

Considering that most of the drainage area is included within ADOT's calculations and that this discharge does not add to the peak flow rate of the channel, the discharge of Bell Road stormwater runoff into ADOT's drainage channel is acceptable to us. This is a preliminary hydraulic approval. Final approval is required through the ADOT District 1 Permit Supervisor.

Please be aware that the MCHD will be responsible for the water quality of the stormwater being discharged into ADOT's channel. Any future NPDES permit requirements which may result from this discharge is the responsibility of MCHD.

Very truly yours,

Rolando M. Simeon
Urban Highway Engineer

/bjf

cc: R. Jordan, ADOT
J. Melanson, DCCO

VAL-TEC, INC. CONSULTING CIVIL ENGINEERS
CIVIL ENGINEERING AND SITE DEVELOPMENT SPECIALISTS IN ARIZONA SINCE 1975
CHARLES G. NIXON, P.E. DENNIS L. DeWITT, P.E., L.S.

March 5, 1990

Mr. Larry Broyles, P.E.
Project Manager
City of Glendale
5850 West Glendale Avenue
Glendale, AZ 85301

RE: North Valley Mall Stormwater Outfall
to Skunk Creek
VT 13-10

Dear Larry:

As requested in our meeting of February 22, 1990, Val-Tec has developed the following North Valley Mall criteria to be utilized by Donohue and Associates in their design of the Bell Road/North Valley Mall stormwater outfall pipe. It is our understanding that the outfall pipe will be designed to meet the criteria required by the North Valley Mall as well as that required for the roadway drainage of Bell Road.

As discussed with Mr. Bill Amlong and Mr. Dan Sherwood of your staff, it is the intent of this criteria to provide for the conveyance of stormwater from the North Valley Mall for storms up to and including the 25-year, t_c = 30 minute, design storm (intensity = ±2.6 in/hr. Additionally the design will be evaluated to access the impact of greater storms up to and including the 100-year, t_c = 30 minutes design storm (intensity = ±3.35 in/hr) and will convey such storms to the extent that ponding does not adversely impact the development of the North Valley Mall or adjacent commercial parcels. In all cases the storm drain will convey stormwater greater than that generated from the retention requirement 100-year-2 hour storm (intensity = 1.25 in/hr).

The following criteria applies to the design of the stormwater outfall pipe at the North end of the Bell Road grade separation structure:

Maximum invert = 1185.5 (Glendale datum)
Total CA = 130
t_c = 30 minutes
Q25-year = 336 cfs, Maximum HW = 1192.5 @ Mall Inlet
Q100-year = 433 cfs
Q10-year - 129 cfs

Tailwater elevation: 100-year (35,000 cfs) HGL in Skunk Creek as shown on the Flood Control District of Maricopa County, 83rd Avenue Bridge over Skunk Creek construction documents. (±1183.5 FCD datum)

Enclosed with this letter are plan sheets showing the proposed alignment of the outfall pipe between Bell Road and Skunk Creek. This alignment has been preliminarily approved by the Flood Control District and the City of Peoria pending review of final calculations (see attached correspondence).

Additionally, we have indicated on the enclosed plan sheets the limits of the Westcor Parcels South of Bell Road which are to be considered in the design of the outfall pipe.

If you have any questions concerning this information, or if I can be of further assistance, please call.

Very truly yours,

for Val-Tec, Inc.

Tim Schoonhoven, P.E.
Project Manager

enclosure: City of Peoria correspondence, 2-22-90
Flood Control District Correspondence, 1-19-90
Exhibit 1 - Northwest Mall Topography
Exhibit 2 - Property Ownership Map

cc: Russ Ewers
Chuck Nixon
Dennis DeWitt
Judy Musgrove, City of Peoria
R. W. Shobe, F.C.D.M.C
Jim Zimlock, Donohue & Assoc.

file:1310strm.rpt

THE COLONNADE - 1889 E. CAMELBACK RD - PHOENIX, AZ 85016
(602) 265-6417 FAX (602) 234-3606

PEOPLE PROGRESS PRIDE

CITY OF PEORIA

February 22, 1990

RECEIVED FEB 1990 VAL-TEC 13-10

Mr. Tim Schoonhoven
Val Tech Engineering
1889 East Camelback Road Suite A
Phoenix, AZ 85016

RE: North Valley Mall Storm Water Outfall to Skunk Creek, ID-8802

Dear Mr. Schoonhoven:

Staff has reviewed the proposed storm drain outfall alignment and concurs with your plan, however we would like you to address the following comments:

1. Clarify whether a separate storm drain outfall is to be constructed, or if the Bell Road outfall is to be upsized.

2. Provide certification that Westcor intends to pay for the cost of designing and constructing a second outfall or upsizing the Bell Road outfall.

3. Provide verification that the Flood Control District approves of the alignment of the outfall crossing their property.

4. The outfall must be sized to convey the 100 year flood. For our review, please provide your design criteria used for sizing the pipe.

5. If any additional easements are needed, Westcor will be responsible for obtaining such easements.

If you have further questions, please contact Judy Musgrove at 979-6121.

Sincerely,

Judy T. Musgrove for

Eldon R. Johansen
City Engineer

DLN:221C

FLOOD CONTROL DISTRICT
of
Maricopa County

3335 West Durango Street • Phoenix, Arizona 85009
Telephone (602) 262-1501

D. E. Sagramoso, P.E., Chief Engineer and General Manager

BOARD OF DIRECTORS
Betsey Bayless
James D. Bruner
Carole Carpenter
Tom Freestone
Ed Pastor

JAN 19 1990

Mr. Tim Schoonhoven, P.E.
Project Manager
Val-Tec, Inc.
1889 East Camelback Road, Suite A
Phoenix, Arizona 85016

Subject: North Valley Mall, (Stormwater Outfall to Skunk Creek VT 12-04)

Dear Mr. Schoonhoven:

We have completed our review of your conceptual drainage design sent with your letter dated December 4, 1989. The District concurs with your proposal as submitted. It is assumed that North Valley Mall owners will operate and maintain the storm drain pipe. The outlet maintenance issue will need to be addressed later on in the development of the plans. As you develop the plans please resubmit them for our review and approval.

If you have any questions or need further information please call.

Sincerely,

R. W. Shobe, P.E.
Project Manager

Parsons Brinckerhoff

Parsons Brinckerhoff Quade & Douglas, Inc.
Engineers • Architects • Planners

Memorandum

To: Dave Healey

Date: July 20, 1987

From: Naji Ali-Adeeb

Job: 2246C104

Subject: Preliminary Cost Estimates of Alternative Plans for the Skunk Creek Bridge on Bell Road

Background

The Skunk Creek Bridge is one of four major highway bridge crossings on Bell Road, with a projected traffic volume of 25,500 vpd in the year 2005, (using unadjusted MAG data). A planned regional shopping center at 83rd Avenue could further increase the projected traffic volumes.

The existing bridge was constructed to a two-lane width in 1964 and widened to four lanes (74 feet) in 1976. Thus, the bridge presently provides two 36-foot clear roadways and no sidewalks.

The 295'-long, reinforced concrete structure consists of nine spans with wall-type piers and abutments founded on spread footings approximately 12 feet below the 1976 channel bottom. The bridge and supports incorporate a 45-degree skew angle.

The 1976 bridge plans show a low-chord elevation of 1218.79, a top-of-road elevation 1220.37, and a channel bed elevation of 1210±.

The 1964 bridge design called for the bridge to be submerged (DHW elev. 1222.4) during the then 100-year discharge of 36,000 cfs; and to operate under pressure (DHW elev. 1219.9) during the then 50-year discharge of 26,000 cfs.

The 1976 study determined that the bridge had the capacity to pass the then 37-year discharge of 23,000 cfs at a DHW elev. 1219.0 (i.e., at the point of transition from open-channel flow to pressure flow.)

After the completion of Adobe Dam in April, 1982, the regulatory 100-year discharge on Skunk Creek was reduced to 12,650 cfs at Bell Road. Using this discharge, a 1981 Flood Insurance Study determined a bridge headwater elevation of 1217.46, indicating that the bridge was capable of passing the current regulatory discharge as open-channel flow with about 1.5' freeboard. This is in conformance with current design criteria.

The 1981 Flood Insurance Study used aerial topography flown on 2/4/80 and showing a channel-bed elevation of 1208 at the bridge. This is two feet below the 1976 channel-bed elevation of 1210. Arizona Department of Transportation (ADOT) Bridge Inspection Reports show the channel-bed elevation remaining at 1208± from 12/1/81 thru 12/4/85.

1232 East Broadway, Suite 120 • Tempe, Arizona 85282 • 602-966-8295

Current Conditions

Sometime in 1986, a haul road was excavated under the two central spans of Skunk Creek bridge. The resulting pit almost reaches the depth of the spread footings supporting the three central piers, while excavated material is partially blocking adjacent bridge spans. In addition to the obvious danger of having exposed footings supporting the bridge structure, the problem is aggravated by the alteration to the watercourse, concentrating the flow and increasing the potential for contraction and local scour. Clearly, this situation is unsafe.

As pointed out earlier, the channel bed elevation at the bridge crossing remained around 1208 for at least six years after degrading two feet from the 1976 elevation suggesting that this elevation (1208) provides a relatively stable slope for the reach. In the absence of a more detailed analysis of the long-term sediment-transport characteristics of Skunk Creek, it is recommended that the channel bed be restored to its 1208 elevation at Bell Road, regardless of the treatment ultimately chosen for the bridge.

Two projects currently underway will likely impact Skunk Creek upstream of Bell Road. The Outer Loop Highway Project, SR-417, is in its final design phase under the management of Deleuw Cather & Company. Runoff intercepted by SR-417, west of the CAP canal, will be conveyed along the highway and discharged into Scatter Wash, a Skunk Creek tributary, near 35th Avenue. However, these flows will be routed through a series of structures and detention basins such that the peak discharge to Scatter Wash will match existing conditions (about 70 cfs). The Outer Loop Highway project is therefore not expected to have any impact on the Bell Road bridge over Skunk Creek.

The second project is the Union Hills Drive Drainage Study, being conducted by Erickson & Salmon, Inc. for the Flood Control District of Maricopa County. The study proposes a ten-year-capacity storm drain which collects flows along Union Hills Drive west of the CAP canal and discharges these flows to Skunk Creek near 59th Avenue. For storms larger than the ten-year magnitude, the storm drain system will be surcharged, delivering a maximum of 1,600 cfs during the 100-year event. The discharge hydrograph to Skunk Creek will thus show an abrupt rise and a flat peak of relatively long duration during a 100-year storm. As a result of controlled release from Adobe Dam, the Skunk Creek 100-year hydrograph is also distinguished by a flat peak of long duration. The firm of Erickson & Salmon, therefore, added the peak discharge from the storm drain directly to the Skunk Creek peak discharge, in their analysis of the 59th Avenue bridge on Skunk Creek. This seems quite reasonable and it is recommended that 1600 cfs be added to the current regulatory 100-year discharge of 12,650 cfs at Bell Road. Thus, a design discharge of 14,250 cfs was used in this analysis.

Using a revised version of the 1981 HEC-2 model, it was found that the existing bridge is capable of conveying the design discharge of 14,250 cfs without exceeding the current regulatory floodway limits.

Using data from the above HEC-2 model, a potential depth of local scour around the bridge piers of up to ten feet, during a 100-year storm, was calculated. This implies that, during a 100-year storm, a local scour hole reaching the depth of existing spread

footings could develop. Clearly, this situation is potentially unsafe, and scour protection measures (such as rock riprap, or gabion mattresses) should be provided for the existing bridge.

Alternative Plans

The existing roadways are capable of meeting the minimum traffic capacity and service level requirements. However, the desirable "full roadway section" at this location consists of two 47-foot clear roadways, a 16-foot median allowing for a future left-turn lane, and two sidewalks; a total roadway width of 110 feet.

As a result of the Bell Road Widening Project, three alternatives are presently under consideration for the Skunk Creek bridge.

The first alternative represents the minimal treatment required. This consists of adding two six-foot sidewalks separated from traffic by concrete barriers, and of restoring the channel bed to its 1208 elevation and providing scour protection measures (probably a 9" thick gabion mattress tied to the piers and extending over the full right-of-way width.)

The second alternative is to provide the full roadway section by widening the existing bridge by another 36 feet and adding two sidewalks. The channel bed will also need to be restored to its 1208 elevation and scour protection measures installed.

The third alternative is to demolish the existing bridge and replace it with a new bridge wide enough to accommodate the full roadway section and two sidewalks. A conceptual bridge design, utilizing the 1980 topo and a revised version of the 1981 HEC-2 model, indicates that a three-span, 246-foot-long reinforced concrete bridge would convey the design discharge without exceeding current regulatory floodway limits. The bridge would be constructed on drilled shaft foundations, eliminating the need for any significant scour protection measures. The design does, however, assume that the channel bed has been restored to its 1208 elevation. The roadway elevation was raised to 1222, and the low-chord elevation was set at 1218 in the conceptual bridge design. A design headwater elevation of 1216 allows for about 2-feet of freeboard.

A preliminary estimate of the relative costs of the three alternative plans is presented on the following page.

COMPARATIVE COSTS OF ALTERNATIVE PLANS FOR THE FUTURE BELL ROAD BRIDGE AT SKUNK CREEK

	Existing Bridge (74' x 295') **Add Sidewalks**	Existing Bridge (74' x 295') **Widen to 110' & Add Sidewalks**	**New Bridge** 110' x 246' Plus Sidewalks
Channel Improvement and Scour Protection	$200,000	$ 200,000	----
Sawcut and Remove Structure for Widening @ $15/sq. ft.	----	27,000	----
Bridge Widening @ $55/sq. ft.	----	617,000	----
Demolition of Existing Bridge @ $15/sq. ft.	----	----	332,000
New Bridge Construction @ $50/sq. ft.	----	----	1,353,000
Sidewalk @ $50/sq. ft.	236,000	236,000	197,000
Traffic Control During Construction	----	50,000	50,000
TOTALS	**$436,000**	**$1,130,000**	**$1,932,000**

NAA/ksl

APPENDIX 7

HEC-II MODEL INPUT/OUTPUT

THIS RUN EXECUTED 12/ 6/90 10: 2:55

****
HEC2 RELEASE DATED SEP 88 UPDATED SEPT 1989

MARICOPA CO. FIS
COE & VAN LOO

ERROR CORR - 01,02,03
MODIFICATION -
****

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

PRESENT CONDITION

10-YEAR FLOWS, EXISTING

10-YR Q = 2200 CFS
50-YR Q = 6700 CFS
100-YR Q = 11,000 CFS

SUMMARY PRINTOUT

	SECNO	Q	CWSEL	DEPTH	ELMIN	EG	CRIWS	VCH	10*KS	XLCH	SSTA	TOPWID	ENDST
	1.663	2200.00	1187.70	4.00	1183.70	1188.59	1187.22	7.58	79.18	.00	9948.12	99.46	10047.58
	1.663	6700.00	1190.60	6.90	1183.70	1192.55	1190.01	11.22	78.68	.00	9941.53	112.16	10053.69
	1.663	11000.00	1192.50	8.80	1183.70	1195.31	1192.01	13.45	82.14	.00	9937.21	120.48	10057.69
	1.763	2200.00	1191.77	4.97	1186.80	1192.71	1191.26	7.75	76.26	528.00	9949.73	92.38	10042.11
	1.763	6700.00	1194.75	7.95	1186.80	1196.81	1194.21	11.53	81.29	528.00	9945.19	108.28	10053.47
	1.763	11000.00	1196.80	10.00	1186.80	1199.63	1196.29	13.50	81.19	528.00	9942.04	119.25	10061.30
	1.857	2200.00	1195.15	4.55	1190.60	1195.94	1194.28	7.15	55.97	496.00	9955.09	88.08	10043.17
	1.857	6700.00	1198.52	7.92	1190.60	1200.26	1197.36	10.56	59.01	496.00	9942.77	103.88	10046.65
	1.857	11000.00	1200.65	10.05	1190.60	1203.18	1199.47	12.76	62.67	496.00	9938.55	110.29	10048.84
*	1.868	2200.00	1195.30	4.00	1191.30	1196.80	1195.30	9.82	153.05	58.00	9954.33	75.63	10029.96
*	1.868	6700.00	1198.64	7.34	1191.30	1201.29	1198.64	13.06	127.98	58.00	9946.20	98.25	10044.45
*	1.868	11000.00	1200.91	9.61	1191.30	1204.19	1200.91	14.53	119.51	58.00	9940.35	117.31	10057.66
*	1.912	2200.00	1197.61	7.11	1190.50	1198.14	1195.30	5.88	27.17	232.00	9967.93	73.96	10041.89
*	1.912	6700.00	1201.52	11.02	1190.50	1202.98	1198.97	9.69	41.96	232.00	9961.15	87.75	10048.90
*	1.912	11000.00	1203.72	13.22	1190.50	1206.08	1201.51	12.33	54.54	232.00	9957.35	95.47	10052.83
*	1.962	2200.00	1198.05	5.85	1192.20	1199.78	1197.92	10.56	110.90	264.00	9974.24	55.73	10029.97
*	1.962	6700.00	1202.03	9.83	1192.20	1205.28	1202.03	14.47	103.86	264.00	9966.37	72.32	10038.69
*	1.962	11000.00	1204.76	12.56	1192.20	1208.87	1204.76	16.28	97.54	264.00	9960.98	83.68	10044.66
*	2.034	2200.00	1201.02	7.12	1193.90	1201.51	1198.58	5.64	22.08	380.00	9955.16	79.78	10034.94
*	2.034	6700.00	1206.14	12.24	1193.90	1207.05	1202.24	7.68	21.34	380.00	9939.28	108.87	10048.15
*	2.034	11000.00	1209.45	15.55	1193.90	1210.62	1204.66	8.69	20.27	380.00	9898.50	156.71	10055.22
	2.129	2200.00	1202.20	6.00	1196.20	1202.79	1200.35	6.14	28.29	502.00	9969.80	77.54	10047.34
	2.129	6700.00	1207.16	10.96	1196.20	1208.30	1203.78	8.55	25.88	502.00	9964.40	94.10	10058.50
	2.129	11000.00	1210.33	14.13	1196.20	1211.89	1206.21	10.02	26.27	502.00	9960.94	103.80	10064.75

MARICOPA CO. FIS
COE & VAN LOO

SECNO	Q	CWSEL	DEPTH	ELMIN	EG	CRIWS	VCH	10*KS	XLCH	SSTA	TOPWID	ENDST
2.230	2200.00	1205.48	5.88	1199.60	1206.33	1205.48	7.40	136.22	533.00	9893.23	159.42	10052.65
2.230	6700.00	1209.14	9.54	1199.60	1209.88	1207.46	6.87	32.48	533.00	9865.14	198.85	10064.00
2.230	11000.00	1212.42	12.82	1199.60	1213.09	1208.76	6.61	17.05	533.00	9849.27	222.07	10071.34
2.319	2200.00	1210.01	3.11	1206.90	1210.48	1209.47	5.51	61.05	470.00	9924.39	185.53	10109.92
2.319	6700.00	1211.29	4.39	1206.90	1212.99	1211.29	10.45	123.16	470.00	9920.61	192.86	10113.47
2.319	11000.00	1213.08	6.18	1206.90	1214.97	1212.63	11.06	82.15	470.00	9916.13	202.32	10118.45
2.353	2200.00	1211.15	4.95	1206.20	1211.49	1209.98	4.74	48.27	180.00	9854.36	200.09	10060.63
2.353	6700.00	1213.72	7.52	1206.20	1214.42	1212.09	6.74	38.29	180.00	9853.44	207.22	10060.66
2.353	11000.00	1215.13	8.93	1206.20	1216.27	1213.36	8.55	44.54	180.00	9853.42	207.25	10060.67
2.379	2200.00	1211.18	5.28	1205.90	1211.67	.00	5.65	80.00	106.00	9871.95	188.67	10060.63
2.379	6700.00	1213.79	7.89	1205.90	1214.62	.00	7.32	49.77	106.00	9853.45	207.20	10060.66
2.379	11000.00	1215.27	9.37	1205.90	1216.52	.00	9.00	52.21	106.00	9853.43	207.24	10060.67
2.422	2200.00	1212.60	4.40	1208.20	1212.95	1211.38	4.73	32.93	258.00	9881.87	169.12	10050.99
2.422	6700.00	1214.92	6.72	1208.20	1215.81	1213.51	7.60	41.87	258.00	9868.52	188.49	10057.01
2.422	11000.00	1216.46	8.26	1208.20	1217.81	1214.94	9.31	45.77	258.00	9862.15	198.88	10061.04
2.491	2200.00	1214.13	5.63	1208.50	1214.54	1213.46	5.14	58.58	364.00	9814.02	213.28	10027.30
2.491	6700.00	1216.56	8.06	1208.50	1217.31	1215.23	6.95	39.62	364.00	9805.52	226.79	10032.32
2.491	11000.00	1218.29	9.79	1208.50	1219.30	1216.44	8.06	35.40	364.00	9799.47	236.24	10035.71
2.561	2200.00	1216.24	3.84	1212.40	1216.64	1215.65	5.04	55.00	370.00	9928.36	213.67	10142.03
2.561	6700.00	1218.16	5.76	1212.40	1219.12	1217.30	7.84	57.18	370.00	9924.58	221.23	10145.81
2.561	11000.00	1219.66	7.26	1212.40	1220.99	1218.53	9.24	53.14	370.00	9921.64	227.11	10148.75
2.634	2200.00	1217.44	5.04	1212.40	1217.56	1215.96	2.76	12.75	385.00	9897.15	323.42	10220.58
2.634	6700.00	1219.82	7.42	1212.40	1220.10	1217.31	4.20	12.90	385.00	9879.16	347.10	10226.26
2.634	11000.00	1221.56	9.16	1212.40	1221.94	1218.26	4.99	12.28	385.00	9874.47	355.93	10230.40
2.720	2200.00	1218.52	5.32	1213.20	1219.29	1218.52	7.04	177.11	454.00	9972.93	222.99	10195.92
2.720	6700.00	1220.47	7.27	1213.20	1221.57	1220.20	8.43	88.46	454.00	9969.90	257.26	10227.17
2.720	11000.00	1221.99	8.79	1213.20	1223.31	1221.39	9.20	65.91	454.00	9964.09	271.58	10235.67
2.801	2200.00	1221.43	4.13	1217.30	1221.67	1220.29	3.94	26.03	428.00	9837.05	227.45	10064.50
2.801	6700.00	1223.30	6.00	1217.30	1223.98	1222.00	6.59	37.65	428.00	9820.94	251.93	10072.87
2.801	11000.00	1224.52	7.22	1217.30	1225.59	1223.14	8.28	43.02	428.00	9819.36	257.38	10076.74
2.900	2200.00	1222.96	4.66	1218.30	1223.24	1222.16	4.25	34.31	523.00	9828.72	229.57	10058.28
2.900	6700.00	1225.19	6.89	1218.30	1225.84	1223.66	6.46	33.52	523.00	9820.10	240.29	10060.39
2.900	11000.00	1226.65	8.35	1218.30	1227.62	1224.86	7.91	34.99	523.00	9817.12	244.66	10061.78
3.000	2200.00	1224.84	4.84	1220.00	1225.14	1223.78	4.38	37.61	528.00	9935.30	184.80	10120.10
3.000	6700.00	1227.15	7.15	1220.00	1227.95	1225.55	7.15	46.29	528.00	9932.53	192.08	10124.61
3.000	11000.00	1228.69	8.69	1220.00	1229.92	1226.90	8.90	51.57	528.00	9930.69	197.30	10128.00
3.077	2200.00	1226.49	3.69	1222.80	1226.82	1225.55	4.57	44.73	407.00	9916.66	192.35	10109.01
3.077	6700.00	1229.02	6.22	1222.80	1229.74	1227.33	6.81	41.77	407.00	9910.41	203.83	10114.24
3.077	11000.00	1230.78	7.98	1222.80	1231.81	1228.66	8.16	41.37	407.00	9907.13	210.74	10117.87

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

SKUNK CREEK
OODPLAIN DELINEATION

ACDC TO CAP

MMENDED DATE:

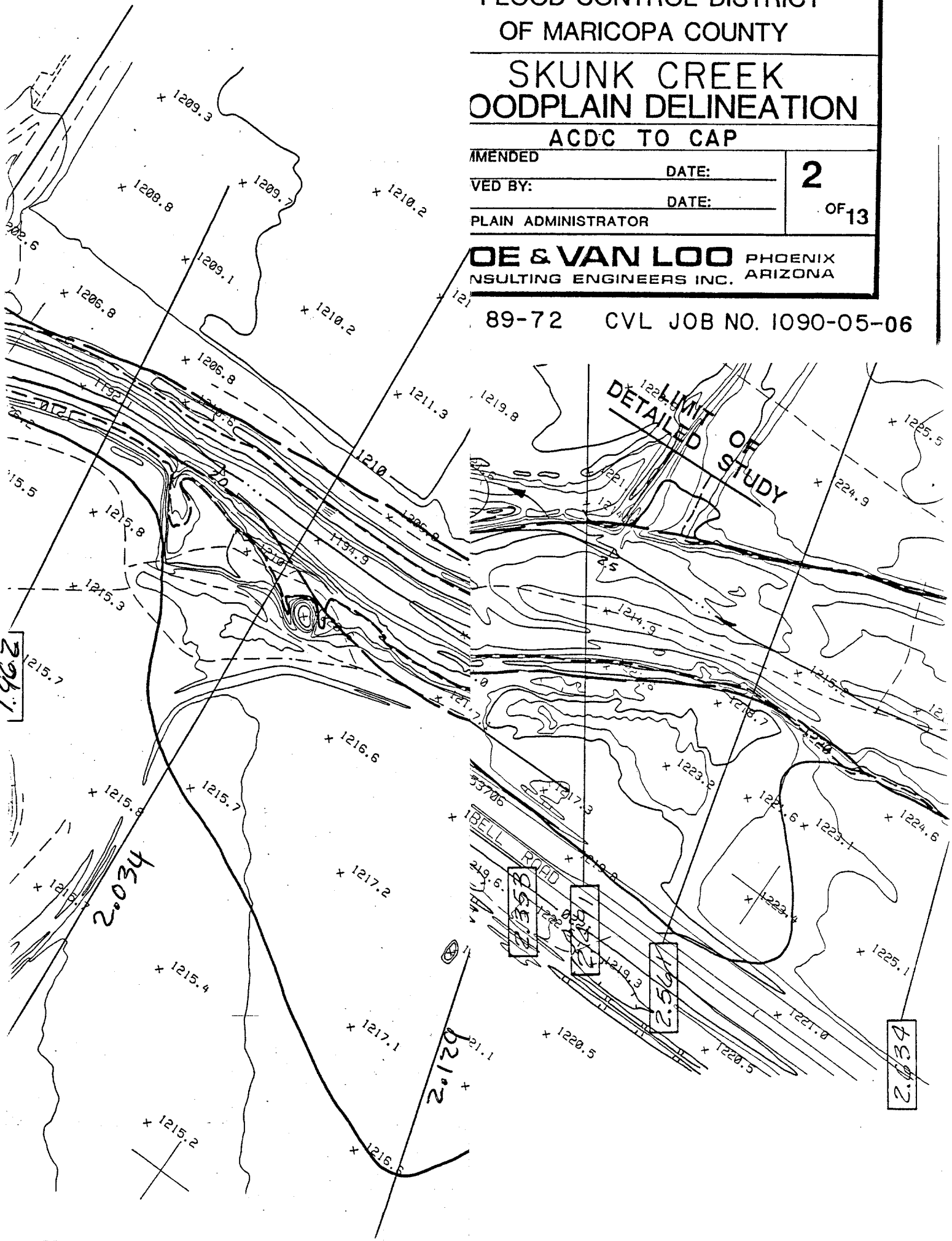
VED BY: DATE:

PLAIN ADMINISTRATOR

2 OF 13

OE & VAN LOO PHOENIX
NSULTING ENGINEERS INC. ARIZONA

89-72 CVL JOB NO. 1090-05-06



4/9/91

THIS RUN EXECUTED ~~07/29/90~~ 13:06:50

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**************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION
**************************************************
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Q_{100} = 11,000 cfs

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C
T1    BELL ROAD IMPROVEMENTS, SKUNK CREEK ANALYSIS  FILE: SKUNK1.DAT
T2          1000 FT. DOWNSTREAM TO 1400 FT. UPSTREAM OF BELL ROAD BRIDGE
T3      SKUNK CREEK-EXISTING CONDITIONS      Subcritical Flow

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

      0.       3.       0.       0. -1.000000     .00      .0       0.  1208.000     .000

J2  NPROF    IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

     1.000     .000   -1.000     .000     .000     .000   -1.000     .000     .000     .000

J3  VARIABLE CODES FOR SUMMARY PRINTOUT

    38.000    1.000   43.000   14.000    8.000   26.000    4.000    5.000   67.000   69.000

   100.000     .000     .000     .000     .000     .000     .000     .000     .000     .000

NC      .045     .045     .035     .100     .300     .000     .000     .000     .000     .000
QT     2.000 6700.000 11000.000     .000     .000     .000     .000     .000     .000     .000
          CRITICAL DEPTH OCCURS AT CHANNEL CONTRACTION
X1    30.000    8.000  340.000  560.000  350.000  240.000  300.000     .000     .000     .000
GR  1217.100     .000 1217.800  190.000 1217.000  340.000 1200.000  450.000 1200.000  490.000
GR  1212.000  560.000 1218.000  630.000 1216.000  680.000     .000     .000     .000     .000

X1    33.000    9.000  240.000  455.000  371.000  253.000  300.000     .000     .000     .000
GR  1217.000     .000 1217.000  180.000 1213.000  240.000 1205.000  300.000 1203.000  360.000
GR  1203.000  380.000 1204.000  430.000 1212.000  455.000 1213.500  470.000     .000     .000

X1    36.000    8.000   50.000  312.000  300.000  300.000  300.000     .000     .000     .000
GR  1216.000     .000 1218.000   50.000 1210.000  110.000 1206.000  195.000 1206.000  290.000
GR  1217.000  312.000 1219.100  430.000 1219.000  460.000     .000     .000     .000     .000

NC      .000     .000     .045     .000     .000     .000     .000     .000     .000     .000
          DOWNSTREAM SIDE OF BELL RD. BRIDGE
          0.045 'N' VALUE USED TO MODEL EFFECTS OF VEGETATION AT BRIDGE
X1    38.600   16.000  140.000  530.000  260.000  260.000  260.000     .707     .000     .000
GR  1219.000     .000 1216.000  140.000 1212.000  190.000 1211.000  214.000 1210.000  232.000
GR  1209.000  273.000 1207.500  290.000 1207.500  400.000 1208.000  456.000 1208.000  457.000
GR  1209.000  470.000 1210.000  475.000 1210.000  500.000 1211.000  510.000 1218.000  530.000
GR  1219.100  600.000     .000     .000     .000     .000     .000     .000     .000     .000
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SB      .900     1.560     2.600      .000    174.000     27.000   1704.000      2.000   1207.500   1207.500
        UPSTREAM SIDE OF BELL RD. BRIDGE
        SPECIAL BRIDGE ROUTINE USED
X1    40.200      .000      .000      .000    160.000    160.000    160.000      .707      .000      .000
X2      .000      .000     1.000   1218.800   1221.100      .000      .000     1.330      .707      .000
X3    10.000      .000      .000      .000      .000      .000      .000      .000      .000      .000
BT     8.000      .000   1219.600   1219.000    140.000   1219.600   1216.000    190.000   1219.600   1212.000
BT   191.000   1219.600   1218.800    456.000   1220.400   1218.800    457.000   1220.400   1208.000    530.000
BT  1220.400   1218.000    600.000   1220.400   1220.000      .000      .000      .000      .000      .000

X1    41.500     10.000      .000    243.000    130.000    130.000    130.000      .000      .000      .000
GR  1219.000      .000   1211.000     65.000   1210.000    100.000   1209.000    104.000   1208.000    155.000
GR  1208.000    205.000   1209.000    208.000   1210.000    215.000   1211.000    232.000   1219.000    243.000

X1    43.000      8.000    160.000    400.000    130.000    130.000    130.000      .000      .000      .000
GR  1218.000      .000   1217.000    140.000   1220.400    160.000   1210.000    300.000   1208.000    350.000
GR  1208.000    360.000   1210.000    375.000   1220.500    400.000      .000      .000      .000      .000

NC      .000      .000      .035      .100      .300      .000      .000      .000      .000      .000
X1    46.000     10.000    200.000    460.000    300.000    300.000    300.000      .000      .000      .000
GR  1220.500      .000   1219.000    145.000   1220.800    200.000   1214.000    275.000   1214.000    330.000
GR  1210.000    380.000   1210.000    395.000   1219.000    460.000   1216.000    520.000   1220.000    590.000

X1    48.400     12.000    320.000    550.000    240.000    240.000    240.000      .000      .000      .000
GR  1221.000      .000   1220.000     95.000   1220.000    180.000   1219.000    280.000   1221.000    320.000
GR  1214.000    380.000   1214.000    410.000   1213.000    430.000   1213.000    465.000   1222.000    550.000
GR  1223.000    570.000   1224.300    720.000      .000      .000      .000      .000      .000      .000

X1    51.000      8.000    210.000    560.000    260.000    260.000    260.000      .000      .000      .000
GR  1223.000      .000   1223.000    140.000   1224.000    210.000   1214.000    270.000   1214.000    430.000
GR  1217.000    530.000   1225.000    560.000   1225.700    770.000      .000      .000      .000      .000

X1    54.000     12.000     50.000    400.000    300.000    300.000    300.000      .000      .000      .000
GR  1225.000      .000   1224.000     50.000   1219.000     65.000   1219.000    100.000   1215.000    160.000
GR  1215.000    180.000   1217.000    210.000   1218.000    300.000   1218.000    390.000   1225.000    400.000
GR  1225.000    420.000   1228.000    560.000      .000      .000      .000      .000      .000      .000
EJ      .000      .000      .000      .000      .000      .000      .000      .000      .000      .000
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  SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS   BANK ELEV
  Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA   LEFT/RIGHT
  TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN      SSTA
  SLOPE    'XLOBL   XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID     ENDST


*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS


CCHV=    .100 CEHV=    .300
*SECNO 30.000
3720 CRITICAL DEPTH ASSUMED
         CRITICAL DEPTH OCCURS AT CHANNEL CONTRACTION
   30.00     8.72  1208.72  1208.72  1208.00  1211.54     2.81      .00      .00  1217.00
  11000.       0.   11000.       0.       0.     817.       0.       0.       0.   1212.00
     .00      .00    13.46      .00     .045     .035     .045     .000  1200.00   393.55
 .010367     350.     300.     240.        0        7        0      .00   147.34   540.89


*SECNO 33.000

3301 HV CHANGED MORE THAN HVINS

   33.00     9.19  1212.19  1209.46      .00  1213.14      .95     1.41      .19  1213.00
  11000.       0.   11000.       0.       0.    1409.       0.       8.       1.   1212.00
     .01      .00     7.81      .36     .045     .035     .045     .000  1203.00   246.05
 .002683     371.     300.     253.        2       15        0      .00   210.89   456.94


*SECNO 36.000
   36.00     6.99  1212.99  1211.76      .00  1214.36     1.37     1.09      .13  1218.00
  11000.       0.   11000.       0.       0.    1170.       0.      17.       3.   1217.00
     .02      .00     9.40      .00     .045     .035     .045     .000  1206.00    87.59
 .005227     300.     300.     300.        3       14        0      .00   216.38   303.98


*SECNO 38.600
         DOWNSTREAM SIDE OF BELL RD. BRIDGE
         0.045 'N' VALUE USED TO MODEL EFFECTS OF VEGETATION AT BRIDGE
   38.60     7.39  1214.89  1212.88      .00  1215.77      .88     1.36      .05  1216.00
  11000.       0.   11000.       0.       0.    1459.       0.      24.       4.   1218.00
     .03      .00     7.54      .00     .045     .045     .045     .000  1207.50   108.80
 .005260     260.     260.     260.        3       15        0      .00   259.62   368.42
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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

SPECIAL BRIDGE

SB	XK	XKOR	COFQ	RDLEN	BWC	BWP	BAREA	SS	ELCHU	ELCHD
	.90	1.56	2.60	.00	174.00	27.00	1704.00	2.00	1207.50	1207.50

*SECNO 40.200

3301 HV CHANGED MORE THAN HVINS

CLASS A LOW FLOW

3420 BRIDGE W.S.= 1214.16 BRIDGE VELOCITY=, 10.30 CALCULATED CHANNEL AREA=, 1068.

EGPRS	EGLWC	H3	QWEIR	QLOW	BAREA	TRAPEZOID AREA	ELLC	ELTRD
.00	1216.80	.35	0.	11000.	1704.	1916.	1218.80	1221.10

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA= 1216.00 ELREA= 1218.00

UPSTREAM SIDE OF BELL RD. BRIDGE
SPECIAL BRIDGE ROUTINE USED

40.20	7.74	1215.24	.00	.00	1216.80	1.56	1.03	.00	1216.00
11000.	0.	11000.	0.	0.	1097.	0.	29.	5.	1218.00
.03	.00	10.03	.00	.000	.045	.000	.000	1207.50	74.70
.008807	160.	160.	160.	0	0	0	.00	186.28	260.98

*SECNO 41.500

3301 HV CHANGED MORE THAN HVINS

41.50	8.76	1216.76	1214.14	.00	1217.66	.89	.78	.07	1219.00
11000.	0.	11000.	0.	0.	1449.	0.	33.	6.	1219.00
.04	.00	7.59	.00	.045	.045	.045	.000	1208.00	18.11
.004392	130.	130.	130.	2	15	0	.00	221.82	239.93

*SECNO 43.000

3301 HV CHANGED MORE THAN HVINS

43.00	8.93	1216.93	1216.27	.00	1218.87	1.93	.90	.31	1220.40
11000.	0.	11000.	0.	0.	986.	0.	37.	6.	1220.50
.04	.00	11.16	.00	.045	.045	.045	.000	1208.00	206.67
.012416	130.	130.	130.	3	12	0	.00	184.84	391.51

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


CCHV=    .100 CEHV=    .300
*SECNO 46.000

3265 DIVIDED FLOW


3301 HV CHANGED MORE THAN HVINS

    46.00      9.83  1219.83  1217.97       .00  1220.60       .77      1.62       .12  1220.80
   11000.       43.   10159.     798.       43.    1392.      267.       46.        8.   1219.00
      .05      1.00      7.30     2.98      .045      .035      .045      .000   1210.00     65.36
  .002998      300.      300.     300.         2        15         0       .00    480.96    586.92


*SECNO 48.400

3265 DIVIDED FLOW


3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    48.40      7.33  1220.33  1220.33       .00  1222.04      1.70      1.09       .28  1221.00
   11000.      297.   10703.       0.      135.    1010.        0.       54.       11.   1222.00
      .06      2.20     10.60      .00      .045      .035      .045      .000   1213.00     63.18
  .007653      240.      240.     240.         0        15         0       .00    452.09    534.27


*SECNO 51.000

3301 HV CHANGED MORE THAN HVINS

    51.00      8.36  1222.36  1218.31       .00  1222.72       .36       .55       .13  1224.00
   11000.        0.   11000.       0.        0.    2288.        0.       64.       13.   1225.00
      .07       .00      4.81      .00      .045      .035      .045      .000   1214.00    219.83
  .000977      260.      260.     260.         2        11         0       .00    330.28    550.11


*SECNO 54.000
    54.00      7.62  1222.62  1220.66       .00  1223.25       .63       .45       .08  1224.00
   11000.        0.   11000.       0.        0.    1728.        0.       78.       16.   1225.00
      .09       .00      6.37      .00      .045      .035      .045      .000   1215.00     54.13
  .002620      300.      300.     300.         3        19         0       .00    342.48    396.61
```

THIS RUN EXECUTED 07/29/90 13:08:11

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**************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION
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T1 BELL ROAD IMPROVEMENTS, SKUNK CREEK ANALYSIS
T2 1000 FT. DOWNSTREAM TO 1400 FT. UPSTREAM OF BELL ROAD BRIDGE
T3 SKUNK CREEK-EXISTING CONDITIONS Subcritical Flow

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0.	2.	0.	0.	-1.000000	.00	.0	0.	1208.000	.000

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	15.000	.000	-1.000	.000	.000	.000	-1.000	.000	.000	.000

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

```
*PROF 2

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS


CCHV=    .100 CEHV=    .300
*SECNO 30.000
3720 CRITICAL DEPTH ASSUMED
          CRITICAL DEPTH OCCURS AT CHANNEL CONTRACTION
    30.00     6.77  1206.77  1206.77  1208.00  1209.05     2.28      .00      .00  1217.00
    6700.       0.    6700.       0.       0.     553.       0.       0.       0.   1212.00
      .00      .00    12.12      .00     .045     .035     .045     .000  1200.00   406.19
  .011153     350.     300.     240.        0       14        0      .00   123.30   529.49


*SECNO 33.000

3301 HV CHANGED MORE THAN HVINS

    33.00     7.00  1210.00  1207.90      .00  1210.73      .73     1.53      .15  1213.00
    6700.       0.    6700.       0.       0.     975.       0.       5.       1.   1212.00
      .01      .00     6.87      .00     .045     .035     .045     .000  1203.00   262.49
  .002907     371.     300.     253.        2       19        0      .00   186.26   448.75


*SECNO 36.000
    36.00     4.97  1210.97  1210.39      .00  1212.20     1.23     1.32      .15  1218.00
    6700.       0.    6700.       0.       0.     754.       0.      11.       2.   1217.00
      .02      .00     8.89      .00     .045     .035     .045     .000  1206.00   102.68
  .007398     300.     300.     300.        3       14        0      .00   197.27   299.95


*SECNO 38.600

3301 HV CHANGED MORE THAN HVINS

          DOWNSTREAM SIDE OF BELL RD. BRIDGE
          0.045 'N' VALUE USED TO MODEL EFFECTS OF VEGETATION AT BRIDGE
    38.60     5.75  1213.25  1211.63      .00  1213.88      .64     1.62      .06  1216.00
    6700.       0.    6700.       0.       0.    1048.       0.      17.       4.   1218.00
      .03      .00     6.40      .00     .045     .045     .045     .000  1207.50   123.29
  .005340     260.     260.     260.        2       15        0      .00   241.82   365.11
```

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

SPECIAL BRIDGE

SB	XK	XKOR	COFQ	RDLEN	BWC	BWP	BAREA	SS	ELCHU	ELCHD
	.90	1.56	2.60	.00	174.00	27.00	1704.00	2.00	1207.50	1207.50

*SECNO 40.200

3301 HV CHANGED MORE THAN HVINS

CLASS A LOW FLOW

3420 BRIDGE W.S.= 1212.86 BRIDGE VELOCITY=, 7.92 CALCULATED CHANNEL AREA=, 846.

EGPRS	EGLWC	H3	QWEIR	QLOW	BAREA	TRAPEZOID AREA	ELLC	ELTRD
.00	1214.63	.24	0.	6700.	1704.	1916.	1218.80	1221.10

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA= 1216.00 ELREA= 1218.00

UPSTREAM SIDE OF BELL RD. BRIDGE
SPECIAL BRIDGE ROUTINE USED

40.20	5.99	1213.49	.00	.00	1214.63	1.14	.75	.00	1216.00
6700.	0.	6700.	0.	0.	783.	0.	20.	4.	1218.00
.04	.00	8.56	.00	.000	.045	.000	.000	1207.50	85.64
.009076	160.	160.	160.	0	0	0	.00	172.84	258.48

*SECNO 41.500

41.50	6.83	1214.83	1212.73	.00	1215.48	.65	.80	.05	1219.00
6700.	0.	6700.	0.	0.	1037.	0.	23.	5.	1219.00
.04	.00	6.46	.00	.045	.045	.045	.000	1208.00	33.87
.004416	130.	130.	130.	2	15	0	.00	203.39	237.27

*SECNO 43.000

3301 HV CHANGED MORE THAN HVINS

43.00	7.13	1215.13	1214.55	.00	1216.65	1.51	.91	.26	1220.40
6700.	0.	6700.	0.	0.	679.	0.	25.	6.	1220.50
.05	.00	9.87	.00	.045	.045	.045	.000	1208.00	230.88
.012753	130.	130.	130.	3	8	0	.00	156.35	387.23

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


CCHV=    .100 CEHV=    .300
*SECNO 46.000

3265 DIVIDED FLOW


3301 HV CHANGED MORE THAN HVINS

    46.00     7.92  1217.92  1216.50      .00  1218.66      .74      1.94      .08  1220.80
    6700.       0.    6561.     139.       0.     942.      69.       31.       7.   1219.00
      .06      .00     6.96     2.01     .045     .035     .045      .000  1210.00   231.73
  .003896     300.     300.     300.        2       11        0       .00   292.63   553.66


*SECNO 48.400

3301 HV CHANGED MORE THAN HVINS

    48.40     5.77  1218.77  1218.27      .00  1220.17     1.40      1.31      .20  1221.00
    6700.       0.    6700.       0.       0.     705.       0.       36.       8.   1222.00
      .07      .00     9.50      .00     .045     .035     .045      .000  1213.00   339.11
  .008164     240.     240.     240.        3       14        0       .00   180.39   519.50


*SECNO 51.000

3301 HV CHANGED MORE THAN HVINS

    51.00     6.57  1220.57  1217.26      .00  1220.81      .24       .52      .12  1224.00
    6700.       0.    6700.       0.       0.    1711.       0.       43.      10.   1225.00
      .08      .00     3.92      .00     .045     .035     .045      .000  1214.00   230.59
  .000886     260.     260.     260.        2       11        0       .00   312.80   543.38


*SECNO 54.000
    54.00     5.84  1220.84  1219.74      .00  1221.39      .55       .49      .09  1224.00
    6700.       0.    6700.       0.       0.    1124.       0.       53.      12.   1225.00
      .10      .00     5.96      .00     .045     .035     .045      .000  1215.00    59.48
  .003941     300.     300.     300.        3       19        0       .00   334.58   394.06
```

THIS RUN EXECUTED 07/29/90 13:09:15

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**************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION
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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

SKUNK CREEK-EXISTING CON

SUMMARY PRINTOUT

	SECNO	CWSEL	Q	QCH	DEPTH	VCH	TOPWID	10K*S	XECH1	XICE2
*	30.000	1208.72	11000.00	11000.00	8.72	13.46	147.34	103.67	.00	.00
*	30.000	1206.77	6700.00	6700.00	6.77	12.12	123.30	111.53	.00	.00
	33.000	1212.19	11000.00	10999.93	9.19	7.81	210.89	26.83	.00	.00
	33.000	1210.00	6700.00	6700.00	7.00	6.87	186.26	29.07	.00	.00
	36.000	1212.99	11000.00	11000.00	6.99	9.40	216.38	52.27	.00	.00
	36.000	1210.97	6700.00	6700.00	4.97	8.89	197.27	73.98	.00	.00
	38.600	1214.89	11000.00	11000.00	7.39	7.54	259.62	52.60	.00	.00
	38.600	1213.25	6700.00	6700.00	5.75	6.40	241.82	53.40	.00	.00
	40.200	1215.24	11000.00	11000.00	7.74	10.03	186.28	88.07	.00	.00
	40.200	1213.49	6700.00	6700.00	5.99	8.56	172.84	90.76	.00	.00
	41.500	1216.76	11000.00	11000.00	8.76	7.59	221.82	43.92	.00	.00
	41.500	1214.83	6700.00	6700.00	6.83	6.46	203.39	44.16	.00	.00
	43.000	1216.93	11000.00	11000.00	8.93	11.16	184.84	124.16	.00	.00
	43.000	1215.13	6700.00	6700.00	7.13	9.87	156.35	127.53	.00	.00
	46.000	1219.83	11000.00	10158.82	9.83	7.30	480.96	29.98	.00	.00
	46.000	1217.92	6700.00	6560.79	7.92	6.96	292.63	38.96	.00	.00
*	48.400	1220.33	11000.00	10702.50	7.33	10.60	452.09	76.53	.00	.00
	48.400	1218.77	6700.00	6700.00	5.77	9.50	180.39	81.64	.00	.00
	51.000	1222.36	11000.00	11000.00	8.36	4.81	330.28	9.77	.00	.00
	51.000	1220.57	6700.00	6700.00	6.57	3.92	312.80	8.86	.00	.00
	54.000	1222.62	11000.00	11000.00	7.62	6.37	342.48	26.20	.00	.00
	54.000	1220.84	6700.00	6700.00	5.84	5.96	334.58	39.41	.00	.00

SKUNK CREEK-EXISTING CON

SUMMARY PRINTOUT TABLE 100

SECNO	EGLWC	ELLC	EGPRS	ELTRD	QPR	QWEIR	CLASS	H3	DEPTH	CWSEL	VCH	EG
40.200	1216.80	1218.80	.00	1221.10	11000.00	.00	1.00	.35	7.74	1215.24	10.03	1216.8
40.200	1214.63	1218.80	.00	1221.10	6700.00	.00	1.00	.24	5.99	1213.49	8.56	1214.6

SUMMARY OF ERRORS AND SPECIAL NOTES

```
CAUTION  SECNO=    30.000  PROFILE= 1  CRITICAL DEPTH ASSUMED
CAUTION  SECNO=    30.000  PROFILE= 2  CRITICAL DEPTH ASSUMED

CAUTION  SECNO=    48.400  PROFILE= 1  CRITICAL DEPTH ASSUMED
CAUTION  SECNO=    48.400  PROFILE= 1  MINIMUM SPECIFIC ENERGY
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THIS RUN EXECUTED ~~07/29/90~~ 4/9/91 13:13:15

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**************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION
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C
T1    BELL ROAD IMPROVEMENTS, SKUNK CREEK ANALYSIS  FILE: SKUNK1.DAT
T2          1000 FT. DOWNSTREAM TO 1400 FT. UPSTREAM OF BELL ROAD BRIDGE
T3      SKUNK CREEK-EXISTING CONDITIONS      Subcritical Flow

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

      0.       3.        0.        0. -1.000000       .00        .0        0.  1208.000      .000

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

     1.000      .000    -1.000      .000      .000      .000    -1.000      .000      .000      .000

J3  VARIABLE CODES FOR SUMMARY PRINTOUT

    38.000     1.000    43.000    14.000     8.000    26.000     4.000     5.000    67.000    69.000


   100.000      .000      .000      .000      .000      .000      .000      .000      .000      .000


NC      .045      .045      .035      .100      .300      .000      .000      .000      .000      .000
QT     2.000  6800.000 13000.000      .000      .000      .000      .000      .000      .000      .000
          CRITICAL DEPTH OCCURS AT CHANNEL CONTRACTION
X1    30.000     8.000   340.000   560.000   350.000   240.000   300.000      .000      .000      .000
GR  1217.100      .000  1217.800   190.000  1217.000   340.000  1200.000   450.000  1200.000   490.000
GR  1212.000   560.000  1218.000   630.000  1216.000   680.000      .000      .000      .000      .000

X1    33.000     9.000   240.000   455.000   371.000   253.000   300.000      .000      .000      .000
GR  1217.000      .000  1217.000   180.000  1213.000   240.000  1205.000   300.000  1203.000   360.000
GR  1203.000   380.000  1204.000   430.000  1212.000   455.000  1213.500   470.000      .000      .000

X1    36.000     8.000    50.000   312.000   300.000   300.000   300.000      .000      .000      .000
GR  1216.000      .000  1218.000    50.000  1210.000   110.000  1206.000   195.000  1206.000   290.000
GR  1217.000   312.000  1219.100   430.000  1219.000   460.000      .000      .000      .000      .000

NC      .000      .000      .045      .000      .000      .000      .000      .000      .000      .000
          DOWNSTREAM SIDE OF BELL RD. BRIDGE
          0.045 'N' VALUE USED TO MODEL EFFECTS OF VEGETATION AT BRIDGE
X1    38.600    16.000   140.000   530.000   260.000   260.000   260.000      .707      .000      .000
GR  1219.000      .000  1216.000   140.000  1212.000   190.000  1211.000   214.000  1210.000   232.000
GR  1209.000   273.000  1207.500   290.000  1207.500   400.000  1208.000   456.000  1208.000   457.000
GR  1209.000   470.000  1210.000   475.000  1210.000   500.000  1211.000   510.000  1218.000   530.000
GR  1219.100   600.000      .000      .000      .000      .000      .000      .000      .000      .000
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$Q_{100} = 13000$ cfs

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SB      .900     1.560     2.600      .000    174.000     27.000   1704.000      2.000   1207.500   1207.500
        UPSTREAM SIDE OF BELL RD. BRIDGE
        SPECIAL BRIDGE ROUTINE USED
X1    40.200      .000      .000      .000    160.000    160.000    160.000      .707      .000      .000
X2      .000      .000     1.000   1218.800   1221.100      .000      .000     1.330      .707      .000
X3    10.000      .000      .000      .000      .000      .000      .000      .000      .000      .000
BT     8.000      .000   1219.600   1219.000    140.000   1219.600   1216.000    190.000   1219.600   1212.000
BT   191.000   1219.600   1218.800    456.000   1220.400   1218.800    457.000   1220.400   1208.000    530.000
BT  1220.400   1218.000    600.000   1220.400   1220.000      .000      .000      .000      .000      .000

X1    41.500     10.000      .000    243.000    130.000    130.000    130.000      .000      .000      .000
GR  1219.000      .000   1211.000     65.000   1210.000    100.000   1209.000    104.000   1208.000    155.000
GR  1208.000    205.000   1209.000    208.000   1210.000    215.000   1211.000    232.000   1219.000    243.000

X1    43.000      8.000    160.000    400.000    130.000    130.000    130.000      .000      .000      .000
GR  1218.000      .000   1217.000    140.000   1220.400    160.000   1210.000    300.000   1208.000    350.000
GR  1208.000    360.000   1210.000    375.000   1220.500    400.000      .000      .000      .000      .000

NC      .000      .000      .035      .100      .300      .000      .000      .000      .000      .000
X1    46.000     10.000    200.000    460.000    300.000    300.000    300.000      .000      .000      .000
GR  1220.500      .000   1219.000    145.000   1220.800    200.000   1214.000    275.000   1214.000    330.000
GR  1210.000    380.000   1210.000    395.000   1219.000    460.000   1216.000    520.000   1220.000    590.000

X1    48.400     12.000    320.000    550.000    240.000    240.000    240.000      .000      .000      .000
GR  1221.000      .000   1220.000     95.000   1220.000    180.000   1219.000    280.000   1221.000    320.000
GR  1214.000    380.000   1214.000    410.000   1213.000    430.000   1213.000    465.000   1222.000    550.000
GR  1223.000    570.000   1224.300    720.000      .000      .000      .000      .000      .000      .000

X1    51.000      8.000    210.000    560.000    260.000    260.000    260.000      .000      .000      .000
GR  1223.000      .000   1223.000    140.000   1224.000    210.000   1214.000    270.000   1214.000    430.000
GR  1217.000    530.000   1225.000    560.000   1225.700    770.000      .000      .000      .000      .000

X1    54.000     12.000     50.000    400.000    300.000    300.000    300.000      .000      .000      .000
GR  1225.000      .000   1224.000     50.000   1219.000     65.000   1219.000    100.000   1215.000    160.000
GR  1215.000    180.000   1217.000    210.000   1218.000    300.000   1218.000    390.000   1225.000    400.000
GR  1225.000    420.000   1228.000    560.000      .000      .000      .000      .000      .000      .000
EJ      .000      .000      .000      .000      .000      .000      .000      .000      .000      .000
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  SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS   BANK ELEV
  Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA   LEFT/RIGHT
  TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN      SSTA
  SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID     ENDST


*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS


CCHV=    .100 CEHV=    .300
*SECNO 30.000
3720 CRITICAL DEPTH ASSUMED
         CRITICAL DEPTH OCCURS AT CHANNEL CONTRACTION
   30.00     9.47  1209.47  1209.47  1208.00  1212.50     3.03      .00      .00  1217.00
  13000.       0.   13000.       0.       0.     931.       0.       0.       0.   1212.00
     .00      .00    13.96      .00     .045     .035     .045     .000  1200.00   388.70
 .010167     350.     300.     240.        0       10        0      .00   156.56   545.26


*SECNO 33.000

3301 HV CHANGED MORE THAN HVINS

   33.00    10.04  1213.04  1210.08      .00  1214.08     1.04     1.38      .20  1213.00
  13000.       0.   12994.       6.       0.    1589.       5.       9.       1.   1212.00
     .01      .02     8.18     1.09     .045     .035     .045     .000  1203.00   239.37
 .002606     371.     300.     253.        2       15        0      .00   226.05   465.42


*SECNO 36.000
   36.00     7.79  1213.79  1212.32      .00  1215.24     1.45     1.04      .12  1218.00
  13000.       0.   13000.       0.       0.    1347.       0.      19.       3.   1217.00
     .02      .00     9.65      .00     .045     .035     .045     .000  1206.00    81.58
 .004791     300.     300.     300.        3       14        0      .00   224.00   305.58


*SECNO 38.600
         DOWNSTREAM SIDE OF BELL RD. BRIDGE
         0.045 'N' VALUE USED TO MODEL EFFECTS OF VEGETATION AT BRIDGE
   38.60     8.10  1215.60  1213.38      .00  1216.57      .97     1.29      .05  1216.00
  13000.       0.   13000.       0.       0.    1647.       0.      28.       4.   1218.00
     .03      .00     7.90      .00     .045     .045     .045     .000  1207.50   102.50
 .005107     260.     260.     260.        3       15        0      .00   267.36   369.86
```

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

SPECIAL BRIDGE

SB	XK	XKOR	COFQ	RDLEN	BWC	BWP	BAREA	SS	ELCHU	ELCHD
	.90	1.56	2.60	.00	174.00	27.00	1704.00	2.00	1207.50	1207.50

*SECNO 40.200

3301 HV CHANGED MORE THAN HVINS

CLASS A LOW FLOW

3420 BRIDGE W.S.= 1214.72 BRIDGE VELOCITY=, 11.15 CALCULATED CHANNEL AREA=, 1166.

EGPRS	EGLWC	H3	QWEIR	QLOW	BAREA	TRAPEZOID AREA	ELLC	ELTRD
.00	1217.70	.39	0.	13000.	1704.	1916.	1218.80	1221.10

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA= 1216.00 ELREA= 1218.00

UPSTREAM SIDE OF BELL RD. BRIDGE
SPECIAL BRIDGE ROUTINE USED

40.20	8.49	1215.99	.00	.00	1217.70	1.71	1.13	.00	1216.00
13000.	0.	13000.	0.	0.	1238.	0.	33.	5.	1218.00
.03	.00	10.50	.00	.000	.045	.000	.000	1207.50	70.06
.008578	160.	160.	160.	0	0	0	.00	191.99	262.05

*SECNO 41.500

3301 HV CHANGED MORE THAN HVINS

41.50	9.55	1217.55	1214.72	.00	1218.55	.99	.77	.07	1219.00
13000.	0.	13000.	0.	0.	1626.	0.	37.	6.	1219.00
.04	.00	7.99	.00	.045	.045	.045	.000	1208.00	11.75
.004374	130.	130.	130.	3	15	0	.00	229.26	241.01

*SECNO 43.000

3265 DIVIDED FLOW

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


3301 HV CHANGED MORE THAN HVINS

    43.00      9.73  1217.73  1217.02       .00  1219.72      2.00       .87       .30  1220.40
   13000.       70.   12930.       0.       38.    1137.       0.       42.       7.   1220.50
      .04      1.81    11.37      .00      .045     .045     .045      .000  1208.00    38.37
  .011633      130.     130.     130.        3       10        0       .00   303.30   393.40


CCHV=    .100 CEHV=    .300
*SECNO 46.000

3265 DIVIDED FLOW

3280 CROSS SECTION     46.00 EXTENDED       .55 FEET


3301 HV CHANGED MORE THAN HVINS

    46.00     10.55  1220.55  1218.50       .00  1221.31       .76      1.47       .12  1220.80
   13000.      224.   11553.    1223.      153.    1576.      362.       53.       10.   1219.00
      .05      1.47     7.33     3.38      .045     .035     .045      .000  1210.00       .00
  .002672      300.     300.     300.        2       15        0       .00   579.69   590.00


*SECNO 48.400

3265 DIVIDED FLOW


3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    48.40      7.99  1220.99  1220.99       .00  1222.58      1.60       .97       .25  1221.00
   13000.      937.   12063.       0.      318.    1149.       0.       63.       13.   1222.00
      .06      2.95    10.50      .00      .045     .035     .045      .000  1213.00     1.38
  .006794      240.     240.     240.        0       16        0       .00   538.62   540.42


*SECNO 51.000
```

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

3301 HV CHANGED MORE THAN HVINS

51.00	8.85	1222.85	1218.73	.00	1223.28	.44	.58	.12	1224.00
13000.	0.	13000.	0.	0.	2449.	0.	74.	15.	1225.00
.07	.00	5.31	.00	.045	.035	.045	.000	1214.00	216.92
.001108	260.	260.	260.	2	14	0	.00	335.00	551.92

*SECNO 54.000

54.00	8.14	1223.14	1221.05	.00	1223.86	.72	.49	.08	1224.00
13000.	0.	13000.	0.	0.	1908.	0.	89.	18.	1225.00
.08	.00	6.81	.00	.045	.035	.045	.000	1215.00	52.55
.002655	300.	300.	300.	2	19	0	.00	344.80	397.36

THIS RUN EXECUTED 07/29/90 13:14:40

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**************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION
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T1 BELL ROAD IMPROVEMENTS, SKUNK CREEK ANALYSIS
T2 1000 FT. DOWNSTREAM TO 1400 FT. UPSTREAM OF BELL ROAD BRIDGE
T3 SKUNK CREEK-EXISTING CONDITIONS Subcritical Flow

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0.	2.	0.	0.	-1.000000	.00	.0	0.	1208.000	.000

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	15.000	.000	-1.000	.000	.000	.000	-1.000	.000	.000	.000

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


*PROF 2

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS


CCHV=    .100 CEHV=    .300
*SECNO 30.000
3720 CRITICAL DEPTH ASSUMED
          CRITICAL DEPTH OCCURS AT CHANNEL CONTRACTION
   30.00     6.82  1206.82  1206.82  1208.00  1209.12     2.30      .00      .00  1217.00
   6800.       0.    6800.       0.       0.     559.       0.       0.       0.   1212.00
     .00      .00    12.16      .00     .045     .035     .045     .000  1200.00   405.86
 .011138     350.     300.     240.        0       14        0      .00   123.93   529.79


*SECNO 33.000

3301 HV CHANGED MORE THAN HVINS

   33.00     7.06  1210.06  1207.94      .00  1210.80      .74     1.52      .16  1213.00
   6800.       0.    6800.       0.       0.     986.       0.       5.       1.   1212.00
     .01      .00     6.89      .00     .045     .035     .045     .000  1203.00   262.05
 .002897     371.     300.     253.        2       19        0      .00   186.89   448.94


*SECNO 36.000
   36.00     5.03  1211.03  1210.43      .00  1212.26     1.23     1.31      .15  1218.00
   6800.       0.    6800.       0.       0.     764.       0.      11.       2.   1217.00
     .02      .00     8.90      .00     .045     .035     .045     .000  1206.00   102.30
 .007312     300.     300.     300.        3       14        0      .00   197.76   300.05


*SECNO 38.600

3301 HV CHANGED MORE THAN HVINS

          DOWNSTREAM SIDE OF BELL RD. BRIDGE
          0.045 'N' VALUE USED TO MODEL EFFECTS OF VEGETATION AT BRIDGE
   38.60     5.79  1213.29  1211.67      .00  1213.93      .64     1.62      .06  1216.00
   6800.       0.    6800.       0.       0.    1058.       0.      17.       4.   1218.00
     .03      .00     6.43      .00     .045     .045     .045     .000  1207.50   122.93
 .005345     260.     260.     260.        2       15        0      .00   242.26   365.19
```

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

SPECIAL BRIDGE

SB	XK	XKOR	COFQ	RDLEN	BWC	BWP	BAREA	SS	ELCHU	ELCHD
	.90	1.56	2.60	.00	174.00	27.00	1704.00	2.00	1207.50	1207.50

*SECNO 40.200

3301 HV CHANGED MORE THAN HVINS

CLASS A LOW FLOW

3420 BRIDGE W.S.= 1212.89 BRIDGE VELOCITY=, 7.99 CALCULATED CHANNEL AREA=, 851.

EGPRS	EGLWC	H3	QWEIR	QLOW	BAREA	TRAPEZOID AREA	ELLC	ELTRD
.00	1214.69	.25	0.	6800.	1704.	1916.	1218.80	1221.10

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA= 1216.00 ELREA= 1218.00

UPSTREAM SIDE OF BELL RD. BRIDGE
SPECIAL BRIDGE ROUTINE USED

40.20	6.04	1213.54	.00	.00	1214.69	1.15	.76	.00	1216.00
6800.	0.	6800.	0.	0.	790.	0.	20.	4.	1218.00
.04	.00	8.61	.00	.000	.045	.000	.000	1207.50	85.37
.009082	160.	160.	160.	0	0	0	.00	173.17	258.54

*SECNO 41.500

41.50	6.88	1214.88	1212.77	.00	1215.53	.65	.80	.05	1219.00
6800.	0.	6800.	0.	0.	1047.	0.	23.	5.	1219.00
.04	.00	6.49	.00	.045	.045	.045	.000	1208.00	33.47
.004417	130.	130.	130.	2	15	0	.00	203.87	237.34

*SECNO 43.000

3301 HV CHANGED MORE THAN HVINS

43.00	7.18	1215.18	1214.60	.00	1216.70	1.53	.91	.26	1220.40
6800.	0.	6800.	0.	0.	686.	0.	26.	6.	1220.50
.05	.00	9.91	.00	.045	.045	.045	.000	1208.00	230.27
.012767	130.	130.	130.	3	8	0	.00	157.07	387.33

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


CCHV=    .100 CEHV=    .300
*SECNO 46.000

3265 DIVIDED FLOW


3301 HV CHANGED MORE THAN HVINS

   46.00     7.98  1217.98  1216.54      .00  1218.72      .74     1.93      .08  1220.80
   6800.       0.    6651.     149.       0.     954.      73.      31.       7.  1219.00
     .06      .00     6.97     2.04     .045     .035     .045     .000  1210.00   231.17
 .003871     300.     300.     300.        2       11        0      .00   295.46   554.55


*SECNO 48.400

3301 HV CHANGED MORE THAN HVINS

   48.40     5.81  1218.81  1218.32      .00  1220.22     1.42     1.30      .20  1221.00
   6800.       0.    6800.       0.       0.     712.       0.      36.       8.  1222.00
     .07      .00     9.55      .00     .045     .035     .045     .000  1213.00   338.78
 .008180     240.     240.     240.        3       14        0      .00   181.08   519.86


*SECNO 51.000

3301 HV CHANGED MORE THAN HVINS

   51.00     6.62  1220.62  1217.29      .00  1220.86      .24      .52      .12  1224.00
   6800.       0.    6800.       0.       0.    1727.       0.      43.      10.  1225.00
     .08      .00     3.94      .00     .045     .035     .045     .000  1214.00   230.28
 .000887     260.     260.     260.        2       11        0      .00   313.30   543.58


*SECNO 54.000
   54.00     5.89  1220.89  1219.77      .00  1221.44      .55      .49      .09  1224.00
   6800.       0.    6800.       0.       0.    1141.       0.      53.      12.  1225.00
     .10      .00     5.96      .00     .045     .035     .045     .000  1215.00    59.33
 .003866     300.     300.     300.        3       19        0      .00   334.80   394.13
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THIS RUN EXECUTED 07/29/90 13:15:47

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**************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION
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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

SKUNK CREEK-EXISTING CON

SUMMARY PRINTOUT

	SECNO	CWSEL	Q	QCH	DEPTH	VCH	TOPWID	10K*S	XECH1	XICE2
*	30.000	1209.47	13000.00	13000.00	9.47	13.96	156.56	101.67	.00	.00
*	30.000	1206.82	6800.00	6800.00	6.82	12.16	123.93	111.38	.00	.00
	33.000	1213.04	13000.00	12994.10	10.04	8.18	226.05	26.06	.00	.00
	33.000	1210.06	6800.00	6800.00	7.06	6.89	186.89	28.97	.00	.00
	36.000	1213.79	13000.00	13000.00	7.79	9.65	224.00	47.91	.00	.00
	36.000	1211.03	6800.00	6800.00	5.03	8.90	197.76	73.12	.00	.00
	38.600	1215.60	13000.00	13000.00	8.10	7.90	267.36	51.07	.00	.00
	38.600	1213.29	6800.00	6800.00	5.79	6.43	242.26	53.45	.00	.00
	40.200	1215.99	13000.00	13000.00	8.49	10.50	191.99	85.78	.00	.00
	40.200	1213.54	6800.00	6800.00	6.04	8.61	173.17	90.82	.00	.00
	41.500	1217.55	13000.00	13000.00	9.55	7.99	229.26	43.74	.00	.00
	41.500	1214.88	6800.00	6800.00	6.88	6.49	203.87	44.17	.00	.00
	43.000	1217.73	13000.00	12930.36	9.73	11.37	303.30	116.33	.00	.00
	43.000	1215.18	6800.00	6800.00	7.18	9.91	157.07	127.67	.00	.00
	46.000	1220.55	13000.00	11552.57	10.55	7.33	579.69	26.72	.00	.00
	46.000	1217.98	6800.00	6651.27	7.98	6.97	295.46	38.71	.00	.00
*	48.400	1220.99	13000.00	12062.84	7.99	10.50	538.62	67.94	.00	.00
	48.400	1218.81	6800.00	6800.00	5.81	9.55	181.08	81.80	.00	.00
	51.000	1222.85	13000.00	13000.00	8.85	5.31	335.00	11.08	.00	.00
	51.000	1220.62	6800.00	6800.00	6.62	3.94	313.30	8.87	.00	.00
	54.000	1223.14	13000.00	13000.00	8.14	6.81	344.80	26.55	.00	.00
	54.000	1220.89	6800.00	6800.00	5.89	5.96	334.80	38.66	.00	.00

SKUNK CREEK-EXISTING CON

SUMMARY PRINTOUT TABLE 100

SECNO	EGLWC	ELLC	EGPRS	ELTRD	QPR	QWEIR	CLASS	H3	DEPTH	CWSEL	VCH	EG
40.200	1217.70	1218.80	.00	1221.10	13000.00	.00	1.00	.39	8.49	1215.99	10.50	1217.70
40.200	1214.69	1218.80	.00	1221.10	6800.00	.00	1.00	.25	6.04	1213.54	8.61	1214.69

SUMMARY OF ERRORS AND SPECIAL NOTES

```
CAUTION  SECNO=    30.000  PROFILE= 1  CRITICAL DEPTH ASSUMED
CAUTION  SECNO=    30.000  PROFILE= 2  CRITICAL DEPTH ASSUMED

CAUTION  SECNO=    48.400  PROFILE= 1  CRITICAL DEPTH ASSUMED
CAUTION  SECNO=    48.400  PROFILE= 1  MINIMUM SPECIFIC ENERGY
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THIS RUN EXECUTED ~~07/29/90~~ 4/9/91 12:53:51

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**************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION
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Q100 = 11,000cfs

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C
T1    BELL ROAD IMPROVEMENTS, SKUNK CREEK ANALYSIS  FILE: SKUNK2.DAT
T2          1000 FT. DOWNSTREAM TO 1400 FT. UPSTREAM OF BELL ROAD BRIDGE
T3      SKUNK CREEK-IMPROVED BRIDGE OPENING CONDITION   Subcritical Flow

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

      0.       3.       0.       0. -1.000000     .00      .0       0.  1208.000     .000

J2  NPROF    IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

     1.000     .000   -1.000     .000     .000     .000   -1.000     .000     .000     .000

J3  VARIABLE CODES FOR SUMMARY PRINTOUT

    38.000    1.000   43.000   14.000    8.000   26.000    4.000    5.000   67.000   69.000

   100.000     .000     .000     .000     .000     .000     .000     .000     .000     .000

NC      .045     .045     .035     .100     .300     .000     .000     .000     .000     .000
QT     2.000 6700.000 11000.000     .000     .000     .000     .000     .000     .000     .000
          CRITICAL DEPTH OCCURS AT CHANNEL CONTRACTION
X1    30.000    8.000  340.000  560.000  350.000  240.000  300.000     .000     .000     .000
GR  1217.100     .000 1217.800  190.000 1217.000  340.000 1200.000  450.000 1200.000  490.000
GR  1212.000  560.000 1218.000  630.000 1216.000  680.000     .000     .000     .000     .000

X1    33.000    9.000  240.000  455.000  371.000  253.000  300.000     .000     .000     .000
GR  1217.000     .000 1217.000  180.000 1213.000  240.000 1205.000  300.000 1203.000  360.000
GR  1203.000  380.000 1204.000  430.000 1212.000  455.000 1213.500  470.000     .000     .000

X1    36.000    8.000   50.000  312.000  300.000  300.000  300.000     .000     .000     .000
GR  1216.000     .000 1218.000   50.000 1210.000  110.000 1206.000  195.000 1206.000  290.000
GR  1217.000  312.000 1219.100  430.000 1219.000  460.000     .000     .000     .000     .000

          DOWNSTREAM SIDE OF BELL RD. BRIDGE
X1    38.600   14.000  140.000  530.000  260.000  260.000  260.000     .707     .000     .000
GR  1219.000     .000 1216.000  140.000 1208.500  190.000 1208.500  256.500 1207.500  258.000
GR  1207.500  357.000 1208.500  358.000 1208.500  457.000 1209.000  470.000 1210.000  475.000
GR  1210.000  500.000 1211.000  510.000 1218.000  530.000 1219.100  600.000     .000     .000
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SB      .900     1.560     2.600      .000    174.000     27.000   1704.000      2.000   1207.500   1207.500
        UPSTREAM SIDE OF BELL RD. BRIDGE
        SPECIAL BRIDGE ROUTINE USED
        CONCRETE CHANNEL BOTTOM LINING THROUGH BRIDGE
X1    40.200      .000      .000      .000    160.000    160.000    160.000      .707      .000      .000
X2      .000      .000     1.000  1218.800   1221.100      .000      .000     1.330      .707      .000
X3    10.000      .000      .000      .000      .000      .000      .000      .000      .000      .000
BT     8.000      .000  1219.600  1219.000    140.000   1219.600   1216.000   190.000   1219.600   1212.000
BT   191.000  1219.600  1218.800   456.000   1220.400   1218.800    457.000  1220.400   1208.000    530.000
BT  1220.400  1218.000   600.000  1220.400   1220.000      .000      .000      .000      .000      .000

X1    41.500    10.000      .000   243.000    130.000    130.000    130.000      .000      .000      .000
GR  1219.000      .000  1211.000    65.000   1210.000    100.000   1209.000   104.000   1208.000    155.000
GR  1208.000   205.000  1209.000   208.000   1210.000    215.000   1211.000   232.000   1219.000    243.000

X1    43.000     8.000   160.000   400.000    130.000    130.000    130.000      .000      .000      .000
GR  1218.000      .000  1217.000   140.000   1220.400    160.000   1210.000   300.000   1208.000    350.000
GR  1208.000   360.000  1210.000   375.000   1220.500    400.000      .000      .000      .000      .000

NC      .000      .000      .035      .100      .300      .000      .000      .000      .000      .000
X1    46.000    10.000   200.000   460.000    300.000    300.000    300.000      .000      .000      .000
GR  1220.500      .000  1219.000   145.000   1220.800    200.000   1214.000   275.000   1214.000    330.000
GR  1210.000   380.000  1210.000   395.000   1219.000    460.000   1216.000   520.000   1220.000    590.000

X1    48.400    12.000   320.000   550.000    240.000    240.000    240.000      .000      .000      .000
GR  1221.000      .000  1220.000    95.000   1220.000    180.000   1219.000   280.000   1221.000    320.000
GR  1214.000   380.000  1214.000   410.000   1213.000    430.000   1213.000   465.000   1222.000    550.000
GR  1223.000   570.000  1224.300   720.000      .000      .000      .000      .000      .000      .000

X1    51.000     8.000   210.000   560.000    260.000    260.000    260.000      .000      .000      .000
GR  1223.000      .000  1223.000   140.000   1224.000    210.000   1214.000   270.000   1214.000    430.000
GR  1217.000   530.000  1225.000   560.000   1225.700    770.000      .000      .000      .000      .000

X1    54.000    12.000    50.000   400.000    300.000    300.000    300.000      .000      .000      .000
GR  1225.000      .000  1224.000    50.000   1219.000     65.000   1219.000   100.000   1215.000    160.000
GR  1215.000   180.000  1217.000   210.000   1218.000    300.000   1218.000   390.000   1225.000    400.000
GR  1225.000   420.000  1228.000   560.000      .000      .000      .000      .000      .000      .000
EJ      .000      .000      .000      .000      .000      .000      .000      .000      .000      .000
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  SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
  Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
  TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
  SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS


CCHV=    .100 CEHV=    .300
*SECNO 30.000
3720 CRITICAL DEPTH ASSUMED
          CRITICAL DEPTH OCCURS AT CHANNEL CONTRACTION
    30.00     8.72  1208.72  1208.72  1208.00  1211.54     2.81      .00      .00  1217.00
   11000.       0.   11000.       0.       0.     817.       0.       0.       0.   1212.00
      .00      .00    13.46      .00     .045     .035     .045     .000  1200.00   393.55
  .010367     350.     300.     240.        0        7        0      .00   147.34   540.89


*SECNO 33.000

3301 HV CHANGED MORE THAN HVINS

    33.00     9.19  1212.19  1209.46      .00  1213.14      .95     1.41      .19  1213.00
   11000.       0.   11000.       0.       0.    1409.       0.       8.       1.   1212.00
      .01      .00     7.81      .36     .045     .035     .045     .000  1203.00   246.05
  .002683     371.     300.     253.        2       15        0      .00   210.89   456.94


*SECNO 36.000
    36.00     6.99  1212.99  1211.76      .00  1214.36     1.37     1.09      .13  1218.00
   11000.       0.   11000.       0.       0.    1170.       0.      17.       3.   1217.00
      .02      .00     9.40      .00     .045     .035     .045     .000  1206.00    87.59
  .005227     300.     300.     300.        3       14        0      .00   216.38   303.98


*SECNO 38.600

3301 HV CHANGED MORE THAN HVINS

          DOWNSTREAM SIDE OF BELL RD. BRIDGE
    38.60     7.08  1214.58  1212.51      .00  1215.41      .83     1.00      .05  1216.00
   11000.       0.   11000.       0.       0.    1501.       0.      25.       4.   1218.00
      .03      .00     7.33      .00     .045     .035     .045     .000  1207.50   105.65
  .002945     260.     260.     260.        2       19        0      .00   262.16   367.81
```

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

SPECIAL BRIDGE

SB XK	XKOR	COFQ	RDLEN	BWC	BWP	BAREA	SS	ELCHU	ELCHD
.90	1.56	2.60	.00	174.00	27.00	1704.00	2.00	1207.50	1207.50

*SECNO 40.200

3301 HV CHANGED MORE THAN HVINS

CLASS A LOW FLOW

3420 BRIDGE W.S.= 1213.56 BRIDGE VELOCITY=, 11.40 CALCULATED CHANNEL AREA=, 965.

EGPRS	EGLWC	H3	QWEIR	QLOW	BAREA	TRAPEZOID AREA	ELLC	ELTRD
.00	1216.40	.33	0.	11000.	1704.	1916.	1218.80	1221.10

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA= 1216.00 ELREA= 1218.00

UPSTREAM SIDE OF BELL RD. BRIDGE
SPECIAL BRIDGE ROUTINE USED
CONCRETE CHANNEL BOTTOM LINING THROUGH BRIDGE

40.20	7.41	1214.91	.00	.00	1216.40	1.49	.99	.00	1216.00
11000.	0.	11000.	0.	0.	1122.	0.	29.	5.	1218.00
.03	.00	9.80	.00	.000	.035	.000	.000	1207.50	73.61
.005010	160.	160.	160.	0	0	0	.00	186.90	260.51

*SECNO 41.500

41.50	7.80	1215.80	1214.14	.00	1217.03	1.22	.60	.03	1219.00
11000.	0.	11000.	0.	0.	1239.	0.	33.	6.	1219.00
.04	.00	8.88	.00	.045	.035	.045	.000	1208.00	25.97
.004225	130.	130.	130.	3	15	0	.00	212.64	238.61

*SECNO 43.000

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

43.00	8.24	1216.24	1216.24	.00	1218.77	2.53	.83	.39	1220.40
11000.	0.	11000.	0.	0.	862.	0.	36.	6.	1220.50
.04	.00	12.77	.00	.045	.035	.045	.000	1208.00	215.99
.010839	130.	130.	130.	0	8	0	.00	173.87	389.86

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


CCHV=    .100 CEHV=    .300
*SECNO 46.000

3265 DIVIDED FLOW


3301 HV CHANGED MORE THAN HVINS

    46.00      9.74  1219.74  1218.01       .00  1220.54       .81      1.60       .17  1220.80
   11000.       33.   10196.     771.       35.    1371.      257.       45.        8.   1219.00
      .05       .96     7.44     3.00      .045     .035      .045      .000   1210.00     73.67
  .003164      300.     300.     300.         2        8         0       .00    467.58    585.41


*SECNO 48.400

3265 DIVIDED FLOW


3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    48.40      7.33  1220.33  1220.33       .00  1222.04      1.70      1.13       .27  1221.00
   11000.      297.   10703.       0.      135.    1009.        0.       52.       11.   1222.00
      .06      2.20     10.60      .00      .045     .035      .045      .000   1213.00     63.21
  .007654      240.     240.     240.         0       15         0       .00    452.05    534.27


*SECNO 51.000

3301 HV CHANGED MORE THAN HVINS

    51.00      8.36  1222.36  1218.31       .00  1222.72       .36       .55       .13  1224.00
   11000.        0.   11000.       0.        0.    2288.        0.       63.       13.   1225.00
      .07       .00     4.81      .00      .045     .035      .045      .000   1214.00    219.83
  .000977      260.     260.     260.         2       11         0       .00    330.28    550.11


*SECNO 54.000
    54.00      7.62  1222.62  1220.66       .00  1223.25       .63       .45       .08  1224.00
   11000.        0.   11000.       0.        0.    1728.        0.       76.       16.   1225.00
      .09       .00     6.37      .00      .045     .035      .045      .000   1215.00     54.13
  .002620      300.     300.     300.         3       19         0       .00    342.48    396.61
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THIS RUN EXECUTED 07/29/90 12:55:10

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**************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION
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T1 BELL ROAD IMPROVEMENTS, SKUNK CREEK ANALYSIS
T2 1000 FT. DOWNSTREAM TO 1400 FT. UPSTREAM OF BELL ROAD BRIDGE
T3 SKUNK CREEK-IMPROVED BRIDGE OPENING CONDITION Subcritical Flow

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0.	2.	0.	0.	-1.000000	.00	.0	0.	1208.000	.000

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	15.000	.000	-1.000	.000	.000	.000	-1.000	.000	.000	.000

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


*PROF 2

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS


CCHV=    .100 CEHV=    .300
*SECNO 30.000
3720 CRITICAL DEPTH ASSUMED
          CRITICAL DEPTH OCCURS AT CHANNEL CONTRACTION
    30.00     6.77  1206.77  1206.77  1208.00  1209.05     2.28      .00      .00  1217.00
    6700.       0.    6700.       0.       0.     553.       0.       0.       0.   1212.00
      .00      .00    12.12      .00     .045     .035     .045     .000  1200.00   406.19
  .011153     350.     300.     240.        0       14        0      .00   123.30   529.49


*SECNO 33.000

3301 HV CHANGED MORE THAN HVINS

    33.00     7.00  1210.00  1207.90      .00  1210.73      .73     1.53      .15  1213.00
    6700.       0.    6700.       0.       0.     975.       0.       5.       1.   1212.00
      .01      .00     6.87      .00     .045     .035     .045     .000  1203.00   262.49
  .002907     371.     300.     253.        2       19        0      .00   186.26   448.75


*SECNO 36.000
    36.00     4.97  1210.97  1210.39      .00  1212.20     1.23     1.32      .15  1218.00
    6700.       0.    6700.       0.       0.     754.       0.      11.       2.   1217.00
      .02      .00     8.89      .00     .045     .035     .045     .000  1206.00   102.68
  .007398     300.     300.     300.        3       14        0      .00   197.27   299.95


*SECNO 38.600

3301 HV CHANGED MORE THAN HVINS

          DOWNSTREAM SIDE OF BELL RD. BRIDGE
    38.60     5.37  1212.87  1211.36      .00  1213.49      .62     1.23      .06  1216.00
    6700.       0.    6700.       0.       0.    1061.       0.      17.       4.   1218.00
      .03      .00     6.32      .00     .045     .035     .045     .000  1207.50   113.75
  .003269     260.     260.     260.        2       15        0      .00   250.59   364.34
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  SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS   BANK ELEV
  Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA   LEFT/RIGHT
  TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN      SSTA
  SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID     ENDST


SPECIAL BRIDGE

SB  XK        XKOR      COFQ      RDLEN     BWC       BWP       BAREA     SS        ELCHU     ELCHD
     .90      1.56      2.60       .00    174.00     27.00   1704.00     2.00   1207.50   1207.50

*SECNO 40.200
CLASS A LOW FLOW

3420 BRIDGE W.S.=   1212.32 BRIDGE VELOCITY=,      8.88      CALCULATED CHANNEL AREA=,      754.

 EGPRS      EGLWC       H3       QWEIR      QLOW      BAREA   TRAPEZOID      ELLC     ELTRD
                                                                 AREA
      .00   1214.22      .25        0.     6700.     1704.     1916.     1218.80   1221.10



3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1216.00 ELREA=     1218.00

         UPSTREAM SIDE OF BELL RD. BRIDGE
         SPECIAL BRIDGE ROUTINE USED
         CONCRETE CHANNEL BOTTOM LINING THROUGH BRIDGE
   40.20     5.62  1213.12      .00      .00  1214.22     1.10      .73      .00  1216.00
   6700.       0.    6700.       0.       0.     794.       0.      20.       5.   1218.00
     .04      .00     8.43      .00     .000     .035     .000     .000  1207.50    79.59
 .005495     160.     160.     160.        0        0        0      .00   178.36   257.95


*SECNO 41.500
   41.50     5.96  1213.96  1212.73      .00  1214.89      .93      .65      .02  1219.00
   6700.       0.    6700.       0.       0.     865.       0.      23.       5.   1219.00
     .04      .00     7.75      .00     .045     .035     .045     .000  1208.00    40.90
 .004627     130.     130.     130.        2       15        0      .00   195.18   236.08


*SECNO 43.000

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
   43.00     6.52  1214.52  1214.52      .00  1216.55     2.03      .90      .33  1220.40
   6700.       0.    6700.       0.       0.     586.       0.      25.       6.   1220.50
     .05      .00    11.43      .00     .045     .035     .045     .000  1208.00   239.13
 .011556     130.     130.     130.        0        8        0      .00   146.64   385.77
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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


CCHV=    .100 CEHV=    .300
*SECNO 46.000

3265 DIVIDED FLOW


3301 HV CHANGED MORE THAN HVINS

    46.00     7.85  1217.85  1216.50      .00  1218.62       .77      1.94       .13  1220.80
    6700.       0.    6572.     128.       0.     925.       64.       30.        7.   1219.00
      .06      .00     7.10     2.01     .045     .035      .045      .000   1210.00   232.59
  .004120     300.     300.     300.        2        5         0       .00    288.29   552.30


*SECNO 48.400

3301 HV CHANGED MORE THAN HVINS

    48.40     5.75  1218.75  1218.28      .00  1220.17      1.41      1.36       .19  1221.00
    6700.       0.    6700.       0.       0.     702.       0.       35.        8.   1222.00
      .06      .00     9.54      .00     .045     .035      .045      .000   1213.00   339.24
  .008255     240.     240.     240.        3       14         0       .00    180.11   519.35


*SECNO 51.000

3301 HV CHANGED MORE THAN HVINS

    51.00     6.57  1220.57  1217.26      .00  1220.81       .24       .52       .12  1224.00
    6700.       0.    6700.       0.       0.    1711.       0.       42.       10.   1225.00
      .08      .00     3.92      .00     .045     .035      .045      .000   1214.00   230.59
  .000886     260.     260.     260.        2       11         0       .00    312.79   543.38


*SECNO 54.000
    54.00     5.84  1220.84  1219.74      .00  1221.39       .55       .49       .09  1224.00
    6700.       0.    6700.       0.       0.    1124.       0.       52.       12.   1225.00
      .10      .00     5.96      .00     .045     .035      .045      .000   1215.00    59.48
  .003945     300.     300.     300.        3       19         0       .00    334.57   394.06
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THIS RUN EXECUTED 07/29/90 12:56:15

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  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION
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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

SKUNK CREEK-IMPROVED BRI

SUMMARY PRINTOUT

	SECNO	CWSEL	Q	QCH	DEPTH	VCH	TOPWID	10K*S	XECH1	XICE2
*	30.000	1208.72	11000.00	11000.00	8.72	13.46	147.34	103.67	.00	.00
*	30.000	1206.77	6700.00	6700.00	6.77	12.12	123.30	111.53	.00	.00
	33.000	1212.19	11000.00	10999.93	9.19	7.81	210.89	26.83	.00	.00
	33.000	1210.00	6700.00	6700.00	7.00	6.87	186.26	29.07	.00	.00
	36.000	1212.99	11000.00	11000.00	6.99	9.40	216.38	52.27	.00	.00
	36.000	1210.97	6700.00	6700.00	4.97	8.89	197.27	73.98	.00	.00
	38.600	1214.58	11000.00	11000.00	7.08	7.33	262.16	29.45	.00	.00
	38.600	1212.87	6700.00	6700.00	5.37	6.32	250.59	32.69	.00	.00
	40.200	1214.91	11000.00	11000.00	7.41	9.80	186.90	50.10	.00	.00
	40.200	1213.12	6700.00	6700.00	5.62	8.43	178.36	54.95	.00	.00
	41.500	1215.80	11000.00	11000.00	7.80	8.88	212.64	42.25	.00	.00
	41.500	1213.96	6700.00	6700.00	5.96	7.75	195.18	46.27	.00	.00
*	43.000	1216.24	11000.00	11000.00	8.24	12.77	173.87	108.39	.00	.00
*	43.000	1214.52	6700.00	6700.00	6.52	11.43	146.64	115.56	.00	.00
	46.000	1219.74	11000.00	10196.30	9.74	7.44	467.58	31.64	.00	.00
	46.000	1217.85	6700.00	6571.81	7.85	7.10	288.29	41.20	.00	.00
*	48.400	1220.33	11000.00	10702.74	7.33	10.60	452.05	76.54	.00	.00
	48.400	1218.75	6700.00	6700.00	5.75	9.54	180.11	82.55	.00	.00
	51.000	1222.36	11000.00	11000.00	8.36	4.81	330.28	9.77	.00	.00
	51.000	1220.57	6700.00	6700.00	6.57	3.92	312.79	8.86	.00	.00
	54.000	1222.62	11000.00	11000.00	7.62	6.37	342.48	26.20	.00	.00
	54.000	1220.84	6700.00	6700.00	5.84	5.96	334.57	39.45	.00	.00

SKUNK CREEK-IMPROVED BRI

SUMMARY PRINTOUT TABLE 100

SECNO	EGLWC	ELLC	EGPRS	ELTRD	QPR	QWEIR	CLASS	H3	DEPTH	CWSEL	VCH	EG
40.200	1216.40	1218.80	.00	1221.10	11000.00	.00	1.00	.33	7.41	1214.91	9.80	1216.40
40.200	1214.22	1218.80	.00	1221.10	6700.00	.00	1.00	.25	5.62	1213.12	8.43	1214.22

SUMMARY OF ERRORS AND SPECIAL NOTES

```
CAUTION  SECNO=    30.000  PROFILE= 1  CRITICAL DEPTH ASSUMED
CAUTION  SECNO=    30.000  PROFILE= 2  CRITICAL DEPTH ASSUMED

CAUTION  SECNO=    43.000  PROFILE= 1  CRITICAL DEPTH ASSUMED
CAUTION  SECNO=    43.000  PROFILE= 1  MINIMUM SPECIFIC ENERGY
CAUTION  SECNO=    43.000  PROFILE= 2  CRITICAL DEPTH ASSUMED
CAUTION  SECNO=    43.000  PROFILE= 2  MINIMUM SPECIFIC ENERGY

CAUTION  SECNO=    48.400  PROFILE= 1  CRITICAL DEPTH ASSUMED
CAUTION  SECNO=    48.400  PROFILE= 1  MINIMUM SPECIFIC ENERGY
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THIS RUN EXECUTED ~~07/28/90~~ 3/20/91 00:44:09

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


C
T1    BELL ROAD IMPROVEMENTS, SKUNK CREEK ANALYSIS  FILE: SKUNK2.DAT
T2          1000 FT. DOWNSTREAM TO 1400 FT. UPSTREAM OF BELL ROAD BRIDGE
T3      SKUNK CREEK-IMPROVED BRIDGE OPENING CONDITION   Subcritical Flow

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

      0.        3.        0.        0. -1.000000      .00       .0        0.  1208.000      .000

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

     1.000      .000    -1.000      .000      .000      .000    -1.000      .000      .000      .000

J3  VARIABLE CODES FOR SUMMARY PRINTOUT

    38.000     1.000    43.000    14.000     8.000    26.000     4.000     5.000    67.000    69.000


   100.000      .000      .000      .000      .000      .000      .000      .000      .000      .000


NC      .045      .045      .035      .100      .300      .000      .000      .000      .000      .000
QT     2.000   6800.000  13000.000      .000      .000      .000      .000      .000      .000      .000
          CRITICAL DEPTH OCCURS AT CHANNEL CONTRACTION
X1    30.000     8.000   340.000   560.000   350.000   240.000   300.000      .000      .000      .000
GR  1217.100      .000  1217.800   190.000  1217.000   340.000  1200.000   450.000  1200.000   490.000
GR  1212.000   560.000  1218.000   630.000  1216.000   680.000      .000      .000      .000      .000

X1    33.000     9.000   240.000   455.000   371.000   253.000   300.000      .000      .000      .000
GR  1217.000      .000  1217.000   180.000  1213.000   240.000  1205.000   300.000  1203.000   360.000
GR  1203.000   380.000  1204.000   430.000  1212.000   455.000  1213.500   470.000      .000      .000

X1    36.000     8.000    50.000   312.000   300.000   300.000   300.000      .000      .000      .000
GR  1216.000      .000  1218.000    50.000  1210.000   110.000  1206.000   195.000  1206.000   290.000
GR  1217.000   312.000  1219.100   430.000  1219.000   460.000      .000      .000      .000      .000

          DOWNSTREAM SIDE OF BELL RD. BRIDGE
X1    38.600    14.000   140.000   530.000   260.000   260.000   260.000      .707      .000      .000
GR  1219.000      .000  1216.000   140.000  1208.500   190.000  1208.500   256.500  1207.500   258.000
GR  1207.500   357.000  1208.500   358.000  1208.500   457.000  1209.000   470.000  1210.000   475.000
GR  1210.000   500.000  1211.000   510.000  1218.000   530.000  1219.100   600.000      .000      .000
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$Q_{100} = 13000$ cfs

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SB      .900     1.560     2.600      .000    174.000     27.000   1704.000      2.000   1207.500   1207.500
        UPSTREAM SIDE OF BELL RD. BRIDGE
        SPECIAL BRIDGE ROUTINE USED
        CONCRETE CHANNEL BOTTOM LINING THROUGH BRIDGE
X1    40.200      .000      .000      .000    160.000    160.000    160.000      .707      .000      .000
X2      .000      .000     1.000   1218.800   1221.100      .000      .000     1.330      .707      .000
X3    10.000      .000      .000      .000      .000      .000      .000      .000      .000      .000
BT     8.000      .000   1219.600   1219.000    140.000   1219.600   1216.000    190.000   1219.600   1212.000
BT   191.000   1219.600   1218.800    456.000   1220.400   1218.800    457.000   1220.400   1208.000    530.000
BT  1220.400   1218.000    600.000   1220.400   1220.000      .000      .000      .000      .000      .000

X1    41.500    10.000      .000    243.000    130.000    130.000    130.000      .000      .000      .000
GR  1219.000      .000   1211.000     65.000   1210.000    100.000   1209.000    104.000   1208.000    155.000
GR  1208.000   205.000   1209.000    208.000   1210.000    215.000   1211.000    232.000   1219.000    243.000

X1    43.000     8.000    160.000    400.000    130.000    130.000    130.000      .000      .000      .000
GR  1218.000      .000   1217.000    140.000   1220.400    160.000   1210.000    300.000   1208.000    350.000
GR  1208.000   360.000   1210.000    375.000   1220.500    400.000      .000      .000      .000      .000

NC      .000      .000      .035      .100      .300      .000      .000      .000      .000      .000
X1    46.000    10.000    200.000    460.000    300.000    300.000    300.000      .000      .000      .000
GR  1220.500      .000   1219.000    145.000   1220.800    200.000   1214.000    275.000   1214.000    330.000
GR  1210.000   380.000   1210.000    395.000   1219.000    460.000   1216.000    520.000   1220.000    590.000

X1    48.400    12.000    320.000    550.000    240.000    240.000    240.000      .000      .000      .000
GR  1221.000      .000   1220.000     95.000   1220.000    180.000   1219.000    280.000   1221.000    320.000
GR  1214.000   380.000   1214.000    410.000   1213.000    430.000   1213.000    465.000   1222.000    550.000
GR  1223.000   570.000   1224.300    720.000      .000      .000      .000      .000      .000      .000

X1    51.000     8.000    210.000    560.000    260.000    260.000    260.000      .000      .000      .000
GR  1223.000      .000   1223.000    140.000   1224.000    210.000   1214.000    270.000   1214.000    430.000
GR  1217.000   530.000   1225.000    560.000   1225.700    770.000      .000      .000      .000      .000

X1    54.000    12.000     50.000    400.000    300.000    300.000    300.000      .000      .000      .000
GR  1225.000      .000   1224.000     50.000   1219.000     65.000   1219.000    100.000   1215.000    160.000
GR  1215.000   180.000   1217.000    210.000   1218.000    300.000   1218.000    390.000   1225.000    400.000
GR  1225.000   420.000   1228.000    560.000      .000      .000      .000      .000      .000      .000
EJ      .000      .000      .000      .000      .000      .000      .000      .000      .000      .000
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  SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
  Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
  TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
  SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS


CCHV=    .100 CEHV=    .300
*SECNO 30.000
3720 CRITICAL DEPTH ASSUMED
          CRITICAL DEPTH OCCURS AT CHANNEL CONTRACTION
    30.00     9.47  1209.47  1209.47  1208.00  1212.50     3.03      .00      .00  1217.00
   13000.       0.   13000.       0.       0.     931.       0.       0.       0.   1212.00
      .00      .00    13.96      .00     .045     .035     .045     .000  1200.00   388.70
  .010167     350.     300.     240.        0       10        0      .00   156.56   545.26


*SECNO 33.000

3301 HV CHANGED MORE THAN HVINS

    33.00    10.04  1213.04  1210.08      .00  1214.08     1.04     1.38      .20  1213.00
   13000.       0.   12994.       6.       0.    1589.       5.       9.       1.   1212.00
      .01      .02     8.18     1.09     .045     .035     .045     .000  1203.00   239.37
  .002606     371.     300.     253.        2       15        0      .00   226.05   465.42


*SECNO 36.000
    36.00     7.79  1213.79  1212.32      .00  1215.24     1.45     1.04      .12  1218.00
   13000.       0.   13000.       0.       0.    1347.       0.      19.       3.   1217.00
      .02      .00     9.65      .00     .045     .035     .045     .000  1206.00    81.58
  .004791     300.     300.     300.        3       14        0      .00   224.00   305.58


*SECNO 38.600

3301 HV CHANGED MORE THAN HVINS

          DOWNSTREAM SIDE OF BELL RD. BRIDGE
    38.60     7.82  1215.32  1212.99      .00  1216.23      .91      .94      .05  1216.00
   13000.       0.   13000.       0.       0.    1696.       0.      28.       4.   1218.00
      .03      .00     7.66      .00     .045     .035     .045     .000  1207.50   102.17
  .002810     260.     260.     260.        2       19        0      .00   267.13   369.30
```

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

SPECIAL BRIDGE

SB	XK	XKOR	COFQ	RDLEN	BWC	BWP	BAREA	SS	ELCHU	ELCHD
	.90	1.56	2.60	.00	174.00	27.00	1704.00	2.00	1207.50	1207.50

*SECNO 40.200

3301 HV CHANGED MORE THAN HVINS

CLASS A LOW FLOW

3420 BRIDGE W.S.= 1214.07 BRIDGE VELOCITY=, 12.36 CALCULATED CHANNEL AREA=, 1052.

EGPRS	EGLWC	H3	QWEIR	QLOW	BAREA	TRAPEZOID AREA	ELLC	ELTRD
.00	1217.31	.36	0.	13000.	1704.	1916.	1218.80	1221.10

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA= 1216.00 ELREA= 1218.00

UPSTREAM SIDE OF BELL RD. BRIDGE
SPECIAL BRIDGE ROUTINE USED
CONCRETE CHANNEL BOTTOM LINING THROUGH BRIDGE

40.20	8.17	1215.67	.00	.00	1217.31	1.64	1.08	.00	1216.00
13000.	0.	13000.	0.	0.	1266.	0.	33.	5.	1218.00
.03	.00	10.27	.00	.000	.035	.000	.000	1207.50	71.07
.004814	160.	160.	160.	0	0	0	.00	190.53	261.60

*SECNO 41.500

41.50	8.59	1216.59	1214.72	.00	1217.91	1.32	.57	.03	1219.00
13000.	0.	13000.	0.	0.	1410.	0.	37.	6.	1219.00
.04	.00	9.22	.00	.045	.035	.045	.000	1208.00	19.56
.004025	130.	130.	130.	3	15	0	.00	220.13	239.69

*SECNO 43.000

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

43.00	8.84	1216.84	1216.84	.00	1219.64	2.80	.81	.44	1220.40
13000.	0.	13000.	0.	0.	968.	0.	41.	6.	1220.50
.04	.00	13.43	.00	.045	.035	.045	.000	1208.00	207.95
.011013	130.	130.	130.	0	8	0	.00	183.34	391.28

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


CCHV=    .100 CEHV=    .300
*SECNO 46.000

3265 DIVIDED FLOW

3280 CROSS SECTION     46.00 EXTENDED       .53 FEET


3301 HV CHANGED MORE THAN HVINS

    46.00    10.53  1220.53  1218.56      .00  1221.29      .77     1.45      .20  1220.80
   13000.     215.   11571.    1214.     148.    1570.     358.      51.       9.   1219.00
      .05     1.45     7.37     3.39     .045     .035     .045     .000  1210.00      .00
  .002714     300.     300.     300.        2        8        0      .00   578.62   590.00


*SECNO 48.400

3265 DIVIDED FLOW


3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    48.40     7.99  1220.99  1220.99      .00  1222.58     1.60      .98      .25  1221.00
   13000.     937.   12063.       0.     318.    1149.       0.      61.      12.   1222.00
      .06     2.95    10.50      .00     .045     .035     .045     .000  1213.00     1.36
  .006792     240.     240.     240.        0       16        0      .00   538.66   540.42


*SECNO 51.000

3301 HV CHANGED MORE THAN HVINS

    51.00     8.85  1222.85  1218.73      .00  1223.28      .44      .58      .12  1224.00
   13000.       0.   13000.       0.       0.    2449.       0.      73.      15.   1225.00
      .07      .00     5.31      .00     .045     .035     .045     .000  1214.00   216.92
  .001108     260.     260.     260.        2       14        0      .00   335.00   551.92


*SECNO 54.000
    54.00     8.14  1223.14  1221.05      .00  1223.86      .72      .49      .08  1224.00
   13000.       0.   13000.       0.       0.    1908.       0.      88.      17.   1225.00
      .08      .00     6.81      .00     .045     .035     .045     .000  1215.00    52.55
  .002655     300.     300.     300.        2       19        0      .00   344.80   397.36
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THIS RUN EXECUTED 07/28/90 00:45:29

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


T1          BELL ROAD IMPROVEMENTS, SKUNK CREEK ANALYSIS
T2          1000 FT. DOWNSTREAM TO 1400 FT. UPSTREAM OF BELL ROAD BRIDGE
T3      SKUNK CREEK-IMPROVED BRIDGE OPENING CONDITION      Subcritical Flow

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

       0.       2.       0.       0. -1.000000       .00       .0       0.  1208.000      .000

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

     15.000      .000    -1.000      .000      .000      .000    -1.000      .000      .000      .000
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  SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
  Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
  TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
  SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


*PROF 2

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS


CCHV=    .100 CEHV=    .300
*SECNO 30.000
3720 CRITICAL DEPTH ASSUMED
          CRITICAL DEPTH OCCURS AT CHANNEL CONTRACTION
    30.00     6.82  1206.82  1206.82  1208.00  1209.12     2.30      .00      .00  1217.00
    6800.       0.    6800.       0.       0.     559.       0.       0.       0.   1212.00
      .00      .00    12.16      .00     .045     .035     .045     .000  1200.00   405.86
  .011138     350.     300.     240.        0       14        0      .00   123.93   529.79


*SECNO 33.000

3301 HV CHANGED MORE THAN HVINS

    33.00     7.06  1210.06  1207.94      .00  1210.80      .74     1.52      .16  1213.00
    6800.       0.    6800.       0.       0.     986.       0.       5.       1.   1212.00
      .01      .00     6.89      .00     .045     .035     .045     .000  1203.00   262.05
  .002897     371.     300.     253.        2       19        0      .00   186.89   448.94


*SECNO 36.000
    36.00     5.03  1211.03  1210.43      .00  1212.26     1.23     1.31      .15  1218.00
    6800.       0.    6800.       0.       0.     764.       0.      11.       2.   1217.00
      .02      .00     8.90      .00     .045     .035     .045     .000  1206.00   102.30
  .007312     300.     300.     300.        3       14        0      .00   197.76   300.05


*SECNO 38.600

3301 HV CHANGED MORE THAN HVINS

          DOWNSTREAM SIDE OF BELL RD. BRIDGE
    38.60     5.41  1212.91  1211.39      .00  1213.54      .63     1.22      .06  1216.00
    6800.       0.    6800.       0.       0.    1071.       0.      17.       4.   1218.00
      .03      .00     6.35      .00     .045     .035     .045     .000  1207.50   113.55
  .003263     260.     260.     260.        2       15        0      .00   250.87   364.42
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  SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS   BANK ELEV
  Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA   LEFT/RIGHT
  TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN      SSTA
  SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID     ENDST


SPECIAL BRIDGE

SB  XK       XKOR     COFQ     RDLEN    BWC      BWP      BAREA    SS       ELCHU    ELCHD
     .90     1.56     2.60      .00   174.00    27.00  1704.00     2.00  1207.50  1207.50

*SECNO 40.200
CLASS A LOW FLOW

3420 BRIDGE W.S.=   1212.35 BRIDGE VELOCITY=,      8.95      CALCULATED CHANNEL AREA=,      759.

 EGPRS     EGLWC      H3       QWEIR     QLOW     BAREA   TRAPEZOID     ELLC     ELTRD
                                                            AREA
      .00  1214.28     .25        0.     6800.    1704.    1916.     1218.80  1221.10



3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1216.00 ELREA=     1218.00

         UPSTREAM SIDE OF BELL RD. BRIDGE
         SPECIAL BRIDGE ROUTINE USED
         CONCRETE CHANNEL BOTTOM LINING THROUGH BRIDGE
   40.20     5.66  1213.16      .00      .00  1214.28     1.12      .74      .00  1216.00
   6800.       0.    6800.       0.       0.     802.       0.      20.       5.  1218.00
     .04      .00     8.48      .00     .000     .035     .000     .000  1207.50    79.44
 .005486     160.     160.     160.        0        0        0      .00   178.57   258.01


*SECNO 41.500
   41.50     6.01  1214.01  1212.77      .00  1214.95      .94      .65      .02  1219.00
   6800.       0.    6800.       0.       0.     874.       0.      23.       5.  1219.00
     .04      .00     7.78      .00     .045     .035     .045     .000  1208.00    40.52
 .004617     130.     130.     130.        2       15        0      .00   195.62   236.14


*SECNO 43.000

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
   43.00     6.57  1214.57  1214.57      .00  1216.61     2.04      .90      .33  1220.40
   6800.       0.    6800.       0.       0.     593.       0.      25.       6.  1220.50
     .05      .00    11.47      .00     .045     .035     .045     .000  1208.00   238.49
 .011523     130.     130.     130.        0        8        0      .00   147.39   385.88
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  SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
  Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
  TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
  SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


CCHV=    .100 CEHV=    .300
*SECNO 46.000

3265 DIVIDED FLOW


3301 HV CHANGED MORE THAN HVINS

    46.00     7.89  1217.89  1216.54      .00  1218.67      .77     1.93      .13  1220.80
    6800.      0.    6663.     137.       0.     936.      67.      30.       7.   1219.00
      .06      .00     7.12     2.04     .045     .035     .045     .000  1210.00   232.04
  .004097     300.     300.     300.        2        5        0      .00   291.02   553.16


*SECNO 48.400

3301 HV CHANGED MORE THAN HVINS

    48.40     5.79  1218.79  1218.32      .00  1220.22     1.43     1.36      .20  1221.00
    6800.      0.    6800.       0.       0.     709.       0.      35.       8.   1222.00
      .06      .00     9.59      .00     .045     .035     .045     .000  1213.00   338.92
  .008275     240.     240.     240.        3       14        0      .00   180.79   519.71


*SECNO 51.000

3301 HV CHANGED MORE THAN HVINS

    51.00     6.62  1220.62  1217.29      .00  1220.86      .24      .52      .12  1224.00
    6800.      0.    6800.       0.       0.    1727.       0.      42.      10.   1225.00
      .08      .00     3.94      .00     .045     .035     .045     .000  1214.00   230.28
  .000887     260.     260.     260.        2       11        0      .00   313.29   543.57


*SECNO 54.000
    54.00     5.89  1220.89  1219.77      .00  1221.44      .55      .49      .09  1224.00
    6800.      0.    6800.       0.       0.    1140.       0.      52.      12.   1225.00
      .10      .00     5.96      .00     .045     .035     .045     .000  1215.00    59.33
  .003869     300.     300.     300.        3       19        0      .00   334.80   394.13
```

THIS RUN EXECUTED 07/28/90 00:46:34

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

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

SKUNK CREEK-IMPROVED BRI

SUMMARY PRINTOUT

	SECNO	CWSEL	Q	QCH	DEPTH	VCH	TOPWID	10K*S	XECH1	XICE2
*	30.000	1209.47	13000.00	13000.00	9.47	13.96	156.56	101.67	.00	.00
*	30.000	1206.82	6800.00	6800.00	6.82	12.16	123.93	111.38	.00	.00
	33.000	1213.04	13000.00	12994.10	10.04	8.18	226.05	26.06	.00	.00
	33.000	1210.06	6800.00	6800.00	7.06	6.89	186.89	28.97	.00	.00
	36.000	1213.79	13000.00	13000.00	7.79	9.65	224.00	47.91	.00	.00
	36.000	1211.03	6800.00	6800.00	5.03	8.90	197.76	73.12	.00	.00
	38.600	1215.32	13000.00	13000.00	7.82	7.66	267.13	28.10	.00	.00
	38.600	1212.91	6800.00	6800.00	5.41	6.35	250.87	32.63	.00	.00
	40.200	1215.67	13000.00	13000.00	8.17	10.27	190.53	48.14	.00	.00
	40.200	1213.16	6800.00	6800.00	5.66	8.48	178.57	54.86	.00	.00
	41.500	1216.59	13000.00	13000.00	8.59	9.22	220.13	40.25	.00	.00
	41.500	1214.01	6800.00	6800.00	6.01	7.78	195.62	46.17	.00	.00
*	43.000	1216.84	13000.00	13000.00	8.84	13.43	183.34	110.13	.00	.00
*	43.000	1214.57	6800.00	6800.00	6.57	11.47	147.39	115.23	.00	.00
	46.000	1220.53	13000.00	11571.27	10.53	7.37	578.62	27.14	.00	.00
	46.000	1217.89	6800.00	6662.90	7.89	7.12	291.02	40.97	.00	.00
*	48.400	1220.99	13000.00	12062.60	7.99	10.50	538.66	67.92	.00	.00
	48.400	1218.79	6800.00	6800.00	5.79	9.59	180.79	82.75	.00	.00
	51.000	1222.85	13000.00	13000.00	8.85	5.31	335.00	11.08	.00	.00
	51.000	1220.62	6800.00	6800.00	6.62	3.94	313.29	8.87	.00	.00
	54.000	1223.14	13000.00	13000.00	8.14	6.81	344.80	26.55	.00	.00
	54.000	1220.89	6800.00	6800.00	5.89	5.96	334.80	38.69	.00	.00

SKUNK CREEK-IMPROVED BRI

SUMMARY PRINTOUT TABLE 100

SECNO	EGLWC	ELLC	EGPRS	ELTRD	QPR	QWEIR	CLASS	H3	DEPTH	CWSEL	VCH	EG
40.200	1217.31	1218.80	.00	1221.10	13000.00	.00	1.00	.36	8.17	1215.67	10.27	1217.31
40.200	1214.28	1218.80	.00	1221.10	6800.00	.00	1.00	.25	5.66	1213.16	8.48	1214.28

SUMMARY OF ERRORS AND SPECIAL NOTES

```
CAUTION  SECNO=    30.000  PROFILE= 1  CRITICAL DEPTH ASSUMED
CAUTION  SECNO=    30.000  PROFILE= 2  CRITICAL DEPTH ASSUMED

CAUTION  SECNO=    43.000  PROFILE= 1  CRITICAL DEPTH ASSUMED
CAUTION  SECNO=    43.000  PROFILE= 1  MINIMUM SPECIFIC ENERGY
CAUTION  SECNO=    43.000  PROFILE= 2  CRITICAL DEPTH ASSUMED
CAUTION  SECNO=    43.000  PROFILE= 2  MINIMUM SPECIFIC ENERGY

CAUTION  SECNO=    48.400  PROFILE= 1  CRITICAL DEPTH ASSUMED
CAUTION  SECNO=    48.400  PROFILE= 1  MINIMUM SPECIFIC ENERGY
```

APPENDIX 8

BRIDGE SCOUR COMPUTATIONS AND SOILS REPORT EXCERPTS

Scour Computations for Existing Conditions

Contraction Scour (C_s)

Use FHWA Interim procedures Case 2 - little to no overbank flow

$$\frac{y_2}{y_1} = \left(\frac{Q_t}{Q_c}\right)^{6/7} \left(\frac{W_1}{W_2}\right)^{\frac{6(2+e)}{7(3+e)}} \left(\frac{n_2}{n_1}\right)^{\frac{6e}{7(3+e)}} \qquad (1)$$

$y_s = y_2 - y_1$ Average scour depth

Where
- y_1 = average depth in the main channel
- y_2 = average depth in the contracted section
- W_1 = Width of the main channel
- W_2 = Width of the contracted section
- Q_t = flow in the contracted section
- Q_c = flow in main channel
- n_2 = Manning n for contracted section
- n_1 = Manning n for main channel
- e = transport factor from the following

V_{*c}/ω	e	A	B	Mode of Bed Material Transport
<0.5	0.25	0.59	0.066	mostly contact load
1.0	1.0	.64	.021	some suspended bed material
>2.0	2.25	.69	.037	mostly suspended bed material

- $V_{*c} = \sqrt{gy_1S_1}$, shear velocity
- ω = fall velocity of D_{50} of bed material
- g = gravity constant, 32.2
- S_1 = slope, energy grade line main channel

$Y_1 = 9.55$ ft (HEC-II X-sec 41.50)
$W_1 = 229.26$ ft
$W_2 = 191.99$ ft
$Q_t = Q_c = 13000$ cfs
$n_1 = n_2 = 0.035$
$e = 2.25$

$$Y_2 = Y_1 \left(W_1/W_2\right)^{\frac{6(2+e)}{7(3+e)}}$$

$$Y_2 = 9.55 \left(\frac{229.26}{191.99}\right)^{\frac{6(2+2.25)}{7(3+2.25)}}$$

$Y_2 = 10.80$ ft

$C_s = Y_2 - Y_1 = 10.80 - 9.55 = 1.25$ ft

Dsn: CMG 5/10/91
CHKD: BPL 6/30/91

Abutment Scour (A_s)

Use FHWA Equation 5 - Liu & Gill

$$Y_s/Y_1 = 2.15\left(a/Y_1\right)^{0.40} Fr_1^{0.33}$$ where

Y_s = equilibrium scour depth (ft)
Y_1 = upstream depth of flow (ft)
a = abutment and embankment length (ft)
Fr = upstream Froude number

$Y_1 = 8.49$ ft (HEC-II x-section 40.20)
$a = 8$ ft

$$Fr = V_1/\sqrt{gY_1} = 10.50/\sqrt{32.2 \times 8.49} = 0.63$$

$$Y_s/8.49 = 2.15\left(8/8.49\right)^{0.40}(0.63)^{0.33}$$

$$Y_s/8.49 = 1.80$$

$$Y_s = 1.80 \times 8.49 = 15.3 \text{ ft}$$

Total Abutment Scour (T_s)

$$T_s = A_s + C_s = 15.3 + 1.25 = 16.55 \text{ ft}$$

Dsn: CMG 5/10/91
CHKD: BPL 5/30/91

Pier Scour (P_s)

Use FHWA Interim Procedures Equation 12 - Chang

$$y_s/a = 1.6\ K_1\ K_2\ (y_1/a)^{0.33} \qquad (12)$$

$$(y_s/a)\ \text{Maximum} = 2.3 \qquad (13)$$

Where
- y_s = scour depth
- a = pier width
- K_1 = Correction for pier shape
- K_2 = Correction for flow angle of attack to pier
- y_1 = depth of flow upstream of the pier

Chang found that the maximum scour depths are less than 2.3 times the pier width Equation 13, regardless of the flow condition, sediment size and ratio of flow depth to pier width.

5.2 Correction for pier shape K_1.

Type of pier	K_1
Circular cylinder	1.0
Round nose pier	1.0
Square nose	1.1
Sharp nose	0.9
Group of cylinders	1.0

5.3 Correction for angle of attack of the flow K_2.

The value of K_2 for skewed flow direction depends on the skew angle, length l and width a of the pier. Values of K_2 are given in the following table:

Angle of skew in degrees	$\ell/a = 4$	$\ell/a = 8$	$\ell/a = 12$
0	1.0	1.0	1.0
15	1.5	2.0	2.5
30	2.0	2.5	3.5
45	2.3	3.3	4.3
90	2.5	3.9	5.0

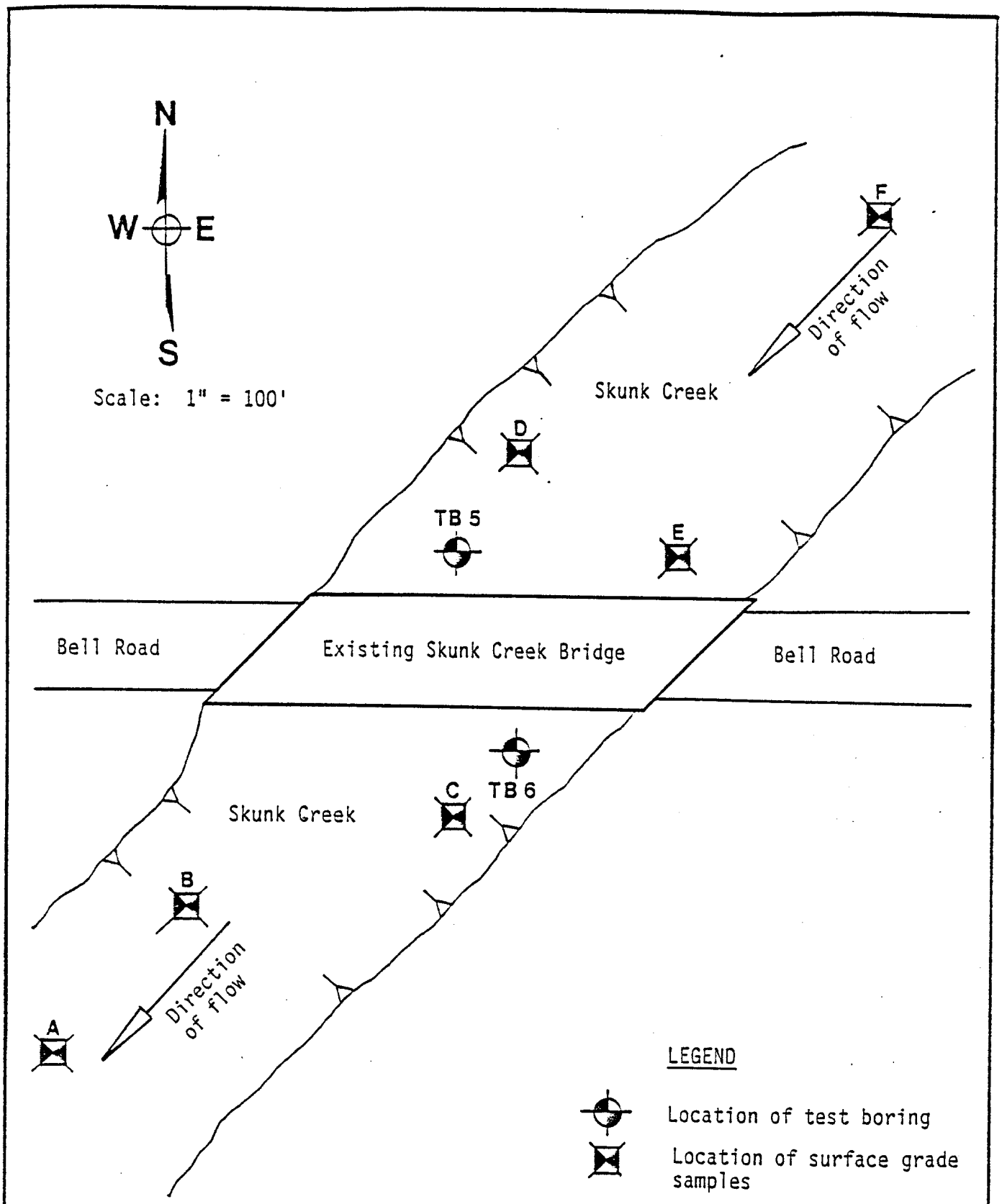
$$Y_s/3 = 1.6 \times 1.0 \times 1.0\ (8.49/3)^{0.33}$$

$$Y_s = 3 \times 2.25 = 6.8\ \text{ft.} = P_s$$

Dsn: CMG 5/10/91
CHKD: BOL 5/30/91

Total Pier Scour Depth (T_s)

$$T_s = P_s + C_s = 6.8 + 1.25 = 8.05\ \text{ft}$$



SITE PLAN 2: Skunk Creek Bridde site plan

PROJECT NO: 89-0277B

THOMAS-HARTIG & ASSOCIATES, INC.

REPORT ON LABORATORY TESTS

SAMPLE: Date April 1989

Source Noted below

Type Grab sample

Material Skunk Creek channel samples

Sampled By TH/Spadola

TESTED: Sieve Analysis and Atterberg Limits

RESULTS:

Sample	LL	PI	Sieve Size - 200	100	50	30	16	Accum. % Passing 8	4	3/4"	1"	2"	3"	* Class
A; 0 - 3'		NP	6	8	13	22	32	41	50	73	78	93	100	GM-GP
B; 0 - 3'		NP	4	6	10	20	35	46	53	68	74	96	100	SP
C; 0 - 3'		NP	7	9	12	21	36	57	76	92	93	97	100	SM-SW
D; 0 - 3'		NP	4	6	10	18	29	44	58	85	91	100		SW
E; 0 - 3'		NP	5	7	11	19	31	43	51	74	81	98	100	GM-GP
F; 0 - 3'		NP	6	8	11	13	16	19	23	62	74	92	100	GM-GP

NP = Non-plastic

* Unified Soil Classification

Project No. 89-0277B

THOMAS-HARTIG & ASSOCIATES, INC.

THOMAS-HARTIG & ASSOCIATES, INC.

TOM W. THOMAS, P.E. • HARRY E. HARTIG, P.E.
Geotechnical, Materials Testing, and Environmental Consultants
7031 West Oakland Street • Chandler, Arizona 85226

James R. Morrow
John P. Boyd, P.E.
Charles H. Atkinson, P.E.

Glen K. Copeland, P.E.
James. M. Willson, P.E.

Frank M. Guerra, P.E.
Steven A. Haire, P.E.
Kenneth L. Ricker, P.E.

Donohue & Associates, Inc. -Royden
3055 West Indian School Road
Phoenix, Arizona 85017

14 August 1989

Attention: Dick Moseke

Project: Geotechnical Services
Skunk Creeek Bridge Addition and
Separation Structures, Bell Road.
Bell Road (Outer Loop Highway to 67th Avenue)
Maricopa County Highway Department
Project No. 89-0277B
Glendale, Arizona

Project No. 89-0277B

This report presents the results of the geotechnical engineering services for Skunk Creek Bridge Addition and Separation Structures at Bell Road from Outer Loop Highway to 67th Avenue, Glendale, Arizona. The services are performed in accordance with "Scope of Services for Design of Highway Improvement Projects, Bell Road-Grand Avenue to Scottsdale Road, MCHD Project No. 68546-Outer Loop Highway to 67th Avenue," prepared by Donohue & Associates, Inc.-Royden.

The recommendations presented in this report are based upon the project information received and described within the report. This firm should be contacted for review if the design conditions are changed substantially.

If requested, we will be available to review project plans and specifications relative to compliance to the intent of this report.

Respectfully submitted,

THOMAS-HARTIG & ASSOCIATES, INC.

By: _____
Kenneth L. Ricker, P. E.

Reviewed by: _____
Harry E. Hartig, P.E.

/go

Copies to: Addressee (6)

APPENDIX 9

BRIDGE MODIFICATION DETAILS

• NOTE: USE 1/ 2 " PREFORMED JOINT FILLER BETWEEN CHANNEL LINING AND ABUTMENTS, PIERS, OR WING WALLS.

CONSTRUCT 6" CHANNEL & SLOPE LINING WITH WELDED WIRE FABRIC REINFORCEMENT [780 SY]

3:1 SLOPE

+58, 83'LT. ELEV. 1208.5
+41.5, 65'LT. ELEV. 1208.5
+13, 65'LT. ELEV. 1208.5
+20, 65'LT. ELEV. 1207.5
+35, 65'LT. ELEV. 1207.5
+42, 65'LT. ELEV. 1208.5
+12, 65'LT. ELEV. 1208.5

CREEK

TEL

4"G (to be Relocated)

6" W (to be Abandoned)

453 454 455 456 457

Proposed 12" Water (City of Glendale)

+94, 55'RT. ELEV. 1208.5
+12, 55'RT. ELEV. 1208.5
+19, 55'RT. ELEV. 1207.5
+12, 55'RT. ELEV. 1207.5
+14, 55'RT. ELEV. 1208.5
+21, 55'RT. ELEV. 1208.5

SKUNK CREEK

BOTTOM OF INCLINED CUT-OFF WALL ELEV. 1195.5

Contours Shown are Finished Grades

3:1 SLOPE

SLOPE LINING (6"- WITH WWF)
3:1 SLOPE
TOP OF LINING ELEV. 1214.0

Proposed 36" SD

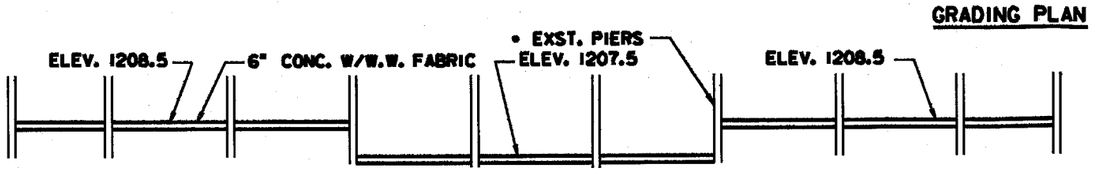
37, 55'RT. ELEV. 1214.0

TIE 6' CUT-OFF WALL INTO SLOPE LINING CUT-OFF WALL

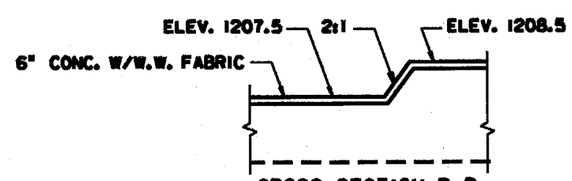
N

0 20 40
SCALE IN FEET

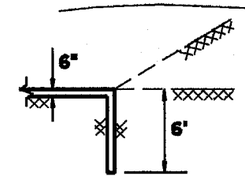
GRADING PLAN



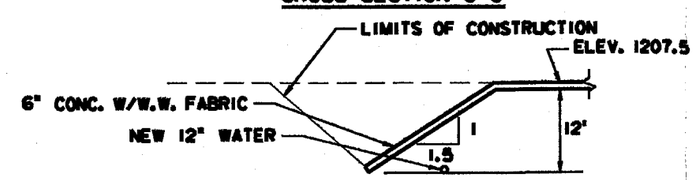
CROSS-SECTION A-A



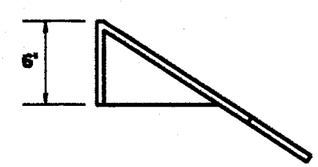
CROSS-SECTION B-B



CROSS-SECTION C-C



CROSS-SECTION D-D



CROSS-SECTION E-E

ENGINEERS
ARCHITECTS
SCIENTISTS

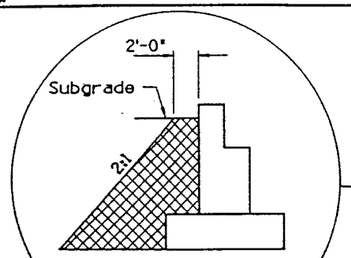
Designed
Drawn
Checked

No.	Date	Description

REVISIONS

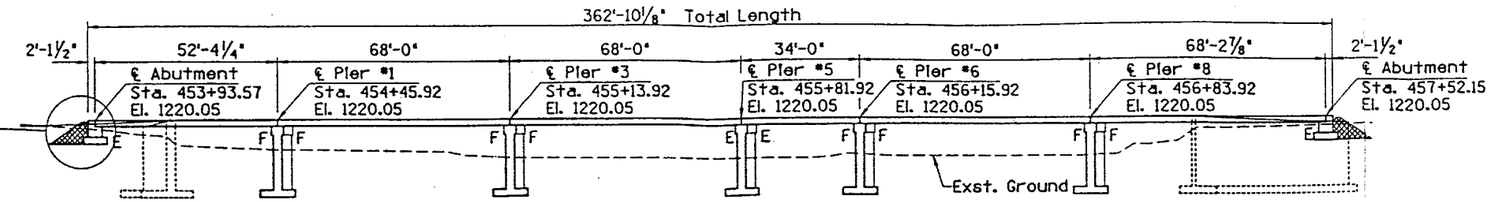
BELL ROAD IMPROVEMENTS
OUTER LOOP TO 67TH AVE.
SKUNK CREEK GRADING AND DRAINAGE PLAN

SHT. ____
OF ____



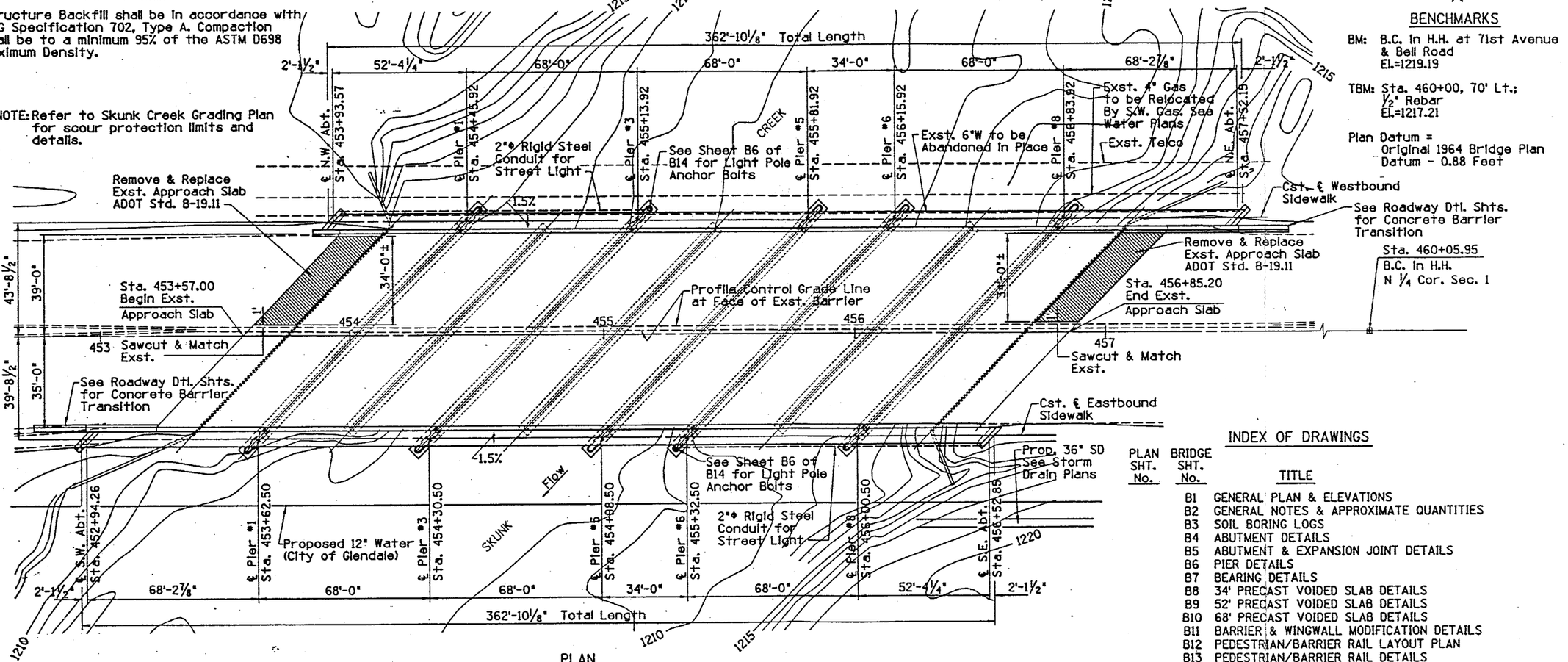
STRUCTURE BACKFILL
Not to Scale

Structure Backfill shall be in accordance with MAG Specification 702, Type A. Compaction shall be to a minimum 95% of the ASTM D698 Maximum Density.

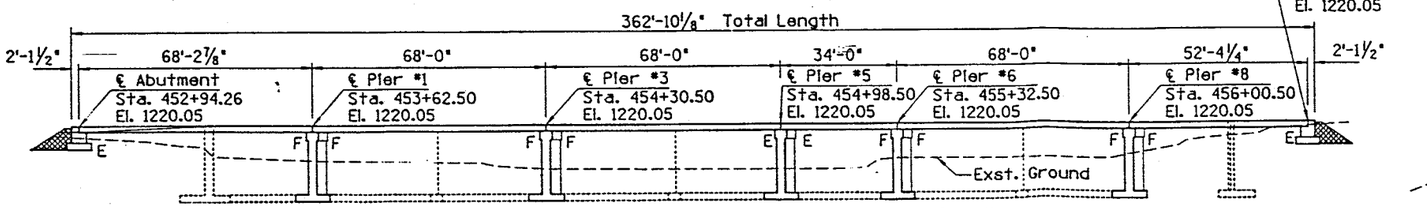


LONGITUDINAL SECTION ALONG CST. ℄ WESTBOUND SIDEWALK
Scale:1"=20'

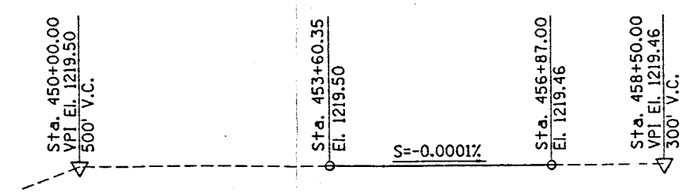
NOTE: Refer to Skunk Creek Grading Plan for scour protection limits and details.



PLAN
Scale:1"=20'



LONGITUDINAL SECTION ALONG CST. ℄ EASTBOUND SIDEWALK
Scale:1"=20'



PROFILE CONTROL GRADE LINE
N.T.S.

BENCHMARKS

BM: B.C. in H.H. at 71st Avenue & Bell Road
El.=1219.19

TBM: Sta. 460+00, 70' Lt.; 1/2" Rebar
El.=1217.21

Plan Datum = Original 1964 Bridge Plan Datum - 0.88 Feet

INDEX OF DRAWINGS

PLAN SHT. No.	BRIDGE SHT. No.	TITLE
	B1	GENERAL PLAN & ELEVATIONS
	B2	GENERAL NOTES & APPROXIMATE QUANTITIES
	B3	SOIL BORING LOGS
	B4	ABUTMENT DETAILS
	B5	ABUTMENT & EXPANSION JOINT DETAILS
	B6	PIER DETAILS
	B7	BEARING DETAILS
	B8	34' PRECAST VOIDED SLAB DETAILS
	B9	52' PRECAST VOIDED SLAB DETAILS
	B10	68' PRECAST VOIDED SLAB DETAILS
	B11	BARRIER & WINGWALL MODIFICATION DETAILS
	B12	PEDESTRIAN/BARRIER RAIL LAYOUT PLAN
	B13	PEDESTRIAN/BARRIER RAIL DETAILS
	B14	PEDESTRIAN/BARRIER RAIL DETAILS

Donohue ENGINEERS ARCHITECTS SCIENTISTS
3655 West Anthem Boulevard
Phoenix, Arizona 85027
(602) 374 1541
Telefax (602) 374 1514

CITY OF GLENDALE
PUBLIC WORKS / ENGINEERING
5850 W. Glendale Avenue
Glendale, Arizona 85301 (602) 435-4152

No.	Date	Description
		REVISIONS

Designed DS
Drawn RGH
Checked RAB SLG

BELL ROAD IMPROVEMENTS
OUTER LOOP TO 67TH AVE.
SKUNK CREEK BRIDGE
GENERAL PLAN & ELEVATION

2S3-1100

B1 of B14

SHT. 104
OF 126

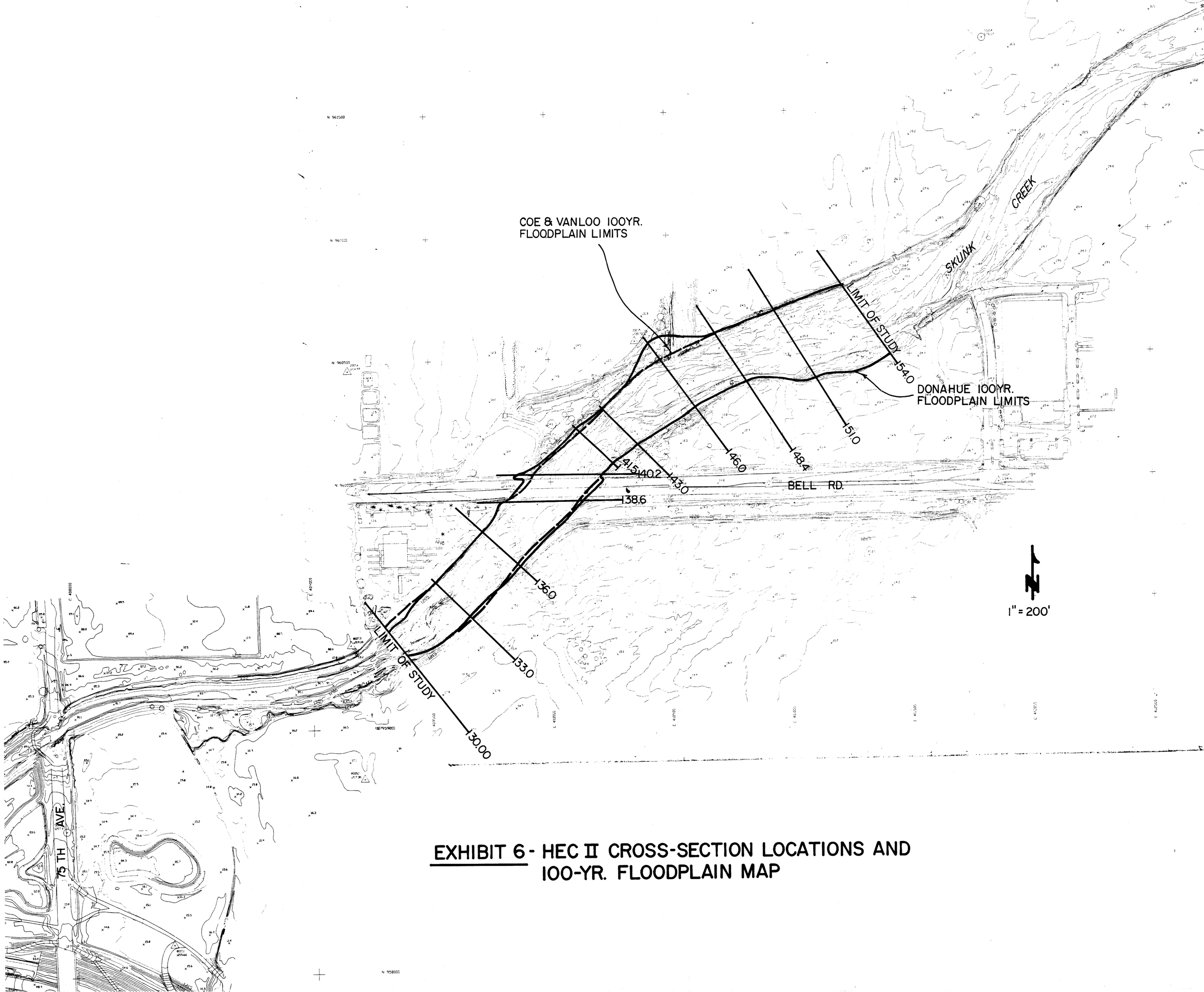
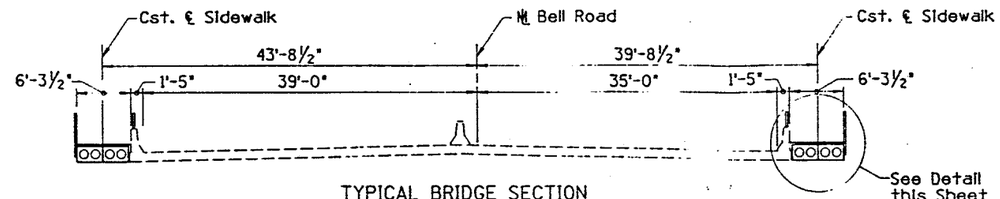
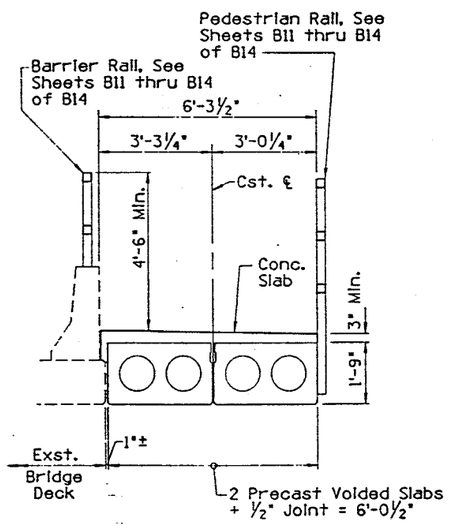


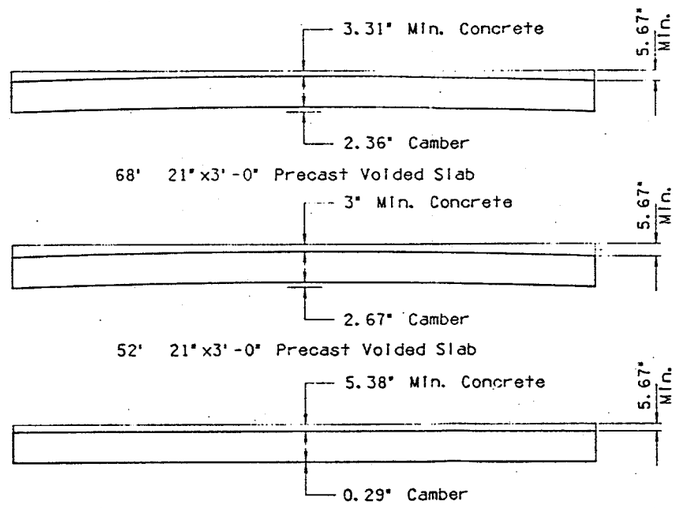
EXHIBIT 6 - HEC II CROSS-SECTION LOCATIONS AND 100-YR. FLOODPLAIN MAP



TYPICAL BRIDGE SECTION
Scale: ⅛"=1'-0"



TYPICAL SECTION
THRU SIDEWALK
Scale: ½"=1'-0"



CAMBER DIAGRAM
Not to Scale
(Min. Concrete Thickness @ Outside Edge of Sidewalk)

GENERAL NOTES:

Construction - Uniform Standard Specifications for Public Works Construction by the Maricopa Association of Governments, 1979 Edition and revisions to date.

Design Specifications - The Standard Specifications for Highway Bridges. 13th Edition, 1983, as adopted by the American Association of State Hwy. & Transportation Officials (AASHTO) and as amended by the 1984, 1985, 1986, 1987 and 1988 Interim Specifications.

Loading:
Live load = 85 lbs/sqft

Reinforcing steel shall conform to ASTM Specifications A615. Bar sizes #6 and smaller shall be designed as Grade 40 but may be furnished as Grade 40 or Grade 60. Bar sizes #7 or larger shall be designed and furnished as Grade 60.

All bend dimensions for reinforcing steel shall be out to out of bars. All placement dimensions for reinforcing steel shall be to center of bars unless noted otherwise.

All reinforcing bars shall have 2" clear cover unless noted otherwise.

All concrete shall be M.A.G. Class "A", f'c=3,000 psi. Except for precast voided slabs.

Stresses:

Precast Voided Slabs	f'c = 5,000 psi
	f'ci= 4,000 psi
Concrete Slabs	f'c = 3,000 psi
Abutments	f'c = 3,000 psi
Approach Slabs	f'c = 3,000 psi
Concrete Barrier	f'c = 3,000 psi

All structural steel shall conform to ASTM A-36. All surfaces of metals shall be painted in accordance with M.A.G. specification 515.

All welding for structural steel shall be in accordance with the American Welding Society (AWS), Structural Welding Code ANSI/AASHTO/AWS D1.5-88

Plan dimensions and details relative to existing structure have been taken from existing plans and are subject to nominal construction variations. It shall be the contractor's responsibility to verify such dimensions and details in the field and make necessary approved adjustments prior to construction or ordering of materials. Such variations shall not be cause for additional compensation for a change of scope of work.

Dimensions shall not be scaled from drawings.

Chamfer all exposed edges of concrete 3/4" unless noted otherwise.

ADOT Structures Section Standards, 1988 Edition. Standards B-19.11, B-21.18.

Bridge Lighting Conduit System shall include 2"ϕ rigid steel conduit, 1 1/2"ϕ rigid steel conduit, conduit expansion joints, junction boxes, conduit outlet bodies, angle support brackets, u-bolts, anchor bolts and all miscellaneous materials required for installation. See special provisions

APPROXIMATE QUANTITIES

ITEM	34' PRECAST VOIDED SLABS	52' PRECAST VOIDED SLABS	68' PRECAST VOIDED SLABS	M.A.G. CLASS "A" CONC.	REINF. STEEL	PEDESTRIAN RAIL	BARRIER RAIL	CONCRETE BARRIER (MODIFIED)	BRIDGE LIGHTING CONDUIT SYSTEM	DRILL AND EPOXY GROUT DOWELS	ELASTOMERIC BEARING PADS ½"	ELASTOMERIC BEARING PADS 1½"	ELASTOMERIC BEARING PADS 2"	PNEUMATICALLY PLACED MORTAR
	Each	Each	Each	C.Y.	lbs.	lin. ft.	lin. ft.	lin. ft.	Lump Sum	Each	Each	Each	Each	S. Y.
Abutments				49	2,390									98
Piers No.1,3,5,6,8				178	13,760					300				
Approach Slabs				43	7,450									
Sidewalks & Rails	4	4	16	74		714	724	76			32	16	16	
TOTALS	4	4	16	344	23,600	714	724	76	1	300	32	16	16	98

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Glendale, Arizona 85301 (602) 435-4152

Designed DS | Drawn RGH | Checked RAB SLG

No.	Date	Description
		REVISIONS

BELL ROAD IMPROVEMENTS
OUTER LOOP TO 67TH AVE.
SKUNK CREEK BRIDGE
GENERAL NOTES & APPROX. QUANTITIES

CALL FOR THE BLUE STAKES 283-1100 Phoenix Area CALL COLLECT

SHT. 105
OF 126