EXHIBIT D

TEAL BROOK ESTATES AND SUNRIDGE ADDITION

HYDROLOGY AND FLOOD ROUTING

5-YEAR FREQUENCY STORM WITH EXISTING CONDITIONS

DRAINAGE PLAN FOR TEAL BROOK AND SUNRIDGE ADDITIONS

Variables for SCS Hydrographs, 5-year Storm w/Existing Conditions

Basin 1. Cedar Downs Estates, 21st Street right of way and a commercial corner at 119th Street and 21st.
Drainage Area = 62.5 acres (0.0977 square miles) SCS CN = 82
Rational Method c-factor = 0.35 Time of Concentration = 85 minutes
Q by Rational Formula 62.5*0.35*1.72 = 38 cfs.

Basin 2. North-Center portion in Teal Brook Addition.
Drainage Area = 3.74 acres (0.00584 square miles) SCS CN = 90
Rational Method c-factor = 0.40 Time of Concentration = 15 minutes
Q by Rational Formula 3.74*0.40*4.56 = 7 cfs.

Basin 3. East portion in Teal Brook and all of Sunridge Addition.
Drainage Area = 37.41 acres (0.0585 square miles) SCS CN = 90
Rational Method c-factor = 0.40 Time of Concentration = 15 minutes
Q by Rational Formula 37.41*0.40*4.56 = 68 cfs.

Basin 4. South portion in Teal Brook Addition.
Drainage Area = 10.12 acres (0.0158 square miles) SCS CN = 89
Rational Method c-factor = 0.40 Time of Concentration = 15 minutes
Q by Rational Formula 10.12*0.40*4.56 = 18 cfs.

Basin 5. West portion in Teal Brook Addition.
Drainage Area = 12.71 acres (0.0199 square miles) SCS CN = 90
Rational Method c-factor = 0.40 Time of Concentration = 15 minutes
Q by Rational Formula 12.71*0.40*4.56 = 23 cfs.

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

    1         ID        FLOOD HYDROGRAPHS FOR TEAL BROOK AND SUNRIDGE ADDITIONS FILE     TLBRK3E
    2         ID        TEAL BROOK DRAINAGE PLAN EXISTING CONDITIONS
    3         ID        5-YEAR   FREQUENCY, 6-HOUR STORM W/SCS 15 MINUTE DISTRIBUTION
    4         IT      15       0       0      40
    5         IO       5       1

    6         KK   HYDR1
    7         KM    RUNOFF HYDROGRAPH FOR BASIN 1, CEDAR DOWNS ESTATES U/S FROM 21ST STREET,
    8         KM    21ST STREET RIGHT OF WAY AND 2 1/2 ACRE COMMERCIAL CORNER AT 119TH STREET
    9         PR     3.4
   10         PI     .05     .08     .07     .05     .10     .10     .14     .22     .54     .65
   11         PI     .20     .17     .12     .14     .08     .09     .10     .08     .07     .07
   12         PI     .07     .09     .05     .07
   13         BA   .0977
   14         LS      0      82
   15         UD     .85

   16         KK   HYDR2
   17         KM    RUNOFF HYDROGRAPH FOR BASIN 2 SOUTH OF 21ST STREET
   18         BA  .00584
   19         LS             90
   20         UD     .15

   21         KK   HYRR3
   22         KM    RUNOFF HYDROGRAPH FOR BASIN 3 SOUTH OF 21ST STREET
   23         BA   .0585
   24         LS             90
   25         UD     .15

   26         KK   HYDR4
   27         KM    RUNOFF HYDROGRAPH FOR BASIN 4 SOUTH OF 21ST STREET
   28         BA   .0158
   29         LS             89
   30         UD     .15

   31         KK   HYDR5
   32         KM    RUNOFF HYDROGRAPH FOR BASIN 5 SOUTH OF 21ST STREET
   33         BA   .0199
   34         LS             90
   35         UD     .15

   36         KK    COMB
   37         KM    COMBINE RUNOFF HYDROGRAPHS FOR BASINS 1 THRU 5
   38         HC       5
   39         ZZ
```

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	HYDR1	38.	3.25	18.	11.	11.	.10		
HYDROGRAPH AT	HYDR2	7.	2.50	1.	1.	1.	.01		
HYDROGRAPH AT	HYRR3	68.	2.50	15.	9.	9.	.06		
HYDROGRAPH AT	HYDR4	18.	2.50	4.	2.	2.	.02		
HYDROGRAPH AT	HYDR5	23.	2.50	5.	3.	3.	.02		
5 COMBINED AT	COMB	126.	2.50	43.	26.	26.	.20		

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

EXHIBIT E

TEAL BROOK ESTATES AND SUNRIDGE ADDITION

HYDROLOGY AND FLOOD ROUTING

100-YEAR FREQUENCY STORM WITH EXISTING CONDITIONS

DRAINAGE PLAN FOR TEAL BROOK AND SUNRIDGE ADDITIONS

Variables for SCS Hydrographs, 100-year Storm w/Existing Conditions

Basin 1. Cedar Downs Estates, 21st Street right of way and a commercial corner at 119th Street and 21st.
Drainage Area = 62.5 acres (0.0977 square miles) SCS CN = 83
Rational Method c-factor = 0.51 Time of Concentration = 85 minutes
Q by Rational Formula 62.5*0.51*3.01 = 96 cfs.

Basin 2. North-Center portion in Teal Brook Estates
Drainage Area = 3.74 acres (0.00584 square miles) SCS CN = 80
Rational Method c-factor = 0.40 Time of Concentration = 15 minutes
Q by Rational Formula 3.74*0.40*7.37 = 11 cfs.

Basin 3. East portion in Teal Brook Estates and all of Sunridge Addition.
Drainage Area = 37.41 acres (0.0585 square miles) SCS CN = 81
Rational Method c-factor = 0.40 Time of Concentration = 15 minutes
Q by Rational Formula 37.41*0.40*7.37 = 110 cfs.

Basin 4. South portion in Teal Brook Estates
Drainage Area = 10.12 acres (0.0158 square miles) SCS CN = 82
Rational Method c-factor = 0.40 Time of Concentration = 15 minutes
Q by Rational Formula 10.12*0.40*7.37 = 30 cfs.

Basin 5. West portion in Teal Brook Estates
Drainage Area = 12.71 acres (0.0199 square miles) SCS CN = 81
Rational Method c-factor = 0.40 Time of Concentration = 15 minutes
Q by Rational Formula 12.71*0.40*7.37 = 37 cfs.

****
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
****

THIS HEC-1 VERSION CONTAINS ALL OPTIONS EXCEPT ECONOMICS, AND THE NUMBER OF PLANS ARE REDUCED TO 3

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

    1         ID        FLOOD ROUTING FOR TEAL BROOK AND SUNRIDGE ADDITIONS          FILE TLBRK2E
    2         ID        TEAL BROOK & SUNRIDGE DRAINAGE PLAN W/EXISTING CONDITIONS
    3         ID        100-YEAR FREQUENCY DISCHARGES BY RATIONAL METHOD W/SCS HYDROGRAPHS
    4         ID        W/100-YEAR 6-HOUR STORM AND SCS 15 MINUTE DISTRIBUTION
    5         IT     15       0       0      40
    6         IO      5       1

    7         KK   HYDR1
    8         KM    RUNOFF HYDROGRAPH FOR BASIN 1, CEDAR DOWNS ESTATES U/S FROM 21ST STREET,
    9         KM    21ST STREET RIGHT OF WAY AND 2 1/2 ACRE COMMERCIAL CORNER AT 119TH STREET
   10         PR     5.9
   11         PI     .09     .13     .13     .09     .18     .18     .23     .38     .94    1.12
   12         PI     .35     .30     .21     .23     .15     .15     .17     .15     .12     .12
   13         PI     .12     .15     .09     .12
   14         BA   .0977
   15         LS      0      83
   16         UD     .85

   17         KK   HYDR2
   18         KM    RUNOFF HYDROGRAPH FOR BASIN 2 SOUTH OF 21ST STREET
   19         BA  .00584
   20         LS             80
   21         UD     .15

   22         KK   HYRR3
   23         KM    RUNOFF HYDROGRAPH FOR BASIN 3 SOUTH OF 21ST STREET
   24         BA   .0585
   25         LS             81
   26         UD     .15

   27         KK   HYDR4
   28         KM    RUNOFF HYDROGRAPH FOR BASIN 4 SOUTH OF 21ST STREET
   29         BA   .0158
   30         LS             82
   31         UD     .15

   32         KK   HYDR5
   33         KM    RUNOFF HYDROGRAPH FOR BASIN 5 SOUTH OF 21ST STREET
   34         BA   .0199
   35         LS             81
   36         UD     .15

   37         KK    COMB
   38         KM    COMBINE RUNOFF HYDROGRAPHS FOR BASINS 1 THRU 5
   39         HC       5
   40         ZZ
```

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	HYDR1	97.	3.25	42.	26.	26.	.10		
HYDROGRAPH AT	HYDR2	11.	2.50	2.	1.	1.	.01		
HYDROGRAPH AT	HYRR3	109.	2.50	24.	15.	15.	.06		
HYDROGRAPH AT	HYDR4	30.	2.50	7.	4.	4.	.02		
HYDROGRAPH AT	HYDR5	37.	2.50	8.	5.	5.	.02		
5 COMBINED AT	COMB	223.	2.50	82.	51.	51.	.20		

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

EXHIBIT F

TEAL BROOK ESTATES AND SUNRIDGE ADDITION

HYDROLOGY AND FLOOD ROUTING

2-YEAR FREQUENCY STORM WITH DEVELOPED CONDITIONS

DRAINAGE PLAN FOR TEAL BROOK AND SUNRIDGE ADDITIONS

Variables for SCS Hydrographs, 2-year Storm w/Developed Conditions

Routed thru Lake # 1

Basin 1. Cedar Downs Estates, 21st Street right of way and a commercial corner at 119th Street and 21st.
Drainage Area = 62.5 acres (0.0977 square miles), SCS CN = 85
Rational Method c-factor = 0.33, Time of Concentration = 85 minutes
Q by Rational Formula 62.5*0.33*1.30 = 27 cfs.

Node 94. Area between 21st Street right of way and centerline of Cornelison Street.
Drainage Area = 3.79 acres (0.0059 square miles), SCS CN = 90
Rational Method c-factor = 0.37, Time of Concentration = 15 minutes
Q by Rational Formula 3.79*0.37*3.83 = 5 cfs.

Node 95. Area south of centerline of Cornelison Street between Pintail Court and Main Entrance.
Drainage Area = 1.44 acres (0.00225 square miles), SCS CN = 90
Rational Method c-factor = 0.37, Time of Concentration = 15 minutes
Q by Rational Formula 1.44*0.37*3.83 = 2 cfs.

Node 101. Sunridge Storm Sewer System at Outlet.
Drainage Area = 27.73 acres (0.0483 square miles), SCS CN = 94
Rational Method c-factor = 0.46, Q from Moehring's Page 9, Hydrology Calculations for System 100 = 37 cfs.

Node 90. Teal Brook Storm Sewer System at Outlet from Teal Brook Court.
Drainage Area = 5.63 acres (0.0088 square miles), SCS CN = 95
Rational Method c-factor = 0.39, Q from Moehring's Page 5, Hydrology Calculations for System 90 = 8 cfs.

Lake # 1 and Adjacent Contributing Drainage Area.
Drainage Area = 7.42 acres (0.0116 square miles), SCS CN = 95
Rational Method c-factor = 0.38, Time of Concentration = 15 minutes
Q by Rational Formula 7.42*0.38*3.83 = 11 cfs.

****

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

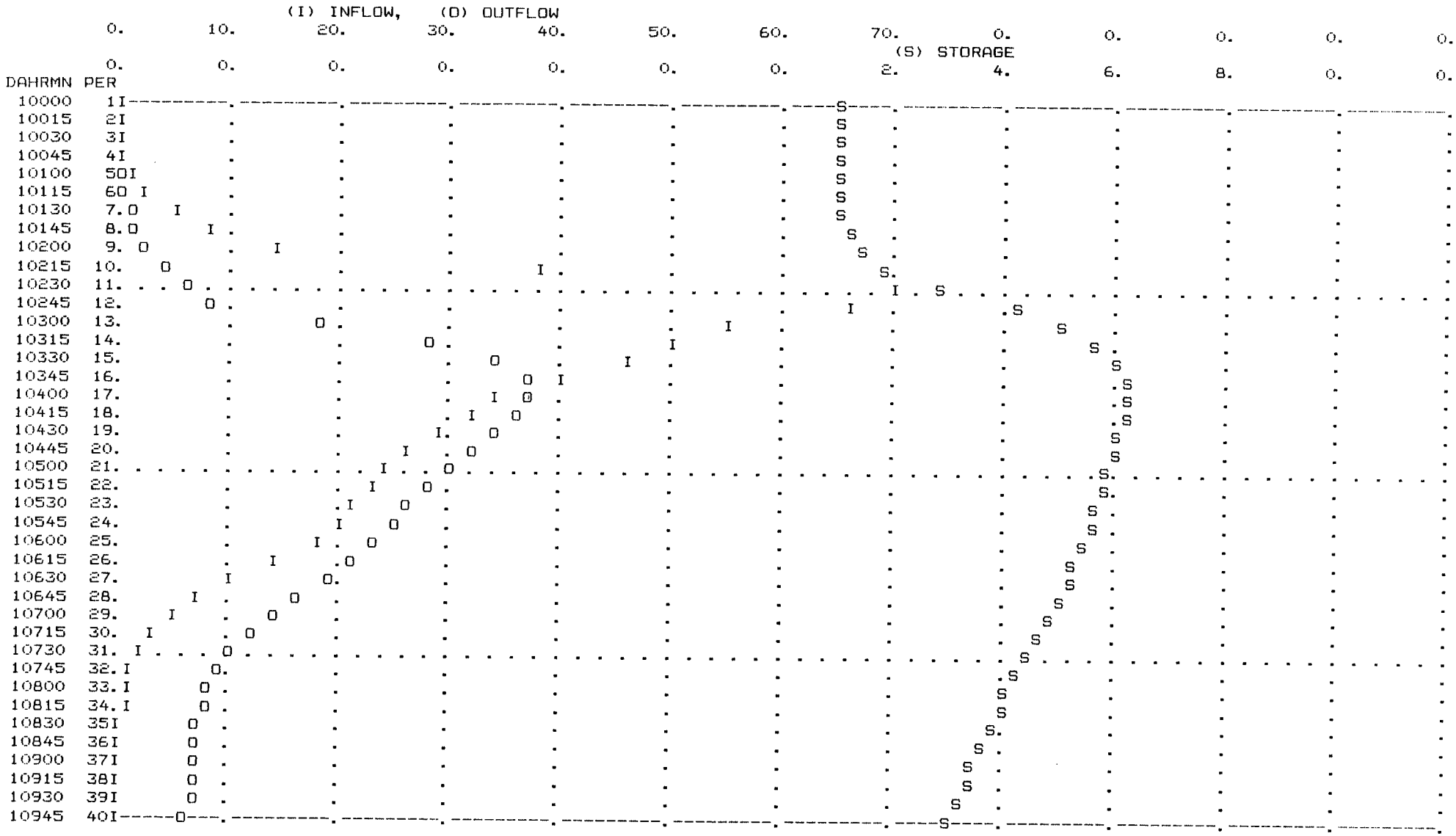
****

THIS HEC-1 VERSION CONTAINS ALL OPTIONS EXCEPT ECONOMICS, AND THE NUMBER OF PLANS ARE REDUCED TO 3

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

    1         ID    FLOOD ROUTING FOR TEAL BROOK AND SUNRIDGE ADDITIONS            FILE TLBRK7X
    2         ID        TEAL BROOK & SUNRIDGE DRAINAGE PLAN W/ DEVELOPED CONDITIONS
    3         ID      W/2-YEAR   FREQUENCY, 6-HOUR STORM W/SCS 15 MINUTE DISTRIBUTION
    4         IT      15       0       0      40
    5         IO       5       1

    6         KK   HYDR1
    7         KM    RUNOFF HYDROGRAPH FOR BASIN 1, CEDAR DOWNS ESTATES U/S FROM 21ST STREET
    8         KM    21ST STREET RIGHT OF WAY AND 2 1/1 ACRE COMMERCIAL CORNER AT 119TH STREET
    9         PR     2.5
   10         PI    0.04     .06     .06     .05     .07     .08     .10     .16     .40     .48
   11         PI     .15     .12     .09     .10     .06     .06     .08     .06     .05     .05
   12         PI     .05     .05     .04     .04
   13         BA   .0977
   14         LS      0       85
   15         UD     .85

   16         KK  HYDR94
   17         KM    RUNOFF HYDROGRAPH FOR DRAINAGE AREA AT NODE 94
   18         BA   .0059
   19         LS      0       90
   20         UD     .15

   21         KK  HYDR95
   22         KM    RUNOFF HYDROGRAPH FOR DRAINAGE AREA AT NODE 95
   23         BA  .00225
   24         LS      0       90
   25         UD     .15

   26         KK    COMB
   27         KM    COMBINE RUNOFF HYDROGRAPHS FROM BASIN 1, NODE 94 AND NODE 95
   28         HC      3

   29         KK   HYDSR
   30         KM    RUNOFF HYDROGRAPH FOR SUNRIDGE STORM SEWER OUTLET AT NODE 101
   31         BA   .0483
   32         LS      0       94
   33         UD     .26

   34         KK   HYD90
   35         KM    RUNOFF HYDROGRAPH FOR DRAINAGE AREA CONTRIBUTING TO STORM SEWER AT NODE 90
   36         BA   .0088
   37         LS      0       95
   38         UD     .18

   39         KK   HYDL1
   40         KM    RUNOFF HYDROGRAPH FOR LAKE 1 AND ADJACENT DRAINAGE AREA
   41         BA   .0116
   42         LS      0       95
   43         UD     .15
```

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

  44      KK    COMB
  45      KM    COMBINE RUNOFF HYDROGRAPHS FROM COMBINATION 1 WITH RUNOFF HYDROGRAPHS FROM
  46      KM    SUNRIDGE STORM SEWER, NODE 90 AND LAKE 1 AND ADJACENT AREA
  47      HC       4

  48      KK   RTLK1
  49      KM    ROUTE INFLOW HYDROGRAPH FROM COMBINATION ON RUNOFF HYDROGRAPHS FROM
  50      KM    SUNRIDGE STROM SEWER AND ALL NODES IN TEAL BROOK DRAINING TO LAKE 1
  51      KM    THRU LAKE 1 STORAGE VOLUME
  52      KO       3       2
  53      RS       1    FLOW      -1
  54      SV     .02     1.9    4.01    6.37       9   11.94   15.20
  55      SE    1338    1339    1340    1341    1342    1343    1344
  56      SL  1338.5    .785       1      .5
  57      SS    1340      10       3     1.5
  58      ZZ
```

STATION RTLK1



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	HYDR1	27.	3.25	12.	8.	8.	.10		
HYDROGRAPH AT	HYDR94	5.	2.50	1.	1.	1.	.01		
HYDROGRAPH AT	HYDR95	2.	2.50	0.	0.	0.	.00		
3 COMBINED AT	COMB	29.	3.25	14.	8.	8.	.11		
HYDROGRAPH AT	HYDSR	37.	2.50	10.	6.	6.	.05		
HYDROGRAPH AT	HYD90	8.	2.50	2.	1.	1.	.01		
HYDROGRAPH AT	HYDL1	11.	2.50	2.	2.	2.	.01		
4 COMBINED AT	COMB	70.	2.50	27.	17.	17.	.17		
ROUTED TO	RTLK1	37.	3.75	22.	14.	14.	.17	1340.93	3.75

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

EXHIBIT G

TEAL BROOK ESTATES AND SUNRIDGE ADDITION

HYDROLOGY AND FLOOD ROUTING

5-YEAR FREQUENCY STORM WITH DEVELOPED CONDITIONS

DRAINAGE PLAN FOR TEAL BROOK AND SUNRIDGE ADDITIONS

Variables for SCS Hydrographs, 5-year Storm w/Developed Conditions

Basin 1. Cedar Downs Estates, 21st Street right of way and a commercial corner at 119th Street and 21st.
Drainage Area = 62.5 acres (0.0977 square miles), SCS CN = 82,
Rational Method c-factor = 0.35, Time of Concentration = 85 minutes
Q by Rational Formula 62.5*0.35*1.72 = 38 cfs.

Node 94. Area between 21 st Street right of way and centerline of Cornelison Street.
Drainage Area = 3.79 acres (0.0059 square miles), SCS CN = 92,
Rational Method c-factor = 0.39, Time of Concentration = 15 minutes
Q by Rational Formula 3.79*0.39*4.56 = 7 cfs.

Node 95. Area south of centerline of Cornelison Street between Pintail Court and Main Entrance.
Drainage Area = 1.44 acres (0.00225 square miles), SCS CN = 92
Rational Method c-factor = 0.39, Time of Concentration = 15 minutes
Q by Rational Formula 1.44*0.39*4.56 = 3 cfs.

Node 101. Sunridge Storm Sewer System at Outlet.
Drainage Area = 27.73 acres (0.0483 square miles), SCS CN = 90
Rational Method c-factor = 0.46, Time of Concentration = 26 minutes
Q by Rational Formula 27.73*0.46*3.50 = 45 cfs.

Node 90. Teal Brook Storm Sewer System at Outlet from Teal Brook Court.
Drainage Area = 5.63 acres (0.0088 square miles), SCS CN = 90
Rational Method c-factor = 0.39, Time of Concentration = 15 minutes
Q by Rational Formula 5.63*0.39*4.56 = 10 cfs.

Lake # 1 and Adjacent Contributing Drainage Area.
Drainage Area = 7.42 acres (0.0116 square miles), SCS CN = 91
Rational Method c-factor = 0.40, Time of Concentration = 15 minutes
Q by Rational Formula 7.42*0.40*4.56 = 14 cfs.

Node 96. Area North of Teal Brook Street and South of Lake # 1 Drainage area.
Drainage Area = 1.86 acres (0.00291 square miles), SCS CN = 90
Rational Method c-factor = 0.39, Time of Concentration = 15 minutes
Q by Rational Formula 1.86*0.39*4.56 = 3 cfs.

Node 97. Area South of Teal Brook Street and North of Lake # 2 and its Adjacent Contributing Drainage Area (does not include Area TLB 10).
Drainage Area = 3.65 acres (0.0057 square miles), SCS CN = 94
Rational Method c-factor = 0.39, Time of Concentration = 15 minutes
Q by Rational Formula 3.65*0.39*4.56 = 6 cfs.

Lake # 2 and Adjacent Contributing Drainage Area including Area TLB 10.
Drainage Area = 5.28 acres (0.00825 square miles), SCS CN = 95
Rational Method c-factor = 0.59, Time of Concentration = 80 minutes
Q by Rational Formula 5.28*0.59*1.79 = 6 cfs.

****

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

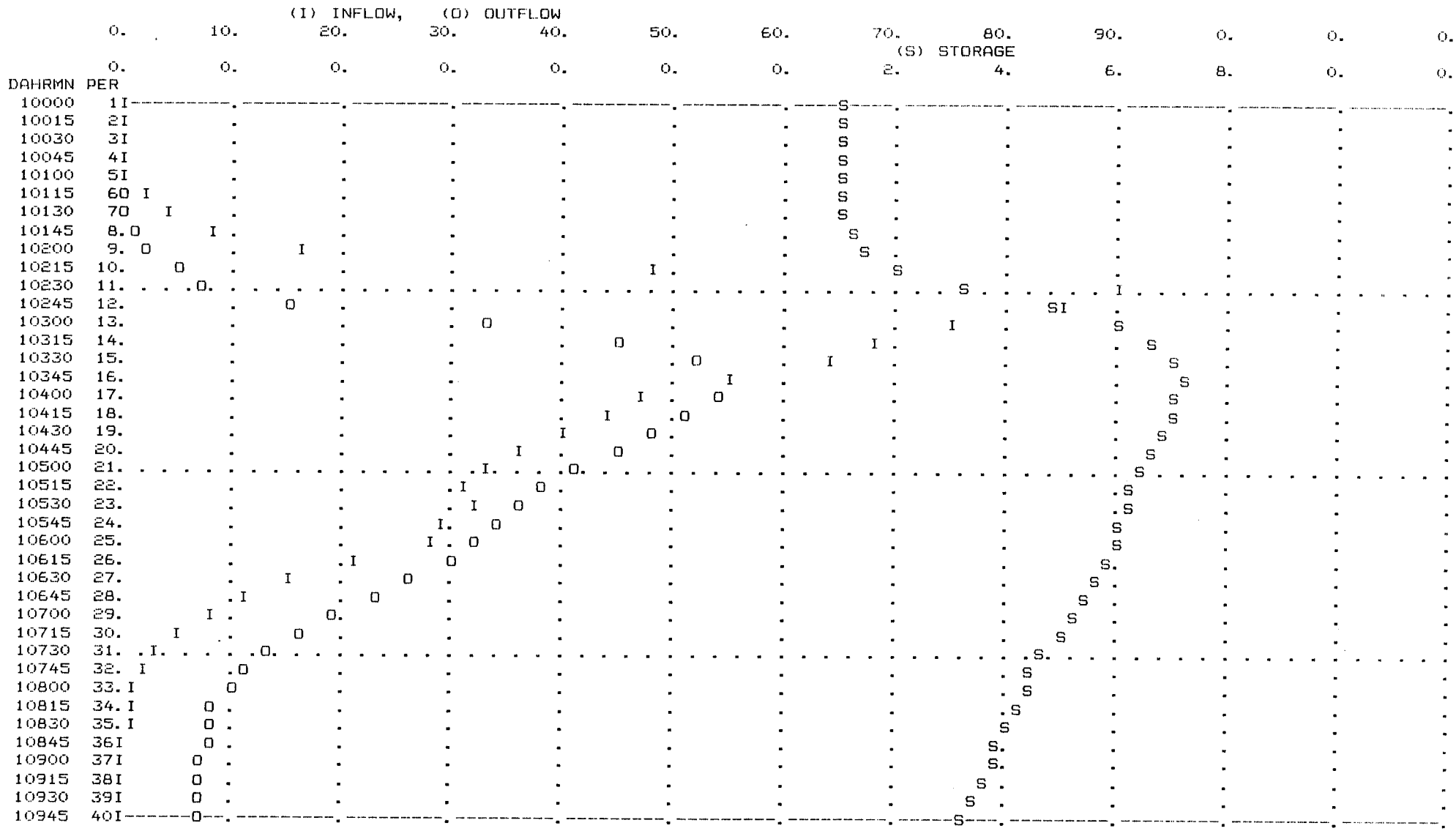
****

THIS HEC-1 VERSION CONTAINS ALL OPTIONS EXCEPT ECONOMICS, AND THE NUMBER OF PLANS ARE REDUCED TO 3

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

    1     ID    FLOOD ROUTING FOR TEAL BROOK AND SUNRIDGE ADDITIONS FILE    TLBRK3F
    2     ID    TEAL BROOK & SUNRIDGE DRAINAGE PLAN W/DEVELOPED CONDITIONS
    3     ID      5-YEAR FREQUENCY DISCHARGES BY RATIONAL METHOD W/SCS HYDROGRAPHS
    4     ID      W/5-YEAR 6-HOUR STORM AND SCS 15 MINUTE DISTRIBUTION ROUTED THRU LAKES 1&2
    5     IT      15       0       0      40
    6     IO       5       1

    7     KK   HYD 1
    8     KM    RUNOFF HYDROGRAPH FOR BASIN 1, CEDAR DOWNS ESTATES U/S FROM 21ST STREET,
    9     KM    21ST STREET RIGHT OF WAY AND 2 1/2 ACRE COMMERCIAL CORNER AT 119TH STREET
   10     PR     3.4
   11     PI     .05     .08     .07     .05     .10     .10     .14     .22     .54     .65
   12     PI     .20     .17     .12     .14     .08     .09     .10     .08     .07     .07
   13     PI     .07     .09     .05     .07
   14     BA   .0977
   15     LS       0      82
   16     UD     .85

   17     KK   HYD94
   18     KM    RUNOFF HYDROGRAPH FOR DRAINAGE AREA AT NODE 94
   19     BA   .0059
   20     LS       0      92
   21     UD     .15

   22     KK   HYD95
   23     KM    RUNOFF HYDROGRAPH FOR DRAINAGE AREA AT NODE 95
   24     BA  .00225
   25     LS       0      92
   26     UD     .15

   27     KK    COMB
   28     KM    COMBINE RUNOFF HYDROGRAPHS FROM BASIN 1, NODE 94 AND NODE 95
   29     HC       3

   30     KK   HYDSR
   31     KM    RUNOFF HYDROGRAPH FOR SUNRIDGE STORM SEWER OUTLET AT NODE 101
   32     BA   .0483
   33     LS       0      90
   34     UD     .26

   35     KK   HYD90
   36     KM    RUNOFF HYDROGRAPH FOR DRAINAGE AREA CONTRIBUTING TO STORM SEWER AT NODE 90
   37     BA   .0088
   38     LS       0      90
   39     UD     .15

   40     KK   HYDL1
   41     KM    RUNOFF HYDROGRAPH FOR LAKE 1 AND ADJACENT DRAINAGE AREA
   42     BA   .0116
   43     LS       0      91
   44     UD     .15
```

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

  45      KK    COMB
  46      KM    COMBINE RUNOFF HYDROGRAPHS FROM COMBINATION 1 WITH RUNOFF HYDROGRAPHS FROM
  47      KM    SUNRIDGE STORM SEWER, NODE 90 AND LAKE 1 AND ADJACENT AREA
  48      HC       4

  49      KK   RTLK1
  50      KM    ROUTE INFLOW HYDROGRAPH FROM COMBINATION OF RUNOFF HYDROGRAPHS FROM
  51      KM    SUNRIDGE STORM SEWER AND ALL NODES IN TEAL BROOK DRAINING TO LAKE 1
  52      KM    THRU LAKE 1 STORAGE VOLUME
  53      KO       3       2
  54      RS       1    FLOW       -1
  55      SV     .02     1.9     4.01     6.37        9    11.94    15.20
  56      SE    1338    1339     1340     1341     1342     1343     1344
  57      SL  1338.5    .785        1       .5
  58      SS    1340      10        3      1.5

  59      KK   HYD96
  60      KM    RUNOFF HYDROGRAPH FOR DRAINAGE AREA AT NODE 96
  61      BA  .00291
  62      LS       0      90
  63      UD     .15

  64      KK    COMB
  65      KM    COMBINE OUTFLOW HYDROGRAPH FROM LAKE # 1 WITH RUNOFF HYDROGRAPH FROM NODE 96
  66      HC       2

  67      KK   HYD97
  68      KM    RUNOFF HYDROGRAPH FOR DRAINAGE AREA AT NODE 97
  69      BA   .0057
  70      LS       0      87
  71      UD     .15

  72      KK   HYDL2
  73      KM    RUNOFF HYDROGRAPH FOR LAKE 2 AND ADJACENT AREA AND FOR AREA TLB10
  74      BA  .00825
  75      LS       0      95
  76      UD     0.8

  77      KK    COMB
  78      KM    COMBINE OUTFLOW HYDROGRAPH FROM COMBINATION  ABOVE WITH RUNOFF HYDROGRAPHS
  79      KM    FROM NODES 96 AND 97 AND WITH RUNOFF HYDROGRAPH FROM LAKE # 2 AND ADJACENT
  80      KM    AREA INCLUDING AREA DRAINING TO TLB10
  81      HC       3

  82      KK   RTLK2
  83      KM    ROUTE INFLOW HYDROGRAPH FROM COMBINATION ABOVE THRU LAKE 2 STORAGE VOLUME
  84      KO       3       2
  85      RS       1    FLOW       -1
  86      SV     .01    1.78     3.67     5.67     7.78
  87      SE    1337    1338     1339     1340     1341
  88      SL  1337.5    .785        1       .5
  89      SS    1339      10        3      1.5
```

STATION RTLK1



STATION RTLK2

(I) INFLOW, (O) OUTFLOW

	0.	10.	20.	30.	40.	50.	60.	70.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	2.	(S) STORAGE 4.	6.	8.	0.	0.
DAHRMN	PER												
10000	1	I						S					
10015	2	I						S					
10030	3	I						S					
10045	4	I						S					
10100	5	I						S					
10115	6	I						S					
10130	7	OI						S					
10145	8	O I						S					
10200	9.0	I						S					
10215	10.0		I					S					
10230	11.	.O.	I.					.S.					
10245	12.	O		I				S.					
10300	13.	O				I		S					
10315	14.	O					I	S					
10330	15.		O				I	S					
10345	16.			O			I	S					
10400	17.				O.		I.	S					
10415	18.				O		I	S					
10430	19.					O I		S					
10445	20.					I O		S					
10500	21.					I. .O.		S					
10515	22.				I O			S					
10530	23.				I O			S					
10545	24.				I O			S.					
10600	25.				I O			S.					
10615	26.			I O				S					
10630	27.			I O				S					
10645	28.		I .O					S					
10700	29.		I O					S					
10715	30.		I O					S					
10730	31.		I . .O.					S					
10745	32.		.I O.					S					
10800	33.		I O					S					
10815	34.		I . O					S					
10830	35.		I . O					S					
10845	36.		I . O					S					
10900	37.		I .O					S					
10915	38.		I O					S					
10930	39.		I O					S					
10945	40.		I-O.					S.					

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	HYD 1	38.	3.25	18.	11.	11.	.10		
HYDROGRAPH AT	HYD94	7.	2.50	2.	1.	1.	.01		
HYDROGRAPH AT	HYD95	3.	2.50	1.	0.	0.	.00		
3 COMBINED AT	COMB	41.	3.25	20.	12.	12.	.11		
HYDROGRAPH AT	HYDSR	45.	2.50	12.	8.	8.	.05		
HYDROGRAPH AT	HYD90	10.	2.50	2.	1.	1.	.01		
HYDROGRAPH AT	HYDL1	14.	2.50	3.	2.	2.	.01		
4 COMBINED AT	COMB	90.	2.50	37.	23.	23.	.17		
ROUTED TO	RTLK1	55.	3.75	31.	20.	20.	.17	1341.29	3.75
HYDROGRAPH AT	HYD96	3.	2.50	1.	0.	0.	.00		
2 COMBINED AT	COMB	56.	3.75	31.	21.	21.	.18		
HYDROGRAPH AT	HYD97	6.	2.50	1.	1.	1.	.01		
HYDROGRAPH AT	HYDL2	6.	3.25	2.	2.	2.	.01		
3 COMBINED AT	COMB	61.	3.75	35.	23.	23.	.19		
ROUTED TO	RTLK2	50.	4.75	30.	19.	19.	.19	1340.20	4.75

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

EXHIBIT H

TEAL BROOK ESTATES AND SUNRIDGE ADDITION

HYDROLOGY AND FLOOD ROUTING

100-YEAR FREQUENCY STORM WITH DEVELOPED CONDITIONS

DRAINAGE PLAN FOR TEAL BROOK AND SUNRIDGE ADDITIONS

Variables for SCS Hydrographs, 100-year Storm w/Developed Conditions

Basin 1. Cedar Downs Estates, 21st Street right of way and a commercial corner at 119th Street and 21st.
Drainage Area = 62.5 acres (0.0977 square miles), SCS CN = 83
Rational Method c-factor = 0.51, Time of Concentration = 85 minutes
Q by Rational Formula 62.5*0.51*3.01 = 96 cfs.

Node 94. Area between 21st Street right of way and centerline of Cornelison Street.
Drainage Area = 3.79 acres (0.0059 square miles), SCS CN = 95,
Rational Method c-factor = 0.55, Time of Concentration = 15 minutes
Q by Rational Formula 3.79*0.55*7.37 = 15 cfs.

Node 95. Area south of centerline of Cornelison Street between Pintail Court and Main Entrance.
Drainage Area = 1.44 acres (0.00225 square miles), SCS CN = 94
Rational Method c-factor = 0.55, Time of Concentration = 15 minutes
Q by Rational Formula 1.44*0.55*7.37 = 6 cfs.

Node 101. Sunridge Storm Sewer System at Outlet.
Drainage Area = 27.73 acres (0.0483 square miles), SCS CN = 95
Rational Method c-factor = 0.61, Q from Moehring's Page 10,
Hydrology Calculations for System 100 = 103 cfs.

Node 90. Teal Brook Storm Sewer System at Outlet from Teal Brook Court.
Drainage Area = 5.63 acres (0.0088 square miles), SCS CN = 96
Rational Method c-factor = 0.61, Q from Moehring's Page 6,
Hydrology Calculations for System 90 = 22 cfs.

Lake # 1 and Adjacent Contributing Drainage Area.
Drainage Area = 7.42 acres (0.0116 square miles), SCS CN = 96
Rational Method c-factor = 0.54, Time of Concentration = 15 minutes
Q by Rational Formula 7.42*0.54*7.37 = 30 cfs.

Node 96. Area North of Teal Brook Street and South of Lake # 1 Drainage Area.
Drainage Area = 1.86 acres (0.00291 square miles), SCS CN = 95
Rational Method c-factor = 0.55, Time of Concentration = 15 minutes
Q by Rational Formula 1.86*0.55*7.37 = 7 cfs.

Node 97. Area South of Teal Brook Street and North of Lake # 2 and its Adjacent Contributing Drainage Area (does not include Area TLB 10).
Drainage Area = 3.65 acres (0.0057 square miles), SCS CN = 96
Rational Method c-factor = 0.55, Time of Concentration = 15 minutes
Q by Rational Formula 3.65*0.55*7.37 = 15 cfs.

Lake # 2 and Adjacent Contributing Drainage Area including Area TLB 10.
Drainage Area = 5.28 acres (0.00825 square miles), SCS CN = 96
Rational Method c-factor = 0.70, Time of Concentration = 80 minutes
Q by Rational Formula 5.28*0.70*3.16 = 12 cfs.

****

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

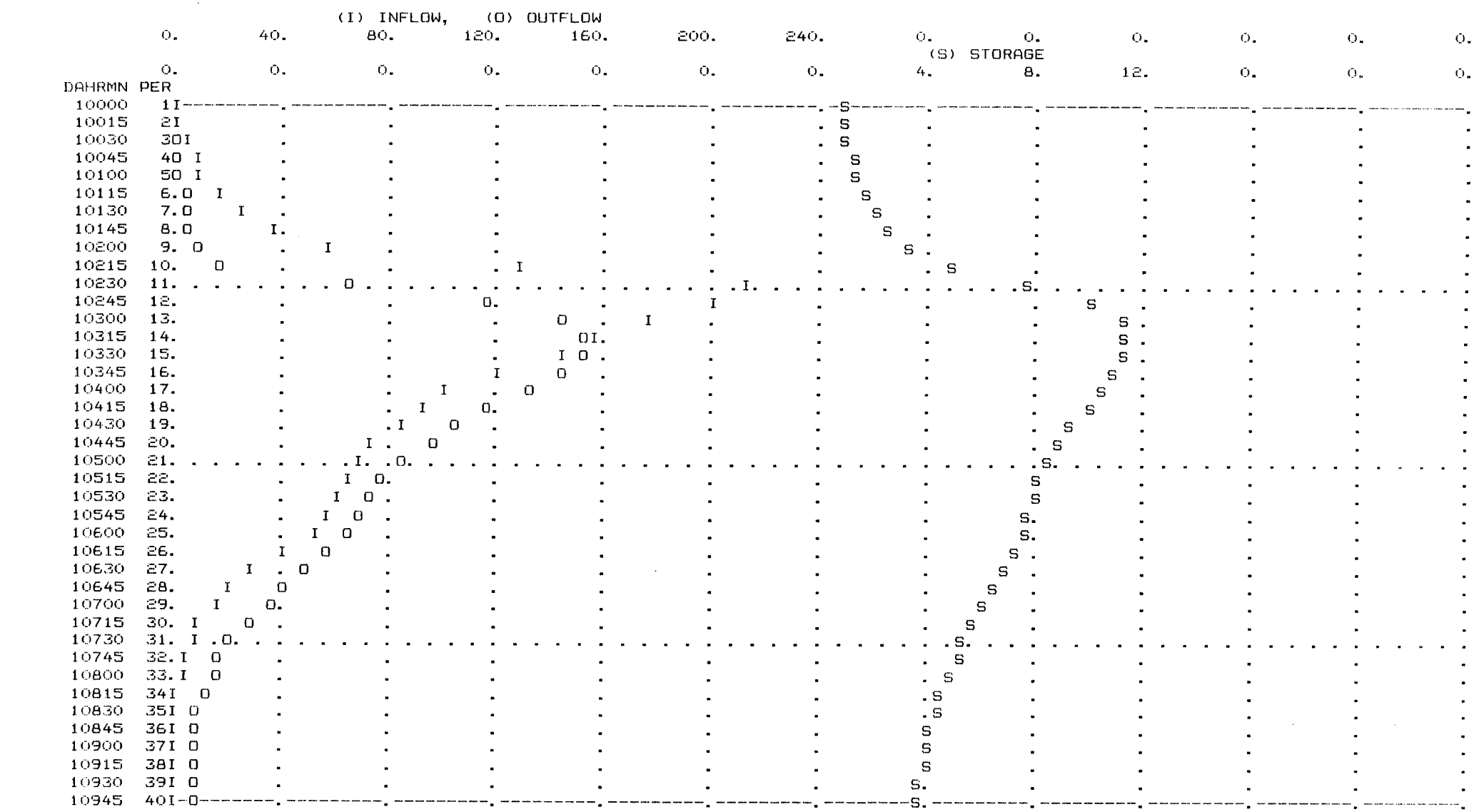
****

THIS HEC-1 VERSION CONTAINS ALL OPTIONS EXCEPT ECONOMICS, AND THE NUMBER OF PLANS ARE REDUCED TO 3

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

    1     ID    FLOOD ROUTING FOR TEAL BROOK AND SUNRIDGE ADDITIONS   FILE TLBRKF1
    2     ID    TEAL BROOK & SUNRIDGE DRAINAGE PLAN W/DEVELOPED CONDITIONS
    3     ID    100-YEAR FREQUENCY DISCHARGES BY RATIONAL METHOD W/SCS HYDROGRAPHS
    4     ID    W/100-YEAR 6-HOUR STORM AND SCS 15 MINUTE DISTRIBUTION ROUTED THRU LAKES 1&2
    5     IT      15       0       0      40
    6     IO       4       1

    7     KK   HYD 1
    8     KM    RUNOFF HYDROGRAPH FOR BASIN 1, CEDAR DOWNS ESTATES U/S FROM 21ST STREET,
    9     KM    21ST STREET RIGHT OF WAY AND 2 1/2 ACRE COMMERCIAL CORNER AT 119TH STREET
   10     PR     5.9
   11     PI     .09     .13     .13     .09     .18     .18     .23     .38     .94    1.12
   12     PI     .35     .30     .21     .23     .15     .15     .17     .15     .12     .12
   13     PI     .12     .15     .09     .12
   14     BA   .0977
   15     LS       0      83
   16     UD     .85

   17     KK   HYD94
   18     KM    RUNOFF HYDROGRAPH FOR DRAINAGE AREA AT NODE 94
   19     BA   .0059
   20     LS       0      95
   21     UD     .15

   22     KK   HYD95
   23     KM    RUNOFF HYDROGRAPH FOR DRAINAGE AREA AT NODE 95
   24     BA  .00225
   25     LS       0      94
   26     UD     .15

   27     KK    COMB
   28     KM    COMBINE RUNOFF HYDROGRAPHS FROM BASIN 1, NODE 94 AND NODE 95
   29     HC       3

   30     KK   HYDSR
   31     KM    RUNOFF HYDROGRAPH FOR SUNRIDGE STORM SEWER OUTLET AT NODE 101
   32     BA   .0483
   33     LS       0      95
   34     UD     .26

   35     KK   HYD90
   36     KM    RUNOFF HYDROGRAPH FOR DRAINAGE AREA CONTRIBUTING TO STORM SEWER AT NODE 90
   37     BA   .0088
   38     LS       0      96
   39     UD     .18

   40     KK   HYDL1
   41     KM    RUNOFF HYDROGRAPH FOR LAKE 1 AND ADJACENT DRAINAGE AREA
   42     BA   .0116
   43     LS       0      96
   44     UD     .15
```

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

  45      KK    COMB
  46      KM    COMBINE RUNOFF HYDROGRAPHS FROM COMBINATION 1 WITH RUNOFF HYDROGRAPHS FROM
  47      KM    SUNRIDGE STORM SEWER, NODE 90 AND LAKE 1 AND ADJACENT AREA
  48      HC       4

  49      KK   RTLK1
  50      KM    ROUTE INFLOW HYDROGRAPH FROM COMBINATION OF RUNOFF HYDROGRAPHS FROM
  51      KM    SUNRIDGE STORM SEWER AND ALL NODES IN TEAL BROOK DRAINING TO LAKE 1
  52      KM    THRU LAKE 1 STORAGE VOLUME
  53      KO       3       2
  54      RS       1    FLOW      -1
  55      SV     .02     1.9    4.01    6.37       9   11.94   15.20
  56      SE    1338    1339    1340    1341    1342    1343    1344
  57      SL  1338.5    .785       1      .5
  58      SS    1340      10       3     1.5

  59      KK   HYD96
  60      KM    RUNOFF HYDROGRAPH FOR DRAINAGE AREA AT NODE 96
  61      BA  .00291
  62      LS       0      95
  63      UD     .15

  64      KK    COMB
  65      KM    COMBINE OUTFLOW HYDROGRAPH FROM LAKE # 1 WITH RUNOFF HYDROGRAPH FROM NODE 96
  66      HC       2

  67      KK   HYD97
  68      KM    RUNOFF HYDROGRAPH FOR DRAINAGE AREA AT NODE 97
  69      BA   .0057
  70      LS       0      96
  71      UD     .15

  72      KK   HYDL2
  73      KM    RUNOFF HYDROGRAPH FOR LAKE 2 AND ADJACENT AREA AND FOR AREA  TLB 10
  74      BA  .00825
  75      LS       0      96
  76      UD     0.8

  77      KK    COMB
  78      KM    COMBINE OUTFLOW HYDROGRAPH FROM COMBINATION  ABOVE WITH RUNOFF HYDROGRAPHS
  79      KM    FROM NODES 96 AND 97 AND WITH RUNOFF HYDROGRAPH FROM LAKE # 2 AND ADJACENT
  80      KM    AREA INCLUDING AREA DRAINING TO TLB10
  81      HC       3

  82      KK   RTLK2
  83      KM    ROUTE INFLOW HYDROGRAPH FROM COMBINATION ABOVE THRU LAKE 2 STORAGE VOLUME
  84      KO       3       2
  85      RS       1    FLOW      -1
  86      SV     .01    1.78    3.67    5.67    7.78
  87      SE    1337    1338    1339    1340    1341
  88      SL  1337.5    .785       1      .5
  89      SS    1339      10       3     1.5
  90      ZZ
```

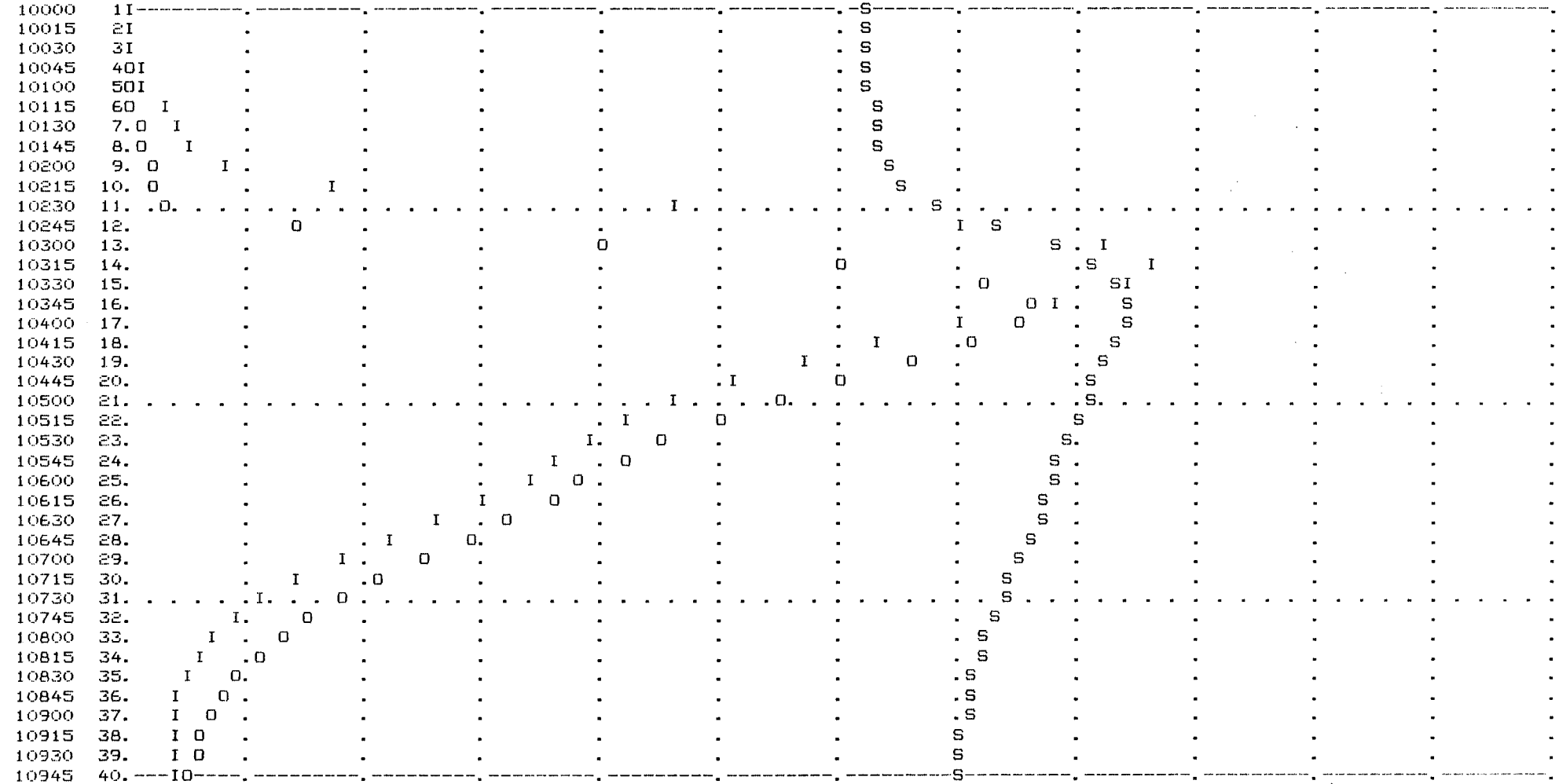
STATION RTLK1



STATION RTLK2

(I) INFLOW, (O) OUTFLOW

(S) STORAGE



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	HYD 1	97.	3.25	42.	26.	26.	.10		
HYDROGRAPH AT	HYD94	15.	2.50	3.	2.	2.	.01		
HYDROGRAPH AT	HYD95	6.	2.50	1.	1.	1.	.00		
3 COMBINED AT	COMB	103.	3.25	46.	29.	29.	.11		
HYDROGRAPH AT	HYDSR	103.	2.50	27.	17.	17.	.05		
HYDROGRAPH AT	HYD90	22.	2.50	5.	3.	3.	.01		
HYDROGRAPH AT	HYDL1	30.	2.50	7.	4.	4.	.01		
4 COMBINED AT	COMB	210.	2.50	84.	53.	53.	.17		
ROUTED TO	RTLK1	154.	3.25	78.	50.	50.	.17	1342.80	3.25
HYDROGRAPH AT	HYD96	7.	2.50	2.	1.	1.	.00		
2 COMBINED AT	COMB	156.	3.25	79.	51.	51.	.18		
HYDROGRAPH AT	HYD97	15.	2.50	3.	2.	2.	.01		
HYDROGRAPH AT	HYDL2	12.	3.25	5.	3.	3.	.01		
3 COMBINED AT	COMB	171.	3.25	86.	56.	56.	.19		
ROUTED TO	RTLK2	152.	3.75	81.	52.	52.	.19	1341.89	3.75

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

EXHIBIT I

TEAL BROOK ESTATES AND SUNRIDGE ADDITION

MISCELLANEOUS CALCULATIONS FOR

HYDROLOGY AND FLOOD ROUTING

TEAL BROOK & SUNRIDGE ADDITION
MISCELLANEOUS CALCULATIONS

BASIN 1. Cedar Downs Estates and area east of Cedar Downs Lane north of 21st Street.

Drainage Area in Cedar Downs Estates contributing to 7x3 RCBC in 21st Street located 1450 feet west of 119th Street as taken from the drainage study done for the Preliminary Plat by the County Department of Public Works is .....30 acres.

Drainage Area east of Cedar Downs Lane and north of 21st Street.
East portion (1130*1200)/2*43560 + (1650*250)/2*43560 = 20 acres.
West portion ((640*(240+435)/2)/43560 +
(120*300)/2*43560 = ... 5 acres.

Sum of sub-drainage areas north of 21st Street = ...55 acres.

Drainage Area of 21st Street right of way 1620*135 = .. 5 acres.

Commercial corner at 119th Street per Sunridge Plat... 2.5 acres.

Total Drainage Area contributing to main draw in
Teal Brook Estates = ...62.5 acres (0.0977 square miles).

Time of Concentration for Basin 1.

Overland flow length in Cedar Downs Estates is 315 feet with slope of .005 feet/foot and modified Manning's roughness factor of .50. Initial Time of Concentration TIC from the Kinematic Wave Equation is

$TIC = K(L^{.6}N^{.6})/(I^{.4}S^{.3}) = 0.93(315^{.6} * .5^{.6})/(3.92^{.4} * .005^{.3}) =$
.....55 minutes.

Travel Time TT in Cedar Downs Lane to cross-road culvert from Kirpich Equation where length of flow is 1900 feet with slope of .005 ft/ft.

$TT = .0078(L/S^{.5})^{.77} = .0078(1900/.005^{.5})^{.77} =$ .....20 minutes.

Travel Time TT in Cedar Downs channel from cross road culvert to 21st Street from Kirpich Equation where length of flow is 290 feet with slope of .004 feet/foot.

$TT = .0078(L/S^{.5})^{.77} = .0078(290/.004^{.5})^{.77} =$ ..... 5 minutes.

Travel Time TT from north line of 21st Street right of way, thru soil saver, RCBC and outlet ditch to south line of 21st Street right of way is estimated to be ..... 5 minutes.

Total Time of Concentration from upper end of Cedar Downs Lane to 7x3 RCBC in 21st Street is 55 + 20 + 5 + 5 = ... 85 minutes.

Lag = 0.6 TC = 0.6*(85/60) = ... 0.85 hours.

SCS Soil Type from Sedgwick County Soil Survey .....Type B.

Basin 2. North-Center portion in Teal Brook Estates.

Drainage Area by planimeter measurement taken from topographic map at scale 1" = 100' where 1 square inch equals 0.23 acres.

DA = 16.24 square inches * 0.23 = 3.74 acres (.00584 square miles).

Time of Concentration from Kirpich Equation where length of flow is 700 feet with slope of .00557 feet/foot.

$TC = .0078(L/S^{.5}) = .0078(700/.00557^{.5}) = 9$ minutes, (Use 15).

Lag = 0.6 TC = 0.6*(15/60) = ... 0.15 hours.

SCS Soil Type from Sedgwick County Soil Survey.....Type B.

Basin 3. East portion in Teal Brook Estates and all of Sunridge Add'n.

Drainage Area by planimeter measurement taken from topographic map at scale 1"=100' where 1 square inch equals 0.23 acres.

DA in Teal Brook Estates = 42.69 square inches * .23 = 9.82 acres.
DA in Sunridge Addition by survey =..... 23.01 acres.
DA in Commercial Exception in Sunridge = ... 2.51 acres.
DA in Residential Exception in Sunridge = ...2.07 acres.

Total Drainage Area in Basin 3 = ... 37.41 acres (.0585 sq.miles).

Time of Concentration from Kirpich Equation where length of flow is 1650 feet with slope of .00667 feet/foot.

$TC = .0078(L/S^{.5}) = .0078(1650/.00667^{.5}) =$ ..... 15 minutes.

Lag = 0.6 TC = 0.6*(15/60) = ... 0.15 hours.

SCS Soil Type from Sedgwick County Soil Survey..... Type B.

Basin 4. South portion in Teal Brook Estates

Drainage Area by planimeter measurement taken from topographic map at scale 1"=100' where 1 square inch equals 0.23 acres.

DA = 44 square inches * 0.23 = 10.12 acres (.0158 square miles).

Time of Concentration from Kirpich Equation where length of flow is 1100 feet with slope of .00818 feet/foot.

$TC = .0078(L/S^{.5}) = .0078(1100/.00818^{.5}) = 11$ minutes (Use 15).

Lag = 0.6 TC = 0.6*(15/60) = ...0.15 hours.

SCS Soil Type from Sedgwick County Soil Survey..... Type B.

Basin 5. West portion in Teal Brook Estates.

Drainage Area by planimeter measurement taken from topographic map at scale 1"=100' where 1 square inch equals 0.23 acres.

DA = 55.26 square inches * .23 = 12.71 acres (.0199 square miles).

Time of Concentration from Kirpich Equation where length of flow is 1400 feet with slope of .0114 feet/foot.

$TC = .0078(L/S^{.5})^{.77} = .0078(1400/.0114^{.5})^{.77}$ = 12 minutes (Use 15).

Lag = 0.6 TC = 0.6*(15/60) = ... 0.15 hours.

SCS Soil Type from Sedgwick County Soil Survey..... Type B.

Node 94. Area in Teal Brook Estates between 21st Street right of way and centerline of Cornelison Street.

Drainage Area taken from development plan for Teal Brook Estates by Moehring..... 3.79 acres (.0059 square miles).

Time of Concentration taken from development plan for Teal Brook Estates by Moehring..... 15 minutes.

Lag = 0.6 TC = 0.6*(15/60) = ... 0.15 hours.

Node 95. Area in Teal Brook Estates south of centerline of Cornelison Street between Pintail Court and the Main Entrance.

Drainage Area taken from development plan for Teal Brook Estates by Moehring..... 1.44 acres (.00225 square miles).

Time of Concentration taken from development plan for Teal Brook Estates by Moehring..... 15 minutes.

Lag = 0.6 TC = 0.6*(15/60) = ... 0.15 hours.

Node 101. Sunridge Addition storm sewer system at outlet into Lake 1.

Drainage Area taken from development plan for Sunridge Addition by Moehring..... 27.73 acres (.0483 square miles).

Time of Concentration taken from development plan for Sunridge Addition by Moehring..... 26 minutes.

Lag = 0.6 TC = 0.6*(26/60) = ... 0.26 hours.

Node 90. Teal Brook Estates storm sewer system at outlet from Teal Brook Court.

Drainage Area taken from development plan for Teal Brook Estates by Moehring..... 5.63 acres (.0088 square miles).

Time of Concentration taken from development plan for Teal Brook Estates by Moehring..... 15 minutes.

Lag = 0.6 TC = 0.6(15/60)..... 0.15 hours.

Lake 1 and adjacent contributing drainage area in Teal Brook Estates.

Drainage Area by planimeter measurement taken from development plan for Teal Brook Estates by Yung at scale 1"=100' where 1 square inch equals 0.23 acres.

DA = 32.26 square inches * 0.23 = 7.42 acres (.0116 square miles).
DA for permanent pool of Lake 1 = 7.56 square inches = 1.74 acres.

Rational Method c-factor for Lake 1 and contributing drainage area using Moehring's developed condition factors for lots in Teal Brook Estates and a c-factor of 1 for the permanent pool area:

For 100-year storm (1.74*1 + 5.68*0.4)/7.42 =..... 0.54
For 5-year storm (1.74*1 + 5.68*0.22)/7.42 = ... 0.40
For 2-year storm (1.74*1 + 5.68*0.20)/7.42 = ... 0.38

Time of Concentration taken from development plan for Teal Brook Estates by Moehring ..... 15 minutes.

Lag = 0.6 TC = 0.6*(15/60) = ... 0.15 hours.

Node 96. Area in Teal Brook Estates north of the centerline of Teal Brook Street and south of the Lake 1 contributing drainage area.

Drainage Area taken from development plan for Teal Brook Estates by Moehring..... 1.86 acres (.00291 square miles).

Time of Concentration taken from development plan for Teal Brook Estates by Moehring..... 15 minutes.

Lag = 0.6 TC = 0.6*(15/60) = ... 0.15 hours.

Node 97. Area south of centerline of Teal Brook Street and north of Lake 2 and its adjacent contributing drainage area (does not include Area TLB 10).

Drainage Area taken from development plan for Teal Brook Estates by Moehring..... 3.65 acres (.0057 square miles).

Time of Concentration taken from development plan for Teal Brook Estates by Moehring..... 15 minutes.

Lag = 0.6 TC = 0.6*(15/60) = ... 0.15 hours.

Lake 2 and adjacent contributing drainage area including Area TLB 10.

Drainage Area by planimeter measurement taken from development plan for Teal Brook Estates by Yung at scale 1" = 100' where 1 square inch equals 0.23 acres for the Lake itself and from development plan by Moehring for the adjacent area contributing to the Lake and for Area TLB 10.

Total DA by Moehring's plan.... 5.28 acres (.00825 square miles).
DA for permanent pool of Lake 2 = 7.49 inches * 0.23 = 1.72 acres.

Rational Method c-factor for Lake 2 and contributing drainage area including Area TLB 10 using Moehring's developed condition factors lots in Teal Brook Estates and a c-factor of 1 for the permanent pool area:

For 100-year storm (1.72*1 + 3.56*0.55)/5.28 = ... 0.70
For 5-year storm (1.72*1 + 3.56*0.39)/5.28 =..... 0.59

Time of Concentration:

Overland flow length in area TLB 10 is 850 feet with slope of .014 feet/foot and modified Manning's roughness factor of 0.50. Initial Time of Concentration TIC from the Kinematic Wave Equation is

$TIC = K(L^{.6}N^{.6})/(I^{.4}S^{.3}) = .93(850^{.6}*.5^{.6})/(3.16^{.4}*.014^{3}) =$
..... 80 minutes which is the total Time of Concentration.

Lag = 0.6 TC = 0.6*(80/60) = ... 0.80 hours.

STORAGE CALCULATIONS FOR LAKES 1 & 2

Lake 1.

Surface area of permanent pool and flood pool by planimeter measurement for lake outline by Yung on topographic map at scale 1"=100' where 1 square inch equals 0.23 acres.

Permanent pool area = 7.56 square inches * 0.23 = ... 1.74 acres.

Flood pool area = 11.45 square inches * 0.23 = ... 2.63 acres.

Area-Depth-Volume Table

ELEVATION	AREA	AVE AREA	DEPTH	LAKE VOLUME INCR.	LAKE VOLUME ACCUM.	+ VOLUME CHANNEL	= VOLUME TOTAL
1338	1.74	-	0	0	0	0.02	0.02
1339	1.89	1.81	1	1.81	1.81	0.09	1.90
1340	2.04	1.96	1	1.96	3.77	0.24	4.01
1341	2.18	2.11	1	2.11	5.88	0.49	6.37
1342	2.33	2.26	1	2.26	8.14	0.86	9.00
1343	2.48	2.41	1	2.41	10.55	1.39	11.94
1344	2.63	2.56	1	2.56	13.11	2.09	15.20

Lake 2.

Surface areas of permanent pool and flood pool by planimeter measurement for lake outline by Yung on topographic map at scale 1" = 100' where 1 square inch equals 0.23 acres.

Permanent pool area = 7.49 square inches * 0.23 ..... 1.72 acres.

Flood pool area = 9.41 square inches * 0.23 ..... 2.16 acres.

Area-Depth-Volume Table

ELEVATION	AREA	AVE AREA	DEPTH	LAKE VOLUME INCR.	LAKE VOLUME ACCUM.
1337	1.72	-	NIL	0.01	0.01
1338	1.83	1.78	1	1.78	1.78
1339	1.94	1.89	1	1.89	3.67
1340	2.05	2.00	1	2.00	5.67
1341	2.16	2.11	1	2.11	7.78

EXHIBIT J

TEAL BROOK ESTATES AND SUNRIDGE ADDITION

HEC-1 COMPUTER PROGRAM INPUT FILE DESCRIPTIONS

FOR

HYDROLOGY AND FLOOD ROUTING

HEC-1 COMPUTER PROGRAM INPUT FILE DESCRIPTIONS

SYMBOL	FIELD	VALUE	DESCRIPTION
IT	1	15	Number of minutes in time interval for tabulation of hydrograph ordinates.
	4	40	Number of hydrograph ordinates to be used.
IO	1	0,1,2	Instruction to print all program output.
		3	Instruction to print input, intermediate and master summaries.
		4	Instruction to print input and master summary.
		5	Instruction to print job specification and master summary only.
	2	0,1	Instruction to not plot hydrographs.
		2	Instruction to plot all hydrographs.
PR	1		Total rainfall amount for 6-hour storm of x frequency.
PI	All		Incremental precipitation distribution for x frequency 6-hour storm per SCS.
KK	1		Stream station identifier. Begins input for a specific drainage basin or routing.
KM	All		Message or description of a basin or routing.
BA	1		Drainage area for basin described above. Unit of measure is square miles.
LS	1		Precipitation loss rate using SCS curve number. Initial abstraction is included in curve number calculation.
	2		SCS curve number for basin.
UD	1		SCS lag time in hours, is numerically equal to Time of Concentration multiplied by 0.6.
RS	1		Storage routing number of steps in calculation. One step used for detention ponds.
	2	FLOW	Instruction to enter discharge for the first time interval in Field 3.
	3	-1	Instruction to make initial outflow set equal to initial inflow.
SV	All		Reservoir storage in acre feet at corresponding elevation increments shown on SE card.
SE	All		Elevation increments corresponding to storage values on SV card.

SYMBOL	FIELD	VALUE	DESCRIPTION
SL	1		Elevation of centerline of low level outlet.
	2		Cross sectional area of low level outlet.
	3		Discharge coefficient for low level outlet.
	4		Exponent of head in orifice equation for low level outlet.
SS	1		Spillway crest elevation.
	2		Spillway width.
	3		Discharge coefficient for spillway.
	4		Exponent of head in weir equation for spillway.
HC	1	2-5	Combine number of hydrographs to be combined at stream station location.

S — SHEET NUMBER 32

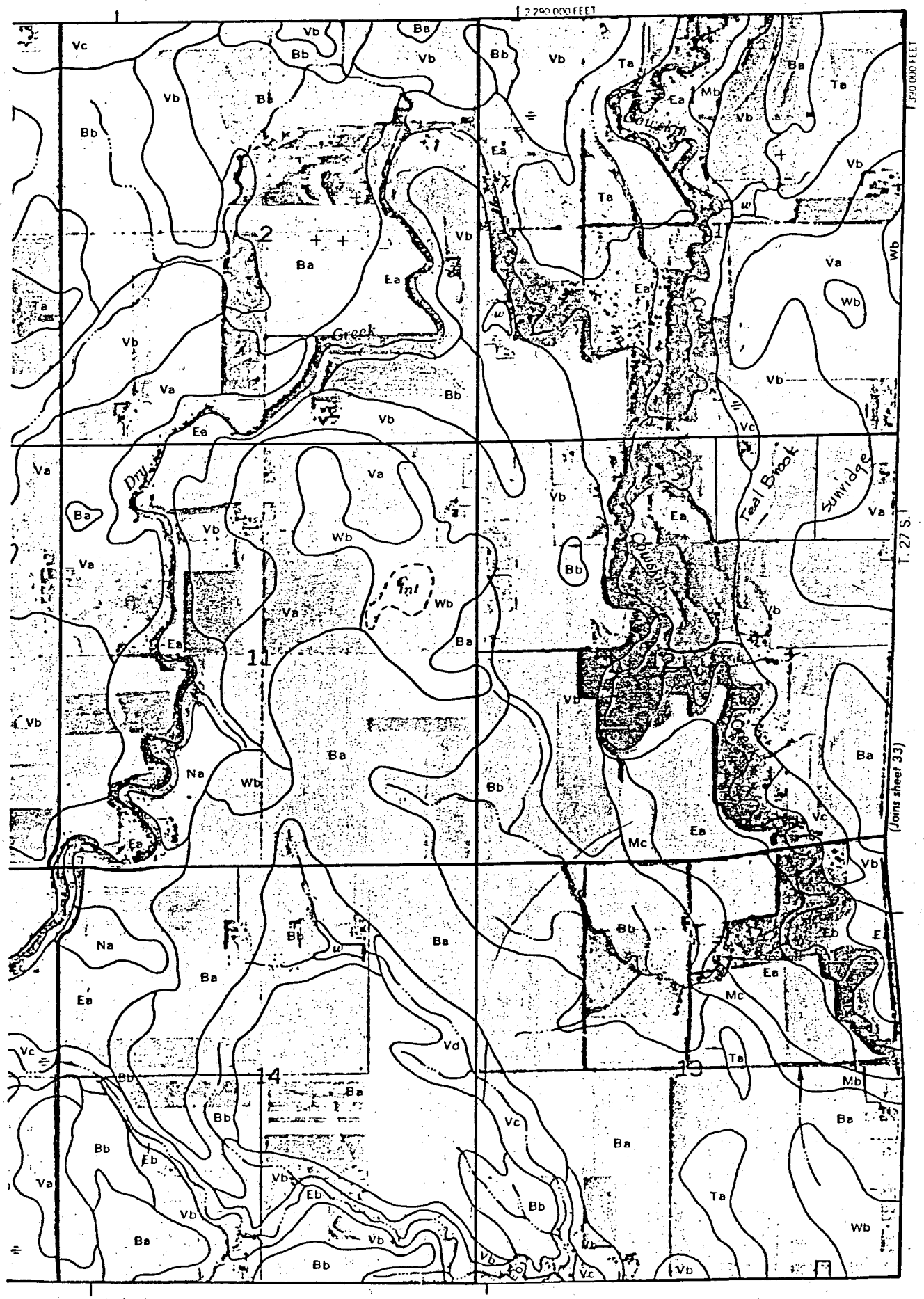


EXHIBIT NO. 1

SOIL LEGEND

SYMBOL	HYDROLOGIC GROUP	NAME
Aa	B	Albion-Shellabarger sandy loams, 1 to 4 percent slopes
Ab	B	Albion and Shellabarger sandy loans, 7 to 15 percent slopes
Ba	C	Blanket silt loam, 0 to 1 percent slopes
Bb	C	Blanket silt loan, 1 to 3 percent slopes
Ca	B	Canadian fine sandy loan
Cb	B	Canadian-Waldeck fine sandy loams
Cc	D	Carwile fine sandy loam
Cd	B	Clark-Ost clay loams, 1 to 4 percent slopes
Ce	C	Clime silty clay, 3 to 6 percent slopes
Ea	B	Elandco silt loam
Eb	B	Elandco silt loam, occasionally flooded
Ec	B	Elandco silt loam, frequently flooded
Fa	B	Farnum loam, 0 to 1 percent slopes
Fb	B	Farnum loam, 1 to 3 percent slopes
Fc	B	Farnum loam, sandy substratum, 0 to 1 percent slopes
Ga	D	Goessel silty clay, 0 to 1 percent slopes
Gb	D	Goessel silty clay, 1 to 2 percent slopes
Ia	D	Irwin silty clay loam, 1 to 3 percent slopes
Ib	D	Irwin silty clay loam, 3 to 6 percent slopes
Ic	D	Irwin silty clay loam, 2 to 6 percent slopes, eroded
La	C	Lesho loam
Lb	A	Lincoln soils
Ma	B	Milan loam, 1 to 3 percent slopes
Mb	B	Milan form, 3 to 6 percent slopes
Mc	B	Milan clay loam, 2 to 6 percent slopes, eroded
Na	B	Naron fine sandy loam
Oc	D	Owens clay loam, 1 to 3 percent slopes
Od	D	Owens-Rock outcrop complex, 3 to 10 percent slopes
Pa		Pits
Pb	D	Plevna fine sandy loam
Pc	A	Pratt loamy fine sand, undulating
Pd	A	Pratt-Tivoli complex, rolling
Ra	D	Renfrow silty clay loam, 1 to 3 percent slopes
Rb	D	Renfrow silty clay loam, 3 to 6 percent slopes
Rc	D	Renfrow-Owens clay loams, 1 to 4 percent slopes
Rd	D	Rosehill silty clay, 1 to 3 percent slopes
Sa	B	Shellabarger sandy loam, 1 to 3 percent slopes
Sb	B	Shellabarger sandy loam, 3 to 6 percent slopes
Sc	B	Shellabarger sandy loam, 3 to 6 percent slopes, eroded
Ta	D	Tabler silty clay loam
Tb	D	Tabler-Drummond complex
Ua	B	Urban land-Canadian complex
Ub	B	Urban land-Elandco complex
Uc	B	Urban land-Farnum complex, 0 to 3 percent slopes
Ud	D	Urban land-Irwin complex, 1 to 3 percent slopes
Ue	D	Urban land-Tabler complex
Va	B	Vanoss silt loam, 0 to 1 percent slopes
Vb	B	Vanoss silt loam, 1 to 3 percent slopes
Vc	B	Vanoss silt loam, 3 to 6 percent slopes
Vd	B	Vanoss silt loam, 3 to 6 percent slopes, eroded
Ve	D	Vernon sandy loam, 1 to 3 percent slopes
Vf	D	Vernon sandy loam, 3 to 6 percent slopes
Wa	C	Waldeck sandy loam
Wb	D	Waurika silt loam

ATTACHMENT D

DRAINAGE CRITERIA

CITY OF WICHITA, KANSAS

RECOMMENDED RUNOFF COEFFICIENTS FOR RATIONAL METHOD
AND PERCENT IMPERVIOUS FOR UNIT HYDROGRAPH METHOD

Land Use or Surface Characteristics	Percent Impervious	Frequency 2	5	10	100
1. Business:					
Downtown Areas	95	0.84	0.85	0.87	0.91
Neighborhood Areas	70	0.68	0.69	0.73	0.80
2. Residential:					
Single Family (Soil Group D)					
1/8 Acre	50	0.57	0.61	0.66	0.79
1/4 Acre	38	0.50	0.54	0.62	0.76
1/3 Acre	30	0.46	0.50	0.59	0.73
1/2 Acre	25	0.42	0.48	0.56	0.72
3/4 Acre	22	0.42	0.46	0.55	0.71
1 Acre	20	0.41	0.45	0.54	0.71
Multi-Family (Soil Group D)					
Multi-Unit (detached)	60	0.62	0.66	0.72	0.82
Multi-Unit (attached)	65	0.64	0.68	0.73	0.83
Apartments	75	0.70	0.73	0.79	0.86
Single Family (Soil Group C)					
1/8 Acre	50	0.55	0.58	0.64	0.73
1/4 Acre	38	0.48	0.51	0.57	0.68
1/3 Acre	30	0.43	0.46	0.53	0.65
1/2 Acre	25	0.40	0.43	0.50	0.63
3/4 Acre	22	0.39	0.42	0.49	0.62
1 Acre	20	0.37	0.40	0.48	0.61
Multi-Family (Soil Group C)					
Multi-Unit (detached)	60	0.60	0.63	0.69	0.77
Multi-Unit (attached)	65	0.63	0.66	0.71	0.79
Apartments	75	0.68	0.72	0.77	0.83
Single-Family (Soil Group B)					
1/8 Acre	50	0.52	0.54	0.59	0.67
1/4 Acre	38	0.44	0.46	0.52	0.61
1/3 Acre	30	0.39	0.41	0.47	0.57
1/2 Acre	25	0.36	0.38	0.44	0.54
3/4 Acre	22	0.34	0.36	0.42	0.52
1 Acre	20	0.33	0.35	0.40	0.51
Multi-Family (Soil Group B)					
Multi-Unit (detached)	60	0.58	0.60	0.65	0.72
Multi-Unit (attached)	65	0.61	0.64	0.68	0.75
Apartments	75	0.67	0.70	0.74	0.80

Land Use or Surface Characteristics	Percent Impervious	Frequency 2	5	10	100
Single Family (Soil Group A)					
1/8 Acre	50	0.47	0.50	0.54	0.60
1/4 Acre	38	0.39	0.41	0.45	0.52
1/3 Acre	30	0.33	0.35	0.39	0.47
1/2 Acre	25	0.30	0.31	0.35	0.44
3/4 Acre	22	0.28	0.29	0.33	0.42
1 Acre	20	0.26	0.28	0.32	0.40
Multi-Family (Soil Group A)					
Multi-Unit (detached)	60	0.55	0.57	0.61	0.67
Multi-Unit (attached)	65	0.58	0.60	0.64	0.70
Apartments	75	0.65	0.68	0.72	0.77
3. Industrial:					
Light Areas	70	0.68	0.69	0.73	0.80
Heavy Areas	80	0.74	0.76	0.79	0.84
4. Playgrounds:	15	0.33	0.35	0.42	0.55
5. Schools:	40	0.49	0.51	0.56	0.66
6. Railroad Yard Areas:	30	0.43	0.45	0.50	0.62
7. Undeveloped Urban Areas:					
Offsite Flow Analysis (when land use not defined)	45	0.52	0.54	0.59	0.68
8. Streets:					
Paved	99	0.87	0.88	0.90	0.93
Gravel	00	0.24	0.26	0.33	0.48
9. Drive, Parking Lots and Walks:	96	0.87	0.87	0.88	0.89
10. Roofs:	90	0.80	0.85	0.90	0.93
11. Urban Lawn Areas (See Note No. 1 below):					
Soil Group A					
Slope less than 1%	00	0.08	0.09	0.13	0.23
Slope 1% to 4%	00	0.12	0.13	0.17	0.27
Slope more than 4%	00	0.16	0.17	0.21	0.31
Soil Group B					
Slope less than 1%	00	0.16	0.18	0.24	0.37
Slope 1% to 4%	00	0.20	0.22	0.28	0.41
Slope more than 4%	00	0.24	0.26	0.32	0.45
Soil Group C					
Slope less than 1%	00	0.24	0.27	0.35	0.51
Slope 1% to 4%	00	0.26	0.29	0.37	0.53
Slope more than 4%	00	0.28	0.31	0.39	0.55

Land Use or Surface Characteristics	Percent Impervious	Frequency 2	5	10	100
Soil Group D					
Slope less than 1%	00	0.28	0.33	0.43	0.63
Slope 1% to 4%	00	0.30	0.35	0.45	0.65
Slope more than 4%	00	0.32	0.37	0.47	0.67

Note No. 1: Coefficients shown in the above table are for pervious open space areas with thick turf which includes pervious areas in parks and cemeteries. Coefficients shown above must be increased 0.02 for use with agricultural pasture areas. Coefficients shown above must be reduced by 0.04 for use with agricultural cultivated areas. Group A soils are well-drained, coarse textured sands with high infiltration rates. Group B soils are moderately well-drained, moderately coarse textured soils with moderate infiltration rates. Group C soils are moderately poor-drained, moderately fine textured soils with slow infiltration rates. Group D soils are poor-drained, fine textured soils with very slow infiltration rates.

GENERAL NOTE: These Rational Formula Coefficients may not be valid for basins 320 acres or larger.

April 15, 1986

ATTACHMENT A
DRAINAGE CRITERIA MANUAL

CITY OF WICHITA, KANSAS

RAINFALL INTENSITY TABLE FOR SEDGWICK COUNTY, KANSAS

The following tabulation contains rainfall intensity in inches per hour as derived from ESSA Weather Bureau Technical Paper 40 Modified to NWS Hydro-35, 1977 During First Hour

DURATION IN MINUTES	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
5	4.18	5.57	6.53	7.41	8.52	9.48	10.32
6	3.99	5.32	6.25	7.09	8.16	9.09	9.89
7	3.81	5.09	5.99	6.81	7.84	8.74	9.50
8	3.66	4.89	5.75	6.55	7.55	8.42	9.15
9	3.52	4.70	5.54	6.31	7.28	8.13	8.83
10	3.39	4.52	5.34	6.09	7.04	7.86	8.54
11	3.27	4.36	5.16	5.89	6.81	7.61	8.27
12	3.18	4.21	4.99	5.71	6.60	7.38	8.02
13	3.05	4.08	4.84	5.53	6.41	7.17	7.79
14	2.96	3.95	4.69	5.37	6.23	6.97	7.57
15	2.87	3.83	4.56	5.22	6.06	6.78	7.37
16	2.78	3.72	4.43	5.08	5.90	6.60	7.18
17	2.71	3.61	4.31	4.95	5.75	6.44	7.00
18	2.63	3.51	4.20	4.83	5.61	6.29	6.84
19	2.56	3.42	4.10	4.71	5.47	6.14	6.68
20	2.50	3.33	4.00	4.60	5.35	6.00	6.53
21	2.44	3.25	3.90	4.50	5.23	5.87	6.39
22	2.38	3.17	3.81	4.40	5.12	5.75	6.26
23	2.32	3.10	3.73	4.31	5.01	5.63	6.13
24	2.27	3.03	3.65	4.22	4.91	5.52	6.01
25	2.22	2.96	3.57	4.13	4.81	5.41	5.90
26	2.20	2.90	3.50	4.05	4.72	5.31	5.79
27	2.16	2.84	3.43	3.98	4.63	5.21	5.69
28	2.14	2.78	3.37	3.90	4.55	5.12	5.59
29	2.11	2.72	3.30	3.83	4.47	5.03	5.49
30	2.08	2.67	3.24	3.76	4.39	4.94	5.40
31	2.05	2.62	3.19	3.70	4.32	4.86	5.32
32	2.02	2.57	3.10	3.63	4.25	4.79	5.22
33	1.99	2.52	3.05	3.57	4.18	4.71	5.14
34	1.96	2.48	3.01	3.51	4.11	4.63	5.07
35	1.93	2.44	2.98	3.46	4.05	4.56	5.00
36	1.91	2.39	2.93	3.41	3.99	4.50	4.93
37	1.89	2.35	2.88	3.36	3.93	4.43	4.86
38	1.87	2.32	2.84	3.31	3.87	4.37	4.79
39	1.85	2.28	2.80	3.26	3.82	4.31	4.73
40	1.83	2.24	2.76	3.22	3.76	4.25	4.66
41	1.81	2.21	2.72	3.17	3.71	4.19	4.60
42	1.79	2.18	2.68	3.13	3.66	4.13	4.54
43	1.77	2.14	2.64	3.09	3.61	4.08	4.49
44	1.75	2.11	2.61	3.05	3.57	4.03	4.43
45	1.73	2.08	2.57	3.01	3.52	3.98	4.38

ATTACHMENT E

DRAINAGE CRITERIA

CITY OF WICHITA, KANSAS

AVERAGE OVERLAND FLOW VELOCITY FOR USE WITH URBANIZED AREAS

Surface Type	VELOCITY IN FEET/SECOND FOR SLOPES IN PERCENT SHOWN																			
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	20.0
Forest with Heavy Ground Litter or Meadow	0.03	0.04	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.16	0.21	0.28	0.33	0.39	0.46	0.53	0.60	0.72	1.10
Fallow or Minimum Tillage Cultivation	0.06	0.08	0.10	0.12	0.13	0.14	0.16	0.17	0.18	0.19	0.29	0.40	0.51	0.66	0.78	0.91	1.05	1.20	1.44	2.10
Short Grass Pasture or Lawns	0.09	0.13	0.15	0.18	0.20	0.21	0.23	0.25	0.26	0.28	0.45	0.60	0.77	0.96	1.17	1.33	1.50	1.68	1.98	3.20
Almost Bare Ground	0.16	0.22	0.28	0.31	0.35	0.38	0.41	0.44	0.46	0.49	0.70	0.85	1.05	1.26	1.50	1.75	2.03	2.32	2.79	4.40
Grassed Waterway	0.35	0.48	0.58	0.67	0.77	0.84	0.91	0.98	1.05	1.12	1.54	1.82	2.10	2.38	2.78	3.20	3.66	4.14	4.56	7.00
Paved Areas (Sheet Flow) or Shallow Gutter Flow	0.44	0.62	0.77	0.91	1.05	1.12	1.19	1.26	1.33	1.40	2.00	2.55	3.20	3.83	4.41	5.04	5.70	6.00	6.20	9.00

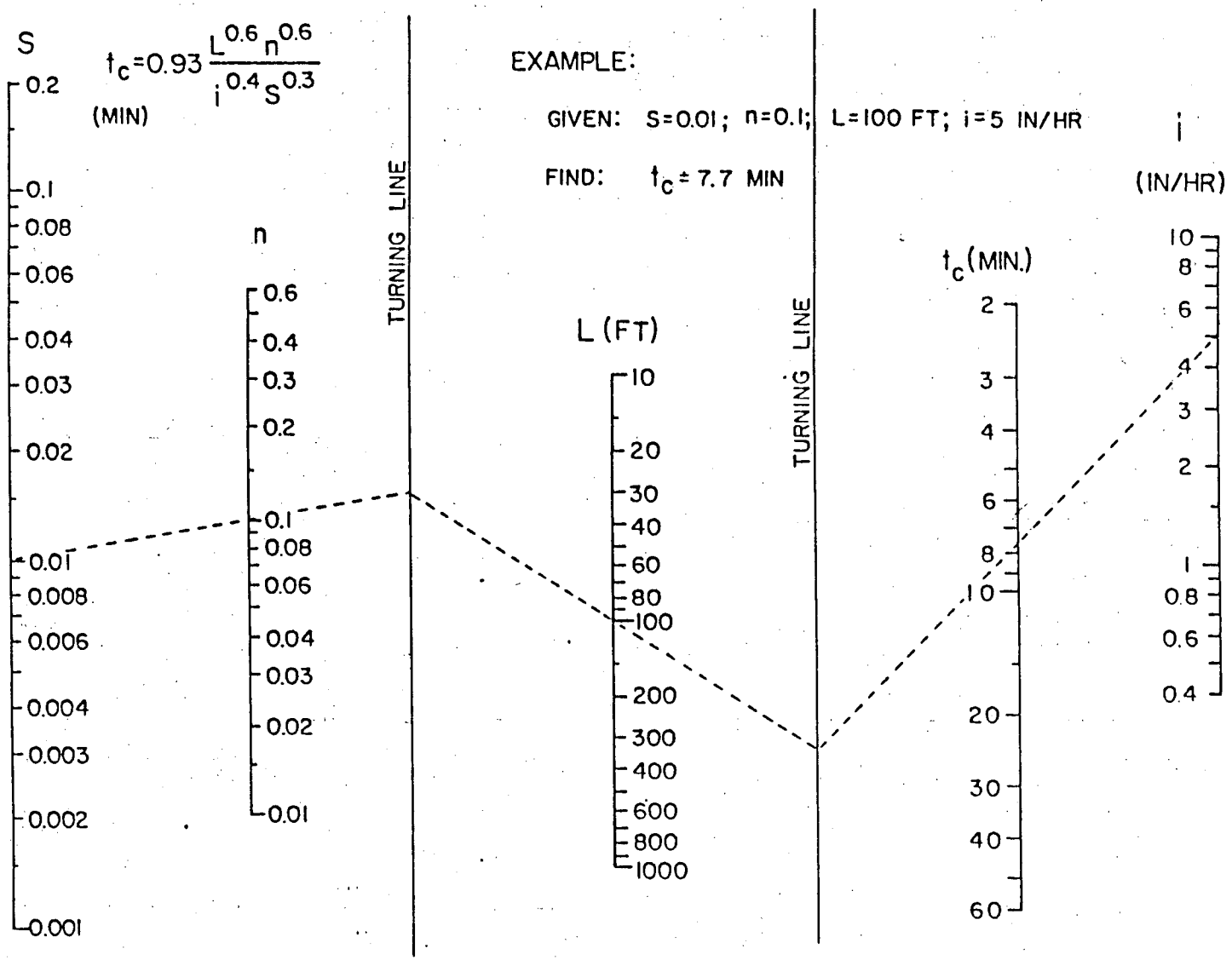


CHART 1. Kinematic wave formulation for determining time of concentration.

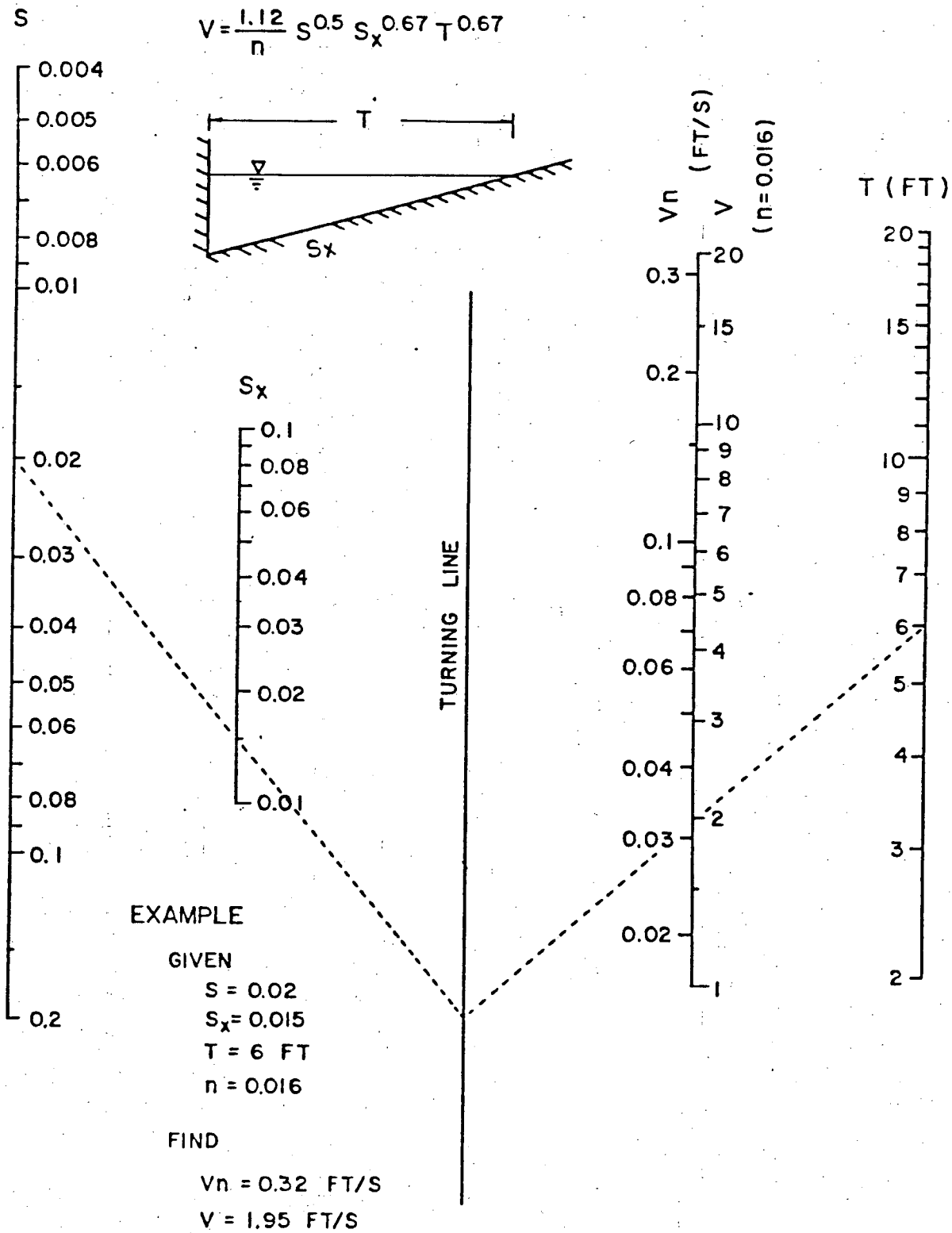


CHART 2. Velocity in triangular gutter sections.

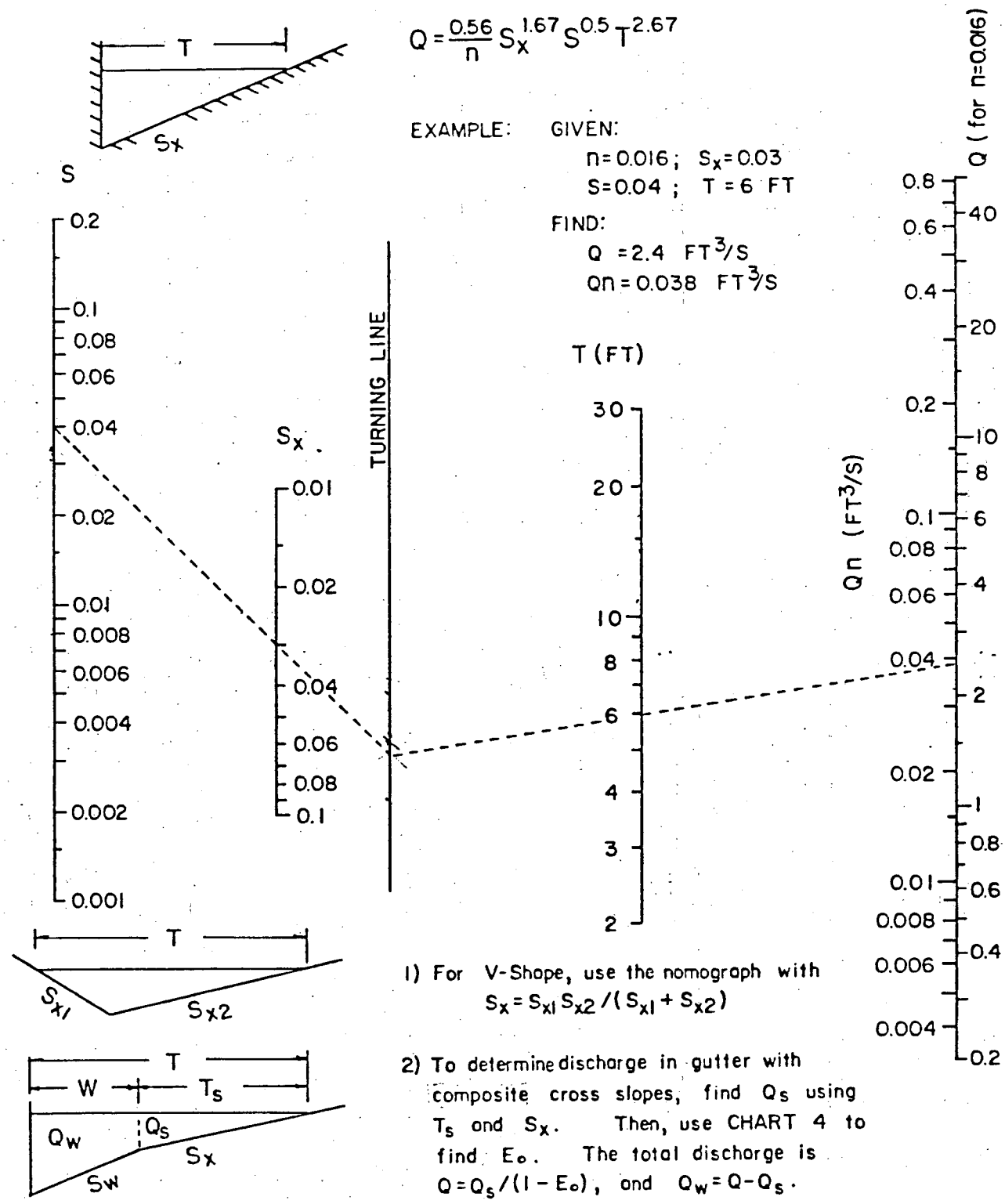


CHART 3. Flow in triangular gutter sections.

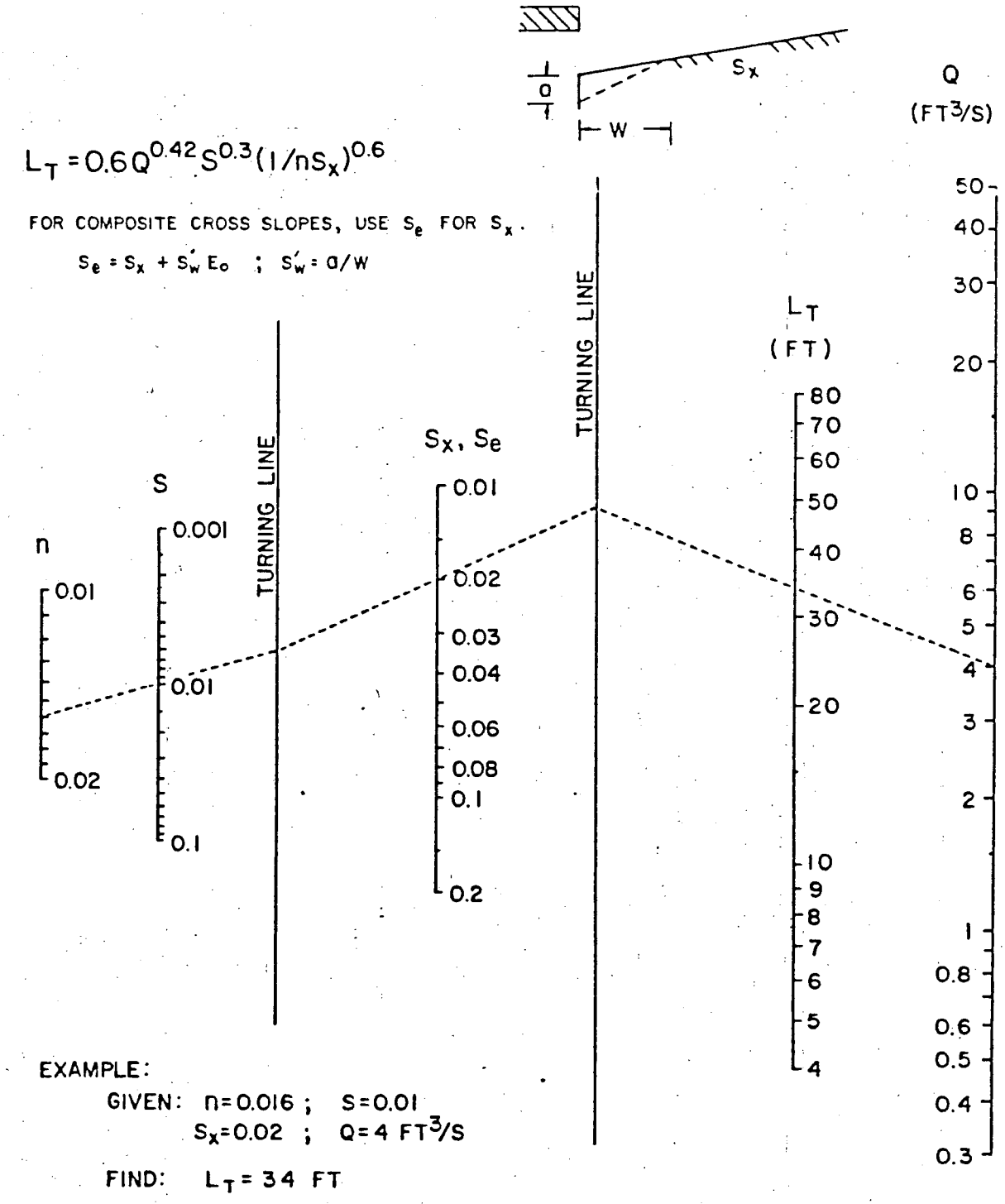


CHART 9. Curb-opening and slotted drain inlet length for total interception.

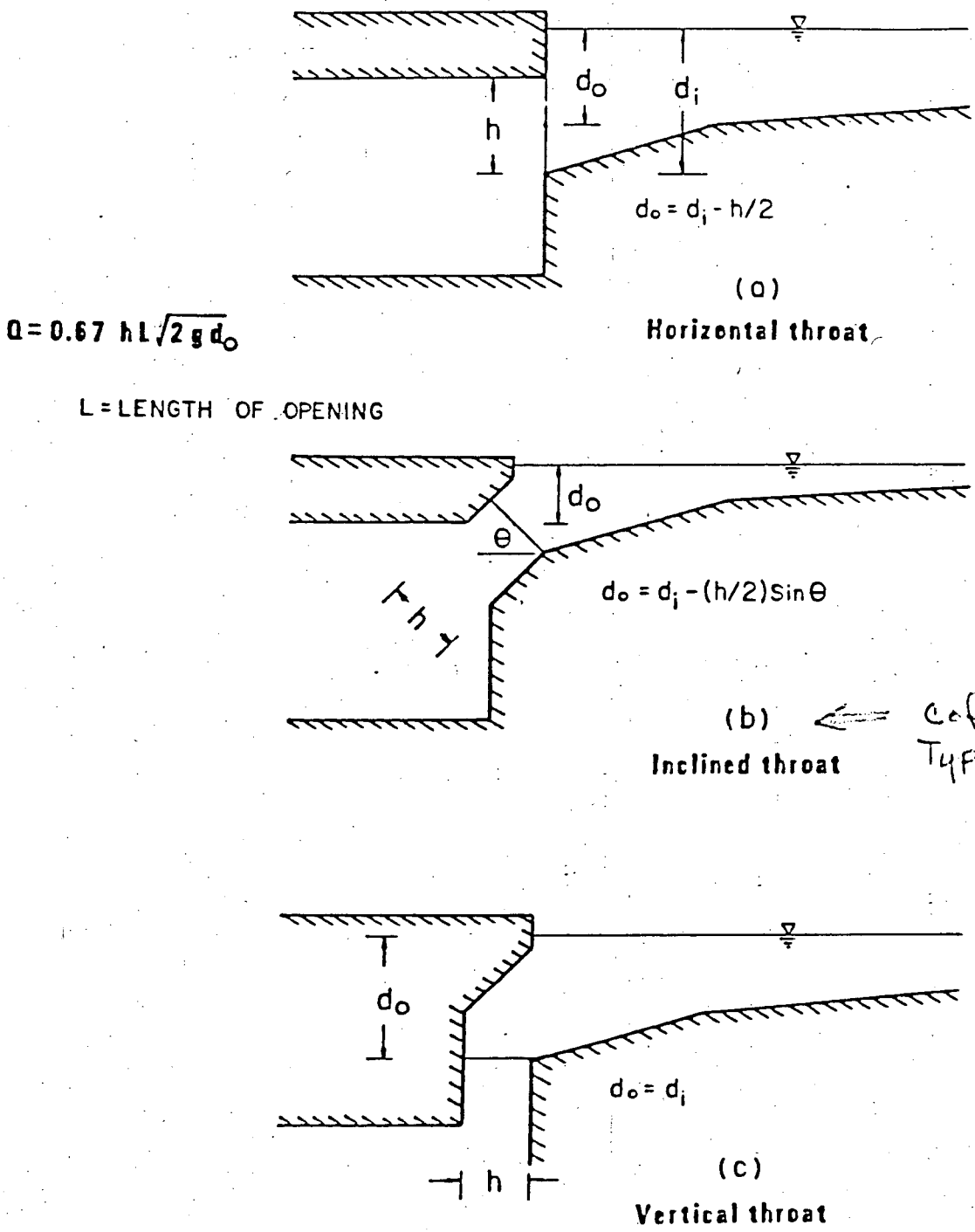


Figure 21. Curb-opening inlets.

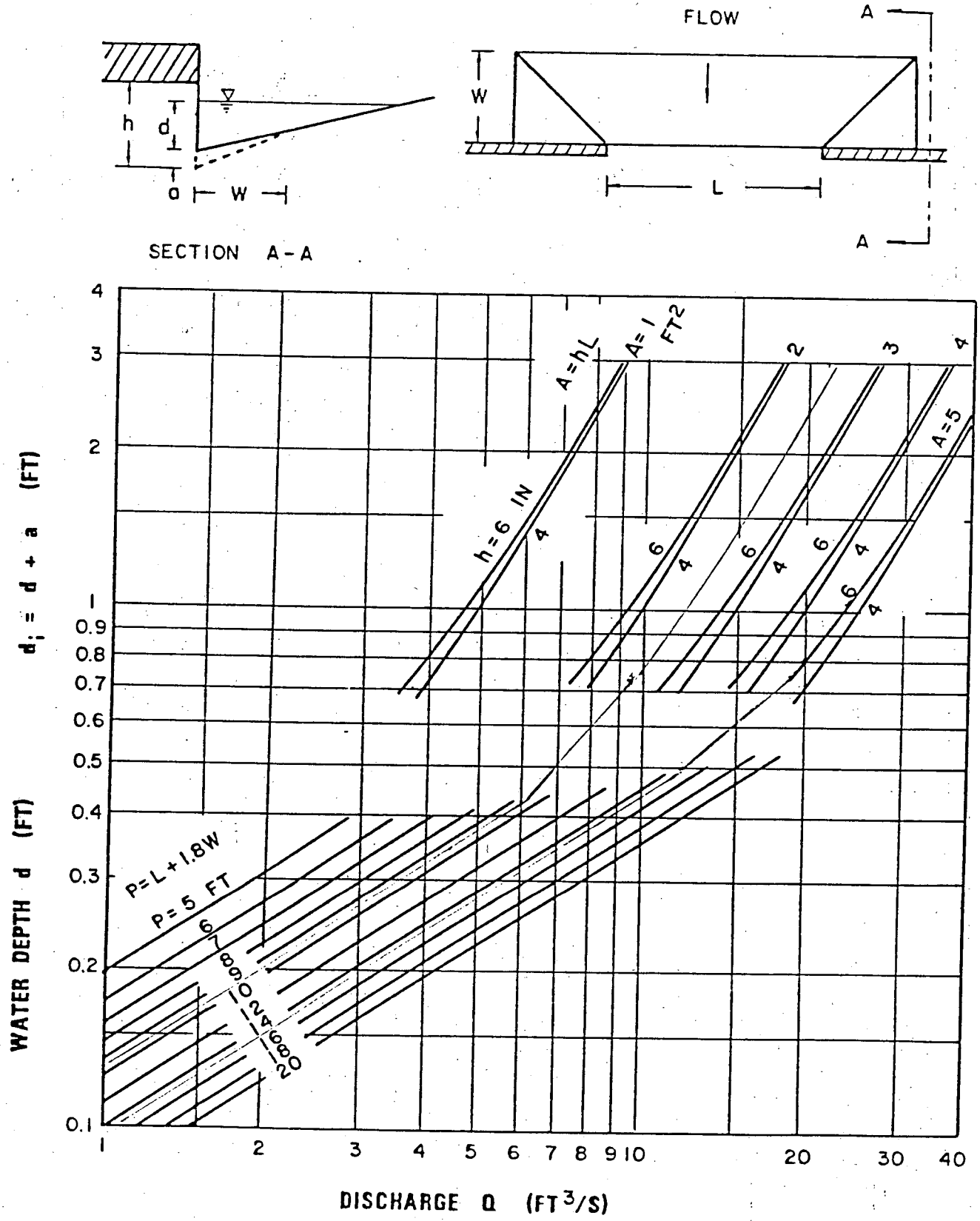
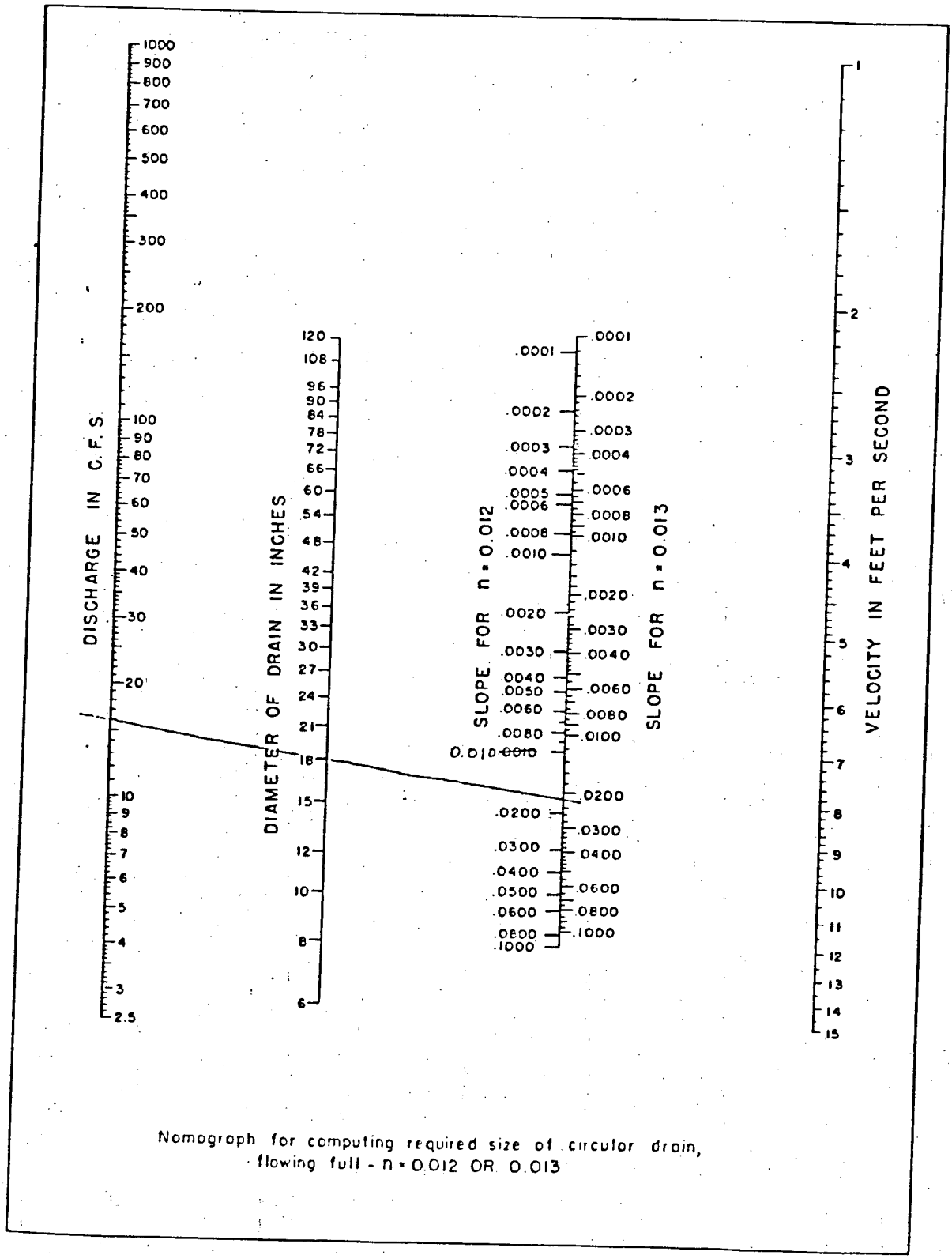


CHART 12. Depressed curb-opening inlet capacity in sump locations.



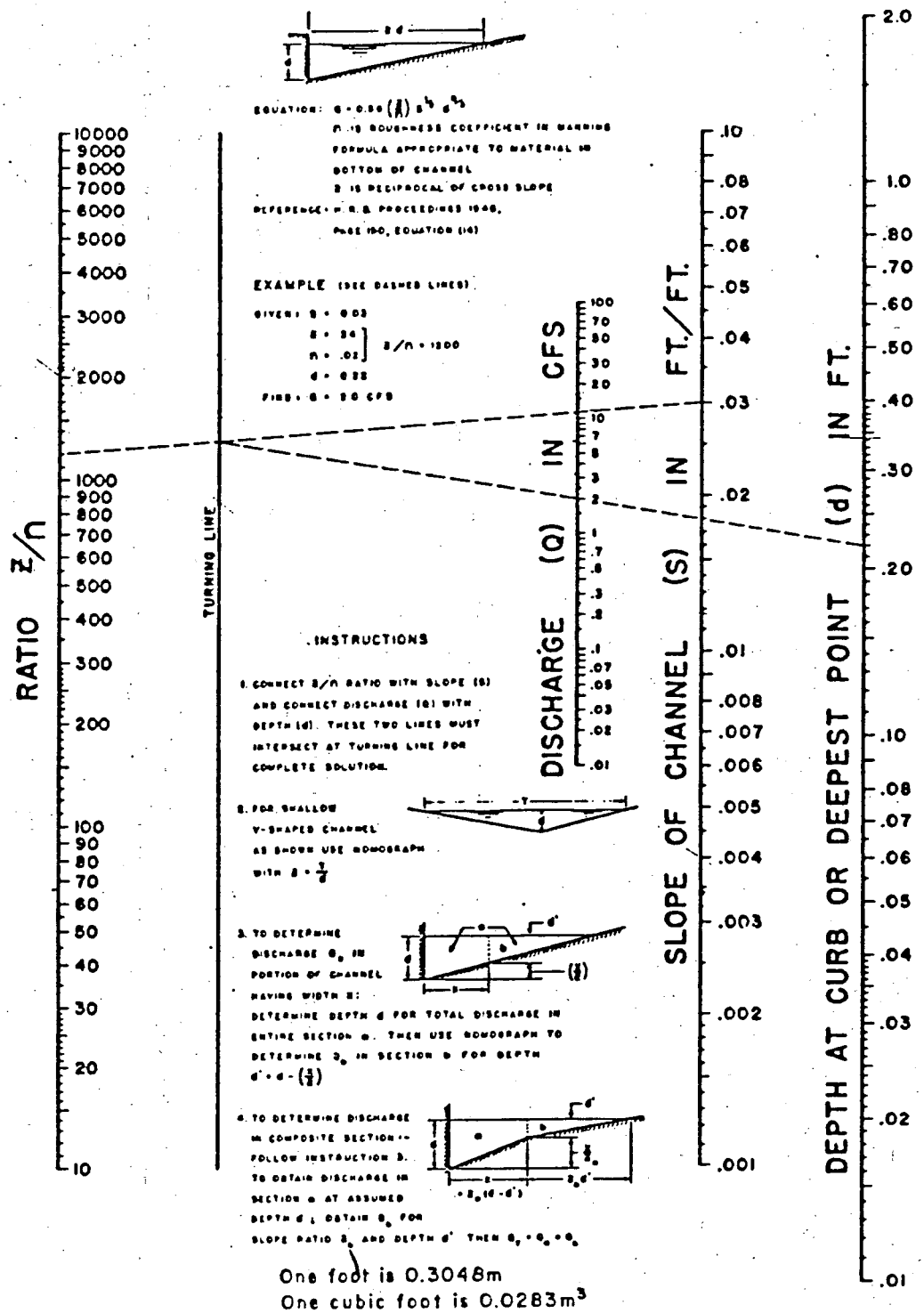
Nomograph for computing required size of circular drain, flowing full - n = 0.012 OR 0.013

"n" = 0.016

Z = 1/3.125" = 32

Z/n = 2,000

NOMOGRAPH FOR FLOW IN TRIANGULAR CHANNELS



One foot is 0.3048m

One cubic foot is $0.0283 m^3$

FIG. 5-1 *(After FHWA)*