TENTATIVE TRACT MAP NO. 37639 – DSRT SURF

IN THE CITY OF
PALM DESERT, CA

PRELIMINARY HYDROLOGY REPORT

PREPARED FOR:
DESERT WAVE VENTURES, LLC
PO BOX 147
SOLANA BEACH, CA 92075
DOUG SHERES, MANAGING MEMBER
(714) 296-5326

PREPARED BY:

TheAltumGroup
73710 FRED WARING DRIVE, SUITE 219
PALM DESERT, CA 92260
(760) 346-4750

DECEMBER 3, 2018

Prepared Under the Supervision of:

12/3/18

James R. Bazua, PE
R.C.E. 58394
Expiration Date: December 31, 2018

TRACT MAP NO. 37639 – DSRT SURF

PRELIMINARY HYDROLOGY REPORT

TABLE OF CONTENTS:

I. PURPOSE AND SCOPE

The Preliminary Hydrology Report is prepared in support of the Tentative Tract Map and Preliminary WQMP submittal for the DSRT Surf Resort project. This report provides a discussion of the preliminary drainage design strategy based on the Runoff Management Plan prepared by Mainiero, Smith and Associates, Inc. (February 12, 1997) for the existing adjacent South Golf Course within Desert Willow Resort.

The DSRT Surf project is proposed to be built on a vacant 17.8 acre parcel within the existing Desert Willow Resort in Palm Desert, CA. The vacant pad is located west of existing Desert Willow Drive, near the roundabout and drop off area serving the existing clubhouse facilities. In general, Desert Willow is bounded by Cook Street and adjacent residential/commercial development to the east; Portola Avenue to the west; Country Club Drive to the south; and Frank Sinatra Drive to the north. Access to the DSRT Surf project will be located south of the existing clubhouse with access off the Desert Willow Drive Roundabout. DSRT Surf will be constructed with a 6.1 acre surf lagoon located in the center of the development with two-three story hotels and several residential villas located around the perimeter. The DSRT Surf development will disturb all of the vacant parcel on which it is to be constructed.

The South Golf Course Runoff Management Plan provides details quantifying the retention capacity of South Golf Course concluding that "The retention areas provided within the golf course fairways provide adequate capacity for the 100 year runoff from all drainage areas". The South Golf Course Runoff Management Plan also includes a Hydrology Map (Section V – Appendix) illustrating the location of areas within the golf course designated for the collection of storm runoff. Under both existing and developed conditions, storm drain runoff generated on-site is designed to be conveyed to the adjacent South Golf Course via an underground storm drain piping system in a similar manner to the systems employed by existing adjacent resort developments. The Hydrology Site Plan included in the Appendix of this report shows the preliminary location of three main underground systems designed to outlet on-site runoff to the adjacent golf course in a manner consistent with the existing South Golf Course Runoff Management Plan. In terms of Water Quality Management Plan terms, the 6.1 acre Surf Lagoon will act as a "self-treating area" since no rainfall tributary to the Lagoon will result in runoff. Instead, the proposed Surf Lagoon is designed to be evacuated frequently via a 16 inch gravity flow pipe that will convey water stored in the Lagoon to a South Golf Course lake within Desert Willow Resort.

II. DESIGN METHODOLOGY AND CALCULATIONS

This report includes:

1) A description of the drainage strategy for the DSRT Surf project based on the Desert Willow South Golf Course Runoff Management Plan

2) A definition of on-site drainage subareas contributing runoff to three separate South Golf Course drainage collection areas.

3) Calculations estimating the anticipated design flowrates generated within each subarea.

4) Preliminary level pipe sizing calculations in support of the Preliminary Grading and Utility Design.

DESIGN CRITERIA

The following parameters were used in the preparation of the analyses:

• Antecedant Moisture Condition – 100 year	2	
• 100 year – 1 hour Precipitation	1.67”	NOAA Atlas 14
• 2 year – 1 hour Precipitation	0.375”	NOAA Atlas 14
• Hydrologic Soil Type “A”		RCFCD Plate C-1.36
• Slope Intensity Duration Curve	0.58	

III DESIGN FLOWRATES – RATIONAL METHOID

SUBAREA 1 (4.9 AC) – 19.6 CFS

SUBAREA 2 (2.06 AC) – 7.9 CFS

SUBAREA 3 (2.4 AC) – 8.3 CFS

SUBAREA 4 (1.13 AC) – 5.0 CFS

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                Riverside County Rational Hydrology Program

     CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version
7.1
           Rational Hydrology Study        Date: 12/07/18
File:SUBAREA1.out
     ---------------------------------------------------------------
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     SUBAREA 1 - 100 YEAR STORM EVENT



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      *********   Hydrology Study Control Information **********

      English (in-lb) Units used in input data file

     ---------------------------------------------------------------
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     Program License Serial Number 6253

     ---------------------------------------------------------------
------
     Rational Method Hydrology Program based on
     Riverside County Flood Control & Water Conservation District
     1978 hydrology manual

     Storm event (year) =  100.00 Antecedent Moisture Condition = 2

     2 year, 1 hour precipitation =  0.375(In.)
     100 year, 1 hour precipitation =  1.670(In.)

     Storm event year = 100.0
     Calculated rainfall intensity data:
     1 hour intensity =  1.670(In/Hr)
     Slope of intensity duration curve = 0.5800




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++++
     Process from Point/Station      100.000 to Point/Station
101.000
     **** INITIAL AREA EVALUATION ****
     ____________________________________________________________________
____
     Initial area flow distance =   690.000(Ft.)
     Top (of initial area) elevation =   271.500(Ft.)
     Bottom (of initial area) elevation =   265.000(Ft.)
     Difference in elevation =     6.500(Ft.)
     Slope =    0.00942  s(percent)=       0.94
     TC = k(0.300)*[(length^3)/(elevation change)]^0.2
     Initial area time of concentration =   10.420 min.
     Rainfall intensity =      4.610(In/Hr) for a   100.0 year storm
```

COMMERCIAL subarea type
Runoff Coefficient = 0.866
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 32.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 19.556(CFS)
Total initial stream area = 4.900(Ac.)
Pervious area fraction = 0.100
End of computations, total study area = 4.90 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 32.0

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1

Rational Hydrology Study Date: 12/07/18 File:SUBAREA2.out

SUBAREA 2 - 100 YEAR STORM EVENT

********* Hydrology Study Control Information **********

English (in-lb) Units used in input data file

Program License Serial Number 6253

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation = 0.375(In.)
100 year, 1 hour precipitation = 1.670(In.)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.670(In/Hr)
Slope of intensity duration curve = 0.5800

++

Process from Point/Station 200.000 to Point/Station 202.000

**** INITIAL AREA EVALUATION ****

Initial area flow distance = 710.000(Ft.)
Top (of initial area) elevation = 268.000(Ft.)
Bottom (of initial area) elevation = 263.000(Ft.)
Difference in elevation = 5.000(Ft.)
Slope = 0.00704 s(percent)= 0.70
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.171 min.
Rainfall intensity = 4.427(In/Hr) for a 100.0 year storm

COMMERCIAL subarea type
Runoff Coefficient = 0.865
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 32.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 7.888(CFS)
Total initial stream area = 2.060(Ac.)
Pervious area fraction = 0.100
End of computations, total study area = 2.06 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 32.0

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1

Rational Hydrology Study Date: 12/07/18 File:SUBAREA3.out

SUBAREA 3 - 100 YEAR STORM EVENT

********* Hydrology Study Control Information **********

English (in-lb) Units used in input data file

Program License Serial Number 6253

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation = 0.375(In.)
100 year, 1 hour precipitation = 1.670(In.)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.670(In/Hr)
Slope of intensity duration curve = 0.5800

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Process from Point/Station 300.000 to Point/Station 303.000

**** INITIAL AREA EVALUATION ****

Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 272.000(Ft.)
Bottom (of initial area) elevation = 266.000(Ft.)
Difference in elevation = 6.000(Ft.)
Slope = 0.00600 s(percent)= 0.60
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.228 min.
Rainfall intensity = 4.014(In/Hr) for a 100.0 year storm

COMMERCIAL subarea type
Runoff Coefficient = 0.863
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 32.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 8.312(CFS)
Total initial stream area = 2.400(Ac.)
Pervious area fraction = 0.100
End of computations, total study area = 2.40 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 32.0

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                Riverside County Rational Hydrology Program

     CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version
7.1
           Rational Hydrology Study        Date: 12/07/18
File:SUBAREA4.out
     ---------------------------------------------------------------
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     SUBAREA 4 - 100 YEAR STORM EVENT



     ---------------------------------------------------------------
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      *********   Hydrology Study Control Information **********

      English (in-lb) Units used in input data file

     ---------------------------------------------------------------
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     Program License Serial Number 6253

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     Rational Method Hydrology Program based on
     Riverside County Flood Control & Water Conservation District
     1978 hydrology manual

     Storm event (year) =  100.00 Antecedent Moisture Condition = 2

     2 year, 1 hour precipitation =  0.375(In.)
     100 year, 1 hour precipitation =  1.670(In.)

     Storm event year = 100.0
     Calculated rainfall intensity data:
     1 hour intensity =  1.670(In/Hr)
     Slope of intensity duration curve = 0.5800




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     Process from Point/Station      400.000 to Point/Station
404.000
     **** INITIAL AREA EVALUATION ****
     ____________________________________________________________________
____
     Initial area flow distance =   310.000(Ft.)
     Top (of initial area) elevation =   272.000(Ft.)
     Bottom (of initial area) elevation =   270.500(Ft.)
     Difference in elevation =     1.500(Ft.)
     Slope =    0.00484  s(percent)=       0.48
     TC = k(0.300)*[(length^3)/(elevation change)]^0.2
     Initial area time of concentration =    8.644 min.
     Rainfall intensity =      5.137(In/Hr) for a   100.0 year storm
```

COMMERCIAL subarea type
Runoff Coefficient = 0.868
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 32.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 5.039(CFS)
Total initial stream area = 1.130(Ac.)
Pervious area fraction = 0.100
End of computations, total study area = 1.13 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 32.0

IV STORM DRAIN SYSTEM SIZING CALCULATIONS

tmp#8.txt

Manning Pipe Calculator

Given Input Data:

Shape	Circular
Solving for	Depth of Flow
Diameter	24.0000 in
Flowrate	19.6000 cfs
Slope	0.0200 ft/ft
Manning's n	0.0130

Computed Results:

Depth	13.5745 in
Area	3.1416 ft2
Wetted Area	1.8325 ft2
Wetted Perimeter	40.8572 in
Perimeter	75.3982 in
Velocity	10.6960 fps
Hydraulic Radius	6.4584 in
Percent Full	56.5605 %
Full flow Flowrate	31.9929 cfs
Full flow velocity	10.1837 fps

Critical Information

Critical depth	19.0926 in
Critical slope	0.0062 ft/ft
Critical velocity	7.1198 fps
Critical area	2.7529 ft2
Critical perimeter	51.8843 in
Critical hydraulic radius	7.6404 in
Critical top width	24.0000 in
Specific energy	2.9093 ft
Minimum energy	2.3866 ft
Froude number	1.9707
Flow condition	Supercritical

tmp#9.txt

Manning Pipe Calculator

Given Input Data:

Shape	Circular
Solving for	Depth of Flow
Diameter	24.0000 in
Flowrate	7.9000 cfs
Slope	0.0050 ft/ft
Manning's n	0.0130

Computed Results:

Depth	11.9131 in
Area	3.1416 ft2
Wetted Area	1.5563 ft2
Wetted Perimeter	37.5253 in
Perimeter	75.3982 in
Velocity	5.0761 fps
Hydraulic Radius	5.9722 in
Percent Full	49.6379 %
Full flow Flowrate	15.9965 cfs
Full flow velocity	5.0918 fps

Critical Information

Critical depth	12.0005 in
Critical slope	0.0049 ft/ft
Critical velocity	5.0290 fps
Critical area	1.5709 ft2
Critical perimeter	37.7001 in
Critical hydraulic radius	6.0002 in
Critical top width	24.0000 in
Specific energy	1.3932 ft
Minimum energy	1.5001 ft
Froude number	1.0145
Flow condition	Supercritical

tmp#10.txt

Manning Pipe Calculator

Given Input Data:

Shape	Circular
Solving for	Depth of Flow
Diameter	24.0000 in
Flowrate	8.3000 cfs
Slope	0.0050 ft/ft
Manning's n	0.0130

Computed Results:

Depth	12.2660 in
Area	3.1416 ft2
Wetted Area	1.6151 ft2
Wetted Perimeter	38.2311 in
Perimeter	75.3982 in
Velocity	5.1389 fps
Hydraulic Radius	6.0835 in
Percent Full	51.1082 %
Full flow Flowrate	15.9965 cfs
Full flow velocity	5.0918 fps

Critical Information

Critical depth	12.3149 in
Critical slope	0.0049 ft/ft
Critical velocity	5.1131 fps
Critical area	1.6233 ft2
Critical perimeter	38.3290 in
Critical hydraulic radius	6.0986 in
Critical top width	24.0000 in
Specific energy	1.4326 ft
Minimum energy	1.5394 ft
Froude number	1.0082
Flow condition	Supercritical

tmp#11.txt

Manning Pipe Calculator

Given Input Data:

Shape	Circular
Solving for	Depth of Flow
Diameter	18.0000 in
Flowrate	5.0000 cfs
Slope	0.0050 ft/ft
Manning's n	0.0130

Computed Results:

Depth	10.8138 in
Area	1.7671 ft2
Wetted Area	1.1088 ft2
Wetted Perimeter	31.9270 in
Perimeter	56.5487 in
Velocity	4.5096 fps
Hydraulic Radius	5.0008 in
Percent Full	60.0768 %
Full flow Flowrate	7.4277 cfs
Full flow velocity	4.2032 fps

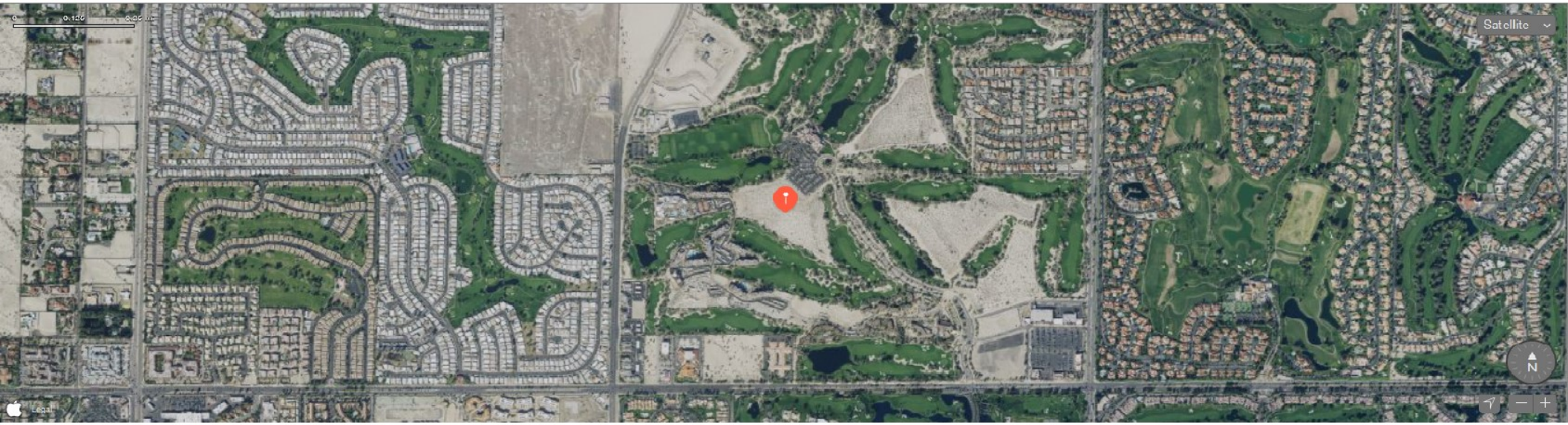
Critical Information

Critical depth	10.3225 in
Critical slope	0.0057 ft/ft
Critical velocity	4.7670 fps
Critical area	1.0489 ft2
Critical perimeter	30.9192 in
Critical hydraulic radius	4.8849 in
Critical top width	18.0000 in
Specific energy	1.2161 ft
Minimum energy	1.2903 ft
Froude number	0.9258
Flow condition	Subcritical

Calculations are provided in this section of the Preliminary Hydrology Report based on the design peak flowrates for each of four subareas within the DSRT Surf project and the anticipated outlet pipe sizes conveying collected flows to the off-site Golf Course drainage basins using Manning's Equation for conduits flowing partially full.. These preliminary results show that subareas 1-3 can easily convey peak design flowrates in a 24inch conduit flowing partially full and subarea 4 can easily convey peak design flowrates in an 18inch conduit flowing partially full.

V APPENDIX – REFERENCE MATERIAL

Latitude and Longitude of a Point



Clear / Reset | Remove Last Blue Marker | Center Red Marker

Get the Latitude and Longitude of a Point

When you click on the map, move the marker or enter an address the latitude and longitude coordinates of the point are inserted in the boxes below.

Latitude:	33.763935
Longitude:	-116.367466

	Degrees	Minutes	Seconds
Latitude:	33	45	50.1654
Longitude:	-116	22	2.877

Show Point from Latitude and Longitude

Use this if you know the latitude and longitude coordinates of a point and want to see where on the map the point is.
Use: **+** for *N* Lat or *E* Long **-** for *S* Lat or *W* Long.
Example: +40.689060 -74.044636
Note: Your entry should not have any embedded spaces.

Decimal Deg. Latitude:	
Decimal Deg. Longitude:	

Show Point

Example: **+34 40 50.12** for *34N 40' 50.12"*

	Degrees	Minutes	Seconds
Latitude:			
Longitude:			

NOAA Atlas 14, Volume 6, Version 2
Location name: Palm Desert, California, USA*
Latitude: 33.7651°, Longitude: -116.3667°
Elevation: 267.49 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.064** (0.053-0.078)	**0.099** (0.082-0.120)	**0.153** (0.127-0.186)	**0.203** (0.167-0.249)	**0.283** (0.225-0.359)	**0.355** (0.277-0.460)	**0.439** (0.334-0.584)	**0.538** (0.397-0.736)	**0.698** (0.494-0.997)	**0.879** (0.600-1.30)
10-min	**0.092** (0.077-0.111)	**0.142** (0.118-0.172)	**0.219** (0.182-0.266)	**0.291** (0.239-0.357)	**0.406** (0.323-0.515)	**0.509** (0.396-0.660)	**0.629** (0.478-0.837)	**0.771** (0.570-1.06)	**1.00** (0.708-1.43)	**1.26** (0.860-1.86)
15-min	**0.111** (0.093-0.134)	**0.172** (0.143-0.208)	**0.265** (0.220-0.322)	**0.352** (0.290-0.431)	**0.491** (0.390-0.623)	**0.615** (0.479-0.798)	**0.761** (0.578-1.01)	**0.933** (0.689-1.28)	**1.21** (0.856-1.73)	**1.52** (1.04-2.25)
30-min	**0.170** (0.141-0.205)	**0.262** (0.218-0.318)	**0.404** (0.336-0.492)	**0.537** (0.442-0.659)	**0.749** (0.596-0.951)	**0.940** (0.732-1.22)	**1.16** (0.883-1.55)	**1.43** (1.05-1.95)	**1.85** (1.31-2.64)	**2.33** (1.59-3.44)
60-min	**0.243** (0.202-0.294)	**0.375** (0.313-0.455)	**0.579** (0.481-0.704)	**0.769** (0.633-0.944)	**1.07** (0.854-1.36)	**1.35** (1.05-1.75)	**1.67** (1.26-2.21)	**2.04** (1.51-2.79)	**2.65** (1.87-3.78)	**3.33** (2.28-4.93)
2-hr	**0.340** (0.284-0.412)	**0.511** (0.426-0.620)	**0.768** (0.638-0.935)	**1.00** (0.827-1.23)	**1.37** (1.09-1.74)	**1.69** (1.32-2.19)	**2.05** (1.56-2.73)	**2.47** (1.82-3.37)	**3.11** (2.20-4.43)	**3.69** (2.52-5.45)
3-hr	**0.407** (0.339-0.493)	**0.607** (0.505-0.736)	**0.903** (0.750-1.10)	**1.17** (0.965-1.44)	**1.58** (1.26-2.01)	**1.94** (1.51-2.52)	**2.34** (1.78-3.11)	**2.80** (2.06-3.83)	**3.49** (2.47-4.98)	**4.10** (2.80-6.06)
6-hr	**0.543** (0.452-0.657)	**0.806** (0.671-0.977)	**1.19** (0.988-1.45)	**1.54** (1.26-1.88)	**2.06** (1.64-2.61)	**2.50** (1.95-3.25)	**3.00** (2.28-3.99)	**3.56** (2.63-4.86)	**4.39** (3.11-6.27)	**5.12** (3.49-7.56)
12-hr	**0.650** (0.542-0.788)	**0.982** (0.818-1.19)	**1.46** (1.22-1.78)	**1.89** (1.56-2.32)	**2.54** (2.02-3.22)	**3.09** (2.41-4.01)	**3.70** (2.81-4.92)	**4.38** (3.24-6.00)	**5.41** (3.83-7.72)	**6.28** (4.29-9.29)
24-hr	**0.771** (0.682-0.889)	**1.19** (1.05-1.37)	**1.80** (1.58-2.08)	**2.34** (2.04-2.73)	**3.14** (2.66-3.79)	**3.83** (3.18-4.71)	**4.59** (3.72-5.77)	**5.44** (4.29-7.03)	**6.71** (5.09-9.03)	**7.80** (5.72-10.8)
2-day	**0.864** (0.765-0.996)	**1.35** (1.19-1.56)	**2.05** (1.81-2.37)	**2.67** (2.34-3.12)	**3.59** (3.04-4.33)	**4.37** (3.63-5.37)	**5.22** (4.23-6.57)	**6.17** (4.87-7.98)	**7.58** (5.75-10.2)	**8.78** (6.44-12.2)
3-day	**0.913** (0.808-1.05)	**1.43** (1.27-1.65)	**2.18** (1.93-2.53)	**2.85** (2.49-3.32)	**3.83** (3.24-4.61)	**4.66** (3.87-5.72)	**5.56** (4.51-7.00)	**6.57** (5.19-8.49)	**8.07** (6.12-10.9)	**9.34** (6.85-13.0)
4-day	**0.951** (0.842-1.10)	**1.50** (1.32-1.73)	**2.29** (2.02-2.65)	**2.98** (2.61-3.48)	**4.01** (3.40-4.83)	**4.88** (4.05-5.99)	**5.83** (4.72-7.33)	**6.88** (5.43-8.89)	**8.45** (6.40-11.4)	**9.77** (7.17-13.6)
7-day	**1.00** (0.889-1.16)	**1.59** (1.41-1.84)	**2.45** (2.16-2.83)	**3.20** (2.80-3.73)	**4.31** (3.65-5.19)	**5.24** (4.35-6.44)	**6.25** (5.07-7.87)	**7.38** (5.82-9.54)	**9.03** (6.85-12.2)	**10.4** (7.65-14.5)
10-day	**1.04** (0.921-1.20)	**1.66** (1.47-1.92)	**2.56** (2.26-2.97)	**3.36** (2.94-3.91)	**4.53** (3.84-5.46)	**5.51** (4.58-6.78)	**6.58** (5.34-8.28)	**7.76** (6.13-10.0)	**9.50** (7.21-12.8)	**11.0** (8.04-15.2)
20-day	**1.11** (0.981-1.28)	**1.80** (1.59-2.08)	**2.80** (2.47-3.25)	**3.70** (3.23-4.31)	**5.03** (4.26-6.05)	**6.14** (5.10-7.54)	**7.35** (5.96-9.25)	**8.68** (6.85-11.2)	**10.6** (8.06-14.3)	**12.2** (8.98-17.0)
30-day	**1.21** (1.07-1.39)	**1.97** (1.74-2.28)	**3.11** (2.74-3.59)	**4.12** (3.60-4.80)	**5.64** (4.77-6.79)	**6.91** (5.73-8.49)	**8.28** (6.72-10.4)	**9.80** (7.73-12.7)	**12.0** (9.10-16.1)	**13.8** (10.1-19.2)
45-day	**1.29** (1.14-1.48)	**2.13** (1.89-2.46)	**3.39** (2.99-3.93)	**4.53** (3.96-5.29)	**6.25** (5.30-7.53)	**7.71** (6.40-9.47)	**9.28** (7.52-11.7)	**11.0** (8.68-14.2)	**13.5** (10.2-18.2)	**15.6** (11.4-21.6)
60-day	**1.37** (1.21-1.58)	**2.29** (2.03-2.64)	**3.68** (3.24-4.26)	**4.94** (4.32-5.76)	**6.84** (5.80-8.24)	**8.46** (7.03-10.4)	**10.2** (8.30-12.9)	**12.1** (9.59-15.7)	**14.9** (11.3-20.1)	**17.2** (12.6-24.0)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical

SITE DATA

TOTAL SITE AREA: 17.8 ACRES
SELF TREATING AREA (SURF LAGOON): 6.1 ACRES

PERCENT IMPERVIOUS AREA – EXISTING CONDITION: 0%
PERCENT IMPERVIOUS AREA – PROPOSED CONDITION: 90%

SUBAREA 1 – 4.90 AC – 19.6 CFS
SUBAREA 2 – 2.06 AC – 7.9 CFS
SUBAREA 3 – 2.40 AC – 8.3 CFS
SUBAREA 4 – 1.13 AC – 5.0 CFS

LEGEND

EXISTING GOLF COURSE DRAINAGE WASTE AREA

DIRECTIONAL DRAINAGE ARROWS

EXISTING 20" RECYCLED WATER LINE

Q=5.0CFS

404 / 270.5

SUBAREA 4

L=310'

400 / 272.0

300 / 272.0

SURF CENTER

SD

EMERGENCY DRAIN – UNDERGROUND PARKING

EXISTING DRAIN BOXES

DESERT WILLOW DRIVE

100 / 271.5

HOTEL

PROJECT BOUNDARY

SUBAREA 3

OFF-SITE GRADING

PROJECT BOUNDARY

LOT 1

L=1000'

EXISTING 15" LAKE EQUALIZER LINE

OFF-SITE GRADING

16" LAGOON EVACUATION LINE

EXISTING GOLF COURSE DRAINAGE WASTE AREA

CITY OF PALM DESERT
620-420-009
LAND USE: DESERT WILLOW
GOLF COURSE

LOT 3

HOTEL

L=690'

SURF LAGOON
NO OFF-SITE SURFACE RUNOFF

303 / 266.0

24" STORM DRAIN LINE

Q=8.3CFS

VILLAS

202 / 263.0

EXISTING GOLF COURSE DRAINAGE WASTE AREA

24" STORM DRAIN LINE

Q=19.6CFS

LOT 2

101 / 265.0

SUBAREA 1

LOT 4

VILLAS

L=710'

LOT 5

SUBAREA 2

EXISTING 15" LAKE EQUALIZER LINE

EMERGENCY ACCESS

200 / 268.0

16" LAGOON EVACUATION LINE

CITY OF PALM DESERT
620-420-011
LAND USE: DESERT WILLOW
GOLF COURSE

WILLOW RIDGE

EXISTING 15" LAKE EQUALIZER LINE

OFF-SITE GRADING/ TURF REDUCTION AREA

PROJECT BOUNDARY

24" STORM DRAIN LINE

Q=7.9CFS

EXISTING GOLF COURSE DRAINAGE WASTE AREA

N

GRAPHIC SCALE
SCALE 1"=60'
0 30 60 120 180 240

The Altum Group
73-710 Fred Waring Dr., Ste. 219
Palm Desert, CA 92260
t.760.346.4750 f. 760.340.0089
TheAltumGroup.com
ENGINEERING | PLANNING | SURVEY | ENVIRONMENTAL

CITY OF PALM DESERT

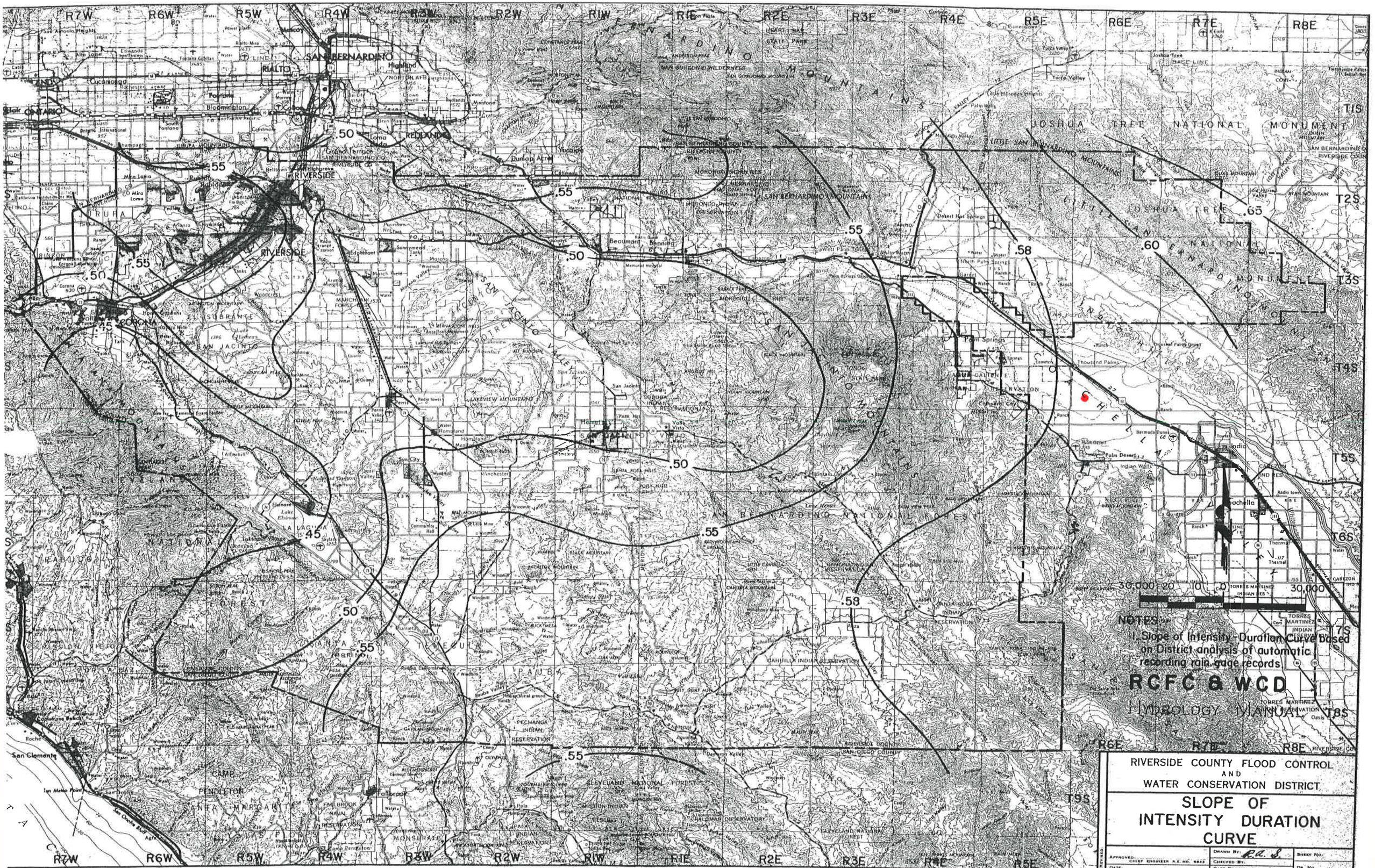
PRELIMINARY WQMP AND HYDROLOGY SITE MAP
DSRT SURF

BEING A PORTION OF THE WEST 1/2 OF SECTION 4, T5S, R6E, SBM

FOR: DESERT WAVE VENTURES, LLC

SHEET 1 OF 1

Plotted: Dec 07, 2018 - 1:18pm DWG: L:\projects\C1316 Desert Willow Due Diligence\engineering\drawings\exhibits\WQMP\WQMP1316101.dwg



NOTES:

1. Slope of Intensity-Duration Curve based on District analysis of automatic recording rain gage records

RCFC & WCD

HYDROLOGY MANUAL

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

SLOPE OF INTENSITY DURATION CURVE

APPROVED: CHIEF ENGINEER R.E. NO. 6822	DRAWN BY: E.A.S.	SHEET NO.
DATE:	CHECKED BY:	DR. NO.
	DATE DRAWN:	

REVISED

Desert Willow South Golf Course

RUNOFF MANAGEMENT PLAN

February 12, 1997

Prepared By:

MAINIERO, SMITH AND ASSOCIATES, INC.

Planning / Civil Engineering / Land Surveying

777 East Tahquitz Canyon Way, Suite 301 Palm Springs, California 92262-6784

Telephone (619) 320-9811 FAX (619) 323-7893

TABLE OF CONTENTS

I. INTRODUCTION

A. Purpose and Scope

The City of Palm Desert and the Coachella Valley Water District have adopted policies of regulating the runoff from new land developments in watersheds which do not have adequate downstream flood control facilities. The City has adopted a runoff management policy which provides for containing all runoff within the Project during the 100-year flood. Under this plan, there will be no significant runoff from the site onto adjacent properties under 100-year flood conditions.

This report presents the results of onsite hydrology and drainage studies conducted to identify drainage collection locations and volumes of water to be managed. The following activities and information were involved in the preparation of this report.

- The interior drainage subareas were delineated on a 100-scale development plan which shows streets, lots, golf course layout and grading. This map is enclosed herewith as Figure 1: DESERT WILLOW SOUTH GOLF COURSE MASTER DRAINAGE PLAN.

- 100-year rainfall amounts for the 3-hour, 6-hour, and 24-hour storms were obtained from the Riverside County Flood Control and Water Conservation District (RCFCWCD) Hydrology Manual.

- Rainfall distribution patterns were obtained from the RCFCWCD Hydrology Manual.

- Net rain was computed from each subarea to determine runoff volume and storage requirements.

- Peak runoff rates were computed for the hotel and residential pads using the RCFCWCD Rational Method. These rates were used for sizing storm drains to convey the drainage to the golf course.

- Provisions were incorporated into the grading plan to collect, convey, and store onsite.

B. Conclusions

- The retention areas provided within the golf course fairways provide adequate capacity for the 100-year runoff from all drainage areas. In addition to the designated retention areas, there are depressions in the grading of the other fairways which provide a generous level of additional storage over and above the calculated amounts.

- The Pipe sizes shown on the Master Drainage Plan are adequate to carry the computed 100-year flood.

C. Recommendation

Implement the runoff management plan depicted on Figure 1 in the Appendices.

II. ORGANIZATION

A. Figures

Figure 1 presents the runoff management plan. Sources, drainage paths, and destinations of runoff are shown on this drawing. The various drainage subareas are created by the grading of the golf course. Runoff is collected in the low areas of the golf course.

B. Appendices

The hydrology and hydraulic calculations are contained in the Appendices. Appendix 1 contains Rational Method Calculations for the peak Qs from the hotel and residential subareas. Appendix 2 contains net rain calculations for each land use, for use in computing the necessary runoff storage volume. Appendix 3 contains the storm drain size analysis for the 100 years Qs.

III. ELEMENTS OF RUNOFF MANAGEMENT PLAN

A. Drainage Concept

Runoff from the hotel, residential area and golf course will be routed to retention areas in the golf course for storage as shown on Figure 1. Disposal of accumulated water will take place by infiltration, assisted by the installation of drywells.

B. Computation of Peak Flow Rates

Appendix 1 contains the Rational Method computations to determine peak runoff from each of the hotel and residential areas and the location of discharge to the golf course. The resulting discharge points and discharges are shown on Figure 1.

C. Runoff Volumes

Figure 1 contains the calculations of runoff volumes from the hotel, residential and golf course areas. Provisions for storage of these amounts has been provided within the retention areas, as shown on Figure 1. Appendix 1 contains calculations of effective rain for the hotel, residential and golf course areas.

APPENDIX 1:

RATIONAL METHOD CALCULATIONS FOR HOTEL AND RESIDENTIAL AREAS

```
 ************************************************************************
******
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-94 Advanced Engineering Software (aes)
             Ver. 1.5A  Release Date: 6/01/94  License ID 1304

                          Analysis prepared by:

                       MAINIERO, SMITH & ASSOCIATES, INC.

       CIVIL & ENVIRONMENTAL ENGINEERING, SURVEYING AND LAND PLANNING

                       777 TAHQUIST CANYON WAY, SUITE 301

                      PALM SPRINGS, CALIFORNIA 92262-7066


  ************************** DESCRIPTION OF STUDY **********************
*****
 * Subareas A1, A2 and A3
     *
 *
     *
 *
     *
  ************************************************************************
*****

   FILE NAME: 1102A.DAT
   TIME/DATE OF STUDY: 15:21   2/12/1997
 ------------------------------------------------------------------------
------
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ------------------------------------------------------------------------
------
   USER SPECIFIED STORM EVENT(YEAR) =   10.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE =
 .95
   10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.770
   10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =   .980
   100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  4.520
   100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.600
   SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =   .5799047
   SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =   .5796024
   COMPUTED RAINFALL INTENSITY DATA:
   STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =  .9898
   SLOPE OF INTENSITY DURATION CURVE =  .5799
```

```
   RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED
   NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANU
AL
         AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYS
ES


 ************************************************************************
******
   FLOW PROCESS FROM NODE   101.00 TO NODE   102.00 IS CODE =  21
 ------------------------------------------------------------------------
------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 ========================================================================
======
          ASSUMED INITIAL SUBAREA UNIFORM
          DEVELOPMENT IS CONDOMINIUM
   TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
   INITIAL SUBAREA FLOW-LENGTH =   900.00
   UPSTREAM ELEVATION =    264.00
   DOWNSTREAM ELEVATION =    260.00
   ELEVATION DIFFERENCE =      4.00
   TC =  .359*[(  900.00**3)/(     4.00)]**.2 =   16.124
     10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.121
   SOIL CLASSIFICATION IS "A"
   CONDOMINIUM DEVELOPMENT RUNOFF COEFFICIENT = .7198
   SUBAREA RUNOFF(CFS) =      6.64
   TOTAL AREA(ACRES) =      4.35   TOTAL RUNOFF(CFS) =      6.64


 ************************************************************************
******
   FLOW PROCESS FROM NODE   102.00 TO NODE   103.00 IS CODE =   6
 ------------------------------------------------------------------------
------
   >>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<<
 ========================================================================
======
   UPSTREAM ELEVATION =    260.00   DOWNSTREAM ELEVATION =    243.00
   STREET LENGTH(FEET) =   750.00   CURB HEIGHT(INCHES) = 6.
   STREET HALFWIDTH(FEET) = 12.00

   DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK =   6.00
   INTERIOR STREET CROSSFALL(DECIMAL) =   .020
   OUTSIDE STREET CROSSFALL(DECIMAL)  =   .020

   SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2

         **TRAVELTIME COMPUTED USING MEAN FLOW(CFS) =    8.58
     STREETFLOW MODEL RESULTS:
         STREET FLOWDEPTH(FEET) =   .33
         HALFSTREET FLOODWIDTH(FEET) =   10.36
```

```
          AVERAGE FLOW VELOCITY(FEET/SEC.) =     3.60
          PRODUCT OF DEPTH&VELOCITY =     1.20
   STREETFLOW TRAVELTIME(MIN) =   3.47   TC(MIN) =  19.60

     10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.894
   SOIL CLASSIFICATION IS "A"
   CONDOMINIUM DEVELOPMENT RUNOFF COEFFICIENT = .7112
   SUBAREA AREA(ACRES) =    2.90   SUBAREA RUNOFF(CFS) =     3.91
   SUMMED AREA(ACRES) =    7.25   TOTAL RUNOFF(CFS) =     10.55
   END OF SUBAREA STREETFLOW HYDRAULICS:
   DEPTH(FEET) =  .36   HALFSTREET FLOODWIDTH(FEET) = 11.67
   FLOW VELOCITY(FEET/SEC.) =  3.56   DEPTH*VELOCITY =   1.28


 ****************************************************************************
******
   FLOW PROCESS FROM NODE   103.00 TO NODE   203.00 IS CODE =   1
 ----------------------------------------------------------------------------
------
   >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 ============================================================================
======
   TOTAL NUMBER OF STREAMS =  2
   CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
   TIME OF CONCENTRATION(MIN.) =  19.60
   RAINFALL INTENSITY(INCH/HR) =   1.89
   TOTAL STREAM AREA(ACRES) =    7.25
   PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.55


 ****************************************************************************
******
   FLOW PROCESS FROM NODE   201.00 TO NODE   202.00 IS CODE =  21
 ----------------------------------------------------------------------------
------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 ============================================================================
======
          ASSUMED INITIAL SUBAREA UNIFORM
          DEVELOPMENT IS CONDOMINIUM
   TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
   INITIAL SUBAREA FLOW-LENGTH =   600.00
   UPSTREAM ELEVATION =    247.00
   DOWNSTREAM ELEVATION =    243.00
   ELEVATION DIFFERENCE =      4.00
   TC =  .359*[(  600.00**3)/(     4.00)]**.2 =   12.642
     10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.442
   SOIL CLASSIFICATION IS "A"
   CONDOMINIUM DEVELOPMENT RUNOFF COEFFICIENT = .7308
   SUBAREA RUNOFF(CFS) =      5.10
   TOTAL AREA(ACRES) =      2.86   TOTAL RUNOFF(CFS) =      5.10
```

```
 ****************************************************************************
******
   FLOW PROCESS FROM NODE   202.00 TO NODE   203.00 IS CODE =   1
 ----------------------------------------------------------------------------
------
   >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
   >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
 ============================================================================
======
   TOTAL NUMBER OF STREAMS =  2
   CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
   TIME OF CONCENTRATION(MIN.) =  12.64
   RAINFALL INTENSITY(INCH/HR) =   2.44
   TOTAL STREAM AREA(ACRES) =    2.86
   PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.10

   ** CONFLUENCE DATA **
   STREAM      RUNOFF       Tc       INTENSITY       AREA
   NUMBER       (CFS)     (MIN.)    (INCH/HOUR)     (ACRE)
       1        10.55     19.60       1.894          7.25
       2         5.10     12.64       2.442          2.86

  ********************************WARNING*********************************
*****
   IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
   ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
   WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
  ****************************************************************************
*****

   RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
   CONFLUENCE FORMULA USED FOR  2 STREAMS.

   ** PEAK FLOW RATE TABLE **
   STREAM      RUNOFF       Tc       INTENSITY
   NUMBER       (CFS)     (MIN.)    (INCH/HOUR)
       1        11.91     12.64       2.442
       2        14.51     19.60       1.894

   COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
   PEAK FLOW RATE(CFS) =     14.51   Tc(MIN.) =   19.60
   TOTAL AREA(ACRES) =     10.11
 ============================================================================
======
   END OF STUDY SUMMARY:
   PEAK FLOW RATE(CFS) =     14.51   Tc(MIN.) =   19.60
   TOTAL AREA(ACRES) =     10.11
 ============================================================================
======
   END OF RATIONAL METHOD ANALYSIS
```

```
 ************************************************************************
******
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
          (c) Copyright 1982-94 Advanced Engineering Software (aes)
              Ver. 1.5A  Release Date: 6/01/94  License ID 1304

                          Analysis prepared by:

                       MAINIERO, SMITH & ASSOCIATES, INC.

                CIVIL & ENVIRONMENTAL ENGINEERING, SURVEYING AND LAND PLANNING

                          777 TAHQUIST CANYON WAY, SUITE 301

                         PALM SPRINGS, CALIFORNIA 92262-7066


  ************************** DESCRIPTION OF STUDY **********************
*****
 * SUBAREA B-1
     *
 * 100 YR. STORM EVENT
     *
 *
     *
  ************************************************************************
*****

   FILE NAME: 1102B.DAT
   TIME/DATE OF STUDY: 15:24   2/12/1997
 ------------------------------------------------------------------------
------
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ------------------------------------------------------------------------
------
   USER SPECIFIED STORM EVENT(YEAR) =   10.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE =
 .95
   10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.770
   10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =   .980
   100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  4.520
   100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.600
   SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =   .5799047
   SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =   .5796024
   COMPUTED RAINFALL INTENSITY DATA:
   STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =  .9898
   SLOPE OF INTENSITY DURATION CURVE =  .5799
```

```
   RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED
   NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANU
AL
         AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYS
ES


 ************************************************************************
******
   FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  21
 ------------------------------------------------------------------------
------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 ========================================================================
======
           ASSUMED INITIAL SUBAREA UNIFORM
           DEVELOPMENT IS CONDOMINIUM
   TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
   INITIAL SUBAREA FLOW-LENGTH =   300.00
   UPSTREAM ELEVATION =    248.00
   DOWNSTREAM ELEVATION =    246.00
   ELEVATION DIFFERENCE =      2.00
   TC =  .359*[(  300.00**3)/(     2.00)]**.2 =    9.581
     10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.868
   SOIL CLASSIFICATION IS "A"
   CONDOMINIUM DEVELOPMENT RUNOFF COEFFICIENT = .7435
   SUBAREA RUNOFF(CFS) =      2.58
   TOTAL AREA(ACRES) =      1.21   TOTAL RUNOFF(CFS) =      2.58
 ========================================================================
======
   END OF STUDY SUMMARY:
   PEAK FLOW RATE(CFS) =      2.58   Tc(MIN.) =    9.58
   TOTAL AREA(ACRES) =      1.21
 ========================================================================
======
   END OF RATIONAL METHOD ANALYSIS

 □
```

```
 ************************************************************************
******
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
          RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                        (RCFC&WCD)  1978 HYDROLOGY MANUAL
           (c) Copyright 1982-94 Advanced Engineering Software (aes)
               Ver. 1.5A  Release Date: 6/01/94  License ID 1304

                              Analysis prepared by:

                          MAINIERO, SMITH & ASSOCIATES, INC.

                 CIVIL & ENVIRONMENTAL ENGINEERING, SURVEYING AND LAND PLANNING

                          777 TAHQUIST CANYON WAY, SUITE 301

                          PALM SPRINGS, CALIFORNIA 92262-7066


  ************************** DESCRIPTION OF STUDY **********************
*****
 * SUBAREAS C-1 AND C-2
     *
 * 100 YR. STORM EVENT
     *
 *
     *
  ************************************************************************
*****

   FILE NAME: 1102C.DAT
   TIME/DATE OF STUDY: 15:25   2/12/1997
 ------------------------------------------------------------------------
------
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ------------------------------------------------------------------------
------
   USER SPECIFIED STORM EVENT(YEAR) =   10.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE =
 .95
   10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.770
   10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =   .980
   100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  4.520
   100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.600
   SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =   .5799047
   SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =   .5796024
   COMPUTED RAINFALL INTENSITY DATA:
   STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =  .9898
   SLOPE OF INTENSITY DURATION CURVE =  .5799
```

```
   RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED
   NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANU
AL
         AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYS
ES


 ****************************************************************
******
   FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  21
 ----------------------------------------------------------------
------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 ================================================================
======
          ASSUMED INITIAL SUBAREA UNIFORM
          DEVELOPMENT IS CONDOMINIUM
   TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
   INITIAL SUBAREA FLOW-LENGTH =  1000.00
   UPSTREAM ELEVATION =    260.00
   DOWNSTREAM ELEVATION =    249.00
   ELEVATION DIFFERENCE =     11.00
   TC =  .359*[( 1000.00**3)/(    11.00)]**.2 =   14.030
     10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.299
   SOIL CLASSIFICATION IS "A"
   CONDOMINIUM DEVELOPMENT RUNOFF COEFFICIENT = .7261
   SUBAREA RUNOFF(CFS) =      9.26
   TOTAL AREA(ACRES) =      5.55   TOTAL RUNOFF(CFS) =      9.26


 ****************************************************************
******
   FLOW PROCESS FROM NODE    402.00 TO NODE    403.00 IS CODE =   6
 ----------------------------------------------------------------
------
   >>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<<
 ================================================================
======
   UPSTREAM ELEVATION =    249.00   DOWNSTREAM ELEVATION =    247.75
   STREET LENGTH(FEET) =   250.00   CURB HEIGHT(INCHES) = 6.
   STREET HALFWIDTH(FEET) = 12.00

   DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK =   6.00
   INTERIOR STREET CROSSFALL(DECIMAL) =   .020
   OUTSIDE STREET CROSSFALL(DECIMAL)  =   .020

   SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2

         **TRAVELTIME COMPUTED USING MEAN FLOW(CFS) =   11.01
   ***STREET FLOWING FULL***
     STREETFLOW MODEL RESULTS:
         STREET FLOWDEPTH(FEET) =   .43
```

```
        HALFSTREET FLOODWIDTH(FEET) =   12.00
        AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.31
        PRODUCT OF DEPTH&VELOCITY =    1.01
  STREETFLOW TRAVELTIME(MIN) =   1.80   TC(MIN) =  15.83

    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.143
  SOIL CLASSIFICATION IS "A"
  CONDOMINIUM DEVELOPMENT RUNOFF COEFFICIENT = .7207
  SUBAREA AREA(ACRES) =    2.26   SUBAREA RUNOFF(CFS) =    3.49
  SUMMED AREA(ACRES) =    7.81   TOTAL RUNOFF(CFS) =     12.76
  END OF SUBAREA STREETFLOW HYDRAULICS:
  DEPTH(FEET) =  .45   HALFSTREET FLOODWIDTH(FEET) = 12.00
  FLOW VELOCITY(FEET/SEC.) =  2.44   DEPTH*VELOCITY =   1.11
 ================================================================
======
  END OF STUDY SUMMARY:
  PEAK FLOW RATE(CFS) =     12.76   Tc(MIN.) =   15.83
  TOTAL AREA(ACRES) =      7.81
 ================================================================
======
  END OF RATIONAL METHOD ANALYSIS
```

```
 ************************************************************************
******
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
          RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
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                              Analysis prepared by:

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                 CIVIL & ENVIRONMENTAL ENGINEERING, SURVEYING AND LAND PLANNING

                          777 TAHQUIST CANYON WAY, SUITE 301

                          PALM SPRINGS, CALIFORNIA 92262-7066


  ************************** DESCRIPTION OF STUDY **********************
*****
 * SUBAREA D-1
     *
 * 100 YEAR STORM EVENT
     *
 *
     *
  ************************************************************************
*****

   FILE NAME: 1102D.DAT
   TIME/DATE OF STUDY: 15:27   2/12/1997
 ------------------------------------------------------------------------
------
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ------------------------------------------------------------------------
------
   USER SPECIFIED STORM EVENT(YEAR) =   10.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE =
 .95
   10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.770
   10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =   .980
   100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  4.520
   100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.600
   SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =   .5799047
   SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =   .5796024
   COMPUTED RAINFALL INTENSITY DATA:
   STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =  .9898
   SLOPE OF INTENSITY DURATION CURVE =  .5799
```

```
   RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED
   NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANU
AL
         AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYS
ES


 ****************************************************************************
******
   FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  21
 ----------------------------------------------------------------------------
------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 ============================================================================
======
          ASSUMED INITIAL SUBAREA UNIFORM
          DEVELOPMENT IS CONDOMINIUM
   TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
   INITIAL SUBAREA FLOW-LENGTH =   500.00
   UPSTREAM ELEVATION =    250.00
   DOWNSTREAM ELEVATION =    246.00
   ELEVATION DIFFERENCE =      4.00
   TC =  .359*[(  500.00**3)/(     4.00)]**.2 =   11.332
     10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.602
   SOIL CLASSIFICATION IS "A"
   CONDOMINIUM DEVELOPMENT RUNOFF COEFFICIENT = .7358
   SUBAREA RUNOFF(CFS) =      4.21
   TOTAL AREA(ACRES) =      2.20   TOTAL RUNOFF(CFS) =      4.21
 ============================================================================
======
   END OF STUDY SUMMARY:
   PEAK FLOW RATE(CFS) =      4.21   Tc(MIN.) =   11.33
   TOTAL AREA(ACRES) =      2.20
 ============================================================================
======
   END OF RATIONAL METHOD ANALYSIS

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 ************************************************************************
******
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
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                          Analysis prepared by:

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                      PALM SPRINGS, CALIFORNIA 92262-7066


  ************************** DESCRIPTION OF STUDY **********************
*****
 * SUBAREAS E-1 AND E-2
     *
 * 100 YEAR STORM EVENT
     *
 *
     *
  ************************************************************************
*****

   FILE NAME: 1102E.DAT
   TIME/DATE OF STUDY: 15:28   2/12/1997
 ------------------------------------------------------------------------
------
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ------------------------------------------------------------------------
------
   USER SPECIFIED STORM EVENT(YEAR) =   10.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE =
 .95
   10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.770
   10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =   .980
   100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  4.520
   100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.600
   SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =   .5799047
   SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =   .5796024
   COMPUTED RAINFALL INTENSITY DATA:
   STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =  .9898
   SLOPE OF INTENSITY DURATION CURVE =  .5799
```

```
   RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED
   NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANU
AL
         AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYS
ES


 ****************************************************************************
******
   FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  21
 ----------------------------------------------------------------------------
------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 ============================================================================
======
          ASSUMED INITIAL SUBAREA UNIFORM
          DEVELOPMENT IS CONDOMINIUM
   TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
   INITIAL SUBAREA FLOW-LENGTH =   600.00
   UPSTREAM ELEVATION =    260.00
   DOWNSTREAM ELEVATION =    257.00
   ELEVATION DIFFERENCE =      3.00
   TC =  .359*[(  600.00**3)/(     3.00)]**.2 =   13.391
     10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.362
   SOIL CLASSIFICATION IS "A"
   CONDOMINIUM DEVELOPMENT RUNOFF COEFFICIENT = .7282
   SUBAREA RUNOFF(CFS) =      2.46
   TOTAL AREA(ACRES) =      1.43   TOTAL RUNOFF(CFS) =      2.46


 ****************************************************************************
******
   FLOW PROCESS FROM NODE    602.00 TO NODE    603.00 IS CODE =   6
 ----------------------------------------------------------------------------
------
   >>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<<
 ============================================================================
======
   UPSTREAM ELEVATION =    257.00   DOWNSTREAM ELEVATION =    254.50
   STREET LENGTH(FEET) =   500.00   CURB HEIGHT(INCHES) = 6.
   STREET HALFWIDTH(FEET) = 12.00

   DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK =   6.00
   INTERIOR STREET CROSSFALL(DECIMAL) =   .020
   OUTSIDE STREET CROSSFALL(DECIMAL)  =   .020

   SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2

         **TRAVELTIME COMPUTED USING MEAN FLOW(CFS) =    5.09
     STREETFLOW MODEL RESULTS:
         STREET FLOWDEPTH(FEET) =   .36
         HALFSTREET FLOODWIDTH(FEET) =   11.67
```

```
        AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.72
        PRODUCT OF DEPTH&VELOCITY =     .62
  STREETFLOW TRAVELTIME(MIN) =   4.85   TC(MIN) =  18.24

    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.975
  SOIL CLASSIFICATION IS "A"
  CONDOMINIUM DEVELOPMENT RUNOFF COEFFICIENT = .7144
  SUBAREA AREA(ACRES) =    3.74   SUBAREA RUNOFF(CFS) =    5.28
  SUMMED AREA(ACRES) =    5.17   TOTAL RUNOFF(CFS) =      7.73
  END OF SUBAREA STREETFLOW HYDRAULICS:
  DEPTH(FEET) =  .40   HALFSTREET FLOODWIDTH(FEET) = 12.00
  FLOW VELOCITY(FEET/SEC.) =  2.03   DEPTH*VELOCITY =    .80
 ================================================================================
  END OF STUDY SUMMARY:
  PEAK FLOW RATE(CFS) =      7.73   Tc(MIN.) =   18.24
  TOTAL AREA(ACRES) =      5.17
 ================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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 ************************************************************************
******
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
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                          Analysis prepared by:

                       MAINIERO, SMITH & ASSOCIATES, INC.

              CIVIL & ENVIRONMENTAL ENGINEERING, SURVEYING AND LAND PLANNING

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                         PALM SPRINGS, CALIFORNIA 92262-7066


  ************************** DESCRIPTION OF STUDY **********************
*****
 * SUBAREA F-1
     *
 * 100 YEAR STORM EVENT
     *
 *
     *
  ************************************************************************
*****

   FILE NAME: 1102F.DAT
   TIME/DATE OF STUDY: 15:29   2/12/1997
 ------------------------------------------------------------------------
------
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ------------------------------------------------------------------------
------
   USER SPECIFIED STORM EVENT(YEAR) =   10.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE =
 .95
   10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.770
   10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =   .980
   100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  4.520
   100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.600
   SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =   .5799047
   SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =   .5796024
   COMPUTED RAINFALL INTENSITY DATA:
   STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =  .9898
   SLOPE OF INTENSITY DURATION CURVE =  .5799
```

```
   RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED
   NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANU
AL
         AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYS
ES


 ************************************************************************
******
   FLOW PROCESS FROM NODE    701.00 TO NODE    702.00 IS CODE =  21
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------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 ========================================================================
======
          ASSUMED INITIAL SUBAREA UNIFORM
          DEVELOPMENT IS COMMERCIAL
   TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
   INITIAL SUBAREA FLOW-LENGTH =  1000.00
   UPSTREAM ELEVATION =     270.00
   DOWNSTREAM ELEVATION =     260.00
   ELEVATION DIFFERENCE =      10.00
   TC =  .303*[( 1000.00**3)/(    10.00)]**.2 =   12.067
     10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.509
   SOIL CLASSIFICATION IS "A"
   COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8523
   SUBAREA RUNOFF(CFS) =      12.44
   TOTAL AREA(ACRES) =       5.82   TOTAL RUNOFF(CFS) =     12.44
 ========================================================================
======
   END OF STUDY SUMMARY:
   PEAK FLOW RATE(CFS) =      12.44   Tc(MIN.) =   12.07
   TOTAL AREA(ACRES) =       5.82
 ========================================================================
======
   END OF RATIONAL METHOD ANALYSIS

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 ************************************************************************
******
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
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                          PALM SPRINGS, CALIFORNIA 92262-7066


  ************************** DESCRIPTION OF STUDY **********************
*****
 * SUBAREA G-1
     *
 * 100 YEAR STORM EVENT
     *
 *
     *
  ************************************************************************
*****

   FILE NAME: 1102G.DAT
   TIME/DATE OF STUDY: 15:31   2/12/1997
 ------------------------------------------------------------------------
------
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ------------------------------------------------------------------------
------
   USER SPECIFIED STORM EVENT(YEAR) =   10.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE =
 .95
   10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.770
   10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =   .980
   100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  4.520
   100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.600
   SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =   .5799047
   SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =   .5796024
   COMPUTED RAINFALL INTENSITY DATA:
   STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =  .9898
   SLOPE OF INTENSITY DURATION CURVE =  .5799
```

```
   RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED
   NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANU
AL
         AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYS
ES


 ************************************************************************
******
   FLOW PROCESS FROM NODE    801.00 TO NODE    802.00 IS CODE =  21
 ------------------------------------------------------------------------
------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 ========================================================================
======
           ASSUMED INITIAL SUBAREA UNIFORM
           DEVELOPMENT IS COMMERCIAL
   TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
   INITIAL SUBAREA FLOW-LENGTH =   900.00
   UPSTREAM ELEVATION =    271.00
   DOWNSTREAM ELEVATION =    260.00
   ELEVATION DIFFERENCE =     11.00
   TC =  .303*[(  900.00**3)/(    11.00)]**.2 =   11.114
     10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.632
   SOIL CLASSIFICATION IS "A"
   COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8533
   SUBAREA RUNOFF(CFS) =     13.50
   TOTAL AREA(ACRES) =      6.01   TOTAL RUNOFF(CFS) =     13.50
 ========================================================================
======
   END OF STUDY SUMMARY:
   PEAK FLOW RATE(CFS) =     13.50   Tc(MIN.) =   11.11
   TOTAL AREA(ACRES) =      6.01
 ========================================================================
======
   END OF RATIONAL METHOD ANALYSIS

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 ************************************************************************
******
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
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                             777 TAHQUIST CANYON WAY, SUITE 301

                            PALM SPRINGS, CALIFORNIA 92262-7066


  ************************** DESCRIPTION OF STUDY **********************
*****
 * SUBAREA H-1 SOUTH PORTION OF HOTEL SITE
     *
 * 100 YEAR STORM EVENT
     *
 *
     *
  ************************************************************************
*****

   FILE NAME: 1102H.DAT
   TIME/DATE OF STUDY: 15:32   2/12/1997
 ------------------------------------------------------------------------
------
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ------------------------------------------------------------------------
------
   USER SPECIFIED STORM EVENT(YEAR) =   10.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE =
 .95
   10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.770
   10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =   .980
   100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  4.520
   100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.600
   SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =   .5799047
   SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =   .5796024
   COMPUTED RAINFALL INTENSITY DATA:
   STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =  .9898
   SLOPE OF INTENSITY DURATION CURVE =  .5799
```

```
   RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED
   NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANU
AL
         AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYS
ES


 ****************************************************************************
******
   FLOW PROCESS FROM NODE    901.00 TO NODE    902.00 IS CODE =  21
 ----------------------------------------------------------------------------
------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 ============================================================================
======
          ASSUMED INITIAL SUBAREA UNIFORM
          DEVELOPMENT IS COMMERCIAL
   TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
   INITIAL SUBAREA FLOW-LENGTH =   900.00
   UPSTREAM ELEVATION =    265.00
   DOWNSTREAM ELEVATION =    259.00
   ELEVATION DIFFERENCE =      6.00
   TC =  .303*[(  900.00**3)/(     6.00)]**.2 =   12.546
     10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.453
   SOIL CLASSIFICATION IS "A"
   COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8518
   SUBAREA RUNOFF(CFS) =     11.68
   TOTAL AREA(ACRES) =      5.59   TOTAL RUNOFF(CFS) =     11.68
 ============================================================================
======
   END OF STUDY SUMMARY:
   PEAK FLOW RATE(CFS) =     11.68   Tc(MIN.) =   12.55
   TOTAL AREA(ACRES) =      5.59
 ============================================================================
======
   END OF RATIONAL METHOD ANALYSIS

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 ************************************************************************
******
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                              Analysis prepared by:

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                CIVIL & ENVIRONMENTAL ENGINEERING, SURVEYING AND LAND PLANNING

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                          PALM SPRINGS, CALIFORNIA 92262-7066


  ************************** DESCRIPTION OF STUDY **********************
*****
 * SUBAREA I-1 RESIDENTIAL AREAS
     *
 * 100 YEAR STORM EVENT
     *
 *
     *
  ************************************************************************
*****

   FILE NAME: 1102I.DAT
   TIME/DATE OF STUDY: 15:34   2/12/1997
 ------------------------------------------------------------------------
------
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ------------------------------------------------------------------------
------
   USER SPECIFIED STORM EVENT(YEAR) =   10.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE =
 .95
   10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.770
   10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =   .980
   100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  4.520
   100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.600
   SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =   .5799047
   SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =   .5796024
   COMPUTED RAINFALL INTENSITY DATA:
   STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =  .9898
   SLOPE OF INTENSITY DURATION CURVE =  .5799
```

```
   RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED
   NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANU
AL
         AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYS
ES


 ************************************************************************
******
   FLOW PROCESS FROM NODE  1001.00 TO NODE  1002.00 IS CODE =  21
 ----------------------------------------------------------------------
------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 ======================================================================
======
           ASSUMED INITIAL SUBAREA UNIFORM
           DEVELOPMENT IS CONDOMINIUM
   TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
   INITIAL SUBAREA FLOW-LENGTH =   800.00
   UPSTREAM ELEVATION =    273.00
   DOWNSTREAM ELEVATION =    261.00
   ELEVATION DIFFERENCE =     12.00
   TC =  .359*[(  800.00**3)/(    12.00)]**.2 =   12.060
     10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.510
   SOIL CLASSIFICATION IS "A"
   CONDOMINIUM DEVELOPMENT RUNOFF COEFFICIENT = .7330
   SUBAREA RUNOFF(CFS) =      5.26
   TOTAL AREA(ACRES) =      2.86   TOTAL RUNOFF(CFS) =      5.26
 ======================================================================
======
   END OF STUDY SUMMARY:
   PEAK FLOW RATE(CFS) =      5.26   Tc(MIN.) =   12.06
   TOTAL AREA(ACRES) =      2.86
 ======================================================================
======
   END OF RATIONAL METHOD ANALYSIS

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 ************************************************************************
******
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
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                          Analysis prepared by:

                       MAINIERO, SMITH & ASSOCIATES, INC.

       CIVIL & ENVIRONMENTAL ENGINEERING, SURVEYING AND LAND PLANNING

                       777 TAHQUIST CANYON WAY, SUITE 301

                       PALM SPRINGS, CALIFORNIA 92262-7066


  ************************** DESCRIPTION OF STUDY **********************
*****
 * SUBAREA J-1 RESIDENTIAL AREA
     *
 * 100 YEAR STORM EVENT
     *
 *
     *
  ************************************************************************
*****

   FILE NAME: 1102J.DAT
   TIME/DATE OF STUDY: 15:35   2/12/1997
 ------------------------------------------------------------------------
------
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ------------------------------------------------------------------------
------
   USER SPECIFIED STORM EVENT(YEAR) =   10.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE =
 .95
   10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.770
   10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =   .980
   100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  4.520
   100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.600
   SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =   .5799047
   SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =   .5796024
   COMPUTED RAINFALL INTENSITY DATA:
   STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =  .9898
   SLOPE OF INTENSITY DURATION CURVE =  .5799
```

```
   RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED
   NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANU
AL
         AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYS
ES


 ****************************************************************
******
   FLOW PROCESS FROM NODE  1101.00 TO NODE  1102.00 IS CODE =  21
 ----------------------------------------------------------------
------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 ================================================================
======
          ASSUMED INITIAL SUBAREA UNIFORM
          DEVELOPMENT IS CONDOMINIUM
   TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
   INITIAL SUBAREA FLOW-LENGTH =   850.00
   UPSTREAM ELEVATION =    273.00
   DOWNSTREAM ELEVATION =    259.00
   ELEVATION DIFFERENCE =     14.00
   TC =  .359*[(  850.00**3)/(    14.00)]**.2 =   12.127
     10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.502
   SOIL CLASSIFICATION IS "A"
   CONDOMINIUM DEVELOPMENT RUNOFF COEFFICIENT = .7327
   SUBAREA RUNOFF(CFS) =      6.45
   TOTAL AREA(ACRES) =      3.52   TOTAL RUNOFF(CFS) =      6.45
 ================================================================
======
   END OF STUDY SUMMARY:
   PEAK FLOW RATE(CFS) =      6.45   Tc(MIN.) =   12.13
   TOTAL AREA(ACRES) =      3.52
 ================================================================
======
   END OF RATIONAL METHOD ANALYSIS

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******
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                      (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-94 Advanced Engineering Software (aes)
             Ver. 1.5A  Release Date: 6/01/94  License ID 1304

                          Analysis prepared by:

                       MAINIERO, SMITH & ASSOCIATES, INC.

                CIVIL & ENVIRONMENTAL ENGINEERING, SURVEYING AND LAND PLANNING

                          777 TAHQUIST CANYON WAY, SUITE 301

                          PALM SPRINGS, CALIFORNIA 92262-7066


  ************************** DESCRIPTION OF STUDY **********************
*****
 * SUBAREA K-1 RESIDENTIAL AREA
     *
 * 100 YEAR STORM EVENT
     *
 *
     *
  ************************************************************************
*****

   FILE NAME: 1102K.DAT
   TIME/DATE OF STUDY: 15:36   2/12/1997
 ------------------------------------------------------------------------
------
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ------------------------------------------------------------------------
------
   USER SPECIFIED STORM EVENT(YEAR) =   10.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE =
 .95
   10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.770
   10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =   .980
   100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  4.520
   100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.600
   SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =   .5799047
   SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =   .5796024
   COMPUTED RAINFALL INTENSITY DATA:
   STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =  .9898
   SLOPE OF INTENSITY DURATION CURVE =  .5799
```

```
   RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED
   NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANU
AL
         AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYS
ES


 ************************************************************************
******
   FLOW PROCESS FROM NODE  1201.00 TO NODE  1202.00 IS CODE =  21
 ----------------------------------------------------------------------
------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 ======================================================================
======
          ASSUMED INITIAL SUBAREA UNIFORM
          DEVELOPMENT IS CONDOMINIUM
   TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
   INITIAL SUBAREA FLOW-LENGTH =   450.00
   UPSTREAM ELEVATION =    273.00
   DOWNSTREAM ELEVATION =    266.00
   ELEVATION DIFFERENCE =      7.00
   TC =  .359*[(  450.00**3)/(     7.00)]**.2 =    9.511
     10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.880
   SOIL CLASSIFICATION IS "A"
   CONDOMINIUM DEVELOPMENT RUNOFF COEFFICIENT = .7438
   SUBAREA RUNOFF(CFS) =      4.95
   TOTAL AREA(ACRES) =      2.31   TOTAL RUNOFF(CFS) =      4.95
 ======================================================================
======
   END OF STUDY SUMMARY:
   PEAK FLOW RATE(CFS) =      4.95   Tc(MIN.) =    9.51
   TOTAL AREA(ACRES) =      2.31
 ======================================================================
======
   END OF RATIONAL METHOD ANALYSIS

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 ************************************************************************
******
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
          RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                        (RCFC&WCD)  1978 HYDROLOGY MANUAL
           (c) Copyright 1982-94 Advanced Engineering Software (aes)
               Ver. 1.5A  Release Date: 6/01/94  License ID 1304

                              Analysis prepared by:

                          MAINIERO, SMITH & ASSOCIATES, INC.

                 CIVIL & ENVIRONMENTAL ENGINEERING, SURVEYING AND LAND PLANNING

                          777 TAHQUIST CANYON WAY, SUITE 301

                          PALM SPRINGS, CALIFORNIA 92262-7066


  ************************** DESCRIPTION OF STUDY **********************
*****
 * SUBAREA L-1 RESIDENTIAL AREA
     *
 * 100 YEAR STORM EVENT
     *
 *
     *
  ************************************************************************
*****

   FILE NAME: 1102L.DAT
   TIME/DATE OF STUDY: 15:37   2/12/1997
 ------------------------------------------------------------------------
------
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ------------------------------------------------------------------------
------
   USER SPECIFIED STORM EVENT(YEAR) =   10.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE =
 .95
   10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.770
   10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =   .980
   100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  4.520
   100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.600
   SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =   .5799047
   SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =   .5796024
   COMPUTED RAINFALL INTENSITY DATA:
   STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =  .9898
   SLOPE OF INTENSITY DURATION CURVE =  .5799
```

```
   RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED
   NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANU
AL
         AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYS
ES


 ************************************************************************
******
   FLOW PROCESS FROM NODE  1301.00 TO NODE  1302.00 IS CODE =  21
 ----------------------------------------------------------------------
------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 ======================================================================
======
          ASSUMED INITIAL SUBAREA UNIFORM
          DEVELOPMENT IS CONDOMINIUM
   TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
   INITIAL SUBAREA FLOW-LENGTH =  1000.00
   UPSTREAM ELEVATION =    266.00
   DOWNSTREAM ELEVATION =    256.00
   ELEVATION DIFFERENCE =     10.00
   TC =  .359*[( 1000.00**3)/(    10.00)]**.2 =   14.300
     10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.274
   SOIL CLASSIFICATION IS "A"
   CONDOMINIUM DEVELOPMENT RUNOFF COEFFICIENT = .7252
   SUBAREA RUNOFF(CFS) =     13.79
   TOTAL AREA(ACRES) =      8.36   TOTAL RUNOFF(CFS) =     13.79
 ======================================================================
======
   END OF STUDY SUMMARY:
   PEAK FLOW RATE(CFS) =     13.79   Tc(MIN.) =   14.30
   TOTAL AREA(ACRES) =      8.36
 ======================================================================
======
   END OF RATIONAL METHOD ANALYSIS

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APPENDIX 2:

EFFECTIVE RAIN
FOR
GOLF COURSE, HOTEL AREA AND RESIDENTIAL AREA

R C F C & W C D HYDROLOGY MANUAL	"SHORTCUT METHOD" SYNTHETIC UNIT HYDROGRAPH METHOD Unit Hydrograph and Effective Rain Calculation Form	Project NET RAIN GOLF COURSE 100 YR. 3 HR. By JAD Date 1/25/96 Checked Date	Sheet 1 of 1

[1] CONCENTRATION POINT	0.000	[2] AREA DESIGNATION	
[3] DRAINAGE AREA-SQ ACRES	1.000	[4] ULTIMATE DISCHARGE-CFS-HRS/IN (645*[3])	0.000
[5] UNIT TIME-MINUTES	10.000	[6] LAG TIME-MINUTES	0.000
[7] UNIT TIME-PERCENT OF LAG (100*[5]/[6])	0.000	[8] S-CURVE	0.000
[9] STORM FREQUENCY & DURATION 100 YEAR- 3 HOUR		[10] TOTAL ADJUSTED STORM RAIN-INCHES	2.000
[11] VARIABLE LOSS RATE (AVG)-INCHES/HOUR	0.000	[12] MINIMUM LOSS RATE (FOR VAR. LOSS)-IN/HR	0.000
[13] CONSTANT LOSS RATE-INCHES/HOUR	0.740	[14] LOW LOSS RATE-PERCENT	100.000

	UNIT HYDROGRAPH				EFFECTIVE RAIN					FLOOD HYDROGRAPH
[15] UNIT TIME PERIOD m	[16] TIME PERCENT OF LAG [7]*[15]	[17] CUMULATIVE AVERAGE PERCENT OF ULTIMATE DISCHARGE (S-GRAPH)	[16] DISTRIB GRAPH PERCENT [17]m-[17]m-1	[17] UNIT HYDROGRAPH CFS-HRS/IN [4]*[18] 100.000	[20] PATTERN PERCENT (PL E-5.9)	[21] STORM RAIN IN/HR 60[10][20] 100[5]	[22] LOSS RATE IN/HR		[23] EFFECTIVE RAIN IN/HR [21]-[22]	[24] FLOW CFS
							MAX	LOW		
1.000					2.600	0.312	0.740	0.312	0.000	0.000
2.000					2.600	0.312	0.740	0.312	0.000	0.000
3.000					3.300	0.396	0.740	0.396	0.000	0.000
4.000					3.300	0.396	0.740	0.396	0.000	0.000
5.000					3.300	0.396	0.740	0.396	0.000	0.000
6.000					3.400	0.408	0.740	0.408	0.000	0.000
7.000					4.400	0.528	0.740	0.528	0.000	0.000
8.000					4.200	0.504	0.740	0.504	0.000	0.000
9.000					5.300	0.636	0.740	0.636	0.000	0.000
10.000					5.100	0.612	0.740	0.612	0.000	0.000
11.000					6.400	0.768	0.740	0.768	0.028	0.028
12.000					5.900	0.708	0.740	0.708	0.000	0.000
13.000					7.300	0.876	0.740	0.876	0.136	0.137
14.000					8.500	1.020	0.740	1.020	0.280	0.282
15.000					14.100	1.692	0.740	1.692	0.952	0.960
16.000					14.100	1.692	0.740	1.692	0.952	0.960
17.000					3.800	0.456	0.740	0.456	0.000	0.000
18.000					2.400	0.288	0.740	0.288	0.000	0.000
TOTALS					100.000				2.348	2.368

EFFECTIVE RAIN = 0.391 INCHES

R C F C & W C D HYDROLOGY MANUAL	"SHORTCUT METHOD" SYNTHETIC UNIT HYDROGRAPH METHOD Unit Hydrograph and Effective Rain Calculation Form	Project NET RAIN HOTEL SITE 100 YR. 24 HOUR By JAD Date 1/25/96 Checked Date	Sheet 1 of 1

[1] CONCENTRATION POINT	0.000	[2] AREA DESIGNATION	
[3] DRAINAGE AREA-SQ ACRES	1.000	[4] ULTIMATE DISCHARGE-CFS-HRS/IN (645*[3])	0.000
[5] UNIT TIME-MINUTES	60.000	[6] LAG TIME-MINUTES	0.000
[7] UNIT TIME-PERCENT OF LAG (100*[5]/[6])	0.000	[8] S-CURVE	0.000
[9] STORM FREQUENCY & DURATION 100 YEAR-	24 HOUR	[10] TOTAL ADJUSTED STORM RAIN-INCHES	4.000
[11] VARIABLE LOSS RATE (AVG)-INCHES/HOUR	0.000	[12] MINIMUM LOSS RATE (FOR VAR. LOSS)-IN/HR	0.000
[13] CONSTANT LOSS RATE-INCHES/HOUR	0.140	[14] LOW LOSS RATE-PERCENT	90.000

	UNIT HYDROGRAPH				EFFECTIVE RAIN					FLOOD HYDROGRAPH
[15] UNIT TIME PERIOD m	[16] TIME PERCENT OF LAG [7]*[15]	[17] CUMULATIVE AVERAGE PERCENT OF ULTIMATE DISCHARGE (S-GRAPH)	[16] DISTRIB GRAPH PERCENT [17]m-[17]m-1	[17] UNIT HYDROGRAPH CFS-HRS/IN [4]*[18] 100.000	[20] PATTERN PERCENT (PL E-5.9)	[21] STORM RAIN IN/HR 60[10][20] 100[5]	[22] LOSS RATE IN/HR MAX	[22] LOSS RATE IN/HR LOW	[23] EFFECTIVE RAIN IN/HR [21]-[22]	[24] FLOW CFS
1.000					1.200	0.048	0.140	0.043	0.005	0.005
2.000					1.300	0.052	0.140	0.047	0.005	0.005
3.000					1.800	0.072	0.140	0.065	0.007	0.007
4.000					2.100	0.084	0.140	0.076	0.008	0.008
5.000					2.800	0.112	0.140	0.101	0.011	0.011
6.000					2.900	0.116	0.140	0.104	0.012	0.012
7.000					3.800	0.152	0.140	0.137	0.015	0.015
8.000					4.600	0.184	0.140	0.166	0.044	0.044
9.000					6.300	0.252	0.140	0.227	0.112	0.113
10.000					8.200	0.328	0.140	0.295	0.188	0.190
11.000					7.000	0.280	0.140	0.252	0.140	0.141
12.000					7.300	0.292	0.140	0.263	0.152	0.153
13.000					10.800	0.432	0.140	0.389	0.292	0.294
14.000					11.400	0.456	0.140	0.410	0.316	0.319
15.000					10.400	0.416	0.140	0.374	0.276	0.278
16.000					8.500	0.340	0.140	0.306	0.200	0.202
17.000					1.400	0.056	0.140	0.050	0.006	0.006
18.000					1.900	0.076	0.140	0.068	0.008	0.008
19.000					1.300	0.052	0.140	0.047	0.005	0.005
20.000					1.200	0.048	0.140	0.043	0.005	0.005
21.000					1.100	0.044	0.140	0.040	0.004	0.004
22.000					1.000	0.040	0.140	0.036	0.004	0.004
23.000					0.900	0.036	0.140	0.032	0.004	0.004
24.000					0.800	0.032	0.140	0.029	0.003	0.003
TOTALS					100.000				1.822	1.837

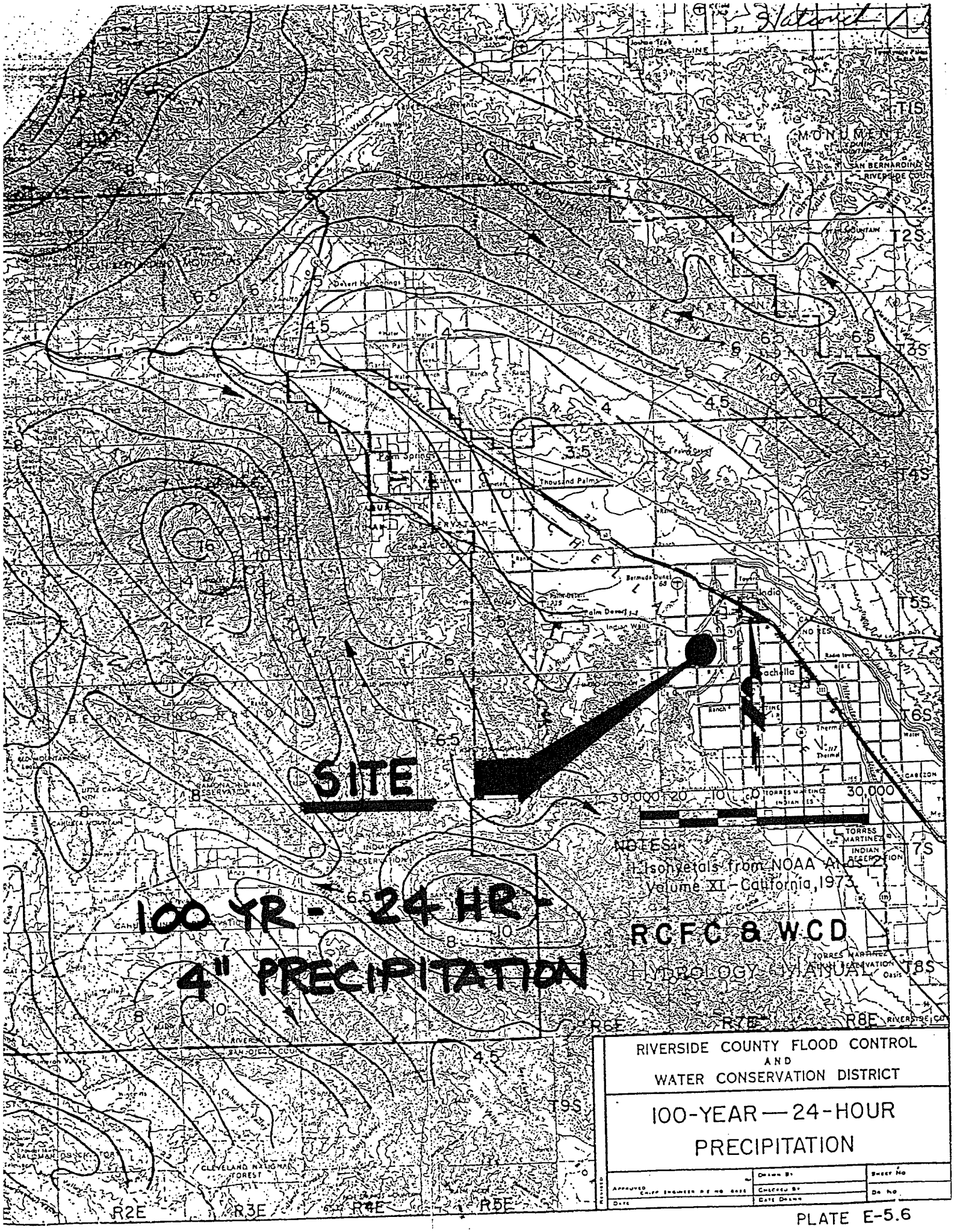
EFFECTIVE RAIN = 1.822 INCHES

R C F C & W C D HYDROLOGY MANUAL	"SHORTCUT METHOD" SYNTHETIC UNIT HYDROGRAPH METHOD Unit Hydrograph and Effective Rain Calculation Form	Project NET RAIN RESIDENTIAL AREA By JAD Date 1/25/96 Checked Date	Sheet 1 of 1

[1] CONCENTRATION POINT	0.000	[2] AREA DESIGNATION	
[3] DRAINAGE AREA-SQ ACRES	1.000	[4] ULTIMATE DISCHARGE-CFS-HRS/IN (645*[3])	0.000
[5] UNIT TIME-MINUTES	10.000	[6] LAG TIME-MINUTES	0.000
[7] UNIT TIME-PERCENT OF LAG (100*[5]/[6])	0.000	[8] S-CURVE	0.000
[9] STORM FREQUENCY & DURATION 100 YEAR-	3 HOUR	[10] TOTAL ADJUSTED STORM RAIN-INCHES	2.000
[11] VARIABLE LOSS RATE (AVG)-INCHES/HOUR	0.000	[12] MINIMUM LOSS RATE (FOR VAR. LOSS)-IN/HR	0.000
[13] CONSTANT LOSS RATE-INCHES/HOUR	0.307	[14] LOW LOSS RATE-PERCENT	90.000

	UNIT HYDROGRAPH				EFFECTIVE RAIN					FLOOD HYDROGRAPH
[15] UNIT TIME PERIOD m	[16] TIME PERCENT OF LAG [7]*[15]	[17] CUMULATIVE AVERAGE PERCENT OF ULTIMATE DISCHARGE (S-GRAPH)	[16] DISTRIB GRAPH PERCENT [17]m-[17]m-1	[17] UNIT HYDROGRAPH CFS-HRS/IN [4]*[18] 100.000	[20] PATTERN PERCENT (PL E-5.9)	[21] STORM RAIN IN/HR 60[10][20] 100[5]	[22] LOSS RATE IN/HR MAX	[22] LOSS RATE IN/HR LOW	[23] EFFECTIVE RAIN IN/HR [21]-[22]	[24] FLOW CFS
1.000					2.600	0.312	0.307	0.281	0.031	0.031
2.000					2.600	0.312	0.307	0.281	0.031	0.031
3.000					3.300	0.396	0.307	0.356	0.089	0.090
4.000					3.300	0.396	0.307	0.356	0.089	0.090
5.000					3.300	0.396	0.307	0.356	0.089	0.090
6.000					3.400	0.408	0.307	0.367	0.101	0.102
7.000					4.400	0.528	0.307	0.475	0.221	0.223
8.000					4.200	0.504	0.307	0.454	0.197	0.199
9.000					5.300	0.636	0.307	0.572	0.329	0.332
10.000					5.100	0.612	0.307	0.551	0.305	0.308
11.000					6.400	0.768	0.307	0.691	0.461	0.465
12.000					5.900	0.708	0.307	0.637	0.401	0.404
13.000					7.300	0.876	0.307	0.788	0.569	0.574
14.000					8.500	1.020	0.307	0.918	0.713	0.719
15.000					14.100	1.692	0.307	1.523	1.385	1.397
16.000					14.100	1.692	0.307	1.523	1.385	1.397
17.000					3.800	0.456	0.307	0.410	0.149	0.150
18.000					2.400	0.288	0.307	0.259	0.029	0.029
TOTALS					100.000				6.574	6.629

EFFECTIVE RAIN = 1.096 INCHES


SITE
100 YR - 24 HR
4" PRECIPITATION
NOTES:
1. Isohyetals from NOAA Atlas 2,
Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
100-YEAR — 24-HOUR
PRECIPITATION
PLATE E-5.6

RCFC & WCD

HYDROLOGY MANUAL

RAINFALL PATTERNS IN PERCENT

RAINFALL PATTERNS IN PERCENT

3-HOUR STORM

TIME PERIOD	5-MIN PERIOD	10-MIN PERIOD	15-MIN PERIOD	30-MIN PERIOD
1	1.3	2.6	3.7	6.5
2	1.3	2.6	4.8	10.0
3	1.1	3.3	5.1	13.9
4	1.5	3.3	4.9	17.4
5	1.5	3.3	6.6	29.9
6	1.8	3.4	7.3	20.3
7	1.5	4.4	8.4	
8	1.8	4.2	9.0	
9	1.8	5.3	12.3	
10	1.5	5.1	17.6	
11	1.6	6.4	16.1	
12	1.8	5.9	4.2	
13	2.2	7.3		
14	2.2	8.5		
15	2.2	14.1		
16	2.0	14.1		
17	2.6	3.8		
18	2.7	2.4		
19	2.4			
20	2.7			
21	3.3			
22	3.1			
23	2.9			
24	3.0			
25	3.1			
26	4.2			
27	5.0			
28	3.5			
29	6.8			
30	7.3			
31	8.2			
32	5.9			
33	2.0			
34	1.8			
35	1.8			
36	.6			

6-HOUR STORM

TIME PERIOD	5-MIN PERIOD	10-MIN PERIOD	15-MIN PERIOD	30-MIN PERIOD
1	.5	1.1	1.7	3.6
2	.6	1.2	1.9	4.3
3	.6	1.3	2.1	4.8
4	.6	1.4	2.2	4.9
5	.6	1.4	2.4	5.3
6	.7	1.5	2.4	5.8
7	.7	1.6	2.4	6.8
8	.7	1.6	2.5	9.0
9	.7	1.6	2.6	11.6
10	.7	1.6	2.7	14.4
11	.7	1.6	2.8	25.1
12	.8	1.7	3.0	4.4
13	.8	1.7	3.2	
14	.8	1.8	3.6	
15	.8	1.8	4.3	
16	.8	1.8	4.7	
17	.8	2.0	5.4	
18	.8	2.0	6.2	
19	.8	2.1	6.9	
20	.8	2.2	7.5	
21	.8	2.5	10.6	
22	.8	2.8	14.5	
23	.8	3.0	3.4	
24	.9	3.2	1.0	
25	.8	3.5		
26	.9	3.9		
27	.9	4.2		
28	.9	4.5		
29	.9	4.8		
30	.9	5.1		
31	.9	6.7		
32	.9	8.1		
33	1.0	10.3		
34	1.0	2.8		
35	1.0	1.1		
36	1.0	.5		
37	1.0			
38	1.1			
39	1.1			
40	1.1			
41	1.2			
42	1.3			
43	1.4			
44	1.4			
45	1.5			
46	1.5			
47	1.6			
48	1.6			

TIME PERIOD	5-MIN PERIOD
49	1.7
50	1.8
51	1.9
52	2.0
53	2.1
54	2.1
55	2.2
56	2.3
57	2.4
58	2.4
59	2.5
60	2.6
61	3.1
62	3.6
63	3.9
64	4.2
65	4.7
66	5.6
67	1.9
68	.9
69	.6
70	.5
71	.3
72	.2

24-HOUR STORM

TIME PERIOD	15-MIN PERIOD	30-MIN PERIOD	60-MIN PERIOD
1	.2	.5	1.2
2	.3	.7	1.3
3	.3	.6	1.8
4	.4	.7	2.1
5	.3	.8	2.8
6	.3	1.0	2.9
7	.3	1.0	3.8
8	.4	1.1	4.6
9	.4	1.3	6.3
10	.4	1.5	8.2
11	.5	1.3	7.0
12	.5	1.6	7.3
13	.5	1.8	10.8
14	.5	2.0	11.4
15	.5	2.1	10.4
16	.6	2.5	8.5
17	.6	3.0	1.4
18	.7	3.3	1.9
19	.7	3.9	1.3
20	.8	4.3	1.2
21	.6	3.0	1.1
22	.7	4.0	1.0
23	.8	3.8	.9
24	.8	3.5	.8
25	.9	5.1	
26	.9	5.7	
27	1.0	6.8	
28	1.0	4.6	
29	1.0	5.3	
30	1.1	5.1	
31	1.2	4.7	
32	1.3	3.8	
33	1.5	.8	
34	1.5	.6	
35	1.6	1.0	
36	1.7	.9	
37	1.9	.8	
38	2.0	.5	
39	2.1	.7	
40	2.2	.5	
41	1.5	.6	
42	1.5	.5	
43	2.0	.5	
44	2.0	.5	
45	1.9	.5	
46	1.9	.4	
47	1.7	.4	
48	1.8	.4	

TIME PERIOD	15-MIN PERIOD
49	2.5
50	2.6
51	2.8
52	2.9
53	3.4
54	3.4
55	2.3
56	2.3
57	2.7
58	2.6
59	2.6
60	2.5
61	2.4
62	2.3
63	1.9
64	1.9
65	.4
66	.4
67	.3
68	.3
69	.5
70	.5
71	.5
72	.4
73	.4
74	.4
75	.3
76	.2
77	.3
78	.4
79	.3
80	.2
81	.3
82	.3
83	.3
84	.2
85	.3
86	.2
87	.3
88	.2
89	.3
90	.2
91	.2
92	.2
93	.2
94	.2
95	.2
96	.2

NOTES:

1. 3 and 6-hour patterns based on the Indio area thunderstorm of September 24,1939.
2. 24-hour patterns based on the general storm of March 2 & 3,1938.

PLATE E-5.9

producing storm of March 1938. Tabulations of these patterns are given on Plate E-5.9 for selected unit time periods. These patterns are considered to represent a reasonable distribution of rainfall which will cause critical runoff conditions during major storm events.

Loss Rates - Factors influencing loss rates are discussed in detail in Section C of this report. Where sufficient data is available loss rates for unit hydrograph hydrology can be estimated from a study of rainfall-runoff relationships of major storms. Where such data is not available loss rates for pervious areas can be estimated using Plates E-6.1 and E-6.2. Loss rates for pervious areas estimated in this manner are generally consistant with previous District studies, and with loss rates developed by the Los Angeles District USCE in numerous hydrology studies in the Southern California area.

Loss rates for pervious areas can be adjusted to account for developed area using the relationship:

$$F = F_p\ (1.00-0.9A_i)$$

where:

F = Adjusted loss rate - inches/hour

F_p = Loss rate for pervious areas - inches/hour (Plate E-6.2)

A_i = Impervious area (actual) - decimal percent (Plate E-6.3)

Adjusted loss rates for the Synthetic Unit Hydrograph method on typical watersheds in the District run generally from 0.10 to 0.40 inches per hour, with most falling between 0.20 and 0.25 inches per hour. For short storms with durations of 6-hours or less the adjusted loss rate may be taken as constant. For longer duration storms the loss rate should normally be varied to decrease with time to yield a mean equal to the adjusted loss rate. For the 24-hour storm the loss curve can be expressed as a function of time:

ACTUAL IMPERVIOUS COVER

Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent(2)
Natural or Agriculture	0 - 10	0
Single Family Residential: (3)		
40,000 S. F. (1 Acre) Lots	10 - 25	20
20,000 S. F. (½ Acre) Lots	30 - 45	40
7,200 - 10,000 S. F. Lots	45 - 55	50
Multiple Family Residential:		
Condominiums	45 - 70	65
Apartments	65 - 90	80
Mobile Home Park	60 - 85	75
Commercial, Downtown Business or Industrial Hotel	80 -100	90

Notes:

1. Land use should be based on ultimate development of the watershed. Long range master plans for the County and incorporated cities should be reviewed to insure reasonable land use assumptions.

2. Recommended values are based on average conditions which may not apply to a particular study area. The percentage impervious may vary greatly even on comparable sized lots due to differences in dwelling size, improvements, etc. Landscape practices should also be considered as it is common in some areas to use ornamental gravels underlain by impervious plastic materials in place of lawns and shrubs. A field investigation of a study area should always be made, and a review of aerial photos, where available may assist in estimating the percentage of impervious cover in developed areas.

3. For typical horse ranch subdivisions increase impervious area 5 percent over the values recommended in the table above.

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HYDROLOGY MANUAL

IMPERVIOUS COVER FOR DEVELOPED AREAS

PLATE E-6.3

RUNOFF INDEX NUMBERS OF HYDROLOGIC SOIL-COVER COMPLEXES FOR PERVIOUS AREAS-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
NATURAL COVERS -					
Barren (Rockland, eroded and graded land)		78	86	91	93
Chaparrel, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparrel, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Cienegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	72	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	28	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
URBAN COVERS -					
Residential or Commercial Landscaping (Lawn, shrubs, etc.)	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
AGRICULTURAL COVERS -					
Fallow (Land plowed but not tilled or seeded)		76	85	90	92

RI= 32

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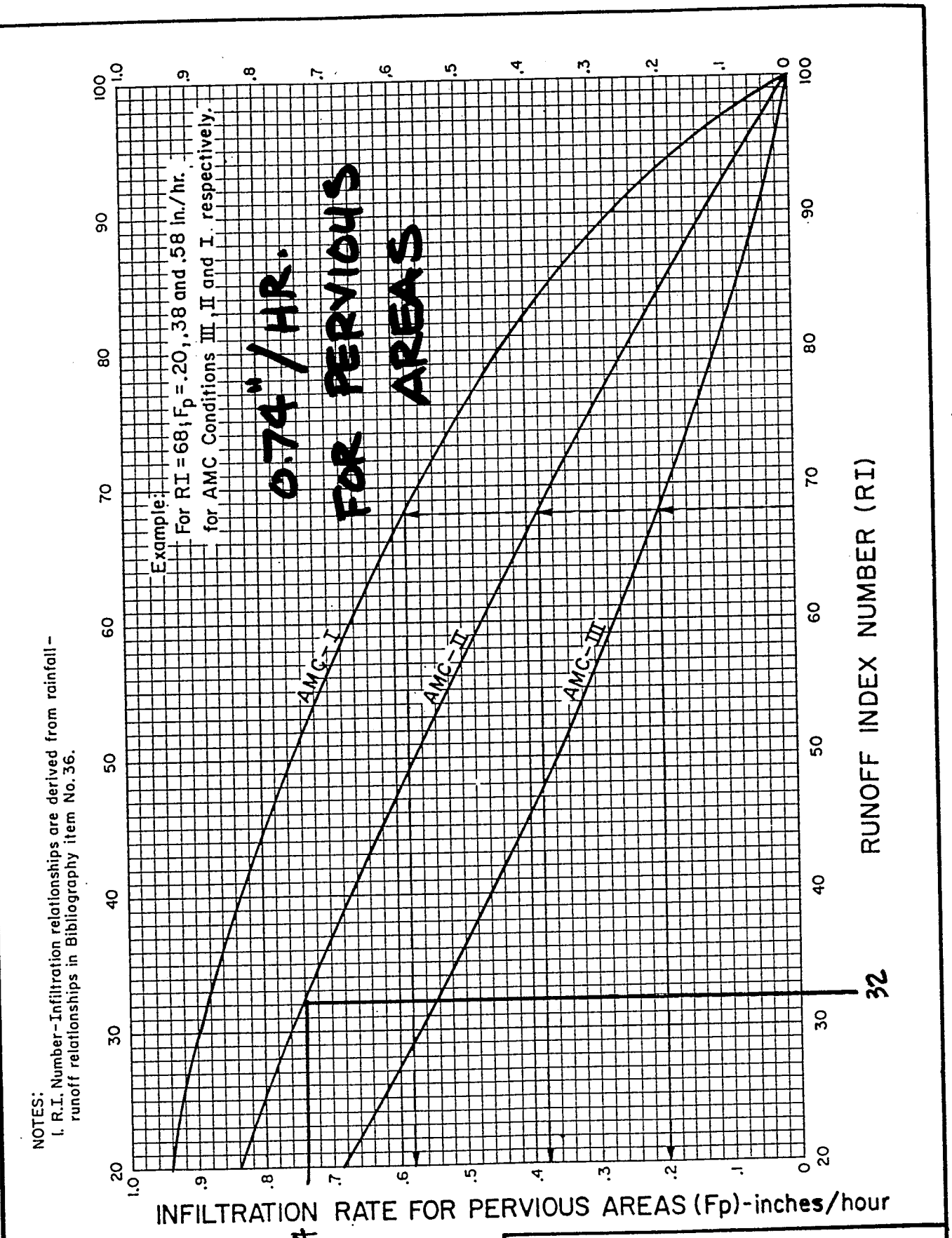
HYDROLOGY MANUAL

RUNOFF INDEX NUMBERS FOR PERVIOUS AREAS

PLATE E-6.1 (1 of 2)



NOTES:
1. R.I. Number-Infiltration relationships are derived from rainfall-runoff relationships in Bibliography item No. 36.

RCFC & WCD

HYDROLOGY MANUAL

INFILTRATION RATE FOR PERVIOUS AREAS VERSUS RUNOFF INDEX NUMBERS

PLATE E-6.2

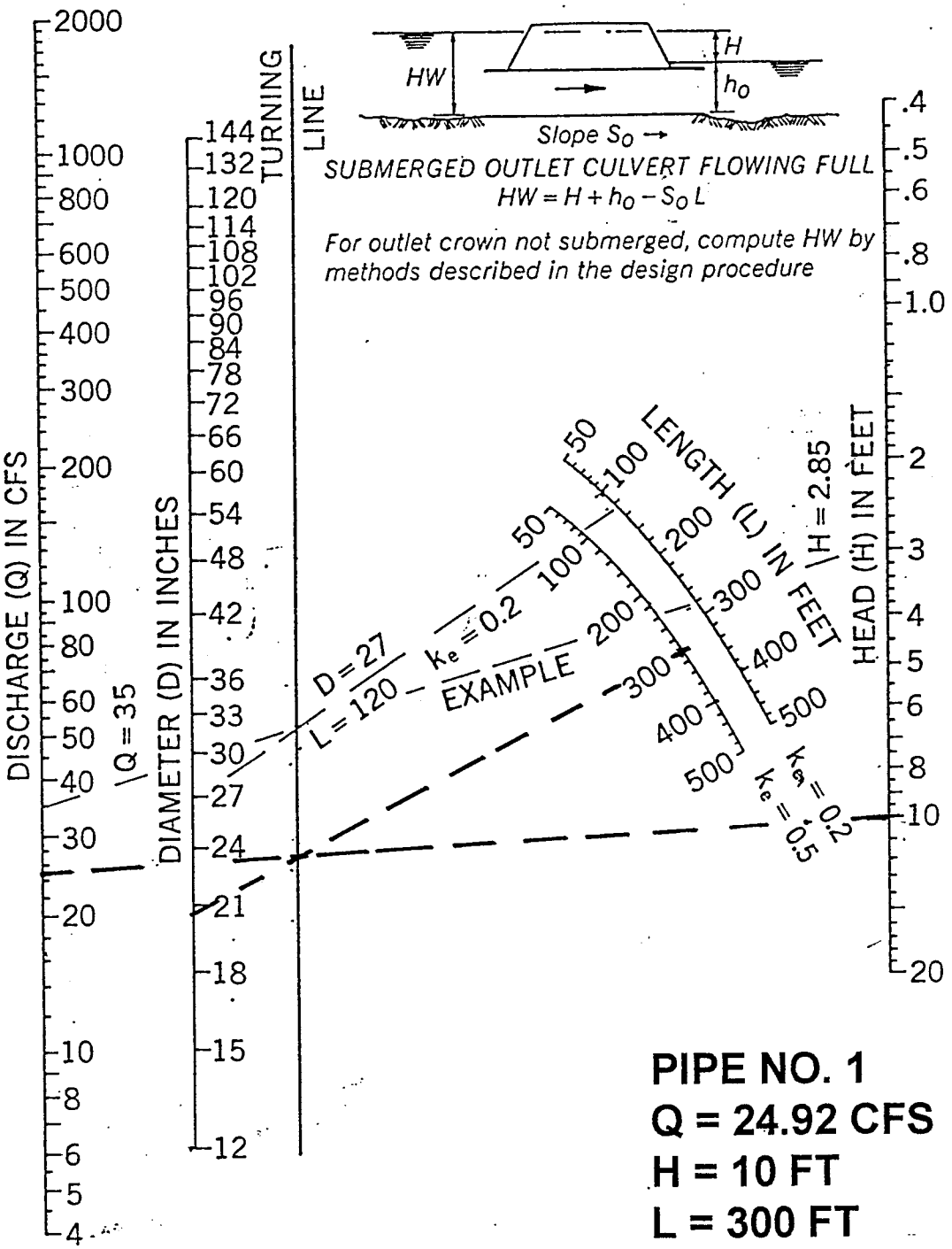
APPENDIX 3:

STORM DRAIN - SIZE ANALYSIS

FIGURE 38

HEAD FOR CIRCULAR CONCRETE PIPE CULVERTS FLOWING FULL

n = 0.012



PIPE NO. 1
Q = 24.92 CFS
H = 10 FT
L = 300 FT
Ke = 0.5

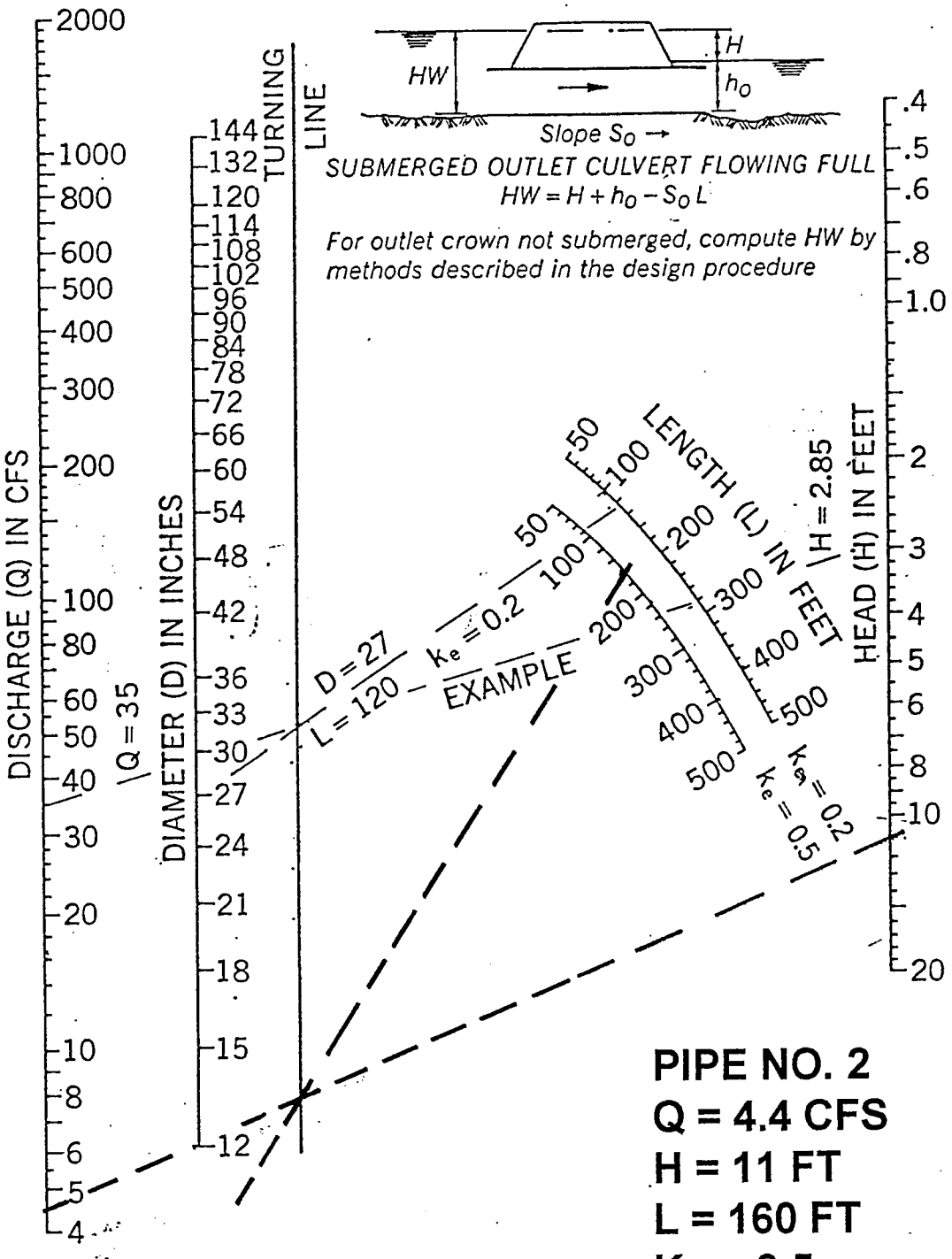
D = 21”

BUREAU OF PUBLIC ROADS JAN. 1963

FIGURE 38

HEAD FOR CIRCULAR CONCRETE PIPE CULVERTS FLOWING FULL

n = 0.012



PIPE NO. 2
Q = 4.4 CFS
H = 11 FT
L = 160 FT
Ke = 0.5

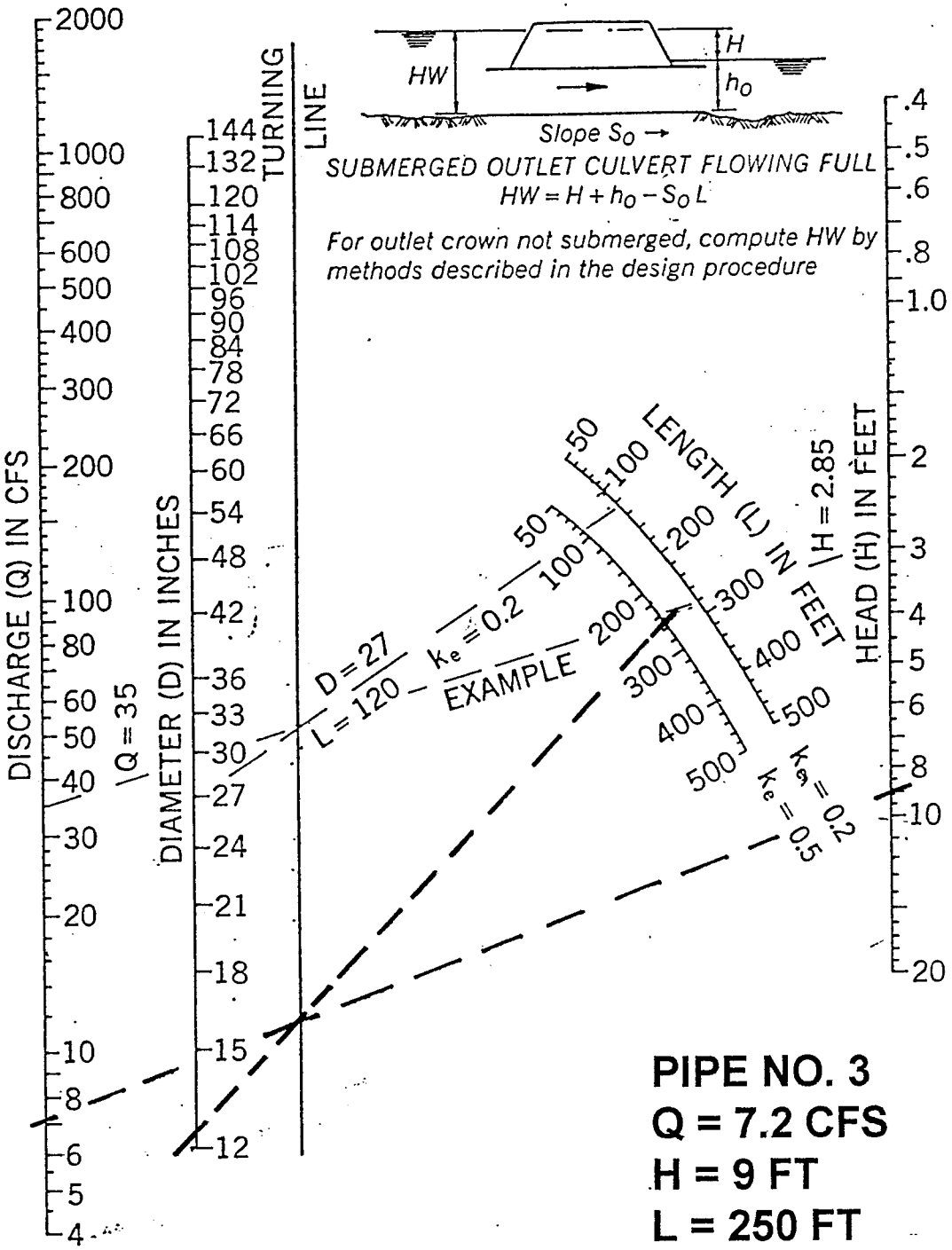
D = 12”

BUREAU OF PUBLIC ROADS JAN. 1963

FIGURE 38

HEAD FOR CIRCULAR CONCRETE PIPE CULVERTS FLOWING FULL

n = 0.012



PIPE NO. 3
Q = 7.2 CFS
H = 9 FT
L = 250 FT
Ke = 0.5

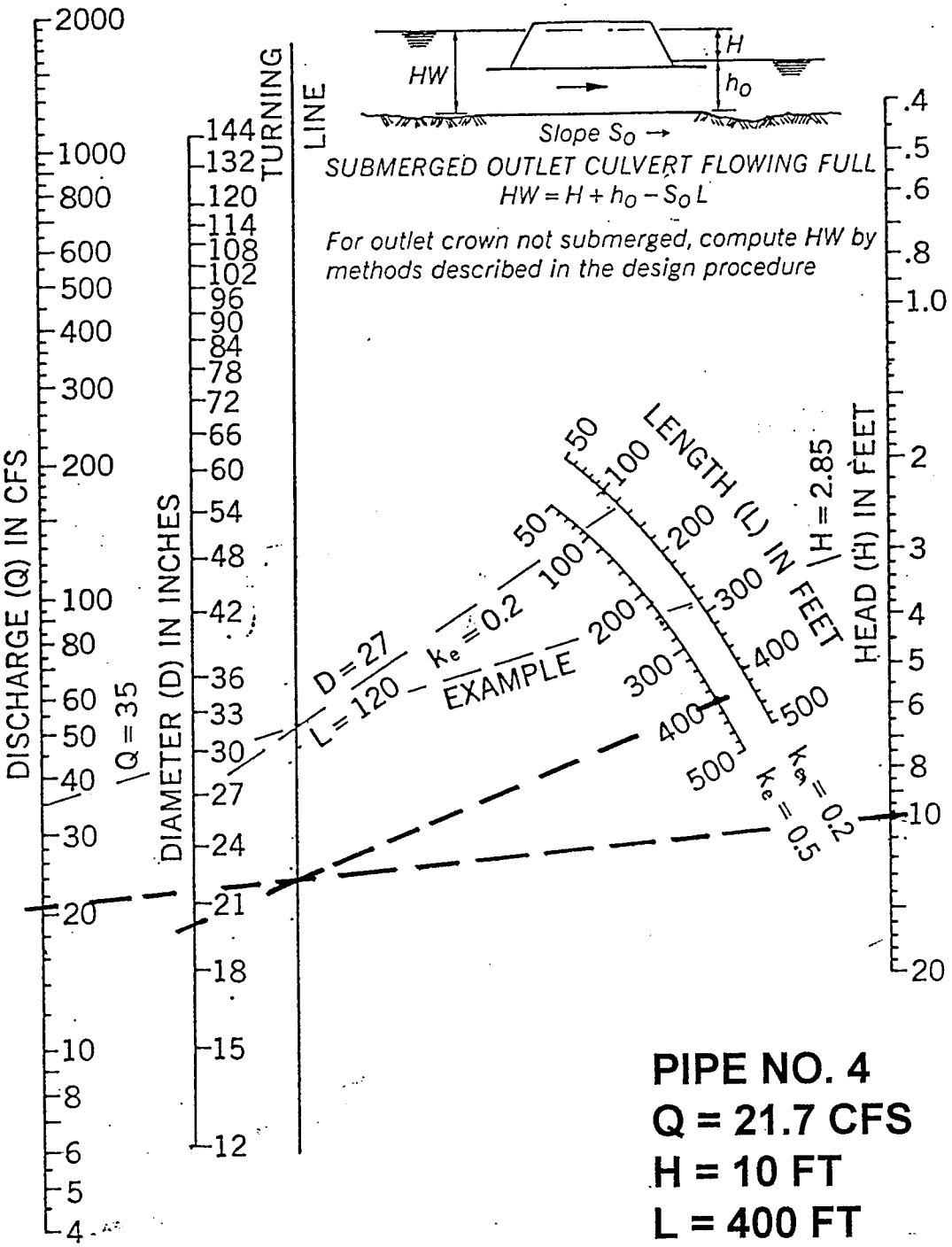
D = 15"

BUREAU OF PUBLIC ROADS JAN. 1963

FIGURE 38

HEAD FOR CIRCULAR CONCRETE PIPE CULVERTS FLOWING FULL

n = 0.012



PIPE NO. 4
Q = 21.7 CFS
H = 10 FT
L = 400 FT
Ke = 0.5

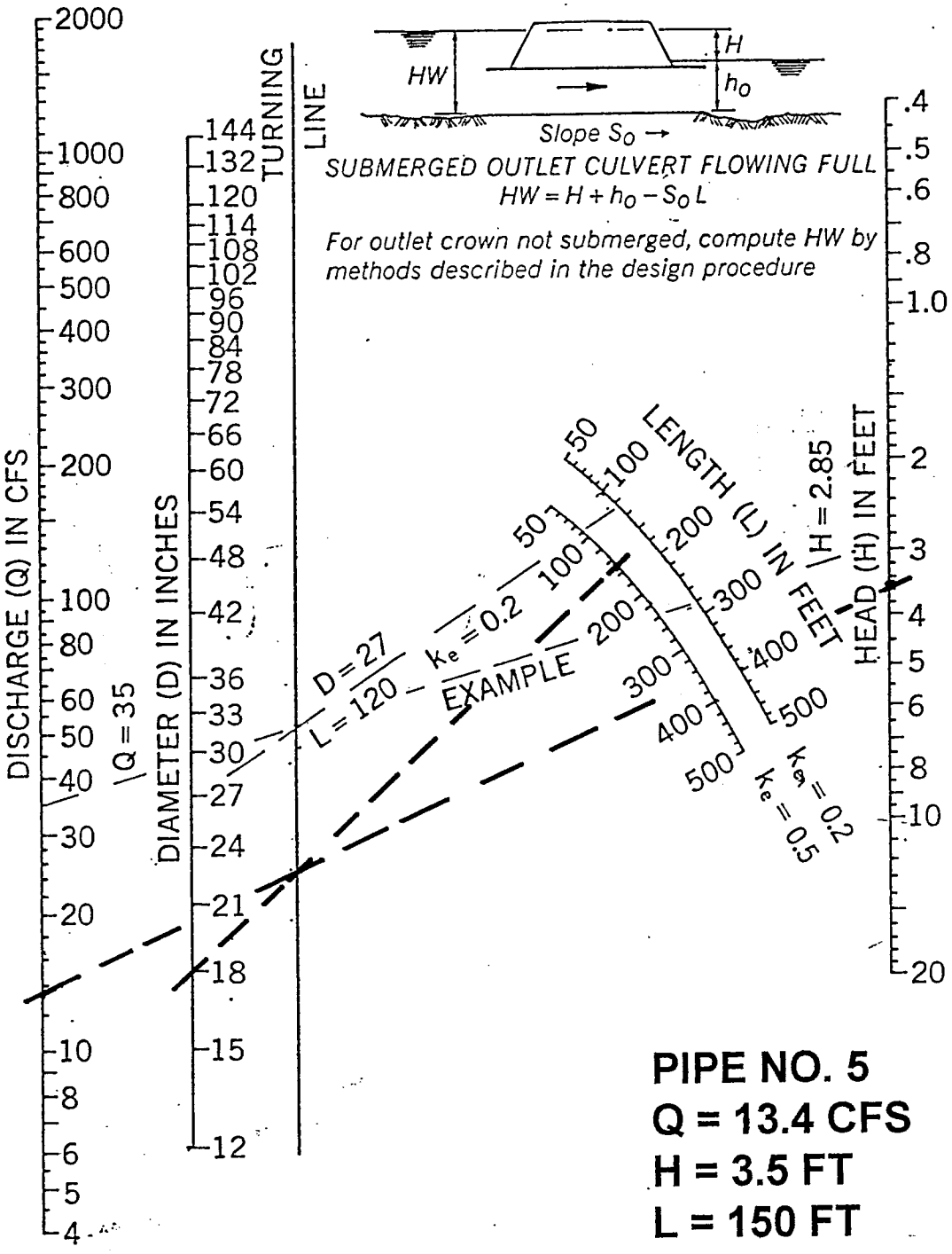
D = 21”

BUREAU OF PUBLIC ROADS JAN. 1963

FIGURE 38

HEAD FOR CIRCULAR CONCRETE PIPE CULVERTS FLOWING FULL

n = 0.012



PIPE NO. 5
Q = 13.4 CFS
H = 3.5 FT
L = 150 FT
Ke = 0.5

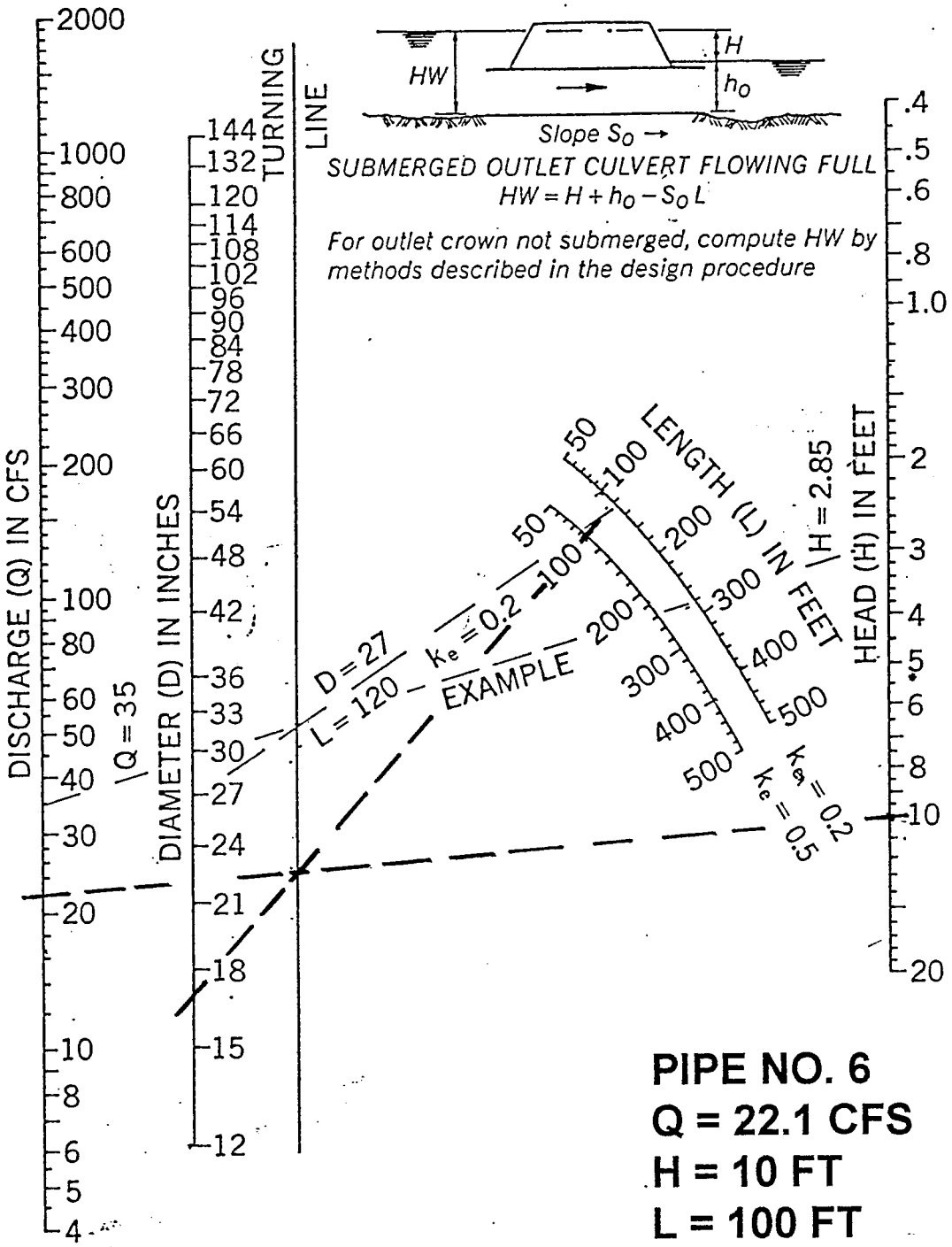
D = 18"

BUREAU OF PUBLIC ROADS JAN. 1963

FIGURE 38

HEAD FOR CIRCULAR CONCRETE PIPE CULVERTS FLOWING FULL

n = 0.012



PIPE NO. 6
Q = 22.1 CFS
H = 10 FT
L = 100 FT
Ke = 0.5

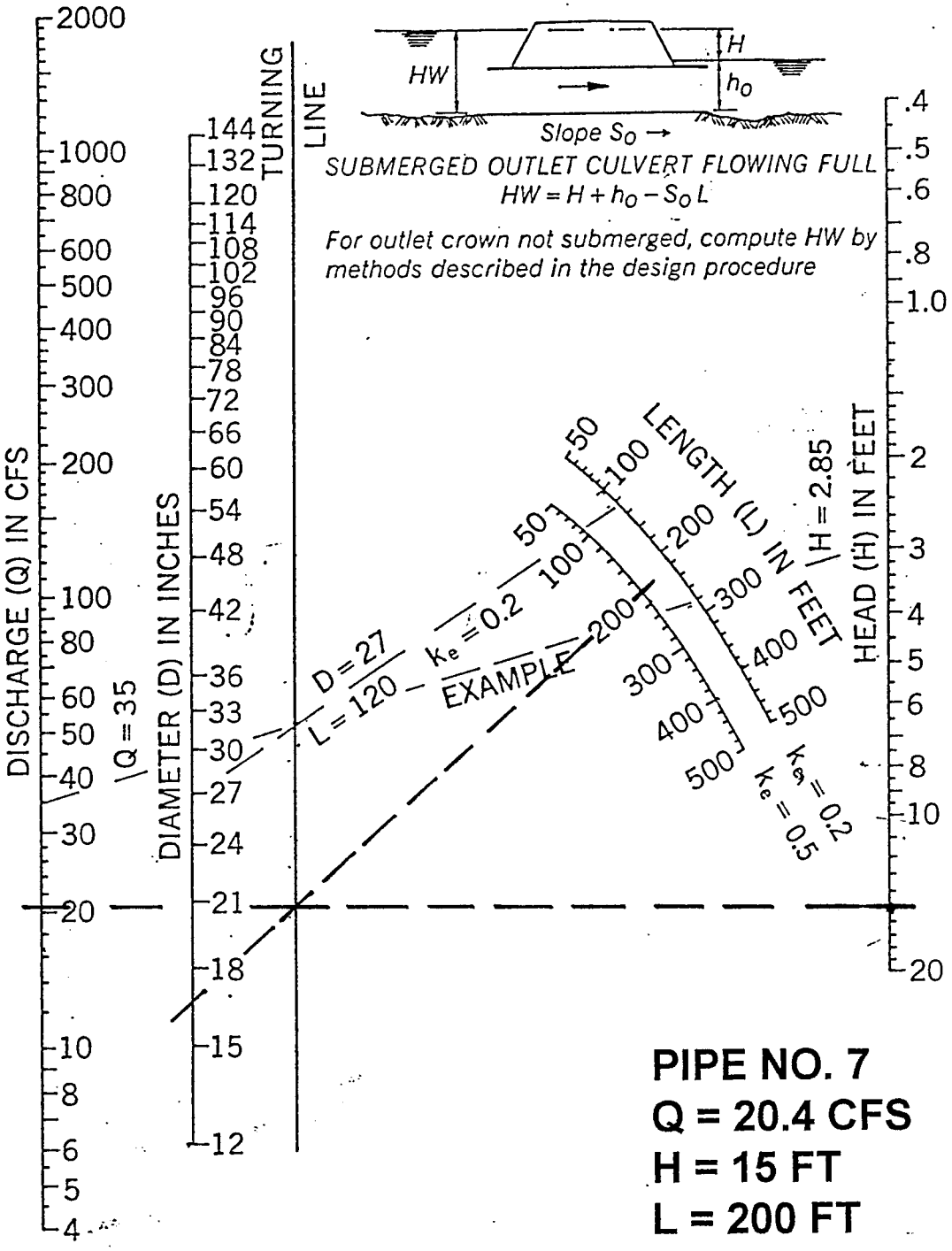
D = 18"

BUREAU OF PUBLIC ROADS JAN. 1963

FIGURE 38

HEAD FOR CIRCULAR CONCRETE PIPE CULVERTS FLOWING FULL

n = 0.012



PIPE NO. 7
Q = 20.4 CFS
H = 15 FT
L = 200 FT
Ke = 0.5

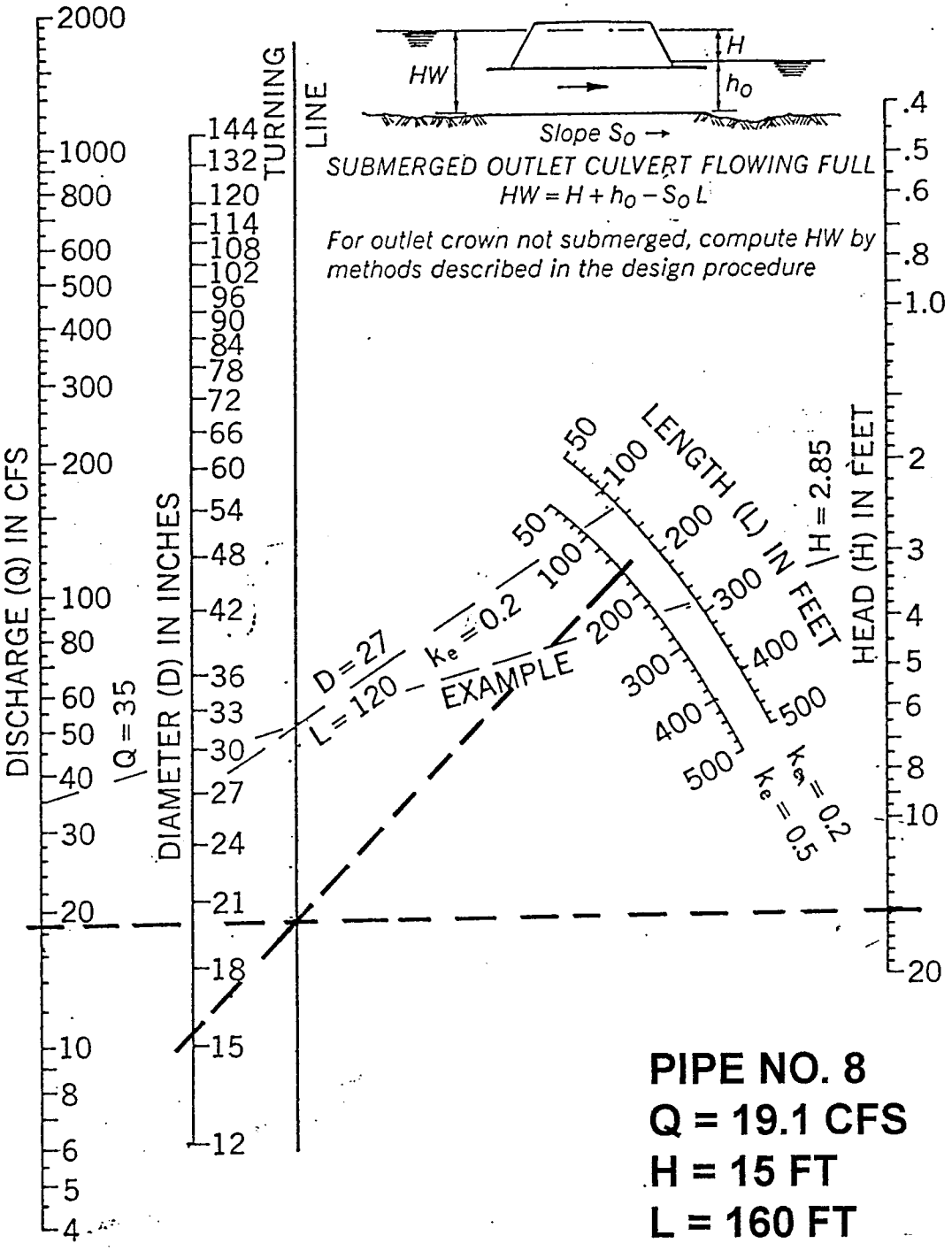
D = 18"

BUREAU OF PUBLIC ROADS JAN. 1963

FIGURE 38

HEAD FOR CIRCULAR CONCRETE PIPE CULVERTS FLOWING FULL

n = 0.012



PIPE NO. 8
Q = 19.1 CFS
H = 15 FT
L = 160 FT
Ke = 0.5

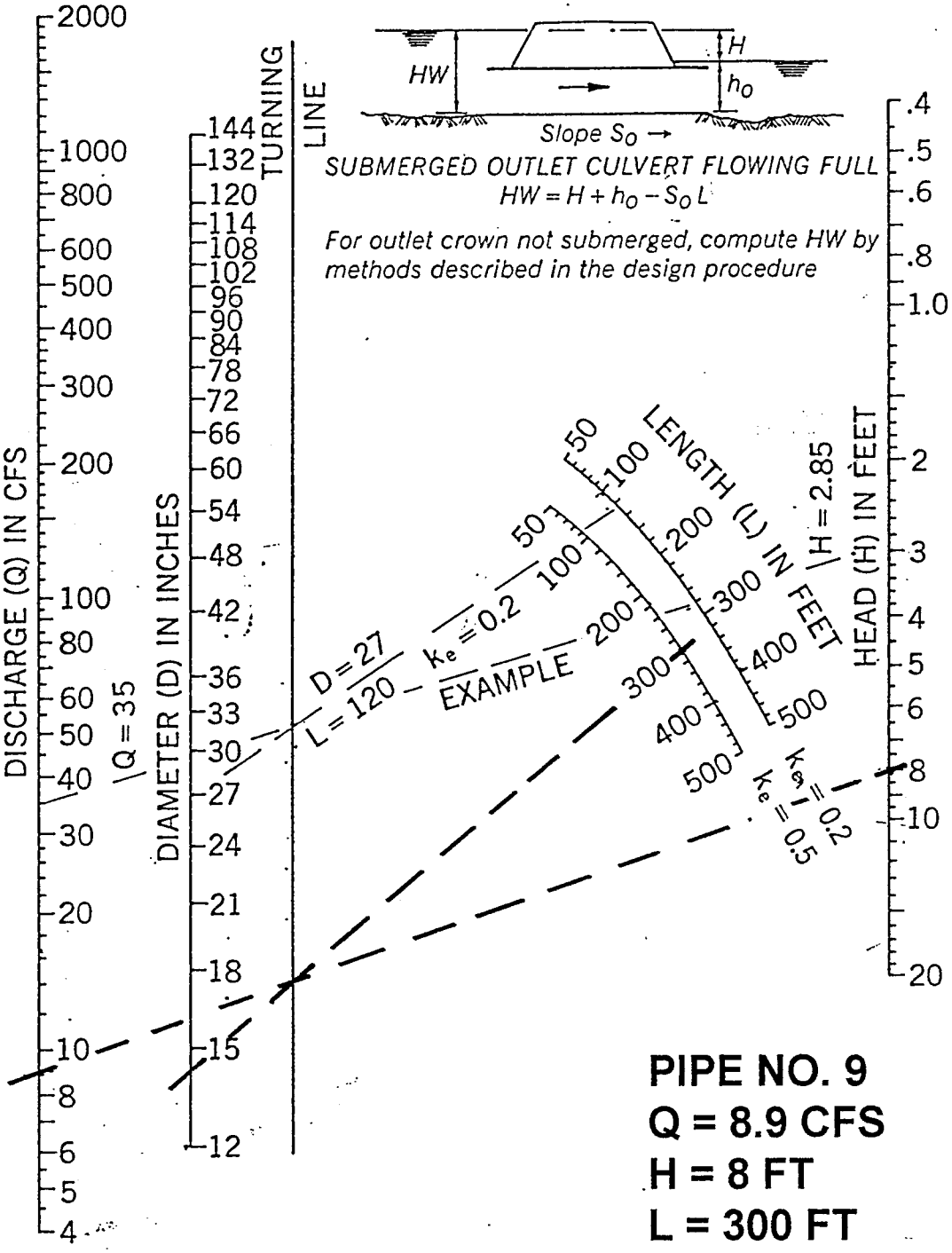
D = 18”

BUREAU OF PUBLIC ROADS JAN. 1963

FIGURE 38

HEAD FOR CIRCULAR CONCRETE PIPE CULVERTS FLOWING FULL

n = 0.012



PIPE NO. 9
Q = 8.9 CFS
H = 8 FT
L = 300 FT
Ke = 0.5

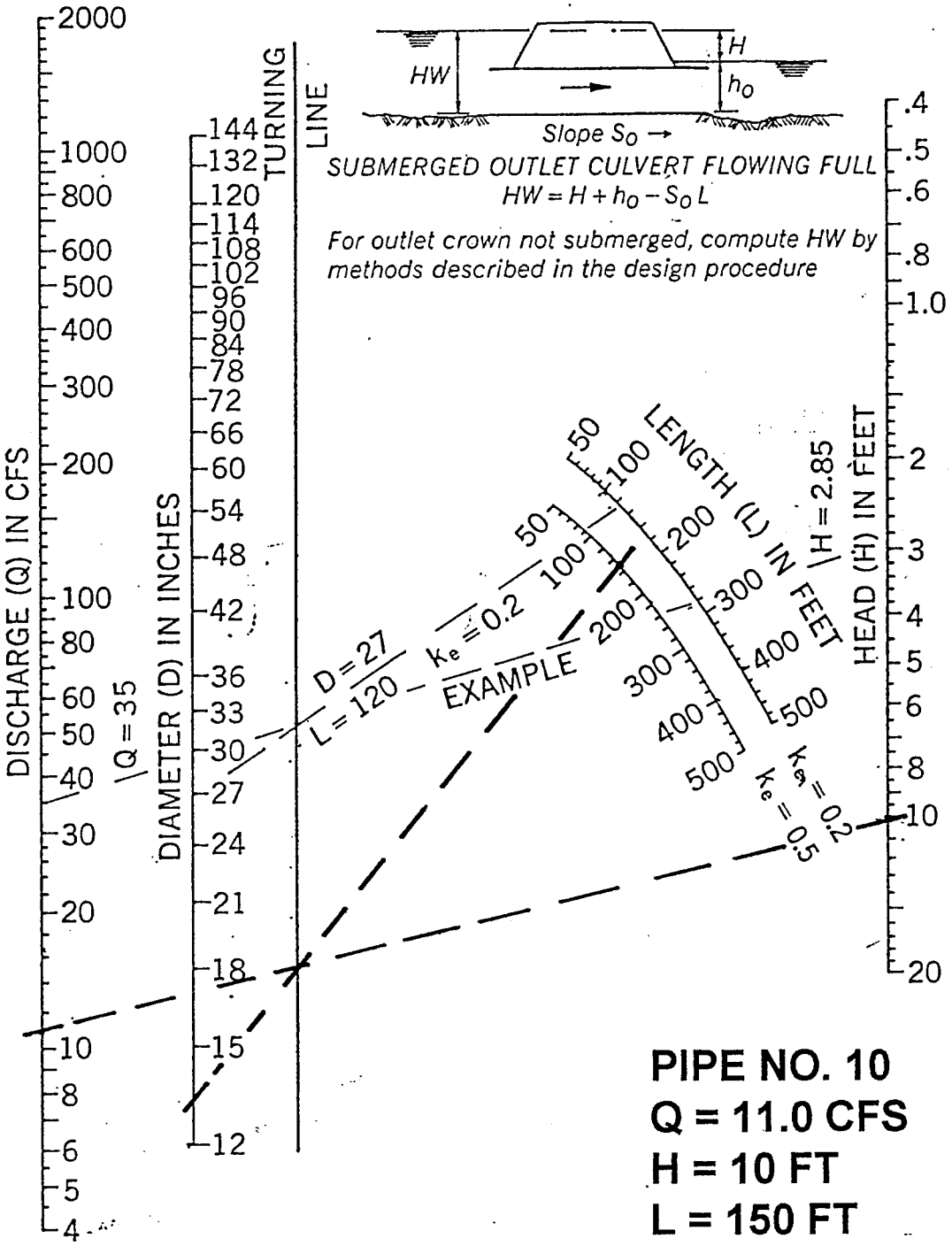
D = 15”

BUREAU OF PUBLIC ROADS JAN. 1963

FIGURE 38

HEAD FOR CIRCULAR CONCRETE PIPE CULVERTS FLOWING FULL

n = 0.012



PIPE NO. 10
Q = 11.0 CFS
H = 10 FT
L = 150 FT
Ke = 0.5

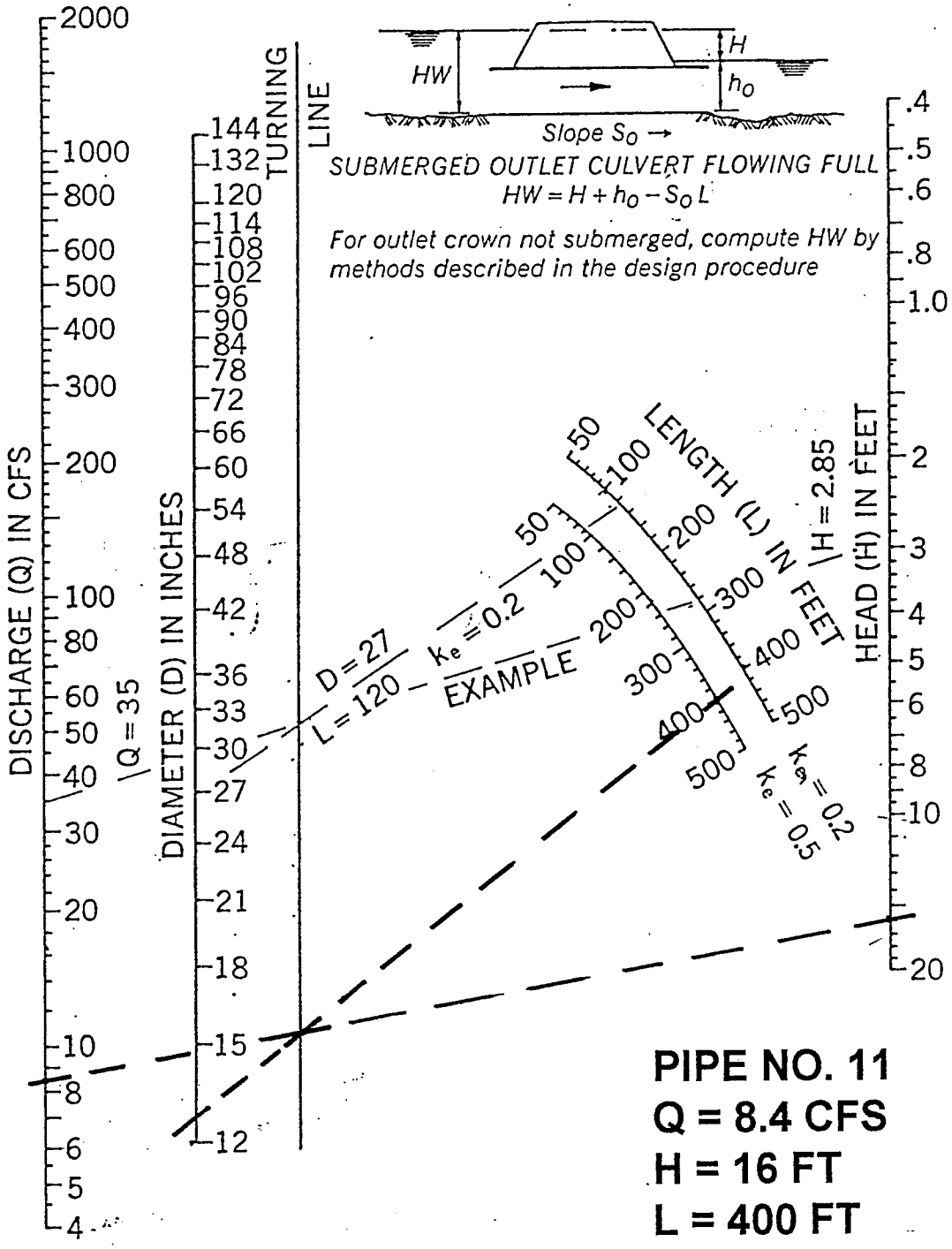
D = 15"

BUREAU OF PUBLIC ROADS JAN. 1963

FIGURE 38

HEAD FOR CIRCULAR CONCRETE PIPE CULVERTS FLOWING FULL

n = 0.012



PIPE NO. 11
Q = 8.4 CFS
H = 16 FT
L = 400 FT
Ke = 0.5

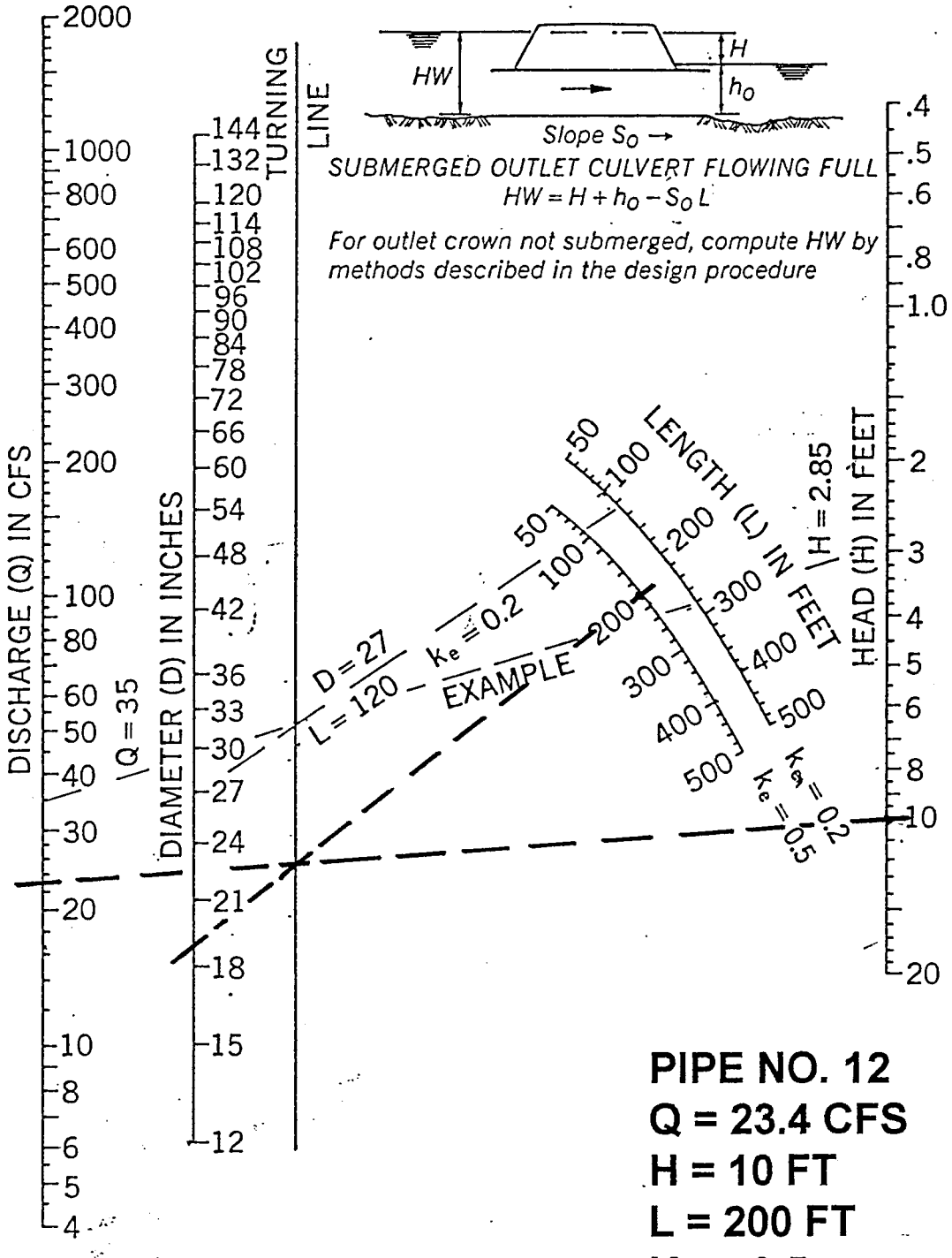
D = 15”

BUREAU OF PUBLIC ROADS JAN. 1963

FIGURE 38

HEAD FOR CIRCULAR CONCRETE PIPE CULVERTS FLOWING FULL

n = 0.012



PIPE NO. 12
Q = 23.4 CFS
H = 10 FT
L = 200 FT
Ke = 0.5

D = 21”

BUREAU OF PUBLIC ROADS JAN. 1963

HYDROLOGY PLAN

AREA H-H, G-1 — VOLUME 0.481 A-F, 0.908 A-F
TOTAL 1.398 A-F
W.S. ELEV. 248.23
WATER SURFACE RAISES 2.23 FT.

AREA F-F, E-1, E-2 — VOLUME 0.500 A-F, 0.130 A-F, 0.340 A-F
TOTAL 0.970 A-F
W.S. ELEV. 238.99
WATER SURFACE RAISES 0.99 FT.

AREA G-G — VOLUME 0.121 A-F
W.S. ELEV. 244.36

AREA I-I — VOLUME 0.112 A-F
W.S. ELEV. 243.09

AREA J-J — VOLUME 0.155 A-F
W.S. ELEV. 234.59

AREA E-E — VOLUME 0.066 A-F
W.S. ELEV. 238.07

AREA D-D, C-1, C-2 — VOLUME 0.109 A-F, 0.505 A-F, 0.206 A-F
TOTAL 0.820 A-F
W.S. ELEV. 238.04

AREA C-C, D-1 — VOLUME 0.167 A-F, 0.200 A-F
TOTAL 0.367 A-F
W.S. ELEV. 235.46

AREA B-B — VOLUME 0.160 A-F
W.S. ELEV. 238.04

AREA W-W, B-1 — VOLUME 0.034 A-F, 0.110 A-F
TOTAL 0.144 A-F
W.S. ELEV. 234.90

AREA K-K, H-1 — VOLUME 0.462 A-F, 0.839 A-F
TOTAL 1.301 A-F
W.S. ELEV. 230.30

AREA M-M, F-1 — VOLUME 0.258 A-F, 0.879 A-F
TOTAL 1.137 A-F
W.S. ELEV. 241.38

AREA O-O — VOLUME 0.255 A-F
W.S. ELEV. 253.59

AREA P-P — VOLUME 0.145 A-F
W.S. ELEV. 255.36

AREA N-N, I-1, J-1 — VOLUME 0.611 A-F, 0.260 A-F, 0.320 A-F
TOTAL 1.191 A-F
W.S. ELEV. 250.56

AREA L-L — VOLUME 0.317 A-F
W.S. ELEV. 234.01

AREA A-A, A-1, A-2, A-3 — VOLUME 0.688 A-F, 0.396 A-F, 0.095 A-F, 0.188 A-F
TOTAL 1.367 A-F
W.S. 233.49
WATER SURFACE RAISES 0.49 FT

AREA V-V, Z-Z — VOLUME 0.398 A-F, 0.406 A-F (DESERT SPRINGS COMM.)
TOTAL 0.804 A-F
W.S. ELEV. 240.68

AREA R-R — VOLUME 0.087 A-F
W.S. ELEV. 249.19

AREA Q-Q, K-1 — VOLUME 0.181 A-F, 0.210 A-F
TOTAL 0.391 A-F
W.S. ELEV. 249.08

AREA S-S — VOLUME 0.186 A-F
W.S. ELEV. 248.41

AREA U-U, L-1 — VOLUME 0.488 A-F, 0.761 A-F
TOTAL 1.249 A-F
W.S. ELEV. 244.84
WATER SURFACE RAISES 1.84 FT.

AREA T-T — VOLUME 0.374 A-F
W.S. ELEV. 238.45

FLOW TABLE

#	Q_{100}	PIPE SIZE
1	24.92 CFS	21" DIA.
2	4.40 CFS	12" DIA.
3	7.2 0 CFS	15" DIA.
4	21.70 CFS	21" DIA.
5	13.40 CFS	18" DIA.
6	22.10 CFS	18" DIA.
7	20.40 CFS	18" DIA.
8	19.10 CFS	18" DIA.
9	8.90 CFS	15" DIA.
10	11.00 CFS	15" DIA.
11	8.40 CFS	15" DIA.
12	23.40 CFS	21" DIA.
13	N/A	12" DIA.

LEGEND

- DRAINAGE AREA
- A-A — DRAINAGE AREA DESIGNATION
- 100 YEAR FLOOD LEVEL
- (1) — 100 YEAR FLOWS & PROPOSED PIPE SIZES
- DRAINAGE DIRECTION
- PROPOSED DRYWELL
- PROPOSED STORM DRAIN
- FUTURE STORM DRAIN
- FUTURE CATCH BASIN

100 SCALE SOUTH FOR JULIAN-2/5/1997 - 1085[0,205]PF: 1102 139 05-Feb-97 12:35 PM / 1102-1