civil engineering
structural design
land surveying

WYNN ENGINEERING

HYDROLOGY STUDY

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May 17, 2004
REVISED Jan. 16, 2006

TPM 20820
LOG NO: 04-08-016

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MR. SOURIS
HYDROLOGY STUDY FOR ROAD TPM 20820

INTRODUCTION

The four parcels, totaling 39.5 acres, are located at 14174 Calle De Vista off of Valley Center Road in the Valley Center planning area of the County of San Diego. The project is approximately 0.9 miles east of Valley Center Road on Calle De Vista. This project is comprised of a proposed four-parcel split, which will divide A.P.N. 189-012-68. The parcel is located atop a hill with one existing residential home. The drainage areas, called A, B, C, D, F, G, H, I, J, and K are hand drawn and labeled on the 200-scale County topography map and on the site plans provided in this study. Since the drainage area/watershed is less than 1 sq. mi., the Rational Method shall be used.

DESIGN SUMMARY AND CONCLUSIONS

Bio-swales have been added to absorb run-off where possible and riprap has been used to dissipate any localized increases in velocity. No increases to runoff or its velocity are expected for this project. The proposed project is not expected to substantially alter the existing drainage pattern of the area or substantially increase the rate or amount of surface runoff in a manner that would cause substantial erosion or substantial siltation on or off site. Brow ditches were used to direct water away from the driveways and pad, in order to direct run-off back to the existing natural drainage courses. Brow ditch maximum velocities do not exceed 6 fps. Required rock class has been determined to be No. 3 backing; detail for riprap is included in this Hydrology Study.

REFERENCES

San Diego County Hydrology Manual, Prepared for the County of San Diego, Department of Public Works, Flood Control Section June 2003.

Brater & King, *Handbook of Hydraulics*, 6th ed.

DECLARATION OF RESPONSIBLE CHARGE

This Hydrology Study has been prepared under the direction of the following Registered Civil Engineer. The Registered Civil Engineer attests to the technical information contained herein and the engineering data upon which recommendations, conclusions, and decisions are based.

GARY R. WYNN
REGISTERED CIVIL ENGINEER

2-8-07
DATE

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HYDROLOGY CALCULATIONS

DATE
Job # 03-334 Sawin
Name Justin
12/12/05
TPM
LAT LON

10 YR / 100 YR	Area No.	Area (ACRES)	H (FT)	L (FT)	Tct10 (MIN)	P6 (IN)	P24 (IN)	P_6/P_{24} (%)	ADJ P6 (IN)	Tc (MIN)	I (in/hr)	C	Q (CFS)
100-YR PRE	Q_{1_0}	1.85	102.5	480		3.7	8.2	45		8.5	6.92	0.3	3.84
100-YR PRE	Q_{2_0}	2.00	67.5	280		3.7	8.2	45		7.9	7.26	0.3	4.36
85th Post	Q_{1_1}	1.85	102.5	560		1				14.3	1.34	0.36	0.89
85th Post	Q_{2_1}	2.00	67.5	640		1				14.2	1.34	0.36	0.96
100-YR Post	Q_{1_1}	1.85	102.5	560		3.7	8.2	45		14.3	4.95	0.36	3.30
100-YR Post	Q_{2_1}	2.00	67.5	640		3.7	8.2	45		14.2	4.97	0.36	3.58

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DATE 8-9-05
Job # 03-334
Name Souris
TPM
LAT LON

HYDROLOGY CALCULATIONS

POST – FOR SIZING OF STRUCTURES

10 YR / 100 YR	Area No.	Area (ACRES)	H (FT)	L (FT)	Tct10 (MIN)	P6 (IN)	P24 (IN)	P_6/P_{24} (%)	ADJ P6 (IN)	Tc (MIN)	I (in/hr)	C	Q (CFS)
100	A	0.44	60	200		3.7	8.2	45	3.7	7.1	7.78	0.36	1.23
	B	0.08	0.6	60						13.5	5.14		0.14
	C	0.07	.5	50						13.4	5.16		0.13
	D	0.13	20	70						6.7	8.07		0.38
	E	0.41	60	540						9.2	6.58		0.97
	F	0.08	0.65	65						13.6	5.11		0.15
	G	0.39	60	220						7.2	7.71		1.08
	H	2.48	70	300						7.5	7.51		6.70
	I	0.49	20	220						13.8	5.06		0.89
	J	0.08	15	220						10.1	6.19		0.18
	K	93.9	370	2375						13.25	5.20		175.8

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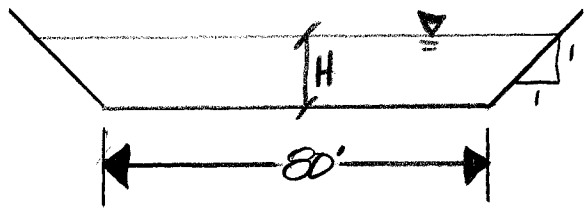
JOB
SHEET NO. OF
CALCULATED BY J. Justis DATE 10/31/05
CHECKED BY DATE
SCALE

$b = 80'$

$CI = 1403$

$Q_{100\ POST} = 158.69\ cfs$

$Q_{100\ PRE} = 150.88\ cfs$



$A = 80(H) + H^2$

$P = 80 + 2\sqrt{2H^2}$

$$158.69 = \frac{1.49}{0.04}(H_1^2 + 80H_1)\left(\frac{H_1^2 + 80H_1}{80 + \sqrt{2H_1^2}}\right)^{2/3} 0.025^{1/2}$$

$$26.9435 = (H_1^2 + 80H_1)\left(\frac{H_1^2 + 80H_1}{80 + 2\sqrt{2H_1^2}}\right)^{2/3}$$

$H_1 = 0.52'$ ∴ Flood line @ $1402.5 + 0.52' = 1403.02'$ for Channel

$$150.88 = \frac{1.49}{0.04}(H_0^2 + 80H_0)\left(\frac{H_0^2 + 80H_0}{80 + \sqrt{2H_0^2}}\right)^{2/3} 0.025^{1/2}$$

$$25.6174 = (H_0^2 + 80H_0)\left(\frac{H_0^2 + 80H_0}{80 + 2\sqrt{2H_0^2}}\right)^{2/3}$$

$H_0 = 0.50'$ ∴ Floodline @ $1402.5 + 0.5 = 1403'$ for Channel

---

Since pond is so close, it is necessary to show W.L. for 100-yr flood

EQN for Broad crested weir $Q = 0.385\, CL\sqrt{2g}\, H^{3/2}$

where $C = 1$ since empirical Q = theoretical Q

∴ $158.69 = 0.385(70')\sqrt{2(32.2)}\, H_1^{3/2}$ / $150.88 = 0.385(70')\sqrt{2(32.2)}\, H_0^{3/2}$

$H_1 = 0.8137'$ / $H_0 = 0.7866$ w/ Max W.L. = 1410.29'

∴ Max water level is 0.82' over Road which dams pond.

∴ Max W.L = $1409.5 + 0.82' = 1410.35'$

∴ Floodline of Inundation located @ 1410.35'; Δ of .06'

n	S	d	y	Theta	T	P	A	R	V	Q
0.03	0.2	2	0.221	1.355454	1.254048	1.355454	0.189275	0.13964	5.962445	1.128544

Area A
Brow Ditch

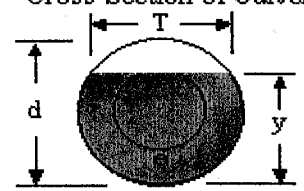
Velocity is non-erodable
Therfore No Rip Rap Required

For safty, No. 3 Backing will be used @ 8' x 6' x 0.6' THICK OVER 0.3' of D.G. and filterfabric PER D-40.

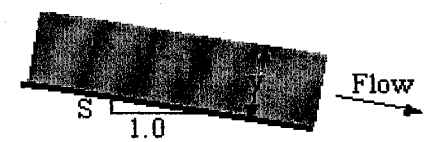
$$Q=VA \qquad V=\frac{k}{n}R^{2/3}S^{1/2} \qquad R=\frac{A}{P} \qquad A=\frac{d^2}{8}(\theta-\sin(\theta))$$

$$P=\frac{\theta d}{2} \qquad y=\frac{d}{2}\left[1-\cos\left(\frac{\theta}{2}\right)\right] \qquad T=2\sqrt{y(d-y)} \qquad F=V\sqrt{\frac{T}{gA\cos(Tan^{-1}S)}}$$

Cross-Section of Culvert



Cut-away Side View



n	S	d	y	Theta	T	P	A	R	V	Q
0.03	0.3	2	0.074	0.774241	0.755047	0.774241	0.037534	0.048478	3.607145	0.135389

Area B
~~Brow Ditch~~ Pad Drainage

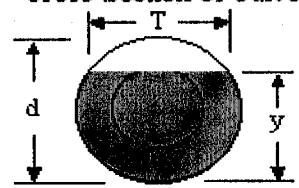
Velocity is non-erodable
Therfore No Rip Rap Required

For Safety, No 3 Backing will be used @ 8' x 6' x 0.6' Thick over 0.3' of D.G. and filter fabric per D-40

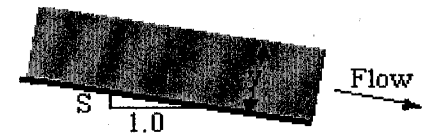
$$Q=VA \qquad V=\frac{k}{n}R^{2/3}S^{1/2} \qquad R=\frac{A}{P} \qquad A=\frac{d^2}{8}(\theta-\sin(\theta))$$

$$P=\frac{\theta d}{2} \qquad y=\frac{d}{2}\left[1-\cos\left(\frac{\theta}{2}\right)\right] \qquad T=2\sqrt{y(d-y)} \qquad F=V\sqrt{\frac{T}{gA\cos(Tan^{-1}S)}}$$

Cross-Section of Culvert



Cut-away Side View



n	S	d	y	Theta	T	P	A	R	V	Q
0.03	0.3	2	0.071	0.75819	0.740159	0.75819	0.035291	0.046546	3.510664	0.123894

Area C
Pad Drainage

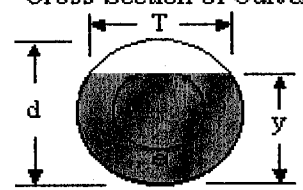
Velocity is non-erodable
Therfore NO RIP RAP Required

For Safety, No. 3 Backing will be used @ 8' x 6' x 0.6' Thick over 0.3' of filter fabric + D.G. per D-40

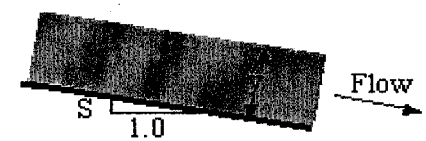
$$Q = VA \qquad V = \frac{k}{n} R^{2/3} S^{1/2} \qquad R = \frac{A}{P} \qquad A = \frac{d^2}{8}(\theta - \sin(\theta))$$

$$P = \frac{\theta d}{2} \qquad y = \frac{d}{2}\left[1 - \cos\left(\frac{\theta}{2}\right)\right] \qquad T = 2\sqrt{y(d-y)} \qquad F = V\sqrt{\frac{T}{gA\cos(Tan^{-1}S)}}$$

Cross-Section of Culvert



Cut-away Side View



n	S	d	y	Theta	T	P	A	R	V	Q
0.022	0.206	1.5	0.117	1.132197	0.804515	0.849148	0.063801	0.075136	5.458861	0.348283

Area D
Pipe d_1

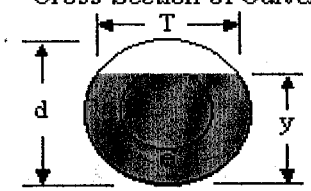
Velocity is non-erodable
Therfore No Rip Rap Required

For Safety, No. 3 Backing will be used @ 8' x 6' x 0.6' THICK over 0.3' of filter fabric & D.G. per D-4D

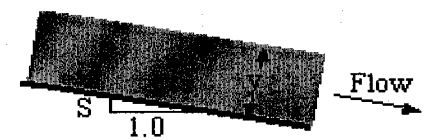
$$Q = VA \qquad V = \frac{k}{n} R^{2/3} S^{1/2} \qquad R = \frac{A}{P} \qquad A = \frac{d^2}{8}(\theta - \sin(\theta))$$

$$P = \frac{\theta d}{2} \qquad y = \frac{d}{2}\left[1 - \cos\left(\frac{\theta}{2}\right)\right] \qquad T = 2\sqrt{y(d-y)} \qquad F = V\sqrt{\frac{T}{gA\cos(Tan^{-1}S)}}$$

Cross-Section of Culvert



Cut-away Side View



n	S	d	y	Theta	T	P	A	R	V	Q
0.03	0.3	2	0.074	0.774241	0.755047	0.774241	0.037534	0.048478	3.607145	0.135389

Area F
Pad Drainage

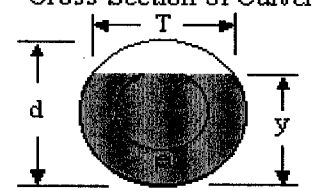
Velocity is non-erodable
Therfore NO RipRap Required

For Safety, No. 3 Backing will be used @ 8'x 6'x 0.6' Thick over 0.3' of filter fabric & DG.
Per D-40

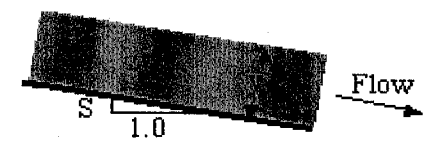
$$Q=VA \qquad V=\frac{k}{n}R^{2/3}S^{1/2} \qquad R=\frac{A}{P} \qquad A=\frac{d^2}{8}(\theta-\sin(\theta))$$

$$P=\frac{\theta d}{2} \qquad y=\frac{d}{2}\left[1-\cos\left(\frac{\theta}{2}\right)\right] \qquad T=2\sqrt{y(d-y)} \qquad F=V\sqrt{\frac{T}{gA\cos(Tan^{-1}S)}}$$

Cross-Section of Culvert



Cut-away Side View



n	S	d	y	Theta	T	P	A	R	V	Q
0.03	0.1	2	0.245	1.430284	1.31145	1.430284	0.22007	0.153864	4.497749	0.98982

Area G

~~Pad Drainage~~ Brow Ditch

Velocity is non-erodable

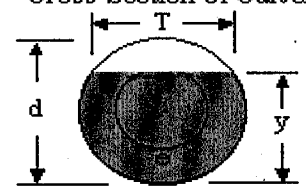
Therfore no rip rap required

For Safety, No. 3 Backing will be used @ 8' x 6' x 0.6' THICK over 0.3' of filter fabric + D.G. per D-40

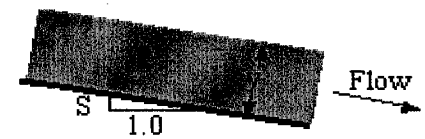
$$Q=VA \qquad V=\frac{k}{n}R^{2/3}S^{1/2} \qquad R=\frac{A}{P} \qquad A=\frac{d^2}{8}(\theta-\sin(\theta))$$

$$P=\frac{\theta d}{2} \qquad y=\frac{d}{2}\left[1-\cos\left(\frac{\theta}{2}\right)\right] \qquad T=2\sqrt{y(d-y)} \qquad F=V\sqrt{\frac{T}{gA\cos(Tan^{-1}S)}}$$

Cross-Section of Culvert



Cut-away Side View



n	S	d	y	Theta	T	P	A	R	V	Q
0.03	0.0435	2	0.787	2.712304	1.954104	2.712304	1.14804	0.423271	5.824032	6.68622

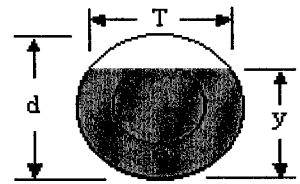
Brow Ditch along
Area A+C+E+F+G+H+I+J
Private Easement Road

Velocity is non-erodable
Therfore no rip rap required

$$Q=VA \qquad V=\frac{k}{n}R^{2/3}S^{1/2} \qquad R=\frac{A}{P} \qquad A=\frac{d^2}{8}(\theta-\sin(\theta))$$

$$P=\frac{\theta d}{2} \qquad y=\frac{d}{2}\left[1-\cos\left(\frac{\theta}{2}\right)\right] \qquad T=2\sqrt{y(d-y)} \qquad F=V\sqrt{\frac{T}{gA\cos(Tan^{-1}S)}}$$

Cross-Section of Culvert



Cut-away Side View

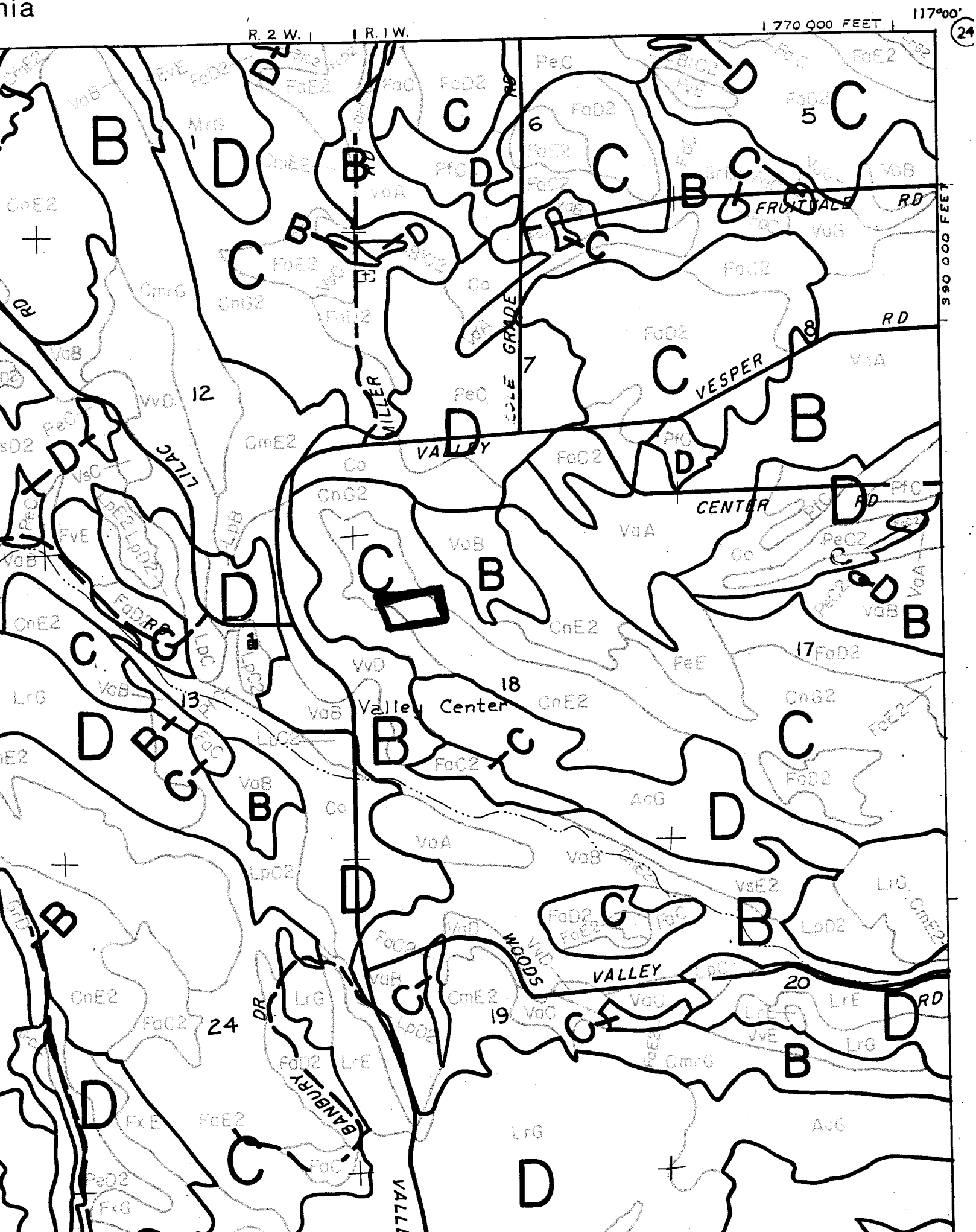

R. 2 W.
R. 1 W.
1 770 000 FEET
117°00'
24
390 000 FEET
FRUITDALE RD
VESPER RD
VALLEY CENTER RD
WOODS VALLEY RD
BANBURY DR
LILAC RD
MILLER RD
COLE GRADE RD
Valley Center
5
6
7
8
12
13
17
18
19
20
24

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

Land Use		Runoff Coefficient "C"				
			Soil Type			
NRCS Elements	County Elements	% IMPER.	A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30 Pre	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36 Post	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
DU/A = dwelling units per acre
NRCS = National Resources Conservation Service

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SHEET NO. ____ OF ____
CALCULATED BY J. Justis DATE 1/16/06
CHECKED BY ____ DATE ____
SCALE ____

t_c & I CALCULATIONS

PRE-CONSTRUCTION

Q_{1_0}

$$t_{c_0} = \left[\frac{11.9\left(\frac{480}{5280}\right)^3}{102.5}\right]^{0.385} \times 60 + 6.9 = 8.5 \text{ min}$$

$$I_{100_{Q_{1_0}}} = 7.44(3.7)8.5^{-.645} = 6.92 \text{ in/hr}$$

Q_{2_0}

$$t_{c_0} = \left[\frac{11.9\left(\frac{380}{5280}\right)^3}{67.5}\right]^{.385} \times 60 + 6.9 = 7.9 \text{ min}$$

$$I_{100_{Q_{2_0}}} = 7.44(3.7)7.9^{-.645} = 7.26 \text{ in/hr}$$

POST-CONSTRUCTION

Q_{1_1}

$$t_{c_1} = \left[\frac{11.9\left(\frac{760}{5280}\right)^3}{102.5}\right]^{.385} \times 60 + 11.5 = 14.3 \text{ min}$$

$$I_{85_{Q_{1_1}}} = 7.44(1.0)14.3^{-.645} = 1.34 \text{ in/hr}$$

$$I_{100_{Q_{1_1}}} = 7.44(3.7)14.3^{-.645} = 4.95 \text{ in/hr}$$

Q_{2_1}

$$t_{c_1} = \left[\frac{11.9\left(\frac{640}{5280}\right)^3}{67.5}\right]^{.385} \times 60 + 11.5 = 14.2 \text{ min}$$

$$I_{85_{Q_{2_1}}} = 7.44(1.0)14.2^{-.645} = 1.34 \text{ in/hr}$$

$$I_{100_{Q_{2_1}}} = 7.44(3.7)14.2^{-.645} = 4.97 \text{ in/hr}$$

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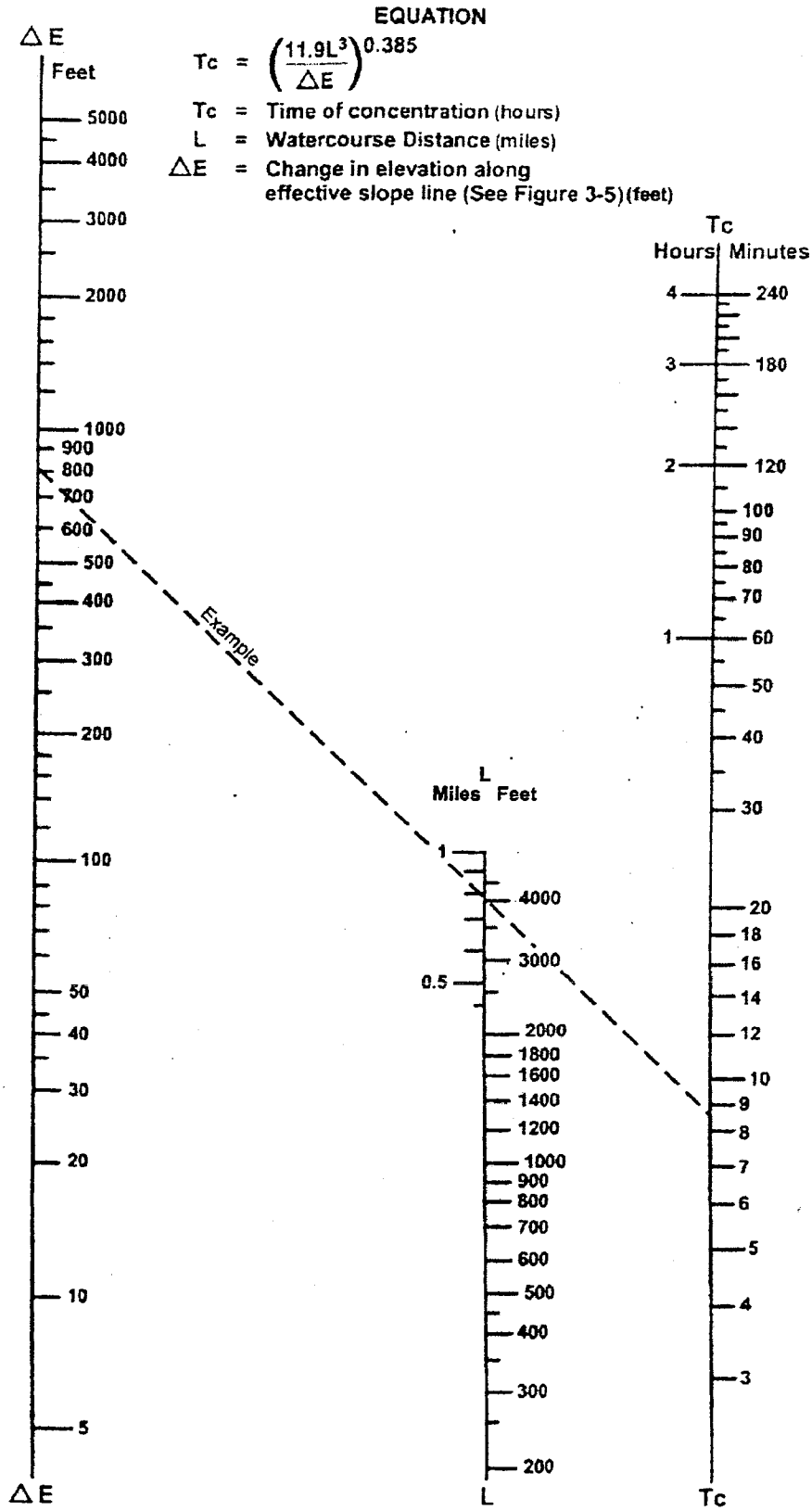
JOB 03-334 Souris
SHEET NO. 1 OF 1
CALCULATED BY J Justus DATE 5-
CHECKED BY DATE
SCALE

TIME OF CONCENTRATION

AREA	Calculation	Tc
K	$t_c = 6.9 + \left[\frac{11.9\left(\frac{2375}{5280}\right)^3}{370}\right]^{.385} * 60 =$	13.25 min
B	$t_c = 12.5 + \left[\frac{11.9\left(\frac{60}{5280}\right)^3}{.60}\right]^{.385} * 60 = 13.5$ min	13.5 min
C	$t_c = 12.5 + \left[\frac{11.9\left(\frac{50}{5280}\right)^3}{.5}\right]^{.385} * 60 = 13.4$ min	13.4 min
F	$t_c = 12.5 + \left[\frac{11.9\left(\frac{65}{5280}\right)^3}{.65}\right]^{.385} * 60 = 13.6$ min	13.6 min
G	$t_c = 6.4 + \left(\frac{11.9\left(\frac{220}{5280}\right)^3}{60}\right)^{.385} * 60 = 6.75$	7.2 min
A	$t_c = 6.4 + \left(\frac{11.9\left(\frac{200}{5280}\right)^3}{60}\right)^{.385} * 60 = 7.13$	7.1 min
D	$t_c = 6.4 + \left(\frac{11.9\left(\frac{70}{5280}\right)^3}{20}\right)^{.385} * 60 = 6.73$	6.7 min
E	$t_c = 6.9 + \left(\frac{11.9\left(\frac{540}{5280}\right)^3}{60}\right)^{.385} * 60 = 9.2$	9.2 MIN
H	$t_c = 6.4 + \left(\frac{11.9\left(\frac{300}{5280}\right)^3}{70}\right)^{.385} \times 60 = 7.5$	7.5 min
I	$t_c = 12.5 + \left(\frac{11.9\left(\frac{220}{5280}\right)^3}{20}\right)^{.385} \times 60 = 13.751$	13.8 min
J	$t_c = 8.7 + \left(\frac{11.9\left(\frac{220}{5280}\right)^3}{15}\right)^{.385} \times 60 = 10.1$	10.1 min



SOURCE: California Division of Highways (1941) and Kirpich (1940)

FIGURE

3-4

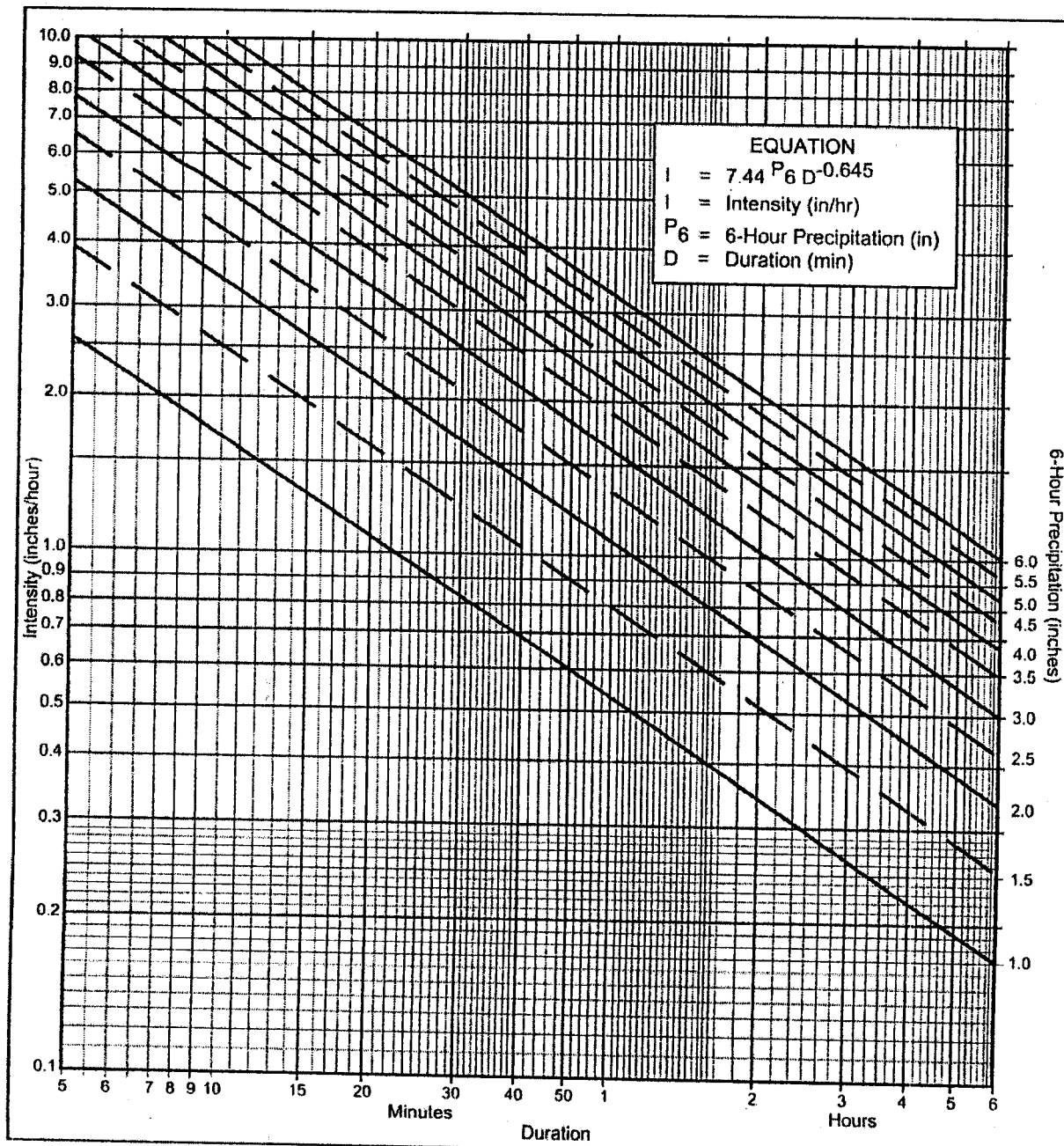
Nomograph for Determination of
Time of Concentration (Tc) or Travel Time (Tt) for Natural Watersheds

Table 3-2

MAXIMUM OVERLAND FLOW LENGTH (L_M) & INITIAL TIME OF CONCENTRATION (T_i)

Element*	DU/	.5%		1%		2%		3%		5%		10%	
	Acre	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0	100	5.6
MDR	4.3	50	10.2	70	9.6	80	8.1	95	7.8	100	6.7	100	5.3
MDR	7.3	50	9.2	65	8.4	80	7.4	95	7.0	100	6.0	100	4.8
MDR	10.9	50	8.7	65	7.9	80	6.9	90	6.4	100	5.7	100	4.5
MDR	14.5	50	8.2	65	7.4	80	6.5	90	6.0	100	5.4	100	4.3
HDR	24	50	6.7	65	6.1	75	5.1	90	4.9	95	4.3	100	3.5
HDR	43	50	5.3	65	4.7	75	4.0	85	3.8	95	3.4	100	2.7
N. Com		50	5.3	60	4.5	75	4.0	85	3.8	95	3.4	100	2.7
G. Com		50	4.7	60	4.1	75	3.6	85	3.4	90	2.9	100	2.4
O.P./Com		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
Limited I.		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
General I.		50	3.7	60	3.2	70	2.7	80	2.6	90	2.3	100	1.9

*See Table 3-1 for more detailed description



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency _____ year

(b) P_6 = _____ in., P_{24} = _____, $\frac{P_6}{P_{24}}$ = _____ %(2)

(c) Adjusted P_6(2) = _____ in.

(d) t_x = _____ min.

(e) I = _____ in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE

3-1

WYNN ENGINEERING INC.
27315 Valley Center Road
Valley Center, CA 92082
(760) 749-8722
(760) 749-9412 Fax

JOB

SHEET NO. OF

CALCULATED BY DATE

CHECKED BY DATE

SCALE

Intensities (85th% + 100-yr)

A $I_{85} = 7.44(1)\,7.1^{-.645} = 2.1$ in/hr
$I_{100} = 7.44(3.7)\,7.1^{-.645} = 7.78$

B $I_{85} = 7.44(1)\,13.5^{-.645} = 1.39$
$I_{100} = 7.44(3.7)\,13.5^{-.645} = 5.14$

C $I_{85} = 7.44(1)\,13.4^{-.645} = 1.40$
$I_{100} = 7.44(3.7)\,13.4^{-.645} = 5.16$

D $I_{85} = 7.44(1)\,6.7^{-.645} = 2.18$
$I_{100} = 7.44(3.7)\,6.7^{-.645} = 8.07$

E $I_{85} = 7.44(1)\,9.2^{-.645} = 1.78$
$I_{100} = 7.44(3.7)\,9.2^{-.645} = 6.58$

F $I_{85} = 7.44(1)\,13.6^{-.645} = 1.38$
$I_{100} = 7.44(3.7)\,13.6^{-.645} = 5.11$

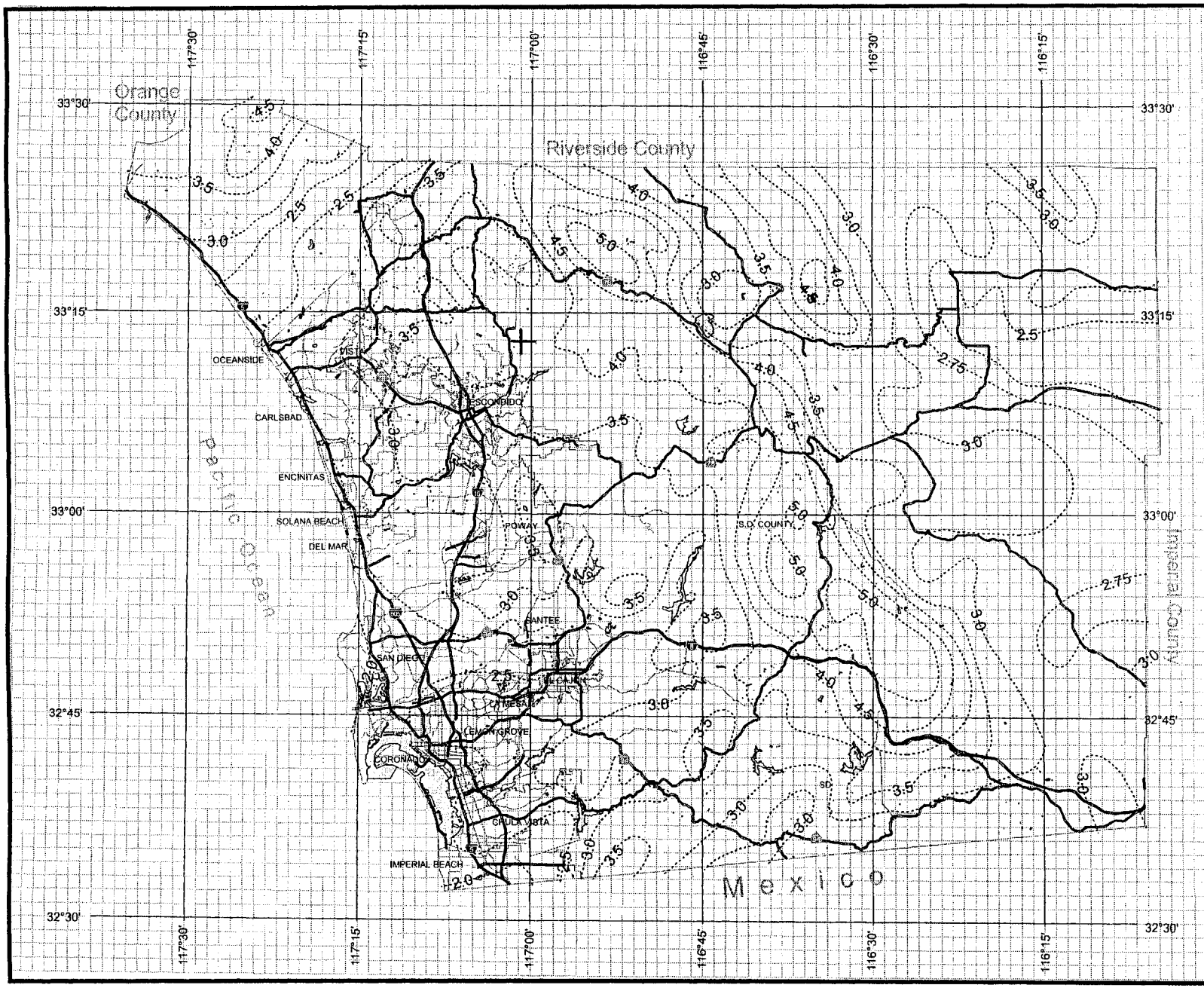
G $I_{85} = 7.44(1)\,7.2^{-.645} = 2.08$
$I_{100} = 7.44(3.7)\,7.2^{-.645} = 7.71$

H $I_{85} = 7.44(1)\,7.5^{-.645} = 2.03$
$I_{100} = 7.44(3.7)\,7.5^{-.645} = 7.51$

I $I_{85} = 7.44(1)\,13.8^{-.645} = 1.37$
$I_{100} = 7.44(3.7)\,13.8^{-.645} = 5.06$

J $I_{85} = 7.44(1)\,10.1^{-.645} = 1.67$
$I_{100} = 7.44(3.7)\,10.1^{-.645} = 6.19$

K $I_{85} = 7.44(1)\,13.25^{-.645} = 1.41$
$I_{100} = 7.44(3.7)\,13.25^{-.645} = 5.20$



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

3.7"

DPW GIS
Department of Public Works
Geographic Information Services

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N
W E
S

3 0 3 Miles

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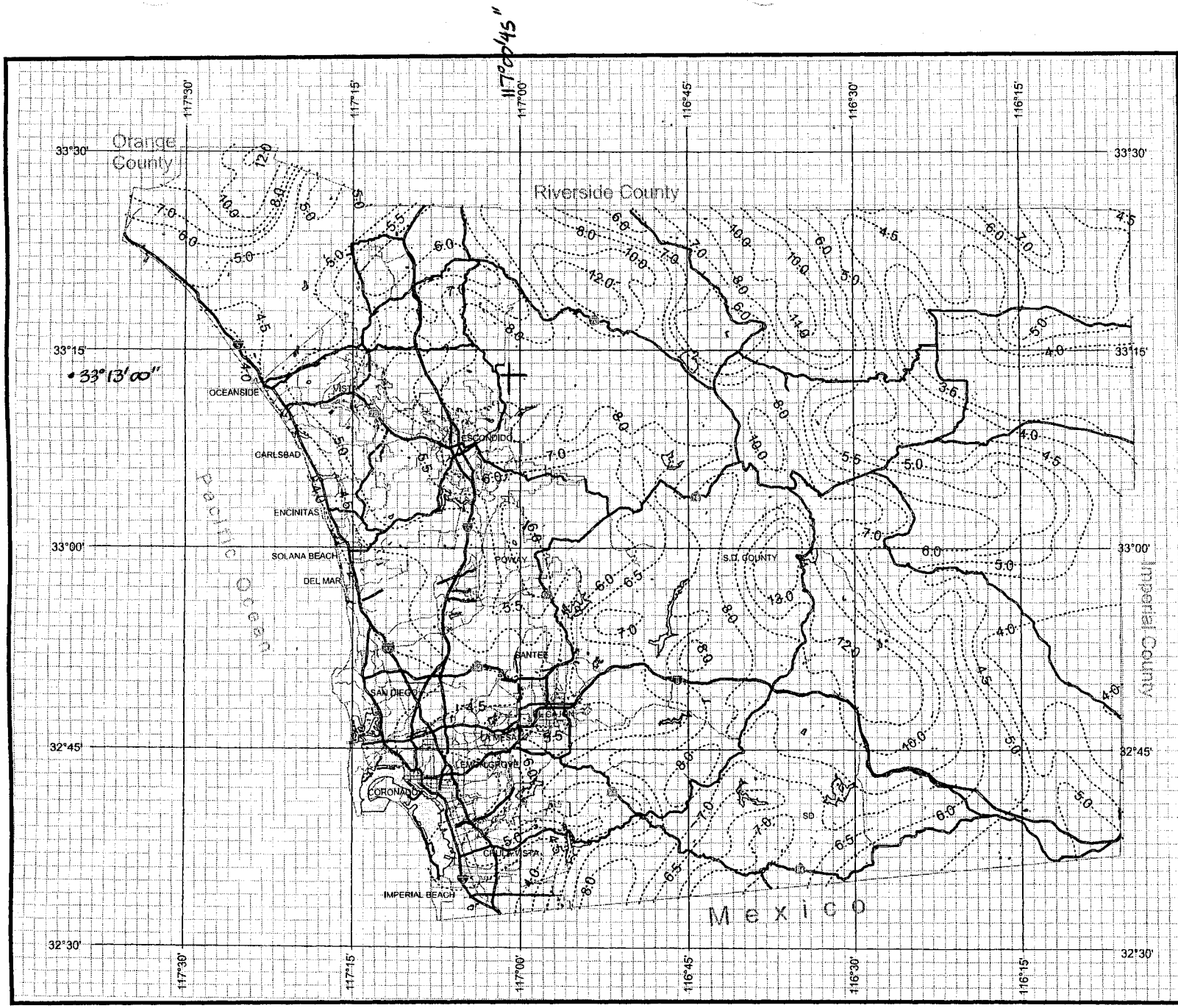

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

8.2"

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N
W E
S

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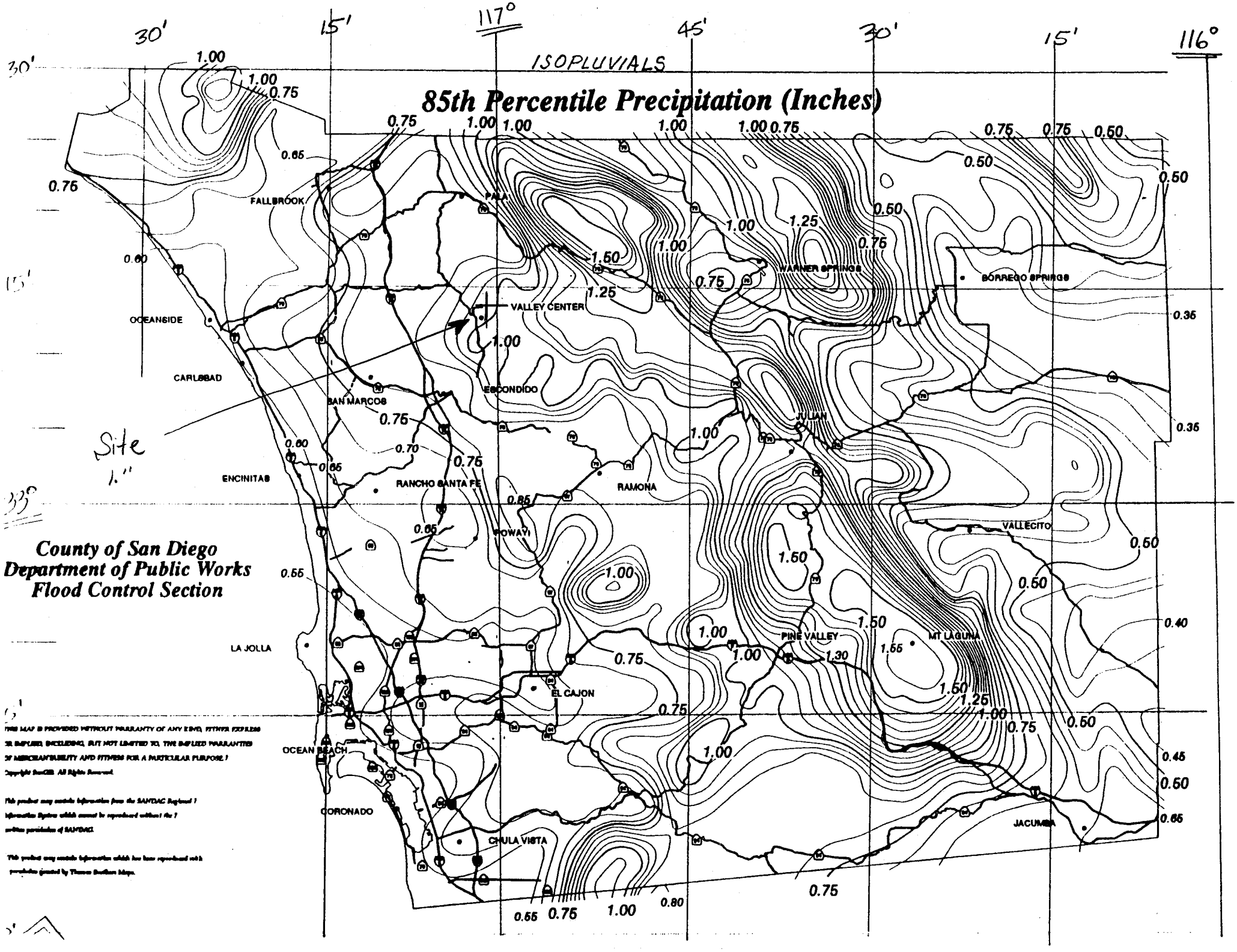
ISOPLUVIALS
85th Percentile Precipitation (Inches)
County of San Diego
Department of Public Works
Flood Control Section
Site
1."
FALLBROOK
PALA
OCEANSIDE
CARLSBAD
VALLEY CENTER
ESCONDIDO
SAN MARCOS
ENCINITAS
RANCHO SANTA FE
RAMONA
POWAY
JULIAN
WARNER SPRINGS
BORREGO SPRINGS
VALLECITO
PINE VALLEY
MT LAGUNA
LA JOLLA
EL CAJON
OCEAN BEACH
CORONADO
CHULA VISTA
JACUMBA

SEC.
T. N. S.
K
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W
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S
1500
1475
1472.5
1498.5
1493.0
1726.0
1744.5
1762.0
1801.0
1667.0
1668.5
1686.0
1700
1725
1750
1772
1600
1625
1650
1675
1700
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1594.0
1503.5
1609.0
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1669.0
1664.0
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175
150
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SEC.
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1762.0
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1668.5
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