SKYLINE
Engineering

1220 South Ditmar Street
Oceanside, California 92054
760.721.3520

Job # 20-2005SWMP

PRELIMINARY HYDROLOGY REPORT

PREPARED FOR :

Country Gardens II

2800 Overland Trail @ South Mission Road
Fallbrook • California

June 22, 2007

REGISTERED PROFESSIONAL ENGINEER
DAVID IAN ZERNIK
No. C59348
Exp. 6-30-09
CIVIL
STATE OF CALIFORNIA

PROJECT CASE NO : P04-058
LOG NO : 04-02-053

APN 123.010.52

Hydrology report Table of Contents

Report narrative	R1-R5
Appendix Preliminary hydrology report	
Soil hydrologic groups	1
Rainfall Isopluvials	2-3
Nomograph for time of concentration	4
Initial time of concentration	5
Run off coefficient	6
Intensity duration design chart	7
Flow volume calculation	8 & 9
Bio-swale design	10-12
Drainage basin topographic map, based on San Diego County Ortho-topo, flood plain Map #426-1695	13
Pipe Sizing calculations	P1-P5
Rick Engineering, excerpts for Mission Road hydrology study	1-3

SKYLINE
Engineering

1220 South Ditmar St.
Oceanside, California 92054
Ph & Fax 760-721-3520
3/1/2007 Job #20-05hyd

Agent
TBNC: Tom Edgemon
7040 Avenida Encinas, #104-299
Carlsbad, California 92009
729-9231 434-5860 Fax 434-5869

Owner
Carl & Barbara Zinner
P.O. Box 1219
Pauma Valley, California 92061
Fax 742-3101 (H) 742-3131
Cell 760-212-5724

Site
2800 Overland Trail
Fallbrook, Calif.

Hydrology Report Narrative

Introduction

Existing Conditions

The site is about 2.0 acres and is located off of Mission Road and Overland trail, in Fallbrook. The site is west of Mission road and north of Overland trail. The site is generally flat with an existing cut slope at the west side of the property. A pad was previously graded at the site. There is also a slope at the southwest side of the property. A short length of Ostrich farm creek runs over the southeast corner of the property. The creek bed consists mainly of granite. The Creek is subject to high flow volumes during storm events. Based on the San Diego county flood plain maps and FEMA FIRM maps the flow during a 100 year storm is confined to the existing banks of Ostrich farms Creek. The existing pad and Overland trail, at the Zinner property, is not subject to inundation during the 100 year storm.

Several easements exists on the south and southeast portions of the property. Overland trail runs on the Zinner property within an easement and also out of the easement. The existing paved road is outside the entitled road easement. The property is surrounded mainly by houses on large, several acre, lots. The lands to the west and north are sloped toward the site. A hydrology study of this area was performed, about 13 acres are tributary to the Zinner site. This adjacent area produces a 100 years storm flow of about 36 cfs. The lands to the south slope away from the site.

Currently rainfall that occurs on the site and the adjacent 13 acres tributary to the site will flow, by sheet flow, south easterly to Ostrich farms creek Water enters the site primarily from the west. Water flows from the adjacent properties down the existing westerly cut slope. These waters, by sheet flow, make there way into Ostrich farm creek.

Some of the water enters the property in an existing concrete swale at the south side of the property. This water flows down an existing catch basin and existing 12" diameter concrete pipe. The 12" diameter concrete pipe relieves itself into Ostrich farms creek through an existing pipe outfall at the creek. The creek bed at the outfall is substantially lined with granite. See the enclosed existing conditions hydrology map.

Erosion is currently a problem for the site and adjacent tributary off site areas. Due to the existing steep slopes and the excessive amount of sheet flow that is occurring. Water flows unchecked toward the creek, the quickly moving flows pickup more soils when flowing over the vast areas without landscaping adjacent to the creek. Soils erosion ruts can be seen and soil collects on Overland trail after rain storms.

Mission road is sloped and slopes downward from north to south. North of the Zinner property water accumulates as it runs down both sides of Mission road. An earth swale is formed along both sides of the road. On the east side of the road water flows south eastward into Ostrich farms creek. On the west side of the road waters run southward as just mention above. Just before the Zinner property, on the west side of Mission road, at the edge of the pavement is a catch basin with an asphalt concrete apron. The run off from the west side of Mission road is relieved by this catch basin. It is believed that a pipe runs from the catch basin, south easterly into Ostrich farms creek. See the existing condition hydrology map which shows the drainage patterns discussed above. In front of the Zinner property, Mission road is curved and super elevated at the curve. Due to the super elevation of the road most of the waters run easterly into Ostrich farms creek.

Proposed Conditions summary

The proposed drainage patterns of the site will remain substantially the same. The storm waters will flow substantially southeasterly to Ostrich farms creek. The proposed improvements will improve the water quality of the flows leaving the site by reducing velocity which helps prevent erosion and attenuate the flow. The proposed paving at the site will reduce the amount of infiltration which increases volume, yet the proposed bioswale will promote infiltration.

Off site waters quickly flow, unchecked, down the existing cut slopes causing erosion. The first critical change will be to construct berms and brow ditches at the top of the existing cut slopes. This will stop the hazardous erosion that has occurred. It will help to limit the amount of sediment pollution downstream. Water will also be directed by sheet flow, pipes and down spouts to a grassy bio-swale at the east side of the property. As much water was directed to the bio-swale as was practical.

The remaining water will be conveyed by a series of pipes and paved areas southward. Ultimately most of the flows will be directed to a pipe outfall into Ostrich

farms creek. It is proposed that the drainage patterns for the area directly adjacent to the creek will remain unchanged and flow into the creek by means of sheet flow.

Hydrology Analysis

The area to the west of the property is sloped toward the Zinner property. See the attached county of San Diego topographic map. The drainage basin and Zinner property are shown on the county topographic map. The drainage basin area tributary to the site is approximately 13 acres. The rain fall intensity, soil type, time of concentration and use of the property was determined, based on the San Diego County hydrology manual, see page 1-6 of this report. A 100 year flow of about 24 cfs was calculated. For on site flows, see page #7 & #8 of the report for an evaluation of pre & post development run-off. Also see the results in tabular form in this report.

Hydraulic Analysis

As discussed above there is a offsite basin to the west that is tributary to the site. As these water reach the site they will encounter a brow ditch. The brow ditch will direct the water into a number of catch basins and one existing concrete swale. The size of the steeply sloping pipes were determined using the attached alignment charts.

Basin areas were determined for the pipe that conduct water to the bio-swale. Most the flows are conducted to the existing outfall at Ostrich farms creek. Reinforced concrete pipes are proposed to conduct that water. Pipe sizing calculations for these pipe are also enclosed. The analysis used for this site design is based on the County of San Diego Hydrology Manual. Pipes sizes were determined by the enclosed alignment chart from the text book "Hydraulic Engineering" by Robertson, Cassidy, and Chaudhry 1988 Houghton Mifflin Company.

Conclusion

Pre & Post construction Hydrology Discussion

Flows volumes were determined based on the San Diego County hydrology Manual. The manual provides techniques for estimating the flows. Based on the tabulated values the proposed development may increase the flow by about 2.54 CFS during the 100 year storm. The proposed site is designed in such a way to mitigate any changes to the existing pre-development flow regime. Several steps are being proposed

that will attenuate the flow, reduce flow volumes and treat the water.

For example. The shallow sloped bio-swale has 18" berms along it. During low flow storm events, its likely that little or no water will leave the site. The swale allows for an increase in infiltration due to the shallow ponds that will be created. It also allows for some flood attenuation due to the water that will be stored on site in the small ponds.

Ostrich farms creek has a large tributary basin, about 7.2 square miles, and flow volumes during the 100 year storm. A hydrology study of the Fallbrook area was performed by Rick Engineering Company in 1991. See the attached portions of the study attached to the end of this report. The volume, based on the Rick engineering report, is about 4,975 CFS at the Zinnner property. The proposed development will add, due to the construction of impervious paved areas, an added flow volume of 2.54 cfs. This amounts to a 0.05% increase in the flow volume. In my opinion this negligible increase will not adversely effect the downstream flow characteristics of Ostrich Farms Creek.

This estimated increase, will have an insignificant impact on the flood plain, flow characteristics and erosion characteristics of Ostrich farms creek. It will have an insignificant impact on the elevation of the downstream flood plane. The site waters will be relieved by a 27" diameter reinforced concrete pipe, with a 3% slope. A head wall will be added at the outfall. The velocity at discharge is about 12.5 ft/sec. The proposed discharge velocity is similar to the existing 12" diameter pipe discharge velocity. Considering that the creek bed is substantially lined with granite, the flow will have an insignificant impact on the downstream erosion characteristics of the creek. It will have no significant effect on the upstream characteristics of the Creek. The proposed facility and the proposed realignment of overland trail will not be subject to inundation during the 100 year storm.

The proposed drainage improvements will reduce the existing sediments that are deposited on the adjacent roadways. The new flow regime will conduct water to Ostrich farms creek. The current regime flowed across Overland trail and Mission road and deposits soils on the roadways.

Please do not hesitate to call if you have questions or concerns regarding this project.

Sincerely

David Zernik, P.E

			Drainage volumes				
	Pre development totals						
Location		Run-off	Rainfall	Area - A	Velocity	Flow Volume for 100 yr	Flow totals
		Coefficient - C	Intensity-I	Acres	FPS	Storm in CFS, Q100	with increase
Tributary off site		0.35	5.2 in/hr	13.17	sheet flow	24	
On entire site		0.35	5.2 in/hr	2	sheet flow	3.46	
Node A				11.77	sheet flow	21.42 See note A below	
Node 1 & 2				0.5	sheet flow	0.91	
Node 3- Existing 12" RCP				3.4	7.7	6.19 See note B below	
Total Run-off		0.35	5.2 in/hr	15.17	sheet flow & 7.7	27.46	27.46
	Post development totals						
Tributary off site		0.35	5.2 in/hr	13.17	sheet flow	24	
On entire site		0.58	5.2 in/hr	2	varies	6	
Node 1				6.9	4.2	12.56	
Node 2				1	5.7	3	
Node 3				15.13	12	29.85	
Total Run-off			5.2 in/hr	15.17	12.5	30	30
							2.54 cfs increase

Note A: The existing flow travels over Overland trail and down the banks of Ostrich farms creek. Sand & gravel sediments are currently deposited on Overland trail causing a hazard. The unchecked flow may also cause future erosion leading into ostrich farms creek

Note B: At existing 12" RCP, the capacity of the pipe is 6.5 CFS, which will not adequately drain the 9.28 CFS flow that occurs during the 100 year storm The excess water will overflow the pipe and flood overland trail.

The approximate post development run-off increase during a 100 year storm is 2.54 CFS, which is considered a negligible increase

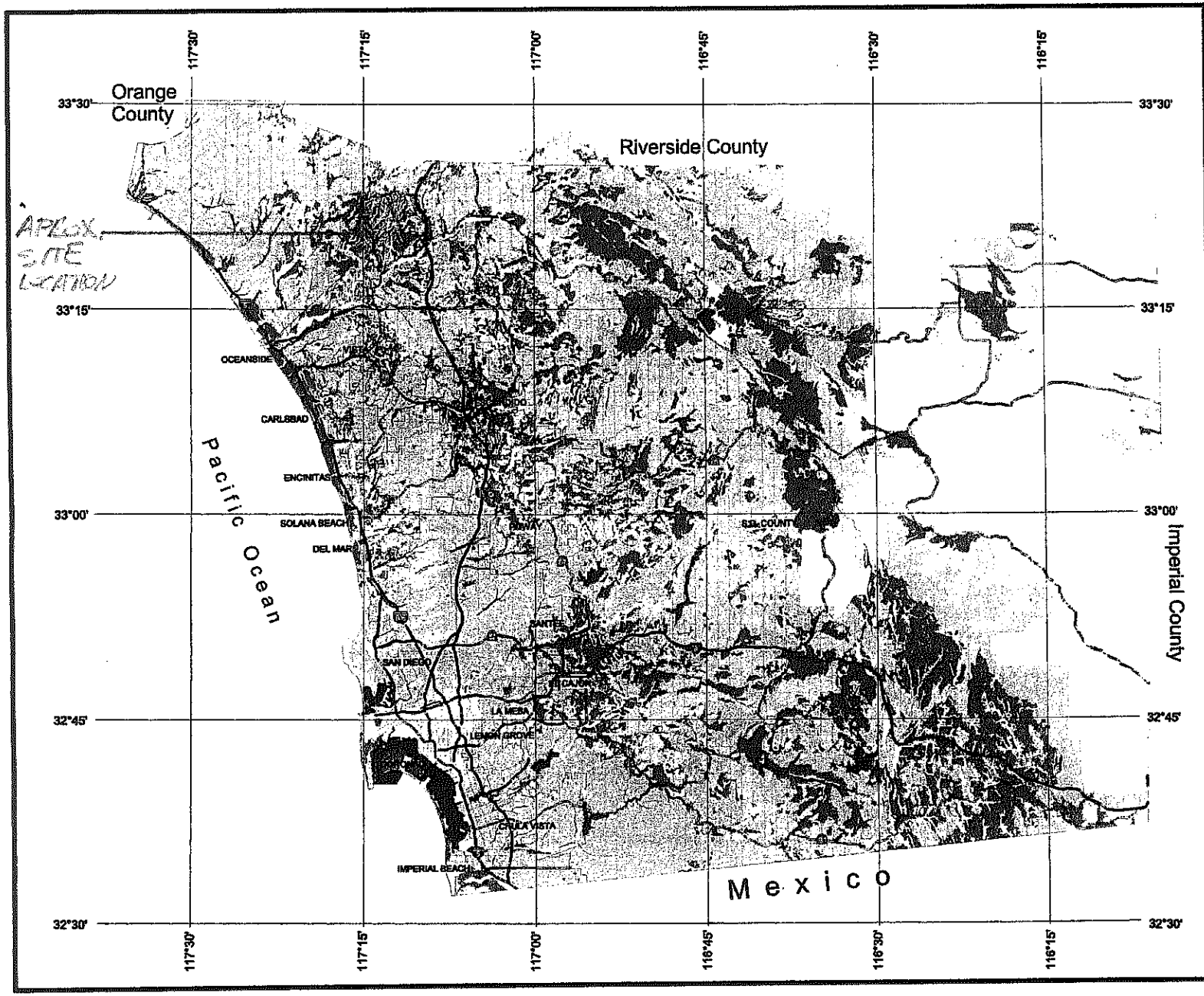
The soil group for the drainage area is soil type B

The time of concentration for the subject basin is 9.8 minutes

PAGE #1 of 12

County of San Diego Hydrology Manual

Soil Hydrologic Groups



Legend

Soil Groups

- Group A
- Group B
- Group C
- Group D
- Undetermined
- Data Unavailable

SOIL GROUP B

DPW GIS
Department of Public Works Geographic Information Services

SanGIS
We Have San Diego Covered

N
W E
S

3 0 3 Miles

THIS MAP IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Copyright SanGIS. All Rights Reserved.

This product may contain information from the SANDAG Regional Information System which cannot be reproduced without the written permission of SANDAG.

This product may contain information which has been reproduced with permission granted by Thomas Brothers Maps.

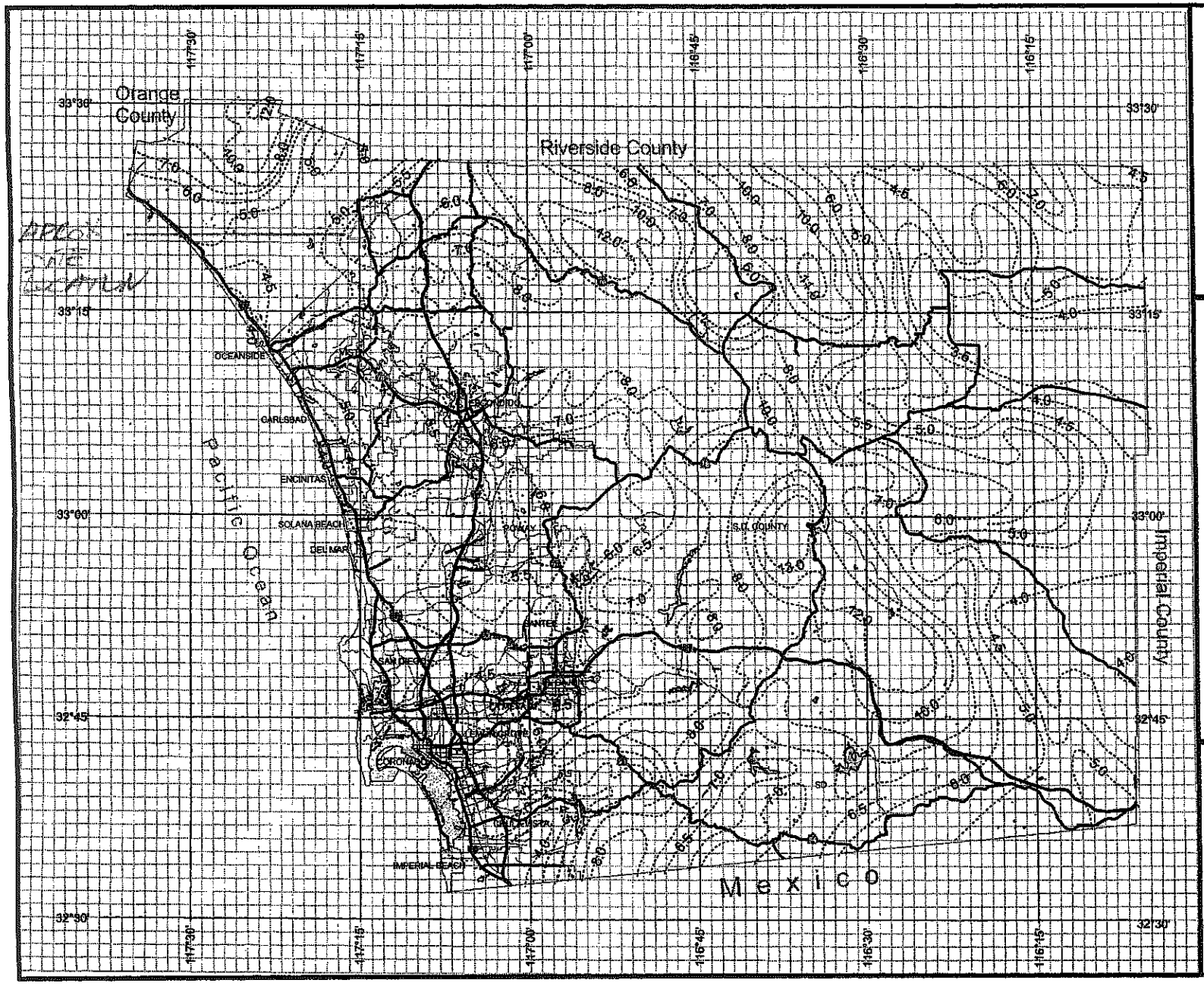
PAGE #2

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)



DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered

N
W E
S

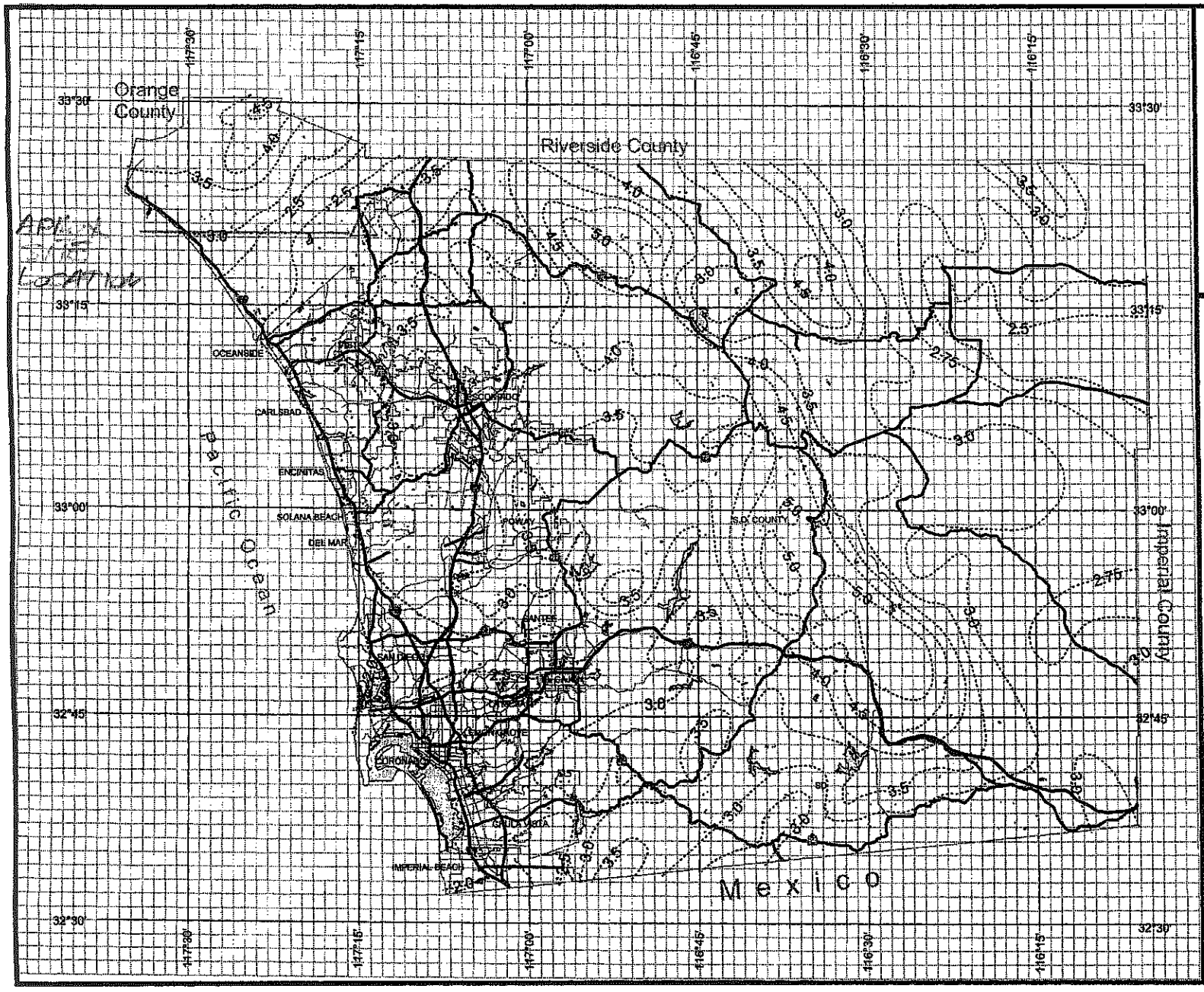
THIS MAP IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Copyright SanGIS. All Rights Reserved.

This products may contain information from the SANDAG Regional Information System which cannot be reproduced without the written permission of SANDAG.

This product may contain information which has been reproduced with permission granted by Thomas Brothers Maps.

3 0 3 Miles

PAGE 43



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (Inches)

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered

N
W E
S

3 0 3 Miles

THIS MAP IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Copyright SanGIS. All Rights Reserved.

This products may contain information from the SANDAG Regional Information System which cannot be reproduced without the written permission of SANDAG.

This product may contain information which has been reproduced with permission granted by Thomas Brothers Maps.

#4

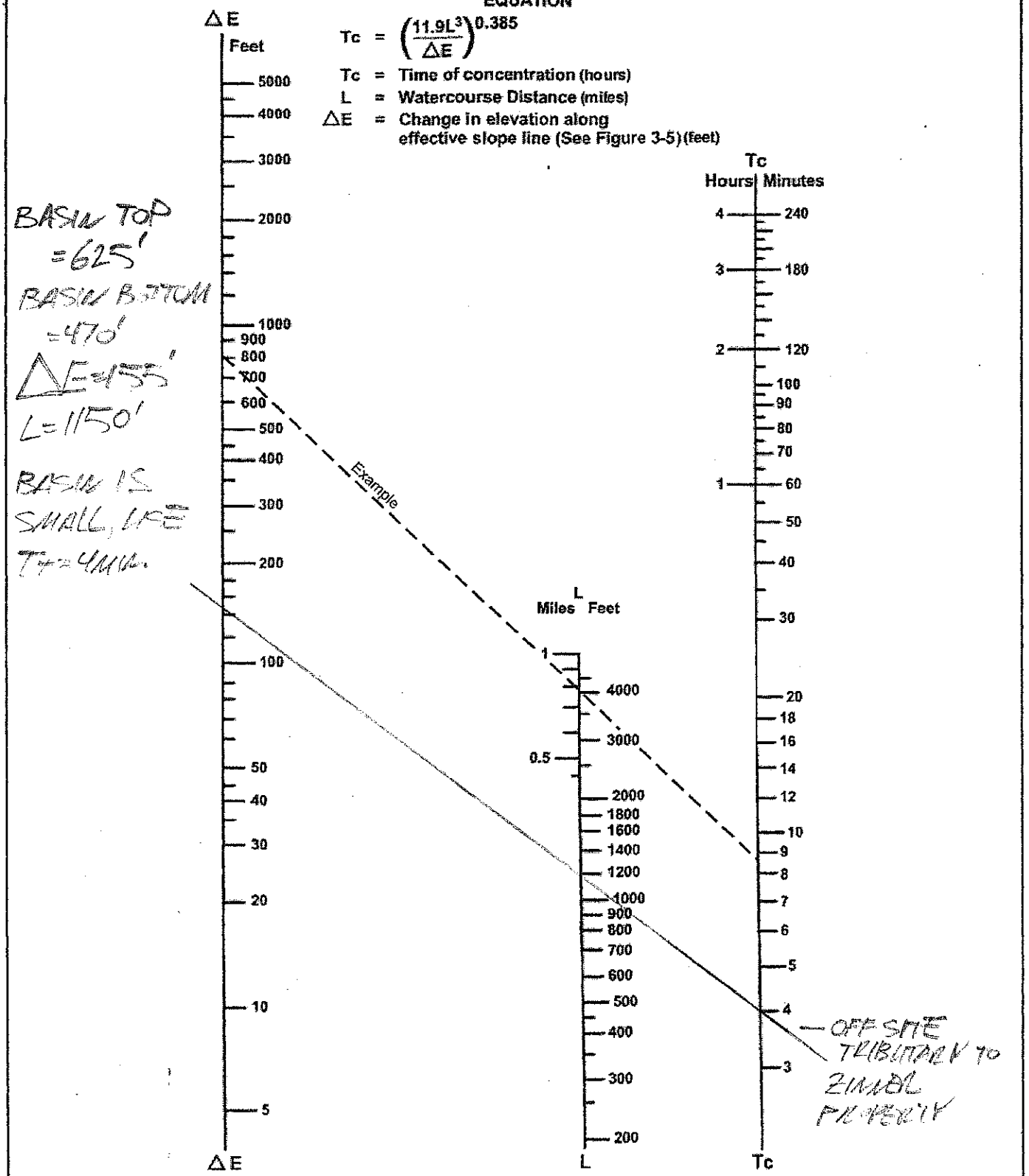
EQUATION

$$T_c = \left(\frac{11.9L^3}{\Delta E}\right)^{0.385}$$

T_c = Time of concentration (hours)

L = Watercourse Distance (miles)

ΔE = Change in elevation along effective slope line (See Figure 3-5) (feet)



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

OFF-SITE

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

Element*	DU/ Acre	.5%		1%		2%		3%		5%		10%	
		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

OFF SITE BASIN, TRIBUTARY TO INNER PROPERTY

$T_c = T_i + T_t$

$= 5.8 + 4 = 9.8$ MINUTES

#6

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	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	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

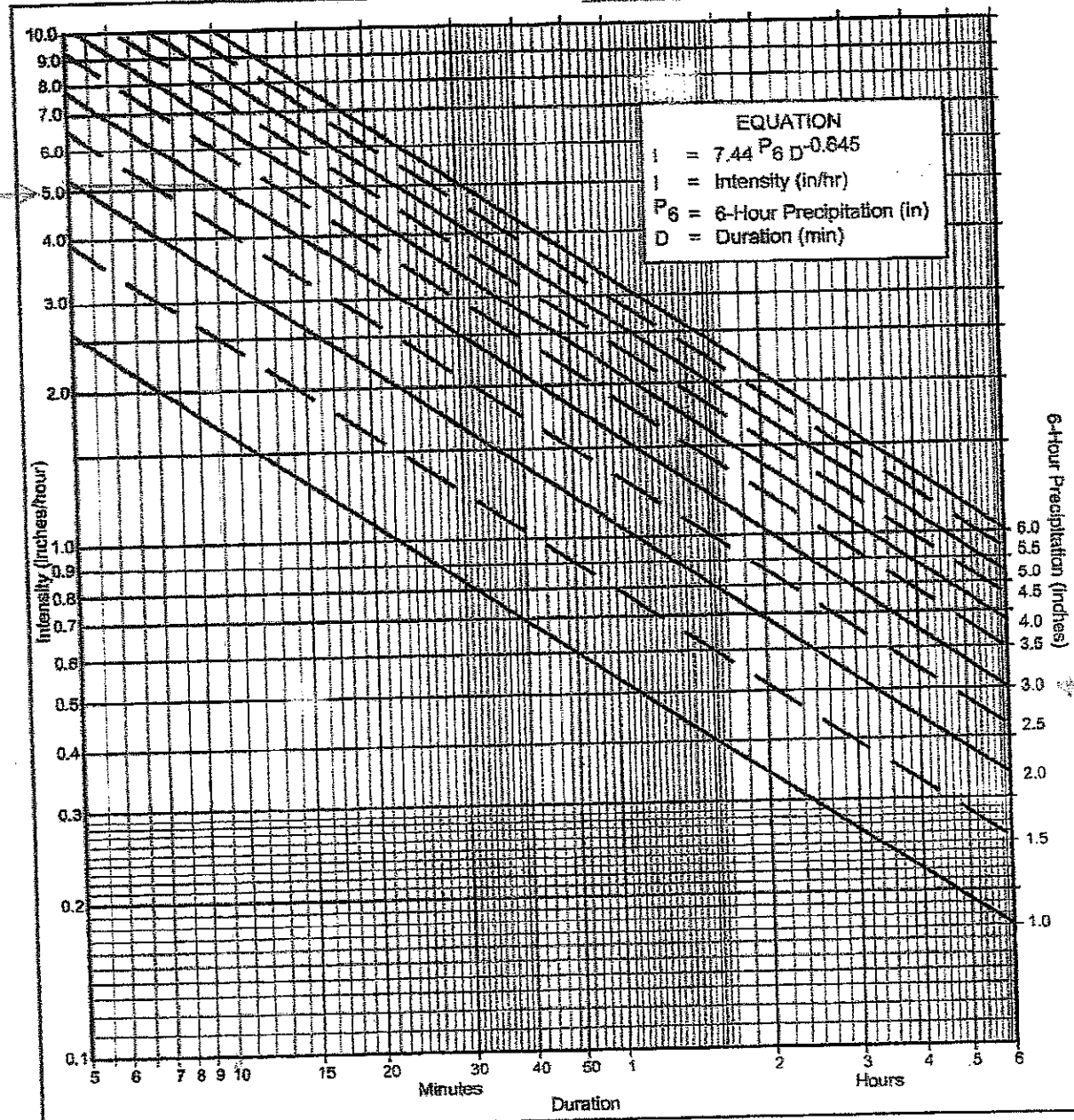
*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area 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

C - OFFSITE = .35

PRE DEV
C = .35

POST DEV
C = .58

OFFSITE BASIN



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 100 year

(b) P_6 = 3.6 in., P_{24} = 5.75, $\frac{P_6}{P_{24}}$ = 62 %(2)

(c) Adjusted P_6(2) = 3.8 in.

(d) t_x = 9.8 min.

(e) I = 5.2 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	2.75	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

HYDROLOGY STUDY

BEFORE DEVELOPMENT

LOCATION: ZIMMER PROPERTY AREA = 2.0 ACRES.

SOIL TYPE B

LAND USE LDR. -10%± IMPERVIOUS DUE TO EXIST'G. PAVING AND IMPROVEMENTS - C=.35

CA = .35 × 2 = .7

I_{10} = 5.2 IN/HR.

Q = CIA = .7 × 5.2 = 3.64 CFS

AFTER PROPOSED DEVELOPMENT

LOCATION: ZIMMER PROPERTY AREA = 2.0 ACRES

SOIL TYPE B

LAND USE -50%± IMPERVIOUS C = .58

CA = 1.16

I = 5.2 IN/HR.

Q = CIA = 1.16 × 5.2 = 6.03 CFS.

HYDROLOGY STUDY

#9

LOCATION: OFF SITE AREA TRIBUTARY TO SITE

AREA = 13.17 ACRES ← SEE ATTACHED BASIN MAP

SOIL TYPE B ← SEE PAGE #1 "SOIL HYDROLOGIC GROUPS"

LAND USE (LDR) LOW DENSITY RESIDENTIAL – C = .35
← SEE TABLE 3-1.

$CA = 13.17^{ACRES} \times .35 = 4.61$

$T_c = 9.8$ MINUTES.

$I_{100} = 5.2$ IN/HR.

$Q_{100} = CIA = 5.2 \times 4.61 = 24$ CFS

BIOSWALE DESIGN

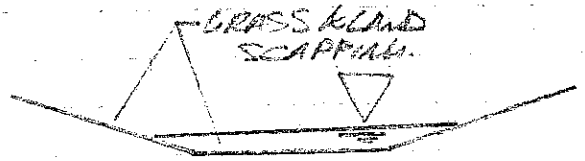
#10

REQUIRED TREATMENT VOLUME - Q_{WQ}

USE 85% ISOPLUVIAL OR .2 INCHES.

C = .5
I = .2 INCHES
A = 2 ACRES

$Q = C \times I \times .5 \times .2 \times 2 = .2$ CFS



HYDRAULICS

RECTANGULAR OPEN CHANNEL

$Q = .2$ CFS
$N = .25$
$S = .015$
$B = 5'$

$$\frac{AR^{2/3}}{B^{8/3}} = \frac{QN}{1.49 \times S_o^{1/2} \times B^{8/3}}$$

$$= \frac{.2 \times .25}{1.49 \times .015^{1/2} \times 5^{8/3}} = .0035$$

$Y/B = .032$ ——— SEE TABLE

$Y_n = .032B = .032 \times 5 \times 12 = 1.92''$ ← DEPTH OF FLOW

AREA $= \frac{1.92}{12} \times 5' = .8$ CF

$Q = VA$

$.2 = V \times .8$ CF

$V = .25$ FPS

RETENSION TIME $= \frac{230'}{.25 \text{ FPS}} = 920$ SEC OR $\boxed{15.33 \text{ MINUTES}}$

VELOCITY = .25 FPS < 1 FPS O.K. RETENTION TIME = 15.33 > 10 MIN O.K.
CHANNEL LENGTH = 230' > 100' O.K.
THE PROPOSED 40' WIDE × 230' LONG LANDSCAPED
CHANNEL BIOFILTER CAN ADEQUATELY FILTER THE FLOW
[illegible] REQUIRED

BIO SWALE DESIGN
AT 100 YRS FLOW

Q = 23.1 CFS - DESIGN, COMPUTED
VOLUME = 15.56 CFS < 23.1 o.k.

n = .028
S = .015
B = 10'

$$\frac{23.1 \times .028}{(.015)^{1/2} \times 10^{8/3}} = \frac{.65}{83.41} = .0078$$

Y/B = .0078

$Y_N = .055B = .055 \times 10 \times 12 = 6.6''$ ← DEPTH OF FLOW

$AREA = \frac{6.6}{12} \times 10 = 5.5$ CF

Q = VA

23.1 = V × 5.5 CF

V = 4.2 FPS ← PROVIDE FOR BIOSWALE CONTROL IN THE LANDSCAPING, ADD RIP WRAP BERMS & CURVE CHANNEL TO SWALE

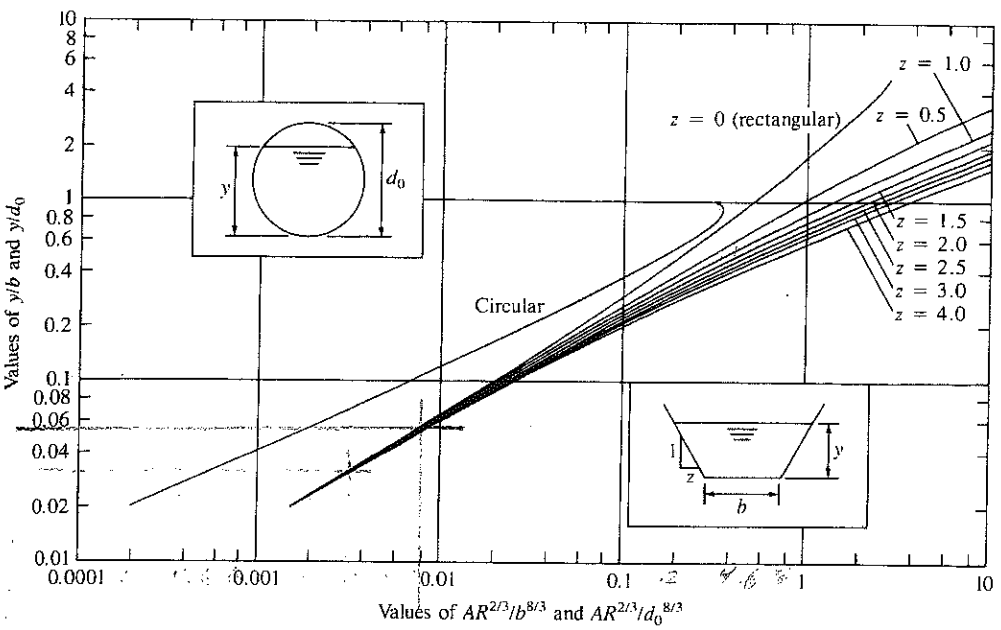
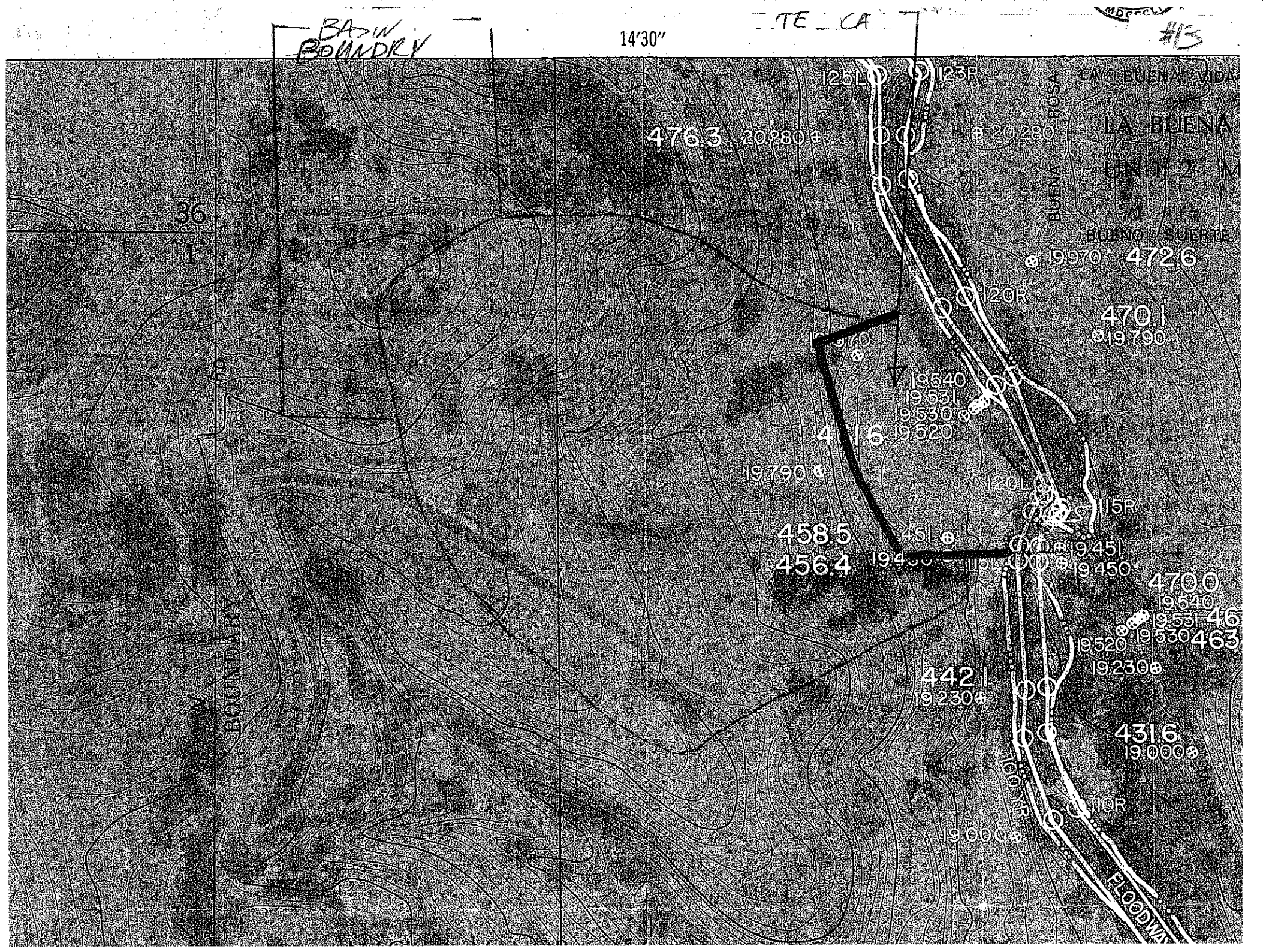


Figure 4-7 Curves for determining the normal depth [adapted from *Open Channel Hydraulics* by Chow (4) Copyright © 1959, McGraw-Hill Book Company, New York; used with permission of McGraw-Hill Book Company.]


BASIN BOUNDRY
14'30"
TE CA
#13
125L
123R
LA BUENA VIDA
ROSA
LA BUENA
UNIT 2
BUENO SUERTE
476.3
20280
20280
19970
472.6
120R
470.1
19790
19540
19531
19530
19520
19790
115R
458.5
451
19451
456.4
19450
470.0
19540
19531
19530
19520
19230
442.1
19230
431.6
19000
110R
19000
36
1
BOUNDARY
FLOODWA

P1 - P5

SKYLINE
Engineering

1220 South Ditmar St.
Oceanside, California
92054
760-721-3520
Job # 20-2005

Pipe sizing calculations

With hydrology and hydraulics study

For

TBNC

At

Country Gardens 2

Located At:
2800 Overland Trail
Fallbrook, California
APN 123-010-52-00
Date August 24, 2005
LB 1522 2/20/2007

PIPE SIZING

OFF SITE FLOW = 36 CFS, DESIGN VOLUME, COMPUTED = 24 CFS

ON SITE FLOW = 7.8 CFS, DESIGN VOLUME, COMPUTED = 6 CFS

PIPES RELIEVING BELOW DITCH

$Q_{max} \neq \frac{36^{CFS}}{3} = 12^{CFS}$

USE (1) 12" Ø PIPE.

PIPE OUTFALL UNDER THE BUILDING

$Q = CIA = .5 \times 7.8 \times .75 \text{ ACRES} = 2.925^{CFS}$

USE (1) 10" Ø PIPE

MAX FLOW AT LOW END OF PROPERTY.

$Q = 43.8^{CFS}$ - DESIGN, COMPUTED = 30 CFS

USE 24" & 27" DIA PIPES TO DRAIN CATCH BASINS AT LOW END OF PROPERTY

EVALUATION OF EXISTING PIPE

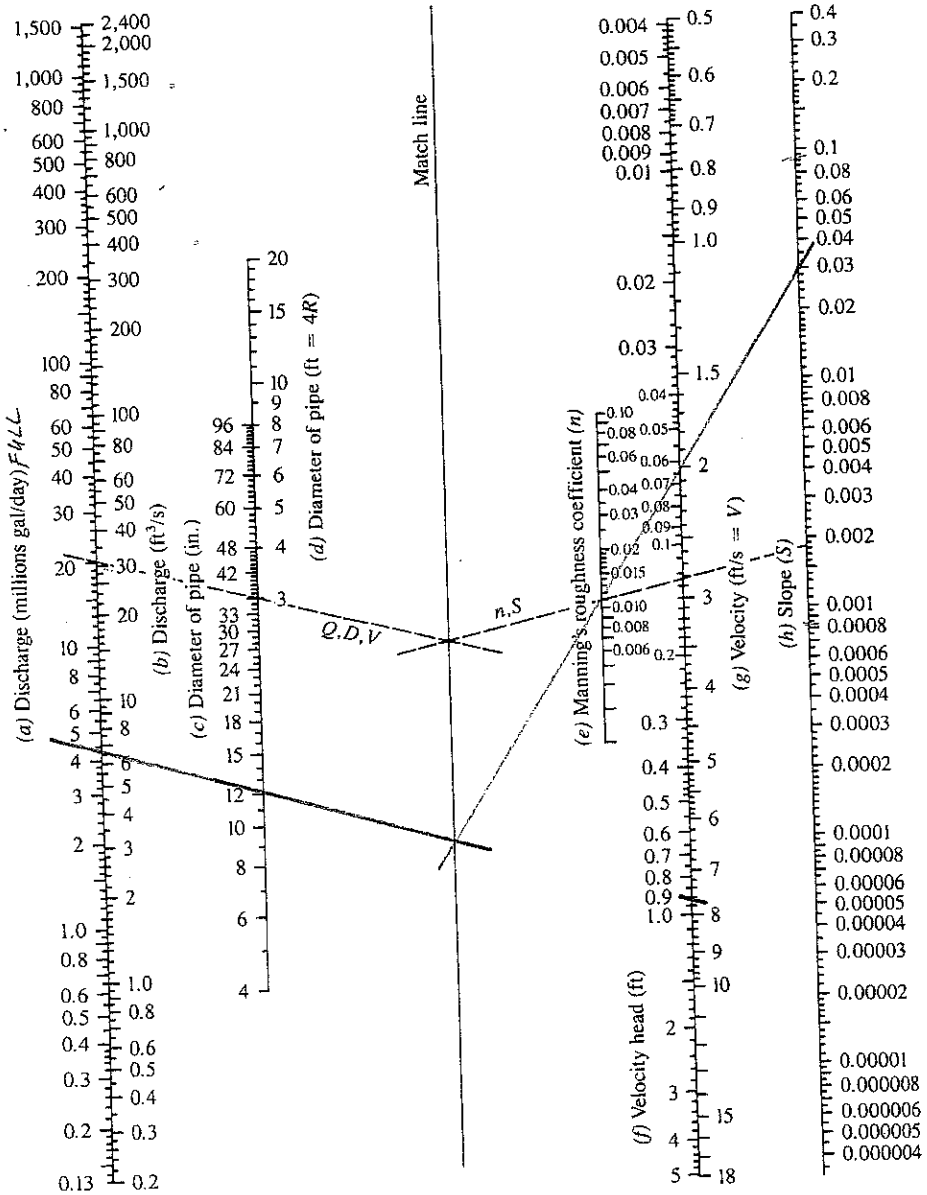


Figure 4-6 Alignment chart for flow of water in pipes flowing full (1)

EXISTING 12" DIA. PIPE UNDER OVERLAND TRAIL.
$Q_{FULL} = 6.5$ CFS < $Q_{100} = 9.28$ CFS DESIGN, VELOCITY = 7.7 FPS
COMPUTED = 6.19 CFS

EVALUATION OF PROPOSED PIPES

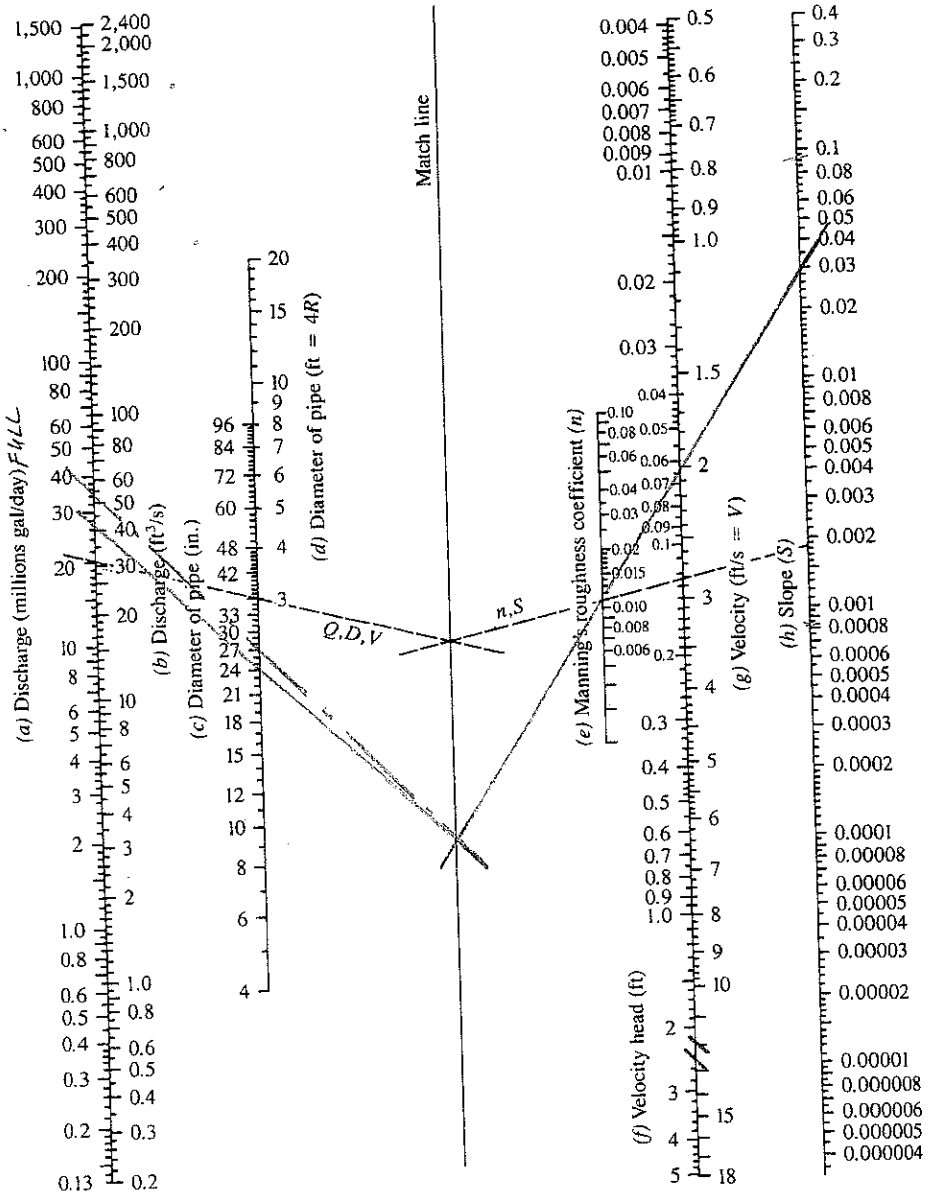


Figure 4-6 Alignment chart for flow of water in pipes flowing full (1)

USE (1) 27" DIA PIPE TO RELIEVE PROPERTY AT OVERLAND, NEARLY ENTIRE SITE TRIBUTARY TO THIS LOCATION.
$Q_{FULL} = 53^{CFS} > 30.0^{CFS}$, VELOCITY IS 12.5 FT/S.
SLOPE = 3% ———

USE (1) 24" DIA PIPE TO RELIEVE BIO-SWALE
$Q_{FULL} = 40^{CFS}$ O.K. VELOCITY IS 12 FT/S
SLOPE = 3% — · — · —

EVALUATION OF PROPOSED PIPES.

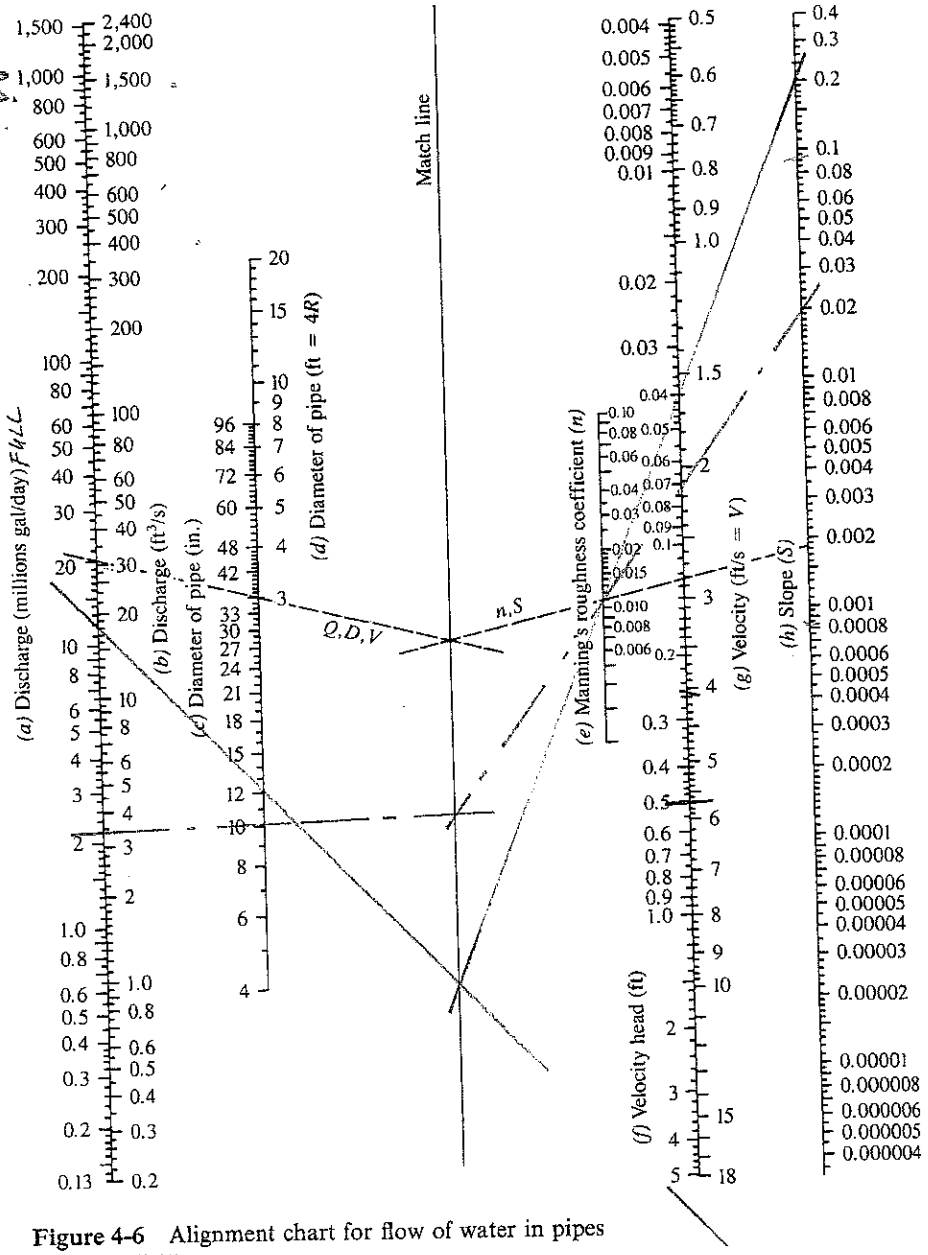
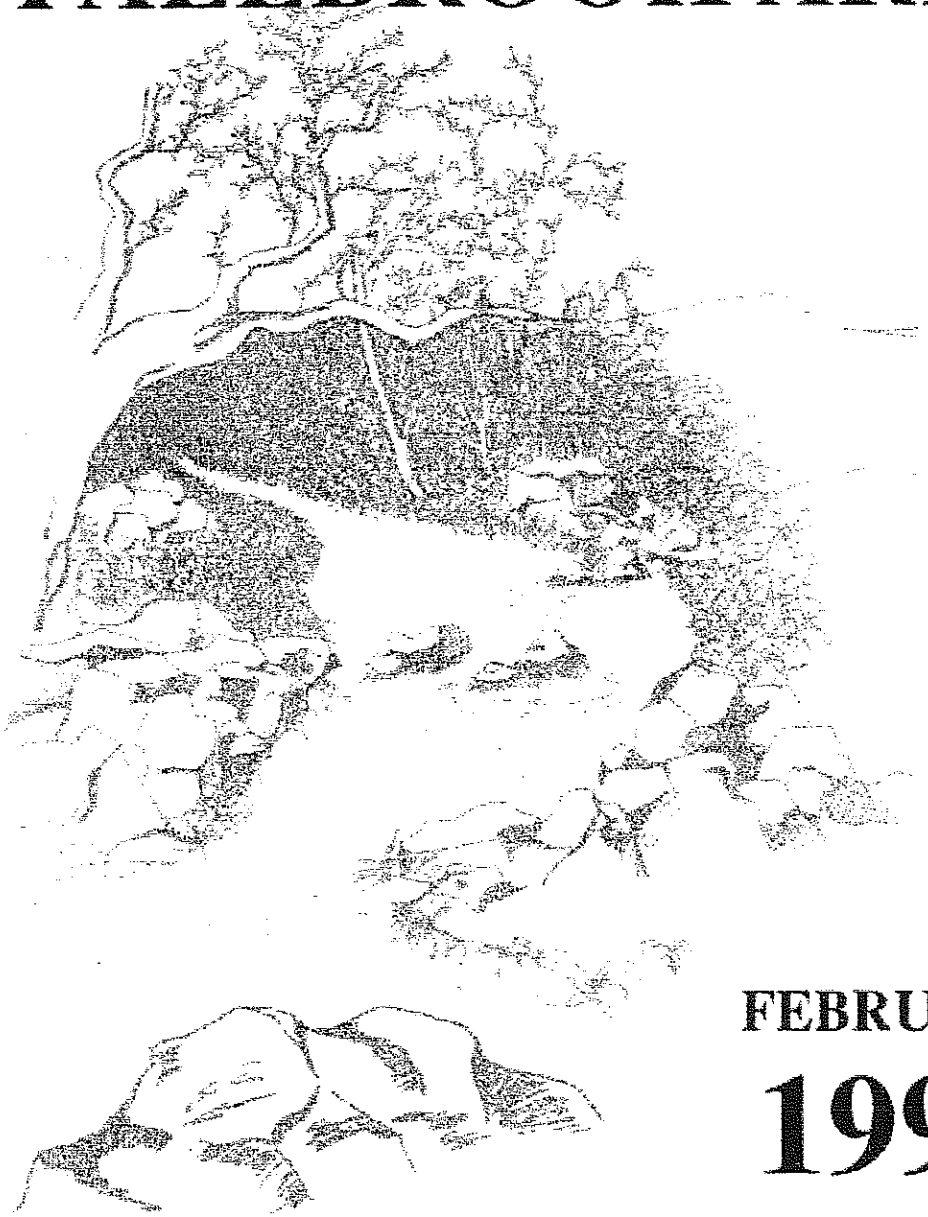


Figure 4-6 Alignment chart for flow of water in pipes flowing full (1)

USE (1) 12" DIA. PIPE TO RELIEVE THE BROW DITCH AT THE TOP OF THE EXISTING CUT SLOPE. Q_{FULL} = 18 CFS > 8 CFS, VELOCITY IS OVER 18 FT/S
SLOPE = 20% ± ———

USE (1) 10" DIA PIPE TO RELIEVE COURT YARD/SIDE YARD.
Q_{FULL} = 3.4 CFS > 3.0 CFS, VELOCITY = 5.7 FT/S
SLOPE = 2% — · — · —

Flood and Drainage
Management Report for the
FALLBROOK AREA



FEBRUARY

1992

Prepared for the County of San Diego
by: Rick Engineering Company and the Department of Public Works

#2

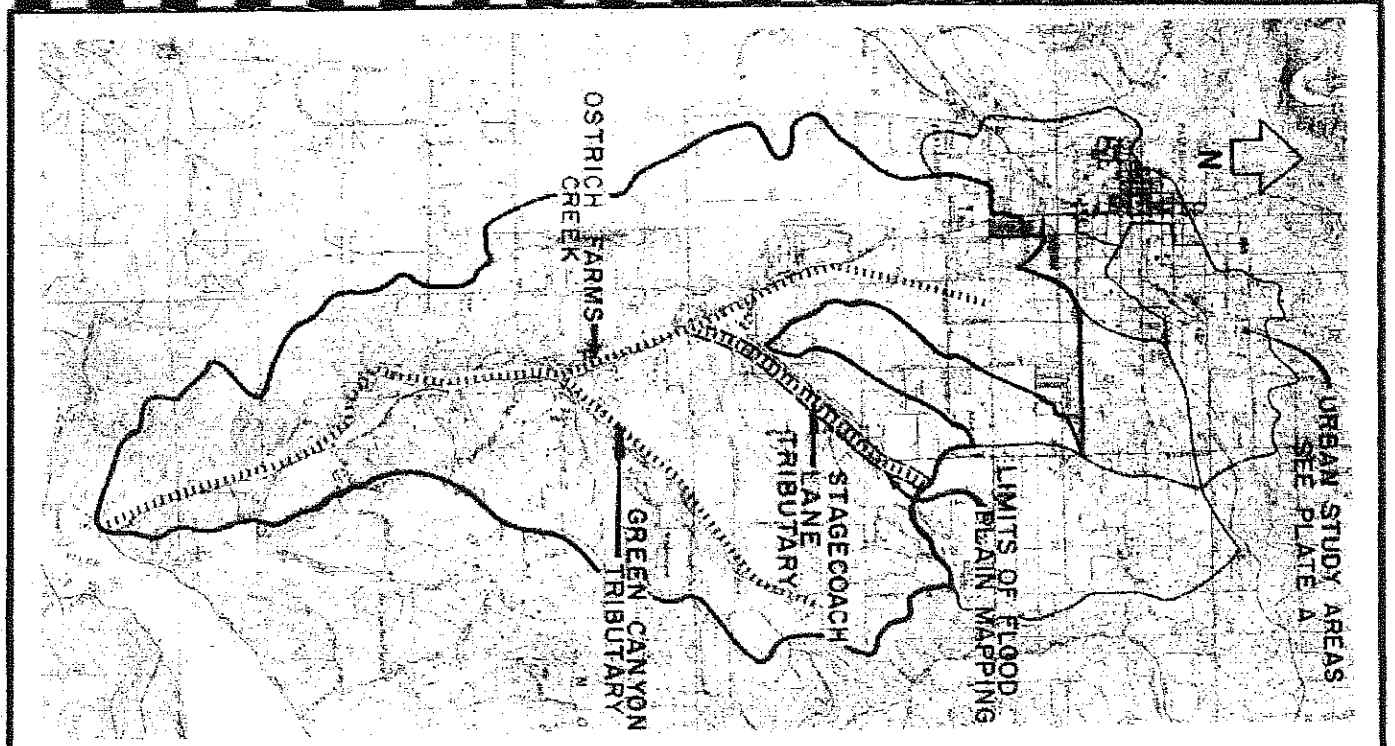


PLATE B	FLOOD AND DRAINAGE MANAGEMENT REPORT FOR THE FALLBROOK AREA DRAINAGE BASIN INDEX: RURAL STUDY AREAS	SCALE: 1" = 4000'
	RICK ENGINEERING COMPANY 5620 FRIARS ROAD SAN DIEGO, CA. 92110 (619) 291-0707	DATE: NOVEMBER 1991

#3

TABLE 9

OSTRICH FARMS CREEK - RURAL

DOWNSTREAM POINT	UPSTREAM POINT	DRAINAGE AREA (SQ. MI.)	100-YEAR DISCHARGE (C.F.S.)	CROSSINGS	ASSOCIATED PROBLEMS	TYPICAL IMPROVEMENTS
1. Pala Road	-----	11.1	6500	4 - 10' wide by 4' high R.C.B.'s	Inadequate Inundated by back-water from San Luis Rey River	Env: Natural, no project FHR: Raise road, replace with bridge
2. Pala Road	Southerly intersection of Mission Road and Heller's Bend	9.7	6500	Private bridge and box culvert crossings	Crossings will wash out, over-bank flooding	Env: Natural, no project FHR: Bridge-type crossings
3. Southerly intersection of Mission Road and Heller's Bend	Northerly intersection of Mission Road and Heller's Bend	9.7	6500	Private bridges and dip sections	Scour at bridge abutments	Env: Natural, no project FHR: Protect abutments
4. Northerly intersection of Mission Road and Heller's Bend	Green Canyon	8.0	5275	Private bridges, boxes and dip sections	Scour at bridge abutments	Additional protection at abutments/Bio Mitigation, save trees
5. Green Canyon	Crossing of Mission Road	7.2	4975	Private dip sections	-----	Future projects: Bio Mitigation
6. Mission Road	-----	7.2	4975	Old bridge crossing	-----	Adequate
				R.C.B.	Inadequate	Replace with a bridge
7. Mission Road	Winterhaven Road	7.2	4975	Private dip sections	Will wash out	Replace with concrete dip sections/Bio Mitigation, save trees
8. Winterhaven Road	-----	2.1	1700	2 - 60" C.M.P.'s	Inadequate	Multiple R.C.B.'s or a bridge/Bio Mitigation

Note:

The typical improvements shown in this table are for the purpose of providing a basic design for cost estimating. Additional environmental review and design will be necessary before any improvements can be constructed.