CEQA Hydrology & Hydraulics Study

Jamul Highlands Road
Jamul, California

APN: 596-152-04-00

PDS2015-TPM-21255

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Exp. 06/30/20

Project #2393

April 03, 2019

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INTRODUCTION

The proposed project site is located in the County of San Diego. The project is located at on the west side of Jamul Highlands Road between Highland Heights Road and Paleo Drive in Jamul, County of San Diego. The overall project site is Parcel 4 of Parcel Map 6976 and is undeveloped. It is bordered to the east by Jamul Highlands Road and to the north, south, and west by existing single family residences. The Assessor's Parcel number for the project lot is APN 596-152-04-00. The project proposes grading and improvements for a new single family residence. This drainage study calculates the peak stormwater discharge entering and leaving the project site (onsite and offsite drainage) in the existing condition and after development.

PROJECT SITE DESCRIPTION

The area of the project site is 458,791.992 s.f. (10.532 acres). The watershed soil is categorized as "Soil Group C". The existing area of the site is undeveloped thus C = 0.30. The area of the new driveway surface (impervious) is 34,332.8 square feet (0.788 acres). The area of the new home surface (impervious) is 9785.0 square feet (0.225 acres). The proposed impervious area of the site is than 11.8% thus C = 0.36 for disturbed or developed portions of the project site.

METHODOLOGY

Stormwater runoff was calculated using the Rational Method as outlined in the San Diego County Hydrology Manual, dated June 2003. Stormwater runoff was calculated for an existing and post-development condition resulting from the 100-year, 6-hour storm event for the project and its drainage area. Standard intensity-duration curve data was used for the San Diego region supplied in the Manual.

The soil group used for the site and in the drainage area is soil hydrologic Group C from Map Soil Hydrology Groups in County Hydrology Manual.

EXISTING CONDITION HYDROLOGY

The existing project site drainage area is approximately 19.418 acres. The site varies in elevation from a high of 1492 on north property line to a low at the southwest corner of the property. The calculation, the 19.418 acre drainage area in the existing condition is divided into 23 separate basins (See Drainage Map (Existing)) each described as follows:

Area E1 a portion of existing Jamul Highlands Road, a portion of the property on the west side of Jamul Highlands Road, and a small portion of the driveway which provides access. The stormwater does not flow into the proposed project. The developed street intercepts the flow and carries the stormwater southerly away from the site in the existing street gutters. No stormwater flows into the proposed project. Jamul Highlands Road collects the flow and carries the stormwater southerly away from the site in the existing street gutters. For this portion, since improved portions offsite, use C = 0.61.

Area E2 is a portion on the north side of the driveway. The stormwater will be collected in an 18" culvert and carried under the driveway into Area P7. This area provides for the proper design of the culvert and rip-rap energy dissipater. The area is self-mitigating and has no impervious areas. Use C = 0.36.

Area E3 is a portion on the north side of the driveway. The stormwater will be collected in an 18" culvert and carried under the driveway into Area P7. This area provides for the proper design of the culvert and rip-rap energy dissipater. The area is self-mitigating and has no impervious areas. Use C = 0.36.

Area E4 is a portion on the north side of the driveway. The stormwater will be collected in an 18" culvert and carried under the driveway into Area P8. This area provides for the proper design of the culvert and rip-rap energy dissipater. The area is self-mitigating and has no impervious areas. Use C = 0.30.

Area E5 consists of a portion which is redefined due to grading for the single family residence. For this portion, which is self-mitigating, there is no impervious area. Use C = 0.30.

Area E6 consists of portion which is redefined due to grading for the single family residence. For this portion, which is self-mitigating, there is no impervious area. Use C = 0.30.

Area E7 is a portion on the south side of the driveway. Stormwater from Area E2 and Area E3 enters this area from the north. For this portion, which is self-mitigating, there is no impervious area. Use C = 0.36.

EXISTING CONDITION HYDROLOGY (continued)

Area E8 is a portion on the south side of the driveway which will provides access and a portion of the driveway. Stormwater after detention enters this area from the north. For this portion, which is self-mitigating, there is no impervious area. Use C = 0.30.

Area E9 is a portion Area E3 on the south side of the driveway. For this portion, which is self-mitigating, there is no impervious area. Use C = 0.30.

Area E10 consists of a portion which is redefined due to grading for the single family residence. For this portion, which is self-mitigating, there is no impervious area. Use C = 0.30.

Area E11 consists of a portion which is redefined due to grading for the single family residence. For this portion, which is self-mitigating, there is no impervious area. Use C = 0.30.

Area E12 consists of a portion which is redefined due to grading for the single family residence. For this portion, which is self-mitigating, there is no impervious area. Use C = 0.30.

Area E13 is a portion which is graded for the single family residential pad and includes a portion of the roof. This area provides for proper design of area drain for the graded pad. For this portion, impervious area is 3863.690 sf or 29%. Use C = 0.47.

Area E14 is a portion which is due to grading the single family residential pad and includes a portion of the roof. This area provides for proper design of area drain for the graded pad. For this portion, impervious area is 1147.689 sf or 26%. Use C = 0.46.

Area E15 is a portion on the north side of the driveway and a portion of the roof. For this portion, impervious area is 15127.611 sf or 44%. Use C = 0.56.

Area E16 is a portion on the south side of the driveway. For this portion, impervious area is 11133.418 sf or 49%. Use C = 0.59.

Area E17 is a portion on the north side of the driveway. For this portion, impervious area is 6614.580 sf or 62%. Use C = 0.62.

Area E18 is a portion on the south side of the driveway. For this portion, impervious area is 6758.351 sf or 68%. Use C = 0.71.

Area E19 is an onsite drainage area that sheet drains southerly over the south boundary. There is no POC for this area. As there has been no development use C = 0.30.

Area E20 is an onsite drainage area and in which the stormwater sheet flows westerly over a natural slope to a POC along the west boundary of the property. As there has been no development use C = 0.30.

Area E21 is an onsite drainage area and in which the stormwater sheet flows westerly over a natural slope to a POC along the west boundary of the property. As there has been no development use C = 0.30.

Area E22 is a small portion onsite that sheet flows southerly over and from the project. There is no POC for this area.

EXISTING CONDITION HYDROLOGY (continued)

Area E23 is a portion of existing Jamul Highlands Road and a portion of the property on the east side of Jamul Highlands Road. The stormwater does not flow into the proposed project. The developed street intercepts the flow and carries the stormwater southerly away from the site in the existing street gutters. For this portion use C = 0.61.

METHODOLOGY (continued)

POST- DEVELOPMENT HYDROLOGY

The project site drainage area is approximately 19.418 acres.

The project proposes new grading or disturbance for three residential pads

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The project does not propose any grading or additional disturbance of any of the remaining Areas (includes paved portion of Jamul Highlands Road.) Continue to use C's per existing descriptions.

The calculations for, the 3.373 acre drainage area that is graded or disturbed is divided into 3 separate basins (See Drainage Map (Proposed)) each described as follows:

Area P1 is grading and construction for a single family residence in Parcel 2. It includes portions of Area E10, Area E11, Area E12, and Area E5. Residual portions of the Areas are labeled E10R, E11R, E12R and E5R. Parcel 2 creates an estimated 9500 sf of impervious area or 9500/29893.212 = 30%. The C value due to increased impervious area increases from 0.30 to 0.48.

Area P2 is grading and construction for a single family residence in Parcel 3. It includes portions of Area E3 and Area E4. The residual portions of the Areas are labeled E3R and E4R. Parcel 3 creates an estimated 6000 sf of impervious area or 6000/ 9794.389 = 61%. The C value due to increased impervious area increases from 0.36 to 0.67.

Area P3 is grading and construction for a single family residence in Parcel 4. It includes portions of Area E7and Area E8. Residual portions of the Areas are labeled E7Rand E8R. Parcel 4 creates an estimated 3600 sf of impervious area or 3600/ 6942.815 = 52%. The C value due to increased impervious area increases from 0.30 to 0.61.

For this project Lm = 85 and Ti = 10.0 from Table 3-2. For conservative design typically used Tc of 5 min. and just oversized facilities.

HYDROLOGY CALCULATIONS

Area < 0.5 square miles. Use Rational Formula $Q_{100} = CIA$

ϕ = N32°43′37″

λ = W116°50′40″

From Hydrology Manual Soils Map - Soils Group C

Undisturbed Natural (Existing)	C = 0.30
Low Density Residential (LDR) (Proposed)	C = 0.36

From INTENSITY-DURATION DESIGN CHART I_{100} = 8.69 in/hr.
I_2 = 3.95 in/hr.

From Existing Drainage Map

Area E1 = 0.142 acres
Area E2 = 7.262 acres
Area E3 = 2.142 acres
Area E4 = 2.037 acres
Area E5 = 1.375 acres
Area E6 = 0.042 acres
Area E7 = 0.550 acres
Area E8 = 0.794 acres
Area E9 = 0.699 acres
Area E10 = 0.245 acres
Area E11 = 0.134 acres
Area E12 = 0.437 acres
Area E13 = 0.303 acres
Area E14 = 0.103 acres
Area E15 = 0.796 acres
Area E16 = 0.517 acres
Area E17 = 0.245 acres
Area E18 = 0.228 acres
Area E19 = 0.357 acres
Area E20 = 0.535 acres
Area E21 = 0.123 acres
Area E22 = 0.026 acres
Area E23 = 0.094 acres
19.418 acres

HYDROLOGY CALCULATIONS (CONTINUED)

Area E1:	Q_{100} = CIA = (0.61)(8.69)(0.142) = 0.75 cfs
Area E2:	Q_{100} = CIA = (0.36)(8.69)(7.262) = 22.72 cfs
Area E3:	Q_{100} = CIA = (0.36)(8.69)(2.142) = 6.70 cfs
Area E4:	Q_{100} = CIA = (0.30)(8.69)(2.037) = 5.31 cfs
Area E5:	Q_{100} = CIA = (0.30)(8.69)(1.375) = 3.58 cfs
Area E6:	Q_{100} = CIA = (0.30)(8.69)(0.042) = 0.11 cfs
Area E7:	Q_{100} = CIA = (0.36)(8.69)(0.550) = 1.72 cfs
Area E8:	Q_{100} = CIA = (0.30)(8.69)(0.794) = 2.07 cfs
Area E9:	Q_{100} = CIA = (0.30)(8.69)(0.699) = 1.82 cfs
Area E10:	Q_{100} = CIA = (0.30)(8.69)(0.245) = 0.64 cfs
Area E11:	Q_{100} = CIA = (0.30)(8.69)(0.134) = 0.35 cfs
Area E12:	Q_{100} = CIA = (0.30)(8.69)(0.437) = 1.14 cfs
Area E13:	Q_{100} = CIA = (0.47)(8.69)(0.303) = 1.24 cfs
Area E14:	Q_{100} = CIA = (0.46)(8.69)(0.103) = 0.41 cfs
Area E15:	Q_{100} = CIA = (0.56)(8.69)(0.796) = 3.87 cfs
Area E16:	Q_{100} = CIA = (0.59)(8.69)(0.517) = 2.65 cfs
Area E17:	Q_{100} = CIA = (0.62)(8.69)(0.245) = 1.32 cfs
Area E18:	Q_{100} = CIA = (0.71)(8.69)(0.228) = 1.41 cfs
Area E19:	Q_{100} = CIA = (0.30)(8.69)(0.357) = 0.93 cfs
Area E20:	Q_{100} = CIA = (0.30)(8.69)(0.535) = 1.39 cfs
Area E21:	Q_{100} = CIA = (0.30)(8.69)(0.354) = 0.92 cfs
Area E22:	Q_{100} = CIA = (0.30)(8.69)(0.026) = 0.07 cfs
Area E23:	Q_{100} = CIA = (0.61)(8.69)(0.094) = 0.50 cfs
	61.62 cfs

HYDROLOGY CALCULATIONS (CONTINUED)

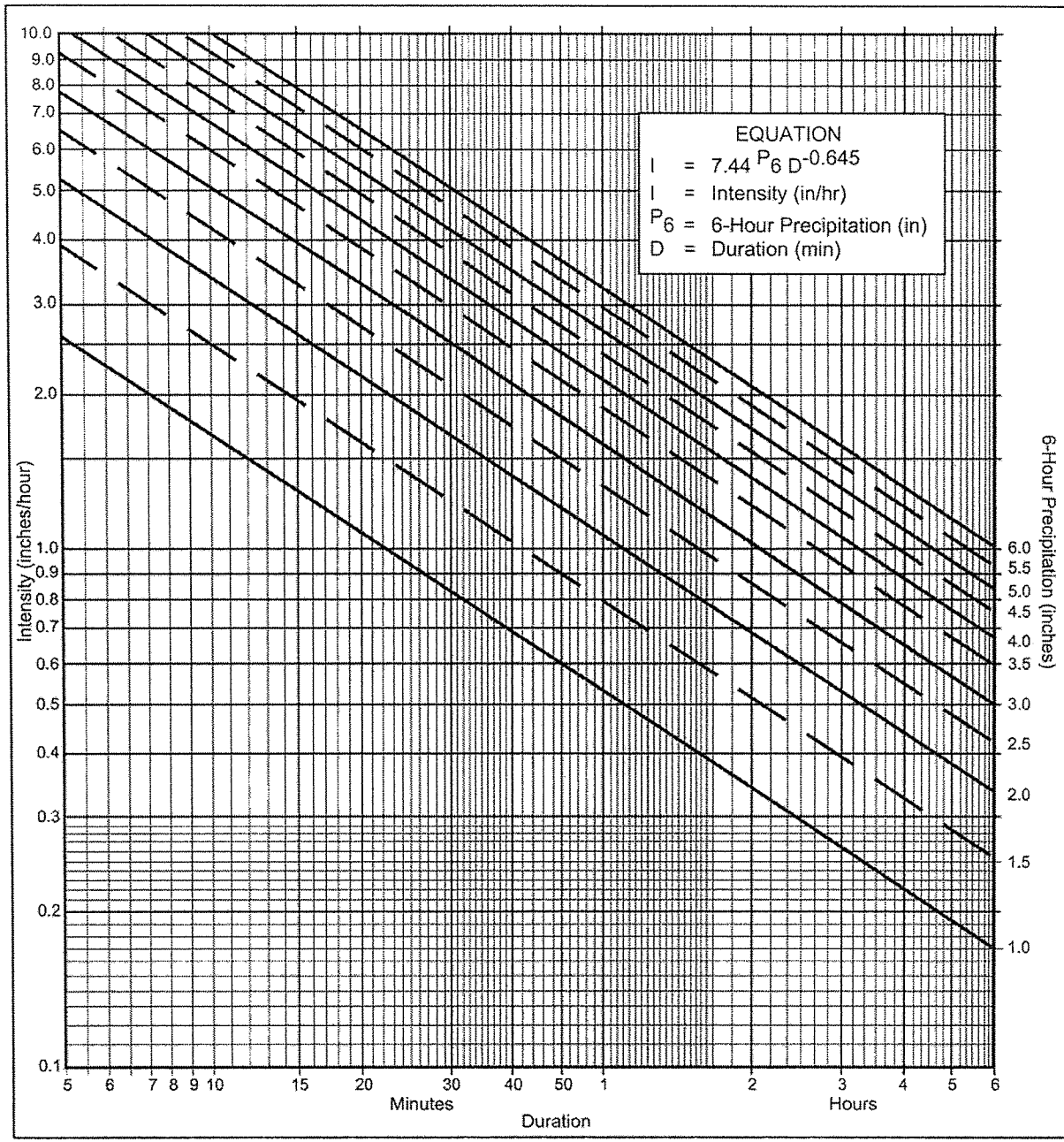
Area E1:	$Q_2 = CIA = (0.61)(3.95)(0.142) =$	0.34 cfs
Area E2:	$Q_2 = CIA = (0.36)(3.95)(7.262) =$	18.33 cfs
Area E3:	$Q_2 = CIA = (0.36)(3.95)(2.142) =$	3.05 cfs
Area E4:	$Q_2 = CIA = (0.30)(3.95)(2.037) =$	2.41 cfs
Area E5:	$Q_2 = CIA = (0.30)(3.95)(1.375) =$	1.63 cfs
Area E6:	$Q_2 = CIA = (0.30)(3.95)(0.042) =$	0.05 cfs
Area E7:	$Q_2 = CIA = (0.36)(3.95)(0.550) =$	0.78 cfs
Area E8:	$Q_2 = CIA = (0.30)(3.95)(0.794) =$	0.94 cfs
Area E9:	$Q_2 = CIA = (0.30)(3.95)(0.699) =$	0.83 cfs
Area E10:	$Q_2 = CIA = (0.30)(3.95)(0.245) =$	0.29 cfs
Area E11:	$Q_2 = CIA = (0.30)(3.95)(0.134) =$	0.16 cfs
Area E12:	$Q_2 = CIA = (0.30)(3.95)(0.437) =$	0.52 cfs
Area E13:	$Q_2 = CIA = (0.47)(3.95)(0.303) =$	0.56 cfs
Area E14:	$Q_2 = CIA = (0.46)(3.95)(0.103) =$	0.19 cfs
Area E15:	$Q_2 = CIA = (0.56)(3.95)(0.796) =$	1.76 cfs
Area E16:	$Q_2 = CIA = (0.59)(3.95)(0.517) =$	1.20 cfs
Area E17:	$Q_2 = CIA = (0.62)(3.95)(0.245) =$	0.60 cfs
Area E18:	$Q_2 = CIA = (0.71)(3.95)(0.228) =$	0.64 cfs
Area E19:	$Q_2 = CIA = (0.30)(3.95)(0.357) =$	0.51 cfs
Area E20:	$Q_2 = CIA = (0.30)(3.95)(0.535) =$	0.76 cfs
Area E21:	$Q_2 = CIA = (0.30)(3.95)(0.354) =$	0.50 cfs
Area E22:	$Q_2 = CIA = (0.30)(3.95)(0.026) =$	0.04 cfs
Area E23:	$Q_2 = CIA = (0.61)(3.95)(0.094) =$	0.23 cfs
		36.32 cfs

HYDROLOGY CALCULATIONS (CONTINUED)

Post-Construction

Area P1:	Q_{100} = CIA = (0.48)(8.69)(0.686) =	2.86 cfs
Area E10R:	Q_{100} = CIA = (0.30)(8.69)(0.151) =	0.39 cfs
Area E11R:	Q_{100} = CIA = (0.30)(8.69)(0.048) =	0.13 cfs
Area E12R:	Q_{100} = CIA = (0.30)(8.69)(0.079) =	0.21 cfs
Area E5R:	Q_{100} = CIA = (0.30)(8.69)(1.226) =	3.20 cfs
Area P2:	Q_{100} = CIA = (0.67)(8.69)(0.225) =	1.31 cfs
Area E3R:	Q_{100} = CIA = (0.30)(8.69)(1.935) =	5.04 cfs
Area E4R:	Q_{100} = CIA = (0.30)(8.69)(2.034) =	5.30 cfs
Area P3:	Q_{100} = CIA = (0.61)(8.69)(0.159) =	0.84 cfs
Area E7R:	Q_{100} = CIA = (0.30)(8.69)(0.531) =	1.38 cfs
Area E8R:	Q_{100} = CIA = (0.30)(8.69)(0.654) =	1.70cfs
		22.36 cfs

Area P1:	Q_2 = CIA = (0.48)(3.95)(0.686) =	1.30 cfs
Area E10R:	Q_2 = CIA = (0.30)(3.95)(0.151) =	0.18 cfs
Area E11R:	Q_2 = CIA = (0.30)(3.95)(0.048) =	0.06 cfs
Area E12R:	Q_2 = CIA = (0.30)(3.95)(0.079) =	0.09 cfs
Area E5R:	Q_2 = CIA = (0.30)(3.95)(1.226) =	1.45 cfs
Area P2:	Q_2 = CIA = (0.67)(3.95)(0.225) =	0.60 cfs
Area E3R:	Q_2 = CIA = (0.30)(3.95)(1.935) =	2.29 cfs
Area E4R:	Q_2 = CIA = (0.30)(3.95)(2.034) =	2.41 cfs
Area P3:	Q_2 = CIA = (0.61)(3.95)(0.159) =	0.38 cfs
Area E7R:	Q_2 = CIA = (0.30)(3.95)(0.531) =	0.63 cfs
Area E8R:	Q_2 = CIA = (0.30)(3.95)(0.654) =	0.77 cfs
		10.16 cfs



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 = 3.3 in., P_{24} = 7.1 , $\frac{P_6}{P_{24}}$ = 46 %(2)

(c) Adjusted P_6(2) = 3.3 in.

(d) t_x = 5 min.

(e) I = 8.69 in./hr. Calculated by formula

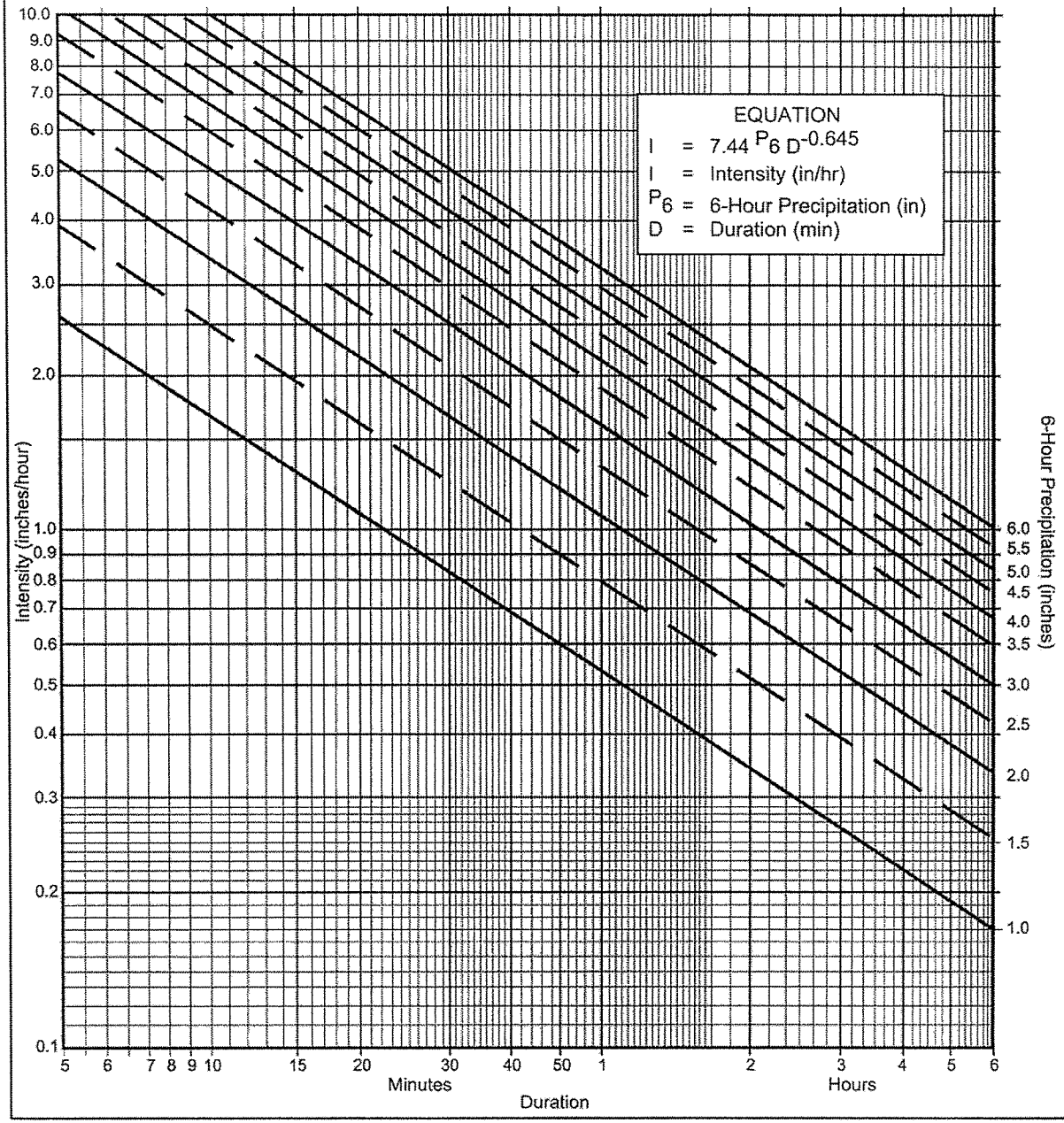
Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

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



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 2 year

(b) P_6 = 1.5 in., P_{24} = 2.5, $\frac{P_6}{P_{24}}$ = 60 %(2)

(c) Adjusted P_6(2) = 1.5 in.

(d) t_x = 5 min.

(e) I = 3.95 in./hr. Calculated by formula

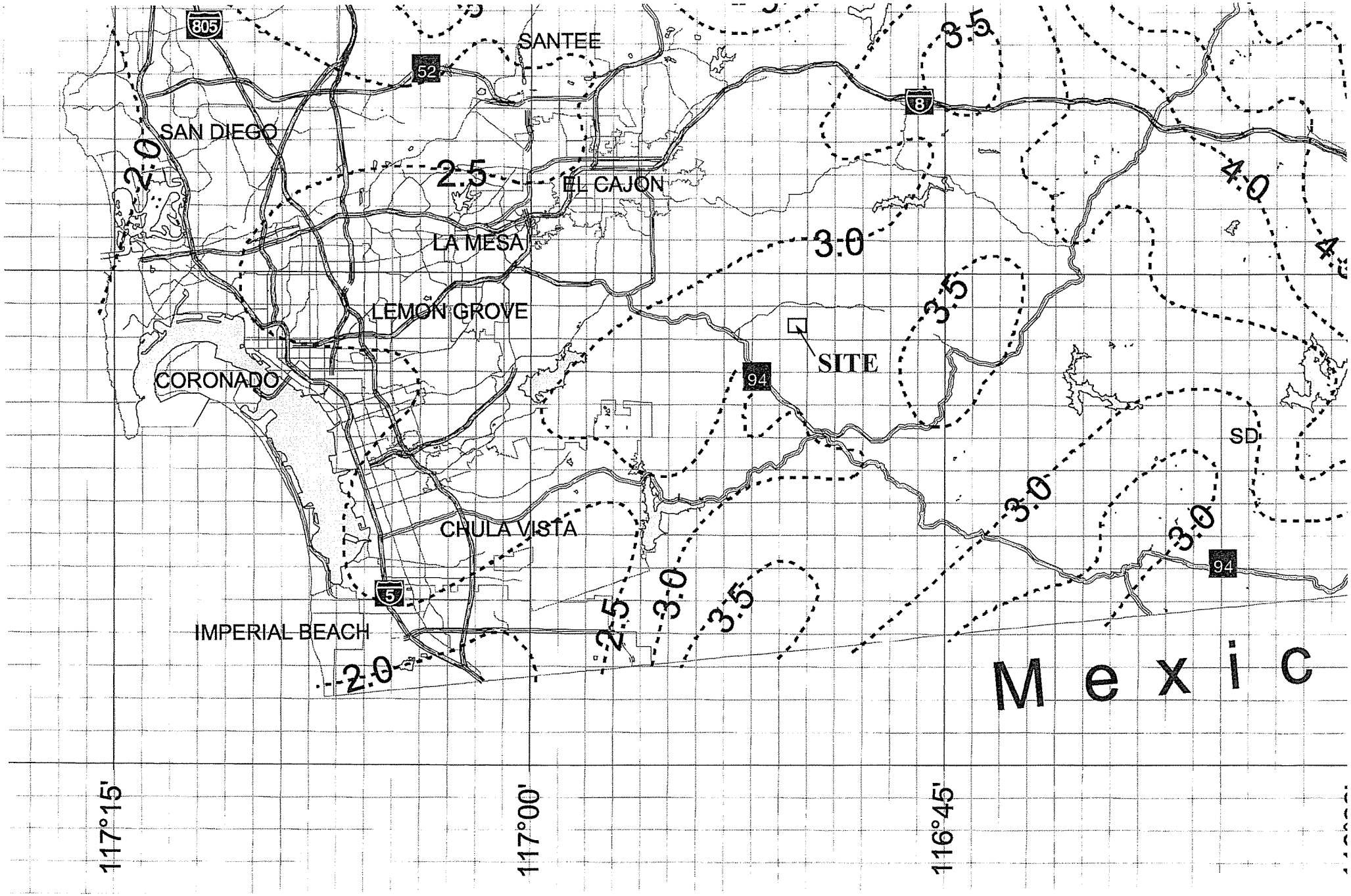
Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

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

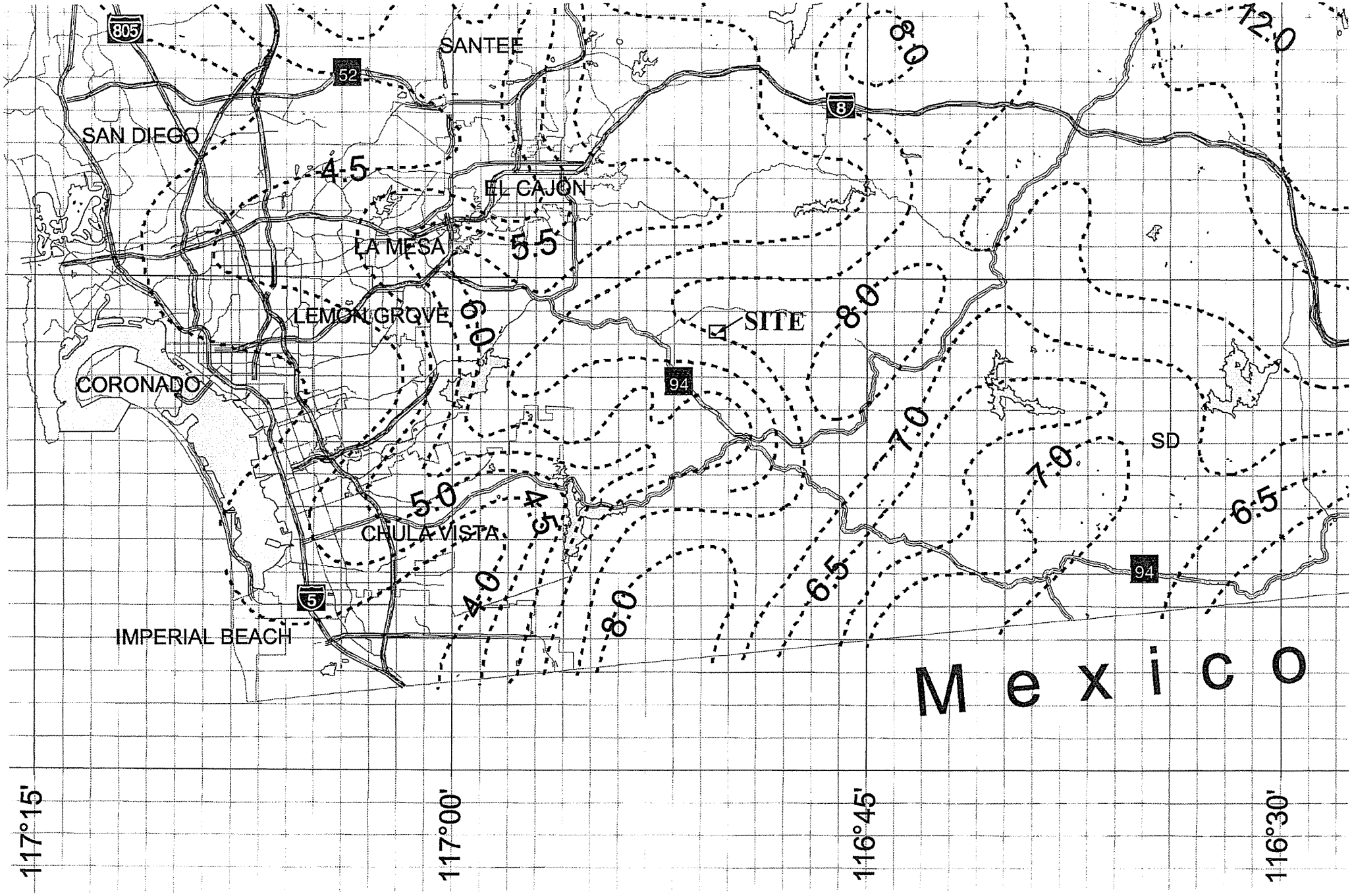
Intensity-Duration Design Chart - Template

FIGURE

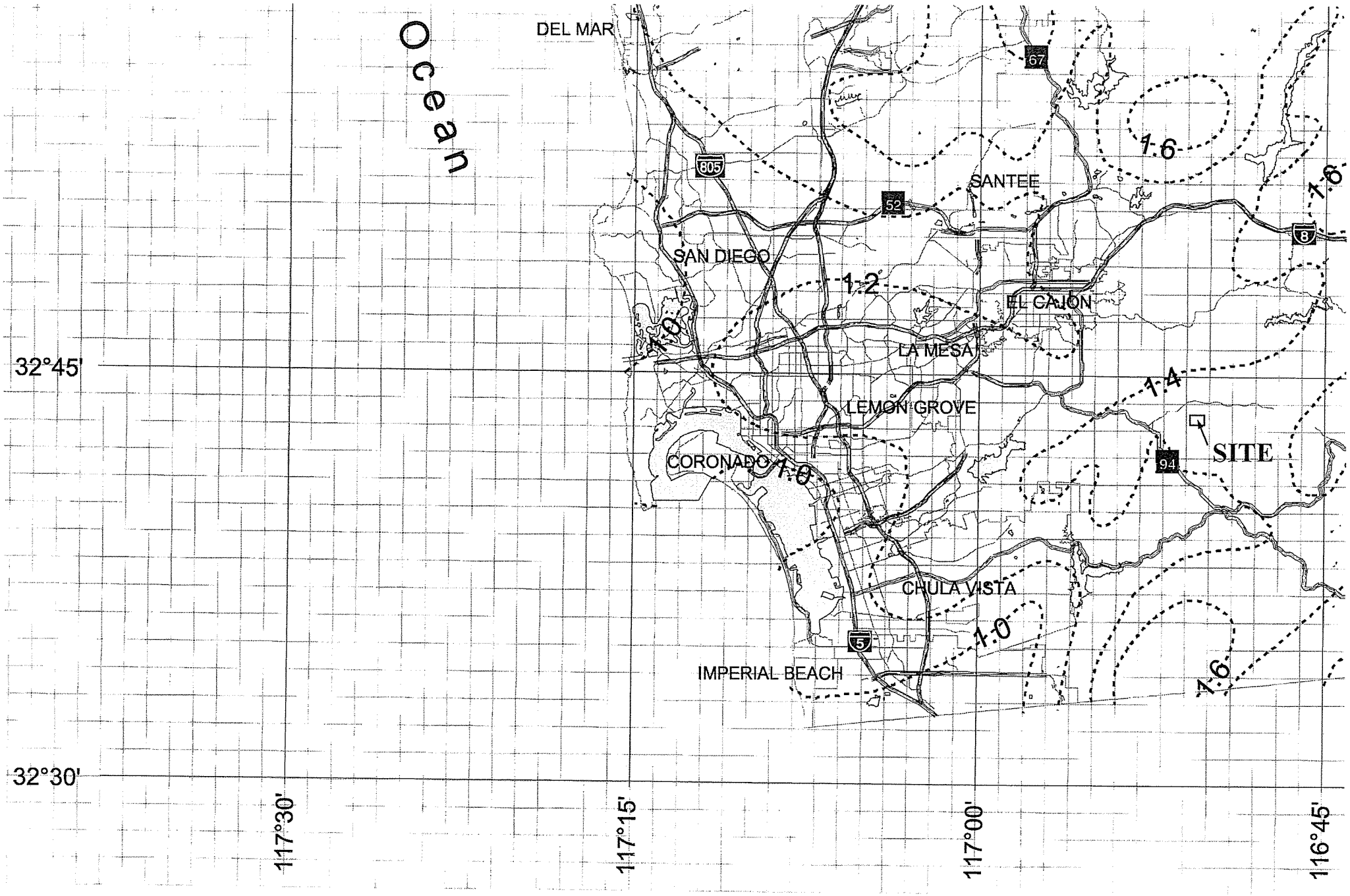
3-1



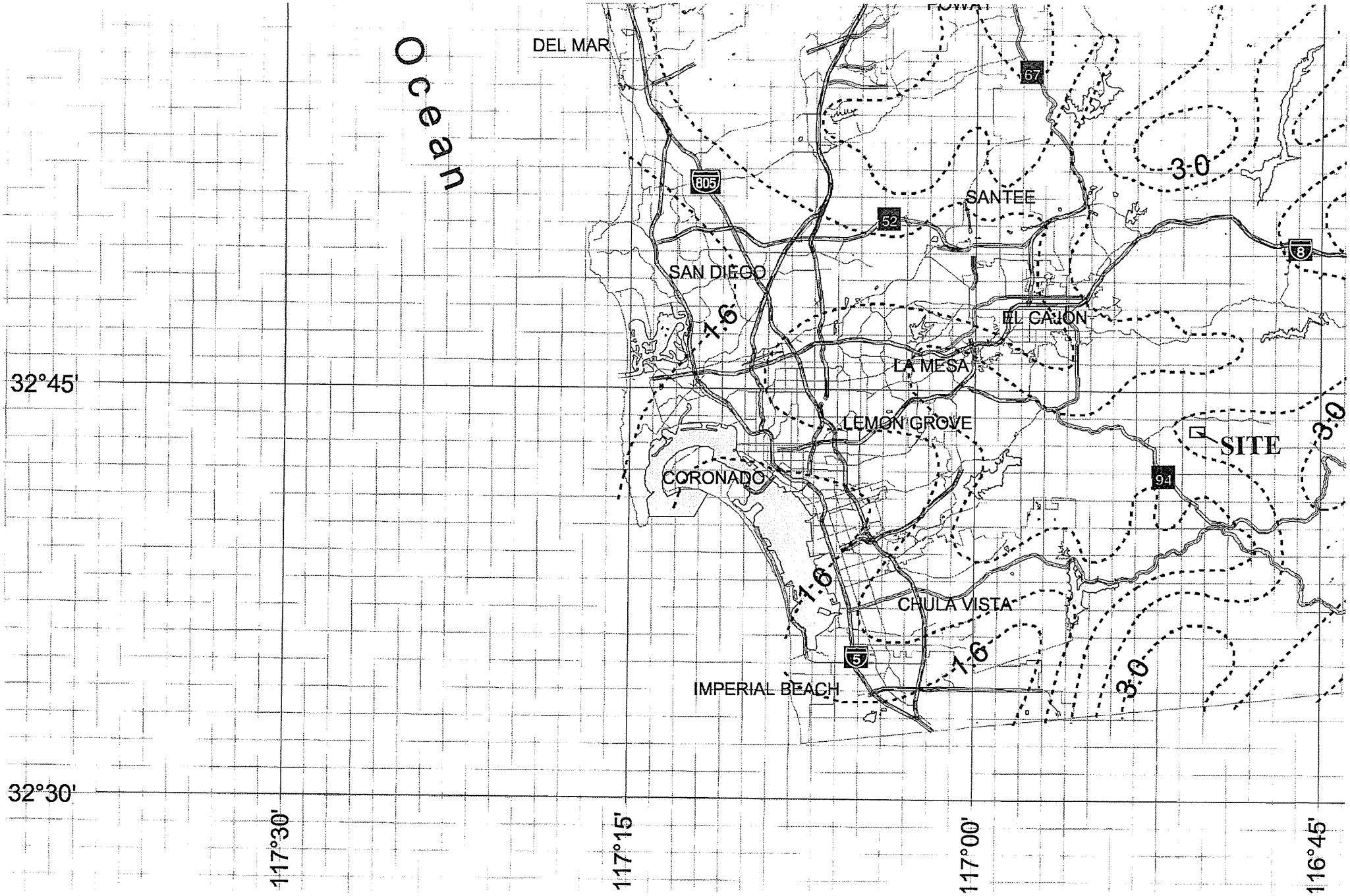
100-year 6-hour



100-year 24-hour


Ocean
DEL MAR
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
CHULA VISTA
IMPERIAL BEACH
SITE
1.6
1.8
1.2
1.0
1.4
1.8
1.0
1.0
1.6
805
52
67
8
94
5
32°45'
32°30'
117°30'
117°15'
117°00'
116°45'

2 -year 6-hour

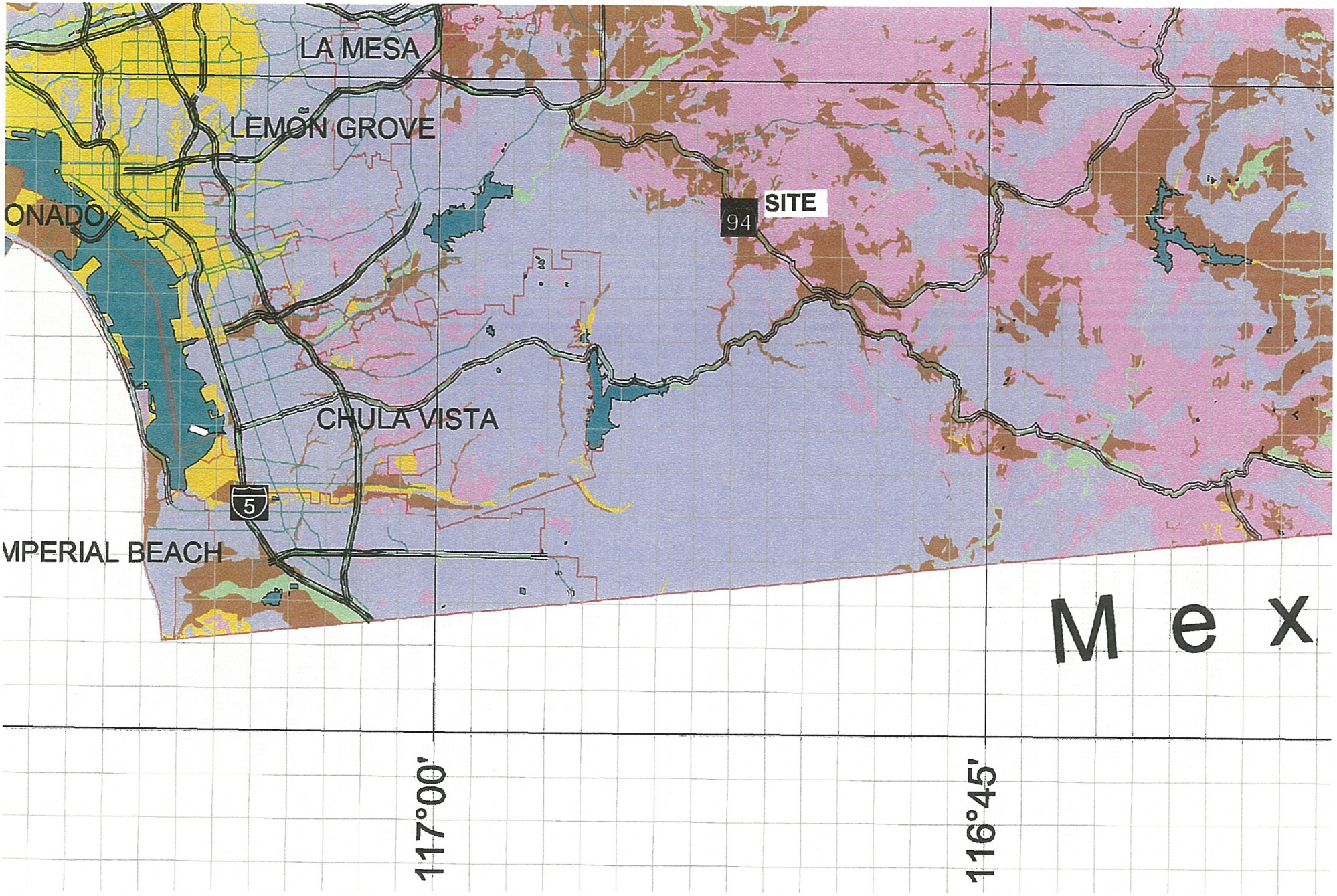


2-year 24-hour

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 51.8	0.66	0.67	0.69 0.61	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



COUNTY SOILS MAP

HYDROLOGY CALCULATIONS SUMMARY

EXPECTED RUNOFF DISCHARGES

Basin	C		Tc		A (acres)	
	Pre	Post	Pre	Post	Pre	Post
POC#1	0.30	0.30	5 min.	5 min.	1. 375	1.226
POC#2	0.30	0.30	5 min.	5 min.	0.437	0.079
POC#3	0.30	0.30	5 min.	5 min.	0.134	0.048
POC#4	0.30	0.30	5 min.	5 min.	0.245	0.151
POC#5	0.30	0.30	5 min.	5 min.	14.589	14.231

EXPECTED RUNOFF DISCHARGES

Basin	V_{100} (fps)		Q_{100} Unmitigated with pads (cfs)		Q_{100} Mitigated without pads (cfs)	
	Pre	Post	Pre	Post	Pre	Post
POC#1	1.52	2.99	3.58	4.65	3.58	3.20
POC#2	1.04	2.03	1.14	1.48	1.14	0.21
POC#3	0.52	1.64	0.35	0.46	0.35	0.13
POC#4	1.36	2.35	0.64	0.75	0.64	0.39
POC#5	4.47	4.84	46.71	50.69	46.71	44.39

Basin	C		Tc		A (acres)	
	Pre	Post	Pre	Post	Pre	Post
P1	0.30	0.48	5 min.	5 min.	0.686	0.686
P2	0.30	0.64	5 min.	5 min.	0.245	0.245
P3	0.30	0.77	5 min.	5 min.	0.113	0.113
Total	N/A	N/A	N/A	N/A	1.044	1.373

Basin	V_{100} (fps)		Q_{100} unmitigated (cfs)	
	Pre	Post	Pre	Post
P1	1.52	2.99	2.42	2.86
P2	4.47	4.84	0.64	1.36
P3	1.66	3.10	0.29	0.76
Total	N/A	N/A	3.35	3.98

TREE WELL STORAGE CALCULATION

Freeboard storage/foot (above soil) = 11.25 ft x 11.25 ft x 1ft = 127 cf/ft tree well
Freeboard storage/foot (above soil) = 20 ft x 20 ft x 1ft = 400 cf/ft canopy

Parcel Storage Requirement

	Parcel 2	Parcel 3	Parcel 4
Area	0.686	0.225	0.159
Q_{pre}	2.42	0.59	0.41
Q_{post}	2.86	1.31	0.84
Q_{post}- Q_{pre}	0.44	0.72	0.43
C_{post}	0.48	0.67	0.61
I_{req} = Q_{pre}/Area/C_{post}	= 7.35	= 3.91	= 4.23
From Figure 3-1			
T_c required min.	= 6.5 min.	= 17.3 min	= 15.3 min.
#Tree Wells	6	4	2
Area 11.25' x 11.25'	762 sf	508 sf	254 sf
Area 20' x 20'	2400 sf	1600 sf	800 sf
$Storage_{req}$ = Tc x 60 x Q_{post}	= 1115.4 cf	= 1359.8 cf	= 771.1 cf
$Storage_{req}$/Tree Well	= 185.9 cf	= 340.0 cf	= 385.6 cf
Minimum depth Tree Well	= 1.46 ft	= 2.68 ft	= 3.34 ft
Minimum depth Canopy	= 0.46 ft	= 0.85 ft	= 0.96 ft

Use Tree Well Depth of 1.00 feet
For all Tree Wells

HYDRAULIC CALCULATIONS

Area Drain 12"X12" private

A = Q/2 (sump condition)
Q = 2A = 2.00 cfs
Area: P13, P14
Q = 1.24 cfs, 0.41 cfs
Capacity Area Drain = 2.00 cfs > 1.24 cfs, 0.41 cfs area drains OK!

Circular Pipes

Area: E2
Q = 22.72 cfs
18" PVC @ 4.33%
d = 18"
Slope = .0433
n = 0.012
A = 1.767 s.f.
R= 0.375
Wetted perimeter (full) = 4.712'
Calculated capacity Q_{100} = 23.74 cfs > 22.72 cfs OK!
y = 1.17 A = 1.485 P = 3.260
V = Q/A =22.72/1.485 = 15.3 fps

Area: E3R
Q = 4.95 cfs
18" PVC @ 9.54%
d = 18"
Slope = .0954
n = 0.012
A = 1.767 s.f.
R= 0.375
Wetted perimeter (full) = 4.712'
Calculated capacity Q_{100} = 35.24 cfs > 4.95 cfs OK!
y = 0.41 A = 0.352 P = 1.582
V = Q/A = 6.70/0.616 = 10.9 fps

Area: E4, E13, E14
Q = 6.96 cfs
Q_{Allow} = 4.55 cfs
12" PVC @ 1.0%
d = 12"
Slope = .01
n = 0.012
A = 0.785 s.f.
R= 0.250
Wetted perimeter (full) = 3.142'
Calculated capacity Q_{100} = 3.87 cfs < 4.55 cfs OK!
y = 0.57 A = 0.616 R = 1.993
V = Q/A = 3.87/0.616 = 6.28 fps

HYDRAULIC CALCULATIONS (CONTINUED)

RIP-RAP per Standard Specifications for Public Works (Green Book)

Area: E2
Q = 22.72 cfs
18" PVC @ 4.33%
y = 1.17 A = 1.485 P = 3.260
V = Q/A =22.72/1.485 = 15.3 fps
Rock Class: 1 Ton
Thickness: 4.3
Upper Layer Filter Blanket: 1-1/2"
Lower Layer Filter Blanket: Sand

Area: E3
Q = 6.70 cfs
18" PVC @ 9.54%
y = 0.57 A = 0.616 P = 1.993
V = Q/A = 6.70/0.616 = 10.9 fps
Rock Class: 1/4 Ton
Thickness: 2.7
Upper Layer Filter Blanket: 3/4"
Lower Layer Filter Blanket: Sand

Area: E4, E13, E14
Q = 3.87 cfs full flow
12" PVC @ 1.00%
y = 1.00 A = 0.785 P = 3.142
V = Q/A =3.87/0.785 = 4.93 fps
Rock Class: 1/4 Ton
Thickness: 2.7
Upper Layer Filter Blanket: 3/4"
Lower Layer Filter Blanket: Sand

CONCLUSION

1. The proposed project does not substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river. No flooding will occur due to development on- or off-site.

2. With no reduction in Time of Concentration, the peak Q is increased from 1.14 cfs to 2.24 cfs, or 1.10 cfs in Parcel 2, from 6.70 cfs to 7.26 cfs, or 0.56 cfs in Parcel 3, and from 2.07 cfs to 2.56 cfs, or 0.49 cfs in Parcel 4. Changes to POCs are tabulated below. The use of tree wells mitigates runoff from pads and yields less runoff at POCs post-construction compared to pre-construction. See tabulation of POCs below.

3. There are thirty-five (35) existing tree wells that have been provided to address WQ/HMP requirements (See SWQMP). An additional eleven (11) are proposed for the three new Parcels to mitigate new roofs, driveways and impervious areas. They will mitigate any increases in runoff due to development of the project.

4. The proposed project would not place housing or structures within a 100-year hazard (See Firmette in Attachments), or expose people or structures to significant risk of loss, injury or death involving flooding.

5. The proposed project does not substantially alter the existing drainage pattern of the site and with the onsite mitigation of flow increases due to new impervious area no substantial erosion or siltation on-site or off-site is anticipated.

6. The proposed project does not substantially alter the existing drainage pattern of the site and with the onsite mitigation of flow increases due to new impervious area no on-site or off-site flooding is anticipated.

7. The proposed project does not create or contribute runoff water which would exceed the capacity of the existing or planned storm water drainage systems. The impervious roadway was mitigated with the original grading for Parcel 1 and proposed mitigation is added for smaller areas of Parcels 2, 3 and 4.

8. The proposed project does not propose any levees or dams with a potential for failing and not therefore expose people or structures to a significant risk of loss, injury or death involving flooding.

CONCLUSION (continued)

9. Hydrology Report Summary:

EXPECTED RUNOFF DISCHARGES @ 5 minutes (with mitigation)

Outlet	Tributary Area (Acres)		Q100 Peak Discharge (cfs)		Q2 Peak Discharge (cfs)	
	Pre	Post	Pre	Post	Pre	Post
Jamul Highlands Road	0.144	0.142	0.76	0.75	0.35	0.34
POC#1	1. 375	1.226	3.58	3.20	1.63	1.45
POC#2	0.437	0.079	1.14	0.21	0.52	0.10
POC#3	0.134	0.048	0.35	0.13	0.16	0.06
POC#4	0.245	0.151	0.64	0.39	0.29	0.18
POC#5	14.589	14.231	46.71	44.00	21.23	20.00

Outlets shown are based on changes per development of the project site.
Stormwater runoff was calculated using the Rational Method as outlined in the San Diego County Hydrology Manual, dated June 2003. Stormwater runoff was calculated for an existing and post-development condition resulting from the 100-year, 6-hour storm event for the project and its drainage area. Standard intensity-duration curve data was used for the San Diego region supplied in the Manual.
*POC#1 is the only one which requires mitigation to reduce Post to below Pre. See conclusion no. 2 above.

CERTIFICTION

Report Preparation

I certify that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is true, accurate, and complete.

CIVIL ENGINEER

Lawrence E. Cole, RCE 36292	April 03, 2019 Date

REFERENCES

1. County of San Diego Department of Public Works Flood Control Section, *San Diego County Hydrology Manual* dated June 2003.

2. County of San Diego *Stormwater Standards Manual*.

DECLARATION OF RESPONSIBLE CHARGE

I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE, AND THAT THE DESIGN IS CONSISTANT WITH CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY COUNTY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

April 03, 2019

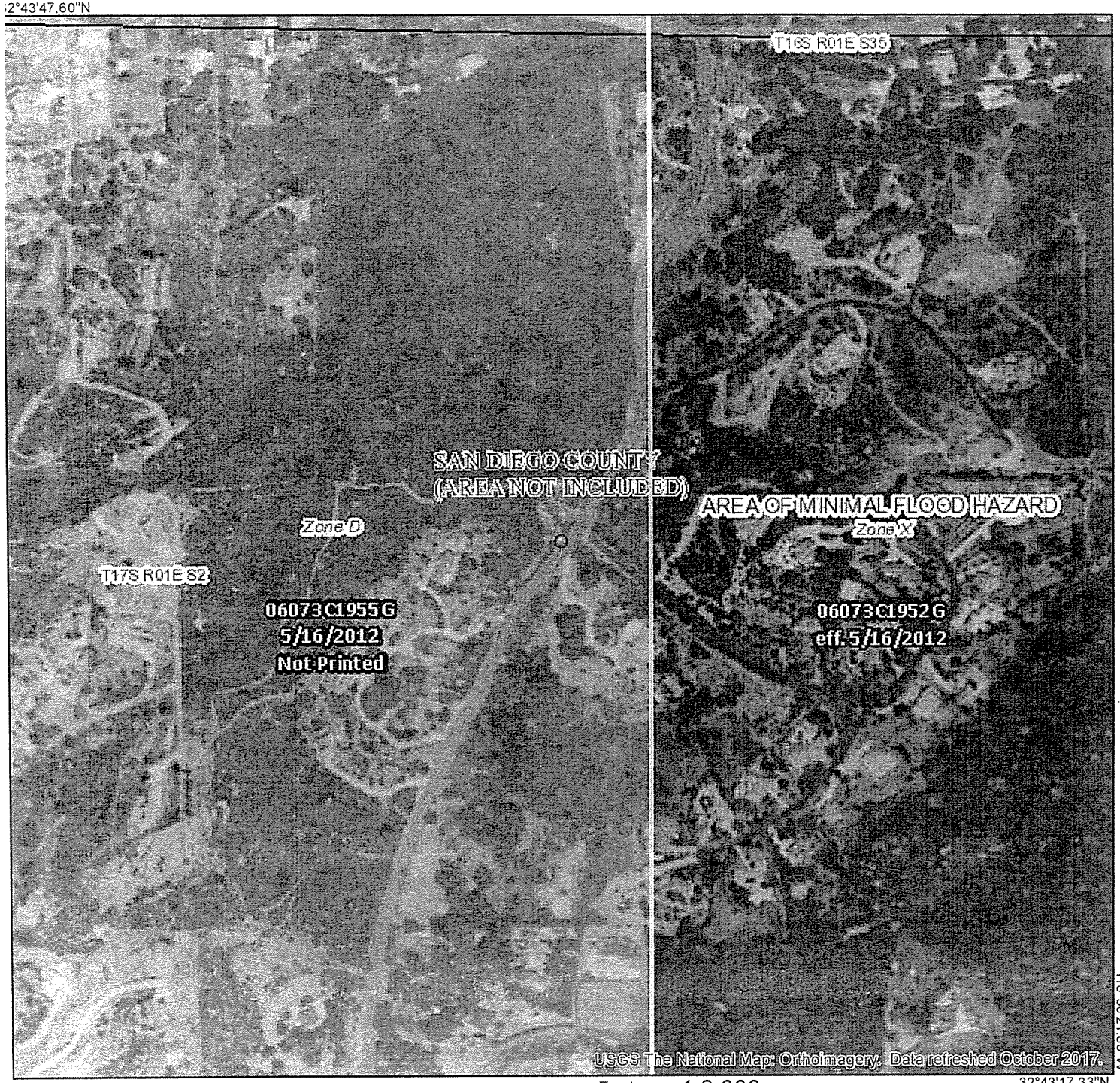
Lawrence E. Cole, RCE 36292 — Date

EXP. 06/30/20

National Flood Hazard Layer FIRMette

FEMA

32°43'47.60"N



116°50'21.80"W

32°43'17.33"N

Feet 1:6,000

0 250 500 1,000 1,500 2,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD

- 0.2% Annual Chance Flood Hazard, Area of 1% annual chance flood with average depth less than one foot or with drainag areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS

- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone*

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES

- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS

- Digital Data Available
- No Digital Data Available
- Unmapped

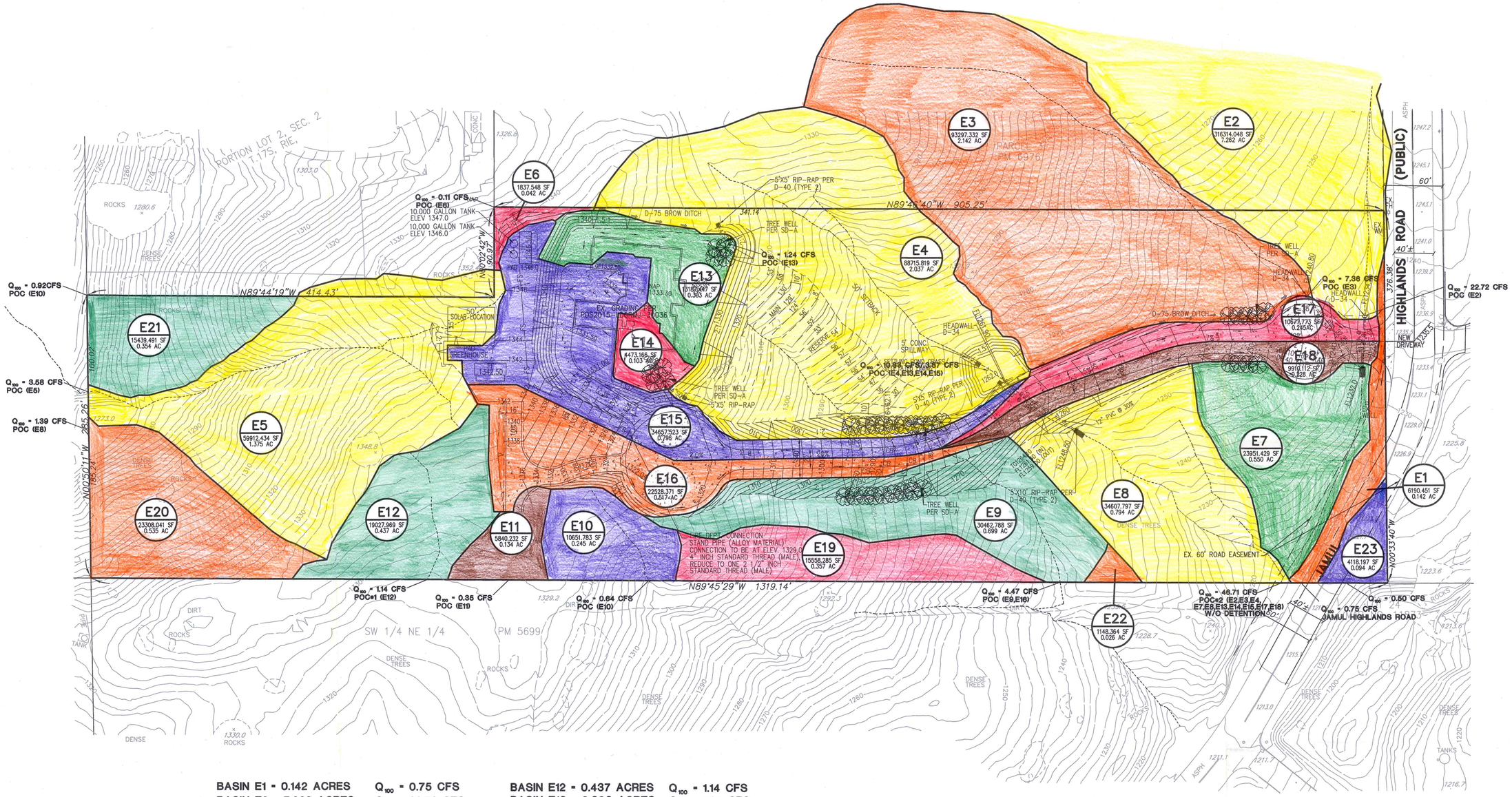
N

The pin displayed on the map is an approximate point selected by the user and does not represe an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 10/8/2018 at 3:05:07 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



BASIN E1 = 0.142 ACRES	Q_{100} = 0.75 CFS	BASIN E12 = 0.437 ACRES	Q_{100} = 1.14 CFS
BASIN E2 = 7.262 ACRES	Q_{100} = 22.72 CFS	BASIN E13 = 0.303 ACRES	Q_{100} = 1.24 CFS
BASIN E3 = 2.142 ACRES	Q_{100} = 6.70 CFS	BASIN E14 = 0.103 ACRES	Q_{100} = 0.41 CFS
BASIN E4 = 2.037 ACRES	Q_{100} = 5.31 CFS	BASIN E15 = 0.796 ACRES	Q_{100} = 3.87 CFS
BASIN E5 = 1.375 ACRES	Q_{100} = 3.58 CFS	BASIN E16 = 0.517 ACRES	Q_{100} = 2.65 CFS
BASIN E6 = 0.042 ACRES	Q_{100} = 0.11 CFS	BASIN E17 = 0.245 ACRES	Q_{100} = 1.32 CFS
BASIN E7 = 0.550 ACRES	Q_{100} = 1.72 CFS	BASIN E18 = 0.228 ACRES	Q_{100} = 1.41 CFS
BASIN E8 = 0.794 ACRES	Q_{100} = 2.07 CFS	BASIN E19 = 0.357 ACRES	Q_{100} = 0.93 CFS
BASIN E9 = 0.669 ACRES	Q_{100} = 1.82 CFS	BASIN E20 = 0.535 ACRES	Q_{100} = 1.39 CFS
BASIN E10 = 0.245 ACRES	Q_{100} = 0.64 CFS	BASIN E21 = 0.354 ACRES	Q_{100} = 0.92 CFS
BASIN E11 = 0.134 ACRES	Q_{100} = 0.35 CFS	BASIN E22 = 0.026 ACRES	Q_{100} = 0.07 CFS
		BASIN E23 = 0.094 ACRES	Q_{100} = 0.50 CFS

SCALE 1" = 50'

REGISTERED PROFESSIONAL ENGINEER LAWRENCE E. COLE No. 36292 Exp. 06/30/20 CIVIL STATE OF CALIFORNIA

ASSESSOR'S PARCEL NUMBER:
596-152-04

BENCH MARK
DESCRIPTION: 172ECCS3 PER COUNTY CONTROL DATA SHEET
2" BRASS DISC MARKED 172ECCc83
LOCATION: IN THE CUL-DE-SAC AT THE OF OLE BURN WAY
RECORD FROM: COUNTY CONTROL DATA SHEET
ELEVATION: 1655.69 DATUM: NAVD88

DRAINAGE MAP (EXISTING) FOR:

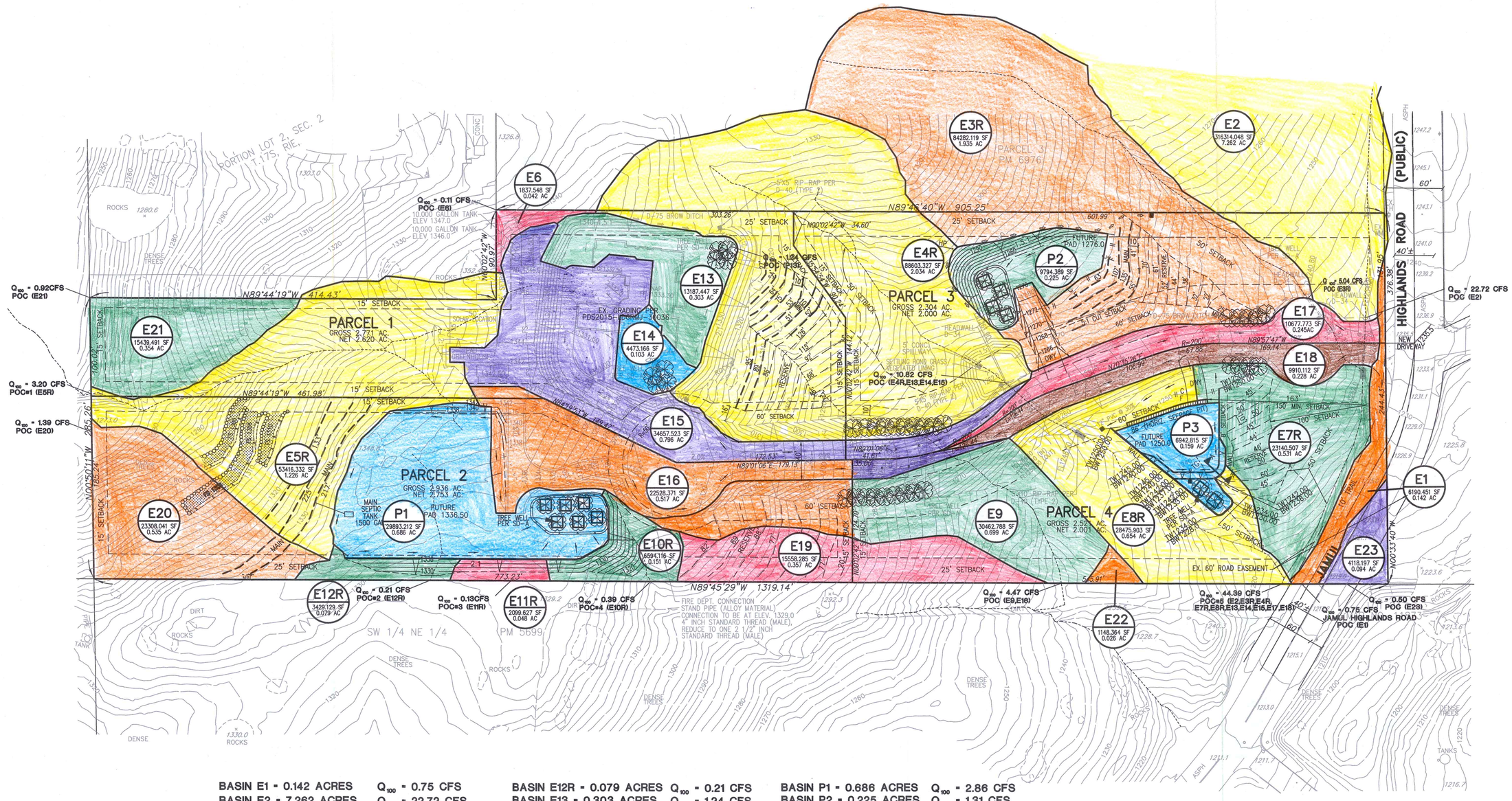
ROETZHEIM PARCEL MAP

PREPARED FOR:
WILLIAM ROETZHEIM
13518 JAMUL DRIVE
JAMUL, CALIFORNIA 91935
PHONE: (619) 917-4917

LANDMARK ENGINEERING CORPORATION
3443 Camino Del Rio South
Suite 204
San Diego, CA 92108
(619) 260-0420

Sht 1 of 1	Date: 10/11/18	Dwn. MC	Apr. LEC	Dwg. No. 2393-DMP-1

FILE NO. 2393



BASIN E1 = 0.142 ACRES Q_{100} = 0.75 CFS
BASIN E2 = 7.262 ACRES Q_{100} = 22.72 CFS
BASIN E3R = 1.935 ACRES Q_{100} = 5.04 CFS
BASIN E4R = 2.034 ACRES Q_{100} = 5.30 CFS
BASIN E5R = 1.226 ACRES Q_{100} = 3.20 CFS
BASIN E6 = 0.042 ACRES Q_{100} = 0.11 CFS
BASIN E7R = 0.531 ACRES Q_{100} = 1.38 CFS
BASIN E8R = 0.654 ACRES Q_{100} = 1.70 CFS
BASIN E9 = 0.669 ACRES Q_{100} = 1.82 CFS
BASIN E10R = 0.151 ACRES Q_{100} = 0.39 CFS
BASIN E11R = 0.048 ACRES Q_{100} = 0.13 CFS

BASIN E12R = 0.079 ACRES Q_{100} = 0.21 CFS
BASIN E13 = 0.303 ACRES Q_{100} = 1.24 CFS
BASIN E14 = 0.103 ACRES Q_{100} = 0.41 CFS
BASIN E15 = 0.796 ACRES Q_{100} = 3.87 CFS
BASIN E16 = 0.517 ACRES Q_{100} = 2.65 CFS
BASIN E17 = 0.245 ACRES Q_{100} = 1.32 CFS
BASIN E18 = 0.228 ACRES Q_{100} = 1.41 CFS
BASIN E19 = 0.357 ACRES Q_{100} = 0.93 CFS
BASIN E20 = 0.535 ACRES Q_{100} = 1.39 CFS
BASIN E21 = 0.354 ACRES Q_{100} = 0.92 CFS
BASIN E22 = 0.026 ACRES Q_{100} = 0.07 CFS
BASIN E23 = 0.094 ACRES Q_{100} = 0.50 CFS

BASIN P1 = 0.686 ACRES Q_{100} = 2.86 CFS
BASIN P2 = 0.225 ACRES Q_{100} = 1.31 CFS
BASIN P3 = 0.159 ACRES Q_{100} = 0.84 CFS

REGISTERED PROFESSIONAL ENGINEER
LAWRENCE E. COLE
No. 36292
Exp. 06/30/20
CIVIL
STATE OF CALIFORNIA

ASSESSOR'S PARCEL NUMBER:
596-152-04

DRAINAGE MAP (PROPOSED) FOR:

ROETZHEIM PARCEL MAP

PREPARED FOR:

WILLIAM ROETZHEIM
13518 JAMUL DRIVE
JAMUL, CALIFORNIA 91935
PHONE: (619) 917-4917

LANDMARK ENGINEERING CORPORATION
3443 Camino Del Rio South
Suite 204
San Diego, CA 92108
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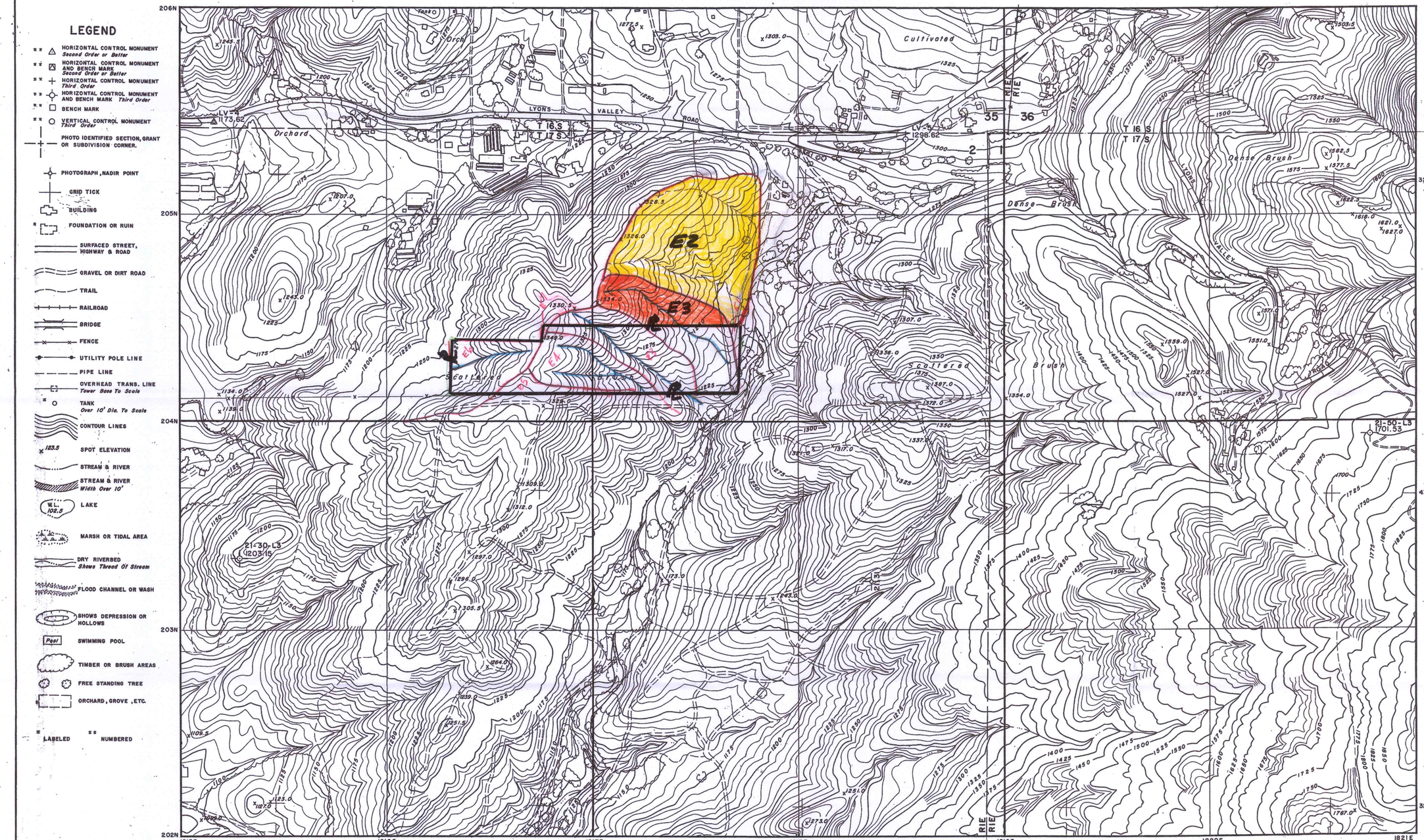
BENCH MARK
DESCRIPTION: 172ECCS3 PER COUNTY CONTROL DATA SHEET
2" BRASS DISC MARKED 172ECCc83
LOCATION: IN THE CUL-DE-SAC AT THE OF OLE BURN WAY
RECORD FROM: COUNTY CONTROL DATA SHEET
ELEVATION: 1655.69 DATUM: NAVD88

Sht 1 of 1	Date:04/01/19	Dwn. MC	Apr. LEC	Dwg. No. 2393-DMP-1

FILE NO. 2393

COUNTY OF SAN DIEGO

TOPOGRAPHIC SURVEY



PREPARED UNDER THE DIRECTION OF THE COUNTY SURVEYOR OF THE COUNTY OF SAN DIEGO, CALIFORNIA.
CONTROL BY U. S. C. & G. S., U. S. G. S. AND THE COUNTY OF SAN DIEGO.
NORTH AMERICAN DATUM 1927.

COMPILED BY PHOTOGRAMMETRIC METHODS FROM PHOTOGRAPHY DATED AUG. 1964 BY

WESTERN AERIAL SURVEYS
A DIVISION OF H. M. GALLAHER, CIVIL ENGINEER
RIVERSIDE - CALIFORNIA

SCALE 1:2400

200 0 200 400 600 800 1000

CONTOUR INTERVAL 5 FEET
U.S.C. & G.S. DATUM

ONE THOUSAND FOOT CALIFORNIA RECTANGULAR GRID (ZONE VI)
THE LAST THREE DIGITS OF THE GRID NUMBERS ARE OMITTED
THE RECTANGULAR COORDINATE VALUES ARE SHOWN ON THE SOUTH AND WEST MARGINS
THE GEOGRAPHIC VALUES ARE SHOWN ON THE NORTH AND EAST MARGINS

INDEX TO ADJOINING SHEETS

206-1809	206-1815	206-1821
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SAN DIEGO COUNTY
CALIFORNIA

EDITION OF 1964

SHEET 202-1815

* OFF SITE EXIST. DRAINAGE MAP