Snipes-Dye associates

HYDROLOGY/HYDRAULIC ANALYSIS

For

TABERNA VISTA WAY GRADING
(PDS2016-LDGRMJ-30079)

County of San Diego

Applicant/Developer:
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Prepared By:
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AL1722

Dated: May 19, 2016
Revised: September 6, 2016
Revised: May 20, 2021
Revised: September 16, 2021

DECLARATION OF RESPONSIBLE CHARGE

I, HEREBY DECLARE THAT I AM THE CIVIL 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 CONSISTENT WITH CURRENT STANDARDS.

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

SON P. NGUYEN
R.C.E. 86249
EXP. 03-31-23

9-16-2021
Date

Project Information

HYDROLOGY/HYDRAULIC ANALYSIS
FOR
TABERNA VISTA WAY GRADING

EXISTING SITE CONDITIONS: The project site is located 1115 Tavern Road, Alpine, California, at the end of Taberna Vista Way. The site was illegally graded. There is no existing structure on subject site. The hydrologic soil group of the project site is Group D.

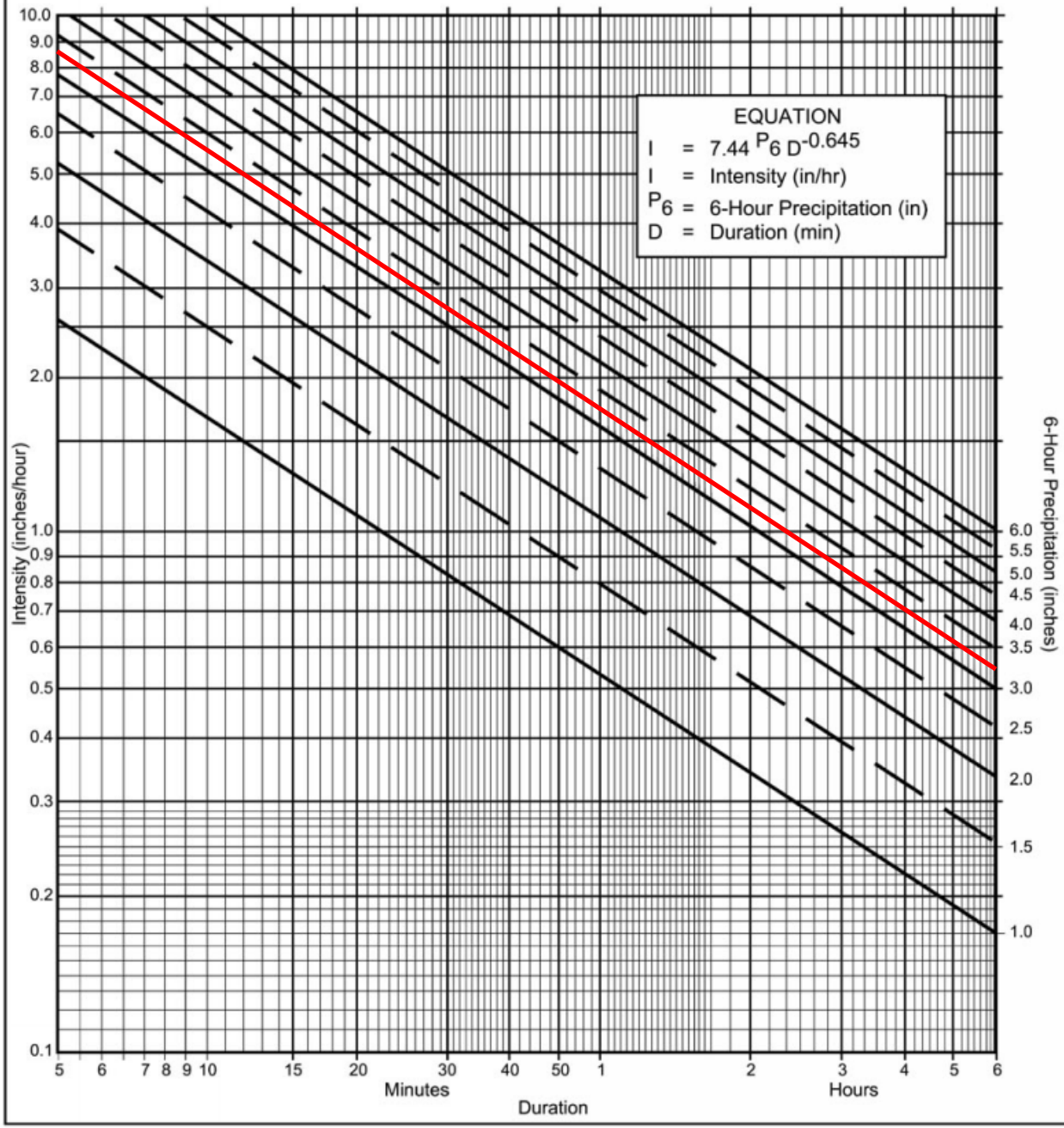
PROPOSED SITE CONDITIONS: The project proposes to re-grade the site to create a flat pad (non-developable) and to construct erosion control facilities to control and correct the flows of the current conditions due to illegal grading operations. No impervious surfaces are proposed for this project.

EXISTING DRAINAGE CONDITIONS: Based on the County 200-scale Topo Map 246-1833, the existing site runoff divides into three sub-drainage basins, the easterly, center and the westerly sub-basins. The easterly sub-basin consists of approximate 2.53 acres of drainage area along Taberna Vista Way and discharges downstream at the Outfall No. 1, as shown on the enclosed drainage map. The center sub-basin consists of approximate 3.44 acres of onsite & offsite drainage area. Its discharge to the downstream is at the Outfall No. 2. The westerly sub-basin consists of 0.32 acre of drainage basin discharging southwesterly along the westerly boundary.

PROPOSED DRAINAGE CONDITIONS: The proposed grading was designed to maintain the similar drainage patterns of the existing site conditions. The outfalls to the downstream from the project site will be at the same locations. Due to the grading of the site, flow lengths have been extended hence increasing the time of concentration. As a result the discharges to the downstream in the proposed conditions will be equal or less than discharges in the existing conditions at all three outfalls. See the drainage summary table below.

	Q_{100} Existing Site Conditions		**Q_{100} Proposed Site Conditions**	
	Basin Area (acres)	**Q_{100} Flow (cfs)**	**Basin Area (acres)**	**Q_{100} Flow (cfs)**
Outfall No. 1	2.53 acres	5.24 cfs	2.75 acre	5.70 cfs
Outfall No. 2	3.44 acres	7.13 cfs	3.22 acres	6.67 cfs
Outfall No. 3	0.32 acre	0.71 cfs	0.32 acre	0.71 cfs
Total	6.29 acres	13.08 cfs	6.29 acres	13.08 cfs

Taberna Vista Way GP



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 = 3.2 in., P_{24} = 7.0, $\frac{P_6}{P_{24}}$ = 45.7 %(2)

(c) Adjusted P_6(2) = 3.2 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

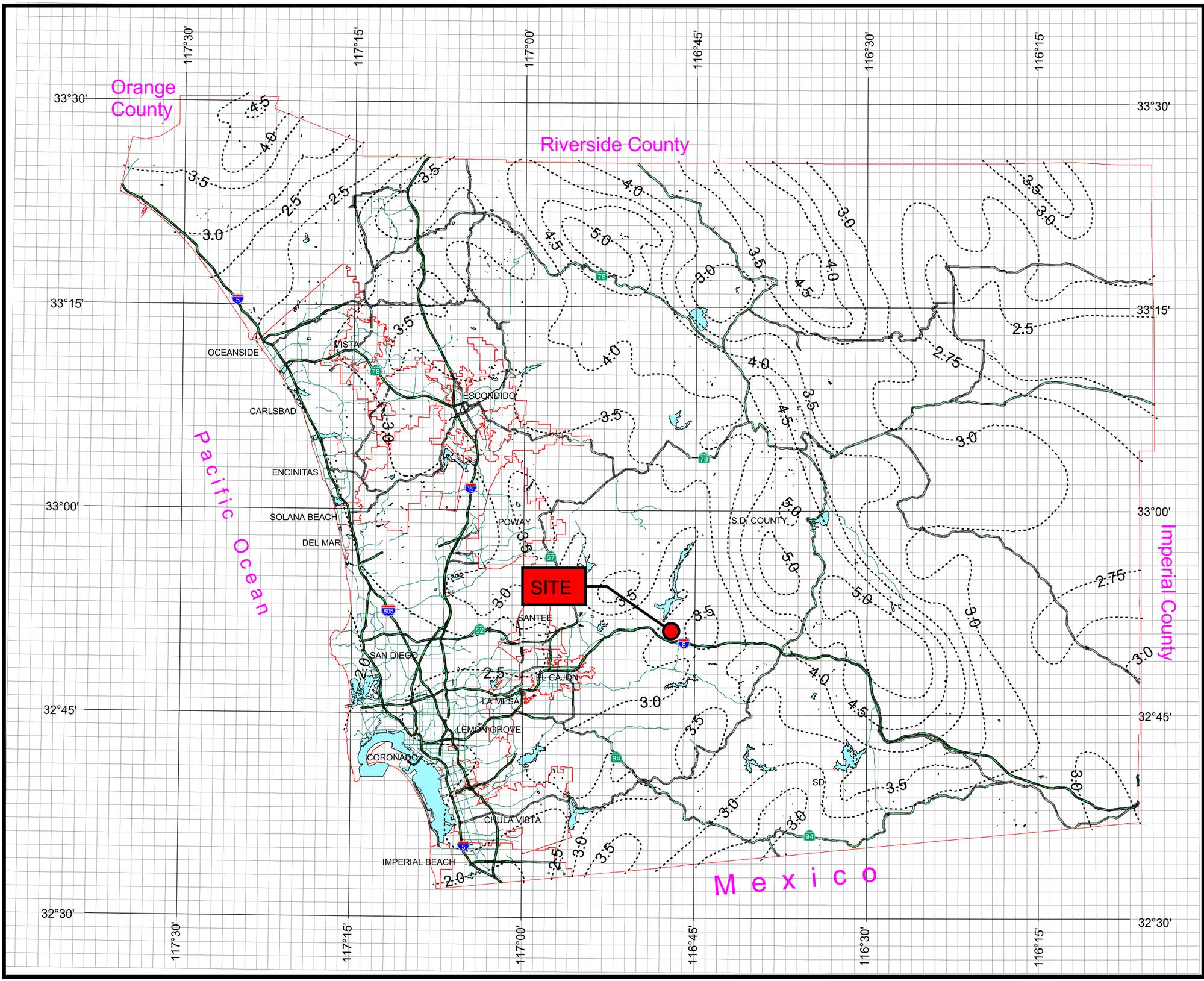
County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

3.2 Isopluvial (inches)

Taberna Vista Way GP



DPW GIS
Department of Public Works
Geographic Information Services

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N
W E
S

3 0 3 Miles

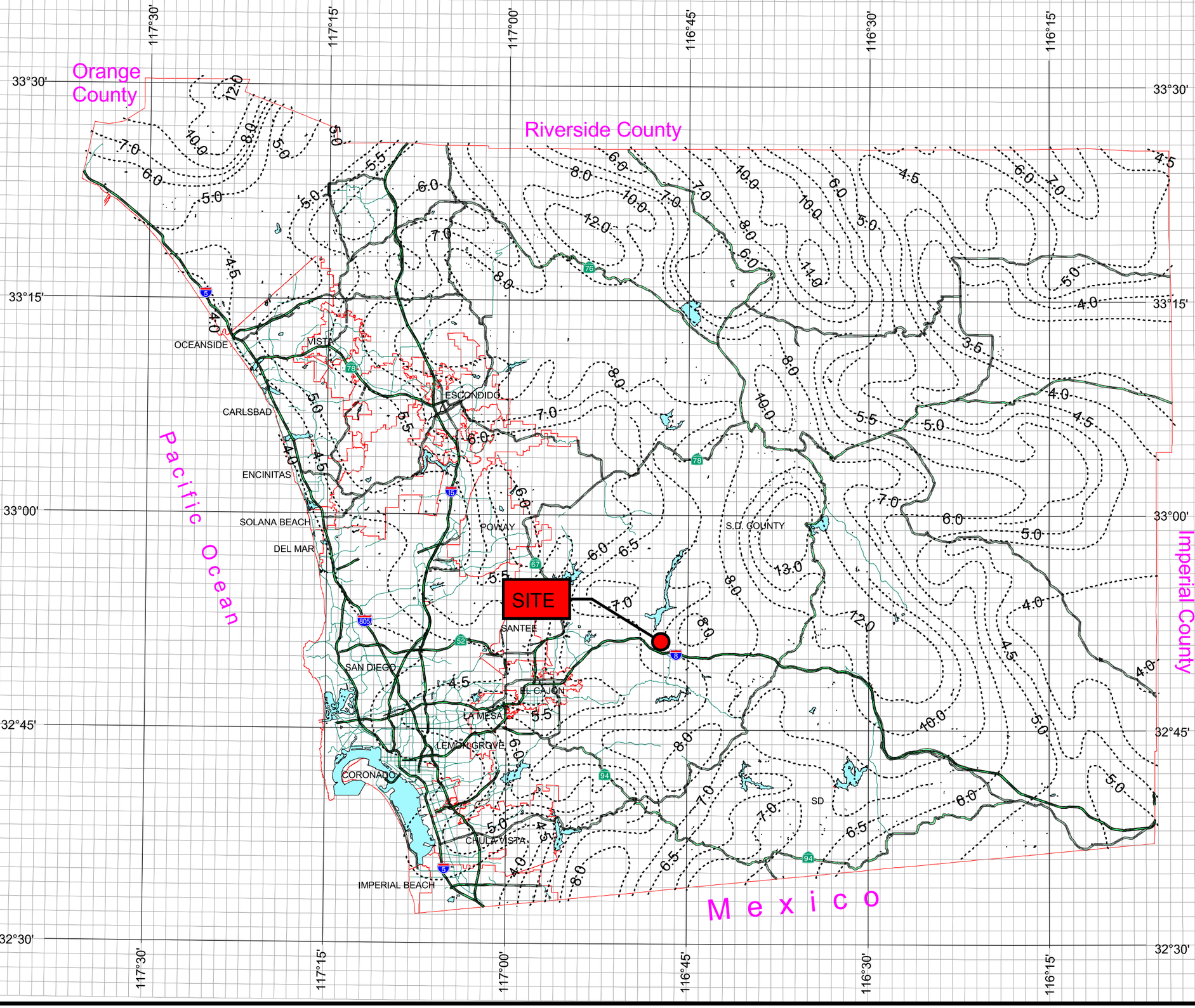
County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

7.0 Isopluvial (inches)

Taberna Vista Way GP



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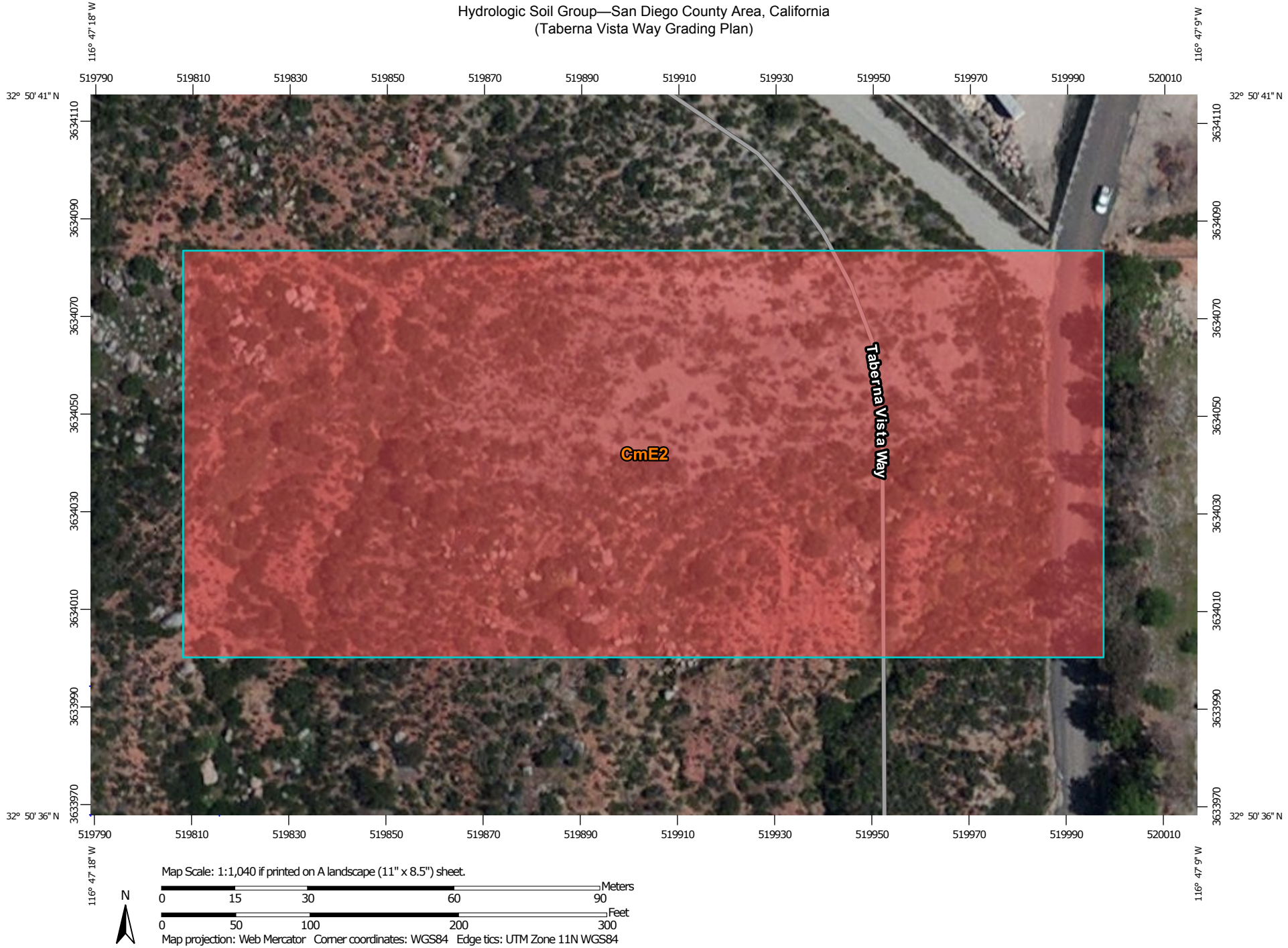
3 0 3 Miles

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

Hydrologic Soil Group—San Diego County Area, California
(Taberna Vista Way Grading Plan)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 9, Sep 17, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Data not available.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California (CA638)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
CmE2	Cieneba rocky coarse sandy loam, 9 to 30 percent slopes , eroded	D	3.9	100.0%
Totals for Area of Interest			**3.9**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Table 3-2

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

Drainage Maps

SOIL GROUP D

SUB-BASIN 2
A = 3.44 ACRES
T_c = 9.1 MIN
C = 0.35

SUB-BASIN 3
A = 0.32 ACRES
T_c = 7.7 MIN
C = 0.35

OUTFALL NO. 3
Q_{100} = 0.71 CFS

OUTFALL NO. 2
Q_{100} = 7.13 CFS

SUB-BASIN 1
A = 2.53 ACRES
T_c = 8.7 MIN
C = 0.35

OUTFALL NO. 1
Q_{100} = 5.24 CFS

(1795.0) 22 L=100' II (1819.0)
(1790.3) 31 L=100' 12 (1806.5)
(1772.0) 32 L=455' L=552' L=457'
(1747.0) 33 23 (1724.5) 13 (1735.0)

ROCK OUTCROP
BRUSH
TREES
"FIRE"
1933.20

32°51'00"
32°50'45"
249N
248N
247N
246N
1833E
1834E
1835E
1836E
1837E
1838E
1839E

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 JULY 1960 BY
INTERNATIONAL MAPPING CORPORATION
LOS ANGELES, CALIFORNIA

INDEX TO ADJOINING SHEETS

41-60	42-60	43-60
41-61	42-61	43-61
41-62	42-62	43-62

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

250-1827	250-1833	250-1839
246-1827	246-1833	246-1839
242-1827	242-1833	242-1839

SAN DIEGO COUNTY
CALIFORNIA

EDITION OF 1960

SHEET ~~42-61~~
246-1833

N
200 100 0 200 400 600
SCALE: 1"=200'

LEGEND

DRAINAGE BASIN BOUNDARY
DRAINAGE SUB-BASIN BOUNDARY
DIRECTION OF FLOW
DRAINAGE NODE (II)
ELEVATION (1819.0)
FLOW LENGTH L = 100'

PRE-DEVELOPMENT
DRAINAGE MAP

SHEET 1 OF 1 SHEETS
JOB NO. AL1721 (C-4)

NO	DATE	REVISION DESCRIPTION	BY
1	5-20-2021	REVISED PER 1ST SD COUNTY REVIEW COMMENTS.	SDA
2	9-16-2021	REVISED PER 2ND SD COUNTY REVIEW COMMENTS.	SDA

DESIGNER SPN
DRAWN JGF
CHECKED WAS
DATE 05-19-16

SHEET TITLE PRE-DEVELOPMENT DRAINAGE MAP
JOB NAME PAD WITH NO BUILDING
TABERNA VISTA WAY

SNIPES-DYE ASSOCIATES 8348 CENTER DRIVE, SUITE G, LA MESA, CA 91942-2910 (619) 697-9234, FAX (619) 460-2033

SOIL GROUP D

(1819.0) 11

(1795.0) 22

L=100'

L=100'

12 (1806.5)

(1790.3) 31

L=100'

L=535'

(1772.0) 32

273,692 SF
6.28 ACRES

SUB-BASIN 3
A = 0.32 ACRES
T_C = 7.7 MIN
C = 0.35

L=155'

Q_{100} = 1.83 CFS
V_{100} = 7.27 FPS

SUB-BASIN 2
A = 3.22 ACRES
T_C = 9.0 MIN
C = 0.35

SUB-BASIN 1
A = 2.75 ACRES
T_C = 8.7 MIN
C = 0.35

L=463'

(1747.0) 33

OUTFALL NO. 3
Q_{100} = 0.71 CFS

(1724.5) 23

OUTFALL NO. 2
Q_{100} = 6.67 CFS

(1735.0) 13

OUTFALL NO. 1
Q_{100} = 5.70 CFS

TABERNA
VISTA WAY

N

SCALE: 1"=30'

LEGEND

- DRAINAGE BASIN BOUNDARY
- DRAINAGE SUB-BASIN BOUNDARY
- DIRECTION OF FLOW
- DRAINAGE NODE (II)
- ELEVATION (1819.0)
- FLOW LENGTH L = 100'

POST-DEVELOPMENT
DRAINAGE MAP

SHEET TITLE: POST-DEVELOPMENT DRAINAGE MAP
JOB NAME: PAD WITH NO BUILDING
TABERNA VISTA WAY

DESIGNER: SPN
DRAWN: JGF
CHECKED: WAS
DATE: 05-19-16

NO	DATE	REVISION DESCRIPTION	BY
1	5-20-2021	REVISED PER 1ST SD COUNTY REVIEW COMMENTS.	SDA
2	9-16-2021	REVISED PER 2ND SD COUNTY REVIEW COMMENTS.	SDA

SNIPES-DYE ASSOCIATES 8348 CENTER DRIVE, SUITE G, LA MESA, CA 91942-2910 (619) 697-9234, FAX (619) 460-2033

SHEET 1 OF 1 SHEETS
JOB NO. AL1721 (C-4)

Time of Concentration Calculations

TIME OF CONCENTRATION (T_c) - PRE-DEV. OUTFALL 1

DETERMINE THE INITIAL TIME OF CONCENTRATION (T_i)

See Table 3-2 of the San Diego County Hydrology Manual

Node ID	11	Elev.=	1,819	Feet
Node ID	12	Elev.=	1,806.5	Feet
Initial Length		L_{in} =	100	Feet
Calculated Slope=		12.5%		

Land Use Element = Natural

Utilize Slope = 10%

Initial Time of Concentration T_i = 6.9 Minutes

DETERMINE THE TRAVEL TIME OF CONCENTRATION (T_t)

ΔE = change in elevation along effective slope line (Feet)

L = Watercourse Distance (Miles)

T_t = Travel Time of Concentration (Hours)

Travel Time of Concentration $T_t = (11.9L^3/\Delta E)^{0.385}$

		L =	457	Feet =	0.087 Miles
Node ID	12	Elev.=	1,806.5	Feet	
Node ID	13	Elev.=	1,735	Feet	
Elevation Difference		ΔE =	72		

T_t = 0.030 Hours = 1.8 Minutes

$T_c = T_i + T_t$

Tc = 8.7 Minutes

TIME OF CONCENTRATION (T_c) - PRE-DEV. OUTFALL 2

DETERMINE THE INITIAL TIME OF CONCENTRATION (T_i)

See Table 3-2 of the San Diego County Hydrology Manual

Node ID	11	Elev.=	1,819	Feet
Node ID	22	Elev.=	1,795	Feet
Initial Length		L_{in} =	100	Feet
Calculated Slope=		24.0%		

Land Use Element = Natural

Utilize Slope = 10%

Initial Time of Concentration T_i = 6.9 Minutes

DETERMINE THE TRAVEL TIME OF CONCENTRATION (T_t)

ΔE = change in elevation along effective slope line (Feet)

L = Watercourse Distance (Miles)

T_t = Travel Time of Concentration (Hours)

Travel Time of Concentration $T_t = (11.9L^3/\Delta E)^{0.385}$

		L =	553	Feet =	0.105 Miles
Node ID	22	Elev.=	1,795	Feet	
Node ID	23	Elev.=	1,724.5	Feet	
Elevation Difference		ΔE =	71		

T_t = 0.037 Hours = 2.2 Minutes

$T_c = T_i + T_t$

Tc = 9.1 Minutes

TIME OF CONCENTRATION (T_c) - PRE-DEV. OUTFALL 3

DETERMINE THE INITIAL TIME OF CONCENTRATION (T_i)

See Table 3-2 of the San Diego County Hydrology Manual

Node ID	31	Elev.=	1,790.3	Feet
Node ID	32	Elev.=	1,772	Feet
Initial Length		L_{in} =	100	Feet
Calculated Slope=		18.3%		

Land Use Element = Natural

Utilize Slope = 10%

Initial Time of Concentration T_i = 6.9 Minutes

DETERMINE THE TRAVEL TIME OF CONCENTRATION (T_t)

ΔE = change in elevation along effective slope line (Feet)

L = Watercourse Distance (Miles)

T_t = Travel Time of Concentration (Hours)

Travel Time of Concentration $T_t = (11.9L^3/\Delta E)^{0.385}$

		L =	155	Feet =	0.029 Miles
Node ID	32	Elev.=	1,772	Feet	
Node ID	33	Elev.=	1,747	Feet	
Elevation Difference		ΔE =	25		

T_t = 0.013 Hours = 0.8 Minutes

$T_c = T_i + T_t$

Tc = 7.7 Minutes

TIME OF CONCENTRATION (T_c) - POST-DEV. OUTFALL 1

DETERMINE THE INITIAL TIME OF CONCENTRATION (T_i)

See Table 3-2 of the San Diego County Hydrology Manual

Node ID	11	Elev.=	1,819	Feet
Node ID	12	Elev.=	1,806.5	Feet
Initial Length		L_{in} =	100	Feet
Calculated Slope=		12.5%		

Land Use Element = Natural

Utilize Slope = 10%

Initial Time of Concentration T_i = 6.9 Minutes

DETERMINE THE TRAVEL TIME OF CONCENTRATION (T_t)

ΔE = change in elevation along effective slope line (Feet)

L = Watercourse Distance (Miles)

T_t = Travel Time of Concentration (Hours)

Travel Time of Concentration $T_t = (11.9L^3/\Delta E)^{0.385}$

		L =	463	Feet =	0.088 Miles
Node ID	12	Elev.=	1,806.5	Feet	
Node ID	13	Elev.=	1,735	Feet	
Elevation Difference		ΔE =	72		

T_t = 0.030 Hours = 1.8 Minutes

$T_c = T_i + T_t$

Tc = 8.7 Minutes

TIME OF CONCENTRATION (T_c) - POST-DEV. OUTFALL 2

DETERMINE THE INITIAL TIME OF CONCENTRATION (T_i)

See Table 3-2 of the San Diego County Hydrology Manual

Node ID	21	Elev.=	1,819	Feet
Node ID	22	Elev.=	1,795	Feet
Initial Length		L_{in} =	100	Feet
ed	Calculated Slope=		24.0%	

Land Use Element = Natural

Utilize Slope = 10%

Initial Time of Concentration T_i = 6.9 Minutes

DETERMINE THE TRAVEL TIME OF CONCENTRATION (T_t)

ΔE = change in elevation along effective slope line (Feet)

L = Watercourse Distance (Miles)

T_t = Travel Time of Concentration (Hours)

Travel Time of Concentration $T_t = (11.9L^3/\Delta E)^{0.385}$

		L =	535	Feet =	0.101 Miles
Node ID	22	Elev.=	1,795	Feet	
Node ID	23	Elev.=	1,724.5	Feet	
Elevation Difference		ΔE =	70.5		

T_t = 0.036 Hours = 2.1 Minutes

$T_c = T_i + T_t$

Tc = 9.0 Minutes

TIME OF CONCENTRATION (T_c) - POST-DEV. OUTFALL 3

DETERMINE THE INITIAL TIME OF CONCENTRATION (T_i)

See Table 3-2 of the San Diego County Hydrology Manual

Node ID	31	Elev.=	1,790.3	Feet
Node ID	32	Elev.=	1,772	Feet
Initial Length		L_{in} =	100	Feet
Calculated Slope=		18.3%		

Land Use Element = Natural

Utilize Slope = 10%

Initial Time of Concentration T_i = 6.9 Minutes

DETERMINE THE TRAVEL TIME OF CONCENTRATION (T_t)

ΔE = change in elevation along effective slope line (Feet)

L = Watercourse Distance (Miles)

T_t = Travel Time of Concentration (Hours)

Travel Time of Concentration $T_t = (11.9L^3/\Delta E)^{0.385}$

		L =	155	Feet =	0.029 Miles
Node ID	32	Elev.=	1,772	Feet	
Node ID	33	Elev.=	1,747	Feet	
Elevation Difference		ΔE =	25		

T_t = 0.013 Hours = 0.8 Minutes

$T_c = T_i + T_t$

Tc = 7.7 Minutes

Pre-Development Calculations

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Hyd. No. 4

Pre-development OUTFALL 1

Hydrograph type	= Rational	Peak discharge	= 5.24 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 2.5 ac	Runoff coeff.	= 0.35
Intensity	= 5.920 in/hr	Time of conc. (Tc)	= 9 min
IDF Curve	= Taberna Vista Way.idf	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 2,831 cuft

Hydrograph Discharge Table

Time (min)	Outflow (cfs)
1	0.58
2	1.17
3	1.75
4	2.33
5	2.91
6	3.50
7	4.08
8	4.66
9	5.24 <<
10	4.66
11	4.08
12	3.50
13	2.91
14	2.33
15	1.75
16	1.17
17	0.58

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Hyd. No. 5

Pre-development OUTFALL 2

Hydrograph type	= Rational	Peak discharge	= 7.13 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 3.4 ac	Runoff coeff.	= 0.35
Intensity	= 5.920 in/hr	Time of conc. (Tc)	= 9 min
IDF Curve	= Taberna Vista Way.idf	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 3,849 cuft

Hydrograph Discharge Table

Time (min)	Outflow (cfs)
1	0.79
2	1.58
3	2.38
4	3.17
5	3.96
6	4.75
7	5.54
8	6.34
9	7.13 <<
10	6.34
11	5.54
12	4.75
13	3.96
14	3.17
15	2.38
16	1.58
17	0.79

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Hyd. No. 6

Pre-development OUTFALL 3

Hydrograph type	= Rational	Peak discharge	= 0.71 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 0.3 ac	Runoff coeff.	= 0.35
Intensity	= 6.367 in/hr	Time of conc. (Tc)	= 8 min
IDF Curve	= Taberna Vista Way.idf	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 342 cuft

Hydrograph Discharge Table

Time (min)	Outflow (cfs)
1	0.09
2	0.18
3	0.27
4	0.36
5	0.45
6	0.53
7	0.62
8	0.71 <<
9	0.62
10	0.53
11	0.45
12	0.36
13	0.27
14	0.18
15	0.09

...End

Post-Development Calculations

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

Post-development OUTFALL 1

Hydrograph type	= Rational	Peak discharge	= 5.70 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 2.8 ac	Runoff coeff.	= 0.35
Intensity	= 5.920 in/hr	Time of conc. (Tc)	= 9 min
IDF Curve	= Taberna Vista Way.idf	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 3,077 cuft

Hydrograph Discharge Table

Time (min)	Outflow (cfs)
1	0.63
2	1.27
3	1.90
4	2.53
5	3.17
6	3.80
7	4.43
8	5.07
9	5.70 <<
10	5.07
11	4.43
12	3.80
13	3.17
14	2.53
15	1.90
16	1.27
17	0.63

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Hyd. No. 2

Post-development OUTFALL 2

Hydrograph type	= Rational	Peak discharge	= 6.67 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 3.2 ac	Runoff coeff.	= 0.35
Intensity	= 5.920 in/hr	Time of conc. (Tc)	= 9 min
IDF Curve	= Taberna Vista Way.idf	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 3,603 cuft

Hydrograph Discharge Table

Time (min)	Outflow (cfs)
1	0.74
2	1.48
3	2.22
4	2.97
5	3.71
6	4.45
7	5.19
8	5.93
9	6.67 <<
10	5.93
11	5.19
12	4.45
13	3.71
14	2.97
15	2.22
16	1.48
17	0.74

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

Post-development OUTFALL 3

Hydrograph type	= Rational	Peak discharge	= 0.71 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 0.3 ac	Runoff coeff.	= 0.35
Intensity	= 6.367 in/hr	Time of conc. (Tc)	= 8 min
IDF Curve	= Taberna Vista Way.idf	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 342 cuft

Hydrograph Discharge Table

Time (min)	Outflow (cfs)
1	0.09
2	0.18
3	0.27
4	0.36
5	0.45
6	0.53
7	0.62
8	0.71 <<
9	0.62
10	0.53
11	0.45
12	0.36
13	0.27
14	0.18
15	0.09

...End