Labib Funk + Associates
Structural | Civil Engineers

HYDROLOGY & DRAINAGE REPORT

FOR

JADE LJ, LLC.

2072 Via Casa Alta
La Jolla, CA 92037

Prepared for:
City of San Diego

Prepared by:
Labib Funk + Associates
Structural | Shoring | Civil Consulting Engineers
319 Main St.
El Segundo, California 90245
JLA Job # 23003
January 13, 2025

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1.0 PROJECT DESCRIPTION

1.1 Existing Project Site Description

The undeveloped site is 0.76 acres in size located in the Mount Soledad are of the City of San Diego. The site currently slopes from south to north with a maximum 2:1 slope. There is no run-on to the site. Storm runoff on the site sheet flow north into an existing concrete swale along Hillside Dr. The path of the public storm drain is still to be determined.

See the pre-development drainage area map in Exhibit A for more detail of the existing site.

1.2 Proposed Project Site Description

The project will consist of construction of a new 2-story single family residence, basement and detached ADU, miscellaneous landscape, pool, and hardscape. The proposed impervious area is 13,870 SF or 0.32 AC, which represents 42.0% of the site.

See post-development drainage area map in Exhibit B for more detail of the project.

2.0 STANDARD AND METHODS

Purpose of calculations

Calculate the storm runoff generated by the new site conditions and the impact to the downstream lands and calculate the discharge pipe size.

Hydrologic model and methods used:

This report uses the "Rational Method" as demonstrated in the County of San Diego Storm Drain Manual.

$$Q = CIA$$

Water quality design storm:

The design storm for this report shall be the 100-year storm for private underground drainage.

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3.0 ANALYSIS

Pre-development runoff volumes and peak flows:

Runoff factor "C" for undisturbed land with a soil type of "D" from table B.1-1 "Runoff Coefficients for Urban Areas" from the above manual and attached in Appendix "B" is 0.30. See Exhibit "A" for plan view of the drainage area.

Time of concentration is composed of "Maximum Overland Flow Length" plus "Travel Time" to point of discharge. The maximum overland flow length is taken from Table 3-2, included in Appendix C. For natural land with a slope of 10%, the initial time of concentration is 6.9 mins. for the first 100 feet. For "Travel Time" for the remaining of the 250 ft to the discharge point, we are estimating to be proportionally with "Initial Time". Based on this, "Travel Time" will become 17.3 mins. Total time of concentration is 24.2 mins.

Using the 100-year storm and the rainfall intensity-duration-frequency curves from the chart in Appendix "D": determine rainfall intensity "I", for 24.2 min., 100-year storm; the rainfall intensity = 1.9 in/hr.

Zone Existing Area = 0.32 acres

Q100 = CIA = 0.30 x 1.9 x 0.76 = 0.43 CFS

Post-development runoff volumes and peak flows:

Runoff factor "C" for impervious surfaces from table B.1-1 "Runoff factors for surfaces draining to BMPs" from the above manual and attached in Appendix "B" is 0.90. See Exhibit "A" for plan view of the drainage area.

Time of concentration is composed of "Maximum Overland Flow Length" plus "Travel Time" to point of discharge. The maximum overland flow length is taken from Table 3-2, included in Appendix C. Low density residential less than 1 acre with slope of 10% is 6.4 mins for the first 100 feet. For "Travel Time" for the remaining of the 250 ft to the discharge point, we estimate to be proportionally with "Initial Time". Based on this, "Travel Time" will become 16.0 min. Total time of concentration is 22.4 min.

Using the 100-year storm and the rainfall intensity-duration-frequency curves from the chart in Appendix "D": determine rainfall intensity "I", for 22.4 min., 100-year storm; the rainfall intensity = 2.0 in/hr.

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Zone Existing Area = 0.32 acres

Q100 = CIA = 0.90 x 2.0 x 0.76 = 1.37 CFS

Orifice Sizing Calculation

Equation 8-12 from the City of San Diego Drainage Design Manual is used to calculate the outlet orifice for the storm water detention system shown below.

Equation 8-12: Single Submerged Orifice Calculation

$$Q=C_O A_O \sqrt{2g(H_o)}$$

where:

Q	=	orifice flow discharge (ft^3/s)
C_O	=	orifice discharge coefficient
A_O	=	cross-sectional area of flow through the orifice (ft^2)
g	=	gravitational acceleration (32.2 ft/s^2)
H_O	=	effective head above orifice (ft)

A = Q / [C*(2g(H)^1/2]
= 0.43 CFS / [0.6 * (2*32.2 FT/S^2 * 5.85 FT) ^1/2]
= 0.037 SF

Orifice Diameter = 2.6”

5.0 CONCLUSION

The proposed site has been found to increase the runoff generated from 0.43 CFS, pre-development, to 1.37 CFS, post-development for the 100-year storm event. The outlet orifice from the detention system is sized above to have a 2.6” diameter for the 100 YR site flowrate.

The calculation for the 100-YR water volume is shown in Appendix E of this study. The 100-YR volume, 2,273 CF, will be retained on-site in a Contech detention system. The proposed project will mitigate the increased runoff volume for the 100-year storm event.

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APPENDIX A
Vicinity Map

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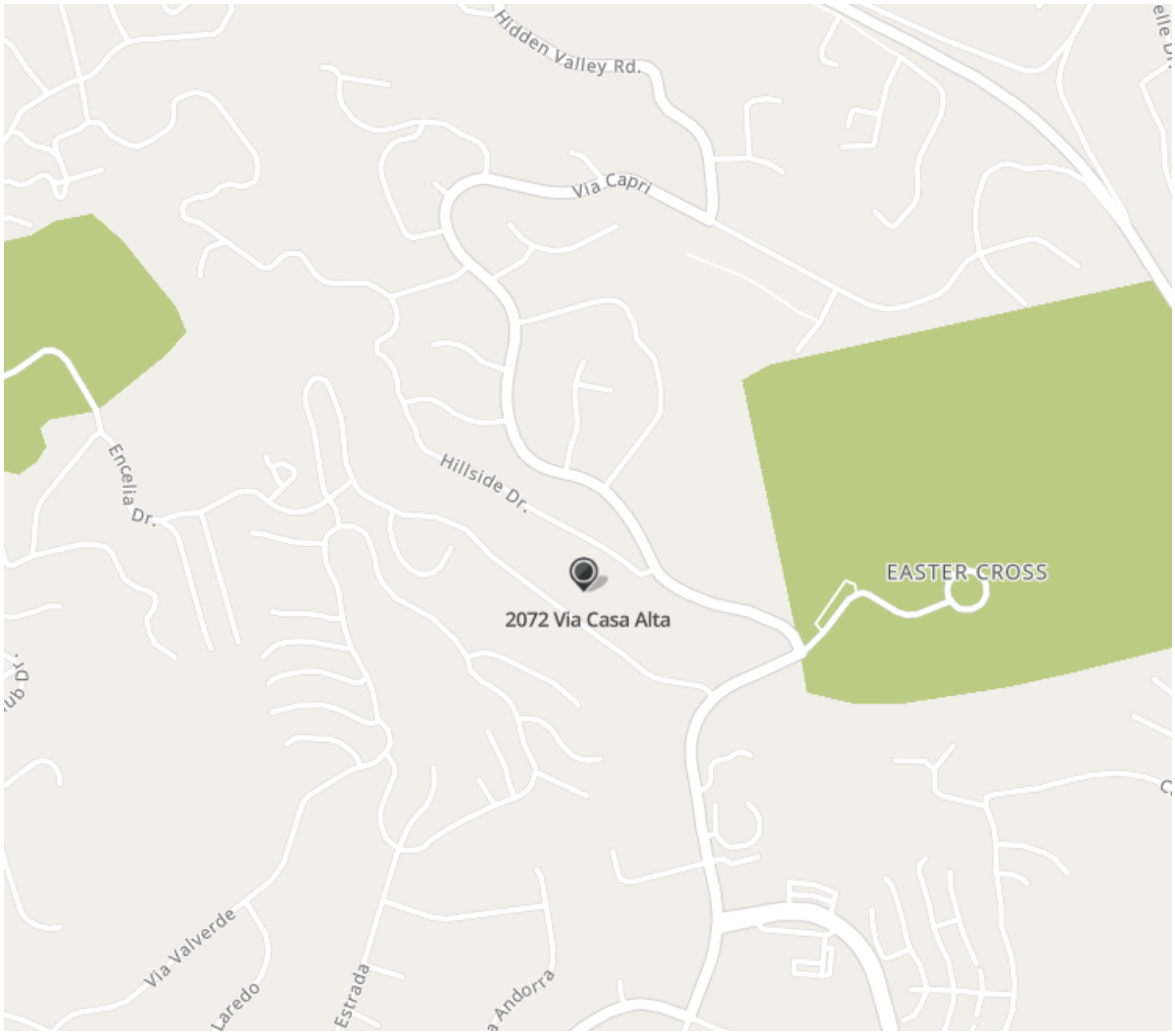

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APPENDIX B
County Of San Diego Storm Drain Manual
Table 3-1, Runoff Coefficients For Urban Area

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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

APPENDIX C
County Of San Diego Storm Drain Manual
Table 3-2, Time Of Concentration Charts

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Note that the Initial Time of Concentration should be reflective of the general land-use at the upstream end of a drainage basin. A single lot with an area of two or less acres does not have a significant effect where the drainage basin area is 20 to 600 acres.

Table 3-2 provides limits of the length (Maximum Length (L_M)) of sheet flow to be used in hydrology studies. Initial T_i values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved by the "Regulating Agency" when submitted with a detailed study.

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

APPENDIX D
County Of San Diego Storm Drain Manual
Figure 3-1, Intensity Duration Design Chart

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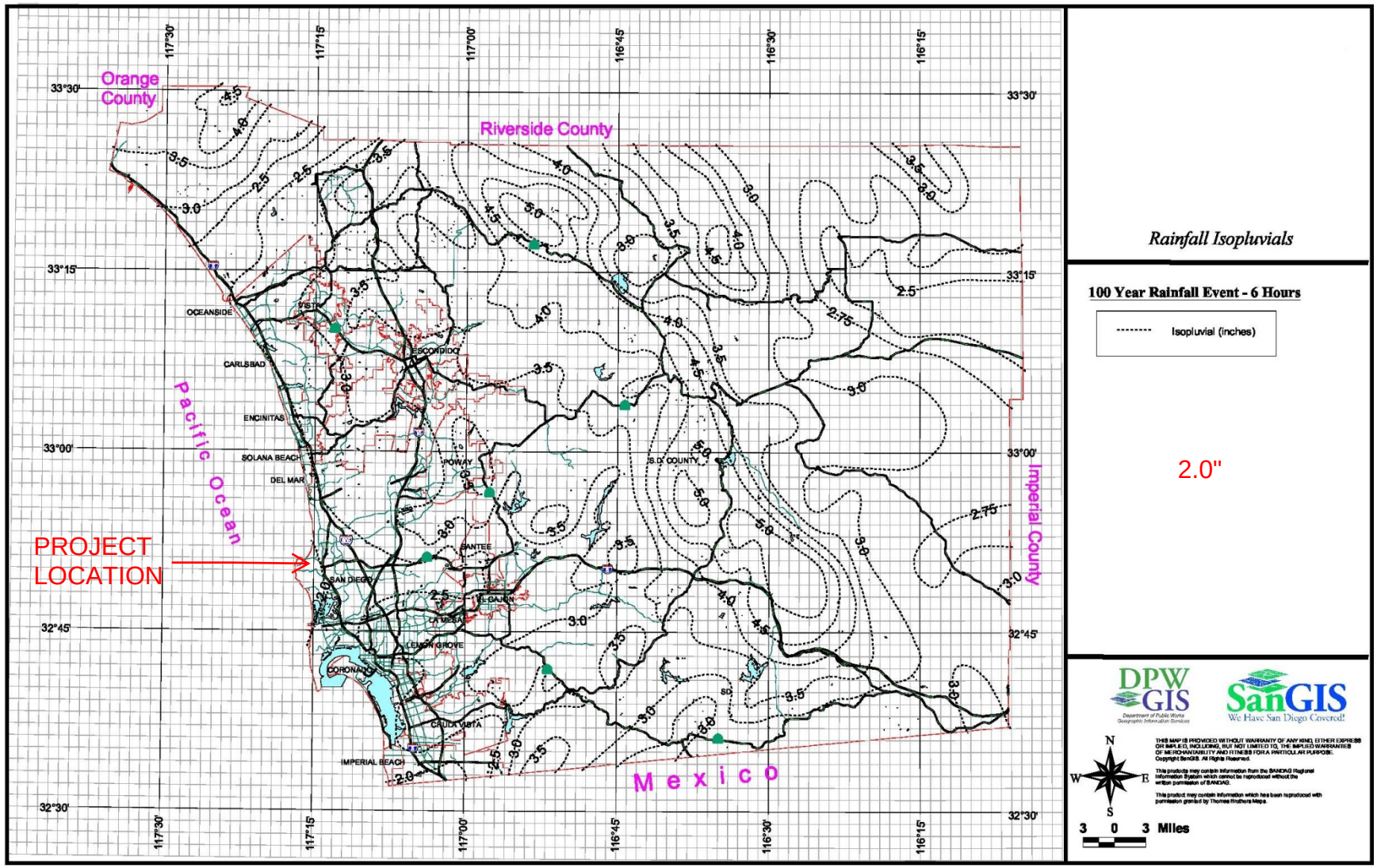


Figure B-2. 100-Year 6-Hour Isopluvials.

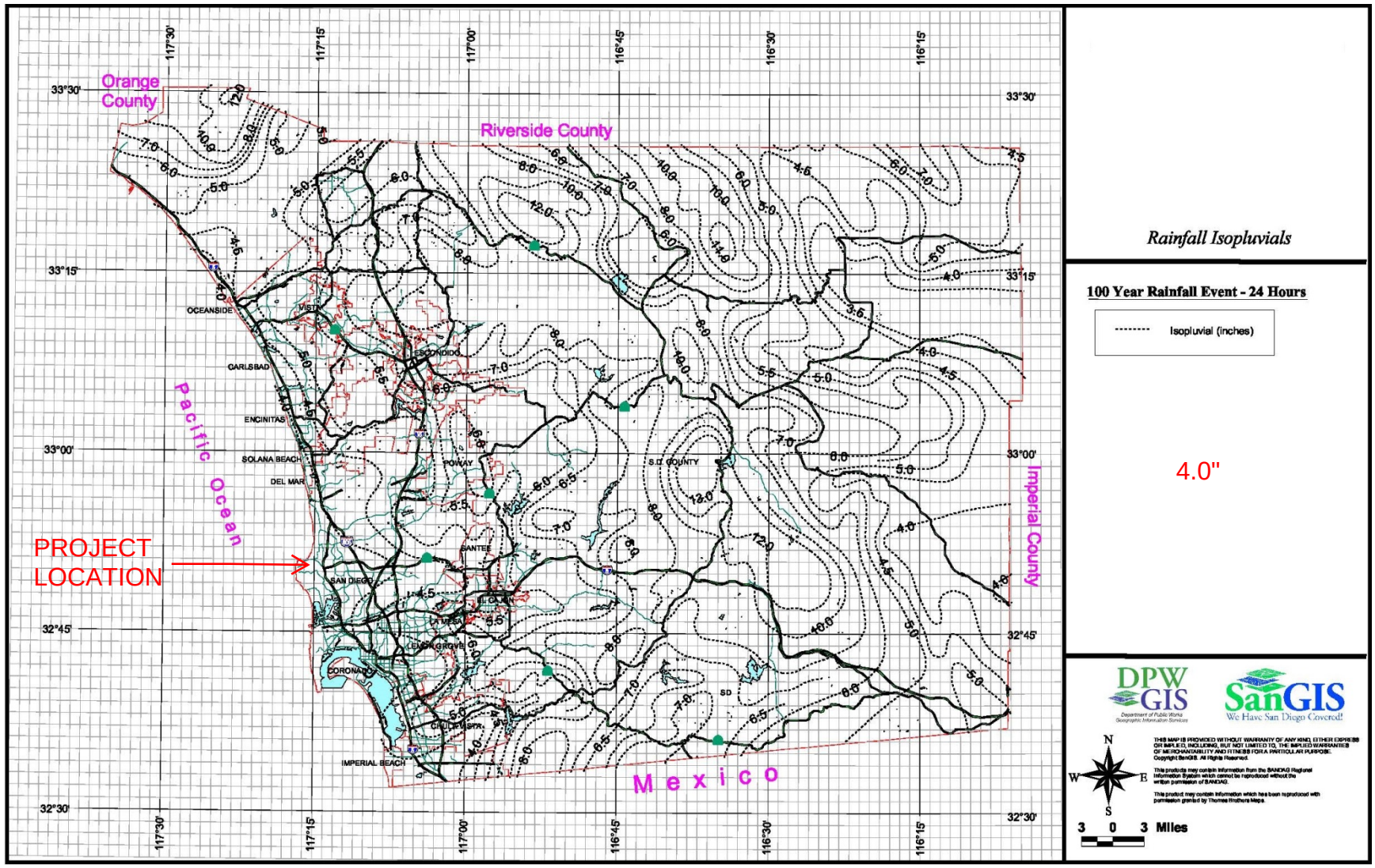
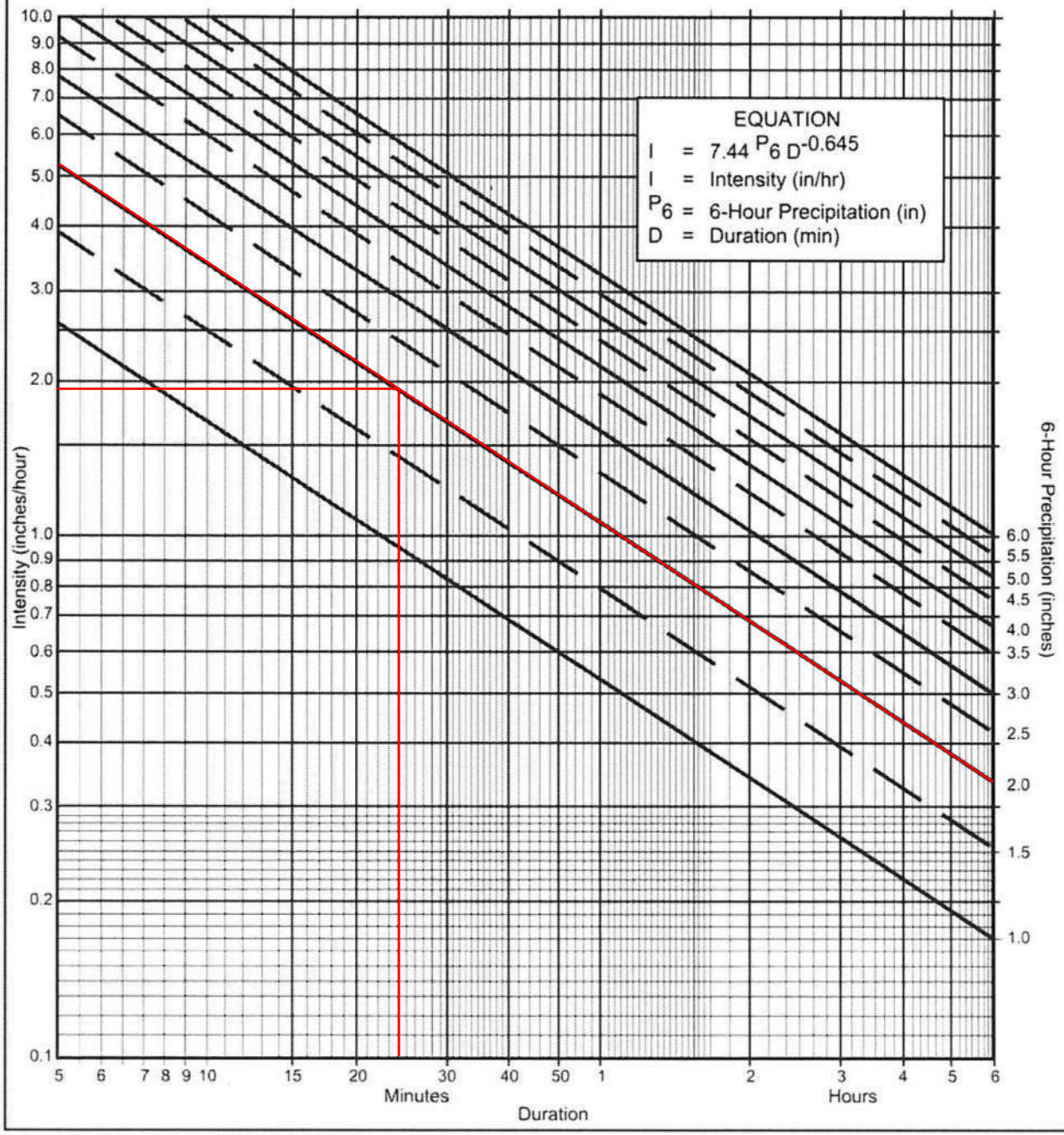


Figure B-3. 100-Year 24-Hour Isopluvials

PRE DEVELOPMENT - RAINFALL INTENSITY



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 = 2 in., P_{24} = 4, $\frac{P_6}{P_{24}}$ = 50.0 %(2)

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

(d) t_x = 24.2 min.

(e) I = 1.9 in./hr.

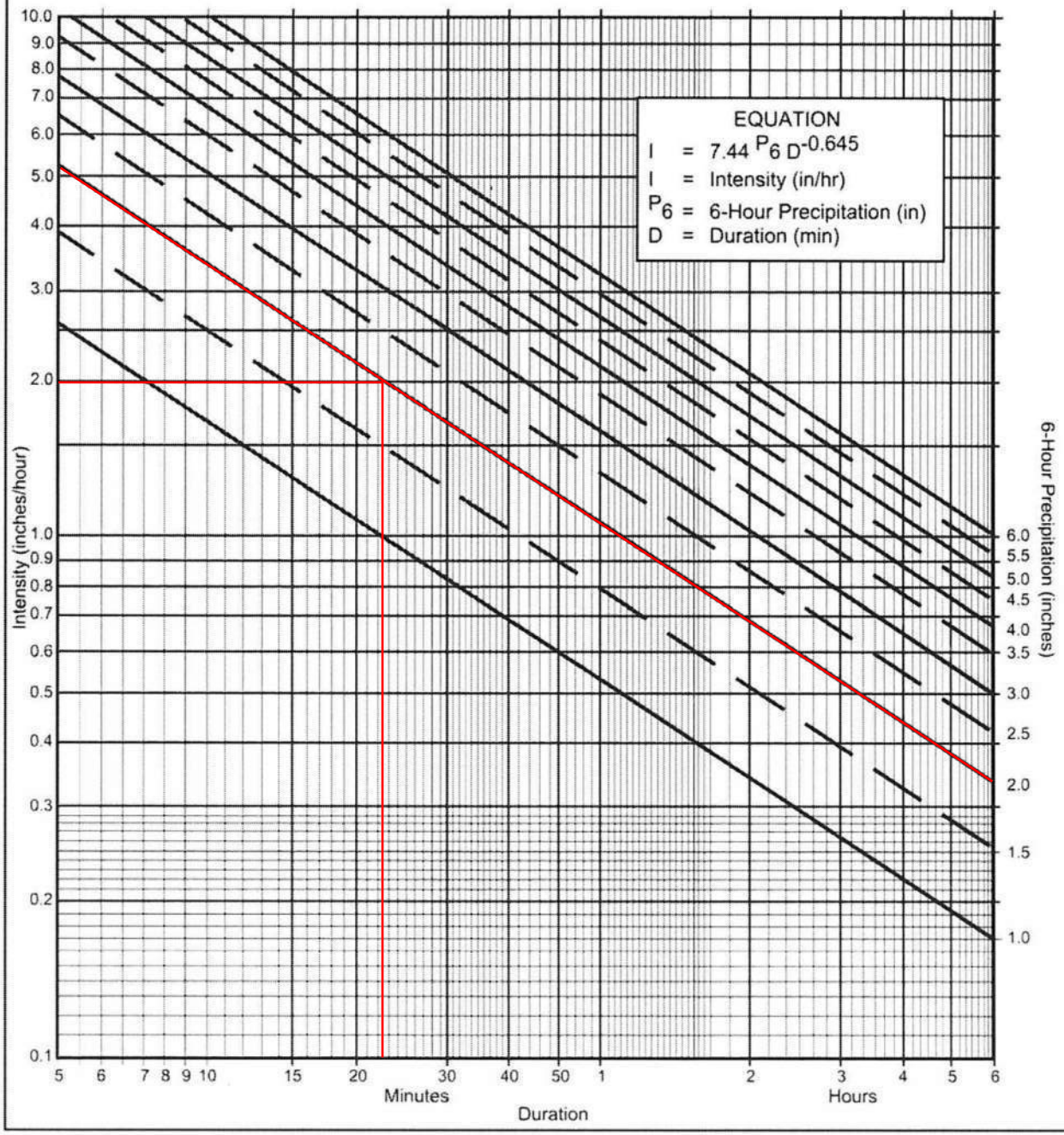
Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6 / Duration	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
	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

POST DEVELOPMENT - RAINFALL INTENSITY



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 50 year

(b) P_6 = 1.8 in., P_{24} = 3.5, $\frac{P_6}{P_{24}}$ = 51.4 %(2)

(c) Adjusted P_6(2) = 1.8 in.

(d) t_x = 22.4 min.

(e) I = 2.0 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

APPENDIX E

San Diego Drainage Design Manual – 100YR Design Volume Calculation

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RATIONAL METHOD HYDROGRAPH PROGRAM

RUNDATE: 12/20/2024
TIME OF CONCENTRATION: 24 MIN.
6 HR RAINFALL: 2 IN.
BASIN AREA: 0.76 ACRES
RUNOFF COEFFICIENT: 0.3
PEAK DISCHARGE: 0.43 CFS

TIME (MIN)	DISCHARGE(CFS)
0	0
24	0
48	0
72	0
96	0
120	0
144	0
168	0.1
192	0.1
216	0.1
240	0.2
264	0.43
288	0.1
312	0
336	0
360	0
384	0

RATIONAL METHOD HYDROGRAPH PROGRAM

RUNDATE: 12/20/2024
TIME OF CONCENTRATION: 24 MIN.
6 HR RAINFALL: 2 IN.
BASIN AREA: 0.76 ACRES
RUNOFF COEFFICIENT: 0.55
PEAK DISCHARGE: 1.37 CFS

TIME (MIN)	DISCHARGE(CFS)
0	0
24	0.1
48	0.1
72	0.1
96	0.1
120	0.1
144	0.1
168	0.1
192	0.1
216	0.2
240	0.3
264	1.37
288	0.1
312	0.1
336	0.1
360	0.1
384	0

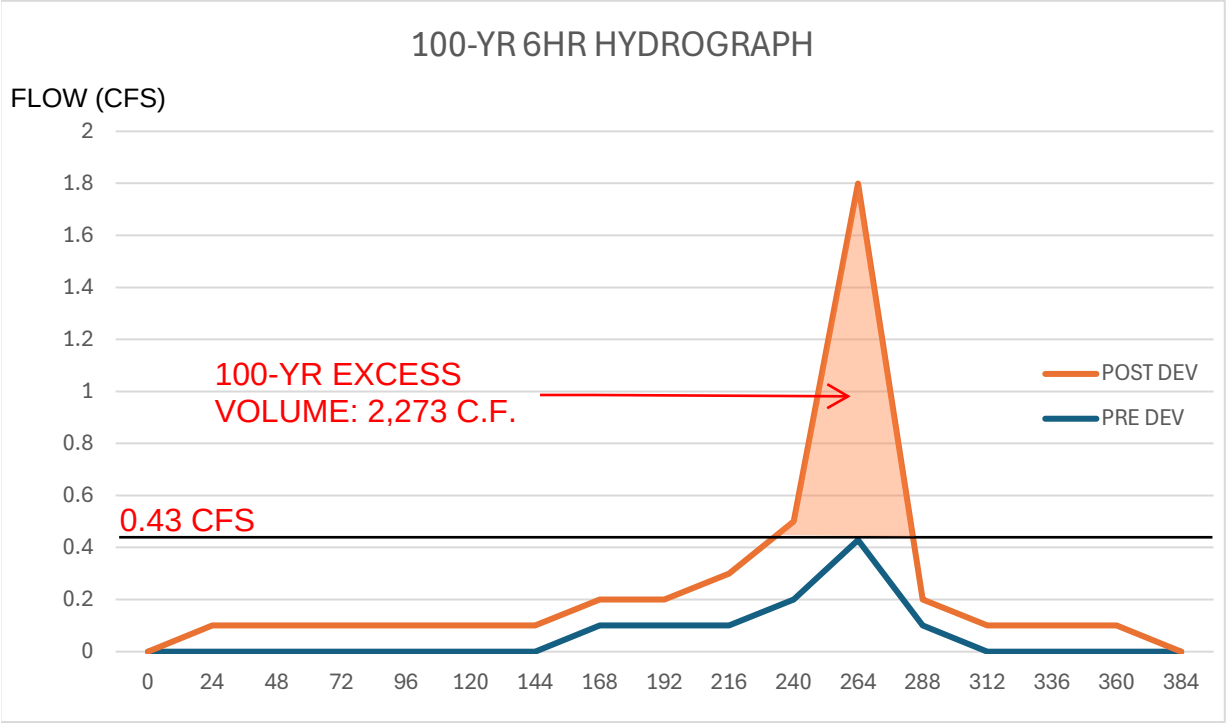
100-YR 6HR HYDROGRAPH
FLOW (CFS)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
100-YR EXCESS
VOLUME: 2,273 C.F.
0.43 CFS
POST DEV
PRE DEV
0
24
48
72
96
120
144
168
192
216
240
264
288
312
336
360
384
T (MIN)

EXHIBIT A
Existing Conditions Drainage Areas Map

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LEGEND

PROPERTY LINE

DMA

PRE DEVELOPMENT SITE CHARACTERISTICS	
IMPERVIOUS AREA (S.F.)	0
PERVIOUS AREA (S.F.)	33,016
Q50 (CFS)	0.40

LFA
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Structural | Shoring | Civil | EBM

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LFA Job no. 23003

JADE LJ, LLC

2072 VIA CASA ALTA
LA JOLLA, CA 92037

REGISTERED PROFESSIONAL ENGINEER
FRANCIS JOSEPH LABIB
No. C78581
Exp. 12/31/2025
CIVIL
STATE OF CALIFORNIA

NOT FOR CONSTRUCTION

REVISIONS:

CITY SUBMITTAL

JOB NO.:

DATE:

SCALE:

SHEET TITLE:
EXHIBIT A
PRE DEVELOPMENT CONDITIONS

SHEET NUMBER:

EXHIBIT B
Proposed Conditions Drainage Areas Map

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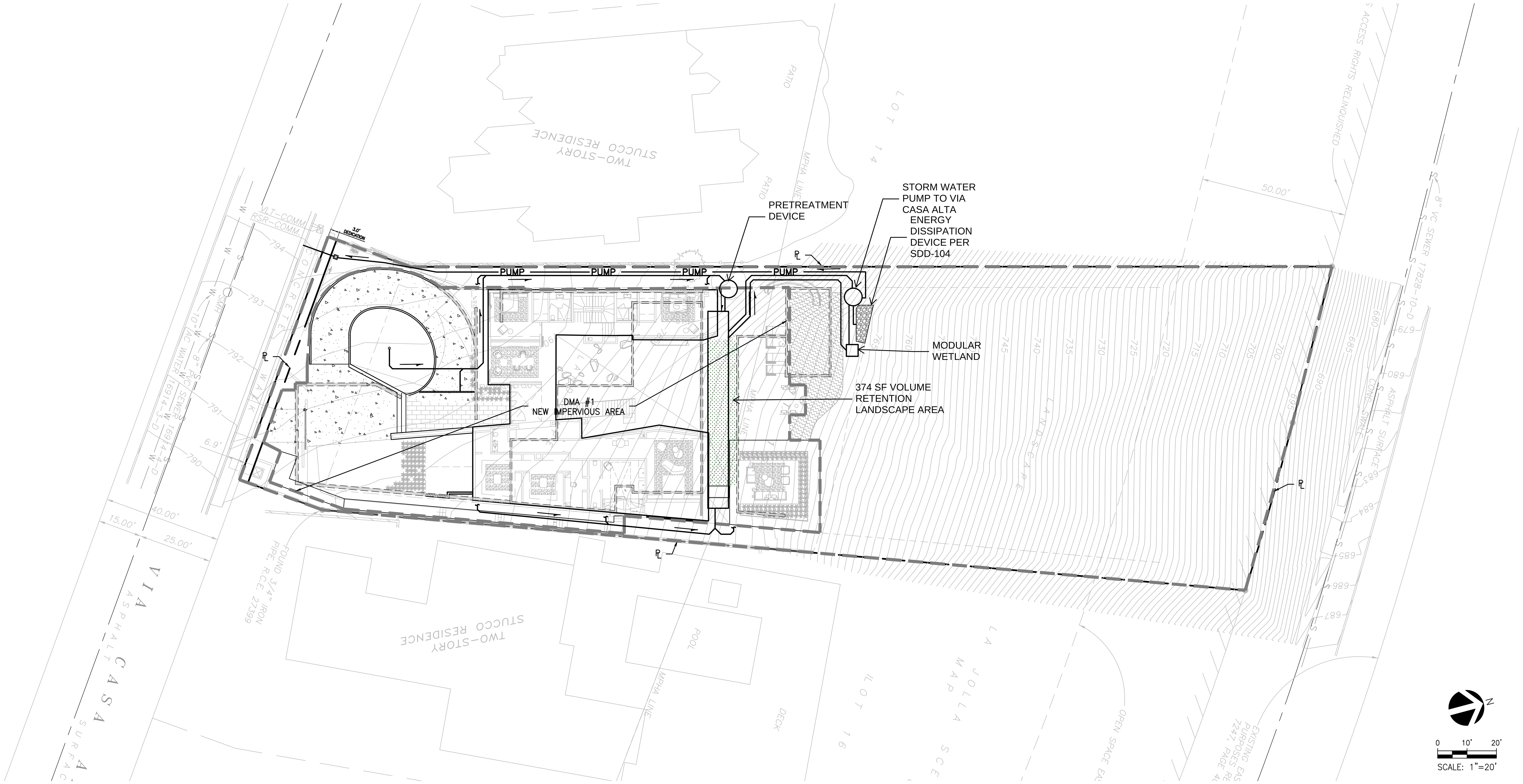
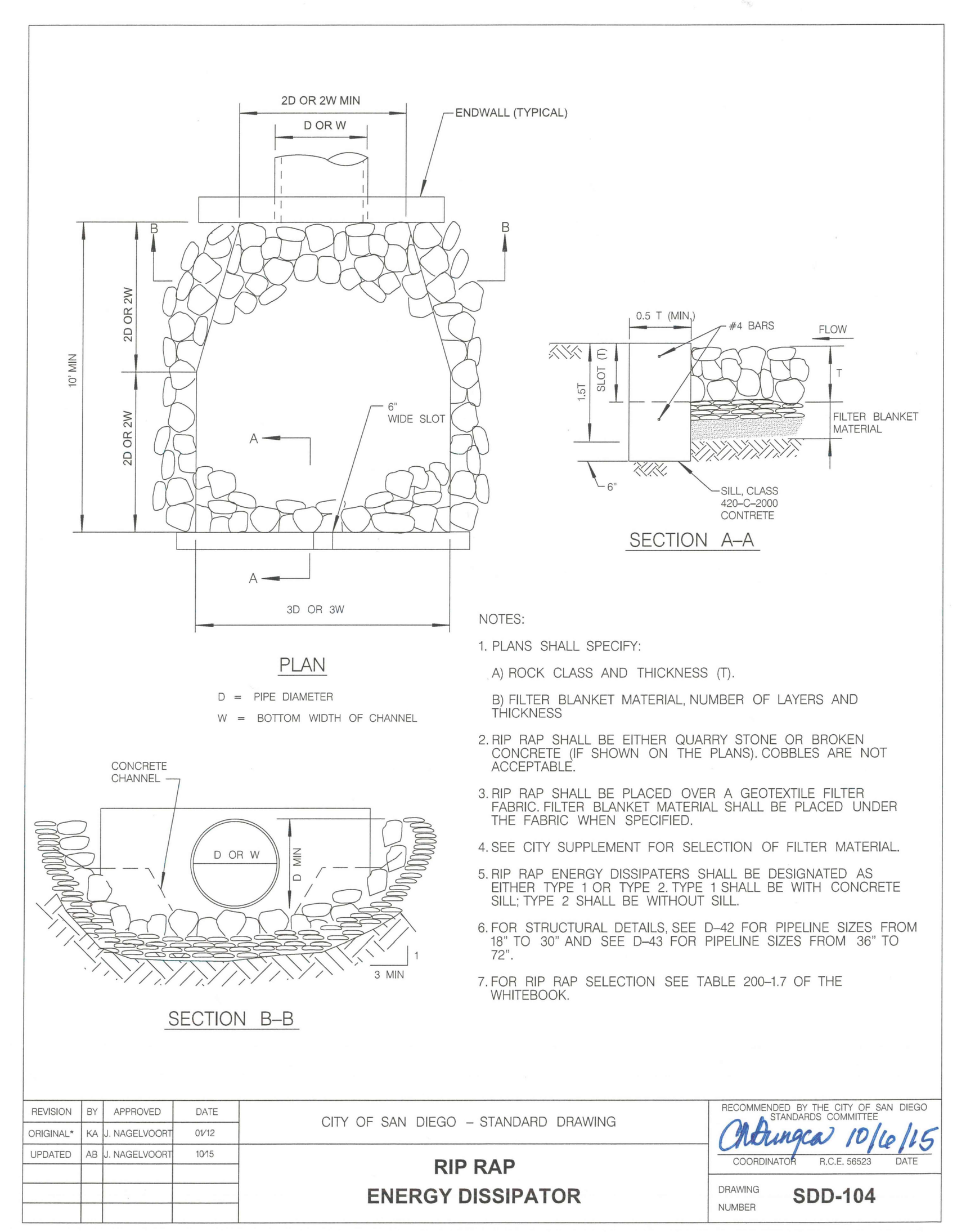


LEGEND

- - -	PROPERTY LINE
— — —	DMA
	CONCRETE PAVING
	PLANTER AREA
	BASEMENT BUILDING WALL
	RETAINING WALL

POST DEVELOPMENT SITE CHARACTERISTICS	
IMPERVIOUS AREA (S.F.)	13,870
PERVIOUS AREA (S.F.)	19,146
Q50 (CFS)	1.30



LFA
Labib Funk + Associates
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REGISTERED PROFESSIONAL ENGINEER FRANCIS JOSEPH LABIB No. C75161 Exp. 12/31/2025 CIVIL STATE OF CALIFORNIA

NOT FOR CONSTRUCTION

REVISIONS:

ENTITLEMENT REVIEW

COSTAL DEVELOPMENT PERMIT APPROVAL NO. 2590140

SITE DEVELOPMENT PERMIT APPROVAL NO. 2590140

JOB NO.:

DATE:

SCALE:

SHEET TITLE: EXHIBIT B POST DEVELOPMENT CONDITIONS

SHEET NUMBER: