PRELIMINARY DRAINAGE STUDY

1118 N. Anza Street Townhomes
PDS2018-TM-5628, PDS2018-REZ-18-003

COUNTY OF SAN DIEGO / EL CAJON, CA

PREPARED FOR:
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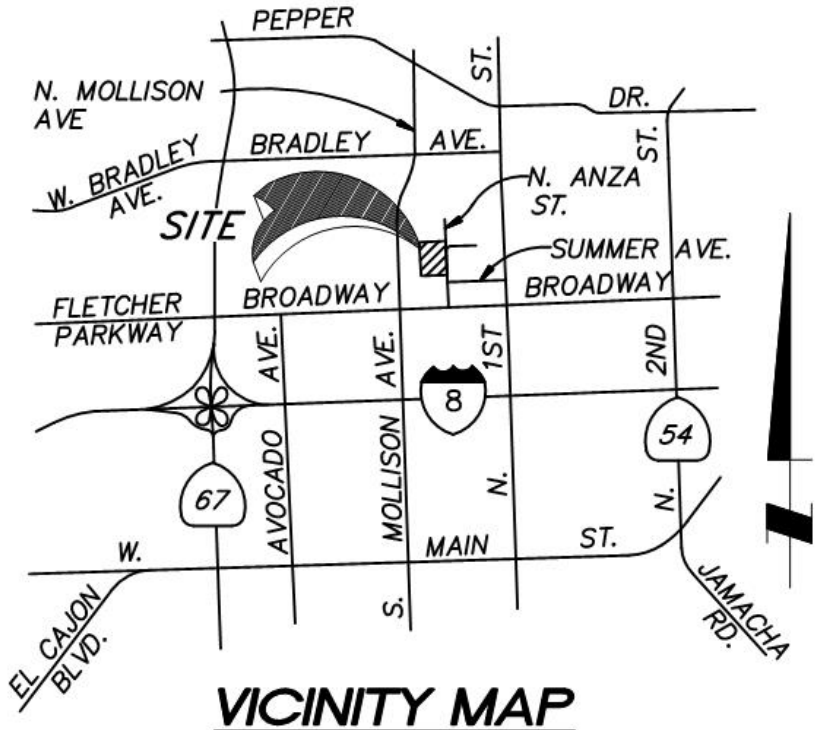
1. Introduction

The scope of this report is limited to addressing the potential storm water impacts associated with the development of the site, in accordance with the San Diego County Hydrology Manual (June 2003) and the San Diego County Hydraulic Design Manual (September 2014).

The purpose of this Preliminary Drainage Report is to determine the peak discharges of storm water runoff generated pre & post development from the site for the 2-, 10- and 100-year storm events.

This project is considered a priority storm water project. The storm water treatment facility and hydromodification storage facility have been shown on the Proposed DMA Drainage Exhibit attached to this study. The total disturbed area is 3.18 acres necessitating a Storm Water Pollution Prevention Plan (SWPPP) during final design.



VICINITY MAP

NOT TO SCALE

THOMAS BROTHERS PG. 1251, GRID H–3 57TH EDITION

2. Declaration of Responsible Charge

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 consistent with the current standards.

I understand that the check of the project drawings and specification by the County of San Diego is confined to a review only and does not relieve me, as the Engineer of Work, of my responsibilities for project design.

EINGINEER OF WORK:

SB&O, Inc.
3990 Ruffin Road, Suite 120
San Diego, CA 92123
Phone: 858-560-1141

Stephen C. Ott, PE C70666 12-17-2019 Date

3. Existing Drainage Conditions

The existing project site is approximately 3.18 acres consisting of five existing lots with five single family homes with limited impervious areas and the remainder being the flat, grassy areas. The properties are rectangular with a north-south dimension of about 413 feet and east-west dimension of approximately 335 feet. The site slopes gently to the southwest corner and flows off-site to the to the west and south. The site has approximately 4.7 feet of elevation difference from the northeast corner to the southwest corner of the site. The existing drainage basin has been delineated is shown on the Existing Drainage Basin Map.

The existing drainage flows run overland and ultimately discharges to the Mollison Ave storm drain inlet and into the Broadway flood control channel.

4. Post-Development Drainage Conditions

The post-development condition proposes to place seven multifamily buildings on a single lot that will consist of 39 townhome units, with private streets, driveways, walks, surface parking lot, with common open space and building frontages, plus private rear yards. To create positive gravity flow to the proposed storm water treatment located at the south east edge of the site and N Anza Street, the site will be raised, creating a mild slope from the northwest to the southeast. Maintaining minimum cover over the private storm drains was the critical factor in determining the raise.

The proposed site will generally flow to the two (2) storm water quality/HMP basins, which will be discharge to a proposed public storm drain in North Anza Street to be connected to the Broadway Flood Control Channel, just downstream of the Anza Street box culvert. The connection will be approximately 12” above the flow line of the channel. The pipe will flow at approximately 0.5% slope, nearly matching the 0.4% N. Anza Street grade above.

The proposed site is subdivided into drainage basins or drainage management areas as shown on the Proposed DMA Drainage Exhibit. The drainage basins are divided by discharge location noted with Node numbers on the DMA. Exhibit. The proposed concrete driveways at each unit garage flows into the private street and the rolled curb and gutter system to curb inlets at the low point opposite each basin as shown on the Exhibit. The streets generally slope near a minimum 0.5% longitudinally with a minimum cross-slope of 2.0%. The curb inlets will be sized in final design to handle the 50-year storm event and will discharge directly into the storm water quality basins as shown on the Exhibit. The remainder of the site consists of buildings, private entry walks and landscaping. These basins will be routed to the storm water quality basins via landscape area drains and private storm pipe. The pervious /impervious breakdown for each proposed DMA is shown in the tables below with the 2, 10, 50 and 100-year flows are calculated using the rational method as described below.

5. Hydrology

5.1 Design Criteria

All on-site private drainage pipes are designed to convey 10-year storm event runoff in an open channel flow condition and street runoff gutter depth shall not exceed the top of curb for a 100-year event. The San Diego County Hydrology Manual (June 2003) and the San Diego County Hydraulic Design Manual (September 2014) were utilized to perform rational method hydrology calculations for 100-, 50-, 10-, and 2-year storm events. (See Appendix for reference materials)

5.2 Soils

The hydrologic project soil type is "D" which can be described as having high runoff potential. Type "D" soils generally provide poor infiltration.

5.3 Runoff Coefficient C-Factor

Although the zoning is identified to be variable family residential (VR-15) with a density of 15 D.U./Acre), the existing impervious area has been calculated to be roughly 20% which warrants using the low end of the zoning from Table 3-1 of residential land uses. According to Table 3-1 of the San Diego County Hydrology Manual, the runoff coefficients (C-Factor) for the proposed conditions for each drainage are summarized below tables.

Existing Basin	Total Area (sf)	Impervious Area (sf)	% Impervious (actual)	Runoff Coefficient "C"
A	73,475	8,932	12.2	0.46*
B	67,988	13,229	19.5	0.46*
C	3,657	0	0	0.46*

*The Medium Density Residential (MDR - 14.5 DU/Ac) was adjusted based upon the actual reduced impervious (20%).

Proposed DMA	Total Area (sf)	Impervious Area (sf)	% Impervious	Runoff Coefficient "C"
1	15,746	7,764	49.3%	0.63
2	7,216	7,216	100%	0.87
3	27,727	18,266	65.9%	0.71
4	29,304	29,304	100%	0.87
5	32,344	17,589	54.4%	0.65
6	2,905	2,905	100%	0.87
7	14,853	7,764	52.3%	0.64
8	1,634	720	44.1%	0.60
9	2,881	0	0%	*
10	2,716	0	0%	*

**Basins 9 & 10 include the Biofiltration Basins/Hydromodification Storage and the adjacent slopes.*

5.4 Adjusted 6-Hour Rainfall

Rainfall intensities were calculated using the rainfall data from the County 6-Hour and 24-Hour Isopluvial maps as follows;

Storm	6-Hour Rainfall (in)	24-Hour Rainfall (in)	Ratio P6/P24	Adjusted P6 (in)
2-Year	1.25	1.85	67.6%	1.20
10-Year	1.75	3.00	58.3%	1.75
50-Year	2.40	4.60	52.2%	2.40
100-Year	2.55	5.20	49.0%	2.55

See Appendix for Rainfall Maps.

5.5 Rational Method Hydrology

A rational method analysis was performed on the site according to Chapter 3 of the 2003 County Hydrology Manual. The flow (Q) in CFS is equal to the Area (A) multiplied by the Runoff Factor (C) multiplied by the Rainfall Intensity (I). The Intensity of the storm (I) is formulated as follows: I= [7.44(P6) (Tc^-0.645)].

The development is divided into drainage basins based on the building roof systems and discharge exit locations for both the existing and proposed conditions. The hydrology results for the discharge locations are shown on the Existing and Proposed Drainage Maps (located in the map pockets). A summary of the Rational Method Hydrology calculation results are shown in the below tables for the existing-development and post-development conditions. Table legend is located after the tables.

The time of concentration (Tc) for Existing Basins were calculated using the maximum allowable length and a 1% overland slope according to Table 3-2 as shown on the Existing Drainage Exhibit. A minimum 5-minute time of concentration is assumed for the proposed basins based on their relatively small size, unless otherwise noted below each basin table.

The total time of concentration (Tt) for the overall on-site basin to discharge point "C" is based on Figure 3-3 for the overland flow initial time (Ti) in the open space (2% for 25'= 4.6 min.), and Figure 3-6 for the gutter flow to curb inlet at BFB#2 (s=0.5%, 0.33' deep: 1.54fps for 475' = 5.1 min.) and the time in the proposed public SD in Anza St (Q_{100}=10.31 cfs @ 0.50%, V_{100}=5.35fps for 314'= 1.0 min.). Tt = Ti + $Tc_{(gutter)}$ + $Tc_{(pipe)}$ = 4.6 + 5.1 + 1.0 = 10.7 min.

Rational Method Hydrology Results – Existing Basin A						
Storm Frequency	P_6 (adjusted)	C	I	A (acres)	T_C	Q (cfs)
2-year	1.20	0.46	2.5	1.69	7.35	1.94
10-year	1.75	0.46	3.6	1.69	7.35	2.80
50-year	2.40	0.46	4.9	1.69	7.35	3.81
100-year	2.55	0.46	5.2	1.69	7.35	4.04

Rational Method Hydrology Results – Existing Basin B						
Storm Frequency	P_6 (adjusted)	C	I	A (acres)	T_C	Q (cfs)
2-year	1.20	0.46	2.7	1.56	6.25	1.94
10-year	1.75	0.46	4.0	1.56	6.25	2.87
50-year	2.40	0.46	5.5	1.56	6.25	3.95
100-year	2.55	0.46	5.8	1.56	6.25	4.16

Rational Method Hydrology Results – Existing Basin C						
Storm Frequency	P_6 (adjusted)	C	I	A (acres)	T_C	Q (cfs)
2-year	1.20	0.46	2.7	0.08	6.42	0.10
10-year	1.75	0.46	3.9	0.08	6.42	0.15
50-year	2.40	0.46	5.4	0.08	6.42	0.20
100-year	2.55	0.46	5.7	0.08	6.42	0.21

Post-development Rational Method Hydrology Results – D.M.A. 1						
Storm Frequency	P_6 (adjusted)	C	I	A (acres)	T_C	Q (cfs)
2-year	1.20	0.63	3.2	0.361	5.0	0.73
10-year	1.75	0.63	4.6	0.361	5.0	1.05
50-year	2.40	0.63	6.3	0.361	5.0	1.43
100-year	2.55	0.63	6.7	0.361	5.0	1.52
Post-development Rational Method Hydrology Results – D.M.A. 2						
Storm Frequency	P_6 (adjusted)	C	I	A (acres)	T_C	Q (cfs)
2-year	1.20	0.87	3.2	0.166	5.0	0.46
10-year	1.75	0.87	4.6	0.166	5.0	0.66
50-year	2.40	0.87	6.3	0.166	5.0	0.91
100-year	2.55	0.87	6.7	0.166	5.0	0.97
Post-development Rational Method Hydrology Results – D.M.A. 3						
Storm Frequency	P_6 (adjusted)	C	I	A (acres)	T_C	Q (cfs)
2-year	1.20	0.71	3.2	0.637	5.0	1.45
10-year	1.75	0.71	4.6	0.637	5.0	2.08
50-year	2.40	0.71	6.3	0.637	5.0	2.85
100-year	2.55	0.71	6.7	0.637	5.0	3.03
Post-development Rational Method Hydrology Results – D.M.A. 4						
Storm Frequency	P_6 (adjusted)	C	I	A (acres)	T_C*	Q (cfs)
2-year	1.20	0.87	2.3	0.673	8.4	1.35
10-year	1.75	0.87	3.3	0.673	8.4	1.93
50-year	2.40	0.87	4.5	0.673	8.4	2.63
100-year	2.55	0.87	4.8	0.673	8.4	2.81

*The time of concentration (Tc) for D.M.A. 4 was based on Figure 3-3 for the overland flow initial time (Ti) in the open space (25' @ 2.0% C = 0.63 = 3.3 min.) and Figure 3-6 for the gutter flow to curb inlet at BFB#2 (s=0.5%, 0.33' deep: 1.54fps for 475' = 5.1 min.). Tc = Ti + $T_{(gutter)}$ = 3.3 + 5.1 = 8.4 min.

Post-development Rational Method Hydrology Results – D.M.A. 5						
Storm Frequency	P_6 (adjusted)	C	I	A (acres)	T_C*	Q (cfs)
2-year	1.20	0.65	3.0	0.743	5.4	1.45
10-year	1.75	0.65	4.4	0.743	5.4	2.13
50-year	2.40	0.65	6.0	0.743	5.4	2.90
100-year	2.55	0.65	6.4	0.743	5.4	3.10

*The time of concentration (Tc) for D.M.A. 5 was based on Figure 3-3 for the overland flow initial time (Ti) in the open space (25' @ 2.0% C = 0.63 = 3.3 min.) and open channel flow in a circular pipe that flows into the curb inlet at the end of Driveway "B" (10" PVC SD @ 0.5%, Q100=3.10 cfs: V100=4.05 fps for 503' = 2.1 min.). Tc = Ti + T(gutter) = 3.3 + 2.1 = 5.4 min.

Post-development Rational Method Hydrology Results – D.M.A. 6						
Storm Frequency	P_6 (adjusted)	C	I	A (acres)	T_C	Q (cfs)
2-year	1.20	0.87	3.2	0.067	5.0	0.19
10-year	1.75	0.87	4.6	0.067	5.0	0.24
50-year	2.40	0.87	6.3	0.067	5.0	0.37
100-year	2.55	0.87	6.7	0.067	5.0	0.39
Post-development Rational Method Hydrology Results – D.M.A. 7						
Storm Frequency	P_6 (adjusted)	C	I	A (acres)	T_C	Q (cfs)
2-year	1.20	0.64	3.2	0.341	5.0	0.70
10-year	1.75	0.64	4.6	0.341	5.0	1.00
50-year	2.40	0.64	6.3	0.341	5.0	1.37
100-year	2.55	0.64	6.7	0.341	5.0	1.46
Post-development Rational Method Hydrology Results – D.M.A. 8						
Storm Frequency	P_6 (adjusted)	C	I	A (acres)	T_C	Q (cfs)
2-year	1.20	0.60	3.2	0.066	5.0	0.07
10-year	1.75	0.60	4.6	0.066	5.0	0.10
50-year	2.40	0.60	6.3	0.066	5.0	0.14
100-year	2.55	0.60	6.7	0.066	5.0	0.15

Table Legend
P_6 = 6 hour precipitation
C= Runoff factor
I= Intensity
A= Area
T_C= Time of Concentration
Q= Flow

5.6 Pre-Development vs Post Development Discharge Summary

Discharge Location "A"
Discharge Location "A" in the existing condition is located along the western property line from Denver Lane to the limits of the Church property. In the pre-development condition, this basin sheet flows across the western property line into the Church site in an overland flow manner. Because the discharge exiting the site is not channelized, the velocity in the table was not calculated.

In the post development condition, the over-all site drainage pattern has been modified to surface drain to the southeast corner of the site to the biofiltration basins for treatment and hydromodification. The only runoff contributing to the Discharge Location "A" in the post development condition is that water between the face of proposed retaining wall and the property line which includes the offsite run-on drainage from the back yards of the duplexes to the north. Although the offsite drainage coming onto the site from the north is routed to the western property line (church site) via modified curb and gutter running along the base of the retaining wall, the flow will be dissipated to mimic the overland flow and cross-lot drainage in the existing condition. Because this small discharge is also not channelized, no velocity was calculated.

Discharge Location "B"
Discharge Location "B" in the existing condition is located along the western property line south of the Church site and along the southern property line. This basin sheet flows cross-lot into the SW corner of the site where it ultimately discharges to the City flood control channel to the south.

In the post development condition, the over-all site drainage pattern has been modified to surface drain to the southeast corner of the site to the biofiltration basins for treatment and hydromodification. The only runoff contributing to the Discharge Location "B" in the post development condition is that water between the face of proposed retaining wall and the property line. Because this small discharge is also not channelized, no velocity was calculated.

Discharge Location "C"
Discharge Location "C" in the existing condition is located along the southern property near the N. Anza Street ROW. This basin sheet flows cross-lot into the property to the south where it ultimately discharges to the City flood control channel to the south.

In the post development condition, the over-all site drainage pattern has been modified to surface drain to the southeast corner of the site to the biofiltration basins for treatment and hydromodification. The only runoff contributing to the Discharge Location "C" in the post development condition is that water between the face of proposed retaining wall and the property line. Because this small discharge is also not channelized, no velocity was calculated.

Discharge Location "D"

Discharge Location "D_2" is located at the end of the N. Anza Street curb and gutter at the downstream end of the project property frontage (SE corner). The existing tributary area upstream of the site "D_1" extends to the end of the cul-de-sac at the north end of N. Anza Street. This discharge was analyzed comparing that area directly in the project frontage only (D_2) to provide the comparison in Q_{100} and V_{100} and that of the existing flow in the gutter from the tributary area to the Anza inlet at the Broadway Channel (D_3).

Discharge Location "E"

Discharge Location "E" is located at the connection of the proposed 18" RCP to the Broadway Flood Control Channel, just downstream (west) of the RCB culverts under N. Anza Street. The site drains into the biofiltration basins and the 100-year flows enter the overflow structures and then into the proposed public SD system to connect with the channel, just downstream of the Anza crossing.

Pre-Development Discharge Summary						
Discharge Location	C	Tc *(min.)*	I *100*	A *(acres)*	Q *100 (cfs)*	V *100 (fps)*
A	0.46	7.35	5.2	1.69	4.04	DNA*
B	0.46	6.25	5.8	1.56	4.16	DNA*
C	0.46	6.42	5.7	0.08	0.21	DNA*
D_2	0.75	19.3	2.81	0.778	1.64	1.5
E	None					

*The discharge is not channelized at this point. The runoff exits the site via sheet flow to the southwest off-site. No velocity could be calculated for this discharge location.

Post-Development Discharge Summary						
Discharge Location	C	Tc *(min.)*	I *100*	A *(acres)*	Q *100 (cfs)*	V *100 (fps)*
A	0.63	7.35[1]	4.7	0.181	0.54	<1.0**
B	0.63	5.0	6.7	0.04	0.17	DNA**
C	0.63	5.0	6.7	0.01	0.04	DNA**
D_2	0.78	19.3	2.81	0.778	1.71	1.5
E	See Detention Analysis for combined basin outflows to proposed 18" storm drain.					

[1]The actual time of concentration calculation for the initial time and the time in the gutter around the retaining wall is equal to 8.65 min. The pre-development Tc was used because it neglected the additional the time past the 65' maximum allowable overland flow length in its calculation.

**The discharge is not channelized at the point of discharge. The comparable post-development area is that area between the face of the wall and the property line. The runoff exits the site similar to the existing condition.*

***Velocities from Figure 3-6 for s and Q100 plot off the chart and have been approximated.*

6. North Anza Street Drainage

The project is required to widen North Anza Street (2 feet of additional paving) and provide a continuous sidewalk along the 413 feet of frontage. This is consistent with the ultimate right-of-way improvements. During extreme storm events, additional runoff may occur in the Anza Street gutter due to the additional impervious area (2' street widening and sidewalk addition).

The southern half of N. Anza Street right-of-way, including the project frontage, is tributary to the curb inlet located at the box culvert undercrossing of the Broadway channel. The total tributary area to the inlet is 0.78 acres. The estimated peak discharge is 1.71 cfs, approximately 0.1 cfs greater than the current condition. The inlet was modified by the Anza Street widening shown on County Drawing CG UY3253, identified as a Modified Type "K" Inlet, L=8.3'. The additional runoff associated with the North Anza Street frontage improvements will have negligible impact on the gutter flow depth and performance of the existing inlet. As expected, the curb inlet appears to be designed to intercept the ultimate right-of-way condition.

See Exhibit A for gutter & curb inlet calculations.

7. Anza Street Storm Drain

The project proposes a new storm drain line in N. Anza Street to convey post development runoff directly to the Broadway channel. The proposed storm drain will be connected just downstream of the existing box culvert crossing (double 7' x 5') of the Broadway flood channel, approximately 300 feet south of the project. The new discharge location will transfer the majority of the site runoff (approximately 3.1 acres) from the Mollison Ave undercrossing to just downstream of the Anza box culvert under-crossing, approximately 800 feet upstream of the current location.

In order to determine a design flow for the pipe and to assess potential impacts to the Broadway flood control system, the combined outflow from the Water Quality/HMP facilities needs to be estimated.

The combined 100-year peak flow rates into the water quality / HMP facilities is estimated at 9.43 cfs, based upon Rational Method Hydrology with a time of concentration of 8.4 minutes based upon the following data;

Peak Runoff 100-Year P6=2.55 in	**Area (ac)**	**Runoff Coefficient**	**Tc (min)**	**I-100 (in/hr.)**	**Q100 (cfs)**
Basin - North	1.226				
Basin - South	1.888				
Site Total	3.118	0.63	8.4	4.81	9.43

Note: Tributary areas shown include the basin footprint. Tc based upon longest path onsite to reach the basins. These peak flow estimates are based upon different times of concentration and ignore the attenuation effects of the basins.
However, detention analyses require a runoff hydrograph to route through the facilities. In accordance with the County of San Diego Hydrology Manual, the Rational Method Hydrograph procedure was used to develop a time-based runoff series. The methodology assumes a simple triangular runoff hydrograph and is based upon the 6-hour rainfall total, and the Rational Method input variables. The methodology provides runoff values at time intervals equal to multiples of the time of concentration. Details related to the procedure to develop the hydrograph are provided in Chapter 6 of the County of San Diego Hydrology Manual (See Appendix).

Since detention analyses are more sensitive to runoff volume rather than peak flow rates, the minimum 5-minute time of concentration was used to develop the inflow hydrograph for both basins with the following inputs;

Peak Runoff 100-Year P6=2.55 in	**Area (ac)**	**Runoff Coefficient**	**Tc (min)**	**I-100 (in/hr.)**	**Q100 (cfs)**
Basin 1 / HMP-1 (South)	1.226	0.722	5.0	6.72	5.95
Basin 2 / HMP-2 (North)	1.888	0.757	5.0	6.72	9.60
Site Total	3.118				15.55

Note: The runoff coefficient for the basins were set at 0.90 to account for a water surface.

The resulting 100-year 6-hour hydrographs may be found in Exhibit B**.**

The detention models are based upon the storage volumes and control opening for the combined biofiltration basins and the HMP facilities. Elevation-storage-discharge rating tables were prepared using the incremental volumes and corresponding outflows. Discharge values for the basins were estimated using standard weir and orifice flow equations. The basins were modeled using the following data;

Lot 1 (HMP-1) Detention Storage (includes treatment basin) = 0.19 ac-ft.

Elevation	Description	Dimension	Comment
449.10	Bottom of HMP Storage	1.0” Orifice	Low Flow
452.0	Top of HMP Storage	1,925 sq. ft.	
453.60	Surface of Basin	797 sq. ft.	3:1 Side Slope
454.10	Surface Area	1,198 sq. ft.	6” depth
454.10	Grated Overflow	48” Square Grate	Overflow to SD
454.55	Top of Surface Basin		

Lot 2 (HMP-2) Detention Storage (includes treatment basin) = 0.28 ac-ft.

Elevation	Description	Dimension	Comment
448.40	Bottom of HMP Storage	1.0” Orifice	Low Flow
450.60	Top of HMP Storage	3,650 sq. ft.	
452.35	Surface of Basin	1,453 sq. ft.	3:1 Side Slopes

452.85	Surface Area	1,755 sq. ft.	6" depth
452.85	Grated Overflow	48" Square Grate	Overflow to SD
454.15	Top of Surface Basin		

Notes:

1. *Storage volume includes void spaces of soil media and sand (20%) and underground storage facilities (98%).*

The Storage Indication Tables for the basins are provided in Exhibit **"C".**

8. Detention Analyses

The 100-year, 6-hour hydrographs were routed through their respective basins to determine the peak outflow and maximum water depth. A review of the results indicates that the composite basins provide significant peak flow reductions;

Detention Summary 100-Year / 6-hour	**Peak Inflow (cfs)**	**Peak Outflow (cfs)**	**Max Depth (ft)**	**Drain time (hrs.)**
Biofiltration 1 / HMP-1	5.95	0.88	5.1	2.43
Biofiltration 2 / HMP-2	9.60	0.88	4.6	4.16
Total	15.55	1.76	---	

Notes:

1. *For both basins, the maximum surface storage is 0.6', which is 0.1' higher than the overflow grate.*
2. *The maximum outflow from the 1" low flow orifice is 0.06 cfs.*
3. *The drain times are based upon the basin surface volumes below the overflow depth (6").*

A Summary of the detention analyses are included in Exhibit **"D"**. Routing calculations for the basins are provided in Exhibit **"E".**

9. Basin – Failure Analysis

Although the basins are not designed as detention basin, they do provide attenuation of post-development flows. Section 6.2.7 of the Hydraulic Design Manual states that *Conjunctive Use Facilities* which provide a combination of water quality, hydromodification and flow attenuation should not include the water quality volume during flood routing. Hydromodification volumes may be used provided that the surface drain time is less than 96 hours.

As noted in the detention summary above, the drain time calculation are less than 96 hours, and only the water quality volume should be excluded. Basin failure analyses were performed to determine the maximum water surface elevations, and the amount of freeboard.

The project water quality basins are shallow basins with the lower 12" used for biofiltration, with below grade hydromodification storage. Outflow is control by a small diameter "low flow" orifice at the bottom of the HMP storage, with grated overflow inlets at 6" above the floor of the basin. The surface volume above the 6" overflow depth is available to provide attenuation. From the basin volume summary below, the water quality volumes (DCV) exceeds the volume of the surface biofiltration basins but is less than the hydromodification volume. As shown, the combined surface volume and HMP volume is significantly larger than DCV.

Basin No	DCV (cf)	Surface Volume @ 6" (cf)	HMP Volume (cf)	Remaining Surface Volume (cf)	Remaining Surface Depth (ft)
1	1,516	326	5,921	2,213	1.4
2	2,512	802	8,614	2,609	1.3

For simplicity of modeling, the entire volume below the 6" overflow will be excluded from the simulation, along with the outflows from the low flow orifice. The resulting constraints assume that the low orifice has clogged and that the surface basin is filled to the top of the overflow structure at the beginning of a 100-year 6-hour storm.

The failure simulation results are summarized as follows;

Basin No	Basin Floor Elevation	Top of Overflow Elevation	Top of Basin Elevation	Max Water Surface Elevation	Storage Depth (ft)	Freeboard (ft)	100-Year Outflow (cfs)
1	453.60	454.10	455.50	454.45	0.35	1.05	4.26
2	452.35	452.85	454.15	453.25	0.4	0.90	6.15

The results indicate that that basins have adequate storage depth and freeboard in the event of failure of the low flow orifice and excluding the surface and underground storage.

The results of the failure analyses are included in Exhibit **"F"**

10. Project Discharge Location

Due to the increased impervious area and drainage facilities, the proposed site will increase runoff volume during large storm events, when compared to the current site development. Maintaining the site discharge locations could result in concentrated surface discharge with greater velocity to the downstream properties, which do not have defined drainage facilities. This could result in a greater burden on the downstream properties.

Instead, the redevelopment of the site will direct the majority of the runoff easterly toward N. Anza Street for treatment and hydromodification management. The project proposes to construct

a public storm drain system (MS-4) in N. Anza Street to convey runoff to the Broadway flood channel. This approach provides a more reasonable alternative and eliminates the potential impacts to the properties immediately downstream of the site.

11. Conclusion

This study and the calculations presented herein demonstrate the 2, 10, 50 and 100-year frequency storm flow for the predevelopment and the post-development conditions.

The post-development drainage basins consist of the multifamily townhome buildings and adjacent private streets and driveways. The private streets and unit driveways flow to a street gutter system which is directed to the biofiltration basins.

The water quality basins and HMP storage discharge to the proposed public storm drain in N. Anza Street that ultimately discharges into the Broadway flood control channel, just downstream of the existing dual 7'x 5' box culvert beneath N. Anza Street.

The results of the project technical reports confirm the following;

- The project does not substantially alter the existing drainage pattern with ultimate discharge from the site which will still discharge to the Broadway flood control channel.
- As confirmed by the Broadway Channel Hydrology & Hydraulics Report, the change in discharge location will not exceed the capacity of the existing storm water drainage system.
- The project is not within the FEMA 100-year flood plain according to FIRM mapping.
- The project does not place structures or facilities within the 100-year flood hazard area.
- The project does not expose people or structures to risk during flooding by providing the Anza storm drain system where currently there is none, eliminating the potential for downstream flooding.
- The project will provide yard space to allow for limited infiltration and will not materially interfere with groundwater recharge or deplete groundwater supplies.
- The project biofiltration and hydromodification control facilities will provide compliance with the applicable water quality standards by providing pollutant treatment and prevent water quality degradation and erosion.

EXHIBIT A

ANZA STREET HYDROLOGY/INLET VERIFICATION

1118 North Anza Street Townhomes

Anza Street Gutter - Existing Condition

Initial Area - Cul-de-sac upstream of Project

Overland Flow - Eqn from Fig 3-3	
E1	457.8
E2	457.4
dE	0.4
Lo =	26 ft
C =	0.57 Type D Soil - MDR 7.3
S =	1.5%
Ti =	19.6 min
Ti =	8.4 min per 7.3 DU/AC
Area D-1	0.257 ac
C1	0.79 Imperv % = 80%
Lg1	251 ft
Sg	0.69%
Vg	1.6 fps
Tg	2.61 min
Tc	11.0 min
I100	4.04 in/hr
Q100	0.82 cfs
Depth	0.24 ft

Anza Project Frontage

Qup	0.82 cfs
Area D-1	0.288 ac
Imperv %	71%
C2	0.74
Lg	413 ft
Sg	0.31%
Vg	1.4 fps
Tg	4.92 min
Tc	15.9 min
I100	3.18 in/hr
Cumm CA	0.416
Qave	1.07 cfs
Q100	**1.32** cfs
Depth	0.30 ft

Anza - Downstream

Qup	1.32 cfs
Area D-3	0.233 ac
Imperv %	65%
C3	0.71
Lg	300 ft
Sg	0.40%
Vg	1.5 fps
Tg	3.33 min
Tc	19.26 min
I100	2.81 in/hr
CA	0.582
Qave	1.48
Q100	**1.64** cfs
Depth	0.31 ft

Anza Street Gutter - Post Development

Initial Area - Cul-de-sac upstream of Project

Overland Flow - Eqn from Fig 3-3	
E1	457.8
E2	457.4
dE	0.4
Lo =	26 ft
C =	0.57 Type D Soil - MDR 7.3
S =	1.5%
Ti =	19.6 min
Ti =	8.4 min per 7.3 DU/AC
Area D-1	0.257 ac
C1	0.79 Imperv % = 80%
Lg1	251 ft
Sg	0.69%
Vg	1.6 fps
Tg	2.61 min
Tc	11.01 min
I100	4.04 in/hr
Q100	0.82 cfs
Depth	0.24 ft

Anza Project Frontage - 2' Widening + Sidewalk

Qup	0.82 cfs
Area D-1	0.288 ac
Imperv %	**87%**
C2	0.83
Lg	413 ft
Sg	0.30%
Vg	1.4 fps
Tg	4.92 min
Tc	15.9 min
I100	3.18 in/hr
Cumm CA	0.442
Qave	1.11 cfs
Q100	**1.41** cfs
Depth	0.31 ft

Anza - Downstream

Qup	1.41 cfs
Area D-3	0.233 ac
Imperv %	65%
C3	0.71
Lg	297 ft
Sg	0.40%
Vg	1.5 fps
Tg	3.30 min
Tc	19.23 min
I100	2.82 in/hr
CA	0.608
Qave	1.56
Q100	**1.71** cfs
Depth	0.32 ft

Inlet Report

Anza Type K Existing

Curb Inlet

Location	= On grade
Curb Length (ft)	= 7.30
Throat Height (in)	= 2.20
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

Slope, Sw (ft/ft)	= 0.103
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 4.00
Gutter Width (ft)	= 1.50
Gutter Slope (%)	= 0.40
Gutter n-value	= 0.015

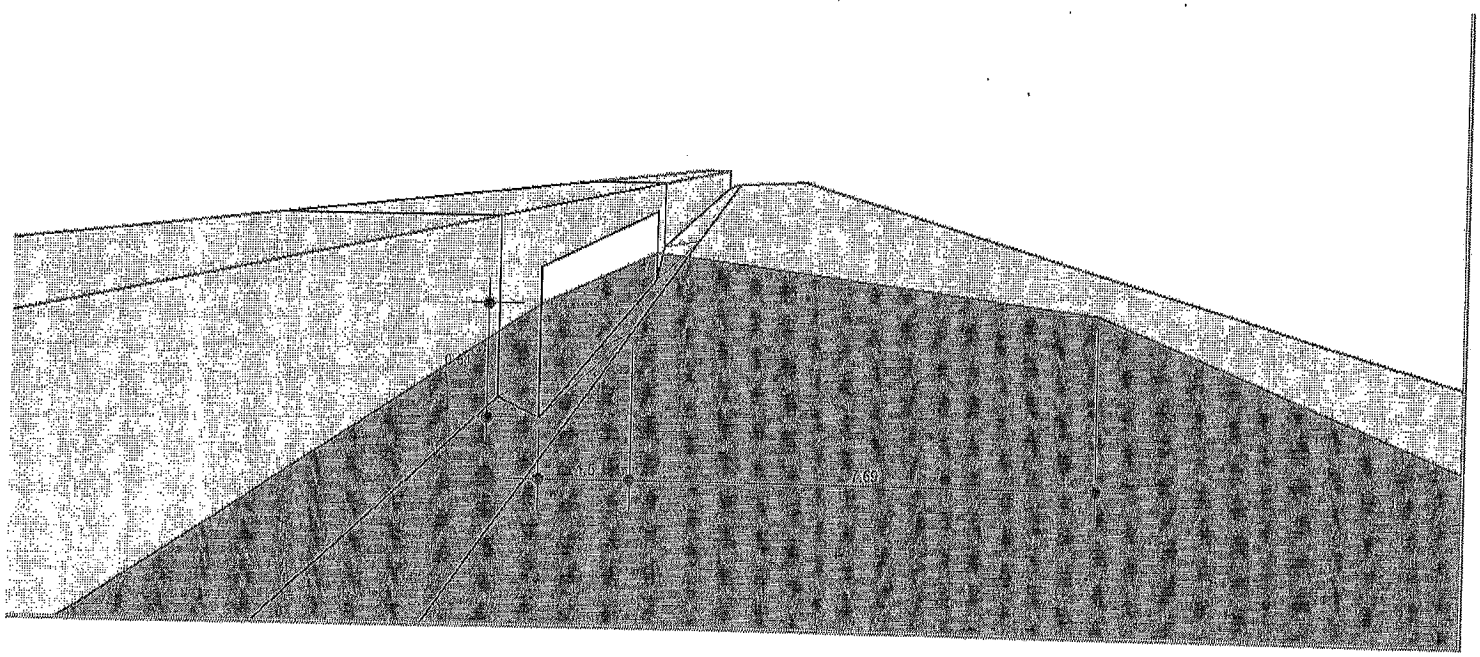
Calculations

Compute by:	Known Q
Q (cfs)	= 1.64

Highlighted

Q Total (cfs)	= 1.64
Q Capt (cfs)	= 1.64
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 7.70
Efficiency (%)	= 100
Gutter Spread (ft)	= 9.19
Gutter Vel (ft/s)	= 1.75
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-

All dimensions in feet



Inlet Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Dec 19 2018

Anza Type K Post Development

Curb Inlet

Location	= On grade
Curb Length (ft)	= 7.30
Throat Height (in)	= 2.20
Grate Area (sqft)	= -0-
Grate Width (ft)	= -0-
Grate Length (ft)	= -0-

Gutter

Slope, Sw (ft/ft)	= 0.103
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= 4.00
Gutter Width (ft)	= 1.50
Gutter Slope (%)	= 0.40
Gutter n-value	= 0.015

Calculations

Compute by:	Known Q
Q (cfs)	= 1.71

Highlighted

Q Total (cfs)	= 1.71
Q Capt (cfs)	= 1.71
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 7.74
Efficiency (%)	= 100
Gutter Spread (ft)	= 9.37
Gutter Vel (ft/s)	= 1.76
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-

All dimensions in feet

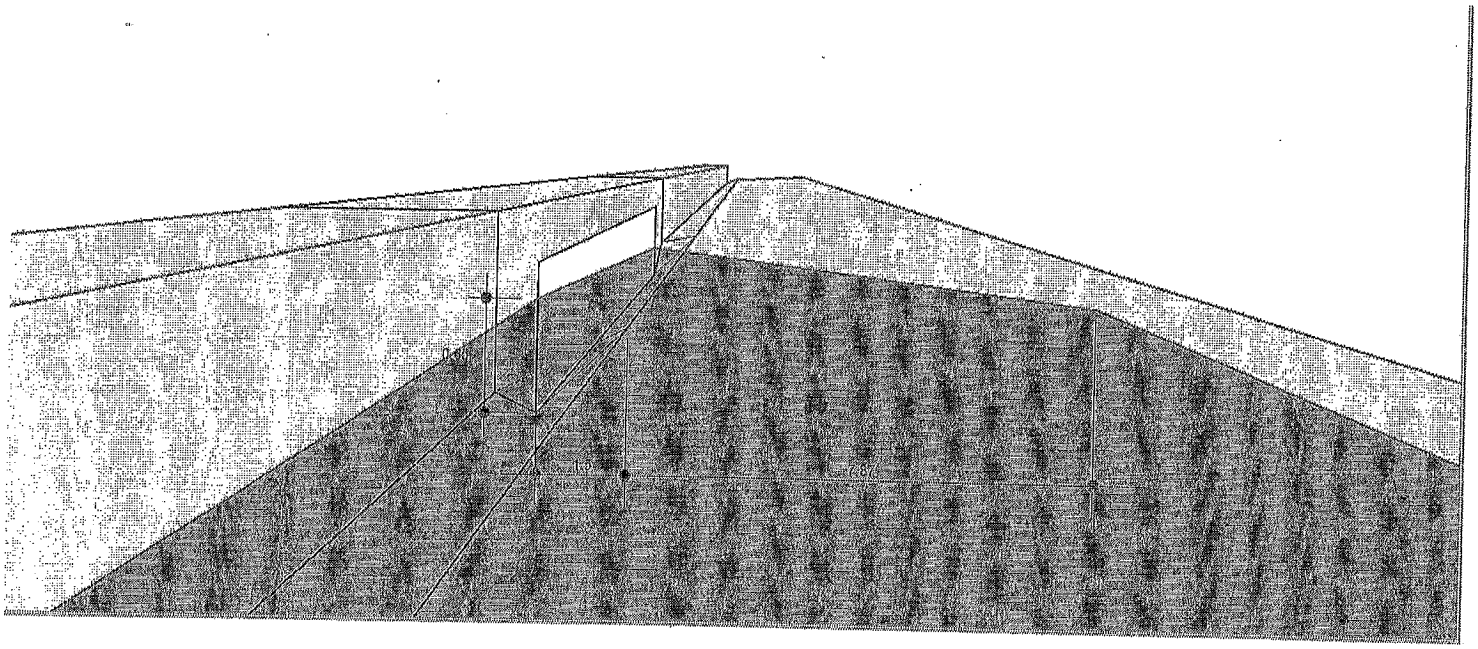


EXHIBIT B

POST DEVELOPMENT HYDROGRAPHS

Anza Street

Biofiltration #1 / HMP-1

Final Design 28-Mar-19

Post Development Condition

Rational Method Unit Hydrograph 6 hr Storm

County of San Diego Hydrology Manual - Chapter 6

Area	1.226 ac	P6 (adj)	2.55 in	P24	5.22 in
C	0.722	Storm	100	P6	2.55 in
Tc=	5			P6/P24	49%
Tc=	5 minutes	I=	6.72 in/hr	7.44 P6 Tc ^-0.645	
Q100 =	5.95 cfs	Vol	8,195		
			8,134		
N=	72 Number of Precipitation Blocks		(61)		
			-0.74%		

Anza Street

Biofiltration #1 / HMP-1

Qn = 60 C A Pn/Tc
Pt(n) = 0.124 P6 (n Tc)^0.355
Pn = Pt(n) - Pt(n-1)

N	Pt(n)	Pn	Q(n)	Q(n)
1	0.56	0.56	5.95	5.95
2	0.72	0.16	1.66	1.66
3	0.83	0.11	1.18	1.18
4	0.92	0.09	0.94	0.94
5	0.99	0.08	0.80	0.80
6	1.06	0.07	0.70	0.70
7	1.12	0.06	0.63	0.63
8	1.17	0.05	0.58	0.58
9	1.22	0.05	0.53	0.53
10	1.27	0.05	0.49	0.49
11	1.31	0.04	0.46	0.46
12	1.35	0.04	0.44	0.44
13	1.39	0.04	0.41	0.41
14	1.43	0.04	0.39	0.39
15	1.46	0.04	0.38	0.38
16	1.50	0.03	0.36	0.36
17	1.53	0.03	0.35	0.35
18	1.56	0.03	0.33	0.33
19	1.59	0.03	0.32	0.32
20	1.62	0.03	0.31	0.31
21	1.65	0.03	0.30	0.30
22	1.68	0.03	0.29	0.29
23	1.70	0.03	0.28	0.28
24	1.73	0.03	0.28	0.28
25	1.76	0.03	0.27	0.27
26	1.78	0.02	0.26	0.26
27	1.80	0.02	0.26	0.26
28	1.83	0.02	0.25	0.25
29	1.85	0.02	0.24	0.24
30	1.87	0.02	0.24	0.24
31	1.89	0.02	0.23	0.23
32	1.92	0.02	0.23	0.23
33	1.94	0.02	0.22	0.22
34	1.96	0.02	0.22	0.22
35	1.98	0.02	0.22	0.22
36	2.00	0.02	0.21	0.21
37	2.02	0.02	0.21	0.21
38	2.04	0.02	0.20	0.20
39	2.06	0.02	0.20	0.20
40	2.07	0.02	0.20	0.20
41	2.09	0.02	0.19	0.19
42	2.11	0.02	0.19	0.19
43	2.13	0.02	0.19	0.19
44	2.15	0.02	0.19	0.19
45	2.16	0.02	0.18	0.18
46	2.18	0.02	0.18	0.18
47	2.20	0.02	0.18	0.18
48	2.21	0.02	0.18	0.18
49	2.23	0.02	0.17	0.17
50	2.25	0.02	0.17	0.17
51	2.26	0.02	0.17	0.17
52	2.28	0.02	0.17	0.17
53	2.29	0.02	0.16	0.16
54	2.31	0.02	0.16	0.16
55	2.32	0.02	0.16	0.16
56	2.34	0.01	0.16	0.16
57	2.35	0.01	0.16	0.16
58	2.37	0.01	0.15	0.15
59	2.38	0.01	0.15	0.15
60	2.40	0.01	0.15	0.15
61	2.41	0.01	0.15	0.15
62	2.42	0.01	0.15	0.15
63	2.44	0.01	0.15	0.15
64	2.45	0.01	0.15	0.15
65	2.46	0.01	0.14	0.14
66	2.48	0.01	0.14	0.14
67	2.49	0.01	0.14	0.14
68	2.50	0.01	0.14	0.14
69	2.52	0.01	0.14	0.14
70	2.53	0.01	0.14	0.14
71	2.54	0.01	0.14	0.14
72	2.56	0.01	0.13	0.13

Anza Street

Biofiltration #1 / HMP-1

Final Design 28-Mar-19

Post Development Hydrographs - 6 Hour Rational Method

2/3 - 1/3 Distr 6 Hour Storm

N	Time (min)	Time (hrs)	Qn (cfs)	N	Time (min)	Time (hrs)	Qn (cfs)
1	245	4.08	5.95	4	250	4.17	0.00
2	240	4.00	1.66	7	255	4.25	0.63
3	235	3.92	1.18	10	260	4.33	0.49
5	230	3.83	0.80	13	265	4.42	0.41
6	225	3.75	0.70	16	270	4.50	0.36
8	220	3.67	0.58	19	275	4.58	0.32
9	215	3.58	0.53	22	280	4.67	0.29
11	210	3.50	0.46	25	285	4.75	0.27
12	205	3.42	0.44	28	290	4.83	0.25
14	200	3.33	0.39	31	295	4.92	0.23
15	195	3.25	0.38	34	300	5.00	0.22
17	190	3.17	0.35	37	305	5.08	0.21
18	185	3.08	0.33	40	310	5.17	0.20
20	180	3.00	0.31	43	315	5.25	0.19
21	175	2.92	0.30	46	320	5.33	0.18
23	170	2.83	0.28	49	325	5.42	0.17
24	165	2.75	0.28	52	330	5.50	0.17
26	160	2.67	0.26	55	335	5.58	0.16
27	155	2.58	0.26	58	340	5.67	0.15
29	150	2.50	0.24	61	345	5.75	0.15
30	145	2.42	0.24	64	350	5.83	0.15
32	140	2.33	0.23	67	355	5.92	0.14
33	135	2.25	0.22	70	360	6.00	0.14
35	130	2.17	0.22	73	365	6.08	0.13
36	125	2.08	0.21				
38	120	2.00	0.20				
39	115	1.92	0.20				
41	110	1.83	0.19				
42	105	1.75	0.19				
44	100	1.67	0.19				
45	95	1.58	0.18				
47	90	1.50	0.18				
48	85	1.42	0.18				
50	80	1.33	0.17				
51	75	1.25	0.17				
53	70	1.17	0.16				
54	65	1.08	0.16				
56	60	1.00	0.16				
57	55	0.92	0.16				
59	50	0.83	0.15				
60	45	0.75	0.15				
62	40	0.67	0.15				
63	35	0.58	0.15				
65	30	0.50	0.14				
66	25	0.42	0.14				
68	20	0.33	0.14				
69	15	0.25	0.14				
71	10	0.17	0.14				
72	5	0.08	0.13				

N	Time (min)	Time (hrs)	100 Year Qn (cfs)	Vol (cf)
72	5	0.08	0.13	10
71	10	0.17	0.14	20
69	15	0.25	0.14	41
68	20	0.33	0.14	42
66	25	0.42	0.14	42
65	30	0.50	0.14	43
63	35	0.58	0.15	44
62	40	0.67	0.15	44
60	45	0.75	0.15	45
59	50	0.83	0.15	46
57	55	0.92	0.16	46
56	60	1.00	0.16	47
54	65	1.08	0.16	48
53	70	1.17	0.16	49
51	75	1.25	0.17	50
50	80	1.33	0.17	51
48	85	1.42	0.18	52
47	90	1.50	0.18	53
45	95	1.58	0.18	54
44	100	1.67	0.19	55
42	105	1.75	0.19	56
41	110	1.83	0.19	58
39	115	1.92	0.20	59
38	120	2.00	0.20	61
36	125	2.08	0.21	62
35	130	2.17	0.22	64
33	135	2.25	0.22	66
32	140	2.33	0.23	68
30	145	2.42	0.24	70
29	150	2.50	0.24	72
27	155	2.58	0.26	75
26	160	2.67	0.26	77
24	165	2.75	0.28	81
23	170	2.83	0.28	84
21	175	2.92	0.30	88
20	180	3.00	0.31	92
18	185	3.08	0.33	97
17	190	3.17	0.35	102
15	195	3.25	0.38	108
14	200	3.33	0.39	116
12	205	3.42	0.44	125
11	210	3.50	0.46	135
9	215	3.58	0.53	149
8	220	3.67	0.58	166
6	225	3.75	0.70	192
5	230	3.83	0.80	226
3	235	3.92	1.18	297
2	240	4.00	1.66	426
1	245	4.08	5.95	1,141
4	250	4.17	0.94	1,034
7	255	4.25	0.63	237
10	260	4.33	0.49	169
13	265	4.42	0.41	136
16	270	4.50	0.36	116
19	275	4.58	0.32	102
22	280	4.67	0.29	92
25	285	4.75	0.27	84
28	290	4.83	0.25	78
31	295	4.92	0.23	72
34	300	5.00	0.22	68
37	305	5.08	0.21	64
40	310	5.17	0.20	61
43	315	5.25	0.19	58
46	320	5.33	0.18	55
49	325	5.42	0.17	53
52	330	5.50	0.17	51
55	335	5.58	0.16	49
58	340	5.67	0.15	47
61	345	5.75	0.15	46
64	350	5.83	0.15	44
67	355	5.92	0.14	43
70	360	6.00	0.14	42
73	365	6.08	0.13	41
				8,134

Anza Street

Biofiltration #1 / HMP-1

Final Design 28-Mar-19

Post Development Hydrographs - 6 Hour Rational Method

2/3 - 1/3 Distr 6 Hour Storm

N	Time (min)	Time (hrs)	Qn (cfs)	N	Time (min)	Time (hrs)	Qn (cfs)
1	245	4.08	5.95	4	250	4.17	0.00
2	240	4.00	1.66	7	255	4.25	0.63
3	235	3.92	1.18	10	260	4.33	0.49
5	230	3.83	0.80	13	265	4.42	0.41
6	225	3.75	0.70	16	270	4.50	0.36
8	220	3.67	0.58	19	275	4.58	0.32
9	215	3.58	0.53	22	280	4.67	0.29
11	210	3.50	0.46	25	285	4.75	0.27
12	205	3.42	0.44	28	290	4.83	0.25
14	200	3.33	0.39	31	295	4.92	0.23
15	195	3.25	0.38	34	300	5.00	0.22
17	190	3.17	0.35	37	305	5.08	0.21
18	185	3.08	0.33	40	310	5.17	0.20
20	180	3.00	0.31	43	315	5.25	0.19
21	175	2.92	0.30	46	320	5.33	0.18
23	170	2.83	0.28	49	325	5.42	0.17
24	165	2.75	0.28	52	330	5.50	0.17
26	160	2.67	0.26	55	335	5.58	0.16
27	155	2.58	0.26	58	340	5.67	0.15
29	150	2.50	0.24	61	345	5.75	0.15
30	145	2.42	0.24	64	350	5.83	0.15
32	140	2.33	0.23	67	355	5.92	0.14
33	135	2.25	0.22	70	360	6.00	0.14
35	130	2.17	0.22	73	365	6.08	0.13
36	125	2.08	0.21				
38	120	2.00	0.20				
39	115	1.92	0.20				
41	110	1.83	0.19				
42	105	1.75	0.19				
44	100	1.67	0.19				
45	95	1.58	0.18				
47	90	1.50	0.18				
48	85	1.42	0.18				
50	80	1.33	0.17				
51	75	1.25	0.17				
53	70	1.17	0.16				
54	65	1.08	0.16				
56	60	1.00	0.16				
57	55	0.92	0.16				
59	50	0.83	0.15				
60	45	0.75	0.15				
62	40	0.67	0.15				
63	35	0.58	0.15				
65	30	0.50	0.14				
66	25	0.42	0.14				
68	20	0.33	0.14				
69	15	0.25	0.14				
71	10	0.17	0.14				
72	5	0.08	0.13				

N	Time (min)	Time (hrs)	100 Year Qn (cfs)	Vol (cf)
72	5	0.08	0.13	10
71	10	0.17	0.14	20
69	15	0.25	0.14	41
68	20	0.33	0.14	42
66	25	0.42	0.14	42
65	30	0.50	0.14	43
63	35	0.58	0.15	44
62	40	0.67	0.15	44
60	45	0.75	0.15	45
59	50	0.83	0.15	46
57	55	0.92	0.16	46
56	60	1.00	0.16	47
54	65	1.08	0.16	48
53	70	1.17	0.16	49
51	75	1.25	0.17	50
50	80	1.33	0.17	51
48	85	1.42	0.18	52
47	90	1.50	0.18	53
45	95	1.58	0.18	54
44	100	1.67	0.19	55
42	105	1.75	0.19	56
41	110	1.83	0.19	58
39	115	1.92	0.20	59
38	120	2.00	0.20	61
36	125	2.08	0.21	62
35	130	2.17	0.22	64
33	135	2.25	0.22	66
32	140	2.33	0.23	68
30	145	2.42	0.24	70
29	150	2.50	0.24	72
27	155	2.58	0.26	75
26	160	2.67	0.26	77
24	165	2.75	0.28	81
23	170	2.83	0.28	84
21	175	2.92	0.30	88
20	180	3.00	0.31	92
18	185	3.08	0.33	97
17	190	3.17	0.35	102
15	195	3.25	0.38	108
14	200	3.33	0.39	116
12	205	3.42	0.44	125
11	210	3.50	0.46	135
9	215	3.58	0.53	149
8	220	3.67	0.58	166
6	225	3.75	0.70	192
5	230	3.83	0.80	226
3	235	3.92	1.18	297
2	240	4.00	1.66	426
1	245	4.08	**5.95**	1,141
4	250	4.17	0.94	1,034
7	255	4.25	0.63	237
10	260	4.33	0.49	169
13	265	4.42	0.41	136
16	270	4.50	0.36	116
19	275	4.58	0.32	102
22	280	4.67	0.29	92
25	285	4.75	0.27	84
28	290	4.83	0.25	78

31	295	4.92	0.23	72
34	300	5.00	0.22	68
37	305	5.08	0.21	64
40	310	5.17	0.20	61
43	315	5.25	0.19	58
46	320	5.33	0.18	55
49	325	5.42	0.17	53
52	330	5.50	0.17	51
55	335	5.58	0.16	49
58	340	5.67	0.15	47
61	345	5.75	0.15	46
64	350	5.83	0.15	44
67	355	5.92	0.14	43
70	360	6.00	0.14	42
73	365	6.08	0.13	41
				8,134

Anza Street
Basin #2 /HMP-2

Final Design 28-Mar-19
Post Development Condition

Rational Method Unit Hydrograph 6 hr Storm

County of San Diego Hydrology Manual - Chapter 6

Area	1.888 ac	P6 (adj)	2.55 in	P24	5.22 in
C	0.757	Storm	100	P6	2.55 in
Tc=	5.0			P6/P24	49%
Tc=	5 minutes	I=	6.72 in/hr	7.44 P6 Tc ^-0.645	
Q100 =	9.60 cfs	Vol	13,226		
			13,095		
N=	72 Number of Precipitation Blocks		(131)		
			-0.99%		

Anza Street

Basin #2 /HMP-2

Qn = 60 C A Pn/Tc
Pt(n) = 0.124 P6 (n Tc)^0.355
Pn = Pt(n) - Pt(n-1)

N	Pt(n)	Pn	Q(n)	Q(n)
1	0.56	0.56	9.60	9.60
2	0.72	0.16	2.68	2.68
3	0.83	0.11	1.90	1.90
4	0.92	0.09	1.52	1.52
5	0.99	0.08	1.29	1.29
6	1.06	0.07	1.14	1.14
7	1.12	0.06	1.02	1.02
8	1.17	0.05	0.93	0.93
9	1.22	0.05	0.86	0.86
10	1.27	0.05	0.80	0.80
11	1.31	0.04	0.75	0.75
12	1.35	0.04	0.71	0.71
13	1.39	0.04	0.67	0.67
14	1.43	0.04	0.64	0.64
15	1.46	0.04	0.61	0.61
16	1.50	0.03	0.58	0.58
17	1.53	0.03	0.56	0.56
18	1.56	0.03	0.54	0.54
19	1.59	0.03	0.52	0.52
20	1.62	0.03	0.50	0.50
21	1.65	0.03	0.49	0.49
22	1.68	0.03	0.47	0.47
23	1.70	0.03	0.46	0.46
24	1.73	0.03	0.44	0.44
25	1.76	0.03	0.43	0.43
26	1.78	0.02	0.42	0.42
27	1.80	0.02	0.41	0.41
28	1.83	0.02	0.40	0.40
29	1.85	0.02	0.39	0.39
30	1.87	0.02	0.38	0.38
31	1.89	0.02	0.38	0.38
32	1.92	0.02	0.37	0.37
33	1.94	0.02	0.36	0.36
34	1.96	0.02	0.35	0.35
35	1.98	0.02	0.35	0.35
36	2.00	0.02	0.34	0.34
37	2.02	0.02	0.33	0.33
38	2.04	0.02	0.33	0.33
39	2.06	0.02	0.32	0.32
40	2.07	0.02	0.32	0.32
41	2.09	0.02	0.31	0.31
42	2.11	0.02	0.31	0.31
43	2.13	0.02	0.30	0.30
44	2.15	0.02	0.30	0.30
45	2.16	0.02	0.29	0.29
46	2.18	0.02	0.29	0.29
47	2.20	0.02	0.29	0.29
48	2.21	0.02	0.28	0.28
49	2.23	0.02	0.28	0.28
50	2.25	0.02	0.28	0.28
51	2.26	0.02	0.27	0.27
52	2.28	0.02	0.27	0.27
53	2.29	0.02	0.26	0.26
54	2.31	0.02	0.26	0.26
55	2.32	0.02	0.26	0.26
56	2.34	0.01	0.26	0.26
57	2.35	0.01	0.25	0.25
58	2.37	0.01	0.25	0.25
59	2.38	0.01	0.25	0.25
60	2.40	0.01	0.24	0.24
61	2.41	0.01	0.24	0.24
62	2.42	0.01	0.24	0.24
63	2.44	0.01	0.24	0.24
64	2.45	0.01	0.23	0.23
65	2.46	0.01	0.23	0.23
66	2.48	0.01	0.23	0.23
67	2.49	0.01	0.23	0.23
68	2.50	0.01	0.23	0.23
69	2.52	0.01	0.22	0.22
70	2.53	0.01	0.22	0.22
71	2.54	0.01	0.22	0.22
72	2.56	0.01	0.22	0.22
73	2.57	0.01	0.22	0.00

Anza Street

Basin #2 /HMP-2

Final Design 28-Mar-19

Post Development Hydrographs - 6 Hour Rational Method

2/3 - 1/3 Distr 6 Hour Storm

N	Time (min)	Time (hrs)	Qn (cfs)	N	Time (min)	Time (hrs)	Qn (cfs)
1	245	4.08	9.60	4	250	4.17	1.52
2	240	4.00	2.68	7	255	4.25	1.02
3	235	3.92	1.90	10	260	4.33	0.80
5	230	3.83	1.29	13	265	4.42	0.67
6	225	3.75	1.14	16	270	4.50	0.58
8	220	3.67	0.93	19	275	4.58	0.52
9	215	3.58	0.86	22	280	4.67	0.47
11	210	3.50	0.75	25	285	4.75	0.43
12	205	3.42	0.71	28	290	4.83	0.40
14	200	3.33	0.64	31	295	4.92	0.38
15	195	3.25	0.61	34	300	5.00	0.35
17	190	3.17	0.56	37	305	5.08	0.33
18	185	3.08	0.54	40	310	5.17	0.32
20	180	3.00	0.50	43	315	5.25	0.30
21	175	2.92	0.49	46	320	5.33	0.29
23	170	2.83	0.46	49	325	5.42	0.28
24	165	2.75	0.44	52	330	5.50	0.27
26	160	2.67	0.42	55	335	5.58	0.26
27	155	2.58	0.41	58	340	5.67	0.25
29	150	2.50	0.39	61	345	5.75	0.24
30	145	2.42	0.38	64	350	5.83	0.23
32	140	2.33	0.37	67	355	5.92	0.23
33	135	2.25	0.36	70	360	6.00	0.22
35	130	2.17	0.35	73	365	6.08	0.00
36	125	2.08	0.34				
38	120	2.00	0.33				
39	115	1.92	0.32				
41	110	1.83	0.31				
42	105	1.75	0.31				
44	100	1.67	0.30				
45	95	1.58	0.29				
47	90	1.50	0.29				
48	85	1.42	0.28				
50	80	1.33	0.28				
51	75	1.25	0.27				
53	70	1.17	0.26				
54	65	1.08	0.26				
56	60	1.00	0.26				
57	55	0.92	0.25				
59	50	0.83	0.25				
60	45	0.75	0.24				
62	40	0.67	0.24				
63	35	0.58	0.24				
65	30	0.50	0.23				
66	25	0.42	0.23				
68	20	0.33	0.23				
69	15	0.25	0.22				
71	10	0.17	0.22				
72	5	0.08	0.22				

N	Time (min)	Time (hrs)	100 Year Qn (cfs)	Vol (cf)
72	5	0.08	0.22	16
71	10	0.17	0.22	33
69	15	0.25	0.22	66
68	20	0.33	0.23	67
66	25	0.42	0.23	68
65	30	0.50	0.23	69
63	35	0.58	0.24	70
62	40	0.67	0.24	71
60	45	0.75	0.24	73
59	50	0.83	0.25	74
57	55	0.92	0.25	75
56	60	1.00	0.26	76
54	65	1.08	0.26	78
53	70	1.17	0.26	79
51	75	1.25	0.27	80
50	80	1.33	0.28	82
48	85	1.42	0.28	84
47	90	1.50	0.29	86
45	95	1.58	0.29	87
44	100	1.67	0.30	89
42	105	1.75	0.31	91
41	110	1.83	0.31	93
39	115	1.92	0.32	95
38	120	2.00	0.33	98
36	125	2.08	0.34	100
35	130	2.17	0.35	103
33	135	2.25	0.36	106
32	140	2.33	0.37	109
30	145	2.42	0.38	113
29	150	2.50	0.39	117
27	155	2.58	0.41	121
26	160	2.67	0.42	125
24	165	2.75	0.44	130
23	170	2.83	0.46	135
21	175	2.92	0.49	141
20	180	3.00	0.50	148
18	185	3.08	0.54	156
17	190	3.17	0.56	165
15	195	3.25	0.61	175
14	200	3.33	0.64	187
12	205	3.42	0.71	201
11	210	3.50	0.75	218
9	215	3.58	0.86	241
8	220	3.67	0.93	268
6	225	3.75	1.14	310
5	230	3.83	1.29	365
3	235	3.92	1.90	479
2	240	4.00	2.68	687
1	245	4.08	9.60	1,842
4	250	4.17	1.52	1,669
7	255	4.25	1.02	382
10	260	4.33	0.80	273
13	265	4.42	0.67	220
16	270	4.50	0.58	188
19	275	4.58	0.52	165
22	280	4.67	0.47	149
25	285	4.75	0.43	136
28	290	4.83	0.40	125
31	295	4.92	0.38	117
34	300	5.00	0.35	109
37	305	5.08	0.33	103
40	310	5.17	0.32	98
43	315	5.25	0.30	93
46	320	5.33	0.29	89
49	325	5.42	0.28	85
52	330	5.50	0.27	82
55	335	5.58	0.26	79
58	340	5.67	0.25	76
61	345	5.75	0.24	74
64	350	5.83	0.23	71
67	355	5.92	0.23	69
70	360	6.00	0.22	67
73	365	6.08	0.00	33
			Vol	13,096

Anza Street

Basin #2 /HMP-2

Final Design 28-Mar-19

Post Development Hydrographs - 6 Hour Rational Method

2/3 - 1/3 Distr 6 Hour Storm

N	Time (min)	Time (hrs)	Qn (cfs)	N	Time (min)	Time (hrs)	Qn (cfs)
1	245	4.08	9.60	4	250	4.17	1.52
2	240	4.00	2.68	7	255	4.25	1.02
3	235	3.92	1.90	10	260	4.33	0.80
5	230	3.83	1.29	13	265	4.42	0.67
6	225	3.75	1.14	16	270	4.50	0.58
8	220	3.67	0.93	19	275	4.58	0.52
9	215	3.58	0.86	22	280	4.67	0.47
11	210	3.50	0.75	25	285	4.75	0.43
12	205	3.42	0.71	28	290	4.83	0.40
14	200	3.33	0.64	31	295	4.92	0.38
15	195	3.25	0.61	34	300	5.00	0.35
17	190	3.17	0.56	37	305	5.08	0.33
18	185	3.08	0.54	40	310	5.17	0.32
20	180	3.00	0.50	43	315	5.25	0.30
21	175	2.92	0.49	46	320	5.33	0.29
23	170	2.83	0.46	49	325	5.42	0.28
24	165	2.75	0.44	52	330	5.50	0.27
26	160	2.67	0.42	55	335	5.58	0.26
27	155	2.58	0.41	58	340	5.67	0.25
29	150	2.50	0.39	61	345	5.75	0.24
30	145	2.42	0.38	64	350	5.83	0.23
32	140	2.33	0.37	67	355	5.92	0.23
33	135	2.25	0.36	70	360	6.00	0.22
35	130	2.17	0.35	73	365	6.08	0.00
36	125	2.08	0.34				
38	120	2.00	0.33				
39	115	1.92	0.32				
41	110	1.83	0.31				
42	105	1.75	0.31				
44	100	1.67	0.30				
45	95	1.58	0.29				
47	90	1.50	0.29				
48	85	1.42	0.28				
50	80	1.33	0.28				
51	75	1.25	0.27				
53	70	1.17	0.26				
54	65	1.08	0.26				
56	60	1.00	0.26				
57	55	0.92	0.25				
59	50	0.83	0.25				
60	45	0.75	0.24				
62	40	0.67	0.24				
63	35	0.58	0.24				
65	30	0.50	0.23				
66	25	0.42	0.23				
68	20	0.33	0.23				
69	15	0.25	0.22				
71	10	0.17	0.22				
72	5	0.08	0.22				

N	Time (min)	Time (hrs)	100 Year Qn (cfs)	Vol (cf)
72	5	0.08	0.22	16
71	10	0.17	0.22	33
69	15	0.25	0.22	66
68	20	0.33	0.23	67
66	25	0.42	0.23	68
65	30	0.50	0.23	69
63	35	0.58	0.24	70
62	40	0.67	0.24	71
60	45	0.75	0.24	73
59	50	0.83	0.25	74
57	55	0.92	0.25	75
56	60	1.00	0.26	76
54	65	1.08	0.26	78
53	70	1.17	0.26	79
51	75	1.25	0.27	80
50	80	1.33	0.28	82
48	85	1.42	0.28	84
47	90	1.50	0.29	85
45	95	1.58	0.29	87
44	100	1.67	0.30	89
42	105	1.75	0.31	91
41	110	1.83	0.31	93
39	115	1.92	0.32	95
38	120	2.00	0.33	98
36	125	2.08	0.34	100
35	130	2.17	0.35	103
33	135	2.25	0.36	106
32	140	2.33	0.37	109
30	145	2.42	0.38	113
29	150	2.50	0.39	117
27	155	2.58	0.41	121
26	160	2.67	0.42	125
24	165	2.75	0.44	130
23	170	2.83	0.46	135
21	175	2.92	0.49	141
20	180	3.00	0.50	148
18	185	3.08	0.54	156
17	190	3.17	0.56	165
15	195	3.25	0.61	175
14	200	3.33	0.64	187
12	205	3.42	0.71	201
11	210	3.50	0.75	218
9	215	3.58	0.86	241
8	220	3.67	0.93	268
6	225	3.75	1.14	310
5	230	3.83	1.29	365
3	235	3.92	1.90	479
2	240	4.00	2.68	687
1	245	4.08	**9.60**	1,842
4	250	4.17	1.52	1,669
7	255	4.25	1.02	382
10	260	4.33	0.80	273

13	265	4.42	0.67	220
16	270	4.50	0.58	188
19	275	4.58	0.52	165
22	280	4.67	0.47	149
25	285	4.75	0.43	136
28	290	4.83	0.40	125
31	295	4.92	0.38	117
34	300	5.00	0.35	109
37	305	5.08	0.33	103
40	310	5.17	0.32	98
43	315	5.25	0.30	93
46	320	5.33	0.29	89
49	325	5.42	0.28	85
52	330	5.50	0.27	82
55	335	5.58	0.26	79
58	340	5.67	0.25	76
61	345	5.75	0.24	74
64	350	5.83	0.23	71
67	355	5.92	0.23	69
70	360	6.00	0.22	67
73	365	6.08	0.00	33
			Vol	13,095

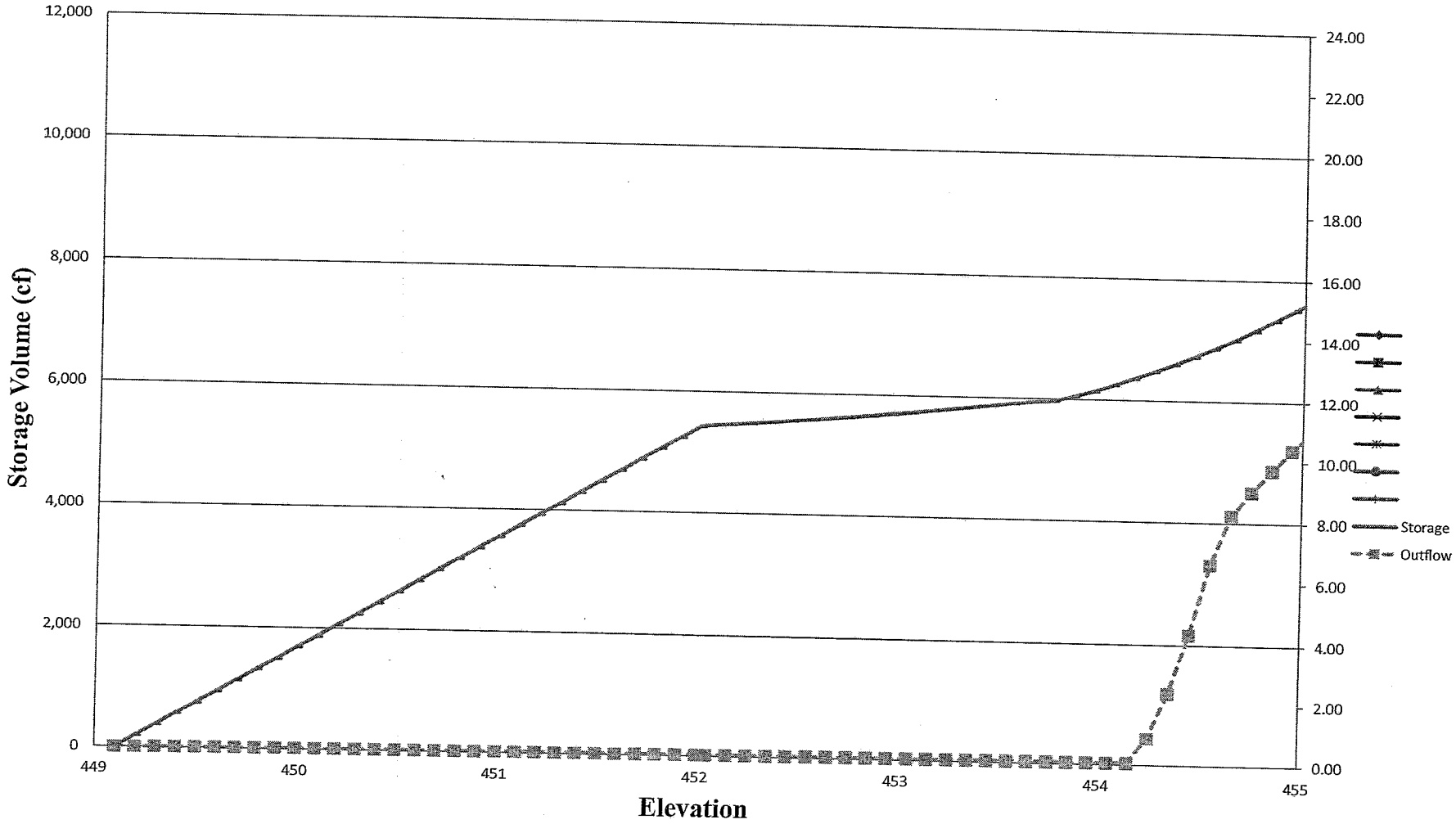
EXHIBIT C

STORAGE INDICATION TABLES

Anza Street

Biofiltration #1 / HMP-1			Top	455.55	8,460 cf						Height	Round				
		Storage @	Overflow	454.10	6,247 cf							0.00				5.00
Basin Storage Volumes			Floor	453.65	5,937	dT= 5		0.14	dT= 15			1.000				48
												1.000				48
DEPTH (FT)	ELEVATION	AREA (SF)	Raw Storage (CF)	Water Quality (CF)	STORAGE (CF)	2S/dT (CFS)	2S/dT + O (CFS)	2S/dT (CFS)	2S/dT + O (CFS)	OUTFLOW (CFS)		449.10 #1 (CFS)	Not Used #2 (CFS)	Not Used #3 (CFS)	454.10 Overflow (CFS)	
0.00	449.10	1,925	0	0	0	0.00	0.00	0.00	0.00	0.00		0.00				
0.10	449.20	1,925	187	0	187	1.24	1.25	0.41	0.42	0.01		0.01				
0.20	449.30	1,925	373	0	373	2.49	2.50	0.83	0.84	0.01		0.01				
0.30	449.40	1,925	560	0	560	3.73	3.75	1.24	1.26	0.01		0.01				
0.40	449.50	1,925	747	0	747	4.98	5.00	1.66	1.68	0.02		0.02				
0.50	449.60	1,925	934	0	934	6.22	6.24	2.07	2.09	0.02		0.02				
0.60	449.70	1,925	1,120	0	1,120	7.47	7.49	2.49	2.51	0.02		0.02				
0.70	449.80	1,925	1,307	0	1,307	8.71	8.74	2.90	2.93	0.02		0.02				
0.80	449.90	1,925	1,494	0	1,494	9.96	9.98	3.32	3.34	0.02		0.02				
0.90	450.00	1,925	1,681	0	1,681	11.20	11.23	3.73	3.76	0.02		0.02				
1.00	450.10	1,925	1,867	0	1,867	12.45	12.47	4.15	4.18	0.03		0.03				
1.10	450.20	1,925	2,054	0	2,054	13.69	13.72	4.56	4.59	0.03		0.03				
1.20	450.30	1,925	2,241	0	2,241	14.94	14.97	4.98	5.01	0.03		0.03				
1.30	450.40	1,925	2,427	0	2,427	16.18	16.21	5.39	5.42	0.03		0.03				
1.40	450.50	1,925	2,614	0	2,614	17.43	17.46	5.81	5.84	0.03		0.03				
1.50	450.60	1,925	2,801	0	2,801	18.67	18.70	6.22	6.26	0.03		0.03				
1.60	450.70	1,925	2,988	0	2,988	19.92	19.95	6.64	6.67	0.03		0.03				
1.70	450.80	1,925	3,174	0	3,174	21.16	21.20	7.05	7.09	0.03		0.03				
1.80	450.90	1,925	3,361	0	3,361	22.41	22.44	7.47	7.50	0.03		0.03				
1.90	451.00	1,925	3,548	0	3,548	23.65	23.69	7.88	7.92	0.04		0.04				
2.00	451.10	1,925	3,735	0	3,735	24.90	24.93	8.30	8.34	0.04		0.04				
2.10	451.20	1,925	3,921	0	3,921	26.14	26.18	8.71	8.75	0.04		0.04				
2.20	451.30	1,925	4,108	0	4,108	27.39	27.42	9.13	9.17	0.04		0.04				
2.30	451.40	1,925	4,295	0	4,295	28.63	28.67	9.54	9.58	0.04		0.04				
2.40	451.50	1,925	4,481	0	4,481	29.88	29.92	9.96	10.00	0.04		0.04				
2.50	451.60	1,925	4,668	0	4,668	31.12	31.16	10.37	10.41	0.04		0.04				
2.60	451.70	1,925	4,855	0	4,855	32.37	32.41	10.79	10.83	0.04		0.04				
2.70	451.80	1,925	5,042	0	5,042	33.61	33.65	11.20	11.25	0.04		0.04				
2.80	451.90	1,925	5,228	0	5,228	34.86	34.90	11.62	11.66	0.04		0.04				
2.90	452.00	1,925	5,415	0	5,415	36.10	36.14	12.03	12.08	0.04		0.04				
2.95	452.05	862	5,436	0	5,436	36.24	36.28	12.08	12.12	0.04		0.04				
3.05	452.15	862	5,462	0	5,462	36.41	36.46	12.14	12.18	0.05		0.05				
3.15	452.25	862	5,480	0	5,480	36.53	36.58	12.18	12.22	0.05		0.05				
3.25	452.35	897	5,506	0	5,506	36.71	36.75	12.24	12.28	0.05		0.05				
3.35	452.45	932	5,533	0	5,533	36.89	36.94	12.30	12.34	0.05		0.05				
3.45	452.55	968	5,562	0	5,562	37.08	37.13	12.36	12.41	0.05		0.05				
3.55	452.65	1,003	5,592	0	5,592	37.28	37.33	12.43	12.47	0.05		0.05				
3.65	452.75	1,039	5,622	0	5,622	37.48	37.53	12.49	12.54	0.05		0.05				
3.75	452.85	1,074	5,654	0	5,654	37.69	37.74	12.56	12.61	0.05		0.05				
3.85	452.95	1,110	5,687	0	5,687	37.91	37.96	12.64	12.69	0.05		0.05				
3.95	453.05	1,145	5,720	0	5,720	38.14	38.19	12.71	12.76	0.05		0.05				
4.05	453.15	1,181	5,755	0	5,755	38.37	38.42	12.79	12.84	0.05		0.05				
4.15	453.25	1,216	5,791	0	5,791	38.61	38.66	12.87	12.92	0.05		0.05				
4.25	453.35	1,252	5,828	0	5,828	38.86	38.91	12.95	13.01	0.05		0.05				
4.35	453.45	1,287	5,866	0	5,866	39.11	39.16	13.04	13.09	0.05		0.05				
4.45	453.55	1,358	5,906	0	5,906	39.37	39.43	13.12	13.18	0.06		0.06				
4.55	453.65	797	5,937	0	5,937	39.58	39.64	13.19	13.25	0.06		0.06				
4.65	453.75	877	5,961	0	5,961	39.74	39.80	13.25	13.30	0.06		0.06				
4.75	453.85	957	6,050	0	6,050	40.33	40.39	13.44	13.50	0.06		0.06				
4.85	453.95	1,038	6,139	0	6,139	40.93	40.98	13.64	13.70	0.06		0.06				
4.95	454.05	1,118	6,247	0	6,247	41.65	41.70	13.88	13.94	0.06		0.06				
5.05	454.15	1,198	6,363	0	6,363	42.42	42.48	14.14	14.20	0.06		0.06				0.00
5.15	454.25	1,192	6,482	0	6,482	43.21	44.09	14.40	15.28	0.88		0.06				0.82
5.25	454.35	1,257	6,605	0	6,605	44.03	46.41	14.68	17.05	2.38		0.06				2.32
5.35	454.45	1,323	6,734	0	6,734	44.89	49.21	14.96	19.28	4.32		0.06				4.26
5.45	454.55	1,388	6,869	0	6,869	45.79	52.41	15.26	21.88	6.62		0.06				6.56
5.55	454.65	1,599	7,018	0	7,018	46.79	55.02	15.60	23.83	8.23		0.06				8.17
5.65	454.75	1,650	7,181	0	7,181	47.87	56.88	15.96	24.97	9.01		0.06				8.95
5.75	454.85	1,700	7,348	0	7,348	48.99	58.72	16.33	26.06	9.73		0.06				9.66
5.85	454.95	1,751	7,521	0	7,521	50.14	60.53	16.71	27.11	10.40		0.06				10.33
5.95	455.05	1,802	7,699	0	7,699	51.32	62.35	17.11	28.13	11.02		0.06				10.96
6.05	455.15	1,853	7,881	0	7,881	52.54	64.16	17.51	29.13	11.62		0.06				11.55
6.15	455.25	1,903	8,069	0	8,069	53.79	65.97	17.93	30.11	12.18		0.06				12.12
6.25	455.35	1,954	8,262	0	8,262	55.08	67.80	18.36	31.08	12.72		0.07				12.65
6.35	455.45	2,005	8,460	0	8,460	56.40	69.64	18.80	32.04	13.24		0.07				13.17

Anza Basin #1
Detention Basin



Anza Street

Biofiltration #2 / HMP-2		Top	454.15	12,026 cf						Height	Round					
		Storage @ Overflow	452.85	9,416 cf				0.22			0.00					4.45
Basin Storage Volumes		Floor	452.35	8,614	dT= 5			dT= 15			1.000					48
											1.000					48
DEPTH (FT)	ELEVATION	AREA (SF)	Raw Storage (CF)	Water Quality (CF)	STORAGE (CF)	2S/dT (CFS)	2S/dT + O (CFS)	2S/dT (CFS)	2S/dT + O (CFS)	OUTFLOW (CFS)	448.40 #1 (CFS)	Not Used #2 (CFS)	Not Used #3 (CFS)	452.85 Overflow (CFS)		
0.00	448.40	3,650	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00					
0.10	448.50	3,650	354	0	354	2.36	2.37	0.79	0.79	0.01	0.01					
0.20	448.60	3,650	708	0	708	4.72	4.73	1.57	1.58	0.01	0.01					
0.30	448.70	3,650	1,062	0	1,062	7.08	7.09	2.36	2.37	0.01	0.01					
0.40	448.80	3,650	1,416	0	1,416	9.44	9.46	3.15	3.16	0.02	0.02					
0.50	448.90	3,650	1,770	0	1,770	11.80	11.82	3.93	3.95	0.02	0.02					
0.60	449.00	3,650	2,124	0	2,124	14.16	14.18	4.72	4.74	0.02	0.02					
0.70	449.10	3,650	2,478	0	2,478	16.52	16.54	5.51	5.53	0.02	0.02					
0.80	449.20	3,650	2,832	0	2,832	18.88	18.91	6.29	6.32	0.02	0.02					
0.90	449.30	3,650	3,186	0	3,186	21.24	21.27	7.08	7.11	0.02	0.02					
1.00	449.40	3,650	3,541	0	3,541	23.60	23.63	7.87	7.89	0.03	0.03					
1.10	449.50	3,650	3,895	0	3,895	25.96	25.99	8.65	8.68	0.03	0.03					
1.20	449.60	3,650	4,249	0	4,249	28.32	28.35	9.44	9.47	0.03	0.03					
1.30	449.70	3,650	4,603	0	4,603	30.68	30.71	10.23	10.26	0.03	0.03					
1.40	449.80	3,650	4,957	0	4,957	33.04	33.08	11.01	11.05	0.03	0.03					
1.50	449.90	3,650	5,311	0	5,311	35.41	35.44	11.80	11.83	0.03	0.03					
1.60	450.00	3,650	5,665	0	5,665	37.77	37.80	12.59	12.62	0.03	0.03					
1.70	450.10	3,650	6,019	0	6,019	40.13	40.16	13.38	13.41	0.03	0.03					
1.80	450.20	3,650	6,373	0	6,373	42.49	42.52	14.16	14.20	0.03	0.03					
1.90	450.30	3,650	6,727	0	6,727	44.85	44.88	14.95	14.98	0.04	0.04					
2.00	450.40	3,650	7,081	0	7,081	47.21	47.24	15.74	15.77	0.04	0.04					
2.10	450.50	3,650	7,435	0	7,435	49.57	49.60	16.52	16.56	0.04	0.04					
2.20	450.60	3,650	7,789	0	7,789	51.93	51.97	17.31	17.35	0.04	0.04					
2.25	450.65	1,380	7,810	0	7,810	52.07	52.10	17.36	17.39	0.04	0.04					
2.35	450.75	1,380	7,851	0	7,851	52.34	52.38	17.45	17.49	0.04	0.04					
2.45	450.85	1,380	7,893	0	7,893	52.62	52.66	17.54	17.58	0.04	0.04					
2.55	450.95	1,380	7,934	0	7,934	52.89	52.93	17.63	17.67	0.04	0.04					
2.65	451.05	1,380	7,975	0	7,975	53.17	53.21	17.72	17.77	0.04	0.04					
2.75	451.15	1,380	8,017	0	8,017	53.45	53.49	17.82	17.86	0.04	0.04					
2.85	451.25	1,380	8,058	0	8,058	53.72	53.77	17.91	17.95	0.04	0.04					
2.95	451.35	1,380	8,100	0	8,100	54.00	54.04	18.00	18.04	0.04	0.04					
3.05	451.45	1,380	8,141	0	8,141	54.27	54.32	18.09	18.14	0.05	0.05					
3.15	451.55	1,380	8,182	0	8,182	54.55	54.60	18.18	18.23	0.05	0.05					
3.25	451.65	1,380	8,224	0	8,224	54.83	54.87	18.28	18.32	0.05	0.05					
3.35	451.75	1,380	8,265	0	8,265	55.10	55.15	18.37	18.41	0.05	0.05					
3.45	451.85	1,380	8,307	0	8,307	55.38	55.43	18.46	18.51	0.05	0.05					
3.55	451.95	1,380	8,348	0	8,348	55.65	55.70	18.55	18.60	0.05	0.05					
3.65	452.05	1,380	8,389	0	8,389	55.93	55.98	18.64	18.69	0.05	0.05					
3.75	452.15	1,380	8,431	0	8,431	56.21	56.26	18.74	18.79	0.05	0.05					
3.85	452.25	1,380	8,472	0	8,472	56.48	56.53	18.83	18.88	0.05	0.05					
3.95	452.35	1,453	8,614	0	8,614	57.43	57.48	19.14	19.19	0.05	0.05					
4.05	452.45	1,513	8,762	0	8,762	58.41	58.47	19.47	19.52	0.05	0.05					
4.15	452.55	1,574	8,917	0	8,917	59.44	59.50	19.81	19.87	0.05	0.05					
4.25	452.65	1,634	9,077	0	9,077	60.51	60.57	20.17	20.22	0.05	0.05					
4.35	452.75	1,694	9,243	0	9,243	61.62	61.68	20.54	20.60	0.05	0.05					
4.45	452.85	1,755	9,416	0	9,416	62.77	62.83	20.92	20.98	0.06	0.06					
4.55	452.95	1,815	9,594	0	9,594	63.96	64.84	21.32	22.20	0.88	0.06					0.00
4.65	453.05	1,875	9,779	0	9,779	65.19	67.57	21.73	24.11	2.37	0.06					0.82
4.75	453.15	1,935	9,969	0	9,969	66.46	70.78	22.15	26.47	4.32	0.06					2.32
4.85	453.25	1,996	10,166	0	10,166	67.77	74.39	22.59	29.21	6.61	0.06					4.26
4.95	453.35	2,056	10,368	0	10,368	69.12	77.35	23.04	31.27	8.23	0.06					6.56
5.05	453.45	2,059	10,574	0	10,574	70.49	79.50	23.50	32.50	9.01	0.06					8.17
5.15	453.55	2,063	10,780	0	10,780	71.87	81.59	23.96	33.68	9.72	0.06					8.95
5.25	453.65	2,066	10,987	0	10,987	73.24	83.64	24.41	34.81	10.39	0.06					9.66
5.35	453.75	2,070	11,193	0	11,193	74.62	85.64	24.87	35.89	11.02	0.06					10.33
5.45	453.85	2,073	11,401	0	11,401	76.00	87.62	25.33	36.95	11.61	0.06					10.96
5.55	453.95	2,080	11,608	0	11,608	77.39	89.57	25.80	37.97	12.18	0.06					11.55
5.65	454.05	2,087	11,817	0	11,817	78.78	91.49	26.26	38.98	12.72	0.06					12.12
5.75	454.15	2,094	12,026	0	12,026	80.17	93.40	26.72	39.96	13.23	0.06					12.65
																13.17

Anza Basin #2
Detention Basin

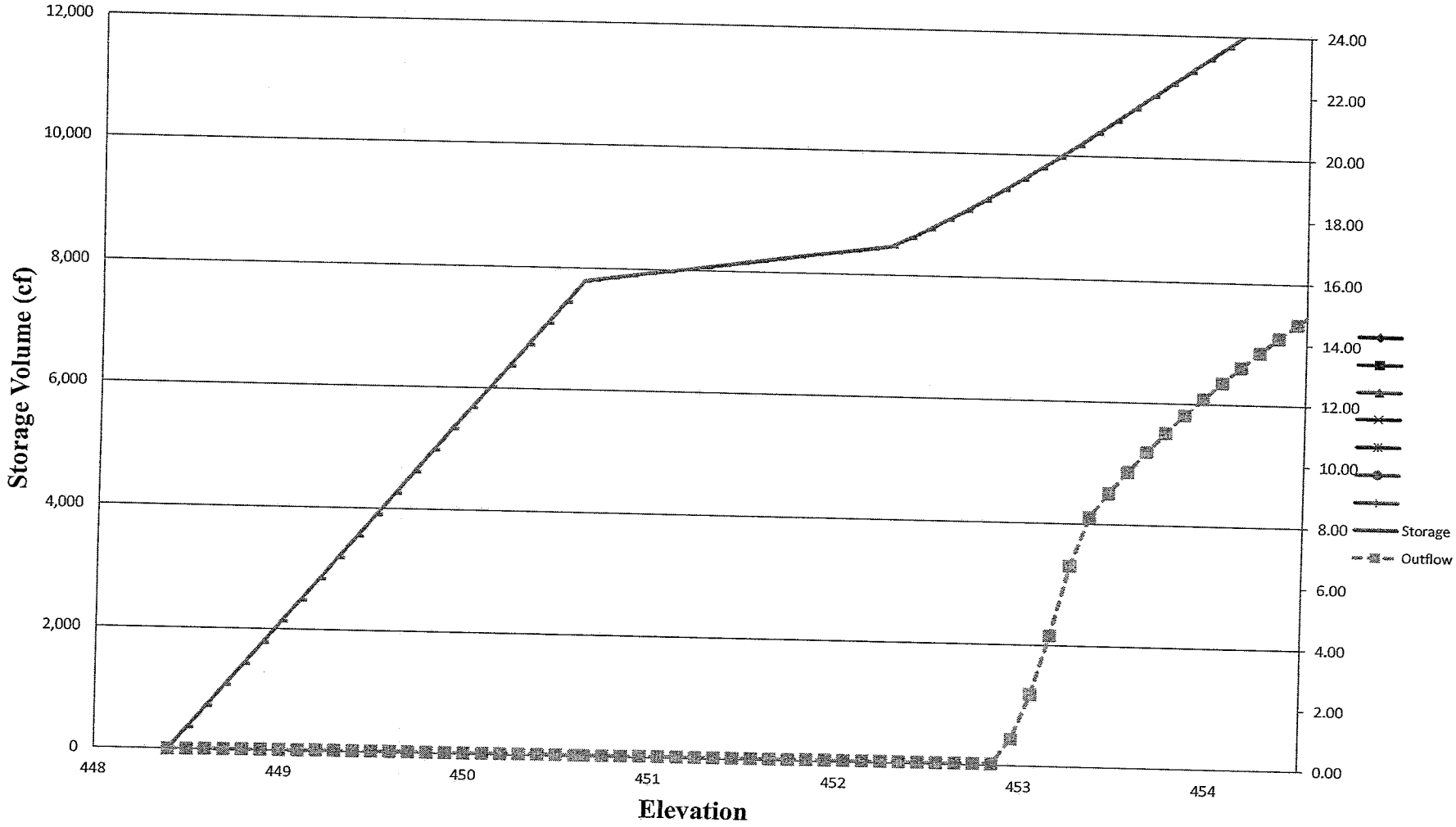


EXHIBIT D

SUMMARY OF BASIN ROUTING

Anza Street

Biofiltration #1 / HMP-1 — Prelim Design — 29-Mar-19

DMAs	1.164	ac
Basin #1	0.062	ac
Total	1.226	ac

6-Hour Rational Method Hydrograph

		Elev	Storage (cf)	Storage (ac-ft)	Depth (ft)
Bottom of Storage		449.10	0		
Top of HMP Storage		452.00	4,108	0.09	2.9
Floor of Basin		453.65	5,937	0.14	4.6
Surface Area @ 6" Depth	1,198	454.15	6,247	0.14	5.1
Grated Overflow		454.10	6,247	0.14	5.0
Emergency Spillway		455.35			
Top of Basin		455.55	8,460	0.19	6.4

Storm Frequency	Qexist (cfs)	Qin (cfs)	Qout (cfs)	WSEL (ft)	Total Depth (ft)
2 YEAR					
5 YEAR					
10 YEAR					
25 YEAR					
50 YEAR					
100 YEAR		5.95	0.88	454.25	5.2

Outlet Control Structure — Use 4' x 4' structure (Inside Dimension)

Opening	#1	#2	#3	Overflow - Grate
Elevation	449.1	Not Used	Not Used	454.1
Width (in)	1.00	0	Not	4 feet
Height (in)	Round	0	Used	4 feet

Drain Time - Surface Volume below overflow elevation

		Elevations / Dimensions	
Total Volume @12"'	7,018 cf	Top 12"	454.65 fg
Surface Area @ Overflow	1,118 sf	Overflow	454.10 grate
Surface Area Btm	797 sf	Btm	453.65 fg
Depth @ Overflow	0.45 ft	Orifice	449.10 fl
Avg Area	957 sf	Dia	1.000 in
Surface Volume	431 cf	Area	0.0055 sf
Drain Time	2.093 hrs	C	0.6
Qavg	0.057 cfs	Hi	4.96 ft
		Hf	4.51 ft

Anza Street

Biofiltration #2 / HMP-2 — Prelim Design — 29-Mar-19

DMAs	1.824	ac
Basin #2	0.064	ac
Total	1.888	ac

6-Hour Rational Method Hydrograph

		Elev	Storage (cf)	Storage (ac-ft)	Depth (ft)
Bottom of Storage		448.40	0		
Top of HMP Storage		450.60	7,789	0.18	2.2
Floor of Basin		452.35	8,614	0.20	4.0
Surface Area @ 6" Depth	1,755	452.85	9,416	0.22	4.5
Grated Overflow		452.85	9,416	0.22	4.5
Emergency Spillway		454.05			
Top of Basin		454.15	12,026	0.28	5.8

Storm Frequency	Qexist (cfs)	Qin (cfs)	Qout (cfs)	WSEL (ft)	Total Depth (ft)	Surface Depth (ft)
2 YEAR						
5 YEAR						
10 YEAR						
25 YEAR						
50 YEAR						
100 YEAR		9.60	0.88	452.95	4.6	0.60

Outlet Control Structure — Use 4' x 4' structure (Inside Dimension)

Opening	#1	#2	#3	Overflow - Grate
Elevation	448.4	Not Used	Not Used	452.9
Width (in)	1.00	0	Not	4 feet
Height (in)	Round	0	Used	4 feet

Drain Time - Surface Volume below overflow elevation

		Elevations / Dimensions	
Total Volume @12"'	10,368 cf	Top 12"	453.35 fg
Surface Area @ Overflow	1,755 sf	Overflow	452.85 grate
Surface Area Btm	1,453 sf	Btm	452.35 fg
Depth @ Overflow	0.50 ft	Orifice	448.40 fl
Avg Area	1,604 sf	Dia	1.000 in
Surface Volume	802 cf	Area	0.0055 sf
Drain Time	4.157 hrs	C	0.6
Qavg	0.054 cfs	Hi	4.41 ft
		Hf	3.91 ft

EXHIBIT E

BASIN STORM ROUTING

Basin #1

DETENTION BASIN ROUTING

5.95

0.65

0.88 Q Out

100 YEAR EVENT ~ 6 Hour STORM

454.25 Max WSEL

Interval	5 Min T (HRS)	Q IN (CFS)	2S/dT+O	2S/dT-O (CFS)	O (CFS)
1	0.08	0.136	0.00	0.00	0.00
2	0.17	0.138	0.27	0.27	0.00
3	0.25	0.140	0.55	0.55	0.00
4	0.33	0.142	0.83	0.83	0.00
5	0.42	0.144	1.12	1.12	0.00
6	0.50	0.147	1.41	1.40	0.01
7	0.58	0.148	1.69	1.68	0.01
8	0.67	0.151	1.98	1.97	0.01
9	0.75	0.153	2.27	2.26	0.01
10	0.83	0.157	2.57	2.55	0.01
11	0.92	0.158	2.86	2.84	0.01
12	1.00	0.162	3.16	3.14	0.01
13	1.08	0.164	3.47	3.45	0.01
14	1.17	0.168	3.78	3.75	0.01
15	1.25	0.170	4.09	4.06	0.01
16	1.33	0.175	4.41	4.38	0.01
17	1.42	0.177	4.74	4.71	0.01
18	1.50	0.183	5.07	5.04	0.02
19	1.58	0.185	5.41	5.37	0.02
20	1.67	0.191	5.75	5.72	0.02
21	1.75	0.194	6.10	6.07	0.02
22	1.83	0.200	6.47	6.43	0.02
23	1.92	0.204	6.84	6.80	0.02
24	2.00	0.211	7.22	7.18	0.02
25	2.08	0.215	7.61	7.57	0.02
26	2.17	0.224	8.01	7.97	0.02
27	2.25	0.228	8.42	8.38	0.02
28	2.33	0.238	8.84	8.80	0.02
29	2.42	0.243	9.28	9.24	0.02
30	2.50	0.255	9.74	9.70	0.02
31	2.58	0.261	10.21	10.17	0.02
32	2.67	0.276	10.70	10.66	0.02
33	2.75	0.283	11.22	11.17	0.02
34	2.83	0.301	11.76	11.71	0.02
35	2.92	0.311	12.32	12.27	0.02
36	3.00	0.333	12.92	12.86	0.03
37	3.08	0.346	13.54	13.49	0.03
38	3.17	0.376	14.22	14.16	0.03
39	3.25	0.394	14.93	14.88	0.03
40	3.33	0.437	15.71	15.65	0.03
41	3.42	0.464	16.55	16.49	0.03
42	3.50	0.531	17.49	17.43	0.03
43	3.58	0.576	18.54	18.47	0.03
44	3.67	0.704	19.76	19.69	0.03

45	3.75	0.802	21.20	21.13	0.03
46	3.83	1.178	23.11	23.04	0.03
47	3.92	1.659	25.88	25.80	0.04
48	4.00	5.948	33.41	33.33	0.04
49	4.08	0.945	40.22	40.11	0.06
50	4.17	0.632	41.69	41.57	0.06
51	4.25	0.495	42.70	42.58	0.06
52	4.33	0.414	43.49	43.37	0.06
53	4.42	0.361	44.15	42.39	0.88
54	4.50	0.322	43.07	42.95	0.06
55	4.58	0.292	43.57	43.45	0.06
56	4.67	0.268	44.01	43.89	0.06
57	4.75	0.249	44.41	42.65	0.88
58	4.83	0.233	43.13	43.01	0.06
59	4.92	0.219	43.47	43.35	0.06
60	5.00	0.207	43.78	43.66	0.06
61	5.08	0.197	44.06	43.95	0.06
62	5.17	0.188	44.33	42.57	0.88
63	5.25	0.180	42.94	42.82	0.06
64	5.33	0.173	43.18	43.06	0.06
65	5.42	0.166	43.40	43.28	0.06
66	5.50	0.160	43.61	43.49	0.06
67	5.58	0.155	43.80	43.69	0.06
68	5.67	0.150	43.99	43.87	0.06
69	5.75	0.145	44.17	42.41	0.88
70	5.83	0.141	42.70	42.58	0.06
71	5.92	0.137	42.86	42.74	0.06
72	6.00	0.134	43.01	42.89	0.06
73	6.08	0.000	43.03	42.91	0.06
74	6.17	0.000	42.91	42.79	0.06
75	6.25	0.000	42.79	42.68	0.06
76	6.33	0.000	42.68	42.56	0.06
77	6.42	0.000	42.56	42.44	0.06
78	6.50	0.000	42.44	42.32	0.06
79	6.58	0.000	42.32	42.21	0.06
80	6.67	0.000	42.21	42.09	0.06
81	6.75	0.000	42.09	41.98	0.06
82	6.83	0.000	41.98	41.86	0.06
83	6.92	0.000	41.86	41.74	0.06
84	7.00	0.000	41.74	41.63	0.06
85	7.08	0.000	41.63	41.51	0.06
86	7.17	0.000	41.51	41.40	0.06
87	7.25	0.000	41.40	41.28	0.06
88	7.33	0.000	41.28	41.17	0.06
89	7.42	0.000	41.17	41.05	0.06
90	7.50	0.000	41.05	40.94	0.06
91	7.58	0.000	40.94	40.82	0.06
92	7.67	0.000	40.82	40.71	0.06
93	7.75	0.000	40.71	40.59	0.06
94	7.83	0.000	40.59	40.48	0.06
95	7.92	0.000	40.48	40.37	0.06

Basin 2

DETENTION BASIN ROUTING

9.60

0.88 Q Out

100 YEAR EVENT ~ 6 Hour STORM

452.95 Max WSEL

Interval	5 Min T (HRS)	Q IN (CFS)	2S/dT+O	2S/dT-O (CFS)	O (CFS)
1	0.08	0.219	0.00	0.00	0.00
2	0.17	0.223	0.44	0.44	0.00
3	0.25	0.225	0.89	0.89	0.00
4	0.33	0.230	1.35	1.35	0.00
5	0.42	0.232	1.81	1.81	0.00
6	0.50	0.237	2.28	2.28	0.00
7	0.58	0.239	2.75	2.74	0.01
8	0.67	0.244	3.22	3.21	0.01
9	0.75	0.247	3.70	3.69	0.01
10	0.83	0.253	4.19	4.18	0.01
11	0.92	0.256	4.68	4.67	0.01
12	1.00	0.262	5.19	5.17	0.01
13	1.08	0.265	5.69	5.67	0.01
14	1.17	0.272	6.21	6.19	0.01
15	1.25	0.275	6.74	6.71	0.01
16	1.33	0.283	7.27	7.25	0.01
17	1.42	0.286	7.81	7.79	0.01
18	1.50	0.295	8.37	8.34	0.01
19	1.58	0.299	8.94	8.91	0.01
20	1.67	0.308	9.52	9.48	0.02
21	1.75	0.313	10.11	10.07	0.02
22	1.83	0.323	10.71	10.68	0.02
23	1.92	0.329	11.33	11.30	0.02
24	2.00	0.341	11.97	11.94	0.02
25	2.08	0.347	12.62	12.59	0.02
26	2.17	0.361	13.30	13.26	0.02
27	2.25	0.368	13.99	13.95	0.02
28	2.33	0.384	14.71	14.67	0.02
29	2.42	0.393	15.44	15.40	0.02
30	2.50	0.412	16.21	16.17	0.02
31	2.58	0.422	17.00	16.96	0.02
32	2.67	0.445	17.83	17.79	0.02
33	2.75	0.457	18.69	18.64	0.02
34	2.83	0.486	19.59	19.54	0.02
35	2.92	0.502	20.53	20.48	0.02
36	3.00	0.538	21.52	21.48	0.02
37	3.08	0.559	22.57	22.52	0.02
38	3.17	0.607	23.69	23.64	0.03
39	3.25	0.636	24.88	24.83	0.03
40	3.33	0.705	26.17	26.12	0.03
41	3.42	0.748	27.57	27.52	0.03
42	3.50	0.858	29.12	29.07	0.03
43	3.58	0.930	30.85	30.80	0.03
44	3.67	1.137	32.86	32.80	0.03
45	3.75	1.295	35.23	35.17	0.03
46	3.83	1.901	38.37	38.30	0.03
47	3.92	2.678	42.88	42.81	0.03

48	4.00	9.600	55.09	55.00	0.05
49	4.08	1.525	66.12	64.37	0.88
50	4.17	1.020	66.91	65.16	0.88
51	4.25	0.798	66.98	65.23	0.88
52	4.33	0.668	66.70	64.95	0.88
53	4.42	0.582	66.20	64.45	0.88
54	4.50	0.519	65.55	63.80	0.88
55	4.58	0.471	64.79	64.68	0.06
56	4.67	0.433	65.58	63.83	0.88
57	4.75	0.402	64.66	64.55	0.06
58	4.83	0.376	65.33	63.58	0.88
59	4.92	0.354	64.31	64.20	0.06
60	5.00	0.335	64.89	63.14	0.88
61	5.08	0.318	63.79	63.68	0.06
62	5.17	0.304	64.30	64.19	0.06
63	5.25	0.290	64.79	64.68	0.06
64	5.33	0.279	65.24	63.49	0.88
65	5.42	0.268	64.04	63.93	0.06
66	5.50	0.259	64.46	64.35	0.06
67	5.58	0.250	64.86	63.10	0.88
68	5.67	0.242	63.60	63.49	0.06
69	5.75	0.234	63.96	63.85	0.06
70	5.83	0.227	64.31	64.20	0.06
71	5.92	0.221	64.65	64.54	0.06
72	6.00	0.000	64.76	64.65	0.06
73	6.08	0.000	64.65	64.54	0.06
74	6.17	0.000	64.54	64.43	0.06
75	6.25	0.000	64.43	64.32	0.06
76	6.33	0.000	64.32	64.21	0.06
77	6.42	0.000	64.21	64.10	0.06
78	6.50	0.000	64.10	63.99	0.06
79	6.58	0.000	63.99	63.88	0.06
80	6.67	0.000	63.88	63.77	0.06
81	6.75	0.000	63.77	63.66	0.06
82	6.83	0.000	63.66	63.55	0.06
83	6.92	0.000	63.55	63.44	0.06
84	7.00	0.000	63.44	63.33	0.06
85	7.08	0.000	63.33	63.22	0.06
86	7.17	0.000	63.22	63.11	0.06
87	7.25	0.000	63.11	63.00	0.06
88	7.33	0.000	63.00	62.89	0.06
89	7.42	0.000	62.89	62.78	0.06
90	7.50	0.000	62.78	62.67	0.05
91	7.58	0.000	62.67	62.56	0.05
92	7.67	0.000	62.56	62.45	0.05
93	7.75	0.000	62.45	62.34	0.05
94	7.83	0.000	62.34	62.23	0.05
95	7.92	0.000	62.23	62.12	0.05
96	8.00	0.000	62.12	62.02	0.05
97	8.08	0.000	62.02	61.91	0.05
98	8.17	0.000	61.91	61.80	0.05
99	8.25	0.000	61.80	61.69	0.05
100	8.33	0.000	61.69	61.58	0.05

EXHIBIT F

FAILURE ANALYSES

Anza Street

Failure Analysis Assumed Full & Clogged

Biofiltration #1 / HMP-1

Final Design 15-Oct-19

DMAs	1.164	ac
Basin #1	0.062	ac
Total	1.226	ac

6-Hour Rational Method Hydrograph

		Elev	Storage (cf)	Storage (ac-ft)	Depth (ft)
Bottom of Storage		449.10	0		
Top of HMP Storage		452.00	0	0.00	2.9
Floor of Basin		453.65	0	0.00	4.6
Surface Area @ 6" Depth	800	454.15	0	0.00	5.1
Grated Overflow		454.10	0	0.00	5.0
Emergency Spillway		455.35			
Top of Basin		455.50	2,077	0.05	6.4

Storm Frequency	Qexist (cfs)	Qin (cfs)	Qout (cfs)	WSEL (ft)	Total Depth (ft)	Surface Depth (ft)
2 YEAR						
5 YEAR						
10 YEAR						
25 YEAR						
50 YEAR						
100 YEAR		5.95	4.26	454.45	5.4	0.80

Anza Street

Failure Analysis

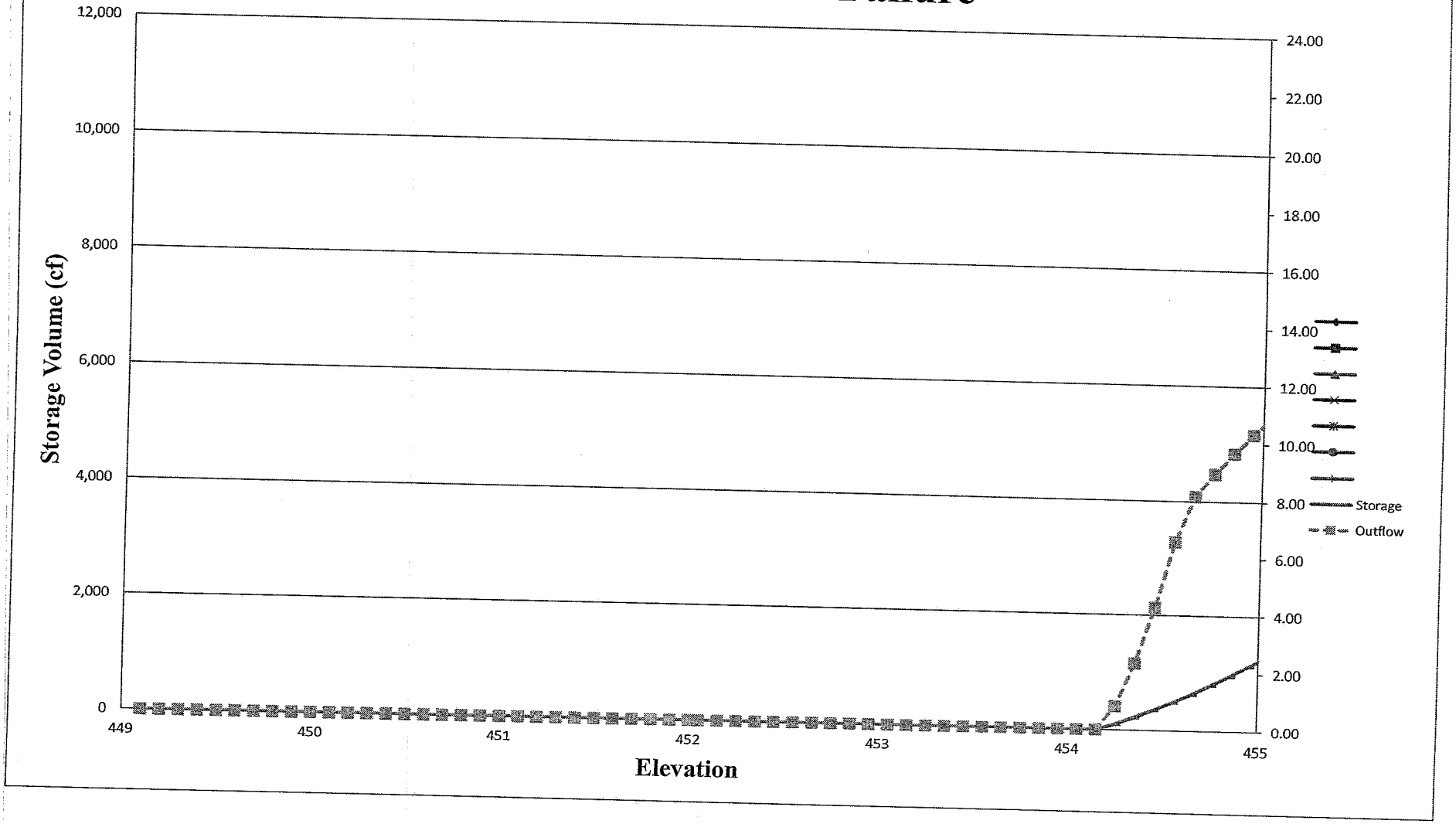
Biofiltration #1 / HMP-1 — Top 455.50 — 2,077 cf — Height — Round 0.00 — 5.00

Basin Storage Volumes — Storage @ Overflow 454.10 — 0 cf — 0.00 — 0.000 — 48

Floor 453.65 — 0 — dT= 5 — dT= 15 — 0.000 — 48

DEPTH (FT)	ELEVATION	AREA (SF)	Raw Storage (CF)	Water Quality (CF)	STORAGE (CF)	2S/dT (CFS)	2S/dT + O (CFS)	2S/dT (CFS)	2S/dT + O (CFS)	OUTFLOW (CFS)	449.10 #1 (CFS)	Not Used #2 (CFS)	Not Used #3 (CFS)	454.10 Overflow (CFS)
0.00	449.10		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
0.10	449.20		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
0.20	449.30		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
0.30	449.40		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
0.40	449.50		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
0.50	449.60		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
0.60	449.70		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
0.70	449.80		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
0.80	449.90		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
0.90	450.00		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
1.00	450.10		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
1.10	450.20		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
1.20	450.30		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
1.30	450.40		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
1.40	450.50		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
1.50	450.60		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
1.60	450.70		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
1.70	450.80		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
1.80	450.90		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
1.90	451.00		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
2.00	451.10		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
2.10	451.20		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
2.20	451.30		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
2.30	451.40		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
2.40	451.50		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
2.50	451.60		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
2.60	451.70		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
2.70	451.80		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
2.80	451.90		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
2.90	452.00		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
2.95	452.05		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
3.05	452.15		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
3.15	452.25		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
3.25	452.35		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
3.35	452.45		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
3.45	452.55		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
3.55	452.65		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
3.65	452.75		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
3.75	452.85		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
3.85	452.95		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
3.95	453.05		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
4.05	453.15		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
4.15	453.25		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
4.25	453.35		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
4.35	453.45		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
4.45	453.55		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
4.55	453.65	0		0	0	0.00	0.00	0.00	0.00	0.00	0.00			
4.65	453.75	160		0	0	0.00	0.00	0.00	0.00	0.00	0.00			
4.75	453.85	320		0	0	0.00	0.00	0.00	0.00	0.00	0.00			
4.85	453.95	480		0	0	0.00	0.00	0.00	0.00	0.00	0.00			
4.95	454.05	640		0	0	0.00	0.00	0.00	0.00	0.00	0.00			
5.05	454.15	800		0	0	0.00	0.00	0.00	0.00	0.00	0.00			
5.15	454.25	1,192	100	0	100	0.66	1.48	0.22	1.04	0.82	0.00			0.00
5.25	454.35	1,257	222	0	222	1.48	3.80	0.49	2.81	2.32	0.00			0.82
5.35	454.45	1,323	351	0	351	2.34	6.60	0.78	5.04	4.26	0.00			2.32
5.45	454.55	1,388	487	0	487	3.24	9.80	1.08	7.64	6.56	0.00			4.26
5.55	454.65	1,599	636	0	636	4.24	12.41	1.41	9.58	8.17	0.00			6.56
5.65	454.75	1,650	798	0	798	5.32	14.27	1.77	10.72	8.95	0.00			8.17
5.75	454.85	1,700	966	0	966	6.44	16.10	2.15	11.81	9.66	0.00			8.95
5.85	454.95	1,751	1,138	0	1,138	7.59	17.92	2.53	12.86	10.33	0.00			9.66
5.95	455.05	1,802	1,316	0	1,316	8.77	19.73	2.92	13.88	10.96	0.00			10.33
6.05	455.15	1,853	1,499	0	1,499	9.99	21.54	3.33	14.88	11.55	0.00			10.96
6.15	455.25	1,903	1,687	0	1,687	11.24	23.36	3.75	15.86	12.12	0.00			11.55
6.25	455.35	1,954	1,879	0	1,879	12.53	25.18	4.18	16.83	12.65	0.00			12.12
6.35	455.45	2,005	2,077	0	2,077	13.86	27.02	4.62	17.79	13.17	0.00			12.65
6.45	455.55	2,106	2,283	0	2,283	15.22	28.89	5.07	18.74	13.67	0.00			13.17
														13.67

Anza Basin #1
Detention Basin - Failure



Basin #1

DETENTION BASIN ROUTING

0.65

Fail 5.95

4.26 Q Out

100 YEAR EVENT ~ 6 Hour STORM

Failure Simulation

454.45 Max WSEL

Interval	5 Min T (HRS)	Q IN (CFS)	2S/dT+O	2S/dT-O (CFS)	O (CFS)
1	0.08	0.136	0.00	0.00	0.00
2	0.17	0.138	0.27	0.27	0.00
3	0.25	0.140	0.55	0.55	0.00
4	0.33	0.142	0.83	0.83	0.00
5	0.42	0.144	1.12	1.12	0.00
6	0.50	0.147	1.41	1.41	0.00
7	0.58	0.148	1.70	0.07	0.82
8	0.67	0.151	0.36	0.36	0.00
9	0.75	0.153	0.67	0.67	0.00
10	0.83	0.157	0.98	0.98	0.00
11	0.92	0.158	1.29	1.29	0.00
12	1.00	0.162	1.61	-0.03	0.82
13	1.08	0.164	0.30	0.30	0.00
14	1.17	0.168	0.63	0.63	0.00
15	1.25	0.170	0.97	0.97	0.00
16	1.33	0.175	1.32	1.32	0.00
17	1.42	0.177	1.67	0.03	0.82
18	1.50	0.183	0.39	0.39	0.00
19	1.58	0.185	0.76	0.76	0.00
20	1.67	0.191	1.14	1.14	0.00
21	1.75	0.194	1.52	-0.12	0.82
22	1.83	0.200	0.28	0.28	0.00
23	1.92	0.204	0.68	0.68	0.00
24	2.00	0.211	1.09	1.09	0.00
25	2.08	0.215	1.52	-0.12	0.82
26	2.17	0.224	0.32	0.32	0.00
27	2.25	0.228	0.77	0.77	0.00
28	2.33	0.238	1.24	1.24	0.00
29	2.42	0.243	1.72	0.08	0.82
30	2.50	0.255	0.58	0.58	0.00
31	2.58	0.261	1.10	1.10	0.00
32	2.67	0.276	1.63	-0.01	0.82
33	2.75	0.283	0.55	0.55	0.00
34	2.83	0.301	1.14	1.14	0.00
35	2.92	0.311	1.75	0.11	0.82
36	3.00	0.333	0.75	0.75	0.00
37	3.08	0.346	1.43	1.43	0.00
38	3.17	0.376	2.16	0.52	0.82
39	3.25	0.394	1.29	1.29	0.00
40	3.33	0.437	2.12	0.48	0.82
41	3.42	0.464	1.38	1.38	0.00
42	3.50	0.531	2.37	0.74	0.82
43	3.58	0.576	1.84	0.20	0.82
44	3.67	0.704	1.48	-0.16	0.82

45	3.75	0.802	1.35	1.35	0.00
46	3.83	1.178	3.33	1.69	0.82
47	3.92	1.659	4.53	-0.11	2.32
48	4.00	5.948	7.50	-1.02	4.26
49	4.08	0.945	5.87	1.24	2.32
50	4.17	0.632	2.81	1.18	0.82
51	4.25	0.495	2.30	0.66	0.82
52	4.33	0.414	1.57	-0.07	0.82
53	4.42	0.361	0.71	0.71	0.00
54	4.50	0.322	1.39	1.39	0.00
55	4.58	0.292	2.00	0.36	0.82
56	4.67	0.268	0.92	0.92	0.00
57	4.75	0.249	1.44	1.44	0.00
58	4.83	0.233	1.92	0.28	0.82
59	4.92	0.219	0.74	0.74	0.00
60	5.00	0.207	1.16	1.16	0.00
61	5.08	0.197	1.57	-0.07	0.82
62	5.17	0.188	0.31	0.31	0.00
63	5.25	0.180	0.68	0.68	0.00
64	5.33	0.173	1.03	1.03	0.00
65	5.42	0.166	1.37	1.37	0.00
66	5.50	0.160	1.70	0.06	0.82
67	5.58	0.155	0.37	0.37	0.00
68	5.67	0.150	0.68	0.68	0.00
69	5.75	0.145	0.97	0.97	0.00
70	5.83	0.141	1.26	1.26	0.00
71	5.92	0.137	1.54	-0.10	0.82
72	6.00	0.134	0.17	0.17	0.00
73	6.08	0.000	0.30	0.30	0.00
74	6.17	0.000	0.30	0.30	0.00
75	6.25	0.000	0.30	0.30	0.00
76	6.33	0.000	0.30	0.30	0.00
77	6.42	0.000	0.30	0.30	0.00
78	6.50	0.000	0.30	0.30	0.00
79	6.58	0.000	0.30	0.30	0.00
80	6.67	0.000	0.30	0.30	0.00
81	6.75	0.000	0.30	0.30	0.00
82	6.83	0.000	0.30	0.30	0.00
83	6.92	0.000	0.30	0.30	0.00
84	7.00	0.000	0.30	0.30	0.00
85	7.08	0.000	0.30	0.30	0.00
86	7.17	0.000	0.30	0.30	0.00
87	7.25	0.000	0.30	0.30	0.00
88	7.33	0.000	0.30	0.30	0.00
89	7.42	0.000	0.30	0.30	0.00
90	7.50	0.000	0.30	0.30	0.00
91	7.58	0.000	0.30	0.30	0.00
92	7.67	0.000	0.30	0.30	0.00
93	7.75	0.000	0.30	0.30	0.00
94	7.83	0.000	0.30	0.30	0.00
95	7.92	0.000	0.30	0.30	0.00

Anza Street

Failure Analysis Assumed Full & Clogged

Biofiltration #2 / HMP-2

Final Design 15-Oct-19

DMAs	1.824	ac
Basin #2	0.064	ac
Total	1.888	ac

6-Hour Rational Method Hydrograph

		Elev	Storage (cf)	Storage (ac-ft)	Depth (ft)
Bottom of Storage		448.40	0		
Top of HMP Storage		450.60	0	0.00	2.2
Floor of Basin		452.35	0	0.00	4.0
Surface Area @ 6" Depth	1,755	452.85	0	0.00	4.5
Grated Overflow		452.85	0	0.00	4.5
Emergency Spillway		454.05			
Top of Basin		454.15	2,610	0.06	5.8

Storm Frequency	Qexist (cfs)	Qin (cfs)	Qout (cfs)	WSEL (ft)	Total Depth (ft)
2 YEAR					
5 YEAR					
10 YEAR					
25 YEAR					
50 YEAR					
100 YEAR		9.60	6.15	453.25	4.9

Outlet Control Structure Use 4' x 4' structure (Inside Dimension)

Opening	#1	#2	#3	Overflow - Grate
Elevation	448.4	Not Used	Not Used	452.9
Width (in)	0.00	0	Not	4 feet
Height (in)	Round	0	Used	4 feet

Anza Street

Failure Analysis

Biofiltration #2 / HMP-2

Top	454.15	2,610	cf
Storage @ Overflow	452.85	0	cf
Floor	452.35	0	

Basin Storage Volumes

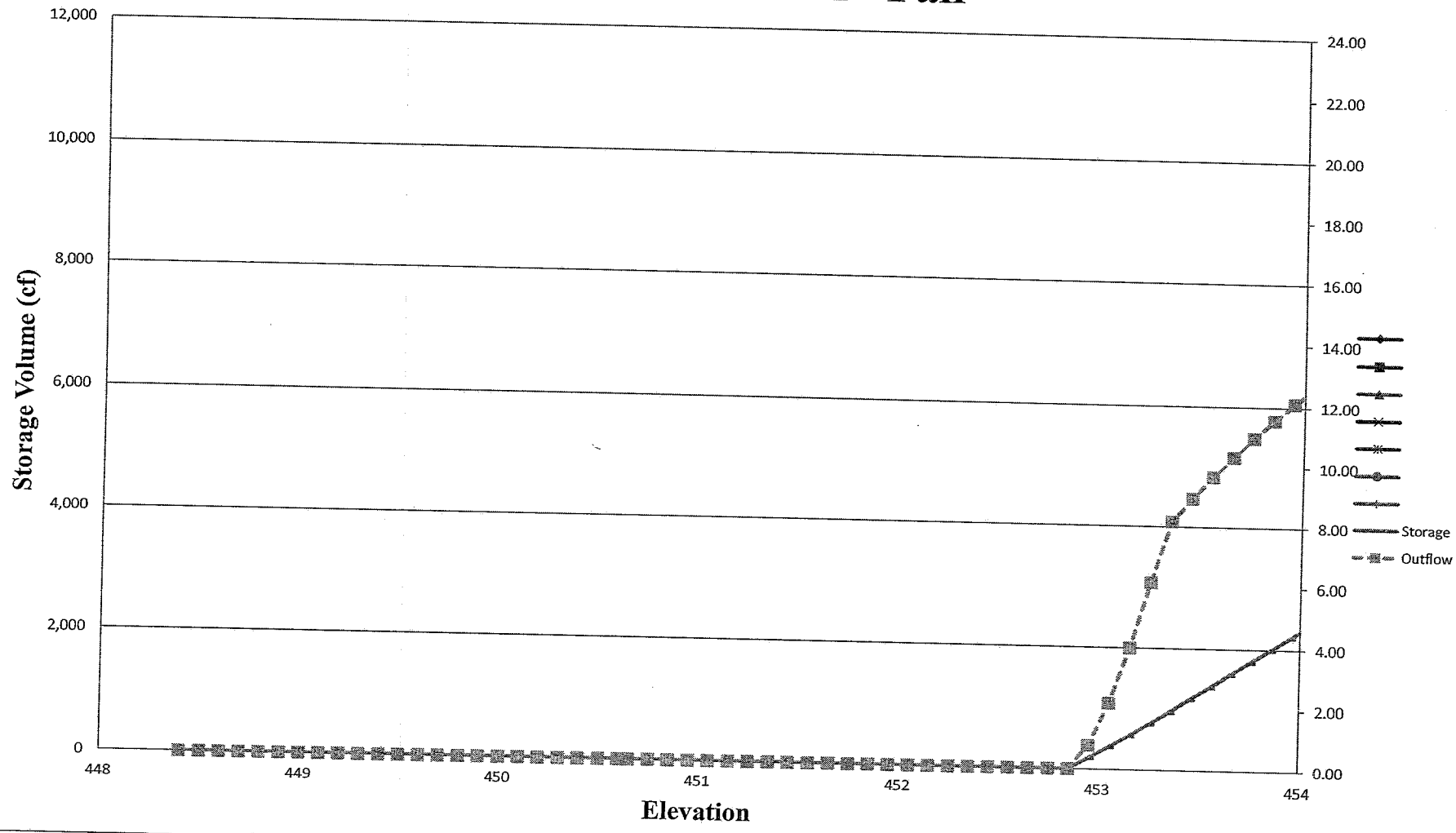
dT= 5 | dT= 15

Height: 4.45

Round: 48

DEPTH (FT)	ELEVATION	AREA (SF)	Raw Storage (CF)	Water Quality (CF)	STORAGE (CF)	2S/dT (CFS)	2S/dT + O (CFS)	2S/dT (CFS)	2S/dT + O (CFS)	OUTFLOW (CFS)	0.00 0.000 0.000 448.40 #1 (CFS)	Not Used #2 (CFS)	Not Used #3 (CFS)	48 452.85 Overflow (CFS)
0.00	448.40	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
0.10	448.50	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
0.20	448.60	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
0.30	448.70	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
0.40	448.80	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
0.50	448.90	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
0.60	449.00	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
0.70	449.10	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
0.80	449.20	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
0.90	449.30	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
1.00	449.40	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
1.10	449.50	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
1.20	449.60	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
1.30	449.70	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
1.40	449.80	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
1.50	449.90	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
1.60	450.00	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
1.70	450.10	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
1.80	450.20	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
1.90	450.30	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
2.00	450.40	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
2.10	450.50	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
2.20	450.60	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
2.25	450.65	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
2.35	450.75	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
2.45	450.85	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
2.55	450.95	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
2.65	451.05	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
2.75	451.15	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
2.85	451.25	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
2.95	451.35	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
3.05	451.45	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
3.15	451.55	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
3.25	451.65	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
3.35	451.75	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
3.45	451.85	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
3.55	451.95	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
3.65	452.05	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
3.75	452.15	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
3.85	452.25	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
3.95	452.35	1,453		0	0	0.00	0.00	0.00	0.00	0.00	0.00			
4.05	452.45	1,513		0	0	0.00	0.00	0.00	0.00	0.00	0.00			
4.15	452.55	1,574		0	0	0.00	0.00	0.00	0.00	0.00	0.00			
4.25	452.65	1,634		0	0	0.00	0.00	0.00	0.00	0.00	0.00			
4.35	452.75	1,694		0	0	0.00	0.00	0.00	0.00	0.00	0.00			
4.45	452.85	1,755		0	0	0.00	0.00	0.00	0.00	0.00	0.00			
4.55	452.95	1,815	178	0	178	1.19	1.96	0.40	1.17	0.77	0.00			0.00
4.65	453.05	1,875	363	0	363	2.42	4.59	0.81	2.98	2.17	0.00			0.77
4.75	453.15	1,935	553	0	553	3.69	7.68	1.23	5.22	3.99	0.00			2.17
4.85	453.25	1,996	750	0	750	5.00	11.15	1.67	7.81	6.15	0.00			3.99
4.95	453.35	2,056	953	0	953	6.35	14.52	2.12	10.29	8.17	0.00			6.15
5.05	453.45	2,059	1,158	0	1,158	7.72	16.67	2.57	11.52	8.95	0.00			8.17
5.15	453.55	2,063	1,365	0	1,365	9.10	18.76	3.03	12.70	9.66	0.00			8.95
5.25	453.65	2,066	1,571	0	1,571	10.47	20.81	3.49	13.82	10.33	0.00			9.66
5.35	453.75	2,070	1,778	0	1,778	11.85	22.81	3.95	14.91	10.96	0.00			10.33
5.45	453.85	2,073	1,985	0	1,985	13.23	24.78	4.41	15.96	11.55	0.00			10.96
5.55	453.95	2,080	2,193	0	2,193	14.62	26.73	4.87	16.99	12.12	0.00			11.55
5.65	454.05	2,087	2,401	0	2,401	16.01	28.66	5.34	17.99	12.65	0.00			12.12
5.75	454.15	2,094	2,610	0	2,610	17.40	30.57	5.80	18.97	13.17	0.00			12.65
														13.17

Anza Basin #2
Detention Basin - Fail



Basin 2

DETENTION BASIN ROUTING

9.60

100 YEAR EVENT ~ 6 Hour STORM

Failure Analysis
6.15 Q Out

453.25 Max WSEL

Interval	5 Min T (HRS)	Q IN (CFS)	2S/dT+O	2S/dT-O (CFS)	O (CFS)
1	0.08	0.219	0.00	0.00	0.00
2	0.17	0.223	0.44	0.44	0.00
3	0.25	0.225	0.89	0.89	0.00
4	0.33	0.230	1.35	1.35	0.00
5	0.42	0.232	1.81	1.81	0.00
6	0.50	0.237	2.28	0.74	0.77
7	0.58	0.239	1.21	1.21	0.00
8	0.67	0.244	1.70	1.70	0.00
9	0.75	0.247	2.19	0.65	0.77
10	0.83	0.253	1.15	1.15	0.00
11	0.92	0.256	1.66	1.66	0.00
12	1.00	0.262	2.18	0.64	0.77
13	1.08	0.265	1.17	1.17	0.00
14	1.17	0.272	1.70	1.70	0.00
15	1.25	0.275	2.25	0.71	0.77
16	1.33	0.283	1.27	1.27	0.00
17	1.42	0.286	1.84	1.84	0.00
18	1.50	0.295	2.42	0.88	0.77
19	1.58	0.299	1.48	1.48	0.00
20	1.67	0.308	2.08	0.55	0.77
21	1.75	0.313	1.17	1.17	0.00
22	1.83	0.323	1.81	1.81	0.00
23	1.92	0.329	2.46	0.92	0.77
24	2.00	0.341	1.59	1.59	0.00
25	2.08	0.347	2.28	0.74	0.77
26	2.17	0.361	1.45	1.45	0.00
27	2.25	0.368	2.18	0.64	0.77
28	2.33	0.384	1.39	1.39	0.00
29	2.42	0.393	2.17	0.63	0.77
30	2.50	0.412	1.44	1.44	0.00
31	2.58	0.422	2.27	0.74	0.77
32	2.67	0.445	1.60	1.60	0.00
33	2.75	0.457	2.50	0.97	0.77
34	2.83	0.486	1.91	1.91	0.00
35	2.92	0.502	2.90	1.36	0.77
36	3.00	0.538	2.40	0.86	0.77
37	3.08	0.559	1.96	0.42	0.77
38	3.17	0.607	1.59	1.59	0.00
39	3.25	0.636	2.83	1.30	0.77
40	3.33	0.705	2.64	1.10	0.77
41	3.42	0.748	2.56	1.02	0.77
42	3.50	0.858	2.62	1.09	0.77
43	3.58	0.930	2.88	1.34	0.77
44	3.67	1.137	3.40	1.87	0.77
45	3.75	1.295	4.30	2.76	0.77
46	3.83	1.901	5.96	1.61	2.17
47	3.92	2.678	6.19	1.84	2.17

48	4.00	9.600	14.12	1.83	6.15
49	4.08	1.525	12.95	0.65	6.15
50	4.17	1.020	3.20	1.66	0.77
51	4.25	0.798	3.48	1.94	0.77
52	4.33	0.668	3.41	1.87	0.77
53	4.42	0.582	3.12	1.59	0.77
54	4.50	0.519	2.69	1.15	0.77
55	4.58	0.471	2.14	0.60	0.77
56	4.67	0.433	1.51	1.51	0.00
57	4.75	0.402	2.34	0.81	0.77
58	4.83	0.376	1.58	1.58	0.00
59	4.92	0.354	2.31	0.78	0.77
60	5.00	0.335	1.47	1.47	0.00
61	5.08	0.318	2.12	0.58	0.77
62	5.17	0.304	1.20	1.20	0.00
63	5.25	0.290	1.80	1.80	0.00
64	5.33	0.279	2.37	0.83	0.77
65	5.42	0.268	1.38	1.38	0.00
66	5.50	0.259	1.90	1.90	0.00
67	5.58	0.250	2.41	0.87	0.77
68	5.67	0.242	1.37	1.37	0.00
69	5.75	0.234	1.84	1.84	0.00
70	5.83	0.227	2.30	0.77	0.77
71	5.92	0.221	1.22	1.22	0.00
72	6.00	0.000	1.44	1.44	0.00
73	6.08	0.000	1.44	1.44	0.00
74	6.17	0.000	1.44	1.44	0.00
75	6.25	0.000	1.44	1.44	0.00
76	6.33	0.000	1.44	1.44	0.00
77	6.42	0.000	1.44	1.44	0.00
78	6.50	0.000	1.44	1.44	0.00
79	6.58	0.000	1.44	1.44	0.00
80	6.67	0.000	1.44	1.44	0.00
81	6.75	0.000	1.44	1.44	0.00
82	6.83	0.000	1.44	1.44	0.00
83	6.92	0.000	1.44	1.44	0.00
84	7.00	0.000	1.44	1.44	0.00
85	7.08	0.000	1.44	1.44	0.00
86	7.17	0.000	1.44	1.44	0.00
87	7.25	0.000	1.44	1.44	0.00
88	7.33	0.000	1.44	1.44	0.00
89	7.42	0.000	1.44	1.44	0.00
90	7.50	0.000	1.44	1.44	0.00
91	7.58	0.000	1.44	1.44	0.00
92	7.67	0.000	1.44	1.44	0.00
93	7.75	0.000	1.44	1.44	0.00
94	7.83	0.000	1.44	1.44	0.00
95	7.92	0.000	1.44	1.44	0.00
96	8.00	0.000	1.44	1.44	0.00
97	8.08	0.000	1.44	1.44	0.00
98	8.17	0.000	1.44	1.44	0.00
99	8.25	0.000	1.44	1.44	0.00
100	8.33	0.000	1.44	1.44	0.00
101	8.42	0.000	1.44	1.44	0.00

APPENDIX

COUNTY OF SAN DIEGO HYDROLOGY MANUAL EXCEPTS

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.

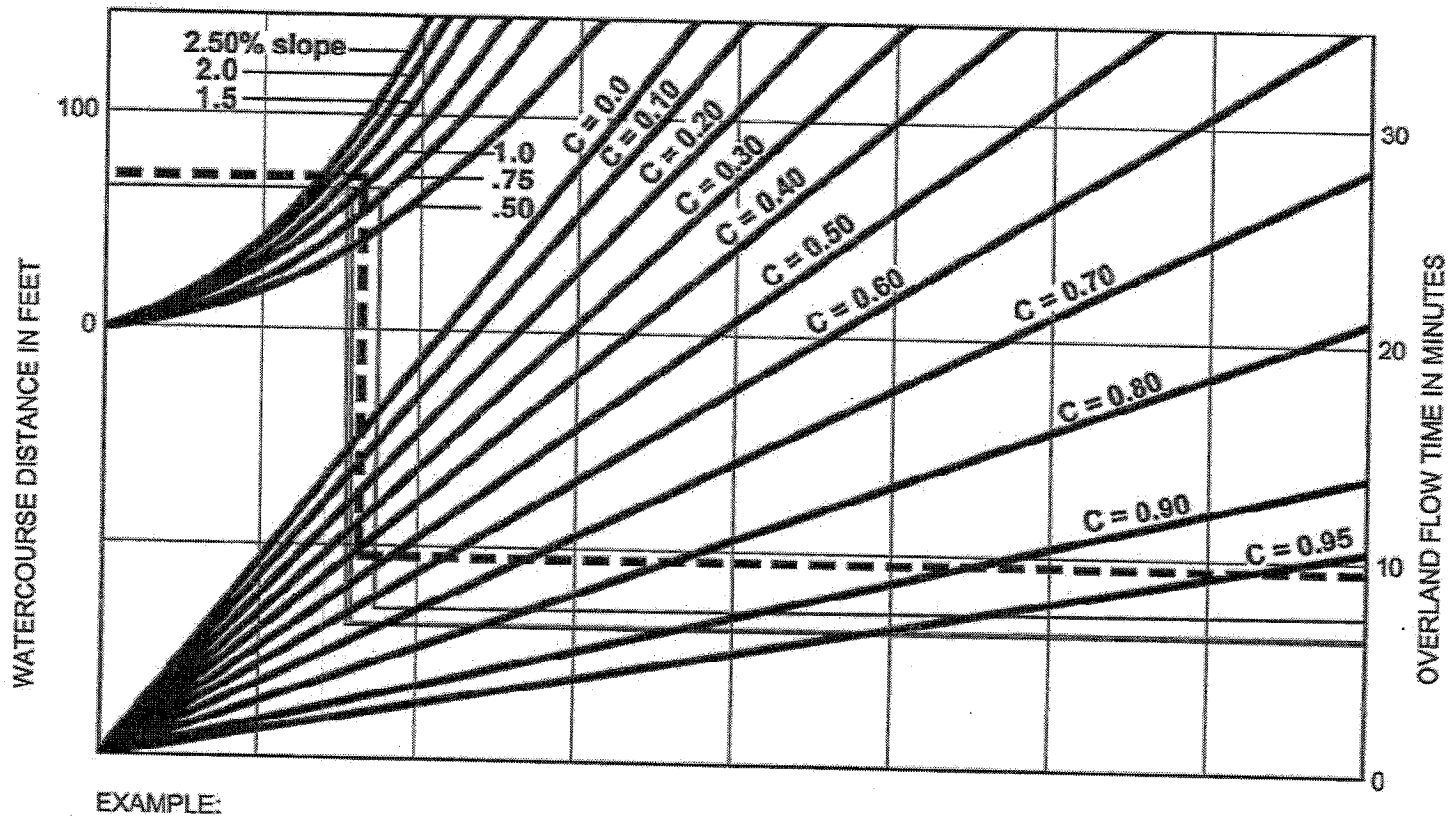
Table 3-2

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

Tc for Existing Drainage Basins A, B, & C



EXAMPLE:

Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

Basin A Tc = 1.8(1.1-.63)(65^(1/2)))/(0.8^(1/3))
= 7.35 min.
Basin B Tc = 6.25 min.
Basin C Tc = 6.42 min.

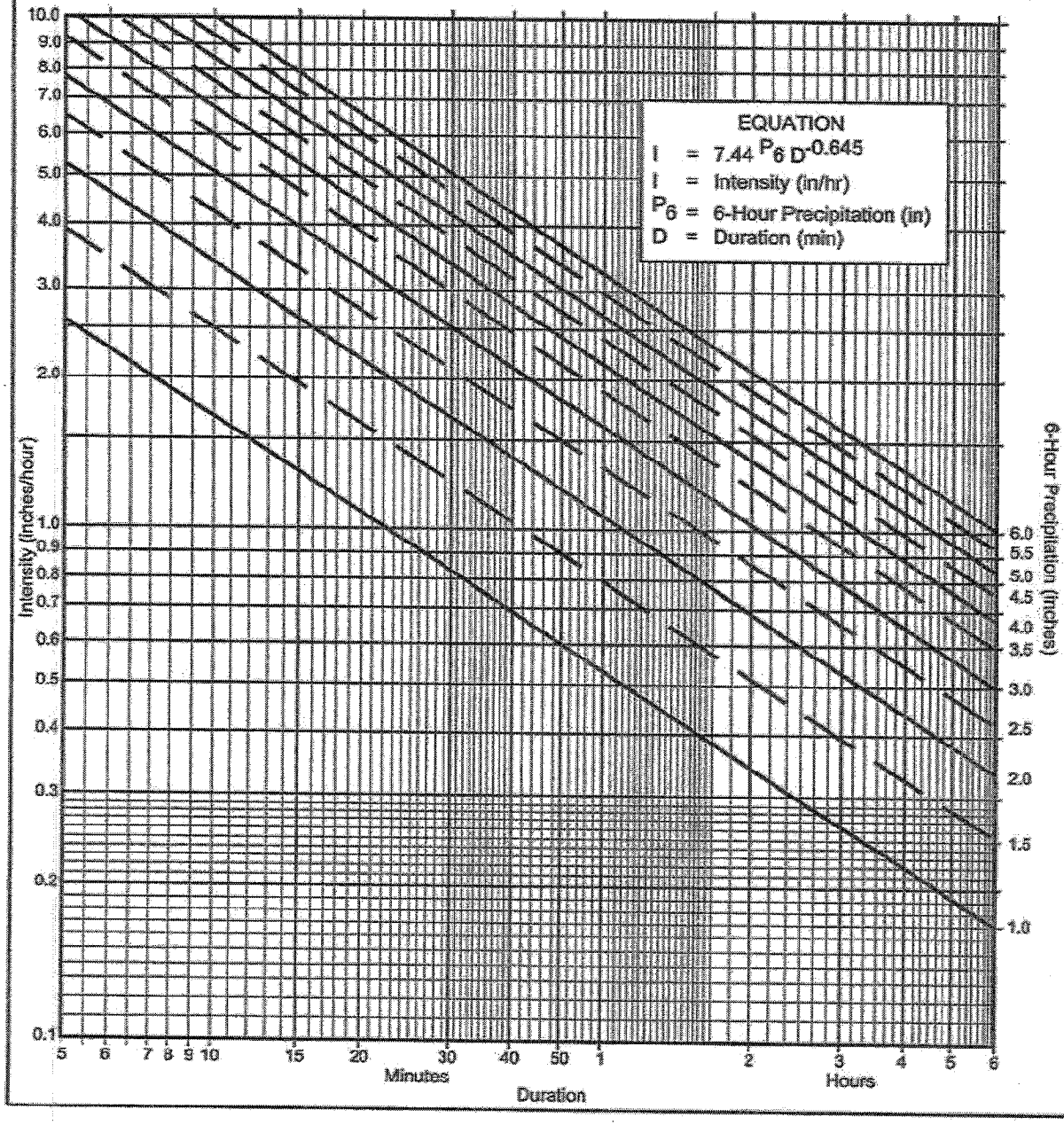
SOURCE: Airport Drainage, Federal Aviation Administration, 1965

Rational Formula - Overland Time of Flow Nomograph

FIGURE

3-3

I_2 for Basin D.M.A. A



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 EXISTING

(b) P_6 = 1.25 in., P_{24} = 1.85 , $\frac{P_6}{P_{24}}$ = 67.6 %(2)

(c) Adjusted P_6(2) = 1.20 in.

(d) t_x = 7.35 min.

(e) I = 2.47 in./hr.

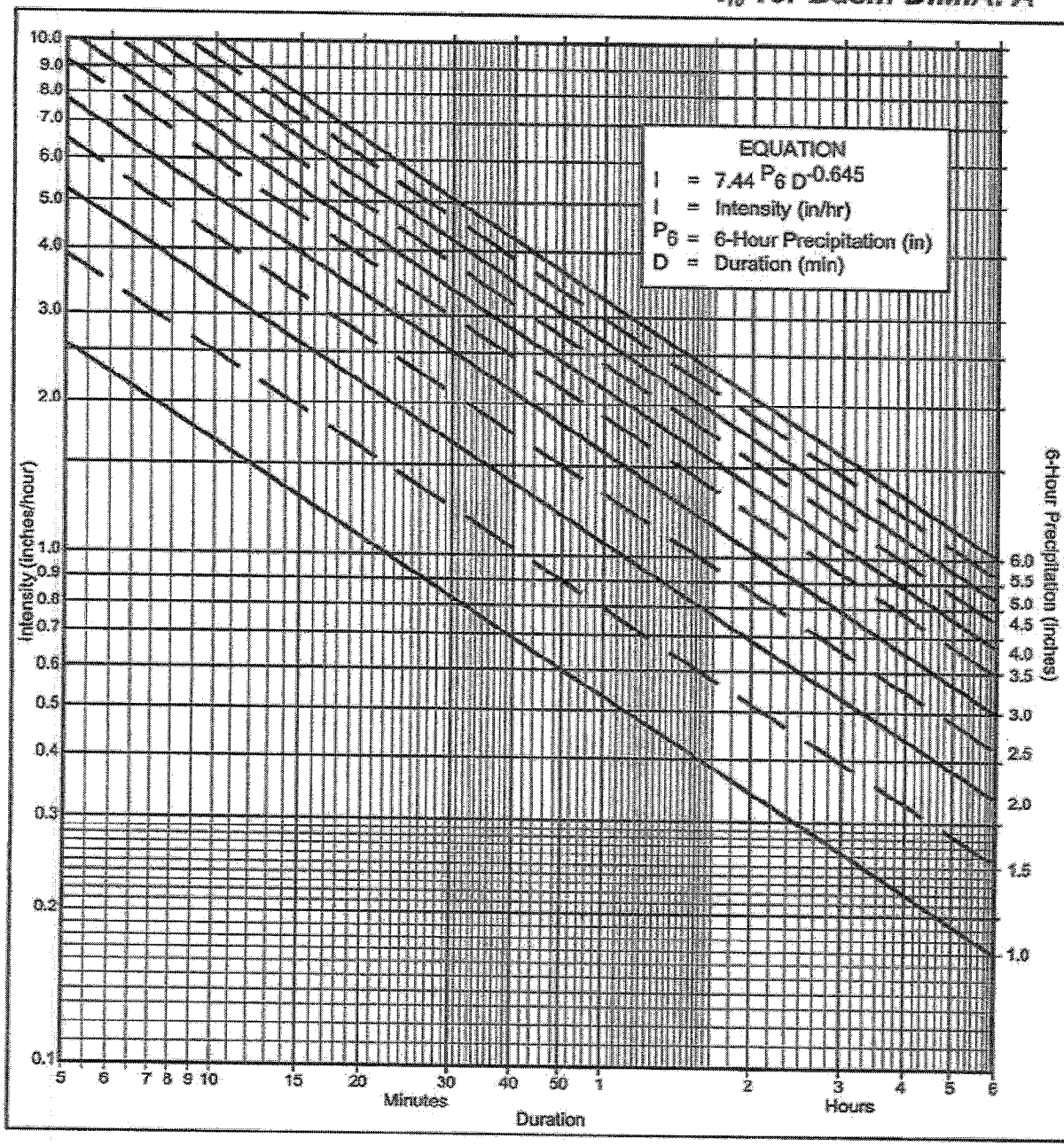
Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

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

I_{10} for Basin D.M.A. A



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 10 year EXISTING

(b) P_6 = 1.75 in., P_{24} = 3.00, $\frac{P_6}{P_{24}}$ = 58.3 %(2)

(c) Adjusted P_6(2) = 1.75 in.

(d) t_x = 7.35 min.

(e) I = 3.60 in./hr.

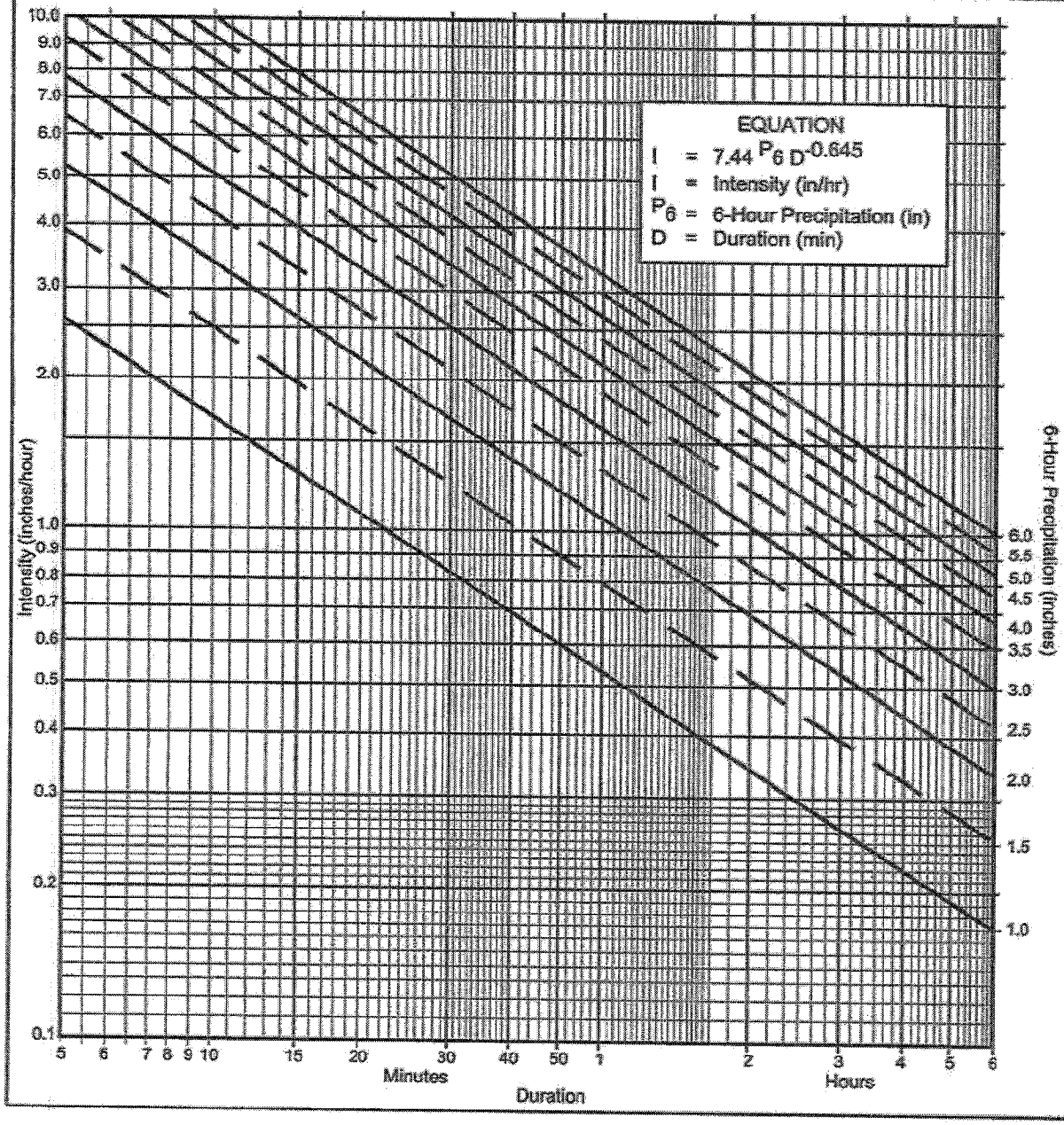
Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

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

I_{50} for Basin D.M.A. A



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 EXISTING

(b) P_6 = 2.40 in., P_{24} = 4.60, $\frac{P_6}{P_{24}}$ = 52.2 %(2)

(c) Adjusted P_6(2) = 2.40 in.

(d) t_x = 7.85 min.

(e) I = 4.93 in./hr.

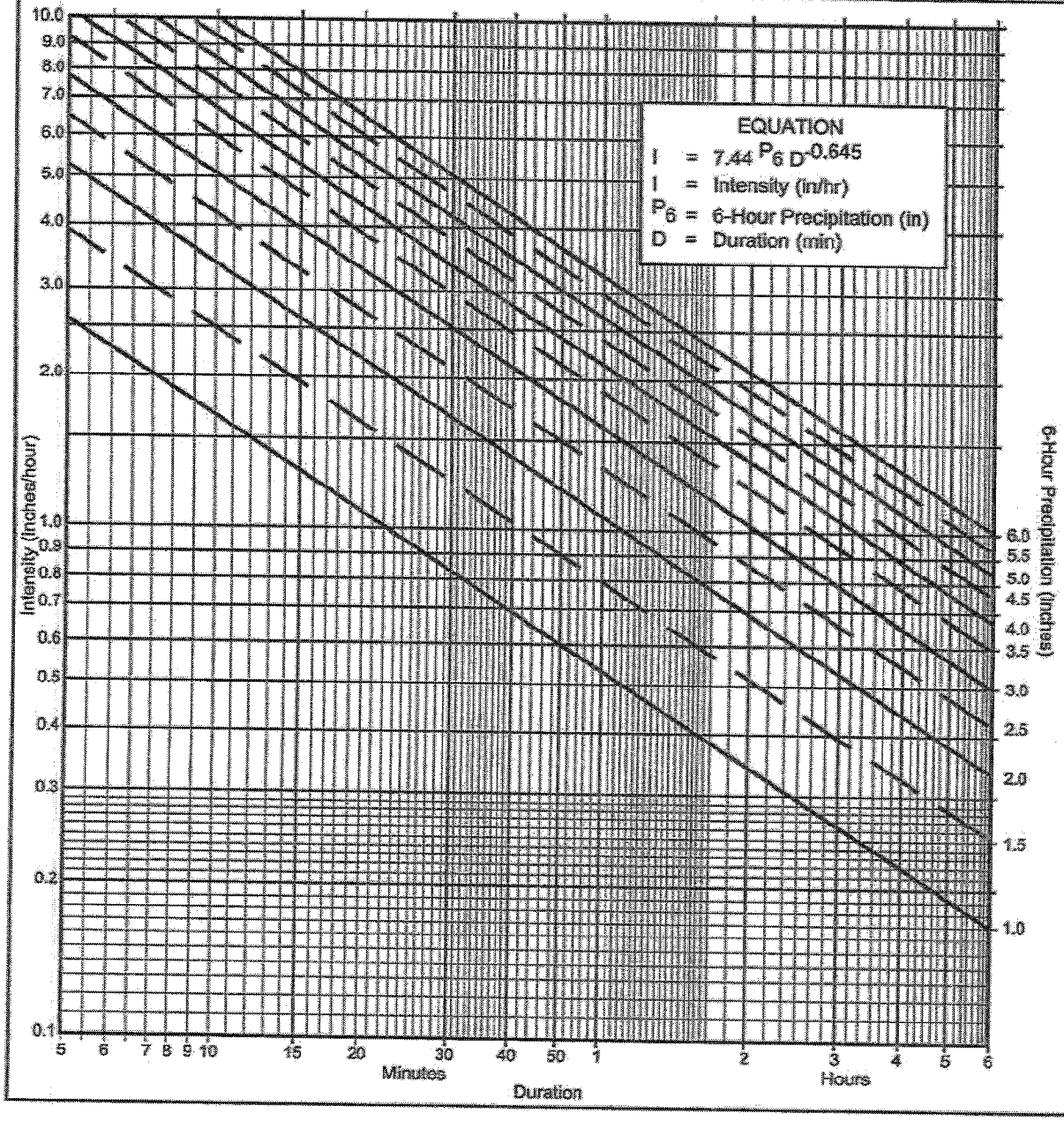
Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

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	0.25	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

I_{100} for Basin D.M.A. A



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 EXISTING

(b) P_6 = 2.55 in., P_{24} = 5.20, $\frac{P_6}{P_{24}}$ = 49.0 %(2)

(c) Adjusted P_6(2) = 2.55 in.

(d) t_x = 7.85 min.

(e) I = 5.24 in./hr.

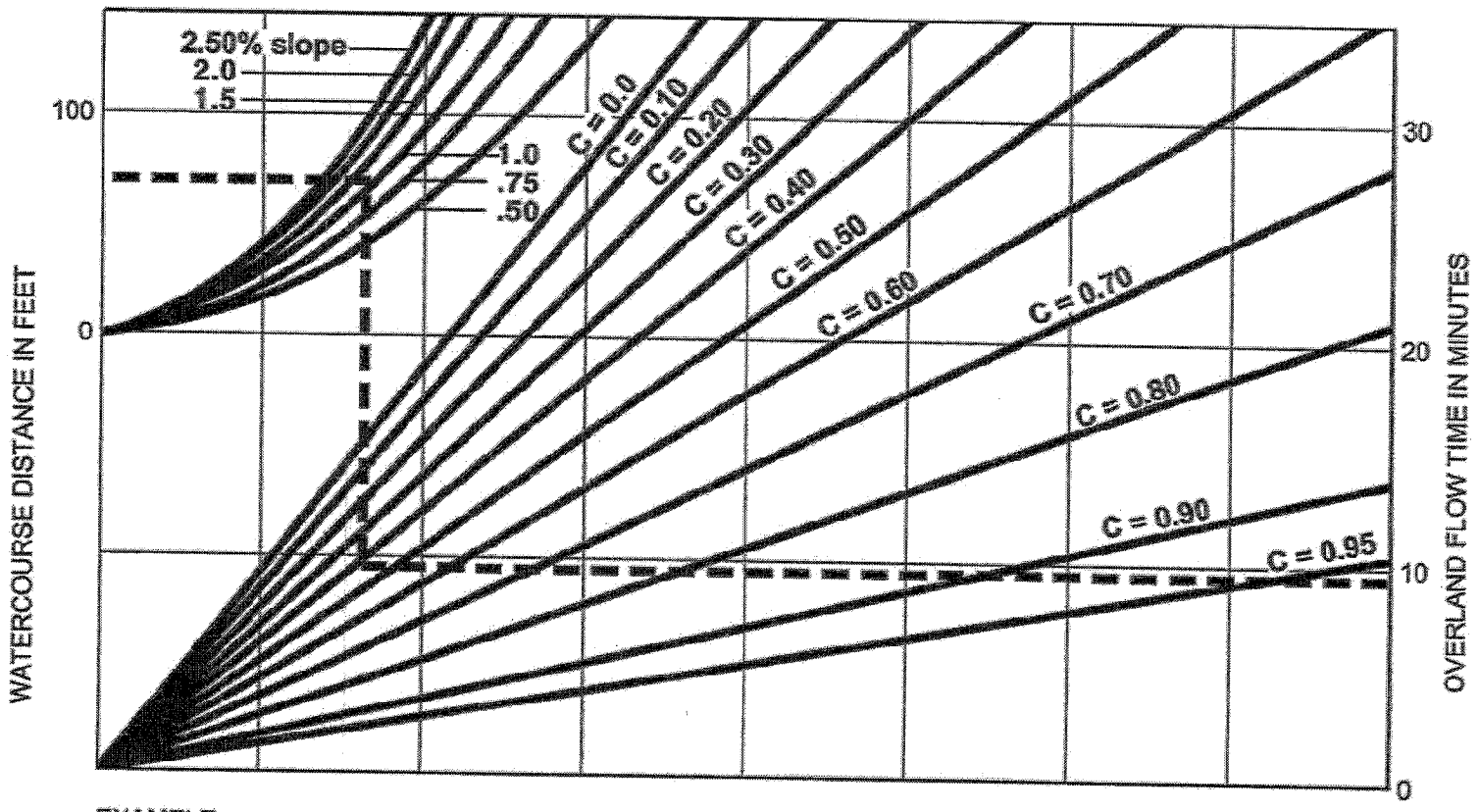
Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

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	1.09	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

Ti for Basin D.M.A. 1



EXAMPLE:

Given: Watercourse Distance (D) = 70 Feet
Slope (s) =1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

= 1.8(1.1-.63)(25^(1/2))/(2^(1/3))
= 3.35 min.
~ 5.0 min. used

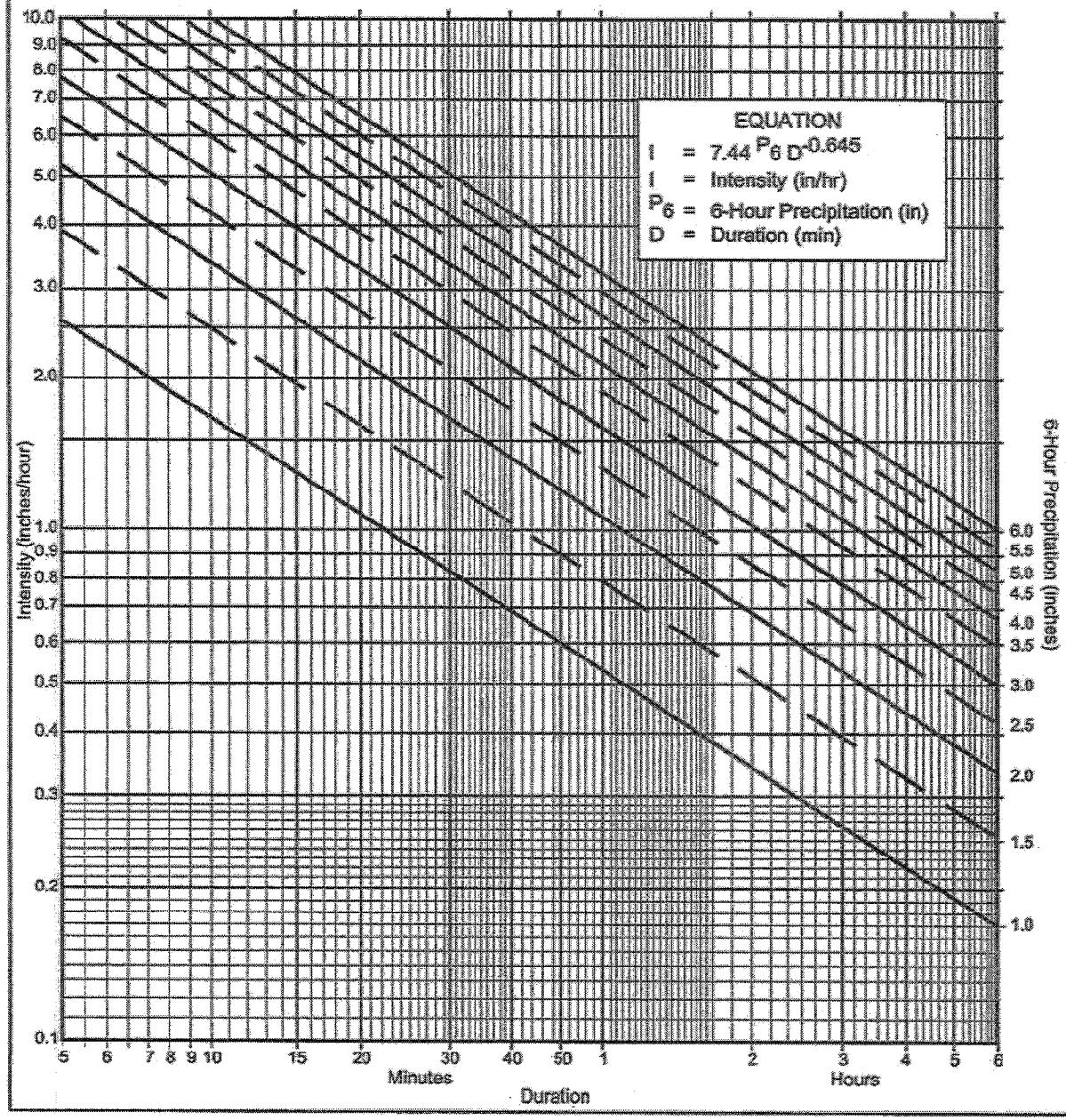
SOURCE: Airport Drainage, Federal Aviation Administration, 1965

Rational Formula - Overland Time of Flow Nomograph

FIGURE

3-3

I_2 for Basin D.M.A. 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 ***PROPOSED***

(b) P_6 = 1.25 in., P_{24} = 1.85, $\frac{P_6}{P_{24}}$ = 67.6 %(2)

(c) Adjusted P_6(2) = 1.20 in.

(d) t_x = 5.0 min.

(e) I = 3.16 in./hr.

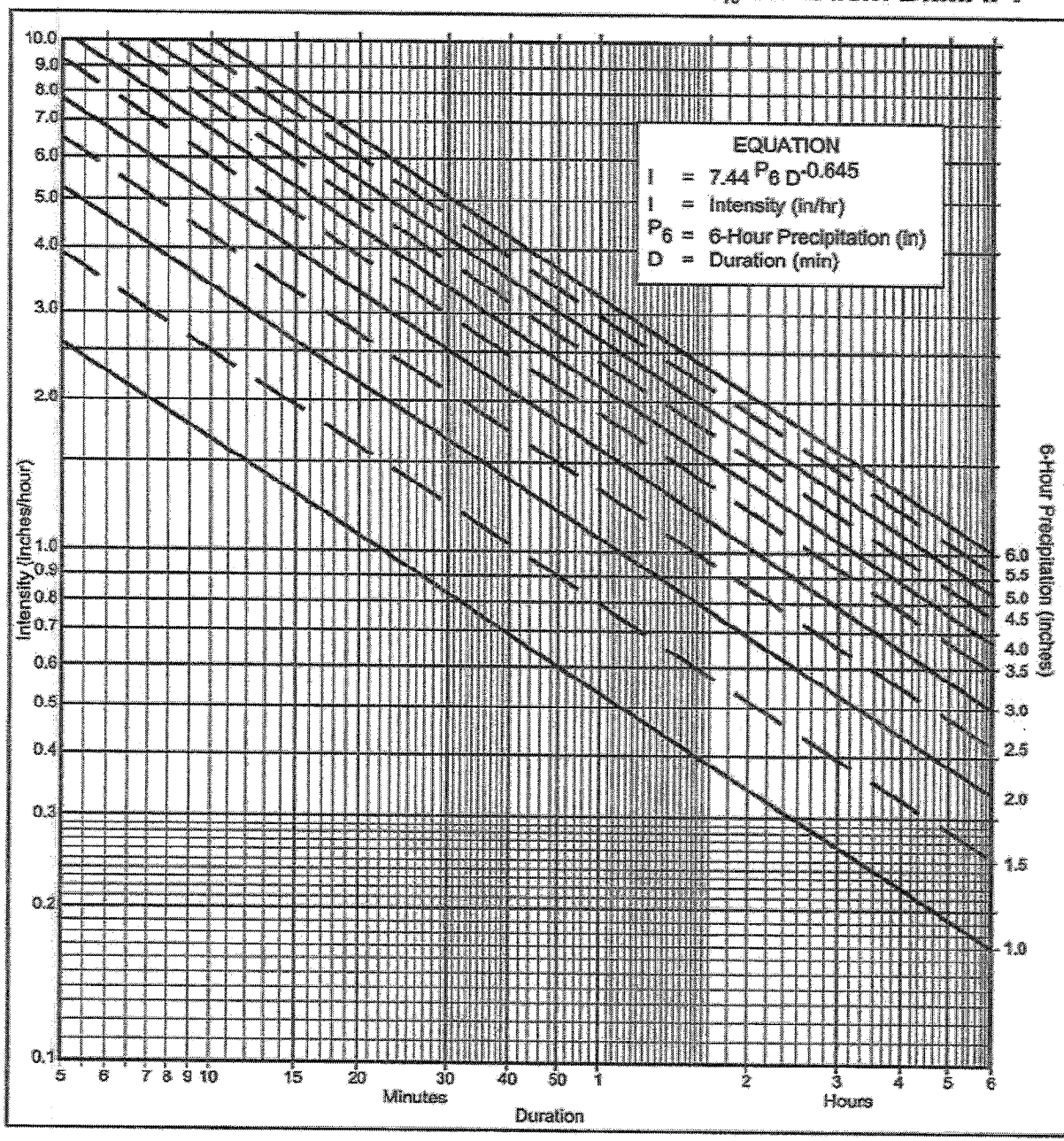
Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

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	1.06	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	0.58	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

I_{10} for Basin D.M.A. 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 applicable 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 10 year **PROPOSED**

(b) P_6 = 1.75 in., P_{24} = 3.00, $\frac{P_6}{P_{24}}$ = 58.3 %(2)

(c) Adjusted P_6(2) = 1.75 in.

(d) t_x = 5.0 min.

(e) I = 4.61 in./hr.

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

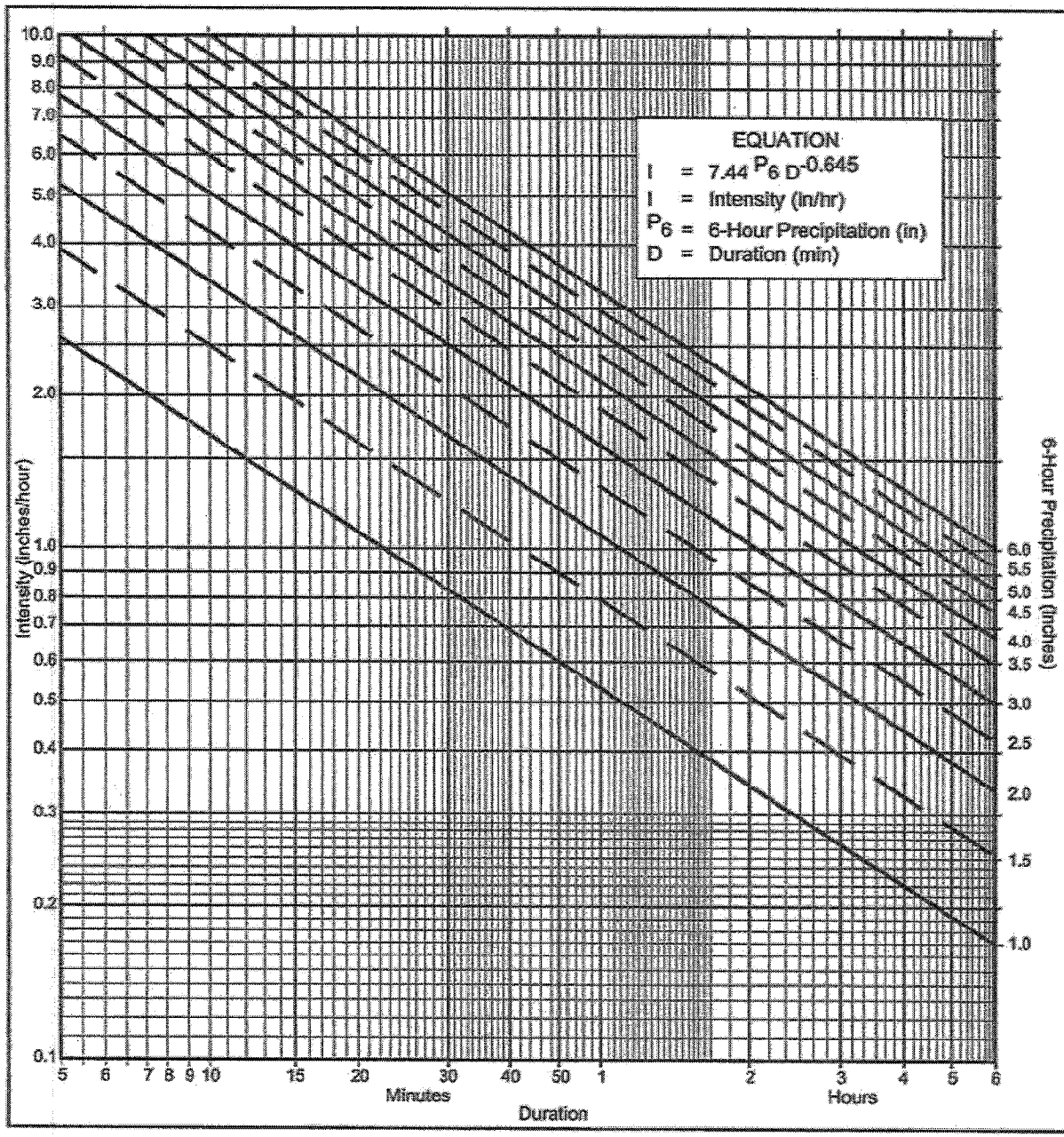
P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.06	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

I_{50} for Basin D.M.A. 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 50 year PROPOSED

(b) P_6 = 2.40 in., P_{24} = 4.60, $\frac{P_6}{P_{24}}$ = 52.2 %(2)

(c) Adjusted P_6(2) = 2.40 in.

(d) t_x = 5.0 min.

(e) I = 6.32 in./hr.

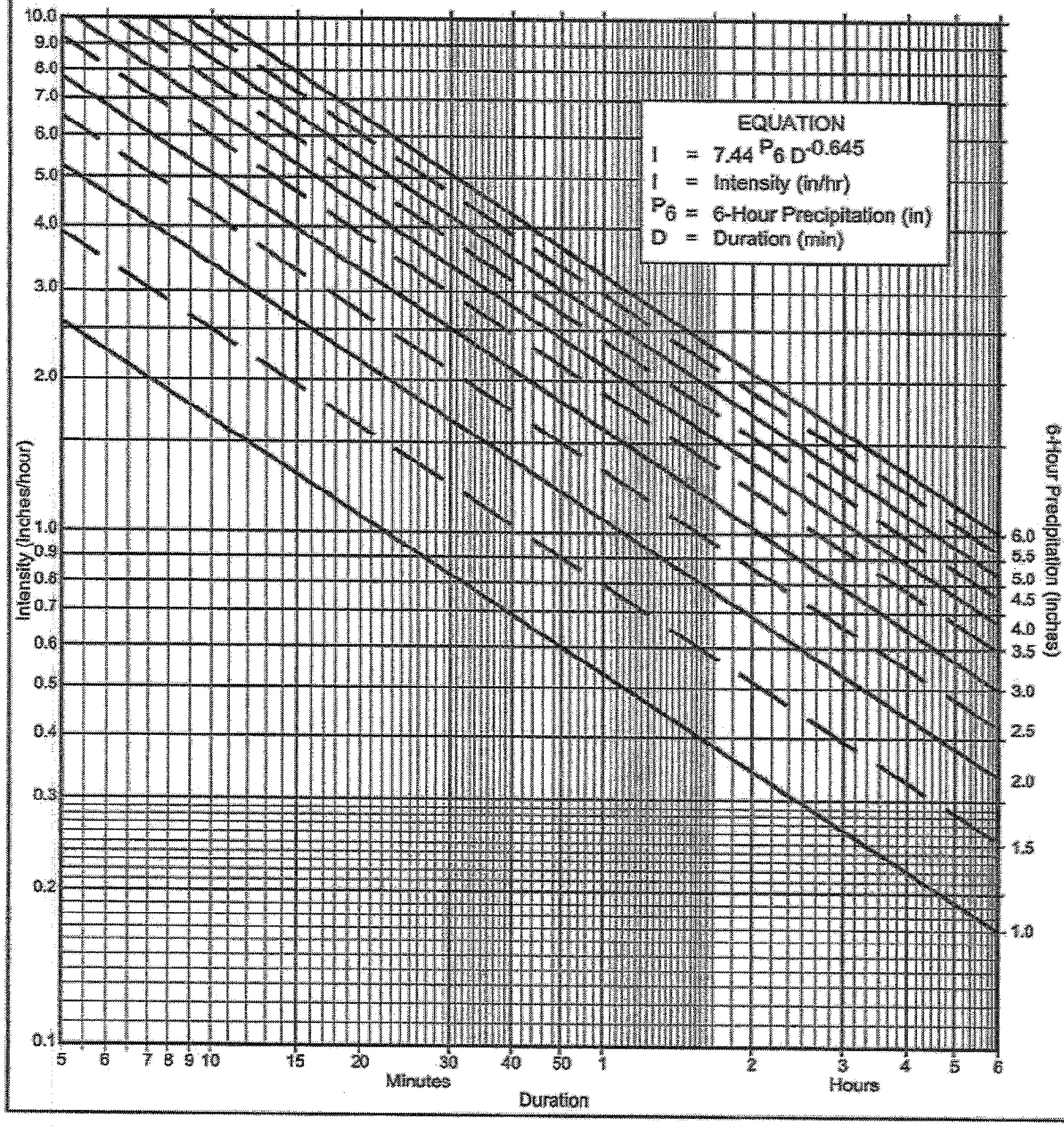
Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

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

I_{100} for Basin D.M.A. 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 ***100*** year ***PROPOSED***

(b) P_6 = ***2.55*** in., P_{24} = ***5.20***, $\frac{P_6}{P_{24}}$ = ***49.0*** %(2)

(c) Adjusted P_6(2) = ***2.55*** in.

(d) t_x = ***5.0*** min.

(e) I = ***6.72*** in./hr.

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

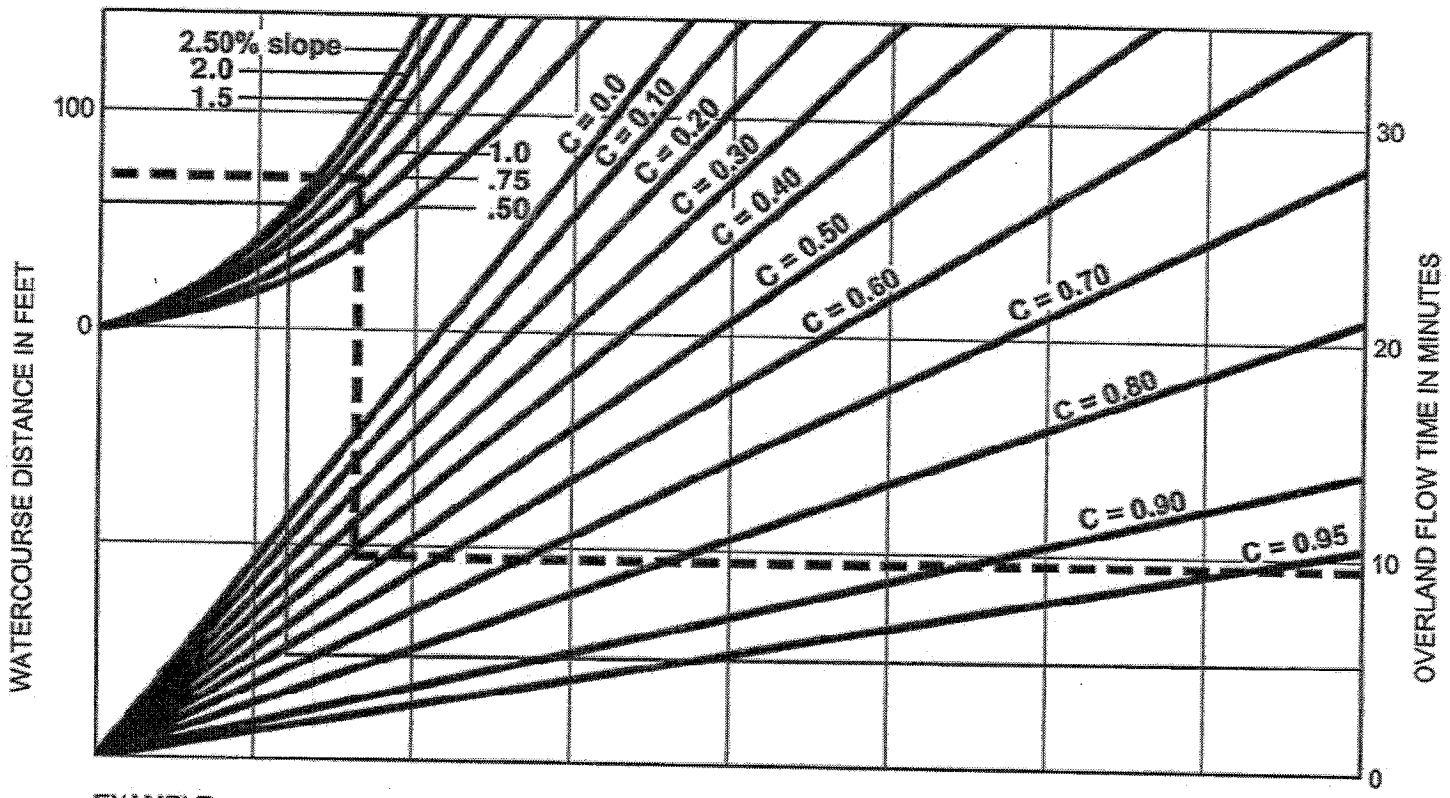
P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
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

T_i for PROPOSED Drainage Basin A



EXAMPLE:

Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

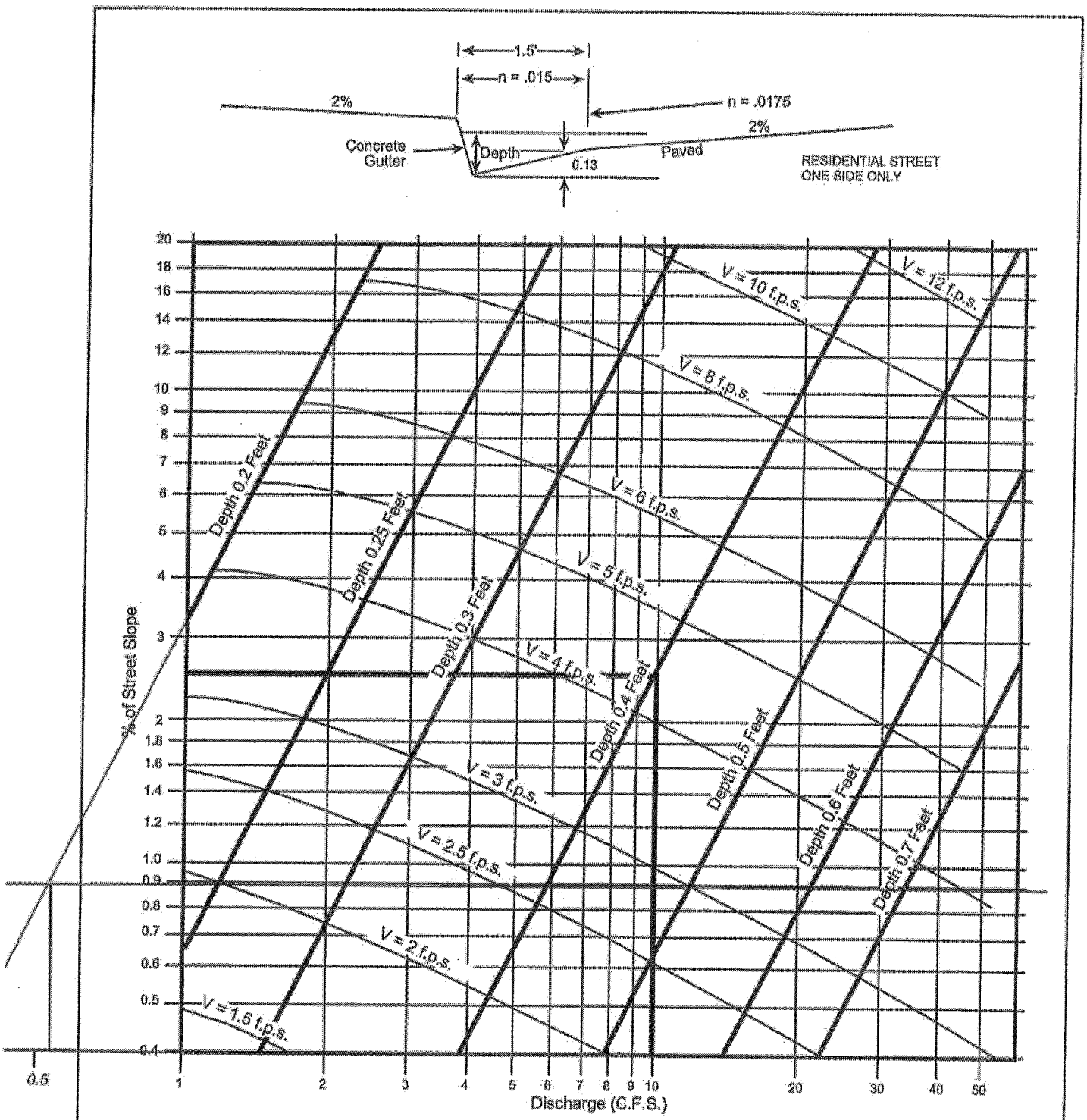
Basin A T_i = (1.8(1.1-.63)(59^(1/2)))/(2.4^(1/3))
= 4.85 min.

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

Rational Formula - Overland Time of Flow Nomograph

FIGURE

3-3



EXAMPLE:
Given: Q = 10 S = 2.5%
Chart gives: Depth = 0.4, Velocity = 4.4 f.p.s.

SOURCE: San Diego County Department of Special District Services Design Manual

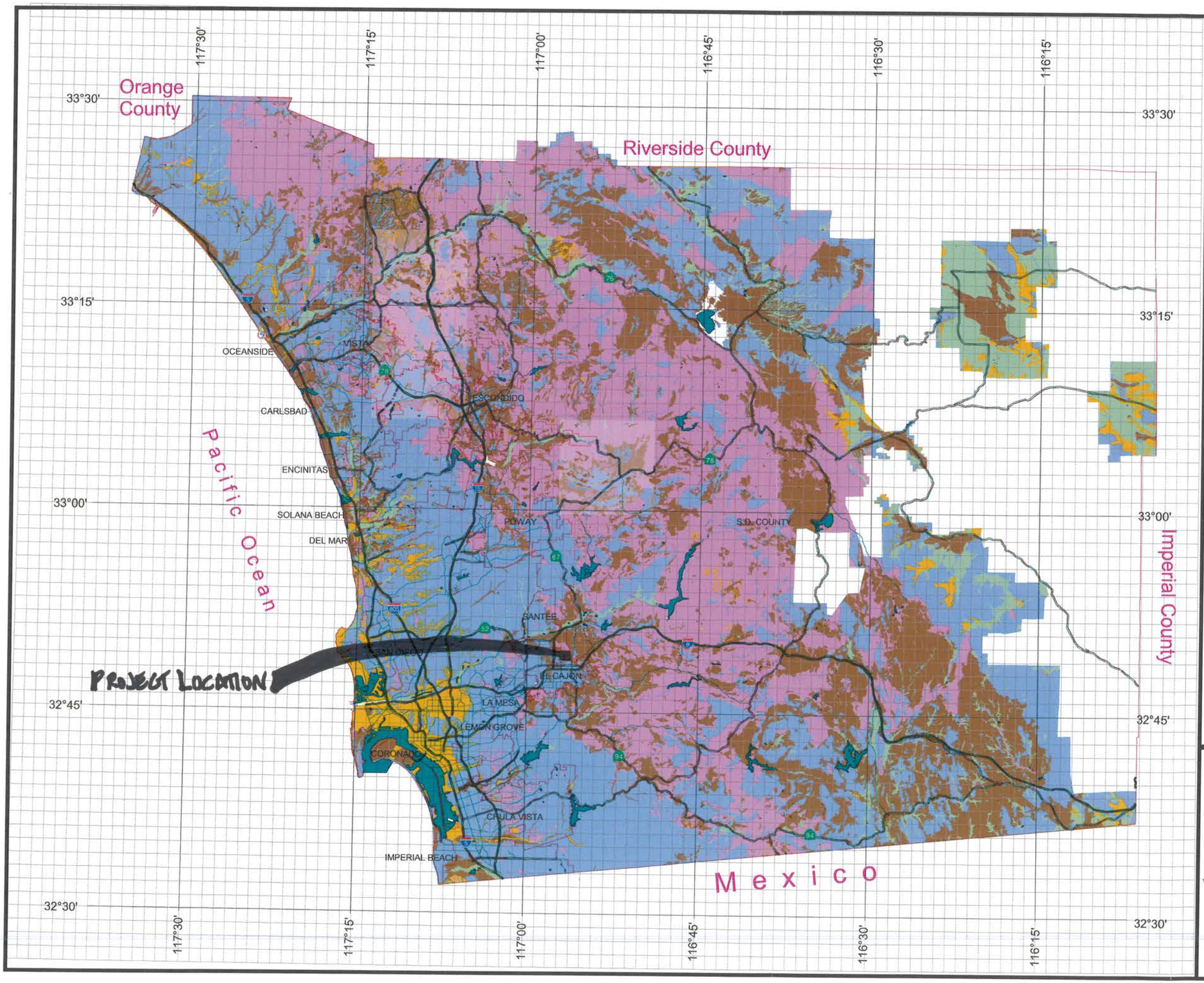
FIGURE

Gutter and Roadway Discharge - Velocity Chart

3-6

County of San Diego Hydrology Manual

Soil Hydrologic Groups



Legend

Soil Groups

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

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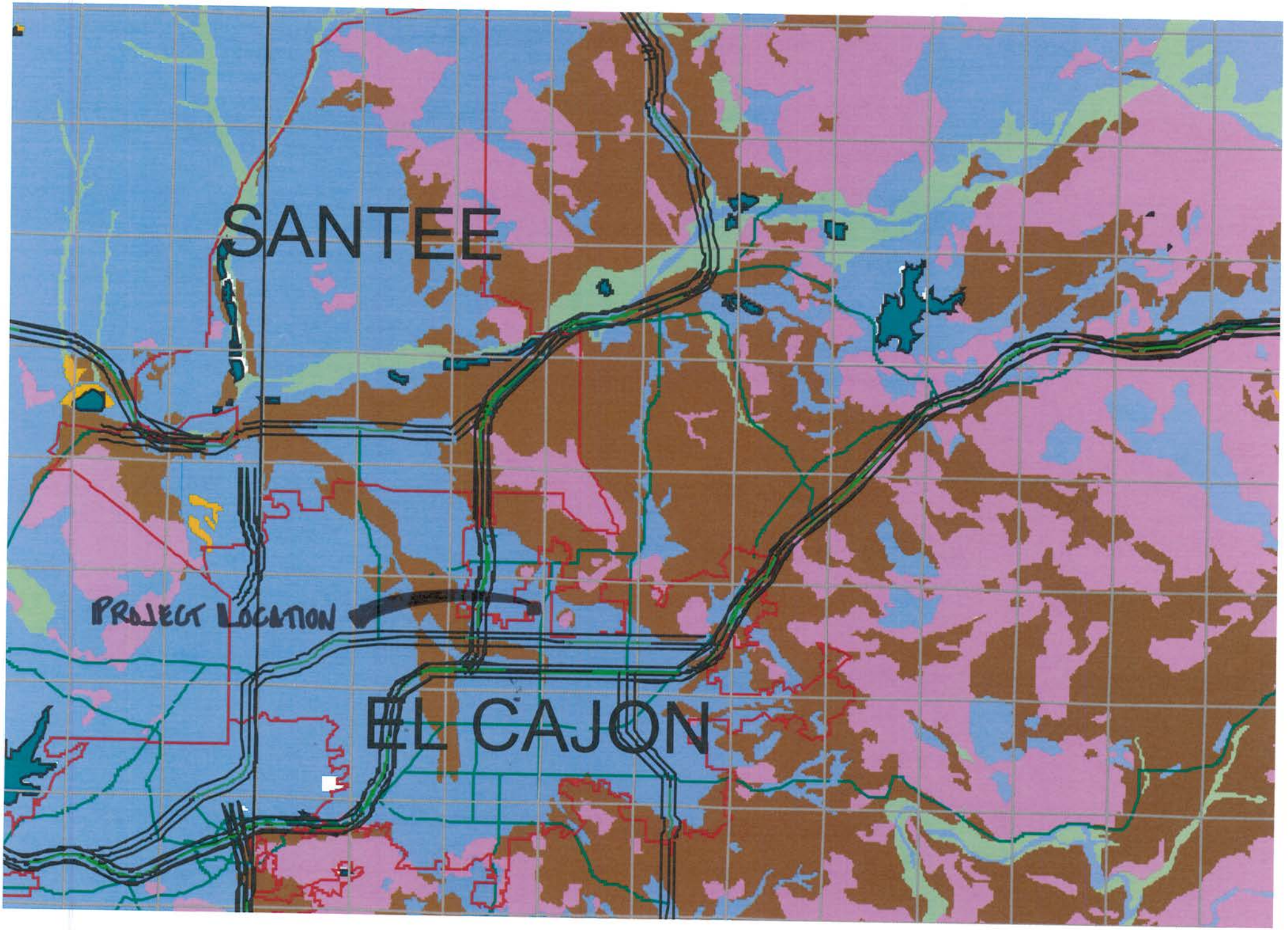

SANTEE
PROJECT LOCATION
EL CAJON

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

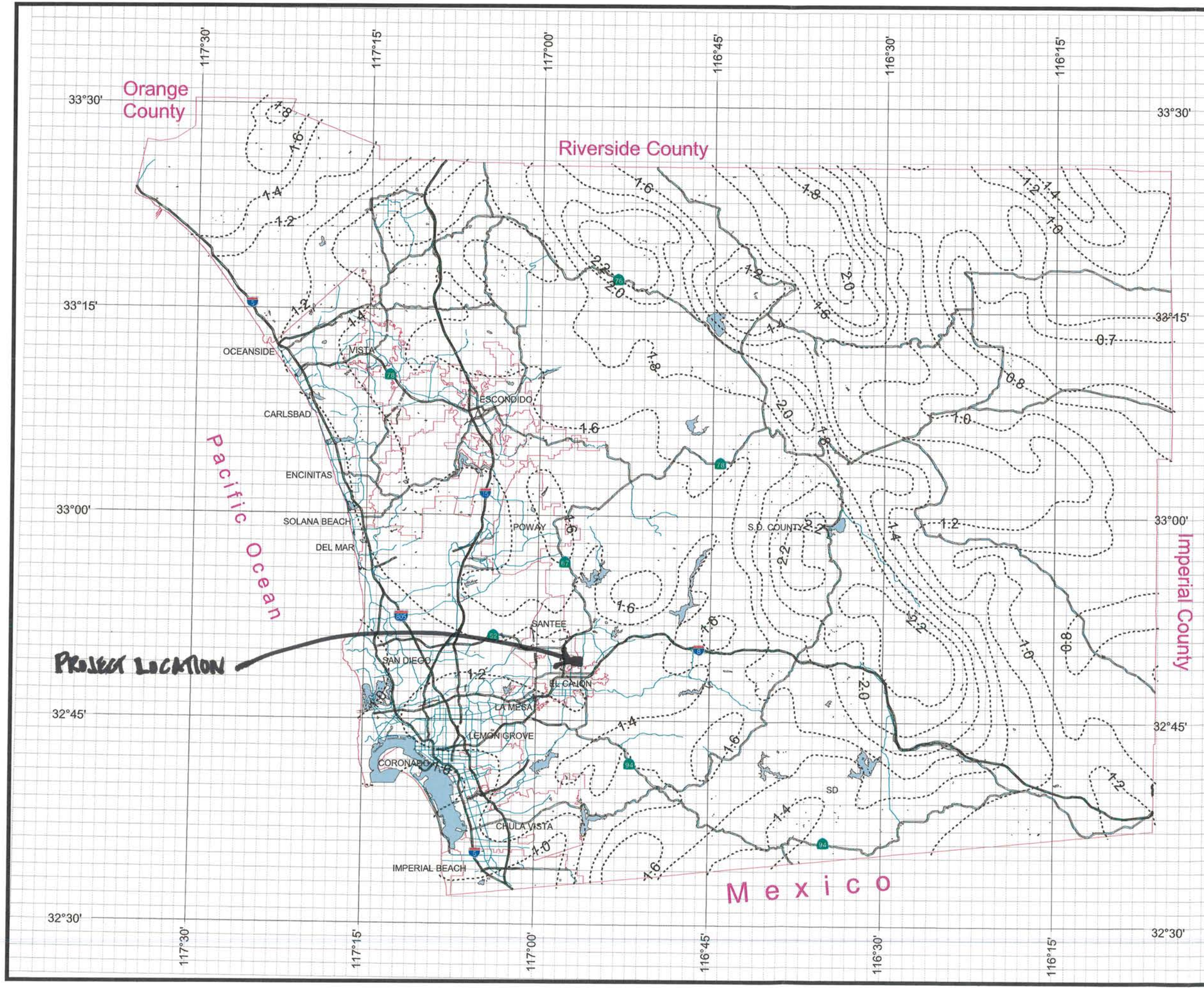
*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area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

County of San Diego Hydrology Manual

Rainfall Isopluvials

2 Year Rainfall Event - 6 Hours

Isopluvial (inches)



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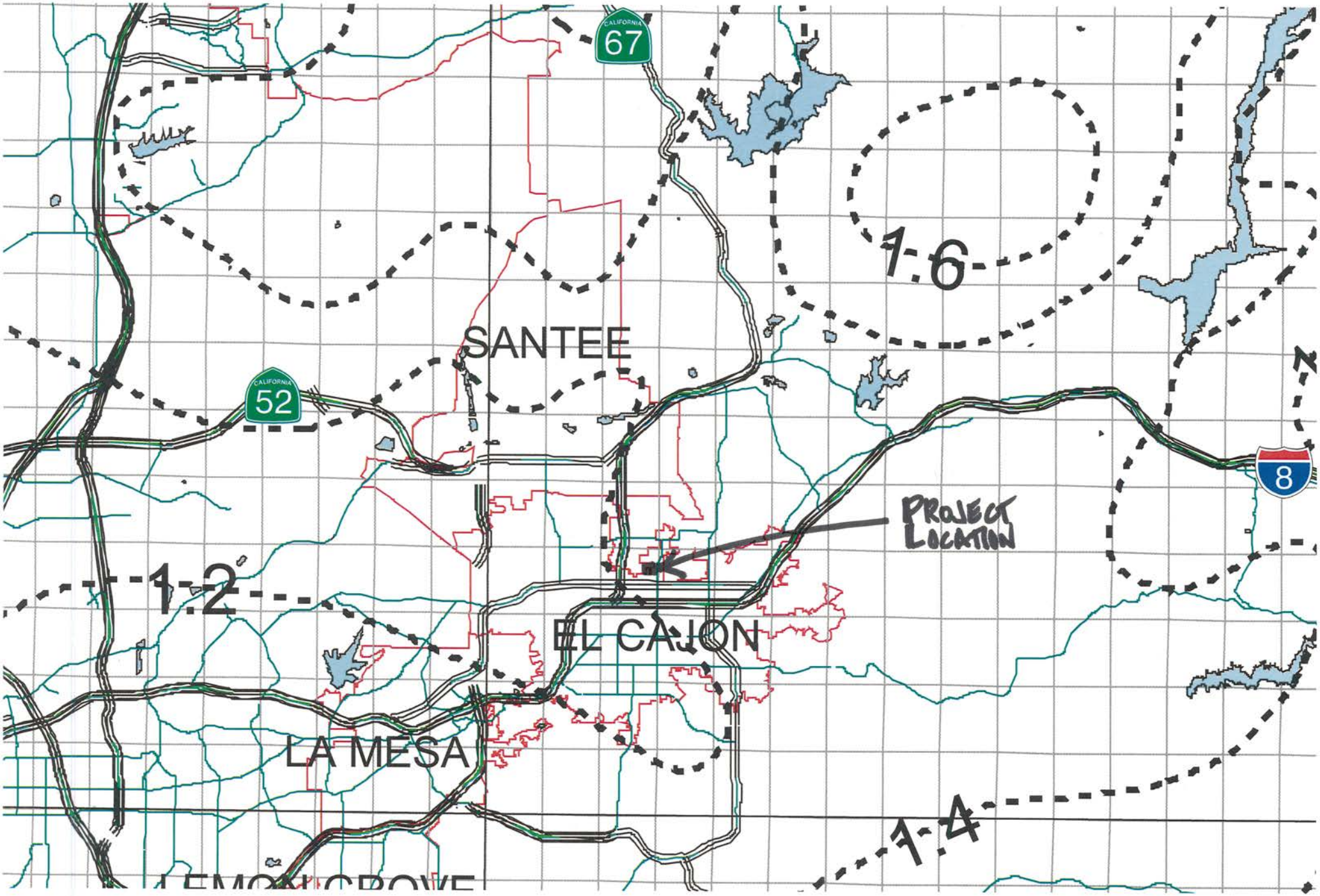
3 0 3 Miles



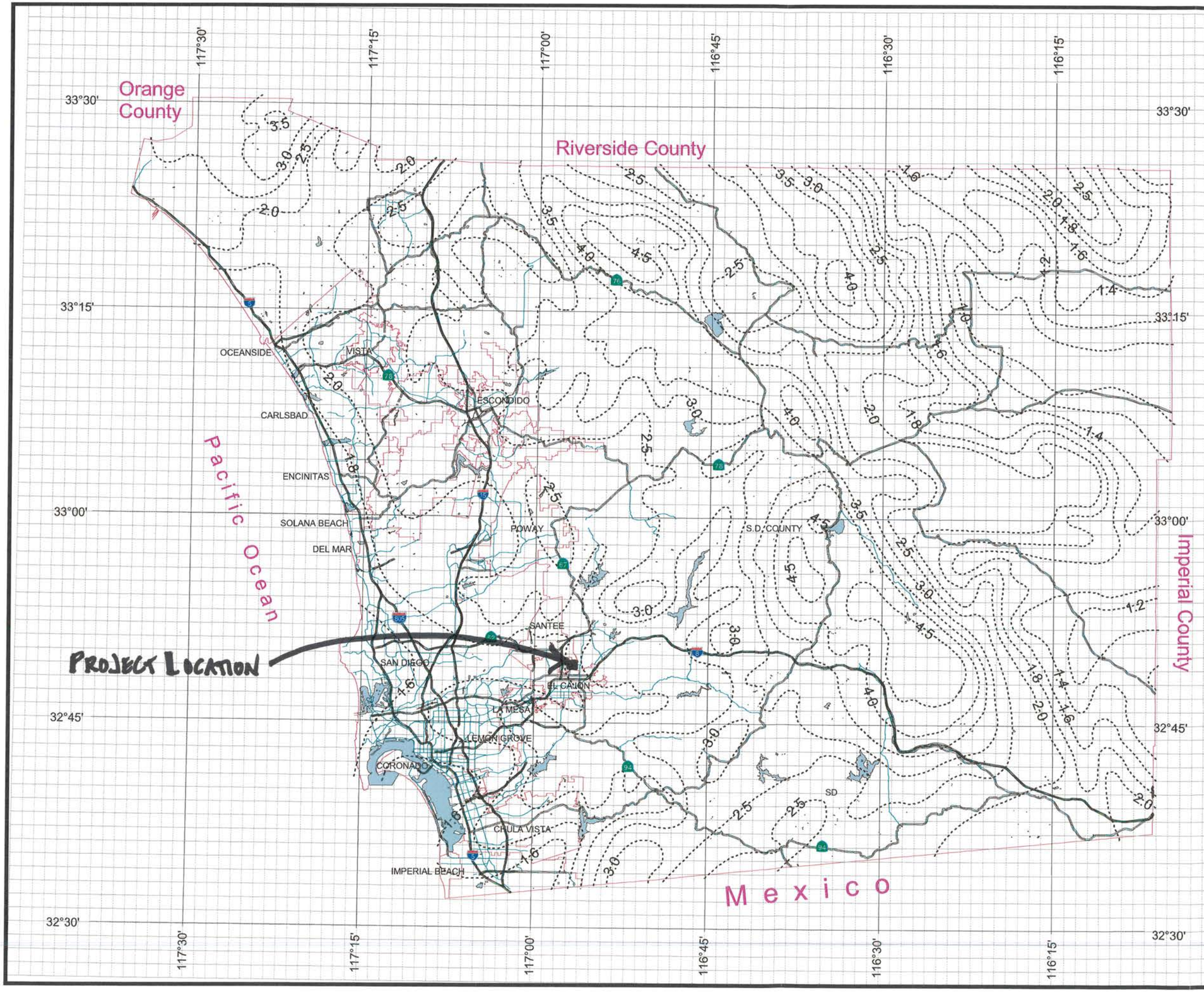
2-YEAR 6-HOUR

County of San Diego Hydrology Manual

Rainfall Isopluvials

2 Year Rainfall Event - 24 Hours

Isopluvial (inches)



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W E
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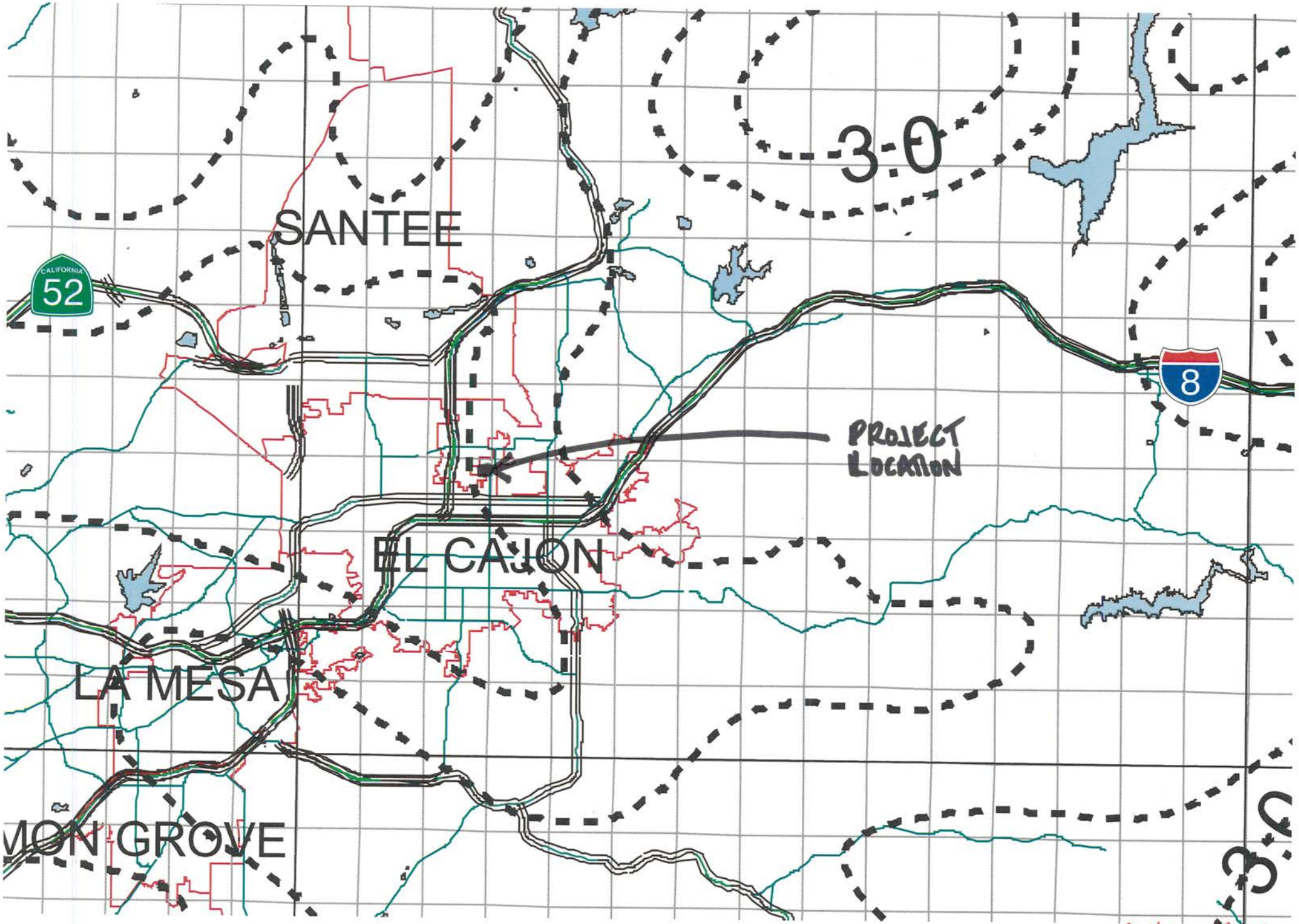
3 0 3 Miles



2-YEAR 24-HOUR

County of San Diego Hydrology Manual

Rainfall Isopluvials

10 Year Rainfall Event - 6 Hours

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Mexico

Pacific Ocean

PROJECT LOCATION

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
S.D. COUNTY
SAN DIEGO
SANTEE
EL CAJON
LA MESA
LEMON GROVE
CORONADO
CHULA VISTA
IMPERIAL BEACH
SD

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'
33°30' 33°15' 33°00' 32°45' 32°30'

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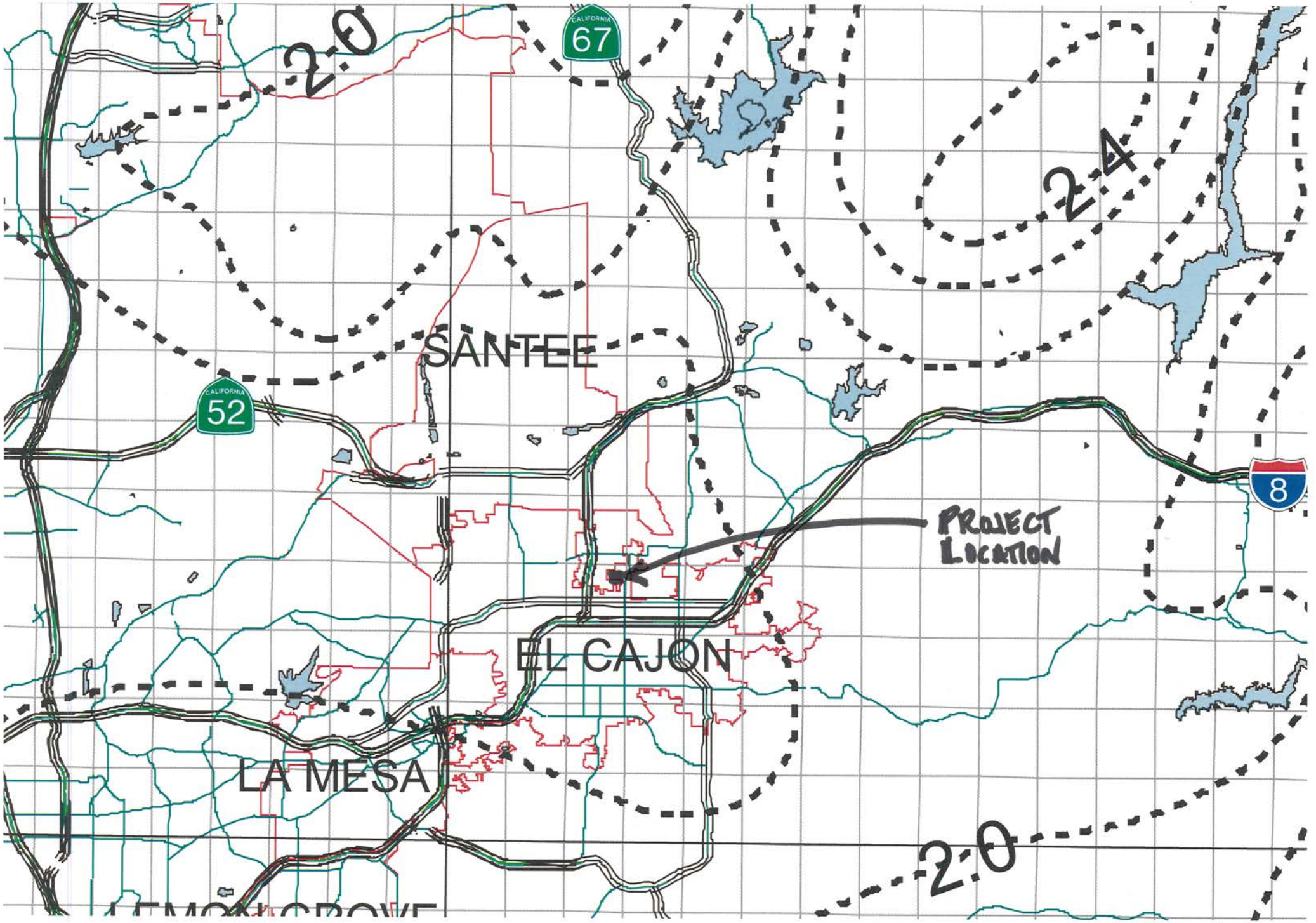

10-YEAR 6-HOUR

County of San Diego Hydrology Manual

Rainfall Isopluvials

10 Year Rainfall Event - 24 Hours

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Pacific Ocean

Mexico

PROJECT LOCATION

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
S.D. COUNTY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
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CORONADO
CAJULA VISTA
IMPERIAL BEACH
SD

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'
33°30' 33°15' 33°00' 32°45' 32°30'

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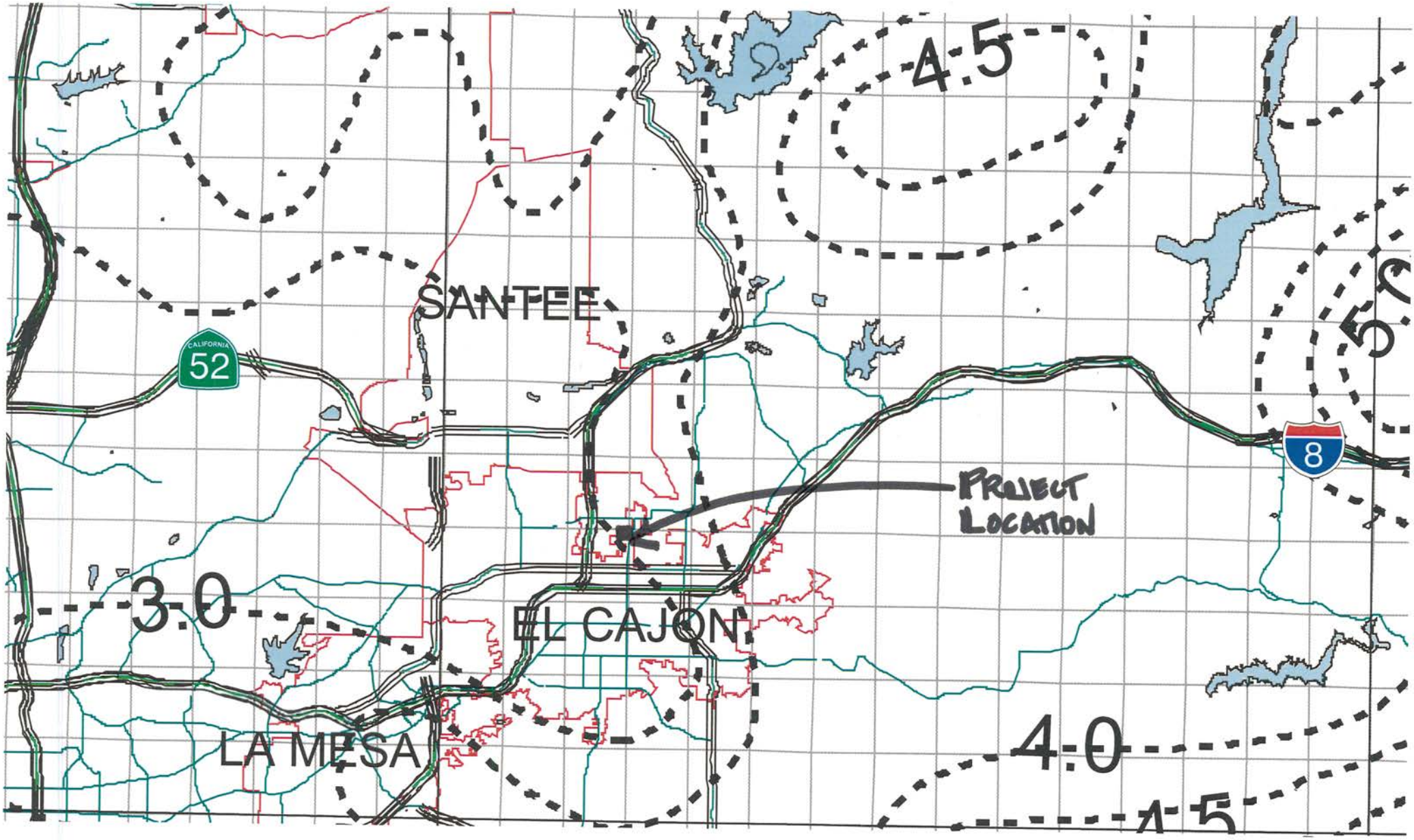
3 0 3 Miles



10-YEAR 24 HOUR

County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 6 Hours

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Mexico

Pacific Ocean

PROJECT LOCATION

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
S.D. COUNTY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
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IMPERIAL BEACH
SD

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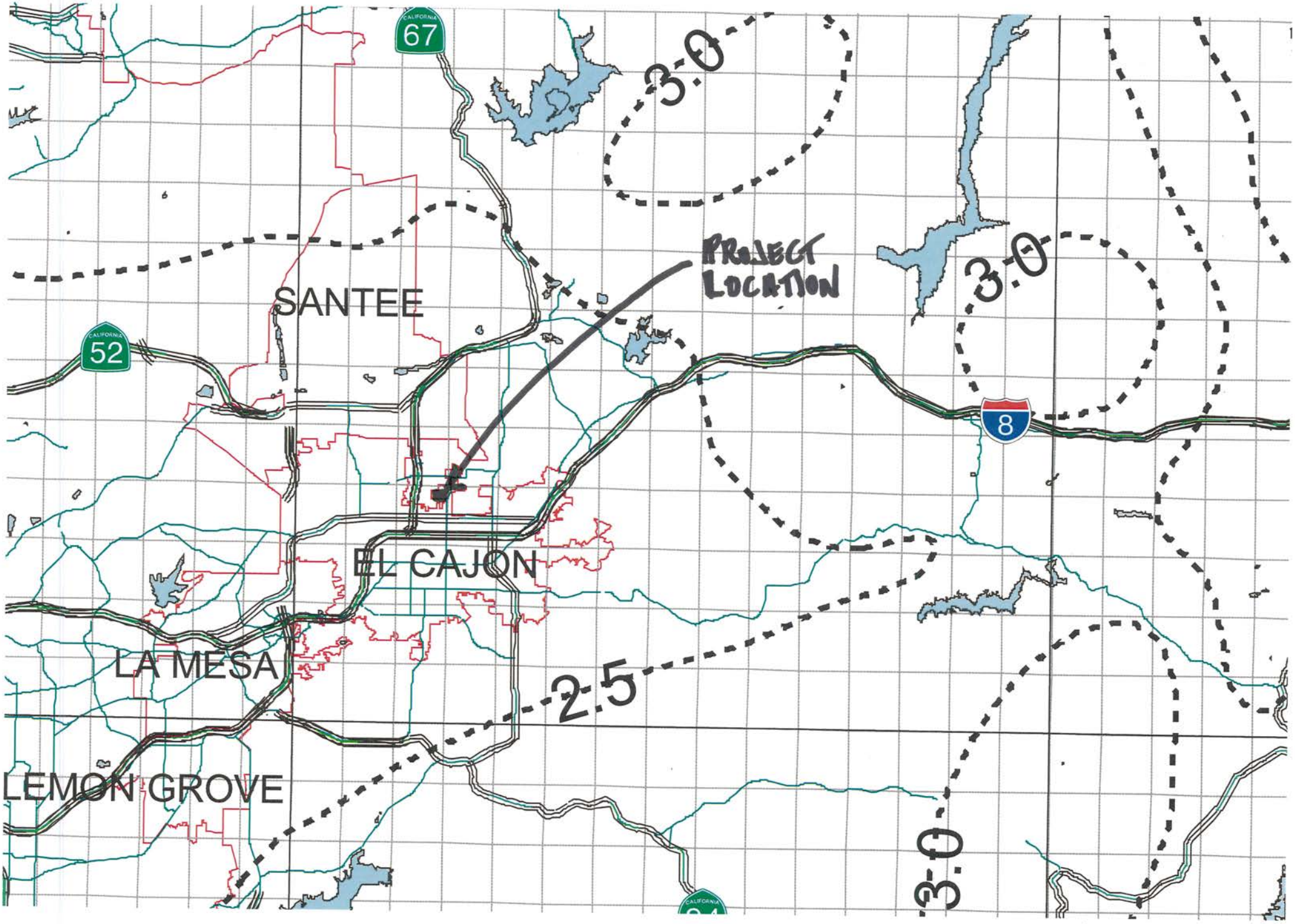
3 0 3 Miles



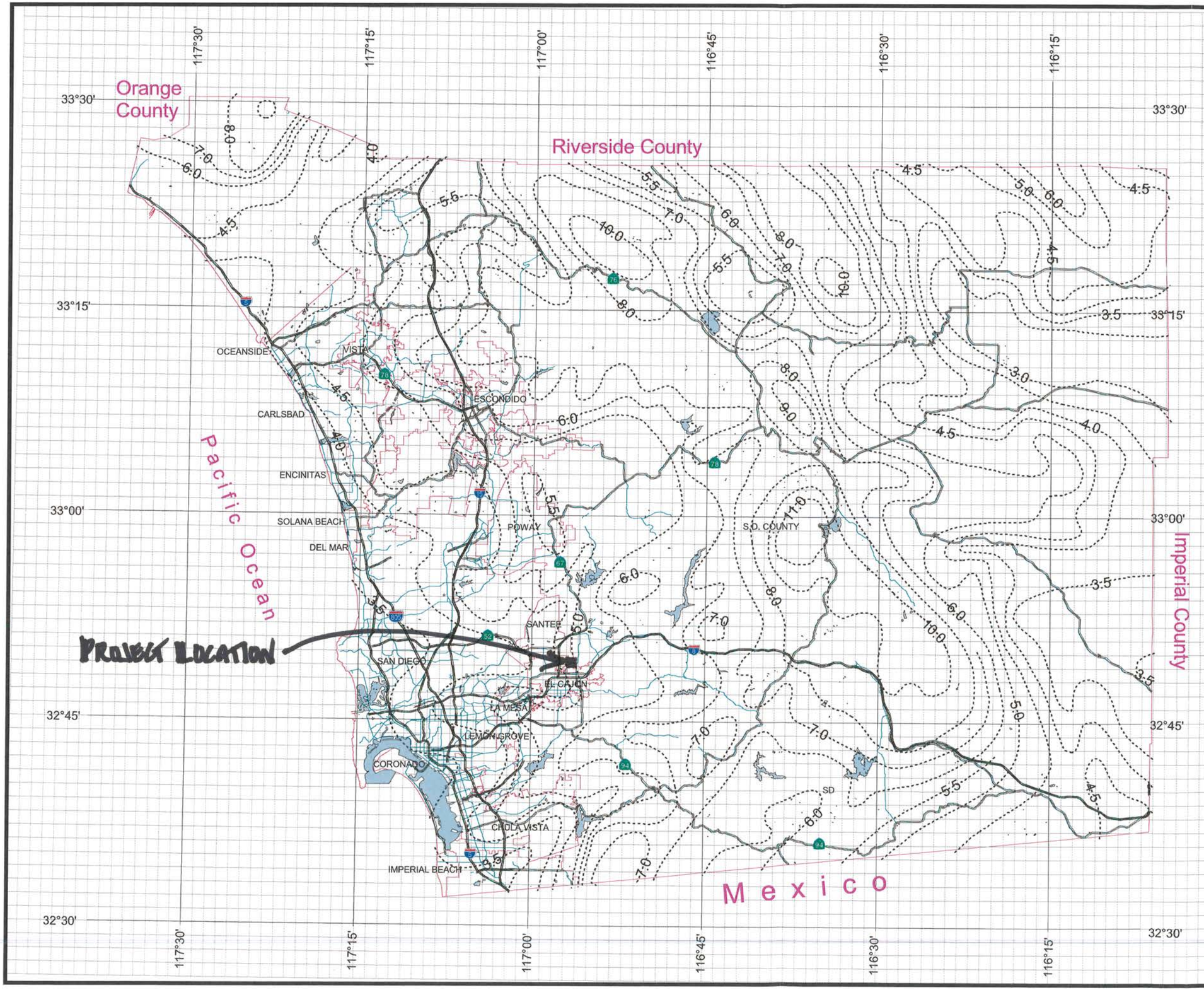
50-YEAR 6-HOUR

County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 24 Hours

Isopluvial (inches)



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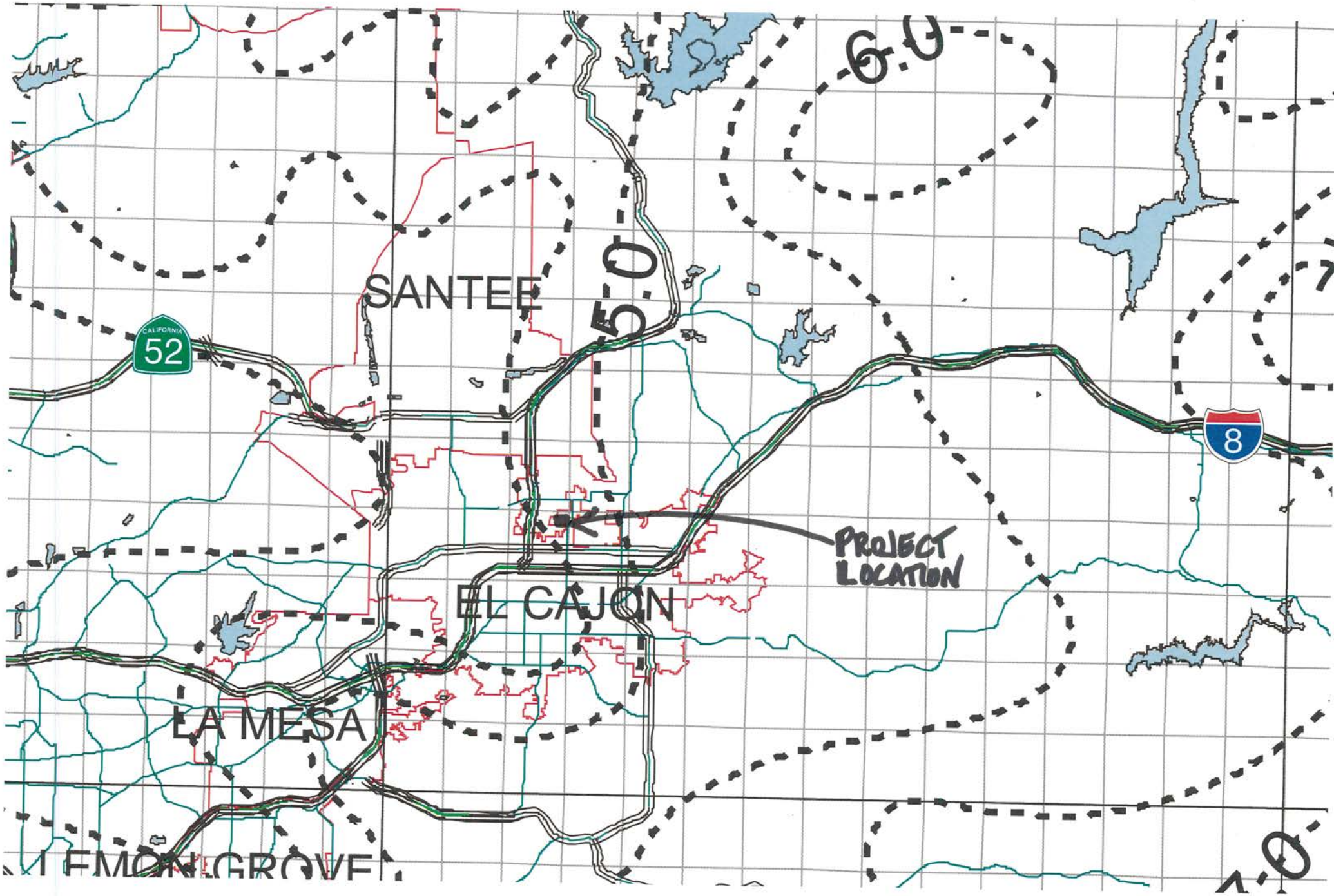

50-YEAR 24-HOUR

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Pacific Ocean

Mexico

PROJECT LOCATION

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
S.D. COUNTY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
CHULA VISTA
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SD

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'
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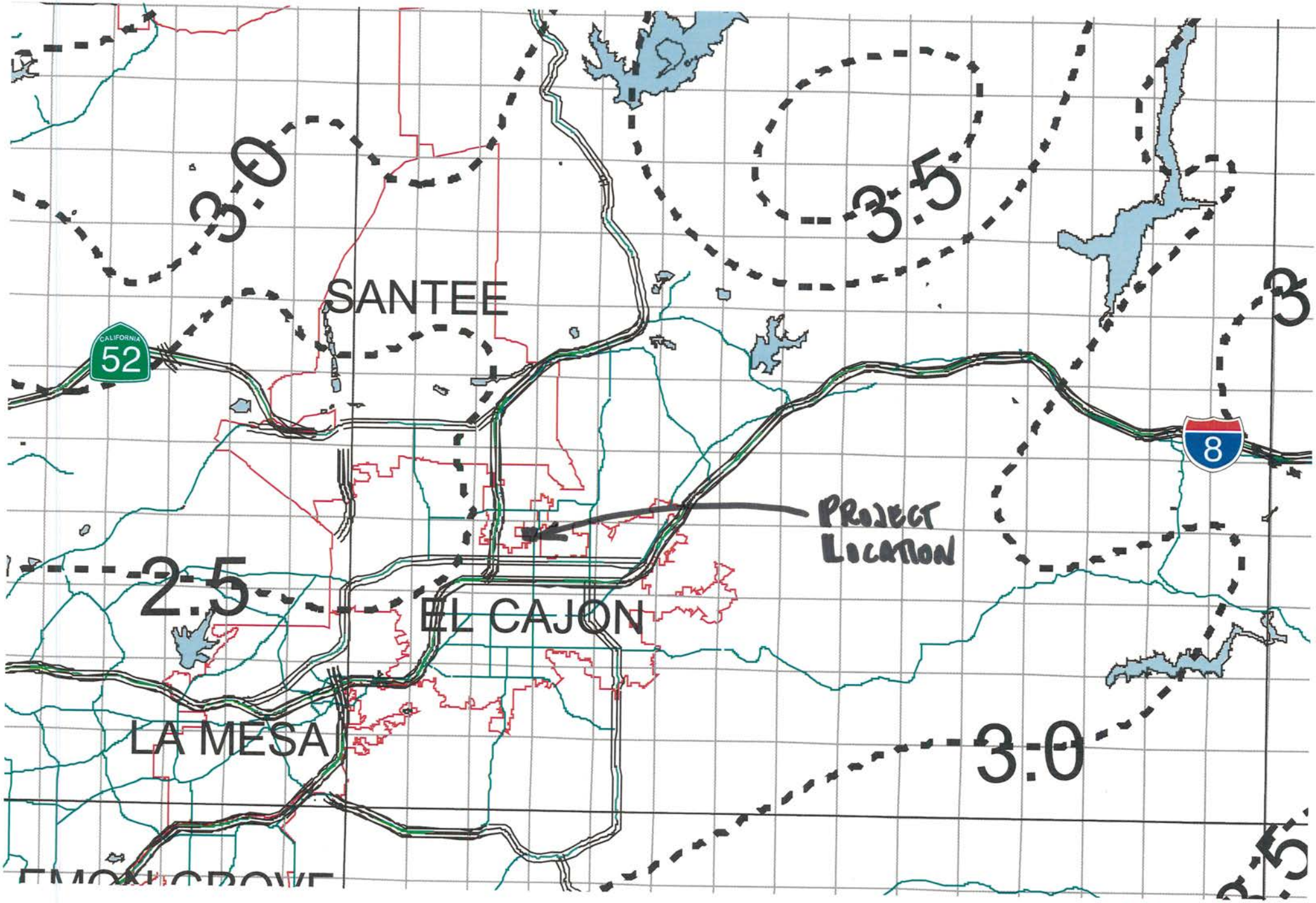
N W E S

3 0 3 Miles



100-YEAR 6HOUR

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Pacific Ocean

Mexico

PROJECT LOCATION

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
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SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
SD
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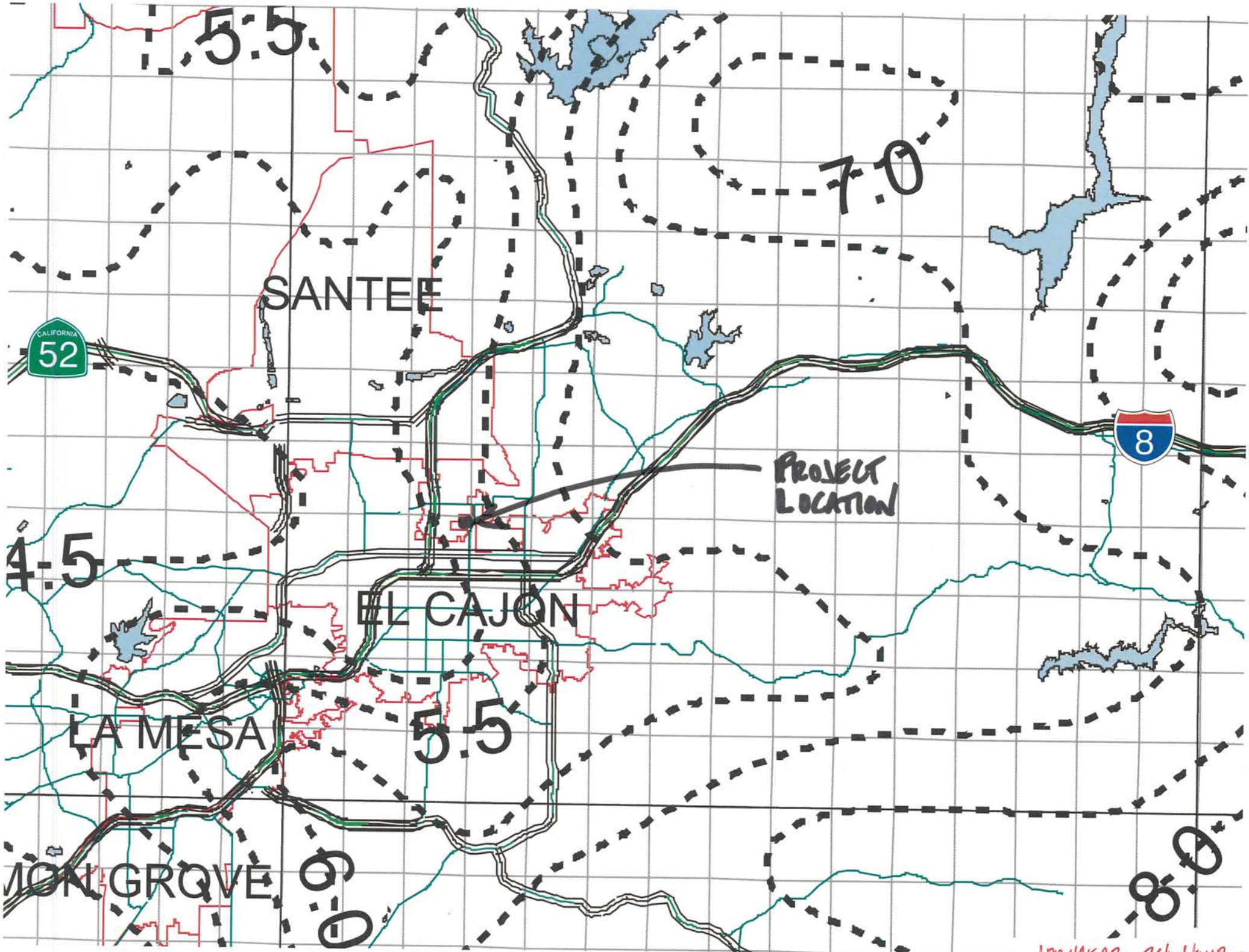
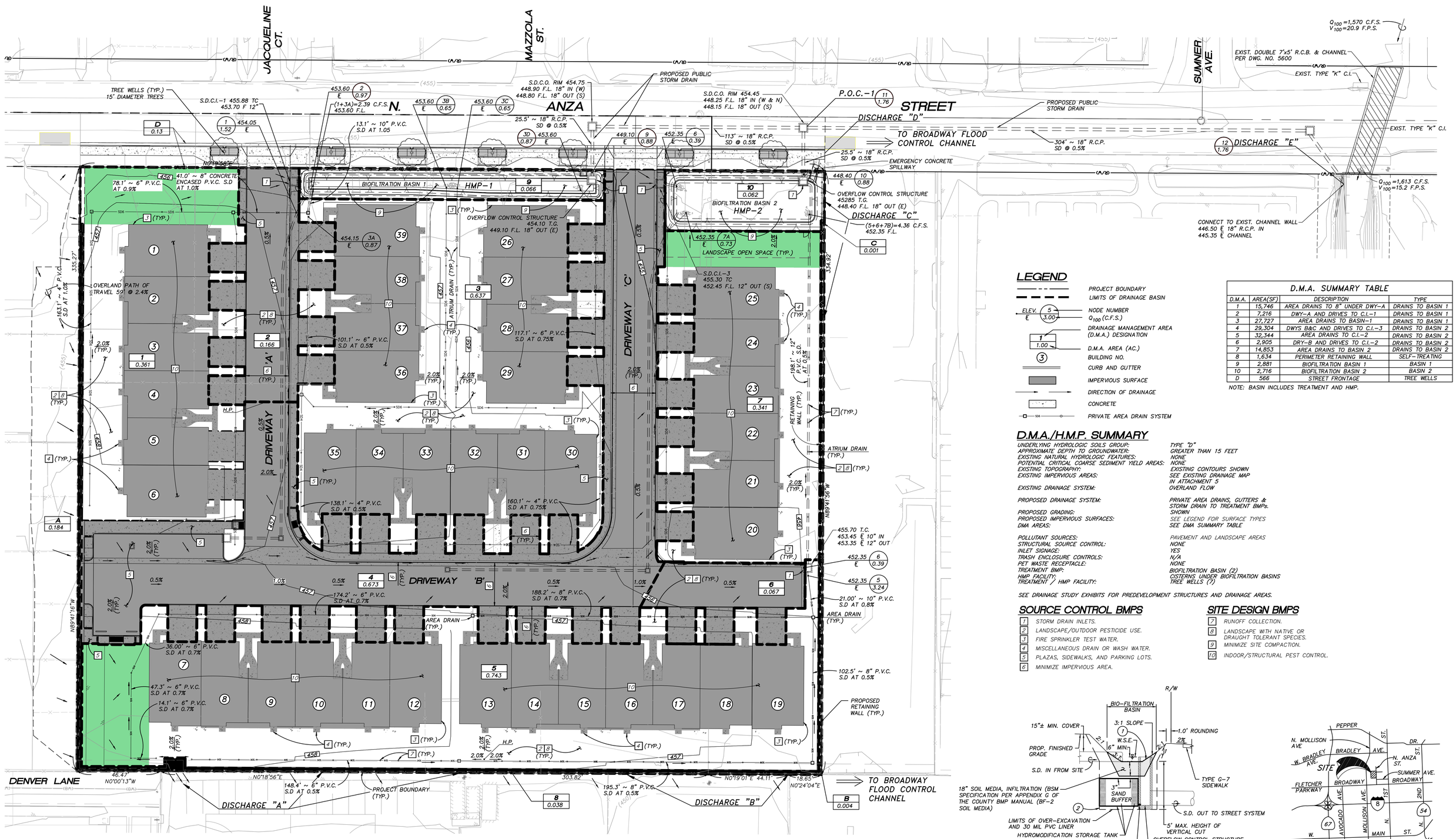

55
70
SANTEE
CALIFORNIA
52
8
PROJECT
LOCATION
45
EL CAJON
LA MESA
55
80
100-YEAR 24-HOUR

PROPOSED D.M.A./H.M.P. DRAINAGE EXHIBIT FOR:
N. ANZA STREET TOWNHOMES



LEGEND

- PROJECT BOUNDARY
- LIMITS OF DRAINAGE BASIN
- ELEV. ℄ 5 / 3.00 — NODE NUMBER / Q_{100} (C.F.S.)
- 1 / 1.00 — DRAINAGE MANAGEMENT AREA (D.M.A.) DESIGNATION / D.M.A. AREA (AC.)
- (3) — BUILDING NO.
- CURB AND GUTTER
- IMPERVIOUS SURFACE
- DIRECTION OF DRAINAGE
- CONCRETE
- SD6 — PRIVATE AREA DRAIN SYSTEM

D.M.A. SUMMARY TABLE

D.M.A.	AREA(SF)	DESCRIPTION	TYPE
1	15,746	AREA DRAINS TO 8" UNDER DWY-A	DRAINS TO BASIN 1
2	7,216	DWY-A AND DRIVES TO C.I.-1	DRAINS TO BASIN 1
3	27,727	AREA DRAINS TO BASIN-1	DRAINS TO BASIN 1
4	29,304	DWYS B&C AND DRIVES TO C.I.-3	DRAINS TO BASIN 2
5	32,344	AREA DRAINS TO C.I.-2	DRAINS TO BASIN 2
6	2,905	DRY-B AND DRIVES TO C.I.-2	DRAINS TO BASIN 2
7	14,853	AREA DRAINS TO BASIN 2	DRAINS TO BASIN 2
8	1,634	PERIMETER RETAINING WALL	SELF-TREATING
9	2,881	BIOFILTRATION BASIN 1	BASIN 1
10	2,716	BIOFILTRATION BASIN 2	BASIN 2
D	566	STREET FRONTAGE	TREE WELLS

NOTE: BASIN INCLUDES TREATMENT AND HMP.

D.M.A./H.M.P. SUMMARY

UNDERLYING HYDROLOGIC SOILS GROUP:	TYPE "D"
APPROXIMATE DEPTH TO GROUNDWATER:	GREATER THAN 15 FEET
EXISTING NATURAL HYDROLOGIC FEATURES:	NONE
POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREAS:	NONE
EXISTING TOPOGRAPHY:	EXISTING CONTOURS SHOWN
EXISTING IMPERVIOUS AREAS:	SEE EXISTING DRAINAGE MAP IN ATTACHMENT 5
EXISTING DRAINAGE SYSTEM:	OVERLAND FLOW
PROPOSED DRAINAGE SYSTEM:	PRIVATE AREA DRAINS, GUTTERS & STORM DRAIN TO TREATMENT BMPs. SHOWN
PROPOSED GRADING:	SEE LEGEND FOR SURFACE TYPES
PROPOSED IMPERVIOUS SURFACES:	SEE DMA SUMMARY TABLE
DMA AREAS:	
POLLUTANT SOURCES:	PAVEMENT AND LANDSCAPE AREAS
STRUCTURAL SOURCE CONTROL:	NONE
INLET SIGNAGE:	YES
TRASH ENCLOSURE CONTROLS:	N/A
PET WASTE RECEPTACLE:	NONE
TREATMENT BMP:	BIOFILTRATION BASIN (2)
HMP FACILITY:	CISTERNS UNDER BIOFILTRATION BASINS
TREATMENT / HMP FACILITY:	TREE WELLS (7)

SEE DRAINAGE STUDY EXHIBITS FOR PREDEVELOPMENT STRUCTURES AND DRAINAGE AREAS.

SOURCE CONTROL BMPS

1. STORM DRAIN INLETS.
2. LANDSCAPE/OUTDOOR PESTICIDE USE.
3. FIRE SPRINKLER TEST WATER.
4. MISCELLANEOUS DRAIN OR WASH WATER.
5. PLAZAS, SIDEWALKS, AND PARKING LOTS.
6. MINIMIZE IMPERVIOUS AREA.

SITE DESIGN BMPS

7. RUNOFF COLLECTION.
8. LANDSCAPE WITH NATIVE OR DRAUGHT TOLERANT SPECIES.
9. MINIMIZE SITE COMPACTION.
10. INDOOR/STRUCTURAL PEST CONTROL.

NOTES

1. INSTALL 3" WELL AGED SHREDDED HARDWOOD MULCH THAT HAS BEEN STOCKED PILED OR STORED FOR AT LEAST 12 MONTHS. MULCH MUST BE NON-FLOATING.
2. 30 MIL PVC LINER SHALL BE FULLY WATER TIGHT. ALL JOINTS SHALL OVERLAP 12" MIN. AND BE SEALED. LINER SHALL BE SEALED WITH MASTIC TO ALL STRUCTURES. ALL PENETRATIONS SHALL BE SEALED.
3. PLACE RIP-RAP PER SDRSD D-40 OR EQUIVALENT ENERGY DISSIPATER FOR ALL VELOCITIES GREATER THAN 3' PER SECOND TO BE DETAILED IN FINAL DESIGN.

(A) DETAIL " BIOFILTRATION BASIN BF-2 WITH HMP CISTERN

NOT TO SCALE

VICINITY MAP

NOT TO SCALE

THOMAS BROTHERS PG. 1251, GRID H-3 57TH EDITION

SCALE: 1" = 20'

GRAPHIC SCALE

20 0 20 40 60

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