Preliminary Hydrology and Hydraulics Report

Mission San Marcos Industrial Park

Ref #CPRKMARC0001
December 17, 2025

DAVID EVANS AND ASSOCIATES INC.

Mission San Marcos Industrial Park

San Marcos, California

Preliminary Hydrology Report

Prepared for
CRP III Mission, LLC



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Project Number: CPRKMARC001

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1 SUMMARY

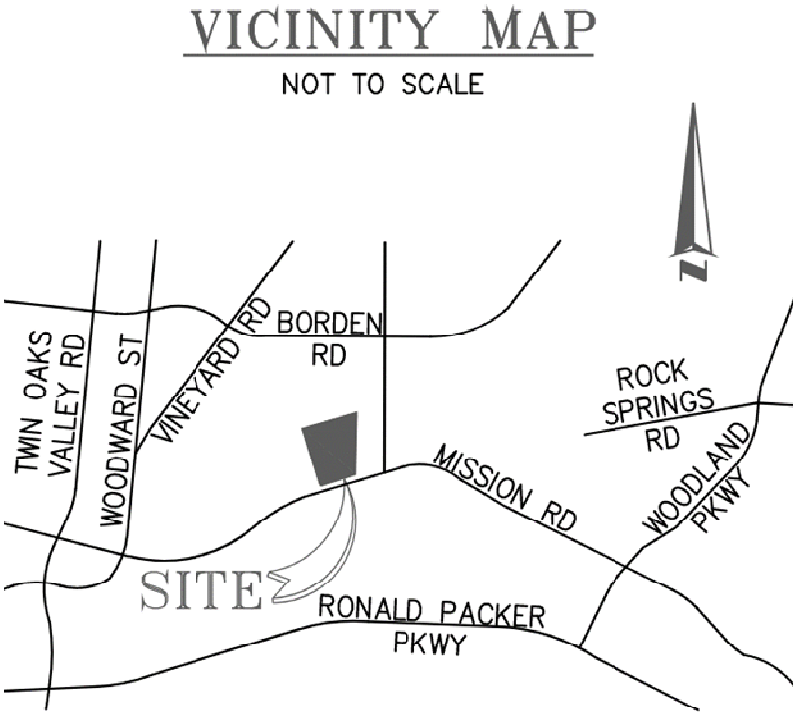
Preliminary engineering services including hydrology, hydraulics and water quality management have been provided for the purpose of securing entitlements for three industrial buildings located on 10.83 acres in the City of San Marcos. The project location is located north of E Mission Road between Falcon Place and Mulberry Drive.

Previous studies are summarized as part of this report. Preliminary sizing of the onsite retention and water quality facilities are outlined for the purposes of site planning and identification of required infrastructure.

2 INTRODUCTION

The proposed Mission San Marcos Industrial Park is located north of E Mission Road between Falcon Place and Mulberry Drive. The proposed development will replace the current industrial site with three new industrial buildings. The overall site drainage and outlet location are maintained between the existing and proposed conditions. Existing culverts convey the site and upstream development flows under E Mission Road to a disturbed riparian forest which ultimately discharges to San Marcos Creek.

FIGURE 2-1 – PROJECT VICINITY



2.1 PREVIOUS STUDIES

Several studies have been produced for the project site, including a previous conceptual drainage study for an alternative site plan, an infiltration summary and a preliminary constraints report. These Studies were reviewed as part of a general site review and utilized in the overall design of the site.

The Infiltration Summary prepared by LGC Geotechnical, Inc. in July 2021 indicated that the site has extremely low infiltration rates, shallow bedrock and shallow depth to groundwater.

The Preliminary Constraints Report for the Mulberry Drive Drainage Project prepared by Rocks Biological Consulting in April 2021 provides summary results of a preliminary constraints survey focused on biological constraints observed on-site.

2.2 EXISTING CONDITIONS AND SITE RECONNAISSANCE

The existing site consists of an undisturbed hill, four industrial buildings, and work yards. The site has an average slope if 1% except for the hill which has a maximum slope of 2:1. The site sheet flows to inlets and drainage swales which discharge to an existing 8'x4' triple reinforced concrete box (RCB) culvert

located in the middle of the southern boundary of the site near Mission Road as shown in Figure 2-3. The existing site has approximately 6.24 ac of impervious and 3.63 ac of pervious.

Offsite flows of approximately 700 cfs are generated from northern developments. The flows are discharged from an energy dissipator, as shown in Figure 2-2, at the northeastern corner of the lot and sheet flow through the site. Flooding onsite has been documented and is attributed to the offsite flows. This project is planning to convey the offsite flows through the eastern edge of the site. It consists of culvert RCBs which would ultimately drain to the existing triple RCB culverts on the project site. The offsite flows are not addressed as part of the on-site analysis, however a PDF of the proposed plan set, and associated Hydrology/Hydraulics report have been included in Appendix D.

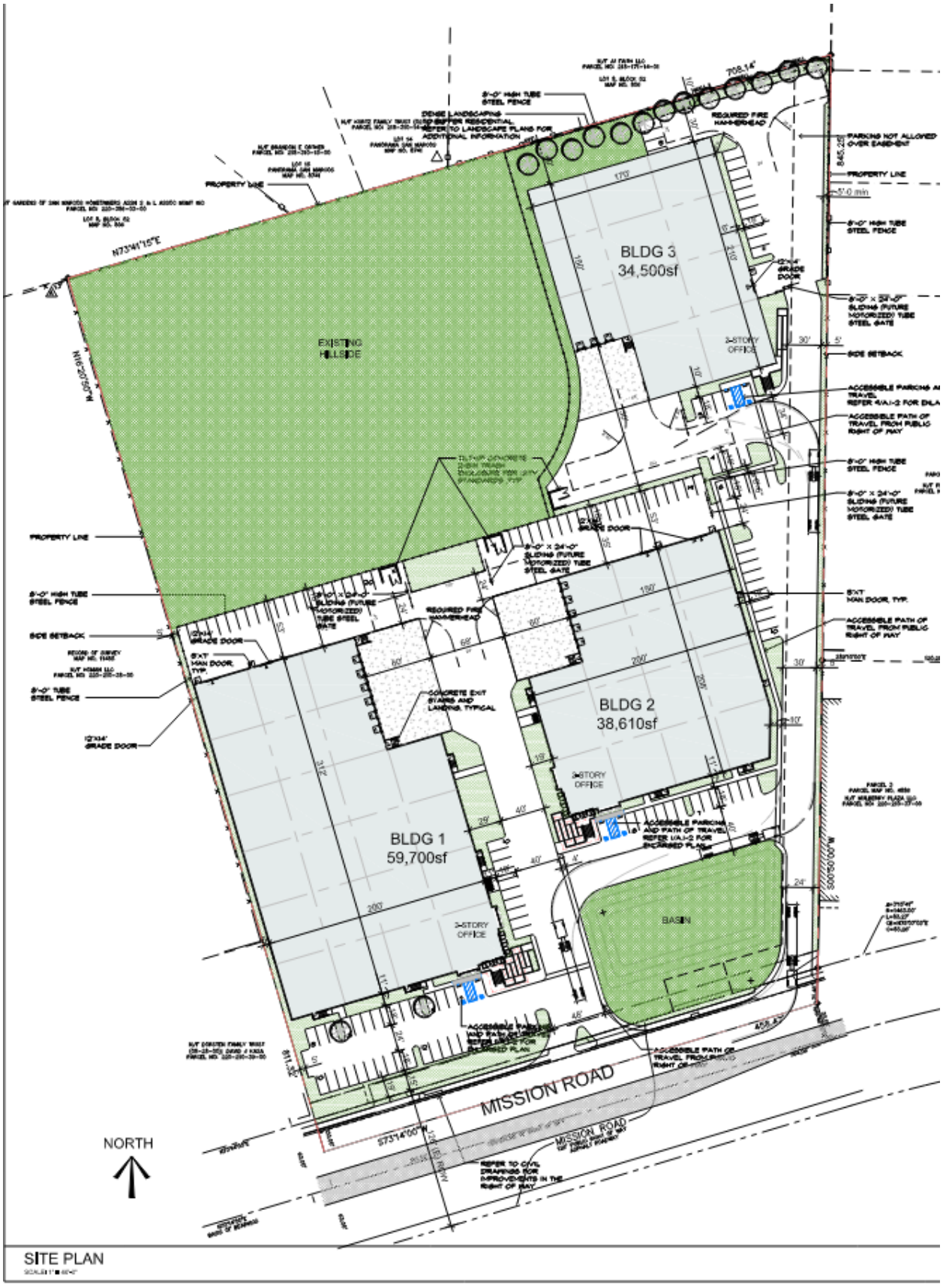
FIGURE 2-2 – OFFSITE ENERGY DISSIPATOR



2.3 PROPOSED IMPROVEMENTS

The proposed industrial park will replace the current buildings and work yards with three new industrial buildings. The existing hill in the northwest corner will be maintained as is. A basin located near the southern boundary of the site will treat water quality and the hydromodification flows before ultimately discharging into the public storm drain facilities in E Mission Road. The proposed development will slightly increase the impervious surface to 6.41 acs and 3.46 pervious from 6.24 acs and 3.63 acs respectively. The preliminary site plan is shown for reference only in Figure 2-3 below.

FIGURE 2-3 – PRELIMINARY SITE PLAN



3 HYDROLOGY

The hydrology study was performed for the existing and proposed conditions of the site following the San Diego County Hydrology Manual (SDCHM) (June 2003). Drainage boundaries were identified within the site based off drainage patterns and concentration points, as depicted in the Existing and Proposed Condition Hydrology Maps located in Appendix A of the report. The proposed project has been analyzed to determine the peak runoff flow for 100-year, 6-hour rainfall event using the Rational. The time of concentration for all existing and proposed drainage areas were calculated following Section 3.4.4 of the SDCHM. The rainfall depth was determined to be 3.4 inches following Appendix B of the SDCHM. Refer to Appendix B for the detailed calculations.

3.1 RATIONAL METHOD

As mentioned above, runoff from the project site was calculated for the 100-year, 6-hour storm event. Runoff was calculated using the Rational Method which is given by the following equation:

$$Q = C \times I \times A$$

Where:

Q = Flow rate in cubic feet per second (cfs)
C = Runoff coefficient
I = Rainfall Intensity in inches per hour (in/hr)
A = Drainage basin area in acres, (ac)

3.2 RUNOFF COEFFICIENT

The Runoff Coefficient, C, for the existing and proposed conditions were selected using Table 3-1 which is included in Appendix B of the SDCHM. The soil type is Type C and D and the existing and proposed site consists of natural and commercial development. Runoff coefficient ranging from 0.30 to 0.85 were applied for the rational method calculation. Mixed land use and soil type subareas use a weighted runoff coefficient.

3.3 RAINFALL INTENSITY

The 6-hour storm rainfall amount (P6) and the 24-hour storm rainfall amount (P24) were read from the isopluvial maps provided in Appendix B and included in Appendix B of this report. Intensity was calculated using the following equation:

$$I = 7.44\ P_6\ D^{-0.645}$$

Where:

P6 = adjusted 6-hour storm rainfall amount (see discussion below)
D = duration in minutes (use Tc)

The Time of Concentration (Tc) is the time required for runoff to flow from the most remote part of the drainage area to the point of interest. Tc was determined following Section 3.1.4 of the SDCHM.

3.4 RESULTS

The overall imperviousness of the site slightly increased, approximately 2-3% increase from the existing to the proposed condition, but storm drain created a shorter time of concentration increases the peak flow for the proposed condition.

A biofiltration and hydromodification basin is located on the south boundary of the site and will mitigate the flow by 2.33 cfs to below the existing condition. A NRCS hydrograph was created and inputted into Bentley's PondPack to route the flows and determine the mitigated flowrate. Results of this analysis can be found in Appendix C.

TABLE 3-1 – UNMITI100-YEAR PEAK FLOW DATA

Condition	Area (ac)	Unmitigated Peak Flow (cfs)	Mitigated Peak Flow (cfs)
Existing	9.9	41.8	41.8
Proposed	9.9	43.97	41.6

4 WATER QUALITY AND HYDROMODIFICATION

The site is located near San Marcos Groundwater Basin, and it is estimated that the depth to the groundwater is approximately 7-feet. Additionally, the soil type for the site is predominately type C and D (low infiltration capacity) so it was determined that infiltration for the site was not feasible. Therefore, a combination of water treatment and water detention was designed to meeting the project's needs.

Located in the south boundary of the site, a two (2) tier basin system was designed. The Storm water enters on the western half of the basin which is a water quality basin that the water will percolate down into a 6" underdrain with a 2" orifice that connects to the eastern half. At the top there is a weir that is designed to store the required treatment volume. The storm water overflows into a detention basin portion of the basin. The basin outlets through a cmp riser with several orifices that vary the flow with the depth. Due to site constraints, additional underground storage chambers are required to provide sufficient storage to mitigate the flows. The outlet riser connects to the public storm drain system. A secondary overflow of a parkway drain was also incorporated into the design.

5 HYDRAULIC DESIGN

The proposed riser in the biofiltration was assessed to determine that it has capacity to pass the 100-year event without overtopping the basin. The headwater elevation for the riser was calculated using Bentley's PondPack, Appendix C includes the calculations results. Design of the offsite and onsite facilities will account for the shallow groundwater during final design.

6 CONCLUSION

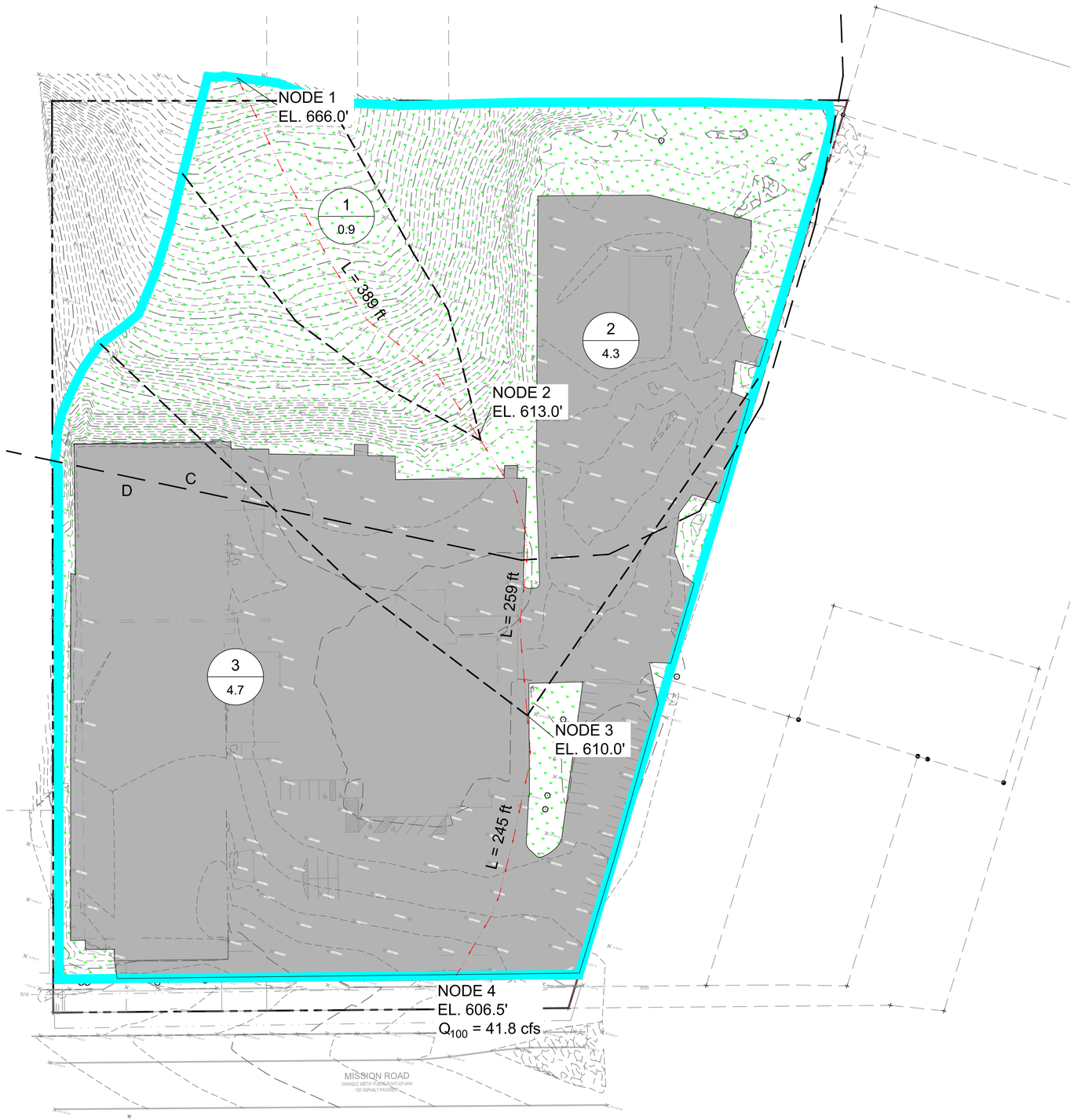
DEA engineers performed a hydrology and hydraulics analysis for Mission San Marcos Industrial Park. The results show that the designed mitigation measures the proposed site mitigates proposed conditions flows to be below the existing condition. Flood mitigation measures are achieved through the biofiltration/hydromodification basin and underground storage facilities.

7 REFERENCES

Federal Highways Administration (FHWA), Hydraulic Toolbox, Version 4.4, 2018.

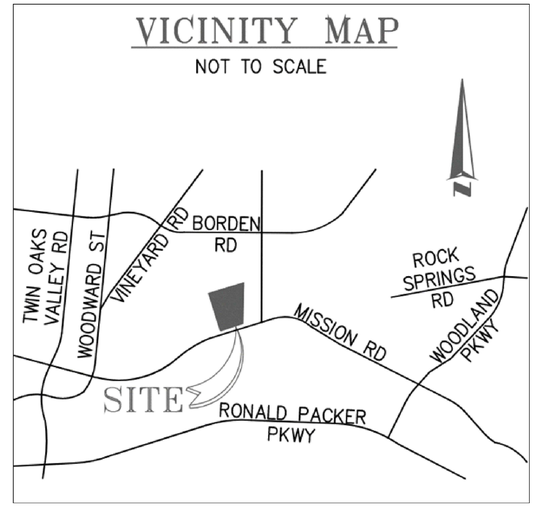
APPENDICES

Appendix A: Hydrology Maps



Legend

- A2 / 3.00 — Subarea Name and Acreage
- EL. 1509.50, Q_{100} = 8.58 cfs — Hydrology Node, Elevation, and Peak Flow Rate
- Flow Path
- Drainage Boundary
- C / D — Soil Type
- Impervious Surface
- Pervious Surface



OVERALL SITE IMPERVIOUS = 271,741
DA 1 IMPERVIOUS = 0
DA 2 IMPERVIOUS = 89,953
DA 3 IMPERVIOUS = 181,788

OVER ALL SITE PERVIOUS = 157,824
DA 1 PERVIOUS = 38,665
DA 2 PERVIOUS = 98,187
DA 3 PERVIOUS = 20,972

50' 0' 25' 50'
SCALE: 1" = 50'

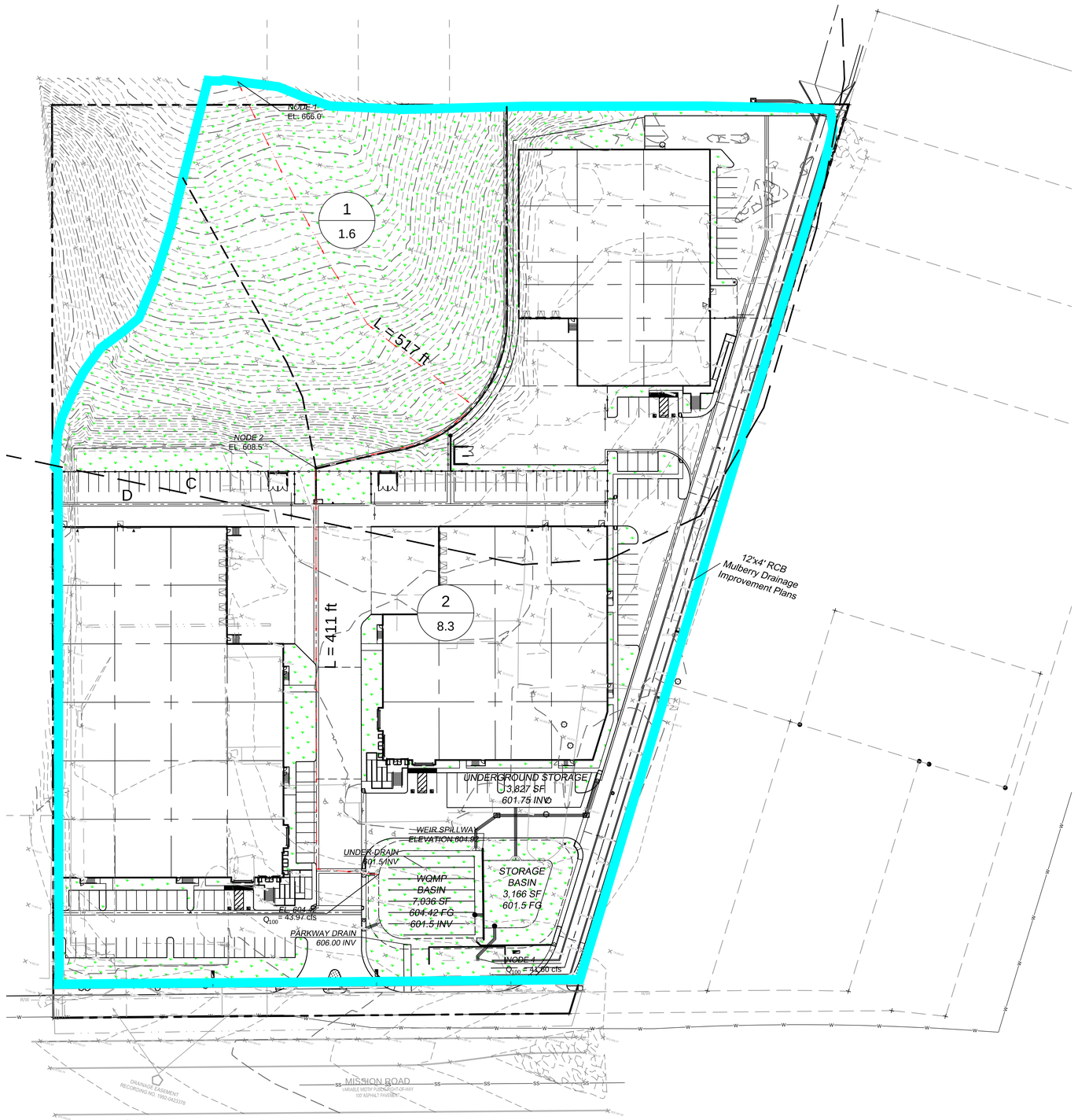
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Phone: 714.665.4500

MISSION SAN MARCOS INDUSTRIAL PARK
EXISTING RATIONAL METHOD MAP
SAN MARCOS, CA

PROJECT NO. CPRK0000-XXXX
DATE: 2/2023
SHEET: 1 OF 1

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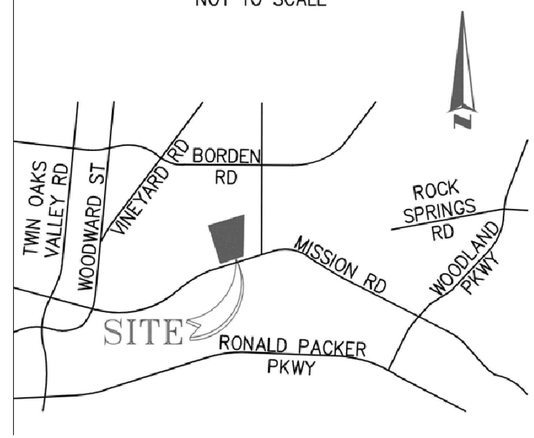


Legend

A2 / 3.00	Subarea Name and Acreage
EL. 1509.50 Q_{100} = 8.58 cfs	Hydrology Node, Elevation, and Peak Flow Rate
	Flow Path
	Drainage Boundary
C / D	Soil Type
	Pervious/Landscape Surface

VICINITY MAP

NOT TO SCALE



OVERALL SITE IMPERVIOUS = 279,640
DA 1 IMPERVIOUS = 0
DA 2 IMPERVIOUS = 279,640

OVER ALL SITE PERVIOUS = 150,670
DA 1 PERVIOUS = 71,350
DA 2 PERVIOUS =79,320

50' 0' 25' 50'

SCALE: 1" = 50'

PREPARED BY:

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MISSION SAN MARCOS INDUSTRIAL PARK
PROPOSED HYDROLOGY MAP
SAN MARCOS, CA

PROJECT NO.
CPRK0000-MARC

DATE:
4/7/25

SHEET:
1 OF 1

P:\CPRK\MARC\00\10\00\CADD\Exhibit\SWA\Proposed Rational Method Map.dwg 4-07-25-11:48 PM

Appendix B: Hydrology Calculations

Time of Concentration

$T_c = T_i + T_{t1} + ... + T_{tn}$ *from Section 3.1.4 SDCHM*

Existing - 100-Yr 6-Hour

T_{i1} =	6.9	*from Table 3-2*
T_{t2} =	2.2	*if natural, use Figure 3-4*
T_{t3} =	1.4	
T_c =	**9.1**	

User Input
Total Q (cfs)

0.87

	Type (Urban/Natural)	Flowpath Length (ft)	US Elev.	DS Elev.	Slope	100-Year P6	100-Year P24	P6/P24	I	V[1]
Subarea 1.:	Natural	389	666	613	0.14	3.4	5.9	58%	7.28	-
Subarea 2:	Urban	259	613	610	0.01	3.4	5.9	58%	6.11	2
Subarea 3:	Urban	245	610	606.5	0.01	3.4	5.9	58%	5.56	2.9

Proposed - 100-Yr 6-Hour

T_i =	6.9	*from Table 3-2*
T_{t1} =	1.6	*Sheet Flow through site*
T_c =	**8.5**	

	Type (Urban/Natural)	Flowpath Length (ft)	US Elev.	DS Elev.	Slope	100-Year P6	100-Year P24	P6/P24	I	V[1]
Subarea 1:	Natural	517	666	608.5	0.11	3.4	5.9	58%	7.28	-
Subarea 2:	Urban	411	608.5	606.5	0.00	3.4	5.9	58%	6.35	4.2

[1] Bentley's FlowMaster used to determine velocity

Rational Method

Q = C I A *from Section 3.1.1 SDCHM*

Existing - 100-Yr 6-Hour

	Type (Urban/Natural)	Flowpath Length (ft)	US Elev.	DS Elev.	Slope	Area (ac)	C[1]	Intensity	Total Q (cfs)
Subarea 1:	Natural	389	666	613	0.14	0.90	0.30	7.28	1.98
Subarea 2:	Urban	259	613	610	0.01	4.30	0.72	6.11	20.72
Subarea 3:	Urban	245	610	606.5	0.01	4.70	0.87	5.56	41.82
[1] See Table 3.1 from SDCHM					**Total Area**	**9.90**		**Q =**	**41.82**

Proposed - 100-Yr 6-Hour

	Type (Urban/Natural)	Flowpath Length (ft)	US Elev.	DS Elev.	Slope	Area (ac)	C[1]	Intensity	Q (cfs)
Subarea 1:	Natural	517	666	608.5	0.11	1.60	0.30	7.28	3.52
Subarea 2:	Urban	411	608.5	606.5	0.00	8.30	0.77	6.35	43.97
[1] See Table 3.1 from SDCHM					**Total Area**	**9.90**		**Q =**	**43.97**

User Input
Calculated
From Tc Sheet

SCS HYDROGRAPH ESTIMATOR

EVENT DURATION=	6
EVENT Q_{PEAK}=	43.97

SCS UNIT HYDROGRAPH		ESTIMATED SCS HYDROGRAPH	
T_{SCS}	Q_{SCS}	T	Q
0	0	0	0
2	3	0.12	1.319179
6	19	0.36	8.354801
8	31	0.48	13.63152
12	66	0.72	29.02194
14	82	0.84	36.05756
16	93	0.96	40.89455
18	99	1.08	43.53291
20	100	1.2	43.97264
22	99	1.32	43.53291
24	93	1.44	40.89455
26	86	1.56	37.81647
30	68	1.8	29.90139
34	46	2.04	20.22741
38	33	2.28	14.51097
44	21	2.64	9.234254
52	11	3.12	4.83699
64	4	3.84	1.758906
100	0	6	0

Total Q
(cfs)

0.87

DEFINITIONS

EVENT DURATION=PERIOD OF HYDROGRAPH IN UNITS OF TIME. TIME UNITS SHOULD BE THE SAME AS THE

EVENT Q_{PEAK}=MAXIMUM DISCHARGE OBSERVED OR ESTIMATED IN UNITS OF DISCHARGE (VOLUME/TIME)

SCS UNIT HYDROGRAPH=DIMENSIONLESS UNIT HYDROGRAPH BASED ON SCS (1972)

ESTIMATED SCS HYDROGRAPH=A HYDROGRAPH WITH USER SUPPLIED EVENT DURATION AND EVENT PEAK DISCHARGE WHERE THE HYDROGRAPH SHAPE IS BASED ON SCS (1972)

GENERAL

THIS SPREADSHEET IS DESIGNED TO CALCULATE AN ESTIMATED SCS HYDROGRAPH FOR A USER SUPPLIED EVENT PEAK DISCHARGE AND EVENT DURATION. UNITS OF TIME AND DISCHARGE (VOLUME/TIME) ARE USER SUPPLIED. THIS SPREADSHEET MAY BE EMPLOYED TO DETERMINE A THE SHAPE OF A HYDROGRAPH WHERE PEAK DISCHARGES ARE KNOWN OR ESTIMATED, BUT RUNOFF VOLUME OR DISCHARGE AS A FUNCTION OF TIME IS UNKNOWN. THE USER IS STRONGLY CAUTIONED TO ENSURE THAT ASSUMPTIONS FOR SCS UNIT HYDROGRAPHS ARE MET BY THE PARTICULAR WATERSHED BEING EVALUATED.

REFERENCE

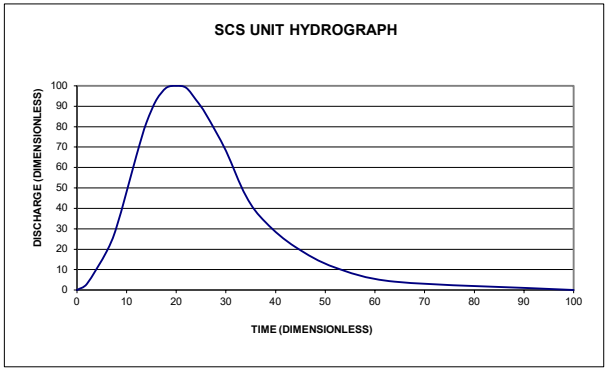
SOIL CONSERVATION SERVICE (1972) NATIONAL ENGINEERING HANDBOOK. SEE SECTION 4: HYDROLOGY

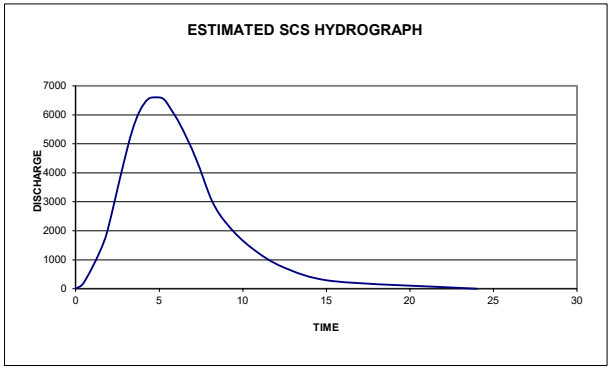
COLOR CODES

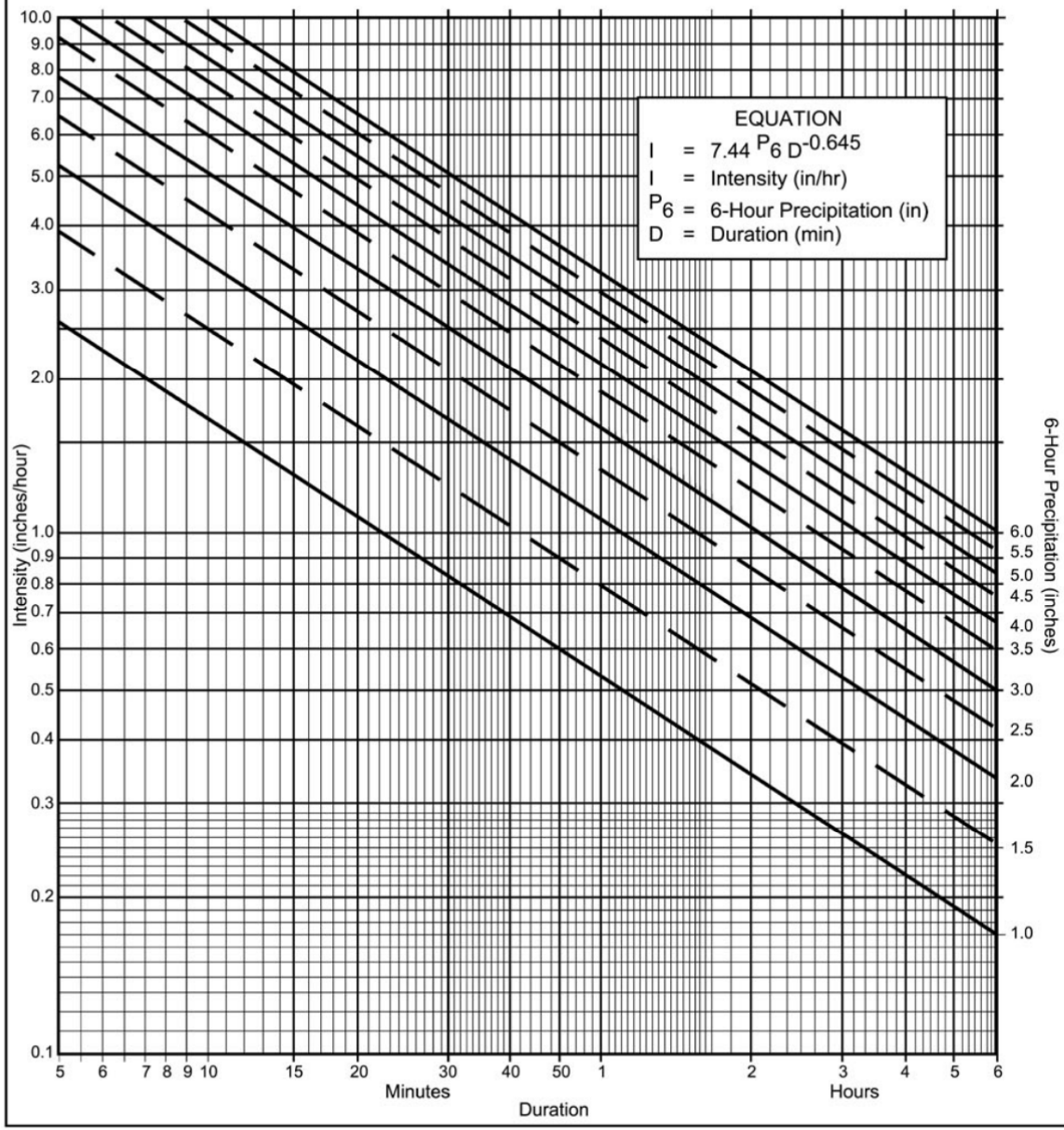
OUTPUT

USER SUPPLIED DATA

DESIGNED BY DAVID A JAFFE, PHD, PE, D.WRE
DAVID EVANS AND ASSOCIATES INC
JULY, 2007
FEBRUARY, 2009, REVISED
MARCH, 2014, REVISED







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.

100

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 3.4 in., P_{24} = 5.9, $\frac{P_6}{P_{24}}$ = 58 %(2)

(c) Adjusted P_6(2) = 3.4 in.

(d) t_x = _____ min. See Excel calculations for Tc and Intenstiy

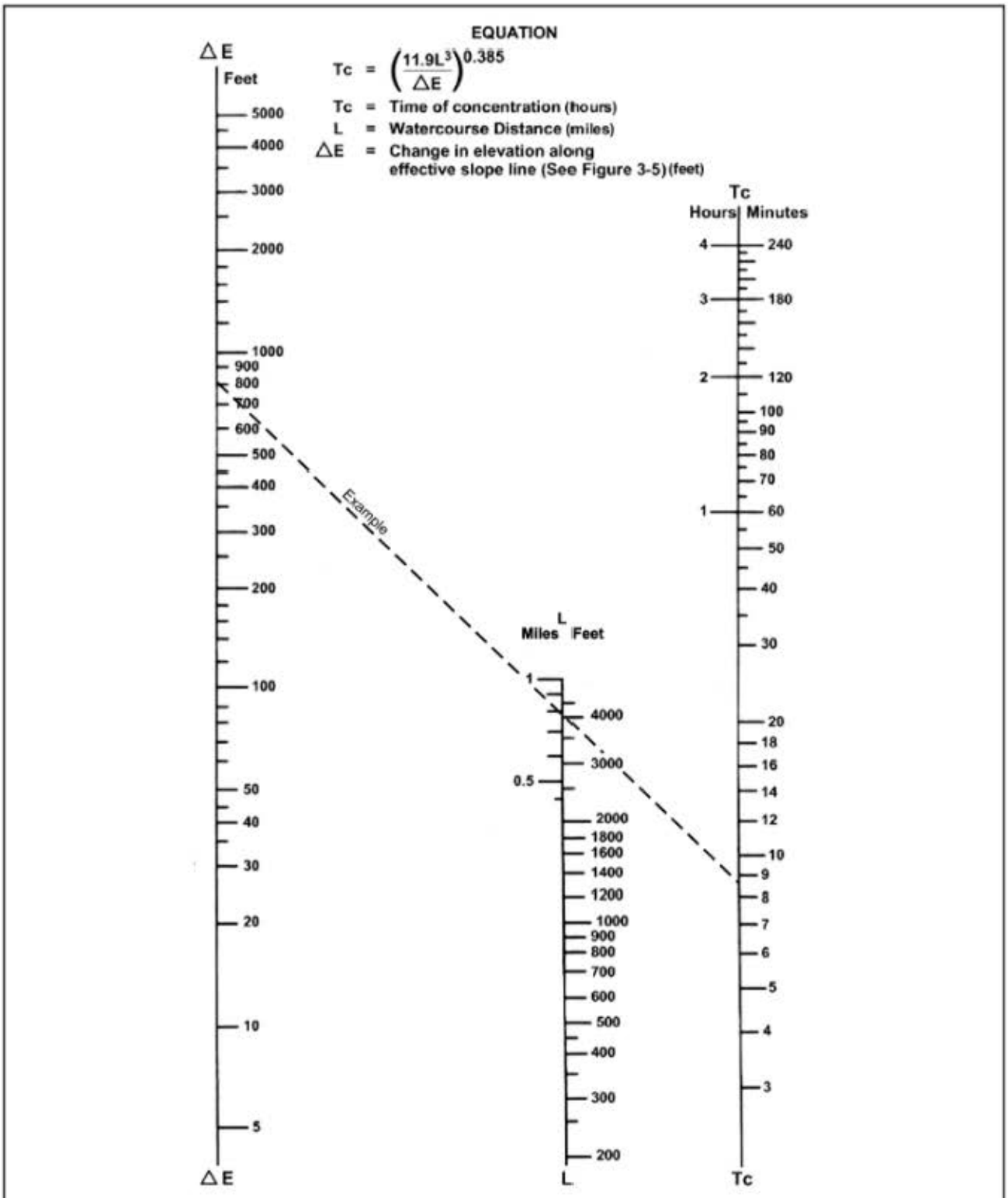
(e) I = _____ in./hr.

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

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE 3-1



SOURCE: California Division of Highways (1941) and Kirpich (1940)

FIGURE

Nomograph for Determination of
Time of Concentration (Tc) or Travel Time (Tt) for Natural Watersheds

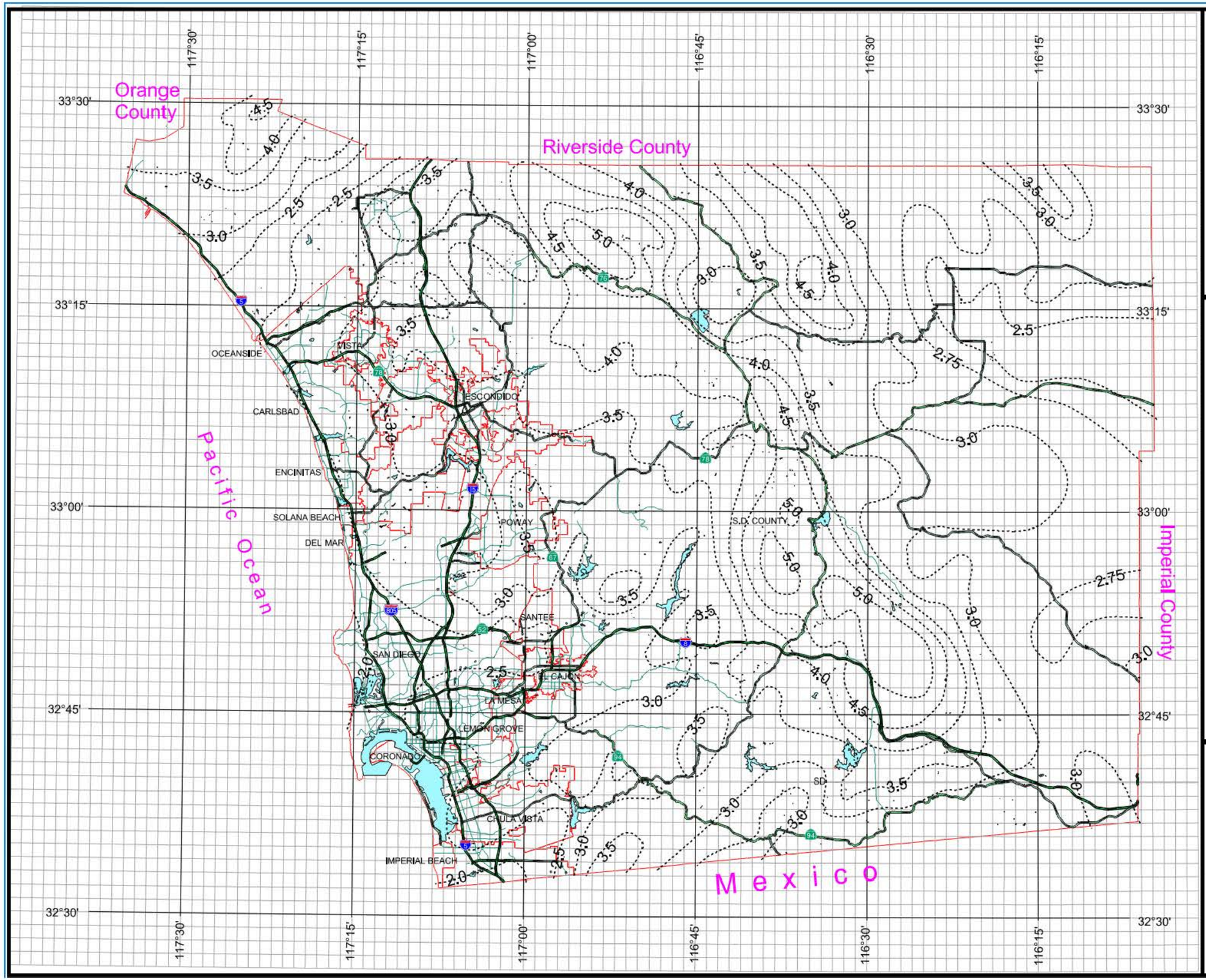
3-4

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)



DPW GIS
Department of Public Works
Geographic Information Services

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We Have San Diego Covered!

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N W E S

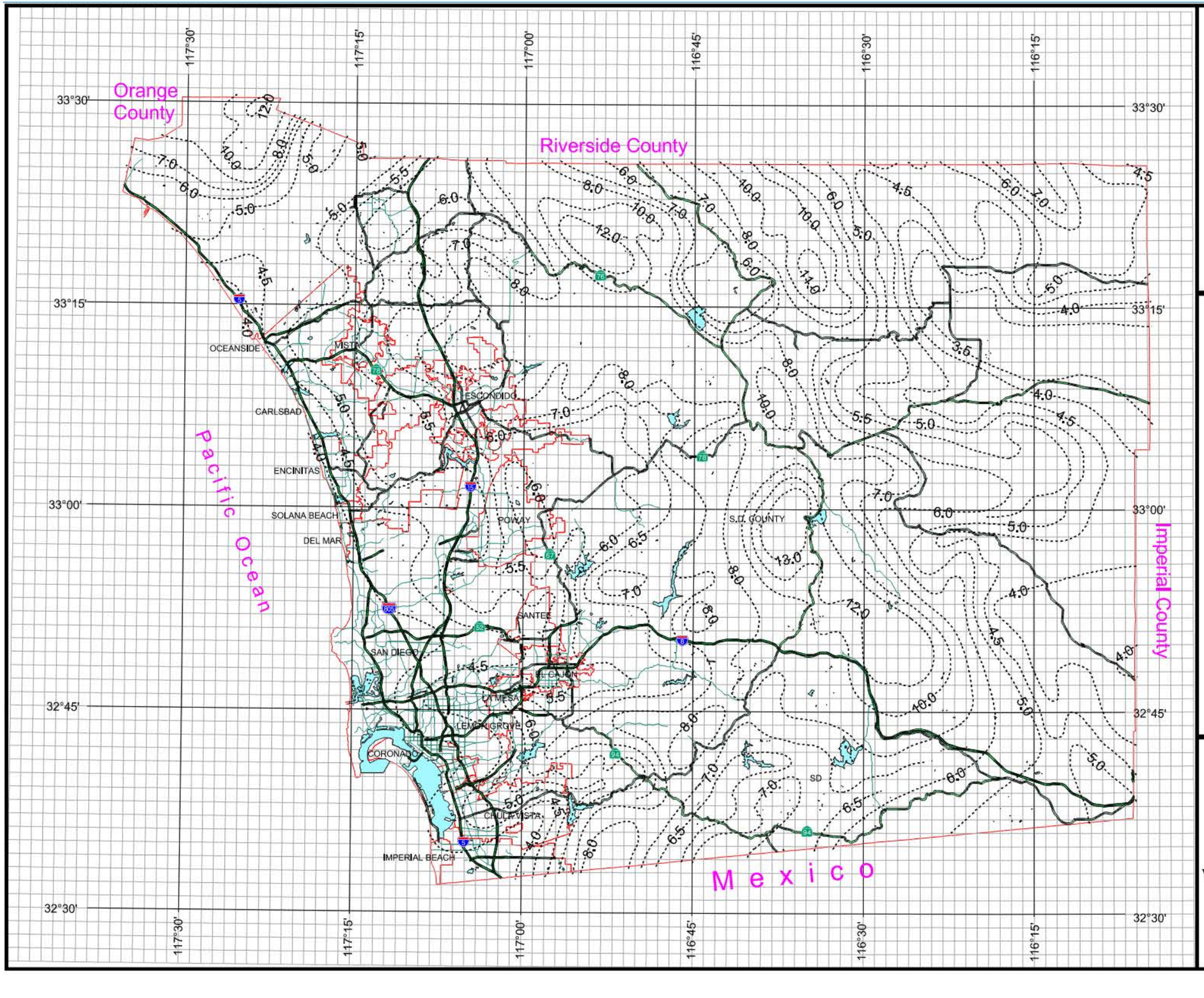
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County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)



DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N
W E
S

3 0 3 Miles

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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

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

Worksheet for Circular Pipe - 1

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Diameter	36.0 in
Discharge	46.60 cfs

Results	
Normal Depth	22.2 in
Flow Area	4.6 ft²
Wetted Perimeter	5.4 ft
Hydraulic Radius	10.1 in
Top Width	2.92 ft
Critical Depth	26.7 in
Percent Full	61.6 %
Critical Slope	0.006 ft/ft
Velocity	10.20 ft/s
Velocity Head	1.62 ft
Specific Energy	3.47 ft
Froude Number	1.438
Maximum Discharge	71.74 cfs
Discharge Full	66.69 cfs
Slope Full	0.005 ft/ft
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	61.6 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	22.2 in
Critical Depth	26.7 in
Channel Slope	0.010 ft/ft
Critical Slope	0.006 ft/ft

Appendix C: Riser Calculations

Project Summary	
Title	Basin Routing Analysis - Basin Design
Engineer	Michael Becerra
Company	David Evans and Associates Inc.
Date	3/25/2024

Notes

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Subsection: User Notifications

User Notifications?	No user notifications generated.

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (min)	Peak Flow (ft^3/s)
Area A2	100 Year Storm Event	0	5.933	72.000	43.97

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (min)	Peak Flow (ft^3/s)
O-3	100 Year Storm Event	0	5.894	84.000	41.55

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (min)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Basin A2 (IN)	100 Year Storm Event	0	5.933	72.000	43.97	(N/A)	(N/A)
Basin A2 (OUT)	100 Year Storm Event	0	5.894	84.000	41.55	5.54	1.328

Subsection: Read Hydrograph
Label: Area A2

Scenario: 100 Year Storm Event

Peak Discharge	43.97 ft³/s
Time to Peak	72.000 min
Hydrograph Volume	5.933 ac-ft

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 7.200 min
Time on left represents time for first value in each row.

Time (min)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.000	0.00	1.32	4.84	8.35	13.63
36.000	21.33	29.02	36.06	40.89	43.53
72.000	43.97	43.53	40.89	37.82	33.86
108.000	29.90	25.06	20.23	17.37	14.51
144.000	12.75	10.99	9.23	8.13	7.04
180.000	5.94	4.84	4.32	3.81	3.30
216.000	2.78	2.27	1.76	1.66	1.56
252.000	1.47	1.37	1.27	1.17	1.07
288.000	0.98	0.88	0.78	0.68	0.59
324.000	0.49	0.39	0.29	0.20	0.10
360.000	0.00	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Time vs. Elevation
Label: Basin A2 (OUT)

Scenario: 100 Year Storm Event

Time vs. Elevation (ft)

Output Time increment = 3.000 min
Time on left represents time for first value in each row.

Time (min)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	0.00	0.02	0.07	0.18	0.36
15.000	0.65	1.16	3.14	3.47	3.53
30.000	3.57	3.61	3.66	3.71	3.77
45.000	3.83	3.89	3.96	4.10	4.36
60.000	4.62	4.88	5.10	5.27	5.38
75.000	5.45	5.50	5.53	5.54	5.53
90.000	5.52	5.49	5.46	5.42	5.38
105.000	5.34	5.29	5.24	5.19	5.13
120.000	5.07	5.02	4.96	4.90	4.84
135.000	4.77	4.69	4.62	4.55	4.48
150.000	4.41	4.33	4.25	4.17	4.08
165.000	4.00	3.97	3.95	3.93	3.91
180.000	3.88	3.86	3.84	3.83	3.81
195.000	3.79	3.78	3.76	3.75	3.73
210.000	3.72	3.71	3.70	3.68	3.67
225.000	3.66	3.65	3.64	3.63	3.63
240.000	3.62	3.61	3.60	3.60	3.59
255.000	3.59	3.58	3.58	3.57	3.57
270.000	3.57	3.56	3.56	3.56	3.55
285.000	3.55	3.55	3.55	3.54	3.54
300.000	3.54	3.54	3.53	3.53	3.53
315.000	3.53	3.53	3.53	3.52	3.52
330.000	3.52	3.52	3.52	3.52	3.51
345.000	3.51	3.51	3.51	3.51	3.51
360.000	3.51	3.50	3.50	3.50	3.50
375.000	3.50	3.50	3.49	3.48	3.47
390.000	3.46	3.45	3.44	3.43	3.42
405.000	3.41	3.41	3.40	3.39	3.38
420.000	3.37	3.36	3.35	3.34	3.33
435.000	3.32	3.31	3.31	3.30	3.29
450.000	3.28	3.27	3.26	3.25	3.24
465.000	3.23	3.23	3.22	3.21	3.20
480.000	3.19	3.18	3.17	3.17	3.16
495.000	3.15	3.14	3.13	3.12	3.11
510.000	3.10	3.10	3.09	3.08	3.07
525.000	3.06	3.05	3.05	3.04	3.03
540.000	3.02	3.01	3.00	2.93	2.82
555.000	2.72	2.62	2.53	2.44	2.35
570.000	2.27	2.20	2.12	2.05	1.99
585.000	1.92	1.86	1.81	1.75	1.70
600.000	1.65	1.61	1.56	1.52	1.48
615.000	1.44	1.40	1.37	1.34	1.31
630.000	1.28	1.25	1.22	1.19	1.17

Time vs. Elevation (ft)

Output Time increment = 3.000 min
Time on left represents time for first value in each row.

Time (min)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
645.000	1.15	1.12	1.10	1.08	1.06
660.000	1.05	1.03	1.01	1.00	1.00
675.000	1.00	0.99	0.99	0.99	0.99
690.000	0.99	0.98	0.98	0.98	0.98
705.000	0.98	0.97	0.97	0.97	0.97
720.000	0.97	0.97	0.96	0.96	0.96
735.000	0.96	0.96	0.95	0.95	0.95
750.000	0.95	0.95	0.95	0.94	0.94
765.000	0.94	0.94	0.94	0.93	0.93
780.000	0.93	0.93	0.93	0.93	0.92
795.000	0.92	0.92	0.92	0.92	0.91
810.000	0.91	0.91	0.91	0.91	0.91
825.000	0.90	0.90	0.90	0.90	0.90
840.000	0.90	0.89	0.89	0.89	0.89
855.000	0.89	0.89	0.88	0.88	0.88
870.000	0.88	0.88	0.88	0.87	0.87
885.000	0.87	0.87	0.87	0.86	0.86
900.000	0.86	0.86	0.86	0.86	0.86
915.000	0.85	0.85	0.85	0.85	0.85
930.000	0.85	0.84	0.84	0.84	0.84
945.000	0.84	0.84	0.83	0.83	0.83
960.000	0.83	0.83	0.83	0.82	0.82
975.000	0.82	0.82	0.82	0.82	0.81
990.000	0.81	0.81	0.81	0.81	0.81
1,005.000	0.81	0.80	0.80	0.80	0.80
1,020.000	0.80	0.80	0.79	0.79	0.79
1,035.000	0.79	0.79	0.79	0.79	0.78
1,050.000	0.78	0.78	0.78	0.78	0.78
1,065.000	0.77	0.77	0.77	0.77	0.77
1,080.000	0.77	0.77	0.76	0.76	0.76
1,095.000	0.76	0.76	0.76	0.76	0.75
1,110.000	0.75	0.75	0.75	0.75	0.75
1,125.000	0.75	0.74	0.74	0.74	0.74
1,140.000	0.74	0.74	0.74	0.73	0.73
1,155.000	0.73	0.73	0.73	0.73	0.73
1,170.000	0.72	0.72	0.72	0.72	0.72
1,185.000	0.72	0.72	0.71	0.71	0.71
1,200.000	0.71	0.71	0.71	0.71	0.71
1,215.000	0.70	0.70	0.70	0.70	0.70
1,230.000	0.70	0.70	0.69	0.69	0.69
1,245.000	0.69	0.69	0.69	0.69	0.68
1,260.000	0.68	0.68	0.68	0.68	0.68
1,275.000	0.68	0.68	0.67	0.67	0.67

Time vs. Elevation (ft)

Output Time increment = 3.000 min
Time on left represents time for first value in each row.

Time (min)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
1,290.000	0.67	0.67	0.67	0.67	0.67
1,305.000	0.66	0.66	0.66	0.66	0.66
1,320.000	0.66	0.66	0.66	0.65	0.65
1,335.000	0.65	0.65	0.65	0.65	0.65
1,350.000	0.65	0.64	0.64	0.64	0.64
1,365.000	0.64	0.64	0.64	0.64	0.63
1,380.000	0.63	0.63	0.63	0.63	0.63
1,395.000	0.63	0.63	0.62	0.62	0.62
1,410.000	0.62	0.62	0.62	0.62	0.62
1,425.000	0.61	0.61	0.61	0.61	0.61
1,440.000	0.61	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Time vs. Volume
Label: Basin A2

Scenario: 100 Year Storm Event

Time vs. Volume (ac-ft)

Output Time increment = 3.000 min
Time on left represents time for first value in each row.

Time (min)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
0.000	0.000	0.001	0.005	0.011	0.023
15.000	0.042	0.066	0.081	0.130	0.141
30.000	0.147	0.154	0.162	0.260	0.398
45.000	0.546	0.701	0.781	0.831	0.923
60.000	1.020	1.108	1.181	1.236	1.274
75.000	1.299	1.315	1.325	1.328	1.327
90.000	1.322	1.313	1.302	1.289	1.275
105.000	1.260	1.244	1.228	1.210	1.192
120.000	1.173	1.154	1.135	1.115	1.093
135.000	1.070	1.045	1.020	0.993	0.968
150.000	0.942	0.914	0.885	0.854	0.823
165.000	0.794	0.786	0.777	0.770	0.733
180.000	0.682	0.633	0.586	0.540	0.497
195.000	0.456	0.418	0.381	0.347	0.314
210.000	0.283	0.253	0.225	0.198	0.172
225.000	0.163	0.161	0.160	0.158	0.157
240.000	0.155	0.154	0.153	0.152	0.151
255.000	0.150	0.149	0.149	0.148	0.147
270.000	0.147	0.146	0.146	0.145	0.145
285.000	0.144	0.144	0.143	0.143	0.143
300.000	0.142	0.142	0.142	0.141	0.141
315.000	0.141	0.140	0.140	0.140	0.139
330.000	0.139	0.139	0.139	0.138	0.138
345.000	0.138	0.138	0.137	0.137	0.137
360.000	0.137	0.137	0.136	0.136	0.136
375.000	0.136	0.135	0.134	0.132	0.131
390.000	0.129	0.128	0.126	0.125	0.123
405.000	0.122	0.120	0.119	0.117	0.116
420.000	0.114	0.113	0.111	0.110	0.108
435.000	0.107	0.105	0.104	0.102	0.101
450.000	0.099	0.098	0.097	0.095	0.094
465.000	0.092	0.091	0.089	0.088	0.087
480.000	0.085	0.084	0.082	0.082	0.082
495.000	0.082	0.081	0.081	0.081	0.081
510.000	0.081	0.081	0.081	0.081	0.081
525.000	0.081	0.081	0.081	0.081	0.081
540.000	0.081	0.080	0.080	0.080	0.079
555.000	0.078	0.077	0.077	0.076	0.075
570.000	0.075	0.074	0.073	0.073	0.072
585.000	0.072	0.071	0.071	0.070	0.070
600.000	0.070	0.069	0.069	0.068	0.068
615.000	0.068	0.068	0.067	0.067	0.067
630.000	0.067	0.066	0.066	0.066	0.066

Subsection: Time vs. Volume
Label: Basin A2

Scenario: 100 Year Storm Event

Time vs. Volume (ac-ft)

Output Time increment = 3.000 min
Time on left represents time for first value in each row.

Time (min)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
645.000	0.065	0.065	0.065	0.065	0.065
660.000	0.065	0.065	0.064	0.064	0.064
675.000	0.064	0.064	0.064	0.064	0.064
690.000	0.063	0.063	0.063	0.063	0.063
705.000	0.063	0.063	0.063	0.062	0.062
720.000	0.062	0.062	0.062	0.062	0.062
735.000	0.062	0.061	0.061	0.061	0.061
750.000	0.061	0.061	0.061	0.061	0.061
765.000	0.060	0.060	0.060	0.060	0.060
780.000	0.060	0.060	0.060	0.060	0.059
795.000	0.059	0.059	0.059	0.059	0.059
810.000	0.059	0.059	0.058	0.058	0.058
825.000	0.058	0.058	0.058	0.058	0.058
840.000	0.058	0.057	0.057	0.057	0.057
855.000	0.057	0.057	0.057	0.057	0.057
870.000	0.056	0.056	0.056	0.056	0.056
885.000	0.056	0.056	0.056	0.056	0.056
900.000	0.055	0.055	0.055	0.055	0.055
915.000	0.055	0.055	0.055	0.055	0.054
930.000	0.054	0.054	0.054	0.054	0.054
945.000	0.054	0.054	0.054	0.054	0.053
960.000	0.053	0.053	0.053	0.053	0.053
975.000	0.053	0.053	0.053	0.052	0.052
990.000	0.052	0.052	0.052	0.052	0.052
1,005.000	0.052	0.052	0.052	0.051	0.051
1,020.000	0.051	0.051	0.051	0.051	0.051
1,035.000	0.051	0.051	0.051	0.051	0.050
1,050.000	0.050	0.050	0.050	0.050	0.050
1,065.000	0.050	0.050	0.050	0.050	0.049
1,080.000	0.049	0.049	0.049	0.049	0.049
1,095.000	0.049	0.049	0.049	0.049	0.049
1,110.000	0.048	0.048	0.048	0.048	0.048
1,125.000	0.048	0.048	0.048	0.048	0.048
1,140.000	0.047	0.047	0.047	0.047	0.047
1,155.000	0.047	0.047	0.047	0.047	0.047
1,170.000	0.047	0.046	0.046	0.046	0.046
1,185.000	0.046	0.046	0.046	0.046	0.046
1,200.000	0.046	0.046	0.046	0.045	0.045
1,215.000	0.045	0.045	0.045	0.045	0.045
1,230.000	0.045	0.045	0.045	0.045	0.044
1,245.000	0.044	0.044	0.044	0.044	0.044
1,260.000	0.044	0.044	0.044	0.044	0.044
1,275.000	0.044	0.043	0.043	0.043	0.043

Time vs. Volume (ac-ft)

Output Time increment = 3.000 min
Time on left represents time for first value in each row.

Time (min)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
1,290.000	0.043	0.043	0.043	0.043	0.043
1,305.000	0.043	0.043	0.043	0.042	0.042
1,320.000	0.042	0.042	0.042	0.042	0.042
1,335.000	0.042	0.042	0.042	0.042	0.042
1,350.000	0.041	0.041	0.041	0.041	0.041
1,365.000	0.041	0.041	0.041	0.041	0.041
1,380.000	0.041	0.041	0.041	0.040	0.040
1,395.000	0.040	0.040	0.040	0.040	0.040
1,410.000	0.040	0.040	0.040	0.040	0.040
1,425.000	0.040	0.039	0.039	0.039	0.039
1,440.000	0.039	(N/A)	(N/A)	(N/A)	(N/A)

Elevation-Volume

Pond Elevation (ft)	Pond Volume (ac-ft)
0.00	0.000
1.00	0.064
3.17	0.082
3.42	0.122
3.67	0.164
3.92	0.767
4.17	0.855
4.42	0.945
4.67	1.037
4.92	1.122
5.17	1.204
5.42	1.288
5.67	1.374
5.92	1.462
6.17	1.553

Volume Complete Filled With Material (Adjust Volumes for Voids)

Void Space = 100.0 %

Elevation (Headwater) (ft)	Volume (Total) (ac-ft)	Volume (Adjusted) (ac-ft)
0.00	0.000	0.000
1.00	0.064	0.064
3.17	0.082	0.082
3.42	0.122	0.122
3.67	0.164	0.164
3.92	0.767	0.767
4.17	0.855	0.855
4.42	0.945	0.945
4.67	1.037	1.037
4.92	1.122	1.122
5.17	1.204	1.204
5.42	1.288	1.288
5.67	1.374	1.374
5.92	1.462	1.462
6.17	1.553	1.553

Requested Pond Water Surface Elevations	
Minimum (Headwater)	0.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	6.17 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
User Defined Table	User Defined Rating Table - 1	Forward	TW	0.00	6.17
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: User Defined Rating Table - 1
Structure Type: User Defined Table

Elevation (ft)	Flow (ft³/s)
0.00	0.00
1.00	0.03
3.17	0.24
3.42	0.25
3.67	0.25
3.92	16.00
4.17	16.50
4.42	17.80
4.67	18.50
4.92	22.20
5.17	28.00
5.42	35.00
5.67	52.76
5.92	49.90
6.17	58.00

Structure ID: TW
Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Subsection: Elevation-Volume-Flow Table (Pond) Scenario: 100 Year Storm Event
Label: Basin A2

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	0.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	3.000 min

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (ft²)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
0.00	0.00	0.000	0.000	0.00	0.00	0.00
0.50	0.02	0.032	0.000	0.00	0.02	15.58
1.00	0.03	0.064	0.000	0.00	0.03	31.15
1.50	0.08	0.068	0.000	0.00	0.08	33.14
2.00	0.13	0.072	0.000	0.00	0.13	35.14
2.50	0.18	0.076	0.000	0.00	0.18	37.13
3.00	0.22	0.080	0.000	0.00	0.22	39.12
3.50	0.25	0.136	0.000	0.00	0.25	65.95
4.00	16.16	0.795	0.000	0.00	16.16	401.04
4.50	18.02	0.975	0.000	0.00	18.02	489.81
5.00	24.06	1.148	0.000	0.00	24.06	579.78
5.50	40.68	1.316	0.000	0.00	40.68	677.44
6.00	52.49	1.491	0.000	0.00	52.49	774.27
6.17	58.00	1.553	0.000	0.00	58.00	809.50

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	0.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	3.000 min

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	43.97 ft³/s	Time to Peak (Flow, In)	72.000 min
Flow (Peak Outlet)	41.55 ft³/s	Time to Peak (Flow, Outlet)	84.000 min

Elevation (Water Surface, Peak)	5.54 ft
Volume (Peak)	1.328 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	5.933 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	5.894 ac-ft
Volume (Retained)	0.039 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.0 %

Summary for Hydrograph Addition at 'Basin A2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Area A2

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (min)	Flow (Peak) (ft^3/s)
Flow (From)	Area A2	5.933	72.000	43.97
Flow (In)	Basin A2	5.933	72.000	43.97

Index

A

Area A2 (Read Hydrograph)...

B

Basin A2 (Elevation vs. Volume Curve)...

Basin A2 (Elevation-Volume-Flow Table (Pond))...

Basin A2 (IN) (Level Pool Pond Routing Summary)...

Basin A2 (IN) (Pond Inflow Summary)...

Basin A2 (OUT) (Time vs. Elevation)...

Basin A2 (Time vs. Volume)...

Basin A2 (Volume Void Adjustments)...

M

Master Network Summary...3

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User Entry Outlet (Outlet Input Data)...

User Notifications...2

Appendix D: Offsite Storm Drain

HYDROLOGY/ HYDRAULIC REPORT

FOR

Mulberry Storm Drain Improvement

City of San Marcos, San Diego, CA

Prepared for:

The City of San Marcos
1 Civic Center Drive
San Marcos, CA 92069

Prepared by:

DAVID EVANS AND ASSOCIATES INC.

4141 E. Inland Empire Blvd. , Suite 250 Ontario, CA 91764
Telephone: (909) 481-5750◆ FAX: (909) 481-5757 ◆ website: v

Jodi Mensen

Jodi Mensen, P.E. QSD

September 20, 2022



DAVID EVANS AND ASSOCIATES INC.

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2. Existing Site Description and Condition 1-2

3. Proposed Project Description 2

4. Hydrology 2

5. Hydraulics 2

6. Conclusion 2-3

Appendix

Appendix A: Vicinity Map

Appendix B: Hydrology Maps

Appendix C: Hydraulic Analysis (WSPG)

Appendix D: Storm Drain Improvement Plans

Appendix E: References

1. Off-Site Storm Drain

2. Conceptual Drainage Study of 10.83-acre Commercial Site

DAVID EVANS AND ASSOCIATES INC.

1. PURPOSE AND SCOPE

This study is for the Mulberry Drive Storm Drain Improvement Project located north of East Mission Road and west of Mulberry Drive, in the City of San Marcos, within San Diego County, California.

The purpose of this Hydrology/Hydraulic Report is to demonstrate that the proposed storm drain system is designed to provide adequate flood protection without adversely impacting existing off-site drainage systems and adjacent properties.

The scope of this analysis includes:

1. Review the hydrology maps and calculated 100-year flowrate from the City's Hydrology Study Map studied by Kimley-Horn and Associates, Identify the Q100 value reach to the project location.

2. Perform a hydraulic analysis of the proposed storm drain system for the 100-year storm event, and ensure the storm drain system has adequate capacity to convey runoff to the existing storm drain system.

3. Provide proposed storm drain improvement plan details.

4. Provide reference of Off-Site Storm Drain Information and Conceptual Drainage Study of Commercial Site

2. EXISTING SITE DESCRIPTION AND CONDITION

There is a 12' x 39' concrete storm drain drop inlet located north of East Mission Road connected to 4-8'x4' RCB storm drain boxes which convey runoff under East Mission Road south to a natural channel. An existing 36" CMP storm drain with inlets carries commercial site (Approximately 10.83 acres) runoff to the 12'x39' concrete inlet.

An energy dissipater with 3-66" CIPP storm drain system north of the project was built in 2014 as part of the Mulberry Residential Development. It releases 693.37 cfs runoff toward to the project. There are several off-site drainage swales and slope drains flow toward to the site. The total off-site area from northern region run-on to the subject site is 226.16 acres, and 100-year storm peak flow is 713.43 cfs. For Hydrology Map refer to Appendix B.

DAVID EVANS AND ASSOCIATES INC.

3. PROPOSED PROJECT DESCRIOTION

The drainage improvement is located on the east side of East Mission Road & west side of the Mulberry Drive. The proposed storm drain alignment will be parallel to the Mulberry Drive, following from north dot south direction. An existing commercial area is between the proposed storm drain and Mulberry Drive.

The proposed project is to construct an approximately 880 linear feet of a subsurface storm drain system proceeding from north to the south towards East Mission Road. The proposed improvement consists of a 12'x4' RCB storm drain main with manholes, drainage inlets and other local storm drains. The RCB downstream will connect to the existing 12' x 39' concrete drop inlet, the upstream will extend to a transition inlet structure connected to the energy dissipator.

As previously mentioned, there is an existing commercial site (10.83-acre area) on the west of the proposed RCB, the runoff of the area will not include in the RCB capacity analysis. The site is going to developed as an industrial site. The hydrology analysis of the site development is not a part of this study. A preliminary drainage concept study of the site in Appendix E is as reference only. The study shows that the 100-year storm runoff in existing condition. The three existing catch basin inlets in sub-area C will connect to the proposed RCB, the runoff of the inlets is prorated from the area.

4. HYDROLOGY

The Hydrology Map of this study is based on the City of San Marcos Department of Public Works, it was studied by Kimley-Horn and Associates, shown in the Appendix B. The project was designed for 100-year frequency flood protection. The total area and the 100-year storm flowrate for each location has been labeled. The upstream of the storm drain total 100-year flowrate is 713.43 cfs.

5. HYDRAULIC

Water Surface Pressure Gradient Package - "WSPG" program Version 14.01 was used for Hydraulic Grade Line calculations of the proposed storm drain system.

6. CONCLUSION

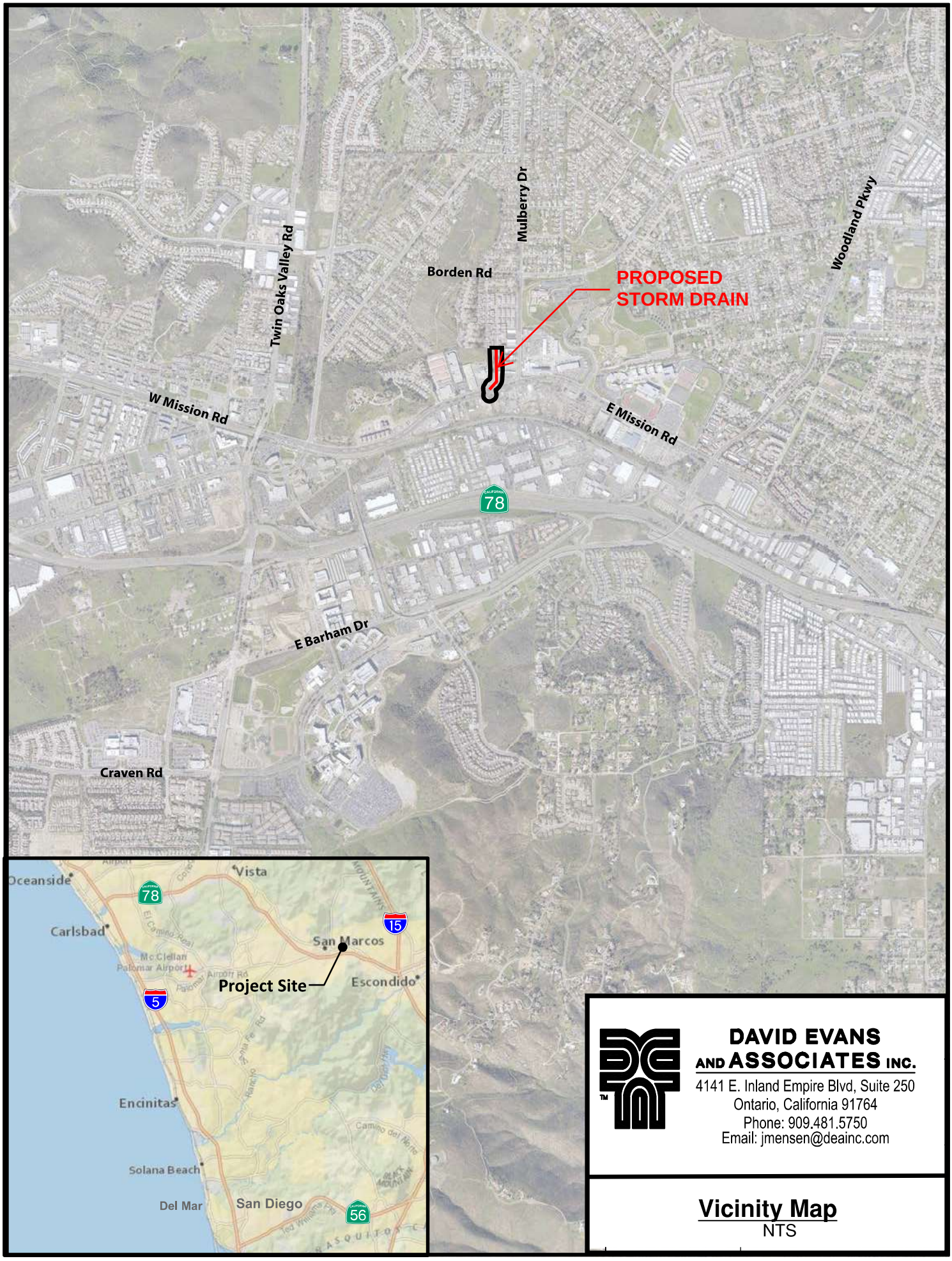
In conclusion, this report demonstrates that the proposed storm drain system is adequately designed for 100-year storm event.

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The proposed storm drain improvement plan will be designed under the City of San Marcos stormwater requirements and will be approved by the city.

Appendix A:

Vicinity Map



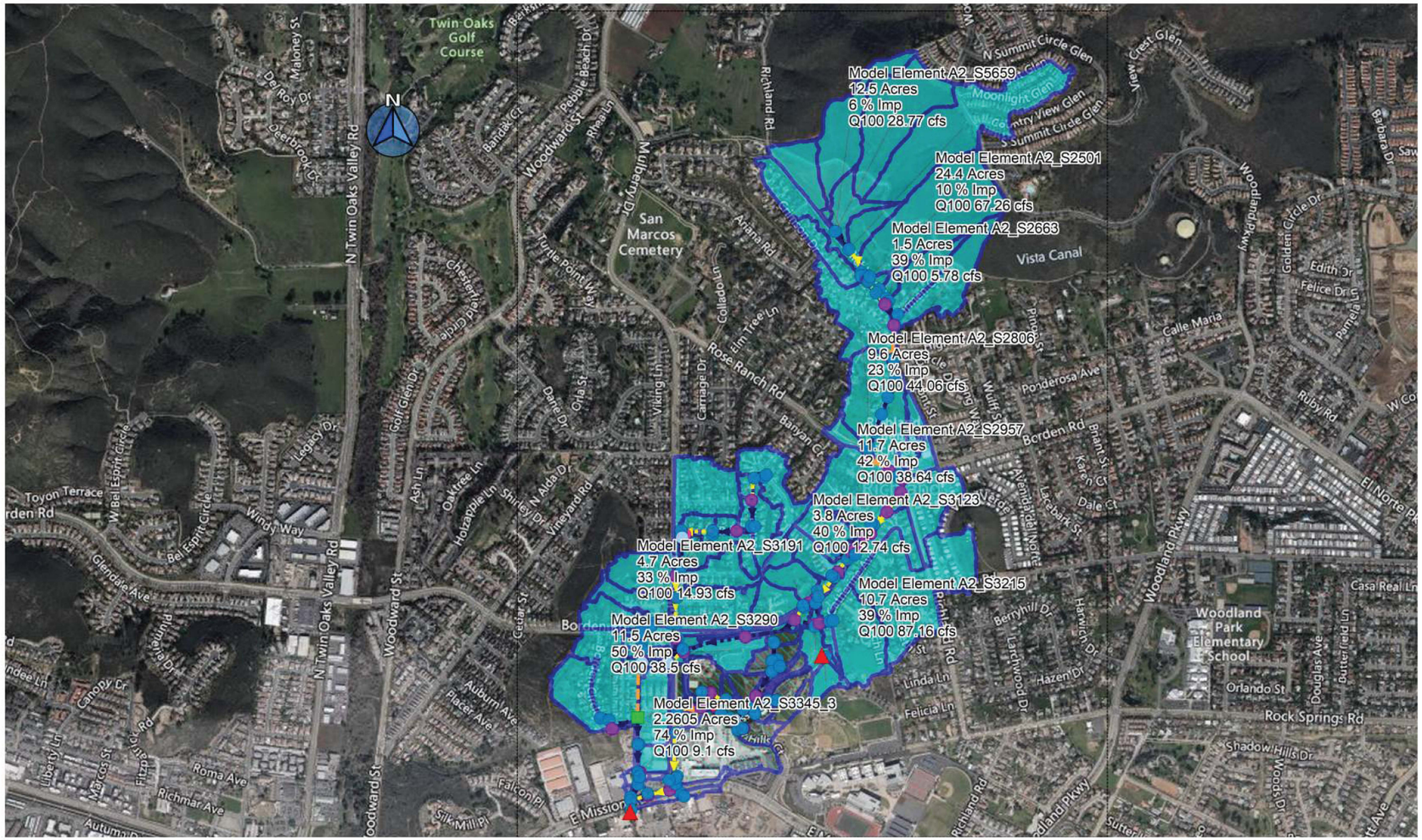
DAVID EVANS AND ASSOCIATES INC.
4141 E. Inland Empire Blvd, Suite 250
Ontario, California 91764
Phone: 909.481.5750
Email: jmensen@deainc.com

Vicinity Map

NTS

Appendix B:

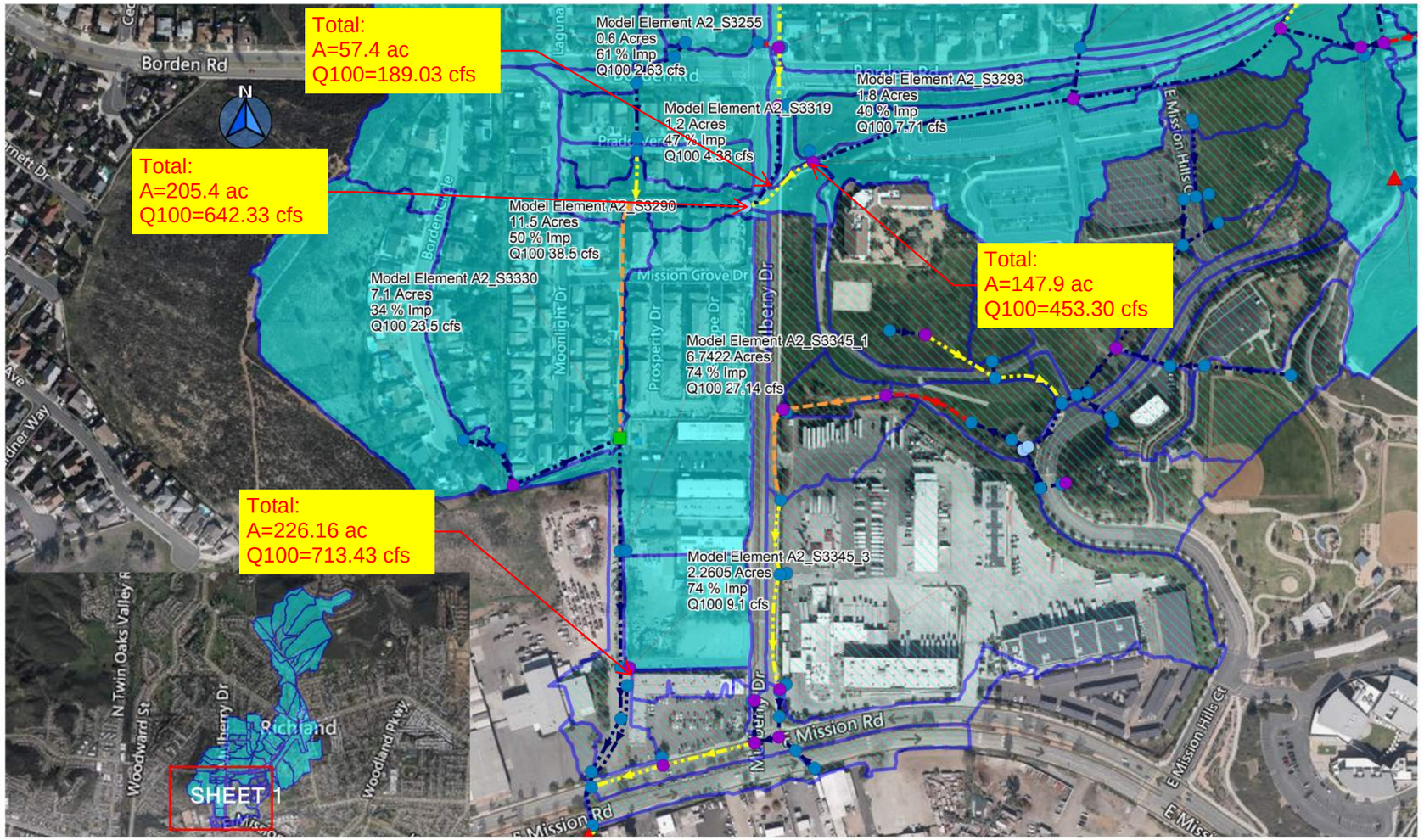
Hydrology Maps



Kimley»Horn

3000 ft

MULBERRY STREET BOX CULVERT
HYDROLOGIC WORK MAP OVERALL STUDY AREA
City of San Marcos, CA



Legend

- Outfalls

Junctions

- Other
- Cleanout
- Inlet
- Curb Outlet
- Detention Basin
- Outlet
- Seperator
- Cleanout 2
- Inlet 2
- Curb Outlet 2
- Detention Basin 2
- Outlet 2
- Seperator 2

Conduits

- Visible
- CAP FLOW >1 & <1.5
- CAP FLOW > 1.5 & <=2
- CAP FLOW >2
- CIP
- CIP CAP FLOW >1 & <1.5
- CIP CAP FLOW > 1.5 & <=2
- CIP CAP FLOW >2

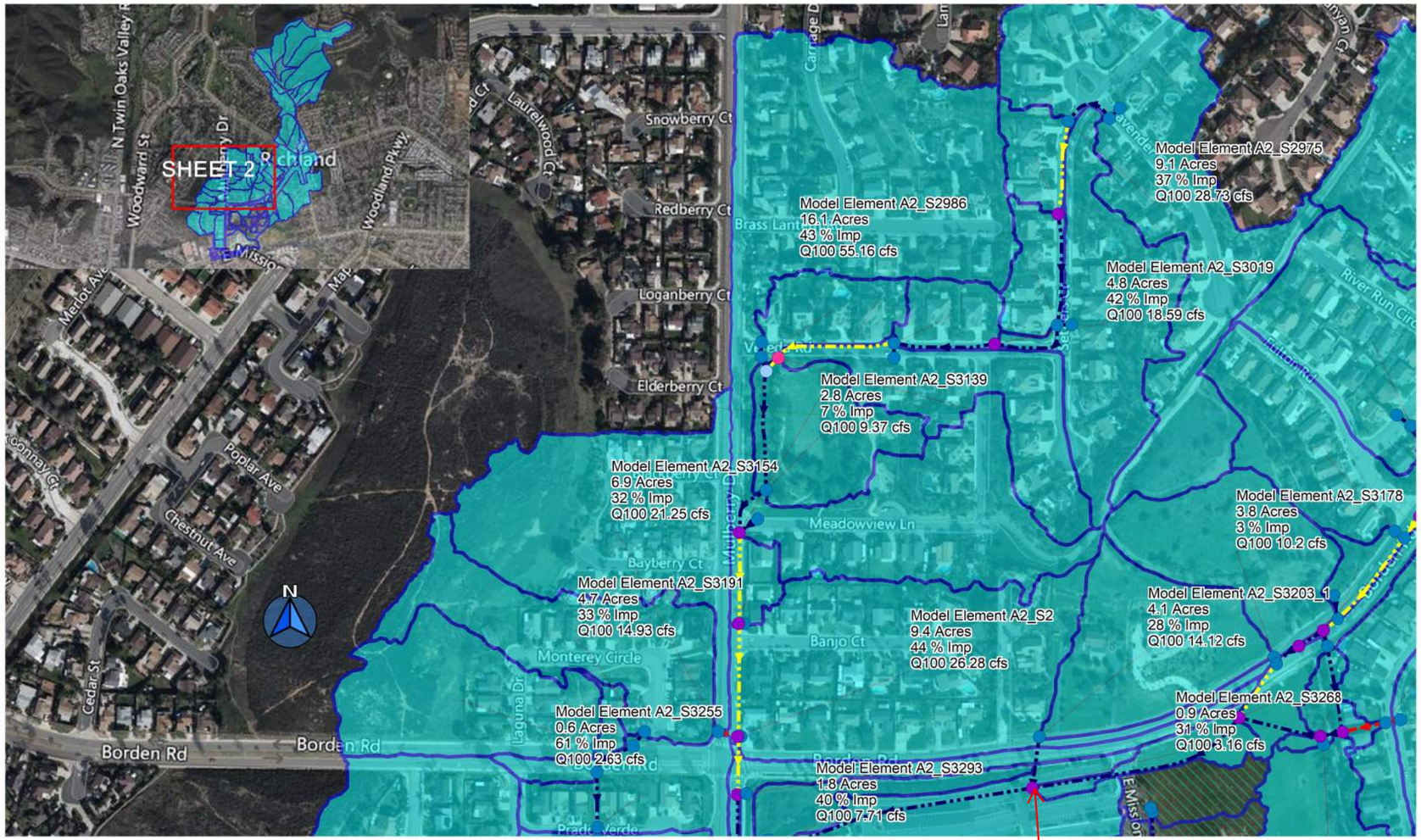
Subcatchments

- Other
- Other
- Drains_to_CIP_13

Kimley»Horn

150 m

MULBERRY STREET BOX CULVERT
HYDROLOGIC WORK MAP SHEET 1
City of San Marcos, CA



Legend

- Outfalls

Junctions

- Other
- Cleanout
- Inlet
- Curb Outlet
- Detention Basin
- Outlet
- Seperator
- Cleanout 2
- Inlet 2
- Curb Outlet 2
- Detention Basin 2
- Outlet 2
- Seperator 2

Conduits

- Visible
- CAP FLOW >1 & <1.5
- CAP FLOW > 1.5 & <=2
- CAP FLOW >2
- CIP
- CIP CAP FLOW >1 & <1.5
- CIP CAP FLOW > 1.5 & <=2
- CIP CAP FLOW >2

Subcatchments

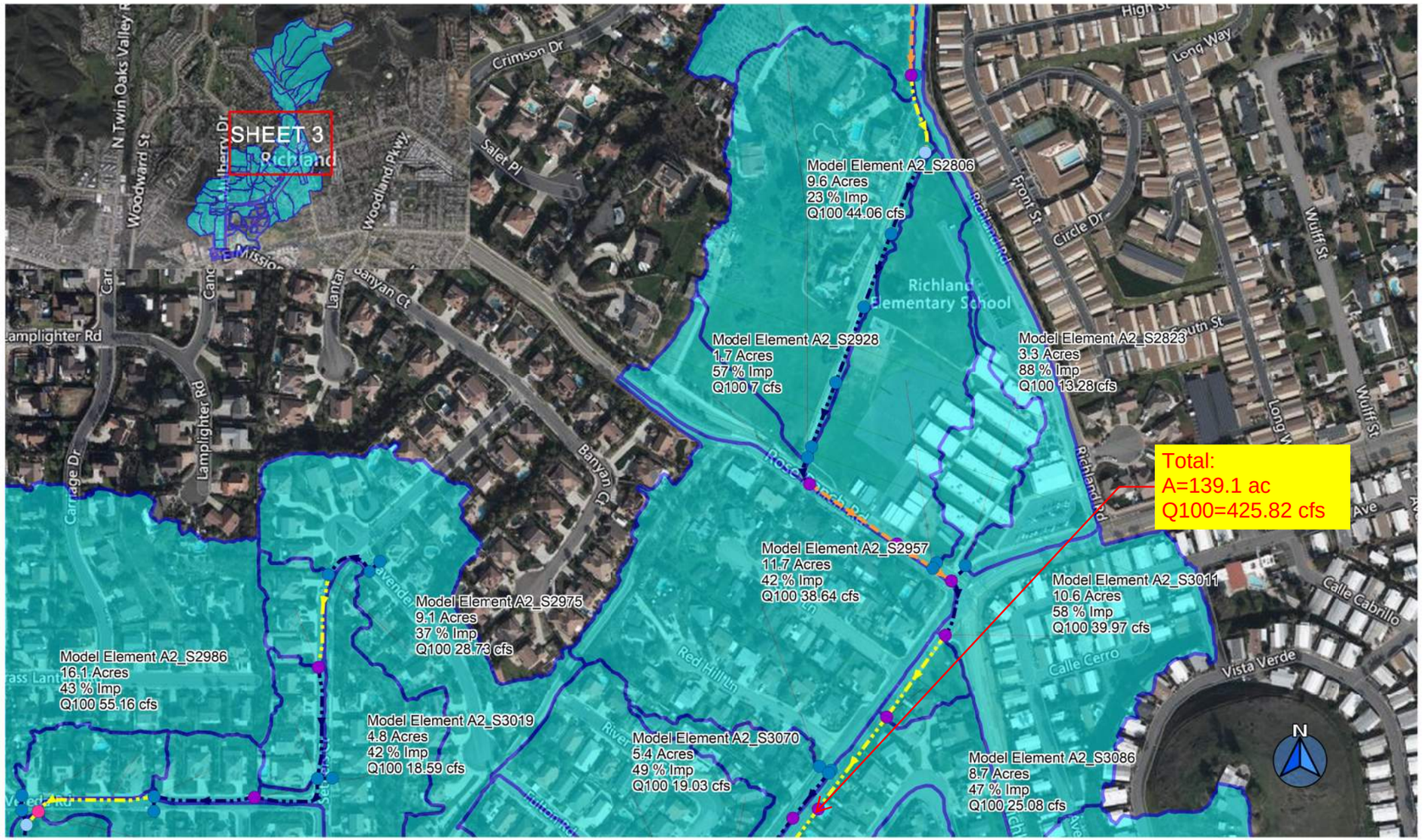
- Other
- Other
- Drains_to_CIP_13

Kimley»Horn

150 m

Total:
A=147.9 ac
Q100=453.30 cfs

MULBERRY STREET BOX CULVERT
HYDROLOGIC WORK MAP SHEET 2
City of San Marcos, CA



Legend

- Outfalls

Junctions

- Other
- Cleanout
- Inlet
- Curb Outlet
- Detention Basin
- Outlet
- Seperator
- Cleanout 2
- Inlet 2
- Curb Outlet 2
- Detention Basin 2
- Outlet 2
- Seperator 2

Conduits

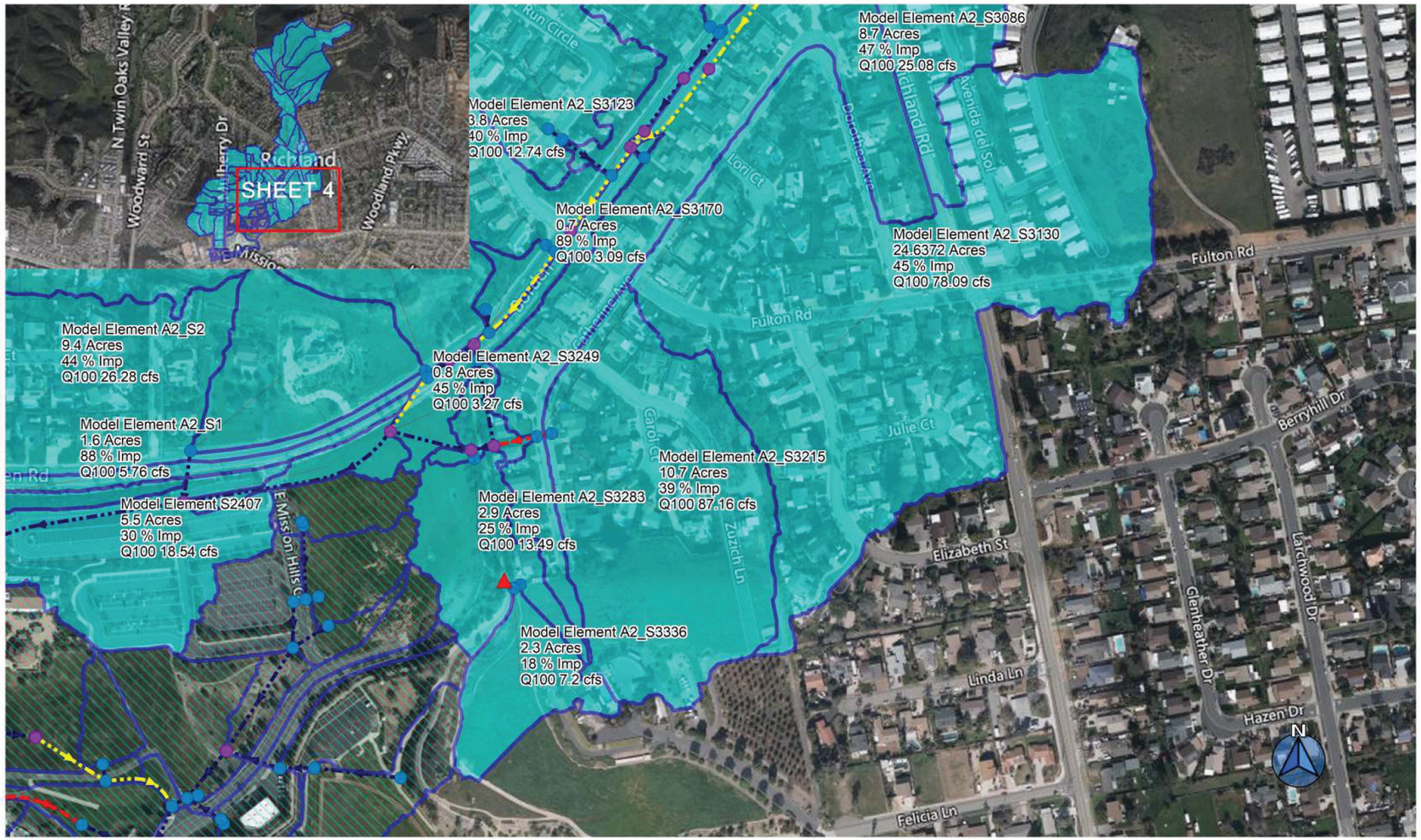
- Visible
- CAP FLOW >1 & <1.5
- CAP FLOW > 1.5 & <=2
- CAP FLOW >2
- CIP
- CIP CAP FLOW >1 & <1.5
- CIP CAP FLOW > 1.5 & <=2
- CIP CAP FLOW >2

Subcatchments

- Other
- Other
- Drains_to_CIP_13

Kimley»Horn

MULBERRY STREET BOX CULVERT
HYDROLOGIC WORK MAP SHEET 3
City of San Marcos, CA



Legend

- Outfalls

Junctions

- Other
- Cleanout
- Inlet
- Curb Outlet
- Detention Basin
- Outlet
- Seperator
- Cleanout 2
- Inlet 2
- Curb Outlet 2
- Detention Basin 2
- Outlet 2
- Seperator 2

Conduits

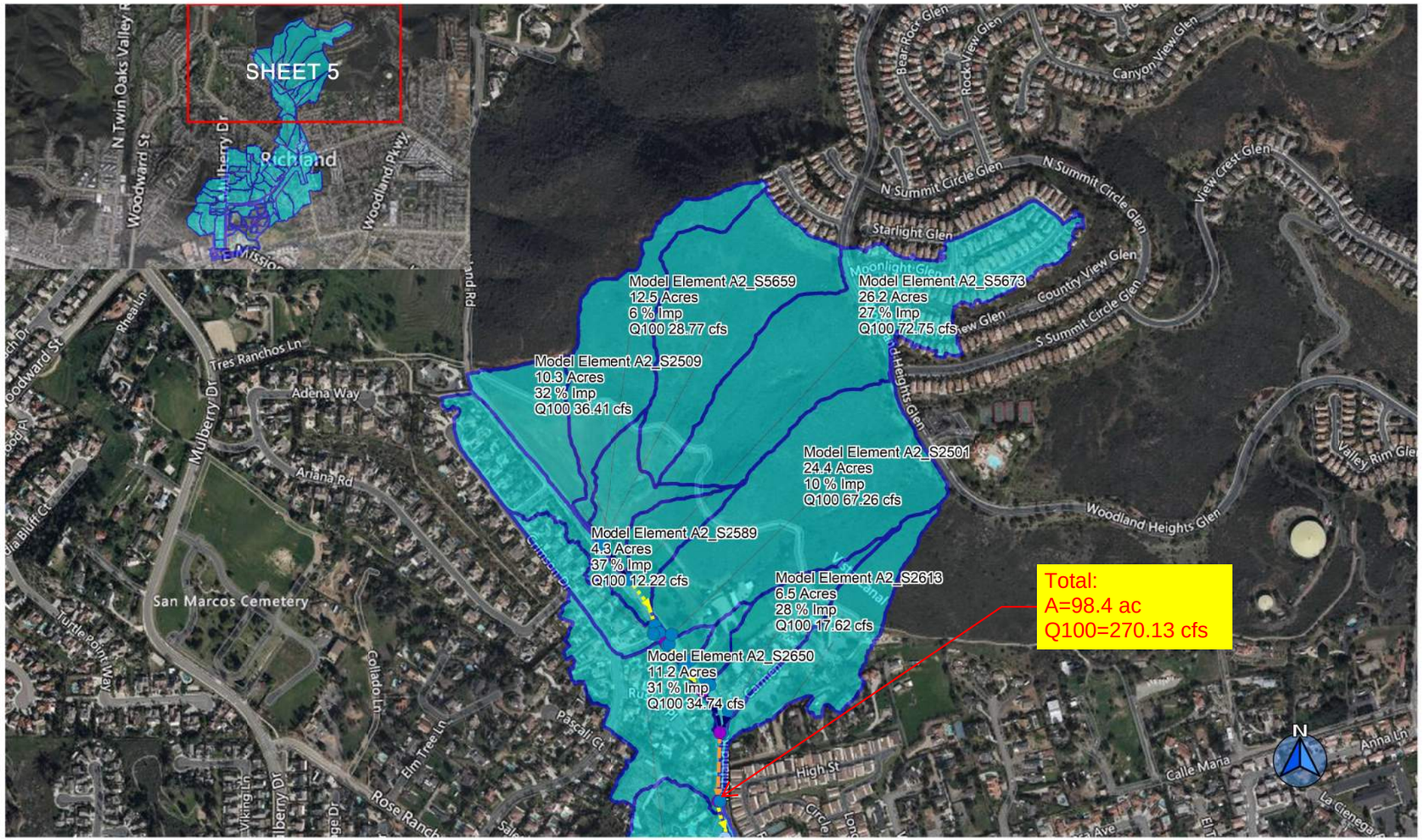
- Visible
- CAP FLOW >1 & <1.5
- CAP FLOW > 1.5 & <=2
- CAP FLOW >2
- CIP
- CIP CAP FLOW >1 & <1.5
- CIP CAP FLOW > 1.5 & <=2
- CIP CAP FLOW >2

Subcatchments

- Other
- Other
- Drains_to_CIP_13

Kimley»Horn

MULBERRY STREET BOX CULVERT
HYDROLOGIC WORK MAP SHEET 4
City of San Marcos, CA



Legend

- Outfalls

Junctions

- Other
- Cleanout
- Inlet
- Curb Outlet
- Detention Basin
- Outlet
- Seperator
- Cleanout 2
- Inlet 2
- Curb Outlet 2
- Detention Basin 2
- Outlet 2
- Seperator 2

Conduits

- Visible
- CAP FLOW >1 & <1.5
- CAP FLOW > 1.5 & <=2
- CAP FLOW >2
- CIP
- CIP CAP FLOW >1 & <1.5
- CIP CAP FLOW > 1.5 & <=2
- CIP CAP FLOW >2

Subcatchments

- Other
- Other
- Drains_to_CIP_13

Kimley»Horn

5000 ft

MULBERRY STREET BOX CULVERT
HYDROLOGIC WORK MAP SHEET 5
City of San Marcos, CA

Appendix C:

Hydraulic Analysis _ WSPG

```
T1 SAN MARCOS OFF-SITE STORM DRAIN ANALYSIS, 12'X 4' RCB
T2 DESIGNED BY DEA, BY 09-22-2022
T3 100-YEAR STORM
SO    832.550 600.680  6                        603.150
R     832.550 600.680  6      .014                            .000
R     950.230 601.090  6      .014                          34.000
R     952.230 601.100  6      .014                            .000
R     980.000 601.299  6      .014                         -45.000
R     986.000 601.300  6      .014                            .000
WE    986.000 601.300  5      .500
R     988.000 601.300  5      .014                          90.000
R    1000.000 601.300  5      .014                            .000
WX   1000.000 601.300  1
R    1000.000 601.300  1      .014                            .000
R    1066.700 601.820  1      .014                         -80.0
JX   1319.810 603.740  1  7   .014    2.000          604.990         90.0         .000
JX   1380.800 604.230  1  9   .014    2.500          605.610         90.0         .000
R    1600.000 606.000  1      .014                            .000    .000 0
JX   1626.980 606.170  1  8   .014    3.000          607.180         90.0         .000
JX   1848.820 607.600  1  8   .014   15.060          608.600         45.0         .000
R    1858.400 607.660  1      .014                            .000
R    1858.401 607.661  2      .050                            .000
TS   1887.000 613.660  3      .030                            .000          .000 0
SH   1887.000 613.000  3                        615.100
CD   1  2   0    .000   4.000   12.000  .000  .000  .000
CD   2  3   0    .000  12.000   21.000  .000  .000  .000
CD   3  3   0    .000  15.000   30.000  .000  .000  .000
CD   4  4   0    .000   3.000     .000  .000  .000  .000
CD   5  2   0    .000  12.000   39.000  .000  .000   .00
CD   6  3   3   1.000   4.000   26.000  .000  .000   .00
CD   7  4   0    .000   1.250     .000  .000  .000  .000
CD   8  4   0    .000   2.000     .000  .000  .000  .000
CD   9  4   0    .000   1.500     .000  .000  .000  .000
Q          698.370   .0
```

Downstream Existing Storm Drain

Program Package Serial Number: 1265

WATER SURFACE PROFILE LISTING Date: 9-22-2022 Time: 7:52: 9

SAN MARCOS OFF-SITE STORM DRAIN ANALYSIS, 12'X 4' RCB

DESIGNED BY DEA, BY 09-22-2022

100-YEAR STORM

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
832.550	600.680	3.125	603.805	720.93	10.03	1.56	605.37	.18	3.13	26.00	4.000	26.000	.00	3 1.0
7.393	.0035					.0046	.03	3.31	1.06	3.65	.014	.00	.00	BOX
839.943	600.706	3.278	603.983	720.93	9.56	1.42	605.40	.16	3.13	26.00	4.000	26.000	.00	3 1.0
36.536	.0035					.0041	.15	3.44	.99	3.65	.014	.00	.00	BOX
876.480	600.833	3.438	604.271	720.93	9.12	1.29	605.56	.15	3.13	26.00	4.000	26.000	.00	3 1.0
73.750	.0035					.0037	.28	3.59	.92	3.65	.014	.00	.00	BOX
950.230	601.090	3.546	604.636	720.93	8.84	1.21	605.85	.00	3.13	26.00	4.000	26.000	.00	3 1.0
2.000	.0050					.0037	.01	3.55	.88	3.18	.014	.00	.00	BOX
952.230	601.100	3.539	604.639	720.93	8.86	1.22	605.86	4.00	3.13	26.00	4.000	26.000	.00	3 1.0
13.588	.0072					.0038	.05	4.00	.88	2.77	.014	.00	.00	BOX
965.818	601.197	3.374	604.571	720.93	9.29	1.34	605.91	4.00	3.13	26.00	4.000	26.000	.00	3 1.0
5.942	.0072					.0043	.03	4.00	.95	2.77	.014	.00	.00	BOX
971.760	601.240	3.285	604.525	720.93	9.54	1.41	605.94	4.00	3.13	26.00	4.000	26.000	.00	3 1.0
HYDRAULIC JUMP														
971.760	601.240	2.970	604.210	720.93	10.55	1.73	605.94	4.00	3.13	26.00	4.000	26.000	.00	3 1.0
1.401	.0072					.0059	.01	4.00	1.15	2.77	.014	.00	.00	BOX
973.161	601.250	2.979	604.229	720.93	10.52	1.72	605.95	4.00	3.13	26.00	4.000	26.000	.00	3 1.0
6.839	.0072					.0056	.04	4.00	1.14	2.77	.014	.00	.00	BOX

Program Package Serial Number: 1265

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
980.000	601.299	3.125	604.424	720.93	10.03	1.56	605.99	.00	3.13	26.00	4.000	26.000	.00	3 1.0
2.216	.0002					.0046	.01	3.13	1.06	4.00	.014	.00	.00	BOX
982.216	601.299	3.278	604.577	720.93	9.56	1.42	606.00	.00	3.13	26.00	4.000	26.000	.00	3 1.0
3.784	.0002					.0043	.02	3.28	.99	4.00	.014	.00	.00	BOX
986.000	601.300	3.373	604.673	720.93	9.29	1.34	606.01	4.00	3.13	26.00	4.000	26.000	.00	3 1.0
WALL ENTRANCE														
986.000	601.300	5.307	606.607	720.93	3.48	.19	606.80	11.54	2.20	39.00	12.000	39.000	.00	0 .0
2.000	.0000					.0002	.00	16.85	.27	.00	.014	.00	.00	RECTANG
988.000	601.300	5.307	606.607	720.93	3.48	.19	606.80	.00	2.20	39.00	12.000	39.000	.00	0 .0
12.000	.0000					.0002	.00	5.31	.27	.00	.014	.00	.00	RECTANG
1000.000	601.300	5.310	606.610	720.93	3.48	.19	606.80	.00	2.20	39.00	12.000	39.000	.00	0 .0
HYDRAULIC JUMP														
1000.000	601.300	3.634	604.934	720.93	16.53	4.24	609.18	2.13	4.82	12.00	4.000	12.000	.00	0 .0
66.700	.0078					.0082	.55	5.77	1.53	3.69	.014	.00	.00	RECTANG
1066.700	601.820	3.612	605.432	720.93	16.63	4.30	609.73	.00	4.82	12.00	4.000	12.000	.00	0 .0
JUNCT STR	.0076					.0095	2.40	5.77	1.54		.014	.00	.00	RECTANG
1319.810	603.740	3.300	607.040	718.93	18.15	5.12	612.16	.00	4.81	12.00	4.000	12.000	.00	0 .0
JUNCT STR	.0080					.0112	.68	3.30	1.76		.014	.00	.00	RECTANG

WATER SURFACE PROFILE LISTING Date: 9-22-2022 Time: 7:52: 9
SAN MARCOS OFF-SITE STORM DRAIN ANALYSIS, 12'X 4' RCB

DESIGNED BY DEA, BY 09-22-2022
100-YEAR STORM

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1380.800	604.230	3.182	607.412	716.43	18.76	5.47	612.88	.00	4.80	12.00	4.000	12.000	.00	0 .0
85.914	.0081					.0126	1.08	3.18	1.85	3.63	.014	.00	.00	RECTANG
1466.714	604.924	3.036	607.960	716.43	19.67	6.01	613.96	.00	4.80	12.00	4.000	12.000	.00	0 .0
71.750	.0081					.0145	1.04	3.04	1.99	3.63	.014	.00	.00	RECTANG
1538.465	605.503	2.895	608.398	716.43	20.63	6.61	615.00	.00	4.80	12.00	4.000	12.000	.00	0 .0
61.535	.0081					.0166	1.02	2.89	2.14	3.63	.014	.00	.00	RECTANG
1600.000	606.000	2.760	608.760	716.43	21.63	7.27	616.03	.00	4.80	12.00	4.000	12.000	.00	0 .0
JUNCT STR	.0063					.0187	.50	2.76	2.29		.014	.00	.00	RECTANG
1626.980	606.170	2.659	608.829	713.43	22.36	7.76	616.59	.00	4.79	12.00	4.000	12.000	.00	0 .0
JUNCT STR	.0064					.0434	9.63	2.66	2.42		.014	.00	.00	RECTANG
1848.820	607.600	1.735	609.335	698.37	33.54	17.47	626.80	.00	4.72	12.00	4.000	12.000	.00	0 .0
9.580	.0063					.0691	.66	1.74	4.49	3.90	.014	.00	.00	RECTANG
1858.401	607.661	1.704	609.365	698.37	19.51	5.91	615.28	.00	3.25	21.00	12.000	21.000	.00	0 .0
TRANS STR	.2098					.0577	1.65	1.70	2.63		.030	.00	.00	BOX
1887.000	613.660	2.100	615.760	698.37	11.09	1.91	617.67	.00	2.56	30.00	15.000	30.000	.00	0 .0

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T1 SAN MARCOS OFF-SITE STORM DRAIN ANALYSIS, LAT-1
T2 DESIGNED BY DEA, BY 09-26-2022
T3 100-YEAR STORM
SO   1000.000 604.990  1                          607.040
R    1000.000 604.990  1      .013                                .000
R    1004.090 608.300  1      .013                                .000
SH   1004.090 608.300  1                           608.300
CD   1  4   0    .000   1.500     .000  .000  .000  .000
CD   4  4   0    .000   2.000     .000  .000  .000  .000
CD   5  4   0    .000   3.000     .000  .000  .000  .000
CD   6  4   0    .000   1.250     .000  .000  .000  .000
Q             2.000   .0
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Program Package Serial Number: 1265

WATER SURFACE PROFILE LISTING Date: 9-26-2022 Time:11:36:35

SAN MARCOS OFF-SITE STORM DRAIN ANALYSIS, LAT-1

DESIGNED BY DEA, BY 09-26-2022

100-YEAR STORM

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	604.990	2.050	607.040	2.00	1.13	.02	607.06	.00	.53	.00	1.500	.000	.00	0 .0
.680	.8093					.0004	.00	2.05	.00	.15	.013	.00	.00	PIPE
1000.680	605.540	1.500	607.040	2.00	1.13	.02	607.06	.00	.53	.00	1.500	.000	.00	0 .0
.169	.8093					.0003	.00	1.50	.00	.15	.013	.00	.00	PIPE
1000.849	605.677	1.360	607.037	2.00	1.19	.02	607.06	.00	.53	.87	1.500	.000	.00	0 .0
.096	.8093					.0003	.00	1.36	.15	.15	.013	.00	.00	PIPE
1000.945	605.755	1.280	607.035	2.00	1.24	.02	607.06	.00	.53	1.06	1.500	.000	.00	0 .0
.080	.8093					.0004	.00	1.28	.18	.15	.013	.00	.00	PIPE
1001.025	605.820	1.213	607.033	2.00	1.31	.03	607.06	.00	.53	1.18	1.500	.000	.00	0 .0
.068	.8093					.0004	.00	1.21	.20	.15	.013	.00	.00	PIPE
1001.094	605.875	1.155	607.030	2.00	1.37	.03	607.06	.00	.53	1.26	1.500	.000	.00	0 .0
.017	.8093					.0004	.00	1.16	.22	.15	.013	.00	.00	PIPE
1001.110	605.889	1.155	607.044	2.00	1.37	.03	607.07	.00	.53	1.26	1.500	.000	.00	0 .0
HYDRAULIC JUMP														
1001.110	605.889	.207	606.096	2.00	13.57	2.86	608.96	.00	.53	1.03	1.500	.000	.00	0 .0
.089	.8093					.2014	.02	.21	6.34	.15	.013	.00	.00	PIPE
1001.200	605.961	.214	606.175	2.00	12.90	2.58	608.76	.00	.53	1.05	1.500	.000	.00	0 .0
.359	.8093					.1748	.06	.21	5.91	.15	.013	.00	.00	PIPE

Program Package Serial Number: 1265

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1001.559	606.252	.221	606.473	2.00	12.30	2.35	608.82	.00	.53	1.06	1.500	.000	.00	0 .0
.313	.8093					.1527	.05	.22	5.54	.15	.013	.00	.00	PIPE
1001.872	606.505	.229	606.734	2.00	11.72	2.13	608.87	.00	.53	1.08	1.500	.000	.00	0 .0
.277	.8093					.1333	.04	.23	5.20	.15	.013	.00	.00	PIPE
1002.148	606.729	.236	606.965	2.00	11.18	1.94	608.90	.00	.53	1.09	1.500	.000	.00	0 .0
.243	.8093					.1163	.03	.24	4.87	.15	.013	.00	.00	PIPE
1002.391	606.925	.244	607.169	2.00	10.66	1.76	608.93	.00	.53	1.11	1.500	.000	.00	0 .0
.215	.8093					.1016	.02	.24	4.56	.15	.013	.00	.00	PIPE
1002.607	607.099	.252	607.352	2.00	10.16	1.60	608.95	.00	.53	1.12	1.500	.000	.00	0 .0
.190	.8093					.0887	.02	.25	4.28	.15	.013	.00	.00	PIPE
1002.796	607.253	.261	607.514	2.00	9.69	1.46	608.97	.00	.53	1.14	1.500	.000	.00	0 .0
.169	.8093					.0776	.01	.26	4.01	.15	.013	.00	.00	PIPE
1002.965	607.390	.270	607.660	2.00	9.24	1.33	608.98	.00	.53	1.15	1.500	.000	.00	0 .0
.150	.8093					.0678	.01	.27	3.76	.15	.013	.00	.00	PIPE
1003.115	607.511	.279	607.790	2.00	8.81	1.20	609.00	.00	.53	1.17	1.500	.000	.00	0 .0
.134	.8093					.0592	.01	.28	3.52	.15	.013	.00	.00	PIPE
1003.250	607.620	.288	607.908	2.00	8.40	1.10	609.00	.00	.53	1.18	1.500	.000	.00	0 .0
.118	.8093					.0517	.01	.29	3.30	.15	.013	.00	.00	PIPE

WATER SURFACE PROFILE LISTING Date: 9-26-2022 Time:11:36:35
SAN MARCOS OFF-SITE STORM DRAIN ANALYSIS, LAT-1

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1003.368	607.715	.298	608.013	2.00	8.01	1.00	609.01	.00	.53	1.20	1.500	.000	.00	0 .0
.105	.8093					.0452	.00	.30	3.09	.15	.013	.00	.00	PIPE
1003.473	607.801	.308	608.109	2.00	7.63	.91	609.01	.00	.53	1.21	1.500	.000	.00	0 .0
.093	.8093					.0395	.00	.31	2.89	.15	.013	.00	.00	PIPE
1003.566	607.876	.319	608.195	2.00	7.28	.82	609.02	.00	.53	1.23	1.500	.000	.00	0 .0
.084	.8093					.0345	.00	.32	2.71	.15	.013	.00	.00	PIPE
1003.649	607.943	.329	608.272	2.00	6.94	.75	609.02	.00	.53	1.24	1.500	.000	.00	0 .0
.072	.8093					.0302	.00	.33	2.54	.15	.013	.00	.00	PIPE
1003.721	608.001	.341	608.343	2.00	6.62	.68	609.02	.00	.53	1.26	1.500	.000	.00	0 .0
.065	.8093					.0264	.00	.34	2.38	.15	.013	.00	.00	PIPE
1003.786	608.054	.352	608.406	2.00	6.31	.62	609.02	.00	.53	1.27	1.500	.000	.00	0 .0
.056	.8093					.0230	.00	.35	2.23	.15	.013	.00	.00	PIPE
1003.842	608.099	.364	608.464	2.00	6.02	.56	609.03	.00	.53	1.29	1.500	.000	.00	0 .0
.048	.8093					.0202	.00	.36	2.09	.15	.013	.00	.00	PIPE
1003.891	608.139	.377	608.516	2.00	5.74	.51	609.03	.00	.53	1.30	1.500	.000	.00	0 .0
.042	.8093					.0176	.00	.38	1.95	.15	.013	.00	.00	PIPE
1003.933	608.173	.390	608.563	2.00	5.47	.46	609.03	.00	.53	1.32	1.500	.000	.00	0 .0
.037	.8093					.0154	.00	.39	1.83	.15	.013	.00	.00	PIPE

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1003.970	608.203	.403	608.606	2.00	5.21	.42	609.03	.00	.53	1.33	1.500	.000	.00	0 .0
.031	.8093					.0135	.00	.40	1.71	.15	.013	.00	.00	PIPE
1004.000	608.227	.417	608.644	2.00	4.97	.38	609.03	.00	.53	1.34	1.500	.000	.00	0 .0
.025	.8093					.0118	.00	.42	1.60	.15	.013	.00	.00	PIPE
1004.025	608.247	.432	608.680	2.00	4.74	.35	609.03	.00	.53	1.36	1.500	.000	.00	0 .0
.021	.8093					.0103	.00	.43	1.50	.15	.013	.00	.00	PIPE
1004.046	608.264	.447	608.712	2.00	4.52	.32	609.03	.00	.53	1.37	1.500	.000	.00	0 .0
.016	.8093					.0091	.00	.45	1.40	.15	.013	.00	.00	PIPE
1004.062	608.277	.463	608.741	2.00	4.31	.29	609.03	.00	.53	1.39	1.500	.000	.00	0 .0
.013	.8093					.0079	.00	.46	1.31	.15	.013	.00	.00	PIPE
1004.075	608.288	.479	608.767	2.00	4.11	.26	609.03	.00	.53	1.40	1.500	.000	.00	0 .0
.009	.8093					.0069	.00	.48	1.23	.15	.013	.00	.00	PIPE
1004.083	608.295	.496	608.791	2.00	3.92	.24	609.03	.00	.53	1.41	1.500	.000	.00	0 .0
.006	.8093					.0061	.00	.50	1.15	.15	.013	.00	.00	PIPE
1004.089	608.299	.513	608.813	2.00	3.74	.22	609.03	.00	.53	1.42	1.500	.000	.00	0 .0
.001	.8093					.0053	.00	.51	1.07	.15	.013	.00	.00	PIPE
1004.090	608.300	.533	608.833	2.00	3.55	.20	609.03	.00	.53	1.44	1.500	.000	.00	0 .0

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T1 SAN MARCOS OFF-SITE STORM DRAIN ANALYSIS, LAT-2
T2 DESIGNED BY DEA, BY 09-26-2022
T3 100-YEAR STORM
SO   1000.000 605.610  1                          607.680
R    1000.000 605.610  1      .013                                .000
R    1005.610 607.080  1      .013                                .000
SH   1005.610 607.080  1                           607.0800
CD   1  4   0    .000   1.250     .000  .000  .000  .000
CD   4  4   0    .000   2.000     .000  .000  .000  .000
CD   5  4   0    .000   3.000     .000  .000  .000  .000
CD   6  4   0    .000   1.500     .000  .000  .000  .000
Q            2.500   .0
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Program Package Serial Number: 1265

WATER SURFACE PROFILE LISTING Date: 9-26-2022 Time:11:40:38

SAN MARCOS OFF-SITE STORM DRAIN ANALYSIS, LAT-2

DESIGNED BY DEA, BY 09-26-2022

100-YEAR STORM

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	605.610	2.070	607.680	2.50	2.04	.06	607.74	.00	.63	.00	1.250	.000	.00	0 .0
3.147	.2620					.0015	.00	2.07	.00	.23	.013	.00	.00	PIPE
1003.147	606.435	1.250	607.685	2.50	2.04	.06	607.75	.00	.63	.00	1.250	.000	.00	0 .0
.416	.2620					.0014	.00	1.25	.00	.23	.013	.00	.00	PIPE
1003.563	606.544	1.134	607.678	2.50	2.14	.07	607.75	.00	.63	.73	1.250	.000	.00	0 .0
.234	.2620					.0014	.00	1.13	.30	.23	.013	.00	.00	PIPE
1003.797	606.605	1.066	607.671	2.50	2.24	.08	607.75	.00	.63	.89	1.250	.000	.00	0 .0
.181	.2620					.0015	.00	1.07	.35	.23	.013	.00	.00	PIPE
1003.978	606.652	1.011	607.664	2.50	2.35	.09	607.75	.00	.63	.98	1.250	.000	.00	0 .0
.155	.2620					.0016	.00	1.01	.40	.23	.013	.00	.00	PIPE
1004.133	606.693	.962	607.655	2.50	2.47	.09	607.75	.00	.63	1.05	1.250	.000	.00	0 .0
1004.142	606.695	.918	607.614	2.50	2.59	.10	607.72	.00	.63	1.10	1.250	.000	.00	0 .0
HYDRAULIC JUMP														
1004.142	606.695	.396	607.092	2.50	7.49	.87	607.96	.00	.63	1.16	1.250	.000	.00	0 .0
.181	.2620					.0295	.01	.40	2.46	.23	.013	.00	.00	PIPE
1004.324	606.743	.410	607.153	2.50	7.12	.79	607.94	.00	.63	1.17	1.250	.000	.00	0 .0
.239	.2620					.0258	.01	.41	2.29	.23	.013	.00	.00	PIPE
1004.563	606.806	.425	607.231	2.50	6.79	.71	607.95	.00	.63	1.18	1.250	.000	.00	0 .0
.209	.2620					.0226	.00	.43	2.14	.23	.013	.00	.00	PIPE

Program Package Serial Number: 1265

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1004.772	606.860	.440	607.300	2.50	6.47	.65	607.95	.00	.63	1.19	1.250	.000	.00	0 .0
.178	.2620					.0198	.00	.44	2.00	.23	.013	.00	.00	PIPE
1004.949	606.907	.456	607.363	2.50	6.17	.59	607.95	.00	.63	1.20	1.250	.000	.00	0 .0
.154	.2620					.0174	.00	.46	1.87	.23	.013	.00	.00	PIPE
1005.104	606.947	.472	607.419	2.50	5.88	.54	607.96	.00	.63	1.21	1.250	.000	.00	0 .0
.129	.2620					.0152	.00	.47	1.75	.23	.013	.00	.00	PIPE
1005.233	606.981	.489	607.470	2.50	5.61	.49	607.96	.00	.63	1.22	1.250	.000	.00	0 .0
.106	.2620					.0134	.00	.49	1.63	.23	.013	.00	.00	PIPE
1005.339	607.009	.507	607.516	2.50	5.35	.44	607.96	.00	.63	1.23	1.250	.000	.00	0 .0
.085	.2620					.0117	.00	.51	1.53	.23	.013	.00	.00	PIPE
1005.424	607.031	.526	607.557	2.50	5.10	.40	607.96	.00	.63	1.23	1.250	.000	.00	0 .0
.070	.2620					.0103	.00	.53	1.43	.23	.013	.00	.00	PIPE
1005.494	607.050	.545	607.595	2.50	4.86	.37	607.96	.00	.63	1.24	1.250	.000	.00	0 .0
.053	.2620					.0090	.00	.55	1.33	.23	.013	.00	.00	PIPE
1005.547	607.064	.565	607.629	2.50	4.63	.33	607.96	.00	.63	1.24	1.250	.000	.00	0 .0
.037	.2620					.0080	.00	.57	1.24	.23	.013	.00	.00	PIPE
1005.584	607.073	.586	607.659	2.50	4.42	.30	607.96	.00	.63	1.25	1.250	.000	.00	0 .0
.022	.2620					.0070	.00	.59	1.16	.23	.013	.00	.00	PIPE

WATER SURFACE PROFILE LISTING Date: 9-26-2022 Time:11:40:38

SAN MARCOS OFF-SITE STORM DRAIN ANALYSIS, LAT-2
DESIGNED BY DEA, BY 09-26-2022
100-YEAR STORM

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1005.606	607.079	.608	607.687	2.50	4.21	.28	607.96	.00	.63	1.25	1.250	.000	.00	0 .0
.004	.2620					.0061	.00	.61	1.08	.23	.013	.00	.00	PIPE
1005.610	607.080	.633	607.713	2.50	4.01	.25	607.96	.00	.63	1.25	1.250	.000	.00	0 .0

```
T1 SAN MARCOS OFF-SITE STORM DRAIN ANALYSIS, LAT-3
T2 DESIGNED BY DEA, BY 09-26-2022
T3 100-YEAR STORM
SO   1000.000 607.170  1                          607.430
R    1000.000 607.170  1      .013                                .000
R    1004.960 609.400  1      .013                                .000
SH   1004.960 609.400  1                           609.400
CD   1  4   0    .000   2.000     .000  .000  .000  .000
CD   2  4   0    .000   1.000     .000  .000  .000  .000
CD   3  4   0    .000   3.000     .000  .000  .000  .000
CD   4  4   0    .000   1.250     .000  .000  .000  .000
Q            3.000   .0
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Program Package Serial Number: 1265

WATER SURFACE PROFILE LISTING Date: 9-26-2022 Time:11:45: 0

SAN MARCOS OFF-SITE STORM DRAIN ANALYSIS, LAT-3

DESIGNED BY DEA, BY 09-26-2022

100-YEAR STORM

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	607.170	.259	607.429	3.00	12.56	2.45	609.88	.00	.60	1.34	2.000	.000	.00	0 .0
.212	.4496					.1334	.03	.26	5.25	.19	.013	.00	.00	PIPE
1000.212	607.265	.261	607.526	3.00	12.36	2.37	609.90	.00	.60	1.35	2.000	.000	.00	0 .0
.631	.4496					.1220	.08	.26	5.13	.19	.013	.00	.00	PIPE
1000.843	607.549	.270	607.819	3.00	11.79	2.16	609.98	.00	.60	1.37	2.000	.000	.00	0 .0
.545	.4496					.1065	.06	.27	4.81	.19	.013	.00	.00	PIPE
1001.389	607.794	.279	608.073	3.00	11.24	1.96	610.03	.00	.60	1.39	2.000	.000	.00	0 .0
.472	.4496					.0931	.04	.28	4.51	.19	.013	.00	.00	PIPE
1001.861	608.007	.289	608.296	3.00	10.72	1.78	610.08	.00	.60	1.41	2.000	.000	.00	0 .0
.416	.4496					.0813	.03	.29	4.23	.19	.013	.00	.00	PIPE
1002.277	608.193	.298	608.492	3.00	10.22	1.62	610.11	.00	.60	1.42	2.000	.000	.00	0 .0
.363	.4496					.0709	.03	.30	3.97	.19	.013	.00	.00	PIPE
1002.639	608.357	.308	608.665	3.00	9.74	1.47	610.14	.00	.60	1.44	2.000	.000	.00	0 .0
.320	.4496					.0619	.02	.31	3.72	.19	.013	.00	.00	PIPE
1002.959	608.500	.318	608.818	3.00	9.29	1.34	610.16	.00	.60	1.46	2.000	.000	.00	0 .0
.280	.4496					.0540	.02	.32	3.48	.19	.013	.00	.00	PIPE
1003.239	608.626	.329	608.955	3.00	8.86	1.22	610.17	.00	.60	1.48	2.000	.000	.00	0 .0
.248	.4496					.0472	.01	.33	3.27	.19	.013	.00	.00	PIPE

Program Package Serial Number: 1265

WATER SURFACE PROFILE LISTING Date: 9-26-2022 Time:11:45: 0

SAN MARCOS OFF-SITE STORM DRAIN ANALYSIS, LAT-3

DESIGNED BY DEA, BY 09-26-2022

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1003.487	608.738	.340	609.078	3.00	8.44	1.11	610.18	.00	.60	1.50	2.000	.000	.00	0 .0
.217	.4496					.0412	.01	.34	3.06	.19	.013	.00	.00	PIPE
1003.704	608.835	.352	609.187	3.00	8.05	1.01	610.19	.00	.60	1.52	2.000	.000	.00	0 .0
.192	.4496					.0361	.01	.35	2.87	.19	.013	.00	.00	PIPE
1003.896	608.922	.364	609.286	3.00	7.68	.92	610.20	.00	.60	1.54	2.000	.000	.00	0 .0
.170	.4496					.0315	.01	.36	2.69	.19	.013	.00	.00	PIPE
1004.066	608.998	.376	609.374	3.00	7.32	.83	610.21	.00	.60	1.56	2.000	.000	.00	0 .0
.148	.4496					.0275	.00	.38	2.52	.19	.013	.00	.00	PIPE
1004.215	609.065	.389	609.454	3.00	6.98	.76	610.21	.00	.60	1.58	2.000	.000	.00	0 .0
.131	.4496					.0240	.00	.39	2.36	.19	.013	.00	.00	PIPE
1004.346	609.124	.402	609.526	3.00	6.65	.69	610.21	.00	.60	1.60	2.000	.000	.00	0 .0
.115	.4496					.0210	.00	.40	2.21	.19	.013	.00	.00	PIPE
1004.461	609.176	.415	609.591	3.00	6.34	.62	610.22	.00	.60	1.62	2.000	.000	.00	0 .0
.097	.4496					.0183	.00	.42	2.07	.19	.013	.00	.00	PIPE
1004.558	609.219	.430	609.649	3.00	6.05	.57	610.22	.00	.60	1.64	2.000	.000	.00	0 .0
.087	.4496					.0160	.00	.43	1.94	.19	.013	.00	.00	PIPE
1004.645	609.258	.444	609.702	3.00	5.77	.52	610.22	.00	.60	1.66	2.000	.000	.00	0 .0
.073	.4496					.0140	.00	.44	1.82	.19	.013	.00	.00	PIPE

Program Package Serial Number: 1265

WATER SURFACE PROFILE LISTING Date: 9-26-2022 Time:11:45: 0

SAN MARCOS OFF-SITE STORM DRAIN ANALYSIS, LAT-3

DESIGNED BY DEA, BY 09-26-2022

100-YEAR STORM

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip

L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1004.719	609.291	.459	609.750	3.00	5.50	.47	610.22	.00	.60	1.68	2.000	.000	.00	0	.0
.061	.4496				.0123	.00	.46	1.70	.19	.013	.00	.00	PIPE		
1004.780	609.319	.475	609.794	3.00	5.24	.43	610.22	.00	.60	1.70	2.000	.000	.00	0	.0
.052	.4496				.0107	.00	.48	1.59	.19	.013	.00	.00	PIPE		
1004.831	609.342	.491	609.833	3.00	5.00	.39	610.22	.00	.60	1.72	2.000	.000	.00	0	.0
.042	.4496				.0094	.00	.49	1.49	.19	.013	.00	.00	PIPE		
1004.873	609.361	.508	609.869	3.00	4.77	.35	610.22	.00	.60	1.74	2.000	.000	.00	0	.0
.032	.4496				.0082	.00	.51	1.40	.19	.013	.00	.00	PIPE		
1004.905	609.375	.526	609.901	3.00	4.54	.32	610.22	.00	.60	1.76	2.000	.000	.00	0	.0
.025	.4496				.0072	.00	.53	1.31	.19	.013	.00	.00	PIPE		
1004.930	609.386	.544	609.931	3.00	4.33	.29	610.22	.00	.60	1.78	2.000	.000	.00	0	.0
.017	.4496				.0063	.00	.54	1.22	.19	.013	.00	.00	PIPE		
1004.947	609.394	.563	609.957	3.00	4.13	.27	610.22	.00	.60	1.80	2.000	.000	.00	0	.0
.011	.4496				.0055	.00	.56	1.15	.19	.013	.00	.00	PIPE		
1004.958	609.399	.582	609.981	3.00	3.94	.24	610.22	.00	.60	1.82	2.000	.000	.00	0	.0
.002	.4496				.0048	.00	.58	1.07	.19	.013	.00	.00	PIPE		
1004.960	609.400	.604	610.004	3.00	3.75	.22	610.22	.00	.60	1.84	2.000	.000	.00	0	.0

```
T1 SAN MARCOS OFF-SITE STORM DRAIN ANALYSIS, LAT-4
T2 DESIGNED BY DEA, BY 09-26-2022
T3 100-YEAR STORM
SO   1000.000 608.600  1                          609.330
R    1000.000 608.600  1      .013                                .000
R    1033.550 611.190  1      .013                                .000
R    1063.980 613.550  1      .013                                .000
SH   1063.980 613.550  1                          613.550
CD   1  4   0    .000   2.000     .000  .000  .000  .000
CD   2  4   0    .000   1.000     .000  .000  .000  .000
CD   3  4   0    .000   3.000     .000  .000  .000  .000
CD   4  4   0    .000   1.250     .000  .000  .000  .000
Q            15.060   .0
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Program Package Serial Number: 1265

WATER SURFACE PROFILE LISTING Date: 9-26-2022 Time:11:51: 5

SAN MARCOS OFF-SITE STORM DRAIN ANALYSIS, LAT-4

DESIGNED BY DEA, BY 09-26-2022

100-YEAR STORM

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	608.600	.704	609.304	15.06	15.25	3.61	612.92	.00	1.40	1.91	2.000	.000	.00	0 .0
13.707	.0772					.0598	.82	.70	3.74	.67	.013	.00	.00	PIPE
1013.707	609.658	.723	610.381	15.06	14.70	3.36	613.74	.00	1.40	1.92	2.000	.000	.00	0 .0
11.639	.0772					.0532	.62	.72	3.55	.67	.013	.00	.00	PIPE
1025.347	610.557	.749	611.306	15.06	14.02	3.05	614.36	.00	1.40	1.94	2.000	.000	.00	0 .0
8.203	.0772					.0467	.38	.75	3.32	.67	.013	.00	.00	PIPE
1033.550	611.190	.776	611.966	15.06	13.37	2.77	614.74	.00	1.40	1.95	2.000	.000	.00	0 .0
2.400	.0776					.0426	.10	.78	3.10	.67	.013	.00	.00	PIPE
1035.951	611.376	.786	612.162	15.06	13.13	2.68	614.84	.00	1.40	1.95	2.000	.000	.00	0 .0
5.558	.0776					.0390	.22	.79	3.02	.67	.013	.00	.00	PIPE
1041.509	611.807	.815	612.622	15.06	12.52	2.43	615.06	.00	1.40	1.97	2.000	.000	.00	0 .0
4.436	.0776					.0342	.15	.82	2.82	.67	.013	.00	.00	PIPE
1045.945	612.151	.844	612.995	15.06	11.94	2.21	615.21	.00	1.40	1.98	2.000	.000	.00	0 .0
3.580	.0776					.0300	.11	.84	2.63	.67	.013	.00	.00	PIPE
1049.525	612.429	.875	613.304	15.06	11.38	2.01	615.32	.00	1.40	1.98	2.000	.000	.00	0 .0
2.929	.0776					.0264	.08	.88	2.46	.67	.013	.00	.00	PIPE
1052.454	612.656	.908	613.564	15.06	10.85	1.83	615.39	.00	1.40	1.99	2.000	.000	.00	0 .0
2.433	.0776					.0232	.06	.91	2.29	.67	.013	.00	.00	PIPE

Program Package Serial Number: 1265

WATER SURFACE PROFILE LISTING Date: 9-26-2022 Time:11:51: 5

SAN MARCOS OFF-SITE STORM DRAIN ANALYSIS, LAT-4

DESIGNED BY DEA, BY 09-26-2022

100-YEAR STORM

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1054.888	612.845	.942	613.787	15.06	10.35	1.66	615.45	.00	1.40	2.00	2.000	.000	.00	0 .0
2.032	.0776					.0204	.04	.94	2.14	.67	.013	.00	.00	PIPE
1056.920	613.002	.977	613.980	15.06	9.86	1.51	615.49	.00	1.40	2.00	2.000	.000	.00	0 .0
1.668	.0776					.0180	.03	.98	1.99	.67	.013	.00	.00	PIPE
1058.587	613.132	1.015	614.147	15.06	9.41	1.37	615.52	.00	1.40	2.00	2.000	.000	.00	0 .0
1.391	.0776					.0158	.02	1.02	1.85	.67	.013	.00	.00	PIPE
1059.979	613.240	1.054	614.294	15.06	8.97	1.25	615.54	.00	1.40	2.00	2.000	.000	.00	0 .0
1.141	.0776					.0140	.02	1.05	1.72	.67	.013	.00	.00	PIPE
1061.119	613.328	1.095	614.423	15.06	8.55	1.14	615.56	.00	1.40	1.99	2.000	.000	.00	0 .0
.923	.0776					.0123	.01	1.10	1.60	.67	.013	.00	.00	PIPE
1062.042	613.400	1.138	614.538	15.06	8.15	1.03	615.57	.00	1.40	1.98	2.000	.000	.00	0 .0
.717	.0776					.0109	.01	1.14	1.49	.67	.013	.00	.00	PIPE
1062.760	613.455	1.184	614.639	15.06	7.77	.94	615.58	.00	1.40	1.97	2.000	.000	.00	0 .0
.549	.0776					.0096	.01	1.18	1.38	.67	.013	.00	.00	PIPE
1063.308	613.498	1.232	614.730	15.06	7.41	.85	615.58	.00	1.40	1.95	2.000	.000	.00	0 .0
.370	.0776					.0085	.00	1.23	1.28	.67	.013	.00	.00	PIPE
1063.678	613.527	1.284	614.811	15.06	7.07	.78	615.59	.00	1.40	1.92	2.000	.000	.00	0 .0
.236	.0776					.0076	.00	1.28	1.18	.67	.013	.00	.00	PIPE

Program Package Serial Number: 1265

WATER SURFACE PROFILE LISTING Date: 9-26-2022 Time:11:51: 5

SAN MARCOS OFF-SITE STORM DRAIN ANALYSIS, LAT-4

DESIGNED BY DEA, BY 09-26-2022

100-YEAR STORM

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip

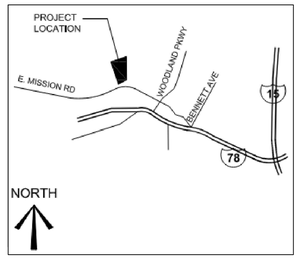
L/Elem	Ch Slope				SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1063.914	613.545	1.338	614.883	15.06	6.74	.70	615.59	.00	1.40	1.88	2.000	.000	.00	0	.0
.066	.0776				.0067	.00	1.34	1.09	.67	.013	.00	.00	PIPE		
1063.980	613.550	1.399	614.948	15.06	6.42	.64	615.59	.00	1.40	1.83	2.000	.000	.00	0	.0

Appendix D:

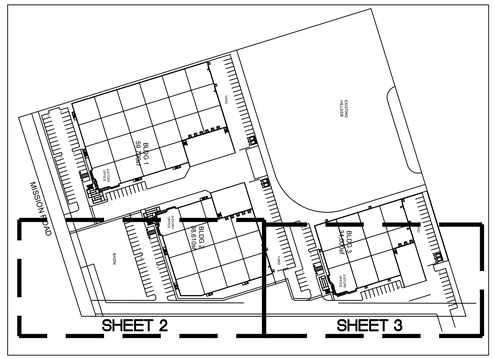
Storm Drain Improvement Plans

CITY OF SAN MARCOS

60% IMPROVEMENT PLANS FOR
MULBERRY DRAINAGE IMPROVEMENTS PROJECTS



VICINITY MAP
N.T.S.



LOCATION MAP
N.T.S.

WORK TO BE DONE

THE IMPROVEMENTS CONSISTS OF THE FOLLOWING WORK TO BE DONE IN ACCORDANCE WITH THE LATEST EDITION OF THE FOLLOWING DOCUMENTS:

1) SAN DIEGO AREA REGIONAL STANDARD DRAWINGS
2) 2015 STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION ("GREEN BOOK")
3) CITY OF SAN MARCOS SUPPLEMENT TO THE 2015 GREENBOOK ("STANDARD SPECIAL PROVISIONS")
3) CITY OF SAN MARCOS GRADING AND EXCAVATION ORDINANCE
4) CITY OF SAN MARCOS TRAFFIC SIGNAL MANUAL FOR NEW SIGNAL DESIGNS AND INSTALLATIONS
5) STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION (CALTRANS) STANDARDS PLANS
6) STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION (CALTRANS) STANDARD SPECIFICATIONS
7) STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION SUPPLEMENTAL TO MUTCD
8) VALLECITOS WATER DISTRICT STANDARD DRAWINGS AND SPECIFICATIONS

LEGEND

ITEM	QTY	STD DWG	SYMBOL
PROPERTY LINE			
STORM DRAIN PIPE			
STORM DRAIN MANHOLE			
EXISTING CURB AND GUTTER			
EXISTING FENCE			
EXISTING WATER			W
EXISITNG SEWER			S
EXISTING GAS			G
EXSITING TELECOMMUNICATIONS			T
EXISTING ELECTRICAL			E

IMPROVEMENT NOTES

1. The structural sections shown on these plans are based on R-value tests or minimum structural standards required by the City, whichever is greater. Actual structural sections will be determined after the "R" value test has been conducted by a qualified geotechnical engineer on the prepared sub_base material. The "R" value test and recommended engineered structural section must be approved by the Public Works Director prior to the installation of base and paving materials. Structural sections shall be designed in accordance with Chapter 600 of the Caltrans Highway Design Manual. Structural sections shall be noted on the "As_built" drawings.

   This note will not apply to those areas where grading is minimal and "R" values can be obtained prior to plan approval. All existing streets shall be core tested to determine the existing structural section and to determine the extent of overlay or reconstruction necessary to achieve the required "R" values, tests shall be performed at locations approved by the Public Works Director.

2. All electrical, telephone and cable television utilities shall be constructed/converted to underground. The relocation and/or undergrounding of existing and new utilities shall be done by the developer of the property at no cost to the City.

3. All underground utilities and laterals shall be installed before construction of the curb and gutter or surfacing of streets.

4. A permit shall be obtained from the City of San Marcos for any excavation and/or construction within the proposed project and public right-of-way.

5. Contractor shall notify the assigned City of San Marcos Public Works Inspector 48-hours prior to the beginning of any grading/construction.

6. Precise locations/elevations of the existing underground utilities are not known. The Contractor shall be solely responsible for making sufficient explorations to locate all utilities and substructures whether shown on the plans or not and to protect them from any possible damage prior to and during construction. The expense of repair or replacement of said utilities and substructures shall be borne by the Contractor. Contractor shall notify the Engineer-of-Work of any potential conflicts sufficiently in time for construction changes to be made and approved.

7. The Contractor shall contact the Underground Service Alert at 1-800-422-4133 at least 48 hours prior to excavating to verify the locations of underground facilities of the following utilities:

   Cox Communications or Adelphia Communications
   Pacific Bell/SBC
   San Diego Gas & Electric/Sempra
   Vallecitos Water District

   A Dig Alert Identification Number must be issued before a "Permit to Excavate" is valid per Government Code section 4216/4217.

8. An AS-BUILT drawing shall be submitted for all public improvements prior to acceptance of said improvements.

9. The Engineer-of-Work shall be notified when construction commences.

10. Contractor shall be responsible for all construction/grading of slopes, pads, street grades and infrastructure improvements according to these plans. The Engineer-of-Work shall be contacted when changes or additions made during the progress of construction or if there is a misunderstanding of these plans or field stakes and an interpretation is needed. Certification from the registered civil engineer stating that the grading has been completed per the approved plan, and the compaction report from the geotechnical engineer on any required fill areas shall be provided prior to building permits being issued.

11. Contractor shall be responsible for protecting any monumentation and/or benchmarks. Any monumentation and/or benchmarks which are disturbed or destroyed by construction shall be replaced at the contractor's expense. Such points shall be referenced and replaced with appropriate monumentation by a licensed land surveyor or a registered civil engineer authorized to practice land surveying. A Corner Record or Record of Survey, as appropriate, shall be filed by the licensed land surveyor or registered civil engineer as required by the Land Surveyor's Act.

12. All existing features and structures in conflict with these plans shall be relocated or removed at the developer's expense.

13. Minimum 90% compaction is required in all on-site fill areas with a minimum of 95% compaction six inches (6") below finished subgrade in a public street.

14. All public improvements shown on these improvement plans shall be constructed to the satisfaction of the Public Works Director prior to occupancy of any building.

15. All operations conducted on the premises, including the warming up, repair, arrival, departure or running of any equipment shall be limited to the hours of 7:00 a.m. to 4:30 p.m., Monday through Friday. No work shall be performed on the premises on Saturday, Sunday or holidays.

16. No private irrigation mains or control valves shall be placed within the public right_of_way.

17. Curb ramps shall be installed at all curb returns per Title 24, Part 2, State Chapter 71, Site Development Requirements for Handicapped Accessibility, Section 7103, Curb Ramps, of the California Building Code.

18. All trench excavation and backfill in the public right_of_way shall conform to the requirements of the City's Street Excavation Ordinance No. 2003-1196 subject to approval from the Public Works Inspector.

19. These plans have been examined by the City's Engineering Division to insure compliance with general engineering standards and the City's design standards and specifications.

20. The Engineer-of-Work shall bear the sole responsibility of the mathematical data and accuracy of design shown hereon.

21. If the improvements shown on this plan have not been constructed and accepted by the City within two (2) years of the date of plan approval by the City Engineer, these plans will be subject to review by the City's Engineering Division for conformance with current City standards, policies and/or additional requirements.

22. The Contractor shall be responsible for the installation, relocation or replacement of all striping, signing or traffic detector loops as required by the Public Works Director.

23. Street signing and striping are the responsibility of the contractor and are subject to City of San Marcos Public Works Department approval.

24. Dust control measures, such as the periodic wetting down of the bare and exposed areas, shall be used at all times during construction to the satisfaction of the Public Works and/or Building Inspectors.

25. The Contractor is advised that he is responsible for maintaining the adjoining public streets and right-of-ways in a clean and dust free condition within the limitation of the City Municipal Code Section 14.15.030 "Illicit Discharges Prohibited." This section of the Code prohibits the "washing down" of a street into a public storm drain. The continuous use of street sweeping machines may be advisable.

26. The Engineer-of-Work is not responsible for grading operations or grading done. The Contractor is solely responsible.

27. A permit must be obtained from the San Marcos Fire Department prior to any blasting. City permits are required prior to any construction, excavation, storage of materials or any other encroachments.

28. Contractor agrees that he shall assume sole and complete responsibility for job site conditions during the course of construction of this project, including the safety of all persons and property. This requirement shall apply continually and not be limited to normal working hours. The Contractor shall defend, indemnify and hold the owner, the engineer and the City harmless from any and all liability, real or alleged, in connection with the performance of work on this project excepting for liability arising from the sole negligence of the owner, engineer or City.

29. Erosion control, including rip-rap, interim slope protection, sandbags or other erosion control measures shall be provided as necessary to control sediment and silt from the project. The Contractor shall be responsible for maintaining all erosion control facilities throughout the development of the project.

30. A traffic control plan, including the layout of construction warning and detour signs, shall be submitted to the Public Works Department for approval a minimum of 14 days prior to the commencement of construction. Traffic control shall be implemented before any work is started.

31. Fire sprinklers are required on all homes on lots _____ through _____.

32. All lots requiring fire sprinklers must have a minimum _____" water meter.

33. In no case shall the City be responsible for construction costs for these improvements, including the undergrounding of existing and new dry utilities, or any necessary repairs.

CONT. IMPROVEMENT NOTES

34. Fire Hydrants shall be as follows:
    - Residential "single family detached dwellings" Jones 3700 or Clow 2050, one 4" and one 2 ½" outlets.
    - Multi-Residential, commercial & Industrial Jones 3775 or Clow 2065, two 4" and one 2 ½" outlets.

EROSION CONTROL NOTES

1. In case emergency work is required, contact _____ at _____, phone no. _____
2. Equipment and workers for emergency work shall be made available at all times during the rainy season. All necessary materials shall be stockpiled on site at convenient locations to facilitate rapid construction of temporary erosion control devices when rain is imminent.
3. Erosion control devices shown on plans shall not be moved or modified without the approval of the Public Works Inspector.
4. The Contractor shall restore all erosion control devices to working order, including silt and other debris removal, to the satisfaction of the Public Works Inspector after each run-off producing rainfall.
5. The Contractor shall install additional erosion control measures as may be required by the Public Works Inspector due to uncompleted grading operations or unforeseen circumstances which may arise.
6. The Contractor shall be responsible and shall take necessary precautions to prevent public trespass onto areas where impounded waters create a hazardous condition.
7. All erosion control measures provided per the approved grading plan shall be incorporated hereon.
8. Graded areas around the project perimeter must drain away from the face of slope at the conclusion of each working day.
9. All removable protective erosion control devices shown shall be in place at the end of each working day when the five-day rain probability forecast exceeds 40%.
10. All gravel bags shall be burlap type with ¾" inch minimum aggregate.
11. Should germination of hydroseeded slopes fail to provide effective coverage (90%) of graded slopes prior to November 15, the slopes shall be stabilized by punch straw.

SITE ADDRESS AND ASSESSOR PARCEL NUMBERS

528 MISSION RD
SAN MARCOS, CA 92069

ASSESSOR PARCEL NO(S): 220-210-26-00

BASIS OF BEARING

BASIS OF BEARING PER XXXXXXXXXX

SOURCE OF TOPO

FIELD SURVEY CONDUCTED BY XXXXXXXXXXXXXX
ON XXXX XX, 20XX .

HYDROLOGY/HYDRAULIC REPORT

THE HYDROLOGY/ HYDRAULIC REPORT WAS PERPARED BY XXXXXXXXXXXX (MONTH 20XX)

SHEET INDEX

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	STORM DRAIN PLAN & PROFILE
3	STORM DRAIN PLAN & PROFILE

DAVID EVANS AND ASSOCIATES INC.
4141 E. Inland Empire Blvd, Suite 250
Ontario, California 91764
Phone: 909.481.5750
Email: jmensen@deainc.com

SAN MARCOS FIRE DEPARTMENT	VALLECITOS WATER DISTRICT	ENGINEER OF WORK
By: _____ Jason Nailon, Fire Marshal	By: _____	By: _____ Date: _____
Date: _____	Date: _____	Name: JODI L. MENSEN
		R.C.E.: 79693 exp: _____

CITY APPROVED CHANGES

No.	Description	App'd By	Date

RECOMMENDED FOR APPROVAL
By: _____
Stephanie Kellar, Principal Civil Engineer
R.C.E.: 71461 exp.: 12/31/2021
Date: _____

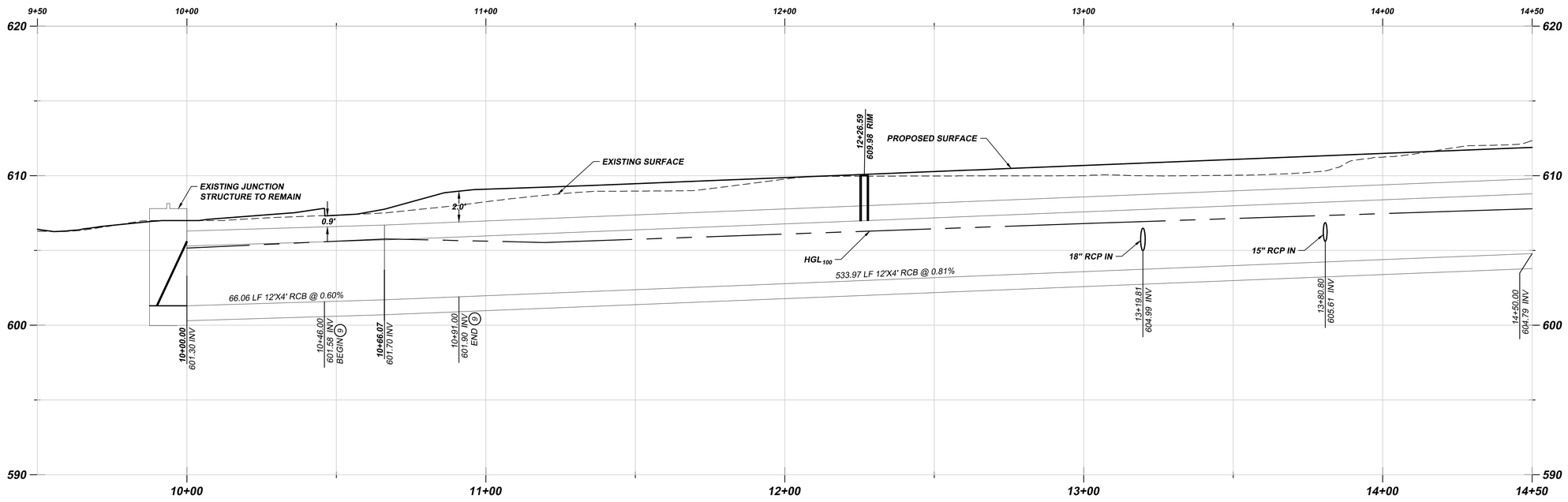
APPROVED FOR CONSTRUCTION
By: _____
Isaac Etchamendy, City Engineer
R.C.E.: 81294 exp.: 9/30/2021
Date: _____

BENCH MARK
Description: _____
Location: _____
Record From: Record of Survey 23731
Elev.: _____ Datum: NAVD88

CITY OF SAN MARCOS
IMPROVEMENT PLANS FOR:
MULBERRY DRAINAGE IMPROVEMENTS PROJECTS

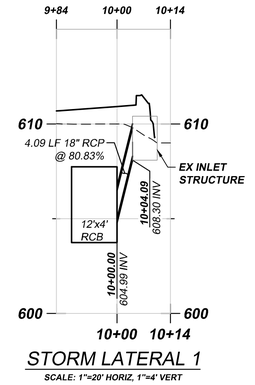
City Drawing No.

Sheet 1 of 3



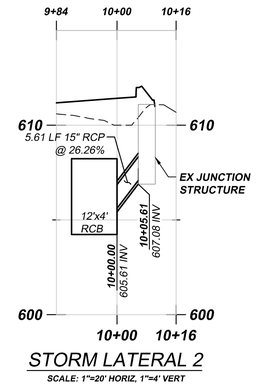
CITY SD MAIN

SCALE: 1"=20' HORIZ, 1"=4' VERT



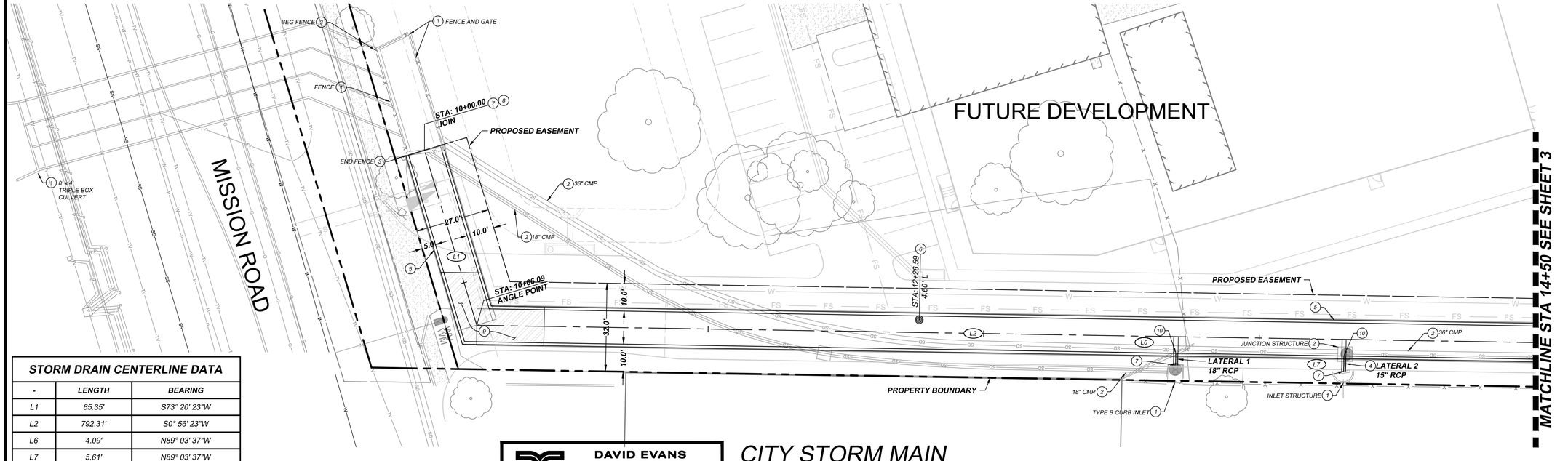
STORM LATERAL 1

SCALE: 1"=20' HORIZ, 1"=4' VERT



STORM LATERAL 2

SCALE: 1"=20' HORIZ, 1"=4' VERT



CITY STORM MAIN

HORIZONAL SCALE 1" = 20'
VERTICAL SCALE 1" = 4'

STORM DRAIN CENTERLINE DATA

-	LENGTH	BEARING
L1	65.35'	S73° 20' 23"W
L2	792.31'	S0° 56' 23"W
L6	4.09'	N89° 03' 37"W
L7	5.61'	N89° 03' 37"W

CONSTRUCTION NOTES

1. PROTECT IN PLACE.
2. REMOVE AND DISPOSE.
3. REMOVE AND SALVAGE.
4. REMOVE AND REPLACE.
5. 12'X4' REINFORCED CONCRETE BOX PER SDRSD PLAN D-76.
6. INSTALL 24" MANHOLE ON REINFORCED CONCRETE BOX PER SPPWC PLAN 323-2.
7. MAKE COMPATIBLE CONNECTION TO EXISTING DRAINAGE STRUCTURE.
8. INSTALL TRASH RACK PER SPPWC PLAN 360-2.
9. 12'X4' REINFORCED CONCRETE BOX PER CALTRANS STANDARD PLAN D80.
10. RCP CONNECTION TO RCB PER SPPWC PLAN 333-2.

20 0 20 40
scale 1"= 20' feet

DAVID EVANS AND ASSOCIATES INC.
4141 E. Inland Empire Blvd, Suite 250
Ontario, California 91764
Phone: 909.481.5750
Email: jmensen@deainc.com

SAN MARCOS FIRE DEPARTMENT	VALLECITOS WATER DISTRICT	ENGINEER OF WORK
By: _____ Jason Nailon, Fire Marshal	By: _____	By: _____ Date: _____
Date: _____	Date: _____	Name: JODI L. MENSON
		R.C.E.: #79693 exp: _____

CITY APPROVED CHANGES			
No.	Description	App'd By	Date

RECOMMENDED FOR APPROVAL	APPROVED FOR CONSTRUCTION
By: _____ Peter Kuey, Principal Civil Engineer	By: _____ Michael D. Edwards, City Engineer
R.C.E.: 44034 exp.: 06/30/2015	R.C.E.: 32977 exp.: 06/30/2016
Date: _____	Date: _____

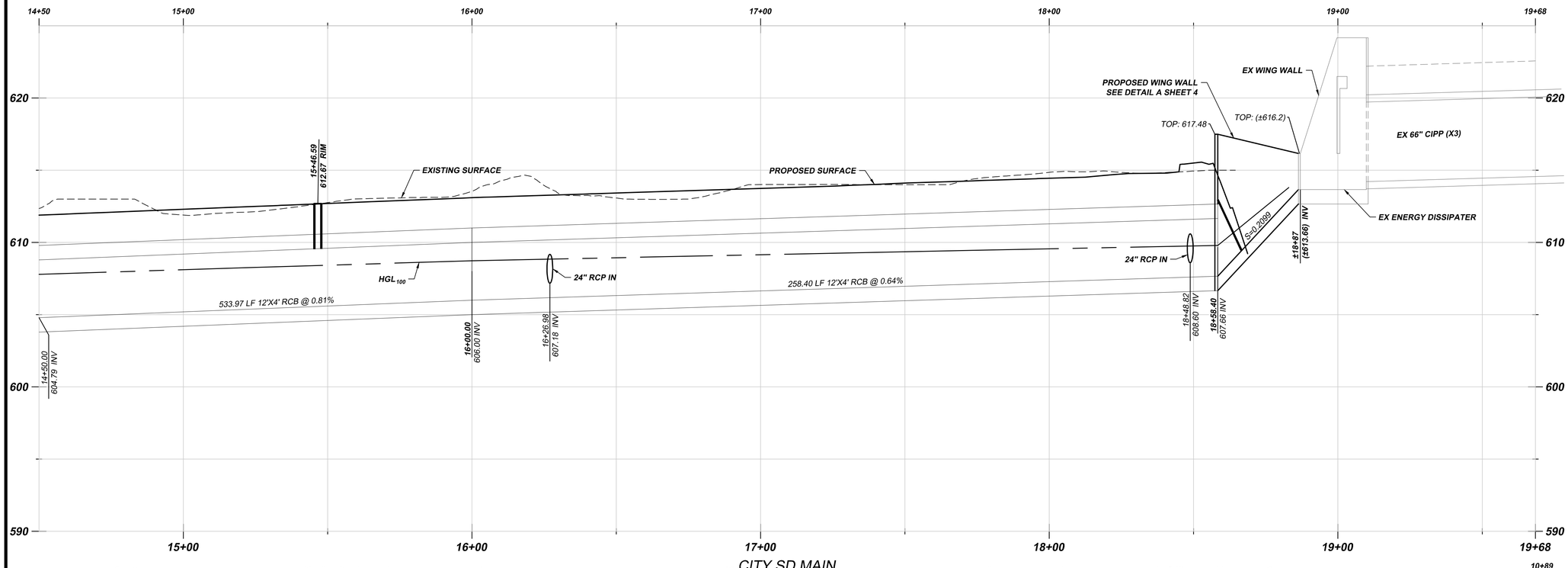
BENCH MARK
Description: _____
Location: _____
Record From: Record of Survey 13928
Elev.: _____ Datum: NAVD88

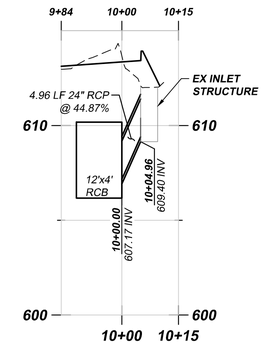
CITY OF SAN MARCOS
DRAINAGE PLAN FOR:
MULBERRY DRAINAGE IMPROVEMENTS PROJECTS

City Drawing No.

Sheet 2 of 3

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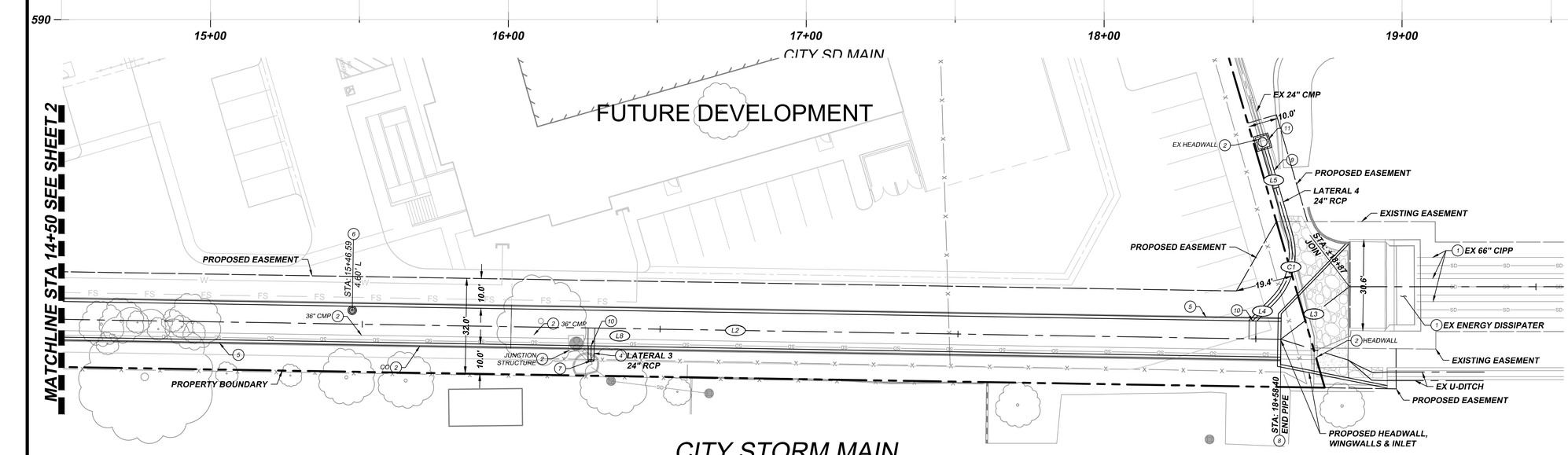


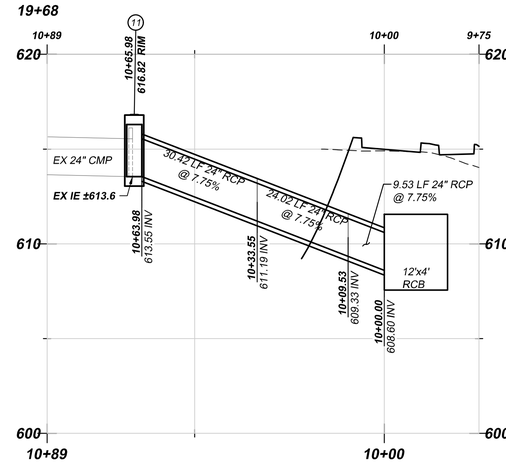
STORM LATERAL 3

SCALE: 1"=20' HORIZ, 1"=4' VERT

CONSTRUCTION NOTES

1. PROTECT IN PLACE.
2. REMOVE AND DISPOSE.
3. REMOVE AND SALVAGE.
4. REMOVE AND REPLACE
5. 12'X4' REINFORCED CONCRETE BOX PER SDRSD PLAN D-76.
6. INSTALL 24" MANHOLE ON REINFORCED CONCRETE BOX PER SPPWC PLAN 323-2.
7. MAKE COMPATIBLE CONNECTION TO EXISTING DRAINAGE STRUCTURE.
8. INSTALL TRASH RACK PER SPPWC PLAN 360-2.
10. RCP CONNECTION TO RCB PER SPPWC PLAN 333-2.
11. CONNECT TO EXISTING 24" CMP WITH TYPE A4 CLEANOUT PER SDRSD PLAN D-09.





STORM LATERAL 4

SCALE: 1"=20' HORIZ, 1"=4' VERT

CITY STORM MAIN

HORIZONAL SCALE 1" = 20'
VERTICAL SCALE 1" = 4'

DAVID EVANS AND ASSOCIATES INC.
4141 E. Inland Empire Blvd, Suite 250
Ontario, California 91764
Phone: 909.481.5750
Email: jmensen@deainc.com

20 0 20 40
scale 1"= 20' feet

STORM DRAIN CENTERLINE DATA

-	LENGTH	BEARING
L2	792.31'	S0° 56' 23"W
L3	29.01'	S37° 26' 52"E
L4	9.53'	S45° 02' 58"E
L5	30.42'	N73° 47' 38"E
L8	4.96'	N89° 03' 37"W

STORM DRAIN CENTERLINE CURVE DATA

-	RADIUS	LENGTH	DELTA
C1	22.50'	24.02'	Δ=61°09'24"

SAN MARCOS FIRE DEPARTMENT	VALLECITOS WATER DISTRICT	ENGINEER OF WORK
By: Jason Nailon, Fire Marshal	By:	By: Date:
Date:	Date:	Name: JODI L. MENSON
		R.C.E.: #79693 exp:

CITY APPROVED CHANGES			
No.	Description	App'd By	Date

RECOMMENDED FOR APPROVAL	APPROVED FOR CONSTRUCTION
By: Peter Kuey, Principal Civil Engineer	By: Michael D. Edwards, City Engineer
R.C.E.: 44034 exp.: 06/30/2015	R.C.E.: 32977 exp.: 06/30/2016
Date:	Date:

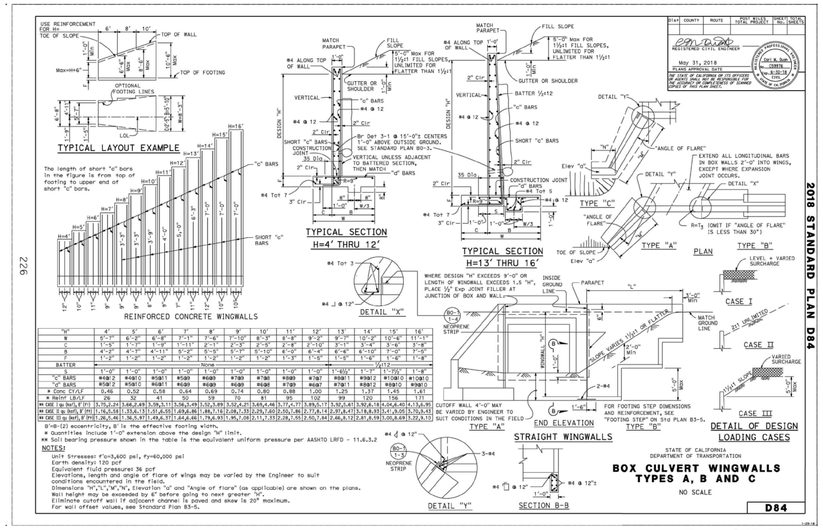
BENCH MARK
Description:
Location:
Record From: Record of Survey 13928
Elev.: Datum: NAVD88

CITY OF SAN MARCOS
DRAINAGE PLAN FOR:
MULBERRY DRAINAGE IMPROVEMENTS PROJECTS

City Drawing No.

Sheet 3 of 3

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"H"	4'	5'	6'	7'	8'	9'	10'	11'	12'	13'	14'	15'	16'
A	5'-3"	6'-0"	6'-9"	7'-1"	7'-6"	8'-0"	8'-3"	8'-6"	8'-9"	9'-0"	9'-3"	9'-6"	9'-9"
B	1'-5"	1'-7"	1'-9"	1'-11"	2'-1"	2'-3"	2'-5"	2'-8"	2'-10"	3'-0"	3'-2"	3'-4"	3'-6"
C	4'-0"	4'-0"	4'-11"	5'-2"	5'-5"	5'-9"	5'-10"	6'-0"	6'-1"	6'-3"	6'-5"	6'-7"	7'-0"
D	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"
BATTER	Note										Note		
	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-00V	1'-3"	11"/V
"c" BARS	#4@2	#4@C	#5@1	#5@1	#6@2	#7@3	#7@2	#8@3	#7@7	#8@7	#9@12	#10@12	#10@C
"c" BARS	#5@2	#5@C	#6@1	#6@1	#6@2	#6@3	#6@2	#7@3	#6@7	#7@11	#8@12	#8@10	#9@10
* Conc Cy/Lf	0.48	0.52	0.58	0.64	0.69	0.74	0.80	0.88	1.00	1.25	1.37	1.45	1.61
* Reinf LB/Lf	20	32	41	50	59	70	81	92	102	99	120	156	171
** CBC || to Ref'd F'ft	3,15,2,2,4	3,6,6,2,4	5,9,5,1,11	5,9,6,3,13	5,10,5,3,9	5,10,6,4,21	5,8,6,4,18	5,11,7,4,17	5,11,8,5,17	5,10,7,4,31	5,10,9,5,28	5,10,10,6,40	4,11,6,5,35
** CBC ⊥ to Ref'd F'ft	1,16,5,5,8	1,33,6,4,13	1,51,8,5,55	1,69,8,8,61	1,89,7,10,29	1,113,9,13,29	1,139,11,16,29	1,172,8,14,29	1,207,8,17,29	1,248,9,20,29	1,293,10,23,29	1,343,11,26,29	1,398,12,29,29
** CBC || to Ref'd F'ft	1,26,5,4,13	1,56,5,6,37	1,89,6,8,55	1,124,8,11,55	1,164,9,14,55	1,208,10,17,55	1,257,12,20,55	1,312,13,24,55	1,372,15,28,55	1,438,16,32,55	1,510,18,37,55	1,588,20,41,55	1,672,21,46,55

B'=B-(2) eccentricity, B' is the effective footing width.
* Quantities include 1'-0" extension above the design "H" limit.
** Soil bearing pressure shown in the table is the equivalent uniform pressure per AASHTO LRFD - 11.6.3.2

NOTES:
Unit Stresses: f'c=3,600 psi, fy=60,000 psi
Earth density: 120 pcf
Equivalent fluid pressures 36 pcf
Elevations, length and angle of flare of wings may be varied by the Engineer to suit conditions encountered in the field.
Dimensions "H","L","W","N", Elevation "a" and "Angle of flare" (as applicable) are shown on the plans.
Wall height may be exceeded by 6" before going to next greater "H".
Eliminate cutoff wall if adjacent channel is paved and skew is 20° maximum.
For wall offset values, see Standard Plan B3-5.

2018 STANDARD PLAN D84

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Return to Table of Contents

DAVID EVANS AND ASSOCIATES INC.
4141 E. Inland Empire Blvd, Suite 250
Ontario, California 91764
Phone: 909.481.5750
Email: jmensen@deainc.com

SAN MARCOS FIRE DEPARTMENT	VALLECITOS WATER DISTRICT	ENGINEER OF WORK	CITY APPROVED CHANGES	RECOMMENDED FOR APPROVAL	APPROVED FOR CONSTRUCTION	BENCH MARK	CITY OF SAN MARCOS	City Drawing No.
By: Jason Nailon, Fire Marshal	By:	By: Date:	No. Description App'd By Date	By: Peter Kuey, Principal Civil Engineer	By: Michael D. Edwards, City Engineer	Description:	DRAINAGE PLAN FOR:	
Date:	Date:	Name: JODI L. MENSON		R.C.E.: 44034 exp.: 06/30/2015	R.C.E.: 32977 exp.: 06/30/2016	Location:	MULBERRY DRAINAGE IMPROVEMENTS PROJECTS	
		R.C.E.: #79693 exp:		Date:	Date:	Record From: Record of Survey 13928		
						Elev.: Datum: NAVD88		Sheet 4 of 4

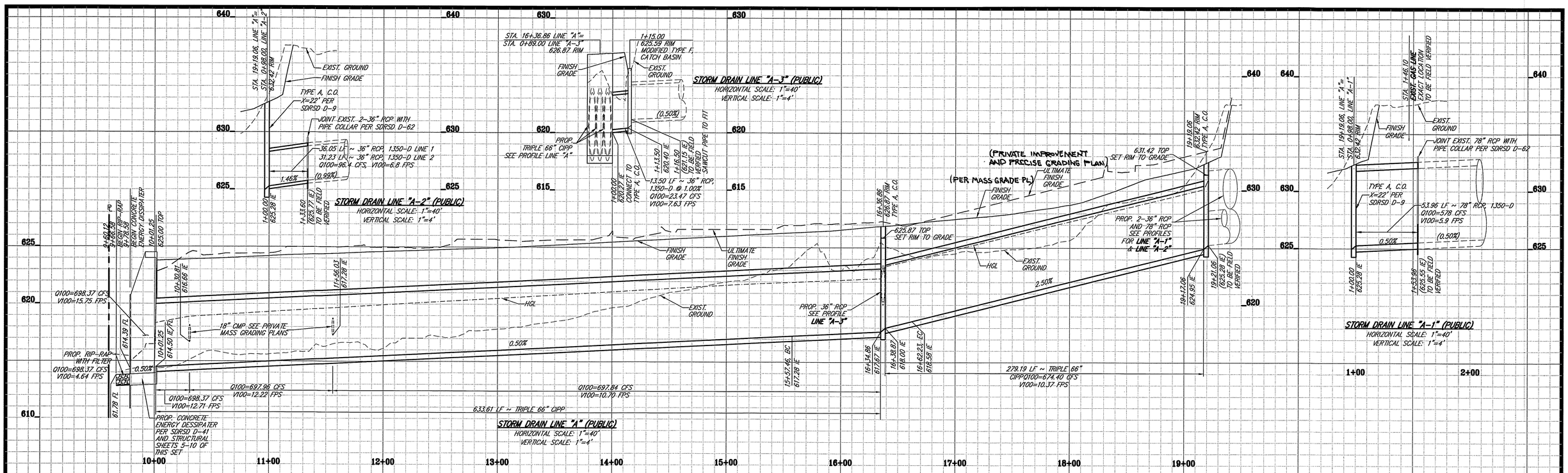
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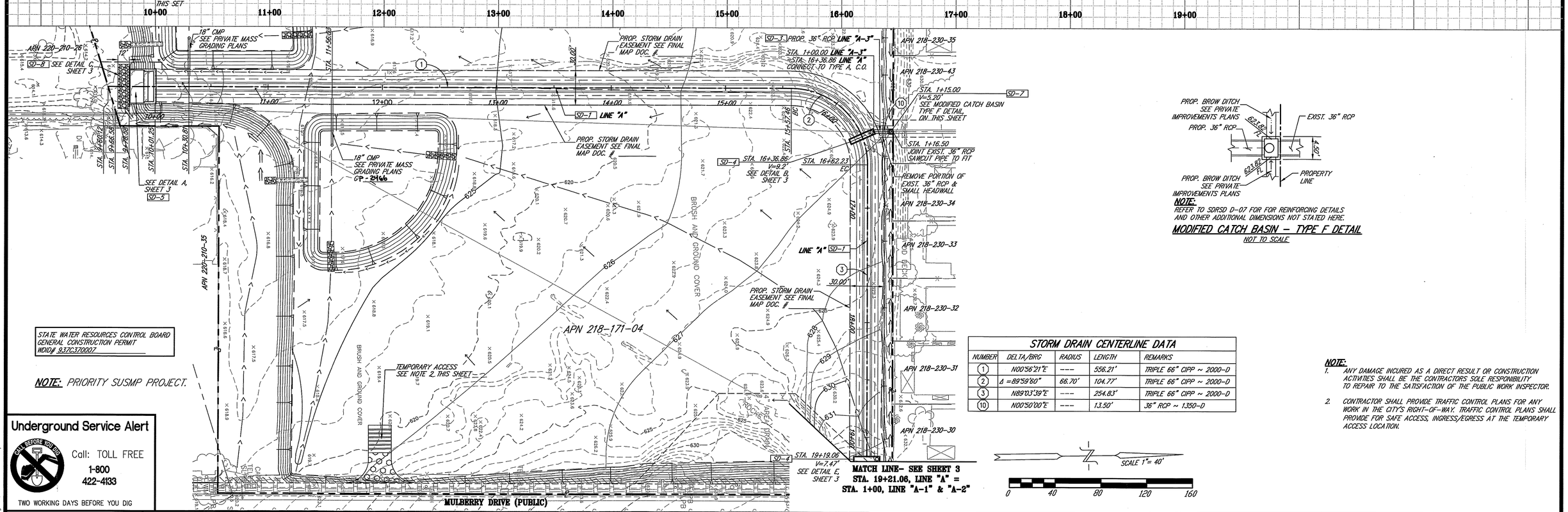
Appendix E:

References:

1. Off-Site Storm Drain Information

2. Drainage Concept Study of the Industrial site





PROP. BROW DITCH SEE PRIVATE IMPROVEMENTS PLANS
PROP. 36" RCP
EXIST. 36" RCP
623.82 FL
623.82 FL
1.67'
PROP. BROW DITCH SEE PRIVATE IMPROVEMENTS PLANS
PROPERTY LINE

NOTE:
REFER TO SDRSD D-07 FOR FOR REINFORCING DETAILS AND OTHER ADDITIONAL DIMENSIONS NOT STATED HERE.

MODIFIED CATCH BASIN – TYPE F DETAIL
NOT TO SCALE

STORM DRAIN CENTERLINE DATA

NUMBER	DELTA/BRG	RADIUS	LENGTH	REMARKS
1	N00°56'21"E	---	556.21'	TRIPLE 66" CIPP ~ 2000-D
2	Δ = 89°59'60"	66.70'	104.77'	TRIPLE 66" CIPP ~ 2000-D
3	N89°03'39"E	---	254.83'	TRIPLE 66" CIPP ~ 2000-D
10	N00°50'00"E	---	13.50'	36" RCP ~ 1350-D

STATE WATER RESOURCES CONTROL BOARD GENERAL CONSTRUCTION PERMIT WDID# 937C370007

NOTE: PRIORITY SUSMP PROJECT.

NOTE:
1. ANY DAMAGE INCURED AS A DIRECT RESULT OR CONSTRUCTION ACTIVITIES SHALL BE THE CONTRACTORS SOLE RESPONIBILITY TO REPAIR TO THE SATISFACTION OF THE PUBLIC WORK INSPECTOR.
2. CONTRACTOR SHALL PROVIDE TRAFFIC CONTROL PLANS FOR ANY WORK IN THE CITY'S RIGHT-OF-WAY. TRAFFIC CONTROL PLANS SHALL PROVIDE FOR SAFE ACCESS, INGRESS/EGRESS AT THE TEMPORARY ACCESS LOCATION.

Underground Service Alert
CALL BEFORE YOU DIG
Call: TOLL FREE
1-800
422-4133
TWO WORKING DAYS BEFORE YOU DIG

SAN MARCOS FIRE DEPARTMENT	VALLECITOS WATER DISTRICT	ENGINEER OF WORK	CITY APPROVED CHANGES	RECOMMENDED FOR APPROVAL	APPROVED FOR CONSTRUCTION	BENCH MARK
By: N/A ROBERT SCOTT, Fire Marshal Date:	By: KEN GERDES DATE: 8/19/14 R.C.E. 39307 EXP: 12-31-14	EFS Drawn By By: Date: 8/13/14 Name: ROBERT D. DENTINO R.C.E.: 45629 exp: 12-31-14	No. / Description / City / VWD / Date	By: PETER KUEY, PRINCIPAL CIVIL ENGINEER R.C.E.: 44034 exp.: 06-30-2015 Date: 8-20-14	By: MATT LITTLE, DEPUTY CITY ENGINEER R.C.E.: 60569 exp.: 12-31-2014 Date: 8.21.14	Description: 3" BRASS DISC STAMPED "RCE 15,382" IN 4" SQ. CONC. MON. W/ 1144/SW1A Location: AT THE CENTERLINE OF MISSION ROAD AND WOODLAND PARKWAY, BEING THE CENTERLINE WELL MONUMENT Record From: BENCH MARK RECORD OF SURVEY 13928 Elev.: 632.29 FEET Datum: NAVD 1988

CITY OF SAN MARCOS ENGINEERING DIVISION
PUBLIC STORM DRAIN IMPROVEMENTS–PLAN & PROFILE FOR: P13-0055: GPA 13-006, R 13-004 ACTIVITIES SP 13-004
MULBERRY RESIDENTIAL DEVELOPMENT MFSDP 13-002
WDID#: 937C370007 **SAN MARCOS, CALIFORNIA** TSM 13-003, NO 14-002

City Drawing No.
IP-4884
Sheet 4 of 10
VWD-144462

SAFCO PRODUCTS • NEW HOPE, MINNESOTA
REORDER BY PART NUMBER 63582
Plotted on: May 22, 2014 - 2:43pm
F:\Projects\2013\13-0055\Eng\Plans\Mulberry Residential\Mulberry Residential Sheet 4 of 10.dwg

ENGINEERING & CONSULTING

Conceptual Drainage Study

For

528 E. Mission Road, City of San Marcos

CAPROCK PARTNERS

X ENGINEERING & CONSULTING, INC.
6 Hutton Centre Drive, Suite 650
Santa Ana, California 92707
949.522.7100 | xengineeringinc.com

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1. INTRODUCTION

1.1 PROJECT SITE DESCRIPTION

The subject site consists of approximately 10.83 gross acres of land located in the City of San Marcos, California. The project site is bounded to the north by an open space area and an existing residential site, to the east by existing commercial/industrial sites, to the west by existing commercial/industrial sites, and to the south by East Mission Road. The subjecty property currently consists of four industrial buildings, work yards, and an undisturbed mound area.

1.2 PURPOSE AND METHODOLOGY

The purpose of this study is to determine the increase in peak storm flow generated from a proposed industrial development, and to provide a conceptual design of detention system to mitigate the increase in storm runoff. The area of the subject site is within the jurisdiction of the City of San Marcos, which is within San Diego County. Therefore, the San Diego County Hydrology Manual is used as a guildance in this study. This study will analyze and compare the 100-Year storm event for the existing and proposed conditions, and the outcomes will be used to size the detention system.

The computer program used to perform hydrologic calculations in this study is CivilCadd/Civil Design Engineering Software. Civil Design's Rational Method program was used to determine the peak runoffs and hydrograph for the drainage areas, and the Civil Design's Flood Hydrograph Routing Program was used to determine the adequate size of detention system.

2. HYDROLOGIC ANALYSIS

2.1 EXISTING CONDITION

In the existing condition, the subject site is averaging 1% from north to south towards East Mission Road, with the exception of the undisturbed mound area which has a maximum slope of 2:1. Based on available as-built drawings, satellite imagery, and topographic data, majority of the onsite drainage is collected by drainage swales and drain inlets, and discharges directly to the existing 8'x4' triple reinforece concrete box culvert near middle of the southern property boundary. A portion of the onsite runoff drains to either the adjacent properties or East Mission Road (node 102, node 402, and node 502). Refer to Existing Condition Rational Method Map in Attachment A for details.

Based on the Infiltration Summary prepared by LGC Geotechnical, Inc., dated July 22,2021, the subject site has extremely low infiltration rates, shallow bedrock and shallow detph to groundwater. Therefore, it is recommended against by the geotechnical engineer to implement infiltration facility for the proposed project.

Approximately 700cfs of offsite runon generated from the northern region of the subject site will not be included in this study per discussions with the client Caprock Partners. Based upon discucssions with the City of San Marcos officials, the conveyance system downstream of the subject site is inadequate to convey the peak storm flow for the master drainage area. This issue is also not a part of this study.

Drainage Area	Acreage (Acres)	100-year Peak Flow (CFS)
A	0.53	1.4
B	8.08	27.0
C	1.67	7.5
D	0.10	0.7
E	0.45	2.8
Total	10.83	39.5

2.2 PROPOSED CONDITION

In the proposed condition, the subject site is modeled as an industrial site in order to take the most conservative approach for impervious area in the hydrologic calculations. Increase in impervious area and change in site grading will increase the total peak storm flow from 39.5cfs to 72.0cfs. To mitigate the increase in peak storm flow, an underground detention basin is proposed near the entrance of the subject site to detain the additional runoff. The outflow from the detention basin will be restricted by a 27" diameter orifice and ultimately discharges to the existing 8'x4' triple reinforced concrete box culvert via a 30" diameter pipe.

Drainage Area	Acreage (Acres)	100-year Peak Flow (CFS)
A	10.83	72.0

2.2.1 MITIGATED PEAK STORM FLOWS

A 50'Wx100'Lx5'H underground detention system with a 90% porosity is proposed at the entrance of the subject site to mitigate the increase in peak storm flow. The inflow to the basin will be the unmitigated peak flow of a 100-year storm event, and the outflow from the basin will be restricted by a 27" orifice. An 1' initial depth is assumed in this routing analysis to reservse space for potential water quality needs. Based on the results, the proposed detention system is able to reduce the peak flow from 72.0 cfs to 37.0 cfs, which is a 2.5 cfs reduction as compared to the existing condition.

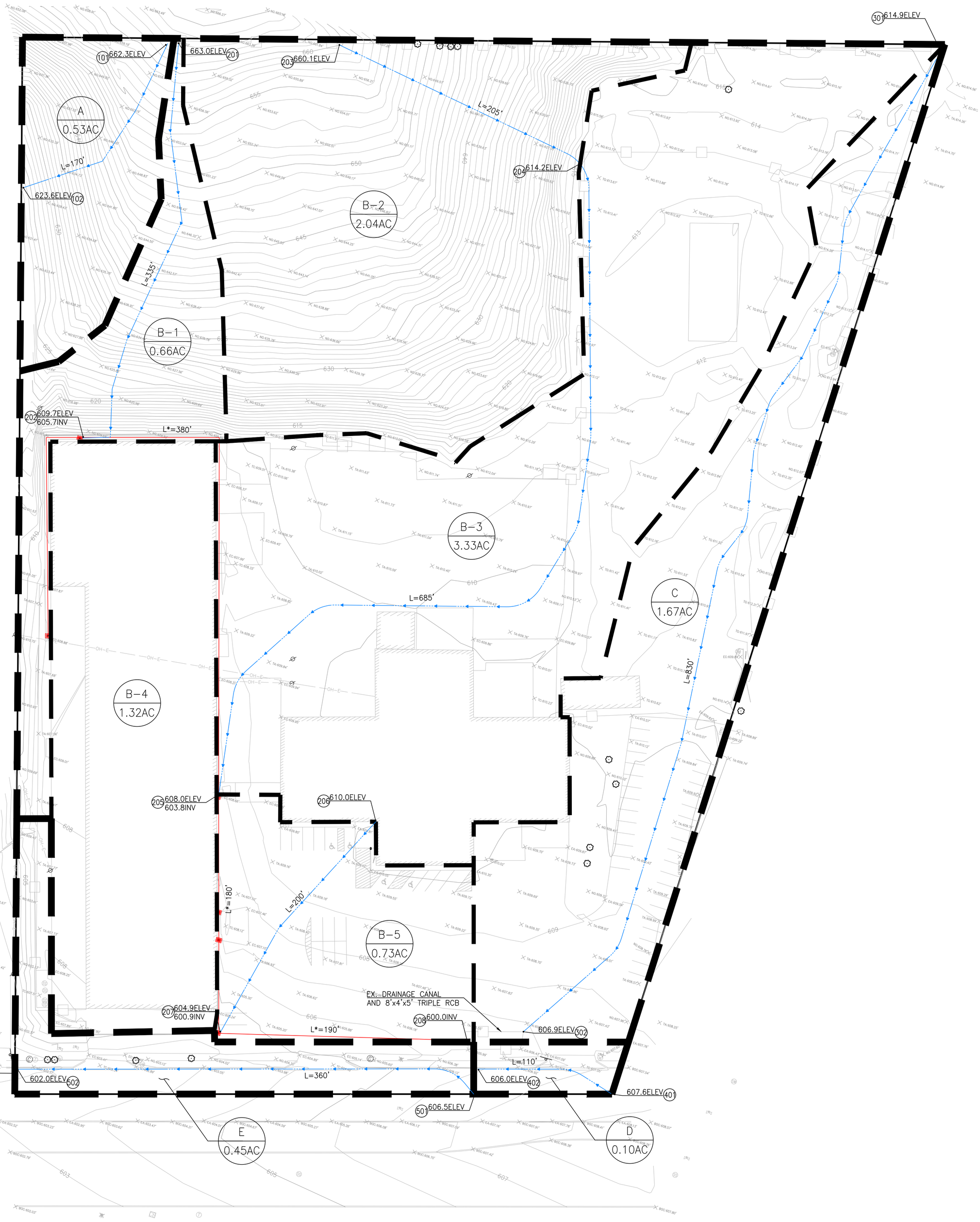
Drainage Area	Acreage (Acres)	Existing (CFS)	Proposed, Mitigated (CFS)	Delta (CFS)
A	10.83	39.5	37.0	-2.5

3. CONCLUSION

Based upon the analysis performed within this study, the proposed detention system will adequately detain the increased runoff emanating from the onsite areas of the project in the proposed condition for a 100-year storm event. This will result in no net increase in runoff from the project site as compared to the existing conditon.

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Attachment A



DRAINAGE SUMMARY

DMA	Q_{100} (CFS)	ΣA (AC)
A	1.4	0.53
B	27.0	8.08
C	7.5	1.67
D	0.7	0.10
E	2.9	0.45
TOTAL	39.5	10.83

LEGEND

- PROPOSED MAJOR AREA BOUNDARY
- PROPOSED MINOR AREA BOUNDARY
- DIRECTION OF SURFACE FLOW
- XXX.XX — PROPOSED ELEVATION
- (101) — NODE NUMBER
- PROPOSED STORM DRAIN PIPE
- CATCH BASIN
- ELEV, INV — ELEVATION, INVERT
- L=XXXX' — SURFACE FLOW PATH LENGTH
- L*=XXXX' — PIPE LENGTH
- A / 0.83 — DRAINAGE AREA DESIGNATION / ACREAGE

40' 0' 20' 40'

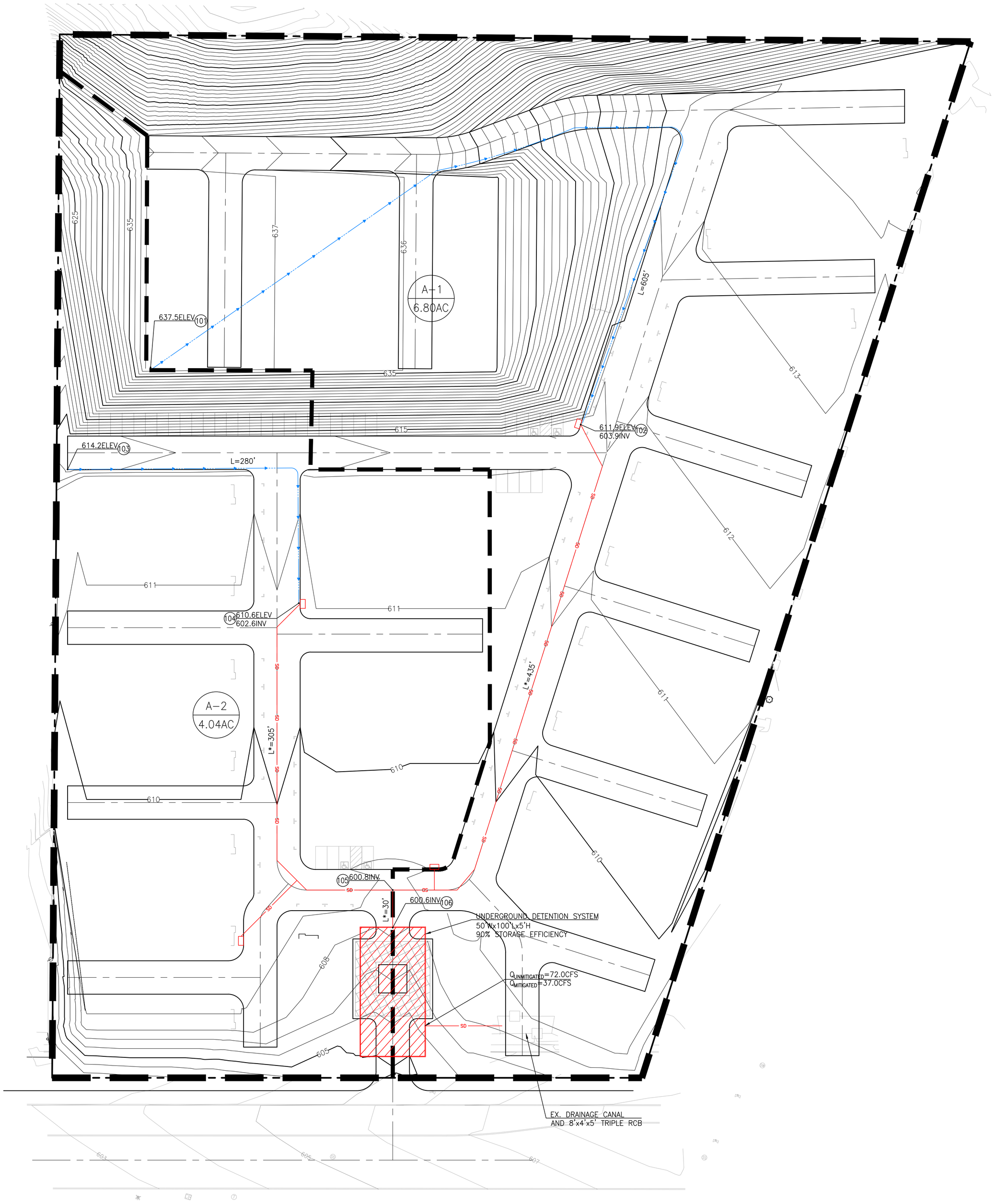
SCALE: 1" = 40'

EXISTING CONDITION RATIONAL METHOD MAP

528 E. MISSION ROAD, CITY OF SAN MARCOS
CAPROCK PARTNERS

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DRAINAGE SUMMARY

DMA	$Q_{100,\ EXISTING}$ (CFS)	$Q_{100,UNMITIGATED}$(CFS)	$Q_{100,MITIGATED}$(CFS)	ΔQ (CFS)	ΣA (AC)
A	39.5	72.0	37.0	−2.5	10.83

LEGEND

	PROPOSED MAJOR AREA BOUNDARY
	PROPOSED MINOR AREA BOUNDARY
	DIRECTION OF SURFACE FLOW
XXX.XX	PROPOSED ELEVATION
(101)	NODE NUMBER
	PROPOSED STORM DRAIN PIPE
	CATCH BASIN
ELEV, INV	ELEVATION, INVERT
L=XXXX'	SURFACE FLOW PATH LENGTH
L*=XXXX'	PIPE LENGTH
A / 0.83	DRAINAGE AREA DESIGNATION / ACREAGE

40' 0' 20' 40'

SCALE: 1" = 40'

PROPOSED CONDITION RATIONAL METHOD MAP

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