



TENTATIVE TRACT MAP 20668
PROJ-2023-00129
FINAL HYDROLOGY STUDY
PRELIM DRNSTY-2024-00059

JN: 10754
CLIENT:
J.T. SANTORI VILLA, LLC
DATE PREPARED
11/20/2024
DATE REVISED
8/21/2025



FINAL HYDROLOGY STUDY

Tent. Tract Map 20668

APN0605-051-01
Southeast Corner of Broadway and Sunever
Located in the County of San Bernardino, CA

Prelim DRNSTY-2024-00059
PROJ-2023-00129

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Section 1 - Introduction

1.1 Introduction

This report provides a for an analysis of proposed storm water infrastructure, detention facilities and the development of Tentative Tract Map No. 20668. This report provides information on proposed and existing storm flows rates, storm volumes, existing facilities, recommended facilities, and the necessary basin storage and water quality sizing criteria associated with managing the projects storm water run-off while effectively treating the quality of the storm water.

The project site is located in the Joshua Tree community within the unincorporated County of San Bernardino. The project is located South of Broadway between Laferney Avenue and Sunever Road. Figure 1.1 provides a location map for the project.

1.2 Land Use Plan

The proposed project encompasses approximately 81.2 acres. Figure 1.2 provides the development plan for the project. The proposed project consists of the development of 32 single-family lots averaging just over 2 acres. Development remains consistent with the existing Rural Living zoning. Density is currently calculated at 0.4 DU/AC and will be served by streets that will collect runoff from the lots to be conveyed to the corner of Broadway and Sunever.

1.3 Purpose of Study

The purpose of this study is to substantiate the hydrology and hydraulic design of the residential development known as Tentative Tract Map No. 20668. This study will analyze the pre-development and post-development storm water run-on and run-off values and propose storm water design recommendations to ensure the adequate size, volumes, and proper operation of drainage facilities for the proposed project while not adversely affecting downstream facilities and maintaining the conveyance of 100-year storm flows for on-site facilities. Along with the standard analysis of a typical report, this report outlines the specific analysis and back-up calculations necessary for determining the hydrology and hydraulics of the development such that the post-developed condition is equal to or improved when compared to pre-developed condition.

1.4 Regional Hydrology

The project site lies within the Mojave Desert in Southern San Bernardino County. It is roughly 3 miles north of the Joshua Tree National Park and 1.8 Miles North of State Route 62. There are minimal drainage features in the area that are typical for desert regions, this includes alluvial fans and dry stream beds. The flow for the Joshua Tree basin is impeded by the Copper Mountain creating the Coyote Lake (dry) roughly 2.6 miles east.

Figure 1.1 Location Map

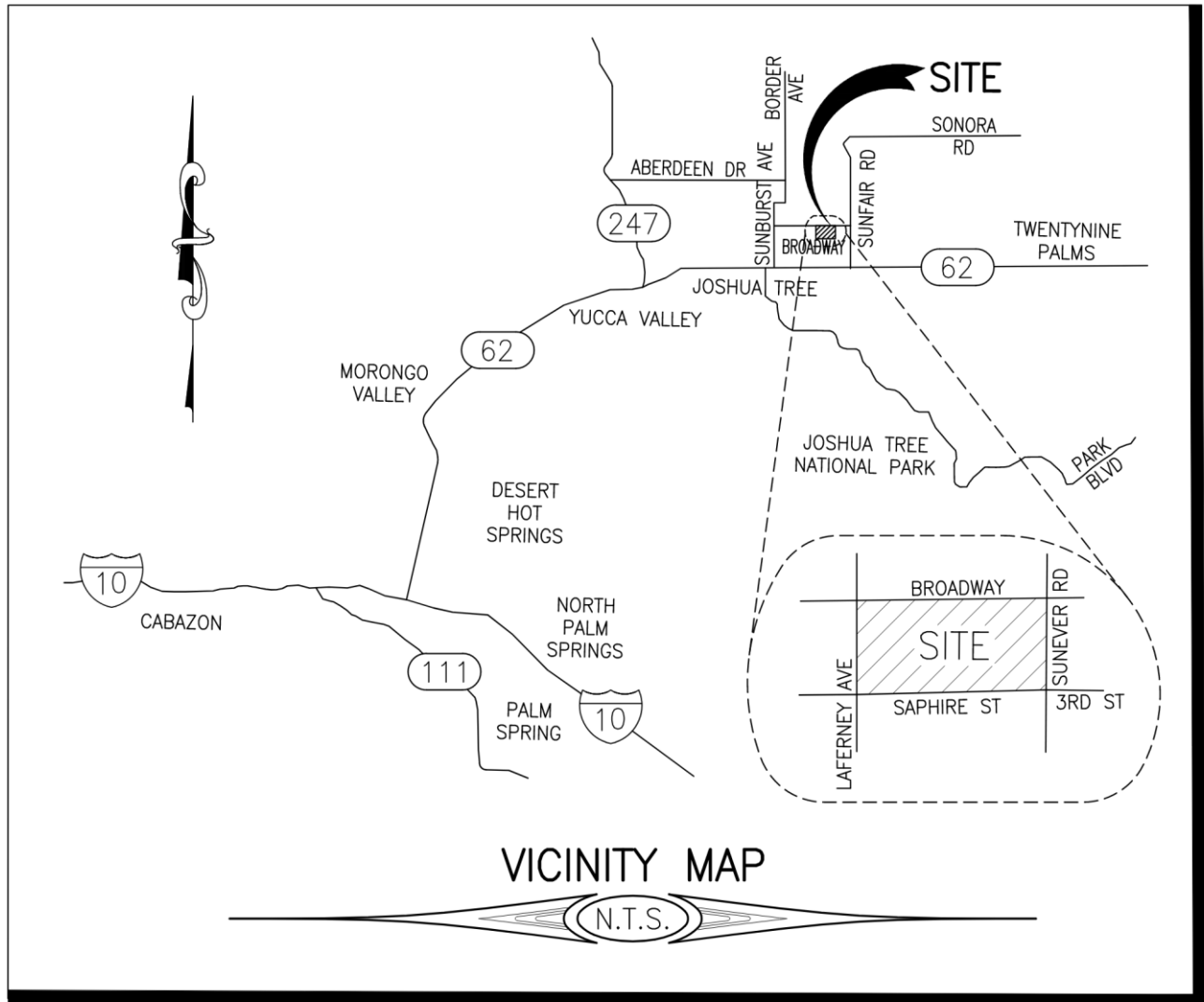
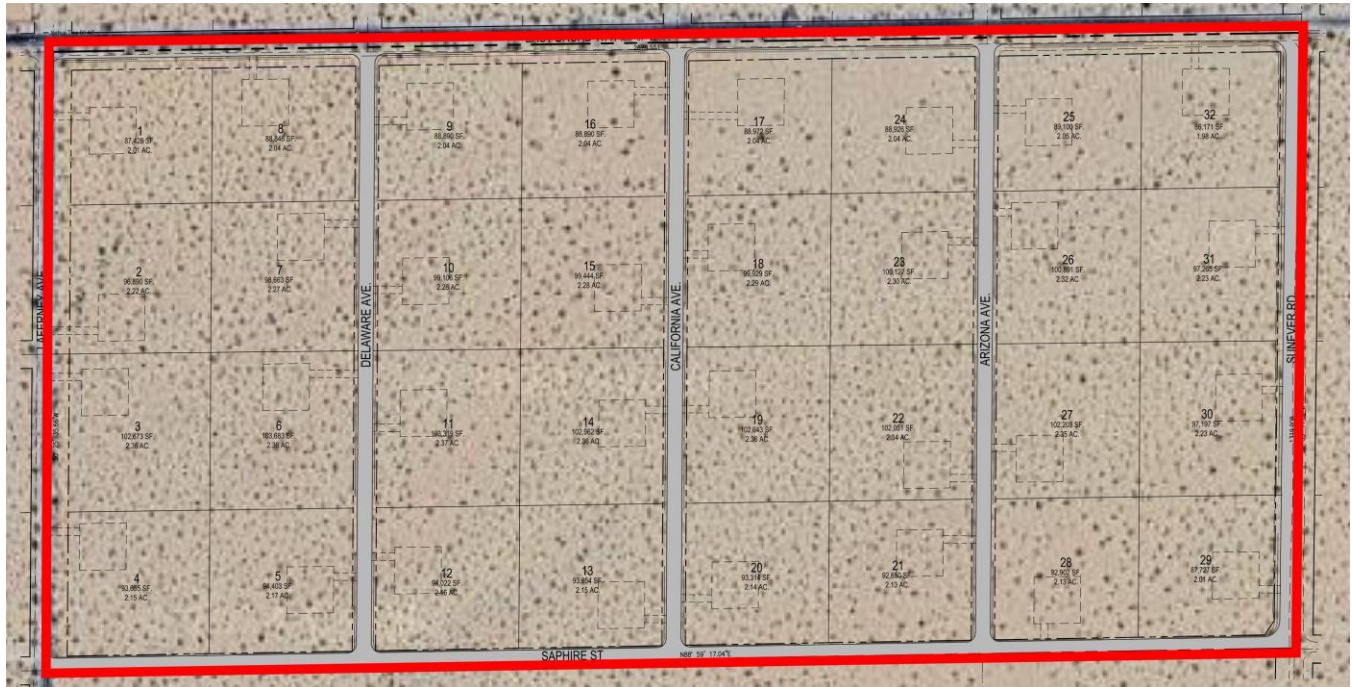


Figure 1.2 Land Use Map



1.5 Regulatory Findings

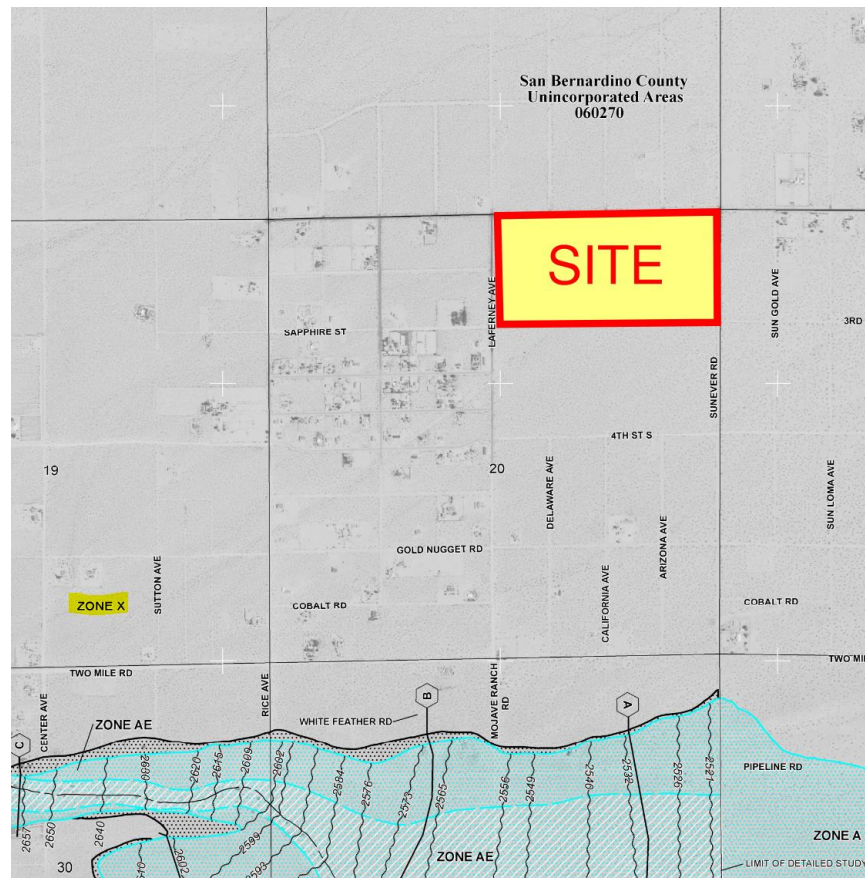
The project site is found in an area where regulatory limits are not typically identified. Excluding environmental studies (JDL, ESA, BIO) the project site does not have defining features identified by FEMA, DWR or USGS.

After reviewing the following figures and supporting data from the public agencies referenced above, it is determined that there are no jurisdictional “Blue Line Streams” within the project boundaries. As referenced elsewhere in this report, there are ephemeral streams that have been identified in the project biological assessment as needing further investigation to determine CDFW impacts, if any, by way of a Jurisdictional Delineation to be completed at a later date.

FEMA

Per the FEMA FIRM Map Panel 06071C8145J, the project site lies within the Zone X designation. These are areas determined to be outside of the 0.2% annual chance floodplain. As such, no further coordination with FEMA will be necessary. The FIRM Map has been included in Appendix E.

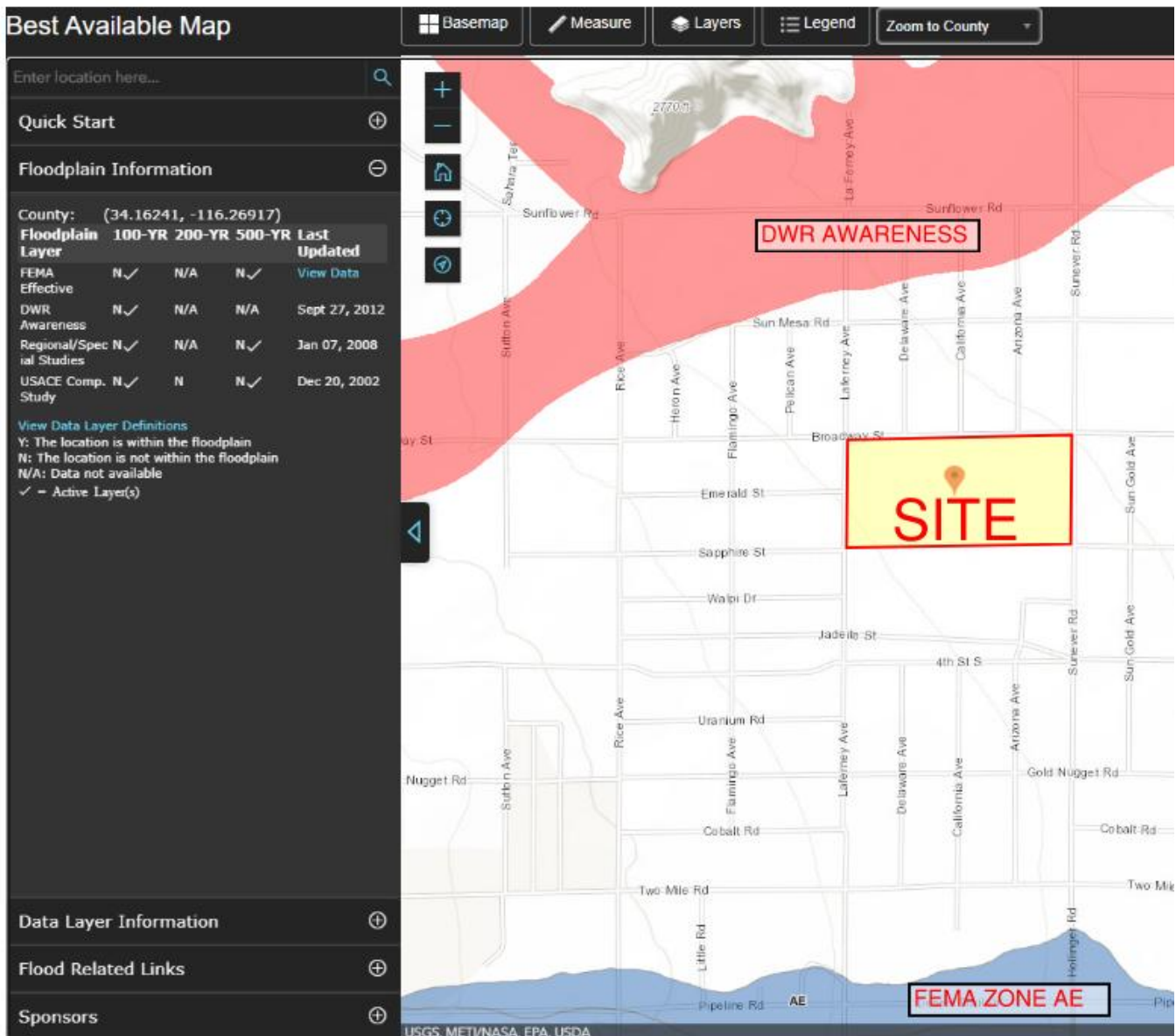
Figure 1.3 FEMA Flood zone



DWR

Research was conducted to find delineation of water jurisdiction for state and federal entities. It was concluded that DWR or ACOE resources were not identified onsite and if further investigation is required, these studies will be provided by the CEQA/Environmental consultant team.

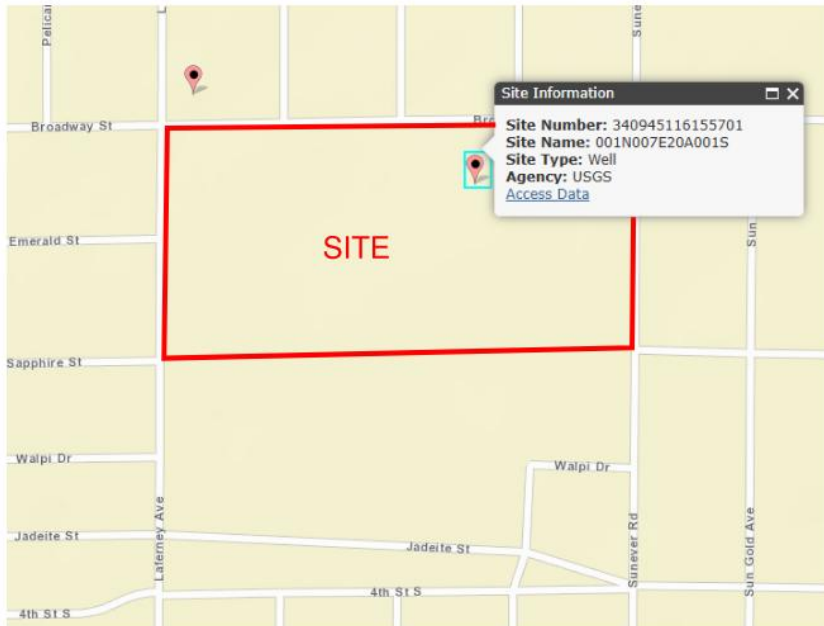
Figure 1.4 DWR Best Available Map



USGS

The 7.5-minute quadrangle map was pulled obtained to verify the existing site features and to confirm the presence of hydrologic features. It was concluded that no blue-line streams exist within the project boundaries. However, it was identified that an abandoned well of unknown depth is located on the east side of the project site.

Figure 1.5 USGS National Water Information System: Mapper



DESCRIPTION:

Latitude 34°09'49", Longitude 116°16'00" NAD27
San Bernardino County, California , Hydrologic Unit 18100100
Well depth: not determined.
Land surface altitude: 2,480 feet above NGVD29.
Well completed in "Basin and Range basin-fill aquifers" (N100BSNRGB) national aquifer.

Section 2 –Rational Method Hydrology Analysis

The Rational Method is commonly used for determining peak discharge from relatively small drainage areas. The rational method is based on the following equation $Q = CIA$, where Q is the peak discharge, C is the coefficient of runoff, I is the rainfall intensity, and A is the area of the watershed. Values of these variables necessary to calculate the peak discharge are found utilizing the various plates located within the San Bernardino County Flood Control Hydrology Manual. The Rational Method Hydrology is calculated for the 10-year, 25-year and 100-year storm events. The criteria for the protection of storm flow are determined by containing the 10-year storm event within the tops of street curbs, and the 100-year storm event within the public right of way. Storm drains and/or channels should be considered when either condition is exceeded.

The San Bernardino County Flood Control Manual was the reference for the Rational Hydrology calculations. The Manual provides plates and tables for the interpretation of curves, runoff index, and precipitation values. For this project, the use of NOAA published precipitation values was requested and these are included in Table 2.1 below. The values used for the project calculations are highlighted below. The remaining pertinent values necessary for hydrograph synthesis are included in Appendix E.

Table 2.1 – Precipitation Values

RETURN YR	1HR	3HR	6HR	24HR
2 YR	0.497	0.707	0.873	1.290
5YR	0.727	0.994	1.220	1.840
10YR	0.935	1.250	1.520	2.320
25YR	1.250	1.630	1.960	3.010
50YR	1.530	1.940	2.330	3.580
100 YR	1.840	2.290	2.730	4.200

PER PUBLISHED NOAA POINT PRECIPITATION FREQUENCY ESTIMATES

Antecedent Moisture Content

Based on the arid climate experienced in the Mojave Desert, the San Bernardino County Flood Control has provided direction that the Rational Hydrology calculations shall utilize Figure ADD-1 to identify the applicable Antecedent Moisture Content (AMC). This figure (included in Appendix E) dictates the use of AMC I for assessment of the soil loss and runoff potential of pervious soil.

2.1 Pre-Development Rational Method Hydrology

The existing site is generally uniform falling from the southwest to the northeast. The site is vacant and consists of desert shrubs that naturally occur. Coverage is minimal and per Figure C-3, the existing pervious area had a general Curve Number of 86 representing barren/eroded land as being most appropriate. There is limited development in the upstream tributary and assumed imperviousness was estimated based on the footprint of rooftops and roads relative to the subarea boundary.

Aerial data was used to generate a surface model of the existing terrain and was used to generate the elevation of nodes and locations of ridges and flowlines. These assumptions were confirmed with aerial images overlaid on the topography and compiled to identify the watershed and subarea boundaries.

The project site is bisected by three (3) natural tributaries. Each subarea was tabulated having the physical properties as depicted in Table 2.2. This data was used to organize the calculation input data. The notes represent the sequencing of the different subareas and how they are organized in the hydrology calculations.

Table 2.2 Pre-Development Watershed Input Data

ID	AREA (AC)	US NODE		DS NODE		ELEV Δ (FT)	LENGTH (FT)	SUBAREA				NOTES
		ID	ELEV	ID	ELEV			COVER	IMP	SOIL	CN	
EXA1	6.78	100	2700	101	2674	26	1000	BARREN	0%	B	86	INITIAL AREA
EXA2	193.93	101	2674	102	2509	165	8686	MIXED	2%	B	86	SUBAREA FLOW ADDITION, CONFLUENCE
EXA3	2.87	110	2621	111	2594	27	1000	BARREN	0%	B	86	INITIAL AREA
EXA4	96.12	111	2594	102	2509	85	4978	MIXED	10%	B	86	SUBAREA FLOW ADDITION, CONFLUENCE
EXA5	5.03	102	2509	103	2492	17	916	BARREN	0%	B	86	SUBAREA FLOW ADDITION, CONFLUENCE
EXA6	3.50	120	2576	121	2557	19	1000	BARREN	0%	B	86	INITIAL AREA
EXA7	51.73	121	2557	122	2501	56	3386	MIXED	4%	B	86	SUBAREA FLOW ADDITION
EXA8	5.03	122	2501	103	2492	9	677	BARREN	0%	B	86	SUBAREA FLOW ADDITION, CONFLUENCE
EXA9	43.37	103	2492	400	2467	25	2035	BARREN	0%	B	86	SUBAREA FLOW ADDITION, CONFLUENCE
EXB1	4.82	200	2680	201	2654	26	1000	BARREN	0%	B	86	INITIAL AREA
EXB2	141.95	201	2654	202	2504	150	7929	MIXED	2%	B	86	SUBAREA FLOW ADDITION
EXB3	20.32	202	2504	400	2467	37	2409	BARREN	0%	B	86	SUBAREA FLOW ADDITION, CONFLUENCE
EXC1	9.22	300	2532	301	2512	20	1000	BARREN	0%	B	86	INITIAL AREA
EXC2	16.70	301	2512	302	2492	20	1133	BARREN	0%	B	86	SUBAREA FLOW ADDITION
EXC3	20.04	302	2492	303	2475	17	1203	BARREN	0%	B	86	SUBAREA FLOW ADDITION

The results of the existing rational method hydrology for the north and south drainage courses are shown in Table 2.3 below. Existing Rational Method Hydrology calculations can be found in Appendix “B” of this report.

Table 2.3 Pre-Development Summary Table

WATERSHED	STORM EVENT	Pre-Development		
		FLOW	TIME OF CONC	VOL
		(CFS)	(MIN)	(AC-FT)
A-B NODE 400	10 YR	337.07	41.33	19.19
	25 YR	588.20	37.93	30.73
	100 YR	984.65	35.24	47.79
C NODE 303	10 YR	44.61	28.21	1.73
	25 YR	73.07	26.85	2.70
	100 YR	116.65	25.74	4.14

2.2 Proposed Rational Method Hydrology

The proposed project consists of 32 single-family residential homes. The project site will be designed to minimize the impact to the existing flow paths. The homes will be constructed in such a way to allow the existing tributary flows to pass through the project unobstructed, and will be conveyed past streets with Channel Crossings per San Bernardino County Department of Public Works standard drawing 200A. Streets will be constructed to match the existing grade to the greatest extent possible and convey runoff to these proposed crossings. Broadway Avenue will be constructed with a series of channel crossings connecting a trapezoidal channel.

It should be noted the Proposed Rational Method Hydrology flow rates are utilized to size the storm drain facilities to provide a level of storm protection to adequately convey the 100-year storm flow rates. This information is utilized to analyze the hydraulics of the storm facilities for the purposes of sizing storm drain lines, inlets and outlets, spillways, street capacities and culverts for the ultimate experienced flow rates. Preliminary calculations for the sizing of these facilities can be found within Appendix F of this report.

There is significant offsite area that contributes to these flows and the existing hydrology was generated capturing the entire tributary and providing nodes at the proposed project boundary. These nodes represented user input data points later to be used in the assessment of the post-development flows to account for the run-on. A summary of those nodes is included in Table 2.1 below.

Table 2.4 Rational Offsite Tributary Summary

NODE	STORM EVENT	EXISTING		
		FLOW	TIME OF CONC	AREA
		(CFS)	(MIN)	(AC)
102	10 YR	199.54	35.90	299.70
	25 YR	350.55	33.10	
	100 YR	583.85	30.96	
122	10 YR	45.82	33.36	55.23
	25 YR	77.74	31.08	
	100 YR	126.65	29.33	
202	10 YR	84.59	45.32	146.77
	25 YR	159.32	40.55	
	100 YR	273.80	37.22	
302	10 YR	30.64	23.15	25.92
	25 YR	48.24	22.47	
	100 YR	75.05	21.91	

Similarly to the Pre-Development, each subarea was tabulated as shown below in Table 2.2 to organize the input data used for the hydrology calculations.

Table 2.2 Proposed Rational Method Flow Rates

ID	AREA (AC)	US NODE		DS NODE		ELEV Δ (FT)	LENGTH (FT)	SUBAREA				NOTES
		ID	ELEV	ID	ELEV			COVER	IMP	SOIL	CN	
NODE 102	299.7	102	2509					MIXED	2%	B	86	USER INPUT
PRA1	19.63	102	2509	150	2492	17	899	MIXED	9%	B	79	SUBAREA FLOW ADDITION, CONFLUENCE
NODE 122	55.23	122	2501					MIXED	2%	B	86	USER INPUT
PRA2	3.32	122	2501	150	2492	9	615	MIXED	10%	B	79	SUBAREA FLOW ADDITION, CONFLUENCE
PRA3	16.01	150	2492	151	2483	9	670	MIXED	10%	B	79	SUBAREA FLOW ADDITION
PRA4	10.25	151	2483	152	2479	4	673	MIXED	10%	B	79	SUBAREA FLOW ADDITION
PRA5	3.40	152	2479	400	2467	12	644	MIXED	10%	B	79	SUBAREA FLOW ADDITION, CONFLUENCE
NODE 202	146.77	202	2504					MIXED	0%	B	86	USER INPUT
PRB1	4.15	202	2504	250	2495	9	569	MIXED	10%	B	79	SUBAREA FLOW ADDITION
PRB2	4.54	250	2495	251	2485	10	770	MIXED	10%	B	79	SUBAREA FLOW ADDITION
PRB3	9.52	251	2485	400	2467	18	1024	MIXED	10%	B	79	SUBAREA FLOW ADDITION, CONFLUENCE
NODE 302	25.92	302	2492					MIXED	0%	B	86	INITIAL AREA
PRC1	7.91	302	2492	350	2486	6	325	MIXED	5%	B	79	SUBAREA FLOW ADDITION
PRC2	14.8	350	2486	303	2475	11	893	MIXED	5%	B	79	SUBAREA FLOW ADDITION

The results of the Post-Development Rational Hydrology are tabulated below. It is a comparison of the Pre-Development and Post-Development flows.

Table 2.2 Post-Development Rational Summary

WATERSHED	STORM EVENT	Pre-Development			Post-Development			ANTICIPATED CHANGE	
		FLOW	TIME OF CONC	VOL	FLOW	TIME OF CONC	VOL	FLOW	VOL
		(CFS)	(MIN)	(AC-FT)	(CFS)	(MIN)	(AC-FT)		
A-B NODE 400	10 YR	337.07	41.33	19.19	418.62	40.23	23.20	24%	4.0
	25 YR	588.20	37.93	30.73	673.94	38.57	35.80	15%	5.1
	100 YR	984.65	35.24	47.79	1064.07	37.97	55.65	8%	7.9
C NODE 303	10 YR	44.61	28.21	1.73	47.10	26.96	1.75	6%	0.0
	25 YR	73.07	26.85	2.70	76.41	26.31	2.77	5%	0.1
	100 YR	116.65	25.74	4.14	120.94	25.78	4.29	4%	0.2

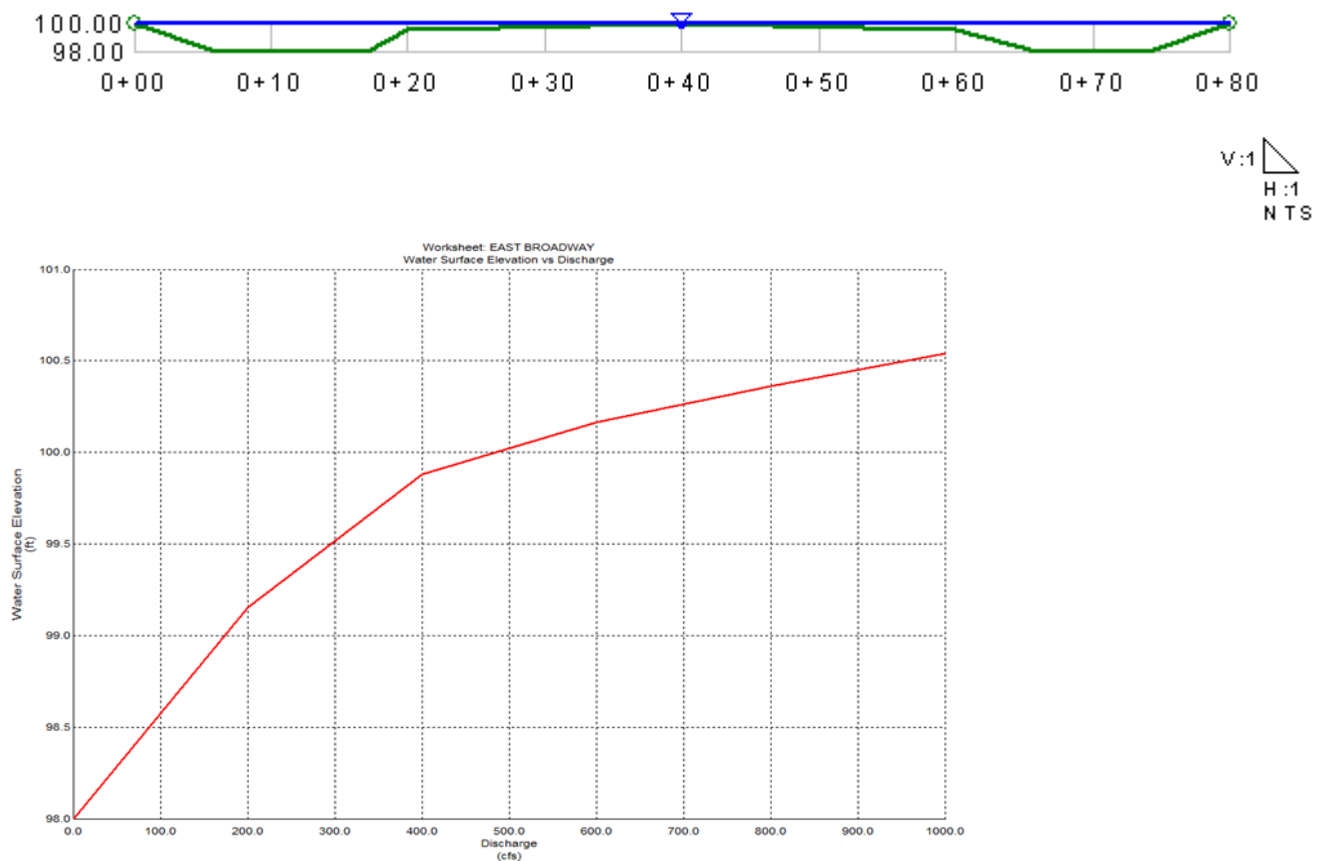
As would be expected with the increase of imperviousness associated with single-family development, the proposed flows and volumes exceed that of the existing. The site will be implementing LID BMPs to capture the runoff of the residential pads. Assuming the increased volume of 4.0 Ac-Ft, which was calculated by a triangular distribution of the flow and time of concentration, this would result in the construction of thirty-two (32) individual rock trenches, each having a volume of 5,445 CF. This interception will lower the run-off to an acceptable level prior to leaving the site. Additional information will be provided in the Final WQMP.

2.3 Proposed Drainage Improvements and Preliminary Hydraulics

The project site will be designed to minimize the impact to the existing flow paths. The homes will be constructed in such a way to allow the existing tributary flows to pass through the project unobstructed, and will be conveyed past streets with Channel Crossings per San Bernardino County Department of Public Works standard drawing 200A. Each lot will be constructed with ornamental landscaping to minimize erosion and maximize flow interception for evapotranspiration and infiltration. Additionally, LID BMPs will be constructed to capture the increased runoff identified in Table 2.2.

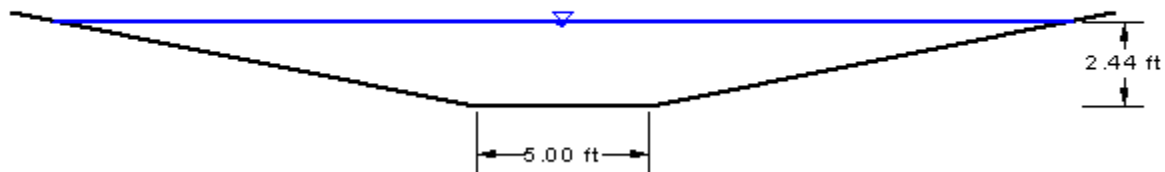
Streets will be constructed to match the existing grade to the greatest extent possible and convey runoff to these proposed crossings. Broadway Avenue will be constructed with a series of channel crossings connecting a trapezoidal channel. Below is a cross section and rating curve with an assumed slope of 1.5% and the Q25 flow of 502.76cfs at Node 152. Further hydraulic calculations will be provided in the Final Hydrology Report including coordination of the culvert crossings.

Figure 2.1 – Broadway Preliminary Cross-Section



There are areas where the natural drainage course conveys offsite flows through the site. These areas will be designed to limit impacts. In areas where these ephemeral streams transect private lots, a drainage easement will be recorded on the map to protect these areas from development and ensure the free passage of flows through the site. The tentative tract map identified the easements as having an undetermined width. Preliminary calculations show that the width will vary with each tributary but the maximum will likely be 30 feet wide. This information will be updated during the preparation of construction documents and the final map specific to each reach.

Figure 2.2 – 30' Drainage Easement Cross-Section



Section 3 – Analytical Approach

The site hydrology was performed utilizing San Bernardino County Flood Control District Hydrology Manual, from which pertinent soil and rainfall information was obtained. See Appendix E of this report for the referenced Plates within the San Bernardino County Flood Control Hydrology Manual.

Rational Method storm flow rates were analyzed by using the “RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM”, San Bernardino County Flood Control District 1965 Hydrology Manual, produced by Bondamin Engineering.

Section 4 – Conclusion

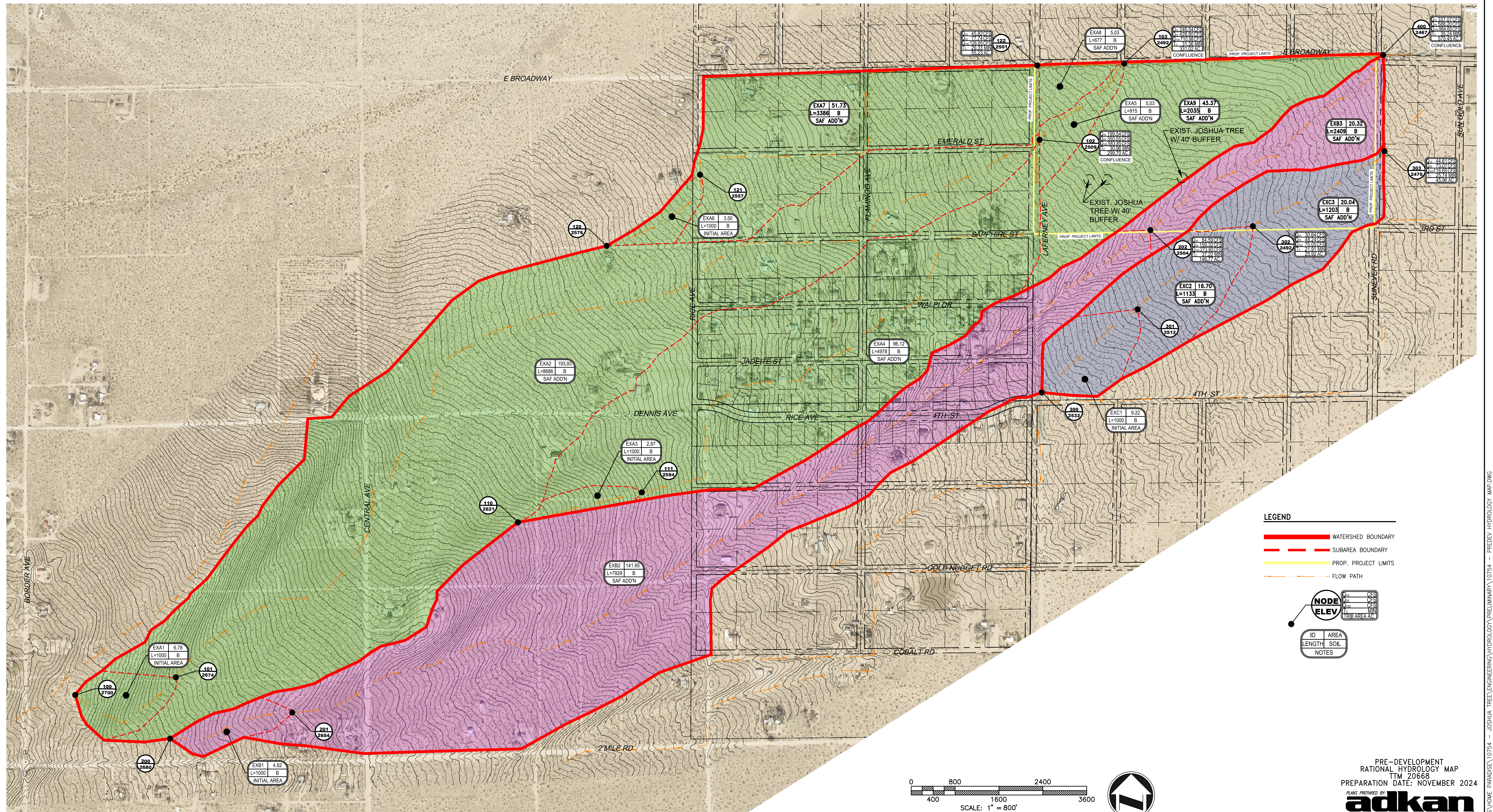
The hydrologic calculations provided within this report substantiate the preliminary hydrology and hydraulic design of the proposed project, Tentative Tract Map No. 20668 and indicate the following:

- The proposed storm drain facilities demonstrate the ability to convey the Rational Hydrology Method 10, 25 and 100 year storm events as required by the San Bernardino County Flood Control Hydrology Manual.

Therefore, it is our conclusion this project **does not** negatively impact the local community or watershed goals and does not adversely affect downstream facilities while maintaining the adequate conveyance of storm flows for on-site facilities to the criteria for the protection of storm flow as determined by the Riverside County Flood Control Hydrology Manual.

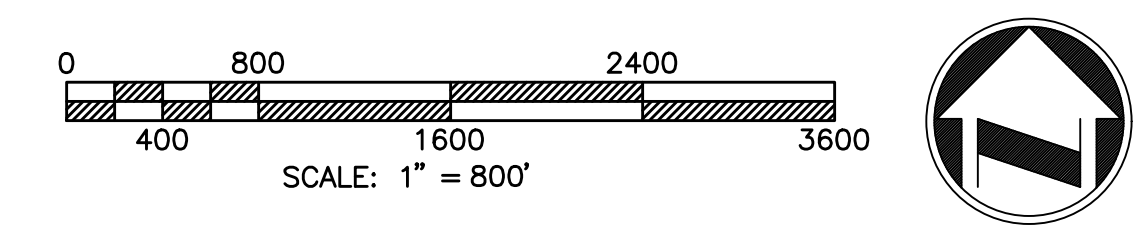
Appendix A – Existing Rational Hydrology Map

PRE-DEVELOPMENT RATIONAL HYDROLOGY MAP TTM 20668



LEGEND

- WATERSHED BOUNDARY
- SUBAREA BOUNDARY
- PROP. PROJECT LIMITS
- FLOW PATH
- NODE ELEV
- ID AREA LENGTH SOIL NOTES



PRE-DEVELOPMENT
RATIONAL HYDROLOGY MAP
TTM 20668
PREPARATION DATE: NOVEMBER 2024
PLANS PREPARED BY:
adkan ENGINEERS
Civil Engineering • Surveying • Planning
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Appendix B – Existing Rational Hydrology Calculations

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date- August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2005 Version 7.1
Rational Hydrology Study Date: 11/18/24

Program License Serial Number 5006

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 10.0
Computed rainfall intensity:
Storm year = 10.00 1 hour rainfall = 0.935 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 1

+++++
Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 2700.000(Ft.)
Bottom (of initial area) elevation = 2674.000(Ft.)
Difference in elevation = 26.000(Ft.)
Slope = 0.02600 s(%)= 2.60
TC = k(0.518)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 17.029 min.
Rainfall intensity = 2.258(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KClA) is C = 0.698
Subarea runoff = 10.681(CFS)
Total initial stream area = 6.780(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.507(In/Hr)

+++++
Process from Point/Station 101.000 to Point/Station 102.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2674.000(Ft.)
Downstream point elevation = 2509.000(Ft.)
Channel length thru subarea = 8686.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 63.536(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 63.536(CFS)
Depth of flow = 0.861(Ft.), Average velocity = 5.155(Ft/s)
Channel flow top width = 18.615(Ft.)
Flow Velocity = 5.15(Ft/s)
Travel time = 28.08 min.

Time of concentration = 45.11 min.
 Critical depth = 0.922(Ft.)
 Adding area flow to channel
 Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 86.00
 Adjusted SCS curve number for AMC 1 = 71.60
 Pervious ratio(Ap) = 0.9800 Max loss rate(Fm)= 0.497(In/Hr)
 Rainfall intensity = 1.142(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area,(total area with modified
 rational method)(Q=KCIA) is C = 0.508
 Subarea runoff = 105.641(CFS) for 193.930(Ac.)
 Total runoff = 116.322(CFS)
 Effective area this stream = 200.71(Ac.)
 Total Study Area (Main Stream No. 1) = 200.71(Ac.)
 Area averaged Fm value = 0.498(In/Hr)
 Depth of flow = 1.187(Ft.), Average velocity = 6.152(Ft/s)
 Critical depth = 1.297(Ft.)

++++++
 Process from Point/Station 100.000 to Point/Station 102.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 200.710(Ac.)
 Runoff from this stream = 116.322(CFS)
 Time of concentration = 45.11 min.
 Rainfall intensity = 1.142(In/Hr)
 Area averaged loss rate (Fm) = 0.4976(In/Hr)
 Area averaged Pervious ratio (Ap) = 0.9807

++++++
 Process from Point/Station 110.000 to Point/Station 111.000
 **** INITIAL AREA EVALUATION ****

Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 86.00
 Adjusted SCS curve number for AMC 1 = 71.60
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
 Initial subarea data:
 Initial area flow distance = 1000.000(Ft.)
 Top (of initial area) elevation = 2621.000(Ft.)
 Bottom (of initial area) elevation = 2594.000(Ft.)
 Difference in elevation = 27.000(Ft.)
 Slope = 0.02700 s(%)= 2.70
 $TC = k(0.518)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 16.901 min.
 Rainfall intensity = 2.270(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.699
 Subarea runoff = 4.552(CFS)
 Total initial stream area = 2.870(Ac.)
 Pervious area fraction = 1.000
 Initial area Fm value = 0.507(In/Hr)

++++++
 Process from Point/Station 111.000 to Point/Station 102.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2594.000(Ft.)
 Downstream point elevation = 2509.000(Ft.)
 Channel length thru subarea = 4978.000(Ft.)
 Channel base width = 10.000(Ft.)

Slope or 'Z' of left channel bank = 5.000
 Slope or 'Z' of right channel bank = 5.000
 Estimated mean flow rate at midpoint of channel = 41.580(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 3.000(Ft.)
 Flow(q) thru subarea = 41.580(CFS)
 Depth of flow = 0.704(Ft.), Average velocity = 4.367(Ft/s)
 Channel flow top width = 17.042(Ft.)
 Flow Velocity = 4.37(Ft/s)
 Travel time = 19.00 min.
 Time of concentration = 35.90 min.
 Critical depth = 0.719(Ft.)
 Adding area flow to channel
 Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 86.00
 Adjusted SCS curve number for AMC 1 = 71.60
 Pervious ratio(Ap) = 0.9000 Max loss rate(Fm)= 0.457(In/Hr)
 Rainfall intensity = 1.340(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area,(total area with modified
 rational method)(Q=KCIA) is C = 0.592
 Subarea runoff = 73.969(CFS) for 96.120(Ac.)
 Total runoff = 78.521(CFS)
 Effective area this stream = 98.99(Ac.)
 Total Study Area (Main Stream No. 1) = 299.70(Ac.)
 Area averaged Fm value = 0.458(In/Hr)
 Depth of flow = 0.993(Ft.), Average velocity = 5.286(Ft/s)
 Critical depth = 1.031(Ft.)

++++++
 Process from Point/Station 110.000 to Point/Station 102.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 98.990(Ac.)
 Runoff from this stream = 78.521(CFS)
 Time of concentration = 35.90 min.
 Rainfall intensity = 1.340(In/Hr)
 Area averaged loss rate (Fm) = 0.4582(In/Hr)
 Area averaged Pervious ratio (Ap) = 0.9029
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
------------	-----------------	------------	----------	------------	----------------------------

1	116.32	200.710	45.11	0.498	1.142
2	78.52	98.990	35.90	0.458	1.340

Qmax(1) =
 $1.000 * 1.000 * 116.322) +$
 $0.775 * 1.000 * 78.521) += 177.208$

Qmax(2) =
 $1.307 * 0.796 * 116.322) +$
 $1.000 * 1.000 * 78.521) += 199.543$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 116.322 78.521
 Maximum flow rates at confluence using above data:
 177.208 199.543
 Area of streams before confluence:
 200.710 98.990
 Effective area values after confluence:
 299.700 258.711
 Results of confluence:

Total flow rate = 199.543(CFS)
Time of concentration = 35.900 min.
Effective stream area after confluence = 258.711(Ac.)
Study area average Pervious fraction(Ap) = 0.955
Study area average soil loss rate(Fm) = 0.485(In/Hr)
Study area total (this main stream) = 299.70(Ac.)

++++
Process from Point/Station 102.000 to Point/Station 103.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2509.000(Ft.)
Downstream point elevation = 2492.000(Ft.)
Channel length thru subarea = 916.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 199.573(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 199.573(CFS)
Depth of flow = 1.573(Ft.), Average velocity = 7.100(Ft/s)
Channel flow top width = 25.733(Ft.)
Flow Velocity = 7.10(Ft/s)
Travel time = 2.15 min.
Time of concentration = 38.05 min.
Critical depth = 1.734(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q = 190.142(CFS)
therefore the upstream flow rate of Q = 199.543(CFS) is being used
Rainfall intensity = 1.286(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.561
Subarea runoff = 0.000(CFS) for 5.030(Ac.)
Total runoff = 199.543(CFS)
Effective area this stream = 263.74(Ac.)
Total Study Area (Main Stream No. 1) = 304.73(Ac.)
Area averaged Fm value = 0.485(In/Hr)
Depth of flow = 1.573(Ft.), Average velocity = 7.100(Ft/s)
Critical depth = 1.734(Ft.)

++++
Process from Point/Station 100.000 to Point/Station 103.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 263.741(Ac.)
Runoff from this stream = 199.543(CFS)
Time of concentration = 38.05 min.
Rainfall intensity = 1.286(In/Hr)
Area averaged loss rate (Fm) = 0.4850(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9558

++++
Process from Point/Station 120.000 to Point/Station 121.000
**** INITIAL AREA EVALUATION ****

Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 86.00
 Adjusted SCS curve number for AMC 1 = 71.60
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
 Initial subarea data:
 Initial area flow distance = 1000.000(Ft.)
 Top (of initial area) elevation = 2576.000(Ft.)
 Bottom (of initial area) elevation = 2557.000(Ft.)
 Difference in elevation = 19.000(Ft.)
 Slope = 0.01900 s(%)= 1.90
 $TC = k(0.518)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 18.132 min.
 Rainfall intensity = 2.161(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area (Q=KClA) is C = 0.689
 Subarea runoff = 5.208(CFS)
 Total initial stream area = 3.500(Ac.)
 Pervious area fraction = 1.000
 Initial area Fm value = 0.507(In/Hr)

++++
 Process from Point/Station 121.000 to Point/Station 122.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2557.000(Ft.)
 Downstream point elevation = 2501.000(Ft.)
 Channel length thru subarea = 3386.000(Ft.)
 Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 5.000
 Slope or 'Z' of right channel bank = 5.000
 Estimated mean flow rate at midpoint of channel = 25.542(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 3.000(Ft.)
 Flow(q) thru subarea = 25.542(CFS)
 Depth of flow = 0.542(Ft.), Average velocity = 3.706(Ft/s)
 Channel flow top width = 15.422(Ft.)
 Flow Velocity = 3.71(Ft/s)
 Travel time = 15.23 min.
 Time of concentration = 33.36 min.
 Critical depth = 0.535(Ft.)

Adding area flow to channel
 Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 86.00
 Adjusted SCS curve number for AMC 1 = 71.60
 Pervious ratio(Ap) = 0.9600 Max loss rate(Fm)= 0.487(In/Hr)
 Rainfall intensity = 1.410(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area,(total area with modified
 rational method)(Q=KClA) is C = 0.588
 Subarea runoff = 40.609(CFS) for 51.730(Ac.)
 Total runoff = 45.817(CFS)
 Effective area this stream = 55.23(Ac.)
 Total Study Area (Main Stream No. 1) = 359.96(Ac.)
 Area averaged Fm value = 0.488(In/Hr)
 Depth of flow = 0.749(Ft.), Average velocity = 4.449(Ft/s)
 Critical depth = 0.758(Ft.)

++++
 Process from Point/Station 122.000 to Point/Station 103.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2501.000(Ft.)
 Downstream point elevation = 2492.000(Ft.)
 Channel length thru subarea = 677.000(Ft.)

Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 5.000
 Slope or 'Z' of right channel bank = 5.000
 Estimated mean flow rate at midpoint of channel = 45.850(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 3.000(Ft.)
 Flow(q) thru subarea = 45.850(CFS)
 Depth of flow = 0.795(Ft.), Average velocity = 4.125(Ft/s)
 Channel flow top width = 17.953(Ft.)
 Flow Velocity = 4.12(Ft/s)
 Travel time = 2.74 min.
 Time of concentration = 36.09 min.
 Critical depth = 0.758(Ft.)
 Adding area flow to channel
 Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 86.00
 Adjusted SCS curve number for AMC 1 = 71.60
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
 The area added to the existing stream causes a
 a lower flow rate of Q = 45.799(CFS)
 therefore the upstream flow rate of Q = 45.817(CFS) is being used
 Rainfall intensity = 1.334(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area,(total area with modified
 rational method)(Q=KCIA) is C = 0.570
 Subarea runoff = 0.000(CFS) for 5.030(Ac.)
 Total runoff = 45.817(CFS)
 Effective area this stream = 60.26(Ac.)
 Total Study Area (Main Stream No. 1) = 364.99(Ac.)
 Area averaged Fm value = 0.490(In/Hr)
 Depth of flow = 0.795(Ft.), Average velocity = 4.124(Ft/s)
 Critical depth = 0.758(Ft.)

++++++
 Process from Point/Station 120.000 to Point/Station 103.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 60.260(Ac.)
 Runoff from this stream = 45.817(CFS)
 Time of concentration = 36.09 min.
 Rainfall intensity = 1.334(In/Hr)
 Area averaged loss rate (Fm) = 0.4900(In/Hr)
 Area averaged Pervious ratio (Ap) = 0.9657
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
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1	199.54	263.741	38.05	0.485	1.286
2	45.82	60.260	36.09	0.490	1.334

Qmax(1) =
 $1.000 * 1.000 * 199.543 + 0.943 * 1.000 * 45.817 = 242.734$

Qmax(2) =
 $1.060 * 0.949 * 199.543 + 1.000 * 1.000 * 45.817 = 246.539$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 199.543 45.817
 Maximum flow rates at confluence using above data:
 242.734 246.539
 Area of streams before confluence:

263.741 60.260
Effective area values after confluence:
324.001 310.441
Results of confluence:
Total flow rate = 246.539(CFS)
Time of concentration = 36.094 min.
Effective stream area after confluence = 310.441(Ac.)
Study area average Pervious fraction(Ap) = 0.958
Study area average soil loss rate(Fm) = 0.486(In/Hr)
Study area total (this main stream) = 324.00(Ac.)

++++
Process from Point/Station 103.000 to Point/Station 400.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2492.000(Ft.)
Downstream point elevation = 2467.000(Ft.)
Channel length thru subarea = 2035.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 246.573(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 246.573(CFS)
Depth of flow = 1.935(Ft.), Average velocity = 6.475(Ft/s)
Channel flow top width = 29.354(Ft.)
Flow Velocity = 6.47(Ft/s)
Travel time = 5.24 min.
Time of concentration = 41.33 min.
Critical depth = 1.938(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q = 230.898(CFS)
therefore the upstream flow rate of Q = 246.539(CFS) is being used
Rainfall intensity = 1.214(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KClA) is C = 0.538
Subarea runoff = 0.000(CFS) for 43.370(Ac.)
Total runoff = 246.539(CFS)
Effective area this stream = 353.81(Ac.)
Total Study Area (Main Stream No. 1) = 408.36(Ac.)
Area averaged Fm value = 0.489(In/Hr)
Depth of flow = 1.935(Ft.), Average velocity = 6.474(Ft/s)
Critical depth = 1.938(Ft.)

++++
Process from Point/Station 100.000 to Point/Station 400.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 353.811(Ac.)
Runoff from this stream = 246.539(CFS)
Time of concentration = 41.33 min.
Rainfall intensity = 1.214(In/Hr)
Area averaged loss rate (Fm) = 0.4886(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9629

++++
Process from Point/Station 200.000 to Point/Station 201.000
**** INITIAL AREA EVALUATION ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 2680.000(Ft.)
Bottom (of initial area) elevation = 2654.000(Ft.)
Difference in elevation = 26.000(Ft.)
Slope = 0.02600 s(%)= 2.60
TC = k(0.518)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 17.029 min.
Rainfall intensity = 2.258(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.698
Subarea runoff = 7.593(CFS)
Total initial stream area = 4.820(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.507(In/Hr)

++++
Process from Point/Station 201.000 to Point/Station 202.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2654.000(Ft.)
Downstream point elevation = 2504.000(Ft.)
Channel length thru subarea = 7929.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 46.134(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 46.134(CFS)
Depth of flow = 0.725(Ft.), Average velocity = 4.672(Ft/s)
Channel flow top width = 17.248(Ft.)
Flow Velocity = 4.67(Ft/s)
Travel time = 28.29 min.
Time of concentration = 45.32 min.
Critical depth = 0.766(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 0.9800 Max loss rate(Fm)= 0.497(In/Hr)
Rainfall intensity = 1.138(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.506
Subarea runoff = 76.993(CFS) for 141.950(Ac.)
Total runoff = 84.586(CFS)
Effective area this stream = 146.77(Ac.)
Total Study Area (Main Stream No. 1) = 555.13(Ac.)
Area averaged Fm value = 0.498(In/Hr)
Depth of flow = 1.005(Ft.), Average velocity = 5.602(Ft/s)
Critical depth = 1.078(Ft.)

++++
Process from Point/Station 202.000 to Point/Station 400.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2504.000(Ft.)
 Downstream point elevation = 2467.000(Ft.)
 Channel length thru subarea = 2409.000(Ft.)
 Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 5.000
 Slope or 'Z' of right channel bank = 5.000
 Estimated mean flow rate at midpoint of channel = 84.632(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 3.000(Ft.)
 Flow(q) thru subarea = 84.632(CFS)
 Depth of flow = 1.062(Ft.), Average velocity = 5.204(Ft/s)
 Channel flow top width = 20.621(Ft.)
 Flow Velocity = 5.20(Ft/s)
 Travel time = 7.71 min.
 Time of concentration = 53.03 min.
 Critical depth = 1.078(Ft.)
 Adding area flow to channel
 Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 86.00
 Adjusted SCS curve number for AMC 1 = 71.60
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
 The area added to the existing stream causes a
 a lower flow rate of Q = 78.285(CFS)
 therefore the upstream flow rate of Q = 84.586(CFS) is being used
 Rainfall intensity = 1.019(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area,(total area with modified
 rational method)(Q=KCIA) is C = 0.460
 Subarea runoff = 0.000(CFS) for 20.320(Ac.)
 Total runoff = 84.586(CFS)
 Effective area this stream = 167.09(Ac.)
 Total Study Area (Main Stream No. 1) = 575.45(Ac.)
 Area averaged Fm value = 0.499(In/Hr)
 Depth of flow = 1.062(Ft.), Average velocity = 5.204(Ft/s)
 Critical depth = 1.078(Ft.)

+++++
 Process from Point/Station 200.000 to Point/Station 400.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 167.090(Ac.)
 Runoff from this stream = 84.586(CFS)
 Time of concentration = 53.03 min.
 Rainfall intensity = 1.019(In/Hr)
 Area averaged loss rate (Fm) = 0.4988(In/Hr)
 Area averaged Pervious ratio (Ap) = 0.9830
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
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1	246.54	353.811	41.33	0.489	1.214
2	84.59	167.090	53.03	0.499	1.019

Qmax(1) =
 $1.000 * 1.000 * 246.539) +$
 $1.373 * 0.779 * 84.586) += 337.073$
 Qmax(2) =
 $0.732 * 1.000 * 246.539) +$
 $1.000 * 1.000 * 84.586) += 265.059$

Total of 2 streams to confluence:
 Flow rates before confluence point:

246.539 84.586
Maximum flow rates at confluence using above data:
337.073 265.059
Area of streams before confluence:
353.811 167.090
Effective area values after confluence:
484.039 520.901
Results of confluence:
Total flow rate = 337.073(CFS)
Time of concentration = 41.332 min.
Effective stream area after confluence = 484.039(Ac.)
Study area average Pervious fraction(A_p) = 0.969
Study area average soil loss rate(F_m) = 0.492(In/Hr)
Study area total (this main stream) = 520.90(Ac.)
End of computations, Total Study Area = 575.45 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(A_p) = 0.968
Area averaged SCS curve number = 86.0

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date- August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2005 Version 7.1
Rational Hydrology Study Date: 11/18/24

Program License Serial Number 5006

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 25.0
10 Year storm 1 hour rainfall = 0.935(In.)
100 Year storm 1 hour rainfall = 1.840(In.)
Computed rainfall intensity:
Storm year = 25.00 1 hour rainfall = 1.295 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 1

+++++
Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 2700.000(Ft.)
Bottom (of initial area) elevation = 2674.000(Ft.)
Difference in elevation = 26.000(Ft.)
Slope = 0.02600 s(%)= 2.60
TC = k(0.518)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 17.029 min.
Rainfall intensity = 3.127(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.754
Subarea runoff = 15.987(CFS)
Total initial stream area = 6.780(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.507(In/Hr)

+++++
Process from Point/Station 101.000 to Point/Station 102.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2674.000(Ft.)
Downstream point elevation = 2509.000(Ft.)
Channel length thru subarea = 8686.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 117.067(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 117.067(CFS)
Depth of flow = 1.191(Ft.), Average velocity = 6.163(Ft/s)
Channel flow top width = 21.906(Ft.)

Flow Velocity = 6.16(Ft/s)
Travel time = 23.49 min.
Time of concentration = 40.52 min.
Critical depth = 1.297(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 0.9800 Max loss rate(Fm)= 0.497(In/Hr)
Rainfall intensity = 1.705(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.637
Subarea runoff = 202.075(CFS) for 193.930(Ac.)
Total runoff = 218.062(CFS)
Effective area this stream = 200.71(Ac.)
Total Study Area (Main Stream No. 1) = 200.71(Ac.)
Area averaged Fm value = 0.498(In/Hr)
Depth of flow = 1.635(Ft.), Average velocity = 7.337(Ft/s)
Critical depth = 1.813(Ft.)

++++
Process from Point/Station 100.000 to Point/Station 102.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 200.710(Ac.)
Runoff from this stream = 218.062(CFS)
Time of concentration = 40.52 min.
Rainfall intensity = 1.705(In/Hr)
Area averaged loss rate (Fm) = 0.4976(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9807

++++
Process from Point/Station 110.000 to Point/Station 111.000
**** INITIAL AREA EVALUATION ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 2621.000(Ft.)
Bottom (of initial area) elevation = 2594.000(Ft.)
Difference in elevation = 27.000(Ft.)
Slope = 0.02700 s(%)= 2.70
TC = $k(0.518)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 16.901 min.
Rainfall intensity = 3.144(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.755
Subarea runoff = 6.810(CFS)
Total initial stream area = 2.870(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.507(In/Hr)

++++
Process from Point/Station 111.000 to Point/Station 102.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2594.000(Ft.)
Downstream point elevation = 2509.000(Ft.)

Channel length thru subarea = 4978.000(Ft.)
 Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 5.000
 Slope or 'Z' of right channel bank = 5.000
 Estimated mean flow rate at midpoint of channel = 70.525(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 3.000(Ft.)
 Flow(q) thru subarea = 70.525(CFS)
 Depth of flow = 0.937(Ft.), Average velocity = 5.122(Ft/s)
 Channel flow top width = 19.375(Ft.)
 Flow Velocity = 5.12(Ft/s)
 Travel time = 16.20 min.
 Time of concentration = 33.10 min.
 Critical depth = 0.977(Ft.)
 Adding area flow to channel
 Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 86.00
 Adjusted SCS curve number for AMC 1 = 71.60
 Pervious ratio(Ap) = 0.9000 Max loss rate(Fm)= 0.457(In/Hr)
 Rainfall intensity = 1.964(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area,(total area with modified
 rational method)(Q=KCIA) is C = 0.690
 Subarea runoff = 127.348(CFS) for 96.120(Ac.)
 Total runoff = 134.158(CFS)
 Effective area this stream = 98.99(Ac.)
 Total Study Area (Main Stream No. 1) = 299.70(Ac.)
 Area averaged Fm value = 0.458(In/Hr)
 Depth of flow = 1.313(Ft.), Average velocity = 6.167(Ft/s)
 Critical depth = 1.391(Ft.)

+++++
 Process from Point/Station 110.000 to Point/Station 102.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 98.990(Ac.)
 Runoff from this stream = 134.158(CFS)
 Time of concentration = 33.10 min.
 Rainfall intensity = 1.964(In/Hr)
 Area averaged loss rate (Fm) = 0.4582(In/Hr)
 Area averaged Pervious ratio (Ap) = 0.9029
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
------------	-----------------	------------	----------	------------	----------------------------

1	218.06	200.710	40.52	0.498	1.705
2	134.16	98.990	33.10	0.458	1.964

Qmax(1) =
 $1.000 * 1.000 * 218.062 + 0.828 * 1.000 * 134.158 = 329.127$

Qmax(2) =
 $1.215 * 0.817 * 218.062 + 1.000 * 1.000 * 134.158 = 350.552$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 218.062 134.158
 Maximum flow rates at confluence using above data:
 329.127 350.552
 Area of streams before confluence:
 200.710 98.990
 Effective area values after confluence:

299.700 262.956
Results of confluence:
Total flow rate = 350.552(CFS)
Time of concentration = 33.099 min.
Effective stream area after confluence = 262.956(Ac.)
Study area average Pervious fraction(Ap) = 0.955
Study area average soil loss rate(Fm) = 0.485(In/Hr)
Study area total (this main stream) = 299.70(Ac.)

++++
Process from Point/Station 102.000 to Point/Station 103.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2509.000(Ft.)
Downstream point elevation = 2492.000(Ft.)
Channel length thru subarea = 916.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 350.578(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 350.578(CFS)
Depth of flow = 2.078(Ft.), Average velocity = 8.276(Ft/s)
Channel flow top width = 30.777(Ft.)
Flow Velocity = 8.28(Ft/s)
Travel time = 1.84 min.
Time of concentration = 34.94 min.
Critical depth = 2.313(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q = 339.068(CFS)
therefore the upstream flow rate of Q = 350.552(CFS) is being used
Rainfall intensity = 1.891(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.669
Subarea runoff = 0.000(CFS) for 5.030(Ac.)
Total runoff = 350.552(CFS)
Effective area this stream = 267.99(Ac.)
Total Study Area (Main Stream No. 1) = 304.73(Ac.)
Area averaged Fm value = 0.485(In/Hr)
Depth of flow = 2.078(Ft.), Average velocity = 8.276(Ft/s)
Critical depth = 2.313(Ft.)

++++
Process from Point/Station 100.000 to Point/Station 103.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 267.986(Ac.)
Runoff from this stream = 350.552(CFS)
Time of concentration = 34.94 min.
Rainfall intensity = 1.891(In/Hr)
Area averaged loss rate (Fm) = 0.4850(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9558

++++
Process from Point/Station 120.000 to Point/Station 121.000

**** INITIAL AREA EVALUATION ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 2576.000(Ft.)
Bottom (of initial area) elevation = 2557.000(Ft.)
Difference in elevation = 19.000(Ft.)
Slope = 0.01900 s(%)= 1.90
TC = $k(0.518)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 18.132 min.
Rainfall intensity = 2.993(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.747
Subarea runoff = 7.830(CFS)
Total initial stream area = 3.500(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.507(In/Hr)

++++
Process from Point/Station 121.000 to Point/Station 122.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2557.000(Ft.)
Downstream point elevation = 2501.000(Ft.)
Channel length thru subarea = 3386.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 42.815(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 42.815(CFS)
Depth of flow = 0.722(Ft.), Average velocity = 4.358(Ft/s)
Channel flow top width = 17.219(Ft.)
Flow Velocity = 4.36(Ft/s)
Travel time = 12.95 min.
Time of concentration = 31.08 min.
Critical depth = 0.727(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 0.9600 Max loss rate(Fm)= 0.487(In/Hr)
Rainfall intensity = 2.052(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.686
Subarea runoff = 69.914(CFS) for 51.730(Ac.)
Total runoff = 77.744(CFS)
Effective area this stream = 55.23(Ac.)
Total Study Area (Main Stream No. 1) = 359.96(Ac.)
Area averaged Fm value = 0.488(In/Hr)
Depth of flow = 0.996(Ft.), Average velocity = 5.212(Ft/s)
Critical depth = 1.031(Ft.)

++++
Process from Point/Station 122.000 to Point/Station 103.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2501.000(Ft.)

Downstream point elevation = 2492.000(Ft.)
 Channel length thru subarea = 677.000(Ft.)
 Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 5.000
 Slope or 'Z' of right channel bank = 5.000
 Estimated mean flow rate at midpoint of channel = 78.538(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 3.000(Ft.)
 Flow(q) thru subarea = 78.538(CFS)
 Depth of flow = 1.061(Ft.), Average velocity = 4.838(Ft/s)
 Channel flow top width = 20.607(Ft.)
 Flow Velocity = 4.84(Ft/s)
 Travel time = 2.33 min.
 Time of concentration = 33.41 min.
 Critical depth = 1.031(Ft.)
 Adding area flow to channel
 Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 86.00
 Adjusted SCS curve number for AMC 1 = 71.60
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
 Rainfall intensity = 1.951(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area,(total area with modified
 rational method)(Q=KCIA) is C = 0.674
 Subarea runoff = 1.497(CFS) for 5.030(Ac.)
 Total runoff = 79.241(CFS)
 Effective area this stream = 60.26(Ac.)
 Total Study Area (Main Stream No. 1) = 364.99(Ac.)
 Area averaged Fm value = 0.490(In/Hr)
 Depth of flow = 1.066(Ft.), Average velocity = 4.851(Ft/s)
 Critical depth = 1.047(Ft.)

+-----+
 Process from Point/Station 120.000 to Point/Station 103.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 60.260(Ac.)
 Runoff from this stream = 79.241(CFS)
 Time of concentration = 33.41 min.
 Rainfall intensity = 1.951(In/Hr)
 Area averaged loss rate (Fm) = 0.4900(In/Hr)
 Area averaged Pervious ratio (Ap) = 0.9657
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
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1	350.55	267.986	34.94	0.485	1.891
2	79.24	60.260	33.41	0.490	1.951

Qmax(1) =
 $1.000 * 1.000 * 350.552 + 0.959 * 1.000 * 79.241 = 426.525$

Qmax(2) =
 $1.043 * 0.956 * 350.552 + 1.000 * 1.000 * 79.241 = 428.796$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 350.552 79.241

Maximum flow rates at confluence using above data:
 426.525 428.796

Area of streams before confluence:
 267.986 60.260

Effective area values after confluence:
328.246 316.503
Results of confluence:
Total flow rate = 428.796(CFS)
Time of concentration = 33.413 min.
Effective stream area after confluence = 316.503(Ac.)
Study area average Pervious fraction(Ap) = 0.958
Study area average soil loss rate(Fm) = 0.486(In/Hr)
Study area total (this main stream) = 328.25(Ac.)

++++
Process from Point/Station 103.000 to Point/Station 400.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2492.000(Ft.)
Downstream point elevation = 2467.000(Ft.)
Channel length thru subarea = 2035.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 428.825(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 428.825(CFS)
Depth of flow = 2.525(Ft.), Average velocity = 7.505(Ft/s)
Channel flow top width = 35.254(Ft.)
Flow Velocity = 7.50(Ft/s)
Travel time = 4.52 min.
Time of concentration = 37.93 min.
Critical depth = 2.563(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q = 420.008(CFS)
therefore the upstream flow rate of Q = 428.796(CFS) is being used
Rainfall intensity = 1.785(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.654
Subarea runoff = 0.000(CFS) for 43.370(Ac.)
Total runoff = 428.796(CFS)
Effective area this stream = 359.87(Ac.)
Total Study Area (Main Stream No. 1) = 408.36(Ac.)
Area averaged Fm value = 0.489(In/Hr)
Depth of flow = 2.525(Ft.), Average velocity = 7.505(Ft/s)
Critical depth = 2.563(Ft.)

++++
Process from Point/Station 100.000 to Point/Station 400.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 359.873(Ac.)
Runoff from this stream = 428.796(CFS)
Time of concentration = 37.93 min.
Rainfall intensity = 1.785(In/Hr)
Area averaged loss rate (Fm) = 0.4885(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9627

++++

Process from Point/Station 200.000 to Point/Station 201.000
**** INITIAL AREA EVALUATION ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 2680.000(Ft.)
Bottom (of initial area) elevation = 2654.000(Ft.)
Difference in elevation = 26.000(Ft.)
Slope = 0.02600 s(%)= 2.60
TC = $k(0.518)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 17.029 min.
Rainfall intensity = 3.127(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.754
Subarea runoff = 11.365(CFS)
Total initial stream area = 4.820(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.507(In/Hr)

+++++
Process from Point/Station 201.000 to Point/Station 202.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2654.000(Ft.)
Downstream point elevation = 2504.000(Ft.)
Channel length thru subarea = 7929.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 85.373(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 85.373(CFS)
Depth of flow = 1.010(Ft.), Average velocity = 5.617(Ft/s)
Channel flow top width = 20.099(Ft.)
Flow Velocity = 5.62(Ft/s)
Travel time = 23.52 min.
Time of concentration = 40.55 min.
Critical depth = 1.086(Ft.)

Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 0.9800 Max loss rate(Fm)= 0.497(In/Hr)
Rainfall intensity = 1.704(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.637
Subarea runoff = 147.951(CFS) for 141.950(Ac.)
Total runoff = 159.316(CFS)
Effective area this stream = 146.77(Ac.)
Total Study Area (Main Stream No. 1) = 555.13(Ac.)
Area averaged Fm value = 0.498(In/Hr)
Depth of flow = 1.397(Ft.), Average velocity = 6.715(Ft/s)
Critical depth = 1.531(Ft.)

+++++
Process from Point/Station 202.000 to Point/Station 400.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2504.000(Ft.)
 Downstream point elevation = 2467.000(Ft.)
 Channel length thru subarea = 2409.000(Ft.)
 Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 5.000
 Slope or 'Z' of right channel bank = 5.000
 Estimated mean flow rate at midpoint of channel = 159.360(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 3.000(Ft.)
 Flow(q) thru subarea = 159.360(CFS)
 Depth of flow = 1.473(Ft.), Average velocity = 6.230(Ft/s)
 Channel flow top width = 24.731(Ft.)
 Flow Velocity = 6.23(Ft/s)
 Travel time = 6.44 min.
 Time of concentration = 47.00 min.
 Critical depth = 1.531(Ft.)
 Adding area flow to channel
 Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 86.00
 Adjusted SCS curve number for AMC 1 = 71.60
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
 The area added to the existing stream causes a
 a lower flow rate of Q = 156.062(CFS)
 therefore the upstream flow rate of Q = 159.316(CFS) is being used
 Rainfall intensity = 1.537(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area,(total area with modified
 rational method)(Q=KCIA) is C = 0.608
 Subarea runoff = 0.000(CFS) for 20.320(Ac.)
 Total runoff = 159.316(CFS)
 Effective area this stream = 167.09(Ac.)
 Total Study Area (Main Stream No. 1) = 575.45(Ac.)
 Area averaged Fm value = 0.499(In/Hr)
 Depth of flow = 1.473(Ft.), Average velocity = 6.229(Ft/s)
 Critical depth = 1.531(Ft.)

++++++
 Process from Point/Station 200.000 to Point/Station 400.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 167.090(Ac.)
 Runoff from this stream = 159.316(CFS)
 Time of concentration = 47.00 min.
 Rainfall intensity = 1.537(In/Hr)
 Area averaged loss rate (Fm) = 0.4988(In/Hr)
 Area averaged Pervious ratio (Ap) = 0.9830
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
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1	428.80	359.873	37.93	0.489	1.785
2	159.32	167.090	47.00	0.499	1.537

Qmax(1) =
 $1.000 * 1.000 * 428.796 + 1.240 * 0.807 * 159.316 = 588.196$

Qmax(2) =
 $0.808 * 1.000 * 428.796 + 1.000 * 1.000 * 159.316 = 505.871$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 428.796 159.316

Maximum flow rates at confluence using above data:

588.196 505.871

Area of streams before confluence:

359.873 167.090

Effective area values after confluence:

494.730 526.963

Results of confluence:

Total flow rate = 588.196(CFS)

Time of concentration = 37.932 min.

Effective stream area after confluence = 494.730(Ac.)

Study area average Pervious fraction(A_p) = 0.969

Study area average soil loss rate(F_m) = 0.492(In/Hr)

Study area total (this main stream) = 526.96(Ac.)

End of computations, Total Study Area = 575.45 (Ac.)

The following figures may

be used for a unit hydrograph study of the same area.

Note: These figures do not consider reduced effective area effects caused by confluences in the rational equation.

Area averaged pervious area fraction(A_p) = 0.968

Area averaged SCS curve number = 86.0

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date- August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2005 Version 7.1
Rational Hydrology Study Date: 11/18/24

Program License Serial Number 5006

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 100.0
10 Year storm 1 hour rainfall = 0.935(In.)
100 Year storm 1 hour rainfall = 1.840(In.)
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.840 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 1

Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 2700.000(Ft.)
Bottom (of initial area) elevation = 2674.000(Ft.)
Difference in elevation = 26.000(Ft.)
Slope = 0.02600 s(%)= 2.60
TC = k(0.518)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 17.029 min.
Rainfall intensity = 4.443(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.797
Subarea runoff = 24.016(CFS)
Total initial stream area = 6.780(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.507(In/Hr)

Process from Point/Station 101.000 to Point/Station 102.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2674.000(Ft.)
Downstream point elevation = 2509.000(Ft.)
Channel length thru subarea = 8686.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 199.067(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 199.067(CFS)
Depth of flow = 1.562(Ft.), Average velocity = 7.155(Ft/s)
Channel flow top width = 25.621(Ft.)

Flow Velocity = 7.16(Ft/s)
Travel time = 20.23 min.
Time of concentration = 37.26 min.
Critical depth = 1.734(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 0.9800 Max loss rate(Fm)= 0.497(In/Hr)
Rainfall intensity = 2.568(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.726
Subarea runoff = 350.019(CFS) for 193.930(Ac.)
Total runoff = 374.035(CFS)
Effective area this stream = 200.71(Ac.)
Total Study Area (Main Stream No. 1) = 200.71(Ac.)
Area averaged Fm value = 0.498(In/Hr)
Depth of flow = 2.132(Ft.), Average velocity = 8.493(Ft/s)
Critical depth = 2.406(Ft.)

++++
Process from Point/Station 100.000 to Point/Station 102.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 200.710(Ac.)
Runoff from this stream = 374.035(CFS)
Time of concentration = 37.26 min.
Rainfall intensity = 2.568(In/Hr)
Area averaged loss rate (Fm) = 0.4976(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9807

++++
Process from Point/Station 110.000 to Point/Station 111.000
**** INITIAL AREA EVALUATION ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 2621.000(Ft.)
Bottom (of initial area) elevation = 2594.000(Ft.)
Difference in elevation = 27.000(Ft.)
Slope = 0.02700 s(%)= 2.70
TC = k(0.518)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 16.901 min.
Rainfall intensity = 4.467(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.798
Subarea runoff = 10.227(CFS)
Total initial stream area = 2.870(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.507(In/Hr)

++++
Process from Point/Station 111.000 to Point/Station 102.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2594.000(Ft.)
Downstream point elevation = 2509.000(Ft.)

Channel length thru subarea = 4978.000(Ft.)
 Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 5.000
 Slope or 'Z' of right channel bank = 5.000
 Estimated mean flow rate at midpoint of channel = 115.008(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 3.000(Ft.)
 Flow(q) thru subarea = 115.008(CFS)
 Depth of flow = 1.213(Ft.), Average velocity = 5.903(Ft/s)
 Channel flow top width = 22.128(Ft.)
 Flow Velocity = 5.90(Ft/s)
 Travel time = 14.05 min.
 Time of concentration = 30.96 min.
 Critical depth = 1.281(Ft.)
 Adding area flow to channel
 Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 86.00
 Adjusted SCS curve number for AMC 1 = 71.60
 Pervious ratio(Ap) = 0.9000 Max loss rate(Fm)= 0.457(ln/Hr)
 Rainfall intensity = 2.924(ln/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area,(total area with modified
 rational method)(Q=KClA) is C = 0.759
 Subarea runoff = 209.474(CFS) for 96.120(Ac.)
 Total runoff = 219.701(CFS)
 Effective area this stream = 98.99(Ac.)
 Total Study Area (Main Stream No. 1) = 299.70(Ac.)
 Area averaged Fm value = 0.458(ln/Hr)
 Depth of flow = 1.686(Ft.), Average velocity = 7.073(Ft/s)
 Critical depth = 1.828(Ft.)

++++++
 Process from Point/Station 110.000 to Point/Station 102.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 98.990(Ac.)
 Runoff from this stream = 219.701(CFS)
 Time of concentration = 30.96 min.
 Rainfall intensity = 2.924(ln/Hr)
 Area averaged loss rate (Fm) = 0.4582(ln/Hr)
 Area averaged Pervious ratio (Ap) = 0.9029
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (ln/Hr)	Rainfall Intensity (ln/Hr)
------------	-----------------	------------	----------	------------	----------------------------

1	374.03	200.710	37.26	0.498	2.568
2	219.70	98.990	30.96	0.458	2.924

Qmax(1) =
 $1.000 * 1.000 * 374.035 + 0.856 * 1.000 * 219.701 = 562.025$

Qmax(2) =
 $1.172 * 0.831 * 374.035 + 1.000 * 1.000 * 219.701 = 583.848$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 374.035 219.701
 Maximum flow rates at confluence using above data:
 562.025 583.848
 Area of streams before confluence:
 200.710 98.990
 Effective area values after confluence:

299.700 265.732
Results of confluence:
Total flow rate = 583.848(CFS)
Time of concentration = 30.956 min.
Effective stream area after confluence = 265.732(Ac.)
Study area average Pervious fraction(Ap) = 0.955
Study area average soil loss rate(Fm) = 0.485(In/Hr)
Study area total (this main stream) = 299.70(Ac.)

++++
Process from Point/Station 102.000 to Point/Station 103.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2509.000(Ft.)
Downstream point elevation = 2492.000(Ft.)
Channel length thru subarea = 916.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 583.891(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 583.891(CFS)
Depth of flow = 2.650(Ft.), Average velocity = 9.476(Ft/s)
Channel flow top width = 36.501(Ft.)
Flow Velocity = 9.48(Ft/s)
Travel time = 1.61 min.
Time of concentration = 32.57 min.
Critical depth = 3.000(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q = 569.527(CFS)
therefore the upstream flow rate of Q = 583.848(CFS) is being used
Rainfall intensity = 2.822(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.745
Subarea runoff = 0.000(CFS) for 5.030(Ac.)
Total runoff = 583.848(CFS)
Effective area this stream = 270.76(Ac.)
Total Study Area (Main Stream No. 1) = 304.73(Ac.)
Area averaged Fm value = 0.485(In/Hr)
Depth of flow = 2.650(Ft.), Average velocity = 9.476(Ft/s)
Critical depth = 3.000(Ft.)

++++
Process from Point/Station 100.000 to Point/Station 103.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 270.762(Ac.)
Runoff from this stream = 583.848(CFS)
Time of concentration = 32.57 min.
Rainfall intensity = 2.822(In/Hr)
Area averaged loss rate (Fm) = 0.4850(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9558

++++
Process from Point/Station 120.000 to Point/Station 121.000

**** INITIAL AREA EVALUATION ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 2576.000(Ft.)
Bottom (of initial area) elevation = 2557.000(Ft.)
Difference in elevation = 19.000(Ft.)
Slope = 0.01900 s(%)= 1.90
TC = $k(0.518)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 18.132 min.
Rainfall intensity = 4.252(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.793
Subarea runoff = 11.796(CFS)
Total initial stream area = 3.500(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.507(In/Hr)

+++++
Process from Point/Station 121.000 to Point/Station 122.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2557.000(Ft.)
Downstream point elevation = 2501.000(Ft.)
Channel length thru subarea = 3386.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 69.256(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 69.256(CFS)
Depth of flow = 0.936(Ft.), Average velocity = 5.038(Ft/s)
Channel flow top width = 19.364(Ft.)
Flow Velocity = 5.04(Ft/s)
Travel time = 11.20 min.
Time of concentration = 29.33 min.
Critical depth = 0.969(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 0.9600 Max loss rate(Fm)= 0.487(In/Hr)
Rainfall intensity = 3.036(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.755
Subarea runoff = 114.857(CFS) for 51.730(Ac.)
Total runoff = 126.653(CFS)
Effective area this stream = 55.23(Ac.)
Total Study Area (Main Stream No. 1) = 359.96(Ac.)
Area averaged Fm value = 0.488(In/Hr)
Depth of flow = 1.285(Ft.), Average velocity = 5.998(Ft/s)
Critical depth = 1.359(Ft.)

+++++
Process from Point/Station 122.000 to Point/Station 103.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2501.000(Ft.)

Downstream point elevation = 2492.000(Ft.)
 Channel length thru subarea = 677.000(Ft.)
 Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 5.000
 Slope or 'Z' of right channel bank = 5.000
 Estimated mean flow rate at midpoint of channel = 128.649(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 3.000(Ft.)
 Flow(q) thru subarea = 128.649(CFS)
 Depth of flow = 1.370(Ft.), Average velocity = 5.570(Ft/s)
 Channel flow top width = 23.704(Ft.)
 Flow Velocity = 5.57(Ft/s)
 Travel time = 2.03 min.
 Time of concentration = 31.36 min.
 Critical depth = 1.359(Ft.)
 Adding area flow to channel
 Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 86.00
 Adjusted SCS curve number for AMC 1 = 71.60
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
 Rainfall intensity = 2.898(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area,(total area with modified
 rational method)(Q=KClA) is C = 0.748
 Subarea runoff = 3.929(CFS) for 5.030(Ac.)
 Total runoff = 130.582(CFS)
 Effective area this stream = 60.26(Ac.)
 Total Study Area (Main Stream No. 1) = 364.99(Ac.)
 Area averaged Fm value = 0.490(In/Hr)
 Depth of flow = 1.381(Ft.), Average velocity = 5.594(Ft/s)
 Critical depth = 1.375(Ft.)

+-----+
 Process from Point/Station 120.000 to Point/Station 103.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 60.260(Ac.)
 Runoff from this stream = 130.582(CFS)
 Time of concentration = 31.36 min.
 Rainfall intensity = 2.898(In/Hr)
 Area averaged loss rate (Fm) = 0.4900(In/Hr)
 Area averaged Pervious ratio (Ap) = 0.9657
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
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1	583.85	270.762	32.57	0.485	2.822
2	130.58	60.260	31.36	0.490	2.898

Qmax(1) =
 $1.000 * 1.000 * 583.848 + 0.969 * 1.000 * 130.582 = 710.330$

Qmax(2) =
 $1.032 * 0.963 * 583.848 + 1.000 * 1.000 * 130.582 = 710.978$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 583.848 130.582
 Maximum flow rates at confluence using above data:
 710.330 710.978
 Area of streams before confluence:
 270.762 60.260

Effective area values after confluence:
331.022 320.987
Results of confluence:
Total flow rate = 710.978(CFS)
Time of concentration = 31.360 min.
Effective stream area after confluence = 320.987(Ac.)
Study area average Pervious fraction(Ap) = 0.958
Study area average soil loss rate(Fm) = 0.486(In/Hr)
Study area total (this main stream) = 331.02(Ac.)

++++
Process from Point/Station 103.000 to Point/Station 400.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2492.000(Ft.)
Downstream point elevation = 2467.000(Ft.)
Channel length thru subarea = 2035.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 713.295(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 713.295(CFS)
Depth of flow = 3.165(Ft.), Average velocity = 8.743(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width = 40.000(Ft.)
Flow Velocity = 8.74(Ft/s)
Travel time = 3.88 min.
Time of concentration = 35.24 min.
Critical depth = 3.281(Ft.)
ERROR- Channel depth exceeds maximum allowable depth
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
Rainfall intensity = 2.671(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KClA) is C = 0.735
Subarea runoff = 4.580(CFS) for 43.370(Ac.)
Total runoff = 715.557(CFS)
Effective area this stream = 364.36(Ac.)
Total Study Area (Main Stream No. 1) = 408.36(Ac.)
Area averaged Fm value = 0.488(In/Hr)
Depth of flow = 3.168(Ft.), Average velocity = 8.754(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR- Channel depth exceeds maximum allowable depth
Critical depth = 3.281(Ft.)

++++
Process from Point/Station 100.000 to Point/Station 400.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 364.357(Ac.)
Runoff from this stream = 715.557(CFS)
Time of concentration = 35.24 min.
Rainfall intensity = 2.671(In/Hr)
Area averaged loss rate (Fm) = 0.4885(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9627

++++
Process from Point/Station 200.000 to Point/Station 201.000
**** INITIAL AREA EVALUATION ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 2680.000(Ft.)
Bottom (of initial area) elevation = 2654.000(Ft.)
Difference in elevation = 26.000(Ft.)
Slope = 0.02600 s(%)= 2.60
TC = $k(0.518)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 17.029 min.
Rainfall intensity = 4.443(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.797
Subarea runoff = 17.073(CFS)
Total initial stream area = 4.820(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.507(In/Hr)

++++
Process from Point/Station 201.000 to Point/Station 202.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2654.000(Ft.)
Downstream point elevation = 2504.000(Ft.)
Channel length thru subarea = 7929.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 145.466(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 145.466(CFS)
Depth of flow = 1.333(Ft.), Average velocity = 6.546(Ft/s)
Channel flow top width = 23.334(Ft.)
Flow Velocity = 6.55(Ft/s)
Travel time = 20.19 min.
Time of concentration = 37.22 min.
Critical depth = 1.469(Ft.)
Adding area flow to channel

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 0.9800 Max loss rate(Fm)= 0.497(In/Hr)
Rainfall intensity = 2.570(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.726
Subarea runoff = 256.723(CFS) for 141.950(Ac.)
Total runoff = 273.796(CFS)
Effective area this stream = 146.77(Ac.)
Total Study Area (Main Stream No. 1) = 555.13(Ac.)
Area averaged Fm value = 0.498(In/Hr)
Depth of flow = 1.833(Ft.), Average velocity = 7.796(Ft/s)
Critical depth = 2.047(Ft.)

++++
Process from Point/Station 202.000 to Point/Station 400.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2504.000(Ft.)
 Downstream point elevation = 2467.000(Ft.)
 Channel length thru subarea = 2409.000(Ft.)
 Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 5.000
 Slope or 'Z' of right channel bank = 5.000
 Estimated mean flow rate at midpoint of channel = 274.777(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 3.000(Ft.)
 Flow(q) thru subarea = 274.777(CFS)
 Depth of flow = 1.932(Ft.), Average velocity = 7.233(Ft/s)
 Channel flow top width = 29.322(Ft.)
 Flow Velocity = 7.23(Ft/s)
 Travel time = 5.55 min.
 Time of concentration = 42.77 min.
 Critical depth = 2.047(Ft.)
 Adding area flow to channel
 Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 86.00
 Adjusted SCS curve number for AMC 1 = 71.60
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
 Rainfall intensity = 2.332(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area,(total area with modified
 rational method)(Q=KCIA) is C = 0.707
 Subarea runoff = 1.883(CFS) for 20.320(Ac.)
 Total runoff = 275.679(CFS)
 Effective area this stream = 167.09(Ac.)
 Total Study Area (Main Stream No. 1) = 575.45(Ac.)
 Area averaged Fm value = 0.499(In/Hr)
 Depth of flow = 1.935(Ft.), Average velocity = 7.239(Ft/s)
 Critical depth = 2.063(Ft.)

++++++
 Process from Point/Station 200.000 to Point/Station 400.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 167.090(Ac.)
 Runoff from this stream = 275.679(CFS)
 Time of concentration = 42.77 min.
 Rainfall intensity = 2.332(In/Hr)
 Area averaged loss rate (Fm) = 0.4988(In/Hr)
 Area averaged Pervious ratio (Ap) = 0.9830
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
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1	715.56	364.357	35.24	0.488	2.671
2	275.68	167.090	42.77	0.499	2.332

Qmax(1) =
 $1.000 * 1.000 * 715.557 + 1.185 * 0.824 * 275.679 = 984.649$

Qmax(2) =
 $0.845 * 1.000 * 715.557 + 1.000 * 1.000 * 275.679 = 880.211$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 715.557 275.679

Maximum flow rates at confluence using above data:
 984.649 880.211

Area of streams before confluence:

364.357 167.090

Effective area values after confluence:

502.028 531.447

Results of confluence:

Total flow rate = 984.649(CFS)

Time of concentration = 35.239 min.

Effective stream area after confluence = 502.028(Ac.)

Study area average Pervious fraction(A_p) = 0.969

Study area average soil loss rate(F_m) = 0.492(In/Hr)

Study area total (this main stream) = 531.45(Ac.)

End of computations, Total Study Area = 575.45 (Ac.)

The following figures may

be used for a unit hydrograph study of the same area.

Note: These figures do not consider reduced effective area effects caused by confluences in the rational equation.

Area averaged pervious area fraction(A_p) = 0.968

Area averaged SCS curve number = 86.0

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date- August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2005 Version 7.1
Rational Hydrology Study Date: 11/18/24

Program License Serial Number 5006

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 10.0
Computed rainfall intensity:
Storm year = 10.00 1 hour rainfall = 0.935 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 1

+++++
Process from Point/Station 300.000 to Point/Station 301.000
**** INITIAL AREA EVALUATION ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 2532.000(Ft.)
Bottom (of initial area) elevation = 2512.000(Ft.)
Difference in elevation = 20.000(Ft.)
Slope = 0.02000 s(%)= 2.00
 $TC = k(0.518)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 17.946 min.
Rainfall intensity = 2.176(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KClA) is C = 0.690
Subarea runoff = 13.849(CFS)
Total initial stream area = 9.220(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.507(In/Hr)

+++++
Process from Point/Station 301.000 to Point/Station 302.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2512.000(Ft.)
Downstream point elevation = 2492.000(Ft.)
Channel length thru subarea = 1133.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 22.287(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 22.287(CFS)
Depth of flow = 0.493(Ft.), Average velocity = 3.626(Ft/s)
Channel flow top width = 14.931(Ft.)
Flow Velocity = 3.63(Ft/s)
Travel time = 5.21 min.

Time of concentration = 23.15 min.
Critical depth = 0.492(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
Rainfall intensity = 1.821(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.649
Subarea runoff = 16.791(CFS) for 16.700(Ac.)
Total runoff = 30.639(CFS)
Effective area this stream = 25.92(Ac.)
Total Study Area (Main Stream No. 1) = 25.92(Ac.)
Area averaged Fm value = 0.507(In/Hr)
Depth of flow = 0.589(Ft.), Average velocity = 4.015(Ft/s)
Critical depth = 0.594(Ft.)

+++++
Process from Point/Station 302.000 to Point/Station 303.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2492.000(Ft.)
Downstream point elevation = 2475.000(Ft.)
Channel length thru subarea = 1203.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 37.669(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 37.669(CFS)
Depth of flow = 0.703(Ft.), Average velocity = 3.968(Ft/s)
Channel flow top width = 17.026(Ft.)
Flow Velocity = 3.97(Ft/s)
Travel time = 5.05 min.

Time of concentration = 28.21 min.
Critical depth = 0.672(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
Rainfall intensity = 1.586(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.612
Subarea runoff = 13.968(CFS) for 20.040(Ac.)
Total runoff = 44.607(CFS)
Effective area this stream = 45.96(Ac.)
Total Study Area (Main Stream No. 1) = 45.96(Ac.)
Area averaged Fm value = 0.507(In/Hr)
Depth of flow = 0.771(Ft.), Average velocity = 4.178(Ft/s)
Critical depth = 0.750(Ft.)
End of computations, Total Study Area = 45.96 (Ac.)

The following figures may be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number = 86.0

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date- August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2005 Version 7.1
Rational Hydrology Study Date: 11/18/24

Program License Serial Number 5006

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 25.0
10 Year storm 1 hour rainfall = 0.935(In.)
100 Year storm 1 hour rainfall = 1.840(In.)
Computed rainfall intensity:
Storm year = 25.00 1 hour rainfall = 1.295 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 1

Process from Point/Station 300.000 to Point/Station 301.000
**** INITIAL AREA EVALUATION ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 2532.000(Ft.)
Bottom (of initial area) elevation = 2512.000(Ft.)
Difference in elevation = 20.000(Ft.)
Slope = 0.02000 s(%)= 2.00
TC = $k(0.518)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 17.946 min.
Rainfall intensity = 3.015(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.749
Subarea runoff = 20.805(CFS)
Total initial stream area = 9.220(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.507(In/Hr)

Process from Point/Station 301.000 to Point/Station 302.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2512.000(Ft.)
Downstream point elevation = 2492.000(Ft.)
Channel length thru subarea = 1133.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 34.573(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 34.573(CFS)
Depth of flow = 0.630(Ft.), Average velocity = 4.171(Ft/s)
Channel flow top width = 16.303(Ft.)

Flow Velocity = 4.17(Ft/s)
Travel time = 4.53 min.
Time of concentration = 22.47 min.
Critical depth = 0.641(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
Rainfall intensity = 2.575(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.723
Subarea runoff = 27.437(CFS) for 16.700(Ac.)
Total runoff = 48.242(CFS)
Effective area this stream = 25.92(Ac.)
Total Study Area (Main Stream No. 1) = 25.92(Ac.)
Area averaged Fm value = 0.507(In/Hr)
Depth of flow = 0.757(Ft.), Average velocity = 4.623(Ft/s)
Critical depth = 0.781(Ft.)

++++
Process from Point/Station 302.000 to Point/Station 303.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2492.000(Ft.)
Downstream point elevation = 2475.000(Ft.)
Channel length thru subarea = 1203.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 60.685(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 60.685(CFS)
Depth of flow = 0.910(Ft.), Average velocity = 4.583(Ft/s)
Channel flow top width = 19.100(Ft.)
Flow Velocity = 4.58(Ft/s)
Travel time = 4.37 min.

Time of concentration = 26.85 min.
Critical depth = 0.891(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
Rainfall intensity = 2.274(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.699
Subarea runoff = 24.828(CFS) for 20.040(Ac.)
Total runoff = 73.069(CFS)
Effective area this stream = 45.96(Ac.)
Total Study Area (Main Stream No. 1) = 45.96(Ac.)
Area averaged Fm value = 0.507(In/Hr)
Depth of flow = 1.005(Ft.), Average velocity = 4.841(Ft/s)
Critical depth = 1.000(Ft.)
End of computations, Total Study Area = 45.96 (Ac.)

The following figures may be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number = 86.0

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2005 Version 7.1
Rational Hydrology Study Date: 11/18/24

Program License Serial Number 5006

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 100.0
10 Year storm 1 hour rainfall = 0.935(In.)
100 Year storm 1 hour rainfall = 1.840(In.)
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.840 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 1

Process from Point/Station 300.000 to Point/Station 301.000
**** INITIAL AREA EVALUATION ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 2532.000(Ft.)
Bottom (of initial area) elevation = 2512.000(Ft.)
Difference in elevation = 20.000(Ft.)
Slope = 0.02000 s(%)= 2.00
TC = $k(0.518)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 17.946 min.
Rainfall intensity = 4.283(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.793
Subarea runoff = 31.329(CFS)
Total initial stream area = 9.220(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.507(In/Hr)

Process from Point/Station 301.000 to Point/Station 302.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2512.000(Ft.)
Downstream point elevation = 2492.000(Ft.)
Channel length thru subarea = 1133.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 53.219(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 53.219(CFS)
Depth of flow = 0.798(Ft.), Average velocity = 4.763(Ft/s)
Channel flow top width = 17.985(Ft.)

Flow Velocity = 4.76(Ft/s)
 Travel time = 3.96 min.
 Time of concentration = 21.91 min.
 Critical depth = 0.828(Ft.)
 Adding area flow to channel
 Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 86.00
 Adjusted SCS curve number for AMC 1 = 71.60
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(ln/Hr)
 Rainfall intensity = 3.724(ln/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.777
 Subarea runoff = 43.718(CFS) for 16.700(Ac.)
 Total runoff = 75.047(CFS)
 Effective area this stream = 25.92(Ac.)
 Total Study Area (Main Stream No. 1) = 25.92(Ac.)
 Area averaged Fm value = 0.507(ln/Hr)
 Depth of flow = 0.961(Ft.), Average velocity = 5.278(Ft/s)
 Critical depth = 1.016(Ft.)

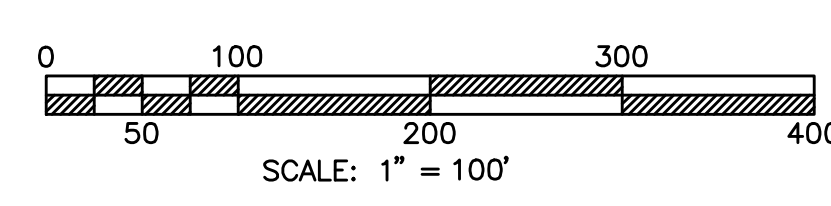
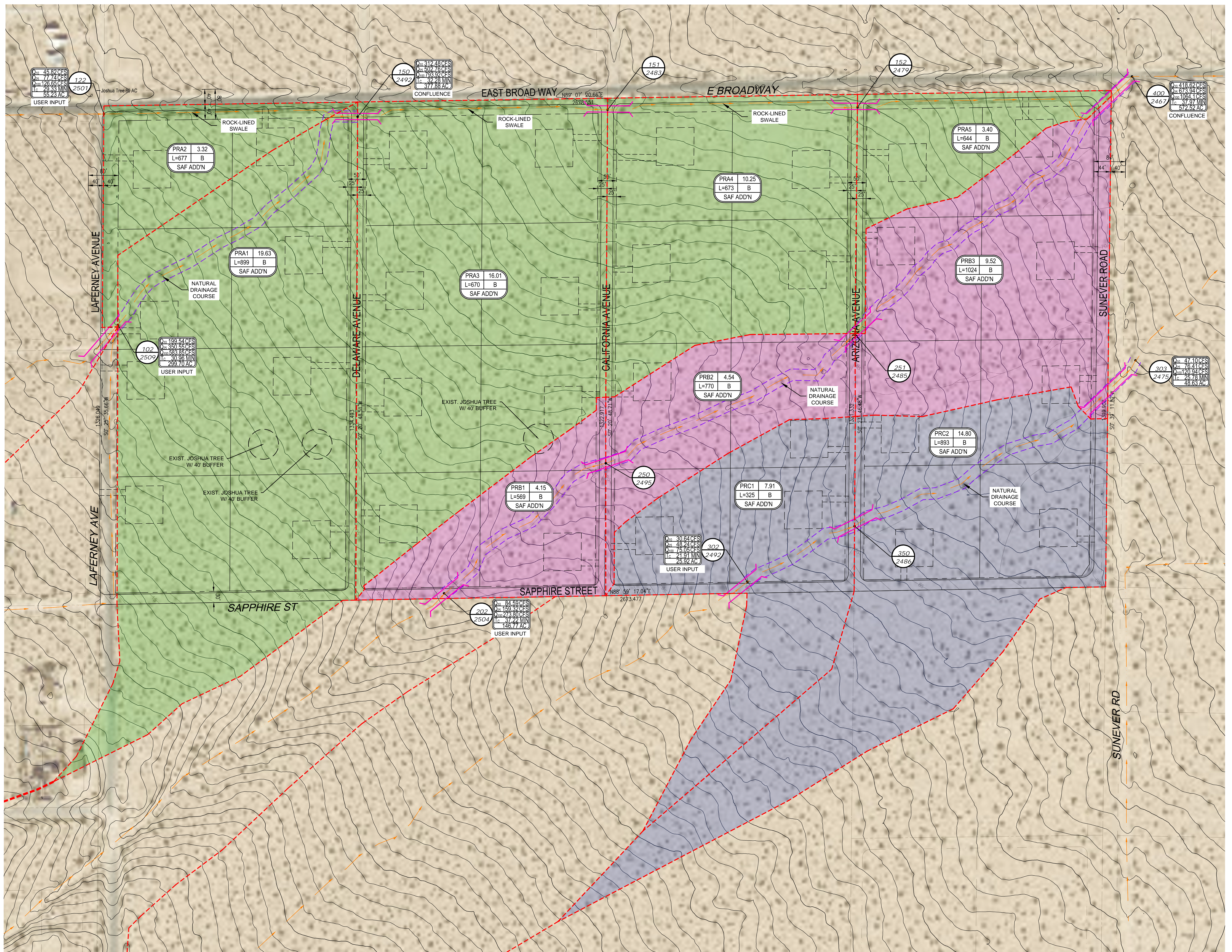
++++++
 Process from Point/Station 302.000 to Point/Station 303.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2492.000(Ft.)
 Downstream point elevation = 2475.000(Ft.)
 Channel length thru subarea = 1203.000(Ft.)
 Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 5.000
 Slope or 'Z' of right channel bank = 5.000
 Estimated mean flow rate at midpoint of channel = 95.884(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 3.000(Ft.)
 Flow(q) thru subarea = 95.884(CFS)
 Depth of flow = 1.159(Ft.), Average velocity = 5.238(Ft/s)
 Channel flow top width = 21.590(Ft.)
 Flow Velocity = 5.24(Ft/s)
 Travel time = 3.83 min.
Time of concentration = 25.74 min.
 Critical depth = 1.156(Ft.)
 Adding area flow to channel
 Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 86.00
 Adjusted SCS curve number for AMC 1 = 71.60
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(ln/Hr)
 Rainfall intensity = 3.327(ln/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.763
 Subarea runoff = 41.601(CFS) for 20.040(Ac.)
Total runoff = 116.648(CFS)
 Effective area this stream = 45.96(Ac.)
 Total Study Area (Main Stream No. 1) = 45.96(Ac.)
 Area averaged Fm value = 0.507(ln/Hr)
 Depth of flow = 1.283(Ft.), Average velocity = 5.539(Ft/s)
 Critical depth = 1.297(Ft.)
End of computations, Total Study Area = 45.96 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.
 Note: These figures do not consider reduced effective area effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
 Area averaged SCS curve number = 86.0

Appendix C – Proposed Rational Hydrology Method Map

POST-DEVELOPMENT RATIONAL HYDROLOGY MAP TTM 20668



LEGEND

- WATERSHED BOUNDARY
- - - SUBAREA BOUNDARY
- FLOW PATH
- - - DRAINAGE EASEMENT
- CHANNEL CROSSINGS (STD 200A)

NODE	ELEV	AREA	SOIL	NOTES
122	2501			
150	2492			
151	2483			
152	2479			
202	2504			
250	2495			
251	2485			
302	2492			
350	2486			
400	2467			

ID	AREA	LENGTH	SOIL	NOTES
PRA1	19.63		B	SAF ADDN
PRA2	3.32		B	SAF ADDN
PRA3	16.01		B	SAF ADDN
PRA4	10.25		B	SAF ADDN
PRA5	3.40		B	SAF ADDN
PRB1	4.15		B	SAF ADDN
PRB2	4.54		B	SAF ADDN
PRB3	9.52		B	SAF ADDN
PRB4	10.24		B	SAF ADDN
PRC1	7.91		B	SAF ADDN
PRC2	14.80		B	SAF ADDN

POST-DEVELOPMENT
RATIONAL HYDROLOGY MAP
TTM 20668
PREPARATION DATE: NOVEMBER 2024

adkan
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Appendix D – Proposed Rational Hydrology Method Calculations

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date- August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2005 Version 7.1
Rational Hydrology Study Date: 11/19/24

Program License Serial Number 5006

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 10.0
Computed rainfall intensity:
Storm year = 10.00 1 hour rainfall = 0.935 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 1

++++
Process from Point/Station 100.000 to Point/Station 102.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 0.9800 Max loss rate(Fm)= 0.497(In/Hr)
Rainfall intensity = 1.486(In/Hr) for a 10.0 year storm
User specified values are as follows:
TC = 30.96 min. Rain intensity = 1.49(In/Hr)
Total area this stream = 299.70(Ac.)
Total Study Area (Main Stream No. 1) = 299.70(Ac.)
Total runoff = 199.54(CFS)

++++
Process from Point/Station 102.000 to Point/Station 150.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2509.000(Ft.)
Downstream point elevation = 2492.000(Ft.)
Channel length thru subarea = 899.000(Ft.)
Channel base width = 5.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 231.937(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 19.630(Ft.)
Flow(q) thru subarea = 231.937(CFS)
Depth of flow = 2.014(Ft.), Average velocity = 7.642(Ft/s)
Channel flow top width = 25.139(Ft.)
Flow Velocity = 7.64(Ft/s)
Travel time = 1.96 min.
Time of concentration = 32.92 min.
Critical depth = 2.219(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 79.00
Adjusted SCS curve number for AMC 1 = 61.80
Pervious ratio(Ap) = 0.9100 Max loss rate(Fm)= 0.596(In/Hr)

Rainfall intensity = 1.423(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.582
Subarea runoff = 64.849(CFS) for 19.630(Ac.)
Total runoff = 264.389(CFS)
Effective area this stream = 319.33(Ac.)
Total Study Area (Main Stream No. 1) = 319.33(Ac.)
Area averaged Fm value = 0.503(In/Hr)
Depth of flow = 2.135(Ft.), Average velocity = 7.903(Ft/s)
Critical depth = 2.359(Ft.)

Process from Point/Station 102.000 to Point/Station 150.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 319.330(Ac.)
Runoff from this stream = 264.389(CFS)
Time of concentration = 32.92 min.
Rainfall intensity = 1.423(In/Hr)
Area averaged loss rate (Fm) = 0.5033(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9757

Process from Point/Station 120.000 to Point/Station 122.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 0.9800 Max loss rate(Fm)= 0.497(In/Hr)
Rainfall intensity = 1.543(In/Hr) for a 10.0 year storm
User specified values are as follows:
TC = 29.33 min. Rain intensity = 1.54(In/Hr)
Total area this stream = 55.23(Ac.)
Total Study Area (Main Stream No. 1) = 374.56(Ac.)
Total runoff = 45.82(CFS)

Process from Point/Station 122.000 to Point/Station 150.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2501.000(Ft.)
Downstream point elevation = 2492.000(Ft.)
Channel length thru subarea = 615.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 46.969(CFS)
Manning's 'N' = 0.060
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 46.969(CFS)
Depth of flow = 1.136(Ft.), Average velocity = 2.636(Ft/s)
Channel flow top width = 21.362(Ft.)
Flow Velocity = 2.64(Ft/s)
Travel time = 3.89 min.
Time of concentration = 33.22 min.
Critical depth = 0.766(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 79.00

Adjusted SCS curve number for AMC 1 = 61.80
Pervious ratio(Ap) = 0.9000 Max loss rate(Fm)= 0.589(In/Hr)
Rainfall intensity = 1.414(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.580
Subarea runoff = 2.230(CFS) for 3.320(Ac.)
Total runoff = 48.050(CFS)
Effective area this stream = 58.55(Ac.)
Total Study Area (Main Stream No. 1) = 377.88(Ac.)
Area averaged Fm value = 0.502(In/Hr)
Depth of flow = 1.150(Ft.), Average velocity = 2.653(Ft/s)
Critical depth = 0.781(Ft.)

+++++

Process from Point/Station 122.000 to Point/Station 150.000

**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2

Stream flow area = 58.550(Ac.)

Runoff from this stream = 48.050(CFS)

Time of concentration = 33.22 min.

Rainfall intensity = 1.414(In/Hr)

Area averaged loss rate (Fm) = 0.5025(In/Hr)

Area averaged Pervious ratio (Ap) = 0.9755

Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
------------	-----------------	------------	----------	------------	----------------------------

1	264.39	319.330	32.92	0.503	1.423
2	48.05	58.550	33.22	0.502	1.414

Qmax(1) =

$$1.000 * 1.000 * 264.389 + 1.010 * 0.991 * 48.050 = 312.475$$

Qmax(2) =

$$0.990 * 1.000 * 264.389 + 1.000 * 1.000 * 48.050 = 309.870$$

Total of 2 streams to confluence:

Flow rates before confluence point:

264.389 48.050

Maximum flow rates at confluence using above data:

312.475 309.870

Area of streams before confluence:

319.330 58.550

Effective area values after confluence:

377.356 377.880

Results of confluence:

Total flow rate = 312.475(CFS)

Time of concentration = 32.921 min.

Effective stream area after confluence = 377.356(Ac.)

Study area average Pervious fraction(Ap) = 0.976

Study area average soil loss rate(Fm) = 0.503(In/Hr)

Study area total (this main stream) = 377.88(Ac.)

+++++

Process from Point/Station 150.000 to Point/Station 151.000

**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2492.000(Ft.)

Downstream point elevation = 2483.000(Ft.)

Channel length thru subarea = 670.000(Ft.)

Channel base width = 10.000(Ft.)

Slope or 'Z' of left channel bank = 5.000
 Slope or 'Z' of right channel bank = 5.000
 Estimated mean flow rate at midpoint of channel = 312.501(CFS)
 Manning's 'N' = 0.060
 Maximum depth of channel = 3.000(Ft.)
 Flow(q) thru subarea = 312.501(CFS)
 Depth of flow = 2.950(Ft.), Average velocity = 4.281(Ft/s)
 Channel flow top width = 39.496(Ft.)
 Flow Velocity = 4.28(Ft/s)
 Travel time = 2.61 min.
 Time of concentration = 35.53 min.
 Critical depth = 2.188(Ft.)
 Adding area flow to channel
 Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 79.00
 Adjusted SCS curve number for AMC 1 = 61.80
 Pervious ratio(Ap) = 0.9000 Max loss rate(Fm)= 0.589(In/Hr)
 The area added to the existing stream causes a
 a lower flow rate of Q = 298.306(CFS)
 therefore the upstream flow rate of Q = 312.475(CFS) is being used
 Rainfall intensity = 1.349(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area,(total area with modified
 rational method)(Q=KCIA) is C = 0.562
 Subarea runoff = 0.000(CFS) for 16.010(Ac.)
 Total runoff = 312.475(CFS)
 Effective area this stream = 393.37(Ac.)
 Total Study Area (Main Stream No. 1) = 393.89(Ac.)
 Area averaged Fm value = 0.507(In/Hr)
 Depth of flow = 2.950(Ft.), Average velocity = 4.281(Ft/s)
 Critical depth = 2.188(Ft.)

++++++
 Process from Point/Station 151.000 to Point/Station 152.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2483.000(Ft.)
 Downstream point elevation = 2479.000(Ft.)
 Channel length thru subarea = 673.000(Ft.)
 Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 5.000
 Slope or 'Z' of right channel bank = 5.000
 Estimated mean flow rate at midpoint of channel = 312.507(CFS)
 Manning's 'N' = 0.060
 Maximum depth of channel = 3.000(Ft.)
 Flow(q) thru subarea = 312.507(CFS)
 Depth of flow = 3.468(Ft.), Average velocity = 3.335(Ft/s)
 !!Warning: Water is above left or right bank elevations
 Channel flow top width = 40.000(Ft.)
 Flow Velocity = 3.33(Ft/s)
 Travel time = 3.36 min.
 Time of concentration = 38.89 min.
 Critical depth = 2.188(Ft.)
 ERROR- Channel depth exceeds maximum allowable depth
 Adding area flow to channel
 Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 79.00
 Adjusted SCS curve number for AMC 1 = 61.80
 Pervious ratio(Ap) = 0.9000 Max loss rate(Fm)= 0.589(In/Hr)
 The area added to the existing stream causes a
 a lower flow rate of Q = 275.250(CFS)
 therefore the upstream flow rate of Q = 312.475(CFS) is being used
 Rainfall intensity = 1.267(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area,(total area with modified

rational method)(Q=KCIA) is C = 0.538
Subarea runoff = 0.000(CFS) for 10.250(Ac.)
Total runoff = 312.475(CFS)
Effective area this stream = 403.62(Ac.)
Total Study Area (Main Stream No. 1) = 404.14(Ac.)
Area averaged Fm value = 0.509(In/Hr)
Depth of flow = 3.468(Ft.), Average velocity = 3.335(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR- Channel depth exceeds maximum allowable depth
Critical depth = 2.188(Ft.)

++++
Process from Point/Station 152.000 to Point/Station 400.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2479.000(Ft.)
Downstream point elevation = 2467.000(Ft.)
Channel length thru subarea = 644.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 312.516(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 312.516(CFS)
Depth of flow = 1.963(Ft.), Average velocity = 8.036(Ft/s)
Channel flow top width = 29.628(Ft.)
Flow Velocity = 8.04(Ft/s)
Travel time = 1.34 min.
Time of concentration = 40.23 min.
Critical depth = 2.188(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 79.00
Adjusted SCS curve number for AMC 1 = 61.80
Pervious ratio(Ap) = 0.9000 Max loss rate(Fm)= 0.589(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q = 266.485(CFS)
therefore the upstream flow rate of Q = 312.475(CFS) is being used
Rainfall intensity = 1.237(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.529
Subarea runoff = 0.000(CFS) for 3.400(Ac.)
Total runoff = 312.475(CFS)
Effective area this stream = 407.02(Ac.)
Total Study Area (Main Stream No. 1) = 407.54(Ac.)
Area averaged Fm value = 0.509(In/Hr)
Depth of flow = 1.963(Ft.), Average velocity = 8.036(Ft/s)
Critical depth = 2.188(Ft.)

++++
Process from Point/Station 102.000 to Point/Station 400.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 407.016(Ac.)
Runoff from this stream = 312.475(CFS)
Time of concentration = 40.23 min.
Rainfall intensity = 1.237(In/Hr)
Area averaged loss rate (Fm) = 0.5095(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9701

++++
Process from Point/Station 202.000 to Point/Station 202.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 0.9800 Max loss rate(Fm)= 0.497(In/Hr)
Rainfall intensity = 1.306(In/Hr) for a 10.0 year storm
User specified values are as follows:
TC = 37.22 min. Rain intensity = 1.31(In/Hr)
Total area this stream = 146.77(Ac.)
Total Study Area (Main Stream No. 1) = 554.31(Ac.)
Total runoff = 84.59(CFS)

++++
Process from Point/Station 202.000 to Point/Station 250.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2504.000(Ft.)
Downstream point elevation = 2495.000(Ft.)
Channel length thru subarea = 569.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 94.213(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 5.000(Ft.)
Flow(q) thru subarea = 94.213(CFS)
Depth of flow = 1.115(Ft.), Average velocity = 5.425(Ft/s)
Channel flow top width = 21.150(Ft.)
Flow Velocity = 5.42(Ft/s)
Travel time = 1.75 min.
Time of concentration = 38.97 min.
Critical depth = 1.148(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 79.00
Adjusted SCS curve number for AMC 1 = 61.80
Pervious ratio(Ap) = 0.9000 Max loss rate(Fm)= 0.589(In/Hr)
Rainfall intensity = 1.265(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.544
Subarea runoff = 19.316(CFS) for 4.150(Ac.)
Total runoff = 103.906(CFS)
Effective area this stream = 150.92(Ac.)
Total Study Area (Main Stream No. 1) = 558.46(Ac.)
Area averaged Fm value = 0.500(In/Hr)
Depth of flow = 1.174(Ft.), Average velocity = 5.580(Ft/s)
Critical depth = 1.219(Ft.)

++++
Process from Point/Station 250.000 to Point/Station 251.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2495.000(Ft.)
Downstream point elevation = 2485.000(Ft.)
Channel length thru subarea = 770.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 103.954(CFS)

Manning's 'N' = 0.030
 Maximum depth of channel = 3.000(Ft.)
 Flow(q) thru subarea = 103.954(CFS)
 Depth of flow = 1.236(Ft.), Average velocity = 5.201(Ft/s)
 Channel flow top width = 22.355(Ft.)
 Flow Velocity = 5.20(Ft/s)
 Travel time = 2.47 min.
 Time of concentration = 41.44 min.
 Critical depth = 1.219(Ft.)
 Adding area flow to channel
 Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 79.00
 Adjusted SCS curve number for AMC 1 = 61.80
 Pervious ratio(Ap) = 0.9000 Max loss rate(Fm)= 0.589(In/Hr)
 The area added to the existing stream causes a
 a lower flow rate of Q = 99.223(CFS)
 therefore the upstream flow rate of Q = 103.906(CFS) is being used
 Rainfall intensity = 1.212(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area,(total area with modified
 rational method)(Q=KCIA) is C = 0.527
 Subarea runoff = 0.000(CFS) for 4.540(Ac.)
 Total runoff = 103.906(CFS)
 Effective area this stream = 155.46(Ac.)
 Total Study Area (Main Stream No. 1) = 563.00(Ac.)
 Area averaged Fm value = 0.502(In/Hr)
 Depth of flow = 1.235(Ft.), Average velocity = 5.200(Ft/s)
 Critical depth = 1.219(Ft.)

++++++
 Process from Point/Station 251.000 to Point/Station 400.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2485.000(Ft.)
 Downstream point elevation = 2467.000(Ft.)
 Channel length thru subarea = 1024.000(Ft.)
 Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 5.000
 Slope or 'Z' of right channel bank = 5.000
 Estimated mean flow rate at midpoint of channel = 103.955(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 3.000(Ft.)
 Flow(q) thru subarea = 103.955(CFS)
 Depth of flow = 1.142(Ft.), Average velocity = 5.795(Ft/s)
 Channel flow top width = 21.420(Ft.)
 Flow Velocity = 5.79(Ft/s)
 Travel time = 2.95 min.
 Time of concentration = 44.38 min.
 Critical depth = 1.219(Ft.)
 Adding area flow to channel
 Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 79.00
 Adjusted SCS curve number for AMC 1 = 61.80
 Pervious ratio(Ap) = 0.9000 Max loss rate(Fm)= 0.589(In/Hr)
 The area added to the existing stream causes a
 a lower flow rate of Q = 96.114(CFS)
 therefore the upstream flow rate of Q = 103.906(CFS) is being used
 Rainfall intensity = 1.155(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area,(total area with modified
 rational method)(Q=KCIA) is C = 0.505
 Subarea runoff = 0.000(CFS) for 9.520(Ac.)
 Total runoff = 103.906(CFS)
 Effective area this stream = 164.98(Ac.)
 Total Study Area (Main Stream No. 1) = 572.52(Ac.)

Area averaged Fm value = 0.507(In/Hr)
 Depth of flow = 1.142(Ft.), Average velocity = 5.794(Ft/s)
 Critical depth = 1.219(Ft.)

++++
 Process from Point/Station 202.000 to Point/Station 400.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 164.980(Ac.)
 Runoff from this stream = 103.906(CFS)
 Time of concentration = 44.38 min.
 Rainfall intensity = 1.155(In/Hr)
 Area averaged loss rate (Fm) = 0.5074(In/Hr)
 Area averaged Pervious ratio (Ap) = 0.9712
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
------------	-----------------	------------	----------	------------	----------------------------

1	312.47	407.016	40.23	0.509	1.237
2	103.91	164.980	44.38	0.507	1.155

Qmax(1) =
 $1.000 * 1.000 * 312.475 + 1.127 * 0.906 * 103.906 = 418.619$

Qmax(2) =
 $0.887 * 1.000 * 312.475 + 1.000 * 1.000 * 103.906 = 381.071$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 312.475 103.906

Maximum flow rates at confluence using above data:
 418.619 381.071

Area of streams before confluence:
 407.016 164.980

Effective area values after confluence:
 556.558 571.996

Results of confluence:

Total flow rate = 418.619(CFS)

Time of concentration = 40.228 min.

Effective stream area after confluence = 556.558(Ac.)

Study area average Pervious fraction(Ap) = 0.970

Study area average soil loss rate(Fm) = 0.509(In/Hr)

Study area total (this main stream) = 572.00(Ac.)

End of computations, Total Study Area = 572.52 (Ac.)

The following figures may

be used for a unit hydrograph study of the same area.

Note: These figures do not consider reduced effective area effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.970

Area averaged SCS curve number = 85.1

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date- August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2005 Version 7.1
Rational Hydrology Study Date: 11/19/24

Program License Serial Number 5006

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 25.0
10 Year storm 1 hour rainfall = 0.935(In.)
100 Year storm 1 hour rainfall = 1.840(In.)
Computed rainfall intensity:
Storm year = 25.00 1 hour rainfall = 1.295 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 1

+++++
Process from Point/Station 100.000 to Point/Station 102.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 0.9800 Max loss rate(Fm)= 0.497(In/Hr)
Rainfall intensity = 2.058(In/Hr) for a 25.0 year storm
User specified values are as follows:
TC = 30.96 min. Rain intensity = 2.06(In/Hr)
Total area this stream = 299.70(Ac.)
Total Study Area (Main Stream No. 1) = 299.70(Ac.)
Total runoff = 350.55(CFS)

+++++
Process from Point/Station 102.000 to Point/Station 150.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2509.000(Ft.)
Downstream point elevation = 2492.000(Ft.)
Channel length thru subarea = 899.000(Ft.)
Channel base width = 5.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 387.681(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 19.630(Ft.)
Flow(q) thru subarea = 387.681(CFS)
Depth of flow = 2.525(Ft.), Average velocity = 8.714(Ft/s)
Channel flow top width = 30.245(Ft.)
Flow Velocity = 8.71(Ft/s)
Travel time = 1.72 min.
Time of concentration = 32.68 min.
Critical depth = 2.813(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 79.00

Adjusted SCS curve number for AMC 1 = 61.80
Pervious ratio(Ap) = 0.9100 Max loss rate(Fm)= 0.596(In/Hr)
Rainfall intensity = 1.982(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.671
Subarea runoff = 74.316(CFS) for 19.630(Ac.)
Total runoff = 424.866(CFS)
Effective area this stream = 319.33(Ac.)
Total Study Area (Main Stream No. 1) = 319.33(Ac.)
Area averaged Fm value = 0.503(In/Hr)
Depth of flow = 2.627(Ft.), Average velocity = 8.920(Ft/s)
Critical depth = 2.938(Ft.)

++++
Process from Point/Station 102.000 to Point/Station 150.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 319.330(Ac.)
Runoff from this stream = 424.866(CFS)
Time of concentration = 32.68 min.
Rainfall intensity = 1.982(In/Hr)
Area averaged loss rate (Fm) = 0.5033(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9757

++++
Process from Point/Station 120.000 to Point/Station 122.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 0.9800 Max loss rate(Fm)= 0.497(In/Hr)
Rainfall intensity = 2.137(In/Hr) for a 25.0 year storm
User specified values are as follows:
TC = 29.33 min. Rain intensity = 2.14(In/Hr)
Total area this stream = 55.23(Ac.)
Total Study Area (Main Stream No. 1) = 374.56(Ac.)
Total runoff = 77.74(CFS)

++++
Process from Point/Station 122.000 to Point/Station 150.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2501.000(Ft.)
Downstream point elevation = 2492.000(Ft.)
Channel length thru subarea = 615.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 77.857(CFS)
Manning's 'N' = 0.060
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 77.857(CFS)
Depth of flow = 1.474(Ft.), Average velocity = 3.041(Ft/s)
Channel flow top width = 24.738(Ft.)
Flow Velocity = 3.04(Ft/s)
Travel time = 3.37 min.
Time of concentration = 32.70 min.
Critical depth = 1.031(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user

USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 79.00
 Adjusted SCS curve number for AMC 1 = 61.80
 Pervious ratio(Ap) = 0.9000 Max loss rate(Fm)= 0.589(In/Hr)
 Rainfall intensity = 1.981(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area,(total area with modified
 rational method)(Q=KCIA) is C = 0.672
 Subarea runoff = 0.158(CFS) for 3.320(Ac.)
 Total runoff = 77.898(CFS)
 Effective area this stream = 58.55(Ac.)
 Total Study Area (Main Stream No. 1) = 377.88(Ac.)
 Area averaged Fm value = 0.502(In/Hr)
 Depth of flow = 1.474(Ft.), Average velocity = 3.042(Ft/s)
 Critical depth = 1.031(Ft.)

+++++
 Process from Point/Station 122.000 to Point/Station 150.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 58.550(Ac.)
 Runoff from this stream = 77.898(CFS)
 Time of concentration = 32.70 min.
 Rainfall intensity = 1.981(In/Hr)
 Area averaged loss rate (Fm) = 0.5025(In/Hr)
 Area averaged Pervious ratio (Ap) = 0.9755
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
------------	-----------------	------------	----------	------------	----------------------------

1	424.87	319.330	32.68	0.503	1.982
2	77.90	58.550	32.70	0.502	1.981

Qmax(1) =
 $1.000 * 1.000 * 424.866 + 1.001 * 0.999 * 77.898 = 502.761$
 Qmax(2) =
 $0.999 * 1.000 * 424.866 + 1.000 * 1.000 * 77.898 = 502.510$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 424.866 77.898
 Maximum flow rates at confluence using above data:
 502.761 502.510
 Area of streams before confluence:
 319.330 58.550
 Effective area values after confluence:
 377.843 377.880
 Results of confluence:
 Total flow rate = 502.761(CFS)
 Time of concentration = 32.679 min.
 Effective stream area after confluence = 377.843(Ac.)
 Study area average Pervious fraction(Ap) = 0.976
 Study area average soil loss rate(Fm) = 0.503(In/Hr)
 Study area total (this main stream) = 377.88(Ac.)

+++++
 Process from Point/Station 150.000 to Point/Station 151.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2492.000(Ft.)
 Downstream point elevation = 2483.000(Ft.)

Channel length thru subarea = 670.000(Ft.)
 Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 5.000
 Slope or 'Z' of right channel bank = 5.000
 Estimated mean flow rate at midpoint of channel = 502.802(CFS)
 Manning's 'N' = 0.060
 Maximum depth of channel = 3.000(Ft.)
 Flow(q) thru subarea = 502.802(CFS)
 Depth of flow = 3.565(Ft.), Average velocity = 5.152(Ft/s)
 !!Warning: Water is above left or right bank elevations
 Channel flow top width = 40.000(Ft.)
 Flow Velocity = 5.15(Ft/s)
 Travel time = 2.17 min.
 Time of concentration = 34.85 min.
 Critical depth = 2.781(Ft.)
 ERROR- Channel depth exceeds maximum allowable depth
 Adding area flow to channel
 Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 79.00
 Adjusted SCS curve number for AMC 1 = 61.80
 Pervious ratio(Ap) = 0.9000 Max loss rate(Fm)= 0.589(In/Hr)
 The area added to the existing stream causes a
 a lower flow rate of Q = 491.949(CFS)
 therefore the upstream flow rate of Q = 502.761(CFS) is being used
 Rainfall intensity = 1.895(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area,(total area with modified
 rational method)(Q=KCIA) is C = 0.659
 Subarea runoff = 0.000(CFS) for 16.010(Ac.)
 Total runoff = 502.761(CFS)
 Effective area this stream = 393.85(Ac.)
 Total Study Area (Main Stream No. 1) = 393.89(Ac.)
 Area averaged Fm value = 0.507(In/Hr)
 Depth of flow = 3.565(Ft.), Average velocity = 5.151(Ft/s)
 !!Warning: Water is above left or right bank elevations
 ERROR- Channel depth exceeds maximum allowable depth
 Critical depth = 2.781(Ft.)

++++++
 Process from Point/Station 151.000 to Point/Station 152.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2483.000(Ft.)
 Downstream point elevation = 2479.000(Ft.)
 Channel length thru subarea = 673.000(Ft.)
 Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 5.000
 Slope or 'Z' of right channel bank = 5.000
 Estimated mean flow rate at midpoint of channel = 502.786(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 3.000(Ft.)
 Flow(q) thru subarea = 502.786(CFS)
 Depth of flow = 3.181(Ft.), Average velocity = 6.114(Ft/s)
 !!Warning: Water is above left or right bank elevations
 Channel flow top width = 40.000(Ft.)
 Flow Velocity = 6.11(Ft/s)
 Travel time = 1.83 min.
 Time of concentration = 36.68 min.
 Critical depth = 2.781(Ft.)
 ERROR- Channel depth exceeds maximum allowable depth
 Adding area flow to channel
 Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 79.00
 Adjusted SCS curve number for AMC 1 = 61.80

Pervious ratio(Ap) = 0.9000 Max loss rate(Fm)= 0.589(In/Hr)
 The area added to the existing stream causes a
 a lower flow rate of Q = 479.685(CFS)
 therefore the upstream flow rate of Q = 502.761(CFS) is being used
 Rainfall intensity = 1.828(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area,(total area with modified
 rational method)(Q=KCIA) is C = 0.649
 Subarea runoff = 0.000(CFS) for 10.250(Ac.)
 Total runoff = 502.761(CFS)
 Effective area this stream = 404.10(Ac.)
 Total Study Area (Main Stream No. 1) = 404.14(Ac.)
 Area averaged Fm value = 0.509(In/Hr)
 Depth of flow = 3.181(Ft.), Average velocity = 6.114(Ft/s)
 !!Warning: Water is above left or right bank elevations
 ERROR- Channel depth exceeds maximum allowable depth
 Critical depth = 2.781(Ft.)

++++++
 Process from Point/Station 152.000 to Point/Station 400.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2479.000(Ft.)
 Downstream point elevation = 2467.000(Ft.)
 Channel length thru subarea = 644.000(Ft.)
 Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 5.000
 Slope or 'Z' of right channel bank = 5.000
 Estimated mean flow rate at midpoint of channel = 502.794(CFS)
 Manning's 'N' = 0.060
 Maximum depth of channel = 3.000(Ft.)
 Flow(q) thru subarea = 502.794(CFS)
 Depth of flow = 3.337(Ft.), Average velocity = 5.683(Ft/s)
 !!Warning: Water is above left or right bank elevations
 Channel flow top width = 40.000(Ft.)
 Flow Velocity = 5.68(Ft/s)
 Travel time = 1.89 min.
 Time of concentration = 38.57 min.
 Critical depth = 2.781(Ft.)
 ERROR- Channel depth exceeds maximum allowable depth
 Adding area flow to channel
 Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 79.00
 Adjusted SCS curve number for AMC 1 = 61.80
 Pervious ratio(Ap) = 0.9000 Max loss rate(Fm)= 0.589(In/Hr)
 The area added to the existing stream causes a
 a lower flow rate of Q = 460.326(CFS)
 therefore the upstream flow rate of Q = 502.761(CFS) is being used
 Rainfall intensity = 1.765(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area,(total area with modified
 rational method)(Q=KCIA) is C = 0.640
 Subarea runoff = 0.000(CFS) for 3.400(Ac.)
 Total runoff = 502.761(CFS)
 Effective area this stream = 407.50(Ac.)
 Total Study Area (Main Stream No. 1) = 407.54(Ac.)
 Area averaged Fm value = 0.509(In/Hr)
 Depth of flow = 3.337(Ft.), Average velocity = 5.683(Ft/s)
 !!Warning: Water is above left or right bank elevations
 ERROR- Channel depth exceeds maximum allowable depth
 Critical depth = 2.781(Ft.)

++++++
 Process from Point/Station 102.000 to Point/Station 400.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1

Stream flow area = 407.503(Ac.)

Runoff from this stream = 502.761(CFS)

Time of concentration = 38.57 min.

Rainfall intensity = 1.765(In/Hr)

Area averaged loss rate (Fm) = 0.5094(In/Hr)

Area averaged Pervious ratio (Ap) = 0.9702

+++++

Process from Point/Station 202.000 to Point/Station 202.000

**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS values input by user

USER INPUT of soil data for subarea

SCS curve number for soil(AMC 2) = 86.00

Adjusted SCS curve number for AMC 1 = 71.60

Pervious ratio(Ap) = 0.9800 Max loss rate(Fm)= 0.497(In/Hr)

Rainfall intensity = 1.809(In/Hr) for a 25.0 year storm

User specified values are as follows:

TC = 37.22 min. Rain intensity = 1.81(In/Hr)

Total area this stream = 146.77(Ac.)

Total Study Area (Main Stream No. 1) = 554.31(Ac.)

Total runoff = 159.32(CFS)

+++++

Process from Point/Station 202.000 to Point/Station 250.000

**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2504.000(Ft.)

Downstream point elevation = 2495.000(Ft.)

Channel length thru subarea = 569.000(Ft.)

Channel base width = 10.000(Ft.)

Slope or 'Z' of left channel bank = 5.000

Slope or 'Z' of right channel bank = 5.000

Estimated mean flow rate at midpoint of channel = 165.221(CFS)

Manning's 'N' = 0.030

Maximum depth of channel = 5.000(Ft.)

Flow(q) thru subarea = 165.221(CFS)

Depth of flow = 1.489(Ft.), Average velocity = 6.360(Ft/s)

Channel flow top width = 24.891(Ft.)

Flow Velocity = 6.36(Ft/s)

Travel time = 1.49 min.

Time of concentration = 38.71 min.

Critical depth = 1.563(Ft.)

Adding area flow to channel

Soil classification AP and SCS values input by user

USER INPUT of soil data for subarea

SCS curve number for soil(AMC 2) = 79.00

Adjusted SCS curve number for AMC 1 = 61.80

Pervious ratio(Ap) = 0.9000 Max loss rate(Fm)= 0.589(In/Hr)

Rainfall intensity = 1.760(In/Hr) for a 25.0 year storm

Effective runoff coefficient used for area,(total area with modified

rational method)(Q=KCIA) is C = 0.644

Subarea runoff = 11.861(CFS) for 4.150(Ac.)

Total runoff = 171.181(CFS)

Effective area this stream = 150.92(Ac.)

Total Study Area (Main Stream No. 1) = 558.46(Ac.)

Area averaged Fm value = 0.500(In/Hr)

Depth of flow = 1.516(Ft.), Average velocity = 6.423(Ft/s)

Critical depth = 1.594(Ft.)

+++++

Process from Point/Station 250.000 to Point/Station 251.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2495.000(Ft.)
Downstream point elevation = 2485.000(Ft.)
Channel length thru subarea = 770.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 171.221(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 171.221(CFS)
Depth of flow = 1.593(Ft.), Average velocity = 5.981(Ft/s)
Channel flow top width = 25.934(Ft.)
Flow Velocity = 5.98(Ft/s)
Travel time = 2.15 min.
Time of concentration = 40.86 min.
Critical depth = 1.594(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 79.00
Adjusted SCS curve number for AMC 1 = 61.80
Pervious ratio(Ap) = 0.9000 Max loss rate(Fm)= 0.589(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q = 166.840(CFS)
therefore the upstream flow rate of Q = 171.181(CFS) is being used
Rainfall intensity = 1.695(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.633
Subarea runoff = 0.000(CFS) for 4.540(Ac.)
Total runoff = 171.181(CFS)
Effective area this stream = 155.46(Ac.)
Total Study Area (Main Stream No. 1) = 563.00(Ac.)
Area averaged Fm value = 0.502(In/Hr)
Depth of flow = 1.593(Ft.), Average velocity = 5.981(Ft/s)
Critical depth = 1.594(Ft.)

+++++
Process from Point/Station 251.000 to Point/Station 400.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2485.000(Ft.)
Downstream point elevation = 2467.000(Ft.)
Channel length thru subarea = 1024.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 171.222(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 171.222(CFS)
Depth of flow = 1.476(Ft.), Average velocity = 6.673(Ft/s)
Channel flow top width = 24.763(Ft.)
Flow Velocity = 6.67(Ft/s)
Travel time = 2.56 min.
Time of concentration = 43.41 min.
Critical depth = 1.594(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 79.00
Adjusted SCS curve number for AMC 1 = 61.80
Pervious ratio(Ap) = 0.9000 Max loss rate(Fm)= 0.589(In/Hr)

The area added to the existing stream causes a lower flow rate of $Q = 165.842(\text{CFS})$ therefore the upstream flow rate of $Q = 171.181(\text{CFS})$ is being used
 Rainfall intensity = $1.624(\text{In}/\text{Hr})$ for a 25.0 year storm
 Effective runoff coefficient used for area, (total area with modified rational method) ($Q=KCIA$) is $C = 0.619$
 Subarea runoff = $0.000(\text{CFS})$ for $9.520(\text{Ac.})$
 Total runoff = $171.181(\text{CFS})$
 Effective area this stream = $164.98(\text{Ac.})$
 Total Study Area (Main Stream No. 1) = $572.52(\text{Ac.})$
 Area averaged F_m value = $0.507(\text{In}/\text{Hr})$
 Depth of flow = $1.476(\text{Ft.})$, Average velocity = $6.672(\text{Ft}/\text{s})$
 Critical depth = $1.594(\text{Ft.})$

+++++
 Process from Point/Station 202.000 to Point/Station 400.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = $164.980(\text{Ac.})$
 Runoff from this stream = $171.181(\text{CFS})$
 Time of concentration = 43.41 min.
 Rainfall intensity = $1.624(\text{In}/\text{Hr})$
 Area averaged loss rate (F_m) = $0.5074(\text{In}/\text{Hr})$
 Area averaged Pervious ratio (A_p) = 0.9712
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	F_m (In/Hr)	Rainfall Intensity (In/Hr)
------------	-----------------	------------	----------	---------------	----------------------------

1	502.76	407.503	38.57	0.509	1.765
2	171.18	164.980	43.41	0.507	1.624

$Q_{\text{max}}(1) = 1.000 * 1.000 * 502.761 + 1.126 * 0.888 * 171.181 = 673.938$
 $Q_{\text{max}}(2) = 0.888 * 1.000 * 502.761 + 1.000 * 1.000 * 171.181 = 617.761$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 502.761 171.181
 Maximum flow rates at confluence using above data:
 673.938 617.761
 Area of streams before confluence:
 407.503 164.980
 Effective area values after confluence:
 554.074 572.483

Results of confluence:
 Total flow rate = $673.938(\text{CFS})$
 Time of concentration = 38.570 min.
 Effective stream area after confluence = $554.074(\text{Ac.})$
 Study area average Pervious fraction (A_p) = 0.970
 Study area average soil loss rate (F_m) = $0.509(\text{In}/\text{Hr})$
 Study area total (this main stream) = $572.48(\text{Ac.})$
 End of computations, Total Study Area = $572.52(\text{Ac.})$

The following figures may be used for a unit hydrograph study of the same area.
 Note: These figures do not consider reduced effective area effects caused by confluences in the rational equation.

Area averaged pervious area fraction (A_p) = 0.970
 Area averaged SCS curve number = 85.1

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date- August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2005 Version 7.1
Rational Hydrology Study Date: 11/19/24

Program License Serial Number 5006

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 100.0
10 Year storm 1 hour rainfall = 0.935(In.)
100 Year storm 1 hour rainfall = 1.840(In.)
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.840 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 1

+++++
Process from Point/Station 100.000 to Point/Station 102.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 0.9800 Max loss rate(Fm)= 0.497(In/Hr)
Rainfall intensity = 2.924(In/Hr) for a 100.0 year storm
User specified values are as follows:
TC = 30.96 min. Rain intensity = 2.92(In/Hr)
Total area this stream = 299.70(Ac.)
Total Study Area (Main Stream No. 1) = 299.70(Ac.)
Total runoff = 583.85(CFS)

+++++
Process from Point/Station 102.000 to Point/Station 150.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2509.000(Ft.)
Downstream point elevation = 2492.000(Ft.)
Channel length thru subarea = 899.000(Ft.)
Channel base width = 5.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 625.824(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 19.630(Ft.)
Flow(q) thru subarea = 625.824(CFS)
Depth of flow = 3.101(Ft.), Average velocity = 9.840(Ft/s)
Channel flow top width = 36.014(Ft.)
Flow Velocity = 9.84(Ft/s)
Travel time = 1.52 min.
Time of concentration = 32.48 min.
Critical depth = 3.500(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 79.00

Adjusted SCS curve number for AMC 1 = 61.80
Pervious ratio(Ap) = 0.9100 Max loss rate(Fm)= 0.596(In/Hr)
Rainfall intensity = 2.827(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.740
Subarea runoff = 84.042(CFS) for 19.630(Ac.)
Total runoff = 667.892(CFS)
Effective area this stream = 319.33(Ac.)
Total Study Area (Main Stream No. 1) = 319.33(Ac.)
Area averaged Fm value = 0.503(In/Hr)
Depth of flow = 3.188(Ft.), Average velocity = 10.003(Ft/s)
Critical depth = 3.594(Ft.)

++++
Process from Point/Station 102.000 to Point/Station 150.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 319.330(Ac.)
Runoff from this stream = 667.892(CFS)
Time of concentration = 32.48 min.
Rainfall intensity = 2.827(In/Hr)
Area averaged loss rate (Fm) = 0.5033(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9757

++++
Process from Point/Station 120.000 to Point/Station 122.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 0.9800 Max loss rate(Fm)= 0.497(In/Hr)
Rainfall intensity = 3.037(In/Hr) for a 100.0 year storm
User specified values are as follows:
TC = 29.33 min. Rain intensity = 3.04(In/Hr)
Total area this stream = 55.23(Ac.)
Total Study Area (Main Stream No. 1) = 374.56(Ac.)
Total runoff = 126.65(CFS)

++++
Process from Point/Station 122.000 to Point/Station 150.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2501.000(Ft.)
Downstream point elevation = 2492.000(Ft.)
Channel length thru subarea = 615.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 126.680(CFS)
Manning's 'N' = 0.060
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 126.680(CFS)
Depth of flow = 1.879(Ft.), Average velocity = 3.476(Ft/s)
Channel flow top width = 28.790(Ft.)
Flow Velocity = 3.48(Ft/s)
Travel time = 2.95 min.
Time of concentration = 32.28 min.
Critical depth = 1.359(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user

USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 79.00
 Adjusted SCS curve number for AMC 1 = 61.80
 Pervious ratio(Ap) = 0.9000 Max loss rate(Fm)= 0.589(In/Hr)
 The area added to the existing stream causes a
 a lower flow rate of Q = 123.162(CFS)
 therefore the upstream flow rate of Q = 126.650(CFS) is being used
 Rainfall intensity = 2.840(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area,(total area with modified
 rational method)(Q=KCIA) is C = 0.741
 Subarea runoff = 0.000(CFS) for 3.320(Ac.)
 Total runoff = 126.650(CFS)
 Effective area this stream = 58.55(Ac.)
 Total Study Area (Main Stream No. 1) = 377.88(Ac.)
 Area averaged Fm value = 0.502(In/Hr)
 Depth of flow = 1.879(Ft.), Average velocity = 3.476(Ft/s)
 Critical depth = 1.359(Ft.)

++++++
 Process from Point/Station 122.000 to Point/Station 150.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 58.550(Ac.)
 Runoff from this stream = 126.650(CFS)
 Time of concentration = 32.28 min.
 Rainfall intensity = 2.840(In/Hr)
 Area averaged loss rate (Fm) = 0.5025(In/Hr)
 Area averaged Pervious ratio (Ap) = 0.9755
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
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1	667.89	319.330	32.48	0.503	2.827
2	126.65	58.550	32.28	0.502	2.840

Qmax(1) =
 $1.000 * 1.000 * 667.892 + 0.995 * 1.000 * 126.650 = 793.865$

Qmax(2) =
 $1.005 * 0.994 * 667.892 + 1.000 * 1.000 * 126.650 = 793.917$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 667.892 126.650

Maximum flow rates at confluence using above data:
 793.865 793.917

Area of streams before confluence:
 319.330 58.550

Effective area values after confluence:
 377.880 375.875

Results of confluence:
 Total flow rate = 793.917(CFS)
 Time of concentration = 32.279 min.
 Effective stream area after confluence = 375.875(Ac.)
 Study area average Pervious fraction(Ap) = 0.976
 Study area average soil loss rate(Fm) = 0.503(In/Hr)
 Study area total (this main stream) = 377.88(Ac.)

++++++
 Process from Point/Station 150.000 to Point/Station 151.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2492.000(Ft.)
 Downstream point elevation = 2483.000(Ft.)
 Channel length thru subarea = 670.000(Ft.)
 Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 5.000
 Slope or 'Z' of right channel bank = 5.000
 Estimated mean flow rate at midpoint of channel = 793.950(CFS)
 Manning's 'N' = 0.060
 Maximum depth of channel = 3.000(Ft.)
 Flow(q) thru subarea = 793.950(CFS)
 Depth of flow = 4.334(Ft.), Average velocity = 6.184(Ft/s)
 !!Warning: Water is above left or right bank elevations
 Channel flow top width = 40.000(Ft.)
 Flow Velocity = 6.18(Ft/s)
 Travel time = 1.81 min.
 Time of concentration = 34.08 min.
 Critical depth = 3.438(Ft.)
 ERROR- Channel depth exceeds maximum allowable depth
 Adding area flow to channel
 Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 79.00
 Adjusted SCS curve number for AMC 1 = 61.80
 Pervious ratio(Ap) = 0.9000 Max loss rate(Fm)= 0.589(In/Hr)
 The area added to the existing stream causes a
 a lower flow rate of Q = 785.417(CFS)
 therefore the upstream flow rate of Q = 793.917(CFS) is being used
 Rainfall intensity = 2.734(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area,(total area with modified
 rational method)(Q=KCIA) is C = 0.733
 Subarea runoff = 0.000(CFS) for 16.010(Ac.)
 Total runoff = 793.917(CFS)
 Effective area this stream = 391.89(Ac.)
 Total Study Area (Main Stream No. 1) = 393.89(Ac.)
 Area averaged Fm value = 0.507(In/Hr)
 Depth of flow = 4.334(Ft.), Average velocity = 6.184(Ft/s)
 !!Warning: Water is above left or right bank elevations
 ERROR- Channel depth exceeds maximum allowable depth
 Critical depth = 3.438(Ft.)

++++++
 Process from Point/Station 151.000 to Point/Station 152.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2483.000(Ft.)
 Downstream point elevation = 2479.000(Ft.)
 Channel length thru subarea = 673.000(Ft.)
 Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 5.000
 Slope or 'Z' of right channel bank = 5.000
 Estimated mean flow rate at midpoint of channel = 793.957(CFS)
 Manning's 'N' = 0.060
 Maximum depth of channel = 3.000(Ft.)
 Flow(q) thru subarea = 793.957(CFS)
 Depth of flow = 5.224(Ft.), Average velocity = 4.842(Ft/s)
 !!Warning: Water is above left or right bank elevations
 Channel flow top width = 40.000(Ft.)
 Flow Velocity = 4.84(Ft/s)
 Travel time = 2.32 min.
 Time of concentration = 36.40 min.
 Critical depth = 3.438(Ft.)
 ERROR- Channel depth exceeds maximum allowable depth
 Adding area flow to channel
 Soil classification AP and SCS values input by user

USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 79.00
 Adjusted SCS curve number for AMC 1 = 61.80
 Pervious ratio(Ap) = 0.9000 Max loss rate(Fm)= 0.589(In/Hr)
 The area added to the existing stream causes a
 a lower flow rate of Q = 760.700(CFS)
 therefore the upstream flow rate of Q = 793.917(CFS) is being used
 Rainfall intensity = 2.611(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area,(total area with modified
 rational method)(Q=KCIA) is C = 0.725
 Subarea runoff = 0.000(CFS) for 10.250(Ac.)
 Total runoff = 793.917(CFS)
 Effective area this stream = 402.14(Ac.)
 Total Study Area (Main Stream No. 1) = 404.14(Ac.)
 Area averaged Fm value = 0.509(In/Hr)
 Depth of flow = 5.224(Ft.), Average velocity = 4.842(Ft/s)
 !!Warning: Water is above left or right bank elevations
 ERROR- Channel depth exceeds maximum allowable depth
 Critical depth = 3.438(Ft.)

++++++
 Process from Point/Station 152.000 to Point/Station 400.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2479.000(Ft.)
 Downstream point elevation = 2467.000(Ft.)
 Channel length thru subarea = 644.000(Ft.)
 Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 5.000
 Slope or 'Z' of right channel bank = 5.000
 Estimated mean flow rate at midpoint of channel = 793.943(CFS)
 Manning's 'N' = 0.060
 Maximum depth of channel = 3.000(Ft.)
 Flow(q) thru subarea = 793.943(CFS)
 Depth of flow = 4.034(Ft.), Average velocity = 6.822(Ft/s)
 !!Warning: Water is above left or right bank elevations
 Channel flow top width = 40.000(Ft.)
 Flow Velocity = 6.82(Ft/s)
 Travel time = 1.57 min.
 Time of concentration = 37.97 min.
 Critical depth = 3.438(Ft.)
 ERROR- Channel depth exceeds maximum allowable depth
 Adding area flow to channel

Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 79.00
 Adjusted SCS curve number for AMC 1 = 61.80
 Pervious ratio(Ap) = 0.9000 Max loss rate(Fm)= 0.589(In/Hr)
 The area added to the existing stream causes a
 a lower flow rate of Q = 739.078(CFS)
 therefore the upstream flow rate of Q = 793.917(CFS) is being used
 Rainfall intensity = 2.534(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area,(total area with modified
 rational method)(Q=KCIA) is C = 0.719
 Subarea runoff = 0.000(CFS) for 3.400(Ac.)
 Total runoff = 793.917(CFS)
 Effective area this stream = 405.54(Ac.)
 Total Study Area (Main Stream No. 1) = 407.54(Ac.)
 Area averaged Fm value = 0.509(In/Hr)
 Depth of flow = 4.034(Ft.), Average velocity = 6.822(Ft/s)
 !!Warning: Water is above left or right bank elevations
 ERROR- Channel depth exceeds maximum allowable depth
 Critical depth = 3.438(Ft.)

++++
Process from Point/Station 102.000 to Point/Station 400.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 405.535(Ac.)
Runoff from this stream = 793.917(CFS)
Time of concentration = 37.97 min.
Rainfall intensity = 2.534(In/Hr)
Area averaged loss rate (Fm) = 0.5095(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9701

++++
Process from Point/Station 202.000 to Point/Station 202.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 0.9800 Max loss rate(Fm)= 0.497(In/Hr)
Rainfall intensity = 2.570(In/Hr) for a 100.0 year storm
User specified values are as follows:
TC = 37.22 min. Rain intensity = 2.57(In/Hr)
Total area this stream = 146.77(Ac.)
Total Study Area (Main Stream No. 1) = 554.31(Ac.)
Total runoff = 273.80(CFS)

++++
Process from Point/Station 202.000 to Point/Station 250.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2504.000(Ft.)
Downstream point elevation = 2495.000(Ft.)
Channel length thru subarea = 569.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 273.830(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 5.000(Ft.)
Flow(q) thru subarea = 273.830(CFS)
Depth of flow = 1.915(Ft.), Average velocity = 7.304(Ft/s)
Channel flow top width = 29.151(Ft.)
Flow Velocity = 7.30(Ft/s)
Travel time = 1.30 min.
Time of concentration = 38.52 min.
Critical depth = 2.047(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 79.00
Adjusted SCS curve number for AMC 1 = 61.80
Pervious ratio(Ap) = 0.9000 Max loss rate(Fm)= 0.589(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q = 272.947(CFS)
therefore the upstream flow rate of Q = 273.800(CFS) is being used
Rainfall intensity = 2.509(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.721
Subarea runoff = 0.000(CFS) for 4.150(Ac.)
Total runoff = 273.800(CFS)
Effective area this stream = 150.92(Ac.)
Total Study Area (Main Stream No. 1) = 558.46(Ac.)

Area averaged Fm value = 0.500(In/Hr)
Depth of flow = 1.915(Ft.), Average velocity = 7.304(Ft/s)
Critical depth = 2.047(Ft.)

++++
Process from Point/Station 250.000 to Point/Station 251.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2495.000(Ft.)
Downstream point elevation = 2485.000(Ft.)
Channel length thru subarea = 770.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 273.832(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 273.832(CFS)
Depth of flow = 2.010(Ft.), Average velocity = 6.797(Ft/s)
Channel flow top width = 30.096(Ft.)
Flow Velocity = 6.80(Ft/s)
Travel time = 1.89 min.
Time of concentration = 40.41 min.
Critical depth = 2.047(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 79.00
Adjusted SCS curve number for AMC 1 = 61.80
Pervious ratio(Ap) = 0.9000 Max loss rate(Fm)= 0.589(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q = 269.227(CFS)
therefore the upstream flow rate of Q = 273.800(CFS) is being used
Rainfall intensity = 2.427(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.714
Subarea runoff = 0.000(CFS) for 4.540(Ac.)
Total runoff = 273.800(CFS)
Effective area this stream = 155.46(Ac.)
Total Study Area (Main Stream No. 1) = 563.00(Ac.)
Area averaged Fm value = 0.502(In/Hr)
Depth of flow = 2.010(Ft.), Average velocity = 6.796(Ft/s)
Critical depth = 2.047(Ft.)

++++
Process from Point/Station 251.000 to Point/Station 400.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2485.000(Ft.)
Downstream point elevation = 2467.000(Ft.)
Channel length thru subarea = 1024.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 273.833(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 273.833(CFS)
Depth of flow = 1.866(Ft.), Average velocity = 7.591(Ft/s)
Channel flow top width = 28.662(Ft.)
Flow Velocity = 7.59(Ft/s)
Travel time = 2.25 min.
Time of concentration = 42.65 min.
Critical depth = 2.047(Ft.)

Adding area flow to channel
 Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 79.00
 Adjusted SCS curve number for AMC 1 = 61.80
 Pervious ratio(Ap) = 0.9000 Max loss rate(Fm)= 0.589(In/Hr)
 The area added to the existing stream causes a
 a lower flow rate of Q = 271.569(CFS)
 therefore the upstream flow rate of Q = 273.800(CFS) is being used
 Rainfall intensity = 2.336(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area,(total area with modified
 rational method)(Q=KCIA) is C = 0.705
 Subarea runoff = 0.000(CFS) for 9.520(Ac.)
 Total runoff = 273.800(CFS)
 Effective area this stream = 164.98(Ac.)
 Total Study Area (Main Stream No. 1) = 572.52(Ac.)
 Area averaged Fm value = 0.507(In/Hr)
 Depth of flow = 1.866(Ft.), Average velocity = 7.590(Ft/s)
 Critical depth = 2.047(Ft.)

++++
 Process from Point/Station 202.000 to Point/Station 400.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 164.980(Ac.)
 Runoff from this stream = 273.800(CFS)
 Time of concentration = 42.65 min.
 Rainfall intensity = 2.336(In/Hr)
 Area averaged loss rate (Fm) = 0.5074(In/Hr)
 Area averaged Pervious ratio (Ap) = 0.9712
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
------------	-----------------	------------	----------	------------	----------------------------

1	793.92	405.535	37.97	0.509	2.534
2	273.80	164.980	42.65	0.507	2.336

Qmax(1) =
 $1.000 * 1.000 * 793.917 + 1.108 * 0.890 * 273.800 = 1064.066$

Qmax(2) =
 $0.902 * 1.000 * 793.917 + 1.000 * 1.000 * 273.800 = 990.064$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 793.917 273.800

Maximum flow rates at confluence using above data:
 1064.066 990.064

Area of streams before confluence:
 405.535 164.980

Effective area values after confluence:
 552.410 570.515

Results of confluence:
 Total flow rate = 1064.066(CFS)
 Time of concentration = 37.974 min.
 Effective stream area after confluence = 552.410(Ac.)
 Study area average Pervious fraction(Ap) = 0.970
 Study area average soil loss rate(Fm) = 0.509(In/Hr)
 Study area total (this main stream) = 570.52(Ac.)
 End of computations, Total Study Area = 572.52 (Ac.)

The following figures may
 be used for a unit hydrograph study of the same area.

Note: These figures do not consider reduced effective area effects caused by confluences in the rational equation.

Area averaged pervious area fraction(A_p) = 0.970
Area averaged SCS curve number = 85.1

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date- August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2005 Version 7.1
Rational Hydrology Study Date: 11/19/24

Program License Serial Number 5006

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 10.0
Computed rainfall intensity:
Storm year = 10.00 1 hour rainfall = 0.935 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 1

+++++
Process from Point/Station 300.000 to Point/Station 302.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
Rainfall intensity = 1.893(In/Hr) for a 10.0 year storm
User specified values are as follows:
TC = 21.91 min. Rain intensity = 1.89(In/Hr)
Total area this stream = 25.92(Ac.)
Total Study Area (Main Stream No. 1) = 25.92(Ac.)
Total runoff = 30.64(CFS)

+++++
Process from Point/Station 302.000 to Point/Station 350.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2492.000(Ft.)
Downstream point elevation = 2486.000(Ft.)
Channel length thru subarea = 325.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 34.910(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 34.910(CFS)
Depth of flow = 0.626(Ft.), Average velocity = 4.249(Ft/s)
Channel flow top width = 16.258(Ft.)
Flow Velocity = 4.25(Ft/s)
Travel time = 1.27 min.
Time of concentration = 23.18 min.
Critical depth = 0.648(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 79.00
Adjusted SCS curve number for AMC 1 = 61.80
Pervious ratio(Ap) = 0.9500 Max loss rate(Fm)= 0.622(In/Hr)

Rainfall intensity = 1.819(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.636
Subarea runoff = 8.485(CFS) for 7.910(Ac.)
Total runoff = 39.125(CFS)
Effective area this stream = 33.83(Ac.)
Total Study Area (Main Stream No. 1) = 33.83(Ac.)
Area averaged Fm value = 0.534(In/Hr)
Depth of flow = 0.667(Ft.), Average velocity = 4.403(Ft/s)
Critical depth = 0.688(Ft.)

Process from Point/Station 350.000 to Point/Station 303.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2486.000(Ft.)
Downstream point elevation = 2475.000(Ft.)
Channel length thru subarea = 893.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 43.152(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 43.152(CFS)
Depth of flow = 0.786(Ft.), Average velocity = 3.943(Ft/s)
Channel flow top width = 17.857(Ft.)
Flow Velocity = 3.94(Ft/s)
Travel time = 3.77 min.

Time of concentration = 26.96 min.
Critical depth = 0.734(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 79.00
Adjusted SCS curve number for AMC 1 = 61.80
Pervious ratio(Ap) = 0.9500 Max loss rate(Fm)= 0.622(In/Hr)
Rainfall intensity = 1.637(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.592
Subarea runoff = 7.973(CFS) for 14.800(Ac.)
Total runoff = 47.098(CFS)
Effective area this stream = 48.63(Ac.)
Total Study Area (Main Stream No. 1) = 48.63(Ac.)
Area averaged Fm value = 0.561(In/Hr)
Depth of flow = 0.824(Ft.), Average velocity = 4.049(Ft/s)
Critical depth = 0.773(Ft.)

End of computations, Total Study Area = 48.63 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.977
Area averaged SCS curve number = 82.7

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date- August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2005 Version 7.1
Rational Hydrology Study Date: 11/19/24

Program License Serial Number 5006

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 25.0
10 Year storm 1 hour rainfall = 0.935(In.)
100 Year storm 1 hour rainfall = 1.840(In.)
Computed rainfall intensity:
Storm year = 25.00 1 hour rainfall = 1.295 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 1

+++++
Process from Point/Station 300.000 to Point/Station 302.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
Rainfall intensity = 2.622(In/Hr) for a 25.0 year storm
User specified values are as follows:
TC = 21.91 min. Rain intensity = 2.62(In/Hr)
Total area this stream = 25.92(Ac.)
Total Study Area (Main Stream No. 1) = 25.92(Ac.)
Total runoff = 48.24(CFS)

+++++
Process from Point/Station 302.000 to Point/Station 350.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2492.000(Ft.)
Downstream point elevation = 2486.000(Ft.)
Channel length thru subarea = 325.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 54.574(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 54.574(CFS)
Depth of flow = 0.800(Ft.), Average velocity = 4.875(Ft/s)
Channel flow top width = 17.996(Ft.)
Flow Velocity = 4.88(Ft/s)
Travel time = 1.11 min.
Time of concentration = 23.02 min.
Critical depth = 0.844(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 79.00

Adjusted SCS curve number for AMC 1 = 61.80
 Pervious ratio(Ap) = 0.9500 Max loss rate(Fm)= 0.622(In/Hr)
 Rainfall intensity = 2.532(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.710
 Subarea runoff = 12.601(CFS) for 7.910(Ac.)
 Total runoff = 60.841(CFS)
 Effective area this stream = 33.83(Ac.)
 Total Study Area (Main Stream No. 1) = 33.83(Ac.)
 Area averaged Fm value = 0.534(In/Hr)
 Depth of flow = 0.848(Ft.), Average velocity = 5.038(Ft/s)
 Critical depth = 0.891(Ft.)

+++++

Process from Point/Station 350.000 to Point/Station 303.000
 **** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2486.000(Ft.)
 Downstream point elevation = 2475.000(Ft.)
 Channel length thru subarea = 893.000(Ft.)
 Channel base width = 10.000(Ft.)
 Slope or 'Z' of left channel bank = 5.000
 Slope or 'Z' of right channel bank = 5.000
 Estimated mean flow rate at midpoint of channel = 68.672(CFS)
 Manning's 'N' = 0.030
 Maximum depth of channel = 3.000(Ft.)
 Flow(q) thru subarea = 68.672(CFS)
 Depth of flow = 1.008(Ft.), Average velocity = 4.529(Ft/s)
 Channel flow top width = 20.082(Ft.)
 Flow Velocity = 4.53(Ft/s)
 Travel time = 3.29 min.

Time of concentration = 26.31 min.

Critical depth = 0.961(Ft.)
 Adding area flow to channel
 Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 79.00
 Adjusted SCS curve number for AMC 1 = 61.80
 Pervious ratio(Ap) = 0.9500 Max loss rate(Fm)= 0.622(In/Hr)
 Rainfall intensity = 2.307(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.681
 Subarea runoff = 15.566(CFS) for 14.800(Ac.)

Total runoff = 76.407(CFS)

Effective area this stream = 48.63(Ac.)
 Total Study Area (Main Stream No. 1) = 48.63(Ac.)
 Area averaged Fm value = 0.561(In/Hr)
 Depth of flow = 1.067(Ft.), Average velocity = 4.672(Ft/s)
 Critical depth = 1.016(Ft.)

End of computations, Total Study Area = 48.63 (Ac.)

The following figures may be used for a unit hydrograph study of the same area.
 Note: These figures do not consider reduced effective area effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.977
 Area averaged SCS curve number = 82.7

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date- August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2005 Version 7.1
Rational Hydrology Study Date: 11/19/24

Program License Serial Number 5006

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 100.0
10 Year storm 1 hour rainfall = 0.935(In.)
100 Year storm 1 hour rainfall = 1.840(In.)
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.840 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 1

+++++
Process from Point/Station 300.000 to Point/Station 302.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 86.00
Adjusted SCS curve number for AMC 1 = 71.60
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.507(In/Hr)
Rainfall intensity = 3.725(In/Hr) for a 100.0 year storm
User specified values are as follows:
TC = 21.91 min. Rain intensity = 3.72(In/Hr)
Total area this stream = 25.92(Ac.)
Total Study Area (Main Stream No. 1) = 25.92(Ac.)
Total runoff = 75.05(CFS)

+++++
Process from Point/Station 302.000 to Point/Station 350.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2492.000(Ft.)
Downstream point elevation = 2486.000(Ft.)
Channel length thru subarea = 325.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 84.424(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 84.424(CFS)
Depth of flow = 1.010(Ft.), Average velocity = 5.551(Ft/s)
Channel flow top width = 20.104(Ft.)
Flow Velocity = 5.55(Ft/s)
Travel time = 0.98 min.
Time of concentration = 22.89 min.
Critical depth = 1.078(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 79.00

Adjusted SCS curve number for AMC 1 = 61.80
Pervious ratio(Ap) = 0.9500 Max loss rate(Fm)= 0.622(In/Hr)
Rainfall intensity = 3.613(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.767
Subarea runoff = 18.681(CFS) for 7.910(Ac.)
Total runoff = 93.731(CFS)
Effective area this stream = 33.83(Ac.)
Total Study Area (Main Stream No. 1) = 33.83(Ac.)
Area averaged Fm value = 0.534(In/Hr)
Depth of flow = 1.068(Ft.), Average velocity = 5.723(Ft/s)
Critical depth = 1.141(Ft.)

+++++

Process from Point/Station 350.000 to Point/Station 303.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 2486.000(Ft.)
Downstream point elevation = 2475.000(Ft.)
Channel length thru subarea = 893.000(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 5.000
Slope or 'Z' of right channel bank = 5.000
Estimated mean flow rate at midpoint of channel = 107.367(CFS)
Manning's 'N' = 0.030
Maximum depth of channel = 3.000(Ft.)
Flow(q) thru subarea = 107.367(CFS)
Depth of flow = 1.274(Ft.), Average velocity = 5.150(Ft/s)
Channel flow top width = 22.736(Ft.)
Flow Velocity = 5.15(Ft/s)
Travel time = 2.89 min.

Time of concentration = 25.78 min.

Critical depth = 1.234(Ft.)
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 79.00
Adjusted SCS curve number for AMC 1 = 61.80
Pervious ratio(Ap) = 0.9500 Max loss rate(Fm)= 0.622(In/Hr)
Rainfall intensity = 3.324(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.748
Subarea runoff = 27.212(CFS) for 14.800(Ac.)

Total runoff = 120.943(CFS)

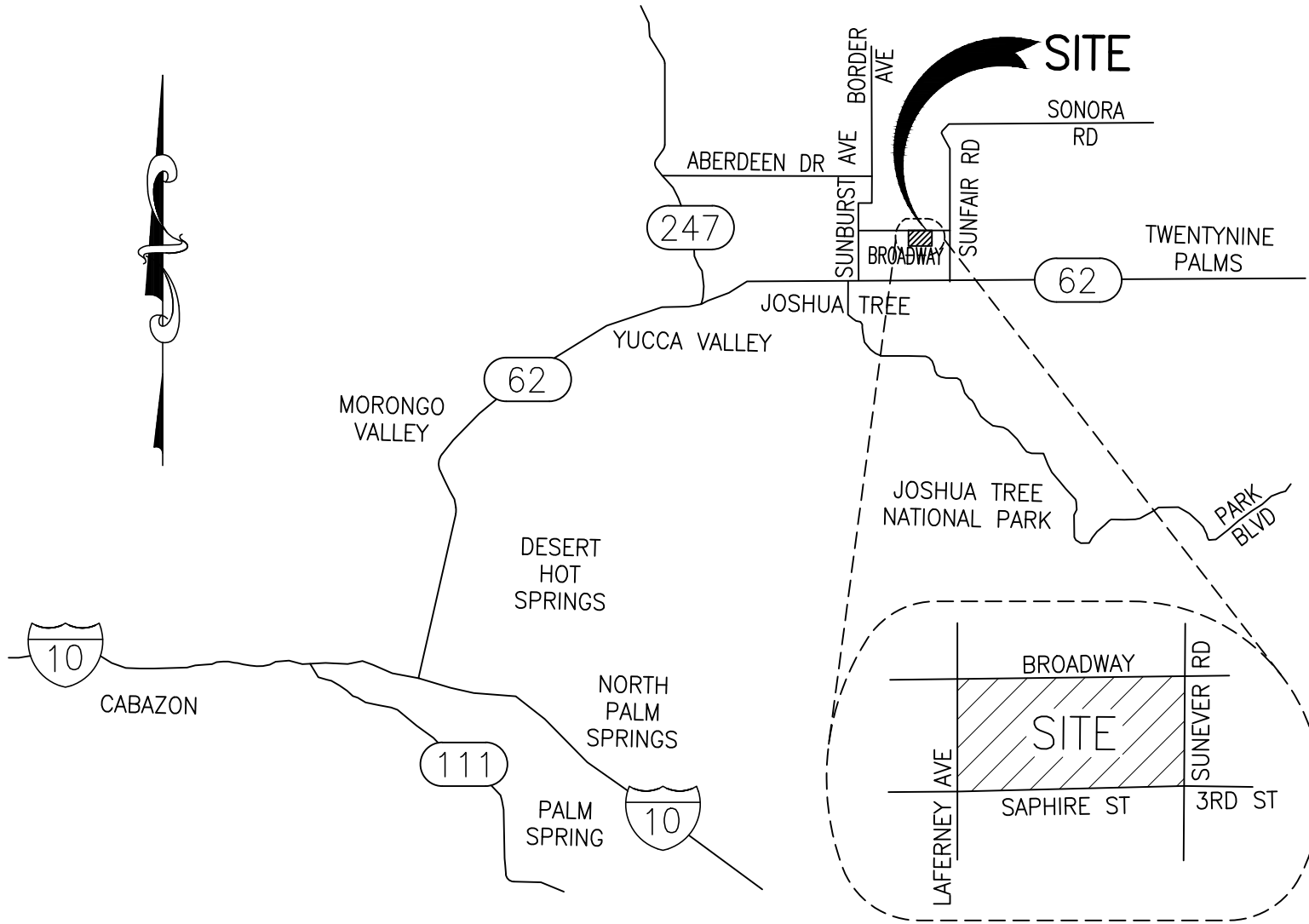
Effective area this stream = 48.63(Ac.)
Total Study Area (Main Stream No. 1) = 48.63(Ac.)
Area averaged Fm value = 0.561(In/Hr)
Depth of flow = 1.354(Ft.), Average velocity = 5.327(Ft/s)
Critical depth = 1.320(Ft.)

End of computations, Total Study Area = 48.63 (Ac.)

The following figures may be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.977
Area averaged SCS curve number = 82.7

Appendix E – Supporting Reference Data



VICINITY MAP



JOSHUA TREE ESTATES

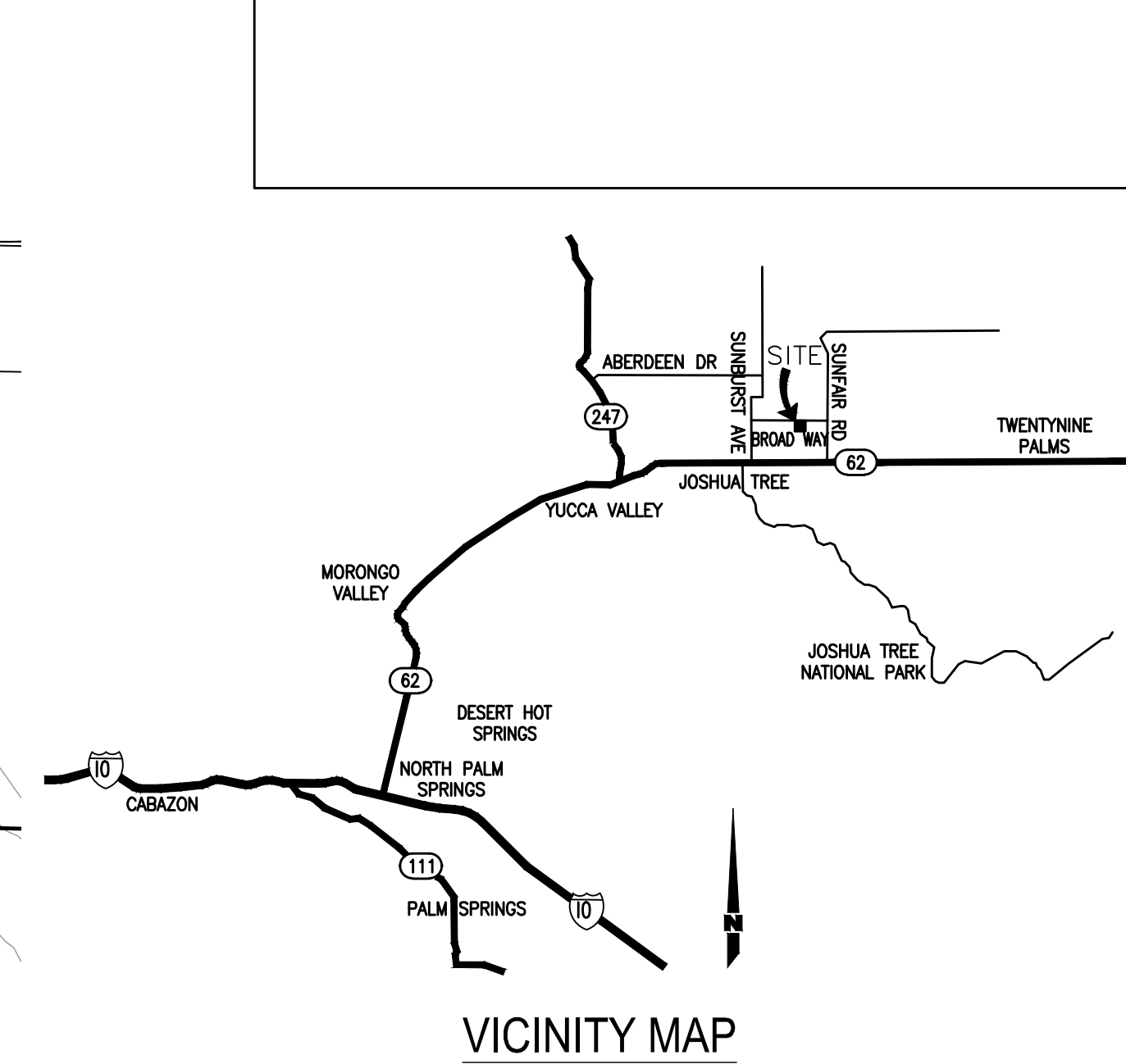
IN UNINCORPORATED TERRITORY OF SAN BERNARDINO COUNTY, STATE OF CALIFORNIA

TENTATIVE TRAC.T No. 20668

BEING A PROPOSED SUBDIVISION OF THE NORTH ONE-HALF OF THE NORTHEAST ONE-QUARTER OF SECTION 20, TOWNSHIP 1 NORTH, RANGE 7 EAST, SAN BERNARDINO MERIDIAN IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA ACCORDING TO THE OFFICIAL PLAT THEREOF.

JULY 2024

FOR OFFICIAL USE ONLY



LEGEND		ABBREVIATIONS	
[Symbol]	PROJECT BOUNDARY	FS	FINISH SURFACE ELEVATION
[Symbol]	EXISTING RIGHT-OF-WAY	H.P.	HIGH POINT
[Symbol]	PROPOSED RIGHT-OF-WAY	L.P.	LOW POINT
[Symbol]	STREET CENTERLINE	H=2.5'	HEIGHT OF WALL OR D.F.
[Symbol]	EXISTING MAJOR CONTOUR	T/G	TOP OF GRADE INLET
[Symbol]	EXISTING MINOR CONTOUR	T/S	TOP OF SLOPE
[Symbol]	PROPOSED CONTOUR	G.B.	GRADE BREAK
[Symbol]	EXIST. FLOW LINE & DIRECTION	FL	FLOWLINE
[Symbol]	PROPOSED SWALE	TR	TRACT MAP
[Symbol]	PROPOSED SLOPE W/SLOPE RATIO	NO.	MAP BOOK
[Symbol]	FLOW DIRECTION	PMB	PARCEL MAP BOOK
[Symbol]	PROPOSED CHANNEL CROSSING	PM	PARCEL MAP
[Symbol]	10,000 S.F. BLDG. ENVELOPE	ST	STREET
[Symbol]		BNDY	BOUNDARY
		CL	CENTERLINE
		HZ	HORIZONTAL
		EX	EXISTING
		N'LY	NORTHERLY
		S'LY	SOUTHERLY
		E'LY	EASTERLY
		W'LY	WESTERLY
		AC	ACRE
		PROP.	PROPOSED

LEGAL DESCRIPTION
 NORTH ONE-HALF OF NORTHEAST ONE-QUARTER OF SECTION 20, TOWNSHIP 1 NORTH, RANGE 7 EAST, SAN BERNARDINO MERIDIAN, COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA.
 ASSESSOR'S PARCEL NUMBER: 0605-051-01

UTILITY PROVIDERS

ELECTRIC: SOUTHERN CALIFORNIA EDISON COMPANY P.O. BOX 11482 SANTA ANA, CA 92711 (714) 796-9920	SCHOOL DISTRICT: MORONGO UNIFIED SCHOOL DISTRICT 5715 UTAH TRAIL TWENTYNINE PALMS, CA 92277 (760) 367-9191
WATER: JOSHUA BASIN WATER DIST. 61750 CHOLITA RD. JOSHUA TREE, CA 92252 (760) 336-8438	TRASH SERVICES: 4578 NEWTON ROAD YUCCA VALLEY, CA 92284 (760) 340-2113
SEWER: PRIVATE INDIVIDUAL SEPTIC	GAS: SOUTHERN CALIFORNIA GAS COMPANY (800) 427-2200 DEVELOPER WILL USE PROPANE

TELEPHONE:
AT&T
(800) 310-2355

SITE SUMMARY

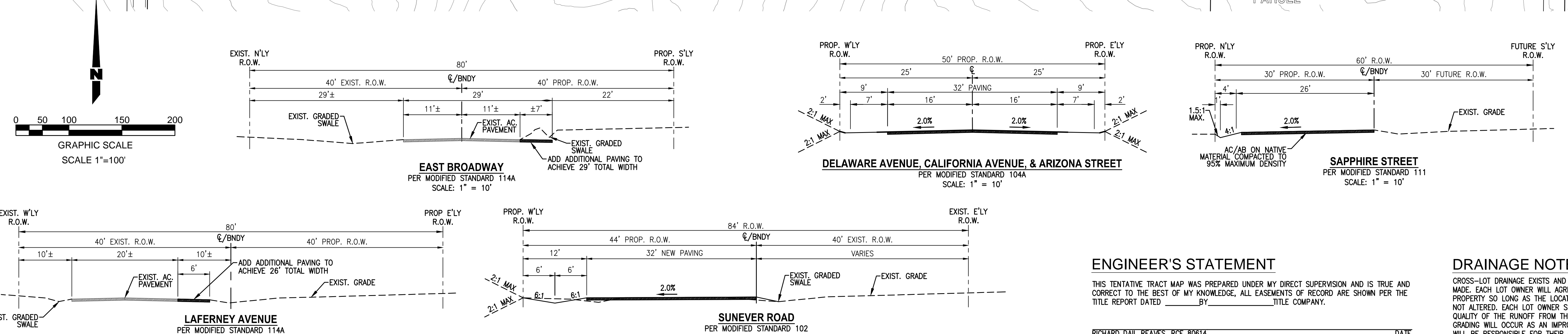
SITE ACREAGE (GROSS):	81.2 AC.
R.O.W. TO BE DEDICATED:	-11.0 AC.
SITE ACREAGE (NET):	70.2 AC.
TOTAL NUMBER OF RESIDENTIAL LOTS:	32
LINEAR FEET OF NEW STREETS:	6,642 LF

SITE INFORMATION

ASSESSOR'S PARCEL NUMBER: 0605-051-01
 TRACT NUMBER: 20668
 EXISTING ZONING: JT/RL (JOSHUA TREE/RURAL LIVING)
 PROPOSED ZONING: NO CHANGE
 EXISTING LAND USE: VACANT
 PROPOSED LAND USE: SFR
 PROJECT TYPE: DEVELOPER BUILD OUT
 NOTE: ALL ADJACENT PARCELS ARE ZONED JT/RL

EARTHWORK

	CUT (C.Y.)	FILL (C.Y.)
RAW EARTHWORK:	14,620	7,830
OVEREX & RECOMPACT:	29,200	29,200
SUBSIDENCE (0.1"):	-(1,500)	0
SUBTOTAL:	42,320	0
SHRINKAGE (12.5%):	-(5,280)	0
SURFACE ORGANICS & OTHER LOSSES:	0	0
TOTAL:	37,030	37,030
NET IMPORT/EXPORT - 0 (C.Y.):	---	0



ENGINEER'S STATEMENT
 THIS TENTATIVE TRACT MAP WAS PREPARED UNDER MY DIRECT SUPERVISION AND IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE, ALL EASEMENTS OF RECORD ARE SHOWN PER THE TITLE COMPANY.
 RICHARD DAIL REAVES, RCE 80614 DATE

DRAINAGE NOTE
 CROSS-LOT DRAINAGE EXISTS AND WILL REMAIN AFTER PUBLIC IMPROVEMENTS ARE MADE. EACH LOT OWNER WILL AGREE TO ACCEPT RUNOFF FROM THE ADJACENT PROPERTY SO LONG AS THE LOCATION OF THE FLOW OR CONCENTRATED RUNOFF IS NOT ALTERED. EACH LOT OWNER SHALL AGREE NOT TO ALTER THE QUANTITY OR QUALITY OF THE RUNOFF FROM THEIR LOT ONTO THE ADJACENT PROPERTY. NO LOT GRADING WILL OCCUR AS AN IMPROVEMENT OF THIS DEVELOPMENT. EACH LOT OWNER WILL BE RESPONSIBLE FOR THEIR OWN PAD GRADING, SWALES AND RUNOFF MITIGATION.

ENGINEER
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OWNER/APPLICANT
 KIM CHEN
 J.T. SANTORINI VILLA LLC
 1751 COLORADO BLVD., #333
 LOS ANGELES, CA 90041
 PHONE: (626) 673-2672
 EMAIL: kim@jonesparadiserg.com

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adkan ENGINEERS
 Civil Engineering • Surveying • Planning
 6879 Airport Drive, Riverside, CA 92504
 Tel: (951) 688-0241 • Fax: (951) 688-0599

RICHARD DAIL REAVES
 R.C.E. 80614 DATE EXP. 03-31-27

MARK	REVISIONS	APPR	DATE

COUNTY OF SAN BERNARDINO
 DEPARTMENT OF LAND USE SERVICES

RECOMMENDED BY: _____ DATE: _____
 APPROVED BY: _____ DATE: _____

TENTATIVE TRAC.T MAP

TRAC.T No. 20668
 APN: 0605-051-01
 JOSHUA TREE

DATE PREPARED: 7/19/2024
 DATE: _____
 FILE NO. _____

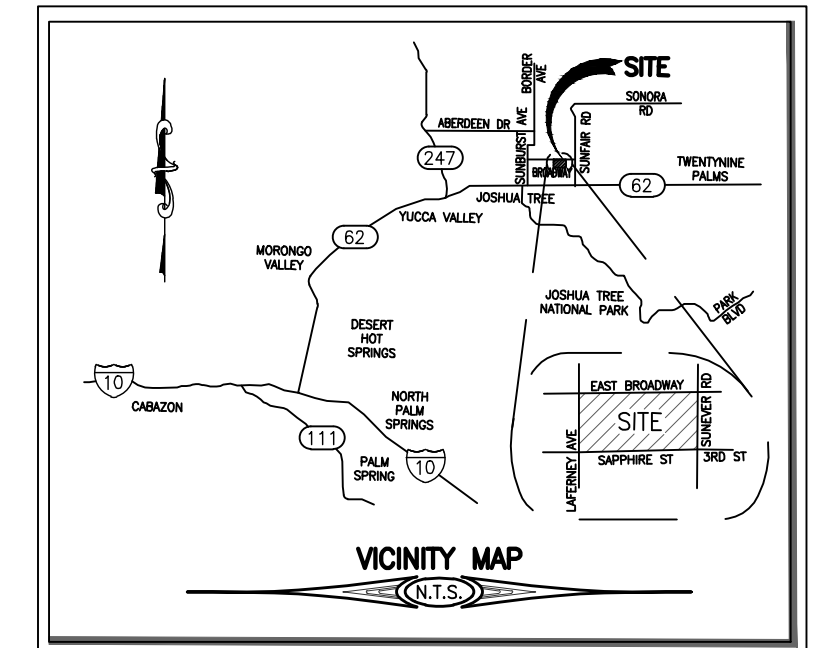
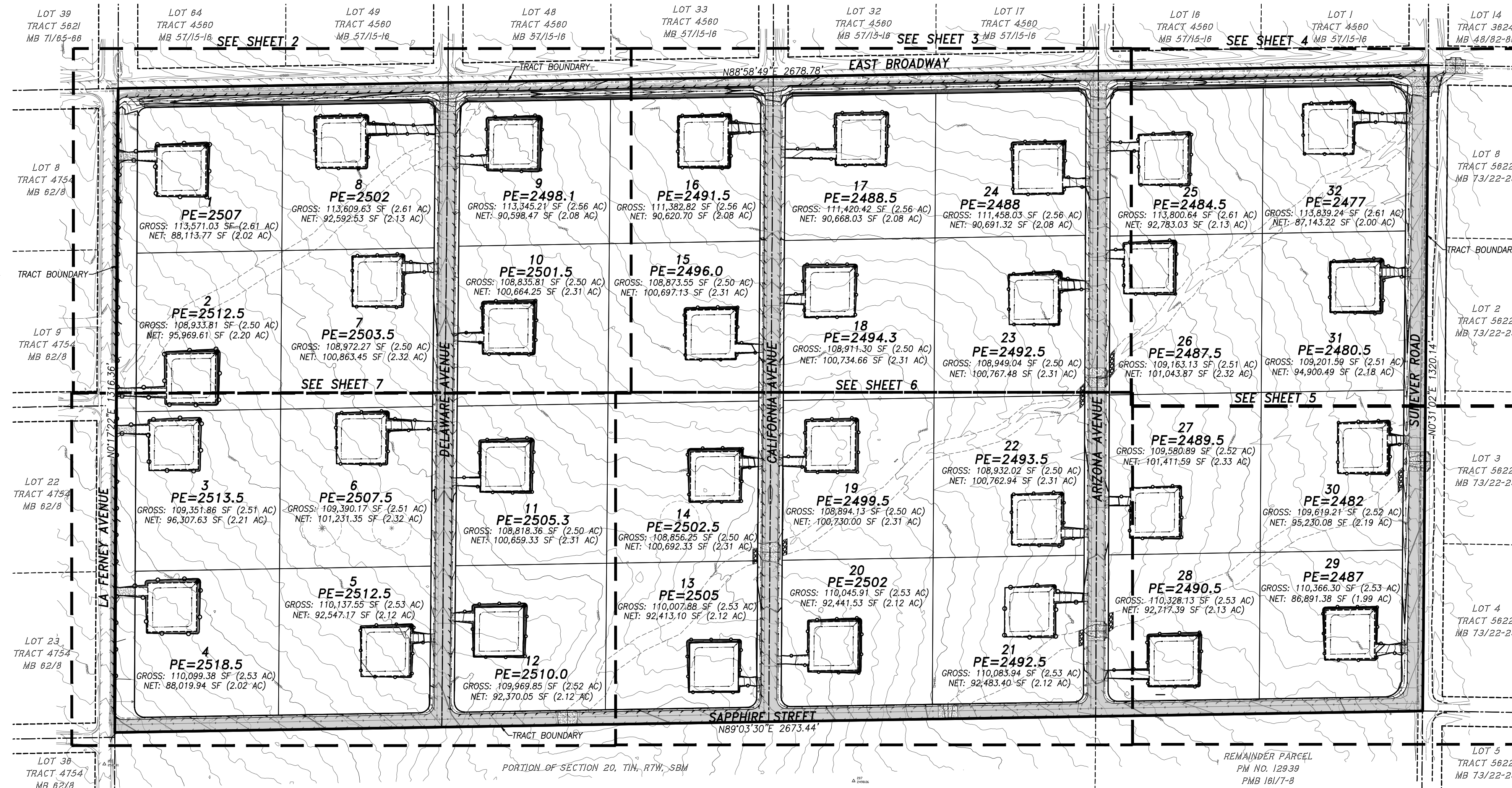
SHEET 1 OF 1

GRADING NOTES:

- 1) ALL GRADING SHALL CONFORM TO THE LATEST CALIFORNIA BUILDING CODE (CBC) CHAPTERS 17, 18, APPENDIX J AND ALL APPLICABLE SECTIONS.
- 2) A GRADING PERMIT SHALL BE OBTAINED PRIOR TO COMMENCEMENT OF ANY WORK ON THE SITE.
- 3) ISSUANCE OF A GRADING PERMIT DOES NOT ELIMINATE THE NEED FOR PERMITS FROM OTHER REGULATORY AGENCIES WITH REGULATORY RESPONSIBILITIES FOR CONSTRUCTION ACTIVITIES ASSOCIATED WITH THE WORK AUTHORIZED IN THIS PLAN.
- 4) ALL WORK UNDER THIS PERMIT SHALL BE LIMITED TO WORK WITHIN THE PROPERTY LINES. A SEPARATE CONSTRUCTION, EXCAVATION OR ENCROACHMENT PERMIT FROM THE DEPARTMENT OF PUBLIC WORKS MAY BE REQUIRED FOR ANY WORK WITHIN THE COUNTY RIGHT-OF-WAY.
- 5) APPROVAL OF THESE PLANS DOES NOT AUTHORIZE ANY WORK OR GRADING TO BE PERFORMED UNTIL A VALID GRADING PERMIT HAS BEEN ISSUED.
- 6) THIS PLAN IS FOR GRADING PURPOSES ONLY AND IS NOT TO BE USED FOR THE PURPOSE OF CONSTRUCTING ONSITE OR OFFSITE IMPROVEMENTS. ISSUANCE OF A PERMIT BASED ON THIS PLAN DOES NOT CONSTITUTE APPROVAL OF DRIVEWAY LOCATIONS OR SIZES, PARKING LOT STRUCTURAL SECTIONS OR LAYOUT, ADA-RELATED REQUIREMENTS, BUILDING LOCATIONS OR FOUNDATIONS, CURBING, OFFSITE FACILITIES OR OTHER ITEMS NOT RELATED DIRECTLY TO THE BASIC GRADING OPERATION. ONSITE IMPROVEMENTS SHALL BE CONSTRUCTED IN ACCORDANCE TO THE APPROVED BUILDING PERMIT PLANS. OFFSITE IMPROVEMENTS SHALL BE CONSTRUCTED IN ACCORDANCE TO PLANS APPROVED FOR THIS PURPOSE BY THE PUBLIC WORKS DEPARTMENT.
- 7) MAXIMUM CUT AND FILL SLOPE = 2:1 (HORIZONTAL TO VERTICAL) AND MAXIMUM VERTICAL HEIGHT = 30 FEET, UNLESS AN APPROVED GEOTECHNICAL REPORT CAN JUSTIFY A STEEPER AND TALLER SLOPE.
- 8) NO FILL SHALL BE PLACED ON EXISTING GROUND UNTIL THE GROUND HAS BEEN CLEARED OF WEEDS, DEBRIS, TOPSOIL AND OTHER DELETERIOUS MATERIAL.
- 9) FILL SLOPES SHALL NOT HAVE LESS THAN 90% RELATIVE COMPACTION, OR AS RECOMMENDED ON THE APPROVED GEOTECHNICAL REPORT.
- 10) IT IS THE GRADING CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT ADEQUATE COMPACTION HAS BEEN OBTAINED ON THE ENTIRE GRADING SITE, INCLUDING FILL AREAS OUTSIDE THE BUILDING PADS AND ON ALL FILL SLOPES.
- 11) UNLESS OTHERWISE RECOMMENDED IN AN APPROVED GEOTECHNICAL REPORT, OVER-EXCAVATION SHALL BE AT LEAST 24 INCHES MINIMUM BELOW THE BOTTOM OF FOOTINGS OR TO COMPETENT NATIVE SOIL OR BEDROCK MATERIALS, WHICHEVER IS DEEPER, AS APPROVED BY THE PROJECT'S GEOTECHNICAL ENGINEER OR GEOLOGIST.
- 12) EARTHWORK VOLUMES:
CUT (CY), FILL (CY), TOTAL DISTURBED AREA (SF)
- 13) EARTHWORK QUANTITIES ARE SHOWN FOR GRADING PERMIT PURPOSES ONLY, AND SAN BERNARDINO COUNTY IS NOT RESPONSIBLE FOR THEIR ACCURACY.
- 14) A COPY OF THE GRADING PERMIT AND APPROVED GRADING PLANS MUST BE IN THE POSSESSION OF A RESPONSIBLE PERSON AND AVAILABLE AT THE SITE AT ALL TIMES.
- 15) ANY ONSITE RETAINING WALLS SHOWN ON THE GRADING PLANS THAT ARE OVER 4' IN HEIGHT, MEASURED FROM TOP OF WALL TO BOTTOM OF FOOTING, ARE FOR REFERENCE ONLY. RETAINING WALLS OVER 4' IN HEIGHT ARE NOT CHECKED, PERMITTED, OR INSPECTED PER THE GRADING PERMIT. A SEPARATE RETAINING WALL PERMIT IS REQUIRED FOR ALL RETAINING WALLS OVER 4' IN HEIGHT.
- 16) ANY WALLS, FENCES, STRUCTURES AND/OR APPURTENANCES ADJACENT TO THIS PROJECT ARE TO BE PROTECTED IN PLACE. IF GRADING OPERATIONS DAMAGE OR ADVERSELY AFFECT SAID ITEMS IN ANY WAY, THE CONTRACTOR AND/OR DEVELOPER IS RESPONSIBLE FOR WORKING OUT AN ACCEPTABLE SOLUTION TO THE SATISFACTION OF THE AFFECTED PROPERTY OWNER(S).
- 17) FOR SITES WITH PROTECTED SPECIES OR TREES, THE PROPOSED GRADING MAY BE SUBJECT TO A SEPARATE PERMIT.
- 18) ADEQUATE FIRE ACCESS AROUND BUILDINGS (INCLUDING GARAGES) SHOULD BE PROVIDED AS APPROVED BY COUNTY FIRE.
- 19) EXISTING DRAINAGE COURSES SHALL NOT BE OBSTRUCTED, ALTERED, OR DIVERTED WITHOUT PRIOR APPROVAL FROM THE COUNTY OF SAN BERNARDINO, LAND DEVELOPMENT DIVISION. A STREAMBED ALTERATION AGREEMENT MAY ALSO BE REQUIRED FROM THE CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE.
- 20) DRAINAGE EASEMENTS SHALL NOT BE OBSTRUCTED, ALTERED OR DIVERTED WITHOUT PRIOR APPROVAL OF THE COUNTY OF SAN BERNARDINO, LAND DEVELOPMENT DIVISION.
- 21) SETBACKS AND BUILDING LOCATIONS SHOWN ON THIS PLAN ARE FOR REFERENCE ONLY AND MUST BE REVIEWED AND APPROVED UNDER A SEPARATE BUILDING PERMIT.
- 22) UTILITY AND SEPTIC IMPROVEMENTS SHOWN ON THIS PLAN ARE FOR REFERENCE ONLY AND MUST BE REVIEWED AND APPROVED UNDER A SEPARATE BUILDING PERMIT.
- 23) ON PROJECTS DISTURBING ONE ACRE OR MORE, THE FOLLOWING NOTE MUST BE ADDED: A NOTICE OF INTENT (NOI) HAS BEEN, OR WILL BE FILED WITH THE STATE WATER RESOURCES CONTROL BOARD (SWRCB) AND A STORM WATER POLLUTION PREVENTION PLAN (SWPPP) HAS BEEN OR WILL BE PREPARED IN ACCORDANCE WITH THE REQUIREMENTS OF CALIFORNIA GENERAL PERMIT FOR STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY (PERMIT NO. CAS00002) FOR ALL OPERATIONS ASSOCIATED WITH THESE PLANS. THE PERMITTEE SHALL KEEP A COPY OF THE SWPPP ON SITE AND AVAILABLE FOR REVIEW BY THE COUNTY.
- 24) IN CONJUNCTION WITH THE CALIFORNIA GENERAL PERMIT FOR PROPOSED DISTURBANCE OVER ONE ACRE, AN ACTIVE WASTEWATER DISCHARGE ID # (WID) _____ MUST BE INCLUDED ON THE FINAL GRADING PLAN.
- 25) A FINAL GRADING CERTIFICATION WILL BE COLLECTED BY THE BUILDING INSPECTOR AT THE FINAL BUILDING INSPECTION OR PRIOR TO A GRADING FINAL STATUS ON THE PERMIT. THE FINAL GRADING CERTIFICATION IS TO BE COMPLETED BY THE ENGINEER OF RECORD.
- 26) THE SOILS ENGINEER SHALL PROVIDE A FINAL SOIL GRADING REPORT INCLUDING LOCATIONS AND ELEVATIONS OF FIELD DENSITY TESTS, SUMMARIES OF FIELD AND LABORATORY TESTS AND OTHER SUBSTANTIATING DATA AND COMMENTS ON ANY CHANGES MADE DURING GRADING AND THEIR EFFECT ON THE RECOMMENDATIONS MADE IN THE SOILS ENGINEERING INVESTIGATION REPORT. IT SHALL ALSO PROVIDE INFORMATION AS TO LOCATION AND NATURE OF TESTS, STATEMENTS RELATIVE TO THE EXPANSIVE NATURE OF SOIL AND/OR ROCK MATERIAL, LIMITS OF COMPACTED FILL SHOWN ON THE AS-GRADED PLAN AND CERTIFICATION AS TO THE ADEQUACY AND STABILITY OF THE SITE FOR THE INTENDED USE.
- 27) IF APPLICABLE, THE ENGINEERING GEOLOGIST SHALL PROVIDE A GEOLOGIC GRADING REPORT INCLUDING A FINAL DESCRIPTION OF THE GEOLOGY OF THE SITE INCLUDING ANY NEW INFORMATION DISCLOSED DURING THE GRADING AND THE EFFECT OF SAME ON RECOMMENDATIONS INCORPORATED IN THE APPROVED GRADING PLAN. THE ENGINEERING GEOLOGIST SHALL PROVIDE CERTIFICATION AS TO THE ADEQUACY OF THE SITE FOR THE INTENDED USE AS AFFECTED BY GEOLOGIC FACTORS WHERE NECESSARY, A REVISED GEOLOGIC MAP AND CROSSSECTIONS, AND ANY RECOMMENDATIONS REGARDING SPECIAL BUILDING RESTRICTIONS OR FOUNDATION SETBACKS SHALL BE INCLUDED.
- 28) SHOULD THE EXCAVATION DISCLOSE SOIL AND/OR ROCK CONDITIONS WHERE CUT SLOPES ARE UNSTABLE, THE ENGINEERING GEOLOGIST AND/OR THE SOILS ENGINEER SHALL RECOMMEND NECESSARY TREATMENT TO THE BUILDING OFFICIAL FOR APPROVAL.
- 29) GEOLOGICAL AND SOILS ENGINEERING REPORTS BY _____ DATED _____ AND ALL SOILS REPORT ADDENDUM(DA) SHALL BE INCORPORATED HERewith AND MADE PART OF THIS GRADING PLAN.
- 30) THE CONTRACTOR SHALL IMPLEMENT PREVENTIVE MEASURES TO ASSURE THAT NO ROCKS, SOIL DUST, OR DEBRIS OF ANY FORM SHALL FALL, SLIDE OR FLOW ONTO ADJOINING PROPERTIES OR PUBLIC WAYS. ALL VEHICLE LOADS SHALL BE TRIMMED AND WATERED OR OTHERWISE SECURED TO PREVENT SPILLAGE FROM THE EQUIPMENT.
- 31) ALL EXPORT AND IMPORT OF MATERIAL OVER DEDICATED AND IMPROVED STREETS SHALL BE UNDERTAKEN OR CONDUCTED BY EQUIPMENT THAT COMPLIES IN ALL RESPECTS TO THE STATE VEHICLE CODE. REPAIR TO ANY DAMAGED DEDICATED OR IMPROVED STREETS SHALL BE MADE TO THE SATISFACTION OF THE BUILDING OFFICIAL AND IS THE RESPONSIBILITY OF THE OWNER, PERMITTEE, AND THE GRADING CONTRACTOR.
- 32) ALL FLOOD ZONE REQUIREMENTS MUST BE REFLECTED OR ACCOUNTED FOR ON THE GRADING PLANS. ELEVATIONS OR CONSTRUCTION NOTES MUST BE INCLUDED IN THE PLANS TO ENSURE COMPLIANCE WITH ALL APPLICABLE FIRST FLOOR ELEVATION REQUIREMENTS PER FEMA AND SAN BERNARDINO COUNTY DEVELOPMENT CODE GUIDELINES.
- 33) ALL GRADING SHALL COMPLY WITH SBC DEVELOPMENT CODE SECTION 82.14.050.C:
IF FILL IS PLACED TO ELEVATE PADS ABOVE BASE ELEVATION, IT MUST BE DEMONSTRATED THAT FILL WILL NOT SETTLE AND IS PROTECTED FROM EROSION, SCOUR, OR DIFFERENTIAL SETTLEMENT, AS FOLLOWS:
a) THE PAD ELEVATION SHALL BE CERTIFIED TO MEET OR EXCEED THE ELEVATION REQUIRED BY THE APPLICABLE FLOODPLAIN SAFETY REVIEW AREA, AND IT MUST BE DEMONSTRATED THAT THE CUMULATIVE EFFECT OF THE PROPOSED DEVELOPMENT WHEN COMBINED WITH ALL OTHER EXISTING AND ANTICIPATED DEVELOPMENT WILL NOT INCREASE THE WATER SURFACE ELEVATION OF THE BASE FLOOD AT ANY POINT WITHIN THE COMMUNITY.
b) FILL SHALL BE COMPACTED TO 95 PERCENT PER ASTM (AMERICAN SOCIETY OF TESTING MATERIALS) STANDARD D-698.
c) FILL SLOPES SHALL BE NO STEEPER THAN TWO FEET HORIZONTAL TO ONE FOOT VERTICAL RATIO UNLESS SUBSTANTIATING DATA FOR STEEPER SLOPES IS PROVIDED, AND THE SLOPES ARE APPROVED BY THE COUNTY.
d) FILL SLOPES ADJACENT TO A WATER COURSE MAY BE REQUIRED TO BE ARMORED WITH STONE, ROCK OR APPROVED EQUAL PROTECTION.
- 34) FOR NONRESIDENTIAL PROJECTS, PROVIDE FOLLOWING NOTE ON PLANS: CALIFORNIA GREEN BUILDING STANDARDS CODE 5.408.3 EXCAVATED SOIL AND LAND CLEARING DEBRIS:
100 PERCENT OF TREES, STUMPS, ROCKS AND ASSOCIATED VEGETATION AND SOILS RESULTING PRIMARILY FROM LAND CLEARING SHALL BE REUSED OR RECYCLED. FOR A PHASED PROJECT, SUCH MATERIAL MAY BE STOCKPILED ON SITE UNTIL THE STORAGE SITE IS DEVELOPED.
EXCEPTION: REUSE, EITHER ON-OR OFF-SITE, OF VEGETATION OR SOIL CONTAMINATED BY DISEASE OR PEST INFESTATION.

IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA

TRACT MAP NO. 20668 ROUGH GRADING PLAN

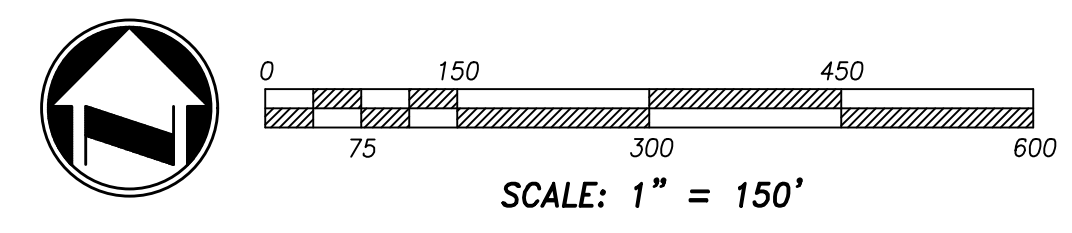


LEGEND

CL	CENTERLINE	P.I.P.	PROTECT IN PLACE
EP	EDGE OF PAVEMENT	R/W	RIGHT OF WAY
EX	EXISTING	TYP.	TYPICAL
FL	FLOW LINE	WTR	WATER
FS	FINISHED SURFACE		
FG	FINISHED GROUND		
HP	HIGH POINT		
LP	LOW POINT		
N.T.S.	NOT TO SCALE		
PE	PAD ELEVATION		
PROP.	PROPOSED		
PL	PROPERTY LINE		

EARTHWORK

	CUT (CY)	FILL (CY)
RAW EARTHWORK:	13,077	27,320
NET IMPORT/EXPORT - 0 (CY)	---	14,243



ENGINEER
ADKAN ENGINEERS
6879 AIRPORT DRIVE
RIVERSIDE, CA 92504
TELEPHONE: (951) 688-0241
EMAIL: RREAIVES@ADKAN.COM

ASSESSORS PARCEL NUMBERS
0605-051-01

OWNER/DEVELOPER
KIM CHEN
J.T. SANTORI VILLA LLC
1751 COLORADO BLVD., #333
LOS ANGELES, CA 90041
PHONE: (626) 673-2672
EMAIL: kim@homeparadiserg.com

SOILS ENGINEER
SLADDEN ENGINEERING
45090 GOLF CENTER PARKWAY, STE F
INDIO, CA 92201
TELEPHONE: (760) 863-0713

CONSTRUCTION NOTES & QUANTITIES

THE QUANTITIES SHOWN BELOW ARE FOR BONDING INFORMATION ONLY. THE CONTRACTOR IS TO CONSTRUCT PROJECT PER THESE PLANS AND SUBMIT CONSTRUCTION BID BASED ON THEIR OWN QUANTITY "TAKE-OFF".

1. INSTALL 1/2 TON RIP-RAP, #2 BACKING.....	1,521 SF
2. INSTALL 3'X10' 1/2 TON RIP-RAP PAD.....	2,623 SF

LEGAL DESCRIPTION
NORTH ONE-HALF OF NORTHEAST ONE-QUARTER OF SECTION 20, TOWNSHIP 1 NORTH, RANGE 7 EAST, SAN BERNARDINO MERIDIAN, COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA.
ASSESSOR'S PARCEL NUMBER: 0605-051-01

DRAINAGE NOTE:
CROSS-LOT DRAINAGE EXISTS AND WILL REMAIN AFTER PUBLIC IMPROVEMENTS ARE MADE. EACH LOT OWNER WILL AGREE TO ACCEPT RUNOFF FROM THE ADJACENT PROPERTY SO LONG AS THE LOCATION OF THE FLOW OR CONCENTRATED RUNOFF IS NOT ALTERED. EACH LOT OWNER SHALL AGREE NOT TO ALTER THE QUANTITY OR QUALITY OF THE RUNOFF FROM THEIR LOT ONTO THE ADJACENT PROPERTY. NO LOT GRADING WILL OCCUR AS AN IMPROVEMENT OF THIS DEVELOPMENT. EACH LOT OWNER WILL BE RESPONSIBLE FOR THEIR OWN PAD GRADING, SWALES AND RUNOFF MITIGATION.

UTILITIES
ELECTRIC:
SOUTHERN CALIFORNIA EDISON
P.O. BOX 11482
SANTA ANA, CA 92711
(714) 796-9920

TRASH SERVICES:
4878 NEWTON ROAD
YUCCA VALLEY, CA 92284
(760) 340-2113

WATER:
JOSHUA BASIN WATER DIST.
61750 CHOLITA RD.
JOSHUA TREE, CA 92252
(760) 336-8438

TELEPHONE:
AT&T
(800) 310-2355

GAS:
SOUTHERN CALIFORNIA GAS COMPANY
(800) 742-2200
DEVELOPER WILL USE PROPANE

SCHOOL DISTRICT:
MORONGO UNIFIED SCHOOL DISTRICT
5715 UTAH TRAIL
TWENTYNINE PALMS, CA 92277
(760) 367-9191

BASIS OF BEARINGS
THE CENTERLINE OF SUNEVER AVENUE BEING NORTH 0°31'35" EAST PER PARCEL MAP NO. 12938, FILED IN BOOK 161 OF PARCEL MAPS, AT PAGES 7 AND 8, RECORDS OF SAN BERNARDINO COUNTY, WAS HELD AS THE BASIS OF BEARINGS FOR THIS MAP.

SHEET INDEX

SHEET 1:	TITLE SHEET
SHEET 2-7:	GRADING
SHEET 8:	SECTIONS
SHEET 9:	EROSION CONTROL

SOILS ENGINEER'S CERTIFICATION:

THIS GRADING PLAN HAS BEEN REVIEWED BY THE UNDERSIGNED AND FOUND TO BE IN CONFORMANCE WITH THE RECOMMENDATIONS AS OUTLINED IN THE FOLLOWING SOILS AND GEOLOGICAL REPORT FOR THIS PROJECT.

REPORT TITLE:
REPORT DATE:
FIRM NAME:

DATE _____ SEAL _____

Underground Service Alert

Call: TOLL FREE
1-800-227-2600

TWO WORKING DAYS BEFORE YOU DIG

BENCHMARK
BM 62-1-11
9.85 MILE EAST ALONG STATE HIGHWAY 62 FROM THE POST OFFICE AT YUCCA VALLEY, AT THE INTERSECTION OF HIGHWAY 62 AND RICE AVENUE, 187 FT. NORTH OF THE CENTERLINE OF THE HIGHWAY, 35 FT. WEST OF THE CENTERLINE OF RICE AVENUE, 10 FT. WEST OF A POWER POLE 70557 WITH LINES NORTH, SOUTH, EAST, AND WEST. NOTE BM MAY ALSO BE REACHED BY GOING 13.15 MILE WEST ALONG STATE HIGHWAY 62 FROM ITS INTERSECTION WITH ADOBE ROAD AT TWENTYNINE PALMS.
ELEVATION: 2601.15 NAVD 1988

PREPARED BY:

adkan ENGINEERS
Civil Engineering - Surveying - Planning
6820 Airport Drive, Riverside, CA 92504
Tel: (951) 688-0241, Fax: (951) 688-0599

Under the Supervision of
RICHARD DAL REAVES, R.C.E. 80614 Exp. 03.31.27 Date

REGISTERED PROFESSIONAL ENGINEER
RICHARD DAL REAVES
NO. 80614
EXP. 03/31/27
CIVIL
STATE OF CALIFORNIA

MARK	REVISIONS	APPR DATE

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

RECOMMENDED BY: _____ DATE _____
APPROVED BY: _____ DATE _____

GHASSEM SHEHETI
SUPERVISING ENGINEER, TRAFFIC DIVISION

JEREMY JOHNSON
ENGINEERING MANAGER, TRAFFIC DIVISION

GREG GRIFFITH
LAND DEVELOPMENT MANAGER

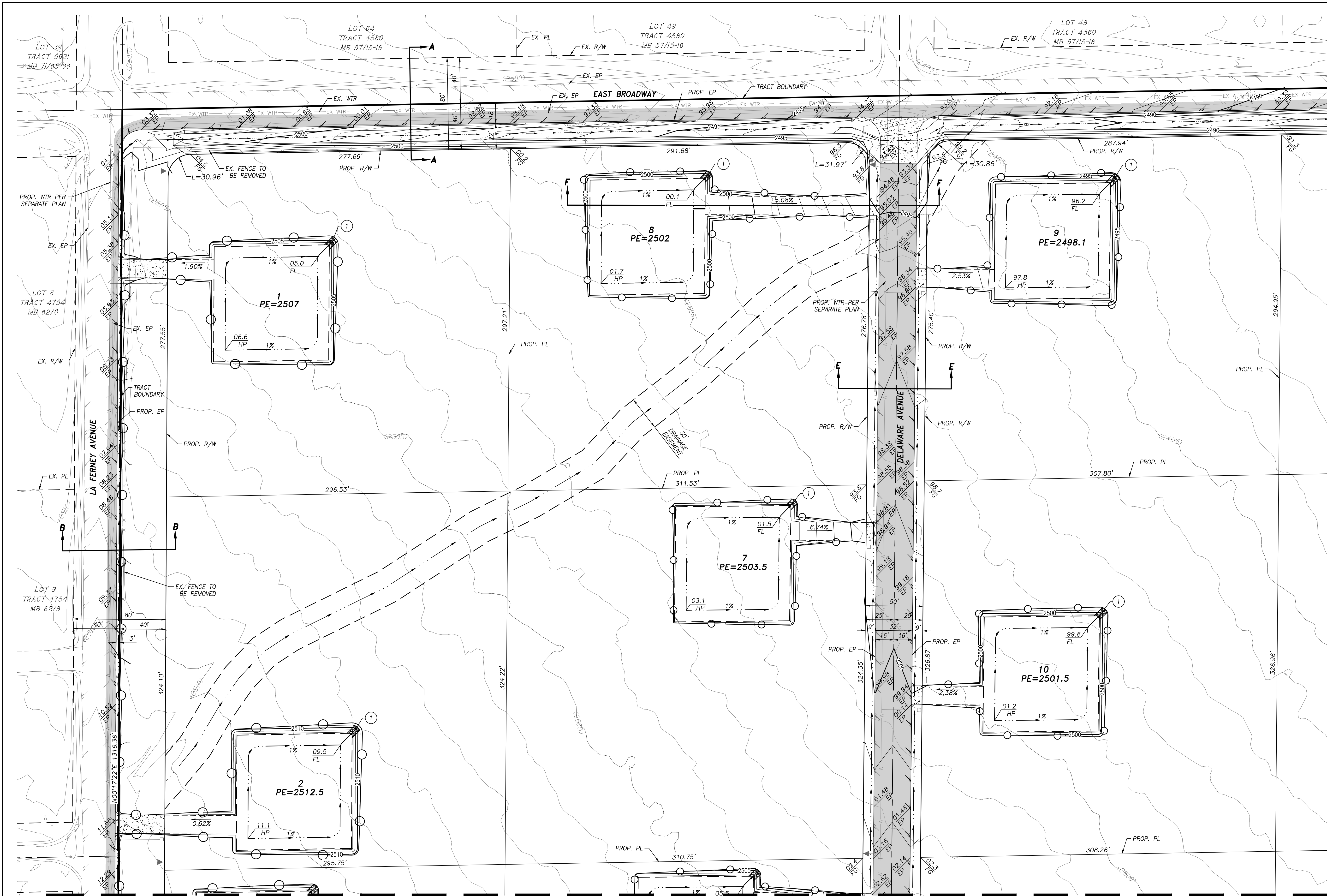
TITLE SHEET

TRACT NO. 20668
APN 0605-051-01
JOSHUA TREE

ROAD NO.

FILE NO.

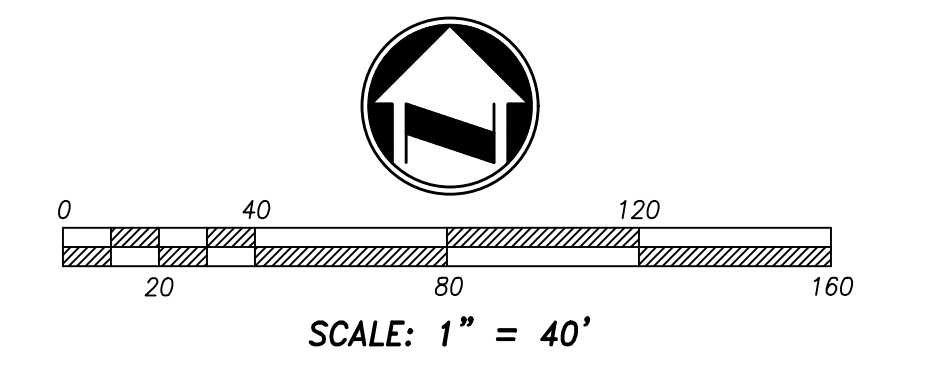
SHEET 1 OF 9



CONSTRUCTION NOTES

- 1 INSTALL 1/2 TON RIP-RAP, #2 BACKING

SEE SHEET 3



SEE SHEET 7

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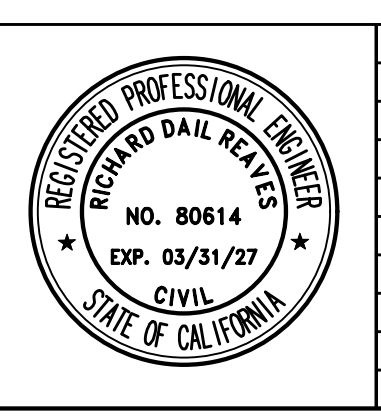
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**COUNTY OF SAN BERNARDINO
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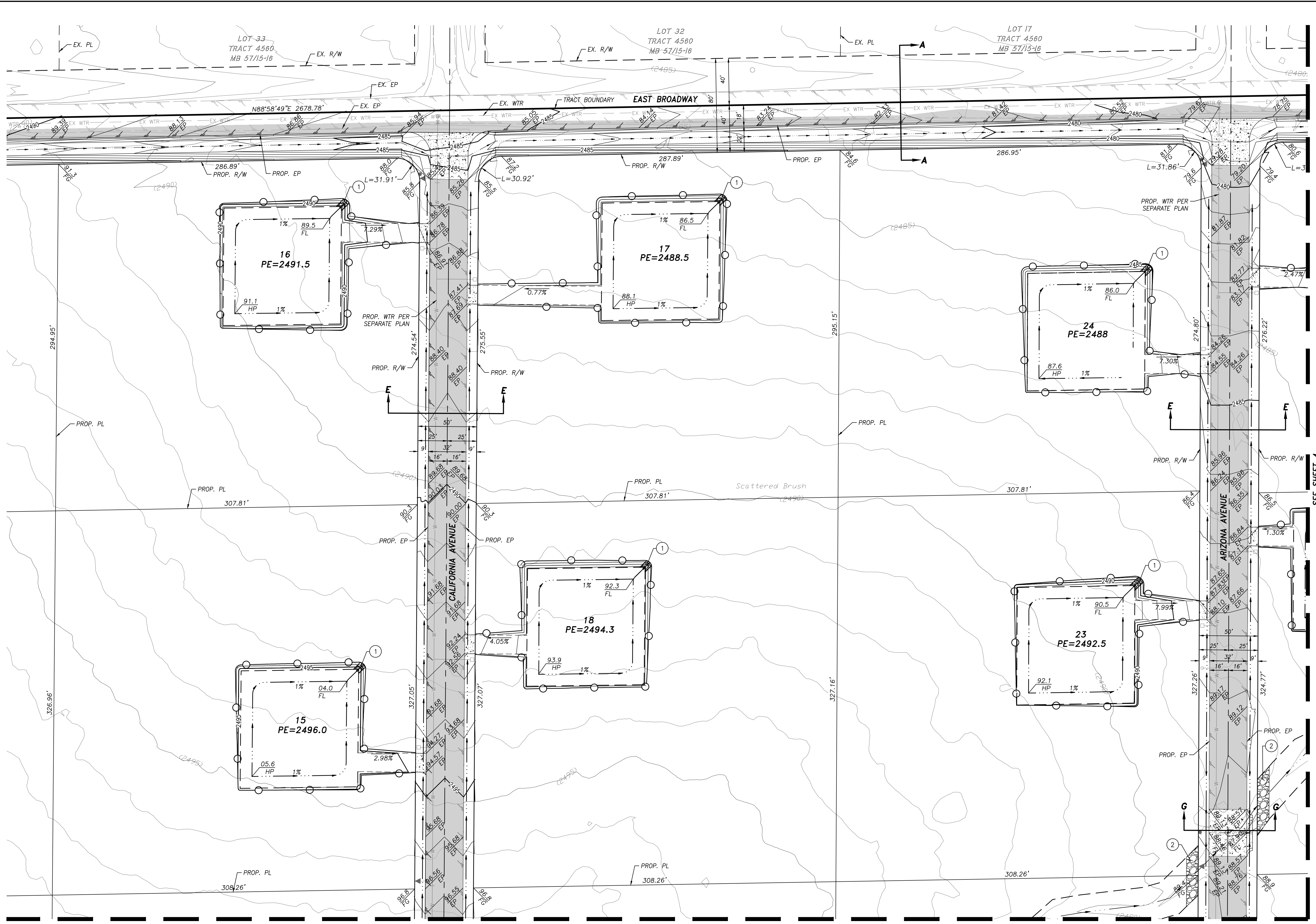
RECOMMENDED BY:
GHASSAN SHELEH, SUPERVISING ENGINEER, TRAFFIC DIVISION, DATE

APPROVED BY:
JEREMY JOHNSON, ENGINEERING MANAGER, TRAFFIC DIVISION, DATE

ROUGH GRADING

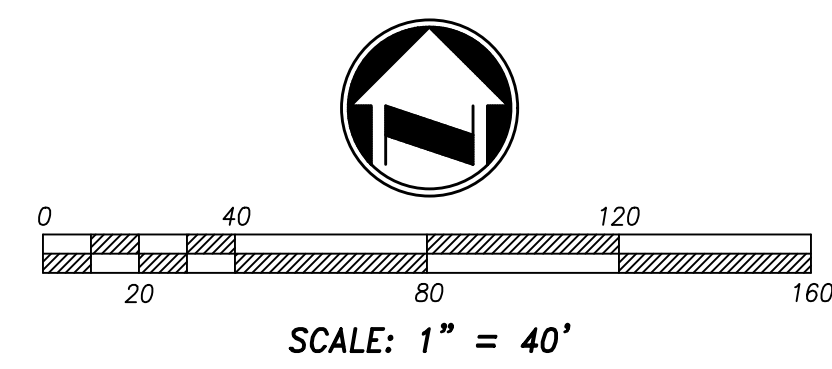
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JOSHUA TREE

ROAD NO.
FILE NO.
SHEET 2 OF 9



CONSTRUCTION NOTES

- ① INSTALL 1/2 TON RIP-RAP, #2 BACKING
- ② INSTALL 3'X10' 1/2 TON RIP-RAP PAD



SEE SHEET 6

SEE SHEET 4

Underground Service Alert

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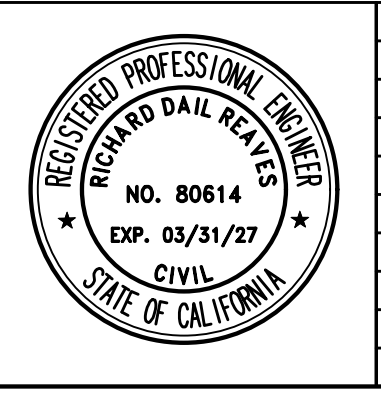
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COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

RECOMMENDED BY:
GHASSAN SHELEH, SUPERVISING ENGINEER, TRAFFIC DIVISION, DATE

APPROVED BY:
JEREMY JOHNSON, ENGINEERING MANAGER, TRAFFIC DIVISION, DATE

GREG GRIFFITH, LAND DEVELOPMENT MANAGER, DATE

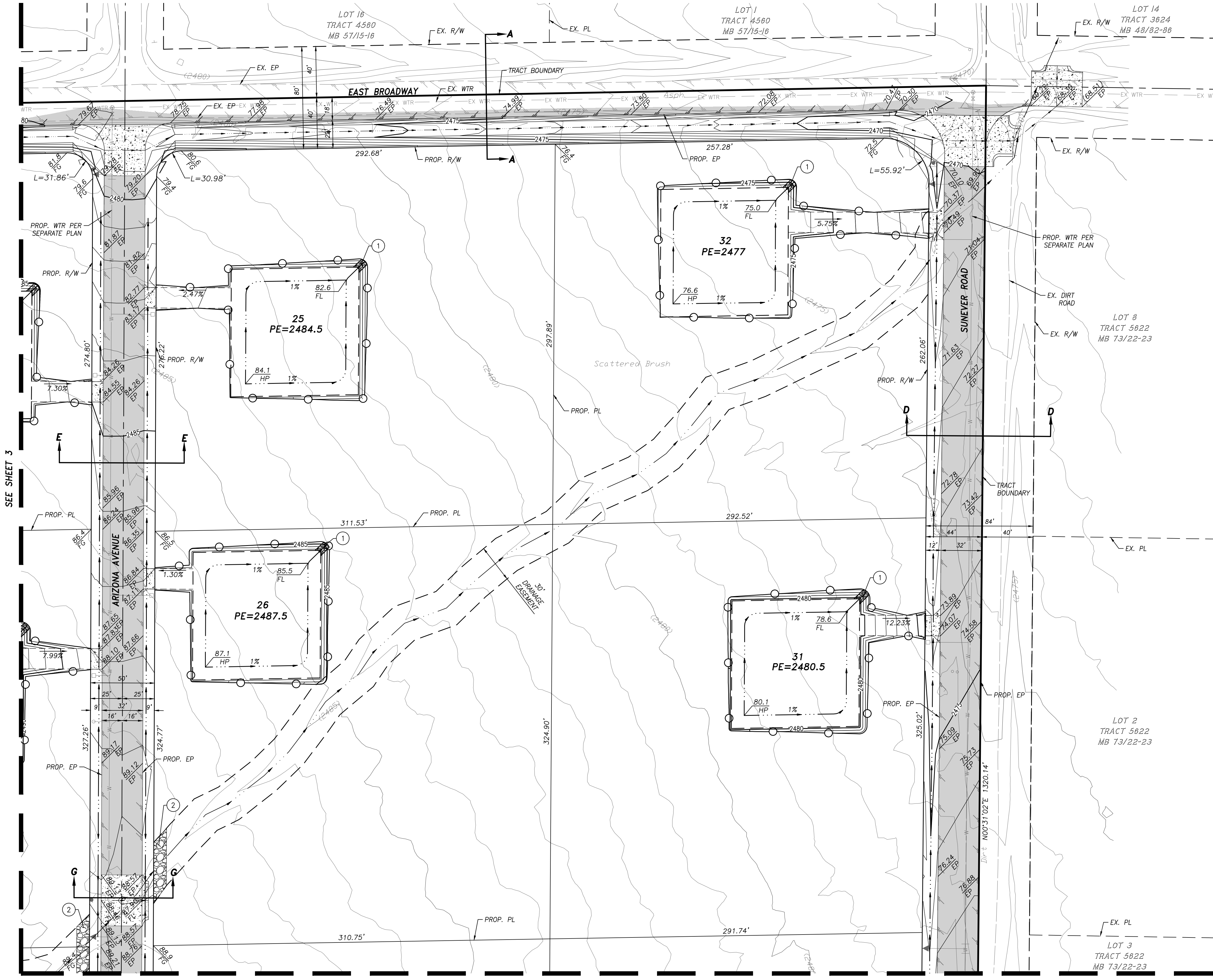
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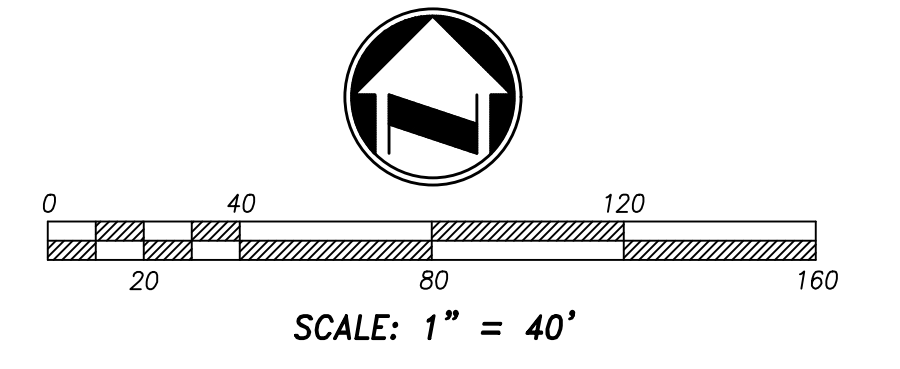
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FILE NO.

SHEET 3 OF 9



- CONSTRUCTION NOTES**
- ① INSTALL 1/2 TON RIP-RAP, #2 BACKING
 - ② INSTALL 3'x10' 1/2 TON RIP-RAP PAD



SEE SHEET 3

SEE SHEET 5

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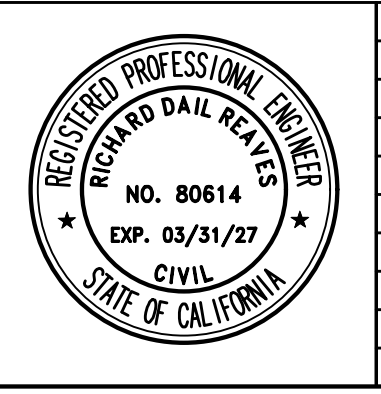
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 GHASSAN SHELLER, SUPERVISING ENGINEER, TRAFFIC DIVISION, DATE

APPROVED BY:
 JEREMY JOHNSON, ENGINEERING MANAGER, TRAFFIC DIVISION, DATE

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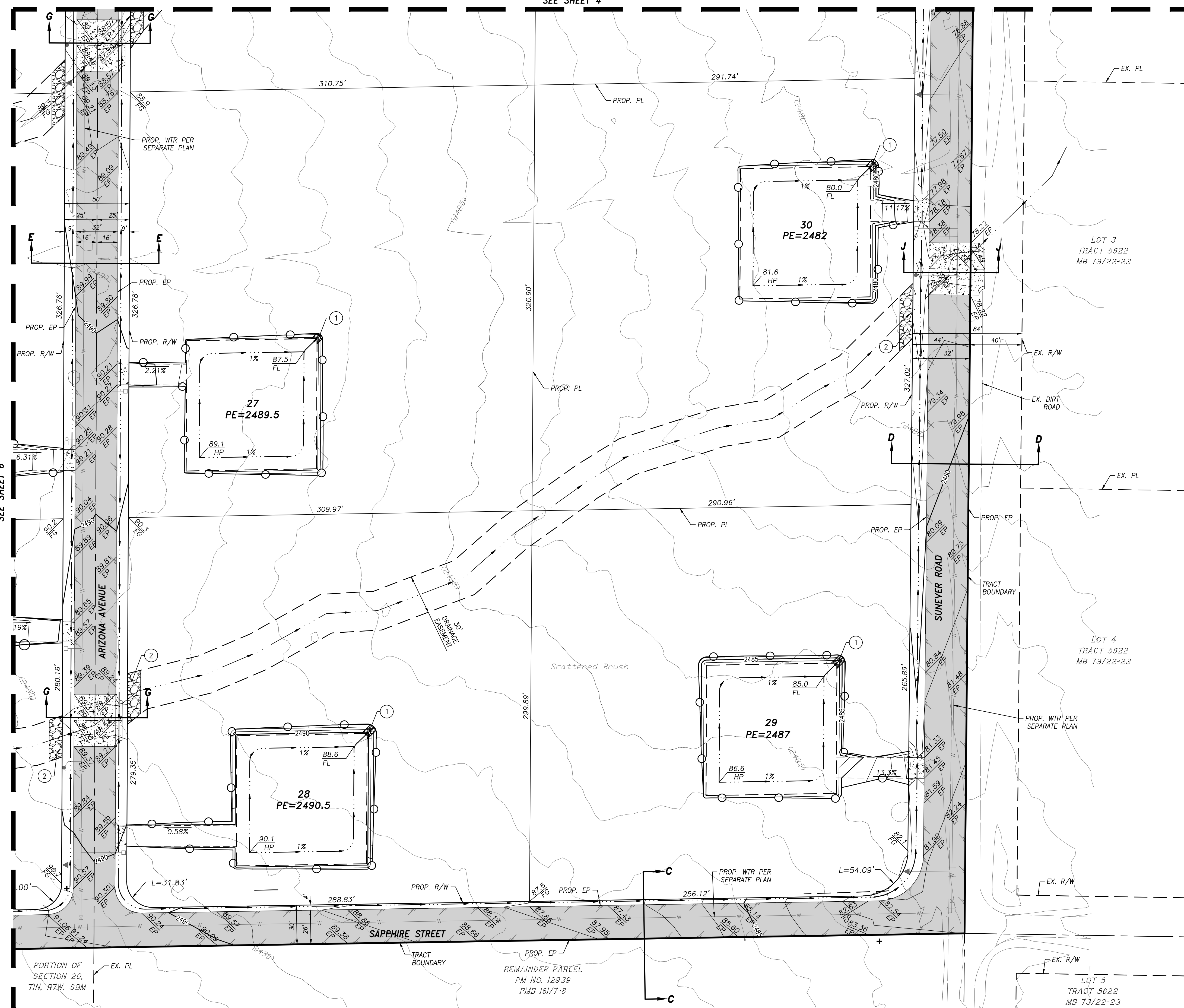
ROAD NO.
 FILE NO.
 SHEET 4 OF 9

SEE SHEET 4

CONSTRUCTION NOTES

- ① INSTALL 1/4 TON RIP-RAP, #2 BACKING
- ② INSTALL 3'X10' 1/4 TON RIP-RAP PAD

SEE SHEET 6



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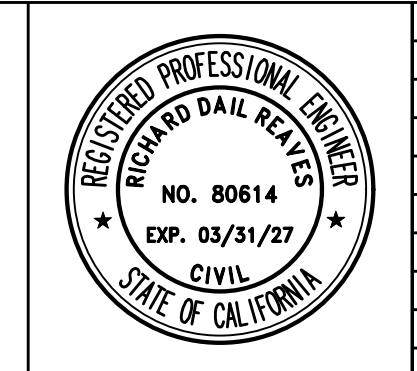
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Under the Supervision of: **RICHARD DAL REAKES, R.C.E. 80614 EXP. 03/31/27** Date



MARK	REVISIONS	APPR	DATE

COUNTY OF SAN BERNARDINO
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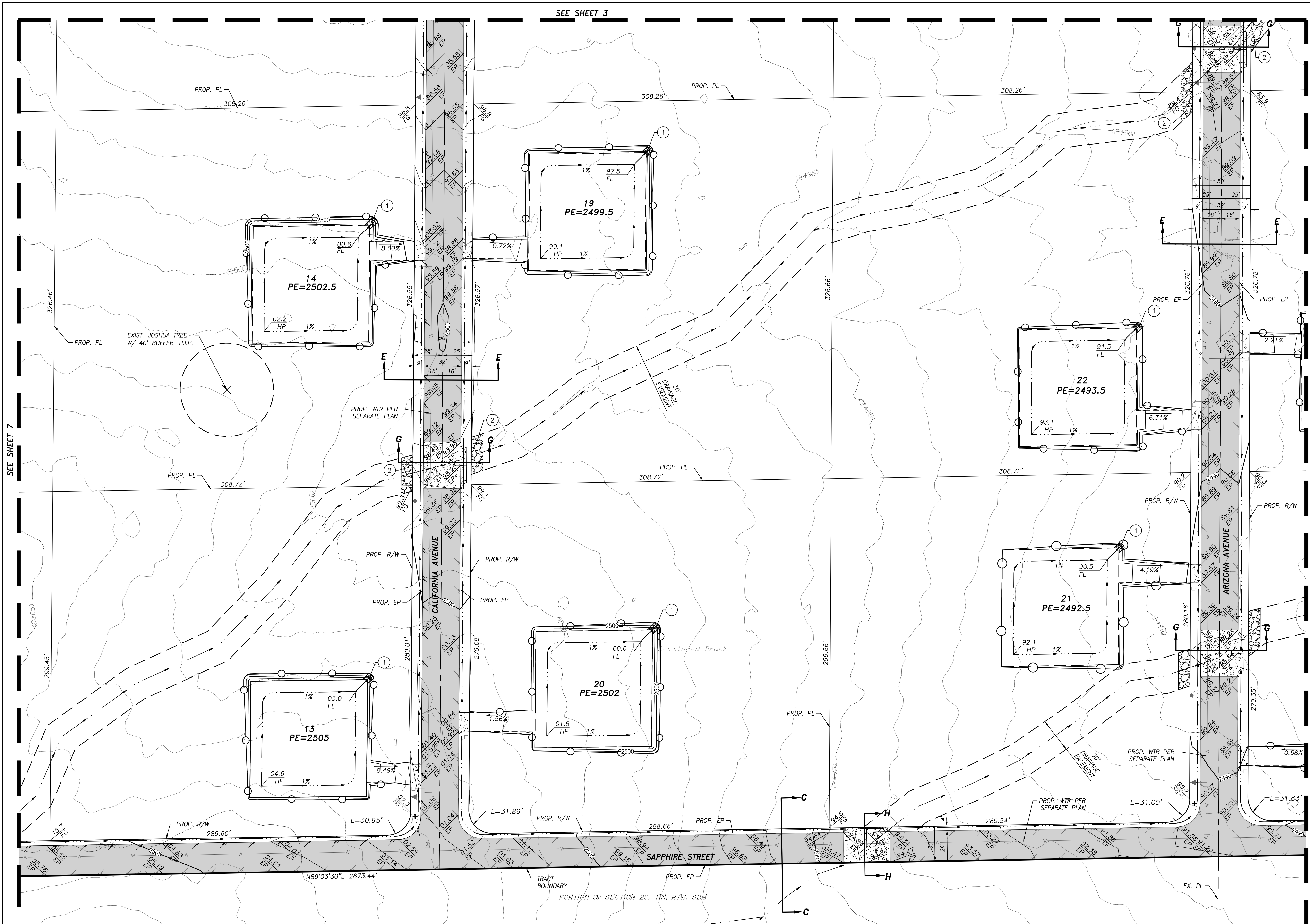
GHASSAN SHELEH, SUPERVISING ENGINEER, TRAFFIC DIVISION
 JEREMY JOHNSON, ENGINEERING MANAGER, TRAFFIC DIVISION

ROUGH GRADING

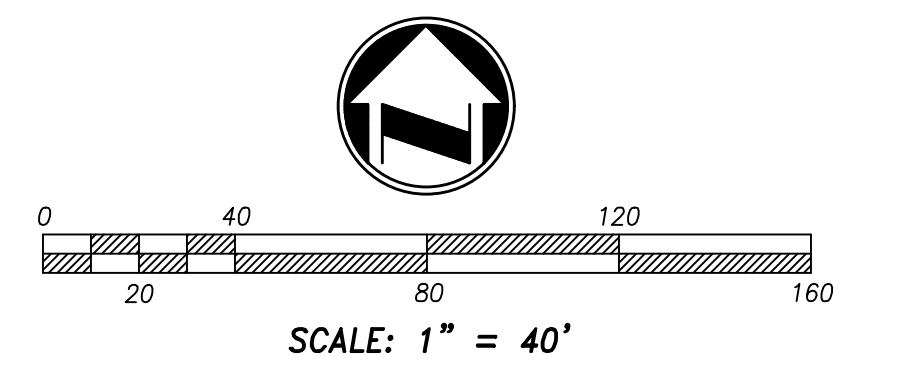
TRACT NO. 20668
 APN 0605-051-01
 JOSHUA TREE

ROAD NO. _____
 FILE NO. _____
 SHEET 5 OF 9

SEE SHEET 3



- CONSTRUCTION NOTES**
- ① INSTALL 1/4 TON RIP-RAP, #2 BACKING
 - ② INSTALL 3'X10' 1/4 TON RIP-RAP PAD



Underground Service Alert

Call: TOLL FREE
1-800-227-2600

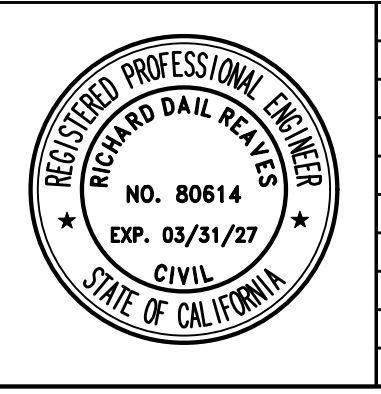
TWO WORKING DAYS BEFORE YOU DIG

BENCHMARK
 BM 62-1-11
 9.85 MILE EAST ALONG STATE HIGHWAY 62 FROM THE POST OFFICE AT YUCCA VALLEY, AT THE INTERSECTION OF HIGHWAY 62 AND RICE AVENUE, 187 FT. NORTH OF THE CENTER LINE OF THE HIGHWAY, 35 FT. WEST OF THE CENTERLINE OF RICE AVENUE, 10 FT. WEST OF A POWER POLE 70557 WITH LINES NORTH, SOUTH, EAST, AND WEST. NOTE BM MAY ALSO BE REACHED BY GOING 13.15 MILE WEST ALONG STATE HIGHWAY 62 FROM ITS INTERSECTION WITH ADOBE ROAD AT TWENTYNINE PALMS.
 ELEVATION: 2601.15 NAVD 1988

PREPARED BY:

adkan ENGINEERS
 Civil Engineering - Surveying - Planning
 6820 Airport Drive, Riverside, CA 92504
 Tel: (951) 688-0241 Fax: (951) 688-0599

Under the Supervision of
 RICHARD DAL REAKS, R.C.E. 80614 EXP. 03.31.27 Date



MARK	REVISIONS	APPR	DATE

COUNTY OF SAN BERNARDINO
 DEPARTMENT OF PUBLIC WORKS

RECOMMENDED BY: _____ DATE _____
 APPROVED BY: _____ DATE _____

GHASSAN SHELEH
 SUPERVISING ENGINEER, TRAFFIC DIVISION

JEREMY JOHNSON
 ENGINEERING MANAGER, TRAFFIC DIVISION

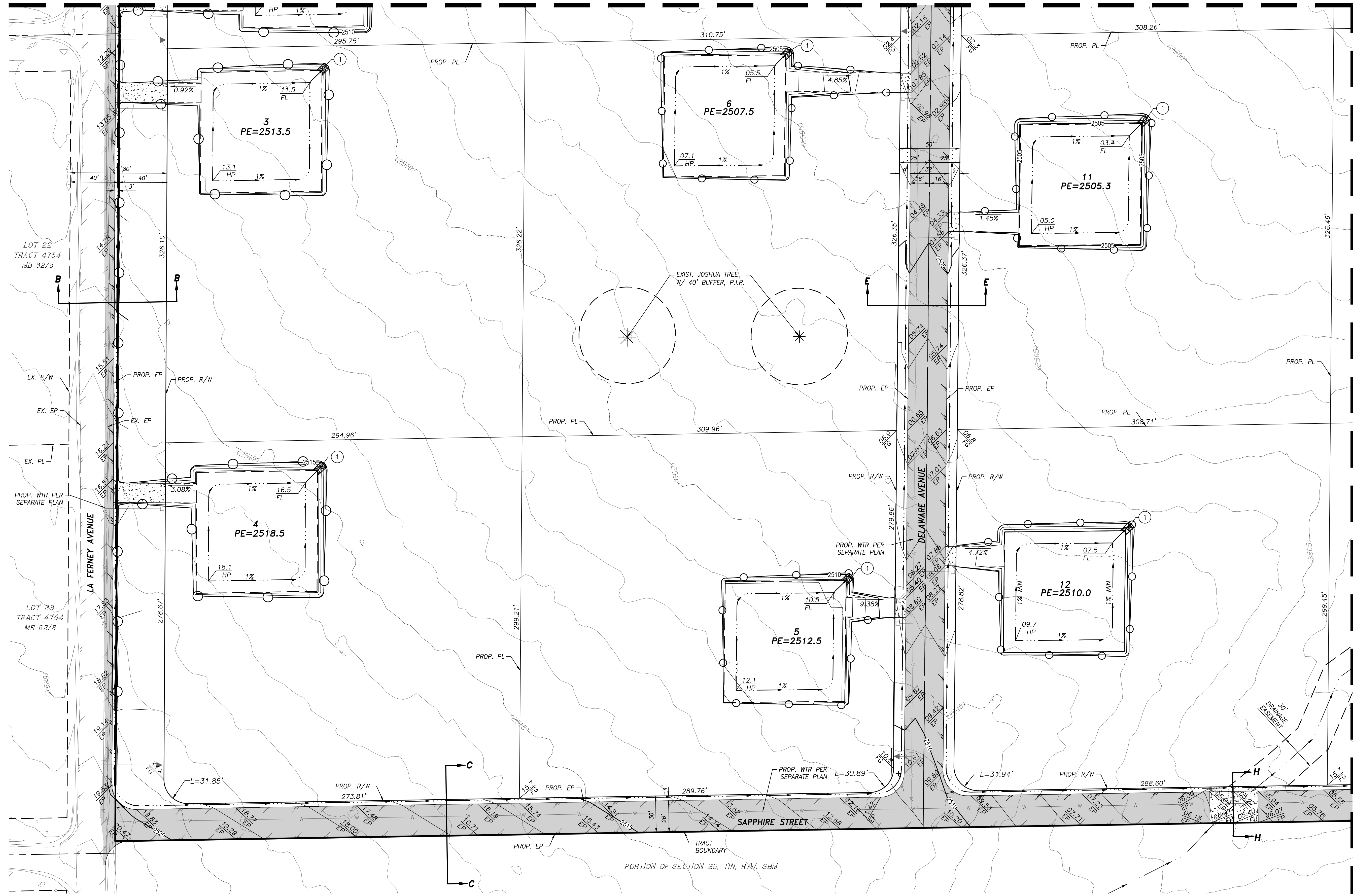
GREG GRIFFITH
 LAND DEVELOPMENT MANAGER

ROUGH GRADING

TRACT NO. 20668
 APN 0605-051-01
 JOSHUA TREE

ROAD NO. _____
 FILE NO. _____
 SHEET 6 OF 9

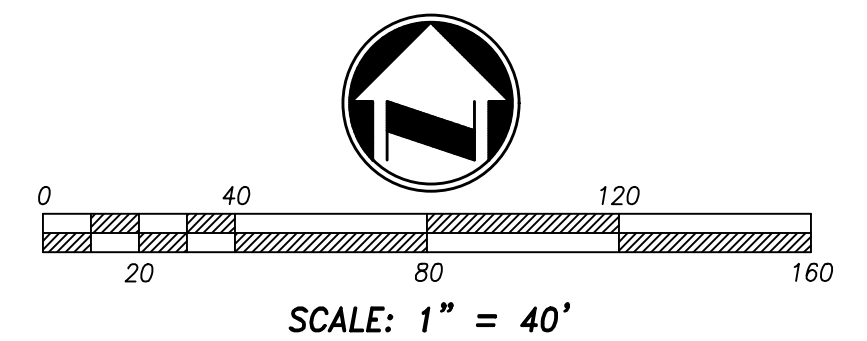
SEE SHEET 2



CONSTRUCTION NOTES

- 1 INSTALL 1/2 TON RIP-RAP, #2 BACKING

SEE SHEET 6



Underground Service Alert

Call: TOLL FREE
1-800-227-2600

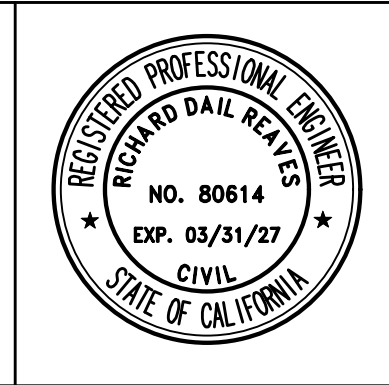
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BENCHMARK
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GHIASSAN SHELEH
SUPERVISING ENGINEER, TRAFFIC DIVISION

JEREMY JOHNSON
ENGINEERING MANAGER, TRAFFIC DIVISION

GREG GRIFFITH
LAND DEVELOPMENT MANAGER

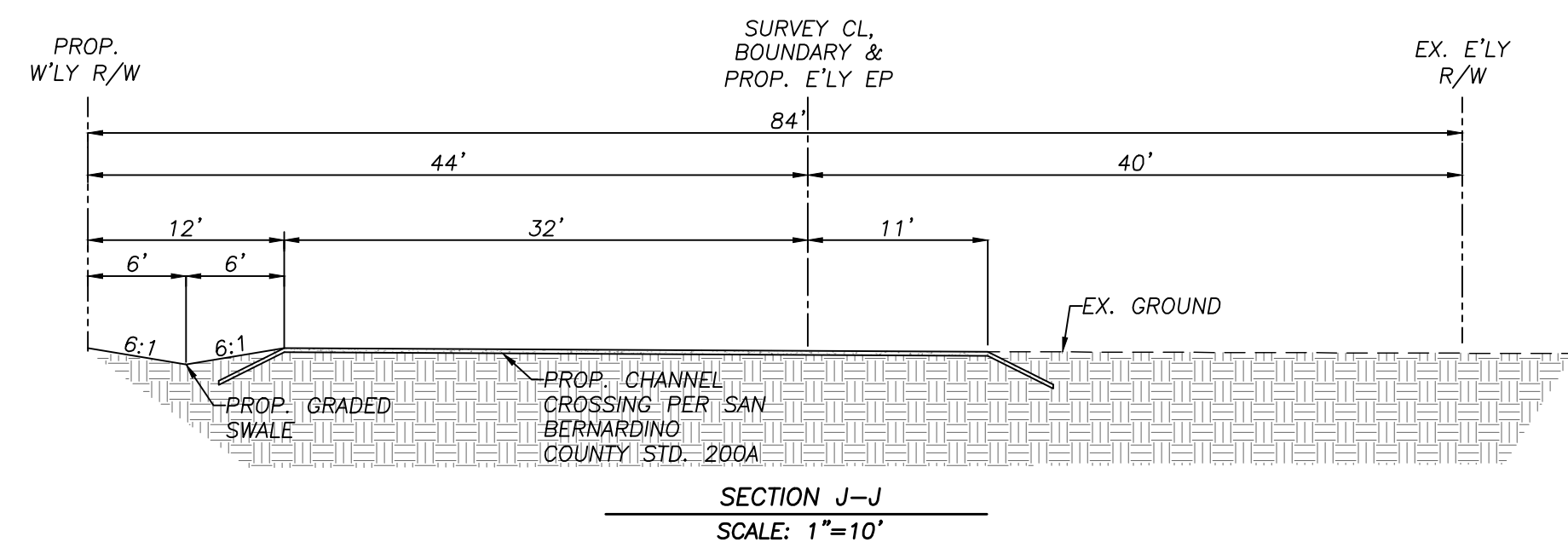
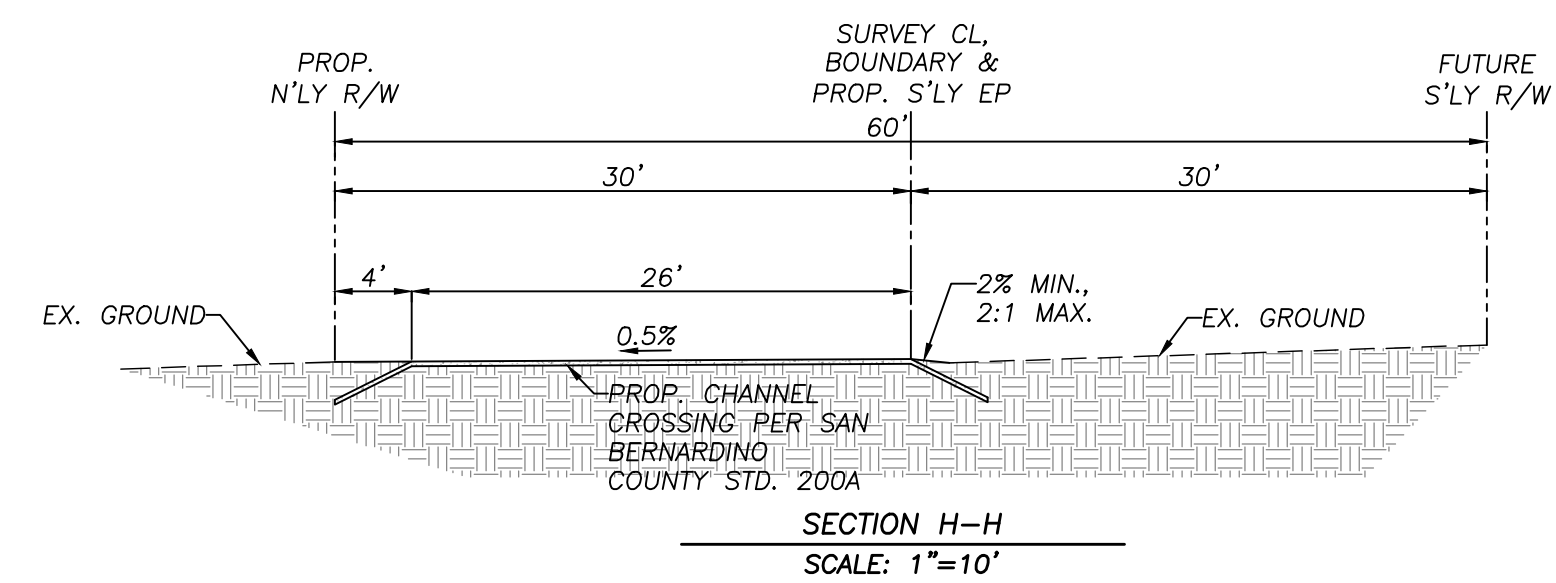
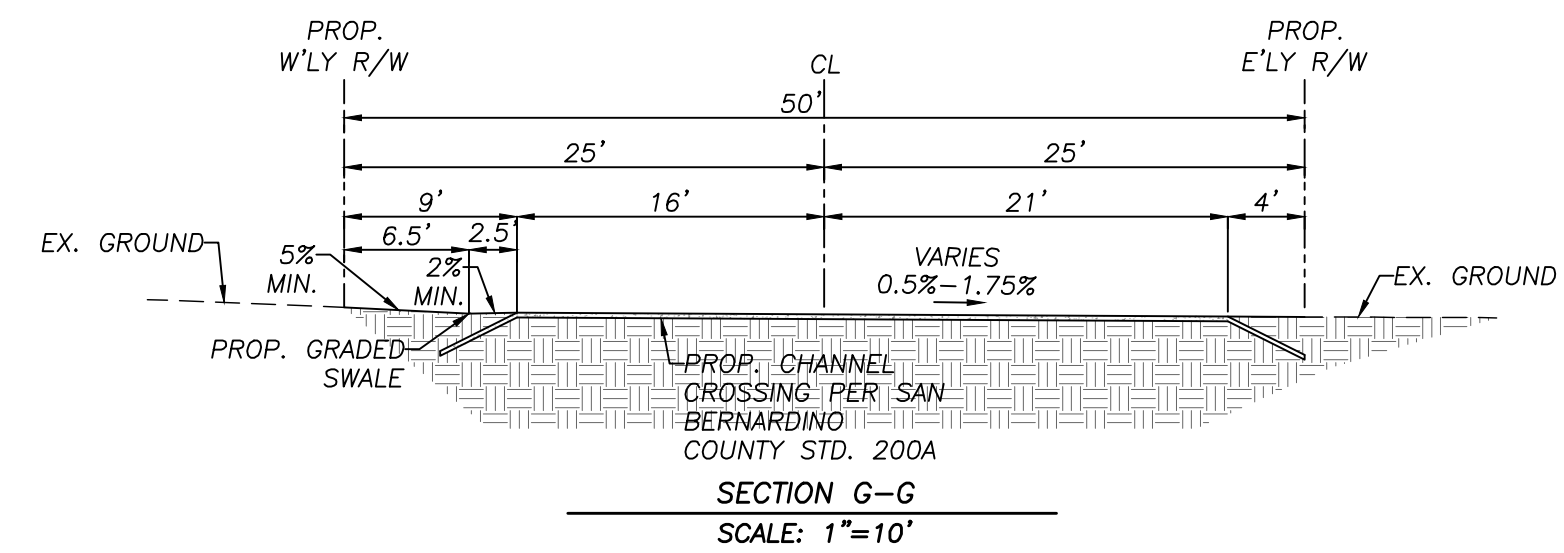
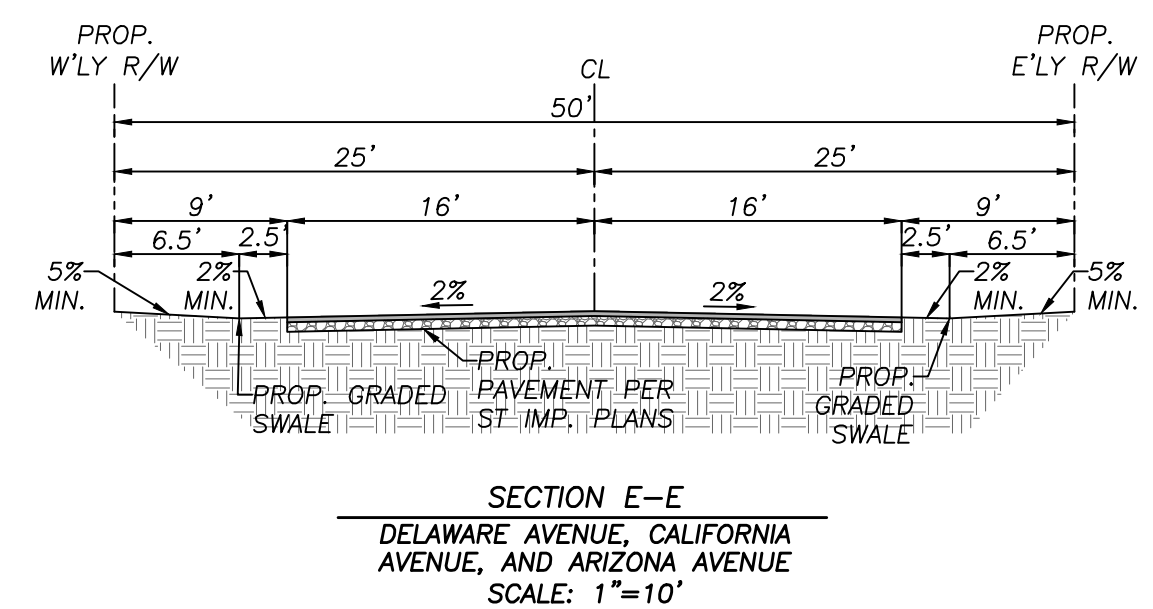
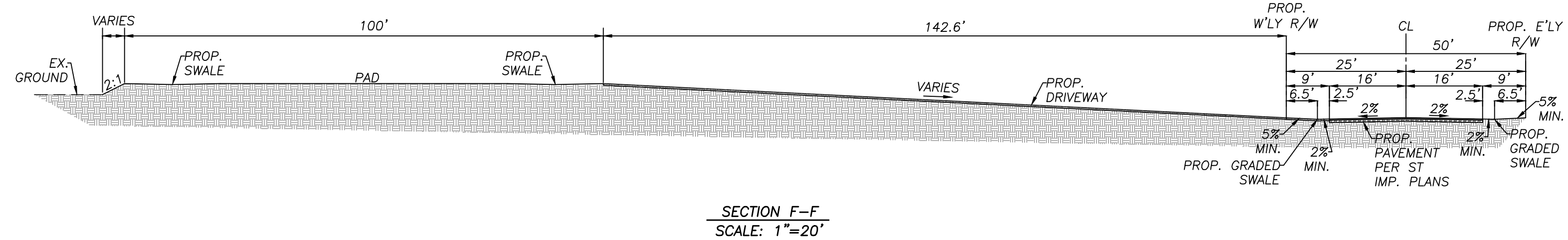
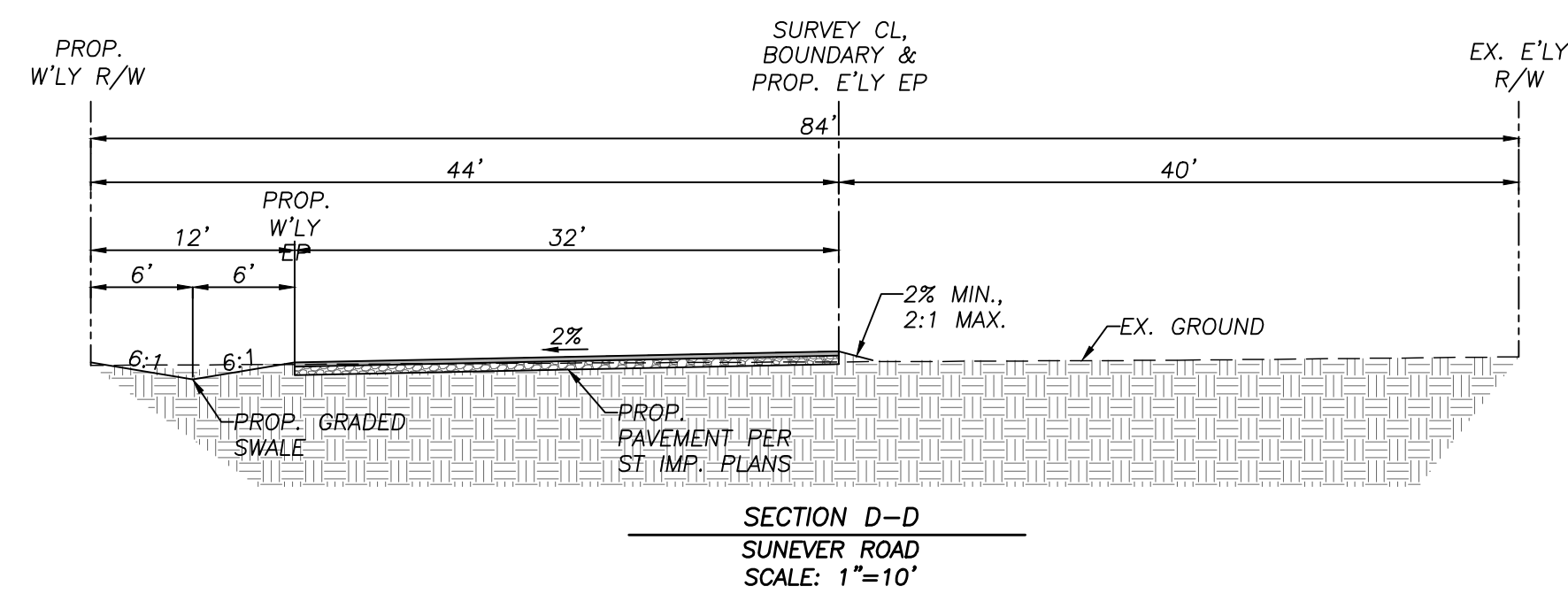
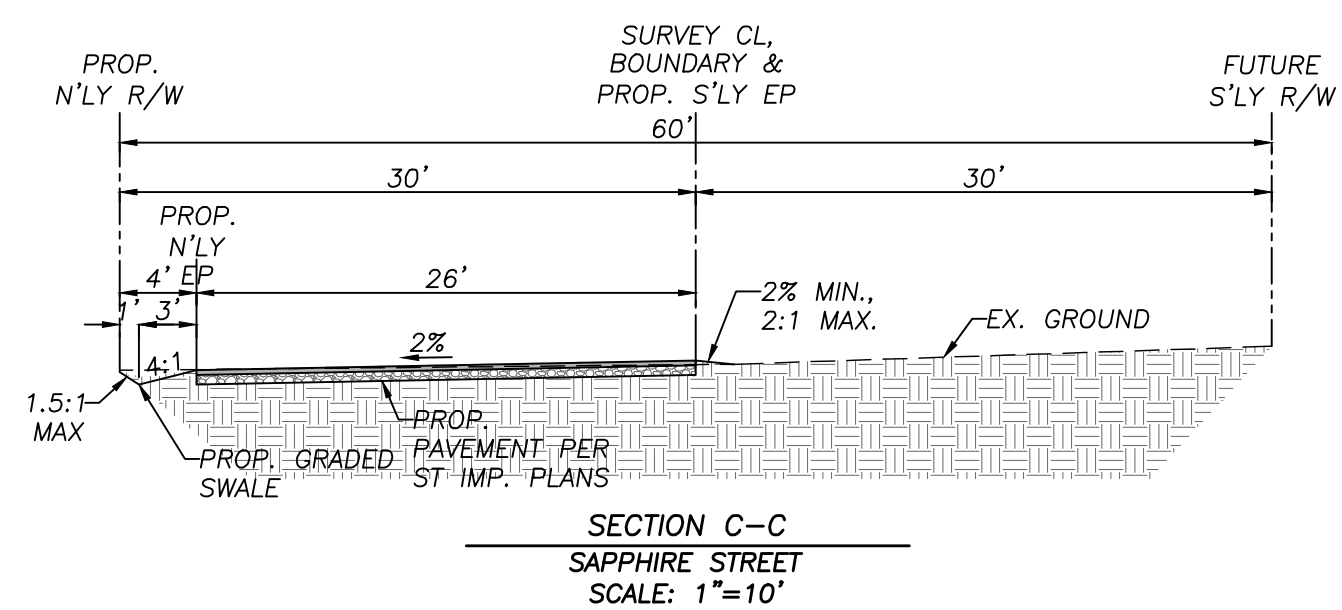
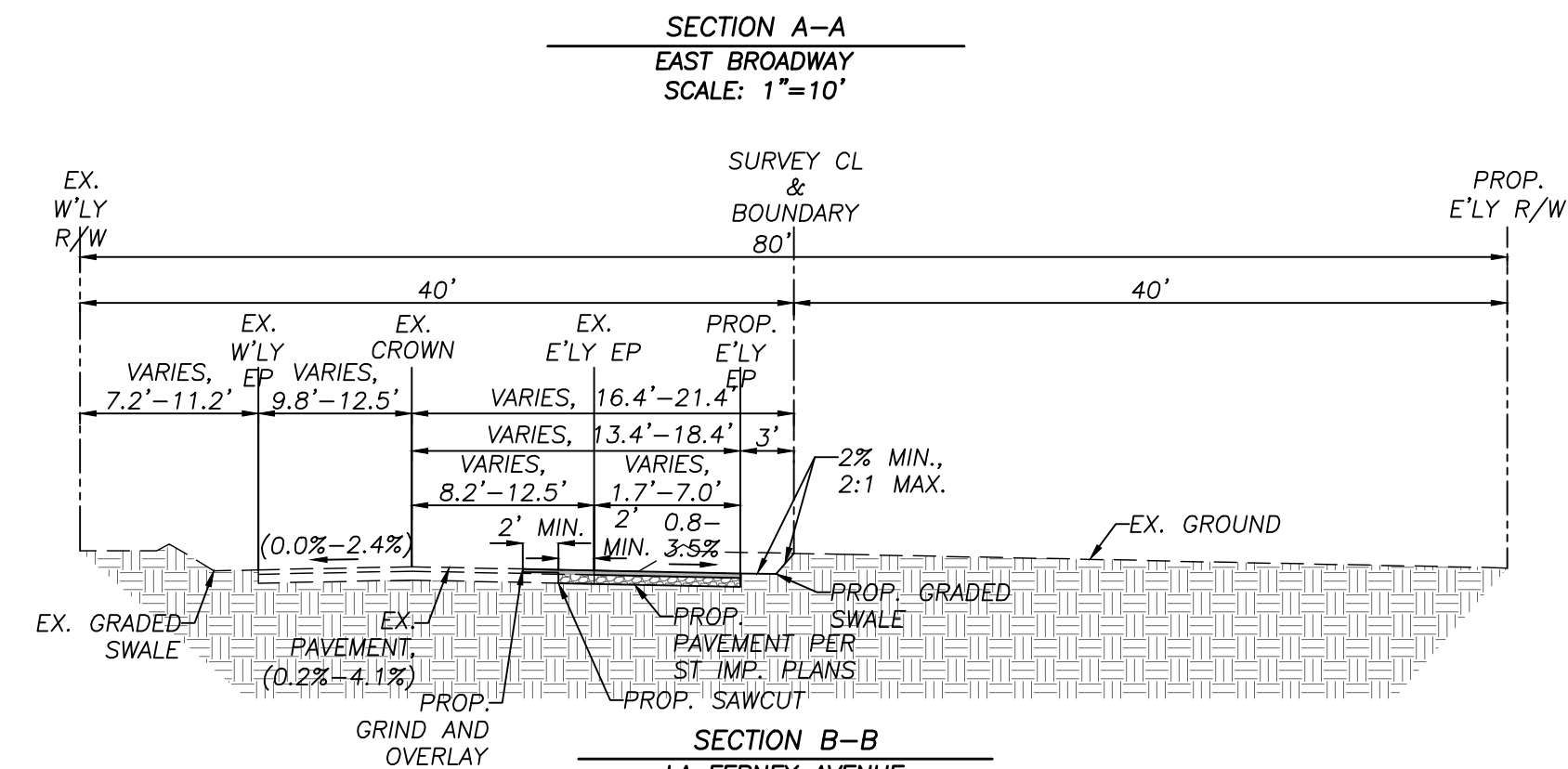
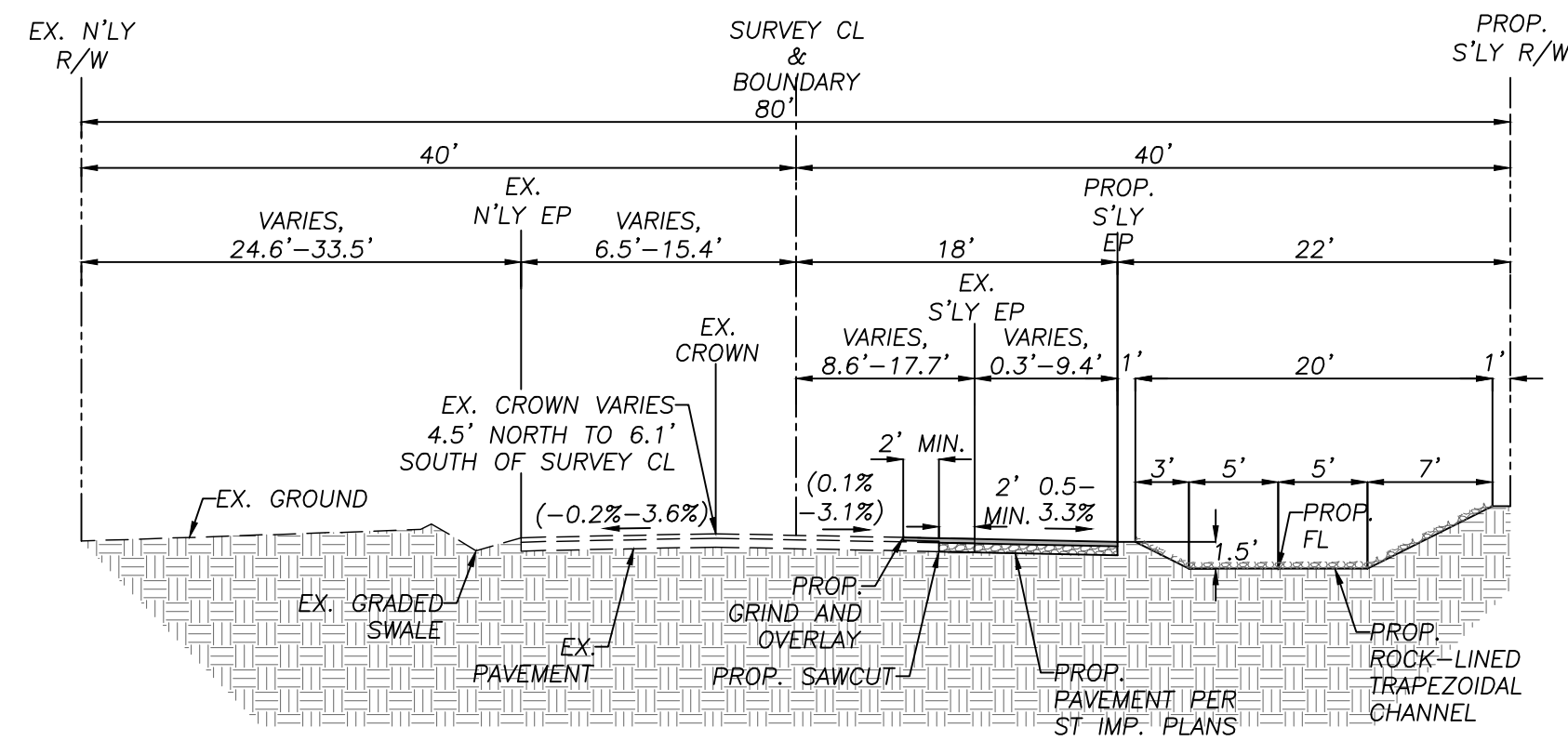
ROUGH GRADING

TRACT NO. 20668
APN 0605-051-01
JOSHUA TREE

ROAD NO. _____

FILE NO. _____

SHEET 7 OF 9



BENCHMARK
 BM 62-1-11
 9.85 MILE EAST ALONG STATE HIGHWAY 62 FROM THE POST OFFICE AT YUCCA VALLEY, AT THE INTERSECTION OF HIGHWAY 62 AND RICE AVENUE, 187 FT. NORTH OF THE CENTER LINE OF THE HIGHWAY, 35 FT. WEST OF THE CENTERLINE OF RICE AVENUE, 10 FT. WEST OF A POWER POLE 70557 WITH LINES NORTH, SOUTH, EAST, AND WEST. NOTE BM MAY ALSO BE REACHED BY GOING 13.15 MILE WEST ALONG STATE HIGHWAY 62 FROM ITS INTERSECTION WITH ADOBE ROAD AT TWENTYNINE PALMS.
 ELEVATION: 2601.15 NAVD 1988

PREPARED BY:
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 Civil Engineering - Surveying - Planning
 6820 Airport Drive, Riverside, CA 92504
 Tel: (951) 688-0241, Fax: (951) 688-0599
 Under the Supervision of: RICHARD DAL REAKS, R.C.E. 80614 EXP. 03.31.27 Date



MARK	REVISIONS	APPR	DATE

COUNTY OF SAN BERNARDINO
 DEPARTMENT OF PUBLIC WORKS

RECOMMENDED BY: _____ DATE _____
 GHAFFAN SHELLER, SUPERVISING ENGINEER, TRAFFIC DIVISION

APPROVED BY: _____ DATE _____
 JEREMY JOHNSON, ENGINEERING MANAGER, TRAFFIC DIVISION

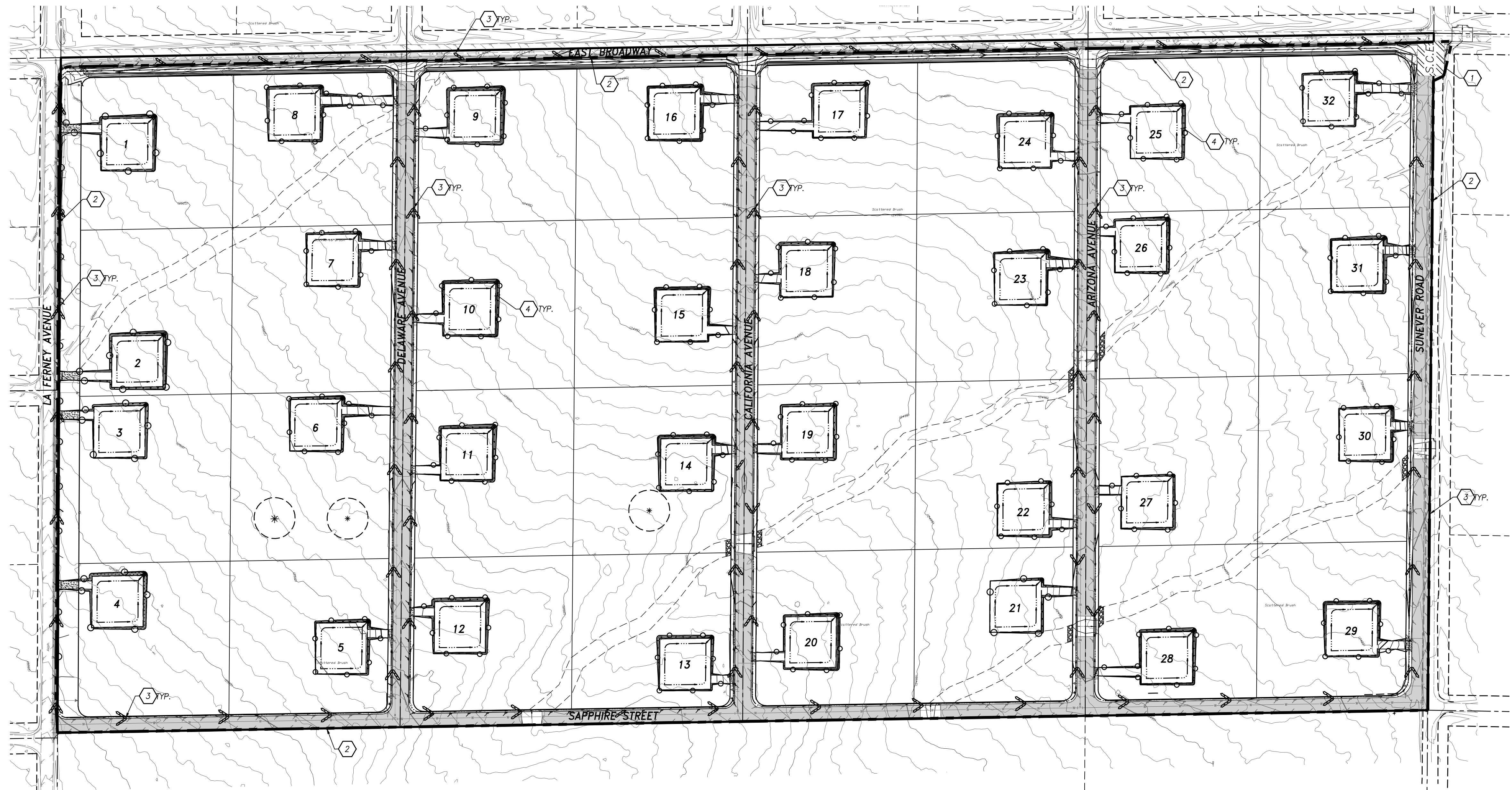
SECTIONS
 TRACT NO. 20668
 APN 0605-051-01
 JOSHUA TREE

ROAD NO.
 FILE NO.
 SHEET 8 OF 9

EROSION CONTROL NOTES (LAND DEVELOPMENT DIVISION)

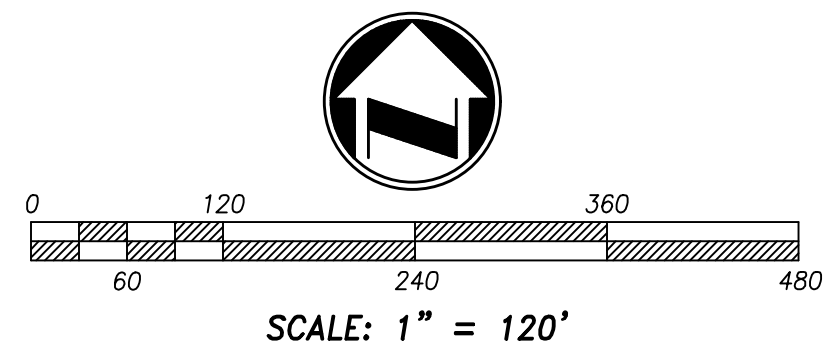
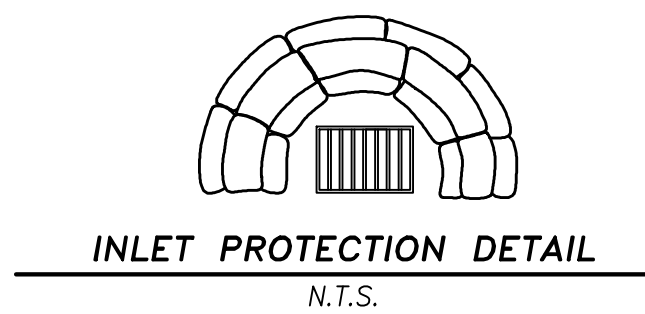
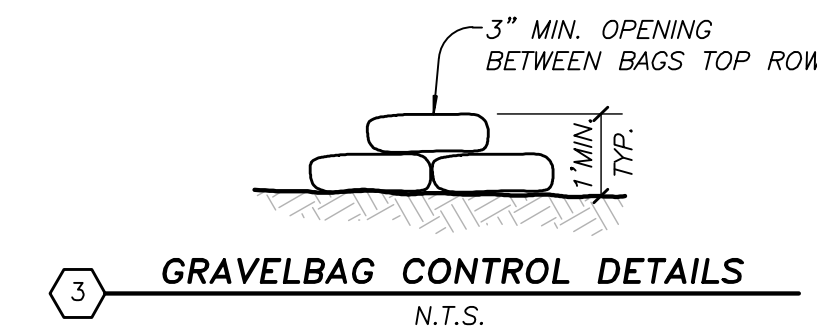
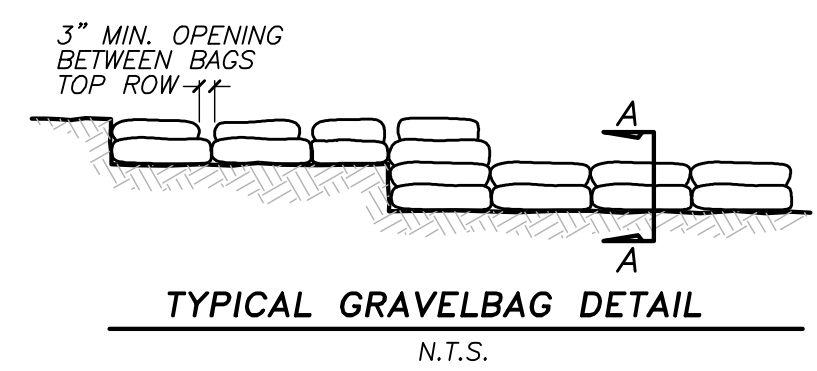
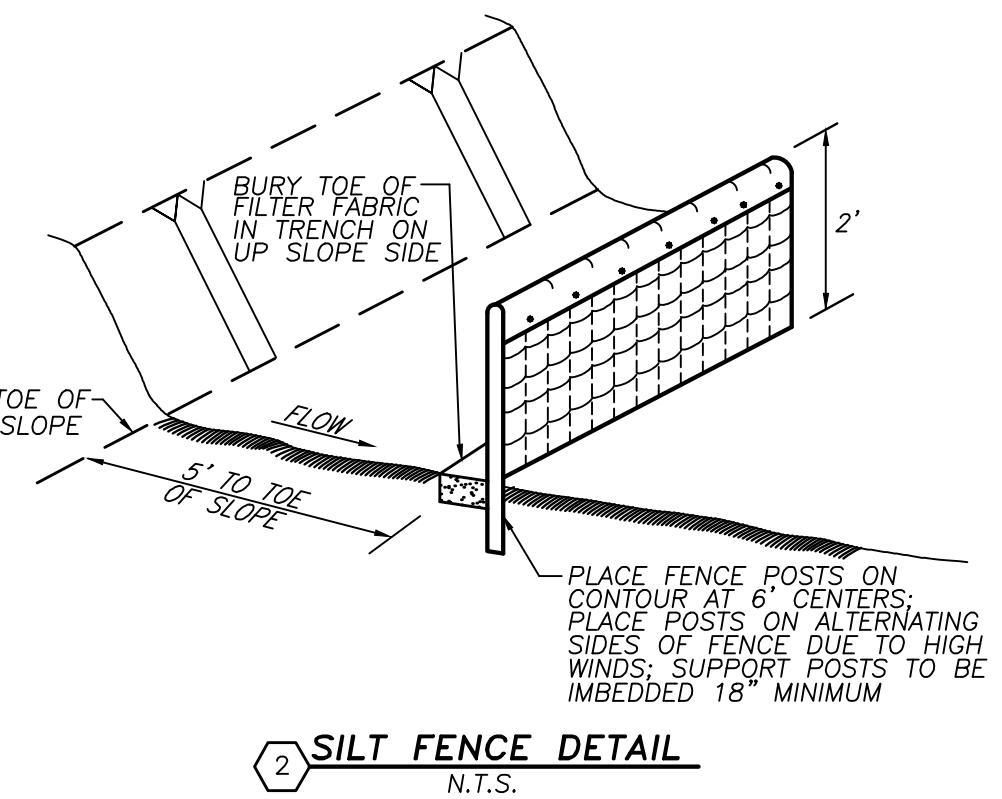
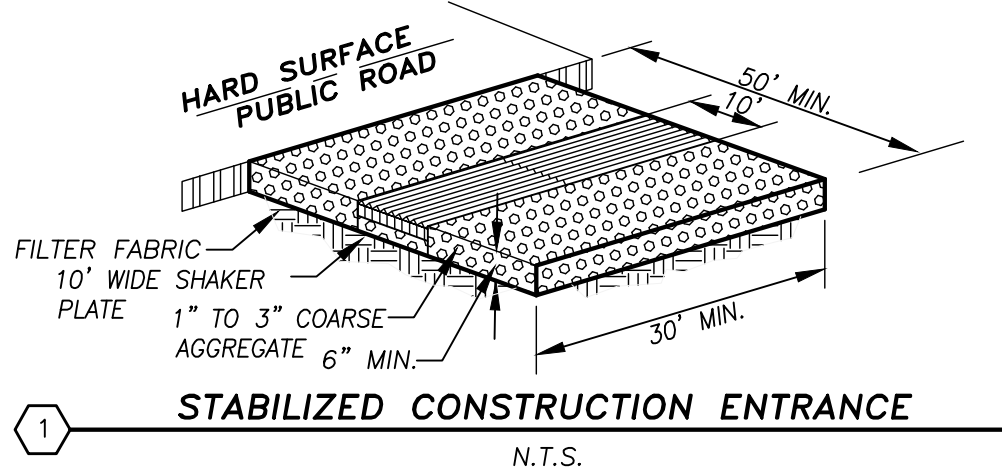
1. IN CASE OF EMERGENCY, CALL (RESPONSIBLE PERSON) AT (24-HOUR TELEPHONE).
2. POLLUTION AND EROSION PREVENTION MEASURES, ALSO KNOWN AS BEST MANAGEMENT PRACTICES (BMPs), MUST BE INSTALLED PRIOR TO GRADING. THESE MEASURES, INCLUDING THE PREVENTION OF SEDIMENTATION OR FLOOD DAMAGE, TO OFFSITE PROPERTY SHALL BE ADEQUATE WHETHER OR NOT AN EROSION CONTROL PERMIT IS REQUIRED.
3. ERODED SEDIMENTS AND OTHER POLLUTANTS MUST BE RETAINED ONSITE AND MAY NOT BE TRANSPORTED FROM THE SITE VIA SHEET FLOW, SWALES, AREA DRAINS, NATURAL DRAINAGE COURSES, OR WIND.
4. EROSION CONTROL DEVICES SHALL BE FUNCTIONING AT ALL TIMES. IN CASE OF FAILURE, RAPID CONSTRUCTION OF EMERGENCY DEVICES SHALL BE IMPLEMENTED.
5. STOCKPILES OF EARTH AND OTHER CONSTRUCTION-RELATED MATERIALS MUST BE PROTECTED FROM BEING TRANSPORTED FROM THE SITE BY THE FORCES OF WIND OR WATER.
6. FUELS, OILS, SOLVENTS, AND OTHER TOXIC MATERIALS MUST BE STORED IN ACCORDANCE WITH THEIR LISTING AND ARE NOT TO CONTAMINATE THE SOILS AND SURFACE WATERS. ALL APPROVED STORAGE CONTAINERS ARE TO BE PROTECTED FROM THE WEATHER. SPILLS MUST BE CLEANED UP IMMEDIATELY AND DISPOSED OF IN A PROPER MANNER. SPILLS MAY NOT BE WASHED INTO THE DRAINAGE SYSTEM.
7. EXCESS OR WASTE CONCRETE MUST BE CONTAINED ONSITE. PROVISIONS SHALL BE MADE TO RETAIN CONCRETE WASTES ONSITE UNTIL THEY CAN BE DISPOSED OF AS SOLID WASTE.
8. DEVELOPERS/CONTRACTORS ARE RESPONSIBLE TO ENSURE ALL EROSION CONTROL DEVICES AND BMPs ARE INSTALLED AND FUNCTIONING PROPERLY PER PLAN. PROPER PRECAUTION SHALL BE CONSIDERED WHEN 50% OR GREATER PROBABILITY OF PREDICTED PRECIPITATION, AND AFTER ACTUAL PRECIPITATION. A CONSTRUCTION SITE INSPECTION CHECKLIST AND INSPECTION LOG SHALL BE MAINTAINED AT THE PROJECT SITE AT ALL TIMES AND AVAILABLE FOR REVIEW BY THE BUILDING OFFICIAL.
9. TRASH AND CONSTRUCTION-RELATED SOLID WASTES MUST BE DEPOSITED INTO A COVERED RECEPTACLE TO PREVENT CONTAMINATION OF RAINWATER AND DISPERSAL BY WIND.
10. SEDIMENTS AND OTHER MATERIALS MAY NOT BE TRACKED FROM THE SITE BY VEHICLE TRAFFIC. THE CONSTRUCTION ENTRANCE ROADWAYS MUST BE STABILIZED SO AS TO INHIBIT SEDIMENTS FROM BEING DEPOSITED INTO THE PUBLIC WAY. ACCIDENTAL DEPOSITIONS MUST BE SWEEPED UP IMMEDIATELY AND MAY NOT BE WASHED DOWN BY RAIN OR OTHER MEANS.
11. ANY SLOPES WITH DISTURBED SOILS OR DENUDED OF VEGETATION MUST BE STABILIZED SO AS TO INHIBIT EROSION BY WIND AND WATER.
12. ALL SILT AND DEBRIS SHALL BE REMOVED FROM ALL DEVICES WITHIN 24 HOURS AFTER EACH RAINSTORM AND BE DISPOSED OF PROPERLY.
13. ALL STORM WATER CAPTURE DEVICES SHALL BE PROTECTED AT ALL TIMES.
14. EROSION AND SEDIMENT CONTROL PRACTICES SHOULD BE IN CONFORMANCE WITH STANDARD PRACTICE. THE MOST COMMON EROSION CONTROL MEASURES ARE:
 - a. SCHEDULING
 - b. PRESERVATION OF EXISTING VEGETATION
 - c. STOCKPILE MANAGEMENT
 - d. SILT FENCE
 - e. FIBER ROLLS
 - f. SANDBAG BARRIER
 - g. STRAW BALE BARRIER
 - h. STORM DRAIN INLET PROTECTION
 - i. CONCRETE WASTE MANAGEMENT
 - j. VEHICLE AND EQUIPMENT FUELING
 - k. VEHICLE AND EQUIPMENT MAINTENANCE
 - l. STABILIZED CONSTRUCTION ENTRANCE/EXIT
 - m. ENTRANCE/EXIT TIRE WASH
 - n. WIND EROSION CONTROL
15. DUST SHALL BE CONTROLLED BY WATERING.

IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA
TRACT MAP NO. 20668
EROSION CONTROL PLAN



LEGEND

- = STABILIZE CONSTRUCTION ENTRANCE W/ GRAVEL
- = SILT FENCE PER DETAIL HEREON
- = GRAVELBAG BARRIER PER DETAIL HEREON
- = HYDROSEED



CONSTRUCTION NOTES & QUANTITIES

- THE QUANTITIES SHOWN BELOW ARE FOR BONDING PURPOSES ONLY. THE CONTRACTOR IS TO CONSTRUCT PROJECT PER THESE PLANS AND SUBMIT BID BASED ON THEIR OWN QUANTITY "TAKE-OFF."
1. INSTALL STABILIZED CONSTRUCTION ENTRANCE PER CASQA FACT SHEET TC-1 AND DETAIL HEREON.....1 EA
 2. INSTALL SILT FENCE PER CASQA FACT SHEET SE-1 AND DETAIL HEREON8,000 LF
 3. INSTALL GRAVEL BAGS PER CASQA FACT SHEET SE-6 AND DETAIL HEREON.....2,714 LF
 4. INSTALL HYDROSEED.....61,140 SF

Underground Service Alert
 Call: TOLL FREE
 1-800-227-2600
 TWO WORKING DAYS BEFORE YOU DIG

BENCHMARK
 BM 62-1-11
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 ELEVATION: 2601.15 NAVD 1988

PREPARED BY:

adkan ENGINEERS
 Civil Engineering - Surveying - Planning
 6820 Airport Drive, Riverside, CA 92504
 Tel: (951) 688-0241, Fax: (951) 688-0599
 Under the Supervision of: RICHARD DAL REAKS, R.C.E. 80614 EXP. 03.31.27 Date

MARK REVISIONS APPR DATE

COUNTY OF SAN BERNARDINO
 DEPARTMENT OF PUBLIC WORKS
 RECOMMENDED BY: GHASSAN SHELEH, SUPERVISING ENGINEER, TRAFFIC DIVISION
 APPROVED BY: JEREMY JOHNSON, ENGINEERING MANAGER, TRAFFIC DIVISION
 DATE

EROSION CONTROL
 ROAD NO.
 TRACT NO. 20668
 APN 0605-051-01
 JOSHUA TREE
 FILE NO.
 SHEET 9 OF 9



NOAA Atlas 14, Volume 6, Version 2
 Location name: Joshua Tree, California, USA*
 Latitude: 34.1628°, Longitude: -116.2685°
 Elevation: 2495 ft**
 * source: ESRI Maps
 ** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerials](#)

PF tabular

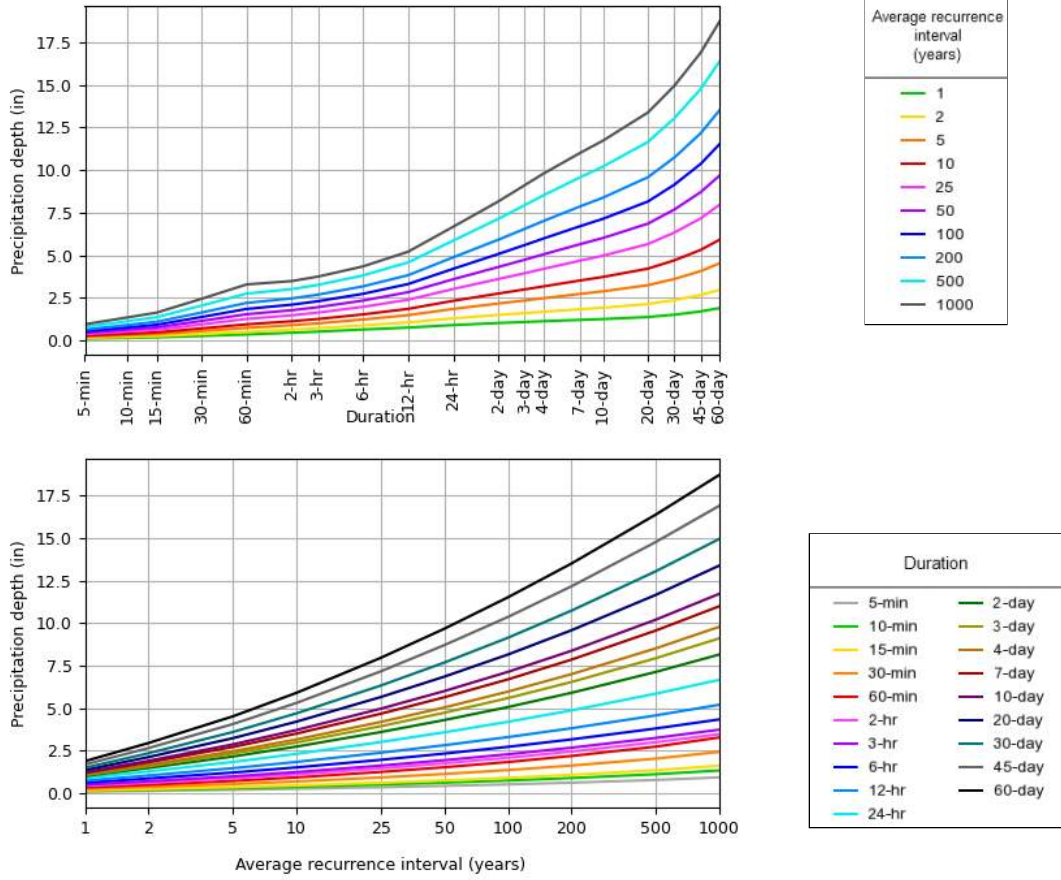
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.097 (0.080-0.118)	0.142 (0.117-0.173)	0.207 (0.171-0.254)	0.267 (0.218-0.330)	0.358 (0.283-0.457)	0.436 (0.338-0.569)	0.525 (0.397-0.701)	0.626 (0.461-0.860)	0.782 (0.552-1.12)	0.936 (0.639-1.38)
10-min	0.139 (0.115-0.170)	0.203 (0.168-0.248)	0.297 (0.245-0.365)	0.382 (0.313-0.473)	0.513 (0.405-0.655)	0.625 (0.484-0.815)	0.752 (0.569-1.00)	0.897 (0.660-1.23)	1.12 (0.792-1.60)	1.34 (0.915-1.98)
15-min	0.168 (0.139-0.205)	0.246 (0.203-0.300)	0.360 (0.296-0.441)	0.463 (0.378-0.572)	0.620 (0.490-0.792)	0.756 (0.586-0.986)	0.909 (0.688-1.22)	1.08 (0.798-1.49)	1.36 (0.957-1.94)	1.62 (1.11-2.40)
30-min	0.252 (0.209-0.308)	0.369 (0.305-0.451)	0.540 (0.445-0.662)	0.695 (0.568-0.859)	0.931 (0.736-1.19)	1.14 (0.879-1.48)	1.37 (1.03-1.82)	1.63 (1.20-2.24)	2.04 (1.44-2.91)	2.44 (1.66-3.60)
60-min	0.340 (0.281-0.415)	0.497 (0.411-0.608)	0.727 (0.599-0.891)	0.935 (0.764-1.16)	1.25 (0.991-1.60)	1.53 (1.18-1.99)	1.84 (1.39-2.46)	2.19 (1.61-3.01)	2.74 (1.94-3.92)	3.28 (2.24-4.86)
2-hr	0.441 (0.365-0.538)	0.622 (0.514-0.760)	0.884 (0.728-1.08)	1.12 (0.913-1.38)	1.47 (1.16-1.87)	1.76 (1.36-2.30)	2.09 (1.58-2.79)	2.46 (1.81-3.37)	3.00 (2.12-4.30)	3.48 (2.37-5.15)
3-hr	0.506 (0.419-0.618)	0.707 (0.584-0.864)	0.994 (0.819-1.22)	1.25 (1.02-1.54)	1.63 (1.29-2.08)	1.94 (1.51-2.54)	2.29 (1.73-3.06)	2.68 (1.97-3.68)	3.25 (2.30-4.65)	3.74 (2.55-5.54)
6-hr	0.629 (0.520-0.768)	0.873 (0.721-1.07)	1.22 (1.00-1.49)	1.52 (1.24-1.88)	1.96 (1.55-2.51)	2.33 (1.81-3.04)	2.73 (2.06-3.65)	3.17 (2.33-4.35)	3.81 (2.69-5.45)	4.34 (2.96-6.43)
12-hr	0.743 (0.615-0.908)	1.05 (0.865-1.28)	1.47 (1.22-1.81)	1.84 (1.51-2.28)	2.38 (1.88-3.04)	2.82 (2.19-3.68)	3.30 (2.50-4.41)	3.82 (2.81-5.25)	4.58 (3.23-6.55)	5.20 (3.55-7.70)
24-hr	0.891 (0.790-1.03)	1.29 (1.14-1.48)	1.84 (1.62-2.12)	2.32 (2.03-2.70)	3.01 (2.55-3.62)	3.58 (2.98-4.40)	4.20 (3.41-5.28)	4.87 (3.85-6.30)	5.85 (4.44-7.88)	6.67 (4.89-9.29)
2-day	1.01 (0.897-1.16)	1.49 (1.32-1.72)	2.16 (1.91-2.50)	2.74 (2.40-3.20)	3.60 (3.05-4.33)	4.30 (3.57-5.29)	5.07 (4.11-6.38)	5.91 (4.66-7.64)	7.13 (5.40-9.60)	8.16 (5.98-11.4)
3-day	1.07 (0.950-1.23)	1.59 (1.41-1.84)	2.34 (2.06-2.70)	2.99 (2.62-3.48)	3.94 (3.34-4.74)	4.73 (3.93-5.81)	5.59 (4.54-7.04)	6.54 (5.16-8.46)	7.94 (6.01-10.7)	9.11 (6.67-12.7)
4-day	1.12 (0.989-1.28)	1.67 (1.48-1.93)	2.47 (2.18-2.85)	3.16 (2.77-3.69)	4.19 (3.55-5.04)	5.04 (4.19-6.20)	5.98 (4.85-7.52)	7.00 (5.53-9.06)	8.52 (6.45-11.5)	9.79 (7.17-13.6)
7-day	1.20 (1.06-1.38)	1.82 (1.61-2.10)	2.72 (2.40-3.14)	3.51 (3.07-4.09)	4.67 (3.96-5.62)	5.64 (4.68-6.93)	6.69 (5.43-8.42)	7.86 (6.20-10.2)	9.56 (7.25-12.9)	11.0 (8.06-15.3)
10-day	1.24 (1.10-1.43)	1.91 (1.69-2.20)	2.87 (2.54-3.32)	3.72 (3.26-4.33)	4.97 (4.21-5.98)	6.01 (4.99-7.38)	7.14 (5.79-8.98)	8.38 (6.61-10.8)	10.2 (7.73-13.7)	11.7 (8.59-16.3)
20-day	1.36 (1.21-1.57)	2.13 (1.88-2.46)	3.24 (2.86-3.74)	4.21 (3.68-4.90)	5.65 (4.79-6.80)	6.85 (5.69-8.42)	8.15 (6.61-10.3)	9.58 (7.56-12.4)	11.7 (8.84-15.7)	13.4 (9.81-18.6)
30-day	1.50 (1.33-1.73)	2.36 (2.08-2.72)	3.60 (3.18-4.16)	4.70 (4.11-5.47)	6.33 (5.36-7.62)	7.68 (6.38-9.44)	9.14 (7.41-11.5)	10.7 (8.47-13.9)	13.0 (9.89-17.6)	15.0 (11.0-20.8)
45-day	1.69 (1.50-1.95)	2.66 (2.35-3.07)	4.06 (3.59-4.70)	5.31 (4.65-6.19)	7.16 (6.07-8.62)	8.70 (7.23-10.7)	10.4 (8.40-13.0)	12.2 (9.60-15.7)	14.8 (11.2-19.9)	16.9 (12.4-23.5)
60-day	1.89 (1.67-2.17)	2.96 (2.62-3.41)	4.52 (3.99-5.22)	5.90 (5.17-6.88)	7.96 (6.74-9.58)	9.67 (8.03-11.9)	11.5 (9.34-14.5)	13.5 (10.7-17.5)	16.4 (12.4-22.0)	18.7 (13.7-26.1)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 34.1628°, Longitude: -116.2685°



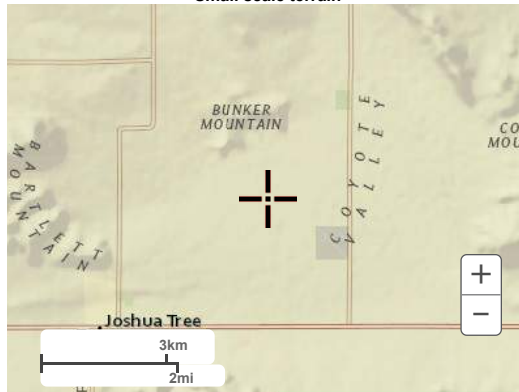
NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Tue Nov 19 00:17:10 2024

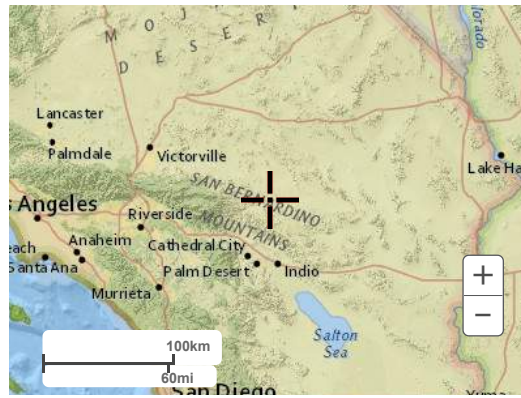
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Maps & aerials

Small scale terrain



Large scale terrain



Large scale map



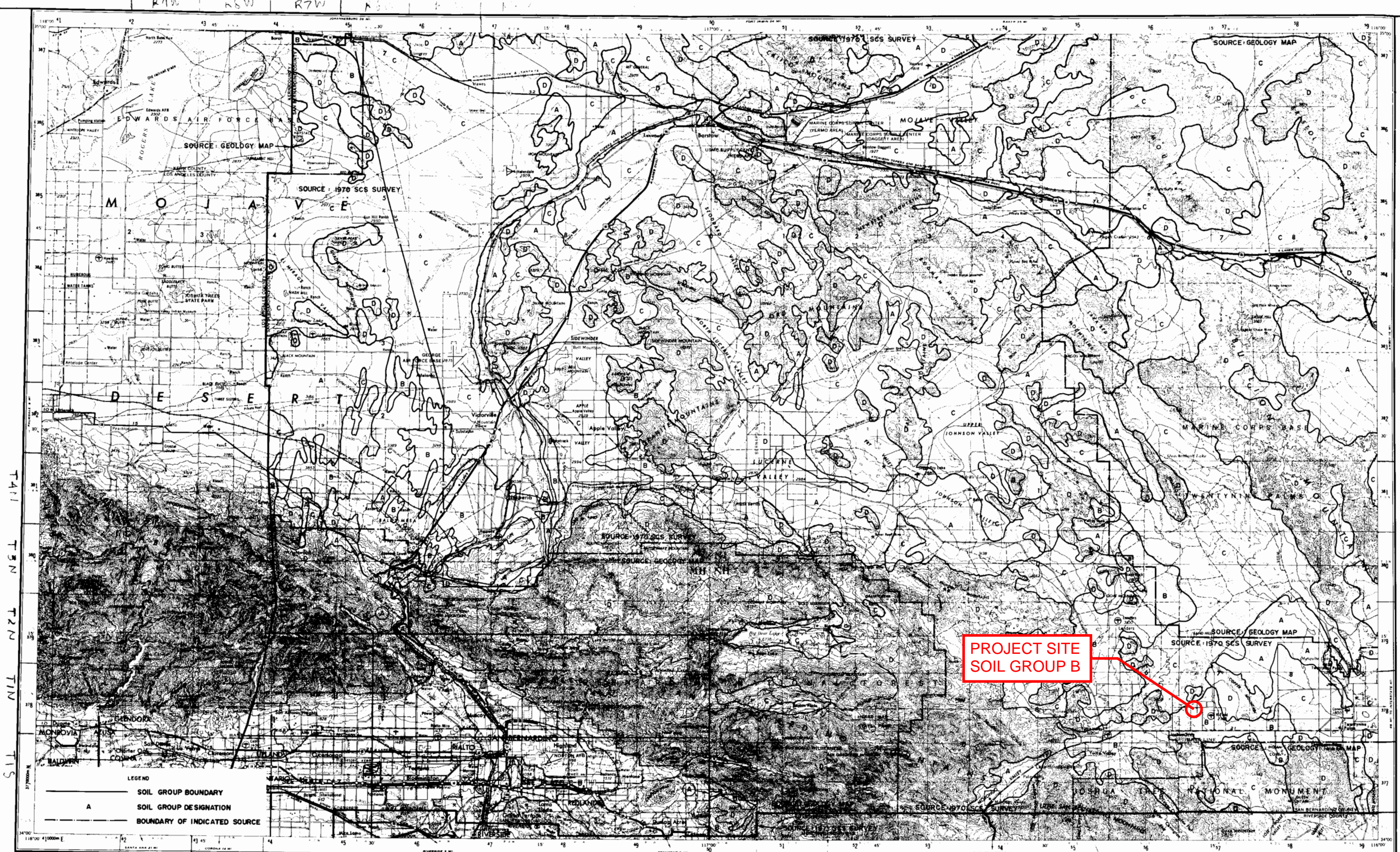
Large scale aerial



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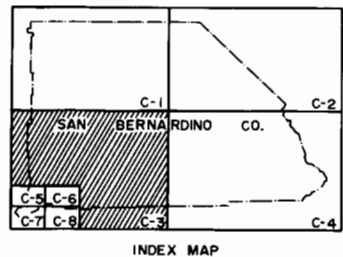
[US Department of Commerce](#)
[National Oceanic and Atmospheric Administration](#)
[National Weather Service](#)
[National Water Center](#)
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

[Disclaimer](#)



LEGEND
 — SOIL GROUP BOUNDARY
 A SOIL GROUP DESIGNATION
 - - - BOUNDARY OF INDICATED SOURCE

SAN BERNARDINO COUNTY
 HYDROLOGY MANUAL



Scale 1:250,000
 0 5 10 15 20 25 30 Statute Miles
 0 5 10 15 20 25 30 Nautical Miles

CONTOUR INTERVAL 200 FEET
 WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS
 TRANSVERSE MERCATOR PROJECTION
 BLACK NUMBERED LINES INDICATE THE 4200 METER UNIVERSAL TRANSVERSE MERCATOR GRID, ZONE 11
 1983 MAGNETIC DECLINATION FROM TRUE NORTH VARIES FROM 1.94° (200 MILES) EASTERLY FROM
 THE CENTER OF THE WEST EDGE TO 1.9° (210 MILES) EASTERLY FOR THE CENTER OF THE EAST EDGE

BASE MAP REPRODUCED FROM U.S.G.S. "SAN BERNARDINO" TOPOGRAPHIC MAP
SCALE REDUCED BY 1/2

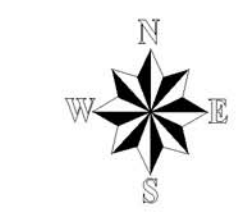
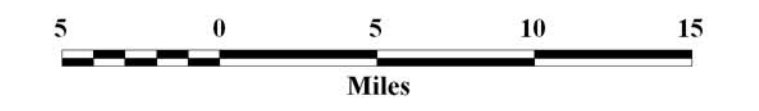


HYDROLOGIC SOILS GROUP MAP
 FOR
 SOUTHCENTRAL AREA

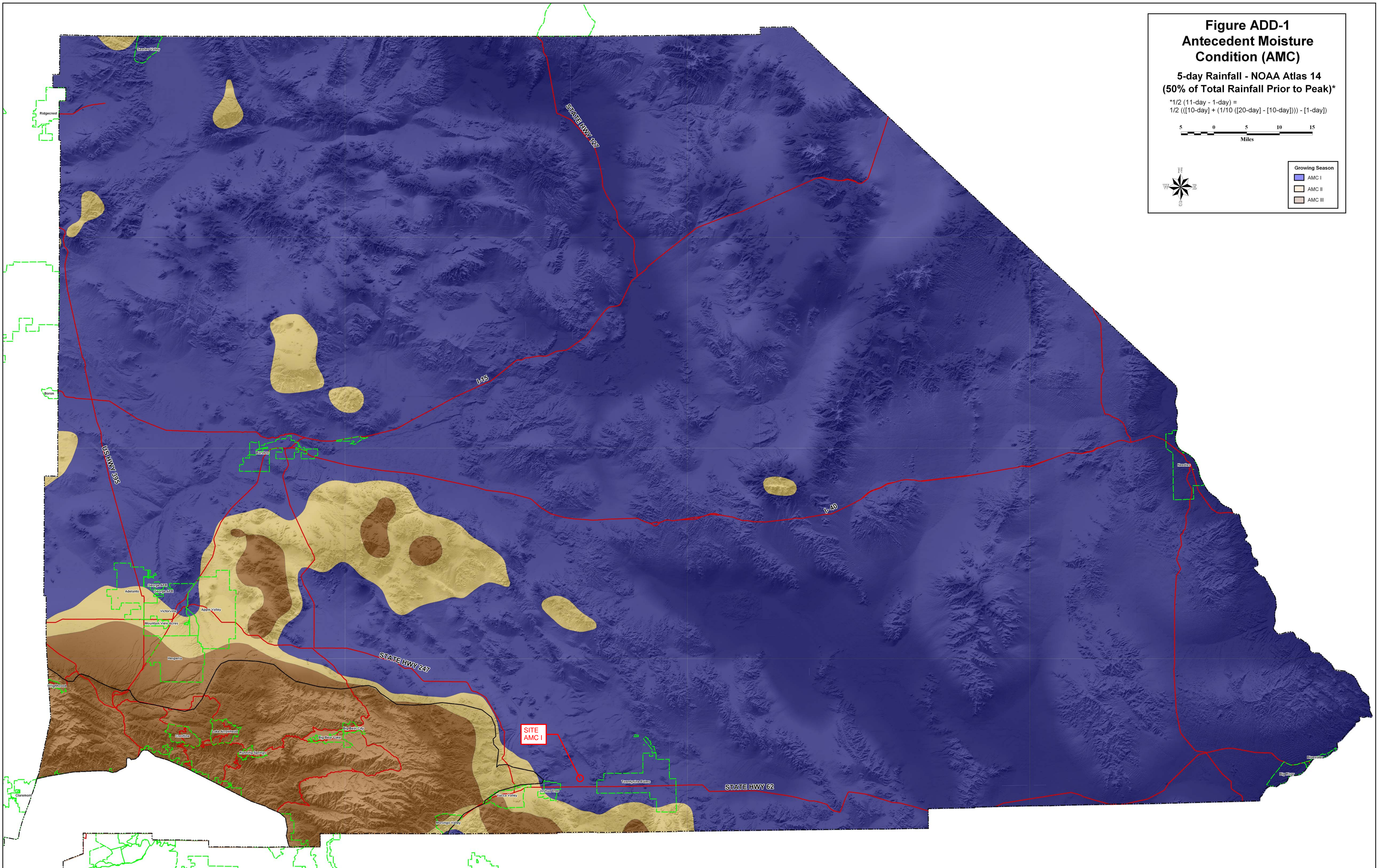
Figure ADD-1 Antecedent Moisture Condition (AMC)

5-day Rainfall - NOAA Atlas 14
(50% of Total Rainfall Prior to Peak)*

$$*1/2 (11\text{-day} - 1\text{-day}) = 1/2 ((10\text{-day}) + (1/10 ((20\text{-day}) - [10\text{-day}]))) - [1\text{-day}]$$



Growing Season	
AMC I	Dark Blue
AMC II	Light Yellow
AMC III	Dark Brown



Curve (I) Numbers of Hydrologic Soil-Cover Complexes For Pervious Areas-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group			
		A	B	C	D
<u>NATURAL COVERS -</u>					
Barren (Rockland, eroded and graded land) EXISTING		78	86	91	93
Chaparral, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparral, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Cienegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	71	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent.)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	25	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
<u>URBAN COVERS -</u>					
Residential or Commercial Landscaping (Lawn, shrubs, etc.) PROPOSED	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
<u>AGRICULTURAL COVERS -</u>					
Fallow (Land plowed but not tilled or seeded)		77	86	91	94

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

CURVE NUMBERS
FOR
PERVIOUS AREAS

ACTUAL IMPERVIOUS COVER

Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent (2)
Natural or Agriculture	0 - 0	0
Public Park	10 - 25	15
School	30 - 50	40
Single Family Residential: (3)		
2.5 acre lots	5 - 15	10
1 acre lots	10 - 25	20
2 dwellings/acre	20 - 40	30
3-4 dwellings/acre	30 - 50	40
5-7 dwellings/acre	35 - 55	50
8-10 dwellings/acre	50 - 70	60
More than 10 dwellings/acre	65 - 90	80
Multiple Family Residential:		
Condominiums	45 - 70	65
Apartments	65 - 90	80
Mobile Home Park	60 - 85	75
Commercial, Downtown Business or Industrial	80 - 100	90

Notes:

1. Land use should be based on ultimate development of the watershed. Long range master plans for the County and incorporated cities should be reviewed to insure reasonable land use assumptions.
2. Recommended values are based on average conditions which may not apply to a particular study area. The percentage impervious may vary greatly even on comparable sized lots due to differences in dwelling size, improvements, etc. Landscape practices should also be considered as it is common in some areas to use ornamental gravels underlain by impervious plastic materials in place of lawns and shrubs. A field investigation of a study area shall always be made, and a review of aerial photos, where available, may assist in estimating the percentage of impervious cover in developed areas.
3. For typical equestrian subdivisions increase impervious area 5 percent over the values recommended in the table above.

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

ACTUAL IMPERVIOUS COVER
FOR
DEVELOPED AREAS

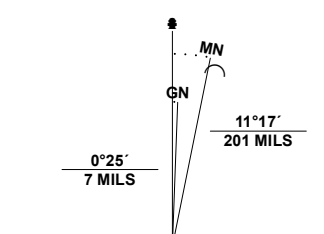


Produced by the United States Geological Survey

North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84) Projection and
1 000 meter grid/Universal Transverse Mercator, Zone 11S
Data is provided by The National Map (TNM), is the best available at the time of map
generation, and includes data content from supporting themes of Elevation,
Hydrography, Geographic Names, Boundaries, Transportation, Structures, Land Cover,
and Orthoimagery. Refer to associated Federal Geographic Data Committee (FGDC)
Metadata for additional source data information.

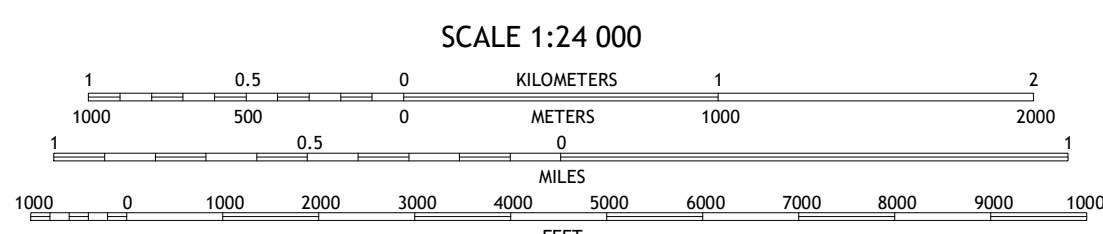
This map is not a legal document. Boundaries may be generalized for this map scale.
Private lands within government reservations may not be shown. Obtain permission
before entering private lands. Temporal changes may have occurred since these data
were collected and some data may no longer represent actual surface conditions.

Learn About The National Map: <https://nationalmap.gov>

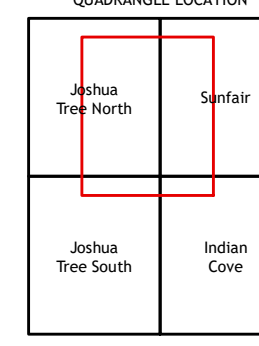


UTM GRID AND 2011 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000 - m Square ID
NT
Grid Zone Designation
11S



CONTOUR INTERVAL 40 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988
CONTOUR SMOOTHNESS = Medium



ROAD CLASSIFICATION	
Expressway	Local Connector
Secondary Hwy	Local Road
Ramp	4WD
Interstate Route	US Route
	State Route

7.5-MINUTE TOPO, CA
2024

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations (BFEs)** and/or **Floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations (BFEs) shown on this map apply only landward of 0.2% North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The projection used in the preparation of this map was Universal Transverse Mercator (UTM) zone 11 North. The horizontal datum was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov> or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, NIMS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at <http://www.ngs.noaa.gov>.

Base map information shown on this FIRM was provided in digital format by the San Bernardino County GIS Department, United States Geological Survey, the Bureau of Land Management, the United States Department of Agriculture, and the National Geodetic Survey. The imagery was flown by U.S. Department of Agriculture Farm Service Agency in 2012 and was produced with a 1-meter ground sampling distance.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels, community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products, or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at <http://msc.fema.gov>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information eXchange.

ACCREDITED LEVEE NOTES TO USERS: Check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, or the levee system(s) shown as providing protection for areas on this panel. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA website at <http://www.fema.gov/business/info/index.shtml>.

Note: This area is shown as being protected from the 1-percent-annual-chance or greater flood hazard by a levee system. Overlapping or failure of any levee system is possible. For additional information see the "Accredited Levee Note" in the Notes to Users.

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

- ZONE A** No Base Flood Elevations determined.
- ZONE AE** Base Flood Elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently identified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99** Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

- ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

- ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.
- ZONE D** Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities
- Base Flood Elevation line and value; elevation in feet
- Base Flood Elevation value where uniform within zone; elevation in feet

- * Referenced to the North American Vertical Datum of 1988
- (A)—(A)— Cross section line
- (23)—(23)— Transect line
- Geographic coordinates: referenced to the North American Datum of 1983 (NAD 83). Western Hemisphere
- 1000-meter Universal Transverse Mercator grid values, zone 11
- 5000-foot grid ticks; California State Plane coordinate system, Zone V (PPSZONE = 405), Lambert projection.
- Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 River Mile

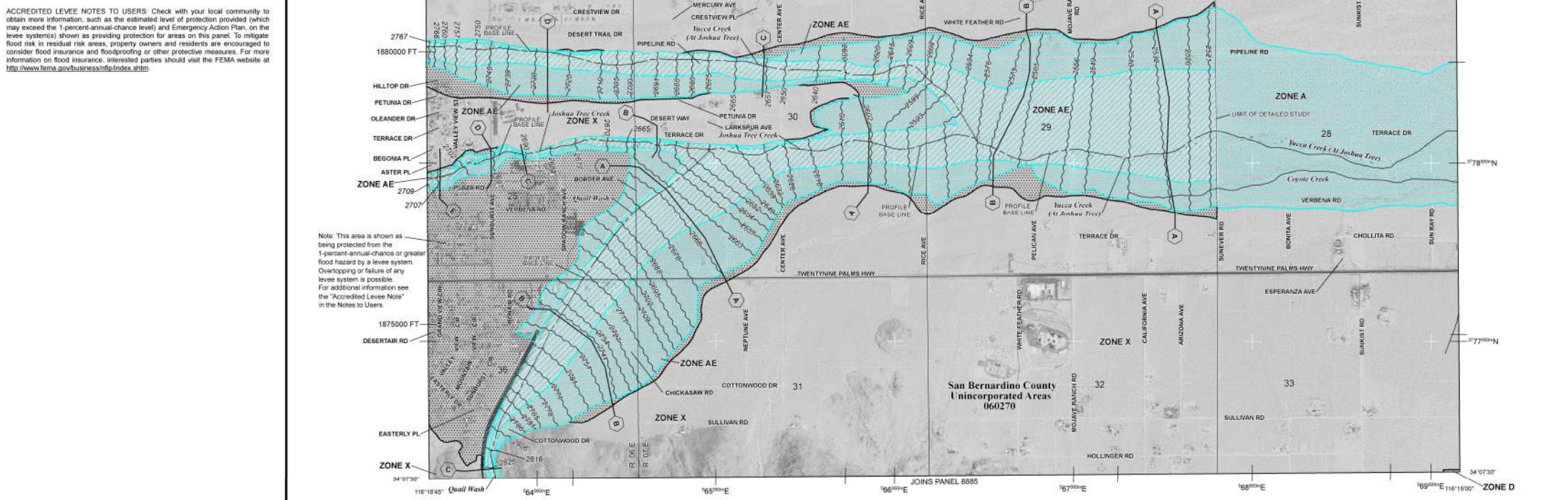
MAP REPOSITORIES
Refer to Map Repositories List on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
August 28, 2008

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
September 2, 2016 - to change Base Flood Elevations, to add Base Flood Elevations, to change Special Flood Hazard Areas, to add Special Flood Hazard Areas, to change zone designations, to incorporate previously issued Letters of Map Revision, and to reflect updated topographic information.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.



NFIP **PANEL 8145J**

FIRM
FLOOD INSURANCE RATE MAP
SAN BERNARDINO COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 8145 OF 9400
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SAN BERNARDINO COUNTY	060270	8145	J

Note to User: The Map Number shown below should be used when electing map orders. The Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
06071C8145J

MAP REVISED
SEPTEMBER 2, 2016

Federal Emergency Management Agency