



MEMORANDUM

To: Heidi Schwegler, Yucca Valley Material Lab

JN 40.165.000

From: John McCarthy

Date: August 16, 2024

Subject: Yucca Valley Material Lab – Hydrology Assessment

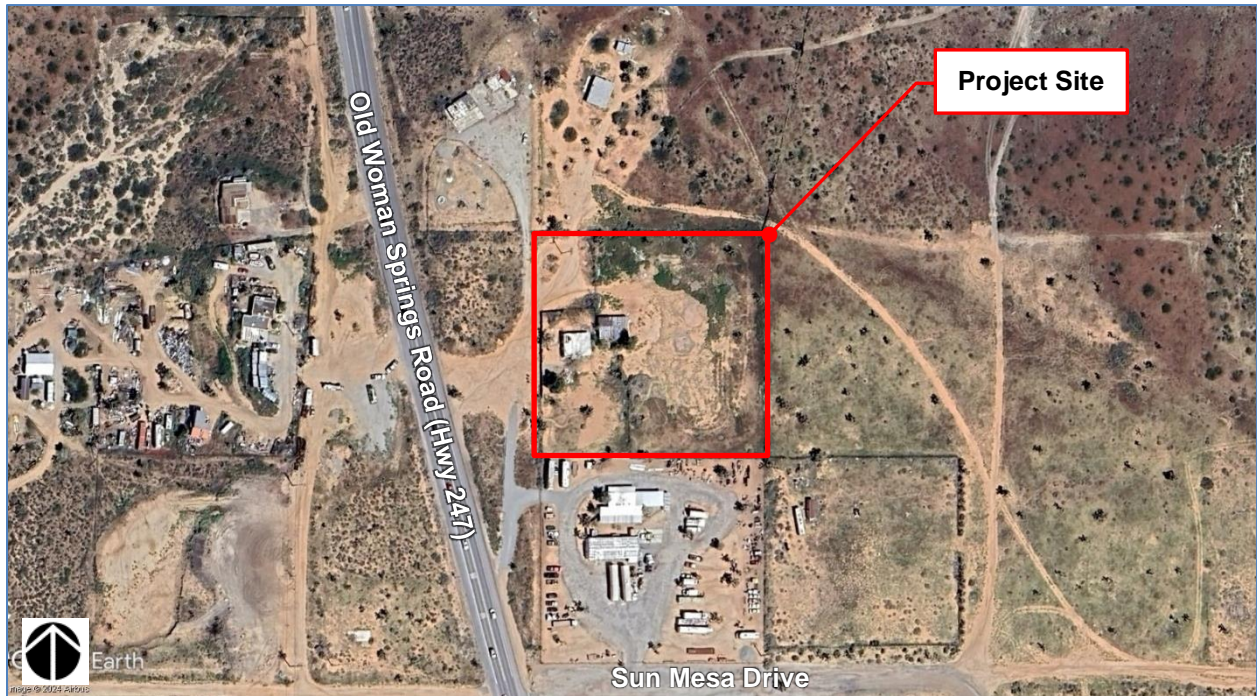
The purpose of this memorandum is to provide an assessment of the hydrology at the Yucca Valley Material Lab (YVML) site located at 56885 Sunflower Drive, Yucca Valley, California. The site is located off Old Woman Springs Road near the intersection with Sun Mesa Drive. The property is approximately 2.5 acres and includes existing structures which total 2,432 square feet (sf). The YVML is proposing to expand the existing site facilities to include a new artist studio building and additional paved parking. The hydrology assessment includes an evaluation of the existing flood hazard at the project site and hydrologic impacts associated with the site development.

The vicinity and location of the site are illustrated in Figures 1 and 2.

Figure 1 – Vicinity Map

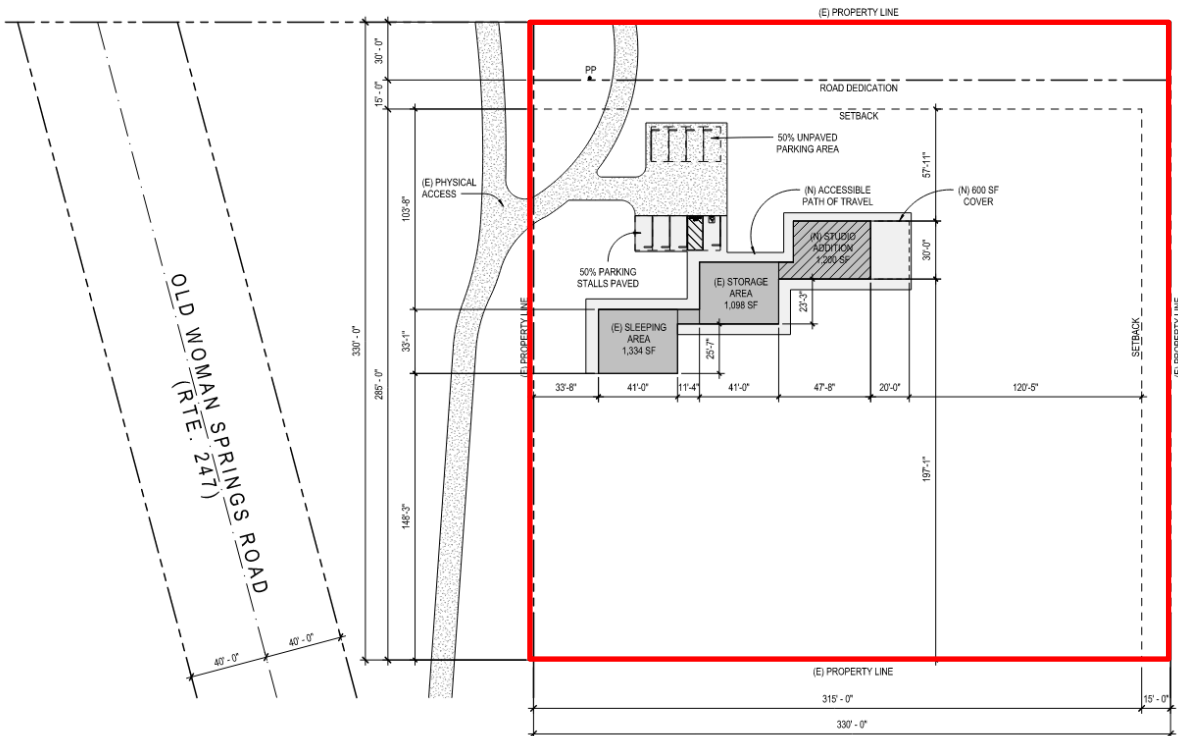


Figure 2 – Location Map



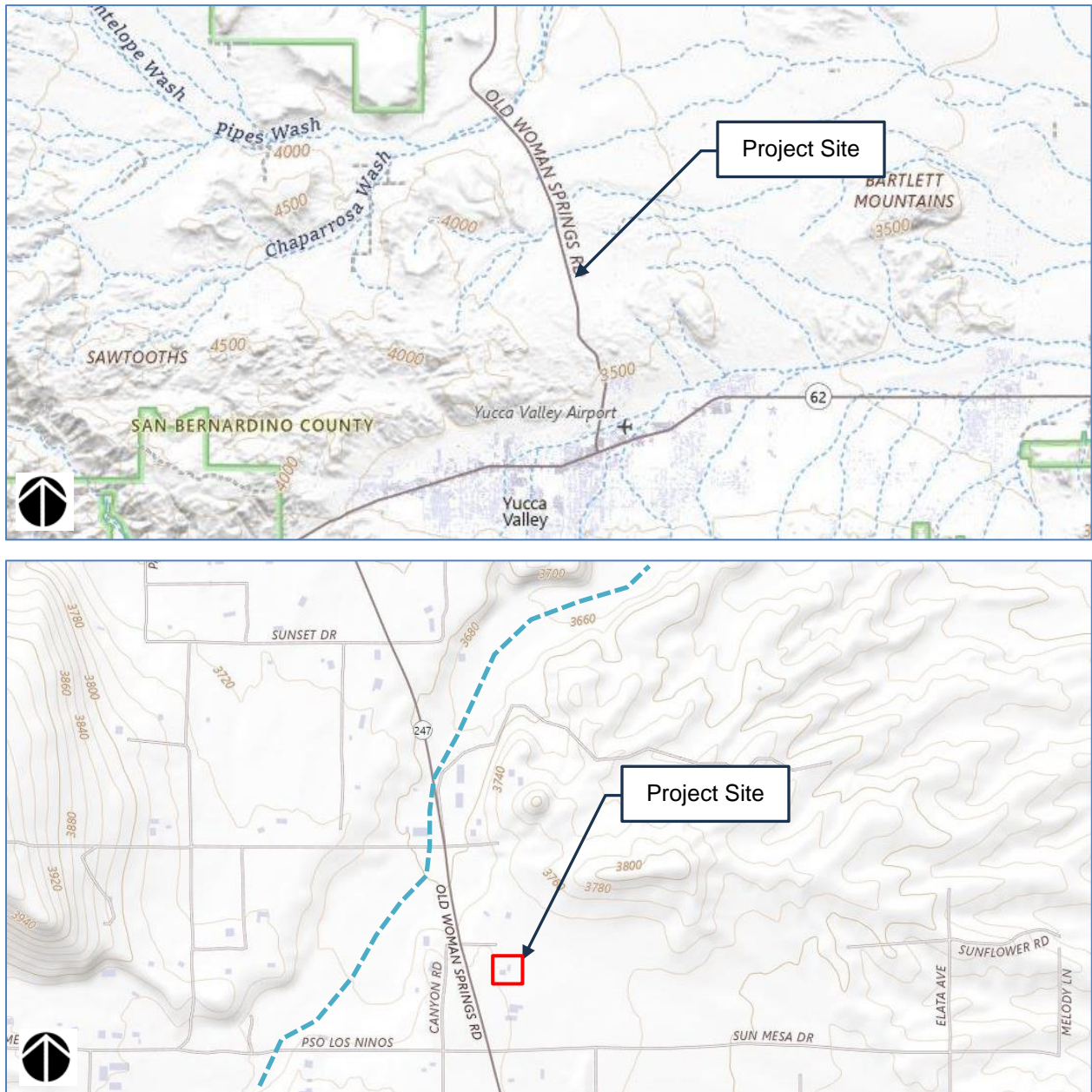
The YVML is proposing to build an art studio on the project site. This will include the expansion of the existing building structure and new paved parking for ADA access. The improvements will include approximately 2,070 sf of additional impervious area. The existing site has approximately 2,430 sf of impervious area. The proposed site plan is shown in Figure 3.

Figure 3 – Proposed Site Development



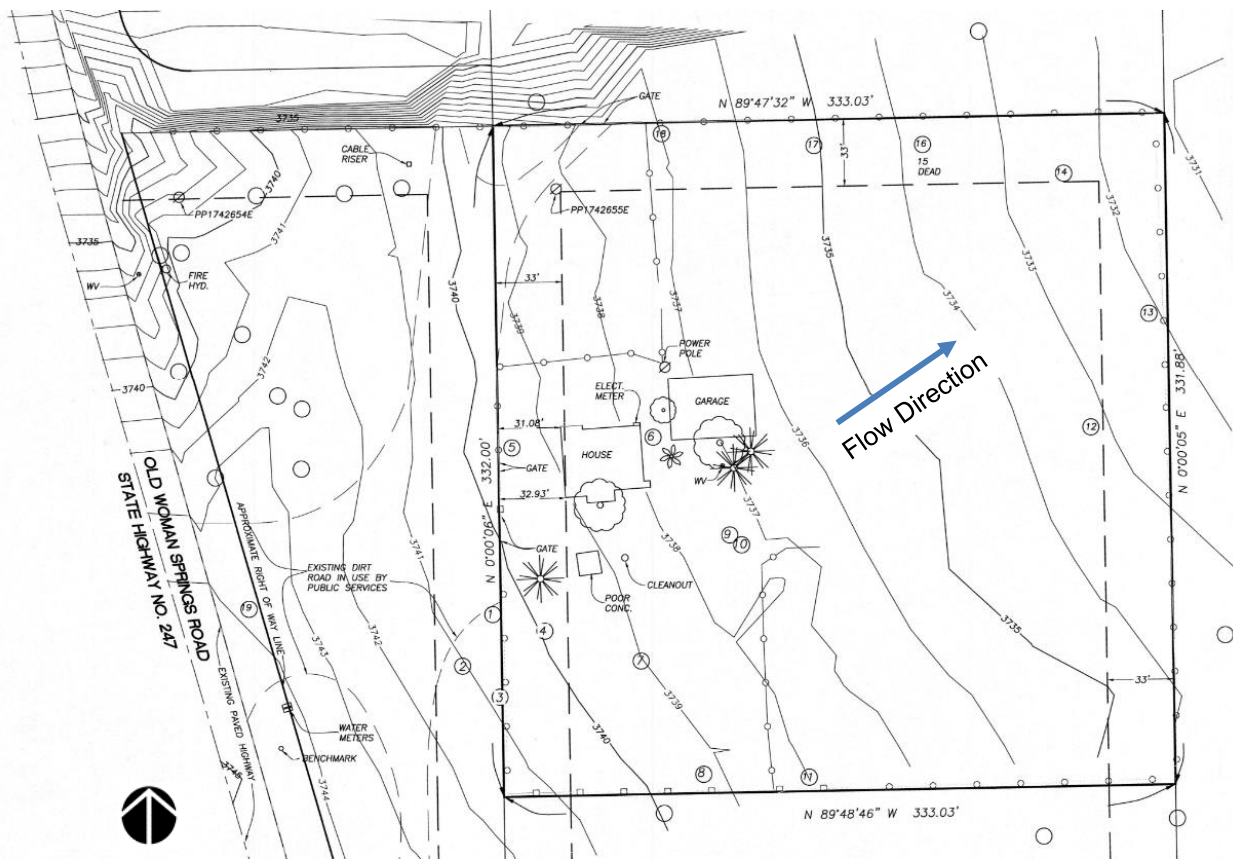
The project site is located on a mildly sloping parcel that generally drains to the northeast. The elevations on the site range from 3741.5 feet (ft) (mean sea level) at the southwest corner, to 3731.0 ft at the northeast corner. Very little offsite area drains onto the project site. This offsite area includes a small area between the site and Old Woman Springs Road on the western side. There are no concentrated flow paths in the local area and runoff sheet flows onto and off the property. A larger watercourse is located to the west and north of the property. The watercourse is an unnamed ephemeral stream that shows up as a blue line stream on some USGS maps. Excerpts from the USGS topographic mapping are shown in Figure 4. The blue line stream is located a sufficient distance away from and below the elevation of the project site to prevent the stream from impacting the proposed development. This is confirmed by the Federal Emergency Management Agency’s (FEMA) Flood Insurance Rate Map (FIRM) for the area which indicate that the project site is not located in a special flood hazard area (Copy in appendix).

Figure 4 – USGS Topographic Mapping.



Local runoff from the project site generally flows in a northeasterly direction and ultimately discharges to the unnamed stream. The topography of the project site is shown in Figure 5.

Figure 5 – Project Site Topographic Mapping.



Estimated storm water runoff from the project site for the existing and project conditions was estimated using the Rational Method procedures outlined in the San Bernardino County Hydrology Manual (SBCHM). The runoff was calculated for a 100-year storm event. In the existing conditions, the percent of the project site with impervious surfaces is 2.2%. In the project condition, the amount impervious increases to 4.1%.

The following parameters were developed for the project site using the guidelines in the Hydrology Manual:

- Soil Type: B (SBCHM Figure C-11)
- Time of Concentration: 15 min (length=463 ft, elevation difference=10.5 ft) (SBCHM Figure D-1)
- Rainfall Intensity (I): 3.46 in/hr (NOAA Atlas 14) (100-year 15 min duration)
- Curve Number: Natural Barren, 86 (AMC II), 70 (AMC I) (SBCHM Figure C-3)
- Infiltration Rate (F_p) for pervious areas: 0.50 in/hour (SBCHM Figure C-6)
- Maximum Loss Rate: $F_m = a_p(F_p)$, where a_p is the pervious area fraction
 - Existing Condition: $F_m = 0.98(0.50) = 0.49$
 - Project Condition: $F_m = 0.96(0.50) = 0.48$

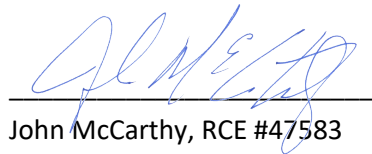
The peak flow rate was then calculated using the estimated parameters, a watershed area (A) of 2.5 acres, and the Rational Method formula from the Hydrology Manual:

Rational Method Formula: $Q = 0.90(I - Fm)A$

- Existing Condition = 6.68 cfs
- Project Condition = 6.70 cfs

The results of the Rational Method analysis indicate that the proposed project improvements will have an insignificant impact on the stormwater runoff from the project site. This is due to the limited size of the proposed improvements in relation to the size of the property, and the limited impervious area associated with the project improvements. Charts and calculations for the watershed parameters are included in the appendix.

Based on the results of this hydrology assessment, the proposed project improvements are not subject to any regional flood hazards and will have an insignificant impact on the local hydrology. No drainage improvements or mitigation measures are needed for the proposed improvements.



John McCarthy, RCE #47583
Q3 Consulting
949-259-6730

APPENDIX

National Flood Hazard Layer FIRMette

116°25'42"W 34°10'25"N



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE)
Zone A, V, A99
- With BFE or Depth *Zone AE, AG, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD

- 0.2% Annual Chance Flood Hazard. Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS

- NO SCREEN
- Area of Minimal Flood Hazard *Zone X*
- Effective LOMRMs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES

- Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS

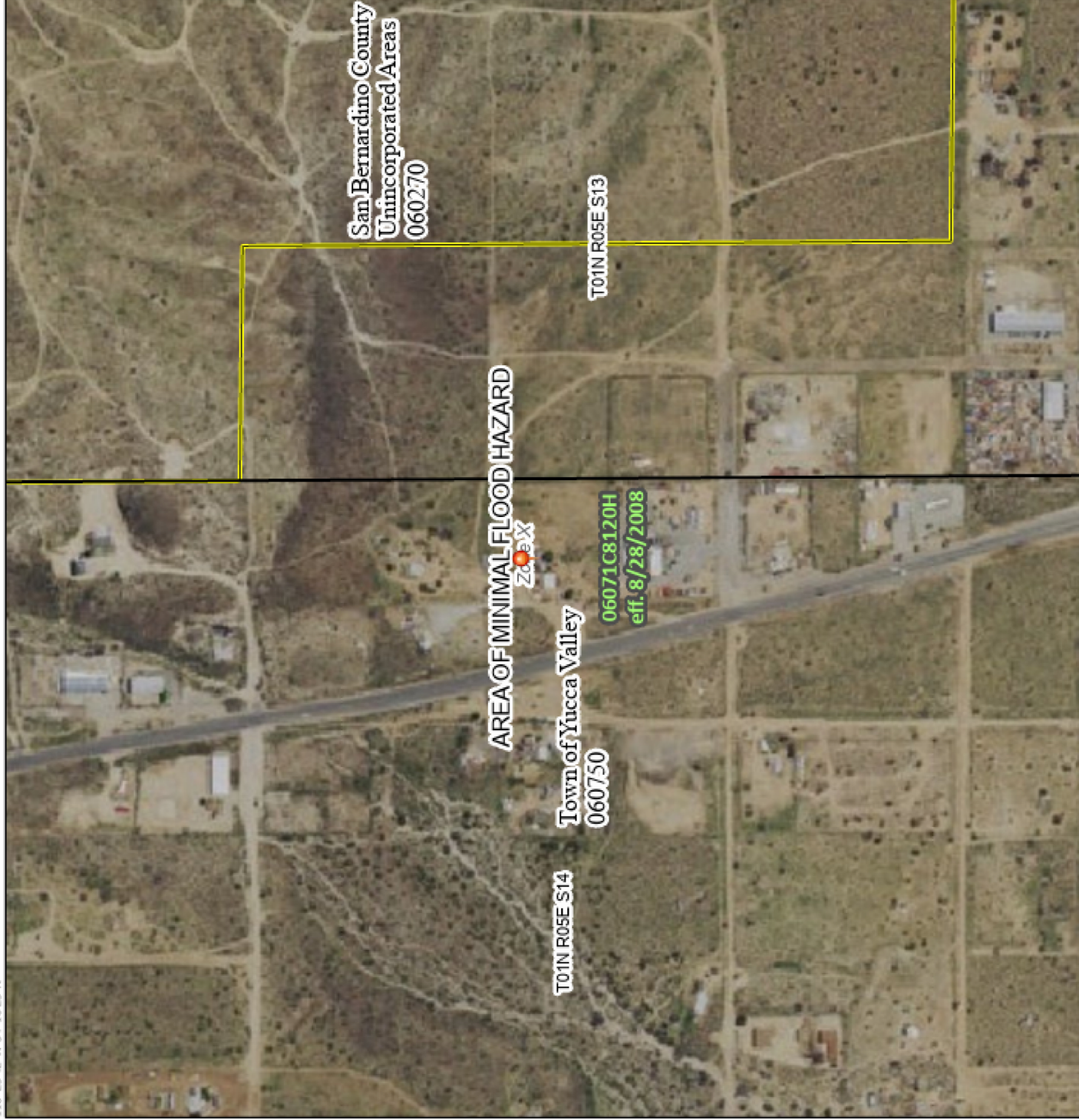
- Digital Data Available
- No Digital Data Available
- Unmapped

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps, if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards.

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 6/15/2024 at 12:03 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



116°25'42"W 34°10'25"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap Imagery Source: USGS National Map 2023



NOAA Atlas 14, Volume 6, Version 2
Location name: Yucca Valley, California, USA*
Latitude: 34.1698°, Longitude: -116.423°
Elevation: 3735 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 & aeriels](#)

PF tabular

| PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)¹ | | | | | | | | | | |
|---|--|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| Duration | Average recurrence interval (years) | | | | | | | | | |
| | 1 | 2 | 5 | 10 | 25 | 50 | 100 | 200 | 500 | 1000 |
| 5-min | 1.06 (0.876-1.28) | 1.55 (1.28-1.90) | 2.29 (1.88-2.81) | 2.96 (2.42-3.67) | 4.02 (3.18-5.14) | 4.94 (3.83-6.44) | 6.00 (4.54-8.00) | 7.21 (5.30-9.90) | 9.10 (6.42-13.0) | 12.1 (8.28-18.0) |
| 10-min | 0.756 (0.624-0.924) | 1.11 (0.918-1.36) | 1.64 (1.35-2.01) | 2.13 (1.74-2.63) | 2.88 (2.28-3.68) | 3.54 (2.75-4.62) | 4.30 (3.25-5.74) | 5.17 (3.80-7.09) | 6.52 (4.60-9.33) | 8.71 (5.94-12.9) |
| 15-min | 0.608 (0.504-0.744) | 0.896 (0.740-1.10) | 1.32 (1.09-1.62) | 1.72 (1.40-2.12) | 2.32 (1.84-2.97) | 2.86 (2.21-3.72) | 3.46 (2.62-4.62) | 4.16 (3.06-5.72) | 5.26 (3.71-7.52) | 7.02 (4.79-10.4) |
| 30-min | 0.462 (0.384-0.566) | 0.682 (0.564-0.832) | 1.01 (0.830-1.23) | 1.30 (1.07-1.61) | 1.77 (1.40-2.26) | 2.17 (1.68-2.83) | 2.63 (1.99-3.52) | 3.17 (2.33-4.35) | 4.00 (2.82-5.72) | 5.34 (3.64-7.90) |
| 60-min | 0.322 (0.267-0.393) | 0.474 (0.392-0.580) | 0.701 (0.578-0.859) | 0.908 (0.743-1.12) | 1.23 (0.973-1.57) | 1.51 (1.17-1.97) | 1.83 (1.39-2.45) | 2.21 (1.62-3.03) | 2.78 (1.96-3.98) | 3.72 (2.54-5.50) |
| 2-hr | 0.223 (0.185-0.272) | 0.315 (0.260-0.385) | 0.448 (0.369-0.549) | 0.566 (0.463-0.700) | 0.745 (0.589-0.951) | 0.897 (0.695-1.17) | 1.07 (0.806-1.42) | 1.26 (0.924-1.72) | 1.54 (1.09-2.20) | 1.88 (1.28-2.78) |
| 3-hr | 0.176 (0.146-0.216) | 0.246 (0.203-0.300) | 0.344 (0.284-0.422) | 0.432 (0.353-0.534) | 0.562 (0.445-0.718) | 0.671 (0.520-0.876) | 0.792 (0.599-1.06) | 0.926 (0.680-1.27) | 1.12 (0.793-1.61) | 1.29 (0.882-1.91) |
| 6-hr | 0.116 (0.096-0.142) | 0.160 (0.132-0.195) | 0.221 (0.182-0.271) | 0.275 (0.224-0.339) | 0.353 (0.279-0.450) | 0.417 (0.323-0.544) | 0.487 (0.368-0.650) | 0.563 (0.414-0.774) | 0.675 (0.476-0.966) | 0.768 (0.524-1.14) |
| 12-hr | 0.072 (0.059-0.088) | 0.099 (0.082-0.121) | 0.138 (0.114-0.169) | 0.171 (0.140-0.212) | 0.220 (0.174-0.281) | 0.260 (0.201-0.339) | 0.303 (0.229-0.405) | 0.350 (0.257-0.481) | 0.418 (0.295-0.599) | 0.475 (0.324-0.704) |
| 24-hr | 0.045 (0.040-0.052) | 0.063 (0.056-0.073) | 0.089 (0.078-0.103) | 0.111 (0.097-0.130) | 0.144 (0.122-0.174) | 0.171 (0.142-0.211) | 0.201 (0.163-0.253) | 0.233 (0.184-0.302) | 0.281 (0.213-0.378) | 0.321 (0.235-0.447) |
| 2-day | 0.025 (0.022-0.029) | 0.036 (0.032-0.041) | 0.051 (0.045-0.059) | 0.065 (0.057-0.076) | 0.085 (0.072-0.102) | 0.102 (0.084-0.125) | 0.120 (0.097-0.151) | 0.140 (0.110-0.181) | 0.170 (0.129-0.229) | 0.195 (0.143-0.272) |
| 3-day | 0.018 (0.016-0.021) | 0.026 (0.023-0.030) | 0.038 (0.033-0.044) | 0.048 (0.042-0.056) | 0.064 (0.054-0.077) | 0.077 (0.063-0.094) | 0.091 (0.073-0.114) | 0.107 (0.084-0.138) | 0.130 (0.098-0.175) | 0.150 (0.110-0.209) |
| 4-day | 0.014 (0.012-0.016) | 0.020 (0.018-0.024) | 0.030 (0.026-0.035) | 0.038 (0.033-0.045) | 0.051 (0.043-0.061) | 0.061 (0.051-0.075) | 0.073 (0.059-0.092) | 0.086 (0.067-0.111) | 0.105 (0.079-0.141) | 0.121 (0.088-0.169) |
| 7-day | 0.009 (0.008-0.010) | 0.013 (0.011-0.015) | 0.019 (0.017-0.022) | 0.025 (0.022-0.029) | 0.033 (0.028-0.040) | 0.040 (0.033-0.049) | 0.048 (0.039-0.060) | 0.056 (0.044-0.073) | 0.069 (0.052-0.093) | 0.080 (0.059-0.112) |
| 10-day | 0.006 (0.006-0.007) | 0.010 (0.008-0.011) | 0.014 (0.013-0.017) | 0.019 (0.016-0.022) | 0.025 (0.021-0.030) | 0.030 (0.025-0.037) | 0.036 (0.029-0.046) | 0.043 (0.034-0.055) | 0.053 (0.040-0.071) | 0.061 (0.044-0.085) |
| 20-day | 0.003 (0.003-0.004) | 0.005 (0.005-0.006) | 0.008 (0.007-0.009) | 0.010 (0.009-0.012) | 0.014 (0.012-0.017) | 0.017 (0.014-0.021) | 0.020 (0.016-0.025) | 0.024 (0.019-0.031) | 0.029 (0.022-0.039) | 0.034 (0.024-0.047) |
| 30-day | 0.002 (0.002-0.003) | 0.004 (0.003-0.004) | 0.006 (0.005-0.007) | 0.008 (0.007-0.009) | 0.010 (0.008-0.012) | 0.012 (0.010-0.015) | 0.015 (0.012-0.019) | 0.017 (0.014-0.022) | 0.021 (0.016-0.029) | 0.024 (0.018-0.034) |
| 45-day | 0.002 (0.001-0.002) | 0.003 (0.002-0.003) | 0.004 (0.004-0.005) | 0.006 (0.005-0.007) | 0.007 (0.006-0.009) | 0.009 (0.007-0.011) | 0.011 (0.009-0.014) | 0.013 (0.010-0.017) | 0.016 (0.012-0.021) | 0.018 (0.013-0.025) |
| 60-day | 0.001 (0.001-0.002) | 0.002 (0.002-0.003) | 0.004 (0.003-0.004) | 0.005 (0.004-0.005) | 0.006 (0.005-0.007) | 0.007 (0.006-0.009) | 0.009 (0.007-0.011) | 0.010 (0.008-0.014) | 0.013 (0.009-0.017) | 0.015 (0.011-0.020) |

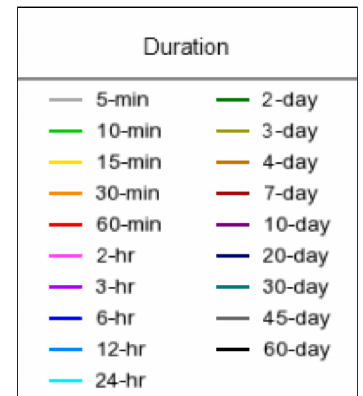
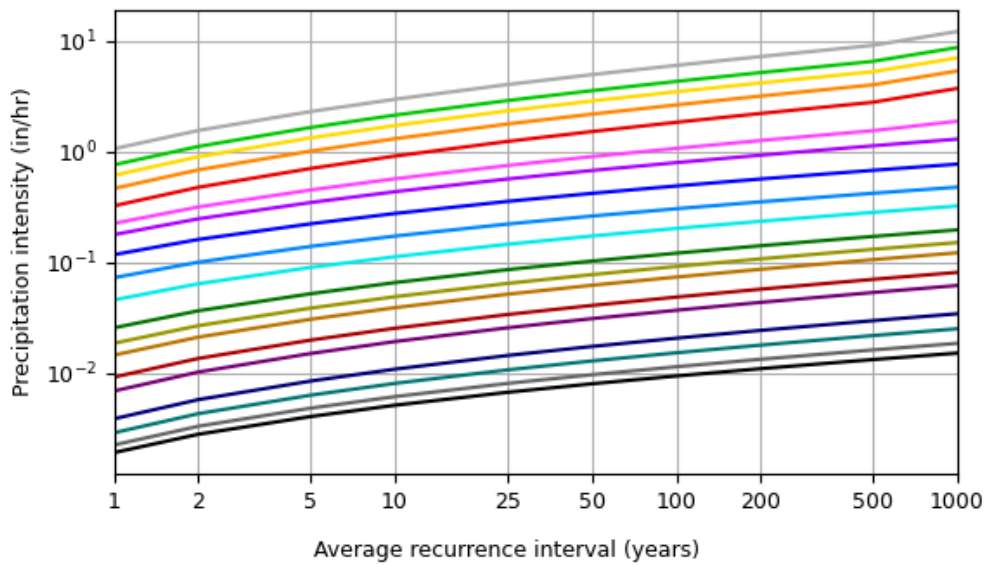
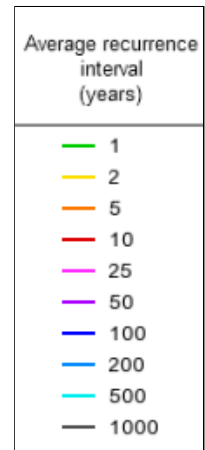
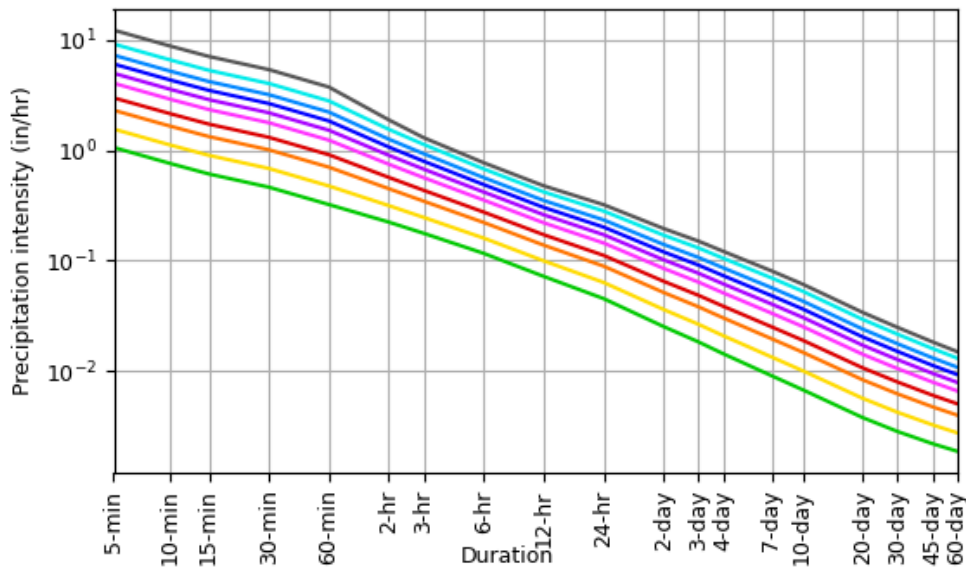
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average 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 intensity-duration-frequency (IDF) curves

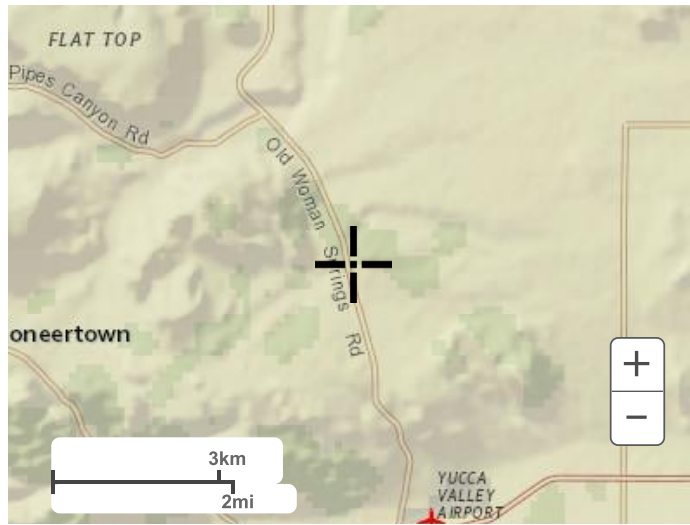
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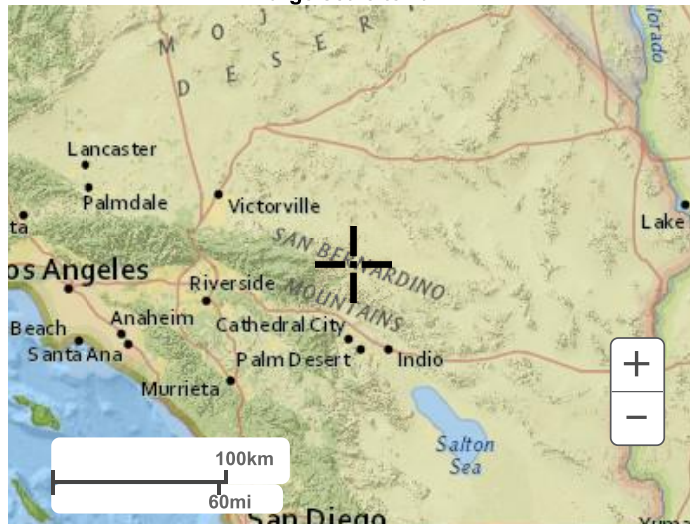
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Maps & aerials

Small scale terrain



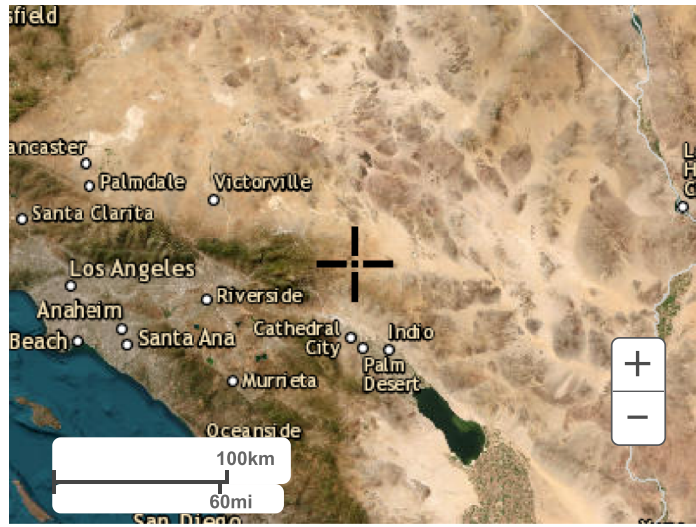
Large scale terrain



Large scale map



Large scale aerial



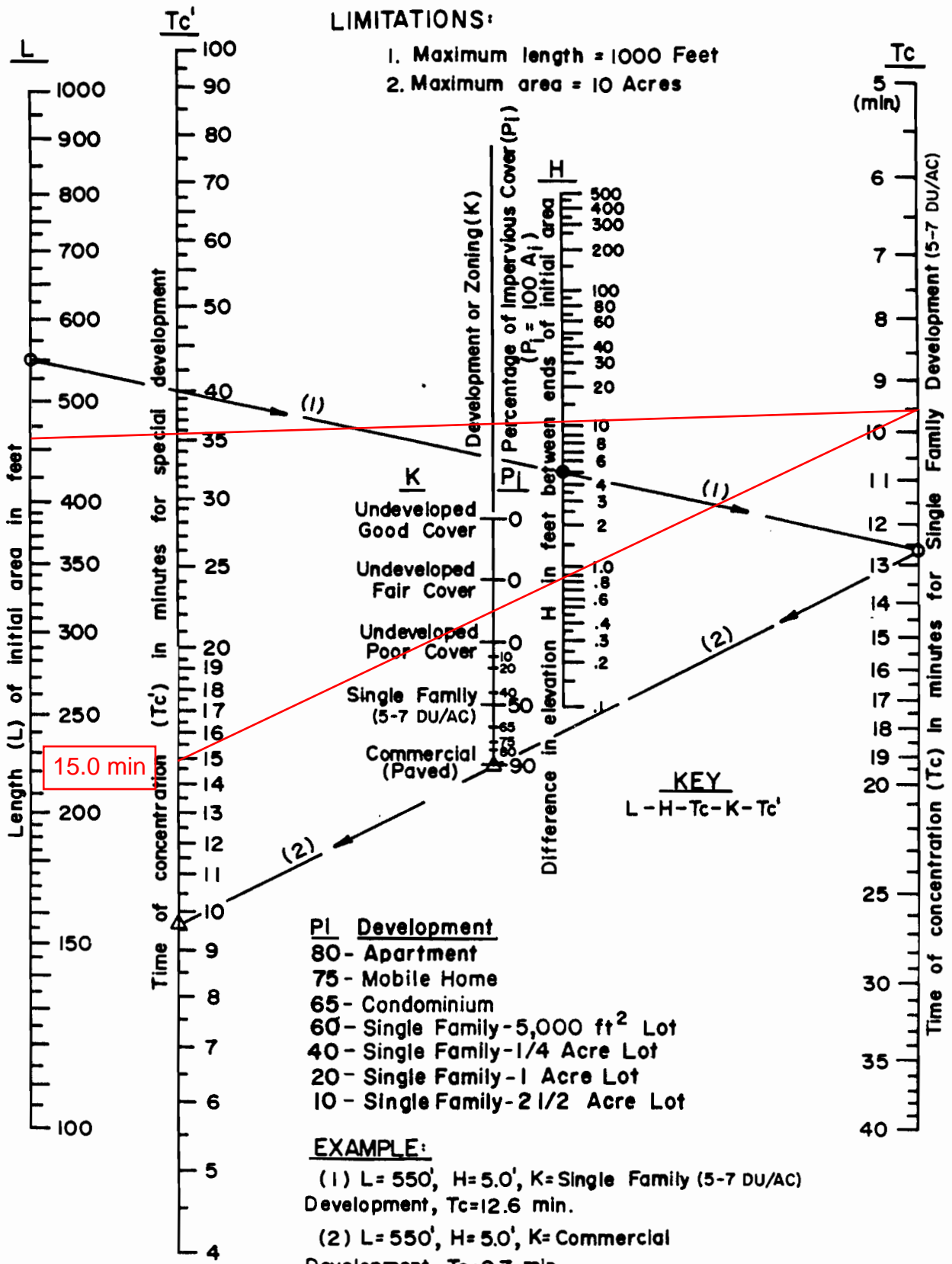
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[National Oceanic and Atmospheric Administration](#)
[National Weather Service](#)
[National Water Center](#)
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

[Disclaimer](#)

LIMITATIONS:

1. Maximum length = 1000 Feet
2. Maximum area = 10 Acres



SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

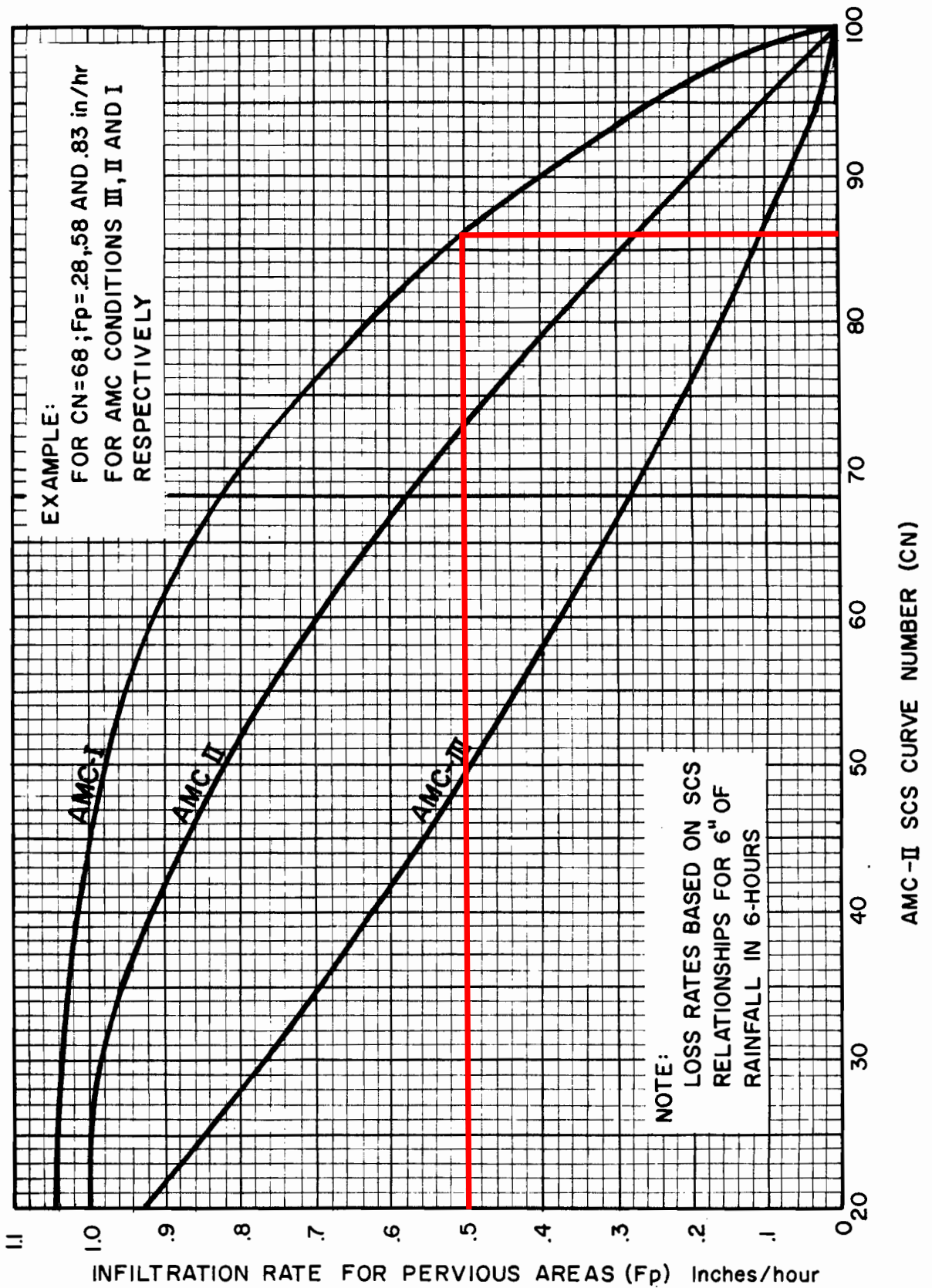
TIME OF CONCENTRATION
NOMOGRAPH
FOR INITIAL SUBAREA

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) | | 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.) | 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 |

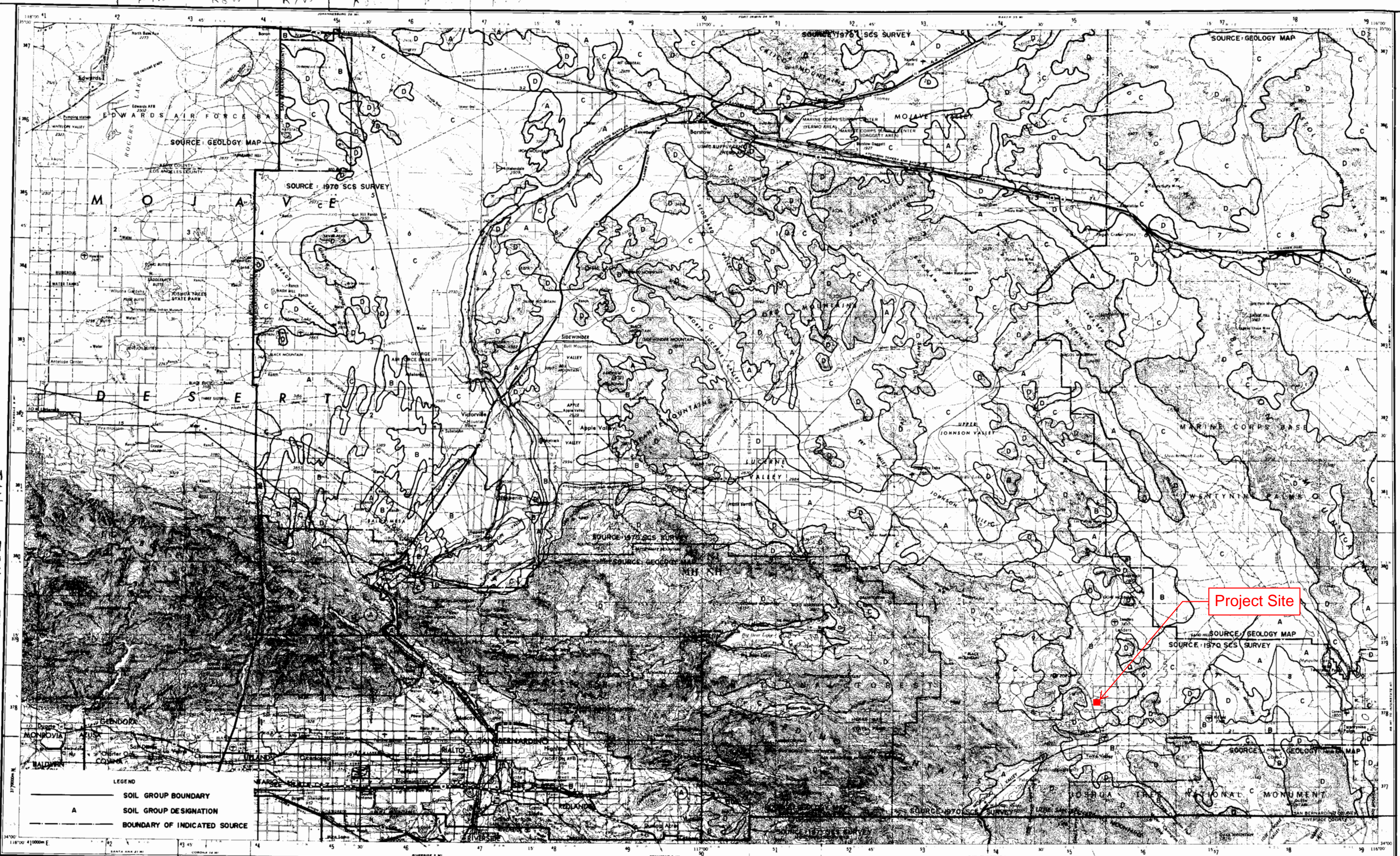
SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

CURVE NUMBERS
FOR
PERVIOUS AREAS



**SAN BERNARDINO COUNTY
 HYDROLOGY MANUAL**

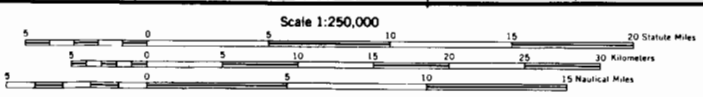
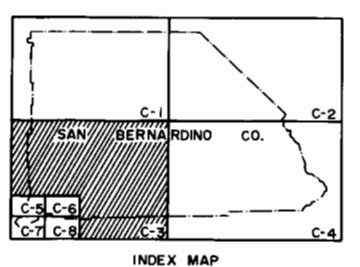
**INFILTRATION RATE FOR
 PERVIOUS AREAS VERSUS
 SCS CURVE NUMBERS**



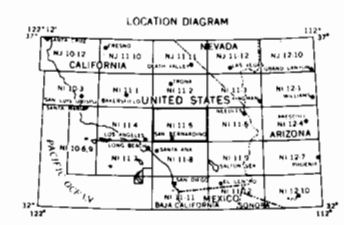
LEGEND
 — SOIL GROUP BOUNDARY
 A SOIL GROUP DESIGNATION
 — BOUNDARY OF INDICATED SOURCE

Project Site

SAN BERNARDINO COUNTY
 HYDROLOGY MANUAL



Scale 1:250,000
 CONTOUR INTERVAL 200 FEET
 WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS
 TRANSVERSE MERCATOR PROJECTION
 BLACK NUMBERED LINES INDICATE THE 4300 METERS UNIVERSAL TRANSVERSE MERCATOR GRID, ZONE 11
 1983 MAGNETIC DECLINATION FROM TRUE NORTH VARIES FROM 19M' (200 MILES) EASTERLY FOR THE CENTER OF THE WEST EDGE TO 19° (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