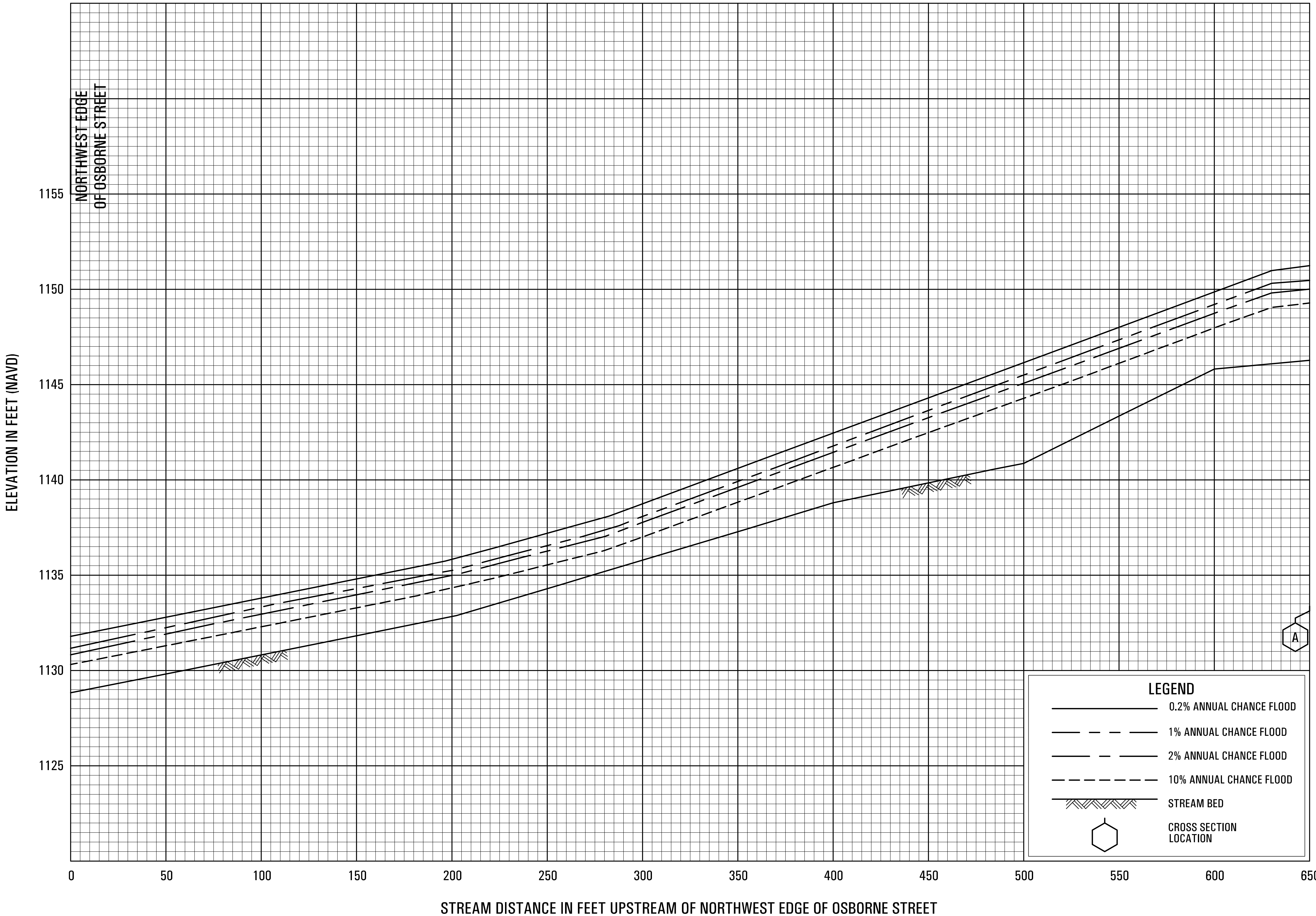
Appendix A –
Effective FEMA Flood Profiles for Kagel Canyon (January 2016)



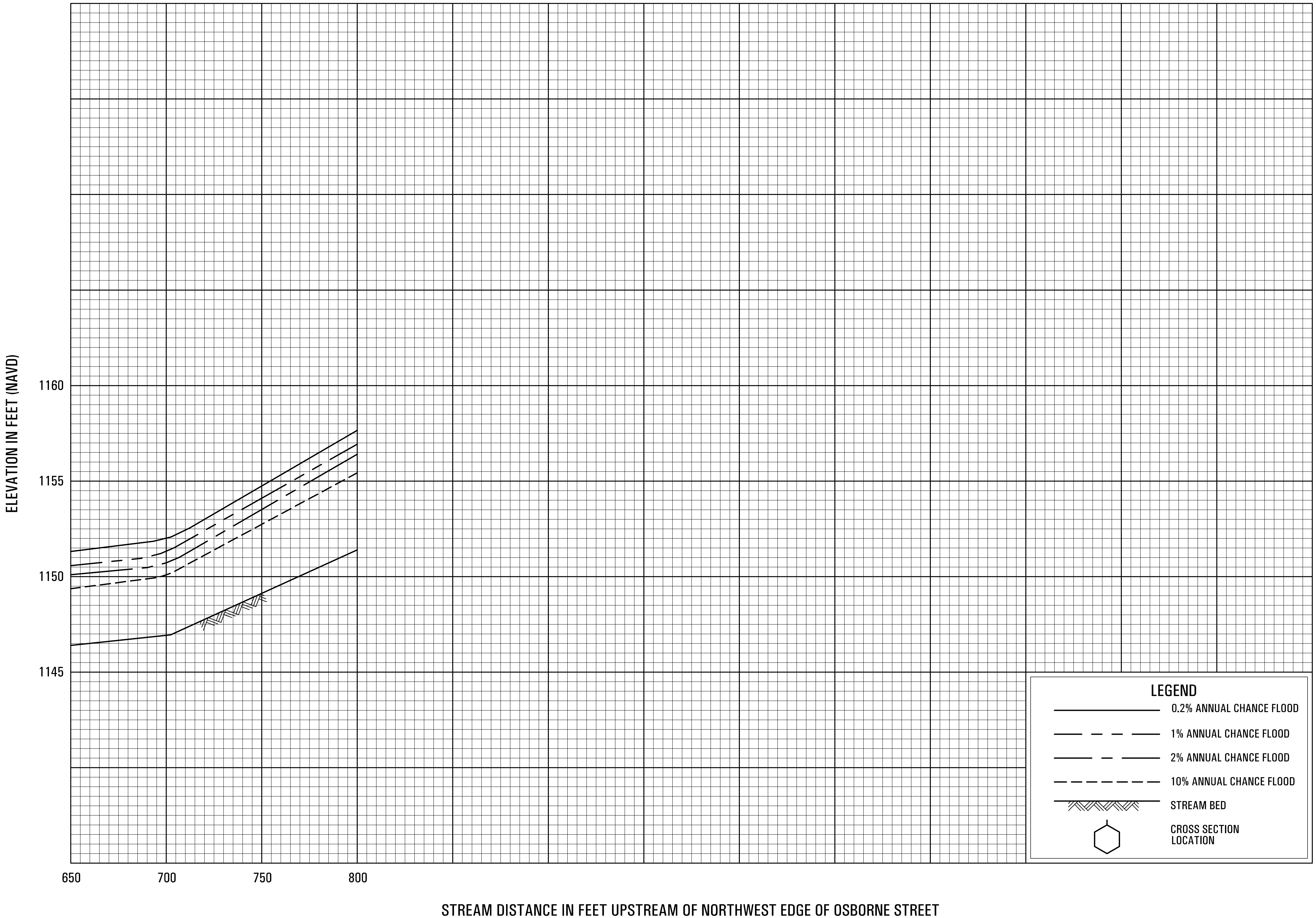
FLOOD PROFILES

KAGEL CANYON

FEDERAL EMERGENCY MANAGEMENT AGENCY

LOS ANGELES COUNTY, CA

AND INCORPORATED AREAS



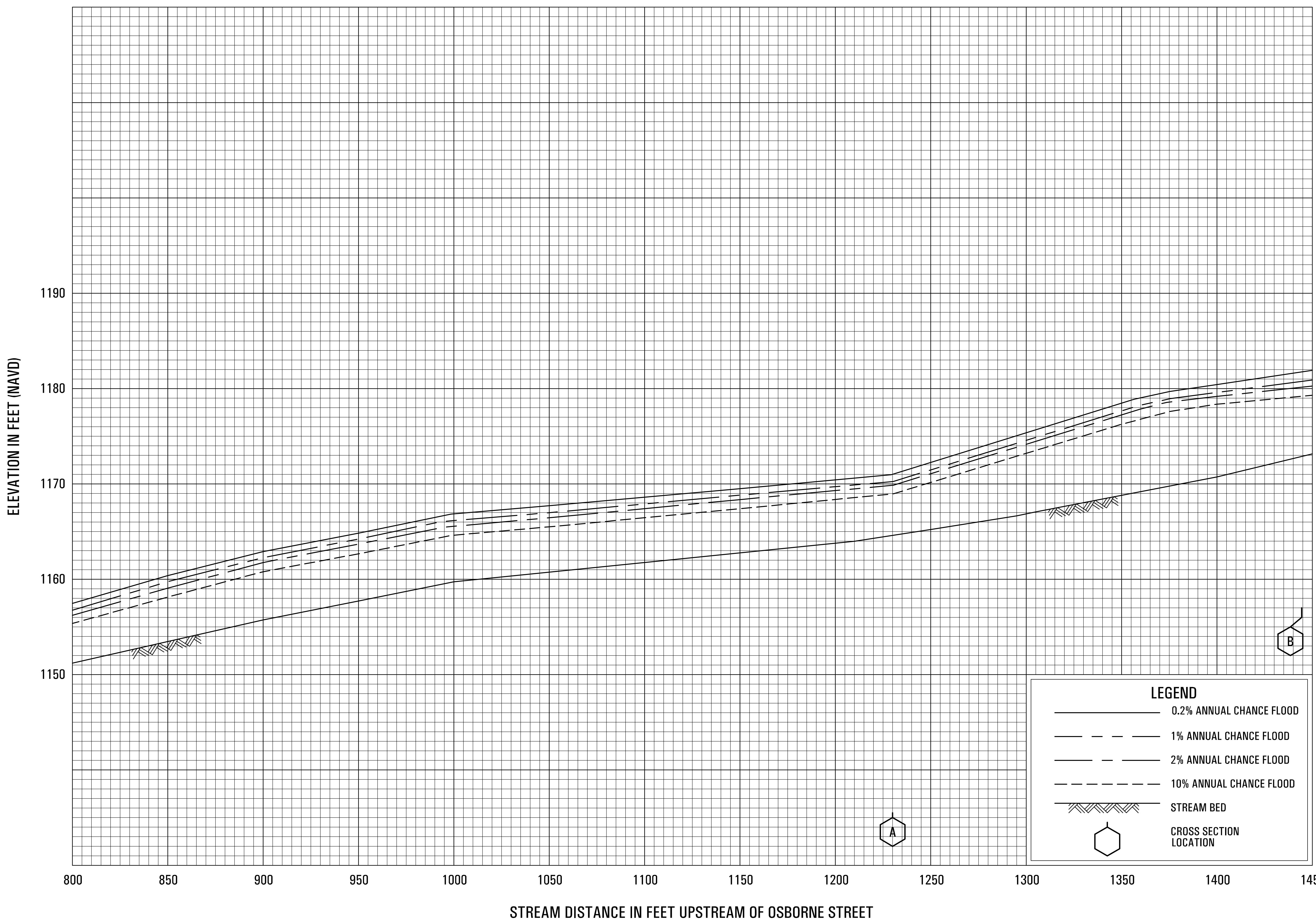
FLOOD PROFILES

KAGEL CANYON

FEDERAL EMERGENCY MANAGEMENT AGENCY

LOS ANGELES COUNTY, CA

AND INCORPORATED AREAS



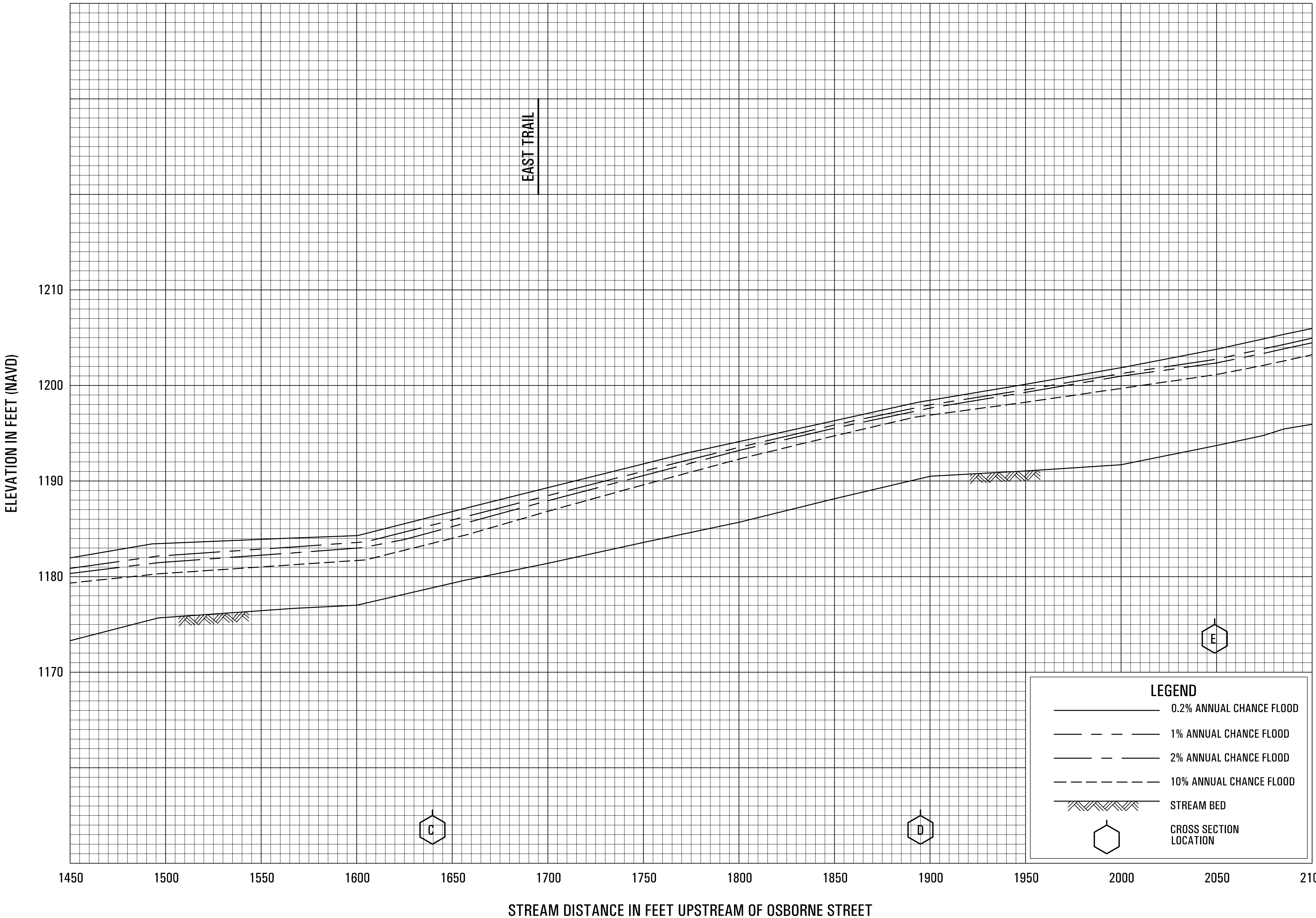
FLOOD PROFILES

KAGEL CANYON

FEDERAL EMERGENCY MANAGEMENT AGENCY

LOS ANGELES COUNTY, CA

AND INCORPORATED AREAS



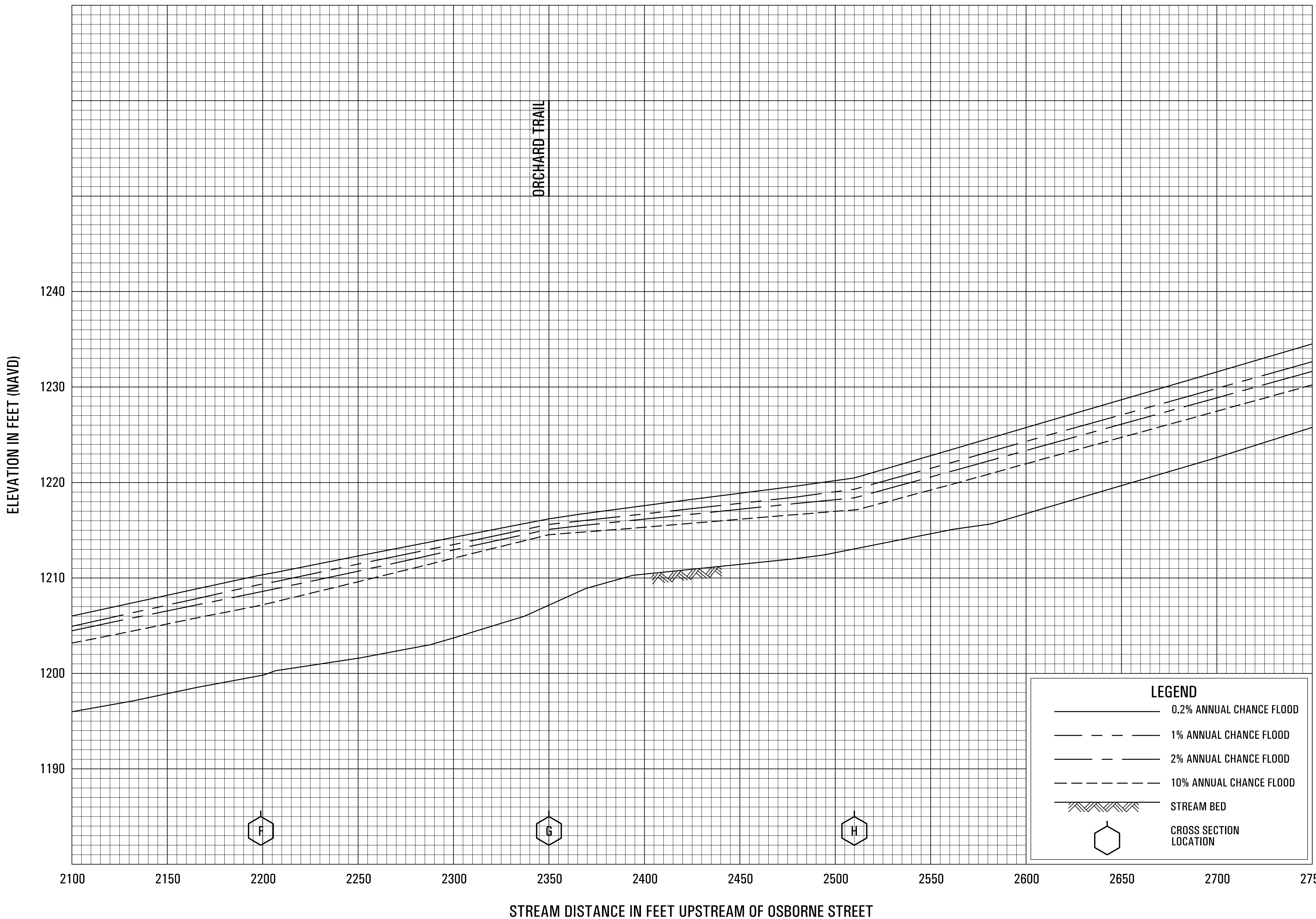
FLOOD PROFILES

KAGEL CANYON

FEDERAL EMERGENCY MANAGEMENT AGENCY

LOS ANGELES COUNTY, CA

AND INCORPORATED AREAS



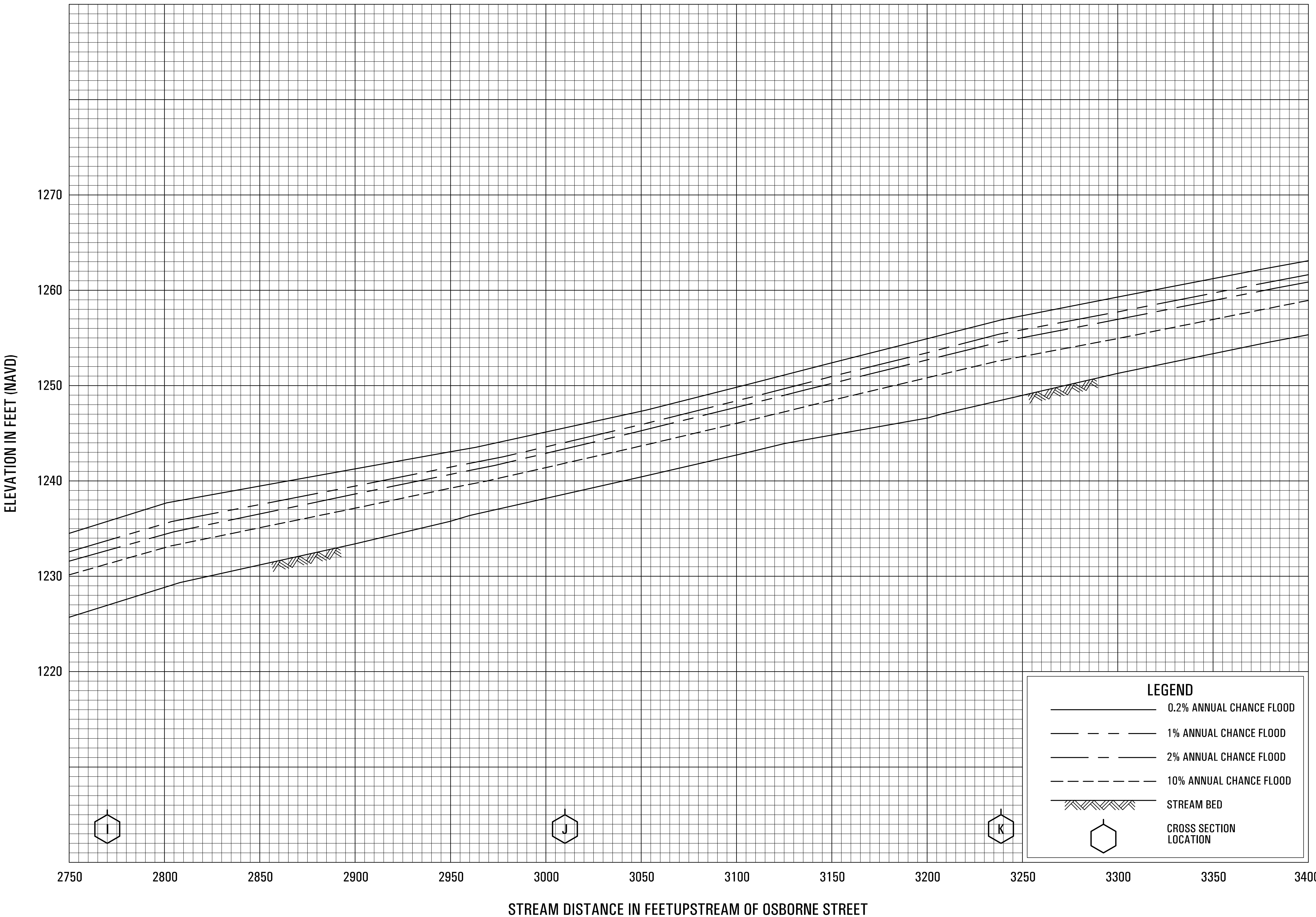
FLOOD PROFILES

KAGEL CANYON

FEDERAL EMERGENCY MANAGEMENT AGENCY

LOS ANGELES COUNTY, CA

AND INCORPORATED AREAS



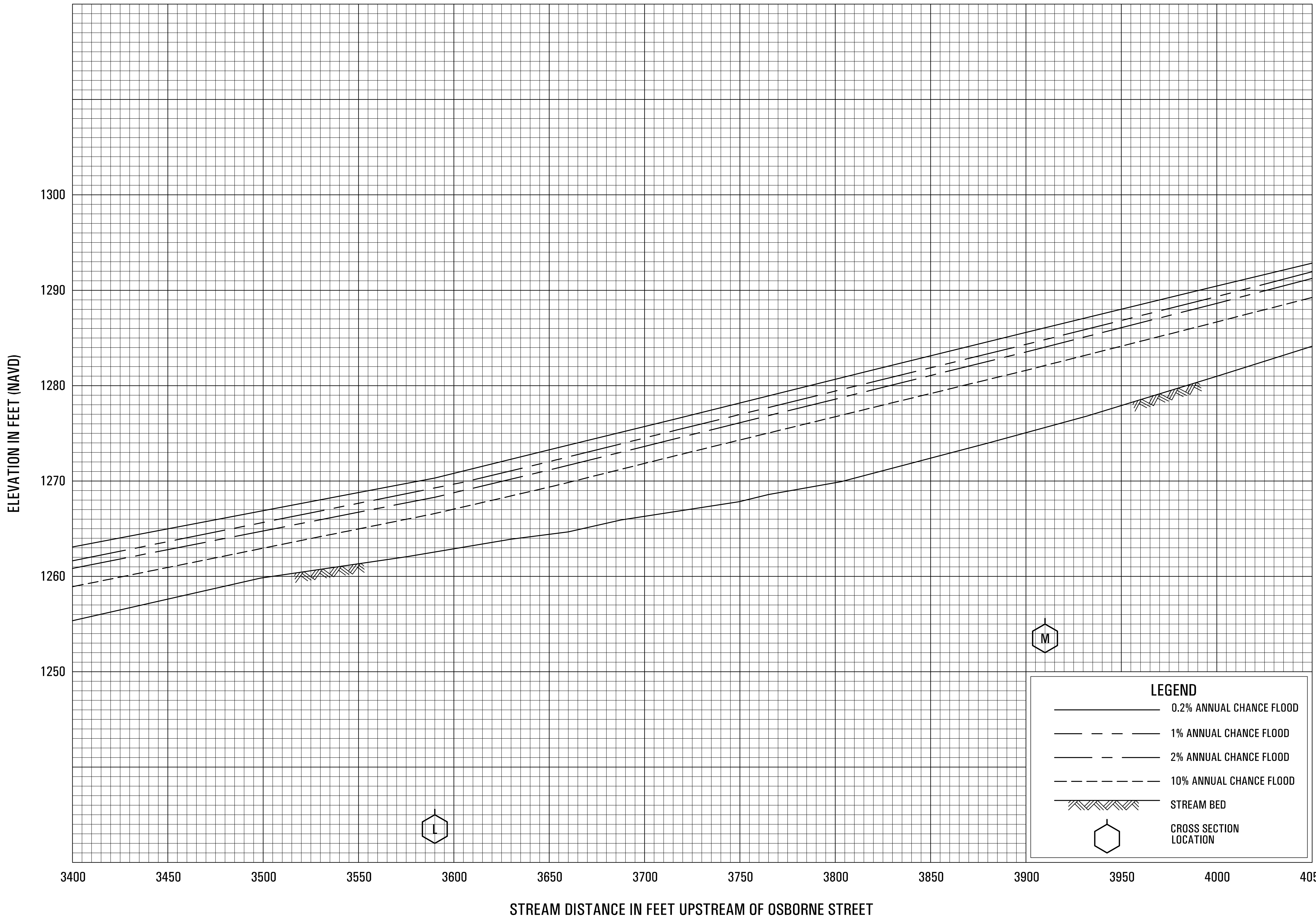
FLOOD PROFILES

KAGEL CANYON

FEDERAL EMERGENCY MANAGEMENT AGENCY

LOS ANGELES COUNTY, CA

AND INCORPORATED AREAS



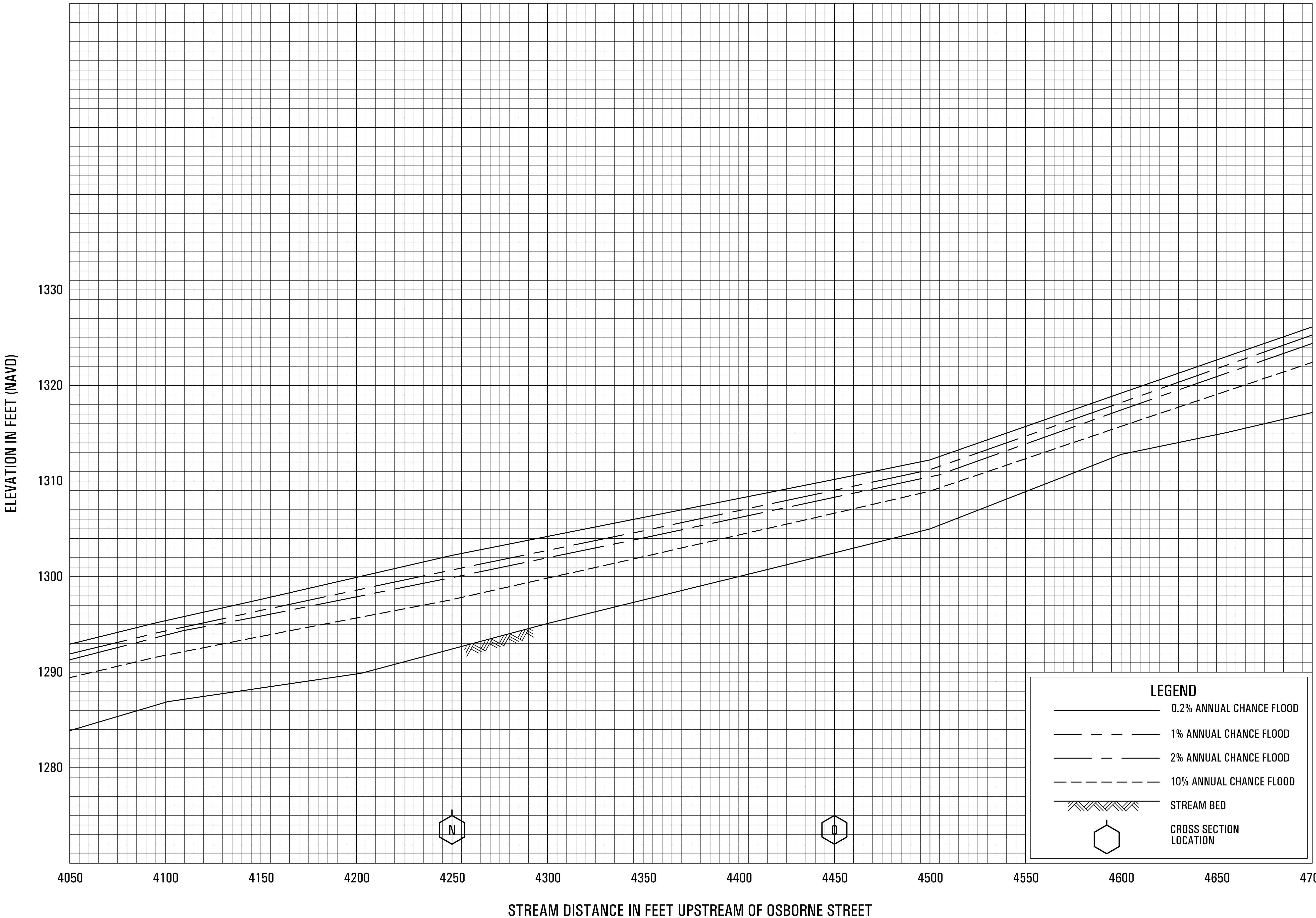
FLOOD PROFILES

KAGEL CANYON

FEDERAL EMERGENCY MANAGEMENT AGENCY

LOS ANGELES COUNTY, CA

AND INCORPORATED AREAS



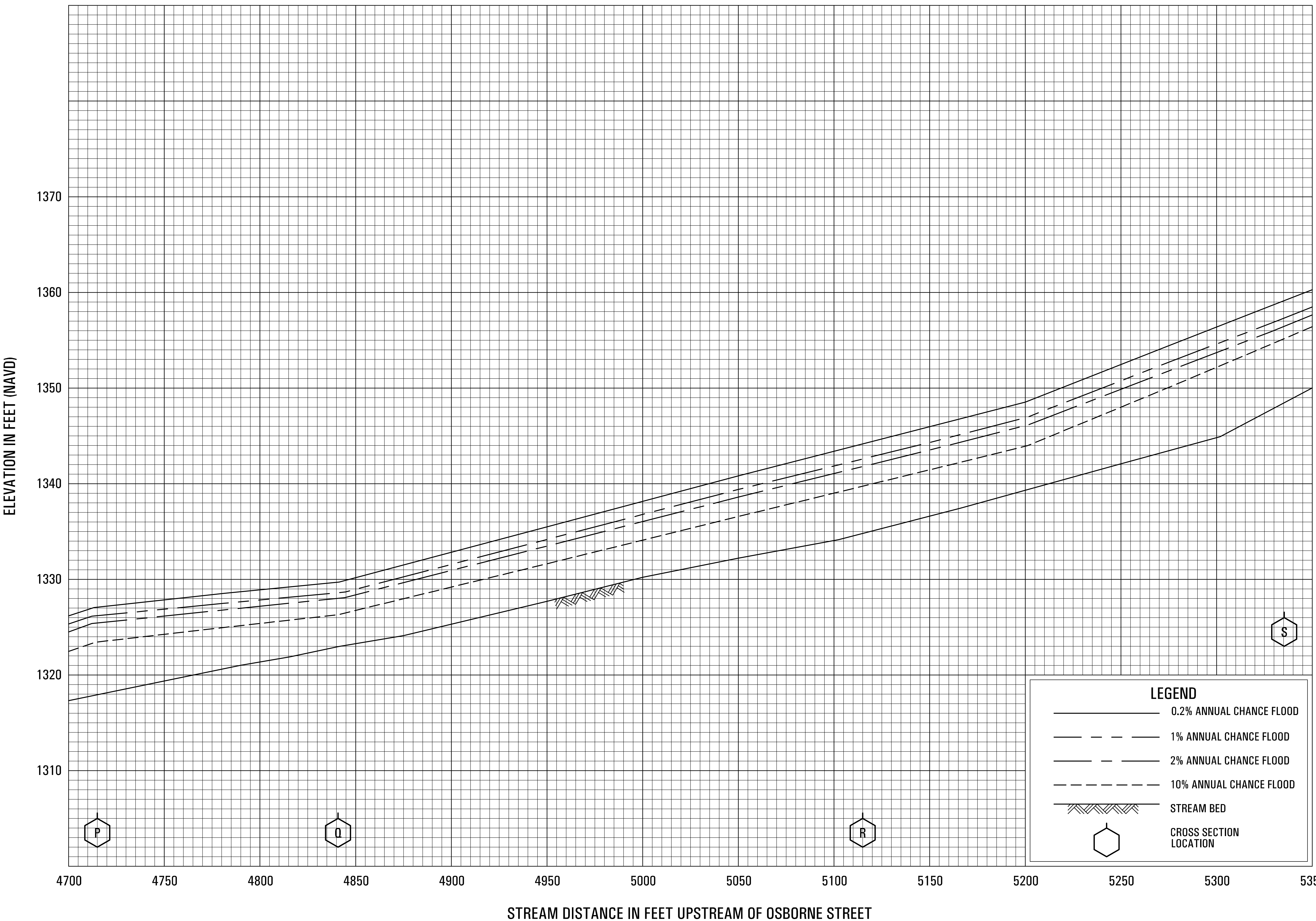
FLOOD PROFILES

KAGEL CANYON

FEDERAL EMERGENCY MANAGEMENT AGENCY

LOS ANGELES COUNTY, CA

AND INCORPORATED AREAS



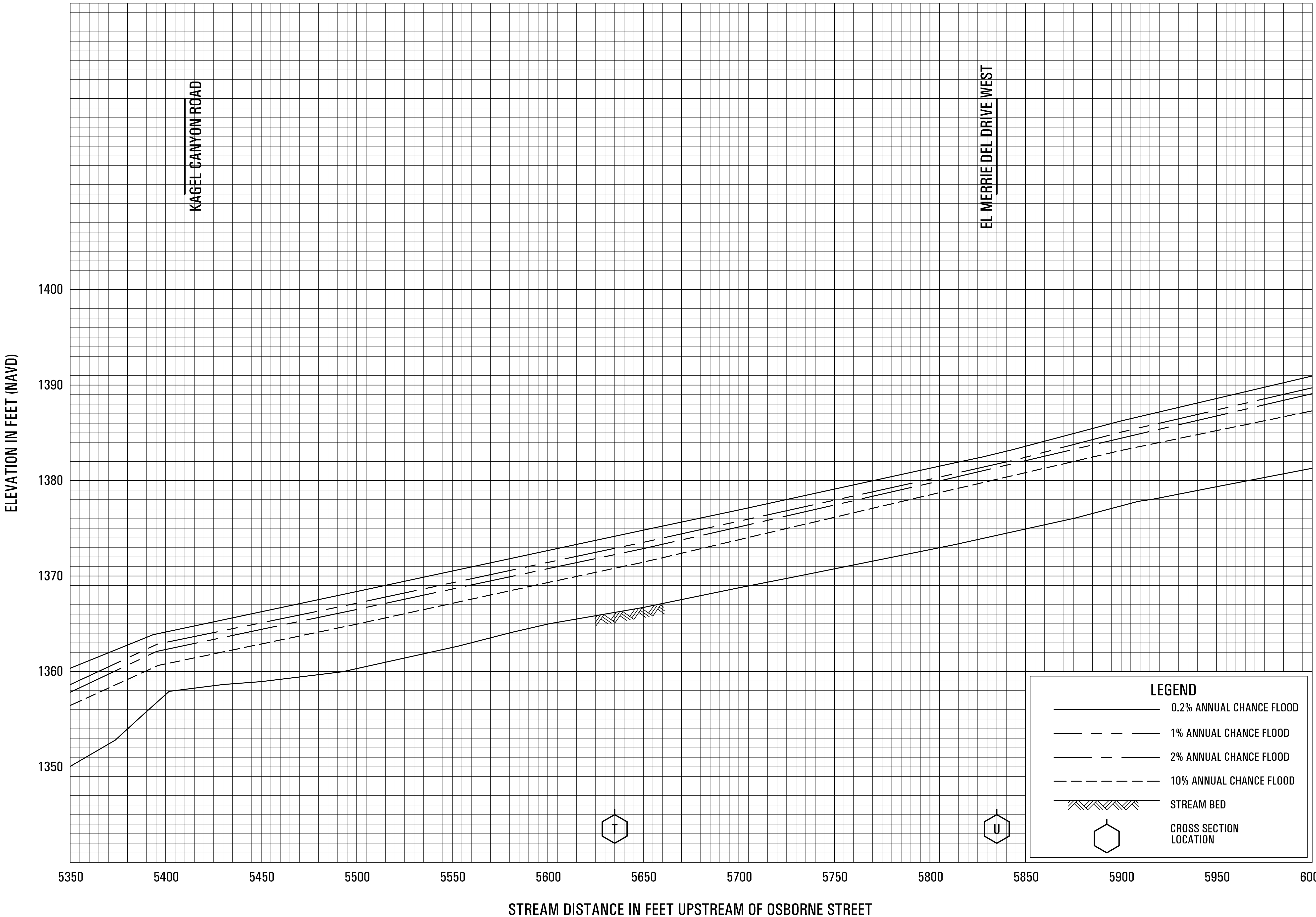
FLOOD PROFILES

KAGEL CANYON

FEDERAL EMERGENCY MANAGEMENT AGENCY

LOS ANGELES COUNTY, CA

AND INCORPORATED AREAS



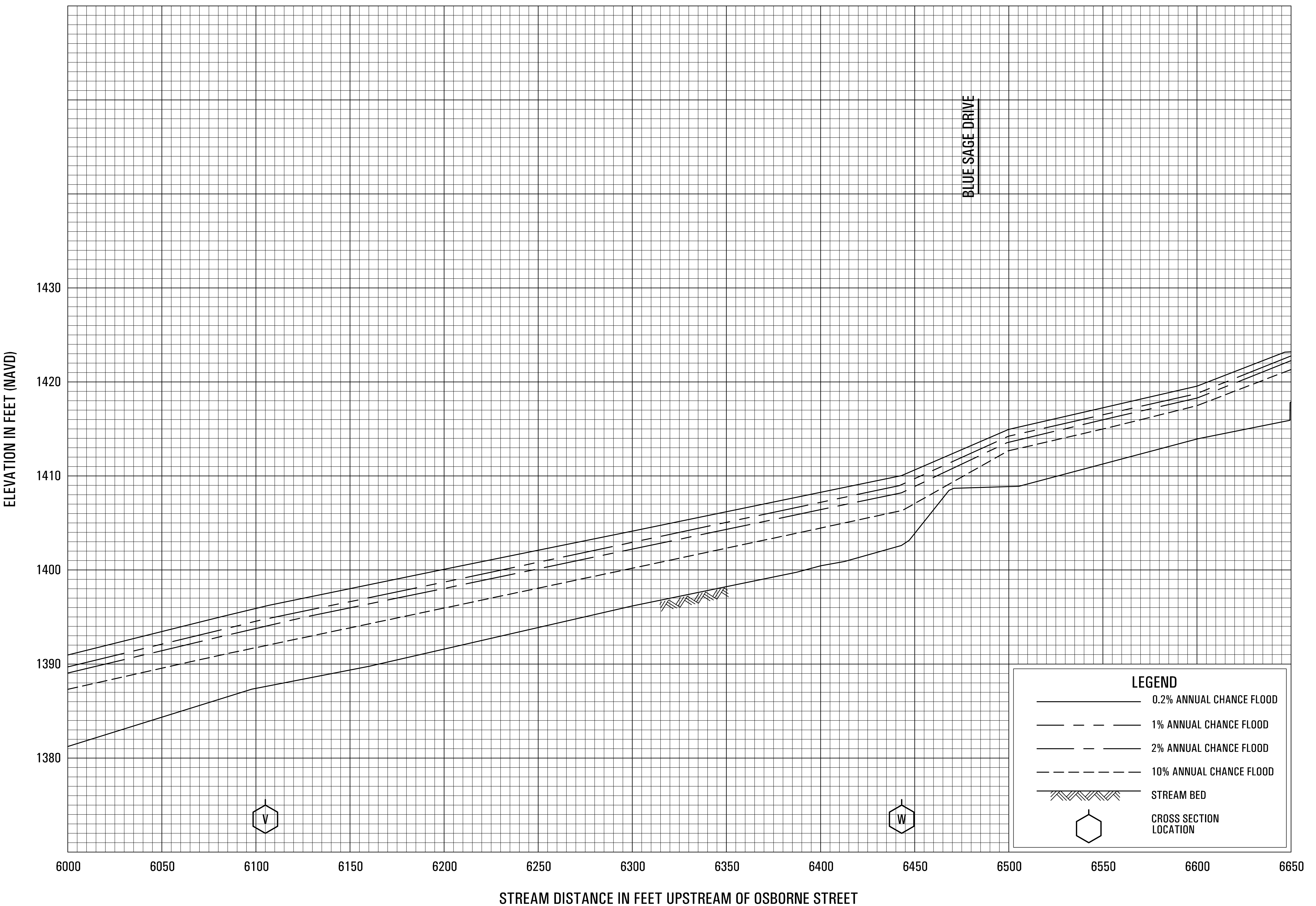
FLOOD PROFILES

KAGEL CANYON

FEDERAL EMERGENCY MANAGEMENT AGENCY

LOS ANGELES COUNTY, CA

AND INCORPORATED AREAS



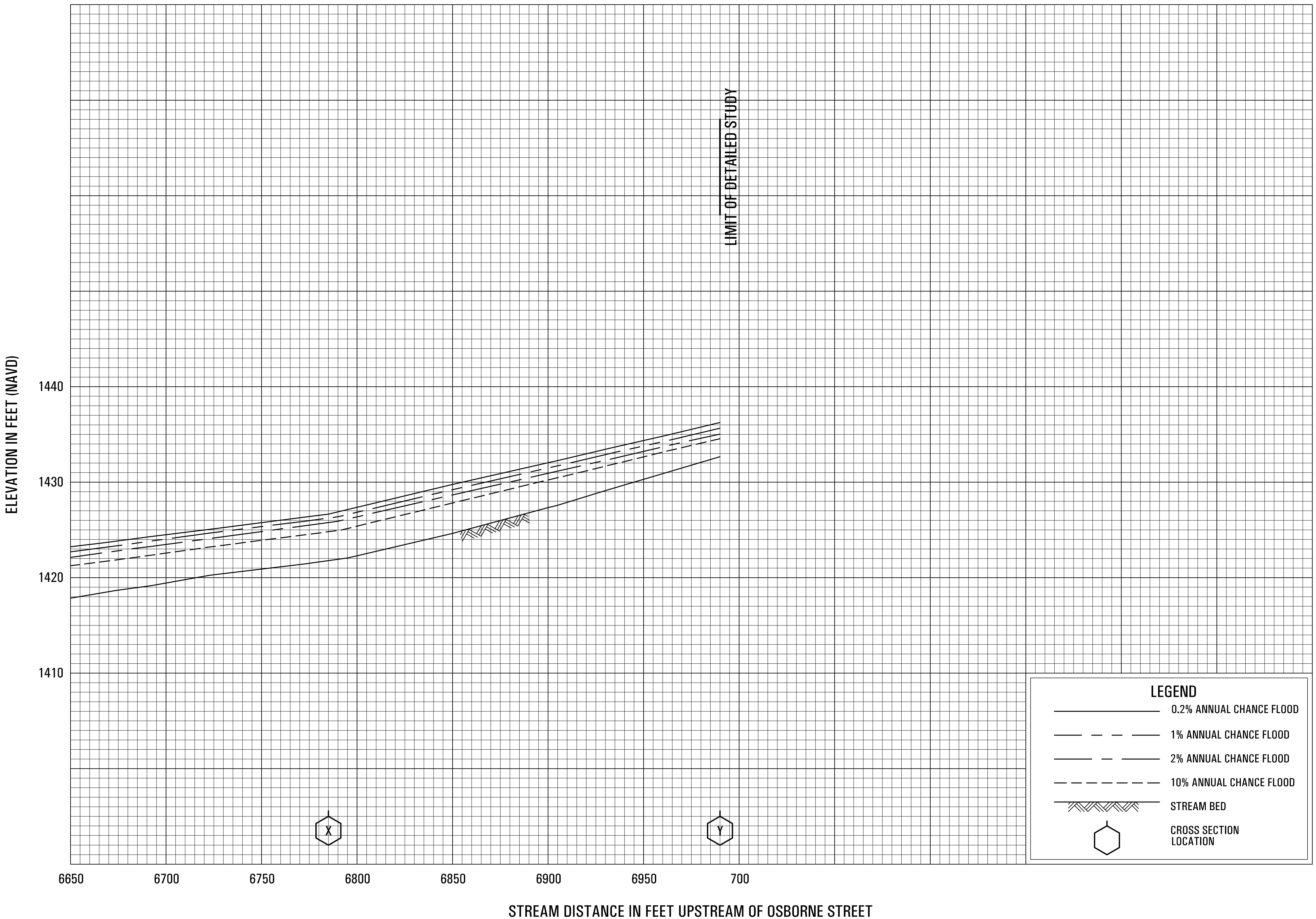
FLOOD PROFILES

KAGEL CANYON

FEDERAL EMERGENCY MANAGEMENT AGENCY

LOS ANGELES COUNTY, CA

AND INCORPORATED AREAS



FLOOD PROFILES

KAGEL CANYON

FEDERAL EMERGENCY MANAGEMENT AGENCY

LOS ANGELES COUNTY, CA

AND INCORPORATED AREAS

Appendix B –
Field Investigation Site Photographs and Notes

Kagel Canyon Flood Hazard Study

Field Investigation 8-4-2016

Looking upstream at Str. 1 (Osborne St)

Looking downstream at Str. 1 (Osborne St)

Looking upstream at Kagel Canyon channel from Str. 1 (Osborne St.)

Looking downstream at Kagel Canyon channel from Str. 1 (Osborne St.)

Kagel Canyon Flood Hazard Study

Field Investigation 8-4-2016

Looking at confluence with Little Tujunga Wash

Looking upstream at Kagel Canyon channel between Str. 1 and 2

Looking upstream at Str. 2

Looking downstream at Kagel Canyon channel from Str. 2

Kagel Canyon Flood Hazard Study

Field Investigation 8-4-2016

Looking upstream at Kagel Canyon channel from Str. 2

Looking upstream at Str. 3

Looking downstream at Kagel Canyon channel from Str. 3

Looking upstream at Kagel Canyon channel from Str. 3

Kagel Canyon Flood Hazard Study

Field Investigation 8-4-2016

Looking downstream at Str. 3

Looking downstream at Str. 4

Looking upstream at Str. 4

Looking upstream at Str. 5

Kagel Canyon Flood Hazard Study

Field Investigation 8-4-2016

Looking downstream at Kagel Canyon channel from Str. 6 (East Trl)

Looking upstream at Str. 6 (East Trl)

Looking upstream at Kagel Canyon channel and Str. 7 from Str. 6 (East Trl)

Looking downstream at Str. 6 (East Trl)

Kagel Canyon Flood Hazard Study

Field Investigation 8-4-2016

Looking upstream at Str. 7

Looking upstream at Str. 8

Looking upstream at Str. 9

Looking upstream at Str. 10

Kagel Canyon Flood Hazard Study

Field Investigation 8-4-2016

Looking downstream at Str. 10.5

Looking upstream at Kagel Canyon channel from Str. 10.5

Looking upstream at Str. 11 (Orchard Trl, low water crossing)

Looking upstream at Kagel Canyon channel from Str. 11 (Orchard Trl)

Kagel Canyon Flood Hazard Study

Field Investigation 8-4-2016

Looking downstream at Str. 11
(Orchard Trl, low water crossing)

Looking downstream at Str. 12

Looking upstream at Str. 12

Looking upstream at Kagel Canyon channel from Str. 12

Kagel Canyon Flood Hazard Study

Field Investigation 8-4-2016

Looking upstream at Kagel Canyon channel between Str. 12 and 13

Looking downstream at Str. 13

Looking upstream at Str. 13

Looking downstream at Kagel Canyon channel from Str. 13

Kagel Canyon Flood Hazard Study

Field Investigation 8-4-2016

Looking upstream at Kagel Canyon channel from Str. 13

Looking downstream at Str. 14

Looking downstream at Kagel Canyon channel from Str. 14

Looking upstream at Kagel Canyon channel from Str. 14

Kagel Canyon Flood Hazard Study

Field Investigation 8-4-2016

Looking upstream at Str. 15 (Blue Sage Dr, low water crossing)

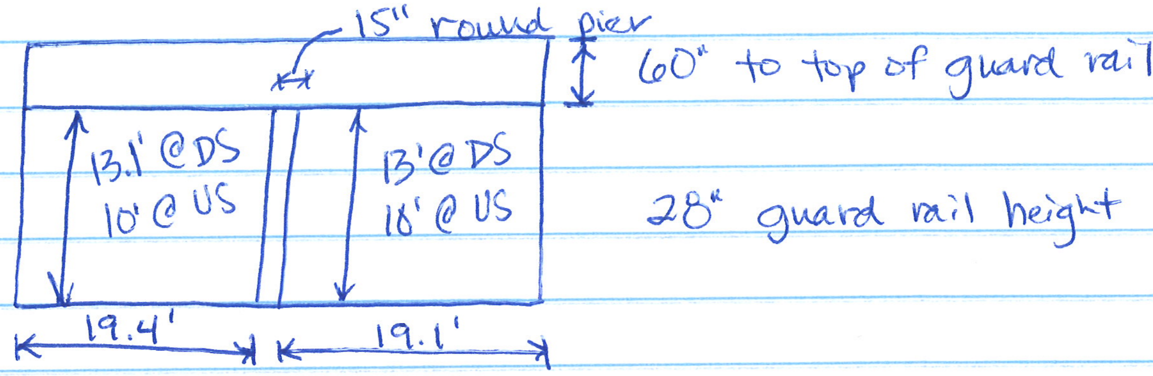
Looking downstream at Kagel Canyon channel from Str. 15 (Blue Sage Dr)

Looking upstream at Kagel Canyon channel from Str. 15 (Blue Sage Dr)

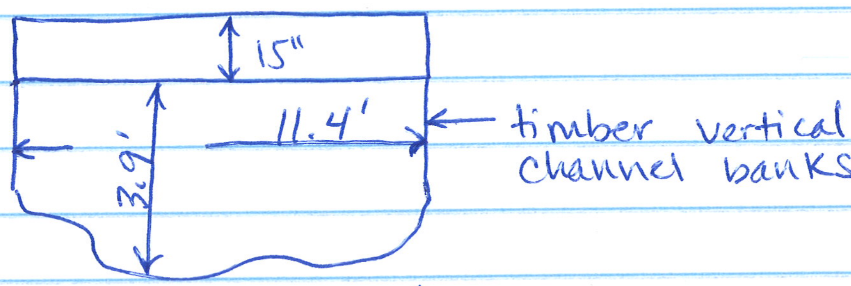
Looking at Str. 15 (Blue Sage Dr, low water crossing)

Kagel Canyon Field Investigation 8-4-16

Str. ① Double box @ Osborne St

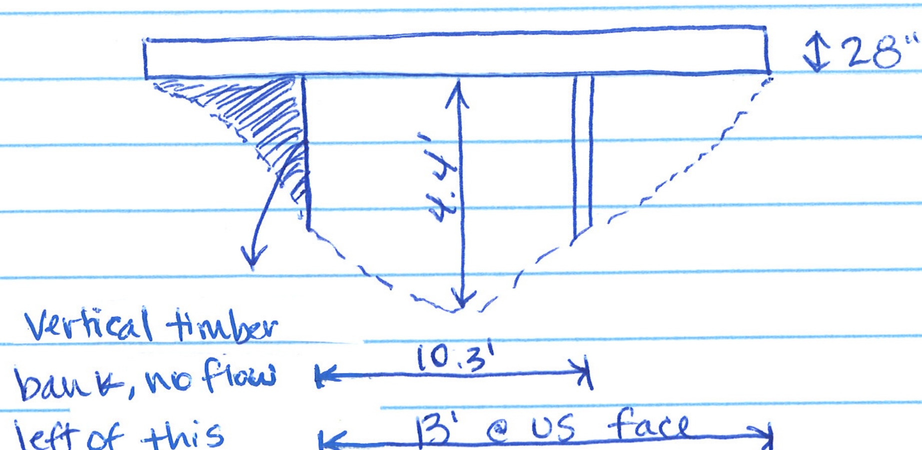


Str. ② Foot bridge

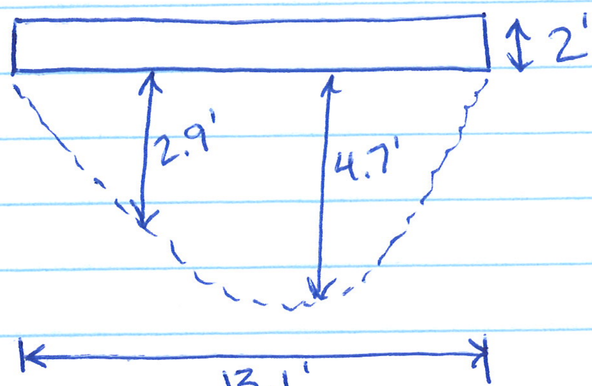


deck width = 5.5'

Str. ③ Horse facility bridge

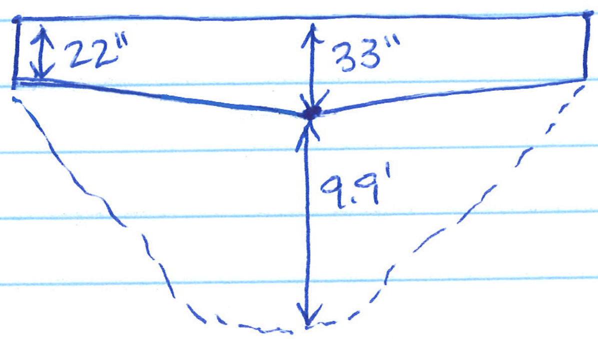


Str. (4) Foot | Horse bridge

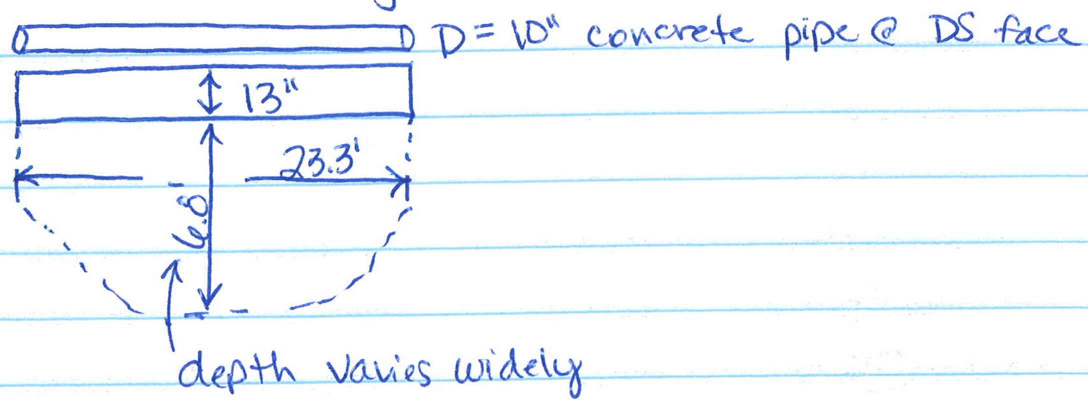


deck width = 12.5'

Str. (5) Foot bridge



Str. (6) East Trl Bridge



Str. (7) Foot bridge (no rail)

deck width = 3'

deck thickness = 1'

↑ similar section for Str. 7–10.5

Str. (8) Foot bridge (no rail)

deck width = 3'

deck thickness = 1'

Str. (9) Foot bridge

deck width = 3'

deck thickness = 1.5'

Str. (10) Foot bridge

deck width = 3'

deck thickness = 0.5'

Str. (10.5) Foot bridge

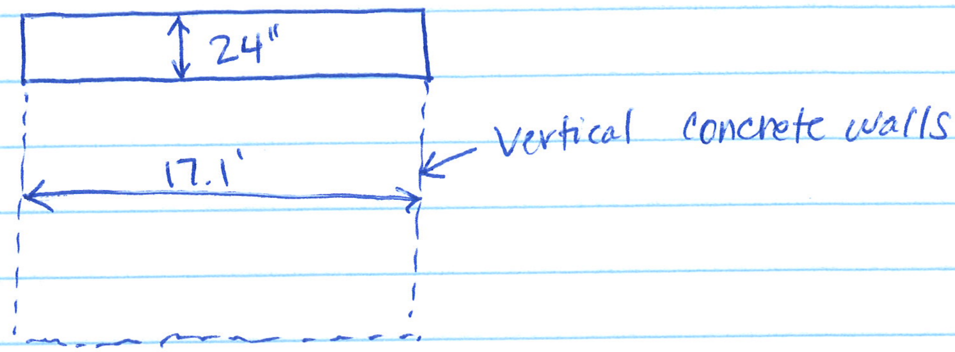
deck width = 3'

deck thickness = 1'

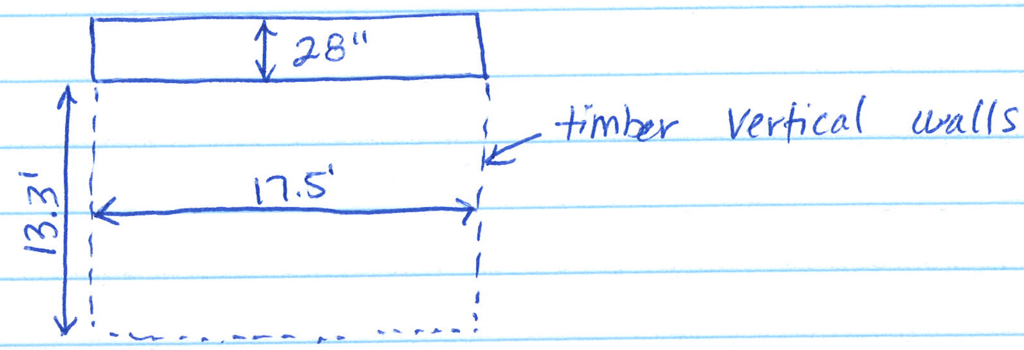
Str. (11) Low water crossing @ Orchard Trl

US grate inlet w/ 12" dia roadway culvert
fairly steep slope from road to DS channel

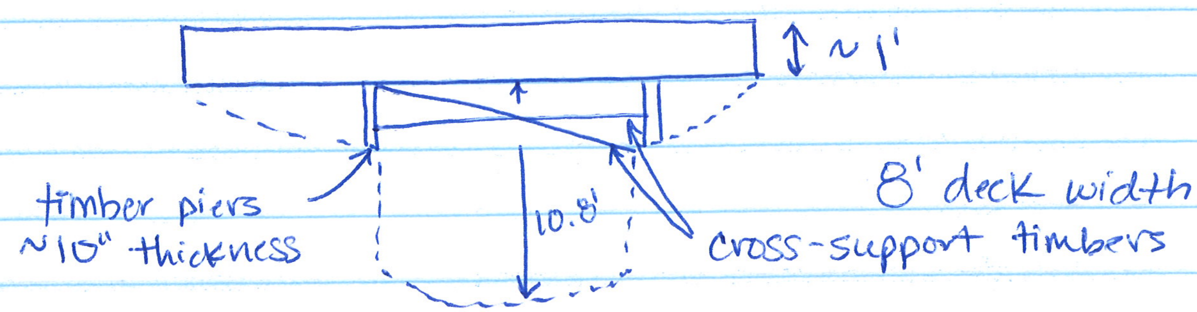
Str. (12) Bridge



Str. (13) Kagel Canyon Bridge



Str. (14) Foot bridge



Str. (15) low water crossing @ Blue Sage Dr.
(see pics)

Appendix C –
Kagel Canyon Flood Hazard Study Hydrologic Analysis (Developed by LACDPW)

KAGEL CANYON
FLOOD HAZARD STUDY
HYDROLOGIC ANALYSIS REPORT

Prepared By:

County of Los Angeles
Department of Public Works
Water Resources Division, Hydrology Section

June 2015

Table of Contents

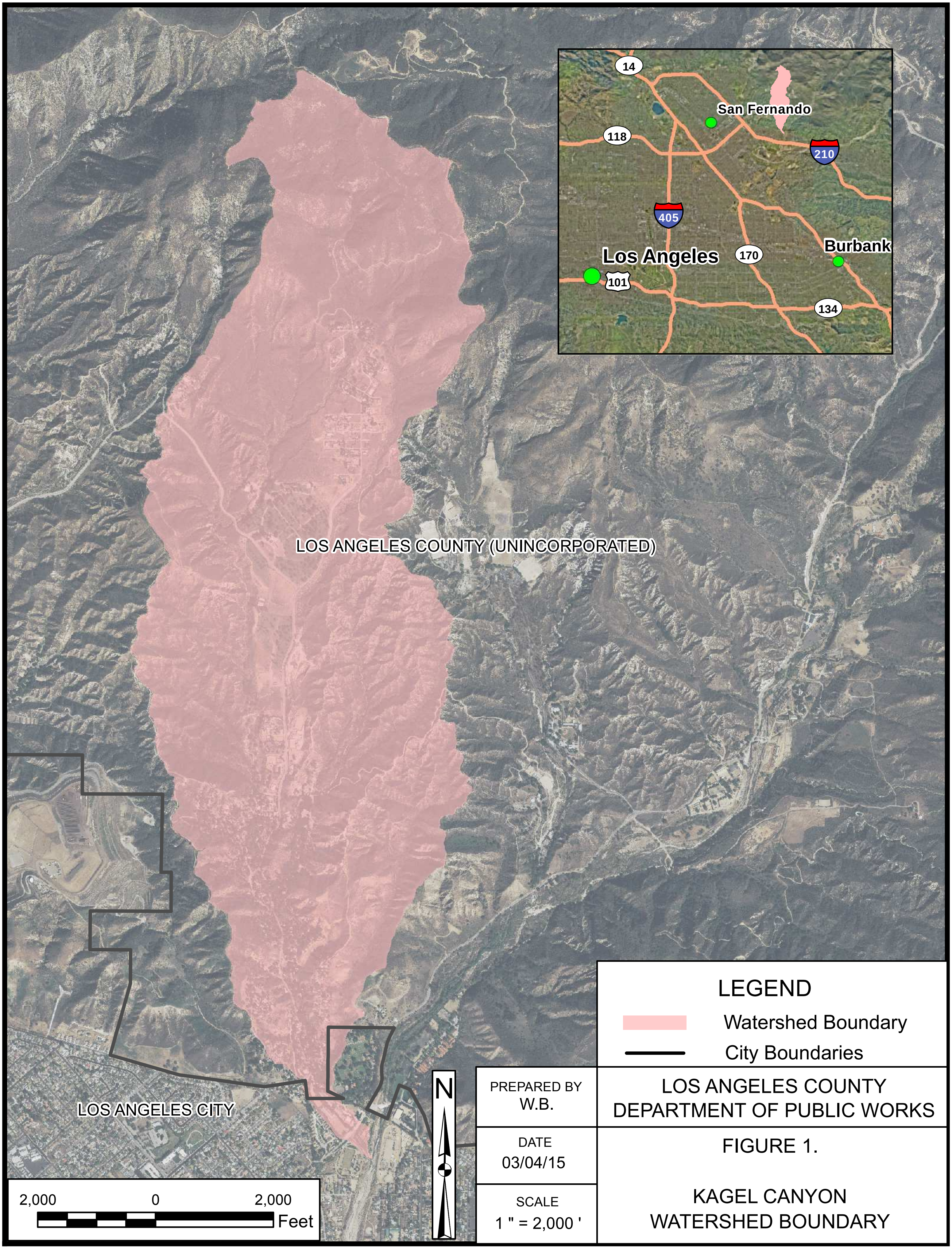
1. INTRODUCTION

1.1 Purpose

The purpose of this study is to develop a HEC-HMS model to simulate the 10-year, 50-year, 100-year, and 500-year floods for the Kagel Canyon watershed. These peak flowrates will be used to evaluate the flood hazard area boundary for flood insurance purposes and will be part of a Letter of Map Revision application processed by the Department of Public Works. This report summarizes the methodology and hydrologic modeling approach used and the simulation results.

1.2 Background

Kagel Canyon is located in the southwest part of Angeles National Forest east of San Fernando, just northeast of the intersection at Foothill Freeway (210) and the Ronald Reagan Freeway (118). Kagel Canyon is primarily an unincorporated community in Los Angeles County. The southern tip of the watershed is within the City of Los Angeles. Figure 1 shows the study's watershed location and boundary.



PREPARED BY
W.B.

LOS ANGELES COUNTY
DEPARTMENT OF PUBLIC WORKS

DATE
03/04/15

SCALE
1 " = 2,000 '

FIGURE 1.

KAGEL CANYON
WATERSHED BOUNDARY

2. HYDROLOGIC ANALYSIS

2.1 Watershed Area Characteristics

The Kagel Canyon watershed is approximately 2.31 square miles. The watershed is located within a rural area of the San Gabriel Mountains with some residential development. Kagel Canyon has an earthen-bottom channel that outlets to Little Tujunga Creek. The watershed has an elevation range from 3,380 feet to 1,120 feet.

2.2 Previous Study

The original flood hazard mapping for the Kagel Canyon watershed was performed by the Los Angeles County Flood Control District (LACFCD) for FEMA, under Contract No. 27696. The LACFCD performed the hydrologic analysis to establish the peak discharge-frequency relationships for the flooding sources affecting the Los Angeles basin. Peak flow rates were computed using the Regional Runoff Frequency Equations developed by the LACFCD. These regional runoff frequency equations were developed through the multiple-linear regression analysis of the peak flow data of 48 gaging stations in Los Angeles County (FEMA 2008).

Peak discharges for Kagel Canyon are presented in the 2008 FEMA report and summarized in Table 1 below.

Table 1. Peak Discharges for Kagel Canyon (2008 FEMA).

Flooding Source and Location	Drainage Area (sq. mi.)	Peak Discharges (cfs)			
		10-yr	50-yr	100-yr	500-yr
Kagel Canyon Channel (Cross Section A)	2.04	490	1,081	1,380	2,159

2.3 Current Study Method

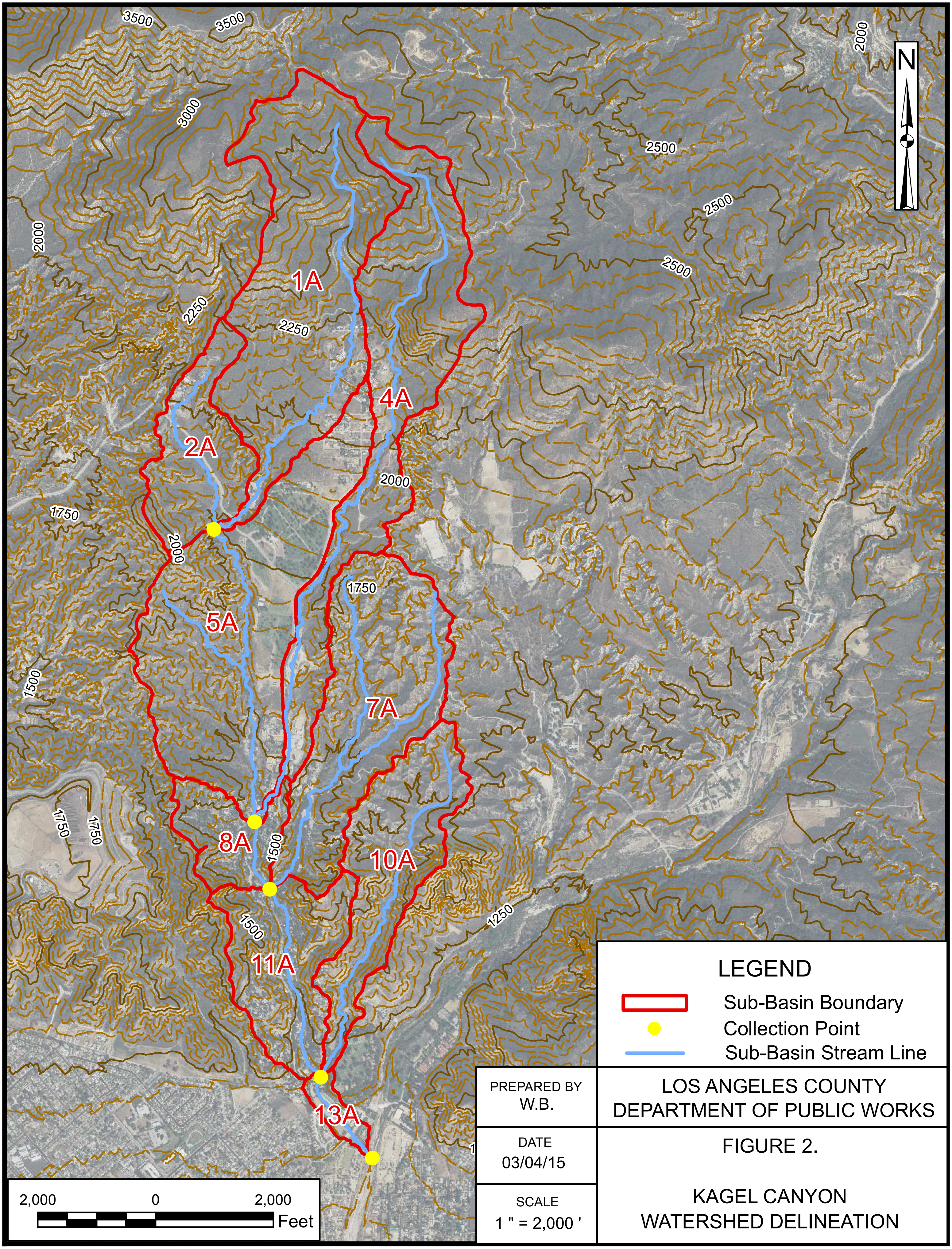
The hydrologic analysis prepared for the current study was developed using the U.S. Army Corps of Engineers (USACE) HEC-HMS, version 4.0. The hydrologic methods and procedures used in the hydrologic analysis are summarized in the following sections.

2.4 Watershed Delineation

ArcGIS along with LiDAR 2-ft interval contours from 2006 were used to delineate the watershed into nine sub-basins as shown in Figure 2. The flow lengths and elevations for each sub-basin were also determined using ArcGIS.

The geographic information system (GIS) tools of WMS were utilized to compute areas, impervious values, and rainfall depths for each sub-basin. These watershed parameters were inputted into HEC-HMS.

The study watershed was divided into several sub-basins and concentration points based on the necessity for developing flow rates for the hydraulic modeling and analysis. A HEC-HMS model schematic diagram showing the sub-basins, reaches, and concentration points is presented in Figure 3.



LEGEND

Sub-Basin Boundary

Collection Point

Sub-Basin Stream Line

PREPARED BY W.B.	LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS
DATE 03/04/15	FIGURE 2.
SCALE 1 " = 2,000 '	KAGEL CANYON WATERSHED DELINEATION

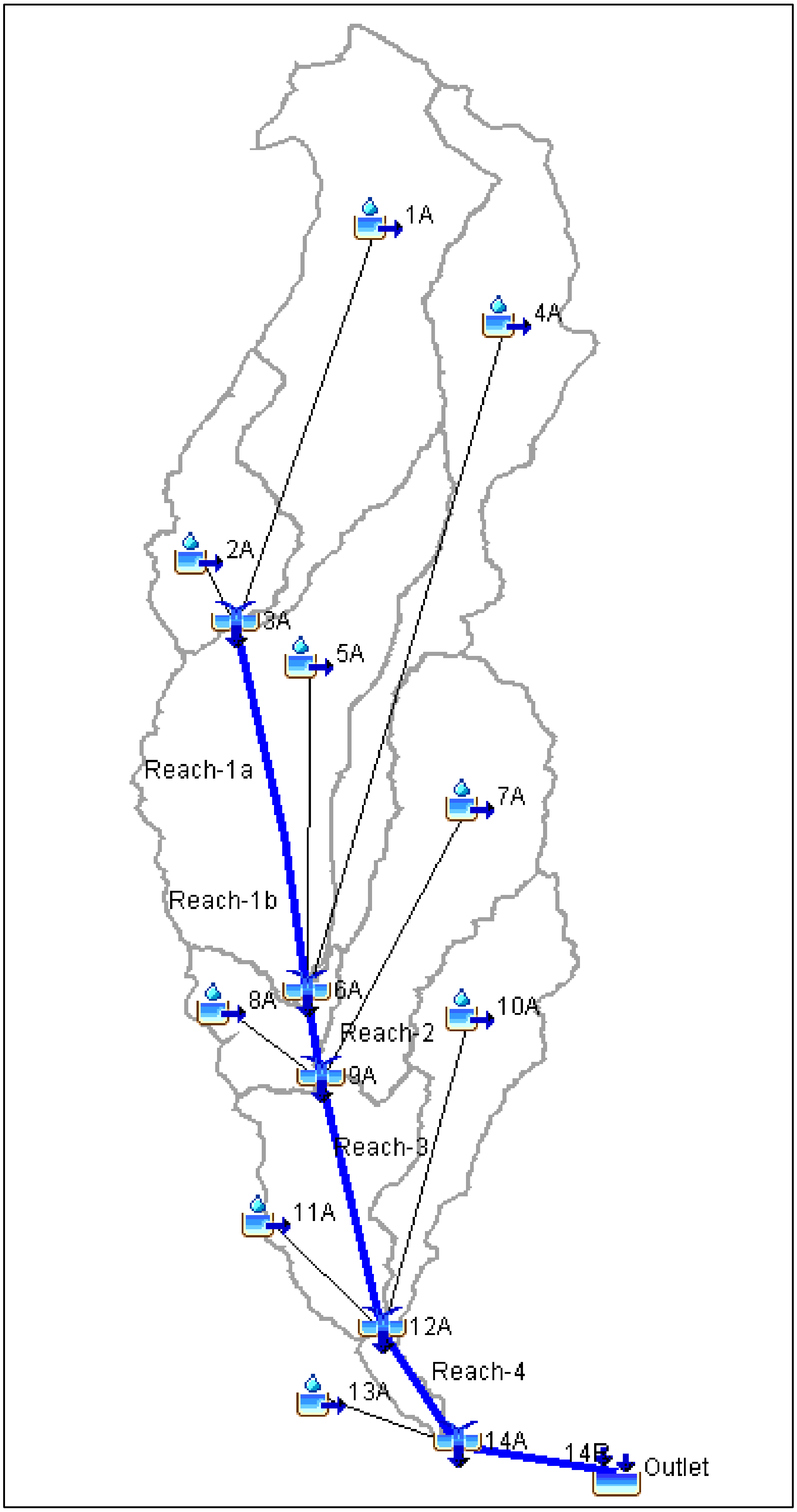


Figure 3. HEC-HMS Model Schematic.

2.5 Land Use

The study watershed area consisted of mainly undeveloped land and a small portion of residential land, verified by Google Map 2015 aerial imagery. The percent impervious value of each sub-basin was determined from land use information data compiled by the Southern California Association of Governments (SCAG) dated 2005. The area-weighted percent imperviousness of each sub-basin is listed in Table 2. A map showing the various land use types within the study area is provided in Figure 4.

Table 2. Kagel Canyon Sub-basin Imperviousness.

Basin ID	Area (ac.)	Area (sq. mi.)	Impervious (%)
1A	297	0.465	1.5
2A	97	0.152	7.12
4A	248	0.388	2.86
5A	302	0.473	5.26
7A	207	0.324	2.7
8A	57	0.088	22.24
10A	137	0.214	2.46
11A	118	0.184	21.18
13A	15	0.024	31.97

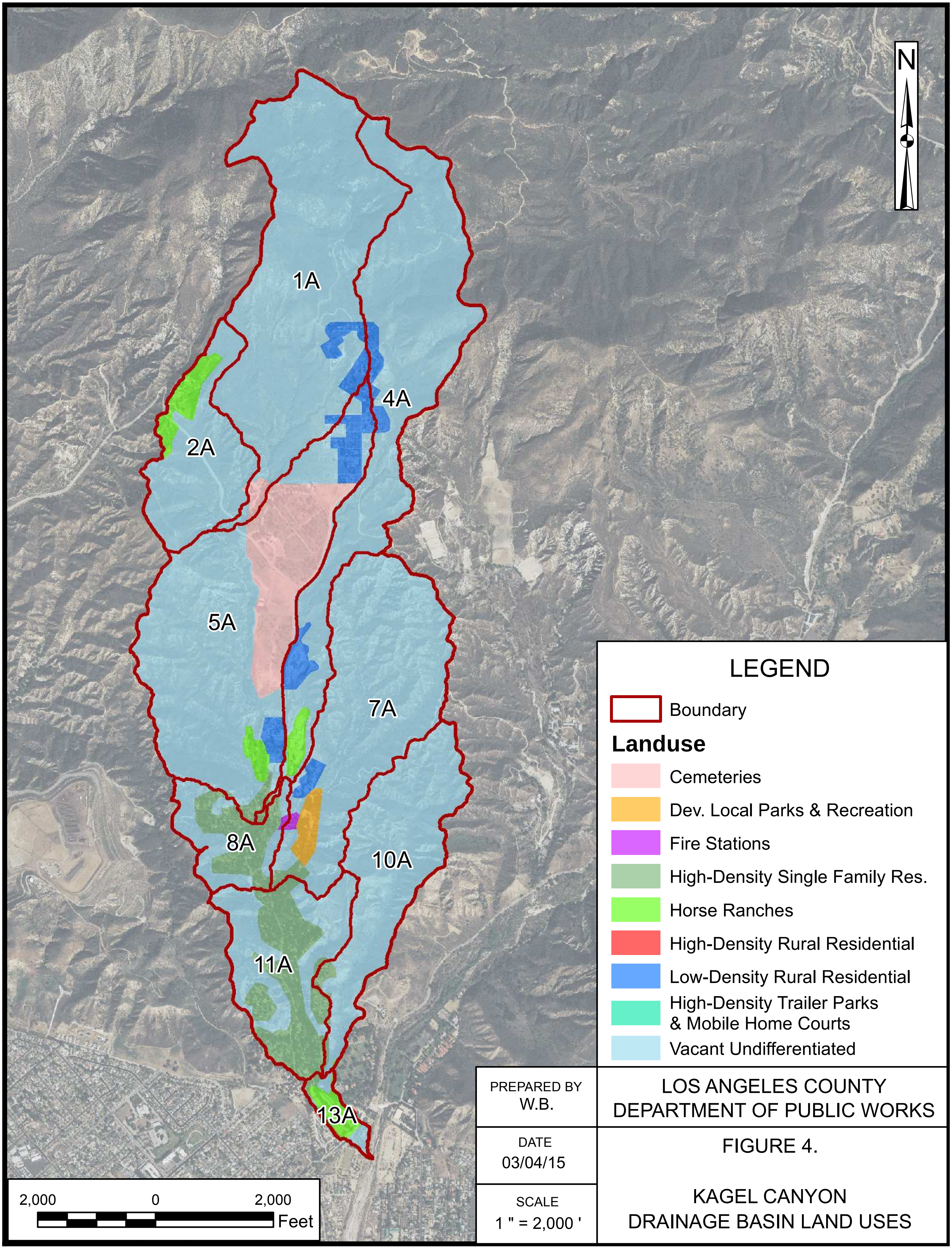


FIGURE 4.

KAGEL CANYON DRAINAGE BASIN LAND USES

2.6 Precipitation

Rainfall isohyetal maps published in the 2006 Los Angeles County Hydrology Manual were used to obtain precipitation values. The 50-year, 24-hour rainfall isohyetal map from LACDPW was used to determine the storm rainfall amount for the sub-basins. Figure 5 shows the 50-year, 24-hour rainfall isohyets within the study limits. Rainfall frequency multiplication factors of 0.714, 1.122, and 1.402 from the 2006 Los Angeles County Hydrology Manual were used to convert the 50-year, 24-hour rainfall depth values to 10-year, 100-year, and 500-year frequency depths, respectively. The partial duration rainfall depth values were computed using Equation 5.1.2 from the 2006 Hydrology Manual,

$$\frac{I_t}{I_{1440}} = \left(\frac{1440}{t}\right)^{0.47}$$

Where:

t = duration in minutes

I_t = rainfall intensity for the duration in inch/hour

I_{1440} = 24-hour rainfall intensity in inch/hour

Sub-basin rainfall depths for each frequency and duration are summarized in Table 3 through Table 6.

Table 3. Kagel Canyon – 10-Year Frequency Rainfall Depths (in).

Basin ID	Duration							
	5-min	15-min	60-min	2-hour	3-hour	6-hour	12-hour	24-hour
1A	0.24	0.44	0.91	1.32	1.63	2.36	3.41	4.92
2A	0.24	0.43	0.90	1.30	1.61	2.33	3.36	4.85
4A	0.24	0.43	0.89	1.29	1.59	2.30	3.32	4.80
5A	0.23	0.42	0.88	1.26	1.57	2.26	3.27	4.72
7A	0.23	0.41	0.86	1.24	1.53	2.21	3.19	4.61
8A	0.23	0.40	0.84	1.22	1.51	2.18	3.15	4.55
10A	0.22	0.40	0.84	1.21	1.49	2.16	3.12	4.50
11A	0.22	0.40	0.83	1.20	1.49	2.15	3.11	4.49
13A	0.22	0.40	0.83	1.20	1.49	2.15	3.11	4.49

Table 4. Kagel Canyon – 50-Year Frequency Rainfall Depths (in).

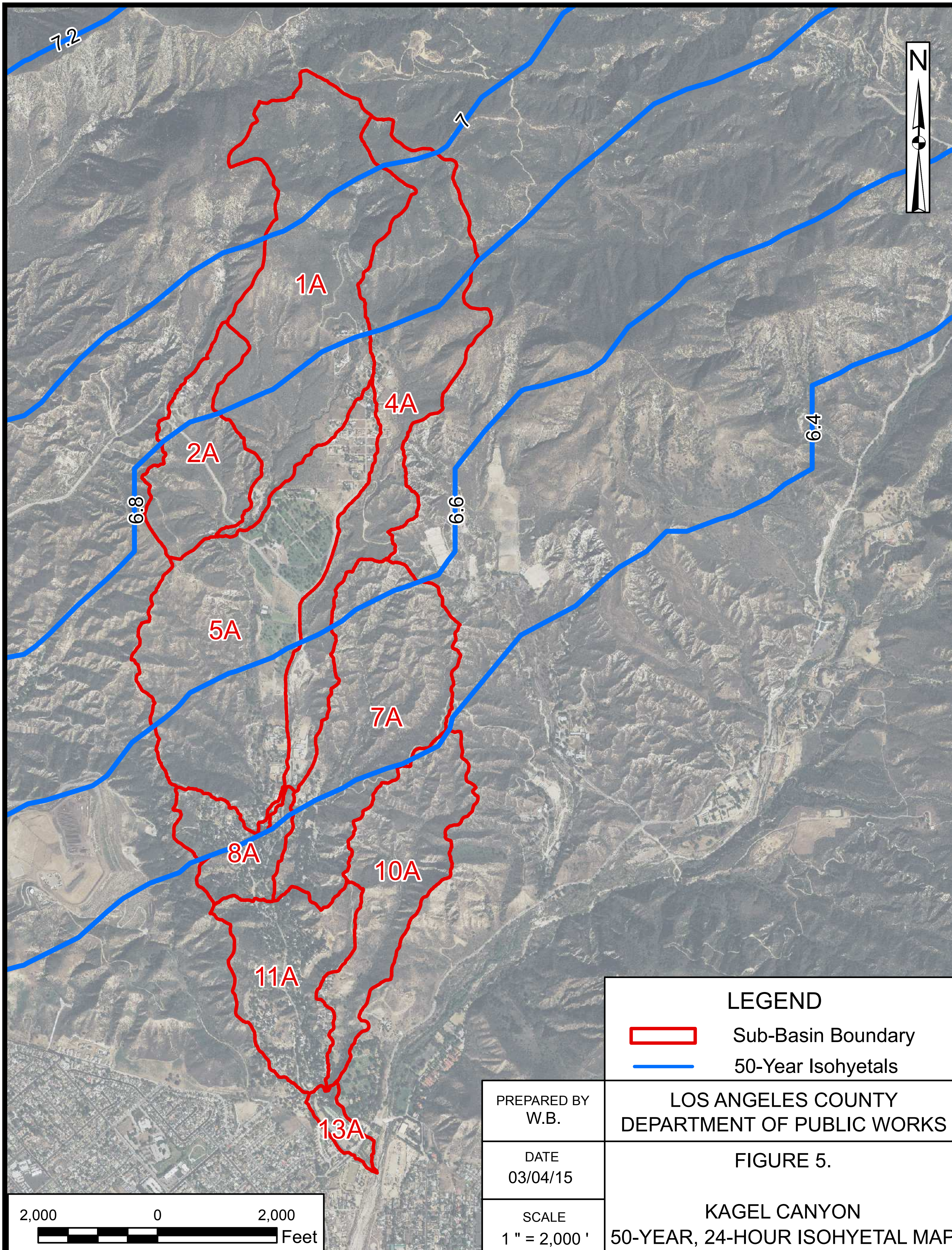
Basin ID	Duration							
	5-min	15-min	60-min	2-hour	3-hour	6-hour	12-hour	24-hour
1A	0.34	0.61	1.28	1.84	2.29	3.30	4.76	6.88
2A	0.34	0.60	1.26	1.82	2.25	3.25	4.70	6.78
4A	0.33	0.60	1.25	1.80	2.23	3.22	4.65	6.72
5A	0.33	0.59	1.23	1.77	2.20	3.17	4.58	6.61
7A	0.32	0.57	1.20	1.73	2.14	3.09	4.47	6.45
8A	0.32	0.57	1.18	1.71	2.12	3.06	4.42	6.38
10A	0.31	0.56	1.17	1.69	2.10	3.03	4.37	6.31
11A	0.31	0.56	1.17	1.69	2.09	3.02	4.36	6.29
13A	0.31	0.56	1.17	1.69	2.09	3.02	4.36	6.29

Table 5. Kagel Canyon – 100-Year Frequency Rainfall Depths (in).

Basin ID	Duration							
	5-min	15-min	60-min	2-hour	3-hour	6-hour	12-hour	24-hour
1A	0.38	0.69	1.43	2.07	2.56	3.70	5.35	7.72
2A	0.38	0.68	1.41	2.04	2.53	3.65	5.27	7.61
4A	0.37	0.67	1.40	2.02	2.50	3.62	5.22	7.54
5A	0.37	0.66	1.38	1.99	2.46	3.56	5.14	7.42
7A	0.36	0.64	1.34	1.94	2.40	3.47	5.01	7.24
8A	0.36	0.64	1.33	1.92	2.38	3.43	4.95	7.15
10A	0.35	0.63	1.31	1.90	2.35	3.40	4.90	7.08
11A	0.35	0.63	1.31	1.89	2.35	3.39	4.89	7.06
13A	0.35	0.63	1.31	1.89	2.34	3.38	4.88	7.05

Table 6. Kagel Canyon – 500-Year Frequency Rainfall Depths (in).

Basin ID	Duration							
	5-min	15-min	60-min	2-hour	3-hour	6-hour	12-hour	24-hour
1A	0.48	0.86	1.79	2.59	3.21	4.63	6.68	9.65
2A	0.47	0.85	1.76	2.55	3.16	4.56	6.59	9.51
4A	0.47	0.84	1.75	2.52	3.13	4.52	6.52	9.42
5A	0.46	0.83	1.72	2.48	3.08	4.45	6.42	9.27
7A	0.45	0.81	1.68	2.42	3.01	4.34	6.27	9.05
8A	0.44	0.80	1.66	2.40	2.97	4.29	6.19	8.94
10A	0.44	0.79	1.64	2.37	2.94	4.24	6.12	8.84
11A	0.44	0.78	1.63	2.36	2.93	4.23	6.10	8.81
13A	0.44	0.78	1.63	2.36	2.93	4.23	6.10	8.81



PREPARED BY
W.B.

LOS ANGELES COUNTY
DEPARTMENT OF PUBLIC WORKS

DATE
03/04/15

FIGURE 5.

KAGEL CANYON
50-YEAR, 24-HOUR ISOHYETAL MAP

SCALE
1 " = 2,000 '

2.7 Design Storm

The HEC-HMS frequency storm option with peak intensity occurring at 50 percent of the storm duration was used in conjunction with partial duration rainfall depths for each sub-basin (Table 3 through Table 6). The 100-year temporal distribution is graphically presented in Figure 6.

.

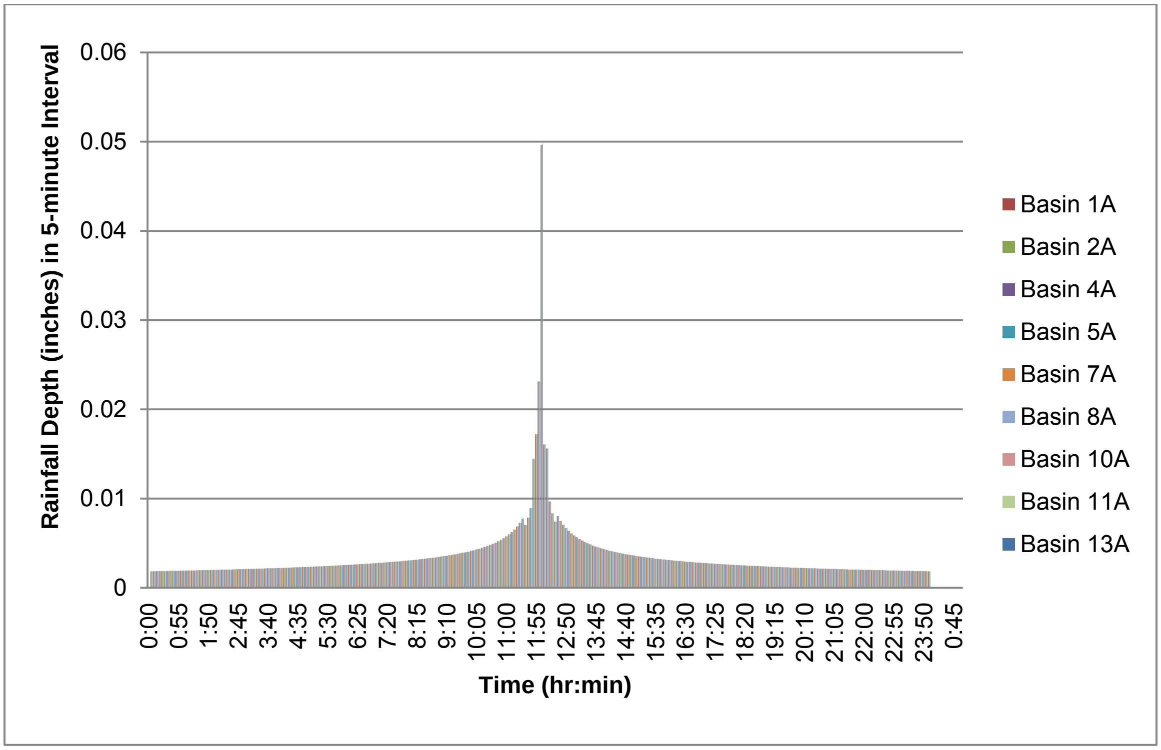


Figure 6. HEC-HMS Frequency Storm Temporal Distribution.

2.8 Transform Function

The surface runoff calculations were computed using the summation unit hydrograph (S-graph) method. The S-graph represents the response of a sub-basin to a unit of precipitation. The mountain S-graph established by the USACE Los Angeles District is used in this study (Figure 7).

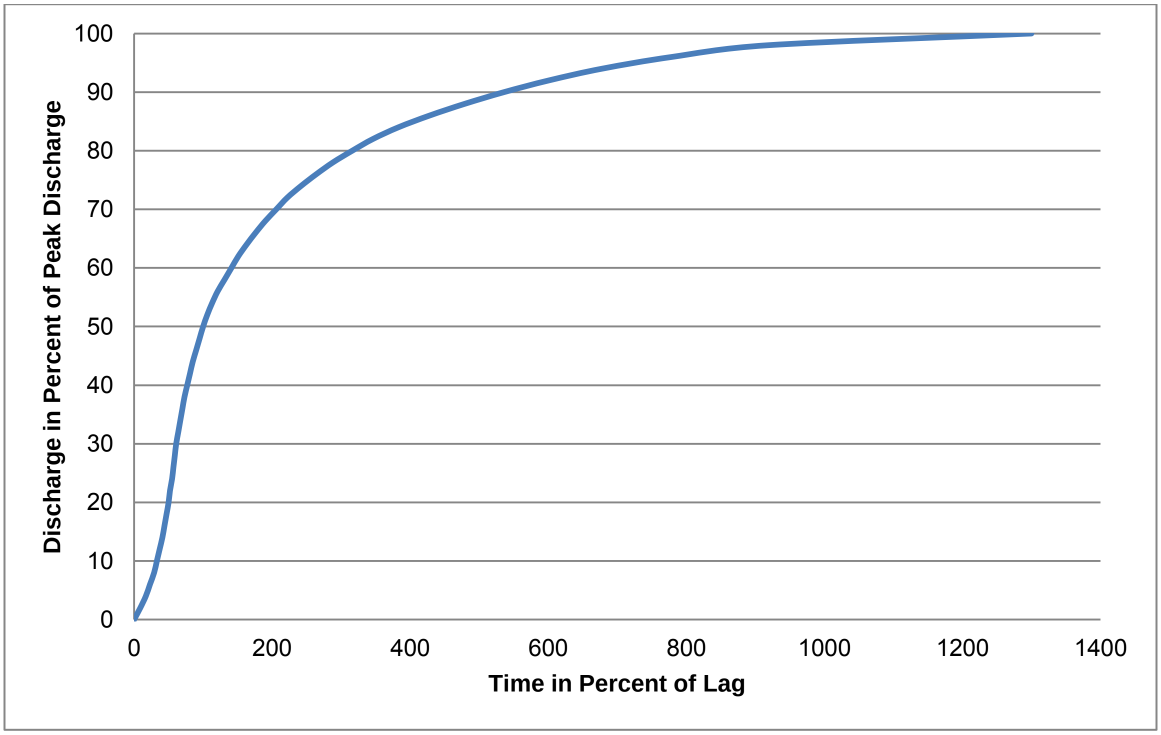


Figure 7. Mountain S-Graph.

2.9 Watershed Lag Time

The watershed lag time is defined as the time from the centroid of precipitation mass to the resulting hydrograph peak flow. The S-graph uses this parameter to transform the rainfall to runoff. The following equation from the USACE Los Angeles District (1962) was used to develop the sub-basins lag times:

$$L_t = 24 \times \bar{n} \times \left[\frac{L \times L_c}{\sqrt{s}}\right]^{0.38}$$

Where:

L_t = lag time in hours
$\bar{n}$ = basin roughness coefficient
L = longest watercourse length in miles
L_c = longest watercourse length, measured from the outlet upstream to a point opposite the drainage area centroid in miles
S = longest watercourse average slope in feet/mile

A basin roughness coefficient of 0.06 was used in the Kagel Canyon drainage area. This value was selected based on the roughness coefficient for rural surface cover provided in Table 7.3.1 from the 2006 Hydrology Manual. The watershed lag times for the sub-basins computed using the USACE lag equation are provided in Table 7.

Table 7. Kagel Canyon Sub-basin Lag Time.

Basin ID	Area (sq. mi.)	$\bar{n}$	L (mi)	L_c (mi)	S (ft/mi)	L_t (hr)
1A	0.465	0.06	1.99	1.22	827.86	**0.56**
2A	0.152	0.06	0.87	0.31	657.17	**0.26**
4A	0.388	0.06	2.87	1.68	638.65	**0.77**
5A	0.473	0.06	1.59	0.66	461.30	**0.46**
7A	0.324	0.06	1.43	0.75	389.09	**0.48**
8A	0.088	0.06	0.54	0.25	596.66	**0.20**
10A	0.214	0.06	1.45	0.86	361.59	**0.51**
11A	0.184	0.06	0.81	0.41	579.63	**0.28**
13A	0.024	0.06	0.38	0.20	313.99	**0.18**

2.10 Loss Method

The initial loss and constant loss rate method in HEC-HMS was used for this study to simulate watershed losses. The initial loss specifies the amount of precipitation that falls on the watershed without producing runoff and the constant rate defines the infiltration rate that occurs after the initial loss is satisfied. These losses were determined based on the watershed's physical properties: soil, land use, and antecedent conditions. GIS shapefiles of soil types from the Natural Resources Conservation Service (NRCS) for the Angeles National Forest Area and Los Angeles County, West San Fernando Valley Area (NRCS 2004) were used in determining the hydrologic soil groups (A, B, C, or D) in the project area (Figure 8).

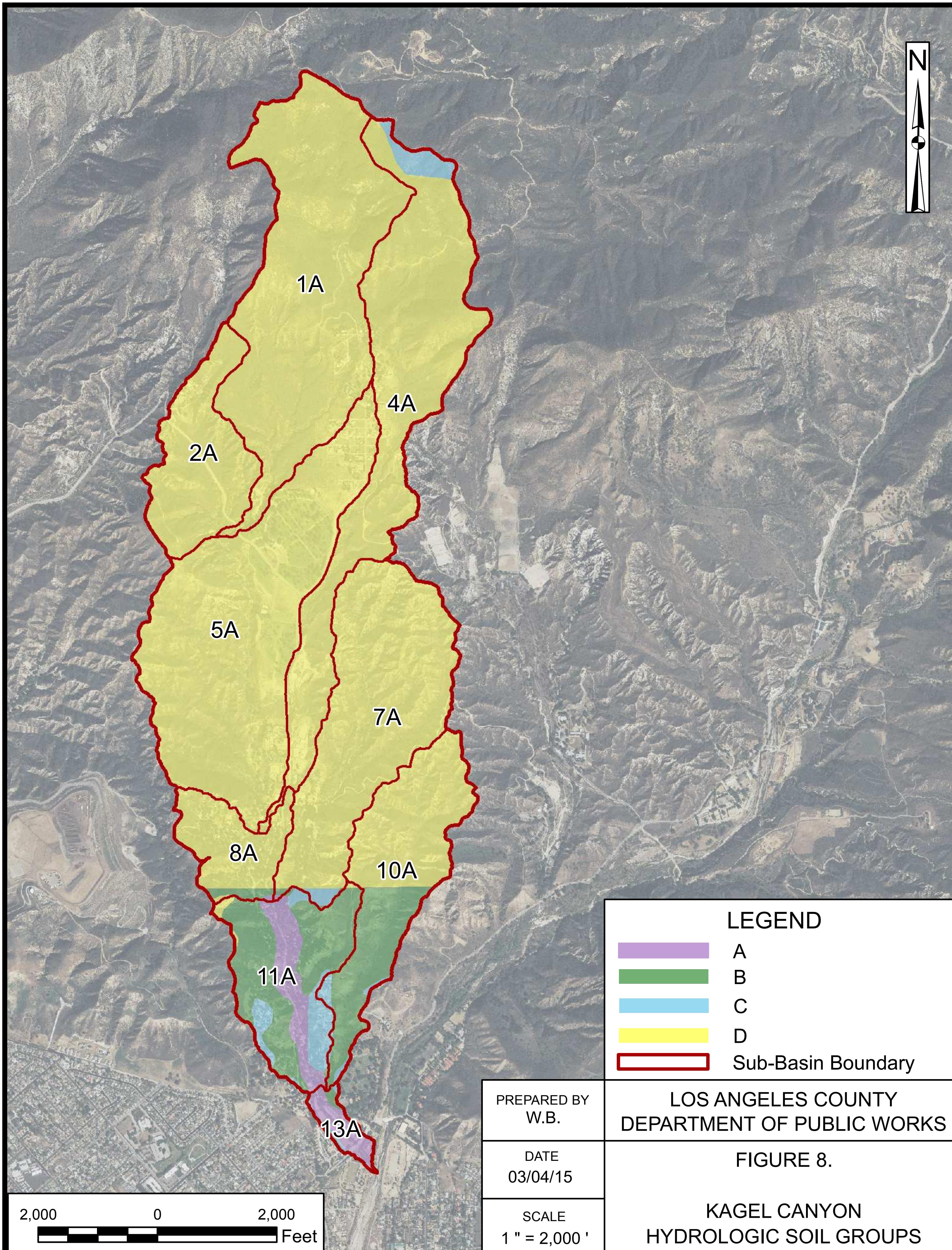
Ranges of infiltration rates for each NRCS soil group were taken from the HMS Technical Reference Manual (Chapter 5, Table 11). The maximum value of the given ranges for each hydrologic soil group was used as shown in Table 8 below. Area-weighted averages were determined for sub-basins with more than one hydrologic soil group. The hydrologic soil groups and their corresponding constant loss rates for each sub-basin are summarized in Table 9. Initial loss was considered to be zero for all sub-basins since it was assumed that the watershed is fully saturated.

Table 8. Constant Loss Rate.

NRCS Soil Group	Constant Loss Rate (in/hr)
A	0.45
B	0.30
C	0.15
D	0.05

Table 9. Kagel Canyon Sub-basin Soil Groups and Constant Loss Rates.

Basin ID	NRCS Soil Group	Constant Loss Rate (in/hr)
1A	D	0.05
2A	D	0.05
4A	C, D	0.0543
5A	D	0.05
7A	A, B, C, D	0.0529
8A	A, B, D	0.0701
10A	B, C, D	0.1432
11A	A, B, C, D	0.3036
13A	A, B, C	0.4002



LEGEND

A

B

C

D

Sub-Basin Boundary

PREPARED BY W.B.	LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS
DATE 03/04/15	FIGURE 8.
SCALE 1 " = 2,000 '	KAGEL CANYON HYDROLOGIC SOIL GROUPS

2.11 Reach Routing

The Muskingum-Cunge method was used to route flows from one concentration point to the next. Since no single standard cross-section shape can represent the channel geometry for the entire Kagel Canyon watershed, the 8-point cross-section configuration was used for each routing reach. A representative cross section for each routing reach was defined using 8 pairs of x, y (distance, elevation) values. Reach lengths, roughness coefficients, and channel slopes were also determined and summarized in Table 10. Reach 1 was divided into two segments, 1a (upstream) and 1b (downstream), because the contour lines showed significant changes in channel shape from upstream to downstream.

Table 10. Muskingum-Cunge Parameters.

Reach	Length (ft)	Slope (ft/ft)	Manning's n	Left Manning's n	Right Manning's n
1a	3,640	0.057	0.060	0.060	0.060
1b	2,281	0.046	0.060	0.060	0.060
2	1,261	0.051	0.025	0.043	0.043
3	3,613	0.045	0.045	0.045	0.045
4	1,755	0.040	0.050	0.050	0.050

3. RESULTS

3.1 HEC – HMS Results

The HEC-HMS model simulated the 10-year, 50-year, 100-year, and 500-year peak flow rates at five concentration points within the watershed. The results are summarized in Table 11. The computed peak flow rates at the watershed outlet for the 10-year flood is 1,067 cfs, for the 50-year flood is 1,572 cfs, for the 100-year flood is 1,790 cfs, and for the 500-year flood is 2,270 cfs. See Appendix A for HEC-HMS summary output.

Table 11. Peak Discharge Results Summary.

Concentration Point	Drainage Area (sq. mi.)	Peak Discharge (cfs)			
		10-Year	50-Year	100-Year	500-Year
3A	0.62	341	485	547	688
6A	1.48	729	1,052	1,191	1,505
9A	1.89	924	1,354	1,536	1,941
12A	2.29	1,069	1,568	1,779	2,265
14A	2.31	1,067	1,572	1,790	2,270

3.2 Validation of HEC – HMS Results

Kagel Canyon is an un-gaged watershed; therefore, no calibration was performed. In order to validate the results of HEC-HMS model, four USGS gaging stations with adequate streamflow data and similar hydrologic characteristics to the Kagel Canyon watershed were selected. Table 12 lists the selected gaging stations.

A flood flow frequency analysis, based on Bulletin 17B, was conducted for the gaging stations. Table 13 summarizes the results. Appendix B includes the full results for the flood flow frequency analysis.

Table 12. USGS Stream Gages in the Vicinity of Kagel Canyon.

USGS Stream Gage Name	Gage Station	Drainage Area (sq. mi.)	Period of Record	Years of Record
Kagel Canyon	-	2.31	-	-
Rogers C NR Azusa CA	11084000	6.64	1918-1962	44
Little Dalton C NR Glendora CA	11086500	2.72	1939-1971	32
Little Tujunga C NR San Fernando CA	11096500	21.1	1929-1973	44
Arroyo Seco NR Pasadena CA	11098000	16.0	1914-2013	99

Table 13. Peak Discharge for Stream Gages.

Gage Station	Peak Discharge (cfs)			
	10-Year	50-Year	100-Year	500-Year
11084000	1,158	2,921	3,974	7,195
11086500	328	999	1,458	3,062
11096500	2,496	7,211	10,156	19,338
11098000	2,864	6,971	9,347	16,384

To validate the HEC-HMS simulation results, the unit peak flow rate per acre corresponding to several recurrence intervals for Kagel Canyon and gaging stations were computed. Table 14 shows the comparisons. The comparison shows that the HEC-HMS simulates extreme events, such as the 100-year and 500-year frequency, more closely to the results from the flood flow frequency analysis.

Table 14. Peak Discharge per Area.

Gage Station	Peak Discharge per Area (cfs/ac.)			
	10-Year	50-Year	100-Year	500-Year
Kagel Canyon	0.722	1.063	1.210	1.535
11084000	0.272	0.687	0.935	1.693
11086500	0.189	0.574	0.837	1.759
11096500	0.185	0.534	0.752	1.432
11098000	0.280	0.681	0.913	1.600

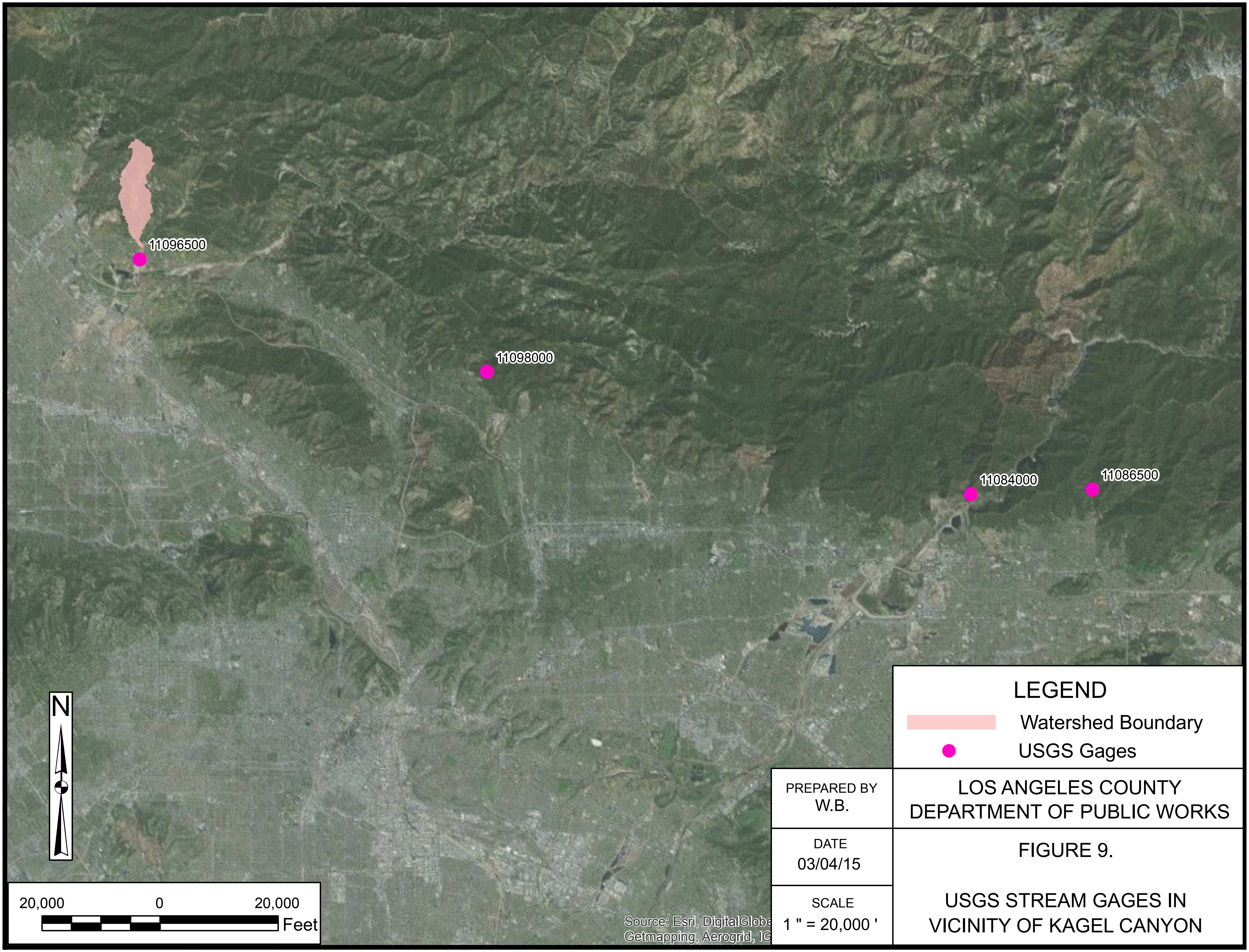


FIGURE 9.

USGS STREAM GAGES IN VICINITY OF KAGEL CANYON

4. REFERENCES

County of Los Angeles Department of Public Works. Hydrology Manual. January 2006.

FEMA (Federal Emergency Management Agency). Flood Insurance Study, Los Angeles County, California and Incorporated Areas. September 26, 2008.

NRCS (Natural Resources Conservation Service). 2004. Soil Survey Geographic (SSURGO) database for Angeles National Forest Area, California and Los Angeles County, California, West San Fernando Valley Area. http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

SCAG (Southern California Association of Governments). Land Use Database. Los Angeles, California. 2005

U.S. Army Corps of Engineers, Hydrologic Engineering Center. Hydrologic Modeling System HEC-HMS, Technical Reference Manual. March 2000.

U.S. Army Corps of Engineers, Hydrologic Engineering Center. Hydrologic Modeling System HEC-HMS, User's Manual. December 2013.

U.S. Army Corps of Engineers, Hydrologic Engineering Center. Statistical Software Package HEC-SSP, User's Manual, Version 2.0. October 2010.

U.S. Army Corps of Engineers, Los Angeles District. Los Angeles County Drainage Area Final Feasibility Interim Report, Part 1 Hydrology Technical Report, Base Conditions. December 1991.

U.S. Interagency Advisory Committee on Water Data. Guidelines for Determining Flood Flow Frequency, Bulletin 17B of the Hydrology Subcommittee. March 1982.

APPENDIX A

HEC-HMS OUTPUT

Global Summary Results for Run "10yr w/ max cl"

Project: Kagel_Final   Simulation Run: 10yr w/ max cl

Start of Run: 01Jan2014, 00:00   Basin Model: Kagel with Max Constant Loss
End of Run: 02Jan2014, 12:00   Meteorologic Model: 10yr
Compute Time: 05May2016, 15:26:13   Control Specifications: Control 1

Show Elements: All Elements   Volume Units: IN / AC-FT   Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
1A	0.4647	255.4	01Jan2014, 12:20	3.7229
2A	0.1519	116.6	01Jan2014, 12:10	3.7206
3A	0.6166	341.3	01Jan2014, 12:20	3.7223
Reach-1a	0.6166	337.1	01Jan2014, 12:25	3.7225
Reach-1b	0.6166	335.5	01Jan2014, 12:30	3.7226
4A	0.3878	177.5	01Jan2014, 12:30	3.5194
5A	0.4725	271.1	01Jan2014, 12:20	3.5686
6A	1.4769	729.3	01Jan2014, 12:25	3.6200
Reach-2	1.4769	727.0	01Jan2014, 12:25	3.6203
7A	0.3240	177.7	01Jan2014, 12:20	3.3605
8A	0.0884	70.5	01Jan2014, 12:10	3.2278
9A	1.8893	924.1	01Jan2014, 12:20	3.5574
Reach-3	1.8893	920.4	01Jan2014, 12:25	3.5573
10A	0.2137	100.3	01Jan2014, 12:20	1.4639
11A	0.1842	100.1	01Jan2014, 12:10	1.4104
Reach-4	2.2872	1060.3	01Jan2014, 12:25	3.1889
12A	2.2872	1068.5	01Jan2014, 12:25	3.1888
13A	0.0237	15.8	01Jan2014, 12:10	1.7228
14A	2.3109	1067.1	01Jan2014, 12:25	3.1738
14R	2.3109	1067.1	01Jan2014, 12:25	3.1738
Outlet	2.3109	1067.1	01Jan2014, 12:25	3.1738

Global Summary Results for Run "50yr w/ max cl"

Project: Kagel_Final   Simulation Run: 50yr w/ max cl

Start of Run: 01Jan2014, 00:00   Basin Model: Kagel with Max Constant Loss
End of Run: 02Jan2014, 12:00   Meteorologic Model: 50yr
Compute Time: 05May2016, 15:27:15   Control Specifications: Control 1

Show Elements: All Elements   Volume Units: IN AC-FT   Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
1A	0.4647	363.0	01Jan2014, 12:20	5.6769
2A	0.1519	164.8	01Jan2014, 12:10	5.6447
3A	0.6166	485.0	01Jan2014, 12:20	5.6690
Reach-1a	0.6166	479.8	01Jan2014, 12:25	5.6692
Reach-1b	0.6166	474.9	01Jan2014, 12:30	5.6700
4A	0.3878	253.7	01Jan2014, 12:30	5.4335
5A	0.4725	385.5	01Jan2014, 12:20	5.4529
6A	1.4769	1052.0	01Jan2014, 12:20	5.5384
Reach-2	1.4769	1050.6	01Jan2014, 12:25	5.5386
7A	0.3240	253.0	01Jan2014, 12:20	5.1949
8A	0.0884	100.0	01Jan2014, 12:10	5.0522
9A	1.8893	1354.2	01Jan2014, 12:20	5.4569
Reach-3	1.8893	1341.6	01Jan2014, 12:25	5.4567
10A	0.2137	148.3	01Jan2014, 12:20	2.9410
11A	0.1842	150.7	01Jan2014, 12:10	2.2797
Reach-4	2.2872	1560.4	01Jan2014, 12:25	4.9658
12A	2.2872	1567.8	01Jan2014, 12:25	4.9658
13A	0.0237	23.6	01Jan2014, 12:10	2.6041
14A	2.3109	1571.6	01Jan2014, 12:25	4.9416
14R	2.3109	1571.6	01Jan2014, 12:25	4.9416
Outlet	2.3109	1571.6	01Jan2014, 12:25	4.9416

Global Summary Results for Run "100yr w/ max cl"

Project: Kagel_Final   Simulation Run: 100yr w/ max cl

Start of Run: 01Jan2014, 00:00   Basin Model: Kagel with Max Constant Loss
End of Run: 02Jan2014, 12:00   Meteorologic Model: 100yr
Compute Time: 05May2016, 15:28:20   Control Specifications: Control 1

Show Elements: All Elements   Volume Units: IN AC-FT   Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
1A	0.4647	409.2	01Jan2014, 12:20	6.5143
2A	0.1519	185.4	01Jan2014, 12:10	6.4721
3A	0.6166	546.6	01Jan2014, 12:20	6.5039
Reach-1a	0.6166	540.8	01Jan2014, 12:25	6.5078
Reach-1b	0.6166	532.7	01Jan2014, 12:30	6.5073
4A	0.3878	286.3	01Jan2014, 12:30	6.2510
5A	0.4725	434.4	01Jan2014, 12:20	6.2604
6A	1.4769	1190.8	01Jan2014, 12:20	6.3610
Reach-2	1.4769	1185.4	01Jan2014, 12:25	6.3611
7A	0.3240	285.2	01Jan2014, 12:20	5.9825
8A	0.0884	112.4	01Jan2014, 12:10	5.8198
9A	1.8893	1536.1	01Jan2014, 12:20	6.2709
Reach-3	1.8893	1516.2	01Jan2014, 12:25	6.2707
10A	0.2137	168.8	01Jan2014, 12:20	3.7060
11A	0.1842	172.5	01Jan2014, 12:10	2.7087
Reach-4	2.2872	1776.9	01Jan2014, 12:25	5.7442
12A	2.2872	1779.2	01Jan2014, 12:20	5.7442
13A	0.0237	26.9	01Jan2014, 12:10	3.0123
14A	2.3109	1789.9	01Jan2014, 12:25	5.7162
14R	2.3109	1789.9	01Jan2014, 12:25	5.7162
Outlet	2.3109	1789.9	01Jan2014, 12:25	5.7162

Global Summary Results for Run "500yr w/ max cl"

Project: Kagel_Final   Simulation Run: 500yr w/ max cl

Start of Run:	01Jan2014, 00:00	Basin Model:	Kagel with Max Constant Loss
End of Run:	02Jan2014, 12:00	Meteorologic Model:	500yr
Compute Time:	05May2016, 15:31:28	Control Specifications:	Control 1

Show Elements: All Elements   Volume Units: IN AC-FT   Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
1A	0.4647	515.1	01Jan2014, 12:20	8.4384
2A	0.1519	232.9	01Jan2014, 12:10	8.3663
3A	0.6166	688.0	01Jan2014, 12:20	8.4206
Reach-1a	0.6166	679.4	01Jan2014, 12:25	8.4224
Reach-1b	0.6166	673.7	01Jan2014, 12:25	8.4224
4A	0.3878	361.0	01Jan2014, 12:30	8.1252
5A	0.4725	546.4	01Jan2014, 12:20	8.1047
6A	1.4769	1504.8	01Jan2014, 12:20	8.2427
Reach-2	1.4769	1497.4	01Jan2014, 12:25	8.2429
7A	0.3240	359.3	01Jan2014, 12:20	7.7869
8A	0.0884	141.4	01Jan2014, 12:10	7.6044
9A	1.8893	1940.5	01Jan2014, 12:20	8.1348
Reach-3	1.8893	1911.8	01Jan2014, 12:25	8.1349
10A	0.2137	215.5	01Jan2014, 12:20	5.4606
11A	0.1842	222.4	01Jan2014, 12:10	3.8161
Reach-4	2.2872	2252.4	01Jan2014, 12:25	7.5376
12A	2.2872	2265.2	01Jan2014, 12:20	7.5372
13A	0.0237	34.7	01Jan2014, 12:10	4.0405
14A	2.3109	2269.8	01Jan2014, 12:25	7.5018
14R	2.3109	2269.8	01Jan2014, 12:25	7.5018
Outlet	2.3109	2269.8	01Jan2014, 12:25	7.5018

APPENDIX B

HEC-SSP RESULTS

```
--------------------------------
Bulletin 17B Frequency Analysis
    14 Jan 2015   11:29 AM
--------------------------------


--- Input Data ---

Analysis Name: 11084000
Description:

Data Set Name: ROGERS C-AZUSA CA-FLOW-ANNUAL PEAK
DSS File Name: C:\Users\wbreakwell\Desktop\Weiwei\Kagel Canyon\HEC
SSP\Kagel\Kagel.dss
DSS Pathname: /ROGERS C/AZUSA CA/FLOW-ANNUAL PEAK/01jan1900/IR-
CENTURY/USGS/

Report File Name: C:\Users\wbreakwell\Desktop\Weiwei\Kagel Canyon\HEC
SSP\Kagel\Bulletin17bResults\11084000\11084000.rpt
XML File Name: C:\Users\wbreakwell\Desktop\Weiwei\Kagel Canyon\HEC
SSP\Kagel\Bulletin17bResults\11084000\11084000.xml

Start Date:
End Date:

Skew Option: Use Station Skew
Regional Skew: -Infinity
Regional Skew MSE: -Infinity

Plotting Position Type: Median

Upper Confidence Level: 0.05
Lower Confidence Level: 0.95

Display ordinate values using 1 digits in fraction part of value

--- End of Input Data ---


----------------------
<< Low Outlier Test >>
----------------------
 Based on 45 events, 10 percent outlier test deviate K(N) = 2.727
                          Computed low outlier test value = 3.84

             0 low outlier(s) identified below test value of 3.84

-----------------------
<< High Outlier Test >>
-----------------------
 Based on 45 events, 10 percent outlier test deviate K(N) = 2.727
                     Computed high outlier test value = 9,742.89

        0 high outlier(s) identified above test value of 9,742.89
```

--- Final Results ---

<< Plotting Positions >>
ROGERS C-AZUSA CA-FLOW-ANNUAL PEAK

Events Analyzed				Ordered Events			
Day	Mon	Year	FLOW CFS	Rank	Water Year	FLOW CFS	Median Plot Pos
10	Mar	1918	332.0	1	1959	2,400.0	1.54
11	Feb	1919	17.0	2	1938	2,070.0	3.74
02	Mar	1920	206.0	3	1926	1,800.0	5.95
14	Mar	1921	244.0	4	1943	1,700.0	8.15
09	Feb	1922	576.0	5	1927	1,200.0	10.35
13	Dec	1922	130.0	6	1952	867.0	12.56
26	Mar	1924	28.0	7	1934	825.0	14.76
04	Apr	1925	555.0	8	1962	700.0	16.96
07	Apr	1926	1,800.0	9	1935	576.0	19.16
16	Feb	1927	1,200.0	10	1922	576.0	21.37
04	Feb	1928	64.0	11	1925	555.0	23.57
10	Mar	1929	62.0	12	1936	520.0	25.77
15	Mar	1930	60.0	13	1944	494.0	27.97
26	Apr	1931	38.0	14	1956	485.0	30.18
28	Dec	1931	296.0	15	1958	472.0	32.38
19	Jan	1933	200.0	16	1941	408.0	34.58
01	Jan	1934	825.0	17	1946	400.0	36.78
08	Apr	1935	576.0	18	1918	332.0	38.99
02	Feb	1936	520.0	19	1954	327.0	41.19
31	Dec	1936	190.0	20	1945	300.0	43.39
02	Mar	1938	2,070.0	21	1932	296.0	45.59
19	Dec	1938	153.0	22	1947	271.0	47.80
08	Jan	1940	196.0	23	1921	244.0	50.00
04	Mar	1941	408.0	24	1920	206.0	52.20
29	Dec	1941	32.0	25	1933	200.0	54.41
23	Jan	1943	1,700.0	26	1940	196.0	56.61
22	Feb	1944	494.0	27	1937	190.0	58.81
02	Feb	1945	300.0	28	1939	153.0	61.01
23	Dec	1945	400.0	29	1950	132.0	63.22
20	Nov	1946	271.0	30	1923	130.0	65.42
29	Apr	1948	13.0	31	1953	115.0	67.62
20	Jan	1949	22.0	32	1957	90.0	69.82
18	Dec	1949	132.0	33	1928	64.0	72.03
28	Apr	1951	10.0	34	1929	62.0	74.23
16	Jan	1952	867.0	35	1961	60.0	76.43
01	Dec	1952	115.0	36	1930	60.0	78.63
25	Jan	1954	327.0	37	1960	43.0	80.84
18	Jan	1955	18.0	38	1931	38.0	83.04
26	Jan	1956	485.0	39	1942	32.0	85.24
13	Jan	1957	90.0	40	1924	28.0	87.44
03	Apr	1958	472.0	41	1949	22.0	89.65
06	Jan	1959	2,400.0	42	1955	18.0	91.85
27	Apr	1960	43.0	43	1919	17.0	94.05
26	Jan	1961	60.0	44	1948	13.0	96.26
11	Feb	1962	700.0	45	1951	10.0	98.46

<< Skew Weighting >>

Based on 45 events, mean-square error of station skew = 0.135
Mean-square error of regional skew = -?

<< Frequency Curve >>
ROGERS C-AZUSA CA-FLOW-ANNUAL PEAK

Computed Curve FLOW, CFS	Expected Probability FLOW, CFS	Percent Chance Exceedance	Confidence Limits 0.05 FLOW, CFS	Confidence Limits 0.95 FLOW, CFS
7,194.5	8,772.2	0.2	17,008.6	3,827.9
5,222.5	6,097.5	0.5	11,622.3	2,892.4
3,974.1	4,504.8	1.0	8,408.3	2,275.4
2,921.4	3,219.5	2.0	5,846.7	1,734.0
1,807.5	1,927.8	5.0	3,329.5	1,130.8
1,157.9	1,207.0	10.0	1,985.6	756.3
659.0	674.1	20.0	1,043.9	449.7
207.9	207.9	50.0	298.1	145.6
59.2	57.6	80.0	86.6	37.6
29.5	27.9	90.0	45.5	16.9
16.2	14.8	95.0	26.6	8.4
5.0	4.1	99.0	9.4	2.1

<< Systematic Statistics >>
ROGERS C-AZUSA CA-FLOW-ANNUAL PEAK

Log Transform: FLOW, CFS		Number of Events	
Mean	2.287	Historic Events	0
Standard Dev	0.624	High Outliers	0
Station Skew	-0.301	Low Outliers	0
Regional Skew	---	Zero Events	0
Weighted Skew	---	Missing Events	0
Adopted Skew	-0.301	Systematic Events	45

--- End of Analytical Frequency Curve ---

Bulletin 17B Frequency Analysis
14 Jan 2015   11:30 AM

--- Input Data ---

Analysis Name: 11086500
Description:

Data Set Name: LITTLE DALTON C-GLENDORA CA-FLOW-ANNUAL PEAK
DSS File Name: C:\Users\wbreakwell\Desktop\Weiwei\Kagel Canyon\HEC SSP\Kagel\Kagel.dss
DSS Pathname: /LITTLE DALTON C/GLENDORA CA/FLOW-ANNUAL PEAK/01jan1900/IR-CENTURY/USGS/

Report File Name: C:\Users\wbreakwell\Desktop\Weiwei\Kagel Canyon\HEC SSP\Kagel\Bulletin17bResults\11086500\11086500.rpt
XML File Name: C:\Users\wbreakwell\Desktop\Weiwei\Kagel Canyon\HEC SSP\Kagel\Bulletin17bResults\11086500\11086500.xml

Start Date:
End Date:

Skew Option: Use Station Skew
Regional Skew: -Infinity
Regional Skew MSE: -Infinity

Plotting Position Type: Median

Upper Confidence Level: 0.05
Lower Confidence Level: 0.95

Display ordinate values using 1 digits in fraction part of value

--- End of Input Data ---

--- Preliminary Results ---

Note: Adopted skew equals station skew and preliminary frequency statistics are for the conditional frequency curve because of zero or missing events.

<< Frequency Curve >>
LITTLE DALTON C-GLENDORA CA-FLOW-ANNUAL PEAK

Computed Curve	Expected Probability	Percent Chance Exceedance	Confidence Limits 0.05	Confidence Limits 0.95
FLOW, CFS			FLOW, CFS	
3,058.5	4,359.3	0.2	10,462.3	1,313.4
2,063.9	2,715.0	0.5	6,431.0	938.7
1,480.9	1,843.3	1.0	4,270.9	705.9
1,022.4	1,209.0	2.0	2,710.3	512.6
577.6	643.9	5.0	1,351.7	311.3
342.3	366.9	10.0	720.5	195.6
178.1	184.9	20.0	333.6	107.8
48.0	48.0	50.0	77.7	29.8
11.9	11.4	80.0	19.6	6.4
5.5	5.1	90.0	9.8	2.6
2.9	2.5	95.0	5.5	1.2
0.8	0.6	99.0	1.9	0.3

<< Conditional Statistics >>
LITTLE DALTON C-GLENDORA CA-FLOW-ANNUAL PEAK

Log Transform: FLOW, CFS		Number of Events	
Mean	1.656	Historic Events	0
Standard Dev	0.700	High Outliers	0
Station Skew	-0.218	Low Outliers	0
Regional Skew	---	Zero Events	0
Weighted Skew	---	Missing Events	1
Adopted Skew	-0.218	Systematic Events	33

<< Conditional Probability Adjusted Ordinates >>

<< Frequency Curve >>

LITTLE DALTON C-GLENDORA CA-FLOW-ANNUAL PEAK

Computed Curve FLOW, CFS	Expected Probability FLOW, CFS	Percent Chance Exceedance	Confidence Limits 0.05 FLOW, CFS	Confidence Limits 0.95 FLOW, CFS
3,020.1	---	0.2	---	---
2,034.9	---	0.5	---	---
1,457.8	---	1.0	---	---
1,004.6	---	2.0	---	---
565.3	---	5.0	---	---
333.5	---	10.0	---	---
172.2	---	20.0	---	---
45.0	---	50.0	---	---
10.1	---	80.0	---	---
4.0	---	90.0	---	---
1.4	---	95.0	---	---
---	---	99.0	---	---

--- End of Preliminary Results ---

<< Low Outlier Test >>

Based on 32 events, 10 percent outlier test deviate K(N) = 2.591
Computed low outlier test value = 0.7

0 low outlier(s) identified below test value of 0.7

Based on statistics after 0 zero events and 1 missing events were deleted.

<< High Outlier Test >>

Based on 32 events, 10 percent outlier test deviate K(N) = 2.591
Computed high outlier test value = 2,942.96

0 high outlier(s) identified above test value of 2,942.96

Note: Statistics and frequency curve were modified using conditional probablity adjustment.

--- Final Results ---

<< Plotting Positions >>
LITTLE DALTON C-GLENDORA CA-FLOW-ANNUAL PEAK

Events Analyzed			Ordered Events			
Day Mon Year	FLOW CFS		Rank	Water Year	FLOW CFS	Median Plot Pos
05 Jan 1939	36.0		1	1962	1,700.0	2.10
07 Jan 1940	63.0		2	1967	325.0	5.09
04 Mar 1941	73.0		3	1961	314.0	8.08
29 Dec 1941	10.0		4	1966	280.0	11.08
23 Jan 1943	182.0		5	1944	198.0	14.07
22 Feb 1944	198.0		6	1943	182.0	17.07
11 Nov 1944	96.0		7	1958	180.0	20.06
21 Dec 1945	111.0		8	1956	180.0	23.05
20 Nov 1946	57.0		9	1963	122.0	26.05
03 Apr 1948	4.0		10	1952	118.0	29.04
04 Mar 1949	1.9		11	1946	111.0	32.04
18 Dec 1949	8.1		12	1945	96.0	35.03
11 Jan 1951	5.4		13	1941	73.0	38.02
16 Jan 1952	118.0		14	1959	64.0	41.02
01 Dec 1952	13.0		15	1940	63.0	44.01
25 Jan 1954	58.0		16	1965	62.0	47.01
18 Jan 1955	4.3		17	1954	58.0	50.00
26 Jan 1956	180.0		18	1947	57.0	52.99
13 Jan 1957	12.0		19	1968	49.0	55.99
03 Apr 1958	180.0		20	1939	36.0	58.98
16 Feb 1959	64.0		21	1970	30.0	61.98
08 Feb 1960	2.2		22	1964	28.0	64.97
26 Jan 1961	314.0		23	1971	25.0	67.96
20 Nov 1961	1,700.0		24	1953	13.0	70.96
09 Feb 1963	122.0		25	1957	12.0	73.95
21 Jan 1964	28.0		26	1942	10.0	76.95
09 Apr 1965	62.0		27	1950	8.1	79.94
22 Nov 1965	280.0		28	1951	5.4	82.93
06 Dec 1966	325.0		29	1955	4.3	85.93
08 Mar 1968	49.0		30	1948	4.0	88.92
25 Jan 1969	---		31	1960	2.2	91.92
04 Mar 1970	30.0		32	1949	1.9	94.91
21 Dec 1970	25.0		33	1969	---	97.90

<< Skew Weighting >>

Based on 33 events, mean-square error of station skew = 0.168
Mean-square error of regional skew = -?

<< Frequency Curve >>

LITTLE DALTON C-GLENDORA CA-FLOW-ANNUAL PEAK

Computed Curve FLOW, CFS	Expected Probability FLOW, CFS	Percent Chance Exceedance	Confidence Limits 0.05 FLOW, CFS	Confidence Limits 0.95 FLOW, CFS
3,062.4	4,353.6	0.2	10,390.5	1,316.3
2,046.9	2,685.7	0.5	6,323.3	932.5
1,457.8	1,810.2	1.0	4,167.4	696.5
998.8	1,178.6	2.0	2,624.3	502.2
558.3	621.5	5.0	1,295.5	302.0
328.2	351.4	10.0	685.1	188.3
169.3	175.6	20.0	314.8	102.8
45.0	45.0	50.0	72.6	28.1
11.1	10.6	80.0	18.2	6.0
5.2	4.8	90.0	9.1	2.4
2.7	2.4	95.0	5.1	1.1
0.8	0.6	99.0	1.7	0.2

<< Synthetic Statistics >>

LITTLE DALTON C-GLENDORA CA-FLOW-ANNUAL PEAK

Log Transform: FLOW, CFS		Number of Events	
Mean	1.630	Historic Events	0
Standard Dev	0.704	High Outliers	0
Station Skew	-0.202	Low Outliers	0
Regional Skew	---	Zero Events	0
Weighted Skew	---	Missing Events	1
Adopted Skew	-0.202	Systematic Events	33

--- End of Analytical Frequency Curve ---

Bulletin 17B Frequency Analysis
14 Jan 2015 11:32 AM

--- Input Data ---

Analysis Name: 11096500
Description:

Data Set Name: LITTLE TUJUNGA C-SAN FERNANDO CA-FLOW-ANNUAL PEAK
DSS File Name: C:\Users\wbreakwell\Desktop\Weiwei\Kagel Canyon\HEC SSP\Kagel\Kagel.dss
DSS Pathname: /LITTLE TUJUNGA C/SAN FERNANDO CA/FLOW-ANNUAL PEAK/01jan1900/IR-CENTURY/USGS/

Report File Name: C:\Users\wbreakwell\Desktop\Weiwei\Kagel Canyon\HEC SSP\Kagel\Bulletin17bResults\11096500\11096500.rpt
XML File Name: C:\Users\wbreakwell\Desktop\Weiwei\Kagel Canyon\HEC SSP\Kagel\Bulletin17bResults\11096500\11096500.xml

Start Date:
End Date:

Skew Option: Use Station Skew
Regional Skew: -Infinity
Regional Skew MSE: -Infinity

Plotting Position Type: Median

Upper Confidence Level: 0.05
Lower Confidence Level: 0.95

Display ordinate values using 1 digits in fraction part of value

--- End of Input Data ---

--- Preliminary Results ---

Note: Adopted skew equals station skew and preliminary frequency statistics are for the conditional frequency curve because of zero or missing events.

<< Frequency Curve >>
LITTLE TUJUNGA C-SAN FERNANDO CA-FLOW-ANNUAL PEAK

Computed Curve FLOW, CFS	Expected Probability FLOW, CFS	Percent Chance Exceedance	Confidence Limits 0.05 FLOW, CFS	Confidence Limits 0.95 FLOW, CFS
12,465.5	14,198.0	0.2	32,777.2	6,060.9
9,975.4	11,139.3	0.5	25,191.2	4,977.5
8,114.9	8,941.3	1.0	19,753.2	4,144.8
6,318.0	6,850.5	2.0	14,722.5	3,316.6
4,122.1	4,380.8	5.0	8,941.5	2,260.9
2,668.7	2,781.8	10.0	5,406.2	1,523.7
1,463.3	1,499.8	20.0	2,724.0	874.4
362.9	362.9	50.0	593.8	225.3
63.5	60.8	80.0	105.4	34.7
22.0	20.1	90.0	39.7	10.4
8.5	7.3	95.0	16.9	3.4
1.2	0.8	99.0	3.0	0.3

<< Conditional Statistics >>
LITTLE TUJUNGA C-SAN FERNANDO CA-FLOW-ANNUAL PEAK

Log Transform: FLOW, CFS		Number of Events	
Mean	2.453	Historic Events	0
Standard Dev	0.831	High Outliers	0
Station Skew	-0.775	Low Outliers	0
Regional Skew	---	Zero Events	2
Weighted Skew	---	Missing Events	0
Adopted Skew	-0.775	Systematic Events	46

<< Conditional Probability Adjusted Ordinates >>

<< Frequency Curve >>
LITTLE TUJUNGA C-SAN FERNANDO CA-FLOW-ANNUAL PEAK

Computed Curve FLOW, CFS	Expected Probability FLOW, CFS	Percent Chance Exceedance	Confidence Limits 0.05 FLOW, CFS	Confidence Limits 0.95 FLOW, CFS
12,337.1	---	0.2	---	---
9,849.0	---	0.5	---	---
7,991.2	---	1.0	---	---
6,204.4	---	2.0	---	---
4,016.6	---	5.0	---	---
2,577.4	---	10.0	---	---
1,393.2	---	20.0	---	---
325.6	---	50.0	---	---
45.6	---	80.0	---	---
10.5	---	90.0	---	---
0.7	---	95.0	---	---
---	---	99.0	---	---

--- End of Preliminary Results ---

<< Low Outlier Test >>

Based on 44 events, 10 percent outlier test deviate K(N) = 2.719
Computed low outlier test value = 1.56

1 low outlier(s) identified below test value of 1.56

Based on statistics after 2 zero events and 0 missing events were deleted.

Statistics and frequency curve adjusted for 1 low outlier(s)

<< Conditional Statistics >>
LITTLE TUJUNGA C-SAN FERNANDO CA-FLOW-ANNUAL PEAK

Log Transform: FLOW, CFS		Number of Events	
Mean	2.512	Historic Events	0
Standard Dev	0.745	High Outliers	0
Station Skew	-0.407	Low Outliers	1
Regional Skew	---	Zero Events	2
Weighted Skew	---	Missing Events	0
Adopted Skew	-0.775	Systematic Events	46

<< High Outlier Test >>

Based on 43 events, 10 percent outlier test deviate K(N) = 2.71
Computed high outlier test value = 33,988.43

0 high outlier(s) identified above test value of 33,988.43

Note: Statistics and frequency curve were modified
using conditional probablity adjustment.

--- Final Results ---

<< Plotting Positions >>
LITTLE TUJUNGA C-SAN FERNANDO CA-FLOW-ANNUAL PEAK

Events Analyzed				Ordered Events			
Day	Mon	Year	FLOW CFS	Rank	Water Year	FLOW CFS	Median Plot Pos
31	Dec	1913	4,100.0	1	1938	8,500.0	1.51
30	Nov	1928	0.0	2	1944	4,220.0	3.66
30	Nov	1929	0.0	3	1914	4,100.0	5.82
04	Feb	1931	30.0	4	1943	3,700.0	7.97
09	Feb	1932	660.0	5	1952	2,110.0	10.13
19	Jan	1933	450.0	6	1940	2,090.0	12.28
01	Jan	1934	1,360.0	7	1962	1,630.0	14.44
13	Dec	1934	89.0	8	1973	1,570.0	16.59
02	Feb	1936	653.0	9	1969	1,420.0	18.75
14	Feb	1937	964.0	10	1934	1,360.0	20.91
02	Mar	1938	8,500.0	11	1941	1,310.0	23.06
09	Mar	1939	175.0	12	1966	1,300.0	25.22
08	Jan	1940	2,090.0	13	1937	964.0	27.37
04	Mar	1941	1,310.0	14	1967	901.0	29.53
28	Dec	1941	198.0	15	1972	762.0	31.68
23	Jan	1943	3,700.0	16	1932	660.0	33.84
22	Feb	1944	4,220.0	17	1936	653.0	35.99
11	Nov	1944	244.0	18	1971	569.0	38.15
30	Mar	1946	156.0	19	1958	559.0	40.30
20	Nov	1946	200.0	20	1933	450.0	42.46
24	Mar	1948	16.0	21	1956	445.0	44.61
19	May	1949	0.9	22	1970	353.0	46.77
18	Dec	1949	9.8	23	1961	266.0	48.92
11	Jan	1951	13.0	24	1964	256.0	51.08
16	Jan	1952	2,110.0	25	1945	244.0	53.23
01	Dec	1952	138.0	26	1965	223.0	55.39
13	Feb	1954	198.0	27	1947	200.0	57.54
18	Jan	1955	35.0	28	1954	198.0	59.70
26	Jan	1956	445.0	29	1942	198.0	61.85
28	Feb	1957	112.0	30	1939	175.0	64.01
03	Apr	1958	559.0	31	1946	156.0	66.16
06	Jan	1959	84.0	32	1953	138.0	68.32
01	Feb	1960	6.7	33	1968	112.0	70.47
05	Nov	1960	266.0	34	1957	112.0	72.63
11	Feb	1962	1,630.0	35	1935	89.0	74.78
10	Feb	1963	52.0	36	1959	84.0	76.94
22	Jan	1964	256.0	37	1963	52.0	79.09
09	Apr	1965	223.0	38	1955	35.0	81.25
22	Nov	1965	1,300.0	39	1931	30.0	83.41
06	Dec	1966	901.0	40	1948	16.0	85.56
19	Nov	1967	112.0	41	1951	13.0	87.72
25	Feb	1969	1,420.0	42	1950	9.8	89.87
28	Feb	1970	353.0	43	1960	6.7	92.03
29	Nov	1970	569.0	44	1949	0.9*	94.18
25	Dec	1971	762.0	45	1930	0.0	96.34
11	Feb	1973	1,570.0	46	1929	0.0	98.49

* Outlier

<< Skew Weighting >>

Based on 46 events, mean-square error of station skew = 0.143
Mean-square error of regional skew = -?

<< Frequency Curve >>
LITTLE TUJUNGA C-SAN FERNANDO CA-FLOW-ANNUAL PEAK

Computed Curve FLOW, CFS	Expected Probability FLOW, CFS	Percent Chance Exceedance	Confidence Limits 0.05 FLOW, CFS	Confidence Limits 0.95 FLOW, CFS
19,338.4	23,739.0	0.2	53,109.9	9,163.1
13,698.0	16,121.7	0.5	35,308.6	6,769.0
10,155.6	11,613.6	1.0	24,803.0	5,199.4
7,210.8	8,014.5	2.0	16,580.5	3,838.7
4,182.0	4,494.5	5.0	8,772.0	2,359.5
2,495.8	2,616.2	10.0	4,827.7	1,478.9
1,281.3	1,315.2	20.0	2,259.9	798.9
313.6	313.6	50.0	490.0	202.3
64.1	61.9	80.0	102.4	36.7
26.0	24.2	90.0	44.5	13.1
11.8	10.5	95.0	21.9	5.2
2.5	1.9	99.0	5.5	0.8

<< Synthetic Statistics >>
LITTLE TUJUNGA C-SAN FERNANDO CA-FLOW-ANNUAL PEAK

Log Transform: FLOW, CFS		Number of Events	
Mean	2.441	Historic Events	0
Standard Dev	0.779	High Outliers	0
Station Skew	-0.426	Low Outliers	1
Regional Skew	---	Zero Events	2
Weighted Skew	---	Missing Events	0
Adopted Skew	-0.426	Systematic Events	46

--- End of Analytical Frequency Curve ---

```
--------------------------------
Bulletin 17B Frequency Analysis
    14 Jan 2015   02:10 PM
--------------------------------


--- Input Data ---

Analysis Name: 11098000
Description:

Data Set Name: ARROYO SECO-PASADENA CA-FLOW-ANNUAL PEAK
DSS File Name: C:\Users\wbreakwell\Desktop\Weiwei\Kagel Canyon\HEC
SSP\Kagel\Kagel.dss
DSS Pathname: /ARROYO SECO/PASADENA CA/FLOW-ANNUAL PEAK/01jan1900/IR-
CENTURY/USGS/

Report File Name: C:\Users\wbreakwell\Desktop\Weiwei\Kagel Canyon\HEC
SSP\Kagel\Bulletin17bResults\11098000\11098000.rpt
XML File Name: C:\Users\wbreakwell\Desktop\Weiwei\Kagel Canyon\HEC
SSP\Kagel\Bulletin17bResults\11098000\11098000.xml

Start Date:
End Date:

Skew Option: Use Station Skew
Regional Skew: -Infinity
Regional Skew MSE: -Infinity

Plotting Position Type: Median

Upper Confidence Level: 0.05
Lower Confidence Level: 0.95

Display ordinate values using 1 digits in fraction part of value

--- End of Input Data ---
```

--- Preliminary Results ---

Note: Adopted skew equals station skew and preliminary frequency statistics are for the conditional frequency curve because of zero or missing events.

<< Frequency Curve >>
ARROYO SECO-PASADENA CA-FLOW-ANNUAL PEAK

Computed Curve FLOW, CFS	Expected Probability FLOW, CFS	Percent Chance Exceedance	Confidence Limits 0.05 FLOW, CFS	Confidence Limits 0.95 FLOW, CFS
16,217.1	17,549.4	0.2	27,471.4	10,553.5
12,086.4	12,866.6	0.5	19,786.7	8,071.8
9,383.9	9,877.8	1.0	14,926.7	6,404.4
7,038.6	7,327.9	2.0	10,844.9	4,919.5
4,472.4	4,596.0	5.0	6,568.4	3,238.1
2,922.0	2,974.5	10.0	4,116.6	2,179.3
1,694.7	1,711.5	20.0	2,279.4	1,303.9
545.0	545.0	50.0	692.7	429.9
154.6	152.6	80.0	200.4	115.4
76.0	74.1	90.0	102.6	53.4
41.1	39.4	95.0	58.1	27.1
12.1	11.0	99.0	19.1	7.0

<< Conditional Statistics >>
ARROYO SECO-PASADENA CA-FLOW-ANNUAL PEAK

Log Transform: FLOW, CFS		Number of Events	
Mean	2.698	Historic Events	0
Standard Dev	0.622	High Outliers	0
Station Skew	-0.372	Low Outliers	0
Regional Skew	---	Zero Events	0
Weighted Skew	---	Missing Events	1
Adopted Skew	-0.372	Systematic Events	100

<< Conditional Probability Adjusted Ordinates >>

<< Frequency Curve >>
ARROYO SECO-PASADENA CA-FLOW-ANNUAL PEAK

Computed Curve FLOW, CFS	Expected Probability FLOW, CFS	Percent Chance Exceedance	Confidence Limits 0.05 FLOW, CFS	Confidence Limits 0.95 FLOW, CFS
16,167.2	---	0.2	---	---
12,043.8	---	0.5	---	---
9,346.6	---	1.0	---	---
7,006.9	---	2.0	---	---
4,446.9	---	5.0	---	---
2,901.4	---	10.0	---	---
1,678.9	---	20.0	---	---
535.2	---	50.0	---	---
147.5	---	80.0	---	---
69.4	---	90.0	---	---
34.5	---	95.0	---	---
---	---	99.0	---	---

--- End of Preliminary Results ---

<< Low Outlier Test >>

Based on 99 events, 10 percent outlier test deviate K(N) = 3.014
Computed low outlier test value = 6.67

0 low outlier(s) identified below test value of 6.67

Based on statistics after 0 zero events and 1 missing events were deleted.

<< High Outlier Test >>

Based on 99 events, 10 percent outlier test deviate K(N) = 3.014
Computed high outlier test value = 37,285.21

0 high outlier(s) identified above test value of 37,285.21

Note: Statistics and frequency curve were modified using conditional probablity adjustment.

--- Final Results ---

<< Plotting Positions >>
ARROYO SECO-PASADENA CA-FLOW-ANNUAL PEAK

Events Analyzed				Ordered Events			
Day	Mon	Year	FLOW CFS	Rank	Water Year	FLOW CFS	Median Plot Pos
20	Feb	1914	5,800.0	1	1938	8,620.0	0.70
03	Feb	1915	634.0	2	1969	8,540.0	1.69
17	Jan	1916	3,150.0	3	1914	5,800.0	2.69
24	Dec	1916	760.0	4	1943	5,660.0	3.69
10	Mar	1918	570.0	5	1978	5,360.0	4.68
11	Feb	1919	92.0	6	2010	4,620.0	5.68
02	Mar	1920	450.0	7	1998	4,380.0	6.67
13	Mar	1921	650.0	8	1973	3,740.0	7.67
19	Dec	1921	2,800.0	9	2005	3,540.0	8.67
13	Dec	1922	370.0	10	1966	3,160.0	9.66
26	Mar	1924	81.0	11	1916	3,150.0	10.66
04	Apr	1925	210.0	12	1980	3,080.0	11.65
07	Apr	1926	1,450.0	13	1922	2,800.0	12.65
16	Feb	1927	1,400.0	14	1983	2,640.0	13.65
04	Feb	1928	298.0	15	2011	2,260.0	14.64
04	Apr	1929	155.0	16	1935	2,000.0	15.64
03	May	1930	143.0	17	1944	1,800.0	16.63
03	Feb	1931	151.0	18	1995	1,730.0	17.63
28	Dec	1931	480.0	19	1968	1,720.0	18.63
19	Jan	1933	---	20	1993	1,710.0	19.62
01	Jan	1934	950.0	21	1992	1,710.0	20.62
17	Oct	1934	2,000.0	22	1967	1,530.0	21.61
12	Feb	1936	706.0	23	1962	1,500.0	22.61
06	Feb	1937	640.0	24	1926	1,450.0	23.61
02	Mar	1938	8,620.0	25	1927	1,400.0	24.60
18	Dec	1938	375.0	26	1941	1,340.0	25.60
08	Jan	1940	452.0	27	1971	1,330.0	26.59
20	Feb	1941	1,340.0	28	1945	1,210.0	27.59
10	Dec	1941	146.0	29	2006	1,120.0	28.59
23	Jan	1943	5,660.0	30	1952	1,090.0	29.58
22	Feb	1944	1,800.0	31	1934	950.0	30.58
11	Nov	1944	1,210.0	32	1991	921.0	31.57
30	Mar	1946	680.0	33	2008	892.0	32.57
25	Dec	1946	600.0	34	1956	815.0	33.57
29	Apr	1948	45.0	35	1961	769.0	34.56
20	Jan	1949	35.0	36	1917	760.0	35.56
10	Nov	1949	150.0	37	1958	715.0	36.55
29	Apr	1951	12.0	38	1936	706.0	37.55
16	Jan	1952	1,090.0	39	2004	705.0	38.55
02	Dec	1952	49.0	40	1946	680.0	39.54
24	Jan	1954	571.0	41	1970	668.0	40.54
30	Apr	1955	107.0	42	1921	650.0	41.53
26	Jan	1956	815.0	43	1937	640.0	42.53
23	Feb	1957	158.0	44	1915	634.0	43.53
03	Apr	1958	715.0	45	1981	627.0	44.52
16	Feb	1959	351.0	46	1982	615.0	45.52
12	Jan	1960	170.0	47	1947	600.0	46.51
06	Nov	1960	769.0	48	1976	590.0	47.51
11	Feb	1962	1,500.0	49	1996	584.0	48.51

09 Feb 1963	464.0	50	1954	571.0	49.50
21 Jan 1964	182.0	51	1918	570.0	50.50
09 Apr 1965	194.0	52	1997	569.0	51.49
22 Nov 1965	3,160.0	53	1975	535.0	52.49
06 Dec 1966	1,530.0	54	2000	509.0	53.49
19 Nov 1967	1,720.0	55	1932	480.0	54.48
25 Jan 1969	8,540.0	56	1963	464.0	55.48
28 Feb 1970	668.0	57	1988	457.0	56.47
29 Nov 1970	1,330.0	58	1940	452.0	57.47
24 Dec 1971	222.0	59	1920	450.0	58.47
11 Feb 1973	3,740.0	60	2003	433.0	59.46
08 Mar 1974	390.0	61	1974	390.0	60.46
06 Mar 1975	535.0	62	1939	375.0	61.45
09 Feb 1976	590.0	63	1923	370.0	62.45
09 May 1977	230.0	64	1959	351.0	63.45
04 Mar 1978	5,360.0	65	2001	348.0	64.44
21 Feb 1979	193.0	66	1928	298.0	65.44
16 Feb 1980	3,080.0	67	2009	270.0	66.43
29 Jan 1981	627.0	68	1977	230.0	67.43
17 Mar 1982	615.0	69	2012	227.0	68.43
02 Mar 1983	2,640.0	70	1972	222.0	69.42
25 Dec 1983	217.0	71	1984	217.0	70.42
16 Dec 1984	139.0	72	1986	213.0	71.41
30 Jan 1986	213.0	73	1925	210.0	72.41
05 Jan 1987	13.0	74	1965	194.0	73.41
29 Feb 1988	457.0	75	1979	193.0	74.40
16 Dec 1988	155.0	76	1964	182.0	75.40
17 Feb 1990	163.0	77	1960	170.0	76.39
01 Mar 1991	921.0	78	1990	163.0	77.39
11 Feb 1992	1,710.0	79	1957	158.0	78.39
17 Jan 1993	1,710.0	80	1989	155.0	79.38
07 Feb 1994	129.0	81	1929	155.0	80.38
10 Jan 1995	1,730.0	82	1931	151.0	81.37
21 Feb 1996	584.0	83	1950	150.0	82.37
22 Dec 1996	569.0	84	1942	146.0	83.37
23 Feb 1998	4,380.0	85	1930	143.0	84.36
09 Feb 1999	62.0	86	1985	139.0	85.36
20 Feb 2000	509.0	87	1994	129.0	86.35
13 Feb 2001	348.0	88	1955	107.0	87.35
28 Jan 2002	41.0	89	1919	92.0	88.35
12 Feb 2003	433.0	90	1924	81.0	89.34
26 Feb 2004	705.0	91	1999	62.0	90.34
09 Jan 2005	3,540.0	92	1953	49.0	91.33
02 Jan 2006	1,120.0	93	1948	45.0	92.33
27 Feb 2007	12.0	94	2002	41.0	93.33
28 Jan 2008	892.0	95	1949	35.0	94.32
06 Feb 2009	270.0	96	2013	30.0	95.32
06 Feb 2010	4,620.0	97	1987	13.0	96.31
22 Dec 2010	2,260.0	98	2007	12.0	97.31
17 Mar 2012	227.0	99	1951	12.0	98.31
11 Oct 2012	30.0	100	1933	---	99.30

<< Skew Weighting >>

Based on 100 events, mean-square error of station skew = 0.07
Mean-square error of regional skew = -?

<< Frequency Curve >>
ARROYO SECO-PASADENA CA-FLOW-ANNUAL PEAK

Computed Curve FLOW, CFS	Expected Probability FLOW, CFS	Percent Chance Exceedance	Confidence Limits 0.05 FLOW, CFS	Confidence Limits 0.95 FLOW, CFS
16,384.0	17,760.4	0.2	27,707.1	10,675.5
12,110.4	12,906.4	0.5	19,775.3	8,103.9
9,346.6	9,845.2	1.0	14,820.4	6,394.8
6,971.3	7,260.5	2.0	10,701.6	4,886.9
4,400.5	4,522.4	5.0	6,435.5	3,197.0
2,863.8	2,915.2	10.0	4,016.7	2,143.8
1,657.3	1,673.6	20.0	2,219.3	1,279.8
535.2	535.2	50.0	677.8	423.5
154.2	152.3	80.0	199.2	115.6
76.8	74.9	90.0	103.3	54.2
42.1	40.5	95.0	59.2	28.0
12.8	11.7	99.0	20.0	7.5

<< Synthetic Statistics >>
ARROYO SECO-PASADENA CA-FLOW-ANNUAL PEAK

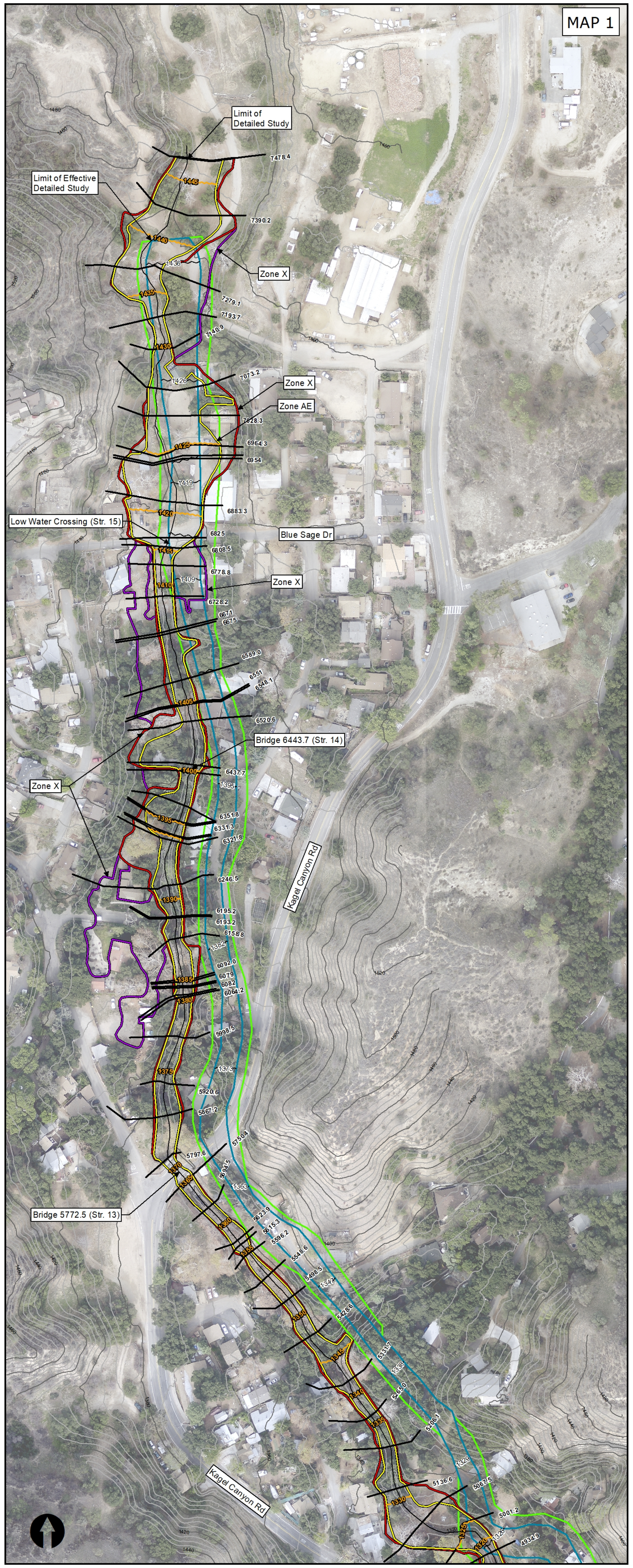
Log Transform: FLOW, CFS		Number of Events	
Mean	2.694	Historic Events	0
Standard Dev	0.616	High Outliers	0
Station Skew	-0.341	Low Outliers	0
Regional Skew	---	Zero Events	0
Weighted Skew	---	Missing Events	1
Adopted Skew	-0.341	Systematic Events	100

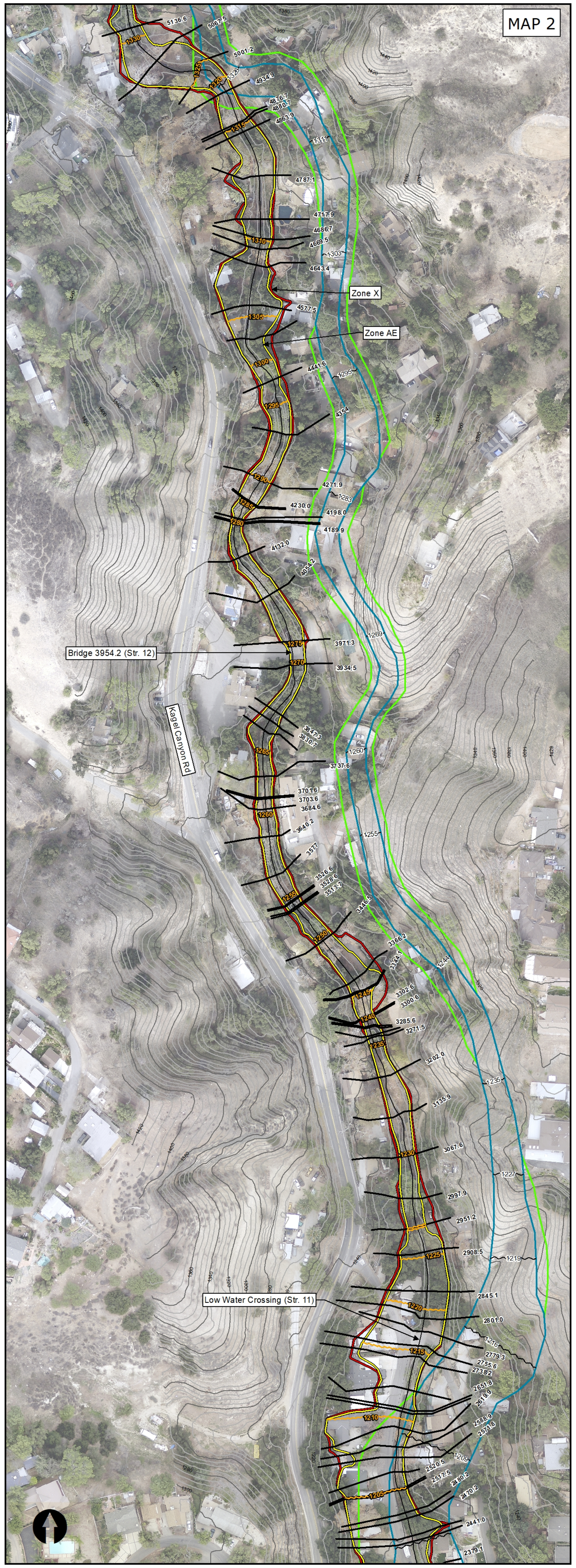
--- End of Analytical Frequency Curve ---

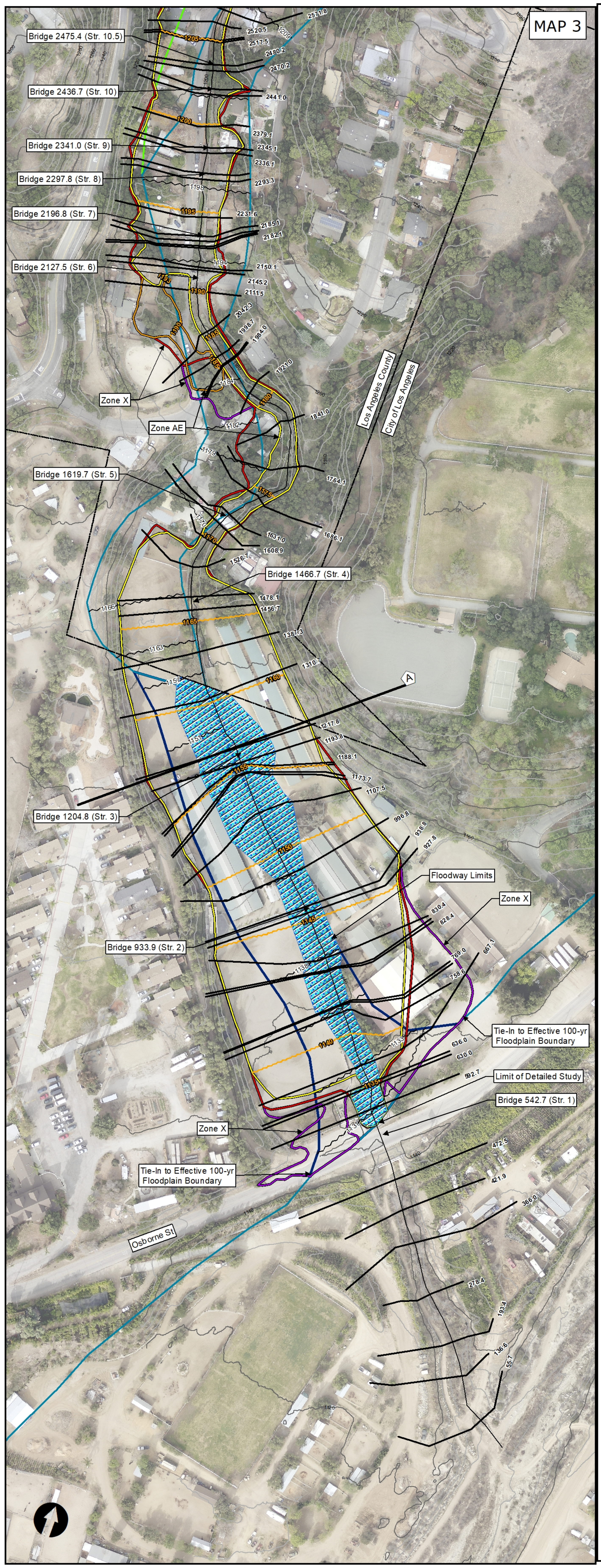
APPENDIX C

ELECTRONIC FILES

Appendix D –
Kagel Canyon Workmap







LEGEND

- EFFECTIVE SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD
- EFFECTIVE FLOODWAY AREAS IN ZONE AE
- EFFECTIVE 0.2% ANNUAL CHANCE FLOOD
- EFFECTIVE FEMA BFE
- 20 FT* CONTOUR
- 5 FT* CONTOUR

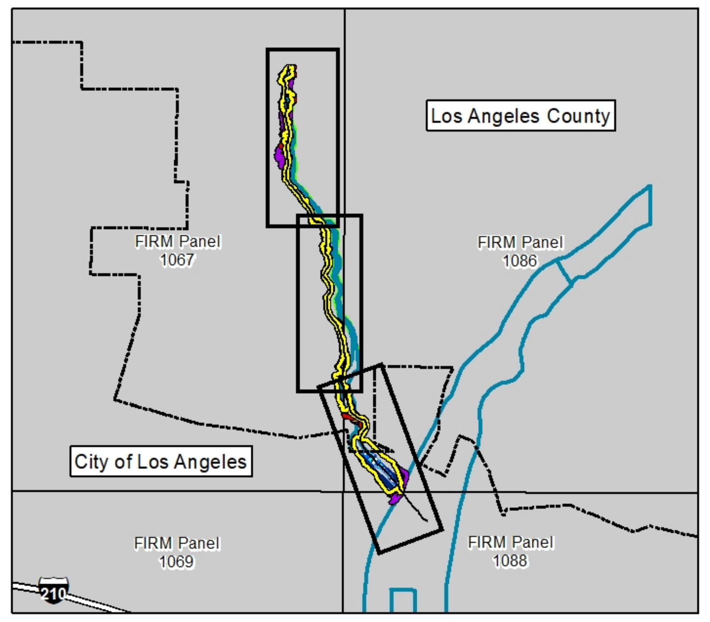
HYDRAULIC MODELING

- PROPOSED 100 YR INUNDATION LIMITS (ZONE AE)
- PROPOSED FLOODWAY INUNDATION LIMITS
- PROPOSED 500 YR INUNDATION LIMITS (ZONE X)
- PROPOSED 100 YR INUNDATION LIMITS (2D, ZONE AE)
- PROPOSED 100 YR (< 1 FT DEPTH) AND 500 YR INUNDATION LIMITS (2D, ZONE X)
- PROPOSED BFE
- CROSS SECTION LINE
- CITY BOUNDARY

*Referenced to the North American Vertical Datum of 1988

REGISTERED PROFESSIONAL ENGINEER
MARK H. SEITS
No. 41103
EXP. 3-31-21
CIVIL
STATE OF CALIFORNIA

WORKMAP



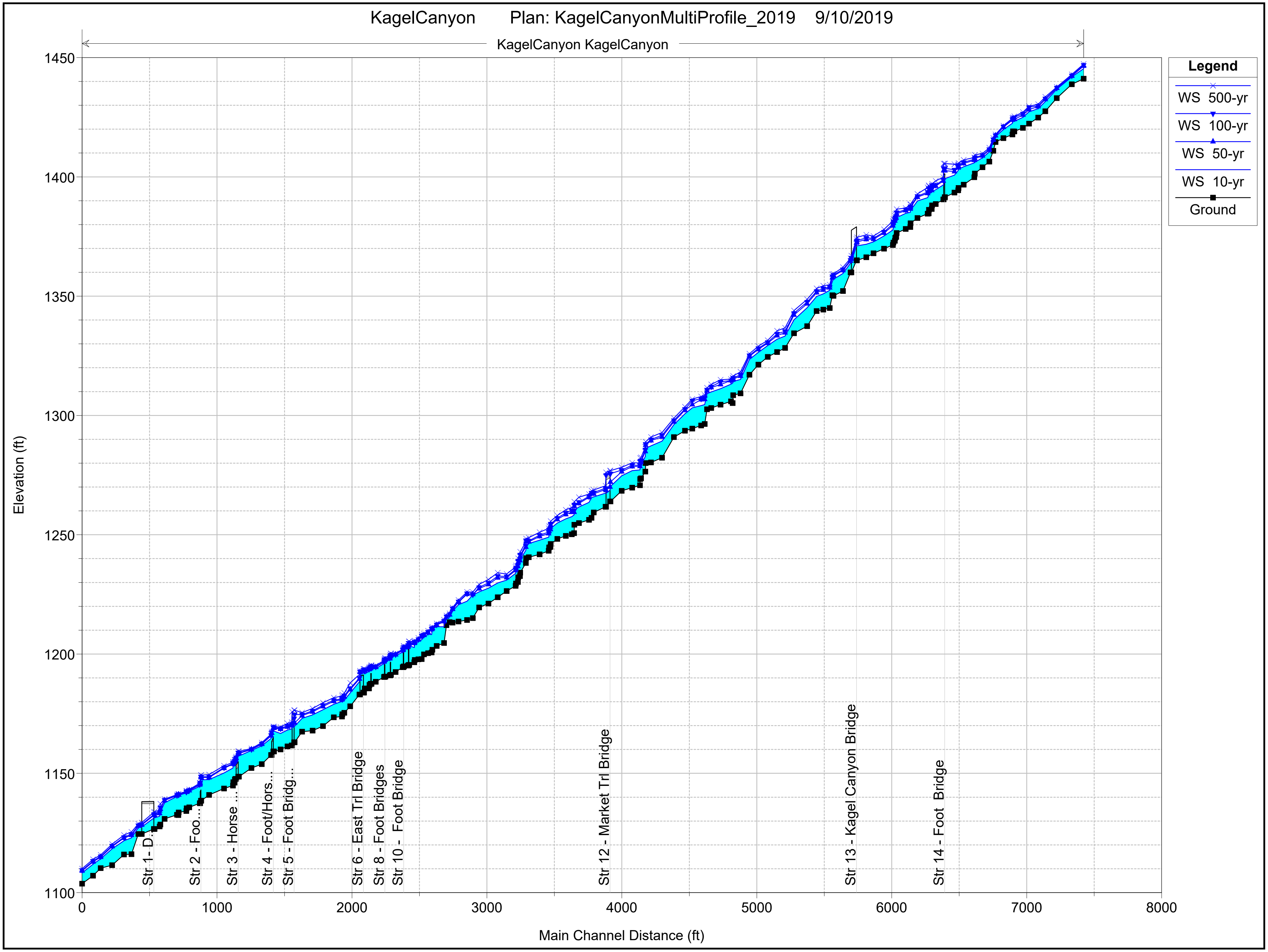
MAP SCALE 1" = 100'

50 0 100 200 FEET

30 0 30 60 METERS

Appendix E –

Updated Flood Profile and Encroachment Table



KagelCanyon Plan: KagelCanyonMultiProfile_2019 9/10/2019
KagelCanyon KagelCanyon
Legend
WS 500-yr
WS 100-yr
WS 50-yr
WS 10-yr
Ground
Elevation (ft)
Main Channel Distance (ft)
1100
1150
1200
1250
1300
1350
1400
1450
0
1000
2000
3000
4000
5000
6000
7000
8000
Str 1- D...
Str 2 - Foo...
Str 3 - Horse ...
Str 4 - Foot/Hors...
Str 5 - Foot Bridg...
Str 6 - East Trl Bridge
Str 8 - Foot Bridges
Str 10 - Foot Bridge
Str 12 - Market Trl Bridge
Str 13 - Kagel Canyon Bridge
Str 14 - Foot Bridge

Kagel Canyon Encroachment Summary Table
(Excludes River Stations without Encroachments)

River Sta	Profile	W.S. Elev	Prof Delta WS	Top Wdth Act[1]	Enc WD	Flow Area	Vel Total	Enc Sta L	Enc Sta R
		(ft)	(ft)	(ft)	(ft)	(sq ft)	(ft/s)	(ft)	(ft)
1387.3	100-yr	1162.43		78.76		219.20	8.12		
1387.3	100-yrEncroached	1162.45	0.02	74.58	74.58	214.43	8.30	91.92	166.50
1310.7	100-yr	1160.12		150.89		306.94	5.80		
1310.7	100-yrEncroached	1160.34	0.22	86.49	86.49	241.01	7.38	121.96	208.45
1217.8	100-yr	1158.67		127.11		429.35	4.14		
1217.8	100-yrEncroached	1158.68	0.02	121.30	121.30	430.97	4.13	77.69	198.99
1204.8 BR U	100-yr	1158.67		101.11		286.19	6.22		
1204.8 BR U	100-yrEncroached	1158.68	0.02	95.58	121.30	287.34	6.19	77.69	198.99
1204.8 BR D	100-yr	1156.60		101.54		224.40	7.93		
1204.8 BR D	100-yrEncroached	1156.60	0.00	101.54	127.54	224.23	7.93	74.47	202.01
1193.8	100-yr	1156.02		127.54		274.02	6.49		
1193.8	100-yrEncroached	1156.02	0.00	127.54	127.54	274.02	6.49	74.47	202.01
1188.1	100-yr	1155.26		126.13		256.34	6.94		
1188.1	100-yrEncroached	1155.33	0.07	118.84	120.87	261.63	6.80	97.50	218.37
1186.1	100-yr	1155.01		124.34		256.13	6.95		
1186.1	100-yrEncroached	1155.02	0.01	113.80	118.50	253.16	7.03	100.25	218.75
1175.7	100-yr	1154.39		115.24		239.97	7.41		
1175.7	100-yrEncroached	1154.39	0.00	106.30	116.64	236.20	7.53	115.80	232.44
1173.7	100-yr	1154.09		99.00		238.53	7.46		
1173.7	100-yrEncroached	1154.10	0.00	97.02	114.47	236.00	7.54	122.36	236.83
1107.5	100-yr	1152.46		94.60		219.26	8.11		
1107.5	100-yrEncroached	1152.47	0.01	92.36	123.18	220.19	8.08	112.46	235.64
996.8	100-yr	1148.55		48.90		169.54	10.49		
996.8	100-yrEncroached	1148.83	0.28	51.34	51.34	183.80	9.68	156.04	207.38
938.8	100-yr	1148.61		83.11		366.27	4.86		
938.8	100-yrEncroached	1149.38	0.77	56.40	56.40	347.14	5.12	187.34	243.74
933.9 BR U	100-yr	1148.61		83.11		260.21	6.84		
933.9 BR U	100-yrEncroached	1149.38	0.77	56.40	56.40	241.07	7.38	187.34	243.74
933.9 BR D	100-yr	1146.01		172.27		527.89	3.37		
933.9 BR D	100-yrEncroached	1146.97	0.96	34.60	56.40	171.45	10.38	187.06	243.46
927.8	100-yr	1145.38		74.31		207.32	8.58		
927.8	100-yrEncroached	1145.48	0.10	56.40	56.40	185.90	9.57	187.06	243.46
849.8	100-yr	1142.93		143.70		259.67	6.85		
849.8	100-yrEncroached	1143.54	0.61	60.70	60.70	187.69	9.48	152.46	213.16
830.4	100-yr	1142.40		171.35		291.41	6.10		

Kagel Canyon Encroachment Summary Table
(Excludes River Stations without Encroachments)

River Sta	Profile	W.S. Elev	Prof Delta WS	Top Wdth Act[1]	Enc WD	Flow Area	Vel Total	Enc Sta L	Enc Sta R
		(ft)	(ft)	(ft)	(ft)	(sq ft)	(ft/s)	(ft)	(ft)
830.4	100-yrEncroached	1143.17	0.76	60.60	60.60	194.44	9.15	168.50	229.10
828.4	100-yr	1142.27		168.19		283.85	6.27		
828.4	100-yrEncroached	1142.89	0.62	61.29	61.29	190.81	9.32	169.88	231.17
771	100-yr	1141.16		200.05		309.53	5.75		
771	100-yrEncroached	1142.04	0.88	57.00	57.00	203.26	8.75	181.92	238.92
769	100-yr	1141.09		202.07		307.56	5.78		
769	100-yrEncroached	1141.66	0.57	53.14	53.14	182.11	9.77	184.54	237.68
758.6	100-yr	1140.82		206.41		301.84	5.89		
758.6	100-yrEncroached	1141.20	0.38	46.04	46.04	171.29	10.39	177.81	223.85
667.1	100-yr	1138.80		131.90		274.72	6.48		
667.1	100-yrEncroached	1138.81	0.01	34.26	34.26	154.32	11.53	248.05	282.31

1. Note "top width act." represents the top width of the wetted cross section, not including ineffective flow areas. Actual mapped width may vary due to inclusion of ineffective flow areas and blocked obstructions.

Appendix F –

Updated Annotated FIRMs

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 shown on this map apply only landward of 0.0' 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. 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, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

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 derived from U.S. Geological Survey Digital Orthophoto Quadrangles produced at a scale of 1:12,000 from photography dated 1994 or later and from National Geospatial Intelligence Agency imagery produced at a scale of 1:4,000 from photography dated 2003 or later.

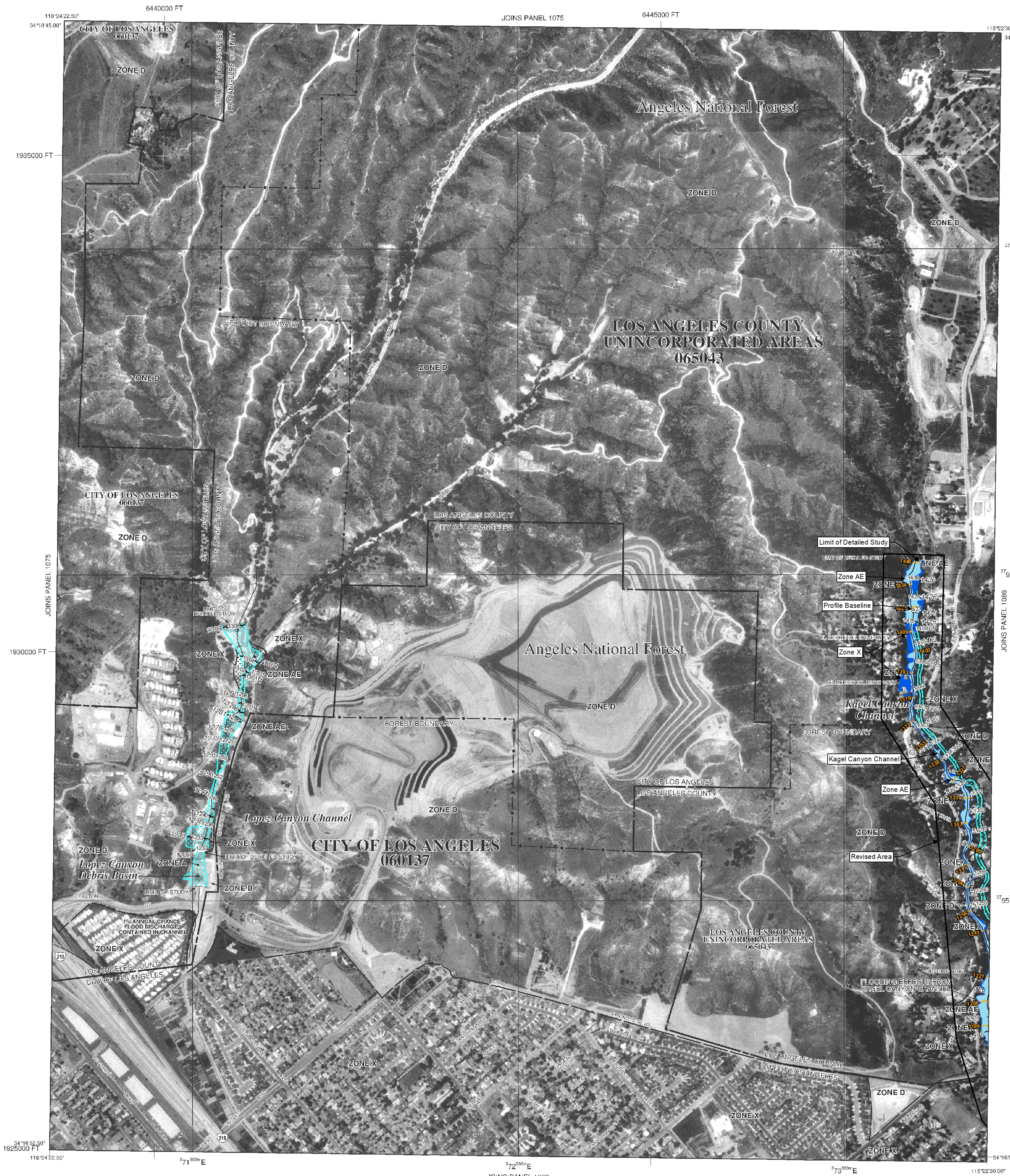
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, 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.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, *a Flood Insurance Study report,* and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/.



LEGEND

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

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of 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 decertified. 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	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	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 Areas of different Base Flood Elevations, flood depths or flood velocities.
~~ 513 ~~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

(A)———(A)	Cross section line
(23)- - - -(23)	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN	1000-meter Universal Transverse Mercator grid values, zone 11
6000000 FT	5000-foot grid ticks: California State Plane coordinate system, V zone (FIPSZONE 0405), Lambert Conformal Conic
DX5510 ×	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
September 26, 2008
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1067F

FIRM
FLOOD INSURANCE RATE MAP
LOS ANGELES COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 1067 OF 2350
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LOS ANGELES COUNTY	065043	1067	F
LOS ANGELES, CITY OF	060137	1067	F

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

MAP NUMBER
06037C1067F

EFFECTIVE DATE
SEPTEMBER 26, 2008

Federal Emergency Management Agency

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 shown on this map apply only landward of 0.0' 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. 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, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

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 derived from U.S. Geological Survey Digital Orthophoto Quadrangles produced at a scale of 1:12,000 from photography dated 1994 or later and from National Geospatial Intelligence Agency imagery produced at a scale of 1:4,000 from photography dated 2003 or later.

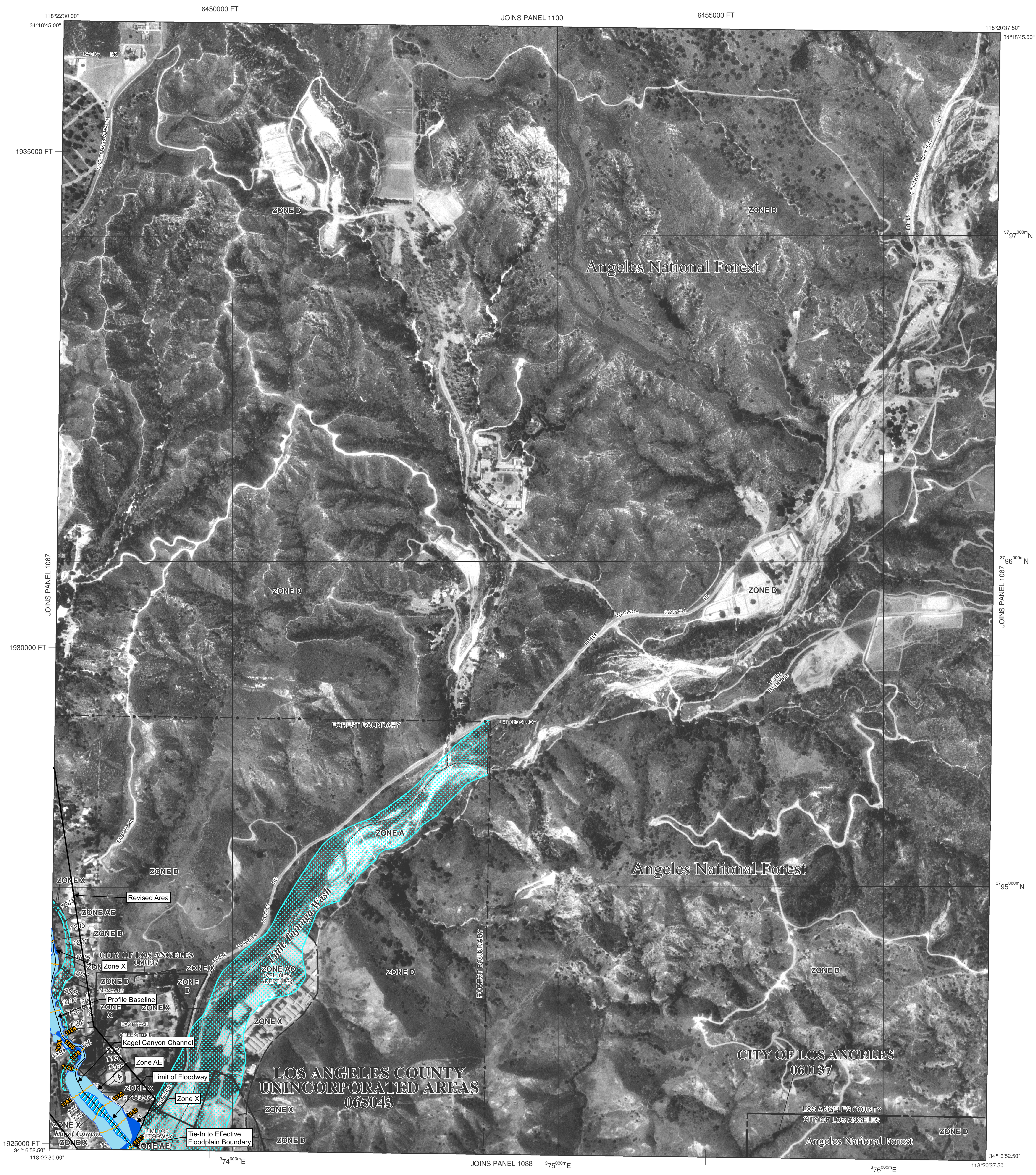
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, 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.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, *a Flood Insurance Study report*, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/.



LEGEND

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

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of 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 decertified. 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 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE 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 Areas of different Base Flood Elevations, flood depths or flood velocities.

~~~ 513 ~~~ Base Flood Elevation line and value; elevation in feet*

(EL 987) Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

(A)——(A) Cross section line

(23)- - - -(23) Transect line

97°07'30", 32°22'30" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

$^{42}75^{000m}$N 1000-meter Universal Transverse Mercator grid values, zone 11

6000000 FT 5000-foot grid ticks: California State Plane coordinate system, V zone (FIPSZONE 0405), Lambert Conformal Conic

DX5510 × 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
September 26, 2008
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1086F

FIRM
FLOOD INSURANCE RATE MAP
LOS ANGELES COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 1086 OF 2350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LOS ANGELES COUNTY	065043	1086	F
LOS ANGELES, CITY OF	060137	1086	F

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

MAP NUMBER
06037C1086F

EFFECTIVE DATE
SEPTEMBER 26, 2008

Federal Emergency Management Agency
~~~

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 shown on this map apply only landward of 0.0' 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. 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, N/NGS12
National Geodetic Survey
SSMC–3, #9202
1315 East–West Highway
Silver Spring, MD 20910–3282

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 derived from U.S. Geological Survey Digital Orthophoto Quadrangles produced at a scale of 1:12,000 from photography dated 1994 or later and from National Geospatial Intelligence Agency imagery produced at a scale of 1:4,000 from photography dated 2003 or later.

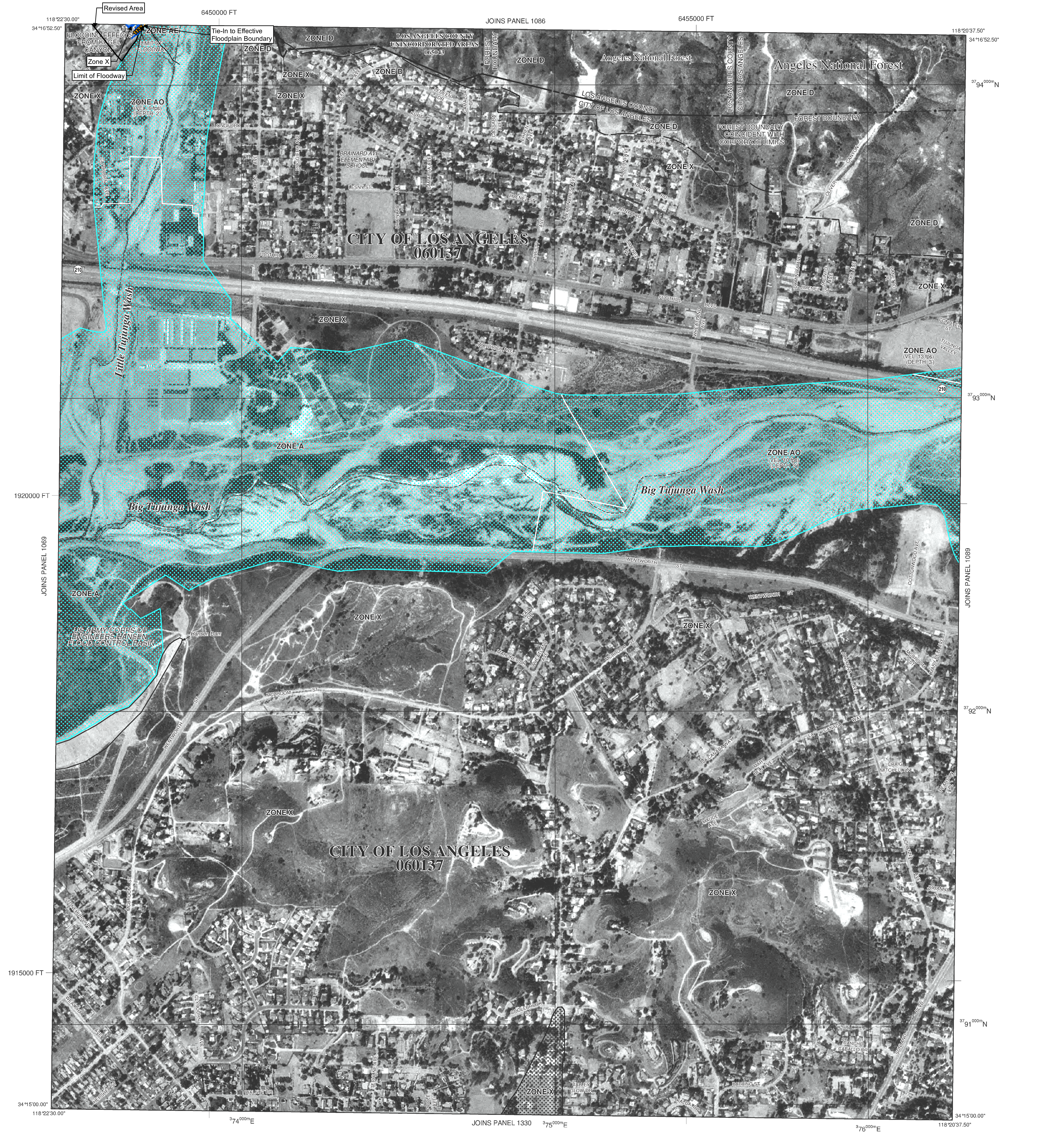
This map reflects more detailed and up–to–date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, 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.

Contact the **FEMA Map Service Center** at 1–800–358–9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, *a Flood Insurance Study report*, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1–800–358–9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1–877–FEMA MAP** (1–877–336–2627) or visit the FEMA website at http://www.fema.gov/.



LEGEND

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

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of 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 decertified. 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	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	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 Areas of different Base Flood Elevations, flood depths or flood velocities.

~~ 513 ~~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

(A)———(A)	Cross section line
(23)- - - - -(23)	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN	1000-meter Universal Transverse Mercator grid values, zone 11
6000000 FT	5000-foot grid ticks: California State Plane coordinate system, V zone (FIPSZONE 0405), Lambert Conformal Conic
DX5510 ×	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
September 26, 2008
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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.

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1088F

FIRM

FLOOD INSURANCE RATE MAP

LOS ANGELES COUNTY, CALIFORNIA

AND INCORPORATED AREAS

PANEL 1088 OF 2350

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LOS ANGELES COUNTY	065043	1088	F
LOS ANGELES, CITY OF	060137	1088	F

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

MAP NUMBER
06037C1088F

EFFECTIVE DATE
SEPTEMBER 26, 2008

Federal Emergency Management Agency