IV - WATERSHED CHARACTERISTICS

4-01 GENERAL CHARACTERISTICS

Lopez Dam is located on Pacoima Wash in the northcentral part of the San Fernando Valley, about 2.2 miles northeast of the city of San Fernando, and entirely within the city of Los Angeles. The drainage area is 34 square miles, about 15 miles long and from 1.5 to 3 miles wide. Pacoima Dam, owned and operated by the LACDPW, has flood control and conservation storage and is located 1.5 miles upstream of Lopez Dam. The drainage area located between Pacoima Dam and Lopez Dam is 6 square miles.

4-02 TOPOGRAPHY

The elevations in the drainage area range from a peak of 6,532 feet above National Geodetic Vertical Datum (NGVD) on Mount Gleason in the San Gabriel Mountains to 1,250 feet above NGVD at Lopez Dam. The longest water course in the area, Pacoima Wash, is about 19 miles in length with an average gradient of 275 feet per mile.

4-03 GEOLOGY AND SOILS

The soils in the mountains, which are derived mainly from metamorphic and igneous rocks, are shallow and stony. In the valleys, the soil consists of silt, sand, and gravel with some boulders and is relatively deep. The canyon slopes have a sparse cover of live oak, chaparral, and native grass.

4-04 SEDIMENT

The original design for Lopez Dam was based on providing a debris control reservoir to retain the debris of a 50-year accumulation plus the debris produced by a single flood. Using a 1 percent debris surface slope projected upstream from the spillway crest, a debris storage allowance of 1,280,000 cubic yards (794 acre-feet) was originally provided. This storage was completely filled with debris by February 1969, only 15 years after completion of the dam. As a result of this higher debris production, either the spillway crest should be raised 16.5 feet to provide the necessary debris storage, or, more likely, debris should be removed more frequently.

4-05 CLIMATE

The climate of the watershed is characterized by warm, dry summers and cool, moist winters. The climate varies throughout the watershed due to the variation in elevation. The higher elevations are generally slightly cooler and receive more precipitation than the lower portion of the watershed. Nearly all the precipitation occurs during the months of December through March. Elevations above 5,000 feet frequently experience snowfall with the snow usually melting rapidly except on higher peaks and northern slopes. The average annual temperature at the city of San Fernando is 63.6 degrees F. The lowest average monthly temperature is 54.2 degrees F in January and the highest average monthly temperature is 74.6 degrees F in August. The average annual rainfall recorded at the San Fernando station is 16.12 inches. The average monthly rainfall for this station is heaviest in January (3.39 inches)

and is lightest in July (0.02 inches).

4-06 STORMS AND FLOODS

Precipitation in the Lopez Dam drainage area occurs both in the form of general winter storms associated with extratropical cyclones of North Pacific origin and convective type storms generally occurring during the summer. Estimates of probable maximum precipitation furnished by the U.S. Weather Bureau indicate that the highest rate of discharge from the drainage area for Lopez Dam would result from a 6-hour convective type storm.

Precipitation in the area is highly variable as shown by the monthly precipitation recorded at Pacoima Dam (Table 4-1). The variability in the precipitation can be illustrated by inspecting the statistical parameters presented in Table 4-2. A comparison of the highest on record values with the mean or median values shows the wide variation. The four quartile mean values and median values are shown graphically on Plate 4-1.

4-07 RUNOFF CHARACTERISTICS

The annual runoff from the Lopez Dam drainage area is also highly variable. A summary of the outflow from Pacoima Dam is shown in Table 4-3. The annual runoff is also shown on Plate 4-2 (1937-1958) and Plate 4-3 (1959-1976). Selected Pacoima Dam outflow hydrographs are plotted on Plate 4-4. A basin unit hydrograph has been developed and is shown on Plate 4-5.

4-08 WATER QUALITY

The watershed for Lopez Dam lies almost entirely in the unpopulated and undeveloped Angeles National Forest. No agricultural or industrial activity is present upstream from Lopez Reservoir. Under these conditions, water quality of inflow to Lopez Reservoir is expected to be high (low concentrations of heavy metals, pesticides and other pollutants).

In the past, high concentrations of suspended solids and nonvegetative debris from storm runoff and sluicing operations at upstream Pacoima Reservoir have resulted in a continual problem of sediment deposition in Lopez Reservoir. This has necessitated frequent clean-out operations to allow operation of the dam outlet and to ensure that adequate debris storage exists for a potential future flood.

TABLE 4-1

PRECIPITATION DATA RECORDED AT PACOIMA DAM*

(Value in inches)

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	TOTAL
1929	0.35	1.66	2.76	1.85	2.02	1.69	2.18	0	0.18	0	0	0.30	12.99
1930	0.16	0	6.37	1.04	5.60	0.37	1.72	0.15	0	T	0	0.08	15.49
1931	0.55	3.52	0	4.13	5.96	0.02	2.76	0.84	0.23	0	0.27	0.09	8.37
1932	0.24	2.61	7.36	2.21	9.47	0.22	1.26	0.36	0.36	0	0	0.07	24.16
1933	0.07	0	1.49	11.16	0.08	0.37	0.86	1.03	0.35	0	0.07	0	15.48
1934	0.59	0.19	6.63	4.31	3.33	0.04	0.03	0.01	0.96	0	T	0.33	16.42
1935	3.74	2.51	6.50	3.57	2.12	3.84	2.50	0.07	0	0.18	0.14	0	25.17
1936	0.57	1.38	0.68	0.40	11.28	2.48	0.65	0.03	0.04	0.05	0.02	0.21	17.79
1937	2.01	0.06	8.55	4.27	8.02	4.83	0.58	1.02	0.05	0.01	0	T	29.40
1938	0	0.03	5.01	1.95	10.09	12.84	1.96	0.35	0.30	0	0.06	0.06	32.65
1939	0.27	T	10.27	3.55	1.45	1.96	0.23	0.18	0	0	0	4.07	21.98
1940	0.20	0.23	0.82	6.97	6.18	1.43	2.17	0.04	0	0	0	0.06	18.13
1941	1.52	0.21	7.72	3.35	13.00	8.98	5.27	0.07	0.03	0.22	0.04	0	40.41
1942	2.00	0.15	5.89	0.36	0.98	1.25	3.04	0.03	0	0	0.79	0	14.49
1943	1.41	0.64	1.20	16.08	4.50	5.22	1.22	0.01	0.03	0	0	0	30.27
1944	0.32	0.28	8.12	1.39	11.80	4.16	1.05	0.18	0.59	0	0	0.09	27.98
1945	0	5.13	1.44	0.09	5.62	4.22	0.59	0.01	0.18	0.12	0.90	0	18.18
1946	1.41	0.36	6.38	0.24	1.38	5.77	0.83	0.37	0	0.12	0	0	16.86
1947	2.50	8.27	6.10	0.75	0.15	1.50	0.33	0.61	0.12	0	0.13	0.46	20.92
1948	0.12	0.02	1.70	0	1.78	3.36	1.83	0.17	0.48	0	0	0	9.46
1949	0.12	0	3.01	2.74	2.37	1.48	0.12	2.14	0.03	0	T	0	12.01
1950	0.06	1.99	3.31	2.61	2.31	1.09	1.15	0.29	0.23	T	0	0.96	14.00
1951	0.61	1.48	0.16	4.21	0.95	0.70	2.87	0.10	0	0	0.74	0	11.82
1952	0.99	2.16	7.38	13.10	0.54	9.12	3.06	0	0.01	0	0	0.11	36.47
1953	0	4.12	3.72	1.77	0.36	1.06	1.81	0.23	0.08	0	0	0	13.15
1954	0	0.99	0.27	6.51	2.71	4.79	0.42	0.11	0.07	0	0	0	15.87
1955	0	1.77	1.23	4.40	1.67	0.28	3.04	1.88	0.01	0	0.06	0	14.34
1956	0	1.77	2.38	7.19	0.84	0	4.45	1.12	T	0	0.01	0	17.76
1957	1.16	0	0.40	6.30	1.95	2.08	1.33	2.04	0.40	0	0	T	15.66
1958	2.25	0.72	4.48	2.53	7.54	6.13	6.06	0.08	0	0	0.03	0.69	30.56
1959	0.37	0.26	0	2.85	4.87	0	0.95	0.02	0.01	T	T	0.07	9.40
1960	0.03	T	1.36	3.10	2.52	1.01	1.62	T	0	0	0	T	9.64
1961	0	5.12	0.26	1.39	0.03	0.61	0.51	0.10	0	0.01	0.58	0.13	8.74
1962	0	2.07	2.39	4.01	14.51	1.45	0.12	0.41	T	0	0	0	24.96
1963	0.26	0.03	T	0.83	4.10	3.04	3.00	0.07	0.67	0	T	1.11	13.11
1964	0.99	3.19	0.06	3.09	T	3.02	1.91	0.06	0.31	0	T	T	12.63
1965	0.75	2.39	2.64	0.72	0.62	2.01	6.86	T	0.06	0.17	0.02	1.98	18.22
1966	0	15.66	4.68	1.00	1.38	0.35	0	0.33	0	T	0	0.61	24.01
1967	0.15	3.93	7.91	6.98	0.17	4.89	5.73	0.65	T	0	0	1.58	31.99
1968	0	6.96	1.06	1.66	1.95	3.50	0.63	T	T	0	0.12	0.03	15.91
1969	0.50	0.38	1.56	16.55	9.45	1.49	1.45	0.02	0.25	0.12	0	T	31.77
1970	0	2.25	0.11	2.05	4.20	5.84	T	0.02	0.12	T	0	0	14.59
1971	0.03	6.75	6.76	1.53	0.94	1.06	0.88	1.38	0.05	0.02	0	0.15	19.55
1972	0.51	0.71	8.24	T	0.21	0	0.14	0.08	0.06	T	0.11	0.03	10.09
1973	1.60	2.39	2.08	4.07	12.70	4.02	0.08	0.01	0.09	0	T	T	27.04
1974	0.54	2.01	0.79	8.69	0	4.22	0.62	0.01	0.03	T	0	0	16.91
1975	1.05	0.13	3.48	0.29	3.08	5.08	3.35	0.12	0.04	0	0	0.10	16.72
1976	0.62	0.01	0.78	0.00	4.25	1.92	1.54	0.24	0.21	0.01	0.34	4.33	14.25
1977	2.97	0.58	0.67	4.96	0.13	2.15	0	5.16	0.04	0	2.90	T	19.56
1978	0.02	0.23	5.13	7.79	8.01	14.01	2.93	T	T	0	0	0.98	39.10
1979	0.16	2.72	1.83	8.20	4.05	5.74	0.03	0.34	0.16	0	0.07	0.02	23.32
1980	1.20	0.70	0.55	7.41	12.52	5.59	0.69	0.85	T	0.04	0	0	29.55
1981	0	0	0.85	3.49	1.38	4.63	1.49	T	0	0	0	0	11.84
1982	0.59	2.72	0.28	2.70	1.00	6.59	2.74	0.06	0.21	0	0	1.32	18.21
1983	0.32	4.92	1.85	6.46	5.68	12.00	4.41	0.19	0.02	0	4.12	2.10	42.07
x	0.65	1.97	3.10	4.08	3.99	3.47	1.74	0.46	0.13	0.02	0.21	0.40	20.21
s	0.84	2.74	2.91	3.78	4.06	3.25	1.67	0.85	0.19	0.05	0.69	0.90	8.46
x_y	0.40	1.15	2.26	2.99	2.80	2.53	1.26	0.22	0.07	0.01	0.06	0.16	18.64
s_y	2.69	2.82	2.21	2.20	2.32	2.21	2.24	3.38	2.91	4.09	4.81	3.83	1.49

LACDPW STATION NO. 33A

x = normal mean s = normal standard deviation x_y = log-normal mean s_y = log-normal standard deviation

TABLE 4-2

STATISTICAL PARAMETERS FOR PRECIPITATION DATA RECORDED AT PACOIMA DAM*

(Values in inches unless noted otherwise)

Parameter	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Total
Mean	0.65	1.97	3.10	4.08	3.99	3.47	1.74	0.46	0.13	0.02	0.21	0.40	20.21
Median	0.32	0.99	1.85	3.10	2.31	2.48	1.26	0.11	0.04	0	0	0.03	17.79
First Quartile Mean	0.004	0.03	0.25	0.53	0.36	0.41	0.17	0.01	0	0	0	0	11.65
Second Quartile Mean	0.18	0.46	1.28	2.33	1.60	1.71	0.85	0.07	0.02	0	0	0.004	16.02
Third Quartile Mean	0.61	2.03	3.64	4.36	4.09	4.11	1.95	0.27	0.11	0	0.03	0.11	21.05
Fourth Quartile Mean	1.91	5.62	7.53	9.47	10.35	7.96	4.16	1.57	0.41	0.08	0.86	1.58	33.02
Highest on Record	3.74	15.66	10.27	16.55	14.51	14.01	6.86	5.16	0.96	0.22	4.12	4.33	42.07
Lowest on Record	0	0	0	0	0	0	0	0	0	0	0	0	8.74
Percentage of Years with Measurable Precipitation	78.2	87.3	92.7	94.6	96.4	94.6	94.6	87.3	69.1	21.8	38.2	52.7	100.00

*LACDPW STATION NO. 33A

TABLE 4-3

PACOIMA DAM OUTFLOW*

Season	Annual Outflow (AF)	Instantaneous Peak Outflow (cfs)	Date of Peak
1937-38	26796	2062	3-2
1938-39	3080	66	1-20
1939-40	3133	169	2-4
1940-41	25942	430	3-5
1941-42	2032	97	7-15
1942-43	20407	598	1-23
1943-44	15167	326	3-2
1944-45	4911	397	2-2
1945-46	2904	241	2-5
1946-47	6029	237	1-7
1947-48	335	8	6-29
1948-49	740	10	6-24
1949-50	1019	231	4-11
1950-51	69	6	9-30
1951-52	14325	634	1-18
1952-53	3500	163	11-17
1953-54	2941	292	4-5
1954-55	737	39	4-21
1955-56	1252	66	5-17
1956-57	773	47	5-7
1957-58	15808	420	2-5
1958-59	708	242	6-18
1959-60	271	4	8-1
1960-61	11	0	N/A
1961-62	6279	511	4-7
1962-63	228	24	9-25
1963-64	722	117	6-15
1964-65	1041	5	5-7
1965-66	15214	664	11-23
1966-67	23600	197	7-6
1967-68	3833	105	11-22
1968-69	42998	2715	2-25
1969-70	2308	153	3-3
1970-71	4994	85	12-26
1971-72	802	90	2-11
1972-73	7383	1540	2-11
1973-74	4154	460	1-8
1974-75	2526	83	8-19
1975-76	1614	66	6-6
1976-77	507	470	4-4
1977-1984 not available for this study			

N/A - Not Applicable

* Outflow data provided by Los Angeles County Department of Public Works (LACDPW) for Pacoima Creek Flume below Pacoima Dam. LACDPW Station No. F/188B-R.

4-09 CHANNEL AND FLOODWAY CHARACTERISTICS

The basin channel upstream of Lopez Dam is natural with no channel improvements for flood control. Flood control channel improvements have been constructed on Pacoima Wash downstream of Lopez Dam as described in Section 3-04. The channel has been divided into three sections in terms of nomenclature:

Section	Name	Description
1	Pacoima Creek	Watershed up to Pacoima Dam
2	Pacoima Wash	Pacoima Dam to Pacoima Spreading Grounds
3	Pacoima Diversion	Pacoima Spreading Grounds to Tujunga Wash Channel

A profile of the channel from Tujunga Wash to the watershed crest is shown on Plate 4-6 (Sta. 0+00-Sta. 80+00) and Plate 4-7 (Sta. 80+00-Sta. 160+80).

4-10 UPSTREAM STRUCTURES

Pacoima Dam. Pacoima Dam is located on Pacoima Creek approximately 1.5 miles upstream of the Lopez Dam site (see Plate 3-1). The concrete-arch structure, completed in 1929, is operated and maintained by the LACDPW for flood control and water conservation. Information pertaining to Pacoima Dam and Reservoir is given in Exhibit A.

4-11 DOWNSTREAM STRUCTURES

(a) Hansen Dam. Located along Tujunga Wash, 9 miles above its confluence with Los Angeles River (see Plate 3-1), Hansen Dam is a major flood-control facility owned, operated, and maintained by the LAD, as part of the LACDA flood-control project. Hansen Dam controls floods on the downstream portions of Los Angeles River, as well as on Tujunga Wash, immediately downstream of Hansen Dam. Pertinent data for Hansen Dam are included in Exhibit B.

(b) Sepulveda Dam. Sepulveda Dam is a major flood control dam owned, operated and maintained by the LAD. It is located along Los Angeles River, 43 miles above the mouth of the river, and 6 miles above the confluence of Tujunga Wash and Los Angeles River. The dam is in the southcentral portion of the San Fernando Valley, just northwest of the junction of the Ventura Freeway (U.S. Highway 101) and the San Diego Freeway (Interstate Highway 405) (see Plate 3-1). Pertinent data for Sepulveda Dam are included in Exhibit B.

4-12 ECONOMIC DATA

a. Population. The watershed for Lopez Dam lies almost completely in the Angeles National Forest. This is an unpopulated and unincorporated part of Los Angeles County. The downstream area is located in the cities of San Fernando and Pacoima. The population estimates below are from the State of California, Department of Finance, Population Research Unit, and are of January, 1984:

Pacoima	74,662
San Fernando	18,966

b. Agriculture. The downstream area was once primarily an agricultural and ranch area. The postwar era has brought increasing urbanization to the area which has virtually replaced all agriculture and ranching.

c. Industry. The downstream area is heavily residential and supports general office and commercial development. There are a number of business/industrial parks. Most of the manufacturing is light industry.

d. Flood Damages. Since completion of the project, flood damages prevented through fiscal year 1984 are estimated to be $159,584,000. The reason this much damage has been prevented is because Lopez Dam serves as a debris collection basin. If this debris was allowed to flow downstream it would damage the channel lining thus causing greater flood damages for a particular event than if the channel lining was intact.