

Table 1

Summary of climatological data at Santa Maria (public airport), Santa Maria
River and tributaries, Calif.*

Month	Temperature			Precipitation		
	Mean	Record	Record	Mean	Maximum	Minimum
	monthly	highest	lowest	monthly	monthly	monthly
	Degrees Fahrenheit	Degrees Fahrenheit	Degrees Fahrenheit	Inches	Inches	Inches
Jan.....	50.4	82	22	2.71	5.88	0.01
Feb.....	51.8	87	24	2.47	5.18	T
Mar.....	54.0	88	29	2.29	4.68	T
Apr.....	55.8	97	31	1.20	4.24	.07
May.....	57.7	93	34	.32	1.03	T
June.....	60.1	95	36	.14	.26	T
July.....	62.2	104	43	.03	.62	T
Aug.....	62.4	93	43	.03	.11	T
Sep.....	62.1	102	36	.12	1.57	T
Oct.....	60.0	103	30	.62	1.18	T
Nov.....	56.4	93	25	.94	3.41	0
Dec.....	52.4	90	26	2.61	4.82	.16
Period	:	:	:	:	:	:
of	57.1	104	22	**13.48	5.88	0
record	:	:	:	:	:	:

* Latitude 34° 54' N.; longitude 120° 27' W.; elevation 238 feet above mean sea level (see pl. 4).

** Mean seasonal.

Note.--

1. Period of record for maximum and minimum temperature and precipitation values 16 years. Period of record for mean temperature and precipitation values 30 years (1921-50). "T" represents trace.

2. Greatest snowfall reported during 16-year record was a trace.

Table 2

Summary of climatological data at Cuyama, Santa Maria River and tributaries,
Calif.*

Month	Temperature			Precipitation		
	Mean	Record	Record	Mean	Maximum	Minimum
	monthly	highest	lowest	monthly	monthly	monthly
	Degrees	Degrees	Degrees			
	Fahrenheit	Fahrenheit	Fahrenheit	Inches	Inches	Inches
Jan.....	43.2	79	7	1.09	3.47	T
Feb.....	46.1	81	15	.67	2.08	0.08
Mar.....	47.4	84	19	1.13	3.13	.03
Apr.....	54.6	92	22	.51	.97	0
May.....	60.3	102	27	.21	.92	0
June.....	67.0	108	32	.03	.25	0
July.....	74.6	109	39	.01	.07	0
Aug.....	73.0	108	36	.03	.25	0
Sep.....	69.1	109	12	.28	2.99	0
Oct.....	58.2	98	21	.27	1.27	0
Nov.....	50.4	89	15	.54	2.58	0
Dec.....	45.6	87	11	.95	2.94	0
Period						
of	57.5	109	7	**5.72	3.47	0
record						

* Latitude 34° 56' N.; longitude 119° 37' W.; elevation 2,240 feet above mean sea level (see pl. 4).

** Mean seasonal.

Note.--Period of record 14 years (1945-58). "T" represents trace.

Table 3

Existing stream-gaging stations and pertinent data, Santa Maria River and tributaries, Calif.

Station*	Drainage area	Period of record	Maximum recorded peak flow
	Square miles		Cubic feet per second
Santa Maria River at Guadalupe.	**1,728	January 1941-July 1959...	23,800
Huasna River near Santa Maria.	119	December 1929-July 1959..	11,400
Alamos Creek near Santa Maria.	88	October 1943-July 1959...	2,820
Cuyama River near Santa Maria.	912	November 1903-December 1905*** and December 1929-July 1959.	17,300
La Brea Creek near Sisquoc.	87	October 1943-July 1959...	3,320
Tepusquet Creek near Sisquoc.	29	October 1943-July 1959...	318
Sisquoc River near Garey (Gary).	442	February 1941-July 1959..	13,000

* (See pl. 4 for location)

** From latest quadrangle maps. The U. S. Geological Survey water supply papers show 1,763 square miles.

*** Station listed as Santa Maria River near Santa Maria, Calif., during this period.

Table 4

Runoff data, Santa Maria River at Guadalupe, Santa Maria River and tributaries, Calif.*

Season**	Maximum peak discharge	Date	Maximum mean daily discharge	Date
	Cubic feet per second		Cubic feet per second	
1940-41.....	14,700	5 Mar	10,800	5 Mar
1941-42.....	(***)	(***)	160	23 Apr
1942-43.....	13,800	23 Jan	7,940	23 Jan
1943-44.....	5,000	22 Feb	2,500	22 Feb
1944-45.....	3,700	2 Feb	1,130	3 Feb
1945-46.....	3,500	30 Mar	850	30 Mar
1946-47.....	(#)		350	26 Dec
1947-48.....	(#)		(#)	
1948-49.....	(#)		(#)	
1949-50.....	3,600	7 Feb	1,150	7 Feb
1950-51.....	(#)		(#)	
1951-52.....	23,800	16 Jan	14,400	16 Jan
1952-53.....	84	14 Jan	63	15 Jan
1953-54.....	2,090	25 Jan	431	25 Jan
1954-55.....	(#)		(#)	
1955-56.....	(##)	27 Jan	1,100	27 Jan
1956-57.....	(#)		(#)	
1957-58.....	21,500	3 Apr	(##)	

* Data from U. S. Geological Survey gaging station 0.5 mile north of Guadalupe, Santa Barbara County and 4.5 miles upstream from mouth (see pl. 4 for location). Prior to 12 August 1955, at site, 100 feet upstream. Drainage area 1,763 square miles.

** 1 October to 30 September, inclusive.

*** Records not available.

No flow.

Not determined.

Table 5

Runoff data, Huasna River near Santa Maria, Santa Maria River and tributaries, Calif.*

Season**	Maximum	Date	Maximum	Date
	peak discharge		mean daily discharge	
	Cubic feet per second		Cubic feet per second	
1929-30.....	10	14 Mar	7	15 Mar
1930-31.....	11	2 Jan	6	2 Jan
1931-32.....	4,000	28 Dec	1,620	28 Dec
1932-33.....	1,240	19 Jan	480	19 Jan
1933-34.....	37	31 Dec	16	1 Jan
1934-35.....	3,110	8 Apr	1,490	8 Apr
1935-36.....	2,360	23 Feb	1,560	23 Feb
1936-37.....	8,370	7 Feb	5,010	6 Feb
1937-38.....	11,400	11 Feb	4,630	11 Feb
1938-39.....	16	9 Mar	12	8 Feb
1939-40.....	493	10 Jan	227	29 Feb
1940-41.....	5,180	4 Mar	2,290	4 Mar
1941-42.....	701	28 Dec	336	28 Dec
1942-43.....	4,700	23 Jan	2,800	23 Jan
1943-44.....	1,500	4 Mar	575	5 Mar
1944-45.....	1,250	2 Feb	574	2 Feb
1945-46.....	550	30 Mar	380	30 Mar
1946-47.....	32	20 Nov	23	20 Nov
1947-48.....	6.5	24 Mar	4.8	10 Apr
1948-49.....	7.1	4 Mar	5.9	4 Mar
1949-50.....	900	6 Feb	381	6 Feb
1950-51.....	414	19 Nov	206	19 Nov
1951-52.....	4,060	15 Jan	2,220	15 Jan
1952-53.....	359	8 Jan	180	8 Jan
1953-54.....	811	25 Jan	316	25 Jan
1954-55.....	144	10 Jan	23	19 Jan
1955-56.....	2,260	25 Jan	1,000	27 Jan
1956-57.....	129	2 Dec	9	2 Dec
1957-58.....	4,230	3 Apr	2,660	3 Apr

* Data from U. S. Geological Survey gaging station on left bank 0.4 mile upstream from mouth and 8 miles NE. of Santa Maria, Santa Barbara County. (see pl. 4 for location). Drainage area 119 square miles.

** 1 October to 30 September, inclusive.

Table 6

Runoff data, Alamos (Alamo) Creek near Santa Maria, Santa Maria River and tributaries, Calif.*

Season**	Maximum peak discharge	Date	Maximum mean daily discharge	Date
	<u>Cubic feet</u> <u>per second</u>		<u>Cubic feet</u> <u>per second</u>	
1943-44.....	560	4 Mar	270	5 Mar
1944-45.....	700	2 Feb	216	2 Feb
1945-46.....	10	22 Dec	9	22 Dec
1946-47.....	8.7	20 Nov	4.8	20 Nov
1947-48.....	2.6	24 Mar	1.6	9 Apr
1948-49.....	4.1	26 Dec	1.9	27 Dec
1949-50.....	614	6 Feb	271	6 Feb
1950-51.....	248	27 Oct	75	19 Nov
1951-52.....	2,820	15 Jan	1,350	15 Mar
1952-53.....	124	14 Jan	70	14 Jan
1953-54.....	598	25 Jan	173	25 Jan
1954-55.....	8.8	18 Jan	5.9	18 Jan
1955-56.....	1,360	26 Jan	427	27 Jan
1956-57.....	2.3	17 Apr	2	23 Dec

* Data from U. S. Geological Survey gaging station on right bank just downstream from highway bridge, 1.2 miles upstream from mouth and 9 miles NE. of Santa Maria, Santa Barbara County (see pl. 4 for location). Drainage area 87.7 square miles.

** 1 October to 30 September, inclusive.

Table 7

Runoff data, Cuyama River near Santa Maria, Santa Maria River and tributaries, Calif.*

Season**	Maximum	Date	Maximum	Date
	peak discharge		mean daily discharge	
	Cubic feet per second		Cubic feet per second	
1929-30.....	101	14 Mar	60	16 Mar
1930-31.....	231	5 Feb	142	5 Feb
1931-32.....	4,480	9 Feb	2,410	9 Feb
1932-33.....	511	19 Jan	267	19 Jan
1933-34.....	382	2 Jan	195	2 Jan
1934-35.....	820	8 Apr	390	8 Apr
1935-36.....	492	16 Feb	340	23 Feb
1936-37.....	5,220	6 Feb	3,560	6 Feb
1937-38.....	17,300	3 Mar	5,350	3 Mar
1938-39.....	415	15 Dec	140	16 Dec
1939-40.....	224	26 Feb	82	27 Feb
1940-41.....	4,600	5 Mar	3,000	4 Mar
1941-42.....	782	22 Apr	168	22 Apr
1942-43.....	8,400	23 Jan	2,290	23 Jan
1943-44.....	1,900	22 Feb	1,520	22 Feb
1944-45.....	1,400	3 Feb	515	3 Feb
1945-46.....	1,000	22 Dec	250	22 Dec
1946-47.....	500	13 Nov	250	14 Nov
1947-48.....	23	26 Mar	19	6 Feb
1948-49.....	31	4 Mar	24	4 Mar
1949-50.....	150	6 Feb	78	6 Feb
1950-51.....	18	12 Jan	11	1 Mar
1951-52.....	6,200	16 Jan	2,930	16 Jan
1952-53.....	207	13 Jan	117	14 Jan
1953-54.....	1,350	24 Jan	181	24 Jan
1954-55.....	151	18 Jan	70	19 Jan
1955-56.....	770	25 Jan	325	27 Jan
1956-57.....	272	14 Jan	71	15 Jan

* Data from U. S. Geological Survey gaging station on right bank 3 miles upstream from Alamo Creek, and 10 miles NE. of Santa Maria, Santa Barbara County (see pl. 4 for location). Drainage area 912 square miles.

** 1 October to 30 September, inclusive.

Table 8

Runoff data, Sisquoc River near Garey (Gary), Santa Maria River and tributaries, Calif.*

Season**	Maximum peak discharge	Date	Maximum mean daily discharge	Date
	<u>Cubic feet per second</u>		<u>Cubic feet per second</u>	
1940-41.....	7,000	5 Mar	4,100	5 Mar
1941-42.....	875	22 Apr	512	22 Apr
1942-43.....	13,000	23 Jan	5,900	23 Jan
1943-44.....	6,600	22 Feb	3,350	22 Feb
1944-45.....	5,400	2 Feb	2,120	2 Feb
1945-46.....	4,000	30 Mar	1,900	30 Mar
1946-47.....	900	23 Nov	200	23 Nov
1947-48.....	(***)	(***)
1948-49.....	50	11 Mar	29	12 Mar
1949-50.....	900	6 Feb	250	6 Feb
1950-51.....	(***)	(***)
1951-52.....	8,910	15 Jan	3,270	16 Jan
1952-53.....	480	14 Jan	365	14 Jan
1953-54.....	(#)	25 Jan	##1,050	25 Jan
1954-55.....	137	17 Feb	60	18 Feb
1955-56.....	2,120	27 Apr	1,400	27 Apr
1956-57.....	105	18 Oct	28	19 Oct

* Data from U. S. Geological Survey gaging station 0.5 mile east of Garey and 3.5 miles downstream from Tepusquet Creek (see pl. 4 for location). Drainage area 442 square miles.

** 1 October to 30 September, inclusive.

*** No flow.

Records not available.

Approximate.

Table 9

Pertinent data, Twitchell Dam and Reservoir, Santa Maria River and tributaries, Calif.

Item	Quantity
Drainage area.....	1,125 sq. mi.
Reservoir:	
Elevation -	
Original streambed.....	476 ft., m.s.l.
Conservation pool.....	623 ft., m.s.l.
Flood-control pool (spillway crest).....	651.5 ft., m.s.l.
Area (survey of 1946, revised March 1959) -	
Conservation pool.....	2,620 ac.
Spillway crest.....	3,690 ac.
Top of dam.....	5,700 ac.
Capacity, gross (survey of 1946, revised March 1959) -	
Conservation pool.....	151,050 ac.-ft.
Spillway crest.....	240,120 ac.-ft.
Top of dam.....	426,000 ac.-ft.
Allowance for silting.....	40,000 ac.-ft.
Dam - type.....	Earth
Crest elevation.....	692 ft., m.s.l.
Maximum height above original streambed.....	216 ft.
Crest length.....	1,800 ft.
Spillway - type.....	Concrete tunnel, ungated
Crest - type.....	Ogee
Crest elevation.....	651.5 ft., m.s.l.
Crest length.....	50 ft.
Discharge tunnel - diameter.....	23 ft.
Maximum discharge capacity (elevation 692).....	28,000 c. f. s.
Terminal structure.....	Flip bucket
Outlet works:	
Gates - type.....	High pressure vertical lift
Number.....	4 (2 tandem pairs)
Size.....	7' x 12'
Sill elevation.....	473 ft., m.s.l.
Maximum discharge at spillway crest (low port blocked).....	12,700 c. f. s.
Maximum discharge at spillway crest (low port open).....	13,050 c. f. s.
Intake structure -	
Sill elevation.....	504 ft., m.s.l.
Top elevation.....	526 ft., m.s.l.

Table 9--Continued

Pertinent data, Twitchell Dam and Reservoir, Santa Maria River and tribu-
taries, Calif.--Continued

Item	Quantity
Conduit - type.....	Pressure
Diameter.....	15 ft.
Tunnel - type.....	Pressure
Diameter.....	15 ft.
Tunnel - type.....	Free flow
Size.....	19' x 17'
Terminal structure.....	Stilling basin
Reservoir design flood:	
Length of design storm.....	4 days
Inflow volume (1st through 3d day).....	139,100 ac.-ft.
Inflow peak.....	95,000 c. f. s.
Outflow peak.....	12,700 c. f. s.
Reduction in peak.....	82,300 c. f. s.
Spillway design flood:	
Length of storm.....	5 days
Inflow volume (1st through 3d day).....	368,000 ac.-ft.
Inflow peak.....	120,000 c. f. s.
Outflow peak.....	39,700 c. f. s.
Reduction in peak.....	80,300 c. f. s.

Table 10

Area and gross capacity data - Twitchell Dam and Reservoir, Santa Maria River and tributaries, Calif.*

Eleva- tion	Capac- ity	Area	Eleva- tion	Capac- ity	Area	Eleva- tion	Capac- ity	Area
<u>Feet</u> <u>above</u> <u>mean sea</u> <u>level</u>	<u>Acre-</u> <u>feet</u>	<u>Acres</u>	<u>Feet</u> <u>above</u> <u>mean sea</u> <u>level</u>	<u>Acre-</u> <u>feet</u>	<u>Acres</u>	<u>Feet</u> <u>above</u> <u>mean sea</u> <u>level</u>	<u>Acre-</u> <u>feet</u>	<u>Acres</u>
477	0	1	517	7,490	520	557	37,970	1,030
478	1	2	518	8,010	540	558	39,000	1,050
479	3	3	519	8,550	550	559	40,050	1,060
480	6	6	520	9,100	560	560	41,120	1,080
481	12	10	521	9,660	570	561	42,200	1,100
482	20	10	522	10,230	580	562	43,290	1,110
483	32	20	523	10,810	600	563	44,400	1,130
484	50	20	524	11,410	610	564	45,530	1,140
485	73	30	525	12,020	620	565	46,670	1,160
486	100	40	526	12,640	630	566	47,830	1,170
487	140	40	527	13,270	640	567	49,000	1,190
488	180	50	528	13,910	650	568	50,190	1,210
489	240	60	529	14,560	670	569	51,400	1,220
490	300	70	530	15,230	680	570	52,620	1,240
491	370	80	531	15,900	690	571	53,860	1,260
492	450	90	532	16,600	700	572	55,120	1,280
493	540	110	533	17,300	720	573	56,400	1,300
494	650	120	534	18,020	730	574	57,690	1,310
495	770	130	535	18,740	740	575	59,000	1,330
496	900	140	536	19,490	760	576	60,340	1,350
497	1,040	160	537	20,240	770	577	61,690	1,370
498	1,200	170	538	21,010	780	578	63,060	1,390
499	1,370	190	539	21,800	800	579	64,450	1,410
500	1,560	210	540	21,590	810	580	65,860	1,430
501	1,760	220	541	23,400	820	581	67,290	1,460
502	1,990	240	542	24,220	830	582	68,740	1,480
503	2,230	260	543	25,050	840	583	70,220	1,500
504	2,480	270	544	25,900	850	584	71,720	1,530
505	2,760	290	545	26,750	860	585	73,250	1,550
506	3,050	310	546	27,610	880	586	74,800	1,580
507	3,350	320	547	28,490	890	587	76,380	1,600
508	3,680	340	548	29,380	900	588	77,980	1,630
509	4,020	360	549	30,280	910	589	79,610	1,650
510	4,380	380	550	31,190	920	590	81,260	1,680
511	4,760	400	551	32,110	940	591	82,940	1,700
512	5,160	420	552	33,050	950	592	84,650	1,730
513	5,580	440	553	34,000	970	593	86,380	1,760
514	6,030	470	554	34,970	980	594	88,130	1,780
515	6,490	490	555	35,960	1,000	595	89,918	1,810
516	6,980	510	556	36,960	1,020	596	91,730	1,840

See footnote at end of table.

Table 10--Continued

Area and gross capacity data - Twitchell Dam and Reservoir, Santa Maria River and tributaries, Calif.*--continued

Eleva- tion	Capac- ity	Area	Eleva- tion	Capac- ity	Area	Eleva- tion	Capac- ity	Area
<u>Feet above mean sea level</u>	<u>Acre- feet</u>	<u>Acres</u>	<u>Feet above mean sea level</u>	<u>Acre- feet</u>	<u>Acres</u>	<u>Feet above mean sea level</u>	<u>Acre- feet</u>	<u>Acres</u>
597	93,570	1,870	629	167,290	2,830	661	276,790	4,080
598	95,430	1,890	630	170,120	2,870	662	280,870	4,130
599	97,330	1,920	631	172,990	2,900	663	285,000	4,170
600	99,250	1,950	632	175,900	2,940	664	289,170	4,220
601	101,200	1,970	633	178,840	2,980	665	293,390	4,270
602	103,170	2,000	634	181,820	3,020	666	297,660	4,310
603	105,170	2,030	635	184,830	3,060	667	301,980	4,360
604	107,200	2,050	636	187,890	3,090	668	306,340	4,410
605	109,250	2,080	637	190,980	3,130	669	310,750	4,460
606	111,330	2,110	638	194,110	3,170	670	315,210	4,510
607	113,430	2,130	639	197,280	3,210	671	319,720	4,560
608	115,570	2,160	640	200,490	3,250	672	324,280	4,620
609	117,730	2,190	641	203,730	3,280	673	328,900	4,680
610	119,910	2,210	642	207,020	3,320	674	333,590	4,740
611	122,130	2,240	643	210,330	3,360	675	338,330	4,800
612	124,370	2,270	644	213,690	3,390	676	343,130	4,860
613	126,640	2,300	645	217,090	3,440	677	347,980	4,920
614	128,950	2,330	646	220,520	3,470	678	352,900	4,980
615	131,280	2,360	647	223,990	3,510	679	357,880	5,040
616	133,640	2,390	648	227,510	3,550	680	362,910	5,090
617	136,030	2,420	649	231,060	3,590	681	368,010	5,180
618	138,450	2,450	650	234,650	3,630	682	373,160	5,210
619	140,910	2,480	651	238,280	3,670	683	378,370	5,270
620	143,390	2,520	652	241,950	3,710	684	383,650	5,330
621	145,910	2,550	653	245,660	3,750	685	388,980	5,390
622	148,460	2,580	654	249,410	3,790	686	394,370	5,400
623	151,050	2,620	655	253,190	3,830	**687	399,810	5,450
624	153,660	2,660	656	257,020	3,870	**688	403,000	5,500
625	156,320	2,690	657	260,890	3,910	**689	409,000	5,550
626	159,010	2,720	658	264,810	3,950	**690	414,000	5,600
627	161,730	2,760	659	268,760	3,990	**691	420,000	5,640
628	164,490	2,800	660	272,750	4,040	**692	426,000	5,700

* Table from data supplied by U. S. Bureau of Reclamation based on 1946 survey and revision of March 1959.

** Extrapolated values.

Table 11

Pertinent data, Santa Maria Valley levees and channel improvements, Santa
Maria River and tributaries, Calif.

Item	Quantity
Drainage areas and design discharges:	
Bradley Canyon levees at -	
Upper end:	
Drainage area.....	7.9 sq. mi.
Peak discharge.....	9,000 c. f. s.
Santa Maria River:	
Drainage area.....	12.6 sq. mi.
Peak discharge.....	9,000 c. f. s.
Santa Maria River levees at -	
Upper end:	
Drainage area.....	1,634 sq. mi.
Peak discharge.....	160,000 c. f. s.
Lower end:	
Drainage area.....	1,719 sq. mi.
Peak discharge.....	150,000 c. f. s.
General:	
Bradley Canyon levees and channel:	
Length of left levee.....	10,900 ft.
Length of right levee.....	900 ft.
Top width of levees.....	12 ft.
Height of levees - range.....	8 to 10.5 ft.
Thickness of revetments - range.....	1.5 to 2.0 ft.
Levee slopes.....	1 on 2
Height of revetments.....	11.6 to 15.4 ft.
Thickness of stone toe.....	3 ft.
Width of channel.....	80 ft.
Santa Maria River:	
Length of left levee.....	87,560 ft.
Length of right levee.....	25,420 ft.
Top width of levees.....	18 ft.
Height of levees - range.....	6 to 15 ft.
Levee slopes.....	1 on 2
Height of revetments - range.....	22.5 to 31.5 ft.
Thickness of revetments - range.....	1.5 to 2.0 ft.
Thickness of stone toe.....	6 ft.

Table 12

Outlet gate operation schedule for flood-control storage - Twitchell Dam and Reservoir, Santa Maria River and tributaries, Calif.*

Step No.	When reservoir water surface is between elevations		Gate setting for gates as indicated		Computed discharge**
			No. 1	No. 2	
	Feet above mean sea level		Feet of opening	Feet of opening	Cubic feet per second
1.....	504.0 -	623.0	0	0	0
2.....	623.0 -	623.2	.5	.5	500 - 510
3.....	623.2 -	623.4	1.5	1.5	1,500 - 1,510
4.....	623.4 -	623.6	3.0	3.0	3,000 - 3,010
5.....	623.6 -	623.8	5.0	5.0	5,000 - 5,010
6.....	623.8 -	624.0	8.0	8.0	7,800 - 7,820
7.....	624.0 -	***651.5	12.0	12.0	11,630 - 12,700

* Schedule applicable for rising or falling stages.

** Low port assumed blocked.

*** Spillway flow above elevation 651.5.

Note.--The outlet gates shall not be opened faster than 1 foot in 10 minutes.

INSTRUCTIONS

1. Schedule is for downstream gates. Normally upstream gates are wide open and function as guard gates.
2. If one of the downstream gates cannot be operated, adjust the other gate, if possible, so that its opening will equal the sum of the openings shown in the schedule. However, the operable gate should not be opened more than 80 percent (9.6 ft.).

