BAY-DELTA WATER RIGHTS HEARING

BEFORE THE
STATE WATER RESOURCES CONTROL BOARD

EAST BAY MUNICIPAL UTILITY DISTRICT

EBMUD'S MOKELUMNE RIVER PROJECT IN PERSPECTIVE

TESTIMONY OF JON A. MYERS

June 1998

EBMUD EXHIBIT NO. 2

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PHOTOS

I. INTRODUCTION

The East Bay Municipal Utility District (EBMUD or District) is a public entity formed under the Municipal Utility District (MUD) Act passed by the state legislature in 1921. This Act permits formation of multipurpose government agencies to provide needed services on a regional basis. In accordance with the MUD Act's provisions, voters in the East San Francisco Bay Area created EBMUD in 1923 to provide water service. The District's first application for a right to appropriate Mokelumne River water was filed in 1924. Water service began in 1929 when EBMUD took over the system of the predecessor East Bay Water Company, and deliveries of Mokelumne River water began that same year.

The MUD Act was later amended to enable formation of special districts. In 1944, voters elected to form Special District No. 1 to treat wastewater released into San Francisco Bay. Wastewater treatment began in 1951.

EBMUD is governed by a seven-member Board of Directors publicly elected from wards within the District. The management of EBMUD is under the direction of its General Manager. Activities of the District are guided by the EBMUD Mission Statement:

> *To manage the natural resources with which the District is entrusted, to provide reliable, high-quality water and wastewater services for the people of the East Bay and to preserve and protect the environment for future generations.*

EBMUD supplies water to customers in 20 cities and 15 unincorporated communities in parts of Alameda and Contra Costa Counties. Approximately 1.2 million people (nearly 4 percent of the state's population) are served by the District's water system in a 325-square-mile area extending from Crockett in the north,

southward to San Lorenzo encompassing the major cities of Oakland, Berkeley and Richmond, and eastward from San Francisco Bay to Walnut Creek, Danville and San Ramon. (See Figure 1)

II. THE MOKELUMNE RIVER

The District obtains almost all of the water used to serve its customers from the Mokelumne River. Streamflow from the Mokelumne River is collected and stored in the District's Pardee and Camanche Reservoirs located in the foothills of the Sierra Nevada Mountains. The District diverts a portion of this flow through an 82-mile-long aqueduct system that crosses the Central Valley and the Sacramento-San Joaquin River Delta to terminal reservoirs and water treatment plants located in the East Bay Area. The remainder is released down the lower Mokelumne River to satisfy requirements of senior water rights holders and environmental uses. The land uses surrounding the lower Mokelumne River are primarily agriculture, although there is some urban use as well. (See photographs, Appendix A). Ultimately the Mokelumne River enters the Delta at New Hope Landing.

The Mokelumne River basin constitutes only a tiny fraction (about 1.5%) of the Delta's 43,000 square-mile watershed. (See Figure 2) This small basin produces a varying portion of the Delta watershed's runoff. According to estimates of unimpaired flow prepared by the Department of Water Resources, the Mokelumne River basin has produced from 1.7% (in 1961) to 3.2% (in 1950) of the unimpaired flow from all lands tributary to the Delta. On average, it produces only 2.5% of the Delta watershed's unimpaired flow. (See Figure 3).

FIGURE 1. EBMUD Water Supply Facilities and Service Area

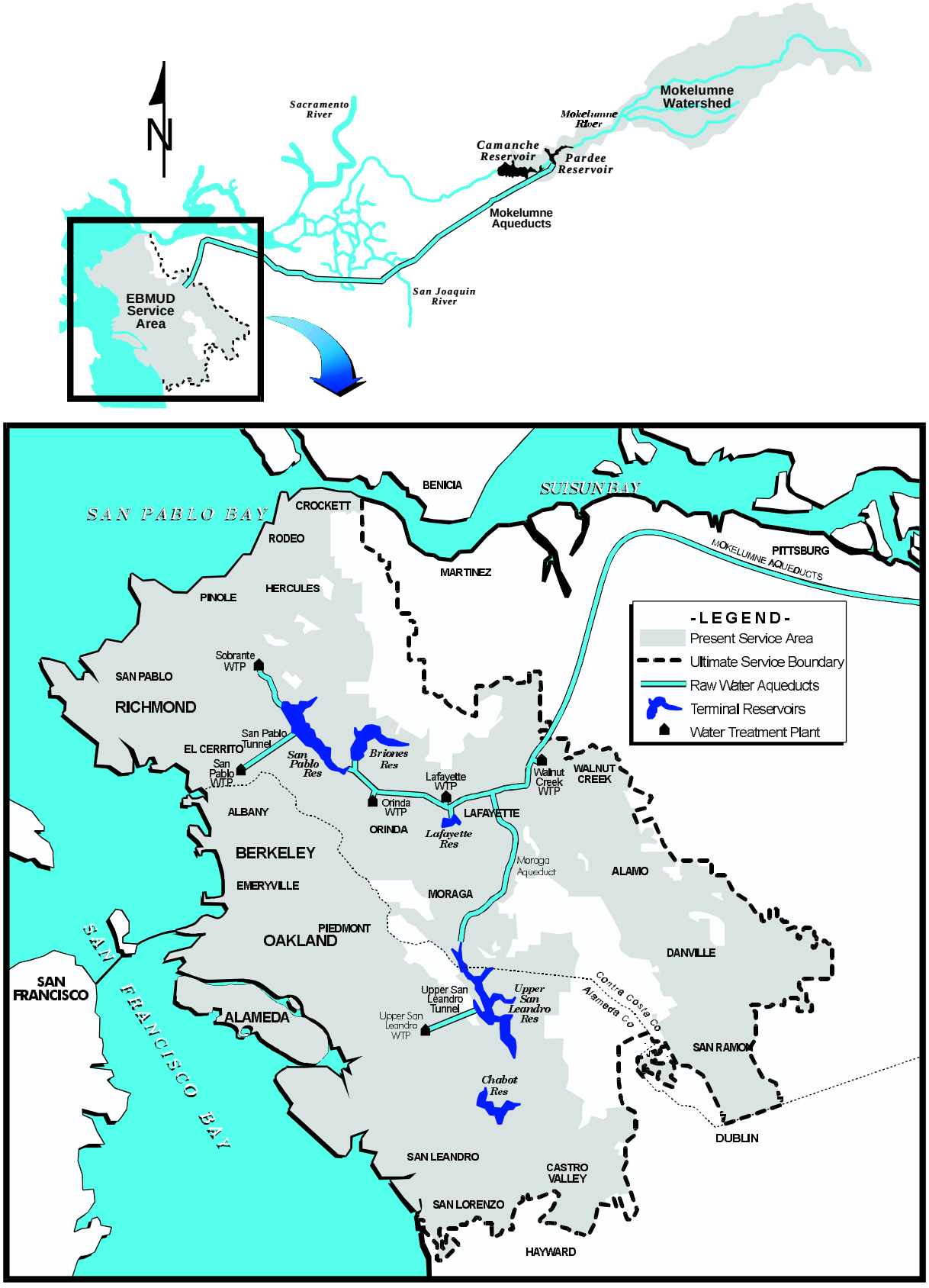
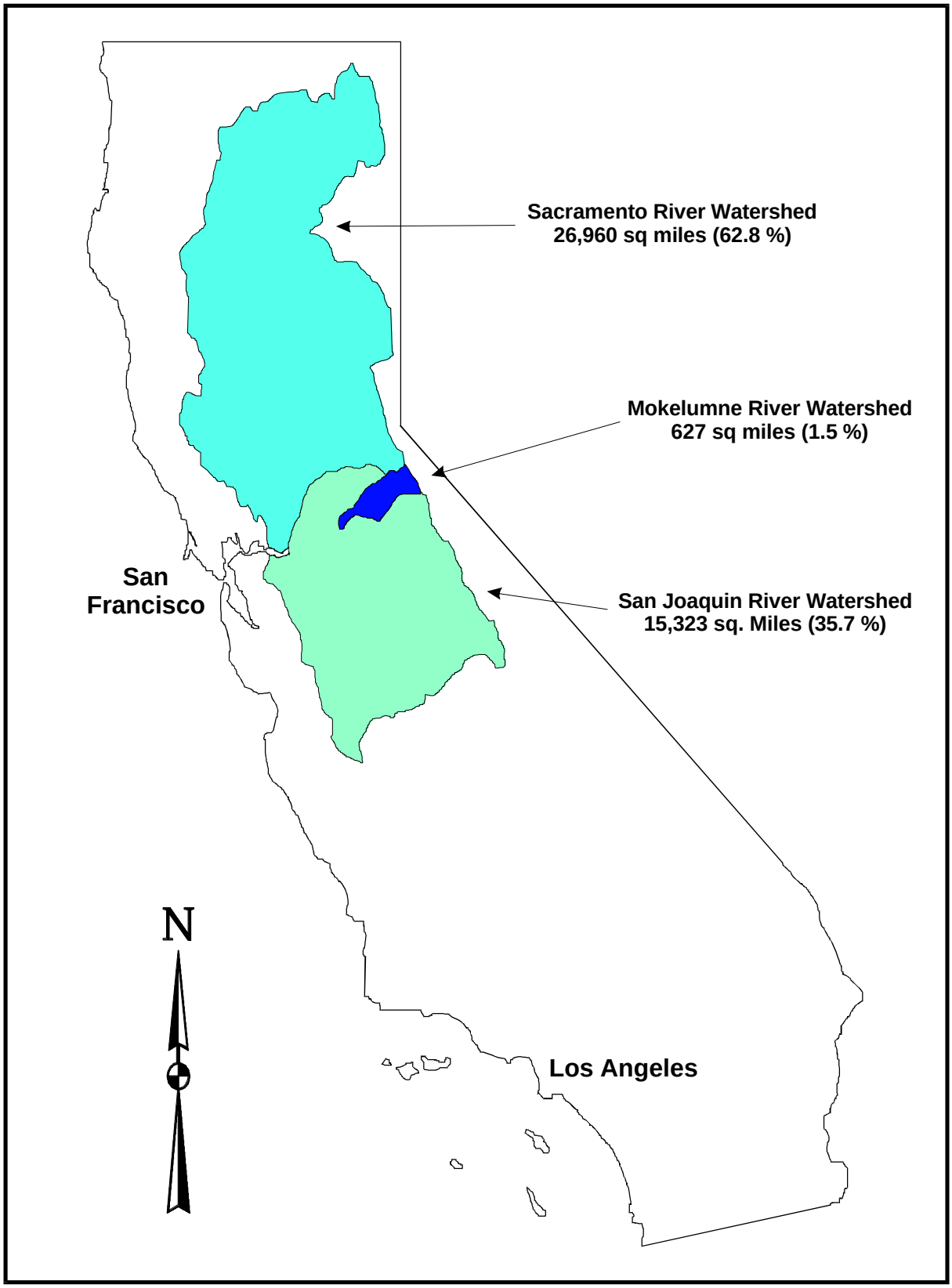
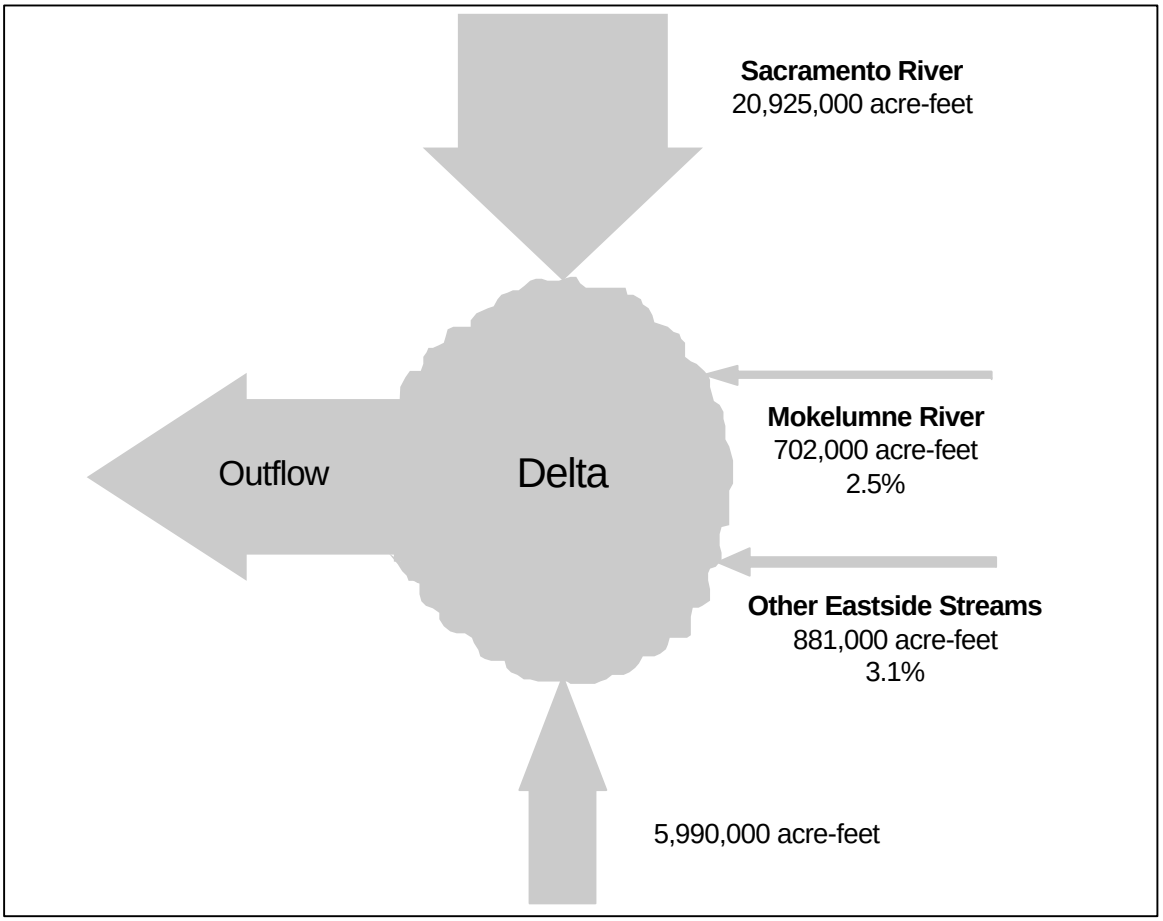


FIGURE 2. Delta Watershed



Source: Based on the California Water Plan Update, DWR Bulletin 160-93, October 1994

FIGURE 3. Delta Unimpaired Flows (1921-1994 annual average)



Source: Department of Water Resources, Central Valley Unimpaired Flow Data, 1921-1994

A. MOKELUMNE RIVER UPSTREAM OF PARDEE RESERVOIR

The Mokelumne River Watershed

The Mokelumne River watershed upstream of Camanche Dam lies on the western Mountains in Alpine, Amador, Calaveras, and San Joaquin Counties. The watershed covers an area of 627 square miles and extends from Highland Peak (elevation 10,934

ft) near the crest of the Sierras to Camanche Reservoir (elevation 235 ft)
Most of the watershed is forested land within the El Dorado and Stanislaus National

Three major forks comprise the upper reaches of the Mokelumne River: the North, Middle and South Forks.

The North Fork is the major tributary flowing some 55 miles from its source at the crest of the Sierras to its confluence with the South Fork near West Point. Major tributaries to the North Fork include: Blue Creek which is fed by Upper and Lower Blue Lakes (elevation 8,000 ft) and by Twin Lake; Meadow Creek which flows from Meadow Lake (elevation 7,800 ft); Summit Creek; the Bear River which flows through Upper Bear (elevation 5,900 ft) and Lower Bear (elevation 5,820 ft) reservoirs; and Tiger Creek. Flow in the North Fork is regulated by Pacific Gas and Electric's (PG&E) Mokelumne River Project which is located upstream of Pardee Dam.

The Middle Fork flows about 22 miles from its headwaters in Stanislaus National Forest at elevation 7000 ft near Bailey Ridge to join the South Fork about one mile upstream of its confluence with the North Fork. Schaads Reservoir (1,800 acre-feet capacity) partially regulates streamflow on the Middle Fork.

The South Fork flows about 24 miles from its headwaters in Stanislaus National Forest near elevation 7,000 ft between Summit Level Ridge and Bailey Ridge to its confluence with the North Fork. The Licking Fork joins the South Fork about four miles upstream of its confluence with the Middle Fork.

The main stem of the Mokelumne River begins 17 river miles upstream of Pardee Dam at the confluence of the North and South Forks. It flows southwest through the foothills in a narrow valley, passes PG&E's Electra Powerhouse, flows under Highway 49 near the community of Mokelumne Hill, and enters Pardee Reservoir about two miles downstream of the Highway 49 bridge.

River, is extremely variable both from month to month and from year to year. Most precipitation normally occurs between November and May. Peak runoff in the

June and then tapers off during the summer to minimum flows in late summer or fall. (See Table 1)

TABLE 1. Estimated Mokelumne River Unimpaired Flow at Pardee Reservoir, 1921-1994

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	TOTAL
1921	8	23	36	80	62	110	125	225	183	20	1	1	874
1922	2	2	12	22	60	57	108	334	284	40	3	1	925
1923	4	11	60	47	35	46	129	231	111	31	2	4	711
1924	8	5	6	8	17	19	56	69	2	0	0	0	190
1925	6	20	24	23	108	84	169	247	129	20	2	3	835
1926	4	6	15	15	39	49	136	95	16	1	0	0	376
1927	2	31	37	42	105	82	159	211	189	32	3	2	895
1928	5	26	19	23	35	188	140	172	29	5	0	0	642
1929	2	2	6	9	14	29	66	148	61	5	1	0	343
1930	1	1	20	19	31	65	116	116	84	6	1	1	461
1931	2	5	3	6	15	30	73	64	11	0	0	1	210
1932	2	5	19	22	59	68	109	229	196	30	3	3	745
1933	0	2	3	5	9	28	64	126	163	16	4	5	425
1934	5	6	20	24	29	73	78	40	21	1	0	0	297
1935	0	13	13	23	33	41	179	229	153	16	2	1	703
1936	4	4	4	39	138	102	187	246	145	22	4	2	897
1937	3	3	7	7	61	73	127	279	117	15	2	2	696
1938	3	6	125	27	78	158	180	334	265	51	8	4	1239
1939	7	12	12	13	15	55	125	76	17	2	1	2	337
1940	8	4	9	81	95	157	168	240	89	8	2	2	863
1941	3	6	31	38	69	95	107	285	167	31	7	3	842
1942	4	11	66	96	76	59	154	221	241	51	8	4	991
1943	3	35	54	107	76	192	184	208	113	25	6	3	1006
1944	5	4	8	14	22	46	66	188	79	11	3	0	446
1945	2	33	34	28	112	56	122	208	148	23	5	2	773
1946	5	38	84	60	33	75	153	207	80	10	2	1	748
1947	4	19	21	14	28	57	91	130	29	1	0	0	394
1948	14	12	9	28	17	29	105	206	184	25	2	2	633
1949	3	4	9	8	9	47	146	204	78	4	3	2	517
1950	1	4	5	36	60	69	173	228	150	21	3	3	753
1951	10	270	264	93	83	88	122	156	59	10	3	2	1160
1952	3	13	53	78	93	96	223	374	268	94	17	11	1323
1953	5	8	15	64	35	51	130	139	181	42	6	4	680
1954	4	8	10	16	35	84	157	165	42	8	1	0	530
1955	1	5	19	20	24	38	63	168	90	8	2	0	438
1956	1	4	239	186	78	85	139	258	206	30	14	7	1247
1957	7	9	12	13	55	85	92	179	131	13	5	1	602
1958	5	9	18	25	85	97	188	343	223	55	12	5	1065
1959	5	6	7	30	36	55	102	89	33	7	0	6	376
1960	4	2	3	7	49	72	111	119	42	4	0	2	415
1961	0	4	8	7	19	29	73	102	33	3	0	1	279
1962	1	3	10	8	65	49	180	163	140	16	4	1	640

[1] In Thousand Acre-Feet

Source: Department of Water Resources, Central Valley Unimpaired Flow Data, 1921-1994

TABLE 1. Estimated Mokelumne River Unimpaired Flow at Pardee Reservoir, 1921-1994[1] (continued)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	TOTAL
1963	19	7	18	37	176	47	128	263	145	23	7	4	874
1964	6	40	19	17	18	27	87	137	66	10	0	1	428
1965	3	15	295	151	68	57	156	205	168	47	27	4	1196
1966	8	28	21	22	28	64	139	127	15	3	0	2	457
1967	2	15	71	51	59	119	102	294	292	118	13	4	1140
1968	7	4	9	15	69	59	86	114	36	4	4	0	407
1969	4	34	22	195	96	88	208	385	228	60	6	3	1329
1970	16	12	65	238	80	81	79	191	125	21	3	0	911
1971	14	27	46	57	50	74	111	176	190	38	0	1	784
1972	6	12	28	22	32	104	81	159	70	10	2	3	529
1973	7	13	42	73	64	64	128	284	105	11	3	1	795
1974	7	85	68	105	40	118	136	284	146	38	9	3	1001
1975	3	6	10	19	40	83	72	246	235	42	8	4	779
1976	23	24	14	11	14	28	44	257	8	2	5	2	247
1977	3	2	2	4	6	9	34	72	25	0	1	1	129
1978	1	3	28	76	57	124	147	42	213	52	6	14	958
1979	2	5	9	45	43	91	121	237	94	11	3	1	686
1980	9	18	19	252	163	97	127	261	176	66	6	2	1141
1981	2	2	7	16	26	45	110	206	32	0	0	1	366
1982	6	78	131	90	201	150	296	125	172	56	9	16	1510
1983	65	62	101	95	141	254	140	305	377	203	29	16	1800
1984	8	156	192	85	56	84	87	317	98	16	14	0	1014
1985	5	30	16	16	29	43	131	218	34	4	1	3	454
1986	2	12	25	68	331	246	140	142	140	22	5	2	1205
1987	2	0	4	8	21	41	80	212	12	3	1	1	253
1988	2	6	11	17	19	41	67	80	23	2	0	0	256
1989	0	9	9	10	24	144	152	68	64	6	1	4	553
1990	12	16	12	17	16	57	97	130	33	4	1	0	338
1991	0	1	3	3	2	42	65	73	80	9	1	0	338
1992	4	7	8	8	35	51	106	132	7	8	0	0	288
1993	2	4	16	89	63	154	152	54	191	46	7	3	1003
1994	5	4	6	8	17	38	77	276	18	2	1	2	270
Average	**6**	**19**	**37**	**46**	**58**	**78**	**122**	**92**	**116**	**24**	**4**	**3**	**702**

[1] In Thousand Acre-Feet
Source: Department of Water Resources, Central Valley Unimpaired Flow Data, 1921-1994

Streamflow in the Mokelumne River is modified by upstream diversions and regulated by reservoir storage operations for hydroelectric power generation and water supply. PG&E operates a network of storage reservoirs and diversion facilities on the North Fork. The Amador Water Agency diverts Mokelumne River water through the Amador Canal and from the Tiger Creek Afterbay to its Central Amador Water Project. Jackson Valley Irrigation District receives water from the Amador Canal and from Pardee Reservoir. Calaveras Public Utility District owns and operates Schaads Reservoir on the Middle Fork and diverts water into Jeff Davis Reservoir (1,750 acre-feet capacity of off-stream storage) for treatment and distribution to customers. These various diversions are illustrated in Figure 4.

PG&E Hydroelectric System

PG&E's Mokelumne Hydroelectric Project consists of seven storage reservoirs having a combined capacity of about 220,000 acre-feet, various tunnels (approximately 16 miles in total length) stream diversions, conduits, regulating reservoirs, and four powerhouses with a total capacity of 215 megawatts. Electric power generated from these facilities is used to serve PG&E customers in its Northern California service territory.

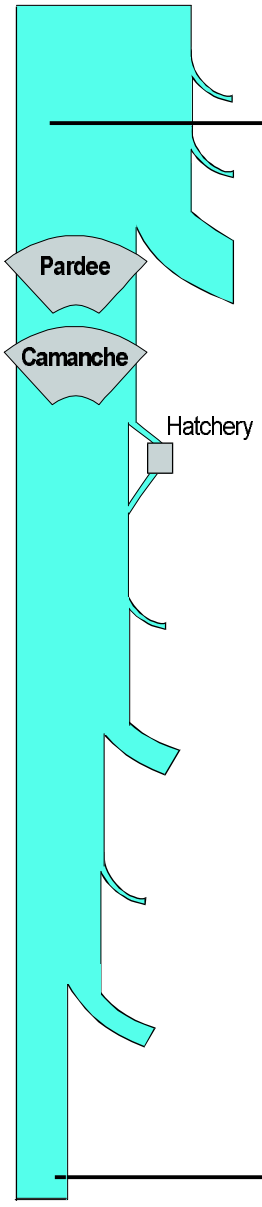
Water flowing from the "Old Reservoirs" (Upper and Lower Blue Lakes, Meadow Lake, and Twin Lakes) on the North Fork is stored at Salt Springs Reservoir and flows through Salt Springs Powerhouse Unit 1. Inflow from Bear River is stored in Upper and Lower Bear Reservoirs and flows through Salt Springs Powerhouse Unit 2.

Below Salt Springs, water is diverted by the 18-mile-long Tiger Creek Canal to the Tiger Creek Regulator and then by way of a two-mile conduit to the Tiger Creek Forebay. Once the water is used by the Tiger Creek Powerhouse, it is returned to the North Fork and collected in Tiger Creek Afterbay.

Water from the Tiger Creek Afterbay is diverted to the West Point Powerhouse via the West Point Tunnel. Water exiting the West Point Powerhouse is then diverted into the Electra Powerhouse tunnel. Additional water from the North Fork can also be diverted to the Electra tunnel.

Water travels through the Electra Tunnel and is discharged into Lake Tabeaud which serves as a forebay to the Electra Powerhouse. Some water is diverted from Lake Tabeaud into the Amador Canal for domestic and irrigation uses within Amador County. Electra Powerhouse has three turbine-generator units each having

FIGURE 4. Mokelumne River Releases, Diversions, and Losses (1995 and Maximum Entitlement)



Releases, Diversions, and Losses	1995 Releases, Diversions, and Losses (TAF)	Maximum Entitlement (TAF/yr)
Amador and Calaveras Counties	12.1	47.0
Mokelumne Hill Gage	1495.7	
Jackson Valley Irrigation District	3.85	3.85
EBMUD Aqueduct Draft	177.8	364.0 (325 MGD)
Releases for Fish[1]	121.0	varies[1]
North San Joaquin Water Conservation District	2.6	20.0
Woodbridge Irrigation District	72.1	60.0[2]
Riparians and Senior Appropriators	14.5	20.6
Channel Losses	35.0	130.0
Woodbridge Gage	1064.2	

Notes:

[1] The existing fishery flow release requirement is 13 TAF pursuant to the 1961 Agreement with CDF&G. However, in 1993 EBMUD voluntarily began releasing flows consistent with its 1992 Lower Mokelumne River Management Plan and in 1996 EBMUD voluntarily began releasing flows consistent with the Joint Settlement Agreement between EBMUD, CDF&G, and USFWS. JSA flows vary with year type.

[2] EBMUD's obligation to release water to the Woodbridge Irrigation District is limited by a series of water rights settlement agreements to a maximum of 60 TAF/yr.

a capacity of 350 cubic feet per second (cfs). Water discharged from Electra Powerhouse returns to the main stem Mokelumne and then flows about five miles downstream into Pardee Reservoir. Key data for PG&E facilities are presented in Table 2.

The PG&E project is operated within limits set by the following judgments and decrees:

1) City of Lodi, Plaintiff vs. East Bay Municipal Utility District, et al., Defendants. Judgment and decree No. 22415 of the Superior Court of San Joaquin County, dated March 14, 1938.
2) East Bay Municipal Utility District, Plaintiff vs. Pacific Gas and Electric Company, Defendant. Judgment and decree No. 1950 of the Superior Court of Calaveras County, dated July 25, 1940.
3) City of Lodi, Plaintiff vs. East Bay Municipal Utility District, et al., Defendants. Order modifying Judgment and decree No. 22415, dated October 4, 1950.

Collectively, these decrees are commonly known as the “Lodi Decree”. The Lodi Decree defines the relative rights of Lodi, EBMUD, PG&E, and areas around Jackson and Sutter Creek which received domestic water from PG&E’s Mokelumne River facilities. Under the Lodi Decree, PG&E is bound to a strict set of operating rules governed by storage and by precipitation, an example of the complexity of the interrelationships between Mokelumne Basin water users. These operating rules address the timing and quantity of PG&E discharges of water into the Mokelumne River, which can have impacts upon EBMUD’s exercise of its Pardee and Camanche water rights.

TABLE 2. PG&E Hydroelectric Facilities

Reservoirs	Year Completed	Gross Storage Capacity (acre-feet)	Elevation of Dam (feet)	Generating Capacity (MW)	Flow Capacity (cfs)
Old Reservoirs					
Upper Bear	1900	6,756[2]	5876[1]		
Upper Blue Lake	1881	7,300[2]	8138[1]		
Lower Blue Lake	1885	5,091[2]	8053[1]		
Twin Lakes	1898	1,207[2]	8145[1]		
Meadow Lake	1903	5,656[2]	7774[1]		
New Reservoirs					
Salt Springs	1931	141,817[2]	3959[1]		
Lower Bear	1952	52,025[4]	5818[1]		
Powerhouses					
Salt Springs				39.8[2]	
Unit 1					600[3]
Unit 2					225[3]
Tiger Creek				56.3[2]	750[3]
West Point				13.6[2]	725[1]
Electra				105.3[2]	1,130[3]
Tunnels and Canals					
Tiger Creek Canal					550[3]
Tiger Creek Regulator Conduit					625[3]
West Point Tunnel					675[1]
Electra Tunnel					875[3]
Totals		**219,852**		**215.0**	

Sources:
1. Mokelumne River Project (FERC Project No. 137) - Application of PG&E to FERC for a New License, 12/19/72
2. Draft Environmental Assessment for Hydropower License, Mokelumne River Project No. 137, 12/19/96
3. Description of PG&E's Mokelumne River Project (faxed document from PG&E to EBMUD dated 10/21/96)
4. Emergency Action Plan for PG&E's Mokelumne River Project (FERC Project No. 137)

Water Supply Diversions

Amador County

Amador Water Agency (AWA) is a wholesale and retail water supplier chartered to serve municipal and agricultural needs in all areas of Amador County. Amador County has entitlements to water from the Mokelumne River based upon pre-1914 water rights and upon partial assignments of water rights originally issued to the California Department of Finance, based on water right applications made in 1927. AWA's entitlements include 1,150 acre-feet annually for use in their Central Amador Water Project and another 15,000 acre-feet purchased from PG&E that is diverted through the Amador Canal.

In addition to diversions from Jackson Creek, the Jackson Valley Irrigation District (JVID) has an entitlement to divert up to 3,850 acre-feet annually from the Mokelumne River at the Jackson Creek Spillway structure on the north arm of Pardee Reservoir. These releases flow into Lake Amador. JVID provides irrigation water to farmland in the lower elevations of Amador County. JVID has a water right permit (an assignment of the 1927 California Department of Finance filing) to transfer water from the Mokelumne River to its storage reservoir. Pursuant to an agreement with EBMUD, water is released to JVID by gravity from the north arm of Pardee Reservoir. However, if the level of Pardee Reservoir drops below elevation 550 feet, or if there is no water available under this Permit's 1927 seniority date, no water is available to JVID from Pardee.

Calaveras County

The following water agencies serving Calaveras County divert water from the Mokelumne River:

CALAVERAS COUNTY WATER DISTRICT (CCWD) - CCWD serves domestic water to approximately 8,000 households in the rural areas of the county. It is primarily a retail provider although it provides some water wholesale. CCWD's entitlement of Mokelumne River water, for up to 400 acre-feet per year, is based upon a pre-1914 water right. CCWD diverts from Bear Creek near West Point, about six miles above the confluence with Middle Fork.

CALAVERAS PUBLIC UTILITY DISTRICT (CPUD) - serves treated water to about 1,800 households in unincorporated communities of San Andreas and Mokelumne Hill. CPUD's rights on the Mokelumne include diversion to storage of 2,130 acre-feet, and direct diversion or rediversion of up to 15 cfs, based upon a combination of pre-1914 and partial assignments of the 1927 State filings. CPUD currently diverts water to storage in Schaads Reservoir and rediverts that supply by pumping into off-stream storage at Jeff Davis Reservoir from just below the confluence of Licking Fork and South Fork, upstream of Pardee Reservoir.

B. EBMUD'S MOKELUMNE PROJECT

The District owns and operates Pardee and Camanche Reservoirs on the Mokelumne River in tandem to provide water storage for the District, to generate hydroelectric power, to meet senior water rights, to provide flood control protection for the lower Mokelumne River area, to meet downstream water needs and instream flow requirements, and for recreation.

Pardee Dam and Reservoir

Pardee Reservoir is located on the main stem of the Mokelumne River about 38 miles northeast of Stockton, near the town of Jackson. The reservoir has 37 miles of shoreline and a surface area of 2,222 acres at the spillway crest elevation of

567.7 feet. The maximum storage capacity of the reservoir is 197,950 acre-feet and the dead storage is 12,200 acre-feet.

Pardee Dam and Reservoir were completed in 1929 to develop EBMUD's original 200 million gallons per day (MGD) supply. The dam is a 1337-foot-long concrete gravity structure that rises 345 feet above the Mokelumne riverbed. The 28.6 megawatt hydroelectric power plant at the base of Pardee Dam generates about 110 million kilowatt-hours in average or better years. A separate concrete gravity overflow spillway structure is located to the south of the main dam.

Pardee Tunnel

EBMUD diverts Mokelumne River water to its service area through an outlet tower located on the south side of Pardee Reservoir. The water enters the tower at elevations of 550, 520, 490, and 460 feet, and also through a submerged intake structure at elevation 396 feet in the southern arm of the reservoir. The water is then conveyed into a 2.2 mile-long and 8 foot-high horseshoe-shaped tunnel with invert elevation of 392 feet. The tunnel ends at Campo Seco at the beginning of the Mokelumne Aqueducts.

Mokelumne Aqueducts

The Mokelumne Aqueduct system includes three parallel 82-mile-long steel pipelines which begin in Campo Seco in Calaveras County, traverse the Delta, and end in Walnut Creek in the East Bay Area.

Releases from Pardee to Camanche Reservoir

Water is released from Pardee Reservoir to Camanche Reservoir either through the Pardee Hydroelectric Plant, through sluiceways at the toe of the dam, or over the spillway.

Camanche Dam and Reservoir

Camanche Reservoir is located on the Mokelumne River just downstream of Pardee Reservoir. It has 63 miles of shoreline and a surface area of 7,470 acres at the spillway crest elevation of 235.5 feet. The maximum storage capacity of the reservoir is 417,120 acre-feet.

The reservoir is impounded by Camanche Dam, an earthfill structure that rises 171 feet above the Mokelumne riverbed. The Camanche Main Dam has a crest length of 2,640 feet. There are four miles of earthen dikes in addition to the main dam. The dam and dikes were completed in 1964 to develop an additional 125 MGD of supply for EBMUD by providing additional streamflow regulation, flood-control space, and capacity to meet downstream needs. A 10.6 megawatt power plant at the dam generates approximately 40 million kilowatt-hours, in average or better years.

Releases from Camanche Reservoir to the Lower Mokelumne River

Storage in Camanche Reservoir is used to meet EBMUD's flow obligations, including releases for flood control, fishery needs, and the rights of riparian landowners and senior appropriators.

C. MOKELUMNE RIVER DOWNSTREAM OF EBMUD

The Lower Mokelumne River

The lower reach of the Mokelumne River flows about 35 miles from Camanche Dam westerly across the floor of the Central Valley to the point where it enters the Delta at New Hope Landing. Along its route, the river passes through the City of Lodi before meandering northerly across flatlands, intercepts the Cosumnes River near Thornton, turns south and enters the Delta at New Hope Landing.

Water is released from Camanche Dam through Camanche Hydroelectric Power Plant or through discharge valves. There is a fish hatchery located at the toe of the dam. The hatchery receives water from Camanche Reservoir and discharges it into the river.

From the reservoir, the river flows west, crosses beneath Highways 88 and 99, and then enters Lake Lodi, a shallow impoundment on the north side of Lodi. Lake Lodi is formed by the Woodbridge Irrigation District (WID) diversion dam that seasonally raises the water level of the Mokelumne River sufficiently for diversion to WID's canal system.

Diversions and Losses

<u>Riparians and Individual Appropriators</u>

Riparian landowners have rights that are tied to the river's natural flow. Other individuals and agencies with appropriative rights that predate EBMUD's rights have claims on the Mokelumne River that are senior to EBMUD's rights. These individuals and agencies include ranches, vineyards, and farms that pump water

from the Mokelumne River between Camanche Dam and tidewater for irrigation and domestic purposes.

North San Joaquin Water Conservation District

North San Joaquin Water Conservation District (NSJWCD) is an irrigation district located below Camanche Dam and upstream of Woodbridge Irrigation District. NSJWCD does not have permanent water rights on the Mokelumne River. NSJWCD receives its temporary entitlement in normal and wet years under a temporary water rights permit to divert and store water derived from the unused portion of EBMUD's Camanche water right. Because its entitlement is temporary, NSJWCD has not constructed a permanent storage facility on the Mokelumne River. Instead, NSJWCD entered into an agreement with EBMUD to store water in Pardee and Camanche Reservoirs for later release to NSJWCD's diversion facilities along the river below Camanche Dam. The maximum entitlement under this agreement is 20,000 acre-feet per year although NSJWCD's diversions are typically 8,000 to 10,000 acre-feet when water is available. In dry and critically dry years NSJWCD usually receives no water under this agreement.

Woodbridge Irrigation District

Woodbridge Irrigation District serves irrigation water to about 20,000 acres of agricultural land in San Joaquin County in the vicinity of Lodi and Woodbridge.

The original WID diversion dam was built in 1891. The current structure located at the northeast side of Woodbridge was constructed shortly after the turn of the century. The dam creates Lake Lodi, a seasonal, shallow impoundment with a capacity of approximately 2,000 acre-feet. From this lake, WID diverts water into an extensive canal system. (See Appendix A for photographs of the WID Dam and Lake Lodi)

WID has two licensed water rights for direct diversions ranging from 114.4 cfs to 414.4 cfs. These entitlements are conditioned by a series of water rights agreements with EBMUD which provide WID with firm annual diversions of 60,000 acre-feet in normal and wet water years and 39,000 acre-feet in dry years.

City of Lodi

The City of Lodi, with a population of 51,900 in 1990, draws its water supply from the regional groundwater basin. Its well field is replenished, in part, by seepage from the Mokelumne River. Under the "Lodi Decree", EBMUD is required to ensure that up to 3,600 acre-feet per year is available to the City of Lodi. This may require EBMUD to make additional releases, if certain groundwater and pumping conditions cannot be met.

Channel Losses

Water is lost from the streamflow due to evaporation, evapotranspiration, and seepage from the streambed into the groundwater basin. The amount of the channel losses varies with soil properties and geology, groundwater levels, and total flow in the river.

Since the completion of Camanche Reservoir, channel losses have ranged from 47,000 to 130,000 acre-feet per year. Channel losses between Camanche Dam and Woodbridge Dam vary from year to year but, in general, have increased with time.

III. EBMUD MOKELUMNE RIVER WATER RIGHTS

EBMUD's Mokelumne Project reservoirs are operated in accordance with water right permits and licenses which have been issued to EBMUD by the State Water Resources Control Board (SWRCB). Riparian landowners, who have rights that are tied to the river's natural flow, and other individuals and agencies with appropriative water rights that predate EBMUD's rights have claims on the river that are senior to EBMUD's rights.

A. MUNICIPAL AND INDUSTRIAL USE

EBMUD's share of Mokelumne River water for municipal and industrial uses is governed by License 11109 and Permit 10478, both of which were issued by the SWRCB.

License 11109

EBMUD filed water right Application 4228 with the State on September 22, 1924, seeking permission to divert up to 200 MGD of Mokelumne River water directly to use, and to divert up to 209,950 acre-feet per year to storage for later use, to serve its East Bay customers. After a water rights hearing which led to SWRCB Decision 100 on April 17, 1926, EBMUD was issued Permit 2459. On April 3, 1981, the SWRCB issued License 11109 to EBMUD for its Pardee Project, with revised terms and conditions.

Under License 11109, EBMUD can divert up to 310 cfs from the river to direct use year-round, and can divert up to 209,950 acre-feet of water to storage between October 1 and July 15. Combined direct diversion and withdrawal from storage under this license cannot exceed 310 cfs (200 MGD) or 224,037 acre-feet per year,

and the total amount of water taken from the river by direct diversion and diversion to storage cannot exceed 316,250 acre-feet per year.

Permit 10478

On June 16, 1949, EBMUD filed water right Application 13156, seeking permission to divert an additional 125 MGD of Mokelumne water directly to use, and an additional 353,000 acre-feet per year to storage. After a hearing which led to SWRCB Decision 858 on July 3, 1956, EBMUD was issued Permit 10478.

Under Permit 10478, EBMUD can divert up to 194 cfs from the river to direct use from December 1 to July 1, and can also divert up to 353,000 acre-feet per year of water to storage between December 1 and July 1.

On March 5, 1959, EBMUD was granted a Release from Priority that gives Permit 10478 priority over some (but not all) of the Mokelumne River water rights that may be issued based on filings made by the Department of Finance in 1927. This Release from Priority adds a further restriction to the amount of water EBMUD can divert under Permit 10478: Combined direct diversions and diversions from storage cannot exceed an average flow of 194 cfs or 140,000 acre-feet per year.

Permit 10478 also contained two pre-conditions: Construction of Camanche Dam could not commence until the possibility of incorporating flood control was explored with local and/or federal interests; and no diversions could be made under the permit until agreement was reached with the California Department of Fish and Game on flows to be by-passed for fish.

The following sections describe EBMUD water rights and operational constraints related to flood control in the dual reservoir system and flow requirements

downstream of Camanche Reservoir to maintain fish habitat in the lower Mokelumne River.

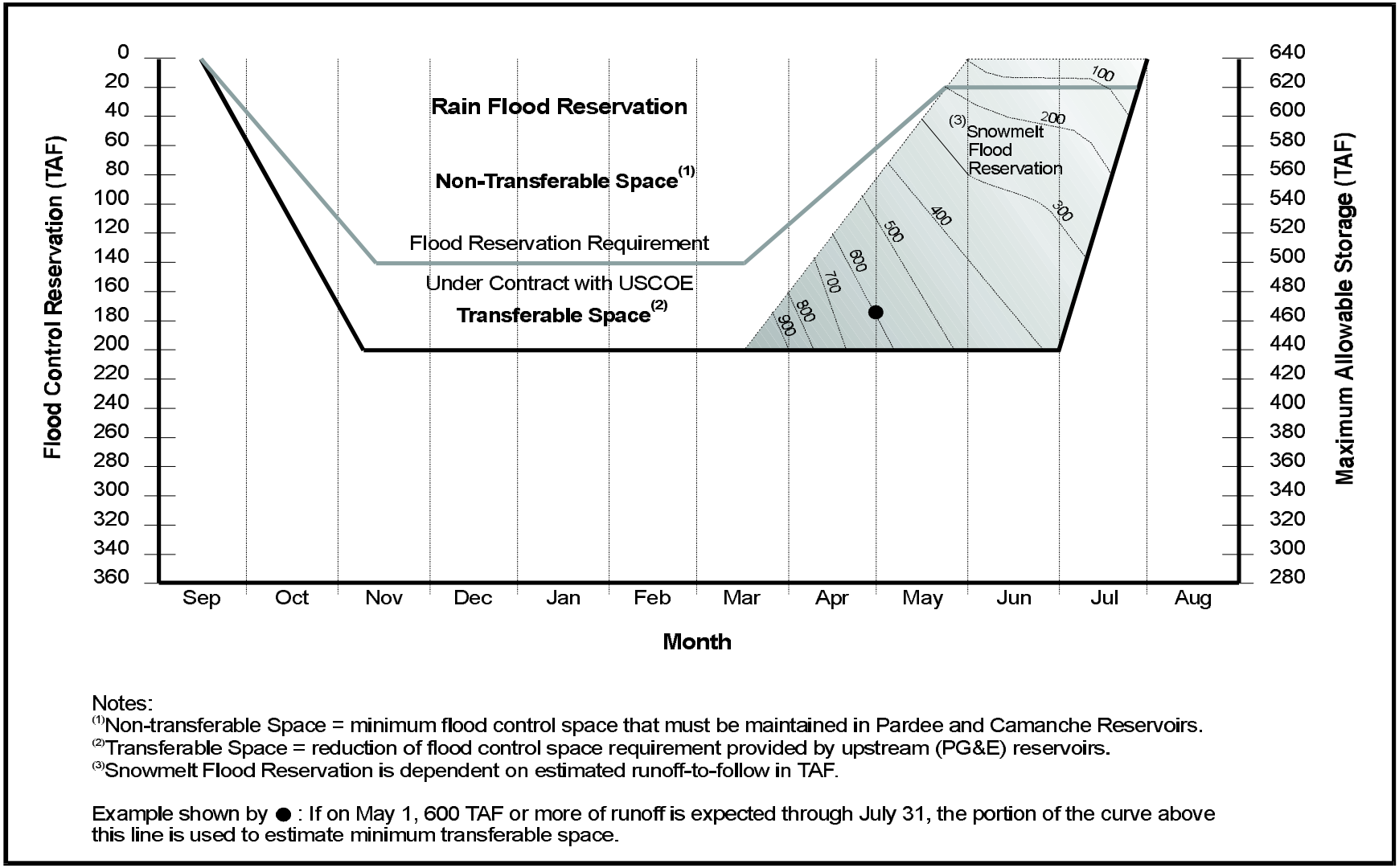
Flood Control Requirements

On March 19, 1962, EBMUD entered into an agreement with the United States Army Corps of Engineers (Corps) to enlarge the planned capacity of Camanche Reservoir to provide up to 200,000 acre-feet of flood control reservation. EBMUD further agreed to operate Camanche Reservoir for flood control in accordance with rules and regulations prescribed by the Corps.

Figure 5 provides a summary of the flood control requirements, which are fully described in a flood control manual prepared by the Corps. EBMUD must begin to create flood control reservation in Camanche and/or Pardee Reservoir(s) in mid-September of each year. By November 5th, between 130,000 and 200,000 acre-feet of flood control reservation (depending on how full PG&E's upstream reservoirs are at the time) must have been created. The flood control reservation must be maintained if possible at least through mid-March, and potentially into July in years of heavy snow accumulation. During this period the flood control reservation is divided into two categories: Rain Flood Reservation and Snowmelt Flood Reservation.

The Rain Flood Reservation is mandatory and does not depend on forecasting runoff in the river basin. The Rain Flood Reservation increases uniformly from zero requirement on September 15 to a maximum reservation of 200,000 acre-feet by November 5. The reservation is maintained at 200,000 acre-feet through March 15 after which, unless additional reservation is required for snowmelt runoff, it will decrease uniformly to zero requirement on May 31. A portion of the reservation is transferable to PG&E’s reservoirs depending on the available storage space in the upper reservoirs. The relationship between the transferable amount and the

FIGURE 5. Flood Control Requirements Rule Curves



Notes:
(1)Non-transferable Space = minimum flood control space that must be maintained in Pardee and Camanche Reservoirs.
(2)Transferable Space = reduction of flood control space requirement provided by upstream (PG&E) reservoirs.
(3)Snowmelt Flood Reservation is dependent on estimated runoff-to-follow in TAF.

Example shown by ● : If on May 1, 600 TAF or more of runoff is expected through July 31, the portion of the curve above this line is used to estimate minimum transferable space.

Source: US Corps of Engineers Water Control Manual for Camanche Dam and Reservoir, September 1981

available storage space in PG&E's reservoirs is calculated by a formula. A more detailed explanation of this formula is provided in the Corps' Flood Control Manual.

The Snowmelt Flood Reservation is conditional and is based on the forecast of snowmelt runoff in the Mokelumne River basin. The snowmelt reservation period starts on March 15 and lasts until August 1. During this time, periodic forecasting of the spring runoff until August 1 determines the total required flood reservation. As with the Rain Flood Reservation, a portion of this reservation is transferable to PG&E's upstream reservoirs in accordance with the formula described in the Manual. The Snowmelt Flood Reservation, however, cannot fall below the mandatory Rain Flood Reservation.

The flood control agreement with the Corps also provides a release schedule from Camanche Reservoir whenever encroachment into the flood control reservation occurs. The schedule specifies that the maximum release from Camanche Reservoir should be limited to 5,000 cfs, insofar as possible, and the rate of change in release shall not exceed 1,000 cfs per 2-hour interval.

Flow Requirements

On January 3, 1961, EBMUD and CDF&G reached an agreement on releases of water for fishery purposes and other mitigation measures for Camanche Reservoir. To offset fall-run Chinook salmon and steelhead trout habitat that would be lost when Camanche Dam was built, EBMUD agreed to construct and maintain a fish hatchery near the base of the dam, which CDF&G would operate. EBMUD also agreed to release 5,400 acre-feet of water in critically dry years and 13,000 acre-feet of water in all other years specifically for fishery purposes, in addition to other releases for downstream water users and releases needed to offset channel losses.

EBMUD and CDF&G agreed on details of the fish facility on March 23, 1962. On January 11, 1963, EBMUD and CDF&G signed another agreement, specifying that no year would be considered "critically dry" for purposes of determining fish flow releases until: a) EBMUD's average annual M&I diversion reaches 250 million gallons daily, or b) a water right license has replaced Permit 10478. Since completion of Camanche Reservoir in 1964, the District has never released less than 13,000 acre-feet annually for fishery purposes.

Under these agreements, CDF&G can specify when the 13,000 acre-feet of water for fish is to be released; otherwise, it is released in November through March when releases are not already being made to meet downstream irrigation demands.

Since 1964, downstream releases from Camanche Reservoir have exceeded 125,000 acre-feet in every water year, including 1977 when the Mokelumne River's estimated natural flow dropped to 129,000 acre-feet. These downstream releases are far greater than the 13,000 acre-feet minimum fishery flow under the 1961 CDF&G Agreement. At this time, the 1961 Agreement remains the fishery flow standard which the District is required to meet.

Pursuant to a Joint Settlement Agreement (JSA) between EBMUD, CDF&G and the U. S. Fish & Wildlife Service (USFWS) developed in a Federal Energy Regulatory Commission (FERC) proceeding, a revised set of flow requirements has been developed. These flows have been submitted to (but not yet acted on by) FERC, so that at this time the 1961 Agreement fishery flows remain the legal standard. If the JSA flows are approved by FERC, they will become the new fishery flow requirement for EBMUD under the District’s FERC License. The JSA flows are substantially higher than those set forth in the 1961 Agreement. A description of the JSA flows is provided in the testimony of John B. Lampe (EBMUD Exhibit No. 10). EBMUD has been voluntarily releasing flows consistent with the JSA since March 1996.

B. HYDROPOWER USE

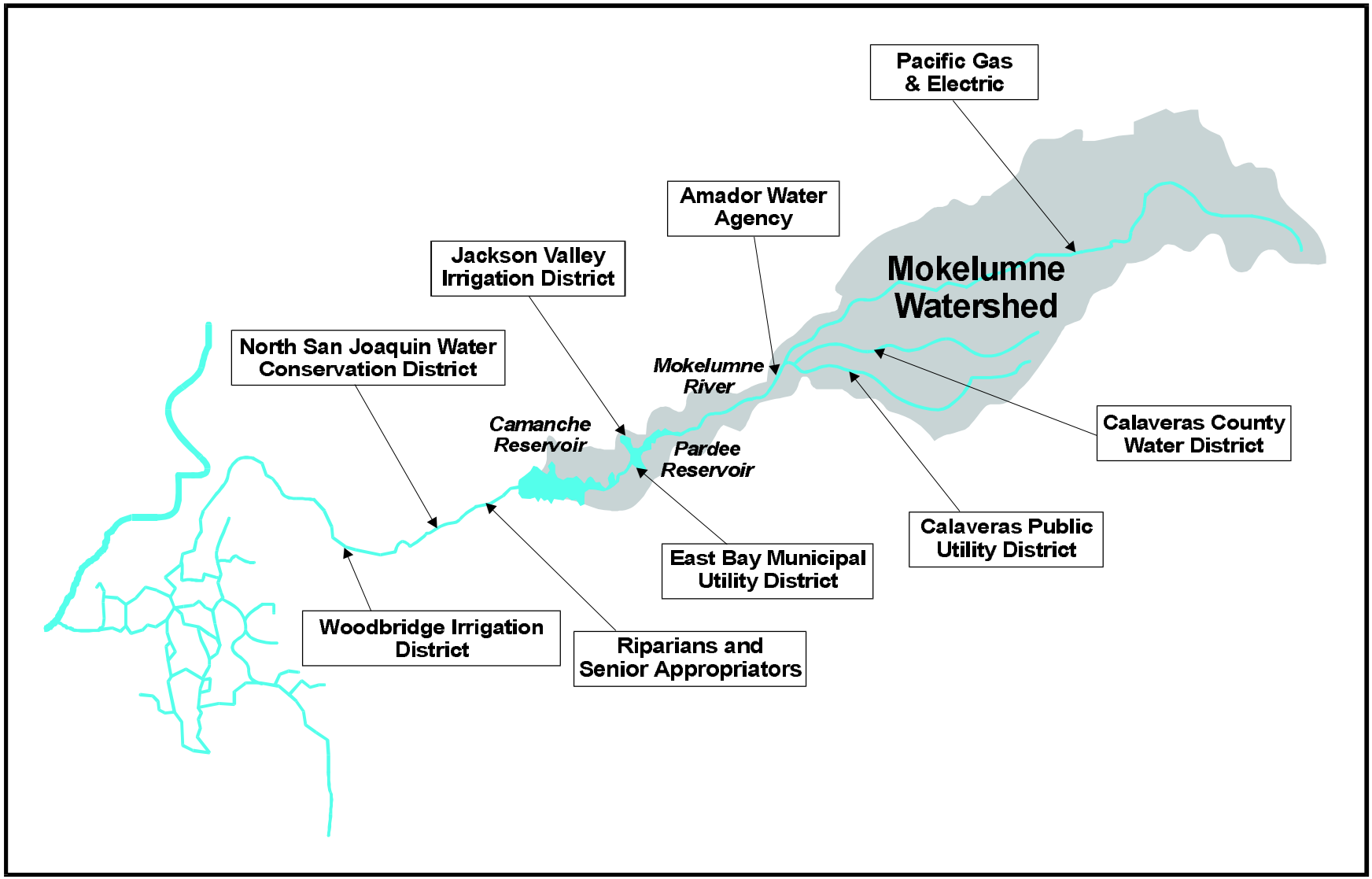
EBMUD also possesses other water rights related to hydroelectric power generation. Power is generated from releases mandated for downstream appropriators, flood control, fish, and other uses. The hydroelectric power plants at Pardee Dam and Camanche Dam utilize water under the following SWRCB authorizations:

Pardee License 1388
Pardee License 6062
Pardee Permit 10479
Camanche Permit 17378

IV. CONCLUSION

While it is a small river, the Mokelumne River serves a variety of uses, including agriculture, fisheries, flood control, hydropower, and municipal and industrial use. The interdependence of these uses and users is complex and has a long history, as described in this exhibit. (Please see Figure 6 for a depiction of the major diverters that make use of the Mokelumne River.)

FIGURE 6. Mokelumne River Water Users



APPENDIX A

PHOTOGRAPHS