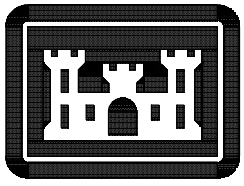
STARVATION
DAM AND RESERVOIR
STRAWBERRY RIVER, UTAH

WATER CONTROL MANUAL

APPENDIX III TO
MASTER WATER CONTROL MANUAL
UPPER COLORADO RIVER BASIN



US ARMY CORPS
OF ENGINEERS
Sacramento District

SEPTEMBER 1988

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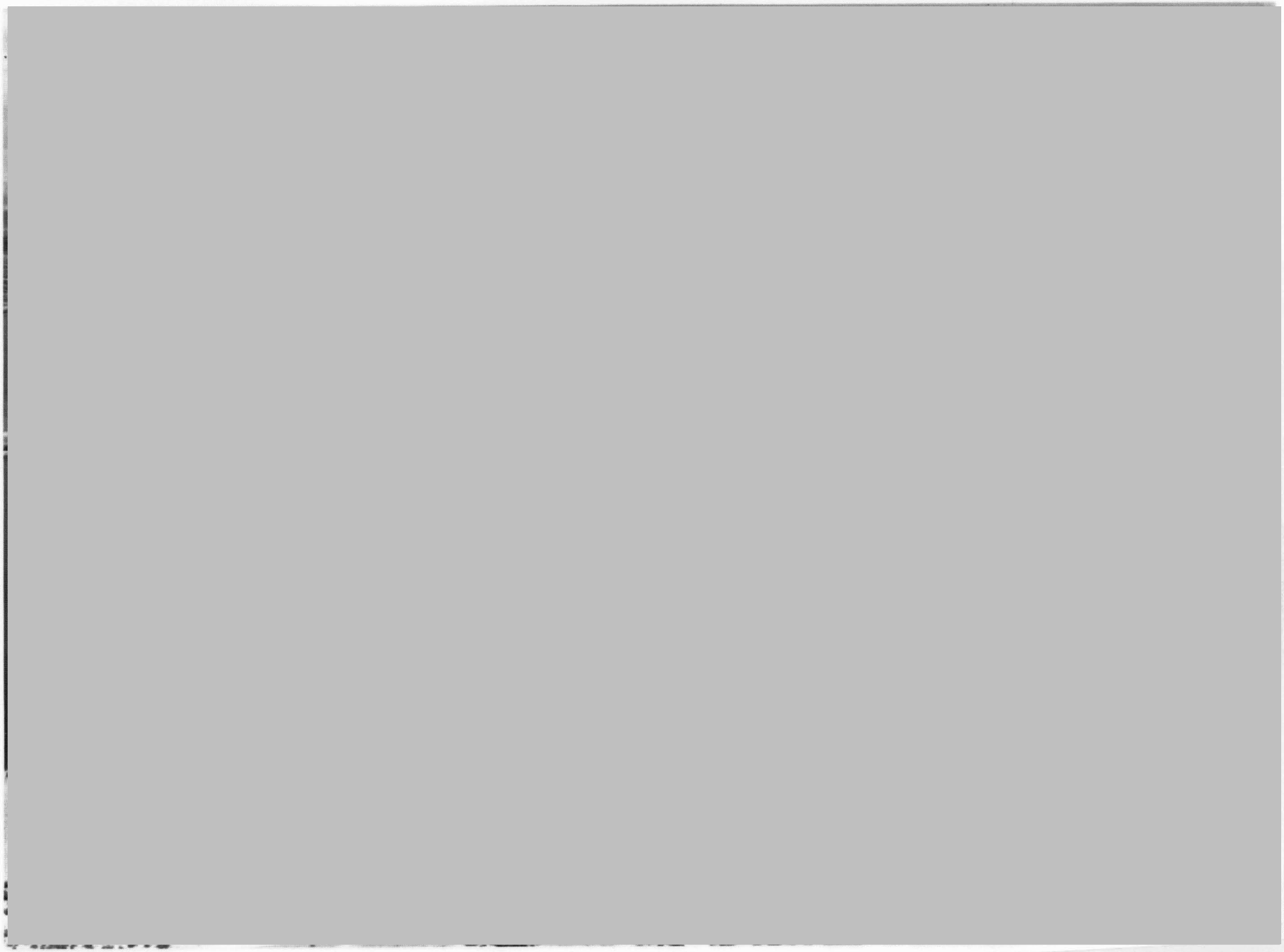
STARVATION DAM AND RESERVOIR

STRAWBERRY RIVER, UTAH

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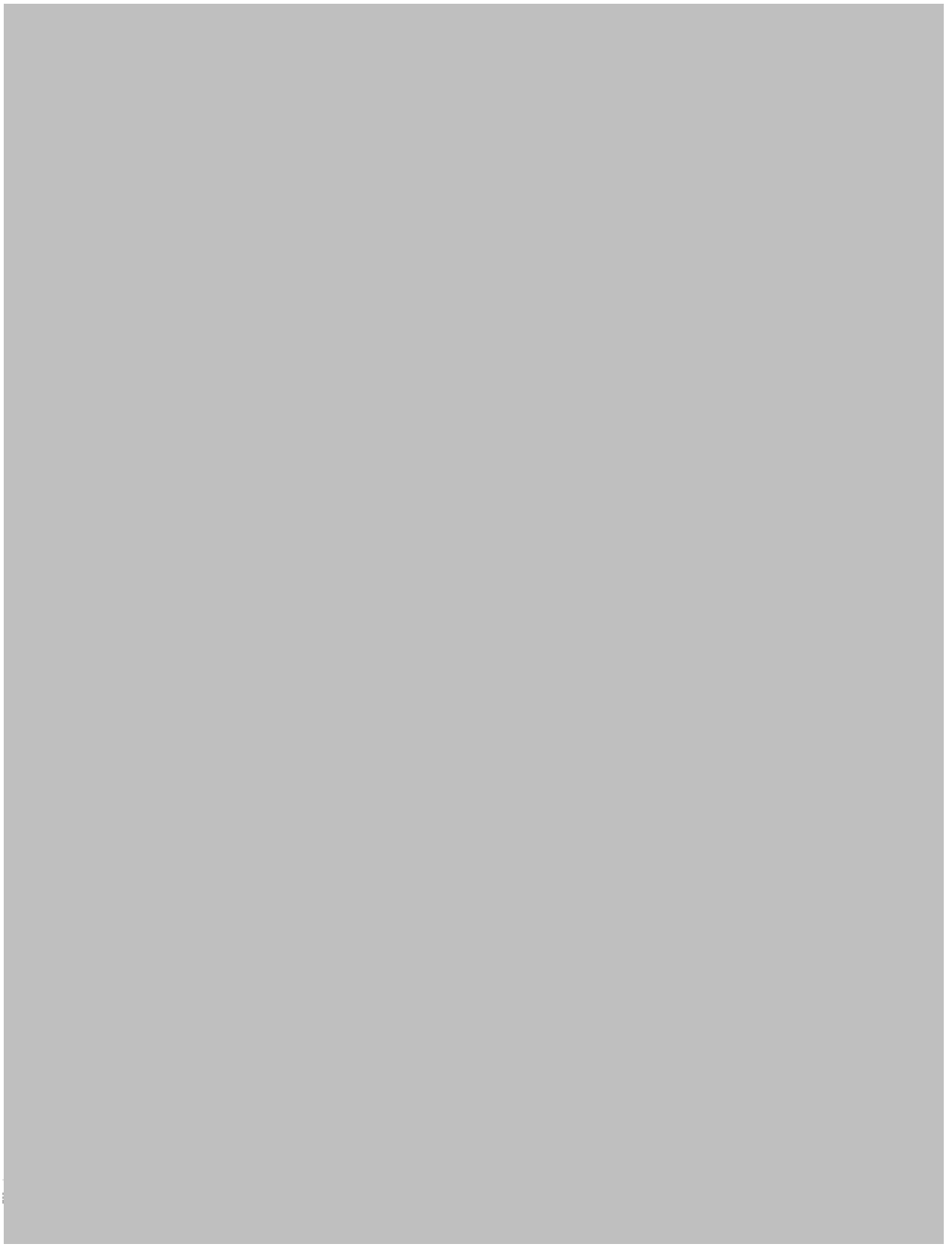
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U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
SACRAMENTO, CALIFORNIA



STARVATION DAM AND RESERVOIR

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STARVATION DAM AND RESERVOIR
STRAWBERRY RIVER, UTAH
PERTINENT DATA

General

Drainage area.....1050 sq mi
Average snowmelt runoff
(Jan-Jul).....86,300 ac-ft
Maximum mean daily inflow
(May 7,1952).....3,400 cfs
Spillway design maximum mean daily
inflow.....25,000 cfs

Reservoir

Elevations
Minimum Pool (top of dead
storage).....5595.0 ft
Inactive Pool.....5624.8 ft
Gross Pool.....5712.0 ft
Spillway Design Flood Pool....5718.3 ft
Areas
Minimum Pool.....199 ac
Inactive Pool.....689 ac
Gross Pool.....3310 ac
Spillway Design Flood Pool.....3575 ac
Storage Capacities
Dead Storage.....1990 ac-ft
Inactive Storage.....14980 ac-ft
Gross Pool..... 167310 ac-ft
Spillway Design Flood Pool.188980 ac-ft



Spillway



Maximum discharge... 16,600 cfs
(at maximum water surface of
5718.3 ft)

Outlet Works



Maximum discharge (water surface
elevation 5718.3 ft....2,400cfs

Notes:

Elevation datum is NGVD.
No hydropower facilities.

NOTICE TO USERS OF THIS MANUAL

Regulations specify that this Water Control Manual be published in looseleaf form, and only those sections, or parts thereof, requiring changes will be revised and printed. Therefore, this copy should be preserved in good condition so that inserts can be made to keep this manual current.

STARVATION DAM AND RESERVOIR
STRAWBERRY RIVER, DUCHESNE COUNTY, UTAH

FLOOD CONTROL MANUAL

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I INTRODUCTION

1-01. AUTHORIZATION

The Starvation Water Control Manual, Strawberry River, Utah, is an appendix to the Upper Colorado River Basin Master Water Control Manual. It is prepared in accordance with instructions contained in ER 1110-2-240, ER 1110-2-241, ER 1110-2-1941, EM 1110-2-3600, and ETL 1110-2-251. All pertain to requirements for reports on Reservoir Regulation for Corps of Engineers projects and/or projects subject to the provisions of Section 7 of the Flood Control Act of 1944 (58 Stat. 890, 33 USC 709). The pertinent portion of that Act as applies to this Water Control Manual is:

> "Hereafter it shall be the duty of the Secretary of War to prescribe regulations for the use of storage allocated for flood control or navigation at all reservoirs constructed wholly or in part with Federal funds provided on the basis of such purposes, and the operation of any such projects shall be in accordance with....."

1-02. PURPOSE AND SCOPE

This manual provides the detailed plan of regulation for Starvation Dam and Reservoir for flood control. It also includes descriptive information that expands upon the purpose and normal operation of the project. A portion of the material used in this report was furnished by the U.S. Bureau of Reclamation, Upper Colorado Region, Salt Lake City, Utah. A description of the overall Upper Colorado River Basin plan for flood control is given in the Master Water Control Manual, Upper Colorado River Basin.

1-03. RELATED MANUALS AND REPORTS

There are two manuals detailing the operation of the Starvation project, both published by the U.S. Bureau of Reclamation. One is The Designers Operating Criteria, the other is the Standard Operating Procedures for the project. Both were published in 1970. A technical report "Dam Failure Inundation Study, Starvation Dam" was completed in November, 1986.

1-04. PROJECT OWNER

The owner of Starvation Dam and Reservoir is the U.S. Bureau of Reclamation, United States Department of the Interior.

1-05. OPERATING AGENCY

The Central Utah Water Conservancy District (Offices located in Orem, Utah, about 6 miles north from Provo, Utah) is the operating agency for Starvation Dam and Reservoir. The District operates under the supervision of the U.S. Bureau of Reclamation Utah Projects Office, Provo, Utah.

The Starvation Lake State Recreation Area facilities are under the supervision and control of the State of Utah Department of Natural Resources, Parks and Recreation Office. Fish and Wildlife management is provided by the State of Utah Department of Natural Resources, Fish and Wildlife Office.

1-06. REGULATING AGENCIES

The flood control operating criteria for the Starvation Project were developed and mutually agreed upon by the U.S. Bureau of Reclamation and the U.S. Army Corps of Engineers. Ultimate responsibility for promulgation of flood control regulations is vested in the U.S. Army Corps of Engineers while responsibility for the safety of the dam and the actual operation of the outlet facilities is the responsibility of the U.S. Bureau of Reclamation. See the list in the front of this manual for the persons and offices with appropriate addresses and telephone numbers of those responsible for the operation of Starvation Dam.

II DESCRIPTION OF THE PROJECT

2-01. LOCATION

Starvation dam is located on the Strawberry River in north-eastern Utah, about three miles northwest from the town of Duchesne in Duchesne County. The Strawberry River is tributary to the Duchesne River, which in turn is tributary to the Green River. A map of the reservoir area is depicted on Plate 1 and a map of the general area is illustrated on Plate 2.

2-02. PURPOSE

The Starvation Project is a multi-purpose conservation and flood control project. Unappropriated flows of both the Strawberry River and the Duchesne River are stored in the reservoir in order to provide supplemental irrigation water for 26,000 acres of land in the Duchesne Basin. Useable water to this area will be increased by 21,400 acre-feet annually. The reservoir will also provide supplemental water to 10,000 acres of Indian land and flood control to the town of Duchesne.

2-03. PHYSICAL COMPONENTS



d. **Reservoir.** The reservoir has a capacity of 167,310 acre-feet at the normal full pool of elevation 5712.0 feet NGVD. Included in this capacity is 24,000 acre-feet reserved for the estimated 100-year sediment deposition. The water surface area is 3310 acres and there is 32 miles of shoreline. There is surcharge capacity of 21,670 acre-feet between elevations 5712.0 and 5718.3 NGVD. Water surface elevation at 5718.3 is 3575 acres.

2-04. RELATED FACILITIES

. The spillway leading to the Duchesne river has a designed maximum capacity of 6,000 cfs. The capacity of the concrete headworks to the Starvation feeder conduit is 300 cfs. The purpose of the diversion dam is to provide a source of unclaimed water from the Duchesne River during the late fall and early winter months for storage in Starvation Reservoir in addition to channeling undiverted flows down the Duchesne River.

2-05. REAL ESTATE ACQUISITION

The Starvation Project required 7,360 acres of land, 3,590 acres for the reservoir and dam and 3,770 acres for the recreation area. The majority of land acquisition was from private lands, about 7,115 acres. Indian land acquisition for the project totaled 230 acres and an additional 15 acres was purchased from Duchesne County. See Plate 6.

2-06. PUBLIC FACILITIES

Starvation Lake State Park offers a 31-unit campground, with restrooms and hot showers, a reservation-only group camping and day use area, a large boat ramp with an adjacent boat-trailer parking area and a 70-space beach/picnic area. A fish cleaning station and sanitary station is also available. See Plate 6.

III HISTORY OF THE PROJECT

3-01. AUTHORIZATION

Conservation and development of the water resources of the Upper Colorado River Basin was authorized by a Congressional Act dated April 11,1956 (Public Law 485, 84th Congress, 70 Stat.105). The Act authorized the Colorado River Storage Project and eleven participating projects. One of the participating projects was the initial phase of the Central Utah Project of which the Starvation Project is a subunit.

3-02. PLANNING AND DESIGN

The Starvation Project is part of the planning process that began informally in the late 1880's when the available water supply could not adequately support further expansion of agricultural lands in the Spanish Forks drainage basin. The first reconnaissance and preliminary surveys for supplemental water for the basin were undertaken by the U.S. Government in 1903. In 1905, the Federal Government recommended construction of the Strawberry Valley Project. In December, 1905 the project was authorized by the Secretary of Interior under provisions of the Reclamation Act of 1902. The purpose of the project was to divert water from the Strawberry River Basin to the Spanish Forks River for further distribution within the Spanish Forks Basin.

Construction of the Strawberry Tunnel and the Strawberry Dam began in 1906. The tunnel was completed and storage began in Strawberry Reservoir in 1912. The Dam and Reservoir was completed in the following year. This part of the project diverted and stored flows from the Strawberry River, Indian Creek, and Trail Hollow Creek. In 1934, construction commenced and was completed in 1936 on the Currant Creek diversion system to Strawberry Reservoir. This completed the Strawberry Valley Project.

The study for the Central Utah Project began in 1945 when a group of local citizens and state officials requested the U.S. Bureau of Reclamation to expand the Strawberry Valley Project. During the course of the study, the plan was expanded to cover the same area as was considered in the proposed Colorado River-Great Basin Project, and the name Central Utah Project was adopted.

The Central Utah Project is very large and complex, as a consequence it was sub-divided into six seperate projects. The Bonneville Project is one of the six units and was further sub-divided into another six units. The six units of the Bonneville Project are: The Starvation Collection System, the Strawberry Aqueduct and Collection System, the Diamond Fork Power System, the Irrigation and Drainage system, the Municipal and Industrial Water System, and the Indian Commitments System.

The purpose of the Starvation Collection System is to store surplus late fall and early winter flows from the Duchesne and Strawberry Rivers,

and to release the impounded water during the spring and summer months as a supplement irrigation supply to the Duchesne River area and as replacement water for the storage diverted to the Bonneville Basin through the Strawberry Aqueduct.

The basis for the approved plan and design of the Bonneville unit of the Central Utah Project is Utah State Water Application No. 36689 filed November 19, 1964 and approved by the Utah State Engineer on June 17, 1965. Under the terms of the application, up to 50,000 acre-feet of water may be diverted annually from the Strawberry and Duchesne Rivers for storage in Starvation Reservoir and from higher tributaries of these rivers for storage in Strawberry Reservoir.

3-03. CONSTRUCTION

Dam site clearing and foundation preparation began in March, 1967. Construction of Starvation Dam, Knight Diversion Dam and the Starvation Conduit followed with all construction work completed in 1970. The first diversion into the Starvation Conduit from the Duchesne River began in November, 1970.

3-04. RELATED PROJECTS

Projects related to the Bonneville Project (Starvation is a subunit of the Bonneville Project) are the enlarged Strawberry Reservoir, the Strawberry collector and aqueduct system, the Upper Stillwater dam and reservoir as well as the Currant Creek dam and reservoir. Details for each of these projects are provided below, locations are plotted on Plate 2.

a. Upper Stillwater Reservoir and Dam. Under construction at the present time (1988). When completed this project will impound South Rock Creek flows and serve as a regulating reservoir at the head of the Strawberry Aqueduct. The dam is located on Rock Creek in the Duchesne River basin.

b. Strawberry Aqueduct. This aqueduct which heads at Upper Stillwater Reservoir will conduct flows from Upper Stillwater along with collected flows routed to the aqueduct in the intervening area between Upper Stillwater and Currant Creek Reservoir. In addition, the aqueduct will collect flows diverted to the aqueduct between the Currant Creek Reservoir and the Strawberry Reservoir as well as flows from Currant Creek Reservoir and convey the flows to Strawberry Reservoir where the aqueduct terminates.

c. Currant Creek Dam and Reservoir. The now completed Currant Creek dam and reservoir will divert and store Currant Creek flows and flows inputed from Upper Stillwater and the aqueduct between the two reservoirs. Currant Creek is located in the Strawberry River drainage basin.

d. Strawberry Dam and Reservoir. This reservoir, enlarged in 1974, is the primary storage unit of the Bonneville Project. Storage is diverted from the reservoir through the Strawberry Tunnel to the Bonneville Basin where it is further diverted within that basin. Flows into the Strawberry Reservoir orginate from the Strawberry Aqueduct as well as from the Strawberry River above the reservoir. The Strawberry River drains 223 square miles above Strawberry Dam.

3-05. MODIFICATION TO REGULATIONS

There is no modification to the regulations governing the operation of the Starvation Project for flood control. This report is the first one to detail the flood control plan for the project.

3-06. PRINCIPAL REGULATION PROBLEMS

There are no known regulation problems such as stream bank erosion, river channel overflow, or other possible hazards associated with the operation of Starvation Dam for flood control.

IV WATERSHED CHARACTERISTICS

4-01. GENERAL CHARACTERISTICS

The shape of Strawberry drainage basin resembles that of a pear with the stem portion aligned with the Strawberry River channel and the maximum width nearly coincidental with the mid point of the river. Maximum length of the basin is about 50 miles (the length of the river is approximately 85 miles), while the maximum basin width is 35 miles.

Strawberry River slope varies from 0.003 at the mouth of the river to river mile 32, increases to 0.0108 between river mile 32 and 49.5 and flattens to 0.0061 in the vicinity of Strawberry Reservoir between river mile 49.5 and 80.5. The channel slope increases abruptly to an average 0.0473 above Strawberry Reservoir and the headwaters of the river. Stream profiles are plotted on Plate 7.

Extremes in elevation are from a low of 5495 feet at the mouth of the river to a maximum height of 10,554 feet for Currant Peak located on the eastern rim of the basin. Table 1 is a tabulation of the drainage area by elevations.

Major tributary streams are the Lake Canyon, Sams Canyon, Timber Canyon, Avintaquin and Willow Creeks which drain the western side of the basin. The Eastern side of the basin is drained by the Red and Currant Creeks .

Vegetation in the semi-arid area surrounding Starvation and Strawberry Reservoirs is predominitely sage brush and prairie grasses while the upland slopes of the basin are covered with a fairly dense forest of aspen and pine trees.

TABLE 1

STARVATION RESERVOIR - DRAINAGE AREA BY ELEVATION

Elevation	Area (sq-Mi)	% of total
Above 9,000 feet	85	8
Between 8,000 and 9,000 feet	469	45
Between 7,000 and 8,000 feet	265	25
Between 6,000 and 7,000 feet	201	19
Below 6,000 feet	33	3
Totals	1053	100

4-02. TOPOGRAPHY

The topography of the basin is mostly flat valley floor around each of the reservoirs with a deeply incised canyon channeling the flows of the Strawberry River between the reservoirs. The area above the reservoirs rapidly grades into steep mountainous slopes. An area-elevation curve is plotted on Plate 8.

4-03. GEOLOGY AND SOILS

Only one formation, the Uinta, occurs in the dam site and reservoir area. It is mostly fluvial in origin at the dam site but becomes partially lacustrine within the upper areas of the reservoir. It is composed of interbedded variegated shale, sandstone, and some limestone upstream from the damsite. Shale is predominant and is generally bentonitic to carbonaceous with some beds which may be classed as oil shale. Most of the rocks within the reservoir area are poor to well bedded and appear as thin layers ranging from paper thin to up to about 10 feet. This type of sediment is impervious. The soil mantle above the reservoir area is relatively thin, hence there is little ground water storage.

4-04. SEDIMENT

Extensive sediment deposition has recently occurred above Starvation Reservoir in the vicinity of the Strawberry Pinnacles. Apparently the greater portion of the deposition is from two tributary streams, Red Creek and Avintaquin Creek. Each discharges into the Strawberry River adjacent to the Strawberry Pinnacles. There is no specific referance to the sediment potential in any of the planning documents for the project other than an 100-year sediment allowance of 24,000 acre-feet of storage space in Starvation Reservoir.

4-05. CLIMATE

The climate in the Strawberry River Basin is temperate and semi-arid. In the mountains, winter temperatures are moderately severe, with minimums well below freezing during the period between October and March while warm days and cool nights characterize the summer months. Lower elevations within the valley floor are usually parallel in temperatures, exceeding the higher elevation by ten to fifteen degrees.

a. Temperature. Average monthly temperatures for two stations in the Uintah drainage basin are presented in Table 2. The Strawberry River drainage is a sub-basin of the Uintah and the climatological conditions are similar. See Plate 9 for the locations of these two stations. Extreme observed temperatures are presented in Table 3.

TABLE 2

AVERAGE MONTHLY TEMPERATURES (FARENHEIT DEGREES)

	FORT DUCHESNE El 5050	JENSEN El 4750
October	47.6	48.0
November	32.7	33.3
December	19.5	20.0
January	14.8	15.4
February	22.0	22.8
March	34.6	35.3
April	45.6	46.5
May	55.8	56.8
June	64.4	65.1
July	71.5	72.2
August	68.7	69.1
September	59.4	60.0
Average Annual	44.7	45.4

NOTE: Period of record is 1951-1980

TABLE 3

OBSERVED TEMPERATURE EXTREMES (FARENHEIT DEGREES)

	MINIMUM		MAXIMUM	
LOCATION	TEMP	MONTH	TEMP	MONTH
Duchesne	-43	Jan	101	Aug
Altamont	-24	Jan	96	Jul
Neola	-27	Jan	95	Aug
Roosevelt	-32	Jan	105	NA 1/

NOTE: 1/ NA = Not available.

b. Precipitation. Annual precipitation in the basin varies from an average of 10 inches in the Duchesne area to over 30 inches around the western and southern rim of the area. See Plate 9 for the annual precipitation distribution and station locations and Table 4 for normal monthly precipitation amounts for those stations.

TABLE 4

NORMAL MONTHLY PRECIPITATION (INCHES)

	NEOLA		ROOSEVELT		DUCHESNE		ALTAMONT		MYTON	
	El 5920		El 5104		El 5510		El 6370		El 5080	
Month	in.	%	in.	%	in.	%	in.	%	in.	%
Oct	0.85	-	NA	-	1.03	9.94	0.65	6.47	0.72	10.76
Nov	1.24	-	NA	-	0.61	5.89	2.12	21.12	0.44	6.58
Dec	0.26	-	NA	-	0.44	4.25	0.82	8.17	0.53	7.92
Jan	0.65	-	0.54	-	0.50	4.83	0.80	7.97	0.42	6.28
Feb	NA	-	0.42	-	0.12	1.16	0.09	0.90	0.31	4.63
Mar	0.77	-	0.56	-	1.10	10.62	1.00	9.96	0.51	7.62
Apr	0.08	-	0.63	-	0.62	5.98	0.26	2.59	0.57	8.52
May	0.74	-	0.63	-	0.86	8.30	0.62	6.18	0.68	10.16
Jun	0.65	-	0.71	-	0.72	6.95	0.67	6.67	0.68	10.16
Jul	1.34	-	0.40	-	2.53	24.42	1.28	12.75	0.48	7.17
Aug	NA	-	0.73	-	0.17	1.64	0.00	00.00	0.75	11.21
Sep	NA	-	0.66	-	1.66	16.02	1.73	17.23	0.60	8.97
Total	-	-	-	-	10.36	100	10.04	100	6.69	100

Note: As of the end of 1985, each of the following stations had the following record length:

Neola.....32 years
Roosevelt...46 years
Duchesne....74 years
Altamont....46 years
Myton.....68 years
NA = Not available

c. Snow Snowmelt is the main source of inflow to the Strawberry River Basin. Plate 9 displays the locations of major snow courses around the basin and Table 5 sumarizes the normal monthly snowfall measurements for the snow courses.

TABLE 5

NORMAL MONTHLY SNOWPACK MEASUREMENTS

	February 1	March 1	April 1	May 1
Snow Course	W.E.(in)	W.E.(in)	W.E.(in)	W.E.(in)
Indian Canyon El. 9100	8.4	10.8	13.5	10.9
Strawberry Divide El. 8400	12.8	17.0	19.9	14.9
Daniels-Strawberry El. 8000	10.2	12.9	15.1	9.9
Currant Creek El. 8000	7.4	8.9	9.3	2.8

Notes: Source: Water Supply Outlook for Utah, U.S. Soil Conservation Service monthly report.
W.E. = water equivalent in inches.

d. Evaporation and wind. Data is unavailable for Starvation Resrvoir, however, it is collected and summarized on an annual basis for the months of May through October at Fort Duchesne, located 30 miles east of the reservoir in an area similar to the area surrounding Starvation Reservoir. Table 6 summarizes these measurements.

TABLE 6

MONTHLY PAN EVAPORATION AND WIND MOVEMENT

	MAY	JUN	JUL	AUG	SEP
evaporation	8.26	10.19	10.59	9.63	6.84
wind movement	2128	1835	1466	1440	1388

Notes: Data is pan evaporation and wind movement over the pan at Fort Duchesne for the years 1970-1985, inclusive.
Evaporation is in inches, wind movement is the average monthly total over the pan in miles.

4-06. STORMS AND FLOODS

Significant floods in the basin are produced from two different types of hydrologic events, snowmelt and thunderstorms. Snowmelt floods are the most damaging because of sustained high flows that can last for two to four days. Peak flows usually occur during the last two weeks of May and the first week in June and major floods are the result of accelerated snowmelt caused by unseasonably high temperatures. Thunderstorms are of relatively short duration, lasting from one hour to no more than a day. Although none were recorded that actually exceeded snowmelt flows on the Strawberry River peak flows in the sub-basins can very often exceed the maximum peak snowmelt in the same sub-basins, but contribute little to the peak flows on the main stem. This is because of the small areal extent of thunderstorms.

Average monthly stream flow as a percentage of annual flow, could not be calculated because Strawberry Reservoir records are not maintained during the months of November through March. Table 7 lists the unregulated and regulated flows for the Strawberry River at Duchesne for some of the floods. Peak flows were regulated by either Strawberry Reservoir and/or Starvation Reservoir.

TABLE 7

MEAN DAILY PEAK FLOWS, STRAWBERRY RIVER

AT DUCHESNE (cfs)

YEAR	DATE	UNREGULATED	REGULATED1/	STARVATION OUTFLOW
1922	27 May	4300	3200	-
1949	14 Jun	2900	2800	-
1952	7 May	4800	3400	-
1980	23 May	3100	1200	440
1982	28 May	3800	1200	640
1983	31 May	6100	2000	1900
1984	24 May	5500	1800	770

Notes: 1/ Regulated by Strawberry Reservoir only.

4-07. RUNOFF CHARACTERISTICS

The major portion of the annual runoff occurs during the months of April through November. The four winter months have little runoff due to the cold, precipation remains as snow until the first warm days in spring. Snowmelt runoff generally starts in the latter part of April at the lower elevations in the watershed and progressively increases as melting occurs in the higher mountains, normally reaching a peak in the later half of May or the first half of June.

Annual maximum snowmelt flows for the Strawberry River at Duchesne, unregulated conditions are tabulated on Plate 14, included are the statistics for the flows. Frequency curves are plotted on Plate 15.

4-08. WATER QUALITY

There are no water quality records available for the Strawberry River, either for random, short, or long term sampling.

4-09. CHANNEL AND FLOODWAY CHARACTERISTICS

The river channel below Starvation is fairly well defined, but shallow, with several meanders between the dam and the town of Duchesne, located three miles below the dam. Channel capacity within this area is estimated to be 2200 cfs, however the maximum flood release from Starvation is limited to 1,800 cfs in so far as possible in order to provide an adequate margin of safety. Flows in excess of 2,200 cfs will exit the river channel immediately upstream from Duchesne, spill over into the overbank area and inundate the northwestern portion of the town. Plate 11 illustrates the overflow area in Duchesne. The overflow area below Duchesne is not depicted because there is no field data from previous floods.

The only channel improvements at Duchesne is the addition of rock bank protection along the river within the city limits.

The estimated flood wave travel time between Strawberry Dam and Starvation Reservoir is 24 hours. This estimate was obtained from the U.S. Bureau planning document for the project. Stream flow measurements for the gage located just above the headwaters of Starvation Reservoir were computed only for low water conditions and are not representative of high flood stages and the associated higher velocities.

4-10. UPSTREAM STRUCTURES

Upstream structures from Starvation Dam include Strawberry Dam, Currant Creek Dam, Upper Stillwater Dam, and several open channels and tunnels between Upper Stillwater Dam and Currant Creek Reservoir and between Currant Creek Dam and Strawberry Reservoir. All of these structures are part of the Bonneville Unit of the Central Utah Project. Refer to paragraph 3-04 for additional details.

The Bonneville project will collect and store unapproiated flows from the Duchesne River Basin by storing flows from Rock Creek in Upper Stillwater Reservoir for later transmission through the Strawberry Aqueduct to the Currant Creek Reservoir located in the Strawberry River Basin. Drainage area above the Upper Stillwater Dam is approximately 120 square miles, reservoir capacity is 33,100 acre-feet.

Currant Creek Reservoir will, in addition to receiving and storing flows from the Duchesne Basin, collect and store the Currant Creek flows

and function as a reregulating storage unit between Upper Stillwater Reservoir and the Strawberry Reservoir. The drainage area above Currant Creek Dam is 48 square miles and maximum reservoir capacity is 16,000 acre-feet.

The Strawberry Aqueduct continues from the Currant Creek Reservoir area to the Strawberry Reservoir. The aqueduct collects intercepted flows between the reservoirs as well as transporting the flow from the Currant Creek reservoir. The Strawberry Reservoir with a capacity of 1,106,500 acre-feet is main storage in the Bonneville Project. Flows from this reservoir are routed to the Bonneville Basin through the Strawberry Tunnel, also into the Strawberry River through the dam outlets. The drainage area above the dam is 170 square miles.

4-11. DOWNSTREAM STRUCTURES

There are no downstream structures related to water conservation or diversion below Starvation Dam and the mouth of the Strawberry River.

4-12. ECONOMIC DATA

The three major sources of livelihood in the area are mining, oil, and agriculture. Phosphate, gilsonite, sand, and gravel are mined in economical quantities and oil and gas are produced in quantity. Beef cattle, dairy cattle, and sheep are raised because of the abundance of grazing land in the foothills and mountains. Irrigated lands are devoted primarily to alfalfa, meadow hay, and other crops related to the livestock industry.

Population in the area increased in the late 1970's because of the intensified effort to develop alternative energy sources, mainly coal and shale oil extraction. Population data is tabulated in the following table.

TABLE 8

POPULATION DATA

City/County	1960	1970	1980
Duchesne County	7179	7299	12565
Duchesne City	770	1094	1677
Myton	329	322	500
Roosevelt	1812	2005	3842

V DATA COLLECTION AND COMMUNICATION NETWORKS

5-01. HYDROMETEOROLOGICAL STATIONS

Temperature and precipitation data is collected at several stations scattered throughout the Strawberry, Duchesne, and Unitah river basins. Location of the stations as well the type of data and the method of transmitting the data to the National Weather Service Office in Salt Lake City is depicted on a map and summarized in a table adjacent to the map on Plate 9. . A monthly report and an annual summary is published for all stations in Utah by the National Climatic Data Center, located in Asheville, North Carolina.

Snowcourse measurements are made in a joint cooperative venture by Federal and State surveys and are published by the U.S. Soil Conservation Service. The first of January report is a preliminary report based upon an initial survey of about ten percent of the total snowcourses. All snowcourses are measured and reported for each of the following four months and a final report is usually published on May 15, or occasionally on June 1 if snowpack conditions are significant at that time. Plate 9 displays the snowcourse locations and other pertinent data.

Stream gage and reservoir storage data is collected by the U.S.Bureau of Reclamation and the U.S. Geological Survey. A large segment of this data is published in an annual joint document prepared by the State of Utah and the U.S. Geological Survey. Stream gage,and reservoir gage locations are plotted on Plate 10.

5-02. WATER QUALITY STATIONS

Water quality is not systematically sampled and reported for any stream in the Strawberry River Basin.

5-03. SEDIMENT STATIONS

Sediment data is not collected on a systematic basis anywhere on the streams and reservoirs in the Strawberry River drainage area.

5-04. RECORDING HYDROLOGIC DATA

A daily record of the Starvation Reservoir water surface elevation, storage, outflow, and computed inflow is maintained by the Water Operations Branch, U.S. Bureau of Reclamation, Salt Lake City, Utah and the U.S. Army Corps of Engineers, Sacramento District, Reservoir Control Section. The records are stored in a computer data base.

5-05. COMMUNICATION NETWORK

Communication between the Reservoir Control Section, U.S. Army Corps of Engineers, Sacramento District and the U.S. Bureau of Reclamation, Upper Colorado Region Water Operations Branch is by telephone. Communication between the Water Operations Branch and the Utah Projects Office and the damtender is normally by telephone or by a back-up microwave radio relay system. See the page in the front of this manual for a list of personnel concerned in the operation of Starvation Dam.

5-06. COMMUNICATION WITH PROJECT

Primary responsibility and supervision of the hydrometeorological forecasts, and flood control is vested in the Water Operation Branch, Upper Colorado River Region, U.S. Bureau of Reclamation, Salt Lake City, Utah. The normal communication chain is from the Water Operations Branch to the Bureau's Utah Projects Office, located in Provo, Utah. The Utah Projects Office will contact the damtender if flood control releases are required, otherwise for day to day operation the Projects Office contacts the Operating Agency which is the Central Utah Water Conservancy District in Orem, Utah, who in turn will notify the damtender if gate changes are required. A list of the offices and personnel involved in the supervision and operation of Starvation Dam is located in the front of this manual.

5-07. PROJECT REPORTING INSTRUCTIONS

The damtender is the primary source of information relative to the operation of the project. The damtender will on a daily basis record reservoir water surface elevation, computed reservoir storage, outlet discharge, and computed inflow. The damtender will also report to the responsible office any gate changes made for flood control operation.

The damtender will report any unusual circumstances requiring, or that could require, shut down or readjustment of the discharge outlets, or of any emergency that could possibly compromise the safety of the dam or of the flood control function of the project.

5-08. WARNINGS

The Colorado Basin River Forecast Center (CBRFC), a regional office of the National Weather Service located in Salt Lake City will issue flood warnings and is the focal point for the collection and dissemenation of severe weather warnings and runoff forecasts for the entire Upper Colorado River Basin.

VI HYDROLOGIC FORECASTS

6-01. GENERAL

Streamflow forecasts are made at the Colorado Basin River Forecast Center (CBRFC), which is operated by the National Weather Service, in Salt Lake City, Utah. The U.S. Soil Conservation Service, the U.S. Bureau of Reclamation, the U.S. Army Corps of Engineers, the Geological Survey, and the Western Area Power Administration cooperate in making these forecasts.

6-02. FLOOD CONDITION FORECASTS

Special flood condition forecasts are made by the Colorado Basin River Forecast Center as needed.

6-03. CONSERVATION PURPOSE FORECASTS

Streamflow forecasts are made at least twice per month. Using these forecasts, the U.S. Bureau of Reclamation compiles an operating plan which is updated at least once per month.

6-04. LONG RANGE FORECASTS

Long range stream flow forecasts begining on January 1 of each year are made for the following seven months, January through July. On August 1, forecasts are completed for the remainder of the year, August through December.

VII WATER CONTROL PLAN

7-01. GENERAL OBJECTIVES

The primary purpose of Starvation Dam and Reservoir is to store water appropriated under the terms of a Utah State Water Use Application, approved on June 19,1965. Under the terms of the application, up to 50,000 acre-feet of water may be diverted annually from the Strawberry and Duchesne Rivers for storage in Starvation Reservoir and from higher tributaries of these rivers for storage in the Strawberry Reservoir.

The water appropriated into Starvation Reservoir will be supplemental water for 60,000 acres of land along the Duchesne River and exchange water in lieu of the water that will be diverted from the higher tributaries to the enlarged Strawberry Reservoir and into the Bonneville Basin. In addition, part of the storage of Starvation Reservoir will be available as exchange water in lieu of water that will be diverted to higher lands in the Uintah Basin from tributaries of the Duchesne River.

Secondary objectives for the project are flood protection and water supply for Duchesne, Utah.

7-02. MAJOR CONSTRAINTS

Extreme care must be used when releases are being made through the outlet works during periods of low reservoir level (below elevation 5604) as air may become trapped in the tunnel upstream from the gate chamber and may be blown back through the intake structure with great force. In order to avoid blow-back, gate openings shall not exceed those tabulated below for the corresponding water surface elevation.

TABLE 9

OUTLET WORKS DISCHARGE LIMITATIONS- 2 GATE OPERATION
(Maximum gate opening in percent)

WATER SURFACE ELEVATION	MAX OPEN (%)
5604.0 and above	100
5603.0 to 5604.0	90
5602.5 to 5603.0	80
5602.0 to 5602.5	70
5601.5 to 5602.0	60
5601.0 to 5601.5	50
5600.5 to 5601.0	40
5599.5 to 5600.5	30
5598.5 to 5599.5	20
5597.0 to 5598.5	10
Below 5597.0	Gates closed

TABLE 10

OUTLET WORKS DISCHARGE LIMITATIONS- 1 GATE OPERATION
(Maximum gate opening in percent)

WATER SURFACE ELEVATION	MAX OPEN (%)
5601.5 and above	100
5601.0 to 5601.5	90
5600.5 to 5601.0	80
5600.0 to 5600.5	70
5595.5 to 5600.0	60
5599.0 to 5595.0	50
5598.5 to 5599.0	40
5598.0 to 5598.5	30
5597.5 to 5598.0	20
5597.0 to 5597.5	10
Below 5597.0	Gate Closed

The approach channels for the spillway and outlet works intake structures are subject to strong currents when these structures are releasing water. Swimming and boating must be prohibited in these areas to avoid loss of life.

7-03. OVERALL PLAN FOR WATER CONTROL

The main water control plan for the Starvation Project is water conservation by diverting unappropriated fall and winter flows of the Duchesne River, plus Strawberry River inflows and storing them in the reservoir. Storage releases will be made as necessary for supplemental irrigation water for 60,000 acres of irrigated fields on the Duchesne River Basin. In addition, water will be treated and supplied to the town of Duchesne. Releases will not exceed 1,800 cfs, if possible for flood protection to the town.

7-04. STANDING INSTRUCTIONS TO DAMTENDER

During flood periods, the outlet works will be operated in accordance with the regulations for flood control cited in paragraph 7-05 and in Exhibit A of this manual. The purpose of Exhibit A is to function as a seperate, complete document for normal and emergency flood operation. Charts required for normal and emergency flood control operation are provided therein.

7-05. FLOOD CONTROL

a. Normal Flood Control Regulation. The criteria for flood control operation is given on the Flood Control Diagram contained in Exhibit A of this manual. The necessity for flood control releases occur whenever the required space for flood control is greater than the actual empty space

in the reservoir as determined from the Flood Control Diagram. Flood control release requirements will normally be determined by the Water Operations Branch of the U.S. Bureau of Reclamation, Upper Colorado Region Office in Salt Lake City, Utah and relayed to the Bureau's Utah Projects Office, located in Provo, Utah. The Utah Projects Office will then contact the damtender, who will reset the outlet gates as necessary for the release.

Large changes in releases should be avoided by starting the releases early and changing the release frequently.

b. **Emergency Regulation.** The following procedures will be followed:

If communication between the Water Operations Branch in Salt Lake City and the Utah Projects Office is lost and cannot be re-established, the Water Operations Branch will try to establish contact with the damtender. If able to do so, direct the necessary information for the release change to the damtender and request that the damtender contact the Project Office, if possible, with details of the action taken.

The Utah Projects Office will notify the Water Operations Branch if contact between their office and the damtender is lost and cannot be re-established. The Water Operations Branch will try to contact the damtender as above.

The following actions will be taken by the damtender if communication is lost between the damtender and the Projects Office and between the damtender and the Water Operations Branch:

Continue the flood control releases according to the last instructions received and try to re-establish communication. If unable to re-establish contact, determine the release requirements as determined from Chart A-6, Flood Control Diagram.

7-06. RECREATION

Specific releases for downstream recreational purposes were not considered as necessary because boating or rafting was not planned as a recreation purpose.

There are no minimum pool elevations or storage requirements within the reservoir as the dead storage of 1990 acre-feet will meet minimum swimming and boating needs.

7-07. WATER QUALITY

There are no specific release requirements, or other constraints applicable to the maintenance of water quality. The Starvation Standard

Operations Procedures (SOP) does contain extensive procedures for spills, particularily oil pollution.

7-08. FISH AND WILDLIFE

Reservoir releases, storage and pool levels have not been established for fish and wildlife except for a fish pool below water surface elevation 5620. The exception is documented in the Starvation Standard Opereating Procedures.

7-09. WATER SUPPLY

Water for municipal use is pumped from the reservoir and treated as necessary at a small treatment plant adjacent to the left abutment of the dam. The maximum annual allowable use is 96 acre-feet as treated and distributed to the Duchesne Water Conservancy District.

7-10. HYDROELECTRIC POWER

There are no hydroelectric power facilities.

7-11. NAVIGATION

There are no navigation facilities.

7-12. OTHER PLANS

The U.S. Bureau of Reclamation Standard Operting Procedures (SOP) for Starvation Dam covers in extensive detail actions that will be taken for several emergencies, among these emergencies are oil pollution, landslides, and project security.

There are no other formalized plans not contained in this manual or in the U.S. Bureau of Reclamation Standard Operating Procedures (SOP).

7-13. DEVIATIONS FROM NORMAL REGULATIONS

The Upper Colorado Region of the U.S. Bureau of Reclamation may be requested to deviate from the established flood control plan. Prior approval of deviations are required from the District Engineer, U.S. Army Corps of Engineers, Sacramento District, except for emergencies and deviations as discussed in subparagraphs a and b, below.

a. Emergencies. Some emergencies that can be expected are: drownings and other accidents, and failures of operation facilities, bridges, or levees. In emergencies, such as these, the District Engineer, U.S. Army Corps of Engineers, Sacramento District will be notified as soon as practical if flood control is involved.

b. Unplanned minor deviations. Although they are not considered emergencies requiring immediate action, there are occassional unplanned minor deviations required from the flood control plan. Construction activities account for the majority of the deviations. Requests for changes in release are for a few hours to a few days. Each request is analyzed on its own merits. Consideration is given to upstream watershed conditions, potential flood threat, condition of reservoirs, and possible alternative measures. In the interest of maintaining good public relations, the requests are usually complied with, providing there are no unforseen adverse effects on the overall operation of the project for the authorized purpose. Approval for these deviations, if flood control is involved, will normally be obtained from the U.S. Army Corps of Engineers, Sacramento District by telephone. A written confirmation explaining the deviation will be furnished to the District Engineer by the U.S. Bureau of Reclamation.

c. Planned deviations. Sufficient data must be furnished if flood control is involved or could be involved to the District Engineer, U.S. Army Corps of Engineers, Sacramento District. The data should include flood potential, reservoir and watershed conditions, possible alternative measures and effects on other projects. The U.S. Bureau of Reclamation should forward this information along with their recommendations for approval by the most expeditious means.

d. Low Flow Contingency Plan. The flood control regulations described in this manual are not in conflict with any drought contingency plans developed by the Upper Colorado Region, U.S. Bureau of Reclamation.

7-14. RATE OF RELEASE CHANGE

There are no restrictions on the rate of release change.

VIII EFFECT OF WATER CONTROL PLAN

8-01. GENERAL

There are numerous beneficial effects of the Starvation Project as it relates to the Central Utah Project. Among those benefits are water conservation by storage and redistribution of the storage as necessary to the Bonneville Basin. Starvation Reservoir serves as a storage unit for water that is diverted into it during the late fall and winter months from the Duchesne River via the Knight Diversion Dam and the Starvation Aqueduct. There is no claim on this storage by downstream interests by the fact that the water is stored during the non-growing season. Releases are made from Starvation Reservoir during the growing season for supplemental irrigation flows along the Duchesne River below Starvation Dam in addition to fulfulling downstream water rights. Starvation Reservoir also provides the replacement water to the Duchesne River for the flows that are diverted from the Duchesne River Basin into Strawberry Reservoir. Starvation Reservoir has an excellant recreation and fishing area.

8-02. FLOOD CONTROL

a. Spillway Design Flood. The spillway design flood, consisting of snowmelt and rainfall during the April-June period, has a peak of 25,000 cfs, a 4-day volume of 96,000 ac-feet, and a 15-day volume of 179,400 ac-feet as shown on the hydrograph depicted on Plate 12. The spillway design flood study, approved March 16, 1962, considered inflow from 223 square miles of Strawberry Reservoir drainage area and 830 square miles of intervening area between Strawberry Dam and Starvation Dam. The study assumed that Strawberry Reservoir was full to the normal full capacity of 1,106,500 acre-feet, the flows were laged 24 hours and combined with the local inflow between Starvation Dam and Strawberry Dam.

A surcharge of 21,670 acre-feet (maximum water surface elevation 5718.3 feet) in combination with a spillway discharge of 16,600 cfs and a river outlet discharge of 2,400 cfs is provided at Starvation Dam as protection against this design flood. In routing the flood, the outlet works gates were considered to be fully open throughout the period of spillway discharge. Pool elevation at the beginning of the flood was at the spillway crest, elevation 5712.0 feet.

b. Other Floods. See Table 11 for a tabulation of some floods on the Strawberry River at Duchesnne. All of the potential or actual floods listed in this table exceeded 2,200 cfs (unregulated conditions), which is the capacity of the Strawberry River channel at Duchesne. The area subject to flooding in and around the town of Duchesne is depicted on Plate 11, hydrographs of some of the floods are plotted on Plate 13.

TABLE 11

FLOODS ON THE STRAWBERRY RIVER AT DUCHESNE, UTAH 1/

	YEAR						
	1922	1949	1952	1980	1982	1983	1984
Unregulated Conditions							
Volume (AF)	266100	297000	368300	211500	194800	297000	275600
Maximum Mean Daily Peak (cfs)	4300	3100	4800	3100	3800	6100	5500
As regulated by Strawberry Reservoir only							
Volume (AF)	220400	235100	232700	98600	125100	184800	167700
Maximum Mean Daily Peak (cfs)	3200	2800	3400	1200	1200	2000	1800
As regulated by Strawberry and Starvation Reservoirs							
Volume (AF)				32700	98700	149800	99200
Maximum Mean Daily Peak (cfs)				440	640	1900	770

Note: 1/ 120-day volume in acre-feet.

8-03. RECREATION

Starvation Lake State Recreation Area offers the only water-oriented park in the western half of the Uintah Basin, and plays an important role, economically and recreationally within the area. Table 12 contains estimated visitations for selected years. Plate 6 depicts the recreation area.

The recreation area is readily available via four miles of paved road from US Highway 40. The park offers a 31-unit campground, a reservation-only group camping and day-use area, a large boat ramp with adjacent boat-trailer parking area and a 70-space beach and picnic area.

TABLE 12

ANNUAL VISITATION, STARVATION LAKE RECREATION AREA

(Attendance in person-recreation days)

YEAR	ATTENDANCE
1979	72,200
1980	32,000
1981	37,900
1982	40,000
1983	25,700
1984	32,300
1985	29,000

8-04. WATER QUALITY

There are no significant water quality problems associated with the operation of the Starvation Project.

8-05. FISH AND WILDLIFE

No fishery program existed before the construction of the Starvation Project, however, since construction of the project and attendant recreation facilities sport fishing is available through the stocking of brown trout, large mouth bass, and walleye pike. No specific wildlife program was developed.

8-06. WATER SUPPLY

Water supply to the town of Duchesne and the immediate Duchesne County area is available in dry years because of the storage capacity of the reservoir, and a pumping plant capable of pumping water directly from the reservoir. The pump system can pump down to the top of inactive pool, elevation 5624.8.

8-07. HYDROELECTRIC POWER

Hydropower is not a project purpose.

8-08. NAVIGATION

Navigation is not a project purpose.

8-09. FREQUENCIES

a. Unregulated Flow Frequencies. Annual maximum unregulated flows and statistic parameters for Strawberry River at Duchesne are given on Plate 14. Unregulated conditions exclude the storage effects of Strawberry Reservoir,Starvation Reservoir,and Currant Creek Reservoir, or of any trans-basin diversion into or out of the Strawberry River basin. Volume snowmelt frequency curves were developed for the 1, 15, 30, 60, 90, and 120-day events, and shown on Plate 15. The curves were based upon criteria contained in Bulletin 17B Guidelines for Determining Flood Flow Frequency, published by the U.S. Water Resources Council.

b. Peak Flow Frequencies, Pre-project and Project Conditions. The one day pre-project flows depicted on Plate 16, is the same 1-day curve shown on Plate 15, while the project maximum mean daily flows are plotted by using the Weibull plotting position.

c. Stage Frequency Curve. A stage frequency curve for Starvation Reservoir is plotted on Plate 17. The curve is based upon the maximum annual stage recorded for the years 1972 through 1985 inclusive.

d. Stage Duration Curve. A plot of the average percent of time that stages (water surface elevations) are equalled or exceeded is shown on Plate 18. For Comparative purposes, a plot of the dryest year of record (1977) and one of the maximum snowmelt years (1983) is also included.

e. Seasonal Variation of Stage. Seasonal variation of stage expressed as a percentage of time that a stage-elevation is exceeded is plotted on Plate 19.

f. Operation Record. Storage in Starvation Reservoir began during November, 1969. A plot of the daily inflow, outflow and storage for the project from 1970 through 1985 is depicted on Plate 20.

g. Key Control Point. The key control point for flood control is Duchesne, Utah.

IX WATER CONTROL MANAGEMENT

9-01. RESPONSIBILITIES AND ORGANIZATION

The U.S. Bureau of Reclamation, Upper Colorado Region in Salt Lake City, Utah has direct responsibility for the operation and maintenance of the Starvation Project. Operating supervision is exercised by the Bureau's Water Operations Branch (also located in Salt Lake City) and is directed to the Bureau's Utah Projects Office, Provo, Utah. The dam operator, acting under the direction of the Utah Projects Office is the Central Utah Water Conservancy District, with offices in Orem, Utah.

The U.S. Army Corps of Engineers, Sacramento District is responsible for flood control operating plans for Starvation Dam and Reservoir.

9-02. INTERAGENCY COORDINATION

The Upper Colorado Region, U.S. Bureau of Reclamation interacts with NOAA's Colorado River Basin Forecast Center and the U.S. Soil Conservation Service for snowmelt forecasts, projected runoff and actual runoff. Local weather forecasts and storm warnings for Duchesne County are issued by the NWS office in Salt Lake City. The storm warnings and forecasts are distributed to the local news media, and if appropriate to the local law enforcement and diaster reaction/preparedness offices. Stream gages are operated and maintained by the U.S. Geological Survey.

9-03. INTERAGENCY AGREEMENTS

Coordination for flood control purposes between the U.S. Bureau of Reclamation, Upper Colorado Region and the U.S. Army Corps of Engineers, Sacramento District is detailed in a Field Working Agreement approved and signed by the Regional Director, Upper Colorado Region, U.S. Bureau of Reclamation and the U.S. Army Corps of Engineers, South Pacific Division Engineer. See Appendix C of this manual.

9-04. COMMITTEES AND COMPACTS

The major laws (compacts) affecting the Upper Colorado River Basin are:

a. **The Colorado River Compact, November, 1922.** This compact divided the basin into two parts, the Upper and Lower Colorado River Basins. the point of severance is Lee Ferry, near the Utah-Arizona stateline. The compact apportioned the Colorado River Basin flows in perpetuity to 7.5 million acre feet annually to each of the subbasins.

b. **Mexican Water Treaty, 1945.** Mexico's claim to a share of the Colorado River preceded the 1922 compact but were not formalized until 1945 in a treaty between the United States and Mexico.

c. Upper Colorado River Basin Compact, 1948. Congress consented to this compact between Arizona, New Mexico, Colorado, Wyoming, and Utah. The compact apportioned the annual 7.5 million acre feet of water granted to the Upper Colorado Basin among the parties to the compact.

d. Colorado River Basin Project Act, 1948. Title II of this act declared that the satisfaction of the Mexican Water Treaty constitutes a national obligation which shall be the first obligation of any water augmentation project planned and authorized by Congress pursuant to the Act.

9-05. REPORTS

The U.S. Bureau of Reclamation, Upper Colorado Region will, within 10 days after the end of the month provide to the U.S. Army Corps of Engineers, Sacramento District, Reservoir Control Section a monthly summary of the daily operation of Starvation Dam and Reservoir. The summary is to include daily inflow, daily outflow and storage in the reservoir. The Reservoir Control Section shall prepare monthly operation and other special reports as required by the District, Division, and Chief of Engineers Office.



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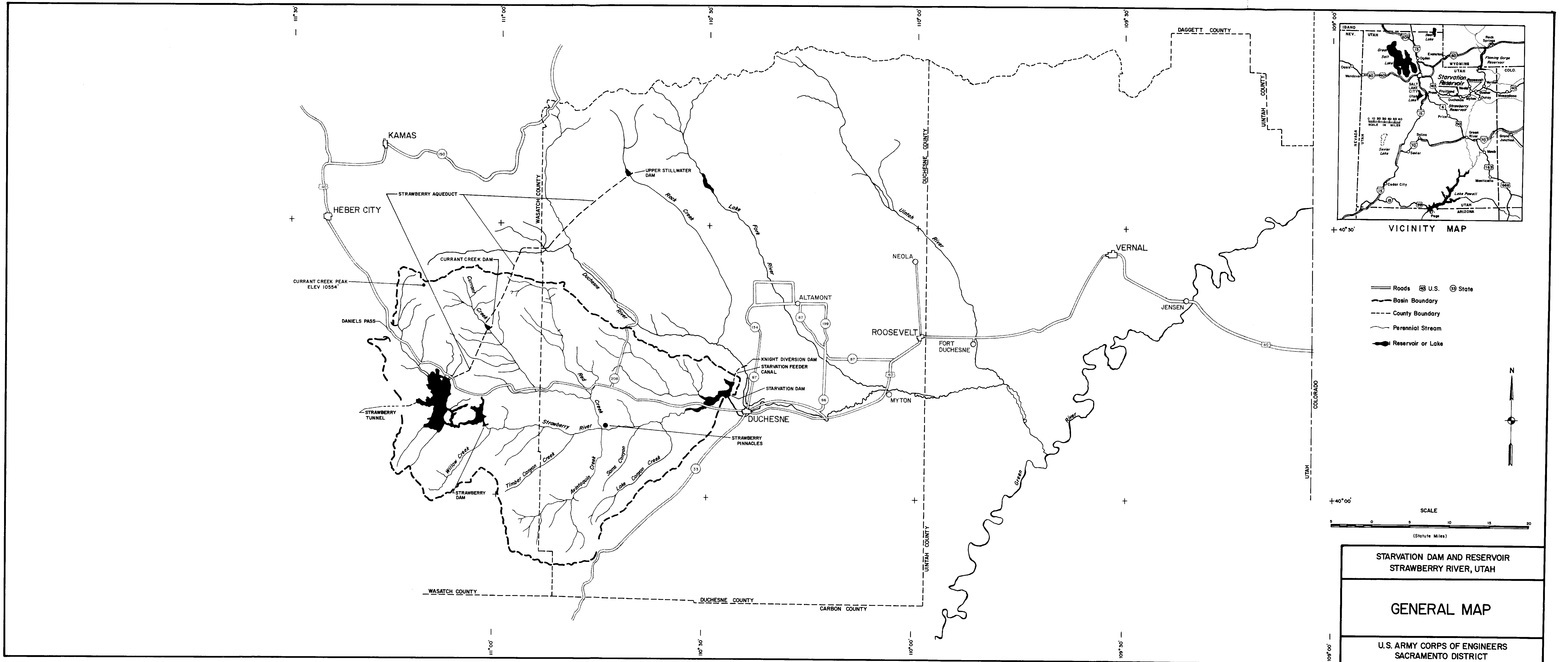
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STARVATION DAM AND RESERVOIR
STRAWBERRY RIVER, UTAH

STARVATION
RESERVOIR AREA

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

PLATE 1



STARVATION DAM AND RESERVOIR
STRAWBERRY RIVER, UTAH

GENERAL MAP

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

PLATE 2



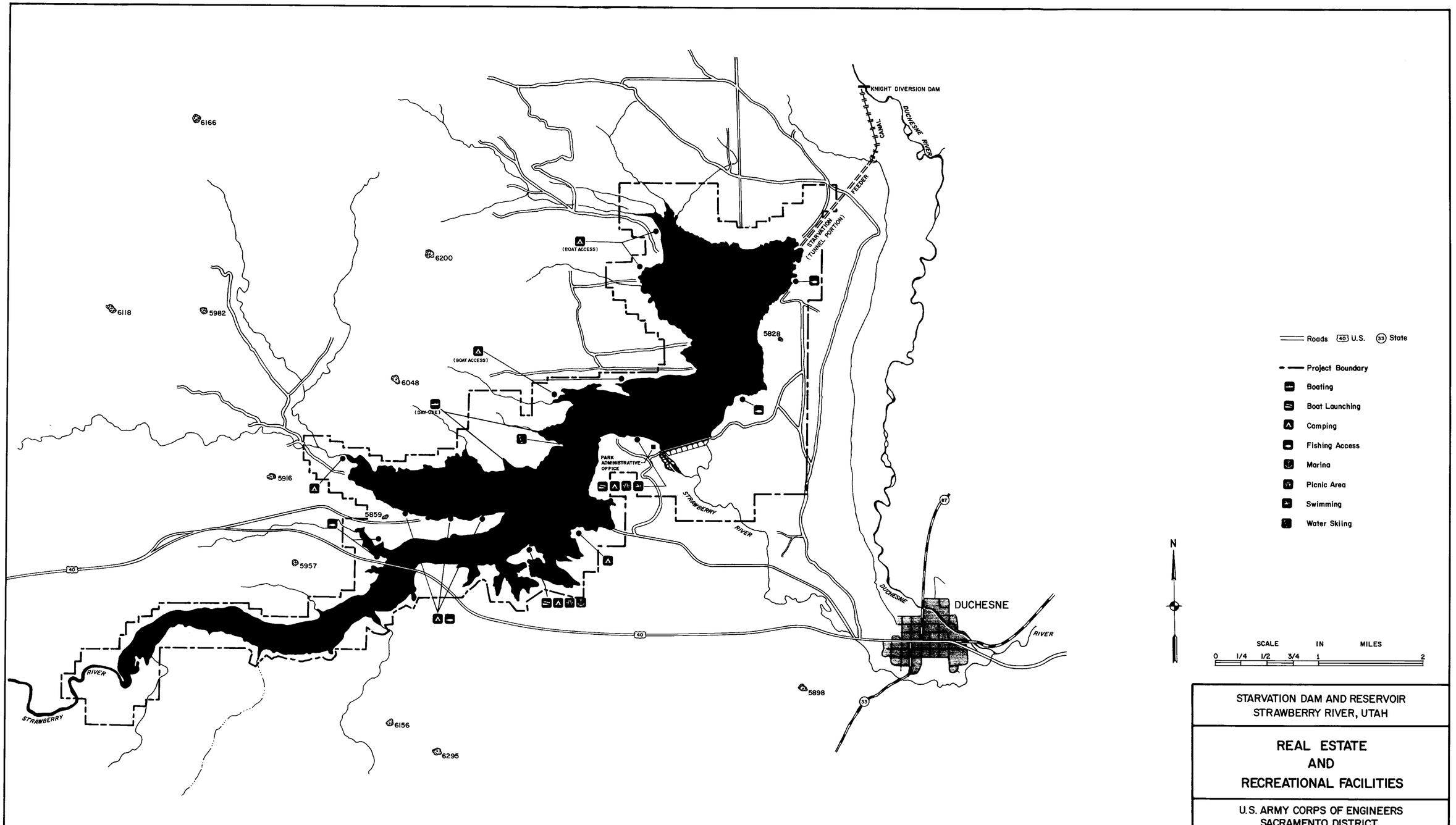
PLATE 3



PLATE 4



PLATE 5

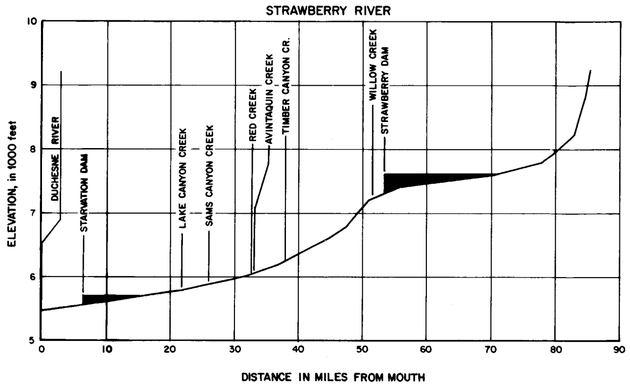


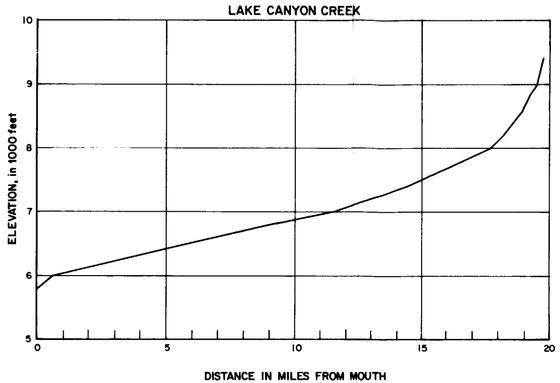
STARVATION DAM AND RESERVOIR
STRAWBERRY RIVER, UTAH

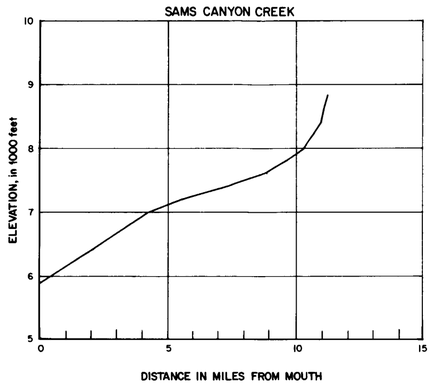
REAL ESTATE AND RECREATIONAL FACILITIES

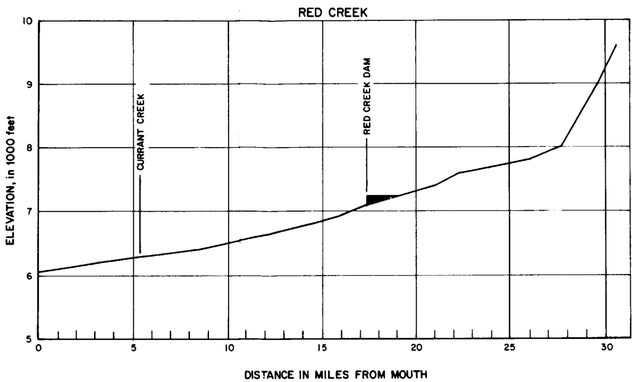
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

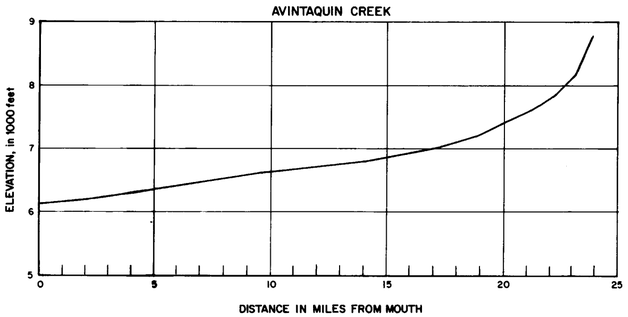
PLATE 6

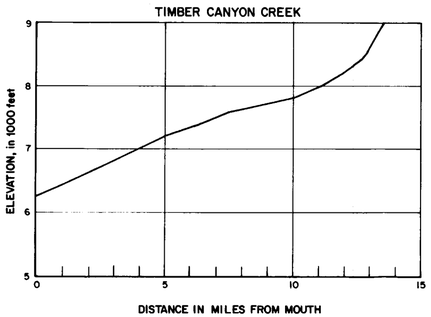


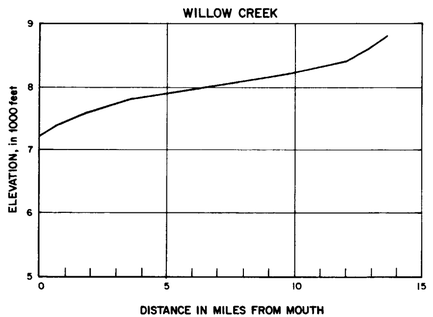


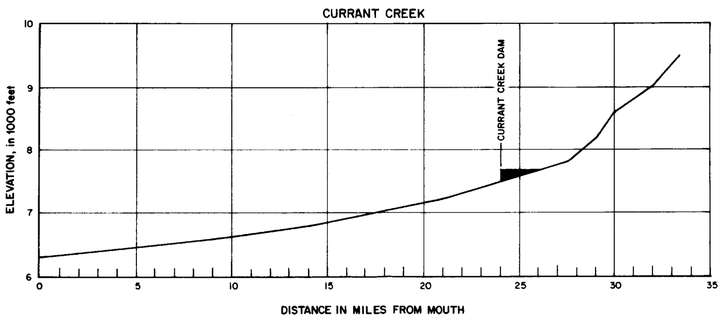










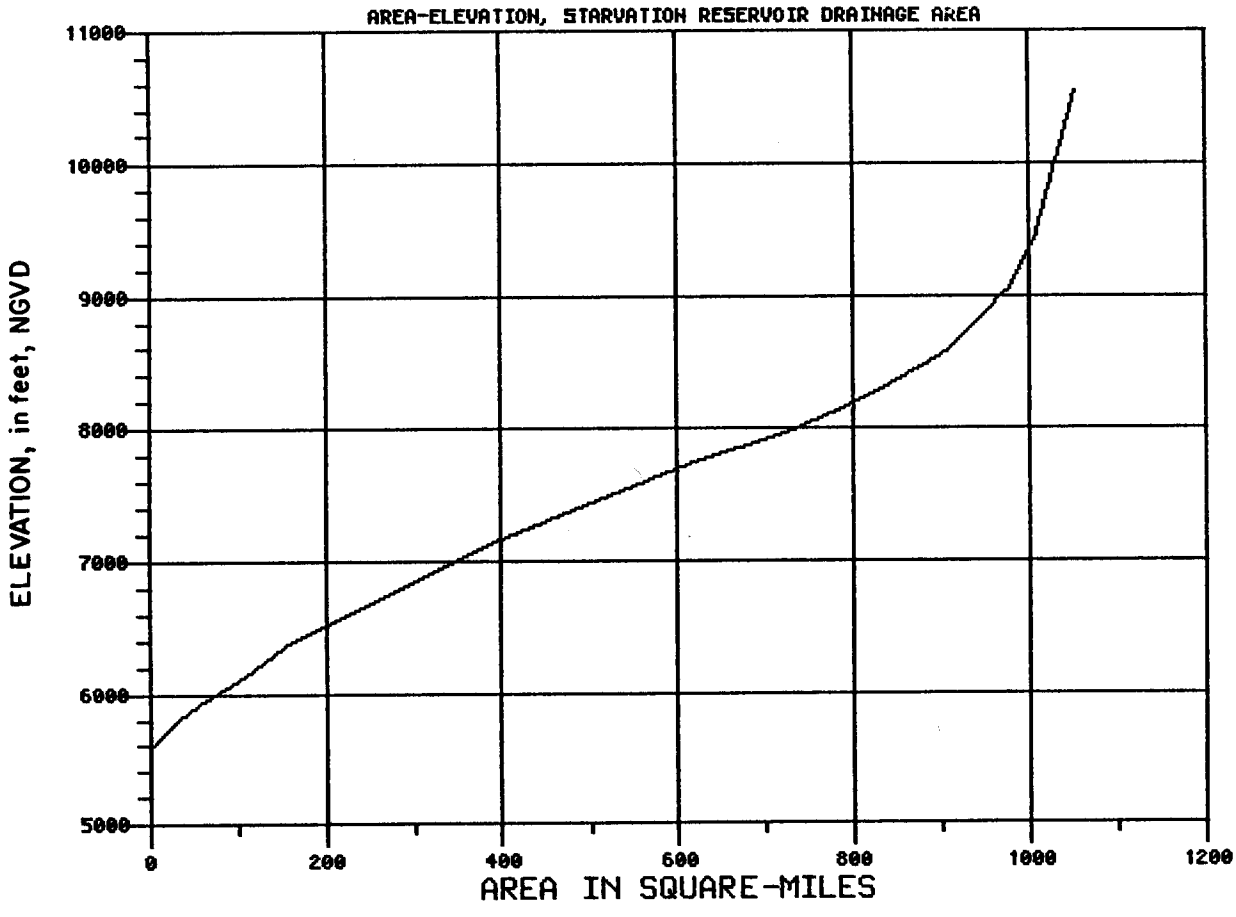


STRAWBERRY DAM AND RESERVOIR
STRAWBERRY RIVER, UTAH

STREAM PROFILES

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

PLATE 7



STARVATION DAM AND RESERVOIR
STRAWBERRY RIVER UTAH

AREA - ELEVATION CURVE

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

PLATE 8

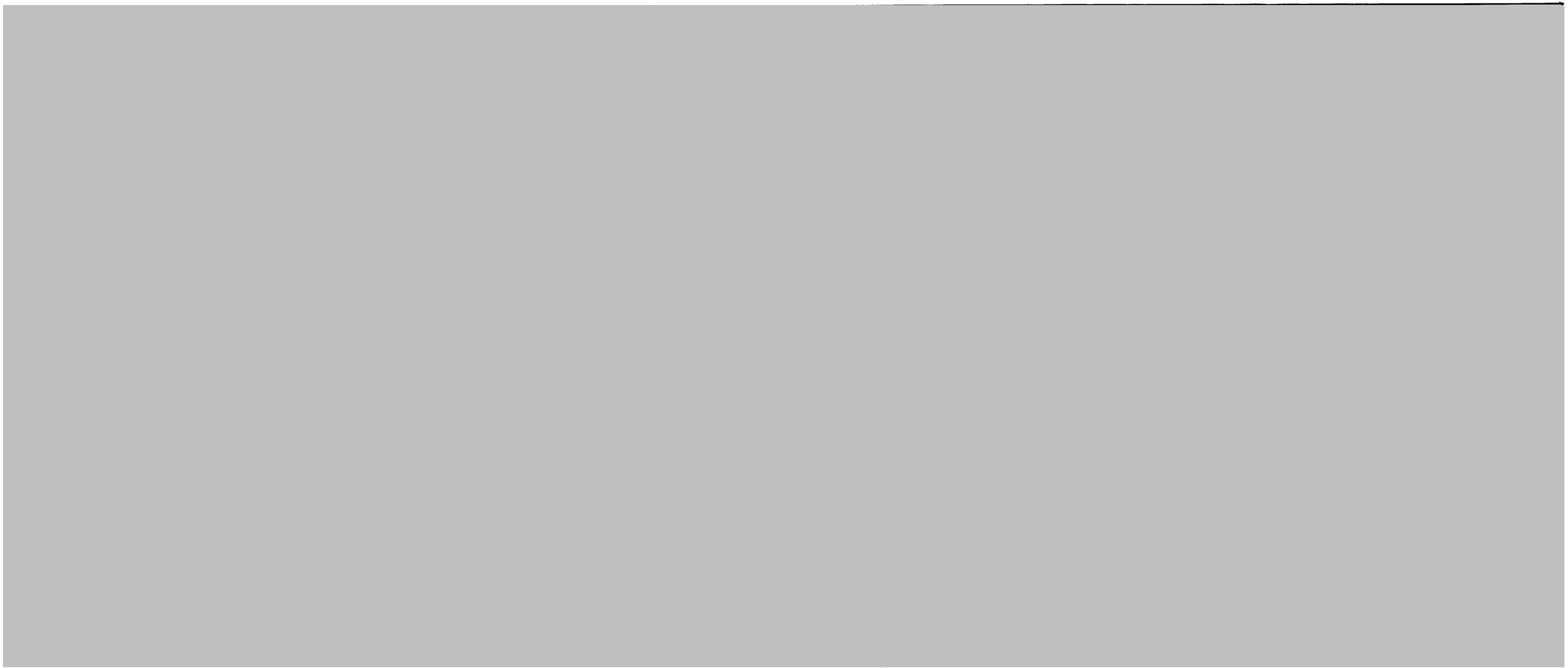


PLATE 9



PLATE 10

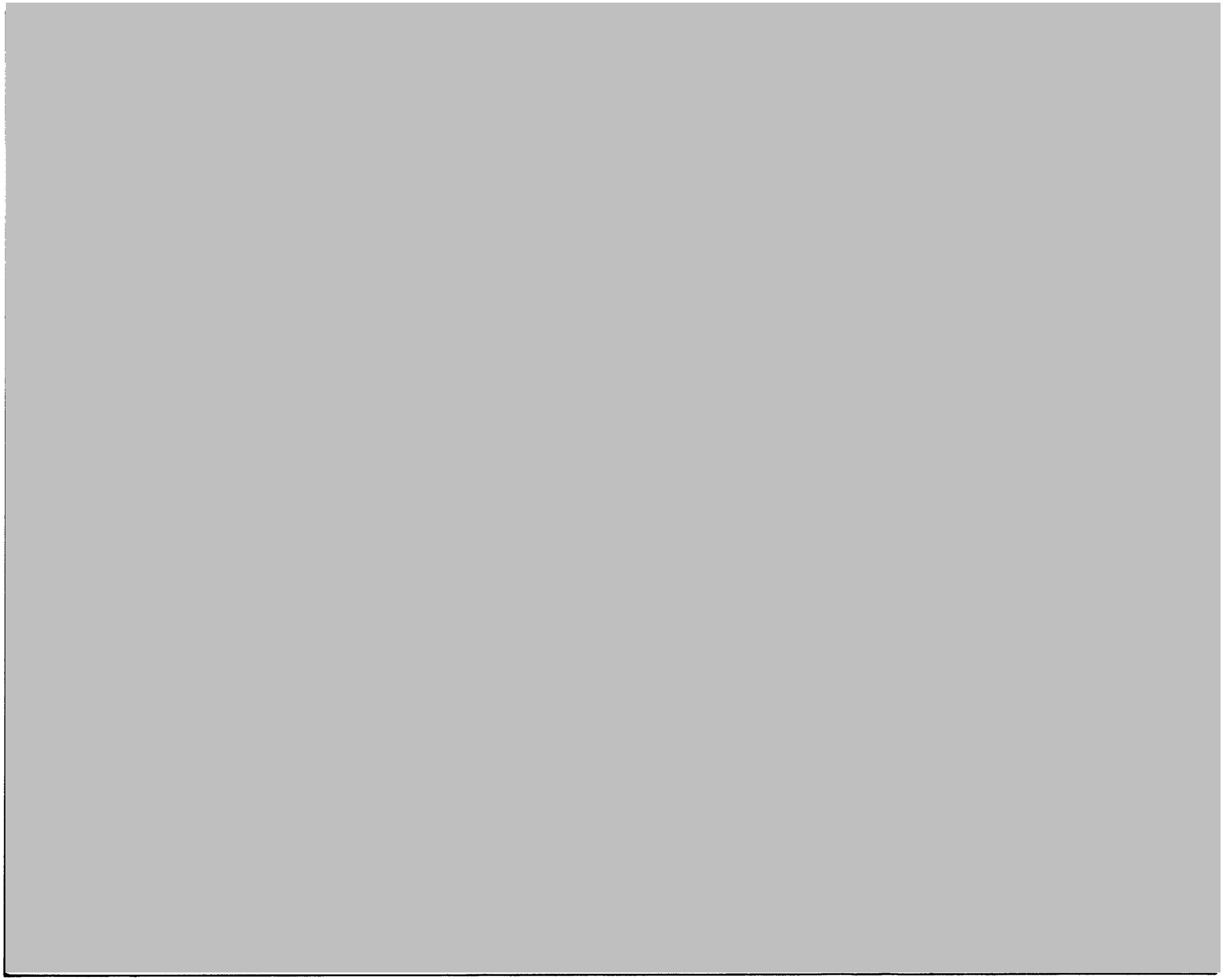
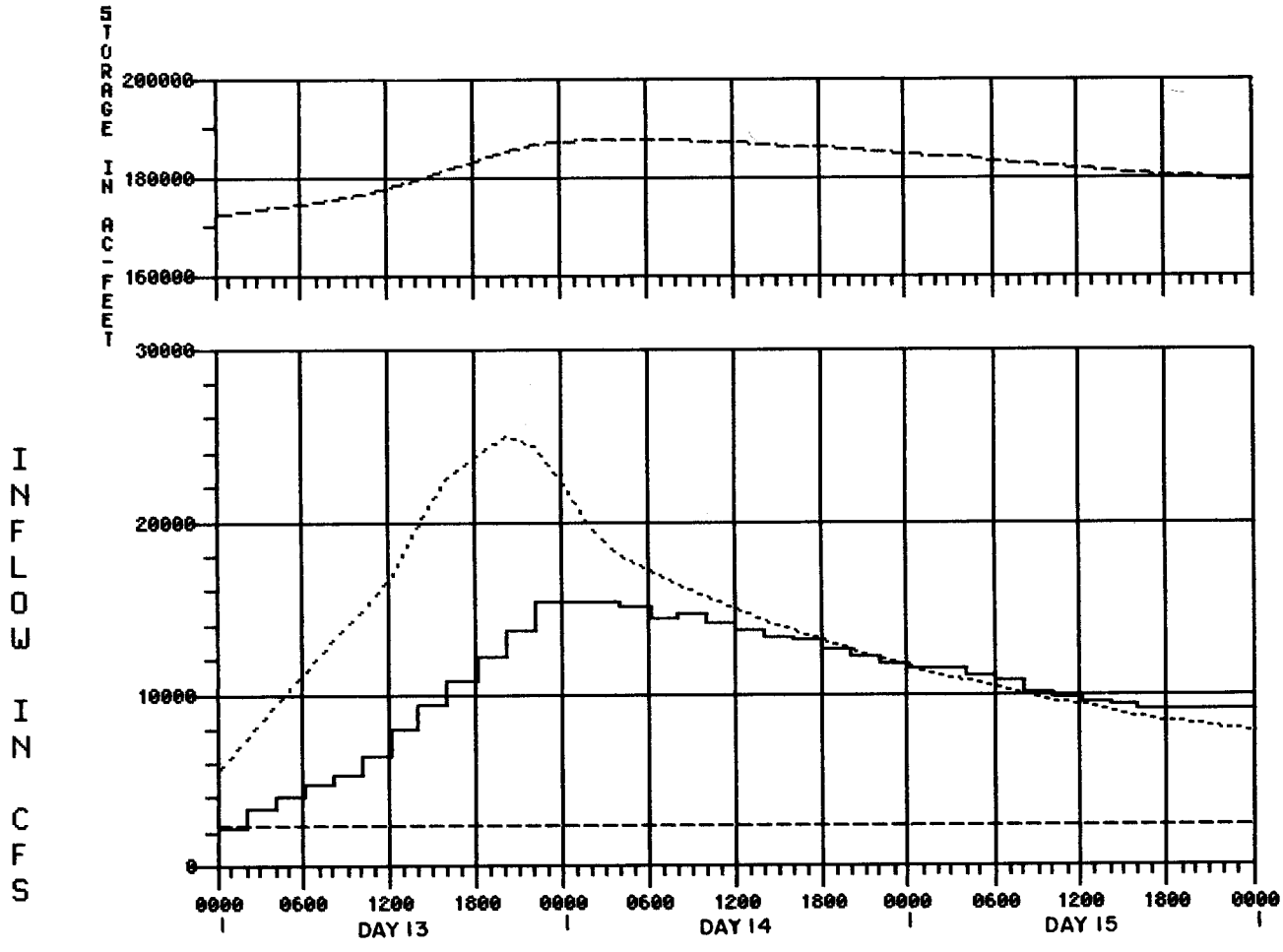


PLATE 11



LEGEND:

---------- INFLOW

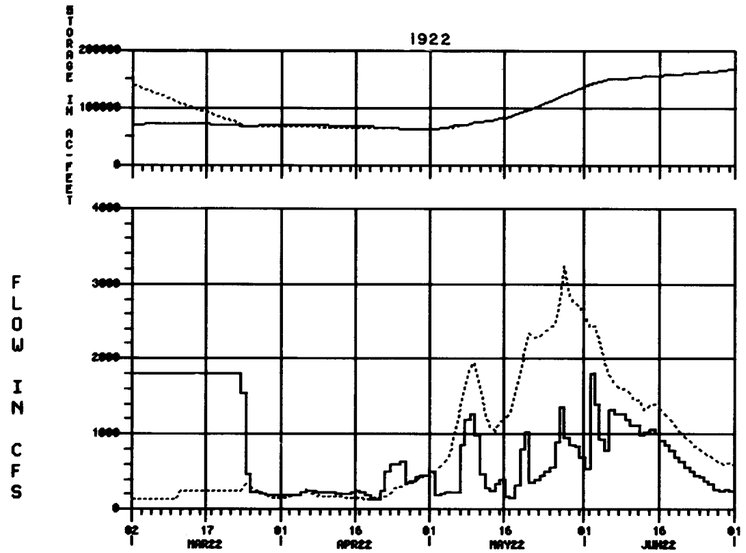
- - - - - - - - OUTFLOW, RIVER

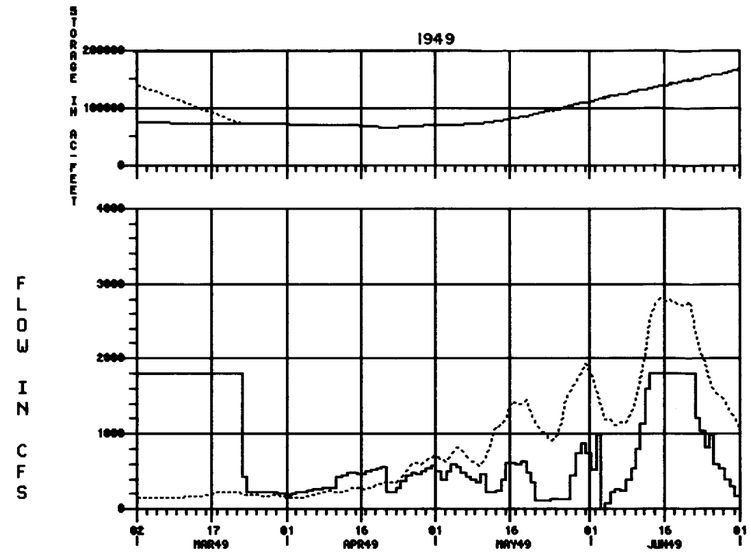
———— OUTFLOW, SPILLWAY

---------- STORAGE

STARVATION DAM AND RESERVOIR STRAWBERRY RIVER UTAH
SPILLWAY DESIGN FLOOD
U.S. ARMY CORPS OF ENGINEERS SACRAMENTO DISTRICT

PLATE 12



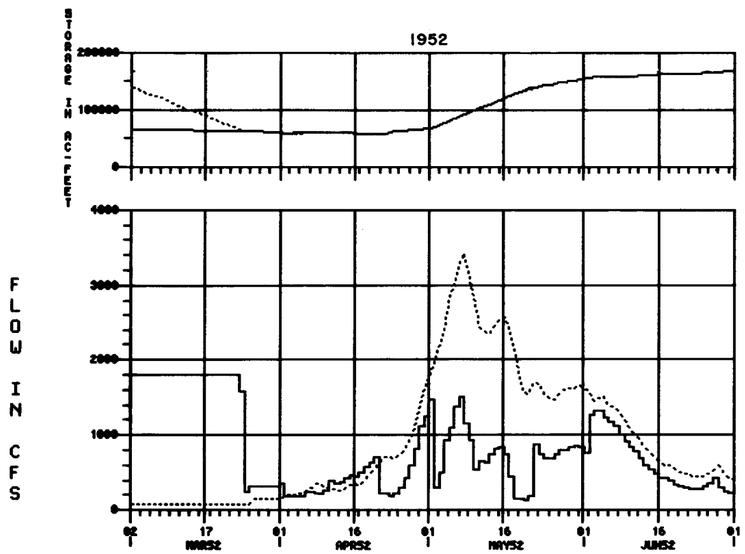


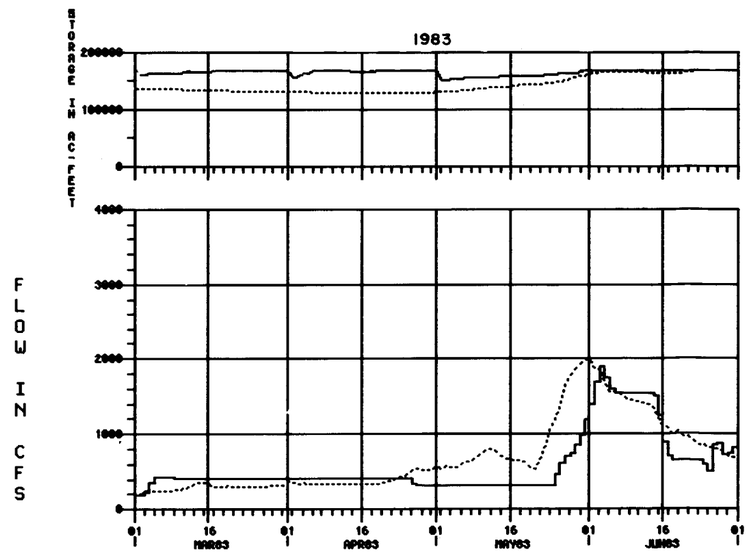
NOTES:

1. ROUTINGS THROUGH STARVATION RESERVOIR ARE MADE IN CONFORMITY WITH THE FLOOD CONTROL DIAGRAM, CHART A-6
2. INFLOW REPRESENTS THE HISTORICAL INFLOW TO STARVATION RESERVOIR.
3. 1922, 1949, and 1952 FLOODS -- ROUTINGS ARE HYPOTHETICAL AND REPRESENTS ONE OF SEVERAL POSSIBLE OPERATIONS; PERFECT FORECAST OF SNOWMELT RUNOFF WAS USED.
4. 1983 FLOOD -- ROUTING IS ACTUAL HISTORICAL OPERATION; ACTUAL HISTORICAL FORECAST WAS USED AND UPDATED MONTHLY.

LEGEND:

- ---------- INFLOW
- ——— OUTFLOW
- ——— ALLOWABLE STORAGE
- ---------- COMPUTED STORAGE





STARVATION DAM AND RESERVOIR
STRAWBERRY RIVER UTAH

HYPOTHETICAL & HISTORICAL
SNOWMELT FLOOD ROUTINGS

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

PLATE 13

ANNUAL MAXIMUM SNOWMELT FLOWS
STRAWBERRY RIVER AT DUCHESNE, UTAH
UNREGULATED CONDITIONS

(Flows in cfs)

YEAR	[1-day]		[15-day]		[30-day]		[60-day]		[90-day]		[120-day]	
1909	8JUN	2950	27MAY	2610	12MAY	2500	4MAY	2040	18APR	1580	17APR	1280
1910	21APR	1860	18APR	1630	15APR	1430	12APR	1080	21MAR	850	3MAR	710
1914	25MAY	2100	16MAY	1960	5MAY	1760	16APR	1400	2APR	1120	1APR	920
1915	30APR	570	17MAY	530	12MAY	480	15APR	440	27MAR	390	1MAR	330
1916	10MAY	2060	5MAY	1750	2MAY	1670	13APR	1270	31MAR	1000	1MAR	850
1917	21MAY	2000	17MAY	1880	15MAY	1720	2MAY	1360	15APR	1080	2APR	900
1918	27MAY	670	17MAY	630	2MAY	550	3APR	430	31MAR	360	4MAR	300
1919	5MAY	890	14MAY	800	26APR	790	13APR	640	17MAR	520	1MAR	430
1920	31MAY	3000	18MAY	2550	10MAY	1920	1MAY	1300	8APR	960	25APR	790
1921	31MAY	2540	17MAY	1840	15MAY	1720	30APR	1360	7APR	1060	4APR	880
1922	27MAY	4340	19MAY	3300	7MAY	2560	26APR	1820	20APR	1380	6APR	1120
1923	28MAY	2630	18MAY	2160	7MAY	1820	19APR	1330	1APR	1060	31MAR	900
1924	14MAY	420	9MAY	390	22APR	360	2APR	340	3MAR	280	1MAR	230
1925	22MAY	300	10APR	260	12APR	240	2APR	240	4APR	220	5MAR	200
1926	30APR	1040	22APR	740	10APR	620	3APR	530	14MAR	410	1MAR	330
1927	18MAY	2370	14MAY	1520	30APR	1290	25APR	920	12APR	710	13MAR	580
1928	10MAY	2170	30APR	1860	29APR	1700	19APR	1210	23MAR	920	15MAR	750
1929	25MAY	2720	16MAY	1730	9MAY	1270	2MAY	880	3MAY	670	10APR	560
1930	25APR	770	22APR	530	23APR	450	5APR	420	13MAR	330	1MAR	280
1931	15APR	220	6APR	200	1APR	180	1APR	160	2MAR	150	1MAR	120
1932	22MAY	1830	12MAY	1350	4MAY	1030	28APR	710	2APR	560	16MAR	450
1933	31MAY	1530	27MAY	960	21MAY	800	27APR	560	11APR	430	11MAR	360
1934	24APR	130	16APR	100	31MAR	100	1MAR	90	1MAR	60	1MAR	50
1935	28MAY	1120	18MAY	700	17MAY	560	21APR	440	1APR	350	2MAR	290
1936	15MAY	1550	11MAY	1320	3MAY	1170	15APR	910	15APR	690	9APR	590
1937	16MAY	1750	8MAY	1530	3MAY	1250	21APR	860	21APR	670	9APR	540
1938	29MAY	1710	17MAY	1200	3MAY	950	17APR	780	2APR	580	3APR	480
1939	18MAR	860	22APR	510	19APR	440	17MAR	380	11MAR	330	1MAR	280
1940	16MAY	460	11MAY	360	21APR	320	2APR	280	3MAR	230	1MAR	190
1941	14MAY	2010	11MAY	1400	3MAY	1160	28APR	820	10APR	620	30MAR	500
1942	27MAY	1350	18MAY	910	30APR	660	11APR	660	29MAR	540	4MAR	440
1943	24APR	1560	21APR	1300	16APR	1000	14APR	750	1APR	620	4MAR	510
1944	31MAY	1950	17MAY	1460	7MAY	1260	3MAY	910	4APR	700	11MAR	570
1945	13MAY	1200	7MAY	950	3MAY	840	1MAY	610	6APR	470	11APR	400
1946	27APR	2310	25APR	1720	25APR	1540	19APR	1390	2APR	1070	12MAR	860
1947	9MAY	1210	4MAY	930	2MAY	850	11APR	660	31MAR	540	3MAR	450
1948	24MAY	1290	20MAY	1110	16MAY	900	22APR	610	2APR	490	3MAR	410
1949	30MAY	2950	10JUN	2690	26MAY	2280	10MAY	1870	17APR	1540	30MAR	1250
1950	31MAY	2540	18MAY	1740	14MAY	1250	17APR	990	1APR	780	15MAR	640
1951	29MAY	2190	19MAY	1350	9MAY	920	13APR	690	1APR	580	13MAR	470
1952	7MAY	4790	3MAY	4000	2MAY	3520	20APR	2580	13APR	1940	2APR	1550

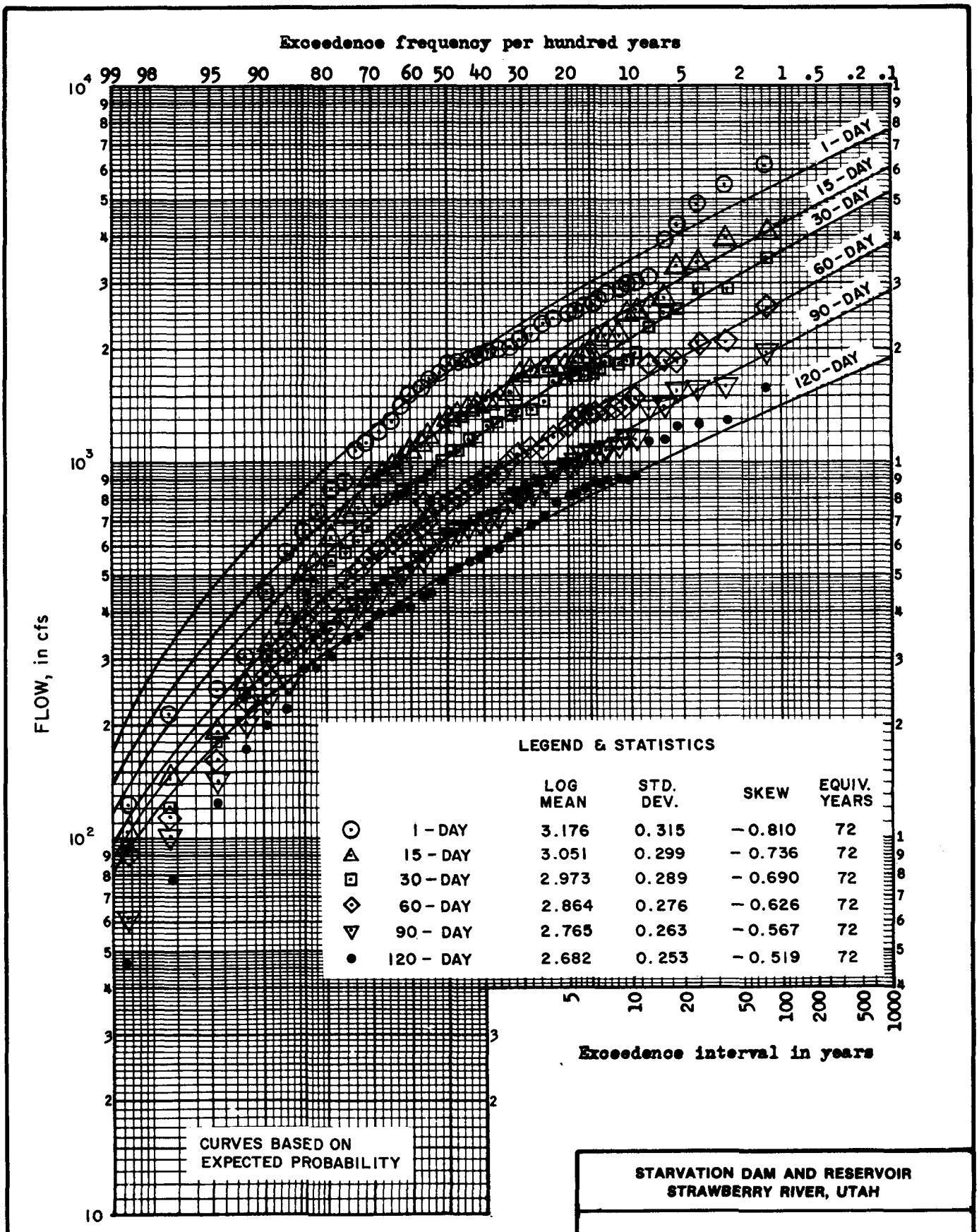
YEAR	[1-day]		[15-day]		[30-day]		[60-day]		[90-day]		[120-day]	
1953	29MAY	1870	18MAY	1090	3MAY	860	24APR	640	24MAR	490	2MAR	410
1954	28APR	600	17APR	440	2APR	350	31MAR	310	3MAR	260	1MAR	220
1955	23MAY	1400	12MAY	990	5MAY	790	14APR	540	26MAR	430	1MAR	350
1956	26MAY	1290	18MAY	1060	4MAY	840	11APR	690	24MAR	530	1MAR	440
1957	31MAY	1700	28MAY	1170	11MAY	1030	3MAY	860	15APR	650	31MAR	540
1958	27MAY	2420	18MAY	1870	5MAY	1400	17APR	920	30MAR	680	2MAR	550
1959	30APR	250	3APR	190	2APR	180	2APR	170	15MAR	140	1MAR	130
1960	14MAY	450	12MAY	350	4MAY	280	2APR	250	11MAR	200	1MAR	170
1961	30APR	210	16APR	150	1APR	140	3MAR	120	1MAR	100	1MAR	80
1962	11MAY	1990	4MAY	1490	19APR	1360	15APR	1020	27MAR	820	19MAR	660
1963	23MAY	870	17MAY	760	5MAY	560	7APR	410	24MAR	340	1MAR	280
1964	26MAY	2020	17MAY	1510	13MAY	1020	2MAY	680	3APR	540	15MAR	430
1965	22MAY	2130	18MAY	1720	17MAY	1380	29APR	1090	20APR	870	8APR	710
1966	10MAY	730	5MAY	560	16APR	550	2APR	510	13MAR	410	7MAR	340
1967	25MAY	2430	19MAY	1740	21MAY	1330	9MAY	1030	18APR	780	31MAR	650
1968	31MAY	2640	21MAY	1420	11MAY	1150	1MAY	910	10APR	690	17MAR	570
1969	9MAY	1850	6MAY	1760	1MAY	1610	13APR	1160	1APR	940	29MAR	760
1970	28MAY	1590	18MAY	1140	14MAY	810	3MAY	580	8APR	450	12MAR	370
1971	29MAY	1410	17MAY	940	3MAY	780	10APR	630	2APR	540	6MAR	440
1972	31MAY	1110	17MAY	730	3MAY	600	7APR	520	15MAR	450	6MAR	390
1973	20MAY	2770	14MAY	2170	6MAY	1640	26APR	1090	5APR	820	22MAR	660
1974	29MAY	1700	17MAY	1010	5MAY	880	18APR	590	25MAR	460	1MAR	390
1975	20MAY	1980	17MAY	1440	19MAY	1380	12MAY	1080	24APR	800	23MAR	640
1976	20MAY	1070	17MAY	910	6MAY	660	4APR	480	22MAR	380	1MAR	310
1977	30APR	280	17APR	140	3APR	120	3MAR	120	1MAR	100	1MAR	80
1978	31MAY	1850	17MAY	1390	14MAY	1060	23APR	800	31MAR	660	4MAR	530
1979	29MAY	1860	20MAY	1270	18MAY	1090	23APR	790	3APR	640	6MAR	520
1980	23MAY	3130	17MAY	2130	3MAY	1860	25APR	1460	13APR	1120	25MAR	890
1981	30APR	650	23APR	380	17APR	310	6APR	270	5MAR	230	1MAR	200
1982	28MAY	3850	18MAY	2480	3MAY	1870	27APR	1340	12APR	1030	1APR	820
1983	31MAY	6060	25MAY	3410	25MAY	2880	2MAY	2070	25APR	1550	16APR	1250
1984	24MAY	5480	17MAY	4120	11MAY	2820	3MAY	1880	14APR	1400	3APR	1160
1985	28MAY	1910	17MAY	1400	2MAY	1310	12APR	1120	14MAR	930	1MAR	810

COMPUTED STATISTICS

	[-1-DAY-]	[15-DAY]	[30-DAY]	[60-DAY]	[90-DAY]	[120-DAY]
YEARS OF RECORD	74	74	74	74	74	74
LOG MEAN	3.15029	3.02492	2.94778	2.84132	2.74127	2.65785
LOG STD DEV	0.34180	0.34103	0.33032	0.30298	0.29347	0.29150
SKEW	-0.97096	-0.96645	-0.88874	-0.81499	-0.88563	-0.97751

ADOPTED STATISTICS

	[-1-DAY-]	[15-DAY]	[30-DAY]	[60-DAY]	[90-DAY]	[120-DAY]
EQ. YEARS	72	72	72	72	72	72
LOG MEAN	3.17629	3.05090	2.97321	2.86450	2.76490	2.68239
LOG STD DEV	0.31497	0.29924	0.28949	0.27586	0.26337	0.25302
SKEW	-0.81027	-0.73627	-0.69042	-0.62626	-0.56748	-0.51878



DRAINAGE AREA: 1050 sq. mi.

PERIOD OF RECORD: 1909 - 1910
1914 - 1985

NOTE: For clarity, every other point plotted between 20 and 97 year Exceedance frequency

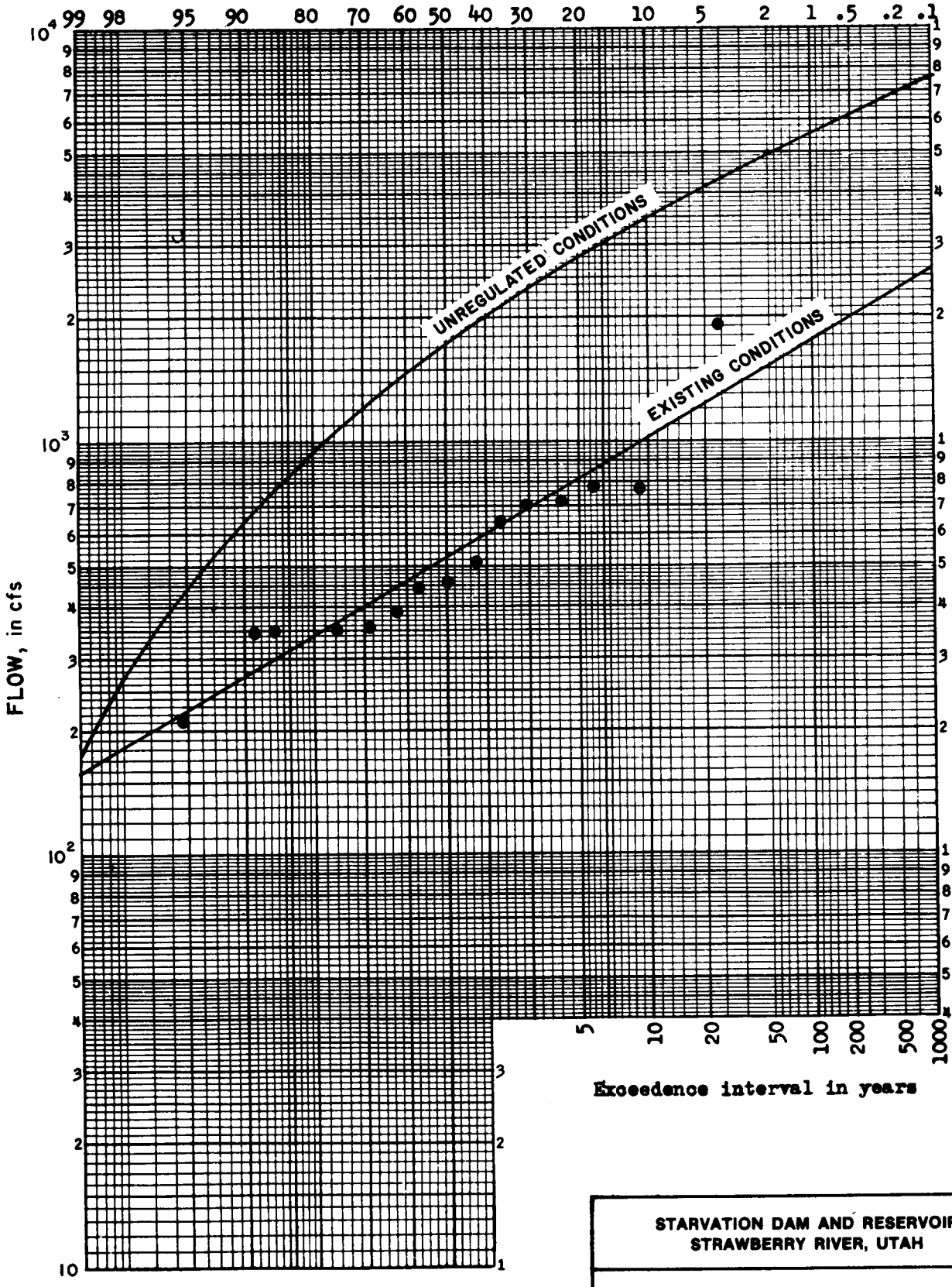
STARVATION DAM AND RESERVOIR
STRAWBERRY RIVER, UTAH

SNOWMELT FREQUENCY CURVES

STRAWBERRY RIVER AT DUCHESNE
(UNREGULATED CONDITIONS)

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

PLATE 15



PERIOD OF RECORD:

Unregulated Conditions: 1909 — 1910
1914 — 1985

Existing Conditions: 1971 — 1985

STARVATION DAM AND RESERVOIR
STRAWBERRY RIVER, UTAH

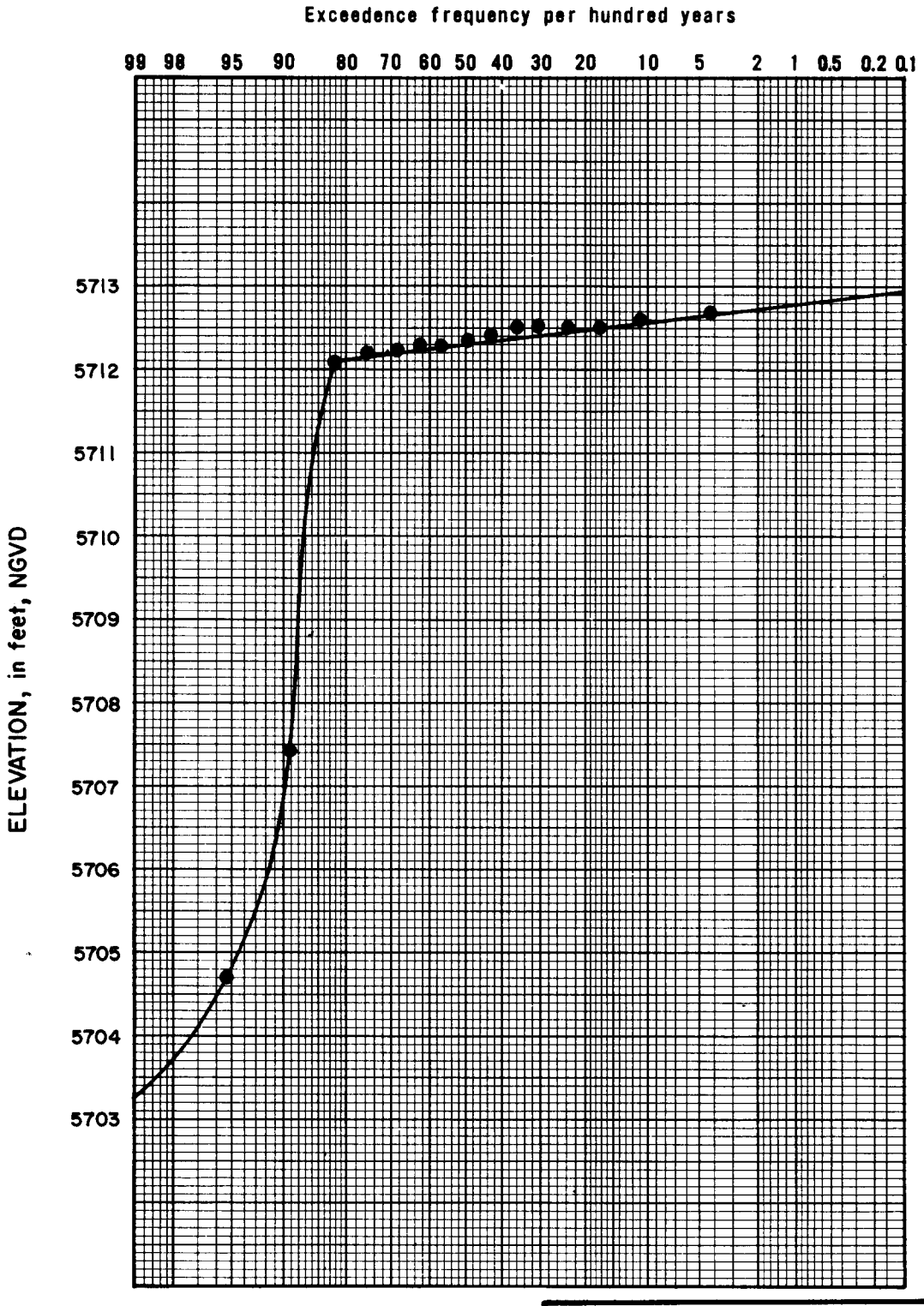
SNOWMELT FREQUENCY CURVES

1-DAY MAXIMUM ANNUAL

STRAWBERRY RIVER AT DUCHESNE

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

PLATE 16



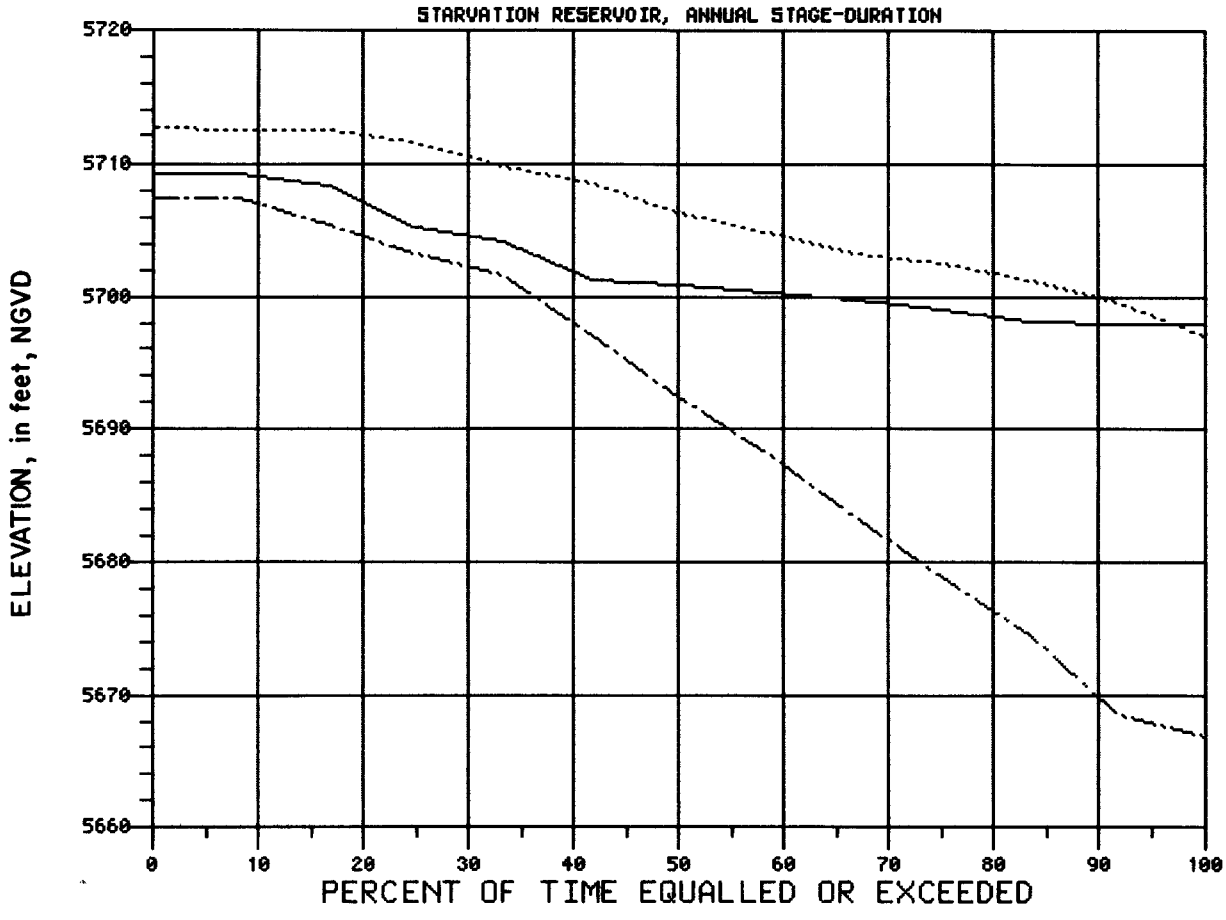
Period of Record: 1971 – 1985

STARVATION DAM AND RESERVOIR
STRAWBERRY RIVER, UTAH

STAGE–FREQUENCY CURVE

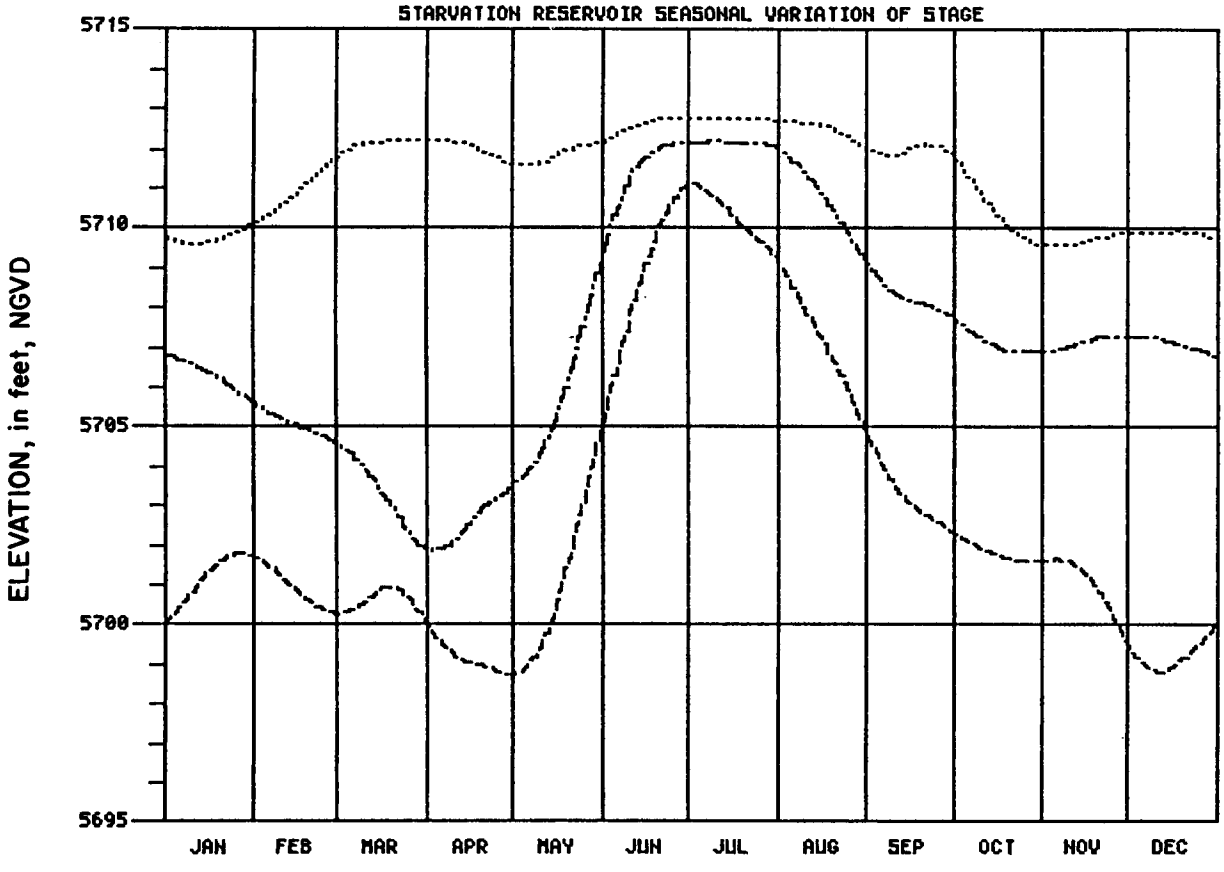
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

PLATE 17



STARVATION DAM AND RESERVOIR STRAWBERRY RIVER UTAH
STAGE DURATION CURVE
U.S. ARMY CORPS OF ENGINEERS SACRAMENTO DISTRICT

PLATE 18



..... 10% EQUALLED OR EXCEEDED
—·—·—·— 50% EQUALLED OR EXCEEDED
– – – – – 75% EQUALLED OR EXCEEDED

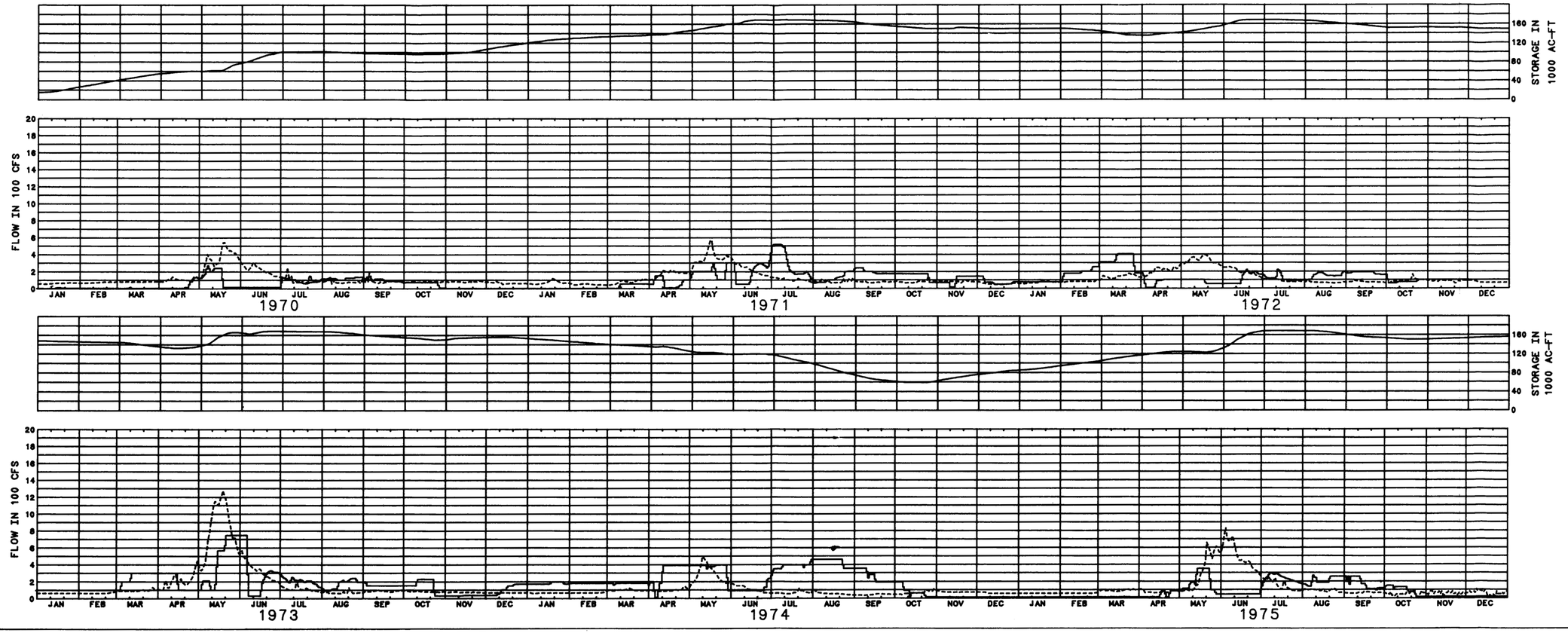
STARVATION DAM AND RESERVOIR
STRAWBERRY RIVER UTAH

SEASONAL VARIATION OF
STAGE FREQUENCY

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

GPO 685-057/2504

PLATE 19

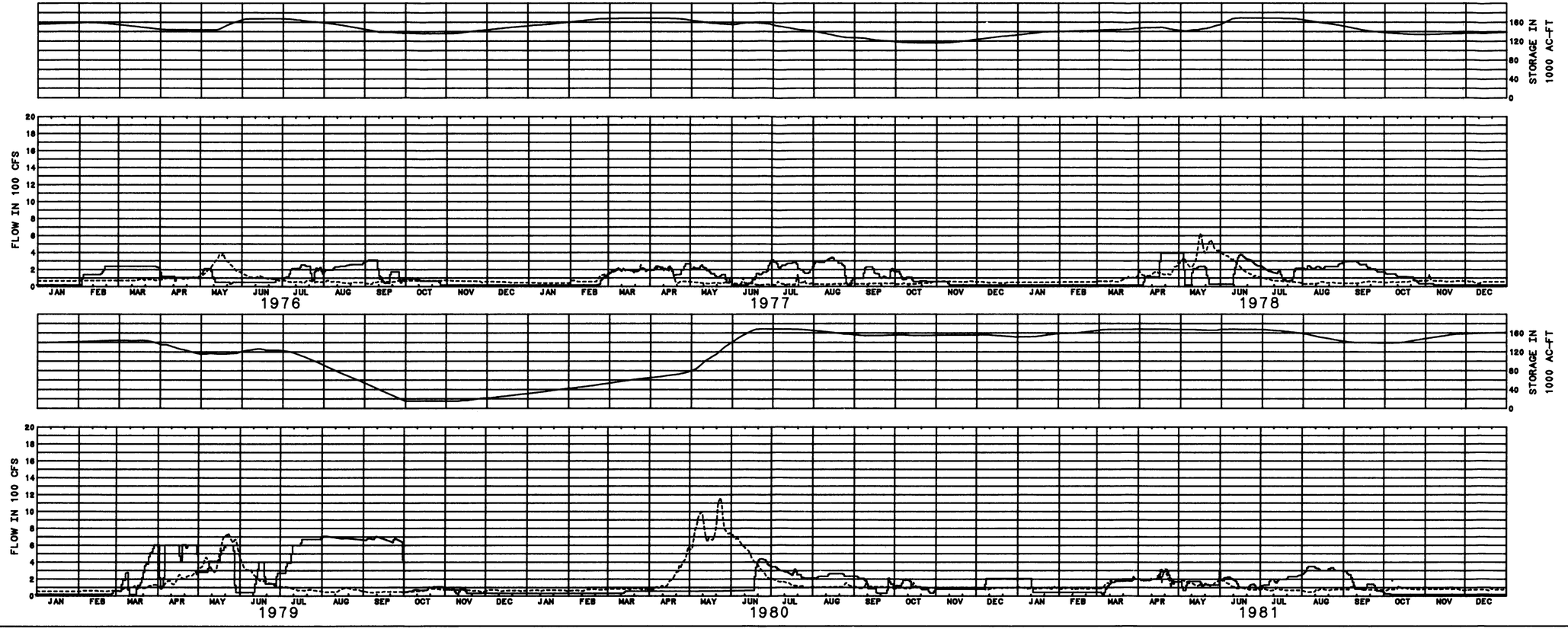


STARVATION DAM AND RESERVOIR
STRAWBERRY RIVER UTAH

HISTORICAL OPERATION

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

PLATE 20-1

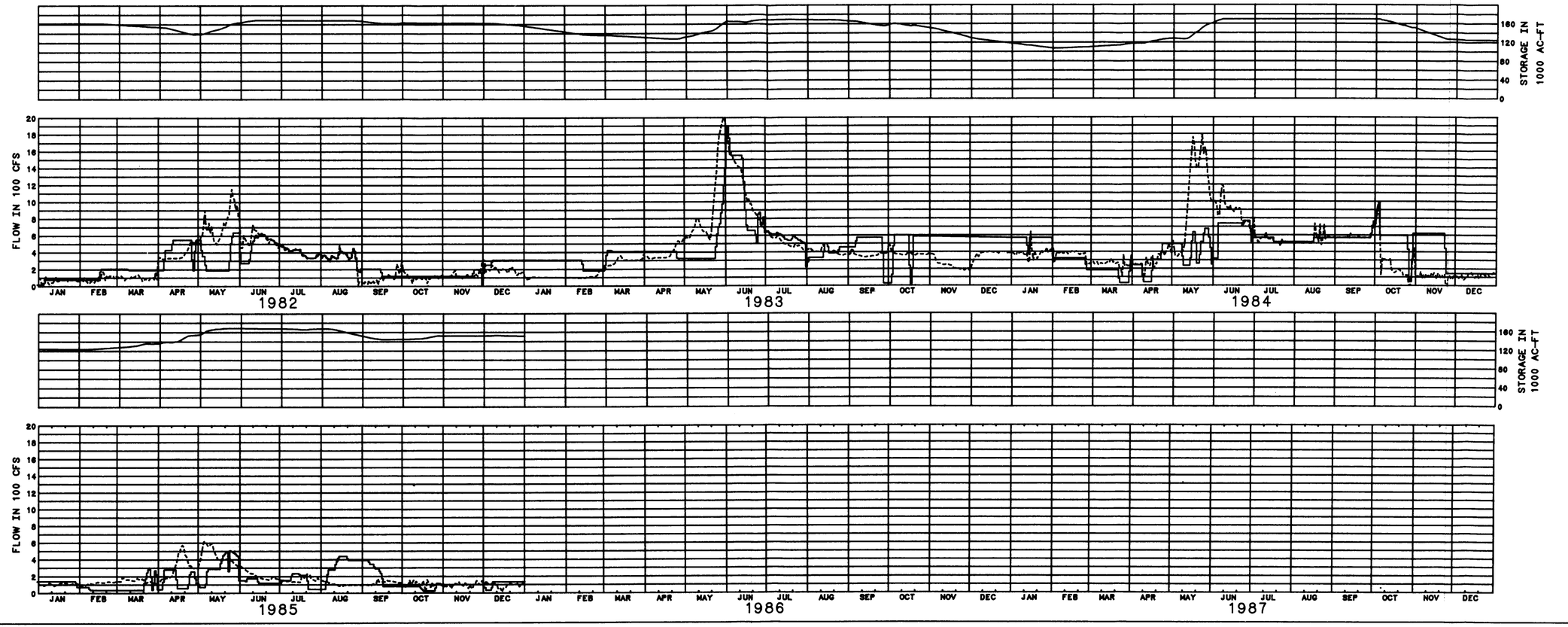


STARVATION DAM AND RESERVOIR
STRAWBERRY RIVER UTAH

HISTORICAL OPERATION

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

PLATE 20-2



STARVATION DAM AND RESERVOIR
STRAWBERRY RIVER UTAH

HISTORICAL OPERATION

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

PLATE 20-3

STARVATION DAM AND RESERVOIR

STRAWBERRY RIVER, UTAH

WATER CONTROL MANUAL

SEPTEMBER 1988

EXHIBIT A

STANDING INSTRUCTIONS TO DAMTENDER

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
SACRAMENTO, CALIFORNIA

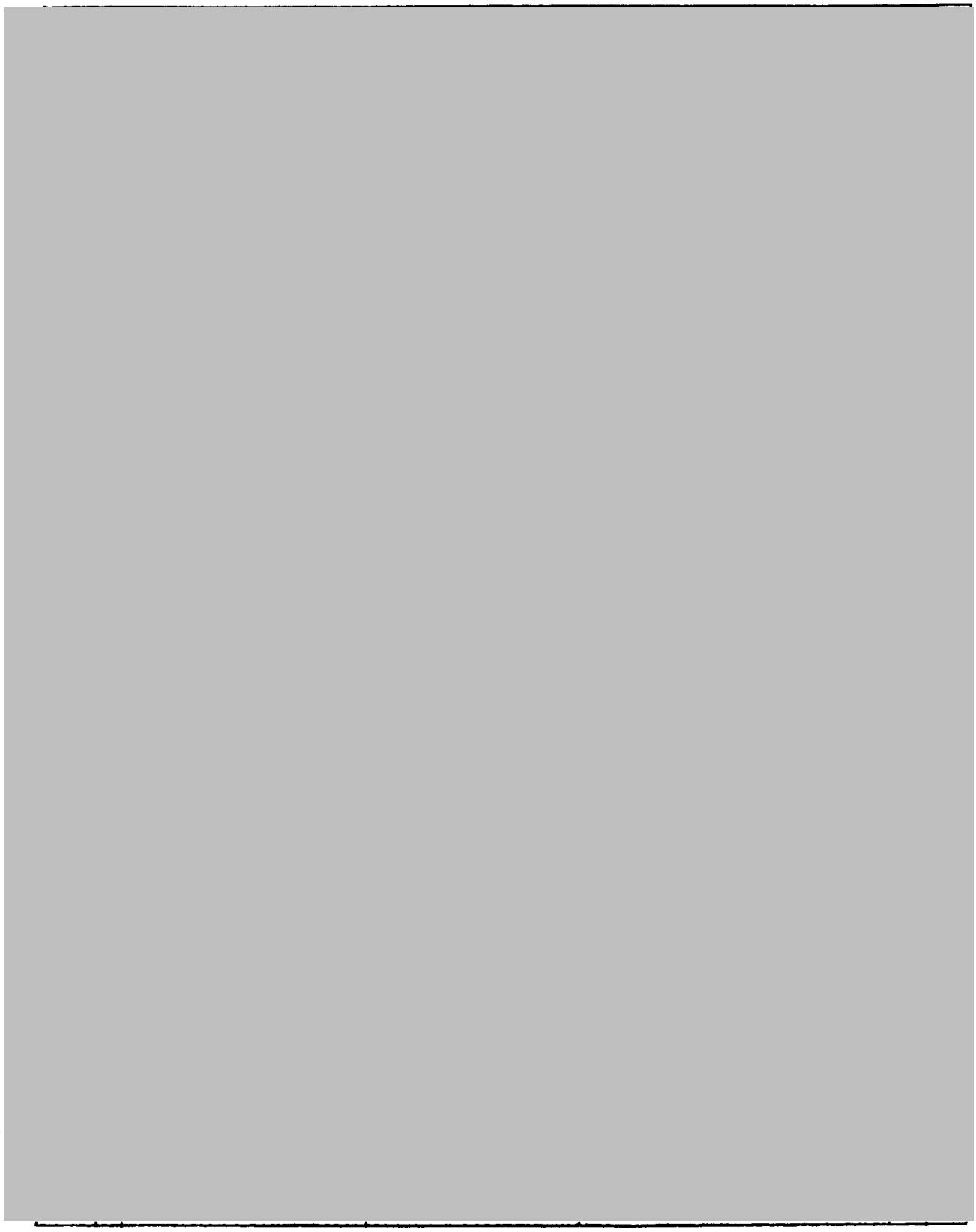


EXHIBIT A

STANDING INSTRUCTIONS TO DAMTENDER
FOR
STARVATION DAM AND RESERVOIR

CONTENTS

Personnel Concerned in Flood Control
Operation of Starvation Dam and Reservoir

Paragraph		Page
1	General	A-1
2	Flood Control Operation Requirements	A-1
3	Limitations On Storage	A-1
4	Limitations On Releases	A-1
5	Standing Instructions During Flood Season	A-2
6	Operational Responsibilities	A-2
7	Deviation From Normal Regulations	A-2
8	Reporting Instructions	A-3
9	Modification of Regulations	A-3

CHARTS

A-1	Starvation Reservoir Area and Capacity Curves
A-2	Starvation Reservoir Area and Capacity Tables
A-3	Outlet Works Discharge Rating Curves
A-4	Spillway Rating Curve
A-5	Discharge Rating Curve, Strawberry River near Duchesne
A-6	Flood Control Diagram

STARVATION DAM AND RESERVOIR
STRAWBERRY RIVER, UTAH
WATER CONTROL MANUAL
EXHIBIT A
STANDING OPERATING INSTRUCTIONS TO DAMTENDER

1. GENERAL

This exhibit is prepared in accordance with instructions contained in EM 1110-2-3600, paragraph 9-02 (Standing instructions to Damtenders), and ETL 1110-2-251 and pertains to duties and responsibilities of the damtenders in connection with the operation of Starvation Dam and Reservoir for flood control.

Operational instructions to the damtender are outlined with specific emphasis on flood emergencies when communication facilities between the Damtender and the Utah Projects Office in Provo, Utah or between the Utah Projects Office and the U.S. Bureau of Reclamation Upper Colorado Regional Office in Salt Lake City, Utah are disrupted. The exhibit is designed to be used independently as a flood control guide or in conjunction with the rest of the water control manual. To facilitate independent use of this exhibit , charts required for emergency flood control operation of Starvation Dam are included.

2. FLOOD CONTROL OPERATION REQUIREMENTS

Starvation Dam will be operated as is necessary for flood control according to the Flood Control Diagram (Chart A-6). The flood control objective for the Starvation Project is to minimize flood damage downstream from the dam and insofar as possible to avoid causing damage that would not have occured without the project.

A maximum of 152,330 acre-feet is reserved for flood control in Starvation Reservoir. Whenever the required flood control space is encroached water shall be released in accordance with the schedule shown on the Flood Control Diagram (Chart A-6).

3. LIMITATIONS ON STORAGE

The maximum permissible storage in Starvation Reservoir is the storage available below the limiting water surface elevation of 5718.3 feet NGVD. This includes a surcharge capacity of 21,670 acre-feet between elevations 5712.0 NGVD and the spillway design flood elevation 5718.3 NGVD.

4. LIMITATIONS ON RELEASES

There are no specific rate of release limitations on the river outlet.

5. STANDING INSTRUCTIONS DURING FLOOD SEASON

a. Normal Flood Control Regulation. The criteria for flood control operation is given on the Flood Control Diagram (Chart A-6) of this appendix. The neccessity for flood control releases occur whenever the required space for flood control is greater than the actual empty space in the reservoir as determined from the Flood Control Diagram. Flood control release requirements will normally be determined by the Bureau of Reclamation Water Operations Branch in Salt Lake City, Utah and relayed to the Utah Projects Office in Provo, Utah. The Projects Office will direct the damtender to make the changes. It is essential that these releases be made as soon as possible and the diagram be checked frequently after the gates are set in order to minimize later large changes in gate settings.

b. Emergency Regulation. If communication between the Water Operations Branch in Salt Lake City, Utah and the Utah Projects Office in Provo, Utah is lost the following procedures will be followed by the Water Operations Branch:

(1) Contact the Starvation Damtender and direct the necessary changes as may be required.
(2) Try to re-establish contact with the Projects Office.

If communication is lost between the Damtender and both offices the Damtender will:

(1) Continue flood control releases in accordance with the last instructions received and try to re-establish communication.

(2) If communication cannot be re-established make releases as determined from Chart A-6.

6. OPERATIONAL RESPONSIBILITIES

a. U.S. Bureau of Reclamation. This agency is the dam operator. The U.S. Bureau of Reclamation has the responsibility for the safety of the dam and the actual operation of the outlet facilities.

b. U.S. Army Corps of Engineers. This agency has the ultimate responsibility for the promulgation of the regulations and schedules for flood control for the Starvation Project.

7. DEVIATION FROM NORMAL REGULATIONS

Deviations involving temporary adjustments in the flood control release schedule such as a reduction of flows for downstream construction, increased flows for flushing or other minor adjustments

will be accomplished under the direction and control of the Utah Projects Office in Provo, Utah acting in coordination with the Bureau of Reclamation Water Operations Branch Office in Salt Lake City,Utah.

Emergency events requiring prompt reaction such as earthquakes, downstream levee failures or other catastrophies will be initiated by the Damtender unless such reaction would create a more severe condition. The Bureau of Reclamation Water Operations Branch and the Utah Projects Office will be notified as soon as practical by the most expeditious means with details of the emergency. The Water Operations Branch will in turn inform the Corps of Engineers, Sacramento District by telephone if flood space is or will be encroached. A written confirmation of the action(s) taken and why they were taken will be furnished to the Water Operations Branch. An information copy will be forwarded to the Corps of Engineers, Sacramento District if flood control space is or will be encroached.

8. REPORTING INSTRUCTIONS

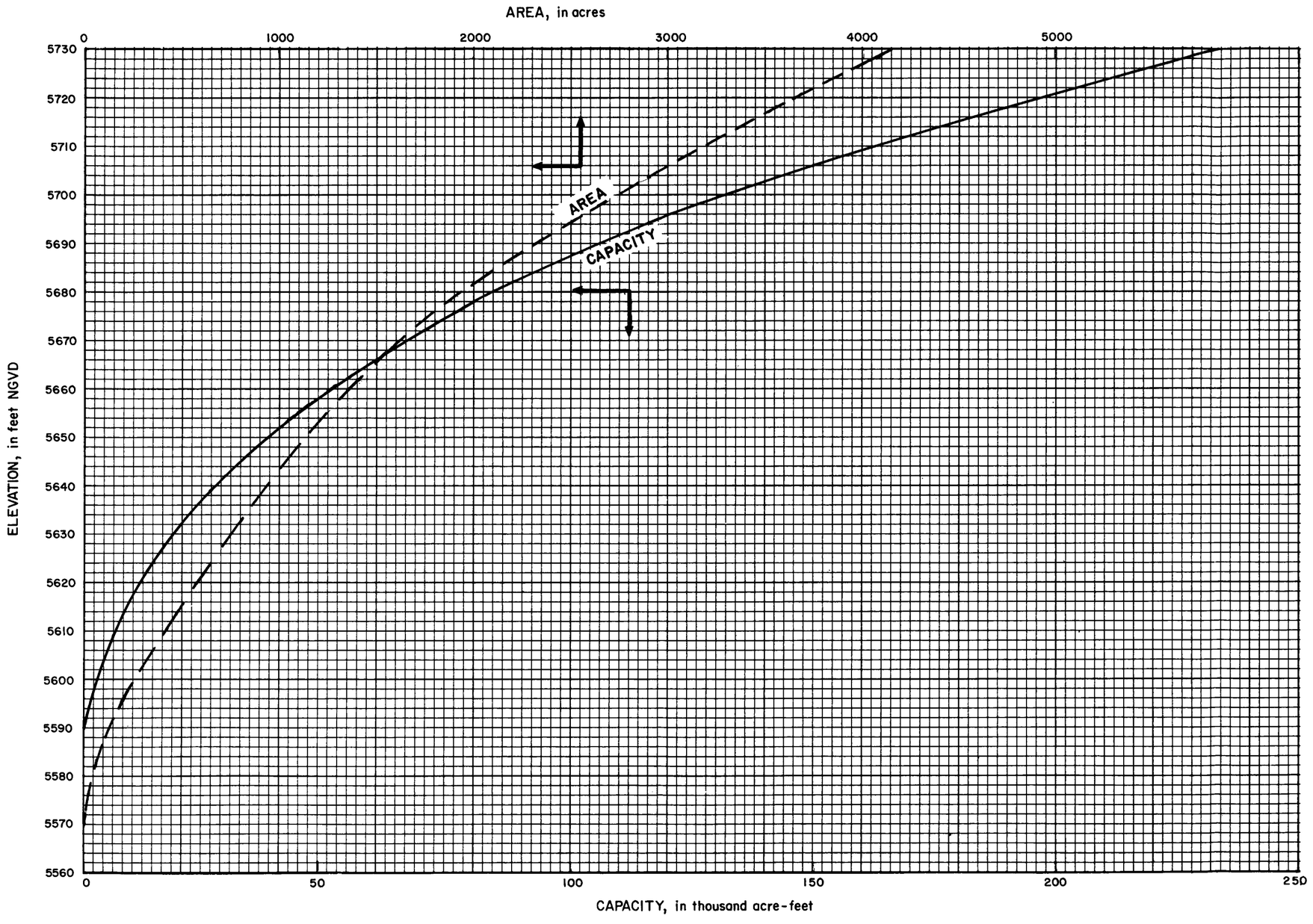
The Damtender is the primary source of information relative to the operation of the Starvation Project. He will record reservoir storage, discharges through the river outlets, and the spillway and the calculated inflow to the reservoir.

The Damtender will report any change in gate settings made by him. The Damtender will also report any unusual circumstances requiring or that could require shut-down or readjustment of the discharge outlets or of any emergency that could possibly compromise the safety of the dam or of the flood control function of the project.

9. MODIFICATION OF REGULATIONS

The official regulations are subject to temporary modification during flood emergencies by the District Engineer, Sacramento District, U.S. Army Corps of Engineers. The flood control criteria will be revised by the Corps of Engineers as necessary to reflect changed conditions that come to bear upon flood control operation of the reservoir. Permanent revisions of flood control criteria are subject to prior approval of the Chief of Engineers, U.S. Army Corps of Engineers, or his duly authorized representative.





STARVATION DAM AND RESERVOIR
STRAWBERRY RIVER UTAH

STARVATION RESERVOIR
AREA - CAPACITY CURVES

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

CHART A-1

CENTRAL UTAH PROJECT
BONNEVILLE UNIT

STARVATION RESERVOIR

AREA IN ACRES

JANUARY 1, 1964

ELEV. FEET	0	1	2	3	4	5	6	7	8	9
5560							1	1	2	3
5570	4	6	8	11	15	20	24	29	35	40
5580	46	53	60	67	74	82	94	106	119	131
5590	144	158	171	185	199	214	226	239	253	267
5600	282	297	312	328	345	362	378	393	408	421
5610	434	447	458	470	480	491	514	537	559	580
5620	600	620	639	657	675	692	708	724	740	756
5630	772	789	805	822	839	857	876	895	913	931
5640	949	966	983	999	1020	1030	1060	1100	1120	1150
5650	1180	1200	1230	1250	1270	1290	1300	1320	1340	1360
5660	1380	1400	1420	1450	1470	1500	1530	1560	1590	1620
5670	1650	1680	1720	1750	1790	1820	1860	1900	1930	1970
5680	2000	2030	2070	2100	2130	2160	2190	2220	2260	2290
5690	2330	2370	2400	2440	2480	2520	2570	2610	2660	2700
5700	2750	2800	2840	2890	2940	2990	3040	3080	3130	3180
5710	3220	3260	3310	3350	3390	3430	3470	3520	3560	3610
5720	3650	3700	3740	3790	3840	3880	3940	3990	4040	4090
5730	4140	4190	4240	4290	4340	4380				

CENTRAL UTAH PROJECT
BONNEVILLE UNIT

STARVATION RESERVOIR

CAPACITY IN ACRE FEET

JANUARY 1, 1964

ELEV. FEET	0	1	2	3	4	5	6	7	8	9
5560							1	1	3	5
5570	8	13	19	29	42	59	81	107	139	176
5580	220	269	325	388	459	537	625	725	837	962
5590	1100	1250	1420	1590	1790	1990	2210	2440	2690	2950
5600	3220	3510	3820	4140	4480	4830	5200	5590	5990	6400
5610	6830	7270	7720	8190	8660	9150	9650	10180	10730	11300
5620	11880	12490	13130	13770	14440	15120	15820	16540	17270	18020
5630	18780	19560	20360	21170	22000	22850	23710	24590	25500	26420
5640	27370	28320	29300	30280	31300	32320	33360	34440	35560	36690
5650	37860	39050	40260	41500	42760	44040	45330	46640	47970	49320
5660	50700	52090	53500	54940	56400	57880	59400	60940	62510	64110
5670	65750	67410	69110	70840	72610	74420	76260	78140	80060	82010
5680	83990	86010	88060	90140	92250	94400	96570	98770	101020	103300
5690	105610	107960	110340	112770	115230	117730	120280	122870	125500	128180
5700	130910	133680	136500	139370	142280	145250	148260	151320	154430	157580
5710	160780	164020	167310	170640	174010	177420	180870	184360	187910	191490
5720	195120	198790	202510	206280	210090	213950	217830	221800	225830	229880
5730	234010	238160	242370	246660	250970	255330				

CENTRAL UTAH PROJECT
BONNEVILLE UNIT

STARVATION RESERVOIR

CAPACITY IN ACRE FEET

JANUARY 1, 1964

ELEV. FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
5560										
5561										
5562										
5563										
5564										
5565								1	1	1
5566	1	1	1	1	1	1	1	1	1	1
5567	1	1	2	2	2	2	2	2	2	2
5568	3	3	3	3	3	4	4	4	4	4
5569	5	5	5	6	6	6	7	7	7	8
5570	8	8	9	9	10	10	11	11	12	12
5571	13	13	14	15	15	16	17	17	18	19
5572	19	20	21	22	23	24	25	26	27	28
5573	29	30	31	33	34	35	37	38	39	40
5574	42	43	45	47	49	50	52	54	55	57
5575	59	61	63	65	68	70	72	74	76	78
5576	81	83	86	89	91	94	97	99	102	105
5577	107	110	114	117	120	123	126	130	133	136
5578	139	143	147	150	154	158	162	165	169	173
5579	176	181	185	189	194	198	202	207	211	215
5580	220	225	230	235	239	244	249	254	259	264
5581	269	275	280	286	292	297	303	308	314	320
5582	325	332	338	344	350	357	363	369	376	382
5583	388	395	402	409	417	424	431	438	445	452
5584	459	467	474	482	490	498	506	513	521	529
5585	537	546	554	563	572	581	590	598	607	616
5586	625	635	645	655	665	675	685	695	705	715
5587	725	736	747	759	770	781	792	803	815	826
5588	837	850	862	875	887	900	912	925	937	950
5589	962	976	990	1000	1020	1030	1040	1060	1070	1090
5590	1100	1120	1130	1150	1160	1180	1190	1210	1220	1240
5591	1250	1270	1280	1300	1320	1330	1350	1370	1380	1400
5592	1420	1430	1450	1470	1490	1500	1520	1540	1560	1580
5593	1590	1610	1630	1650	1670	1690	1710	1730	1750	1770
5594	1790	1810	1830	1850	1870	1890	1910	1930	1950	1970
5595	1990	2010	2040	2060	2080	2100	2120	2150	2170	2190
5596	2210	2230	2260	2280	2300	2330	2350	2370	2400	2420
5597	2440	2470	2490	2520	2540	2570	2590	2620	2640	2670
5598	2690	2720	2740	2770	2790	2820	2850	2870	2900	2920
5599	2950	2980	3010	3030	3060	3090	3110	3140	3170	3200
5600	3220	3250	3280	3310	3340	3370	3400	3430	3460	3480
5601	3510	3540	3570	3610	3640	3670	3700	3730	3760	3790
5602	3820	3850	3880	3910	3950	3980	4010	4040	4070	4110
5603	4140	4170	4210	4240	4270	4310	4340	4370	4410	4440
5604	4480	4510	4550	4580	4620	4650	4690	4720	4760	4790
5605	4830	4870	4900	4940	4980	5010	5050	5090	5130	5160
5606	5200	5240	5280	5320	5350	5390	5430	5470	5510	5550
5607	5590	5630	5670	5710	5750	5790	5830	5870	5910	5950
5608	5990	6030	6070	6110	6150	6190	6230	6280	6320	6360
5609	6400	6440	6490	6530	6570	6610	6660	6700	6740	6790

CENTRAL UTAH PROJECT
BONNEVILLE UNIT

STARVATION RESERVOIR

CAPACITY IN ACRE FEET

JANUARY 1, 1964

ELEV. FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
5610	6830	6870	6920	6960	7000	7050	7090	7140	7180	7220
5611	7270	7310	7360	7400	7450	7490	7540	7590	7630	7680
5612	7720	7770	7810	7860	7910	7950	8000	8050	8090	8140
5613	8190	8230	8280	8330	8380	8420	8470	8520	8570	8610
5614	8660	8710	8760	8810	8850	8900	8950	9000	9050	9100
5615	9150	9200	9250	9300	9350	9400	9450	9500	9550	9600
5616	9650	9700	9760	9810	9860	9910	9970	10020	10070	10130
5617	10180	10230	10290	10340	10400	10450	10510	10560	10620	10670
5618	10730	10780	10840	10900	10950	11010	11070	11120	11180	11240
5619	11300	11350	11410	11470	11530	11590	11650	11710	11760	11820
5620	11880	11940	12000	12060	12130	12190	12250	12310	12370	12430
5621	12490	12560	12620	12680	12750	12810	12870	12940	13000	13060
5622	13130	13190	13260	13320	13380	13450	13510	13580	13640	13710
5623	13770	13840	13900	13970	14040	14100	14170	14240	14300	14370
5624	14440	14510	14580	14640	14710	14780	14850	14920	14980	15050
5625	15120	15190	15260	15330	15400	15470	15540	15610	15680	15750
5626	15820	15890	15960	16040	16110	16180	16250	16320	16390	16470
5627	16540	16610	16680	16760	16830	16900	16980	17050	17120	17200
5628	17270	17340	17420	17490	17570	17640	17720	17790	17870	17940
5629	18020	18090	18170	18250	18320	18400	18470	18550	18630	18700
5630	18780	18860	18940	19010	19090	19170	19250	19330	19400	19480
5631	19560	19640	19720	19800	19880	19960	20040	20120	20200	20280
5632	20360	20440	20520	20600	20680	20760	20850	20930	21010	21090
5633	21170	21250	21340	21420	21500	21590	21670	21750	21840	21920
5634	22000	22090	22170	22260	22340	22430	22510	22600	22680	22770
5635	22850	22940	23020	23110	23200	23280	23370	23460	23540	23630
5636	23710	23800	23890	23930	24070	24150	24240	24330	24420	24500
5637	24590	24680	24770	24860	24950	25040	25130	25230	25320	25410
5638	25500	25590	25680	25770	25870	25960	26050	26150	26240	26330
5639	26420	26520	26610	26710	26800	26890	26990	27080	27180	27270
5640	27370	27460	27560	27650	27750	27840	27940	28040	28130	28230
5641	28320	28420	28520	28620	28710	28810	28910	29000	29100	29200
5642	29300	29390	29490	29590	29690	29790	29890	29990	30090	30180
5643	30280	30380	30490	30590	30690	30790	30890	30990	31090	31200
5644	31300	31400	31500	31600	31710	31810	31910	32010	32110	32220
5645	32320	32420	32530	32630	32740	32840	32950	33050	33160	33260
5646	33360	33470	33580	33690	33800	33900	34010	34120	34230	34340
5647	34440	34560	34670	34780	34890	35000	35110	35220	35330	35440
5648	35560	35670	35780	35900	36010	36120	36240	36350	36470	36580
5649	36690	36810	36930	37040	37160	37280	37390	37510	37630	37740
5650	37860	37980	38100	38220	38340	38450	38570	38690	38810	38930
5651	39050	39170	39290	39410	39540	39660	39780	39900	40020	40140
5652	40260	40390	40510	40640	40760	40880	41010	41130	41250	41380
5653	41500	41630	41750	41880	42000	42130	42260	42380	42510	42630
5654	42760	42890	43010	43140	43270	43400	43520	43650	43780	43910
5655	44040	44170	44290	44420	44550	44680	44810	44940	45070	45200
5656	45330	45460	45590	45720	45860	45990	46120	46250	46380	46510
5657	46640	46780	46910	47040	47180	47310	47440	47580	47710	47840
5658	47970	48110	48240	48380	48510	48650	48780	48920	49050	49190
5659	49320	49460	49600	49740	49870	50010	50150	50280	50420	50560

CENTRAL UTAH PROJECT
BONNEVILLE UNIT

STARVATION RESERVOIR

CAPACITY IN ACRE FEET

JANUARY 1, 1964

ELEV. FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
5660	50700	50830	50970	51110	51250	51390	51530	51670	51810	51950
5661	52090	52230	52370	52510	52650	52790	52930	53080	53220	53360
5662	53500	53640	53790	53930	54070	54220	54360	54510	54650	54790
5663	54940	55080	55230	55380	55520	55670	55810	55960	56110	56250
5664	56400	56550	56700	56840	56990	57140	57290	57440	57590	57740
5665	57880	58040	58190	58340	58490	58640	58790	58940	59090	59250
5666	59400	59550	59710	59860	60010	60170	60320	60480	60630	60790
5667	60940	61100	61250	61410	61570	61730	61880	62040	62200	62350
5668	62510	62670	62830	62990	63150	63310	63470	63630	63790	63950
5669	64110	64280	64440	64600	64770	64930	65090	65260	65420	65580
5670	65750	65910	66080	66250	66410	66580	66740	66910	67080	67240
5671	67410	67580	67750	67920	68090	68260	68430	68600	68770	68940
5672	69110	69280	69460	69630	69800	69980	70150	70320	70500	70670
5673	70840	71020	71200	71380	71550	71730	71910	72080	72260	72440
5674	72610	72790	72970	73160	73340	73520	73700	73880	74060	74240
5675	74420	74600	74790	74970	75160	75340	75530	75710	75900	76080
5676	76260	76450	76640	76830	77020	77200	77390	77580	77770	77960
5677	78140	78340	78530	78720	78910	79100	79290	79490	79680	79870
5678	80060	80250	80450	80640	80840	81030	81230	81430	81620	81820
5679	82010	82210	82410	82610	82800	83000	83200	83400	83600	83800
5680	83990	84200	84400	84600	84800	85000	85200	85410	85610	85810
5681	86010	86220	86420	86630	86830	87040	87240	87450	87650	87860
5682	88060	88270	88480	88690	88890	89100	89310	89520	89730	89930
5683	90140	90350	90560	90780	90990	91200	91410	91620	91830	92040
5684	92250	92470	92680	92900	93110	93320	93540	93750	93970	94180
5685	94400	94610	94830	95050	95270	95480	95700	95920	96130	96350
5686	96570	96790	97010	97230	97450	97670	97890	98110	98330	98550
5687	98770	99000	99220	99450	99670	99900	100120	100350	100570	100800
5688	101020	101250	101480	101700	101930	102160	102390	102610	102840	103070
5689	103300	103530	103760	103990	104220	104450	104680	104910	105150	105380
5690	105610	105840	106080	106310	106550	106780	107020	107250	107490	107720
5691	107960	108200	108430	108670	108910	109150	109390	109630	109870	110100
5692	110340	110590	110830	111070	111310	111550	111800	112040	112280	112520
5693	112770	113010	113260	113510	113750	114000	114240	114490	114740	114980
5694	115230	115480	115730	115980	116230	116480	116730	116980	117230	117480
5695	117730	117990	118240	118500	118750	119000	119260	119510	119770	120020
5696	120280	120540	120800	121050	121310	121570	121830	122090	122350	122610
5697	122870	123130	123400	123660	123920	124190	124450	124710	124980	125240
5698	125500	125770	126040	126310	126570	126840	127110	127380	127650	127910
5699	128180	128450	128730	129000	129270	129550	129820	130090	130360	130640
5700	130910	131190	131460	131740	132020	132290	132570	132850	133130	133400
5701	133680	133960	134240	134530	134810	135090	135370	135650	135940	136220
5702	136500	136790	137070	137360	137650	137930	138220	138510	138790	139080
5703	139370	139660	139950	140240	140530	140830	141120	141410	141700	141990
5704	142280	142580	142880	143170	143470	143770	144060	144360	144660	144950
5705	145250	145550	145850	146150	146450	146760	147060	147360	147660	147960
5706	148260	148570	148870	149180	149490	149790	150100	150400	150710	151020
5707	151320	151630	151940	152250	152560	152880	153190	153500	153810	154120
5708	154430	154740	155060	155370	155690	156010	156320	156640	156950	157270
5709	157580	157900	158220	158540	158860	159180	159500	159820	160140	160460

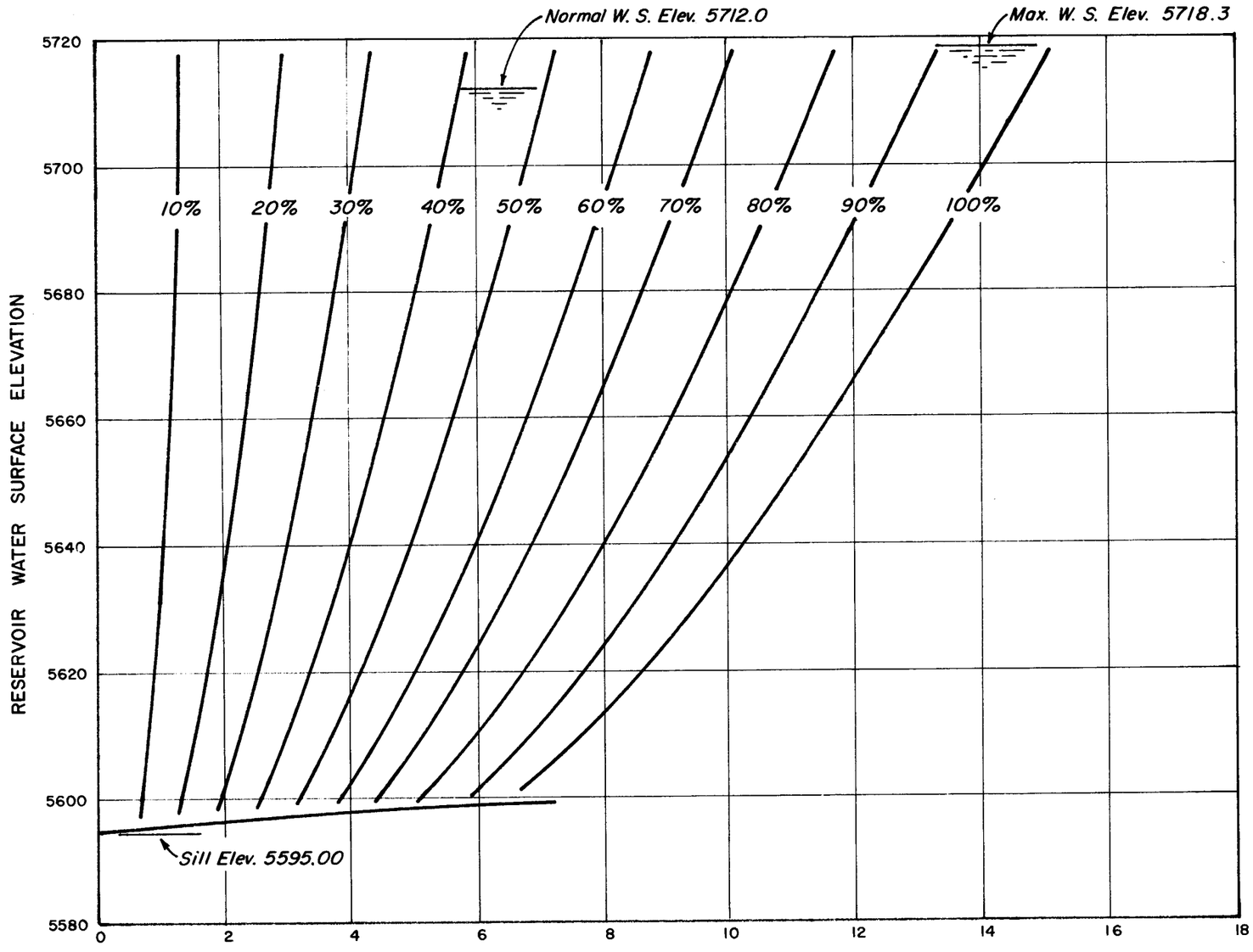
CENTRAL UTAH PROJECT
BONNEVILLE UNIT

STARVATION RESERVOIR

CAPACITY IN ACRE FEET

JANUARY 1, 1964

ELEV. FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
5710	160780	161100	161430	161750	162080	162400	162720	163050	163370	163700
5711	164020	164350	164680	165010	165340	165660	165990	166320	166650	166980
5712	167310	167640	167970	168310	168640	168970	169310	169640	169970	170310
5713	170640	170980	171310	171650	171990	172320	172660	173000	173330	173670
5714	174010	174350	174690	175030	175370	175710	176050	176400	176740	177080
5715	177420	177760	178110	178450	178800	179150	179490	179840	180180	180530
5716	180870	181220	181570	181920	182270	182620	182970	183320	183670	184010
5717	184360	184720	185070	185430	185780	186130	186490	186840	187200	187550
5718	187910	188260	188620	188980	189340	189700	190060	190410	190770	191130
5719	191490	191850	192220	192580	192940	193300	193670	194030	194390	194750
5720	195120	195480	195850	196220	196590	196960	197320	197690	198060	198430
5721	198790	199170	199540	199910	200280	200650	201020	201400	201770	202140
5722	202510	202890	203270	203640	204020	204400	204770	205150	205530	205900
5723	206280	206660	207040	207420	207800	208190	208570	208950	209330	209710
5724	210090	210480	210860	211250	211630	212020	212410	212790	213180	213560
5725	213950	214340	214720	215110	215500	215890	216280	216670	217050	217440
5726	217830	218230	218620	219020	219420	219820	220210	220610	221010	221410
5727	221800	222210	222610	223010	223410	223820	224220	224620	225020	225430
5728	225830	226230	226640	227040	227450	227850	228260	228660	229070	229470
5729	229880	230290	230700	231120	231530	231950	232360	232770	233190	233600
5730	234010	234430	234840	235260	235670	236090	236500	236920	237330	237750
5731	238160	238590	239010	239430	239850	240270	240690	241110	241530	241950
5732	242370	242800	243230	243660	244090	244520	244950	245370	245800	246230
5733	246660	247090	247520	247950	248380	248810	249240	249670	250100	250530
5734	250970	251400	251840	252280	252710	253150	253590	254020	254460	254900
5735	255330	255770	256210	256640	257080	257520	257950	258390	258830	



ONE GATE CLOSED - ONE GATE AT % OPENING

NOTES:

With one gate, the following operating restrictions must be observed when the reservoir water surface is below elevation 5601.5 to prevent blowback and damage to the intake structure and trashracks.

RESERVOIR RANGE ELEVATION		MAX. ALLOWED GATE OPENING IN %
5601.5 and above		100
5601.0	5601.5	90
5600.5	5601.0	80
5600.0	5600.5	70
5599.5	5600.0	60
5599.0	5599.5	50
5598.5	5599.0	40
5598.0	5598.5	30
5597.5	5598.0	20
5597.0	5597.5	10
Below 5597.0		Gate closed

When possible, two gates with equal openings should be used for releasing water.

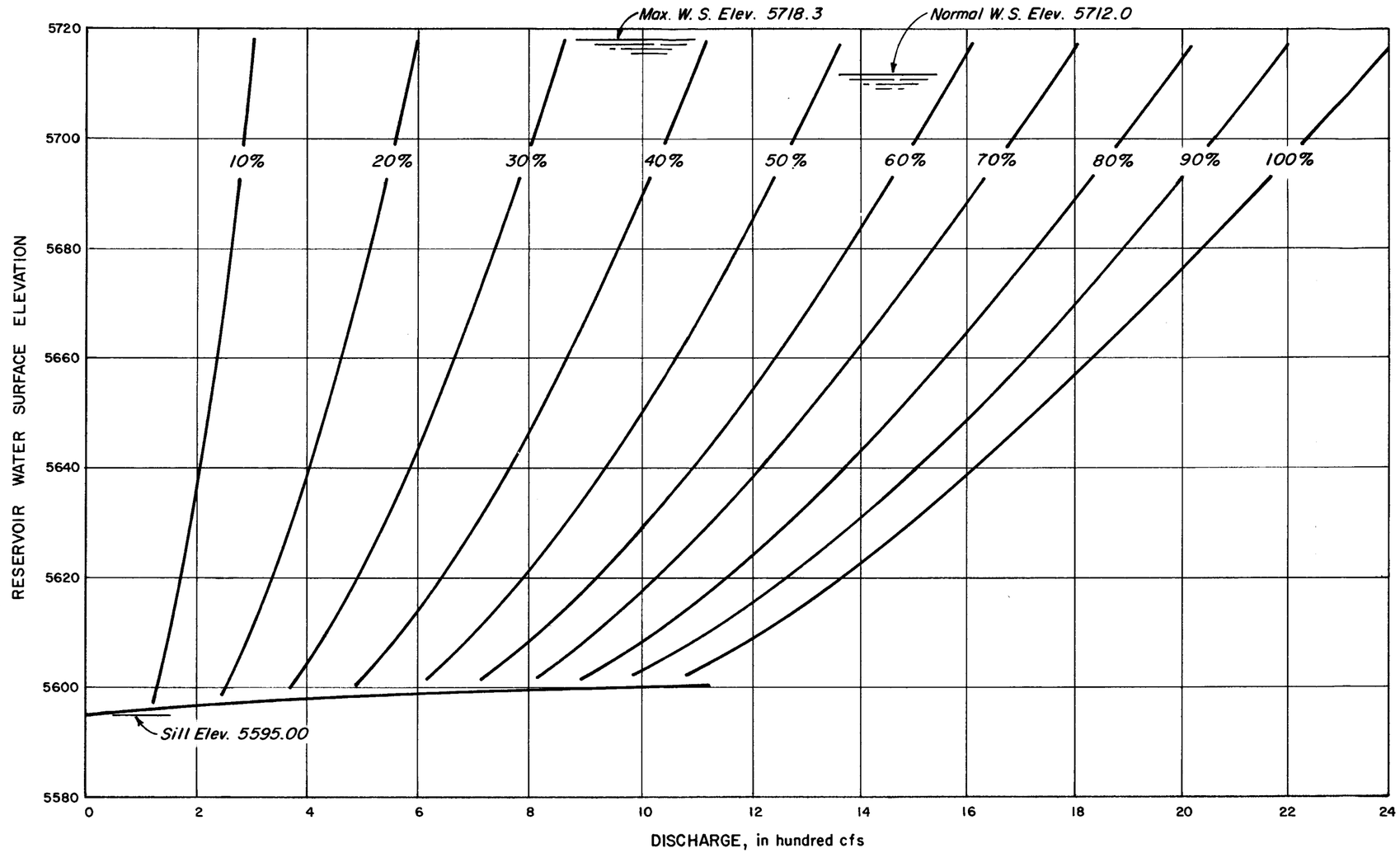
STARVATION DAM AND RESERVOIR
STRAWBERRY RIVER UTAH

OUTLET WORKS

DISCHARGE RATING CURVES

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

CHART A-3-1



TWO GATES AT SAME % OPENING

NOTES:

With two gates, the following operating restrictions must be observed when the reservoir water surface is below elevation 5604.0 to prevent blowback and damage to the intake structure and trashracks.

RESERVOIR RANGE ELEVATION		MAX. ALLOWED GATE OPENING IN %
5604.0 and above		100
5603.0	5604.0	90
5602.5	5603.0	80
5602.0	5602.5	70
5601.5	5602.0	60
5601.0	5601.5	50
5600.5	5601.0	40
5599.5	5600.5	30
5598.5	5599.5	20
5597.0	5598.5	10
Below 5597.0		Gates closed

When possible, two gates with equal openings should be used for releasing water.

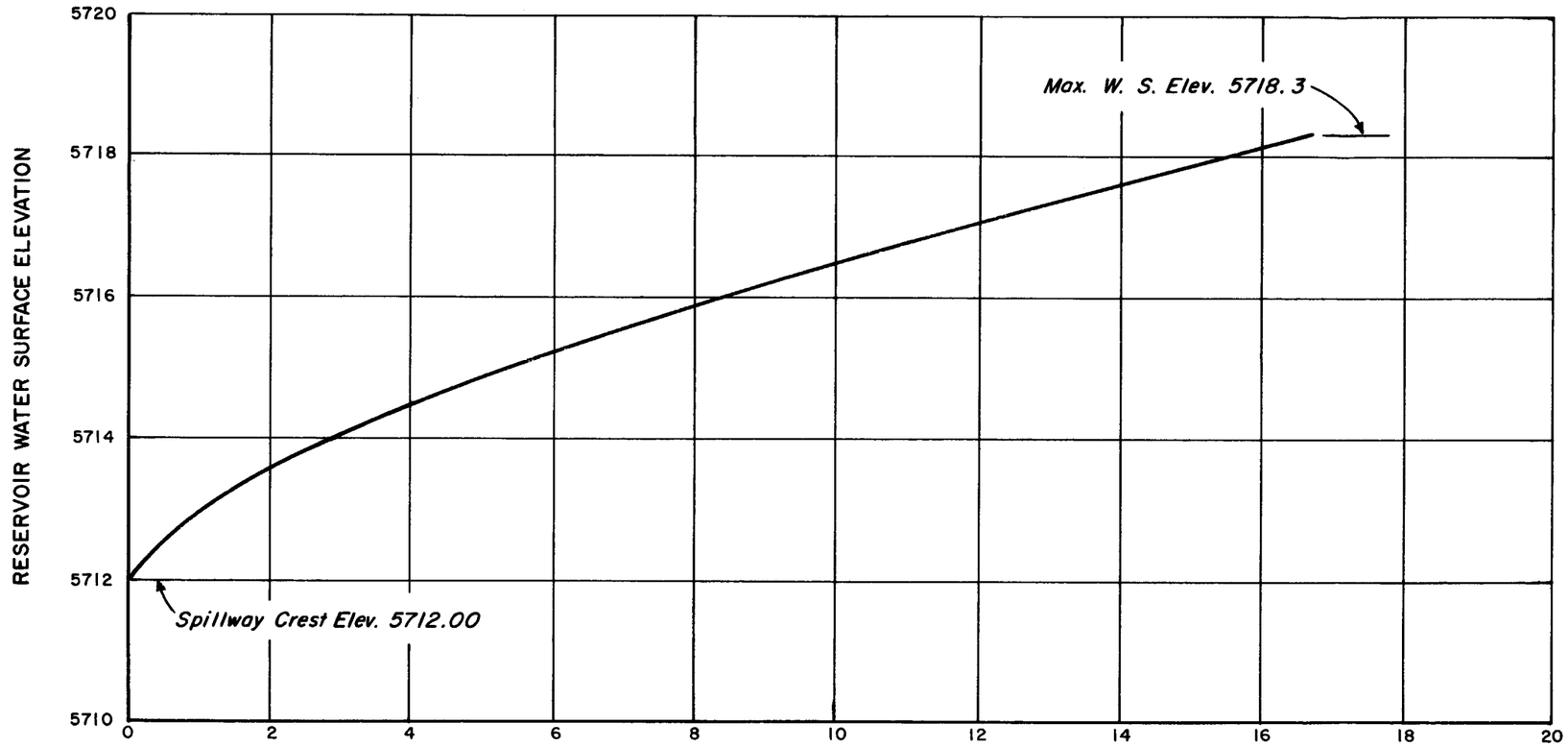
STARVATION DAM AND RESERVOIR
STRAWBERRY RIVER UTAH

OUTLET WORKS

DISCHARGE RATING CURVES

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

CHART A-3-2

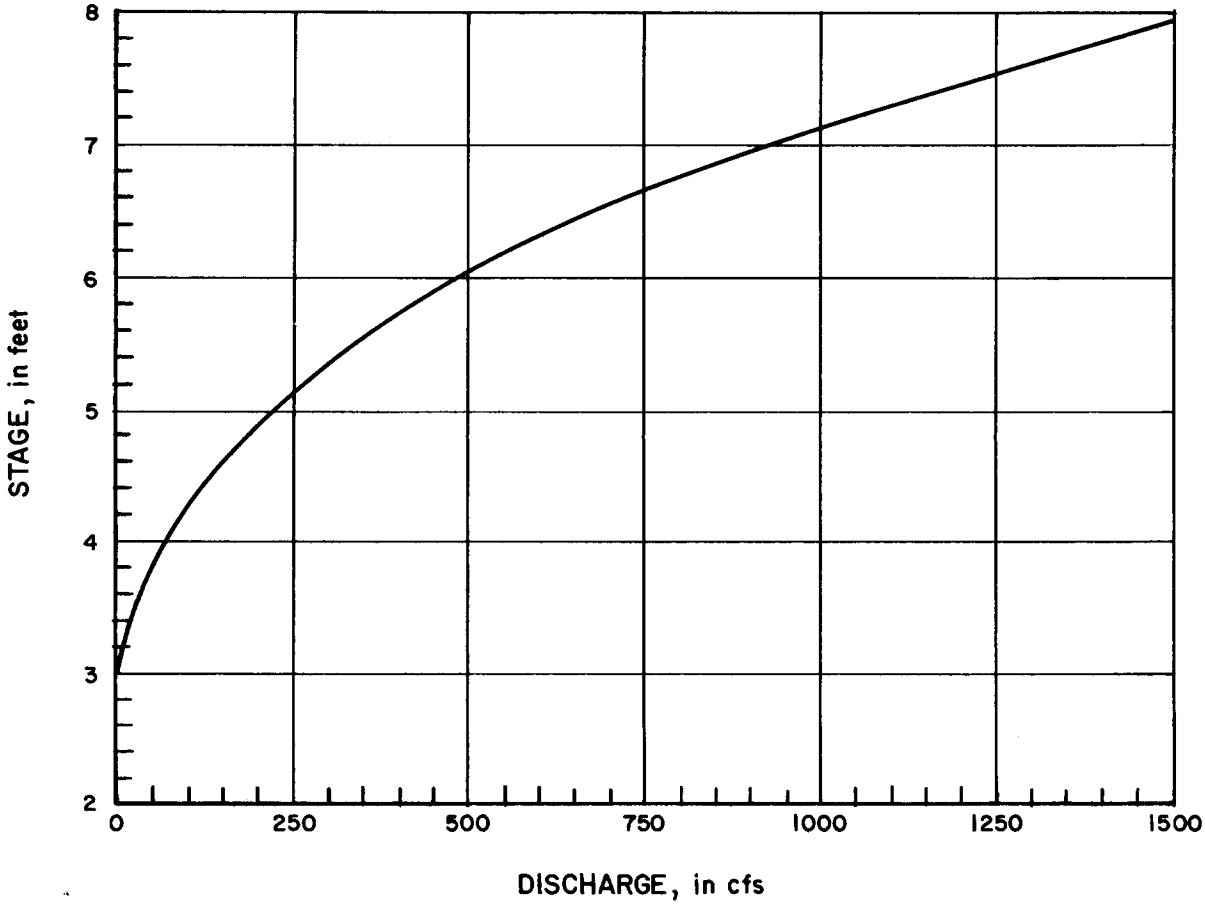


STARVATION DAM AND RESERVOIR
STRAWBERRY RIVER, UTAH

SPILLWAY RATING CURVE

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

CHART A-4



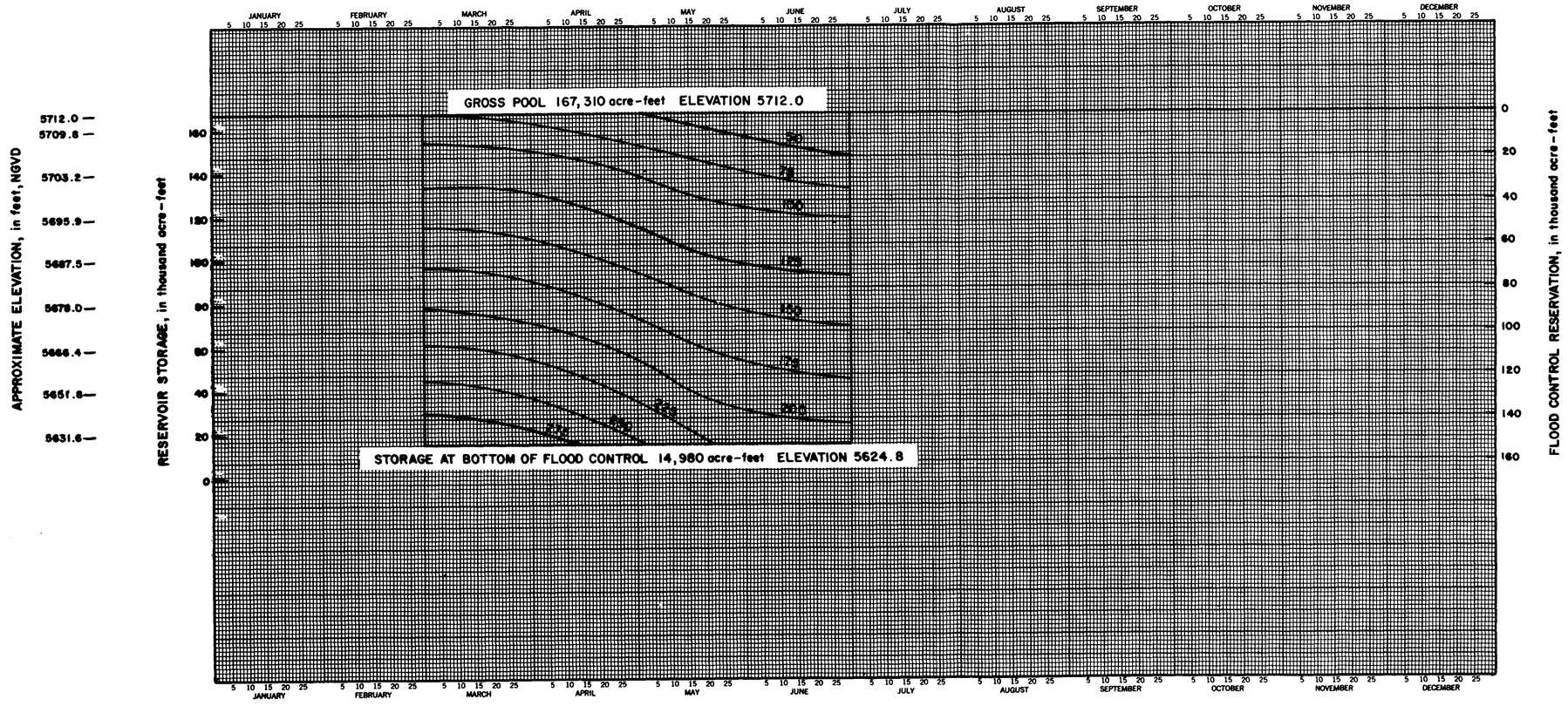
STARVATION DAM AND RESERVOIR
STRAWBERRY RIVER, UTAH

DISCHARGE RATING CURVE

STRAWBERRY RIVER NEAR DUCHESNE

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

CHART A-5



NOTES:

1. Parameter values are forecasted remaining regulated inflow in thousands of acre-feet into Starvation Reservoir between the given date and July 31.
2. When available storage space is less than the required flood control space as indicated on this diagram water shall be released as rapidly as possible without causing flows in the Strawberry River at Duchesne to exceed 2,200 cfs in so far as possible.
3. Do not release more than 1,800 cfs unless directed to do so by the Regional Director of the Upper Colorado Region, U.S. Bureau of Reclamation.
4. Notify the City of Duchesne if a release greater than 1,300 cfs is required.
5. Consideration will be given to early reservoir drawdown if the February 1 snowmelt forecast for Starvation Reservoir indicates that there is a possibility of flood space encroachment on March 1, based upon that forecast and actual reservoir storage during February.

STARVATION DAM AND RESERVOIR
Strawberry River, Utah

FLOOD CONTROL DIAGRAM

Prepared Pursuant to Flood Control Regulations for Starvation Dam & Reservoir in accordance with the Codes of Federal Regulations Title 33 Part 208.11

APPROVED: _____
Brigadier General, USA, Division Engineer
South Pacific Division

APPROVED: _____
Regional Director, Upper Colorado Region
U.S.B.R.

Effective Date 1/4/89

CHART A-6

STARVATION DAM AND RESERVOIR

STRAWBERRY RIVER, UTAH

EXHIBIT B

CODE OF FEDERAL REGULATIONS: TITLE 33, PARAGRAPH 208.11

SEPTEMBER 1988

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
SACRAMENTO, CALIFORNIA

absence of any indication that further public comment would shed any new light on the matter, OSHA concludes that no change in the standard is warranted. Accordingly, the ground-fault protection standard at 29 CFR 1910.309(c) and 29 CFR 1926.400(h), as promulgated on December 21, 1976, is hereby reaffirmed.

(Secs. 6(b) and 8(c), Pub. L. 91-596, 84 Stat. 1593, 1599 (29 U.S.C. 655, 657); sec. 107, Pub. L. 91-54, 83 Stat. 96 (40 U.S.C. 333); Secretary of Labor's Order No. 8-76 (41 FR 25059); 29 CFR Part 1911.)

Signed at Washington, D.C., this 3d day of October 1978.

EULA BINGHAM,
Assistant Secretary of Labor.

[FR Doc. 78-28687 Filed 10-12-78; 8:45 am]

[3710-92-M]

Title 33—Navigation and Navigable Waters

CHAPTER II—CORPS OF ENGINEERS, DEPARTMENT OF THE ARMY

[ER 1110-2-241]

PART 208—FLOOD CONTROL REGULATIONS

Use of Storage Allocated for Flood Control and Navigation Purposes

AGENCY: U.S. Army Corps of Engineers, DOD.

ACTION: Final rule.

SUMMARY: This revision of 33 CFR 208.11 regulations prescribes the policy and procedure for regulating reservoir projects capable of regulation for flood control or navigation and the use of storage allocated for such purposes and provided on the basis of flood control and navigation. The revised regulations are applicable to dam and reservoir projects licensed, maintained, and operated under provisions of the Federal Power Act (41 Stat. 1063 (16 U.S.C. 791(A))), Pub. L. 83-436, and other similar authorizing legislation; as well as to reservoir projects constructed wholly or in part with Federal funds as directed by section 7 of the Flood Control Act of 1944. These regulations are intended to establish an understanding between project owners, operating agencies and the Corps of Engineers with regard to certain activities and responsibilities concerning water control management throughout the Nation in the interest of flood control and navigation. Interested persons were given until November 2, 1977 (42 FR 57141) to submit comments. No written comments were received.

DATES: This regulation is effective on October 15, 1978.

ADDRESSES: HQDA (DAEN-CWE-HY) Washington, D.C. 20314.

FOR FURTHER INFORMATION CONTACT:

Mr. Edgar P. Story, Engineering Division, Civil Works Directorate, Office of the Chief of Engineers, Washington, D.C. 20314 202-693-7330.

SUPPLEMENTARY INFORMATION: This final regulation is essentially the same as the proposed rule (42 FR 53637), however, certain reordering has been done of the reference material presented in § 208.11(b). Specifically, excerpts from sections 4(e), 10(a), and 10(c) of the Federal Power Act have been added for improved clarity. Also Federal Power Commission order No. 540 issued October 31, 1975, and published November 7, 1975 (40 FR 51998), amending § 2.9 of the Commission's general policy and interpretations which prescribed standardized conditions (Forms) for inclusion in preliminary permits and licenses issued under part I of the Federal Power Act has been cited and appropriately excerpted. Reference to and citation from article 33 of Federal Power Commission license No. 2009 have been deleted in lieu thereof.

In addition to the proposed action, certain project names and pertinent data are added to and deleted from the list of projects shown in § 208.11(e), list of projects (42 FR 53637). The following projects are added to the list of projects:

(a) U.S. Army Corps of Engineers, Missouri River Division area: Webster Dam and Lake.

(b) U.S. Army Corps of Engineers, New England Division area:

(i) Bear Swamp Pumped Storage Project.

(ii) Turners Falls Reservoir.

(c) U.S. Army Corps of Engineers, North Pacific Division area:

(i) American Falls Dam and Reservoir.

(ii) Anderson Ranch Dam and Reservoir.

(iii) Arrowrock Dam and Reservoir.

(iv) Brownlee Dam and Reservoir.

(v) Grand Coulee Dam and Franklin D. Roosevelt Lake.

(vi) Hells Canyon Dam and Reservoir.

(vii) Kerr Dam and Flathead Lake.

(viii) Mayfield Dam and Reservoir.

(ix) Mossyrock Dam and Davisson Lake.

(x) Oxbow Dam and Reservoir.

(xi) Priest Rapids Dam and Reservoir.

(xii) Ririe Dam and Reservoir.

(xiii) Rocky Reach Dam and Lake Entiat.

(xiv) Ross Dam and Reservoir.

(xv) Upper Baker Dam and Baker Lake.

(xvi) Wanapum Dam and Reservoir.

(xvii) Wells Dam and Lake Pateros.

(d) U.S. Army Corps of Engineers, South Atlantic Division area: Lewis M. Smith Dam and Reservoir.

(e) U.S. Army Corps of Engineers, South Pacific Division area:

(i) Indian Valley Dam and Reservoir.

(ii) Lemon Dam and Reservoir.

(iii) Navajo Dam and Reservoir.

(iv) Paoina Dam and Reservoir.

(v) Vallecito Dam and Reservoir.

The following projects are deleted from the list of projects:

(a) U.S. Army Corps of Engineers, South Altantic Division area: H. Neely Henry Dam and Reservoir.

(b) U.S. Army Corps of Engineers, South Pacific Division area:

(i) Causey Dam and Reservoir.

(ii) Devil Creek Dam and Reservoir.

NOTE.—The Chief of Engineers has determined that this rule does not contain a major proposal requiring preparation of an inflation impact statement under Executive Order 11821 and OMB Circular A-107 (Statutory Authority Pub. L. 90-483).

Dated: October 10, 1978.

CHARLES I. MCGINNIS,
Major General, USA,
Director of Civil Works.

Section 208.11 is revised to read as follows:

§ 208.11 Regulations for use of storage allocated for flood control or navigation and/or project operation at reservoirs subject to prescription of rules and regulations by the Secretary of the Army in the interest of flood control and navigation.

(a) *Purpose.* This regulation prescribes the responsibilities and general procedures for regulating reservoir projects capable of regulation for flood control or navigation and the use of storage allocated for such purposes and provided on the basis of flood control and navigation, except projects owned and operated by the Corps of Engineers; the International Boundary and Water Commission, United States and Mexico; and those under the jurisdiction of the International Joint Commission, United States, and Canada, and the Columbia River Treaty. The intent of this regulation is to establish an understanding between project owners, operating agencies, and the Corps of Engineers.

(b) *Responsibilities.* The basic responsibilities of the Corps of Engineers regarding project operation are set out in the cited authority and described in the following paragraphs:

(1) Section 7 of the Flood Control Act of 1944 (58 Stat. 890, 33 U.S.C. 709) directs the Secretary of the Army to prescribe regulations for flood control and navigation in the following manner:

Hereafter, it shall be the duty of the Secretary of War to prescribe regulations for the use of storage allocated for flood control or navigation at all reservoirs constructed wholly or in part with Federal funds provided on the basis of such purposes, and the operation of any such project shall be in accordance with such regulations: *Provided*, That this section shall not apply to the Tennessee Valley Authority, except that in case of danger from floods on the lower Ohio and Mississippi Rivers the Tennessee Valley Authority is directed to regulate the release of water from the Tennessee River into the Ohio River in accordance with such instructions as may be issued by the War Department.

(2) Federal Energy Regulatory Commission (formerly Federal Power Commission (FPC)) licenses.

(i) Responsibilities of the Secretary of the Army and/or the Chief of Engineers in Federal Energy Regulatory Commission (FERC) licensing actions are set out in the Federal Power Act. Pertinent sections of that Act are cited herein. The Commission may also stipulate, as part of license conditions, that the licensee enter into an agreement with the Department of the Army providing for operation of the project during flood times, in accordance with rules and regulations prescribed by the Secretary of the Army.

(A) Section 4(e) of the Federal Power Act requires approval by the Chief of Engineers and the Secretary of the Army of plans of dams or other structures affecting the navigable capacity of any navigable waters of the United States, prior to issuance of a license by the Commission as follows:

The Commission is hereby authorized and empowered to issue licenses to citizens * * * for the purpose of constructing, operating, and maintaining dams, water conduits, reservoirs, powerhouses, transmission lines, or other project works necessary or convenient for the development and improvement of navigation and for the development, transmission, and utilization of power across, along, from or in any of the streams or other bodies of water over which Congress has jurisdiction * * * *Provided further*, That no license affecting the navigable capacity of any navigable waters of the United States shall be issued until the plans of the dam or other structures affecting navigation have been approved by the Chief of Engineers and the Secretary of the Army.

(B) Sections 10(a) and 10(c) of the Federal Power Act specify conditions of project licenses including the following:

(1) Section 10(a). That the project adopted * * * shall be such as in the judgment of the Commission will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for the use of benefit of interstate or foreign commerce, for the improvement and utilization of waterpower development, and for other beneficial public use * * *.

(2) Section 10(c). That the licensee shall * * * so maintain and operate said works as not to impair navigation, and shall conform to such rules and regulations as the Commisssion may from time to time prescribe for the protection of life, health, and property.* * *

(C) Section 18 of the Federal Power Act directs the operation of any navigation facilities built under the provision of that act, be controlled by rules and regulations prescribed by the Secretary of the Army as follows:

The operation of any navigation facilities which may be constructed as part of or in connection with any dam or diversion structure built under the provisions of this Act, whether at the expense of a licensee hereunder or of the United States, shall at all times be controlled by such reasonable rules and regulations in the interest of navigation; including the control of the pool caused by such dam or diversion structure as may be made from time to time by the Secretary of the Army, * * *

(ii) Federal Power Commission order No. 540 issued October 31, 1975, and published November 7,1975 (40 FR 51998), amending section 2.9 of the Commission's general policy and interpretations prescribed standardized conditions (forms) for inclusion in preliminary permits and licenses issued under part I of the Federal Power Act. As an example, article 12 of standard form L-3, titled: "Terms and Conditions of License for Constructed Major Projects Affecting Navigable Waters of the United States," sets out the Commission's interpretation of appropriate sections of the Act, which deal with navigation aspects, and attendant responsibilities of the Secretary of the Army in licensing actions as follows:

The United States specifically retains and safeguards the right to use water in such amount, to be determined by the Secretary of the Army, as may be necessary for the purposes of navigation on the navigable waterway affected; and the operation of the Licensee, so far as they affect the use, storage and discharge from storage of waters affected by the license, shall at all times be controlled by such reasonable rules and regulations as the Secretary of the Army may prescribe in the interest of navigation, and as the Commission may prescribe for the protection of life, health, and property, * * *, and the Licensee shall release water from the project reservoir at such rate * * *, as the Secretary of the Army may prescribe in the interest of navigation, or as the Commission may prescribe for the other purposes hereinbefore mentioned.

(3) Section 9 of Public Law 436, 83d Congress (68 Stat. 303) provides for the development of the Coosa River, Ala. and Ga., and directs the Secretary of the Army to prescribe rules and regulations for project operation in the interest of flood control and navigation as follows:

The operation and maintenance of the dams shall be subject to reasonable rules and regulations of the Secretary of the Army in the interest of flood control and navigation.

NOTE.—This Regulation will also be applicable to dam and reservoir projects operated under provisions of future legislative acts wherein the Secretary of the Army is directed to prescribe rules and regulations in the interest of flood control and navigation. The Chief of Engineers, U.S. Army Corps of Engineers, is designated the duly authorized representative of the Secretary of the Army to exercise the authority set out in the congressional acts. This regulation will normally be implemented by letters of understanding between the Corps of Engineers and project owner and will incorporate the provisions of such letters of understanding prior to the time construction renders the project capable of significant impoundment of water. A water control agreement signed by both parties will follow when deliberate impoundment first begins or at such time as the responsibilities of any corps-owned projects may be transferred to another entity. Promulgation of this regulation for a given project will occur at such time as the name of the project appears in the FEDERAL REGISTER in accordance with the requirements of § 208.11(d)(11). When agreement on a water control plan cannot be reached between the corps and the project owner after coordination with all interested parties, the project name will be entered in the FEDERAL REGISTER and the Corps of Engineers plan will be the officials water control plan until such time as differences can be resolved.

(c) *Scope and terminology.* This regulation applies to Federal authorized flood control and/or navigation storage projects, and to non-Federal projects which require the Secretary of the Army to prescribe regulations as a condition of the license, permit or legislation, during the planning, design and construction phases, and throughout the life of the project. In compliance with the authority cited above, this regulation defines certain activities and responsibilities concerning water control management throughout the Nation in the interest of flood control and navigation. In carrying out the conditions of this regulation, the owner and/or operating agency will comply with applicable provisions of Pub. L. 85-624, the Fish and Wildlife Coordination Act of 1958, and Pub. L. 92-500, the Federal Water Pollution Control Act Amendments of 1972. This regulation does not apply to local flood protection works governed by § 208.10, or to navigation facilities and associated structures which are otherwise covered by part 207 (Navigation Regulations) of title 33 of the code. Small reservoirs, containing less than 12,500 acre-feet of flood control or navigation storage, may be excluded from this regulation and covered under § 208.10, unless specifically required by law or conditions of the license or permit.

(1) The terms "reservoir" and "project" as used herein include all water resource impoundment projects constructed or modified, including natural lakes, that are subject to this regulation.

(2) The term "project owner" refers to the entity responsible for maintenance, physical operation, and safety of the project, and for carrying out the water control plan in the interest of flood control and/or navigation as prescribed by the Corps of Engineers. Special arrangements may be made by the project owner for "operating agencies" to perform these tasks.

(3) The term "letter of understanding" as used herein includes statements which consummate this regulation for any given project and define the general provisions or conditions of the local sponsor, or owner, cooperation agreed to in the authorizing legislative document, and the requirements for compliance with section 7 of the 1944 Flood Control Act, the Federal Power Act or other special congressional act. This information will be specified in the water control plan and manual. The letter of understanding will be signed by a duly authorized representative of the Chief of Engineers and the project owner. A "field working agreement" may be substituted for a letter of understanding, provided that the specified minimum requirements of the latter, as stated above, are met.

(4) The term "water control agreement" refers to a compliation of water control criteria, guidelines, diagrams, release schedules, rule curves and specifications that basically govern the use of reservoir storage space allocated for flood control or navigation and/or release functions of a water control project for these purposes. In general, they indicate controlling or limiting rates of discharge and storage space required for flood control and/or navigation, based on the runoff potential during various seasons of the year.

(5) For the purpose of this regulation, the term "water control plan" is limited to the plan of regulation for a water resources project in the interest of flood control and/or navigation. The water control plan must conform with proposed allocations of storage capacity and downstream conditions or other requirements to meet all functional objectives of the particular project, acting separately or in combination with other projects in a system.

(6) The term "real-time" denotes the processing of current information or data in a sufficiently timely manner to influence a physicial response in the system being monitored and controlled. As used herein the term connotes * * * the analyses for and execution of water control decisions for both minor and major flood events and for navigation, based on prevailing hydrometeorological and other conditions and constraints, to achieve efficient management of water resource systems.

(d) *Procedures.* (1) *Conditions during project formulation.* During the planning and design phases, the project owner should consult with the Corps of Engineers regarding the quantity and value of space to reserve in the reservoir for flood control and/or navigation purposes, and for utilization of the space, and other requirements of the license, permit or conditions of the law. Relevant matters that bear upon flood control and navigation accomplishment include: runoff potential, reservoir discharge capability, downstream channel characteristics, hydrometeorological data collection, flood hazard, flood damage charateristics, real estate acquisition for flowage requirements (fee and easement), and resources required to carry out the water control plan. Advice may also be sought on determination of and regulation for the probable maximum or other design flood under consideration by the project owner to establish the quantity of surcharge storage space, and freeboard elevation of top of dam or embankment for safety of the project.

(2) *Corps of Engineers involvement.* If the project owner is responsible for real-time implemenetation of the water control plan, consultation and assistance will be provided by the Corps of Engineers when appropriate and to the extent possible. During any emergency that affects flood control and/or navigation, the Corps of Engineers may temporarily prescribe regulation of flood control or navigation storage space on a day-to-day (real-time) basis without request of the project owner. Appropriate consideration will be given for other authorized project functions. Upon refusal of the project owner to comply with regulations prescribed by the Corps of Engineers, a letter will be sent to the project owner by the Chief of Engineers or his duly authorized representative describing the reason for the regulations prescribed, events that have transpired, and notification that the project owner is in violation of the Code of Federal Regulations. Should an impasse arise, in that the project owner or the designated operating entity persists in noncompliance with regulations prescribed by the Corps of Engineers, measures may be taken to assure compliance.

(3) *Corps of Engineers implementation of real-time water control decisions.* The Corps of Engineers may prescribe the continuing regulation of flood control storage space for any project subject to this regulation on a day-to-day (real-time) basis. When this is the case, consultation and assistance from the project owner to the extent possible will be expected. Special requests by the project owner, or appropriate operating entity, are preferred before the Corps of Engineers offers advice on real-time regulation during surcharge storage utilization.

(4) *Water control plan and manual.* Prior to project completion, water control managers from the Corps of Engineers will visit the project and the area served by the project to become familiar with the water control facilities, and to insure sound formulation of the water control plan. The formal plan of regulation for flood control and/or navigation, referred to herein as the water control plan, will be developed and documented in a water control manual prepared by the Corps of Engineers. Development of the manual will be coordinated with the project owner to obtain the necessary pertinent information, and to insure compatibility with other project purposes and with surcharge regulation. Major topics in the manual will include: Authorization and description of the project, hydrometeorology, data collection and communication networks, hydrologic forecasting, the water control plan, and water resource management functions, including responsibilities and coordination for water control decisionmaking. Special instructions to the dam tender or reservoir manager on data collection, reporting to higher Federal authority, and on procedures to be followed in the event of a communication outage under emergency conditions, will be prepared as an exhibit in the manual. Other exhibits will include copies of this regulation, letters of understanding consummating this regulation, and the water control agreements. After approval by the Chief of Engineers or his duly authorized representative, the manual will be furnished the project owner.

(5) *Water control agreement.* (i) A water control diagram (graphical) will be prepared by the Corps of Engineers for each project having variable space reservation for flood control and/or navigation during the year; e.g., variable seasonal storage, joint-use space, or other rule curve designation. Reservoir inflow parameters will be included on the diagrams when appropriate. Concise notes will be included on the diagrams prescribing the use of storage space in terms of release schedules, runoff, nondamaging or other controlling flow rates downstream of the damsite, and other major factors as appropriate. A water control release schedule will be prepared in tabular form for projects that do not have variable space reservation for flood control and/or navigation. The water control diagram or release schedule will be signed by a duly authorized representative of the Chief of Engineers, the project owner, and the designated operating agency, and will be used as the basis for carrying out this

regulation. Each diagram or schedule will contain a reference to this regulation.

(ii) When deemed necessary by the Corps of Engineers, information given on the water control diagram or release schedule will be supplemented by appropriate text to assure mutual understanding on certain details or other important aspects of the water control plan not covered in this regulation, on the water control diagram or in the release schedule. This material will include clarification of any aspects that might otherwise result in unsatisfactory project performance in the interest of flood contol and/or navigation. Supplementation of the agreement will be necessary for each project where the Corps of Engineers exercises the discretionary authority to prescribe the flood control regulation on a day-to-day (real-time) basis. The agreement will include delegation of the responsibility. The document should also cite, as appropriate, section 7 of the 1944 Flood Control Act, the Federal Power Act and/or other congressional legislation authorizing construction an/or directing operation of the project.

(iii) All flood control regulations published in the FEDERAL REGISTER under this section (part 208) of the code prior to the date of this publication which are listed in paragraph 208.11(e) are hereby superseded.

(iv) Nothing in this regulation prohibits the promulgation of specific regulations for a project in compliance with the authorizing acts, when agreement on acceptable regulations cannot be reached between the Corps of Engineers and the owner.

(6) *Hydrometeorological instrumentation.* The project owner will provide instrumentation in the vicinity of the damsite and will provide communication equipment necessary to record and transmit hydrometeorological and reservoir data to all appropriate Federal authorities on a real-time basis unless there are extenuating circumstances or are otherwise provided for as a condition of the license or permit. For those projects where the owner retains responsibility for real-time implementation of the water control plan, the owner will also provide or arrange for the measurement and reporting of hydrometeorological parameters required within and adjacent to the watershed and downstream of the damsite, sufficient to regulate the project for flood control and/or navigation in an efficient manner. When data collection stations outside the immediate vicinity of the damsite are required, and funds for installation, observation, and maintenance are not available from other sources, the Corps of Engineers may agree to share the costs for such stations with the project owner. Availability of funds and urgency of data needs are factors which will be considered in reaching decisions on cost sharing.

(7) *Project safety.* The project owner is responsible for the safety of the dam and appurtenant facilities and for regulation of the project during surcharge storage utilization. Emphasis upon the safety of the dam is especially important in the event surcharge storage is utilized, which results when the total storage space reserved for flood control is exceeded. Any assistance provided by the Corps of Engineers concerning surcharge regulation is to be utilized at the discretion of the project owner, and does not relieve the owner of the responsibility for safety of the project.

(8) *Notification of the general public.* The Corps of Engineers and other interested Federal and State agencies, and the project owner will jointly sponsor public involvement activities, as appropriate, to fully apprise the general public of the water control plan. Public meetings or other effective means of notification and involvement will be held, with the initial meeting being conducted as early as practicable but not later than the time the project first becomes operational. Notice of the initial public meeting shall be published once a week for 3 consecutive weeks in one or more newspapers of general circulation published in each county covered by the water control plan. Such notice shall also be used when appropriate to inform the public of modifications in the water control plan. If no newspaper is published in a county, the notice shall be published in one or more newspapers of general circulation within that county. For the purposes of this section a newspaper is one qualified to publish public notices under applicable State law. Notice shall be given in the event significant problems are anticipated or experienced that will prevent carrying out the approved water control plan or in the event that an extreme water condition is expected that could produce severe damage to property or loss of life. The means for conveying this information shall be commensurate with the urgency of the situation. The water control manual will be made available for examination by the general public upon request at the appropriate office of the Corps of Engineers, project owner or designated operating agency.

(9) *Other generalized requirements for flood control and navigation.* (i) Storage space in the reservoirs allocated for flood control and navigation purposes shall be kept available for those purposes in accordance with the water control agreement, and the plan of regulation in the water control manual.

(ii) Any water impounded in the flood control space defined by the water control agreement shall be evacuated as rapidly as can be safely accomplished without causing downstream flows to exceed the controlling rates; i.e., releases from reservoirs shall be restricted insofar as practicable to quantities which, in conjunction with uncontrolled runoff downstream of the dam, will not cause water levels to exceed the controlling stages currently in force. Although conflicts may arise with other purposes, such as hydropower, the plan or regulation may require releases to be completely curtailed in the interest of flood control or safety of the project.

(iii) Nothing in the plan of regulation for flood control shall be construed to require or allow dangerously rapid changes in magnitudes of releases. Releases will be made in a manner consistent with requirements for protecting the dam and reservoir from major damage during passage of the maximum design flood for the project.

(iv) The project owner shall monitor current reservoir and hydro- meteorological conditions in and adjacent to the watershed and downstream of the damsite, as necessary. This and any other pertinent information shall be reported to the Corps of Engineers on a timely basis, in accordance with standing instructions to the damtender or other means requested by the Corps of Engineers.

(v) In all cases where the project owner retains responsibility for real-time implementation of the water control plan, he shall make current determinations of: Reservoir inflow, flood control storage utilized, and scheduled releases. He shall also determine storage space and releases required to comply with the water control plan prescribed by the Corps of Engineers. The owner shall report this information on a timely basis as requested by the Corps of Engineers.

(vi) The water control plan is subject to temporary modification by the Corps of Engineers if found necessary in time of emergency. Requests for and action on such modifications may be made by the fastest means of communication available. The action taken shall be confirmed in writing the same day to the project owner and shall include justification for the action.

(vii) The project owner may temporarily deviate from the water control plan in the event an immediate short-term departure is deemed necessary for emergency reasons to protect the safety of the dam, or to avoid other serious hazards. Such actions shall be immediately reported by the fastest

means of communication available. Actions shall be confirmed in writing the same day to the Corps of Engineers and shall include justification for the action. Continuation of the deviation will require the express approval of the Chief of Engineers, or his duly authorized representative.

(viii) Advance approval of the Chief of Engineers, or his duly authorized representative, is required prior to any deviation from the plan of regulation prescribed or approved by the Corps of Engineers in the interest of flood control and/or navigation, except in emergency situations provided for in paragraph (d)(9)(vii) of this section. When conditions appear to warrant a prolonged deviation from the approved plan, the project owner and the Corps of Engineers will jointly investigate and evaluate the proposed deviation to insure that the overall integrity of the plan would not be unduly compromised. Approval of prolonged deviations will not be granted unless such investigations and evaluations have been conducted to the extent deemed necessary by the Chief of Engineers, or his designated representatives, to fully substantiate the deviation.

(10) *Revisions.* The water control plan and all associated documents will be revised by the Corps of Engineers, as necessary, to reflect changed conditions that come to bear upon flood control and navigation, e.g., reallocation of reservoir storage space due to sedimentation or transfer of storage space to a neighboring project. Revision of the water control plan, water control agreement, water control diagram, or release schedule requires approval of the Chief of Engineers or his duly authorized representative. Each such revision shall be effective upon the date specified in the approval. The original (signed document) water control agreement shall be kept on file in the Office, Chief of Engineers, Department of the Army, Washington, D.C. Copies of the agreement shall be kept on file and may be obtained from the office of the project owner, or from the office of the appropriate Division Engineer, Corps of Engineers.

(11) *Federal Register.* The following information for each project subject to section 7 of the 1944 Flood Control Act and other applicable congressional acts shall be published in the FEDERAL REGISTER prior to the time the projects becomes operational and prior to any significant impoundment before project completion or * * * at such time as the responsibility for physical operation and maintenance of the Corps of Engineers owned projects is transferred to another entity: (i) Reservoir, dam, and lake names, (ii) stream, county, and State corresponding to the damsite location, (iii) the maximum current storage space in acre-feet to be reserved exclusively for flood control and/or navigation purposes, or any multiple-use space (intermingled) when flood control or navigation is one of the purposes, with corresponding elevations in feet above mean sea level, and area in acres at the upper and lower limits of said space, (iv) the name of the project owner, and (v) congressional legislation authorizing the project for Federal participation.

(e) *List of projects.* The following tables, "Pertinent Project Data—Section 208.11 Regulation," show the pertinent data for projects which are subject to this regulation.

(Sec. 7, Pub. L. 78-534, 58 Stat. 890 (33 U.S.C. 709); the Federal Power Act, 41 Stat. 1063 (16 U.S.C. 791(A)); and Sec. 9, Pub. L. 83-436, 68 Stat. 303.)

[FR Doc. 78-29100 Filed 10-12-78; 8:45 am]

with regard to certain activities and responsibilities concerning water control management throughout the nation in the interest of flood control and navigation.

EFFECTIVE DATE: November 30, 1981.

FOR FURTHER INFORMATION CONTACT:

Mr. Earl Eiker, Chief, Water Control/ Quality Section, Office, Commander, U.S. Army Corps of Engineers, Department of the Army, Washington, DC 20314 (202) 272-0234.

SUPPLEMENTARY INFORMATION:

Note.—The Commander has determined that this rule is not a "major rule" proposal requiring preparation of a regulatory impact analysis under Executive Order 12291.

Dated: November 16, 1981.

James W. Ray,

Colonel, Corps of Engineers, Executive Director, Engineer Staff.

PART 208—FLOOD CONTROL REGULATIONS

§ 208.11 [Amended]

Accordingly 33 CFR 208.11 is amended by revising the table in paragraph (e) as follows:

LIST OF PROJECTS

[Pertinent project data]

Project name[1]	State, county and stream[1]	Exclusive-use					Multiple-use					Project owner[2]	Authorizing legislation[3]
		Flood control/navigation					Flood control/navigation						
		Storage (1,000 AF)	Elevation limits (feet, m.s.l.)		Area (acres)		Storage (1,000 AF)	Elevation limits (feet, m.s.l.)		Area (acres)			
			Upper	Lower	Upper	Lower		Upper	Lower	Upper	Lower		
Alpine Dam	IL, Winnebago, Keith Cr	0.6	796.0	764.0	52	0						City of Rockford, IL	PWA Proj.
Agency Valley Dam & Res	OR, Malheur, N. Fork Malheur R						60.0	3,340.0	3,263.2	1,900	0	USBR	PL 68-292.
American Fall Dam & Res	ID, Power, Snake River						1,700.0	4,343.2	4,295.6	56,100	0	USBR	FERC 2259.
Anderson Ranch Dam & Res.	ID, Elmore, S. Fk. Boise River						423.2	4,196.0	4,043.0	4,740	1,150	USBR	Act of 1939 53 Stat 1187.
Arrowrock Dam & Res	ID, Elmore, Boise River						286.6	3,216.0	2,967.0	3,100	200	USBR	Act of 1902 32 Stat 388.
Bear Cr Dam	MO, Marion Ralls, Bear Cr	8.7	546.5	520.0	540	0						City of Hannibel, MO	PL 83-780.
Bear Swamp Pumped Storage.	MA, Franklin, Deerfield R Trib											New England Pwr Co	Fed Pwr Act.
Big Dry Creek and Div	CA, Fresno, Big Dry Cr & Dog Cr	16.2	425.0	393.0	1,530	0						Reclamation Board of CA	PL 77-228.
Bocu Dam & Res	CA, Nevada, Little Truckee R					41	5,605.0	5,596.4	980	873		USBR	PL 61-289, PL 68-292.
Bonny Dam & Res	CO, Yuma, S. Fork Republican R	128.8	3,710.0	3,672.0	5,036	2,042						USBR	PL 78-534.
Boysen Dam & Res	WY, Fremont, Wild River	146.0	4,732.0	4,725.0	22,100	19,560	146.1	4,725.0	4,717.0	19,560	16,955	USBR	PL 78-534.
Brownlee Dam & Res	OR, Baker, ID, Washington, Snake River						980.3	2,077.0	1,976.0	13,840	6,650	Idaho Pwr Co	FERC No 1971-C.
Bully Cr Dam & Res	OR, Malheur, Bully Creek						31.6	2,523.0	2,456.8	1,082	140	USBR	PL 86-248.
Camanche Dam & Res	CA, San Joaquin, Mokelumne R						200.0	235.5	205.1	7,600	5,507	East Bay Mun Util Dist	PL 86-645.
Canyon Ferry Dam & Lk	MT, Lewis, Clark, Missouri R						799.1	3,797.0	3,770.0	34,435	24,126	USBR	PL 78-534.
Cedar Bluff Dam & Res	KS, Trego, Smoky Hill River	191.9	2,166.0	2,144.0	10,790	6,869						USBR	PL 78-534.
Clark Canyon Dam & Res	MT, Beaverhead, Beaverhead River	79.1	5,560.4	5,546.1	5,903	5,160	50.4	5,546.1	5,535.7	5,160	4,496	USBR	PL 78-534.
Del Valle Dam & Res	CA, Alameda, Alameda Cr	37.0	745.0	703.1	1,060	710	1.0	03.1	702.2	710	700	CA Dept of Wtr Rsc	PL 87-874.
Don Pedro Dam & Lk	CA, Tuolumne, Tuolumne R						340.0	830.0	802.0	12,900	11,260	Modesto & Turlock Irr	PL 78-534.
East Canyon Dam & Res	UT, Morgan, East Canyon Creek						48.0	5,705.5	5,577.0	684	127	USBR	PL 81-273.
Echo Dam & Res	UT, Summit, Weber River						74.0	5,560.0	5,450.0	1,455	0	USBR	PL 81-273.
Emigrant Dam & Res	OR, Jackson, Emigrant Cr	39.0	2,241.0	2,131.5	801	80						USBR	PL 83-606.
Enders Dam & Res	NB, Chase, Frenchman Cr	30.0	3,127.0	3,112.3	2,405	1,707						USBR	PL 78-534.
Folsom Dam & Lk	CA, Sacramento, American R						400.0	466.0	427.0	11,450	9,040	USBR	PL 81-356.
Friant Dam & Millerton LK	CA, Fresno, San Joaquin River						390.0	578.0	466.3	4,850	2,101	USBR	PL 75-392, PL 76-868.
Gaston-Roanoke Rapids Dam Res.	NC, Northhampton, Halifax, Roanoke R	63.0	203.0	200.0	22,500	20,300						VA Elec & Pwr Co	Fed Pwr Act.
Glen Elder Dam & Waconda Lk.	KS, Mitchel, Solomon R	722.3	1,488.0	1,455.6	33,682	12,602						USBR	PL 78-534, PL 79-526.
Glendo Dam & Res	WY, Platte, N. Platte R	271.9	4,653.0	4,653.0,	17,966	12,365						USBR	PL 78-534.
Grand Coulee Dam, FDR Lk.	WA, Okanogan, Grant, Columbia R						5,185.5	1,290.0	1,208.0	82,280	45,592	USBR	PL 89-561.
H. Neely Henry	AL, Calhoun, St. Clair, Coosa River						49.7	508.0	502.5	11,235	7,632	Alabama, Pwr Co	PL 83-436.
Heart Butte Dam & Lk Tschida.	ND, Grant, Heart River	150.0	2,094.5	2,064.5	6,625	3,400						USBR	PL 78-534.
Hells Canyon Dam & Res	OR, Wallowa, ID, Adams, Snake River						11.7	1,688.0	1,683.0	2,380	2,280	Idaho Pwr Co	FERC No 1971-A.
Hoover Dam & Lake Mead	NV, Clark, AZ, Mohave, Colorado R	1,500	1,229.0	1,219.6	162,700	156,500	15.8	1,219.6	1,083.0	156,500	83,500	USBR	PL 70-642.
Hungry Horse Dam & Res	MT, Flathead, S. Fork Flathead R	2,982.0	3,560.0	3,336.0	23,800	5,400						USBR	PL 78-329.
Indian Valley Dam & Res	CA, Lake, N. Fork Cache Creek						40.0	1,485.0	1,474.7	3,975	3,749	Yolo Cty Fl Cont & Wtr	PL 84-984 Cons Dist.
Jamestown Dam & Res	ND, Stutsman, James River	185.4	1,454.0	1,432.7	13,206	2,555	6.6	1,432.7	1,429.8	2,555	2,085	USBR	PL 78-534.
Kerr Dam, Flathead Lk	MT, Lake, Flathead R						1,219.0	2,893.0	2,883.0	125,560	120,000	Montana Pwr Co	FERC No 5.
Keyhole Dam & Res	WY, Crook, Belle Fourche River	140.2	4,111.5	4,099.3	13,686	9,394						USBR	PL 78-534.
Kirwin Dam & Res	KS, Phillips, N. Fork Solomon R	215.1	1,757.3	1,729.3	10,640	5,073						USBR	PL 78-534.
Lemon Dam & Res	CO, La Plata, Florida R						39.0	8,148	8,023	622	62	USBR	PL 84-485
Lewis M. Smith Dam & Res	AL, Walker, Culman, Sipsey Fork Black Warrior River.	280.0	522.0	510.0	25,700	21,200						Alabama Pwr Co	Fed Pwr Act.
Little Wood	ID, Blain, Little Wood River	30.0	5,237.3	5,127.8	574	0						USBR	PL 84-993.

LIST OF PROJECTS—Continued

[Pertinent project data]

Project name[1]	State, county and stream[1]	Exclusive-use					Multiple-use					Project owner[2]	Authorizing legislation[3]
		Flood control/navigation					Flood control/navigation						
		Storage (1,000 AF)	Elevation limits (feet, m.s.l.)		Area (acres)		Storage (1,000 AF)	Elevation limits (feet, m.s.l.)		Area (acres)			
			Upper	Lower	Upper	Lower		Upper	Lower	Upper	Lower		
Logan Martin Dam & Res	AL, Talladega, Coosa River	245.3	477.0	465.0	26,310	15,260						Alabama Pwr Co	PL 83-436.
Los Banos Dam & Detention.	CA, Merced, Los Banos Cr						14.0	353.5	327.8	619	467	USBR	PL 86-488.
Lost Creek Dam & Res	UT, Morgan, Lost Creek						20.0	6,005.0	5,912.0	365	93	USBR	PL 81-273.
Lovewell Dam & Res	KS, Jewell, White Rock Cr	50.5	1,595.3	1,582.6	5,025	2,986						USBR	PL 78-534.
Markham Ferry Dam, Lake Wash E. Hudson.	OK, Mayes, Grand Neosho River	244.2	636.0	619.0	18,000	10,900						Grand R Dam Authority	PL 76-476.
Mayfield Dam & Res	WA, Lewis, Cowlitz River						21.4	425.0	415.0	2,070	1,825	City of Tacoma	FPC No 2016-A.
Medicine Cr Dam Harry Strunk Lk.	NB, Frontier, Medicine Cr	52.2	2,386.2	2,366.1	3,465	1,850						USBR	PL 78-534.
Mossyrock Dam Davisson Lk.	WA, Lewis, Cowlitz River						1,397.0	778.5	621.5	11,800	5,000	City of Tacoma	FERC No 2016-B.
Navajo Dam & Res	NM, San Juan, Arriba, Rio, San Juan R						1,036.1	6,085.0	5,990.0	15,610	7,400	USBR	PL 84-485.
New Exchequer Dam & Lake.	CA, Tuolumne, Merced River						400.0	867.0	799.7	7,110	4,849	Merced Irr	PL 86-645.
New Melones Dam & Lk	CA, Tuolumne, Calaveras, Stanislaus R						450.0	1,088.0	1,049.5	12,500	10,900	USBR	PL 87-874.
Norton Dam Res	KS, Norton, Prairie Dog Cr	98.8	2,331.4	2,304.3	5,316	5,316						USBR	PL 78-534.
Ochoco Dam & Res	OR, Crook, Ochoco Creek	51.4	3,136.2	3,048.1	1,150	120						USBR	PL 84-992.
Oroville Dam & Lake	CA, Butte, Feather River						750.0	900.0	848.5	15,800	13,346	CA Dept of Wtr Rsc	PL 85-500.
Oxbow Dam & Res	OR, Baker, ID, Adams, Snake River						5.0	1,805.0	1,800.0	1,165	1,115	Idaho Pwr Co	FERC No 1971-B.
Pactola Dam & Res	SD, Pennington, Rapid Creek	34.0	4,621.5	4,580.2	1,232	860						USBR	PL 78-534.
Palisades Dam & Res	ID, Bonneville, Snake River	1,202.0	5,620.0	5,452.4	16,100	2,170						USBR	PL 81-864.
Paonia Dam & Res	CO, Gunnision, Muddy Creek						17.0	6,447.5	6,373.0	334	120	USBR	PL 80-177, PL 84-485.
Pineview Dam & Res	UT, Weber, Odgen River						110.0	4,900.0	4,818.0	2,874	0	USBR	PL 81-273.
Platoro Dam & Res	CO, Conejos, Conejos R	6.0	10,034.0	10,027.5	947	920	54.0	10,027.5	9,911.0	920	0	USBR	PL 76-640.
Priest Rapid Dam & Res	WA, Grant, Columbia R						44.0	488.0	481.0	7,100	6,500	Grant County PUD No 2	FERC No 2114-A.
Pineville Dam & Res	OR, Crook, Crooked Cr	153.0	3,234.8	3,112.0	2,990	120						USBR	PL 84-992.
Prosser Cr & Res	CA, Nevada, Prosser Cr						20.0	5,741.2	5,703.7	745	334	USBR	PL 84-858.
Pueblo Dam & Res	CO, Pueblo, Arkansaw R	27	4,898.7	4,893.8	5664	5350	66.0	4,893.8	4,880.6	5,350	4,641	USBR	PL 87-590
Red Willow Dam, Hugh Butler Lk.	NB, Frontier, Red Willow	48.9	2,604.0	2,581.8	2,682	1,629						USBR	PL 78-534, PL 85-783.
Ririe Dam & Res	ID, Bonneville, Willow Cr						99.0	5,119.0	5,023.0	1,560	360	USBR	PL 87-874.
Rocky Reach Dam Lk Entiat.	WA, Chelan, Columbia R						37.0	707.0	703.0	9,600	0	Chelan Cnty PUD No 1	FERC No 2145.
Ross Dam & Res	WA, Whatcom, Skagit R						530.5	1,602.5	1,475.0	6,000	2,168	City of Seattle	FERC No 553-C.
Sanford Dam & Lk Meredith.	TX, Hutchison, Canadian R	462.1	2,965.0	2,941.3	21,640	17,320						USBR	PL 81-898.
Savage River Dam & Res	MD, Garrett, Savage R						16.0	1,468.5	1,400.0	366	127	Upper Potomac R Commission.	PL 78-534.
Shadehill Dam & Res	SD, Perkins, Grand R	217.7	2,302.0	2,272.0	9,900	4,800						USBR	PL 78-534.
Shasta Dam & Lake	CA, Shasta, Sacramento R						1,300.0	1,067.0	1,018.6	29,570	23,894	USBR	PL 75-392.
Smith Mtn & Leesville Dam & Res.	VA, Bedford, Compbell, VA, Pittsylvania, Roanoke River.						(4)	(4)	(4)	(4)	(4)	Appalachian Pwr Co	Fed Pwr Act.
Stampede Dam & Res	CA, Sierra, Little Truckee R						226.5	5,948.7	5,942.1	3,430	3,230	USBR	PL 84-858.
Trenton Dam & Res	NB, Hitchcock, Republican R	133.8	2,773.0	2,752.0	7,975	4,974						USBR	PL 78-534.
Twitchell Dam & Res	CA, Santa Barbara, Cuyama River	89.0	651.5	623.0	3,690	2,650						USBR	PL 83-774.
Upper Baker Dam, Baker Lk.	WA, Whatcom, Baker River						220.6	724.0	655.0	4,890	0	Puget Sound Pwr Light Co.	PL 89-298, FERC 2150-B.
Vallecito Dam & Res	CO, La Plata, Los Pinos R						115.4	7,665	7,600	2,723	693	USBR	PL 61-288, PL 68-292.
Wanapum Dam & Res	WA, Grant, Columbia R						151.6	571.5	560.0	14,400	9,600	Grant Cnty PUD No 2	FERC No 2114-B.
Wanship Dam & Rockport	UT, Summit, Weber River						61.0	6,037.0	5,930.0	1,077	121	USBR	PL 81-273.
Warm Springs Dam & Res	OR, Malheur, Middle Fork Malheur R						191.0	3,406.0	3,327.0	4,600	90	50% Vale Irr 50% USBR	
Waterbury Dam & Res	VT, Washington, Little River	27.2	617.5	592.0	1,330	890						State of VT	PL 78-534.
Weiss Dam & Res	AL, Cherokee, Coosa River	397.0	574.0	564.0	50,000	30,200						Alabama Pwr Co	PL 83-436.
Wells Dam Lk Paterns	WA, Douglas, Columbia R						74.0	799.0	711.0	10,700	7,700	Douglas Cnty PUD No 1	FERC No 2149.
Webster Dam & Res	KS, Rocks, S. Fork Solomon R	183.4	1,923.7	1,892.45	8,480	3,766						USBR	PL 534 78-2.
Yellowtail Dam & Bighorn Lk.	MT, Big Horn, Bighorn R	259.0	3,657.0	3,640.0	17,298	12,685	250.0	3,640.0	3,614.0	12,685	7,410	USBR	PL 78-534.

[1] Res—Reservoir; Lk—Lake; Div—Division; R—River; Cr—Creek.
[2] USBR—United States Bureau of Reclamation; Irr—Irrigation District; Mun—Muncipal; Fl—Flood; Rsc—Resources.
[3] PL—Public Law; HD—House Document; FERC—Federal Energy Regulatory Commission (formerly Federal Power Commission (FPC)).
[4] No specific FC/Nav. storage allocation.

[FR Doc. 81-34222 Filed 11-27-81; 8:45 am]
BILLING CODE 3710-06-M

STARVATION DAM AND RESERVOIR
STRAWBERRY RIVER, UTAH

WATER CONTROL MANUAL

SEPTEMBER 1988

EXHIBIT C

FIELD WORKING AGREEMENT, UPPER COLORADO BASIN
DAMS AND RESERVOIRS

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
SACRAMENTO, CALIFORNIA

FIELD WORKING AGREEMENT
BETWEEN
DEPARTMENT OF THE INTERIOR, BUREAU OF RECLAMATION
AND
DEPARTMENT OF THE ARMY, CORPS OF ENGINEERS
FOR
FLOOD CONTROL OPERATION
OF
UPPER COLORADO BASIN DAMS AND RESERVOIRS
IN
COLORADO, NEW MEXICO, UTAH AND WYOMING

THIS agreement, made and entered into this 23 RD day of March 1978, between the Bureau of Reclamation and the Corps of Engineers,

WITNESSETH THAT:

WHEREAS, the Department of the Interior, acting through the Bureau of Reclamation, represented by its appropriate Regional Director, has constructed dams and reservoirs on the Upper Colorado Basin Rivers and their tributaries, and is responsible for normal operation and structural safety of the projects, and

WHEREAS, the Department of the Army, acting through the Corps of Engineers, represented by its appropriate District and Division Engineers, is responsible for the flood control operation plans of said dams and reservoirs in accordance with Section 7 of the 1944 Flood Control Act (33 U.S.C. 709) and as promulgated in Code of Federal Regulations, Title 33, Part 208.11, 15 May 1976, and

WHEREAS, there is a need for a working agreement to insure a clear understanding of the flood control regulations and information exchange required for the projects operation.

NOW, THEREFORE, it is mutually understood and agreed by and between the parties hereto that the Upper Colorado Basin Projects will be operated in accordance with the following criteria:

(a) Conservation operations shall be in accordance with Bureau of Reclamation criteria as determined by the Regional Director or his designated representative.

(b) Storage space in the Upper Colorado Basin Projects shall be made available on a seasonal basis and operated for flood control in accordance with the Flood Control Diagrams currently in force.

(c) Emergency operation shall be in accordance with the procedure set forth on the Spillway Gate Operation Curves or procedures currently in force.

(d) The Regional Director is responsible for the safety of the dam and appurtenant facilities and for regulation of the Upper Colorado Basin Projects during surcharge storage utilization. Emphasis upon the safety of the dam is especially important in the event surcharge storage is utilized, which results when the total storage space reserved for flood control is exceeded. Any assistance provided by the Corps of Engineers concerning surcharge regulation is to be utilized at the discretion of the Regional Director, and does not relieve the Regional Director of the responsibility for safety of the Upper Colorado Basin Projects.

(e) Revisions of the Flood Control or Spillway Gate Operation Curves and procedures may be developed as necessary by parties of this agreement. Each such revision shall be effective on the date specified.

(f) Except as necessary in order to comply with Emergency Operation procedures, the flood control regulations shall not be construed to require dangerously rapid changes in magnitude of releases. Releases will be made in a manner consistent with requirements for protecting the dam, reservoir and appurtenances from major damages.

(g) Any water impounded in the flood control space defined by the Flood Control Diagrams shall be evacuated as rapidly as can be safely accomplished without causing downstream flows to exceed the controlling rates; i.e., releases from the reservoir shall be restricted insofar as practicable to quantities which, in conjunction with uncontrolled runoff downstream of the dams, will not cause water levels to exceed the controlling stages currently in force. Although conflicts may arise with other purposes, such as hydropower, the plan or regulation may require releases to be completely curtailed in the interest of flood control or safety of the projects.

(h) The Regional Director shall procure such current basic hydrologic data and make such current determinations of required flood control space and releases at the reservoir as are required to accomplish the flood control objectives.

(i) The Regional Director shall keep the District Engineer advised of such reservoir operating data as the District Engineer may request. The minimum data required is reservoir storage, inflow, releases and streamflow at control points designated by the Flood Control Diagrams on a daily basis.

(j) The flood control regulations are subject to temporary modification by the Corps of Engineers if found necessary in time of emergency. Requests for and action on such modifications may be made by the fastest means of communication available. The action taken shall be confirmed in writing the same day to the office of the Regional Director and shall include justification for the action.

(k) The Regional Director may temporarily deviate from the flood control regulations in the event an immediate short-term departure is deemed necessary for emergency reasons to protect the safety of the dam, or to avoid other serious hazards. Such actions shall be immediately reported by the fastest means of communication available. Actions shall be confirmed in writing the same day to the Corps of Engineers and shall include justification for the action. Continuation of the deviation will require the express approval of the Division Engineer.

IN WITNESS WHEREOF, the parties hereto have caused this memorandum of agreement to be executed as the day and date first above written.

CORPS OF ENGINEERS

By: William E. Vandenberg
Division Engineer
South Pacific Division

BUREAU OF RECLAMATION

By: D. Crandall
Regional Director
Upper Colorado Region