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ANNUAL OPERATING PLAN

Kansas River Projects

1963 Operations

1964 Outlook

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
REGION 7
DENVER, COLORADO

February 1964

UNITED STATES DEPARTMENT OF THE INTERIOR
Stewart L. Udall, Secretary

BUREAU OF RECLAMATION
Floyd E. Dominy, Commissioner

Region 7 - Denver, Colorado
H. P. Dugan, Regional Director

ANNUAL OPERATING PLAN

KANSAS RIVER PROJECTS

1963 OPERATIONS

1964 OUTLOOK

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February 1964

WEBSTER DAM AND RESERVOIR

SYNOPSIS

ANNUAL OPERATING PLAN - KANSAS RIVER PROJECTS

1963 OPERATIONS - 1964 OUTLOOK

GENERAL

This is the eleventh Annual Operating Plan for irrigation units in the Kansas River Projects area. The facilities that are completed or under construction are featured as Exhibit 32 which can be folded out for easy reference. The prime purpose of this report is to describe the irrigation operations and define the responsibilities of the Bureau of Reclamation in relation to the Federally constructed and rehabilitated irrigation facilities in the Republican, Solomon, and Smoky Hill River drainage areas. Harlan County Reservoir on the Republican River is operated by the Corps of Engineers. The following reservoirs are operated by the Bureau of Reclamation:

(a) Bonny, Enders, Norton and Lovewell Reservoirs; Swanson, Hugh Butler and Harry Strunk Lakes in the Republican River Basin.

(b) Kirwin and Webster Reservoirs in the Solomon River Basin.

(c) Cedar Bluff Reservoir on the Smoky Hill River.

Kanopolis Reservoir on the Smoky Hill River and Tuttle Creek Reservoir on the Big Blue River were constructed and operated by the Corps of Engineers and as there are no irrigation facilities completed at the present time are not considered in the scope of this report.

Chapter I, the introduction, gives a description of the irrigation facilities in the Kansas River Projects area. Chapter II summarizes the 1963 Operations and Chapter III presents the plan of operation for 1964.

1963 OPERATIONS

The water supply was adequate to meet the 1963 irrigation requirements of 115,640 acres served by the Kansas River Project. The annual precipitation for 1963 was near normal but the distribution was such that the average diversion rate per acre (2.60 acre-feet) and farm delivery rate per acre (1.1 to 1.7 acre-feet) were well above normal.

All of the reservoirs spilled in 1963 except Cedar Bluff, Enders and Hugh Butler Lake. No major flooding was experienced within the area of concern of this report.

The total available water supply of each reservoir is equal to the carryover storage from previous year plus the inflow of the current year. While the carryover storage is readily known, it is difficult to forecast reservoir inflows for an area where the major source of water is rain flood run-off. For forecasting purposes, values of annual inflows that will be statistically equaled or exceeded 10, 50 and 90 percent of the time were selected from the probability curve to be "reasonable maximum," "most probable," and "reasonable minimum" inflow conditions. The estimates for 1964 are shown in Table 2 and are graphically compared with the historical inflow records on Exhibits 21 through 31. Estimated operation studies under the three probabilities have been prepared for 1964 and are shown in Table 11.

1964 OUTLOOK

Facilities are completed to serve 150,048 acres of which 122,000 acres are expected to be irrigated in 1964. The carryover storage and the inflow that can reasonably be expected on a dry year will be more than adequate to meet the 1964 demands. All reservoir conservation pools are expected to fill by the start of the 1964 irrigation season if most probable or greater inflow occur.

KANSAS RIVER PROJECTS
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ANNUAL OPERATING PLAN - KANSAS RIVER PROJECTS

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CHAPTER I - INTRODUCTION

PURPOSE OF THE REPORT

The purpose of this eleventh Annual Operating Plan is to advise water users, cooperating agencies, and other interested groups or persons of the actual operations during 1963 and of the plan of operations for 1964 in the Kansas River Projects area.

OPERATIONAL RESPONSIBILITIES

The Bureau of Reclamation is responsible for irrigation operations at all Federal reservoirs in the Kansas River Basin. The Corps of Engineers holds like responsibility for flood control operations. The constructing agency is solely responsible for the accomplishment of all other project functions such as: recreation, municipal and industrial sanitation, water quality control and project safety.

LOCATION AND MAJOR FEATURES

The Kansas River Projects is a part of the Missouri River Basin Project and includes multipurpose reservoirs which provide storage for irrigation, flood control, municipal water supply, recreational purposes, stream pollution abatement, and other uses. These dams and reservoirs, constructed and operated by the Bureau of Reclamation or Corps of Engineers, serve the irrigation systems which are within the scope of this report. The canals and diversion dams which have been constructed or rehabilitated by the Bureau of Reclamation and are operated by the Irrigation Districts with the exception of Cedar Bluff Canal which is being operated by the Bureau of Reclamation.

Twelve reservoirs, fifteen canal systems, and six diversion dams are in operation. Red Willow Canal construction will be completed in 1964. Norton Dam on Prairie Dog Creek is under construction by the Bureau of Reclamation and is expected to be finished by December of this year. Construction of the irrigation facilities to serve the Almena Irrigation District has been deferred. Glen Elder Dam on the Solomon River is under construction by the Bureau of Reclamation. Milford Dam on the Republican River, Wilson Dam on the Saline River, and Perry Dam on the Delaware River are under construction by the Corps of Engineers. As Tuttle Creek and Kanopolis Reservoirs, operated by the Corps of Engineers, do not serve irrigation systems at the present time, they are not considered in this report. Storage allocations for the eleven reservoirs presently serving irrigated areas are shown in Table 1. The reservoirs and main irrigation canals are shown in Exhibit 32.

IRRIGATION DISTRICTS

Nine irrigation districts in the Kansas River Projects have contracted with the Bureau of Reclamation for construction of irrigation facilities. Table No. 5 shows the status of the repayment and water service contracts with the development periods, where appropriate. Table 6 shows the planned ultimate acreage, the acres irrigated in 1963 and the acreage expected to be irrigated in 1964 for each irrigation district.

Frenchman Valley Irrigation District and H&RW Irrigation District

Culbertson Diversion Dam and Canal were reconstructed and Culbertson Extension Canal constructed to serve 9,600 acres in the Frenchman Valley Irrigation District and 11,490 acres in the H&RW Irrigation District. The lands in the Frenchman Valley Irrigation District have been irrigated since the 1890's. Supplemental storage was first delivered to these lands under repayment contract in 1958. The H&RW Irrigation District operated and maintained the Culbertson Extension System for the first time in 1963. The lands in these districts lie to the north of the Frenchman Creek and Republican River from Palisade to approximately three miles east of McCook, Nebraska. Enders Reservoir provides storage water for both districts. An erosion control construction program will be started on Frenchman Creek between Enders Dam and Culbertson Diversion Dam during 1964.

Frenchman-Cambridge Irrigation District

This irrigation district has 43,190 acres in the Republican River Valley from Swanson Lake to Harlan County Reservoir. Total service will be available to these lands by June of this year when all of the major construction will be completed. Swanson, Harry Strunk and Hugh Butler Lakes provide storage for these lands. The district is operating Meeker-Driftwood, Red Willow, Bartley and Cambridge systems. The Red Willow Canal is being operated by the district for the Bureau of Reclamation, and complete operation and maintenance will be turned over to the district on January 1, 1965.

Bostwick Irrigation District in Nebraska

Storage for the ultimate planned 24,240 acres in this irrigation district is provided by Harlan County Reservoir. The Franklin, Naponee, Franklin Pump, Superior and Courtland (Nebraska) Canals have been constructed with service available to 22,755 acres in Nebraska. These lands are in the Republican River Valley from Harlan County Dam to Kansas-Nebraska State line. Courtland Canal was also constructed to serve lands in the Kansas-Bostwick Irrigation District. All of the major construction is completed.

Kansas-Bostwick Irrigation District No. 2

This District was originally planned for 49,000 acres. Construction work has been completed with service available for 36,413 acres. Storage water for these will be provided by Harlan County and Lovewell Reservoirs. Lovewell Reservoir serves as a regulating and storage reservoir. The Courtland system above Lovewell Dam is constructed to serve 11,498 acres of land as well as to transport Republican River flows and Harlan County storage releases as required to Lovewell Reservoir. The Courtland system below Lovewell Dam serves an additional 24,915 acres of land. The Kansas-Bostwick Irrigation District lands are in the Republican River and White Rock Creek Basins from the Nebraska-Kansas State line south of Superior, Nebraska to five miles south of Courtland, Kansas.

Kirwin Irrigation District No. 1

Kirwin Reservoir provides storage for 11,500 acres of land served by the Kirwin Main, North and South Canals. The project area of 11,500 acres is 1,500 acres larger than the area originally planned for irrigation with the available water supply, and successful irrigation operation will be dependent upon several years of carryover reservoir storage. These lands are in the North Fork of the Solomon River Valley between Kirwin and Portis, Kansas. All of the major construction is completed.

Webster Irrigation District No. 4

Webster Reservoir provides storage for the 8,500 acres served by the Osborne Canal. These lands are on the north side of the South Fork of the Solomon River Valley from Woodston to approximately five miles east of Osborne, Kansas. All of the major construction is completed.

Almena Irrigation District No. 5

Norton Reservoir will provide storage for the irrigation of 5,350 acres of land in the Almena Irrigation District. The construction of Norton Dam is expected to be completed in 1964. Construction of the Almena Diversion Dam and irrigation facilities has been indefinitely deferred.

Cedar Bluff Irrigation District No. 6

Cedar Bluff Reservoir provides storage for 6,600 acres in the Smoky Hill Basin served by the Cedar Bluff Canal. All of the major construction has been completed and the system will be turned over to the district for operation and maintenance on January 1, 1965.

IRRIGATION SEASON

The contracted irrigation season for Frenchman Valley, H&RW, and Frenchman-Cambridge Irrigation Districts is from May 1 to October 15, and for all other districts, the irrigation season is from May 1 to September 30.

MUNICIPAL WATER

City of Norton, Kansas

Norton Reservoir when completed will provide storage for the municipal water supply of Norton, Kansas. A contract has been negotiated with the City to furnish a maximum of 1,600 acre-feet annually.

City of Beloit, Kansas

A contract has been signed to furnish a municipal water supply of 2,000 acre-feet to the City of Beloit, Kansas from Glen Elder Reservoir when completed. An interim contract has been executed for a supply of storage water not to exceed 1,000 acre-feet per year from Webster Reservoir until such time as Glen Elder Dam is completed.

City of Russell, Kansas

Cedar Bluff Reservoir will provide storage to supplement the municipal water supply of the City of Russell, Kansas. A contract has been completed for storage not to exceed 2,000 acre-feet per year.

FISH HATCHERY

A United States Bureau of Sport Fisheries and Wildlife warm-water fish hatchery is in operation below Cedar Bluff Reservoir. A maximum of 4,000 acre-feet of reservoir storage per year is allocated for hatchery use.

OTHER FUNCTIONS

The principal operational objective of fish and wildlife preservation is to maintain the reservoirs at the highest practicable level. A secondary objective for fish and wildlife interests is the regulation of outflow in excess of minimum requirements when feasible and compatible with the primary objectives. When practicable, the maintenance of regulated outflow in excess of minimum requirements will be of some advantage to farmers, industries, cities, and other interests.

CHAPTER II - SUMMARY OF 1963 OPERATIONS

PRECIPITATION

The precipitation at the end of July was 79% of normal but due to late storms the average annual precipitation was near normal at all of the reservoirs. These data are shown on table 4.

RESERVOIR INFLOW

The inflows varied from 53% of most probable at Kirwin Reservoir to 133% at Lovewell. Table 2 shows the 1963 inflows compared to the historical averages and the forecasts for 1964. Exhibits 21 through 31 graphically present the 1963 inflow as compared to historical inflows for the period of record.

The method of forecasting "Reasonable Minimum", "Most Probable" and "Reasonable Maximum" are described in the synopsis.

RESERVOIR OPERATIONS

All of the reservoirs except Cedar Bluff, Enders and Hugh Butler spilled during 1963. The operations were all within the scope of the plan of operation except Harlan County Reservoir and Lovewell Reservoir, as explained on Page 7. There were no irrigation shortages experienced in 1963. Table 3 shows the 1963 reservoir contents by months. The operation hydrographs are plotted on Exhibits 1 through 11.

No major flooding was experienced below the reservoirs considered in this report during 1963.

The details of operation for each reservoir are described in the following paragraphs:

Bonny Reservoir

In cooperation with the Colorado Department of Parks, Fish and Game, the spring operation to lower the pool level to elevation 3670.0 feet was made in May. Natural flow bypasses as required for irrigation were made to Hale Ditch from April 28 to September 9. Only 70 acre-feet of storage was sold under Warran Act Contracts as a supplemental water supply for 590 acres served by Hale Ditch. The minimum pool level of elevation 3668.6 (34,760 acre-feet) was reached on August 3, 1963. This is 3.4 feet below the top of the conservation pool. As a result of the storage accumulated from September runoff releases were made in the fall to lower the pool level to elevation 3669.0. The spring and fall drawdown operations were made to avoid undesirable winter releases.

Swanson Lake

The reservoir inflow for 1963 was 70% of the most probable. Nine thousand acre-feet was stored in the flood control pool in March to provide water to sluice the channel at the old Meeker Diversion Dam site. During October, an investigation was made of the upper end of the reservoir to determine sediment accumulations. A resurvey of the reservoir area is not required at this time.

The 20,116 acres irrigated under the Bartley and Meeker-Driftwood Canals were provided a full water supply from controlled spills and irrigation releases. The water surface was drawn down approximately 12 feet (52,620 acre-feet) in the conservation pool by the end of the irrigation season. No storage was sold under Warren Act Contracts.

Enders Reservoir

The reservoir inflow for 1963 was 98% of the most probable, with a maximum elevation of 3112.12 feet (44,170 acre-feet) reached on June 11. This was 0.18 feet below the top of the conservation pool.

The storage was adequate to meet the demands of the 18,929 acres irrigated by the Frenchman Valley and H&RW Irrigation Districts. The reservoir by early September was drawn down to elevation 3088.4 feet (14,450 acre-feet). Active conservation carryover storage at this elevation was 6,000 acre-feet. No storage was sold under Warren Act Contracts.

Hugh Butler Lake

The reservoir inflow for 1963 was 94% of the most probable, with a maximum elevation of 2573.87 (26,370 acre-feet) reached on June 9. This was 7.93 feet below top of the conservation pool.

Storage releases were made during the irrigation season for downstream rights and for demands of the partially developed Red Willow system. No storage was sold under Warren Act Contracts.

Harry Strunk Lake

The reservoir inflow for 1963 was 104% of the most probable. The reservoir reached a depth of 3.6 feet (6,840 acre-feet) in the flood control pool on June 5. Controlled spills emptied the flood storage by the end of June possibly preventing some minor flood damage on Medicine Creek. Irrigation demands resulted in the reservoir being drawn down approximately 12.3 feet (18,000 acre-feet) in the conservation pool by August 18. No storage was sold under Warren Act Contracts.

All releases were discontinued August 30 so repairs to outlet works could be started and possibly completed before winter weather or demands for stock water releases occurred.

During the irrigation season, an inspection of the Medicine Creek channel between Medicine Creek Dam and its mouth was made to determine if project use for conveyance of irrigation releases were creating any erosion problems that would not have occurred without project use. It was concluded that although erosion has occurred, the channel appears to be more stable than at any time since construction of Medicine Creek Dam. Several referenced cross-sections were taken to evaluate erosion progress.

During October, an investigation was made of the upper end of the reservoir to determine sediment accumulations, and a resurvey is not required at this time.

Harlan County Reservoir

The reservoir inflow for 1963 was 61% of the most probable. The reservoir reached a depth of 1.79 feet (24,890 acre-feet) on February 21, and a depth of 0.44 feet (6,050 acre-feet) on June 24 in the flood control pool. Controlled spills were made during February, March, and early April. Irrigation demands and special releases in late August and early September resulted in the reservoir being drawn down approximately 8.2 feet (98,790 acre-feet). This drawdown was necessary to inspect and make temporary repairs to the riprap on the upstream face of the dam.

During the irrigation season, a series of current meter measurements were made below the Superior-Courtland Diversion Dam to determine the river gain from return flows of irrigation diversions. It was found that these return flows and natural accretions were adequate to meet the allocated water rights and sanitation requirements below the Superior, Nebraska sewer outlet with no by-pass at the Superior-Courtland Diversion Dam. It was also found that when many of the irrigation pumps were operating simultaneously at a higher rate than their allocated appropriation, the minimum instantaneous flow recorded at Hardy, Nebraska was 38 cfs while the minimum mean daily flow was 41 cfs. Hardy, Nebraska is about 6 miles downstream from Superior, Nebraska. These studies are to be continued in future years when climatic conditions are favorable.

Lovewell Reservoir

Controlled spills were made in January, February and March to maintain the pool elevation at 1578.0 while erosion control structures were being completed in the upper reaches of the reservoir. The reservoir inflow for 1963 was 133% of the most probable. The 14,972 acres of the Kansas-Bostwick Irrigation District below Lovewell were provided a full water supply. During the drawdown of Harlan County reservoir for the inspection and temporary riprap repairs, Lovewell Reservoir reached a depth of

3.5 feet (11,200 acre-feet) in the flood control pool on September 24. This depth in agreement with the Corps of Engineers was lowered to 2.0 feet (6,000 acre-feet) in the flood control pool and will be maintained there until removed by irrigation demands or flood releases after it is no longer needed to assure an adequate irrigation supply.

During the summer months a group of farmers constructed an unauthorized earthen dam across White Rock Creek about two stream miles below Lovewell Dam. The backwater from this dam inundated the control structure at the Lovewell outflow gaging station and made it inoperable during July, August and part of September. A complaint was registered with the Kansas Department of Water Resources and they were taking legal steps to have the dam removed. This was not necessary as a new channel was created in late September by releases made to evacuate the flood storage in Lovewell Reservoir.

Kirwin Reservoir

The reservoir inflow for 1963 was 53% of the most probable. The reservoir reached a depth of 0.45 feet (2,200 acre-feet) in the flood control pool on March 16, and small controlled spills were made from March until June.

The 8,512 acres irrigated under the Kirwin Canal were provided a full water supply. The minimum pool level of elevation 1724.94 feet (79,060 acre-feet) was reached on August 11. This was about 3.5 feet (16,120 acre-feet) below the top of the conservation pool.

Webster Reservoir

The reservoir inflow for 1963 was 98% of the most probable. The reservoir reached a depth of 0.10 feet (340 acre-feet) in the flood control pool on April 10, controlled spills were made during January, February, March, April and early May.

The 5,755 acres irrigated under the Osborne Canal were provided a full water supply. On September 18, the minimum pool level of elevation 1886.05 feet (55,545 acre-feet) was reached. This was about 3.5 feet (11,560 acre-feet) below the top of the conservation pool.

Cedar Bluff Reservoir

The reservoir inflow for 1963 was 66% of the most probable. The conservation pool did not fill in 1963. Maximum elevation 2143.86 (184,140 acre-feet) was reached on September 28 which was .14 feet below the top of the conservation pool.

The 2,226 acres irrigated under the partially developed Cedar Bluff Canal were provided a full water supply. There was 236 acre-feet of storage

released to the Smoky Hill River for the City of Russell, Kansas, under the terms of the Municipal Water Supply Contract. The Kansas Department of Water Resources administered the use of water during this period. The Fish Hatchery operated by the United States Bureau of Sport Fisheries and Wildlife diverted 2,315 acre-feet with 1,338 acre-feet returning to the Smoky Hill River below Cedar Bluff Dam. Minimum conservation storage was reached on September 20 at elevation 2141.74 (169,990 acre-feet), 2.3 feet (15,100 acre-feet) below the top of the conservation pool.

IRRIGATION OPERATIONS

A total of 300,275 acre-feet of water was diverted into fifteen canal systems for irrigation of 115,640 acres of land in the Kansas River Projects. This is 79% of the area that had service available in 1963, and 71% of the ultimate area planned. Acreage irrigated, diversion and farm delivery data for each of the irrigation districts are shown in the following table:

Irrigation District	Acres Irrigated	Acre-feet Diverted	Diversion Rate Acre-feet/acre	Farm delivery Acre-feet/acre
Frenchman Valley	8,627	26,633	3.09	(no records)
H&RW	10,302	23,721	2.30	1.58
Frenchman-Cambridge	35,062	86,091	2.46	1.67
Bostwick in Nebraska	20,039	54,475 1/	2.72	1.32
Kansas-Bostwick	25,117	67,437	2.68	1.47
Kirwin	8,512	19,702	2.31	1.48
Webster	5,755	15,070	2.62	1.53
Cedar Bluff	2,226	7,146	3.21	1.11
Total-Kansas River Projects	115,640	300,275	2.60	

1/ Does not include minor diversions made for ponding tests on Courtland Canal in November 1964.

Due to the excessive accumulation of sediment above the Culbertson Diversion Dam special releases were made at Enders Dam to sluice this sediment into the Frenchman Creek channel below the diversion dam. This operation was necessary four times during the 1963 irrigation season, requiring 25 acre-feet of conservation storage for each sluicing operation.

Water diverted to the Hale Ditch totaled 2,924 acre-feet of which 70 acre-feet were sold under Warren Act Contract.

The acres irrigated in 1963 and estimated to be irrigated in 1964 are compared to the planned and service available acreage on table 6. A graphic representation of development by irrigation districts is presented in Exhibits 12 through 20.

Table 7 lists the 1963 monthly diversions and acres irrigated for each canal system. Table 8 tabulates the acreage irrigated and water diversion data for 1959 through 1963 together with estimates for 1964.

During 1963 studies were made on the Courtland Canal near the Nebraska-Kansas state line to evaluate the compacted earth lining that was constructed in 1954.

RECREATION

During the 1963 season, at the Bureau of Reclamation reservoirs, and lakes recreation areas and facilities drew 1,372,562 visitors to enjoy boating, water skiing, swimming, camping, hunting and fishing. Table 13 shows the major recreation uses and the number of visitors participating in each use for each of the facilities.

CHAPTER III - ANNUAL OPERATING PLAN FOR 1964

WATER SUPPLY

The water supply outlook for 1964 is fair to excellent at all reservoirs. Even under extremely dry conditions, no shortages are expected in meeting the demands of 122,000 acres of Kansas River Project lands which are expected to be irrigated, or any demands for municipal water by Beloit and Russell, Kansas.

RESERVOIR OPERATIONS

To facilitate permanent riprap repairs on Harlan County Dam, the maximum allowable pool level will be at elevation 1935.0 feet from September 1, 1964 through February 1965. After July 15, 1964, if inflow conditions are favorable for the reservoirs except Harlan County in the Republican River Basin, the operation plan may deviate from the normal storage limitations shown in Table 1 and accumulate conservation storage in the flood control pool to provide replacement carryover storage for that portion of Harlan County Reservoir between elevations 1935.0 and 1946.0. Administration of the use of water in accordance with state laws will affect the amount and time of storing stream flows.

Each fall after the demand period, the storage in each reservoir is evaluated and when it is apparent that a reservoir will spill under all inflow conditions before the start of the next irrigation season, controlled releases will be made storing that portion of the inflow required to fill the conservation pool by the first of April. This plan is not used for Bonny Reservoir, as winter releases are undesirable.

Under the assumed or dependable water supply conditions as analyzed in this report, storage will not be available for sale under Warren Act contract at any of the reservoirs.

Exhibits 1 through 11 show the probable effects on each reservoir for 1964 under "most probable," "reasonable minimum," and "reasonable maximum" inflow conditions.

Bonny Reservoir

There is no expected demand on Bonny Reservoir. Continuous winter releases are undesirable because of the exposed Hale Ditch outlet pipe. Releases in extremely cold weather are not necessary if the pool level is at least three feet below the top of the conservation pool in the fall. To reduce the chances of a large fall drawdown, the

reservoir pool is lowered to elevation 3670.0 (37,390 acre-feet) by the end of March and maintained there or below throughout the spring and summer months except for flood control operation. During the dry years, the normal reservoir losses will lower the pool another two to three feet by September. During other years, it will be necessary to make special releases during September or early October to draw the pool level down another foot to elevation 3669.00 (35,500 acre-feet). On the basis of later evaluations of storage in the Republican River Basin Reservoirs and in the interest of increasing carryover storage to offset storage depletions for riprap repair in the Harlan County conservation pool, it may be necessary to defer the above drawdown plans.

Swanson Lake

Irrigation demands on storage will be made by irrigators under the Meeker-Driftwood and Bartley systems for 20,100 acres. The carry-over storage and available inflow will be more than adequate to meet this demand. The maximum expected drawdown under "reasonable minimum" conditions will be about 12 feet (53,360 acre-feet) below the top of the conservation pool. After the conservation storage pool is filled, controlled spills will be made as inflow and downstream conditions dictate. Painting of the spillway gates is scheduled for this fall. Under " reasonable minimum" conditions, this would require no special releases. If "most probable" or "reasonable maximum" conditions occur, special releases would have to be made to expose the gate surfaces. It may however become advisable to reschedule this work until the fall of 1965 due to the 11 feet (128,530 acre-feet) of the conservation storage pool at Harlan County being unusable while riprap repairs are being made.

Enders Reservoir

Enders Reservoir under "reasonable minimum" conditions will not fill by about 0.60 feet (1,000 acre-feet). The water supply will be adequate to meet the demands for 19,300 acres expected to be irrigated by the Frenchman Valley and H&RW Irrigation Districts.

Hugh Butler Lake

Hugh Butler conservation storage pool is not expected to fill under "reasonable minimum" or "most probable" conditions. Inflow and conservation storage will be more than adequate to meet senior appropriations and demands of 2,600 acres expected to be irrigated by the Red Willow Canal system.

Harry Strunk Lake

Harry Strunk conservation storage pool will fill under all inflow conditions and controlled spills will be made as dictated by the inflow. The storage and available inflow will be more than adequate to meet the demands of 14,000 acres expected to be irrigated by the Cambridge Canal system.

While the outlet was out of service for repair of the stilling basin, water was siphoned over the spillway notch during December 1963 and January 1964 to meet downstream stock water demands. The structure was back in service by the end of January.

On February 2, the water surface reached the bottom of the spillway notch and controlled spills dictated by the inflow began. On February 10th by agreement with the Corps of Engineers, it was decided to store water in the flood control pool until such time as the temporary repairs are completed at Harlan County Reservoir. This space if water is available after July 15th may again be used for temporary storage during permanent riprap repairs.

Norton Reservoir

Flows of Prairie Dog Creek were diverted through the outlet works on January 28, 1964 with storage scheduled to start about the first of August. The conservation storage pool is not expected to fill in 1964.

Harlan County Reservoir

Harlan County conservation storage pool is drawn down 8.0 feet (96,960 acre-feet) and releases will be made as necessitated by inflow to maintain this elevation until March 20, 1964, when temporary riprap repairs are scheduled to be completed. Under "reasonable minimum" conditions the conservation storage pool will not fill but an ample water supply will be available to irrigate 20,000 acres in the Bostwick Irrigation District in Nebraska, and 26,500 acres in Kansas-Bostwick Irrigation District. As an added assurance of a full irrigation supply for 1964, the Corps of Engineers has agreed to allow temporary conservation storage in the flood control pools of all the other reservoirs in the Republican River Basin. At the time of this report, the only reservoirs that can be utilized under this agreement are Harry Strunk and Lovewell. This same agreement will be in effect after July 15, to compensate for the permanent riprap repairs which will commence on September 1, 1964. This will require special releases under "most probable" and "reasonable maximum" conditions to draw the conservation storage pool down 11.0 feet (128,500 acre-feet) and will be maintained at this elevation until repairs are completed. Completion date will depend on working conditions.

Lovewell Reservoir

Lovewell conservation storage pool and 2.0 feet (6,000 acre-feet) in the flood control pool were carried over into 1964 due to operation explained in Harlan County 1964 Operation. The 6,000 acre-feet stored in the flood control pool will be emptied this spring either by irrigation demand or controlled spills under all three conditions. The supply will be adequate to meet full irrigation demands. The same operation criteria will be used this fall.

Normal operation of Lovewell Reservoir was planned for regulation of Courtland Canal as well as the storage of natural flows of White Rock Creek. The demands of 17,300 acres under the Courtland Canal below Lovewell Reservoir will be met with water stored from White Rock Creek flows and transfers of Republican River flows and storage releases, if required, from Harlan County Reservoir through the upper Courtland Canal. During the periods of low water supply and when space is available in Harlan County and Lovewell Reservoirs, Republican River flows not required by Superior and Courtland Canals, and downstream water rights will be diverted into Lovewell Reservoir. Under prolonged drought conditions, these diversions could continue through all of the non-irrigation season except January and February. The pool level is not expected to be below elevation 1577 at the end of the irrigation season.

Kirwin Reservoir

The carryover storage and available inflow are more than adequate to meet the irrigation demands of 9,000 acres served by the Kirwin Canal in 1964. The reservoir is expected to spill if greater than minimum inflows occur.

Webster Reservoir

The carryover storage and available inflow are more than adequate for both the 7,500 acres under the Osborne Canal and the municipal demands of Beloit, Kansas. The conservation pool will fill and controlled releases will be made if greater than reasonable minimum inflows occur.

Cedar Bluff Reservoir

The carryover storage and available inflow will be more than adequate to meet the demands of 3,000 acres expected to be irrigated in the Cedar Bluff Irrigation District, supplement the municipal water supply of Russell, Kansas, and furnish a water supply for certain functions of the Cedar Bluff Fish Cultural Station. A well is used as a supply of those functions requiring clear water.

A contract will be let this year to install a radial gate in the ungated orifice in the spillway. If "most probable" or "reasonable maximum" conditions should occur, special releases will be made to accommodate this construction.

IRRIGATION OPERATIONS

It is estimated that 122,000 acres under the Kansas River Projects will be irrigated in 1964. Of this, 76,000 acres are in Nebraska and 46,000 acres in Kansas. The acres expected to be irrigated in 1964 are shown by canals in Table 6. The irrigable acres and probable canal diversions for 1964 under the "normal," "dry" and "wet" years are shown graphically on Exhibits 12 through 20.

The expected canal operations for 1964 are discussed in the following paragrpahs for each irrigation district.

Frenchman Valley and H&RW Irrigation Districts

The irrigated lands in these two districts are served from the Culbertson Canal and the Culbertson Extension Canal. The two systems are operated under joint management. The transportation losses of the main Culbertson Canal are shared by both districts. There are 8,800 acres in the Frenchman Valley Irrigation District and 10,500 acres in the H&RW Irrigation District which are expected to be irrigated.

In addition to meeting the irrigation demands of Frenchman Valley and the H&RW Irrigation Districts, approximately 150 acre-feet will be needed for sediment sluicing operations at the Culbertson Diversion Dam.

The Frenchman Creek erosion control program is scheduled to begin in in 1964, but there will be no special water requirements.

Frenchman-Cambridge Irrigation District

The Irrigation District will operate and maintain the Bartley, Cambridge, and Meeker-Driftwood systems. The Bureau of Reclamation will maintain and the District will operate the partially developed Red Willow Canal system in 1964. It is estimated that 36,700 acres will be irrigated by these four systems in 1964.

Scheduled to start in 1964 and to continue for the next five years is a water use study in the area served by the Meeker-Driftwood system.

Bostwick Irrigation District in Nebraska

Franklin, Naponee, Franklin Pump, and Superior Canals will be operated and maintained by the Irrigation District. It is estimated that 18,400 acres will be irrigated in 1964. The Kansas-Bostwick Irrigation District will operate the Superior-Courtland Diversion Dam and Courtland Canal in Nebraska and the Bostwick Irrigation District in Nebraska will operate and maintain the Courtland Lateral System in Nebraska. The maintenance cost of the Diversion Dam and main Courtland Canal in Nebraska is shared by the Kansas-Bostwick and Nebraska-Bostwick Irrigation Districts.

Kansas-Bostwick Irrigation District No. 2

There are 26,500 acres expected to be irrigated in 1964, of which 9,200 acres are above Lovewell Reservoir and 17,300 acres below.

Kirwin Irrigation District No. 1

The District will operate and maintain the Kirwin system. It is estimated that 9,000 acres will be irrigated during the 1964 irrigation season.

Webster Irrigation District No. 4

Of the 8,500 acres available for service under the Osborne System 7,500 acres are expected to be irrigated this year. Kirwin and Webster Irrigation Districts are under joint management.

Cedar Bluff Irrigation District No. 6

This will be the last year of operation and maintenance by the Bureau of Reclamation. It is expected that 3,000 acres will be irrigated during the 1964 irrigation season.

TABLE 1

RESERVOIR DATA - KANSAS RIVER PROJECTS

RESERVOIR	STORAGE ALLOCATIONS		
	DEAD 1/	CONSERVATION 1/	FLOOD CONTROL
Bonny			
Elevation (Ft.)	3635.5	3672.0	3710.0
Total Acre Feet	1,420	41,340	170,160
Net Acre Feet	1,420	39,920	128,820
Swanson Lake			
Elevation (Ft.)	2710.0	2752.0	2773.0
Total Acre Feet	4,100	120,160	253,950
Net Acre Feet	4,100	116,060	133,790
Enders			
Elevation (Ft.)	3080.0	3112.3	3127.0
Total Acre Feet	8,470	44,480	74,520
Net Acre Feet	8,470	36,010	30,040
Hugh Butler			
Elevation (Ft.)	2552.0	2581.8	2604.9
Total Acre Feet	6,310	37,780	86,630
Net Acre Feet	6,310	31,470	48,850
Harry Strunk			
Elevation (Ft.)	2335.0	2366.1	2386.2
Total Acre Feet	5,370	39,230	90,920
Net Acre Feet	5,370	33,860	51,690
Norton			
Elevation (Ft.)	2275.0	2304.3	2331.4
Total Acre Feet	3000	36,700	136,700
Net Acre Feet	3000	33,700	100,000
Harlan County			
Elevation (Ft.)	1920.0 2/	1946.0	1973.5
Total Acre Feet	97,200 3/	350,120	850,000
Net Acre Feet	97,200 3/	252,920	499,880
Lovewell			
Elevation (Ft.)	1562.07 4/	1582.6	1595.3
Total Acre Feet	5,050 5/	41,690	92,150
Net Acre Feet	5,050 5/	36,640	50,460
Kirwin			
Elevation (Ft.)	1693.0	1728.4	1757.3
Total Acre Feet	6,380	95,180	314,550
Net Acre Feet	6,380	88,800	219,370
Webster			
Elevation (Ft.)	1855.5	1889.6	1923.7
Total Acre Feet	2,180	67,100	260,740
Net Acre Feet	2,180	64,920	193,640
Cedar Bluff			
Elevation (Ft.)	2100.4 4/	2144.0	2166.0
Total Acre Feet	21,580 6/	185,090	376,950
Net Acre Feet	21,580 6/	163,510	191,860
Total Storage (A.F.)	158,060	1,022,170	2,570,570
Total Net Acreage Feet	158,060	864,110	1,548,401

1/ Includes space for sediment storage.
2/ Controlling elevation to Franklin Canal.
3/ Could release 95,900 A.F. to river.
4/ Controlling elevation to canal.
5/ Could release 690 A.F. to river.
6/ Could release 13,649 A.F. to river and fish hatchery.

Note: Reservoir storage data based on latest reservoir surveys.

TABLE 2

INFLOW INTO RESERVOIRS - 1963 RECORDS, 1964 ESTIMATES

1	2	3	4	5	6	7
	1,000 Acre-feet					
	1963 Records		1964 Estimates 1/			
Reservoir	Actual	Adjusted	Reasonable Minimum	Most Probable	Reasonable Maximum	Average for period of Record 2/
Bonny	23.3		17.0	26.7	38.2	31.7
Swanson Lake	78.6	88.2 3/	67.6	112.6	207.0	136.6 3/
Enders	49.2		45.0	50.0	57.8	50.3
Hugh Butler Lake	19.4		14.8	20.7	29.1	21.7
Harry Strunk Lake	51.4		37.4	49.5	80.4	55.7
Harlan County	242.8	335.3 3/	211.0	399.0	760.0	485.0 3/
Lovewell	68.9 4/	20.3 5/	53.1 4/	51.7 4/	69.5 4/	27.7 5/
Kirwin	21.3		17.0	40.0	115.0	53.8
Webster	36.8		12.8	37.6	98.0	53.5
Cedar Bluff	27.0		14.0	40.6	146.2	64.4

1/ Values determined from inflow frequency curves. A value of 90% on curve = reasonable minimum conditions, 50% = most probable conditions, and 10% = reasonable maximum conditions.
2/ Average computed for period of record up to and including 1962.
3/ Actual records plus upstream depletions caused by reservoirs and canals in Missouri Basin Projects.
4/ Includes total of White Rock Creek and inflow from Courtland Canal.
5/ Natural inflow from White Rock Creek

TABLE 3
RESERVOIR OPERATIONS
BONNY, SWANSON & ENDERS RESERVOIR
(Units in 1,000 Acre-Feet)

Month	TOTAL STORAGE END OF MONTH 1962	1963	TOTAL 1963 OUTFLOW	INFLOW 1963 ACTUAL	Most PROBABLE	DAM AND RESERVOIR INFORMATION
Jan.	39.0	39.6	0.4	1.7	2.2	DAM: BONNY
Feb.	40.5	41.3	0.4	2.1	2.2	
Mar.	37.4	43.4	0.4	2.6	2.9	RESERVOIR: BONNY
Apr.	37.3	42.6	1.6	1.7	2.5	
May	37.4	37.4	5.8	1.3	3.0	STORAGE CAPACITY
June	39.0	36.5	1.0	0.7	3.0	
July	36.8	35.0	0.7	0.6	1.7	
Aug.	36.1	35.4	1.2	3.3	1.8	DEAD 1.4
Sept.	35.0	38.7	0.5	3.9	1.5	CONSERVATION 39.9
Oct.	35.3	35.6	3.7*	1.4*	1.7	SUB-TOTAL 41.3
Nov.	36.8	37.0	0.4*	2.1*	2.0	FLOOD 128.8
Dec.	38.2	38.4	0.4*	1.9*	2.2	TOTAL 170.1
Total			16.5	23.3	26.7	
Jan.	97.6	117.0	8.4	5.4	9.1	DAM: TRENTON
Feb.	107.1	121.5	8.6	12.5	11.7	
Mar.	120.6	120.4	14.7	14.1	14.8	RESERVOIR: SWANSON LAKE
Apr.	120.6	120.0	6.4	7.2	12.2	
May	121.8	120.2	5.1	7.2	15.6	STORAGE CAPACITY
June	123.6	113.8	6.2	2.1	14.0	
July	124.3	85.1	27.0	0.1	5.4	
Aug.	113.4	68.8	14.2	0.3	6.0	DEAD 4.1
Sept.	105.2	76.7	3.1	13.0	5.1	CONSERVATION 116.1
Oct.	108.2	82.1	0.1*	6.7*	4.2	SUB-TOTAL 120.2
Nov.	114.5	87.2	0.1*	6.0*	7.2	FLOOD 133.8
Dec.	119.9	90.9	0.1*	4.0*	7.7	TOTAL 254.0
Total			94.0	78.6 a/	112.6	
Jan.	37.0	35.0	0.5	4.9	4.9	DAM: ENDERS
Feb.	39.8	38.9	0.5	4.9	4.3	
Mar.	43.0	42.2	0.6	4.7	4.4	RESERVOIR: ENDERS
Apr.	44.3	43.8	0.7	3.6	4.2	
May	45.1	43.6	3.6	3.8	4.1	STORAGE CAPACITY
June	46.1	40.8	5.4	3.3	4.2	
July	41.8	25.3	19.2	3.6	3.8	
Aug.	27.8	14.6	15.5	3.7	3.6	DEAD 8.5
Sept.	21.7	17.7	2.2	3.6	3.6	CONSERVATION 36.0
Oct.	22.4	21.5	0.3*	4.4*	3.9	SUB-TOTAL 44.5
Nov.	26.0	25.4	0.5*	4.6*	4.3	FLOOD 30.0
Dec.	30.6	29.3	0.5*	4.2*	4.7	TOTAL 74.5
Total			49.5	49.3	50.0	

a/ Recorded inflow - Adjusted inflow for upstream depletions = 88,200 A.F.

* Computed from Reservoir Operation Data

TABLE 3
RESERVOIR OPERATIONS
HUGH BUTLER, HARRY STRUNK AND HARLAN COUNTY RESERVOIRS
(Units in 1,000 Acre-Feet)

Month	TOTAL STORAGE END OF MONTH 1962	1963	TOTAL 1963 OUTFLOW	INFLOW 1963 ACTUAL	MOST PROBABLE	DAM AND RESERVOIR INFORMATION
Jan.	2.6	23.2	0.2	1.6	1.5	DAM: RED WILLOW
Feb.	3.9	24.9	0.2	2.3	1.6	RESERVOIR:
Mar.	5.4	25.9	0.2	2.3	2.1	HUGH BUTLER LAKE
Apr.	6.2	25.9	0.2	1.6	1.9	
May	8.2	26.1	0.3	1.5	2.3	STORAGE CAPACITY
June	17.2	25.1	0.9	1.2	3.1	
July	20.5	23.1	1.5	0.6	1.9	DEAD 6.3
Aug.	22.2	22.1	0.9	0.8	1.1	CONSERVATION 31.5
Sept.	21.7	26.0	0.2	5.0	1.0	SUBTOTAL 37.8
Oct.	21.6	26.0	0.3*	0.6*	1.2	FLOOD 48.8
Nov.	22.0	26.6	0.3*	1.2*	1.4	TOTAL 86.6
Dec.	22.5	26.9	0.4*	0.8*	1.6	
Total			5.6	19.5	20.7	
Jan.	35.0	38.3	3.8	3.7	3.6	DAM: MEDICINE CREEK
Feb.	37.8	39.4	5.9	7.2	3.8	RESERVOIR:
Mar.	39.2	39.4	4.5	4.5	4.3	HARRY STRUNK LAKE
Apr.	39.1	39.7	2.8	3.7	4.5	
May	41.8	40.1	2.6	3.9	5.4	STORAGE CAPACITY
June	42.9	38.5	1.6	9.2	6.8	
July	43.1	26.2	16.9	3.3	5.0	DEAD 5.4
Aug.	38.9	21.9	6.0	1.8	3.4	CONSERVATION 33.8
Sept.	38.0	27.8	0.0	4.7	3.0	SUBTOTAL 39.2
Oct.	37.9	30.4	0.0*	3.0*	3.0	FLOOD 51.7
Nov.	38.3	33.4	0.0*	3.4*	3.2	TOTAL 90.9
Dec.	38.2	36.1	0.1*	2.9*	3.5	
Total			44.2	51.3	49.5	
Jan.	320.0	356.3	4.2	18.0	20.7	DAM: HARLAN COUNTY
Feb.	334.2	368.9	30.7	41.9	30.7	RESERVOIR:
Mar.	359.2	355.3	57.9	39.4	35.5	HARLAN COUNTY
Apr.	349.6	349.8	26.5	23.9	36.6	
May	349.7	342.2	16.5	11.2	55.3	STORAGE CAPACITY
June	385.5	351.5	15.5	30.0	98.0	
July	359.7	288.6	63.3	3.6	38.2	DEAD 1.3
Aug.	345.4	252.1	54.6	19.7	23.7	INACTIVE 95.9
Sept.	313.3	267.6	19.7	30.5	15.9	CONSERVATION 252.9
Oct.	319.2	260.3	14.0*	10.2*	12.1	SUBTOTAL 350.1
Nov.	331.2	254.9	11.9*	9.0*	15.5	FLOOD 499.9
Dec.	341.8	249.3	10.2*	5.5*	16.8	TOTAL 850.0
Total			325.0	242.9 a/	399.0	

* Computed from reservoir operation data.

a/ Measured inflow, adjusted inflow for upstream depletions = 335,300 A.F.

TABLE 3
RESERVOIR OPERATIONS
LOVEWELL, KIRWIN AND WEBSTER RESERVOIRS
(Units in 1,000 Acre-feet)

Month	TOTAL STORAGE END OF MONTH 1962	1963	TOTAL 1963 OUTFLOW	INFLOW 1963 ACTUAL	MOST PROBABLE	DAM AND RESERVOIR INFORMATION
Jan.	48.6	29.0	1.3	0.4	0.2	DAM: LOVEWELL
Feb.	41.7	29.4	1.3	0.5	0.5	
Mar.	41.8	30.0	1.7	0.7	0.5	RESERVOIR: LOVEWELL
Apr.	41.7	31.7	0.2	1.1	0.6	
May	42.0	36.2	0.9	4.7	3.4	STORAGE
June	43.5	41.7	3.0	8.6	7.2	CAPACITY
July	39.2	37.6	22.4	19.8	9.5	
Aug.	31.0	41.1	12.9	17.6	9.7	DEAD 4.4
Sept.	31.4	50.0	7.8	14.5	1.9	INACTIVE 0.7
Oct.	29.5	47.8	1.6*	0.2*	0.6	CONSERVATION 36.6
Nov.	30.0	47.6	0*	0.5*	0.3	SUB-TOTAL 41.7
Dec.	29.5	47.6	0*	0.3*	0.3	FLOOD 50.5
Total			53.1	68.9 a/	34.7 b/	TOTAL 92.2
Jan.	87.8	93.7	0	0.4	0.9	DAM: KIRWIN
Feb.	90.4	95.7	0	1.9	1.8	
Mar.	94.0	96.3	1.4	2.0	2.1	RESERVOIR: KIRWIN
Apr.	94.7	95.7	1.6	1.5	2.8	
May	93.4	95.6	0.4	0.8	4.6	STORAGE
June	98.1	92.2	5.8	3.9	10.3	CAPACITY
July	95.2	82.5	10.1	2.4	6.7	
Aug.	90.3	84.1	3.8	5.9	4.5	DEAD 6.4
Sept.	90.0	86.0	0.1	2.2	2.5	CONSERVATION 88.8
Oct.	92.2	84.8	0*	0.4*	1.6	SUB-TOTAL 95.2
Nov.	92.8	84.2	0*	0*	1.2	FLOOD 219.4
Dec.	93.2	83.6	0*	0*	1.0	TOTAL 314.6
Total			23.2	21.4	40.0	
Jan.	62.2	66.4	2.7	2.6	0.8	DAM: WEBSTER
Feb.	66.9	69.2	1.7	4.3	1.7	
Mar.	70.6	67.1	6.7	4.4	2.1	RESERVOIR: WEBSTER
Apr.	66.8	67.1	1.6	2.6	2.9	
May	67.3	66.9	0.8	1.5	6.4	STORAGE
June	70.8	61.9	6.2	2.2	10.4	CAPACITY
July	99.2	60.6	8.6	8.9	4.6	
Aug.	78.9	56.3	5.6	3.5	3.4	DEAD 2.2
Sept.	78.9	60.3	0.5	4.4	2.3	CONSERVATION 64.9
Oct.	67.1	60.3	0*	1.2*	1.1	SUB-TOTAL 67.1
Nov.	67.1	60.6	0*	0.6*	1.0	FLOOD 193.6
Dec.	67.1	61.1	0*	0.6*	0.9	TOTAL 260.7
Total			34.4	36.8	37.6	

a/ Inflow from Courtland Canal - 48,600 A.F. Inflow from White Rock Creek - 20,300 A.F.

b/ Forecasted inflow from Upper Courtland Canal - 16,500 A.F. Forecasted inflow from White Rock Creek - 18,200 A.F.

* Computed from reservoir operation data.

TABLE 3
RESERVOIR OPERATIONS
CEDAR BLUFF RESERVOIR
(Units in 1,000 Acre-Feet)

Month	TOTAL STORAGE END OF MONTH 1962	TOTAL STORAGE END OF MONTH 1963	TOTAL 1963 OUTFLOW	INFLOW 1963 ACTUAL	INFLOW MOST PROBABLE
Jan.	185.8	181.4	0.2	0.3	0.8
Feb.	185.8	182.4	0.2	0.9	1.2
Mar.	185.8	182.6	0.2	0.9	1.3
Apr.	182.1	180.0	0.2	0.2	2.0
May	180.3	176.3	1.1	0.1	4.5
June	188.6	175.4	1.1	3.3	12.0
July	189.6	178.6	2.6	6.4	6.8
Aug.	181.2	171.7	3.0	0.4	4.7
Sept.	185.8	183.9	1.1	13.0	3.9
Oct.	183.4	181.8	0.5*	0.9*	1.5
Nov.	183.0	179.8	0.1*	0.3*	1.1
Dec.	182.0	178.8	0.1*	0.2*	0.8
Total			10.4 a/	26.9	40.6

DAM AND RESERVOIR INFORMATION	
DAM: CEDAR BLUFF	
RESERVOIR: CEDAR BLUFF	
	STORAGE CAPACITY
DEAD	8.3
INACTIVE	13.3
CONSERVATION	163.5
SUB-TOTAL	185.1
FLOOD	191.9
TOTAL	377.0

a/ Cedar Bluff outflow includes releases to Fish Hatchery.

* Computed from reservoir operation data.

Table 4

PRECIPITATION DATA

	BONNY DAM				TRENTON				ENDERS DAM				RED WILLOW DAM				MEDICINE CREEK DAM			
MONTH	NORM.	1961	1962	1963	NORM.	1961	1962	1963	NORM.	1961	1962	1963	NORM.	1961	1962	1963	NORM.	1961	1962	1963
JAN.	0.35	T	.26	.31	0.44	0	.11	.47	0.42	0	.03	1.47	0.50	0	0.06	.56	0.40	T	.02	.56
FEB.	0.41	T	.23	.07	0.52	0.11	.13	.11	0.46	0.03	.19	.12	0.59	0.06	No	.13	0.64	0.05	.50	.11
MAR	0.91	1.16	.66	1.80	1.21	1.41	1.48	1.85	1.06	2.23	1.44	1.50	1.35	1.53	Record	1.74	0.99	1.20	2.37	1.46
APR.	1.59	1.11	.80	.06	1.94	0.95	1.11	1.09	1.94	1.52	.87	.75	2.06	1.58	.37	.77	2.31	2.44	.14	1.04
MAY	2.40	4.04	3.26	1.62	3.20	4.55	5.40	1.87	3.38	3.12	4.99	1.52	3.12	5.63	4.90	3.52	3.22	9.47	4.41	1.07
JUNE	2.57	1.36	5.88	2.32	3.19	2.10	8.88	1.03	3.36	3.06	7.42	.81	3.17	3.03	7.29	2.11	3.52	1.54	5.70	4.06
JULY	2.32	4.22	2.00	1.84	2.61	2.18	8.53	2.92	2.19	2.03	5.14	2.28	2.80	1.02	4.95	2.60	2.79	0.93	5.48	1.34
AUG.	2.27	1.47	2.07	2.88	2.50	1.78	.97	2.21	2.23	1.46	2.56	2.87	2.30	2.02	3.25	2.03	2.61	1.71	2.93	4.21
SEPT.	1.28	2.20	.66	4.70	1.68	2.30	.96	4.40	1.79	2.48	2.06	3.70	1.70	2.06	1.62	4.16	2.02	1.84	1.01	6.68
OCT.	0.74	0.42	.71	.15	0.87	0.24	.98	.08	0.80	0.40	.34	.92	0.87	0.36	1.06	.28	1.12	0.61	1.05	.52
NOV.	0.41	0.78	.40	.39	0.68	1.04	.47	.49	0.54	0.66	.44	.27	0.76	0.80	.20	.59	0.84	0.68	.16	.83
DEC.	0.39	0.43	.33	.23	0.45	0.62	.37	.17	0.45	0.35	.59	.05	0.53	0.89	.55	.11	0.57	0.66	.70	.08
TOTAL	15.64	17.19	17.26	16.37	19.29	17.28	29.39	16.69	18.62	17.34	26.07	16.26	19.75	18.77	24.19	18.60	21.03	21.13	24.47	21.96

	HARLAN CO. DAM				LOVEWELL DAM				KIRWIN DAM				WEBSTER DAM				CEDAR BLUFF DAM			
MONTH	NORM.	1961	1962	1963	NORM.	1961	1962	1963	NORM.	1961	1962	1963	NORM.	1961	1962	1963	NORM.	1961	1962	1963
JAN.	0.41	0.03	.26	.31	0.60	0.06	.85	.56	0.47	0.04	.57	.33	0.40	0.05	.59	.47	0.48	T	.35	.14
FEB.	0.58	0.40	.90	.02	0.85	0.56	1.67	T	0.70	0.25	1.11	.02	0.78	0.37	.99	.02	0.62	0.25	.21	T
MAR.	0.95	1.42	1.96	1.77	1.26	2.60	1.07	1.54	1.18	2.16	1.91	1.56	1.00	2.29	1.89	1.51	1.26	1.39	1.41	1.07
APR.	2.27	1.29	.32	1.26	2.21	1.99	.41	3.11	2.40	1.50	.36	2.00	2.20	1.74	.30	1.07	2.11	1.01	.75	.14
MAY	3.21	6.20	3.69	1.15	3.60	8.38	3.40	2.22	2.90	8.96	1.92	2.57	2.90	8.77	4.20	1.07	3.62	3.72	2.84	.79
JUNE	3.66	5.31	4.30	2.72	4.82	3.70	6.87	3.48	3.75	5.33	5.22	2.72	3.70	5.09	5.04	2.55	3.92	4.28	5.22	3.09
JULY	2.86	1.28	6.84	2.23	2.81	2.63	6.85	4.69	2.87	1.98	5.63	2.65	2.70	1.96	7.24	4.64	2.33	3.29	7.07	6.96
AUG.	2.48	2.30	4.72	3.75	2.68	3.97	3.89	3.55	2.85	4.30	3.64	5.42	2.75	3.65	1.63	2.62	2.43	4.66	4.27	1.13
SEPT.	2.19	2.94	1.31	5.46	2.69	6.24	4.31	6.13	2.27	2.59	1.92	4.13	2.50	3.94	1.53	5.07	2.06	3.44	1.57	4.42
OCT.	1.03	0.35	1.14	.46	1.45	1.01	3.54	1.11	1.26	0.65	3.00	.80	1.40	1.30	1.40	.22	1.16	1.26	.17	.91
NOV.	0.77	1.19	.08	.06	1.03	1.90	.81	.25	0.84	1.00	.15	.03	0.99	1.22	.23	0	0.86	1.53	.34	0
DEC.	0.49	0.64	.55	.13	0.77	1.04	.39	.23	0.57	0.69	.35	.08	0.70	0.77	.28	.40	0.55	0.31	.06	.14
TOTAL	20.90	23.35	26.07	19.32	24.77	34.08	34.06	26.85	22.06	29.45	25.78	22.31	22.02	31.15	25.32	19.24	21.40	25.14	24.26	18.79

The records on this table were taken from U. S. Weather Bureau Records.

TABLE 5

Table 5

STATUS OF REPAYMENT--WATER SERVICE CONTRACTS
KANSAS RIVER PROJECTS

Contracting Organization	Contracts Number	Date Executed	Date Approved By Dist. Court	Development Period
Frenchman-Cambridge Irrigation District	I lr-1500	5/29/47	7/19/50 (Rej)	Blk I 1/1/57-12/31/66
	Amendatory No.1	7/19/51	2/11/56 (Appr)	II 1/1/60-12/31/69
	Amendatory No.2	1/4/56		
	Amendatory No.3	11/1/57		
	Amendatory No.4	8/9/63		
Frenchman Valley Irrigation District	14-06-700-1241	11/7/56	10/20/58	None
H & RW Irrigation District	14-06-700-1242	11/7/56	7/19/57	2/1/63-1/31/68
	Amendment No.1	8/12/58		
Bostwick Irrigation District in Nebr.	I lr-1079	2/21/49		1/1/57-12/31/66
	Amendatory No.1	11/10/54	2/28/55	
	Amendatory No.2	5/3/60		
	Supplementary	3/16/61		
	Amendatory No.3	8/9/63		
Kansas-Bostwick Irrig. Dist. No.2	I lr-1584	4/20/51	3/9/53	Blk I 1/1/57-12/31/66
	Amendatory No.2	4/24/57	12/20/57	II 1/1/60-12/31/69
	Amendatory No.3	4/18/60		III 1/1/61-12/31/70
	Amendatory No.4	8/9/63		IV 1/1/62-12/31/71
Almena Irrigation District No. 5	14-06-700-1579	3/7/58	11/20/58	
Kirwin Irrigation District No. 1	14-06-W55	6/9/53	5/26/54	1/1/60-12/31/64
	Amendatory	10/18/55		
	Amendatory No.2	2/12/59		
Webster Irrigation District No. 4	14-06-700-1375	4/24/57	10/22/57	1/1/62-12/31/66
Cedar Bluff Irrigation District No. 6	14-06-700-2118	9/3/59	3/17/60	Not determined
City of Norton, Kansas	14-06-700-1573	3/7/58	Not Required	Not Applicable
City of Beloit, Kansas	14-06-700-3215	5/24/62	Not Required	Not Applicable

TABLE 6

IRRIGATION DEVELOPMENT AND OPERATION OF PROJECT CANAL SYSTEMS

Canal System	Acres Planned in Definite Plan Reports	Acres 1963 Irrigation Season: Service Avail. 1/	Acres 1963 Irrigation Season: Actually Irrig. 2/	Acres 1964 Estimates: Service Available	Acres 1964 Estimates: Expected to Be Irrigated	System Operations Calendar Years: Bureau of Reclamation	System Operations Calendar Years: Irrigation District
FRENCHMAN VALLEY IRRIGATION DISTRICT							
Culbertson	9,600	9,600	8,627	9,600	8,800	None	1958-Present 3/
H & RW IRRIGATION DISTRICT							
Culbertson Extension	11,490	11,490	10,302	11,490	10,500	1961	1963-Present
FRENCHMAN-CAMBRIDGE IRRIGATION DISTRICT							
Red Willow 4/	4,150	947	690	4,150	2,600	1963	1964
Meeker-Driftwood	16,440	16,440	14,486	16,440	14,500	1957-59 5/	1960-Present
Bartley	7,000	7,000	5,630	7,000	5,600	1954-56	1957-Present
Cambridge	15,600	15,600	14,256	15,600	14,000	1951-56	1957-Present
Total	43,190	39,987	35,062	43,190	36,700		
BOSTWICK IRRIGATION DISTRICT IN NEBRASKA							
Franklin	11,510	11,350	9,594	11,350	9,550	1954-56	1957-Present
Naponee	1,640	1,564	1,507	1,564	1,500	1955-56	1957-Present
Franklin Pump	2,120	2,091	1,960	2,091	1,950	1953-56	1957-Present
Superior	6,320	5,941	5,380	5,941	5,400	1951-56	1957-Present
Courtland	2,650	1,809	1,598	1,809	1,600	1952-58 6/	1959-Present
Total	24,240	22,755	20,039	22,755	20,000		
KANSAS-BOSTWICK IRRIGATION DISTRICT							
Courtland (above Lovewell Res.)	15,270	11,498	10,145	11,498	9,200	1954-58 7/	1959-Present
Courtland (below Lovewell Res.)	33,730	24,915	14,972	24,915	17,300	1958	1959-Present
Total	49,000	36,413	25,117	36,413	26,500		

TABLE 6
IRRIGATION DEVELOPMENT AND OPERATION OF PROJECT CANAL SYSTEMS (Cont'd) Sheet 2 of 2

Canal System	Acres Planned in Definite Plan Reports	Acres 1963 Irrigation Season Service Avail. 1/	Acres 1963 Irrigation Season Actually Irrig. 2/	Acres 1964 Estimates Service Available	Acres 1964 Estimates Expected to Be Irrigated	System Operations Calendar Years Bureau of Reclamation	System Operations Calendar Years Irrigation District
			KIRWIN IRRIGATION DISTRICT				
Kirwin	10,000 8/	11,500	8,512	11,500	9,000	1957-59	1960-Present
			WEBSTER IRRIGATION DISTRICT				
Osborne	8,500	8,500	5,755	8,500	7,500	1960-61	1962-Present
			CEDAR BLUFF IRRIGATION DISTRICT				
Cedar Bluff 9/	6,200 10/	6,600	2,226	6,600	3,000	1963-64	
TOTAL OF PROJECTS	162,220	146,845	115,640	150,048	122,000		

1/ Acres used in crop census reports and official program documents.

2/ Determined by crop census.

3/ District operated since 1890, but 1958 was first year operated as part of Kansas River Projects.

4/ Construction will be completed in 1964. The system will be operated by the district and maintained by the Bureau of Reclamation in 1964.

5/ In 1948 Bureau took over operation of 2,912 acres of old Meeker Canal now included in Meeker-Driftwood system.

6/ Nebraska-Bostwick District has operated laterals since 1957. Kansas-Bostwick District has operated the main canal since 1959, and the Superior-Courtland Diversion Dam since 1960.

7/ Kansas-Bostwick District operated lateral system since 1957.

8/ The repayment contract states 11,500 acres.

9/ This system will be operated and maintained by the Bureau of Reclamation in 1964, and will be turned over to the irrigation district January 1, 1965.

10/ The repayment contract states 6,600 acres.

TABLE 7
CANAL DIVERSIONS AND ACRES IRRIGATED
KANSAS RIVER PROJECTS
1963

Irrigation District and Canal	State	Diversions-Acre Feet April	May	June	July	Aug.	Sept.	Oct.	Total	Acres Irrigated
NON-PROJECT LANDS										
Hale Ditch (Includes 70 A.F. of Warren Act)	Colorado	44	1,047	573	343	739	178	0	2,924	590
Warren Act	Nebraska	0	0	0	0	0	0	0	0	0
PROJECT LANDS										
FRENCHMAN VALLEY	Nebraska									
Culbertson Canal		2,636	3,340	2,259	8,398	8,734	1,266	0	26,633	8,627
H&RW	Nebraska									
Culbertson Extension Canal		0	2,319	2,206	9,916	8,013	1,267	0	23,721	10,302
FRENCHMAN-CAMBRIDGE	Nebraska									
Meeker-Driftwood Canal		0	4,126	5,387	17,578	11,130	2,442	0	40,663	14,486
Red Willow Canal		0	0	593	1,160	752	18	0	2,523	690
Bartley Canal		0	968	758	6,597	2,487	369	0	11,179	5,630
Cambridge Canal		0	3,681	3,529	17,318	6,430	768	0	31,726	14,256
Total		0	8,775	10,267	42,653	20,799	3,597	0	86,091	35,062
NEBRASKA-BOSTWICK	Nebraska									
Franklin Canal		256	3,390	3,447	13,386	7,495	512	0	28,486	9,594
Naponee Canal		0	102	226	2,093	712	26	0	3,159	1,507
Franklin Pump Canal		0	0	196	2,390	643	0	0	3,229	1,960
Superior Canal		210	2,176	1,874	6,678	4,185	38	0	15,161	5,380
Courtland Canal		260	1,688	1,182	1,054	302	-46	0	4,440	1,598
Total		726	7,356	6,925	25,601	13,337	530	0	54,475	20,039
KANSAS-BOSTWICK	Kansas									
Courtland above Lovewell		0	2,128	2,374	14,474	8,029	110	0	27,115	10,145
Courtland below Lovewell		258	908	2,902	22,413	12,908	933	0	40,322	14,972
Total		258	3,036	5,276	36,887	20,937	1,043	0	67,437	25,117
KIRWIN	Kansas									
Kirwin Canal		0	0	5,748	10,078	3,753	123	0	19,702	8,512
WEBSTER	Kansas									
Osborne Canal		0	0	4,663	6,670	3,584	153	0	15,070	5,755
CEDAR BLUFF	Kansas									
Cedar Bluff Canal		0	829	738	1,985	2,553	831	210	7,146	2,226
Total for Project Lands		3,620	25,655	38,082	142,188	81,710	8,810	210	300,275	115,640

IRRIGATION UNDER CANAL SYSTEMS IN KANSAS RIVER PROJECTS Sheet 1 of 2

Irrig. Dist	COLORADO (Non-Proj)	(Non-Proj)	NEBRASKA								
					Frenchman-Cambridge					Nebr.-Bostwick	
Canal	Hale Ditch 1/	Warren Act 2/	Fr. Valley Culbertson	H & RW Extension	Meeker-Driftwood	Red Willow	Bartley	Cambridge	Total	Franklin	Naponee
					1964 Estimates						
Acres	590	1,500	8,800	10,500	14,500	2,600	5,600	14,000	36,700	9,550	1,500
AF-Dry Yr.	5,200	300	25,300	30,300	39,200	9,100	14,600	35,300	98,200	32,100	5,000
AF-Nor. Yr.	3,800	200	17,600	21,000	27,600	6,300	10,000	23,800	67,700	21,300	3,300
AF-Wet Yr.	2,600	0	11,000	13,100	16,200	3,600	5,900	14,000	39,700	10,800	1,700
					1963						
Acres	590	0	8,627	10,302	14,486	690	5,630	14,256	35,062	9,594	1,507
AF Div.	2,924	0	26,633	23,721	40,663	2,523	11,179	31,726	86,091	28,486	3,159
AF/Ac.	4.96	0	3.09	2,30	2.81	3.66	1.98	2.22	2.46	2.97	2.10
					1962						
Acres	590	0	8,310	8,677	13,175		5,458	13,470	32,103	9,189	1,352
AF Div.	3,340	0	22,928	13,474	25,849		8,592	18,428	52,869	19,761	2,152
AF/Ac.	5.66	0	2.76	1.55	1.96		1.57	1.37	1.65	2.15	1.59
					1961						
Acres	590	3,166	8,109	4,744	13,192		5,354	13,272	31,818	7,794	1,297
AF Div.	2,495	932	26,844	12,769	31,535		10,857	27,187	69,579	24,805	3,239
AF/Ac.	4.23	0.29	3.31	2.69	2.39		2.03	2.05	2.19	3.18	2.50
					1960						
Acres	590	4,355	9,400		13,538		4,911	14,249	32,698	8,424	1,411
AF Div.	2,855	1,095	22,094		33,960		11,760	27,170	72,890	22,596	2,293
AF/Ac.	4.83	0.25	2.40		2.51		2.39	1.90	2.23	2.68	1.62
					1959						
Acres	590	4,499	9,400		9,670		4,815	13,485	27,970	9,687	1,474
AF Div.	2,571	1,039	22,076		30,141		10,457	30,807	71,405	25,847	3,223
AF/Ac.	4.36	0.23	2.35		3.12		2.17	2.29	2.55	2.67	2.19

1/ Hale Ditch is not a Government Project. Acre-feet diverted includes both natural flow and supplemental water delivered under Warren Act Contracts.

2/ Supplemental storage delivered under Warren Act Contracts to private pumps and irrigation systems.

Table 8
Sheet 1 of 2

IRRIGATION UNDER CANAL SYSTEMS IN KANSAS RIVER PROJECTS

	NEBRASKA (cont'd)				KANSAS						TOTAL
Irrig.Dist.	Nebraska-Bostwick				Kansas-Bostwick			Kirwin	Webster	Cedar Bl.	FOR
	Franklin			Total	Courtland Canal						PROJECT
Canal	Pump	Superior	Courtland		Upper	Lower	Total	Kirwin	Osborne	Cedar Bl.	SYSTEMS 1/
					1964 Estimates						
Acres	1,950	5,400	1,600	20,000	9,200	17,300	26,500	9,000	7,500	3,000	122,000
AF-Dry Yr.	6,600	16,000	4,100	63,800	23,700	44,600	68,300	24,000	23,200	9,300	342,400
AF-Nor. Yr.	4,300	11,600	3,000	43,500	17,100	32,200	49,300	16,200	15,900	6,600	237,800
AF-Wet Yr.	2,200	5,600	1,400	21,700	8,300	15,600	23,900	10,100	9,900	4,200	133,600
					1963						
Acres	1,960	5,380	1,598	20,039	10,145	14,972	25,117	8,512	5,755	2,226	115,640
AF Div.	3,229	15,161	4,440	54,475	27,115	40,322	67,437	19,702	15,070	7,146	300,275
AF/Ac.	1.65	2.82	2.78	2.72	2.67	2.69	2.68	2.31	2.62	3.21	2.60
					1962						
Acres	1,774	3,896	616	16,827	7,406	14,989	22,395	7,227	4,240	0	99,779
AF Div.	403	11,122	3,197	36,635	19,377	26,216	45,593	13,219	7,978	0	192,696
AF/Ac.	0.23	2.86	5.19	2.18	2.62	1.75	2.04	1.83	1.88	0	1.93
					1961						
Acres	1,739	4,837	1,239	16,906	7,910	14,052	21,962	7,551	2,912		94,002
AF Div.	2,322	13,436	6,161	49,963	20,983	28,103	49,086	19,904	9,270		237,415
AF/Ac.	1.34	2.78	4.97	2.95	2.65	2.00	2.24	2.64	3.18		2.53
					1960						
Acres	1,903	5,029	1,427	18,194	7,020	12,935	19,955	8,216	1,159		89,622
AF Div.	2,676	13,124	5,230	45,919	18,592	26,529	45,121	16,834	4,185		207,043
AF/Ac.	1.41	2.61	3.66	2.52	2.65	2.05	2.26	2.04	3.61		2.31
					1959						
Acres	1,930	5,080	1,664	19,835	7,159	9,081	16,240	6,470			79,915
AF Div.	3,110	17,449	5,133	54,762	23,343	26,388	49,731	21,005			218,979
AF/Ac.	1.61	3.43	3.08	2.76	3.26	2.91	3.06	3.25			2.74

1/ Totals for project systems only. Excludes Hale Ditch and deliveries under Warren Act Contracts.

Table 8
Sheet 2 of 2

TABLE 9
RESERVOIR OPERATION FORECAST FROM SWANSON LAKE TO CAMBRIDGE DIVERSION DAM

(Units in 1,000 acre-feet)

	Month	Gain (+) or Loss (-) Trenton to Bartley	Affect of Hugh Butler Operation	Bartley Canal Reg.	Total River Reg.	Meeker-Driftwood Canal Reg.	Total Release Reg. from Swanson Lake	Cambridge Canal Reg.	Avail. Pickup Passing Bartley	Water Admin.	Total Release Reg. from Harry Strunk Lake
Reas. Minimum	May	+ 2.9	- 1.7	1.4	1.7	3.9	5.6	3.5	1.5	0	2.0
	June	+ 2.6	- 1.5	1.5	1.9	3.9	5.8	3.5	1.5	0	2.0
	July	- 0.5	- 1.0	4.4	7.4	11.8	19.2	10.6	1.5	0	9.1
	Aug.	- 0.7	- 0.8	4.4	7.4	11.8	19.2	10.6	1.5	0	9.1
	Sept.	- 0.3	- 0.7	2.2	4.7	5.9	10.6	5.3	1.5	0	3.8
	Oct.	+ 1.6	- 0.8	0.7	1.4	1.9	3.3	1.8	1.5	0.2	0.5
	Total	+ 5.6	- 6.5	14.6	24.5	39.2	63.7	35.3	9.0	0.2	26.5
Most Probable	May	+ 4.9	- 2.3	0.5	0	1.4	1.4	1.2	1.5	0.3	0.3
	June	+ 5.1	- 3.1	0.5	0	1.4	1.4	1.2	1.5	0.3	0.3
	July	+ 1.8	- 1.9	3.5	5.1	9.7	14.8	8.3	1.5	0	6.8
	Aug.	+ 1.2	- 1.1	4.0	5.4	11.0	16.4	9.5	1.5	0	8.0
	Sept.	+ 1.8	- 1.0	1.0	1.7	2.7	4.4	2.4	1.5	0	0.9
	Oct.	+ 3.3	- 1.2	0.5	0	1.4	1.4	1.2	1.5	0.3	0.3
	Total	+18.1	-10.6	10.0	12.2	27.6	39.8	23.8	9.0	0.9	16.6
Reas. Maximum	May	+ 5.4	- 3.0	0.3	0	0.8	0.8	0.7	1.5	0.3	0.3
	June	+ 8.7	- 2.4	0.3	0	0.8	0.8	0.7	1.5	0.3	0.3
	July	+ 4.0	- 1.7	2.0	1.2	5.7	6.9	4.9	1.5	0	3.4
	Aug.	+ 3.0	- 1.7	2.4	2.6	6.5	9.1	5.6	1.5	0	4.1
	Sept.	+ 4.3	- 1.1	0.6	0	1.6	1.6	1.4	1.5	0.3	0.3
	Oct.	+ 3.9	- 0.8	0.3	0	0.8	0.8	0.7	1.5	0.3	0.3
	Total	+29.3	-10.7	5.9	3.8	16.2	20.0	14.0	9.0	1.2	8.7

TABLE 10
ESTIMATED DEMANDS ON HARLAN COUNTY RESERVOIR - 1964
(Units in 1,000 acre-feet)

		1	2	3	4	5	6	7	8	9	10	11	12
								Lovewell Reservoir Requirements					
	Months	Total Demand by Franklin, Naponee & Franklin Pump Canal	Total Demand by Superior & Courtland Above Lovewell	Avail. Pickup	Pickup in Col. 3 used to satisfy Col. 2 1/	Total Releases For Demands Above Lovewell	Unused Pickup	Operation Releases from Harlan County 2/	Usable Pickup from Col. 6 3/	Total Avail. Supply	Lovewell Inflow Req. From Courtland Canal	Total Demands on Harlan County for Lovewell	Total Demands on Harlan County Reservoir
Dry Year	May	4.3	4.4	2.7	2.7	6.0	0	1.2	0	1.2	1.2	0	7.2
	June	4.4	4.4	3.5	3.5	5.3	0	1.2	0	1.2	1.2	0	6.5
	July	13.1	13.2	0.8	0.8	25.5	0	1.2	0	1.2	9.0	7.8	34.5
	Aug.	15.4	15.3	0.5	0.5	30.2	0	1.2	0	1.2	9.0	7.8	39.2
	Sept.	6.5	6.5	0.8	0.8	12.2	0	1.2	0	1.2	8.8	7.6	21.0
	Oct.	0	0	0	0	0	0	0	0	0	0	0	0
	Total	43.7	43.8	8.3	8.3	79.2	0	6.0	0	6.0	29.2	23.2	108.4
Median Year	May	1.5	1.6	7.0	1.6	1.5	5.4	0	3.5	3.5	0	0	1.5
	June	1.5	1.7	13.8	1.7	1.5	12.1	0	4.2	4.2	0	0	1.5
	July	11.5	12.6	7.8	7.8	16.3	0	1.2	0	1.2	12.6	11.4	28.9
	Aug.	11.5	12.6	5.0	5.0	19.1	0	1.2	0	1.2	12.7	11.5	31.8
	Sept.	2.9	3.2	2.7	2.7	3.4	0	1.2	0	1.2	8.2	7.0	11.6
	Oct.	0	0	0	0	0	0	0	0	0	0	0	0
	Total	28.9	31.7	36.3	18.8	41.8	17.5	3.6	7.7	11.3	33.5	29.9	75.3
Wet Year	May	0.7	0.8	21.5	0.8	0.7	20.7	0	5.1	5.1	0	0	0.7
	June	0.8	0.8	37.5	0.8	0.8	36.7	0	6.9	6.9	0	0	0.8
	July	5.9	6.1	15.0	6.1	5.9	8.9	0	4.0	4.0	0	0	5.9
	Aug.	5.9	6.0	9.4	6.0	5.9	3.4	0	3.4	3.4	0	0	5.9
	Sept.	1.4	1.6	20.0	1.6	1.4	18.4	0	4.9	4.9	5.7	0.8	2.2
	Oct.	0	0	0	0	0	0	0	0	0	0	0	0
	Total	14.7	15.3	103.4	15.3	14.7	88.1	0	24.3	24.3	5.7	0.8	15.5

1/ Available pickup can be used for Superior and Courtland Canals only.
2/ Maximum of 20 c.f.s. per day (1,200 A.F. per month) released to meet unexpected demands for irrigation and sudden increases in transportation losses. This extra amount may be diverted into Lovewell Reservoir through the upper Courtland Canal.
3/ Estimated from curve based on past records of flood durations as affected by canal capacity limitations for picking up flood flows.

TABLE 11
KANSAS RIVER PROJECTS - BUREAU OF RECLAMATION
RESERVOIR OPERATION ESTIMATES - 1964
(Units in 1,000 Acre-feet)

Month	BONNY RESERVOIR Res. Inflow	Net Evap.	Total Release	Res. Change	End of Month Content	End of Month Elev. (Ft.)	Control Flood Release	SWANSON LAKE Depleted Res. Inflow	Net Evap.	Total Release	Res. Change	End of Month Content	End of Month Elev. (Ft.)	Control Flood Release	ENDERS RESERVOIR Res. Inflow	Net Evap.	Total Release	Res. Change	End of Month Content	End of Month Elev. (Ft.)	Control Flood Release
Reasonable Minimum Year																					
Jan.	2.1	0.3	0.4	+1.4	39.8	3671.2	0	5.1	0.4	0.1	+4.6	95.5	2746.7	0	4.6	0.1	0.6	+4.2	33.5	3105.3	0
Feb.	2.2	0.3	0.4	+1.5	41.3	3672.0	0	7.7	0.5	0.1	+7.1	102.6	2748.3	0	4.0	0.1	0.6	+3.6	37.1	3107.7	0
Mar.	2.3	0.4	0.4	-3.9	37.4	3670.0	5.4	14.2	0.8	0.1	+13.3	115.9	2751.1	0	4.2	0.3	0.6	+3.6	40.7	3110.0	0
Apr.	2.1	0.7	0.7	0	37.4	3670.0	0.7	8.0	1.6	0.1	+4.3	120.2	2752.0	2.0	3.8	0.6	2.0	+1.5	42.2	3110.9	0
May	2.0	0.8	1.3	-0.1	37.3	3669.9	0	7.5	1.7	5.6	0	120.2	2752.0	0.2	3.8	0.7	2.1	+1.3	43.5	3111.7	0
June	0.8	0.9	1.3	-1.4	35.9	3669.2	0	7.1	2.1	5.8	-0.8	119.4	2751.8	0	3.6	0.8	3.9	-0.8	42.7	3111.2	0
July	0.3	1.3	1.3	-2.3	33.6	3668.0	0	3.0	3.1	19.2	-19.3	100.1	2747.8	0	3.2	1.2	14.2	-11.9	30.8	3103.3	0
Aug.	0.5	1.0	1.2	-1.7	31.9	3667.0	0	2.3	2.4	19.2	-19.3	80.8	2743.3	0	3.3	0.7	14.2	-11.3	19.5	3093.8	0
Sep.	0.1	0.7	1.0	-1.6	30.3	3666.1	0	1.0	1.7	10.6	-11.3	69.5	2740.5	0	3.2	0.5	6.4	-3.4	16.1	3090.3	0
Oct.	1.0	0.7	0.9	-0.6	29.7	3665.7	0	2.1	1.5	3.3	-2.7	66.8	2739.8	0	3.6	0.4	2.0	+1.5	17.6	3091.9	0
Nov.	1.6	0.4	0.7	+0.5	30.2	3666.0	0	4.6	0.8	0.1	+3.7	70.5	2740.7	0	3.7	0.2	0.6	+3.2	20.8	3095.0	0
Dec.	2.0	0.3	0.4	+1.3	31.5	3666.8	0	4.1	0.4	0.1	+3.6	74.1	2741.6	0	4.0	0.1	0.6	+3.6	24.4	3098.2	0
Total	17.0	7.8	10.0	-6.9			6.1	66.7	17.0	64.3	-16.8			2.2	45.0	5.7	47.8	-4.9			0
Most Probable Year																					
Jan.	2.2	0.2	0.4	+1.6	40.0	3671.3	0	**7.3**	0.3	0.1	+6.9	97.8	2747.3	0	4.9	0.1	0.6	+4.5	33.8	3105.5	0
Feb.	2.2	0.3	0.4	+1.3	41.3	3672.0	0.2	10.1	0.4	0.1	+9.6	107.4	2749.4	0	4.3	0.1	0.6	+3.9	37.7	3108.1	0
Mar.	2.9	0.3	0.4	-3.9	37.4	3670.0	6.1	18.4	0.6	0.1	+12.8	120.2	2752.0	4.9	4.4	0.2	0.6	+3.9	41.6	3110.6	0
Apr.	2.5	0.4	0.8	0	37.4	3670.0	1.3	**11.8**	1.0	0.1	0	120.2	2752.0	10.7	4.2	0.4	0.6	+2.9	44.5	3112.3	0.6
May	3.0	0.5	1.0	0	37.4	3670.0	1.5	14.7	0.9	1.4	0	120.2	2752.0	12.4	4.1	0.5	0.6	0	44.5	3112.3	3.3
June	3.0	0.7	1.0	0	37.4	3670.0	1.3	13.3	1.6	1.4	0	120.2	2752.0	10.3	4.2	0.5	2.3	0	44.5	3112.3	1.7
July	1.7	0.9	0.8	0	37.4	3670.0	0	4.5	2.1	14.8	-12.4	107.8	2749.4	0	3.8	0.8	10.5	-7.2	37.3	3107.8	0
Aug.	1.8	1.0	0.8	0	37.4	3670.0	0	5.0	2.2	16.4	-13.6	94.2	2746.4	0	3.6	0.8	12.4	-9.3	28.0	3101.2	0
Sep.	1.5	0.7	1.0	-1.9	35.5	3669.0	1.7	6.3	1.2	4.4	+0.7	94.9	2746.6	0	3.6	0.4	1.9	+1.6	29.6	3102.4	0
Oct.	1.7	0.7	1.0	0	35.5	3669.0	0	3.5	1.6	1.4	+0.5	95.4	2746.7	0	3.9	0.5	0.6	+3.1	32.7	3104.7	0
Nov.	2.0	0.4	0.6	+1.0	36.4	3669.5	0	5.8	0.8	0.1	+4.9	100.3	2747.8	0	4.3	0.3	0.6	+3.7	36.4	3107.3	0
Dec.	2.2	0.2	0.4	+1.6	38.1	3670.4	0	5.9	0.4	0.1	+5.4	105.7	2749.0	0	4.7	0.1	0.6	+4.3	40.7	3110.0	0
Total	26.7	6.3	8.6	-0.3			12.1	106.6	13.1	40.4	+14.8			38.3	50.0	4.7	31.9	+11.4			5.6
Reasonable Maximum Year																					
Jan.	2.5	0.2	0.4	+1.9	40.3	3671.5	0	11.6	0.2	0.1	+11.3	102.2	2748.2	0	5.1	0.1	0.6	+4.7	34.0	3105.6	0
Feb.	2.6	0.2	0.4	+1.0	41.3	3672.0	1.0	15.4	0.3	0.1	+15.0	117.2	2751.4	0	4.8	0.1	0.6	+4.4	38.4	3108.5	0
Mar.	3.2	0.2	0.4	-3.9	37.4	3670.0	6.5	24.4	0.3	0.1	+3.0	120.2	2752.0	21.0	5.1	0.1	0.6	+4.7	43.1	3111.5	0
Apr.	3.1	0.4	0.7	0	37.4	3670.0	2.0	19.5	0.3	0.1	0	120.2	2752.0	19.1	4.7	0.1	0.6	+1.4	44.5	3112.3	2.9
May	5.0	0.3	0.9	0	37.4	3670.0	3.8	26.2	0.3	0.8	0	120.2	2752.0	25.1	5.0	0.2	0.6	0	44.5	3112.3	4.5
June	5.4	0.4	0.6	0	37.4	3670.0	4.4	28.2	0.8	0.8	0	120.2	2752.0	26.6	5.7	0.4	0.6	0	44.5	3112.3	5.0
July	4.2	0.8	0.6	0	37.4	3670.0	2.8	23.6	1.7	6.9	0	120.2	2752.0	15.0	4.3	0.6	4.6	-0.6	43.9	3112.0	0
Aug.	3.6	0.6	0.8	0	37.4	3670.0	2.2	15.5	2.1	9.1	0	120.2	2752.0	4.3	4.1	0.6	5.0	-1.2	42.7	3111.2	0
Sep.	1.9	0.5	0.8	-1.9	35.5	3669.0	2.5	11.8	1.0	1.6	0	120.2	2752.0	9.2	4.6	0.3	0.6	+1.8	44.5	3112.3	2.2
Oct.	2.2	0.5	0.7	0	35.5	3669.0	1.0	8.6	1.6	0.8	0	120.2	2752.0	6.2	4.7	0.5	0.6	0	44.5	3112.3	3.9
Nov.	2.2	0.4	0.7	+1.1	36.6	3669.6	0	8.5	0.6	0.1	0	120.2	2752.0	7.8	4.7	0.3	0.6	0	44.5	3112.3	4.1
Dec.	2.3	0.2	0.4	+1.7	38.3	3670.5	0	9.1	0.3	0.1	0	120.2	2752.0	8.7	5.0	0.1	0.6	0	44.5	3112.3	4.6
Total	38.2	4.7	7.4	-0.1			26.2	202.4	9.5	20.6	+29.3			143.0	57.8	3.4	15.6	+15.2			27.2

TABLE 11
KANSAS RIVER PROJECTS - BUREAU OF RECLAMATION
RESERVOIR OPERATION ESTIMATES - 1964
(Units in 1,000 Acre-Feet)

		HUGH BUTLER LAKE				End of Month			HARRY STRUNK LAKE				End of Month			NORTON RESERVOIR				End of Month		
	Month	Res. Inflow	Net Evap.	Total Release	Res. Change	Content	Elev. (Ft.)	Control Flood Release	Res. Inflow	Net Evap.	Total Release	Res. Change	Content	Elev. (Ft.)	Control Flood Release	Res. Inflow	Net Evap.	Total Release	Res. Change	Content	Elev. (Ft.)	Control Flood Release
Reasonable Minimum Year	Jan.	1.2	0.1	0.2	+0.9	27.8	2575.0	0	3.0	0.1	0.3	+2.6	38.7	2365.8	0	0.3	0	0.3	0	0		0
	Feb.	1.5	0.1	0.2	+1.2	29.0	2575.9	0	3.3	0.1	0.3	+0.5	39.2	2366.1	2.4	0.5	0	0.5	0	0		0
	Mar.	1.7	0.2	0.2	+1.3	30.3	2576.9	0	3.8	0.3	0.3	0	39.2	2366.1	3.2	0.6	0	0.6	0	0		0
	Apr.	1.5	0.5	0.2	+0.8	31.1	2577.4	0	3.8	0.6	0.3	0	39.2	2366.1	2.9	0.7	0	0.7	0	0		0
	May	1.7	0.5	1.8	-0.6	30.5	2577.0	0	3.6	0.6	2.0	0	39.2	2366.1	1.0	1.2	0	1.2	0	0		0
	June	1.5	0.8	1.8	-1.1	29.4	2576.2	0	3.8	0.7	2.0	0	39.2	2366.1	1.1	2.4	0	2.4	0	0		0
	July	1.0	0.9	2.7	-2.6	26.8	2574.2	0	2.7	1.2	9.1	-7.6	31.6	2361.4	0	1.2	0	1.2	0	0		0
	Aug.	0.8	0.7	2.3	-2.2	24.6	2572.4	0	2.7	0.9	9.1	-7.3	24.3	2356.3	0	0.8	0.1	0	+0.7	0.7	2266.2	0
	Sep.	0.7	0.6	1.2	-1.1	23.5	2571.5	0	2.1	0.5	3.8	-7.2	22.1	2354.5	0	0.5	0.1	0	+0.4	1.1	2268.6	0
	Oct.	0.8	0.5	0.5	-0.2	23.3	2571.3	0	2.6	0.4	0.5	+1.7	23.8	2355.9	0	0.1	0	0	+0.1	1.2	2269.0	0
	Nov.	1.1	0.3	0.2	+0.6	23.9	2571.8	0	3.0	0.3	0.3	+2.4	26.2	2357.7	0	0.2	0	0	+0.2	1.4	2269.8	0
	Dec.	1.3	0.1	0.2	+1.0	24.9	2572.7	0	3.0	0.1	0.3	+2.6	28.8	2359.5	0	0.3	0	0	+0.3	1.7	2270.9	0
	Total	14.8	5.3	11.5	-2.0			0	37.4	5.8	28.3	-7.3			10.6	8.8	0.2	6.9	+1.7			0
Most Probable Year	Jan.	1.5	0.1	0.2	+1.2	28.1	2575.2	0	3.6	0.1	0.3	+3.1	39.2	2366.1	0.1	0.6	0	0.6	0	0		0
	Feb.	1.6	0.1	0.2	+1.3	29.4	2576.2	0	3.8	0.1	0.3	0	39.2	2366.1	3.4	0.9	0	0.9	0	0		0
	Mar.	2.1	0.1	0.2	+1.8	31.2	2577.5	0	4.3	0.2	0.3	0	39.2	2366.1	3.8	0.9	0	0.9	0	0		0
	Apr.	1.9	0.3	0.2	+1.4	32.6	2578.5	0	4.5	0.4	0.3	0	39.2	2366.1	3.8	1.0	0	1.0	0	0		0
	May	2.3	0.3	1.0	+1.0	33.6	2579.2	0	5.4	0.4	0.3	0	39.2	2366.1	4.7	2.9	0	2.9	0	0		0
	June	3.1	0.3	1.0	+1.8	35.4	2580.3	0	6.8	0.5	0.3	0	39.2	2366.1	6.0	6.8	0	6.8	0	0		0
	July	1.9	0.8	2.3	-1.2	34.2	2579.5	0	5.0	0.7	6.8	-2.5	36.7	2364.6	0	4.0	0	4.0	0	0		0
	Aug.	1.1	0.6	2.1	-1.6	32.6	2578.5	0	3.4	0.7	8.0	-5.3	31.4	2361.3	0	2.1	0.1	0	+2.0	2.0	2271.9	0
	Sep.	1.0	0.4	0.7	-0.1	32.5	2578.4	0	3.0	0.4	0.9	+1.7	33.1	2362.4	0	1.0	0.1	0	+0.9	2.9	2274.6	0
	Oct.	1.2	0.4	0.4	+0.4	32.9	2578.7	0	3.0	0.6	0.3	+2.1	35.2	2363.7	0	0.5	0.1	0	+0.4	3.3	2275.7	0
	Nov.	1.4	0.2	0.2	+1.0	33.9	2579.4	0	3.2	0.3	0.3	+2.6	37.8	2365.3	0	0.3	0	0	+0.3	3.6	2276.4	0
	Dec.	1.6	0.1	0.2	+1.3	35.2	2580.2	0	3.5	0.1	0.3	+1.4	39.2	2366.1	1.7	0.5	0	0	+0.5	4.1	2277.5	0
	Total	20.7	3.7	8.7	+8.3			0	49.5	4.5	18.4	+3.1			23.5	21.5	0.3	17.1	+4.1			0
Reasonable Maximum Year	Jan.	1.8	0	0.2	+1.6	28.5	2575.5	0	4.2	0	0.3	+3.1	39.2	2366.1	0.8	0.9	0	0.9	0	0		0
	Feb.	1.9	0.1	0.2	+1.6	30.1	2576.7	0	4.3	0.1	0.3	0	39.2	2366.1	3.9	1.3	0	1.3	0	0		0
	Mar.	2.6	0.1	0.2	+2.3	32.4	2578.3	0	5.7	0.1	0.3	0	39.2	2366.1	5.3	1.9	0	1.9	0	0		0
	Apr.	2.5	0.2	0.2	+2.1	34.5	2579.7	0	6.0	0.1	0.3	0	39.2	2366.1	5.6	1.6	0	1.6	0	0		0
	May	3.0	0.2	0.7	+2.1	36.6	2581.1	0	8.4	0.1	0.3	0	39.2	2366.1	8.0	9.5	0	9.5	0	0		0
	June	5.5	0.5	0.7	+1.2	37.8	2581.8	3.1	19.1	0.1	0.3	0	39.2	2366.1	18.7	16.5	0	16.5	0	0		0
	July	3.1	0.5	1.2	0	37.8	2581.8	1.4	9.4	0.8	3.4	0	39.2	2366.1	5.2	11.2	0	11.2	0	0		0
	Aug.	1.8	0.4	1.3	0	37.8	2581.8	0.1	5.4	0.6	4.1	0	39.2	2366.1	0.7	5.6	0.1	0	+5.5	5.5	2280.0	0
	Sep.	2.2	0.5	0.6	0	37.8	2581.8	1.1	6.1	0.3	0.3	0	39.2	2366.1	5.5	3.2	0.2	0	+3.0	8.5	2284.5	0
	Oct.	1.5	0.5	0.3	0	37.8	2581.8	0.7	4.1	0.5	0.3	0	39.2	2366.1	3.3	1.5	0.2	0	+1.3	9.8	2286.1	0
	Nov.	1.6	0.2	0.2	0	37.8	2581.8	1.2	3.8	0.1	0.3	0	39.2	2366.1	3.4	0.9	0.1	0	+0.8	10.6	2287.0	0
	Dec.	1.6	0.1	0.2	0	37.8	2581.8	1.3	3.9	0.1	0.3	0	39.2	2366.1	3.5	0.9	0	0	+0.9	11.5	2287.9	0
	Total	29.1	3.3	6.0	+10.9			8.9	80.4	2.9	10.5	+3.1			63.9	55.0	0.6	42.9	+11.5			0

TABLE 11
KANSAS RIVER PROJECTS - BUREAU OF RECLAMATION
RESERVOIR OPERATION ESTIMATES - 1964
(Units in 1,000 Acre-Feet)

		HARLAN COUNTY RESERVOIR							LOVEWELL RESERVOIR							KIRWIN RESERVOIR						
						End of Month							End of Month							End of Month		
	Month	Depleted Res. Inflow	Net Evap.	Total Release	Res. Change	Content	Elev. (Ft.)	Control Flood Release	Res.* Inflow	Net Evap.	Total Release	Res. Change	Content	Elev. (Ft.)	Control Flood Release	Res. Inflow	Net Evap.	Total Release	Res. Change	Content	Elev. (Ft.)	Control Flood Release
Reasonable Minimum Year	Jan.	0.9	0.8	0.6	-0.5	248.8	1937.6	0	0.1	0.2	0	-0.1	47.5	1584.5	0	0.2	0.3	0	-0.1	83.5	1725.9	0
	Feb.	3.9	0.6	0.6	+2.7	251.5	1937.9	0	0.1	0.2	0	-0.1	47.4	1584.4	0	0.8	0.4	0	+0.4	83.9	1726.0	0
	Mar.	12.1	1.6	0.6	+4.3	255.8	1938.2	5.6	0.2	0.4	0	-0.2	47.2	1584.4	0	1.4	0.7	0	+0.7	84.6	1726.2	0
	Apr.	15.6	5.0	0.6	+10.0	265.8	1939.2	0	0.2	0.9	0	-0.7	46.5	1584.1	0	1.5	1.8	0	-0.3	84.3	1726.1	0
	May	16.4	4.0	7.2	+5.2	271.0	1939.6	0	1.9	0.9	4.4	-3.4	43.1	1583.1	0	2.4	1.9	2.4	-1.9	82.4	1725.7	0
	June	23.5	6.2	6.5	+10.8	281.8	1940.6	0	2.8	1.4	4.5	-3.1	40.0	1582.0	0	3.9	2.0	2.4	-0.5	81.9	1725.6	0
	July	13.1	9.2	34.5	-30.6	251.2	1937.8	0	9.6	1.8	13.4	-5.6	34.4	1580.0	0	3.1	2.9	7.2	-7.0	74.9	1724.0	0
	Aug.	11.1	7.6	39.2	-35.7	215.5	1934.4	0	9.4	1.1	15.6	-7.3	27.1	1577.0	0	1.8	2.3	8.4	-8.9	66.0	1721.8	0
	Sep.	3.3	4.5	21.0	-22.2	193.3	1932.1	0	9.1	1.0	6.7	+1.4	28.5	1577.6	0	0.9	1.8	3.6	-4.5	61.5	1720.7	0
	Oct.	0	3.5	0.6	-4.1	189.2	1931.7	0	0.1	0.7	0	-0.6	27.9	1577.3	0	0.2	1.4	0	-1.2	60.3	1720.4	0
	Nov.	0	2.0	0.6	-2.6	186.6	1931.4	0	0	0.5	0	-0.5	27.4	1577.1	0	0.4	0.8	0	-0.4	59.9	1720.3	0
	Dec.	0.2	0.9	0.6	-1.3	185.3	1931.3	0	0	0.2	0	-0.2	27.2	1577.0	0	0.4	0.4	0	0	59.9	1720.3	0
	Total	100.1	45.9	112.6	-64.0			5.6	33.5	9.3	44.6	-20.4			0	17.0	16.7	24.0	-23.7			0
Most Probable Year	Jan.	4.0	0.5	0.6	+2.9	252.2	1937.9	0	0.2	0.1	0	+0.1	47.7	1584.5	0	0.9	0.2	0	+0.7	84.3	1726.1	0
	Feb.	14.8	0.6	0.6	+1.0	253.2	1938.0	12.6	0.5	0.1	0	0	47.7	1584.5	0.4	1.8	0.3	0	+1.5	85.8	1726.4	0
	Mar.	20.7	1.0	0.6	+7.3	260.5	1938.7	11.8	0.5	0.2	0	0	47.7	1584.5	0.3	2.1	0.4	0	+1.7	87.5	1726.6	0
	Apr.	31.0	1.1	0.6	+29.3	289.8	1941.2	0	0.6	0.5	0	0	47.7	1584.5	0.1	2.8	0.8	0	+2.0	89.5	1727.2	0
	May	48.5	3.4	1.5	+43.6	333.4	1944.7	0	3.4	0.4	1.6	0	47.7	1584.5	1.4	4.6	1.4	0.8	+2.4	91.9	1727.7	0
	June	89.6	6.0	1.5	+16.7	350.1	1946.0	65.4	7.2	0.4	1.6	-6.0	41.7	1582.6	11.2	10.3	1.9	0.8	+3.3	95.2	1728.4	4.3
	July	27.4	8.3	24.3	-55.2	294.9	1941.7	45.4	14.1	1.2	12.9	0	41.7	1582.6	0	6.7	2.5	6.5	-2.3	92.9	1727.9	0
	Aug.	14.0	5.9	31.8	-73.3	221.6	1935.0	49.6	13.9	1.1	12.9	-0.1	41.6	1582.6	0	4.5	2.2	6.5	-4.2	88.7	1727.1	0
	Sep.	4.0	3.7	16.2	-11.3	210.3	1933.9	0	10.1	0.8	3.2	+6.1	47.7	1584.5	0	2.5	1.7	1.6	-0.8	87.9	1726.9	0
	Oct.	0	2.8	0.6	-3.4	206.9	1933.5	0	0.6	0.5	0	0	47.7	1584.5	0.1	1.6	1.4	0	+0.2	88.1	1726.9	0
	Nov.	2.2	1.2	0.6	+0.4	207.3	1933.6	0	0.3	0.4	0	-0.1	47.6	1584.5	0	1.2	0.7	0	+0.5	88.6	1727.0	0
	Dec.	3.3	0.6	0.6	+2.1	209.4	1933.8	0	0.3	0.1	0	+0.1	47.7	1584.5	0.1	1.0	0.3	0	+0.7	89.3	1727.2	0
	Total	259.5	35.1	79.5	-39.9			184.8	51.7	5.8	32.2	+0.1			13.6	40.0	13.8	16.2	+5.7			4.3
Reasonable Maximum Year	Jan.	3.7	0	0.6	+3.1	252.4	1937.4	0	0.5	0.1	0	+0.1	47.7	1584.5	0.3	1.8	0.2	0	+1.6	85.2	1726.3	0
	Feb.	14.6	0.3	0.6	+0.8	253.2	1938.0	12.9	1.3	0.1	0	0	47.7	1584.5	1.2	2.6	0.2	0	+2.4	87.6	1726.8	0
	Mar.	57.4	0.6	0.6	+20.4	273.6	1939.8	35.8	3.3	0.1	0	0	47.7	1584.5	3.2	2.9	0.2	0	+2.7	90.3	1727.4	0
	Apr.	55.7	0.3	0.6	+54.8	328.4	1944.4	0	4.4	0.1	0	0	47.7	1584.5	4.3	5.3	0.2	0	+4.9	95.2	1728.4	0.2
	May	102.8	1.9	0.7	+21.7	350.1	1946.0	78.5	9.7	0.1	0.8	0	47.7	1584.5	8.8	15.2	0.6	0.5	0	95.2	1728.4	14.1
	June	181.1	1.6	0.8	0	350.1	1946.0	178.7	21.5	0.3	0.8	-6.0	41.7	1582.6	26.4	35.2	0.7	0.5	0	95.2	1728.4	34.0
	July	59.5	6.8	5.9	-53.2	296.9	1941.8	100.0	8.4	1.0	6.2	0	41.7	1582.6	1.2	14.8	2.3	4.0	0	95.2	1728.4	8.5
	Aug.	35.0	3.2	5.9	-75.3	221.6	1935.0	101.2	2.5	0.7	6.2	-4.4	37.3	1581.1	0	15.0	1.9	4.1	0	95.2	1728.4	9.0
	Sep.	56.6	3.2	2.2	0	221.6	1935.0	51.2	12.4	0.4	1.6	+10.4	47.7	1584.5	0	12.5	1.2	1.0	0	95.2	1728.4	10.3
	Oct.	20.0	1.9	0.6	0	221.6	1935.0	17.5	3.5	0.3	0	0	47.7	1584.5	3.2	4.8	1.0	0	0	95.2	1728.4	3.8
	Nov.	25.7	0.9	0.6	0	221.6	1935.0	24.2	1.0	0.2	0	0	47.7	1584.5	0.8	2.8	0.4	0	0	95.2	1728.4	2.4
	Dec.	24.0	0.3	0.6	0	221.6	1935.0	23.1	1.0	0	0	0	47.7	1584.5	1.0	2.1	0.2	0	0	95.2	1728.4	1.9
	Total	636.1	21.0	19.7	-27.7			623.1	69.5	3.4	15.6	+0.1			50.4	115.0	9.1	10.1	+11.6			84.2

*Includes Inflow from Courtland Canal

TABLE 11
KANSAS RIVER PROJECTS - BUREAU OF RECLAMATION
RESERVOIR OPERATION ESTIMATES - 1964
(Units in 1,000 Acre-Feet)

		WEBSTER RESERVOIR				End of Month			CEDAR BLUFF RESERVOIR				End of Month		
	Month	Res. Inflow	Net Evap.	Total Release	Res. Change	Content	Elev. (Ft.)	Control Flood Release	Res. Inflow	Net Evap.	Total Release	Res. Change	Content	Elev. (Ft.)	Control Flood Release
Reasonable Minimum Year	Jan.	0.3	0.3	0	0	61.1	1887.8	0	0.4	0.7	0.5	-0.8	178.0	2143.0	0
	Feb.	0.7	0.3	0	+0.4	61.5	1887.9	0	0.6	0.7	0.4	-0.5	177.5	2142.9	0
	Mar.	1.1	0.6	0	+0.5	62.0	1888.1	0	0.7	1.3	0.6	-1.2	176.3	2142.7	0
	Apr.	1.5	1.3	0	+0.2	62.2	1888.1	0	0.9	2.8	0.4	-2.3	174.0	2142.4	0
	May	1.8	1.2	2.6	-2.0	60.2	1887.5	0	1.8	2.7	1.5	-2.4	171.6	2142.0	0
	June	3.4	2.0	2.5	-1.1	59.1	1887.2	0	2.9	4.3	1.4	-2.8	168.8	2141.6	0
	July	1.4	2.3	8.4	-9.3	49.8	1884.1	0	2.7	5.0	3.3	-5.6	163.2	2140.7	0
	Aug.	1.2	1.8	9.4	-10.0	39.8	1880.4	0	1.8	4.2	3.6	-6.0	157.2	2139.7	0
	Sep.	0.8	1.3	4.9	-5.4	34.4	1878.2	0	0.8	3.2	2.6	-5.0	152.2	2138.9	0
	Oct.	0.2	0.9	0.4	-1.1	33.3	1877.7	0	0.5	2.5	1.2	-3.2	149.0	2138.4	0
	Nov.	0.1	0.5	0	-0.4	32.9	1877.5	0	0.5	1.4	0.4	-1.3	147.7	2138.2	0
	Dec.	0.3	0.2	0	+0.1	33.0	1877.6	0	0.4	0.7	0.4	-0.7	147.0	2138.0	0
	Total	12.8	12.7	28.2	-28.1			0	14.0	29.5	16.3	-31.8			0
Most Probable Year	Jan.	0.8	0.2	0	+0.6	61.7	1888.0	0	0.8	0.6	0.5	-0.3	178.5	2143.0	0
	Feb.	1.7	0.2	0	+1.5	63.2	1888.4	0	1.2	0.6	0.4	+0.2	178.7	2143.1	0
	Mar.	2.1	0.4	0	+1.7	64.9	1889.0	0	1.3	0.8	0.6	-0.1	178.6	2143.0	0
	Apr.	2.9	0.7	0	+2.2	67.1	1889.6	0	2.0	1.9	0.4	-0.3	178.3	2143.0	0
	May	6.4	0.9	0.9	0	67.1	1889.6	4.6	4.5	1.9	0.9	+1.7	180.0	2143.3	0
	June	10.4	1.2	1.0	0	67.1	1889.6	8.2	12.0	2.8	0.8	+5.1	185.1	2144.0	3.3
	July	4.6	1.9	8.0	-5.3	61.8	1888.0	0	6.8	4.5	2.8	-0.5	184.6	2143.9	0
	Aug.	3.4	1.5	8.1	-6.2	55.6	1886.1	0	4.7	3.2	3.3	-1.8	182.8	2143.7	0
	Sep.	2.3	1.2	2.4	-1.3	54.3	1885.6	0	3.9	2.8	1.3	-4.5	178.3	2143.0	4.3
	Oct.	1.1	0.8	0.4	-0.1	54.2	1885.6	0	1.5	2.2	0.8	-1.5	176.8	2142.8	0
	Nov.	1.0	0.4	0	+0.6	54.8	1885.8	0	1.1	1.2	0.4	-0.5	176.3	2142.7	0
	Dec.	0.9	0.2	0	+0.7	55.5	1886.0	0	0.8	0.7	0.4	-0.3	176.0	2142.7	0
	Total	37.6	9.6	20.8	-5.6			12.8	40.6	23.2	12.6	-2.8			7.6
Reasonable Maximum Year	Jan.	2.2	0.2	0	+2.0	63.1	1888.4	0	2.0	0.5	0.5	+1.0	179.8	2143.2	0
	Feb.	2.8	0.2	0	+2.6	65.7	1889.2	0	2.2	0.5	0.4	+1.3	181.1	2143.4	0
	Mar.	3.9	0.2	0	+1.4	67.1	1889.6	2.3	3.3	0.6	0.6	+2.1	183.2	2143.7	0
	Apr.	6.7	0.3	0	0	67.1	1889.6	6.4	6.8	1.3	0.4	+1.9	185.1	2144.0	3.2
	May	12.5	0.5	0.3	0	67.1	1889.6	11.7	23.1	1.0	0.8	0	185.1	2144.0	21.3
	June	24.9	0.2	0.5	0	67.1	1889.6	24.2	48.5	0.5	0.7	0	185.1	2144.0	47.3
	July	15.3	1.6	4.7	0	67.1	1889.6	9.0	19.5	3.9	2.0	0	185.1	2144.0	13.6
	Aug.	10.5	1.1	5.0	0	67.1	1889.6	4.4	17.6	2.4	2.2	0	185.1	2144.0	13.0
	Sep.	10.6	1.0	1.0	0	67.1	1889.6	8.6	12.0	2.4	0.9	-6.8	178.3	2143.0	15.5
	Oct.	3.9	0.8	0	0	67.1	1889.6	3.1	6.6	1.6	0.7	0	178.3	2143.0	4.3
	Nov.	2.5	0.3	0	0	67.1	1889.6	2.2	2.5	0.9	0.4	0	178.3	2143.0	1.2
	Dec.	2.2	0.2	0	0	67.1	1889.6	2.0	2.1	0.5	0.4	0	178.3	2143.0	1.2
	Total	98.0	6.6	11.5	+6.0			73.9	146.2	16.1	10.0	-0.5			120.6

TABLE 12
1963 EVAPORATION COMPARISON
Units in 1,000 Acre-Feet)

Month	BONNY 1963 Evap.	BONNY Reas. 1/ Min.	SWANSON 1963 Evap.	SWANSON Reas. Min.	ENDERS 1963 Evap.	ENDERS Reas. Min.	HUGH BUTLER 1963 Evap.	HUGH BUTLER Reas. Min.	HARRY STRUNK 1963 Evap.	HARRY STRUNK Reas. Min.
Jan.	0.1	0.2	0.2	0.4	0.1	0.1	0	0.1	0	0.1
Feb.	0.2	0.3	0.3	0.5	0.1	0.2	0	0.1	0.1	0.1
Mar.	0.2	0.4	0.4	0.8	0.1	0.3	0.1	0.2	0.1	0.3
Apr.	1.3	0.7	2.4	1.6	0.7	0.6	0.5	0.5	0.8	0.6
May	1.2	0.8	2.5	1.7	0.8	0.7	0.6	0.5	0.9	0.6
June	1.7	1.0	3.7	2.1	1.2	0.8	0.9	0.8	1.4	0.7
July	1.7	1.2	3.9	3.0	1.1	1.2	0.9	0.9	1.2	1.2
Aug.	1.3	1.0	2.4	2.4	0.6	0.7	0.7	0.7	0.8	0.9
Sept.	0.8	0.7	1.5	1.7	0.3	0.5	0.5	0.7	0.5	0.4
Oct.	0.8	0.6	1.3	1.5	0.3	0.4	0.4	0.5	0.5	0.4
Nov.	0.3	0.4	0.5	0.9	0.2	0.2	0.1	0.3	0.2	0.3
Dec.	0.2	0.3	0.3	0.4	0.1	0.1	0.1	0.1	0.1	0.1
Total	9.8	7.6	19.4	17.0	5.6	5.8	4.8	5.4	6.6	5.7

Month	HARLAN COUNTY 1963 Evap.	HARLAN COUNTY Reas. Min.	LOVEWELL 1963 Evap.	LOVEWELL Reas. Min.	KIRWIN 1963 Evap.	KIRWIN Reas. Min.	WEBSTER 1963 Evap.	WEBSTER Reas. Min.	CEDAR BLUFF 1963 Evap.	CEDAR BLUFF Reas. Min.
Jan.	0.5	1.0	0.1	0.1	0.2	0.4	0.1	0.3	0.4	0.7
Feb.	0.5	0.8	0.1	0.1	0.2	0.4	0.3	0.3	0.4	0.7
Mar.	0.9	1.9	0.1	0.3	0.3	0.7	0.3	0.6	0.6	1.3
Apr.	6.4	5.4	1.0	0.8	2.5	1.9	1.2	1.3	4.6	2.7
May	6.3	4.8	1.0	0.7	1.9	2.0	1.6	1.3	3.8	2.7
June	9.8	7.2	1.6	1.3	3.0	2.6	2.3	2.1	5.6	4.4
July	9.7	9.8	1.6	1.8	3.0	3.9	2.4	2.5	6.0	5.1
Aug.	6.9	8.0	1.5	1.3	2.4	2.9	1.8	2.0	4.5	4.2
Sept.	3.7	4.9	0.9	1.0	1.4	2.0	1.2	1.7	2.9	3.4
Oct.	3.7	4.0	1.1	0.5	1.5	1.6	1.2	1.0	2.9	2.5
Nov.	1.0	2.4	0.3	0.4	0.5	0.8	0.3	0.5	0.8	1.4
Dec.	0.4	1.0	0.1	0.2	0.2	0.4	0.1	0.3	0.4	0.6
Total	49.8	51.2	9.4	8.5	17.1	19.6	12.8	13.9	32.9	29.7

1/ Based on reasonable minimum inflow conditions.

RECREATION USES OF BUREAU OF RECLAMATION RESERVOIRS IN KANSAS RIVER PROJECTS
During 1963
Annual Totals

Reservoirs	Visitors	Cars in area	Water Craft	Sport Fish Caught	Season Take	
					Ducks	Geese
Colorado						
Bonny	27,150			50,000	1,000	500
Kansas						
Cedar Bluff	179,953	45,485	2,000	85,246	900	24
Webster	239,244	62,300	5,920	256,165	75	110
Kirwin	166,650	72,079	6,150	140,000	492	123
Lovewell	208,743	52,186	3,291	55,100	600	10
Nebraska						
Enders	91,451	24,862	1,485	0	412	30
Swanson	236,707	59,175	2,949	58,028	473	34
Hugh Butler	147,047	34,743	3,570	62,680	112	0
Harry Strunk	75,617	18,654	1,340	69,532	0	10
Total	1,372,562	369,484	26,705	776,751	4,064	841

Visitors = Total visitor days which includes fishing, hunting, boating, skiing, camping, picnicking & sightseeing.

Water Craft = Boating days which includes rentals, inboards, outboards, rowboats & sailboats.

Exhibit 1

OPERATION HYDROGRAPHS

BONNY RESERVOIR

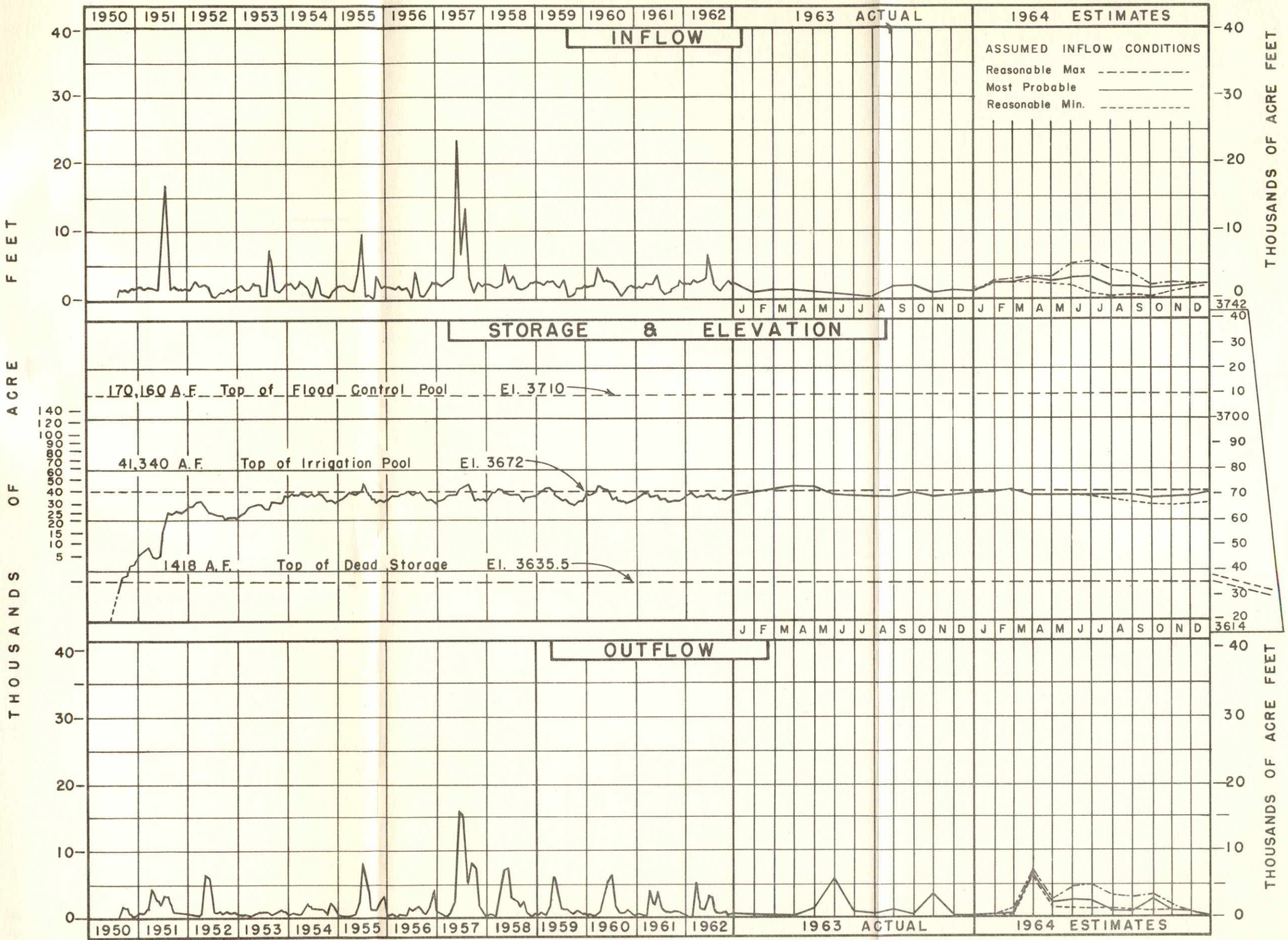


Exhibit 2

OPERATION HYDROGRAPHS

SWANSON LAKE

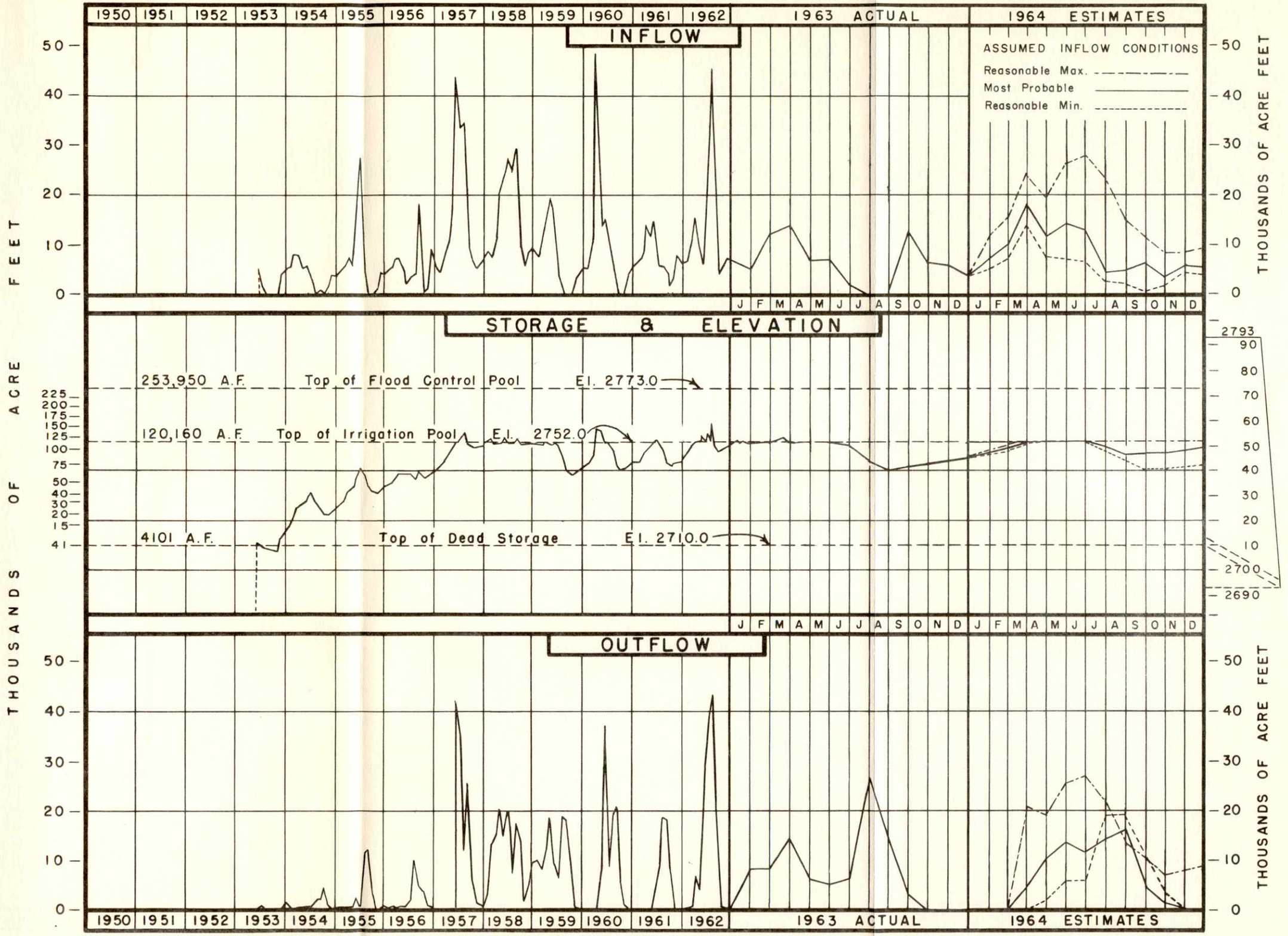


Exhibit 3

OPERATION HYDROGRAPHS

ENDERS RESERVOIR

1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 | 1963 ACTUAL | 1964 ESTIMATES

INFLOW

ASSUMED INFLOW CONDITIONS
Reasonable Max. _ _ _ _ _
Most Probable _____
Reasonable Min. _ _ _ _ _

ACRE FEET — 20 — 10 — 0 — THOUSANDS OF ACRE FEET

J F M A M J J A S O N D | J F M A M J J A S O N D

STORAGE & ELEVATION

74,520 A.F. Top of Flood Control Pool El. 3127.0
44,480 A.F. Top of Irrigation Control Pool El. 3112.3
8,467 A.F. Top of Dead Storage El. 3080.0

THOUSANDS OF ACRE FEET — 80 70 60 50 40 30 25 20 15

3137.5 — 30 — 20 — 10 — 3100 — 90 — 80 — 70 — 60 — 50 — 3034 — ELEVATION IN FEET

J F M A M J J A S O N D | J F M A M J J A S O N D

OUTFLOW

THOUSANDS OF ACRE FEET — 20 — 10 — 0 — THOUSANDS OF ACRE FEET

1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 | 1963 ACTUAL | 1964 ESTIMATES

OPERATION HYDROGRAPHS

Exhibit 4

HUGH BUTLER LAKE

1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 ACTUAL | 1964 ESTIMATES

INFLOW

ASSUMED INFLOW CONDITIONS
Reasonable Max.
Most Probable
Reasonable Min.

THOUSANDS OF ACRE FEET: 6, 4, 2

J F M A M J J A S O N D | J F M A M J J A S O N D

STORAGE & ELEVATION

El. 2604.9 Top of the Flood Control Pool — 86,630 A.F.

El. 2581.8 Top of the Irrigation Control Pool — 37,780 A.F.

El. 2552.00 Top of Dead Storage — 6,310 A.F.

THOUSANDS OF ACRE FEET: 86, 74, 52, 37.8, 25, 15, 6.3, 3, 1

ELEVATION IN FEET: 2634.00, 20, 10, 2600, 90, 80, 70, 60, 2550.00, 2511.00

OUTFLOW

THOUSANDS OF ACRE FEET: 8, 6, 4, 2

THOUSANDS OF ACRE FEET: 8, 6, 4, 2

1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 ACTUAL | 1964 ESTIMATES

Exhibit 5

OPERATION HYDROGRAPHS

HARRY STRUNK LAKE

1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 | 1963 ACTUAL | 1964 ESTIMATES

INFLOW

ASSUMED INFLOW CONDITIONS
Reasonable Max.
Most Probable
Reasonable Min.

THOUSANDS OF ACRE FEET

20 — 10 — 0

J F M A M J J A S O N D | J F M A M J J A S O N D

STORAGE & ELEVATION

90,920 A.F. Top of Flood Control Pool El. 2386.2

39,230 A.F. Top of Irrigation Pool El. 2366.1

5,370 A.F. Top of Dead Storage El. 2335.0

THOUSANDS OF ACRE FEET

70 60 50 40 30 25 20 15 10

2415 — 2400 — 80 — 60 — 40 — 30 — 2300

ELEVATION IN FEET

J F M A M J J A S O N D | J F M A M J J A S O N D

OUTFLOW

20 — 10 — 0

THOUSANDS OF ACRE FEET

1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 | 1963 ACTUAL | 1964 ESTIMATES

Exhibit 6

OPERATION HYDROGRAPHS

NORTON RESERVOIR

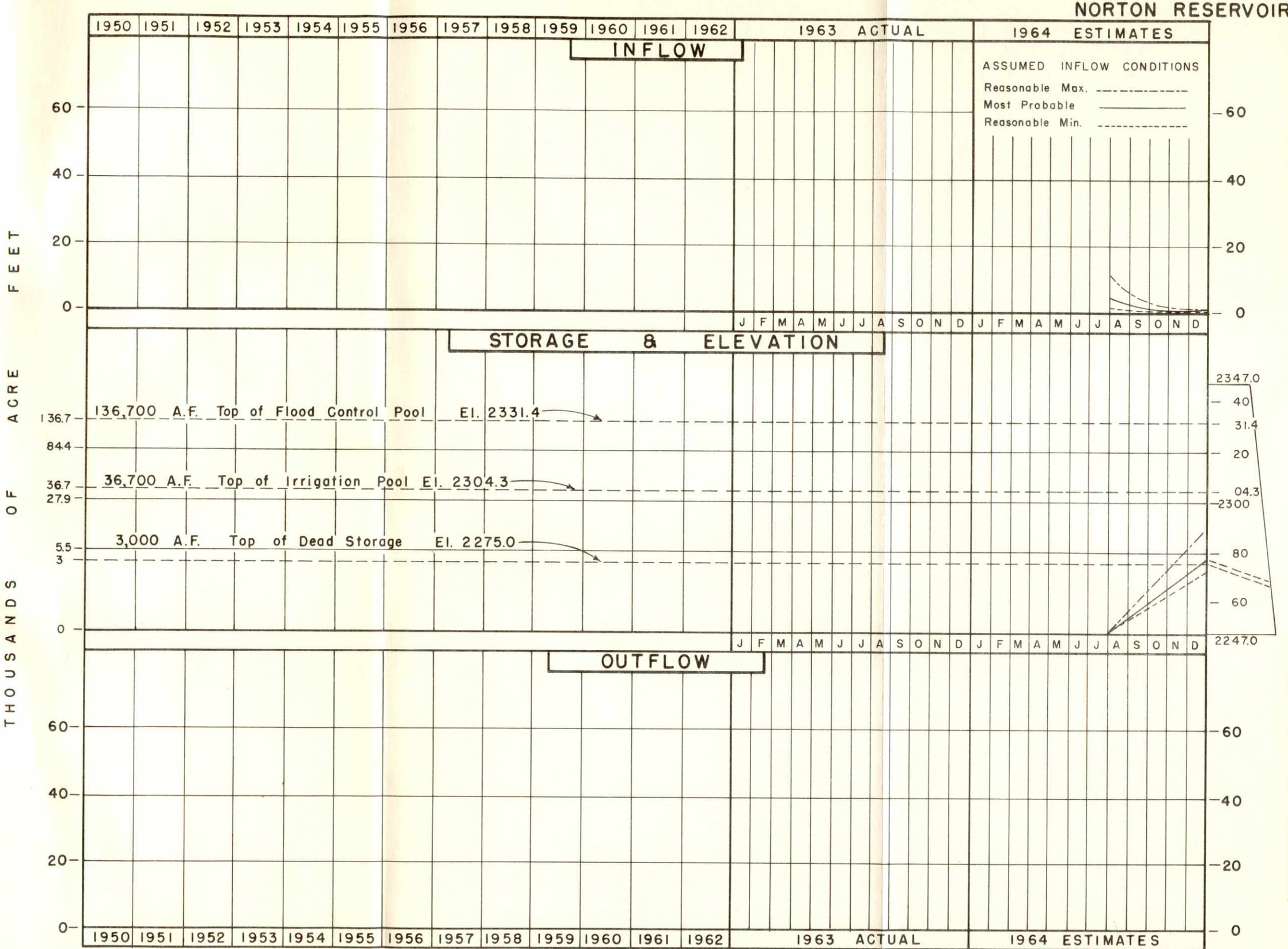


Exhibit 7

OPERATION HYDROGRAPHS

HARLAN COUNTY RESERVOIR

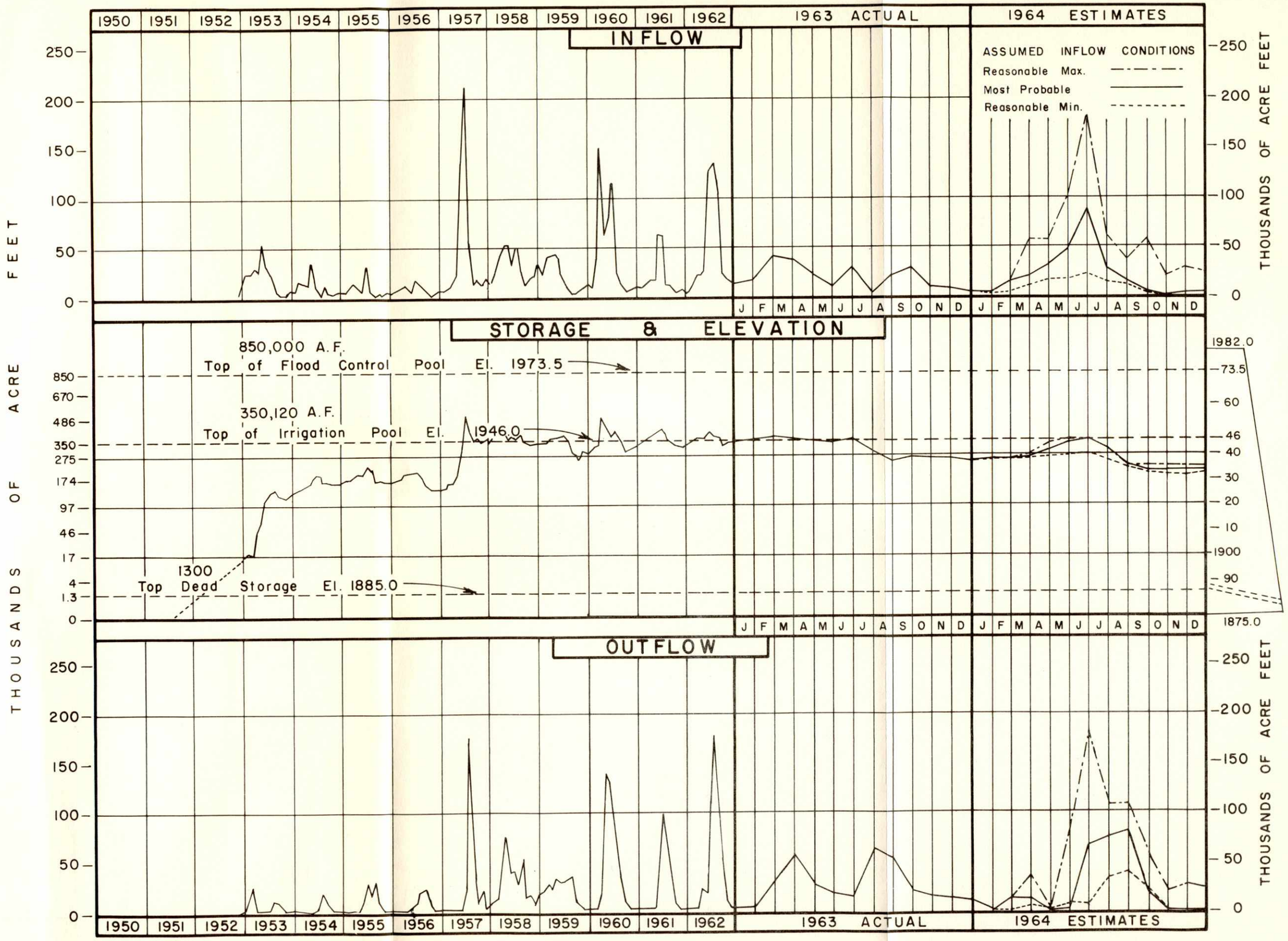


Exhibit 8

OPERATION HYDROGRAPHS

LOVEWELL RESERVOIR

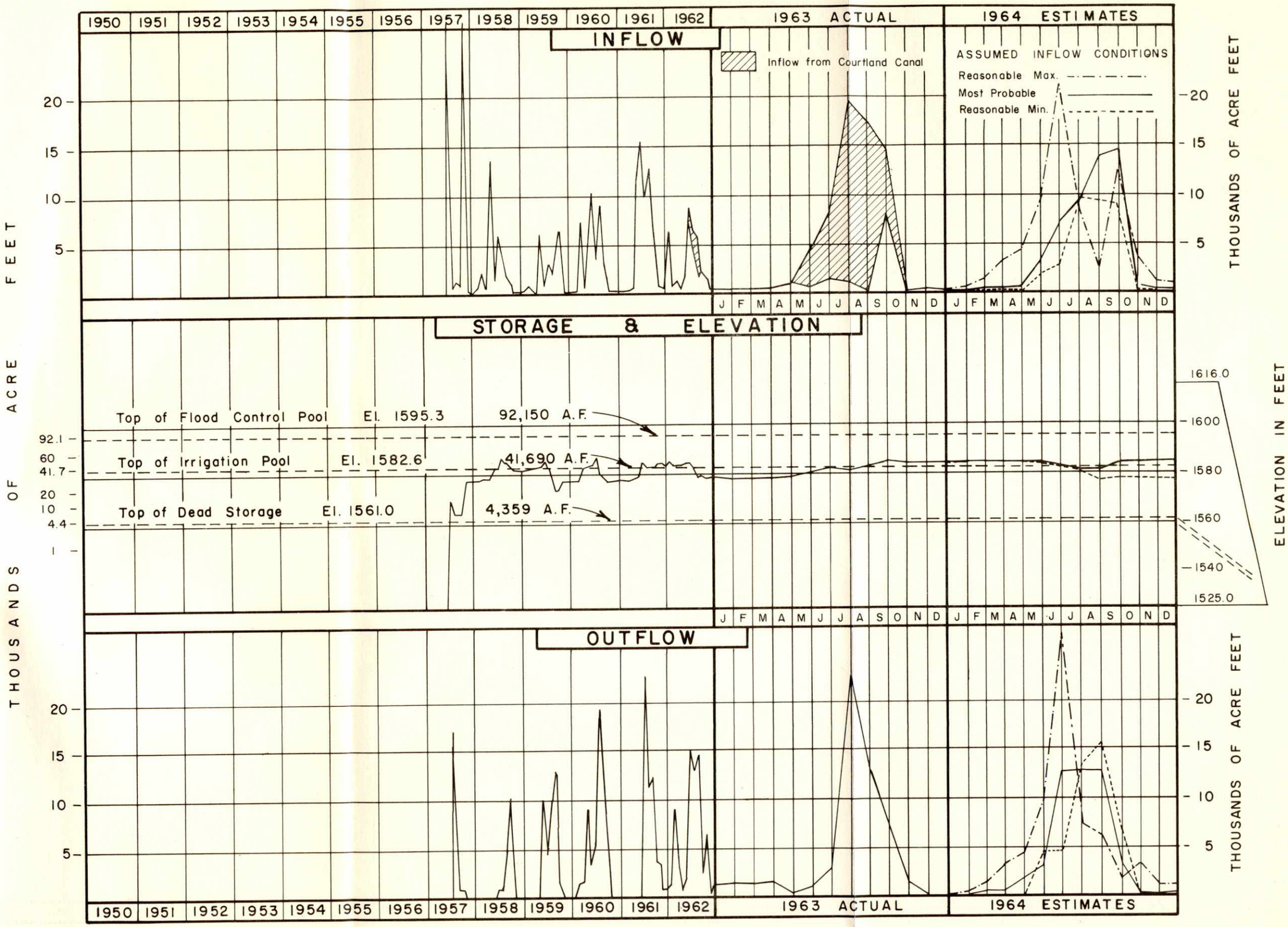


Exhibit 9

OPERATION HYDROGRAPHS

KIRWIN RESERVOIR

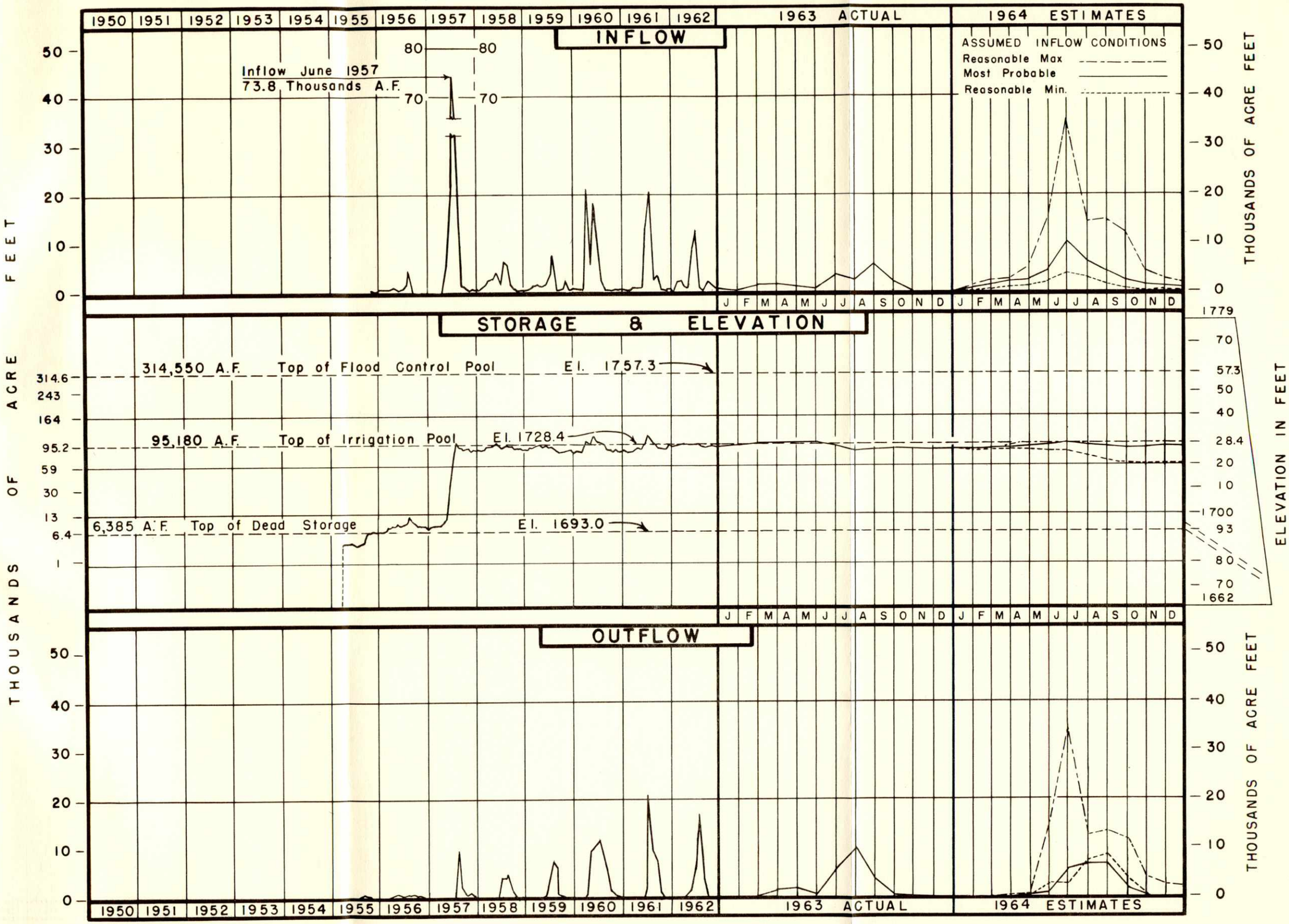


Exhibit 10

OPERATION HYDROGRAPHS — WEBSTER RESERVOIR

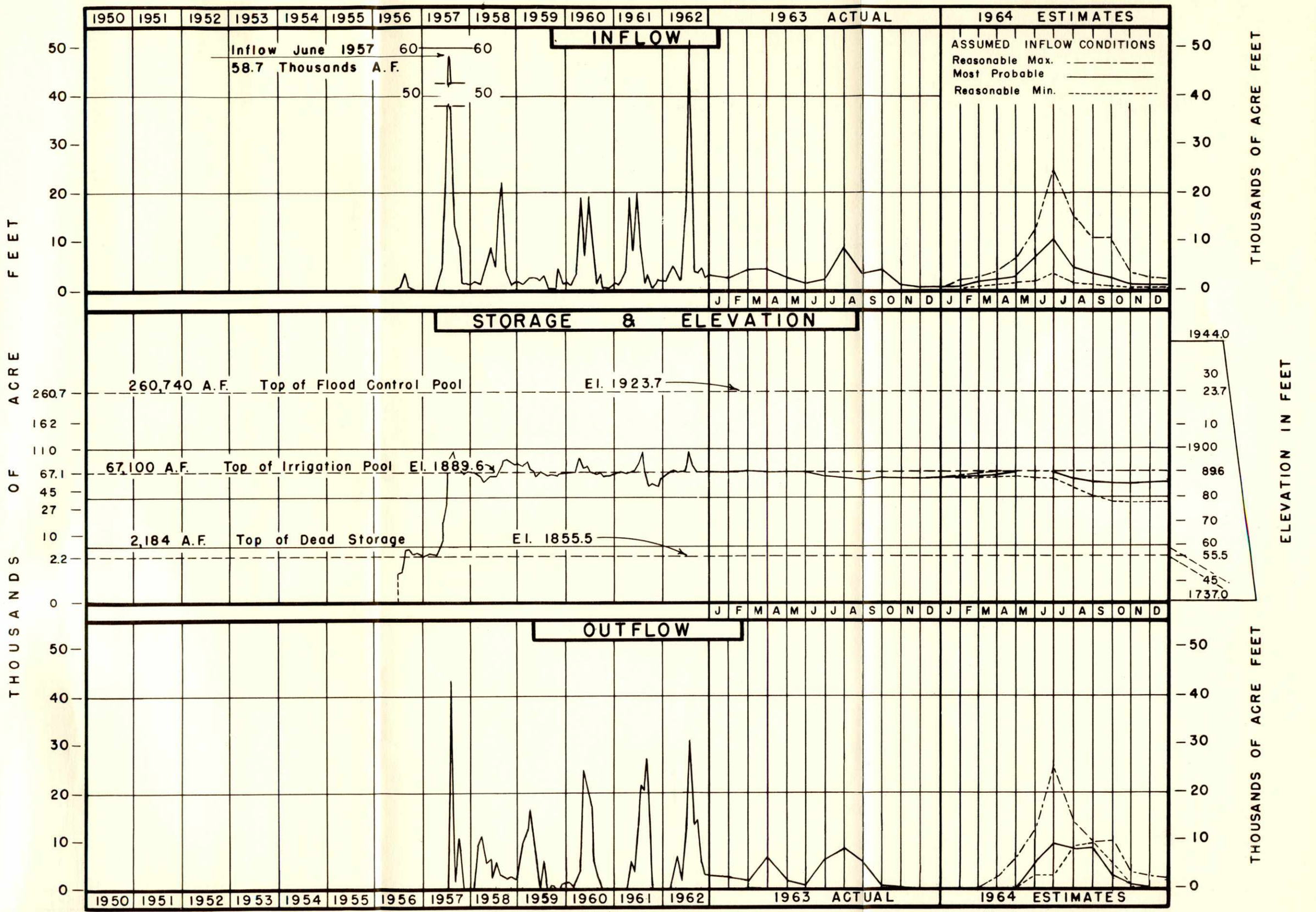


Exhibit 11

OPERATION HYDROGRAPHS

CEDAR BLUFFS RESERVOIR

1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 ACTUAL | 1964 ESTIMATES

INFLOW

ACRE FEET

50 — 40 — 30 — 20 — 10 — 0

300 — 200 — 100 — 0

Inflow June 1951
257.7 Thousands A.F.

100 — 50 — 0

Inflow June 1957
79.4 Thousands A.F.

ASSUMED INFLOW CONDITIONS
Reasonable Max.
Most Probable
Reasonable Min.

THOUSANDS OF ACRE FEET

50 — 40 — 30 — 20 — 10 — 0

J F M A M J J A S O N D | J F M A M J J A S O N D

STORAGE & ELEVATION

THOUSANDS OF ACRE FEET

377 — 270 — 229 — 185 — 141 — 100 — 67 — 40 — 21 — 8.2 — 1 — 0

376,950 A.F. Top of Flood Control Pool El. 2166.0

185,090 A.F. Top of Irrigation Pool El. 2144.0

8,261 A.F. Top of Dead Storage El. 2090.0

66 — 44 — 40 — 20 — 10

2198.0

2100 — 90 — 80 — 70

2064.0

ELEVATION IN FEET

J F M A M J J A S O N D | J F M A M J J A S O N D

OUTFLOW

THOUSANDS OF ACRE FEET

100 — 50

Outflow July 1951
80.6 Thousands A.F.

Outflow July 1957
93.7 Thousands A.F.

50 — 40 — 30 — 20 — 10 — 0

THOUSANDS OF ACRE FEET

50 — 40 — 30 — 20 — 10 — 0

1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1962 ACTUAL | 1964 ESTIMATES

CANAL DIVERSIONS AND ACRES IRRIGATED

Kansas River Projects

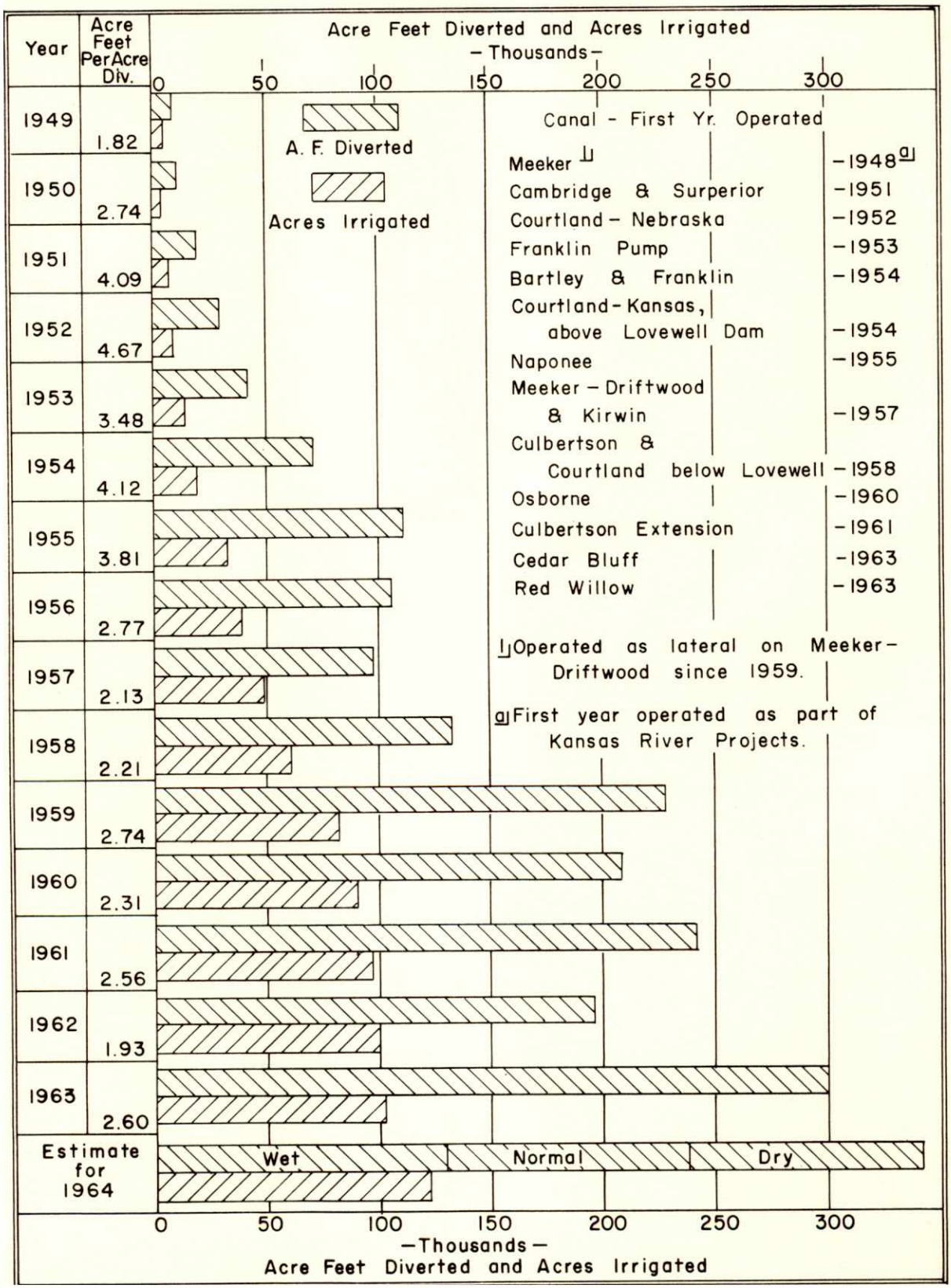


Exhibit 13

CANAL DIVERSIONS AND ACRES IRRIGATED

Frenchman Valley Irrigation District

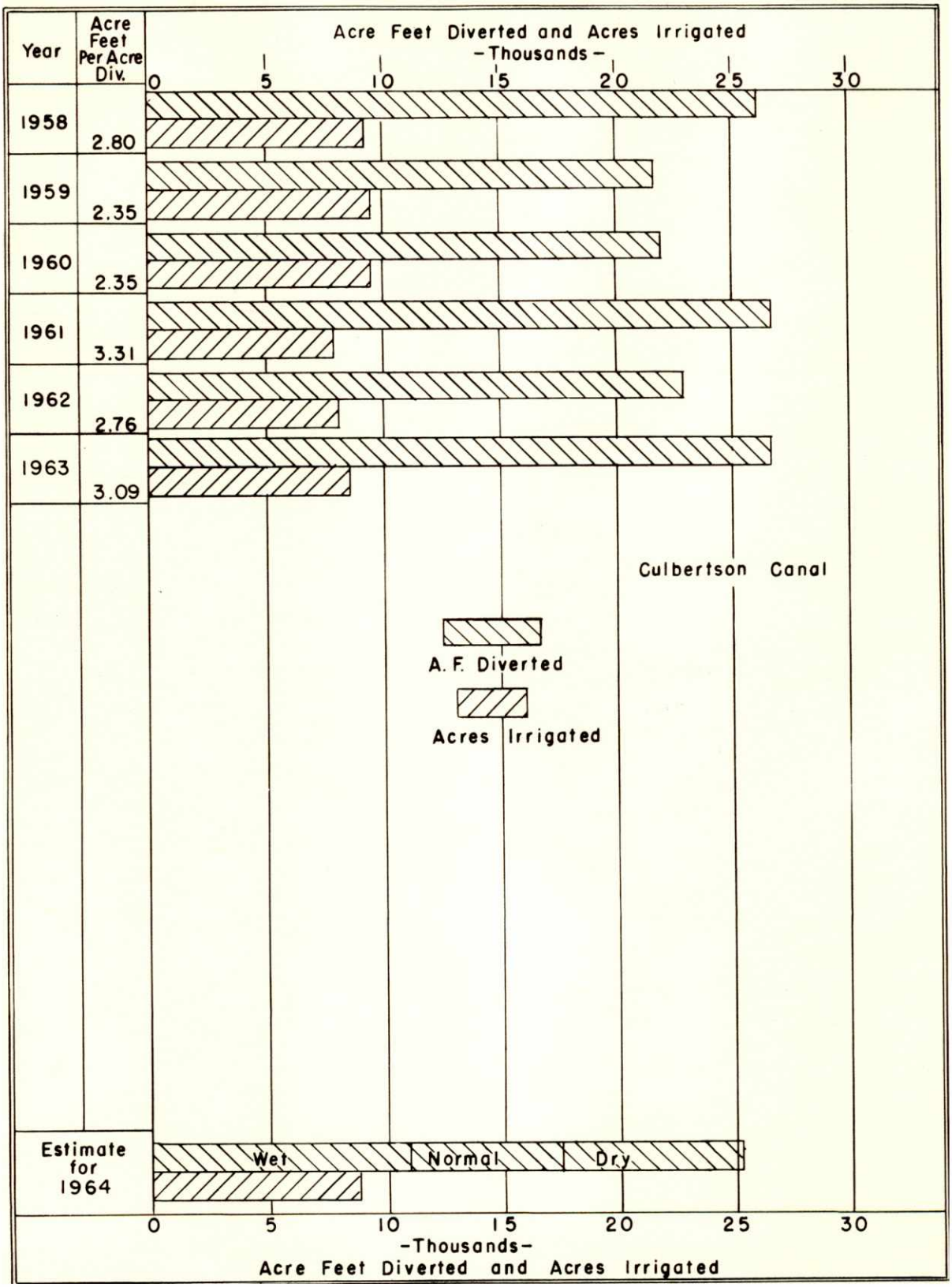
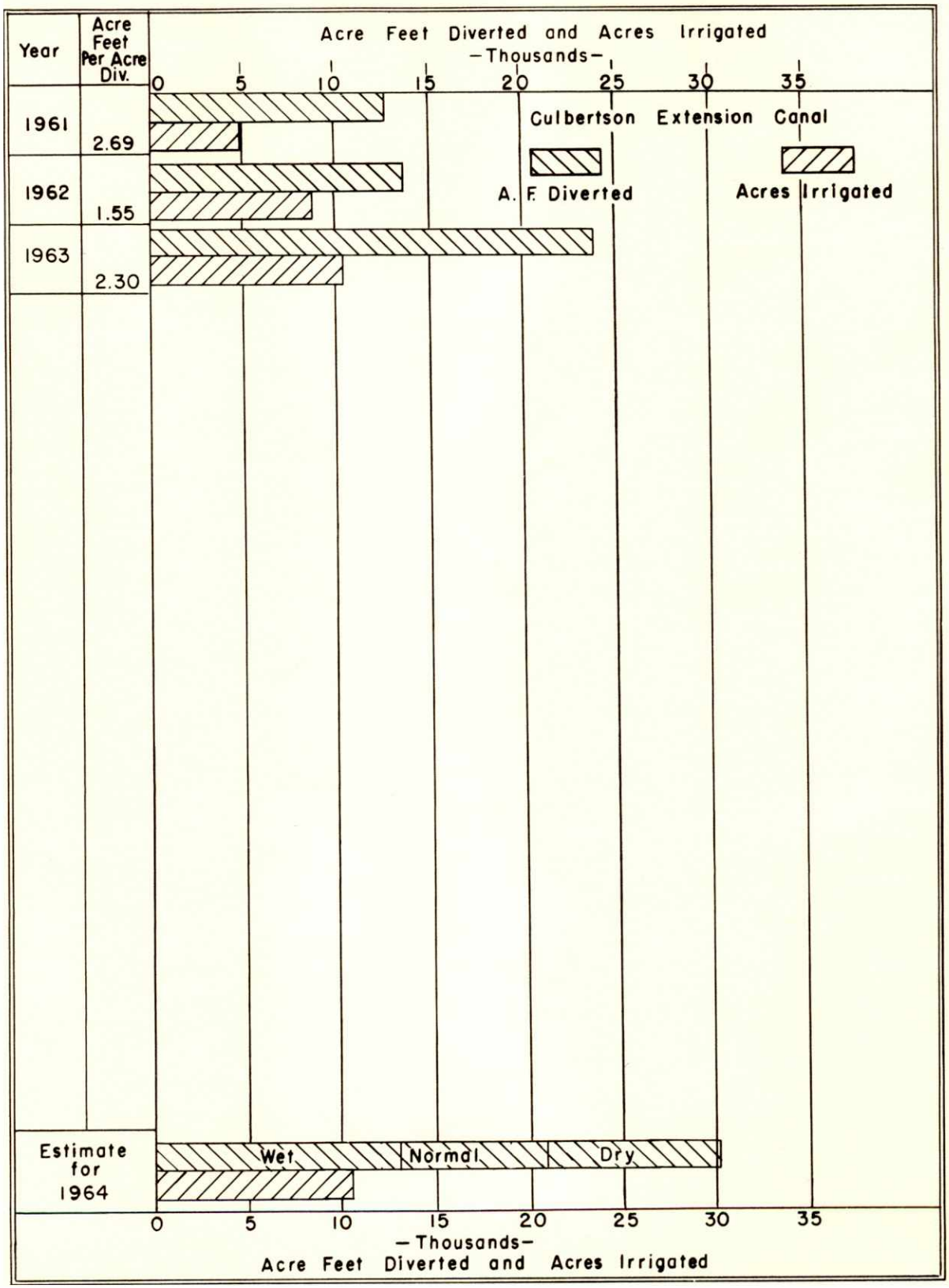


Exhibit 14

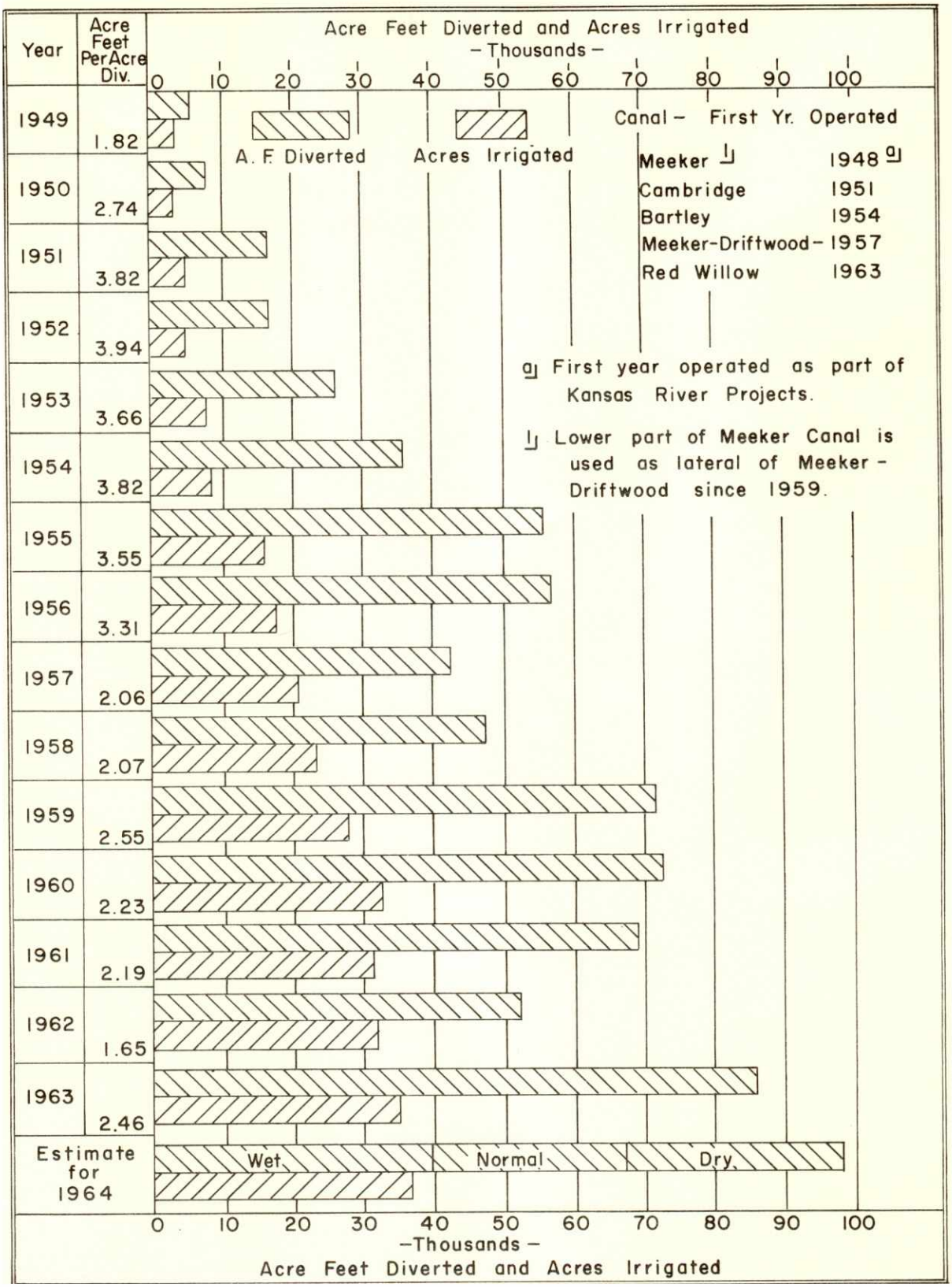
CANAL DIVERSIONS AND ACRES IRRIGATED

H. and R.W. Irrigation District



CANAL DIVERSIONS AND ACRES IRRIGATED

Frenchman-Cambridge Irrigation District



CANAL DIVERSIONS AND ACRES IRRIGATED

Bostwick Irrigation District in Nebraska

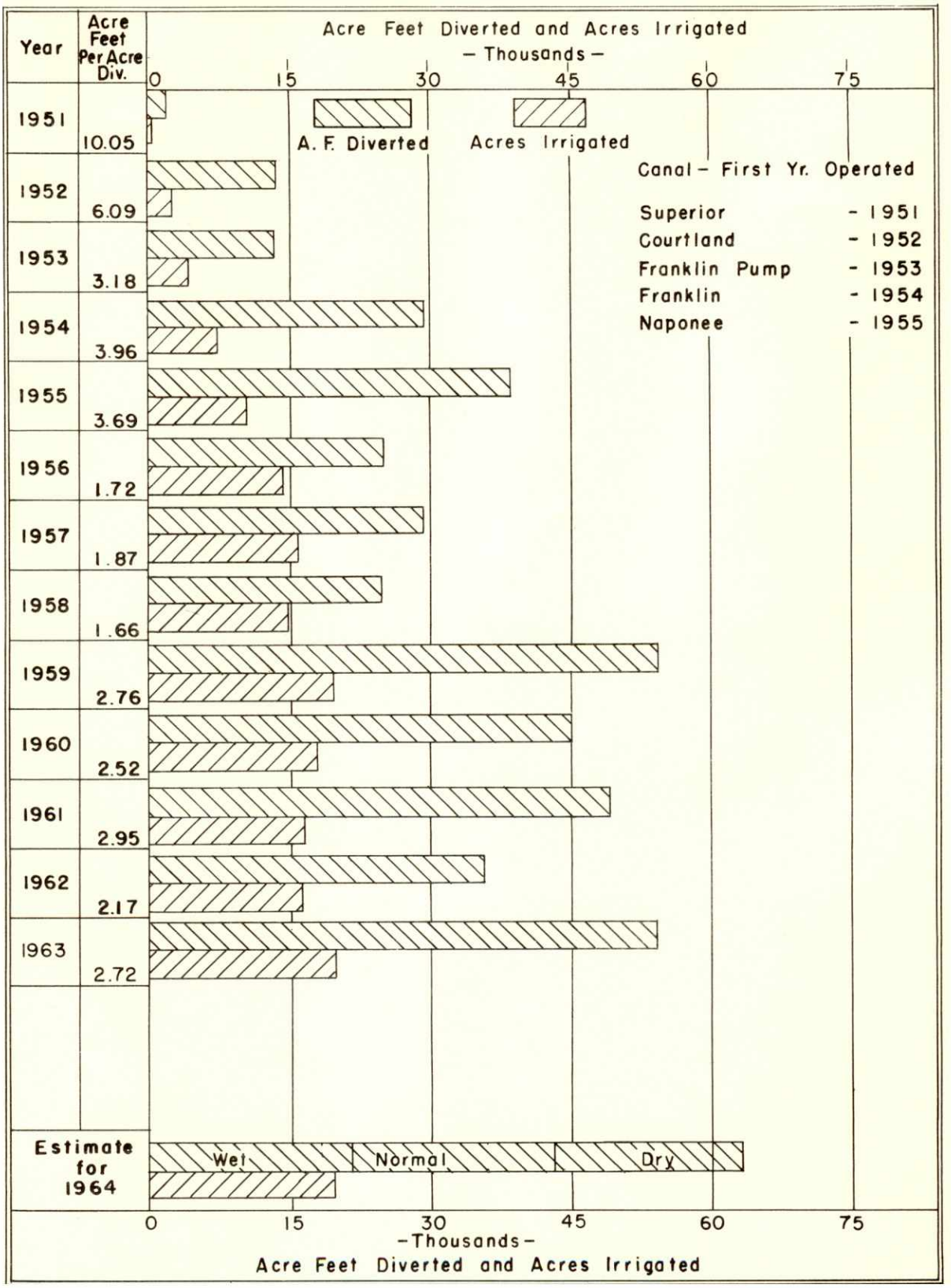
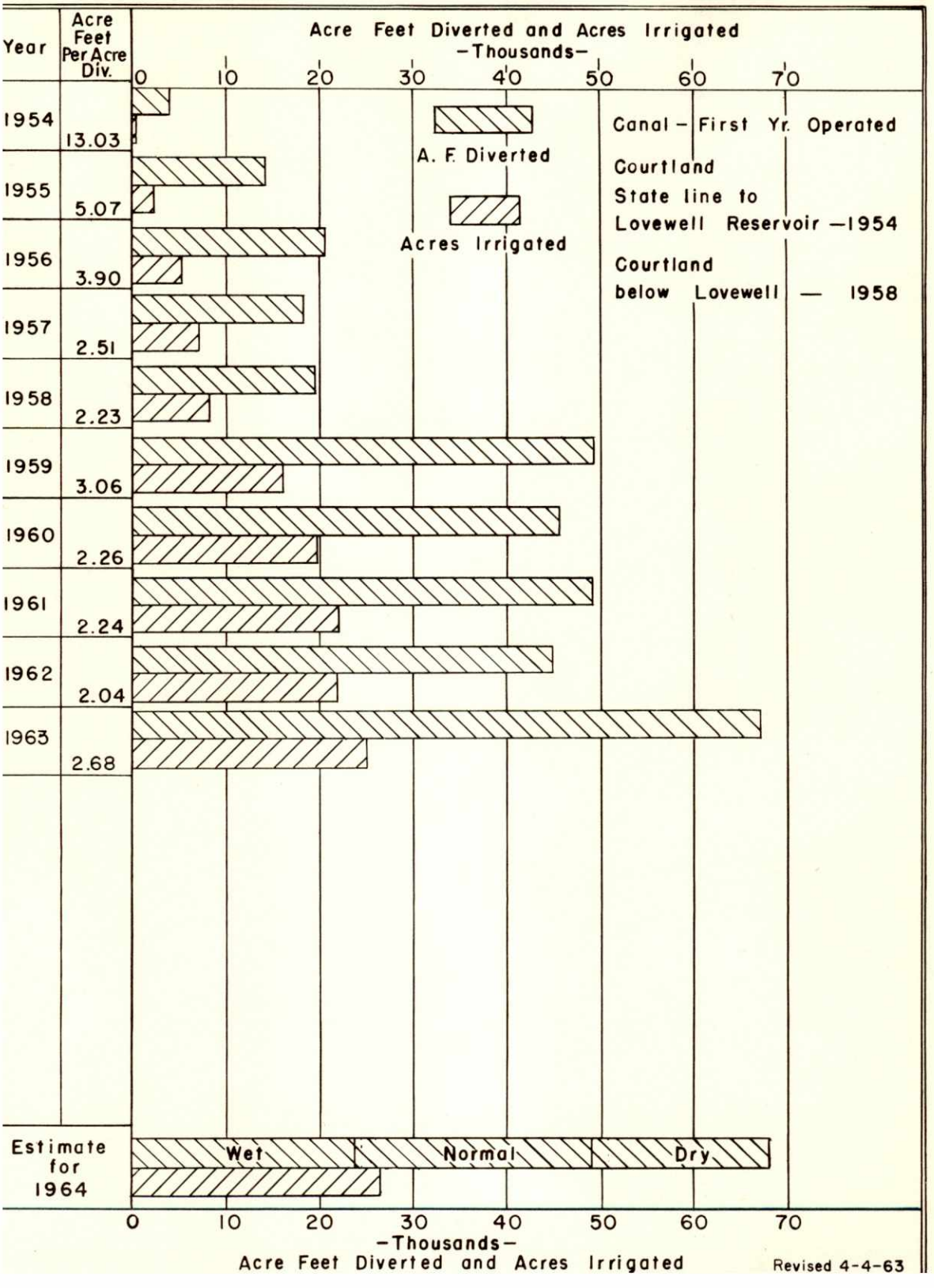


Exhibit 17

CANAL DIVERSIONS AND ACRES IRRIGATED

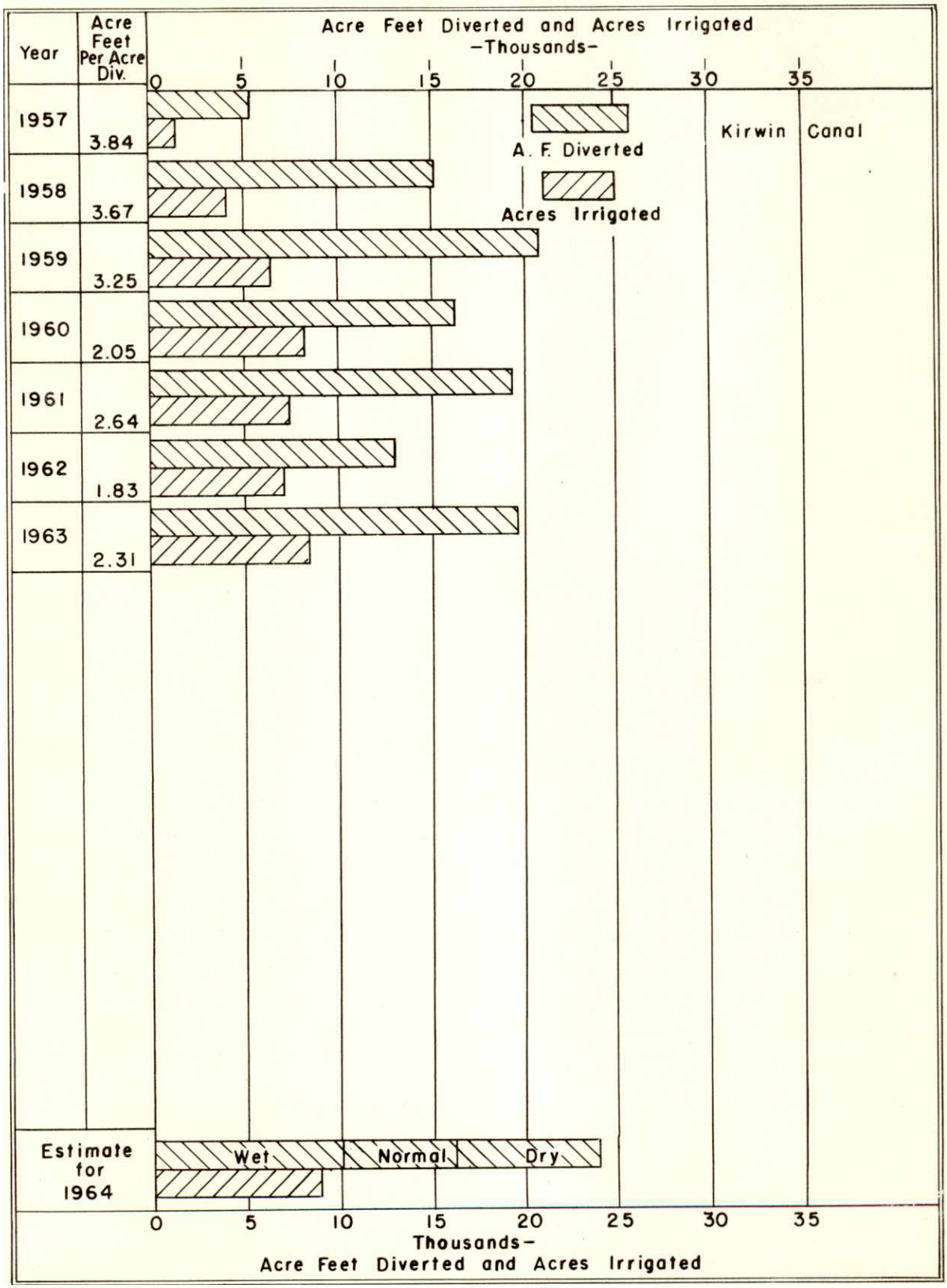
Kansas-Bostwick Irrigation District



Revised 4-4-63

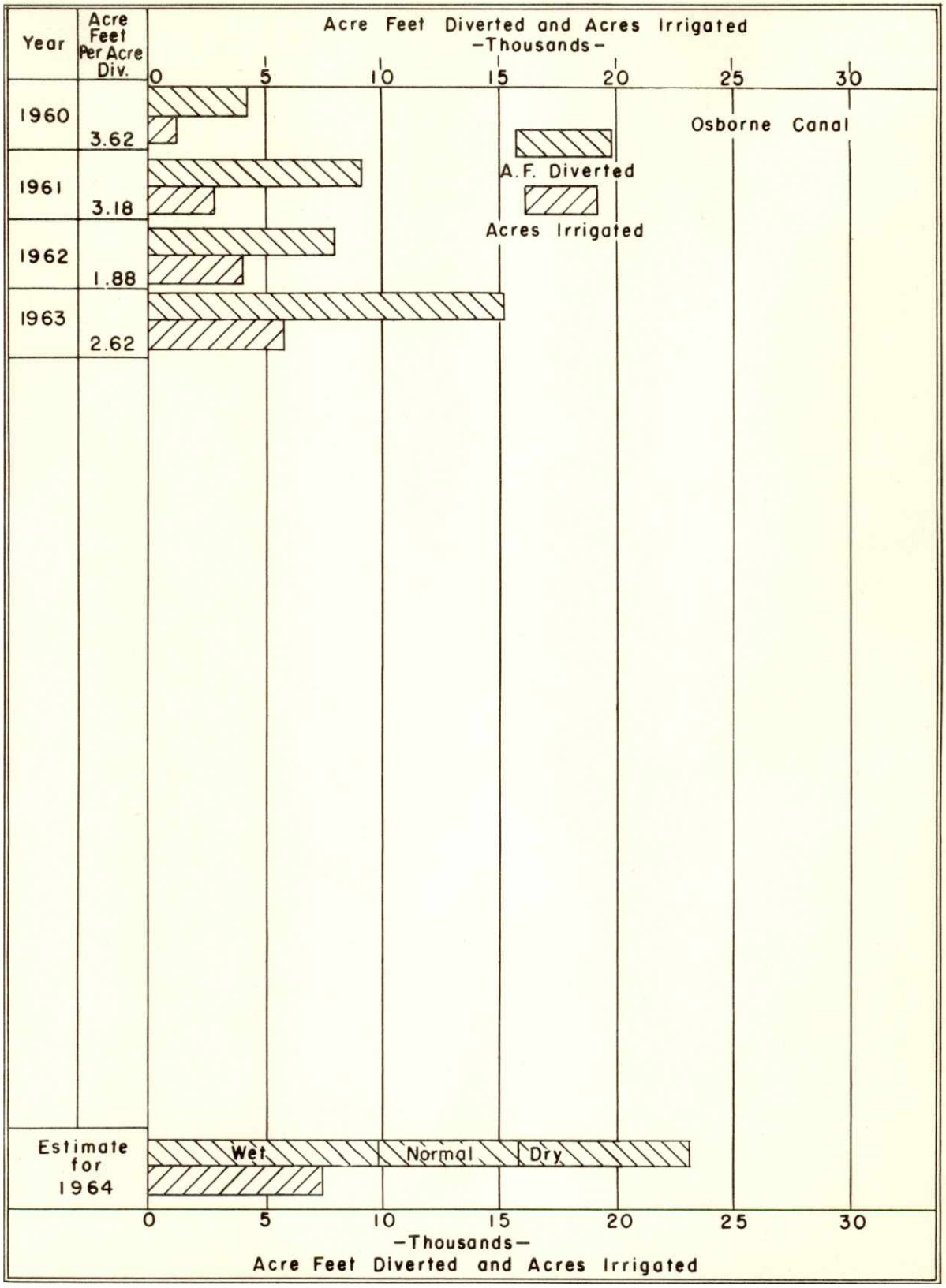
CANAL DIVERSIONS AND ACRES IRRIGATED

Kirwin Irrigation District



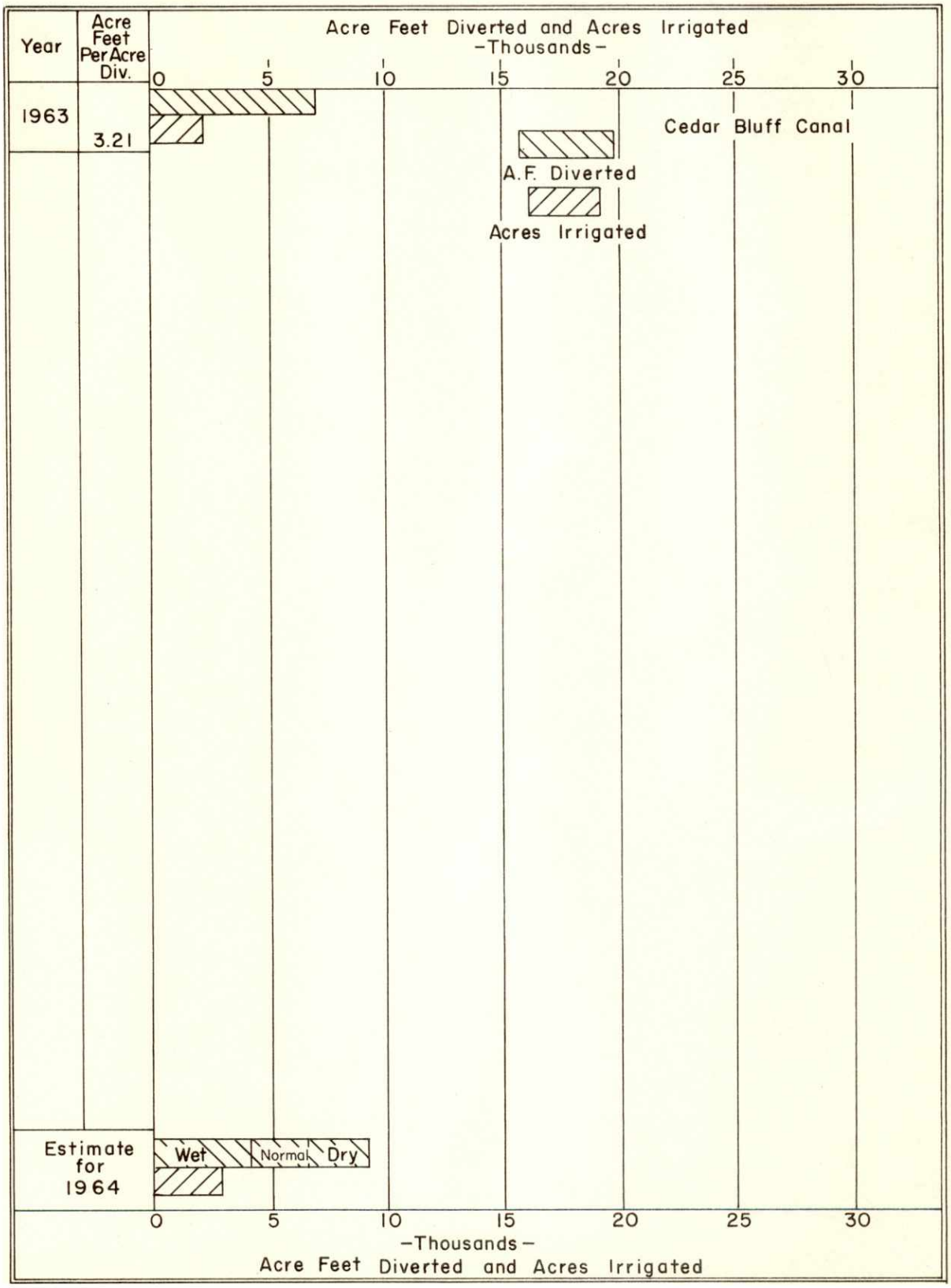
CANAL DIVERSIONS AND ACRES IRRIGATED

Webster Irrigation District

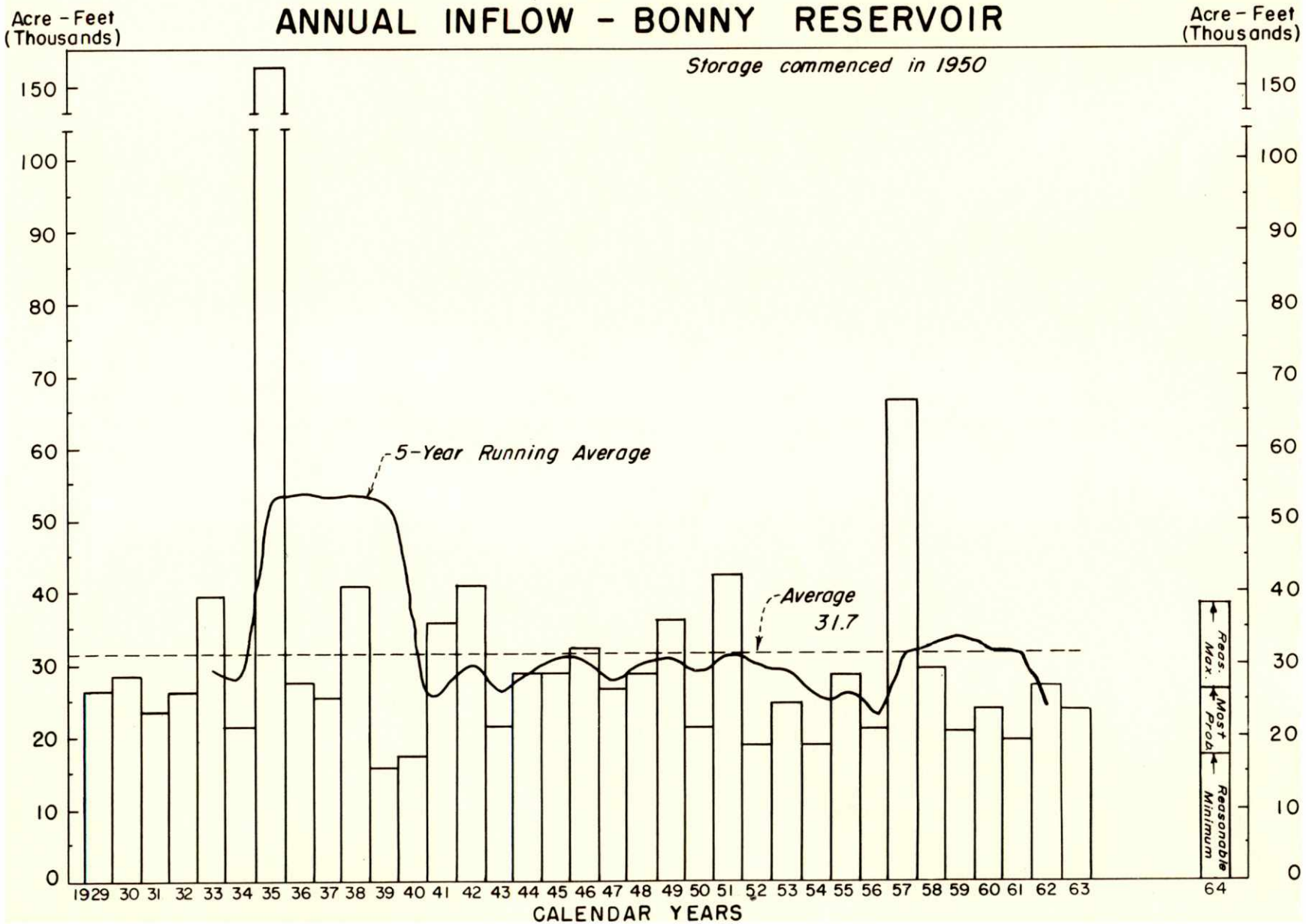


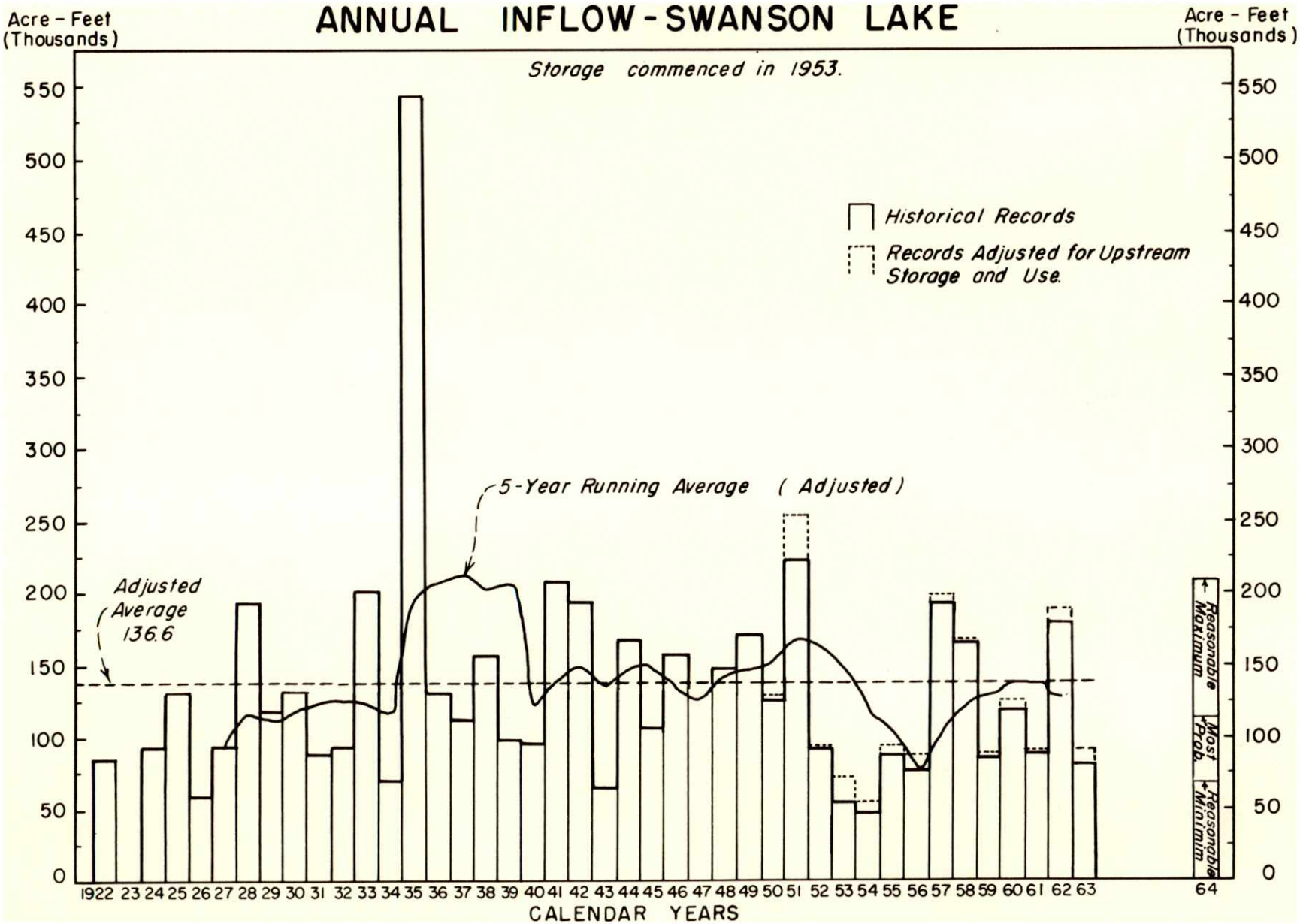
CANAL DIVERSIONS AND ACRES IRRIGATED

Cedar Bluff Irrigation District

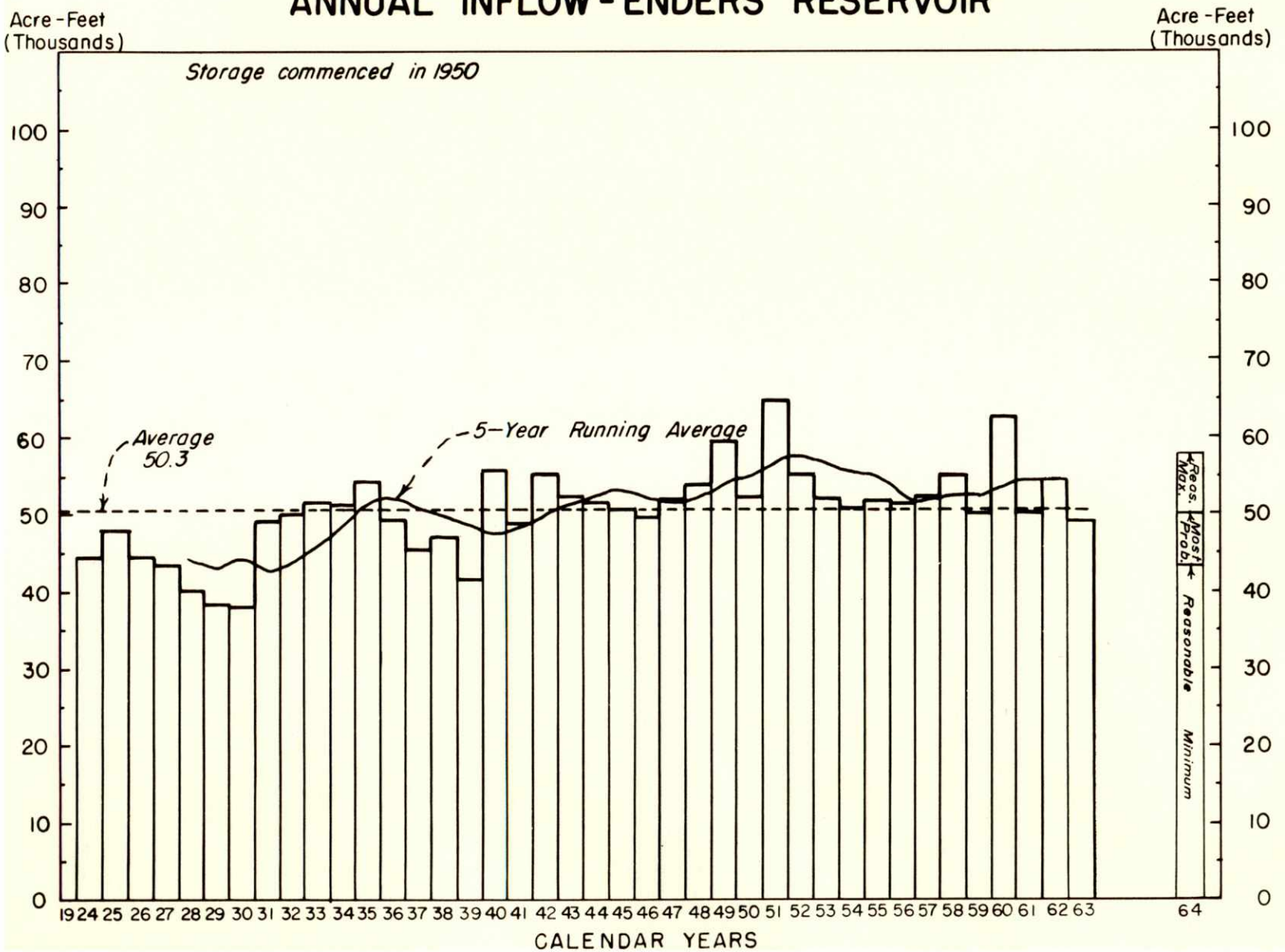


ANNUAL INFLOW - BONNY RESERVOIR

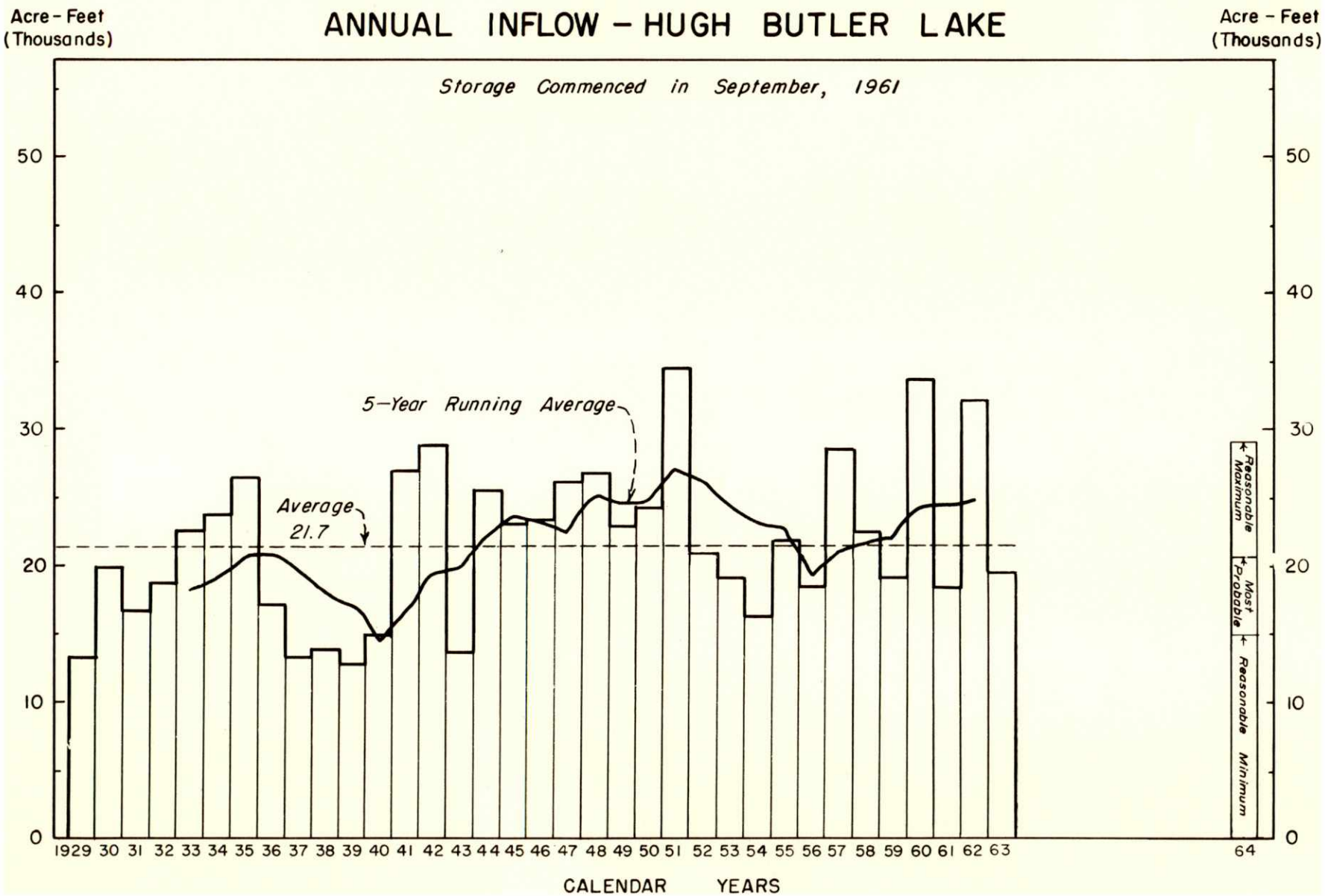


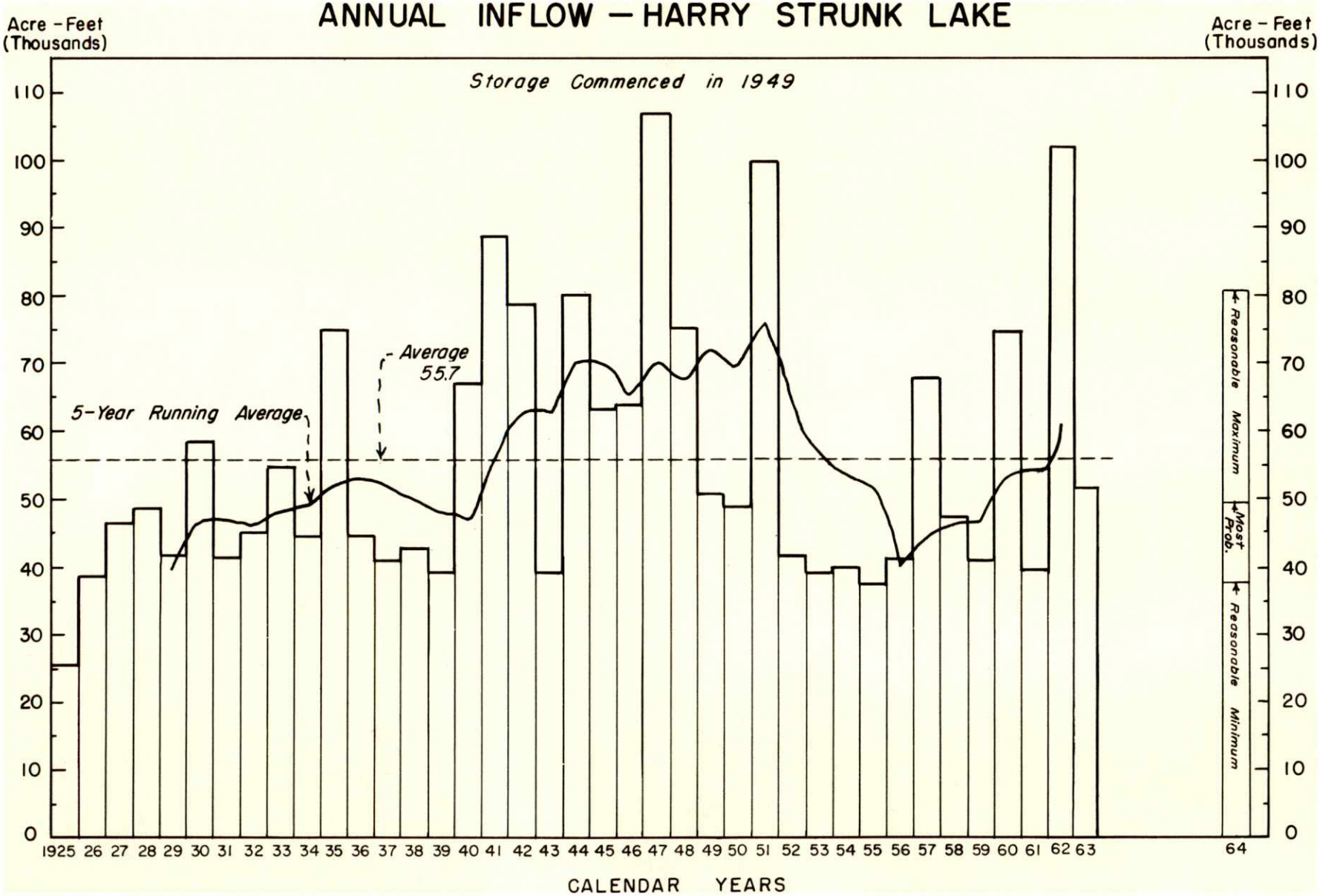

ANNUAL INFLOW - SWANSON LAKE
Acre - Feet (Thousands)
Acre - Feet (Thousands)
Storage commenced in 1953.
Historical Records
Records Adjusted for Upstream Storage and Use.
5-Year Running Average (Adjusted)
Adjusted Average 136.6
Reasonable Maximum
Most Prob.
Reasonable Minimum
550
500
450
400
350
300
250
200
150
100
50
0
1922 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64
CALENDAR YEARS

ANNUAL INFLOW - ENDERS RESERVOIR



ANNUAL INFLOW – HUGH BUTLER LAKE




ANNUAL INFLOW — HARRY STRUNK LAKE
Acre - Feet (Thousands)
Acre - Feet (Thousands)
Storage Commenced in 1949
Average 55.7
5-Year Running Average
Reasonable Maximum
Most Prob.
Reasonable Minimum
0
10
20
30
40
50
60
70
80
90
100
110
1925 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
64
CALENDAR YEARS

ANNUAL INFLOW - NORTON RESERVOIR

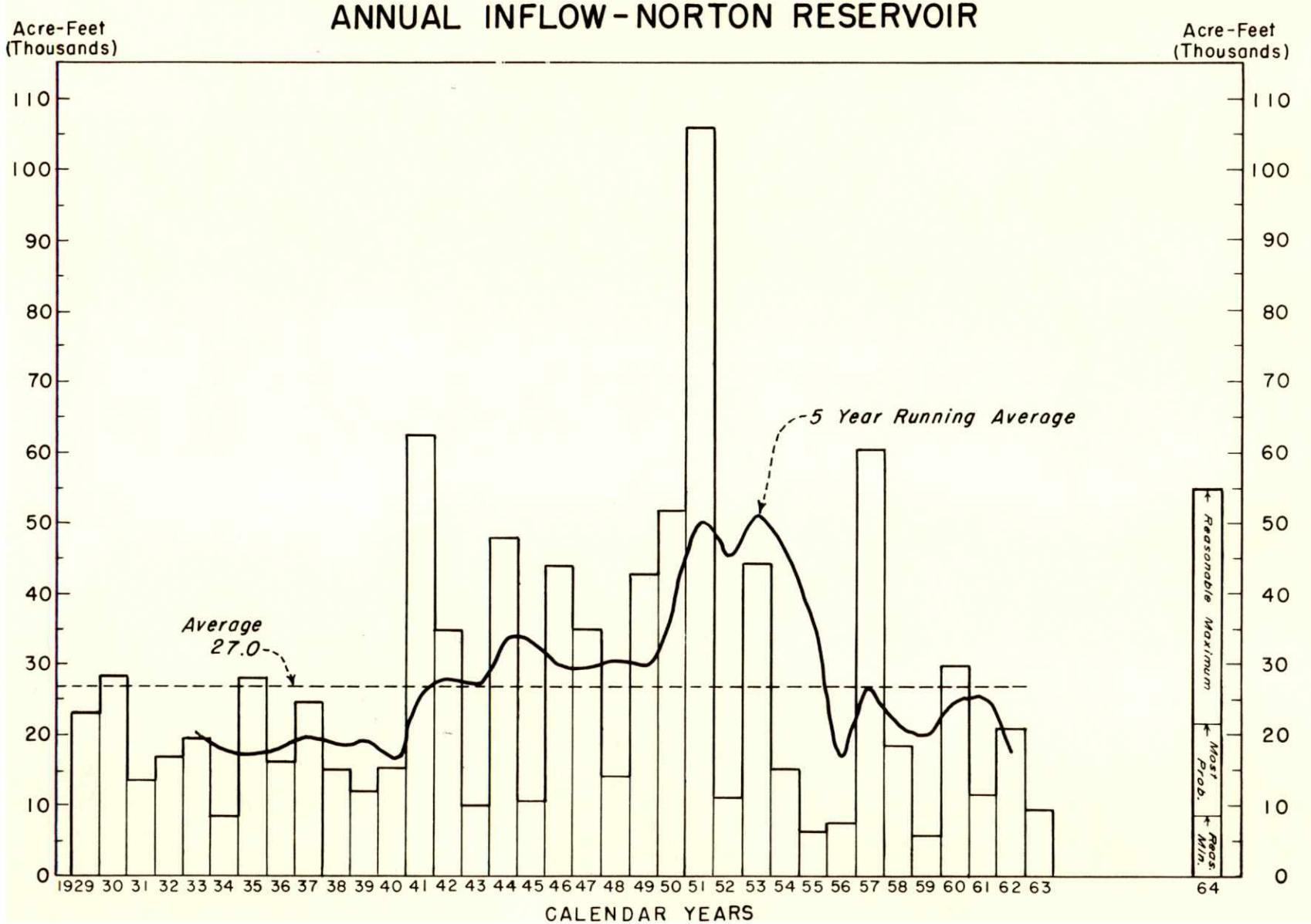
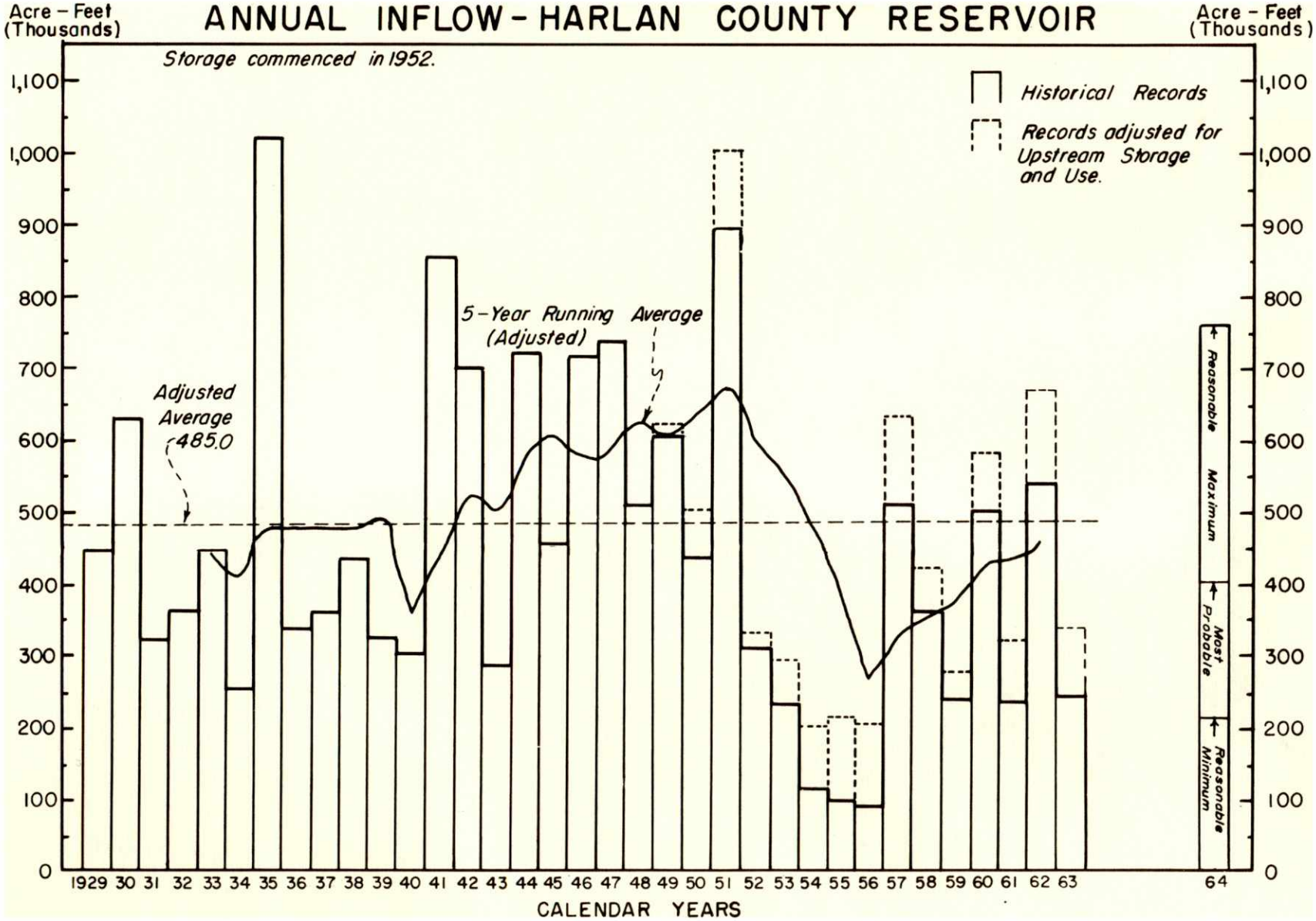


Exhibit 26


ANNUAL INFLOW - HARLAN COUNTY RESERVOIR
Acre - Feet (Thousands)
Acre - Feet (Thousands)
Storage commenced in 1952.
Historical Records
Records adjusted for Upstream Storage and Use.
5-Year Running Average (Adjusted)
Adjusted Average 485.0
Reasonable Maximum
Most Probable
Reasonable Minimum
1,100
1,000
900
800
700
600
500
400
300
200
100
0
1929 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64
CALENDAR YEARS

ANNUAL INFLOW - LOVEWELL RESERVOIR

(WHITE ROCK CREEK DOES NOT INCLUDE INFLOW FROM COURTLAND CANAL)

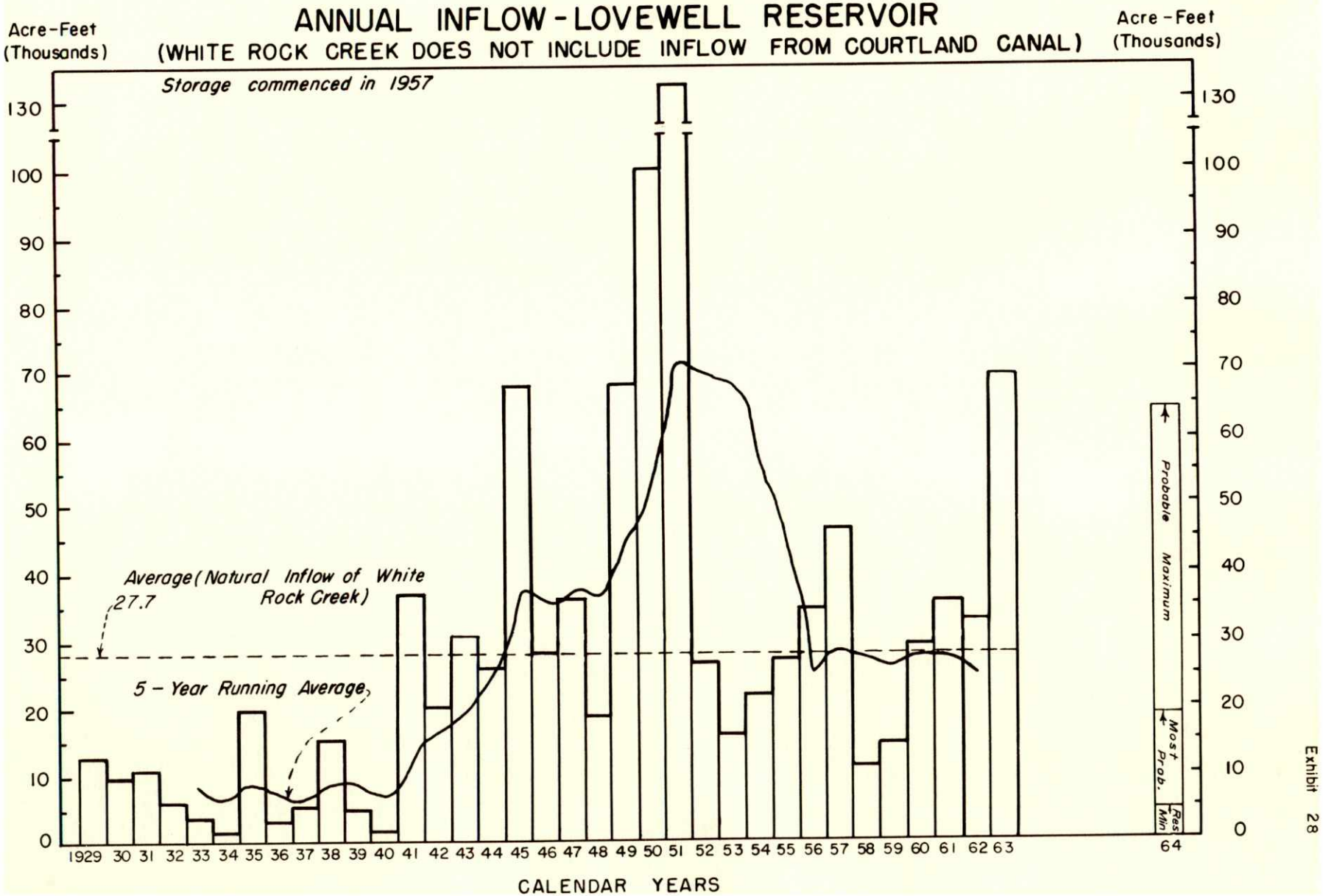
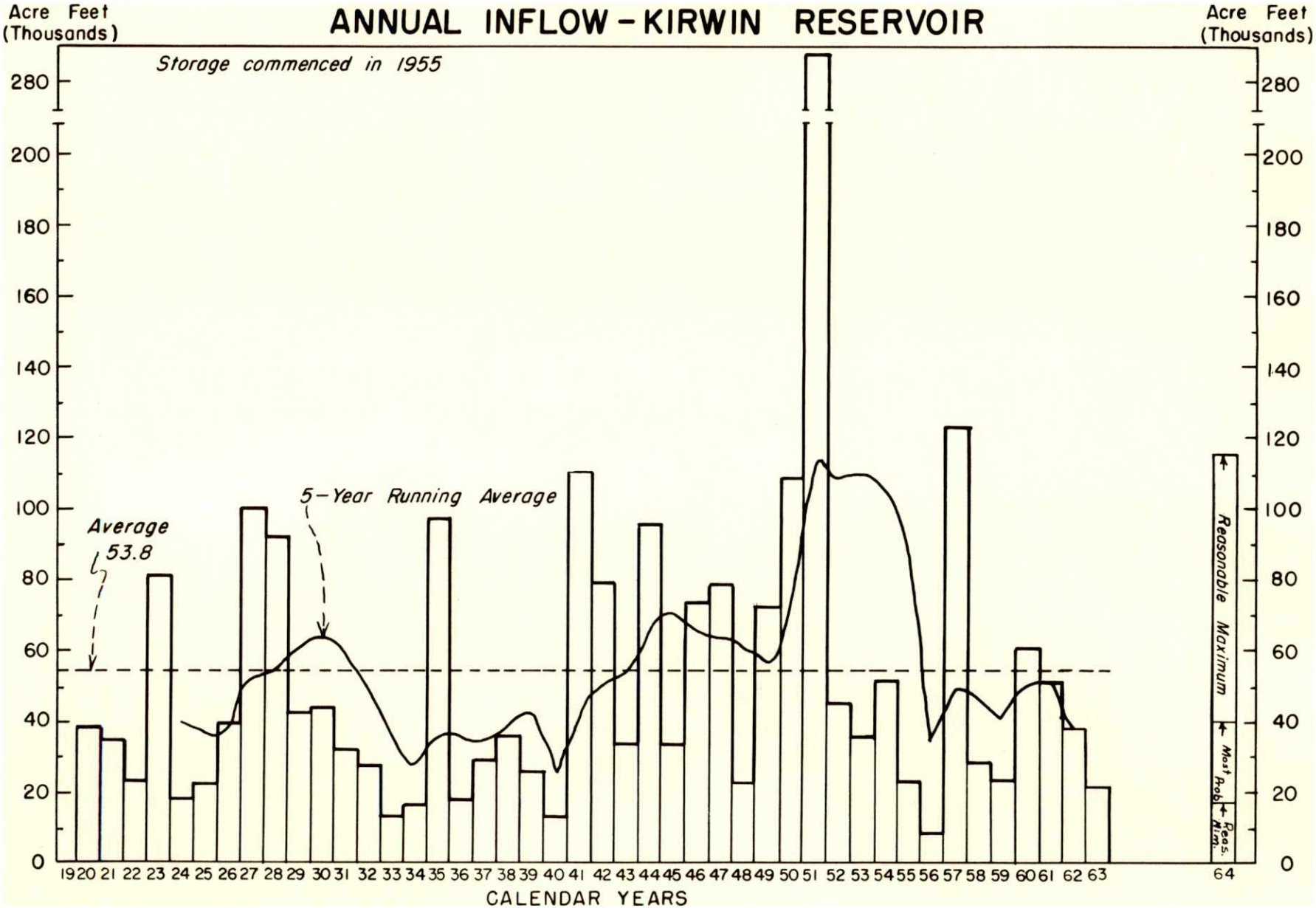


Exhibit 28


ANNUAL INFLOW - KIRWIN RESERVOIR
Acre Feet (Thousands)
Acre Feet (Thousands)
Storage commenced in 1955
5-Year Running Average
Average 53.8
Reasonable Maximum
Most Prob.
Reas. Min.
0
20
40
60
80
100
120
140
160
180
200
280
19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64
CALENDAR YEARS

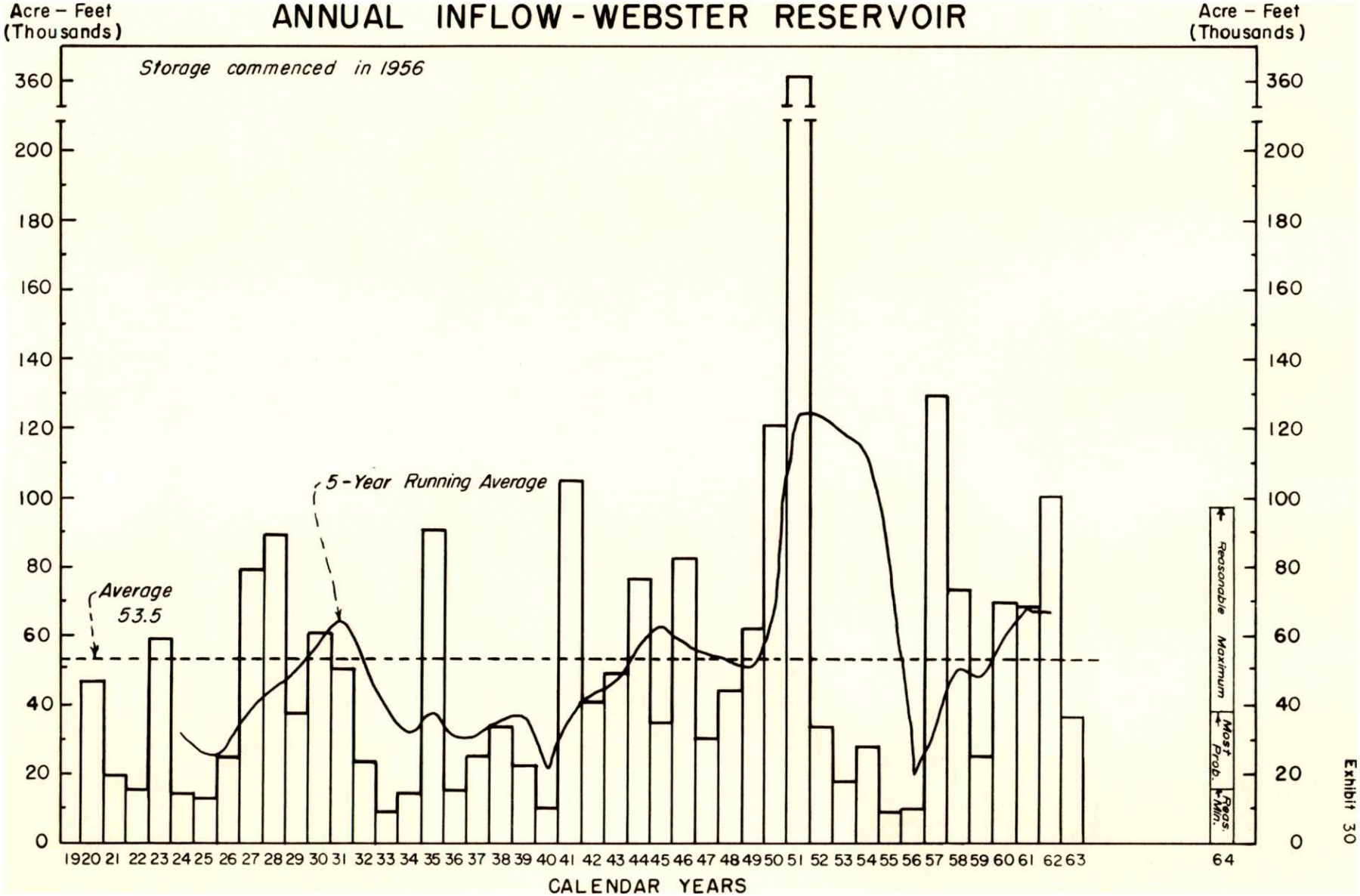

ANNUAL INFLOW - WEBSTER RESERVOIR
Acre – Feet (Thousands)
Acre – Feet (Thousands)
Storage commenced in 1956
5-Year Running Average
Average 53.5
Reasonable Maximum
Most Prob.
Reas. Min.
360
200
180
160
140
120
100
80
60
40
20
0
1920 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
64
CALENDAR YEARS

Exhibit 30

ANNUAL INFLOW-CEDAR BLUFF RESERVOIR

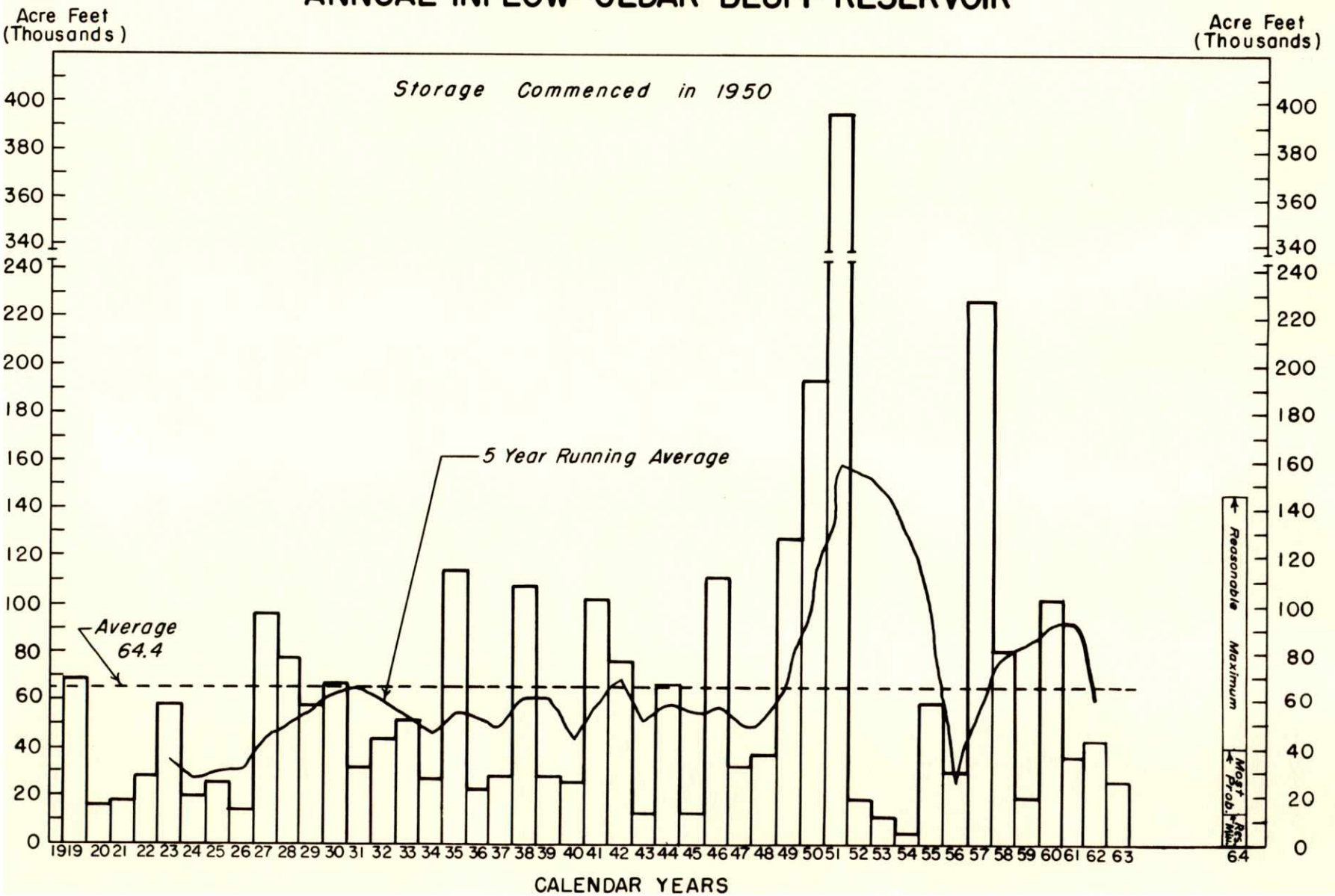
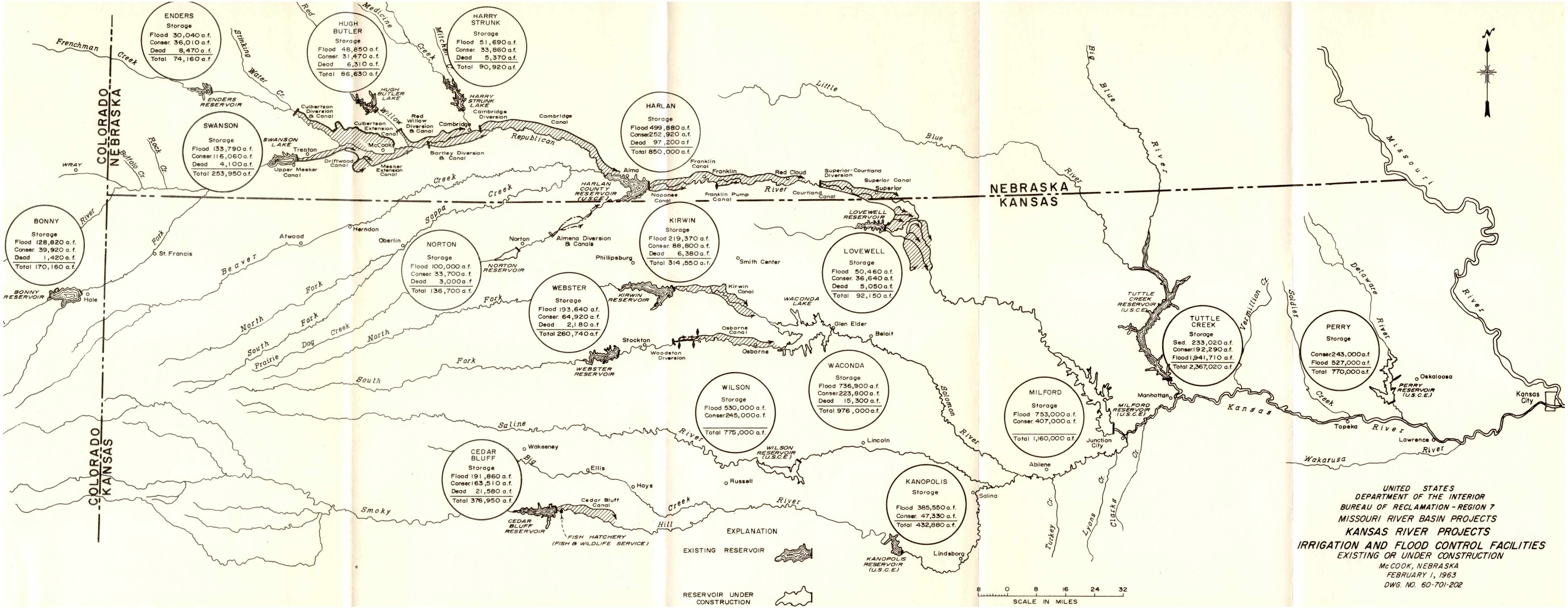


Exhibit 31



ENDERS
Storage
Flood 30,040 a.f.
Conser. 36,010 a.f.
Dead 8,470 a.f.
Total 74,160 a.f.
HUGH BUTLER
Storage
Flood 48,850 a.f.
Conser. 31,470 a.f.
Dead 6,310 a.f.
Total 86,630 a.f.
HARRY STRUNK
Storage
Flood 51,690 a.f.
Conser. 33,860 a.f.
Dead 5,370 a.f.
Total 90,920 a.f.
SWANSON
Storage
Flood 133,790 a.f.
Conser. 116,060 a.f.
Dead 4,100 a.f.
Total 253,950 a.f.
HARLAN
Storage
Flood 499,880 a.f.
Conser. 252,920 a.f.
Dead 97,200 a.f.
Total 850,000 a.f.
BONNY
Storage
Flood 128,820 a.f.
Conser. 39,920 a.f.
Dead 1,420 a.f.
Total 170,160 a.f.
NORTON
Storage
Flood 100,000 a.f.
Conser. 33,700 a.f.
Dead 3,000 a.f.
Total 136,700 a.f.
KIRWIN
Storage
Flood 219,370 a.f.
Conser. 88,800 a.f.
Dead 6,380 a.f.
Total 314,550 a.f.
LOVEWELL
Storage
Flood 50,460 a.f.
Conser. 36,640 a.f.
Dead 5,050 a.f.
Total 92,150 a.f.
WEBSTER
Storage
Flood 193,640 a.f.
Conser. 64,920 a.f.
Dead 2,180 a.f.
Total 260,740 a.f.
WILSON
Storage
Flood 530,000 a.f.
Conser. 245,000 a.f.
Total 775,000 a.f.
WACONDA
Storage
Flood 736,900 a.f.
Conser. 223,800 a.f.
Dead 15,300 a.f.
Total 976,000 a.f.
MILFORD
Storage
Flood 753,000 a.f.
Conser. 407,000 a.f.
Total 1,160,000 a.f.
TUTTLE CREEK
Storage
Sed. 233,020 a.f.
Conser. 192,290 a.f.
Flood 1,941,710 a.f.
Total 2,367,020 a.f.
PERRY
Storage
Conser. 243,000 a.f.
Flood 527,000 a.f.
Total 770,000 a.f.
CEDAR BLUFF
Storage
Flood 191,860 a.f.
Conser. 163,510 a.f.
Dead 21,580 a.f.
Total 376,950 a.f.
KANOPOLIS
Storage
Flood 385,550 a.f.
Conser. 47,330 a.f.
Total 432,880 a.f.
COLORADO
NEBRASKA
KANSAS
NEBRASKA
KANSAS
ENDERS RESERVOIR
HUGH BUTLER LAKE
HARRY STRUNK LAKE
SWANSON LAKE
HARLAN COUNTY RESERVOIR (U.S.C.E.)
LOVEWELL RESERVOIR
KIRWIN RESERVOIR
WEBSTER RESERVOIR
BONNY RESERVOIR
NORTON RESERVOIR
WACONDA LAKE
WILSON RESERVOIR (U.S.C.E.)
CEDAR BLUFF RESERVOIR
KANOPOLIS RESERVOIR (U.S.C.E.)
MILFORD RESERVOIR (U.S.C.E.)
TUTTLE CREEK RESERVOIR (U.S.C.E.)
PERRY RESERVOIR (U.S.C.E.)
FISH HATCHERY (FISH & WILDLIFE SERVICE)
Culbertson Diversion & Canal
Culbertson Extension Canal
Red Willow Diversion & Canal
Cambridge Diversion
Cambridge Canal
Bartley Diversion & Canal
Meeker Extension Canal
Upper Meeker Canal
Driftwood Canal
Franklin Canal
Naponee Canal
Franklin Pump Canal
Superior-Courtland Diversion
Superior Canal
Courtland Canal
Almena Diversion & Canals
Kirwin Canal
Osborne Canal
Woodston Diversion
Cedar Bluff Canal
Frenchman Creek
Stinking Water Cr.
Red Willow Creek
Medicine Creek
Mitchell Creek
Republican River
Little Blue River
Big Blue River
Missouri River
Rock Cr.
Buffalo Cr.
North Fork
South Fork
Beaver Creek
Sappa Creek
Prairie Dog Creek
North Fork
South Fork
Saline River
Big Creek
Smoky Hill River
Solomon River
Kansas River
Delaware River
Vermillion Cr.
Soldier Creek
Wakarusa River
Turkey Cr.
Lyons Cr.
Clarks Cr.
WRAY
Hale
St. Francis
Atwood
Herndon
Oberlin
Norton
Phillipsburg
Smith Center
Trenton
McCook
Cambridge
Alma
Franklin
Red Cloud
Superior
Stockton
Osborne
Glen Elder
Beloit
Wakeeney
Ellis
Hays
Russell
Lincoln
Salina
Lindsborg
Abilene
Junction City
Manhattan
Topeka
Lawrence
Oskaloosa
Kansas City
EXPLANATION
EXISTING RESERVOIR
RESERVOIR UNDER CONSTRUCTION
8 0 8 16 24 32
SCALE IN MILES
N
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION - REGION 7
MISSOURI RIVER BASIN PROJECTS
KANSAS RIVER PROJECTS
IRRIGATION AND FLOOD CONTROL FACILITIES
EXISTING OR UNDER CONSTRUCTION
McCOOK, NEBRASKA
FEBRUARY 1, 1963
DWG. NO. 60-701-202