ANNUAL

OPERATING

PLAN

Kansas River Projects

1964 Operations

1965 Outlook

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

February 1965

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 OPERATION PLAN

KANSAS RIVER PROJECTS

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1965 OUTLOOK

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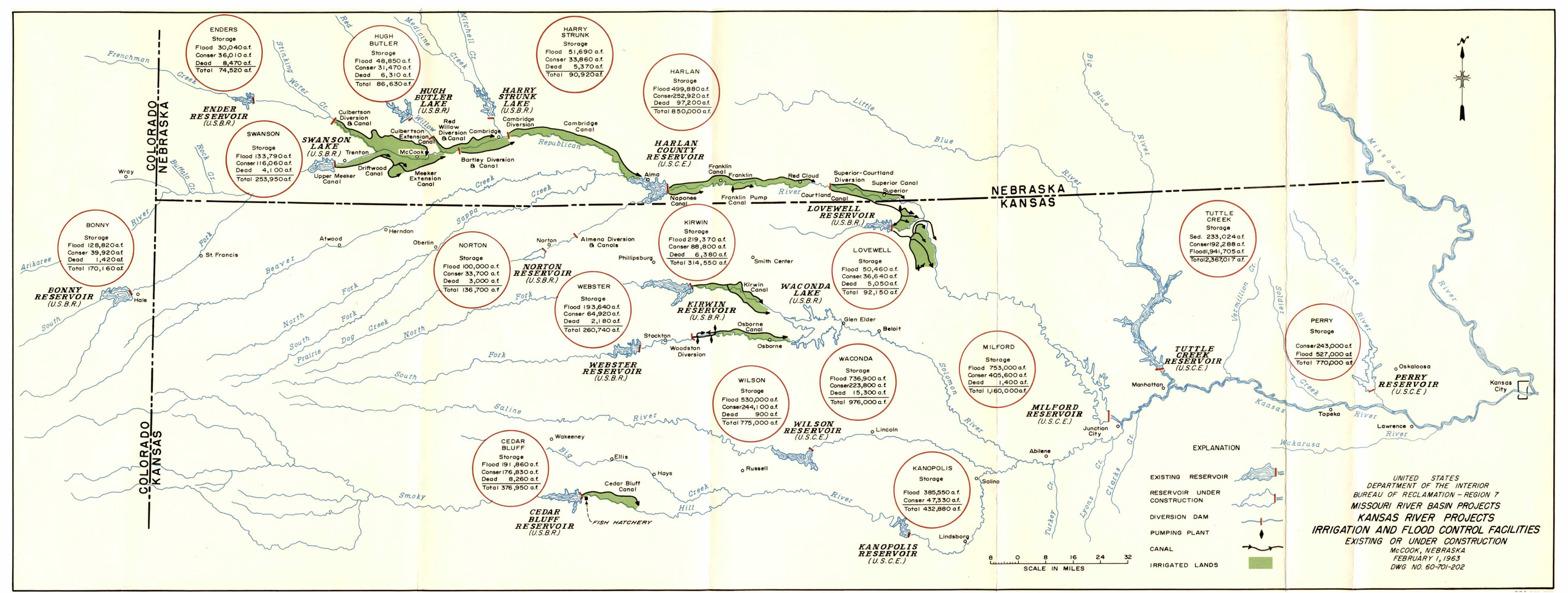
February 1965

TRENTON DAM
AND
SWANSON LAKE


ENDERS
Storage
Flood 30,040 a.f.
Conser 36,010 a.f.
Dead 8,470 a.f.
Total 74,520 a.f.
ENDER RESERVOIR (U.S.B.R.)
HUGH BUTLER
Storage
Flood 48,850 a.f.
Conser 31,470 a.f.
Dead 6,310 a.f.
Total 86,630 a.f.
HUGH BUTLER LAKE (U.S.B.R.)
HARRY STRUNK
Storage
Flood 51,690 a.f.
Conser 33,860 a.f.
Dead 5,370 a.f.
Total 90,920 a.f.
HARRY STRUNK LAKE (U.S.B.R.)
HARLAN
Storage
Flood 499,880 a.f.
Conser 252,920 a.f.
Dead 97,200 a.f.
Total 850,000 a.f.
HARLAN COUNTY RESERVOIR (U.S.C.E.)
SWANSON
Storage
Flood 133,790 a.f.
Conser 116,060 a.f.
Dead 4,100 a.f.
Total 253,950 a.f.
SWANSON LAKE (U.S.B.R.)
BONNY
Storage
Flood 128,820 a.f.
Conser 39,920 a.f.
Dead 1,420 a.f.
Total 170,160 a.f.
BONNY RESERVOIR (U.S.B.R.)
NORTON
Storage
Flood 100,000 a.f.
Conser 33,700 a.f.
Dead 3,000 a.f.
Total 136,700 a.f.
NORTON RESERVOIR (U.S.B.R.)
KIRWIN
Storage
Flood 219,370 a.f.
Conser 88,800 a.f.
Dead 6,380 a.f.
Total 314,550 a.f.
KIRWIN RESERVOIR (U.S.B.R.)
WEBSTER
Storage
Flood 193,640 a.f.
Conser 64,920 a.f.
Dead 2,180 a.f.
Total 260,740 a.f.
WEBSTER RESERVOIR (U.S.B.R.)
LOVEWELL
Storage
Flood 50,460 a.f.
Conser 36,640 a.f.
Dead 5,050 a.f.
Total 92,150 a.f.
LOVEWELL RESERVOIR (U.S.B.R.)
WACONDA LAKE (U.S.B.R.)
WILSON
Storage
Flood 530,000 a.f.
Conser 244,100 a.f.
Dead 900 a.f.
Total 775,000 a.f.
WILSON RESERVOIR (U.S.C.E.)
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 405,600 a.f.
Dead 1,400 a.f.
Total 1,160,000 a.f.
MILFORD RESERVOIR (U.S.C.E.)
TUTTLE CREEK
Storage
Sed. 233,024 a.f.
Conser 192,288 a.f.
Flood 1,941,705 a.f.
Total 2,367,017 a.f.
TUTTLE CREEK RESERVOIR (U.S.C.E.)
PERRY
Storage
Conser 243,000 a.f.
Flood 527,000 a.f.
Total 770,000 a.f.
PERRY RESERVOIR (U.S.C.E.)
CEDAR BLUFF
Storage
Flood 191,860 a.f.
Conser 176,830 a.f.
Dead 8,260 a.f.
Total 376,950 a.f.
CEDAR BLUFF RESERVOIR (U.S.B.R.)
FISH HATCHERY
KANOPOLIS
Storage
Flood 385,550 a.f.
Conser 47,330 a.f.
Total 432,880 a.f.
KANOPOLIS RESERVOIR (U.S.C.E.)
COLORADO
NEBRASKA
COLORADO
KANSAS
NEBRASKA
KANSAS
Frenchman Creek
Stinking Water Cr.
Red Willow Creek
Medicine Creek
Mitchell Cr.
Culbertson Diversion & Canal
Culbertson Extension Canal
Red Willow Diversion & Canal
Cambridge Diversion
Cambridge Canal
McCook
Trenton
Driftwood Canal
Meeker Extension Canal
Upper Meeker Canal
Bartley Diversion & Canal
Republican River
Alma
Naponee Canal
Franklin Canal
Franklin
Franklin Pump
Red Cloud
Superior-Courtland Diversion
Superior Canal
Superior
Courtland Canal
Courtland
Wray
Rock Cr.
Buffalo Cr.
Sappa Creek
Arikaree River
St. Francis
Atwood
Herndon
Oberlin
Norton
Almena Diversion & Canals
Phillipsburg
Smith Center
Hale
South Fork Beaver Creek
North Fork Prairie Dog Creek
South Fork Solomon River
North Fork Solomon River
Kirwin Canal
Osborne Canal
Osborne
Glen Elder
Beloit
Stockton
Woodston Diversion
Saline River
Wakeeney
Ellis
Hays
Russell
Lincoln
Abilene
Salina
Lindsborg
Big Creek
Smoky Hill River
Cedar Bluff Canal
Little Blue River
Big Blue River
Missouri River
Delaware River
Vermillion Cr.
Soldier Creek
Manhattan
Junction City
Clarks Cr.
Lyons Cr.
Turkey Cr.
Kansas River
Wakarusa River
Topeka
Lawrence
Oskaloosa
Kansas City
EXPLANATION
EXISTING RESERVOIR
RESERVOIR UNDER CONSTRUCTION
DIVERSION DAM
PUMPING PLANT
CANAL
IRRIGATED LANDS
8 0 8 16 24 32
SCALE IN MILES
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

SYNOPSIS

ANNUAL OPERATING PLAN -- KANSAS RIVER PROJECTS

1964 OPERATIONS -- 1965 OUTLOOK

GENERAL

This is the twelfth Annual Operating Plan for the irrigation units in the Kansas River Projects area. This area is a part of the Missouri River Basin Project and includes multipurpose reservoirs which provide storage for irrigation, flood control, municipal water supply, recreation, fish and wildlife, stream pollution abatement and other uses. The dams and reservoirs constructed and operated by the Bureau of Reclamation or Corps of Engineers which serve the irrigation systems are within the scope of this report. Eleven reservoirs, fifteen canal systems and six diversion dams are now in operation in the Kansas River Projects area. The facilities that are completed or under construction are featured on the frontispiece of the report.

The primary 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 basins. The irrigation operations are a responsibility of the Bureau of Reclamation, while the flood control operations are a responsibility of the Corps of Engineers.

The gross crop value of the irrigated project lands in 1964 was $11,808,881. The flood damages prevented by reservoirs in the scope of this report during 1964 was $300,000.

Chapter I, the introduction, gives a description of the irrigation facilities in the Kansas River Projects Area. Chapter II summarizes the 1964 operations, and Chapter III presents the plan of operation for 1965.

1964 OPERATIONS

The water supply was adequate to meet the 1964 irrigation requirements of 113,216 acres served by the Kansas River Projects. The annual precipitation for 1964 was below normal throughout the project area. The average diversion rate per irrigated acre (2.68 acre-feet) and farm delivery rate per irrigated acre (1.4 to 1.9 acre-feet) were well above normal.

The conservation pools of Bonny, Enders, Lovewell, Webster and Cedar Bluff Reservoirs and Swanson and Harry Strunk Lakes filled in 1964. The conservation pools of Hugh Butler Lake, Harlan County and Kirwin Reservoirs did not fill. Storage was commenced in Norton Reservoir on October 6, 1964.

1965 OUTLOOK

The total available water supply of each reservoir is equal to the carryover storage from the previous year plus the inflow of the current year. The forecasts of inflow are made on a "reasonable minimum," "most probable" and "reasonable maximum" basis. All reservoir conservation pools are expected to fill by the start of the 1965 irrigation season if greater than "most probable" inflows occur. The carryover storage and the inflow that can reasonably be expected will be adequate to meet the 1965 demands. Facilities are completed to serve 151,145 acres, of which 118,700 acres are expected to be irrigated in 1965.

KANSAS RIVER PROJECTS
1964 OPERATIONS
1965 OUTLOOK

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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 twelfth Annual Operating Plan is to advise water users, cooperating agencies, and other interested groups or persons of the actual operations during 1964 and of the plan of operations for 1965 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 Projects area. Where the Bureau of Reclamation is the constructing agency, it is responsible for the employment of operation and maintenance personnel, safety of the structure, and all other conservation functions not specifically associated with regulation of the flood control storage such as: recreation, fish and wildlife, municipal and industrial sanitation, and quality control.

The Corps of Engineers is responsible for regulation of the flood control storage at all Federal reservoirs in the Kansas River Basin, and of the conservation functions other than irrigation at the dams where they are the construction agency.

The State Departments of Water Resources in Nebraska, Colorado and Kansas are responsible for administration and enforcement of the laws of the State pertaining to the rights and priorities of all parties concerned with respect to the beneficial consumptive use of water.

The Republican River Compact was authorized on August 4, 1942 by Public Law No. 696 which was enacted by the 77th Congress. The Compact was ratified by the States of Colorado, Kansas and Nebraska. This Annual Operating Plan is in accordance with the objectives of the Compact which are: To provide for the most efficient and multiple purpose use of the waters of the Republican River Basin; to provide for an equitable division of such waters; to remove all causes, present and future, which might lead to controversies; to promote interstate comity; to recognize that the most efficient utilization of the waters within the Basin is for consumptive use; and to promote joint action by the States and the United States in the efficient use of water and the control of destructive floods. The State officials responsible for the administration of the Compact are those charged with the duty of administering the public water supplies of Colorado, Nebraska, and Kansas.

MAJOR FEATURES

The Kansas River Projects are a part of the Missouri River Basin Project and includes multipurpose reservoirs which provide storage

for irrigation, flood control, municipal water supply, recreation fish and wildlife, stream pollution abatement and other uses. Eleven storage facilities, constructed and operated by the Bureau of Reclamation or the Corps of Engineers which serve the irrigation systems covered in this report are as follows:

Constructed by 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.

Constructed by the Corps of Engineers

(a) Harlan County Reservoir in the Republican River Basin.

Fifteen canal systems and six diversion dams served by the above storage facilities are now in operation in the Kansas River Projects area. All canals, laterals and diversion dams will be operated and maintained by the irrigation districts in 1965.

The Bureau of Reclamation completed construction of the Red Willow irrigation system in July of 1964, and Norton Dam in December 1964. Construction of the Glen Elder Dam, railroad relocation and the protective facilities was started by the Bureau of Reclamation in 1964, and will be continued in 1965. Construction of highway relocation work will get underway in 1965.

Storage allocations for the eleven reservoirs presently serving irrigated areas are shown in Table 1. The reservoirs and main irrigation canals are shown on the frontispiece map of the Kansas River Projects.

IRRIGATION DISTRICTS

Nine irrigation districts in the Kansas River Projects have contracted with the Bureau of Reclamation for a water supply and repayment of the construction of irrigation facilities. Table No. 5 shows the status of the repayment and water service contracts. Table No. 6 shows the acres irrigated in 1964 and the acreage expected to be irrigated in 1965 for each irrigation district.

Frenchman Valley Irrigation District and H & RW Irrigation District

Culbertson Diversion Dam and Canal were reconstructed and Culbertson Extension system 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 the Republican River and from Palisade to approximately three miles east of McCook, Nebraska. Enders Reservoir provides storage water for both districts. The transportation of water from Enders Reservoir through 52 miles of the Frenchman Creek to the Culbertson Diversion Dam has created an erosion problem that has made it necessary to initiate a construction program in 1964 to restore private access, protect the private and public improvements and to stabilize various reaches of channel banks. This program is to be continued in 1965. The sediment as experienced at the Culbertson Diversion Dam is several times the amount that was expected.

Frenchman-Cambridge Irrigation District

All of the major construction to provide service to the planned 43,190 acres of land in the Frenchman-Cambridge Irrigation District was completed in July 1964. These lands are situated, primarily, in the Republican River Valley extending from Swanson Lake to Harlan County Reservoir. Swanson, Harry Strunk and Hugh Butler Lakes provide storage for these lands. During 1964, the District operated and maintained the Meeker-Driftwood, Bartley and Cambridge systems. Operation and maintenance of the Red Willow System was 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) systems have been constructed with service available to 22,787 acres. These lands are in the Republican River Valley from Harlan County Dam to Kansas-Nebraska State line. All of the major construction is completed.

Kansas-Bostwick Irrigation District No. 2

Construction work has been essentially completed with service available to 37,478 acres. Storage water for these lands will be provided by Harlan County and Lovewell Reservoirs. Lovewell serves as both a regulating and storage reservoir. The Courtland system above Lovewell Dam is constructed to serve 11,863 acres of district lands 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 the remaining 25,615 acres of district land. The Kansas-Bostwick Irrigation District lands are situated 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 systems. 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 carry-over reservoir storage. These lands are in the valley of the North Fork of the Solomon River 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 system. 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 was completed in 1964 and storage began October 6, 1964. The specifications for the Almena Diversion Dam, canals and laterals are essentially completed and a portion of the right-of-way has been purchased. However, as no funds for the Almena irrigation facilities were included in the President's budget for fiscal year 1966, issuance of specifications for construction of these facilities has been deferred.

Cedar Bluff Irrigation District No. 6

Cedar Bluff Reservoir provides storage for irrigation of 6,600 acres of Cedar Bluff Irrigation District lands on the north side of the Smoky Hill River Valley. All of the major construction has been completed and the system was transferred to the District for care, 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 provides storage for the municipal water supply of Norton, Kansas. A contract has been completed 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 Waconda 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 provides storage to supplement the municipal water supply of the City of Russell, Kansas. A contract with the City has been executed for a storage supply 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 fish hatchery use.

OTHER FUNCTIONS

The "Statement of Operational Objectives" states that recreation and fish and wildlife interests will be best served by high pool levels with minimum fluctuations. A secondary objective for fish and wildlife interests is the regulation of outflow in excess of minimum requirements insofar as feasible. When practicable, the maintenance of regulated outflow in excess of minimum requirements will be of some advantage to farmers, industries, cities, and other interests along the Republican River below Harlan County Dam.

CHAPTER II - SUMMARY OF 1964 OPERATIONS

PRECIPITATION

The precipitation for the Kansas River Projects for 1964 was 77% of normal ranging from 98% at Swanson Lake to 56% at Webster Reservoir. The precipitation for the first six months of the year was 87% of normal. These data are shown on Table 4.

RESERVOIR INFLOW

The inflows varied from 22% of most probable at Kirwin Reservoir to 100% at Enders. Table 2 show the 1964 inflows compared to the forecasts for 1965. Exhibits 21 through 31 graphically present the 1964 inflow as compared to historical inflows for the period of record.

RESERVOIR OPERATIONS

The conservation pools of the reservoirs except Hugh Butler, Harlan County and Kirwin were filled during 1964. Operations were within the scope of the annual operating plan except for Bonny Reservoir. A full water supply was furnished to 113,216 acres of project land. Table 3 shows the 1964 reservoir contents by months. The operation hydrographs are plotted on Exhibits 1 through 11.

No major flooding was experienced during 1964 below the reservoirs considered in this report; however, the regulation of these reservoirs prevented $300,000 of flood damages on the Missouri River.

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

Bonny Dam and Reservoir

The reservoir inflow for 1964 was 72% of the most probable. The normal spring drawdown in 1964 was deferred until 1965 so as to provide an additional 4,000 acre-feet of storage for Harlan County Reservoir. Natural flow bypasses as requested by the Colorado Department of Water Resources were made to Hale Ditch from May 13 to November 9. Only 151 acre-feet of storage was sold under Warren Act as a supplemental water supply for 590 acres served by Hale Ditch. The minimum pool level of elevation 3668.9 (35,370 acre-feet) was reached on November 3, 1964. This is 3.1 feet below the top of the conservation pool.

No flood damages were prevented during 1964. During the life of the dam, the accumulation of the damages prevented has been $1,647,000.

Trenton Dam and Swanson Lake

The reservoir inflow for 1964 was 61% of the most probable, with a maximum elevation of 2752.73 feet (123,820 acre-feet) reached on June 23. This was 0.73 feet (3,660 acre-feet) in the flood control pool.

The 18,805 acres irrigated under the Bartley and Meeker-Driftwood Canals were provided a full water supply from controlled spills and irrigation releases out of Swanson Lake. The minimum pool level elevation 2742.1 (75,880 acre-feet) was reached on November 2, 1964. No surplus storage was available for sale under Warren Act Contracts.

During 1964, Trenton Dam prevented $50,000 in flood damages and since 1953 the accrued flood damages prevented are $1,309,000.00.

Enders Dam and Reservoir

The reservoir inflow for 1964 was 100% of the most probable, with a maximum elevation of 3112.65 (45,080 acre-feet) reached on June 27. This was 0.35 feet (600 acre-feet) in the flood control pool.

The reservoir storage was adequate to meet the demands of the 19,166 acres irrigated by the Frenchman Valley and H & RW Irrigation Districts. Special releases were made at various times throughout the season to periodically sluice sediment deposits from the pool area above the Culbertson Diversion Dam. The reservoir was drawn down to elevation 3088.1 feet (14,167 acre-feet) on September 12 with an active conservation carryover storage of 5,700 acre-feet. No surplus storage was available for sale under Warren Act Contracts.

Major repairs on the outlet works hollow jet valves was started in September of 1964 and will be completed prior to the start of the 1965 irrigation season.

Although no flood damages were prevented by Enders Dam during 1964, the project has prevented damages amounting to $773,000 since 1950.

Red Willow Dam and Hugh Butler Lake

The reservoir inflow for 1964 was 76* of the most probable with a maximum elevation of 2578.12 (32,082 acre-feet) reached on May 8. This was 3.7 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 surplus storage was available for sale under Warren Act Contracts.

No flood damages were prevented during 1964. During four years of operation, the accumulated damages prevented has been $2,000.

Medicine Creek Dam and Harry Strunk Lake

The reservoir inflow for 1964 was 89% of the most probable. During the fall and winter months of 1963, about 2,000 acre-feet was accumulated in the Harry Strunk Flood Control Pool and released to Harlan County Reservoir in March 1964 following the completion of temporary riprap repairs to Harlan County Dam. The reservoir reached a depth of 1.7 feet (3,346 acre-feet) in the flood control pool on June 8. Irrigation demands resulted in the reservoir being drawn down approximately 12.1 feet (17,724 acre-feet) in the conservation pool by August 19. No surplus storage was available forsale under Warren Act Contracts.

No flood damages were prevented by operation of Medicine Creek Dam during 1964. There has been, however, $246,000 of flood damages prevented since 1949.

Norton Dam and Reservoir

Flows of Prairie Dog Creek were diverted through the outlet works of Norton Dam on January 28 and storage began on October 6. The elevation December 31, 1964 was 2260.80 (87 acre-feet). The inflows during October, November and December, 1964, were less than the "reasonable minimum".

Harlan County Dam and Reservoir

The reservoir inflow for 1964 was 80% of the most probable, with a maximum elevation of 1944.42 feet (329,210 acre-feet) reached on June 30. This was 1.6 feet below the top of the conservation pool. Irrigation demands and special releases in August and early September lowered the reservoir to elevation 1933.70 (208,580 acre-feet) on September 15. This drawdown was necessary to facilitate permanent repair of the riprap on the upstream face of the dam.

The riprap repair was started in the fall of 1964 and was continued into the winter months with the pool level being maintained at about elevation 1934 during this period. The riprap repairs had progressed to the extent that storage was resumed on January 25, 1965. By special agreement with the Corps of Engineers to supplement the water supply for 1965 with the low storage in Harlan County Reservoir, 6,000 acre-feet of additional conservation storage was held in the flood control pool of Lovewell Reservoir at the end of the 1964 irrigation season.

On only five days throughout the period June through September the minimum daily flow of the Republican River below the Superior, Nebraska Sewer Outlet was less than the minimum of 40 c.f.s. as outlined in the "1952 Statement of Operational Objectives for Harlan County Reservoir."

The State Health Department indicated at a November meeting in Lincoln, Nebraska, that pollution abatement was very satisfactory during the low flow months of 1964.

During the period of May 18 through 26, all of the available flow in the Republican River was diverted through the Superior-Courtland Diversion Dam into the Superior and Courtland Canals. On May 18, the flow in the river below the diversion dam was reduced from about 120 c.f.s. to 1 c.f.s. This resulted in a considerable loss of fish downstream (mostly non-game) when they were trapped in shallow water by the sudden change in the river flow. In future years, this will be alleviated by a gradual closure of the gates to give the fish the opportunity to escape to deeper pools.

During 1964, Harlan County Dam prevented $182,000 in flood damages and since 1952 the accrued flood damages prevented are $6,380,000.

Because of the requirement of a low pool level to facilitate riprap repairs at Harlan County Dam it was possible to make special releases in cooperation with the Fish and Wildlife Service and the Nebraska Game, Fish and Parks Commission to make a study of the fishery conditions for various stages of flow in the Republican River below the Superior-Courtland Diversion Dam. These releases were started on May 27.

On November 24, 1964, an inter-agency meeting was held in Lincoln, Nebraska, to discuss the problems created by low flows downstream from the various diversion dams in the Kansas River Projects in the Republican River Basin. The Fish and Wildlife Service personnel reported the results of their special studies and requested a bypass of a minimum of 10% of the mean annual flow of record below all dams in the Republican Basin to achieve desired benefits to fish and wildlife. The Nebraska Department of Water Resources pointed out that under the Appropriation Law, water bypassed at a diversion dam for fish and wildlife purposes is a non-beneficial use under the state water laws and the Department is powerless to administer the stream for this purpose.

Without administration of the river flows, there would be no regulation for the use of water by an estimated 50 appropriators whose rights are junior to the Bostwick Irrigation District in Nebraska. In order to protect the water supply of the Bostwick Irrigation District, the Republican River must be administered by the Department of Water Resources. The Bureau of Reclamation is obligated by contract to furnish a water supply to the district and therefore under existing laws are unable to make continuous bypasses at the Superior-Courtland Diversion Dam.

Lovewell Dam and Reservoir

During the months of August and September, 1964, special releases were made to lower the pool level at Harlan County Reservoir and closure was being made on Milford Dam near the mouth of the Republican River. In order to accomplish both operations and maintain a low flow in the Milford area, about 20,000 acre-feet of water was diverted through the Courtland Canal into Lovewell Reservoir. During this operation, Lovewell Reservoir reached a depth of 4.1 feet (13,640 acre-feet) in the flood control pool of which 2.0 feet (6,000 acre-feet) was used as additional carryover storage. It is intended to maintain this storage until the 1965 irrigation season, or until it is no longer needed to assure an adequate irrigation supply. The additional flood control pool storage was released in late September when low flows were no longer required for the closure operation at Milford Dam.

Although no flood damages were prevented during 1964, the project has prevented $246,000 in damages since 1957.

Kirwin Dam and Reservoir

The reservoir inflow for 1964 was 22% of the most probable. The reservoir reached elevation 1726.79 (87,440 acre-feet) in the conservation pool on May 8.

The 8,680 acres irrigated under the Kirwin Canal were provided a full water supply. The minimum pool level of elevation 1719.73 (57,921 acre-feet) was reached on December 30. This was about 8.7 feet (37,259 acre-feet) below the top of the conservation pool.

During 1964, Kirwin Dam prevented $34,000 in flood damages. Damages prevented since 1955 are $1,067,000.

Webster Dam and Reservoir

The reservoir inflow for 1964 was 49% of the most probable. The reservoir reached a depth of 0.3 feet (1,040 acre-feet) in the flood control pool on April 6, controlled spills were made during April and early May.

The 6,202 acres irrigated under the Osborne Canal were provided a full water supply. On December 5, the minimum pool level of elevation 1879.10 (36,590 acre-feet) was reached. This was about 10.5 feet (30,510 acre-feet) below the top of the conservation pool.

The City of Stockton, Kansas, purchased 58 acre-feet of storage under a temporary, emergency contract during August and September to augment their municipal water supply.

A release of 200 c.f.s. was made on August 14 for 6 hours to flush the channel of the South Fork of the Solomon River from the Woodston Diversion Dam to Beloit, Kansas. This release was made to lower the salt content of the water below the 500 ppm desirable maximum at the municipal pumping plant for Beloit under terms of the interim municipal water supply contract.

Flood damages in the amount of $17,000 were prevented by Webster Dam in 1964. The accumulated total of flood damages prevented since 1956 are $1,477,000.

Cedar Bluff Dam and Reservoir

The reservoir inflow for 1964 was 63% of the most probable. The reservoir reached a depth of 1.95 feet (13,670 acre-feet) in the flood control pool on June 22, controlled spills were made during June and early July.

The 4,017 acres irrigated under the Cedar Bluff Canal were provided a full water supply. There were 688 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 Cedar Bluff National Fish Hatchery, located below Cedar Bluff Dam and operated by the United States Bureau of Sport Fisheries and Wildlife, was delivered 2,247 acre-feet of which 1,250 acre-feet was returned to the Smoky Hill River below the fish hatchery. Minimum conservation storage was reached on December 18 at elevation 2140.20 (160,160 acre-feet), 3.8 feet (24,930 acre-feet) below the top of the conservation pool.

A radial gate was installed in the uncontrolled sluiceway during the summer and fall months. This will now afford full regulation of releases from the flood control pool.

During 1964, $17,000 in flood damages were prevented by Cedar Bluff Dam. The accumulated damages prevented to date are $8,306,000.

IRRIGATION OPERATIONS SUMMARY

A total of 303,597 acre-feet of water was diverted into fifteen canal systems for irrigation of 113,216 acres of land in the Kansas River Projects. This is 75% of the acreage that had service available in 1964. The irrigation operations for each of the irrigation districts are shown in the following table:

Irrigation District	Acres Irrig.	Diversion (A.F.)	Diversion (A.F./ac.)	Farm Del. (A.F./ac.)	Crop Value per acre
Frenchman Valley	8,122	21,958	2.70	(no records)	$ 99.00
H & RW	11,044	26,549	2.40	1.40	89.84
Frenchman-Cambridge	34,294	81,679	2.38	1.47	107.24
Bostwick in Nebraska	17,965	52,525	2.92	1.53	105.72
Kansas-Bostwick	22,892	67,806	2.96	1.83	119.42
Kirwin	8,680	21,985	2.53	1.87	98.13
Webster	6,202	18,274	2.94	1.78	94.87
Cedar Bluff	4,017	12,821	3.19	1.53	65.22
Total - Kansas River Projects	113,216	303,597			$11,808,881

Water diverted to the Hale Ditch totaled 3,589 acre-feet of which 151 acre-feet were sold under Warren Act Contract.

The acres irrigated in 1964 and estimated to be irrigated in 1965 are compared to the service available acreage on Table 6. A graphic representation of development by irrigation districts is presented in Exhibits 13 through 20.

Table 7 lists the 1964 monthly diversions and acres irrigated for each canal system. Table 8 tabulates the acreage irrigated and water diversion data for 1960 through 1964, together with estimates for 1965.

OTHER USES

During the 1964 season, at the Bureau of Reclamation reservoirs, and lakes, recreation areas and facilities drew 1,403,518 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 1965

WATER SUPPLY

The water supply outlook for 1965 is fair to excellent. Even under reasonable minimum conditions, we expect to be able to meet the irrigation requirements of 121,900 acres of Kansas River Project lands expected to be irrigated, and the municipal demands of Beloit and Russell, Kansas. Water may be available by mid-summer for use of Norton, Kansas.

For forecasting purposes, values of annual inflows that will be statistically equaled or exceeded 10, 50 and 90 per cent of the time were selected from the probability curve to be "reasonable maximum," "most probable," and "reasonable minimum" inflow conditions. The estimates for 1965 are shown in Table 2 and are graphically compared with the historical inflow records in Exhibits 21 through 31. Estimated operation studies under the three probabilities have been prepared for 1965 and are shown in Table 11.

RESERVOIR OPERATIONS

Each fall after the demand period, the storage in each reservoir is evaluated. When it is apparent that the conservation pool of a reservoir will fill 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. However, this plan is not used for Bonny Reservoir, as winter releases are undesirable.

Under the inflow conditions assumed in this report, no surplus storage will be available for sale under Warren Act Contract at any of the reservoirs except Bonny.

Exhibits 1 through 11 shows the probable effects on each reservoir for 1965 under "most probable," "reasonable minimum," and "reasonable maximum" inflow conditions.

Bonny Dam and Reservoir

The normal operating criteria for Bonny Reservoir schedules special releases to lower the pool level to elevation 3670 (37,390 acre-feet) by the end of March. Because of the low storage condition in Harlan County Reservoir, described on Page 8, the normal operating criteria will not be followed for 1965. On March 1, a release of 100 c.f.s. (river outlet works capacity) will be started to transport 18,000 acre-feet to downstream reservoirs. The lowest pool level of 3662.0 (23,710 acre-feet) is expected by the end of May with reasonable minimum inflow conditions.

The Colorado, Fish and Game Commission plan to take advantage of the low Bonny pool level to make repairs to existing boat ramps and to construct new facilities in the reservoir area.

The natural flows of the South Fork of the Republican River and Landsman Creek above Bonny Reservoir will be released to Hale Ditch when requested by the Colorado Department of Water Resources. Storage water will again be available for sale to Hale Ditch irrigators under Warren Act contracts as a supplemental water supply.

Trenton Dam and Swanson Lake

Irrigation requirements on storage will be made by irrigators under the Meeker-Driftwood and Bartley systems for 18,700 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 11.3 (49,800 acre-feet) below the top of the conservation pool. After the conservation pool is filled, controlled releases will be made as inflow and downstream conditions dictate.

Enders Dam and Reservoir

The conservation pool of Enders Reservoir under "reasonable minimum" conditions will not fill by about 1.0 feet (1,700 acre-feet). The water supply will be adequate to meet the irrigation requirements of 19,300 acres expected to be irrigated by the Frenchman Valley and H & RW Irrigation Districts.

Red Willow Dam and Hugh Butler Lake

Hugh Butler conservation 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 requirements of 3,000 acres expected to be irrigated by the Red Willow Canal system.

Medicine Creek Dam and Harry Strunk Lake

Harry Strunk conservation pool will fill under all inflow conditions. Controlled releases will be made as dictated by the inflow. The storage and available inflow will be more than adequate to meet the requirements of 12,900 acres expected to be irrigated by the Cambridge Canal system.

Based on a 1962 sediment survey, the area-capacity data indicates a loss of 2,089 acre-feet of conservation storage. The new area-capacity data was put into use on October 1, 1964.

Norton Dam and Reservoir

Flows of Prairie Dog Creek were diverted through the outlet works on January 28, 1964; storage began October 6, 1964. The dead storage pool will fill by the end of May under "reasonable minimum" conditions. The conservation pool is not expected to fill under "reasonable minimum" or "most probable" conditions.

Harlan County Dam and Reservoir

Bonny storage will be utilized to maintain the pool level at Harlan County Reservoir above the base of the riprap (elevation 1928.0) with "reasonable minimum" inflow conditions. A portion of the Bonny storage will be retained in Swanson Lake until such time as a need develops for additional storage in Harlan County Reservoir. With "most probable" inflow conditions, Harlan County conservation pool is expected to be filled by the end of June 1965. Under all inflow conditions, it is expected that an ample water supply will be available to irrigate 20,000 acres of land in the Bostwick Irrigation District in Nebraska and 26,500 acres in the Kansas-Bostwick District.

Lovewell Dam and Reservoir

Normal operation of Lovewell Reservoir is planned for regulation of the Courtland Canal as well as the storage of natural flows of White Rock Creek. The irrigation requirements 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 when a water shortage is apparent in Harlan County and when space is available in Lovewell Reservoir, 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 White Rock Creek inflows during the dry fall of 1964 were too low to maintain the 6,000 acre-feet of temporary storage in the flood control pool, consequently, on February 1, only 5,210 acre-feet of this storage was available for irrigation use. This temporary storage along with White Rock Creek flows and water diverted from the Republican River are expected to meet full irrigation demands. The pool level is not expected to be below elevation 1575 at the end of the 1965 irrigation season.

Kirwin Dam and Reservoir

Kirwin conservation pool is not expected to fill under "reasonable minimum" or "most probable" conditions. Inflow and conservation storage will be more than adequate to meet the irrigation requirements of 9,000 acres expected to be irrigated under the Kirwin Canal system in 1965.

Webster Dam and Reservoir

Webster conservation pool is not expected to fill under "reasonable minimum" or "most probable" conditions. The conservation storage and inflow will be more than adequate to meet the requirements of the 7,500 acres expected to be irrigated under the Osborne Canal system and to meet the municipal water demands of Beloit, Kansas.

Cedar Bluff Dam and Reservoir

Cedar Bluff conservation pool is not expected to fill under "reasonable minimum" or "most probable" conditions. The conservation storage and available inflow will be more than adequate to meet the irrigation requirements of 5,000 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 the Cedar Bluff Fish Cultural Station.

IRRIGATION OPERATIONS

It is estimated that 121,900 acres under the Kansas River Projects will be irrigated in 1965. Of this, 73,900 acres are in Nebraska and 48,000 acres in Kansas. The acres expected to be irrigated in 1965 are shown by canals in Table 6. The probable canal diversions for 1965 under the "normal," "dry" and "wet" years are shown graphically together with the acreage expected to be irrigated on Exhibits 12 through 20. The expected canal operations for 1965 are discussed in the following paragraphs for each irrigation district.

Frenchman Valley and H & RW Irrigation Districts

The irrigated lands in these two districts are served by Enders Reservoir through the Culbertson Canal and the Culbertson Extension Canal systems which are operated under joint management. For 1965, 8,300 acres in the Frenchman Valley Irrigation District and 11,000 acres in the H & RW Irrigation District are expected to be irrigated.

In addition to meeting the irrigation requirements of Frenchman Valley and the H & RW Irrigation Districts, approximately 150 acre-feet will be needed for periodic sediment sluicing operations at the Culbertson Diversion Dam. A bank protection program for Frenchman Creek to control the erosion of the channel will be continued in 1965.

Frenchman-Cambridge Irrigation District

The Frenchman-Cambridge Irrigation District will operate and maintain the Red Willow, Bartley, Cambridge and Meeker-Driftwood systems. It is estimated that 34,600 acres will be irrigated by these four systems in 1965 utilizing storage from Swanson, Hugh Butler and Harry Strunk Lakes.

The water use study initiated by the Bureau of Reclamation in 1964 in the area served by the Meeker-Driftwood system will continue during 1965 and the next three years.

Bostwick Irrigation District in Nebraska

Franklin, Naponee, Franklin Pump and Superior systems and Courtland Laterals in Nebraska will be operated and maintained by the Bostwick Irrigation District in Nebraska with storage from Harlan County Reservoir. An estimated 20,000 acres will be irrigated in 1965. The Kansas-Bostwick Irrigation District No. 2 will operate and maintain the Superior-Courtland Diversion Dam and Courtland Canal in Nebraska. The Courtland Canal supplies water for irrigation of district lands in Nebraska, Kansas-Bostwick Irrigation District lands and diversions to Lovewell Reservoir. Transportation loss is shared on a water use basis. The maintenance cost of the diversion dam and Courtland Canal in Nebraska is shared by the Kansas-Bostwick Irrigation District and the Bostwick Irrigation District in Nebraska.

Kansas-Bostwick Irrigation District No. 2

In 1965, 26,500 acres are expected to be irrigated in the Kansas-Bostwick Irrigation District No. 2, of which 9,200 acres are above Lovewell Reservoir and 17,300 acres are below. Lovewell and Harlan County Reservoirs provide storage for this district.

Kirwin Irrigation District No. 1

The Kirwin Irrigation District No. 1 will operate and maintain the Kirwin system to irrigate an estimated 9,000 acres during the 1965 irrigation season from Kirwin Reservoir.

Webster Irrigation District No. 4

The Webster Irrigation District No. 4 will operate and maintain the Osborne System. Of the 8,500 acres available for service, 7,500 acres are expected to be irrigated in 1965. Kirwin and Webster Irrigation Districts are operated under joint management. Webster Reservoir provides storage for this district.

Cedar Bluff Irrigation District No. 6

The Cedar Bluff Irrigation District No. 6 will operate and maintain the Cedar Bluff system for the first time in 1965. An estimated 5,000 acres will be irrigated during the 1965 irrigation season from Cedar Bluff Reservoir.

MUNICIPAL WATER

City of Norton, Kansas

Under reasonable minimum conditions, the dead pool in Norton Reservoir will be filled by the end of May 1965. Water may be available for diversion to Norton, Kansas for municipal water use by mid-summer.

City of Beloit, Kansas

Water will be available from Webster Reservoir for diversion to the City of Beloit, Kansas, until such time as Glen Elder Dam is completed. It is expected that releases from the reservoir for this purpose will be required in 1965 if the current dry cycle continues into the summer months.

City of Russell, Kansas

The municipal water supply demands of the City of Russell, Kansas, are supplied by return flows to the Smoky Hill River from the Cedar Bluff National Fish Hatchery below Cedar Bluff Dam and the Cedar Bluff irrigation system and by special releases from Cedar Bluff Reservoir. Demands of the City of Russell, Kansas, will be met in full during 1965.

OTHER USES

The visitation and use of reservoirs is expected to increase in the future. Paved roads are being constructed to Medicine Creek and Norton recreation areas and over Webster Dam. Cedar Bluff and Kirwin Reservoirs in Kansas and Enders Reservoir and Swanson Lake in Nebraska are included in the respective states scenic road and parkway study. Even with irrigation operations and possible flood operations, the reservoirs in this report will provide excellent opportunities for fish, wildlife and recreation activities during 1965.

TABLE 1

RESERVOIR DATA - KANSAS RIVER PROJECTS

RESERVOIR	CAPACITY ALLOCATIONS		
	DEAD 1/	LIVE CONSERVATION 1/	FLOOD CONTROL 1/
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 2/	39,230 2/	90,920 2/
Net Acre Feet	5,370	33,860	51,690
Norton			
Elevation (Ft.)	2275.0	2304.3	2331.4
Total Acre Feet	3,000	36,700	136,700
Net Acre Feet	3,000	33,700	100,000
Harlan County			
Elevation (Ft.)	1885.0 2/	1946.0	1973.5
Total Acre Feet	1,300	350,120 2/	850,000 2/
Net Acre Feet	1,300	348,820	499,880
Lovewell			
Elevation (Ft.)	1562.07	1582.6	1595.3
Total Acre Feet	5,050	41,690	92,150
Net Acre Feet	5,050	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.)	2090.0	2144.0	2166.0
Total Acre Feet	8,260	185,090	376,950
Net Acre Feet	8,260	176,830	191,860
Total Storage (A.F.)	51,840	1,058,870	2,707,270
Total Net Acreage Feet	51,840	1,007,030	1,648,400

1/ Includes space for sediment storage.

2/ Resurveys were made in 1962 but space has not been reallocated.

TABLE 2

INFLOW INTO RESERVOIRS - 1964 RECORDS, 1965 ESTIMATES

1	2	3	4	5	6	7
	1,000 Acre-Feet					
	1964 Inflows		1965 Estimates 1/			Average for period of Record 2/
Reservoir	Measured	Adjusted 3/	Reasonable Minimum	Most Probable	Reasonable Maximum	
Bonny	19.3		17.0	26.7	38.2	31.7
Swanson Lake	64.8	77.1 3/	67.6	112.6	207.0	136.6 3/
Enders	53.1		45.0	50.0	57.8	50.3
Hugh Butler Lake	15.8		14.8	20.7	29.1	21.7
Harry Strunk Lake	44.1		37.4	49.5	80.4	55.7
Harlan County	179.7	280.8 3/	211.0	399.0	760.0	485.0 3/
Lovewell	62.2 4/	5.3 5/	27.4 4/	45.9 4/	66.0 4/	27.7 5/
Kirwin	8.9		17.0	40.0	115.0	53.8
Webster	18.3		12.8	37.6	98.0	53.5
Cedar Bluff	24.9		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/ Measured records plus upstream depletions caused by operation of 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 RESERVOIRS
(Units in 1,000 Acre-Feet)

Month	TOTAL STORAGE END OF MONTH 1963	TOTAL STORAGE END OF MONTH 1964	TOTAL 1964 OUTFLOW	INFLOW 1964 ACTUAL	INFLOW MOST PROBABLE	DAM AND RESERVOIR INFORMATION	
Jan.	39.6	40.1	0.4	2.3	2.2	DAM: BONNY	
Feb.	41.3	41.6	0.4	2.0	2.2	RESERVOIR: BONNY	
Mar.	43.4	42.6	1.4	2.2	2.9		
Apr.	42.6	41.3	3.2	2.2	2.5		RESERVOIR CAPACITY
May	37.4	41.0	1.8	2.1	3.0		
June	36.5	41.3	1.3	2.5	3.0		
July	35.0	39.6	0.8	0.3	1.7	DEAD	1.4
Aug.	35.4	37.4	0.5	0	1.8	LIVE CONSER.	
Sept.	38.7	36.2	0.8	0.5	1.5	Inactive	1.4
Oct.	35.6	35.5	1.4*	1.4*	1.7	Active	38.5
Nov.	37.0	36.2	0.6*	1.9*	2.0	SUB-TOTAL	41.3
Dec.	38.4	37.5	0.4*	1.9*	2.2	FLOOD	128.8
Total			13.0	19.3	26.7	TOTAL	170.1
Jan.	117.0	98.4	0.1	8.4	7.3	DAM: TRENTON	
Feb.	121.5	106.9	0.1	10.4	9.9	RESERVOIR: SWANSON LAKE	
Mar.	120.4	116.6	0.1	10.4	18.3		
Apr.	120.0	120.0	12.5	16.5	16.5		RESERVOIR CAPACITY
May	120.2	118.6	5.0	5.7	19.2		
June	113.8	120.5	6.1	8.4	17.3		
July	85.1	101.1	18.1	0.3	4.5	DEAD	4.1
Aug.	68.8	84.2	13.6	0	5.0	LIVE CONSER.	
Sept.	76.7	77.2	5.4	0	4.6	Inactive	11.4
Oct.	82.1	76.0	0.1*	0.1*	3.5	Active	104.7
Nov.	87.2	76.6	0.1*	1.5*	5.8	SUB-TOTAL	120.2
Dec.	90.9	79.4	0.1*	3.1*	5.9	FLOOD	133.8
Total			61.3	64.8 a/	117.8 b/	TOTAL	254.0
Jan.	35.0	33.3	0.5	4.7	4.9	DAM: ENDERS	
Feb.	38.9	36.7	0.5	4.3	4.3	RESERVOIR: ENDERS	
Mar.	42.2	40.0	0.5	4.4	4.4		
Apr.	43.8	42.5	0.9	4.1	4.2		RESERVOIR CAPACITY
May	43.6	43.5	1.6	3.6	4.1		
June	40.8	44.9	2.4	4.2	4.2		
July	25.3	30.4	17.9	3.3	3.8	DEAD	8.5
Aug.	14.6	17.1	17.0	3.3	3.6	LIVE CONSER.	36.0
Sept.	17.7	16.6	4.8	3.4	3.6	SUB-TOTAL	44.5
Oct.	21.5	20.3	0.4*	5.6*	3.9	FLOOD	30.0
Nov.	25.4	24.1	0.4*	4.4*	4.3	TOTAL	74.5
Dec.	29.3	28.4	0.4*	4.8*	4.7		
Total			47.3	50.1	50.0		

a/ Recorded inflow b/ Inflow adjusted for upstream depletions

* 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 1963	TOTAL STORAGE END OF MONTH 1964	TOTAL 1964 OUTFLOW	INFLOW 1964 ACTUAL	INFLOW MOST PROBABLE	DAM AND RESERVOIR INFORMATION
Jan.	23.2	27.6	0.2	1.3	1.5	DAM: RED WILLOW
Feb.	24.9	28.4	0.2	1.6	1.6	RESERVOIR: HUGH BUTLER LAKE
Mar.	25.9	29.9	0.2	2.5	2.1	
Apr.	25.9	31.9	0.2	2.8	1.9	
May	26.1	31.4	0.6	1.4	2.3	RESERVOIR CAPACITY
June	25.1	31.0	0.8	1.4	3.1	
July	23.1	28.0	3.0	0.9	1.9	DEAD 6.3
Aug.	22.1	25.1	2.6	0.5	1.1	LIVE CONSER.
Sept.	26.0	24.3	0.8	0.7	1.0	Inactive 1.3
Oct.	26.0	24.5	0.2*	0.7*	1.2	Active 30.2
Nov.	26.6	25.0	0.2*	1.0*	1.4	SUB-TOTAL 37.8
Dec.	26.9	25.7	0.2*	1.0*	1.6	FLOOD 48.8
Total			9.2	15.8	20.7	TOTAL 86.6
Jan.	38.3	39.0	0.2	3.6	3.6	DAM: MEDICINE CREEK
Feb.	39.4	40.8	1.7	3.5	3.8	RESERVOIR: HARRY STRUNK LAKE
Mar.	39.4	39.0	5.9	4.3	4.3	
Apr.	39.7	38.8	6.1	6.2	4.5	
May	40.1	40.2	1.0	3.4	5.4	RESERVOIR CAPACITY 1/
June	38.5	39.2	7.2	6.7	6.8	
July	26.2	31.1	11.9	2.7	5.0	
Aug.	21.9	23.0	10.2	2.1	3.4	DEAD 4.9
Sept.	27.8	23.9	1.5	2.9	3.0	LIVE CONSER. 32.2
Oct.	30.4	23.5	0.4*	2.8*	3.0	SUB-TOTAL 37.1
Nov.	33.4	25.9	0.3*	3.1*	3.2	FLOOD 52.2
Dec.	36.1	28.4	0.2*	2.8*	3.5	TOTAL 89.3
Total			46.6	44.1	49.5	
Jan.	356.3	252.2	6.6	9.1	3.3	DAM: HARLAN COUNTY
Feb.	368.9	254.4	12.2	12.4	10.5	RESERVOIR: HARLAN COUNTY
Mar.	355.3	274.7	0.6	22.5	12.8	
Apr.	349.8	299.4	0.8	30.3	27.7	
May.	342.2	304.2	7.8	15.7	50.3	RESERVOIR CAPACITY 1/
June	351.5	329.2	9.6	33.0	87.0	
July	288.6	267.9	72.9	15.8	23.1	DEAD 0.9
Aug.	252.1	240.0	46.4	22.0	13.8	LIVE CONSER.
Sept.	267.6	209.8	30.8	4.1	4.0	& SEDIMENT
Oct.	260.3	206.5	0.6*	4.6*	0.2	Inactive 143.9
Nov.	254.9	209.5	0.6*	5.1*	2.3	Active 197.8
Dec.	249.3	212.9	1.2*	5.1*	4.7	SUB-TOTAL 342.6
Total			190.1	179.7 a/	239.7 b/	FLOOD 498.0
						TOTAL 840.6

* Computed from reservoir operation data.
a/ Measured inflow b/ Inflow adjusted for upstream depletions.
1/ Revised capacity data effective October 1, 1964

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

Month	TOTAL STORAGE END OF MONTH 1963	TOTAL STORAGE END OF MONTH 1964	TOTAL 1964 OUTFLOW	INFLOW 1964 ACTUAL	INFLOW MOST PROBABLE	DAM AND RESERVOIR INFORMATION	
Jan.	29.0	48.0	0	0.3	0.2	DAM: LOVEWELL	
Feb.	29.4	48.2	0	0.3	0.6	RESERVOIR: LOVEWELL	
Mar.	30.0	47.8	0.6	0.4	0.6		
Apr.	31.7	48.3	0	0.3	0.6		RESERVOIR CAPACITY
May	36.2	43.2	6.0	0.3	4.0		
June	41.7	39.4	3.8	1.7	8.4		
July	37.6	34.3	25.4	22.0	14.1	DEAD	5.1
Aug.	41.1	49.9	13.6	29.8	14.0	LIVE CONSER.	
Sept.	50.0	48.4	9.7	6.9	2.1	Inactive	11.7
Oct.	47.8	47.1	0.1*	0 *	0.7	Active	24.9
Nov.	47.6	46.4	0 *	0.1*	0.4	SUB-TOTAL	41.7
Dec.	47.6	46.3	0 *	0.1*	0.2	FLOOD	50.5
Total			59.2	62.2 a/	45.9 b/	TOTAL	92.2
Jan.	93.7	83.8	0	0.6	0.9	DAM: KIRWIN	
Feb.	95.7	84.8	0	1.0	1.8	RESERVOIR: KIRWIN	
Mar.	96.3	85.7	0	1.3	2.1		
Apr.	95.7	86.6	0	1.1	2.8		RESERVOIR CAPACITY
May	95.6	83.8	1.8	0.5	4.6		
June	92.2	84.3	1.5	2.5	10.3		
July	82.5	73.0	10.8	1.6	6.7	DEAD	6.4
Aug.	84.1	63.0	7.1	0	4.5	LIVE CONSER.	
Sept.	86.0	60.5	0.8	0	2.5	Inactive	3.4
Oct.	84.8	59.1	0 *	0 *	1.6	Active	85.4
Nov.	84.2	58.2	0 *	0.3*	1.2	SUB-TOTAL	95.2
Dec.	83.6	57.9	0 *	0. *	1.0	FLOOD	219.4
Total			22.0	8.9	40.0	TOTAL	314.6
Jan.	66.4	63.0	0	2.0	0.8	DAM: WEBSTER	
Feb.	69.2	65.4	0	2.2	1.7	RESERVOIR: WEBSTER	
Mar.	67.1	67.6	0	1.8	2.1		
Apr.	67.1	66.9	2.8	2.1	2.9		RESERVOIR CAPACITY
May	66.9	63.4	3.7	1.4	6.4		
June	61.9	61.4	2.6	1.7	10.4		
July	60.6	50.5	11.2	3.3	4.6	DEAD	2.2
Aug.	56.3	41.2	7.1	0.4	3.4	LIVE CONSER.	
Sept.	60.3	38.2	1.9	3.2	2.3	Inactive	1.1
Oct.	60.3	37.1	0 *	0 *	1.1	Active	63.8
Nov.	60.6	36.7	0 *	0.2*	1.0	SUB-TOTAL	67.1
Dec.	61.1	36.6	0 *	0 *	0.9	FLOOD	193.6
Total			29.3	18.3	37.6	TOTAL	260.7

* Computed from reservoir operation data.

a/ Inflow from Courtland Canal - 56,900 A.F. Inflow from White Rock Creek - 5,300 A. F.

b/ Forecasted inflow from Upper Courtland Canal - 24,900 A.F. Forecasted inflow from White Rock Creek - 21,000 A. F.

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

Month	TOTAL STORAGE END OF MONTH 1963	TOTAL STORAGE END OF MONTH 1964	TOTAL 1964 OUTFLOW	INFLOW 1964 ACTUAL	INFLOW MOST PROBABLE
Jan.	181.4	178.3	0.1	0.5	0.8
Feb.	182.4	178.6	0	0.8	1.2
Mar.	182.6	178.5	0	0.7	1.3
Apr.	180.0	177.6	0.2	0.5	2.0
May	176.3	174.6	2.9	1.9	4.5
June	175.4	191.7	12.0	19.8	12.0
July	178.6	180.3	8.0	0.6	6.8
Aug.	171.7	171.4	4.9	0.1	4.7
Sept.	183.9	165.5	2.3	0	3.9
Oct.	181.8	162.0	0.8*	0 *	1.5
Nov.	179.8	160.8	0.1*	0 *	1.1
Dec.	178.8	160.2	0.1*	0. *	0.8
Total			31.4 a/	24.9	40.6

DAM AND RESERVOIR INFORMATION	
DAM: CEDAR BLUFF	
RESERVOIR: CEDAR BLUFF	
	RESERVOIR CAPACITY
DEAD	8.3
LIVE CONSER.	
Inactive	27.0
Active	149.8
SUB-TOTAL	185.1
FLOOD	191.9
TOTAL	377.0

* Computed from reservoir operation data.

a/ Cedar Bluff outflow includes releases to Fish Hatchery.

TABLE 4
PRECIPITATION DATA

	BONNY DAM				TRENTON				ENDERS DAM				RED WILLOW DAM				MEDICINE CREEK DAM			
Month	Norm.	1962	1963	1964	Norm.	1962	1963	1964	Norm.	1962	1963	1964	Norm.	1962	1963	1964	Norm.	1962	1963	1964
Jan.	0.35	0.26	0.31	0	0.44	0.11	0.47	0	0.42	0.03	1.47	0	0.50	0.06	0.56	0	0.40	0.02	0.56	0
Feb.	0.41	0.23	0.07	0.19	0.52	0.13	0.11	1.00	0.46	0.19	0.12	0.96	0.59	No	0.13	0.67	0.64	0.50	0.11	0.51
Mar.	0.91	0.66	1.80	0.61	1.21	1.48	1.85	1.09	1.06	1.44	1.50	0.77	1.35	Rec.	1.74	1.26	0.99	2.37	1.46	1.82
Apr.	1.59	0.80	0.06	2.16	1.94	1.11	1.09	2.79	1.94	0.87	0.75	3.73	2.06	0.37	0.77	2.74	2.31	0.14	1.04	3.30
May	2.40	3.26	1.62	3.22	3.20	5.40	1.87	1.80	3.38	4.99	1.52	1.18	3.12	4.90	3.52	0.78	3.22	4.41	1.07	0.63
June	2.57	5.88	2.32	2.86	3.19	8.88	1.03	4.58	3.36	7.42	0.81	3.39	3.17	7.29	2.11	2.40	3.52	5.70	4.06	2.62
July	2.32	2.00	1.84	0.97	2.61	8.53	2.92	4.06	2.19	5.14	2.28	1.37	2.80	4.95	2.60	2.75	2.79	5.48	1.34	3.46
Aug.	2.27	2.07	2.88	0.63	2.50	0.97	2.21	1.87	2.23	2.56	2.87	0.70	2.30	3.25	2.03	1.53	2.61	2.93	4.21	1.99
Sept.	1.28	0.66	4.70	0.82	1.68	0.96	4.40	1.12	1.79	2.06	3.70	0.97	1.70	1.62	4.16	0.90	2.02	1.01	6.68	0.90
Oct.	0.74	0.71	0.15	0.05	0.87	0.98	0.08	0.13	0.80	0.34	0.92	0.36	0.87	1.06	0.28	0.13	1.12	1.05	0.52	0.08
Nov.	0.41	0.40	0.39	0.17	0.68	0.47	0.49	0.18	0.54	0.44	0.27	0.24	0.76	0.20	0.59	0.05	0.84	0.16	0.83	0.02
Dec.	0.39	0.33	0.23	0.05	0.45	0.37	0.17	0.19	0.45	0.59	0.05	0.44	0.53	0.55	0.11	0.10	0.57	0.70	0.08	0.02
Total	15.64	17.26	16.37	11.73	19.29	29.39	16.69	18.81	18.62	26.07	16.26	14.11	19.75	24.19	18.60	13.31	21.03	24.47	21.96	15.35

	HARLAN CO. DAM				LOVEWELL DAM				KIRWIN DAM				WEBSTER DAM				CEDAR BLUFF DAM			
Month	Norm.	1962	1963	1964	Norm.	1962	1963	1964	Norm.	1962	1963	1964	Norm.	1962	1963	1964	Norm.	1962	1963	1964
Jan.	0.41	0.26	0.31	0	0.60	0.85	0.56	0.02	0.47	0.57	0.33	0	0.40	0.59	0.47	0.05	0.48	0.35	0.14	0
Feb.	0.58	0.90	0.02	0.51	0.85	1.67	T	0.39	0.70	1.11	0.02	0.60	0.78	0.99	0.02	0.77	0.62	0.21	T	0.45
Mar.	0.95	1.96	1.77	0.92	1.26	1.07	1.54	1.03	1.18	1.91	1.56	0.87	1.00	1.89	1.51	0.86	1.26	1.41	1.07	0.76
Apr.	2.27	0.32	1.26	0.79	2.21	0.41	3.11	2.21	2.40	0.36	2.00	1.40	2.20	0.30	1.07	1.39	2.11	0.75	0.14	0.58
May	3.21	3.69	1.15	0.82	3.60	3.40	2.22	1.65	2.90	1.92	2.57	1.51	2.90	4.20	1.07	2.05	3.62	2.84	0.79	3.36
June	3.66	4.30	2.72	6.80	4.82	6.87	3.48	3.14	3.75	5.22	2.72	3.83	3.70	5.04	2.55	2.67	3.92	5.22	3.09	6.82
July	2.86	6.84	2.23	1.57	2.81	6.85	4.69	2.54	2.87	5.63	2.65	1.40	2.70	7.24	4.64	1.43	2.33	7.07	6.96	2.24
Aug.	2.48	4.72	3.75	3.26	2.68	3.89	3.55	6.16	2.85	3.64	5.42	1.02	2.75	1.63	2.62	1.00	2.43	4.27	1.13	1.30
Sept.	2.19	1.31	5.46	1.29	2.69	4.31	6.13	3.21	2.27	1.92	4.13	1.12	2.50	1.53	5.07	0.91	2.06	1.57	4.42	1.26
Oct.	1.03	1.14	0.46	0.12	1.45	3.54	1.11	0.23	1.26	3.00	0.80	0.15	1.40	1.40	0.22	0.23	1.16	0.17	0.91	0.25
Nov.	0.77	0.08	0.06	0.43	1.03	0.81	0.25	1.40	0.84	0.15	0.03	0.81	0.99	0.23	0	0.90	0.86	0.34	0	1.62
Dec.	0.49	0.55	0.13	0.02	0.77	0.39	0.23	0.21	0.57	0.35	0.08	0	0.70	0.28	0.40	0	0.55	0.06	0.14	0.17
Total	20.90	26.07	19.32	16.53	24.77	34.06	26.85	22.19	22.06	25.78	22.31	12.71	22.02	25.32	19.24	12.26	21.40	24.26	18.79	18.81

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

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 1r-1500	5/29/47	7/19/50 (Rej)	Blk I 1/1/57-1/1/67
	Amendatory No. 1	7/19/51	2/11/56 (Appr)	II 1/1/60-1/1/70
	Amendatory No. 2	1/4/56		III 1/1/65-1/1/75
	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	1/1/63-1/1/68
	Amendment No. 1	8/12/58		
Bostwick Irrigation District in Nebr.	I 1r-1079	2/21/49		1/1/57-1/1/67
	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 1r-1584	4/20/51	3/9/53	Blk I 1/1/57-1/1/67
	Amendatory No. 2	4/24/57	12/20/57	II 1/1/60-1/1/70
	Amendatory No. 3	4/18/60		III 1/1/61-1/1/71
	Amendatory No. 4	8/9/63		IV 1/1/62-1/1/72
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	Expired 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	1/1/62-1/1/67
Cedar Bluff Irrigation District No. 6	14-06-700-2118	9/3/59	3/17/60	1/1/65-1/1/70
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 1964 Irrigation Season: Service Avail. 1/	Acres 1964 Irrigation Season: Actually Irrig. 2/	Acres 1965 Estimates: Service Available	Acres 1965 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	8,122	9,600	8,300	None	1958-Present 3/
H & RW IRRIGATION DISTRICT						
Culbertson Extension	11,490	11,044	11,490	11,000	1961-62	1963-Present
FRENCHMAN-CAMBRIDGE IRRIGATION DISTRICT						
Red Willow	2,540	2,220	4,150	3,000	1963	1964
Meeker-Driftwood	16,440	13,524	16,440	13,700	1957-59 4/	1960-Present
Bartley	7,000	5,281	7,000	5,000	1954-56	1957-Present
Cambridge	15,600	13,269	15,600	12,900	1951-56	1957-Present
Total	41,580	34,294	43,190	34,600		
BOSTWICK IRRIGATION DISTRICT IN NEBRASKA						
Franklin	11,412	8,901	11,412	9,550	1954-56	1957-Present
Naponee	1,556	1,292	1,556	1,500	1955-56	1957-Present
Franklin Pump	2,079	2,033	2,079	1,950	1953-56	1957-Present
Superior	5,905	4,391	5,905	5,400	1951-56	1957-Present
Courtland	1,835	1,348	1,835	1,600	1952-58 5/	1959-Present
Total	22,787	17,965	22,787	20,000		
KANSAS-BOSTWICK IRRIGATION DISTRICT						
Courtland (above Lovewell Res.)	11,498	7,884	11,863	8,400	1954-58 6/	1959-Present
Courtland (below Lovewell Res.)	24,915	15,008	25,615	15,600	1958	1959-Present
Total	36,413	22,892	37,478	24,000		

Table 6
Sheet 1 of 2

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

Canal System	Acres 1964 Irrigation Season: Service Avail. 1/	Acres 1964 Irrigation Season: Actually Irrig. 2/	Acres 1965 Estimates: Service Available	Acres 1965 Estimates: Expected to Be Irrigated	System Operations Calendar Years: Bureau of Reclamation	System Operations Calendar Years: Irrigation District
		KIRWIN IRRIGATION DISTRICT				
Kirwin	11,500	8,680	11,500	9,000	1957-59	1960-Present
		WEBSTER IRRIGATION DISTRICT				
Osborne	8,500	6,202	8,500	6,800	1960-61	1962-Present
		CEDAR BLUFF IRRIGATION DISTRICT				
Cedar Bluff	6,600	4,017	6,600	5,000	1963-64	1965
TOTAL OF PROJECTS	148,470	113,216	151,145	118,700		

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

5/ 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.

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

TABLE 7
CANAL DIVERSIONS AND ACRES IRRIGATED
KANSAS RIVER PROJECTS
1964

Irrigation District and Canal	State	Diversions - Acre Feet								Acres Irrigated
		April	May	June	July	Aug.	Sept.	Oct.	Nov. Total	
Hale Ditch (Includes 151 A.F. of Warren Act)	Colorado	0	546	777	343	148	479	992	171 3,456	590
Warren Act	Nebraska	0	0	0	0	0	0	0	0	0
FRENCHMAN VALLEY	Nebraska									
Culbertson Canal		2,465	1,094	1,604	6,672	7,030	3,093	0	21,958	8,122
H&RW	Nebraska									
Culbertson Extension Canal		0	1,716	2,980	8,810	10,672	2,371	0	26,549	11,044
FRENCHMAN-CAMBRIDGE	Nebraska									
Meeker-Driftwood Canal		0	2,261	3,239	12,482	11,139	5,133	0	34,254	13,524
Red Willow Canal		0	215	429	2,326	2,080	623	0	5,673	2,220
Bartley Canal		0	563	863	4,901	3,731	1,238	0	11,296	5,281
Cambridge Canal		0	2,275	2,398	14,781	9,489	1,511	0	30,454	13,269
Total		0	5,314	6,929	34,490	26,441	8,505	0	81,679	34,294
NEBRASKA-BOSTWICK	Nebraska									
Franklin Canal		236	3,314	2,327	14,170	7,500	916	0	28,463	8,901
Naponee Canal		0	265	34	2,352	1,061	48	0	3,760	1,292
Franklin Pump Canal		0	325	181	2,129	712	83	0	3,430	2,033
Superior Canal		169	1,936	1,363	7,398	3,642	198	0	14,706	4,391
Courtland Canal		0	158	41	1,434	533	0	0	2,166	1,348
Total		405	5,998	3,946	27,483	13,448	1,245	0	52,525	17,965
KANSAS-BOSTWICK	Kansas									
Courtland above Lovewell		0	1,709	2,682	12,924	5,157	84	0	22,556	7,884
Courtland below Lovewell		0	1,482	3,761	25,398	13,591	1,018	0	45,250	15,008
Total		0	3,191	6,443	38,322	18,748	1,102	0	67,806	22,892
KIRWIN	Kansas									
Kirwin Canal		0	1,752	1,468	10,784	7,160	821	0	21,985	8,680
WEBSTER	Kansas									
Osborne Canal		0	2,406	1,325	8,801	4,986	756	0	18,274	6,202
CEDAR BLUFF	Kansas									
Cedar Bluff Canal		20	2,547	296	3,699	3,889	1,930	440	12,821	4,017
Total for Project Lands		2,890	24,018	24,991	139,061	92,374	19,823	440	303,597	113,216

TABLE 8
IRRIGATION UNDER CANAL SYSTEMS IN KANSAS RIVER PROJECTS

COLORADO			NEBRASKA								
Irrig. Dist.	(Non-Proj)	(Non-Proj)			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
					1965 Estimates						
Acres	590	0	8,300	11,000	13,700	3,000	5,000	12,900	34,600	9,550	1,500
AF-Dry Yr.	5,200	0	23,900	31,700	37,000	7,800	13,000	32,500	90,300	32,100	5,000
AF-Nor.Yr.	3,800	0	16,600	22,000	26,000	5,400	9,000	21,900	62,300	21,300	3,300
AF-Wet Yr.	2,600	0	11,400	13,800	15,300	3,200	5,200	12,900	36,600	10,800	1,700
					1964						
Acres	590 E	0	8,122	11,044	13,524	2,220	5,281	13,269	34,294	8,901	1,292
AF Div.	3,456	0	21,958	26,549	34,254	5,675	11,296	30,454	81,679	28,463	3,760
AF/Ac.	5.86	0	2.70	2.40	2.53	2.56	2.14	2.30	2.38	3.20	2.91
					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

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

NEBRASKA (Cont'd.)					KANSAS						TOTAL
Irrig. Dist.	Nebraska-Bostwick				Kansas-Bostwick			Kirwin	Webster	Cedar Bl.	FOR
	Franklin				Courtland Canal						PROJECT
Canal	Pump	Superior	Courtland	Total	Upper	Lower	Total	Kirwin	Osborne	Cedar Bl.	SYSTEMS
					1965 Estimates						
Acres	1,950	5,400	1,600	20,000	8,400	15,600	24,000	9,000	6,800	5,000	118,700
AF-Dry Yr.	6,600	16,000	4,100	63,800	23,700	44,600	68,300	24,000	23,200	15,500	340,700
AF-Nor.Yr.	4,300	11,600	3,000	43,500	17,100	32,200	49,300	16,200	15,900	11,000	236,800
AF-Wet Yr.	2,200	5,600	1,400	21,700	8,300	15,600	23,900	10,100	9,900	7,000	133,400
					1964						
Acres	2,033	4,391	1,348	17,965	7,884	15,008	22,892	8,680	6,202	4,017	113,216
AF Div.	3,430	14,706	2,166	52,525	22,556	45,250	67,806	21,985	18,274	12,821	303,597
AF/Ac.	1.69	3.35	1.61	2.92	2.86	3.02	2.96	2.53	2.94	3.19	2.68
					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

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

TABLE 9

RESERVOIR OPERATION FORECASE 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	1.3	1.6	3.7	5.3	3.2	1.5	0	1.7
	June	+2.6	-1.5	1.3	1.7	3.7	5.4	3.2	1.5	0	1.7
	July	-0.5	-1.0	3.9	6.9	11.1	18.0	9.7	1.5	0	8.2
	Aug.	-0.7	-0.8	3.9	6.9	11.1	18.0	9.8	1.5	0	8.3
	Sept.	-0.3	-0.7	2.0	4.5	5.5	10.0	4.9	1.5	0	3.4
	Oct.	+1.6	-0.8	0.6	1.3	1.9	3.2	1.7	1.5	0.2	0.4
	Total	+5.6	-6.5	13.0	22.9	37.0	59.9	32.5	9.0	0.2	23.7
Most Probable	May	+4.9	-2.3	0.4	0	1.2	1.2	1.0	1.5	0.3	0.3
	June	+5.1	-3.1	0.4	0	1.4	1.4	1.2	1.5	0.3	0.3
	July	+1.8	-1.9	3.2	4.8	9.0	13.8	7.7	1.5	0	6.2
	Aug.	+1.2	-1.1	3.6	5.0	10.4	15.4	8.8	1.5	0	7.3
	Sept.	+1.8	-1.0	0.9	1.6	2.6	4.2	2.2	1.5	0	0.7
	Oct.	+3.3	-1.2	0.5	0	1.4	1.4	1.0	1.5	0.3	0.3
	Total	+18.1	-10.6	9.0	11.4	26.0	37.4	21.9	9.0	0.9	15.1
Reas. Maximum	May	+5.4	-3.0	0.2	0	0.7	0.7	0.6	1.5	0.3	0.3
	June	+8.7	-3.0	0.2	0	0.8	0.8	0.6	1.5	0.3	0.3
	July	+4.0	-1.8	1.8	1.1	5.3	6.4	4.5	1.5	0	3.0
	Aug.	+3.0	-1.8	2.1	2.4	6.2	8.6	5.2	1.5	0	3.7
	Sept.	+4.3	-1.2	0.6	0	1.5	1.5	1.3	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	-11.6	5.2	3.5	15.3	18.8	12.9	9.0	1.2	7.9

TABLE 11
KANSAS RIVER PROJECTS - BUREAU OF RECLAMATION
RESERVOIR OPERATION ESTIMATES - 1965
(Units in 1,000 Acre-feet)

		BONNY RESERVOIR							SWANSON LAKE							ENDERS RESERVOIR						
							End of Month							End of Month							End of Month	
	Month	Meas. Res. Inflow	Evap.	Required Release	Total Release	Res. Change	Content	Elev. (ft.)	Depleted Res. Inflow	Evap.	Required Release	Total Release	Res. Change	Content	Elev. (ft.)	Adjusted Res. Inflow	Evap.	Required Release	Total Release	Res. Change	Content	Elev. (ft.)
Reasonable Minimum Year	Jan.	2.1	0.2	0.4	0.4	+ 1.5	39.0	3670.8	5.1	0.4	0.1	0.1	+ 4.6	84.0	2744.1	4.9	0.1	0.6	0.6	+ 4.2	32.6	3104.6
	Feb.	2.2	0.2	0.4	0.4	+ 1.6	40.6	3671.6	7.7	0.4	0.1	0.1	+ 7.2	91.2	2745.8	4.3	0.1	0.6	0.6	+ 3.6	36.2	3107.1
	Mar.	2.3	0.4	0.4	6.4	- 4.5	36.1	3669.3	14.8	0.7	0.1	0.1	+14.0	105.2	2748.9	4.5	0.2	0.6	0.6	+ 3.7	39.9	3109.5
	Apr.	2.1	0.7	0.7	6.7	- 5.3	30.8	3666.4	13.3	1.5	0.1	0.1	+11.7	116.9	2751.4	4.1	0.6	2.0	2.0	+ 1.5	41.4	3110.4
	May	2.0	0.8	1.3	7.3	- 6.1	24.7	3662.7	13.5	1.6	5.3	8.8	+ 3.1	120.0	2752.0	4.1	0.6	2.1	2.1	+ 1.4	42.8	3111.3
	June	0.8	1.0	1.3	1.3	- 1.5	23.2	3661.7	7.1	2.2	5.4	5.4	- 0.5	119.5	2751.9	3.9	0.7	3.9	3.9	- 0.7	42.1	3110.9
	July	0.3	1.3	1.3	1.3	- 2.3	20.9	3660.2	3.0	2.9	18.0	18.0	-17.9	101.6	2748.1	3.5	1.0	14.1	14.1	-11.6	30.5	3103.8
	Aug.	0.5	1.0	1.2	1.2	- 1.7	19.2	3658.8	2.3	2.3	18.0	18.0	-18.0	83.6	2744.0	3.6	0.6	14.1	14.1	-11.1	19.4	3093.7
	Sep.	0.1	0.8	1.0	1.0	- 1.7	17.5	3657.5	1.0	1.7	10.0	10.0	-10.7	72.9	2741.3	3.5	0.4	6.4	6.4	- 3.3	16.1	3090.3
	Oct.	1.0	0.7	0.9	0.9	- 0.6	16.9	3657.2	2.1	1.4	3.2	3.2	- 2.5	70.4	2740.7	3.9	0.3	2.0	2.0	+ 1.6	17.7	3092.0
	Nov.	1.6	0.4	0.7	0.7	+ 0.5	17.4	3657.5	4.6	0.8	0.1	0.1	+ 3.7	74.1	2741.6	4.0	0.2	0.6	0.6	+ 3.2	20.9	3095.1
	Dec.	2.0	0.3	0.4	0.4	+ 1.3	18.7	3658.5	4.1	0.3	0.1	0.1	+ 3.7	77.8	2742.6	4.3	0.1	0.6	0.6	+ 3.6	24.5	3098.3
	Totals	17.0	7.8	10.0	28.0	-18.8			78.6	16.2	60.5	64.0	- 1.6			48.6	4.9	47.6	47.6	- 3.9		
Most Probable Year	Jan.	2.2	0.2	0.4	0.4	+ 1.6	39.1	3670.9	7.3	0.2	0.1	0.1	+ 7.0	86.4	2744.6	5.2	0.1	0.6	0.6	+ 4.5	32.9	3104.8
	Feb.	2.2	0.2	0.4	0.4	+ 1.6	40.7	3671.7	9.9	0.4	0.1	0.1	+ 9.4	95.8	2746.8	4.5	0.1	0.6	0.6	+ 3.9	36.8	3107.5
	Mar.	2.9	0.3	0.4	6.4	- 3.8	36.9	3669.8	18.3	0.5	0.1	0.1	+17.7	113.5	2750.6	4.7	0.2	0.6	0.6	+ 3.9	40.7	3110.1
	Apr.	2.5	0.4	0.8	6.8	- 4.7	32.2	3667.2	16.5	1.0	0.1	9.0	+ 6.5	120.0	2752.0	4.5	0.4	0.6	0.6	+ 3.5	44.2	3112.1
	May	3.0	0.5	1.0	7.0	- 4.5	27.7	3664.5	14.2	0.9	1.2	18.3	0	120.0	2752.0	4.4	0.5	0.6	3.6	+ 0.3	44.5	3112.3
	June	3.0	0.7	1.0	6.3	- 4.0	23.7	3662.0	17.3	1.5	1.4	15.8	0	120.0	2752.0	4.5	0.5	2.3	4.0	0	44.5	3112.3
	July	1.7	1.0	0.8	0.8	- 0.1	23.6	3662.0	4.5	2.5	13.8	13.8	-11.8	108.2	2749.5	4.1	0.8	10.4	10.4	- 7.1	37.4	3107.9
	Aug.	1.8	1.0	0.8	0.8	0	23.6	3662.0	5.0	2.1	15.4	15.4	-12.5	95.7	2746.7	3.9	0.8	12.5	12.5	- 9.4	28.0	3101.2
	Sep.	1.5	0.7	1.0	1.0	- 0.2	23.4	3662.0	4.6	1.3	4.2	4.2	+ 0.9	94.8	2746.6	3.9	0.4	1.9	1.9	+ 1.6	29.6	3102.4
	Oct.	1.7	0.7	1.0	1.0	0	23.4	3662.0	3.5	1.6	1.4	1.4	+ 0.5	95.3	2746.7	4.2	0.5	0.6	0.6	+ 3.1	32.7	3104.7
	Nov.	2.0	0.4	0.6	0.6	+ 1.0	24.4	3662.5	5.8	0.8	0.1	0.1	+ 4.9	100.2	2747.8	4.5	0.3	0.6	0.6	+ 3.7	36.4	3107.2
	Dec.	2.2	0.2	0.4	0.4	+ 1.6	26.0	3663.5	5.9	0.4	0.1	0.1	+ 5.4	105.6	2749.0	5.0	0.1	0.6	0.6	+ 4.3	40.7	3110.0
	Totals	26.7	6.3	8.6	31.9	-11.5			117.8	13.2	38.0	78.4	+26.2			53.6	4.7	31.9	36.6	+12.3		
Reasonable Maximum Year	Jan.	2.5	0.1	0.4	0.4	+ 2.0	39.5	3671.1	11.6	0.2	0.1	0.1	+11.3	90.7	2745.9	5.4	0.1	0.6	0.6	+ 4.7	33.1	3105.0
	Feb.	2.6	0.2	0.4	0.6	+ 1.8	41.3	3672.0	14.6	0.2	0.1	0.1	+14.3	105.0	2748.8	5.1	0.1	0.6	0.6	+ 4.4	37.5	3108.0
	Mar.	3.2	0.2	0.4	6.4	- 3.4	37.9	3670.3	23.9	0.2	0.1	8.7	+15.0	120.0	2752.0	5.4	0.1	0.6	0.6	+ 4.7	42.2	3110.9
	Apr.	3.1	0.4	0.7	6.7	- 4.0	33.9	3668.2	23.5	0.2	0.1	23.3	0	120.0	2752.0	5.0	0.1	0.6	2.6	+ 2.3	44.5	3112.3
	May	5.0	0.3	0.9	6.9	- 2.2	31.7	3666.9	28.4	0.3	0.7	28.1	0	120.0	2752.0	5.3	0.2	0.6	5.1	0	44.5	3112.3
	June	5.4	0.4	0.6	6.6	- 1.6	30.1	3665.9	29.8	0.8	0.8	29.0	0	120.0	2752.0	6.0	0.4	0.6	5.6	0	44.5	3112.3
	July	4.2	0.8	0.6	0.6	+ 2.8	32.9	3667.6	20.8	1.7	6.4	19.1	0	120.0	2752.0	4.6	0.6	4.6	4.6	- 0.6	43.9	3112.0
	Aug.	3.6	0.6	0.8	0.8	+ 2.2	35.1	3668.8	13.3	2.1	8.6	11.2	0	120.0	2752.0	4.4	0.6	5.1	5.1	- 1.3	42.6	3111.2
	Sep.	1.9	0.5	0.8	1.0	+ 0.4	35.5	3669.0	9.5	1.0	1.5	8.5	0	120.0	2752.0	4.9	0.3	0.6	2.7	+ 0.9	44.5	3112.3
	Oct.	2.2	0.5	0.7	1.7	0	35.5	3669.0	8.6	1.6	0.8	7.0	0	120.0	2752.0	5.0	0.5	0.6	4.5	0	44.5	3112.3
	Nov.	2.2	0.4	0.7	0.7	+ 1.1	36.6	3669.6	8.5	0.7	0.1	7.8	0	120.0	2752.0	5.0	0.3	0.6	4.7	0	44.5	3112.3
	Dec.	2.3	0.2	0.4	0.4	+ 1.7	38.3	3670.5	9.1	0.3	0.1	8.8	0	120.0	2752.0	5.3	0.1	0.6	5.2	0	44.5	3112.3
	Totals	38.2	4.6	7.4	32.8	+ 0.8			201.6	9.3	19.4	151.7	+40.6			61.4	3.4	15.7	41.9	+16.1		

TABLE 11
KANSAS RIVER PROJECTS - BUREAU OF RECLAMATION
RESERVOIR OPERATION ESTIMATES - 1965
(Units in 1,000 Acre-Feet)

		HUGH BUTLER LAKE							HARRY STRUNK LAKE							NORTON RESERVOIR						
							End of Month							End of Month							End of Month	
	Month	Meas. Res. Inflow	Evap.	Required Release	Total Release	Res. Change	Content	Elev. (ft.)	Meas. Res. Inflow	Evap.	Required Release	Total Release	Res. Change	Content	Elev. (ft.)	Meas. Res. Inflow	Evap.	Required Release	Total Release	Res. Change	Content	Elev. (ft.)
Reasonable Minimum Year	Jan.	1.2	0.1	0.2	0.2	+ 0.9	26.6	2574.1	3.0	0.1	0.3	0.3	+ 2.6	31.0	2362.6	0.3	0	0	0	+ 0.3	0.4	2265.1
	Feb.	1.5	0.1	0.2	0.2	+ 1.2	27.8	2575.0	3.3	0.1	0.3	0.3	+ 2.9	33.9	2364.3	0.5	0	0	0	+ 0.5	0.9	2268.0
	Mar.	1.7	0.2	0.2	0.2	+ 1.3	29.1	2576.0	3.8	0.2	0.3	1.3	+ 3.2	37.1	2366.1	0.6	0	0	0	+ 0.6	1.5	2271.0
	Apr.	1.5	0.5	0.2	0.2	+ 0.8	29.9	2576.6	3.8	0.6	0.3	3.2	0	37.1	2366.1	0.7	0.1	0	0	+ 0.6	2.1	2273.0
	May	1.7	0.5	1.0	1.0	+ 0.2	30.1	2576.7	3.6	0.6	1.7	3.0	0	37.1	2366.1	1.2	0.1	0.2	0.2	+ 0.9	3.0	2275.5
	June	1.5	0.8	1.0	1.0	- 0.3	29.8	2576.5	3.8	0.7	1.7	3.1	0	37.1	2366.1	2.4	0.3	0.3	0.3	+ 1.8	4.8	2279.3
	July	1.0	0.9	2.5	2.5	- 2.4	27.4	2574.7	2.7	1.1	8.2	8.2	- 6.6	30.5	2362.2	1.2	0.4	0.3	0.3	+ 0.5	5.3	2280.2
	Aug.	0.8	0.7	2.5	2.5	- 2.4	25.0	2572.8	2.7	0.9	8.3	8.3	- 6.5	24.0	2357.8	0.8	0.3	0.3	0.3	+ 0.2	5.5	2280.6
	Sep.	0.7	0.6	1.4	1.4	- 1.3	23.7	2571.7	2.1	0.5	3.4	3.4	- 1.8	22.2	2356.4	0.5	0.3	0.3	0.3	- 0.1	5.4	2280.4
	Oct.	0.8	0.5	0.6	0.6	- 0.3	23.4	2571.4	2.6	0.5	0.4	0.4	+ 1.7	23.9	2356.9	0.1	0.2	0.1	0.1	- 0.2	5.2	2280.0
	Nov.	1.1	0.3	0.2	0.2	+ 0.6	24.0	2571.9	3.0	0.3	0.3	0.3	+ 2.4	26.3	2359.4	0.2	0.1	0.1	0.1	0	5.2	2280.0
	Dec.	1.3	0.1	0.2	0.2	+ 1.0	25.0	2572.8	3.0	0.1	0.3	0.3	+ 2.6	28.9	2361.2	0.3	0.1	0.1	0.1	+ 0.1	5.3	2280.2
	Totals	14.8	5.3	10.2	10.2	- 0.7			37.4	5.7	25.5	31.2	+ 0.5			8.8	1.9	1.7	1.7	+ 5.2		
Most Probable Year	Jan.	1.5	0.1	0.2	0.2	+ 1.2	26.9	2574.3	3.6	0.1	0.3	0.3	+ 3.2	31.6	2362.9	0.6	0	0	0	+ 0.6	0.7	2267.2
	Feb.	1.6	0.1	0.2	0.2	+ 1.3	28.2	2575.3	3.8	0.1	0.3	0.3	+ 3.4	35.0	2364.9	0.9	0	0	0	+ 0.9	1.6	2271.3
	Mar.	2.1	0.1	0.2	0.2	+ 1.8	30.0	2576.7	4.3	0.2	0.3	2.0	+ 2.1	37.1	2366.1	0.9	0	0	0	+ 0.9	2.5	2274.2
	Apr.	1.9	0.3	0.2	0.2	+ 1.4	31.4	2577.6	4.5	0.4	0.3	4.1	0	37.1	2366.1	1.0	0.1	0.2	0.2	+ 0.7	3.2	2276.0
	May	2.3	0.3	0.5	0.5	+ 1.5	32.9	2578.7	5.4	0.4	0.3	5.0	0	37.1	2366.1	2.9	0.1	0.2	0.2	+ 2.6	5.8	2281.1
	June	3.1	0.3	0.5	0.5	+ 2.3	35.2	2580.2	6.8	0.5	0.3	6.3	0	37.1	2366.1	6.8	0.2	0.3	0.3	+ 6.3	12.1	2289.0
	July	1.9	0.8	2.1	2.1	- 1.0	34.2	2579.5	5.0	0.7	6.2	6.2	- 1.9	35.2	2365.0	4.0	0.5	0.3	0.3	+ 3.2	15.3	2291.9
	Aug.	1.1	0.6	2.4	2.4	- 1.9	32.3	2578.3	3.4	0.7	7.3	7.3	- 4.6	30.6	2362.3	2.1	0.6	0.3	0.3	+ 1.2	16.5	2292.9
	Sep.	1.0	0.4	0.7	0.7	- 0.1	32.2	2578.2	3.0	0.4	0.7	0.7	+ 1.9	32.5	2363.5	1.0	0.4	0.3	0.3	+ 0.3	16.8	2293.1
	Oct.	1.2	0.4	0.4	0.4	+ 0.4	32.6	2578.4	3.0	0.6	0.3	0.3	+ 2.1	34.6	2364.1	0.5	0.4	0.1	0.1	0	16.8	2293.1
	Nov.	1.4	0.2	0.2	0.2	+ 1.0	33.6	2579.1	3.2	0.3	0.3	1.3	+ 2.5	37.1	2366.1	0.3	0.2	0.1	0.1	0	16.8	2293.1
	Dec.	1.6	0.1	0.2	0.2	+ 1.3	34.9	2580.0	3.5	0.1	0.3	3.4	0	37.1	2366.1	0.5	0.1	0.1	0.1	+ 0.3	17.1	2293.4
	Totals	20.7	3.7	7.8	7.8	+ 9.2			49.5	4.5	16.9	36.3	+ 8.7			21.5	2.6	1.9	1.9	+17.0		
Reasonable Maximum Year	Jan.	1.8	0	0.2	0.2	+ 1.6	27.3	2574.6	4.2	0	0.3	0.3	+ 3.9	32.3	2363.3	0.9	0	0	0	+ 0.9	1.0	2268.9
	Feb.	1.9	0.1	0.2	0.2	+ 1.6	28.9	2575.8	4.3	0.1	0.3	0.3	+ 3.9	36.2	2365.6	1.3	0	0	0	+ 1.3	2.3	2273.6
	Mar.	2.6	0.1	0.2	0.2	+ 2.3	31.2	2577.5	5.7	0.1	0.3	4.7	+ 0.9	37.1	2366.1	1.9	0	0.1	0.1	+ 1.8	4.1	2278.0
	Apr.	2.5	0.2	0.2	0.2	+ 2.1	33.3	2578.9	6.0	0.1	0.3	5.9	0	37.1	2366.1	1.6	0.1	0.2	0.2	+ 1.3	5.4	2280.4
	May	3.0	0.2	0.4	0.4	+ 2.4	35.7	2580.5	8.4	0.1	0.3	8.3	0	37.1	2366.1	9.5	0.1	0.2	0.2	+ 9.2	14.6	2291.3
	June	5.5	0.5	0.4	2.9	+ 2.1	37.8	2581.8	19.1	0.1	0.3	19.0	0	37.1	2366.1	16.5	0.3	0.3	0.3	+15.9	30.5	2301.8
	July	3.1	0.5	1.3	2.6	0	37.8	2581.8	9.4	0.8	3.0	8.6	0	37.1	2366.1	11.2	0.8	0.3	4.2	+ 6.2	36.7	2304.3
	Aug.	1.8	0.5	1.5	1.5	- 0.2	37.6	2581.7	5.4	0.6	3.7	4.8	0	37.1	2366.1	5.6	0.9	0.3	4.7	0	36.7	2304.3
	Sep.	2.2	0.5	0.5	1.5	+ 0.2	37.8	2581.8	6.1	0.3	0.3	5.8	0	37.1	2366.1	3.2	0.6	0.3	2.6	0	36.7	2304.3
	Oct.	1.5	0.5	0.3	1.0	0	37.8	2581.8	4.1	0.5	0.3	3.6	0	37.1	2366.1	1.5	0.5	0.1	1.0	0	36.7	2304.3
	Nov.	1.6	0.2	0.2	1.4	0	37.8	2581.8	3.8	0.1	0.3	3.7	0	37.1	2366.1	0.9	0.2	0.1	0.7	0	36.7	2304.3
	Dec.	1.6	0.1	0.2	1.5	0	37.8	2581.8	3.9	0.1	0.3	3.8	0	37.1	2366.1	0.9	0.1	0.1	0.8	0	36.7	2304.3
	Totals	29.1	3.4	5.6	13.6	+12.1			80.4	2.9	9.7	68.8	+ 8.7			55.0	3.6	2.0	14.8	+36.6		

TABLE 11
KANSAS RIVER PROJECTS - BUREAU OF RECLAMATION
RESERVOIR OPERATION ESTIMATES - 1965
(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	Evap.	Required Release	Total Release	Res. Change	Content	Elev. (ft.)	Meas. Res. * Inflow	Evap.	Required Release	Total Release	Res. Change	Content	Elev. (ft.)	Meas. Res. Inflow	Evap.	Required Release	Total Release	Res. Change	Content	Elev. (ft.)
Reasonable Minimum Year	Jan.	0.6	0.7	0.6	0.6	- 0.7	212.2	1934.5	0.1	0.2	0	0	- 0.1	46.2	1584.1	0.2	0.3	0	0	- 0.1	57.8	1719.7
	Feb.	1.0	0.6	0.6	0.6	- 0.2	212.0	1934.4	0.1	0.2	0	0	- 0.1	46.1	1584.0	0.8	0.3	0	0	+ 0.5	58.3	1719.8
	Mar.	8.4	1.5	0.6	0.6	+ 6.3	218.3	1935.1	0.3	0.4	0	0	- 0.1	46.0	1584.0	1.4	0.5	0	0	+ 0.9	59.2	1720.1
	Apr.	12.9	4.0	0.6	0.6	+ 8.3	226.6	1935.9	0.3	0.9	0	0	- 0.6	45.4	1583.8	1.5	1.4	0	0	+ 0.1	59.3	1720.1
	May	18.7	3.8	7.2	7.2	+ 7.7	234.3	1936.6	2.1	0.9	4.4	4.4	- 3.2	42.2	1582.7	2.4	1.4	2.4	2.4	- 1.4	57.9	1719.7
	June	21.4	5.7	6.5	6.5	+ 9.2	243.5	1937.5	3.3	1.4	4.5	4.5	- 2.6	39.6	1581.9	3.9	2.0	2.4	2.4	- 0.5	57.4	1719.6
	July	11.5	8.3	34.5	34.5	-31.3	212.2	1934.5	9.8	1.8	13.4	13.4	- 5.4	34.2	1579.9	3.1	2.3	7.2	7.2	- 6.4	51.0	1717.8
	Aug.	10.7	6.6	38.5	38.5	-34.4	177.8	1930.8	8.8	1.3	15.6	15.6	- 8.1	26.1	1576.5	1.8	2.0	8.4	8.4	- 8.6	42.4	1715.1
	Sep.	3.1	3.9	16.9	16.9	-17.7	160.1	1928.8	5.1	1.0	6.7	6.7	- 2.6	23.5	1575.3	0.9	1.3	3.6	3.6	- 4.0	38.4	1713.7
	Oct.	0	3.0	0.6	0.6	- 3.6	156.5	1928.4	0.8	0.7	0	0	+ 0.1	23.6	1575.3	0.2	1.0	0	0	- 0.8	37.6	1713.4
	Nov.	0	1.7	0.6	0.6	- 2.3	154.2	1928.1	0.0	0.5	0	0	- 0.5	23.1	1575.1	0.4	0.5	0	0	- 0.1	37.5	1713.4
	Dec.	0.2	0.7	0.6	0.6	- 1.1	153.1	1928.0	0.0	0.2	0	0	- 0.2	22.9	1575.0	0.4	0.3	0	0	+ 0.1	37.6	1713.4
	Totals	88.5	40.5	107.8	107.8	-59.8			30.7	9.5	44.6	44.6	-23.4			17.0	13.3	24.0	24.0	-20.3		
Most Probable Year	Jan.	3.3	0.5	0.6	2.8	+ 9.4	212.9	1934.5	0.2	0.1	0	0	+ 0.1	46.4	1584.1	0.9	0.2	0	0	+ 0.7	58.6	1719.9
	Feb.	10.5	0.5	0.6	0.6	+11.2	222.3	1935.5	0.6	0.1	0	0	+ 0.5	46.9	1584.3	1.8	0.2	0	0	+ 1.6	60.2	1720.6
	Mar.	12.8	1.0	0.6	0.6	+26.0	233.5	1936.6	0.6	0.2	0	0	+ 0.4	47.3	1584.4	2.1	0.3	0	0	+ 1.8	62.0	1720.8
	Apr.	27.7	1.1	0.6	0.6	+45.6	259.5	1939.0	0.6	0.5	0	0	+ 0.1	47.4	1584.4	2.8	0.6	0	0	+ 2.2	64.2	1721.4
	May	50.3	3.2	1.5	1.5	+37.5	305.1	1943.2	4.0	0.4	1.6	3.3	+ 0.3	47.7	1584.5	4.6	1.3	0.8	0.8	+ 2.5	66.7	1722.0
	June	87.0	6.0	1.5	43.5	-13.9	342.6	1946.0	8.4	0.4	1.6	14.0	- 6.0	41.7	1582.6	10.3	1.6	0.8	0.8	+ 7.9	74.6	1723.9
	July	23.1	8.3	28.7	28.7	-23.5	328.7	1944.9	14.1	1.2	12.9	12.9	0	41.7	1582.6	6.7	2.3	6.5	6.5	- 2.1	72.5	1723.4
	Aug.	13.8	5.7	31.6	31.6	- 5.1	305.2	1943.0	14.0	1.1	12.9	12.9	0	41.7	1582.6	4.5	1.9	6.5	6.5	- 3.9	68.6	1722.5
	Sep.	4.0	4.5	4.6	4.6	- 3.8	300.1	1942.6	2.1	0.8	3.2	3.2	- 1.9	39.8	1582.0	2.5	1.5	1.6	1.6	- 0.6	68.0	1722.3
	Oct.	0.2	3.4	0.6	0.6	+ 0.2	296.3	1942.3	0.7	0.5	0	0	+ 0.2	40.0	1582.0	1.6	1.3	0	0	+ 0.3	68.3	1722.4
	Nov.	2.3	1.5	0.6	0.6	+ 3.4	296.5	1942.3	0.4	0.3	0	0	+ 0.1	40.1	1582.1	1.2	0.6	0	0	+ 0.6	68.9	1722.5
	Dec.	4.7	0.7	0.6	0.6	+87.0	299.9	1942.6	0.2	0.1	0	0	+ 0.1	40.2	1582.1	1.0	0.2	0	0	+ 0.8	69.7	1722.7
	Totals	239.7	36.4	72.1	116.3	+87.0			45.9	5.7	32.2	46.3	- 6.1			40.0	12.0	16.2	16.2	+11.8		
Reasonable Maximum Year	Jan.	2.0	0	0.6	2.0	0	212.9	1934.5	0.7	0.1	0	0	+ 0.6	46.9	1584.3	1.8	0.2	0	0	+ 1.6	59.5	1720.2
	Feb.	9.4	0.3	0.6	0.6	+ 8.5	221.4	1935.4	1.3	0.1	0	0.4	+ 0.8	47.7	1584.5	2.6	0.2	0	0	+ 2.4	61.9	1720.8
	Mar.	42.2	0.6	0.6	0.6	+41.0	262.4	1939.2	3.3	0.1	0	3.2	0	47.7	1584.5	2.9	0.2	0	0	+ 2.7	64.6	1721.5
	Apr.	57.4	0.3	0.6	0.6	+56.5	318.9	1944.1	4.6	0.1	0	4.5	0	47.7	1584.5	5.3	0.2	0	0	+ 5.1	69.7	1722.7
	May	95.8	1.9	0.7	70.2	+23.7	342.6	1946.0	9.9	0.1	0.8	9.8	0	47.7	1584.5	15.2	0.6	0.5	0.5	+14.1	83.8	1726.0
	June	165.9	1.7	0.8	164.2	0	342.6	1946.0	22.5	0.3	0.8	28.2	- 6.0	41.7	1582.1	35.2	0.6	0.5	23.2	+11.4	95.2	1728.4
	July	50.2	7.3	5.9	42.9	0	342.6	1946.0	8.6	1.0	6.2	7.6	0	41.7	1582.1	14.8	2.3	4.0	12.5	0	95.2	1728.4
	Aug.	38.0	3.9	5.9	34.1	0	342.6	1946.0	2.6	0.7	6.2	6.2	- 4.3	37.4	1581.0	15.0	1.9	4.1	13.1	0	95.2	1728.4
	Sep.	56.6	4.3	1.4	52.3	0	342.6	1946.0	6.6	0.4	1.6	1.9	+ 4.3	41.7	1582.6	12.5	1.1	1.0	11.4	0	95.2	1728.4
	Oct.	20.9	2.5	0.6	18.4	0	342.6	1946.0	3.3	0.3	0	3.0	0	41.7	1582.6	4.8	0.9	0	3.9	0	95.2	1728.4
	Nov.	26.2	1.1	0.6	25.1	0	342.6	1946.0	1.3	0.2	0	1.1	0	41.7	1582.6	2.8	0.4	0	2.4	0	95.2	1728.4
	Dec.	24.7	0.5	0.6	24.2	0	342.6	1946.0	1.3	0.	0	1.3	0	41.7	1582.6	2.1	0.2	0	1.9	0	95.2	1728.4
	Totals	589.3	24.4	18.9	435.2	+129.7			66.0	3.4	15.6	67.2	- 4.6			115.0	8.8	10.1	68.9	+37.3		

*Includes Inflow from Courtland Canal

TABLE 11
KANSAS RIVER PROJECTS - BUREAU OF RECLAMATION
RESERVOIR OPERATION ESTIMATES - 1965
(Units in 1,000 Acre-feet)

		WEBSTER RESERVOIR							CEDAR BLUFF RESERVOIR						
							End of Month							End of Month	
	Month	Meas. Res. Inflow	Evap.	Required Release	Total Release	Res. Change	Content	Elev. (ft.)	Meas. Res. Inflow	Evap.	Required Release	Total Release	Res. Change	Content	Elev. (ft.)
Reasonable Minimum Year	Jan.	0.3	0.2	0	0	+ 0.1	36.7	1879.1	0.4	0.6	0.5	0.5	- 0.7	159.5	2140.1
	Feb.	0.7	0.2	0	0	+ 0.5	37.2	1879.4	0.6	0.7	0.4	0.4	- 0.5	159.0	2140.0
	Mar.	1.1	0.4	0	0	+ 0.7	37.9	1879.6	0.7	1.2	0.6	0.6	- 1.1	157.9	2139.8
	Apr.	1.5	1.0	0	0	+ 0.5	38.4	1879.8	0.9	2.5	0.4	0.4	- 2.0	155.9	2139.5
	May	1.8	0.9	2.6	2.6	- 1.7	36.7	1879.2	1.8	2.5	2.2	2.2	- 2.9	153.0	2139.0
	June	3.4	1.5	2.5	2.5	- 0.6	36.1	1878.9	2.9	4.0	2.1	2.1	- 3.2	149.8	2138.5
	July	1.4	1.6	8.4	8.4	- 8.6	27.5	1875.0	2.7	4.6	5.1	5.1	- 7.0	142.8	2137.3
	Aug.	1.2	1.3	9.4	9.4	- 9.5	18.0	1870.0	1.8	3.9	5.4	5.4	- 7.5	135.3	2136.0
	Sep.	0.8	0.8	4.9	4.9	- 4.9	13.1	1866.8	0.8	3.0	3.5	3.5	- 5.7	129.6	2135.0
	Oct.	0.2	0.5	0.4	0.4	- 0.7	12.4	1866.3	0.5	2.2	1.5	1.5	- 3.2	126.4	2134.3
	Nov.	0.1	0.2	0	0	- 0.1	12.3	1866.2	0.5	1.1	0.4	0.4	- 1.0	125.4	1234.1
	Dec.	0.3	0.1	0	0	+ 0.2	12.5	1866.4	0.4	0.6	0.4	0.4	- 0.6	124.8	2134.0
	Totals	12.8	8.7	28.2	28.2	-24.1			14.0	26.9	22.5	22.5	-35.4		
Most Probable Year	Jan.	0.8	0.1	0	0	+ 0.7	37.3	1879.4	0.8	0.6	0.5	0.5	- 0.3	159.9	2140.2
	Feb.	1.7	0.2	0	0	+ 1.5	38.8	1880.0	1.2	0.6	0.4	0.4	+ 0.2	160.1	2140.3
	Mar.	2.1	0.3	0	0	+ 1.8	40.6	1880.7	1.3	0.8	0.6	0.6	- 0.1	160.0	2140.2
	Apr.	2.9	0.6	0	0	+ 2.3	42.9	1881.6	2.0	1.8	0.4	0.4	- 0.2	159.8	2140.1
	May	6.4	0.7	0.9	0.9	+ 4.8	47.7	1883.4	4.5	1.7	1.2	1.2	+ 1.6	161.4	2140.4
	June	10.4	1.0	1.0	1.0	+ 8.4	56.1	1886.2	12.0	2.5	1.1	1.1	+ 8.4	169.8	2141.7
	July	4.6	1.7	8.0	8.0	- 5.1	51.0	1884.5	6.8	4.1	4.3	4.3	- 1.6	168.2	2141.5
	Aug.	3.4	1.3	8.1	8.1	- 6.0	45.0	1882.4	4.7	3.0	5.0	5.0	- 3.3	164.9	2141.0
	Sep.	2.3	1.0	2.4	2.4	- 1.1	43.9	1882.0	3.9	2.5	1.7	1.7	- 0.3	164.6	2140.9
	Oct.	1.1	0.7	0.4	0.4	0	43.9	1882.0	1.5	2.1	1.0	1.0	- 1.6	163.0	2140.6
	Nov.	1.0	0.3	0	0	+ 0.7	44.6	1882.3	1.1	1.2	0.4	0.4	- 0.5	162.5	2140.5
	Dec.	0.9	0.2	0	0	+ 0.7	45.3	1882.5	0.8	0.6	0.4	0.4	- 0.2	162.3	2140.5
	Totals	37.6	8.1	20.8	20.8	+ 8.7			40.6	21.5	17.0	17.0	+ 2.1		
Reasonable Maximum Year	Jan.	2.2	0.1	0	0	+ 2.1	38.7	1880.0	2.0	0.5	0.5	0.5	+ 1.0	161.2	2140.4
	Feb.	2.8	0.1	0	0	+ 2.7	41.4	1881.0	2.2	0.4	0.4	0.4	+ 1.4	162.6	2140.6
	Mar.	3.9	0.2	0	0	+ 3.7	45.1	1882.4	3.3	0.6	0.6	0.6	+ 2.1	164.7	2140.9
	Apr.	6.7	0.2	0	0	+ 6.5	51.6	1884.7	6.8	1.2	0.4	0.4	+ 5.2	169.9	2141.7
	May	12.5	0.4	0.3	0.3	+11.8	63.4	1888.5	23.1	1.0	1.0	6.9	+15.2	185.1	2144.0
	June	24.9	0.2	0.5	21.0	+ 3.7	67.1	1889.6	48.5	0.5	0.9	48.0	0	185.1	2144.0
	July	15.3	1.6	4.7	13.7	0	67.1	1889.6	19.5	3.7	2.9	15.8	0	185.1	2144.0
	Aug.	10.5	1.1	5.0	9.4	0	67.1	1889.6	17.6	2.5	3.3	15.1	0	185.1	2144.0
	Sep.	10.6	1.0	1.0	9.6	0	67.1	1889.6	12.0	2.5	1.2	9.5	0	185.1	2144.0
	Oct.	3.9	0.7	0	3.2	0	67.1	1889.6	6.6	1.6	0.8	5.0	0	185.1	2144.0
	Nov.	2.5	0.3	0	2.2	0	67.1	1889.6	2.5	0.8	0.4	1.7	0	185.1	2144.0
	Dec.	2.2	0.2	0	2.0	0	67.1	1889.6	2.1	0.5	0.4	1.6	0	185.1	2144.0
	Totals	98.0	6.1	11.5	61.4	+30.5			146.2	15.8	12.8	105.5	+24.9		

TABLE 10
ESTIMATED DEMANDS ON HARLAN COUNTY RESERVOIR - 1965
(Units in 1,000 Acre-Feet)

	Months	1 Total Demand by Franklin, Naponee & Franklin Pump Canal	2 Total Demand by Superior & Courtland Above Lovewell	3 Avail. Pickup	4 Pickup in Col. 3 used to satisfy Col. 2 1/	5 Total Releases For Demands Above Lovewell	6 Unused Pickup	Lovewell Reservoir Requirements 7 Operation Releases from Harlan County 2/	8 Usable Pickup from Col. 6 3/	9 Total Avail. Supply	10 Lovewell Inflow Req. From Courtland Canal	11 Total Demands on Harlan County for Lovewell	12 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	8.3	7.1	38.5
	Sept.	6.5	6.5	0.8	0.8	12.2	0	1.2	0	1.2	1.2	3.5	16.9
	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	20.9	18.4	103.6
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	12.4	11.2	28.7
	Aug.	11.5	12.6	5.0	5.0	19.1	0	1.2	0	1.2	12.5	11.3	31.6
	Sept.	2.9	3.2	2.7	2.7	3.4	0	1.2	0	1.2	0	0	4.6
	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	24.9	22.5	67.9
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	0	0	1.4
	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	0	0	14.7

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 12
1964 EVAPORATION COMPARISON
(Units in 1,000 Acre-Feet)

Month	BONNY 1964 Evap.	BONNY Reas. Min. 1/	SWANSON 1964 Evap.	SWANSON Reas. Min.	ENDERS 1964 Evap.	ENDERS Reas. Min.	HUGH BUTLER 1964 Evap.	HUGH BUTLER Reas. Min.	HARRY STRUNK 1964 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	0.1	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.	0.9	0.7	1.9	1.6	0.6	0.6	0.5	0.5	0.6	0.6
May	1.2	0.8	2.9	1.7	0.9	0.7	0.8	0.5	1.0	0.6
June	1.4	1.0	3.5	2.1	1.1	0.8	0.9	0.8	1.2	0.7
July	1.8	1.2	3.6	3.0	1.2	1.2	1.1	0.9	1.2	1.2
Aug.	1.6	1.0	3.0	2.4	0.8	0.7	0.9	0.7	0.9	0.9
Sept.	1.1	0.7	2.1	1.7	0.5	0.5	0.6	0.7	0.6	0.4
Oct.	0.8	0.6	1.4	1.5	0.4	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	20.1	17.0	6.1	5.8	5.6	5.4	6.5	5.7

Month	HARLAN COUNTY 1964 Evap.	HARLAN COUNTY Reas. Min.	LOVEWELL 1964 Evap.	LOVEWELL Reas. Min.	KIRWIN 1964 Evap.	KIRWIN Reas. Min.	WEBSTER 1964 Evap.	WEBSTER Reas. Min.	CEDAR BLUFF 1964 Evap.	CEDAR BLUFF Reas. Min.
Jan.	0.4	1.0	0.1	0.1	0.2	0.4	0.1	0.3	0.4	0.7
Feb.	0.4	0.8	0.1	0.1	0.2	0.4	0.2	0.3	0.4	0.7
Mar.	0.7	1.9	0.2	0.3	0.3	0.7	0.3	0.6	0.6	1.3
Apr.	4.2	5.4	1.3	0.8	1.6	1.9	1.4	1.3	2.9	2.7
May	7.7	4.8	1.8	0.7	2.5	2.0	2.2	1.3	4.5	2.7
June	7.8	7.2	1.6	1.3	2.5	2.6	2.2	2.1	4.7	4.4
July	9.4	9.8	2.0	1.8	3.0	3.9	2.4	2.5	6.1	5.1
Aug.	7.7	8.0	1.8	1.3	2.4	2.9	1.9	2.0	5.1	4.2
Sept.	4.6	4.9	1.1	1.0	1.5	2.0	1.2	1.7	3.7	3.4
Oct.	3.6	4.0	1.0	0.5	1.1	1.6	0.9	1.0	2.5	2.5
Nov.	0.9	2.4	0.3	0.4	0.4	0.8	0.2	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	47.8	51.2	11.4	8.5	15.9	19.6	13.1	13.9	32.1	29.7

1/ Based on reasonable minimum inflow conditions.

TABLE 13
OTHER USES OF BUREAU OF RECLAMATION RESERVOIRS IN KANSAS RIVER PROJECTS
During 1964
Annual Totals

Reservoirs	Visitors	Cars in Area	Water Craft	Sport Fish Caught	Season Take Ducks	Season Take Geese
Colorado						
Bonny	27,975	700	1,025	40,000	300	2
Kansas						
Cedar Bluff	230,504	49,976	4,212	92,000	840	26
Webster	221,570	55,392	3,500	205,000	100	30
Kirwin	113,575	37,860	3,270	30,000	120	45
Lovewell	199,903	49,976	4,122	49,200	590	15
Nebraska						
Enders	56,551	14,135	1,276	23,248		22
Swanson	225,000	56,150	3,700	65,668		
Hugh Butler	233,100	56,620	6,715	110,148		
Harry Strunk	89,577	22,394	3,216	62,577		
Total	1,397,755	343,203	30,011	677,841	1,950	140

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

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

Exhibit I

OPERATION HYDROGRAPHS

BONNY RESERVOIR

1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 ACTUAL | 1965 ESTIMATES

INFLOW

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

CFS — 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

170,160 A.F. Top of Flood Control Pool El. 3710

41,340 A.F. Top of Live Conservation Pool El. 3672

1418 A.F. Top of Dead Storage El. 3635.5

THOUSANDS OF ACRE FEET — 160 — 120 — 80 — 40 — 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

OUTFLOW

CFS — 30 — 20 — 10 — 0

1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 ACTUAL | 1965 ESTIMATES

Exhibit 2

OPERATION HYDROGRAPHS

SWANSON LAKE

1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 ACTUAL | 1965 ESTIMATES

INFLOW

FEET

50 – 40 – 30 – 20 – 10 – 0

ASSUMED INFLOW CONDITIONS

Reasonable Max. _ _ _ _ _ _ _ _

Most Probable ————————

Reasonable Min. _ _ _ _ _ _ _ _

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

ACRE FEET

253,950 A.F. Top of Flood Control Pool El. 2773.0

250 – 200 – 150 – 100 – 50 – 0

120,160 A.F. Top of Live Conservation Pool El. 2752.0

4,100 A.F. Top of Dead Pool El. 2710.0

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

OUTFLOW

THOUSANDS OF

50 – 40 – 30 – 20 – 10 – 0

1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 ACTUAL | 1965 ESTIMATES

Exhibit 3

OPERATION HYDROGRAPHS

ENDERS RESERVOIR

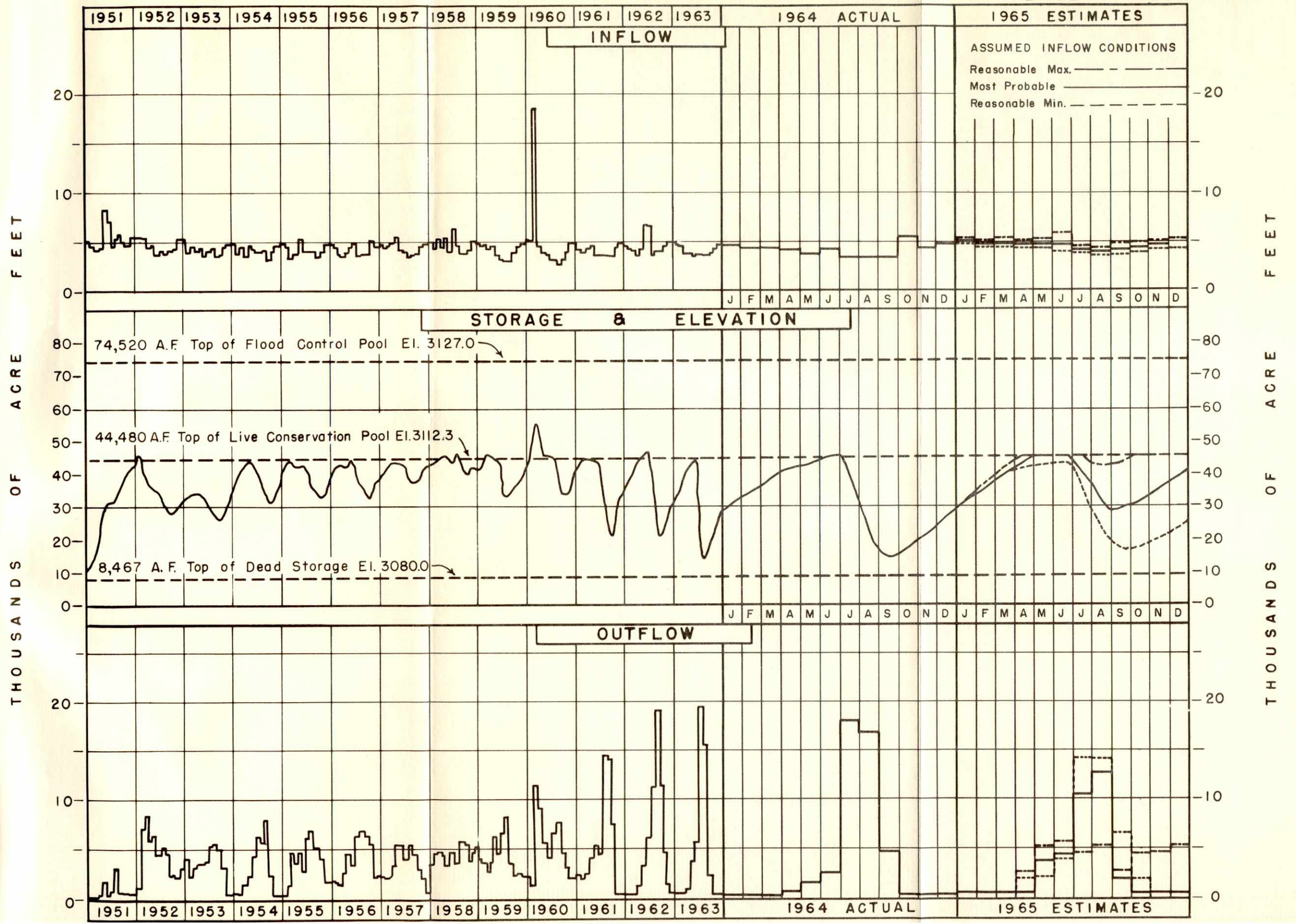


Exhibit 4

OPERATION HYDROGRAPHS

HUGH BUTLER LAKE

1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 ACTUAL | 1965 ESTIMATES

INFLOW

ASSUMED INFLOW CONDITIONS
Reasonable Max. — — — — —
Most Probable ———————
Reasonable Min. - - - - - -

ACRE FEET
8
6
4
2
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

El. 2604.9 Top of Flood Control 86,630. A.F.
El. 25,818 Top of Live Conservation Pool 37,780 A.F.
El. 25,520 Top of Dead Storage 6,310 A.F.

THOUSANDS OF ACRE FEET
80
60
40
20
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

OUTFLOW

ACRE FEET
8
6
4
2
0

1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 ACTUAL | 1965 ESTIMATES

Exhibit 5

OPERATION HYDROGRAPHS

HARRY STRUNK LAKE

1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 ACTUAL | 1965 ESTIMATES

INFLOW

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

THOUSANDS OF ACRE FEET

0 — 10 — 20 — 30

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 Live Conservation Pool El. 2366.1

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

El. 2386.2
89,313 A.F. *

NOTE: New area capacity data put in use Oct. 1, 1964

El. 2366.1
37,141 A.F. *

El. 2335.0
4,911 A.F. *

THOUSANDS OF ACRE FEET

0 — 20 — 40 — 60 — 80 — 100

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

0 — 10 — 20

1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 ACTUAL | 1965 ESTIMATES

OPERATION HYDROGRAPHS

NORTON RESERVOIR

1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 ACTUAL | 1965 ESTIMATES

INFLOW

ASSUMED INFLOW CONDITIONS

Reasonable Max. _ _ _ _ _ _

Most Probable _____

Reasonable Min. _ _ _ _ _ _

CUBIC FEET PER SECOND — THOUSANDS OF ACRE FEET

60 — 40 — 20 — 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

136,700 A.F. Top of Flood Control Pool El. 2331.4

36,700 A.F Top of Live Conservation Pool El. 2304.3

3,000 A.F. Top of Dead Storage El. 2275.0

140 — 120 — 100 — 80 — 60 — 40 — 20 — 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

OUTFLOW

CUBIC FEET PER SECOND — THOUSANDS OF ACRE FEET

60 — 40 — 20 — 0

1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 ACTUAL | 1965 ESTIMATES

Note: Storage begin Oct. 6, 1964 (87 A.F. on Dec. 31, 1964)

OPERATION HYDROGRAPHS

HARLAN COUNTY RESERVOIR

1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 ACTUAL | 1965 ESTIMATES

INFLOW

FEET

200 – 150 – 100 – 50 – 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

ASSUMED INFLOW CONDITIONS

Reasonable Max. _ _ _ _ _ _ _ _

Most Probable _____

Reasonable Min. _ _ _ _ _ _ _ _

200 – 150 – 100 – 50 – 0

FEET

STORAGE & ELEVATION

ACRE

850,000 A.F. Top Flood Control Pool El. 1973.5

800 – 600 – 400 – 200 – 0

Top of Live Conservation Pool El. 1946.0

350,120 A.F.

1300 A.F. Top of Dead Storage El. 1885.0

THOUSANDS OF

El. 1973.5

840,561 A.F. *

NOTE: New area capacity data placed in use on Oct. 1, 1964

800 – 600 – 400 – 200 – 0

ACRE

El. 1946.0

342,560 A.F. *

El. 1885.0

929 A.F. *

THOUSANDS OF

OUTFLOW

200 – 150 – 100 – 50 – 0

200 – 150 – 100 – 50 – 0

1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 ACTUAL | 1965 ESTIMATES

* New area capacity data placed in use on Oct 1 1964, based on re-survey of 1962

Exhibit 8

OPERATION HYDROGRAPHS

LOVEWELL RESERVOIR

1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 ACTUAL | 1965 ESTIMATES

INFLOW

ASSUMED INFLOW CONDITIONS
Reasonable Max.
Most Probable
Reasonable Min.

ACRE FEET — 37, 20, 15, 10, 5

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

Top of Flood Control Pool El. 1595.3 92,150 A. F.

Top of Live Conservation Pool El. 1582.6 41,690 A. F.

Top of Dead Storage El. 1561.0 4,359 A. F.

THOUSANDS OF ACRE FEET — 100, 80, 60, 40, 20, 0

OUTFLOW

THOUSANDS OF ACRE FEET — 20, 15, 10, 5

1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 ACTUAL | 1965 ESTIMATES

Exhibit 9

OPERATION HYDROGRAPHS

KIRWIN RESERVOIR

INFLOW

1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 ACTUAL | 1965 ESTIMATES

Inflow June 1957
73.8 Thousands A.F.

70

ASSUMED INFLOW CONDITIONS
Reasonable Max
Most Probable
Reasonable Min

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

50 40 30 20 10 0 — THOUSANDS OF ACRE FEET

50 40 30 20 10 0

STORAGE & ELEVATION

314,550 A.F. Top of Flood Control Pool
El. 1757.3

95,180 A.F. Top of Live Conservation Pool El. 1728.4

6,385 A.F. Top of Dead Storage El. 1693.0

300 250 200 150 100 50 0 — THOUSANDS OF ACRE FEET

300 250 200 150 100 50 0

OUTFLOW

1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 ACTUAL | 1965 ESTIMATES

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

50 40 30 20 10 0 — THOUSANDS OF ACRE FEET

50 40 30 20 10 0

Exhibit 10

OPERATION HYDROGRAPHS

WEBSTER RESERVOIR

1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 ACTUAL | 1965 ESTIMATES

INFLOW

Infow June 1957
58.7 Thousands A.F.

ASSUMED INFLOW CONDITIONS
Reasonable Max.
Most Probable
Reasonable Min.

ACRE FEET

50 40 30 20 10 0

60 50 40

50 40

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

260,740 A.F. Top of Flood Control Pool El. 1923.7

67,100 A.F. Top of Live Conservation Pool El. 1889.6

2184 A.F. Top of Dead Storage El. 18,55.5

THOUSANDS OF ACRE FEET

250 200 150 100 50 0

250 200 150 100 50 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

OUTFLOW

50 40 30 20 10 0

50 40 30 20 10 0

1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 ACTUAL | 1965 ESTIMATES

Exhibit II

OPERATION HYDROGRAPHS

CEDAR BLUFF RESERVOIR

1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 ACTUAL | 1965 ESTIMATES

INFLOW

300
Inflow June 1951
257.7 Thousands A.F.

100
Inflow June 1957
79.4 Thousands A.F.

ASSUMED INFLOW CONDITIONS
Reasonable Max.
Most Probable
Reasonable Min.

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

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

185,090 A.F. Top of Live Conservation Pool El. 2144.0

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

OUTFLOW

100 Outflow July 1951
80.6 Thousands A.F.

100
Outflow July 1957
93.7 Thousands A.F.

1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 ACTUAL | 1965 ESTIMATES

THOUSANDS OF ACRE FEET

CANAL DIVERSIONS AND ACRES IRRIGATED
Kansas River Projects

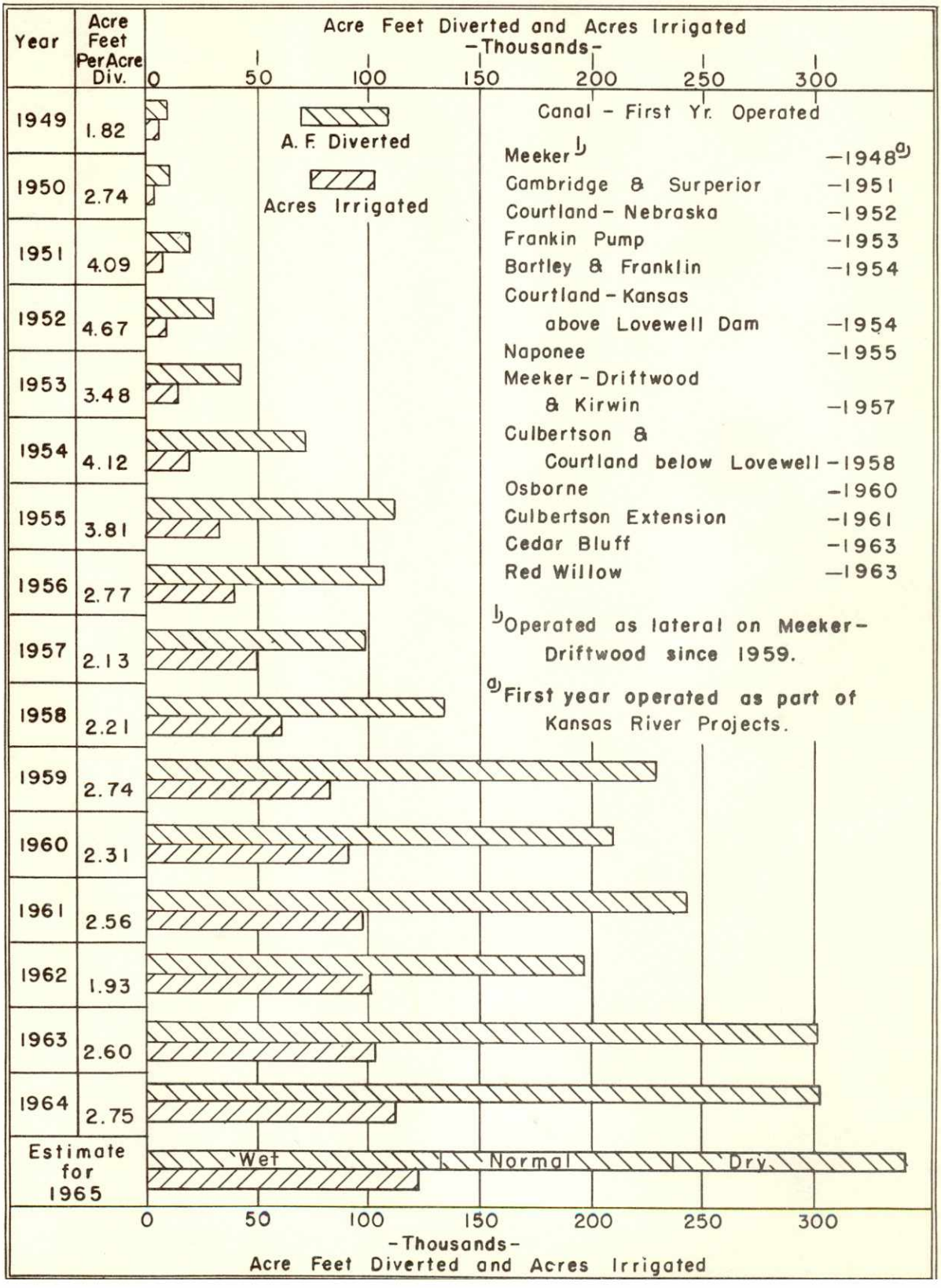


Exhibit 13

CANAL DIVERSIONS AND ACRES IRRIGATED

Frenchman Valley Irrigation District

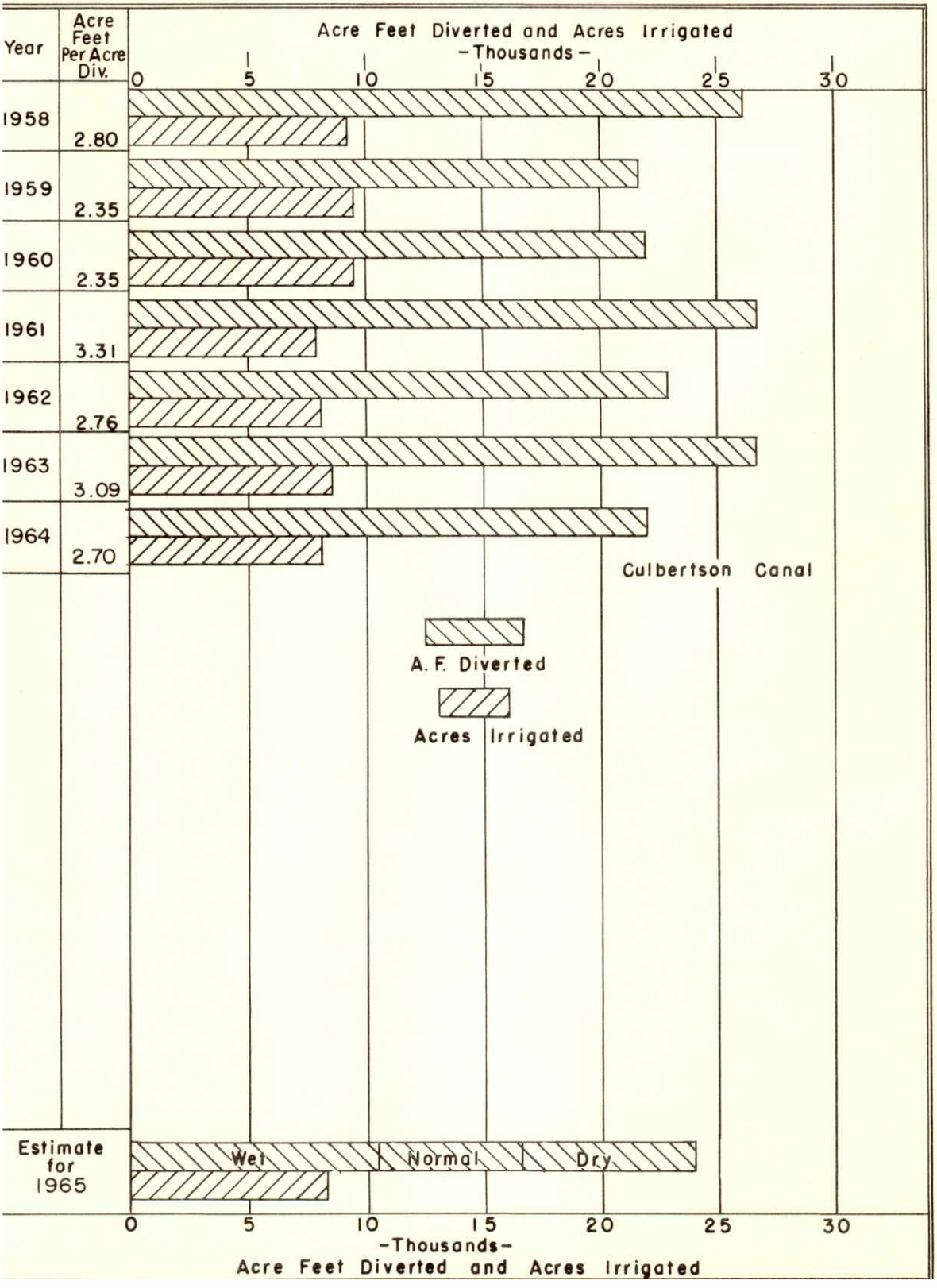
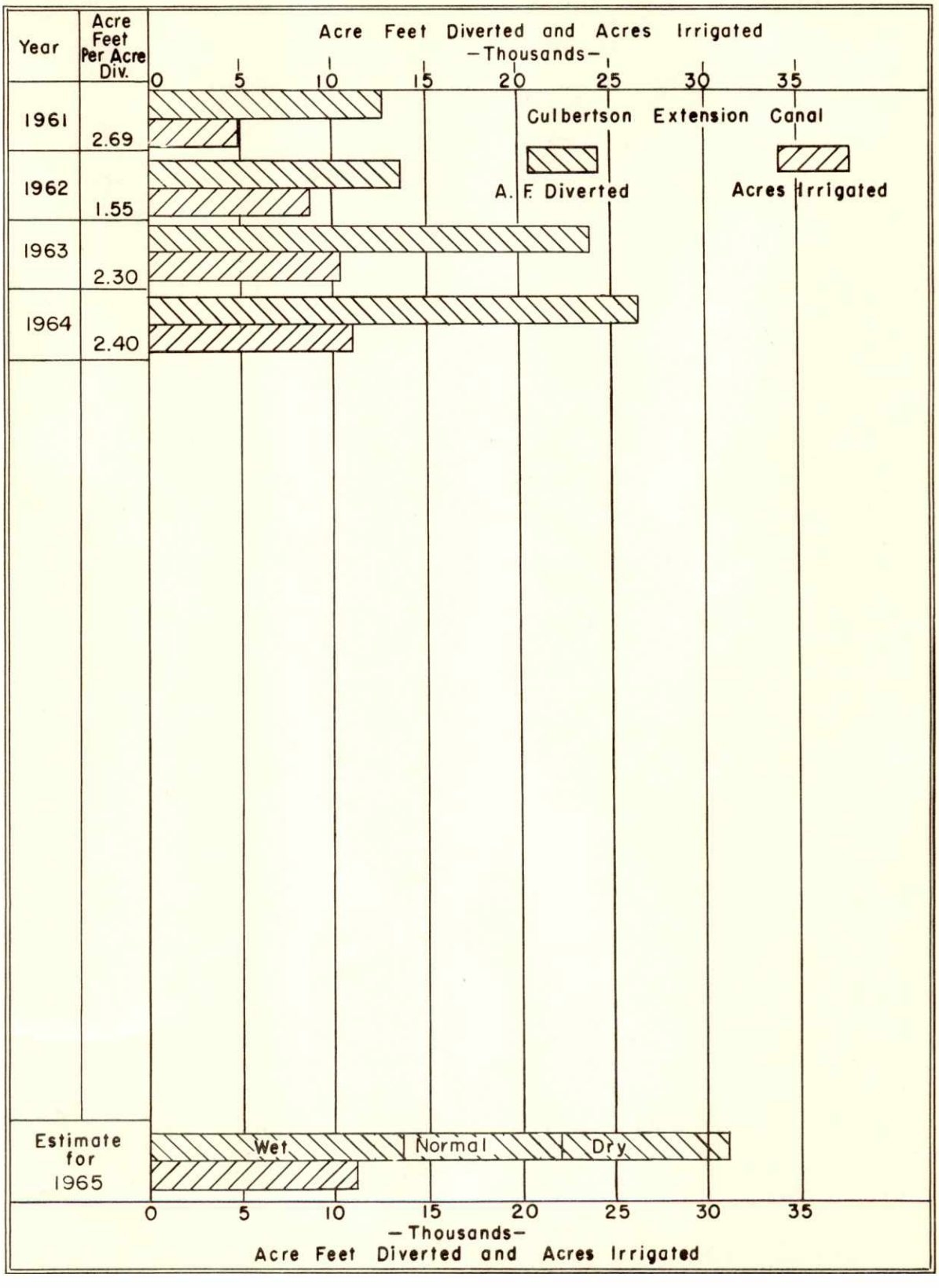


Exhibit 14

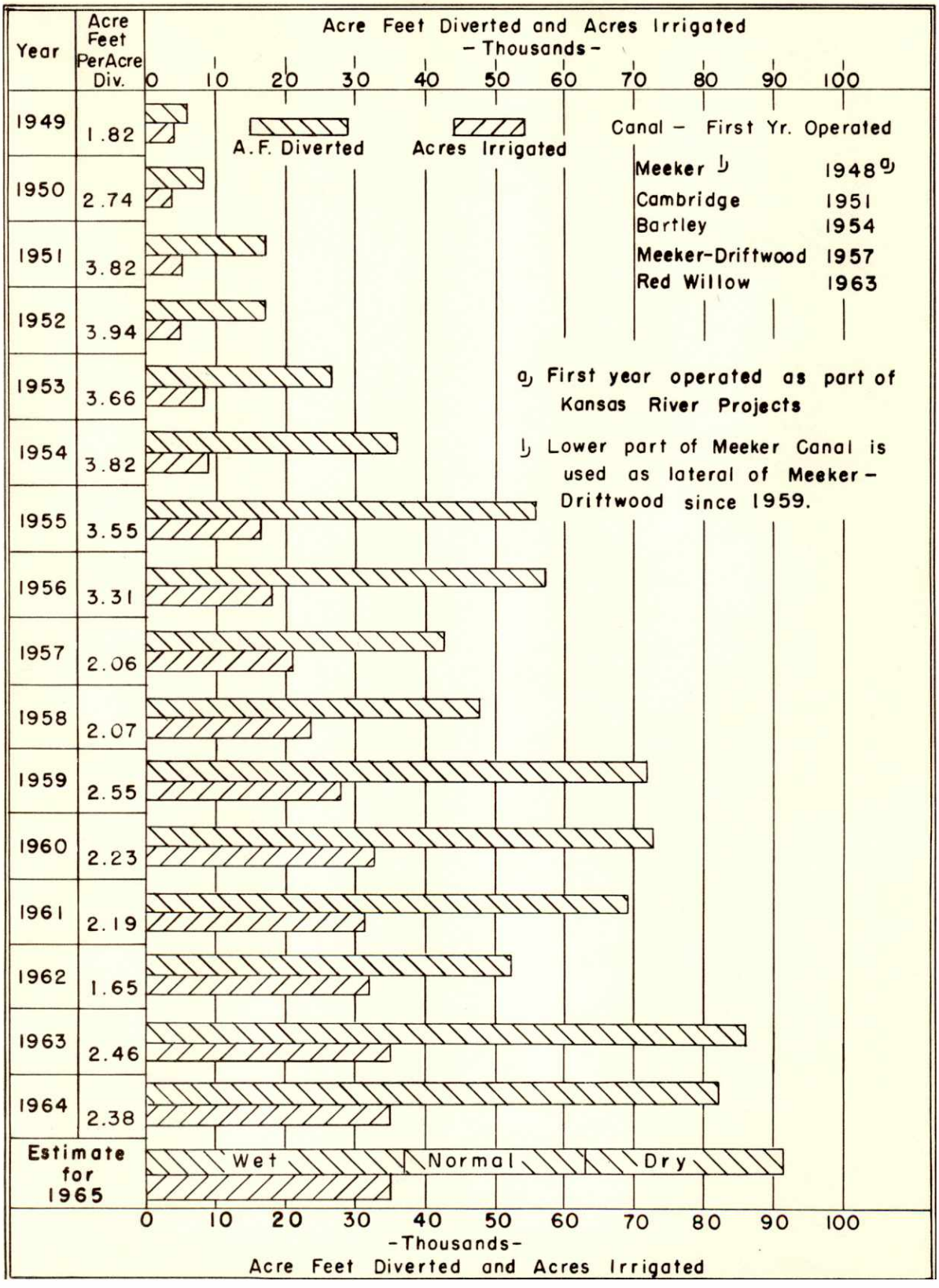
CANAL DIVERSIONS AND ACRES IRRIGATED

H. and R.W. Irrigation District



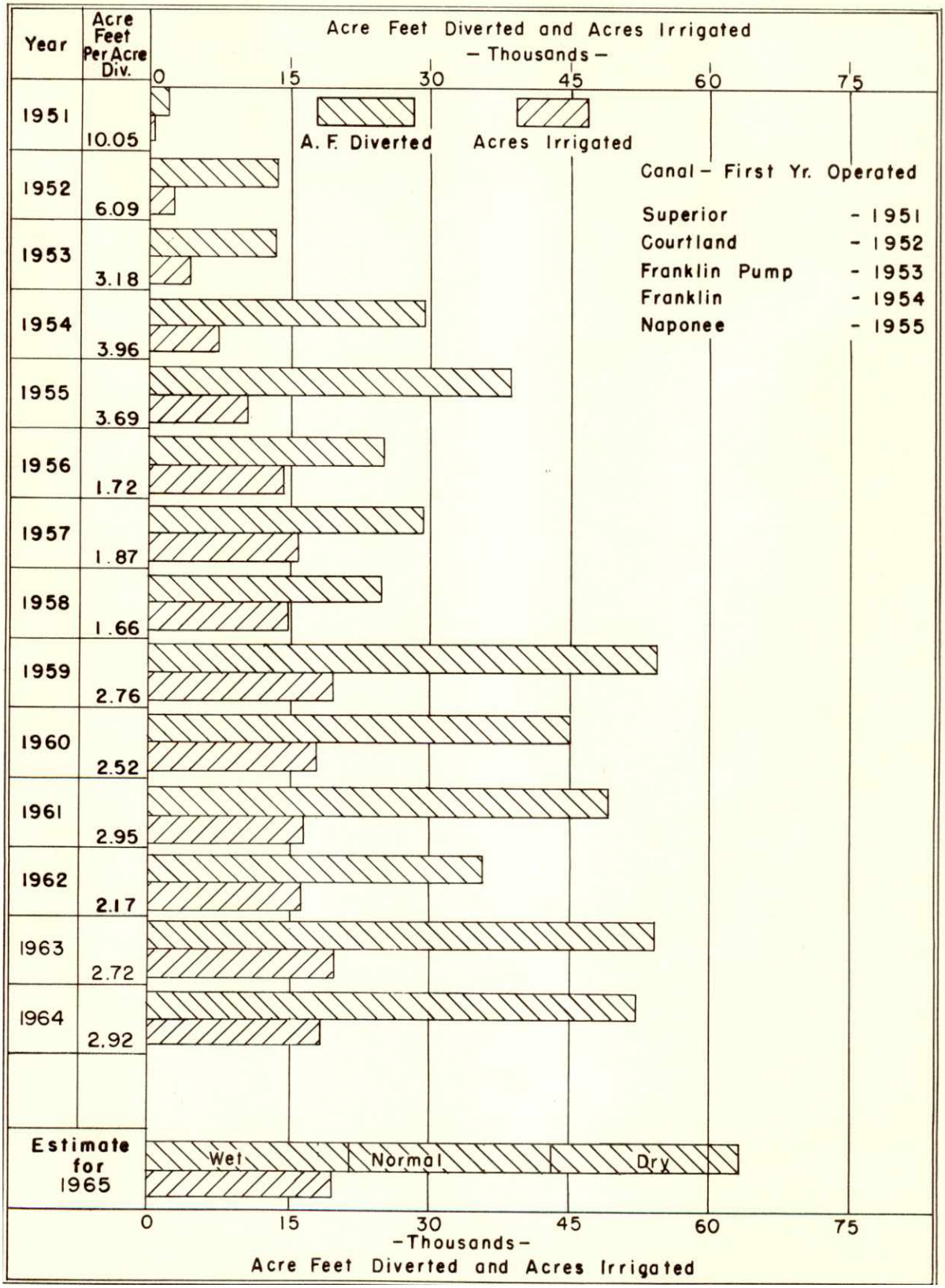
CANAL DIVERSIONS AND ACRES IRRIGATED

Frenchman-Cambridge Irrigation District



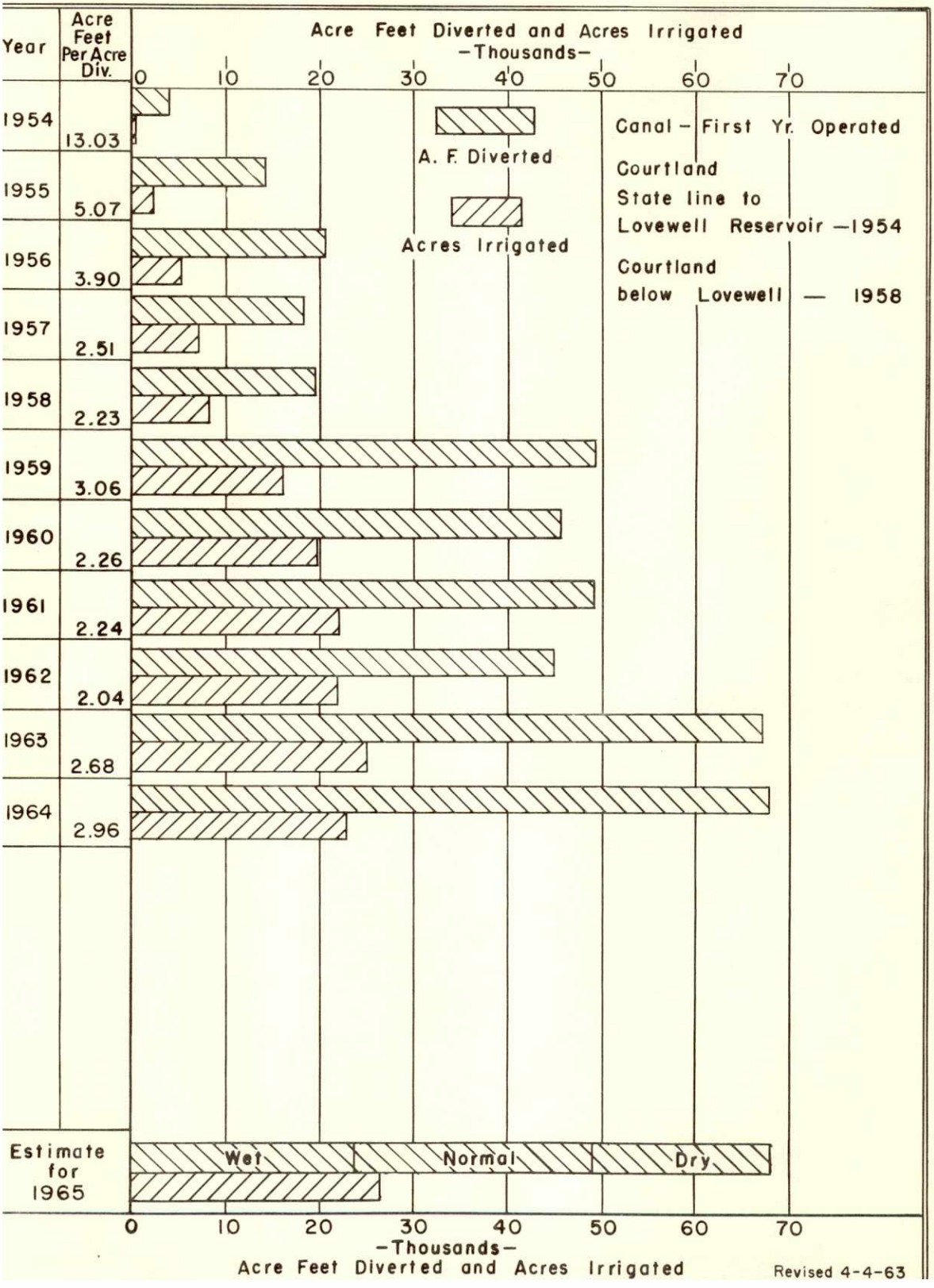
CANAL DIVERSIONS AND ACRES IRRIGATED

Bostwick Irrigation District in Nebraska



CANAL DIVERSIONS AND ACRES IRRIGATED

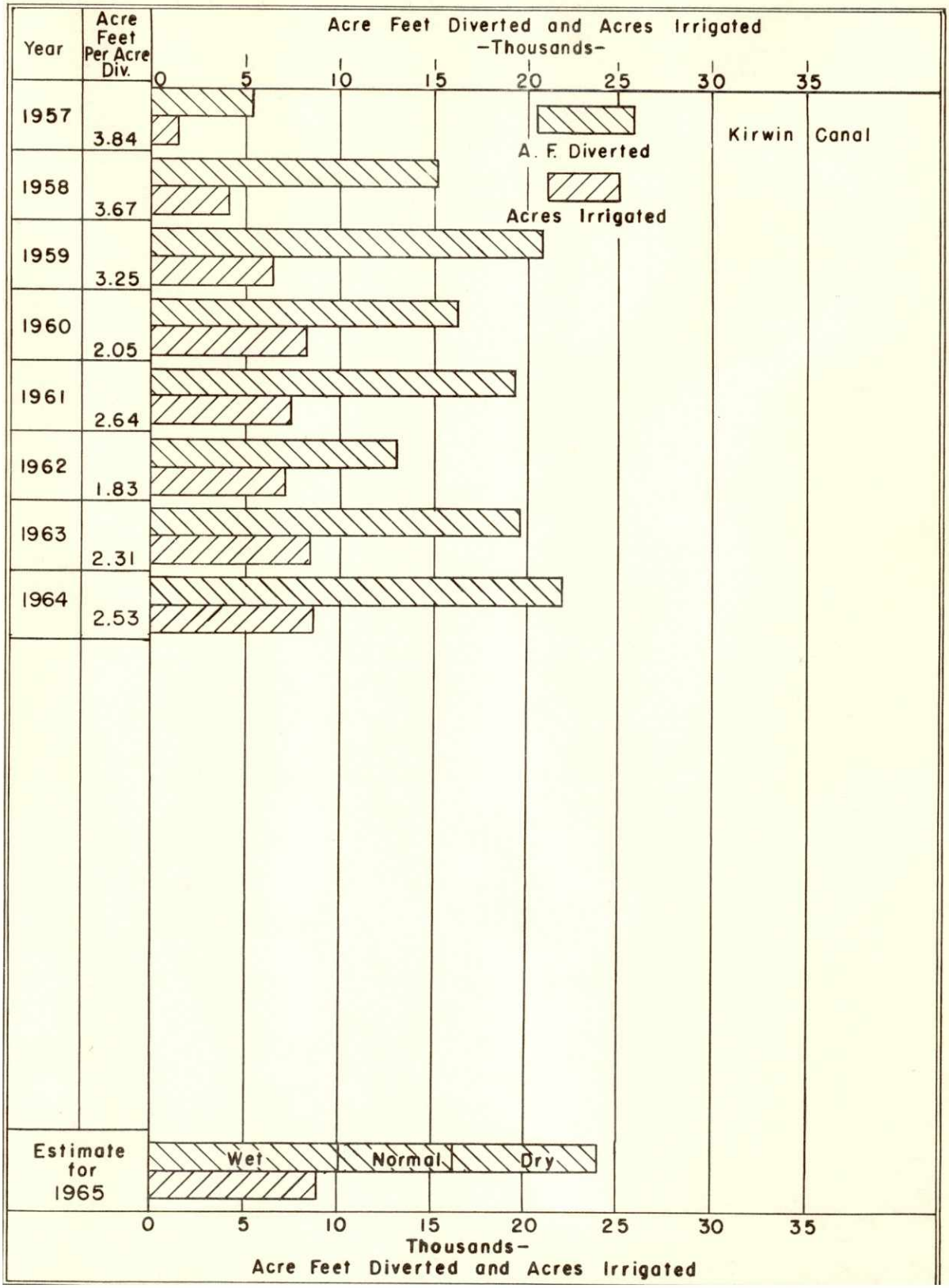
Kansas-Bostwick Irrigation District



Revised 4-4-63

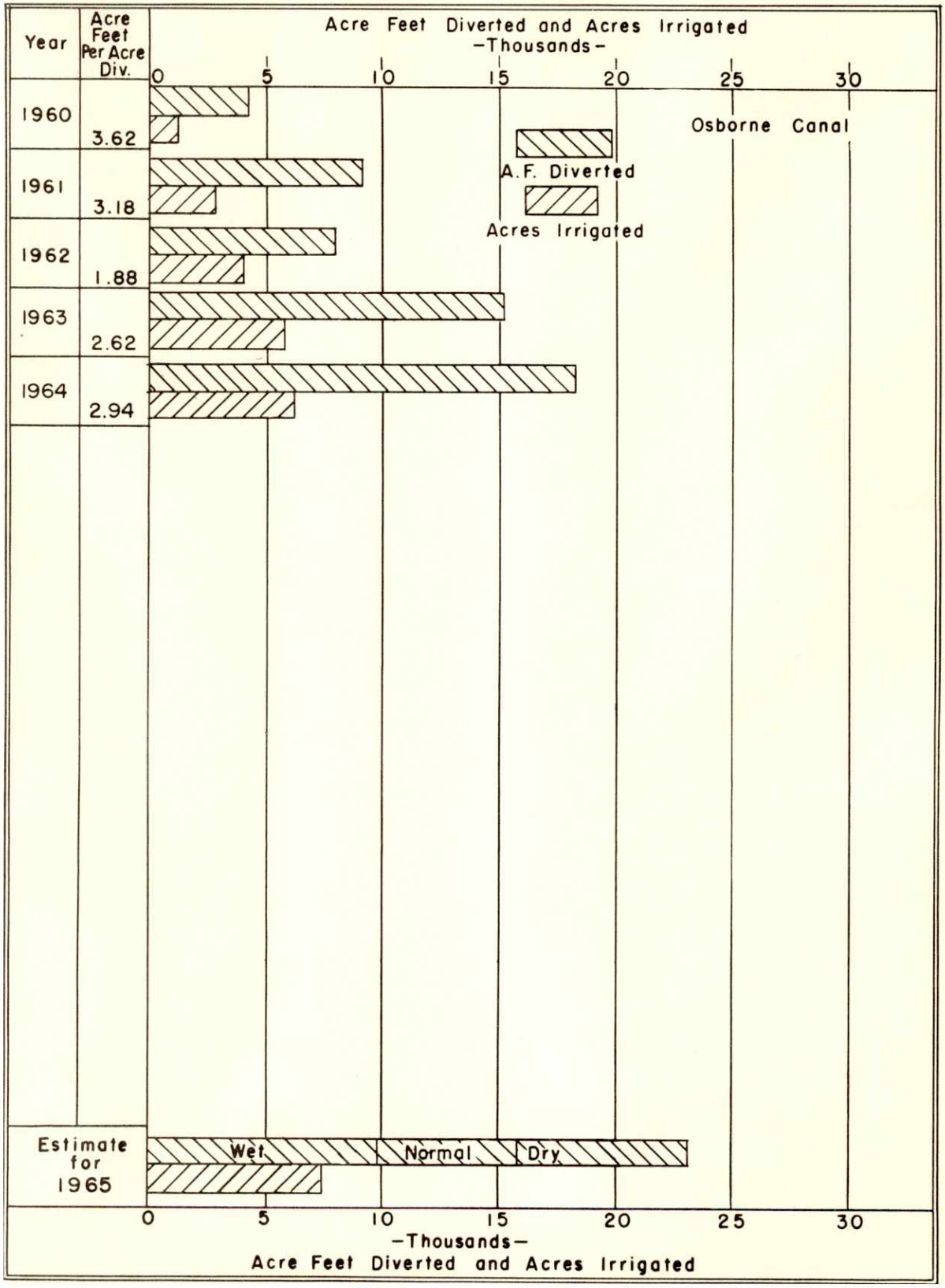
CANAL DIVERSIONS AND ACRES IRRIGATED

Kirwin Irrigation District



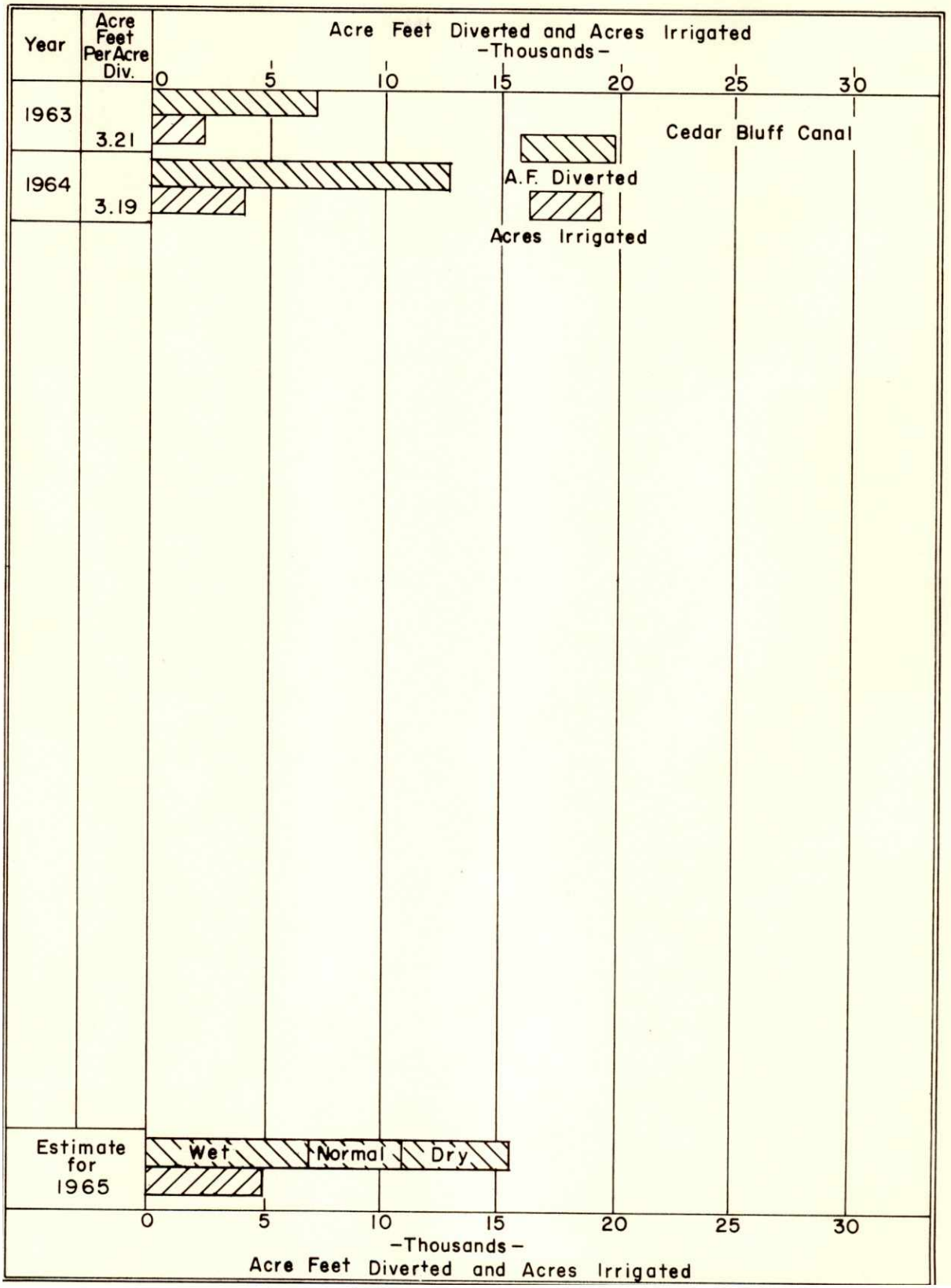
CANAL DIVERSIONS AND ACRES IRRIGATED

Webster Irrigation District



CANAL DIVERSIONS AND ACRES IRRIGATED

Cedar Bluff Irrigation District



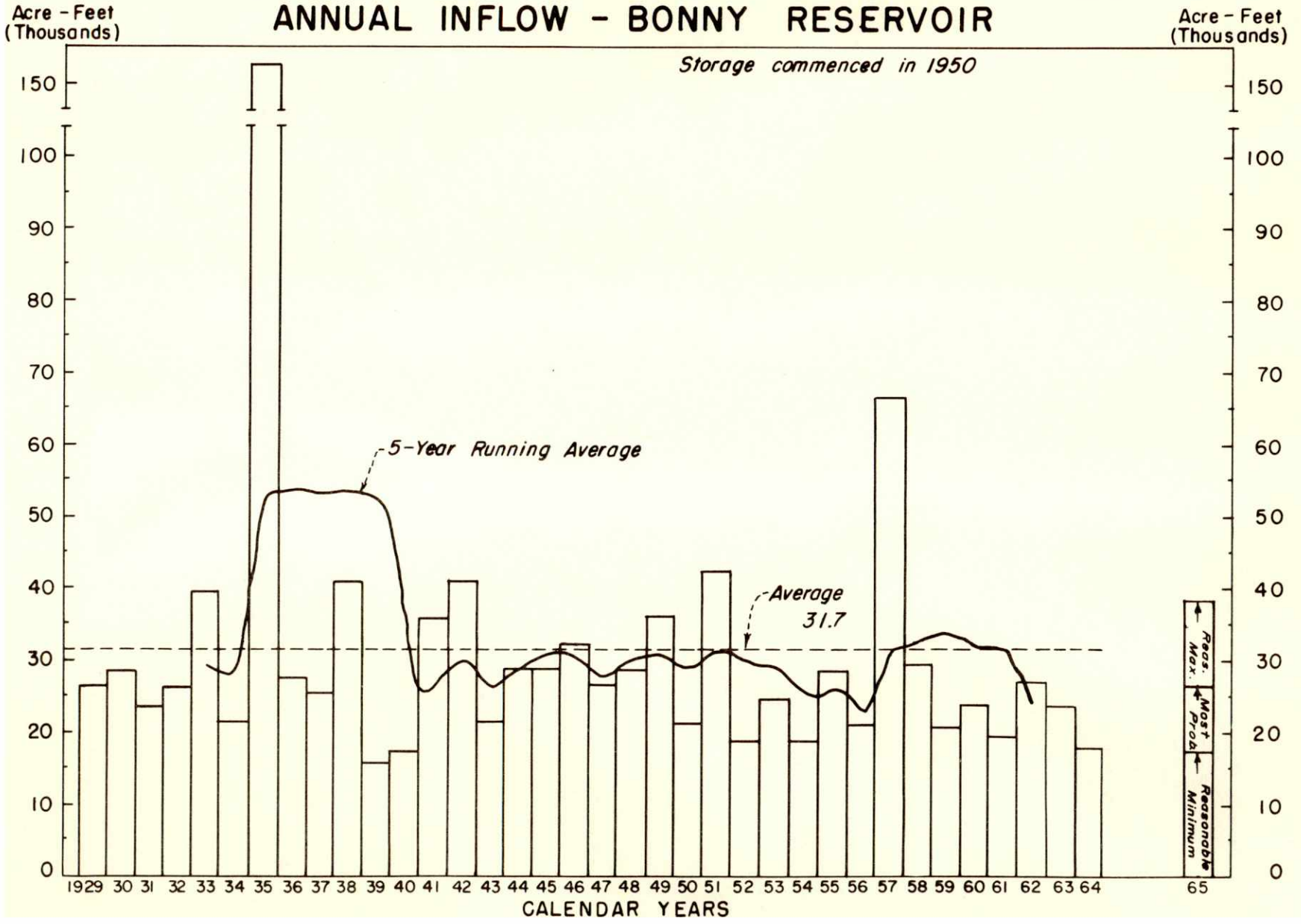
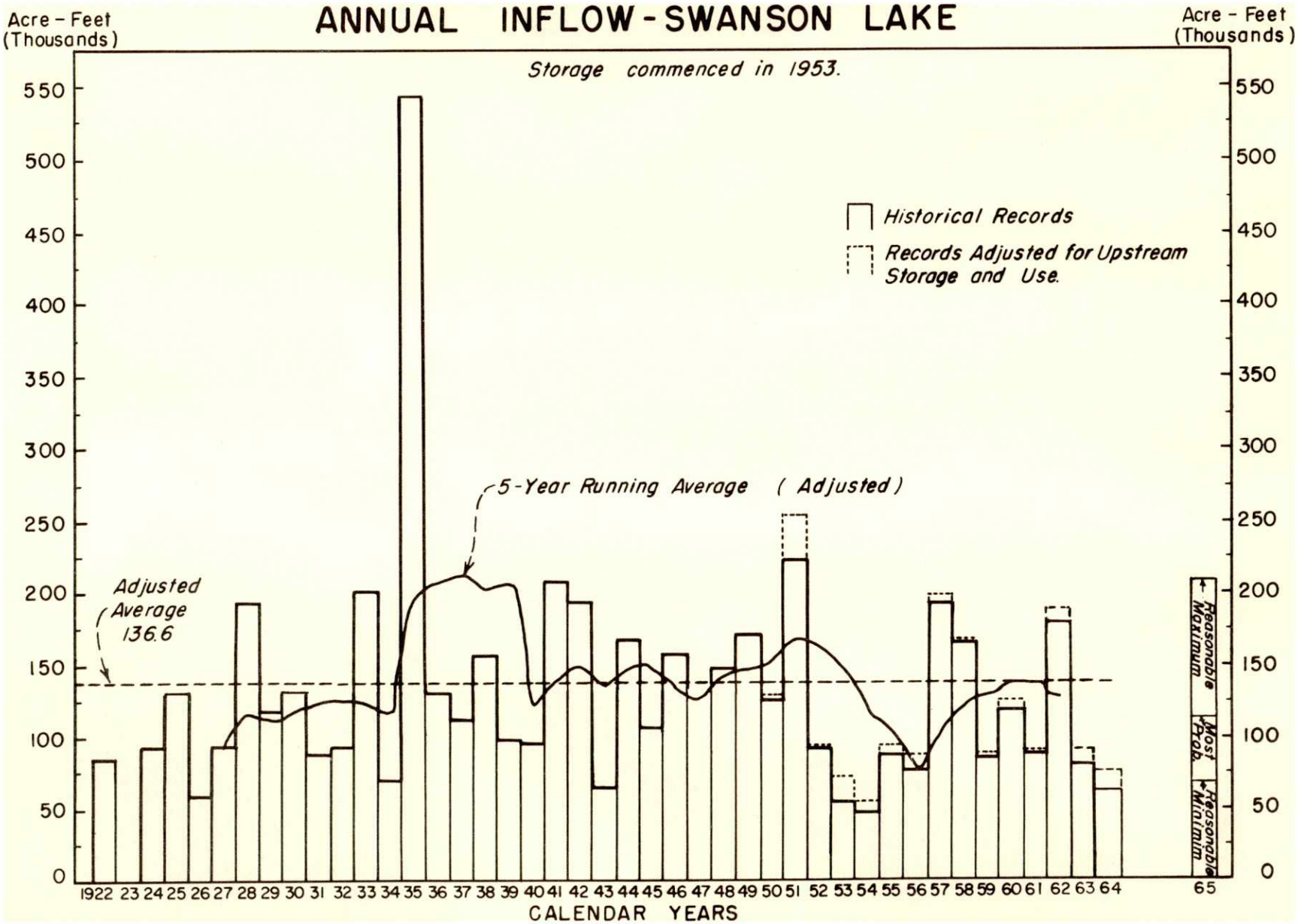
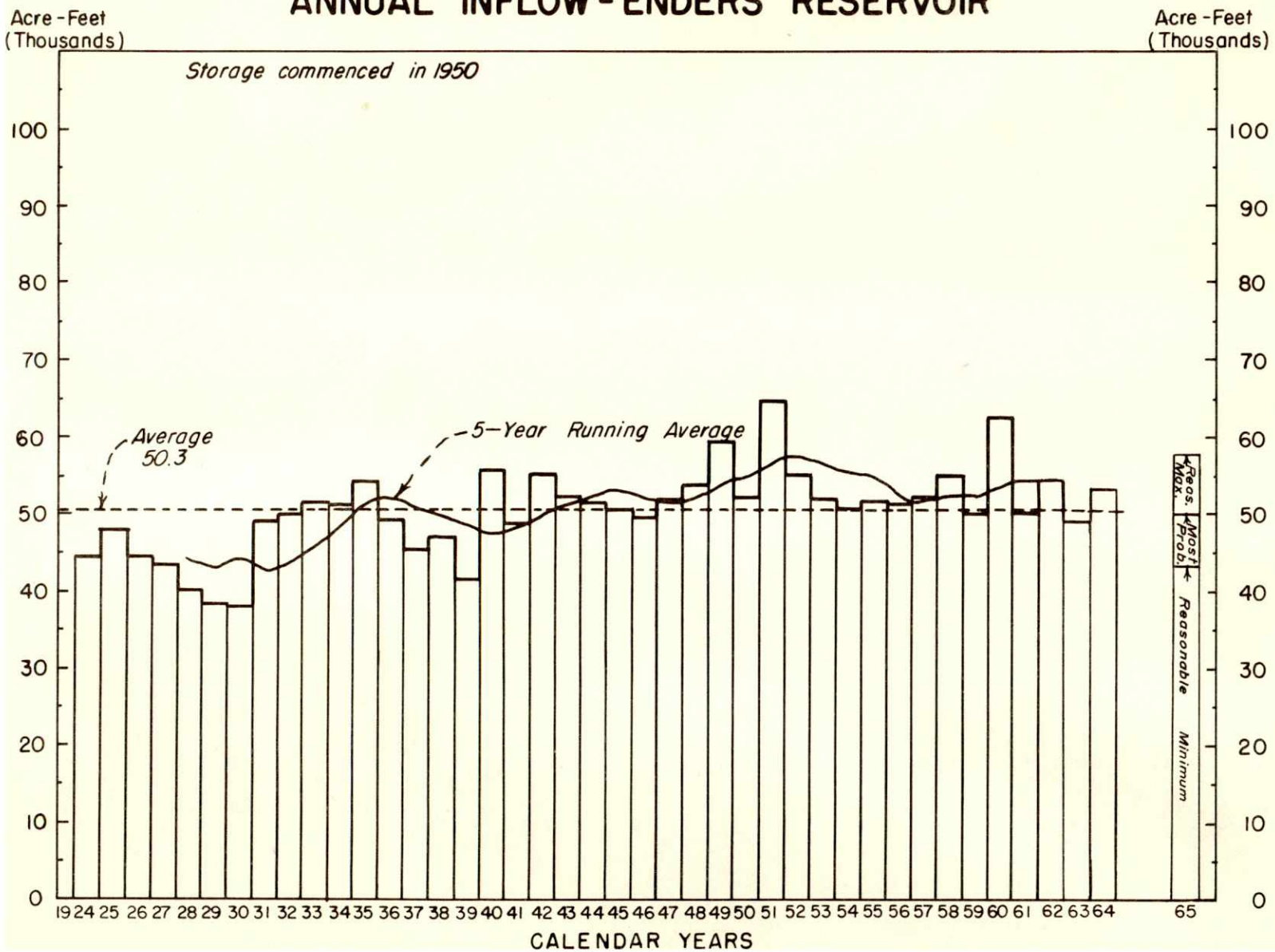

ANNUAL INFLOW - BONNY RESERVOIR
Acre - Feet (Thousands)
Acre - Feet (Thousands)
Storage commenced in 1950
5-Year Running Average
Average 31.7
Reas. Max.
Most Prob.
Reasonable Minimum
150
100
90
80
70
60
50
40
30
20
10
0
1929 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65
CALENDAR YEARS

Exhibit 21


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 65
CALENDAR YEARS

ANNUAL INFLOW - ENDERS RESERVOIR



ANNUAL INFLOW – HUGH BUTLER LAKE

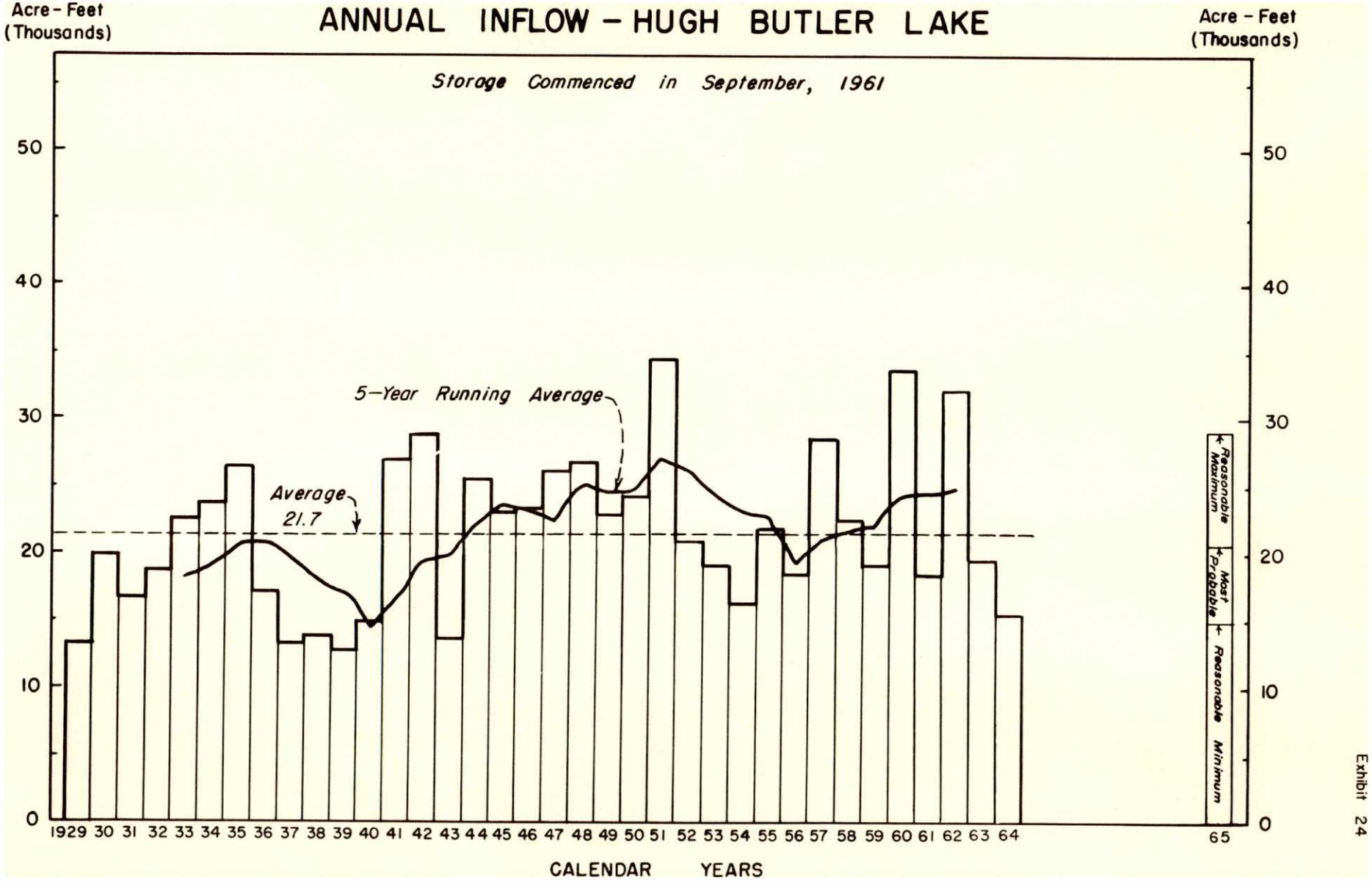
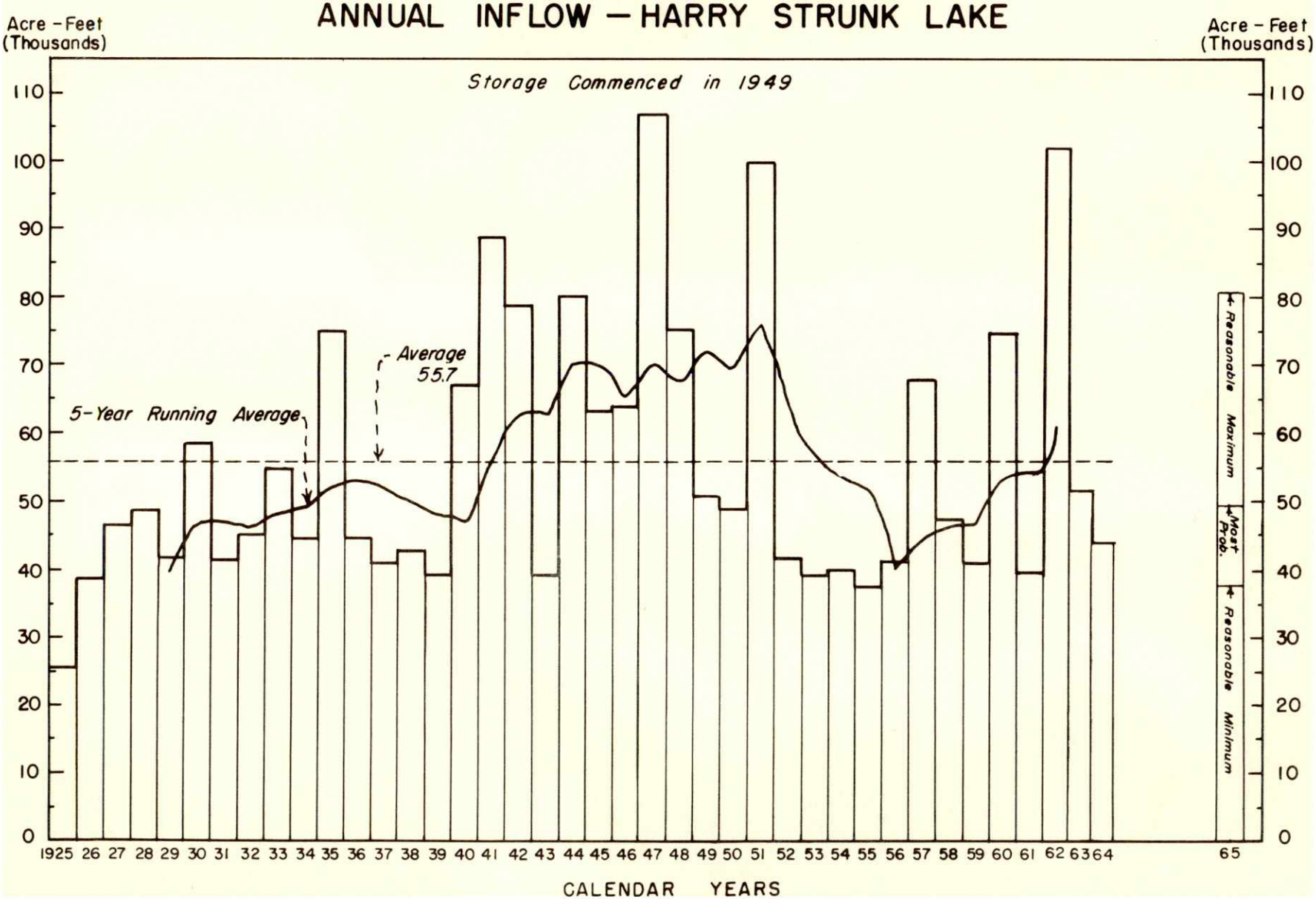
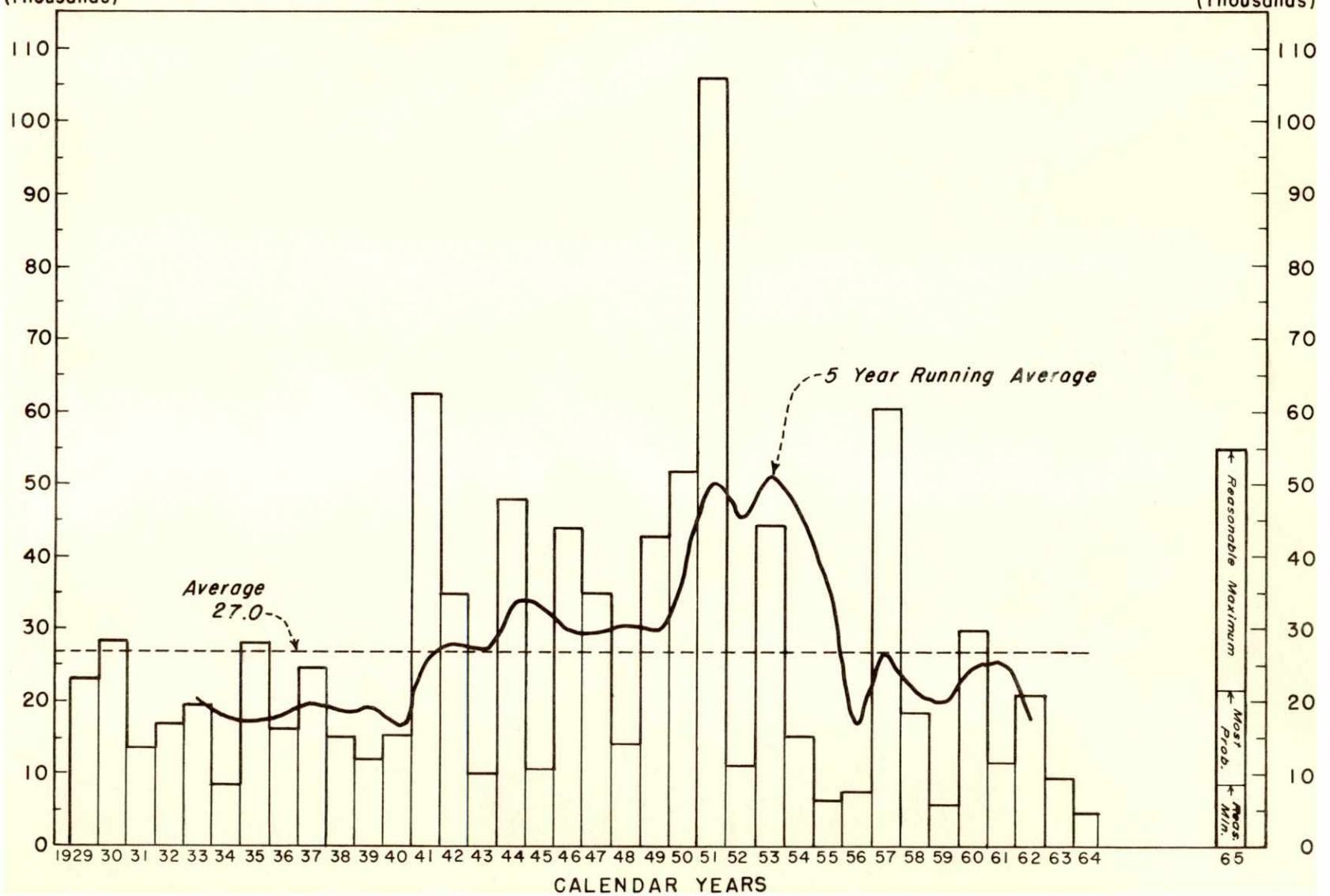


Exhibit 24

ANNUAL INFLOW — HARRY STRUNK LAKE



ANNUAL INFLOW - NORTON RESERVOIR



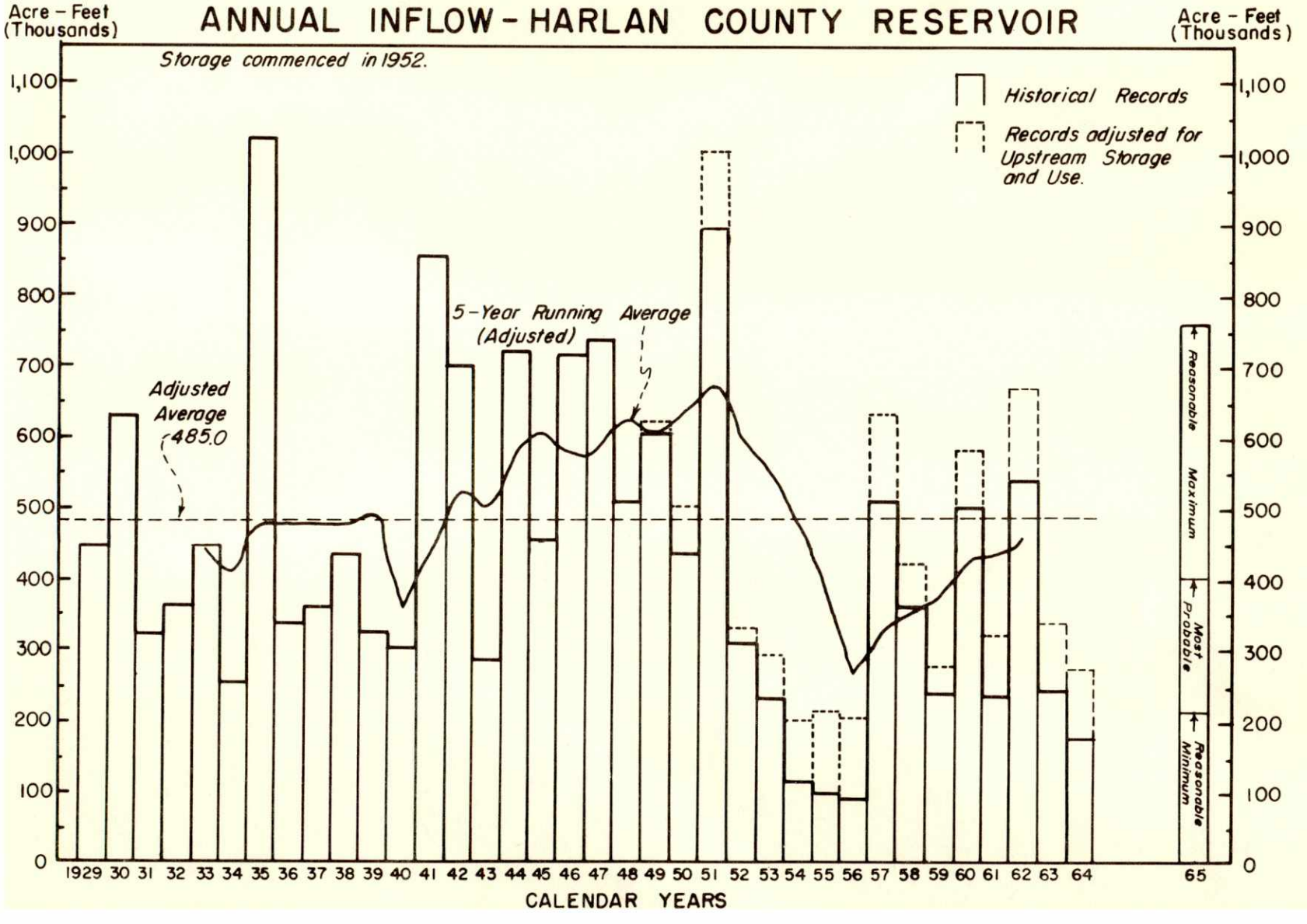
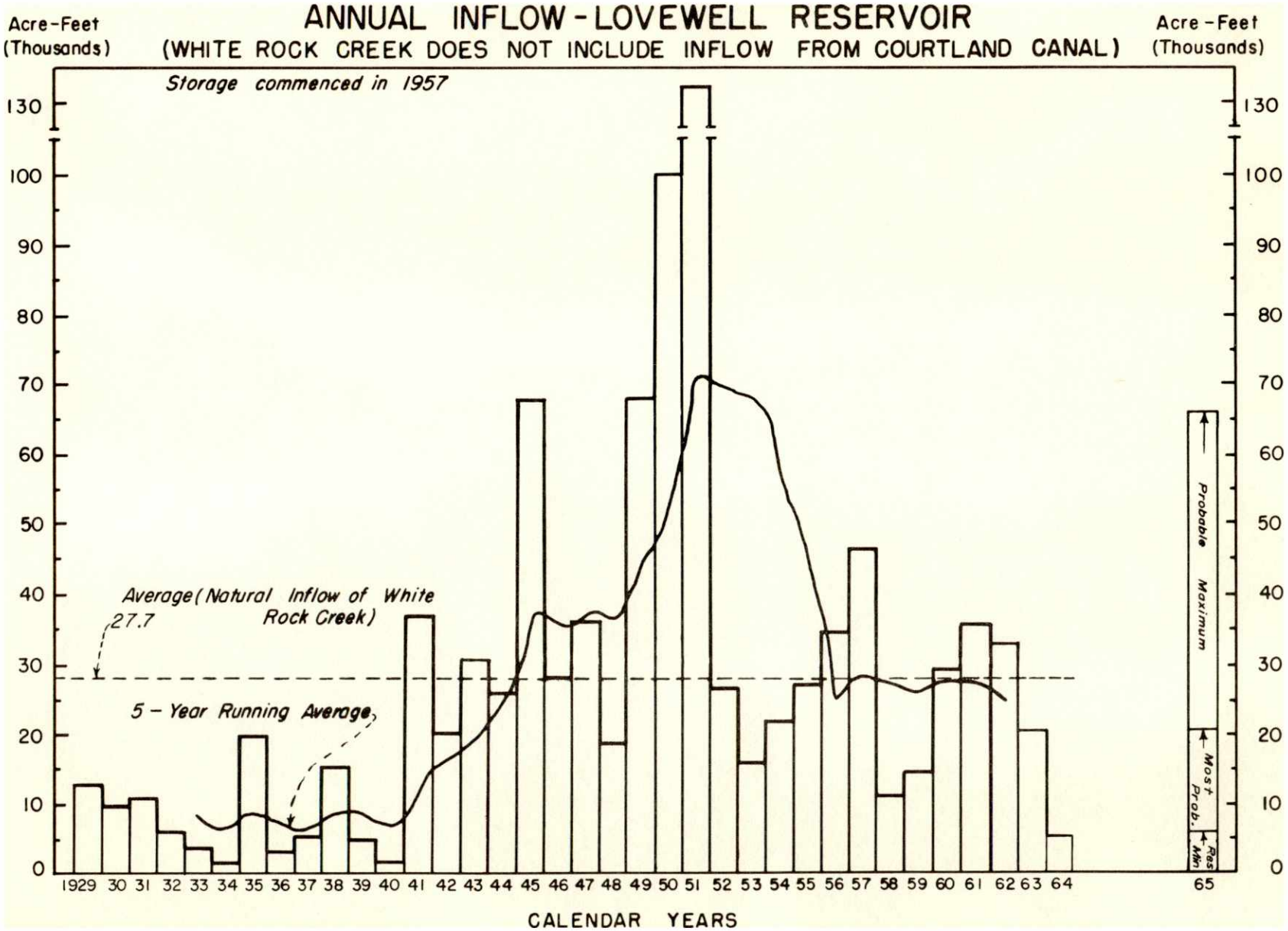
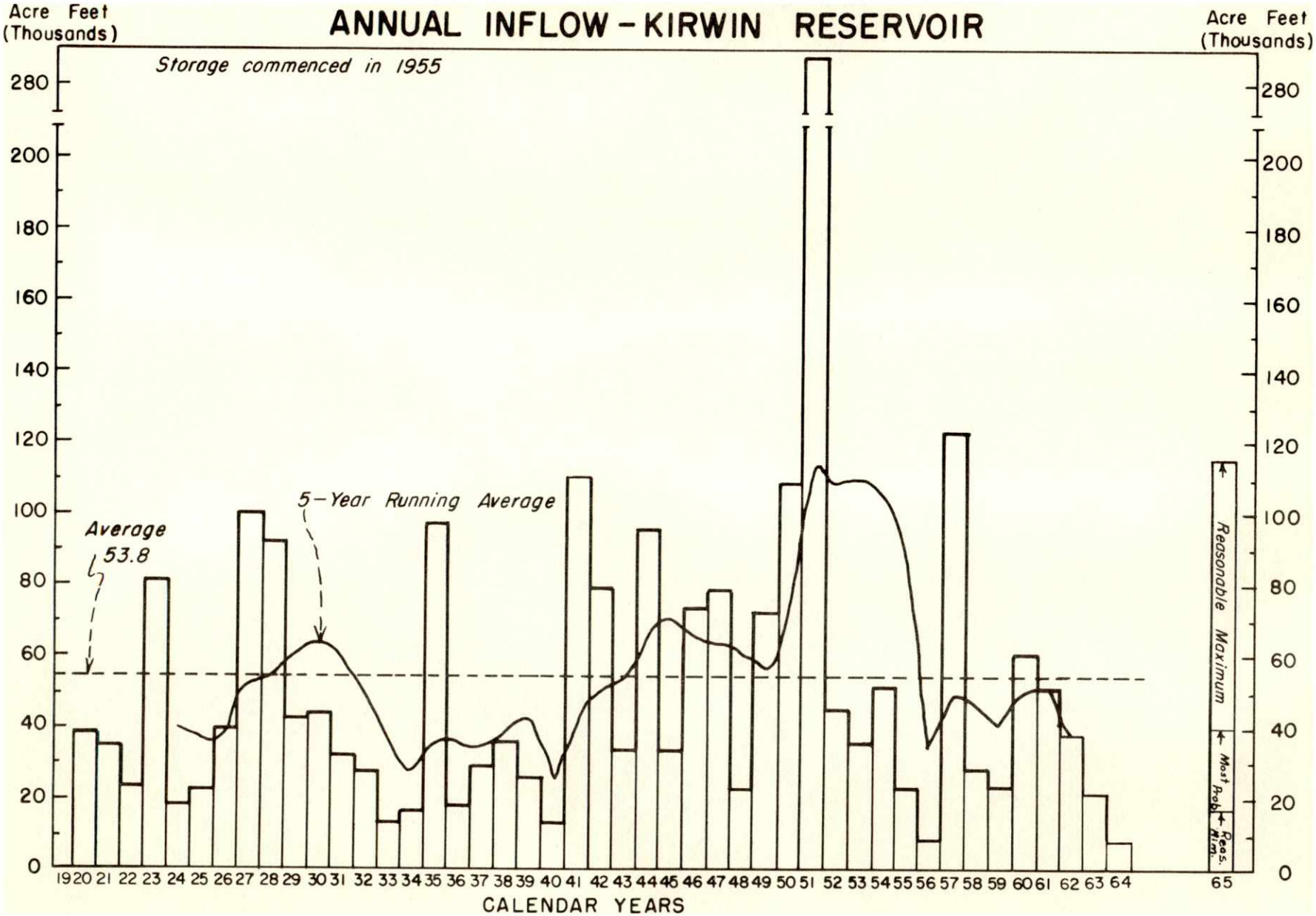
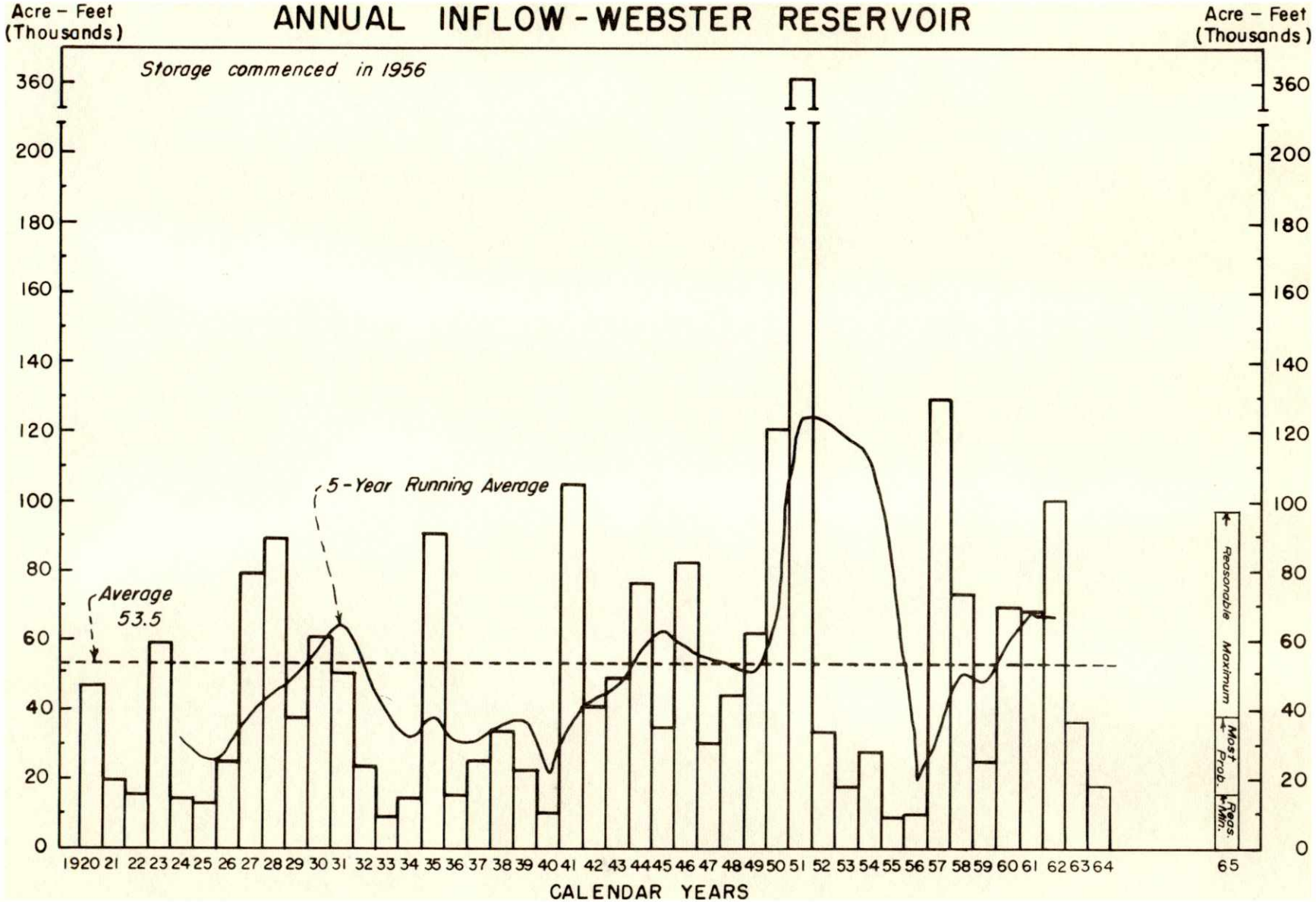

ANNUAL INFLOW - HARLAN COUNTY RESERVOIR
Acre - Feet (Thousands)
Acre - Feet (Thousands)
Storage commenced in 1952.
Historical Records
Records adjusted for Upstream Storage and Use.
5-Year Running Average (Adjusted)
Adjusted Average 485.0
Reasonable Maximum
Most Probable
Reasonable Minimum
0
100
200
300
400
500
600
700
800
900
1,000
1,100
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 65
CALENDAR YEARS

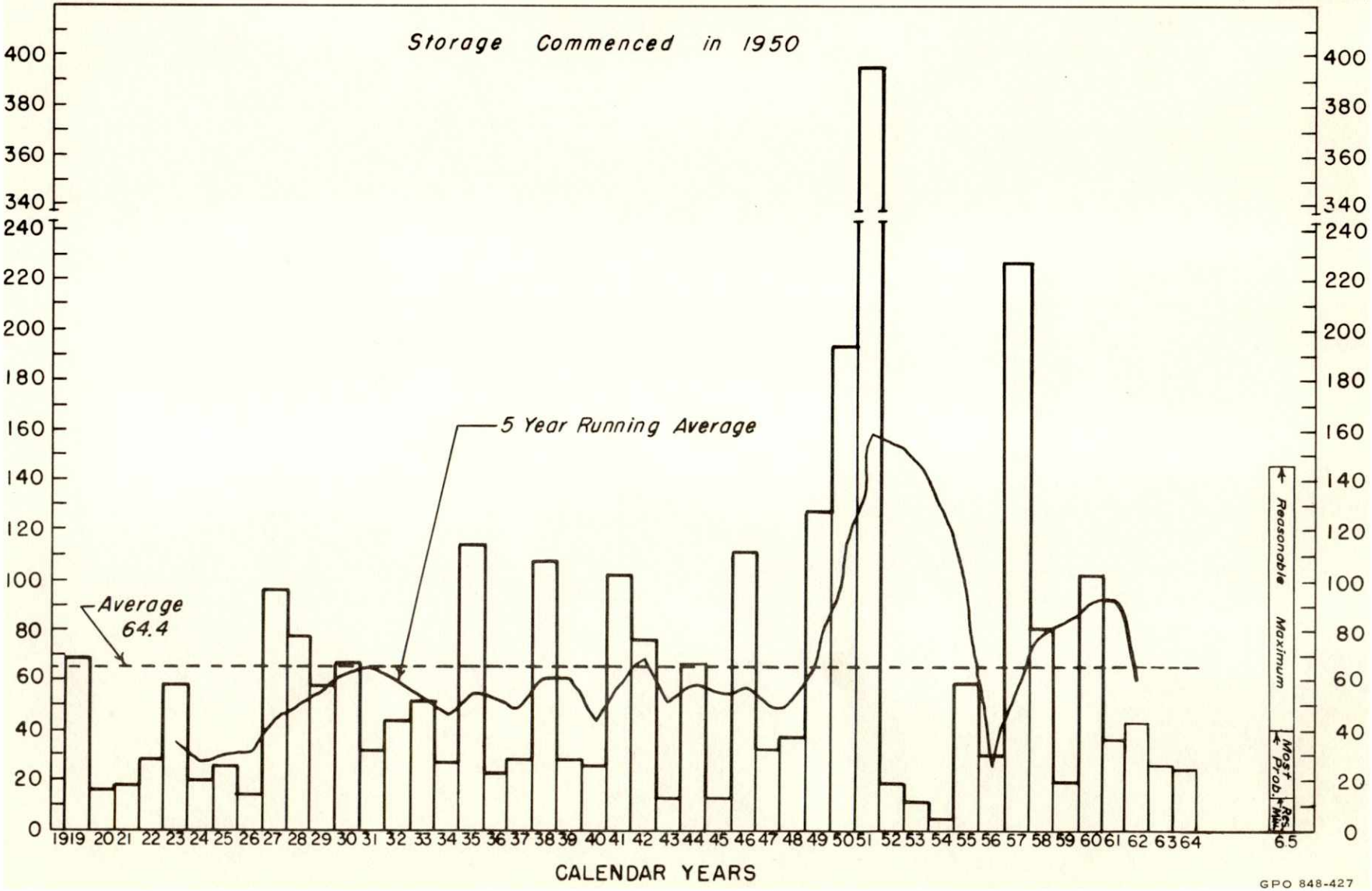
Exhibit 27


ANNUAL INFLOW - LOVEWELL RESERVOIR
(WHITE ROCK CREEK DOES NOT INCLUDE INFLOW FROM COURTLAND CANAL)
Acre-Feet (Thousands)
Acre-Feet (Thousands)
Storage commenced in 1957
Average (Natural Inflow of White Rock Creek)
27.7
5 - Year Running Average
Probable Maximum
Most Prob.
Ass Min
130
100
90
80
70
60
50
40
30
20
10
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
65
CALENDAR YEARS


ANNUAL INFLOW - KIRWIN RESERVOIR
Acre Feet (Thousands)
Acre Feet (Thousands)
Storage commenced in 1955
Average 53.8
5-Year Running Average
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 65
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.
Recs. 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
65
CALENDAR YEARS

ANNUAL INFLOW-CEDAR BLUFF RESERVOIR



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