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**REPORT TO
THE CONGRESS OF THE UNITED STATES**



**AUDIT OF
UPPER COLORADO RIVER BASIN
WATER RESOURCES DEVELOPMENT PROGRAM
BUREAU OF RECLAMATION
DEPARTMENT OF THE INTERIOR
FISCAL YEARS 1957-1959**



**BY
THE COMPTROLLER GENERAL OF THE UNITED STATES
JANUARY 1960**

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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON 25

B-133053

JAN 25 1960

Honorable Sam Rayburn
Speaker of the House of Representatives

Dear Mr. Speaker:

Herewith is our report on the audit of selected activities of the Bureau of Reclamation, Department of the Interior, in the upper Colorado River basin for the fiscal years 1957, 1958, and 1959.

This report is our first on the major activities of the Bureau of Reclamation in the upper Colorado River basin. The report includes comments on the significant changes that have occurred since authorization of the Collbran Project, Colorado, and the unusually long period required for repayment of the Government's investment in power of that project. The report also includes comments on the financial and economic analyses of the Colorado River Storage Project and participating projects and a recommendation that the Secretary of the Interior adopt and apply consistently an acceptable policy for recording interest during construction. A summary of our principal findings appears in the forepart of the report.

This report is also being sent today to the President of the Senate. Copies are being sent to the President of the United States, to the Secretary of the Interior, and to the Commissioner of Reclamation.

Sincerely yours,

A handwritten signature in cursive script, appearing to read "W. J. Campbell".

Comptroller General
of the United States

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REPORT ON AUDIT
OF
UPPER COLORADO RIVER BASIN
WATER RESOURCES DEVELOPMENT PROGRAM
BUREAU OF RECLAMATION
DEPARTMENT OF THE INTERIOR
FOR THE FISCAL YEARS 1957-1959

The General Accounting Office has made an audit of selected activities of the Bureau of Reclamation, Department of the Interior, in the upper Colorado River basin for the fiscal years ended June 30, 1957, 1958, and 1959. This audit was made pursuant to the Budget and Accounting Act, 1921 (31 U.S.C. 53), and the Accounting and Auditing Act of 1950 (31 U.S.C. 67). The scope of the audit work performed is described on page 51 of this report.

GENERAL COMMENTS

The upper Colorado River basin is designated as those parts of the States of Arizona, Colorado, New Mexico, Utah, and Wyoming within and from which waters naturally drain into the Colorado River system above Lee Ferry, Arizona.

The key projects in the development of water resources in the upper Colorado River basin were authorized by the Colorado River Storage Project Act, approved April 11, 1956 (43 U.S.C. 620). This act authorized (1) the construction, operation, and maintenance of initial units of the Colorado River Storage Project consisting of dams, reservoirs, power plants, and transmission

facilities at Curecanti, Colorado; Flaming Gorge, Utah; Glen Canyon, Arizona; and Navajo, New Mexico (dam and reservoir only) and (2) the construction, operation, and maintenance of 11 additional reclamation projects (including related power-generating and transmission facilities) referred to as participating projects. The act provided also that, in carrying out further investigations of projects in the upper Colorado River basin, priority should be given to completion of planning reports on 25 additional participating projects. The purposes of the authorized projects were defined as river regulation, irrigation, generation of hydroelectric power, flood control, expansion of recreational facilities, development of fish and wildlife habitat, and municipal water supply.

According to the Bureau's financial and economic analysis, dated December 1958, construction of the four initial storage units and the Transmission Division of the Colorado River Storage Project, and the 11 initial participating projects is estimated to cost more than 1 billion dollars. The proposed program provides for the construction of hydroelectric facilities at three initial storage units and one participating project with a total installed capacity of 1,228,000 kilowatts.

Individually authorized reclamation projects constructed or under construction by the Bureau of Reclamation in the upper Colorado River basin are also included in this report.

At June 30, 1959, there were 10 individually authorized projects in the upper basin of which 8 were completed and 2 were under construction. All these projects except the Collbran Project were authorized as single-purpose irrigation projects. The purposes for

which the Collbran Project was authorized included power, irrigation, and municipal water supply. However, the Bureau's revised plan of development does not include construction of facilities for the municipal water-supply purpose. The Bureau's latest estimates of construction costs for the 10 individually authorized projects total \$53,842,386.

Existing power facilities of the individually authorized projects consist of two small power plants which have been constructed at the Grand Valley and the Strawberry Valley Projects. The Grand Valley Project power plant was financed and is operated by a utility company. The Strawberry Valley Project power plant is operated by the water users.

At December 31, 1958, the Bureau had completed irrigation facilities sufficient to furnish irrigation service to 344,446 acres in the upper basin. During calendar year 1958, irrigation service was furnished to 275,137 acres.

The Bureau of Reclamation is an organization within the Department of the Interior under the supervision of the Assistant Secretary of the Interior for Water and Power Development. Under authority delegated by the Secretary of the Interior, the management of the Bureau is vested in the Commissioner of Reclamation, who is appointed by the President. The Commissioner, in directing and supervising the irrigation, power, and other programs of the Bureau, has four assistant commissioners. Technical staffs are organized into 16 divisions with offices located at Washington, D.C., and Denver, Colorado. The activities of the Bureau included in this report are conducted from the regional offices of the

Bureau located at Salt Lake City, Utah; Amarillo, Texas; Boulder City, Nevada; and Denver, Colorado; and from the Upper Colorado River Office located at Salt Lake City, Utah; project offices located at Rock Springs, Wyoming; Spanish Fork, Utah; and Grand Junction, Colorado; the development office located at Durango, Colorado; and unit offices located at Page, Arizona; Dutch John, Utah; and Farmington, New Mexico.

SUMMARY OF PRINCIPAL FINDINGS

1. Financial and economic analyses of the Colorado River Storage Project and participating projects

In the Bureau of Reclamation's second financial and economic analysis of the authorized Colorado River Storage Project and participating projects, dated December 1958, construction costs are estimated to total \$1,003,550,000. This estimate is an increase of \$11,376,000 over the estimate shown in the Bureau's first financial and economic analysis, dated February 1958, and an increase of \$69,890,000 over the estimate considered by the Congress prior to authorization of the Colorado River Storage Project and participating projects by the act of April 11, 1956. The Bureau anticipates that net power revenues will repay about 91 percent of the total reimbursable construction costs within the repayment periods specified in the authorizing legislation. The Bureau's determinations on the ability of the project to produce the anticipated net power revenues are based on assumptions and estimates relating to many factors including water supply and resultant power-production capability, power-marketing arrangements, and interest rates.

Our comments on certain aspects of the Bureau's financial and economic analyses of the Colorado River Storage Project and participating projects appear on pages 13 through 17.

Pursuant to our request, the Federal Power Commission (FPC) made an appraisal of engineering and hydraulic criteria used in repayment analyses to estimate firm power capabilities and anticipated power revenues of the Colorado River Storage Project. The FPC report is discussed on page 18 and is included as appendix A, pages 66 through 77.

2. Significant changes in project plans have occurred since authorization and an unusually long period is required for repayment of the Government's investment in power of the Collbran Project, Colorado

Our audit disclosed that significant changes in the construction and repayment plans for the Collbran Project have occurred since the project was authorized by the Congress in 1952. The principal differences between the revised plan and the authorized plan are (1) the elimination of the specific municipal and industrial water supply features because the city of Grand Junction, Colorado, declined to participate in the project, (2) the relocation of the Cameo power plant to the Lower Molina site, and (3) an increase in total installed generating capacity of the proposed power plants from 7,400 kilowatts to 13,500 kilowatts. We found also that, based on Bureau studies and a rate of 8.8 mills a kilowatt-hour for firm power, it will take 61 years to repay, with interest, the Government's investment in power; the studies show also that it will take another 14 years after power has been repaid, or a total of 75 years, to repay irrigation construction costs which are beyond the water users' ability to repay within their 50-year contract period.

A more detailed discussion of the Collbran Project appears on pages 28 through 32.

3. Project beneficiaries are not required to reimburse the Government for investigation costs financed from the Colorado River Development Fund

Under reclamation law, investigation costs applicable to authorized projects are generally reimbursable by project beneficiaries. However, since there is no specific legislative requirement for reimbursement of expenditures made from the Colorado River Development Fund, the Bureau considers all costs financed from such fund as nonreimbursable even though certain costs are applicable to authorized projects and are transferred to and recorded as a cost of such projects. A more detailed discussion of the activities financed from the Colorado River Development Fund is contained on pages 44 through 46.

4. Accounting and financial policy

The financial statements (schedules 1 through 3) included in this report present on a combined basis the assets and liabilities and the results of operations of the major activities of the Bureau of Reclamation in the upper Colorado River basin. These financial statements have been prepared from the records of the Bureau of Reclamation. Our opinion on the financial statements appears on page 52.

With respect to the Bureau's accounting procedures for activities in the upper Colorado River basin, the principal deficiency disclosed by our audit relates to a lack of acceptable and consistently applied procedures for recording interest during construction. We are recommending that the Secretary of the Interior adopt and apply consistently an acceptable policy for recording interest during construction.

Accounting and financial policy is discussed on pages 47 through 50 of this report.

COLORADO RIVER STORAGE PROJECT

AND PARTICIPATING PROJECTS

AUTHORIZATION BY THE CONGRESS

The Colorado River Storage Project (hereinafter sometimes referred to as the Storage Project) and participating projects were authorized by the Colorado River Storage Project Act, approved April 11, 1956. This legislation provided for the initiation of a comprehensive plan for development of the water resources of the upper Colorado River basin for purposes of river regulation and storage of water for beneficial consumptive use. It provided also the means by which the states of the upper basin can utilize their water apportionments consistent with the provisions of the Colorado River Compact of November 24, 1922, which has been approved by all the seven Colorado River basin states.

The act authorized the construction of four initial units of the Colorado River Storage Project consisting of dams, reservoirs, power plants, transmission facilities, and appurtenant works and of 11 additional reclamation projects (including power-generating and transmission facilities related thereto) to be known as participating projects. Also, it established priority for the investigation and completion of planning reports on 25 additional participating projects. The act authorized appropriations not to exceed 760 million dollars for carrying out the purposes of the act.

At the time the Congress was considering passage of the Colorado River Storage Project Act, the Bureau of Reclamation estimated that it would cost \$1,655,529,000 to construct the four storage units, electric transmission facilities, the 11 participating projects authorized for construction, and the 25 projects that were to be given priority in the completion of planning reports. These cost estimates are summarized as follows:

4 Initial storage units and transmission facilities of the Storage Project	\$ 629,304,000
11 Participating projects	<u>304,356,000</u>
Total authorized for construction	933,660,000
25 Projects on which planning reports are to be given priority	<u>721,869,000</u>
Total estimated cost	<u>\$1,655,529,000</u>

These estimates were based generally on 1953 price level

In the Bureau's February 1958 financial and economical analysis, the estimated total construction costs of the units authorized

for construction were \$992,174,000 or an increase of \$58,514,000 over the estimates considered by the Congress prior to passage of the act. The increase was due primarily to updating the estimates to reflect (1) January 1957 price levels and/or actual contract prices, and (2) changes in projects resulting from studies of more detailed investigations of project requirements. In the Bureau's December 1958 financial and economic analysis, estimated construction costs totaled \$1,003,550,000. These increased costs are discussed on pages 13 and 14 of this report. The tentative allocation of the \$1,003,550,000 construction costs is discussed on pages 9 through 11 of this report.

The authorized initial units of the Colorado River Storage Project and participating projects are as follows:

Storage Project

<u>Name of unit</u>	<u>Location</u>	<u>River</u>
Glen Canyon	Northern Arizona	Colorado
Flaming Gorge	Northeastern Utah	Green
Navajo	Northwestern New Mexico	San Juan
Curecanti	Western Colorado	Gunnison
Transmission Division	Entire basin	-

The primary purposes of the Glen Canyon, Flaming Gorge, and Curecanti units are the regulation of the flows of the Colorado River and its major tributaries and the generation of hydroelectric power. The Navajo unit will provide storage and make irrigation water available for 110,630 acres of new lands, most of which are on the Navajo Indian Reservation.

The current status of construction on the storage units and the Transmission Division is discussed on pages 22 through 27. The act provides that construction cannot start on the Curecanti unit until engineering and economic studies have been completed, and the Secretary of the Interior has certified to the Congress and the President of the United States that this unit is economically justified. The certification report, dated February 1959, was submitted to the President in May 1959 and to the Congress in July 1959.

Participating projects

<u>Name of project</u>	<u>Location</u>	<u>Stream</u>
Paonia	West central Colorado	North Fork of the Gunnison River
Florida	Southwestern Colorado	Florida River
Smith Fork	West central Colorado	Smith Fork of the Gunnison River
Pine River Extension	Southwestern Colorado and northwestern New Mexico	Pine River
Silt	West central Colorado	Between Rifle and Elk Creeks
Hammond	Northwestern New Mexico	San Juan River
Central Utah (initial phase)	Southern slope of the Uintah Mountains	Strawberry River
Emery County	East central Utah	Cottonwood Creek
Seedskadee	Southwestern Wyoming	Green River
La Barge	Southwestern Wyoming	Green River
Lyman	Southwestern Wyoming	Black's Fork of the Green River

Participating projects will use water of the upper Colorado River system for irrigation and other purposes and will receive assistance from power revenues of the Storage Project in the repayment of irrigation construction costs which are beyond the ability of the water users to repay. The individually authorized Eden Project, Wyoming, will also receive assistance from power revenues of the Storage Project in the repayment of irrigation construction costs. However, since no additional construction on this project was authorized in the Colorado River Storage Project Act, the Eden Project is not classified in the act as a "participating project."

Investigations work was in progress on the participating projects at June 30, 1959. These investigations consisted primarily of advance planning for the purpose of formulating firm development plans and preparing cost estimates and repayment studies for those participating projects given priority for construction by the Bureau and the interested states. These investigations are discussed on pages 39 through 43 of this report.

The Paonia Project was initially authorized for construction by Presidential approval March 18, 1939. Owing to subsequent findings, changes in the original plan were made in 1940 and 1946. The project was reauthorized by the act of June 25, 1947 (61 Stat. 181), to give effect to these changes, but the storage features of the project were not constructed. The Colorado River Storage Project Act reauthorized Paonia as a participating project.

As a result of detailed investigations, the Pine River Project Extension was declared economically infeasible and plans for its construction have been abandoned.

TENTATIVE ALLOCATION OF TOTAL ESTIMATED CONSTRUCTION COSTS TO PURPOSES

The total estimated construction costs of the Colorado River Storage Project and participating projects excluding interest during construction is \$1,003,550,000. This estimate, as shown in the financial and economic analysis, dated December 1958, is the latest official estimate of the Bureau of Reclamation and cooperating agencies. The estimated construction costs by individual unit and participating project and the allocations to purposes are as follows:

	Total estimated construction costs	Less costs not allocated (note a)	Total costs allocated to purposes	Allocation of construction costs to purposes															
				Nonreimbursable			Reimbursable												
				Total reimbursable	Flood control	Fish and wildlife	Recreation	Total reimbursable	Power	Irrigation	Municipal water	Other							
COLORADO RIVER STORAGE PROJECT:																			
Glen Canyon	\$ 325,704,000	\$2,923,000	\$322,781,000	\$ -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pine River Extension	67,813,000	87,000	67,726,000	-	-	-	-	1,222,000	573,210,000	\$565,216,000	\$107,994,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Flaming Gorge	43,203,000	64,000	43,139,000	207,000	-	-	-	834,000											
Navaajo	84,563,000	132,000	84,431,000	-	-	-	-	452,000											
Curecanti	157,549,000	100,000	157,449,000	-	-	-	-	-											
Transmission Division																			
Total	679,231,000	3,306,000	675,925,000	2,715,000	207,000	-	2,508,000	673,210,000	565,216,000	107,994,000	-	-	-	-	-	-	-	-	-
PARTICIPATING PROJECTS:																			
Faonia	8,493,000	187,000	8,306,000	80,000	72,000	-	8,000	8,226,000	-	-	8,226,000	-	-	-	-	-	-	-	-
Pine River Extension	245,000	53,000	192,000	-	-	-	-	192,000	-	-	4,122,000	-	-	-	-	-	-	-	-
Smith Fork	4,426,000	72,000	4,354,000	286,000	125,000	-	29,000	4,759,000	-	-	7,234,000	-	-	-	-	-	-	-	-
Florida	7,433,000	22,000	7,411,000	177,000	-	-	-	3,531,000	-	-	3,531,000	-	-	-	-	-	-	-	-
Silt	3,548,000	17,000	3,531,000	-	-	-	-	3,174,000	-	-	3,174,000	-	-	-	-	-	-	-	-
Hammond	3,280,000	8,000	3,272,000	98,000	-	-	-	98,000	-	-	49,048,000	-	-	-	-	-	-	-	-
Central Utah (initial phase)	228,894,000	1,047,000	227,847,000	4,142,000	2,232,000	-	1,460,000	223,705,000	223,705,000	49,048,000	125,089,000	43,818,000	5,750,000 ^c	-	-	-	-	-	-
Vernal Unit, Central Utah	6,956,000	82,000	6,874,000	119,000	-	-	92,000	6,755,000	-	-	6,123,000	632,000	-	-	-	-	-	-	-
Emery County	9,913,000	18,000	9,895,000	190,000	-	-	190,000	9,705,000	-	-	9,705,000	-	-	-	-	-	-	-	-
Seedsakadee	37,885,000	411,000	37,474,000	2,025,000	-	-	185,000	35,449,000	-	-	35,449,000	-	-	-	-	-	-	-	-
Lyman	11,436,000	60,000	11,376,000	-	-	-	-	11,376,000	-	-	11,376,000	-	-	-	-	-	-	-	-
La Barge	1,816,000	65,000	1,751,000	-	-	-	-	1,751,000	-	-	1,751,000	-	-	-	-	-	-	-	-
Total	324,319,000	2,042,000	322,277,000	7,057,000	2,429,000	2,429,000	1,964,000	315,220,000	49,048,000	215,972,000	44,450,000	5,750,000	-	-	-	-	-	-	-
TOTAL, COLORADO RIVER STORAGE PROJECT AND PARTICIPATING PROJECTS	\$1,003,550,000^{d,e}	\$5,248,000	\$998,202,000	\$9,772,000	\$2,636,000	\$2,636,000	\$4,472,000	\$988,430,000	\$614,264,000^d	\$323,956,000	\$44,450,000^e	\$5,750,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

^a Consists of costs financed by contributions and the Colorado River Development Fund.
 (See p. 11.)

^b Construction of Pine River extension deferred. Investigative costs of \$192,000 allocated to irrigation--repayment not included on payout schedules.

^c Cost of constructing certain features of the Central Utah Project to ultimate phase capacity. The Bureau has not allocated this cost to purposes at June 30, 1959.

^d Exclusive of interest during construction at 2-7/8 percent, amounting to \$48,746,000.

^e Exclusive of interest during construction at 2-7/8 percent, amounting to \$2,463,000.

The total estimated construction costs of \$1,003,550,000 include costs of \$5,348,000 not allocated to purposes as follows:

Contributed funds:

State of Arizona	\$1,635,000
Bureau of Public Roads	600,000
Colorado Department of Highways	130,000
State of Utah and private groups	63,000
City of Los Angeles	60,000
State of Colorado	<u>35,000</u>

2,523,000

Investigations costs financed from the
Colorado River Development Fund

2,825,000

Total

\$5,348,000

The contribution from the Bureau of Public Roads, Department of Commerce, was applied toward the cost of the Glen Canyon Bridge. (See p. 23.)

Only the cost of adding recreational facilities to the project was allocated to recreation. All other costs were allocated to purposes by the separable cost-remaining benefits method.

REPAYMENT OF CONSTRUCTION COSTS
ALLOCATED TO REIMBURSABLE PURPOSES

Repayment of the total estimated construction costs of the Storage Project and participating projects as proposed by the latest published Bureau of Reclamation repayment study is as follows:

	<u>Amount</u>	<u>Percent</u>
Reimbursable construction costs--		
source of repayment:		
Commercial power	\$ 896,940,000	89.4
Irrigators	32,655,000	3.3
Municipal and industrial water users	44,450,000	4.4
Other revenues	8,443,000	.8
Unidentified (note a)	<u>5,750,000</u>	<u>.6</u>
Total reimbursable costs	<u>988,238,000</u>	<u>98.5</u>
Nonreimbursable construction costs:		
Flood control	2,636,000	.3
Recreation	4,472,000	.4
Fish and wildlife	2,664,000	.3
Investigations financed from the Colorado River Development Fund	2,825,000	.3
Contributed funds	<u>2,523,000</u>	<u>.2</u>
Total nonreimbursable costs	<u>15,120,000</u>	<u>1.5</u>
Deferred costs (note b)	<u>192,000</u>	<u>-</u>
Total estimated construction costs	<u>\$1,003,550,000</u>	<u>100.0</u>

^aCosts pertaining to the Central Utah Project (ultimate phase) which have not been allocated to purposes at June 30, 1958.

^bCost of investigation, Pine River extension. Construction of this project deferred and investigation costs not included in payment schedules. Included as reimbursable cost in allocation of total construction costs on page 10.

In addition to the repayments shown above, net revenues from commercial power are to provide \$6,629,000 for repayment of construction costs of the Eden Project. Further, net revenues from commercial power and municipal and industrial water are to provide interest during construction and interest on the unrepaid investment in these purposes at the rate of 3-1/4 percent a year for the Vernal Unit of the Central Utah Project and 2-7/8 percent a year for all other units.

COMMENTS ON THE BUREAU'S FINANCIAL AND ECONOMIC
ANALYSES DATED FEBRUARY 1958 AND DECEMBER 1958

The first financial and economic analysis of the Colorado River Storage Project and participating projects dated February 1958 was transmitted to the President of the Senate on April 15, 1958, and was published later as Senate Document 101, Eighty-fifth Congress, second session. In transmitting the analysis, the Secretary of the Interior emphasized that, with construction just starting on initially scheduled units, the analysis was based largely on planning estimates with such refinements as were possible in a few instances from detailed preconstruction estimates and from bids on construction work. The Secretary stated also that the analysis will be reviewed and revised periodically as detailed investigations and construction of the development progress and as new data becomes available.

The second economic analysis of the Colorado River Storage Project and participating projects dated December 1958 is a supplement to the first report. It primarily incorporates changes in the rate and schedule of development. The basic assumptions and procedures used in preparing the first analysis were also used for the second analysis.

Our observations and comments on certain aspects of the financial and economic analyses follow:

Increase in construction cost estimate

The Bureau of Reclamation estimated the cost of the Colorado River Storage Project and participating projects as \$933,660,000 when the Congress was considering passage of the Colorado River Storage Project Act, approved April 11, 1956. In its February 1958 analysis, construction costs of authorized projects were estimated by the Bureau to total \$992,174,000.

In the December 1958 analysis, this estimate had been increased by \$11,376,000 and totaled \$1,003,550,000. The \$11,376,000 increase consists of \$1,849,000 representing the cost of additional recreational facilities at the Flaming Gorge and Navajo storage units and \$9,527,000 representing the net increase in costs of participating projects summarized as follows:

<u>Project</u>	<u>Increase or Decrease (-)</u>
Paonia	\$ 680,000
Pine River Extension	-5,294,000
Smith Fork	887,000
Hammond	839,000
Seedskadee	<u>12,415,000</u>
Total	<u>\$ 9,527,000</u>

The Pine River Extension Project has been determined to be economically infeasible and is not scheduled for construction. The \$12,415,000 increase in the cost of the Seedskadee Project is based on a Definite Plan Report dated November 1958. In this report, a dam and reservoir for storage are recommended in place of the previously recommended diversion dam. The report also recommends a wildlife refuge costing \$1,070,000 and recreational facilities not included in the previous analysis.

Repayment of construction costs

The authorizing act provides specific maximum periods for repayment of all reimbursable construction costs, including interest on costs allocated to power and municipal water supply. These maximum repayment periods begin upon completion of each storage unit, participating project, or separable feature thereof. Because of the time lag between completion of the first and last separable features, the allowable maximum period for repayment of the total construction cost of a storage unit or a participating project can be many years longer than the maximum repayment period for each separable feature.

With respect to construction costs, including interest, allocated to power and municipal water supply and the costs of the storage units which are allocated to irrigation, the authorizing act requires that repayment be made within 50 years from completion of each separable feature. The Bureau's repayment section of the December 1958 analysis shows that repayment of the total of these costs is anticipated as follows:

Cost allocated to	Years from date of completion of first unit	
	Allowable repayment period	Anticipated repayment period
Power	70	46
Municipal water supply	69	69
Storage unit costs allocated to irrigation	56	49

Costs allocated to irrigation are required to be repaid within 60 years, including a development period of up to 10 years, except for the Paonia and Eden Projects where the maximum repayment periods, including a development period of up to 10 years, are 78 years and 70 years, respectively, from the time of completion of each separable feature. The analysis shows that repayment is anticipated to be made within the authorized periods.

The analysis indicates that beginning in the year 2012, or 49 years after the first power plant goes into operation, net power revenues from the Storage Project will be in excess of repayment requirements of such revenues. The analysis shows that by the

year 2050 accumulated excess net revenues from power will total \$704,226,000.

Electric power generation

Net revenues from the sale of electric energy are expected to repay 91 percent of the total reimbursable construction costs of the Storage Project and participating projects. Since over 70 percent of the electric power capacity and energy is anticipated to be provided by the Glen Canyon Unit of the Storage Project during the repayment period, our comments are directed generally to the power operations of that unit.

Estimates of water supply at Glen Canyon site

Since the financial feasibility of the projects is largely dependent on power and power is dependent on water supply, estimates of water supply are extremely important. The Bureau's estimates of future water supply available at Glen Canyon were based on the assumption that the historical water flows at the Glen Canyon site for the 32-year period 1914 through 1945 were representative of long-term water flow conditions of the Colorado River. These flows, as modified to reflect experienced and anticipated man-made depletions, were used in estimating the future water supply available at Glen Canyon.

We believe that it is pertinent to point out that the historical flows of the Colorado River at Glen Canyon have been very erratic, ranging from a low of 3.9 million acre-feet in 1934 to a high of 21.2 million acre-feet in 1917. Even the year-to-year flows have varied greatly. For example, the 1956 flow was 8.6 million acre-feet whereas the 1957 flow was 19.1 million acre-feet. Because of the erratic flows, any estimate of future water availability is subject to greater deviation from actual flows than would be the case if historical flows were more uniform. Thus the period required to fill the Glen Canyon reservoir to a reasonable operating level and the amount of water available for power and other purposes could vary substantially from the estimates used in the Bureau's analysis. For example, should actual flows follow the historical pattern for the 32-year period 1926 through 1957 rather than the 32-year period 1914 through 1945 used by the Bureau, the average annual flows would be less than the flows used in the Bureau's analysis by about 1.7 million acre-feet or about 12 percent. Should the actual flows follow the historical pattern for the 44-year period 1914 through 1957, the average annual flows would be less than the historical flows used by the Bureau by about 0.6 million acre-feet or about 4 percent.

Water releases required to meet lower basin commitments

An important factor in estimating power production of the Glen Canyon unit is the determination of water releases required

to meet lower basin commitments. Water release requirements to the lower basin are covered principally in the Colorado River Compact of 1922 and the Mexican Treaty of 1945. Certain questions concerning requirements for water releases to the lower basin under these agreements are before the Supreme Court of the United States in the case of Arizona vs. California, et al.

In the analysis, the Bureau assumed that minimum annual water releases to the lower basin would be 8.35 million acre-feet at Glen Canyon. Also, in the analysis, the Bureau states that utilization of any of the assumptions underlying the basic water supply studies does not carry with it any actual or implied finding of legal restrictions or limitations.

Market for power produced

The Federal Power Commission issued a report, dated June 1958, on the potential markets for power expected to be developed at presently authorized hydroelectric plants in the Colorado River basin. The FPC concluded that, in view of the large amounts of additional energy it estimates will be needed, power from presently authorized projects will find a ready market in the area, provided its cost is competitive with that of equivalent power from fuel-electric plants. With respect to the competitiveness of costs, the Bureau's repayment section of the analysis is based on average selling prices of 6 mills a kwh for firm energy and 2.5 mills a kwh for non-firm energy. These prices are lower than the Bureau's estimate of the average cost of alternative steam-electric energy produced in large, modern, privately owned plants. The Bureau's estimate of the cost of alternative steam-electric energy delivered to representative load centers in the market area is 7.27 mills a kwh for firm energy and 2.73 mills a kwh for nonfirm energy.

Determination of firm energy production

Assumptions as to whether energy produced is firm or nonfirm are very important because, in the repayment section of the analysis, firm energy is expected to be sold at an average rate of 6 mills a kwh compared to an average of 2.5 mills a kwh for nonfirm energy.

During the period of the filling of the reservoirs (1961 through 1971), the Bureau has considered firm energy for each year to be all the energy that can be utilized within the monthly load pattern to meet the annual load growth estimated by the Federal Power Commission. After the filling operation of the reservoirs, annual firm energy was determined for each subsequent 10-year period to be the average annual generation for each period within the monthly load pattern estimated by the Federal Power Commission.

Determination of nonfirm energy production

In the months when the releases of the minimum water needed to generate the requirements of the monthly load pattern would

result in spills of the excess inflows into the reservoir, the Bureau assumed that the generators would be operated up to 100 percent of their capacity and that the energy generated in excess of the energy needed to supply the monthly load pattern would be sold at nonfirm rates.

Interest rates used in the analyses

Four different interest rates were used in preparing various sections of the December 1958 analysis. The interest rates used were established by the Bureau of the Budget, the Federal Power Commission, and the Department of the Treasury.

The economic desirability of developing the projects was measured by a comparison of benefits from a national standpoint and the Federal costs of development (benefit-cost section of analysis). In this comparison, both benefits and costs were converted to average annual equivalent values at 2-1/2 percent interest. The 2-1/2 percent interest rate was also used in allocating prime construction costs to purposes. The use of a 2-1/2 percent interest rate was in conformance with Bureau of the Budget instructions for fiscal year 1958 presentations on water resources projects.

Annual power benefits used in the benefit-cost analysis and in allocating construction costs to purposes were determined by estimating the average annual cost of obtaining equivalent power from the most economic alternative source likely to be developed in the absence of the projects. The total annual costs of the alternate power development were estimated on the basis of private financing with interest at the rate of 6-1/4 percent. The interest rate of 6-1/4 percent covers both interest costs on borrowed money and return on the investment made by stockholders. This rate was established for use in studies of this type by the Federal Power Commission.

In the section of the analyses pertaining to repayment of the Government's investment in the projects, an interest rate of 2-7/8 percent was used in computing repayment requirements for construction costs allocated to power and to municipal and industrial water purposes, except that 3-1/4 percent was used in the repayment of municipal and industrial water costs of the Vernal Unit at the Central Utah participating project. The 2-7/8 percent interest rate is the rate established by the Secretary of the Treasury for application to the power portion of construction costs of the Glen Canyon and Flaming Gorge units of the Storage Project, and the 3-1/4 percent interest rate was similarly established for the Vernal Unit. Actual interest rates to be applied to power and to municipal and industrial water construction costs of other units and projects will be established by the Secretary of the Treasury at the time the first advance is made for such units or projects in accordance with the specific provisions of the Colorado River Storage Project Act.

Federal Power Commission appraisal of engineering and hydraulic criteria used in repayment analyses to estimate firm power capabilities and anticipated power revenues

During our examination, we were provided copies of a study entitled "Repayment Analysis, Colorado River Storage Project, May 1959," and advised that the study had been prepared by the Colorado River Board of California (Board). The Board's study indicated that the Bureau of Reclamation, in its financial and economic analysis, dated December 1958, had overestimated the power capability and repayment ability of the Colorado River Storage Project.

Our comparison of the study prepared by the Board with that prepared by the Bureau showed that the principal differences resulted from the use of different engineering and hydraulic criteria. Since evaluation of the reasonableness of these criteria requires technical engineering knowledge not available to the General Accounting Office, on June 26, 1959, we requested the Federal Power Commission to review the two studies to determine the reasonableness of the engineering and hydraulic criteria used in each study to estimate the firm power capabilities and anticipated power revenues of the Colorado River Storage Project.

On November 10, 1959, the Federal Power Commission transmitted its report on the review. The FPC report concludes with the statement "*** The time that will be required for the repayment of a water resources development as large and complex as the 'Colorado River Storage Project and Participating Projects' is not susceptible of precise determination. Understandably, judgments will vary with respect to estimates of what flows will occur over the repayment period, including the amounts available for power production. However, it appears that the repayment analysis made by the Bureau of Reclamation is reasonably realistic."

The complete text of the FPC report is included as appendix A, pages 66 through 77.

FINANCING PROJECT CONSTRUCTION AND
OPERATION AND MAINTENANCE COSTS

The Colorado River Storage Project Act established a special fund to be known as the Upper Colorado River Basin Fund and directed the Secretary of the Treasury to credit all appropriations made for purposes of carrying out the act to this fund as advances from the general fund of the Treasury. The act further provided that all revenues from operation of the Colorado River Storage Project and participating projects shall be credited to the Basin Fund and are available for expenditure without further appropriation for the following purposes:

1. Payment of operation and maintenance expenses, emergency expenses, and replacement costs for all facilities of the Colorado River Storage Project and participating projects within the limitations set forth in the annual appropriation acts, provided that expenditures made for each participating project shall be paid from revenues received from that project. Revenues credited to the Basin Fund are not available for appropriation for construction of units or participating projects authorized by or pursuant to the act.
2. Payments to the Treasury to return:
 - a. The cost of each unit, participating project, or any separable feature thereof which is allocated to commercial power purposes within a period of not to exceed 50 years from date of completion of such unit, participating project, or separable feature.
 - b. The cost of each unit, participating project, or any separable feature thereof which is allocated to municipal water purposes within a period of not to exceed 50 years from date of completion of such unit, participating project, or separable feature.
 - c. Interest on the unamortized balance of the investment (including interest during construction) in the power and municipal water supply features at a rate determined by the Secretary of the Treasury as of the time the first advance of construction funds is made for each unit or project. The interest rate will be determined by calculating the average yield to maturity on the basis of daily closing-market-bid quotations during the month of June next preceding the fiscal year in which the construction fund advance is made, on all interest-bearing marketable public debt obligations of the United States having a maturity date of 15 or more years from the first day of June, and by adjusting such average annual yield to the nearest one eighth of 1 percent.

- d. The cost of each storage unit which is allocated to irrigation within a period not to exceed 50 years.
3. Apportionment of revenues in excess of requirements of items (1) and (2) above among the states of the upper basin as follows:

	<u>Percent</u>
Colorado	46.0
Utah	21.5
Wyoming	15.5
New Mexico	<u>17.0</u>
Total	<u>100.0</u>

Provided that, prior to the application of such percentages, all revenues remaining in the Basin Fund from each participating project or part thereof which is now or subsequently authorized, after payments made in (1) and (2) above, shall be apportioned to the state in which such participating projects are located.

Revenues apportioned to each state shall be used only for the repayment of construction costs of participating projects or parts thereof located within that state and may not be used in another state without the consent of the state to which such revenues have been apportioned. Subject to this requirement, annual payments shall be made to the general fund of the Treasury as follows:

- a. The cost of each participating project authorized by Colorado River Storage Project Act (except Paonia) which is allocated to irrigation, within a period of not to exceed 50 years, in addition to any development period authorized by law, from the date of completion of such participating project or part thereof. In the case of Indian lands, payments are to be made within the ability of the lands to repay subject to the act of July 1, 1932 (47 Stat. 564).
- b. Costs of the Paonia Project which are beyond the ability of the water users to repay within the 68-year period prescribed in the act of June 25, 1947 (61 Stat. 181).
- c. Cost of the Eden Project as specified in the act of June 28, 1949 (63 Stat. 277).

Business-type budgets are required to be submitted to the Congress annually for all operations financed from the Basin Fund.

Congressional appropriations to finance construction activities on the Colorado River Storage Project for fiscal years 1958, 1959 and cumulative to June 30, 1959, were made as follows:

<u>Appropriation</u>	<u>Fiscal year 1958</u>	<u>Fiscal year 1959</u>	<u>Cumulative through June 30, 1959</u>
Upper Colorado River Basin Fund, 14X4081	\$35,142,000	\$68,033,335	\$116,175,335
Bureau of Public Roads, 14-13X0226(06)	<u>-</u>	<u>-</u>	<u>600,000</u>
Total	<u>\$35,142,000</u>	<u>\$68,033,335</u>	<u>\$116,775,335</u>

To September 30, 1959, congressional appropriations for payment to the Upper Colorado River Basin Fund in fiscal year 1960 amount to \$74,459,775.

The status of funds appropriated by the Congress for the Colorado River Storage Project as of June 30, 1959, is summarized below:

<u>Appropriation</u>	<u>Status at June 30, 1959</u>			
	<u>Total</u>	<u>Unobli- gated</u>	<u>Unliqui- dated obli- gations</u>	<u>Expended (net)</u>
Upper Colorado River Basin Fund	\$116,175,335	\$1,636,770	\$16,940,627	\$97,597,938
Bureau of Public Roads	<u>600,000</u>	<u>-</u>	<u>-</u>	<u>600,000</u>
Total	<u>\$116,775,335</u>	<u>\$1,636,770</u>	<u>\$16,940,627</u>	<u>\$98,197,938</u>

CONSTRUCTION ACTIVITIES
TO JUNE 30, 1959

At June 30, 1959, construction costs had been incurred on the Glen Canyon, Flaming Gorge, and Navajo storage units and on the Transmission Division of the Storage Project and the Paonia and Central Utah participating projects. The Bureau's accounting records show that \$85,485,555 has been classified as construction work in progress and \$15,096,810 has been expended for construction service facilities on the Storage Project and participating projects.

The status of construction work at June 30, 1959, is as follows:

Glen Canyon

<u>Feature</u>	<u>Total estimated cost</u>	<u>Cost to June 30, 1959</u>	<u>Dollar percent complete</u>
Dam and reservoir	\$210,627,000	\$55,375,698	26
Power plant	97,000,000	9,265,213	10
Switchyard	10,146,000	429,540	4
General property	<u>7,931,000</u>	<u>-</u>	<u>-</u>
Total	<u>\$325,704,000^a</u>	<u>\$65,070,451^b</u>	<u>20</u>
Construction service facilities (at acquisition cost)	<u>\$ 11,800,000^c</u>	<u>\$10,289,731</u>	<u>87</u>

^aExcludes interest during construction.

^bExclusive of interest during construction amounting to \$1,405,044 at June 30, 1959.

^cTotal estimated cost for construction service facilities of \$11,800,000 includes costs of \$7,931,000 to be capitalized as general property and \$3,869,000 of construction service facilities to be disposed of when construction is completed.

About 37 percent of the work under the prime contract was complete. Completed work included the right and left diversion tunnels, the upstream and downstream cofferdams, and the excavation of the spillway tunnels. Substantially complete was the power plant service road and tunnel and the excavation of the dam keyways. Other work in progress included excavations for the power plant and the dam foundations and the erection of the contractor's cement mixing plant, refrigeration plant, and related facilities for the production of concrete.

The construction service facilities for the Glen Canyon Unit were substantially complete at June 30, 1959. Work to be done included the completion of the administration building and the soil stabilization and landscaping at Page, Arizona.

Glen Canyon bridge

Construction of the Glen Canyon bridge was completed in February 1959. Located 900 feet downstream from the damsite, the bridge is 1,028 feet long and 700 feet above the river level. At June 30, 1959, the recorded cost of the bridge was \$5,159,749.

The Bureau determined that a bridge across Glen Canyon was necessary and would result in substantial net savings during the construction of Glen Canyon Dam. In May 1956, the Bureau estimated that a temporary bridge for construction purposes would cost \$1,800,000. For permanent travel across the canyon, a highway constructed on top of the dam was estimated to cost \$600,000. The Act of July 31, 1956 (70 Stat. 771), authorized the Secretary of Commerce to provide funds for construction of the bridge limited to the cost of placing a highway on the dam. In September 1956, the Bureau negotiated an agreement with the Arizona State Highway Department to participate in the cost of a bridge across Glen Canyon that would conform to the standards of a primary highway. The agreement was based on a total estimated cost of \$3,200,000 and provided that the Bureau of Reclamation would pay \$1,800,000 (the estimated cost of a temporary bridge), the Bureau of Public Roads, Department of Commerce would pay \$600,000 (the estimated cost of a highway constructed on top of the dam), and the State of Arizona would pay \$800,000. The agreement provided also that, if the actual costs exceeded \$3,200,000, the United States would pay 75 percent of the excess and the State of Arizona would pay 25 percent of the excess.

The contract for the construction of the bridge, awarded in January 1957, was considerably in excess of the Bureau of Reclamation estimates. As of June 30, 1959, the recorded costs of the bridge were \$5,159,749 or almost \$2,000,000 in excess of the September 1956 estimate. The final cost analysis and final billing to the State of Arizona had not been made as of August 1959. A comparison of the allocation of cost based on the September 1956 estimate and the June 30, 1959, recorded costs is as follows:

<u>Agency</u>	<u>September 1956 estimate</u>	<u>June 30, 1959, costs</u>	<u>Increase</u>
State of Arizona	\$ 800,000	\$1,289,937	\$ 489,937
Bureau of Public Roads	600,000	600,000	-
Bureau of Reclamation	<u>1,800,000</u>	<u>3,269,812</u>	<u>1,469,812</u>
Total	<u>\$3,200,000</u>	<u>\$5,159,749</u>	<u>\$1,959,749</u>

Glen Canyon housing

Construction of the permanent houses at Page, Arizona, was completed in April 1959. The total recorded costs of the 200 houses at June 30, 1959, were \$3,578,822, an average cost of \$17,894 a house. The total costs consisted of \$3,188,791 for furnishing all materials and performing all work required for constructing the houses and \$390,031 for costs, such as investigations, engineering service facilities and labor by the Government. The costs of the houses, less depreciation, will be transferred to "general property" when the storage unit is completed.

The costs of the houses do not include the costs for constructing access roads, streets, sewer mains and water mains for Page, Arizona. These latter items, which include costs for grading the residential sites and installing sidewalks for the residences, are estimated by the Bureau to cost \$2,335,000. The contract cost for general grading at Page, Arizona, was \$230,018, and the cost of concrete for the sidewalks, curbs, and gutters was \$196,907. This site improvement work also involves lands to be used for the project administrative area and private residential and commercial development. The portion of the costs directly applicable to the 200 residences is not shown in the records.

The permanent houses at Page, Arizona, which will be used by project operation and maintenance personnel as well as construction employees, are 3-bedroom, one-story masonry-block constructed on concrete slabs. One hundred houses have attached garages and 100 have carports. The houses have central heat and air conditioning. Over-all dimensions are 30 feet 8 inches by 63 feet 8 inches including the garage or carport. The exterior block is painted in selected colors to relieve the monotony of the design. The lots average about 85 feet by 110 feet. The water supply and sewage systems have been completed.

Flaming Gorge

<u>Feature</u>	<u>Total estimated cost</u>	<u>Cost to June 30, 1959</u>	<u>Dollar percent complete</u>
Dam	\$34,850,000	\$2,743,481	8
Reservoir	5,396,000	365,960	7
Access road (permanent)	3,310,000	1,079,433	33
Power plant	14,652,000	1,631,663	11
Switchyard	5,480,000	109,617	2
General property	2,903,000	715,278	25
Total	<u>\$66,591,000^a</u>	<u>\$6,645,432^b</u>	<u>10</u>
Construction service facilities (at acquisition cost)	<u>\$ 5,000,000^c</u>	<u>\$4,146,847</u>	<u>83</u>

^aExcludes recreational facility costs of \$1,222,000 and interest during construction.

^bExclusive of interest during construction, amounting to \$147,550 at June 30, 1959.

^cTotal estimated cost for construction facilities of \$5,000,000 includes costs of \$2,903,000 to be capitalized as general property and \$2,097,000 of construction service facilities to be disposed of when construction is completed.

At June 30, 1959, about 10 percent of the work under the prime contract was completed. Completed work included the excavation of the diversion tunnel, excavation of the power plant service road, and clearing the switchyard area. Work in progress included the concrete lining of the diversion tunnel, the excavating and surfacing of the access road from Dutch John, Utah, to the dam, and the excavating of the switchyard service road and the visitors' parking area.

Flaming Gorge housing

At June 30, 1959, construction of family residences at Dutch John, Utah, was complete. The contract cost of the 50 houses was \$957,470, of which \$650,000 was for 30 permanent houses and \$306,570 was for 20 temporary houses. The costs of the houses are recorded as a part of the construction service facilities. Contract costs of the various types of houses are as follows:

	<u>Type</u>	<u>Number of bed-rooms</u>	<u>Number of houses</u>	<u>Contract cost</u>	
				<u>Each</u>	<u>Total</u>
<u>Permanent houses</u>					
	57P-1	3	16	\$22,000	\$352,000
	57P-2	3	<u>14</u>	<u>21,350</u>	<u>298,900</u>
<u>Total permanent houses</u>			<u>30</u>		<u>\$650,900</u>
<u>Temporary houses</u>					
	57T-1	2	5	14,530 ^a	\$ 72,650
	57T-2	3	<u>15</u>	15,575 ^a	<u>233,920</u>
<u>Total temporary houses</u>			<u>20</u>		<u>\$306,570</u>

^a Average. Cost of 2-bedroom houses ranges from \$14,420 to \$14,680 and of 3-bedroom houses ranges from \$15,480 to \$15,700. Differences in cost are due to variation in exterior materials.

The above amounts are for furnishing all materials and performing all work required for constructing the houses. The following items, excluded from the housing costs, were included in the costs of the streets and utilities:

- General grading of building site
- Concrete driveways and sidewalks
- Excavations and backfills for house foundations
- Water and sewer lines from the houses to the water and sewer mains

While the costs of the above items applicable to the houses have not been identified in the records, the following contract costs of some larger items indicate the magnitude of these costs:

	<u>Contract costs</u>
General excavation for the community	\$175,887
Concrete in driveways, sidewalks, curbs and gutters	99,281
Excavating and backfills about structures	39,715

The permanent houses at Dutch John, Utah, are 3-bedroom, brick veneer 1-story dwellings without basements. Each house has an attached garage and a porch and storage room on the rear of the house. Over-all dimensions of the houses, including the garages, are about 60 feet by 30 feet. Lots average about 85 feet by 110 feet.

The temporary houses are frame constructed 1-story dwellings without basements. Five are 2-bedroom dwellings, and 15 are 3-bedroom dwellings. Each house has an attached garage and a porch and storage room on the rear of the house. Over-all dimensions of the 2-bedroom houses are 44 feet by 26 feet, and for the 3-bedroom temporary houses the over-all dimensions, including the garage, are 48 feet by 28-2/3 feet. The building lots are similar in size to those of the permanent houses.

Navajo

<u>Feature</u>	<u>Total estimated cost</u>	<u>Cost to June 30, 1959</u>	<u>Dollar percent complete</u>
Dam	\$34,971,000	\$8,071,872	23
Reservoir	<u>7,401,000</u>	<u>1,047,804</u>	<u>14</u>
Total	<u>\$42,372,000^a</u>	<u>\$9,119,676</u>	<u>22</u>
Construction service facilities (at acquisition cost)	<u>\$ 770,000^b</u>	<u>\$ 554,287</u>	<u>72</u>

^aExcludes recreation facilities costs of \$834,000.

^bIncludes costs of \$706,000 to be capitalized as general property or plant in service.

At June 30, 1959, 30 percent of the prime contract had been completed. Drilling of the main and auxiliary outlet works tunnels was completed and concrete lining operations were underway. Over five million cubic yards of fill had been placed in the dam embankment. Diversion of the San Juan River is scheduled for October 1959.

Service facilities, consisting of 15 temporary dwellings, utilities, streets, and access road, are substantially complete.

Transmission Division

<u>Feature</u>	<u>Total estimated cost</u>	<u>Cost to June 30, 1959</u>	<u>Dollar percent complete</u>
Glen Canyon--Flaming Gorge transmission lines and interconnecting facilities	\$ 41,800,000	\$122,059	-
Future transmission lines and substations	112,745,000	329,229	-
General property	<u>3,000,000</u>	<u>-</u>	<u>-</u>
Total	<u>\$157,545,000^a</u>	<u>\$451,288^b</u>	<u>Less than 1</u>
Construction facilities (at acquisition cost)	<u>\$ 3,990,000</u>	<u>\$ 14,615</u>	<u>Less than 1</u>

^aExcludes interest during construction.

^bExcludes interest during construction amounting to \$6,939 at June 30, 1959.

The above costs represent all expenditures for the Transmission Division at June 30, 1959, and consist of costs for general investigations and general expense.

Participating projects

At June 30, 1959, construction had started on the Paonia and Central Utah (Vernal Unit) participating projects. Recorded construction costs amounted to \$1,564,206 for Paonia and \$1,074,970 for the Vernal Unit of the Central Utah Project.

COLLBRAN PROJECT, COLORADO

SIGNIFICANT CHANGES IN PROJECT PLANS HAVE OCCURRED SINCE AUTHORIZATION

The Collbran Project was authorized by the act of July 3, 1952 (66 Stat. 325). The authorizing act directed the Secretary of the Interior to construct the Collbran Project substantially in accordance with the plans set forth in a Bureau of Reclamation report, approved by the Secretary of Interior May 9, 1950 (H. Doc. 216, 82nd Cong., 1st sess.). These plans provided that:

1. The irrigation features of the project would consist of Vega Dam and Reservoir on Plateau Creek with a storage capacity of 30,000 acre-feet, the Leon Creek-Park Creek feeder canal to divert flows of these two creeks into the reservoir, and the Southside canal extending 30 miles from the reservoir to project lands to furnish a supplemental water supply for 18,340 acres now inadequately irrigated and a full irrigation supply for 2,310 acres of new irrigated land.
2. The industrial, municipal, and domestic water-supply features include Bonham Reservoir on Big Creek enlarged to a storage capacity of 6,300 acre-feet, together with eight natural lakes in the headwaters of Big and Cottonwood Creeks with an aggregate storage capacity of 3,830 acre-feet, two feeder canals to divert flows into the reservoirs, and a pipeline approximately 44 miles long with a minimum capacity of 20 second-feet to convey water from the reservoirs to an equalizing reservoir near Grand Junction to be built by potential water users.
3. Hydroelectric power would be generated by the 20-second-foot pipeline flow at two power plants, one located about 3-1/2 miles from Molina, Colorado, with an installed generating capacity of 5,000 kilowatts, and one near Cameo, Colorado, of 2,400-kilowatt capacity. These two power plants would produce approximately 51,600,000 kilowatt-hours of firm power and 6,670,000 kilowatt-hours of non-firm power annually.

In January 1955, the city of Grand Junction, Colorado, notified the Bureau of its withdrawal from the project and its intention to obtain municipal water from another source. Because of this action, the Bureau prepared a revised definite plan report, dated November 1955, which describes the project as it is now intended to be built. The principal differences between the revised plan and the authorized plan are the elimination of the municipal water supply features, the relocation of Cameo power plant to a new site, and an increase in total installed generating capacity of the proposed power plants from 7,400 kw to 13,500 kw. The

Department of the Interior advised us on August 25, 1959, that the power capacity increase was made to take advantage of flexibility in water operations realized through no longer being required to maintain water releases patterned for municipal and industrial purposes.

Construction of the Collbran Project under the revised plan was begun in fiscal year 1957 and construction work in progress at June 30, 1959, amounted to \$4,560,353.

A comparison of the tentative cost allocations to purposes at the date of authorization and at September 3, 1959, follows:

<u>Allocation to purposes</u>	<u>At date of authorization</u>	<u>Percent of total</u>	<u>At September 3, 1959</u>	<u>Percent of total</u>
Reimbursable costs:				
Irrigation	\$ 4,792,000	29.8	\$ 6,050,000	36.8
Municipal water	3,747,000	23.3	-	-
Power	<u>7,290,000</u>	<u>45.3</u>	<u>10,164,000</u>	<u>61.9</u>
Total	<u>15,829,000</u>	<u>98.4</u>	<u>16,214,000</u>	<u>98.7</u>
Nonreimbursable costs:				
Fish and Wildlife	257,000	1.6	62,000	.4
U.S. Forest Service contributions	-	-	42,000	.3
General investigations	-	-	<u>104,000</u>	<u>.6</u>
Total	<u>257,000</u>	<u>1.6</u>	<u>208,000</u>	<u>1.3</u>
Total estimated project costs	<u>\$16,086,000</u>	<u>100.0</u>	<u>\$16,422,000^a</u>	<u>100.0</u>

^aIncludes interest during construction of \$432,000.

The revised project plans were considered by the Bureau to be within the scope of the original congressional authorization, therefore the Bureau did not deem it necessary to obtain additional congressional authorization to construct the project.

We believe that the Bureau's revised plans for construction of the Collbran Project represent a significant change from the plans as authorized by the Congress and that submission of the revised plans to the Congress for approval prior to start of construction would have been desirable.

REPAYMENT OF CONSTRUCTION COSTS
ALLOCATED TO REIMBURSABLE PURPOSES

The authorizing act for the Collbran Project did not fix a specific period of years for either the over-all repayment of the project or the repayment of the power investment. The act did limit the repayment period to 50 years exclusive of any development period for irrigation repayment contracts (and 50 years for municipal and industrial water supply contracts).

The Bureau's September 3, 1959, allocation and expected repayment of reimbursable costs are as follows:

	Reimbursable cost <u>allocation</u>	Expected repayment of costs	
		<u>By irrigators</u>	<u>By power</u>
Irrigation	\$ 6,050,000	\$1,070,000	\$ 4,980,000
Power	<u>10,164,000^a</u>	<u>-</u>	<u>10,164,000</u>
Total repayments	<u>\$16,214,000^a</u>	<u>\$1,070,000</u>	<u>\$15,144,000</u>

^aIncludes interest during construction of \$432,000 to be repaid from power revenues.

On May 27, 1957, the Collbran Conservancy District contracted to repay to the United States the sum of \$1,070,000 in 50 annual payments after a development period of 3 years.

Net revenues derived from the sale of commercial power will be applied first to the amortization, with interest at 3 percent per annum, of construction costs allocated to power and thereafter will be applied to amortization of that portion of the costs allocated to irrigation which are beyond the ability of the irrigation water users to pay within the 50-year contract period.

Under the Bureau's repayment concept, power revenues will repay approximately 93 percent of the total reimbursable construction costs of the project, including 82 percent of the costs tentatively allocated to irrigation at September 3, 1959.

Unusually long period required for repayment
of the Government's investment in power

As mentioned above, the authorizing act for the Collbran Project does not fix a specific period for repayment of the Government's investment in power. Authorizing legislation for many other reclamation projects also does not fix a specific repayment period for power. In the absence of specific legislative requirements, the Secretary of the Interior has established a

general administrative policy calling for repayment of the Government's investment in power within 50 years from the date the power facilities are placed in service.

Preliminary Bureau studies show that a rate in excess of 9.3 mills a kwh for firm power generated by the Collbran Project would be required to repay with interest the Government's investment in power within 50 years.

Sixty-one years required to repay power investment
if firm power can be sold for 8.8 mills a kwh

No contracts for the sale of Collbran power had been executed at August 31, 1959. However, in preliminary contacts with potential power customers, the Bureau has discussed the possibility of selling firm power at a rate of about 8.8 mills a kwh. This rate is based on the Bureau's September 1956 estimate of the selling price for firm power.

Preliminary Bureau studies show that, with a rate of 8.8 mills a kwh for firm power, it would take 61 years to repay, with interest, the Government's investment in power. The studies also show that it would take 14 years after power had been repaid, or a total of 75 years, to repay irrigation construction costs which are beyond the water users' ability to repay within their 50-year contract period.

Sale of firm power at 8.8 mills a kwh
for an extended period of time seems unlikely
in view of future availability of lower cost power

The Bureau has received letters from several potential power customers interested in buying various portions of the project's firm power generation. With the exception of one letter containing an expression of willingness to buy 6,500 kw of firm power for 15 years, the letters from potential customers do not specify the period during which they are interested in buying firm power at 8.8 mills a kwh. Based on the expressions of intent in these letters, it appears that during the initial years of operation the Bureau may be able to sell the firm power generation for about 8.8 mills a kwh. However, it seems unlikely that sales at this rate can be made for an extended period of time because, within a few years after completion of the Collbran Project, firm power at an estimated rate of 6.0 mills a kwh from the Bureau's Colorado River Storage Project is expected to be available in the Collbran power-marketing area.

If, because of competition from the Colorado River Storage Project, the Bureau finds it necessary to sell firm power at less than 8.8 mills a kwh, the period required for repayment of the power investment could be substantially longer than the 61-year period mentioned previously. In such event, the repayment period

for the irrigation construction costs would also be substantially longer.

Pertinent to this matter is the following excerpt from the April 17, 1959, testimony of the Associate Commissioner of Reclamation at congressional hearings on the Bureau's fiscal year 1960 appropriations requests.¹

"We recognize *** that when the Colorado storage project is completed and we have an interconnection between Curecanti - which is authorized subject to a finding of feasibility - and Flaming Gorge, and Glen Canyon - when the distribution lines are in and that power becomes available, we recognize the Collbran project with 8.8 mills power will be an island of high cost power and I predict at that time there will be demands to incorporate the Collbran project into the Colorado Storage Project in order to absorb some of these costs into the Colorado Storage Project." (Underscoring supplied.)

POSSIBLE INTEGRATION OF POWER OPERATIONS WITH OTHER BUREAU PROJECTS

The Bureau anticipates that power operations of the Collbran Project will be coordinated with power operations of the Colorado-Big Thompson Project which is included in the Missouri River basin power system. The Bureau also recognizes that integration of the Collbran Project with the Colorado River Storage Project may become desirable at the time power becomes available from the Storage Project. Financial integration of the Collbran Project with another Bureau power system could well result in financial assistance to the Collbran Project. However, the Congress has not authorized financial integration of the Collbran Project with other Bureau projects.

¹ Page 276 of published hearings before the Subcommittee of the Committee on Appropriations, House of Representatives, Eighty-sixth Congress, first session, on the Public Works Appropriations for 1960.

OTHER INDIVIDUALLY AUTHORIZED PROJECTS

Prior to the authorization of the Colorado River Storage Project and participating projects, the Bureau had been authorized to construct 11 projects in the upper Colorado River basin. The Collbran Project, discussed on pages 28 to 32 of this report, and the Paonia Project, reauthorized as a participating project under the Colorado River Storage Project Act, are excluded from this section of the report. The remaining 9 projects are as follows:

<u>Project and state</u>	<u>Authorization</u>
Completed projects:	
Uncompahgre, Colorado: Diversion tunnel	Secretary of the Interior March 14, 1903
Project rehabilitation and construction Strawberry Valley, Utah	Approved by the President November 6, 1935
Grand Valley, Colorado	Secretary of the Interior December 15, 1905
Moon Lake, Utah	Approved by the President January 5, 1911
Pine River, Colorado	Approved by the President November 6, 1935
Fruitgrowers Dam, Colorado	Approved by the President June 17, 1937
Mancos, Colorado	Approved by the President January 11, 1938
Scofield, Utah	Approved by the President October 24, 1940
Project under construction:	
Eden, Wyoming	Approved by the President June 24, 1943
	Approved by the President September 18, 1940

The Eden Project, Wyoming, was approved for construction by the President of the United States on September 18, 1940, under the water conservation and utility provision of the Interior Department Appropriation Act of 1940 (53 Stat. 685) and was later placed under the Water Conservation and Utilization Program (53 Stat. 1418). The Bureau was designated as the construction agency and the Department of Agriculture was made responsible for land development, operation and maintenance, and the collection of reimbursable costs.

Construction was begun on July 30, 1941, with Civilian Conservation Corps labor. Work was 16 percent completed on the Big Sandy Dam when construction was halted by the War Production Board in December 1942. Construction was not resumed after World War II because of greatly increased construction costs and other changed conditions.

Completion of the Eden Project was authorized by the act of June 28, 1949 (63 Stat. 277). This act provides for "*** such modification in the physical features as the Secretary of the Interior may find will result in greater engineering and economic feasibility ***." The responsibilities for operation and maintenance and collection of reimbursable costs previously assigned to the Department of Agriculture were transferred to the Bureau.

The Bureau's most recent cost estimate of the Eden Project amounts to \$8,184,689 at August 28, 1959, of which \$1,500,000 is to be repaid by the water users.

The Act of June 28, 1949, provides "*** that construction costs of the irrigation features of the project which are not hereby made reimbursable by the water users shall be set aside in a special account against which net revenues derived from the sale of power generated at the hydroelectric plants of the Colorado River Storage Project in the Upper Basin shall be charged when such plants are constructed ***." Repayment of such construction costs from power revenues is specifically provided for in the Colorado River Storage Project Act.

WATER SERVICE PLANT CONSTRUCTION AND OPERATION

Construction of irrigation facilities of other individually authorized projects in the upper Colorado River basin is substantially completed, except for the Eden Project. Existing facilities consist primarily of dams and reservoirs, diversion dams, distribution canals, and the necessary laterals and drains.

The cost of the irrigation plant in service at June 30, 1959, is as follows:

<u>Project</u>	<u>Total</u>	<u>Plant in service</u>		<u>Cost of facilities abandoned</u>
		<u>Operated by the Bureau</u>	<u>Operated by water users</u>	
Eden	\$ 7,053,908	\$ 7,053,908	\$ -	\$ -
Pine River	3,466,830	3,466,827	-	3
Moon Lake	1,799,859	-	1,799,859	-
Mancos	3,915,061	3,913,966	-	1,095
Fruitgrowers Dam	200,309	-	200,309	-
Strawberry Valley	3,332,530	-	3,264,327	68,203
Uncompahgre	8,965,960	-	8,965,960	-
Grand Valley	<u>5,781,100</u>	<u>-</u>	<u>5,525,700</u>	<u>255,400</u>
Total	<u>\$34,515,557</u>	<u>\$14,434,701</u>	<u>\$19,756,155</u>	<u>\$324,701</u>

At June 30, 1959, costs of construction work in progress at the Eden and the Grand Valley Projects totaled \$707,936 (new construction) and \$217,288 (rehabilitation), respectively.

The Bureau did not engage in water service operations during fiscal year 1959, except for certain operation and maintenance activities financed by advances of funds from water users. The results from water service operations for the account of water users for fiscal year 1959 are shown in schedule 3, on page 56 of this report. Comments on these operations follow.

WATER SERVICE OPERATIONS FOR THE ACCOUNT OF WATER USERS

The policy of the Bureau is to encourage water users' organizations to operate completed facilities and to transfer the responsibility for operation and maintenance to the water users' organizations. In fiscal year 1959, the Bureau operated and maintained the Mancos, Pine River, and Eden Projects for the account of water users.

The Mancos Project was completed in 1950. Operation and maintenance of the project have been performed by the Bureau on a reimbursable basis since January 1, 1951. The contract between the Government and the Mancos Water Conservancy District provides that the United States will operate and maintain the project as long as deemed necessary by the Secretary of the Interior. The Bureau has experienced operational difficulties with the project works due primarily to water seepage and landslides along portions of the inlet canal. Because of these operational problems, the Mancos Water Conservancy District has refused to accept responsibility for the operation and maintenance of the project. We were advised that the Bureau is controlling the use of water to reduce seepage and has placed concrete covers on portions of the canal where slides have occurred.

The Pine River Project was completed in 1941. Operation and maintenance of the project have been performed by the Bureau on a reimbursable basis. The contract with the Pine River Irrigation District provides that the District will take over the operation and maintenance after notice from the Secretary of the Interior.

The Pine River Project provides irrigation water for project lands in both Indian and non-Indian ownership, and some river regulation is accomplished by means of the Vallecito Dam and Reservoir. Principally because of a possible conflict in interests between the Indian and non-Indian irrigators and because certain project works are used for river regulation, Bureau officials believe that the present arrangement is in the best interests of the United States.

The Eden Project, Wyoming, is under construction and the Bureau is performing the operation and maintenance of completed works under an interim contract with the water users.

At June 30, 1959, no balances were due from water users for operations; balances due to the water users amounted to \$28,535, as follows:

<u>Project</u>	<u>Operating surplus due to water users</u>
Eden	\$17,392
Pine River	3,823
Mancos	<u>7,320</u>
Total	<u>\$28,535</u>

Results of water operations for the account of water users for fiscal year 1959 and cumulative to June 30, 1959, are shown in schedule 3, page 56.

REPAYMENT OF FEDERAL INVESTMENT IN IRRIGATION

The probable repayment of construction costs of other individually authorized projects in the upper Colorado River basin is as follows:

Project	Estimated total construction costs	Costs not recoverable	Other cost credits	Reimbursable construction costs allocated to irrigation	Other reimbursable costs	Total reimbursable costs	Repayable from	
							Contracts for repayment of costs	Sale of water and other revenues
Eden	\$ 8,129,496	\$ -	\$ 18,194	\$ 8,111,302	\$ 55,193	\$ 8,166,495	\$ 1,500,000	\$6,666,495 ^a
Pine River	3,466,830	1,945,507	-	1,521,323	-	1,521,323	1,495,785	25,538
Moon Lake	1,799,859	200,500	8,093	1,591,266	-	1,591,266	1,591,266	-
Mancos	3,915,061	3,029,177	10	885,874	-	885,874	884,037	1,837
Fruitgrowers Dam	200,309	-	-	200,309	-	200,309	197,809	2,500
Strawberry Valley	3,485,419	-	4,179	3,481,240	9,216	3,490,456	3,240,450	250,006
Uncompangre	8,965,959	2,878,139	-	6,087,820	-	6,087,820	6,062,219	25,601
Grand Valley (note b)	6,243,070	2,130,726	211,300	3,901,044	53,274	3,954,318	3,897,081	57,237
Scofield	<u>943,837</u>	<u>691,081</u>	<u>6,015</u>	<u>246,741</u> ^c	<u>-</u>	<u>246,741</u>	<u>245,634</u>	<u>1,107</u>
Total	<u>\$37,149,840</u>	<u>\$10,875,130</u>	<u>\$247,791</u>	<u>\$26,026,919</u> ^c	<u>\$117,683</u>	<u>\$26,144,602</u>	<u>\$19,114,281</u>	<u>\$7,030,321</u> ^a

^aRepayment of \$6,665,320 is planned to be made from power revenues of the Colorado River Storage Project.

^bExcludes costs totaling \$1,268,176 relating to reconstruction of works owned by the water users. Repayment is being made under contract. The unrepaid amount of \$594,284 is recorded in the accounts as deferred and unmatured receivables.

^cIncludes \$31,000 reimbursable allocation to fish and wildlife which was fully repaid by the Utah Fish and Game Commission at June 30, 1959.

Costs not recoverable consist of \$491,800 of costs incurred by Civilian Conservation Corps forces, \$3,327,258 of costs in excess of water users' ability to repay in accordance with the Water Conservation and Utilization Act (54 Stat. 1119), \$4,717,565 representing charge-offs authorized by the Congress pursuant to the act of May 25, 1926 (44 Stat. 636, 637, 646), and \$2,338,507 representing nonreimbursable allocations to flood control.

Other cost credits consist of contributions totaling \$223,583 and investigation costs financed from the Colorado River Development Fund totaling \$24,208.

Other reimbursable costs consist of transitional development costs totaling \$71,827 and investigation costs of abandoned works totaling \$45,856.

As shown above, the Bureau anticipates repayment of reimbursable costs totaling \$19,114,281 to be made under repayment contracts. The status of repayment contracts at June 30, 1959, is as follows:

Project	Amount of contracts		Total	Matured installments	Unmatured installments
	Construction and related costs	Other funded charges (note a)			
Edeq	\$ 1,500,000	\$ -	\$ 1,500,000	\$ -	\$ 1,500,000
Pine River	1,495,785	4,215	1,500,000	400,020	1,099,980
Moon Lake	1,591,266	1,002	1,592,268	636,907	955,361
Mancos	884,037	15,963	900,000	75,000	825,000
Fruitgrowers Dam	197,809	432	198,241	72,791	125,450
Strawberry Valley	3,240,450	108,974	3,349,424	2,822,048	527,376
Uncompahgre	6,062,219	830,293	6,892,512	1,389,019	5,503,493
Grand Valley	3,897,081	185,561	4,082,642	996,630	3,086,012
Scofield	245,634	1,366	247,000	95,800	151,200
Total	<u>\$19,114,281</u>	<u>\$1,147,806</u>	<u>\$20,262,087</u>	<u>\$6,488,215</u>	<u>\$13,773,872</u>

^aOther funded charges consist of operation and maintenance costs, property transfers and interest and penalty charges totaling \$1,103,242, and excess of repayment contracts over reimbursable construction costs totaling \$44,564. The repayment contracts will be adjusted for the latter amount when final repayment obligation of the water users has been determined by the Bureau.

GENERAL INVESTIGATION AND ADVANCE PLANNING PROGRAMS

PLANNING ACTIVITIES OF THE BUREAU OF RECLAMATION

The Reclamation Act of 1902 (43 U.S.C. 391) authorized and directed the Secretary of the Interior:

*** to make examinations and surveys for, and to locate
*** irrigation works for the storage, diversion, and de-
velopment of waters, including artesian wells ***."

Under this legislation, examinations and surveys of proposed projects were carried out to determine their practicability.

The Reclamation Project Act of 1939 (43 U.S.C. 485) provided also for findings on the engineering feasibility of proposed projects. To comply with this requirement, the Bureau makes extensive studies of land uses and productivity, projected agricultural demands, drainage requirements, and similar factors prior to requesting authorization and initiating construction of a project.

The program of the Bureau includes three types of investigations, as follows:

1. Engineering, economic, and financial investigations of proposed Federal reclamation projects and studies of water conservation and development plans.
2. Formulation of plans and preparation of designs and specifications for authorized Federal reclamation projects prior to initial allocation of appropriations for construction of such projects.
3. Activities preliminary to reconstruction, rehabilitation and betterment, and financial adjustment or extension of existing projects.

INVESTIGATIONS BY THE BUREAU OF RECLAMATION IN THE UPPER COLORADO RIVER BASIN

Investigations of means to develop the waters of the upper Colorado River system were started by the Bureau in 1902, the year of the Bureau's organization. Within 3 years, two major projects in the upper basin--Uncompahgre in Colorado and Strawberry Valley in Utah--were authorized for construction. A few years later, the Grand Valley Project in Colorado was authorized. No further significant action was then taken until 1928 when the Congress, recognizing the need for further development, wrote into the Boulder Canyon Project Act (43 U.S.C. 617n) a directive to the Secretary of the Interior to make investigations and publish reports on the feasibility of projects for irrigation, power, and other multiple uses for the purpose of formulating a comprehensive plan of control and the improvement and utilization of the water of the

Colorado River and its tributaries. In accordance with the congressional mandate, work was undertaken after 1928 on land classification in the upper drainage basin, water supply studies of the tributary streams, and the location and investigation of reservoir and canal sites. Prior to completion of these studies, a few projects were selected for construction. These basin-wide studies, retarded by the war, were reported to the Congress in a publication of March 1946, entitled "The Colorado River" which was printed as House Document 419 (80th Cong., 1st sess.). The report included a description of the basin and its natural resources, needs, and problems. It described present and potential developments in the basin.

Cooperating with the Bureau in the basin-wide investigations and contributing to the 1946 report were other agencies of the Department of the Interior, the Forest Service of the Department of Agriculture, and the Federal Power Commission.

Since 1946 investigations have been made to determine the most attractive plan for providing river regulation, sediment retention, power production, and other benefits on the Colorado River and its major tributaries within the upper Colorado River basin. These investigations were carried out in sufficient detail to establish an over-all plan and to determine engineering and economic feasibility. A report on these studies was presented in House Document 364 (83d Cong., 2d sess.), March 1954.

This report was prepared by the Department of the Interior and assembled under the sponsorship of the Bureau of Reclamation. Important contributions to the report were made by the Upper Colorado River Compact Commission and States of the upper Colorado River basin. Information was obtained also from the Federal Power Commission and other Federal agencies.

Under Bureau accounting procedures, generally investigation costs applicable to authorized projects are ultimately recorded in the accounts maintained for such projects. Within the project accounts, investigative costs are usually transferred to construction accounts after money has been allotted for physical construction of the project or units thereof.

Investigation costs not applicable to authorized projects are recorded in the general (nonproject) accounts of the Bureau pending authorization of the projects involved.

The total amount expended by the Bureau for investigations in the upper Colorado River basin is not readily available. However, at June 30, 1959, investigation costs of \$10,838,853 recorded in the Bureau's general accounts had not been transferred to the project accounts. In addition, investigative costs of \$5,209,959 recorded in project accounts are shown in the statement of assets and liabilities (schedule 1) under the heading "Examinations and Surveys, Including Advance Planning" because the costs had not been transferred to construction and other accounts. Hereinafter these two items which total \$16,048,812 are referred to as undistributed costs.

The total undistributed investigative costs and fiscal year 1959 costs are summarized as follows:

	Number of units	Fiscal year 1959 costs	Total undistributed costs at June 30, 1959	Amounts in project accounts, shown in schedule 1
Colorado River Storage Project and participating projects:				
Under construction:				
Storage units	3	\$ -	\$ 44,048	\$ -
Participating projects	2	348,693	2,130,396	1,820,062
Transmission Division	1	-	-	-
	<u>6</u>	<u>348,693</u>	<u>2,174,444</u>	<u>1,820,062</u>
Initial construction scheduled for fiscal years 1960-65:				
Storage unit	1	134,229	517,488	517,488
Participating projects	5	362,442	2,144,833	2,144,833
	<u>6</u>	<u>496,671</u>	<u>2,662,321</u>	<u>2,662,321</u>
Other units or projects:				
Participating projects--construction after 1965	3	143,082	438,199	438,199
Participating project--not scheduled for construction	1	5,892	243,521	243,521
Other potential units, projects and basin investigations	49	725,694	10,363,498	-
	<u>53</u>	<u>874,668</u>	<u>11,045,218</u>	<u>681,720</u>
Total, Colorado River Storage Project and participating projects	<u>65</u>	<u>1,720,032</u>	<u>15,881,983</u>	<u>5,164,103</u>
Individually authorized projects:				
General investigations	4	-	120,973	-
Investigations of abandoned or unprogramed works	2	-	45,856	45,856
Total, individually authorized projects	<u>6</u>	<u>-</u>	<u>166,829</u>	<u>45,856</u>
Total	<u>71</u>	<u>\$1,720,032</u>	<u>\$16,048,812^a</u>	<u>\$5,209,959</u>

^aIncludes \$6,082,251 of costs financed from the Colorado River Development Fund classified as nonreimbursable expenses.

Reimbursability of investigation costs

Under reclamation laws, generally, investigation costs which are applicable to authorized projects are considered by the Bureau as reimbursable costs to be recovered from project beneficiaries, whereas investigation costs not applicable to authorized projects are considered as nonreimbursable expenses. A major exception to this general rule is found in the treatment of investigation costs financed by the Colorado River Development Fund. Under the Bureau's concept, all costs financed by this fund are treated as nonreimbursable expenses for repayment purposes even though certain costs are applicable to authorized projects and are transferred to such projects for recording purposes. A more detailed discussion of the activities financed from the Colorado River Development Fund is contained on pages 44 through 46 of this report.

Investigations in fiscal year 1959

In fiscal year 1959 investigation costs of \$1,720,032 were incurred in the upper Colorado River basin. Of this amount, all but \$66,494 applied to projects authorized for construction or for special consideration by the Colorado River Storage Project Act. The following schedule shows the costs for fiscal years 1958 and 1959 by projects and the cumulative undistributed costs of such projects at June 30, 1959.

	Fiscal year 1958 <u>costs</u>	Fiscal year 1959 <u>costs</u>	Undistributed investigative costs at <u>June 30, 1959</u>
Storage Project:			
Flaming Gorge Unit	\$ 39,645	\$ -	\$ -
Curecanti Unit	<u>89,619</u>	<u>134,229</u>	<u>517,489</u>
	<u>129,264</u>	<u>134,229</u>	<u>517,489</u>
Participating projects:			
Central Utah	236,874	348,692	1,801,268
Seedskadee	292,937	140,878	1,144,690
Florida	93,729	103,326	296,053
Lyman	11,076	96,812	220,555
Emery County	21,574	69,965	133,546
Silt	54,846	54,470	194,234
LaBarge	6,043	18,648	110,419
Smith Fork	65,924	17,102	199,922
Pine River Extension	82,559	5,892	243,521
Hammond	101,128	4,324	283,612
Paonia	<u>57,707</u>	<u>-</u>	<u>18,794</u>
	<u>1,024,397</u>	<u>860,109</u>	<u>4,646,614</u>
Projects requiring priority for completion of planning reports:			
Dolores	99,397	168,988	614,708
West Divide	48,176	125,435	305,469
Animas-LaPlata	82,178	118,626	589,183
Dallas Creek	-	79,008	111,798
Fruitland Mesa	50,429	60,529	302,953
San Miguel	-	36,624	245,879
Bostwick Park	54,016	24,304	113,207
San Juan-Chama	21,299	18,701	1,122,995
Gooseberry	9,176	6,450	100,277
Savery-Pot Hook	4,678	2,384	292,761
Fruit Growers Extension	<u>246</u>	<u>552</u>	<u>59,021</u>
	<u>369,595</u>	<u>641,601</u>	<u>3,858,251</u>
Basin-type investigations:			
Upper Colorado River basin	<u>9,566</u>	<u>10,727</u>	<u>1,366,166</u>
Other projects in the upper Colorado River basin:			
Buckskin	31,700	50,300	385,993
Pack Creek	22,768	9,651	57,735
Fryingpan-Arkansas	7,317	6,872	1,047,980
Fontenelle	5,180	6,316	13,092
Cedaredge	1,008	-	77,097
Cross Mountain	-	227	37,463
Other projects (3)	<u>51</u>	<u>-</u>	<u>278,805</u>
	<u>68,024</u>	<u>73,366</u>	<u>1,898,165</u>
Total	<u>\$1,600,846</u>	<u>\$1,720,032</u>	<u>\$12,286,685</u>

The Colorado River Storage Project Act provided that construction of the Curecanti Unit of the Storage Project should not be undertaken until the Secretary of the Interior certifies to the Congress and to the President that, in his judgment, the benefits of such a unit will exceed its costs. This certification was to be accompanied by a supplemental report. An economic justification report on the Curecanti Unit dated February 1959 and the required certification were submitted to the President on May 15, 1959, and to the Congress on July 14, 1959. The report covers only the upper two potential units, Blue Mesa and Morrow Point, for which detailed studies were completed.

Although the participating projects listed on the preceding page were authorized for construction by the act of April 11, 1956, a reexamination of these projects was undertaken by the Bureau in accordance with the request of the President made in 1954 prior to the passing of the Colorado River Storage Act. In fiscal year 1959, definite plan reports were prepared on the Seedskadee, Smith Fork, and Hammond participating projects. A special report was prepared recommending deferment of the Pine River Extension participating project.

At June 30, 1959, investigations were in progress on 11 potential participating projects. Feasibility reports are not anticipated until fiscal year 1961 and later.

A report on the potential Pack Creek Project dated February 1959 recommended deferment of the project at that time.

ACTIVITIES FINANCED BY THE
COLORADO RIVER DEVELOPMENT FUND

The Boulder Canyon Project Adjustment Act (43 U.S.C. 618a) provided for the establishment of the Colorado River Development Fund. The act provided also for the transfer of \$500,000 for the year ended May 31, 1938, and \$500,000 for each year of operation thereafter until and including the year ending May 31, 1987, from the Colorado River Dam Fund to the Colorado River Development Fund.

Receipts of the Colorado River Development Fund for the years of operation ended in 1938, 1939, and 1940, were authorized to be appropriated for only the continuation and extension of studies and investigations by the Bureau of Reclamation for the formulation of a comprehensive plan for the utilization of water of the Colorado River system for irrigation, electric power, and other purposes in the upper basin states, consisting of parts of Arizona, Colorado, New Mexico, Utah, and Wyoming, and the lower basin states, consisting of parts of California, Nevada, Arizona, Utah, and New Mexico. Subsequent receipts up to and including the receipts for the year of operation ended in 1955 were authorized to be appropriated for only investigation and construction of projects for such utilization in, and equitably distributed among, the upper basin states excluding Arizona, provided the distribution of such funds for use in fiscal years 1949 to 1955, inclusive, was on a basis which was as nearly equal as practicable. Receipts for fiscal years 1956 to 1987 are authorized to be appropriated for the investigation and construction of projects for such utilization in, and equitably distributed among, the upper and lower basin states. The source and application of funds from inception to June 30, 1959, are summarized as follows:

Source of funds:	
Colorado River Dam Fund	\$10,500,000
Miscellaneous receipts and other sources	<u>11,346</u>
Total, source of funds	<u>\$10,511,346</u>
Application of funds:	
General investigations--undistributed	\$ 7,431,758
General investigations--transferred to projects	2,980,565
Increase in net working assets and other application of funds	<u>99,023</u>
Total, application of funds	<u>\$10,511,346</u>

As shown above, at June 30, 1959, general investigations costs totaled \$10,412,323, consisting of \$7,431,758 of undistributed costs and \$2,980,565 of costs transferred to projects. The distribution between upper and lower basin states and classification of projects are summarized as follows:

<u>Grouping</u>	<u>Total</u>	<u>Upper basin</u>	<u>Lower basin</u>
Intrastate projects	\$ 4,321,089	\$3,713,168	\$ 607,921
Interstate projects	1,296,358	1,139,071	157,287
Over-all basin investigations	1,736,129	1,154,580	581,549
Washington Office costs	<u>78,182</u>	<u>75,432</u>	<u>2,750</u>
Total undistributed costs	7,431,758	6,082,251	1,349,507
Transfers to projects constructed or under construction	<u>2,980,565</u>	<u>2,954,367</u>	<u>26,198</u>
Total general investigations costs cumulative to June 30, 1959	<u>\$10,412,323</u>	<u>\$9,036,618</u>	<u>\$1,375,705</u>

Distribution of cumulative costs between states is as follows:

<u>State</u>	<u>Total</u>	<u>Upper basin</u>	<u>Lower basin</u>
New Mexico	\$ 1,640,726	\$1,623,910	\$ 16,816
Utah	2,198,267	2,016,776	181,491
Colorado	3,642,078	3,642,078	-
Wyoming	1,753,854	1,753,854	-
Arizona	703,660	-	703,660
California	233,702	-	233,702
Nevada	<u>240,036</u>	<u>-</u>	<u>240,036</u>

Total costs to June 30, 1959 \$10,412,323 \$9,036,618 \$1,375,705

The investigations costs in the upper basin are distributed principally among 14 investigations which account for 62.8 percent of the total cost to date and 68.1 percent of the fiscal year 1959 costs as summarized below:

<u>Project</u>	<u>Fiscal year 1959</u>	<u>Cumulative to June 30, 1959</u>
Glen Canyon	\$ -	\$ 628,242
Flaming Gorge	-	87,083
Navajo	-	64,828
Curecanti	-	96,923
Central Utah (initial phase)	-	1,067,730
Seedskadee	-	410,528
Animas-La Plata	110,724	407,533
Dolores	109,519	299,928
Savery-Pot Hook	1,341	236,566
Buckskin	49,266	279,419
Upper basin, general	-	611,327
San Juan-Chama	18,876	574,082
Blue-South Platte	-	589,242
Gunnison-Arkansas	-	<u>315,305</u>
Total	289,726	5,668,736
Remaining studies (51)	<u>135,656</u>	<u>3,367,882</u>
Total costs	<u>\$425,382</u>	<u>\$9,036,618</u>

Investigations costs in the lower basin were incurred primarily on six investigations which account for 81.9 percent of the total costs to date and 88.6 percent of the fiscal year 1959 costs as follows:

<u>Project</u>	<u>Fiscal year 1959</u>	<u>Cumulative to June 30, 1959</u>
Bridge Canyon	\$ 10,455	\$ 307,589
Middle Gila River	83,629	246,329
Lower Colorado River, general	-	186,288
Hurricane Division--Dixie Project	2,162	151,086
Marble Canyon	38,125	125,867
Central Arizona	-	108,944
	<u>134,371</u>	<u>1,126,103</u>
Total		
Remaining studies (29)	<u>17,336</u>	<u>249,602</u>
Total	<u>\$151,707</u>	<u>\$1,375,705</u>

ACCOUNTING AND FINANCIAL POLICY

DEVELOPMENT OF ACCOUNTING SYSTEM

The accounting system used by the Bureau of Reclamation is based on recognized accounting principles with the accounts for power operations generally maintained in accordance with the uniform system of accounts prescribed for public utilities by the Federal Power Commission under the Federal Power Act (16 U.S.C. 825b). This system was developed jointly by representatives of the Office of the Secretary of the Interior, the Bureau of Reclamation, the Bureau of the Budget, the Department of the Treasury, and the General Accounting Office. An interagency committee, composed of representatives from these five offices, undertook in May 1948 to develop an accounting system for the Bureau of Reclamation that would afford financial control by management over operations and would integrate budgeting, programming, accounting, and reporting. A system that encompasses these features was developed and put into effect in July 1950.

The system of the Bureau is based on accrual accounting and distinguishes between capital and revenue expenditures. Capital expenditures are charged to fixed asset accounts, and revenue expenditures are charged to operations. The Bureau prescribes a work-order system for accumulating costs incurred for each kind of project work. Work orders are issued in accordance with approved programs and classified according to the uniform cost classifications.

COST ACCOUNTING PRACTICES

Costs of administrative and other services rendered by other Federal agencies that benefit Bureau activities are not borne by the Bureau when not assignable to projects pursuant to law or administrative policy. These services include rentals and other benefits furnished without charge by General Services Administration and other Federal agencies; death and disability claims on account of Bureau employees paid by the Bureau of Employees' Compensation, Department of Labor; and the amounts applicable to the Bureau's operations of the Government's contribution to the Civil Service Retirement System prior to July 1957.

The costs of the Commissioner's Office, Washington, D.C., and a part of the costs of the Commissioner's Office, Denver, Colorado, and the regional offices of the Bureau of Reclamation are paid from an appropriation to the Bureau for general administrative expenses, and the costs are not distributed to projects. These costs are nonreimbursable under the act of December 5, 1924, as amended (43 U.S.C. 377).

Provisions for accrued annual and sick leave of employees are not included in property costs and operating expenses by the Bureau. The amounts of salaries and wages paid to employees while

on annual or sick leave, however, are charged to property or operating expense accounts.

DEFICIENCIES IN ACCOUNTING FOR INTEREST
DURING CONSTRUCTION

Our review disclosed the following deficiencies in the Bureau's accounting for interest during construction.

Improper computations of interest during construction
on the Colorado River Storage Project
and participating projects

Significant costs have been improperly excluded from the base used by the Bureau to compute interest during construction on the Government's investment in interest-bearing purposes of the Colorado River Storage Project and participating projects.

The authorizing legislation for the construction of the Colorado River Storage Project and participating projects provides that interest during construction be computed on the construction costs allocated to power and municipal water purposes at a rate determined by the Secretary of the Treasury. Accordingly, interest during construction has been computed at a rate of 2.875 percent on the Glen Canyon and Flaming Gorge storage units and the Transmission Division of the Storage Project and of 3.25 percent on the Vernal Unit of the Central Utah participating project.

The Bureau's computations of interest during construction have been made in accordance with instructions issued May 10, 1957, by the Commissioner of Reclamation. These instructions provide that the following costs will be excluded from the base used to compute interest during construction.

1. Significant nonappropriation cost or property transfers.
2. General investigations costs financed from (a) Upper Colorado River Basin Fund, (b) Colorado River Development Fund, and (c) Reclamation Fund.
3. Cost of materials and supplies inventory.
4. Contract costs for fabrication of machinery and equipment prior to availability for use at the site.
5. Unpaid costs--contract holdbacks.
6. Contributions in aid of construction including fund transfers from other governmental agencies.
7. Payments to contractors for erection of special plant and equipment until recovered through reduction of contractors earnings.

8. Cost of construction facilities including general property until depreciation expense is recorded on such assets.

We believe that the exclusion of items 1, 2a, 2c, 3, 4, 7, and 8, above, from the base used for computations of interest during construction is generally improper and precludes reasonable computations of the interest cost on the Government investment in interest-bearing purposes because all of these items have required investment of reimbursable funds by the Government. We did not make a computation of the amount of interest that the Bureau did not record because of these improper exclusions; however, such amount would be substantial both in total and in its relationship to the amount of interest actually recorded by the Bureau. The significance of the amounts improperly excluded from the Bureau's interest computations is indicated by comparing the costs of \$54,274,503 (of which about 91 percent was allocated to interest-bearing purposes) used in the Bureau's fiscal year 1959 computations with the exclusions of \$26,551,479 (before allocation to interest-bearing and non-interest-bearing purposes) which we consider improper. The exclusions of \$26,551,479, which we consider improper, consist of (1) the undepreciated cost of construction service facilities (\$15,096,810), (2) payments to a contractor for a concrete plant (\$4,500,000) and power generating facilities used for construction purposes (\$2,100,000), (3) advances to contractors for materials (\$3,880,161), (4) investigative costs (\$924,473) and, (5) Government-furnished material received but not installed (\$50,035).

Interest during construction not recorded
in accounting records for Collbran Project

Bureau of Reclamation repayment studies for the Collbran Project show interest during construction on the Government's investment in power facilities as a cost to be repaid from power revenues. However, although construction of the project started in the fiscal year 1957, no amounts for interest during construction had been recorded in the accounting records at June 30, 1959.

We believe that full disclosure of the financial position of the project requires the recording of interest during construction in the accounting records.

Recommendation to the Secretary of the Interior

For purposes of obtaining consistency, comparability, and accuracy of financial data on all commercial power and municipal water-supply operations of the Department of the Interior, we recommend that the Secretary of the Interior adopt a policy for recording interest during construction based on the following principles:

1. Simple interest during construction should be computed on the Government's investment in project purposes required

to bear interest by law or administrative policy established pursuant to law. The procedures utilized to compute interest on the Government's investment in interest-bearing purposes should be such that no significant amounts of reimbursable Government investment are excluded from the computations. Also, the computation of interest should begin upon conversion of unexpended funds from cash to construction materials, equipment, supplies, advances, or other forms of resources to be used in project construction.

2. The computed costs of interest during construction on project purposes required to bear interest should be recorded in the project accounting records.

By letter dated August 25, 1959, the Administrative Assistant Secretary of the Interior advised us that these matters are under review by the Department.

SCOPE OF AUDIT

Our audit of the Bureau of Reclamation's water resources development program in the upper Colorado River basin included reviews of activities and selected examinations of financial transactions in the following manner:

1. We reviewed the basic laws authorizing the activities, and the pertinent legislative history, to ascertain the purposes of the activities and their intended scope.
2. We ascertained the policies adopted by the Bureau and reviewed the policies for conformance with basic legislation.
3. We reviewed the procedures followed by employees of the Bureau to determine the effectiveness of the procedures.
4. We did not make a detailed audit, but we examined certain selected transactions for fiscal years 1957-59 to the extent deemed appropriate for the purposes of this report. Our examination was made with due regard for the nature and volume of transactions and the effectiveness of internal control including internal audits. The examination of transactions was conducted at the Salt Lake City, Utah (Region 4), Bureau of Reclamation, regional office. Certain supplemental data relating to the Colorado River Storage Project and participating projects was obtained from the Upper Colorado River Office located at Salt Lake City, Utah, and regional offices located at Denver, Colorado; Amarillo, Texas; and Boulder City, Nevada.

The projects under audit were the Colorado River Storage Project and participating projects and the individually authorized projects located within the basin.

OPINION OF FINANCIAL STATEMENTS

The accompanying statement of assets and liabilities (schedule 1) and related statements of operations (schedules 2 and 3) are based upon the Bureau of Reclamation's accounting records. These financial statements present on a combined basis the assets and liabilities of the Bureau in the upper Colorado River basin, except for certain exclusions noted on page 57 of this report.

In our opinion, the accompanying financial statements present fairly for these projects the financial position at June 30, 1959, and the financial results of operations for the fiscal year then ended, except for the condition set forth in the following paragraph, the full effect of which cannot now be determined.

The amounts recorded as interest during construction are understated on the books of account. Certain costs should not have been excluded from the base used in computing interest during construction for the Colorado River Storage Project. Moreover, interest during construction of the joint- and single-purpose facilities applicable to the power investment in the Collbran Project has not been recorded in the accounts of that project.

FINANCIAL STATEMENTS

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
UPPER COLORADO RIVER BASIN

SCHEDULE 1

STATEMENT OF ASSETS AND LIABILITIES (note 1)
JUNE 30, 1959

A S S E T S		L I A B I L I T I E S		
<p>PLANT, PROPERTY, AND EQUIPMENT: Completed works (note 2) Construction work in progress (note 3) Construction service facilities, less accumulated depreciation of \$1,244,715 (note 4) Total plant, property, and equipment</p>	<p>143,863,755</p>	<p>Colorado River Storage Project and participating projects</p>	<p>Individually authorized projects</p>	<p>Combined</p>
<p>EXAMINATIONS AND SURVEYS, INCLUDING ADVANCE PLANNING (note 5)</p>	<p>5,209,959</p>	<p>1,599,704 85,485,555 15,096,810</p>	<p>102,182,069</p>	<p>41,681,686</p>
<p>CASH AND CURRENT ASSETS: Unexpended funds in U.S. Treasury for construction and operation and maintenance (note 6) Deposit funds (note 7) Accounts receivable Materials and supplies Prepayments and advances to other Government agencies and Bureau offices Total cash and current assets</p>	<p>22,868,397 5,375,909 184,748 123,041 614,457 29,166,552</p>	<p>21,222,060 5,325,632 180,616 107,795 372,075 27,208,178</p>	<p>1,646,337 50,277 4,132 15,246 242,382 1,958,374</p>	<p>1,697,525 71,827 293,149 2,062,527</p>
<p>OTHER DEBITS: Other work in progress Deferred and unamortized receivables (note 8) Transitional development costs (note 9) Other deferred debits Total other debits</p>	<p>26 1,697,525 71,827 293,149 2,062,527</p>	<p>26 - 275,625 275,651</p>	<p>1,697,525 71,827 17,524</p>	<p>1,786,876</p>
<p>Total assets</p>	<p><u>\$180,302,793</u></p>	<p><u>\$134,830,001</u></p>	<p><u>\$45,472,792</u></p>	<p><u>\$180,302,793</u></p>
<p>INVESTMENT OF U.S. GOVERNMENT AND ACCUMULATED EXCESS OF REVENUES OVER DEDUCTIONS: Congressional appropriation (net) (note 10) Cost and property transfers (net) (note 11) Interest on Federal investment (note 12)</p>	<p>174,685,767</p>	<p>167,316,639 5,808,749 1,560,379</p>	<p>118,821,402 4,313,240 1,500,379</p>	<p>48,495,237 1,495,509</p>
<p>Deduct: Charge-offs authorized by the Congress (note 13) Funds returned to the U.S. Treasury (note 14) Nonreimbursable expenses (note 15)</p>	<p>4,717,565 12,716,549 239,945 17,674,059</p>	<p>- 32,405 69,417 101,822</p>	<p>4,717,565 12,684,144 170,528 17,572,237</p>	<p>49,990,746</p>
<p>Net investment of U.S. Government</p>	<p>157,011,708</p>	<p>124,593,199</p>	<p>32,418,509</p>	<p>157,011,708</p>
<p>Accumulated excess of revenues over deductions: According to U.S. Government Pending distribution Total excess of revenues over deductions (schedule 2)</p>	<p>652,629 43,270 695,899</p>	<p>24,235 6,754 30,989</p>	<p>626,394 36,516 664,910</p>	<p>652,629 43,270 695,899</p>
<p>REPAYMENT REALIZED FROM OTHER SOURCES (note 16)</p>	<p>157,707,607</p>	<p>124,624,188</p>	<p>33,083,419</p>	<p>157,707,607</p>
<p>REPAYMENT CONTRACTS--MATURED</p>	<p>338,742</p>	<p>-</p>	<p>338,742</p>	<p>338,742</p>
<p>CURRENT AND ACCRUED LIABILITIES: Accounts payable including accrued payroll and contractors' earnings Other current and accrued liabilities Credit due water users--operating surplus (schedule 3) Total current and accrued liabilities</p>	<p>3,119,789 5,365,010 28,535 8,513,334</p>	<p>2,821,104 5,314,733 - 8,135,837</p>	<p>298,685 50,277 28,535 377,497</p>	<p>3,119,789 5,365,010 28,535 8,513,334</p>
<p>ADVANCE COLLECTIONS AND OTHER DEFERRED CREDITS</p>	<p>336,034</p>	<p>108,585</p>	<p>227,449</p>	<p>336,034</p>
<p>RESERVE FOR REPAYMENT REDUCTIONS AUTHORIZED</p>	<p>4,717,565</p>	<p>-</p>	<p>4,717,565</p>	<p>4,717,565</p>
<p>CONTRIBUTIONS IN AID OF PROJECT DEVELOPMENT AND CONSTRUCTION (note 17)</p>	<p>2,201,297</p>	<p>1,961,391</p>	<p>239,906</p>	<p>2,201,297</p>
<p>Total liabilities and investment of U.S. Government</p>	<p><u>\$180,302,793</u></p>	<p><u>\$134,830,001</u></p>	<p><u>\$45,472,792</u></p>	<p><u>\$180,302,793</u></p>

The explanatory notes and comments on the financial statements on pages 57 through 64 are an integral part of this statement. The opinion of the General Accounting Office on the financial statements appears on page 52.

D E P A R T M E N T O F T H E I N T E R I O R
 BUREAU OF RECLAMATION
 UPPER COLORADO RIVER BASIN

STATEMENT OF NONOPERATING AND MISCELLANEOUS INCOME (NET)
 FOR FISCAL YEAR 1959 AND CUMULATIVE TO JUNE 30, 1959

	<u>Combined</u>	<u>Colorado River Storage Project and partici- pating projects</u>	<u>Individ- ually author- ized projects</u>
FISCAL YEAR INCOME (NET):			
Rental of grazing and farming land	\$ 3,704	\$ 2,839	\$ 865
Rental of water for power	4,204	-	4,204
Rental of buildings and houses	2,000	2,000	-
Rental of land (oil and gas leases)	400	-	400
Sale of timber	242	-	242
Sale of sand and gravel	350	350	-
Boat concessions	163	-	163
Miscellaneous	625	-	625
	<u>11,688</u>	<u>5,189</u>	<u>6,499</u>
Total fiscal year in- come (net)			
PRIOR YEAR INCOME (NET):			
Cumulative to June 30, 1958	712,963	24,358	688,605
Adjustments applicable to prior years	<u>-28,752</u>	<u>1,442</u>	<u>-30,194</u>
Total prior year in- come (net)	<u>684,211</u>	<u>25,800</u>	<u>658,411</u>
Total excess of in- come over deduc- tions--June 30, 1959 (schedule 1)	<u>\$695,899</u>	<u>\$30,989</u>	<u>\$664,910</u>

The accompanying explanatory notes and comments on the financial statements on pages 57 through 64 are an integral part of this statement.

The opinion of the General Accounting Office on the financial statements appears on page 52.

DEPARTMENT OF THE INTERIOR

BUREAU OF RECLAMATION

UPPER COLORADO RIVER BASIN

STATEMENT OF RESULTS OF WATER OPERATIONS

FOR THE ACCOUNT OF WATER USERS

FOR FISCAL YEAR 1959 AND CUMULATIVE TO JUNE 30, 1959

	<u>Com- bined</u>	<u>Eden Proj- ect</u>	<u>Mancos Proj- ect</u>	<u>Pine River Project</u>
FISCAL YEAR 1959 OPERATIONS:				
Revenues:				
Operation and maintenance as- sessments or accruals	\$30,626	\$14,741	\$11,385	\$4,500
Fees from issuance of boat permits	4,182	-	216	3,966
Rental of buildings	858	-	468	390
Miscellaneous	<u>343</u>	<u>-</u>	<u>143</u>	<u>200</u>
Total revenues	<u>36,009</u>	<u>14,741</u>	<u>12,212</u>	<u>9,056</u>
Operation and maintenance expenses:				
Storage system	17,572	640	8,232	8,700
Carriage system	2,041	2,041	-	-
Distribution system	5,528	5,528	-	-
Drainage system	36	36	-	-
General and administrative ex- penses	<u>3,945</u>	<u>2,465</u>	<u>790</u>	<u>690</u>
Total operation and main- tenance expenses	<u>29,122</u>	<u>10,710</u>	<u>9,022</u>	<u>9,390</u>
Net excess of revenues over de- ductions, fiscal year 1959	<u>\$ 6,887</u>	<u>\$ 4,031</u>	<u>\$ 3,190</u>	<u>\$ -334</u>
CUMULATIVE OPERATIONS:				
Net excess of revenues over de- ductions to June 30, 1958	\$21,648	\$13,361	\$ 4,130	\$4,157
Fiscal year 1959	<u>6,887</u>	<u>4,031</u>	<u>3,190</u>	<u>-334</u>
Credit due water users--oper- ating surplus, June 30, 1959 (schedule 1)	<u>\$28,535</u>	<u>\$17,392</u>	<u>\$ 7,320</u>	<u>\$3,823</u>

The accompanying explanatory notes and comments on the financial state-
ments on pages 57 through 64 are an integral part of this statement.

The opinion of the General Accounting Office on the financial state-
ments appears on page 52.

DEPARTMENT OF THE INTERIOR

BUREAU OF RECLAMATION

UPPER COLORADO RIVER BASIN

EXPLANATORY NOTES AND COMMENTS ON THE FINANCIAL STATEMENTS

1. Basis of preparation

The financial statements combine amounts recorded by the Bureau of Reclamation for projects located in the upper Colorado River basin. Projects included in the statements consist of the Colorado River Storage Project and participating projects and 10 individually authorized projects in the upper Colorado River basin. Certain features of projects located outside the upper basin area which divert water from the upper Colorado River basin are excluded. These features consist of diversion tunnels constructed as part of the Sanpete and Provo River Projects, located in central Utah, and the Colorado-Big Thompson Project, located in north-eastern Colorado, which is integrated with the Missouri River basin system.

Financial data for the Colorado River Storage Project includes expenditures to date for the Glen Canyon, Flaming Gorge, and Navajo storage units, the Transmission Division, and the Vernal Unit of the Central Utah and Paonia participating projects.

Financial data for the Curecanti Unit of the Colorado River Storage Project and the other participating projects is being maintained by the Bureau under a single entity entitled "Advance Planning" until such time as construction of these projects is started.

Excluded from this statement are costs of investigations related to projects or units not yet authorized, general administrative expenses, and cost of soil and moisture conservation operations, which, though integral components of river basin development plans, do not affect the financial presentation of power and water operations.

2. Completed works

Completed works are classified on the basis of functional use of the facilities by project as follows:

<u>Project</u>	<u>Total</u>	<u>Multiple- purpose</u>	<u>Irrigation</u>	<u>Electric power</u>	<u>Other physical property</u>
Paonia	\$ 1,599,704	\$ -	\$ 1,599,704	\$ -	\$ -
Eden	7,053,908	-	7,053,908	-	-
Moon Lake	1,799,859	-	1,799,859	-	-
Strawberry Valley	3,485,420	-	3,332,530	91,804	61,086
Scotfield	943,837	943,837	-	-	-
Uncompahgre	8,965,959	-	8,965,959	-	-
Grand Valley Fruitgrowers Dam	5,994,769	-	5,781,100	213,669	-
	200,309	-	200,309	-	-
Pine River	3,466,830	-	3,466,830	-	-
Mancos	3,915,061	-	3,915,061	-	-
Individually authorized projects	<u>35,825,952</u>	<u>943,837</u>	<u>34,515,556</u>	<u>305,473</u>	<u>61,086</u>
Total	<u>\$37,425,656</u>	<u>\$943,837</u>	<u>\$36,115,260</u>	<u>\$305,473</u>	<u>\$61,086</u>

Completed works are generally stated at original cost to the Bureau.

Multiple-purpose plant is plant operated for the benefit of two or more purposes. The Secretary of the Interior allocated the total estimated costs of the Scotfield Project to irrigation, flood control, and fish and wildlife.

3. Construction work in progress

Accumulated costs for construction work in progress of the Colorado River Storage Project and individually authorized projects are classified by the Bureau as follows:

	<u>Total</u>	<u>Construction work in progress</u>	<u>Interest during construction</u>
Colorado River Storage Project and participating projects:			
Glen Canyon	\$66,475,494	\$65,070,450	\$1,405,044
Flaming Gorge	6,792,982	6,645,432	147,550
Navajo	9,119,676	9,119,676	-
Transmission Division	458,227	451,288	6,939
Paonia	1,564,206	1,564,206	-
Central Utah (Verma Unit)	1,074,970	1,074,124	846
	<u>85,485,555</u>	<u>83,925,176</u>	<u>1,560,379</u>
Individually authorized projects:			
Eden	707,936	707,936	-
Collbran	4,560,353	4,560,353	-
Grand Valley (rehabilitation)	217,288	217,288	-
	<u>5,485,577</u>	<u>5,485,577</u>	<u>-</u>
Total	<u>\$90,971,132</u>	<u>\$89,410,753</u>	<u>\$1,560,379</u>

4. Construction service facilities,
less accumulated depreciation

Construction service facilities consist of cranes, trucks, automobiles, warehouses, office buildings, town sites, housing, construction camps, and similar items used in carrying out construction activities.

Depreciation is provided on most of these assets and is distributed to construction work in progress and other cost accounts.

5. Examinations and surveys,
including advance planning

Costs of examinations, surveys, and studies of authorized projects, including formulation of plans, preparation of designs and specifications, and similar activities, are included in this account.

Investigations costs applicable to authorized units or projects which have not been included in construction accounts are as follows:

<u>General investigations</u>	<u>Total</u>	<u>Fund Source</u>			
		<u>Construc- tion and rehabili- tation</u>	<u>Colorado River develop- ment</u>	<u>Upper Colorado River basin</u>	<u>Reclama- tion</u>
Colorado River Storage Project and participat- ing projects:					
Advance planning	\$5,145,309	\$ -	\$1,807,698	\$2,599,346	\$738,265 ^a
Investigations of abandoned works-- Paonia	<u>18,794</u>	<u>18,794^b</u>	<u>-</u>	<u>-</u>	<u>-</u>
	<u>5,164,103</u>	<u>18,794</u>	<u>1,807,698</u>	<u>2,599,346</u>	<u>738,265</u>
Individually authorized projects:					
Investigations of abandoned or unpro- gramed works:					
Eden Project	33,779	33,779	-	-	-
Grand Valley Proj- ect	<u>12,077</u>	<u>12,077</u>	<u>-</u>	<u>-</u>	<u>-</u>
	<u>45,856</u>	<u>45,856</u>	<u>-</u>	<u>-</u>	<u>-</u>
Total	<u>\$5,209,959</u>	<u>\$64,650</u>	<u>\$1,807,698</u>	<u>\$2,599,346</u>	<u>\$738,265</u>

^a Includes contributions of \$54,613 by the State of Utah and \$5,378 by water users.

^b Costs incurred prior to reauthorization by the Colorado River Storage Project Act.

6. Unexpended funds in the United States Treasury for construction and operation and maintenance

Unexpended funds in the United States Treasury are classified as follows:

	<u>Balances</u>	<u>Available for Payment of liabilities Obligation</u>		<u>Not avail-able</u>
Upper Colorado River Basin Fund	\$20,338,353	\$18,808,389	\$1,529,964	\$ -
Operation and main-tenance	35,231	3,630	11,177	20,424
Construction and re-habilitation	<u>2,494,813</u>	<u>2,229,978</u>	<u>264,835</u>	<u>-</u>
Total	<u>\$22,868,397</u>	<u>\$21,041,997</u>	<u>\$1,805,976</u>	<u>\$20,424</u>

7. Deposit funds

The principal items in this account are holdbacks on contracts pertaining to construction of storage units of the Colorado River Storage Project and participating projects, the Collbran Project, and the Eden Project amounting to \$5,325,632, \$43,212, and \$7,065, respectively.

8. Deferred and unmatured receivables

Deferred and unmatured receivables consist of the following items:

Unmatured contract amounts for repayment of costs of reconstructing irrigation works owned by the irrigators of the Grand Valley Project	\$ 594,284
Other charges recoverable under irrigation repayment contracts:	
Operation and maintenance (7 projects)	693,116
Interest and penalties (3 projects)	390,586
Property transfers (4 projects)	<u>19,539</u>
Total	<u>\$1,697,525</u>

9. Transitional development costs

Transitional development costs are classified as follows:

Settlers assistance costs:	
Grand Valley Project	\$41,197
Strawberry Valley Project	<u>9,216</u>
	<u>50,413</u>
Future years capacity provision:	
Eden Project	<u>21,414</u>
Total	<u>\$71,827</u>

Settlers assistance costs represent the expenses of farm unit settlement and development.

Future years capacity provision represents the operation and maintenance costs of project features allocated to lands not presently under irrigation.

10. Congressional appropriations (net)

Congressional appropriations (net) to the Bureau of Reclamation for the upper Colorado River basin for fiscal year 1959 were allotted as follows:

Construction and rehabilitation	\$ 3,813,122
Upper Colorado River Basin Fund	<u>68,033,335</u>
Total (net)	<u>\$71,846,457</u>

Congressional appropriations (net) in the financial statements of the upper Colorado River basin program at June 30, 1959, are classified, as to status, as follows:

<u>Appropriation</u>	<u>Total</u>	<u>Status of funds</u>		
		<u>Unobligated</u>	<u>Unliquidated obligations</u>	<u>Expended (net)</u>
Upper Colorado River Basin Fund	\$116,175,335	\$1,636,770	\$16,940,627	\$ 97,597,938
Bureau of Public Roads	600,000	-	-	600,000
Construction and Rehabilitation Reclamation Fund	14,631,310	158,027	1,159,544	13,313,739
Water Conservation and Utility	23,517,705	-	-	23,517,705
Project Act of August 11, 1939	4,469,268	-	-	4,469,268
Construction, Water Conservation and Utility Project Act	1,417,461	-	-	1,417,461
General Fund	1,797,295	-	-	1,797,295
Emergency Fund, Bureau of Reclamation	5,242	-	-	5,242
Emergency Fund, Grand Valley Project, act of July 1, 1954	23,678	-	-	23,678
National Industrial Recovery Act (NIRA)	3,764,904	-	-	3,764,904
Emergency Relief Administration	324,185	-	-	324,185
Public Works Administration	99,851	-	-	99,851
Claims settlements (Court of Claims awards)	440	-	-	440
Increase in compensation (Special Allotment, WWI)	215,284	-	-	215,284
Working Fund, Interior, Office of Land Utilization	<u>274,681</u>	-	-	<u>274,681</u>
Total	<u>\$167,316,639</u>	<u>\$1,794,797</u>	<u>\$18,100,171</u>	<u>\$147,421,671</u>

11. Cost and property transfers (net)

Cost of equipment, materials and supplies, and services transferred to or from other projects within the Bureau of Reclamation, or other Federal agencies, without a transfer of funds have been recorded by the Bureau as a part of the investment of the United States Government. The net cost comprises:

Appropriation transfer warrants:	
Transfers to Bureau's Denver office to finance costs of investigations and other work in the basin	\$ 54,776
Nonappropriation property transfers (net):	
Transfers from other Bureau projects	5,168,800
Transfers from other Government agencies	96,390
Transfers to non-Federal agencies	-3,017
Other:	
Estimated cost of property constructed by Civilian Conservation Corps	<u>491,800</u>
Total	<u>\$5,808,749</u>

12. Interest on the Federal investment

Amounts recorded as interest on the Federal investment in the upper Colorado River basin have been allocated as follows:

<u>Project</u>	<u>Amount</u>
Colorado River Storage Project and participating projects:	
Glen Canyon Unit	\$1,405,043
Flaming Gorge Unit	147,550
Central Utah	847
Transmission Division	<u>6,939</u>
Total	<u>\$1,560,379</u>

Interest during construction is charged only on the Colorado River Storage Project and participating projects. The interest costs are established by computing simple interest on the balance of the construction work in progress account, less certain exclusions as provided for by Bureau policy. Interest rates of 2.875 percent for the Glen Canyon and Flaming Gorge Units and the Transmission Division of the Storage Project and 3.25 percent for the Central Utah participating project were established by the Secretary of the Treasury in accordance with the authorizing act. The costs excluded from the base in the fiscal year 1959 interest computations amounted to \$17,614,658 on the Glen Canyon Unit, \$706,806 on the Flaming Gorge Unit, \$150,000 on the Transmission Division, and \$495,327 on the Central Utah project. Also excluded was the undepreciated cost of construction service facilities totaling \$15,096,810.

13. Charge-offs authorized by the Congress

These amounts represent net write-offs of construction costs applicable to project lands reclassified as unproductive under authority of the act of May 25, 1926 (44 Stat. 636, 637), as follows:

<u>Project</u>	<u>Amount</u>
Uncompahgre	\$2,878,139
Grand Valley	<u>1,839,426</u>
Total charge-offs authorized by the Congress	<u>\$4,717,565</u>

The Bureau has established a "Reserve for Repayment Reductions Authorized" account which is contra to this account.

14. Funds returned to the United States Treasury

Funds returned to the United States Treasury as shown by the accounting records of projects in the upper Colorado River basin comprise:

Repayment contracts matured	\$ 6,361,635
Rental of grazing and farming lands	320,677
Rental of water	875,292
Interest and penalties	547,030
Miscellaneous cost credits (including \$1,600,555 from water rentals during construction)	4,102,997
Rental of buildings	80,592
Miscellaneous	99,717
Power revenues	<u>328,609</u>
	<u>\$12,716,549</u>

15. Nonreimbursable expenses

The amounts recorded as nonreimbursable expenses are as follows:

	<u>Total</u>	<u>Colorado River Storage Project (advance planning)</u>	<u>Moon Lake Project</u>	<u>Straw- berry Valley Project</u>	<u>Uncompahgre Project</u>	<u>Grand Valley Project</u>
NIRA expenditures	\$ 19,737	\$ -	\$7,032	\$ -	\$ 12,705	\$ -
General investigations, costs non- reimbursable by act of May 6, 1949, Public Law 56, 81st Cong.	134,735	-	-	-	134,735	-
Cost of surveys from Denver office (43 U.S.C. 466)	14,763	-	-	154	9,937	4,672
Costs of fire suppression reimbursed to Utah County from emergency funds	1,293	-	-	1,293	-	-
Costs of quality of water studies financed from Upper Colorado River Basin Fund	<u>69,417</u>	<u>69,417</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
Total	<u>\$239,945</u>	<u>\$69,417</u>	<u>\$7,032</u>	<u>\$1,447</u>	<u>\$157,372</u>	<u>\$4,672</u>

16. Repayments realized from other sources

This account consists of revenues and contributions from water users which have been credited to water users' organizations in determining the original amounts due under their construction repayment contracts. The items credited to the water users are as follows:

Power revenues	\$ 16,309
Rental of grazing and farming lands	227,907
Rental of buildings	44,999
Contributions from water users	3,096
Other	<u>46,431</u>
Total	<u>\$338,742</u>

17. Contributions in aid
of project development and construction

Contributions in cash, property, or services for project development and construction are received by the Bureau from states, municipalities, associations, and individuals. The contributions received through June 30, 1959, are as follows:

<u>Contribution by</u>	<u>Amount</u>
State of Arizona for construction of access road to Glen Canyon Dam and Glen Canyon Bridge	\$1,743,619
Public Service Company of Colorado for construction of Grand Valley Project Power Plant	210,500
State of Utah for investigations of:	
Upper Colorado River Storage Projects	\$53,176
Moon Lake Project	8,093
Vernal Unit, Central Utah Project	3,565
Emery County Project	<u>1,436</u>
	66,270
City of Los Angeles, California, for investigations of Glen Canyon Unit	60,000
Colorado State Highway Department for relocation of state highway	59,217
State of Colorado for investigation of the Curecanti Unit	35,000
Other	<u>26,691</u>
Total	<u>\$2,201,297</u>

APPENDIXES

REVIEW REPORT ON REPAYMENT ANALYSES
OF
COLORADO RIVER STORAGE PROJECT AND PARTICIPATING PROJECTS

Federal Power Commission
San Francisco Regional Office
October 1959

Introduction

On June 26, 1959, in a letter to the Chairman of the Federal Power Commission, the Comptroller General of the United States asked to have Federal Power Commission engineers assist the General Accounting Office in a review of repayment analyses of the Colorado River Storage Project. The two repayment analyses are: (1) the Bureau of Reclamation's report of December 1958, titled "Financial and Economic Analysis, Colorado River Storage Project and Participating Projects;" and (2) a report identified as being prepared by the Colorado River Board of California under date of May 1959, titled "Repayment Analysis, Colorado River Storage Project Units and Power Features of Central Utah Project," hereinafter referred to as the Board's report. In response to the request of the Comptroller General, the Commission agreed to have its staff engineers make an appraisal of the engineering and hydraulic criteria which were used in the repayment analyses to estimate the firm power capabilities and anticipated power revenues. Such an appraisal is contained in this report by the Commission's San Francisco Regional Office. No attempt has been made to make an independent repayment analysis.

Water Supply

The Board's report criticizes the Bureau's use of the 32-year stream-flow period from 1914 to 1945 because this period does not include the low runoff period from 1946 through 1956. It also states that the 32-year period from 1914 to 1945 is overly optimistic and that "the flow data for years prior to 1922 are estimates of questionable accuracy."

A review was made of the estimated and gaged flows of the Colorado River at Lees Ferry for the 63-year period from 1896 to 1958. A hydrograph of this 63-year period on an annual (water-year) basis is attached. It shows "present modified" flows which, as defined on page 18 of the Bureau's report, are those flows which would have occurred in the past had the present level of development and depletions been in full effect.

A gaging station at Lees Ferry has been maintained by the U. S. Geological Survey (USGS) since the summer of 1921. According to the published USGS Water Supply papers, the recorded flows at Lees Ferry, for the water years 1922 through 1958, are excellent.

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The flows for the period from 1914 to 1922 are based on correlation studies using the combined runoff of the Colorado River at Cisco, Green River at Green River, Utah, and San Juan River near Bluff. These three gages measure the runoff from about 81 percent of the drainage area above Lees Ferry. Moreover, the average flow from the watershed above these three gages is approximately 96 percent of the average flow at Lees Ferry. Since the three gages were in operation by 1914, the flows at Lees Ferry for the eight years (1914-1921) can be very accurately estimated. To ascertain the degree of accuracy involved, Mr. Douglas D. Lewis, District Engineer for the U.S. Geological Survey at Tucson, Arizona, was contacted. He reported that, using the period 1928 to 1958 as the period for correlation, a standard error was found, on an annual basis, of 1.2 percent. Flows for the years 1914 to 1922 are, therefore, considered excellent.

Regarding the accuracy of the estimates for 1896-1913, Mr. Lewis reported that, while there seems to be no known method by which the probable error can be estimated for these earlier years, the estimated runoff figures (which are published in Water Supply Paper No. 1313) are probably as good as any that can be derived from existing data. He further expressed the view that it is doubtful that, on an annual basis, any gross errors have been introduced, and that those errors which are inevitable are undoubtedly of a compensating nature.

These earlier flows (1896-1913) are based on records at gaging stations above Lees Ferry which measured the flows from a smaller proportion of the total drainage area at Lees Ferry. Consequently, the accuracy of the estimated yearly flows at Lees Ferry is considered to vary from fair to good for these 18 years.

Attached to this report is a copy of Mr. Lewis' letter of August 19, 1959, concerning the estimated flows of the Colorado River at Lees Ferry.

The Bureau assumed for purposes of their report that present modified flow conditions will exist until about 1963, which approximates the start of the Glen Canyon reservoir filling period. The average annual irrigation depletion corresponding to present modified flows is about 2,550,000 acre-feet. For the purpose of comparing the runoff years to be included in the payout period of analysis, present modified flow conditions are used as a basis of these comments. ^{1/} Since water supply is a primary factor in determining project power benefits, the problem is to estimate the probable runoff over the payout period of the Colorado River Storage Project. The 63 years of measured and estimated flows at Lees Ferry from 1896 to 1958 are used herein as a yardstick of available future water supply. The Bureau's study shows repayment of total power and irrigation costs of the authorized storage units in

^{1/} The Bureau and the Board used the same schedule of depletions to modify historic flows for conditions beyond 1963.

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49 years, compared to 70 years in the Board's study. For the purposes of this report, comparisons are made on the basis of a 50-year repayment period, since Public Law 485 specifies that reimbursable power and irrigation costs must be repaid within that period.

It will be noted from the hydrograph that the average annual flow for the 63-year period is 12.7 million acre-feet, as compared with the Bureau's 32-year average of 13.1 million acre-feet per year. Both of these quantities are somewhat higher than the average annual flow of 11.8 million acre-feet for the 36-year period (1922-1957) assumed in the Board's report. The Bureau's 1914-1945 average is only about 3.1 percent higher than the 63-year average, while the Board's 1922-1957 average, which includes a predominance of dry years, is about 7.1 percent lower than the 63-year average. This might indicate that the Bureau's streamflow period gives an average flow that is somewhat more representative of the long-term average flow of the Colorado River than the streamflow period used in the Board's report. However, the 50-year payout period, using the Bureau's flows, includes a repetition of the years 1914 through 1924 which were mostly wet years, so the actual average annual water supply in the 50-year period is 13.6 million acre-feet, or 7.1 percent greater than the 63-year average of 12.7 million acre-feet.

For the same 50-year period, using the Board's flows and its assumption that a dry period would follow the initial filling of the reservoirs there would be a repetition of the years 1931 through 1938 which were mostly dry years, so the comparable 50-year average annual water supply is 11.6 million acre-feet, or 8.7 percent less than the 63-year average of 12.7 million acre-feet. Consequently, it appears that the Board has been even more pessimistic regarding water supply than the Bureau has been optimistic.

The average annual present modified flow at Lees Ferry for the 50-year period from 1909 through 1958 is 12.8 million acre-feet, which is practically the same as the 63-year average of 12.7 million acre-feet. A logical approach in this matter would be to use the 50 years 1909 through 1958 in the 50-year repayment analysis.

Insofar as the adverse streamflow periods are concerned, the lowest 10-year period of streamflow was that from 1931 through 1940, with an average flow of only 9.6 million acre-feet. This compares with the 10-year average of 10.8 million acre-feet for the periods 1946-1955 and 1947-1956. The low-flow period from 1896 through 1905 averaged 11.3 million acre-feet. Therefore, the streamflow records used by both the Bureau and the Board included the driest decade in the entire 63-year period, but the records used by the Bureau also included many of the wettest years of record and these were repeated in the repayment period. On the other hand, during the same 50-year period, the Board repeated eight of the years in the driest decade of record.

Initial Filling of Reservoirs

The Board's report questions the Bureau's assumption of average runoff conditions during the initial filling period of the four major storage units in the Colorado Storage Project. On page 6, the Board's report states:

"The Bureau studies assume initial filling of an aggregate amount of about 25,000,000 acre-feet of surface capacity between 1962 and 1969. Runoff conditions during 1962-69 are unpredictable, and streamflow may or may not be large enough to fill the storage reservoirs while releasing sufficient water for downstream requirements. In this respect, the Bureau once again assumes the most favorable conditions."

This statement is not strictly correct. First, examination of the table on page 22 of the Bureau's report indicates that the filling period is actually April 1961 through March 1971 instead of "between 1962 and 1969"; second, the water retained as storage during the initial filling period is 23,400,000 acre-feet instead of 25,000,000; and, third, the assumption of approximately average runoff during the filling period is not "the most favorable conditions." A much more favorable condition would be the assumption of a 10-year wet period during the initial filling period, such as that from 1914 through 1923, which has an average annual present modified flow of 15.9 million acre-feet. This is about 21 percent greater than the 13.1 million acre-feet used by the Bureau. As previously indicated, the 13.1 million acre-feet is the average of the 32 years, 1914 through 1945, and it is slightly higher than the 63-year average of 12.7 million acre-feet.

An assumption of average runoff during the filling period is considered reasonable. However, the possibility of a recurrence of the 1931-1956 critical streamflows during the Glen Canyon filling period should be considered. Consequently, a preliminary study of this possibility was made in this office on the basis of the following criteria:

1. Monthly streamflows into Lake Mead are unregulated^{1/} 1970 depleted flows, and these are corrected for evaporation in Lake Mead.
2. Releases from Hoover will average about 10.1 million acre-feet per year during the filling period, since this flow is required to meet firm power requirements at Hoover.^{2/} (Page 5 of Senate Document No. 77 gives total consumptive use below Hoover at 8.9 million acre-feet per year by 1970.)

^{1/} That is, assuming no regulation by upstream storage at Flaming Gorge, Curecanti, Navajo, and Glen Canyon reservoirs.

^{2/} Hoover has failed in the past to meet its firm power requirements under existing contracts and it could do so again, with a repetition of the critical streamflows of 1931-1940 and 1953-1956.

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3. Start of Lake Mead operation is April 30, 1959 (with 20.2 million acre-feet of usable storage available on this date), which corresponds, for purposes of runoff, to April 30, 1933. (April 30, 1959, is the latest date for which data on Hoover plant and Lake Mead were available in this office when this study was made.)

4. No runoff will be stored at Glen Canyon as long as Lake Mead is below 17.0 million acre-feet of usable storage (same as S.D. 77).

Following the above criteria, it was found that Lake Mead would be drawn down to 13.0 million acre-feet by December 1, 1961, the date Glen Canyon Dam is expected to be closed; that while a little water would be stored at Glen Canyon in 1964 and 1965, all of this water would be released to help maintain the power discharge at Hoover of 10.1 million acre-feet per year (assumption No. 2 above); that power generation at Glen Canyon would start in July 1968, but outages would occur each year until July 1973 due to reservoir drawdown below the minimum pool level; and that Glen Canyon reservoir would fill to 19.1 million acre-feet (the same level as in the routings for Senate Document 101) by July 1978, instead of March 1971 based on average inflows. However, a recurrence of the critical flows of 1953 through 1956 would then require that the storage in both the Glen Canyon and Lake Mead reservoirs be drawn down heavily in order to meet the 10.1 million acre-feet per year release at Hoover.

On the basis of this study, it is concluded that the operation of Glen Canyon could be critical for 20 years or more if the 1933-1956 flows should recur beginning April 1959. Further, neither Hoover nor Glen Canyon would fill completely during such a period of streamflow if the present firm power demand at Hoover, requiring about 10.1 million acre-feet of flow annually, is maintained. However, head and water for both powerplants would be available continuously by July 1973. A later check of this preliminary study indicates that the rule curve used in the study for Hoover storage could be revised so that both Glen Canyon and Hoover could operate continuously from July 1968.

It should be noted also that streamflows may be better than average during the initial filling of the reservoirs. In that case results more favorable than those shown in the Bureau's report would be realized. For purpose of analysis, it is considered reasonable to consider that average streamflow would be realized during the initial filling of the reservoirs.

Estimated Amounts of Firm and Non-Firm Power

The Bureau and the Board differ in their method of estimating firm energy, and they use different streamflows for estimating the total salable energy. It follows, therefore, that the estimated amounts of

firm and non-firm energy would differ. Through 1969 the Board's report uses the firm and non-firm energy estimated by the Bureau. After fiscal year 1969, however, the Bureau's power production figures are greater than those of the Board, as indicated in the table below:

Comparison of USBR and Colorado River Board of California
Estimates of Salable Energy
(Million kwh per year)

Fiscal Year	USBR			Colorado River Board		
	Firm	Non- Firm	Total	Firm	Non- Firm	Total
1970	4200	550	4750	4361	0	4361
1980	5700	1150	6850	4883	90	4973
1990	5550	550	6100	4881	190	5071
2000	4850	0	4850	4754	700	5454
2010	5400	1150	6550	4639	450	5089
2020	5200	800	6000	4521	190	4711
2030	4850	350	5200	4453	220	4673
2040	4850	350	5200	4386	550	4936
2049	4850	350	5200	4319	70	4389

The Bureau's total output over the 50 years, 1964-2013, is 17.6 percent greater than the Board's over the same period. Also, the Bureau's firm energy output is 10.1 percent greater.

An examination of the Board's reservoir routing studies indicates that they have based their firm energy on the average output during the 26-year "dry cycle" period, 1931-1956. This, of course, gives considerably smaller results than the Bureau's study which was based on the average annual generation for each 10-year period "within the monthly load pattern estimated by the Federal Power Commission." The total generation was, of course, based upon the 1914-1945 flows.

Of the Bureau's total output of about 284 billion kwh over the 50-year repayment period, about 12.3 percent or 35 billion kwh is non-firm energy. As estimated by the Board, the total output over the same 50-year period is 242 billion kwh, of which about 6.4 percent, or 15 billion kwh, is non-firm energy.

It is believed that the total output figures, as estimated by the Board, are too low because they are based on streamflows that are not representative of the long-term average flow of the Colorado River. (See the section on water supply.) Another important reason for the difference between the Board's and the Bureau's estimates of power output is the assumption as to plant efficiency. The Board's figures are based on an average efficiency of 80 percent as compared with 83 percent by the Bureau. The Bureau's estimate of 83 percent for plant efficiency is considered reasonable.

The Bureau's estimates of power output during the repayment period which begins in fiscal year 1964 are based on the water years 1914 through 1945. The average flow during that period of years was used through 1970, so water-year 1914 corresponds to year 1971 in the repayment study. Because the streamflow record covers only 32 years, the wet years beginning on 1914 are repeated at the 40th year of the repayment study, year 2003. This assumption increases the estimated amount of both firm and non-firm energy over what would be obtained by using a 50-year record of streamflows. The increase would not, however, be proportional to the increase in available water because some of the water during a series of wet years is spilled. Using the Bureau's assumption, the average annual flow at Glen Canyon would be 13.6 million acre-feet during the 50-year period, as compared with the 32-year average of 13.1 million acre-feet and the average annual flow for the 50 years 1909-1958 of 12.8 million acre-feet. Although the figure of 13.6 would be reduced somewhat by spills, it appears that the Bureau's estimates of power output may be slightly optimistic.

The Bureau's criteria for estimating the proportion of energy output that would be firm are considered reasonable. One reason for this conclusion is the fact that the power from the project plants will be absorbed in electric power systems having large installations of steam-electric generating capacity. On the basis of a power market survey made by this office in 1958 it is evident that all energy generated by plants of the Colorado River Storage Project will be usable either directly in supplying loads or as fuel-plant energy replacement.

Repayment of Costs

A comparison of the Board's independent payout study (Table 2 of their report) with that shown on page 51 of the Bureau's report indicates that the reason for the wide discrepancy in the payout dates and "surplus net power revenues available to States by 2049," shown on page 13 of the Board's report, is due to the differences in estimated amounts of deliverable energy and in the apportionment of such energy between firm and non-firm. The reasons for such differences have already been discussed in this report. The Bureau and the Board used the same unit rates for the sale of firm and non-firm energy so the value of energy was not a factor in the differences.

The Board assumed the same deliverable firm and non-firm energy as the Bureau through fiscal year 1969. Therefore, the differences in power revenues do not begin until fiscal year 1970. However, due to the differences in estimated revenues beginning in 1970, the Board's payout analysis indicates that the power investment would be paid out in fiscal year 2028 or 65 years after the start of power production, as compared with 46 years (fiscal year 2009) in the Bureau's study; also, the Board's payout analysis indicates that the allocated irrigation costs would be repaid by 2033, or 70 years after the start of power production, as compared with 49 years (fiscal year 2012) in the Bureau's study.

Costs Allocated to Irrigation

The Board contends that the Bureau's allocation of costs to irrigation is too large. The principal reason given is that an alternative single-purpose river control system to permit anticipated Upper Basin development and at the same time to meet III (d) obligations under the Colorado River Compact need not be constructed for 50 years or more, and then a relatively small, easy to fill, reservoir would be all that would be required. This is in contrast to the Bureau's assertion that large holdover storage reservoirs are needed to provide additional water when required for compact fulfillment during prolonged periods of drought. The Board's argument on this point appears to be academic because the decision to provide holdover storage has been made. Furthermore, any change in the allocation to irrigation would not materially affect the project payout period. In any event, the question of allocated costs is not a factor in comparing the two repayment analyses because the same costs were used in both analyses.

On page five of the Board's main report, it is indicated in connection with the need for holdover storage in the Upper Basin, that a release of 75,000,000 acre-feet in a 10-year period to meet Article III(d) of the Colorado Compact is all that is required. However, reference to column 9 of Exhibits A-3, A-4, and A-5, and the explanatory notes following these exhibits, indicates that the minimum annual release from Glen Canyon is not governed by firm power requirements, but by the Upper Basin delivery obligation. This is assumed there to be equal to the Article III(d) obligation of 7.5 million acre-feet plus one-half of the Mexican Treaty requirement of 1.5 million acre-feet, or a total of 8.3 million acre-feet annually. This would put the need for holdover storage in the Upper Basin at about 1982, instead of the "50 years or more" indicated in the Board's report. In addition, the Upper Basin may be required to provide water equivalent to the channel losses inherent with one-half of the Mexican Treaty water.

Conclusions

1. The Bureau's estimates of potential generation were based upon an assumed recurrence of 1914-1945 streamflows, whereas the corresponding estimates by the Board were based upon an assumed recurrence of 1922-1957 streamflows. In a 50-year repayment analysis the usual practice would be to assume a repetition of the flows during the latest 50 years of record, which in this case would have been the years 1909-1958, or 1908-1957 if the 1958 flows were not available at the time of the analysis. The flows used by the Bureau are higher than the average flow during these 50 years while those used by the Board are lower.

2. The Bureau's assumption of average streamflow during filling of the storage reservoirs is reasonable. However, it used an average annual flow of 13.1 million acre-feet, based upon the 32 years, 1914-1945, which is slightly higher than the 1909-1958 average annual flow

of 12.8 million acre-feet, and the longer 63-year average annual flow of 12.7 million acre-feet. Although it is reasonable to anticipate average flows during the filling of the reservoirs, studies show that operation of Glen Canyon could be critical for 20 years or more if the low flows of 1933-1956 should recur coincident with filling of the reservoir.

3. The total energy output estimated by the Board is too low for two reasons: (1) because it is based upon an average annual streamflow of 11.6 million acre-feet which is substantially lower than the average annual flow of 12.8 million acre-feet which occurred during the 50 years, 1909-1958, and (2) because the assumed overall plant efficiency of 80 percent is low. The Bureau's estimate of a plant efficiency of 83 percent is more reasonable.

4. The Bureau's estimate of total energy output in the 50-year repayment period may be slightly high, because it is based upon average annual flows of 13.6 million acre-feet as compared with the average annual flows of 12.8 million acre-feet which occurred during the 50 years, 1909-1958. Reduction of these flows to take account of spills would reduce the indicated difference in the water available for generation.

5. The Bureau's method of determining the proportion of the total energy that would be firm is considered reasonable. On the basis of the anticipated power loads in the market area, the Bureau's method would indicate greater amounts of firm energy than would be obtained under the Board's method, even if each derived its total estimate of energy from use of the same streamflow records.

6. The Bureau's payout analysis indicates that the power investment would be repaid in 46 years and the allocated irrigation costs in 49 years, whereas the Board's payout analysis shows repayment of the power investment in 65 years and the irrigation costs in 70 years. In both analyses the same project costs and the same unit rates for the sale of firm and non-firm energy were used. Therefore, the basic difference between the two analyses is in the different amounts of firm and non-firm energy estimated to be available and salable.

7. The Board's criticism of the Bureau's allocation of costs to irrigation is not a factor in comparing the two repayment studies because the same costs were used in both analyses.

8. The time that will be required for the repayment of a water resources development as large and complex as the "Colorado River Storage Project and Participating Projects" is not susceptible of precise determination. Understandably, judgments will vary with respect to estimates of what flows will occur over the repayment period, including the amounts available for power production. However, it appears that the repayment analysis made by the Bureau of Reclamation is reasonably realistic.

C O P Y

Address Reply to:	UNITED STATES	Water Resources Division
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P. O. Box 4126		Tucson, Arizona
Tucson, Arizona	August 19, 1959	

Mr. Leshar S. Wing
 Federal Power Commission
 San Francisco, California

Discharge - Colorado River at Lee's Ferry, Ariz.

Dear Mr. Wing:

The original estimates of discharge for Colorado River at Lee's Ferry, Ariz. were made by Mr. E. C. LaRue and published in Water Supply Paper 556. These records were reviewed by Mr. W. E. Dickinson and some revisions by him were published in W.S.P. 918. At various times in the past these records have been reviewed, with final revisions published in W.S.P. 1313. It is highly doubtful if the records used in W.S.P. can be improved and we hope that no further changes will be made.

For the period 1914 through 1922, the final revisions were computed on the basis of correlations of monthly runoff at Lee's Ferry with the combined runoff of Colorado River at Cisco, Green River at Green River, and San Juan River near Bluff, for the period 1922 to 1950. The correlation values so obtained were then applied to the combined flow of the upper stations to provide computed monthly records for Lee's Ferry from 1914 to 1922. It was found that the records so computed were almost identical with those in the Final Report of the Engineering Advisory Committee to the Upper Colorado River Basin Compact Committee, dated November 29, 1948. Accordingly, the figures in the aforementioned report were published in W.S.P. 1313.

The probable error of these records would depend upon

- (1) The standard error of correlation,
- (2) The weighted error of records at Cisco, Green River, and Bluff.

Using the period 1928 to 1958 as a period for correlation we have found a standard error, on an annual basis, of 1.2 percent.

During the period October 1917 to February 1927 there was no gage on San Juan River near Bluff, and, to fill in this period, it was necessary to correlate the records near Bluff with those of San Juan River at Shiprock, San Juan River at Farmington and Animas River at Durango. These correlations are considered no better than fair. However, it should be pointed out that the San Juan River normally contributes between 10 percent and 20 percent of the discharge past Lee's Ferry. Thus a 15 percent error in the records of San Juan River near Bluff would introduce a probable error of less than 3 percent in the computed records at Lee's Ferry.

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Original estimates for 1895-1913 were also published in W.S.P. 556. Some changes were made in W.S.P. 918, as revisions were made in the upstream records on which the Lee's Ferry figures depended. There has been subsequent review but no basis for any revisions to the records published in W.S.P. 918. There seems to be no known method by which the probable error of these earlier records can be determined.

The stream flow records of Colorado River at Lee's Ferry, Arizona have probably been given more critical examination than those on any other river in the United States, both by the Geological Survey and by other agencies. While the estimated or computed records are not to be considered as good as the gaging station records, the runoff figures published in W.S.P. 1313 for such periods are probably as good as any that can be derived from existing data. It is doubtful that, on an annual basis, any gross errors have been introduced; those errors that are inevitable are undoubtedly of a compensating nature.

Very truly yours,

s/ DOUGLAS D. LEWIS
District Engineer

cc: Division Hydrologist



